

## The World Radiosport Team Championship 2014 Station Test

We have all seen how calmly a duck appears to glide across the water, while knowing that beneath the water, the duck's feet are paddling furiously. While it may not be obvious on the surface, preparations for the next World Radiosport Team Championship (WRTC 2014), which takes place in New England in July 2014, are making steady progress. We reached a major milestone this past July when the WRTC Organizing Committee, led by Doug Grant, K1DG, conducted an initial test and training exercise during the IARU HF Championship. The objective was to assemble and operate 13 stations in a manner similar to what WRTC 2014 will require. The test goals were to evaluate sites, train volunteers, test the equipment, assess the logistics and let site owners see us in action.

Fifty-nine teams will be invited to participate in WRTC 2014, and it is a goal of the organizers to give every team an equivalent station, set up in the most favorable locations possible. This is no easy task in New England, where flat terrain is difficult to find. It also means assembling 65 sites (six spares, just in case) with towers, beams, coax, tents, generators and so on. Organizers will have to pull together all of these sites within a 24 to 36 hour period, just before the competitors arrive on site!

This kind of enterprise requires enormous teamwork and logistical planning. We need volunteers to assemble and maintain the stations during the competition, as well as to coordinate delivery of the more than 100 pieces of gear each station will require. This includes everything from towers and beams to ground rods and toilet facilities.

### Finding Sites

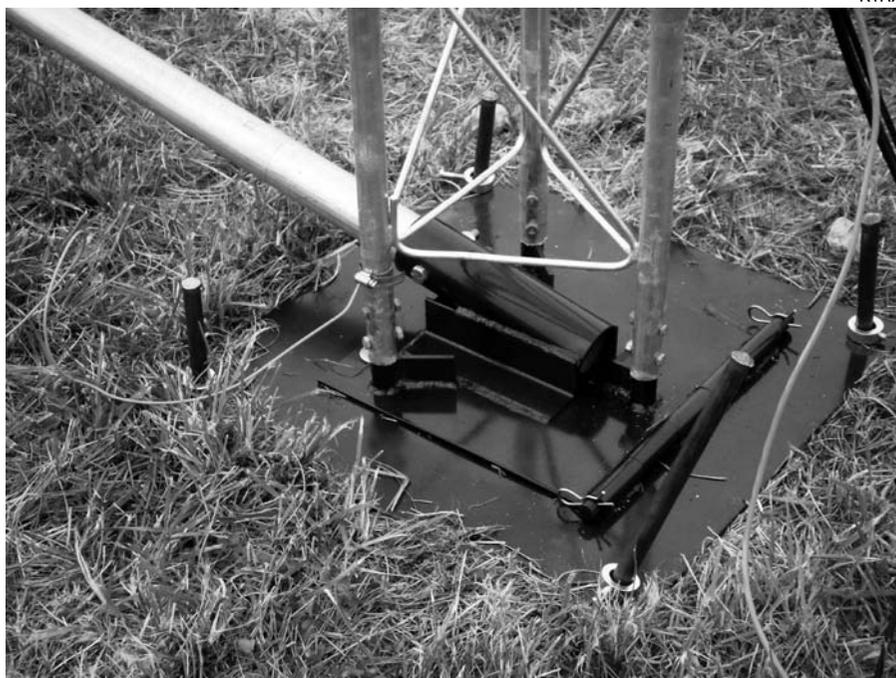
The "2012 Station Test," as it came to be called, started well before July. Tom Frenaye, K1KI, led the effort to identify suitable sites and acquire permission to use them. Tom attended meetings, filled out applications, pored over legal fine print and worked with site owners to help them understand the needs and the impact of a WRTC site. In the end, stations were sited at apple orchards, public parks, nature preserves and even a decommissioned hospital.

Given the New England landscape and the desire to provide each team



KM3T

Figure 1 — One tower kit is ready for delivery to the operating site.



K1RX

Figure 2 — A custom tower mounting base with derrick pole

with a “winning” site, we needed a way to evaluate prospective locations. It was easy to rule out sites in a valley or on a hilltop, but evaluating sites that did not offer clear visual clues was another matter. Rich Assarabowski, K1CC, with guidance from Dean Straw, N6BV, took on the job of conducting a terrain analysis of each potential site. Using *HFTA* software and terrain models from the USGS Digital Elevation Models (<http://data.geocomm.com/dem/>), Rich created *HFTA* plots of selected sites for beam headings of 45°, 210°, and 270° — the key directions for making contacts and building scores from New England.

