



# ARRL 10 GHz and Above Contest 2014 Results

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*Rain can be a good thing — rain scatter!*



Kevin, AD7OI, spent some of the August weekend on Towers Mountain (DM34tf) between Phoenix and Prescott in Arizona. (Photo Tammy Jacobson)

Microwavers look forward to August and September each year. Chatter begins months before: “What are we doing for 10 gigs this year?” On the weekend of August 16th and 17<sup>th</sup> then again on the weekend of September 20th and 21st, microwavers took to the “ultra highs” for the ARRL 10 GHz and Above Contest putting those plans into action. While a few are able to operate from home, most operators head to the mountains, shorelines, and plains to find good horizons that let their microwave signals traverse long distances. The weather in August and September is usually pleasant to be at these outdoor operating locations. It’s not so much a contest as an operating activity. The primary goal is activity—contacts! The next goal is increasing the distance of contacts.

Microwave signals are strong when in direct line of site but once two stations are beyond line of site, signals are generally pretty weak. The scattering mechanisms (dust and water droplets primarily) that propagate microwaves beyond line of site only reflect a weak signal in the direction of the other operator. The further the distance, the weaker signals get. Many operators are probing the maximum distance at which they can hear a weak signal in the noise.

As signals get weaker, many operators use CW to eke out a successful contact. It takes longer than a SSB voice contact but many times a voice contact is not possible. Several operators around the country report using digital

modes like JT4 to extend the range of their contacts. Glen, KCØIYT, worked many JT4F contacts with Donn, WA2VOI. Donn was on Buck Hill just south of Minneapolis-St Paul, MN. Glen was roving 300 to 400 km to the south in Central Iowa. At the longer distances, Glen could see the signal on the waterfall display but could not hear the tones in the noise coming out of the speaker. Nevertheless, the decoded message printed out in the text area of the decoding program exchanged the required information for a successful contact.



Tommy, W1AUV, spent Saturday morning of the September weekend on Mt Equinox. Notice the dish is tied using nylon ties to both the guardrail cables and the battery. Without those measures, the dish would have flown off the mountain. Although microwavers love the great horizons on mountains, the weather can make it a tough time. At the time of this photo, the temperature was 48 degrees and winds were about 30-40 mph. (Photo W1AUV)

Every now and then, there are propagation anomalies that make signals much louder—even at 300-400 km. The anomalies are usually unexpected and short-lived. This year several operators reported rain scatter enhancing their contacts. In a rain storm, while there are droplets falling to earth, there are also droplets thousands of feet up in the air just beginning their downward plunge. Some of the droplets are of the proper size to scatter 10 GHz signals very well. If these droplets are thousands of feet up, they are on a beautiful tower (figuratively). The horizon from there is much longer than from even a mountain top. We say that two stations trying to work are “illuminating” (with their signals) a “common volume”. If there are only dust particles or less in that common volume, there will be either no or exceedingly

weak signals heard. If a thunderstorm moves into that common volume, however, the water droplets are a great scatterer of 10 GHz signals.



Kevin, AD7OI, on Harquahala Mountain (DM33ht) during the August weekend. This mountain is west of Phoenix and he had many successful contacts in California from San Diego northward. The photo below shows Kevin on Towers Mountain (DM34tf) on the August weekend. (Photos Tammy Jacobson)



## Reflections on Rain

Signals scattered by rain are loud but distorted. The distortion comes from phase cancellation and smearing from all the rain particles being at different distances in the rain column rather than in a flat plane. The distortion sounds just like VHF signals bounced off the aurora borealis (because the auroral scattering surface is lumpy). SSB voice contacts via rain scatter are possible but it pays to speak very slowly. CW signals are wide, loud, and easy to make out from the background noise.

Sometimes, as the loud CW signals are bouncing off of rain, someone will send "FM, FM". It's a surprise to switch to FM and hear high fidelity voice audio across hundreds of kilometers. The wider bandwidth of FM is

mostly immune to the smearing and distortion of rain scatter. Sometimes we note a clicking sound. But FM requires a strong signal — which well-placed thunderstorms provide.



