·CTU·
CONTEST UNIVERSITY

Dayton Contest University
May 17, 2018
Crowne Plaza Hotel
Dayton, Ohio

DX Engineering can supply you with what you need to stay competitive, including advice from serious Amateur Operators, access to great gear, and the fastest shipping in the industry.

Trim Coaxial Cable the Easy Way!

Whether you are preparing 8U/213 or 8X sized cables for installing crimp-on PL-259, N Type or BNC connectors, you'll find these tools convenient and easy to use. These tools prepare cables for DX Engineering and select Amphenol Connex® crimp shield connectors. They are not designed for solder-on connectors. For a complete set of these fine tools, order our DXE-UT-KIT-CC1 Complete Coax Crimp Connector Prep Tool Kit! It provides all four cutters, two cable grippers, 10 replacement blades, coax shears, and a precision braid trimmer. The kit also includes a convenient carrying case to keep your tools handy and organized!

HF Multiplexers and Band-Pass Filters

Use Low Band Systems' Multiplexers to connect multiple radios to a single multi-band antenna, so you can use each radio to operate on a different band simultaneously. This reduces equipment installation hassles and saves money since there's no need for extra antennas and coax cable.

The multiplexers work with Low Band Systems' multi-stage band-pass filters to limit the RF to a single band, effectively eliminating most RF interference issues. Sold separately, the filters deliver the isolation demanded by the multiplexer's band input.

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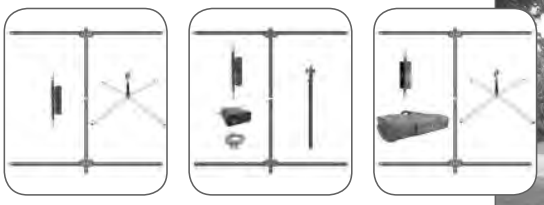
Hi-Z's high performance components work exceptionally well in high-RF fields and are perfect for contesting (or if you've got a powerful AM broadcast station nearby). The compact arrays won't take up a lot of space on your lot. Hi-Z offers a complete line of Array Systems, Preamps, Filters and Transformers.

NCC-2 Receive Antenna Variable Phasing System

The NCC-2 now combines the NCC-1 Phase Controller and our RTR-1A Receive Antenna Interface technologies into one box. It also has enhanced balance functionality, expanding its ability to phase between two different types of antennas. This is a handy feature if you've got space constraints on your property. We've also made it easier (and more economical) to expand the NCC-2's versatility by providing internal slots for modules like the new plug-in versions of our Receiver Guard 5000HD and RPA-2 preamplifier. **DXE-NCC-2**



TransWorld Antenna Packages

The famed TransWorld Antenna is small and portable, yet offers exceptional performance. DX Engineering has purchased TW Antennas to ensure the TransWorld Antenna will continue to be available as a DX Engineering product. We've bundled them together in packages based on different operating setups.

Active Magnetic Loop MF/HF Receive Antenna

The well-known RF-PRO-1B® is now manufactured and sold by DX Engineering. This design incorporates a high performance preamplifier for excellent broadband reception from 50 kHz to 30 MHz. Installation is easy, because it's only 38 inches in diameter. When rotated, this antenna provides deep nulls for effective reduction of directional noise and interfering signals. Ideal for Amateurs, SWLs and AM DXers, this loop also offers up to 30 dB rejection of electrostatic field noise. **DXE-RF-PRO-1B**

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The **World Wide Radio Operators Foundation** was created in 2009 by a group of experienced radio operators who saw a need for an independent organization devoted to the skill and art of radio operating. Until now, many of the elements of modern radio contest operating 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 of amateur radio operators around the world, 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
- Stewards 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

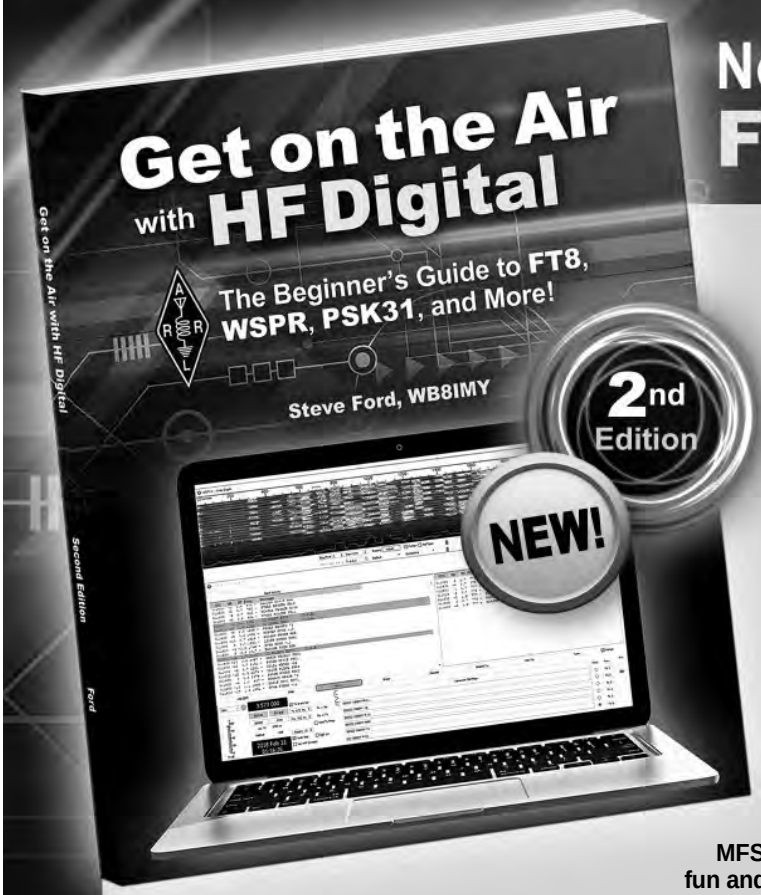
John Dorr, K1AR, Chair
Tim Duffy, K3LR, Vice-Chair
Ralph Bowen, N5RZ, Treasurer
Tom Lee, K8AZ, Secretary
Doug Grant, K1DG, Founding Director
Mark Beckwith, N5OT, Founding Director
Bob Cox, K3EST, Founding Director
John Sluymer, VE3EJ, Director
Tine Brajnik, S50A, Director
Randy Thompson, K5ZD, Director
Dennis Motschenbacher, K7BV

Donate

Can you imagine contesting without electronic logs? Sophisticated log checking software? Certificates for winners? 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



Now Includes Modes FT8 and WSPR!

The popularity of HF digital communications among Amateur Radio operators continues to grow rapidly. A few watts of RF power are all it takes to work the world—digitally!

Fully updated, the second edition of *Get on the Air with HF Digital* **written by popular author, Steve Ford, WB8IMY, is a step-by-step guide that'll get you started in the fascinating world of HF digital technology. Written in an easy to understand style, this book will show you how to set up and operate your own HF digital station. Includes instructions for configuring software programs for popular modes such as PSK31, RTTY, FT8 and JT65. You'll also learn about other digital communication modes such as MFSK, Olivia, PACTOR, and WSPR. It's a fun and easy way for beginners to** *get on the air!*

Includes:

- Let's Build an HF Digital Station — **An HF digital station boils down to three essential pieces: a radio, a computer and a device that ties them together.**
- PSK31 — **Enjoy text chats throughout the world with low power and minimal antennas.**
- RTTY — **RTTY may be an old operating mode, but it's still the champ when it comes to contesting and DX hunting.**
- The "WSJT Modes:" FT8 and JT65 — **You'll be astonished at how low you can go with FT8 and JT65. High power and big antennas are definitely not required!**
- MFSK and Olivia — **With these two modes you'll still be chatting when all the others have given up.**
- PACTOR — **When your message absolutely must get through error free, PACTOR is a great way to go.**
- WSPR — **Transmissions are strictly one-way, but the results are fascinating!**

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∘ CTU ∘
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May 17, 2018
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Dayton, Ohio USA

First Edition

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Welcome

On behalf of the CTU Board of Directors K1DG, N9JA and K1AR, K8MNJ and the 10 CTU Professors of Dayton Contest University 2018 we are pleased you are here and we extend a warm welcome to you!

There have been more than 40 CTU's held in the past twelve years. CTU's have been held here in Dayton, Chicago, Brazil, England, Germany, Finland, Italy, Australia, Russia and Puerto Rico.

Over 20 presentations are available here at Dayton Contest University 2018. They are the work product of many hours of effort by your Professors and the CTU staff (special thanks to K8MNJ, N9RV, DL1QQ and K1SO).

Icom America has led the way by sponsoring this event from the start in 2007. Contest University would not be possible without the support of Ray Novak, N9JA and Icom, DX Engineering, CQ Magazine, and The ARRL, 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 on going support for CTU is critical as we move forward to more Contest University's in the future.

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

Very 73!

Tim Duffy K3LR
CTU Chairman

2018 Dayton Contest University "CTU" – COURSE OUTLINE – 7:00 AM to 5:00 PM

7:00 ALL SALONS ABCD – Student Registration and Contest Buffet Breakfast – ALL – 60 minutes
8:00 ALL SALONS ABCD – Welcome to CTU 2018 – K3LR – ALL – 10 minutes
8:10 ALL SALONS ABCD – Radio Contesting – Having Fun is Easy – K1DG – ALL – 40 minutes

9:00 CONTEST TOPIC SESSION #1 – attend ONE of 4 sessions – 60 minutes
SALON A – How to Improve your Transmitting Antennas for Low Solar Activity – W3LPL
SALON B – RadioSport Contesting Hints and Kinks – NØAX
SALON C/D – CW and RTTY Skimmers and the Reverse Beacon Network – N6TV
HARDING – Utilizing Digital Modes FT8 and MSK144 for Competitive Advantage in VHF Contests – W5ZN

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

10:15 CONTEST TOPIC SESSION #2 – attend ONE of 4 sessions – 60 minutes
SALON A – Easy to Build Low Band Receiving Antennas for Small and Large Lots – W3LPL
SALON B –Grounding and Bonding for Contest Stations – NØAX
SALON C/D – How to Read and Learn from your Log-Checking Report – K1DG
HARDING– Having Fun with RTTY Contesting – WØYK

11:20 CONTEST TOPIC SESSION #3 – attend ONE of 4 sessions – 55 minutes
SALON A – How to Adapt your DX Contest Strategies for Low Solar Activity – W3LPL
SALON B – Contest Operating Best Practices – K2YWE
SALON C/D – The Advantages of Waterfall Displays for Contesting and DXing – N6TV
HARDING – Pursuing RTTY Contesting to the Limit – WØYK

12:15 ALL SALONS ABCD – *CONTEST LUNCH* – ALL – 35 minutes
12:50 ALL SALONS ABCD – 2018 Eye Ball Sprint Contest "LIVE" – ALL – 10 minutes – K1DG
1:00-1:35 ALL SALONS ABCD – Contesting & Station Optimization – K3LR

***1:45 CONTEST TOPIC SESSION by REQUEST to RERUN** – 50 minutes
*SALON A – As determined by *vote 1
SALON B – As determined by *vote 2
*SALON C/D – As determined by *vote 3
*HARDING – As determined by *vote 4

2:40 CONTEST OPEN DISCUSSION Q&A GROUPs Attend ONE of 4 sessions – 30 minutes
SALON A – Antennas and Propagation – W3LPL
SALON B – Waterfalls, Recordings and Reverse Beacon Network – N6TV
SALON C/D – Contest Shack Design Ideas – NØAX
HARDING – Antenna/Tower Reliability – W3YQ

3:15 CONTEST OPEN DISCUSSION Q&A GROUPs Attend ONE of 4 sessions – 30 minutes
SALON A – Receiving Antenna Ideas – W3LPL
SALON B – Small Stations With Big Ideas – K2YWE
SALON C/D – Grounding and Bonding – NØAX
HARDING – RTTY Contesting Discussion – WØYK

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

4:00 ALL SALONS ABCD – 2018 Contest Radio Review – NCØB – ALL – 50 minutes
4:50 ALL SALONS ABCD – 2018 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.

Biographies

Doug Grant, K1DG

Doug Grant, K1DG, has been licensed since 1967. Over the years, he has managed to collect plaques for first-place scores in single-op, single-op-assisted, multi-single, multi-2 and multi-multi categories from his own station and numerous host stations. In addition, he was a competitor in 5 WRTC events, winning one gold and two bronze medals, and will be competing at WRTC2018 in Germany this summer.

Doug is a past president of the Yankee Clipper Contest Club, past member and Chairman of the ARRL Contest Advisory Committee, member of the CQWW Contest Committee and has chaired the Dayton Hamvention Contest Forum for over 10 years. He is a Director of Contest University and the World Wide Radio Operators Foundation, and was Chairman of the WRTC2014 Organizing Committee.

Tim Duffy, K3LR

Tim has been an active contest operator for over 46 years. He has hosted over 130 different operators as part of the K3LR Multi-Multi DX contest efforts since 1992 – making over 700,000 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 28 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 35 years. He is a founding member and Vice President of the North Coast Contesters. K3LR serves as founder and chairman of Contest University (12 years) and the Dayton Contest Dinner (26 years), chairman of the Top Band Dinner (7 years) – as well as coordinator of the Contest Super Suite (33 years) in Dayton. He is 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 – four times – he will operate with DL1QQ in Germany for WRTC2018. Tim serves on the board of directors of the World Wide Radio Operators Foundation (WWROF) as Vice Chairman. He is President of The Radio Club of America (RCA). Tim is President of the Mercer County Amateur Radio Club – W3LIF (17 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 Amateur of the Year as awarded by the Dayton Amateur Radio Association which runs the Dayton Hamvention®. K3LR was awarded the YASME Excellence Award in 2016. Tim is the Chief Operating Officer and General Manager at DX Engineering.

Frank Donovan, W3LPL

Frank's contesting career began as a twelve year old at the Providence Radio Association. 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 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 CQ WW CW and four ARRL CW DX contests from 1973 to 1978. His first multi-multi experience was with the world high scoring 1974 PJ9JT CQ WW CW team. W3LPL multi-multi teams started forty years ago with a small entry in the 1978 CQ

WW Phone DX Contest. Less than four years later two incredible long nights of 10 meter JA runs unexpectedly produced the 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 completing more than one million QSOs and achieved more than fifty first place USA finishes out of more than 150 entries in the CQ WW and ARRL DX contests. Frank became a member of the prestigious CQ Contest Hall of Fame in 1999 and is a regular presenter at Contest University. He retired seven years ago as a Chief Engineer at General Dynamics Corporation after a 45 year career in electronics and systems engineering.

Ward Silver, NØAX

Ward has been an active contester since before his Novice days began in 1972, participating with high school club friends as WAØWBJ and WBØDQI.

Ward is the author of *Ham Radio for Dummies* and is the Lead Editor of the *ARRL Handbook*, *Antenna Book*, and all three *License Manuals*. He was inducted into the CQ Contest Hall of Fame in 2015 and has received the Bill Orr Technical Writing Award from the ARRL twice, once in 2003 and again in 2017. He was a founder of the World Radiosport Team Championships (WRTC) in 1990 and is currently Secretary of the WRTC Sanctioning Committee. In 2013 he was elected President of the Yasme Foundation which supports amateur radio activities around the world. He has been known to amuse his fellow amateurs by "hamifying" popular songs and performing them publicly with the Spurious Emissions (Out of the) Band and the Pin One Problem.

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

Bob Wilson, N6TV

"TV Bob" is an active CW contester and Win-Test supporter. Licensed for 46 years, Bob competed at the World Radiosport Team Championship (WRTC) in San Francisco (1996), Slovenia (2000), and Moscow (2010). He finished first in the 2013 ARRL November CW Sweepstakes CW (Class B), and the September 2014 NA Sprint CW. In 2017, he was inducted into the CQ Contest Hall of Fame.

Bob was an early adopter of the Perseus and QS1R SDRs and CW Skimmer, and has recently been developing accessory hardware and software for the latest generation of HF transceivers. He voluntarily supports Win-Test users, and also helps update the documentation. He was a member of K2KW's original "Team Vertical" group (6Y4A, 4M7X), and has been part of the multi-op teams at HC8N, K3LR, and W7RN (K5RC). Bob recently retired after 36 years as a software engineer at IBM.

Joel Harrison, W5ZN

Joel was first licensed as WN5IGF in 1972. His first contest was the old ARRL CD Party in 1973. 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 active in HF contests. 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 their operating in the 2015 ARRL Rookie Roundup – CW contest from his station as a Multi-op team that finished with the most Q’s. Joel is on the DXCC Honor Roll for Mixed. Phone & CW and holds 11 band DXCC (160 thru 2 meters) and 11 band VUCC (50 MHz thru 24 GHz), is an A-1 Operator and served as ARRL President from 2006 until 2010 when he retired from ARRL elected service after 27 years. In 2014 he was awarded the ARRL Medal of Honor for outstanding service to amateur radio. Professionally Joel is Director, Nuclear Services for System One providing nondestructive testing services to the nuclear power industry.

Ed Muns, WØYK

Ed, WØYK, 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 KØRF 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 Ten-Meter RTTY Contest which they initiated in December 2011 with nearly 700 logs submitted. He was inducted into the CQ Contest Hall of Fame in May 2014. This is his eleventh year at CTU delivering the two RTTY presentations and Q&A.

Dan Zeitlin, K2YWE (K3AU)

Dan started contesting after almost 40 years of CW rag-chewing and leisurely DX chasing. In 1995 he was invited to be a member of a four-Op 2A Field Day team with W3LPL, K3RA, and K3MM. Dan loved the contest-like environment generated by the group. He summarily became infected with the contest bug and joined the W3LPL team. After several years at W3LPL, Dan struck out on his own with a “grass roots” low power station and eventually earned consistent top 10 finishes in domestic and international contests. Several 2nd place US/VE (always a bride’s maid) and top 5 Worldwide being among the results. Concurrently, Dan maintained a presence at multi-multi stations in selected contests. He recently rejoined the W3LPL team, the Single Op “iron man” routine having become harder to sustain at his advancing age. He still operates as a little pistol from home, but mounts serious efforts only in shorter events like SS, where he holds two recent Atlantic Division plaques. K3AU has been Dan’s contest call since 2004. He is a Vice President of PVRC and member of several CW clubs. Over the past ten years, Dan has given a variety of contest presentations to radio clubs, an ARRL convention, international Webinars, and CTU. He retired from the Aerospace industry in late 2008 and volunteers his time in STEM educational programs at the National Electronics Museum (NEM). Dan actively promotes contesting to less experienced and new hams as a guest speaker during the annual NEM Amateur Radio Operating class given by K3RA.

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 participants 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 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.

Rob Sherwood, NCØB

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 over 100 transceivers included at 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 my tenth appearance at Contest University was followed by ARRL Hamcon in Cody Wyoming, and a second appearance at the Duke City Hamfest in Albuquerque.

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

Ten 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 agis, plus 6 and 2 meters, and several wire antennas on 160, 40 and 30 meters.

My most recent new project has been making contacts on the new 630m band with a transverter from Australia. An IC-7300 on 160 meters handles receiver and transmit on 630m. I use my 160-meter Marconi T antenna on the new MF band with a second tuner. Since the band has been opened to hams, my log includes 22 states, including Hawaii, Alaska and Maine using WSJT X mode JT9.

2018 Contesting Related Events

May 16th – Wednesday night

7 PM Contest Super Suite at the Crowne Plaza opens hosted by the Mad River Radio Club (MRRC), Frankford Radio Club (FRC) and the North Coast Contesters (NCC).

8 PM to 10 PM Dayton Contest University 2018 Registration

10:30 PM Pizza Party in the Harding Room sponsored by Dayton Contest University 2018. http://www.contestsupersuite.com.

May 17th – Thursday daytime

7 AM Dayton Contest University 2018 Registration opens. Must sign up in advance. http://www.contestuniversity.com.

8 AM – 5 PM Dayton Contest University 2018 at the Crowne Plaza – 2nd floor.

May 17th – Thursday night

6 PM RTTY Contesting Dinner, Spaghetti Warehouse.

7 PM Contest Super Suite at the Crowne Plaza hosted by the Mad River Radio Club (MRRC), Frankford Radio Club (FRC) and the North Coast Contesters (NCC).

10:30 PM Pizza and Wing Party in the Harding Room sponsored by K3WW, K3LR and Society of Midwest Contesters (SMC). http://www.contestsupersuite.com

May 18th – Friday daytime

2:00 PM – 5:00 PM Antenna Forum at Hamvention in Xenia, Ohio, Room 1 Moderator: Tim Duffy, K3LR.

A Five Element Parasitic Rotatable Vertical Yagi for 160 Meters – Joel Harrison, W5ZN

A Pragmatic Approach to 630 Meter Antennas – E.M. Tichansky, NO3M

Near Vertical Incidence Skywave (NVIS) Antenna System Design, Construction and Operation – Cory Gibson, W3CDG

Hydro Excavation for Radio Antenna Tower Construction – Everett Jackson, WZ8P

May 18th – Friday night

7 PM Contest Super Suite at the Crowne Plaza hosted by The Mad River Radio Club (MRRC), Frankford Radio Club (FRC) and North Coast Contesters (NCC).

7:00 PM 29th Annual Top Band Dinner at the Crowne Plaza – Presidential Ballroom. Speaker is Jerry Rosalius, WB9Z. Tickets in advance from http://www.topbanddinner.com.

10:00 PM “Working by Numbers Band” Live in The Presidential Ballroom 2nd Floor of The Crowne Plaza.

11:00 PM Pizza Party in the Harding Room sponsored by the Potomac Valley Radio Club (PVRC). http://www.contestsupersuite.com

May 19th – Saturday daytime

10:45 AM – 11:45 AM RTTY Contest Forum at Hamvention in Xenia, Ohio Room 3 Moderator: Ed Muns, WØYK

Will Digital Contesting Migrate from RTTY to FT8? – Ned Stearns, AA7A

RTTY Transmit Bandwidth Management – Ed Muns, WØYK

RTTY Contest Q&A

1:20 PM – 3:05 PM Contest Forum at Hamvention in Xenia, OH, Room 1 Moderator: Doug Grant, K1DG

The Reverse Beacon Network Turns 10 – Pete Smith, N4ZR

Countdown to WRTC2018 – Christian Janssen, DL1MGB

What has the WWROF been up to lately? – John Dorr, K1AR

Winning a Contest Using a Remote Station – Chris Hurlbut, KL9A; Kevin Stockton, N5DX; Nate Moreschi, N4YDU

May 19th – Saturday evening

6:30 PM – 26th Annual Dayton Contest Dinner hosted by North Coast Contesters at the Crowne Plaza Presidential Ballroom. Dinner speaker is Chris Janssen, DL1MGB. Space is limited. Details and tickets in advance are available at http://www.contestdinner.com.

7 PM Contest Super Suite at the Crowne Plaza hosted by The Mad River Radio Club (MRRC), Frankford Radio Club (FRC) and North Coast Contesters (NCC).

11 PM Pizza Party in the Harding Room sponsored by the Yankee Clipper Contest Club (YCCC). http://www.contestsupersuite.com

World Wide Radio Operators Foundation

Contester's Code of Ethics

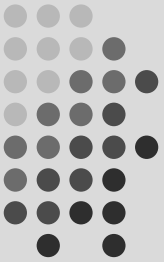
- I will learn and obey the rules of any contest I enter, including the rules of my entry category
- I will obey the rules for amateur radio in my country.
- I will not modify my log after the contest by using additional data sources to correct callsign/exchange errors.
- I will accept the judging and 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.

Contents

Advertising

Radio Contesting – Having Fun is Easy

Doug Grant, K1DG



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Explaining Radio Contesting to a non-ham (or non-contester)

"We operate for 24/48 hours, log all the stations we contact, and see who can make the most contacts in the most states, countries"

"How do you know who won?"

"We send our logs to the sponsor, and they check them"

"How much money do you get for winning?"

"Nothing"

"Huh?? Then why do you do this?"

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The Four Stages of Contesting

- Starting out
- Getting hooked on the game
- Making it more fun
  - The right way
  - The wrong way
- Passing it along

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My First Contest: 1968 Novice Roundup (WN1ICD)

- 2 QSOs x 2 sec = 4 points
- Wait! Where's the score?
- You mean you have to submit a log?
- Would have been dead last in W1

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WNØTLT 3705- 95-39-38
WNØSQG 3008- 94-32-21
WNØRMB 2464- 78-28-19
WNØSYI 583- 53-11- 4
WNØTAY 9- 3- 3- 3

Nebraska

WNØSHO 2100- 70-30- 5

NEW ENGLAND DIVISION

Connecticut

WN1HVL 20,496-321-61-38
WN1IQJ 16,856-286-56-40
WN1JAD 14,734-268-53-35
WN1HUN 12,180-200-58-23
WN1HWD 4440-111-40-11
WN1HUE 4288-134-32-12
WN1IBD 4170-124-30-36
WN1IXJ 2320- 80-29-25
WN1IBT 902- 31-22- 9
WN1HOL 720- 25-16- 6
WN1HZN 315- 15- 9-15
WN1HVE 144- 16- 9-10

Eastern Massachusetts

WN1HRT 20,480-305-64-30
WN1JDW 18,900-300-63-36
WN1IDP 9888-206-48-24
WN1ISH 6960-155-42-25
WN1IVA 3420- 85-36-23
WIKBN (WN1ION, opr.) 3078- 81-38-14
WN1IIQV 2596-118-22-21

WN1HTC 2324- 83-28-21
WN1IDO 1134- 54-21-10
WN1IRV 1020- 68-15-15
WN3ITR/1 208- 26- 8-21

Maine

WN1IOG 3030-101-30-26
WN1IUU 1456- 56-26- –
WN1IGG/1 368- 23-16- 5

New Hampshire

WN1IIH 2958- 87-29-20

Rhode Island

WN1IJB 15,576-264-59-40
WN1IJC 14,952-267-56-39

Vermont

WN1HUQ 5220-106-45- –
WN1HRM 697- 41-17- 6

Western Massachusetts

WN1HYT 13,974-274-51-25
WN1IPZ, 1 13,530-236-55-37
WN1IZS 7350-140-49-18
WN1ICT 5371-131-41-17
WN1IJI 3937-127-31-27
WN6WKN/1 2016- 69-24- 8

NORTHWESTERN DIVISION

Oregon

WN7IOK 304- 38- 8-33

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What's this Sweepstakes thing?

- 1969: WA1JYY, Advanced Class
- DX-100, SB-10 SSB adaptor, SX-110, fan dipole at 20 feet
- Band changes took 5 minutes

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WA1JYY
1969 SS

183-41-19 CW
117-39-16 SSB

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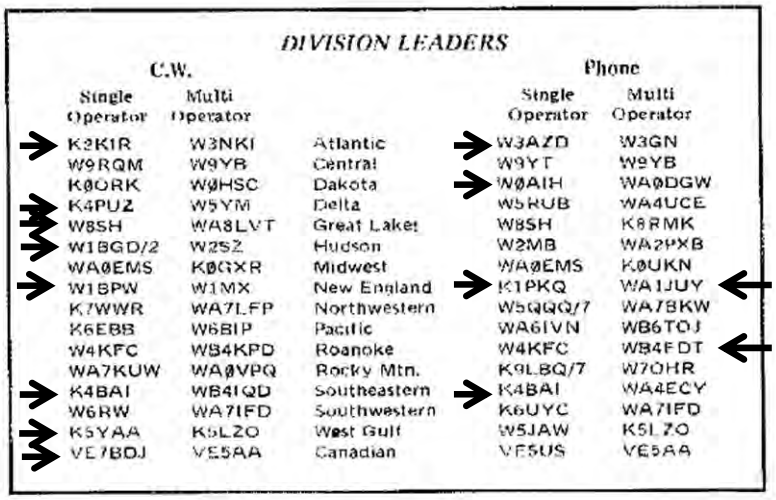
Who else was in the 1969 SS?



DIVISION LEADERS

C.W. Single Operator	C.W. Multi Operator		Phone Single Operator	Phone Multi Operator
K2KIR	W3NKI	Atlantic	W3AZD	W3GN
W9RQM	W9YB	Central	W9YT	W9YB
KØORK	WØHSC	Dakota	WØAIH	WAØDGW
K4PUZ	W5YM	Delta	W5RUB	WA4UCE
W8SH	WA8LVT	Great Lakes	W8SH	K8RMK
W1BGD/2	W2SZ	Hudson	W2MB	WA2PXB
WAØEMS	KØGXR	Midwest	WAØEMS	KØUKN
W1BPW	W1MX	New England	K1PKQ	WA1JUY
K7WWR	WA7LFP	Northwestern	W5QQQ/7	WA7BKW
K6EBB	W6BIP	Pacific	WA6IVN	WB6TOJ
W4KFC	WB4KPD	Roanoke	W4KFC	WB4FDT
WA7KUW	WAØVPQ	Rocky Mtn.	K9LBQ/7	W7OHR
K4BAI	WB4IQD	Southeastern	K4BAI	WA4ECY
W6RW	WA7IFD	Southwestern	K6UYC	WA7IFD
K5YAA	K5LZO	West Gulf	W5JAW	K5LZO
VE7BDJ	VE5AA	Canadian	VE5US	VE5AA

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Why are these guys still at it *50 years* later?

- The abundant cash prizes
- The admiration of family, friends, and co-workers
- The groupies

- Must be something else…

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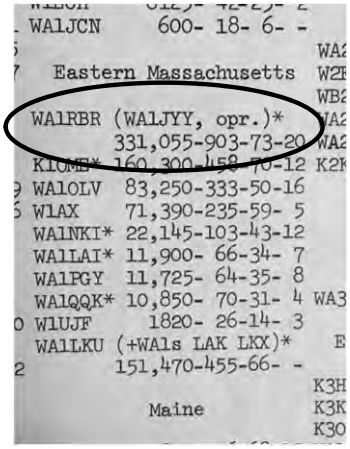
1973 Open CD Party (prehistoric version of NAQP)



WA1JCN 600- 18- 6- -

Eastern Massachusetts

WA1RBR (WA1JYY, opr.)* 331,055-903-73-20

K1OME* 160,300-458-70-12

WA1OLV 83,250-333-50-16

W1AX 71,390-235-59- 5

WA1NKI* 22,145-103-43-12

WA1LAI* 11,900- 66-34- 7

WA1PGY 11,725- 64-35- 8

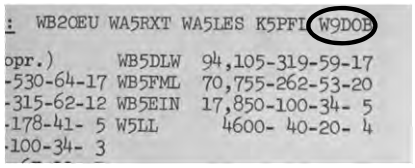
WA1QQK* 10,850- 70-31- 4

W1UJF 1820- 26-14- 3

WA1LKU (+WA1s LAK LKX)* 151,470-455-66- -

Maine

Top Scorers



WB2OEU WA5RXT WA5LES K5PFL W9DOB

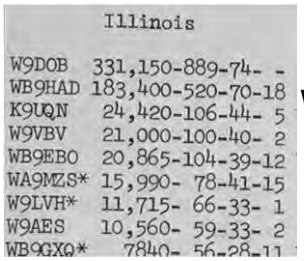
opr.) WB5DLW 94,105-319-59-17

-530-64-17 WB5FML 70,755-262-53-20

-315-62-12 WB5EIN 17,850-100-34- 5

-178-41- 5 W5LL 4600- 40-20- 4

-100-34- 3



Illinois

W9DOB 331,150-889-74- -

WB9HAD 183,400-520-70-18

K9UQN 24,420-106-44- 5

W9VBV 21,000-100-40- 2

WB9EBO 20,865-104-39-12

WA9MZS* 15,990- 78-41-15

W9LVH* 11,715- 66-33- 1

W9AES 10,560- 59-33- 2

WB9GXQ* 7840- 56-28-11

W9DOB (now W9XR) beat me by about 0.3 QSO

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Top Scorers in 1973 Open CD

- CW
  - W6PAA WA2UOO K4PUZ WA5LES W9YT
- SSB
  - WB2OEU WA5RXT WA5LES K5PFL W9DOB
- Still crazy after all these years !?!

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Fun!
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

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At some point, you make a decision

Play by the rules

- Work on improving skills
- Power consistent with class
- Don’t use cluster when SO
- Submit log when contest ends

Make your own rules

- Work on being obnoxious
- More power (turn to “11”)
- Use the cluster – who will know?
- Take time to scrub log (fix calls, add calls, “adjust” times, etc.)

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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 (sibling rivalry)
- 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 don’t specifically disallow a practice
- Rules apply to others, not me/us

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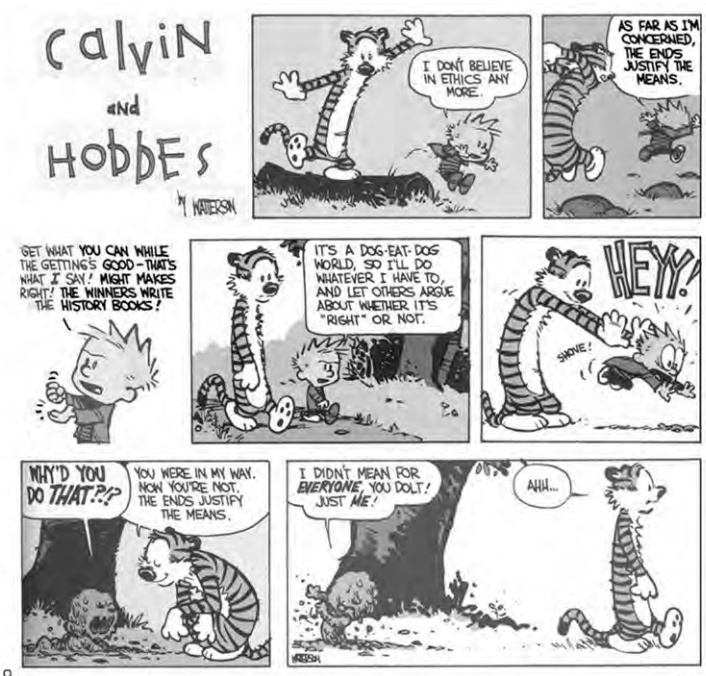

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But people *DO* notice…

- "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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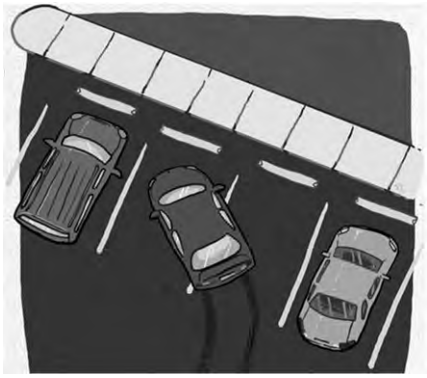
Cheating = Rudeness

Breaking a <u>written</u> rule

Breaking an <u>unwritten</u> rule



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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

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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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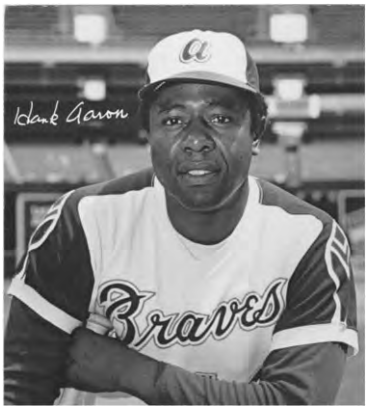
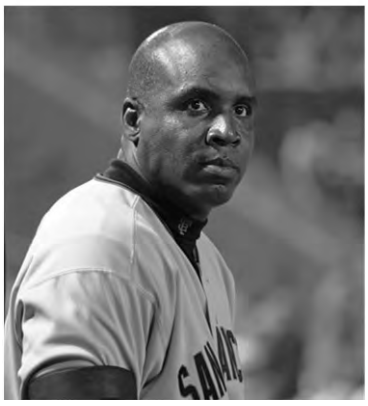
Honest competitors earn respect; cheaters do not



Hank Aaron
755 Home Runs



Barry Bonds
762 Home Runs

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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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Cultural differences (according to Wikipedia, not me!)

- England: “Everything which is not forbidden is allowed”
- Germany: “Everything which is not allowed is forbidden”
- France: “Everything is allowed even if it is forbidden”
- Russia: “Everything is forbidden, even that which is expressly allowed” (Everything which is expressly forbidden is the best way to succeed)

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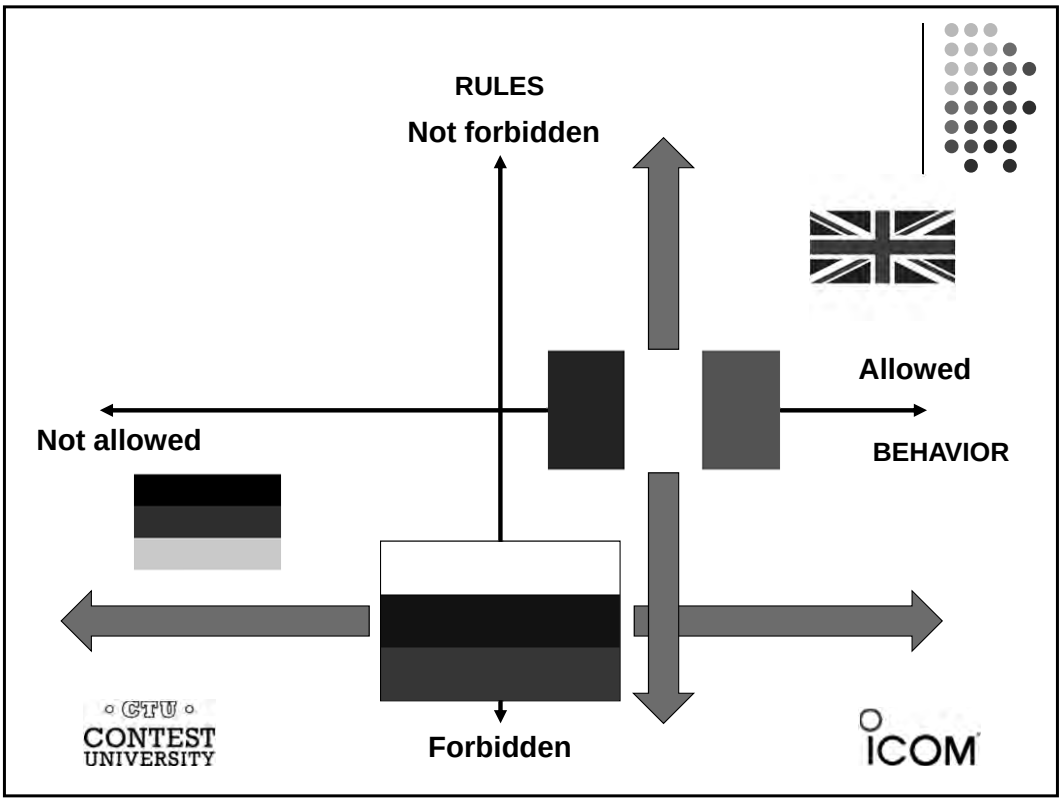

Covering your cheating takes too much effort to be fun

- The RBN and wideband recording systems can verify what really happened
- 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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Cheating leads to more rules

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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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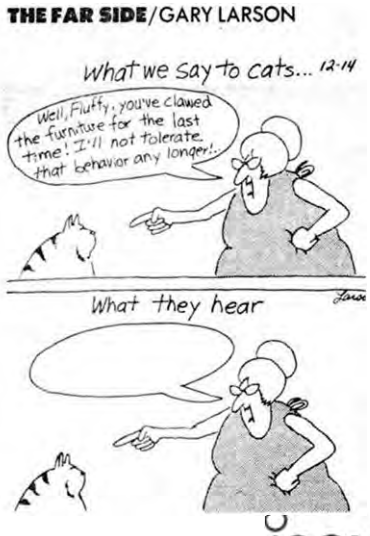
Communication Success is Defined by the Receiver



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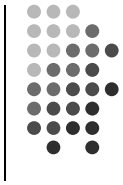
Non-contesters Don't Like Us



- And we give them plenty of reasons!
  - CQ first, ask if frequency is in use later
- A few bad apples create a bad reputation for all of us
  - "Contesters all run high power"
- Contesters take over all the bands
  - (pssst…ever try those "new bands"?)

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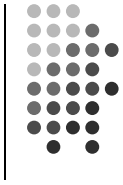
When you are confronted by a non-contester ***during*** a contest



- Assess the situation
  - Did you just fire up on the frequency?
  - Maybe there really *is* a net there
- Are you possibly overdriving things?
  - A clean signal attracts more callers
- Try to compromise
  - "I'll move up a little if you move down a little"
- The bottom line – put your ego aside
  - Which approach will put more QSOs in your log?

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Outside a contest…

- Assure the hater that the vast majority of contesters run legal power
  - They are loud because they have good antennas and locations and are on the best band
- Tell them that contesters do some good
  - Their skills apply in EmComm situations
  - Have you done something you can use as an example?
- Be polite!

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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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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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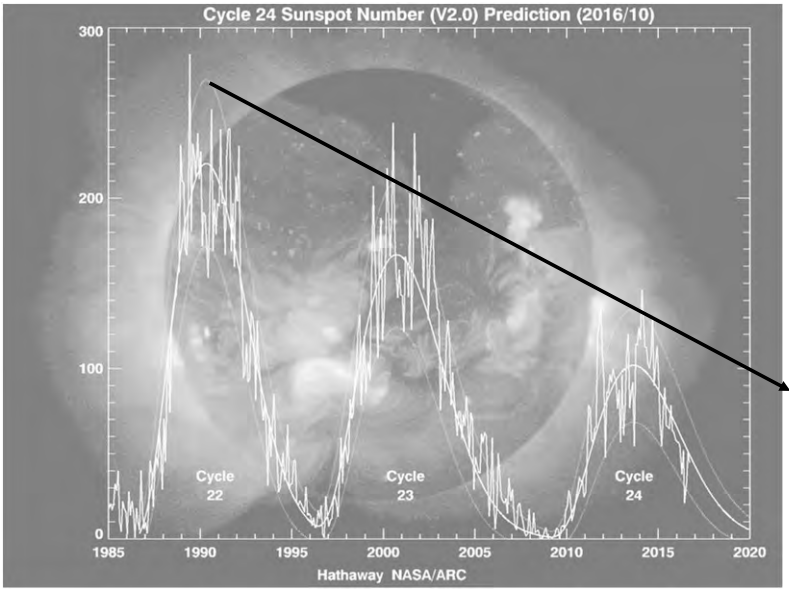
How to Improve your Transmitting Antennas for Very Low Solar Activity

- 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…

Dayton 2018

Very Low Solar Activity until 2021

Solar activity <u>starts</u> to slowly increase in 2020



Cycle 25?

Cycle 25 is likely to be somewhat stronger

Transmitting Antenna Elevation Angles Needed for Very Low Solar Activity

- **10 meters** - almost all DX openings are now to the south
  - almost all DX propagation is at low elevation angles **below 10 degrees**
  - marginal DX paths require very low elevation angles **well below 5 degrees**
- **15 meters** - shorter and weaker openings
  - almost all DX propagation is at low elevation angles **below 10 degrees**
  - marginal DX paths require very low elevation angles **well below 5 degrees**
- **20 meters** - a very crowded, very competitive daytime band
  - almost all DX propagation is at low elevation angles **below 15 degrees**
  - marginal DX paths require very low elevation angles **well below 10 degrees**
- **40 meters** - a very crowded, competitive afternoon and night band
  - almost a 24 hour DX band especially during the November CQWW CW
  - **requires a broad range of elevation angles** **5 to 25 degrees**
- **80 meters** - a very important DX band for the next four years
  - very efficient antennas over a broad range of angles **10 to 30 degrees**
- **160 meters** - an excellent DX band for the next four years
  - **vertical antennas** *almost always* provide much better DX performance

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High horizontally polarized antennas are much more important during very low solar activity

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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*
- Vertically polarized antennas can achieve nearly 6 dB of ground gain
  - but only over highly conductive soil such as a salt marsh
- Competitive DX contest stations require high horizontally polarized 40 through 10 meter antennas during very low solar activity
- 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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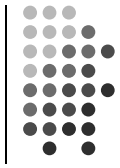
Vertical Polarization for 160 Meters



- 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 better DX performance than horizontal 160M antennas

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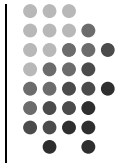
High Performance Transmitting Antennas for 160 Meter DX

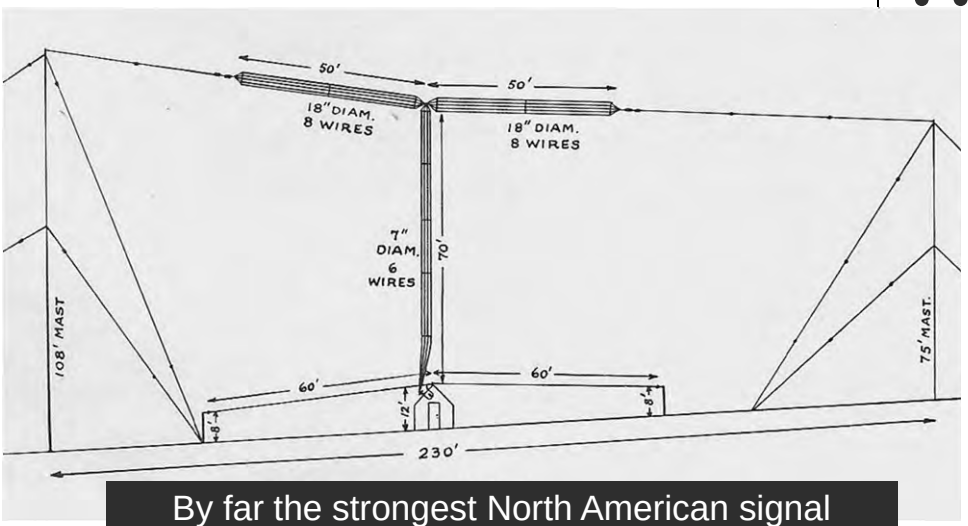


- 125 foot vertical: the gold standard 160 meter DX antenna
  - well spaced from all nearby tall towers and antennas
    - at least 140 feet from towers over 80 feet tall supporting large HF Yagis
    - optimum performance with spacing much greater than 140 feet
  - at least 30 to 60 shallow buried 125 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

CONTEST UNIVERSITY

ICOM

Cage T-Vertical Used by 1BCG during the Successful 1921 Transatlantic Tests



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

CTU CONTEST UNIVERSITY

ICOM

Horizontal Polarization for 80 Meters

easily provides 6 dB of "free" ground gain

- Horizontal dipole or inverted-V dipole at least 50 feet high
  - superb Sweepstakes and Field Day antenna
  - 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 65 foot radials
  - or a corner fed delta loop or corner fed inverted-U
  - vertical antennas 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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ICOM

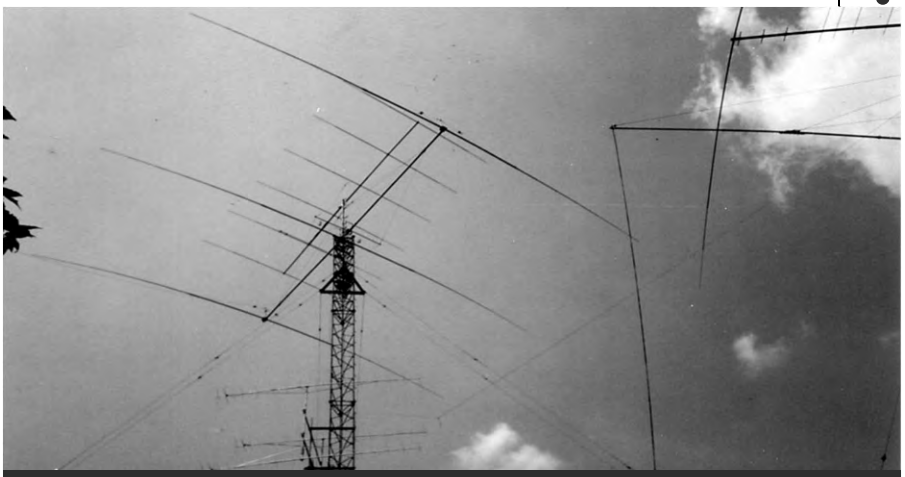
High Performance Transmitting Antennas for 80 Meter DX

- 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 (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 over 40 feet 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

CONTEST UNIVERSITY

ICOM

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

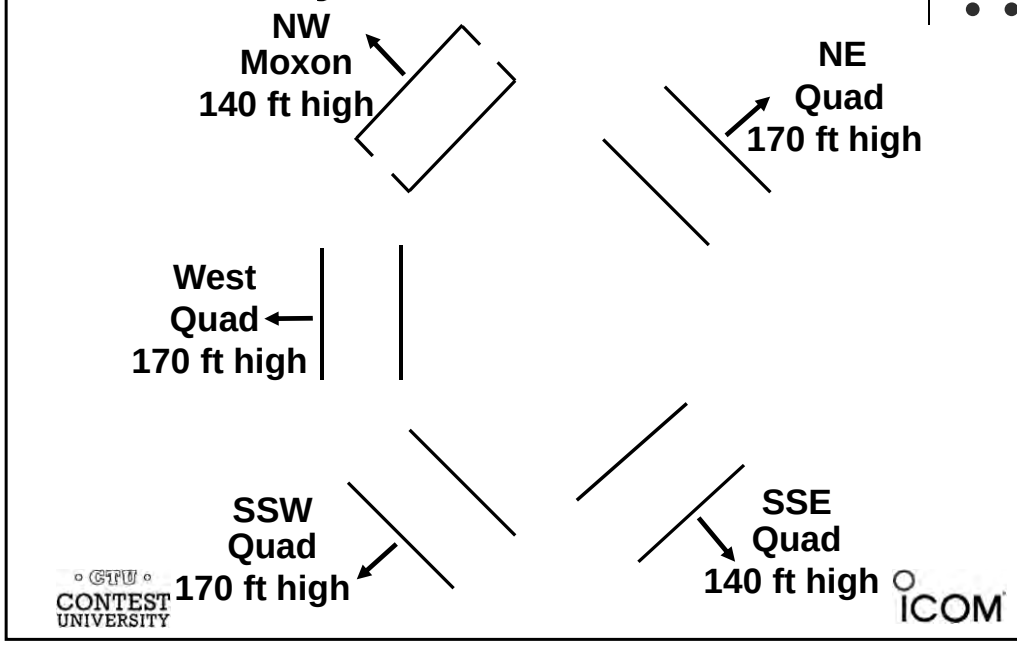


K3ZO's very successful horizontally polarized 3 element Yagi changed my thinking about 80 meter antennas for DX

CONTEST UNIVERSITY

ICOM

80 Meter 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 feet from all towers*
  - 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

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Comtek 4-Square Controller

CONTEST UNIVERSITY

www.dxengineering.com/search/brand/comtek

ICOM

High Performance 40M Antennas

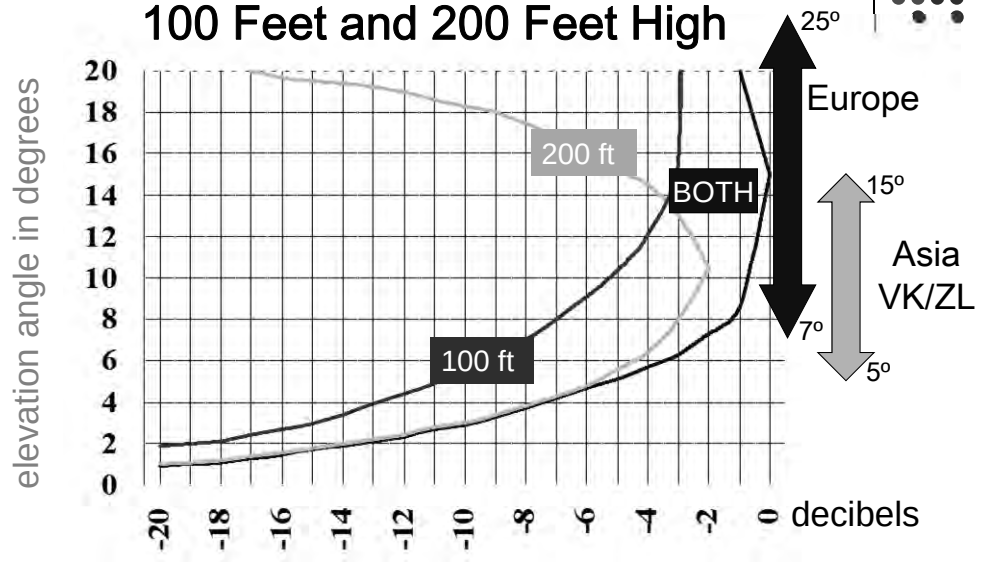
- Horizontal dipole at least 70 feet high
  - 13 to 45 degree elevation beam pattern at -3 dB points
  - otherwise use a vertical or a four-square vertical array with 30 to 60 radials
- Higher gain: 2 element “shorty 40” Yagi at 70 to 100 feet high
  - 10 to 30 degree elevation beam pattern at -3 dB points
  - significant improvement over a simple horizontal dipole for DX
  - a Cushcraft XM-240 at 100 feet high is very cost effective
  - a Moxon Yagi 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 the effort !

