Dayton Contest University 2023

CTU
CONTEST UNIVERSITY

Dayton Contest University

May 18, 2023

Hope Hotel

Dayton, Ohio

Youth On The Air

There is youth in ham radio!

YouthOnTheAir.org

Stop by our website for all the information about the Youth on the Air movement in the Americas. We promote all youth ham radio programs, contests, and opportunities across the hemisphere. In addition, we sponsor a summer camp and participate in December YOTA month and the YOTA contest.

Visit Us at Booth 4304 at Hamvention!

Listen for **VE3YOTA** on the air July 16-21, 2023 from our next camp!

The **World Wide Radio Operators Foundation** was created in 2009 by a group of experienced radio operators who saw the need for an independent organization devoted to the skill and art of radio operating. Until now, many of the elements of modern radio contesting such as log-checking software, log submission robots, etc., have been developed and supported by volunteers. Who will organize and fund the enhancement of these tools into the future? The **World Wide Radio Operators Foundation** was created to help fill that need.

WWROF is dedicated to improving the skills and fun of amateur radio operators around the world by utilizing education, competition, advancement of technology and scientific research, promoting international friendship and goodwill, and preparing them to better serve society in times of communication need.

WWROF Programs

- Webinar series on contesting and operating topics
- Stewardship of the Cabrillo log file standard
- Log submission and processing infrastructure
- Contest award management including certificate and plaque distribution
- Support of Contest University and WRTC
- Other projects that support contesting

WWROF Contester's Code of Ethics

- I will learn and obey the rules of any contest I enter, including the rules of my entry category.
- I will obey the rules for amateur radio in my country.
- I will not modify my log after the contest by using additional data sources to correct callsign/exchange errors.
- I will accept the judging and scoring decisions of the contest sponsor as final.
- I will adhere to the DX Code of Conduct in my operating style.
- I will yield my frequency to any emergency communications activity.
- I will operate my transmitter with sufficient signal quality to minimize interference to others.

Leadership

Tim Duffy, K3LR, Chair
Doug Grant, K1DG, Vice-Chair
Ralph Bowen, N5RZ, Treasurer
Tom Lee, K8AZ, Secretary
John Dorr, K1AR, Founding Director
Mark Beckwith, N5OT, Founding Director
Bob Cox, K3EST, Founding Director
John Sluymer, VE3EJ, Director
Tine Brajnik, S50A, Director
Randy Thompson, K5ZD, Director
Philipp Springer, DK6SP, Director
Teri Grizer, K8MNJ, Executive Administrator

Donate

Can you imagine contesting without electronic logs? Sophisticated log checking software? Online certificates? The World Wide Radio Operators Foundation is completely dependent on contributions for our funding. We welcome donations of any amount to help us fund our projects.

WWROF is recognized by the Internal Revenue Service as a tax-exempt public charity under section 501(c)(3) of the Internal Revenue Code.

Learn more. Visit wwrof.org

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Dayton, Ohio USA

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Welcome!

On behalf of the CTU Board of Directors K1DG, N9JA, K1AR, CTU Chief Coordinator K8MNJ and the CTU Professors of Dayton Contest University 2023 we are pleased you are here and we extend a warm welcome to you!

There have been more than 55 CTU’s held in the past sixteen years. CTU’s have been held here in Dayton, Chicago (small CTU), Brazil, England, Germany, Finland, Italy, Australia, and Puerto Rico.

Over 20 presentations are available here at Dayton Contest University 2023 They are the work product of many hours of effort by your Professors and the CTU staff (thank you again to K8MNJ, KC3UCJ, N8AMY, N9RV, DL1QQ and K1SO for all they do to make CTU happen). Continuing with our attention to youth in ham radio we are proud to have Philipp, DK6SP from Germany as a Professor here.

Icom America has led the way by sponsoring CTU from the start in 2007. Contest University would not be possible without the support of Ray Novak, N9JA and Icom, DX Engineering and the ARRL. They all have contributed their help and guidance in making this CTU the best ever. Please support these vendors who have given back to our RadioSport hobby.

Contest University is a platform for sharing ideas and learning new ways to enjoy Amateur Radio Contesting. We hope you will enjoy and share what you learn here today.

Finally, while we have tried to make everything as perfect as possible for you here at CTU, I ask for your patience as we work out any problems. Your ongoing support for CTU is critical as we move forward to more Contest University’s in the future.

Thanks so much to Teri, K8MNJ – all of what you see here at CTU would not be possible without her.

Remember to Always – Share, Learn, Enjoy and Encourage!

Very 73!

2023 Dayton Contest University "CTU" – COURSE OUTLINE – 7:00 AM to 5:00 PM

7:00 ALL ROOMS – Student Registration and Contest Buffet Breakfast – ALL – 60 minutes
8:00 ALL ROOMS – Welcome to CTU 2023 – K3LR, W8CI and N9JA – ALL – 10 minutes
8:10 ALL ROOMS – Radiosport - Read the Rules Follow the Rules & Have Fun - K1DG – ALL – 40 minutes

9:00 CONTEST TOPIC SESSION #1 – attend ONE of 4 sessions – 60 minutes

ROOM 1 – Basic Station Automation Techniques & Recommendations - N6TV
ROOM 2 – Optimizing Low Band Receiving Antenna Performance - W3LPL
ROOM 3 – Understanding Remote Contesting - W1VE
ROOM 4 – RTTY - FT4/FT8 Digital Contesting - W0YK

10:00 ALL – *CONTEST SNACK* – 15 minutes

10:15 CONTEST TOPIC SESSION #2 – attend ONE of 4 sessions – 60 minutes

ROOM 1 – Small Stations - Getting to the Next Level - N0AX
ROOM 2 – Competitive Transmitting Antennas for Solar Maximum - W3LPL
ROOM 3 – Year Long Contest! State QSO Party Challenge & CQ DX Marathon - K8ZT
ROOM 4 – How to Maximize Your Digital Contest Station & Operation - W0YK

11:20 CONTEST TOPIC SESSION #3 – attend ONE of 4 sessions – 55 minute

ROOM 1 – How You Can Become Involved With Youth on the Air - DK6SP
ROOM 2 – How the Strongest Solar Maximum in 20 Years Affects Planning - W3LPL
ROOM 3 – Simple & Effective Low Band Antennas for Contesting - W5ZN
ROOM 4 – QRP & Low Power Contesting - Tips & Strategies - K8ZT

12:15 ALL ROOMS – *CONTEST LUNCH* – ALL – 35 minute

12:50 ALL ROOMS – 2023 Eye Ball Sprint Contest "LIVE" – ALL – 10 minutes – K1DG
1:00-1:35 ALL Rooms – Contesting for Ionospheric Science During the 2023 & 2024 North American Solar Eclipse – W2NAF

***1:45 CONTEST TOPIC SESSION by REQUEST to RERUN** – 50 minutes

ROOM 1 – As determined by *vote 1
ROOM 2 – As determined by *vote 2
ROOM 3 – As determined by *vote 3
ROOM 4 – As determined by *vote 4

2:40 CONTEST OPEN DISCUSSION Q&A GROUPs Attend ONE of 4 sessions – 30 minutes

ROOM 1 – Waterfalls & USB Port Q&A - N6TV
ROOM 2 – Small Stations - Getting to the Next Level - N0AX
ROOM 3 – Remote Station Help & Ideas - W1VE
ROOM 4 – Tower Climbing & Tower Safety - W3YQ

3:15 CONTEST OPEN DISCUSSION Q&A GROUPs Attend ONE of 4 sessions – 30 minutes

ROOM 1 – VHF Contest - Update and Questions - W5ZN
ROOM 2 – Improving Your Contest Station Competitiveness & Reliability - W3LPL
ROOM 3 – Digital & RTTY Contesting - W0YK
ROOM 4 – QRP Contesting & State QSO Parties - K8ZT

3:45 ALL – *CONTEST SNACK* – 15 minutes

4:00 ALL ROOMS – Transceiver Performance & Selection of a New Radio - NC0B – ALL – 50 minutes
4:50 ALL ROOMS – 2023 CTU Survey – K3LR – ALL – 10 minutes

*** 1:45 PM CONTEST SESSION by REQUEST vote to RERUN**
CTU students will vote for 4 topics/classes that they missed and would like to have presented again – the top 4 WANTED by vote – will RERUN in this time slot.

Author Bios

Frank Donovan, W3LPL

Frank's contesting career began as twelve-year-old at the Providence Radio Assn. 1959 ARRL Field Day, W1OP/1, on Neutaconkanut Hill two miles from his home in Providence, Rhode Island. Soon afterwards he began to slowly build his own small contest station on 1/10th acre in a densely populated urban neighborhood.

17-year-old K1LPL finished first place USA in the 1964 ARRL CW DX Contest low power category. In 1968 he was the leader of the W1OP/1 Field Day that finished in first place in the 4A category from a former World War II FCC Radio Intelligence Division monitoring site in Scituate, RI. Immediately after college, US Air Force 2nd Lieutenant Frank Donovan's first military assignment was in the Washington D.C. area where he worked under PVRC member W3GN and with his multi-multi mentor W4BVV.

Frank finished first place USA single operator in four CQWW CW and four ARRL CW DX contests from 1973 to 1978. His first multi-multi experience was with the world high scoring 1974 PJ9JT CQWW CW team. W3LPL multi-multi teams started 46 years ago with a small entry in the 1977 ARRL Phone DX Contest. Five years later two incredible long nights of 10-meter JA runs unexpectedly produced his team's first USA multi-multi win in the 1982 ARRL Phone DX Contest, the same year that renowned multi-multi competitor W2PV became a silent key.

W3LPL multi-multi teams have completed more than one million QSOs and achieved more than 50 first place USA finishes out of more than 150 multi-multi entries in the CQWW and ARRL DX contests. Frank was inducted into the prestigious CQ Contest Hall of Fame in 1999 and is a regular presenter at Contest University. He retired 11 years ago as a Chief Engineer at General Dynamics Corporation after a 45-year career in electronics and systems engineering.

Tim Duffy, K3LR

Tim has been an active contest operator for over 50 years. He has hosted over 150 different operators as part of the K3LR multi operator DX contest efforts since 1992 – which have made almost 900,000 QSOs. Tim served on the ARRL Contest Advisory Committee as a member and multi-year Chairman. K3LR has been an active member of the CQ Contest Committee for 33 years. Tim was the Atlantic Division Technical Achievement award winner in 1998. He was moderator of the Dayton Contest Forum for 10 years and has been moderator of the Hamvention Antenna forum for 39 years. He is a founding member and Vice President of the North Coast Contesters. K3LR serves as founder and chairman of Contest University (16 years) and the Dayton Contest Dinner (29 years), chairman of the Top Band Dinner (11 years) – as well as coordinator of the Contest Super Suite (37 years) in Dayton. He is the founder and moderator of the popular RFI Reflector (RFI@contesting.com). He has been a guest on Ham Nation many times. Tim was a member of Team USA at WRTC – five times. Tim serves on the board of directors of the World Wide Radio Operators Foundation (WWROF) as Chairman. He was President of The Radio Club of America (RCA) from 2016 to 2018. Tim is President of the Mercer County Amateur Radio Club - W3LIF (21 years). K3LR was elected to the CQ Contest Hall of Fame in 2006. He was honored with the prestigious Barry Goldwater Amateur Radio service award by RCA in 2010. Tim served as ARRL Section Manager for Western Pennsylvania 2015/2016. Tim was honored to be the 2015 Hamvention Amateur of the Year. K3LR was awarded the YASME Excellence Award in 2016. K3LR is a graduate of Pennsylvania State University. Tim is the Chief Executive Officer of DX Engineering.

Dr. Nathaniel Frissell, W2NAF

Nathaniel Frissell, W2NAF, is an Assistant Professor of Physics and Engineering at The University of Scranton. Nathaniel's passion for radio and radio science began in middle school when he was introduced to the amateur radio hobby through scouting. He eventually went on to earn his B.S. in Music Education and Physics from Montclair State University, and M.S. and Ph.D. in Electrical Engineering from Virginia Tech working in the Virginia Tech Super Dual Auroral Radar Network (SuperDARN) laboratory. Nathaniel founded and now leads the Ham Radio Science Citizen Investigation (HamSCI) citizen science collective. Nathaniel is the advisor for the W3USR University of Scranton Amateur Club, is a winner of the 2017 Yasme Foundation Excellence award, the 2019 Dayton Amateur Radio Association Amateur of the Year Award, and is a 2021 inductee of the CQ Amateur Radio Hall of Fame.

Joel Harrison, W5ZN

Joel was first licensed as WN5IGF in 1972. His first contest was the 1973 ARRL Novice Roundup followed by the old ARRL CD Party in 1973 as a General Class licensee. His interests later turned to VHF contesting, finally breaking into the top 10 in the ARRL June VHF contest in 1993. In June 1996 he won first place in the single op category setting a new world record under the callsign WB5IGF. In 1998 he returned to the June contest as W5ZN, once again winning first place and breaking his previous 1996 record. In 2001 he won first place single op in the ARRL UHF Contest and in 2011 the W5ZN team won first place in the Limited Multiop category of the ARRL June VHF Contest. W5ZN was a team member of the record setting WA8WZG contest team in 1999 and 2000 and the K1WHS team that finished first in the multiop category of the 2010 ARRL September VHF contest outing multi-year winner W2SZ.

W5ZN is also very active in HF DX contesting, especially on the low bands. In the 2006 ARRL DX Contest he set a new 80-meter CW record for the W5 call area that held until 2009. In 2011 he reclaimed that record that still holds today. He is a member of the N2CEI Multi-op team for the ARRL 160 Meter Contest and in 2016 was a team member of the W2GD CQWW 160 CW Contest Team finishing with the top claimed NA score.

In 2015 he challenged a group of "Rookies" in his local club to learn CW and the prize was to operate the W5ZN station in the 2015 ARRL Rookie Roundup – CW as a Multi-op team that finished with the most Q's.

Joel holds 11 band DXCC, 11 band VUCC, and is an A-1 Operator. In December 2021 he completed his 12th Worked All States band, becoming the 11th recipient of a 222 MHz WAS.

He served as ARRL President from 2006 until 2010 when he retired from ARRL elected volunteer service after 27 years. In 2014 he was awarded the ARRL Medal of Honor for outstanding service to amateur radio. In 2021 he was elected to serve as Secretary of the International Amateur Radio Union and is active in the IARU HF World Championship contest providing the coveted "AC" multiplier!

Professionally Joel is a Research Analyst in the Applied Physics group of the Pacific Northwest National Laboratory's Nuclear Engineering & Analysis Division.

Gerry Hull, W1VE

Gerry began his contesting career a year after receiving his first license in 1975, participating in ARRL SS as WA4UUX. Hailing from Nova Scotia, Canada, he returned to the Maritimes for college.

Originally operating as VE1BXC, later as VE1CER then VE1RM, he began a life-long love for multi-operator contesting, operating with the winning VE1DXC crew at Bob Billing's. VE1YX's QTH.

After college, he worked in broadcasting, and then returned to the US, joining ARRL HQ as a Lab Technician, moving on to become an Assistant Technical Editor under the tutelage of Doug DeMaw, W1FB. W1FB suggested Gerry head up to Mt. Greylock to see what was up in V/U/uW contesting and technology, leading to a 30+ year amazing relationship with the W2SZ/1 crew, the so-called "Mount Greylock Expeditionary Force". The Greylock gang is an amazing group of engineers, builders and operators, who continue to dominate VHF multi-op contesting.

While at HQ, he joined Murphy's Marauders, then on to the Yankee Clipper Contest Club. From 1982 to 1985, he organized and participated in three DXpeditions, to Canada's St Paul Island (VE1SPI/'82, CY0SPI/'83) and to Sable Island (CY0SAB/'85). Continuing his passion for Multi-Operator contesting, he has spent the better part of 46 years in the hobby operating from powerhouse stations K1ZZ, K1TTT/KY1H, K1IR, K1LZ, K2LE, P40LE, VY2SS, HP3SS, 6Y1V, ZF5T, LO5D and many others. Gerry is proud of the scores generated by these multi-op teams, typically in the top 10, including top NA wins in ARRL DX CW and SSB, and a world win in ARRL DX CW M/S from P40LE.

Gerry enjoys mixing his avocation with his vocation, which has been software development for many decades. In September 2007 he built getscores.org, the first real-time score reporting system for the World Wide Web. Controversial at first, this concept has bloomed into another fun aspect of the game. Over the years, he has developed many applications for ham radio contesting.

A lifelong passion for ARRL SS led Gerry to a bucket-list quest: operate from as many different sections as possible in his lifetime. VY1 was a very interesting QTH, but the expense of travel vs the chance of poor propagation led to a multi-year relationship with J, VY1JA – operating the station via Internet remote. This has been very successful, and VY1AAA, the Internet-remote club call at J's place, has provided the rare multiplier to many of the deserving.

Gerry introduced remote contesting to many in the contest community at WRTC 2014 in Boston, organizing six remote stations at the HQ Hotel. SK3W, K2LE, VY1AAA, PR1T, RHR Blueberry Hill. and N3AD were activated remotely. Gerry was a referee at WRTC 2018 in Germany, and again setup VY1AAA and K2LE for remote activation by guest ops from Germany. Gerry will also be a referee at WRTC 2022 in Bologna, Italy in 2023.

The COVID pandemic restricted much multi-op, in-person operation. Remote via Internet helped keep people safe and stations active. However, the Internet, networking technology and our radios have improved to the point where remote contesting is not only practical, it is very competitive. Gerry continues to innovate and help fellow contesters develop great remote operating strategies and techniques. He is currently the Remote Contesting columnist for the National Contest Journal, where he discusses techniques and technology for remote contest operating.

Tim Jellison, W3YQ/KL7WV

Tim was licensed in 1973 at 13 years of age. He achieved 5BDXCC then went on to confirm 100+ countries on 160. He is on the air regularly, chasing DX, and he participates in CW DX contests, these days primarily as an operator at the K8AZ multi-op station.

Professionally, he took a job managing a satellite communication facility following his graduation from Penn State in 1981. He then changed career paths in 1999 and accepted a position running a cellular network throughout the state of Alaska. He left corporate life in 2012 and is now semi-retired, working for a commercial tower company.

Tim has been a technician and a technical manager all of his adult life. He's been involved in all aspects of electronics, radio, towers, and antennas. He holds a valid FCC Radiotelephone License and is Comtrain and CITCA certified as an Authorized/Competent Tower Climber/Rescuer. He's installed, maintained, and repaired numerous towers and antennas and can often be found working on K3LR's equipment and towers.

Anthony Luscre, K8ZT

First licensed in 1981 as KA8NRC, Anthony has been a QRP operator from his very first QSO (no one told him Novices should not start with a 2-watt QRP rig). Changed callsign to K8ZT in June 2000 after updating to Extra Class License. One significant thing in his early Amateur Radio learning was the publications of two QRP clubs - **SPRAT** from the GQRP Club and **QRP Quarterly** from the QRP ARCI.

He is active in a variety of Amateur Radio activities, but his favorite activity is operating! Whether it is contesting, DXing or rag chewing, satellites, etc. CW Phone or Digital, the QRP contacts have added up and now top 108,000. First drawn to contesting by his love of working DX, he has consistently finished in the top ten of a variety of major contests and finished first in the US in both CQ Worldwide Phone and CW QRP categories multiple times. As a bonus, his QRP DXCC total recently topped the 328 mark, and he has completed 11-band WAS.

Recently retired, Anthony's work background includes 20 years as a Medical Technologist working in Clinical Microbiology and private computer consulting and 20 years as a Computer Technology Coordinator, Technology Director (most recently as a Technology Integration Specialist for 30 school districts). His retirement activities include volunteering as a Trainman on the Cuyahoga Valley Scenic Railroad.

Anthony lives with his wife Linda, KA8ODP, near Akron, Ohio. His station is definitely not a super contesting station. His small suburban lot is cramped with a modest array of antennas, proving that you can be competitive in contests without acres of aluminum if you choose your entry category carefully.

Anthony currently serves as ARRL Ohio Section Youth Coordinator. He enjoys sharing his Amateur Radio interests with others by maintaining a website k8zt.com, writing articles for a variety of publications, including **CQ Magazine** (column "Ham Radio Explorer"), DX Engineering blog "On All Bands" and developing an online course "Introduction to Contesting" for the ARRL. In addition to frequent in-person club presentations pre-COVID, during the pandemic, he has done over 325 club presentations virtually in multiple states and countries.

Ed Muns, W0YK

Ed, W0YK, entered CW and SSB DX contests initially in the early 1970s as a way to work new band/mode-countries for DXCC. His interest rapidly evolved from DXing to contesting with his early learning at the K0RF multi-multi. Today, CW and RTTY contesting dominate Ed's operating time. His local contest club, the Northern California Contest Club (NCCC), mounted an effort for the club competition gavel first offered in the 2004 ARRL RTTY Round-Up where Ed reluctantly (kicking and screaming) learned how to setup RTTY and ultimately won the Pacific Division SOHP plaque. He ironically enjoyed that induction into RTTY so much that he now includes all the major RTTY contests in his contesting schedule. With his P49X call sign, Ed holds the world SOHP record in ARRL RTTY Round-Up, having broken the record eight times, and the world SOHP record in CQ WPX RTTY, having broken that record seven times and set a world SOHP record in the 2010 CQ WW RTTY. Ed is the contest manager for the NCJ NA RTTY Sprint and the contest director for the two CQ RTTY contests, CQ WW RTTY and CQ WPX RTTY. He and Don, AA5AU, sponsor the FT Roundup which they initiated as the Ten-Meter RTTY Contest in December 2011 with nearly 700 logs submitted. In 2018, it became the FT8 Roundup with over 1200 logs using ARRL RTTY Roundup rules. He was inducted into the CQ Contest Hall of Fame in May 2014. This is his sixteenth year at CTU delivering the two Digital Contesting presentations and Q&A.

Rob Sherwood, NC0B

Ham radio began for me in 1961 in Cincinnati, Ohio, as both a novice and general-class operator. After graduating college in 1969 with a degree in physics, I moved to Denver and worked for KOA radio as an engineer until 1987. While at KOA, I maintained their 50 KW AM and FM transmitters, microwave links and studio equipment.

1974 saw the beginning of Sherwood Engineering, offering roofing filters and upgrade kits for the Drake R-4C. In 1976 I started measuring receiver performance on dozens of radios, since reviews in QST did not correlate with actual on-air observations at crunch time in CW contests. In 1977 “ham radio magazine” published the first of several of my articles on receiver problems and cures, vertical antenna ground systems and mobile antenna efficiency. Those articles are available on my web site as PDF files. Receiver test data is now web based with 150 transceiver and receiver listings.

www.nc0b.com/table.html.

In the 80s I was invited to be a forum speaker at the Dayton Hamvention on several occasions, discussing both receiver and antenna performance issues. In 2004 I returned to the Dayton Contest Forum, giving a talk on the status of receivers both old and new, with special emphasis on the Orion and the Icom 7800. In 2007 the Drake Forum had me present a talk on the pros and cons of the new batch of DSP transceivers. In 2009 I made a presentation at the Dayton Hamvention Antenna Forum on ground systems for vertical antennas.

2016 included a presentation at the Visalia DX Convention. In 2017 & 2023 I spoke at ARRL Hamcon in Wyoming. Also two appearances at the Duke City Hamfest in Albuquerque, NM.

Contest University 2023 will be my 16th annual presentation at this great event.

Other speaking invitations at ham events have included W0DXCC, W9DXCC, W4DXCC, YCCC, New Orleans, Austin, Huntsville, Tucson & St. Louis. Locally around Colorado I have discussed receiver performance at the Boulder Amateur Radio, Northern Colorado Amateur Radio, Colorado QRP & 285 TechConnect Radio Clubs.

Sixteen years ago, my XYL encouraged me to build my dream contest station on 10 acres east of Ft. Collins, Colorado on the Pawnee Grassland. This has made it possible to evaluate top transceivers in major contests in a real-world environment to augment my laboratory data. This rural setting has allowed me to focus my interest on effective antennas. Six towers support 9 mono-band HF Yagis, plus 6m, 2m and 70cm, and wire antennas for 160, 80/40 and 30 meters.

I use WSJT X on the 475 kHz band with a 630-meter transverter manufactured in Australia driven with an IC-7610. I use my 160-meter Marconi T antenna with a separate tuner on 475 kHz.

My 630m log of 38 states, including Hawaii, Alaska and Maine using JT9 & FST4. My best DX on 475 kHz is over 8000 miles between Colorado and Australia, having worked Roger, VK4YB, three times.

In person presentations for 2023 so far have been Winterfest in Collinsville, IL, with two Zoom club meetings in March in Wisconsin and Ohio.

Ward Silver, NØAX

Ward has been an active contester since before his Novice days began in 1972, participating with high school club friends. His list of contest operating spans four continents and includes a variety of good scores from home and multioperator stations such as HC8N, PJ4Q, KH6RS/NH6T, K3LR, K9CT, W7RM, KL7RA, W5ZN, and W1AW. Hosting multi-ops with the Elayer Contest Club (W0ECC) is a lot of fun, too!

Ward is a founder of the World Radiosport Team Championships (WRTC) which began in 1990. He was inducted into the CQ Contest Hall of Fame in 2015. In 2013 he was elected President of the Yasme Foundation which supports amateur radio activities around the world. He is the Lead Editor of the ARRL Handbook, Antenna Book, and is the author of Ham Radio for Dummies, now in its 4th edition. He received the Bill Orr Technical Writing Award from the ARRL twice - once in 2003 and again in 2017.

He considers himself fortunate to have a few top finish plaques on the wall of the radio room but the best part is participating in record-setting team efforts with friends from around the world.

Philipp Springer, DK6SP

Philipp started the hobby back in early 2008 at age 10. At this time, the radio youth group got on the air with their educational callsign DN5KID. When he turned age 14 at the end of 2011, he sat his exam to get the novice license DO6PS. Two years later in 2013 he updated to a full HAREC license and call sign DK6SP, which he has kept ever since. In 2016 he applied for the contest call DQ5M where you can work him in most major contests.

Since the end of 2020 he is the chair of the IARU Region 1 Youth Working Group and thus coordinating youth projects within our common hobby. Furthermore, he serves as one of the Directors on the Board of World Wide Radio Operators Foundation (WWROF) and is a member of AGCW-DL, CWOPS, DARC, GDXF, SKCC, and the Bavarian Contest Club where the love of contesting was found out. He also operated at former DL1A when the crew invited him to join their team. During his time there he learned essential contesting skills, including how to run pileups and now cannot get enough of them.

Philipp also has a love for travelling the world and takes every opportunity to visit DX locations. In the past he has been active from various DXCCs like 3B8, 5B, 9A, 9J, A4, EI, ES, GW, P4, PJ2, PJ4, V3, W8, Z6 and others to participate in worldwide contests from big gun stations, doing holiday style or serious DXpeditions. He has also participated in the WRTC 2018 in Germany as team Y82D and will again in Italy 2023.

Currently, Philipp is finishing up his Master Thesis (MSc) in the field of Logistics and Digitalization.

Bob Wilson, N6TV

"TV Bob" is an active CW contester, Win-Test supporter, and Elecraft K4 volunteer Field Tester. Licensed for 51 years, Bob competed at WRTC in San Francisco (1996), Slovenia (2000), and Moscow (2010). He finished first in the 2013 and 2019 ARRL November CW Sweepstakes CW from at W7RN, and the September 2014 NA Sprint CW from home. In 2017, he was inducted into the CQ Contest Hall of Fame.

2023 Contesting Related Events

May 17th – Wednesday night
7:00 PM Contest Super Suite at the Hope Hotel opens hosted by the Mad River Radio Club (MRRC), Frankford Radio Club (FRC) North Coast Contesters (NCC), and Kansas City DX Club (KCDXC).
7:00 PM to 9:00 PM Dayton Contest University 2023 Registration at the Hope Hotel
10:30 PM Pizza Party at the Hope Hotel sponsored by Dayton Contest University 2023. http://www.contestsupersuite.com.

May 18th – Thursday daytime
7:00 AM Dayton Contest University 2023 Registration opens at the Hope Hotel. Must sign up in advance – http://www.contestuniversity.com.
8:00 AM – 5:00 PM Dayton Contest University 2023 at the Hope Hotel.

May 18th – Thursday night
7:00 PM Contest Super Suite at the Hope Hotel hosted by the Mad River Radio Club (MRRC), Frankford Radio Club (FRC) North Coast Contesters (NCC), and Kansas City DX Club (KCDXC).
10:30 PM Pizza Party at the Hope Hotel sponsored by the Society of Midwest Contesters (SMC).
http://www.contestsupersuite.com

May 19th – Friday daytime
7:00 AM - First Bus Pickup from the Hope Hotel to the Fairgrounds. (Bus runs on a continuous loop between the hotel and the fairgrounds). Friday and Saturday only.
10:30 - 11:35 AM Digital Contest Forum at Hamvention in Xenia, Ohio, Room 3 Moderator: Ed Muns, W0YK
"Increasing Rate in FT Contests" - by Peter Driessen, VE7AB
“Can a Little Pistol be Competitive” – by Rich Newbould, N3RWN
"Why You Should Care About Your LCR (Log Check Report)" - by Ed Muns, W0YK
2:00 PM – 5:00 PM Antenna Forum at Hamvention in Xenia, Ohio, Room 1 Moderator: Tim Duffy, K3LR.
"Six Meter Long Distance Propagation During the Next Four Years of Solar Maximum" - by Frank Donovan, W3LPL
"Some Practical and Useful Antenna Innovations for Amateur Radio" - by Dr. Jim Breakall, WA3FET
"HamSCI Festivals of Eclipse Ionospheric Science" - by Dr. Nathaniel Frissell, W2NAF
"The Ten Worst Antennas and How You Can do Better" - by Anthony Luscre, K8ZT
5:00 PM - Final Bus Pickup from the Fairgrounds to the Hope Hotel.

May 19th – Friday night
7:00 PM Contest Super Suite at the Hope Hotel hosted by the Mad River Radio Club (MRRC), Frankford Radio Club (FRC) North Coast Contesters (NCC), and Kansas City DX Club (KCDXC).
7:00 PM 32nd Annual Top Band Dinner at the Hope Hotel. Speaker is Jon Zaimes, AA1K. Tickets in advance from http://www.topbanddinner.com.
11:00 PM Pizza Party at the Hope Hotel sponsored by the Potomac Valley Radio Club (PVRC). http://www.contestsupersuite.com

May 20th – Saturday daytime

7:00 AM - First Bus Pickup from the Hope Hotel to the Fairgrounds. (Bus runs on a continuous loop between the hotel and the fairgrounds). Friday and Saturday only.
2:00 PM – 3:50 PM Contest Forum at Hamvention in Xenia, OH, Room 1 Moderator: Doug Grant, K1DG.
"WRTC2022/2023 Update" - by Fabio Schettini, I4UFH and Claudio Veroli, I4VEQ
"Contest DXpedition from a Rig-in-a-box" - by Gregg Marco, W6IZT/C6AZT
"The New 8P5A Station" - by Tom Georgens, W2SC/8P5A
"The K1LZ Hybrid Multi-multi" - by Krassy Petkov, K1LZ and Jeff Briggs, K1ZM
5:00 PM - Final Bus Pickup from the Fairgrounds to the Hope Hotel.

May 20th – Saturday evening
6:30 PM 29th Annual Dayton Contest Dinner hosted by North Coast Contesters at the Hope Hotel. Dinner speaker is Bryant Rascoll, KG5HVO. Space is limited. Details and tickets in advance are available at http://www.contestdinner.com.
7:00 PM Contest Super Suite at the Hope Hotel hosted by The Mad River Radio Club (MRRC), Frankford Radio Club (FRC) North Coast Contesters (NCC), and Kansas City DX Club (KCDXC).
8:00 PM to 12:00 AM Kansas City DX Club CW Pileup Competition at the Hope Hotel.
11:00 PM Pizza Party at the Hope Hotel sponsored by the Yankee Clipper Contest Club (YCCC). http://www.contestsupersuite.com

World Wide Radio
Operators Foundation

Contester's Code of Ethics

- I will learn and obey the rules of any contest I enter, including the rules of my entry category
- I will obey the rules for amateur radio in my country.
- I will not modify my log after the contest by using additional data sources to correct callsign/exchange errors.
- I will accept the judging and scoring decisions of the contest sponsor as final.
- I will adhere to the DX Code of Conduct in my operating style.
- I will yield my frequency to any emergency communications activity.
- I will operate my transmitter with sufficient signal quality to minimize interference to others.

Table of Contents

Advertising

Read the rules
Obey the rules
Have Fun !

Doug Grant, K1DG

"All Contesters are Cheaters"

I refuse to believe
you can win by playing by the rules.

I realize this may be a shock but
"Contesting is for fun"
is a big lie.
"Winning is everything"

So I will tell operators trying to improve their skills
they are not the most important thing in contesting

Contesters who compete against me unfairly will know that

I have my priorities straight because

Winning
Is more important than
Fair play

I'll tell you this
Once upon a time
Contesters didn't cheat

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But this will not be true in the future

This is a "win-no-matter-what-it-takes" game

Experts tell me

10 years from now every top-scoring station will need an on-site referee to prevent cheating

I do not believe that

I will be competing against honest operators playing by the rules

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In the future

Deliberate QRM, high power, and packet cheating will be the norm.

No longer will it be said that

Contesters are the best operators on earth

It will become evident

That contesters are universally ruthless and unsportsmanlike.

It is foolish to presume

There is hope if we play fair.

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ICOM

And all of this will come true…

unless we choose to reverse it.

So let's reverse it.

Right here.

Right now.

We have all the words we need…listen carefully…

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you ***can*** win by playing by the rules.

I refuse to believe
"All Contesters Are Cheaters"

The Four Stages of Contesting

- Starting out
- Getting hooked on the game
- Trying to win
  - The right way (playing by the rules, having fun)
  - The wrong way (bending or breaking the rules)
- Passing it along

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The Fun in Radiosport It comes in many forms

- Personal Satisfaction
  - Better score than last year
  - Better score than “that guy”
  - Cool band opening
  - Finessing through pileups
- Part of a team
  - Help your club (or multiop) win
- Peer recognition and respect

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What are your goals in contesting?

- Win it all
- Have fun, have some good rates, work some cool DX
- Learn how to play the game better

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Let's face it: Contesting is not a Fair Game

- Geographic advantages
- Local Terrain advantages
- Rareness advantages
- A small station in the Black Hole has a big disadvantage when compared to a mega-station in Maine

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If the game is *that* important to you…

- Neutralize the competition's advantages *(within the rules!)*
- Change QTH or guest-op
- Use a remote station
- Put up better antennas
- Practice, practice, practice

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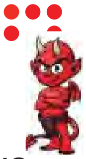
At some point, you make a decision



Play by the rules	**Make your own rules**
• Work on improving skills/station	• Work on being obnoxious
• Power consistent with class	• More power (turn to "11")
• Don't use cluster when not allowed	• Use the cluster – who will know?
• Submit log when contest ends	• Take time to scrub log (fix calls, add calls, "adjust" times, etc.)

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Written and unwritten rules

- Written rules
  - Published by the organizer
  - They try to cover all scenarios
  - They have to evolve

- Unwritten rules
  - Generally accepted by the community
  - Sometimes have to be added to written rules

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Cheating = Rudeness

Breaking a written rule

Breaking an unwritten rule

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"If it's not expressly prohibited, then I can do it"

- Consider this road sign
- Is it really necessary?
- Is there a place where littering is allowed?

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Sometimes a new technique emerges that gives an advantage

- And people don't like it!
  - Guest operator
  - Memory Keyers
  - Computer logging (including databases)
  - SO2R
  - 2BSIQ
- All of these were within the rules but many people protested

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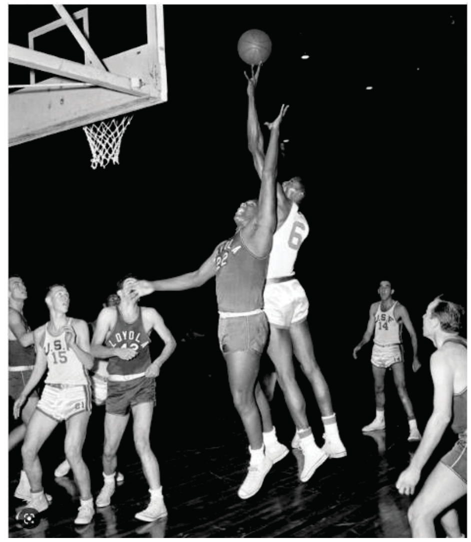
In another sport…

- Bill Russell played defense differently in basketball
- He *jumped* to block shots (gasp!)
- His high-school coach: “A good defender never leaves his feet”
- USF: 55 wins in a row, 2 NCAA titles



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New Technique or Rule Violation?

- Russell didn’t break any rules by leaping
- Eventually it became the norm
- He didn’t throw elbows, trip opponents, commit flagrant fouls, or try to find a way to foul without being seen by the referee

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In Radiosport, sometimes "new techniques" cross an ethical line

- Examples…
  - Remote Receivers
  - Self-spotting
  - CQing on two frequencies on a band
  - Using a (very) remote station to work that new band-country
  - Live-streaming on social media
  - Self-spotting
- Sometimes this results in a rule change

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Cheating or bending rules leads to more rules

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Is this what we want?

Pre-contest announcements

- NG3K list: OK
- Postcards and worldwide "call collect" numbers…?
- (This postcard was sent to a lot of "rare" multipliers, and was allowed by the Contest Director…in 1982)

Why people cheat

- Desire to be a "hero" on the field of competition
- Achieve immortality via community legend, fame, and lasting peer recognition
- Seeking current community "stardom"
- Prove superiority over others
- A means to prove self-worth
- These are *Powerful forces*, worthy of study and caution

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Rationalizations for cheating

- *Everybody is doing it*
  - *(#1 Reason, and provably false)*
- Nobody was hurt
  - (*Except those you beat*)
- Nobody was watching
  - (*Not any longer*)
- Overcome unfair disadvantages
  - *(Life is not fair)*
- Rules apply to others, not me/us

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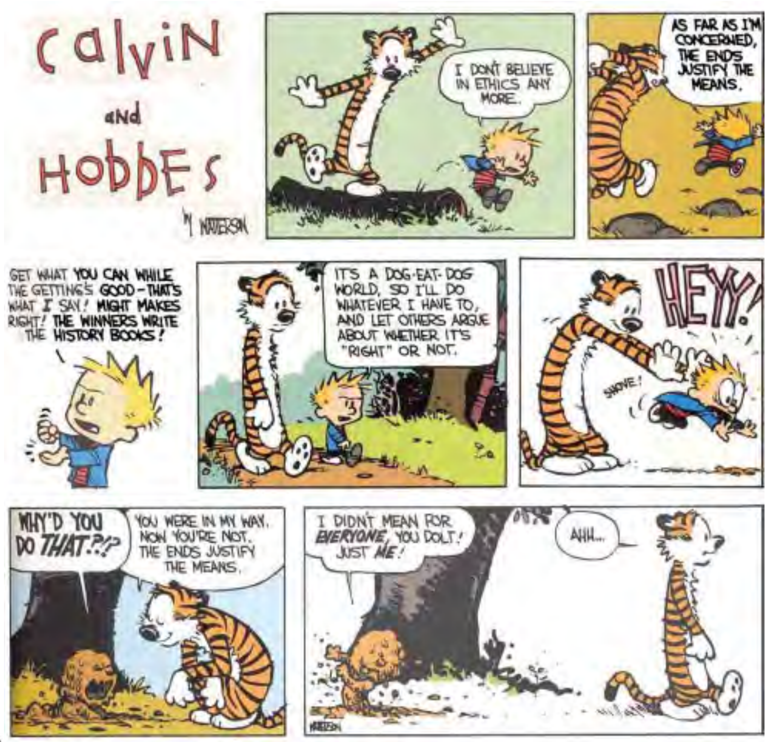

But people *DO* notice…

- "That guy was too loud in the NAQP"
- "That guy uses a pair of 8877s"
- "That guy has remote receivers in …"
- "That guy uses spots but enters as unassisted"
- "That guy padded his log with bogus QSOs"
- "That guy operated with a broad signal to push away nearby stations and keep his channel clear"

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- Banned from all CQ Contests for 5 years
- Previous wins deleted
- This does not sound like fun

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Ethics and Respect

- Ethical behavior requires ***respect***…
  - Respect for ***others***
  - Respect for ***the game***
  - Respect for ***yourself***
- Our fellow competitors want the same respect that we want for ourselves (the "Golden Rule")
- To get respect, you have to ***give*** respect
- ***Ethical behavior results in respect***

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About that "Golden Rule"

- Not really a "rule", but basic *ethics*
- Nearly every religion/social system has it

"In everything, therefore, treat people the same way you want them to treat you…"

Matt. 7:12, New American Standard Version

"Do not do unto others whatever is injurious to yourself."

Shayast-na-Shayast 13.29 (Zoroastrianism)

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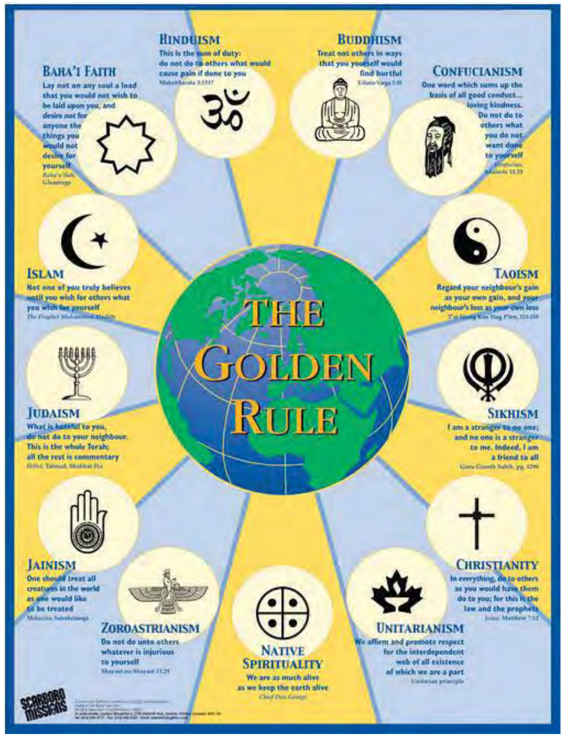
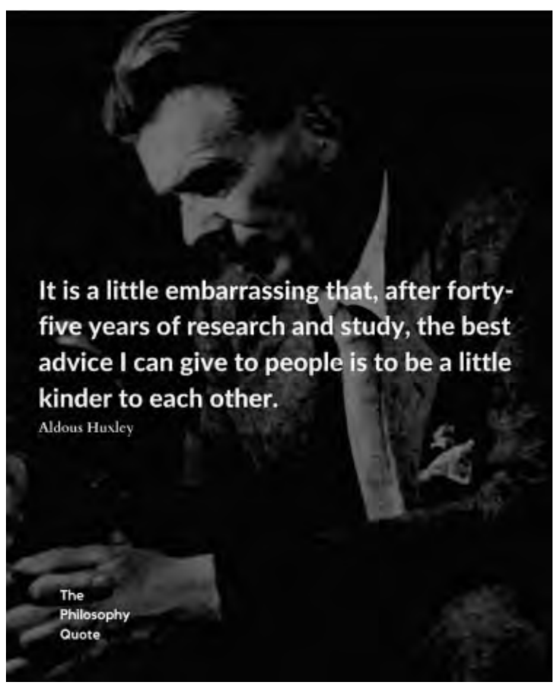
This poster hangs in the U.N.



Aldous Huxley's Best Advice



Cheating is stealing

- If you beat someone by cheating, you have stolen his award/recognition
- In nearly every culture, stealing violates the Golden Rule

The End-game of Rule-Breaking

- "Tragedy of the Commons"
- People abuse a shared resource because it is in their own best interest
- Eventually everyone loses

The Boston Common story

- In the 1600s everyone could graze their animals on the Common, with a limit on number of animals
- Some exceeded the limit because it was good for them
- Eventually all the grass was eaten
- The Common became unusable for grazing

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Howl old is this idea?

- First mentioned in 1833 by the British economist William Forster Lloyd
- Concept dates to Aristotle:
  - “That which is common to the greatest number gets the least amount of care. Men pay most attention to what is their own: they care less for what is common.”
- The term "tragedy of the commons" came from an essay with this title written by Garrett Hardin in 1968. published in Science

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Valid concept, wrong conclusion (maybe)

- Hardin used the concept to promote limits on population growth, especially among lower classes
- He argued that governmental economic policy was needed to prevent overpopulation, overfishing, overhunting, etc.
- He revised the concept to “"The Tragedy of the 'Unmanaged' Commons"

Big Game Hunting Management

- Trophy hunting got out of control in some African countries
- Regulations were put in place
  - Limits on number of permits
  - Limits on certain species
  - Priority given to “problem” animals
- The system works

The BMW Auto-dimming headlight option

- BMW held a focus group to introduce a new feature – headlights that dimmed as a courtesy to oncoming vehicles
- Cost was a few hundred dollars
- Focus group: “Why should I pay for a feature that helps other drivers and not me?”

Related question: Why do they install turn signals on BMWs?

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And in ham radio…

- Contester A sets the CW rise time on his FT5000 to 2 ms, and cranks his SSB Compression to 11
- Nobody can operate within 10 kHz of him so he has a nice clear running frequency
- Works for him, but if everyone does it…
- NOTE: these do not violate specific rules in most contests (“no littering”)

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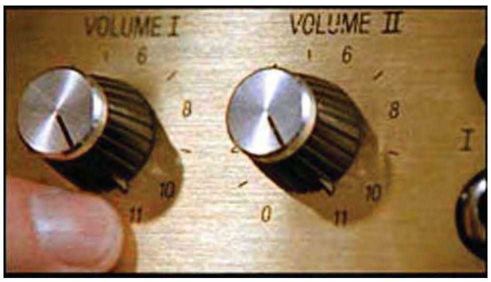
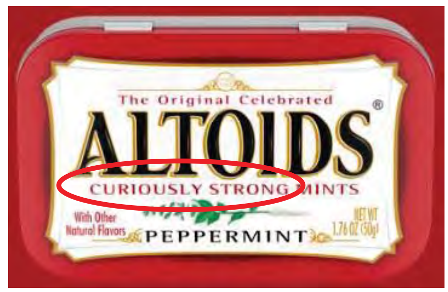
Excessive Power

- Do not exceed power limits for your category
- Just because the knobs go to 11…
- Applies to ALL power categories
- People know if you are in “Altoids” mode





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Examples of Unwritten “Rules”

- **Do not** make pre-arranged schedules
- **Do** identify frequently
- **Do not** ask friends to work you … only
- **Do** encourage club members to work everyone
- **Do not** work friends with multiple calls
- **Do** work and spot stations equally

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Examples of Unwritten "Rules"

- **Do not** telephone or text message multipliers
- **Do** make an effort to help casual callers enjoy the contest and make a contact
- **Do not** let others "help" your single-op effort
- **Do not** plop down 100 Hertz away from your competitor to intentionally disrupt their run

See the ARRL's *"HF Contesting - Good Practices, Interpretations & Suggestions*"

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No "Log Washing"

- Using QRZ.com, spot history, 3830 reports, LoTW, club databases
- Using utilities to analyze and correct the log
- Replaying the contest to change the log
- Asking others who they worked or if a call sign is correct
- "Fixing" off times or band changes
- It's **over** when the 2359 rolls over to 0000

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Some people just don't "get it"

Lance Armstrong admits he would still be lying about doping if he had not been found out

Seven-times Tour de France winner, who is serving a life ban from sport, says only federal investigation stopped his lying about taking drugs

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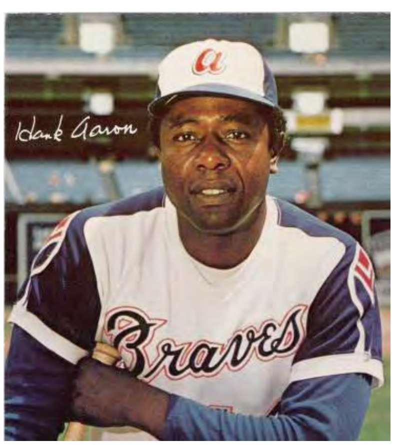
Honest competitors earn respect; cheaters do not



Hank Aaron
755 Home Runs

Barry ("Steroid-man") Bonds
762 Home Runs
NOT ELECTED TO HALL OF FAME

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Covering cheating takes too much effort to be fun (and may not work)

- The RBN and wideband recording systems can verify what really happened (and if your signal was wide)
- Packet/Skimmer cheating is easy to detect
- Power outliers sometimes obvious (plots, RBN)
- Waiting until the log deadline so you can pad your log with guys who did not submit a log *will* be detected
- Open Logs allow an element of crowd-sourcing

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Expend your time and energy in more positive ways

- If someone beats you, ask to exchange logs/rate sheets
- If you are getting clobbered on a specific band, figure out why and work on it (hint: antenna)
- Review your Log-Checking Report and learn from it
- You will gain great satisfaction from improving your station and skills

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Applying Positive Peer Pressure to a Suspected Cheater

- Be aware of your motives
  - Is it personal?
  - If necessary, enlist others to help deliver the message
- Give the benefit of the doubt
  - They may not realize what they are doing is against the rules
- Choose the right time
  - Can they listen without feeling attacked?
- Don't be angry or accusatory
  - Treat the issue as a mistake, not a crime
  - Focus on actions, not character
- Be there
  - People cheat because they see others get away with it
  - Not confronting the problem hurts everyone

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There are really two scores in a contest

- The published score – the winner has the highest number and gets an award
- The *unpublished* score – winner gets ***respect***

Winner	**Loser**
Clean signal	Clicks, splatter, "curiously strong"
Behaves in pileups	Aggressive in pileups
Listens on spot freqs to confirm call	Clicks, calls, logs bad spots
Congratulates guys who beat him	Makes excuses why he didn't win
Works to improve station	Looks for a way to cheat
Invited to join multiop teams	Shunned

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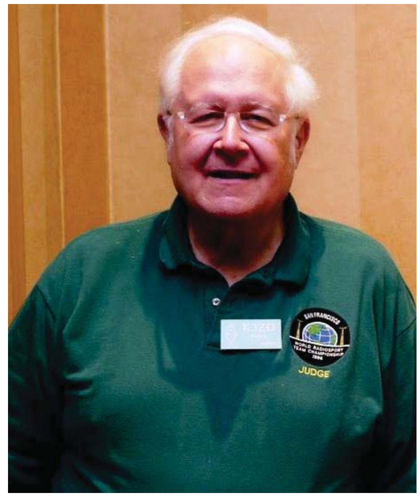
K3ZO (SK) View of Contesting

- "I know about the Assisted Category. But I don't want to operate that way.
- I know a lot of guys use two radios. But I don't want to operate that way.
- I use one radio, my own skills and ears, and have a ball. That's *enough* for me."



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The Lesson of "Cool Runnings"

- Story of the Jamaican Olympic Bobsled Team
- Coach had been banished from the sport for cheating (added weights to his sled)
- Believed that sprinters would make good bobsledders

https://youtu.be/ADROo27EFJo

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Acknowledgments

This presentation draws on material developed by:

Ken Adams, K5KA (SK)
Randy Thompson, K5ZD
Larry Tyree, N6TR
Dave McCarty, K5GN
Ward Silver, NØAX
Kirk Pickering, K4RO
Tim Duffy, K3LR
Joel Harrison, W5ZN

And my biggest contest influence, K1HHN/W9HG (SK)

"Relax, kid. This is supposed to be fun!"

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Contest Code of Ethics, expanded

1. I will learn and obey the rules of any contest I enter, including the rules of my entry category.

No spotting if not permitted, no second op or skimmer for single ops, off-times per rules, correct output power

2. I will obey the rules for amateur radio in my country.

Power, frequencies, licensing – wherever you transmit. Remote operations must be especially vigilant!

3. I will not modify my log after the contest by using additional data sources to correct call sign/exchange errors.

When it's over, it's over

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Contest Code of Ethics, expanded

4. I will accept the judging and scoring decisions of the contest sponsor as final.

No whining, no lawsuits, no threats or defamation of any sort. No operation is that important.

5. I will adhere to the DX Code of Conduct in my operating style (see dx-code.org).

Listen, listen, listen; only call when you can hear the station; never trust the cluster (copy the call!)…

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Contest Code of Ethics, expanded

6. I will yield my frequency to any emergency communications activity.

Contesting is a game. Emergencies are real life.

7. I will operate my transmitter with sufficient signal quality to minimize interference to others.

Mic gain set properly; amp not overdriven; no splatter!

Note that CQWW rules have added language specifically emphasizing this rule of conduct. Expect increased scrutiny as SDR archives reveal the worst offenders!

www.wwrof.org

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Basic Station Automation Techniques & Recommendations

Presented by N6TV
n6tv@arrl.net

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Presentation Overview

- Why Automate?
- Transceivers
- Amplifiers
- Band Decoders
- Antenna Switches
- Bandpass Filters
- Tuners
- Summary of Recommendations
- Q & A

Why Automate?

- Contesting is hard work
- You will get tired. You will get sleepy.
- Fatigue leads to *misteaks*
- Automation helps prevent *disastrous* mistakes
- Let the machines do what they do best
- You do the rest (while not getting much rest)

What should be automated?

- Computer Logging of:
  - Date, time, frequency, mode, callsign, exchange
- Most transmissions (CQ, Your Callsign)
  - CW, RTTY, Voice Keying
- Changing bands on rig should automatically switch:
  - Antenna, Amplifier, Tuner
  - Bandpass filters / coax stubs (For Multi-Transmitter or SO2R)

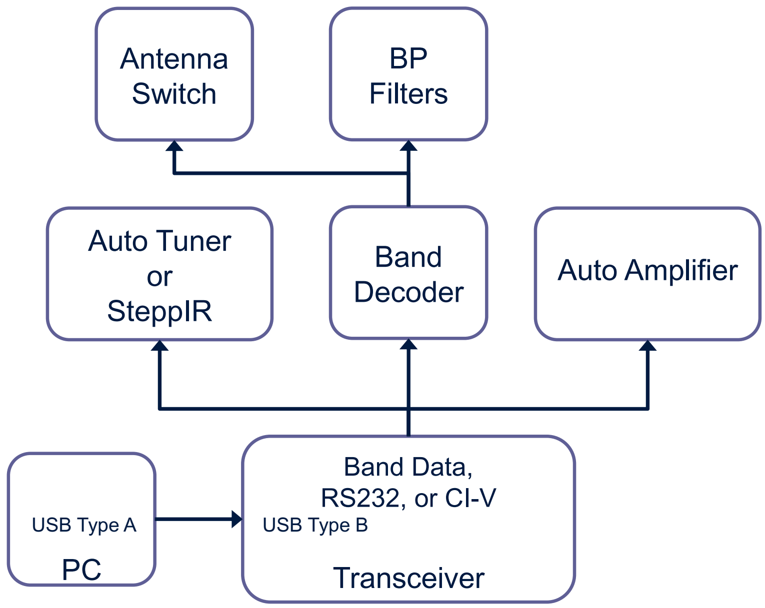
What should *not* be automated?

- CW copying
  - Do not rely on Code Readers
  - Do not blindly trust every cluster spot
- Voice Keying of Callsigns, Letter By Letter
  - “Oscar” “Hotel” “Two” “Bravo” “Alpha” “Delta”
- Exception: persons with disabilities
- Band change decisions
- How often to sign your call when running
- Where to put your VFO

Automating Band Changes Saves Time, *and* your Equipment

- Speed and Reliability is key
- Recommendation: Use hardware automation, not software
  - Everything should switch automatically even when PC is OFF or rebooting
  - Not always possible for some transceivers or peripherals
- Transceivers provide “Band Data” or “Operating Frequency” data to Peripherals
- Peripherals track transceiver using “Band Data” or “Operating Frequency” inputs
  - Amplifiers and Tuners usually have RF Frequency Counters that will override incorrect input

Transceiver Drives the Peripherals



Band Data

- Only provides transceiver's TX Band
  - Does not provide any VFO frequencies
- TX Band Data is ideal for:
  - Broadband solid state amplifiers without tuners
    - KPA500, ACOM 500S, 600S, 700S, 1200S, PGXL, some SPE
  - Band decoders for antenna switches / BP filters
    - Top Ten, Bandmaster, ShackMaster SM-8, Hamplus, BandPasser, OM6BPF, Unified Micro BCD-14, various BCD band decoder boards
- TX Band Data is *not* good enough for devices that need exact TX *frequency*
  - Automatic tuners and amplifiers with auto tuners
    - Kessler AT-AUTO, KAT500, TGXL
    - KPA1500, ACOM 2000A RCU, ACOM with 04AT/06AT tuner, most SPE
  - SteppIR controllers (FluidMotion, SDA100, OptimizIR)
  - Baby Loop controller

Band Data Encoding

- Yaesu and Elecraft use 4-bit "BCD"
  - Binary Coded Decimal, "Band A" to "Band D"
- Icom uses 2-pin Band Voltage: "8V Ref", "Band"

	Band	160m	80m	40m	30m	20m	17m	15m	12m	10m	6m	None
	Frequency	1.8	3.5	7	10	14	18	21	24	28	50	NA
	Icom Voltage	7.0v to 8.0v	6.0v to 6.5v	5.0v to 5.5v	0.1v to 1.2v	4.0v to 4.5v	3.0v to 3.5v	3.0v to 3.5v	2.0v to 2.5v	2.0v to 2.5v	1.2v to 2.0v	0v
Yaesu	Band A	H	L	H	L	H	L	H	L	H	L	L
Yaesu	Band B	L	H	H	L	L	H	H	L	L	H	L
Yaesu	Band C	L	L	L	H	H	H	H	L	L	L	L
Yaesu	Band D	L	L	L	L	L	L	L	H	H	H	L

* Icom outputs same voltage for 17m/15m and 12m/10m

- Flex band data output requires special cable
- Kenwood does not provide any band data output

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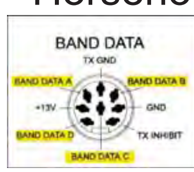
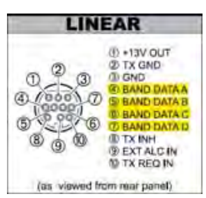
Yaesu Band Data Output Connectors

- Yaesu FT-1000MP, FTdx5000, FTdx9000
  Uncommon 262° "Horsehoe" 8-pin DIN



- FTdx10, FTdx1200
  Uncommon 8-pin MINI DIN



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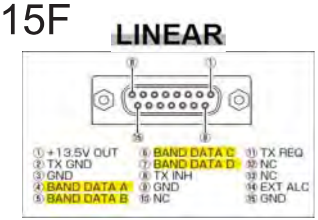
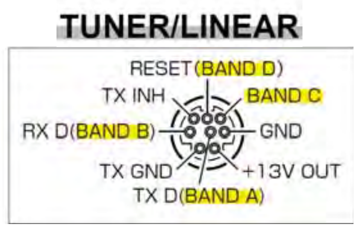
Yaesu Band Data Output Connectors

- Yaesu FTdx101D, FTdx101MP
  Standard DA-15F



- FT-710
  Standard 8-pin MINI DIN

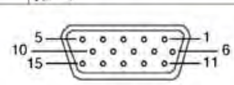


Elecraft Band Data Output

- Elecraft K3 and K4
  Standard 15-pin DE-15F Connector ("ACC")

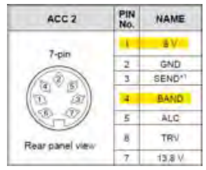
Pin #	Description
1	FSK IN (see **FSK Input**)
2	AUXBUS IN/OUT (see KRC2 or XV-Series transverter instruction manual)
3	BAND1 OUT (see **Band Outputs**)
4	PTT IN (in parallel with MIC PTT)
5	Ground (RF isolated)
6	DIGOUT0 (see **Transverter Control**)
7	K3S ON signal (out) or TX INH (in) (see **Transverter Control, TX INH**)
8	POWER ON (see pg. 46)
9	BAND2 OUT (see **Band Outputs**)
10	KEYOUT-LP (10 mA keying output)
11	DIGOUT1 (see **DIGOUT1**)
12	Ground (RF isolated)
13	BAND0 OUT (see **Band Outputs**)
14	BAND3 OUT (see **Band Outputs**)
15	EXT ALC input (see **External ALC**, pg. 29)

Band	BAND3	BAND2	BAND1	BAND0
160 m	0	0	0	1
80 m	0	0	1	0
60 m	0	0	0	0
40 m	0	0	1	1
30 m	0	1	0	0
20 m	0	1	0	1
17 m	0	1	1	0
15 m	0	1	1	1
12 m	1	0	0	0
10 m	1	0	0	1
6 m	1	0	1	0

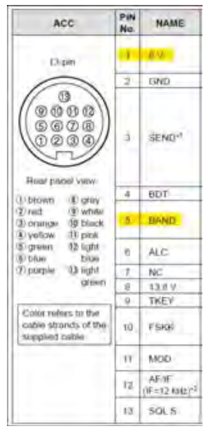


ICOM Band Data Output

- IC-7700, 7800, 7851, 7600, 7610
  Standard 7-pin DIN:



  IC-7300, IC-7410
  Standard 13-pin DIN:



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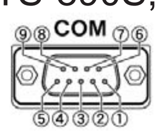
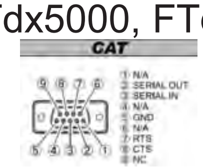
ICOM 13

Exact Frequency Output via RS-232

- Kenwood TS-590SG, TS-890S, TS-990S “COM”
  DE-9M



  - COM connector is not tied to Kenwood USB port used by logger
  - One device can “poll” radio for frequency via RS232 cable
- Yaesu FTdx3000, FTdx5000, FTdx9000 “CAT”
  DE-9M



  - No USB, or FTdx3000 “CAT SELECT” RS-232
  - PC polls radio, peripherals “just listen” (Pin 2 wired, Pin 3 open)
    - Custom RS-232 “Y-Cable” or “S-BOX” required for sharing

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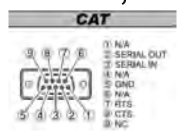
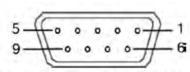
ICOM 14

Exact Frequency Output via RS-232

- Yaesu FTdx10, FTdx101D, FTdx101MP
  DE-9M



  - COM connector independent of USB
  - One device can “poll” radio for frequency via RS232 cable
- Elecraft K3 or K3S
  DE-9F

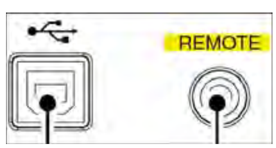


RS232 Connector (female, on KIO3 panel)

  - No *independent* USB connector (Elecraft K4 RS232 *is* independent)
  - PC polls radio, peripherals “just listen” (Pin 2 wired, Pin 3 open)
    - Custom RS-232 “Y-Cable” or “S-BOX” required

Exact Frequency Output via ICOM CI-V

- All ICOM rigs except IC-705 provide a legacy “REMOTE” (CI-V) connector
  3.5mm MONO



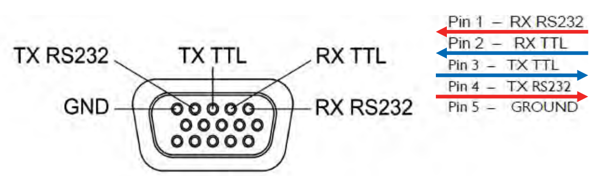
- Two wire serial bus, 19200 baud max
- Important menu setting:
  Set USB CI-V Port to Unlink from [REMOTE]
  (Not available on older rigs like IC-7700)

Automatic Amplifiers

- Usually Solid State and Broadband
- Often include built-in tuners
- Communicate with transceiver via Band Data, RS-232, ICOM CI-V, or Ethernet LAN
- Change bands automatically, no RF transmission required
- Usually have internal RF Frequency Counter as safety, in case RF input doesn't match band or frequency supplied from the transceiver

ACOM 2000A Amplifier

- With new RCU
  "CAT" connector: DE-15F



ACOM Solid State Amplifiers

- ACOM 500S, 600S, 700S, 1200S "CAT/AUX" connector: DE-15F

Table 2-1

CAT/AUX interface	PIN NO.	PIN NAME	DESCRIPTION	SPECIFICATIONS
Rear panel view	1	RxD	Received Data	TTL input
	2	RxD	Received Data	RS232 input
	3	TxD	Transmitted Data	RS232 output
	4	TxD	Transmitted Data	TTL output
	5	GND	Ground	0 Volt
	6	BAND voltage	Analogue input	0 to +8V
	7	Band data 0	Bit 0	TTL input
	8	Band data 1	Bit 1	TTL input
	9	Band data 2	Bit 2	TTL input
	10	Band data 3	Bit 3	TTL input
	11	ON RMT	Remote Pwr On	+4.5 to + 15V / 3mA max
	12	Debug mode	CPU only Pwr Input	+8 to + 15V / 0.4A
	13	KEY-IN	Tx Request	Less than +12V / 6mA
	14	KEY-OUT	Tx Ready	O.C. output, up to +50V / 20mA
	15	GND	Ground	0 Volt

Ameritron Solid State Amplifiers

- For ALS-500M, ALS-600, ALS-1300 series, use ARI-500 Interface and transceiver cables

Elecraft KPA500

- “AUX” Connector: DE-15M for Band Data, K3/K4
  ICOM Band Data, but no ICOM CI-V support.
  RS232 “XCVR” Connector: DE-9M (RS232) for Kenwood

Signal Name	Pin	Direction	Notes
Band VRef (Icom)	1	In	Reference for Icom input – connect to 8V
AuxBus I/O	2	Out	K3 Only
Band1 In	3	In	BCD Band Input – Bit 1*
NC	4		
GND	5		
Band V (Icom)	6	In	Uses Icom standard band voltages
Alarm Out	7	Out	Drives low for fault input Not used by K3. Must not be connected to K3.
Power On/Off	8	In	Pulse low to turn KPA on or off – do not hold low!
Band2 In	9	In	BCD Band Input – Bit 2*
Key	10	In	Low enables amplification. Internally pulled up to +5V. Sources 1 mA when pulled to ground. Diode isolated from the PA KEY RCA jack.
Inhibit#	11	In	Low inhibits amplifier operation
GND	12		
Band0 In	13	In	BCD Band Input – Bit 0*
Band3 In	14	In	BCD Band Input – Bit 3*
ALC	15	Out	ALC output to transceiver

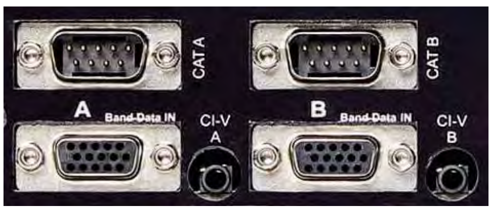
Elecraft KPA1500

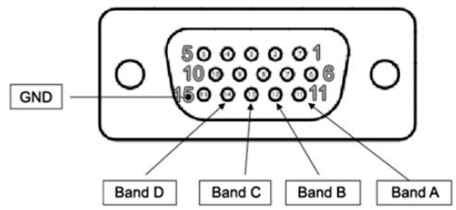
- With built-in Antenna Tuner
  “AUX” Connector: DE-15M for Band Data, K3/K4
  “XCVR Serial” Connector: 3.5mm TRS for
  Kenwood / Yaesu RS-232 *or* Icom CI-V

Signal Name	Pin	Direction	Notes
Band VRef (Icom)	1	In	Reference for Icom input – connect to 8V
AuxBus I/O	2	Out	K3 Only
Band1 In	3	In	BCD Band Input – Bit 1*
NC	4		
GND	5		
Band V (Icom)	6	In	Uses Icom standard band voltages
Alarm Out	7	Out	Drives low for fault input Not used by K3. Must not be connected to K3.
Power On/Off	8	In	Pulse low to turn KPA on or off – do not hold low!
Band2 In	9	In	BCD Band Input – Bit 2*
Key	10	In	Low enables amplification. Internally pulled up to +5V. Sources 1 mA when pulled to ground. Diode isolated from the PA KEY RCA jack.
Inhibit#	11	In	Low inhibits amplifier operation
GND	12		
Band0 In	13	In	BCD Band Input – Bit 0*
Band3 In	14	In	BCD Band Input – Bit 3*
ALC	15	Out	ALC output to transceiver

FlexRadio Power Genius XL (PGXL)

- DE-15F for Elecraft or Yaesu Band Data (x 2)
  DE-9M for RS-232 (x 2), Ethernet LAN port for Flex,
  3.5mm TS for ICOM CI-V (x 2)



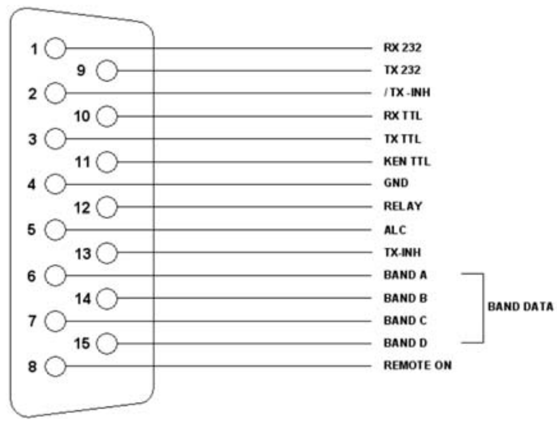


RF Kit RF2K-S

- USB Type A Connector Supports FTDI USB-to-Serial adapters or USB-to-CI-V (CT-17) interface cables. LAN support. No Band Data input.

SPE Expert 1K, 1.3K, 1.5K, 2.0K-FA

- DA-15F (x 2) for RS232, CI-V, and Band Data input



Standalone Band Decoders

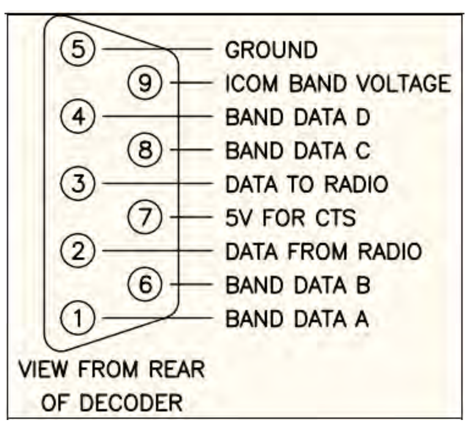
- Connect Band Decoder input to transceiver
  - Band Data, CI-V, or RS-232
- Connect Band Decoder output to Antenna Relay Box and/or Bandpass Filter Box
- Output is typically 13.8V “Source” or 0.0V “Sink”, one line per band
- For triband antennas, Band Decoder can be programmed to select same output line for multiple bands

Array Solutions BandMaster III, IV, V, Shack Master SM-8

- Decodes Band Data, RS-232, or ICOM CI-V
- Drives Antenna Relay box and/or BPF box

Array Solutions BandMaster III, IV, V

- All use the same DE-9M connector for Band Data, Icom Band Voltage, and RXD/TXD RS-232 DATA



Elecraft KRC-2 Band Decoder

- Interior screw terminals for inputs and outputs

HamPlus MBD-8G Band Decoder

- Decodes ICOM CI-V, Elecraft/Yaesu BCD, and Kenwood RS-232
- Drives HamPlus Antenna Relays
- “SEND” In / Out jacks prevent antenna switching during TX

Top Ten Devices
Band Decoder and Band Aide

- Yaesu/Elecraft Band Data
- No longer in production ☹

Unified Microsystems BCD-14 + HSD-9

- Yaesu/Elecraft Band Data with “High Side Driver”
- “Some assembly required”

Automatic Antenna Switches

- Controlled by one or two band decoders
- Switches to correct antenna automatically, when rig changes band
- Prevents two rigs from using the same TX antenna at the same time
- Uses low loss, high power relays

Ameritron RCS-8V and RCS-10
8- and 10-port Remote Coax Switches

- Replace the Ameritron manual switchbox with an automatic band decoder
- One +13.8V line in control cable selects one antenna port

Array Solutions EightPak 2x8 Antenna Switch

- Controlled by a pair of BandMaster Band Decoders
- Prevents 2 radios from connecting to the same antenna at the same time

FlexRadio Antenna 8x2 Switch

- DE-15F for Elecraft or Yaesu Band Data (x 2)
  Same Band Data pins as PGXL.
  LAN Port for Flex.

