# The Quest for 222 MHz WAS

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The ARRL's Worked All States (WAS) award is the most sought-after operating award in amateur radio. Thousands upon thousands of radio amateurs around the world have earned the award. While HF operators tend to focus on the DX Century Club (DXCC) award and VHF enthusiasts pursue the challenge of the VHF/UHF Century Club (VUCC) award, interest in WAS is shared by all.

The *Worked All States Club* was first announced in QST in January, 1936, during the same period as the DXCC award was being developed. Except for endorsements the rules were substantially similar to those used today. An operator was required to be in the same location for all contacts. Currently one can move up to 50 miles away from an original location and still receive credit for previous QSO confirmations. Unlike DXCC, the award did not start fresh after World War II and earlier contacts remained valid. Among radio amateurs worldwide the award remains very popular. Over time the certificate has undergone some changes, mostly to make it more colorful.

Alaska and Hawaii gained statehood after the beginning of the Worked All States award program. As a result, contacts with stations in Alaska must have been made after January 3, 1959, and contacts with stations in Hawaii must have been made after August 21, 1959.

While achieving WAS on the HF bands presents the operator with challenges, in no way does it compare to the effort required to achieve WAS on the bands above 30 MHz. A station must implement different operating modes with tropospheric ducting (tropo), meteor scatter (MS), sporadic E (Es), Aurora (Au) and Earth-Moon-Earth[1] (EME) propagation methods in order to complete a contact with all 50 states.

As 2021 came to a close, the number of WAS awards issued for the bands above 50 MHz[2] is shown in Table 1.

**Table 1 – Number of WAS Awards Issued on Each VHF Band**

| | |
|---|---|
| **50 MHz** | **1532** |
| **144 MHz** | **229** |
| **222 MHz** | **10** |
| **432 MHz** | **30** |
| **902 MHz** | **0** |
| **1296 MHz** | **3** |

There have been no WAS awards issued for 902 MHz or 2304 MHz and above. The low number of awards issued on the bands indicated in the table illustrates the effort one must invest in achieving WAS on these frequencies.

## History of 1.25 Meter Band

Some experimental amateur use in the U.S. was known to occur on the "1+1⁄4-meter band" as early as 1933, with reliable communications achieved in the fall of 1934.

In 1938, the FCC granted U.S. amateurs privileges in two VHF bands: 2.5 meters (112 MHz) and 1.25 meters (224 MHz). Both bands (as well as 70 centimeters) were natural harmonics of the 5-meter band. Amateur privileges in the 2.5-meter band were later moved to 144–148 MHz and the old frequencies reassigned to aircraft communication during World War II. At that time, the 1.25-meter band expanded to a 5 MHz bandwidth, spanning 220–225 MHz.

Amateur use of VHF and UHF allocations exploded in the late 1960s and early 1970s as FM repeaters were placed on the air. Repeater use sparked a huge interest in the 2-meter and 70-centimeter bands however this interest never fully found its way into the 1.25-meter band. Many amateurs attribute this to the abundance of commercial radio equipment designed for 136–174 MHz and 450–512 MHz that amateurs could easily modify for use on the 2-meter and 70-centimeter bands. There was no commercial frequency allocation near the 1.25-meter band and little commercial radio equipment was available. This meant that amateurs who wanted to experiment with the 1.25-meter band had to build their own equipment or purchase one of the few radios available from specialized amateur radio equipment manufacturers. Many of the repeaters which have been constructed for 1.25-meter operation have been based on converted land-mobile base station hardware, often extensively modifying equipment originally designed for other VHF bands.

By the 1980s, amateur use of the 2-meter and 70-centimeter bands was at an all-time high while activity on 1.25 meters remained stagnant. In an attempt to increase use on the band, many amateurs called for holders of Novice-class licenses to be given voice privileges on the band. In 1987, the FCC modified the Novice license to allow voice privileges on portions of the 1.25-meter and 23-centimeter (1.24–1.30 GHz) bands. In response, some of the bigger amateur radio equipment manufacturers started producing equipment for 1.25 meters. It never sold well, and by the early 1990s, most manufacturers had abandoned providing this equipment.

In 1973, the FCC considered Docket Number 19759, which was a proposal to establish a Class E Citizen's band service at 224 MHz. The proposal was opposed by the ARRL and after the explosive growth of 27 MHz Citizen's Band usage the FCC dropped consideration of the docket in 1977.

In the late 1980s, United Parcel Service (UPS) began lobbying the FCC to reallocate part of the 1.25-meter band to the Land Mobile Service. UPS had publicized plans to use the band to develop a narrow-bandwidth wireless voice and data network using a mode called Amplitude-Companded Single Sideband (ACSSB). UPS's main argument for the reallocation was that amateur use of the band was very sparse and that the public interest would be better served by reallocating part of the band to a service that would put it to good use.

In 1988, over the objections of the amateur radio community, the FCC adopted the *220 MHz Allocation Order*, which reallocated 220–222 MHz to private and federal government land-mobile use while leaving 222–225 MHz exclusively for amateur use. The reallocation proceeding took so long, however, that UPS eventually pursued other means of meeting its communications needs. UPS entered into agreements with GTE, McCall, Southwestern Bell, and

Pac-Tel to use cellular telephone frequencies to build a wireless data network. With the 220–222 MHz band then left unused, the FCC issued parts of the band to other private commercial interests via a lottery in hopes that it would spark development of super-narrowband technologies, which would help them gain acceptance in the marketplace. In the 1990s and into the 2000's paging companies made use of the 1.25-meter band. Most all such use ended by the mid-2000's, with the paging companies being purchased by others and services moved to newer systems, or having gone out of business.

