



ARRL 10 GHz and Up Contest

2012 Results

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Get outdoors with ham radio—Be a microwaver!

The ARRL 10 GHz and Up contest, took place on two weekends: Aug 18-19 and Sept 15-16, 2012. Amateur Radio operators active on the microwave bands look forward to these two weekends each year. Most make treks to scenic locations across North America to make contacts on frequencies of 10 GHz and above. While the locations are a joy to view by eye, the long horizons are particularly good for launching microwave signals with likelihood of contacting others over remarkable distances.



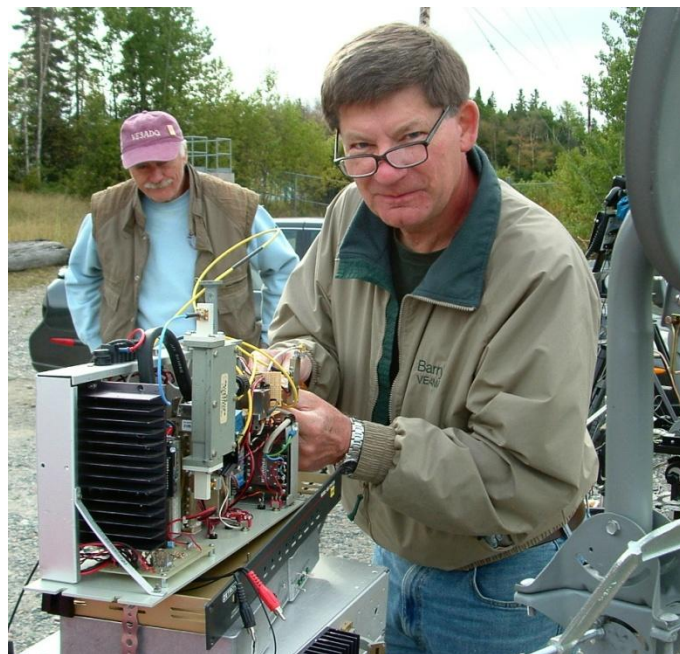
Mt. Washington (FN44ig) can be a crowded place during a microwave contest! Trying for maximum distance are (L-R) W1EX, W1FKF, N1JEZ, W1AIM, K1LPS, and KA1ZD (with K1ZZ). The temperature inversion along the bottom of the distant line of clouds is a rich source of DX microwave propagation! [W1AIM, photo]

Once again, microwave operators across North America got on the air in the ways they know how for fun. Mountain-top sites offer predictably good locations. Ocean shorelines or those of the Great Lakes also give great horizons. While weather sometimes brings operating challenges, microwavers know the joys of mixing their ham radio interests with the beautiful out-of-doors. Occasionally, the weather brings welcome enhancements like tropospheric ducting or well-placed thunderstorms for exciting rainscatter contacts.

Microwavers really show their constitution during contests like this. They go to great effort to get to a prime operating location. But often these locations, while beautiful, are windy or have uneven terrain. This year more than three operators reported serious battle-damage to their stations. Steve, KB8VAO started the September weekend on a hilltop near Altoona, PA FN00sn. He arrived before sunrise to a cold, windy site. He set up his equipment and then hopped in his running car to warm up. Before making even his first QSO of the day, he watched in horror as the wind tipped over his tripod. The

fall caused serious bending and damage to the dish feed. Steve showed his resourceful spirit as he performed an on-site rebuild connecting the operative parts to a large horn antenna he had brought along. Steve still made many contacts that day across Lake Erie and around the region. Hundreds of miles away, Lloyd, NE8I lost both his 10 GHz and 24 GHz stations to wind induced trauma on the last day of the contest. Both Steve and Lloyd are already at work on station rebuilds.

Sometimes microwave gear can be sensitive and finicky. With frequencies so high, some of the circuitry is quite tiny and delicate. Barry, VE4MA traveled all the way from Winnipeg, Manitoba to the north central shore of Lake Superior to get some microwave activity. He brought along two 24 GHz rigs each of which experienced different failures. While on the windy shore, with waves crashing in front of him, Barry resourcefully combined the working portions of each rig to make multiple 180 km shots across Lake Superior.