Art, KC6UQH, was on San Miguel Mountain DM12mq, near San Diego, for the September weekend. Note the drop-off behind him! Here he is working hundreds of kilometers up the state of California. (Photo AD7OI)

On the September weekend, Upper Midwest operators watched radar on their cell phones as a line of weather developed in southwest Minnesota. Its track was right towards Buck Hill which was full of operators. Three groups of roving operators in Iowa and Southwest Wisconsin had been working each other and the group on the hill. Since it was September, the storms weren't very tall, but in the afternoon, the tell-tale rasp of rain scatter was heard and the operators started swinging their dishes to find the best reflecting parts of the storm. Now signals jumped up to needle-pinning strength. Soon, the storms arrived driving the Buck Hill operators off of the hill but rover groups continued to use the rain to work each other for the next few hours. At the peak of the storm, Glen, KCØIYT, worked Bill, KØAWU, 524 km to his north via rain scatter off this mature storm.

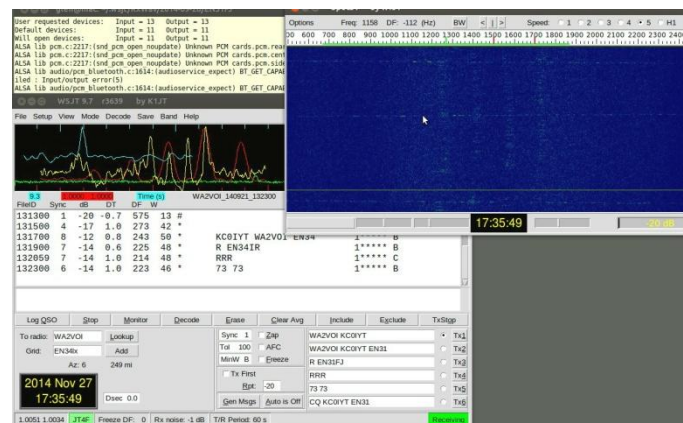
In the Northeast US and around the eastern Great Lakes, operators also had rain enhancement. Unfortunately, several operators were stymied by the rain since it was right on top of them and kept them off the air. Ray, VE3FN relates how periodic rain north of Lake Ontario seriously dampened the entire September weekend for him. In my own case, I kept operating as rain arrived and didn't protect my rig sufficiently. Water damaged the

SSB portion of the rig restricting me to CW the remainder of the weekend. Rain between stations is ideal. Rain on top of stations, not so much.

the screen, the information required for a successful contact is exchanged.



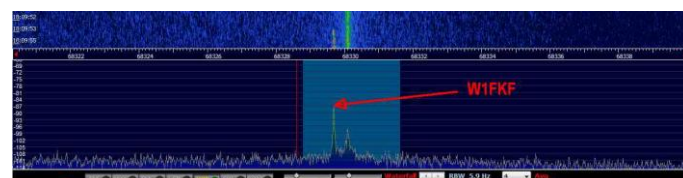
Tommy, W1AUV, at Point Judith (FN42ig) on Saturday of the August weekend. Best DX: 368 km to Mount Mansfield in Vermont. (Photo W1AUV)



Glen, KCØIYT sends along a screen shot of working JT4F with WAZVOI. Glen was in Central Iowa at EN31kf and Donn was 340km north at EN34ir. Notice there is almost no visual indication in the waterfall area yet the letters of the message were successfully decoded. (Photo KCØIYT)



Ray, VE3FN, and Glen, VE3XRA, in the gazebo atop Mont Saint Marie, Quebec (FN25bw). This picture was from a sunny time last year — the actual weather this year was challenging rain. The summit is over 1800 feet ASL with a rugged road for access. Only two contacts were completed this year on account of the weather. The views are spectacular in all directions. Ray's travelogue later in the article tells more of their story. (Photo VE3FN)