220 to 225 MHz (and thus 222 to 225 MHz) is only authorized for use by radio amateurs in ITU Region 2 which is North, Central and South America including the Caribbean and current activity is centered in the United States and a few stations in Canada. Unfortunately, the band is not authorized for amateur radio use in other parts of the world

In 1988 following the FCC's removal of 220-222 MHz for use by radio amateurs, activity and interest in the band dampened. Even though 222-225 MHz became a primary allocation to the Amateur Radio Service it left weak signal enthusiasts with the dilemma of having to modify existing equipment to operate within this range and several operators simply decided not to do so. Ever since the reallocation, amateur weak signal activity has never regained the popularity on 222 MHz it once did, although it still enjoys a significant amount of activity during the VHF contests throughout the year.

## The First Ten 220 MHz WAS Recipients

220 MHz WAS #1 was awarded to Terry Van Benschoten, W0VB, on November 28, 1983. Nine additional radio amateurs subsequently achieved WAS as shown in Table 2.

**Table 2 – Original 220 MHz WAS Recipients**

| Award # | Callsign | Date | Notes |
|---|---|---|---|
| 2 | W0SD | 2/28/84 | Submitted in person at ARRL same day/same time #3 not issued |
| 2 | WB0TEM | 2/28/84 | Submitted in person at ARRL same day/same time #3 not issued |
| 4 | K5FF | 3/13/84 | |
| 5 | W5FF | 3/13/84 | |
| 6 | WB5LUA | 4/30/84 | Now W5LUA |
| 7 | VE3EMS | 11/5/84 | Now VE7PS |
| 8 | W3GPY | 3/26/86 | |
| 9 | K9KFR | 8/19/86 | |
| 10 | KA0Y | 8/24/87 | |

During this time, computer use by radio amateurs did not exist so computer-generated digital modes were not available. When distant contacts were attempted beyond occasional tropospheric ducting openings operators employed MS, Es, Au, and EME using SSB and CW to complete contacts. The difficulty of these attempts far outweighs the luxury we enjoy today with computers, high speed meteor scatter programs and digital signal processing.
There were some states that had no 220 MHz activity. To resolve this issue Ed Gray, W0SD, Marc Thorson, WB0TEM, and Barry Arneson, WB0PJB, embarked on a roving excursion (long

before the term “rover” was commonplace among the VHF community!) from October 29, 1983 through January 22, 1984 to activate CT, DE, ID, KS, MD, NE, NV, NY, OR, RI, VA, VT, WV and WY. W0VB and W0RGU shipped equipment to KH6BFZ in Hawaii and then traveled there to activate that state. Regarding the portable equipment used, W0SD noted “The portable antenna was 8- 220 Yagi’s with about a 12-foot boom. We had a tri-pod and rotated and elevated manually. We had horizontal and elevation markings and it worked fine. I think there was always two of us. With just one it would be a bit of a challenge but with two it was easy. Most of the time we could hear our own echo's. Of course, this was all on CW.”

The story of their adventures, as told in the “K5FF 220 MHz Newsletter”, is reproduced here in Appendix 2.

Stations active on 220 MHz during the early 1980’s utilized a variety of equipment as indicated in Table 3 along with the antenna used for EME.

**Table 3 – EME Equipment Used by 220 MHz Stations in Early 1980’s**

| Station | EME Antenna | Amplifier | LNA |
|---|---|---|---|
| W0VB | 4x17 ele CC Boomers | 8877 | D432 |
| WB0TEM | 16x13 ele Yagis | 2x4CX350 | GaAsFET |
| W0SD | 16x13 ele Yagis | 2x4CX350 | GaAsFET |
| K5FF | 32 ft Dish | 8877 | D432 |
| W5FF | 32 ft Dish | 8877 | D432 |
| WB5LUA | 24 ft Dish | 8877 | D432 |
| VE3EMS | 8x17 ele CC Boomers | 8877 | MGF1200 |
| W3GPY | 8x14 ele KLM | 8877 | D432 |
| KA0Y | 42 ft Dish | 2x8874 | MGF1200 |
| K2UYH | 28 ft Dish | 7930 | MGF1200 |
| W4WD | 4x17 ele CC Boomers | 8877 | |
| K7ND | 4x17 ele CC Boomers | 8877 | MGF1200 |
| W1JR | 8x15 ele NBS Yagis | GL6942 | ALF-1023 |
| KL7NO | 4x17 ele CC Boomers | 2x4CX250 | Lunar |
| W6PO | 16x7 ele Yagis | 8877 | GaAsFET |
| K1WHS | 8x17 ele CC Boomers | 8877 | MGF1200 |
| K7NII | 8x4.2 λ Yagis | 2x4CX250 | D432 |
| K4KPV | 4x17 ele 3.2 λ Yagis | 8877 | DXL3501 |
| WA8VPD | 4x17 ele CC Boomers | 8874 | MGF1402 |
| KH6BFZ | 8 HB Yagis | 8877 | GaAsFET |
| WA4NJP | 36 ft Dish | 900 W | MGF1302 |