In the heat of battle, Barry, VE4MA cobbles two nonfunctioning 24 GHz rigs together to make one working rig that yielded multiple 180 km contacts on 24 GHz. (Photo VE3KRP)

Tony, KC6QHP took part in his fifteenth 10 GHz and Up contest. This year, he started the August weekend east of Los Angeles on Keller Peak at DM14le and operated on 10, 24, and 47 GHz.



Tony, KC6QHP's set-up on Keller Peak (DM14le) east of Los Angeles. (Photo KC6QHP)

By evening, Tony had relocated to multiple spots around Los Angeles one of which was the heights of San Pedro, CA in DM03ur.



Tony, KC6QHP's night set-up at Fort MacArthur in San Pedro, CA (DM03ur). (Photo KC6QHP)

In the Midwest, many operators made an expedition to the shores of Lake Superior for the August weekend. The trip offered a north woods vacation combined with ham radio as described in the sidebar. September found the

Midwesterners back out in the plains or along the shores of Lake Michigan and Lake Erie. (Look for a complete telling of the tale at the end of this writeup!)

The northeast US was, again, humming with microwaves during both weekends of the contest. Many of the regular mountaintop and coastal sites were activated. For example, Mt Washington (FN44ig) and Mt Kearsarge (FN43bj) in New Hampshire, Mt Mansfield (FN34om) in Vermont, and Block Island in Rhode Island (FN41ee) were visited by the region's operators. From these perches, many contacts were made westward to Pennsylvania, northwesterly to Canada, and southerly to the eastern seaboard. On the September weekend, things were a little windy and chilly. Mike, N1JEZ planned to go to Mt Washington but found that winds were over 60 mph up there so he changed his plans to Mt Mansfield where winds were at least bearable.



W1GHZ ready to adjust the 2 meter liaison antenna. View looking north from the highest spot on the Island – a WWII observation bunker now a private house. (Photo W1AIM)

2012 Contest Highlights

This year, the longest distance 10 GHz contact was 652 km by both Rex, KK6MK and Ron, K6GZA. But on the East Coast, Dale, AF1T; Joe, WA3PTV; and John, W3HMS achieved a similar distance at 650 km. Ron, K6GZA reports that he was on Mt Vaca (CM88wj) with Rex, KK6MK. Mt Vaca is between California's Bay Area and Sacramento. They worked Robin, WA6CDR and Mel, WA6JBD who were both on Mt Potosi (DM25gw) in southern Nevada. Midway between the two peaks lies the impediment of the Sierra Nevada mountain range (e.g. Yosemite). Nevertheless, signals were Q5 on SSB and contacts completed in short order. Experienced operators with stations in the 10 to 15-watt range and medium to large dishes work this distance reliably on 10 GHz. The signals traversed the Sierra's obstacles because it's the water molecules and dust particles in the atmosphere above the mountain range that are propagating the signals forward. The key is to have stations with high enough effective radiated power (ERP) to energize those particles at that distance.

John, W3HMS explains that they work the 650 km path most years between FN00wc (south central Pennsylvania) and sites in FN41 (Rhode Island). It takes time and effort. A liaison channel is essential – either cell phone or 2 meters. Sometimes signals have been S9+ on 10 GHz but most of the time they are much weaker. Aircraft scatter gives brief enhancements. By running alternating sequences, the necessary information is exchanged and the QSO progresses to completion.



Mike, WA3TTS operating from Point Gratiot Park, NY (FN02hl). Note his stout tripod to withstand wind. (Photo KB8VAO)

10 GHz Only Category

In the 10 GHz Only category for the second year in a row, Gary, WBØLJC led all 78 operators in this class with a score of 75,333. The husband/wife duo of Chris, NØUK and Holly, KØHAC came in 2nd and 3rd in this category. The top ten scores in this category were split between 6-land and Ø-land. Activity levels remain quite healthy in both areas. Many of the Ø-land operators took part, along with some VE and 8-landers, in an expedition to Lake Superior (see the sidebar). Nationwide, average distances per contact were above 200 km! In the northeast US, (1,2 and 3-land), the average was even higher, trending above 250 km per contact.