Mike, N1JEZ shares a screen shot of listening to W1FKF's 78 GHz signal 20 dB out of the noise. This was a 126 km path from Mt Wachusett at FN42bl to Mt Equinox at FN33kd. (Photo N1JEZ)

## Digital Mode Operating

Use of digital modes is expanding. Operators in all regions are starting to give it a try. Out west, Larry, K6HLH; Rein, W6SZ; and Stu, K6STU, used JT65 to have some successful contacts. In the east, the operators working 78 GHz used digital modes to ensure their success. At those high frequencies, atmospheric absorption is significant. So every kilometer of distance weakens signals. Signals drop closer towards and into the noise. Digital modes crawl into the noise finding signal in what the ear cannot. As the message unfolds on



Bill, W2RMA, had a great weekend for his first real experience on 10 GHz. Using bare-bones equipment (about 70 mW output), he worked hundreds of kilometers across Lake Erie. Here he is at Perry Township Park in Ohio (EN91kt) where he was joined by Mark, WB8TGY, and Mike, WA3TTS. (Photo WB8TGY)

## 2014 Contest Highlights

Both East and West Coast operators made multiple 600+ km contacts. Charles, W6QWN, had the longest 10 GHz QSO this year at 725 km. On 24 GHz, Jim, N9JIM; Lars, AA6IW; and Steven, W6QIW, all worked across

197 km. On 47 GHz, W1EX reached out 102 km. On 78 GHz, W1FKF, N1JEZ, and WA1MBA lengthened their contacts to 126 km by working between Mt Equinox in Vermont and Mt. Wachusett in Massachusetts.. This year W6OAL, VE3OIL, and VE3SMA made contacts at “light” frequencies above 300 GHz—their range was 1 kilometer.



Jerry, K6DYD, operating on High Point near San Diego. He was joined by Dave, WB6TFC. They successfully worked far up the state into north-central California. Their stations are some of the strongest in the region running 25 watts into 4-foot dishes. (Photo WB6TFC)

### 10 GHz Only Category

In the 10 GHz Only category, for the fourth year in a row, Gary, WBØLJC, led all 72 operators with a score of 52,586. Jon, WØZQ, came in 2<sup>nd</sup> place and Pat, N6RMJ, was 3<sup>rd</sup>. Most of the remaining Top Ten were split between 6-land and Ø-land.

#### Top 10 Scores

| 10 GHz Only | Score  | 10 GHz and Up | Score  |
|-------------|--------|---------------|--------|
| WBØLJC      | 52,586 | AA6IW         | 52,520 |
| WØZQ        | 43,928 | K9PW          | 36,642 |
| N6RMJ       | 42,850 | N9JIM         | 32,512 |
| KØCQ        | 42,051 | AF1T          | 31,626 |
| N6VI        | 41,332 | W1MKY         | 26,543 |
| NØKP        | 35,231 | W3RWN         | 26,461 |
| N6NU        | 33,198 | W6QIW         | 21,899 |
| W9FZ        | 31,276 | W6BY          | 21,827 |
| KD6W        | 30,132 | W1GHZ         | 18,523 |
| K6NKC       | 29,737 | N1JEZ         | 14,644 |

### 10 GHz and Up Category

Lars, AA6IW, took top honors in this category this year with 52,520 points. Pete, K9PW, came in 2<sup>nd</sup> with a mixture of roving in Minnesota and along Lake Michigan. Jim, N9JIM, came in 3<sup>rd</sup>. 24 of the 26 participants in this category were active on 24 GHz. Four operators entered with contacts on 47 GHz, 3

operators show 75 GHz, and 3 operators made contact with “light”.