## Publicizing Activity

For the initial group in the early 1980’s, publicizing activation plans and operating schedules had to be performed via nets on the HF bands, on a land line telephone or via regular USPS mail. Email and the internet did not exist! This also forced a station to ensure the contact was complete “on-the-air” and not in an internet chat room! In addition to QST, VHF conference proceedings and newsletters were available that identified active stations and reports of activity however these were distributed via USPS mail. Dave Olean, K1WHS, recalls one such newsletter was the

"K5FF 220 Activity Newsletter" that Lee Fish, K5FF, produced on a mimeograph and mailed out to interested operators. In the December 1982 edition, Lee noted:

> "FLASH!!! 220 MHZ FIRST!!!
>
> K1WHS using a single 220B Cushcraft Boomer yagi worked K5FF with her 32 foot dish for the "FIRST" single yagi EME QSO on the band.
>
> Dave took one of his boomers out of his just completed big array, sealed and waterproofed for winter, and put it on a pipe with a U-bolt to the side of his tropo tower. The back of the antennas was only 5 inches from the garage and the area was so tight that he had to put it up vertically polarized. He ran 50 feet of 7/8 foam with a GaAsFET at the antenna.
>
> Though it was raining in Maine, the QSO was completed with 73's in just 20 minutes and the very first time we tried to run – 1000z to 1020z, December 6, 1982. We had to rotate the feed in the dish 90 degrees between transmit and receive for a very easy QSO.
>
> O.K. you guys get out there: Get those yagis pointed at the moon (no horizon) and call me for a sked."

In Ham Radio magazine Joe Reisert, W1JR, dedicated the September 1984 column "VHF/UHF World" to 220 MHz EME and later presented an update on 222 MHz EME requirements at the 1992 Northeast Weak Signal Group conference. In the 1989, 1990 and 1991 Proceedings of the Central States VHF Society Conference Peter Beedlow, NN9K, presented a list of active 220 MHz stations and in the 1990's active 222 MHz EME stations were listed in the VHF EME Report published by Doug Allen, W2CRS, with a list of "EME Ready" 222 MHz stations assembled by Todd Evans, KB6IGC.

Distributing news and activity is, of course, much easier and more efficient today. So much so that the number of internet chat rooms sometimes makes it difficult to keep up with the flow of information. Slack is a current favorite of VHF'ers however much of the meteor scatter chatter is still on the N0UK Ping Jockey page with 222 MHz EME activity on the HB9Q 222 chat page. A 222 Activity email reflector is available on groups.io.

## A New Quest Begins!

In late 2020 and early 2021 increased focus on 222 MHz WAS developed. K1OR, K5QE, N9HF, and W5ZN each had 40 or more states confirmed on the band and were within reach of completing WAS. Dave Olean, K1WHS and Ray Rector, WA4NJP, who were both active in the early 1980's were still active on the band and only needed one or two states to complete WAS. N0AKC had worked and confirmed 32 states and concluded he could significantly increase his state total with activity currently on the band. Interest was further heightened with planned portable operations by Gene, KB7Q, in the west for MT, NV and WY and Peter, KA6U, in the northeast for MA, NH, RI and VT. KA6U also hit several other states on the east coast and upper Midwest providing new states for those in the 222 MHz WAS pursuit with lower state totals. Photos from some of their setup locations is shown in Figures 1 through 4.

**Figure 1 - KB7Q Big Horn Pass Wyoming MS & EME**

**Figure 2 - KB7Q in DN21 Nevada - EME**

**Figure 3 - KA6U Rhode Island**

**Figure 4 - KA6U New Jersey (lower left) Activation at "Project Dianna" Site of the First Moonbounce Communication in 1946**

The status of the group currently pursuing WAS is shown in Table 4. This reflects their standing as of the writing of this paper.

**Table 4 – Status of Stations currently pursuing WAS on 222 MHz**

| Award # | Station | Award Date | Completed | Needed |
|---|---|---|---|---|
| 11 | W5ZN | 12/28/21 | 50 | N/A |
| 12 | K5QE | 1/11/22 | 50 | N/A |
| 13 | K1OR | 1/12/22 | 50 | N/A |
| 14 | N9HF | 1/18/22 | 50 | N/A |
| 15 | WA4NJP | 1/19/22 | 50 | N/A |
| 16 | N0AKC | 1/28/22 | 50 | N/A |
| N/A | K1WHS | N/A | 48 | AZ, MS |

## Propagation Methods Used to Complete WAS

As previously noted, working all 50 states on any VHF/UHF band requires the use of multiple propagation methods, especially EME on 144 MHz and above. The general impression among casual VHF operators seems to be that 222 MHz propagation isn't very good especially since it is much higher in frequency than 2 meters and must act more like 432 MHz. Experienced 222 MHz operators know very well this is not the case, and in some instances 222 MHz produces fantastic results. While meteor bursts are faster and shorter in duration than on 2 meters the distances possible via meteor scatter are close to those on 144 MHz. Table 5 shows the propagation modes used by N0AKC in Wisconsin, N9HF in Florida, K1WHS in Maine, K1OR in New Hampshire, W5ZN in Arkansas, and W5LUA in Texas (from the 1980's) to contact 50 states while Figures 1 through 6 graphically depict the propagation method used for each state. Tropospheric ducting provided the most success for the southern stations along with MS. The northern and northeast states had significant success using these along with Au providing a few more. Obviously working all states on 222 MHz is not possible using only terrestrial modes and EME must be employed for states beyond terrestrial capabilities. This becomes even more critical for stations located outside the middle USA on the east or west to grab a new state.