HamPlus AS-62 Antenna Switch

- 2 inputs, 6 Outputs
- Driven by HamPlus Band Decoder

microHAM micro SIX and DOUBLE SIX, switches (10 port version also available)

- One +13.8V line in control cable selects antenna port
- Connect control cable to Band Decoder output

Automatic Bandpass Filters

- A must for operating SO2R, or Multi-Op, or Field Day with more than one TX
- Attenuates nearby signals from adjacent bands
- Typically 100 to 200W max.
- High Power BPFs are also available, but much larger, much more expensive
- Will not attenuate in-band harmonics
- Switch BPFs to correct band *automatically* to prevent filter damage, high SWR

Array Solutions AS-419 “BandPasser II”

- Same as SureFire BF-100 with different label
- Built-in Band Decoder for Elecraft / Yaesu Band DATA

DuneStar 600

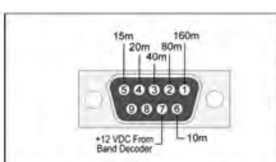
- Requires Source or Sink Band Decoder to DE-9M connector (see manual)

DB9 Pin outs:

(1) Brown 160M	(6) Blue 10M
(2) Red 80M	(7) Violet Ground (gray on older models)
(3) Orange 40M	(8) White Not Used
(4) Yellow 20M	(9) Black +12V
(5) Green 15M	Shell Shield

DX Engineering DXE-419-P

- Requires separate Band Decoder with "Sink" outputs to DE-9F "BAND IN" jack:

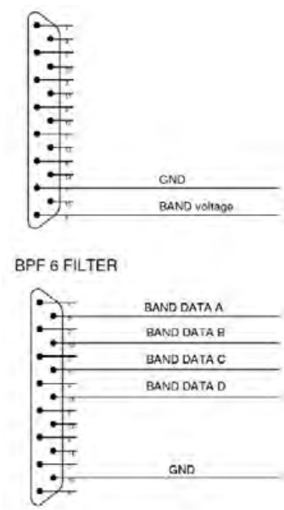


DB-9 Connector on rear of unit

Pin	Band Decoder minus trigger signal
1	160 meters selected
2	80 meters selected
3	40 meters selected
4	20 meters selected
5	15 meters selected
6	10 meters selected
7	+12 VDC from Band Decoder
8	No Connection
9	No Connection

OM Power OM6BPF

- Built-in Band Decoder (Elecraft, Yaesu, Icom Band Voltage)



Automatic Antenna Tuners

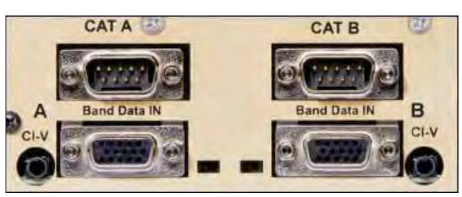
- Once programmed for each segment, tuner remembers the tuning solution(s) for that frequency
- Tuner restores correct tuning solution, based on rig’s frequency, well before you transmit
- Tuner can bypass itself automatically when SWR is low
- Tuner may remember multiple solutions per frequency to support multiple antennas

Elecraft KAT500

- DE-15M and DE-15F passthrough for Elecraft AUX CABLES
- 3.5mm TRS “PC DATA” for Kenwood RS-232

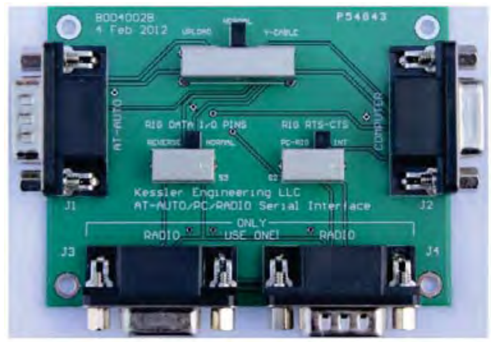
FlexRadio Tuner Genius XL (TGXL)

- Same connectors and pins as PGXL
  Recommendation: Use CAT or CI-V



Kessler Engineering AT-AUTO

- Not to be confused with Palstar AT-AUTO
- The Kessler can track rig frequency by RS232 instead of RF



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ICOM 47

SteppIR Automatic Antenna Controller

- FluidMotion, SDA100, OptimizIR (SDA2000)
- Tracks only by RS-232 or CI-V
- Custom SteppIR interface cable or S-BOX required
- Tuning Relay Interrupt opens amp. keying line while antenna is tuning

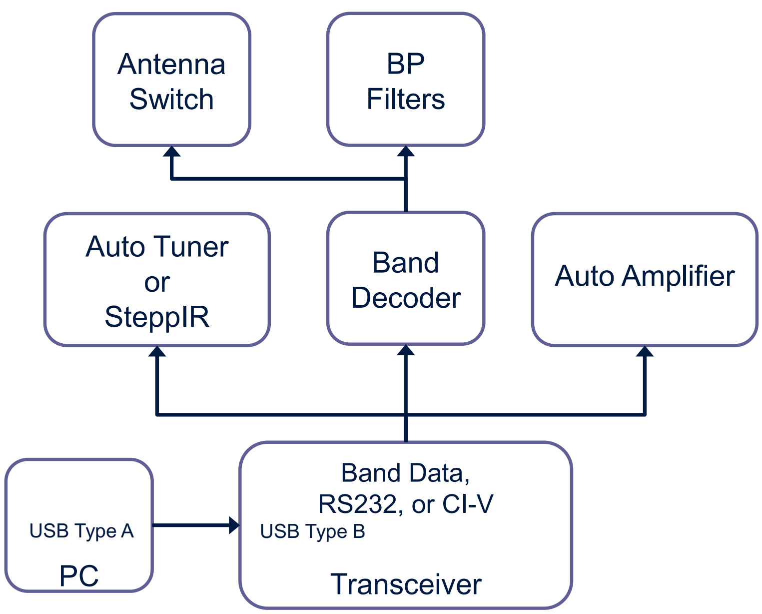
CONTEST UNIVERSITY

ICOM 48

WiMo Ultrabeam RCU-06 Antenna Controller

- Tracks by RS-232 or CI-V, Poll ON or OFF set by app.
- Tuning Relay Interrupt opens Amp. Keying Line while tuning

"So how do I connect all this together?"



Interface Cables

- Check DXE website or eBay
  - Many premade “Interface Cables” are listed
  - But some only provide a “Band Data” and “Keying” connection.
- You can also try to build your own from the documentation and pinouts
- Things get more complicated when you need to split Band Data Outputs or a single RS-232 connector to multiple devices (PC, Amplifier, BP Filters, SteppIR Controller)

Y-Cables for Band Data outputs

- Wiring Band Data Lines in parallel generally works OK, if voltages are compatible
- Winford Engineering CDY15HDMFF:

- N6TV Y-BOX:

Sharing Transceiver RS-232 port requires special wiring

- Cannot wire two Pin 3s (“TXD”) lines in parallel
- Simple DE-9 Y-cables will not work
- Connect only *one* TXD line to radio for polling
- Wire RXD lines in parallel to all devices
- The N6TV S-BOX and S-BOX-USB
  - Connects rig to SteppIR controllers, ACOM, SPE, RF Kit, etc. using standard molded cables

Key Recommendations

- When possible, let the transceiver drive the devices, instead of PC ports or software
- Use Band Data when frequency not needed
  - BPFs, Antenna Switches, Broadband Amplifiers
- Use RS-232 or CI-V data when frequency needed
  - Amps with tuners, SteppIR Controllers, automatic tuners
- Use off-the-shelf solutions if you’re not comfortable wiring your own interconnection cables, in other words …
- “If you don’t know what you’re doing, don’t *do* anything.”

References

- https://www.qrz.com/db/n6tv - Links to this and other presentations
- https://bit.ly/Y-BOX - The “Y-BOX” by N6TV
- https://bit.ly/S-BOX - The “Serial Box” by N6TV
- n6tv@arrl.net

Questions?

Optimizing Low Band Receiving Antenna Performance

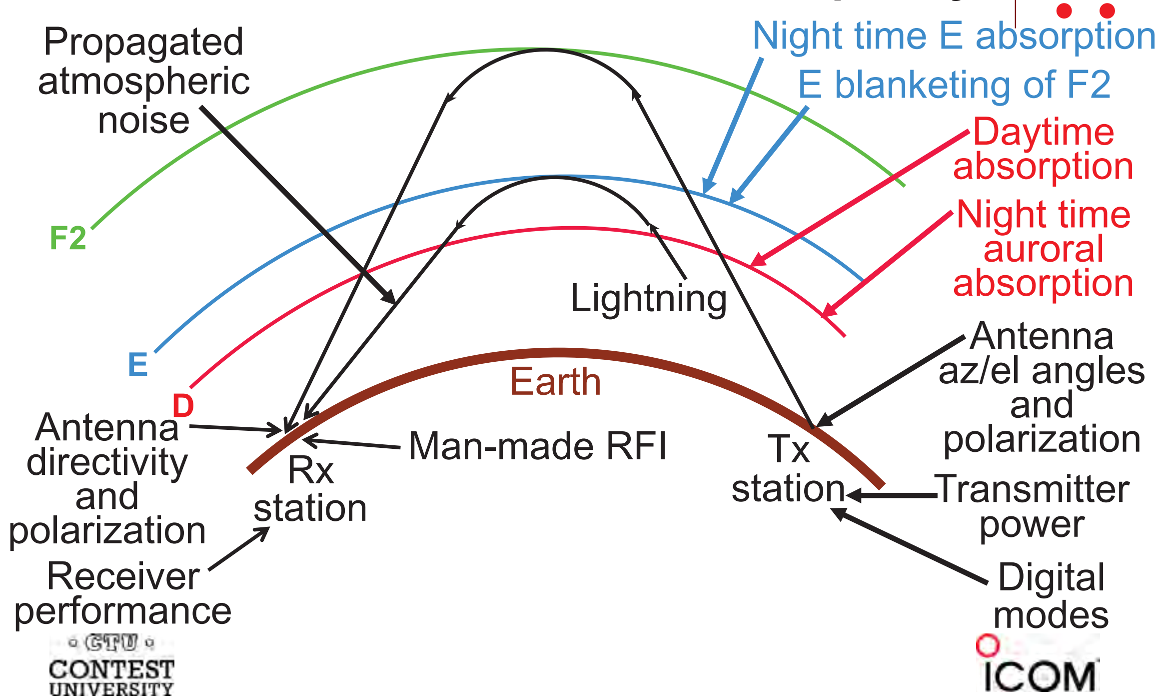
- Small antennas
- High performance antennas
- Diversity reception

Frank Donovan
W3LPL

CTU CONTEST UNIVERSITY   ICOM

160 Meter Propagation

What's So Hard About Communicating Near or Below the Lowest Usable Frequency?



Why Receiving Antennas?

Much better performance than most transmitting antennas

- much lower cost
- greatly reduced footprint
- greatly reduced height (7 to 25 feet)
- good directivity on as little as 650 to 2500 square feet
- excellent directivity on less than an ¼ acre
- directivity equivalent to a 5 element Yagi on less than 3/4 acre
- greatly reduced mutual coupling between individual receiving verticals
- greatly reduced need for efficient matching and extensive radial systems

High performance arrays perform equivalent to a 5 element Yagi!

Combining two antennas with a variable phase controller

- steerable nulls
- optimizes the front-to-back ratio of phased Beverages and phased verticals

Diversity reception with dual phase locked receivers

CTU CONTEST UNIVERSITY

All receiving antennas dimensions are for 160 meters - simply scale them to 80 meters

ICOM

Receiving Directivity Factor (RDF)

proven measure of receiving antenna performance

Compares forward gain at the desired azimuth and elevation angle to average gain over the entire hemisphere

- EZNEC computes antenna RDF

Assumes noise is equally distributed over the entire hemisphere

- an invalid assumption for suburban and especially urban locations where noise is often concentrated on the horizon at specific azimuths

Assumes that RFI is more then 1000 feet away, in the far field of the antenna

- where the antenna pattern of large antennas is fully formed, and
- RFI sources look more like a point sources

www.w8ji.com/receiving

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Re-radiation from antennas, towers and power lines within about 1000 feet can degrade your actual RDF **especially for high RDF arrays**

ICOM

Small Receiving Antennas

4 to 11 dB RDF

4 dB: Bidirectional 8 foot diameter "magnetic" loop *close to the ground*

5 dB: Single vertical antenna (short vertical or ¼ wavelength vertical)

6 dB: 225 foot Beverage on Ground (BOG) *poor low angle sensitivity*

7 dB: 250 foot Beverage about 7 feet high better low angle response

7 dB: Unidirectional terminated small loop *close to the ground*

- flag, pennant, EWE, VE3DO

8 dB: Two switchable small terminated loops at right angles to each other

- K9AY Array
- Shared Apex Loop Array

8 dB: Pair of 250 foot staggered Beverages about 7 feet high

9 dB: Two phased short verticals with 60 to 80 foot spacing

9 dB: Triangle array of phased short verticals with 60 to 80 foot spacing

11 dB: Vertical Waller Flag: two phased vertical loops *close to the ground*

CONTEST UNIVERSITY

Small antennas provide better RFI reduction when local RFI sources are within about 1000 feet

ICOM

High Performance Receiving Antennas

10 to 14 dB RDF

10 dB: Pair of 400 foot staggered Beverages about 7 feet high

10 dB: 500 to 600 foot Beverage about 7 feet high ideal for both 160 and 80 meters

11 dB: Two or three close spaced 500 to 600 foot Beverages, staggered 125 feet

11 dB: Vertical Waller Flag: 2 phased close spaced vertical loops close to the ground

12 dB: 700 to 1000 foot Beverage about 7 feet high *too long for 80 meters*

12 dB: 4 square array of active or passive short verticals 80 x 80 ft

12 dB: 3 element YCCC tri-band array of short active verticals 120 ft long

12 dB: 5 element YCCC tri-band array of short active verticals 84 x 84 ft

12 dB: 9-circle YCCC tri-band array of short active verticals 120 ft diameter

12 dB: Horizontal Waller Flag: 2 phased horizontal loops *100 feet high minimum*

13 dB: 1100 to 1300 foot Beverage about 7 feet high *much too long for 80 meters*

13 dB: BSEF array of 4 short verticals switchable in two directions 350 ft x 65 ft

13 dB: 8-circle array of short verticals with 106º phasing 200 ft diameter

13 dB: 8-circle BSEF array of short passive verticals 350 ft diameter + radials

14 dB: Four broadside/end-fire 750-1000 foot Beverages 750 ft x 330 ft

CONTEST UNIVERSITY

Large antennas are less effective than small antennas for suppressing local RFI sources within about 1000 feet

ICOM

Single Small Loop Antennas

4 - 7 dB RDF   120 to 150º 3 dB beam width

8 foot diameter bidirectional "magnetic" loop   4 dB RDF

- *bi-directional* 150º 3 dB beam width
- 24 dB deep vertically polarized null with very narrow 2º null width
- must be installed *close to the ground* to optimize the depth of the null by suppressing horizontally polarized signals
- a specialized antenna for steering a deep narrow null onto the RFI source onto a single ground wave propagated vertically polarized RFI source
- a 17 foot diameter loop has better DX sensitivity but only 20 dB deep nulls

Unidirectional terminated small loop antennas   6 - 7 dB RDF

- Flag   Pennant   EWE   K9AY   VE3DO
- 120º 3 dB beam width

Mechanically rotatable unidirectional terminated small loop antenna

- rotatable flag   6 - 7 dB RDF
- 120º 3 dB beam width

CTU CONTEST UNIVERSITY

Small antennas are the best RFI reduction antenna when RFI sources are within 1000 feet

ICOM

Two End-Fire Phased Vertical Loops 1919

CTU CONTEST UNIVERSITY

worldradiohistory.com/UK/Wireless-Age/Wireless-Age-1919-Apr.pdf

ICOM

Two End-Fire Phased Vertical Loops 1919

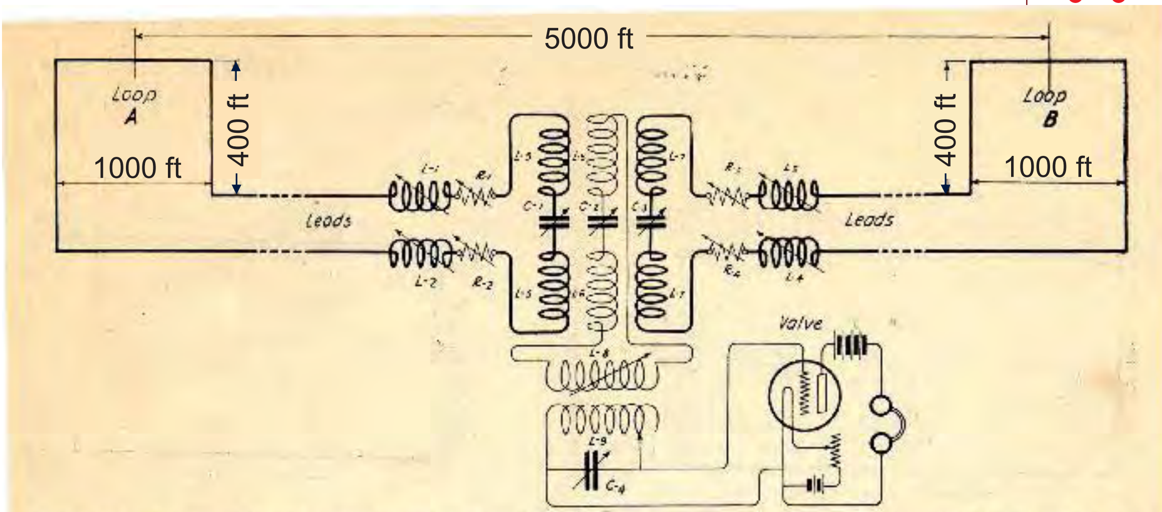


Figure 6—An early form of Weagant's system for eliminating static interference showing two single turn loop antennae spaced 5,000 feet apart. Each loop was 1,000 feet long at the base and 400 feet high. The leads from each loop were connected to the primary coils, L-5 and L-7, of the radio goniometer which were coupled to the secondary coil L-6. By rotating L-6, a position was found where the static currents neutralized and the signal currents were retained. This apparatus and antennae permitted the reception of signals from stations in Europe under conditions of static interference which with ordinary receiving apparatus and antennae would render reception impossible.

Arrays of Two Small Loops

8 - 11 dB RDF 80 to 120º 3 dB beam width

Electrically switchable compact arrays of two small loops

- two switchable K9AY loops installed close to the ground — 8 dB RDF
- Shared Apex Loop Array installed close to the ground — 8 dB RDF
- 120º 3 dB beam width

350 ft broadside spaced small terminated loops — 9 - 10 dB RDF

- Flag pennant EWE K9AY VE3DO installed close to the ground
- 80º 3 dB beam width

Mechanically rotatable array of two end-fire close spaced small loops

- Vertical Waller Flag: 2 phased vertical loops close to the ground — 11 dB RDF
- Horizontal Waller Flag >100 feet high - superb RFI suppression — 11 dB RDF
- 80 degree 3 dB beam width
- Close spaced end-fire small loops produce extremely low signal levels
  - requires at least 40 dB of preamp gain and 2 dB preamp noise figure or less
  - extreme attention to common mode signal suppression – invest in ferrites

Small antennas are the best RFI reduction antenna when RFI sources are within a few thousand feet

BOGs and Arrays of BOGs

BOGs have poor low angle sensitivity

6 to 8 dB RDF   60 - 90º 3 dB beam width

BOG 100º 3 dB beam width 6 dB RDF

- 225 foot wire supported *just above* ***but not on*** the surface of the ground

Switchable bi-directional BOG 100º 3 dB beam width 6 dB RDF

- 225 foot coax cable supported *just above* ***but not on*** the surface of the ground

Close spaced staggered BOGs 100º 3 dB beam width 7 dB RDF

- two or three close spaced BOGs with 125 foot end fire spacing
- significantly improves front-to-back ratio especially if a variable phase controller is used

Two wide spaced BOGs 60º 3 dB beam width 8 dB RDF

- 350 foot broadside spaced BOGs reduces beam width to 60º

BOGs are very low sensitivity antennas especially at low angles requiring excellent suppression of coaxial cable common mode signals

Beverages and Beverage Arrays

only 7 feet high to suppress horizontally polarized signals
single wire Beverage or two wire reversible Beverage

6 to 14 dB RDF   45 to 120º 3 dB beam width

250 foot Beverage	120º	3 dB beam width	8 dB RDF
400 foot Beverage	100º	3 dB beam width	9 dB RDF
500 to 600 foot Beverage	80º	3 dB beam width	10 dB RDF
600 to 750 foot Beverage	70º	3 dB beam width	11 dB RDF
750 to 1000 foot Beverage	60º	3 dB beam width	12 dB RDF

Staggered Beverage arrays 80º 3 dB beam width 11 dB RDF

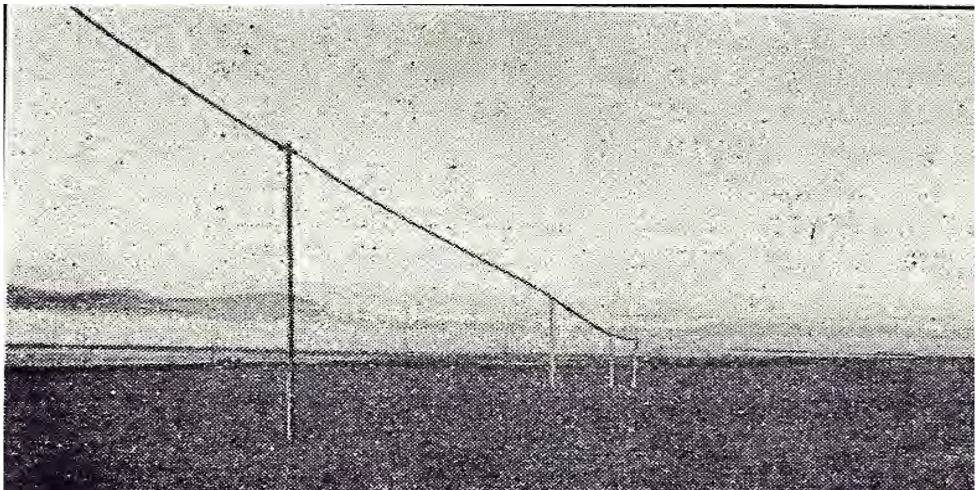
- two or three 500-600 foot Beverages with 125 foot end-fire spacing
- significantly improves front-to-back ratio with a variable phase controller

Broadside Beverage arrays 45 - 60º 3 dB beam width 12-14 dB RDF

- two Beverages with 350 foot broadside spacing, or
- four Beverages with 125 foot end fire spacing and 350 foot broadside spacing
- significantly improves front-to-back ratio with a variable phase controller

1300 Foot Beverage installed by Paul Godley 2ZE

Near the waterfront in Ardrossan, Scotland
During the successful 1921 Transatlantic Tests



Beverages were all but forgotten by hams for 45 years until K1PBW re-introduced them to 160 meter DXers in 1967

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Arrays of Short Phased Verticals

9 - 14 dB RDF 50 to 135º 3 dB beam width

Active high impedance 20 foot verticals

- capable of multi-band operation with some performance compromise
- no radials
- requires a high input impedance amplifier *at the base of each vertical*

----- or ----

Passive low impedance 25 foot verticals

- mono-band operation only
- very easy to troubleshoot and repair low parts count very reliable
- eight 70 foot or sixteen 35 foot radials *at the base of each vertical*
  - stabilizes the feed point impedance during all weather conditions
  - decouples the coax shield to suppress common mode signals
- four 25 foot umbrella wires
  - reduces the required height to 25 feet
  - increases the array bandwidth
  - or 35 foot verticals with no umbrella wires

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Any monoband array of phased short verticals can use either high or low impedance verticals

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Small Diameter Loop Antenna

Eight Foot Diameter "Magnetic" Loop

Excellent for nulling *a single* nearby RFI source

- RFI to be nulled must be vertically polarized and received via *ground wave*

Superb for precisely locating RFI very small loops have deeper nulls

Bi-directional figure-8 pattern very broad 150º 3 dB beam width

- Must be installed close to the ground to suppress horizontally polarized signals

Very deep approximately 2º wide nulls off *both sides* of the loop

- mechanically rotate the loop until the single local RFI source is nulled
- the null is not as deep for skywave propagated signals

Small loop antennas produce very low signal levels

- requires a 20-30 dB gain, very low noise figure preamplifier
- a low sensitivity receiving antenna for DX, limited by preamp noise figure

All attached cables must be choked to suppress common mode signals

- install common mode chokes on the coaxial feedline and preamp power cable
- bury cables about 12 inches deep for optimum null depth

Avoid re-radiated signals from nearby antennas and power lines

- locate the antenna as far as possible from other antennas and power lines

CTU CONTEST UNIVERSITY **The "Magnetic" Loop is a specialized antenna** ICOM

8 Foot Diameter Loop Antenna

4 dB RDF 150º 3 dB beam width deep 2º nulls

Inexpensive and very easy to build and use

Good compromise size with 24 dB null depth and fairly good sensitivity

24 dB nulls 2º wide broadside to the loop for local RFI suppression

Very broad 150º figure-8 bidirectional 3 dB beam width

Poor sensitivity for weak DX signals

Needs a preamplifier with 20-30 dB gain and 2 dB noise figure

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www.seed-solutions.com/gregordy/
Amateur%20Radio/Experimentation/160loop.htm

ICOM

Electrically Steerable Small Loops

- Two K9AY loops
  - switchable in four directions
  - footprint is only 25 x 25 feet and 25 feet tall
  - 120º 3 dB beam width
  - 7 dB RDF
- Shared Apex Loop Array
  - switchable in eight directions
  - footprint is only 50 x 50 feet and 25 feet tall
  - 75º 3 dB beam width
  - 8 dB RDF
- All small loop antennas produce very low signal levels
  - a high gain, low noise figure preamplifier is essential
  - requires very careful attention to choking unwanted common mode signals
    - choke the coaxial cable feed line and filter the control cable and power cable
    - bury the cables about 12 inches deep for best unwanted signal suppression
- Avoid re-radiated signals from nearby antennas, towers and power lines
  - locate the antenna as far as possible from antennas, towers and power lines

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Two K9AY Loops

7 dB RDF in only 625 square feet

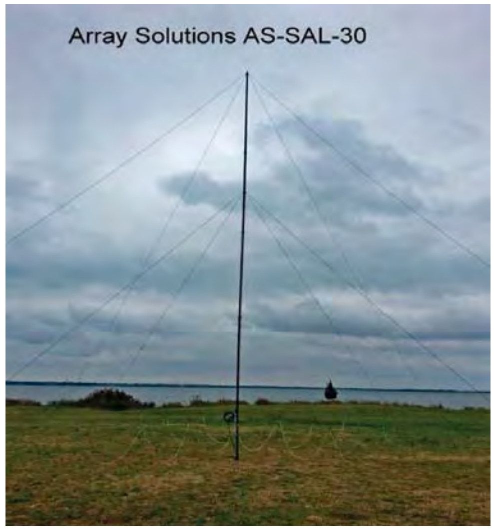
very small 25 x 25 foot square x 25 feet high
switchable in four directions
120º 3 dB beam width

CTU CONTEST UNIVERSITY www.arraysolutions.com/antennas/as-ayl-4-ant ICOM

Shared Apex Loop Array

8 dB RDF in only 2500 square feet

50 x 50 foot square x 25 feet high
switchable in eight directions
75º 3 dB beam width



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www.arraysolutions.com/antennas/as-sal-30

ICOM

Waller Flag Array – Vertical or Horizontal

11 dB RDF in only 30 feet of length

Two small terminated loops with very close end-fire phasing
For most locations: 14 feet tall and 30 feet long
For quiet locations: 20 feet tall and 50 feet long
80º 3 dB beam width
Requires a 30-40 dB gain preamp with very low 2 dB noise figure
A horizontal Waller Flag must be at least 100 feet high but higher is better

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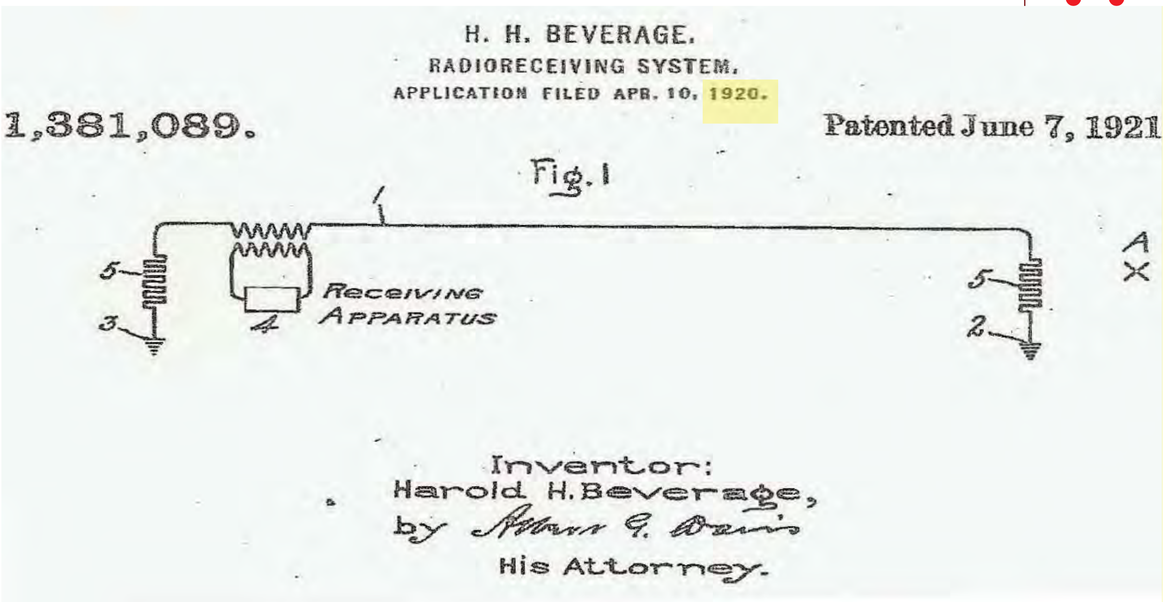
wwrof.org/wp-content/uploads/2016/03/WWROF-WEBNAIR-RX-Antennas-for-a-Small-Lot-.pdf

ICOM

Single Wire Beverage Antenna 1920



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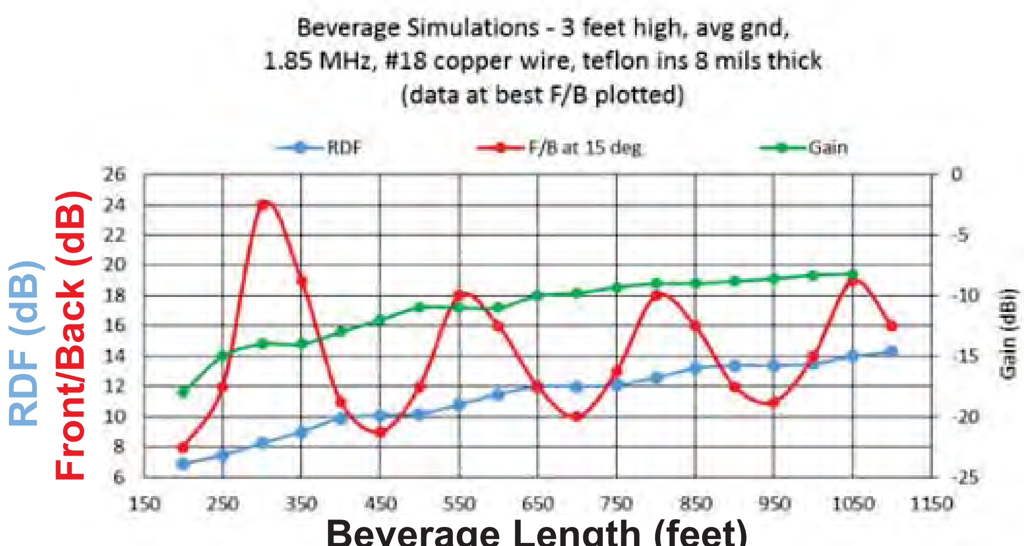
www.w8ji.com/beverages.htm

ICOM

Single Wire Beverage

The simplest and most reliable high performance receiving antenna

250 to 400 feet long	100º-120º 3 dB beam width	7-10 dB RDF
500 to 750 feet long	70-80º 3 dB beam width	10-12 dB RDF
750 to 1000 feet long	60º 3 dB beam width	12-13 dB RDF



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k9la.us/Trends_in_Beverage_and_BOG_Performance.pdf

ICOM

Beverage on (or very near) Ground

6 dB RDF with only 225 feet of length

a good choice when stealth is important

signal levels are *much stronger* if the wire is elevated just a few inches

only about 225 feet long -- *longer lengths significantly degrade performance*

90 to 100º 3 dB beam width

Very low signal levels – requires a high gain preamp with very low noise figure

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vimeo.com/199235390

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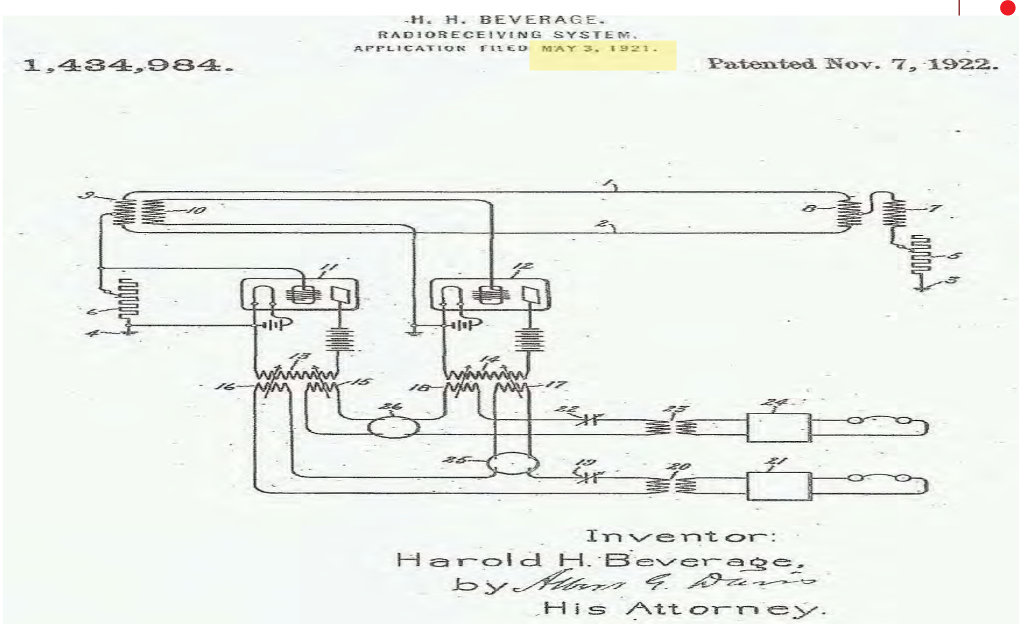
Two Wire Bi-directional Beverage - 1921

Switchable in two directions with one feed line

deep steerable rear null if both feed lines feed a variable phase controller



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w0btu.com/Beverage_antennas.html

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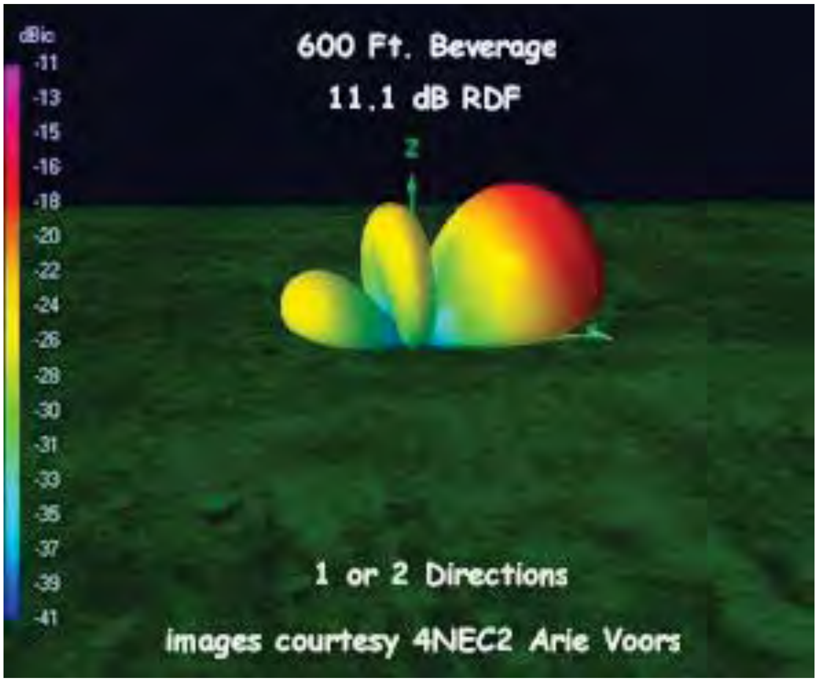
Radiation Pattern of a 600 Foot Beverage



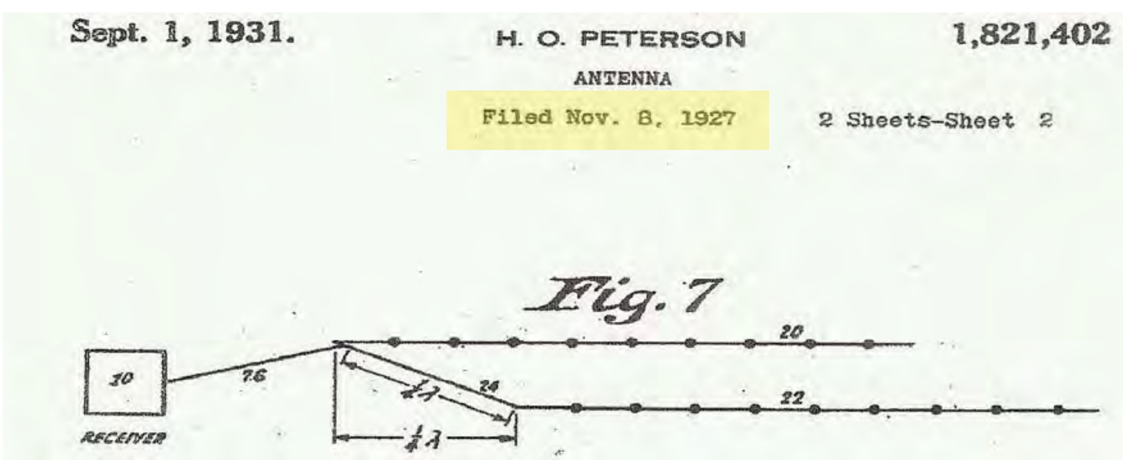
Staggered Beverage Array - 1927

11 dB RDF on one acre

Two or three close spaced, 500 to 600 foot staggered Beverages or two or three close spaced 225 foot BOGs – but only 7 dB RDF

Enhanced front-to-back ratio compared to a single Beverage or BOG

The deep rear null can be steered by a variable phase controller



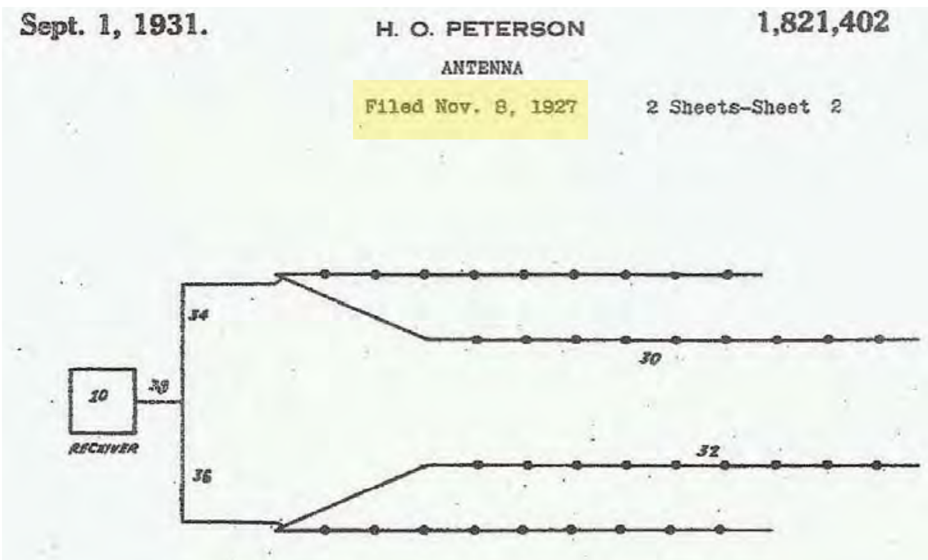
http://ncjweb.com/features/sepoct11feat.pdf

Broadside Pair of Staggered Beverages - 1927

14 dB RDF on 8 Acres

800 foot Beverages, 350 foot broad side spacing

50º 3 dB beam width



Phased *High Impedance* Verticals

Two or More 20 Foot Verticals

No radials

No umbrella wires

Switchable in multiple directions

Multi-band operation with compromise 65 foot element spacing

80 foot element spacing for improved 160 meter performance

- somewhat closer spacing is possible by using a variable phase controller

High input impedance amplifier at the feed point of each vertical

- stray capacitance must be reduced to a very low amount in the construction of the feed point of each vertical and amplifier input

Verticals must not be installed within ten feet of nearby objects

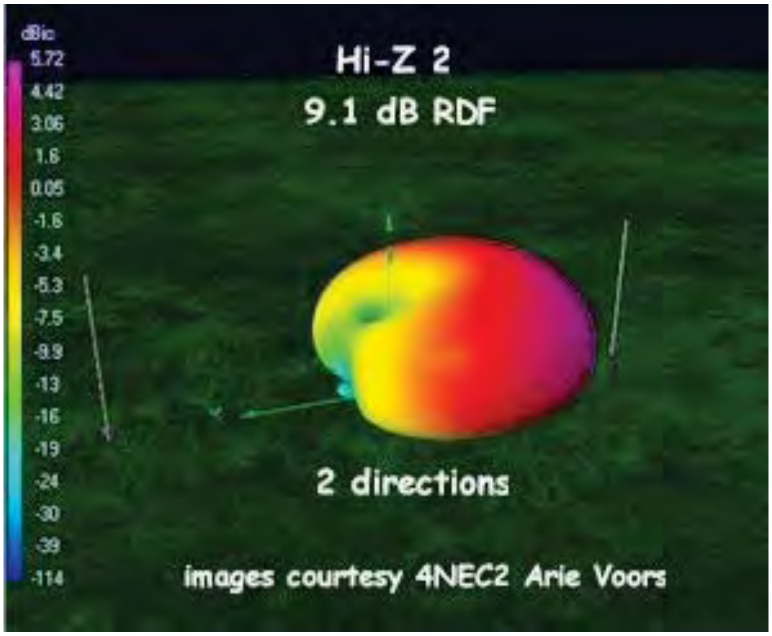
- Avoid nearby trees or any conductive or partially conductive structure

Avoid re-radiated signals from nearby antennas and power lines

- locate the antenna as far as possible from antennas, towers and power lines

Radiation Pattern of a Two Element Array of 20 Foot Verticals

9 dB RDF in 80 feet or less



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Electrically Steerable 4-Square Vertical Array

12 dB RDF on less than ¼ acre

four _high impedance_ 20 foot verticals
no radials no umbrella wires
80 x 80 foot square x 20 feet high
high input impedance amplifier at the base of each vertical
switchable in four or eight directions
100º 3 dB beam width

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dxengineering.com/parts/hiz-4-lv2-80

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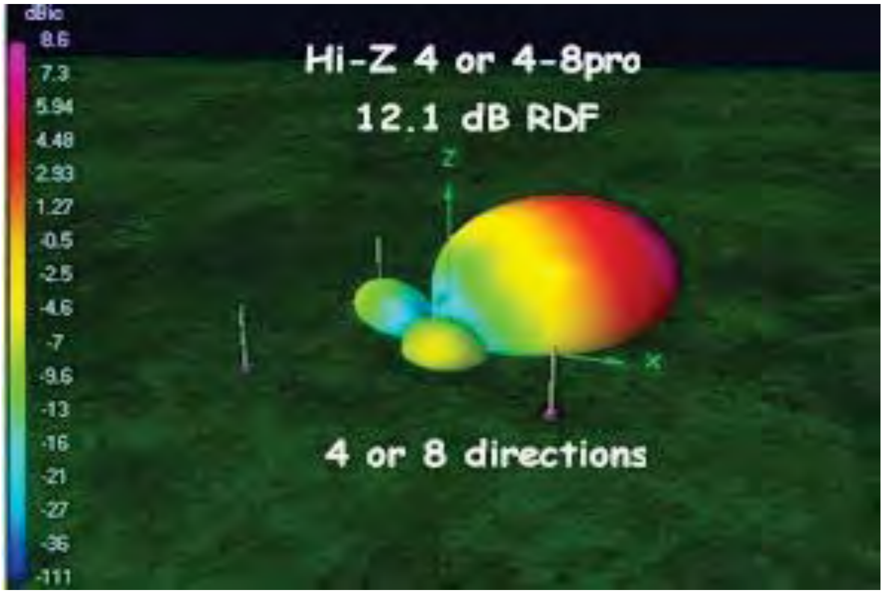
Radiation Pattern of a 4-Square Array of 20 Foot Verticals

12 dB RDF on less than ¼ acre



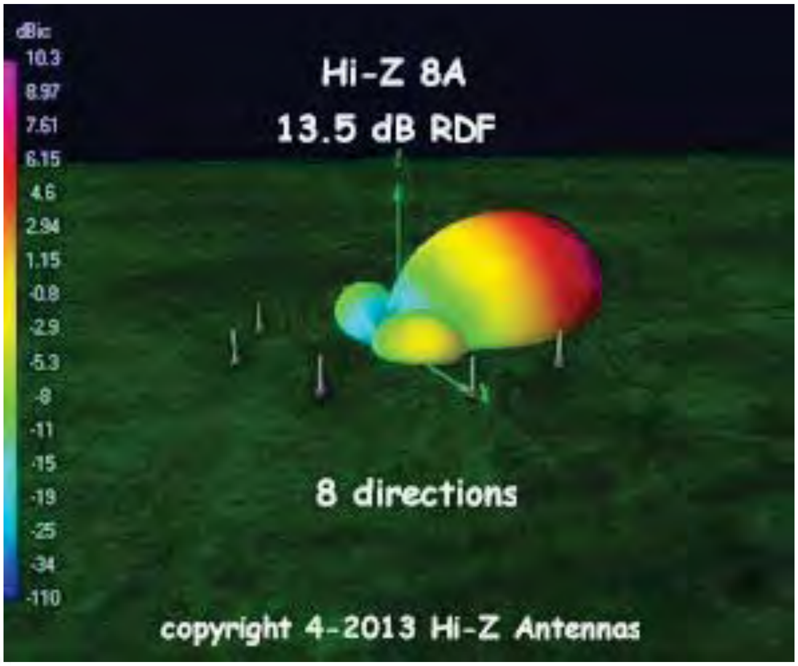
Electrically Steerable 8-Circle Vertical Array

13.5 dB RDF on only ¾ acre

eight *high impedance* 20 foot verticals
no radials and no umbrella wires
requires a high input impedance amplifier at the base of each vertical
only 200 feet in diameter
switchable in eight directions with 106º phasing
50º 3 dB beam width, equivalent to a 5 element Yagi

hizantennas.com/8_element_arrays.htm

200 Foot Diameter 8-Circle Array Radiation Pattern



High impedance verticals with 106° phasing

YCCC Triband Receiving Array

12 dB RDF on only ¼ acre

3, 5 and 9 element configurations with identical performance

- switchable in 180º, 90º and 45º azimuth steps respectively
- 80º 3 dB beam width
- slightly wider beam width and slightly lower RDF on 80 and 40 meters

120 feet in diameter

No radials

No umbrella wires

High impedance amplifier at the feed point of each 20 foot vertical

A common mode choke must be attached to each feedline where it connects to the controller

Install at least 10 feet from nearby trees and metallic structures

Avoid re-radiation from nearby towers, antennas and power lines

- locate the antenna as far as possible from other antennas and power lines

static.dxengineering.com/global/images/instructions/dxe-yccc-3inline.pdf

Phased *Low Impedance* Verticals

Two or More 25 Foot Monoband Umbrella Verticals

Short radials are required at the base of each vertical

- eight 70 foot radials, sixteen 35 foot radials or chicken wire
- randomly laid on the ground or shallow buried, symmetry is not important

Four 25 foot umbrella wires attached to the top of each vertical

- umbrella wires reduce antenna height and improve array bandwidth
- or use 35 foot verticals with no umbrella wires

As little a 65 foot element spacing

- small spacing works best when used with a variable phase controller

Amplifiers not needed at the base of each vertical - better reliability

Switchable in multiple directions

Very easy and low cost to homebrew your own antenna

- large diameter arrays are very tolerant of moderate amplitude and phase errors

Low impedance verticals are tolerant of nearby trees and buildings

Avoid re-radiated signals from nearby towers, antennas and power lines

- locate the antenna as far as possible from other antennas and power lines

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Excellent Performance and High Reliability

ICOM

Electrically Steerable 4-Square Vertical Array

12 dB RDF on ¼ acre

four *low impedance* 25 foot umbrella verticals
four 25 foot umbrella wires attached to the top of each vertical
eight 70 foot radials or sixteen 35 foot radials per vertical
65 x 65 foot square footprint plus additional space for short radials
switchable in four directions
easy and inexpensive to build
100º 3 dB beam width

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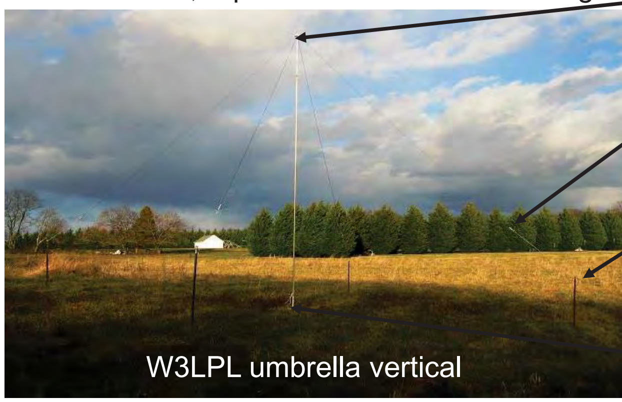
www.iv3prk.it/user/image/site2-rxant.prk_4-square_1.pdf

ICOM

Electrically Steerable 8-Circle Vertical Array

13.5 dB RDF on four acres

eight *low impedance* 25 foot umbrella verticals
four 25 foot umbrella wires installed on each vertical
eight 70 foot radials or sixteen 35 foot radials installed under each vertical
350 foot diameter plus space for radials
or only 200 foot diameter when used with a Hi-Z 106º phasing controller
switchable in eight directions
Very easy and inexpensive to build
50º 3 dB beam width, equivalent to a 5 element Yagi



construction details: www.w5zn.org

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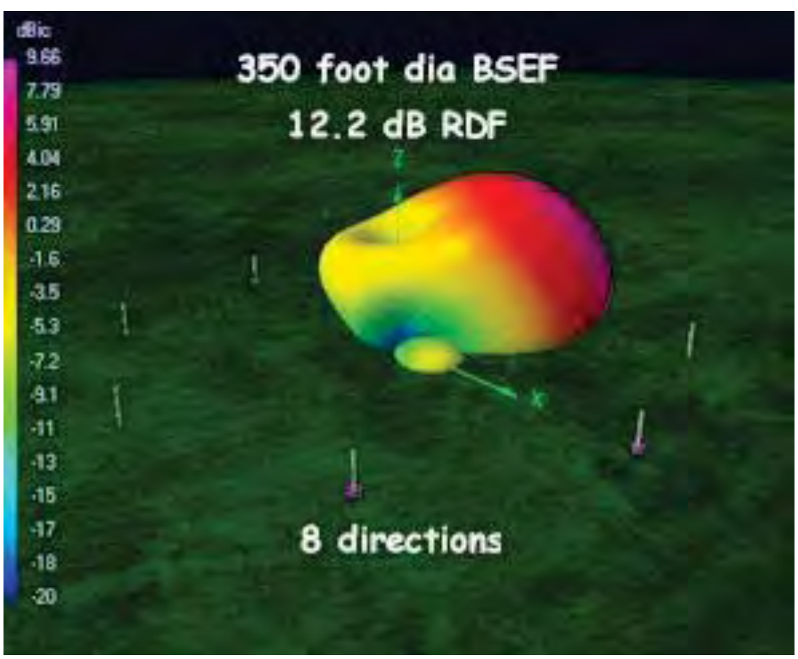
ICOM

350 Foot Diameter 8-Circle Array Radiation Pattern



Four phased elements with 115º end fire phasing

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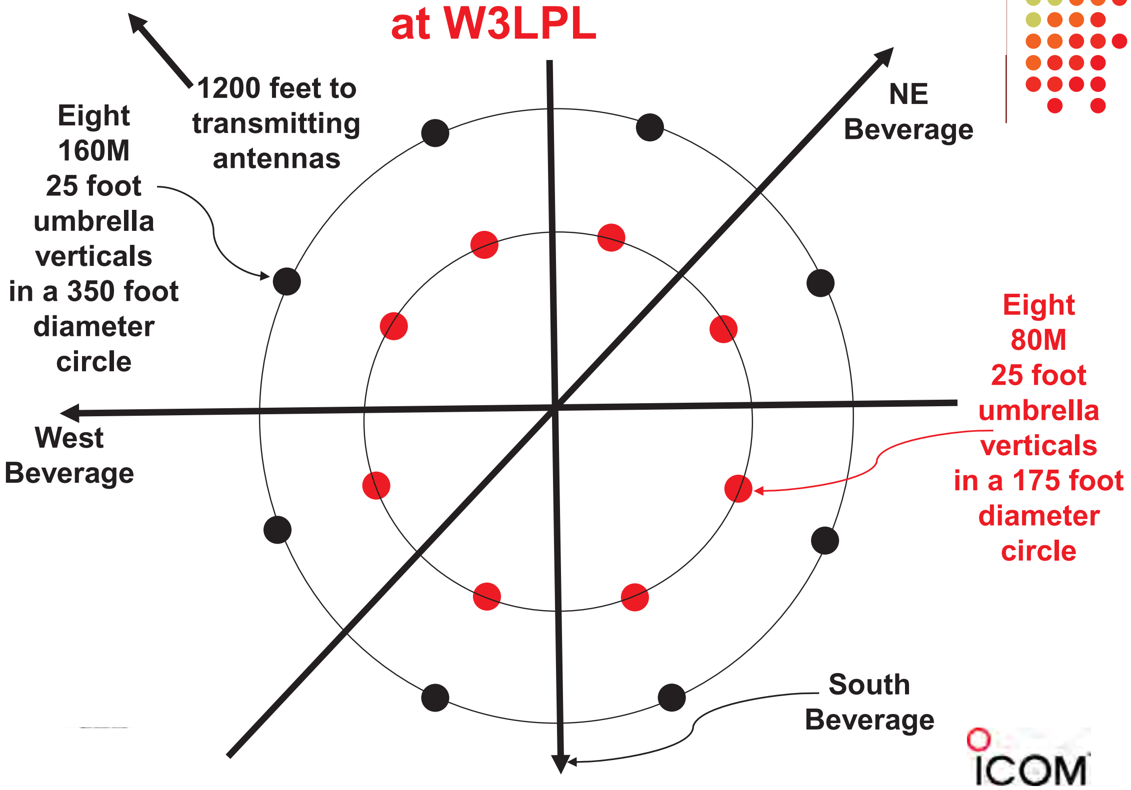
160 and 80 Meter Receiving Antenna Layout at W3LPL



Receiving Antenna Phasing System

DX Engineering NCC-2

Combines the inputs from two antennas

- creates a directional pattern with steerable deep nulls
- significantly improves the performance of phased Beverages and phased verticals
- very well engineered and exceptionally easy to use

dxengineering.com/parts/dxe-ncc-2

Phase Synchronous Diversity Reception

Two widely spaced antennas (at least 500 foot spacing)
feed two identical high performance phase locked receivers

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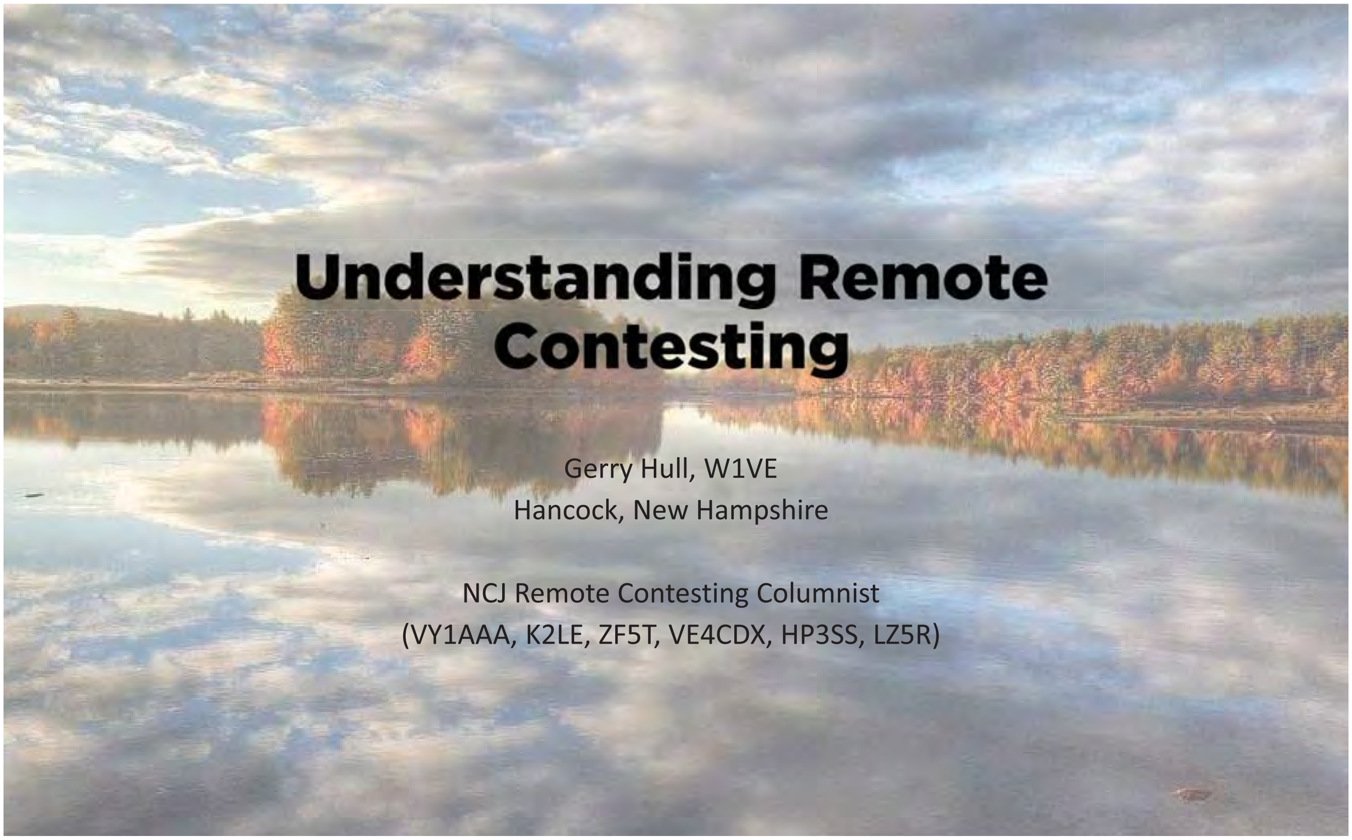
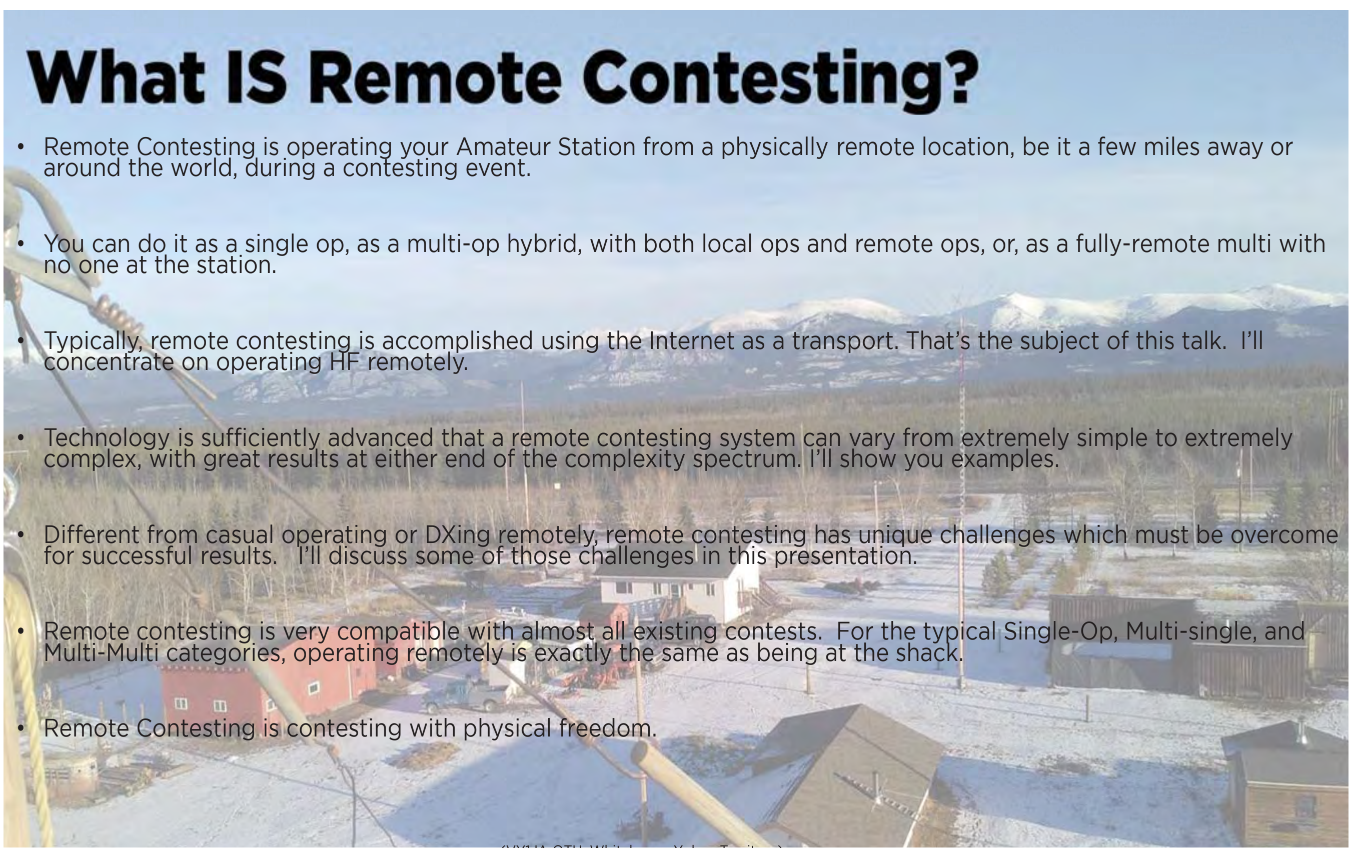
Elecraft K3s transceiver with KRX3 sub-receiver

ICOM

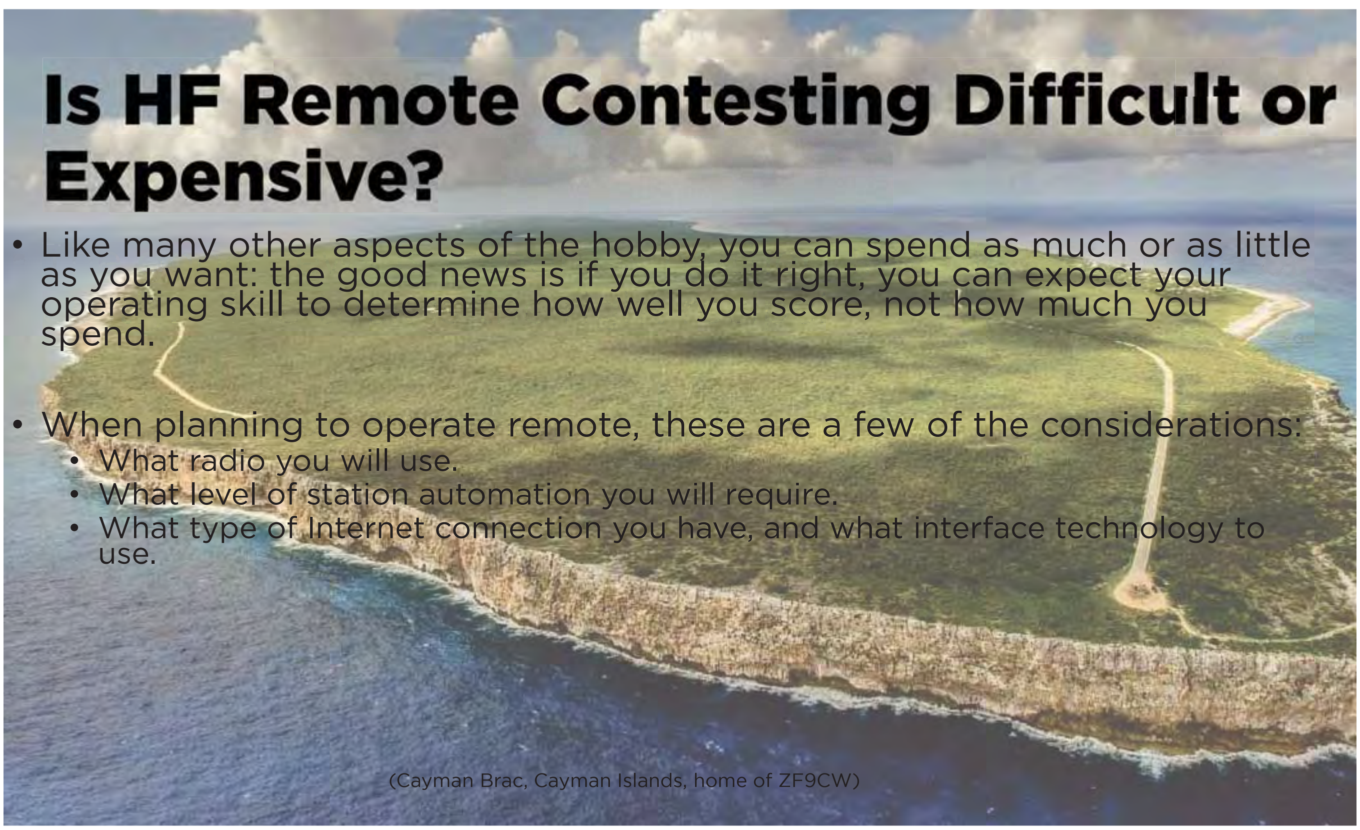

Understanding Remote Contesting
Gerry Hull, W1VE
Hancock, New Hampshire
NCJ Remote Contesting Columnist
(VY1AAA, K2LE, ZF5T, VE4CDX, HP3SS, LZ5R)


What IS Remote Contesting?
• Remote Contesting is operating your Amateur Station from a physically remote location, be it a few miles away or around the world, during a contesting event.
• You can do it as a single op, as a multi-op hybrid, with both local ops and remote ops, or, as a fully-remote multi with no one at the station.
• Typically, remote contesting is accomplished using the Internet as a transport. That's the subject of this talk. I'll concentrate on operating HF remotely.
• Technology is sufficiently advanced that a remote contesting system can vary from extremely simple to extremely complex, with great results at either end of the complexity spectrum. I'll show you examples.
• Different from casual operating or DXing remotely, remote contesting has unique challenges which must be overcome for successful results. I'll discuss some of those challenges in this presentation.
• Remote contesting is very compatible with almost all existing contests. For the typical Single-Op, Multi-single, and Multi-Multi categories, operating remotely is exactly the same as being at the shack.
• Remote Contesting is contesting with physical freedom.

Why Contest Remotely?

- Your location is not good: local noise, proximity to or distance from populations, no real competition, or too much competition.
- You have antenna or travel restrictions/budget restrictions.
- You have no station of your own, and want to experience HF. (Club station, friends QTH, etc.)
- You travel a lot and don't want to lug a lot of gear with you.
- You want to operate a contest with others, but health restrictions are preventing in-person operation (COVID).
- Because you can: another adventure in the contesting game.
- To overcome the technical challenge.

(VY1JA QTH, Whitehorse, Yukon Territory)



(Cayman Brac, Cayman Islands, home of ZF9CW)

What kind of Radio for Remote?

Almost any radio less than 30 years old will work for remote. All it needs to have is CAT control.

- That said, we are contesters. So – evaluate your radio choice for all other considerations before considering a purchase solely on a radio's remote capabilities.

  There are three classes of radios appropriate for remote operation:
  - Radios built before Internet remote was a consideration. These radios must at least have CAT control. These radios can be put into remote service by adding hardware or simple software.
  - Radios built to support Internet remote, either through hardware and/or software mechanisms. Radios in this class include the Kenwood TS-590S/SG, the Icom 7300/7610/7800, the Yaesu FTDX series, and the Elecraft K3/K4 series.
  - Radios built from the ground up intended as Internet-based radios: Flex, SunSDR, etc.
- ALL of the radios mentioned are capable of delivering world-class scores while operating in a remote situation.

Automation is the key to successful Remote Contestng. Period.

- If your station has manual antenna selection controls, a manually-tuned amplifier, and an old-fashioned rotor controller, you are going to have a rough time contesting remotely with any level of operator satisfaction.

- On the other hand, as an advanced contester, if you have automatic band switching via a band decoder, some stack-match switches, rf-relays that switch alternate antennas, and a modern rotator controller, you are in great shape.

- If you are in the later category, the next step is to get software and/or hardware to enable display of the above items on your computer desktop. Shop the DX Engineering catalog, or, if so inclined, write a bit of code and use off-the-shelf relay boards and rotor controller kits to automate the station.

What about Internet Service? What do I need for successful remote contesting?

Almost any kind of Internet service will work for remote.

- There are three things to consider:
  - Latency
  - Jitter
  - Bandwidth
- Latency is the amount of delay present between the station and your remote location. Latencies between 60-150 mS are quite acceptable, and remote works with latencies of over a quarter second, but it's not that much fun. That said, latency does not affect your ability to break pileups – the determining factors are typically the skill of the operator and the performance of the station.
- Jitter is the instantaneous change in latency over time. In ham radio, we want our overall latency (Internet connection + encode/decode overhead) to be low. Therefore, we don't buffer as much. Jitter will quickly cause our buffers to empty, leading to audio breakup.
- Bandwidth is how "thick" your pipe is to the Internet. For really good remote operation, you don't need much. 800Kbps up and down will work just fine for a single station. However, you have to watch out for what is called "Bandwidth Starvation". Typically, you'll run other software when running remote. The combination of all components determines the needed bandwidth. If you starve your connection, you will not be satisfied.
- What ISP Technologies work best for Internet Remote?
  - Fiber and Cable work the best.
  - Cellular 4G/LTE/5G works well IF you have sufficient bandwidth. (800 Kbps both directions. Some radio technologies will require more.)
  - Point-to-Multipoint Wireless is the worst situation, and I've rarely had it work. Most Wireless ISPs using Time-Division Multiplexing to serve sectors from a Multipoint radio. During the "off" time, the latency and jitter goes infinite, and audio dropouts will occur. If you have a wireless ISP, see if you can get a point-to-point connection.
  - DSL is totally acceptable IF you have at least 800 Kbps of upload speed per radio. (upload is the determining factor, usually.)
  - Satellite, such as any LEO service like Starlink, will work excellent for remote hf operation. Geostationary services will not work as they have excessive latency.
- Bandwidth requirements will multiply in a multi-radio scenario. That said, I've operated very successful M/2 using Bonded DSL with 12 Mbps down and 1.2 Mbps up.

The Bane of Remote: Your radios require a server connection.

- No matter the radio type, just about every remote connection uses what is called a peer-to-peer client-server model.
- In this model, your station is a server, and remote clients connect to the server. The address (IP address) or domain name must be known, and, it must be publicly accessible to the client.
- Understanding the network topology of the Internet, and the complexities of routing, the Domain Name Service, Network Address Translation (NAT) or Virtual Private Networking is beyond most hams. If the term Port Forwarding makes your stomach churn, it is best to find a networking guru among your ham buddies, and have them set up your network for remote. That said, there are some very good off-the-shelf solutions that will eliminate these remote headaches.
- The Flex guys understand this, so they offer the Smartlink Service, which essentially manages all of this complexity for you. However, many of us would like to use a variety of radios, and may not have Internet Service that Flex supports…

Solving the server dilemma: Rendezvous Servers

- A Rendezvous Server is a known server on the Internet that has public access for all. It's purpose is to connect Peer-to-Peer applications (such as our remote client server peers). In this scenario, you simply point both your station and the remote clients at the same Rendezvous Server.
- The number one use of this technique is software applications that provide Remote Desktop capabilities between peer computers on the Internet. The most popular of these services are Anydesk, TeamViewer and Rustdesk.

Anydesk as the Remote Desktop for Station Access

- Anydesk is a free download from Anydesk.com.
- Install Anydesk on both the Station side and Remote Side.
- Anydesk has configuration options to allow anytime remote access using a secure password. You can even set an "alias" for the remote-desktop address of your station, such as "w1ve@ad"

Here's what Anydesk looks like when connected to one of the stations at K1TTT's multi-multi. Remember I talked about automation being the key? Here you see The N1MM+ Logger, antenna switching, rotor control, rig control and even SDR panadaptor displays, all accessible via a simple Anydesk connection.

Mumble as the Super-low latency audio gateway to your remote station.

- Mumble is open-source audio conferencing client-server software developed by Internet real-time gamers.
- Mumble is available for a wide variety of operating systems.
- The mumble server and client software is free, and can be downloaded from Mumble.com.
- The trick for successful, very easy remote operation is to use Mumble as a Rendezvous server: Have your station and remote position connect to a publicly-known Mumble server. This has many advantages: it lowers the bandwidth requirements for multiple ops to join, and, no port forwarding is required.
- What I do is host mumble servers on very cheap Linux Virtual Private Servers, which you can lease for a few dollars a month. It is beyond the scope to discuss all that here. Check https://lowendbox.com for great deals on small linux VPS Servers. A good guide for installing a Mumble Server on Ubuntu is at https://www.unixmen.com/install-mumble-server-ubuntu/
- I have a complete guide to using Mumble for Remote available at http://files.w1ve.com/Installing_and_Configuring_Mumble_for_Amateur_Radio_Remote_Operations.pdf
- Don't want to wait? I have a large set of mumble servers for hams. Pick one that is close to you: na.audio.radiosport.network, arctic.audio.radiosport.network, west.audio.radiosport.network, northwest.audio.radiosport.network, and eu2.audio.radiosport.network. All work on the default port, with password ***Demo!***

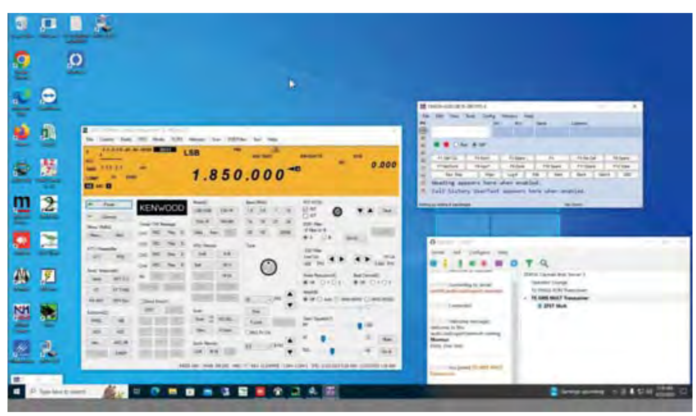
Anydesk + Mumble: Easy. Fast. It Just works.