#### Top 10 QSOs Completed

| 10 GHz Only | QSOs | 10 GHz and Up | QSOs |
|-------------|------|---------------|------|
| WBØLJC      | 225  | AA6IW         | 214  |
| KØCQ        | 187  | K9PW          | 169  |
| WØZQ        | 180  | N9JIM         | 125  |
| N6VI        | 178  | AF1T          | 116  |
| N6RMJ       | 169  | W1MKY         | 106  |
| N9RIN       | 151  | W3RWN         | 99   |
| NØKP        | 150  | W1GHZ         | 88   |
| K6WCI       | 147  | W6QIW         | 88   |
| N6TEB       | 147  | W6BY          | 88   |
| WA6CDR      | 136  | W1JHR         | 71   |

### Regional Highlights

Great Lakes: In August, most activity was across Lake Erie and Lake Ontario. For September, Michigan and Illinois operators lit up both east and west shores of Lake Michigan. Activity was smaller than past years but the fun was the same. Mark, WB8TGY, was near Muskegon for the September weekend. There were good breezes off the water and plenty of choppy waves. Conditions across the lake remained good because of the evaporative duct mentioned in last year’s article. But why a duct? The churning water raises the humidity level at low altitudes above the water. The rapid change from humid to drier air aloft creates the “duct”.



Karl, WD9BGA, has his own fire tower! He invited Bruce, W9FZ, (left) and Janice, KA9VVQ, (right) to operate from atop the tower during the August weekend. Karl and Wendy, KC9YSB, were wonderful hosts for the entire Saturday morning. Stations were worked in Minnesota, Iowa, Illinois, and Michigan. Karl and Wendy are potential future microwave operators!



Mt. Frazier (DM04ms) was active both weekends. Here Andreas, N6NU, along with Brian, W6BY, (and family visitors) point northward for some long shots to northern California. (Photo W6BY)

Randy, W3RWN, traveled from Seattle to California for both weekends of the contest. He found new adventures and high activity levels. On the second weekend, he shipped a particularly compact rig with a flat plane antenna in his luggage. That rig worked many contacts up to 380 kilometers away.



Mark, WB8TGY, operated from Lake Michigan's eastern shore in September. Windy weather churned up frothy waves (and noise). Mark worked several stations near Chicago and further north in Michigan. (Photo WB8TGY)

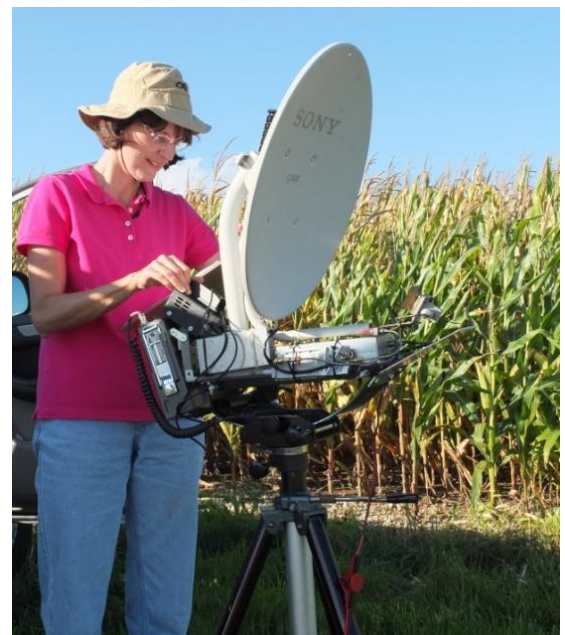
Although the event is called a contest, it's really an operating event. Marty, N6VI, commented "The whole event is really a cooperative effort by all concerned. It's a pleasure to work with such a group." Marty logged a 725 km contact from Mt Frazier just north of Los Angeles when he eked out a contact with Randy, W3RWN, on Shasta Bally Mountain in northern

California. Marty has developed his 2-foot dish system that is entirely contained on or within his vehicle. The dish is on a rotator on the roof and all the rest of his gear is inside. He can sit out rain, wind, and cold temperatures in the comfort of his car. He just needs to calibrate the rotator at each new location.