The first EME contact on 220 MHz occurred on March 15, 1970 between WB6NMT and W7CNK and the following evening WB6NMT worked K2CBA as documented in the May, 1970 issue of QST. A photo of K2CBA's 220 MHz EME array appeared in QST in December, 1969 and is also shown here in Appendix 1.

**Table 5 – Number of states worked per propagation mode**

| Station | State | Tropo/Direct | Meteor Scat | Aurora | EME |
|---|---|---|---|---|---|
| N0AKC | WI | 12 | 10 | 1 | 27 |
| N9HF | FL | 9 | 20 | - | 21 |
| K1WHS | ME | 11 | 9 | 9 | 21 |
| K1OR | NH | 12 | 21 | - | 17 |
| W5ZN | AR | 21 | 16 | - | 13 |
| W5LUA | TX | 24 | 6 | 1 | 19 |

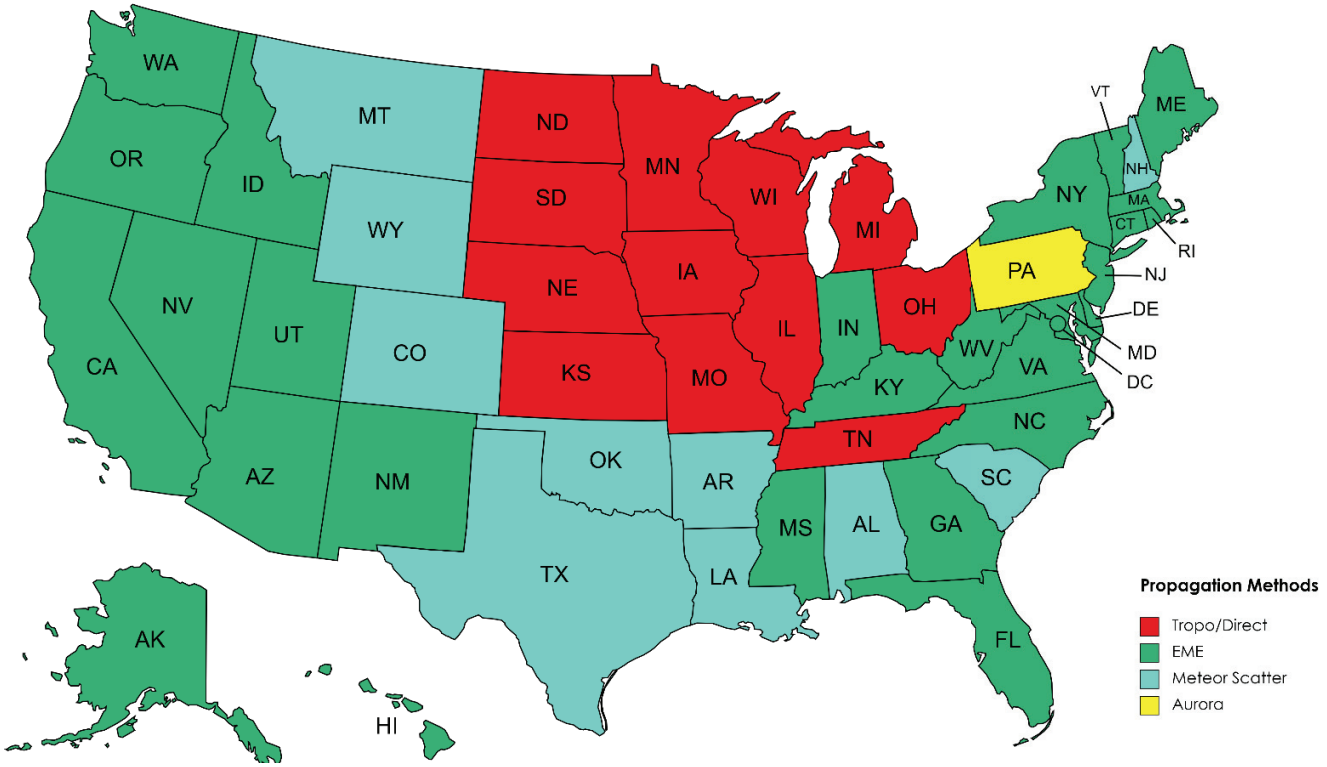


**Figure 1 – N0AKC (WI) States Worked Via the Different Propagation Modes**

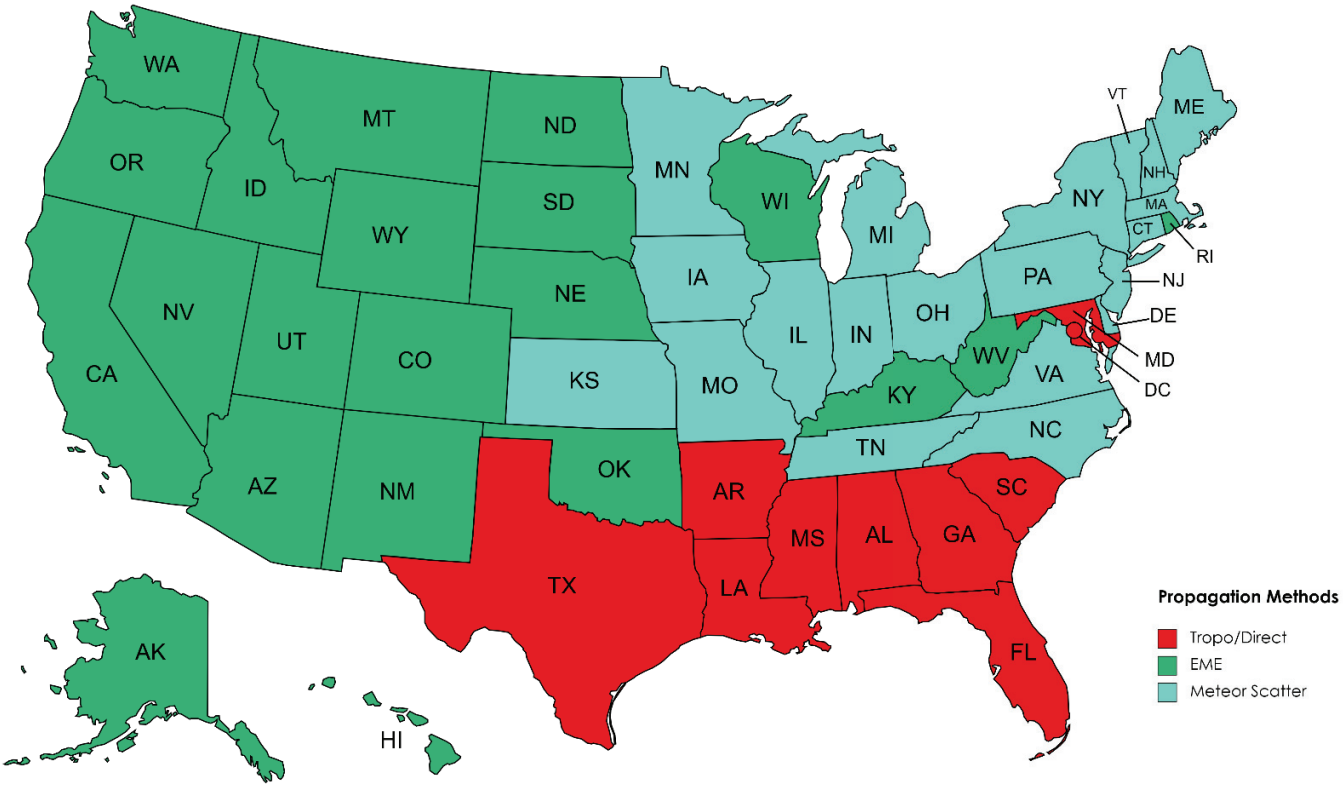


**Figure 2 – N9HF (FL) States Worked Via the Different Propagation Modes**

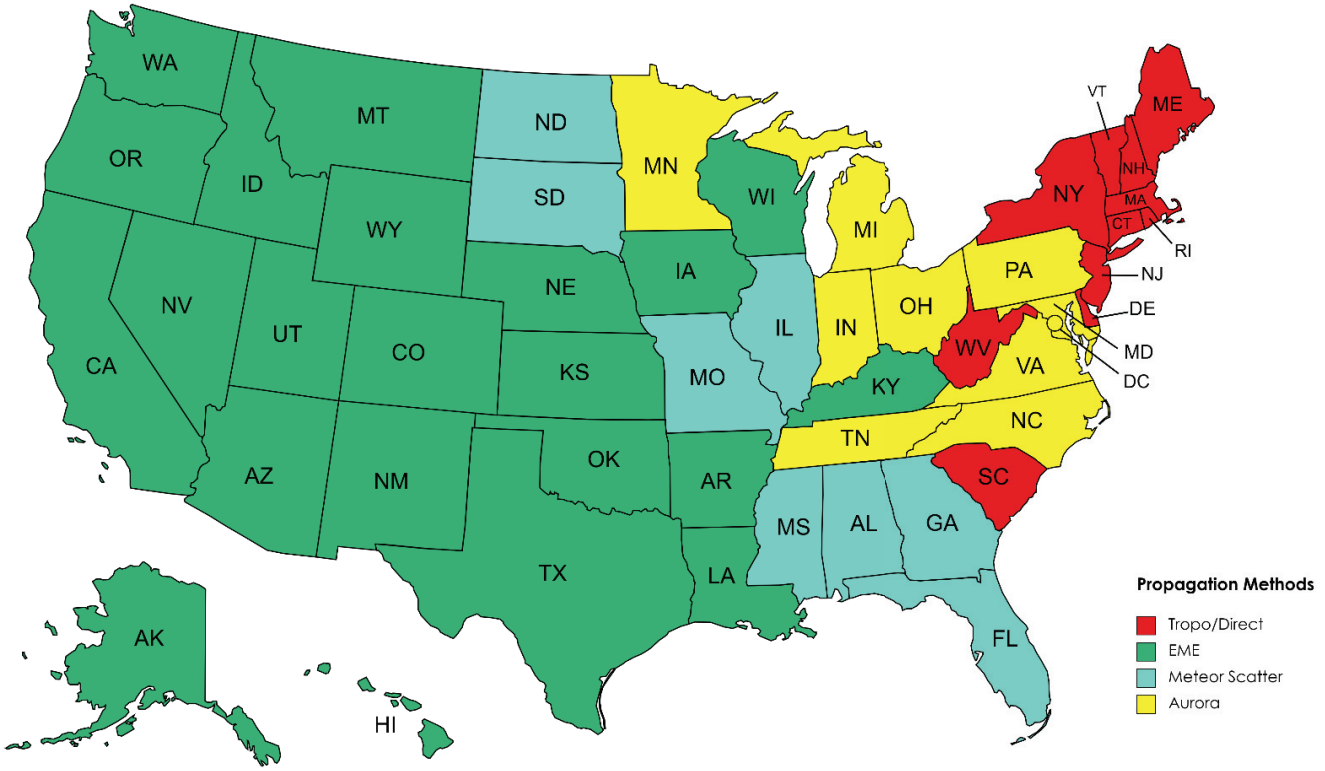


**Figure 3 – K1WHS (ME) States Worked Via the Different Propagation Modes**

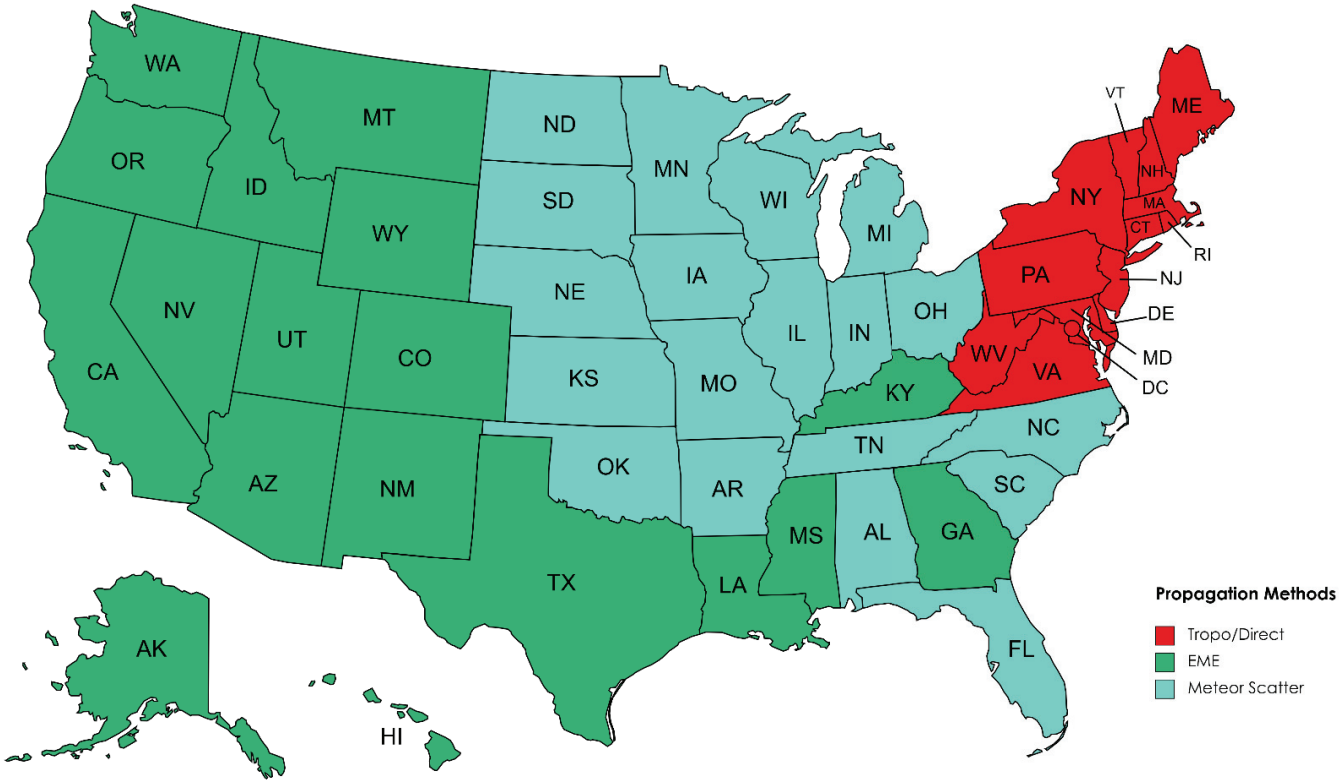


**Figure 4 – K1OR (NH) States Worked Via the Different Propagation Modes**

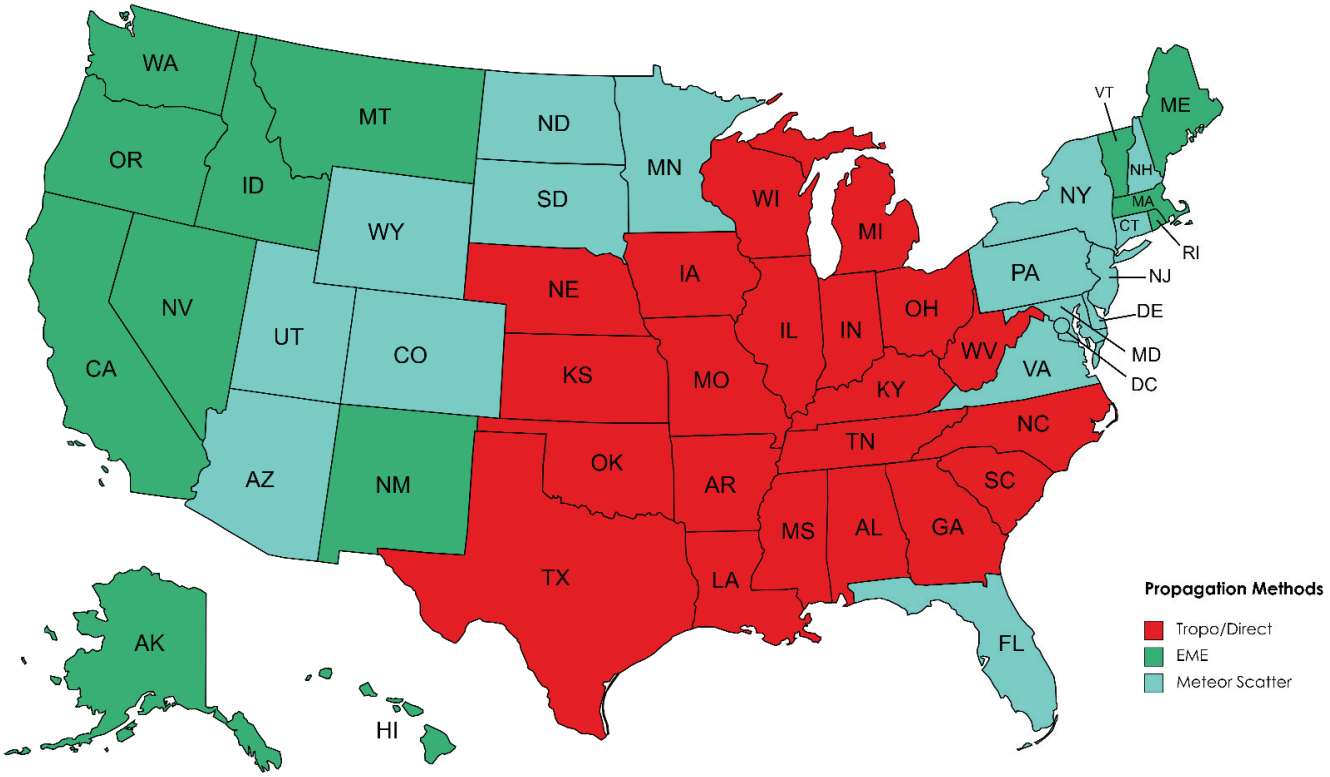