- Setup Anydesk to your station computer's desktop.
- If you are running Icom, Kenwood or Yaesu remote applications, run them on your desktop at the station, and control them over Anydesk. It is much less complex then networking devices.
- Use a Mumble server in my list or setup your own. (See the guide)

Here's the multipler desktop at ZF5T. During This years ARRL DX CW, we finished top Low Power DX World (claimed). Here's a few lines from our CBS file. The Internet connection in Cayman Brac? It's Digicell 4G LTE!

QSO Rate Summary

Hour	160	80	40	20	15	10	Rate	Total	Pct
0000	0	0	0	1	90	89	180	180	3.5
0100	0	0	0	50	114	0	164	344	6.7
0200	0	0	79	158	0	0	237	581	11.3
0300	0	81	123	0	0	0	204	785	15.2
0400	3	186	0	0	0	0	189	974	18.9
0500	32	1	148	0	0	0	181	1155	22.4
0600	69	69	0	0	0	0	138	1293	25.1
0700	13	0	79	6	0	0	98	1391	27.0



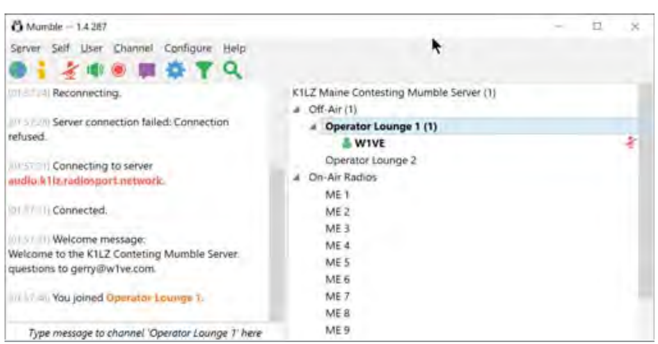
The secret sauce of Remote Contesting Success: Simplicity

- In any serious contest endeavor, there is always a level of complexity. Adding remote to the mix makes it worse.
  - Engineer your remote to reduce complexity.
  - The Internet can be unreliable. A connection that drops for a few seconds can completely through you off your game in the reconnection scenario is too complex:
    - Bad Example: N1MM+ Logger connected to SmartSDR-CAT + SmartSDR to remote Flex Radio. The Internet goes down. N1MM+ loses connection to the radio. SmartSDR-CAT loses it's virtual ports. Essentially you have to bring it all down and back up in sequence to work properly.
    - Good Example: Your Anydesk Connection Drops. Your Mumble audio drops. You immediately reconnect Anydesk and have control. Then, you reconnect Mumble and have audio. Downtime limited to a few seconds.

Remote Contesting Multi-ops: Communication is key

- One of the most important factors for multi-ops is inter-operator communication: in-band co-ordination, passing, band changes, talking strategy.
- In a hybrid or completely remote scenario, you can't tap the op sitting next to you on the shoulder. However, there are a bunch of techniques that work really well:
  - Mumble can have many channels. Some can be set up for Operator chats. In addition, the Mumble interface offers a text chat window.
  - Out-of-band text and audio chat applications such as WhatsApp or Telegram are very reliable and provide another channel for communication.

Here's the Mumble Server K1LZ used during ARRL DX CW, where 9 of the operators were remote:



Reference Material

- Mumble: http://www.mumble.com. Lots of online documentation for setting up both a sever and the client. (both your station and operators are clients.)
- Anydesk: http://www.anydesk.com. Be sure to download the free version. Install Anydesk, and set a password for remote access. Anydesk allows setting an alias, which is easy to remember. Most of us set it as your callsign. Then, connecting is as simple as entering callsign@ad.
- RemoteRig: details available at http://www.remoterig.com.
- DF3CB Yaesu control software (free) http://www.df3cb.com.
- WFView free Icom control software: http://wfview.org
- N1MM+ Logger, great for remote access, https://n1mmwp.hamdocs.com
- See my Remote Contesting articles in National Contest Journal. I cover many topics related to remote operating and station building.

Contact, Questions

- Email me anytime: Gerry@w1ve.com
- Questions?

CTU 2023 Presents

RTTY – FT4/8 Digital Contesting

Ed Muns, W0YK & P49X

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Digital Contesting is Fun!

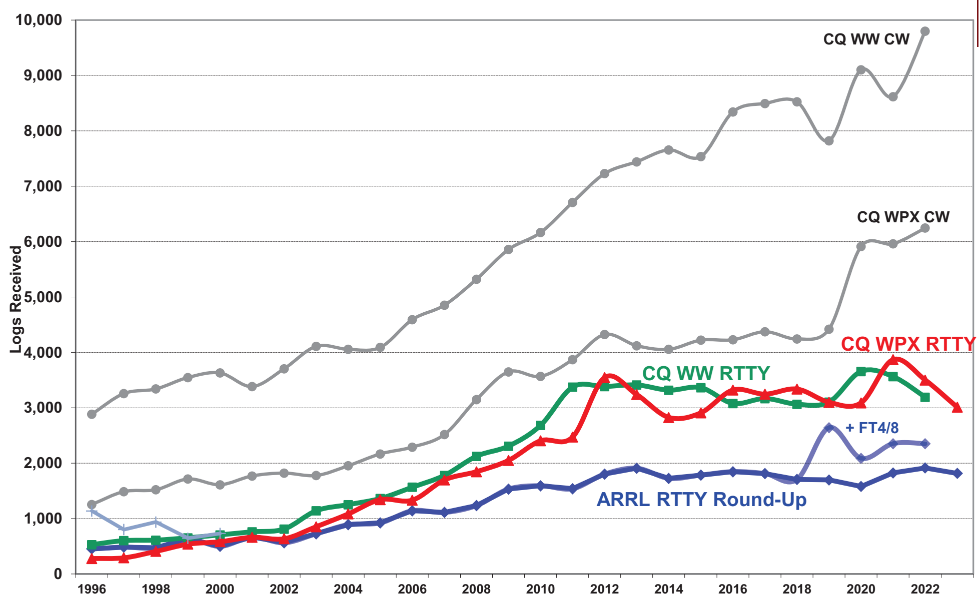
- RTTY Contesting → Digital Contesting
- RTTY
  - Operating
  - Setting Up
- FT4/8
  - Operating
  - Setting Up
- 2nd session: "*How to Maximize Your Digital Contest Station and Operation*"

Lots of RTTY Contests

~ two/month

- **Biggies (3) (3 - FT4/8)**
  - ARRL RTTY Roundup (1st weekend in Jan)
  - CQ WPX RTTY (2nd weekend in Feb)
  - ARRL Int'l Digital (1st weekend in Jun)
  - WW Digi (last weekend in Aug)
  - CQ WW RTTY (last weekend in Sep)
  - FT Roundup(1st Sat in Dec)
- **NCJ contests (4)**
  - NAQP RTTY (3rd Sat in Feb, 2nd Sat in Jul)
  - Sprint RTTY (2nd Sat in Mar & Oct)
- **Other popular RTTY contests (7)**
  - BARTG:
    - Sprint (3rd weekend Jan)
    - HF RTTY (3rd weekend Mar)
    - 75 Baud (3rd weekend Apr)
  - WAE RTTY (2nd weekend in Nov)
  - JARTS, Makrothen, SARTG (2)
- **NCCC Sprint (52 - every Thursday evening)**

Three Largest RTTY Contests



What Makes a Great RTTY Contester?

1) Contester who happily logs casual callers
2) Uses CW & SSB techniques where useful
3) Strives to exploit RTTY uniqueness
   - Auto-decode frees operator time … use it to do things difficult with CW & SSB, e.g., SO3R!
   - Speed is ~2x CW
4) Applies learning back to CW & SSB

What is RTTY?

compared to CW

CW

1) ***One*** RF carrier
2) Local audio ***pitch***
3) On ***or*** off
   - key up is data 0
   - key down is data 1
4) ***Morse*** code
   - typically 25-40 wpm

RTTY

1) ***Two*** RF carriers 170 Hz apart *(Space & Mark; Shift)*
2) Local audio ***tones***
3) One on ***and*** other off
   - Space is data 0
   - Mark is data 1
4) ***Baudot*** code
   - constant 60 wpm *(or 45.45 Baud)*

What is RTTY?

Figures Shift

- 5-bit code→32 chars.
- 2 sets:
  - Letters set & Figures set
  - 6 common control chars.
    - LTRS (unshifted)
    - FIGS (shifted)
    - Null, Space, LF, CR
- LTRS or FIGS toggle set

Code	Control Characters		
11111	LTRS		
11011	FIGS		
00000	Null		
00100	Space		
01000	LF		
00010	CR		
	Letters	Figures	
		ITA2	USTTY
00011	A	-	
11001	B	?	
01110	C	:	
01001	D	ENQ	$
00001	E	3	
01101	F		!
11010	G		&
10100	H		#
00110	I	8	
01011	J	BELL	'
01111	K	(	
10010	L	)	
11100	M	.	
01100	N	,	
11000	O	9	
10110	P	0	
10111	Q	1	
01010	R	4	
00101	S	'	BELL
10000	T	5	
00111	U	7	
11110	V	;	
10011	W	2	
11101	X	/	
10101	Y	6	
10001	Z	"	

What is RTTY?

code history

- Bacon's cipher (1605)
- Gauss & Weber (1833)
- Baudot code (1870)
  - Manual bit entry
  - 5-bit ITA1 code
  - Two 32-bit character sets
    - letters
    - figures
- Murray code (1901)
  - Teletype character entry
  - Western Union variation
- **5-bit ITA2 code (1930)**
    - **USTTY variation**
- ASCII (1963)
  - 7-bit ITA5 code

Code	Control Characters		
11111	LTRS		
11011	FIGS		
00000	Null		
00100	Space		
01000	LF		
00010	CR		
	Letters	Figures	
		ITA2	USTTY
00011	A	-	
11001	B	?	
01110	C	:	
01001	D	ENQ	$
00001	E	3	
01101	F		!
11010	G		&
10100	H		#
00110	I	8	
01011	J	BELL	'
01111	K	(	
10010	L	)	
11100	M	.	
01100	N	,	
11000	O	9	
10110	P	0	
10111	Q	1	
01010	R	4	
00101	S	'	BELL
10000	T	5	
00111	U	7	
11110	V	;	
10011	W	2	
11101	X	/	
10101	Y	6	
10001	Z	"	

What is RTTY?

Figures Shift

- The *LTRS* and *FIGS* characters do not print
  - The code for the characters “Q” and “1” is the same; which one prints depends on if you are in Letters or Figures set
  - Note that the *LTRS*, *FIGS* and *Space* characters appear in both sets
- Example: “***KI7GUO DE K4GMH***” gets sent as:
  - *LTRS* ***K I*** *FIGS* ***7*** *LTRS* ***G U O*** *Space* ***D E*** *Space* ***K*** *FIGS* ***4*** *LTRS* ***G M H***
- Why do we care to understand this?
  - If a burst of static garbles the *LTRS* or *FIGS* character, then what prints after that is from the wrong set until the next *LTRS* or *FIGS* character appears

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What is RTTY?

UnShift on Space

- UnShift On Space (USOS or UOS)
  - Increases noise immunity for alpha text
  - Space character forces a shift to the Letters set
- Contest exchanges are alpha and numeric
  - Should UOS be on ~~or off~~?
  - Should Space ~~or Hyphen~~ delimit exchange elements?
    - 599 1079 1079 or 599-1079-1079
- *Recommendation:*
  - *Turn on both RX & TX UOS and use Space delimiters*

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What is RTTY?

audio tones

- Space and Mark audio tones
  - Default: 2295 and 2125 Hz (“high tones”)
  - Less fatiguing: 1085 and 915 Hz (“low tones”)
- Analogous to CW pitch
  - Operator choice
  - Each operator can use different tone pairs
  - Transmission is two RF carriers 170Hz apart
- Must be same in radio and decoder/encoder

What is RTTY?

AFSK vs. FSK

Two methods of transmission:

- AFSK (Audio Frequency Shift Keying)
  - keyed audio tones into SSB transmitter via:
    - Mic input, or
    - Auxiliary audio input. e.g., Line In
- FSK (Frequency Shift Keying)
  - on/off keys the transmitter just like CW

Note: Receiving is the same in either case.

What is RTTY?

dial frequency

spots are often wrong

- RTTY RF is independent of local audio tones and whether LSB or USB is used:
  - The higher RF frequency is the Mark *(14090.000 kHz)*
  - The lower RF frequency is the Space *(14089.830 kHz)*
  - The difference between the two is the shift *(170 Hz)*
- FSK displays Mark *(14090.000 kHz)*
- AFSK displays suppressed carrier which varies with local audio tones and sideband used!
  - For Mark tone of 2125 Hz (Space tone of 2295 Hz):
    - LSB *(14092.125 kHz)*
    - USB – Mark & Space tones reversed *(14087.005 kHz)*

What is RTTY?

AFSK vs. FSK

AFSK

- Indirect *(tones → Mic input)*
- Any SSB radio *(esp. legacy)*
- SSB (wide) filtering
- Dial = sup. car. frequency
- VOX
- Audio cable *(a'la FT8, JT65/9, PSK31)*
- Must use high tones

NET (automatic TX tone control)

Less bandwidth (depends on radio)

Easier hook-up; NET

FSK

- Direct *(like CW keying)*
- “Modern” radios
- RTTY (narrow) filtering
- Dial = Mark frequency
- PTT
- COM FSK keying cable
- Can use low tones

No audio level adjust

No disabling speech proc.

No erroneous sound keying

Less pitfalls

What is RTTY?

summary

- Uses 5-bit Baudot (actually, USTTY) code with two sets of 32 characters: Letters and Figures
- Space & Mark frequencies separated by 170 Hz “Shift”
- Local Space & Mark tones analogous to pitch in CW
- Constant 45.45 Baud (60 wpm) asynchronous character stream with 5 data bits and 2-3 sync bits
- Figures Shift & Letters UnShift
  - Use optional UnShift-On-Space (UOS), plus space delimiter
- AFSK vs. FSK transmission (receiving is the same)
  - Radio dial frequency differences
  - 100% duty cycle!

The Cynics Say …

- “The RTTY decoder/encoder does everything.”

  however, this attribute …
  - frees the operator to improve other skills
  - enables more contest participants
  - provides mode diversity for contest junkies
- “RTTY is a pain to set up and get working.”

  … stay tuned, it’s really not that difficult!

RTTY Considerations

Much like CW and SSB, except:

- Non-human decoding implications
  - *serial number repeat, universal "fist" or "voice"*
- Distractions are tempting
  - *watch TV, do email, read, etc.*
- RTTY established practice
  - *'CQ' at end of CQ message*
- Whisper-level headphone volume; low tones
  - *just to detect presence & timing*
- Key-down transmission … 100% duty cycle

RTTY Sub-Bands

- 10 meters: 28080-28100, during contests 28080-28200
  - JA: 21070-21150
- 15 meters: 21080-21100, during contests 21080-21150
  - JA: 21070-21150
- 20 meters: 14080-14100, during contests 14080-14150
  - JA: 14070-14150
- 40 meters: 7025-7050 & 7080-7100, during contests 7025-7100
  - JA: 7030-7100
- 80 meters: 3580-3600, during contests 3560-3600
  - JA: 3520-3575 and 3599-3612
- 160 meters: 1800-2000
  - No RTTY contesting

RTTY Messages

CQ WPX RTTY Contest

- Short, as with CW/SSB
- No extraneous info
- 599 (not 5NN) once
- Serial number twice
- Space (not hyphen)
- Omit 'DE'
- RTTY chars
  - %R (CR, LF)
  - %E (drop PTT)
- End with Space

www.rttycontesting.com/tutorials/messages

F02:	%RWPX P49X P49X CQ %O%E
F03:	%R P49X %E
F04:	P49X %E
F05:	%R%C 599 %N2 %N2 %E
F06:	%RTU P49X CQ %O%E
F07:	%RQRV %ZR.1 %E
F08:	%R %C TU .. NOW%L%E
F09:	%RAGN %E
F10:	%RNR? %E
F11:	%R%N3 %E

F02:	%RWPX P49X P49X P49X CQ %O%E
F03:	%RQSL LOTW OR W0YK %E
F04:	%R%C %E
F05:	%RTU 599 %N2 %N2 %L%E
F06:	%RKB %H P49X CQ %L%O%E
F07:	%RQRV %ZS.1 %E
F08:	%R%H %C KB .. NOW%L
F09:	%RQRZ %E
F10:	%RCALL? %E
F11:	? %E

RTTY Messages

formatting

CR/LF Space Receive

F02:	%RWPX P49X P49X CQ %O%E
F03:	%R P49X %E
F04:	P49X %E
F05:	%R%C 599 %N2 %N2 %E
F06:	%RTU P49X CQ %O%E
F07:	%RQRV %ZR.1 %E
F08:	%R %C TU .. NOW%L%E
F09:	%RAGN %E
F10:	%RNR? %E
F11:	%R%N3 %E

Super Check Partial

call sign selection

- SCP (Super Check Partial) enables computer to select call signs in receive window
  - Unworked calls (no mult)
  - New mults and double mults
  - Dupes

XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

N1MM Logger

- Use main SCP from CW/SSB/RTTY contests
  - RTTY SCP is a subset, so use full file

Super Check Partial

logger differences

XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

- *Custom colors*
- *Highlight option*

N1MM Logger

XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

WriteLog

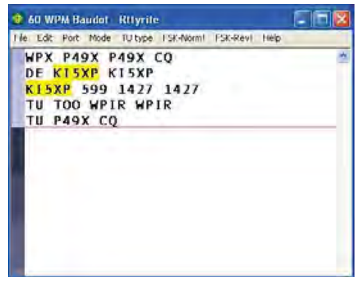
XYZAB	AA5AU	XYZAB
XYZAB	9Y1VC	9N8TT
XYZAB	W5UKM	XYZAB

Win-Test

Tips

"All I receive is gibberish!"

- "Upside-down"
  - Reverse Mark & Space
  - LSB vs. USB
- Figures vs. letters
  - TOO=599, WPIR=2084
  - UOS should be on
  - Shift-click to convert, or look at top two rows
- Audio-In level, tones, flutter
- (Other station's signal)



Tips

"They never answer me!"

- "Upside-down"
  - FSK: polarity switch in radio
  - AFSK: LSB vs. USB; polarity select in software
- Off frequency
  - AFC on with NET (AFSK only) off [recommend RIT instead]
  - AFC & NET on by default in MMTTY
    - changes not sticky; change defaults in USERPARA.INI
- AFSK: Mic & SC levels; speech processor on
- Radio mode, tones, FSK interface

More Tips

- 100% duty cycle … *caution!*
- Practice
  - During RTTY contests (~ two per month)
  - NCCC Thursday night practices (weekly)
- Multi-Ops

RTTY Operating

summary

- Many casual RTTY contest participants
- RTTY sub-bands; 10-80 only; avoid audio-digital & beacons
- 500 Hz receive filtering; USOS on
- Messages ("macros")
  - Short, ~~5NN~~, unique exchange twice, Space delimiter
- Common problems
  - "Upside-down" (reversed Space/Mark or LSB vs. USB)
  - Figures vs. Letters
  - Audio:
    - RX audio output level and TX (AFSK only) audio input level
    - Unmuted soundcard inputs and outputs
    - Space and Mark tone consistency between decoder and radio
  - Off-frequency tuning (AFC & NET); band conditions

The Cynics Say …

- “The RTTY decoder/encoder does everything.”
  however, this attribute …
  - frees the operator to improve other skills
  - enables more contest participants
  - provides mode diversity for contest junkies
- “RTTY is a pain to set up and get working.”
  … stay tuned, it’s really not that difficult!

How Do I Set it Up?

overview

- ***Acquire*** and set up hardware and/or software to convert between the RTTY audio tones and text:
  - RTTY ***receive*** decoder
  - RTTY ***transmit*** encoder
  - PC-radio interface
- ***Configure*** decoder/encoder
- ***Integrate*** decoder/encoder with logger

The rest of the station setup is the same as for CW and SSB

How Do I Set it Up?

RTTY decoder/encoder

- RTTY ***receive*** decoder converts the two RTTY tones to printed characters.
  - CW decoders seldom used
  - Ears/brain/hands for CW/SSB
- RTTY ***transmit*** encoder converts typed characters (or messages) into the two tones (AFSK) or on/off keying (FSK).
  - logger *CW keyers and SSB DVKs are also used, similar to RTTY encoders*
  - Otherwise, brain/hands/mouth for CW/SSB

How Do I Set it Up?

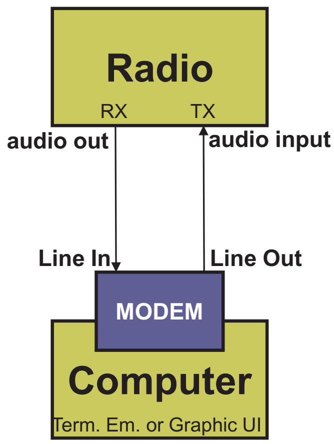
decoder/encoder terminology

- The RTTY ***transmit encoder*** and ***receive decoder*** is sometimes referred to as a MODEM or a TNC:
  - MODEM = MOdulator DEModulator
  - TNC = Terminal Node Controller
- MODEMs can be:
  - a hardware box, or
  - a software application driving a PC soundcard

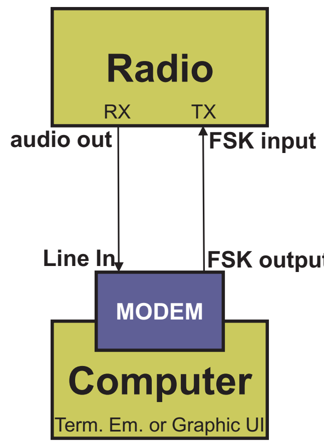
How Do I Set It Up?

hardware MODEM

AFSK



FSK

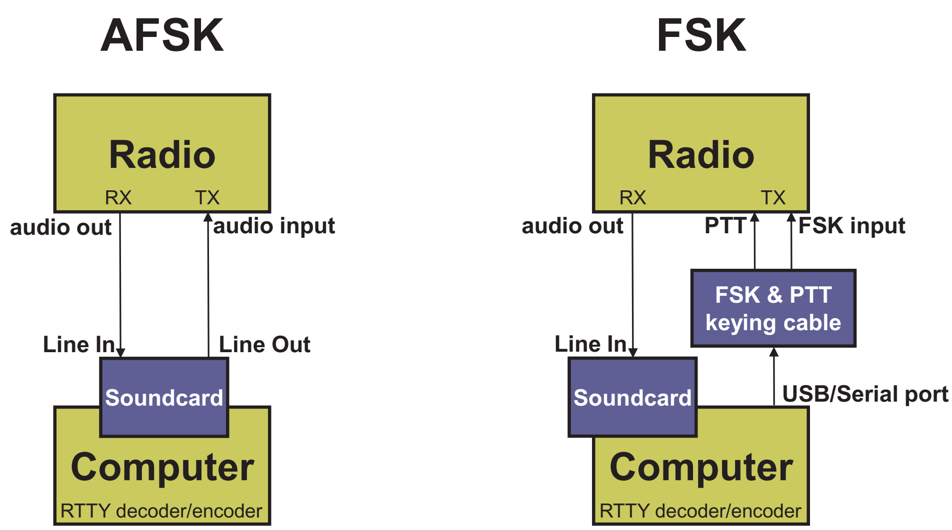


How Do I Set It Up?

hardware MODEM

How Do I Set It Up?

software application & soundcard



How Do I Set it UP?

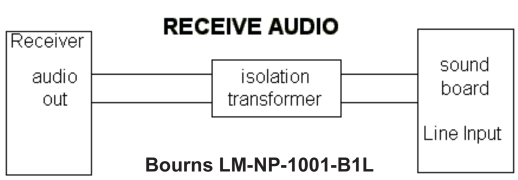
cables

- Receive:
  - RX audio out to soundcard — 1:1 isolation transformer
  - *Optional DSP filter* — *JPS NIR-12, or …*
- Transmit:
  - AFSK: TX audio in from soundcard, *or* — 1:1 isolation transformer, *or*
  - FSK: FSK/PTT keying — Keying interface

How Do I Set It Up?
ground loops

- Eliminate ground loops between radio and PC
- Otherwise insert 1:1 audio isolation transformer on:
  - RX output
  - TX Mic input *(AFSK only)*
- Alternatives:
  - Bourns LM-NP-1001-B1L transformer → homebrew cable
  - Ground loop isolators
  - W2IHY iBox
  - Commercial RTTY interfaces
  - K3 (uses Bourns LM-NP-1001-B1L on LINE IN & OUT)

How Do I Set It Up?
homebrew audio isolation



-90 dBc 3rd order IMD

How Do I Set It Up?

ground loop isolators

Radio Shack $19.49   or   eBay $6.99
-64 dBc 3rd order IMD

eBay $3.35

eBay $5.50

eBay $7.45

How Do I Set It Up?

W2IHY iBox audio isolation

How Do I Set It Up?

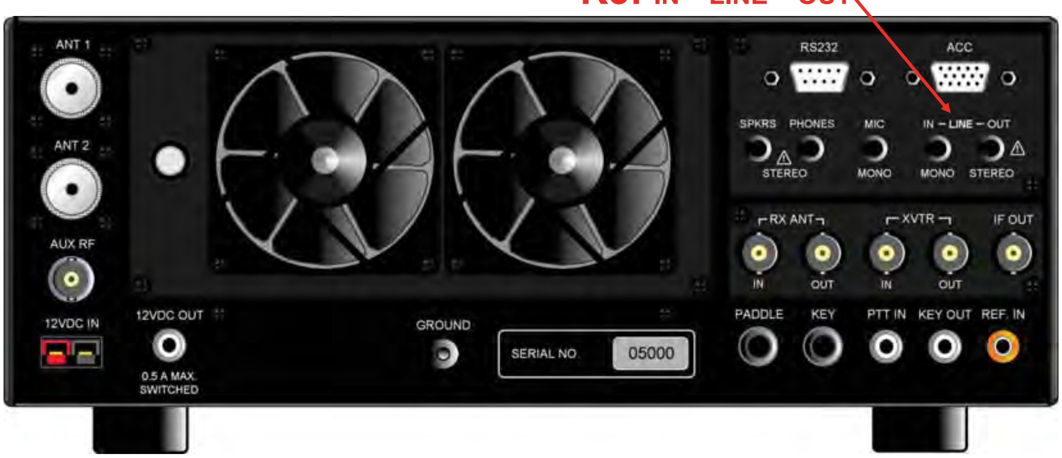
commercial interface audio isolation

Rascal

How Do I Set It Up?

radio audio isolation

K3: IN – LINE – OUT



How Do I Set It Up?

SDR digital audio isolation

K3S digital: CODEC (**soundcard**)
analog: **IN – LINE – OUT**

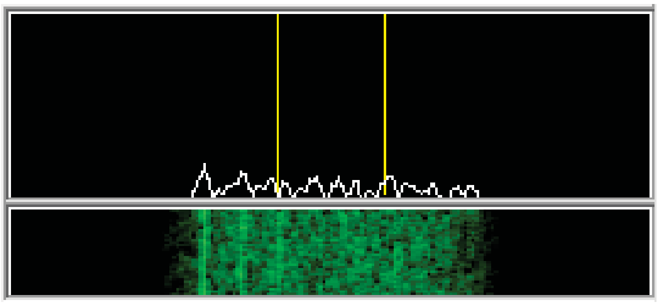
How Do I Set It Up

optional radio AF filtering

- PC Audio isolation
  - Transformer
  - Commercial interface
  - Some radios (K3, Flex)
- Narrow IF filters (Roofing & DSP)
  - 500 Hz - normal
  - 250 Hz – extreme QRM only
  - Tone filters – don't use
    - Icom Twin Peak Filter
    - K3 Dual-Tone Filter
- Audio filtering
  - JPS NIR-10/12
  - Timewave DSP-599zx
  - Modern DSP rigs

How Do I Set It Up?

adjust RX audio



- Set RX audio level for noise 5% of full-scale
  - Receiver audio out level control, and/or
  - *Windows* Recording Volume Control applet

How Do I Set It Up?

adjust AFSK audio

Insure SSB processor (compression) is Off.

- Adjust:
  - the *Windows* Playback Volume control, and
  - the transmitter Mic (or auxiliary audio input)
- Such that:
  - ALC is just backed off to moderate, and
  - full power output is attained.

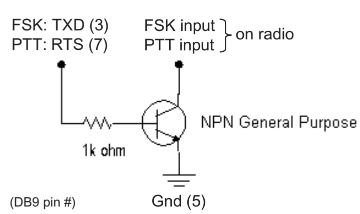
How Do I Set It Up?

PTT vs. VOX

- AFSK uses VOX or PTT
  - radio Mic input will allow VOX
  - rear panel auxiliary audio input may not; then PTT
  - PTT can usually be keyed via the radio CAT cable
- FSK uses PTT
  - Serial port controls FSK and PTT signals

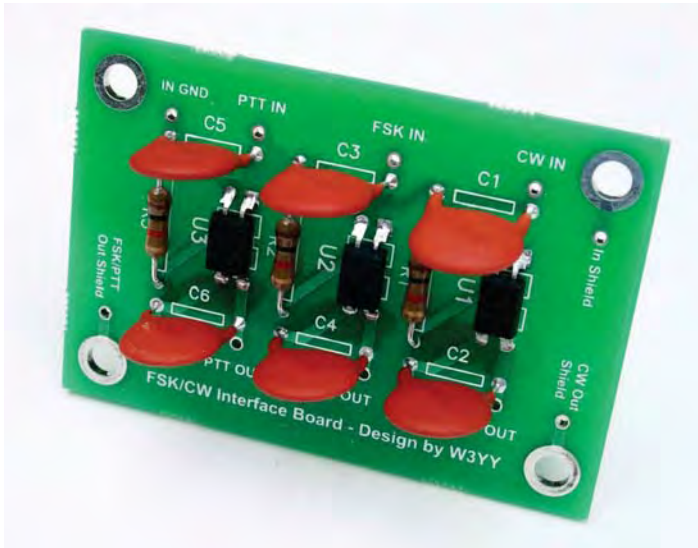
How Do I Set It Up?

homebrew FSK & PTT keying cable



How Do I Set It Up?

W3YY FSK & PTT keying cable



How Do I Set It Up?

Morrty

How Do I Set It Up?

commercial interfaces

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How Do I Set It Up?

RigExpert Interfaces

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18 May 2023

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How Do I Set It Up?

commercial interfaces

Vendor	Model	Price	PC In'fc	PTT	Soundcard	Level ctrl	FSK	CW	WinKey	Voice	Radio in'fc
generic (with K3)	(2) 3.5mm M-M audio cables	$ 10	-			√					
Buxcomm	Rascal-IIB or -IIIA	$ 69	-								
Buxcomm	Rascal GLX	$ 79	Serial	√							
Tigertronics	SL-1+	$ 80	-	auto							
Tigertronics	USB	$ 110	USB	auto	√	√					
MFJ	1273B	$ 60	Serial	√							
MFJ	1275	$ 110	Serial	√							
MFJ	1279	$ 140	Serial	√	√						
Mountain Radio	RIGblaster Nomic	$ 60	Serial/USB	√							
Mountain Radio	RIGblaster Plug & Play	$ 120	USB	√				√			some
Mountain Radio	RIGblaster Plus II	$ 160	USB	√			√ or CW	√ or FSK			some
Mountain Radio	RIGblaster Advantage	$ 200	USB	√	√	√	√ or CW	√ or FSK			√
Mountain Radio	RIGblaster Pro	$ 300	Serial/USB	√			√	√			√
Navigator	Navigator	$ 417	USB	√	√	√	√	√	√		√

See May-June 2012 NCJ, "RTTY Contesting" column

How Do I Set It Up?

microHAM interfaces

One Radio

SO2R

How Do I Set It Up?

RigExpert & microHAM interfaces

Vendor	Model	Price	PC In'fc	PTT	Soundcard	Level ctrl	FSK	CW	WinKey	Voice	Radio in'fc	SO2R
RigExpert	Tiny	$ 120	USB	√	√			√		√	√	
RigExpert	Standard	$ 265	USB	√	√	√	√	√	√	√	√	
RigExpert	TI-5	$ 365	USB	√	√	√	√	√	√	√	√	
microHAM	USB Interface II	$ 179	USB	√				√			√	
microHAM	USB Interface III	$ 225	USB	√	√	√		√			√	
microHAM	Digi KEYER II	$ 369	USB	√	√	√	√	√	√		√	
microHAM	microKEYER II	$ 479	USB	√	√	√	√	√	√	√	√	
microHAM	micro2R	$ 369	USB	√		√	√	√	√	√	√	√
microHAM	MK2R	$ 899	USB	√		√	√	√	√	√	√	√
microHAM	MK2R+	$ 999	USB	√	√	√	√	√	√	√	√	√

See May-June 2012 NCJ, "RTTY Contesting" column

How Do I Set It Up?

summary - receive

1. Connect receiver audio output, via isolation, to …
   - MODEM Audio In,

     or
   - MMTTY via Soundcard Line In (or Mic In with pad):
     - Enable/adjust soundcard Line In (or Mic) input, disable/mute other inputs
2. Optional receive audio filtering

How Do I Set It Up?

summary - AFSK

1. Connect radio's Line In (or, Mic In with pad), via isolation, from:
   - MODEM Audio Out

     or …
   - Soundcard Line Out
2. Speech processor off
3. Enable/adjust SC audio level
   - Disable or mute all other SC outputs

How Do I Set It Up?

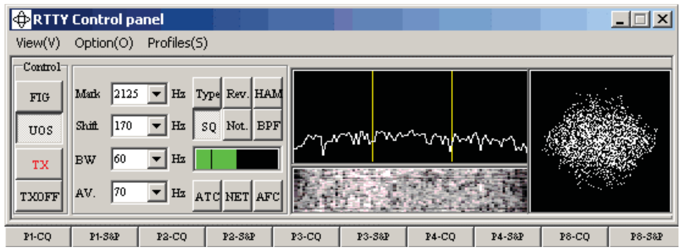
summary - FSK

1. Connect the radio FSK and PTT inputs to:
   - the MODEM FSK and PTT outputs and connect the MODEM Serial port to the PC (USB adapter)

     or, if MMTTY …
   - the RTTY interface FSK and PTT outputs and connect the interface Serial port to PC (USB adapter)
2. If no PC Serial port, then use a USB-Serial adapter.
   - Beware that some won't key FSK properly. Edgeport USB-Serial adapters are known good.

Decoders

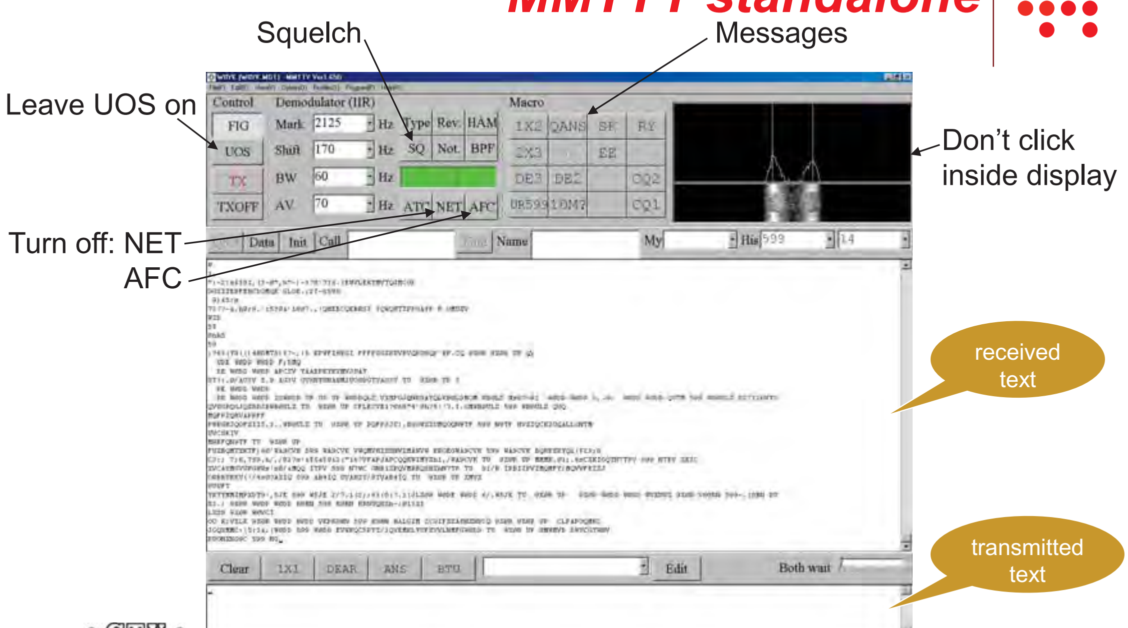
MMTTY



- Dominant soundcard MODEM in use today
- Exceeds performance of most other MODEMs
- Freeware since introduction in 2000
- Written by Mako, JE3HHT

How Do I Set It Up?

MMTTY standalone

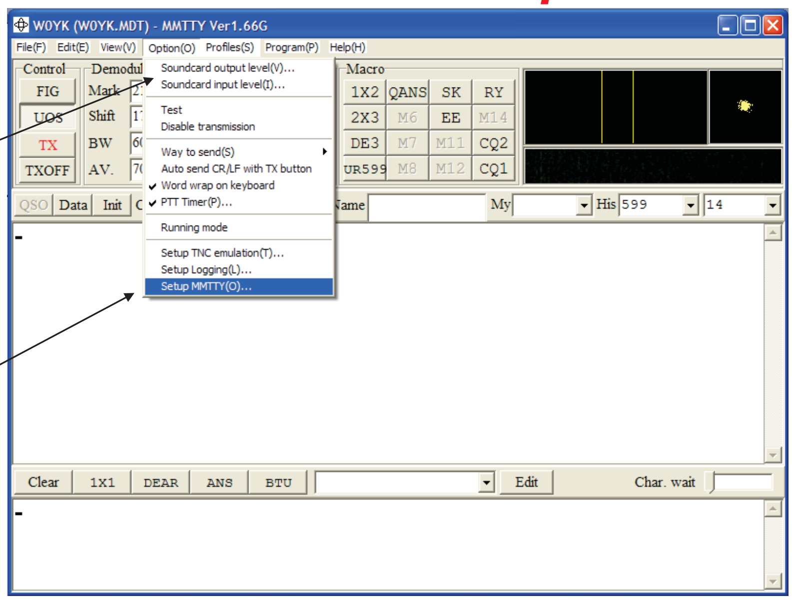


How Do I Set It Up?

MMTTY Option menu

Soundcard levels

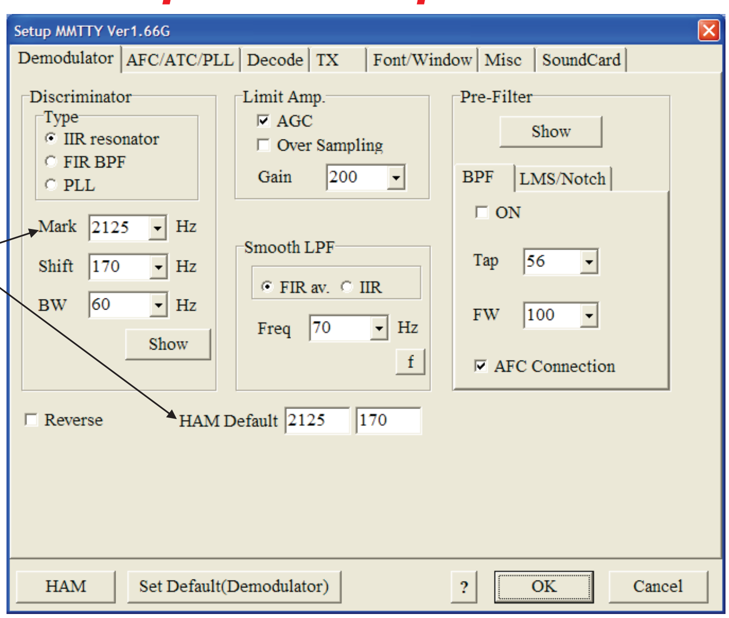
MMTTY setup



How Do I Set It Up?

MMTTY Option/Setup/Demodulator

Set tones (radio same)



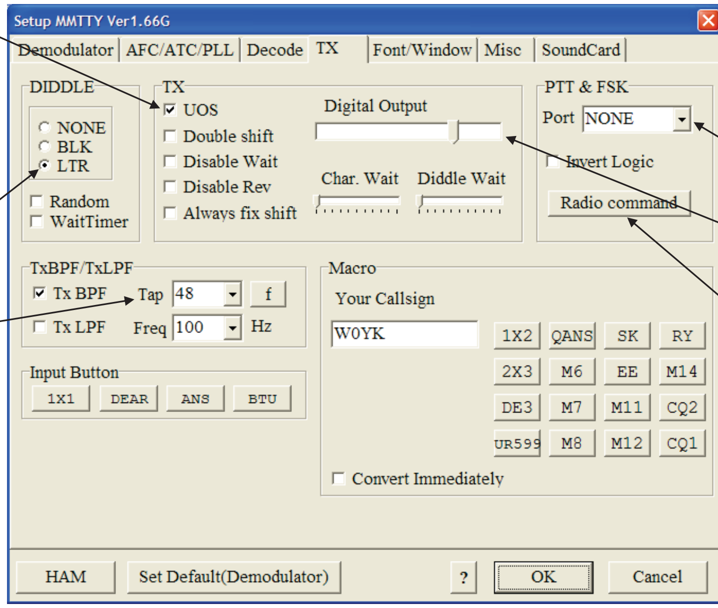
How Do I Set It Up?

MMTTY Option/Setup/TX

TX UOS on

Select LTR

512 Tap, if PC has perf.



FSK/PTT port

Soundcard Line Out level

AFSK PTT

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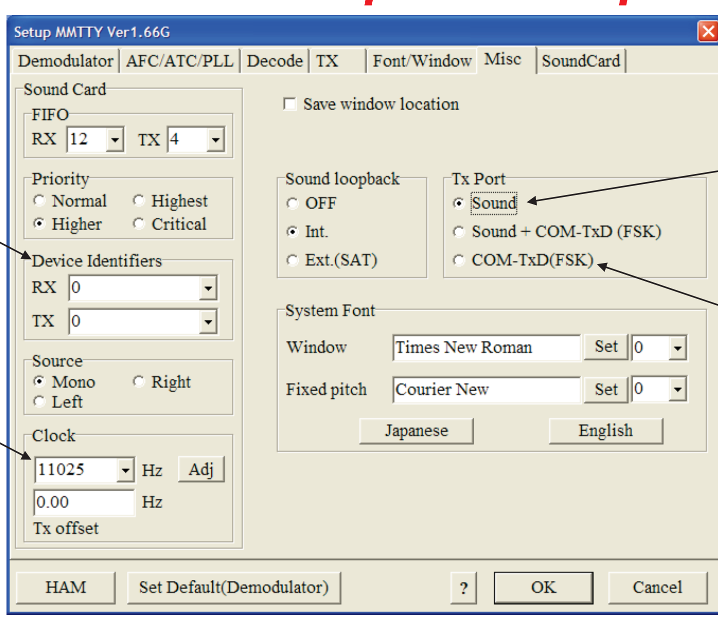
How Do I Set It Up?

MMTTY Option/Setup/Misc

Soundcard

Soundcard Format, 4x



AFSK

FSK

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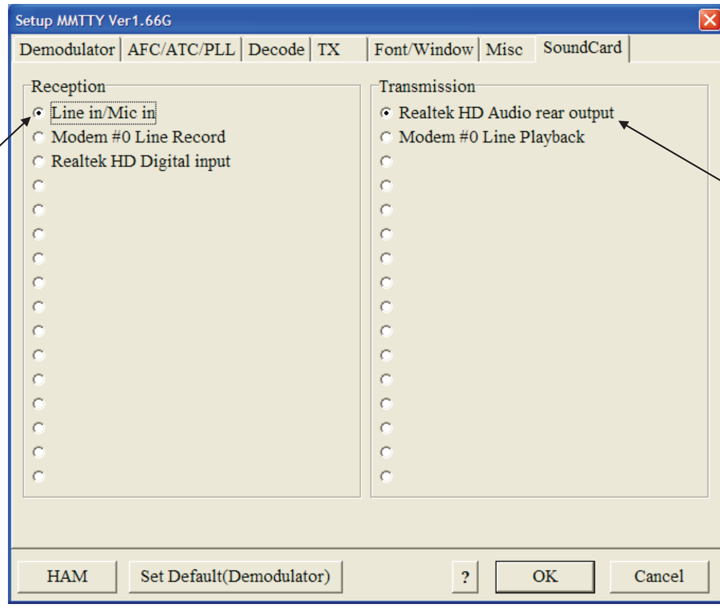
How Do I Set It Up?

MMTTY Option/Setup/SoundCard

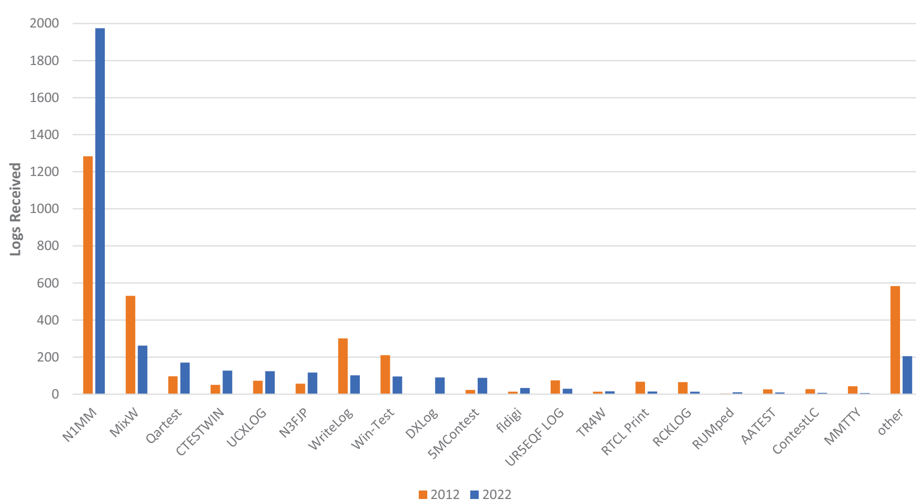
Select receive Soundcard



Select transmit Soundcard (AFSK only)

CQ WPX RTTY

logs received: 2022 vs. 2012



RTTY Contest Loggers

- WriteLog *(1994; created for RTTY)*
  - CW & RTTY came later
  - *www.rttycontesting.com/tutorials*
- N1MM Logger+ *(2000; dedicated RTTY software designer)*
  - Free
  - *www.rttycontesting.com/tutorials*
- Win-Test *(2003; RTTY is low priority)*

All three integrate MMTTY & 2Tone and
have similar functionality for basic RTTY contesting.

A Blizzard of Details!

this is fun??

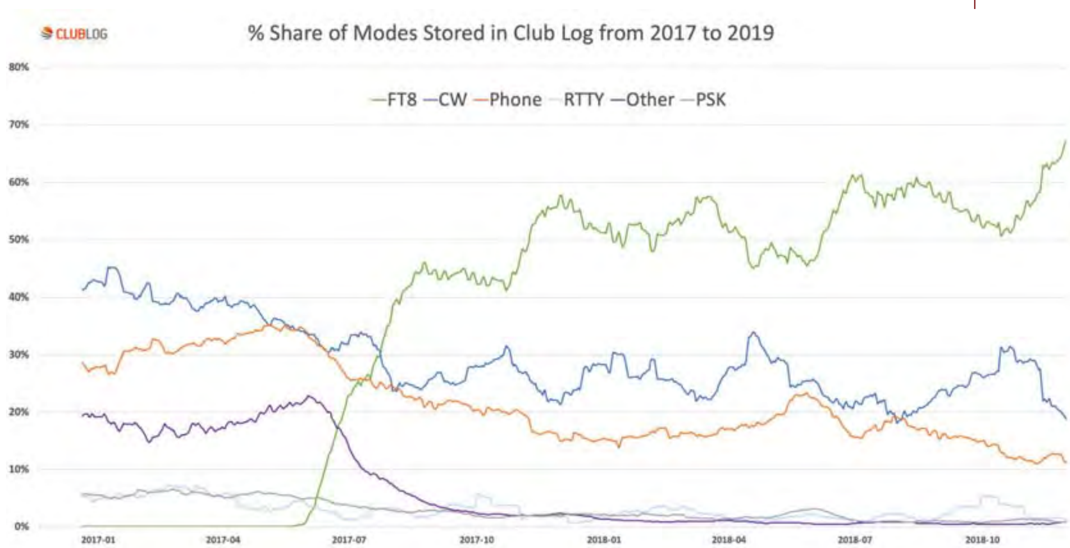
Start Simple, then Enhance

- MMTTY *(free)*
  - get RX working *(std audio cable from radio to PC)*
  - get TX working using either:
    - AFSK *(2nd std audio cable from radio to PC)*
    - FSK *(keying cable or commercial interface)*
- Integrate MMTTY with logging software
- Enhance later
  - Audio isolation *(highly recommended)*
  - 2Tone
  - Higher capability interface *(DIY or commercial)*
  - Advanced setup: SO2V, SO2R, multiple decoders, ...

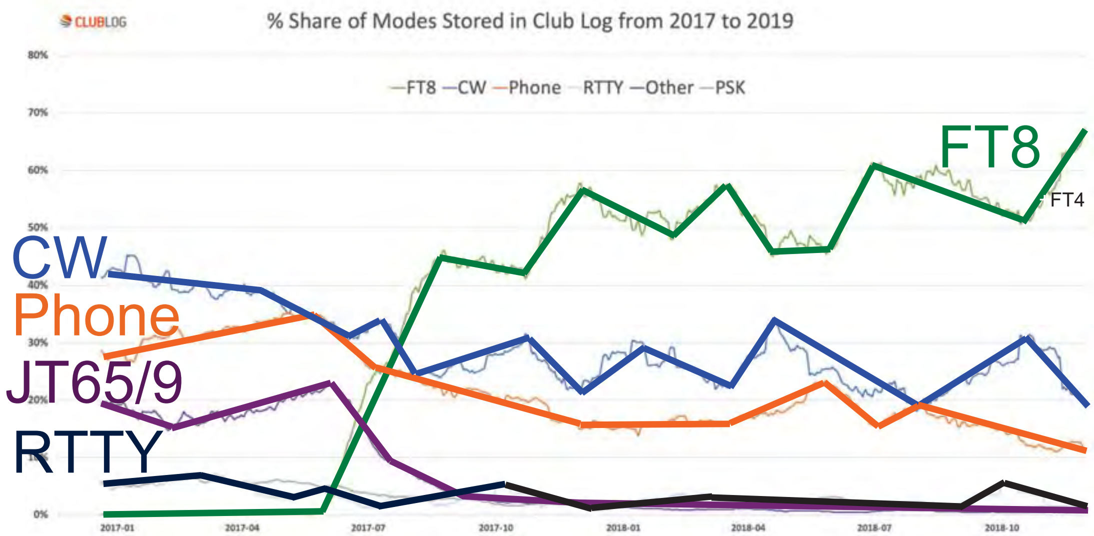
Resources

- www.rttycontesting.com premier website
  - Tutorials and resources (beginner to expert)
  - WriteLog, N1MM Logger+ and MMTTY
- rtty@groups.io Email reflector
  - RTTY contester networking
  - Q&A
- Software web sites
  - hamsoft.ca/ (MMTTY)
  - n1mm.hamdocs.com/tiki-index.php (N1MM Logger+)
  - www.writelog.com (WriteLog)
  - www.win-test.com (Win-Test)
- Software Email reflectors
  - mmtty@yahoogroups.com (MMTTY)
  - N1MMLoggerplus@groups.io (N1MM Logger+)
  - Writelog@contesting.com (WriteLog)
  - support@win-test.com (Win-Test)

Clublog QSOs by Mode



Clublog % QSOs by Mode: 2017-2018



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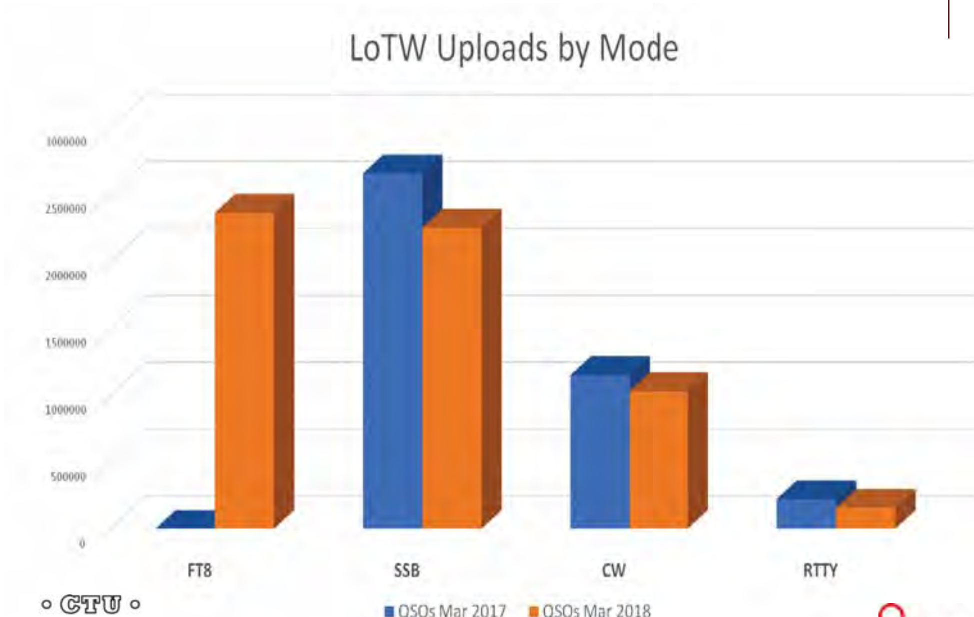
The FT8 Explosion



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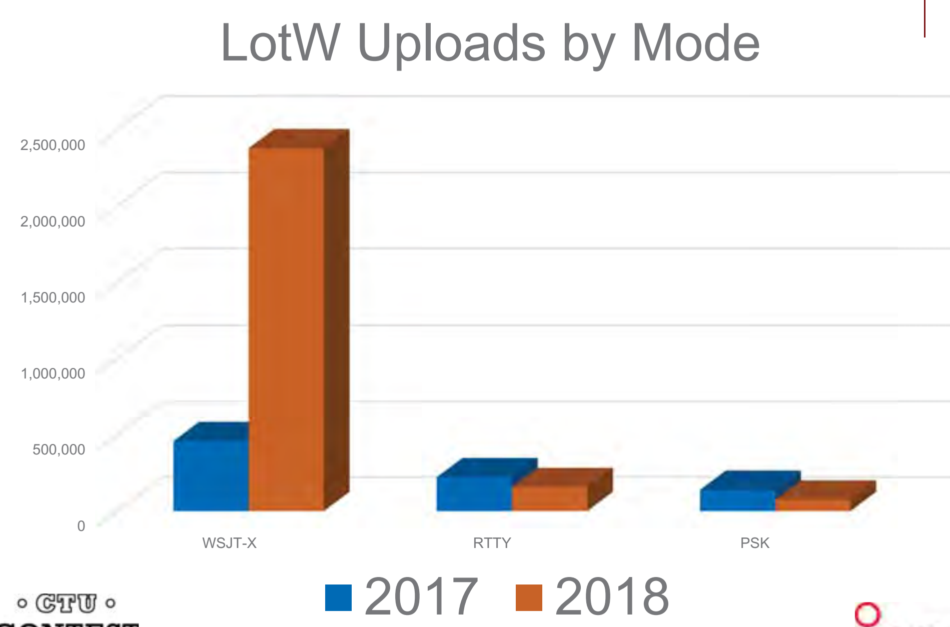
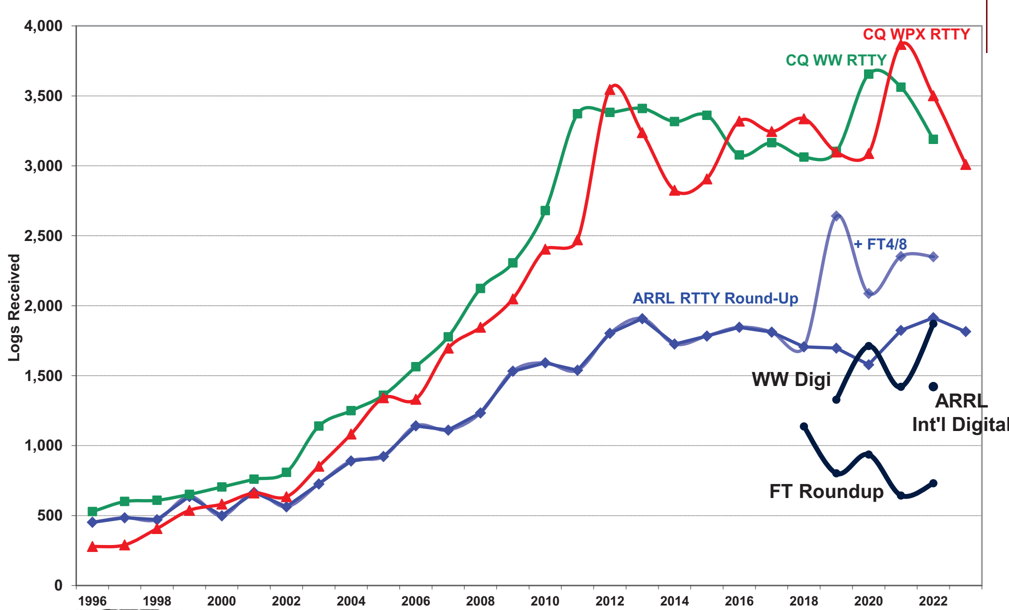
Digital Mode Trends



Three Largest FT4/8 Contests

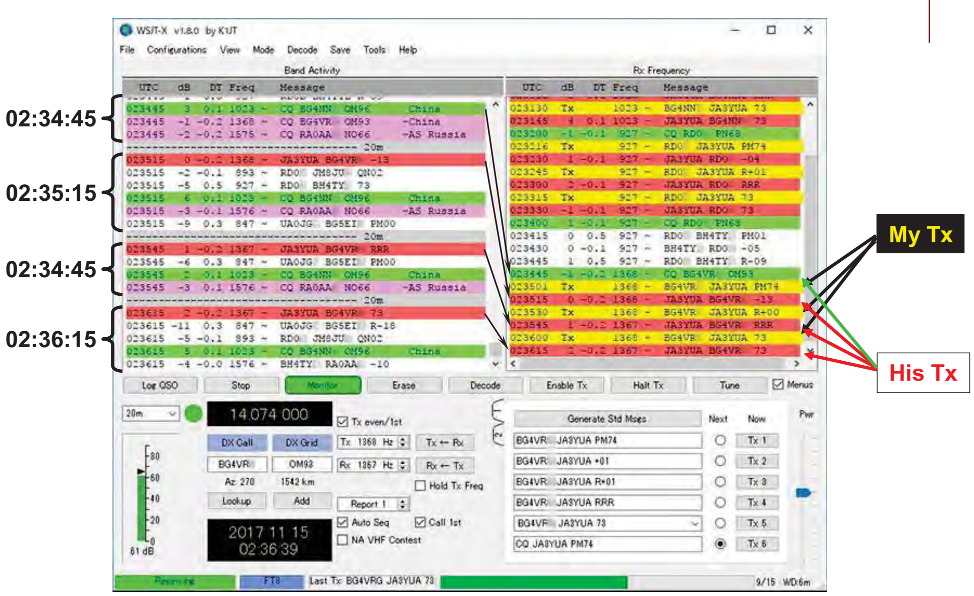


WSJT & WSJT-X Overview

- Weak Signal communication by Joe Taylor - eXperimental
- Developed for EME; adapted by HF
- Several modes (JT65, JT9, FT8, etc.)
- TX/RX cycles synchronous with time servers

+ Multi-channel (external spotting and CQ/S&P irrelevant)
+ Weak signal (inaudible)
  + Longer DX
  + Lower power
  + Compromised antennas and/or QTH
+ Narrow bandwidth (4-176 Hz)
+ "Perfect" copy (SCP irrelevant)

FT8 Multi-Channel Reception

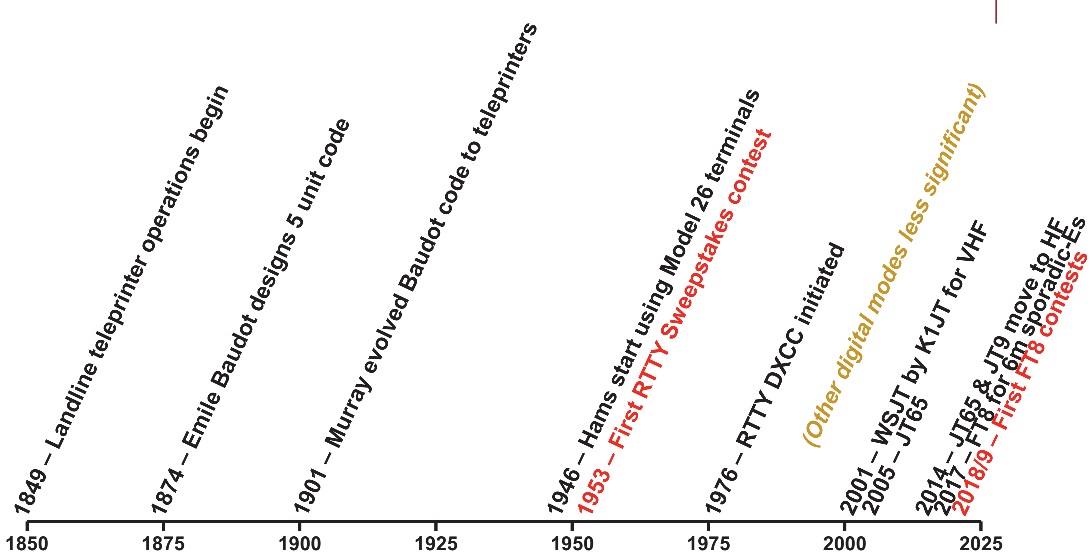


WSJT-X Overview

- Multi-channel (external spotting and CQ vs. S&P irrelevant)
- Weak signal (FT8 -13dB & FT4 -10dB compared to RTTY)
  - Longer DX
  - Lower power
  - Compromised antennas and/or QTH
- Narrow bandwidth (4-176 Hz: FT8=50 Hz; FT4=80 Hz)
- “Perfect” copy (SCP irrelevant)

- Slow 1-6 minutes/QSO → 30 seconds (FT4)
- Limited, fixed messages → fine for contesting
- Minimal reaction time → message automation

RTTY & WSJT History



WSJT & WSJT-X History

- **2001: FSK441 for meteor scatter**
- **2002: JT6M for ionospheric scatter**
- **2003: JT65 VHF/UHF EME**
  - **Adopted for QRP HF DXing; 176 Hz bandwidth; 60 sec. transmission**
- **2014: JT9 for LF, MF and HF**
  - **2 dB more sensitive than JT65; 16 Hz bandwidth**
- **Jun 2017: FT8 for 6m Es & HF**
  - **50 Hz bandwidth; 15 second transmission**
- **May 2018: Baker Is. DXpedition > 11,000 FT8 HF QSOs**
- ***Dec 2018: FT8 Roundup (first WSJT-X HF contest)***
- ***Jan 2019: ARRL RTTY Roundup (FT8 permitted)***
- ***Apr 2019: FT8 DX Contest***
- ***Sep 2019: SCC RTTY Championship → WW Digi***
- ***Jun 2022: ARRL International Digital***
- ***Jan 2023: ARRL RTTY Roundup becomes RTTY-only***

Major FT Contests

- ARRL RTTY Roundup [1st weekend in Jan]
  - 2019: FT8 added
  - 2020: FT4 added
  - 2022: RTTY-only or FT-only or Mixed
  - 2023: RTTY-only; no other modes
- ARRL International Digital [1st weekend in Jun]
  - Distance-based scoring
- WW Digi DX Contest [last weekend in Aug]
  - Same as ARRL Int'l Digital
    - plus Grid multipliers
    - minus 160m and 6m
- FT Roundup [1st weekend in Dec]
  - RTTY Roundup rules

FT8 Standard QSO

90 sec./QSO

- CQ K1ABC FN42
- K1ABC W9XYZ EN37
- W9XYZ K1ABC -11
- K1ABC W9XYZ R-09
- W9XYZ K1ABC RRR
- K1ABC W9XYZ 73 (superfluous 2nd QSL)

FT8 Short-Cycle QSO

60 sec./QSO

- CQ K1ABC FN42
- K1ABC W9XYZ -09 (TX2, not TX1)
- W9XYZ K1ABC R-11
- K1ABC W9XYZ RR73
  K1ABC N5DEF -01
- CQ K1ABC FN42
  N5DEF K1ABC R-07

30 sec. rolling QSOs

FT8 DXpedition QSO

75 sec./QSO
60 sec./5 QSOs

QSO period 1
QSO period 2
QSO period 3

- CQ KH1/KH7Z
- KH7Z K1ABC FN42
- K1ABC KH7Z -12
  <“CQ” for others>
- KH7Z K1ABC R-14
  KH7Z W9XYZ EN37
  KH7Z W0YK CM97
  etc.
- K1ABC RR73
  W9XYZ KH7Z -08
  W0YK KH7Z -13
  <“CQ” for others>
- KH7Z W9XYZ R-11
  KH7Z W0YK R-15
  KH7Z K9YC CM87
  KH7Z W6OAT CN87
  etc.
- W9XYZ KH7Z RR73
  W0YK KH7Z RR73

WW Digi QSO

60-75 sec./QSO
30 sec./rolling QSO

QSO period 1
QSO period 2
QSO period 3

- CQ WW K1ABC FN42
- K1ABC W9XYZ EM05
- W9XYZ K1ABC R-FN42
  (implicit “CQ” for others)
- K1ABC W9XYZ RR73
  K1ABC W0YK CM97
- W0YK K1ABC R-FN42
  (implicit “2nd QSL” for W9XYZ)
  (implicit “CQ” for others)
- K1ABC W0YK RR73 ← K1ABC W9XYZ RR73
  K1ABC P49X FK52
- P49X K1ABC R-FN42
  (implicit “2nd QSL” for W0YK)
- K1ABC P49X RR73 ← K1ABC W0YK RR73
- P49X K1ABC 73
  (superfluous 2nd QSL)

WW Digi QSO

60-75 sec./QSO
30 sec./rolling QSO

QSO period 1
QSO period 2
QSO period 3

- CQ WW K1ABC FN42
- K1ABC W9XYZ EM05
- W9XYZ K1ABC R-FN42
  (implicit "CQ" for others)
- K1ABC W9XYZ RR73
  K1ABC W0YK CM97
- W0YK K1ABC R-FN42
  (implicit "2nd QSL" for W9XYZ) ← W9XYZ may want 73
  (implicit "CQ" for others)
- K1ABC W0YK RR73 ← K1ABC W9XYZ RR73
  K1ABC P49X FK52
- P49X K1ABC R-FN42
  (implicit "2nd QSL" for W0YK) ← W0YK may want 73
- K1ABC P49X RR73 ← K1ABC W0YK RR73
- P49X K1ABC 73
  (superfluous 2nd QSL)

Setting Up for FT8

- Download/install WSJT-X
  - Alternatively MSHV or DigiRite (WriteLog only)
- Hardware (radio and PC) same as AFSK
- Study the:
  - Quick Start Guide to WSJT-X 2.0, and
  - the WSJT-X User Guide

Time Synchronization

mandatory for reliable QSOs

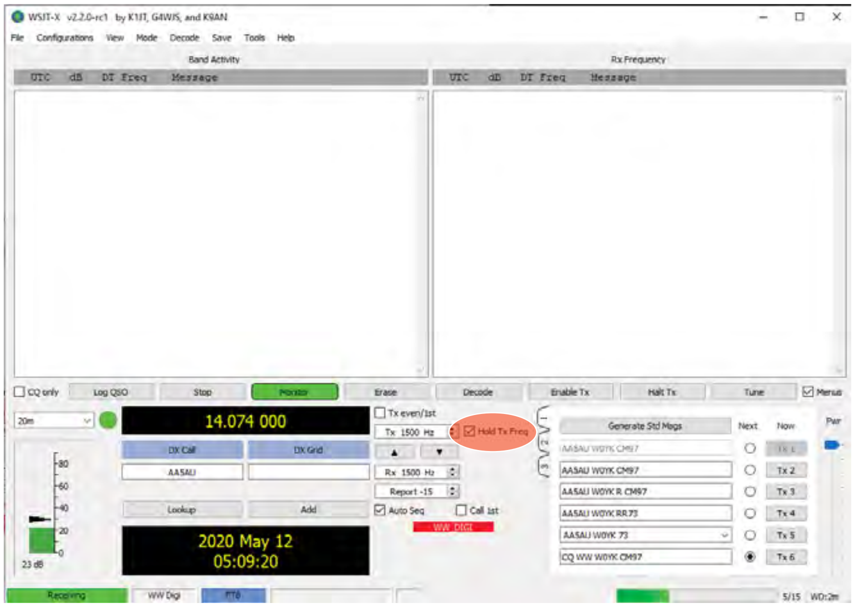
- Windows Internet Time Sync
  - Weekly updates
  - Can be unreliable
- Alternatives
  - Meinberg NTP (recommended by K1JT)
  - NetTime (recommended by W0YK)
  - Dimension 4
  - Atomic Clock Sync

Sub-Band Choices

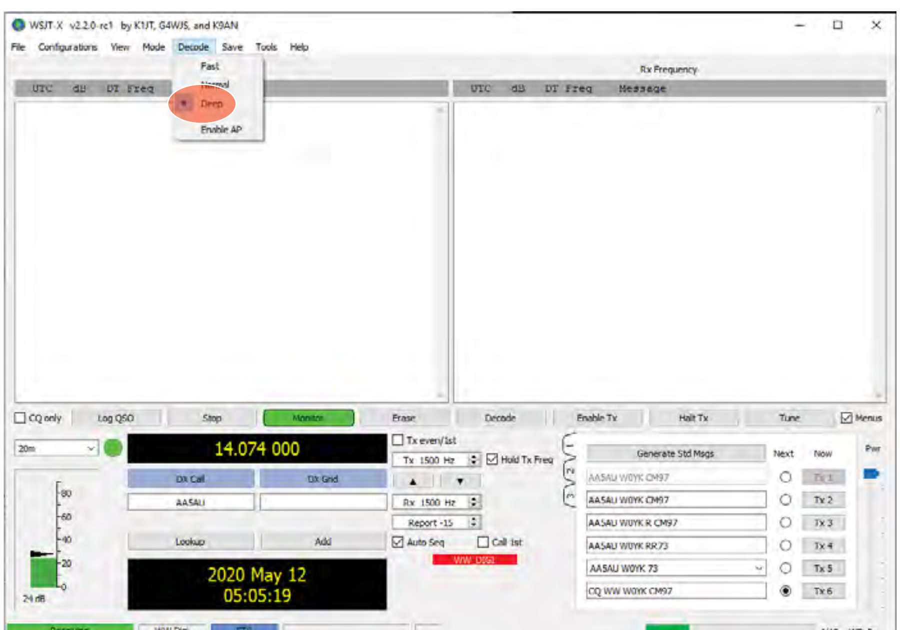
Int'l Digi, WW Digi, FT RU

- Suppressed-Carrier dial frequency
  - FT4: 14080
  - FT8: 14090
- Use receiver's maximum BW: 2.5-4 kHz
- QSO partner > 3 kHz … call above 3 kHz
- Move dial frequency up in 3 kHz increments

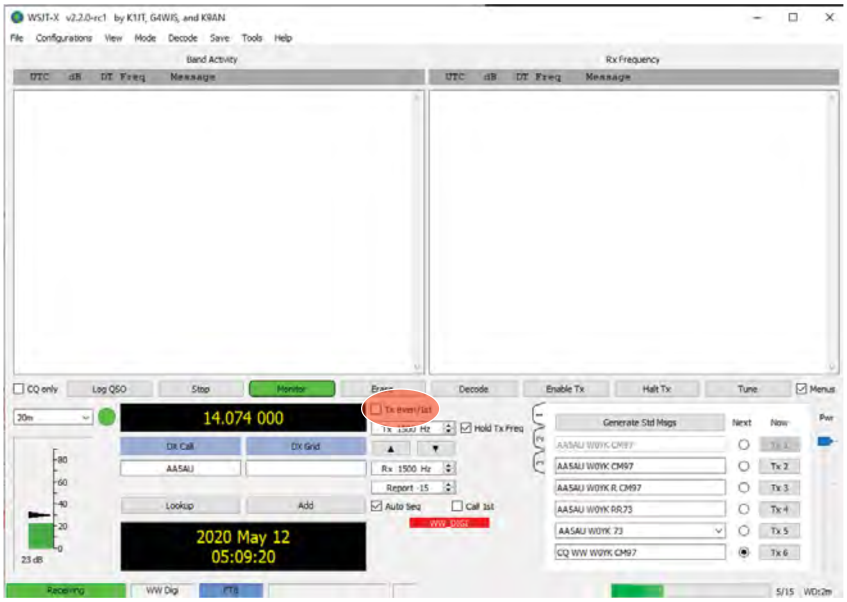
Split Transmit



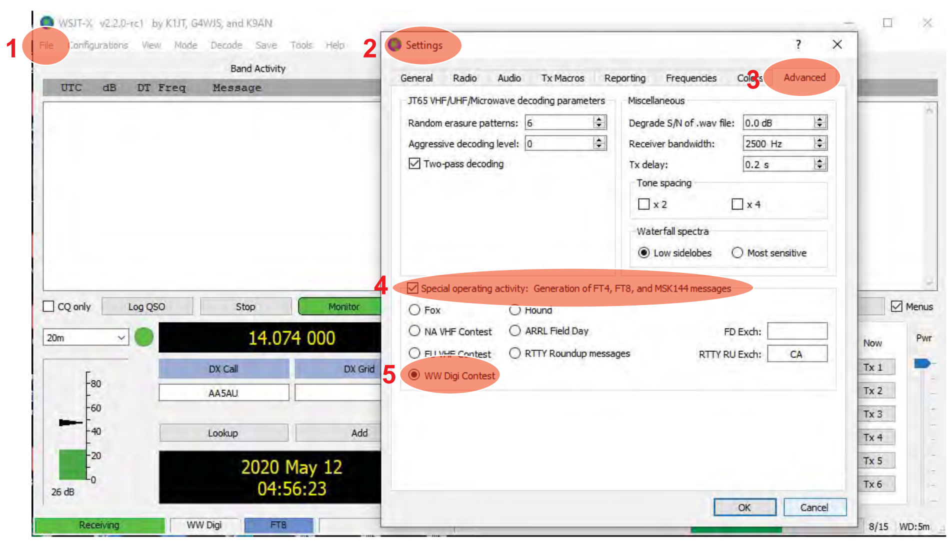
Deep Decode



Utilize Odd/Even Cycles



WW Digi DX Contest



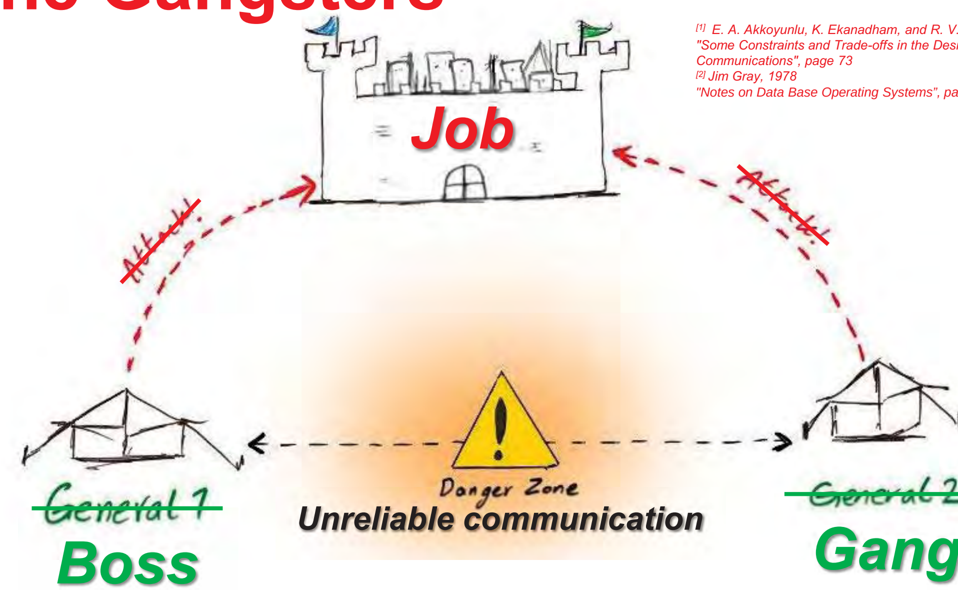
Minimizing NILs in WW Digi

- FT contest NILs are high
  - RTTY is 1-2%, FT is 5-6%
- QSO partners disagree on QSO completion
  - One doesn't log, the other logs (and, gets a NIL)

CQ W0YK CM97
W0YK AA5AU EL92 ← ***AA5AU answers with exch***
AA5AU W0YK R CM97 ← ***W0YK QSLs with exch***
W0YK AA5AU RR73 ← ***AA5AU QSLs***
AA5AU W0YK 73 ← ***W0YK QSLs AA5AU's QSL!***
← ***when does it end?***

~~Two Generals~~ Paradox [1,2]
The Gangsters

[1] E. A. Akkoyunlu, K. Ekanadham, and R. V. Huber, 1975 "Some Constraints and Trade-offs in the Design of Network Communications", page 73
[2] Jim Gray, 1978 "Notes on Data Base Operating Systems", page 465



FT Repeat Protocol

CQ W0YK CM97

W0YK AA5AU EL92	***←AA5AU calls with exch***
AA5AU W0YK R CM97	***← W0YK QSL's with exch***
W0YK AA5AU RR73	***←AA5AU QSL's***
AA5AU W0YK R CM97	***← W0YK missed QSL msg***
W0YK AA5AU RR73	***←AA5AU repeats QSL***

Minimizing NILs

Recommendation

- Develop skill to dynamically change message
  - e.g., use the Alternate F1-F6 keys in WSJT-X
- Always log the QSO when receiving a RRR, RR73 or 73 message.
- Always log the QSO when sending RRR, RR73 or 73 message.
  - Look for a clue that your message was not received, e.g., your QSO partner re-sends his report.