Jim, N9JIM, explains how his longest 24 GHz contact came about: "I was running 2 watts with an 18" dish. The dish had a dual band feed for 10 and 24. I was located in the flat lands in the Central Valley of California while Lars, AA6IW was up on Mt. Frazier 197 km away. We worked on 10 GHz first to line up and then swapped over to 24 GHz. Signals were very strong! I was expecting a weak QSO but Lars was 20 over S9 on 24 GHz SSB." Dry air surely helped.



Randy, W3RWN built this compact rig. He shipped it in his luggage as he traveled from Seattle to California for 10 GHz fun. He made multiple contacts up to 380 km. (Photo W3RWN)



Janice, KA9VVQ, operating in southwest Wisconsin, aims away from the corn, across the soybean fields, towards Chicago about 200 km away (Photo W9FZ)

## VE3FN Travelogue Reveals Challenges

Ray, VE3FN, contributed the following story of his adventures during the contest, illustrating some of the challenges of mountain-top operating.

### First Weekend

Rain showers were forecast for Saturday and Sunday at all the sites from which I operate. Saturday, Doug VE3XK, drove to Foymount, Ontario (FN15ik) realizing there would be scattered showers, but hoping they would be scattered so that we would have time to operate during breaks between the rain. Foymount is at an elevation of almost 1800 feet ASL and is the highest location in that neck of the woods. It was a military radar site in the old Pine Tree line. After a drive of two hours, we arrived and found it raining lightly, but the rain soon became heavier. After an hour or so, the rain stopped and we set up. Shortly after we completed setting up, the rain started again. The weather radar indicated that it would continue for hours, so we tore down everything and went home without trying to make any contacts.

Sunday, Jean, VE2FDJ, and I drove to the summit of Mont Saint Marie, Quebec (FN25bw). Its summit is over 1800 feet ASL and it provides a clear shot in all directions. There is a small wooden gazebo at the summit which provides a good location for operating. The picture below of the gazebo was taken last year. It shows me (in the centre) along with Glenn VE3XRA in the corner. The drive to the summit is over a "road" made for utility trucks although an all-wheel drive car (such as mine) can make it if driven carefully and very slowly. This year, Jean drove his truck thus making the trip to the summit a lot easier!

The showers didn't arrive until the afternoon and most went around us. Unfortunately, we made only 2 contacts on 10 GHz: K2DH in FN02xu (384 km) and KA1OJ (FN42bl) at 499 km. Both had good signals. We tried a couple of other contacts but failed to make them. Nevertheless, I am confident I could have worked more if I had been able to drum up more schedules on 2 meters.

### Second Weekend

Once again, Mother Nature failed to cooperate. The forecasts for all my sites called for rain showers on Saturday and rain on Sunday. I decided to try Mont Tremblant, Quebec (FN25rf) on Saturday and to return to Mont Saint Marie, Quebec (FN25bw) on Sunday. A ski lift at the summit of Mont Tremblant provides some shelter while the gazebo on Mont Saint Marie provides a little better shelter for the heavier precipitation forecast for Sunday. But I was still very doubtful about the possibility of operating at either site because of the weather forecast.

The ski resort at Mont Tremblant is a pedestrian village. Fortunately, there is a small lift that will transport people from the entrance up to the base of the gondola ski lift. I had found that the gondola lift started at 9:00 so we arrived in time to catch it. Unfortunately, upon arrival we learned that the small lift (to take us up to the gondola) didn't start operating until 10:00! So we waited. At 10:00 they tried without success to start the small pedestrian lift -- they eventually got it going about 10:15. This was a bad omen!

While there was no wind at the base of Tremblant, it was at least 40 miles per hour at the summit (2000 feet above the base) — and gusts peaked higher. The temperature was about 49 degrees F — substantially cooler than at the base. Standing in the gusts was difficult and there is no way my equipment could have been set up. We were in the clouds with a visibility not exceeding 50 feet.