Top Ten – 10 GHz Only

WBØLJC	78233
NØUK	71078
KØHAC	64168
KD6W	62505
NØAKC	58931
K6ML	55490
N6NU	55438
KØCQ	54801
WA2VOI	51167
KK6MK	50196



Jerry, KØCQ operated the September weekend from the plains of northern Iowa. Check out the horizons! He completed many 250+ km contacts northward to Minneapolis. (Photo KØCQ)

10 GHz and Up Category

Jon, WØZQ took top honors in this category this year with 76,506 points. Lars, AA6IW and Ron, K6GZA came in 2nd and 3rd in this category. The top ten scores reflect activity across the nation. Almost all of the 37 logs in this category showed activity on 24 GHz. Only four logs showed activity on 47 GHz. Surprisingly, no submitted logs showed operations on 78 GHz. One submitted log showed “light” activity above 300 GHz. Obviously, at least one other operator was on-the-air on those frequencies. Loaner rigs are starting to be available for 24 GHz – see if some are available in your area to use for your first steps on your next new band.

Top Ten – 10 GHz and Up

WØZQ	76506
AA6IW	68446
K6GZA	62992
K9PW	48477
N6RMJ	38551
AF1T	35712
WB8TGY	35102
W1MKY	31021
WA8VPD	26593
W6QIW	25349



Don, W1FKF and Tom, W1EX on Mt. Kearsarge (FN43bj) waiting while Mike, N1JEZ tried to scrounge up some contacts on the 2 meter liaison frequency. (Photo N1JEZ)

Humidity has a detrimental impact on 24 GHz signals. Several operators worked multiple 180 km shots across Lake Superior. Out in California with dry valley air, Ron, K6GZA completed the longest DX on 24 GHz this year at 360 km. Mike, N1JEZ completed the longest 47 GHz QSO at 88 km. Ron, K7RJ completed the longest “light” contact at 156 km using a modulated LED transmitter.

Top 10 QSOs Completed

10 GHz Only QSOs	10 GHz and Up QSOs
WBØLJC 351	WØZQ 336
NØUK 305	AA6IW 308
KØHAC 282	K6GZA 254
KD6W 262	K9PW 235
NØAKC 256	N6RMJ 202
KØCQ 239	WB8TGY 162
KCØP 232	AF1T 143
N6NU 231	W1MKY 132
WA2VOI 226	WA8VPD 129
KØMHC 222	KC6QHP 121



Tony WA8RJF operating from Perry Township Park, OH (EN91kt) on the south shore of Lake Erie in northeast Ohio. Highlight was working Bob, K2YAZ in far northwestern Michigan via rainscatter. (Photo KB8VAO)

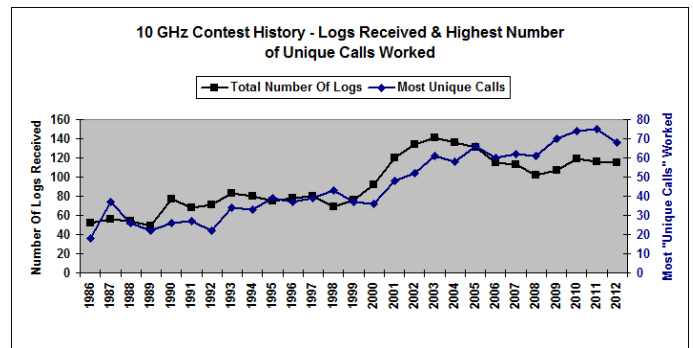
Analysis

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.

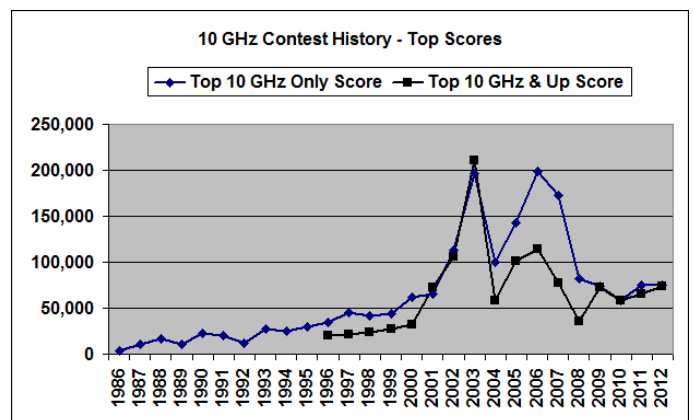
Participation by Call Area

Call Area	Call Entries	Area	Entries
6	31	9	6
1	19	7	5
8	14	3	5
0	13	2	2
VE	10	5	0
4	10	DX	0