FT8 vs. FT4 Strategy

- FT4 is faster; FT8 decodes better
  - Intrinsic vs. extrinsic speed
    - FT4 is intrinsically 2x the speed of FT8
    - FT8 is more likely to decode
    - Either might be extrinsically faster at a given time
  - Dynamically use the mode with highest QSO rate
- New stations & multipliers in each mode

Resources

- Software web sites
  - physics.princeton.edu/pulsar/K1JT/wsjtx.html (WSJT-X)
  - n1mm.hamdocs.com/tiki-index.php (N1MM Logger+)
  - https://writelog.com/digirite (DigiRite)
  - www.writelog.com (WriteLog)
- Software Email reflectors
  - wsjt-devel@lists.sourceforge.net (WSJT-X)
  - n1mmloggerplus@groups.io (N1MM Logger+)
  - digirite@groups.io (DigiRite)
  - writelog@contesting.com (WriteLog)
- Tutorials for WW Digi DX Contest
  - rttycontesting.com/tutorials/n1mm/operating-ww-digi-with-n1mm/ N1MM+/WSJT-X
  - rttycontesting.com/tutorials/writelog3/digirite/ WriteLog/DigiRite

Small Station Bang for the Buck

Ward Silver, NØAX

Thanks to CTU and Icom America

Overview

- Assumptions
- “The Next Level”
- Priorities
- Building On Success
- Bang for the Buck
- Refine & Enhance
- Q&A at the End

The Beginnings

- Every operator and station is different
- We ***all*** started low and slow
- What's the best way to get better?
- The path is its own reward!

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Assumptions – Your Station

- Modest station
  - One radio
  - No amp or not-legal-limit amp
  - One PC available
- Modest budget
- Limited space
  - City or suburban lot
  - Some aesthetic constraints

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Assumptions – About You!

- Familiar with contesting
- Willing to study
  - Contest technique
  - Propagation
  - Basic technical practices
- Pick your battles
- Committed to practice, practice, practice

What's the "Next Level"

- Success is incremental: layer by layer
- Peel the onion
  - Be heard, then hear, then be heard, then hear…
  - S&P then CQ then CQ faster
  - SO1R then SO2R then ???
- Operator improvement is continuous
- Study and analyze and plan
- Pick the low-hanging fruit first

Cycle of Life

Observe

Judge

Act

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Cycle of Life

Observe

Repent

Judge

Act

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Priorities

- Operator First
- Technique Second
- Antennas Third
- Radios Fourth
- Gadgets Last

The Operator – A Human!

- Head and Eyes
- Back & Arms
- Your Butt
- Fitness (Before and During)
- Diet and Rest Cycles
- Stay Alert & Engaged

The Operator – Mental Acuity

- Incredibly important
- Fun or Slog? – Choose!
- Maintain concentration, remove distractions
- Preserve and enhance accuracy
- Labels and logical, consistent layout

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The Operator – Know-How

- Know your station
- Study propagation
- Learn your software
- Copy and recognize calls
- Study your old logs
- Compare with logs of your peers
- Study the logs of winning stations

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Technique

- Number one source of “score dBs”
- Practice makes the master
- Listen to the masters – up close
  - Start working with multi-op teams
  - Or start one!
  - Ask them questions!
- Trade recordings or listen live

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Technique – Gimmes

- Run more and whenever you can
  - Find propagation that allows your station to run
  - You don’t have to be on the band edge!
  - Think signal-to-noise on ***both*** ends
- Type – send – speak – copy accurately
- Breathe, be consistent, find a rhythm
- A second radio – make it play

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Technique – Accuracy

- Go for World Class accuracy (<1% error)
- Study that LCR/UBN report
  - What do you consistently miss?
  - What do others consistently miss from you?
- Pull out full calls
- Be wary of databases and spots
- Learn not to guess and when to move on

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Technique – Managing Time

- Running is key
- Rate meter – QSOs per mult
- Distractions
  - Packet and DX-ing
  - Too much adjusting and tweaking
- Operating time and off-time planning
- Go get that next contact!
  - No magazines, no TV, no texting, no browsing

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Technique – Managing Score

- Watch for & move mults (Sunday!)
- Avoid penalties at all costs
- Expeditions – work ‘em all!
- Make skeds – <u>during</u> the contest
  - Know the propagation
- Quick reviews of the situation now and then
- Review and adjust your plan

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The Second Radio & Antenna

- Keep it simple
- “Temporary” is OK
- Integrate into your station
- Target low-rate periods
- Don’t diminish your primary rig & antenna
- Consider adding automation

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The Second Radio – Using It

- In-band tuning
- The quick QSY
- Running and tuning at the same time
  - Learn to listen to two audio streams at one time
  - Practice shifting your focus
- Great for spot-chasing while slow-running
- Operate for a net gain

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CQing

- Call away from the Big Guns for best SNR
- Respond consistently & efficiently
- Work the fast stations first
- Pull out a full call whenever you can
- Listen for “DX sound” and odd prefixes
- Manage your RF Gain & Attenuation
- Learn to rely on your ears for filtering

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Antenna Selection

- Biggest bang for the hardware buck
- Improve for the next level
- Simplify switching and aiming
  - Contesting is not DX-ing
- A small fixed Yagi to EU, Carib, PacRim, or ?
- Simple low-band receive antennas
  - Reduce noise = reduce fatigue

Radios

- Clean receiver – most important
  - Wide dynamic range
  - Gain management
  - Filtering
  - Low audio distortion
  - Modern radios are all just fine, used correctly
- Clean transmit – code, phone, digital
- Learn to use it!

Gadgets

- The fewer boxes to manage, the better
- Carefully evaluate the need
- Are there alternatives?
- Is the extra complexity worth it?
- Integrate into the station
- Learn to use it!

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Software

- Turn off unused features & windows
- Upgrade and test ***before*** Friday
- Arrange windows to match your layout
- Learn how to
  - Edit a previous QSO while not suspending a run
  - Switch focus between radios
- Put the monitor where you can see it easily

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Resources

- Other contesters & your contest club
- **3830scores.com** soapbox
- SO2R tutorials, station photos, videos
- Towertalk, Amps, Top Band reflectors
- *National Contest Journal* & **ncjweb.com**
  - Check out the Bonus Content
- Contest club newsletters

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Priorities

- Operator First
- Technique Second
- Antennas Third
- Radios Fourth
- Gadgets Last

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Thanks!

Competitive Transmitting Antennas for Solar Maximum

- What's important as solar maximum nears?
- When will it arrive and how long will it last?
- Vertically polarized 160 meter antennas
- Horizontally polarized 80 to 10 meter antennas
- Single Yagi stations
- Stacked Yagis
- Multi-tower stations
- When good antennas go bad…

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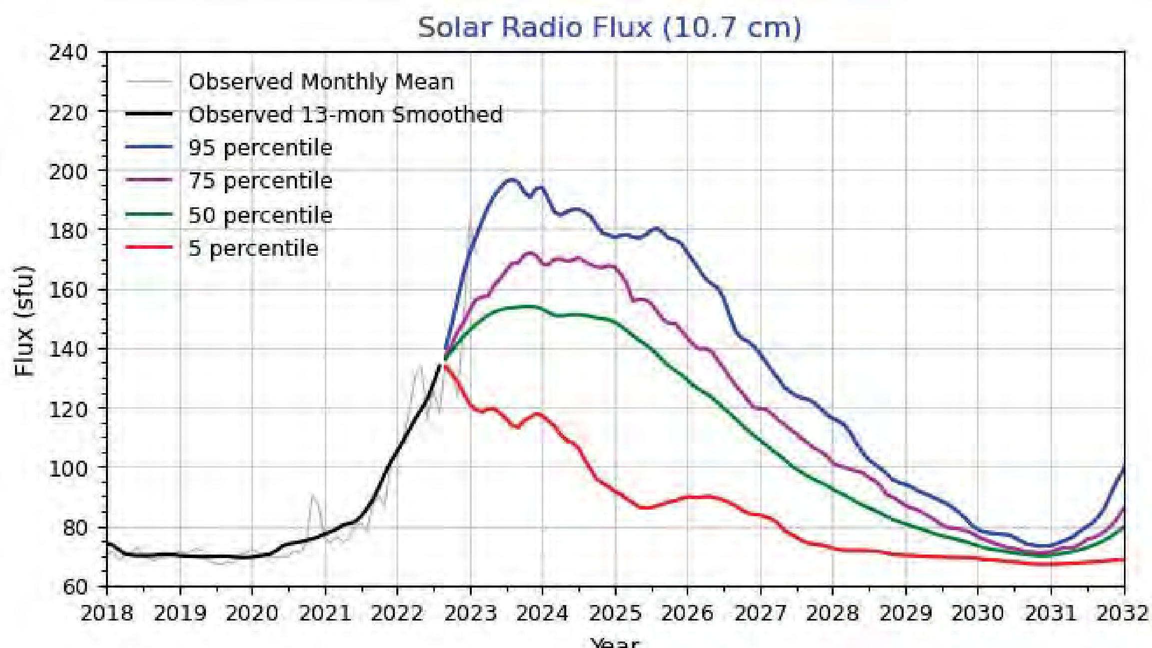
CTU 2022

Solar Cycle 25 Solar Flux Index Forecast
NASA Marshall Space Flight Center
2 Mar 2023



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How Propagation is Affected Over the Next Five Years as Solar Maximum Arrives Next Year Then Starts to Decline About 2 Years Later

Solar maximum propagation conditions began in January 2023

Solar maximum is likely to occur next year

10 and 15 meter worldwide DX will persist later into the night for at least the next 2 years

Excellent 10 meter worldwide propagation will continue for at least the next 3 years

Disturbed geomagnetic conditions will become much more frequent next year, persisting for about 7 years

10 meter propagation starts to slowly decline in about 4 years

15 meter propagation starts to slowly decline in about 5 years

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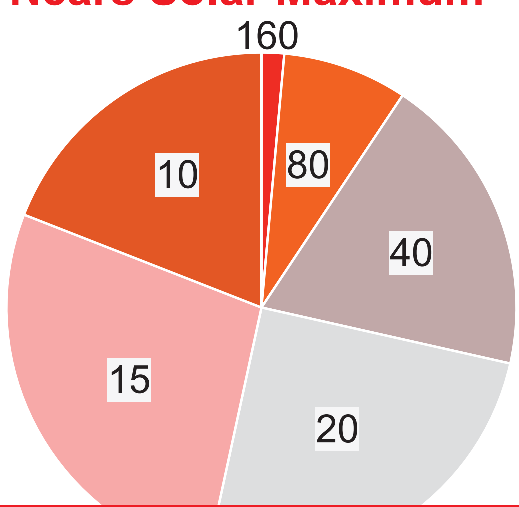
Relative Number of CW DX Contest QSOs Per Band as Solar Cycle 25 Nears Solar Maximum



10 and 15 meters have become <u>much more productive</u> near solar maximum
40 and 20 continues to be <u>very productive</u> near solar maximum
80 is <u>less productive</u> near solar maximum
160 is <u>much less productive</u> near solar maximum

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Transmitting Antenna Elevation Angles as Solar Cycle 25 Nears Solar Maximum

- **10 meters** - early morning to post-sunset worldwide DX band
  - most DX propagation is at low elevation angles **5 to 10 degrees**
  - marginal DX paths require very low elevation angles **well below 5 degrees**
- **15 meters** - pre-sunrise to hours after sunset worldwide DX band
  - most DX propagation is at low to mid elevation angles **5 to 15 degrees**
  - marginal DX paths require very low elevation angles **well below 5 degrees**
- **20 meters** - 24 hour very crowded competitive worldwide DX band
  - DX propagation covers low, mid and high elevation angles **5 to 20 degrees**
  - marginal DX paths require low elevation angles **below 5 degrees**
- **40 meters** – pre-sunset to post-sunrise worldwide DX band
  - requires a broad range of elevation angles **10 to 25 degrees**
  - marginal DX paths require low elevation angles **below 10 degrees**
- **80 meters** - post-sunset to sunrise less reliable, weaker DX band
  - use very efficient antennas covering a broad range of angles **10 to 25 degrees**
- **160 meters** - much less reliable, mostly weak signal DX band
  - **vertical antennas *almost always*** provide much better DX performance

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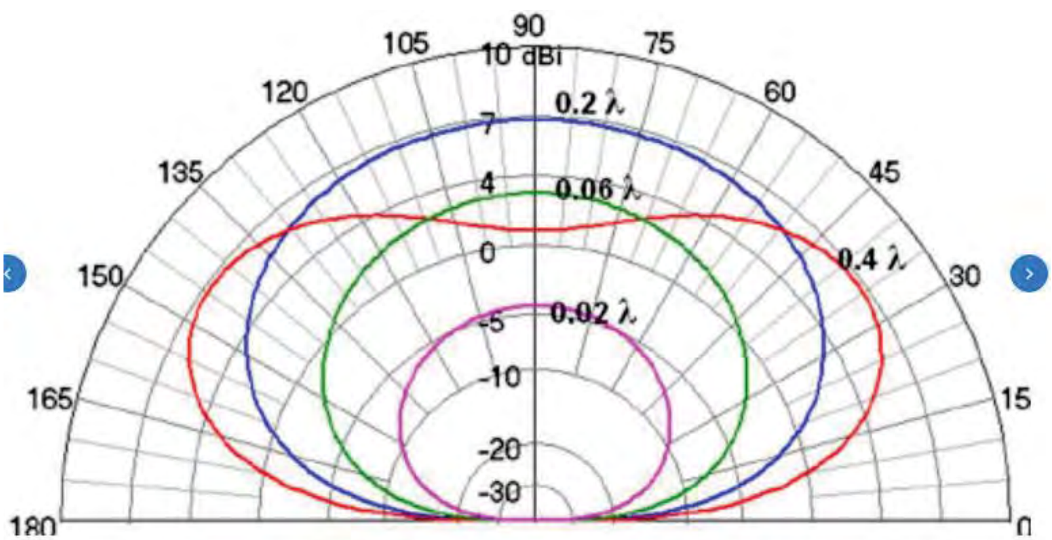
Competitive stations near solar maximum need very effective 15 and 10 meter antennas

ICOM

6 dB of Ground Gain for Horizontally Polarized Antennas At Least 0.2 Wavelengths High



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Its extremely difficult to achieve 6 dB of ground gain with vertical polarization

ICOM

6 dB of "Free" Ground Gain

- Horizontally polarized dipoles, Yagis or quads
  - easily provide 6 dB of very important ground gain over almost any soil
  - *must be installed at an appropriate height*
  - terrain must be reasonably smooth and free of large obstructions
  - *but nearby antennas can destroy ground gain, antenna gain and directivity*
- Some vertically polarized antennas achieve nearly 6 dB of ground gain
  - but only over highly conductive soil such as a salt marsh or ocean front
- Competitive DX contest stations require high horizontally polarized 40 through 10 meter antennas for low angles to Japan and Asia
- Stacked Yagis provide additional gain by suppressing unwanted high angle radiation and redistributing the power into low angles
  - *if installed at proper heights and spacings to obtain significant stacking gain*
  - a Stackmatch allows selection of the optimum elevation angle

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Horizontal antennas easily achieve 6 dB of ground gain when installed at proper heights

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Vertical Polarization for 160 Meters

- Vertical, inverted-L, T, and umbrella antennas
  - *almost always* provide much better DX performance than horizontally polarized antennas at distances beyond 1500 miles
- Nearby tall towers and antennas can significantly degrade the gain and directivity of vertical antennas
  - antenna pattern degradation
  - increased ground losses
- Efficient radial systems are essential to achieving the full performance potential of vertical transmitting antennas

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Verticals *almost always* provide much better DX performance than horizontal 160M antennas

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High Performance Transmitting Antennas for 160 Meter DX

- 125 foot vertical: the gold standard 160 meter DX antenna
  - ***well spaced from all nearby tall towers and antennas***
    - at least 140 ft from towers over 80 feet tall supporting large HF Yagis
    - optimum performance with spacing much greater than 140 feet
  - at least 30 to 60 shallow buried 125 foot radials
    - or at least two (preferably four or more) elevated 125 foot radials
      - but only if 30 to 60 shallow buried 125 foot radials are not possible
    - a K2AV folded counterpoise is a good alternative for small lots
- Inverted-L, T and umbrella antennas are good alternatives
  - 50 feet or higher (as short as 35 feet with reduced performance)
  - supported by a tower, mast or trees
- or a corner fed delta loop or corner fed inverted-U antenna

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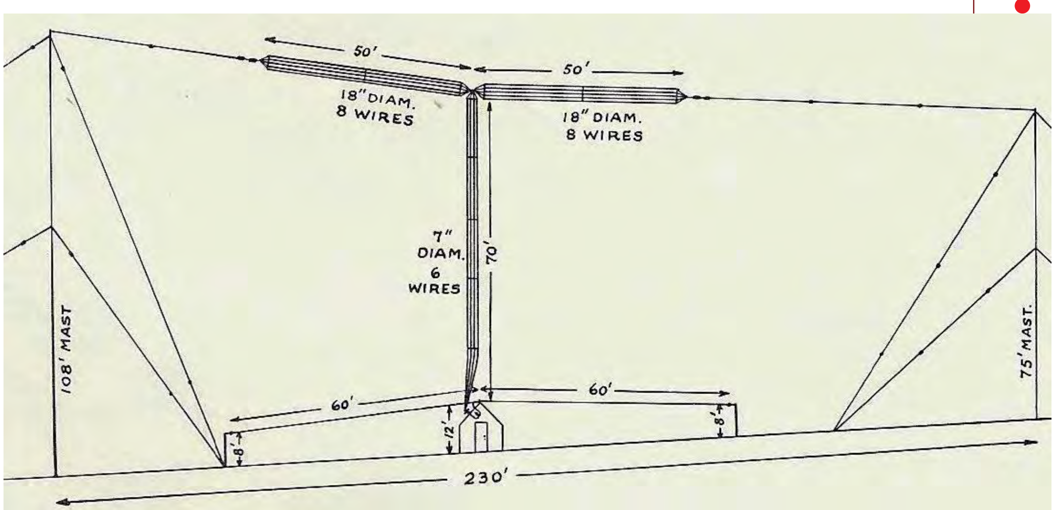
Cage T-Vertical Used by 1BCG at about 1500 kHz during the 1921 Transatlantic Tests



By far the strongest North American signal heard in Europe during the 1921 Transatlantic Tests

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Horizontal Polarization on 80 Meters Easily Achieves 6 dB of Ground Gain

- Horizontal dipole or inverted-V dipole about 50 feet high
  - superb antenna for domestic contests: Sweepstakes and Field Day
  - a good DX antenna for distances up to about 5000 miles
- Horizontal dipole or inverted-V dipole at least 70 feet high
  - outperforms a single 65 foot vertical installed over all but the most conductive soils such as a salt marsh
- Use a vertical antenna if you cannot install a dipole or inverted-V dipole at least 70 feet high
  - 65 foot vertical, inverted-L, T or umbrella with at least thirty 50 foot radials
  - or a corner fed delta loop or a corner fed inverted-U
  - ***verticals are very susceptible to degradation by nearby towers***
- Four-square vertical array
  - very competitive with high horizontally polarized antennas
  - at least sixty 65 foot shallow buried radials for each vertical

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High Performance Transmitting Antennas for 80 Meter DX

- Horizontal dipole at least 70 to 100 feet high
  - higher is better
- 65 foot vertical
  - install at least 30 to 60 shallow buried 65 foot radials
    - or at least two (but preferably four or more) elevated 65 foot radials
      - only if shallow buried radials are not possible
  - ***verticals are very susceptible to degradation by nearby tall towers***
    - at least 70 feet from towers more than 40 ft tall supporting a Yagi antenna
    - optimum performance with much more than 70 foot spacing
- Inverted-L, T and umbrella verticals are good alternatives
  - as little as 25 feet tall -- supported by a tower or trees
  - install at least 30 to 60 shallow buried 65 foot radials
    - or elevated radials
    - or a K2AV reduced size counterpoise for a small lot
  - or a vertically polarized corner fed delta loop or corner fed inverted-U

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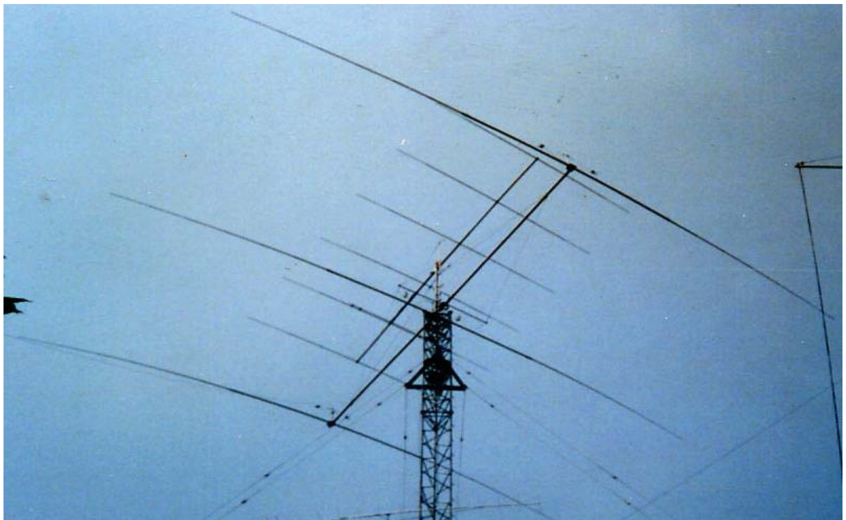
K3ZO (SK) Installed his 3 Element 80 Meter Yagi at 140 Feet in 1984



K3ZO's success with this 3 element Yagi changed my thinking about 80 meter antennas for DX

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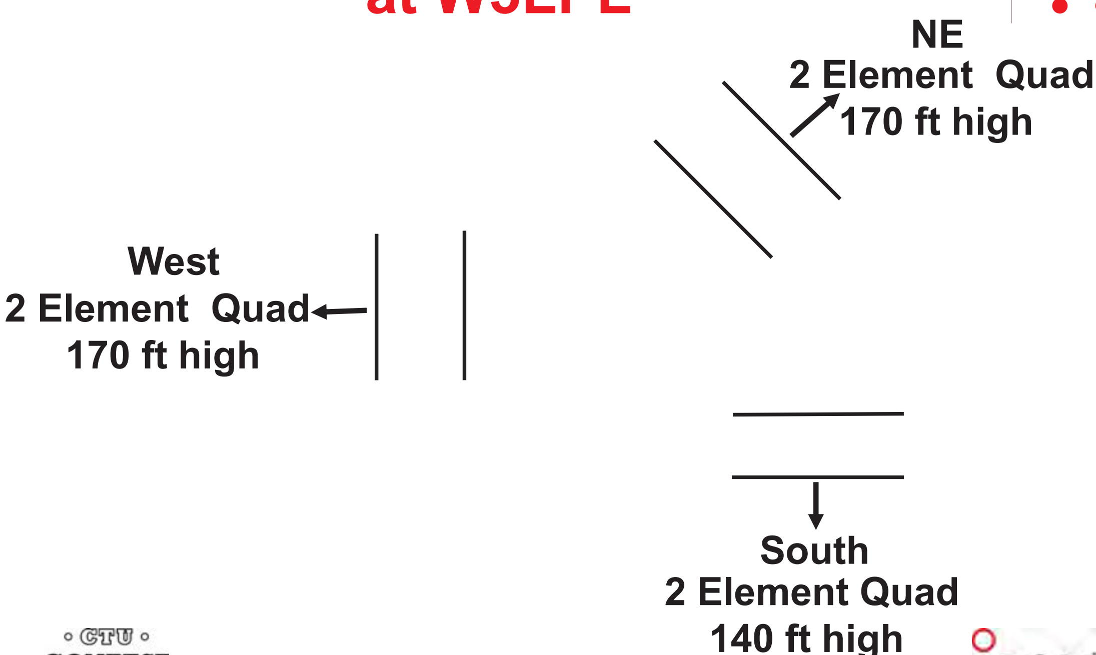
80 Meter Horizontally Polarized Transmitting Antenna Layout at W3LPL



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80 Meter 4-Square Vertical Array

very competitive high performance alternative to a high 80 meter horizontal antenna

- A four square vertical array is very competitive with high horizontally polarized Yagis and quads
- *Install at least 70 ft from towers more than 40 ft tall*
  - much more than 70 foot spacing will significantly improve its performance
- Use at least 60 shallow buried 65 foot radials under each vertical
- A 4-square is also an excellent receiving antenna

Comtek 4-Square Controller

dxengineering.com/search/brand/comtek

High Performance 40M Antennas

- Horizontal dipole at least 70 feet high
  - 13 to 45 degree elevation pattern at -3 dB points
  - otherwise use a vertical or a four-square vertical array with 30 to 60 radials
- Higher gain: 2 element “shorty 40” Yagi at least 70 to 100 ft high
  - 10 to 30 degree elevation pattern at -3 dB points
  - significant improvement over a simple horizontal dipole for DX
  - a Cushcraft XM-240 at 100 feet high is very cost effective
  - a 2 element Moxon is an excellent broad bandwidth low VSWR alternative
- Highest gain: full size 3 or 4 element monoband Yagis
  - single Yagi at least 140 feet high
  - two stacked Yagis on a 200 foot tower and a Stackmatch
    - *selectable* 6 to 30 degree elevation beam patterns at -3 dB points
  - this antenna is often too high for Caribbean and northern South America
  - but don’t underestimate the high cost and complexity of a full size 40M Yagi!

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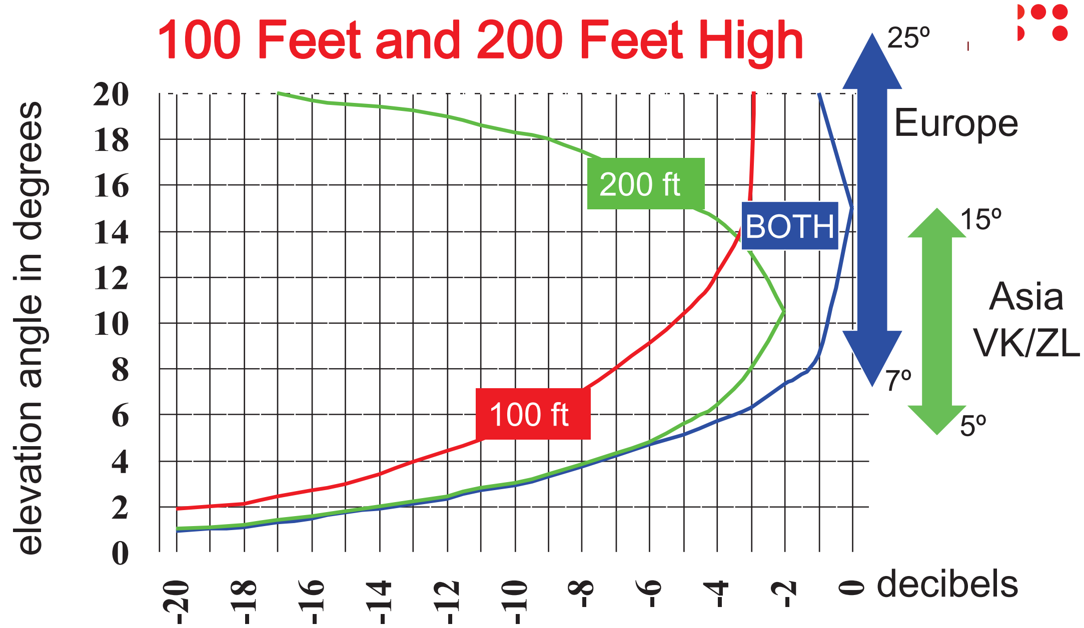
Elevation angles from 5º to 25º are needed

ICOM

Stacked 3 Element 40 Meter Yagis
48 Foot Booms
100 Feet and 200 Feet High



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Elevation angles from 5º to 25º are needed

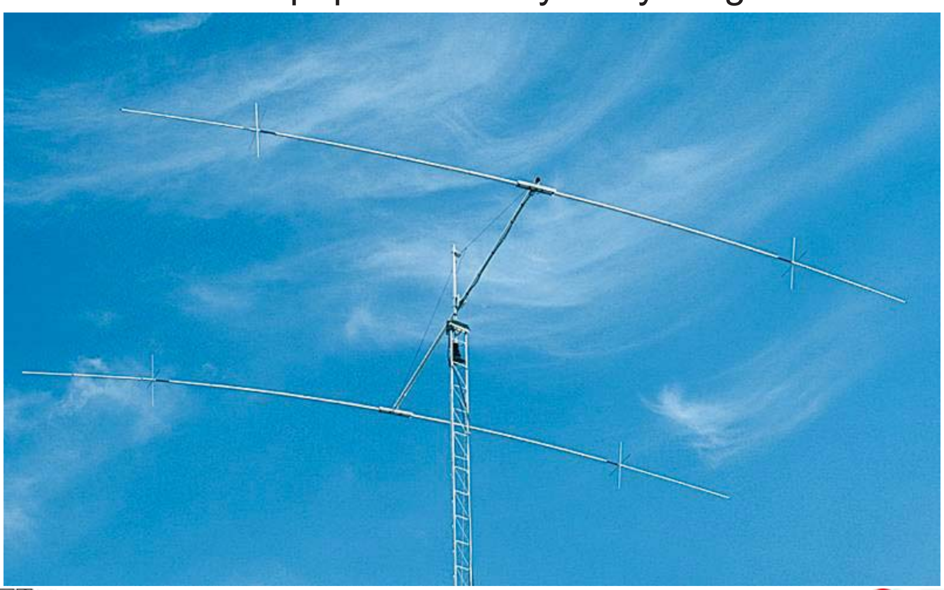
ICOM

The First Known 40 Meter Rotatable Yagi
2 Element Full Size Yagi at 60 Feet
Constructed by W9LM in 1950

Shortly after testing his new 40 meter Yagi, W9LM removed his 40 meter phased verticals

Cushcraft XM-240
2 Element 40 Meter Yagi

The most popular "Shorty Forty" Yagi



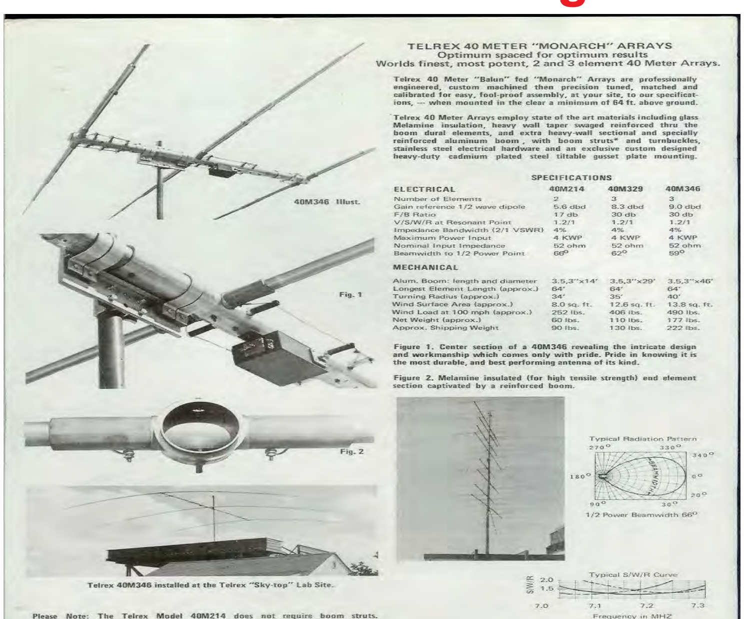
dxengineering.com/parts/csh-xm240

40 Meter Moxon

VSWR less than 1.4:1 from 7.0 to 7.3 MHz
22 foot boom and 48 foot elements
with no loading coils
Two stacked Moxons on a 140 foot tower are very competitive
with a much more expensive full size 3 or 4 element Yagi

www.k3lr.com/engineering/moxon

Telrex (near) Full Size 3 Element Yagi Revolutionized 40 meter Dxing in 1955



TELREX 40 METER "MONARCH" ARRAYS
Optimum spaced for optimum results
Worlds finest, most potent, 2 and 3 element 40 Meter Arrays.

Telrex 40 Meter "Balun" fed "Monarch" Arrays are professionally engineered, custom machined then precision tuned, matched and calibrated for easy, fool-proof assembly, at your site, to our specifications, — when mounted in the clear a minimum of 64 ft. above ground.

Telrex 40 Meter Arrays employ state of the art materials including glass Melamine insulation, heavy wall taper swaged reinforced thru the boom dural elements, and extra heavy-wall sectional and specially reinforced aluminum boom, with boom struts* and turnbuckles, stainless steel electrical hardware and an exclusive custom designed heavy-duty cadmium plated steel tiltable gusset plate mounting.

SPECIFICATIONS

ELECTRICAL	40M214	40M329	40M346
Number of Elements	2	3	3
Gain reference 1/2 wave dipole	5.6 dbd	8.3 dbd	9.0 dbd
F/B Ratio	17 db	30 db	30 db
V/S/W/R at Resonant Point	1.2/1	1.2/1	1.2/1
Impedance Bandwidth (2/1 VSWR)	4%	4%	4%
Maximum Power Input	4 KWP	4 KWP	4 KWP
Nominal Input Impedance	52 ohm	52 ohm	52 ohm
Beamwidth to 1/2 Power Point	66°	62°	59°
MECHANICAL			
Alum. Boom: length and diameter	3.5,3"x14'	3.5,3"x29'	3.5,3"x46'
Longest Element Length (approx.)	64'	64'	64'
Turning Radius (approx.)	34'	35'	40'
Wind Surface Area (approx.)	8.0 sq. ft.	12.6 sq. ft.	13.8 sq. ft.
Wind Load at 100 mph (approx.)	252 lbs.	406 lbs.	490 lbs.
Net Weight (approx.)	60 lbs.	110 lbs.	177 lbs.
Approx. Shipping Weight	90 lbs.	130 lbs.	222 lbs.

Figure 1. Center section of a 40M346 revealing the intricate design and workmanship which comes only with pride. Pride in knowing it is the most durable, and best performing antenna of its kind.

Figure 2. Melamine insulated (for high tensile strength) end element section captivated by a reinforced boom.

40M346 Illust.

Fig. 1

Fig. 2

Telrex 40M346 installed at the Telrex "Sky-top" Lab Site.

Typical Radiation Pattern
270° 330° 340° 180° 0° 20° 90° 30°
1/2 Power Beamwidth 66°

Typical S/W/R Curve
S/W/R 2.0 1.5
7.0 7.1 7.2 7.3
Frequency in MHZ

Please Note: The Telrex Model 40M214 does not require boom struts.

W0MLY W1FZ K2DGT K2GL K2LWR WA2SFP(W2PV) W8FGX W8VSK W9EWC

W3KRQ's Homebrew Full Size 3 Element 40 Meter Yagi in 1959

Contesters and DXers built many 3 element 40M Yagis
W3GRF W3KRQ W3MSK (W3AU) W4BVV W8JIN

Stacked 40 Meter 4 Element OWA Yagis at K9CT

k9ct.us/contest-antennas/40-m

40 Meter 4-Square Vertical Array

- A 4-square vertical array is good alternative to a Yagi
  - if you cannot install a “shorty 40” Yagi at least 70 feet high
- Install at least 60 shallow buried 35 foot radials under each vertical
- *Install at least 40 feet from all towers*
  - more than 40 foot spacing will significantly improve its performance
- A 4-square is also an excellent receiving antenna

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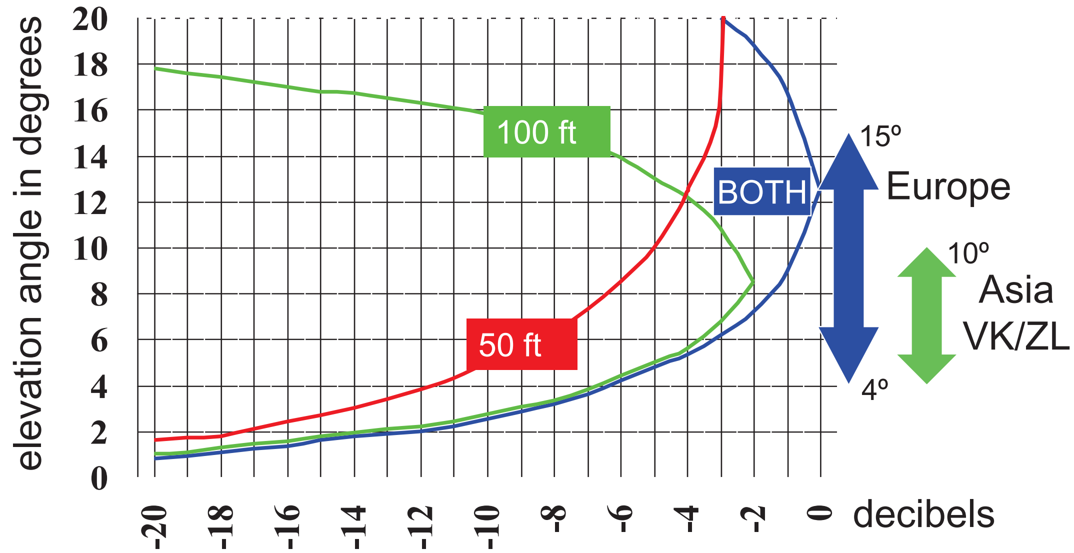
High Performance 20M Antennas

- A horizontal Yagi or quad is *always* the best choice
  - if you can install your antenna at least 35 feet high
    - 13 to 45 degree elevation beam pattern at -3 dB points
- Moderate gain: small tri-band Yagi, hex-beam, Moxon or quad
  - a small Yagi at least 50 to 70 feet high will produce good DX results
    - 10 to 30 degree elevation beam pattern at -3 dB points
- High gain: full size tri-band Yagi, small monoband Yagi or quad
  - at least 70 to 100 feet high
    - 7 to 20 degree elevation beam pattern at -3 dB points
- Highest gain: stacked large 20 meter monoband Yagis
  - 100 to 140 foot tower with two stacked Yagis and a Stackmatch
  - 170 to 200 foot tower with three stacked Yagis and a Stackmatch
    - *selectable* 3 to 25 degree elevation beam patterns at -3 dB points
  - stack switching (a “Stackmatch”) provides high payoff at low cost

CTU CONTEST UNIVERSITY **Elevation angles from <5º to 20º are needed** ICOM

Stacked 5 Element 20 Meter Yagis
48 Foot Booms
50 and 100 Feet High



Elevation angles from <5º to 15º are needed

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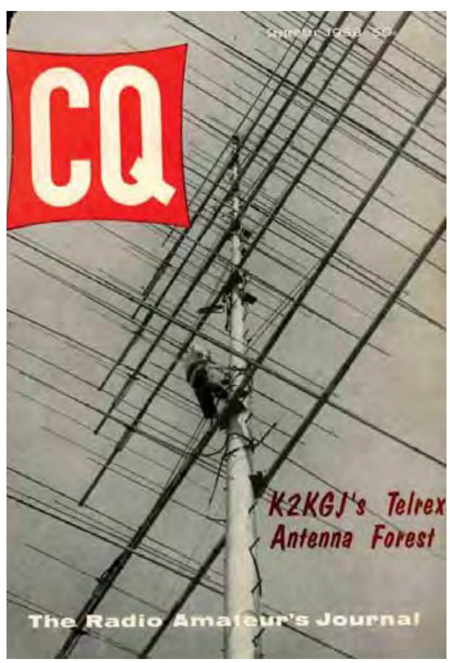
Telrex 20, 15 and 10 meter stacked Yagis revolutionized competitive HF antennas in 1955



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Array Solutions Stack Match

The Stackmatch revolutionized the performance and flexibility of stacked Yagi antennas

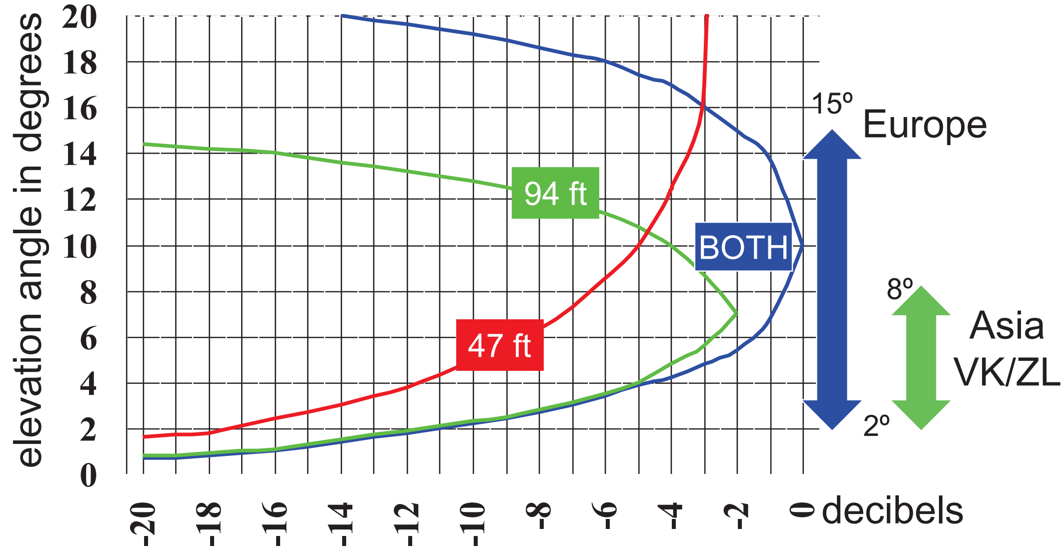
www.arraysolutions.com/Products/stackmatch.htm

High Performance 15M Antennas

- A horizontal Yagi or quad is *always* the best choice
  - if you can install your antenna at least 25 feet high
    - 13 to 45 degree elevation beam pattern at -3 dB points
- Moderate gain: small tri-bander Yagi, hex-beam, Moxon or quad
  - a small Yagi at least 50 to 70 feet high will produce good DX results
    - 7 to 20 degree elevation beam pattern at -3 dB points
- High gain: full size tri-band Yagi, small monoband Yagi or quad
  - at least 70 to 100 feet high
    - 5 to 15 degree elevation beam pattern at -3 dB points
- Highest gain: stacked large 15 meter monoband Yagis
  - at least a 90 foot tower with two stacked Yagis and a Stackmatch
  - at least a 120 to 140 foot tower with three stacked Yagis and a Stackmatch
    - *selectable* 5 to 25 degree elevation beam patterns at -3 dB points
  - stack switching (a “Stackmatch”) provides high payoff at low cost

Elevation angles from <5º to 15º are needed

Stacked 6 Element 15 Meter Yagis
48 Foot Booms
47 and 94 Feet High



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Elevation angles from <5º to 15º are needed

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High Performance 10M Antennas

- A horizontal Yagi or quad is always the best choice
  - if you can install your antenna at 20 feet high or higher
    - 13 to 45 degree elevation beam pattern at -3 dB points
- Moderate gain: small tri-bander Yagi, hex-beam, Moxon or quad
  - a small Yagi at least 35 to 50 feet high will produce good DX results
    - 7 to 20 degree elevation beam pattern at -3 dB points
- High gain: full size tri-band Yagi, small monoband Yagi or quad
  - at least 50 to 70 feet high
    - 5 to 15 degree elevation beam pattern at -3 dB points
- Highest gain: stacked large 10 meter monoband Yagis
  - at least a 70 foot tower with two stacked Yagis and a Stackmatch
  - at least a 90 to 100 foot tower with three stacked Yagis and a Stackmatch
    - *selectable* 4 to 20 degree elevation beam patterns at -3 dB points
  - stack switching (a “Stackmatch”) provides high payoff at low cost

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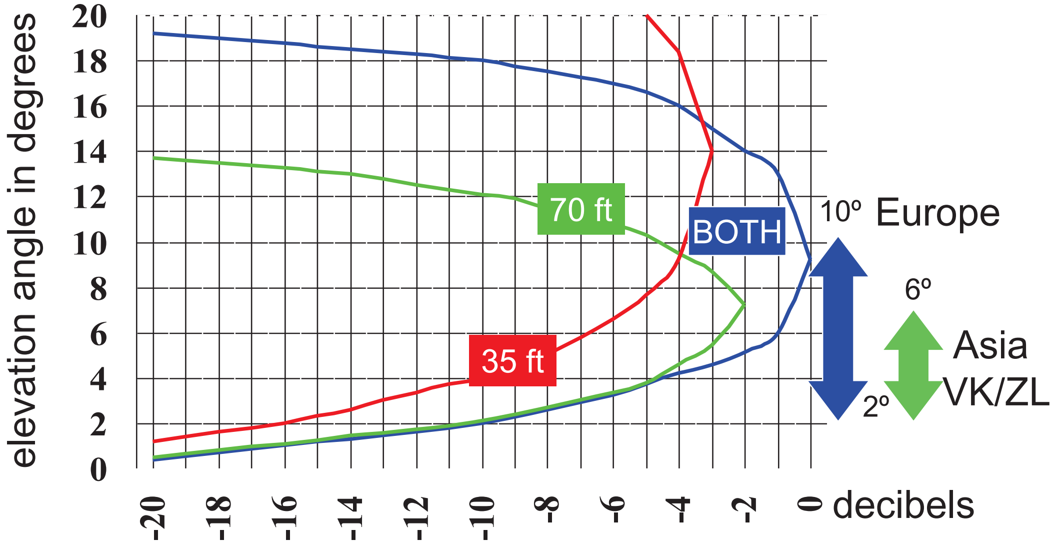
Elevation angles from <5º to 10º are needed

ICOM

Stacked 6 Element 10 Meter Yagis
36 Foot Booms
35 and 70 Feet High



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Elevation angles from <5º to 10º are needed

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Competitive One Tower Antenna Systems

- 50 to 70 foot tower and a small rotator (e.g., HyGain Ham-IV)
  - small tri-band Yagi, Hex-beam or quad
  - 40 and 80 meter dipoles and 160 meter inverted-L
- 70 to 90 foot tower and a medium rotator (e.g. HyGain T2X)
  - Cushcraft XM-240 two element 40 meter Yagi
  - large tri-band Yagi such as the DX Engineering Skyhawk
  - 80 meter dipole and 160 meter inverted-L
- 100 to 140+ foot tower and a large rotator (e.g., M2 Orion)
  - Cushcraft XM-240 two element 40 meter Yagi
  - monoband Yagis such as the Hy-Gain LJ series on ring rotators
  - 80 meter dipole and 160 meter inverted-L

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Multi-Tower Antenna Systems

Designing a multi-tower station with acceptable degradation from multiple antennas and close spaced towers is an antenna modelling challenge

- Placement of Yagis and the relative location of the towers to minimize degradation is critical to achieving high performance
  - in most cases multiple *Triband Yagis* and multiple Yagis for the same band should be installed *on only one tower*
  - placing Yagis covering the same band *on multiple towers* requires detailed antenna modelling
- An excellent design for two towers with minimal degradation:
  - tower one: 40 meter Yagi and 10 meter stacked Yagis
  - tower two: 20 and 15 meter stacked Yagis
- An excellent design for three towers with minimal degradation:
  - tower one: 40 meter Yagi and 10 meter stacked Yagis
  - tower two: 20 meter stacked Yagis
  - tower three: 15 meter stacked Yagis

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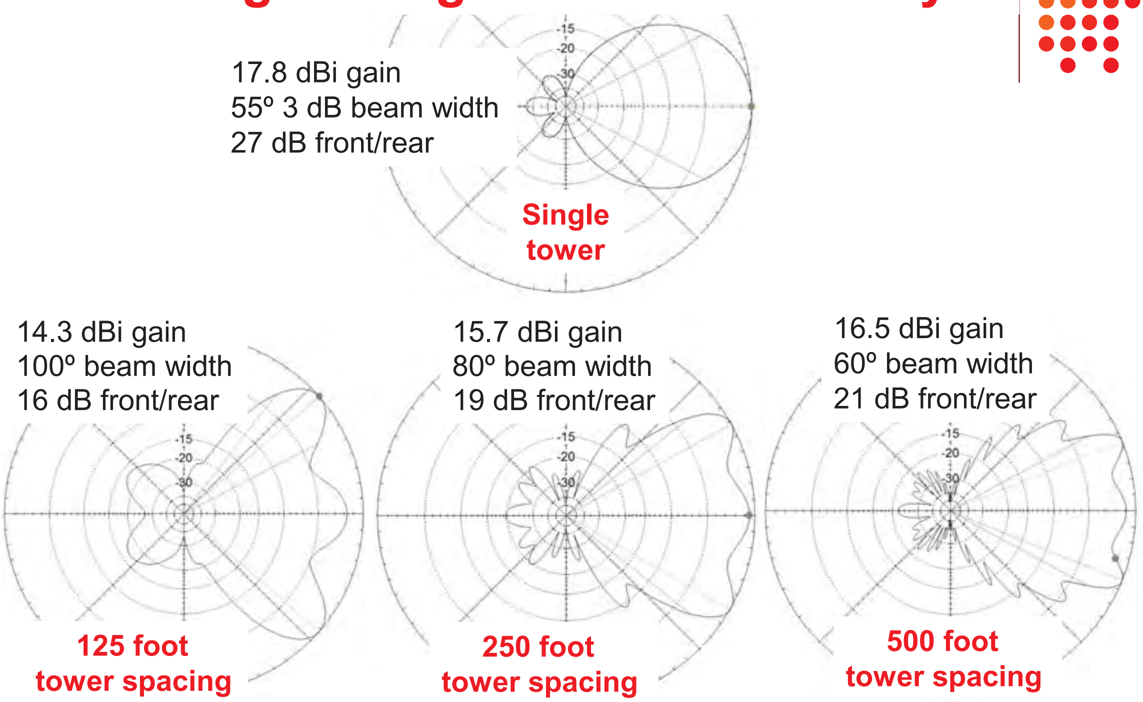
ncjweb.com/bonus-content/Ant_Interact_Part_6.pdf

ICOM

20 Meter 6 Element Stacked Yagi Array Pointing Through an Identical Array



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When Good Antennas Go Bad…

antenna system design issues

- Yagi director installed too close to the tower face
  - spacing *less than one tower diameter* shortens effective director length
- 80 meter dipole installed too close to a 40 meter or 15 meter Yagi
  - A bad choice of coaxial cable length makes an 80 meter dipole operate like two 40 meter dipoles tightly coupled to the 40 or 15 meter Yagi
- 10 and 15 meter Yagis installed too close to each other
  - use 10 foot minimum spacing unless you model their interactions first
- 15 meter Yagi pointed through -- or mounted too close to -- a full size 40 meter Yagi
- Conductive guy wires degrading Yagi antenna performance
- 160 and 80 meter vertical antenna performance degradation caused by installing them too close to towers
- Multiple triband Yagis or multiple Yagis for the same band installed on two or more towers without detailed modelling

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When Good Antennas Go Bad…

common coaxial cable issues

- Improperly installed connectors
- PL-259 connectors not gently wrench tightened ¼ turn
- Obsolete N connectors with floating pins
  - if you must use N connectors… use *only* captive pin connectors
- Connectors not adequately protected from water and moisture
  - connectors on towers should be mounted horizontally not vertically
- Coax not securely fastened to the tower
- Coax not electrically bonded to the top and bottom of the tower
- Inadequate waterproofing of the coax connection to the antenna
- Coaxial cable shield exposed to rain at the antenna connection
- Undetected rodent damage to coaxial cable jackets and worse

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Amphenol 83-1SP
PL-259 Connector

Shell is labeled exactly:
Amphenol 83-1SP

Silver Plated
Center Pin

Silver Plated
Body

newark.com/amphenol-rf/83-1sp/rf-coaxial-uhf-plug-straight-50ohm/dp/59K0534

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This is not a good place to save a few dollars

ICOM

Waterproof your Connectors!

Cover your connectors with two 50% overlapped layers of Scotch 130C self-vulcanizing linerless rubber splicing tape
- stretched to 50% of its original width
- sticky side facing out

homedepot.com/p/3M-Scotch-3-4-in-x-30-ft-Linerless-Rubber-Splicing-Tape-41717-BX-10/205523418

Cover the Scotch 130C tape with two 50% overlapped layers of Scotch Super 33+ vinyl electrical tape

homedepot.com/p/Scotch-Super-33-3-4-in-x-66-ft-x-0-007-in-Vinyl-Electrical-Tape-Black-6132-BA-10/304653556

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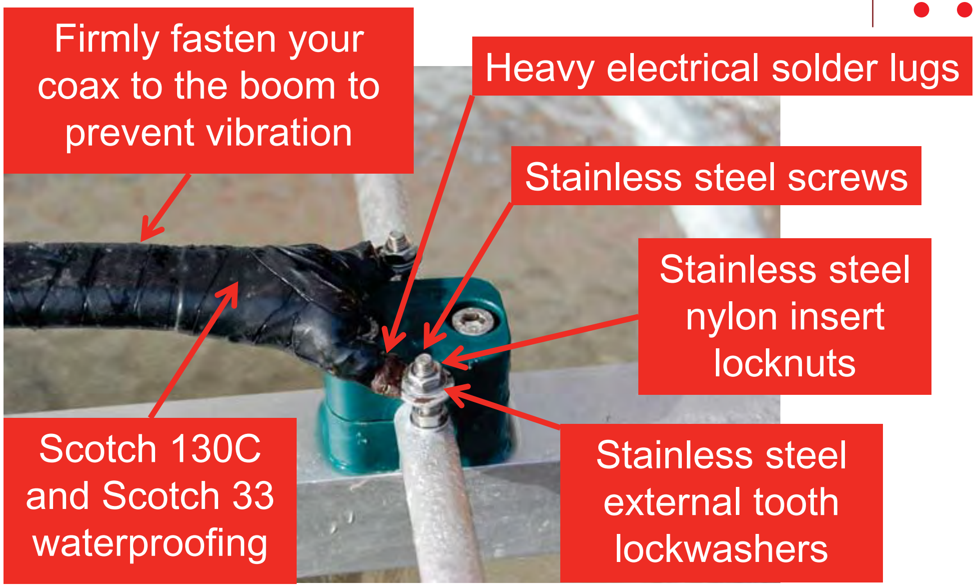
Antenna Feedpoint

Waterproof and Shakeproof Connections



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When Good Antennas Go Bad…

Performance Evaluation, Inspections, and Preventive Maintenance

- Maintaining competitive antenna performance
  - antenna performance evaluations
  - tower, foundation and guy wire inspections
  - guy wire, guy hardware and ground anchor inspections
  - rotator inspections
  - coaxial cable inspections and performance measurements
    - a time domain reflectometer is an excellent investment
  - coaxial connector inspections
    - PL-259 and SO-239 center pin engagement pressure
    - Tighten all PL-259s just enough so they can't be removed by hand

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CTU Presents

Year Long Contests-
State QSO Party Challenge &
CQ DX Marathon

Anthony Luscre, K8ZT

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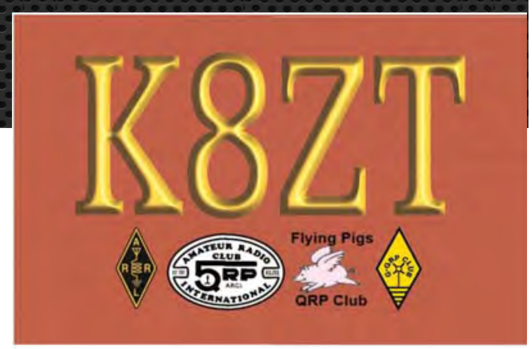
Contact Information

- Email- k8zt73@gmail.com
- Website- www.k8zt.com



2

Many slides & links so you're probably going to want to review extended version of Today's Presentation

View complete slide show and access links at

tiny.cc/ctu-ylc

If you need a PDF- *link*

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ICOM 3

The SQP is sponsored by...
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Visit Icom America

State QSO Party Challenge

state QSO party CHALLENGE

Anthony Luscre, K8ZT

What is a State QSO Party?

- A State QSO Party is a radio contest sponsored by states, provinces or regions
  - In-state stations: activate Counties which are used as their exchange and score multipliers
  - Out-of-state stations: give their state as exchange
  - Some states add additional element(s) to exchange including operator's name or a serial number

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ICOM 5

What is the State QSO Party Challenge?

- State QSO Party Challenge is…
  - A means of recognizing Amateur Radio operators for their active participation in State QSO Party (SQP) contests
  - Not a single contest, instead a challenge "Overlay" of existing SQP contests

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ICOM 6

How Does SQP Challenge Work?

- Participants work any or all of **47** State, Province & Regional QSO Parties, according to each individual party's rules.
- Participants enter their results for each contest via the *3830* claimed scores website
- SQP Challenge automatically aggregates results for each participant's SQP entries

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ICOM 7

How Does SQP Challenge Work?

- Participants SQP score is based on # of QSOs worked times # of parties worked (minimum of 2 QSO for worked party)
- Participants can qualify for one of five award levels and Worked All State QSO Parties (WAQP) award

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ICOM 8

How Does SQP Challenge Work?

- SQP Challenge Scores are displayed on the *SQP Challenge Leaderboard* in descending order based on total score and total number of parties worked

	Operator Call	Total Points	Total QSOs	Total QPs	Cumulative Score	Ave. QSOs per QP	Award
1	**KI6RRN**	2,525,037	14950	46	687,700	325.0	Diamond
2	**N0HJZ**	1,259,970	12396	46	570,216	269.5	Diamond
3	K5CM	1,931,989	12149	41	498,109	296.3	Diamond
4	**K1RO**	1,527,710	9927	46	456,642	215.8	Diamond
5	**W0BH**	1,053,155	8583	46	394,818	186.6	Diamond
6	N8II	1,489,556	8970	44	394,680	203.9	Diamond
7	**W0ZQ**	860,525	6604	46	303,784	143.6	Diamond
8	**W5XX**	649,991	6441	46	296,286	140.0	Diamond
9	K3WJV	1,175,494	7091	41	290,731	173.0	Diamond
10	**WB8WKQ**	817,881	6145	46	282,670	133.6	Diamond
11	K4BAI	916,365	6271	45	282,195	139.4	Diamond
12	**OM2VL**	660,106	5283	46	243,018	114.8	Diamond
13	AA1SU	569,601	5159	44	226,996	117.3	Diamond
14	W6OAT	1,052,258	4790	45	215,550	106.4	Diamond
15	**NS2N**	644,663	4626	46	212,796	100.6	Diamond
16	AA4TI	604,666	4391	45	197,595	97.6	Diamond
17	KA6BIM	636,582	4846	38	184,148	127.5	Diamond
18	**K9WX**	465,811	3790	46	174,340	82.4	Diamond
19	**W3LL**	368,143	3721	46	171,166	80.9	Diamond
20	**WB9HFK**	464,005	3652	46	167,992	79.4	Diamond
21	W1WBB	440,328	3937	42	165,354	93.7	Diamond
22	K4XU	707,443	4673	35	163,555	133.5	Diamond
23	**W9QL**	349,443	3479	46	160,034	75.6	Diamond
24	K8MR	962,742	4910	32	157,120	153.4	Diamond
25	**WN4AFP**	458,873	3368	46	154,928	73.2	Diamond
26	[illegible]	557,846	3903	37	144,411	105.5	Diamond

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How Does SQP Challenge Work?

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12	**WB9HFK**	464,005	3652	46	167,992	79.4	Diamond
13	**W9QL**	349,443	3479	46	160,034	75.6	Diamond
14	**WN4AFP**	458,873	3368	46	154,928	73.2	Diamond
15	**K9CW**	391,673	2860	46	131,560	62.2	Diamond
16	**KJ9C**	252,693	2756	46	126,776	59.9	Diamond
17	**K4VBM**	222,940	2725	46	125,350	59.2	Diamond
18	**N9NM**	253,470	2362	46	108,652	51.3	Diamond
19	**K3PP**	209,758	2147	46	98,762	46.7	Diamond
20	**K2AL**	204,505	2090	46	96,140	45.4	Diamond
21	**N9SE**	302,405	2062	46	94,852	44.8	Diamond
22	**KE8FT**	161,887	1947	46	89,562	42.3	Diamond
23	**N1SOH**	185,362	1910	46	87,860	41.5	Diamond
24	**W1FM**	185,251	1903	46	87,538	41.4	Diamond
25	**K3SV**	315,666	1829	46	84,134	39.8	Diamond

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How Does SQP Challenge Work?

- Worked All State QSO Parties (WAQP) award

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How Does SQP Challenge Work?

- Worked All State QSO Parties (WAQP) award
  - "Ultimate"- 100% participation
  - "Elite"- 90% thru 99% participation
  - "Expert"- 75% thru 89% participation
  - "Aficionado"- 50% thru 74% participation in SQP Challenge state QSO party contests.

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ICOM

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2022 SQP Challenge Final Results

- Write-up of 2022 State QSO Party Challenge Final Results- *link*

Greetings Fellow SQPers,

The 2022 State QSO Party season has been another tremendous success. Now three years old, one might expect the bloom to be off the rose for the State QSO Party Challenge. However, reported statistics continued to increase and the Worked All QSO Parties Award had another great year.

As you read these rankings and statistics, please remember that these statistics are based on claimed scores and information provided by participants to 3830Scores. After adjudication by the sponsors, the final scores usually differ. Individual scores may fall about 1-5 percent because of busted QSOs and accumulations may increase due to additional logs submitted but not reported to 3830Scores.

Highlights for the year

2022: State QSO Party

Challenge

- We again topped a million (1,266,163) QSOs that were reported to 3830Scores, again surpassing the previous year.

2023 SQPs

2023 State QSO Parties

GRP	Date	Start Time	End Date	End Time	Contest Name/Link
1	2/4/2023	0000Z	2/5/2023	2400Z	Vermont QSO Party
	2/4/2023	1400Z	2/5/2023	2400Z	Minnesota QSO Party
	2/4/2023	1600Z	2/5/2023	0359Z	British Columbia QSO Party
	2/5/2023	1600Z	2/5/2023	2359Z	
2	2/25/2023	1500Z	2/26/2023	0159Z	South Carolina QSO Party
	2/26/2023	1500Z	2/27/2023	0059Z	North Carolina QSO Party
3	3/11/2023	1500Z	3/12/2023	0200Z	Oklahoma QSO Party
	3/12/2023	1500Z	3/12/2023	2100Z	
	3/11/2023	1900Z	3/12/2023	1900Z	Idaho QSO Party
	3/12/2023	1800Z	3/13/2023	0100Z	Wisconsin QSO Party
4	3/18/2023	1400Z	3/19/2023	0400Z	Virginia QSO Party
	3/19/2023	1200Z	3/19/2023	2400Z	
5	4/1/2023	1400Z	4/2/2023	0200Z	Louisiana QSO Party
	4/1/2023	1400Z	4/2/2023	0200Z	Mississippi QSO Party
	4/1/2023	1400Z	4/2/2023	0400Z	Missouri QSO Party
	4/2/2023	1400Z	4/2/2023	2000Z	
6	4/8/2023	1300Z	4/9/2023	0100Z	Nebraska QSO Party
	4/9/2023	1300Z	4/9/2023	2200Z	
	4/8/2023	1400Z	4/9/2023	0200Z	New Mexico QSO Party
	4/8/2023	1800Z	4/9/2023	0359Z	Georgia QSO Party
	4/9/2023	1400Z	4/9/2023	2359Z	
	4/8/2023	1800Z	4/9/2023	1800Z	North Dakota QSO Party
7	4/15/2023	1800Z	4/16/2023	0500Z	Ontario QSO Party
	4/16/2023	1200Z	4/16/2023	1800Z	
	4/15/2023	1600Z	4/16/2023	0400Z	Michigan QSO Party
	4/16/2023	1200Z	4/16/2023	2000Z	Quebec QSO Party

GRP	Date	Start Time	End Date	End Time	Contest Name
9	5/6/2023	1300Z	5/7/2023	0700Z	7th Call Area Q
	5/6/2023	1500Z	5/7/2023	0300Z	Indiana QSO Par
	5/6/2023	2000Z	5/7/2023	0500Z	New England QSO
	5/7/2023	1300Z	5/7/2023	2400Z	
	5/6/2023	1700Z	5/7/2023	2359Z	Delaware QSO Par
10	5/13/2023	1700Z	5/14/2023	0300Z	Canadian Prairie
11	5/20/2023	1400Z	5/21/2023	0200Z	Arkansas QSO Par
12	6/3/2023	1300Z	6/4/2023	0100Z	Kentucky QSO P
13	6/17/2023	1600Z	6/18/2023	0400Z	West Virginia Q
14	8/12/2023	1400Z	8/13/2023	0400Z	Maryland-DC QSO
15	8/25/2023	0400Z	8/27/2023	0359Z	Hawaii QSO Party
	8/26/2023	1600Z	8/27/2023	0400Z	Ohio QSO Party
	8/26/2023	1400Z	8/27/2023	0200Z	Kansas QSO Part
	8/27/2023	1400Z	8/27/2023	2000Z	
16	9/2/2023	1300Z	9/3/2023	0400Z	Colorado QSO Part
	9/3/2023	1800Z	9/4/2023	0300Z	Tennessee QSO Pa
17	9/9/2023	1500Z	9/10/2023	0300Z	Alabama QSO Pa
18	9/16/2023	1400Z	9/17/2023	0200Z	Texas QSO Party
	9/17/2023	1400Z	9/17/2023	2000Z	
	9/16/2023	1400Z	9/17/2023	0200Z	Iowa QSO Party
	9/16/2023	1600Z	9/17/2023	0359Z	New Jersey QSO P
	9/16/2023	1600Z	9/17/2023	0400Z	New Hampshire
	9/17/2023	1600Z	9/17/2023	2200Z	
	9/16/2023	1600Z	9/17/2023	0700Z	Washington St Sal
	9/17/2023	1600Z	9/17/2023	2400Z	
19	10/7/2023	1600Z	10/8/2023	2200Z	California QSO Part

Newest QSO Party Addition (2022)!

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Why Participate in State QSO Parties?

- Awards
  - Great for completing (WAS) *Worked All States*
  - Chance to work rarer US Counties
    - USA-Counties Award (USA-CA) Program- *link*
    - County Challenge Award Top Lists- *link*
  - Many parties are small enough that new contesters have a chance to win a category

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Why Participate in State QSO Parties?

- Being a desired multiplier
  - Chance to be in demand (like rare DX stations) when you are operating in your state's party, especially if in or travel to a rare county
  - Great activity for in-state local radio clubs to encourage on-air activity by members

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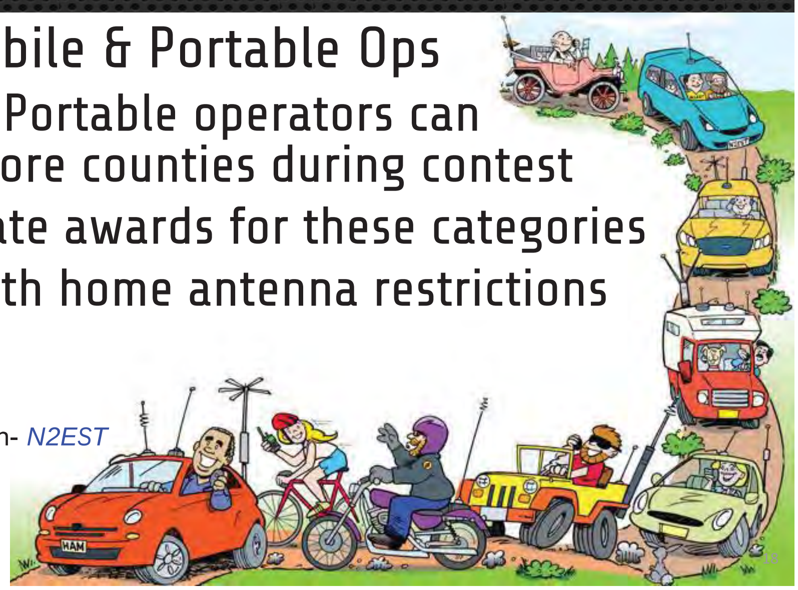
Why Participate in State QSO Parties?

- Great for Rover/Mobile & Portable Ops
  - Rovers/Mobiles & Portable operators can activate one or more counties during contest
  - Many have separate awards for these categories
  - Good for those with home antenna restrictions

* Cartoon- *N2EST*



Rover in State QSO Parties

- K8MR's presentation on operating mobile in contests

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Why Participate in State QSO Parties?

- Friendly
  - Atmosphere of friendly laid back competition
  - Chance to connect with old friends around state
  - Make for great club competitions both between club members and between local clubs

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Why Participate in State QSO Parties?

- Great Activity for New Contesters
  - More laid back atmosphere than many high pressure major contests
  - Both SSB & CW options to work (some have been adding Digital option)
  - Shorter duration contests
  - Many opportunities throughout year

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Why Participate in State QSO Parties?