**Figure 5 – W5ZN (AR) States Worked Via the Different Propagation Modes**

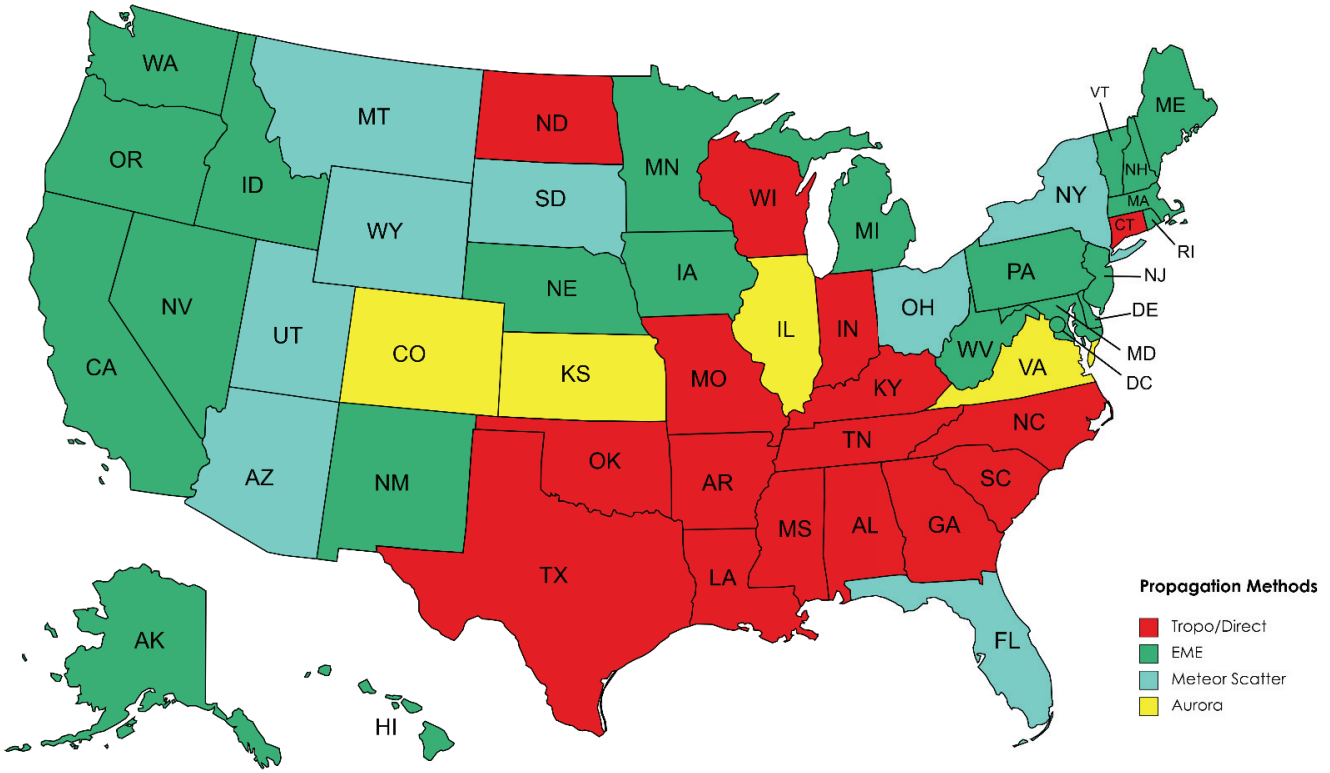


**Figure 6 – W5LUA (TX) States Worked Via the Different Propagation Modes**

## 222 MHz Equipment

The technological improvements in equipment that exists today enhances the probability of success for terrestrial propagation modes and affords the opportunity for smaller stations to complete an EME contact. The component structure of equipment used on 222 MHz has not changed much over the years as the basic transverter layout remains the most popular. A commercially available "all mode" radio for this band does not currently exist although some of the major manufacturers have offered such in the past. One of the reason a stand-alone radio does not exist is simple economics. As previously noted, the 222 MHz band is not an international allocation so there is no market for such a device in Japan, Europe or countries outside of north America. Today's transverters, however, provide very low receive noise figures and transmit power levels up to 100 watts, more than enough power to complete several tropo and meteor scatter contacts. This power level is also more than