A “figure of merit” (FOM) was determined by comparing the *HFTA* prediction from the actual terrain against the same prediction for flat ground. We did this for each site for all five of the bands in play for WRTC 2014. These directional FOMs

were then combined by a weighted formula based on anticipated score contribution by band/direction to determine a composite FOM for the site. This yielded a single number to represent of the relative “quality” of each site.

### Beam Teams and Site Teams

None of the stations was going to transport and assemble itself. We needed volunteers to take on this effort. The high concentration of Amateur Radio operators in New England with contesting, Field Day and public service experience was a real help. Recruiting efforts started early, with presentations at any radio club that would extend an invitation. Dave Pascoe, KM3T, did a wonderful job of contacting clubs and lining up speakers to deliver presentations about WRTC 2014. In the end, more than 100 volunteers were involved in the station test.

One decision of the WRTC 2014 organizers was not to permit any tower climbing during station installation. Organizers did some serious engineering work to design and implement a method whereby towers and beams could be assembled on the ground and raised in one piece — the “falling derrick” method. A special tilt base for the Rohn 25G tower was constructed that accommodated the derrick pole. Using a rigging of ropes and pulleys and a winch, the tower could be tilted up and guy wires installed by a team of five, without anyone having to leave terra firma.

Mark Pride, K1RX, conducted a series of tower installation demonstration and training sessions. Beam team captains were identified and tasked with assembling their own crews. Each beam team had the job of installing towers at one or two sites.

The site teams owned the responsibility of constructing the rest of the station infrastructure. This included the tent, operating tables and generator. These teams also had to pick up all gear from the storage facility and make sure it was returned afterward. Someone from each site team stayed on site to safeguard the installation and take care of logistics, such as fueling the generator. During WRTC 2014 each team of competitors will arrive at its randomly selected station site to find the tent, tower, antennas and generator already in place. This will enable competitors to focus entirely on setting up their own equipment and operating the contest, while the site team handles the rest.

Tom, K1KI, and Mark, K1RX, coordinated the volunteers, and a lot of phone calls and even a conference call of team leaders took place in the weeks leading up to the station test. A detailed 39 page installation manual was created for the beam teams to identify every aspect of the tower and antenna assembly. A 16 page manual was provided to site team managers to define their role in setting up the operating positions and expectations for the contest period.