First, the trend for number of submitted logs remains flat only decreasing by one this year to 115 submitted logs. Several operators were known to be on the air but did not submit logs. Next year, encourage all operators to take the final step and submit their logs. Even if they are not interested in the aspect of “score”, their submitted log helps as an indicator of activity. Of the 115 logs, the mix between categories shifted notably. 10 GHz Only logs decreased from 87 last year to 78 this year. Correspondingly, 10 GHz and above entries increased from 29 to 37.

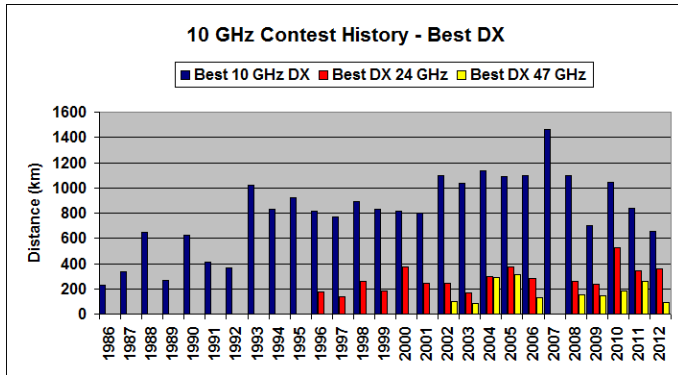


Top Score trends remain steady for the 10 GHz Only category and shows a slight up-tick for the 10 GHz and Above category. Another metric that remained healthy is the total number of QSOs represented in the submitted logs. The recent trend has been in the mid 9000s and this year came in at 9454. Last year was unusual at 8375.



Looking at Best DX over the years, a graph can show the effect of an unusual propagation or the variability of activity levels on the 24 GHz and higher bands. In the past five years, good tropo or rainscatter opportunities

led to the two longer 10 GHz DX distances. While 652 km is a real accomplishment this year, conditions didn't enable spectacular enhancement like some years. The decline in 47 GHz DX this year was more an indicator of activity since only four submitted logs showed activity. Obviously, the more activity, the more we can explore the limits of what is possible.



Looking Ahead

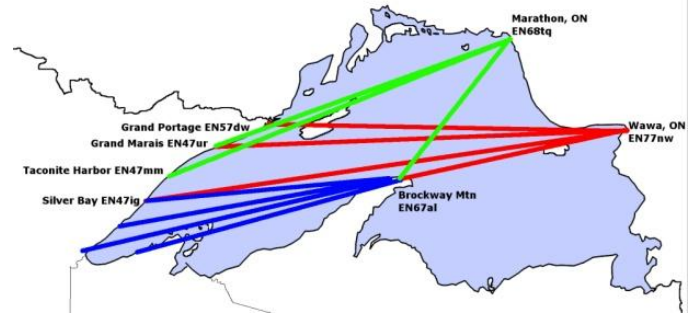
For 2013, make a point to get on the air for this event. Put it on your calendar for August 17-18, 2013 and September 21-22, 2013. I propose a nationwide goal of 125 submitted logs. Reach out to new operators and make sure that all "loaner" rigs get on the air!



Mt. Washington (FN44ig) on the August weekend. Left to right are W1EX 10 GHz, W1EX 24 GHz, W1FKF 10/24 GHz, W1FKF spare 24 GHz, N1JEZ 24/47 GHz (hidden), N1JEZ 10 GHz, W1AIM 10 GHz, and K1LPS 10 GHz. (Photo N1JEZ)

Back to Lake Superior

Microwaves across the Gitche Gumees.