enough to drive a tube or solid-state power amplifier to increase the range of a possible contact or to employ EME. Combined with a modern transceiver, a transverter can provide far superior station performance than any previous stand-alone radio. Table 6 describes the equipment in use today by several of the 222 MHz stations pursuing WAS.

**Table 6 – Equipment in Use Today by 222 MHz WAS Stations**

| Station | Radio | Amplifier | Terrestrial Antenna | EME Antenna | Preamp |
|---|---|---|---|---|---|
| K1OR | Flex 6700 & DEMI xvtr | Larcan SSPA | 1x17 ele LFA | 4x17 ele LFA | GaAsFET |
| K1WHS | Elecraft K3 & DEMI xvtr | 8877 | 2xFO16 | HB 4x22 | DEMI |
| WA4NJP | Yaesu FT-736R | 2x4CX150 350 watts | N/A | 36 ft Dish | HB MGF1302 |
| K5QE | Icom 756 Pro II & DEMI xvtr | Solid State PA | 4x7WL $M^2$ | 8x222XP40 M2 | AGO |
| W5ZN | Elecraft K3 & DEMI xvtr | Lunar Link LA-12 | 2xFO16 | 2xFO16 | ARR |
| N9HF | Yaesu FT-847 & DEMI xvtr | W6PQL SSPA | 4xFO16 (15 ft high) | 4xFO16 | ARR |
| N0AKC | Icom IC7300 & DEMI xvtr | W6PQL SSPA | 1xFO16 | 2x222-7WL $M^2$ | 2 Stage DEMI |