CONTEST UNIVERSITY

Elevation angles from 5º to 25º are needed

ICOM

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

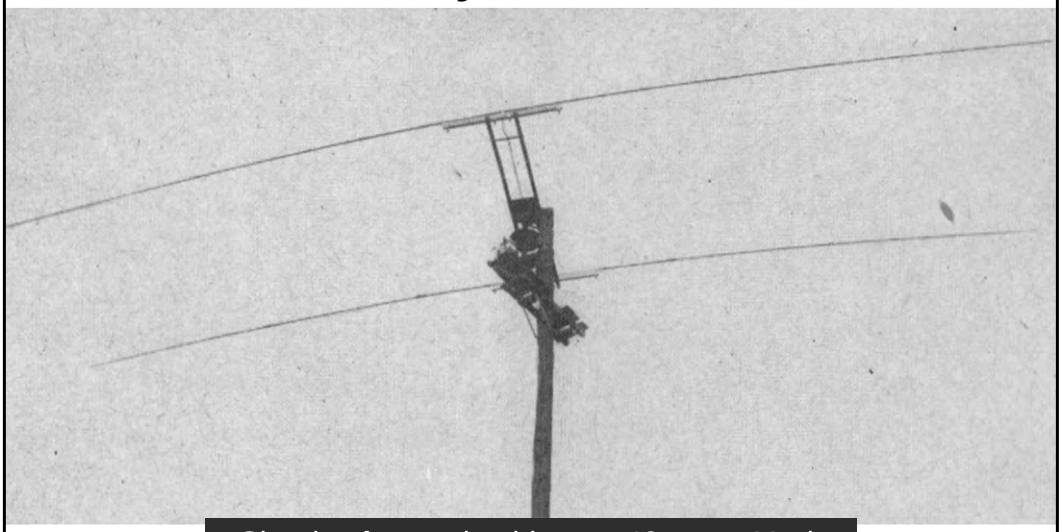


CONTEST UNIVERSITY

Elevation angles from 5º to 25º are needed

ICOM

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



CONTEST UNIVERSITY

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

ICOM

Cushcraft XM-240
2 Element 40 Meter Yagi

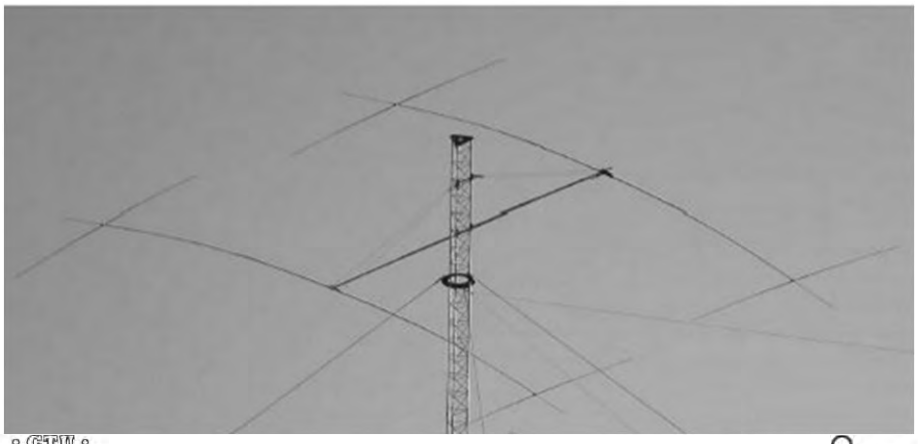
The most popular “Shorty Forty” Yagi”

www.cushcraftamateur.com/Product.php?productid=XM-240

40 Meter Moxon

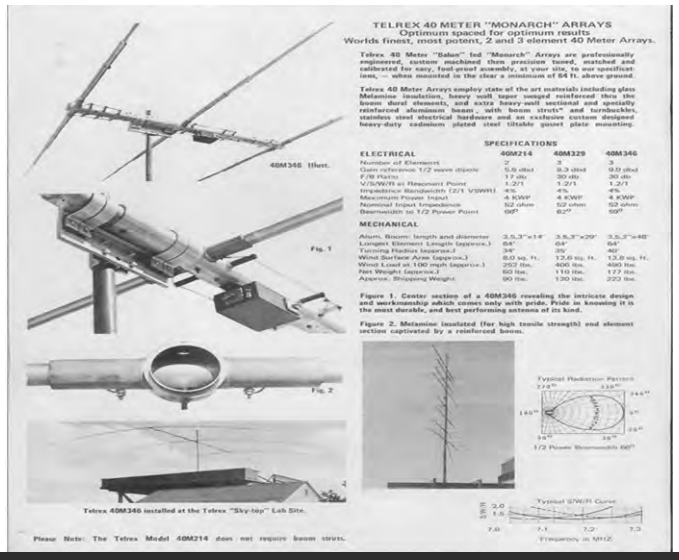
VSWR less than 1.4:1 from 7.0 to 7.3 MHz
22 foot boom and 48 foot elements

Two stacked Moxons on a 140 foot tower are fully 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 "Baton" fed "Monarch" Arrays are professionally engineered, custom machined thru 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 Element	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/SWR 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	98°	82°	69°

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'	46'
Wind Surface Area (approx.)	8.0 sq. ft.	12.6 sq. ft.	13.8 sq. ft.
Wind Load at 100 mph (approx.)	252 lbs.	400 lbs.	490 lbs.
Net Weight (approx.)	60 lbs.	110 lbs.	177 lbs.
Approx. Shipping Weight	90 lbs.	130 lbs.	223 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.

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

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

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

CTU CONTEST UNIVERSITY

ICOM

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) W8JIN and many others

CTU CONTEST UNIVERSITY

ICOM

Stacked 40 Meter 4 Element OWA Yagis at K9CT

k9ct.us/contest-antennas/40-m

40 Meter 4-Square Vertical Array

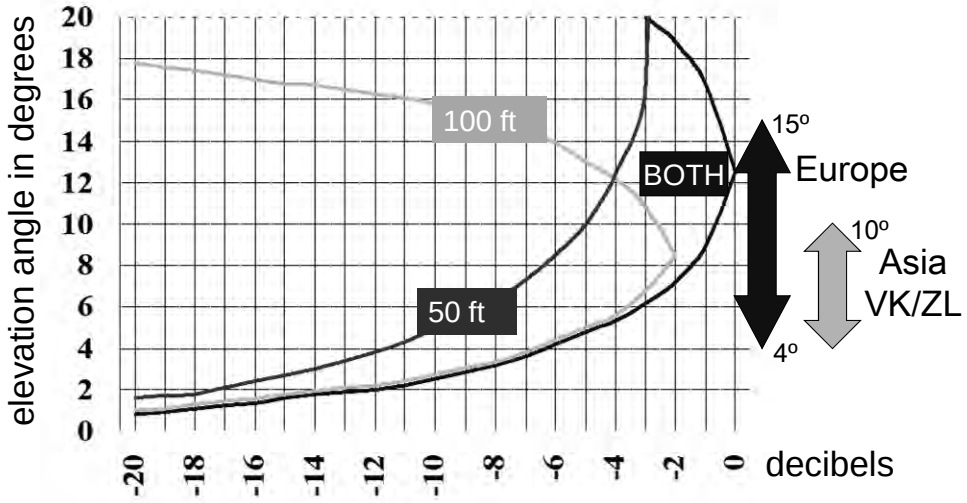
- A 4-square vertical array is good alternative to a Yagi
  - if you cannot install a “shorty 40” Yagi at least 70 feet high
- Install at least 60 shallow buried 35 foot radials under each vertical
- *Install at least 40 feet from all towers*
  - more than 40 foot spacing will significantly improve its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

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

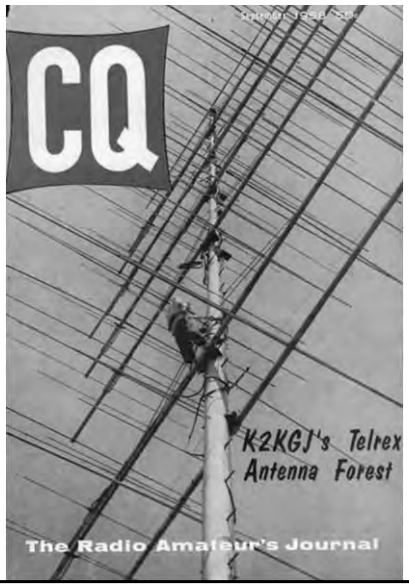
CONTEST UNIVERSITY Elevation angles from <5º to 15º are needed ICOM

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



CONTEST UNIVERSITY Elevation angles from <5º to 15º are needed ICOM

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



CTU CONTEST UNIVERSITY

ICOM

Array Solutions Stack Match

The Stackmatch revolutionized the performance and flexibility of stacked Yagi antennas

CTU CONTEST UNIVERSITY

www.arraysolutions.com/Products/stackmatch.htm

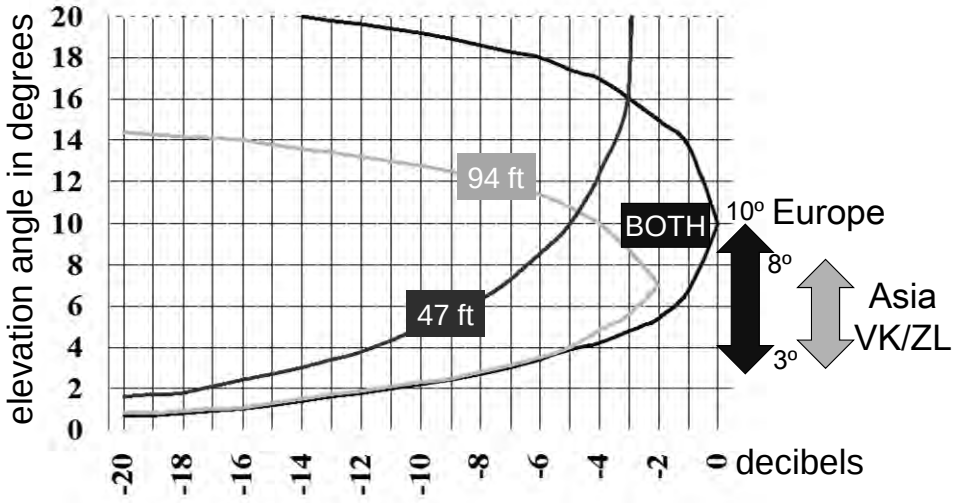
ICOM

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* 4 to 25 degree elevation beam patterns at -3 dB points
  - stack switching (a "Stackmatch") provides high payoff at low cost

CONTEST UNIVERSITY Elevation angles from <5º to 10º are needed ICOM

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



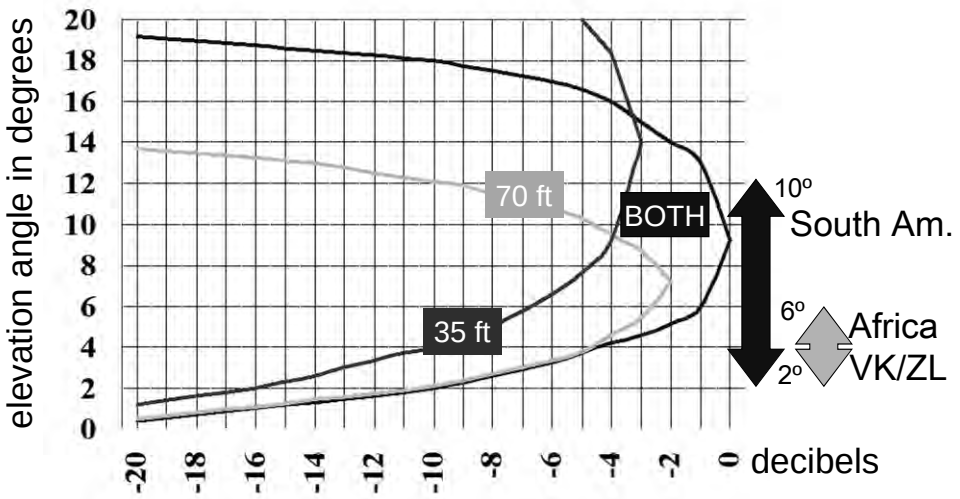
CONTEST UNIVERSITY Elevation angles from <5º to 10º are needed ICOM

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 25 degree elevation beam patterns at -3 dB points
  - stack switching (a "Stackmatch") provides high payoff at low cost

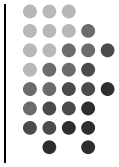
CONTEST UNIVERSITY Elevation angles from <5º to 10º are needed ICOM

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



CONTEST UNIVERSITY Elevation angles from <5º to 10º are needed ICOM

Competitive One Tower Antenna Systems



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

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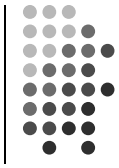
Multi-Tower Antenna Systems

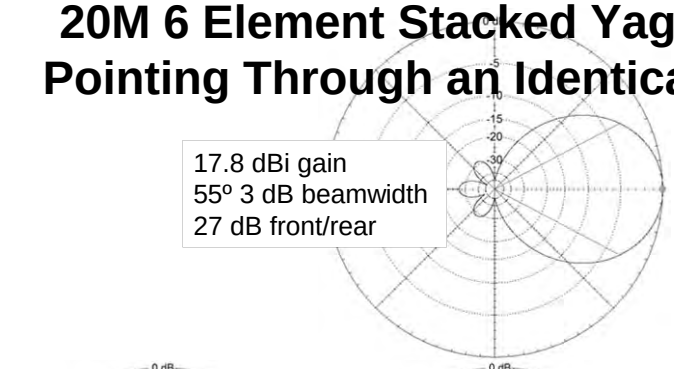
Designing a multi-tower station with acceptable degradation is an antenna modelling challenge



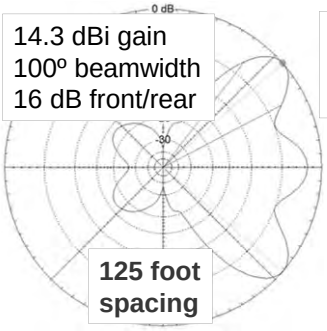
- Placement of Yagis and the relative location of the towers to minimize degradation is critical to achieving high performance
  - in most cases multiple *Triband Yagis* and multiple Yagis for the same band should be installed *on only one tower*
  - placing them *on multiple towers* requires detailed 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

CONTEST UNIVERSITY http://ncjweb.com/bonus-content/Ant_Interact_Part_6.pdf ICOM

20M 6 Element Stacked Yagi Array Pointing Through an Identical Stack

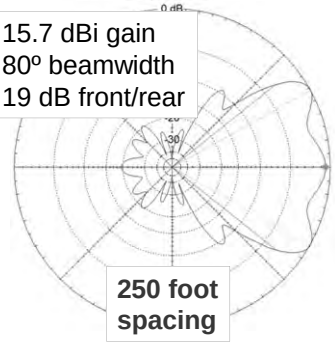


17.8 dBi gain
55º 3 dB beamwidth
27 dB front/rear



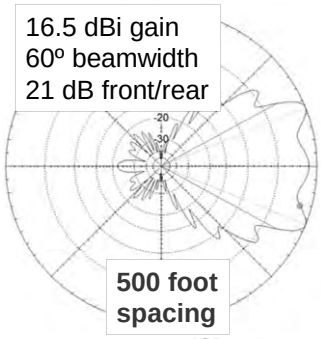
14.3 dBi gain
100º beamwidth
16 dB front/rear

125 foot spacing



15.7 dBi gain
80º beamwidth
19 dB front/rear

250 foot spacing



16.5 dBi gain
60º beamwidth
21 dB front/rear

500 foot spacing

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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 close to a 40 meter Yagi
  - improper coaxial cable length makes an 80 meter dipole operate like two 40 meter dipoles tightly coupled to the 40 meter Yagi
- 10 and 15 meter Yagis installed too close to each other
  - use 10 foot minimum spacing unless you model their interactions
- 15 meter Yagi pointed through -- or mounted 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 more than one tower without detailed modelling

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When Good Antennas Go Bad…
coaxial cable issues

- Improperly installed connectors
- PL-259 connectors not 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 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

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Amphenol 83-1SP
PL-259 Connector

Shell is labeled exactly:
Amphenol 83-1SP

Silver Plated
Center Pin

Silver Plated
Body

www.dxengineering.com/parts/aml-83-1sp

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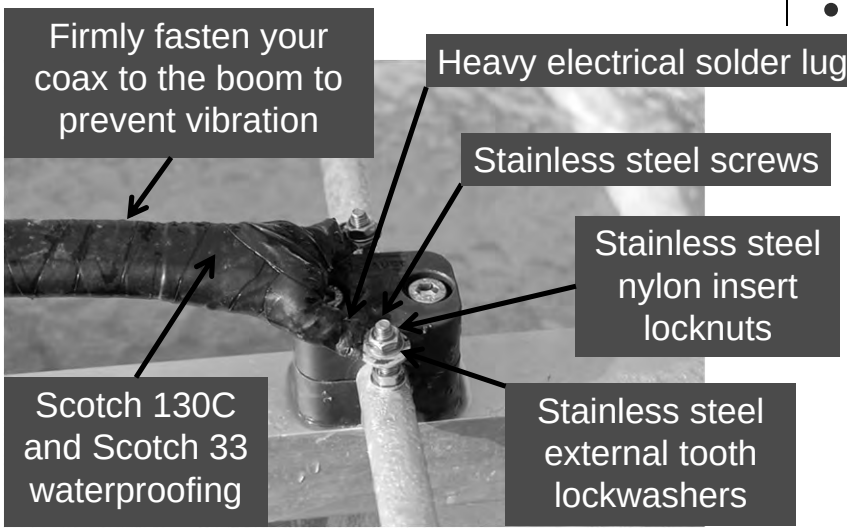
This is not a good place to save a few dollars

ICOM

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 inspections
  - guy wire inspections
  - rotator inspections
  - coaxial cable inspections
  - coaxial connector inspections

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CTU Presents

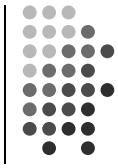
Contest Hints and Kinks – for Operators

Ward Silver, NØAX

Goals of the Session

- Provide tips, suggestions, and guidelines
- Give you ideas for your own circumstances
- Find “Score dB’s” and “low-hanging fruit”
- Develop confidence in your own abilities
- Laff

Assumptions about you



- Contesting for a couple of years
- You feel comfortable with CQ or S&P
- Maybe a Division, State, or Regional winner?
- Decent radios and antennas
- Taken and given some lumps
- Want to give some more lumps
- What's the best way to get better?

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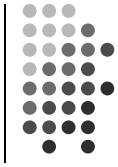
How To Use This Course



- Not a how-to cookbook
- Follow in the text
- Take short notes
- Record those ideas!

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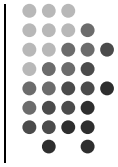
ICOM

Continuous Improvement



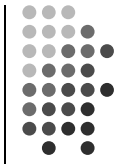
- When asked what was the most powerful force in the Universe, Albert Einstein replied, “Compound interest.”

CTU CONTEST UNIVERSITY

Dayton 2018

ICOM

Continuous Improvement



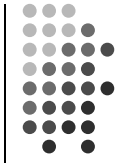
- When asked what was the most powerful force in the Universe, Albert Einstein replied, “Compound interest.”
- Incremental improvement, applied relentlessly, is unstoppable.

CTU CONTEST UNIVERSITY

Dayton 2018

ICOM

Continuous Improvement



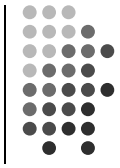
- When asked what was the most powerful force in the Universe, Albert Einstein replied, “Compound interest.”
- Incremental improvement, applied relentlessly, is unstoppable.
- Plaques are won a dB at a time

CTU CONTEST UNIVERSITY

Dayton 2018

ICOM

Continuous Improvement



- When asked what was the most powerful force in the Universe, Albert Einstein replied, “Compound interest.”
- Incremental improvement, applied relentlessly, is unstoppable.
- Plaques are won a dB at a time
- Hints & Kinks are the ham radio equivalent of incremental improvement.

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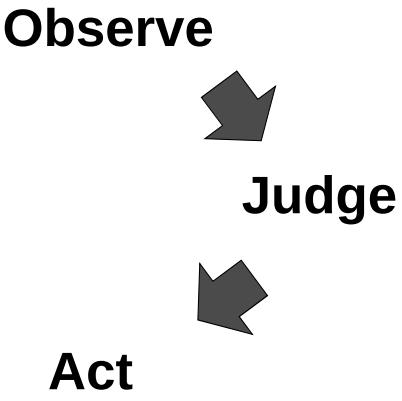
Cycle of Life



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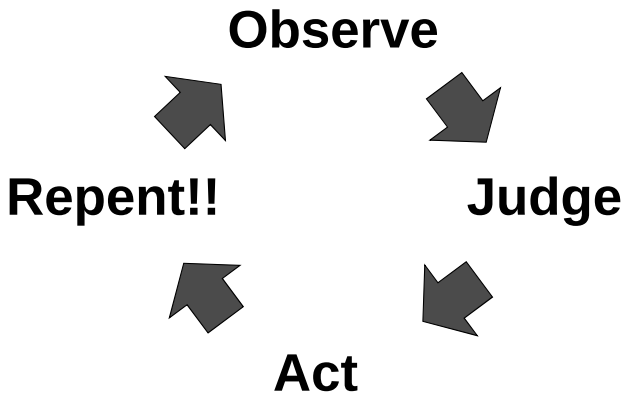
Cycle of Life



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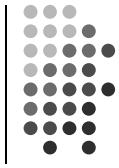
Layers



- Contest success is incremental
- Peel the onion
- Operator improvement is continuous
- Study and analyze and plan
- Address the obvious deficiencies first
- Choose wisely, grasshopper…

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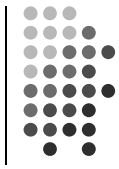
Ergonomics



- Ergonomics
  - Incredibly important
  - Fun or Slog? – Choose!
  - Maintain concentration, remove distractions
  - Make it **EASY** to do the right thing!
    - Especially when you are tired…
  - Labels and logical layout
  - Preserve and enhance accuracy

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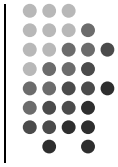
Ergonomics



- Head and Eyes
- Back & Arms
- Your Butt
- Fitness (Before and During)
- Stay Alert & Engaged
- Caffeine – manage your body

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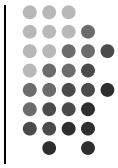
Fitness



- Personal fitness
  - Blood flow and stamina
- Techniques for remaining alert
  - Diet, Catnaps, Breaks
- Understand your body rhythms
- Pacing - trade low-rate periods for sleep
  - Review old logs to find the right off-times
- The 90-minute magic

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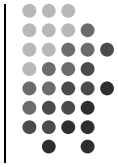
Knowledge



- Know your station equipment
- Study propagation – include possible events
- Learn your software
  - Turn OFF unneeded features and options
- Recognize calls
- Learn the goofy prefixes and zones
- Memorize approximate bearings by zone

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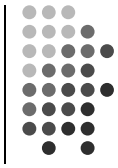
Plan



- What is propagation likely to be like?
- What is propagation Plan B?
- What did you do wrong last time – fix that
- Set goals on a time line
- Look for active station lists and recent spots
- Set break times in advance

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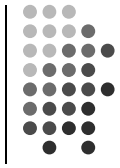
Technique



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

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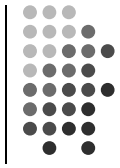
Technique Gimme's



- 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
- Learn when **NOT** to log it! Avoid penalties!
- Type – send – speak – copy accurately
- Breathe, be consistent, find a rhythm
- Keep your BIC (Butt In the Chair)

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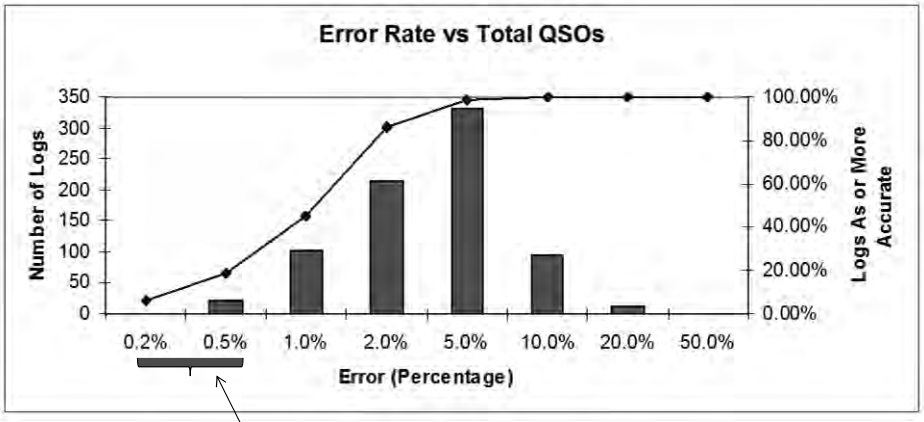
Accuracy

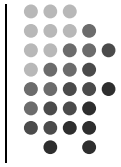


Here are the Top Ten – get there!

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
- Avoid databases and be wary of prefill
- Don't trust spots from *any* source
- Learn not to guess and when to move on

Resources



- Your club, other contesters, public logs
- Record your operating and review (painful)
- Review your LCR and compare to the log
- Use analyzers like *CBS*, *SH5*, *LogView*, etc
- NCJ and other magazine/web articles
- Study other brain-intensive sports and games
- Use simulators like *RUFZ* and *MorseRunner*

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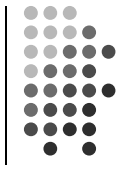
Thanks!



- And go get ‘em!

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CW and RTTY Skimmer and the Reverse Beacon Network

Presented by N6TV
n6tv@arrl.net

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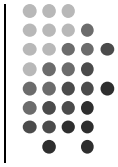
Overview



- **What is CW Skimmer and RTTY Skimmer?**
- **What is the Reverse Beacon Network?**
- **How does it work?**
- **What can the RBN do for *me*?**
- **How can I use it?**
- **How can I help?**
- **What's new?**

It all starts with one developer

- Alex Shovkoplyas, VE3NEA
  (b. 1965, ex-UR5EMI, in Canada since 1998)

- Honored as RAC *Radio Amateur of the Year* for 2014

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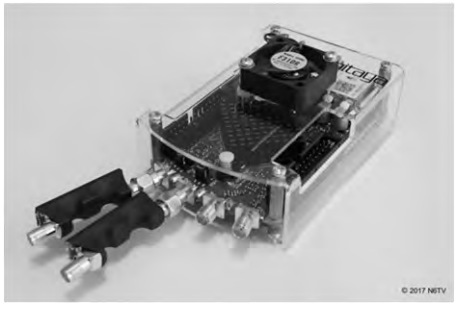
What is CW Skimmer?

1. Hardware: PC + Software Defined Radio (SDR)



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SDR Antenna

2. Wideband RX Antenna, 1.8-30 MHz, e.g. DX Engineering ARAH3-1P Active Dipole or DXE (formerly Pixel) Magnetic Loop RF-PRO-1B®:

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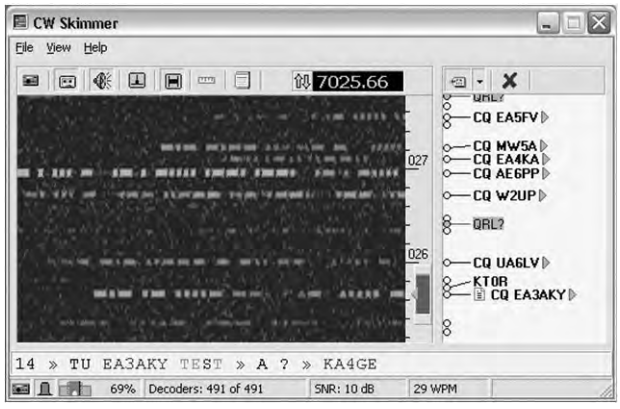
Software

3. CW (or RTTY) Skimmer *or* Skimmer Server



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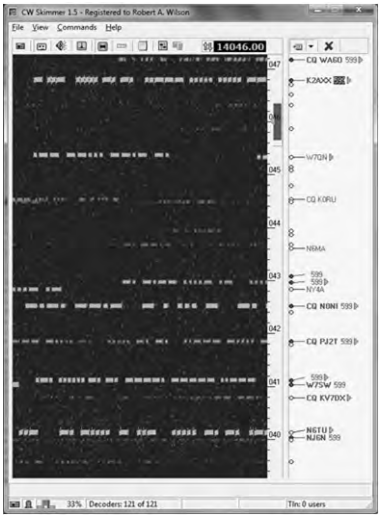
CW Skimmer by VE3NEA



- Works with many SDRs
- Decodes *multiple* CW signals in real time
- Can monitor *entire* CW band (one at a time)
- Waterfall Display
- Band Scope
- Uses MASTER.DTA
- Telnet Server (emulates a DX Cluster)

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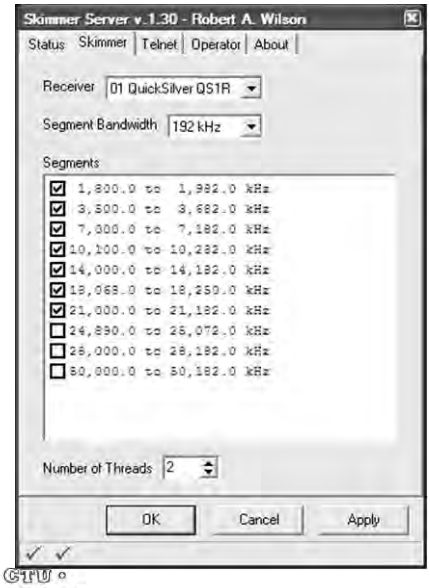
Skimmer Server by VE3NEA



- Natively supports *only* the QS1R SDR (no longer made)
- Supports Red Pitaya running free SDR receiver software
- Decodes multiple CW signals in real time
- Monitors *up to 8 bands* at once with a single SDR
- *No* Waterfall Display
- *No* Band Scope
- *No* MASTER.DTA
- Telnet Server

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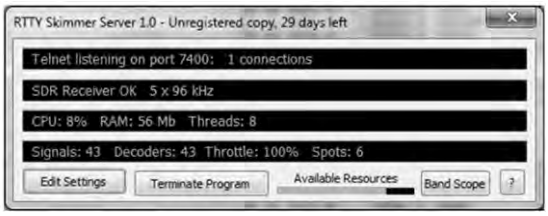
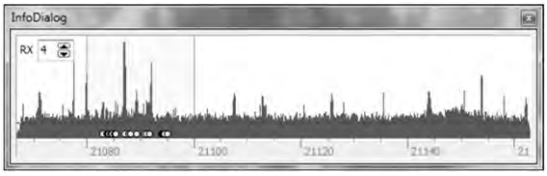
RTTY Skimmer Server





- Natively supports only the QS1R SDR (no longer made)
- Supports Red Pitaya running free SDR receiver software
- Decodes multiple RTTY signals in real time
- Monitors *up to 8 bands* with single SDR
- Requires high-end CPU
- Limited Band Scope
- *No* MASTER.DTA
- Telnet Server

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Telnet server (localhost port 7300)

- Emulates a DX Cluster Node

```
DX de N6TV-#:     14058.7  WR7HE          24 dB  31 WPM  CQ          2350
DX de N6TV-#:     14029.6  NM7D           29 dB  25 WPM  CQ          2350
DX de N6TV-#:     14059.5  YW4D           35 dB  31 WPM  CQ          2350
DX de N6TV-#:     14022.6  J39BS          11 dB  25 WPM  CQ          2350
DX de N6TV-#:     14066.8  NF6A           38 dB  30 WPM  CQ          2350
DX de N6TV-#:     14054.4  N5UM           26 dB  28 WPM  CQ          2350
DX de N6TV-#:     14021.2  NN5J           35 dB  31 WPM  CQ          2350
DX de N6TV-#:     14061.4  WX5S           12 dB  28 WPM  CQ          2350
DX de N6TV-#:     14064.2  WQ5L           15 dB  28 WPM  CQ          2350
DX de N6TV-#:     14032.2  VE7XF          18 dB  27 WPM              2350
DX de N6TV-#:     14042.9  NT5C           45 dB  31 WPM              2350
DX de N6TV-#:     14032.2  VE7XF          18 dB  27 WPM  CQ          2350
DX de N6TV-#:     14039.2  EA3FP          15 dB  31 WPM  CQ          2350
DX de N6TV-#:     14052.5  W0YR           20 dB  28 WPM  CQ          2350
DX de N6TV-#:     14022.9  AB7E           32 dB  25 WPM  CQ          2350
DX de N6TV-#:     14028.4  WH6R            7 dB  29 WPM              2350
DX de N6TV-#:     14065.6  KH7B           25 dB  29 WPM  CQ          2350
To ALL de SKIMMER <0952Z> : Clicked on "VE7XF" at 14032.2
DX de N6TV-#:     14069.6  KF6I           13 dB  28 WPM  CQ          2350
DX de N6TV-#:     14069.1  NK0M           25 dB  28 WPM  CQ          2350
To ALL de SKIMMER <0952Z> : Clicked on "" at 14031.4
DX de N6TV-#:     14035.5  KF8GE          12 dB  26 WPM              2350
DX de N6TV-#:     14028.4  WH6R            7 dB  29 WPM  CQ          2350
DX de N6TV-#:     14036.1  NZ1U           16 dB  28 WPM  CQ          2350
DX de N6TV-#:     14062.7  N4QS           11 dB  29 WPM  CQ          2350
DX de N6TV-#:     14045.1  YU1FM          20 dB  33 WPM  CQ          2350
DX de N6TV-#:     14059.6  YW4D           35 dB  31 WPM              2350
```

Reports Signal to Noise ratio, CW Speed, CQers

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What is the Reverse Beacon Network (RBN)?

- Uses *any* CW or RTTY signal as a beacon
- Multiple Skimmers world-wide record signal strength (S/N ratio in dB) and CW speed (WPM)
- A free “Aggregator” program forwards Skimmer spots to a central server
- Central server distributes spots via web page and public telnet servers
- You don’t need to have an SDR to use it

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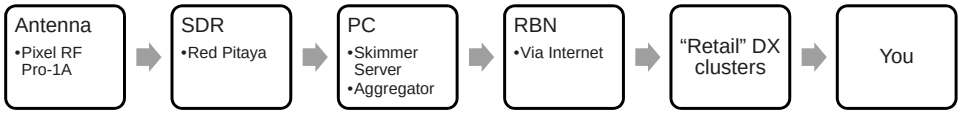
How do spots get to you?



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Acknowledgements

- RBN web site and first aggregator originated by PY1NB (similar to his other web site, www.dxwatch.com). Felipe pays most of the bills.
- Lots of code by W3OA (aggregator), F5VIH (Spots analysis tool)
- CW Skimmer evangelized and tested by N4ZR (also publishes RBN blog) – "RBN Chief Evangelist"
- Telnet server support by K5TR, W2QO, KM3T

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Felipe Ceglia, PY1NB

- Created and maintains the Reverse Beacon Network
- Hosts dxwatch.com and reversebeacon.net

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Dick Williams, W3OA

- Created and maintains the current RBN Aggregator software

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Nick Sinanis, F5VIH

- Wrote the RBN Spots Analysis Tool

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Pete Smith, N4ZR

- RBN Chief Evangelist
- Presenter at Contest Forum this Saturday
- Skimmertalk Reflector: http://dayton.contesting.com/mailman/listinfo/skimmertalk
- Groups.IO Group: RBN-OPS https://groups.io/g/RBN-OPS (187+ members)

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What can the RBN do for *me*?

- It can improve your score
  - Fills spots in band map (SOA, Multi-op)
  - Spots *you* (very often, *if* you call CQ *properly*)
- Entering a contest?
  - Before: Check antenna F/B, signal strength
  - During: See where you are being heard, view skimmer-generated propagation maps
  - After: Compare signal strength with the competition

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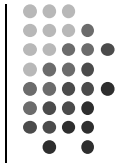
How can I use RBN to improve my score?



- Make sure the Skimmers find and spot *you*
- Access RBN via your favorite DX Cluster, for CW and RTTY contests (when allowed)
- RBN will post far more spots than DXers
  - With smaller pileups, less competition
- RBN quickly fills the band map in your logging software
- RBN helps locate clear spots to call CQ (between stations that you may not hear)

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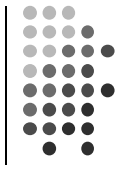
How can I use RBN to improve my score (cont'd):



- The RBN reveals band openings, shows where *you* are being heard
- At K3LR, sunrise on 15m: "Spotted by S50ARX-#"
- First EU answered our 15m CQs 25 minutes later

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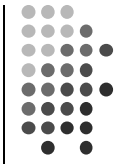
How do I CQ “properly”?



- Send *everything* at the *same consistent speed*
  - *Never* use >/< or +++/--- to change speed in messages
- Call CQ or TEST and send your call twice
  - CQ N6TV N6TV
  - TEST N6TV N6TV
  - CQ N6TV N6TV TEST
- Use proper spacing (let computer send)
  - Don’t send with paddles and *rush-everything-together*
- Change your freq. *slightly* to get spotted again

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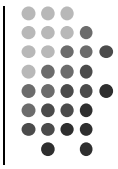
What counts as “CQ”?



- Originally just: “CQ”, “TEST”, and “QRZ”
- VE3NEA Added: “FD”, “SS”, “NA” and “UP”
- Examples:
  - P5DX P5DX UP
  - SS N6TV N6TV
  - NA N6TV N6TV
  - FD N6TV N6TV FD
- Short calls like “W1F” should always be sent twice to help Skimmer identify it quickly

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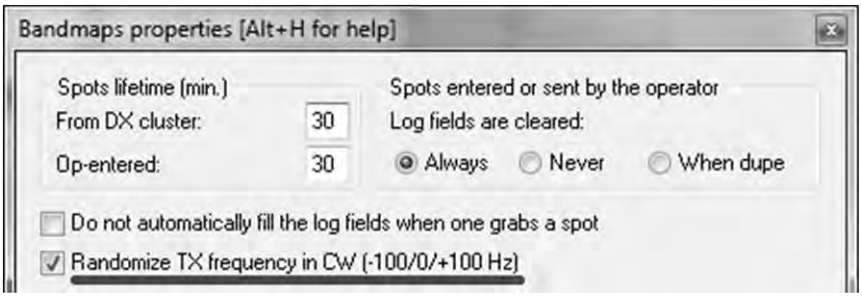
How to improve your chances in a Skimmer-generated pileup

- Use XIT or the “randomize TX” feature of your logging program to call a bit off frequency.



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How do I use the RBN to Check My Antennas?

- To test performance, just call CQ on CW or RTTY, check RBN web site (turn beam, repeat)
- Use RBN web site’s “Spots Analysis Tool” to compare your signal to the competition
- Download raw data files for deeper analysis
  - Every RBN spot posted since February, *2009* is archived on the RBN web site

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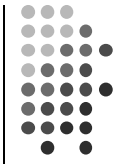
Accessing the RBN (SOA, Multi)



1. Many DX clusters combine RBN and human spots using AR-Cluster V6 (see www.dxcluster.info for address listing).
   - Some ARC V6 clusters offer CT1BOH spot quality filters (flags busts, uniques)
2. dxc.ve7cc.net port 23
   CC Cluster software – removes many bad spots (uniques) and dupes

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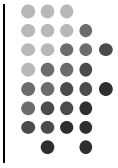
Filtering Spots (old way)



- DXSpider
  - accept/spots by_zone 1,3,4,6,7,31 and not by WZ7I or call N6TV
  - http://www.dxcluster.org/main/filtering_en.html#toc1
- ARCluster V6
  - set dx filter call=N6TV or (unique>1 and (spotterstate=CA or spotterstate=NV or spotterstate=UT))
  - http://www.n8noe.us/ARC.html

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Filtering Spots (new way)

- Use CC User software by VE7CC to log in to dxc.ve7cc.net port 23
- CC User sets filters with a full-feature, Graphical User Interface (GUI)
- CC Cluster nodes *automatically* reject “unique” (busted) spots, eliminates dupes
- New AR-Cluster Client by AB5K
- Updated Tutorial:
  - http://reversebeacon.blogspot.com/2013/12/a-new-tutorial-on-using-rbn.html

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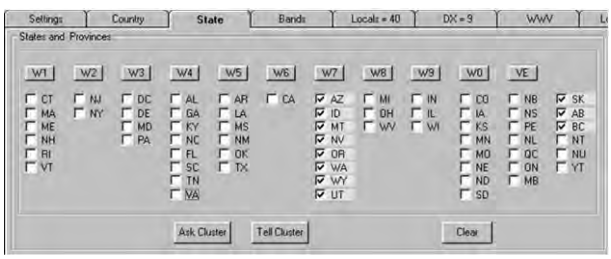
CC User Filter Dialogs



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AR-Cluster Client by AB5K

www.n8noe.us/ARC.html

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Many nodes combine RBN and "legacy" (human) spots

- dxc.ve7cc.net port 23 (CC Cluster, many filtering options, use CC User to set them)
- dxc.w9pa.net port 7373 (AR Cluster)
  `set dx extension skimmerquality`
- dxc.n7tr.com port 7373 (AR Cluster, but pre-filters to show only spots from Zones 3 and 4)

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Real-time propagation maps

- http://www.dxmaps.com
- Click “HF” and band of interest
- Leave page open, it refreshes automatically

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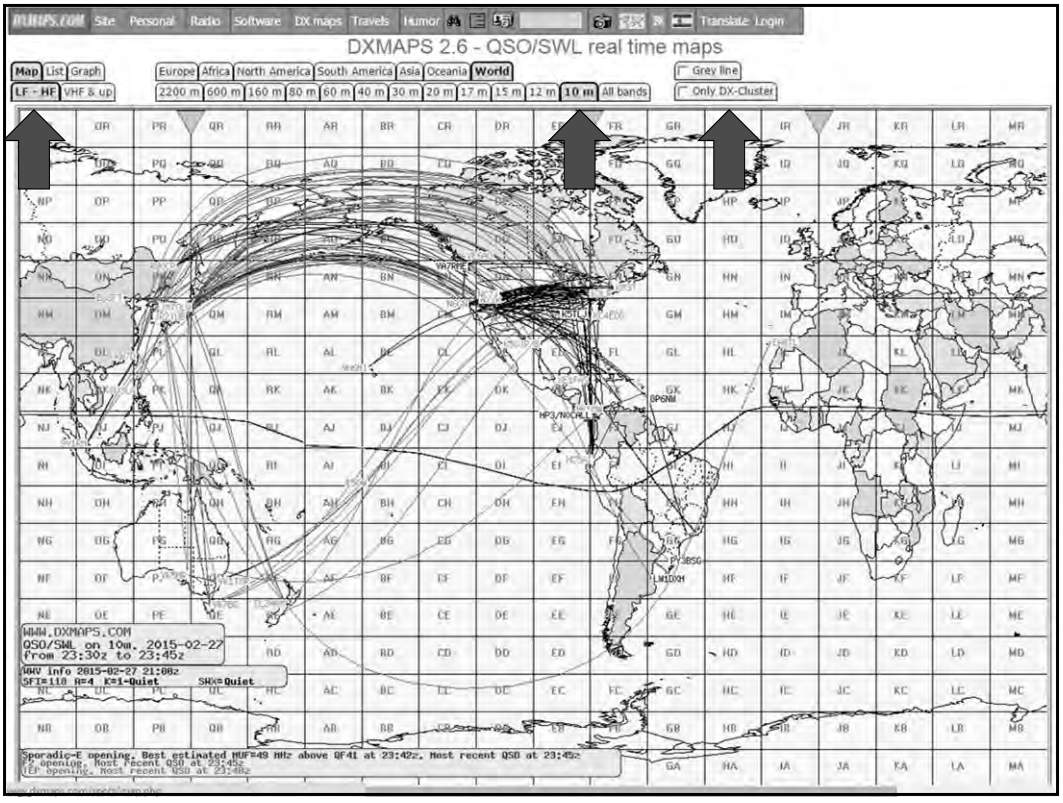

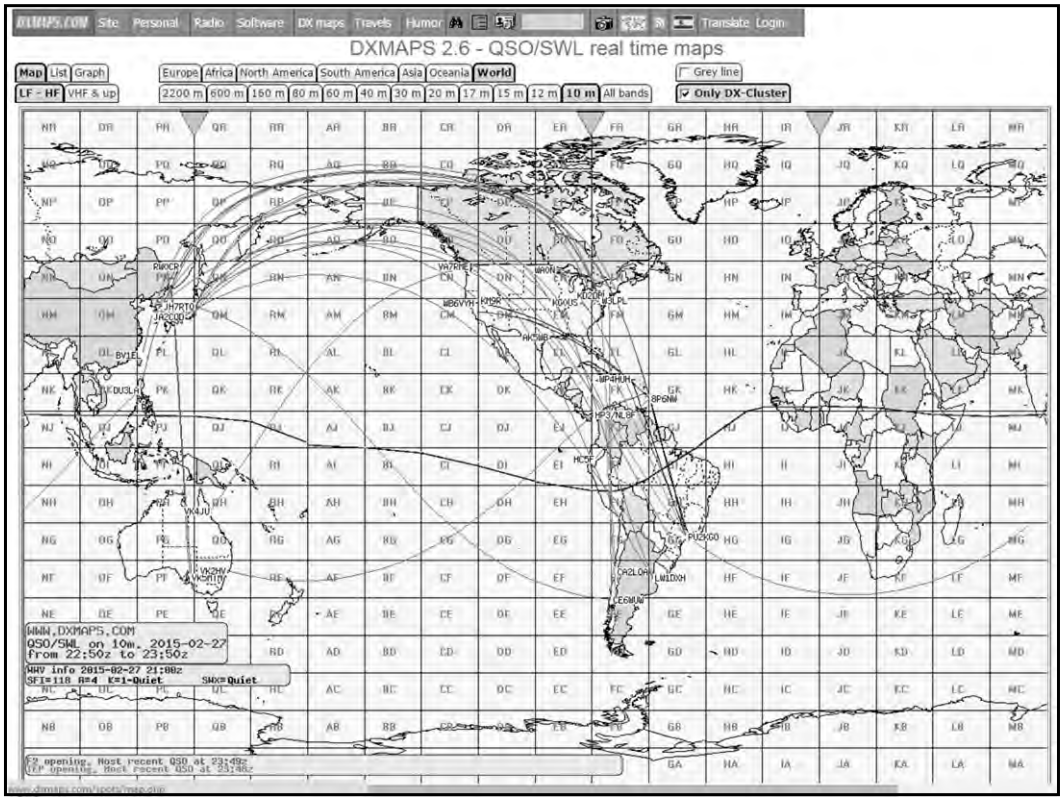

Using www.reversebeacon.net

- Great for post-contest analysis
- Plot signal strengths
- Raw data files can be downloaded / analyzed
  - Millions of spots archived

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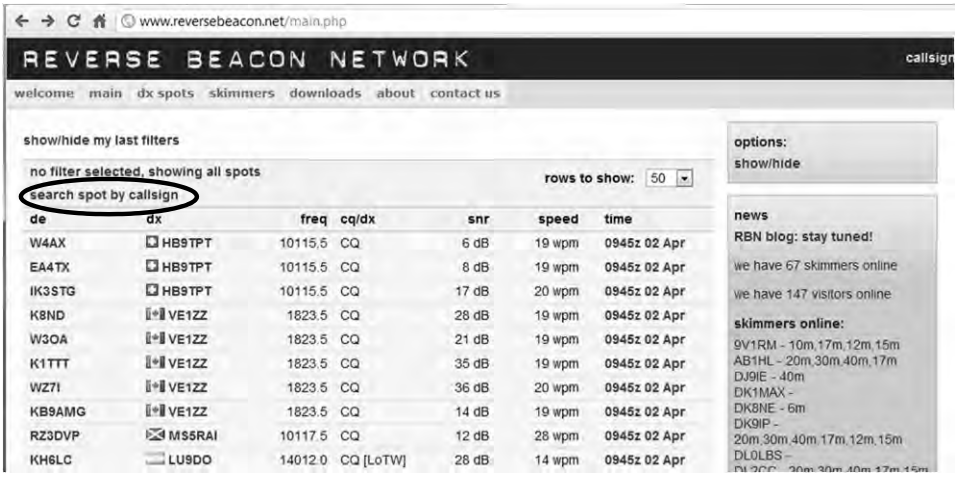
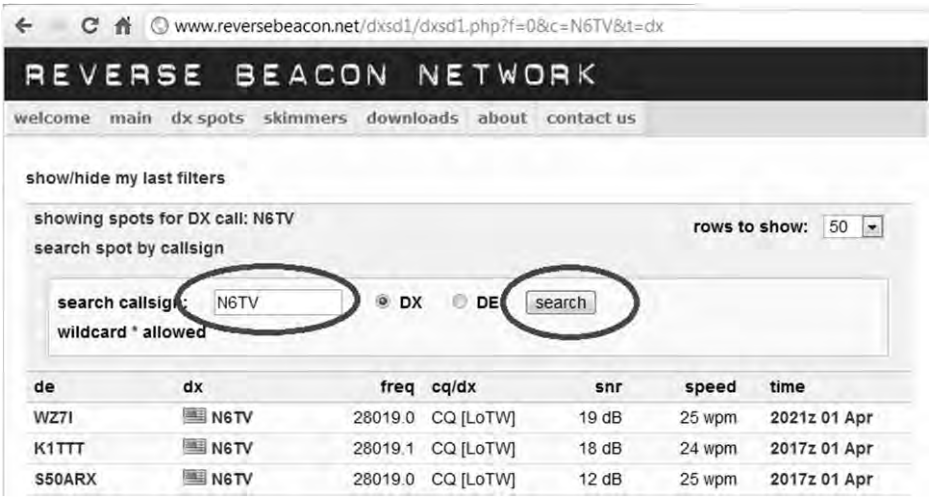
www.reversebeacon.net

www.reversebeacon.net main



Where was I heard?