The [Northern Lights Radio Society](#) (NLRS) footprint is centered on Minnesota's Twin Cities and has members in seven states and two provinces stretching from the west end of the Great Lakes westward into the plains. This VHF/UHF/SHF weak-signal club began dabbling with microwaves at 10 GHz back in the late 90s starting with wide-band FM using [Gunnplexer](#) units. Within just a few years, most operators advanced to transverters utilizing SSB and CW.

Initially, these barebones transverters transmitted at the 10 mW level. By carefully finding the highest and clearest operating locations around the Twin Cities, NLRS members reached out to distances up to 70 miles over obstructed paths even with low power. The next step up in transmit power came from 1-watt amplifiers from the [San Bernardino Microwave Society](#). Then 2-watt amplifiers from [Down East Microwave](#) boosted many of the stations. 18-inch offset fed DSS dishes have been the norm since transverters were employed.



Bruce, W9FZ beams the North Shore of Minnesota from Great Sand Bay EN57vk from Michigan's Upper Peninsula. (Photo KØMHC)

Thinking that line-of-sight was required, and not having mountains like other parts of the country, NLRS members traveled to the west end of Lake Superior to try some experiments back in the early summer of 2002. We

found nice operating locations north of Duluth on what a Minnesotan's call "The North Shore". Aiming southeasterly across the lake at other NLRS members operating on Wisconsin's northern shore near the Apostle Islands yielded easy and loud contacts. Distances were now 70 miles or more – and easy. Based on the success of those early experiments, NLRS members made more significant expeditions to Lake Superior for the 2003 and 2004 ARRL 10 GHz and Up contests.

Understanding that a contest rewards points, all the operators on those early expeditions split up into two groups. One group was a rover group that moved up the North Shore along Highway 61 on Saturday and back southward on Sunday. A fixed group found three excellent fixed locations on Michigan's Keweenaw Peninsula. The Keweenaw is a finger of land that sticks up into the south-central part of Lake Superior. This was an expedition as the rover group had a minimum drive time of 4 hours to get started north of Duluth while the fixed group had a drive time of 7 to 12 hours to get into position on the Keweenaw Peninsula.



Mark, WB8TGY and Bob, WA8VPD traveled over 11 hours of driving from the Detroit area to operate with the Keweenaw group. Here, they are on Brockway Mtn aiming at Minnesota's North Shore. (Photo W9FZ)

What we discovered during these expeditions is that 10 GHz signals can be amazingly loud and easy to make in the 250 to 325 km range. In fact, receivers right on the edge of the water—less than 10 feet above the surface of the lake—often had needle-pinning strong signals. Receivers two and three hundred feet above the water on hilltops, while still good, were never as good as right above the water. What could be enhancing these low-altitude signals right above the water?

Research on the web revealed a mechanism called "the evaporative duct". The Navy found that microwave signals at 3 GHz and above propagated more easily than they expected and led them to research this mechanism. In a nutshell, there is high humidity right above the

water—particularly with wind-churned waters. If a dry air mass is above the water, the humidity falls from "high" right above the water to "low" 100 feet up in the dry air mass. This sharp change in humidity yields a sharp change in the incidence of refraction of RF signals. That sharp change effectively makes a duct of 100 feet or less in height. Right on the shore of the lake one is sure to be "in" the duct. Being on a hill two or three hundred feet above the lake means one is likely "above" the duct.



Jim, KØMHC operates from atop Brockway Mtn EN67al. He's aimed towards Duluth, MN 335 km away. (Photo W9FZ)

Over the years of operating 10 GHz across Lake Superior, we've found that when there is a damp air mass above the lake, then the humidity gradient is not sharp enough to offer much ducting effect. But if the air mass is dry, we've seen phenomenal conditions. Unlike stable air mass enhancements over land that are easily broken up by wind, we've found that wind and wave action on the lake actually ensure high humidity right above the water and good evaporative duct action.



Bill KØAWU operating from an overlook above the beach. The higher vantage point never really showed any advantage over the beach location. (Photo KØAWU)

NLRS member's skills and experiences with 10 GHz continued to grow on overland paths as well. Success with frequency accuracy, azimuth accuracy, and map skills found NLRS members making 250 to 350 km contacts easily and much closer to the Twin Cities. From 2005 through 2011, NLRS microwavers explored the plains of Dakotas, southern and western Minnesota, and northern Iowa. Clear horizons over farm fields are all that are needed to work hundreds of kilometers beyond-the-horizon. Operating across Lake Superior was no longer required. But we missed the beauty of the northern woods and Lake Superior.