- Unique
  - Each party can have different rules & activities
  - Some have bonus stations
  - Some have fun, state related prizes (i.e. Maple Syrup from VT, Smoke Salmon from WA, etc.)

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Getting Started

1. Read *State QSO Party Challenge Rules*
2. Read *State QSO Party FAQ*
3. Find included QSO Parties, Dates, Times & Rules *WA7BNM Contest Calendar*

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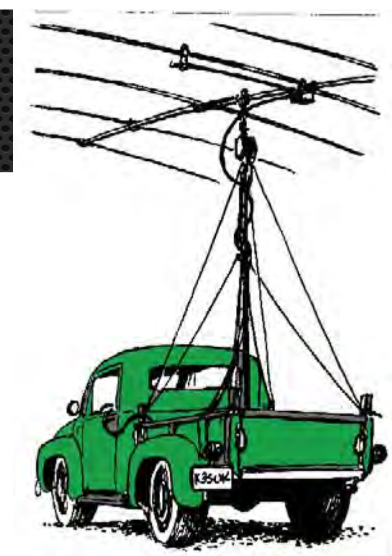
Getting Started



4. Get Ready for the QSO Party
   - Plan your operation
     - Out of State Entry
     - In State Entry Choices...
       - Fixed, Home Station
       - Fixed, Portable Location (Single County)
       - Mobile/Rover (Multi County)

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Getting Started

5. Get Ready for the QSO Party
   - Know your Exchange
   - Install & Configure Contesting Software*
     - *N1MM*
     - *N3FJP*

* For other Logging software and software for Mac & Linux *visit link*

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Getting Started

6. Operate
   - Finding Stations
     - Many Parties publish Suggested Frequencies
     - Stations typically identify that they are participating in the contest with their CQ, i.e. “CQ Ohio QSO Party Kilo Eight Zulu Tango”
     - Most Parties Allow All Stations to Use Spotting Networks (Clusters)
     - Some Parties even have their own spotting networks

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Getting Started

7. Tips for Newer Contesters

- Make sure to read & understand contest rules
- Know your Exchange!!!!
- Contest QSOs should be kept "streamlined"
  - Send only what is required in exchange
  - Avoid excessive information
  - Repeat only requested information
- Not all Contesters will be on suggested frequencies, tune above and below

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Getting Started

7. Tips for Newer Contesters

- If a rover, give your new county in your CQ periodically so stations know it is OK to work you again
- Keep track of stations you have already worked, the only time you can work again is on a new band or if either of you moves to a new county
- Many Rovers/Mobiles tend to operate on or near the same frequencies as they change counties & bands

i.e. station W1ABC operating on 3538, 7038 and 14038 plus or minus, based on QRM/activity on the frequency they have staked out.

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Submitting Your Results

8. After Contest– 2 steps
   A. Submit Log to Sponsor
   B. Post Your Score to *3830scores.com*
      - Post to specific QSO Party
      - No Special Entry for SQP Challenge needed
      - Information automatically added to your SQP Challenge score from 3830

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ICOM 29

Submitting Your Results

- For more info on 3830 visit *tiny.cc/3830*

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ICOM 30

Submitting Your Results

9. View Your Aggregated SQP Challenge Running Score
   - *3830scores.com* SQP Challenge Page
   - *SQP Challenge Leaderboard*
10. Increase your Aggregated SQP Challenge Running Score by entering more SQPs!

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QSP Contesting Resources

- *Mult Chaser* is a free add-on program for N1MM Logger+ that displays contest multipliers on a map as they are worked
- US Census- *State Outline Maps* borders
- NO5W *County Overlay Maps*
- Mob-Rule *Interactive Online County Maps*

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CQ DX Marathon

Anthony Luscre, K8ZT

CQ Amateur Radio
THE RADIO AMATEUR'S JOURNAL


THE EDITORS OF
CQ
The Radio Amateur's Journal
TAKE PLEASURE IN AWARDING THIS CERTIFICATE OF MERIT TO
Anthony Luscre K8ZT
IN RECOGNITION OF THE ACHIEVEMENT OF WINNING THE
2019
CQ DX Marathon
IN THE Formula-5Watt CATEGORY FOR
USA (#1 Call Area 8)
A TOTAL SCORE OF 225 POINTS WAS COMPUTED ON THE BASIS OF ZONES AND COUNTRIES WORKED.
IN WITNESS OF THIS ACHIEVEMENT, WE HEREBY AFFIX OUR SIGNATURES
K9EL — MARATHON DIRECTOR
June, 2020 — DATE
W2VU — EDITOR, CQ

Year-end & New Year's Traditions

- Many of us have both Year-end & New Year's traditions. One of my Amateur Radio year-end activities is **entering** *CQ Magazine's Annual DX Marathon* and **planning** the next year's strategy.

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Year-end & New Year's Traditions

- The marathon is a different type of contest that runs all year, not just a single day or weekend
- Competitors strive all year to work
  - As many CQ Countries (similar to the ARRL DXCC Entities list with a few additions) &
  - 40 CQ Zones

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Year-end & New Year's Traditions

- It is like starting your DXCC chase anew each year, so you can consider it one of your New Year's Resolutions!

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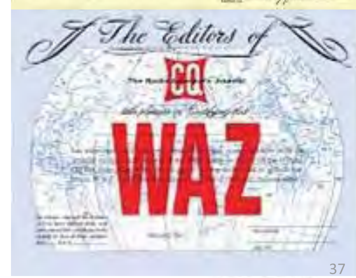
Six Reasons to Take Part in Marathon

1. If you are a ham new to HF it is a great way to
   a. Get your initial *ARRL DXCC* (100 Countries worked)
   b. Get *CQ DX Award*
   c. Get *CQ WAZ Award* (Worked All Zones)



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Six Reasons to Take Part in Marathon

2. If you are a contester, it is a great compliment to your contesting activities
3. If you are a DXer, it is a natural fit!
4. If you are a long time DXer, with almost all entities worked, it is a chance to restart the chase again each year with plenty of fresh targets & work new band/mode combos

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Six Reasons to Take Part in Marathon

5. If you are a member of a DXing or Contesting Club (or any ARC) it is a great intra-club competition activity each year
   a. You can also add your own specific band or mode categories, levels, etc. competitions
   b. Consider monthly running totals "scoreboard"
   c. You might want to have an inter-club competition with another area club

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Six Reasons to Take Part in Marathon

6. For any ham, it is a great way to get on the air, make more contacts & have fun!

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CQ DX Marathon

dxmarathon.com

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CQ DX Marathon

- The CQ DX Marathon is designed to promote DXing activity throughout the year rather than only on contest weekends and during DXpeditions.

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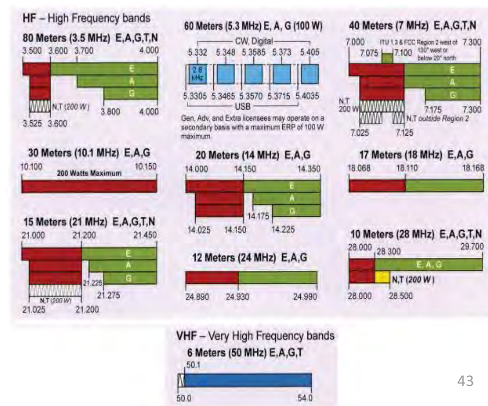
CQ DX Marathon

- Because activity is not concentrated in specific time periods, credit is given for contacts on all ham bands (160 to 6 Meters)
  - Including those not normally used for contesting (e.g., 60, 30, 17 & 12 meters)



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CQ DX Marathon

- Scoring is simple: you score one point the first time you work a new Country and/or a new CQ Zone during the year
- Add the points up at the end of the year for your total score. There are no multipliers

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CQ DX Marathon

- Categories:
  1. **Formula-**
     - maximum output power of 5 watts or
     - 100 watts output to a simple antenna*
  2. **Limited-** 100 watts to most antennas
  3. **Unlimited-** Any antennas may be used, along with any power level for which the operator is licensed.

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* such as a vertical or dipole

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CQ DX Marathon

- Frequencies: Any authorized amateur frequency may be used
  - Contacts through repeaters or satellites are not allowed for credit
  - Nor are contacts with maritime or aeronautical mobile stations allowed
  - All contacts must be made entirely over amateur radio frequencies – i.e., Echolink-type contacts do not count

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CQ DX Marathon

- Modes: Any authorized amateur mode may be used, but only three mode categories will be recognized in the DX Marathon –
  - CW, Phone & Digital

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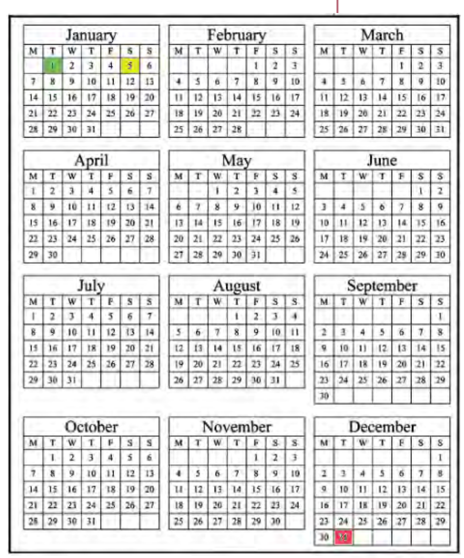
CQ DX Marathon

- Contest Period Runs from
  - 00:00 UTC, January 01 to
  - 23:59 UTC, December 31 each year
- Entry Deadline is Jan 05 each year



CQ DX Marathon

- General Rules:
  - Each entrant in the DX Marathon may submit only one log per operating location.
  - If an entrant operates from both a primary station and a remote station, separate entries for each location may be submitted provided such separate entries have different callsigns or a portable callsign designator. Entries that include contacts made with the assistance of remote receivers and/or transmitters in addition to contacts from a primary station are not permitted.

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CQ DX Marathon

- Verification:
  - QSLs are not required.
  - The operator is expected to claim contacts only…
    - from stations the operator has every reason to believe are legitimate
    - contacts in which an accurate two-way exchange was clearly accomplished

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CQ DX Marathon

- Verification:
  - Scores will be adjusted by the DX Marathon committee for claimed contacts with pirates or any station not considered legitimate
  - Submissions may be penalized or voided in cases of fraud or poor sportsmanship.
  - Every QSO may be subject to verification by the DX Marathon Manager

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ICOM 51

What Entities Are Different from DXCC

- CQ Marathon uses ARRL DXCC with 6 additions:
  1. African Italy (Lampedusa [IG9] or Pantelleria [IH9] (CQZ 33)

Plus Five Countries from WAE (Worked All Europe List)-

1. GM/Shetland
2. IT/Sicily
3. TA1/European Turkey (vs Asian Turkey)
4. 4U1VIC (Vienna United Nations Organisations)
5. JW/Bear Island (in addition to JW Svalbard)

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ICOM 52

What Entities Are Different from DXCC

- African Italy (Lampedusa [IG9] or Pantelleria [IH9] in CQ Zone 33 off the coast of N. Africa)
- IT/Sicily

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What Entities Are Different from DXCC

- GM/Shetland

Stations known to have operated from the Shetland Islands (GM/S) at some time over the last few years.
Not all are currently active or have exclusively operated in Shetlands.

2M0SPX	GM0EKM	GS0AAA	MM0ZRC
2M0VIK/MM0VIK	GM0GFL	GS3BSQ	MM1FEO
GB0DAW	GM0JDB	GS3ZET	MM5PSL
GB1COR	GM3ZET	GS7V	MM6IIP
GB2AES	GM4JPI	GZ1DVP	MM6PTE
GB2ELH	GM4LER	GZ5Y	MM7CGR
GB2QM	GM4S	MA0XAU	
GB2SAA	GM4SLV	MM0SHF/P	MS0OXE
GB2SLH	GM4WSB/P	MM0VIK	MZ5A
GB2SUM		MM0XAU	MZ5B
GB2WAM	GM4SSA - Silent Key		

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What Entities Are Different from DXCC

- TA1/European Turkey (vs Asian Turkey).
- Only TA1 Callsigns are in European Turkey

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What Entities Are Different from DXCC

- **4U1VIC** (The Vienna International Centre is the home of several United Nations Organisations)
    - May also include other UN sponsored callsigns operated from V.I.C. including 4U1A, etc. (see *Valid Callsigns & Callsign Notes*)
    - Not same as 4U1UN in NY which a separate entity
    - 4U1WB (World Bank) does not have separate country status so is not eligible for separate credit (US)

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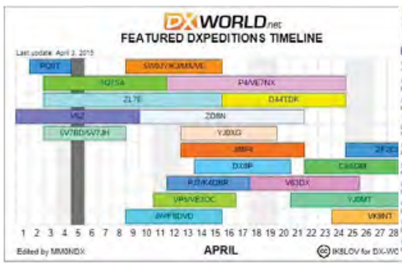
Improving Your Score

- If they are serious about a high score, most competitors start at the beginning of the year.
- In fact, many serious operators devise plans to work specific countries by following DXpedition news, working specific contests, etc.



57

Improving Your Score

- Get on the Air early and often during the Year
- Don't miss the big DX Contests
    - *CQ WW*- SSB, CW & *RTTY* (Oct, Nov & Sept)
    - *CQ WPX*- SSB, CW & *RTTY* (Mar, May, Feb)
    - *ARRL International DX*- CW & SSB
    - *ARRL RTTY Roundup*
    - *WW Digi* - FT8/FT4
    - *WAE (Worked All Europe)* (CW, SSB & RTTY)

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ICOM

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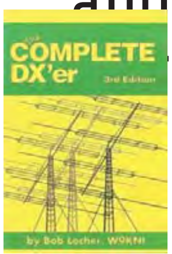
Improving Your Score

- Noted DXing author Bob Locher, W9KNI (author of *"The Complete DX'er"*) wrote a book about his CQ athon experience, *"A Year of DX"*



M 59

Improving Your Score- Resources

- NG3K Announced DX Operations (ADXO)- *www.ng3k.com/Misc/adxo.html*
- DX World.net- *www.dx-world.net*
- DX 425 News- *www.425dxn.org*

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Improving Your Score- Resources

- QRZ Now.com DX News- *http://qrznow.com/category/dxing*
- The fine recurring articles in "DX This Week" by Bill, AJ8B in the *Ohio Section Journal*
- A wide variety of DX Clusters & RBN (*Reverse Beacon Network*)

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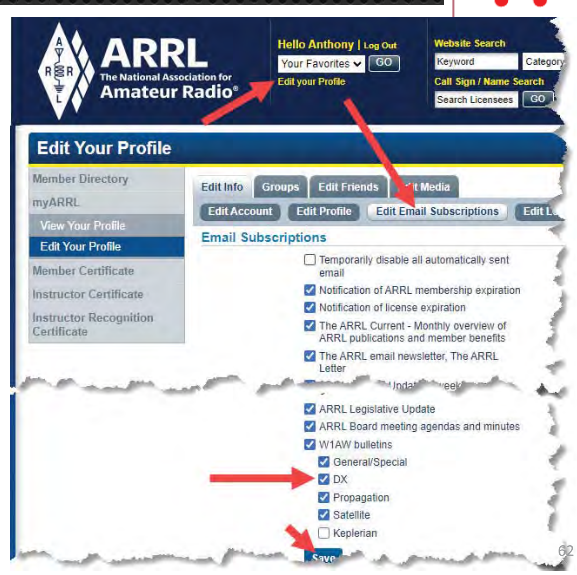
Improving Your Score- Resources

- Weekly ARRL DX Bulletin
  - Sign Into ARRL Website
  - Choose "Edit your Profile"
  - Edit your email Subscriptions.
  - See article- "ARRL Publications, Website & Communications"- *tiny.cc/arrl-info*



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Submitting an Entry

- If you keep your Amateur Radio Log in an electronic logbook entering the DX Marathon can be very easy using AD1C's free–
  ADIF to DX Marathon software
- The free software will take almost any ADIF export file of your current years QSOs and convert it to the Excel spreadsheet format used in the Marathon

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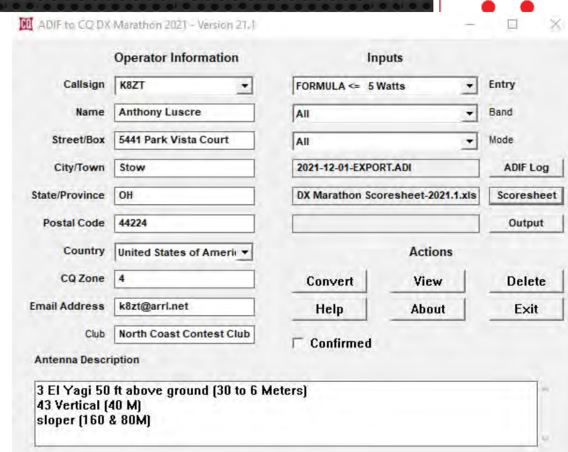
ICOM 63

Submitting an Entry

- Conversion program for MS Windows reads exported ADIF log file
- Extracts all of unique entities & zones worked
- Writes the corresponding QSO data to the official Excel Scoresheet



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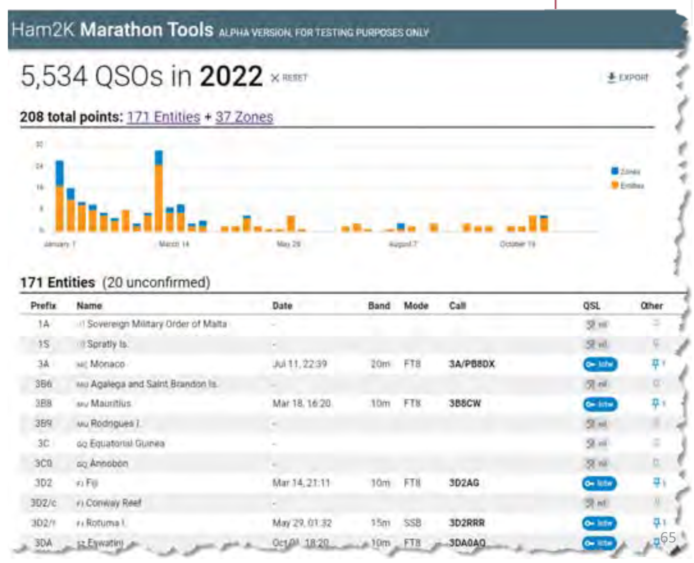
Submitting an Entry

- There is a new web based convertor software in development by Sebastian Delmont, KI2D
  - Currently being alpha tested
  - *https:// marathon. ham2k.net*



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Submitting an Entry

- The final step, in any case, is submitting an Excel file to the CQ Marathon
  - You can use the above tools if you have an electronic logbook
  - If you are still paper-logging all of your contacts, *you can download the Excel spreadsheet entry form* and fill in the entries manually

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Entry

- *Excel spreadsheet entry form*

2021 CQ DX Marathon Score Sheet

SUBMISSION INFORMATION				YOUR SCORE	
Callsign	Name	Street		Countries	165
K8ZT	Anthony Luscre	5441 Park Vista Court		Zones	38
City	State/Province	Country	Postal Code	TOTAL	203
Stow	OH	United States of America	44224	1. Save file as *YOURCALLSIGN.XLS*	
CQ Zone	Email Address	Club Name		2. Enter comments at bottom of form.	
4	k8zt@arrl.net	North Coast Contest Club		3. If you are seeking a single band or mode endorsement, enter QSO's for on that band or mode. Those endorseme are independent of Class.	
NOTE: All Formula and Limited Class entries must provide a detailed antenna description - type, height above ground and length. *ENTER BELOW*	Indicate your Class Here ====> Enter "X" in only ONE box.	UNLIMITED			
		LIMITED ≤ 100 Watts		4. Formula and Limited Class submissio without adequate antenna descriptions be re-classified to Unlimited Class.	
		FORMULA ≤ 100 Watts			
		FORMULA ≤ 5 Watts	X		
3 El Yagi 50 ft above ground (30 to 6 Meters) 43 Vertical (40 M) sloper (160 & 80M)				5. Please submit this form no later than January 5, 2022 at www.dxmarathon.com/logupload	

PREFIX	ENTITY/ZONE	DAY DD	MON MM	UTC HHMM	BAND 2,4,6,10,12,15,17,20,30,40,60,80,160	MODE CW, Phone, or Digital	CALLSIGN
1A0 (unofficial)	Sov. Mil. Order of Malta						
1S (unofficial)	Spratly Is.						
3A	Monaco						
3B6, 7	Agalega & St. Brandon Is.						
3B8	Mauritius	27	11	1732	15	CW	3B8M
3B9	Rodrigues I.	11	11	1418	12	Digital	3B9FR
ZD9	Tristan da Cunha & Gough I.						
ZF	Cayman Is.	03	01	2048	20	Digital	ZF2LZ
ZK3	Tokelau Is.						
ZL-ZM	New Zealand	05	02	2213	12	Digital	ZL1A
ZL7	Chatham Is.						
ZL8	Kermadec Is.						
ZL9	New Zealand Subantarctic Islands						
ZP	Paraguay	06	03	1514	15	Phone	ZP5DBC
ZR-ZU	South Africa	02	01	1658	17	Digital	ZS4JAN
ZS8	Prince Edward & Marion Is.						
KL7,VE8, VY1	Zone 1	04	01	2006	20	Digital	KL7ILA
VO2,VE2(>50°N)	Zone 2	09	02	1848	20	Digital	VO2NS
W6-7; VE7	Zone 3	01	01	1741	15	Digital	K6RO
[illegible],T5,5H,5X,5Z,7O,7Q	Zone 37	25	02	2023	20	Digital	5Z4VJ
A2,V5,ZS,ZD9,3DA,7P	Zone 38	02	01	1658	17	Digital	ZS4JAN
D6,FH,FR,S7,VQ9,3B6-9,5R8	Zone 39	25	02	2025	20	Digital	S79VU
JW,JX,OX,TF	Zone 40	20	02	1926	20	CW	OX3XR

Enter your comments below:

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Submitting an Entry

- Before submitting Excel File, Double Check…
  - Each year there are pirates, operations that are not approved, callsigns that are copied incorrectly and unusual operations that are valid.
  - CQ Marathon committee attempt to document as many of these operations as possible and post them to website & mailing list (*dxmarathon@groups.io*)
  - They encourage you to share your findings on pirates, illegal operations or confusing callsigns with them

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Submitting an Entry

- Double Check-
  - Many points are lost each year due to bad spots on the cluster & RBN networks. See extensive list of bad spots- please check the list (on *website*) before entering any of these callsigns!
  - Please check USA/VE zones carefully especially Zone 2. The number in the callsign does not necessarily match the location
  - Antarctica Callsigns have many zones, be careful

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Submitting an Entry

- Double Check-
  - When a prefix can count for more than country (e.g. E51) double check your entry
  - Although you can use the same QSO for both a Country & a Zone, if there is an error, two points will be lost! We suggest using a different QSO for country & zone
  - Review your submission carefully and make sure your logging program country database is up to date
  - See *FAQ* for more information

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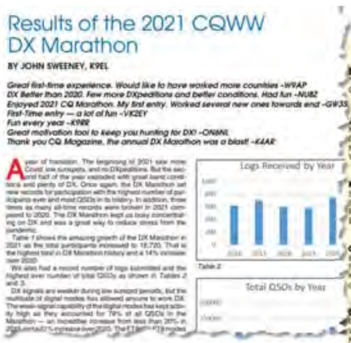
Results

- Results are publish in
  CQ Magazine & On Website


Results of the 2021 CQWW DX Marathon

BY JOHN SWEENEY, K9EL


TOP SCORES

High Claimed Scores for 2022

TOP WORLDWIDE SCORES BY CLASS

UNLIMITED		LIMITED	
Callsign	Score	Callsign	Score
IK0OZD	308	TA4RC	309
VK3GA/K2ZJ	307	SV2AEL	305
K1ZN/K5EK	306	TA1CM	304
K4ZO	305	K2JL	299
CT1IUA,N6WT,TA2LG	304	PY2TC,HK3W	295
FORMULA - 100W		**FORMULA - 5W**	
Callsign	Score	Callsign	Score
OK2FD	301	WG5G	264
PY2CER	290	K8ZT	227
PY2DPM	270	W8QZA	213
OK1TRJ	265	DL6GBM	205
HA7LJ	264	4Z4UO	171

TOP WORLDWIDE SCORES BY MODE

PHONE		CW	
Callsign	Score	Callsign	Score
W4HY	277	OK2PAY	275
PA2LO	270	PA3FQA	266
IZ5CML	258	ZL3CW	265
PY4JW	256	K5BG	250
N3CDA	248	W4JS	243
DIGITAL			
Callsign	Score		
PY7ZZ	300		
HA1RB	299		
R6YY	298		
YO5LD	296		

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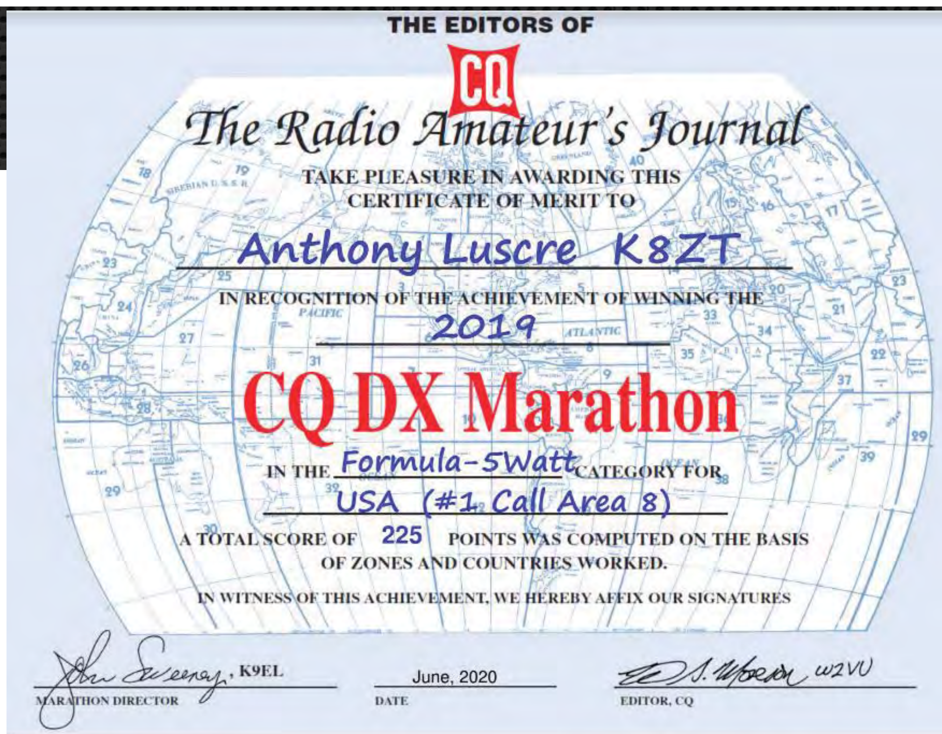

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Questions / Comments ?

View this slideshow & access all resources links at

tiny.cc/ctu-ylc

If you need a PDF copy- *link*

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Addendum

- Marathon How Tos
  - Exporting ADIF from Logging Software
  - AD1C's free- *ADIF to DX Marathon software*
  - Experimental software from Sebastian, KI2D- *https://marathon. ham2k.net*
  - Exporting to Entry Spreadsheet Form
  - Manual completing Entry Spreadsheet Form
  - Checking your entry
  - Submitting your entry

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Exporting ADIF from Logging Software

- Exporting ADIF from Logging Programs-
  - *Ham Radio Deluxe*
  - *DX4Win*
  - *DXLab DXKeeper*
  - *Log4OM* (start at page 61)
  - *Logger32*
  - *LOGic 9 or 10 by PDA*
  - *N3FJP AC Log*

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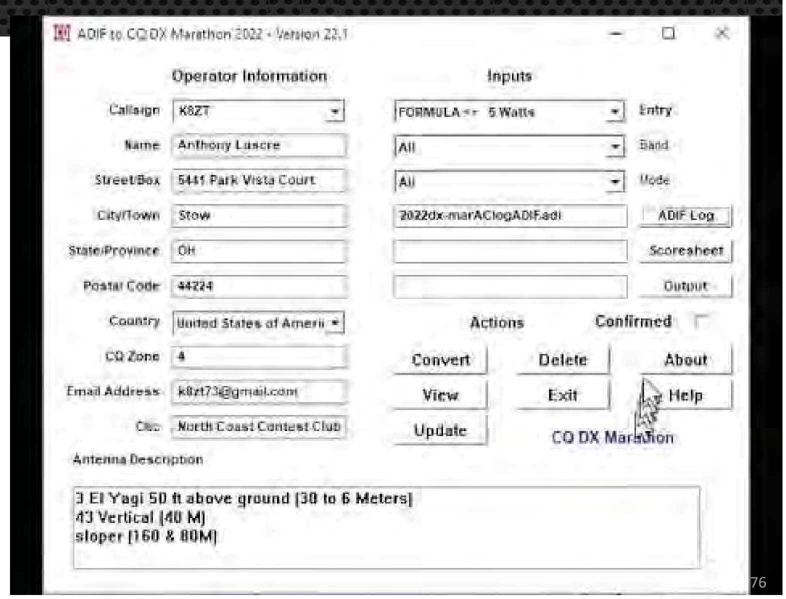
Addendum

- AD1C ADIF to DX Marathon Tool
- *Web Page*
- If you are submitting single band or mode entry make sure appropriate drop-downs are selected



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Addendum

- Experimental software from Sebastian, KI2D

Addendum

- Checking your entry
  - Check all of your personal information (name e-mail, address, etc.)
  - Check category entered
  - Check antenna description
  - Check each DX Entity entry & Zone
  - Use KI2D's experimental program to create a list to compare final entry with

Addendum

- Check each DX Entity entry & Zone
  - Make sure it is not a SWL call
  - Use the web page *Helpful Hints* to check for Bad Spots, Callsign Notes, Invalid Callsigns, etc.
  - Look up call in QRZ to confirm
  - When possible use different calls for your zone entries vs. DX entities in case one is invalid you will not lose two points
  - If you are submitting single band or mode entry make sure all listed QSOs match that criteria

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Addendum

- Submitting Entry
  - Make sure it before deadline (Jan 5 23:59 UTC)

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CTU 2023 Presents

How to Maximize Your Digital Contest Station and Operation

Ed Muns, W0YK & P49X

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Maximizing Digital Contesting

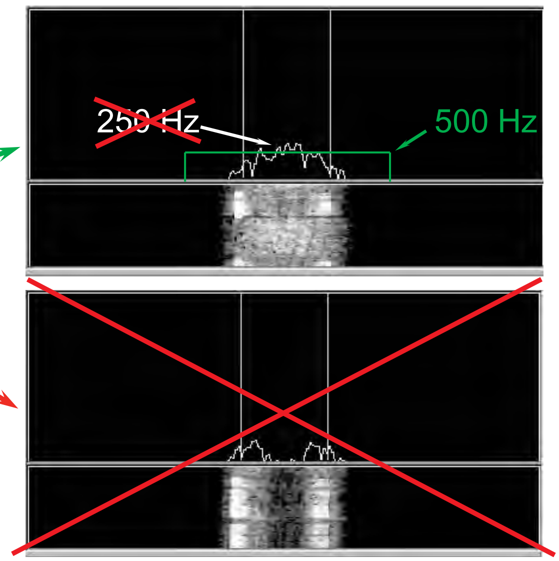
- RTTY Contesting
  - TX bandwidth
  - RX bandwidth
  - UOS and hyphen
  - Multiple decoders
  - SO2V
  - SO2R
- FT4/8 Contesting
  - CQ vs. S&P mode
  - FT8/4 & even/odd
  - Working non-contesters
  - Superfluous 2nd QSL

RTTY Receive Bandwidth

radio IF filtering

Narrow IF filters

- 500 Hz - normal
- 250 Hz - extreme QRM
- Tone filters – don't use!
  - Icom Twin Peak Filter
  - K3 Dual-Tone Filter



RTTY Transmit Bandwidth

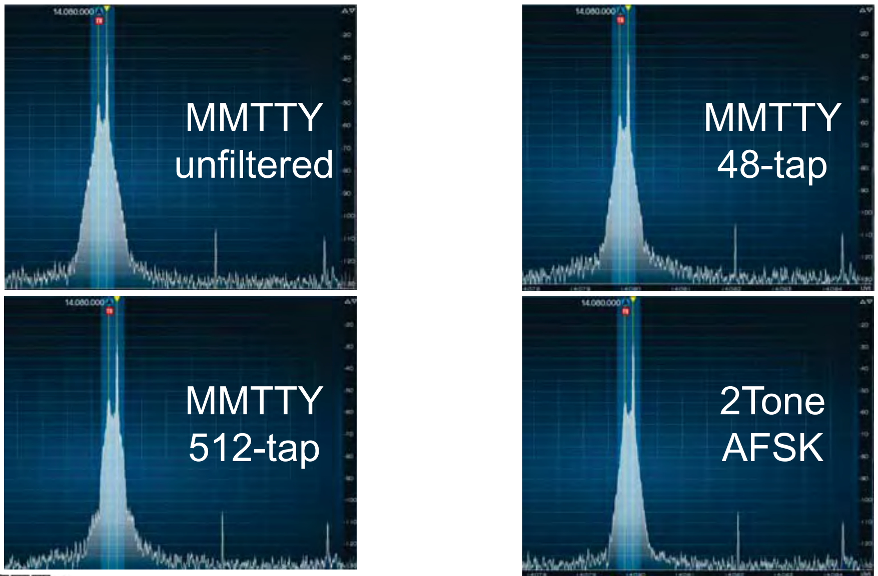
unnecessary QRM

- Wasted power outside receiving decoder BW
  - Suitably narrow TX BW effectively amplifies signal
- Unnecessary QRM
  - Wide 1.5 KW RTTY can QRM 5-10 channels
  - Similar to CW key click problem of the past

Why hurt yourself AND QRM close-by stations?

RTTY Transmit Bandwidth

AFSK

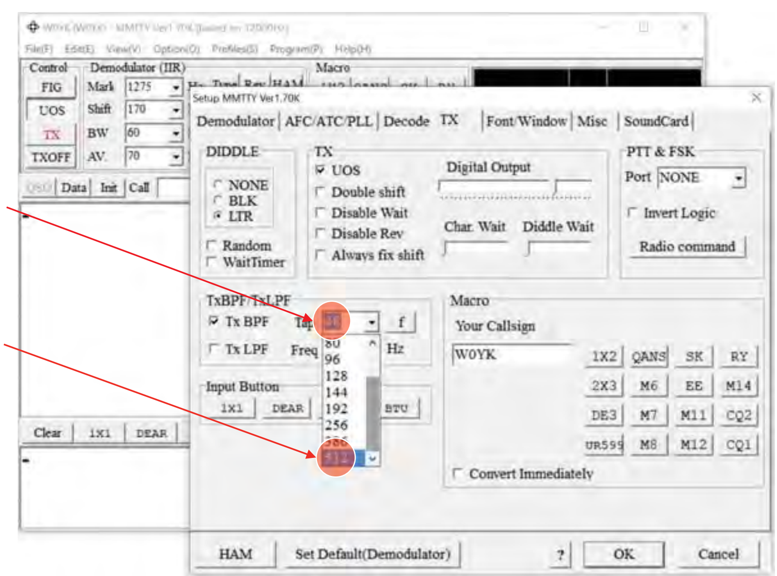


Tx BPF Setting

MMTTY

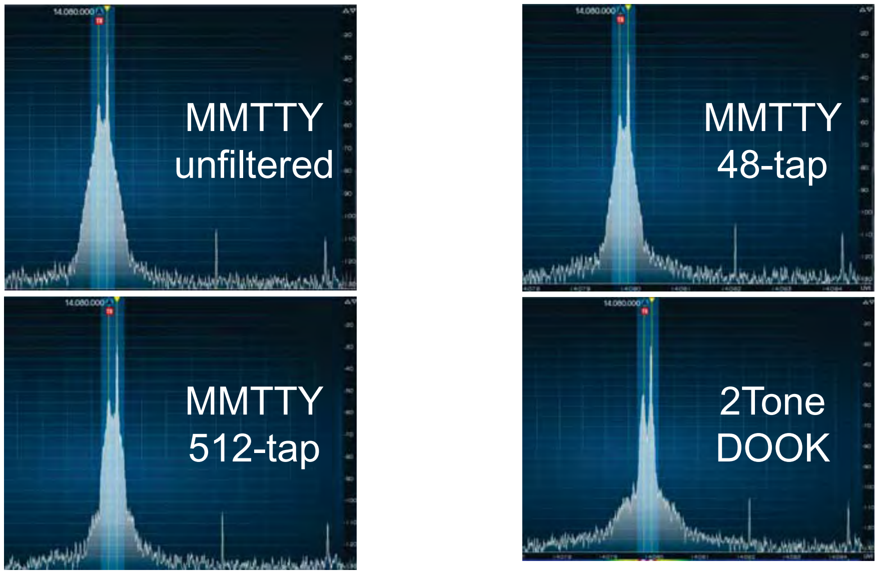
default 48

select 512



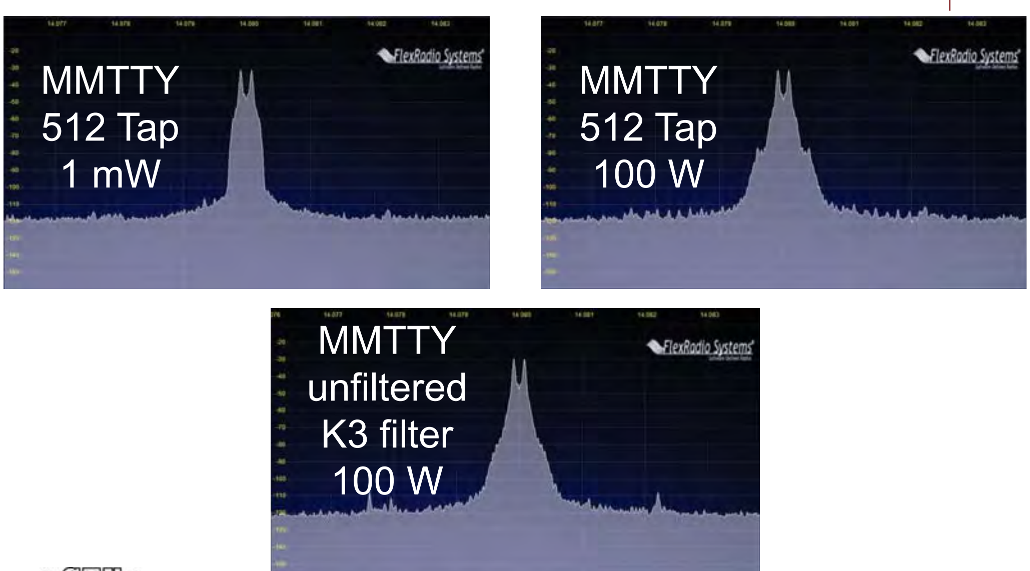
RTTY Transmit Bandwidth

AFSK – 2Tone DOOK



RTTY Transmit Bandwidth

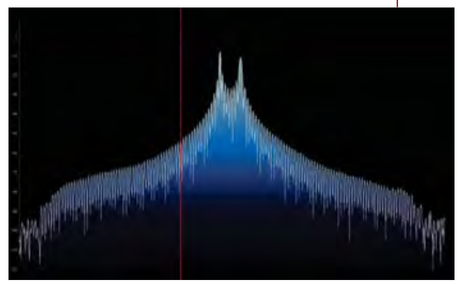
AFSK - *PA IMD effect*



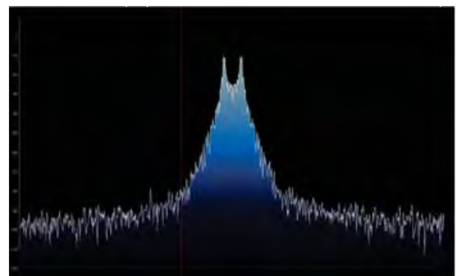
RTTY Transmit Bandwidth

FSK

- Old K3 FSK bandwidth
  - No waveshaping
  - < DSP281 firmware
  - Typical of all radios
  - 50 watts



- New K3 FSK bandwidth
  - Optimal DSP filter
  - DSP281 firmware, March 2013



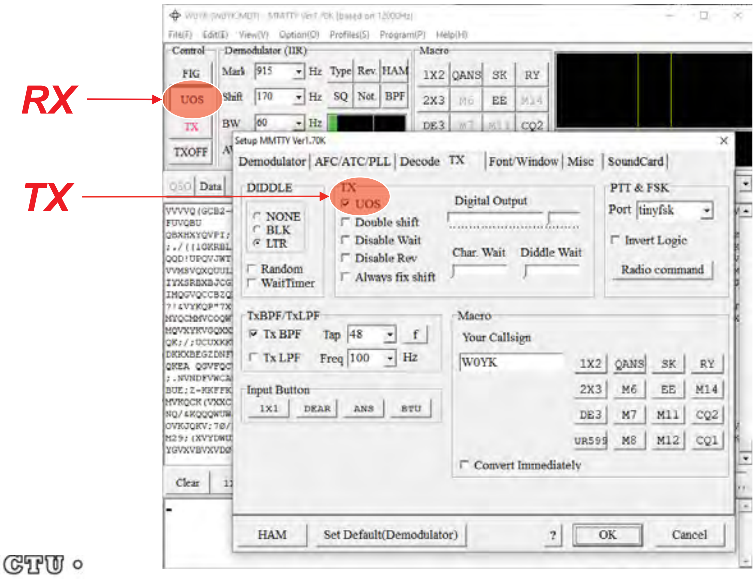
UOS

(Unshift-On-Space)

- Receive UOS:
  - Space character forces a shift to the Letters set
  - Increases noise immunity for alpha text
- Transmit UOS:
  - Sends FIGS character after Space, before numeric "word"
- Contest exchanges are alpha and numeric
  - Should UOS be on or off?
  - Should Space or Hyphen delimit exchange elements?
    - 599 1234 1234 or 599-1234-1234
- *Recommendation:*
  - *Turn on both RX & TX UOS and use Space delimiters*

UOS

MMTTY

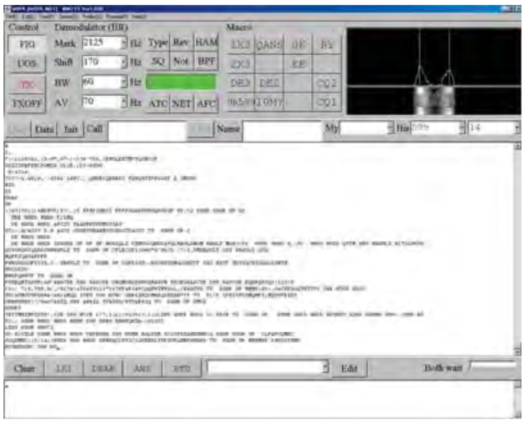


Multiple Decoders

- Parallel decoding with
  - Different decoders
  - Different decoder “profiles”
  - Different RX IF bandwidths (dual receivers)
- Reduces repeats
- Almost “free”
  - Screen space for multiple decoder windows
    - Can be relatively small
  - CPU performance

Multiple Decoders

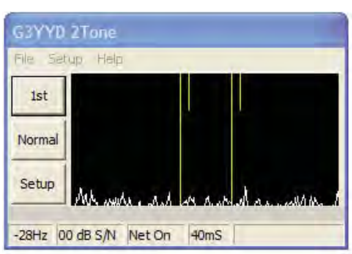
MMTTY

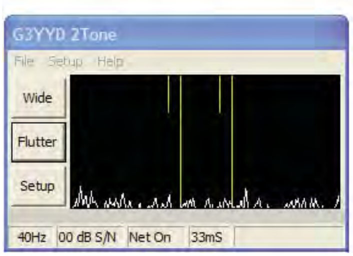


- Dominant SC MODEM
- Standalone, or …
- Contest loggers:
  - N1MM Logger+
  - WriteLog
  - Win-Test
- Introduced June 2000
- Mako Mori, JE3HHT

Multiple Decoders

2Tone

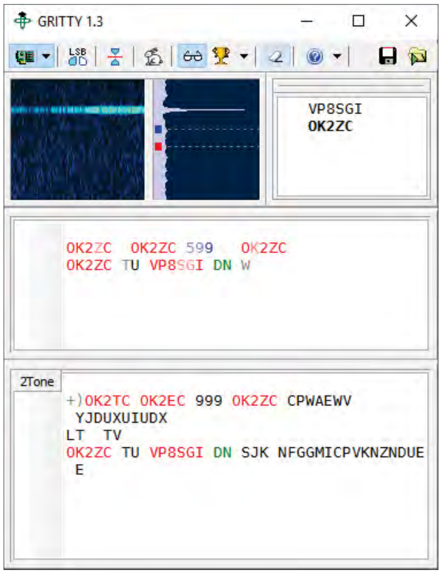




- Outperforms MMTTY ?
- Uses less CPU cycles
- Contest loggers:
  - N1MM Logger+
  - WriteLog
  - Win-Test
- Introduced late 2012
- David Wicks, G3YYD

Multiple Decoders

GRITTY

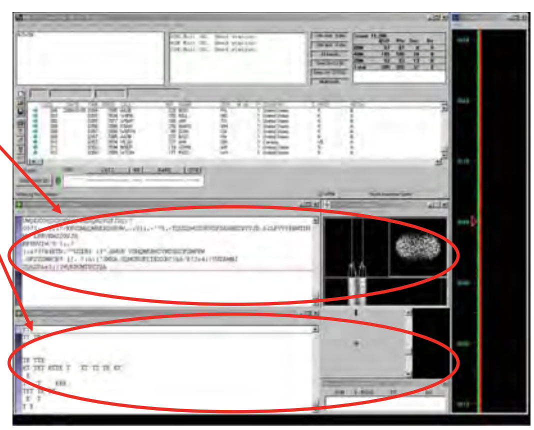


- Best accuracy ?
- Bayesian statistics
- Standalone, or …
- Contest loggers:
  - N1MM Logger+ only
- Introduced late 2015
- Alex Shovkoplyas, VE3NEA

Multiple Decoders

MMTTY & DXP38

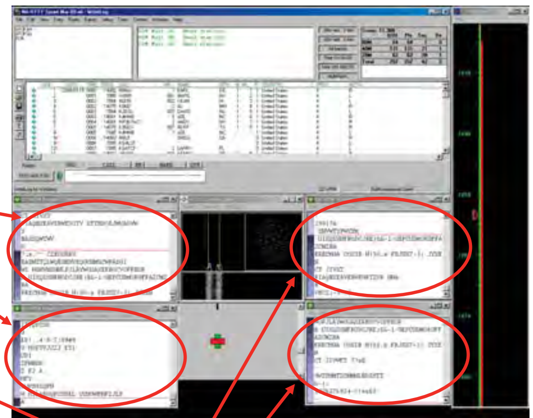
- Parallel decoding
  - Software, e.g., MMTTY
  - Hardware, e.g., DXP38
- Diverse conditions
  - Flutter
  - Multi-path
  - QRM, QRN
  - Weak signals
  - Off-frequency stations



Multiple RTTY Decoders

multiple MMTTY profiles

- Parallel decoding
  - same audio stream
  - switching takes too long
- Multiple profile windows
  - Standard
  - Fluttered signals
  - Fluttered signals (FIR)
  - Multi-path
  - hyper sensitive
  - EU1SA
  - AA6YQ-FIR-512
    - weak signals in QRN



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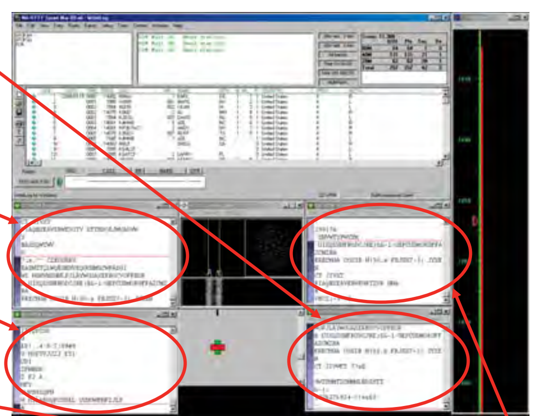
Multiple Decoders

two IF bandwidths

- Narrow IF filtering (main RX)
  - Hardware modem, i.e. DXP38
  - MMTTY profiles:
    - Standard
    - Fluttered signals
    - Fluttered signals (FIR)
    - Multi-path
    - hyper sensitive
    - EU1SA
- Wide IF filtering (sub RX)
  - MMTTY profile:
    - AA6YQ-FIR-512
      - Dual Peak Filter
      - “Matched filter”



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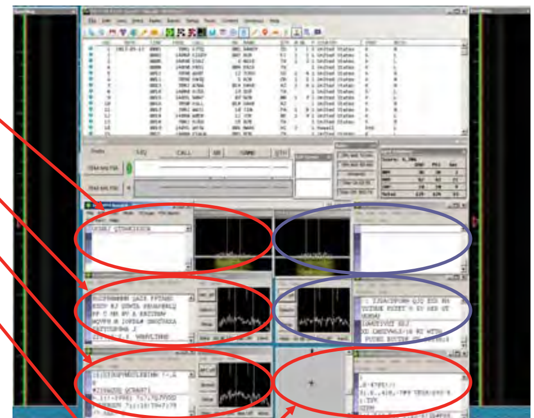
Multiple Decoders

SO2V

- VFO-A (main RX)
  - MMTTY Standard profile
  - 2Tone Flutter profile
  - 2Tone Selective profile
  - DXP38
- VFO-B (sub RX)
  - MMTTY Standard profile
  - 2Tone Flutter profile
- 6 decoders
  - A→B



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Multiple Decoders

Tone choices for monitoring

- Low tones are less fatiguing
  - Use high tones for secondary audio stream(s)
- Low/High tones can be mixed to put two audio streams in one ear:
  - SO2R plus SO2V per radio (4 streams)
  - SOnR (3+ streams)

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SO2V

"1BSIQ"

1. [single rcvr] If Assisted and running on VFO-A, then
   - A<>B, click spot, tune, ID station, work station
   - A<>B, resume running

   Toggle as needed
2. [dual rcvr] Set up decoder windows on VFO-A and VFO-B
   - Radio must have two true receivers
   - Monitor both frequencies simultaneously with right/left channels of sound card and separate RTTY windows
     - Left-click call from 2nd RTTY window into VFO-B Entry Window
   - Two ways to transmit on VFO-B:
     1. A<>B, work the mult, A<>B *(but, mixes print from two frequencies)*
     2. SPLIT, work the mult, un-SPLIT, resume running
        - Requires "wire-OR'd" FSK or AFSK and two transmit RTTY windows
          - WriteLog Shared Com Port obviates the wire-OR
        - K3/WriteLog invokes SPLIT when VFO-B call is clicked

SO2R

- Eliminates SO1R RTTY "boredom"
- Think beyond run and S&P:
  - Dueling CQs; run on two bands simultaneously ***(2BSIQ)***
  - S&P on two bands simultaneously, esp. w/Packet
  - SO2V on one or both radios (SO4V!)
- [optional] Two networked computers:
  - Eliminates swapping radio-focus
  - Display room for more decoder windows per radio
  - RTTY doesn't require much typing; mini-keyboards
  - 2 x SO2V=SO4V for picking up mults on both run bands
  - Easily extendible to SOnR

No time to watch TV or read spy novels!

SO2R

“M2” configuration

SO2R in the NA Sprint

maximize TX duty cycle

- Set VFOs at least 10 kHz apart on both radios
- Find a clear spot on one radio and CQ while you tune the other radio for a station to work
- If you don’t find a station to work before the CQ finishes, find a clear frequency and duel CQ
- After a QSO, swap VFOs on that radio, search during other transmission, then resume dueling CQ
- Don’t waste time trying to work the “couplet” … CQing is OK in Sprint!

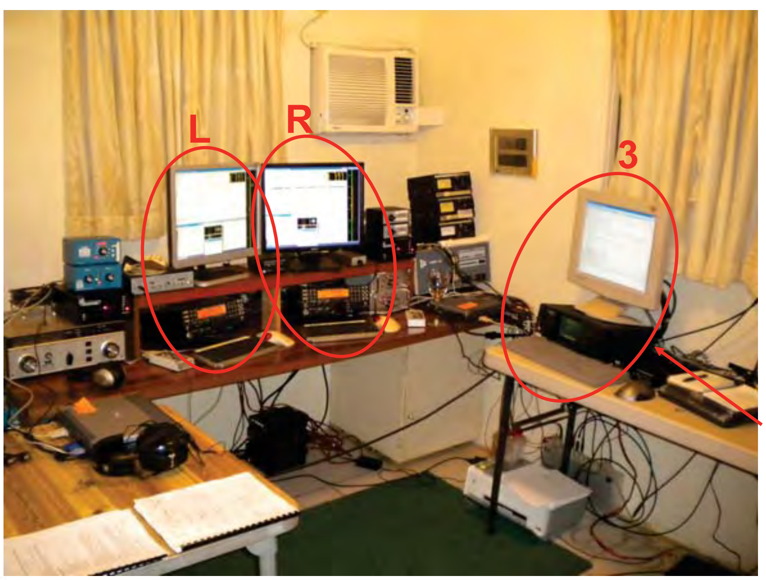
SOnR

> 2 radios

- Simplify antenna/filter band-decoding:
  - Dedicate a band/antenna to the 3rd (or 4th) radio
- Networked PC/radio simplifies configuration
- RTTY (vs. CW or SSB) easier for operator
  - PC decodes for operator
  - Low tones & high tones allows two radios per ear
    - Classic audio headphone mixer (per ear) provides radio A, radio B or both

SOnR

Multi-Multi configuration

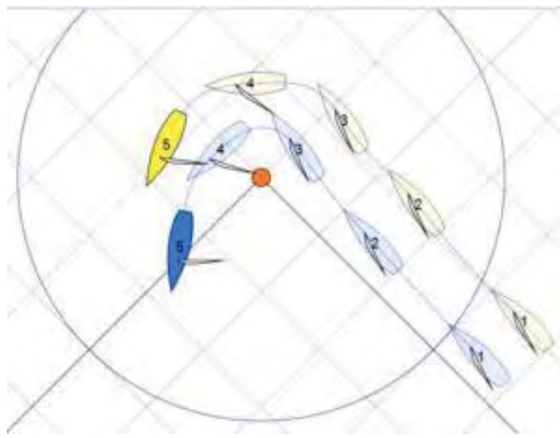


dedicated
to 10 meters

Sailboat Bouy Racing

mark rounding

Yellow falls behind by keeping up with Blue



Call Sign Stacking

"Slow Down to Win"

- Sailboat racing analogy:
  - Pinwheel effect at mark-rounding→slow down
- Let pile-up continue a "beat" after getting the first call sign
  - Increase chance for another call sign or two
  - Increase chance for QSO-phase-skip
- Apply same tactic for tail-enders … pause ½-second before sending TU/CQ message

Call Sign Stacking

The 4 Phases of a QSO

Normal Run mode flow:

1. CQ msg
   - repeat
   - AGN?
2. pile-up
3. Exchange msg
   - Send fill(s)
4. receive his Exchange
   - AGN? or NR? or QTH? or NAME?

1. TU/CQ msg (logs QSO)

Normal S&P mode flow:

1. CQ
2. <mycall> msg
   - repeat
3. receive his Exchange
   - AGN? or NR? or QTH? or NAME?
4. Exchange msg
   - send fill(s)

1. find next CQ

transmit

receive

Call Sign Stacking

Pileup

Normal

1. *WPX P49X P49X CQ, or TU P49X CQ*
2. *K3LR K3LR K5ZD K5ZD*
3. *K3LR 599 2419 2419*
4. *TU 599 842 842*

Shortened

1. (skip CQ)
2. (skip pileup)
3. *K3LR TU NW K5ZD 599 2420 2420*
4. *TU 599 1134 1134*

transmit

receive

Call Sign Stacking

Tail-end

Normal	***Shortened***
1. *WPX P49X P49X CQ, or TU P49X CQ*	1. (skip CQ)
2. *K3LR K3LR*	2. (skip pileup)
3. *K3LR 599 2419 2419 K5ZD (tail-end)*	3. *K3LR TU NW K5ZD 599 2420 2420*
4. *TU 599 842 842*	4. *TU 599 1134 1134*

transmit
receive

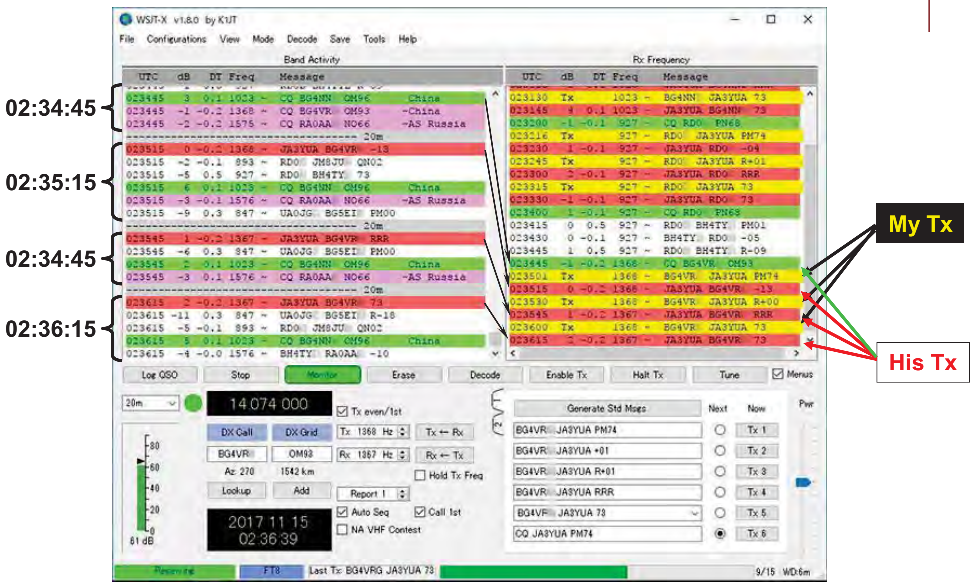
Call Sign Stacking

summary

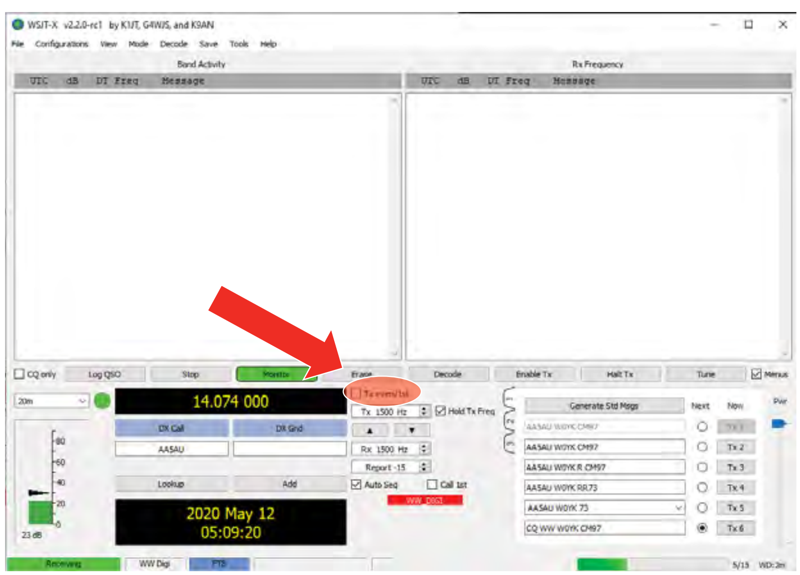
- Efficiently work:
  - multiple callers in a pile-up, and
  - tail-enders to a completing QSO
- Calls pushed onto the stack as they arrive
- Message parameter pops call off of the stack into the Entry window
- Eliminates 2 of 4 QSO phases, which doubles short-term rate

FT8 Multi-Channel Reception

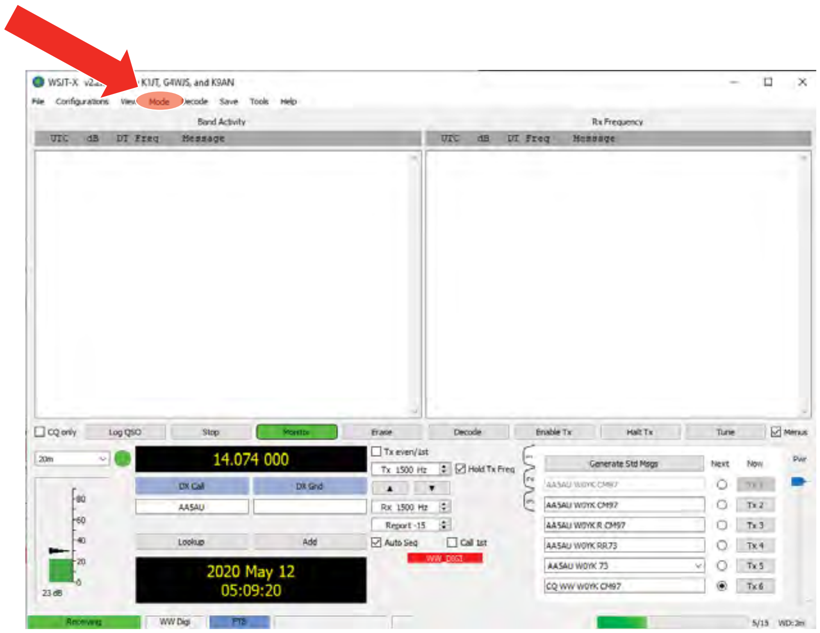
Run vs. S&P is irrelevant



Rotate Odd/Even Cycles



Rotate FT4/FT8 Modes



Working Non-Contesters

- Depends on contest
  - Grid Square exchange
  - QTH, serial number, name, etc.
- Transparant … unless
  - Non-contester skips Tx2, answering with Tx3
- ***Recommendation: Don't call CQ, only answer CQs or messages with Grid Square***

Gangsters Problem [1]

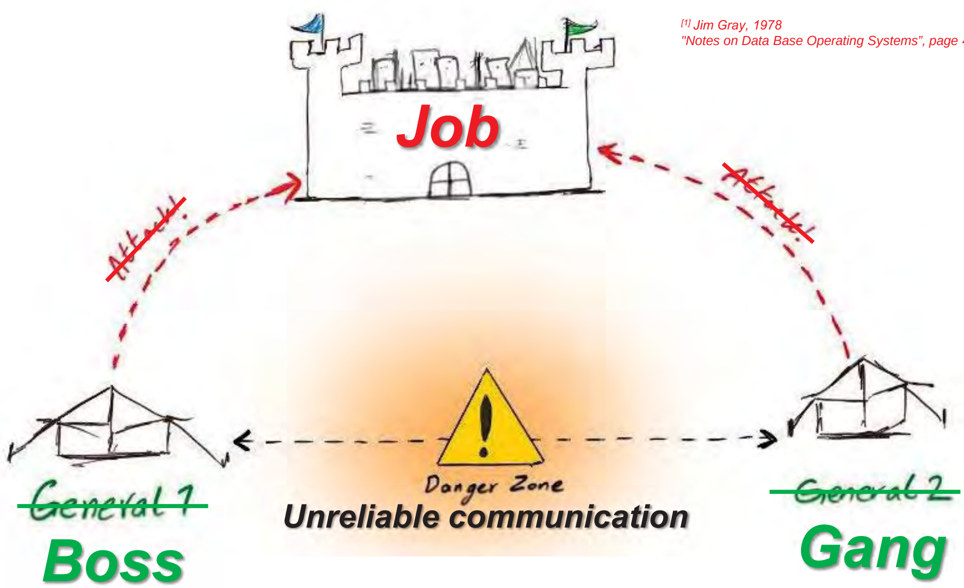
unreliable communication

[1] E. A. Akkoyunlu, K. Ekanadham, and R. V. Huber, 1975
"Some Constraints and Trade-offs in the Design of Network Communications", page 73

- 1975 computer science thought experiment
- Communication over an unreliable link
  - e.g., TCP
- ACKs could theoretically be infinite
- Solution
  - Accept some uncertainty; don't try to eliminate
  - Mitigate to reduce consequence(s)

~~Two Generals~~ Paradox [1]
The Gangsters

[1] Jim Gray, 1978
"Notes on Data Base Operating Systems", page 465



Radiosport Solution

CW, SSB & RTTY

- Each QSO partner QSLs the exchange ***once***
- Context reduces uncertainty
  - Other station doesn't repeat their last message
  - Other station doesn't ask for a repeat
  - Other station rolls into their next QSO

Radiosport Solution

FT4 & FT8

- One QSO partner QSLs the ***QSL***
- Implied by default WSJT-X logging behavior
- Defacto expectation
  - Many FT ops won't log the QSO without this superfluous QSL of the final QSL
  - Thus, NIL rate increases
    - CW, SSB & RTTY = 1-2%
    - FT = 5-6%

WW Digi QSO

CQ W0YK CM97
W0YK AA5AU EL92 ←*AA5AU calls with exch*
AA5AU W0YK R CM97 ← *W0YK QSL with exch*
W0YK AA5AU RR73 ←*AA5AU QSL*
AA5AU W0YK 73 ← *W0YK QSLs AA5AU's QSL!*

This wastes time because W0YK could have used the message to CQ or answer another caller.

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18 May 2023

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WW Digi Alternative QSO

context

CQ W0YK CM97
W0YK AA5AU EL92 ←*AA5AU calls with exch*
AA5AU W0YK R CM97 ← *W0YK QSL's with exch*
W0YK AA5AU RR73 ←*AA5AU QSL's*
CQ W0YK CM97 ← *W0YK calls CQ,*
or
AC0C W0YK R CM97 ← *W0YK rolls into next QSO*

AA5AU then knows, by context, that W0YK received his QSL message

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18 May 2023

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WW Digi Alternative QSO

message repeat

CQ W0YK CM97

W0YK AA5AU EL92 ←*AA5AU calls with exch*

AA5AU W0YK R CM97 ← *W0YK QSL's with exch*

W0YK AA5AU RR73 ←*AA5AU QSL's*

AA5AU W0YK R CM97 ← *W0YK missed QSL msg*

W0YK AA5AU RR73 ←*AA5AU repeats QSL*

Minimizing NILs

Recommendation #1

- Develop skill to dynamically change message
  - e.g., use the Alternate F1-F6 keys in WSJT-X
- Always log the QSO when receiving a RRR, RR73 or 73 message.
- Always log the QSO when sending RRR, RR73 or 73 message.
  - Look for a clue that your message was not received, e.g., your QSO partner re-sends his report.

Minimizing NILs

Recommendation #2

- Give in!
  - Send the superfluous 73, but
  - Don't require it from your QSO partner
- Yes, it's unnecessarily slower, but
  - FT contesting is currently slow enough to absorb it

ROOM 3 – Digital and RTTY Contesting – W0YK

3:15 OPEN DISCUSSION Q&A

How You Can Become Involved With YOTA

Philipp Springer
DK6SP | DQ5M

2023 Contest University

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AGENDA

- Introduction
- Current Situation
- Youth Contest Survey
- Future Plans
- Best Practice Examples
  - Youth Contest Program (YCP)
  - YOTA Contest
  - Youth Activities
- Get started now!

INTRODUCTION

Philipp Springer, DK6SP | DQ5M

Positions

- Chair, Youth Working Group
  IARU Region 1
- Member, Executive Committee+
  IARU Region 1
- Director on the Board
  WWROF Inc.
- Committee Member
  YOTA Contest
- Coordinator
  YOTA Team Germany

Member of

CW enthusiast | Contest crazy | Travel addict | DX-Pedition (e.g., 3B8M, 5B4AQC, 9J2LA, P40X, ZC4RH)

Contact dk6sp@gmx.de

CURRENT SITUATION

Think about your own club …

- Increasing average age of radio hams
  → Also contest community affected
- Impact by decreasing number of participants in future contests

→ "We **CAN** lower the average age of operators by encouraging more youths to join in!"

YOUTH CONTEST SURVEY (1)

Contesting Ability

- Survey in advance of the YOTA Region 2 Summer Camp 2022
- Majority of unexperienced Youths
- Mean = 2.42

Qualitative Survey (1), YOTA Region 2 – WB9VPG (2022).

FUTURE PLANS

What to do?

- Opportunity for youths AND interested people to join contest teams
- Show off this awesome aspect of our common hobby at e.g., YOTA Camps
- Get people interested at e.g., Contest Universities, etc.
- Networking amongst clubs, events etc.

→ "It will not be all about the youths, but they will make up a noteworthy percentage in the near future!"

YOUTH CONTEST SURVEY (2)

Contesting Ability

- Survey as follow-up of the YOTA Region 2 Summer Camp 2022
- Doings: Contest Workshops in various kinds during e.g., YOTA Camps
- Increase of contest understanding → Confirmation 1 year later
- Mean = 2.90 (2.42)

Qualitative Survey (2), YOTA Region 2 – WB9VPG (2022).

BEST PRACTISE EXAMPLES

YOUTH CONTEST PROGRAM

What is YCP in IARU Region 1?

- Youth members invited to take part in contests
  → participating from so called "Big-Gun" stations
- Learn how to
  - Operate a contest and improve own skills
  - Work as a team
- Get to know host country
- Meet local ham operators and make new friends

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YOUTH CONTEST PROGRAM

Key Data

- Young people aged ≤ 25 years
- 1 or 2 participants per IARU member society
- Any level of contest experience is accepted
- Group of ~6 international youths and ~6 domestic youths
- Participants are asked to fund their own travel costs
  → ALL OTHER costs will be covered by IARU Region 1 Youth WG

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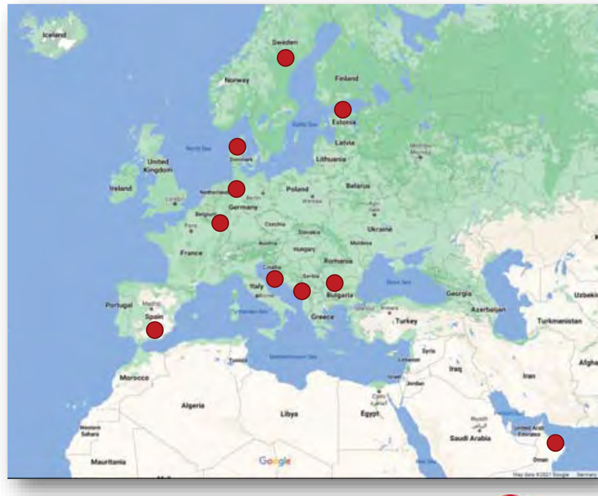
YOUTH CONTEST PROGRAM

Participating Stations in IARU Region 1 since 2013

- 4O3A | Montenegro
- 9A1A | Croatia
- A44A | Oman
- DM9EE | Germany
- EC2DX | Spain
- ES5TV / ES9C | Estonia
- LX7I / LX2A | Luxembourg
- LZ5R | Bulgaria
- OZ5E | Denmark
- SK3W | Sweden
- More stations upcoming!



YOTA CONTEST

Key Data 2023

- Organized by IARU R1 Youth WG and MRASZ
- Contest on 22nd April, 22nd July & 30th December → lasting 12h each
- Participation open for everyone!
  - Open category (everyone)
  - YOTA category (age ≤ 25)
  - Multi-Operator (per two youths max. one operator ≥ 25 years)

YOTA CONTEST

Rules

- General Rules
  - Bands: 80m, 40m, 20m, 15m, 10m
  - Modes: CW and SSB
  - Exchange: RS(T) + age (on 1st of January)
    → Multi-OP: Ø-age or 25, whichever is less
- Scoring
  - Extra points for Youths
    → the younger the better
- Details to be found at ham-yota.com/contest

YOTA CONTEST

Categories

- Single Operator 3 Bands [SO3B]
- Single Operator All Bands [SOAB]
- Single Operator All Bands 6 hours (only YOTA) [SOAB 6h YOTA]
- Multi Operator Single Transmitter All Bands [M/S AB]
- SWL All Bands [SWL AB]
- Station Sponsors (opening stations for YOTA OPs)

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YOTA CONTEST

Our drive for the project

- Special focus on Youth
  - Extra categories for Youths
  - Attractive to work Youth due to scoring system
- Get to know Youth
- Focus on support of Youths
  - Category for station sponsors

YOUTH ACTIVITIES

What to do?

- Networking as key figure
  - YOTA Summer Camps
  - YOTA Subregional Camps
  - Youth Contest Program
  - December YOTA Month (DYM) Activities
- Building up future winning teams
  →Youth teams forming already
  (e.g., YCP, Team Exuberance, etc.)

- Get to know the next generation
  - Highlighted youth scores in various worldwide contests, e.g., NAQP, IARU HF, CQWW, CQWPX, YOTA Contest, etc.
  - Mention of “Youth“ scores in NCJ “Next Gen“ column by WB9VPG
  - Implementing a “Youth” check box including overlay category on 3830scores.com
  - Hopefully more contests following the trend in the future

YOUTH ACTIVITIES

How it can turn out …

Megan – EI5LA & Leon – DL3ON:

- First met at 10th annual IARU R1 YOTA Summer Camp in Croatia 2022
- Both rising CW and SSB Contest Operators
- Applied for WRTC 2022
- Training sessions @DQ2C with Elmers
- Compete against the world in Italy as Youth Team #6

How You Can Become Involved With YOTA
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GET STARTED NOW!

Youth work starts in front of your door!

- Find youths in your local club
- Be open minded
- Small contest activities
- Youths the next technicians of YOUR station?
  → Definitely!
- Youths are the most important and dynamic segment of the population in any country!
- Develop the future of ham radio contests now!

How You Can Become Involved With YOTA
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NEXT GENERATION NOW!

Youth work starts in front of your door!

Elmers can be found anywhere at any time.
CQWW CW 2022 M/M @3B8M

Youths being an active contribution within worldwide contest and DXPedition efforts.

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THANK YOU

Contact & Questions

For any further questions feel free to drop me an email at dk6sp@gmx.de.

Or directly here during the CTU 2023 Q&A session.