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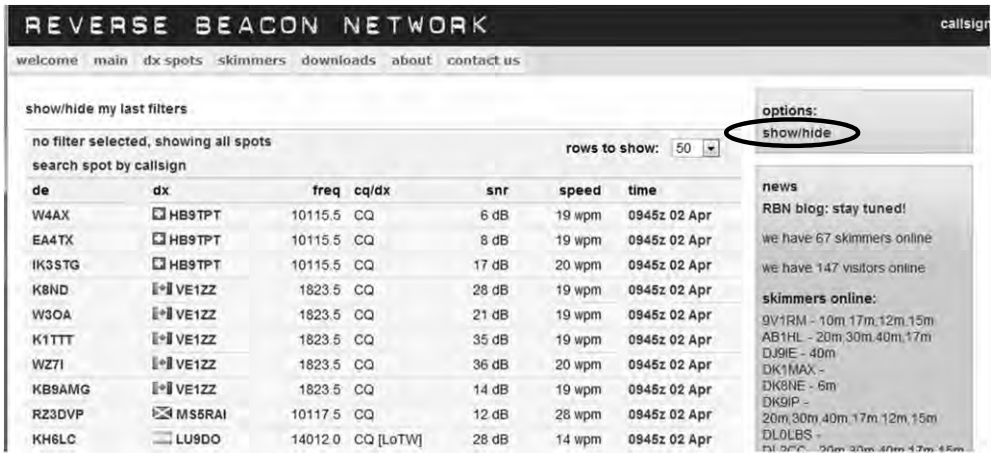
Plot spots on a map



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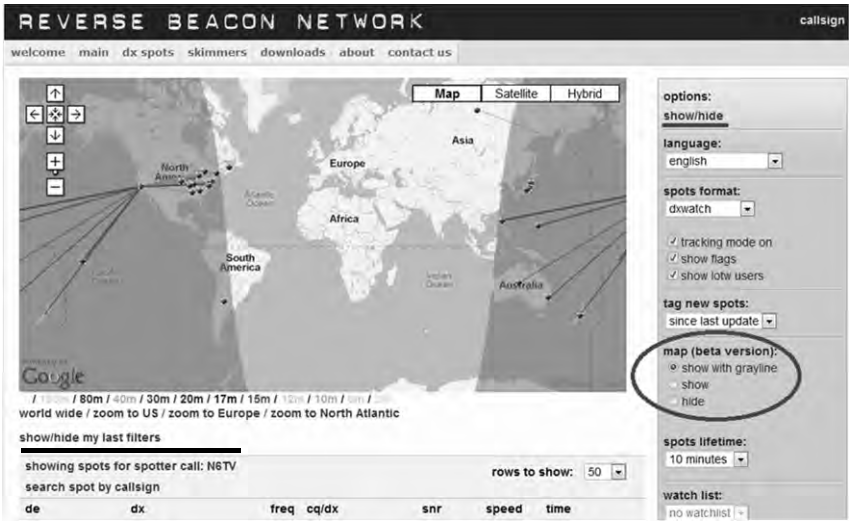
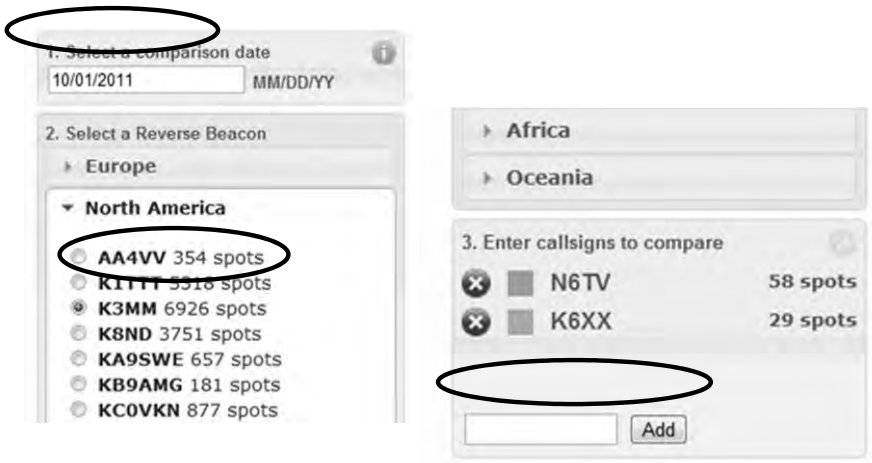
Which bands are open at *my* QTH?

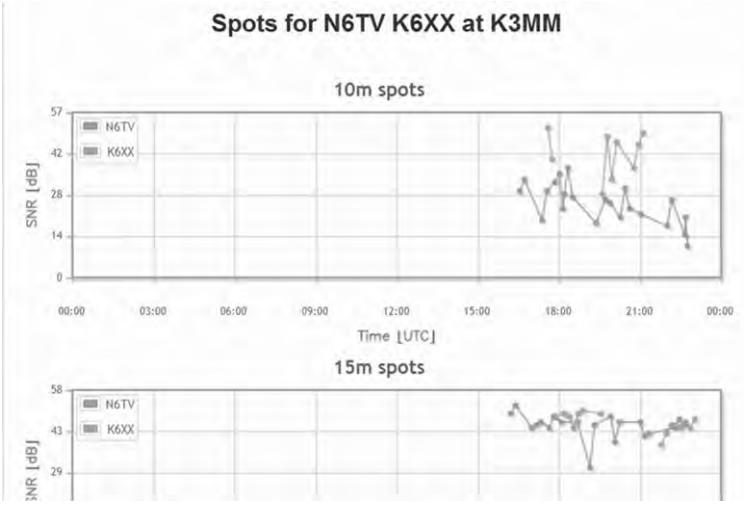


Spots analysis tool

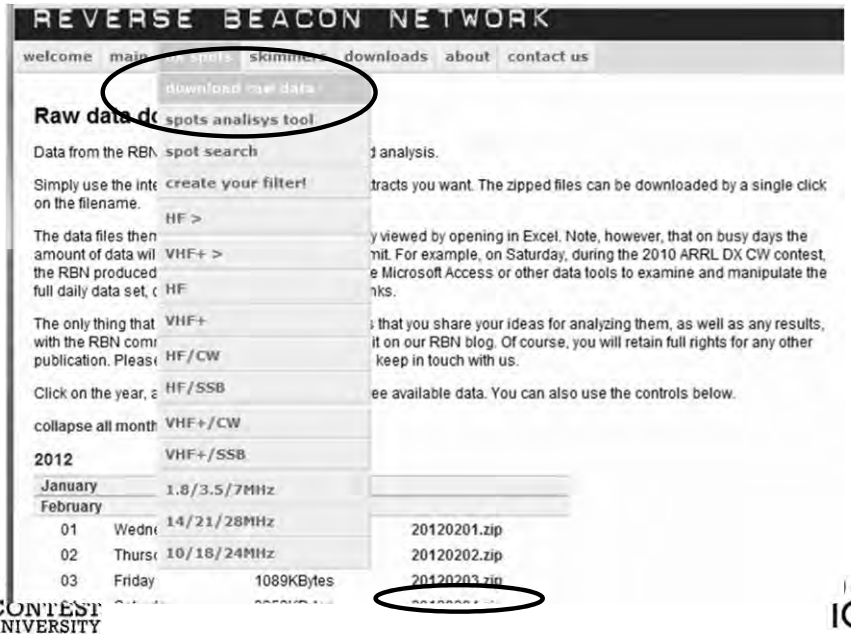
Pick a Date, a Skimmer, add callsigns to compare



And the winner is … K6XX!



Raw data downloads



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Raw data is text file, Comma Separated Values

callsign,de_pfx,de_cont,freq,band,dx,dx_pfx,dx_cont,mode,db,date,**speed,tx_mode**
JE1SGH,JA,AS,28032.6,10m,K6UW,K,NA,CQ,29,2014-02-15 00:00:00,32,CW
XV4Y,3W,AS,14041.1,20m,PT5T,PY,SA,CQ,22,2014-02-15 00:00:00,28,CW
XV4Y,3W,AS,14021,20m,PX2F,PY,SA,CQ,23,2014-02-15 00:00:00,23,CW
NC7J,K,NA,28005.5,10m,N2IC,K,NA,CQ,11,2014-02-15 00:00:00,33,CW

- Total World-Wide RBN CW spots, CQ WW:
  2013: 5,743,545 (33.2 spots per *second*)
  2014: 6,200,340 (35.9) – up 8.0%
  2015: 7,085,553 (41.0) – up 14.0%
  2016: 6,060,130 (35.1) – down 14.5%
  2017: 7,004,509 (40.5) – up 15.6%
- ARRL DX CW:
  2014: 4,146,399 (86,383 spots per *hour*)
  2015: 5,537,017 (115,354) – up 33.5%
  2016: 3,924,585 (81,762) – down 29.1%
  2017: 4,285,719 (89,286) – up 9.2%
  2018: 4,474,188 (93,212) – up 4.4%

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What's the Average CW Speed of a Spot?

- CQ WW CW:
  - 2013: 30.6 WPM
  - 2014: 30.8
  - 2015: 30.7
  - 2016: 30.8
  - 2017: 30.8
- ARRL DX CW:
  - 2014: 29.6 WPM
  - 2015: 30.1
  - 2016: 29.9
  - 2017: 29.6
  - 2018: 29.4

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RTTY Skimmer Stats

- CQ World-Wide RTTY (48 hours):

  2015: 922,311 (5.3 spots per *second*)
  2016: 994,212 (5.8) – up 7.8%
  2017: 1,154,444 (6.7) – up 16.1%

- ARRL January RTTY Roundup (30 hours):

  2016: 457,033 (15,234 spots per *hour*)
  2017: 470,377 (15,679) – up 2.9%
  2018: 566,063 (18,869) – up 20.3%

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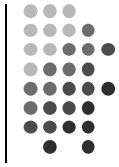
How can I help?



- Set up an SDR, feed Skimmer Spots to the RBN, using the Aggregator program
  - More skimmers needed in Asia/Africa/South America
- Call a bit off frequency (Win-test and N1MM both provide automatic randomization if desired)

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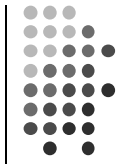
What's New?



- NCDXF and other HF Beacons can be spotted on RBN
  - reversebeacon.blogspot.com/2014/02/ncdxf-beacon-spotting-redux.html
- CW Skimmer 2.0
- CW Skimmer Server 1.6
- RTTY Skimmer Server 1.3
- Aggregator v4.4
- Skimmer Server using Red Pitaya on 8 bands

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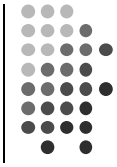
For more information



- http://www.reversebeacon.net
- http://www.dxmaps.com
- http://www.bcdxc.org/ve7cc/default.htm#download
- http://www.dxatlas.com/CwSkimmer
- http://www.dxatlas.com/SkimServer
- http://microtelecom.it/perseus/ (Perseus SDR)
- https://redpitaya.com/ (Red Pitaya)
- http://hamsci.org/n6tv-red-pitaya-combine-cw-rtty-skimmer-hdsdr

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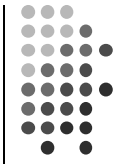
For more information



- http://www.dxengineering.com/parts/ins-rf-pro-1b (RF Pro-1B loop antenna)
- http://www.dxengineering.com/parts/dxe-arah3-1p (Active Broadband Dipole antenna)
- http://www.pvrc.org/~n4zr/rbn.pdf
- http://reversebeacon.blogspot.com/2013/12/a-new-tutorial-on-using-rbn.html
- http://reversebeacon.blogspot.com
- http://www.ve7cc.net/
- http://www.qrz.com/db/n6tv

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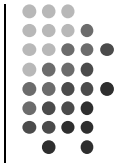
Questions?



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CTU Presents

Utilizing Digital Modes FT8 and MSK144 for Competitive Advantage in VHF Contests

Joel Harrison, W5ZN

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Before We Talk "Digital" Let's Review VHF Contests

- **Available Contests**
- **Available Modes**
- **Propagation Techniques**

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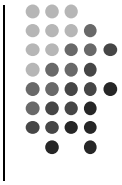
Available Contests



- ARRL VHF
  - January
  - June
  - September
- CQ VHF
  - July
- Sprints

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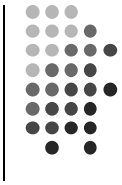
Differences from HF Contests



- Any Mode is Allowed
  - Exception
    - ARRL Contest FM Only category
- You can self spot & make skeds
  - *Absolutely NO QSO information*

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Propagation Techniques

- **Sporadic “E”**
- **Meteor Scatter – “MS”**
- **Tropo**
- **Moonbounce - EME**

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Meteor Scatter

- Meteor scatter is the reflection of radio waves from the ionized trails from meteors burning up in the upper atmosphere.
- Meteors (space debris) burn up in the upper atmosphere at a height of around 65 miles.
- This may be used to make QSOs up to about 1400 miles

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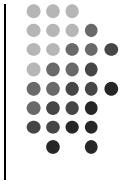
Meteor Scatter



- The earth is bombarded by a constant stream of small particles, remnants of comets that when entering the earth's atmosphere can ionize a column of atoms in the E region at approximately 100km (~60 miles) above the surface of the earth which can reflect radio waves in the VHF region of the spectrum

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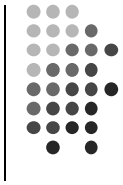
Meteor Scatter



- There are seasonal variations in the number of sporadic meteors
  - Relative rate increases noticeably in May, peaking in July and August then tailing off into October and November.
- There is also an hourly variation in the relative rate of meteors peaking
  - around dawn local time with the minimum late afternoon before the ramp up begins again late evening.
  - The hourly relative rate is due to the fact that the earth's rotation is head on so to speak in the morning into the path of the particles and therefore there is an increase in the relative velocity of a particle entering the earth's atmosphere.

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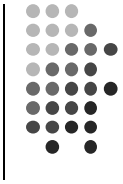
Meteor Scatter



- The length of time of the ionization, or burst duration, is related to meteor velocity and increase in relative velocity results in longer ionization times.

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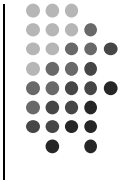
Meteor Scatter



- Most particles entering the earth's atmosphere are the size of a grain of sand resulting in ionization lasting only a fraction of a second
  - much too short to convey any meaningful information using SSB or even high speed CW.
- The digital modes of FSK441 and MSK144 were designed to compress a limited amount of information in a packet and transmit that packet in a very short period of time.
  - In the case of MSK144 the information packet, with a transmission length 0.072 seconds, is repeated over and over again during the duration of the selected transmit interval of 5, 10, 15 or 30 seconds.

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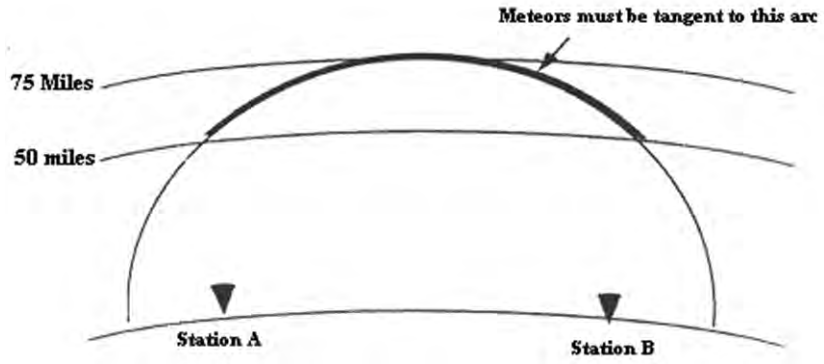
Meteor Scatter

Reflection will occur when the trail is oriented as shown



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Meteor Scatter

- **Excellent for 50 MHz**
- **Very Predictable Paths**
  - Best times between midnight & approx 9 AM
  - Peak during “showers” – Anytime with high speed procedures like ***WSJT***

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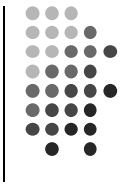
Meteor Scatter



- **Very Good for 144 MHz**
- **Very Predictable Paths**
  - Best times between midnight & approx 9 AM
  - Peak during “showers” – Anytime with high speed procedures like ***WSJT***

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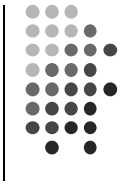
MSK144 & FT8 Digital Modes



- **Weak Signal Communication by K1JT (WSJT) offers specific digital protocols optimized for EME and meteor scatter at VHF/UHF**
- **Free open-source programs in the WSJT-x Suite. Normal usage requires only a standard SSB transceiver and a personal computer with soundcard.**

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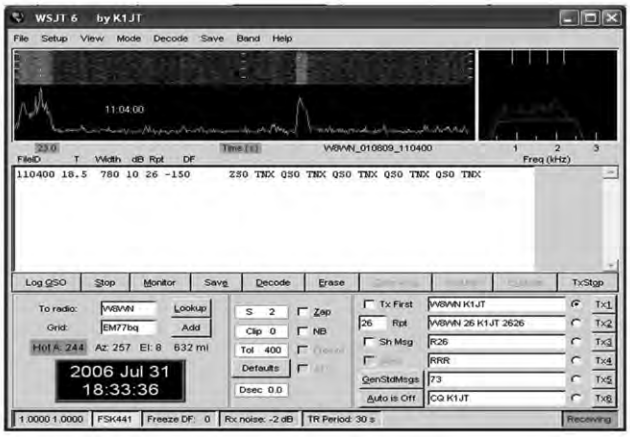
Meteor Scatter

Original JT “FSK441” MS Mode



Meteor Scatter – MSK144

- **New Mode introduced in WSJT-X**
  - Officially released in January 2017
  - Contains 8 new modes
  - **MFSK441 Mode**
    - **Calling frequencies 50.280**
    - **Many new features**

Meteor Scatter – MSK144

- Focussed toward contest style operation that include:
  - a machine human interface that facilitates rapid population of QSO specific information
  - shorter TX and RX periods than FSK441
  - auto sequencing that reduces human error and improves operator efficiency important considerations during contest operation

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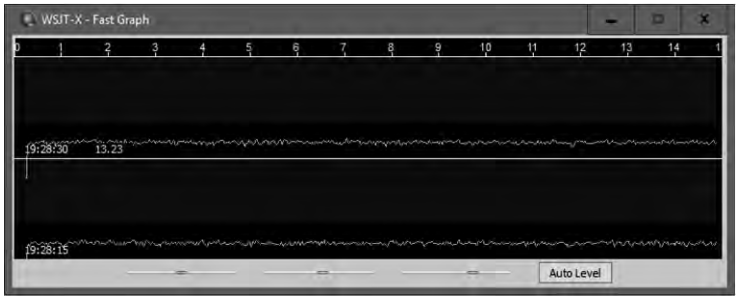
Meteor Scatter – MSK144

Graph still exists but in a separate window called “Fast Graph”



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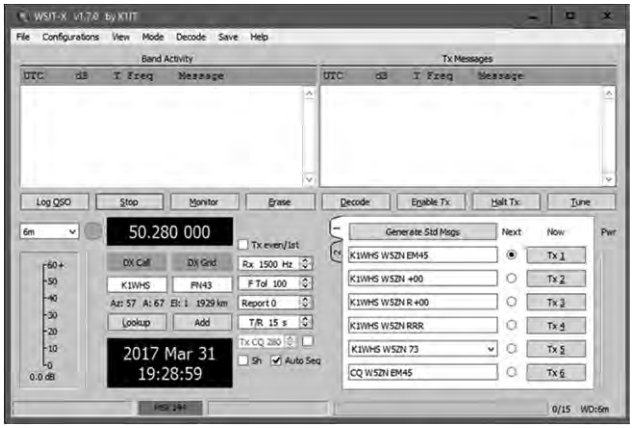
Meteor Scatter – MSK144

MSK144 Window is different from previous FSK441 Window”



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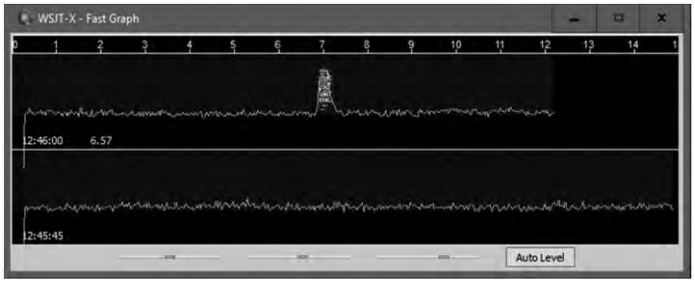
Meteor Scatter – MSK144

Signal bursts still appear in the “Fast Graph”



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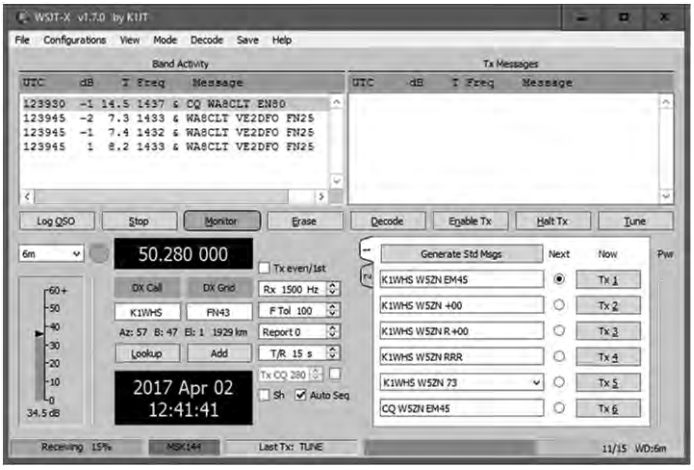
Meteor Scatter – MSK144



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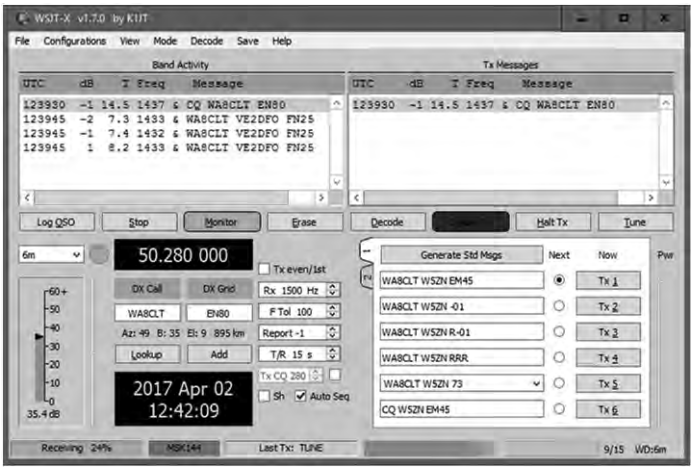
Meteor Scatter – MSK144



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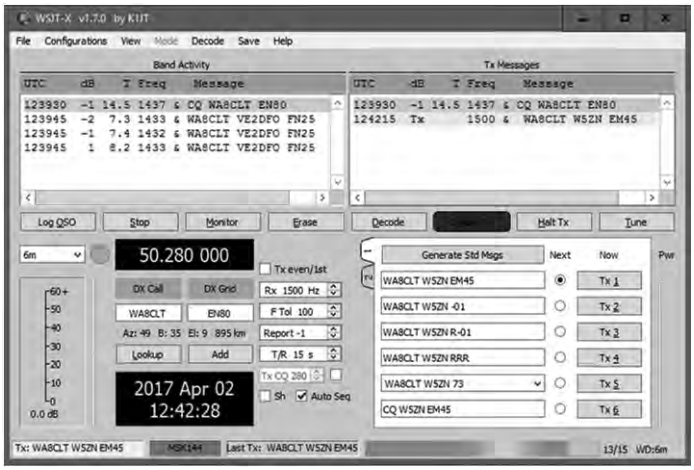
Meteor Scatter – MSK144



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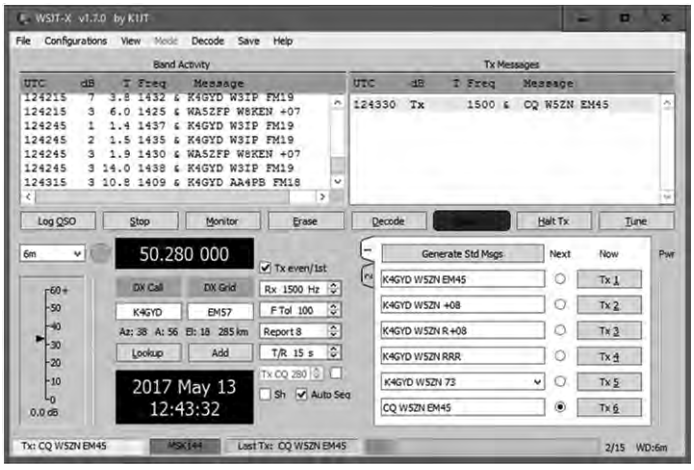
Meteor Scatter – MSK144



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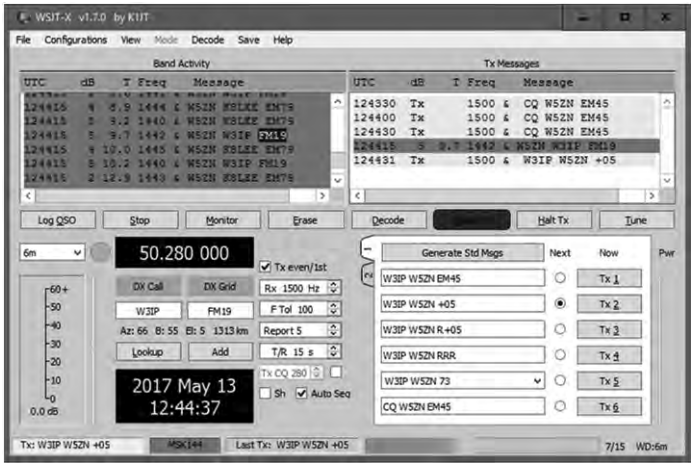
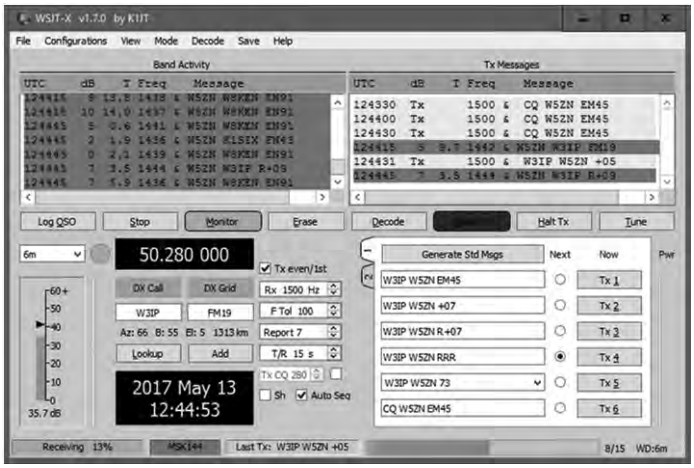
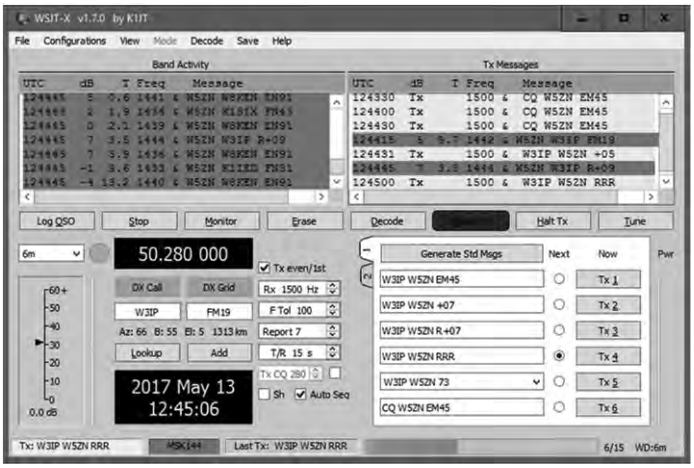
Meteor Scatter – MSK144



Meteor Scatter – MSK144



Meteor Scatter – MSK144



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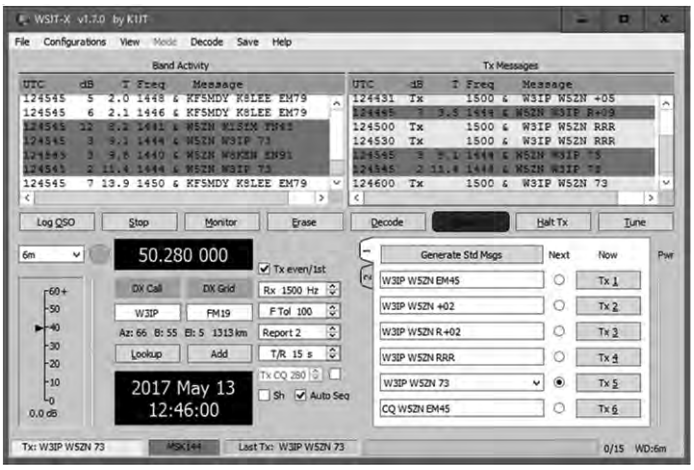
Meteor Scatter – MSK144



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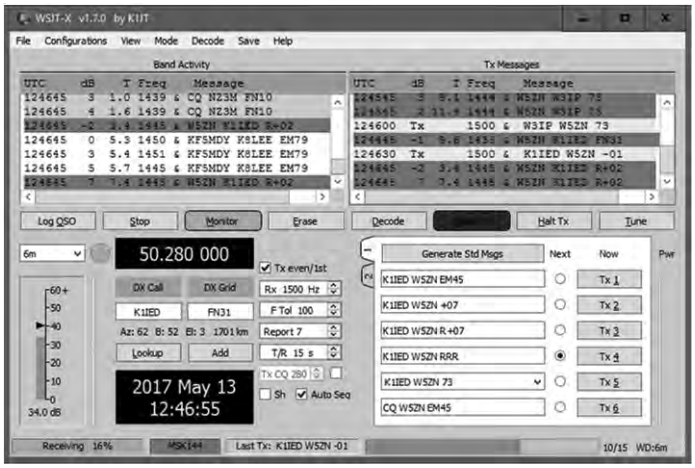
Meteor Scatter – MSK144



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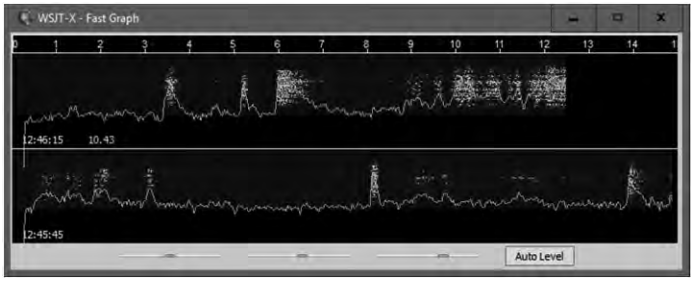
Meteor Scatter – MSK144



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Meteor Scatter – MSK144

K8ZR Test Results

- **Contest QSO Non-Contest QSO**
- **Tx Time:**
- 15 sec. CQ N8JX EN64
- 15 sec. N8JX K8ZR EN91
- 15 sec. K8ZR N8JX R EN64
- 15 sec. N8JX K8ZR RRR
- 15 sec. K8ZR N8JX 73
- Total time: 75 seconds

- **Non-Contest QSO**
- **Tx Time:**
- 15 sec. CQ WB4JWM EM83
- 15 sec. WB4JWM K8ZR EN91
- 15 sec. K8ZR WB4JWM +05
- 15 sec. WB4JWM K8ZR R+07
- 15 sec. K8ZR WB4JWM RRR
- 15 sec. WB4JWM K8ZR 73
- Total time: 90 seconds

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Meteor Scatter – MSK144

K8ZR Test Results

50 MHz MSK144 QSO Summary

• Period January 23rd- March 13th:	50 days
• Number of 50 MHz MSK144 QSOs:	225
• Average number of minutes to complete a QSO:	4.6
• Number of unique callsigns worked:	50
• Number of unique callsigns decoded:	98
• Number of States worked:	22
• Number of unique Grids worked:	42
• Number of 90 second QSOs:	10
• Best DX K5DOG EM00wh:	1,223 miles

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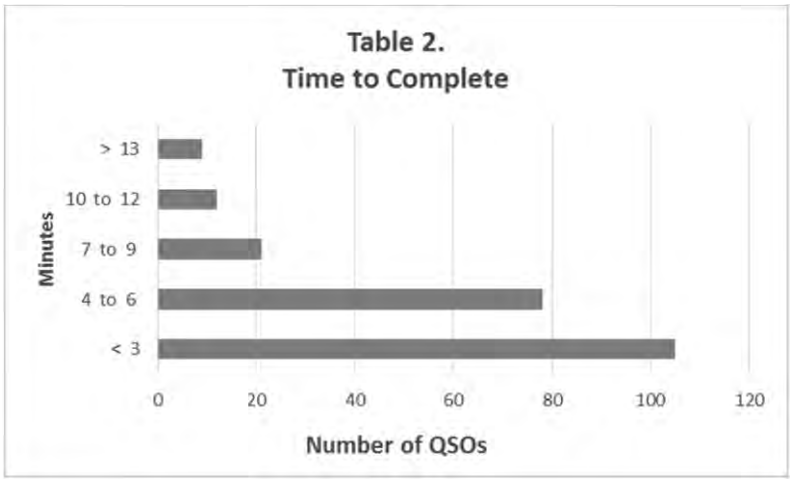
Meteor Scatter – MSK144

K8ZR Test Results



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FT-8 "The Game Changer" ?

- **Outgrowth of JT65**
- **Shorter transmit-receive cycle**
  - Faster contacts – up to 4 times faster
  - Can complete within 1 minute
- **Sensitivity down to -20 dB**
- **Uses 8-Frequency Shift Keying format**

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FT-8 “The Game Changer” ?

- **Excellent for multi-hop sporadic E**
  - Deep QSB often times impacts normal mode Q’s
- **Operation centered on 50.313**

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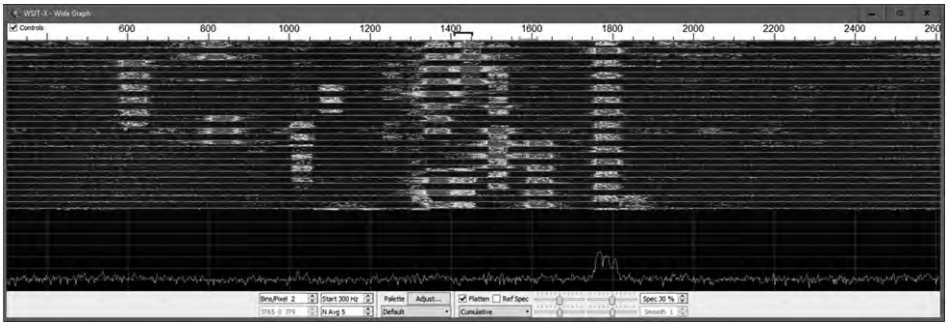
FT-8 “The Game Changer” ?



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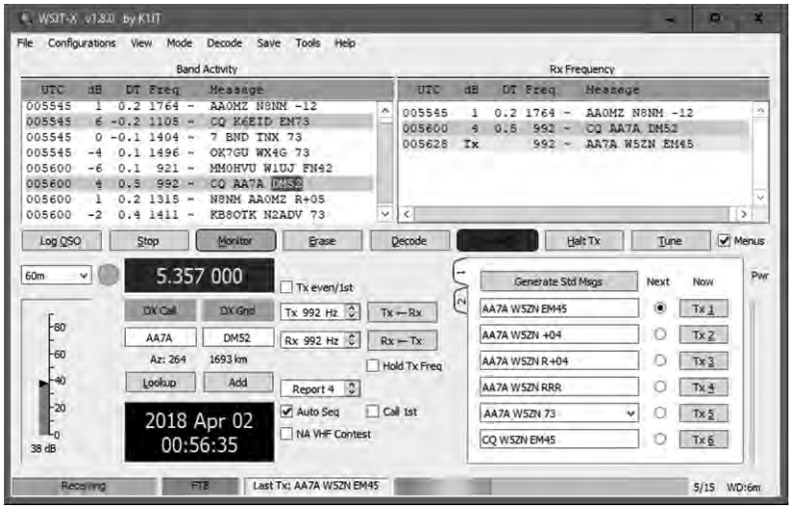
FT-8 “The Game Changer” ?



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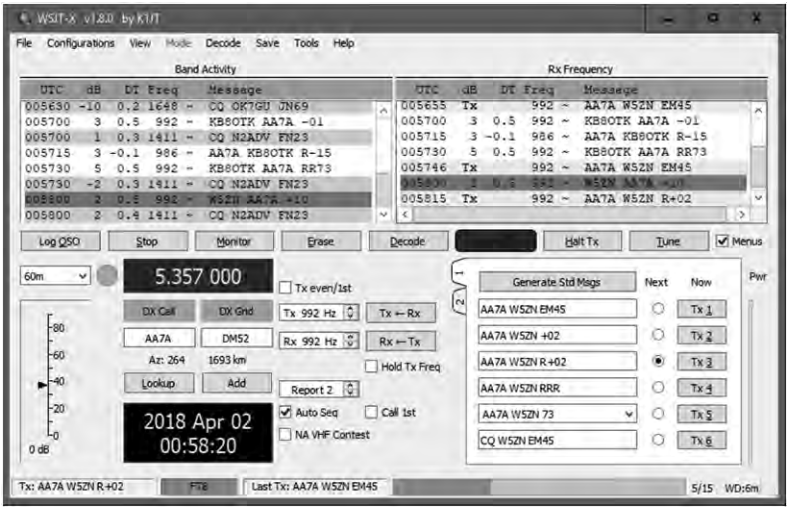
FT-8 “The Game Changer” ?



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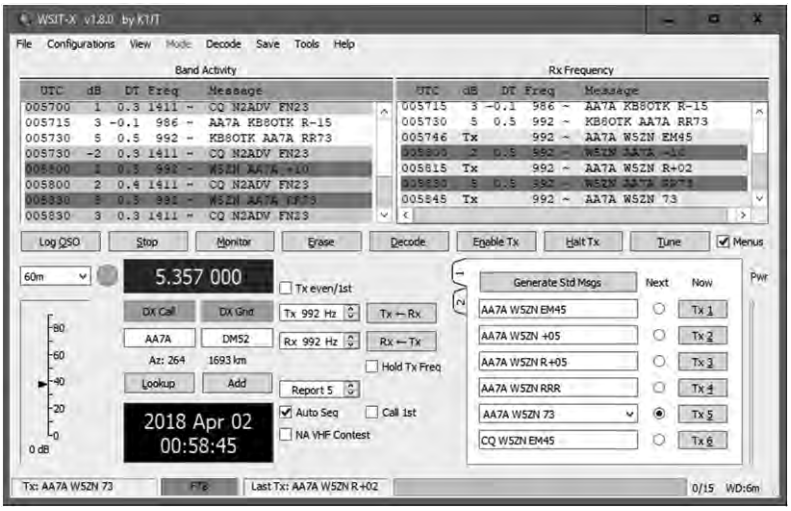
FT-8 “The Game Changer” ?



FT-8 Disadvantage

- **QSO rates can be larger on other modes during big Sporadic E Openings**
  - While a quick FT-8 contact can be completed in 1 minute, SSB or CW rates can be 5 to 10 times that
- **Too many stations sit on 50.313 when the band opens and closes quickly on CW & SSB Frequencies!**

The Competitive Advantage

- **REMEMBER – you can use any mode**
  - Be prepared to USE THEM ALL!
- **Strategy:**
  - 1800z to 0200z
    - Monitor ~50.095 CW; ~50.125 SSB; 50.313 FT8
  - 0200z to 1500z
    - Meteors with MSK144 centered on 50.265
      - Use PingJockey to monitor activity & set skeds
        - https://www.pingjockey.net/cgi-bin/pingtalk

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The Competitive Advantage

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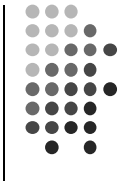
The Competitive Advantage



- **Use 2 Radios or 2nd RX**
  - Keep 2nd Radio on 50.313 FT-8 ***at all times***
  - Keep main radio on CW/SSB frequencies
    - Move to MS frequencies during those peak times
- **Put up a separate antenna for RX #2**
  - Even a 3 or 4 element antenna will produce results
  - Fixed direction will work if toward activity area

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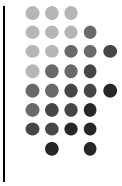
The Competitive Advantage



- **Remember you can listen on several frequencies at the same time**
  - Only one transmitted signal per band at one time !!!!