We took refuge in the nearby lounge building which has large windows facing south and west. The manager gave us permission to set up. There must have been a lot of steel in the building as the "local" VE2FUT 2 meter beacon was only S1 even though the antenna was pointed in its direction out the window. Unfortunately, the 2 meter antenna was damaged in transit -- the connection of the coaxial balun to the driven element was broken. I pointed the 10 GHz antenna through the window and tried a long-haul QSO with VE3SMA, but had no success. The metal in the building sure didn't help.

Both KT1J and N1JEZ planned to operate from Whiteface (FN34bi) and I was counting on working them as they always have strong signals over the 200 km path. However, we never found them on 2 meters nor did they answer their cell phones. Perhaps they could not operate because of the wind.

Early in the afternoon the clouds started to thin out and the wind dropped to a level we thought was acceptable. We moved the 2 meter station outside to the balcony and the VE2FUT beacon was now over S9! Doug, VE3XK, quickly contacted Tommy, W1AUV, who was on Mount Equinox (FN33kd). Tommy had to move to get a clear shot in our direction and we needed time to set up 10 GHz. My two electronic compasses stopped working so I used an analog magnetic compass. At this time, my IF radio also failed so I replaced it with an old Icom IC-202. We finally worked W1AUV on SSB with S9 signals over a path of about 361 km, but that was it. W1AUV was the only station we heard that day on 2 meters and the only station we worked on 10 GHz. Too bad because I believe there were several other stations set up in his neck of the woods and we should have had a good shot at

making more 10 GHz contacts if they had looked north on 2 meters.

Saturday night, the forecast for Sunday at Mont Saint Marie was rain and some wind. After our experience at Mont Tremblant and as the walk to the site includes crossing a large sloping rock, I feared that footing would be dangerous in the rain. Plus I had a few repairs to make and I was too tired to make them. So I decided to stay home on Sunday. As it turned out, there was quite a lot of rain on Sunday, so in remaining at home I made the correct decision. It was a very disappointing second weekend and contest. We made a lot of effort for only three contacts!

73 Ray Perrin VE3FN FN25dk

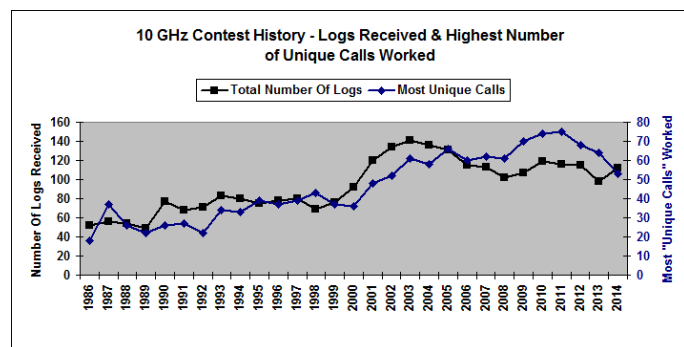
### Analysis

For those of you who like to analyze participation and distances over time, it is interesting to look for causes such as weather or organizational efforts by clubs. These charts were initiated by WØZQ and I thank him for them.

### Participation by Call Area

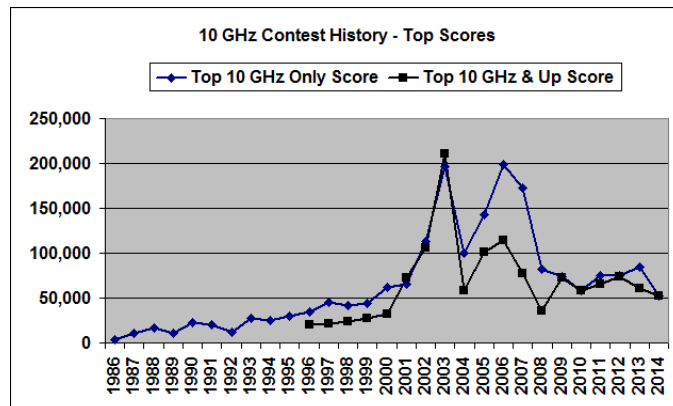
| Call Area | Call Entries | Area | Entries |
|-----------|--------------|------|---------|
| 6         | 26           | 8    | 6       |
| 1         | 20           | 4    | 6       |
| Ø         | 17           | 7    | 4       |
| 9         | 10           | 3    | 4       |
| VE        | 9            | 2    | 3       |
| 5         | 7            | DX   | 0       |

Indicators on participation are mixed. "Logs received" ticked back up to 112. Yet unique callsigns worked declined to 53. We need to continue our recruiting efforts to get new and more callsigns on the air.