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How You Can Become Involved With YOTA
Philipp Springer, DK6SP | DQ5M

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How the Strongest Solar Maximum in 20 Years Affects Contest Planning and Execution

Competitive success often depends more on how you prepare for a contest than it does on what you do during a contest

Frank Donovan
W3LPL

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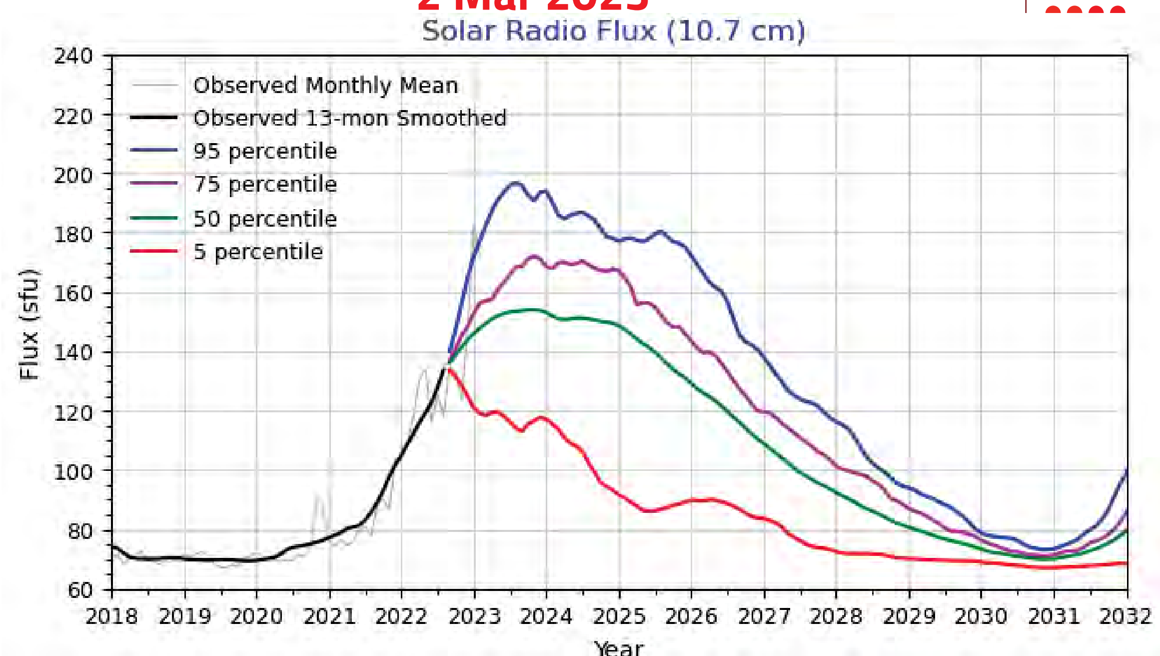
Solar Cycle 25 Solar Flux Index Forecast
NASA Marshall Space Flight Center
2 Mar 2023



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www.nasa.gov/msfcsolar

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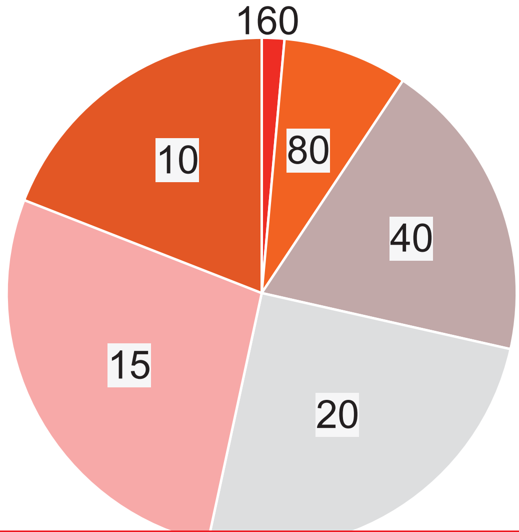
CW DX Contest QSOs Per Band as Solar Cycle 25 Nears Solar Maximum



10 and 15 meters are <u>much more</u> important near solar maximum
40 and 20 continue to be very important near solar maximum
160 and 80 are <u>somewhat less</u> important near solar maximum

How Solar Maximum Affects Propagation for the Next Five Years

- Solar maximum propagation conditions began in January 2023
- Solar maximum is likely to occur next year
  - 10 and 15 meter worldwide DX will persist later into the night for the next two years
- Disturbed geomagnetic conditions will be much more frequent
  - starting next year
- Excellent 10 meter worldwide propagation will continue
  - until at least late 2026
- The slow decline to solar minimum will begin
  - in about 2028

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How Solar Maximum Affects 10 Meter Propagation for the Next Five Years

- Worldwide propagation improved dramatically since January 2023
  - almost every day from October through April
  - huge run rates to Europe from sunrise to early afternoon
  - excellent propagation to Japan and Asia after 2130Z for three or four hours
- Propagation between northern hemisphere locations continue to be infrequent during most days from May to mid-September
  - Sporadic-E is the dominant May to August propagation
- Excellent propagation should continue through at least late 2026

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How Solar Maximum Affects 15 Meter Propagation for the Next Five Years

- Worldwide propagation improved dramatically since 2022
  - almost every day from September through May
  - huge run rates to Europe from sunrise to mid-afternoon
  - excellent propagation to Japan and Asia after 2130Z for four hours or more
- Propagation between northern hemisphere locations begins later and is shorter in duration from June to August
  - Sporadic-E is sometimes the dominant propagation mode from June to August

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How Solar Maximum Affects 20 Meter Propagation for the Next Five Years

- Nighttime propagation improved dramatically since January 2023
  - now almost 24 hour per day worldwide propagation
    - but not during summer mid-day hours
  - excellent nighttime run rates to Europe from 0700-0900Z
  - excellent run rates resume about an hour before sunrise
  - much of the DX activity switches to the higher bands after 1200Z
- Propagation to Japan and Asia is often stronger through the night until a few hours after sunrise
- Summer mid-day DX propagation is much weaker from June to August

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How Solar Maximum Affects 40 Meter Propagation for the Next Five Years

- Nighttime propagation has become more reliable and more long lasting since 2022
  - good run rates to Europe start about an hour before sunset
  - continuing throughout the night until a few hours after European sunrise when Europeans QSY to higher bands
  - the best European propagation and activity is often around European sunrise
- Mid-afternoon propagation to Europe is weaker since 2022
  - much of the DX activity is still on the higher bands
- Propagation from the east coast to Japan and Asia is more reliable since 2022

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How Solar Maximum Affects 80 Meter Propagation for the Next Five Years

- Propagation has become less reliable since 2022
  - weak unreliable DX propagation begins at sunset
  - good run rates to Europe start several hours after sunset
  - The best European activity is often just before their sunrise
  - continuing until about an hour or less after European sunrise when Europeans QSY to higher bands

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How Solar Maximum Affects 160 Meter Propagation for the Next Five Years

- Propagation has become very unreliable since 2022
  - weak unreliable DX propagation begins after sunset
  - propagation to Europe often improves around midnight for a few hours

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Necessary First Steps in Identifying Candidate Station Improvements

- Identify realistic time phased personal contest goals for selected contests, entry categories and competition region
  - first place regional, national or world winner, or
  - consistently placing in the top three, or
  - consistently placing in the top ten, or
  - successfully competing with selected peers
- Identify the realistic constraints that limit your station improvements
  - desired time frame for achieving your contest goals
  - amount of available time to implement station improvements
  - available physical space for more antennas and station equipment
  - annual funds available to support your improvements
- Achieve a balance between your goals and constraints

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Well Before the Contest Evaluate Your Station's Strengths and Weaknesses Compared to Your Peer Competitors

- Identify your station's strengths and weaknesses and evaluate your peer competitor's strengths and weaknesses
  - transmitting and receiving antennas, feedlines and antenna switching
  - transceiver performance -- focusing on receiver performance
  - amplifier output power and reliability
  - audio and CW keying quality
  - computers, software and their internal and external networks
  - all aspects of your station environment that limit operator performance
  - external and inter-station RFI
  - all aspects of station reliability
- Identify opportunities to improve your station's weaknesses and reliability relative to your peer competitors
  - in every category above
  - then prioritize your total list of improvement opportunities

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During and After Every Contest Prepare Notes Documenting Your Station's Strengths and Weaknesses Compared to Your Peer Competitors

- Identify every aspect of your station's performance that was strongly competitive compared to your peer competitors
- Identify every aspect your station's performance that was not competitive compared to your peer competitors
- Identify improvements that your peer competitors can't match
- Identify every opportunity for station improvement that could have improved your score in this contest, in priority order by:
  - estimated score improvement resulting from each improvement
  - degree of difficulty in achieving each improvement
  - practicality of achieving each improvement
  - impediments to achieving each improvement
  - expense to achieve each improvement

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Tower Inspections and Maintenance Will Help You Avoid Mid-Winter Failures and Reliability Problems During Your Next Contest

- Measure all guy wire tensions (7 to 15% of breaking strength)
- Inspect guy wires, guy hardware and guy anchors for damage
- Inspect tower plumb and twist
- Inspect the tower base for standing water and
  - corrosion, settling and cracks at the tower-to-concrete interface
  - regularly remove all debris from tower bases to avoid corrosion
- Inspect rotator performance and play
- Inspect the tower for wind damage
- Pay special attention to damaged, loose, missing or corroded:
  - diagonal and horizontal trusses, welds and hardware
  - especially adjacent to guy attachments

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Annual inspections are essential to tower safety

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Antenna Inspections and Maintenance Will Help You Avoid Mid-Winter Failures and Reliability Problems During Your Next Contest

- Inspect coax cable for cuts, cracks, damage and moisture intrusion
  - cuts, chaffing and worn rotator loops
  - water intrusion at electrical and physical attachments to antennas
- Compare coax cable losses and TDR displays to prior results
- Compare antenna VSWRs to prior measurements
- Inspect connector water proofing and PL-259 tightness
- Inspect rope wear -- its much easier to replace rope before it fails
- Inspect antenna wire for wear and connections to feed lines
- Repair or replace unreliable, failing or overloaded rotators
- Inspect antennas and coaxial cables for lightning damage
- Inspect antennas, feed lines and rotators for wind damage

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Annual inspections are essential to tower. antenna, rotator and coax cable reliability and performance

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Improving the Competitive Performance and Reliability of Coaxial Cables for Multi-tower Stations

- Coaxial cables longer than 300 feet are often used in multi-tower stations
- Andrew Heliax is an ideal choice for lengths up to:
  - 10 meters: 600 feet of LDF5-50A or 300 feet of LDF4-50A
  - 15 meters: 700 feet of LDF5-50A or 350 feet of LDF4-50A
  - 20 meters: 900 feet of LDF5-50A or 450 feet of LDF4-50A
  - 40 meters: 1200 feet of LDF5-50A or 600 feet of LDF4-50A
- Be cautious of the windload and weight (including ice load) of large Heliax cables mounted on light duty towers
- Failure to adequately protect connectors from water intrusion is a very common cause of coaxial cable deterioration

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Improving the Reliability of Coaxial Cable Connectors

- N and UHF connectors are the most common choices
- No significant loss in either N and UHF connectors at HF
- No significant difference in the VSWR of N and UHF connectors at HF
- High quality silver plated UHF connectors provide much more center pin mating force than N connectors
  - eliminates cross-station interference and connector failures from potentially unreliable N connector center pin mating force
  - avoid saving a few dollars on cheap unbranded hamfest connectors
- Avoid use of adapters, but if necessary be sure they are name-brand silver plated adapters, not nickel plated
- Use a wrench to **gently tighten** UHF connectors 1/4 turn
- Inspect SO-239 connectors for center pin mating pressure

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Coaxial Cable
Amphenol 83-1SP PL-259 Connector

Shell labeled exactly:
Amphenol 83-1SP

Silver Plated Center Pin

Silver Plated Body

newark.com/amphenol-rf/83-1sp/rf-coaxial-uhf-plug-straight-50ohm/dp/59K0534

This is not the place to save money

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Coaxial Cable Connector Waterproofing

Cover the connectors with two 50% overlapped layers of Scotch 130C linerless rubber splicing tape stretched to 50% of its original width, sticky side facing out

Cover the Scotch 130C with two 50% overlapped layers of Scotch 33+ vinyl electrical tape

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Indoor Station Performance and Reliability Improvements

- Transceiver performance (sensitivity, dynamic range, filters)
- Amplifier output power and reliability
- Digital wattmeters
- Physical environment that degrades operator performance
  - noise, chair, ventilation, desk height, equipment placement, line of sight
- Keyers and paddles
- Microphones
- Computer keyboards
- Computer monitors
- Computers
- Antenna switching
- DX spotting network displays and alarms
- Propagation map displays from the Reverse Beacon Network
- Connectors: gently tool tightened PL-259s, SO-239 mating force

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Execute Your Proof of Station Performance Checklist Before Every Competitive Contest

- Proves that everything in your station is in working properly
  - improve and update your checklist regularly
  - record all performance measurements
- Never enter a competition with unproven station equipment
- Prove that all indoor and outdoor equipment is working far enough in advance so you can make necessary repairs before the contest

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Single Operator (not including SO2R) Station Improvement Ideas for the Next 4 Years near Solar Maximum

- Antenna improvements are almost always more effective and less expensive than any other station improvement and they improve both transmitting and receiving performance
- Receiving antennas make a big improvement on 160 and 80 meters
- Identify and mitigate internal and external RFI sources well before the contest
- Many modern transceivers have much improved receiver dynamic range and filter selectivity
  - know how to adjust your receiver for optimum dynamic range
  - verify your receiver's sensitivity every time you sit in front of it
- A wattmeter allows you to monitor transmitter and antenna performance during the contest

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Single Tower Station Antenna Improvement Ideas for the Next 4 Years Near Solar Maximum

- 50-60 foot tower and a small rotator (e.g., HyGain Ham-IV)
  - small tribander, Hex-beam or quad
  - 40 and 80 meter dipoles and a 160 meter inverted-L
- 70-80 foot tower and a medium rotator (e.g. HyGain T2X)
  - Cushcraft XM-240 two element 40 meter Yagi
  - large tribander such as the SteppIR 4 element Yagi
  - 80 meter dipole and a 160 meter inverted-L
- 100-140 foot tower and a large rotator (e.g., M2 Orion)
  - Cushcraft XM-240 two element 40 meter Yagi
  - monoband Yagis such as the HyGain LJ series on ring rotators
  - 80 meter dipole and a 160 meter inverted-L

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SO2R Station Improvement Ideas in Addition to Single Op Improvements for the Next 4 Years Near Solar Maximum

- Receiving bandpass filters are almost always necessary to protect transceivers from cross-band interference and physical damage
- 100 watt bandpass filters may be needed on transceiver outputs if your transceiver radiates broadband phase noise (many do)
- Stubs may be necessary on amplifier outputs if multiple antennas are in close proximity
- Multiband antennas can cause excessive cross-band interference
- Many operators find it more effective to use multiple networked computers and keyboards
- Identify and resolve all RFI and cross-band interference
  - intermodulation caused by transmitted signals entering unprotected consumer electronic devices often re-radiate strong harmonics mixed with AC power or computer network signals creating strong broadband noise modulated sidebands on the transmitter harmonic

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CTU Presents

Simple & Effective Low Band Antennas for Contesting

Joel Harrison, W5ZN

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Objectives
Transmit Antennas

- Simple transmit antenna solutions to improve your signal
- Shunt feeding your tower
- Understanding radials for transmit antennas

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Objectives
Receive Antennas

- **What you should expect from a receive antenna based on station location**
- **Understand why we use receive antennas**
- **Understand the difference between receive antennas types**

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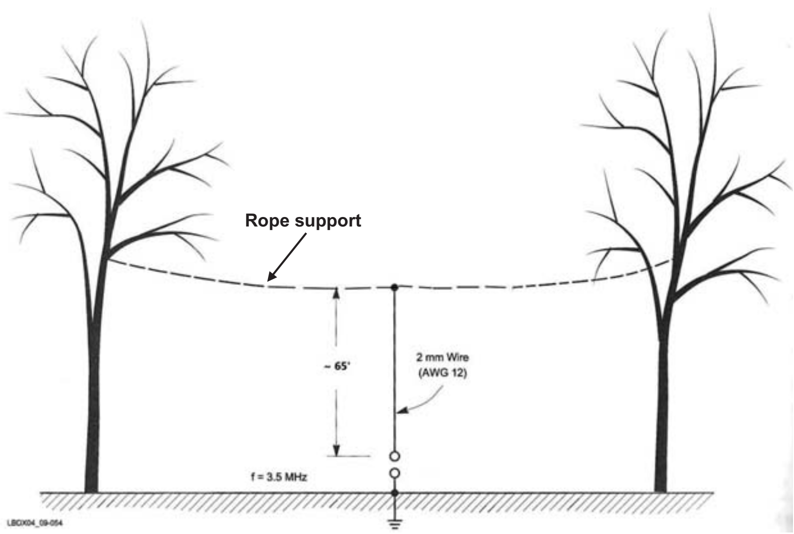
Simple Transmit Antennas
80 Meters - Vertical



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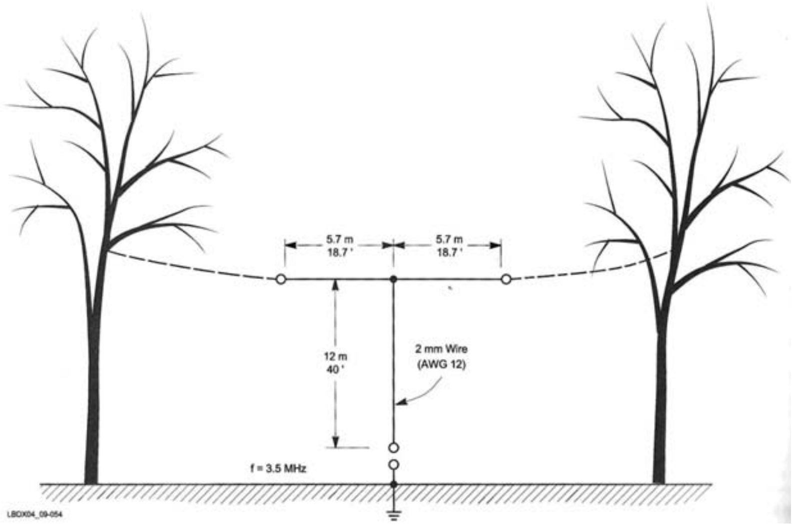
Simple Transmit Antennas
80 Meters - T Vertical



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Simple Transmit Antennas
160 Meters - Inverted L

- **Popular for 160 meters**
- **Not truly vertical as the horizontal section radiates also**
  - Vertical element should be as tall as possible
- **Can use a tower as the vertical support**
  - Make sure tower/antennas are NOT resonant on 160 meters!

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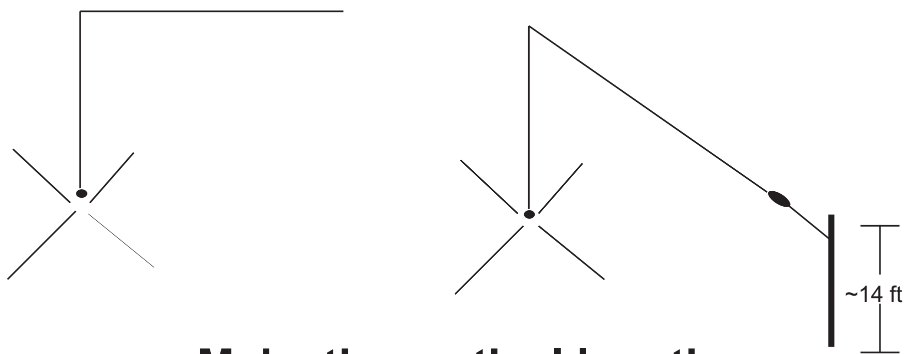
Simple Transmit Antennas
160 Meters - Inverted L

Total Length = ≥ 1/4λ



Make the vertical length as long as possible

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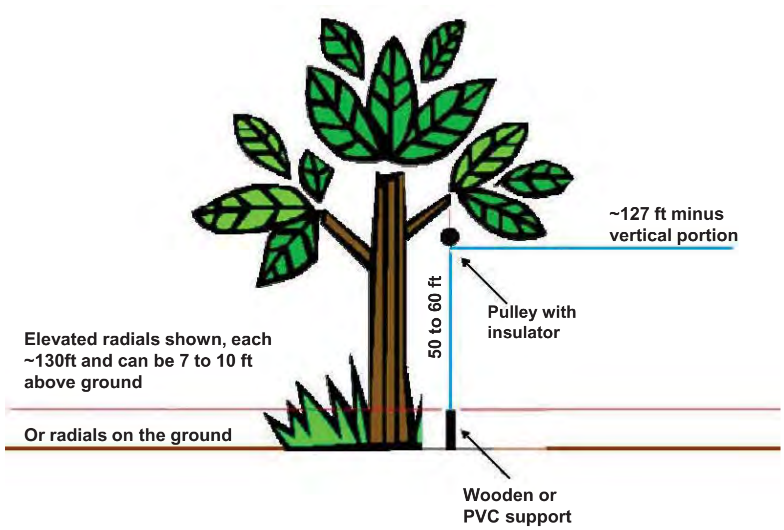
Simple Transmit Antennas
160 Meters - Inverted L



Graphic by K9LA

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Simple Transmit Antennas
Tuning for Resonance

- **Use an antenna analyzer**
  - Don't look at SWR
  - Select "All Parameters"

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Simple Transmit Antennas
Tuning for Resonance

- **Adjust antenna length for zero reactance**

Impedance 19 Ω

Resonant (No reactance)

Not Resonant reactance 52 Ω

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Simple Transmit Antennas Vertical & Inverted L

- **Feed point impedance will vary and may need matching**

Simple L Network can provide an excellent match to 50 Ω

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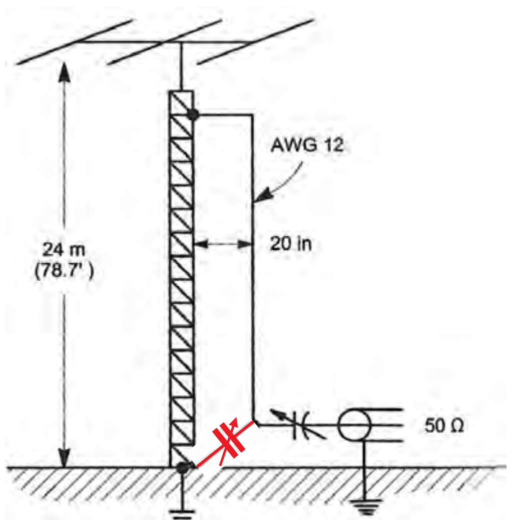
Simple Transmit Antennas Shunt Fed Tower

Very effective on 160 & 80 meters



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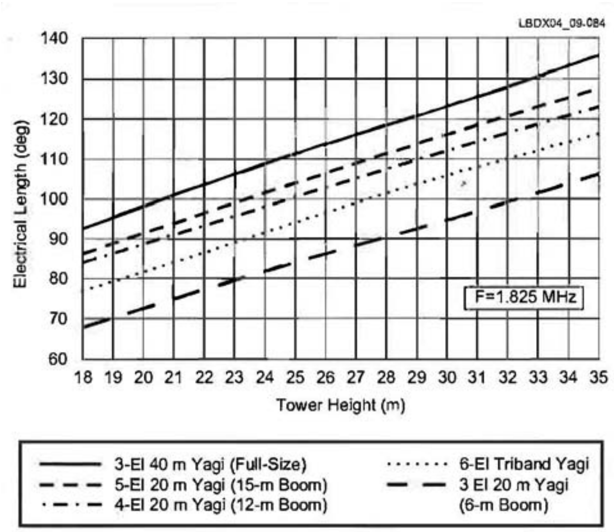
Simple Transmit Antennas
Shunt Fed Tower



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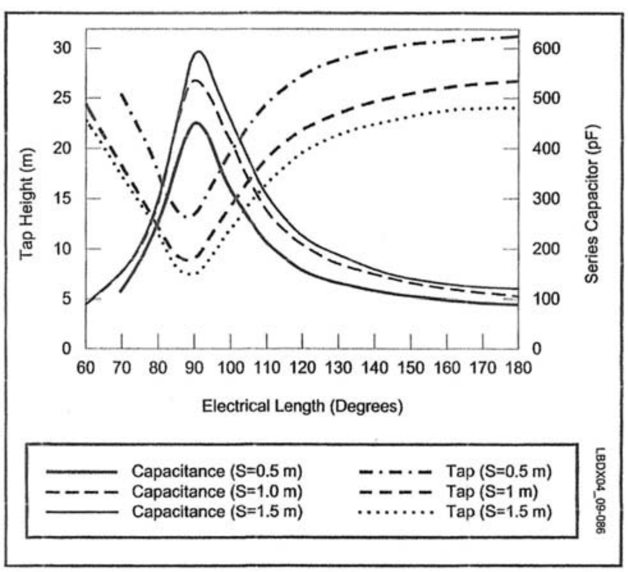
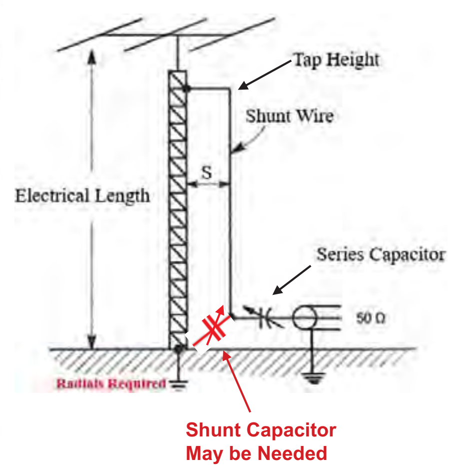
Simple Transmit Antennas
Shunt Fed Tower





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Simple Transmit Antennas
Radials

- **How many radials do I need?**
  - Install as many as possible, as symmetrical as possible (try for 16 minimum. Less may work)
- **Do I have to bury them**
  - No but if you do don't bury them too deep (>6")
  - Laying them on the ground works fine
    - I can't leave radials in the yard year round!
      - Just roll them up in the spring/summer months
    - Don't lay them under fresh water!!
- **Elevated radials?**

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Simple Receive Antennas
For the Low Bands

- **If you're going to put up an effective TX antenna, you'll want to improve your receive capability also!**

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Low Band Receive Antennas Why Do We Use Them?

- **Reduce receive noise (Improve SNR)**
- **Improve the forward pattern in the desired direction**
  - Provide directivity away from noise sources
- **Transmit antennas aren't necessarily good receive antennas**
  - Usually omni-directional & receives noise from 360°
  - W5ZN's 160 meter transmit array has 5 dB forward gain and >20 dB F/B – isn't it great for receiving??

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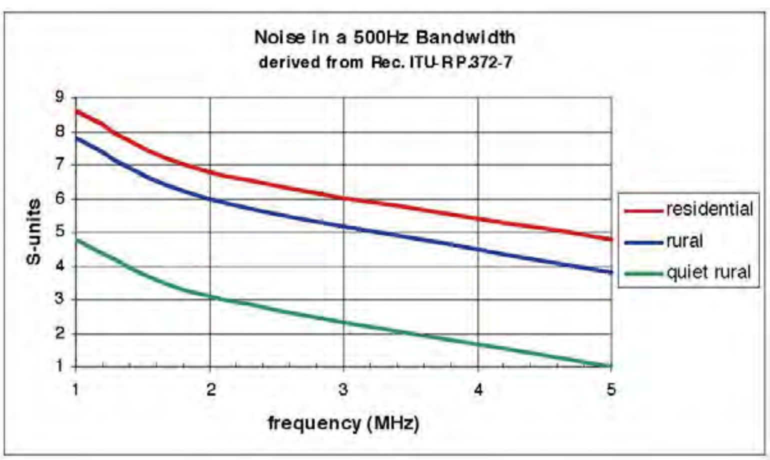
Why Do We Use Receive Antennas?



Prepared by K9LA

W5ZN is in a "rural" area. Without receive antennas my 160 meter noise is just above S6 (-88 dBm) in line with the ITU data

With receive antennas it is S1 (-120 dBm)

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Simple Receive Antennas Beverage – Yes its simple!

- **The Benchmark for receive antennas**
  - The Beverage Antenna Handbook – W1WCR
  - "The Benchmark Beverage" – W8WWV
- **Very simple to build and install**
- **Many different versions and lengths**
  - 2-direction, phased, Beverage on Ground (BOG), etc.

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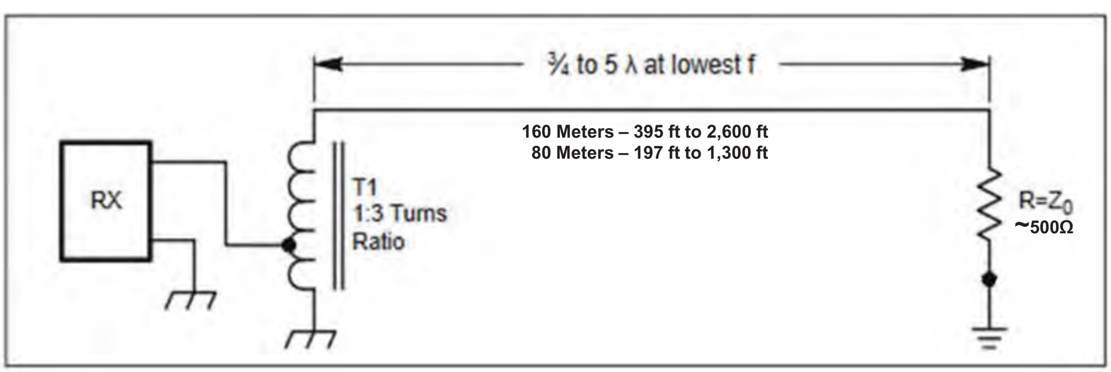
Simple Receive Antennas - Beverage



The Benchmark Beverage Antenna

http://www.seed-solutions.com/gregordy/Amateur%20Radio/Experimentation/Beverage.htm

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Simple Receive Antennas - Beverage

Suggested Beverage Lengths (160 meters)		
W1WCR	ON4UN	W8WWV
290'	286'	335'
581'	563'	710'
887'	853'	990'
1183'	1122'	1225'
-----	1378'	1515'
-----	-----	1765'

From W8WWV "The Benchmark Beverage"

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Simple Receive Antennas Beverage

Beverage Supports are ½" PVC Cut to 7 ft

PVC support is 3/8"x18" Rebar about 9 inches in ground. Slide PVC over rebar

Cut a slit in a ½" T coupling to place Beverage wire in on top of PVC support

Easy installation & take down (if needed). Four 500 ft Beverages can be easily installed in one day by one person

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Simple Receive Antennas Beverage

Termination End – Two 1000 Ω 2 Watt Carbon Resistors in parallel = 500 Ω

Neon bulb across resistors for lightning protection

Plastic enclosures are Hammond 1591LSBK Available from Mouser

Feed point End – Matching transformer #73 Binocular core (only one required)

Binocular Cores are Fair-Rite 2873000202 available from Mouser.

Wire is #28 wire wrap wire available from DigiKey W28-6H-ND (select your favorite color!!)

Winding details – ON4UN's "Low Band Dx'ing", fifth edition, Table 7-28, page 7-69

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Simple Receive Antennas Other Than Beverage

- **Loops**
  - K9AY
  - VE3DO
  - Double Half Delta Loop (DHDL)
  - Flag
  - EWE
- **Vertical Arrays**
  - Active
    - HiZ, YCCC-9
  - Passive
    - Broadside/Endfire (BSEF)

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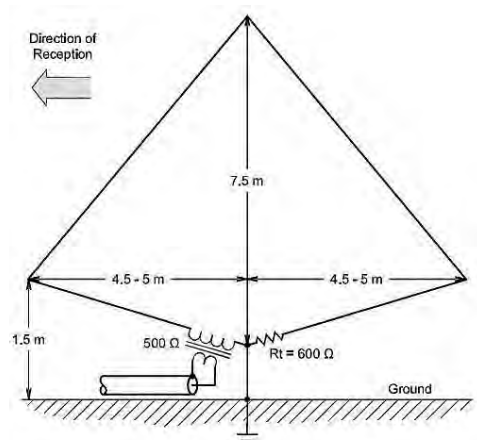
Simple Receive Antennas Loops – General Info

- **Terminated for directional pattern**
  - Cardioid pattern with one deep null
- **Some designs provides up to 4 directions**
- **Can fit in a small yard**
- **Will need a preamp**
- **All small loop designs produce similar results**

Simple Receive Antennas Loops – K9AY



- https://www.aytechnologies.com/TechData/HowToBuild.pdf
- http://www.k9ay.com/TechData/K9AYLoopArrays.pdf

Simple Receive Antennas
Loops – K9AY

- Feed point and termination are at the same location
- Simple switching can instantly reverse the pattern direction by exchanging the feed and termination
- When using two crossed loops, 4 different directions can be selected

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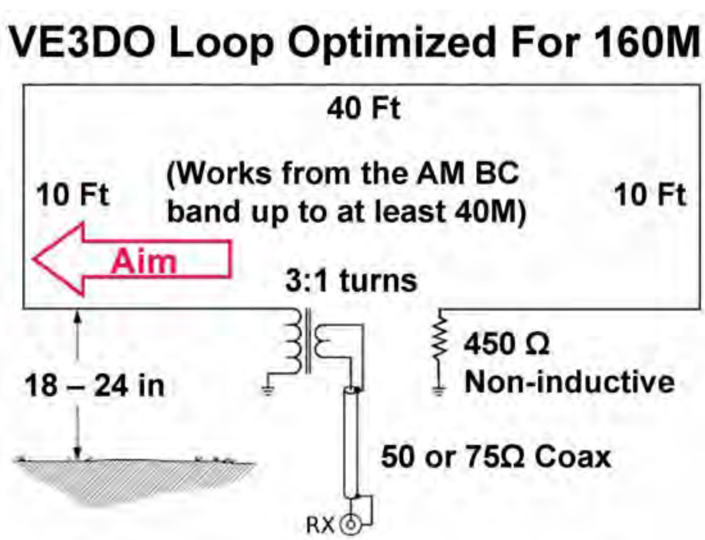
Simple Receive Antennas
Loops – VE3DO



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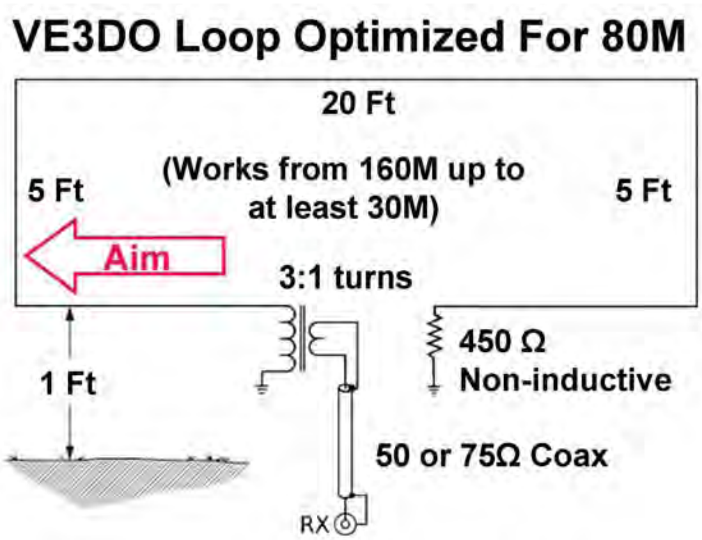
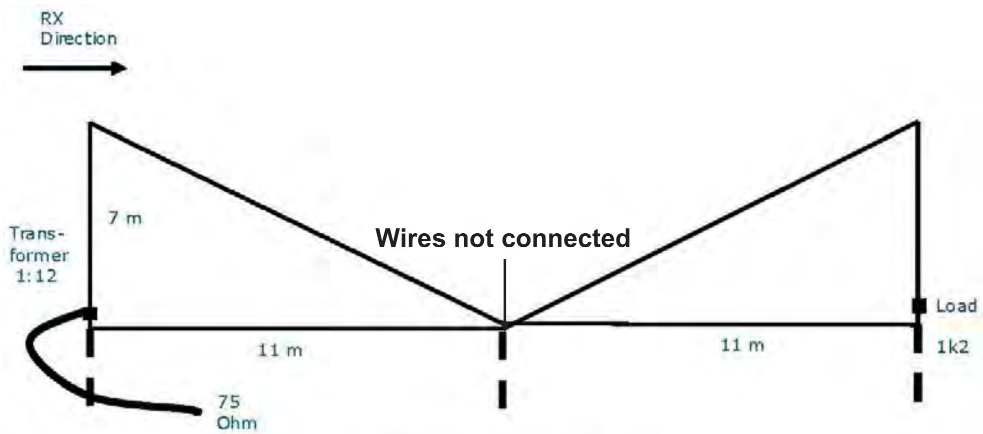
Simple Receive Antennas Loops – VE3DO



Simple Receive Antennas Loops – DHDL

- Designed by George, AA7JV
- Not dependent on ground
- Essentially two half delta loops interconnected to create a single antenna
- Improved performance over a single flag
- Wire diameter not critical

Simple Receive Antennas Loops – DHDL



The Double Half-Delta Loop.

https://tx3a.org/documents/TX3Astory.pdf

Simple Receive Antennas Loops – DHDL

- **Use #31 ferrite cores with several turns of coax for common mode choke**
- **Keep antenna away from resonant verticals and large metal objects (such as metal roof)**
  - May need to "Detune" xmit antenna during receive
- **"This ain't no Beverage, but its better than a single flaw or EWE and almost as good as two phased EWE's!" – George AA7JV**

Simple Receive Antennas Vertical Arrays

- **Several different types and level of complexity. The following are not considered "simple" and will not be reviewed:**
  - HiZ Antennas
    - Several different configurations and switching schemes
    - Special electronic phasing and control system
  - Broad Side/End Fire (BSEF) Array
    - Relatively simple but requires 375 ft diameter circle for 160!
- **We will review the YCCC-9 vertical array**

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Simple Receive Antennas Vertical Arrays – YCCC-9

- **Designed by John Kaufmann, W1FV**
- **Uses 15' to 25' vertical elements**
  - No top hat wires or radials required
  - Uses high impedance amplifier at each element
  - Requires a preamp on output of combiner
- **Requires an amplifier at each element and a main combiner unit**
  - Parts & instructions available
- **Requires only 120' diameter for 8 directions**
  - Covers 160-80-40 meters

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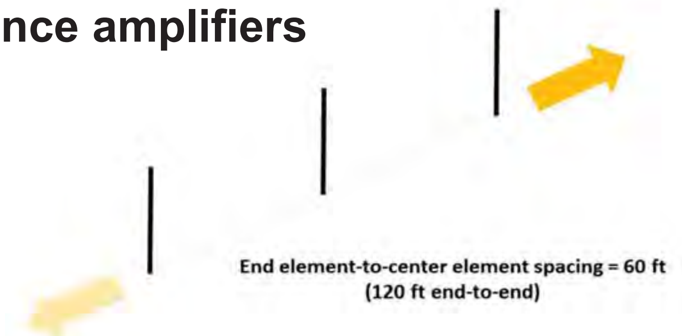
Simple Receive Antennas Vertical Arrays – YCCC-9

Uses 3 inline verticals with active high impedance amplifiers



Designed details in QEX
Part 1 Sept/Oct 2011 Part 2 Nov/Dec 2011

VE6WZ YouTube Videos on YCCC-9:
https://www.youtube.com/watch?v=DLdcR4Qr9Fg
https://www.youtube.com/watch?v=IVW1CmrzP7c
https://www.youtube.com/watch?v=dI-crM5Kb6A

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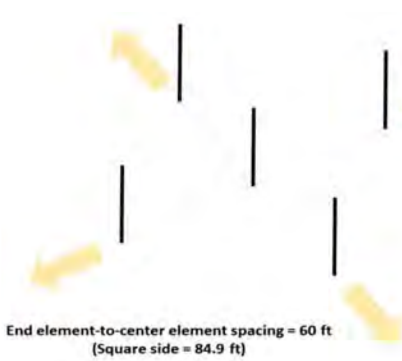
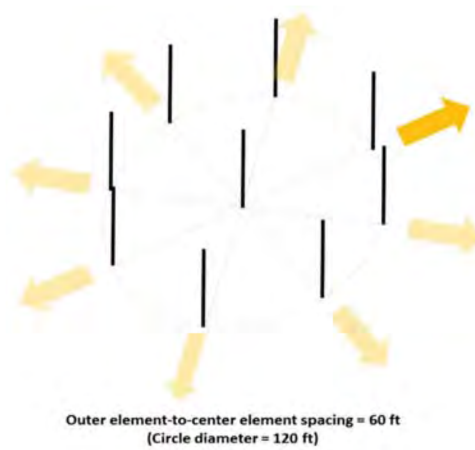
Simple Receive Antennas Vertical Arrays – YCCC-9

Can be configured with up to 9 verticals for eight direction coverage





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Simple Station Improvements
Eliminating Noise!

Noise is the Grim Reaper of Weak Signal Reception

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Simple Station Improvements
Noise - Worst Generators

- **Several years ago the only noise threat to your station was line noise**
  - Amateur radio was viewed as the noise & interference threat to consumer electronics
- **Today, consumer electronics generate significant noise and interference to amateur radio reception**

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Simple Station Improvements
Noise - Worst Generators

#1 Offender | **#2 Offender**

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Simple Station Improvements
Noise - Worst Generators

- **Others include:**
  - Switching power supplies
  - Plasma TV's
  - Medical devices
  - LED lights, outside light & dimmer controls
  - The list is endless and they are everywhere!
- **So what can a little old meek and mild ham do to "GET IN THERE AND WORK 'EM" if he can't hear them over the noise?**

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Simple Station Improvements
Clean Up Your Station First!

- **Cleaning up your station is Rule #1.**
- **Here are some guidelines:**
  - Unplug all unused wall warts, better yet, don't use them but that's a tall order
  - If you must use a switching power supply, be very selective on what you purchase/use
  - Use high quality cables and connectors to interconnect all of your equipment.

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Simple Station Improvements
Clean Up Your Station First!

- **If you are using a 12 Vdc wall wart, cut the cable off and connect it to a 12 Vdc power supply. Throw the wart in the trash**
- **Can't live without it? Here's how to neuter a wall wart**

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Simple Station Improvements Toroids

- **Extremely effective – but MUST use the right ones**
  - Do NOT buy something out of a tray at a hamfest or order one that simply advertises "Excellent RFI suppression"
- **Use a #31 mix toroid**
  Mouser # 623-2631803802
  Fair-Rite Part No:2631803802
  - If it's a DC voltage or control cable – WRAP IT!

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Simple Station Improvements Study K9YC's Paper

http://www.k9yc.com/RFI-Ham.pdf

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Simple Station Improvements Internet Modems & Routers

- **Even if you're all wireless, you can still have noise issues**
  - Any power or other cable connected to these devices is an antenna!
  - For CAT5 or 6, wrap several turns of the cable in a #31 toroid. Also use the DX Engineering DXE-ISO-Plus in-line filters

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Simple Station Improvements Power Supplies

- **If you must use a switching power supply instead of a linear supply, purchase one that is designed to filter out the noise**

MFJ switching power supplies were designed to properly filter the output

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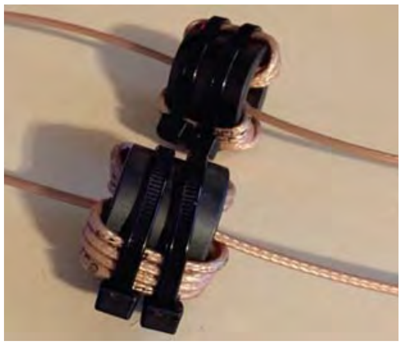
Simple Station Improvements For Receive Antennas

To eliminate common mode noise on the shield



See ON4UN's "Low Band DXing" Fifth Edition for specific details

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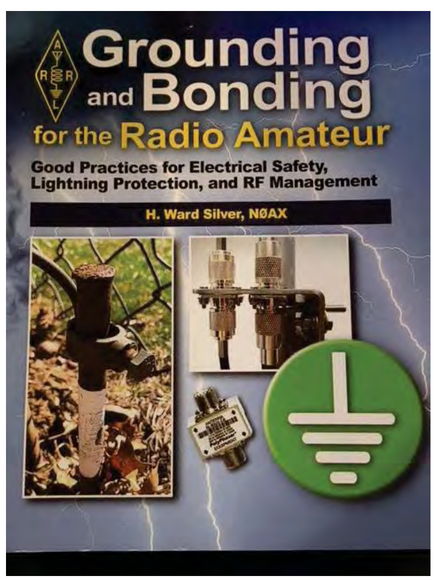
Simple Station Improvements Other Action to Take



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Simple Station Improvements
Other Action to Take

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Simple Station Improvements
Other Action to Take

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Simple Station Improvements Now What?

- **Your station is clean, but you have noise from somewhere**
  - Not much you can do with noise that comes from a neighbor.
- **At W5ZN there is a horrible noise to the east only on 160 meters.**
  - Thought it was line noise until we cleared all power line noise
  - Generated from a house >¼ mile away

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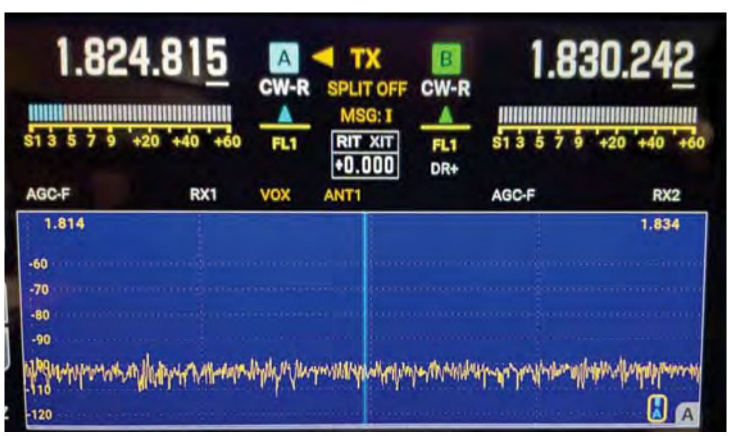
Simple Station Improvements Now What?

- **Concluded it is a medical device or a grow lamp**



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Simple Station Improvements Noise Cancelling Devices

- **Different models available**
  - Timewave ANC-4+
  - MFJ 1026
  - DX Engineering NCC-2

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Simple Station Improvements Noise Cancelling Result

20 dB null in noise

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Simple Station Improvements
Noise Cancelling Result

Steve VE6WZ has an excellent instruction on using a noise cancelling unit:

https://www.youtube.com/watch?v=Gt0Hokz_m3w&t=46s

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Simple Station Improvements
Test Equipment

Test Equipment – the two most valuable instruments beyond a VOM

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Simple Station Improvements Final Thoughts

- Determine the array that fits your need
- Build it
- Test it
- “GET IN THERE AND WORK ‘EM !!!!”

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Simply Outstanding Additional References

- An Introduction to Operating on 160m – K9LA
  https://k9la.us/An_Introduction_to_Operating_on_160m.pdf
- Working 160m From A Small Lot (and Larger Ones Too)
  http://k9yc.com/publish.htm
- W3LPL – Anything antennas - READ IT & LEARN!

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Thank You

?

CTU Presents

QRP/Low Power Contesting- Tips & Strategies

Anthony Luscre, K8ZT

• CTU • CONTEST UNIVERSITY

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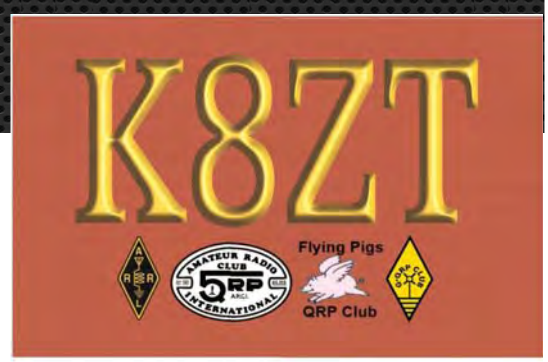
Contact Information

- Email- k8zt73@gmail.com
- Website- www.k8zt.com



2

Many slides & links so you're probably going to want to review extended version of Today's Presentation

View complete slide show and access links at

tiny.cc/ctu-qrp

If you need a PDF copy click [here]

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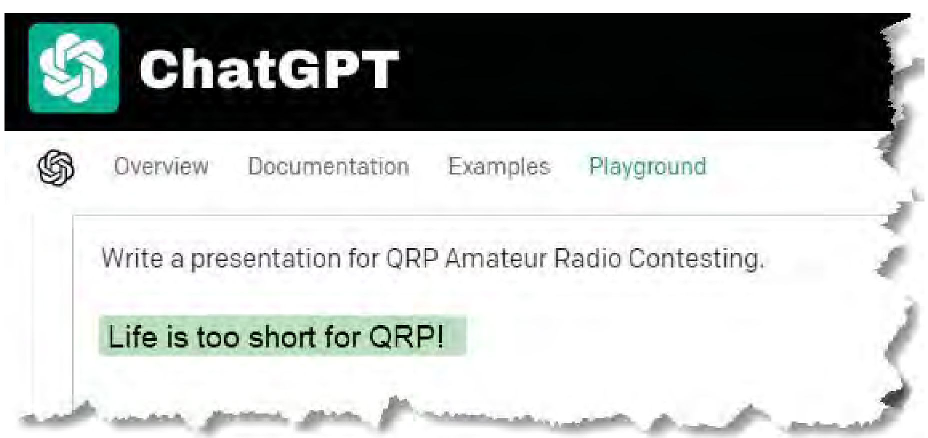
ICOM 3

QRP Contesting

- I thought I could save time by asking Chat GPT to use AI to write this presentation, but…



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ICOM 4

QRP/Lower Power Contesting

- Today's Topics
  - QRP & Low Power Definitions & Why?
  - QRP Myths & Myth Busting
  - Differences in QRP/LP vs. QRO Contesting
  - Getting Started with QRP/LP & Operating Tips
  - Successfully Making Exchange
  - Contest Selection
  - Addendum

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Definition– QRP

- Most contests & awards recognize **5 Watts** as **QRP** for all modes
- A small minority of organizations use 10 watts PEP on SSB, but this is not recognized by most award/contest sponsors as QRP
- QRPp is name for even lower power also called Milliwatting using < 1 watt output power

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Definition- Low Power (LP)

- Most contest & awards recognized 100 Watts or less as Low Power for all modes
- A small minority of organizations use 150 watts but this is not recognized by most award/contest sponsors as Low Power
- Recently ARRL has switched from 150 to 100 Watts

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Decision- QRP or LP

- Most casual contesters choose Low Power over High Power (1500 Watts) because their radios have 100 Watt output & they have no amplifier
- The decision of Low Power vs. QRP is typically not an equipment issue but one of individual choice, style, challenge, etc.
- Most tips & strategies in this presentation apply to both QRP & Low Power, with exception of calling CQ (running)

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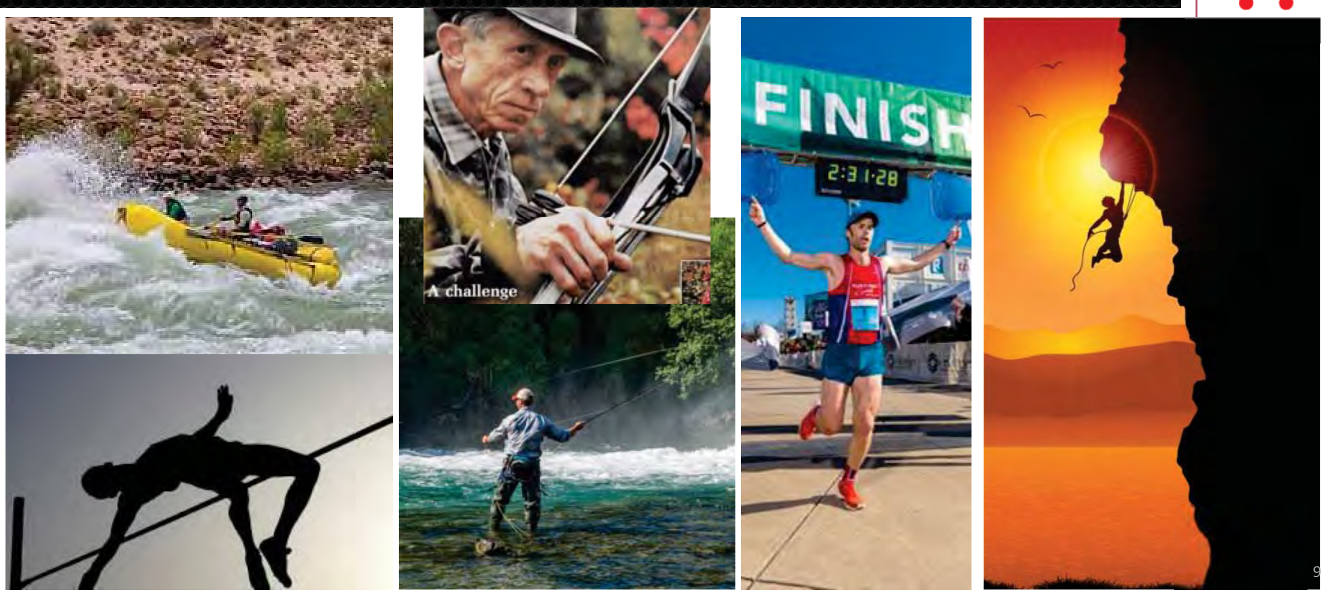
8

The Challenge?



9

Why QRP?

- Why do contesters choose QRP?
  - The Challenge
    - Awards
    - Contests
    - Personal Goals

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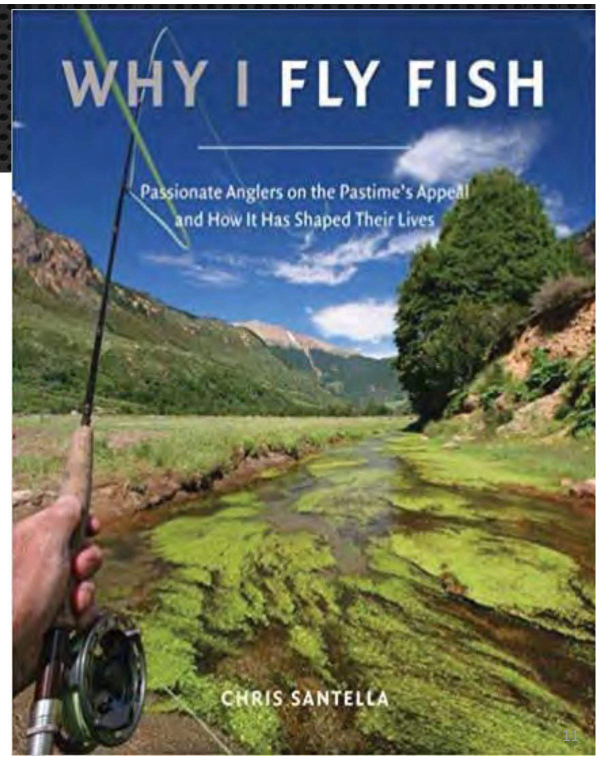
Why QRP?

- “Why I Operate QRP” is similar to the statement… “Why I Fly Fish”



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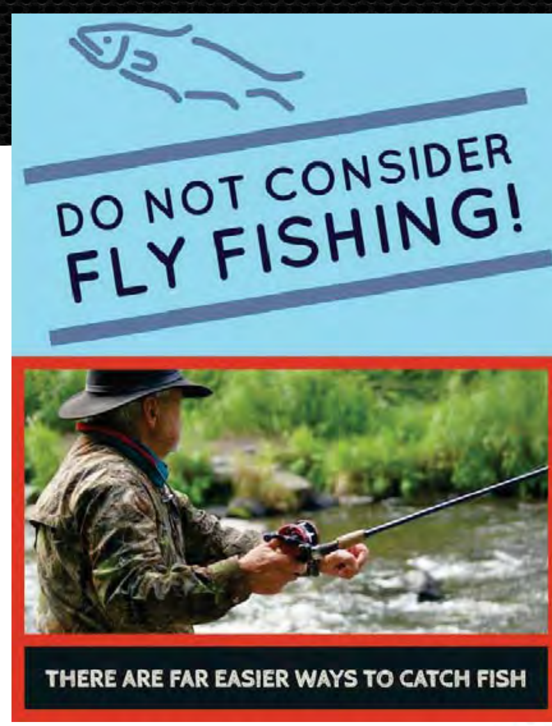
Why Not QRP?



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QRP Myths

- You must use a QRP only radio
- You must use CW Only
- You can't Win Contests
- You can't use beams or good antennas
- You cannot work DX
- You must use QRP all of the time

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QRP Myth Busting

⃠ You must use a QRP only radio

✓ Most QRO (100 watt) radios can be adjusted for lower power output

- Follow manufacturer's suggestions
- Adjust ALC, turn down drive, etc.
- For further, precise power reduction, use step attenuators

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QRP Myth Busting

⃠ You must use CW Only

✓ Although a majority of QRP operators historically used CW, many use SSB

✓ Recent popularity of Weak Signal Digital Modes- *FT8 & FT4* have become very popular for QRP ops

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ICOM 15

But, If You are Interested in CW

- CW is a potent tool for making QRP contacts
- You do not need to be a CW expert to make CW Contest QSOs
- See presentation *Fun with Morse* (if you are not a CW op & are interested in getting started)

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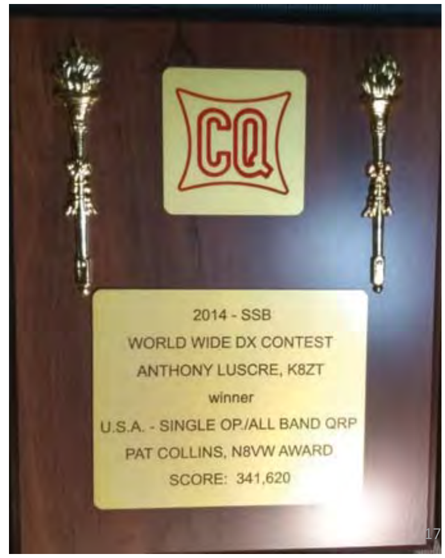
QRP Myth Busting

- ⃠ You can't Win Contests
- ✓ Most contests have separate categories for QRP operators so you are only competing against other QRP Ops



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QRP Myth Busting

- ✓ Most contests have separate categories for QRP

CQ World Wide DX Contest

2022 CQ WW CW Contest Raw Scores Before Checking

SSB / World

Single-Op High All Bands	Single-Op Low All Bands	QRP All Bands
PJ4K..........16,927,740	WP3C...........4,650,789	K8ZT.............370,352
V47T..........13,599,097	N1UR...........4,240,035	HG6C.............303,987
P40T...........9,653,562	HI3T...........3,673,728	JH1OGC...........286,405
CT3KN..........9,567,789	CR2B...........2,300,525	UR5FEO...........278,080
XL3T...........9,556,890	4X0T...........2,198,826	MI5JYK...........233,809
UP0L...........8,481,440	OK1WCF.........1,948,674	JH7UJU...........194,997
C4W............8,064,6[illegible]6	[illegible]...........1,729,980	M7X[illegible]T...........1[illegible]1,012

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QRP Myth Busting

- You can't use beams or other good antennas
  - ✓ You certainly CAN!
  - ✓ Don't confuse low power with poor signals
  - ✓ Unlike high power amps, the gain of antennas benefits you twice– once on transmit and again on receive

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QRP Myth Busting

- You should always append QRP to your callsign
  - ✓ You can choose to, but I strongly suggest you DO NOT
  - ✓ Some stations will not answer because they assume it is going to be too hard to complete the QSO
  - ✓ But if a station is calling for QRP stations, feel free to apply if you are operating QRP either way

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QRP Myth Busting

⃠ You cannot work DX

✓ Maybe you will not be first to break the pileup but with patience and good operating practices you can work plenty of DX

✓ Many QRPers work contests because they are a good chances for DX

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QRP Myth Busting

✓ My QRP Operating Results*

- >105,000 QRP QSOs
- DXCC Mixed 328 (317 Confirmed)
- WAS 11 Bands (160 to 6M)
- WAZ (CQ Worked All Zones)- 3 bands
- ITU Zones 76 out of 77
- DXCC Challenge - 1661
- Grids (AA##) - 2127

Mode	DXCC
CW	315
SSB	305
RTTY	189
FT8/FT4	244
DATA	265
ALL	328

* Note this is over a 40+ year operating history with majority in last 20 years

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QRP Myth Busting

- ✓ My QRP Operating Results
  - Working QRP DXCC, especially, on lower bands can greatly benefit from FT8/FT4 & CW

Band	CW	SSB	FT8/FT4	RTTY	TOTAL DXCC	Band
Mixed	315	305	244	189	328	Mixed
160M	57	11	67	1	82	160M
80M	102	64	64	10	119	80M
60M	2	3	73	29	76	60M
40M	166	85	56	12	173	40M
30M	139	-	89	-	168	30M
20M	269	227	184	123	298	20M
17M	239	147	184	46	276	17M
15M	242	206	159	99	274	15M
12M	214	252	115	86	227	12M
10M	191	101	120	44	279	10M
6M	23	24	37	1	52	6M

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23

Differences in QRP vs. QRO Contesting

- Besides obvious power difference other differences include
  - Strategy of
    - Planning
    - Operating Style
  - Less margin for error
  - You won’t work everyone you hear!

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QRP Contesting

- QRP Contesting often seems like you are always climbing uphill…

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QRP Contesting

- …with very little margin for error
- But it can be done successfully!

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Winning Contest Factors

Factors Contributing to Contest Scoring Success		
1	**Number of QSOs**	Running (Calling CQ) with prolonged high rates is key to high numbers
2	**Point Values of QSOs**	Can be greatly influenced by Geographic Location
3	**Multipliers**	Importance to Final Score influenced by individual Contest's Rules
4	**Secondary Multipliers**	Varies by Contest, may include Power and/or Mode multipliers, Multipliers by Band, by Mode or One Time, Scoring by Distance, Bonus Points for working certain stations or station types
5	**Accuracy**	Avoiding UBNs, Lost Points, Lost Multipliers, Penalties, etc.
6	**Competition**	Who are you competing against varies by year, category, etc.

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Differences in QRP vs. QRO Contesting

- Number of QSOs
  - When operating QRO, Calling CQ (a.k.a Running or Park & Bark) is King– "If you're not running you're losing"
  - Other option is Answering Others' CQing (a.k.a. Search & Pounce, S & P, Hunt & Pounce or Click & Call)
    - See "*Contesting 101 Operating*" (section on How to Search and Pounce)by K1DG

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Differences in QRP vs. QRO Contesting

- CQing QRO vs. QRP

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Differences in QRP vs. QRO Contesting

- Number of QSOs
  - Most QRPers & many LP contesters do a lot of "Search & Pounce"
  - Most beginning contesters typically use S & P, especially on CW

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Differences in QRP vs. QRO Contesting

- Number of QSOs
  - With QRP, Running is Difficult Unless
    - You are a rare multiplier
    - You have a killer antenna farm
    - You are an elite operator
    - Band has a lot of open space
    - You pick an Opportune time
    - 2nd day or near end of contest

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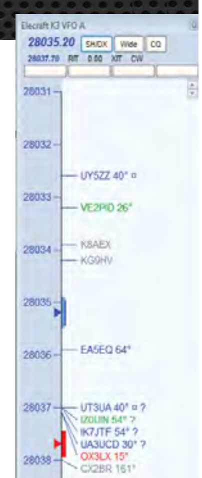
Differences in QRP vs. QRO Contesting



- Number of QSOs
  - Search & Pounce Aids
    - Logging Software Bandmap
      - Assisted- from spotting & tuning
      - Non-Assisted- from tuning
    - Radio Band Scopes or external Waterfalls
      - SDRs & Software
      - See The "*Advantages of Waterfall Displays for Contesting and DXing*" by N6TV

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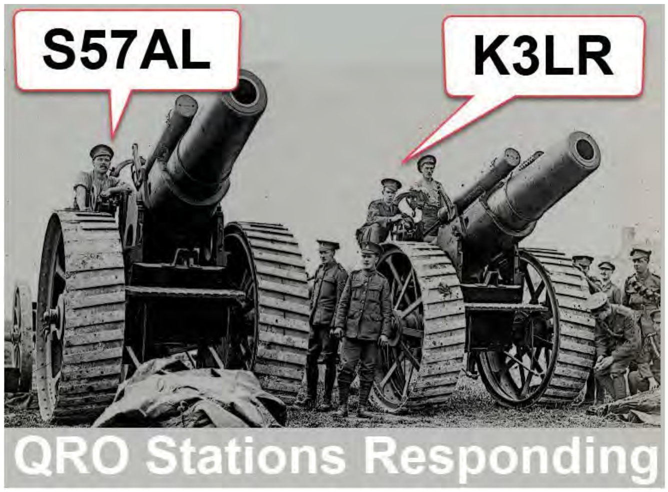
Differences in QRP vs. QRO Contesting

- Search & Pounce– QRP Obstacle!



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Differences in QRP vs. QRO Contesting

- Number of QSOs
  - You still want to maximize # of Qs with QRP but may need to use special strategies
    - Be there just as band opens or closes
    - Be "fresh meat" near end of contest
    - SOR2 or Modified Hunt & Pounce *2BSIQ* (Two Bands Synchronized Interleaved QSOs) both tricky, but not impossible with QRP
    - Strategic periodic CQs under specific conditions

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Differences in QRP vs. QRO Contesting

- Point Values of QSOs
  - On both QRO & QRP, this is all about location, location, location just like real estate
    - In CQ WW your zone and country make a big difference (this is often why contesting stations are where they are)
    - Big difference with QRP is if you are located in a rare or desirable zone or country, you have better chance of running

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Differences in QRP vs. QRO Contesting

- Multipliers
  - While working most available Multipliers can be an important part of a Running a QRO station, it is often not as important as high rates
  - With QRP, Multipliers often play a much bigger role in higher scorers
    - Even more important with CQ WW and other contests with double multipliers and lots of mults available on each band

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Differences in QRP vs. QRO Contesting

- Multipliers
  - QRP operators need to pick up "cheap mults"
    - Don't forget no point mults in CQ WW
    - Working in All Band category, try to work all open bands even if just for a few minutes as each new contact on new bands are often new mults
    - Have a checklist of expected mults and a strategy/ hourly plan for working them

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Differences in QRP vs. QRO Contesting

- Finding Multipliers
  - If you are working Assisted you can use Clusters, RBN, even a local Skimmer
  - Unassisted (and Assisted)
    - Have strategies, band change schedule, etc.
    - Understand Propagation
    - If you can't easily work a multi make a note (and/or add to bandmap) for later or next day on same freq or band & time
    - Quick detection of who's there

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Multiplier Trap

- Avoiding the Multipliers Only Trap
  - Although multipliers can be important you still need points to multiply them by

Points X Multipliers = Score

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ICOM 39

Multiplier Trap

- Avoiding the Multipliers Only Trap
  - If you get too focused on mults you will miss points
    - Work the 2nd, 3rd, etc. instance of a mult, not for mult but for points
    - If you are not CQing you need to be **Harvesting Qs**
    - Understand which target Point QSOs prove easier, abundant points
      - Targets usually vary based on geography & band
      - Don’t waste too much time on nonproductive bands

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ICOM 40

Low Hanging Fruit

- Harvesting Points- Low Hanging Fruit (stations vary by your location)

Low Hanging Fruit

- Most frequently worked prefixes by Mode from my Ohio location)
  - Factors affecting frequency of contact
    - Ham population of each DXCC
    - % of Contesters in each DXCC
    - Your location & distance/path of DX
    - Propagation
    - Bands being used
    - Mode interest by country

	CW	SSB	RTTY	FT8	ST
1	K	K	K	K	CA
2	VE	VE	VE	VE	TX
3	DL	I	I	DL	FL
4	UA	DL	DL	I	WA
5	I	EA	EA	F	OH
6	G	G	UA	EA	NY
7	OH	LU	UR	G	PA
8	HA	PY	G	PY	NC
9	S5	F	KH6	UA	MI
10	OL	OH	LU	PA	AZ
11	F	UA	XE	SP	VA
12	SM	JA	9A	JA	IL
13	EA	S5	OL	ON	OR
14	SP	SM	ON	LU	GA
15	9A	KP4	P4	ZL	TN
16	PY	ON	YV	XE	CO
17	YU	HA	PY	UR	UT
18	UR	SP	F	UA0	IN
19	KH6	GM	SP	VK	MO
20	LU	XE	PA	GM	NJ
21	UA0	KH6	GM	HI	MA

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Differences in QRP vs. QRO Contesting

- Secondary Multipliers
  - Some contests have a point multiplier…
    - for power level
    - for specific modes
    - for specific bands
      - typically lower freq bands in HF
      - typically higher freq bands in VHF/UHF
    - for working a QRP station (Stew Perry Topband)

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Differences in QRP vs. QRO Contesting

- Accuracy
  - As a QRP signal you have a greater chance for stations busting your call/exchange
    - Use Standard NATO/ITU Phonetics or carefully selected substitutes for clarity (esp. non-English speakers)
    - Use good CW sending with proper spacing, judicial use of cut numbers, weighting, etc.
    - See “Busted Callsigns”- *link*
    - If your call is problematic consider a Call Sign Change

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Differences in QRP vs. QRO Contesting

- Accuracy- Consider a Call Sign Change
  - Slideshow- *tiny.cc/idealcall*
  - Video Recording- *youtu.be/BmI9LGdt6aY*

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ICOM 45

Differences in QRP vs. QRO Contesting

- Competition
  - Most contests have separate QRP category or categories, so you are only competing against other QRP stations
  - Often QRP categories have many fewer competitors than Low Power category
  - Just as in QRO categories, who else enters is outside of your control

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Getting Started with QRP

- Steps
  1. Get on HF Bands; if you are not already
  2. Try turning down your current rig's output power level or pick up (or borrow) a QRP radio
  3. Check out the Top 15 Tips
  4. Make QRP contacts
  5. Use additional resources to learn
  6. Join a QRP Club
  7. Make more contacts and have fun!