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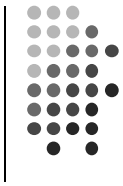
The Competitive Advantage



- **How do I log digital Q's?**
  - Remember you can use any mode so you are not penalized if the mode is not logged correctly (SSB –vs- FT8, digital, etc)
- **Making the contact is the important step!**
  - Get the callsign & grid correct in your log

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Easy to Build
Low Band Receiving Antennas for Small and Large Lots

- Small antennas
- High performance antennas
- Quantitative performance evaluation

Frank Donovan
W3LPL

CONTEST UNIVERSITY ICOM

Dayton 2016

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 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 arrays of Beverages and verticals
- Diversity reception with dual phase locked receivers

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

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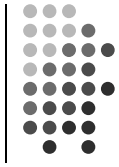
Receiving Directivity Factor (RDF)

proven measure of receiving antenna performance



- Compares forward gain <u>at the desired azimuth and elevation angle</u> to average gain <u>over the entire hemisphere</u>
  - 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
- 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

https://www.w8ji.com/receiving.htm

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

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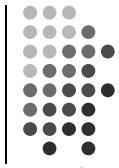
Small Receiving Antennas

4 to 9 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)
- 6 dB: 250 to 400 foot Beverage about 7 feet high
- 7 dB: Unidirectional terminated small loop
  - flag, pennant, EWE, VE3DO
- 8 dB: Close spaced arrays of two small terminated loops
  - K9AY Array
  - Shared Apex Loop Array
- 8 dB: Pair of 250 to 400 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

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

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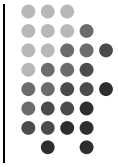
High Performance Receiving Antennas
10 to 14 dB RDF



- 10 dB: 500 to 600 foot Beverage about 7 feet high
- 11 dB: Two or three close spaced 500 to 600 foot Beverages, staggered 125 feet
- **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 *well over 100 ft high*
- 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 800 foot Beverages 800 ft x 330 ft

Large receiving antennas are less effective at suppressing local RFI sources within a few thousand feet of the antenna

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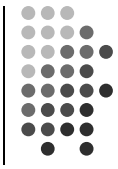
Small Loop Antennas
4 to 7 dB RDF 120º to 150º Beamwidth



- 8 foot diameter "magnetic" loop 4 dB RDF
  - *bi-directional* 150 degree beamwidth
  - installed close to the ground to suppress horizontally polarized RFI
  - a specialized antenna for steering a very deep null onto a single ground wave propagated RFI source
  - poor sensitivity for DX compared to larger antennas
- Unidirectional terminated small loops 6 to 7 dB RDF
  - flag
  - pennant
  - EWE
  - K9AY
  - VE3DO
- Mechanically rotatable unidirectional terminated small loops
  - rotatable flag

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

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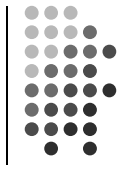
Arrays of Small Loops
8 to 11 dB RDF 80º to 120º Beamwidth



- Electrically steerable compact arrays of two small loops
  - Two switchable K9AY loops 8 to 9 dB RDF
  - Shared Apex Loop Array 8 to 9 dB RDF
- 350 foot broadside spaced pair of small loops 9 to 10 dB RDF
  - pennant
  - EWE
  - K9AY
  - VE3DO
- Mechanically steerable array of two small loops 10 to 11 dB RDF
  - Vertical Waller Flag

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

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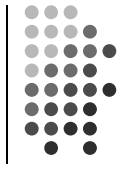
BOGs and BOG Arrays
6 to 8 dB RDF 60º to 90º Beamwidth



- BOG 6 dB RDF 90º beamwidth
  - 225 foot wire laid *just above* the surface of the ground
- Switchable bi-directional BOG 6 dB RDF 90º beamwidth
  - 225 foot coaxial cable laid *just above* the surface of the ground
- Close spaced staggered BOGs 7 dB RDF 90º beamwidth
  - 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 8 dB RDF 60º beamwidth
  - 350 foot broadside spacing

BOGs are low sensitivity antennas requiring significant reduction of common mode signals from the coaxial cable feed line

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Beverages and Beverage Arrays
6 to 14 dB RDF 45º to 120º Beamwidth

- 250 to 400 foot Beverage 6 dB RDF 90º to 120º beamwidth
  - approximately 7 feet high
  - single wire or two wire bi-directional
- 500 to 900 foot Beverage 8 to 10 dB RDF 50º to 70º beamwidth
  - approximately 7 feet high
  - single wire or two wire bi-directional
- Staggered Beverage arrays 11 dB RDF 50º to 70º beamwidth
  - two or three Beverages with 125 foot end-fire spacing
  - significantly improved front-to-back ratio especially with a variable phase controller
- Wide spaced Beverage arrays 12 to 14 dB RDF 45º to 60º beamwidth
  - two Beverages with 350 foot broadside spacing, or
  - four Beverages with 125 foot end fire spacing and 350 foot broadside spacing

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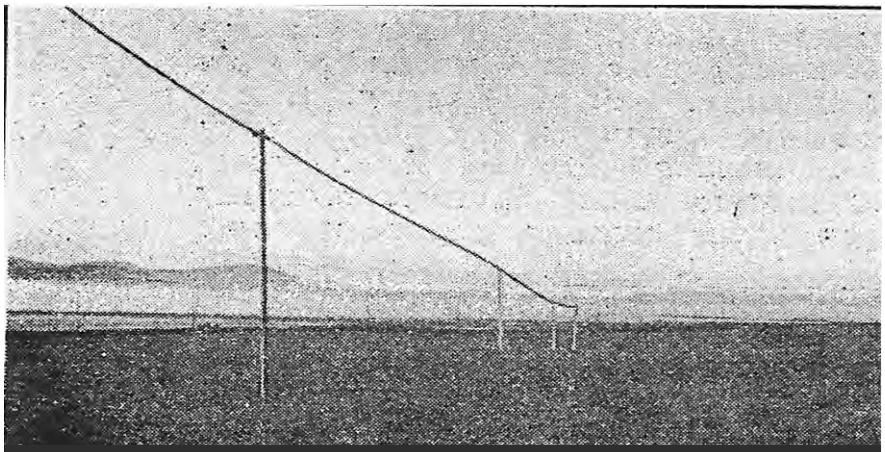
1300 Foot Beverage Installed by 2ZE Paul Godley at Androssan, Scotland During the Successful 1921 Trans-Atlantic Tests



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 Verticals
9 to 14 dB RDF 50º to 135º Beamwidth

- Active high impedance 20 foot verticals
  - requires a high input impedance amplifier *at the base of each vertical*

----- or ----

- Passive low impedance 25 foot verticals
  - **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 in all weather
    - decouples the coax shield
  - four 25 foot umbrella wires
    - reduces the required height to 25 feet
    - increase the array bandwidth
    - *if necessary*, 35 foot verticals with no umbrella wires can be substituted

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Any monoband array of phased short verticals can use high impedance 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 antenna for precisely locating RFI sources
- Bi-directional figure-8 pattern 150º 3 dB beamwidth
  - installed close to the ground to suppress horizontally polarized signals
- Very deep nulls (only about 2º wide) 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 high gain, low noise figure preamplifier
  - a poor low sensitivity DX receiving antenna
- Decouple common mode signals conducted by all attached cables
  - install common mode chokes on the coaxial feed line and the 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

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The "Magnetic" Loop is a Specialized Antenna

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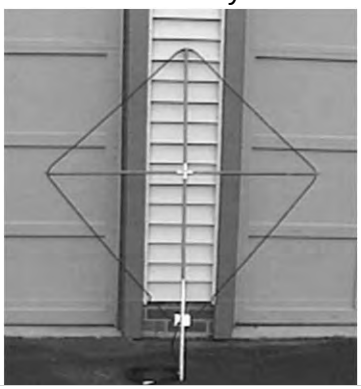
Small Diameter Loop Antenna 4 dB RDF

Inexpensive and very easy to build and use
Compact 8 foot diameter
Very deep 2ººbeamwidth broadside nulls for local RFI suppression
Very broad 150º figure-8 bidirectional 3 dB beamwidth
Poor sensitivity for DX



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

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Electrically Steerable Loop Arrays

- Two K9AY loops
  - switchable in four directions
  - footprint is only 25 x 25 feet and 25 feet tall
  - 120º 3 dB beamwidth
  - 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 beamwidth
  - 8 dB RDF
- Small loops 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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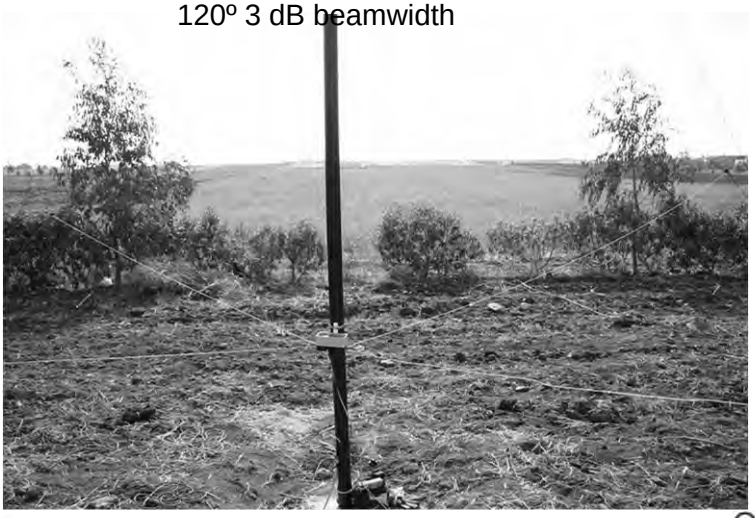
Two K9AY Loops
7 dB RDF in only 625 square feet

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



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www.arraysolutions.com/antennas/as-ayl-4-ant

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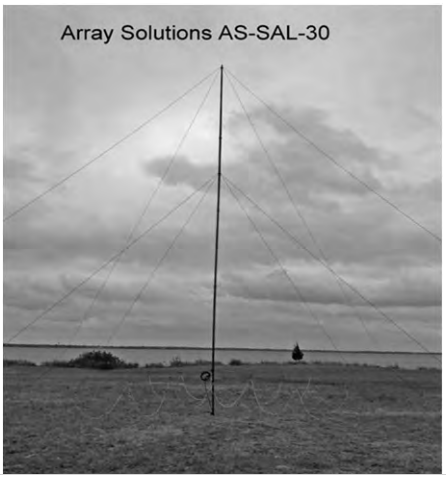
Shared Apex Loop Array
8 dB RDF in only 2500 square feet

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



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

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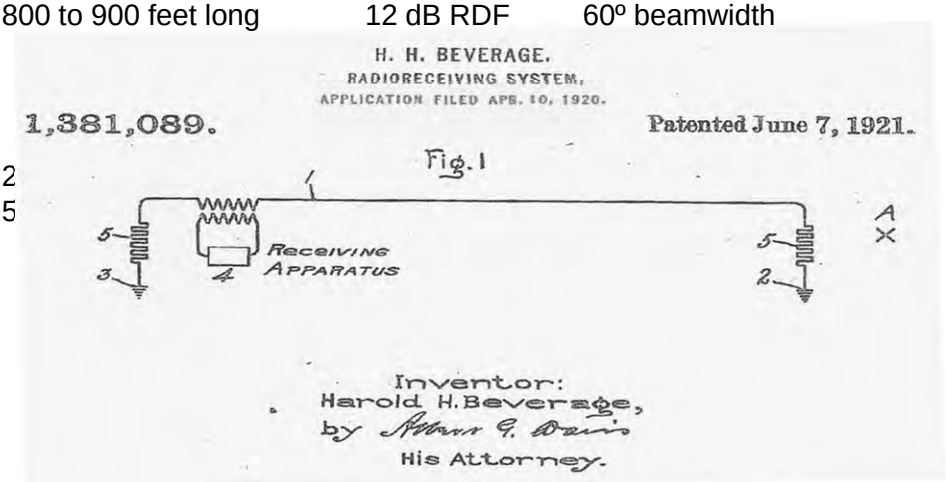
Single Wire Beverage

The simplest and most reliable high performance receiving antenna

250 to 400 feet long	4 to 6 dB RDF	100º beamwidth
500 to 700 feet long	10 to 11 dB RDF	70º beamwidth
800 to 900 feet long	12 dB RDF	60º beamwidth

2
5


H. H. BEVERAGE.
RADIORECEIVING SYSTEM,
APPLICATION FILED APR. 10, 1920.

1,381,089. Patented June 7, 1921.

Fig. 1

Inventor:
Harold H. Beverage,
by Albert G. Davis
His Attorney.

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http://www.w8ji.com/beverages.htm

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Beverage on (or near) Ground

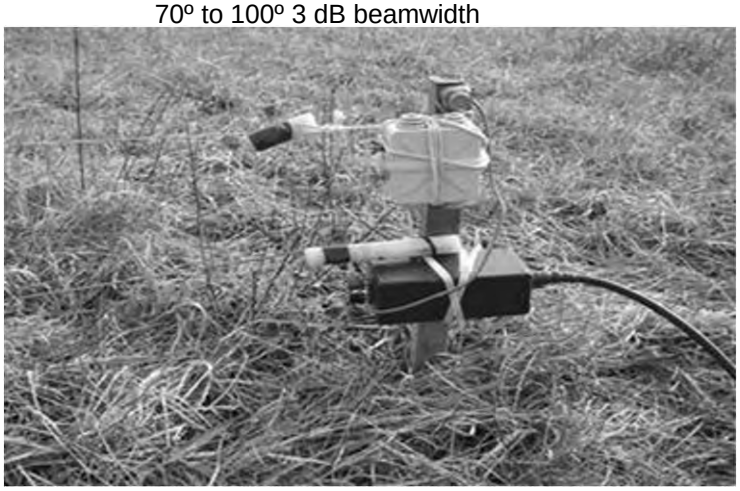
6 to 8 dB RDF with only 225 feet of length

a good choice when stealth is important

signal levels are significantly stronger if the wire is slightly elevated

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

70º to 100º 3 dB beamwidth



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https://vimeo.com/199235390

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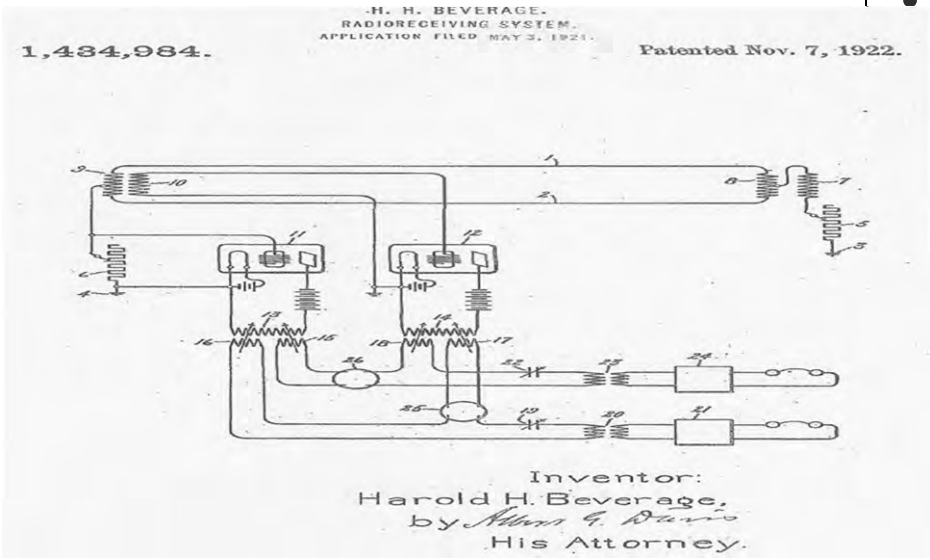
Two Wire Bi-directional Beverage

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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www.w0btu.com/Beverage_antennas.html

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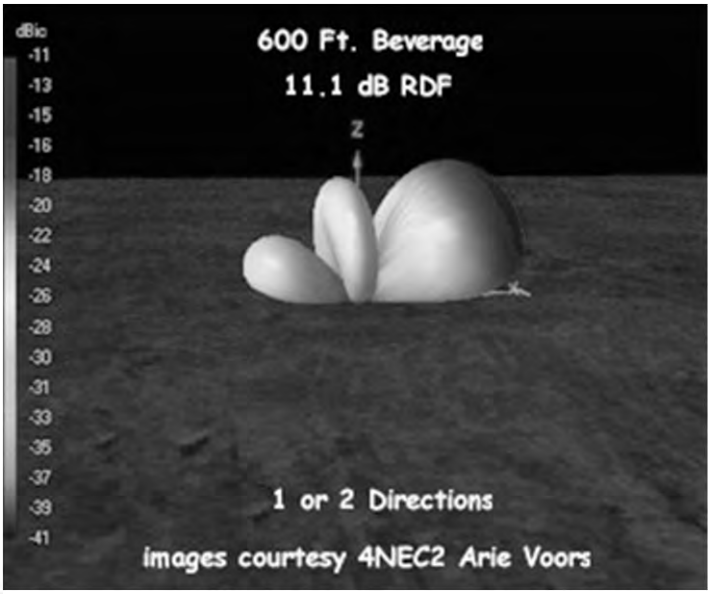
Radiation Pattern of a 600 Foot Beverage



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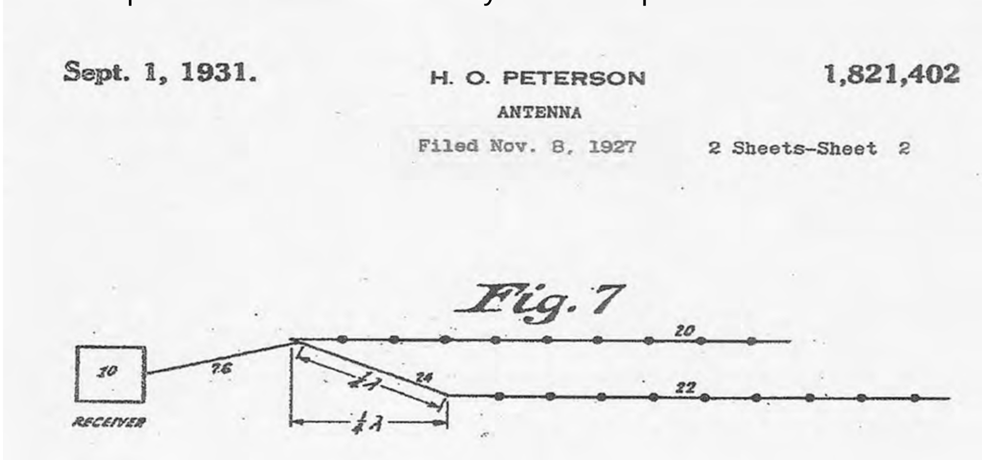
Close Spaced Staggered Beverage Arrays
11 dB RDF on one acre

two or three close spaced, 500 to 600 foot staggered Beverages
two or three close spaced 225 foot BOGs -- 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



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

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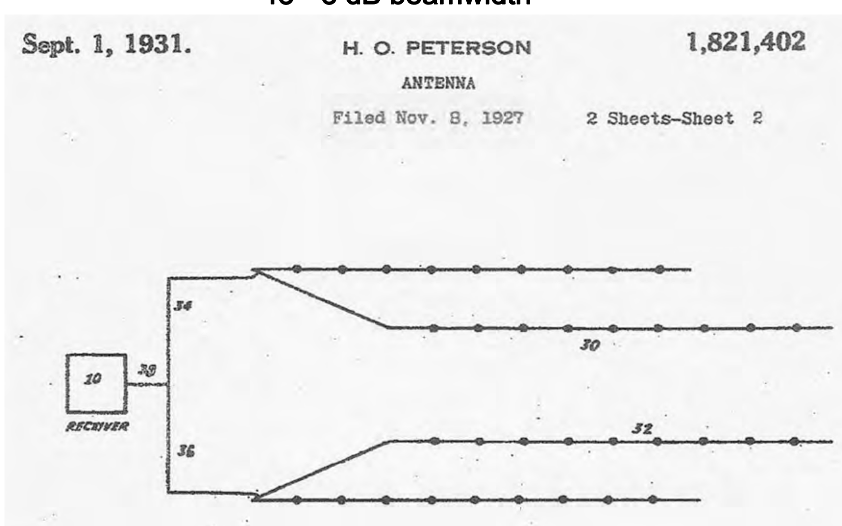
Broadside Pair of Staggered Beverages
14 dB RDF on 8 Acres

800 to 900 foot Beverages, 330 foot broad side spacing

45º 3 dB beamwidth



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Phased *High Impedance* Verticals

Two or More 20 Foot Verticals

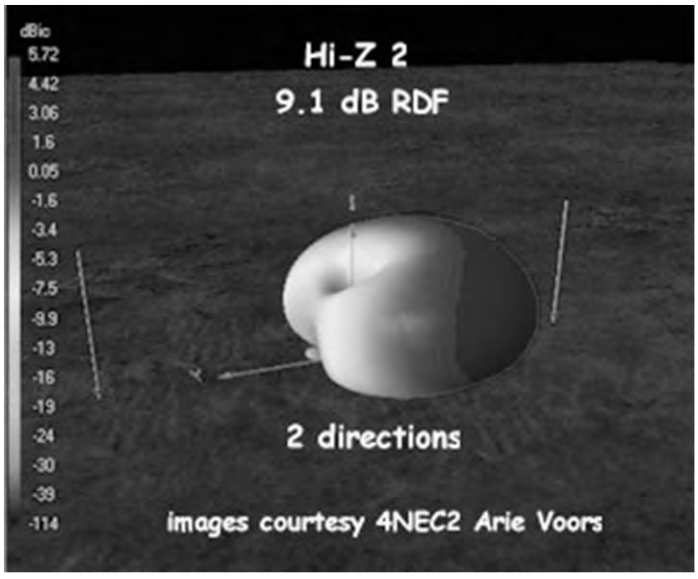
- No radials
- No umbrella wires
- Dual band operation with compromise 65 foot element spacing
- 80 foot element spacing for improved 160 meter performance
  - closer spacing is possible by using a variable phase controller
- High input impedance amplifier at the feed point of <u>each</u> vertical
  - stray capacitance to nearby trees and other objects, at the feed point of each vertical and at the input to each amplifier must be as low as possible
- Switchable in multiple directions
- 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

CTU CONTEST UNIVERSITY

www.hizantennas.com

ICOM

Radiation Pattern of a Two Element Array of 20 Foot Verticals



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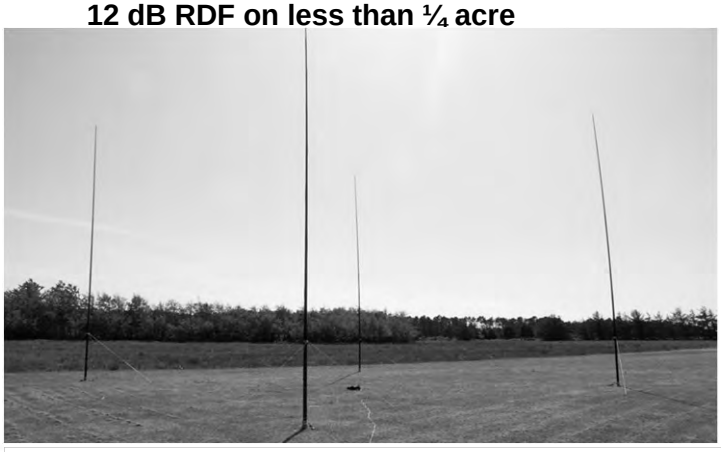
Electrically Steerable 4-Square Vertical Array

four *high impedance* 20 foot verticals
no radials and 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 directions
100º 3 dB beam width
12 dB RDF on less than ¼ acre



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

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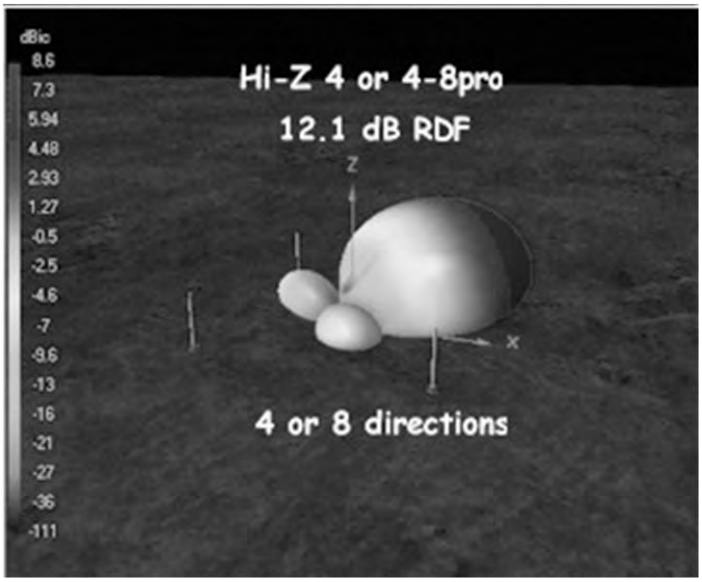
Radiation Pattern of a 4-Square Array of 20 Foot Verticals



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Electrically Steerable 8-Circle Vertical Array

eight *high impedance* 20 foot verticals
no radials and no umbrella wires
requires a high input impedance amplifier at the base of each vertical
200 foot diameter array with 106° phasing
switchable in eight directions
50° 3 dB beam width, equivalent to a 5 element Yagi
13.5 dB RDF on ¾ acre

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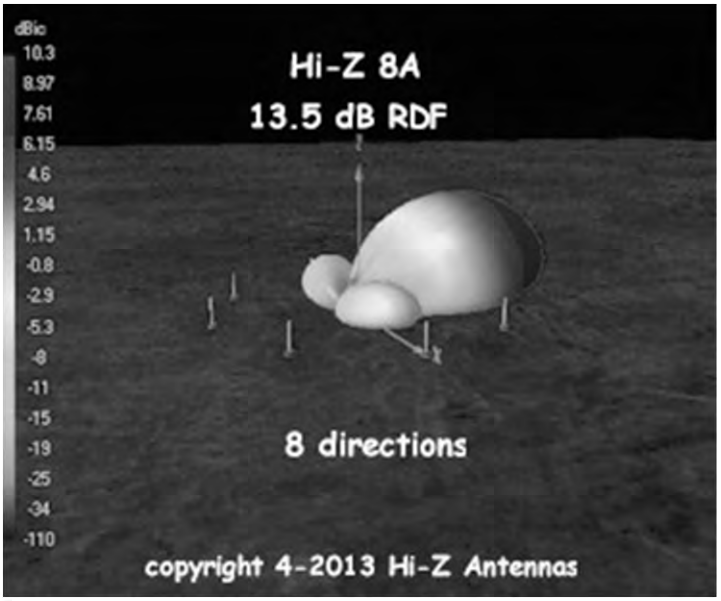
www.hizantennas.com/8_element_arrays.htm

ICOM

Radiation Pattern of a 200 Foot Diameter 8-Circle Array



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Eight phased verticals with 106 degree phasing

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YCCC Triband Receiving Arrays
3, 5 or 9 *High Impedance* Short Verticals

- 3, 5 and 9 element configurations with identical performance
  - switchable in 180º, 90º and 45º steps respectively
  - 80º 3 dB beamwidth
  - **12 dB RDF on ¼ acre**
  - slightly wider beamwidth and slightly lower RDF on 80 and 40 meters
- 120 foot diameter array
- 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

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

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Phased *Low Impedance* Verticals
Two or More 25 Foot 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
  - *if necessary*, use 35 foot verticals with no umbrella wires
- As little a 65 foot element spacing
  - but more difficult to achieve stable, repeatable performance with small spacing
- Amplifiers not needed at the base of each vertical – higher 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

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Electrically Steerable 4-Square Vertical Array

four *low impedance* 25 foot umbrella verticals
four 25 foot umbrella wires attached to the top of each vertical
eight 70 foot or sixteen 35 foot radials per vertical
65 x 65 foot square footprint plus additional space for radials
switchable in four directions
easy and inexpensive to build
100º 3 dB beamwidth
12 dB RDF on ¼ acre

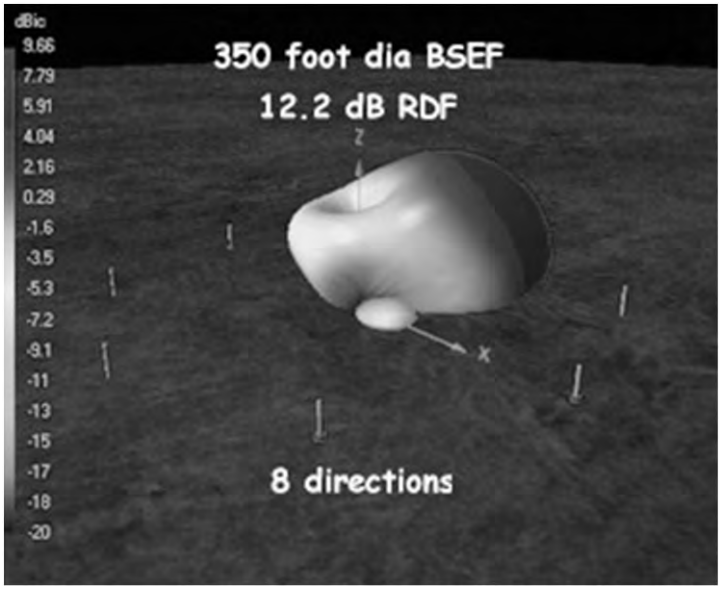
www.iv3prk.it/user/image/site2-rxant.prk_4-square_1.pdf

Electrically Steerable 8-Circle Vertical Array

eight *low impedance* 25 foot umbrella verticals
four 25 foot umbrella wires installed on each vertical
eight 70 foot or sixteen 35 foot radials installed under each vertical
350 foot diameter with 1/4 wavelength spacing plus space for radials
or only 200 foot diameter with a Hi-Z 106 degree phasing controller
switchable in eight directions
Very easy and inexpensive to build
50º 3 dB beamwidth, equivalent to a 5 element Yagi
13.5 dB RDF on four acres

construction details: http://www.w5zn.org

Radiation Pattern of a 350 Foot Diameter 8-Circle Array



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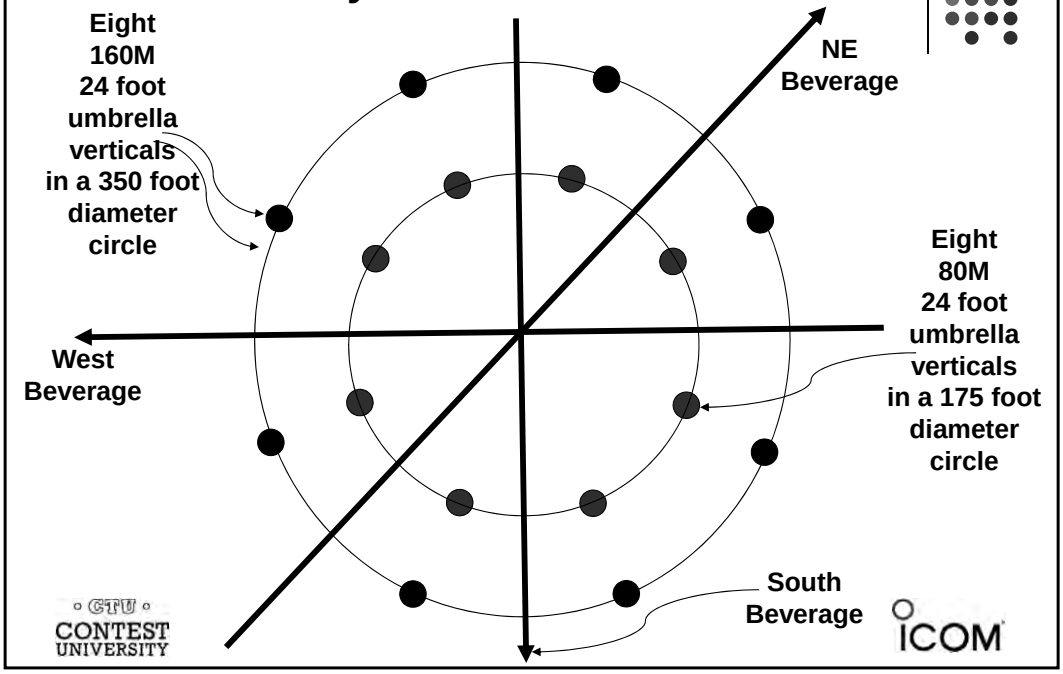
Four phased elements with 115 degree phasing

ICOM

160 and 80 Meter Receiving Antenna Layout at W3LPL



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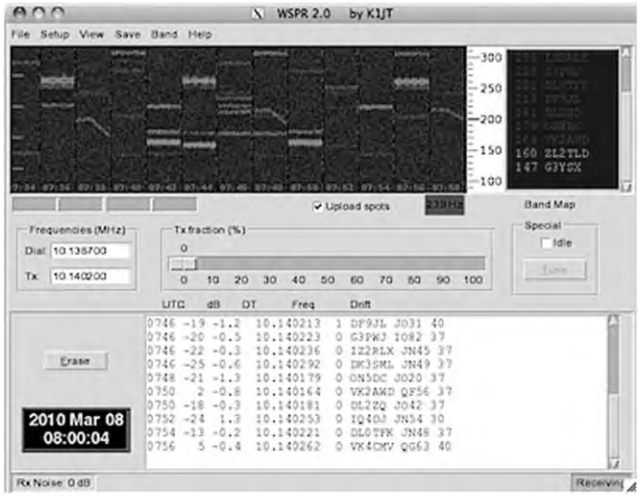
ICOM

Quantitative Performance Evaluation Using K1JT's WSJT-X

Use WSPR or FT-8 to compare the performance of two antennas



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http://physics.princeton.edu/pulsar/K1JT/WSPR_2.0_User.pdf

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Receive Antenna Variable Phasing Controller DX Engineering NCC-2

Combines the inputs from two antennas

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

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www.dxengineering.com/parts/dxe-ncc-2

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Phase Synchronous Diversity Reception

two widely spaced antennas (500 to 1000+ feet) feeding
two identical high performance phase locked receivers

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Elecraft K3s transceiver with KRX3 sub-receiver

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CTU Presents

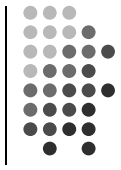
Contest Hints and Kinks – Technique and Station

Ward Silver, NØAX

Goals of the Session

- Provide tips, suggestions, and guidelines
- Give you ideas for your own circumstances
- Find “Score dB’s” and “low-hanging fruit”
- Develop confidence in your own abilities
- Laff

Assumptions about you



- Contesting for a couple of years
- You feel comfortable with CQ or S&P
- Maybe a Division, State, or Regional winner?
- Decent radios and antennas
- Taken and given some lumps
- Want to give some more lumps
- What's the best way to get better?

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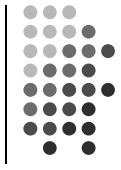
How To Use This Course



- Not a how-to cookbook
- Follow in the text
- Take short notes
- Record those ideas!

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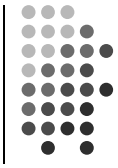
Continuous Improvement



- When asked what was the most powerful force in the Universe, Albert Einstein replied, “Compound interest.”

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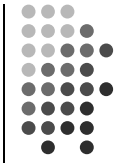
ICOM

Continuous Improvement



- When asked what was the most powerful force in the Universe, Albert Einstein replied, “Compound interest.”
- Incremental improvement, applied relentlessly, is unstoppable.

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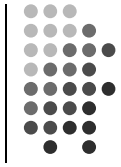
Continuous Improvement



- When asked what was the most powerful force in the Universe, Albert Einstein replied, “Compound interest.”
- Incremental improvement, applied relentlessly, is unstoppable.
- Plaques are won a dB at a time

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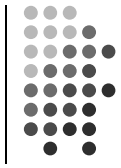
Continuous Improvement



- When asked what was the most powerful force in the Universe, Albert Einstein replied, “Compound interest.”
- Incremental improvement, applied relentlessly, is unstoppable.
- Plaques are won a dB at a time
- Hints & Kinks are the ham radio equivalent of incremental improvement.

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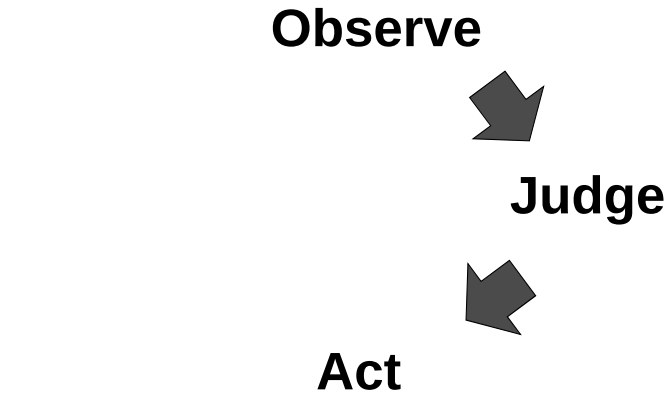
Cycle of Life



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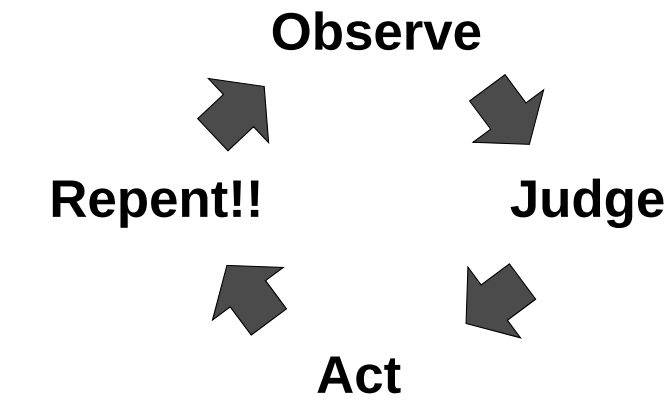
Cycle of Life



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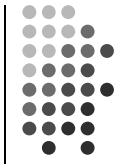
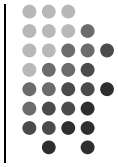
Layers



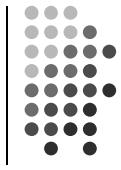
- Contest success is incremental
- Think and plan in layers
  - Be heard, then hear, then be heard, then hear…
- Station improvement is continuous
- Study and analyze and design
- Address the obvious deficiencies first
- Choose wisely, grasshopper…

Technique – Managing Time



- Running is key
- Rate meter – QSOs per multiplier
- Distractions
  - Spots and DX-ing
  - Fiddling with the antennas and rig controls
- Plan your operating time but be flexible
- Go get that next contact!
  - No TV, no Facebook, no browsing, no chat

CQing



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

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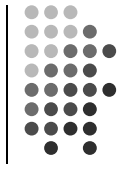
Technique – Managing Score



- Watch for & move mults (Sunday!)
- Avoid penalties at all costs
- Expeditions – work ‘em all!
- Make skeds – during the contest
  - Plan for propagation before the contest starts
  - Know the grey line and when long path works
- Quick reviews of the situation now and then
- Compare to last year or the competition

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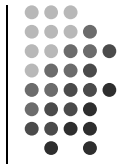
The Second Radio



- Start simple
  - Spare transceiver
  - Amp not necessary
  - Vertical and 100 watts can work a lot of stuff
  - Filters are worth it – build or buy
- Learn your program's keystrokes
- Make SO2R *normal*

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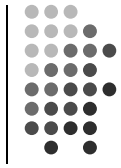
The Second Radio



- Taking it up a level
- The quick QSY – be ready!
- Running and tuning at the same time
  - Learn to listen to two audio streams at one time
  - Practice shifting your focus
- Automate to beat fatigue
  - Build or buy a single-box controller
  - Make the layout match the equipment

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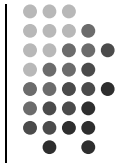
Antenna Selection



- Improve for the next level
  - They already hear you!
- Simplify switching and aiming
- Contesting is not DX-ing
- Beam widths are 30-60 degrees on HF
- Automate rotator control if feasible

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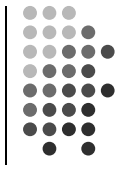
Antenna Selection



- A small fixed Yagi to EU, Carib, PacRim, or ?
- Low dipoles for high-angle success
  - Dipoles are great for domestic contests
- “Temporary” antennas
- Simple low-band receive antennas
  - Reduce noise = reduce fatigue
- Still the biggest bang for the buck

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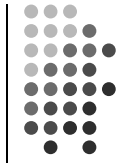
Radios



- Clean receiver – most important
  - Linearity
  - Gain management
  - Filtering
  - Low Distortion audio
  - Comfortable headphones – noise canceling?
- Clean transmit – code, phone, digital
- Learn to use the receiver functions!

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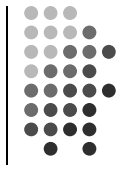
Gadgets



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

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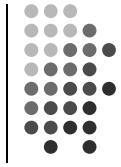
Pileup Management



- Don't panic – set a rate you can maintain
- Respond in a consistent amount of time
  - This establishes a rhythm and keeps order
- Pick the fast guys first
- Listen for "DX sound" and odd first letters
- Manage your RF Gain and Attenuation
- Learn to rely on your ears for filtering

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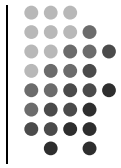
Interstation Interference



- Filters at the exciter, stubs on the amp
  - Wide-band noise must be filtered **at the xmtr**
- QRP (and maybe LP) can S&P on the same band as the run radio!
  - Protect the receiver front end
- Bypass diodes connected to wires
  - Rotator control boxes, relay kickback diodes
- Good RF bonding of all equipment

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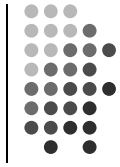
Software



- 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
- Put the monitor where you can see it easily
- Be familiar with several major programs

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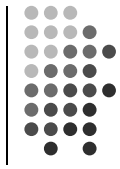
Resources



- Other contesters, your club, 3830scores.com
- SO2R page - www.k8nd.com/Radio/SO2R/K8ND_SO2R.htm
- Amps, Towertalk, Top Band, cq-contest email reflectors
- W2VJN's "Managing Interstation Interference" from International Radio
- W4RNL Antenna design via antennex.com
- ARRL *Contest Update* and NCJ

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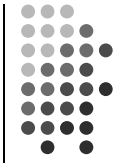
Thanks!



- And go get ‘em!

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Reading and Learning from your Log-Checking Report

Doug Grant
K1DG

If you are reading this after CTU

- There are numerous audio clips embedded
- Much of this presentation relies on them
- Contact K1DG if you want to listen to them

This talk is NOT about…

- The log checking process or software
- Specific QSOs removed from your log unfairly
- “Log-checking is not perfect. The goal of the exercise is to make sure the order of finish is correct.” – Every log-checker in the world

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This talk IS about…

- How to read your LCR report
- What you can learn from it to improve your final score
- Where certain errors originate

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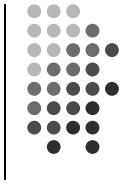
What is in your LCR



- Not-in-Log
- Incorrect call
- Incorrect exchange information
- Unique calls
- Stations copying your call incorrectly
- Stations receiving “Not-in-Log” from you

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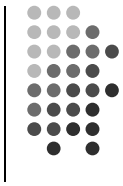
Not-in-Log



- You are not in the other station’s log…
  - …at the time in your log +/- 10 minutes
  - …on the band in your log
  - And nothing remotely close to your call is there
- How does it happen? (QRX for examples)

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Incorrect call

- The callsign in your log is a badly-mutilated entry
  - K1DGGGGGGGGG
  - K1DG05
- The QSO in your log matches (same time/band) to an entry with your callsign in another log with a slightly different call
  - You log K1DG but actually worked K1DJ, K1BG, or N1DG
- There is no such call in the available government data bases

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Incorrect exchange

- Miscopied serial number, name, state…
- No excuse for wrong zone in CQWW
  - (unless you change the call after you have hit ENTER)
- Beware prefills! People move…

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Unique calls

- These are calls that only appear in your log
- They are *NOT* usually removed from your log
- Most of them are really miscopied calls but you “get away with one”
- A few are really legitimate QSOs
- If there are a *lot* in a log, it is suspicious

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Stations copying your call incorrectly

- They lose the QSO, you do not
- Is it someone with a very similar call, or should you use different phonetics or send slower?
- K1 Denmark “Jermany”, K1BG, N1DG…

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Stations receiving N-I-L from you

- If you make a QSO, log it!
  - Log dupes!
  - Log zero-point Qs!
- In some contests, you can use “X-QSO” to give the other guy credit but not claim the QSO yourself
  - “Oops” QSOs (usually band-change violations or out-of-the-band)

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Listen to these clips - decide if the QSO took place or not

- DP6A 160M
  - Good or not?

QSO: 1821 PH 2017-10-28 0429 K1DG 59 5 PI4COM 59 14 0
QSO: 1821 PH 2017-10-28 0429 K1DG 59 5 DP6A 59 14 0

QSO: 7066 PH 2017-10-28 0425 DP6A 59 14 OE2S 59 15 1
QSO: 3756 PH 2017-10-28 0426 DP6A 59 14 UW1M 59 16 0
QSO: 3801 PH 2017-10-28 0428 DP6A 59 14 K3LR 59 05 0
QSO: 3792 PH 2017-10-28 0428 DP6A 59 14 HA8RM 59 15 0
QSO: 3789 PH 2017-10-28 0429 DP6A 59 14 OK8WW 59 15 0
QSO: 3826 PH 2017-10-28 0430 DP6A 59 14 K4ZW 59 05 0

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Another

- T42A

7188 PH 2017-10-28 0904 K1DG 5 T42A 08 NIL

7000 PH 2017-10-28 0915 T42A 8 K1DG 05 NIL

- It appears that T42A hit « ENTER » after trying on 160
- We *both* got NILs

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Another…

- XQ6OA

7178 PH 2017-10-28 1010 K1DG 5 XQ6OA 12 NIL

- XQ6OA did not log this "dupe" despite my request

7000 PH 2017-10-28 0039 XQ6OA 12 K1DG 05 (also NIL!)

7148 PH 2017-10-28 0039 K1DG 59 5 II2S 59 15 0

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How about these two QSOs?

14177 PH 2017-10-28 1038 K1DG 5 DL9HB 14

and a few minutes later…

14177 PH 2017-10-28 1041 K1DG 5 DJ6DO 14

BOTH ARE NILS for K1DG!

What really happened on this frequency?

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14177 at two locations in Europe

QSO: 14177 PH 2017-10-28 1038 DL9HB 59 14 ES4RD 59 15
QSO: 14177 PH 2017-10-28 1038 ES4RD 59 15 DL9HB 59 14

QSO: 14000 PH 2017-10-28 1041 DJ6DO 59 14 ES1RD 59 15
QSO: 14177 PH 2017-10-28 1041 ES4RD 59 15 DJ6DO 59 14

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Now for some of the “CNILs”

21235 PH 2017-10-28 1232 YL3FT 15 K1DG 05

- YL3FT is not in K1DG log

QSO: 21235 PH 2017-10-28 1231 K1DG	59	5	G3WGN	59	14 0
QSO: 21235 PH 2017-10-28 1232 K1DG	59	5	YL2TD	59	15 0
QSO: 21235 PH 2017-10-28 1232 K1DG	59	5	D44BS	59	35 0

- Listen carefully…
- There are TWO YL stations calling

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Listen VERY carefully

- At the end of the UX7QG QSO…

- Did you hear it?
  “What’s your prefix?”
  “Yankee Victor 5, Yankee Victor 5 England Mike Germany”
- YV5EMG logged me, but I was not working him!

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No need to listen too carefully

14335 PH 2017-10-28 1732 9A6RMI 15 K1DG 05

QSO: 14335 PH 2017-10-28 1732 K1DG	59	5	S51I	59	15 0
QSO: 14335 PH 2017-10-28 1732 K1DG	59	5	DG2JA	59	14 0
QSO: 14335 PH 2017-10-28 1732 K1DG	59	5	DL1GME	59	14 0

- 9A6RMI is clearly audible giving K1DG a report
- But K1DG works DG2JA and forgets to work RMI

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Some have no explanation

21229 PH 2017-10-29 1614 K1DG 5 DL1QW 14

- Sounds pretty good to me!

QSO: 14225 PH 2017-10-29 1601 DL1QW	59	14	DF0HQ	59	14 0
QSO: 14167 PH 2017-10-29 1604 DL1QW	59	14	D4C	59	35 0
QSO: 7173 PH 2017-10-29 1615 DL1QW	59	14	VK4KW	59	30 0
QSO: 7160 PH 2017-10-29 1615 DL1QW	59	14	YB3VI	59	28 0
QSO: 7063 PH 2017-10-29 1616 DL1QW	59	14	UP0L	59	17 0

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No explanation

14263 PH 2017-10-29 1828 K1DG 5 N4DWM 05

QSO: 7123 PH 2017-10-28 0037 N4DWM 59 05 VY2ZM 59 05 0
QSO: 14316 PH 2017-10-29 1853 N4DWM 59 05 OM7M 59 15 0

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And another

21235 PH 2017-10-28 1333 K1DG 5 OK1DPU 15

OK1DPU's LOG:

QSO: 21214 PH 2017-10-28 1327	OK1DPU	59	15	KC1XX	59 05
QSO: 21226 PH 2017-10-28 1331	OK1DPU	59	15	CX5BE	59 13
QSO: 21229 PH 2017-10-28 1332	OK1DPU	59	15	W3UA	59 05
QSO: 21247 PH 2017-10-28 1339	OK1DPU	59	15	K8AZ	59 04
QSO: 21250 PH 2017-10-28 1341	OK1DPU	59	15	K5ZD	59 05

- **What happened to OK1DPU between 1332 and 1339?**
- **Only K1DG got a NIL for this period.**

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And yet another

21235 PH 2017-10-28 1326 K1DG 5 IK3XTV 15 NIL

QSO: 28000 PH 2017-10-28 1300 IK3XTV	59 15	EF8R	59 33
QSO: 21000 PH 2017-10-28 1306 IK3XTV	59 15	8P5A	59 08
QSO: 21000 PH 2017-10-28 1309 IK3XTV	59 15	IZ3GNG	59 15
QSO: 21000 PH 2017-10-28 1315 IK3XTV	59 15	RK4FAO	59 16
QSO: 21000 PH 2017-10-28 1319 IK3XTV	59 15	FY5KE	59 09
QSO: 21000 PH 2017-10-28 1642 IK3XTV	59 15	N1UR	59 05

- **What happened to IK3XTV after 1319?**
- **Maybe XTV's power went out, software crashed…**

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And sometimes you get tired

14262 PH 2017-10-29 1956 K1DG 5 VE5SF 04 NIL

QSO: 14262 PH 2017-10-29 1956 K1DG	59 5	N7KDT	59 03	0
QSO: 21322 PH 2017-10-29 1956 K1DG	59 5	VE5SF	59 04	0
QSO: 14262 PH 2017-10-29 1956 K1DG	59 5	VE5SF	59 04	0
QSO: 14262 PH 2017-10-29 1956 K1DG	59 5	N4TO	59 05	0

- **LESSON: Hit ENTER once, and while SO2R box is on correct band!**

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Some detective work required

14262 PH 2017-10-29 2017 K1DG 5 EA7BUU 14 NIL

- **You can hear “Echo Alfa” and “Bravo Uniform Uniform”**
- **Super Check Partial showed EA7BUU worked on other bands**
- **Seemed like a safe guess**
- **He does not correct the call**

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Could it be …?

- Log-checking software builds a “reverse log” for stations that make a few QSOs but do not send in a log
- EA**3**BUU was active…apparently clicking spots, but did not submit a log so the QSO could not be cross-checked

QSO: 14155 PH 2017-10-29 2006 EA3BUU 59 14 W2RE 59 5
QSO: 14335 PH 2017-10-29 2013 EA3BUU 59 14 W1NA 59 5
14262 PH 2017-10-29 2017 K1DG 5 EA7BUU 14
QSO: 14201 PH 2017-10-29 2019 EA3BUU 59 14 VE3JM 59 4
QSO: 14169 PH 2017-10-29 2029 EA3BUU 59 14 K1XM 59 5
QSO: 14155 PH 2017-10-29 2032 EA3BUU 59 14 W2RE 59 5
QSO: 14150 PH 2017-10-29 2035 EA3BUU 59 14 K3LR 59 5
QSO: 14121 PH 2017-10-29 2037 EA3BUU 59 14 VE2IDX 59 2
QSO: 14126 PH 2017-10-29 2040 EA3BUU 59 14 VE3EJ 59 4

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After analyzing the NILs and CNILS in my 2017 WW SSB log

- 15 NILs
  - About half are my errors
  - About half are the “other guy’s” errors
- 29 CNILs
  - 11 caused by other guy logging incomplete QSO
  - 5 errors by DG
  - 3 sounded bogus so I didn’t log them
  - 10 nothing on recording – no idea what happened

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NILs come from…

- Unlogged “oops” QSOs (use X-QSO if necessary)
- Unlogged dupes
- “Frequency sharing” (especially during band shifts)
- Logged QSOs after a >10 minute delay
- “Corrected” calls
- Guessed calls that are bad guesses
  - …or bad spots if you use the Cluster
- Cockpit errors (e.g., logging on wrong band) “PEBCAK”

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And sometimes, "stuff" just happens

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CNILs arise when…

- The other guy doesn't have your call correct
  - Not your fault
- The other guy thinks…
  - he is working you (but you are working someone else)
  - you have his call OK (but you don't)
  - Both mostly not your fault
- Unlogged QSOs (including suspected dupes)
  - Whoever didn't log the QSO is to blame

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LCRs can help you improve

- Sometimes it's your problem
- Sometimes you cause problems for others
- Sometimes it is not possible to figure it out
- Log-checking is not perfect…deal with it!

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CTU 2018 Presents

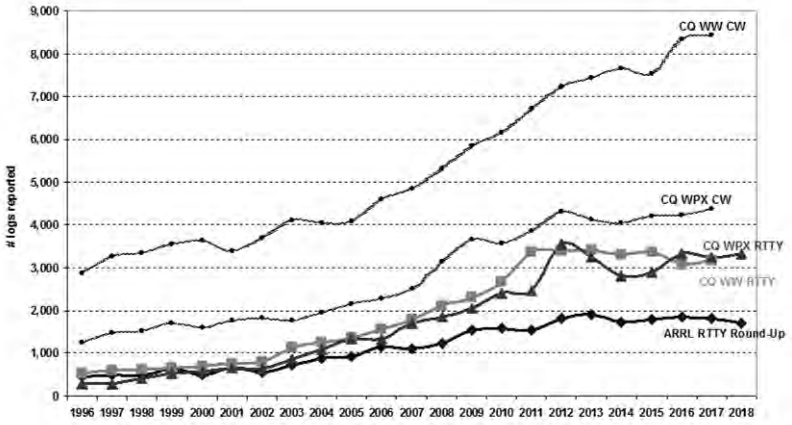
Having Fun with RTTY Contesting

Ed Muns, W0YK

Having Fun in RTTY Contesting

- Introduction: What is RTTY?
- Part 1: Operating
- Part 2: Setting Up
  - Hardware
  - Software
- 2nd session: "*Pursuing the Limit in RTTY Contesting*"

Three Largest RTTY Contests



Lots of RTTY Contests

> two/month

- **Biglies (7)**
  - CQ WW RTTY (last weekend in September)
  - CQ WPX RTTY (2nd weekend in February)
  - ARRL RTTY Roundup (1st weekend in January)
  - BARTG (3rd weekend Jan, 3rd weekend March)
    - 75 Baud (April & September)
  - WAE RTTY (2nd weekend in November)
- **NCJ contests (4)**
  - NAQP RTTY (3rd Sat. in February, 2nd Sat. in July)
  - Sprint RTTY (2nd Sat. in March & October)
- **Other popular RTTY contests (20)**
  - Ten-Meter RTTY (1st Sat. in December)
  - JARTS, Makrothen, SARTG (2)
  - 15 others

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

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What is RTTY?

compared to CW

CW	RTTY
1) ***One*** RF carrier	***1) Two*** RF carriers 170 Hz apart *(Space & Mark; Shift)*
2) Local audio ***pitch***	2) Local audio ***tones***
3) On ***or*** off • key up is data 0 • key down is data 1	3) One on ***and*** other off • Space is data 0 • Mark is data 1
4) ***Morse*** code • typically 25-40 wpm	4) ***Baudot*** code • constant 60 wpm *(or 45.45 Baud)*

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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 JOHN NY or 599-JOHN-NY
- *Recommendation:*
  - *Turn on both RX & TX UOS and use Space delimiters*

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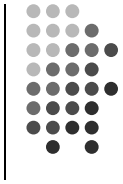
What is RTTY?