The Top Score trend ticks down for the 10 GHz Only category and remains steady for the 10 GHz and Above category. Another metric that showed a concerning drop from last year is the total number of QSOs represented in the submitted logs. The recent trend has been in the mid-9000s and this year came in at 6425. Submitted logs indicate the known activity. Certainly there are operators who get on but do not submit logs. Five years ago in the Upper Midwest, the general focus was on high QSO

volume leading to high scores. In the past two years, some of the operators would prefer to push the distance and settle for lower number of QSOs and even lower scores.

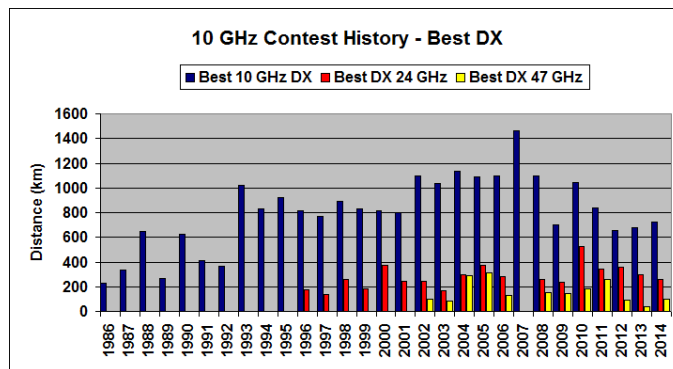


### Best DX by Band

| Category   | Call  | 10 GHz Best DX (km) |
|------------|-------|---------------------|
| 10G        | W6QWN | 725                 |
| 10G        | N6VI  | 723                 |
| 10G and UP | AF1T  | 667                 |
| 10G and UP | W1MKY | 626                 |
| 10G        | NG4C  | 625                 |
| 10G        | AD7OI | 611                 |
| 10G and UP | W3RWN | 609                 |
| 10G        | W7XU  | 609                 |
| 10G        | W6SR  | 602                 |
| 10G        | KB1VC | 593                 |

| Category   | Call  | 24 GHz Best DX (km) |
|------------|-------|---------------------|
| 10G and UP | W3RWN | 257                 |
| 10G and UP | N9JIM | 197                 |
| 10G and UP | AA6IW | 197                 |
| 10G and UP | W6QIW | 197                 |
| 10G and UP | N1JEZ | 180                 |
| 10G and UP | W1FKF | 162                 |
| 10G and UP | W1GHZ | 155                 |
| 10G and UP | K9PW  | 130                 |
| 10G and UP | W1JHR | 126                 |
| 10G and UP | AF1T  | 103                 |

| Category   | Call   | 47 GHz Best DX (km) |
|------------|--------|---------------------|
| 10G and UP | W1EX   | 102                 |
| 10G and UP | WA1MBA | 86                  |
| 10G and UP | N1JEZ  | 82                  |
| 10G and UP | W1FKF  | 36                  |



Looking at Best DX graphed over the years can show the effect of an unusual propagation event or the variability of activity levels on the 24 GHz and above bands. Obviously, the more activity, the more we can explore the limits of what is possible.

### Looking Ahead

If you've never transmitted on the microwaves and find this intriguing, reach out! There are loose groups of activity around the country. Many have loaner rigs to use. Consider subscribing to the "microwave reflector" ([lists.electechs.com/cgi-bin/mailman/listinfo/microwave](http://lists.electechs.com/cgi-bin/mailman/listinfo/microwave)) for email chatter. Start making plans to be on-the-air August 15-16, 2015 and September 19-20, 2015.