Remembering the fun and beauty of those earlier expeditions to Lake Superior, NLRS members decided to return to Lake Superior for the 2012 ARRL 10 GHz and Up contest. Not because we needed to but because we wanted to mix microwave ham radio with a northern vacation.

The Plan

Like before, we'd have a fixed group on Michigan's Keweenaw Peninsula. The south central shore location on the lake would make this group workable from all the other locations on the lake. Donn, WA2VOI; Jim, KØMHC; Jerry, KØCQ; Ed, WBØVHF; Linda, KCØJIB; Bruce, W9FZ; Mel, KCØP; Carol, NØHZO; Russ, KB8U; Bob, WA8VPD; and Mark, WB8TGY pledged to make the trek to the Keweenaw. Note that Russ, Bob, and Mark would make a 12-hour drive from the Detroit area to join in the fun.



Barry, VE4MA uses a low power back-up rig to contact EN67al 180 km away with just 12 mw. Signals were S-7 or better on the other end.. (Photo VE3KRP)

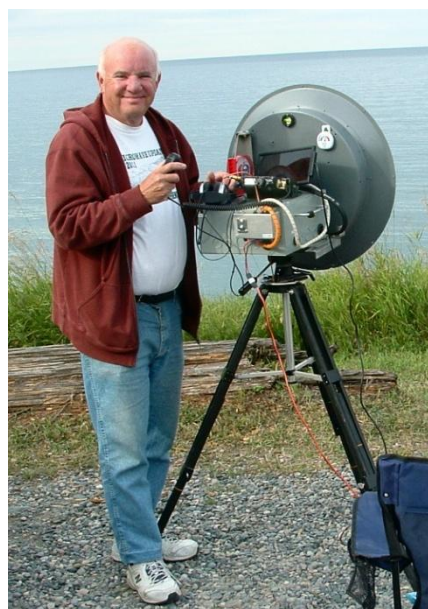
Barry VE4MA from Winnipeg, MB and Eddie VE3KRP from Thunder Bay, ON planned to operate on the north

central shore of the lake from near Marathon, ON. This group would be mostly fixed perhaps locating to one additional location if needed. Peter, VE3ADQ from Sault Ste Marie, ON made the trek westward to join them and have his first 10 GHz experiences.



The three rigs at Wawa, ON EN77nw pointing westward across Lake Superior. Jim KØKFC; Greg N9CHA; and Bill KØAWU are visible. (Photo KØAWU)

Three operators from the Twin Cities intended to make the very long journey to the east end of Lake Superior near Wawa, ON. This team would consist of Bill, KØAWU; Jim, KØKFC; and Greg, N9CHA. Two of three operators went there in 2004 and didn't make a single contact on that trek.



Ed, VE3KRP aims southwesterly across Lake Superior towards Minnesota's North Shore over 300 km away. (Photo VE3KRP)

The reason was that not all operators around the lake had the frequency accuracy necessary for such a long distance contact where signals were very weak. This time, many operators on all sides of the lake had rigs with high frequency accuracy.



Barry, VE4MA; Ed, VE3KRP; and Peter, VE3ADQ were the Marathon, ON contingent. Two days on the beach for only a few contacts – but it was worth it. Peter made his first 10 GHz contacts on this expedition. (Photo VE3KRP)

Several Twin Cities operators really enjoy the idea of roving—lots of radio and lots of changing scenery. These operators pledged to join a “rover pack” that we called “North Shore”. They would operate from many locations northward from Duluth along the North Shore. Gary, WBØLJC; Jon, WØZQ; Chris, NØUK; Holly, KØHAC; Glen, KCØIYT; John, WØJT; Charlie, NØAKC; Mike, KBØOZN; and Pete, K9PW (traveling all the way from Chicago) would be in this group.