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Contesting with QRP

- QRP Only Radio vs. 100 Watt radio with power turned down
  - Just as with low power vs. high power compliance is dependent on the integrity of the operator
  - Turning down your current rig's output power level needs to be confirmed with an accurate meter
  - Avoid temptation of bumping it up "just a tiny bit"
  - Using QRP only radio removes questions

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My First Shack

- Ten-Tec Argonaut 515, in an easily moved wooden case
- I didn't listen to "advice" from other hams- "Novices Shouldn't Start with QRP"

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Ten Tec

- Odyssey of the Argonauts (and beyond) a story of early Ten Tec QRP Radios
  - Slideshow- *tiny.cc/ooa*
  - *Video*

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My 4th QRP Shack in a Box

- Elecraft KX3 for details visit– *KX3 Rapid Deploy Tackle Box Go Kit*

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Elecraft K3S-10 Current QRP Rig

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ICOM IC-705 HF/VHF/UHF QRP TRCVR

- If you are familiar with operating the ICOM IC-7300 the IC-705 has very similar controls & same size display

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Popular QRP Only Rigs

- Elecraft
  - K3/10
  - K3s/10
  - KX3
  - KX2
  - K4/10
- ICOM
  - IC-705
- Yaesu
  - FT-818
  - FT-817
- ELAD
  - FDM Duo
- Xeigu
  - G90
  - X6100
  - X5105
  - G106
- QRP Labs
  - QCX+
  - QCX Mini
- TenTec
  - Argonaut VI
  - Argonaut V
  - Argonaut II
  - Argosy
- Flex
  - 1500

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ICOM

54

Tips for QRP Success

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ICOM 55

Top 15 Tips for QRP Success

1. Use best possible Antennas & feedline for situation
2. Develop Good Operating Techniques
3. Operate during Contests & high volume activities
4. Understand your Radio (know how to use features including filtering, split operation, memories, TX audio tailoring, etc.)
5. Be Persistent (you probably will not be first to break every pileup)

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Top 15 Tips for QRP Success

6. Learn to be a skillful Search & Pouncer (but don't be afraid to call CQ at strategic times)
7. Be there near the end of contests as "fresh meat"
8. Don't append QRP to you call (especially in pile ups & contests)
9. Understand Propagation & current conditions
10. Try using highest freq open band

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Top 15 Tips for QRP Success

11. Operate on as many bands as possible, especially lesser used bands (30, 17 & 12)
12. Operate multiple modes, each mode you operate increases your chances (CW, SSB, DATA)
13. If you don't currently operate CW, learn at least enough to make simple Contest & DX contacts
14. If you haven't tried FT8/FT4 you are missing a great weak signal mode
15. Get on the Air as Often as Possible

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58

Develop Good Operating Techniques

- Try to always use the best operating technique, with QRP power you do not have as much margin for error as QRO, if you want to make QSOs
- Listen, Listen, Listen
- Understand the Timing, Rhythm, Rhyme & Dance of QSOs– *tiny.cc/r-r-d*

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Develop Good Operating Techniques

- Mimic efficient and effective operators
- Know Procedures:
  - S.O.P. including typical contest exchanges
  - Variations by
    - Contest
    - Mode
    - Specific Station you are trying to work
- Good Etiquette still matters with QRP

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Successfully Making Exchange

- Give your exchange in the expected/accepted order/manner
- Use correct abbrv. for Counties/States
- On phone use phonetics as necessary

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Successfully Making Exchange

- If the station has not successfully received your call or exchange?
  - If CQing station is having a problem with your call and/or exchange, consider repeating it twice but don't get carried away with endless repeating
  - Consider alternative phonetic for missed letter(s)
  - Excessive use of sending double calls/exchanges in good conditions can frustrate other stations and greatly slow things down

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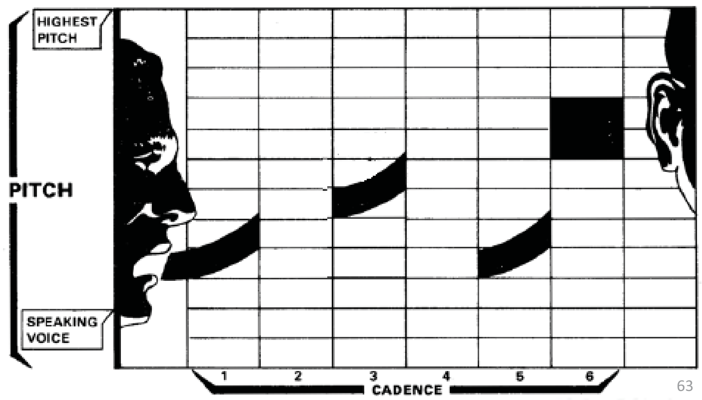
Successfully Making Exchange

- On phone, good operators can add a cadence & pitch to the voicing of the exchange that clarifies different portions of the exchange and can enhance the ability to copy it
- On CW, proper spacing is very important



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Successfully Making Exchange

- If the station repeats back to your exchange with a ? (Questioning or Please Confirm)
  - Confirm it, if it was correct– a quick R, RR, Roger or QSL will do
  - If it was wrong– send NO, NEG or say Negative, then repeat corrected exchange

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Successfully Making Exchange

- If the station is not successful at getting your exchange after multiple tries they may send:
  - LATER (Try Later)*
  - NIL (No contact was made, DO NOT LOG)
  - SRI (Sorry)
  - They start just calling CQ or QRZ again with no acknowledgement- (No contact was made, DO NOT LOG)

* Make a note of freq and try later

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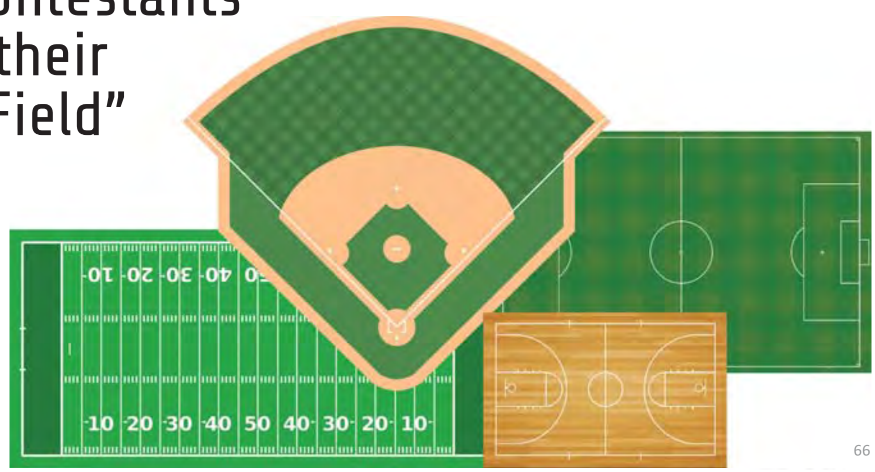
65

Planning- Picking a Specific Contest

- Unlike most other sports competitions, in Radio Sport, contestants get to choose their own "Playing Field"



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Planning– Picking a Specific Contest

- By choosing specific contests and entry categories you can best match your…
  - Interests & Modes
  - Operating skills
  - Radio equipment & antennas
  - Level of competitiveness

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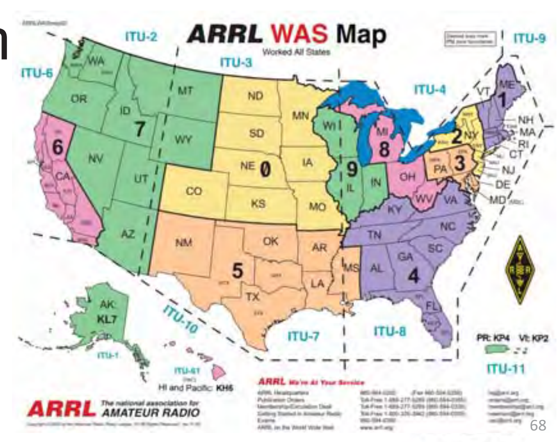
Planning– Picking a Specific Contest

- You can also choose specific contests that also favor…
  - Your Geographic Location
  - Specific Bands
  - Increasing your DXCC, WAS, etc. totals
  - Winning or finishing in a top spot



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Planning- Strategy & Scheduling

- Know Who Will Be There
  - *NG3K* Amateur Radio Contest/DX Page (ADXO)
  - Learn calls, locations, habits of contesters
    - Especially atypical calls for specific multipliers
  - Who to spend extra time trying to work vs. what will be available throughout contest
  - Who & When to target for rare zone or grid mults

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Planning- Strategy & Scheduling

- Know When They Will Be There
  - Propagation Predictions & Previous Results
  - Operator Habits
  - 2nd Day Chances
  - Don't miss short band openings
  - Grey Line can be your low band friend
  - It's hard to beat quality BIC Time to improve score

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ICOM 70

QRP/LP Contesting Summary

- Work Mults, don't miss extra chances
- Timing & Technique are Critical!
- Harvest Qs, remember points are vital & if not CQing, Harvest
- Call CQ if & when opportune
- Plan ahead- ADXO, Prop, etc.
- BIC- Butt In Chair Time Critical + Persistence

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ICOM 71

Questions / Comments ?

View this slideshow and access all resources links at

tiny.cc/ctu-qrp

If you need a PDF copy- *click here*

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ICOM 72

Addendum

- See following for…
  - QRP Introduction
  - Other Resources







ICOM 73

New to QRP Operations ?

- *tiny.cc/qar*

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ICOM 74

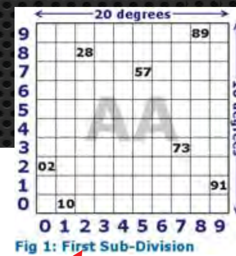
QRP Clubs

- I cannot stress how much QRP clubs around the world, both large and small, have contributed to adoption and innovation of QRP operation
- We also owe an immense gratitude to the many individuals that have contributed to QRP & QRP clubs
- Please take a look a list of QRP clubs on next page and consider joining one or more

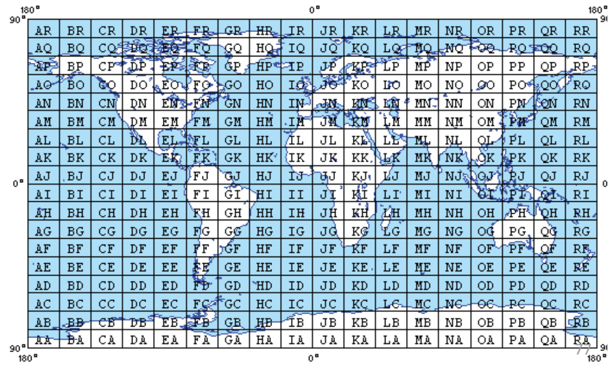
QRP Clubs

- *Alaska QRP Club*
- *Arizona ScQRPions QRP*
- *Austin QRP Club*
- *Central Florida QRP Group*
- *Explorers Radio Club*
- *Flying Pigs QRP Club*
- *Four State QRP Group*
- ***GQRP Club***
- *Hawaii-QRP Club*
- *Michigan QRP Club*
- *New England QRP Club*
- *NOGA QRP Club*
- *NorCal*
- *NORTEX QRP Club*
- *North American QRP CW Club*
- ***QRP-ARCI***
- *St. Louis QRP Society*
- *The Colorado QRP Club*
- *Knightlites QRP Club*

Find Your Exchange



- Finding your Grid, CQ Zone & ITU Zone:
- *tiny.cc/findexc*
  - *Finding your Grid Square* (Web & Apps)
  - *Zone-Check*
  - *CQ Amateur Radio*
  - *Mapability EI8IC*
  - *Levin Central*
  - *Amateur Radio Charts & Maps*



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Find Your Exchange

- Finding your Grid, CQ Zone, ITU Zone, Section, etc.
  - Amateur Radio Charts & Maps– *tiny.cc/chart-maps*
  - For a wide variety of location based exchanges resources visit *www.k8zt.com/operating/maps-charts*
  - Always check individual contest rules for any details on exchange

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ICOM 78

Other Contesting Resources

- *www.k8zt.com* contesting page

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Presentations

- If your club is interested in a online presentation I am currently offering multiple options, for a list visit

tiny.cc/k8zt-p

- Email me if interested
k8zt73@gmail.com

This list- tiny.cc/k8zt-p	Slideshow	Video
Amateur Radio Logging- ARRL Webinar	tiny.cc/arrl-log	https://ww
Choosing Your Ideal Callsign- QSO Today Expo 2021	TBA	TBA
Dx Engineering Interview by K3LR- K8ZT		https://www
Field Day in Social Distancing	tiny.cc/fdsd	https://yout
FT8/FT4 Digital Modes	tiny.cc/ft8ft4	
Fun with Morse	tiny.cc/fwm	https://yout
Intro to AR Contesting	TBA	TBA
N1MM Contesting Software- Elmering Day	.cc/n1mm-eln	https://yout
Pandemic Ham Radio Activities An Opportunity to Grow- RATPAC	ny.cc/clubcovi	Jan 27, 20
QRP Amateur Radio	tiny.cc/qar	
QSLing In Digital World	tiny.cc/qx3	https://yout
Radio, Radio, Radio- 100 yrs of Commercial Broadcasting	tiny.cc/rradio	https://you
RATPAC Programs Listings	ny.cc/ratpac-list	
RATPAC- Ham Radio- Online Meeting Resources	tiny.cc/hromr	https://vime
Software & Web Resources for Contesting	ny.cc/gl-contest	
State QSO Party Challenge	tiny.cc/stqspc	https://yout
Technicians, Life Beyond Repeaters	tiny.cc/btech	
Top Secret Techniques to WAS & DXCC	tiny.cc/ham50	
Youth in Amateur Radio	tiny.cc/yiar	

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80

CTU Presents

Contesting for Ionospheric Science During the 2023 and 2024 North American Solar Eclipses

Nathaniel A. Frissell W2NAF

Gary Mikitin AF8A, Gareth Perry KD2SAK, Joe Huba, Bill Engelke AB4EJ, Rachel Boedicker AC8XY, Kristina Collins KD8OXT, John Gibbons N8OBJ, David Kazdan AD8Y, Phil Erickson W1PJE, Bob Gerzoff WK2Y, Mary Lou West KC2NMC, Ward Silver N0AX, and the HamSCI Community

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Ham radio Science Citizen Investigation

hamsci.org/dayton2022

Founder/Lead HamSCI Organizer:
Dr. Nathaniel A. Frissell, W2NAF
The University of Scranton

A collective that allows university researchers to collaborate with the amateur radio community in scientific investigations.

Objectives:

1. **Advance** scientific research and understanding through amateur radio activities.
2. **Encourage** the development of new technologies to support this research.
3. **Provide** educational opportunities for the amateur radio community and the general public.

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Festivals of Eclipse Ionospheric Science

- **Annular: Saturday, Oct 14, 2023**
- **Total: Monday, April 8, 2024**

https://hamsci.org/eclipse

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Solar Eclipse QSO Party 2.0

- Taking the best concepts from the 2017 event yielded a fresh set of rules, FAQs, etc.
- The HamSCI website is the ultimate resource:
- https://hamsci.org/contest-info
- https://hamsci.org/seqp-faqs
- https://hamsci.org/seqp-rules
- Results will be published

HamSCI

Solar Eclipse QSO Party Rules for 2023 and 2024

Please bookmark this page and join the **HamSCI eclipse mailing list** for future announcements related to the SEQP.

Version 1.01

3 Dec 2022

The following are the complete, detailed rules for the SEQP. For a quick introduction to the SEQP, please visit the **SEQP FAQ** page. The SEQP is one event within the **Festivals of Eclipse Ionospheric Science**.

I) Dates and Times

14 Oct 2023 1200 – 2200 UTC (Partial eclipse begins ~1500 UTC in Oregon ends ~1840 UTC in Texas)

8 Apr 2024 1400-2400 UTC (Partial eclipse begins ~1710 UTC in Texas and ends ~2040 UTC in Maine)

Participants are encouraged to operate before, during and after the eclipse passes over the continental US. Doing so will create baseline data (pre- and post-eclipse), and eclipse influenced data (during annularity or totality) for the research team.

II) Objective

To generate observations of propagation by the **Reverse Beacon Network** and **PSKReporter** event logs before, during, and after the eclipse on the amateur bands for the purpose of ionospheric sounding.

The Solar Eclipse QSO Party (SEQP) is unique among ham radio competitions as it awards points for two-way QSOs (ham to ham contacts via radio) and bonus points for reception reports from skimmers, RBN nodes and the like.

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Gladstone Signal Spotting Challenge

- A contest for people who like running skimmers, using FT8, FST4W, and WSPR!
- The HamSCI website has details on the Challenge and links to WSPR and FST4W information
- https://hamsci.org/contest-info
- https://hamsci.org/gssc-faqs
- https://hamsci.org/gssc-rules
- Results will be published

HamSCI

Gladstone Signal Spotting Challenge Rules for 2023 and 2024

Please bookmark this page and join the HamSCI eclipse mailing list for future announcements related to the GSSC

Version 1.22

24 Jan 2023

The Gladstone Signal Spotting Challenge is named for Philip Gladstone, N1DQ, the creator and maintainer of the **PSKReporter.info** *website, also known as the Digimode Automatic Propagation Reporter. Philip has made a tremendous contribution to Amateur Radio operating, citizen-science and ionospheric research through the data ("spots") which are collected and stored on* **PSKReporter.info**. *This Wikipedia entry tells the story:* **https://en.wikipedia.org/wiki/PSK_Reporter**

The following are the complete, detailed rules for the GSSC. For a quick introduction to the GSSC, please visit the **GSSC FAQ** page. The GSSC is one event within the **HamSCI Festivals of Eclipse Ionospheric Science**.

I) Dates and Times

14 Oct 2023 1200 – 2200 UTC (Partial eclipse begins ~1500 UTC in Oregon ends ~1840 UTC in Texas

8 Apr 2024 1400-2400 UTC (Partial eclipse begins ~1710 UTC in Texas and ends ~2040 UTC in Maine)

Participants are encouraged to operate before, during and after the eclipse passes over the continental US. Doing so will create baseline data (pre- and post-eclipse), and eclipse influenced data (during annularity or totality) for the research team.

II) Objective

To generate observations of propagation by **WSPRNet**, **PSKReporter** and the **Reverse Beacon Network**, along with participants' event logs before, during, and after the eclipse on the amateur bands for the purpose of ionospheric sounding.

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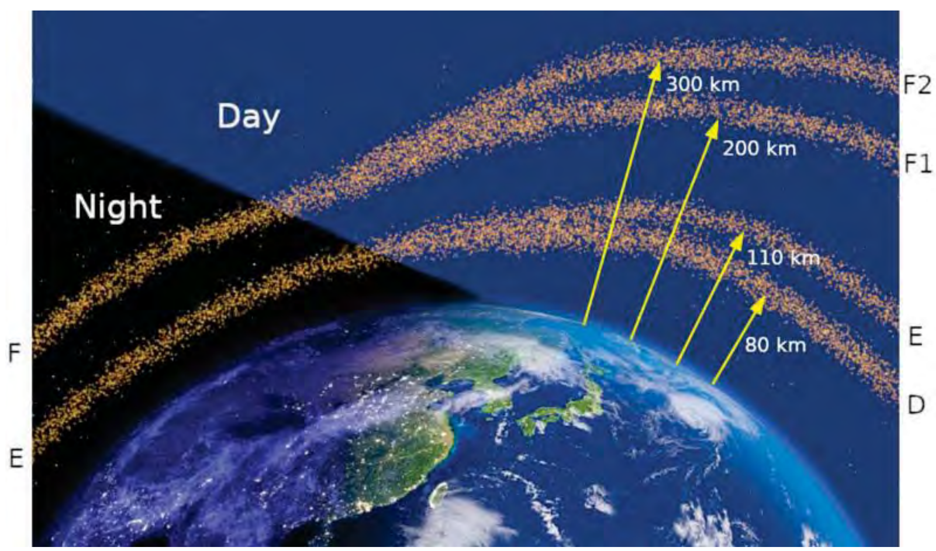
The Ionosphere



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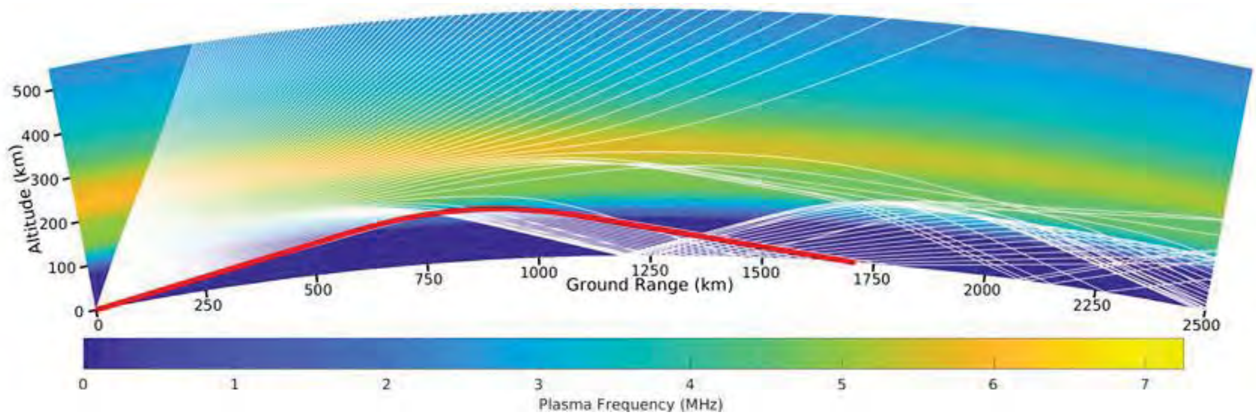
Refraction as a Function of Electron Density



PHaRLAP: Cervera & Harris (2014), https://doi.org/10.1002/2013JA019247
SAMI3: Huba & Drob (2017), https://doi.org/10.1002/2017GL073549
Amateur Radio and the Eclipse: Frissell et al. (2018), https://doi.org/10.1029/2018GL077324

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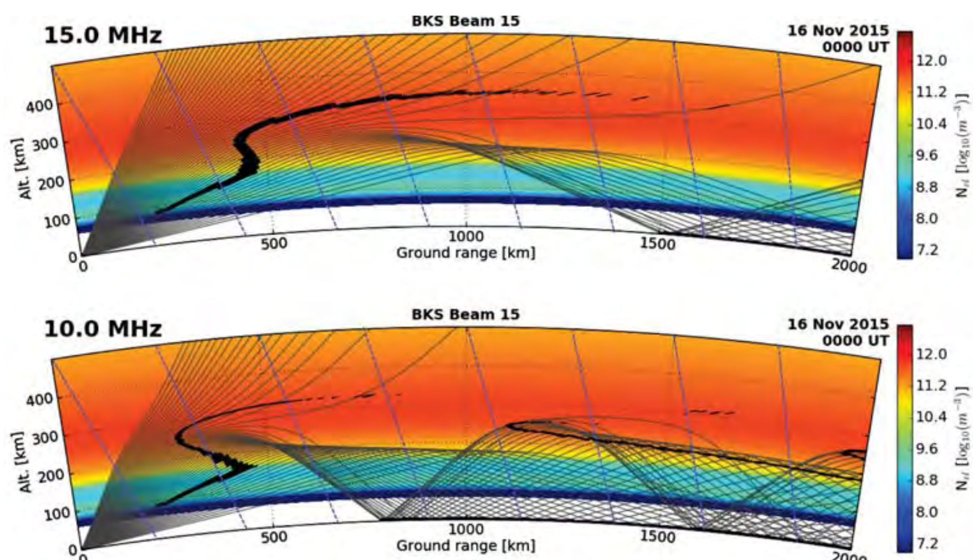

(Frissell, 2016, https://vtechworks.lib.vt.edu/handle/10919/74976)

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Eclipses 2023 and 2024

[https://www.greatamericaneclipse.com/]

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Umbra and Penumbra

Moon's shadow has 2 parts:

- **Umbra:** innermost region of the shadow; Sun fully hidden & objects in total shadow.
- **Penumbra:** outermost region of the shadow; Sun partially hidden & objects still receive some sunlight.

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Total and Partial Eclipse

- **Total Eclipse:** Observer is located in the umbra.
- **Partial Eclipse:** Observer is located in the penumbra.

*A Total Solar Eclipse is **much** more dramatic than a partial solar eclipse. During a total solar eclipse, you can even see the Sun's Corona! If you have a chance to be in the path of totality during a solar eclipse, you should take the opportunity!*

Total and Annular Solar Eclipses

- The Moon appears larger in the sky at perigee compared to apogee.
- By coincidence, when the Moon is at or near perigee, it is sized to completely cover the solar disk during an eclipse. This results in a **Total Solar Eclipse.**
- At apogee when the Moon is farthest from the Earth, it will fit inside the Solar disk rather than totally obscure it. This creates an **Annular Solar Eclipse.**

Total and Annular Solar Eclipses

Total	Partial	Annular

Photo by Jim Sackerman, KC2ZFK

Photo By Yurakum (https://commons.wikimedia.org/wiki/File:Sun_eclipse_25_oct_2022_in_Saratov.jpg)

Photo By Smrgeog~commonswiki (https://commons.wikimedia.org/wiki/File:Annular_Eclipse._Taken_from_Middlegate,_Nevada_on_May_20,_2012.jpg)

Eclipse Ionospheric Effects

- Because solar radiation is blocked from the atmosphere during an eclipse, we can expect the ionosphere to respond similarly to day and night.
- But, there are differences…

What are those differences?

Differences Between Eclipses and Day-Night

- Eclipse is shorter duration.
- More localized.
- Travels at supersonic speeds.
- Travels in directions that are different from westward motion of dawn and dusk terminators.

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Eclipses as Controlled Experiments

- Aside from dusk, dawn, and the seasons, there are very few cases where we know a priori how much solar energy will be input into the upper atmosphere.
- Solar flares, geomagnetic storms, and others are random events we cannot predict.
- We can calculate eclipses with great accuracy ahead of time, and so can be considered a “controlled” ionospheric experiment.

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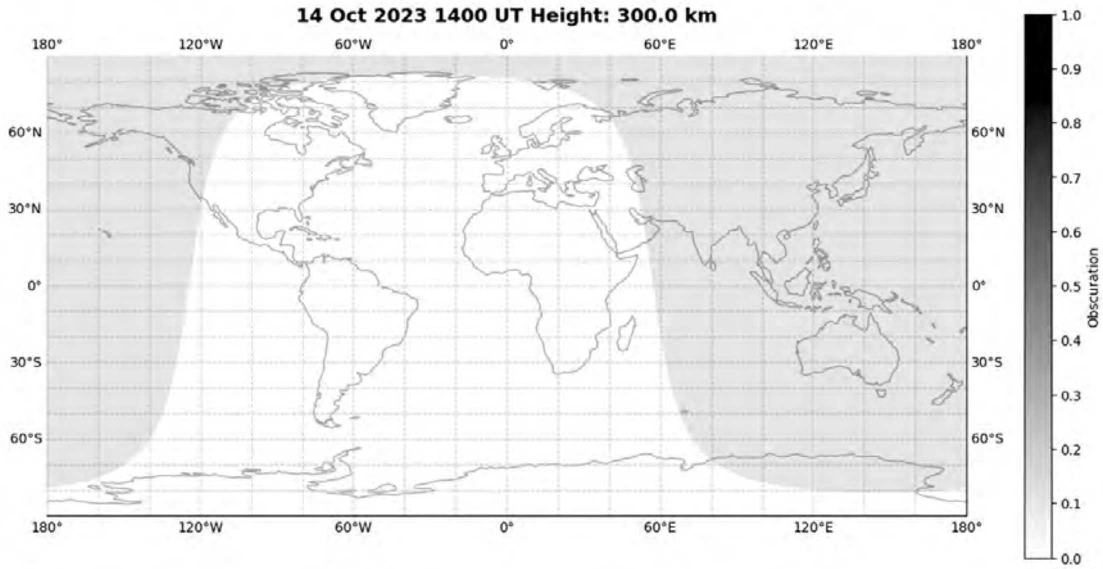
Annular Solar Eclipse: October 14, 2023



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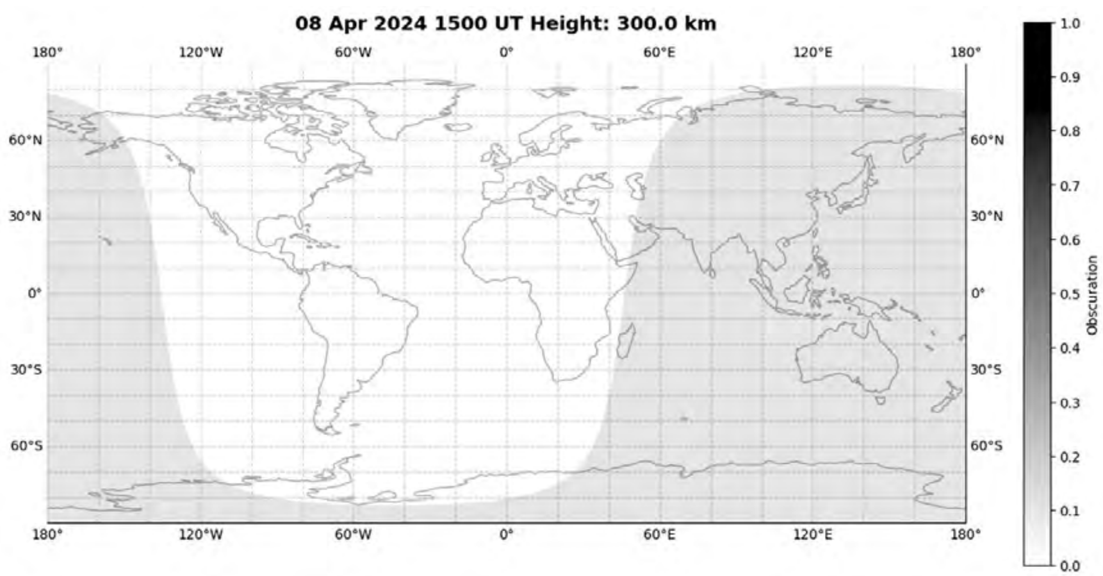
Total Solar Eclipse: April 8, 2024



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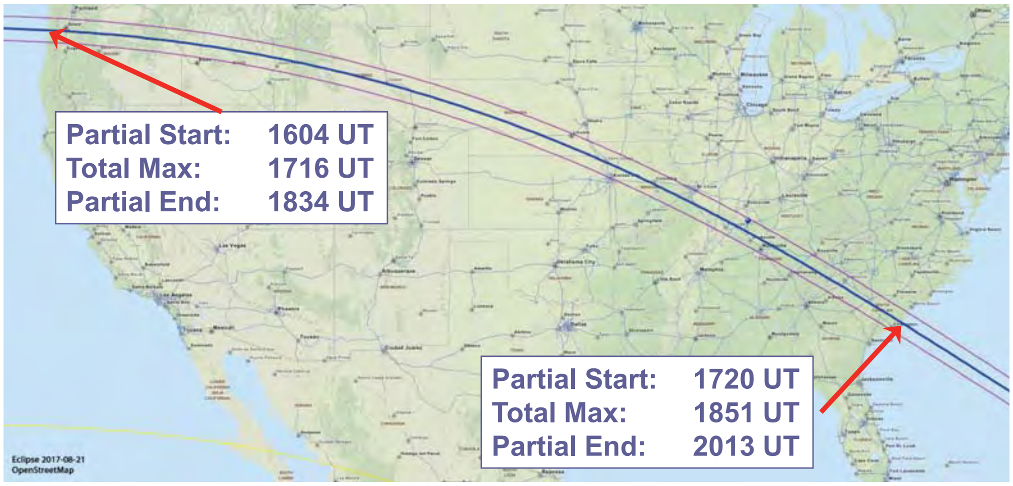
2017 Total Solar Eclipse



HamSCI Eclipse Research Questions

- Can we use HF ham radio communications to observe eclipse effects on the ionosphere?
- Can we use data-model comparisons to:
  - Better understand the ham radio data?
  - Constrain or calibrate the model?


J. Sackerman, KC2ZFK


W. Engelke, AB4EJ

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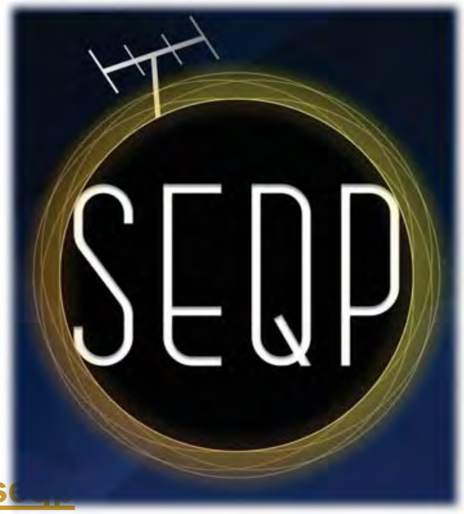
Solar Eclipse QSO Party (SEQP)

- **August 21, 2017 from 1400 – 2200 UT**
- **Contest-like**
  - 2 Points CW or Digital
  - 1 Point for Phone
  - Multiply Score by # of Grids
- **Exchange**
  - RST + 6 Character Grid Square
- **Data sources**
  - Reverse Beacon Network
  - PSKReporter
  - WSPRNet
  - Participant-submitted logs



http://hamsci.org/seqp

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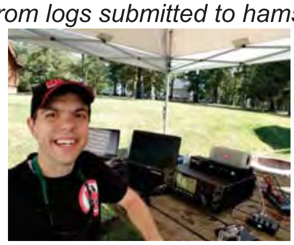
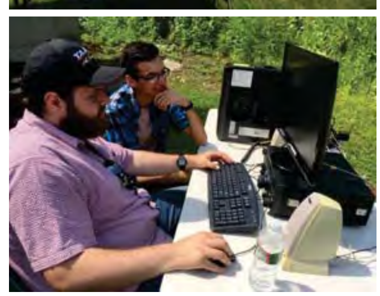
Solar Eclipse QSO Party

- 570 parsed logs
- 29,809 QSOs
- 4,929 unique callsigns
- 649 4-char grid squares
- 80 DX Entities

(from logs submitted to hamsci.org)





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SEQP Observations

RBN
reversebeacon.net

WSPRNet
wsprnet.org

PSKReporter
pskreporter.info

Observations from 21 August 2017 1400 – 2200 UT

Network	# Spots / QSOs
RBN	618,623
WSPRNet	630,132
PSKReporter	1,287,962
Participant Logs	29,809

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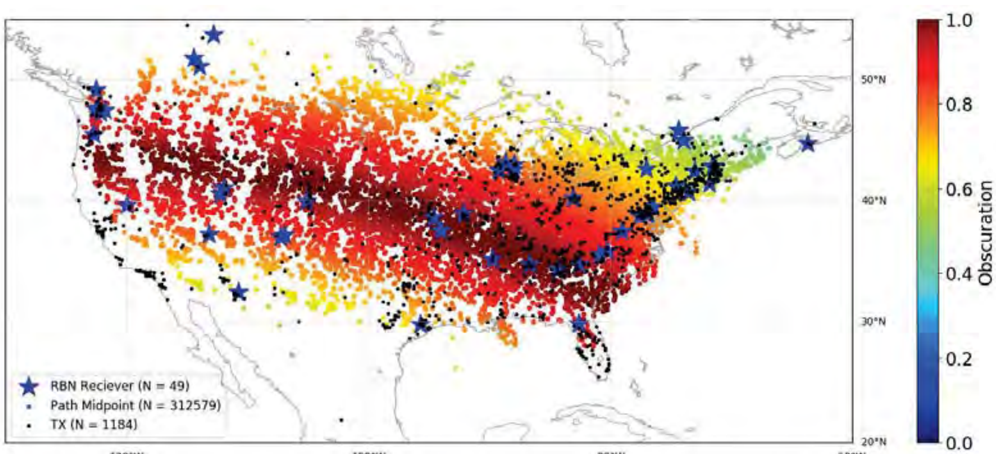
Solar Eclipse QSO Party RBN Observations



[Frissell et al., 2018, https://doi.org/10.1029/2018GL077324]

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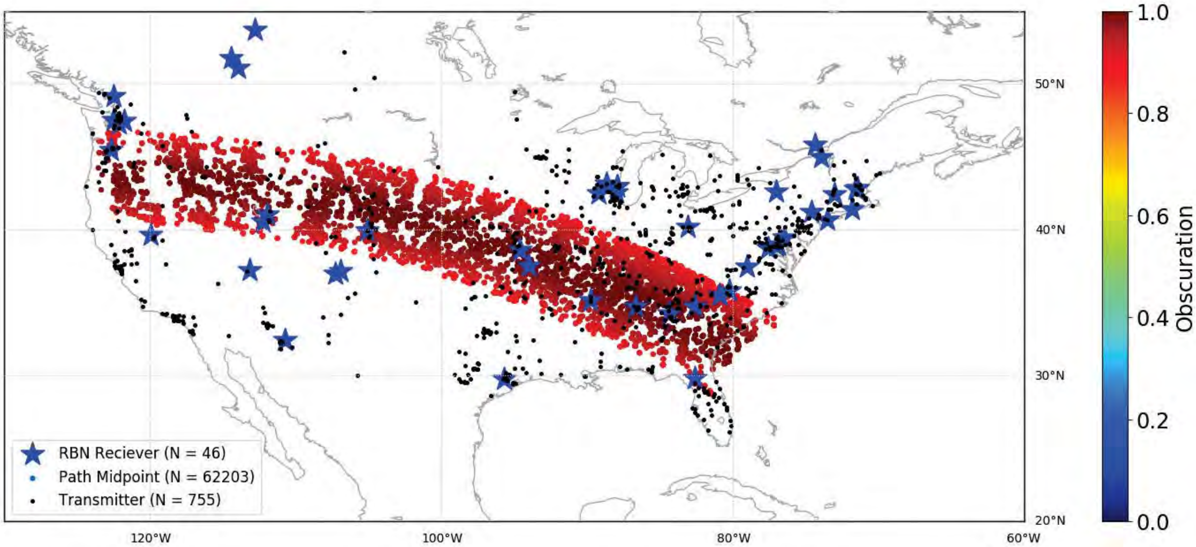
SEQP RBN ($O_{300} \geq 0.9$)



[Frissell et al., 2018, https://doi.org/10.1029/2018GL077324]

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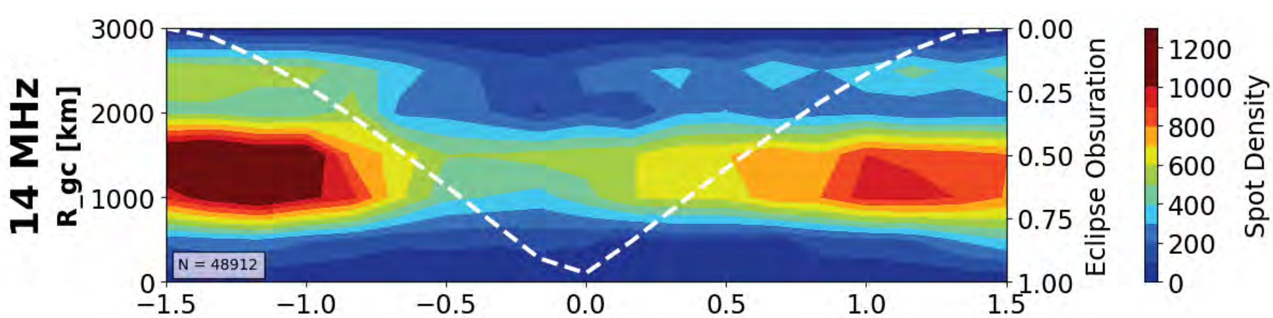
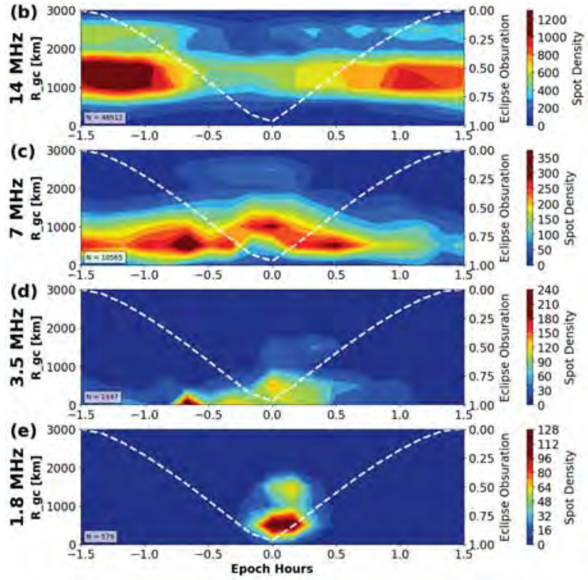
14 MHz 2017 SEQP RBN ($O_{300} \geq 0.9$)



[Frissell et al., 2018, https://doi.org/10.1029/2018GL077324]

CONTEST UNIVERSITY HamSCI THE UNIVERSITY OF SCRANTON A JESUIT UNIVERSITY ICOM

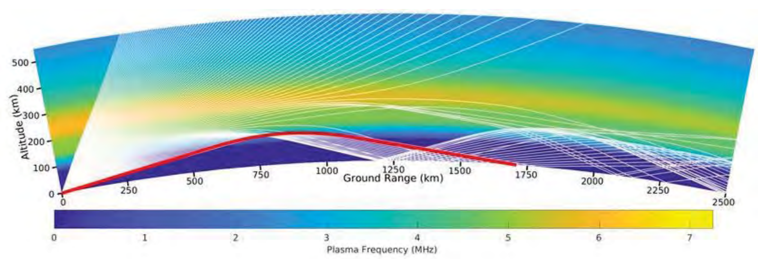
2017 SEQP RBN ($O_{300} \geq 0.9$)

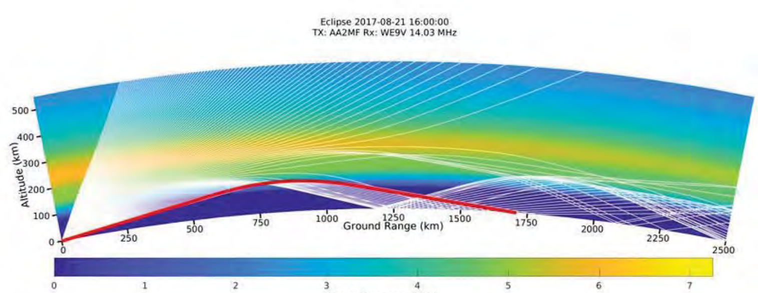


[Frissell et al., 2018, https://doi.org/10.1029/2018GL077324]

Modeling the Solar Eclipse QSO Party

SAMI3-PHaRLAP Raytrace
1600 – 2200 UT 14.03 MHz
TX: AA2MF (Florida)
RX: WE9V (Wisconsin)





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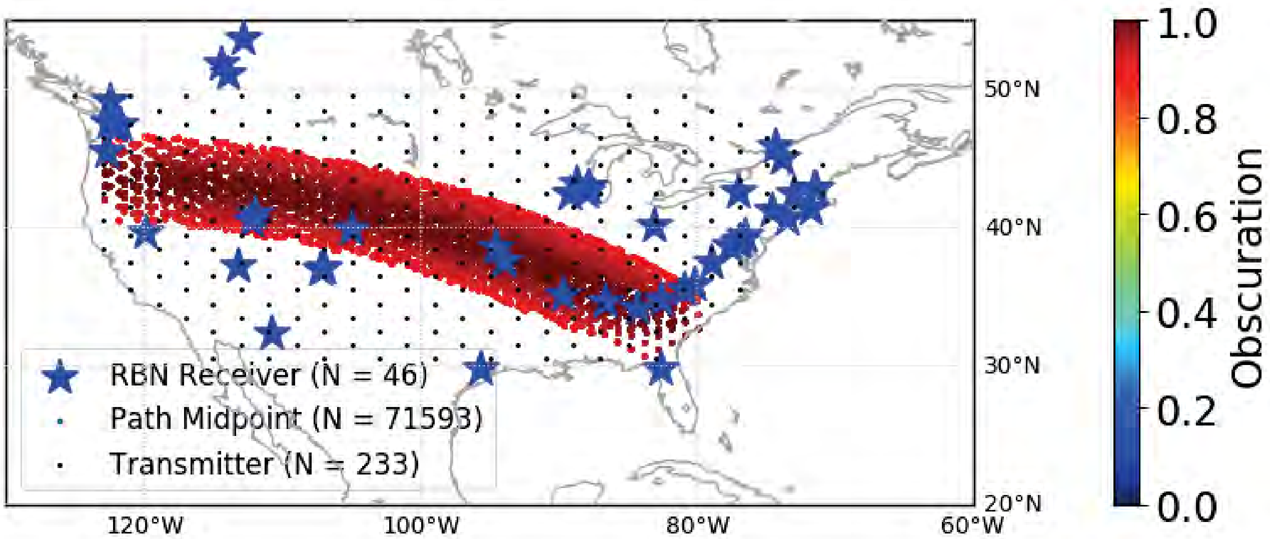
Modeling the Solar Eclipse QSO Party



[Frissell et al., 2018, https://doi.org/10.1029/2018GL077324]

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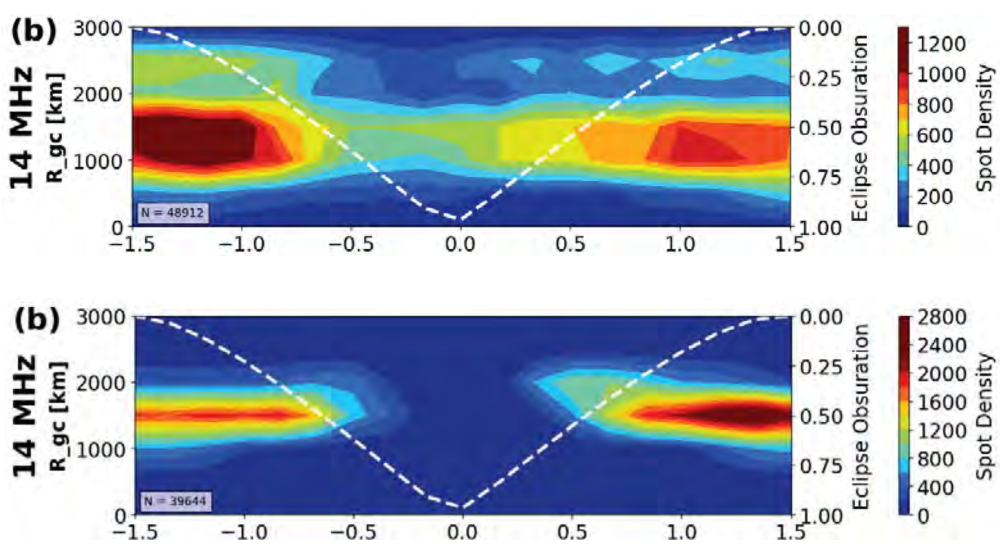
Observations and Model Results



[Frissell et al., 2018, https://doi.org/10.1029/2018GL077324]

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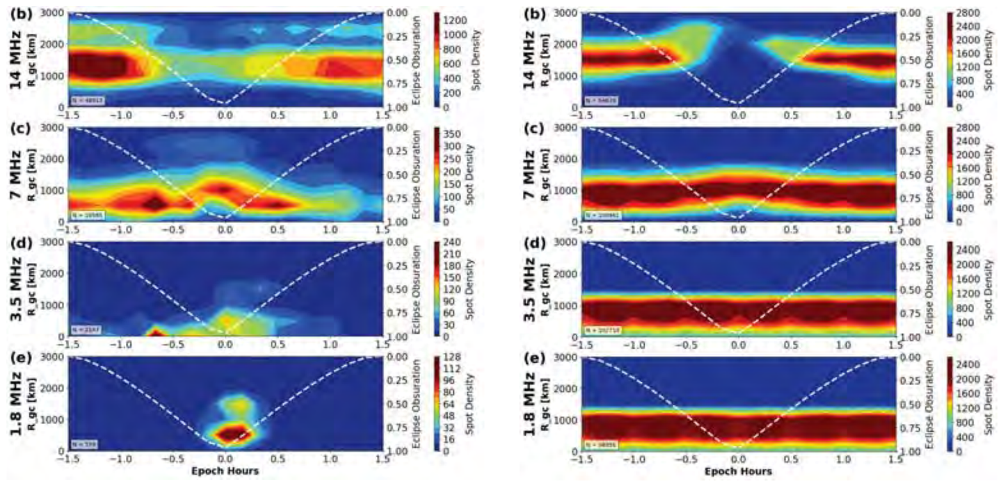
RBN Observations – SAMI3 Simulation



[Frissell et al., 2018, https://doi.org/10.1029/2018GL077324]

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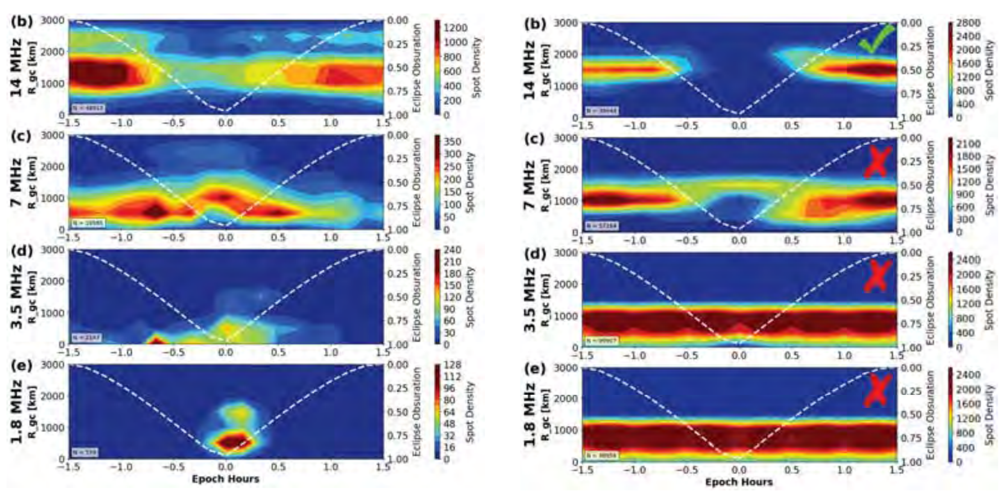
SAMI3 < 125 km alt



[Frissell et al., 2018, https://doi.org/10.1029/2018GL077324]

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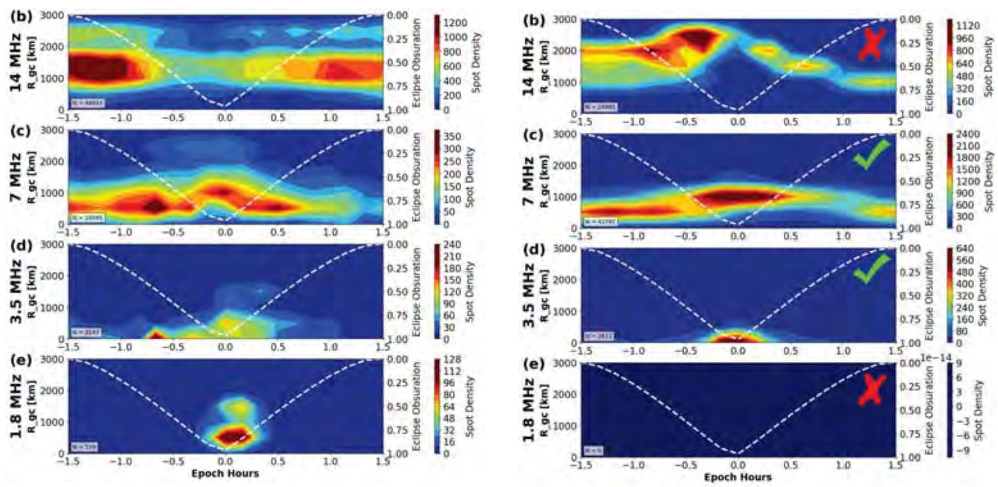
SAMI3 ≥ 125 km alt



[Frissell et al., 2018, https://doi.org/10.1029/2018GL077324]

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2017 Eclipse Conclusions

- SEQP generated over 2.5 million link soundings.
- Eclipse effects are observed:
  - ±0.3 hr on 1.8 MHz
  - ±0.75 hr on 3.5 and 7 MHz
  - ±1 hr on 14 MHz

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2017 Eclipse Conclusions: 14 MHz

Raytracing suggests 14 MHz refracted at h < 125 km

- This means E-layer ionosphere!
- Mean elevation angle was < 10˚
- Higher frequency meant D-layer absorption was not a problem, even at low elevation angles.
- Low-angle rays could be refracted by E-layer (secant law)
- Higher elevation angles penetrated both the E and F layers.

2017 Eclipse Conclusions: 1.8 - 7 MHz

Raytracing suggests 1.8 - 7 MHz refracted at h ≥ 125 km

- This means F-layer ionosphere!
- Elevation angle was > 60˚
- Low-angle rays were likely absorbed by the D-region and not observed.
- Higher elevation angles penetrated the E-layer but could be refracted by F-layer.

2023/2024 Science Questions

- Can the annular eclipse be observed in HF communications?
- How large is the disturbance?
- How long before and after maximum eclipse are eclipse effects observed?
- Is an onset-recovery asymmetry observed?
- Will results again suggest E-layer propagation for 14 MHz and F-layer for 1.8 – 7 MHz?
- How similar are the eclipse effects to dawn and dusk (grayline)?

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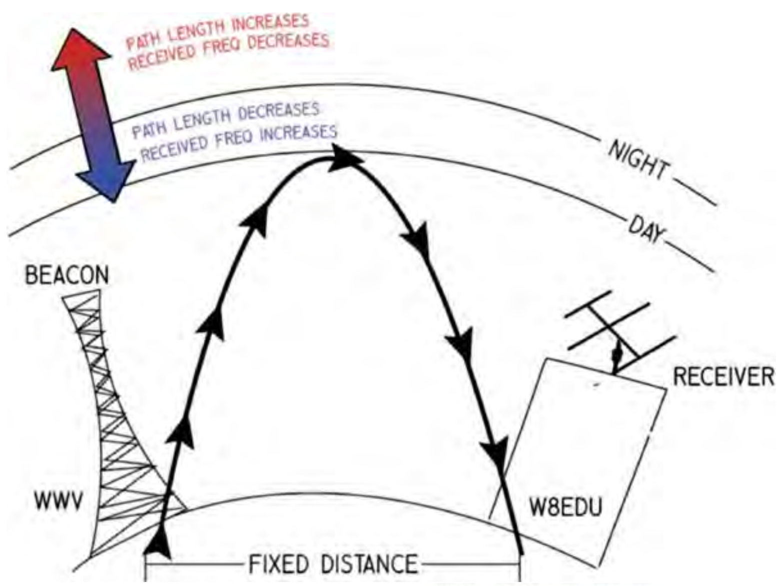
HF Doppler Shift



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Steve Reyer, PhD, WA9VNJ (SK)

- Professor Emeritus of Electrical Engineering at the Milwaukee School of Engineering
- Teacher and Industry Consultant
  - digital signal processing
  - communications
  - microprocessors
  - circuits
  - Senior Design
- Active in FMT Community
- Very important for HamSCI 2017 Eclipse Frequency Measurement Experiment

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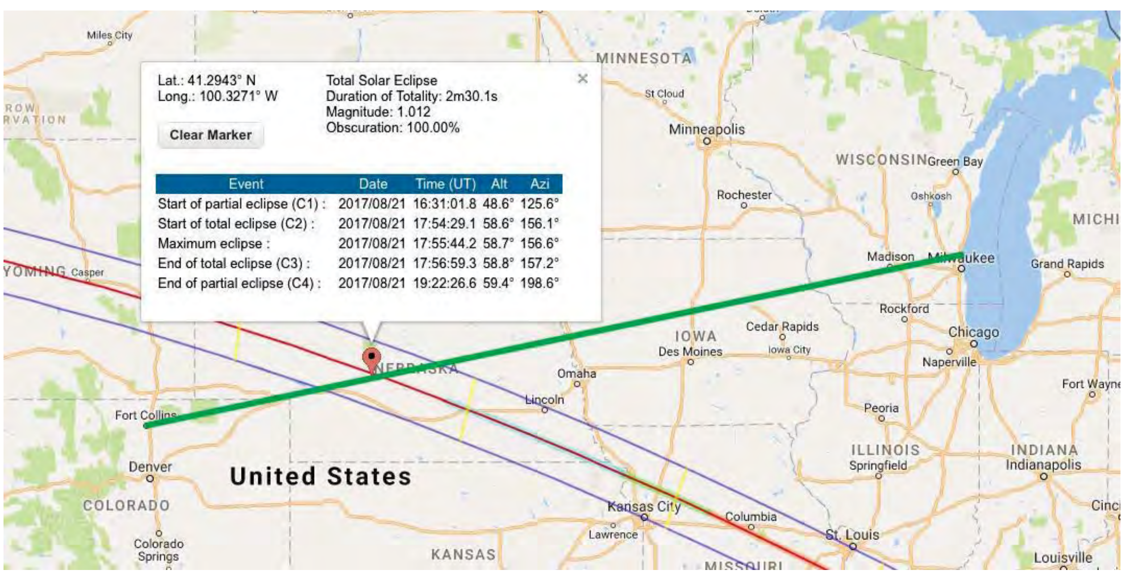
WA9VNJ 10 MHz WWV Observations



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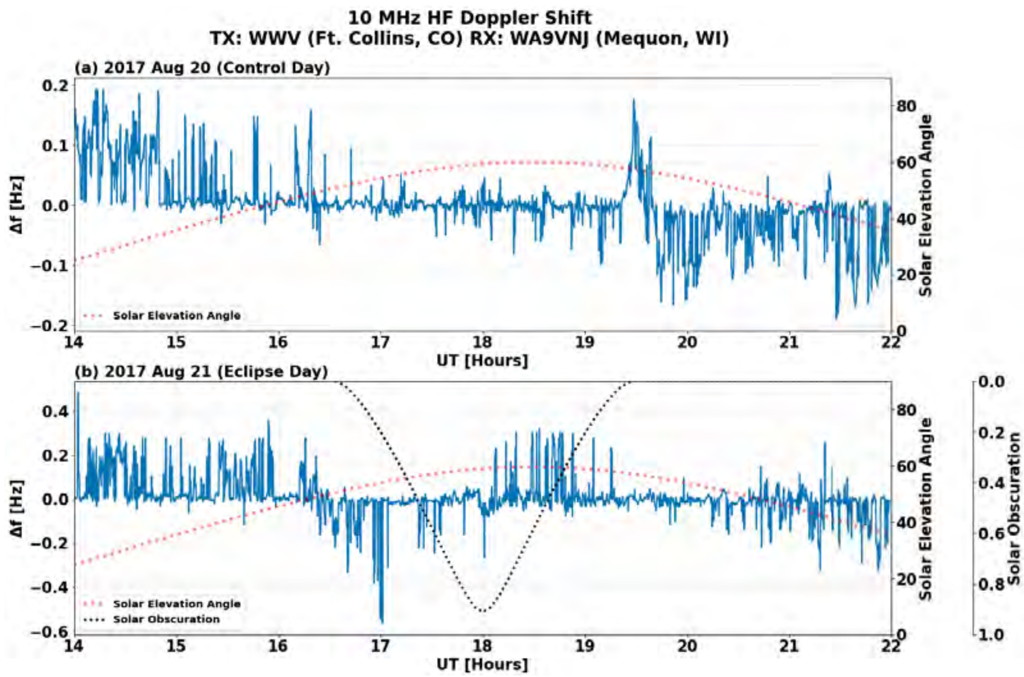
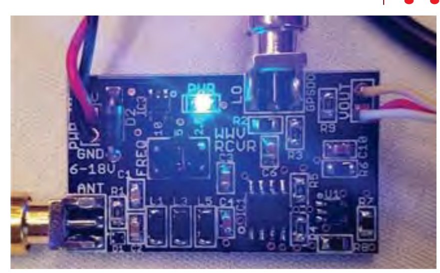
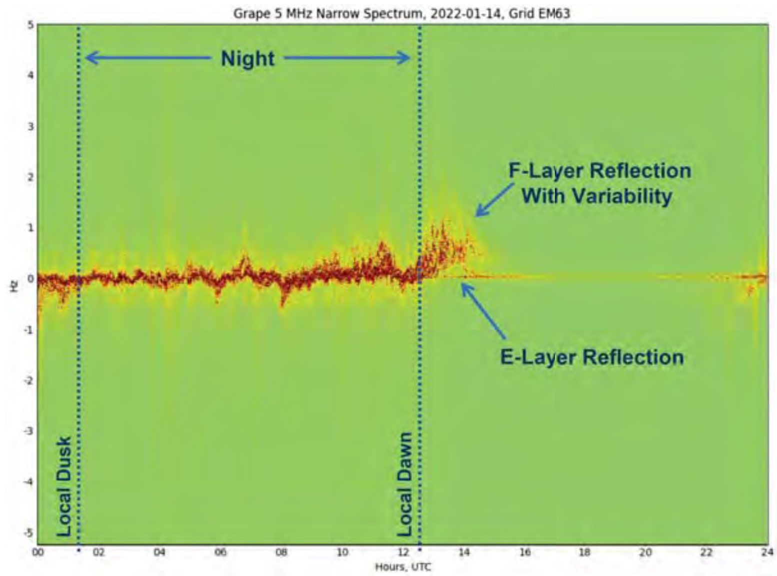


Grape Low-Cost PSWS Status

- **Developed as the "Grape" Receiver by Case Western Reserve University and Case Amateur Radio Club W8EDU.**
- **Primary objective** is to measure Doppler Shift of HF standards stations such as WWV and CHU.
- **Cost of Grape v1 is ~$300 (not including antenna).**
- **Several stations** are currently deployed.
- Grape v1 build documentation is available at hamsci.org/grape1.
- Doppler shift data is collected via spectrographs and frequency estimation algorithms**.**
- Grape V2 will be capable of monitoring 3 HF channels simultaneously.



5 MHz WWV-AB4EJ Doppler Shifts



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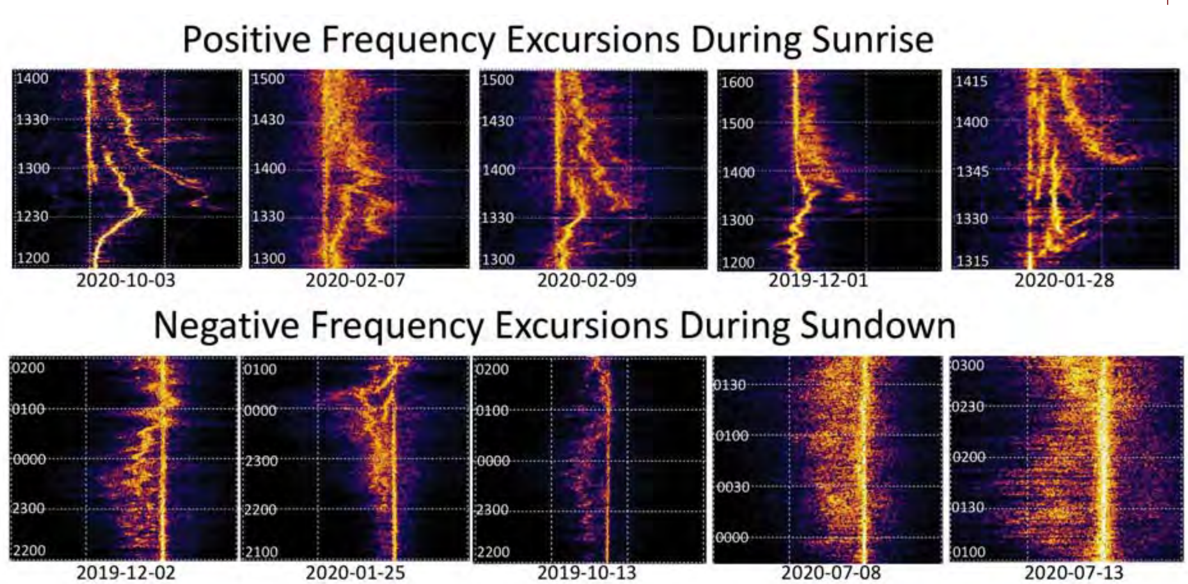
5 MHz WWV-WA5FRF Doppler Shifts



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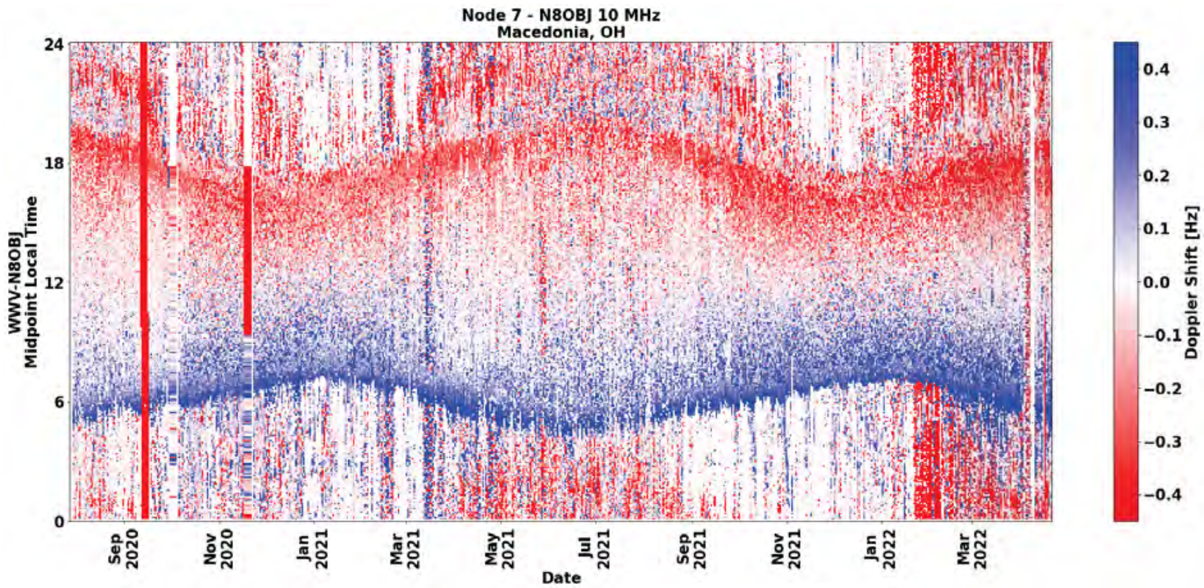
10 MHz WWV-N8OBJ (Cleveland, OH)



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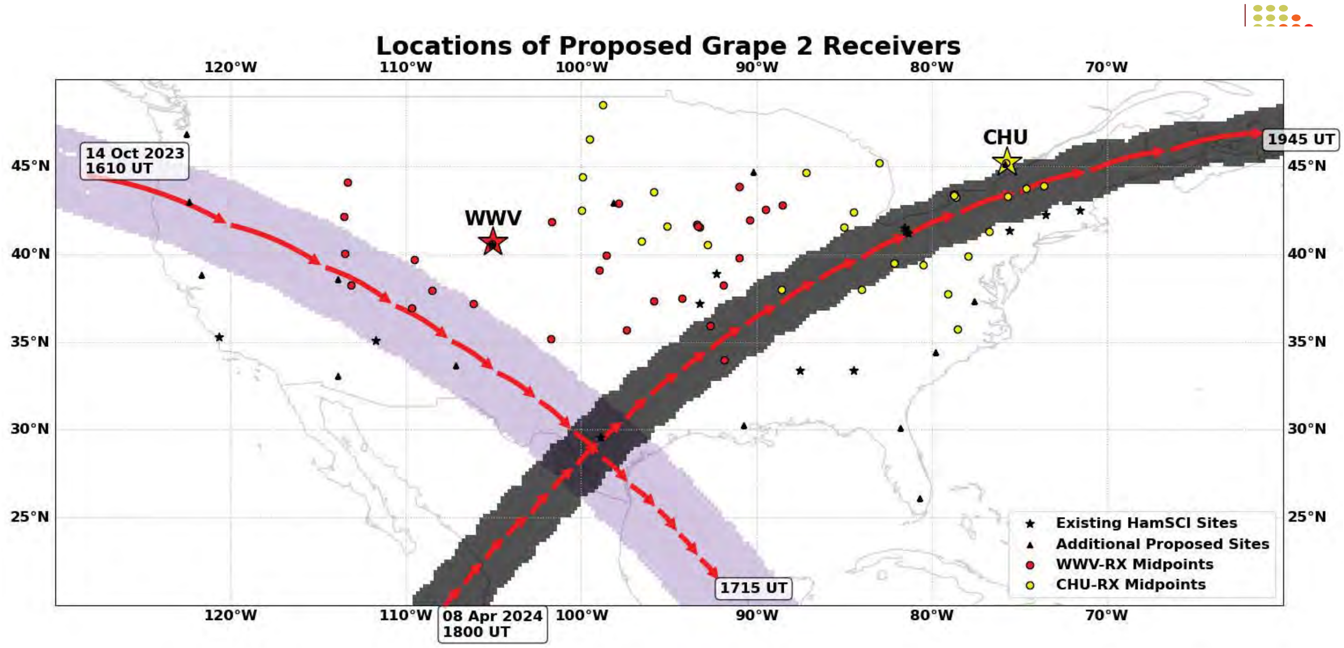

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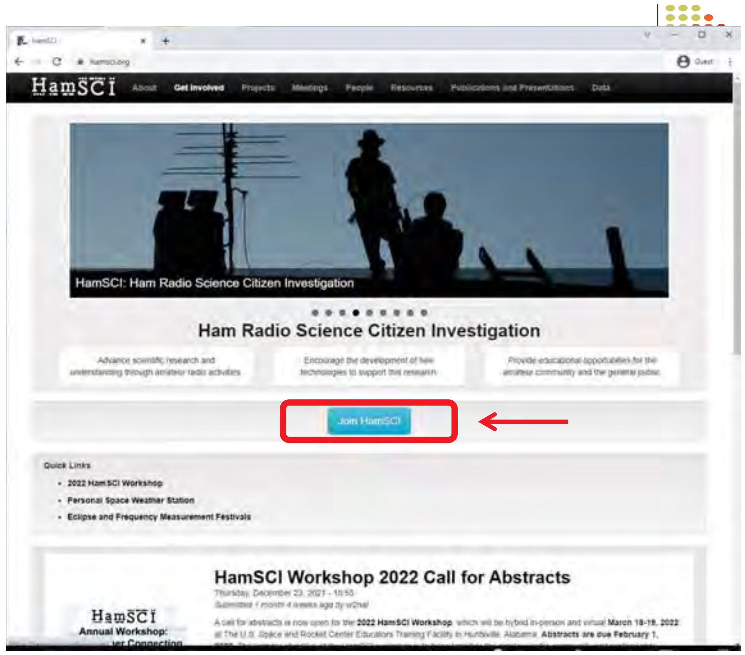
Solar Eclipse Grape Doppler Science Questions

1. How do dawn and dusk ionospheric variability as observed by HF Doppler shift measurements vary with local time, season, latitude, longitude, frequency, distance, and direction from the transmitter?
2. Is eclipse ionospheric response symmetric with regard to onset and recovery timing?
3. How similar is the eclipse to daily dawn and dusk terminator passage?
4. Do we observe multipath HF mode-splitting in the post-eclipse interval that is similar to dawn events?
5. How is the response different for the southward Annular eclipse in 2023 compared to the northward Total eclipse of 2024?

Getting Involved

- **HamSCI now has over 750 members!**
- Join by visiting **hamsci.org**
- Main Google group is open discussion for all things related to HamSCI.
- Many specialized email lists and telecons, too!
- Visit Booth 5008 (with TAPR)!



Visit us in Booth 5008 (with TAPR)!

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Acknowledgments

We are especially grateful for the

- support of NSF Grants AGS-2002278, AGS-1932997, AGS-1932972, AGS-2045755, AGS-2230345, and AGS-2230346.
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- amateur radio community who voluntarily produced and provided the HF radio observations used in this paper, especially the operators of the Reverse Beacon Network (RBN, reversebeacon.net), the Weak Signal Propagation Reporting Network (WSPRNet, wsprnet.org),
  PSKReporter (pskreporter.info) qrz.com, and hamcall.net.
- use of the Free Open Source Software projects used in this analysis: Ubuntu Linux, python (van Rossum, 1995), matplotlib (Hunter, 2007), NumPy (Oliphant, 2007), SciPy (Jones et al., 2001), pandas (McKinney, 2010), xarray (Hoyer & Hamman, 2017), iPython (Pérez & Granger, 2007), and others (e.g., Millman & Aivazis, 2011).

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Tower Safety

Tim Jellison W3YQ/KL7WV

Hazards

- Electrocution
- Structure Failure
- Incapacitation (Don’t climb crank-ups)
- Falls

Safety procedures

- First – check for power lines
- Use a proper harness and lanyards
- 100% Tie-off. NO FREE CLIMBING
- EVERYONE wears a hardhat
- Never "EVER" ride a rope, capstan, hoist

A full-body harness also aids in rescuing you from the tower should that become necessary.

When using a fall arrest lanyard, the tie-off point is critical. Don't trust Rohn cross braces. They're not strong enough.

Snap around the tower leg instead

Plus, you can get a harness with a seat strap. These are the best!!!

Be careful at the top of the tower.
Don't let the lanyard slip over the top.

- If hiring a tower crew, use only certified climbers
- Consider becoming a certified climber yourself
- www.comtrainusa.com
  www.citca4training.com

Open forum and discussion.

And above all, when climbing follow all safety rules!