K1RX

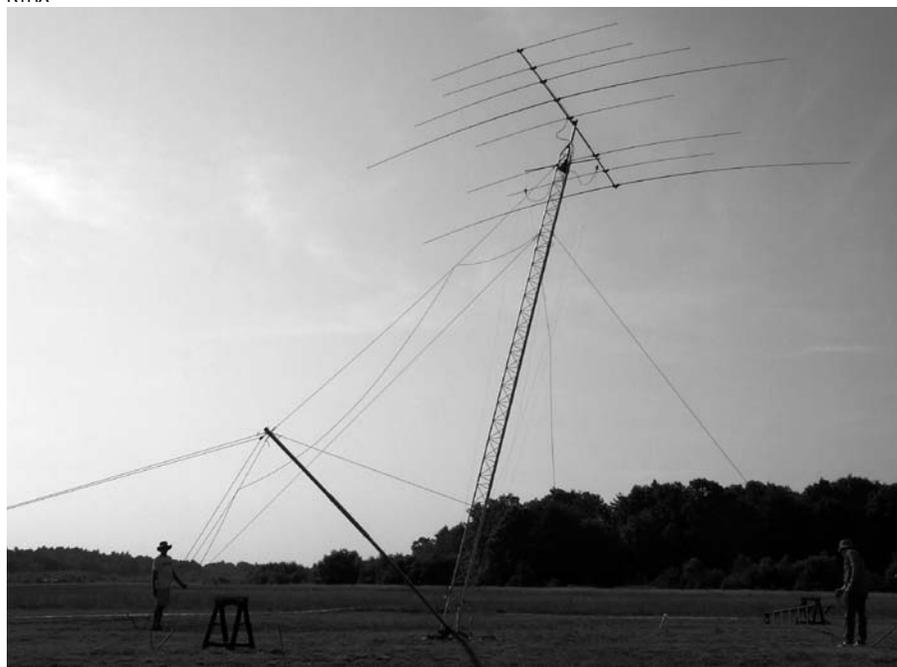


Figure 3 — A tower and antenna going up

#### Beam Team Captains

Jerry Muller, KØTV  
 Bruce Blain, K1BG  
 Ed Deichler, K2TE  
 Ray Lajoie, KB1LRL  
 Les Peters, N1SV  
 Kim Provencher, N1WK  
 Igor Kosvin, N1YX  
 Tom Poland, N9NC  
 Brian Szewczyk, NJ1F  
 Greg Cronin, W1KM  
 Stephen Moynihan, W3SM  
 Bob Feltmate, WA1ZJE

#### Site Team Captains

Barry Devine, K1BFD  
 Rich Assarabowski, K1CC  
 Tom Duffy, K1JHC  
 Craig Clark, K1QX  
 Dick Pechie, KB1H  
 Chris Reynolds, KB1NLW  
 Wayne Pearson, KB1WXR  
 Jim Mullen, KK1W  
 Mike Bernock, N1IW  
 Sandor Toth, NB1N  
 Brian McCaffrey, W1BP  
 Dennis Egan, W1UE  
 Gerry Hull, W1VE  
 Bob Zylinski, WA1DRQ

#### Operator Team Captains

Bill Myers, K1GQ  
 David Sumner, K1ZZ  
 Allen Singer, N2KW  
 Ted Rappaport, N9NB  
 Les Lechowicz, NI1L  
 Brian Szewczyk, NJ1F  
 Ed Lajoie, W1MA  
 Eliot Mayer, W1MJ  
 Matt Wilhelm, W1MSW  
 Mitch Stern, W1SJ  
 Dennis Egan, W1UE  
 Jay Corriveau, W1UJ  
 Ken Caruso, WO1N

**Table 1**  
**WRTC Station Test Results**

Call Sign	Cat	Score	QSOs	CW	SSB	Cty	HQ	Operators
K1ZD	2O2R	2,249,744	1798	1361	437	215	164	K1ZZ, KA1ZD, K1CC
W1UE	2O2R	2,183,797	1846	1507	339	213	146	W1UE, W1KM, W1UJ, N1WK, K1EBY, KB1H, NB1U
W1UJ	2O2R	2,010,396	1976	1540	436	186	132	NR1X
N9NB	2O2R	1,999,275	1757	1393	364	203	142	N9NB, N9NC, K5GO
K1RQ	2O2R	1,439,360	1473	1350	122	168	99	K1RQ, K1IR, KB1W, NJ1F, W1VE, W1MSW, AA1YW,
WB1Z	2O2R	1,180,980	1407	999	408	150	110	KK1W, W3SM
W1MJ	2O2R	1,012,254	1508	1115	393	134	89	W1EQO, K5ZD, K1DNX, KX1X
W1SJ	2O2R	791,252	1373	789	584	118	78	W1MJ, K1IB, K9HI, N1SV, NB1N
W1HH	MS	954,827	1145	863	282	143	118	W1SJ, KM1P, K5ZD
K1GQ	MS	951,936	1271	1271	0	145	82	N1IW, WO1N, W1STT
NI1L	MS	757,253	917	700	217	137	107	K1GQ, W2RU, K1AR
W1MA	MS	576,241	847	666	181	126	85	NI1L, K5ZD, K1KI
N2KW	SO	665,632	833	596	237	136	108	W1MA, K1RX, K5ZD, N1TQ
								N2KW

### Time to Go

Friday, July 13, (our lucky day) was extremely warm by New England standards. The typical average temperature ranges from 65° F (18° C) to 84° F (29° C). This particular weekend, however, the temperature was nearing 100° F (38° C) without a cloud in the sky. The heat made it a real challenge to keep cool and hydrated throughout the weekend.

The beam and site teams were assigned time slots to arrive at the storage facility to pick up the gear they would need. Each team had an inventory checklist that showed what they had received and what was expected back on Sunday. The system worked well, and there were only a few cases where a needed part was missing from the kit. These issues were quickly resolved.