The North Shore rover-pack at yet another location. 30 minutes later they are all down the road towards the next spot. The rover-pack operated from eight different locations each day. (Photo NØAKC)

Gary, WØGHZ and Don, WAØSSN intended to make a small activation near Wisconsin’s Apostle Islands. They’d likely only contact the North Shore rovers, but the additional activity—particularly on 24 GHz would be welcome.



John, WØJT in a typical scene right near the water. Conditions were often quite good within 10 or 20 feet of the water level. (Photo WØJT)



Mike, KBØOZN’s set-up pointing out over the lake. Magnetic compasses were of little use due to local magnetic deposits. (Photo WØJT)

The North Shore to Keweenaw paths were proven many times in the past as a consistent point generator. The real test was to have the North Shore rover group contact the Marathon group and the Wawa group. Liaison would be difficult so frequency and azimuth accuracy would be required for success over these significantly long paths.



Charlie, NØAKC enjoying the north woods adventure. Although there was rain on Saturday morning keeping the rovers in the cars, the rest of the weekend was quite nice. (Photo KBØOZN)

The Results

The weather turned out pretty nice. Yes, the Keweenaw had one morning hampered by light rain. The North Shore rover group had it even worse with heavy rain keeping them in their vehicles. But by noon of Saturday it cleared out and the rest of the weekend was beautiful. Radio conditions were pretty good. Most of the contacts in the 250 km or less range were quite loud and easy.

Evaporative duct conditions were detected some of the time and missing at others. To show you how good conditions can be, Bob, WA8VPD was right down on the water working stations 250 km away across the lake. He noted that signals were needle-pinning strong. He disconnected the antenna and still had S-7 signals with just an open SMA connector on the end of coax. Now that's strong! Later, some rain showers came through and seemed to break up the evaporative duct.



Jon, WØZQ operating at the Thompson Rest Stop EN36vr above Duluth, MN. The path to the Keweenaw is over 325 km eastward. (Photo KBØOZN)

Although signals could be loud, there were periods of “poor” conditions. That’s when other challenges arose. Azimuth accuracy is a challenge near Lake Superior. Due to magnetic deposits, compasses are useless. Operators used visual offsets from known landmarks and GPS units to determine a known line from which to offset. Another challenge was having virtually no liaison on 2 meters or cell phone. Distances were beyond what portable 2 meter sideband can reliably provide. Cell phone coverage was spotty in the north woods—particularly in Canada. 10 GHz actually provided our best liaison.

The North Shore rover pack made over 150 contacts mostly with the stations on the Keweenaw. They activated more than eight locations each day. But the real highlight of the expedition was successfully working across Lake Superior in the long east-west direction.

Hats off to Glen, KCØIYT. He initiated schedules with the Wawa and Marathon groups. Glen chose particularly good operating locations to ensure success. He located to far northern Minnesota near the Canadian border to have the clearest and closest shot towards Wawa, ON. Once he successfully contacted them, he moved southward along the shore lengthening the path and was successful three more times with 488 km being the longest. Jon, WØZQ and Chris, NØUK joined Glen at two sites and also worked Wawa, ON from the North Shore.

Quite a few contacts were made on 24 GHz as well. Barry, VE4MA and Ed, VE3KRP worked 180 km to the Keweenaw contacting Donn, WA2VOI and Bob, WA8VPD. Jon, WØZQ and Pete, K9PW worked from the North Shore to the Keweenaw again working Donn, WA2VOI on 145 km paths and Gary, WØGHZ on 100 km paths. Signals were steady but near the limit of what is possible in that humidity.



Glen, KCØIYT ready to work Wawa, ON EN77nw and Marathon, ON EN68tq. Glen initiated the schedules and made the commitment to be in operating locations offering the best chance to successfully make contacts across the length of Lake Superior. (Photo KCØIYT)

A Success

This expedition was a clear success. Beautiful environment and weather combined with plenty of long-haul microwave contacts. Twenty-eight operators got what they came for – north woods beauty and plenty of microwave activity. There will be future expeditions to Lake Superior but we may do it outside of a contest. If this sounds like fun, consider mounting your own expedition to a Great Lake near you. If Lake Superior sounds particularly attractive, get in touch with the Northern Lights Radio Society for gladly shared details.