NO SK’s

CTU Presents

VHF Contest Updates & Questions

Joel Harrison, W5ZN

• CTU •
CONTEST UNIVERSITY

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Impact of FTx in VHF Contests

- Concern expressed regarding declining use of analog modes (SSB/CW)
- CAC VHF+ Subcommittee task to review
- What is the impact of FTx modes on VHF contesting?
- Analyzed contest data both before and after the introduction of FTx modes into VHF contesting

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CAC VHF+ Subcommittee

- K9CT (Chair)
- W0ZQ (V-Chair)
- W2FU
- KK6MC
- N7EPD
- K2UA
- N2CEI
- K2DRH
- K9JK

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Rules Change

- Implement analog-only categories for single operator.
- Approved by CAC
- Approved by PSC
- Implemented by ARRL

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Introduction of FTx in VHF Contesting

- Significant impact both positive and negative
- Increased use use during contests
- Surveyed the VHF contest community
- Conducted extensive “data mining” of VHF contest log records

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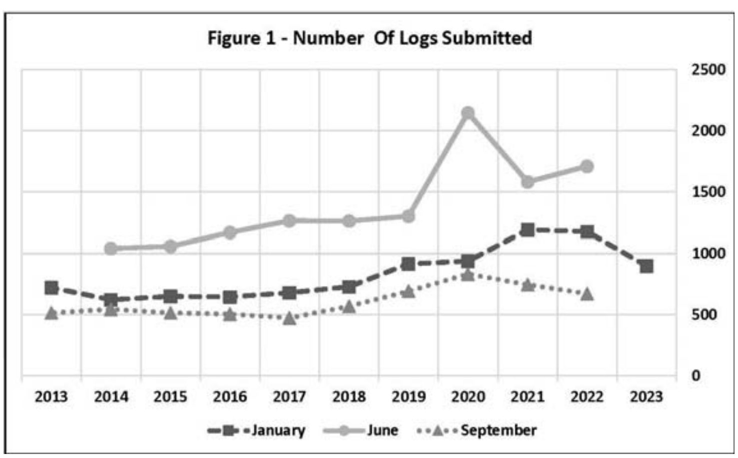
Total Logs Submitted



Beginning 4 years before FTx (2017) and five years after

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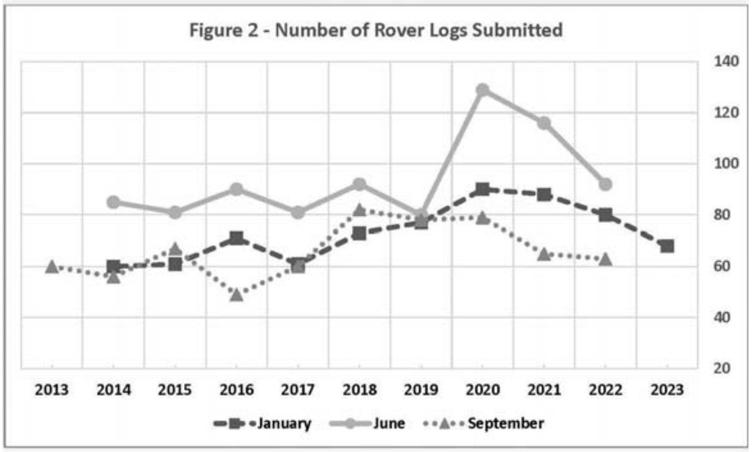
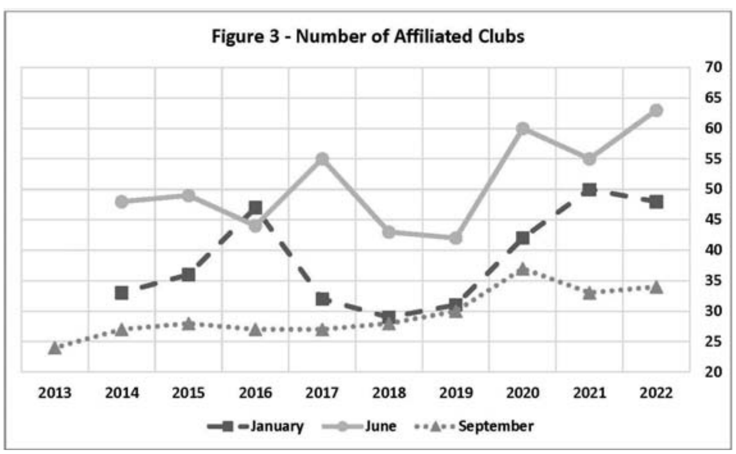
Total Rover Logs



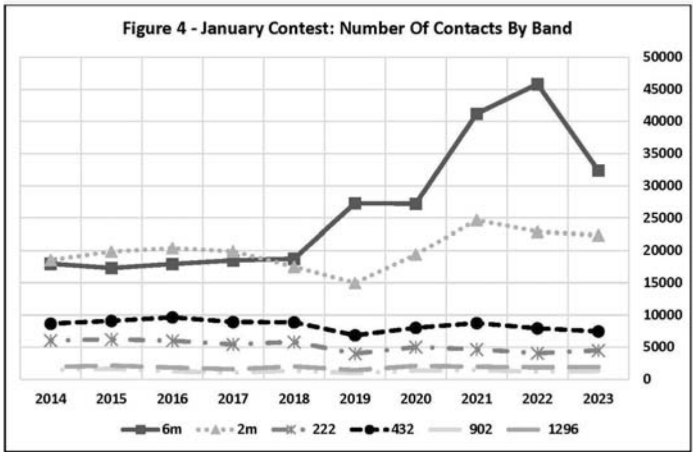
Beginning 4 years before FTx (2017) and five years after

Affiliate Club Logs



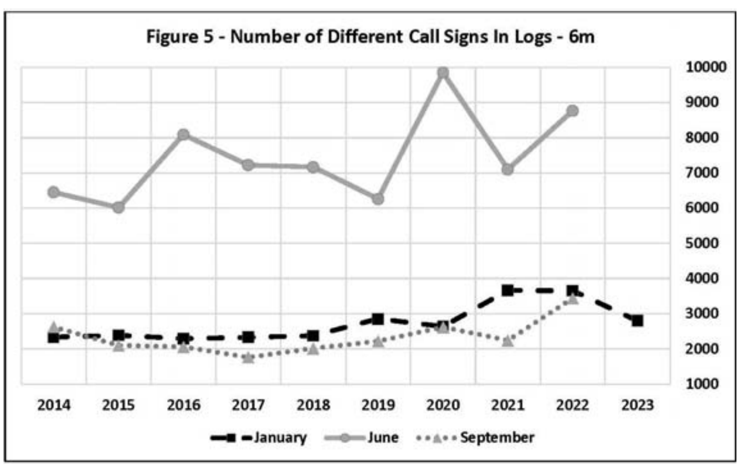
Beginning 4 years before FTx (2017) and five years after

January Contest Number of Contacts by Band



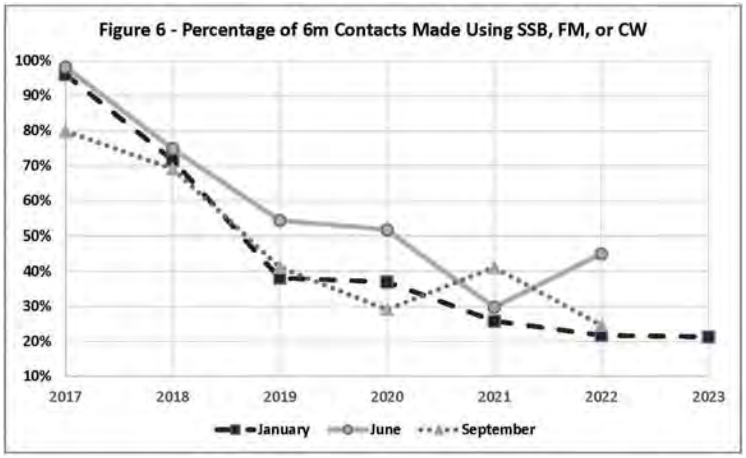
Beginning 4 years before FTx (2017) and five years after

Number of Unique Callsigns in Logs – 6 meters



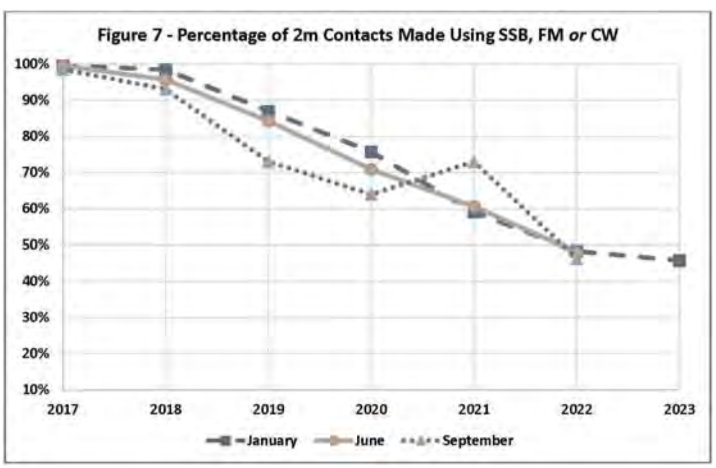
Beginning 4 years before FTx (2017) and five years after

Percentage of 6 meter Contacts Using SSB, CW, FM



Beginning 4 years before FTx (2017) and five years after

Percentage of 2 meter Contacts Using SSB, CW, FM



Beginning 4 years before FTx (2017) and five years after

Rover Logs

RY/DG = Digital QSO's

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Summary

- Number of submitted logs is increasing
- Total QSO's on 6 & 2 Meters has increased
- Total QSO's on 222 MHz has decreased
- Total QSO's on all other bands is flat
- Total submitted logs has increased
- Total rover logs has increased
  - In recent contests about 40% of rovers use digital

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Summary

- There has been an increase in the number of unique callsigns logged
  - Exception: 3456 MHz, 5760 MHz, and 10 GHz
- In recent years 70% of 6 meter contacts and about 40% of 2 meter contacts are digital
- Fewer than 10% of all 222 MHz and 432 MHz contacts were made using digital
  - Trend is increasing though

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Summary

- CAC VHF+ Subcommittee continues to review participation
- Reviewing how new “analog” single op categories are performing

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Discussion

Or

?

Contest University 2023

Transceiver Performance and Selection of a New Radio

Focus on your antenna !
Directivity is a big deal.

Rob Sherwood
NCØB

Consider the overall picture.
It may be more than just a new rig.

Sherwood Engineering

Are you considering a new HF rig?

Goals to emphasize today

- Optimize operation of your current or future rig.
- Net Receiver Gain settings very important !
- When to use a preamp and when to use an attenuator

- New rigs that cost $1600 or less
- IC-7300, FTdx10, FT-710, TS-590SG & IC-705

- Lab measurements to weed out poor choices.
- On-air evaluation is also very helpful.
- Are you locked into one brand?

* RMDR defined in 2012

Defined in QST and *hr magazine* in 1975

What does dynamic range mean?

- When internally generated 3rd order distortion products equal the noise floor of the receiver.
- Can be called “Spurious-free Dynamic Range”.
- Note: For years RMDR* was the practical limit.
- *Reciprocal Mixing (phase noise) Dynamic Range
- FTdx-3000 ARRL DR3 vs RMDR example

20 kHz vs. 2 kHz DR3 values

Dynamic Range with 2 kHz tests

- Wide roofing filter DR3 70 dB is typical
- Narrow roofing filter (Orion II, K3S, 890S, 101D) DR3 is typically 95 to 110 dB
- Direct sampling (Apache, K4, Flex, Icom) no roofing filters, no difference 20 kHz vs 2 kHz
- Direct sampling 100 dB +/- 5 dB any spacing

Top 25 out of 150 radios nc0b.com

Close-in 2-kHz Test @ 500 Hz BW

Dynamic Range of Top 25 HF Transceivers

• Yaesu FTdx-101D	110 dB	
• Yaesu FTdx10	107 dB	
• Yaesu FT-710	107 dB	
• Elecraft K3S	106 dB	
• Icom 7851	105 dB	
• Kenwood TS-890S	105 dB	
• Hilberling PT-8000A	105 dB	
• Elecraft KX3	104 dB	
• Apache 7000DLE	103 dB	
• Elecraft K4	101 dB	
• Yaesu FTdx-5000D	101 dB	
• Flex 6400	100 dB	
• Flex 6600	99 dB	(16 dB preamp ON)
• Flex 6700 (2017)	99 dB	(Preamp OFF)
• Icom 7610	98 dB	(IP+ ON)
• Icom 7300	97 dB	(IP+ ON, S/N around 10,000 and up)
• Flex 5000	96 dB	
• Ten-Tec Orion II	95 dB	
• Ten-Tec Orion I	93 dB	
• Kenwood TS-590SG	92 dB	
• Ten-Tec Eagle	90 dB	
• Flex 6300	89 dB	
• Icom 705	88 dB	(No IP+ ADC linearization)
• TS-990S	87 dB	(RMDR limited close-in)
• Elecraft KX2	86 dB	

You can effectively work DX and Contests with any of these fine transceivers.

New price range $1000 to $12,560+

Used market price even lower !

100 dB radios unheard of of 20 years ago !

I have run contests with 20 of these 25

How do you select a new radio?

- Do you pick one of those top 25 models?
- Married to one brand? Pick $ that fits your budget.

- Price range for new rigs $1000 to $12,560+
- Ergonomics and User Interface (UI) are important

- Quality of Noise Mitigation – NB and NR

- Antennas are more important than the rig model.
- Location, Antennas, Operator Skill, Radio Model

Every ADC needs preamp gain on upper HF bands

Direct Sampling Radio Examples

You need to know your radio

Model	Noise floor no preamp	Dynamic Range
Flex 6600	-111 dBm	99 dB
Elecraft K4	-121 dBm	101 dB
Yaesu FT-710	-127 dBm	106 dB
Apache 7000	-131 dBm	103 dB
Icom 7610	-132 dBm	98 dB
Icom 7300	-133 dBm	97 dB

Up to 22 dB gain differences with no preamp or attenuation.

With the Flex you likely need preamp gain 20m and up.
With the Icom you likely need attenuation on 40m and down.

None of the designs are right or wrong, but they are very different.

You want receiver noise floor 10 dB lower than band noise.
More later when discussing Antenna Noise Gain.

Residential Urban Noise is worse than in this graph

Band Noise vs. Frequency from ARRL Handbook

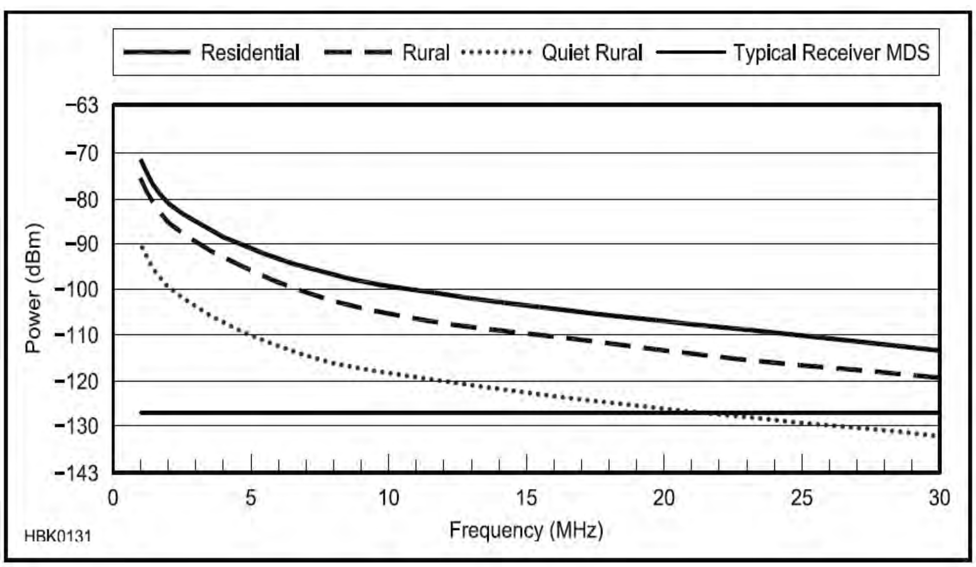

Fig 1 — Typical noise levels versus frequency for various environments. (Man-made noise in a 500-Hz bandwidth, from Rec. ITU-R P.372.7, *Radio Noise*)

Data is with an omnidirectional antenna

How does band noise vary by band?

If we take the ITU rural data as a starting point, what is typical?

160 meters:	-87 dBm *
80 meters:	-93 dBm *
40 meters:	-101 dBm *
20 meters:	-109 dBm #
15 meters:	-114 dBm #
10 meters:	-119 dBm #

That's a 30+ dB difference in band noise

* = nighttime   # = daytime

Beam headings October 20, 2013   9 to 11 AM

Measured band noise at NC0B

Band	20 meters	15 meters	10 meters
0 degrees:	-114 dBm	-124 dBm	-129 dBm
30 degrees:	-113 dBm	-124 dBm	-123 dBm
60 degrees:	-110 dBm	-118 dBm	-120 dBm
90 degrees:	-108 dBm	-114 dBm	-120 dBm
120 degrees:	-107 dBm	-113 dBm	-122 dBm
150 degrees:	-107 dBm	-114 dBm	-122 dBm
180 degrees:	-108 dBm	-114 dBm	-121 dBm
225 degrees:	-109 dBm	-120 dBm	-130 dBm
270 degrees:	-109 dBm	-120 dBm	-130 dBm
315 degrees:	-111 dBm	-122 dBm	-130 dBm
ITU rural value:	-109 dBm	-114 dBm	-119 dBm
Antenna	204BA	155CA	105CA
Height	70 feet	70 feet	65 feet

Typical gain setting mistake

If in doubt turn the preamp ON ?   No

Only use a preamp if necessary. (ARRL DX SSB example)

If an attenuator is ON, you can't copy! Incorrect !

Most radios are too sensitive on 40m and below.

Preamps and attenuators are "tools" to be used when needed, not ON or OFF all the time.

Attenuation may be your RF gain control. (IC-7300)

Misconceptions

If preamp 2 has the lowest noise floor, I should run it all the time.

That is completely incorrect. I'll discuss Antenna Noise Gain.

I purchased an SDR radio since it is digital and it has no noise !

That would be quite an invention, the noiseless radio.

Every radio, superhet, direct sampling or direct conversion has at least 150 dB of gain. It will be divided between analog gain and digital gain, but 150 dB of gain is required to go from -130 dBm to +20 dBm (100 mW of audio).

You can check this by ear but try a meter once.

Antenna Noise Gain

Rig = Icom IC-756 Pro III

6 meter antenna = Ariane C5-50 @ 50 feet

10 meter antenna = Hy-gain 105CA @ 65 feet

15 meter antenna = Hy-gain 155CA @ 70 feet

Preamp	15m	10m	6m
None	4 dB	3 dB*	1 dB
Preamp 1	11.5 dB	9.5 dB	4.5 dB
Preamp 2	13.0 dB	11.0 dB	9.5 dB

* @ 3 dB, receiver noise = band noise = not OK

Rick DJ0IP   Height = Might !

Some Antenna Comments

- Height is very important
- 40 feet or higher vs. 25 feet is a big deal.
- At my QTH 70 feet vs. 40 feet on 20m = 1 to 2 S units.
- Sun spots improving.   More DX 15, 12 & 10m
- Pick horizontal over vertical if at all possible.
- 6 dB ground gain from a horizontal antenna.
- Keep away from house if possible.
- RFI from equipment in your home is an issue.

A step up from a vertical

Optimize your antenna first

- A Yagi at 40 feet vs. a vertical is significant.
- Side and Rear rejection can be 20 dB or more.
- At my QTH 2 Yagis on the same band pointed in different directions sound like two different bands from a QRM standpoint.
- A center-fed 40-foot zepp fed with window ladder line and a balun is broadside on 20m through 10 meters. (Tuner required)
- Know where your RF is pointed !

Didn't I say your antenna is important?

Directive Antennas reduce QRM !

Main Architecture types

Also consider the User Interface (UI)

- Superhet or Direct Sampling architecture
- Most common UI today: Internal LCD or computer screen
- Flex runs on Windows or Apple OS
- Apache runs on Windows only
- Windows updates can "break" things !
- Complication – Computer OS not real-time operating system

- All others are stand-alone embedded operating system
- How you interface with your radio is very personal.
- Let's look at some examples.

Some Rig Price Comparisons

Model	Price	New 2020 / 2022
Elecraft K4D	$5950 (tuner included)	Yes
Yaesu FTdx10	$1400	Yes
Icom IC-705	$1350	Yes
Yaesu FT-710	$1050	Yes
Icom IC-7300	$1000	For comparison
Icom IC-7610	$3250	
FTdx-101D	$3700	Prices as of March 2023
FTdx-101MP	$4900	
TS-890S	$4200	
Flex 6600	$4600	

Comments on Flex

- Preoccupied with a military contract for 2 years.
- That issue is now behind them.
- Focused last 5 years on remote and contesting
- Very few DSP improvements for years
- Some bugs have been around for a very long time.
- Very loyal customer base
- No schematics or documentation published
- Many models currently on backorder
- Maestro an interesting but expensive remote device still on backorder until the fall.

Comments on Apache

- Leading noise mitigation (NB and NR)
- The only brand with pre-distortion splatter reduction.
- A fiddlers delight
- Don’t consider it “plug and play”.
- Not recommended for your first HF transceiver.
- Buy a 100-watt standalone radio (no computer).
- Incomplete documentation on dozens of settings
- OEM makes the radio
- Open Source software runs the radio
- Consider a separate computer for just the radio.

Comments on the IC-7300

- A game changer almost 7 years ago.
- Over 60,000 sold
- Good Dynamic Range
- 7300 operates much like more expensive IC-7610
- Excellent ergonomics and scope display
- Common user interface for all the Icom direct sampling transceivers: 7300, 7610, 9700 & 705
- Added scrolling & re-center feature for these Icom rigs.
- Firmware update summer of 2021

Comments on the Yaesu FT-710

- Yaesu's first direct sampling transceiver
- Similar to IC-7300 but better lab numbers

- Price FT-710: $1050
- Price 7300: $1000
- Price FTdx10: $1400

- User Interface and band scope could be improved.
- Multiple contest evaluations fall of 2022.
  (CQ WW CW, ARRL 160 & 10m)

Comments on the Yaesu FTdx10

- Excellent Lab numbers
- Ergonomics different than the FT-710
- User Interface & band scope could be improved.
- Classic hybrid superhet with roofing filters.
- Both 710 and 10 have an Audio Peak Filter for CW.
- Multiple contest evaluations fall of 2022.
  (ARRL 160 & 10m plus Stew Perry Top Band CW)

Yaesu FTdx10 vs. FT-710

- Sitting in front of both it is as if they were designed by different companies.
- Adjusting filter bandwidth easy on the 10 and not very flexible on the 710.
- The 10 has the volume control on the wrong side of the VFO for right handed people.
- The 710 has less crowded button placement
- Neither of the band scopes and waterfall displays automatically re-center when tuning.

Kenwood TS-590 series

- TS-590SG shipped late 2014
- Excellent overall performer
- Lacks a band scope that is now typical.
- (Can be added with an SDR dongle)
- TS-590S goes back to late 2010
- Reasonable used price option
- Easy User Interface
- I operated both S and SG 160m CW contests several years ago along with T-T Eagle.

Will Kenwood bring out a new rig in 2023?

- The TS-590SG came out in late 2014.
- The TS-890S came out in late 2018.
- TS-890S has the best waterfall in my opinion.
- The HF to UHF TS-2000 discontinued with no replacement.
- That worries me.
- Planned competitor to 7300 & 9700 has never materialized.
- Every new radio in last 7 years has a band scope and waterfall.
- There is a lot of competition against the TS-590SG.

10 watts and a battery

Summits and Parks on the air

- Does operating outdoors interests you?
- Consider the Icom IC-705
- 160 m through 70cm
- SSB, CW, FM, Digital (with a laptop) $1350
- Companion AH-705 single wire tuner $360
- 23 foot single wire plus a radial 40m – 6m
- I worked a 705 POTA new year’s day on 2 meters.
- S9 SSB signal on a mountain 100 miles away

Smaller than a 7300

2.4 pound Icom IC-705

Comments on the IC-705

- For HF, operates much like an IC-7300
- Lots of VHF features
- Excellent ergonomics and scope display
- Common user interface for all the Icom direct sampling transceivers: 7300, 7610, 9700 & now the 705
- Display re-centers when tuning as with the other three.

Comments on the Elecraft K4

- Much of the K3 firmware was ported to the K4.
- Major firmware improvements in the last two years.

- Firmware and features still under development.
- New Beta releases often have new bugs.
- Regression analysis still needs improvement.

- One of the most expensive current mainstream rigs. $6000
- Price increase announced in January not yet published.

- Customer base is likely past K3 owners.
- Lots of brand loyalty and reflector support.
- Note: With a multi-band antenna Sub RX cannot be on a higher band than the main RX due to TX low pass filter in the circuit.

Comments on IC-7610 compared to 7300

- No noisy relays for T/R or amp key line
- Audio Peak Filter (APF) for CW
- Identical dual receivers, DX split or other band
- More physical buttons and larger LCD screen
- Buttons for each band
- Two antenna ports
- Port for external LCD monitor
- Quieter fan
- RX antenna port
- RC-28 tuning knob for Sub RX $300

  (Flex and Elecraft tuning knobs similarly priced)

Don't select a new radio just from one number !

Important factors to consider

- Operator fatigue is made worse by poor receive audio and poor AGC performance.

- NB and NR very important for urban QTHs.
- You might select a radio mainly due to its ability to do noise mitigation.

- Flex may be best for remote operation.
- Apache has PureSignal and great NR & NB.
- Both require an internal or external computer.

Don’t select a new radio just from my chart !

More factors to consider

- Bad ergonomics are frustrating.
- Is speech processor adequate?
- Standalone or Computer Operated?
- Is firmware regularly updated?
- Is warranty service done well and quickly?
- Is the radio supported with parts and service after it is out of production?

- Bottom Line: Do you enjoy using your radio?

http://www.NC0B.com

Sherwood Engineering

Ask for a PDF of this presentation via email.

Email: rob@nc0b.com

Feel free to email questions !

Glossary – by Patrick Barkey, N9RV

10-minute rule

The 10 minute rule restricts band changes for some multi-operator categories for certain contests. The implementation of the rule depends on the contest -- in some cases it has been replaced by a band change rule. The rule was designed to prevent the interleaving of QSO's on different bands for "single" transmitter categories by stations which actually have multiple transmitters on different bands.

Categories: contest specific concept, operating classification,

See Also: Band change rule, MS, M2, rubber clocking

175 mile radius

A geographic requirement for groups of stations jointly submitting their scores as part of the club competition in ARRL contests. In the “unlimited” category of club competition, stations submitting their scores as part of a club for the club competition must either be within a single ARRL section, or within a 175 mile radius of a centroid, to be eligible to contribute their score to the club total.

Categories: contest specific concept, log checking and reporting

See Also:

2BSIQ

Two Band Synchronized Interleaved QSOs. Dual-CQing in a SO2R environment, where a CQ is called alternatively on each radio (typically on separate bands). See Dual-CQ.

Categories: operating technique, operating software/hardware,

See Also: Dual-CQ

3830

The frequency on the 75 meter band where stations congregate at the end of a contest to exchange scores informally. In actual practice, most of this now takes place on internet. The listserv, or reflector, where much of this takes place is called the 3830 reflector. It is hosted by contesting.com. A separate site, 3830scores.com, has comprehensive summaries of (unverified) contest scores reported by participants.

Categories: log checking and reporting

See Also:

4-square

An increasingly common array of four vertical antennas arranged in a square that is electronically steered in four, switchable directions using torroidal or coaxial delay lines. Once used mostly as transmit antennas, particularly on lower frequencies where yagis are not practicable, these arrays are also becoming common as receive antennas. 4-square controllers, which perform the switching, are both homebrew and commercially available.

Categories: station hardware

See Also: Receive antennas

ADIF

Amateur Data Interchange Format. A transport format for contest logs used for inporting/exporting files between different logging software and other programs. Similar in function to Cabrillo.

Categories: operating software/hardware

See Also:

AFSK

Audio Frequency Shift Keying is a RTTY mode where two audio tones are fed into the Mic or auxiliary audio input to the SSB transmitter to create the two RTTY RF frequencies.

Categories: general

See Also:

Assisted

Assisted is an "overlay" category that is interpreted in most contests as meaning that use of spotting information delivered from internet or packet radio based networks which give real-time information on frequencies and call signs of stations in the contest is allowed. It is a single operator overlay -- most multi-operator categories already allow spotting assistance.

Categories: operating classification

See Also: SOA, unassisted

Band change rule

A rule which restricts band changes for certain multi-operator categories in some contests. A band change rule says that a station can, say, only make 8 band changes per hour. Note that moving to a band to work something, and then returning counts as two band changes.

Categories: contest specific concept

See Also: 10-minute rule, MS, M2

Band Decoder

A band decoder either operates through hardware or software to switch station hardware (e.g., antennas, filters) based upon the band selection of the radio. They are a fundamental part of most top tier stations.

Categories: station hardware

See Also:

Band Edge

The band edge generally refers to the lowest (or highest) frequency in the band where one can legally operate within the limits of his/her license. For US operators, for example, this would be approximately 21200.4, say, for 15 (USB), but

would be about 7127 or so for 40 (LSB). The reverse is true for the upper band edge – e.g., on USB on 15 meters the practical limit for transmit frequency is approximately 21448. The lower band edge is sometimes desirable for US operators who are running since QRM from other W stations can only be on one side of your signal.

Categories: operating technique, ethics,

See Also:

Band Map

A graphical, real time display of stations arranged by frequency presented by most popular contest software. The map is either populated by telnet/packet spots from clusters and skimmers, and/or may be filled in using data entered by the user. Most software allows users to then click on stations on the map to be taken directly to the frequency the station is reported to be on. Stations listed on the map are color coded – with new multipliers distinctly noted. (Stations previously worked may not be listed at all). The accuracy of these maps is only as good as the data used to construct it – errors in callsigns are frequently encountered. Use of band maps (or packet/telnet and skimmer spots) are not permitted for Single Operator Unassisted categories.

Categories: operating software/hardware

See Also:

Beacon

Fixed, automated transmitters which transmit signals (typically CW) continuously to allow operators to check propagation. These transmitters are located around the globe and on HF are mostly found on bands such as 10 meters above 28.1 mHz. They typically use low power and omni-directional antennas. It can be good operating strategy to tune to these stations during contests to learn when propagation might support QSO's even if activity and thus stations in the contest are not heard

Categories: operating techniques

See Also: RBN

Bip/Bop

A hardware switching arrangement for stacked yagis or other all driven antenna arrays that allows the operator to select both in phase (BIP) or both out of phase (BOP) operation. The latter can be dramatically better for very high angles of radiation..

Categories: station hardware

See Also: Stack, yagi, phasing

Blind skimmer

A mode of operation for a CW skimmer that disables the decoding of callsigns as well as the integration with internet spots. In this blind mode, the operator only sees (potentially) a waterfall display showing recent historical activity across the band as with a panadaptor. Blind mode is legal for single operator, unassisted entrants in most major contests.

Categories: contesting hardware/software

See Also: Skimmer, panadapater, spots, SOAB, SOA

Breakdown

The disaggregation of one's contest score into QSO's and multipliers worked, usually separately tallied for each band (or even additionally, for each hour).

Categories: log checking and reporting

See Also:

Buffers

To account for latency and jitter, most systems allow for an amount of 'buffering' or 'storing up' packets as they arrive, so that a momentary big swing in either latency or jitter won't interrupt the flow of conversation. Too many buffers introduces extra time and can make transmit / turnaround times grow to be an annoyance in contest situations

Categories: remote radio

See Also: Latency, jitter

Bust

A bust is a QSO that is incorrect in some way -- the callsign or exchange was inaccurately recorded. May also refer to spots which are incorrect.

Categories: log checking and reporting, ethics,

See Also: Spot

Cabrillo

Cabrillo is a very flexible and generalized computer file format that is supported for score reporting by all modern contest software. Most contests have moved to require that electronic log submissions provide contest logs in this format. In most cases contest software will do this automatically.

Categories: log checking and reporting

See Also:

Category

A contest category is the classification defined by the contest rules that you choose to enter when you run the contest. Specific category definitions depend on the rules of the contest, but common examples would be single operator all band or multi-operator (with one or more transmitters).

Categories: operating classification, log checking and reporting

See Also: Category shopping

Category Shopping

The practice of deciding which category to submit your contest score in after the contest is over, and after information on (claimed) scores of potential competitors is public. The purpose of category shopping is to attempt to win a plaque or other recognition in a category that was less competitive than the category that was actually selected in advance. This could be done, say, by claiming SOA when no assistance was used, or even by claiming multi-operator when only one operator was present. This practice is unethical and contrary to the spirit of competition.

Categories: ethics, log checking and reporting

See Also: SOA

Check

A two digit number that corresponds to the first year that you obtained your ham radio license. The check is part of the exchange in the ARRL SS contest. Multi-operator stations use the same check regardless of who is operating.

Categories: contest specific concept

See Also: Exchange

Cheerleading

Describes the practice of a station or group of stations actively supporting the operation of a specific competitor. This could be by, say, spotting the competitor's CQs on spotting networks, coordinating to find and call the station (as a group) to attempt to enhance their score, or passing along multiplier information, etc. Such practices are unethical and, in many cases, cause for disqualification. They have been known to occur in WRTC events and constitute a serious threat to the integrity of those competitions.

Categories: ethics

See Also: Spot, WRTC

Check Log

A category for log submissions which removes the entrant from any competition or score listing. Instead, the log information is submitted solely for log checking purposes by the contest sponsor.

Categories: operating classification

See Also:

Claimed Score

The contest score that is computed before any deductions for incorrectly logged information (conducted after the contestant submits the log to the contest sponsor) take place.

Categories: log checking and reporting

See Also:

Cluster

A legacy term that once referred to the packet radio networks that supported the exchange of real-time spotting information (announcements of calls on specific frequencies). Since the software that made this possible was PacketCluster, written by AK1A, the use of any spotting network is still call using the "cluster," even though the software and the use of packet radio are no longer used.

Categories: operating software/hardware, operating technique

See Also: assisted, RBN

CODEC

CODE then DECODE. This is the software that puts audio from an analog form into a digital form, and reverses the process on the other end of a link. It is how we send audio over the internet. Without this, VOIP would not be possible.

Categories: remote radio

See Also: VO IP

Cty.dat

Cty.dat, or sometimes wl_cty.dat, also known as a "country file." is the computer file containing the lookup information that translates prefixes of callsigns into country and/or zone multipliers. Software would use this file, say, to tell you that N9RV counts as a W, and is in CQ zone 4 (or ITU zone 6). Since worldwide prefixes are frequently in a state of flux, an up-to-date country file is always desirable. More recent country files also contain data that may help determine a station'szone. Such information can be inaccurate and in all cases operators should gather such information from the contest exchanges themselves.

Categories: operating software/hardware

See Also: Mult, Exchange

Deadline

The latest day that logs can be submitted to the contest sponsor to be included in the competition.

Categories: log checking and reporting

See Also:

Digital Voice Keyer

Hardware which digitally records one's voice for CQ's, contest exchanges and other frequently spoken information. The recording is played back using keystrokes defined by software (or by pushing a button for a stand alone box), thus saving the operator the fatigue of doing it manually. Most modern software uses computer sound cards for this purpose. Older software used specially designed cards (e.g., the DVP by K1EA, the W9XT card) or even a stand alone box.

Categories: operating software/hardware

See Also:

Distributed Multiop

A multi-operator (and often multi-transmitter) category where the stations and antennas are physically distant from each other, linked by internet, competing as a single entry using a single call sign. This category has been allowed for headquarters stations in the IARU contest for many years – otherwise it is generally against contest rules that require all antennas/radios to be in one location. Social distancing and Covid have persuaded more contesting sponsors to allow it.

Categories: operating classification

See Also: M2, MS, MM, Headquarters Station

DNS

Domain Name Service or Server. Since humans find it easier to remember names rather than a 12 digit number, we have created names for addresses. The Domain Name Servers keep track of the mapping of names to IP Addresses and provide the number when you put in a 'name', i.e. www.google.com

Categories: remote radio

See Also: IP address, dynamic DNS

DQ

Disqualifaction (DQ) is the disallowal of a contest entry by the sponsor of the contest, for serious rule violations. DQ is a serious step, which can have ramifications for WRTC eligibility and participation in future contests.

Categories: log checking and reporting

See Also: Red card, yellow card

Dual-CQ

Dual-Cqing (or dueling CQ's) is supported by some contest software in a SO2R environment, where a CQ is called alternatively on each radio (typically on separate bands). It adds complexity, but can increase your transmitted presence and has led to significant score increases for some top competitors.. Some have labelled this operating technique with the more complicated moniker "2BSIQ," which stands for Two Band Synchronized Interleaved QSOs.

Categories: operating technique, operating software/hardware,

See Also: 2BSIQ

Dummy CQ

A dummy CQ is a CQ sent out by a SO2R station as a means of holding a frequency (e.g., discouraging others who might start Cqing themselves).   Although it sounds just like any ordinary CQ, in a dummy CQ scenario the SO2R station is not prepared to answer responding stations until his/her QSO on the other radio is completed.

Categories: operating technique, operating software/hardware,

See Also: SO2R, dual-CQ

Dupe

A dupe is a second contact with a station that does not count for additional points. Most contest software will inform you whether or not a station is a "dupe" so you don't waste time working it.

Categories: log checking and reporting

See Also:

Dynamic DNS service

This is a service provided to keep track of your current Dynamic IP address. Since your IP address can change at any time, it's easiest to come up with a name, then have the system keep track of your current IP number. The largest is www.dyn.com – and your router will have an option to communicate with it.

Categories: remote radio

See Also: IP address, router, DNS

Dynamic IP address

Your ISP provides your IP Address on a random basis. As the pool of numbers is limited, they recycle them. This number is assigned to your internet Modem or Router.

Categories: remote radio

See Also: ISP, IP address, router, fixed IP address

ESM Mode

Enter Sends Message mode. A concept for logging software that uses the Enter key on the keyboard to accomplish multiple tasks, depending on the context. While this is implemented differently in specific software, the general concept allows the user to press the Enter key at different stages to, say, start a CQ message, respond to a call by sending the exchange, or send one's own call, depending on the context in which the key is pressed. If a program does not enable ESM mode, then pressing a specific key always produces the same result.

Categories: operating software/hardware

See Also:

Exchange

The information that is passed between stations in a contest (in addition to the call sign). In the CQ WW, for example, the exchange is RST and the two digit CQ zone number.

Categories: contest specific concept, operating software/hardware,

See Also:

Firmware

Computer code that controls a device. The code is generally resident in a chip, and can be updated using whatever communications protocols are set up for this purpose. Many contesting devices are now microprocessor controlled, and the ability to update firmware (generally made available by the manufacturer but sometimes customizable by the user) can greatly add to the capabilities and functionality of the device. The Elecraft K3 tranceiver, for example, has a rich and vibrant community developing new firmware to improve its operation.

Categories: station hardware

See Also:

Fishing Boats

Refers to the SSB QRM found in the CW segment of the HF bands (especially 40 meters) caused by the unlicensed, illegal activity centered in southeast Asia thought to be prevalent among fishing boats in the region.

Categories: general

See Also:

Fixed IP Address

For an extra fee, you may be able to have your IP Address not change. This makes connecting to your device easier since it's number never changes.

Categories: remote radio

See Also: IP address

Flutter

A propagation phenomenon that is characterized by very rapid QSB (fading signal strength), often accompanied by Doppler shift in frequency, which can produce a warbling tone on CW. Signals displaying flutter are most often associated with paths that travel close to or through the auroral zones around each pole of the globe, but during periods of high auroral disturbances flutter can affect almost all signals. For this reason the presence of flutter on a signal gives a useful clue for the callsign of a (possibly weak) station.

Categories: general, operating technique

See Also:

FSK

Frequency Shift Keying is a RTTY mode where the transmitter is keyed directly, similar to CW.

Categories: general

See Also:

FT8

One of the more recently developed (and rapidly evolving) digital communications modes that have exploded in popularity for both HF and VHF. While not yet a contest mode, its increasing use makes it only a matter of time before competition is implemented. Has its origins in the extremely weak signal mode WSJT originally designed by Joe Taylor, K1JT, for use with exotic propagation modes such as moonbounce. Has the ability to "read" – the human ear is not involved – signals at lower signal to noise ratios than many humans can detect using CW or SSB.

Categories: general

See Also:

Gab

Gab is a feature of many contest software packages that allows computers setup at different operating positions in a multi-operator station to send and receive messages at the keyboard to/from each other.

Categories: operating software/hardware

See Also:

Gab file

Gab file is the record of gab messages recorded by the software during the contest.

Categories: operating software/hardware

See Also:

Gas

A derogatory term that refers to running more transmitter power than is allowed by the terms of your radio license. Some contests (e.g., the CQ WW) limit transmitter power to a maximum of 1500W output no matter what the rules for one's country say. Similes include soup, smoke, or "active" antenna tuners.

Categories: ethics

See Also:

Golden Log

A log which survives the contest sponsor's log checking process with zero errors and no change to its claimed score. A golden log is the mark of a careful and skillful operator.

Categories: log checking and reporting

See Also:

Gray Line

The gray line, or daylight/darkness terminator, is a constantly moving circle around the earth where a daylight/darkness transition is taking place. When this circle is over your QTH, potentially enhanced propagation along the terminator is possible, especially on lower frequencies. The timing and potential for gray line propagation depend on a number of predictable (season of the year) and unpredictable (solar conditions) factors. Gray line QSO's can produce new multipliers and/or memorable contest experiences.

Categories: general, operating technique

See Also: Long path

Grid Square

An alphanumeric geographical coordinate system, based on the Maidenhead Locator System developed by VHF enthusiasts in 1980, in which the entire globe is divided into equal-sized rectangles which are denoted by alphanumeric codes. E.g., the four digit grid square for N9RV (western Montana) is DN36. Four (or more) digit grid squares have found increasing popularity as contest exchanges, particularly for VHF contests, as they offer both an increased challenge for successfully completing contest QSOs with accuracy, as well as giving universal location information for all countries/states.

Categories: contest specific concept

See Also: Exchange, http://en.wikipedia.org/wiki/Maidenhead_Locator_System

Great Circle

The bearing between two points on the globe which minimizes the physical distance is known as a great circle bearing. Thus the great circle bearing for working, say, India from the central U.S. is approximately due north. Great circle bearings can vary considerably from what might be suggested from the Mercator projection maps posted in most grade schools. During most openings on HF, great circle bearings are optimal for directional antennas. Long path (180 degrees different) or skew path (aiming towards the equator) are less frequent, but sometimes better, strategies for aiming antennas.

Categories: general

See Also:

Headquarters Station

A special designation in the IARU contest held in July that involves IARU member societies in each country fielding multi-operator, multi-transmitter operations that often involve special calls and multiple station locations (as a distributed multiop). They are especially popular in Europe, where competition between each country's HQ stations is intense. HQ stations count as multipliers in the contest itself, which increases the interest in their operations.

Categories: operating category

See Also: Distributed multiop, mult

IP address

The Internet Protocol uses numbers as addresses to find machines on the internet. It is analogous to a telephone number

Categories: remote radio

See Also: UDP, IP address

ISP

Internet Service Provider. This is the company that provides your connection to the internet.

Categories: remote radio

See Also: IP address

Jitter

This is the change of the latency over time. It is a particular problem on radio remote control, as the difference in latency can make it difficult to adjust the system which has settings to account for latency. If it changes a lot, you will probably experience some audio dropouts.

Categories: remote radio

See Also: Latency

K3

A popular HF transceiver available from Elecraft that is used by many contesters.

Categories: station hardware

See Also:

Key Clicks

W8JI defines keyclicks as “off-frequency sidebands heard when there is no trace of tone (w8ji.com)”. They effectively, and illegally, increase the frequency footprint of a CW signal, since the tone-less clicks of the signal will desense receivers and make copying on adjacent frequencies difficult. Many modern radios continue to be produced that exhibit unacceptable levels of key clicks.

Categories: operating software/hardware

See Also: SO2R

Keyboard focus

An attribute of contest software that controls more than one radio at a time. Keyboard focus is the particular radio that your keyboard is entering information for. This is the “active radio” for purposes of logging. If the software is well designed, keyboard focus will flow naturally between radios as the situation requires. In a two radio situation where radio 1 is on 40 meters and radio 2 is on 20 meters, while your radio 2 is CQing your keyboard focus should probably be on radio 1, and vice versa.

Categories: operating software/hardware

See Also: SO2R

LAN

Local Area Network. This refers to any device that is attached to your router, in your home system. Via wired or wireless connections, that is your local network

Categories: remote radio

See Also: Router, WAN

Latency

All of this travel between 2 machines over the internet takes time, and the time delay in internet parlance is referred to as latency

Categories: remote radio

See Also: WAN

LCR

An acronym for Log Checking Report. A report from the contest sponsor to each individual competitor that details the scoring adjustments to their submitted contest log, reflecting dupes, busted calls, NIL’s and other errors. The LCR is very useful as a means of improving your accuracy in future contests.

Categories: general, ethics,

See Also: Bust, dupe, NIL

Lid

A lid, generally, is someone whose operating behavior shows a lack of awareness, competence or consideration for other amateurs.

Categories: general, ethics,

See Also:

Lockout

A means of preventing two transmitters from keying or transmitting simultaneously. A hardware lockout accomplishes this task by inhibiting the transmit/key line on the different radios with a lockout circuit. A software lockout does the same thing using software. This prevents the station from violating the rules of the contest. E.g., it could prevent a multi/multi station from having more than one transmitted signal on the same band, or it might prevent a single operator station from transmitting simultaneously on multiple bands.

Categories: operating software/hardware, ethics

See Also:

Long Path

A situation where HF propagation exists between two stations in the inverse direction of the great circle heading. “Beaming long path” means pointing your antenna 180 degrees different from the “short path,” or great circle heading, for a particular station. Long path propagation, for example, might allow a North Carolina station to work a station in Hong Kong on 10 meters in the morning by beaming southeast. Depending on the season of the year and the propagation on any particular day, this can be an extremely effective event in a DX contest, allowing for long distance QSOs not possible during short path openings. Gray line QSOs, for instance, are frequently long path. Learning and checking the long path openings, in terms of times, bands and geographies, from your QTH can be very valuable for increasing your multipliers and contest scores in DX contests.

Categories: general, operating technique

See Also: Gray line, skew path

M2

Shorthand for the multi-operator, two-transmitter category offered in some contests. This is a relatively new category that was intended to allow greater flexibility that older single transmitter categories, but with less hardware requirements than the open ended multi transmitter category.

Categories: operating classification

See Also: MS, MM

Master.dta

The master.dta, or "master database" file is a collection of so-called "known good calls" -- e.g., call signs of stations that have been worked in previous contests. It can be used as an operating aid with most contest software to suggest complete calls when only partial information is copied over the air.

Categories: operating software/hardware

See Also:

MOAS

The “mother of all switches” is a project by K1XM and others in theYankee Clipper Contest Club to produce a flexible and powerful switching board to handle a variety of layouts of multiple radios, transmitting antennas, receiving antennas and amplifier interconnections.

Categories: operating software/hardware

See Also:

MM

The multi-operator, multi-transmitter category involves an unlimited number of operators and transmitters, with only one transmitted signal allowed per band.

Categories: operating classification

See Also: M2, MS

Morse Runner

Contest simulation software developed by VE3NEA that faithfully presents users with many aspects of actual CW contesting, including pileups, QRM and band noise.

Categories: operating software/hardware

See Also: Pileup

Moving Multipliers

An operating technique where one asks over the air for a station who is a multiplier (e.g., a new country, state or section) to move (QSY) to a different band so that an additional multiplier can be added to one's score. To be done successfully, there must be propagation between the stations on the new band, and the asking station must be able to move quickly. It is not good contest etiquette to ask a CQ-ing station with a pileup to move bands, but even rare DX that comes back to your own CQ's is fair game for this technique. For contests like SS and WPX that only count multipliers once (instead of once per band) this does not apply.

Categories: operating technique

See Also:

MS

The multi-operator, single-transmitter category found in many contests has evolved to have different definitions in individual contests. Once understood as a "one transmitted signal" category, its exceptions and specific band change rules make it among the most complex, yet most popular, categories.

Categories: operating classification

See Also: 10-minute rule, band change rule

Mult

Most, but not all, contests compute the final score as the product of (i) QSO points and (ii) a tally of zones, countries, prefixes or other unique characteristics. Since they impact the score multiplicatively, this second item is called the multiplier. For example, in the SS contest, the multiplier is the number of unique ARRL sections worked (maximum of 80). Thus when a new (e.g., unique) section is worked, it has a greater impact on the final

Categories: contest specific concept, operating technique,

See Also:

Mult station

The station in a multi-transmitter environment that is working only mulitpliers -- new countries, zones, or prefixes, depending on the contest. This usually entails tuning and answering others who are calling CQ.

Categories: contest specific concept

See Also: S&P, Run station

Multiplier

See the discussion under mult above.

Multiplier Bell

A frequently used motivational device for multioperator contests. The sound of a bell going off in a room of operators when a new multiplier is worked by one of them manning different radios is familiar to many successful multi-operator stations.

Categories: operating technique

See Also:

NCJ

National Contest Journal. A bi-monthly magazine devoted to contesting published by the ARRL. NCJ was originally begun by a group of independent contesters (the first editor was K0TO) in the 1970s, and is responsible for the introduction and growth of the popular Sprint and North American QSO Party contests.

Categories: general

See Also: Sprint

NIL

Not-in-log. A deduction made by the contest sponsor that refers to the situation where a contact claimed by one station is not confirmed by a record in the second station's log. In most cases an NIL results for you when there is nothing even "close" to your call in the other station's log at the time you claimed the contact.

Categories: log checking and reporting

See Also:

Off-by-1

A "one off" call is a call that differs by one character -- W9RV, N7RV, and N9RE are all one off calls for N9RV.

Categories: log checking and reporting

See Also: SCP

Over the Horizon (OTH) Radar

High power radar systems deployed in the HF spectrum that can cause broadband, intense interference to contest and other communications. Recently OTH radar QRM has been particularly bad on 40 meters, and occurs when there is propagation over the north pole.

Categories: general

See Also:

Off-time

Off-time is the amount of time during the contest period that a station is off the air -- no listening or transmitting taking place. Some contests (e.g., Worked All Europe, ARRL SS) require that single operator entrants take a minimum amount of off time. Off time lengths are usually restricted to a minimum block size (30 minutes in SS, for example).

Categories: contest specific concept, operating technique,

See Also: Rubber clocking

Online scoreboard

A web site that delivers real-time score information of participants in a contest, such as those at cqcontest.net . In most cases these scoreboards are designed to seamlessly interface with contest software at participating stations so that one can see at a glance the relative standings of the competitors in any category. Participation in live scoreboards is gaining popularity, but some have questioned whether or not the use of such information during a contest is consistent with unassisted operation.

Categories: operating hardware/software

See Also: Unassisted

Overlay categories

Refers to contest classifications that co-exist with, or overlay, other classifications. Examples might be the "rookie" overlay that is restricted to new contesters, or restricted time overlays (e.g., 24 or 12 hours). A contest overlay category creates a subcategory within a "base" category (which is usually a single operator category). In the CQ WPX contest, for example, one might enter the "tribander/wires" or "youth" overlay category and thus compete for plaques and certificates within that subcategory. Not all contests offer overlay categories, see the rules for the specific contest.

Categories: operating classification

See Also: Single operator

Packet

Packet originally referred to packet radio spotting networks, which were an application of (typically) VHF packet radio networks that were created in the late 1980's as a means of exchanging real-time spot information during contests. The rise of high speed internet since that time has caused almost all of these networks to migrate to the net, greatly increasing their speed and scope. Although no real connection to packet radio networks still exists, the term "packet" has survived, referring to spotting networks in general

Categories: operating software/hardware, operating technique

See Also: spot

Panadaptor

A band scope that displays signals on a band visually, usually as a line or area graph, allowing for a view of activity across an entire band at once. The display show signal strength on the vertical axis and frequency on the horizontal, and is sometimes combined with a waterfall display which presents a brief historical view of activity on a frequency instead of an instantaneous view. This can be a stand alone piece of hardware, integrated into a radio, or software produced by a product like a skimmer.

Categories: contesting hardware/software

See Also: Skimmer

Partial

Partial calls are bits and pieces of full callsigns. They contain valuable information but cannot be logged until they are complete.

Categories: operating software/hardware, operating technique,

See Also: SCP, Super Check

Pass

Passing is an action where a station worked on one band is requested to QSY to a second band, typically in order to obtain additional multiplier credit. Proper contest etiquette holds that only stations who respond to your CQ can be passed -- it is not good manners to ask a station who has established his or her own running frequency to QSY to another band.

Categories: operating technique, operating software/hardware,

See Also:

Penalty

Penalties are additional deductions made for unverified or inaccurate information submitted as part of one's claimed score. For example, a NIL in the ARRL SS contest results in the loss of the claimed QSO as well as an additional penalty QSO deducted. Penalties and other score reductions are incurred by all contest competitors, both new and experienced, and are generally nothing to be ashamed or fearful of. Part of contest competition is acquiring operating habits that minimize these deductions.

Categories: log checking and reporting

See Also:

Phasing

Refers to the relationship between the waveforms of two signals, typically of equal frequency. In-phase, or zero degree phasing, refers to waveforms that are exactly coincident. Out-of-phase, or 180 degree phasing is where the high point of one signal occurs at the low point of a second signal's cycle. Used as a verb, this generally refers to methods or hardware of adjusting the phase, often with transmit or receive antenna systems. "Phased" verticals, for instance, are antennas that use delay lines or other methods to adjust the phase relationship between the antennas to optimize their directivity and performance.

Categories: station hardware

See Also: Stack, yagi, receive antenna

Pileup

Multiple stations calling a CQing station at the same time. Modest pileups are concentrated on a single frequency. Rare DX might result in a pileup that is spread out across multiple frequencies. The skill of picking calls out of a pileup, or alternatively, successfully breaking through a pileup to get a CQing station to respond to your call, is a critical contest skill.

Categories: operating technique

See Also:

Poaching

Poaching is when a third station strays onto the frequency of a station who is running in order to make contact with one of the responding stations. If N9RV is running stations on 14024, say, and you attempt to call one of the stations that he has just worked, you are poaching. As the term implies, this is aggressive and unethical contest.

Categories: operating technique, operating software/hardware, ethics

See Also:

Point and shoot

Also known as point and click. A refinement of the search and pounce operating method which is supported by most major logging software programs. With this method, the operator clicks on calls presented in a window on the monitor, so that the frequency of the radio is immediately changed to the frequency of the call which is listed. Thus one may quickly hop around the band, each time landing on the frequency of a CQing station who can be called. The technique is only allowed for operating categories which allow access to packet/internet spotting networks. The technique, while very attractive, has two major difficulties: (i) calls which are spotted may be incorrect – unless one independently verifies the call one runs a very high risk of incurring penalties for busted QSOs, and (ii) when dozens or hundreds of stations in a contest use this technique simultaneously, it results in big pileups calling on exactly the same frequency, which are hard for CQing stations to disentangle.

Categories: operating technique, operating hardware/software

See Also: S&P, spot, bust, skimmer

Points per q

The number of QSO points that any particular contest contact contributes. In some contests, for example the NA Sprint or ARRL SS, the points per QSO is constant. Most DX contests employ points per q rules that give more credit for contacts outside your continent. Some give zero points for contacts within your own country.

Categories: contest specific concept, operating technique,

See Also:

Prec

Part of the exchange in the ARRL SS contest. It consists of a single letter, once soley based upon your transmitter power: Q = 5 watts or lower, A = 5-100 watts, B = more than 100 watts. Recently additional Prec's were added for multi-operator and assisted categories. See rules for ARRL SS contest.

Categories: contest specific concept

See Also: Exchange

Port

All internet traffic travels to the IP address of your home, which all comes to your router. Once it arrives, it has to ‘announce’ what type of service it is for… some is for a Web Page, another type is for VOIP, or control of a device such as a remote radio setup. Each type of service has been assigned a ‘number’ which gets sent to the device that is handling the particular service of the packet. The word ‘port’ has been given to this ‘service type’.

Categories: remote radio

See Also: IP address, Router, VOIP

Port forwarding

Once a piece of traffic arrives at your router, it may or may not need to be ‘forwarded’ to a particular device on your LAN, the devices in your home. For REMOTE CONTROL, this will be a particular PC or Device, such as a RemoteRig box. The router needs instructions on where to send a ‘packet’ depending on which device on your LAN is handlng that ‘Port’.

Categories: remote radio

See Also: Router, LAN, TCP/IP, Port

Prefill

Prefill refers to the features of some software packages which automatically fill in exchange information based upon information obtained either before or during the contest. Prefill software might enter "Pat" in the name field for the NA Sprint, for example, if you work N9RV, either based upon previous contests, or based on working N9RV on a different band in the current contest. If the prefill information is different from what the station actually changes, of course, it is up to the operator to manually correct it.

Categories: operating software/hardware, operating technique,

See Also: Exchange

Prefix

The portion of a callsign that contains the beginning of the all, up to, and including, the number. The prefix of N9RV is N9. The prefix of 3DA0X is 3DA0. Prefixes count as multipliers in some contests – e.g,, the WPX contest. In most cases, prefixes also reveal the geographical location of the station as well.

Categories: general

See Also: mult

QRP

QRP in contesting is generally where one's maximum output power is no more than 5 watts. In many contests, power is an overlay category. E.g., you can be QRP and SOAB.

Categories: operating classification

See Also: Category, overlay category

Q-signals

A three letter code beginning with the letter Q. In theory, each code has a slighly different meaning when used with a ? appended. ARRL and other groups publish the codes and their text meaning. In contesting only a few of these codes are used, sometimes in ways that have evolved from their "official" meaning.

Categories: general

See Also:

Qso b4

QSO b4 is the CW message sent to tell responding stations that they have been worked for point credit previously in the contest and no second QSO is necessary/desirable.

Categories: operating technique

See Also: Dupe

Rate

Rate refers to the speed of making contest QSOs. It is typically measured in QSOs per hour, even when the time span referred to is longer or shorter than 60 minutes. E.g., if N9RV's 10 minute rate is 70.4, it means that if he continued to make QSOs at the same rate for 60 minutes as he just made in the last 10, he would have 70.4 QSOs in the log. The rate statistics provided by most contest software give valuable information on operating

Categories: operating technique, operating software/hardware,

See Also:

RBN

Reverse Beacon Network is a internet-based network of dedicated wide band receivers around the world which decode CW signals in real time and generate "spots" which contain frequency, signal strength and other information. The effect is that of a traditional beacon in reverse – instead of checking propagation by tuning one's receiver to a transmitting beacon at a particular frequency, one merely transmits (usually by calling CQ on CW) while connected to a RBN to see which of the receivers on the network hears you.

Categories: operating software/hardware

See Also: Spot, skimmer, skimmer network, beacon

RDF

Receiving Directivity Factor is a measure of receiving antenna performance which compares the forward gain of an antenna at the desired azimuth and elevation grade to its average gain over the entire hemisphere (thanks W3LPL for this definition).

Categories: station hardware

See Also: Receive antenna, receive diversity

Receive Antenna

Generally refers to an antenna that is used for receive purposes only – e.g., not the same as the transmitting antenna. These include specialized antennas, such as loops, short verticals, pennants or beverages. Receive antennas can be used singly or in combination – e.g., fed into separate receivers simultaneously – the latter is used for what is known as diversity reception. Most modern receivers allow for this. Receive antennas are often non-resonant, and are of particular advantage on lower frequencies to improve directivity and the signal to noise ratio.

Categories: station hardware

See Also: 4-square

Receive Diversity

The practice of using two antennas, each feeding a separate receiver locked onto the same frequency, to better capture a weak signal. This frequently is an advantage due to the differences in polarization, wave angle, noise susceptibility and other characteristics of propagation at any time. Receive diversity is especially important on the low bands where signal to noise ratios are low. Common practice feeds the audio from each receiver into a separate ear.

Categories: station hardware

See Also: Receive antenna, RDF

Reflector

When referring to an antenna, or specifically, a yagi or quad antenna, the reflector is the parasitic (e.g., not fed with coax) element of the antenna that lies behind (opposite the side of maximum radition) the driven element (the one that receives power directly from the transmitter). The reflector can also refer to an internet-based repository of contest-related postings that contesters have used for decades to exchange information and stories. When people refer to the "contest reflector," they generally refer to the service hosted at the web site www.contesting.com. The term reflector is used because email from contributors is "reflected" to the many subscribers by software at the site.

Categories: station hardware, ethics

See Also: Remote receiver

Remote Operation

This generally describes a situation where the physical location of the transmitter/receiver is different from that of the controlling operator. This can be supported by software that allows receiver audio and other information to be sent to a remote computer (possibly located thousands of miles away) that also controls transmit, rotor, and other station functions. Contest and DX rules are still evolving on the validity of this configuration. Most seem to allow remote operation as long as the transmitters and antennas are in a single physical location.

Categories: station hardware, ethics

See Also: Remote receiver

Remote Receiver

A receiver that is remote (e.g., not at the physical location of the station/transmitter) that is accessed using the internet. The ease with which remote receivers can be accessed (many are open to the public) has grown rapidly, creating opportunities for both entertainment ("I wonder what I sound like in Europe") as well as cheating ("it would be nice to be able to figure out who's calling me"). Remote receivers are not allowed in most contests. Exceptions are certain categories of the Stew Perry and CQ 160 contests, which place limits on how far away they can be located from the main station.

Categories: station hardware, ethics

See Also: Remote operation

Robot

The contest robot, or simply "robot," refers to the automated process that examines contest logs that are submitted to contest sponsors (either via email or a web page) for proper syntax and formatting. Most contest robots will "bounce," or reject with error messages, logs which fail to conform to the proper Cabrillo format, fail to include required information, or which contain other errors.

Categories: log checking and reporting

See Also: Cabrillo

Router

The internet works by sending 'packets' across the house or around the world using 'routes'. It hands off a packet with a destination address to its nearest 'neighbor' router, and it then has instructions of how to reach the destination. Sometimes there can be a dozen or more 'routers' involved in reaching the ultimate destination.

Categories: remote radio

See Also: WAN, TCP/IP

Rover

A rover is a mobile station that travels during a contest to activate multiple geographic locations (typically grid squares) during the course of a contest. Rover stations are especially common in VHF contests, and often involve sophisticated setups that can activate multiple bands as well as high profile (elevation) locations. Rovers can make the contest more fun for everyone by making more multipliers available and thus adding to contest scores. The so-called "captive" rover refers to a rover whose express purpose is to work only a single competitor. The ethics of this variant to the rover concept is dubious at best.

Categories: operating classification, ethics

See Also:

Rubber Clocking

A slang term used to refer to the adjusting of times in the contest log to make QSOs appear to conform to the rules of a category and contest. This includes, for example, to make reported off-times in time-limited contests such as the ARRL SS conform to rules that require them to be at least 30 minutes in length, or making times of QSOs appear to obey the 10-minute rule for multi-operator categories in DX contests. Such changes are unethical and not allowed by contest rules and are grounds for disqualification.

Categories: ethics, log checking and reporting, contest specific concept

See Also: DQ, 10-minute rule

Run

Running refers to staying on one frequency and calling CQ to solicit new contacts. Running may, or may not, be the fastest way to make QSOs and/or build your score at any given time. Whether or not to run is a fundamental decision made during the entire duration of a contest.

Categories: operating technique

See Also: Run station

Run station

The station in a multi-transmitter environment that is "running" stations -- e.g., calling CQ and taking all who respond

Categories: contest specific concept

See Also: Running

S&P

Search & Pounce is the operating method where one tunes a band and responds to other stations who are running (e.g., calling CQ). The "traditional" tuning by spinning the receiver knob has been augmented by contest software that allows one to jump instantly to a spot frequency (for categories which allow this) and more recently through the use of panadaptors and other visual displays that allow operators to jump to a frequency based on visual

Categories: operating technique

See Also: Spot, point and shoot

Schedule

Schedules are advance arrangements to make QSO's with specific stations at specific frequencies and times. Schedules are often made during a contest to try to work additional multipliers on times and frequencies when propagation is favorable. E.g., N9RV may work NH2T on 15 meters at 0100z and set up a schedule for 40 meters on 7030 kHz at 0700z. When 0700z rolls around, if NH2T and N9RV remember to go to 7030 kHz and they hear each other, a new QSO (which may be a new multiplier for one or both) can be made. Schedules made on the air during the contest can be an important and effective contest tactic. Schedules made via non-amateur means (e.g, email) and/or schedules made before the contest starts are not allowed by most contest rules. Even if rules do not explicitly forbid it, such practices are not considered ethical and should be avoided.

Categories: operating technique, ethics

See Also: mult

Sec

Abbreviation for ARRL section. Loosely corresponds to US states and Canadian provinces, but larger entities (e.g., NY or California) are divided, resulting in a total of 80 sections. Sections count as multipliers for some ARRL contests.

Categories: contest specific concept

See Also: Mult

SDR

Software Defined Receiver. An SDR performs many of the basic functions of a receiver (e.g., mixing, filtering, demodulation) in the digital realm using a personal computer or other dedicated microprocessor device, instead of the analog, special purpose hardware built into conventional receivers. Commercial SDR receivers, both sophisticated and simple/inexpensive, have been available commercially for many years, and their popularity has grown.

Categories: station hardware

See Also:

Self Spotting

The practice of using internet spotting networks or other means to spot yourself – e.g., to announce what frequency you are CQ-ing on in an attempt to attract others to call you. This has always been considered unethical behavior and is generally banned by contest rules, but there are exceptions. In ARRL VHF contests self-spotting has been permitted since 2015. The ARRL has announced that self-spotting will be allowed beginning in 2023 for the ARRL DX contests, but this remains controversial and may be reconsidered.

Categories: operating technique, ethics

See Also: Spot

Serial Number

A counter that begins at 1 for the first contest QSO, and increments by 1 for each successive contact. The serial number is part of the exchange for some contests (e.g., the CQ WPX, the Worked All Europe contest).

Categories: contest specific concept

See Also: Exchange

Single-Band

Competitors in the single band categories restrict their competitive efforts to one frequency band (e.g., 40 or 20). In some contests they are allowed to make contacts on other bands, but only their "single" band QSOs count towards their score.

Categories: operating classification

See Also:

Single Operator

A contest category where one person performs all operating and logging during the contest. It is frequently abbreviated SO, forming the root for acronyms such as SOAB (single operator all band) and SOA (single operator assisted).

Categories: category

See Also: SOA

Six-Pack

A six pack is a relay controlled matrix coax switch with two inputs and six outputs. It is used by many stations who use SO2R as a means of allowing either station to have access to any antenna. Newer variants of matrix switches allow for more than six outputs, but the term has stuck.

Categories: station hardware

See Also:

Skew Path

A propagation phenomenon where the ionosphere does not support direct-line propagation (along a great circle heading) between two stations, but contacts can be made by aiming closer to the equator (due east or west) so that the path is skewed, so that the first hops travelling in a more southerly direction (for northern hemisphere stations). For a North American station, for example, a skew path opening to Japan might make signals peak due west or even south of west. Skew path openings can take place at frequencies below the MUF, or maximum usable frequency, between two points on the globe, which is often the case under poor propagation conditions. Turning your antenna to explore skew path propagation is a very useful technique that can make a previously inaudible signal suddenly appear and make a QSO possible.

Categories: general, operating technique

See Also:

Skimmer

A CW Skimmer is a product developed by VE3NEA which combines a CW code reader with a broadband receiver, providing real time spotting information without the use of a spotting network.

Categories: station hardware, operating software/hardware, ethics

See Also: Skimmer network

Skimmer Network

The global network of internet-connected skimmer stations which continuously copy and post call sign, frequency information and signal strength data for ever station they decode (CW and digital modes). The data stream can be used in real time by a variety of applications and contest programs to allow "point and shoot" operating during contests. Note that unassisted categories are not allowed to access skimmer networks.

Categories: station hardware, operating software/hardware, operating technique, ethics

See Also: Skimmer, point and shoot

SO1R

Single operator single radio is not a formal category in most contests, but describes the less complex hardware/software setup where the operator tunes and transmits on one radio at a time.

Categories: operating classification, operating technique,

See Also:

Snow/rain static

QRN caused by electrically charged precipitation hitting antennas. Low antennas and quads are usually less susceptible than high yagis.

Categories: general

See Also:

SO2R

Single operator two radio operation involves using audio feeds from two radios simultaneously (but with only one transmitted signal at a time allowed), which enables an operator to tune and listen on a second radio (usually on a second band) while the primary radio is transmitting.

Categories: operating classification, operating technique,

See Also: Dual-CQ, Dummy CQ

SO2R Controller

A homebrew or commercially made accessory which automates the switching of station peripherals (e.g., headphone audio, key paddle input, microphone) between two radios to enable more effective and efficient two radio operation. These accessories typically integrate with contest software to manage two radio operation as seamlessly as possible.

Categories: station hardware, operating software/hardware

See Also: SO2R

SOA

Single operator assisted is a single operator category where packet/internet spotting assistance is allowed (see Assisted).

Categories: operating classification

See Also: Single operator, assisted

SOAB

Single operator all band is an operating category common to most contests. In most contests, packet/internet spotting assistance is not allowed, but the WAE and some other contests allow it. Due to the popularity of internet assistance, and the difficulty in detecting the (intentional or unintentional) use of this assistance by contest sponsors judging the results, this situation is changing. This category is sometimes referred to as "SOAB Classic" to reflect its legacy to the pre-spotting era. In all cases a single person is responsible for all operating and logging during the contest.

Categories: operating classification

See Also:

SOHP

Single operator high power refers to a SOAB, SOA, or SOSB station that runs more than 100 watts output from the transmitter.

Categories: operating classification

See Also:

SOLP

Single operator low power is a single operator who runs a maximum of 100 watts output.

Categories: operating classification

See Also:

SOQRP

Single operator QRP stations run a maximum of 5 watts from the transmitter.

Categories: operating classification

See Also:

SOSB

Single operator single band is a single operator station who operates a single band. It also may mean unassisted, although this is ambiguous.

Categories: operating classification

See Also:

SOU

Single operator unlimited is used interchangeably with single operator assisted as described above. Unfortunately, both terms "unlimited" and "assisted" have connotations (especially when translated frorm English) that are inconsistent with their intended meaning. They both are supposed to denote a single operator who receives spotting assistance via packet radio or internet.

Categories: operating classification

See Also: SOA, Assisted

SPG

Single point ground is a lightning protection practice that physically binds all of the entry wiring into a house/shack to a single ground -- e.g., RF, AC power, water pipes, telephone.

Categories: station hardware

See Also:

Split

Describes the situation where a CQing station is listening on a frequency that is different from his/her transmit frequency.

Categories: operating classification, operating technique,

See Also:

Sporadic E

Propagation that utilizes the E layer of the ionosphere. Since this layer is inconsistently ionized and is lower than the F layers that support more reliable HF propagation, such propagation is more rare. When it occurs (usually in the summer months) it can support long distance QSOs especially on 10 and 6 meters.

Categories: general

See Also:

Spot

A spot generally refers to a posting of information on the frequency and callsign of a station in the contest, usually received from an internet or packet radio network.

Categories: operating software/hardware, operating technique,

See Also: Assisted

Spot filtering

The process of screening spots to restrict them to the desired geography, frequency range, operating mode or other criteria. This can be accomplished in different ways – either by configuring the RBN node you connect to to receive spots (preferred) to restrict what is sent to you, or by configuring your contest software to only display spots that you wish to see. Spot filtering is useful as a way of showing only the information that is relevant.

Categories: operating software/hardware, operating technique,

See Also: Assisted

Sprint

A short contest that emphasizes frequency agility. The original Sprint contest is the North American Sprint, held in February and September of each year, sponsored by the National Contest Journal. The most unique aspect of Sprint contests is the QSY rule – when a CQing station receives a response, they must QSY and leave the frequency to the calling station at the end of the QSO. Thus sprint contests do not allow the "running" of stations on a single frequency that is characteristic of most other contests.

Categories: operating classification, operating technique,

See Also:

Stack

A stack generally refers to two or more yagi antennas which are pointed in the same direction, aligned vertically on a tower or mast, and fed (typically) in phase to increase gain and better control the take-off angle of the antenna system's forward lobe.

Categories: station hardware

See Also: Bip/Bop

SteppIR

A commercially manufacturer yagi which works on multiple bands. The antenna elements consist of hollow fiberglass tubes which support a conductive ribbon that is adjusted in length with microprocessor controlled motors.

Categories: station hardware

See Also Yagi

Stub

Coaxial stubs are specific lengths of coax (generally, but not always, integer multiple of a quarter wavelength on the design frequency) which are used as impedance transformers for matching, attenuation, or other purposes. In a multi-transmitter environment, stubs are frequently used to reduce inter-station interference by nulling harmonics or other kinds of frequency passing/rejection.

Categories: station hardware

See Also:

Super Check Partial

A legacy term from the original K1EA contest software, abbreviated SCP. When SCP is active in contest software, typing a few characters in the callsign entry field brings up a list of known contest calls from a database that match what is typed. The "super" in the term refers to the use of an external database – check partial checks the partial in the existing log. Most software now extends the concept to offer callsigns that are "one off" of the callsign typed.

Categories: operating software/hardware

See Also: Partial, unique+1

SWL

A station that only listens and does not transmit. This may be because the operator is not licensed to transmit. There is a long tradition of short wave listening (SWL) enthusiasts who compete for awards in a manner very much like amateur radio.

Categories: general

See Also:

TCP/IP

Transmission Control Protocol / Internet Protocol. This is how the internet does what it does. Developed by the Department of Defense in the 1970's to communicate between defense sites, it has grown into what we call The Internet. It delivers 'packets' of information, using an address, from one point on the network to another, which is now worldwide.

Categories: remote radio

See Also: UDP, IP address

UBN

An acronym for "unique, bad, not-in-log" which became slang for a log checking report.

Categories: log checking and reporting

See Also: LCR

UDP

Uniform Datagram Packet. The type of packet used to control a remote radio and send audio. These provide the fastest transmission time between 2 points. No error correction and highest priority. The other type you will see in nomenclature is TCP. This is an 'error corrected' packet, and one which can take a 'back seat' to other VIP packets. Not good for 'real time' applications.

Categories: remote radio

See Also: TCP/IP

Unassisted

Unassisted is the opposite of assisted, in that the use of spotting information delivered from internet or packet radio networks that is allowed in the latter is not allowed. It is a single operator overlay -- most multi-operator categories already allow spotting assistance.

Categories: operating classification

See Also: Assisted, SOA

Unique

A claimed contact that is unique to all of the submitted logs in a particular contest. Such calls are much more likely to have been incorrectly copied.

Categories: log checking and reporting

See Also:

Unique+1

A unique+1 is a call that is (i) "one off" from a unique call and (ii) is a call of someone who was active in the contest. If you claimed contact with N9RU, and no one else in the contest worked N9RU, it is a unique. If N9RV was active in the contest, that is a unique+1. (N9RD might also be a U+1 if he was active).

Categories: log checking and reporting

See Also:

Unlimited

Unlimited means the same as assisted -- e.g., spotting network assistance is allowed.

Categories: operating classification

See Also: Assisted, SOA, SOU

VOIP

Voice Over Internet Protocol. Audio travels over the internet using this technique.

Categories: remote radio

See Also: TCP/IP, IP address

WAN

Wide Area Network. This refers to the network beyond your router, outside of your home. In general, this can be called the internet.

Categories: remote radio

See Also: Router

Waterfall Display

A useful mode of a panadaptor which gives an animated depiction of band activity over the chosen frequency range. In a waterfall display, received signals show up as solid points at a spot on a horizontal display that indicates their frequency. The pattern of the points gives visual information about what kind of signal it is – e.g., a carrier, a station sending CW or some other mode.

Categories: station hardware

See Also: Panadaptor

WRTC

World Radio Team Championship. Begun in 1990 at the World Cup Games in Seattle, the WRTC is a unique competition that occurs approximately every four years in July coincident with the IARU contest. WRTC assembles the competitors – two-person teams drawn from the top operators worldwide – in a single physical area, using identical antennas and power levels, to present a more level playing field in the competition. WRTC's have been held on three continents and in five different countries. WRTC 2023 will be held in Italy.

Categories: general

See Also:

WWROF

The World Wide Radio Operators Foundation is an independent organization committed to supporting radio contesting worldwide.

Categories: general

See Also:

WWYC

Worldwide Young Contesters. An international, internet-based club of young contesters established in 1999 by a group of young European contesters, which is (sadly) rather dormant at the moment.

Categories: general

See Also:

Yagi

A directional antenna typically consisting of a dipole element that is directly fed by the transmitter and a number of closely spaced "parasitic," or indirectly energized, elements which re-radiate RF energy to produce a directional pattern.

Categories: station hardware

See Also: reflector

Zero Beat

When one CW signal is on exactly the same frequency as another they are said to be zero beat. In CW pileups, signals that are zero beat can be difficult to distinguish. Such pileups often occur when those calling have clicked on spots from skimmers or other packet announcements, thus all landing on the exact same frequency and creating a zero beat pileup. It is often a good strategy to call slightly above or below the spotted frequency for this reason.

Categories: operating technique

See Also: spot, skimmer, pileup

The primary mission of the Northern California DX Foundation (NCDXF) is to provide necessary financial support for well-organized DXpeditions to the rarest, most difficult, most expensive DXCC entities and to support advance in DXpeditioning skills, technology, and infrastructure. We do this with funds contributed by DXers worldwide.

Beginning in 2013, NCDXF made a decision to use some of our funds to help bring younger DXers and Contesters into our hobby, by providing full-tuition scholarships for hams less than 25 years of age at Contest University sessions held in Dayton each year.

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