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

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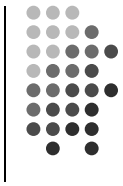
What is RTTY?

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.

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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?

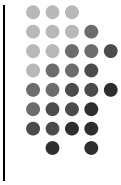
summary

- 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

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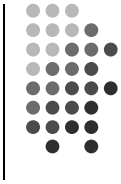
RTTY Sub-Bands



- 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: No RTTY contesting

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RTTY Sub-Bands

don't QRM!

- Avoid audio-digital operations near:
  - e.g., 14070-14080
- Avoid the NCDXF beacons:
  - e.g., 21150 and 14100

- More details:
  www.aa5au.com/rtty/rtty-sub-bands

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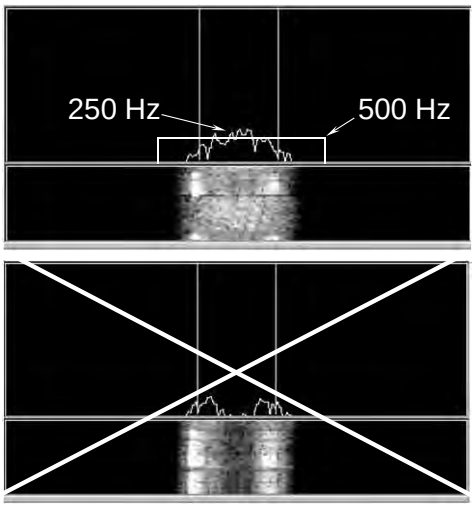
Receiving

radio IF 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



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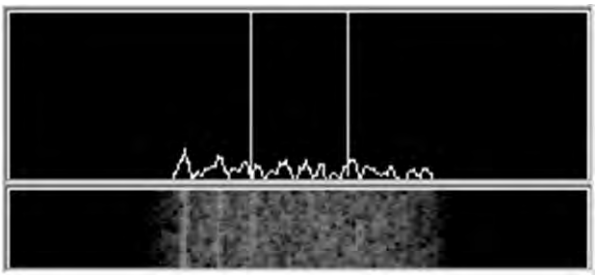
Receiving

adjust audio



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

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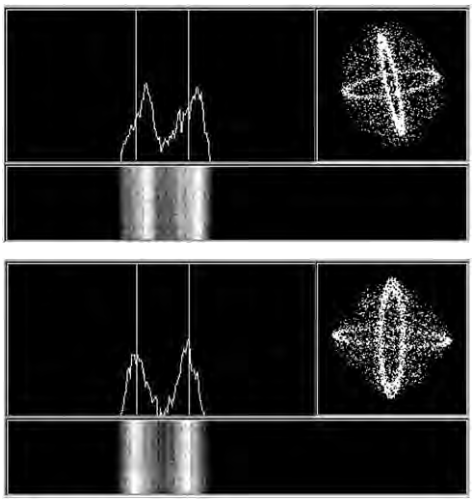
Receiving

tuning a RTTY signal

- Use narrow filtering
  - CW filters ~ 500 Hz
- Set RX audio level
  - noise 5% of full-scale
- Learn to tune by ear
  - practice with eyes closed
  - get within 10-20 Hz



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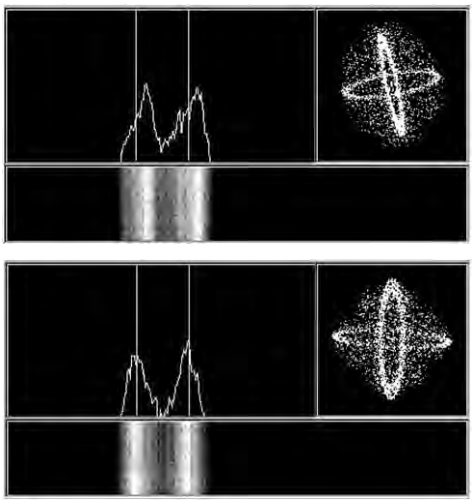
Receiving

MMTTY AFC

- Use narrow filtering
  - CW filters ~ 500 Hz
- Set RX audio level
  - noise 5% of full-scale
- Learn to tune by ear
  - practice with eyes closed
  - get within 10-20 Hz
- AFC On or Off
  - 'On' may cause TX frequency to be off



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Transmitting

AFSK adjustment

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 zero, and
  - full power output is attained.

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Transmitting

FSK adjustment

- None!

(That's the whole point of FSK.)

Basic RTTY Contest QSO

CQ WPX RTTY Contest

- ***WPX K5AM K5AM CQ***
- ***ZC4LI ZC4LI***
- ***ZC4LI 599 1349 1349***
- ***[K5AM] TU 599 985 985***
- ***[ZC4LI] TU K5AM CQ***

K5AM: running station
ZC4LI: S&P station

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, %E)

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
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

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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
F09:	%RAGN %E
F10:	%RNR? %E
F11:	%R%N3 %E

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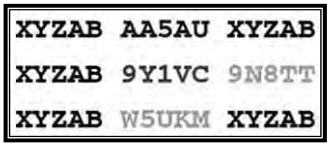
Super Check Partial

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

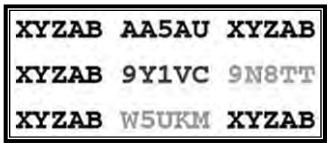


N1MM Logger

- Use main SCP from CW/SSB/RTTY contests
  - RTTY SCP is a subset

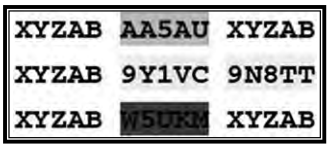
Super Check Partial

logger differences

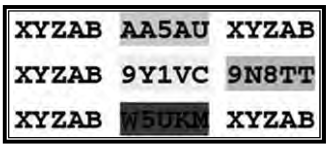


- ***Background option***
- ***Custom colors***

N1MM Logger



WriteLog

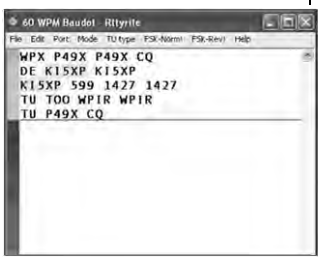


Win-Test

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)



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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 are on by default; changes non-sticky
    - Change defaults in USERPARA.INI
- AFSK: Mic & SC levels; speech processor on
- Radio mode, tones, FSK interface

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More Tips

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

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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

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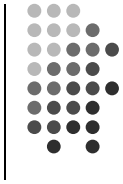
The Cynics Say …



- "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!

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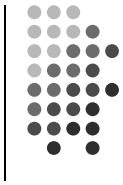
How Do I Set it Up?

overview



- ***Acquire*** and set up hardware and/or software to convert between the RTTY signal 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

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How Do I Set it Up?

RTTY decoder/encoder

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

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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

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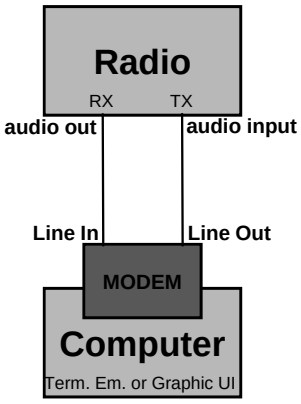
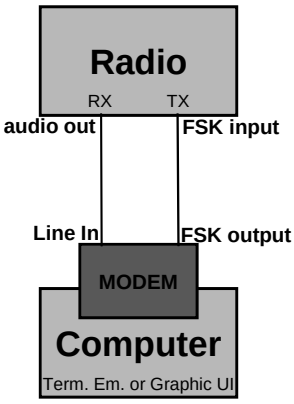
How Do I Set It Up?

hardware MODEM

AFSK



FSK



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How Do I Set It Up?

hardware MODEM

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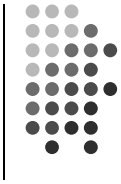
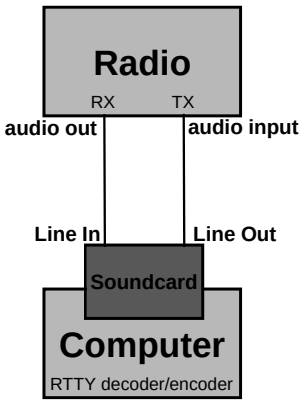
How Do I Set It Up?

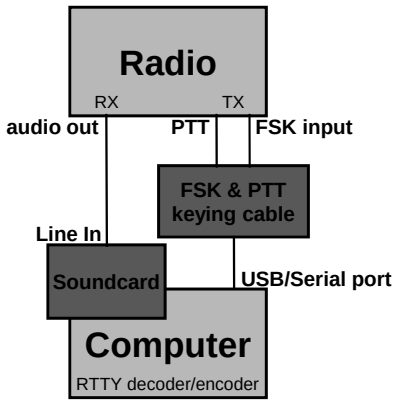
software application & soundcard



AFSK

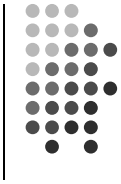


FSK



How Do I Set it UP?

cables



- Receive:
  - RX audio out to soundcard
  - ***Optional DSP filter***
- Transmit:
  - AFSK: TX audio in from soundcard, ***or***
  - FSK: FSK/PTT keying

- Receive:
  - 1:1 isolation transformer
  - ***JPS NIR-12, or …***
- Transmit:
  - 1:1 isolation transformer, ***or***
  - Keying interface

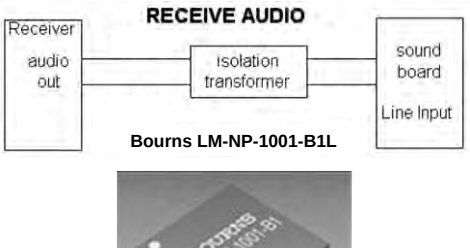
How Do I Set It Up?

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



Bourns LM-NP-1001-B1L

-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

$60

How Do I Set It Up?

commercial interface audio isolation

Rascal

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How Do I Set It Up?

radio audio isolation

K3 audio isolation **IN – LINE – OUT**

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How Do I Set It Up?

SDR digital audio isolation

digital: **soundcard**

analog: **IN – LINE – OUT**

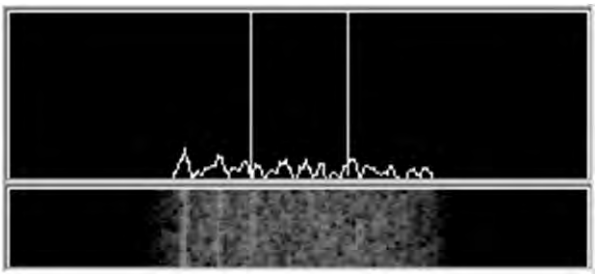
How Do I Set It Up

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 zero, 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

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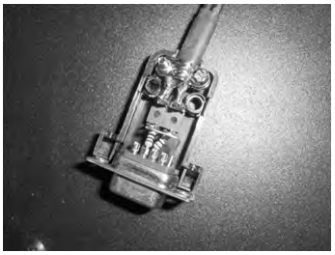
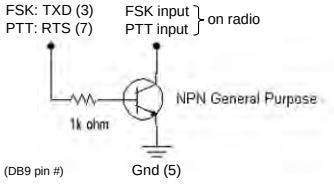
How Do I Set It Up?

homebrew FSK & PTT keying cable





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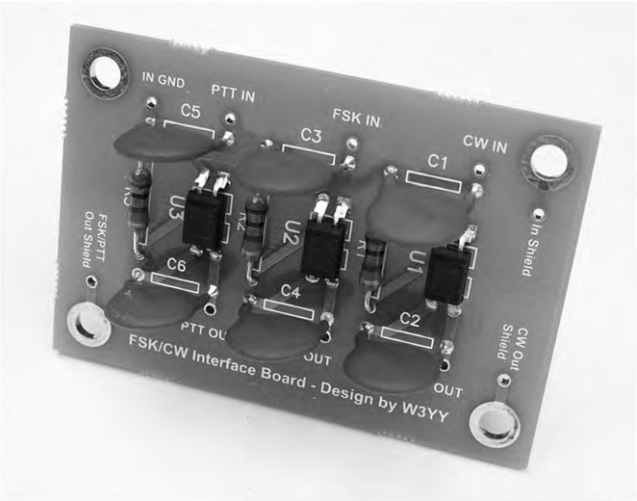
How Do I Set It Up?

W3YY *FSK & PTT keying cable*



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How Do I Set It Up?

commercial interfaces

RASCAL

RIGblasters

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How Do I Set It Up?

RigExpert Interfaces

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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

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How Do I Set It Up?

microHAM interfaces

One Radio

SO2R

How Do I Set It Up?

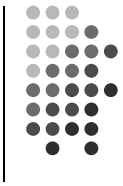
RigExpert & microHAM interfaces

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

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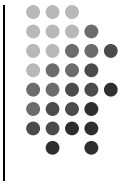
How Do I Set It Up?

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

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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.

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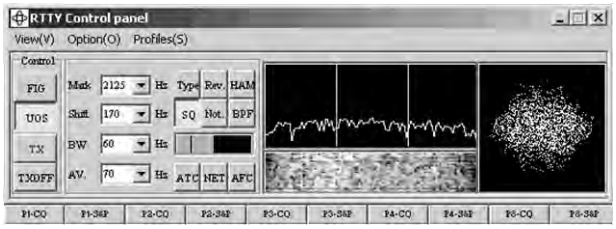
Decoders

MMTTY



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

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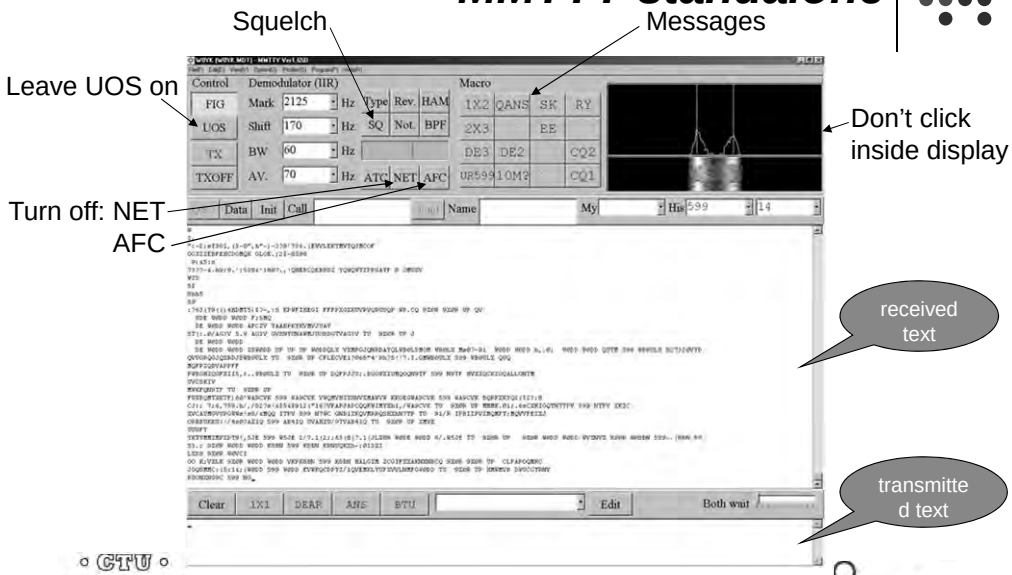
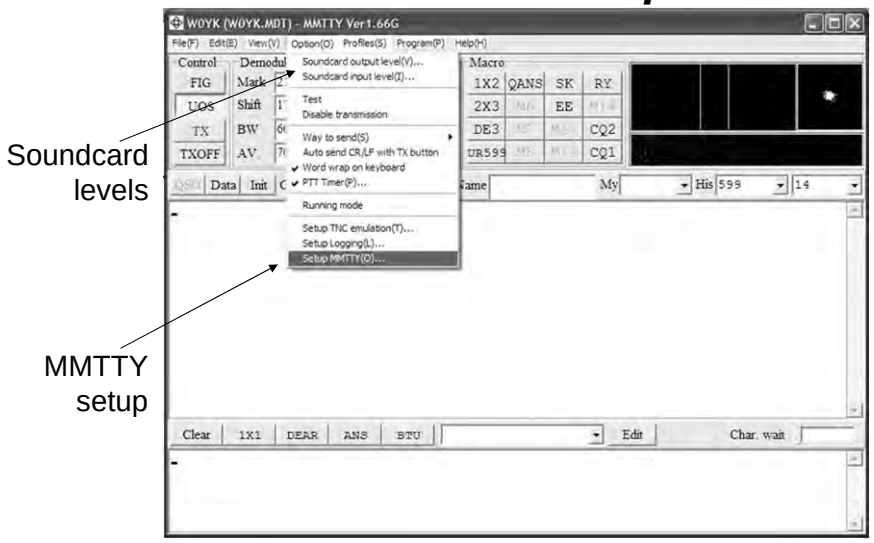
How Do I Set It Up?

MMTTY standalone



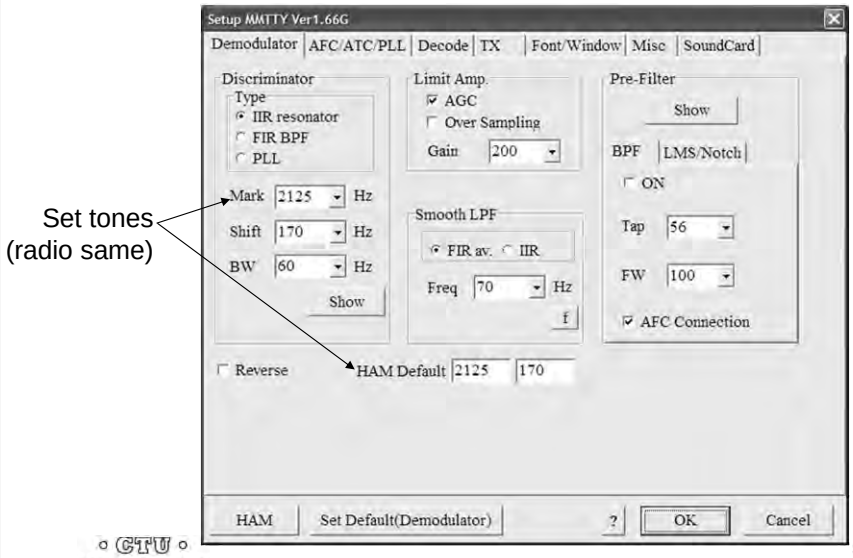
How Do I Set It Up?

MMTTY Option menu



How Do I Set It Up?

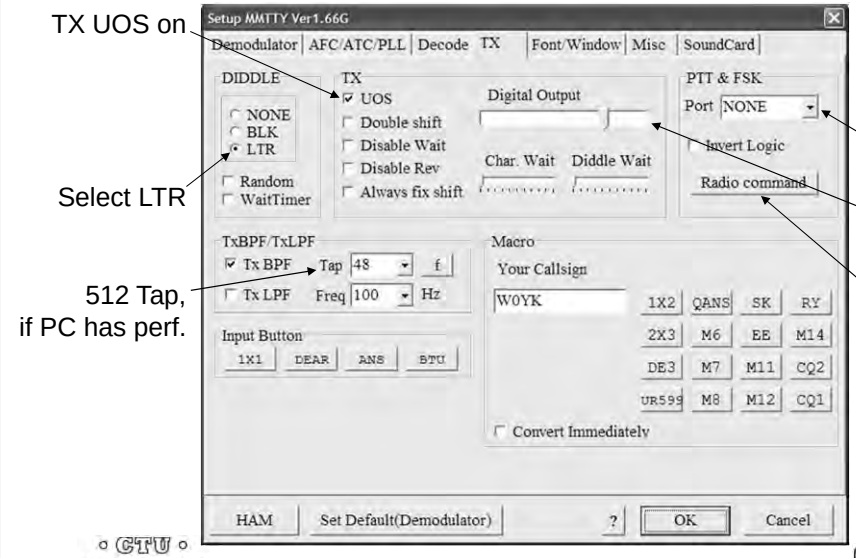
MMTTY Option/Setup/Demodulator



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.

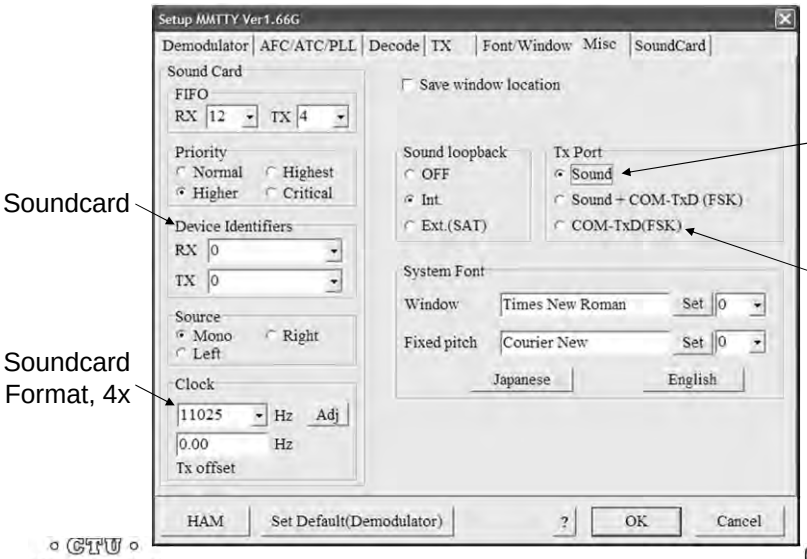
FSK/PTT port

Soundcard Line Out level

AFSK PTT

How Do I Set It Up?

MMTTY Option/Setup/Misc



Soundcard

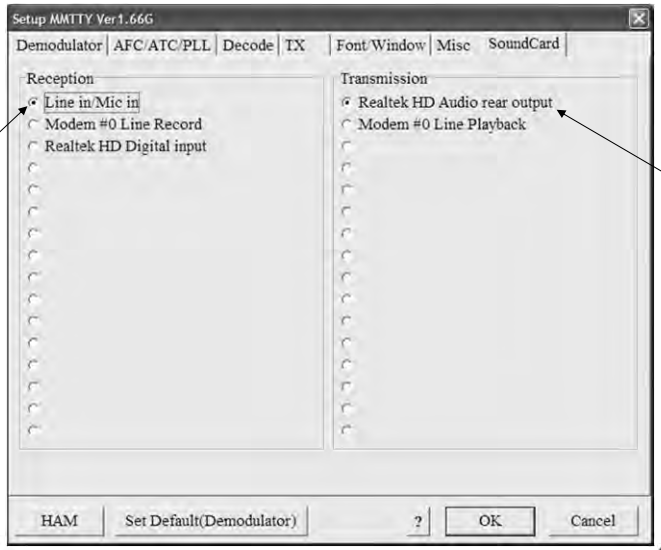
Soundcard Format, 4x

AFSK

FSK

How Do I Set It Up?

MMTTY Option/Setup/SoundCard

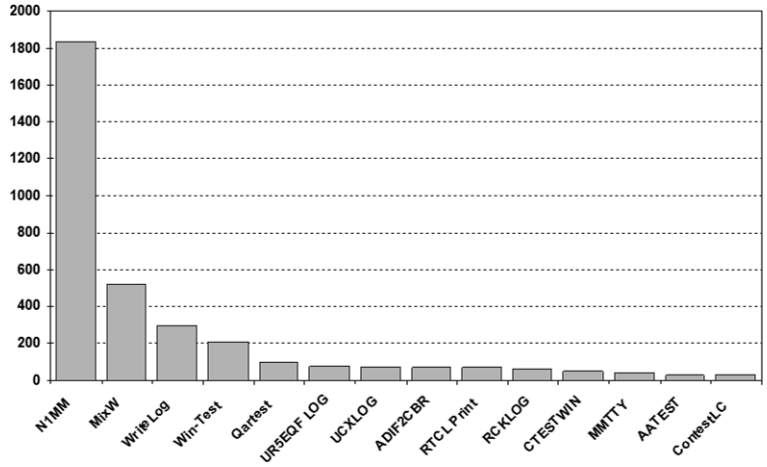


Select receive Soundcard

Select transmit Soundcard (AFSK only)

2012 CQ WPX RTTY

3550 submitted logs



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RTTY Contest Loggers

- WriteLog *(1994)*
  - created for RTTY *(CW & SSB 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 and have similar functionality for basic RTTY contesting.

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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; use 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)*
  - Higher capability interface (DIY or commercial)
  - Advanced setup: SO2V, SO2R, multiple decoders, ...

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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)

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How to Adapt Your DX Contest Strategies for Low Solar Activity

Frank Donovan
W3LPL

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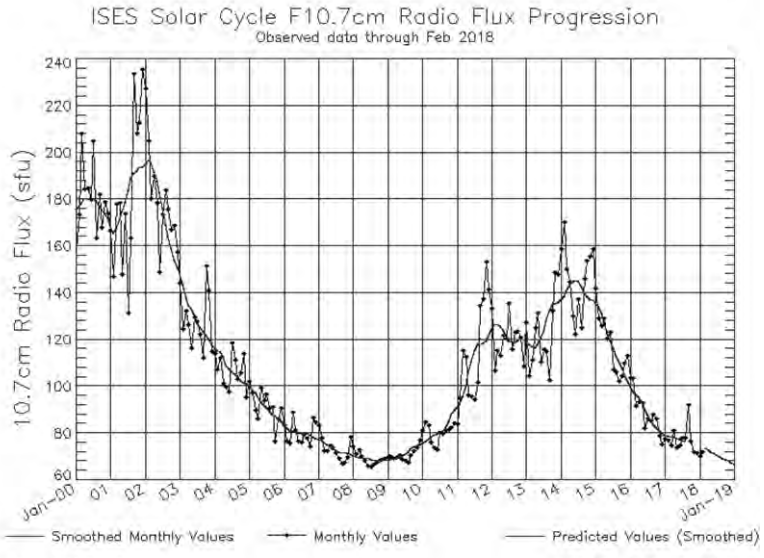
Very Low Solar Activity through 2021

solar activity should <u>start</u> to slowly increase during 2020



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http://services.swpc.noaa.gov/images/solar-cycle-10-cm-radio-flux.gif

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What About Solar Cycle 25 ??

Cycle 25 is likely to be somewhat stronger than Cycle 24

- **Solar polar magnetic field strength is now slightly stronger than at the same period prior to the last Solar Cycle minimum**
  - early indicator that Cycle 25 is likely to be **somewhat stronger** than Cycle 24
  - the magnetic field strength of the Sun's north pole continues to increase
- **Spotless days are now much more frequent** than before October 2017
  - weak cycles are preceded by at least 600 spotless days over five years
  - there were 817 spotless days during the five years prior to Solar Cycle 24
  - there were 94 spotless days in 2017, **there will be many more before 2021**
- **Geomagnetically quiet days** will be more frequent after solar minimum
  - **fewer solar flares and coronal mass ejections** have occurred since 2016
  - less frequent, less intense **coronal holes** will occur after solar minimum
- Cycle 25 sunspots will be more frequent as solar minimum approaches
  - but solar flux will continue at low levels -- 70s or less -- through 2021

High accuracy Cycle 25 forecasting isn't possible until about three years *after* solar minimum

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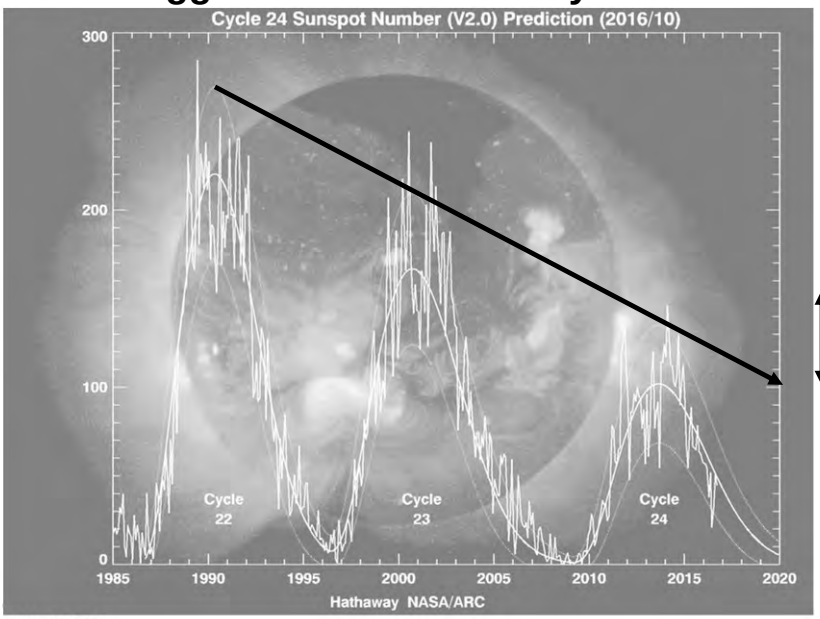
Steadily Declining Solar Activity Since 1990 suggests a weak Solar Cycle 25



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solarscience.msfc.nasa.gov/images/Cycle22Cycle23Cycle24big.gif

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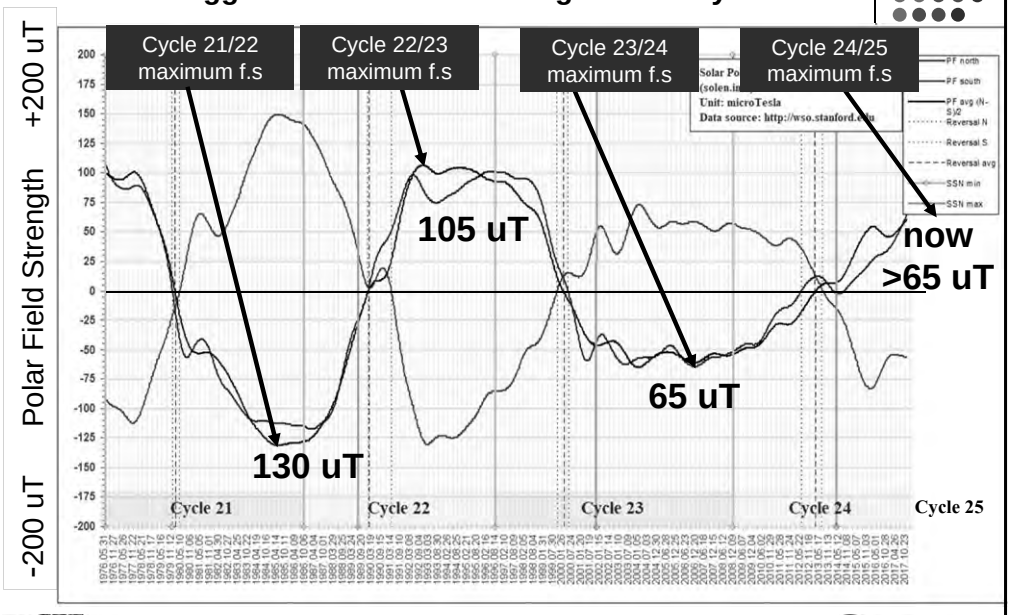
Solar Polar Field Strength Precursor Method

f.s. >65 uT suggests a somewhat stronger Solar Cycle 25



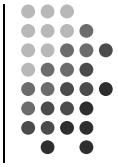
www.solen.info/solar/polarfields/polar.html

160 Meter Propagation

during very low solar activity through 2021

- Significantly improved DX propagation
  - stronger signals
  - longer and more reliable openings especially to Europe and Japan
  - consistently low absorption caused by less frequent, weaker coronal holes
    - especially after solar minimum from 2020 through 2022
      - coronal holes provide the poleward magnetic flux transport mechanism leading to solar minimum
  - less daytime D layer absorption before sunset and just after sunrise
  - less frequent and less intense night time E layer absorption
- More crowded conditions during major contests
  - especially when there is no strong 80 meter propagation to Europe
- More regular, longer and stronger worldwide DX openings
  - continuous openings to Europe, Mid-east and north Africa 2200-0830Z
  - frequent strong JA openings at sunrise mid-Nov to late Feb 1200-1230Z
  - short path polar opening to central Asia will be more frequent 2200-0200Z

80 Meter Propagation
during very low solar activity through 2021



- Significantly improved DX propagation
  - stronger signals
  - more reliable openings especially to Europe and Japan
  - consistently low absorption caused by less frequent, weaker coronal holes
    - especially after solar minimum from 2020 through 2022
    - coronal holes provide the poleward magnetic flux transport mechanism leading to solar minimum
  - less daytime D layer absorption before sunset and just after sunrise
- More crowded conditions during major DX contests
  - especially when there is no strong 40 meter propagation to Europe
- More regular, longer and stronger worldwide DX openings
  - continuous openings to Europe, Mid-East & north Africa 2130-0830Z
  - regular JA opening starting before sunrise Nov to late Feb ~1130-1300Z
  - short path polar opening to central Asia will be more frequent 2200-0200Z

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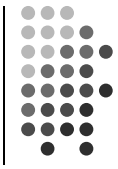
40 Meter Propagation
during very low solar activity through 2021



- Nearly 24 hour DX openings during November CQWW CW
- Europe, Mid-East and north Africa propagation
  - activity QSYs to 40 meters ***before mid-afternoon*** ~1930Z
  - don't miss the strong mid-afternoon/evening openings 2000-0200Z
  - *propagation often fades/fails a few hours after sunset* 0200-0600Z
  - *strong openings* usually resume at sunrise in Europe 0600-0930Z
- Japan, Far East and Central Asia propagation
  - brief direct short path opening at JA sunset 0800-0900Z
  - weak skew path opening at about 240º azimuth ~0900-1130Z
  - strongest short path JA opening from the east coast ~1130-1300Z
  - strong long path Asia signals at 150º azimuth 2130-2215Z
- VK/ZL and Asia long path 90º to 150º 2100-2300Z
- Southeast and central Asia long path about 240º ~1130-1300Z

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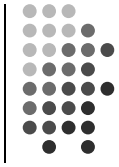
20 Meter Propagation
during very low solar activity through 2021



- Usually closes well before midnight ~0300Z
  - sporadic, weak night time Africa & south Pacific openings 0500-0700Z
  - often -- *but not always* -- stays closed for most of the night
- Europe, Mid-East and north Africa propagation
  - from before our sunrise until mid-afternoon ~1000-1900Z
    - the opening is *sometimes* delayed until after our sunrise
    - the opening fades earlier in the afternoon than in recent years
- Japan, Far East and central Asia propagation
  - short evening short path opening 2130-0100Z
  - morning short path opening 1300-1500Z
  - both openings are much shorter than in recent years
- South Asia and Mid-East morning long path ~240º 1300-1500Z
- VK, ZL and south Pacific mid-afternoon long path 1900-2200Z

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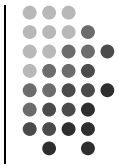
15 Meter Propagation
during very low solar activity through 2021



- Europe, Mid-East and north Africa propagation
  - usually from an hour after sunrise until early afternoon 1230-1800Z
  - much shorter and weaker openings than we've enjoyed until this year
- Japan and Far East propagation
  - weak, unreliable late afternoon short path opening 2130-2300Z
    - sometimes only via the weak signal skew path at about 240º
    - much shorter openings than we've enjoyed in recent years
  - rare morning weak signal long path opening at 150º ~1300-1400Z
- The band usually closes a few hours after our sunset ~0100Z
  - always stays closed all night

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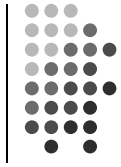
10 Meter Propagation
during very low solar activity through 2021



- South America, Caribbean and Central America
  - PY and LU activity has increased significantly in recent years
  - usually opens a few hours after our sunrise ~1400Z
  - opening often fades for an hour or two, then returns much stronger
  - usually closes at about sunset or earlier ~2200Z
    - always stays closed all night
- Southern Europe and north Africa
  - very weak scatter path signals at 110 to 150º azimuth ~1400-1700Z
- VK/ZL/KH6 and south Pacific
  - usually a reliable weak signal opening ~1900-2100Z
- Japan, North Pacific and Far East
  - rare morning weak signal long path opening at 150º ~1300-1400Z
  - rare evening very weak signal skew path 200 to 240º 2130-2200Z

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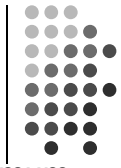
DX Contest Strategies
during very low solar activity through 2021



- High antennas are much more important during solar minimum
- Improve your low band transmitting *and receiving* antennas!
- **Start every DX contest on 40 meters**
  - the strong European opening ***often ends a few hours after our sunset***
- Capitalize on improved 160 and 80M propagation 2200-0830Z
  - especially important when 40 meters is not strongly open to Europe
- Strong 40 meter opening *after sunrise in Europe* 0600-**0930**Z
- 160, 80 and 40 meter openings to VK, ZL and JA 0900-1230Z
- 20M European opening usually starts before sunrise **1000**-1900Z
- 15M European opening usually starts after sunrise 1230-1800Z
- 10 meters openings almost exclusively to the south 1400-2100Z
- Strong 40M afternoon/evening openings to Europe **2000**-0300Z
- 20 meter evening openings to Japan 2130-0100Z

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Contesting Tips and Best Practices

Collected Wisdom and Lessons Learned

K2YWE (K3AU)

CTU CONTEST UNIVERSITY 2018

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What's this about?

- **Objective**
  - Improved Scores
- **How?**
  - Get 'Psyched'
  - Prepare
  - Adopt Best Practices

Agenda

Elements of Success

Same principles apply as in most successful endeavors

- **The Right Frame of Mind**
- **Preparation**
- **Attention to Detail**
- **Operating Best Practices**
- **Practice**
- **Learning and Improvement**
- **Perseverance**

The Right Frame of Mind

Get in the zone

- **Don't forget it *is* a competition**
  You'll be in a fraternity of 'Friendly Competitors'
- **You will not be alone**
  "Contesting skill includes the ability to tolerate high levels of QRM, and if you can't do that, you might as well hang it up" … K3ZO

- **Think Big**
  If you think and act like you're a big dog,
  you will convince much of the pack that you are.
  (Of course you may get nipped once in a while)

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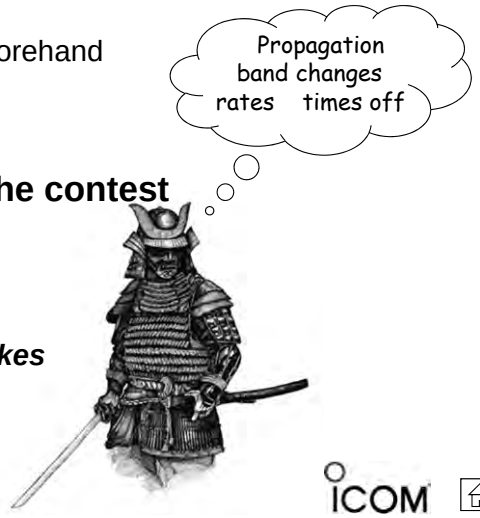
Preparation

'Now the general who wins a battle makes many calculations in his temple ere the battle is fought.' . . . Sun Tzu

- **Have a strategy**
  - **Think** the contest **through** beforehand
  - What do you expect?
  - What if . . ?
- **Adapt to changes during the contest**
  - Execute your 'what if' plans



'The general who loses a battle makes but few calculations beforehand.'

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Preparation

Get your act together before the performance

- **Check your set-up well in advance**
  - Hardware *and* software
  - Provide enough time for fixes
    (I use my contest software every day)
  - Know the file name or date to re-start

- **Make sure you audio is good contest quality**
  - Monitor and **adjust** over-the-air with **another station**
- **Check propagation**
  - Listen ahead of the contest to get a feel for conditions
  - Are they in line with your expectations?

Practice

It may not make you perfect, but it will make you better!

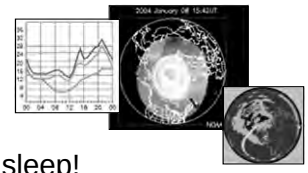
- **Be thoroughly familiar with your logging software**
  - A contest is **not** the time for a **first trial**
  - **Gain** familiarity in non-contest use
  - **Exploit** helpful features
  - Try different modes
  - Modify settings to suit your style


Contest Hound
using Morse Runner

- **Be comfortable with Run techniques**
  - **Practice** with a simulator (Morse Runner)
  - Operate 'run style' on the air (5NN QTH BK . . . TU)
    - Pick days with good conditions on your best band
- **Assess your Operating Practices**
  - Bounce your operation against the ***Best Practices*** *in Appendix A*

Strategy

Having a game plan pays off during the contest



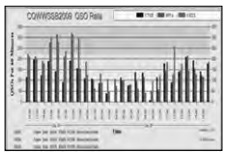
- **Consider Propagation predictions**
  - Temper them with your observations
- **Keep geo-time of day in mind**
  - Not everyone is dedicated, some eat and sleep!

- **Bands and Run times**
  - Make a plan
  - Set ground rules for changes
- **A Generic Band Strategy**
  - **Work bands that may close first.** Move with propagation
  - Chase Mults when one band slows, but other hasn't yet opened
  - **Try more running** when bands are **good**
  - Keep an eye out for **early and low-probability** openings

On/Off Times

Make the best use of your time

- **Choose Off times at lowest expected Q rates**
  - Consider propagation and rate histories
  - Don't forget minimum OFF time rules



- **Ensure using your full time allotment**
- **Allow possibility you may want a late slot**
  - Don't get caught short of time at the end
  - Consider leavng an insurance slot

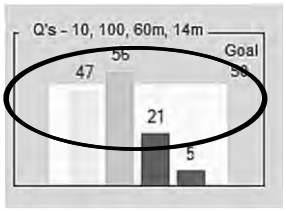
- **Sync with your personal needs (of course)**

Rate Targets

Setting Rate targets helps you achieve QSO goals

- **Set an average rate you want to achieve**
  - (Total Q's) / (Operating Hrs)
  - Keep it in mind
- **Adjust target rates over the contest period**
  - Track your rate
- **Consider a change if you drop below target or rate keeps going down**

1,000/24 = 40	
00-04z	60
04-08z	45
08-12z	30
12-16z	40
16-20z	50
20-24z	25



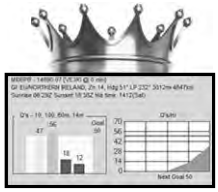
- Change Freq, Band, Mode
- Swap Running and S&P
- Chase some Mults
- Change your Shirt
- ***Change Something!***

About the Score

Q's and Mult's

- **Total QSO's give Multipliers their worth**
- **There will be more Q's than Mults**
- **Q's drive the score**

  That means Rate is King!



- **Rate Drivers**
  - **Being Heard** and **Hearing** others
    - At fixed power level, this mainly means better Antennas
  - **Operating Efficiency** – wasting less time
    - Operating **Best Practices**
    - Shack Arrangement
  - **Available QSO's . . .**

Sources of QSO's

Running deepens the pool

- **Runners - Stations calling CQ**
  - You can generate good S&P rates with them
  - They are **Limited** in number
- **Callers - Non-Runners (S&P)**
  - QSO's you will **never make unless you call CQ**
  - Some will be multipliers
  - Potential for good sustained rates

Run as much as you can consistent with rate

Better conditions favor more run time for little pistols

Strive for efficiency

Higher rates require spending less time per QSO

- **Look at rate as *time per QSO***
  - ***Time in QSO + Time Between QSO's***
  - **Minimize Both**
  - **Most of the Best Practices are about this**
- **In QSO**
  - Eliminate **wasted words**
    "Please copy my …" "Thank you for …"
  - **Avoid repetition** unless conditions warrant
    "Maryland Mike Delta" "Dan Delta Alpha November"
  - Fills - Give only **what's asked for**
    "QTH?" . . . "TX" not "123B K5ABC JOE 81 TX"
  - *Get all fills **before you pass your info***

Strive for efficiency - S&P

Higher rates require spending less time per QSOs

- **Between S&P QSO's**
  - **Give your call once** unless otherwise warranted
    - No more than twice
    - Remember you're a "Big Dog"
  - **Give your whole call**
    - Partial calls often lead to an extra transmission
  - Use K3ZO's 'Rule of **Twice'****
    - If you can't get him after **calling Twice**, move on
    - If he **doesn't ID** after transmitting **Twice**, move on
  - Use the **Bandmap**
    - Save calls in the Bandmap, even if you are Unassisted

******Modify "twice" as is sensible, but ***stick to it***

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Strive for efficiency - Running

Higher rates require spending less time per QSOs

- **In QSO's when Running**
  - Eliminate **wasted words** and avoid unnecessary **repetition**
  - Fills - Ask only for what you **need**
    - Often best to ask for one piece at a time
  - Don't break your run to pull someone through
    - Use K3ZO's 'Rule of **Twice'****
      Move on if you **can't pull him through** in two tries*****
  - **Speed up** if callers are waiting
    - They probably know your exchange
    - You'll lose impatient Ops
    - **Slow back down** again appropriately

******Modify "twice" as is sensible, but ***stick to it***

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Strive for efficiency - Running

Higher rates require spending less time per QSOs

- **Between QSOs when Running**
  - Use only a quick **'thanks'** (or TU) if stations are waiting
    - **They know your call**. Don't waste time on it
    - I use a '**progression**' as the crowd thins
      "Thanks" (with periodic call appended)
      "K3AU"
      "K3AU Contest "
      [CQ Message]
  - Use a situational CQ message
    - The busier it is, the shorter the message
    - Occasionally expand your CQ to 2x2 for the RBN
    - Arrange keyer macros accordingly

More on running in Best Practices later

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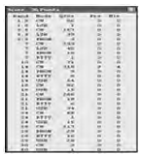
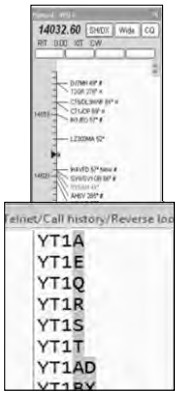
Overall Operating Tips

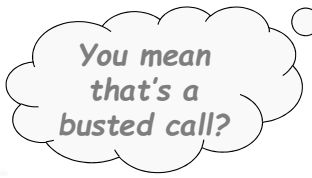
Important overall practices

- **Maintain a friendly sense of urgency in your QSOs**
  - Chattiness will slow your rate and lose you contacts
- **Every point counts!**
  - There's **no** such thing as **'not worthwhile'**
  - Call for '**anybody**' when it's **really slow**





- **Verify the call of the station you're working**
  - Beware of **busted spots**
  - **Log what you hear**



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Some Phone Tips

Apply these basic phone practices

- **Use conventional or unmistakable phonetics**
  - 'Duck Soup' are poor phonetics for 'D S'
  - Use IPA or 'Common' phonetics (countries, cities . ..)
- **Be mindful of SSB signal bandwidths**
  - Stay away from strong runners not to get covered by an **unheard pileup**
- **Listen to what's on your frequency when calling split**
  - If you can hear it, you can better time your call or defer until later

Some CW Tips

Apply these basic CW practices

- **Work at being heard**
  - Try **moving frequency** a bit if no success calling
    - Sometimes bandwidths are set narrow
    - Spots put many stations on the **same frequency**
  - **Distinguish** yourself through Speed or Weight
  - **Moderate** your **CQ speed** by conditions & results

- **Don't let code speed keep you from CW contests**
  - Start with the slower stations **high in the band**
    - Don't worry if you need to hear the call or exchange **several times**
  - Call CQ **higher in the band** at a speed comfortable for you
    - When you're ready

Best Practices - Overall

Make the most of your available time

- **Don't waste time repeatedly calling DX that has moderate signals when the band is otherwise quiet from their area**
  - They are probably 'opening the band' with lots of ERP
- **S&P rates can be very high early in the contest**
  - **Everyone** is **'fresh meat'** for you
  - Quickly hop from station to station with little fear of Dupes
  - It's often safe to call first and then fill-in the call (some risk)
- **Consider using S&P to find a spot to Run**
  - Maintain a **high rate** while **searching for** a **clear** spot
  - The alternative is to establish a frequency before the contest
- **Be sure to call CQ late in the contest**
  - You will **be fresh meat** to some that have been CQing all along

Best Practices - Running

Make the most of your available time

- **Call CQ when the band is active**
  - If **CONDX** are **good** for your station
- **Call CQ when bands are dead or worked out**
  - Big guns and other will be **scavenging** for Q's
- **Use the widest IF bandwidth you can stand**
  - Less chance to miss **off-freq callers**, especially on CW
- **Always work Dupes (set software to allow it)**
  - You **might not be in his log** and it's usually **quickest**

Best Practices - Running

Make the most of your available time

- **Start sending as soon as the call is in your head**
  - **Finish typing** into the log **while it's being sent** (ahead of the buffer)
  - Some programs can do this automatically after *n* characters
- **Send out a full exchange with a partial call**
  - Most **Ops will correct you**, many without a missing a beat
  - Fix the entry during his transmission
- **Send the corrected call as part of your 'bye' message**
  - **Enable call sign correction** in your software
- **Move Multipliers to other bands if you have the time**
  - **Pick or set up frequencies** in advance for quick hops

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Best Practices - Running

Make the most of your available time

- **If another station calls CQ on your frequency, try 'QRL' or 'Frequency in use, please QSY'**
- **Don't engage in extended frequency fights**
  - **If QRL/QSY fails**, it almost always pays to **move**
  - Sometimes you can move up or down a bit to lessen the QRM and still hang on to 'your' frequency
- ***NEVER NEVER NEVER* acknowledge a 'jammer'**
  - **NEVER**. Just keep your pace and **don't change** your tone of voice on phone or even synchronize your calls to his QRM.
  - Often throwing in a few fake Q's will discourage the jammer

The Complete Best Practices Collection appears in Appendix A

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Station Improvements

Put method behind your madness

- **Assess Station Strengths and Weaknesses**
  - Take **band by band inventory** *based on performance history*
- **Attack Weaknesses with biggest payoffs first**
  - Incrementally **fill in the holes**
  - Don't forget to pick 'low hanging fruit'
  - ***Every*** improvement counts – **they all add up**
  - Expect Antennas to rank high
- **Improved Antennas**
  - Better sustain runs and snag S&P QSO's with less calls
  - Hear and work more '**second tier**' stations
- **Set up for Efficiency . . . Huh?**

Station Improvements

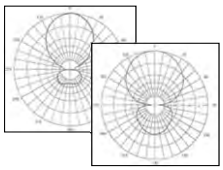
Improvements aimed at higher rates

- **Footswitch**
  - SSB - Frees hands for keyboard use 
  - CW - Quick T/R transition without listening to QSK noise
- **Boom or Headset Mic**
  - Less fatigue, **freedom** to move, respond to local 'QRM' 
- **Antenna switches and relays**
  - **Quicker** band or direction changes 
- **Rearrange Equipment**
  - Easier **more efficient**, operation 

Antenna Improvements

Be innovative within your constraints

- **What assets exist to hang antennas on?**
- **Use all the property lines to full advantage**
- **Add/change antenna to help your weakest band**
- **Try using monobanders**
- **Consider fixed antenna with gain to high QSO area**
- **Enable a new band, like 160m**
  - New Mults and more Q's during slow times
- **Add better SNR Rx Ant for low bands**



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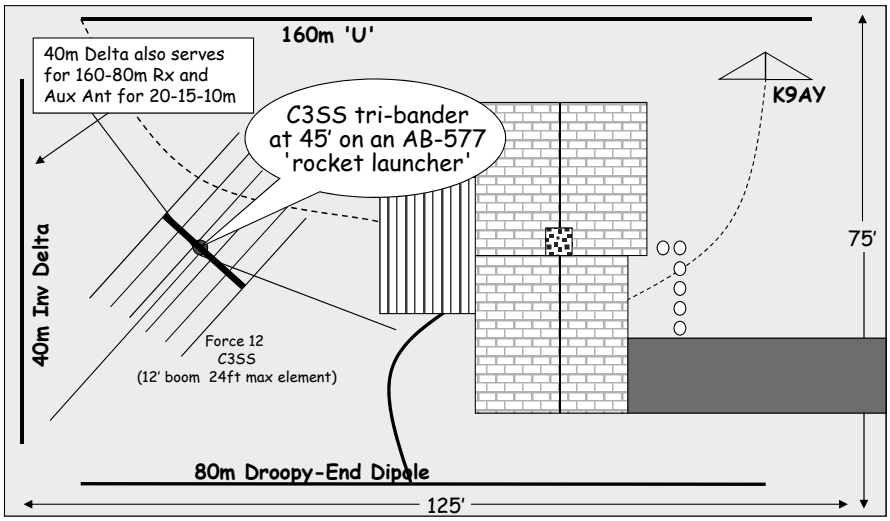
My Antenna Farmette

Three wire monobanders and a 12' tribander in 1/5th acre



Started with multi-band horizontal loop
Made incremental changes to address deficient areas

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Software (S/W)

Use a dedicated contest logger, properly configured

- **Engage Radio and Keying interfaces**
  - Really a competitive 'must do'
- **Recommended Options (min)**
  - Work Dupes
  - Correct all call signs
  - Check Partial Window(s)
  - Rate (Info) Window
  - Bandmap & Spot List Windows
  - Populate Bandmap on move
  - Available Q's & Mults (N1MM) Window
  - Score by Band
- **Spotting Network? -** It's a strategic decision
  - Can be a valuable asset, especially in S&P and on CW (RBN)
  - Does not alleviate you from **confirming** all entries
  - Be careful **not** to get caught up in **chasing Mults**
- **Spectrum & Waterfall displays**
  - Its own full topic! – *sorry, not in this session*.