The operating sites were located along the western edge of the Boston metropolitan area along Interstate 495, over a distance of about 60 miles (100 km). Teams were on site and assembling stations before noon. Besides the heat, the biggest challenge was getting some of the new tower sections to mate properly. The average station setup time was about 5 hours — not bad considering the high temperatures and that this was the first time through the process for most of the volunteers.

### The Contest

The operating teams arrived at their stations Friday afternoon and started setting up inside the tents. Since the goals were aimed more at learning than competing, operators took a relaxed approach to the contest. Some followed the WRTC rules, with two operators and two transmitters. Others followed the WRTC rules but used more than two operators, while still oth-

ers just used one radio with one or more operators.

The contest began at 0800 local time on Saturday. All but one of the test stations were immediately spotted by the Reverse Beacon Network (RBN — [www.reverse-beacon.net/](http://www.reverse-beacon.net/)). The missing station? It started the contest on SSB. It was quite a relief to know that we could assemble the stations and get them all on the air on time.

Summertime propagation is always a wild card, and even more so when running 100 W and using a small Yagi at 40 feet (13 m). Fifteen meters was the hot band at the start, but it was a challenge to get through to the Europeans, who were working each

other. Even 10 meters opened to parts of Europe during the day. In the late afternoon 15 and 20 meters produced some of the highest rates of the weekend.

All teams were pleasantly surprised at the success they enjoyed on the low bands using inverted Vs with the apex at only 35 feet (11 m). Stations were able to work into Europe on 80 and 75 meters. Forty meters even produced some short runs of DX until well after European sunrise. The very early morning hours were slow, without much activity once the bands closed to Europe. The situation is sure to be very different in 2014, when more people are chasing the WRTC stations. Also, without



Figure 4 — WRTC antenna system



Figure 5 — The complete K1ZD operating site

special call signs to attract attention, it was easy for the low-power WRTC test stations to be lost in the crowd.

### RBN Testing

One goal of the station test was to evaluate the analytical work done during the site-selection process. Did real world experience match the computer models?

Dave, KM3T, took on the challenge of finding a way to evaluate the stations during the contest. The RBN seemed like a perfect place to start, given its ability to detect call signs and record signal-to-noise ratio. There was a concern that the RBN, which only records data every 10 minutes, would not provide enough meaningful data.

Alex Shovkopyas, VE3NEA, inventor of the *CW Skimmer* software, was kind

enough to make a special software version that would take a reading every time the RBN heard one of the WRTC test stations. Six skimmer users, recruited by Bob Wilson, N6TV, volunteered to take their systems off the RBN and run the special software during the contest period. These listeners were located in Central Europe, Western Europe, the Washington DC area, and California. Each operating team was provided with a schedule of 10 minute periods throughout the contest and asked to be within a given frequency range and antenna direction (Europe or west). This provided valuable data with all stations in known configurations.

The six “private” skimmers spotted the WRTC test stations 156,905 times during the contest. That’s 109 spots per minute!

They logged 21,690 spots during the 12 “special” 10 minute periods. Each spot included a reading for decibels above noise level.

Bob, N6TV, assisted with data analysis. Preliminary slices of the data looked at averages, peaks, and medians for the stations in the target directions, and it was encouraging to see very little difference in signal strengths among the stations. Stations to the south may have had some small advantage, but not a significant one.

An interesting example illustrates the potential of computer modeling. One station site on a hilltop is used annually by a Field Day group, which deemed the site not great for working toward the west. The terrain analysis showed this might be the case, but also that it would be a great location for working Europe. The recorded skimmer data confirmed both findings — about a 10 dB advantage to Europe but a 10 dB *disadvantage* to the west compared to the other stations. As a result, this station location may be scratched from the list for not meeting the standard of equivalent locations for all.

WRTC 2014 is a unique opportunity to generate data from 59 identical stations with skilled operators using two radios to cover all of the active bands. This data set can be used to create and verify a method for evaluating and comparing potential effectiveness of station locations. The analysis and methodology will be one of the technical contributions of WRTC 2014.

### Results

The WRTC station test activated 13 stations from 11 locations. Eight stations operated in two operator/two radio (2O2R) mode, four used multiple operators and one radio, and one was staffed by a single operator. Seven teams used triplexers to share the triband Yagi between two rigs.

The stations logged more than 18,000 contacts with approximately 3500 different stations. At 78 percent of the contacts, CW was the dominant mode. Roughly 45 percent of all contacts were with Europe, and there were almost *no* contacts with Japan.

The W1UJ team had the most QSOs at 1976, while the K1ZD team logged the most multipliers (using WRTC 2014 scoring) with 379 (see Table 1). Photos, stories, and logs from the test stations are available on the WRTC 2014 Web site ([www.wrtc2014.org/competition/2012-station-test/](http://www.wrtc2014.org/competition/2012-station-test/)).

In addition to the onsite competition, there were awards for stations that made contact with the WRTC test stations. Stations working the test stations on the most band-modes were N5DX (52), N2IC (47), KØEJ (45), K8OO (44), and W4IX (44). Leaders from outside North America



Figure 6 — KM3T and K1DG pack returned equipment into storage.

were EI/W5GN (42), DJ2YA (41), and CR6K (38).

### Packing Up

The beam teams arrived back at the station locations on Sunday morning. As soon as the contest ended, stations were dismantled and stowed. It was still hot on Sunday, but teardown went much faster than setup, with most teams packed and gone within 2 hours of the last contact.

Teams returned their gear as soon as they could get to the storage facility. Everything was checked in and carefully squeezed into the storage area. There were plenty of stories about heat, fluid intake, things that broke, possible improvements, and pride. The spirit, attitude and effort of the beam, site and operator teams over the weekend were truly outstanding.

### Lessons Learned

The station test was an opportunity to learn, and we did. The beam and site

teams contributed more than 500 suggestions for improvements. Many of these were simple things, ranging from more pictures in the setup manuals to ideas for keeping the tents cooler. Others pointed to design improvements in mechanical components, such as the derrick system and the method of mounting the dipoles.

The Cycle-24 TX38 tribanders worked very well and provided an excellent pattern for such a small antenna. Assembly of the feed system was a challenge for some teams, although all problems were easily resolved before the contest. The station test affirmed the value of the falling-derrick method, as the antenna could be easily lowered, corrected, and raised in short order. The Honda generators worked well all weekend and were very quiet. The station test gave us some valuable insights regarding the amount of fuel required for a weekend of operating.

The ARRL New England Convention in

Boxboro, Massachusetts, in late August provided the first opportunity to get many of the teams back together. We held a meeting to review what we accomplished and to acknowledge the feedback and suggestions. With each team working independently, many were happy to hear that other teams had struggled with the same sorts of heat-related and mechanical issues they had. All volunteers who participated in the station test were awarded a bronze medal. Everyone committed to return for silver and gold medals in 2013 and 2014.

### Looking Ahead

Plans call for another station test in July 2013. The thinking is to set up as many as 30 sites, in order to exercise the logistics and to get more practice for the teams that will be handling site installation and management. We will also be looking for operating teams that are willing to work within the WRTC rules and provide valuable log data to help competitors prepare

for 2014.

Operators and volunteers from outside New England are welcome. We have already heard from many people who are scheduling their 2014 vacation plans so they can be in New England to meet the competitors and help with the event.

### Fundraising

The New England WRTC 2014 Organizing Committee is an independent group, and not part of any existing organization, national society or club. We have taken on this project because we are passionate about ham radio and contesting and because we believe in the goodwill that comes from bringing together contesters from around the world to experience a level playing field. Beyond the competition and technical learning, it is our goal to use the WRTC platform to increase the awareness of ham radio competition both inside and outside of the hobby.

WRTC 2014 has received strong support from across the contesting community. One of the most popular ways to contribute has been by clubs and other organizations becoming “tent sponsors.” With less than 24 months to go, just over half of the funding needed has been raised. WRTC 2014 Inc is an IRS 501(c)(3) not-for-profit organization, and contributions are deductible for US taxpayers under Section 170 of the Internal Revenue Code.

For more information on how you can help, visit [www.wrtc2014.org](http://www.wrtc2014.org).



Figure 7 — W1KM (left) and W1WEF proudly wear their bronze medals.