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S/W Features I find most useful

Some software features that pay off

- **Rate (Info) Window**
  - Rates & Targets
  - Band and S&P/Run changes

- **Bandmap**
  - Dupe check & 'check later' **even if Unassisted**
  - List views
    - Jump to spot (if interfaced)
    - Hotkeys without mouse

- **Super Check Partial (SCP) or Check n and n+1**
  - Call sign possibilities
  - n+1 includes transposed and single char error
- **Available Mults & Q's (N1MM)**
  - See band activity/'target density'

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After Action (post mortem)

Analyze your performance after the contest is over

- **Note things you wish you had done differently**
  - Run/S&P ratio?
  - Handling Mults – chasing, moving
  - Station changes you wish you'd made
- **Compare notes with local contesters**
  - Miss any openings?
  - Band scores and band changes
- **Perhaps record the contest***
  - Later check against LCR
  - **Do Not** use recording to "fix" your log

*CQWW top 3 finishers must do this

Summary

Use these practices to improve your scores

- **Prepare and pay attention to detail**
  - Remember **Sun Tzu**

- **Formulate strategies**
  - Pick and **plan** your contests. Use the plan for guidance
- **Adopt proven practices**
  - Try the **Best Practices**. Keep what works for you

- **Run, big dog, run**
  - Try to **Run** if at all possible

- **Make incremental improvements**
  - Small changes can be effective. Make a **list** and work it down

and remember – Rate is King!

A Word About SO2R [single op 2 radio]

Everyone has their own idea of an efficient SO2R layout . . .

A Word About SO2R

Save SO2R until other improvements are well in hand

- **Potential to add significantly to your score**
- **But, It's easy for SO2R to be a distraction**
- **KISS (Keep It Simple Stupid) is key**
  - Start with a simple to use setup
    - I use two networked computers and keyboards
- **Start using SO2R only when things are slow**
  - CQ on A - S&P on B
  - Alternate (ping-pong) CQs
  - Modify your setup and operation with more experience and skill
- **Try SO2V [Single Op 2 VFO] to get your feet wet**
  - Same caveats apply

I'm not a power SO2R user

Best Practices

Appendix A

K2YWE

note: Order in the table was arranged for fit and is not necessarily logical

Best Practices

Appendix A

K2YWE 1 of 9	Best Practice	Rationale
General Operating		
	• Assume a big dog attitude	• If you act like a big dog, most will believe you. If they bite back painfully, you can find other turf.
	• Maintain an "friendly sense of urgency" in your QSOs	• Chattiness will slow your rate and lose you contacts
	• Always work Dupes • Set your software accordingly	• You may *not* be in *their* log • It usually takes more time to rebuff than work
	• Enable and use the Bandmap feature of your logging software even if you are not Assisted. • The Bandmap allows you to enter stations yourself on the fly	• If you need to check back later, the Bandmap will have the call sign and frequency noted for you • You'll waste less S&P time on waiting for station ID or on calling Dupes

Best Practices

Appendix A

K2YWE 2 of 9 Best Practice	Rationale
General Operating - continued	
• In general, use K3ZO's 'Rule of TWICE' • Modify 'TWICE' to suit your station capabilities and contest situation: • If you can't get a station after calling him TWICE, move on • If the station doesn't ID after transmitting TWICE, move on	• Your time can be better spent increasing your rate • A multiplier can quickly become worth less than the QSOs lost trying • You can put his frequency into the Bandmap to check back later
• Try moving frequency a bit if you don't seem to be heard	• Often receiver bandwidths in a crowded band are set very narrow

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Best Practices

Appendix A

K2YWE 3 of 9 Best Practice	Rationale
General Operating - continued	
• Do not waste time repeatedly calling DX stations that have moderate signals when the band is otherwise quiet from their part of the world • This is likely to happen when big guns are just 'opening the band' or 'keeping it open' • Try another time	• Many stations running high power will be heard when propagation is poor, but will not hear you despite elaborate antennas • Remember that 1.5kW vs. 100W is roughly the difference between S-7 and S-3. These are the guys that are S9 or more under better conditions.
• Send only the missing or wrong part when asked for a correction (FILL) • The response to K3? would be 'ABC' (a few times if needed) not all of 'K3ABC' since K3 wasn't in question • Similarly in SS if queried for your CK, don't send the entire exchange	• Time spent sending known information is wasted. • You may squander a clear interval or QSB peak on resending known info The time spent sending known info may be a missed opportunity for the Fill to be heard

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Best Practices

Appendix A

K2YWE 4 of 9 Best Practice	Rationale
Running	
• Call CQ when the band is active if you are able to find and hold a frequency	• You will usually beat your S&P rate • An exception is the start of the contest when everyone is 'fresh meat' for you and your S&P rate can be very high
• Call CQ when the bands are dead for the day or worked out near the end of the contest	• That's when the stations that have been CQing will S&P for 'fresh meat'
• *Consider not* asking if the frequency is busy before CQing. You'll find out soon enough if it is. • *Do ask if you're uncomfortable not asking.* • *"?" is a fast reasonable compromise.*	• QRL? is an announcement to others that it's clear at your end • Someone else may jump in and CQ • Still low risk and courteous in the contest environment

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Best Practices

Appendix A

K2YWE 5 of 9 Best Practice	Rationale
Running - continued	
• Use the widest receiver bandwidth you can stand	• Less chance to miss off-frequency callers, especially on CW
• If another station calls CQ on your freq and fails to respond to your QRL-QSY message, carry on for a while to see if he leaves. But, don't do this for very long	• Even though he is not hearing you, if you are being heard by others he may not get many responses and might give up quickly. No one likes to waste time
• Don't engage in long frequency fights. Try 'QRL' or 'frequency in Use, QSY.' If that fails, it almost always pays to move. • Sometimes you can move up or down a bit in order to lessen the QRM and still hang on to "your" frequency	• It costs you QSO time • You may be in QRM at the other end

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Best Practices

Appendix A

K2YWE 6 of 9 Best Practice	Rationale
Running - continued	
• Don't break a run to pull one station through	• Your rate will suffer if you take long • You will drive away impatient waiting stations
• If you can't drag a station's call through after trying TWICE, ignore him and start calling CQ again • This is part of K3ZO's /Rule of TWICE./ Modify TWICE to suit your station capabilities and contest circumstances	• Running has to do with how fast you can accurately get Q's into the log. You don't want your rate to slow or waiting callers to lose interest • Equally important, on a crowded band you must transmit often to keep "your" frequency clear
• Speed up if your run is being sustained. This is especially true in contests like SS where the exchange includes your call sign.	• Waiting callers likely have your info • More stations will be inclined to wait • Your rate will go up with speed

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Best Practices

Appendix A

K2YWE 7 of 9 Best Practice	Rationale
Running - continued	
• Use only a quick "Thanks" or "TU" without your call sign or QRZ if you heard multiple callers. • Throw in your call every few Q's for new listeners. • Keep it up until there are no more responses, then build back to your "full" QRZ message and CQ. • If you get no responses after just 'Thanks', try only your call and 'TEST' before resuming a full CQ	• Most waiting stations will know your call. Don't waste time on it. • Minimizing the time stations have to wait for you will help to keep the impatient ones hanging around and will increase your QSO rate. • Less experienced contesters may not realize you are waiting for them. "TEST" will alert them you are ready for another station to call
• Send any call you have corrected as part of your goodbye message • Enable call sign correction in your software on CW	• Stations want assurance that you have them correctly. This will keep them from asking QSL? It might also save your from a mistake

CQ CONTEST UNIVERSITY

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Best Practices

Appendix A

K2YWE 8 of 9 Best Practice	Rationale
Running - continued	
• When the call sign of a responder is questionable, send a complete exchange using the questionable call Correct it during his exchange. • You can use SCP to help guess incomplete calls on the first round • *Make sure* you have it right before you let him go	• Nearly all contest stations will correct you on their transmission, good Ops without missing a beat • It saves an extra exchange devoted only to getting the callsign right • You can revert to "normal" fill-in procedures if this practice fails
• Maintain an "friendly sense of urgency" in your QSOs	• Chattiness will slow your rate and lose you contacts
• Move Multipliers if you have the time (a slow run) • Pick frequencies in advance. Give up if you don't connect in a short while	• It's a quick way to gain band-Mults. • Many Ops will go with you • You probably won't make the Q if you don't connect quickly

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Best Practices

Appendix A

K2YWE 9 of 9 Best Practice	Rationale
Running - continued	
• Hit the Send key as soon as the call is in your head, and finish typing it into the log during your outgoing exchange transmission Some software can be set to do this after *n* callsign keystrokes (TR4W and N1MM, for example)	• If your fingers are like mine, they slightly lag my brain and I am still typing when the other station stops sending. • This practice reduces the lag between when the other station finishes calling and when you respond, increasing your rate
• NEVER NEVER NEVER acknowledge a 'jammer.' NEVER! • Just keep your pace, and don't change your tone of voice on phone or even synchronize your calls to his QRM	• With no response to his jamming, he can't be sure he is even bothering you, and it isn't 'fun' for him if he doesn't get a reaction

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Got More?

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Selected Contest Loggers

Appx B

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Popular Contest Loggers

Appx B

Similar capabilities with varying implementations

- **All run under Windows OS**
- **Need varying amounts of learning to fully utilize**
  - **N1MM logger plus (Free)**
    - Most popular Win logger. Continuous cooperative development
  - **Win-Test ($)**
    - Many features and options. Easy transition for CT users
  - **TR4W (Free)**
    - Very flexible. Evolution of popular TR DOS program
  - **Writelog for Windows ($)**
    - Full-featured contest program with SDR interface
  - **N3FJP ($)**
    - Good and improving, *but still lacks some contest features*

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Popular Contest Loggers Appx B

Facilitate operating, logging, and exploiting opportunities

- **Contesting-specific with advanced features**
  - Band Maps with S&P "point & shoot"
  - Rate, Scoring, and other contest visibility tools
  - Enter Sends Message (ESM) mode adaptive behavior
  - SO2R Support
  - Multi Transmitter/Operator Support
  - Spots through Telnet connection
  - Radio, CW & Voice Keying, and Rotator Interfaces
  - Sound card Voice Keyer
  - Digital modes using the sound card (with aux programs)
  - Sound card receive recording (some)
  - Support for External Voice Keyer control (some)

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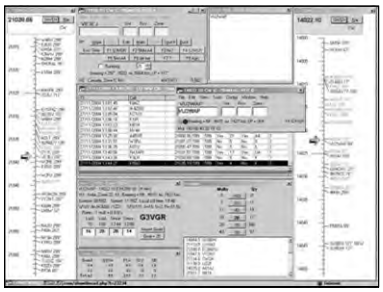
N1MM+ by N1MM et. al. (N1MM, N2AMG, K3CT, N2IC, NA3M, AB5K, KU7T)

Most popular (by far) Windows contest logger

- **Cooperative project with multiple participants**
  - Rewritten in 2014 as N1MM logger plus (N1MM+) using SQlite
  - Continuous updates and improvements
  - Large user community
  - Over 175 supported contests + over 225 user-defined
- **Moderate system needs. Will utilize multi-core**
- **Extensive features and options**
  - Highly customizable
  - Configurable windows
  - Integrated spectrum display
  - Hooks for latest digital modes
- **Sound card voice keyer**
- **RS-232, Parallel, USB support**
- **Free**



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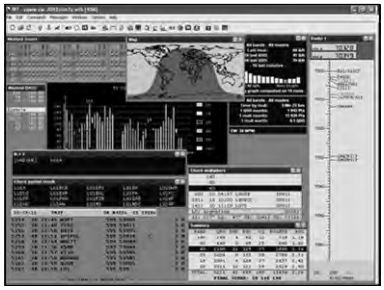
Win-Test by F5MZN

Mature written-for-Windows high performance logger

- **Efficient with minimal processing and memory needs**
  - Strong CT (K1EA) keystroke emulation
  - Over 100 supported contests
- **Extensive features and options**
  - Highly customizable
  - Configurable windows
- **Sound card voice keyer**
  - Built-in editor
- **RS-232, Parallel, USB support**
- **~$70 (50€)**
  - Proceeds support Radio Amateur Club de Kourou contest activities, including FY5KE (French Guiana)



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TR4W by UA4WLI (and UR7QM)

Win version of mature world-class adaptive contest logger

- **Small and fast 100% Windows API, 3GL* - Open Source**
  - Only 100,000 lines of code in 400KB
  - Over 155 supported contests
- **Substantially same features as DOS TRlog by N6TR**
  - Based on TRlog code provided by N6TR
  - (First with ESM and descrambler)
  - Continuously adding more features
- **Sound card voice keyer**
  - Flexible functionality
- **RS-232, LPT, USB support**
  - USB I/O includes log backup
- **Free and Open Source**

*** Also Runs under Linux/WINE**

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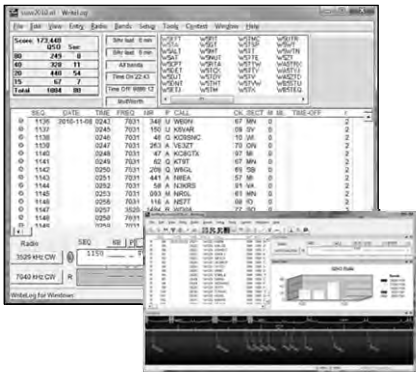
Writelog for windows by Contesting Software, LLC

Mature written-for-Windows high performance logger

- **Recently re-Written**
  - *Latest version* ***requires Win7***
- **Configurable windows**
- **110 supported contests**
  - Also GP logging
- **Extensive sound card support**
  - Voice Keyer
  - Contest Recorder
  - SDR interface
- **RS-232, Parallel, USB support**
- **$30 incl 1 yr updates** ($18 for previous version ***Win XP OK***)



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N3FJP by N3FJP

Basic contest log functionality

- **Daily logger with contest modules - C#.NET**
  - Improved, but still lacks features and flexibility of top loggers
- **Single resizable Main Window + floating Bandmap**
- **100+ supported contests**
  - 34 major + State QP's and other
- **Sound card voice**
- **RS-232 and USB support**
- **No SO2R support**
- **$49 all programs** (includes daily log) or ala carte
  - $25 Daily Contact Log – Free upgrades
  - $ 9 each contest separately – Free upgrades

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Logs most used in CQWW 2015

N1MM/N1MM+ is overwhelmingly the most popular

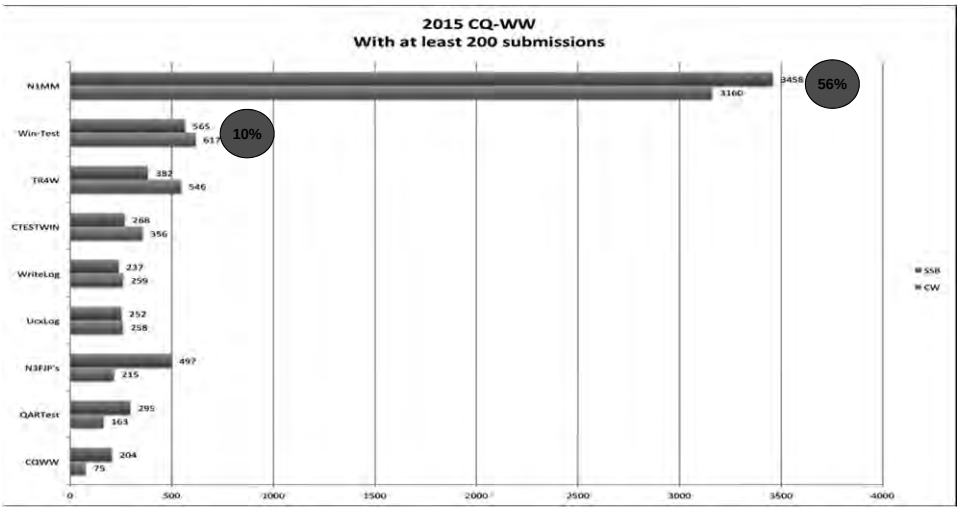


Chart generated by NY4I from CQWW Cabrillo logs

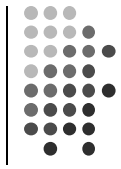
Internet Links

Here are a few of the many available resources

- **Contest Organizations, Calendars, Info, & Sponsors**
  - WA7BNM Calendar — hornucopia.com/contestcal
  - SM3CER Calendar — sk3bg.se/contest
  - Contesting.com — contesting.com
  - National Contest Journal (NAQP …) — ncjweb.com
  - ARRL (Sweepstakes, Field Day, DX …) — arrl.org
  - CQ Magazine (CQWW, WPX …) — cq-amateur-radio.com

- **Popular Contest Logging Programs** *Treated in Appendix B*
  - N1MM — n1mm.hamdocs.com
  - Win-Test — win-test.com
  - Writelog for Windows — writelog.com
  - TR4W — tr4w.net

Odds ‘n ends and notes



CTU CONTEST UNIVERSITY

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The Advantages of Waterfall Displays for Contesting and DXing

Presented by N6TV
n6tv@arrl.net

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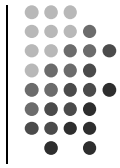
Presentation Overview



- Legacy “Panadapters”
- Waterfall scope in CW Skimmer
- Latest radios with waterfall displays
- Waterfall display advantages & disadvantages
- How to use waterfall displays while contesting or DXing
- Q & A

Legacy Panadapters

- Kenwood SM-230 Station Monitor (25, 100, or 250 KHz):

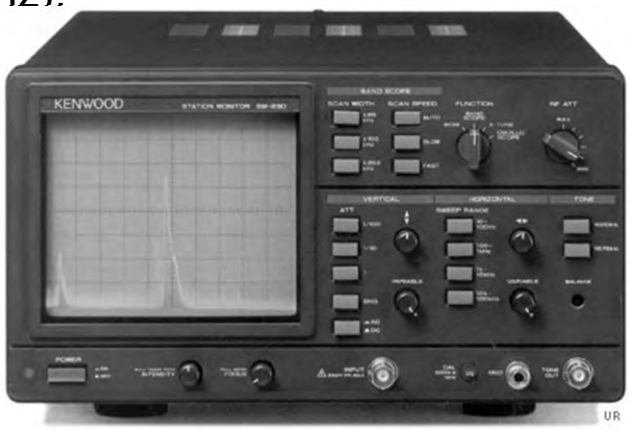
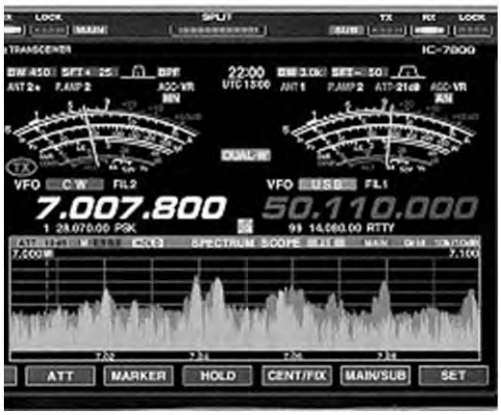


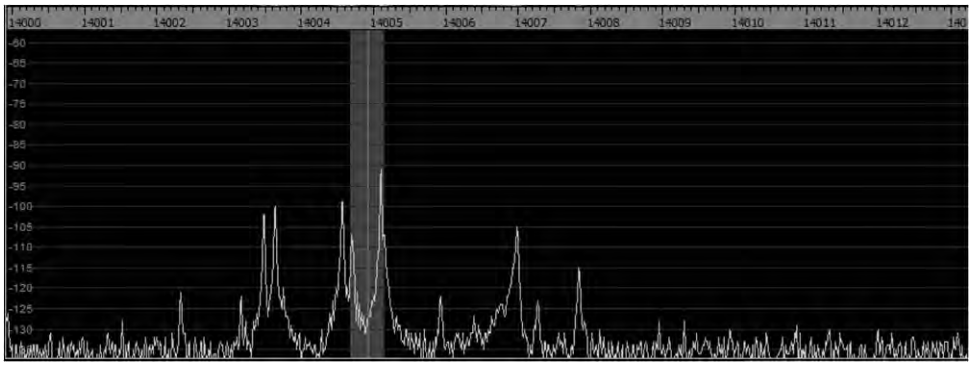
Photo courtesy http://www.universal-radio.com/

Legacy Panadapters

- "Band Scopes" in Icom IC-781, IC-756ProIII, IC-7600, IC-7800, IC-7700 (before new firmware)



Spectrum Displays Hide Weak Signals



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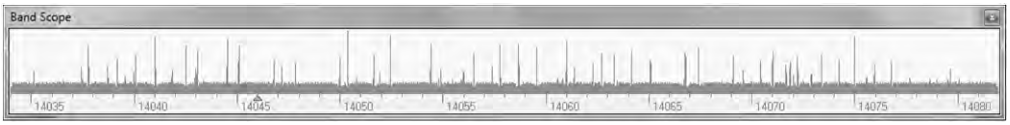
CW Skimmer's Band Scope

- From the CW Skimmer menu, select
  View → Band Scope



- Much better resolution, but display is very jumpy
- No "peak signal" memory
- Not useful on SSB

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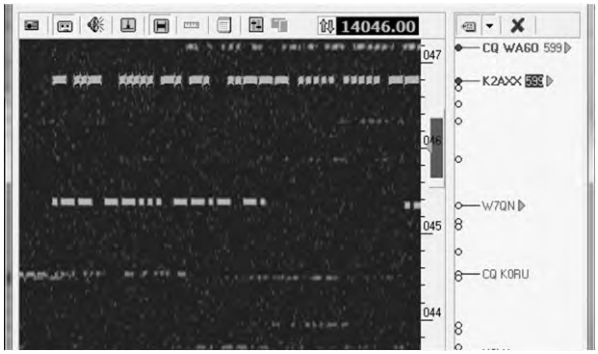
ICOM 6

Legacy Panadapter Limitations

- Big signals dominate the display
- Weak signals very difficult to spot
- Signal peaks disappear, no history
- Difficult to find “clear spots” on a crowded band
- Limited zoom in or out
- Display jumpy, distracting
  - Signal averaging helps, but it also hides things

CW Skimmer Waterfall Limitations



- You only see 10 - 15 kHz of the band at most
- Scale is fixed, cannot “zoom” in or out, or tune smoothly
- Narrow 500 Hz CW filter – *not* usable on phone

Better Waterfall Displays

- The Elecraft P3 Panadapter

- Major improvement over legacy designs

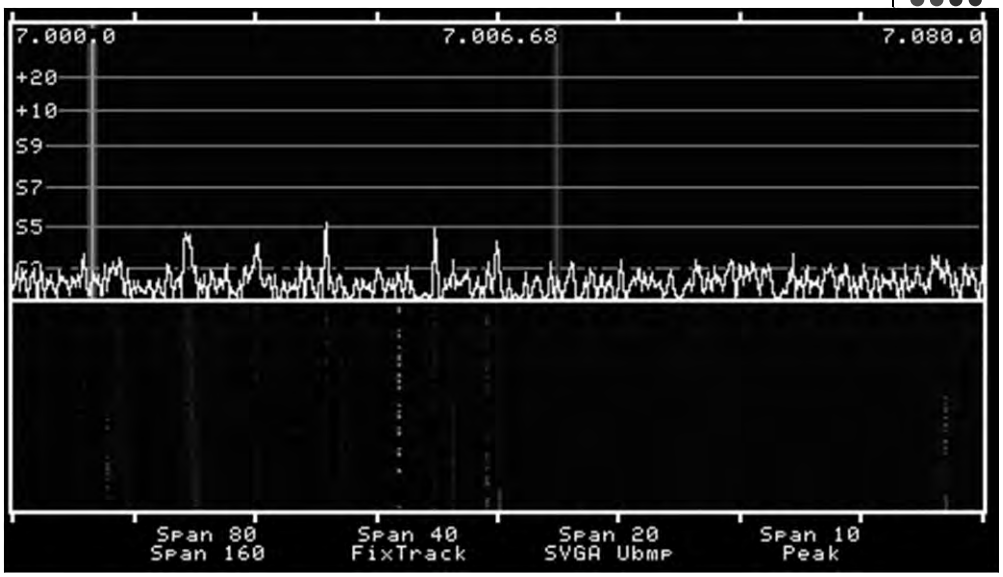
Photo courtesy http://www.elecraft.com

Elecraft P3 + P3SVGA Option

- P3 resolution only 480 x 272 pixels
- P3SVGA: internal SVGA Large Screen Adapter
  - 1024 x 768
  - 1280 x 1024
  - 1440 x 900
  - 1920 x 1080
- Displays far more signals

Photo courtesy http://www.elecraft.com

P3 Built-in Display at 480 x 272



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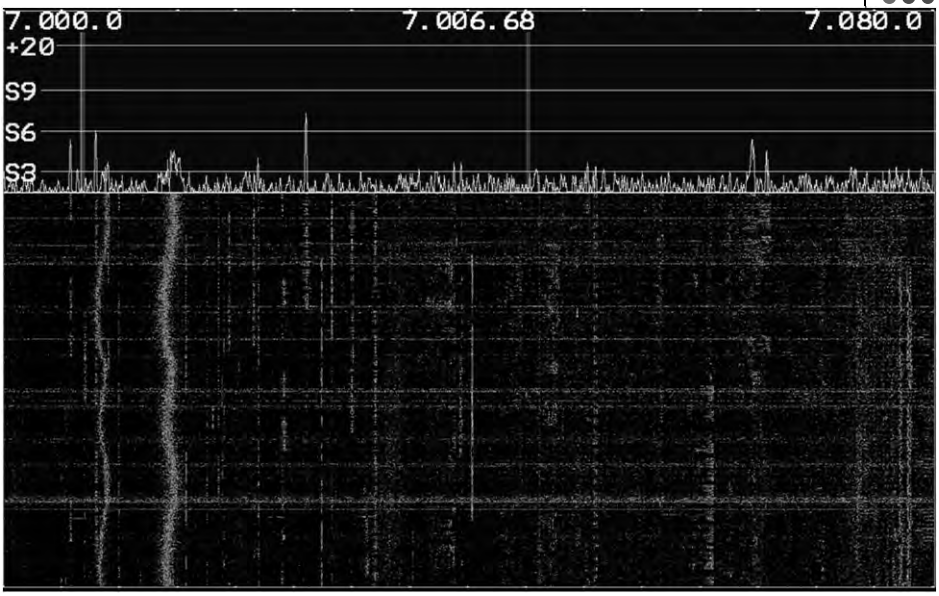
ICOM 11

P3SVGA at 1440 x 900



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ICOM 12

Old Icom IC-7800 firmware

Photo courtesy http://www.icomamerica.com

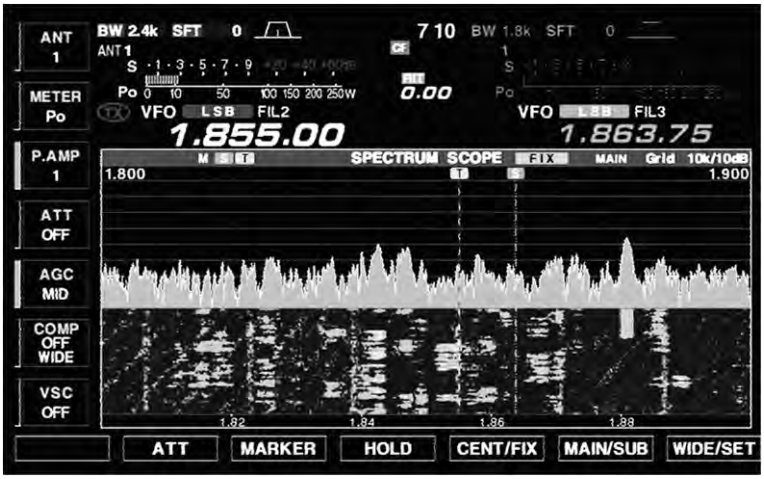
Icom IC-7800 with V3.0 firmware

Photo courtesy http://www.icomamerica.com

IC-7800 V3.0 Screen Shot

IC-7600, IC-7700 V2.0 Also Supports Waterfall

- 800 x 480 (with or without external monitor)



IC-7850 / 7851 – *Huge* Improvement

- Fast, 800 x 600, MAIN only, or MAIN + SUB
- "Click to tune" with USB mouse

New IC-7300 has fast waterfall too!

- With touch screen

Photo courtesy http://www.icomamerica.com

New IC-7610 with dual band waterfall

Kenwood TS-990S

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Photo courtesy http://www.kenwoodusa.com

ICOM 19

FlexRadio FLEX-5000™, FLEX-6700™

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Photos courtesy http://www.flexradio.com

ICOM 20

FlexRadio Systems® SmartSDR

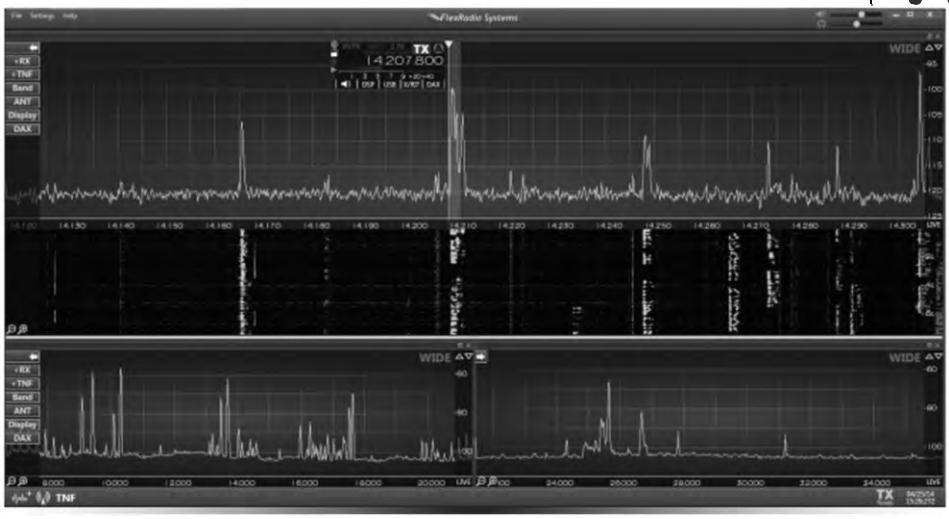
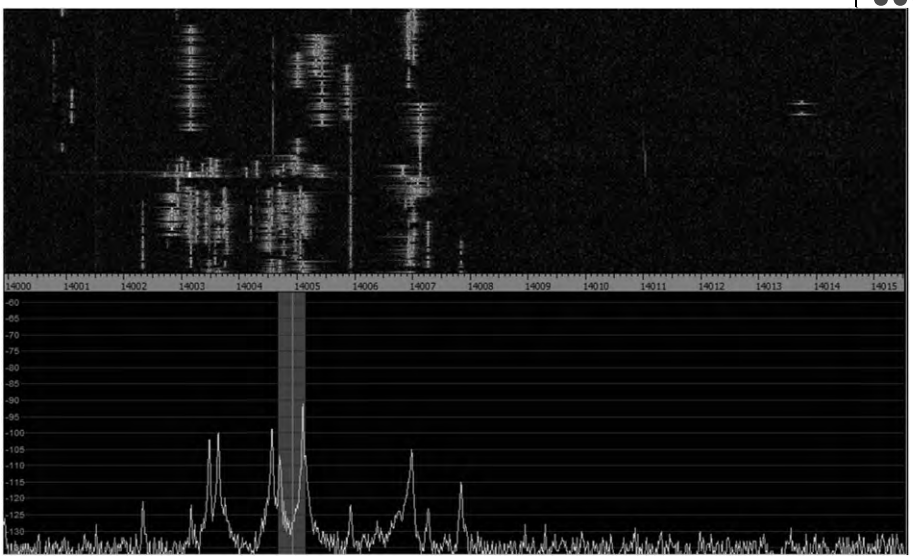
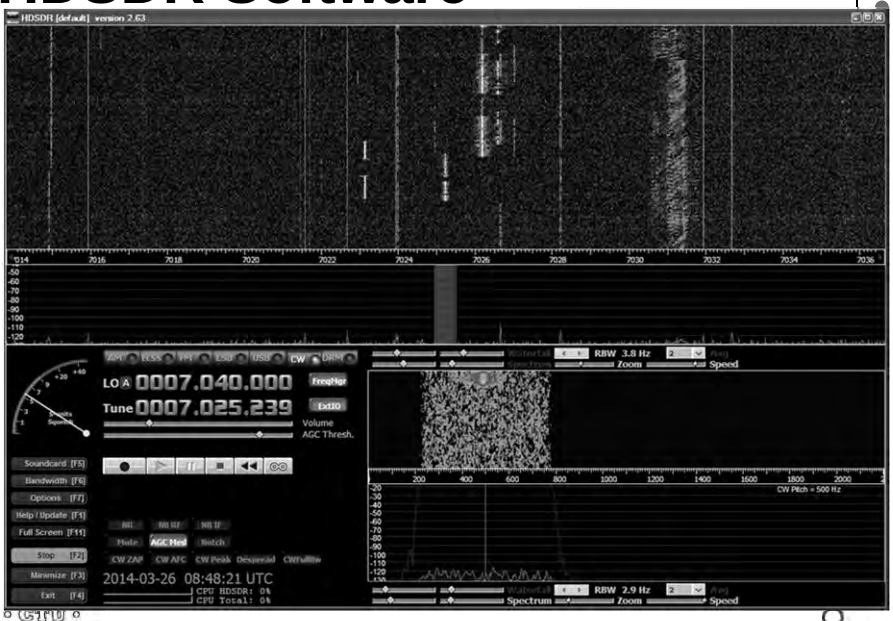


Image courtesy K3UK

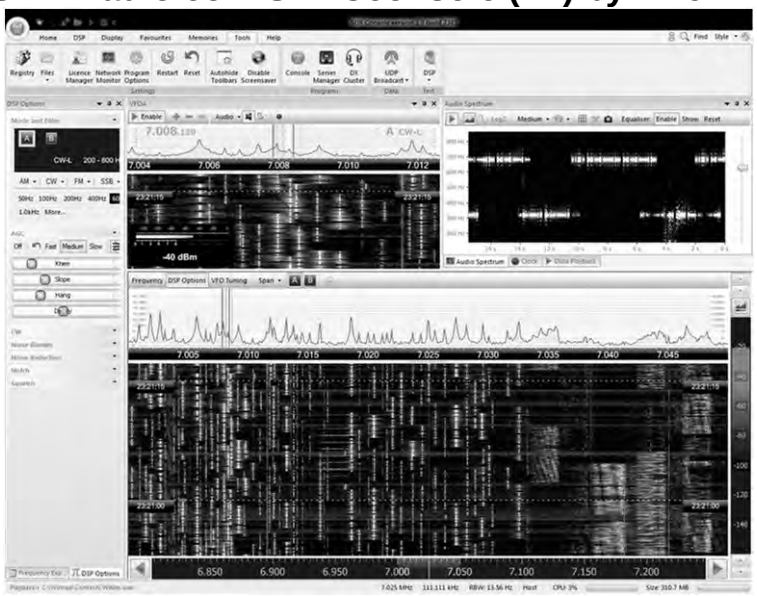
Winrad Software



HDSDR Software

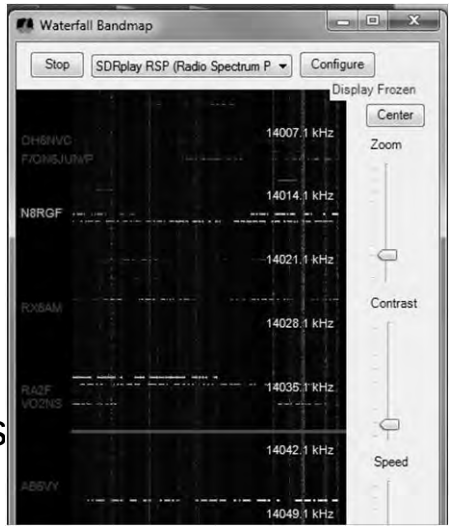


SDR-Radio.com SDRConsole (V2) by HB9DRV



Waterfall Bandmap by N2IC (for N1MM+)

- Combines cluster spots from Internet or Skimmer with waterfall from local SDR
- Zoom Feature
- Click to tune feature
- Potential to support other logging programs



LP-Pan and NaP3

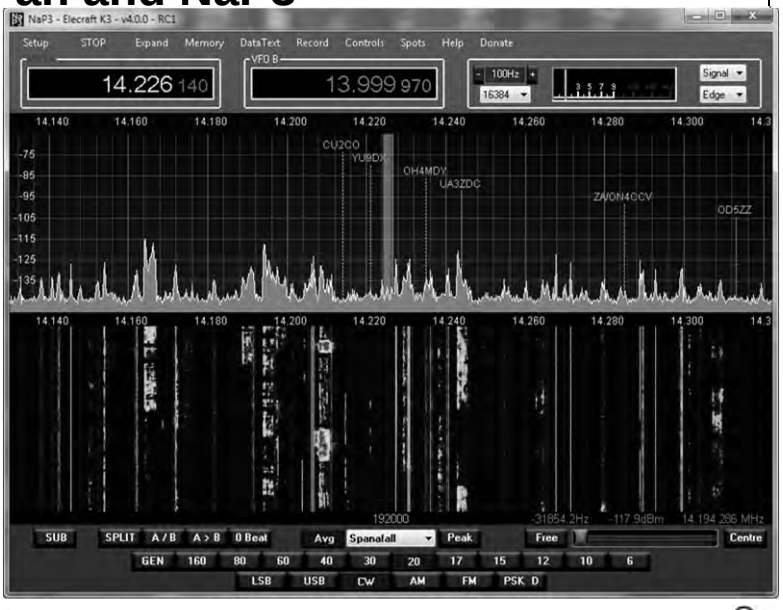
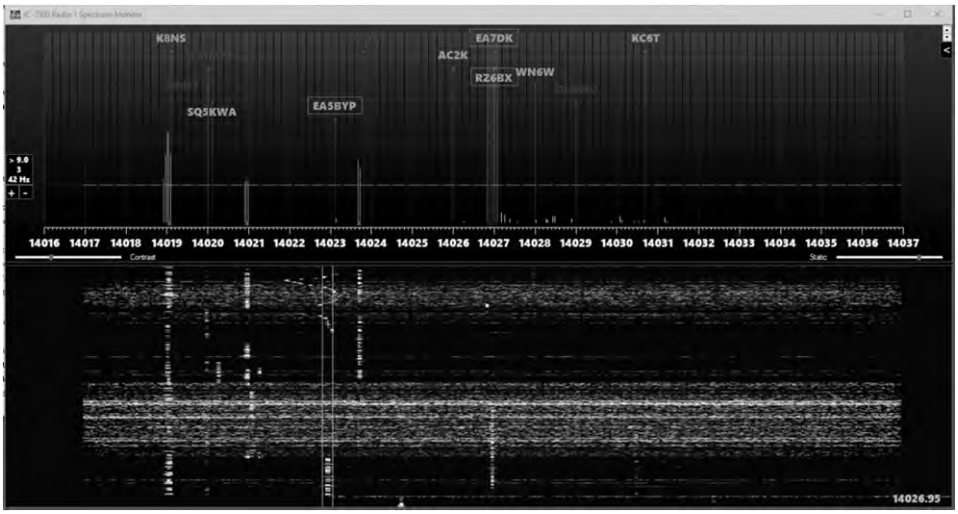


Photo courtesy http://www.telepostinc.com

N1MM+ Spectrum Display Window



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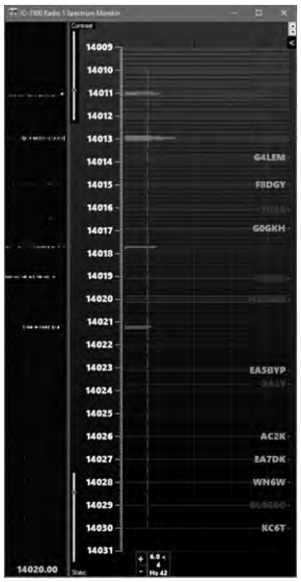
http://n1mm.hamdocs.com/tiki-index.php?page=Spectrum+Display+Window

ICOM 27

N1MM+ Vertical Spectrum Display Window



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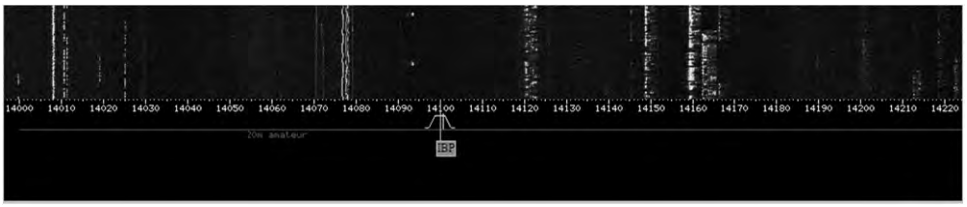
http://n1mm.hamdocs.com/tiki-index.php?page=Spectrum+Display+Window

ICOM 28

WebSDR: Waterfalls on the Web

- http://websdr.ewi.utwente.nl:8901/

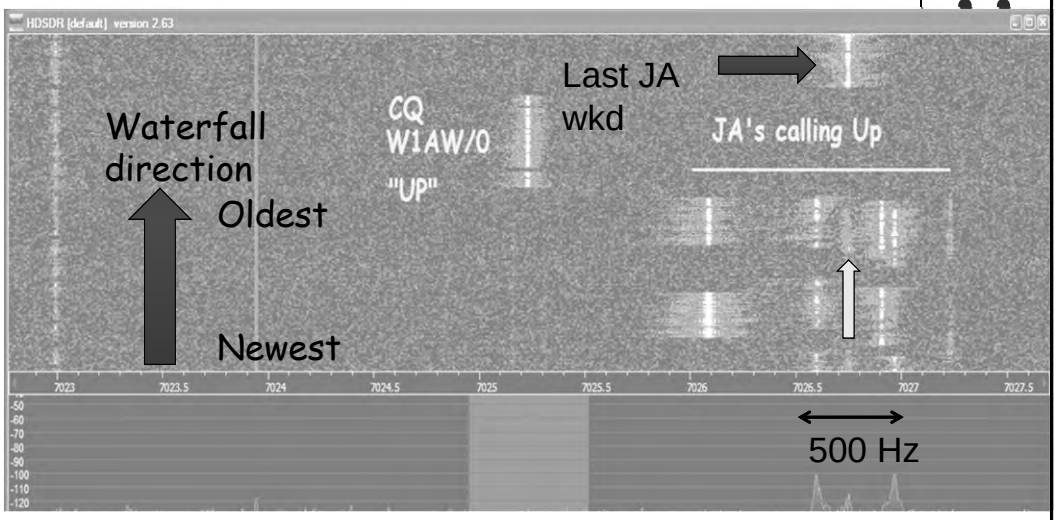


View / Zoom entire HF spectrum

Waterfall Display Advantages

- "Click to Tune" – direct access using a mouse or tap
  - IC-7300, IC-7610, IC-7800 V3.0, IC-7851, Flex/SmartSDR, HDSDR, SDRConsole (but *not* Elecraft P3)
- Jump to Next Signal (N1MM+ Spectrum Display)
- Find "fresh meat" (unidentified signals)
- Weak signals easy to spot (faint traces)
- Many zoom levels: 5, 10, 30, 60, …, 800 KHz+
  - Watch the whole band at once, or a small slice
- Find clear frequencies *fast*
- Find who the DX just worked, *fast*
- Spot the gaps in a crowded CW pileup

Listening “Up”? Not a problem



Who will W1AW/0 answer next?

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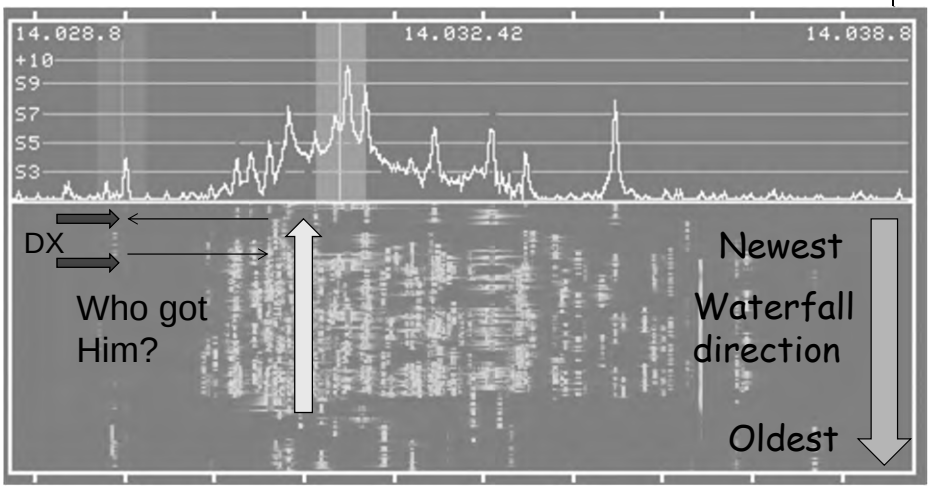
E30FB CW Pileup on P3 display



Where will he listen next?

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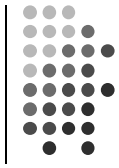
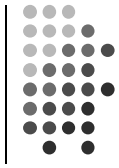
Advantage: Waterfall



- Find “good spots to call” in a CW pileup
- Find clear spots to call CQ
- QRM? You can *see* where to move your VFO to minimize it
- During S&P, find the “next” signal *fast* (no more slow and careful tuning)
- Position VFO B or 2nd receiver without having to *listen* to it
  - S&P while CQing, “SO2V” (single-op, two VFOs)
- Monitor overall band activity
- Keep an eye on the local competition

Waterfall Display *Disadvantages*



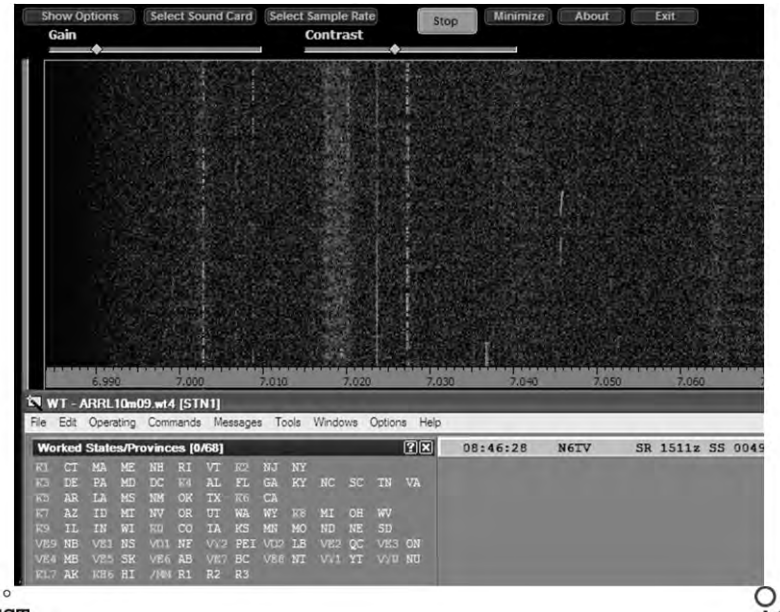
- Most radios don’t automatically tune from signal-to-signal like CW Skimmer
  - Exception: New N1MM+ Spectrum Display
- Clicking on a signal with the mouse not as precise as tuning with VFO, must still fine tune
- Contest software loses focus when you click on waterfall
- Some find it visually distracting
- Cumbersome to adjust scope width and band edges
- **But, if you’re *not* using a waterfall display in a contest, you’re really operating “blind”**
- A waterfall display is really the “killer app”

Recommendations While Contesting

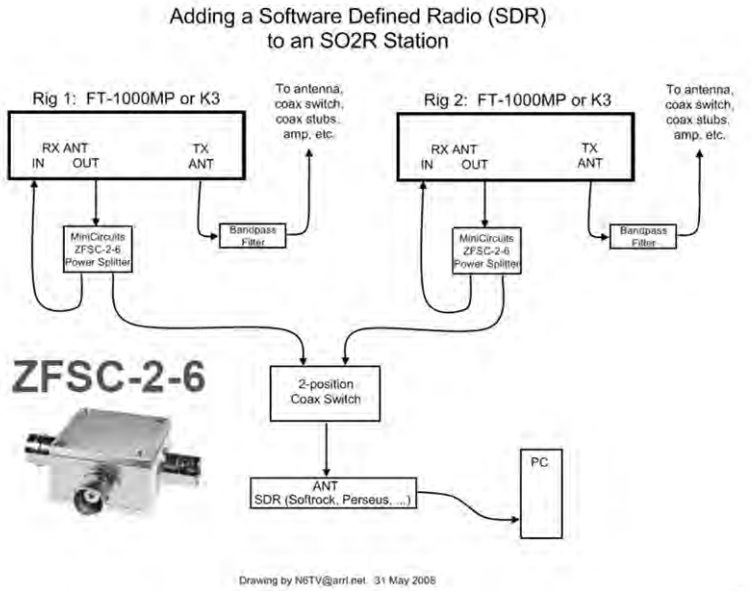
- Always enable the waterfall
- Use **Fixed** Mode (never “Center” mode)
  - You want the VFO cursor to move, not the scope
- Use narrow 5 - 20 kHz span for CQ, running
- Use wider 40 -100 kHz span for S&P, tuning
- Logging software can and should automate this:
  - In Win-Test, type **SPAN20** [Enter] to set a 20 kHz scope span, limited to band edges
  - See http://bit.ly/wtscripts - Win-Test Scripts P3scripts.zip, IcomScripts.zip, includes source code

Winrad on Top, Win-Test on Bottom

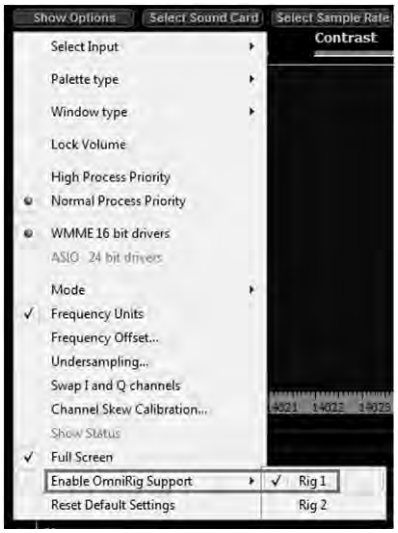
Winrad & Win-Test (zoomed)



Click-To-Tune with a "Legacy" Transceiver + SDR



Use Omnirig support in Winrad or HDSDR to sync freq. with any transceiver



Try Winrad Waterfall Demo

- Perseus SDR used to make a wideband recording (122 KHz for 10 minutes = 300 MB)
- Demo will play back that recording and others
- To try the demo yourself, follow instructions at
  - http://www.kkn.net/~n6tv

Click-To-Tune, IF OUT to LP-PAN 2, NaP3, LP-Bridge

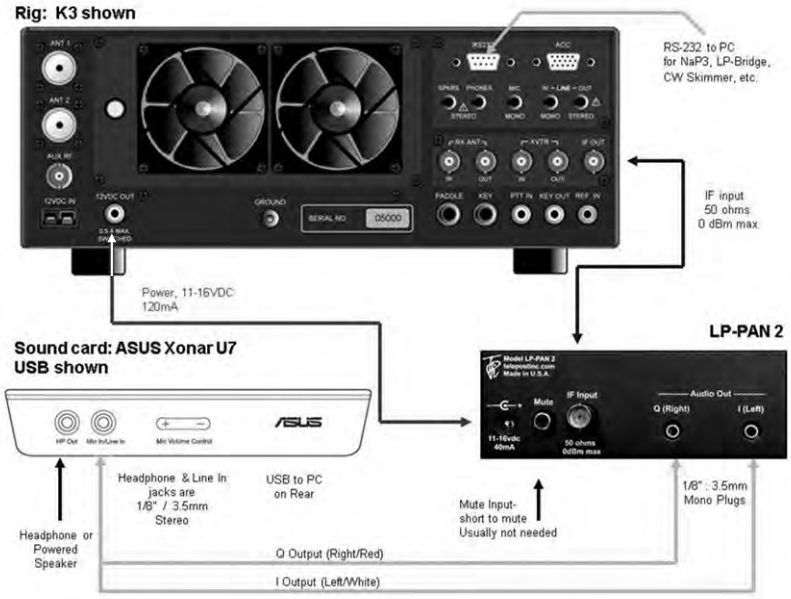


Photo courtesy http://www.telepostinc.com

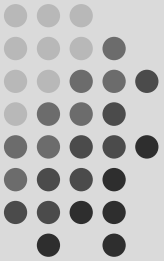
Questions?

- http://www.winrad.org - Winrad software
- http://http://www.hdsdr.de/ - HDSDR software
- http://sdr-radio.com/Software - SDRConsole
- http://n1mm.hamdocs.com/tiki-index.php?page=Spectrum+Display+Window – N1MM+ Spectrum Display setup
- http://www.kkn.net/~n6tv - Winrad demo file
- http://www.telepostinc.com/LP-PAN.html
- http://www.qrz.com/db/n6tv - Links to this and other presentations

CTU 2018 Presents

Pursuing RTTY Contesting to the Limit

Ed Muns, W0YK



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Pursuing RTTY Contesting … to the Limit

- 1st session: *"Having Fun with RTTY Contesting"*
- Receiver Configuration
- Call Sign Stacking
- Multiple Decoders
- SO2V, SO2R-SOnR
- AFSK vs. FSK
- FSK Bit Timing
- RTTY Transmit Bandwidth

Receiver Configuration

AGC; headphone monitoring

- Turn off AGC
  - or, at least minimize it, e.g., AGC=Slow
  - Fast AGC increases error rate in modern software decoders
- Minimize headphone monitoring fatigue
  - Use minimum discernible headphone volume
    - Only need to know start/stop of signal
  - Low Tones, e.g., 915/1085
    - Possible TX harmonics with AFSK

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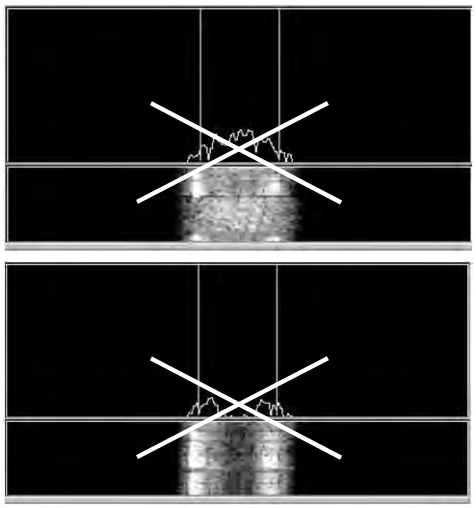
Receiver Configuration

IF filtering

- Narrow IF filters (Roofing & DSP)
  - 500 Hz - normal
  - 250 Hz - extreme QRM only
  - Tone filters – don't use!
    - Icom Twin Peak Filter
    - K3s Dual-Tone Filter



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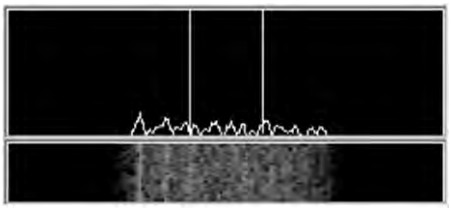
Receiver Configuration

decoder audio level

- Decoder audio level
  - Band noise 5% of full-scale
  - Maximum dynamic range
  - Weak signal decode
- Note 500 Hz IF filtering
  - Decoder optimum



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Call Sign Stacking

"Slow Down to Win"

- Sailboat racing analogy:
  - Pinwheel effect at mark-rounding
- Let pile-up continue 1-3 seconds after getting 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

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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

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Call Sign Stacking

skip 2 phases

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

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Call Sign Stacking

tail-ender

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

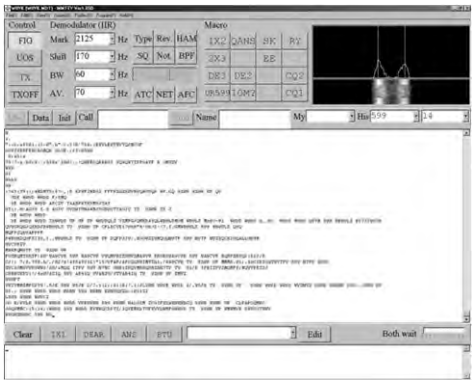
Call Sign Stacking

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

Multiple Decoders

MMTTY



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

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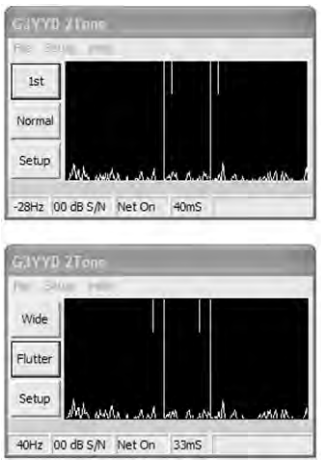
Multiple Decoders

2Tone



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

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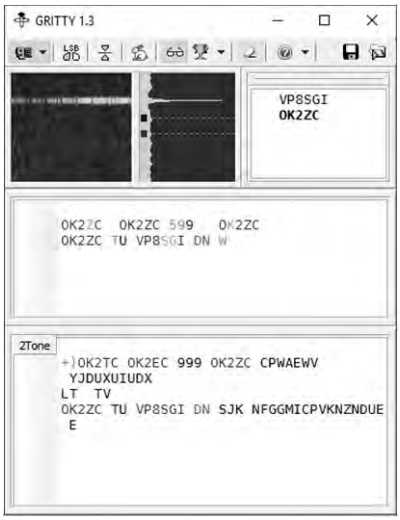
Multiple Decoders

GRITTY



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

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Multiple Decoders

hardware MODEM

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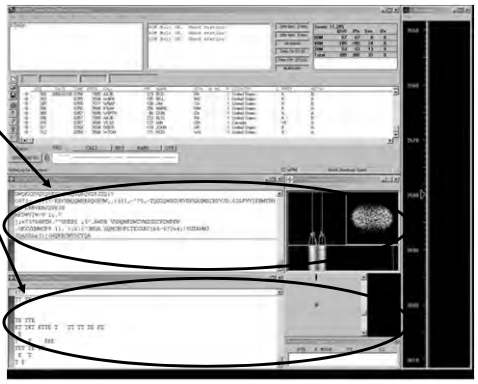
Multiple Decoders

MMTTY & DXP38

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



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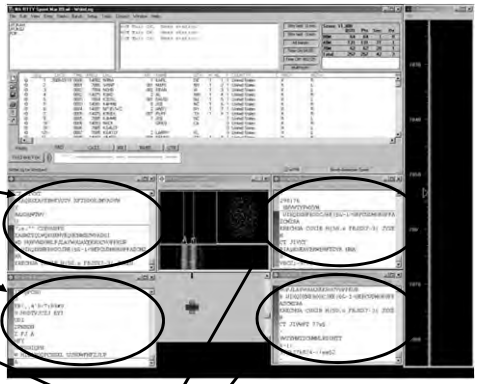
Multiple RTTY Decoders

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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16/46

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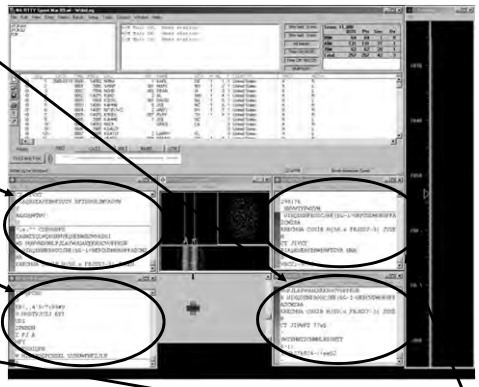
Multiple Decoders

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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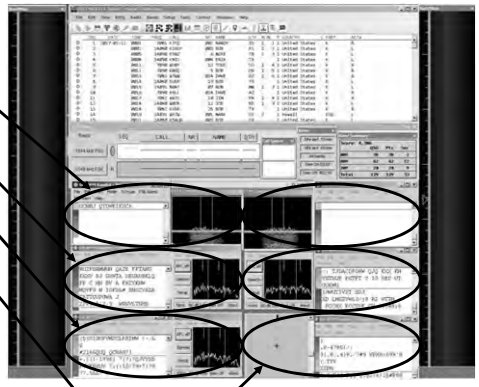
Multiple Decoders

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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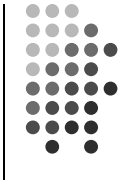
Multiple Decoders

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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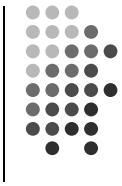
SO2V



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
     - Left-click call from 2nd RTTY window into VFO-B Entry Window
   - Two ways to transmit on VFO-B:
     I. A<>B, work the mult, A<>B
     II. 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

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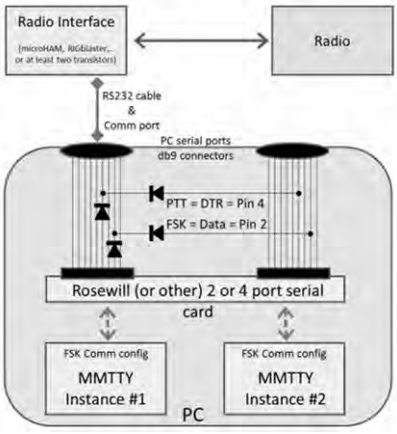
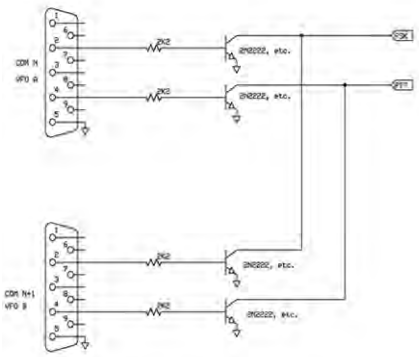
SO2V

Wire-OR FSK/PTT



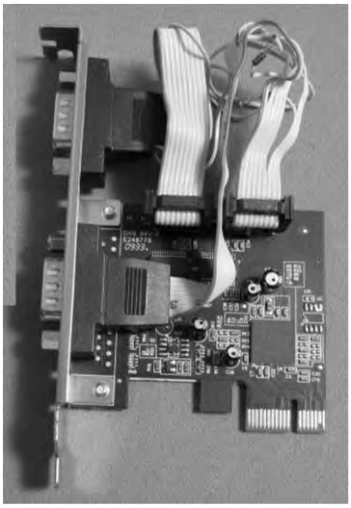
Serial Signals (K8UT)



FSK/PTT Signals (W0YK)

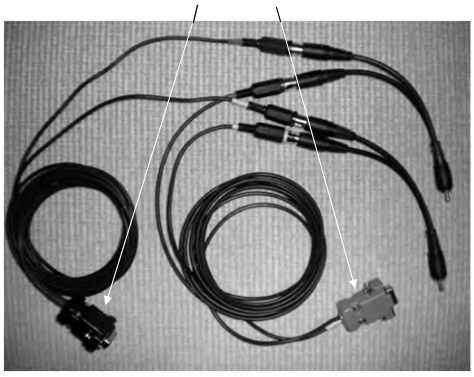
SO2V

Wire-OR FSK/PTT



Serial Signals (K8UT)

Circuitry built into
DE9 hood



FSK/PTT Signals (W0YK)

SO2R

- Eliminates SO1R RTTY boredom
- Think beyond run and S&P:
  - Dueling CQs; run on two bands simultaneously
  - S&P on two bands simultaneously, esp. w/Packet
  - SO2V on one or both radios (SO4V!)
- 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!

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SO2R

"M2" configuration

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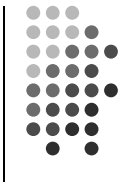
SO2R in the NA Sprint

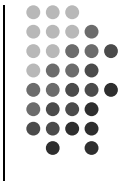
maximize TX duty cycle



- 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

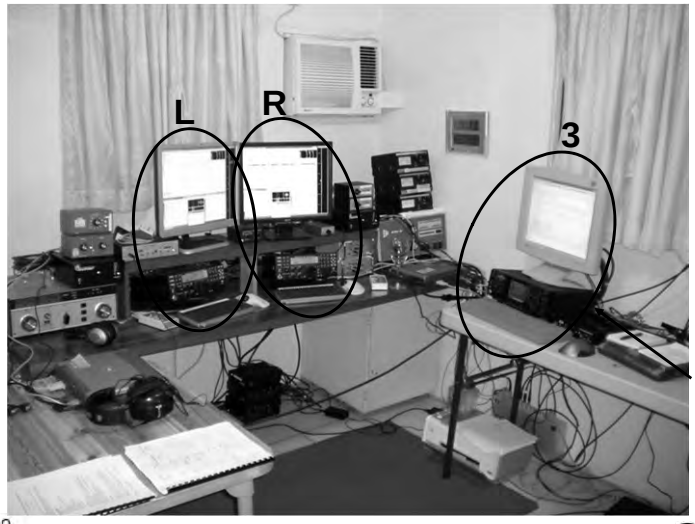
> 2 radios



- 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

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AFSK vs. FSK

which is better?

- First and foremost, a “religious belief”
  - Personal preference, enthusiastically advocated!
- Both are equally high quality on the air, if …
  - They are configured and adjusted properly
- Telegram:
  - AFSK can achieve high quality with any radio
  - FSK minimizes unintended consequences
    - Only K3 has acceptably narrow TX bandwidth

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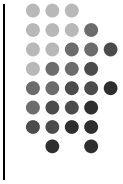
AFSK vs. FSK

comparison



AFSK	FSK
• Indirect *(tones → Mic input)*	• Direct *(like CW keying)*
• Any SSB radio *(esp. legacy)*	• "Modern" radios
• SSB (wide) filtering *(legacy)*	• RTTY (narrow) filtering
• Dial = sup. car. frequency	• Dial = Mark frequency
• VOX or PTT	• PTT
• Audio cable *(a'la FT8, JT65/9, PSK31)*	• Com port FSK/PTT keying cable
• Must use high tones	• Can use low tones
NET (automatic TX tone control)	*Eliminates:*
Less bandwidth (depends on setup)	*audio level adjust*
	disabling speech proc.
	erroneous sound keying
Easier cabling; NET	*Less pitfalls*

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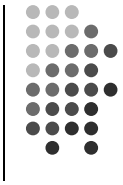
FSK Bit Timing Issues



- Issues
  1. Bit jitter (variation of bit length)
  2. 45 instead of 45.45 baud(22.22 vs. 22.00 msec/bit)
- Caused by *Windows* OS:
  1. Task Scheduler injects delays between bits
  2. API interface limited to sending integer parameters
- Increased receive error rate
  - Adequately loud, but incorrectly printed characters
  - Wasted time on fills

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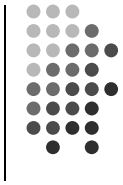
FSK Bit Timing Issues

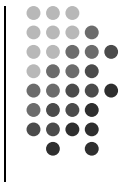
bit generation



- Software FSK
  - Bit transitions generated in a *Windows* program:
    - MMTTY EXTFSK/EXTFSK64
    - 2Tone FSK
    - WriteLog Rittyrite Software FSK
- Hardware FSK
  - Bit transitions generated outside of *Windows*:
    - Hardware modem
    - UART on Serial I/O card or USB-Serial adapter
    - Micro-controller: FSKit, TinyFSK, RpiFSK
    - Psuedo-FSK via AFSK

FSK Bit Timing Issues

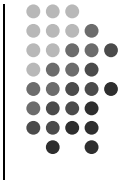
software FSK



- Bit transitions generated in a *Windows* program
- Com port signal toggled: TxD, DTR or RTS
- Windows Task Scheduler interrupts bit stream
  - Other programs which need CPU cycles
  - User operations, e.g.:
    - Mouse movements
    - Starting a program
    - Interacting with a program
  - Average deviation close to zero
  - Some instantaneous deviations of a few msec.

FSK Fit Timing Issues

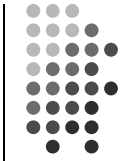
software FSK solutions



- High performance PC
  - Reduces, doesn't eliminate, bit jitter
    - Extent of timing variation
    - Frequency of timing variation
  - Minimize the number of other running programs
- Use hardware FSK
  - May have another timing problem
    - 45 instead of 45.45 baud (22.22 vs. 22.00 msec.)

FSK Bit Timing Issues

hardware FSK



- Bit transitions generated outside of *Windows*:
- 5-bit words sent to hardware bit generator
- Some UARTs don't go below 110-600 baud
  - Modern Serial cards and USB-Serial adapters
    - Clock divider optimized for a higher speed range
- UARTs that handle 45.45 baud
  - Windows API integerizes 45.45 baud to 45
    - Bits are 22.22 msec instead of 22.00
    - Minor impact on receive error rate

FSK Bit Timing Issues

hardware FSK solutions

- Use another hardware FSK alternative:
  - Hardware MODEM (ST-8000, DXP38, PK232, Kam ..)
  - FSKit by K4DSP (PCBs no longer available)
  - TinyFSK (Mortty kit for $18)
  - Pseudo-FSK
    - FSK keying circuits driven by AFSK
      - Jitter-free AFSK[1] without the adjustment issues
      - DIY solutions: FLdigi, 2Tone
- Use AFSK ☻

[1] AFSK tone timing uses soundcard clock, independent of windows

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RTTY Transmit Bandwidth

unnecessary QRM

- Wasted power
  - Outside receiving decoder bandwidth
  - 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?

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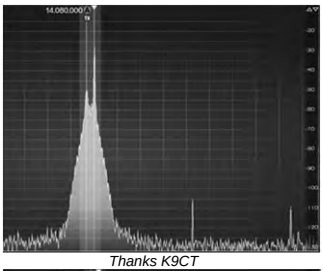
RTTY Transmit Bandwidth

AFSK

MMTTY - AFSK

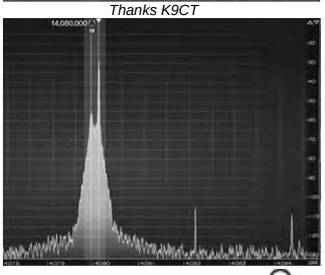
- No filtering
- Flex 6000 @ 60 W



Thanks K9CT

MMTTY - AFSK

- Default 48-tap TX BPF
- Flex 6000 @ 60 W



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RTTY Transmit Bandwidth

AFSK

MMTTY - AFSK

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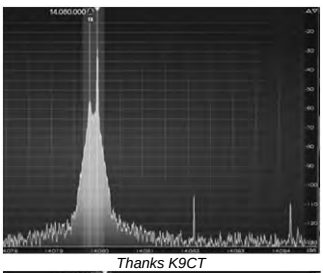
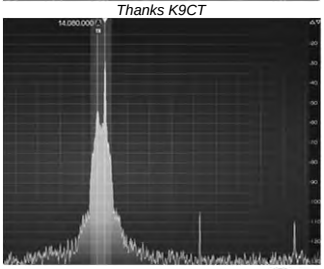


Thanks K9CT

MMTTY - AFSK

- 512-tap TX BPF
- Flex 6000 @ 60 W



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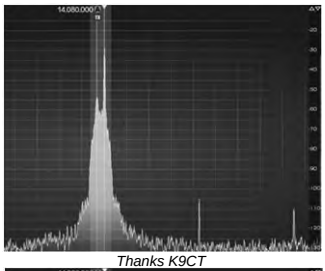
RTTY Transmit Bandwidth

AFSK

MMTTY - AFSK

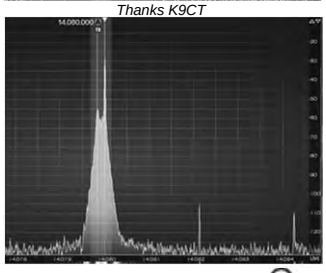
- 512-tap TX BPF
- Flex 6000 @ 60 W



Thanks K9CT

2Tone - AFSK

- Default “AM” setting
- Flex 6000 @ 60 W



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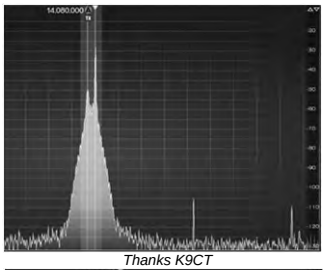
RTTY Transmit Bandwidth

AFSK

MMTTY - AFSK

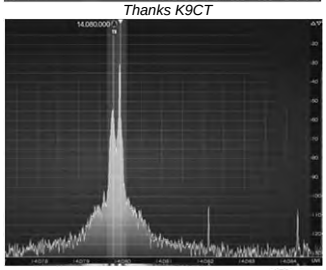
- Unfiltered
- Flex 6000 @ 60 W



Thanks K9CT

2Tone - DOOK

- Default “AM” setting
- Flex 6000 @ 60 W



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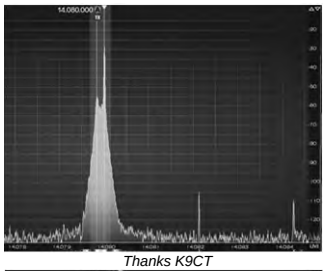
RTTY Transmit Bandwidth

AFSK

2Tone - AFSK

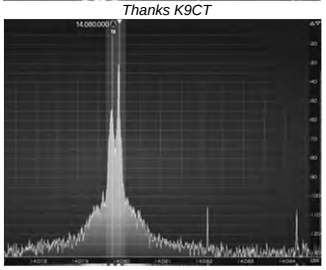
- 512-tap TX BPF
- Flex 6000 @ 60 W



Thanks K9CT

2Tone - DOOK

- Default “AM” setting
- Flex 6000 @ 60 W



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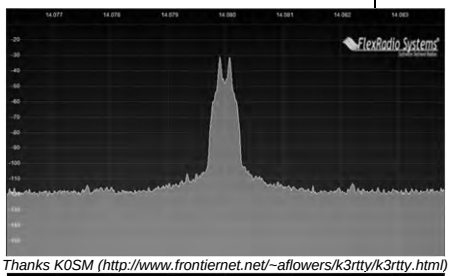
RTTY Transmit Bandwidth

PA IMD impact on AFSK bandwidth

MMTTY - AFSK

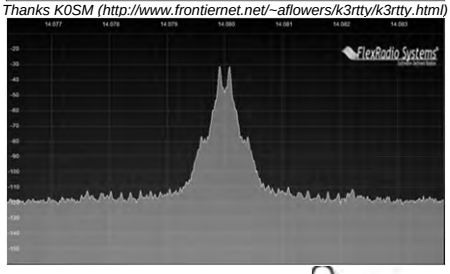
- 512 Tap TX BPF
- K3 @ 1 mW



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

MMTTY - AFSK

- 512 Tap TX BPF
- K3 @ 100 watts



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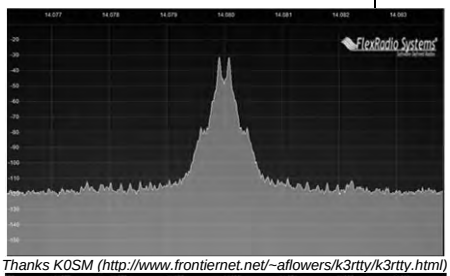
RTTY Transmit Bandwidth

MMTTY AFSK filter vs. K3 AFSK filter

MMTTY - AFSK

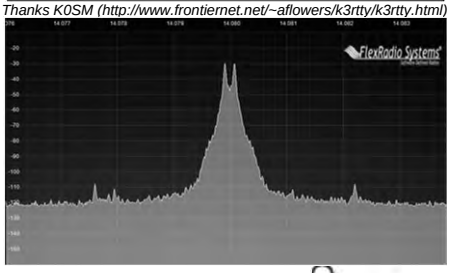
- 512 Tap TX BPF
- K3 @ 100 watts



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3rtty/k3rtty.html)

MMTTY - AFSK

- No MMTTY filter
- K3 AFSK filter
- K3 @ 100 watts



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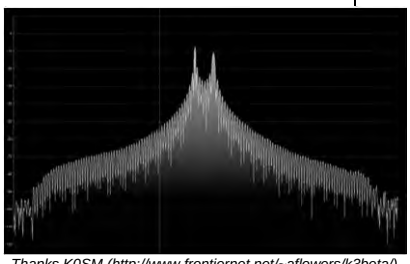
RTTY Transmit Bandwidth

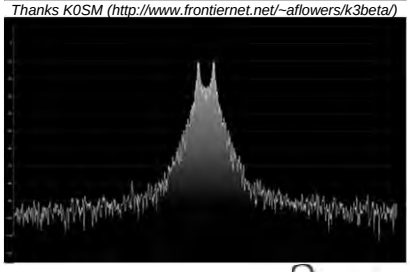
FSK

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



Thanks K0SM (http://www.frontiernet.net/~aflowers/k3beta/)

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



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RTTY Transmit Bandwidth

recommendation for minimum QRM

FSK	AFSK
1) K3, or	1) K3 or Flex
2) QRP with other radios	a) Enable K3 AFSK filter
3) Otherwise, use AFSK →	b) 2Tone DOOK or AFSK
	c) MMTTY 512-Tap
	2) Other radios
	a) 2Tone DOOK or AFSK
	b) MMTTY 512-Tap

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)

CTU Presents

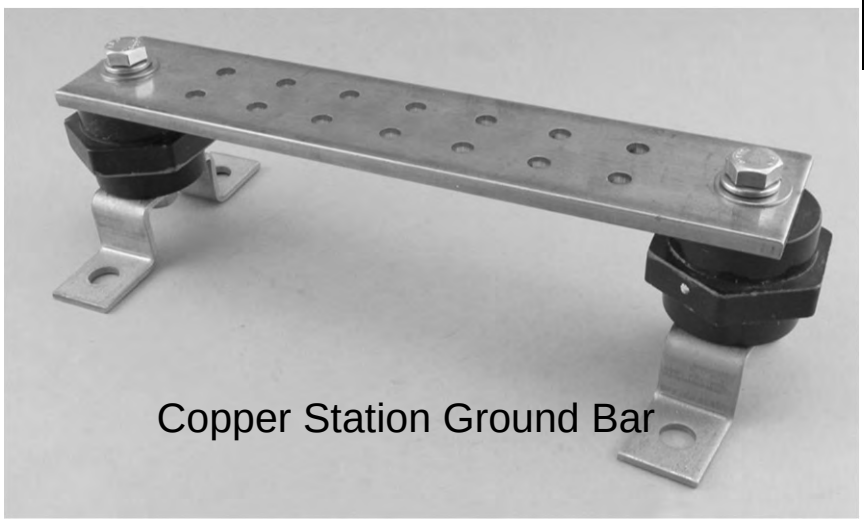
Contesting & Station Optimization

Tim Duffy K3LR

CTU Chairman

ConTest University Update

- **12th year for Dayton CTU**
- **Icom has supported CTU - ALL 12 YEARS!**
- **Over 6000 students have now attended CTU**
- **CTU Live Stream thanks Icom America**
- **Strategic Partnerships with the NCDXF & YASME**
- **Support the vendors that support CTU**
- **CTU YouTube and slide decks available on web**
- **N9RV Contesting Terminology – updated for 2018**



Copper Station Ground Bar

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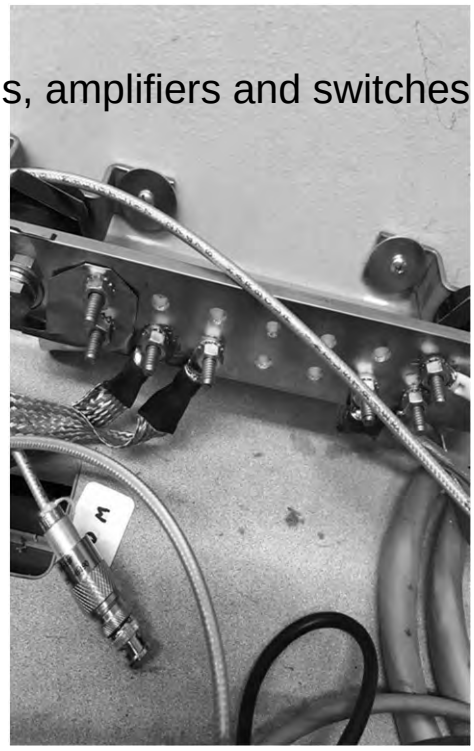
Connect radios, amplifiers and switches



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Strap connection
To ground rod

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Thick 1 inch wide – indoor use only

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Getting the most out of CTU 2018

There is a note pad in your bag – how many ideas have you written down today? You have access to lots of experience here at CTU – ask questions!

Pick a new area to optimize your operating style or station assembly and focus on it this summer. Commit to research – and improve - enjoy.

- **Everyone has a contesting story – tell yours and listen to others. Give a new program at your local club in the next 12 months.**

Be a Field Day coach/mentor this year.

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RG-400 with good connectors

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High Quality RG-400 double shield

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Teflon – aircraft grade 50 ohms

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K3LR 2018 Notebook

- Make sure you use the best coax connectors possible.
- Keep a notecard during every contest.
- Check, Double Check, Re-Check
- Develop a pre contest “Proof Of Performance” plan – KEEP A NOTEBOOK!
- How many house wall warts are causing RFI which hurts your noise floor?
- Let me introduce you to Mr. Ferrite

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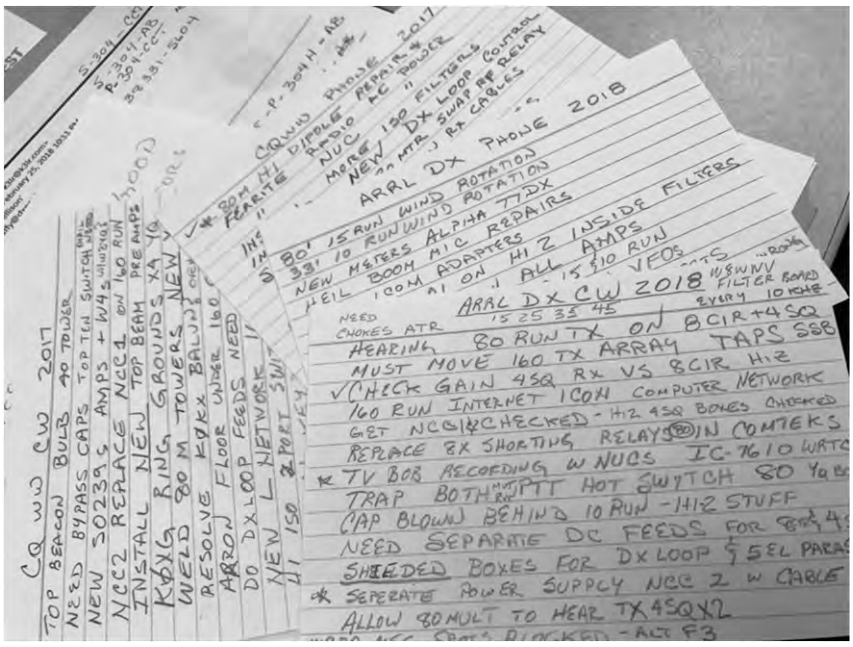

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K3LR Contest Note Cards

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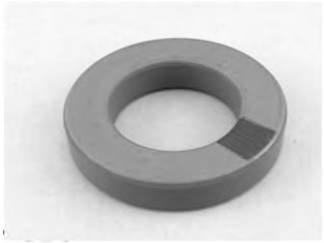
DEX Ferrite cores
Color coded



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Every AC line cord - #31

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Coax cables
And DC cables
#31 - BLUE

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Intel NUC computers - choke RFI

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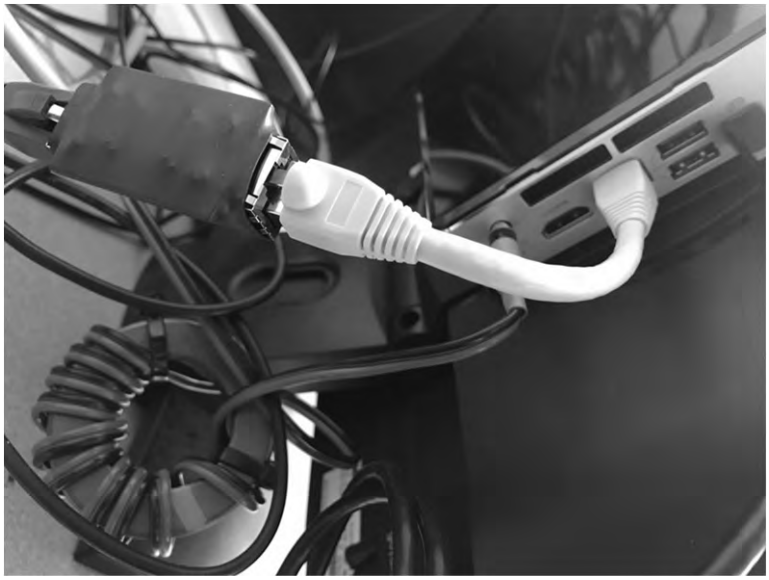
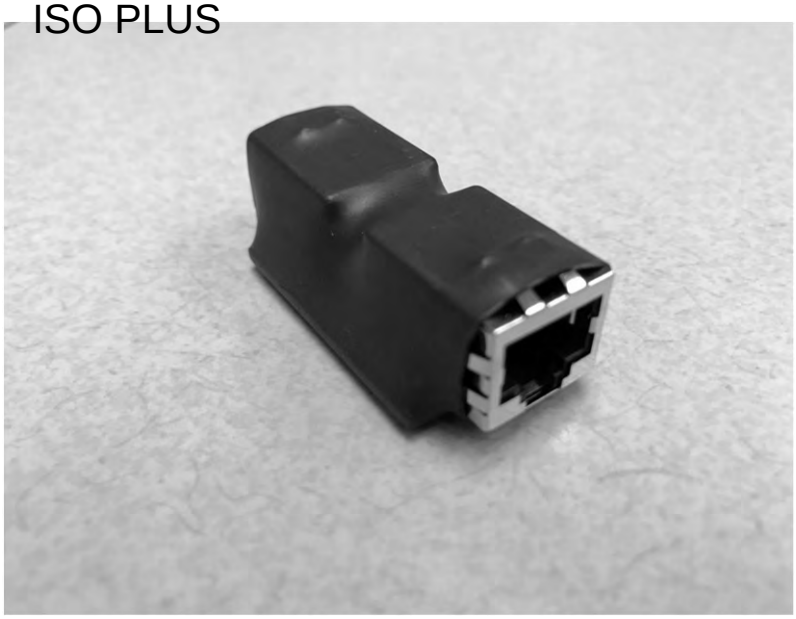


DC Cable with #31 & ISOPLUS

ISO PLUS



New RJ45 Ethernet RFI filter

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ISOPLUS in use at K3LR

ICOM

What are you doing to improve Contesting?

- **Congratulate the CTU “SCHOLARS” and GOLD stars!**
- **Take an interest in helping new hams to become involved in contests.**
- **Radio contesting’s reputation is important – do the right thing – be a model operator. Lots of SWLs.**
- **Find a way to “give back” to our hobby.**
- **Set goals for your contest self improvement. Set something achievable for you and then go hard after your goal.**
- **Remember as a CTU Graduate you are a mentor!**

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It’s 0000 Zulu – Are you worried about your connectors?

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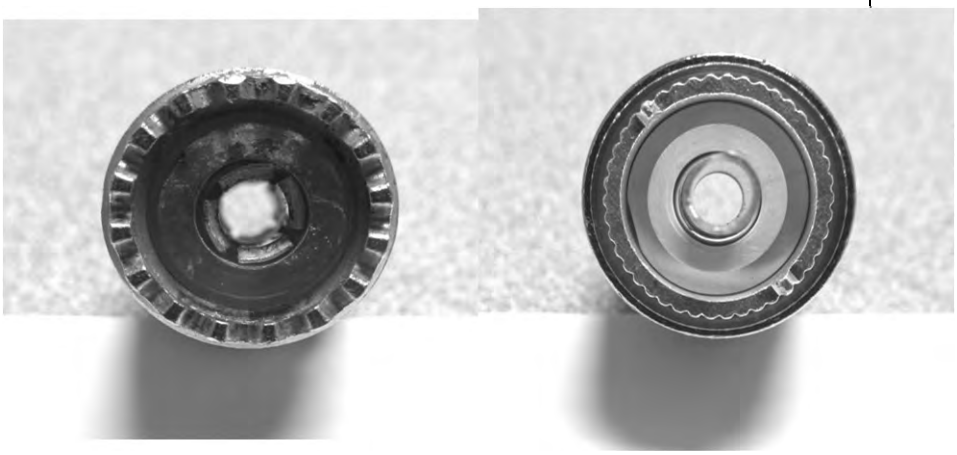
Keep the water out!



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Even good COAX goes BAD in time

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One nick and the water gets in

Coax shields will break at the rotation loop

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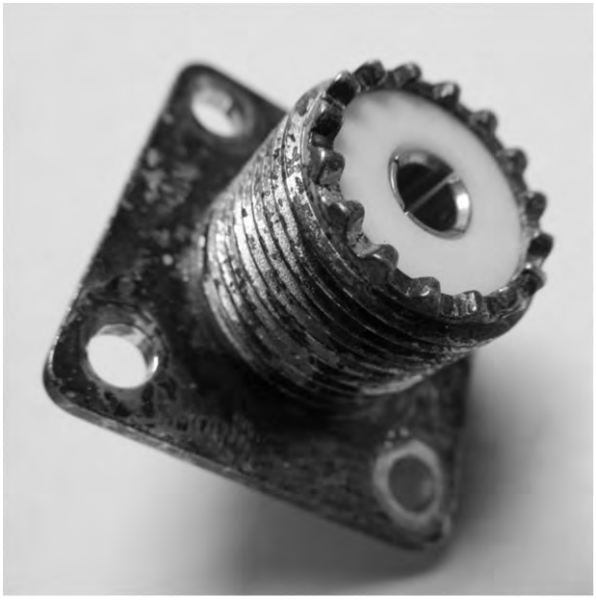
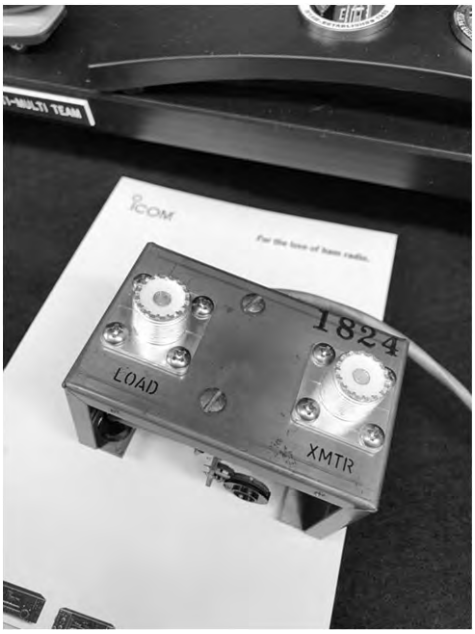


Time to replace!



Do your shields look like this?

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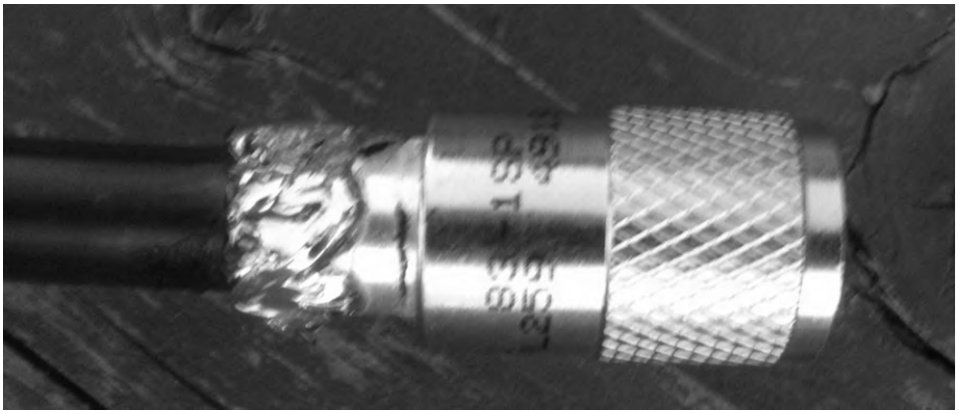
Or this?



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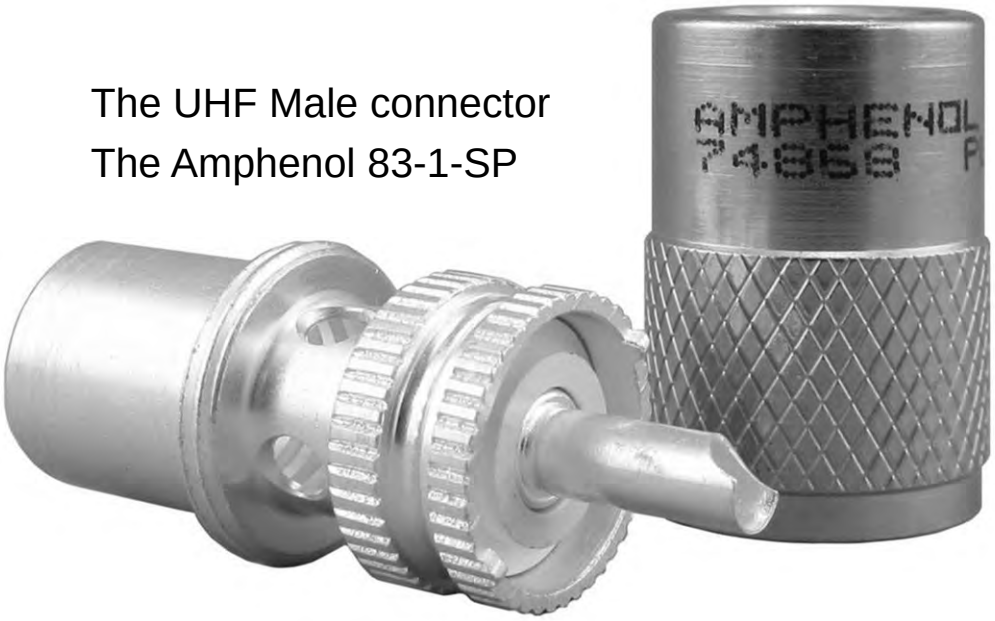
The UHF Male connector

The Amphenol 83-1-SP



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Channel Lock

CNL-426

"Tighten Up"

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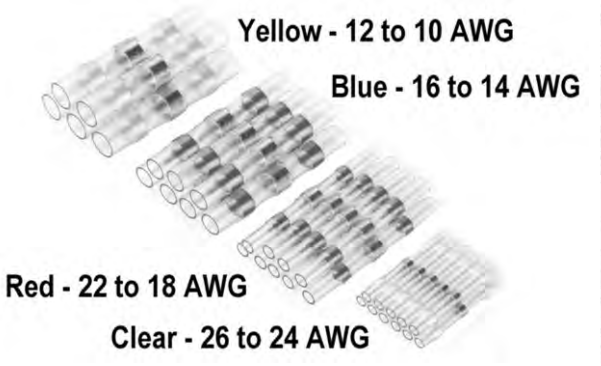
Heat Shrink Self-Solder Butt Splices



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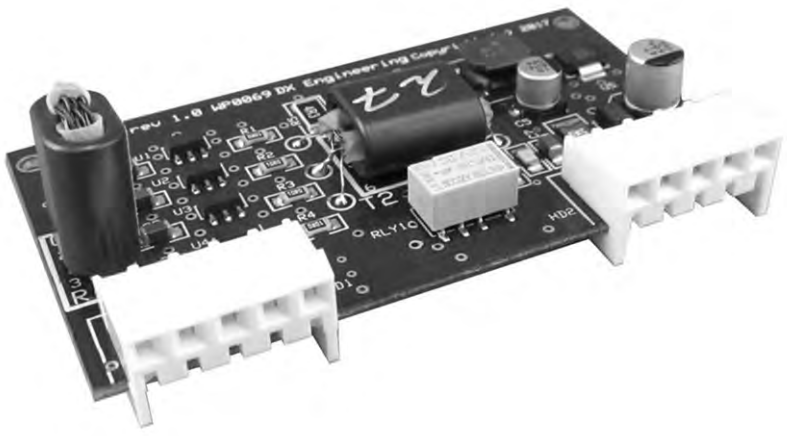
Clifton Labs K8ZOA High Gain HF Preamp



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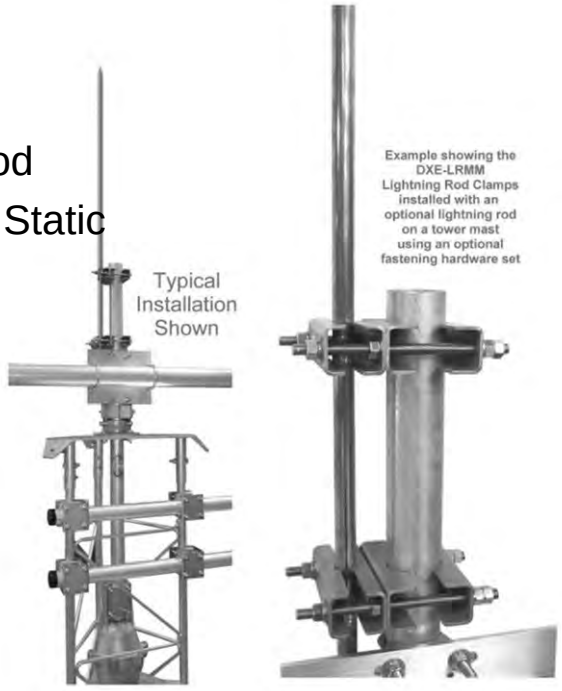
Lightning rod Safety and Static Reduction



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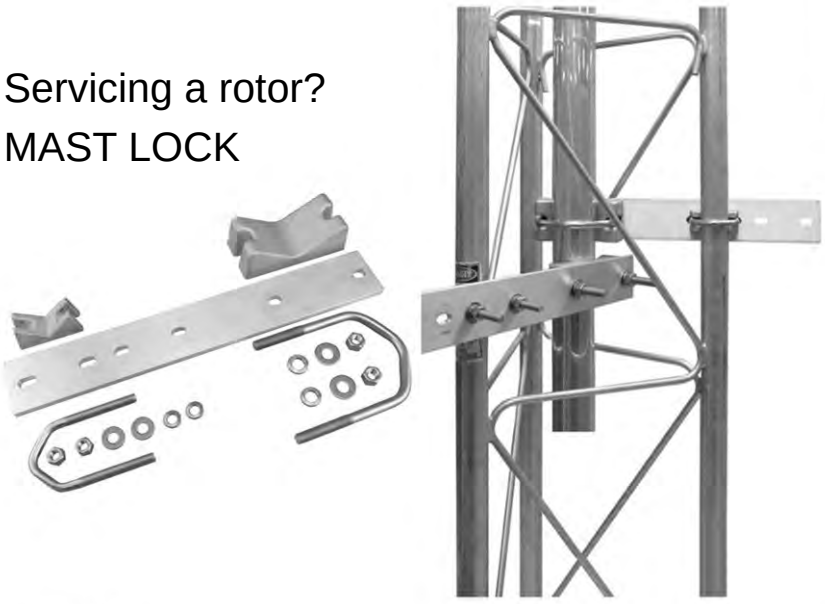
Servicing a rotor? MAST LOCK



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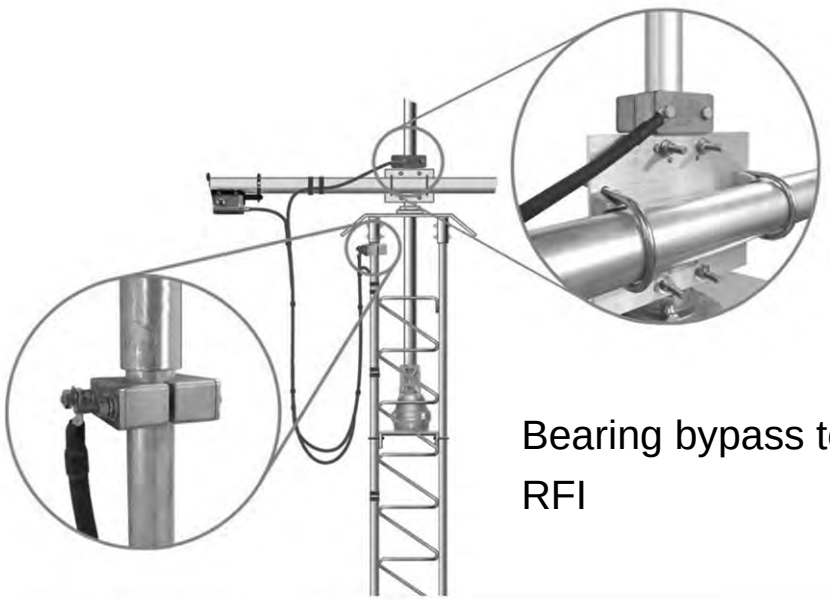

Bearing bypass to reduce RFI

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RX SHARE box for multi ops

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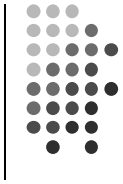
Send out QSL cards!

ICOM

Having Fun with Contesting



- **Be the best example of a model contest operator**
- **Share your contesting passion with others – help THEM put up or fix an antenna. Please be SAFE!**
- **Get on the air and operate. Teach others how to operate in a contest.**
- **Have an open heart to all who are willing to learn – encourage and send congratulations emails.**
- **Be active in your local club – not just Field Day. Join, pay dues and contribute your time and experience!**

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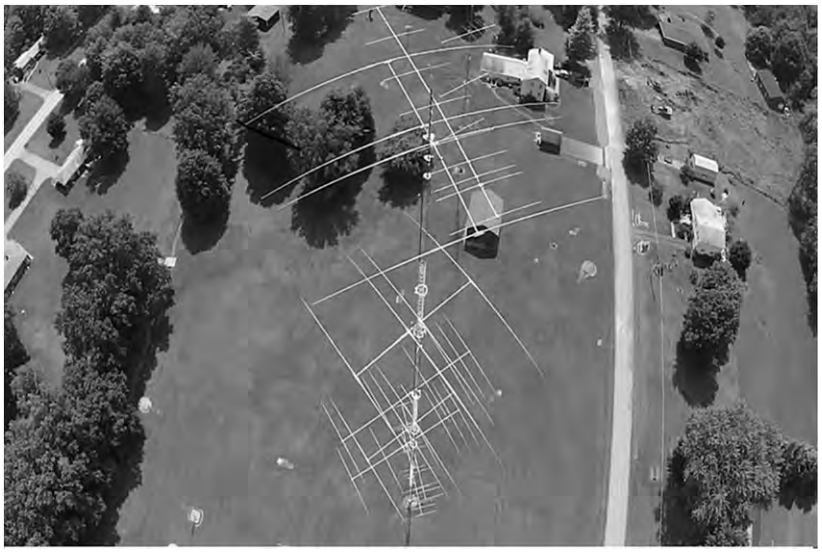
Antenna/Tower Reliability

Tim Jellison W3YQ/KL7WV

- Use quality materials (don't be a cheap ham!)
- Do it right the first time
- Perform regular inspections
- Be safe when working on antennas and towers
- Is it K3LR approved?



Use only good quality materials

- Name-brand connectors only

Use only good quality materials

- Only use good quality tape

Use only good quality materials

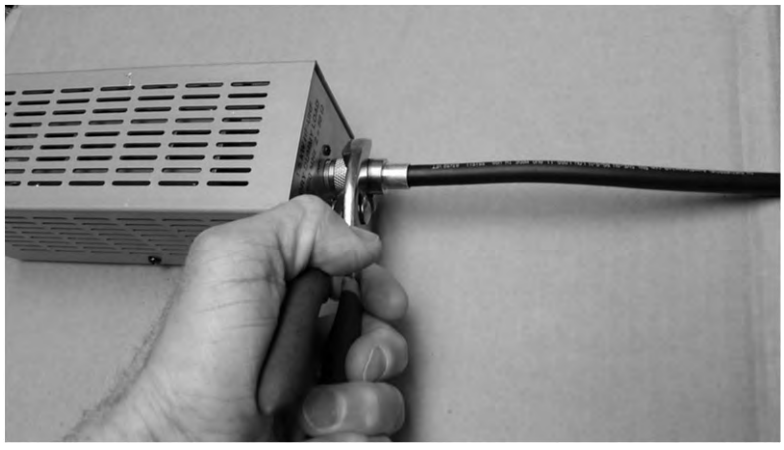
- Consider pre-made cables

When soldering PL259's, don't be afraid to use a big iron and get the connector hot – the solder must flow. Just keep everything straight in-line and be sure to let it cool down completely before you move it. That way the center dielectric will harden back up. I let mine sit about 10 minutes after soldering before doing anything with it.

Moisture is coax's worst enemy. All outdoor connections must be properly sealed. Here's a proven method to keep connections dry.

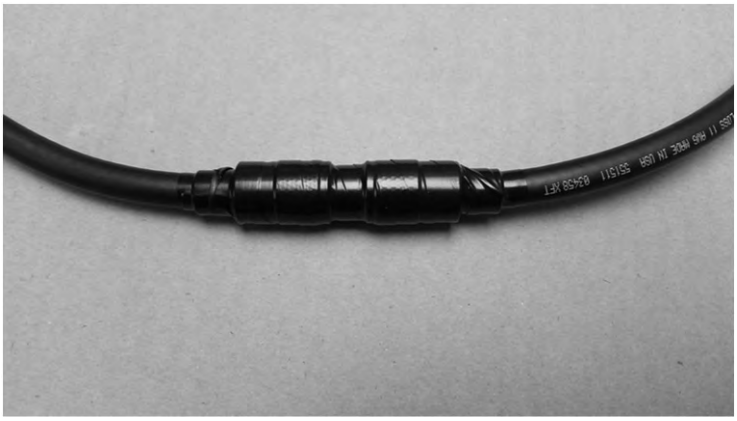
Weatherproofing connections

- First, tighten with pliers. Finger-tight is not good enough.



Weatherproofing connections

- One wrap of 88 tape. And always cut the end when taping. Never pull/tear the end or you'll end up with a tail.



Weatherproofing connections

- Add a layer of mastic.

Weatherproofing connections

Weatherproofing connections

- Two wraps of 88 tape. Overlap each layer by ½ the width of the tape.

- There are two tips in the next photo.
- First, tape your cables with 88 tape – no tiewraps. Tiewraps can smash the coax and they will eventually fail due to weathering.
- Second, always put a barrel at the top of your tower if the feedpoint is out of reach. Makes antenna removal much easier.

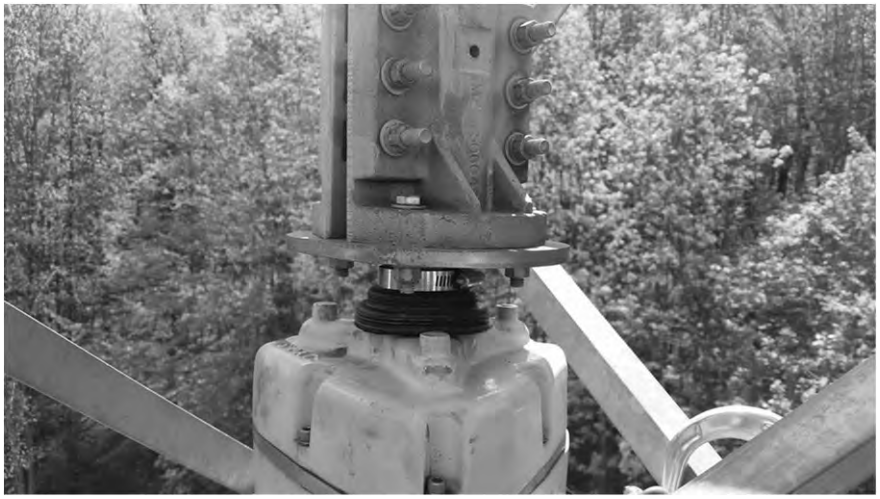
Use a piece of split loom if there's a concern about cables rubbing.

Waterproofing a bearing

- Does your antenna sometimes not turn in the cold weather? It might be ice in your thrust bearing. Make a boot out of one of these.

Waterproofing a bearing

It can also keep the water out of an Orion 2800's top bearing.



The bolts in a TB3 can seize up. Apply anti-seize before installation or swap out the bolts with stainless (and maybe still use anti-seize?)

Notice all the blue stuff? You should also use a lubricant on all stainless hardware. Blue Locktite is a good choice. It lubricates, locks, yet can still be removed later.

Also, when installing a Rohn tower, use anti-seize on the leg joints. It's conductive and makes the inevitable disassembly much easier.

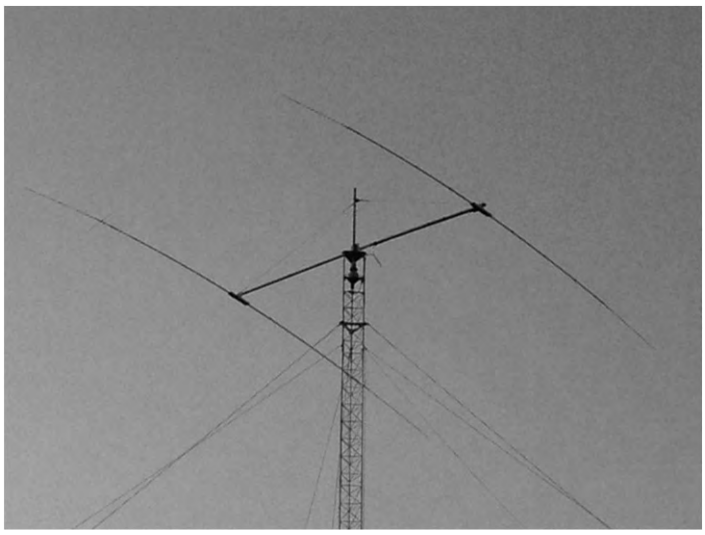
- Tidbits

Does your rotor or antenna slip on the mast? You can add a secondary clamp which will help out your U-bolts. It's better than drilling/pinning the mast.

Here we give a Yaesu rotor some help

Here is a secondary clamp below the mast clamp of a 40M Yagi

If the top section of your tower is above the top set of guys, the leg bolts MUST be tight and should be regularly checked. This is a point of great lateral stress and if the bolts loosen, the holes in the legs will elongate.



Do not over tighten anything on a Rohn tower leg. You could smash the leg (it can even split) and the tower will be compromised.

Solder all your crimps, otherwise the wire could pull out. If you're using insulated lugs, don't worry about melting the plastic.

Conductive paste

- Usable on all metal to metal joints, especially aluminum antenna joints.

Safety

- If hiring a tower crew, use only certified climbers
- Consider becoming a certified climber yourself
- www.comtrainusa.com www.citca4training.com
- Watch for powerlines
- Use proper climbing-safety gear
- Everyone wears a hardhat!

And above all, when climbing follow all safety rules!

NO SK's

2017 / 2018 Rig Contest Comparisons
+
3 New Rigs & 2 other Rigs Evaluated

Rob Sherwood
NCØB

What features are a must ?

Sherwood Engineering

- **What is important in a Contest Environment?**
- We need Good Dynamic Range to hear weak signals in the presence of near-by strong signals.
- In a DXpedition the pile-up is typically:
- CW signals “Up 2” or SSB signals “Up 5 to 10”
- Contests – DX pile-up, it is the same problem
- You need a better receiver for CW than for SSB.
- **How does published test data relate to reception of weak signals?**

State-of-the-Art in Dynamic Range today

- Close-in dynamic range (DR3) > 100 dB
- Phase noise @ 10 kHz ≤ -145 dBc / Hz
- Reciprocal Mixing (RMDR) > 115 dB

- Rigs with this kind of performance:
- Icom IC-7851, Flex 6000 & Elecraft K3S
- Icom 7300/7610 slightly less DR3
- Apache 7000DLE 100+ DR3, slightly less RMDR
- None are RMDR (phase noise) limited

What is new since last year?

- Icom IC-7610 big brother of IC-7300
- Both are direct sampling & 7610 dual receivers.
- 7610 adds solid-state QSK and APF (audio peak filter), a major feature for CW operators.

- Apache ANAN-7000DLE
- 100 watts instead of 200 watt 8000DLE

- Flex 6600/M & 6400/M (M = built-in Maestro)

Icom IC-7610 Direct Sampling

- Identical Dual ADC Receivers
- CW feature upgrade over IC-7300

- 20 kHz dynamic range: 98 dB IP+
- 2 kHz dynamic range: 98 dB IP+
- 20 kHz RMDR: >122 dB (OVF)
- 2 kHz RMDR: 112 dB

- Noise floor as low as -142 dBm Preamp 2

Icom 7610 vs. 7300 Comparisons

Data with IP+ ON	7610	7300
20 kHz dynamic range:	98 dB	106 dB *
2 kHz dynamic range:	98 dB	97 dB
20 kHz RMDR:	>122 dB	113 dB
2 kHz RMDR:	112 dB	100 dB

- Both noise floor -142 dBm with Preamp 2

* Sample #1 103 dB, sample #2 106 dB

* ADC variation can be more than 10 dB as noted in IC-R8600 on 4 different receivers.

Apache ANAN-7000DLE numbers

- 20 kHz dynamic range: 103 dB
- 2 kHz dynamic range: 103 dB
- 20 kHz RMDR: 114 dB
- 2 kHz RMDR: 109 dB
- Noise floor -131 dBm HF
- Noise floor -140 dBm 6 meters
- (The LNA on 6m needs to be available on 10, 12 and possibly 15 meters.)

Apache ANAN new software features

- Open Source code = new features fast
- PureSignal version 2.0
- Support for 7000DLE
- Spectral NB works in contest conditions *
- New NR algorithms
- Lower latency for better QSK
- Midi support for DJ Console and Behringer
- A slew of TX audio tools all in software

* I used the spectral NB during CQWW 160m

ANAN-7000DLE vs. Flex 6600M

ANAN data w/ dither ON	7000	6600M
20 kHz dynamic range:	103 dB	91 dB
2 kHz dynamic range:	103 dB	91 dB
20 kHz RMDR:	114 dB	111 dB
2 kHz RMDR:	109 dB	105 dB
Noise floor HF	-131 dBm	-135 dBm
Noise floor 6m	-140 dBm	-137 dBm

Rigs run at NC0B during this past season

CQ WW SSB October 2017	IC-7300 20m only *
CQ WW SSB October 2017	IC-781 all but 10 & 20
CQ WW SSB October 2017	TS-990S 10m only
ARRL 160m CW Dec 2017	IC-7300 & TS-990S
ARRL 10m December 2017	IC-7610 CW & SSB
W1BB Top Band Dec 2017	IC-7610
CQ WW 160 CW Jan 2018	7000DLE & IC-7610
ARRL DX SSB March 2018	IC-7610 all but 15/10m #

* My most Qs were on 20m, edging out 15m by 1.5%

* 2016 / 2017 IC-7300 only used on 10m and 160m

A pair of IC-7300s on 15 and 10 meters

How did the rigs stack up?

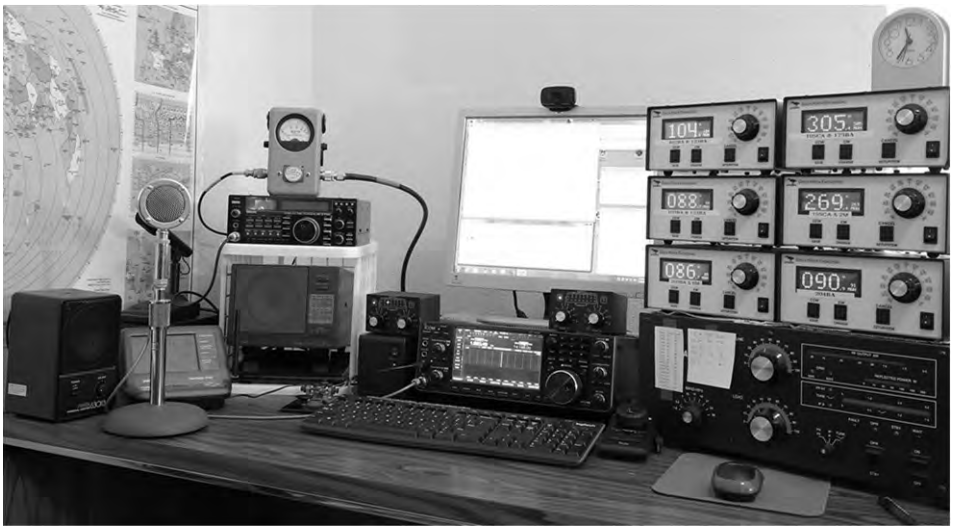
- Let's cover the two new rigs first during CQ WW 160m CW contest in January.
- The 7000DLE was paired against the IC-7610.
- Since the 7610 was used in ARRL 10m and W1BB contests previously, the bulk of the air time was allocated to the Apache.
- 12 hours 7000DLE
- 4.5 hours IC-7610

Very different UI but similar results

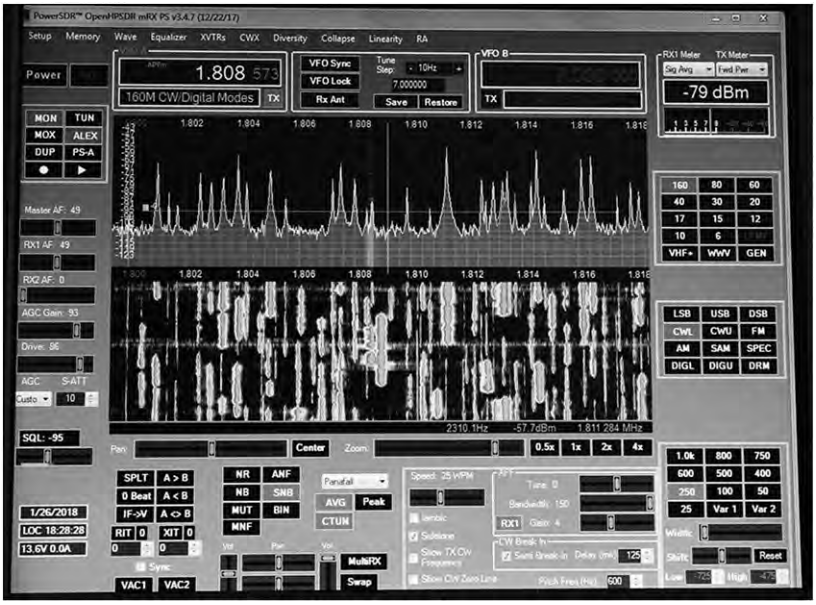
- The Icom and the Apache couldn't be more different as to User Interface.
- Performance wise, it was a toss-up as far as copying CW signals "wall to wall" from 1800 to 1860 kHz on Friday, and 1800 to 1880 with even worse QRM on Saturday night.
- Apache setup more complex requiring dual monitors for the UI, plus the logging program.

Apache 7000DLE Operating Position

Icom IC-7610 Operating Position



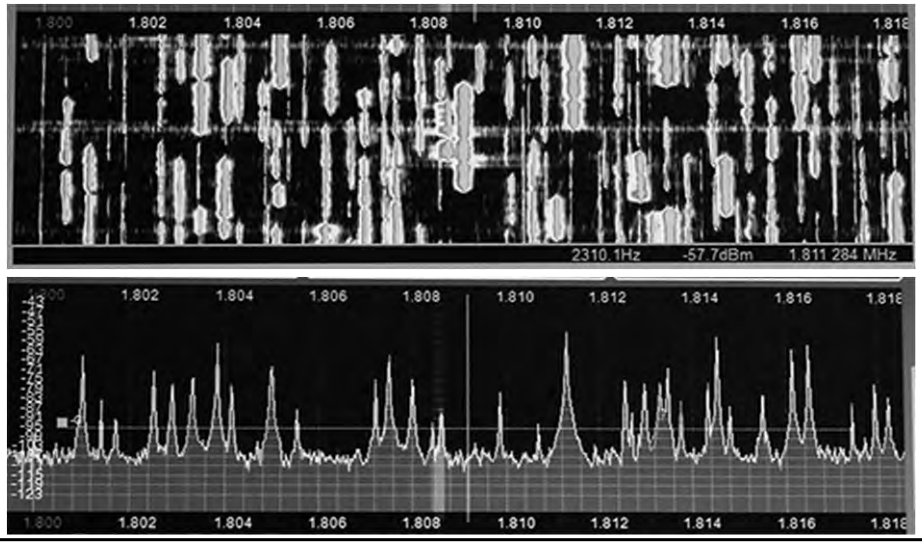
What did the band look like?



I do use waterfall extensively on 630m

Bandscope vs. Waterfall

- The waterfall was almost useless, at least to me, compared to the spectrum scope.



How were the rigs setup?

- **Icom:** BW 250 or 150 Hz, APF 160 Hz 4 dB gain, front-end attenuation 15 dB, NR 3 out of 10, bandscope 5 kHz total span. Tune with main knob.
- **Apache:** BW 250 or 100 Hz, APF 150 Hz 4 dB gain, front-end attenuation 10 dB, NB spectral, bandscope total span of 10 to 15 kHz. Tune with Flex knob.

With 20K IC-7300 sold, compare to TS-990S

- ARRL 160m CW contest I split operation 50/50 between the Icom and the Kenwood.
- Setup both rigs identically as possible
- QSK = Kenwood wins
- Noise Reduction = Icom wins
- Bandscope detail = Icom wins
- Front-End Filtering = Kenwood wins
- Kenwood blocking vs. Icom OVF = 990 wins, not that either was anywhere near overload.

Some are only CW oriented

Contest features desirable today

- QSK, or at least click-free semi-break-in
- APF to reduce band noise and fatigue
- Bandscope / spectrum display for S&P operation and for multipliers
- Efficient User Interface
- Rock solid connection to logging program
- For most, at least some kind of external manual controls for computer-controlled rigs.

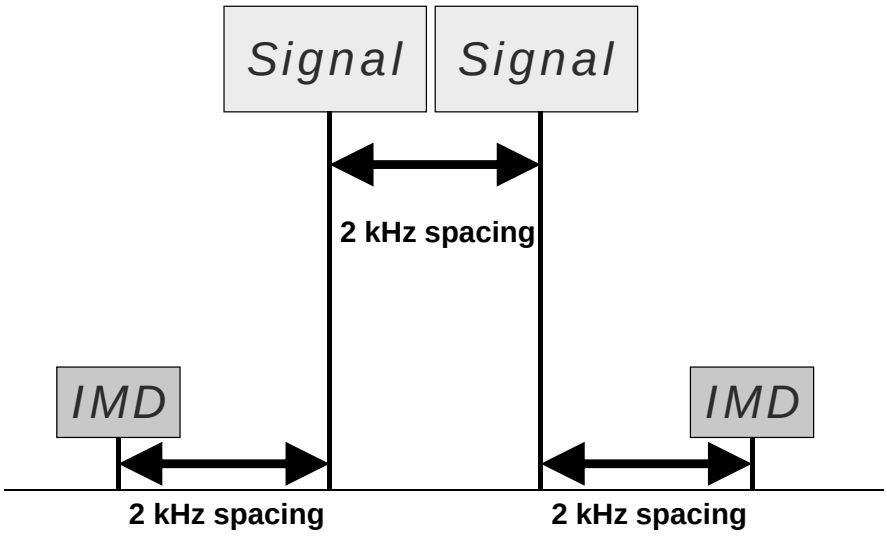
Time for the numbers

- What do these state-of-the-art numbers mean?
- How do we cope with a more typical radio?
- Optimize performance of what we own

What does dynamic range mean?

- Two equal signals are fed into the receiver.
- Third-order IMD is dominant.
- Level increased until distortion = noise floor
- This level vs. the noise floor = dynamic range
- Defined in QST & *hr magazine* 1975
- Noise floor = -128 dBm, test signals = -28 dBm
- -128 dBm minus -28 dBm = 100 dB
- Dynamic Range (DR3) = 100 dB

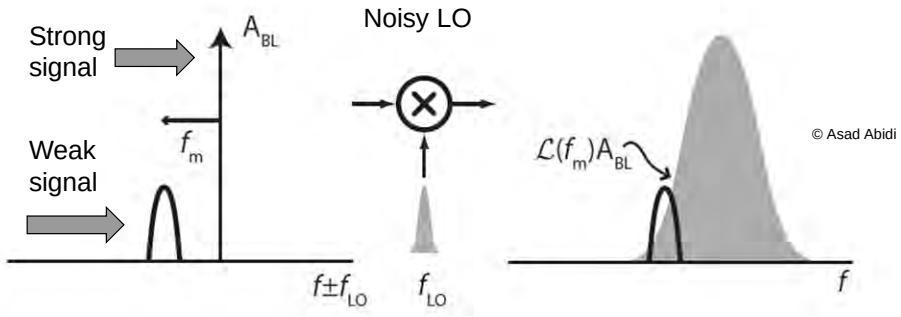
Third Order IMD to Measure Dynamic Range



A note on phase noise / RMDR

- Reciprocal Mixing Dynamic Range (RMDR)
- Only since late in 2013 has the ARRL consistently emphasized the importance of good phase noise performance (RMDR).
- Read Bob Allison's sidebar April 2012 QST & latest update May 2016 QST for details.
- Peter Hart (G3SJX) for RSGB has long published RMDR data.

Reciprocal mixing puts LO noise on top of weak signal



Noisy local oscillator (LO) transfers its noise to the strong out-of-passband signal and on top of the weak signal we are trying to copy.

RMDR often dominates over DR3

- Only a few “legacy” transceivers, plus direct sampling SDR radios have RMDR > DR3.

- Elecraft K3 w/ new synthesizer, K3S or KX3
- Hilberling PT-8000A
- Icom IC-7850, IC-7851, IC-7610 & IC-7300
- Flex 6000 series, old and new
- Apache ANAN series

How do you relate to this data?

- Typical receiver, preamp OFF
- Noise floor = -128 dBm
- “Holy grail” 100 dB DR3 radio (@ 2kHz)
- Can handle signals -28 dBm = S9 +45 dB
- Note: That is above the receiver’s noise floor
- How does that relate to band noise?
- Will get to that in a moment.

Luckily we can live with 85 dB radios

- What performance is usually good enough?
- From the advent of “up-conversion” radios around 1979 (TR-7) until 2003 with the Orion I, all we had were 70 dB DR3 radios at 2 kHz.
- These were barely adequate on SSB and not acceptable on CW in DX pile-ups or contests.
- If we operate our 85 to 90 dB radios properly, they perform well in most environments.
- Most of the time our radios are not stressed to their limits.

Close-in 2-kHz Test @ 500 Hz BW

Dynamic Range of Top 17 Transceivers

Elecraft K3S	106 dB	
Icom 7851	105 dB	
Hilberling	105 dB	
Elecraft KX3	104 dB	
ANAN-7000DLE	103 dB	
FTdx-5000D	101 dB	
Flex 6700 (2017)	99 dB	(Preamp OFF)
Icom 7610	98 dB	
Icom 7300 #2	97 dB	(IP+ ON)
Flex 5000	96 dB	
Elecraft K3	95 dB	(Original Synthesizer)
Orion II	95 dB	
Icom 7300 #1	94 dB	(IP+ ON)
Orion I	93 dB	
TS-590SG	92 dB	
Flex 6600 / 6600M	91 dB	
Ten-Tec Eagle	90 dB	

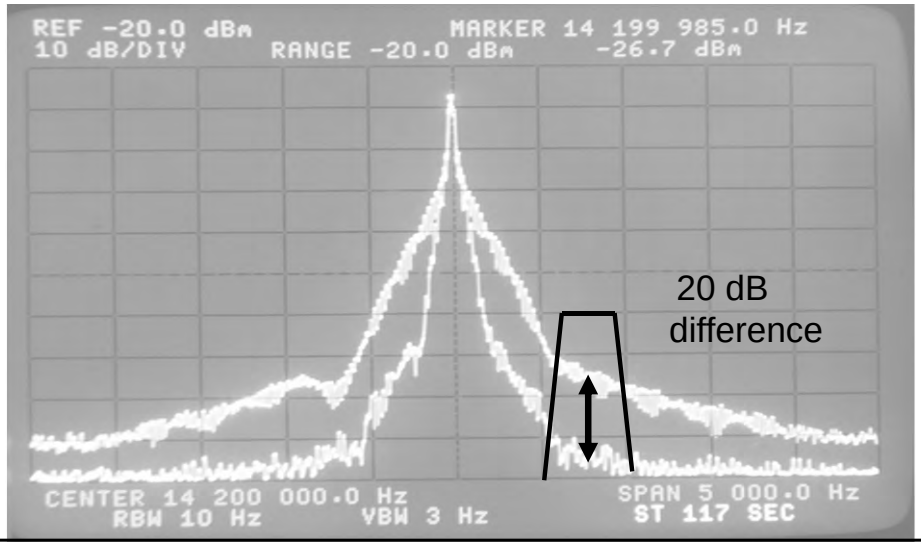
Why is higher DR3 needed on CW?

- Transmitted bandwidth of an adjacent strong signal may be the limit, not receiver overload.
- A CW signal is about 1 kHz wide at -60 dB.
- An SSB signal is about 10 kHz wide at -60 dB.
- A CW pile-up may overload your receiver.
- On SSB, splatter will likely dominate before the receiver dynamic range is exceeded.

Many rigs are much faster than 3 msec

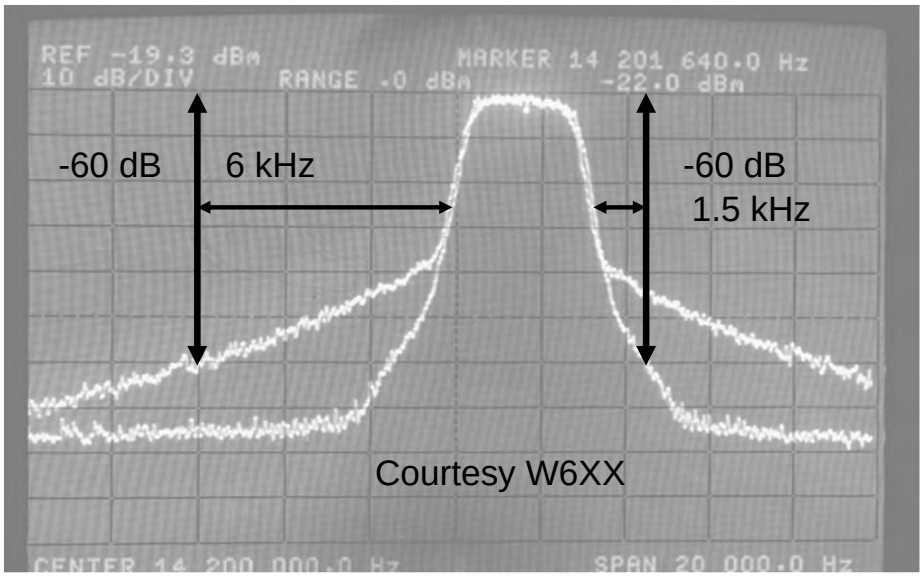
Spectrum of CW Signal on HP 3585A Analyzer

Comparison of 3 msec vs 10 msec rise time



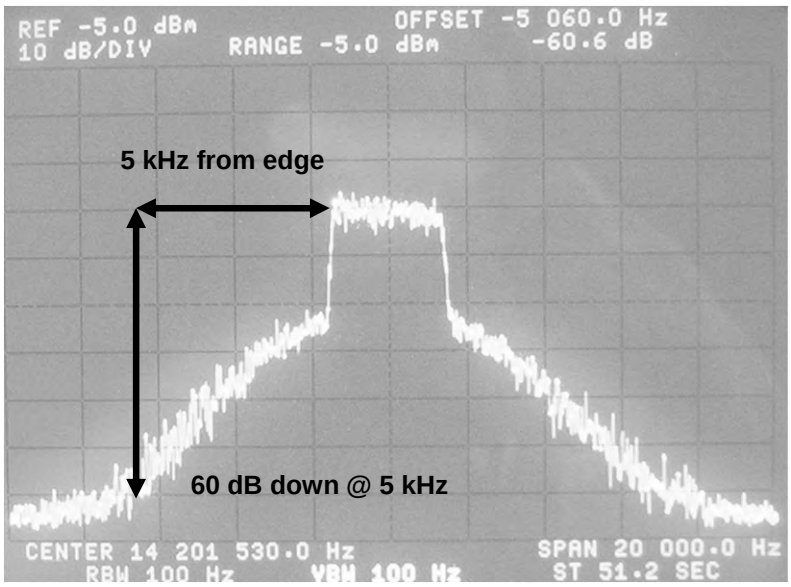
Apache PureSignal much like class A

White Noise Mk V Class A vs. K3 Class B @ 75 Watts



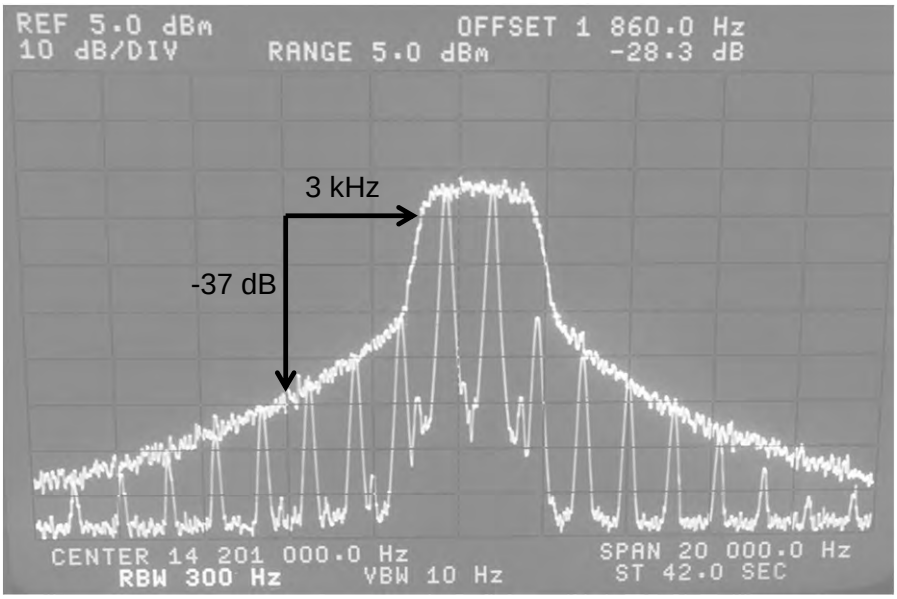
Noise source = GR 1381, 5-kHz -3 dB BW

Icom IC-7410 Class AB, White Noise



How Wide Is Your Signal ?

Comparison 2-Tone vs. Noise Intermodulation Bandwidth



How do we optimize what we have?

- While we might own a 100 dB DR3 radio, many of us have somewhat less performance.
- A TS-990S is around a 90 dB radio @ 2 kHz.
- Consider dynamic range a “window” of performance that can be moved around in absolute level by properly using your attenuator or preamp.

Receiver Noise Floor vs. Band Noise

When is the spec for noise floor significant?

Why does it rarely matter on most bands?

Noise Floor is usually significantly lower than Band Noise.

An ITU graph published in the ARRL Handbook gives us a starting point to relate band noise to noise floor.

This ITU data is in a 500-Hz bandwidth, just like typical noise floor data.

Band Noise vs. Frequency from ARRL Handbook

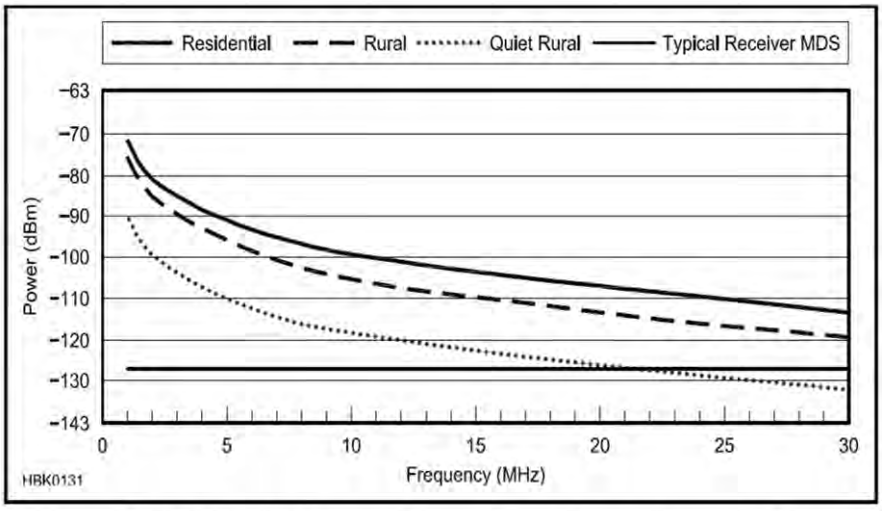


Fig 1 — Typical noise levels versus frequency for various environments. (Man-made noise in a 500-Hz bandwidth, from Rec. ITU-R P.372.7, *Radio Noise*)

Most Radios are designed for 10 meters

Typical rural band noise on 10 meters is -120 dBm

Typical rural band noise on 20 meters is -110 dBm

On 20 meters, band noise is almost 20 dB higher than typical receiver noise with the preamp OFF !

Optimally receiver noise should be 8 to 10 dB lower than band noise to have minimal effect on receiving weak signals.

Even on 10 & 15 meters, a preamp isn't needed all the time in a rural environment.

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

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

A note about the ITU data

- The ITU data assumes an omni-directional antenna.
- Your Yagi or directional low-band antenna (4-square) can significantly improve on your band noise in some directions.

A quick look at latency across the brands @ 500 Hz BW

Model	Latency (delay antenna to speaker in milliseconds)	
IC-781	5.9 ms	analog
IC-756 Pro III	5.9 ms	IF DSP
IC-7300	7.4 ms	Direct Sampling
IC-7610	12.7 ms	Direct Sampling
IC-7851	16.8 ms	IF DSP
TS-990S	17.6 ms	IF DSP
7000DLE	20.0 ms	Direct Sampling #
Flex 6600M	106 ms	Direct Sampling (default)*
Apache 200D	131.6 ms	Direct Sampling (software 2016)
Flex 6700	162 ms	Direct Sampling (software 2016)

Note: 7 settings have to be optimized to obtain 20ms on CW.
* Latency vs. shape factor adjustable from 58 ms to 170 ms

What does all this imply?

- For most radios: Up-conversion / down-conversion
- On the lower bands at night, attenuation is often appropriate.
- There is no point in band noise reading upscale on your S meter.
- A preamp is usually NOT needed on 20 meters.
- A preamp would ***never*** be needed at night on 40 meters and below, assuming the transmit antenna is used on receive.

How do we evaluate & optimize a transceiver?

- 160 – 40m receivers are too sensitive at night.
- Make the most of the radio's dynamic range by properly using the attenuator and using the preamp only when necessary on the high bands.
- Published dynamic range can be misleading, depending on how it is measured. This could be a complete presentation on its own.
- Look at RMDR, as this typically dominates.
- (RMDR* = Reciprocal Mixing Dynamic Range)
- [*QST April 2012 for sidebar – Bob Allison]
- It is a numbers game today!
- Evaluation in pile-up conditions is critical.
- A lab setup can never approximate CQ WW !

http://www.NC0B.com

Sherwood Engineering

Videos from past CTU presentations

CTU 2013 through 2017 (Select desired year)

http://www.contestuniversity.com/videos

Glossary 2018 – 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:

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 callsigns 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:

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

Categories: contest specific concept

See Also: Exchange

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:

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:

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:

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.

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:

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:

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:

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

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

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:

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:

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

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:

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:

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: 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

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

Super check is another term for super check partial, as described above.

Categories: operating software/hardware

See Also: SCP

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 2018 will be held in Germany.

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

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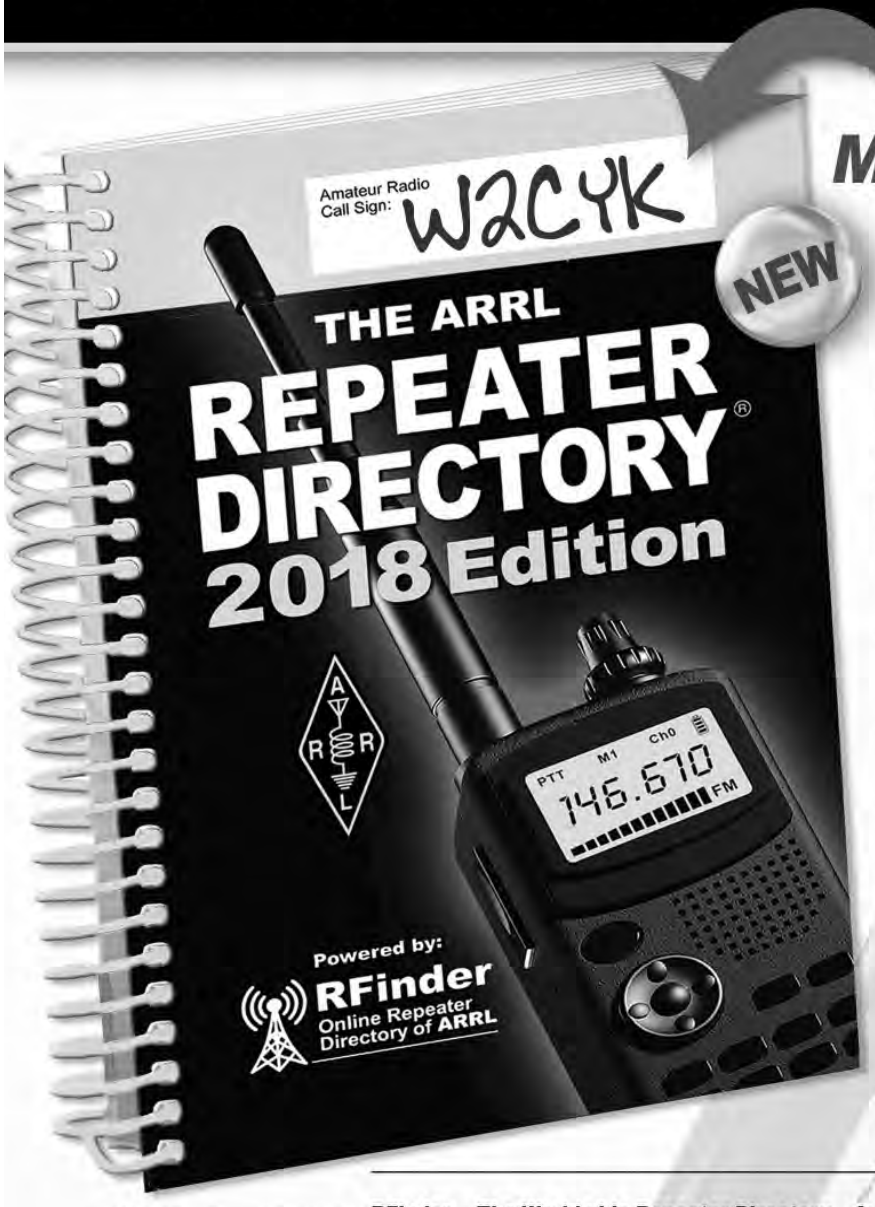

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73
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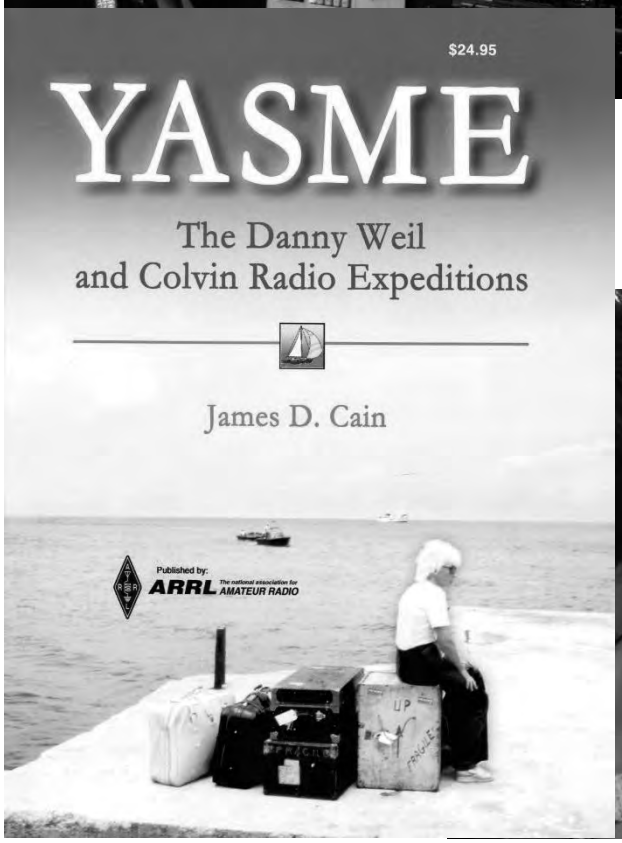

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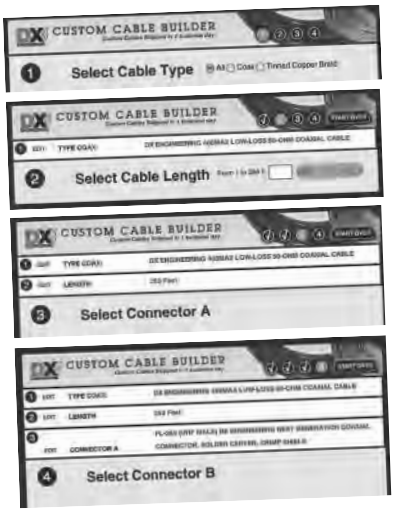

ARRL Contest University Textbooks

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