## Expansion of Operating Modes Beyond SSB & CW

While the operators of the early 1980's utilized the same propagation methods as those pursuing WAS today, the operating techniques have advanced to an amazing technological level. The introduction of the WSJT-x suite of digital software tools has exponentially elevated the ability to detect and decode weak VHF signals. You no longer must sound like an auctioneer screaming the last breath from your lungs to complete a meteor scatter contact with SSB. High speed meteor scatter software programs like MSK144 provide amazing decoding capability for the very fast, short duration meteor bursts on 222 MHz. JT65 and Q65 allow detection and decoding of EME signals beyond what was capable with CW in the 1980's. This alone has permitted single yagi stations the ability to complete an EME contact with 2 yagi stations and even single yagi to single yagi contacts may be possible. For EME, though, dealing with Faraday rotation can still

lock out stations for several hours. And what has become the most popular digital mode, FT8, provides for easy contacts out to 500 miles even during marginal conditions.

No doubt this enhanced the quest of this second group of 222 MHz WAS contenders. One vitally important element, however, that still remains and requires extreme dedication regardless of the operating mode, propagation method or advanced software tools is the focus of the individual operator to be alert, pay attention to propagation conditions, listen intently to the bands, make schedules during optimum times and in some cases lose a lot of sleep to complete that one exciting contact for a new state!

## The 222 MHz Challenge!

Are you up to the challenge to pursue WAS on 222 MHz? Who will be in the next group to join the "Quest for 222 MHz WAS"? Interest and activity on 222 MHz has increased, Alaska and Hawaii have permanent activity now and portable operation from folks like KA6U, KB7Q, and N7GP and others is being planned for the coming year.

Do NOT miss your opportunity to pick up a new state on an exciting VHF band!

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Notes:

[1] "The Journey to EME on 24 GHz" Al Ward, W5LUA & Barry Malowanchuk, VE4MA, Part 1-QST October 2002; Part 2-QST November 2002

[2] http://www.arrl.org/50-mhz-and-up-was-lists as of January 31, 2022

The authors would like to acknowledge the following sources for parts of this paper:

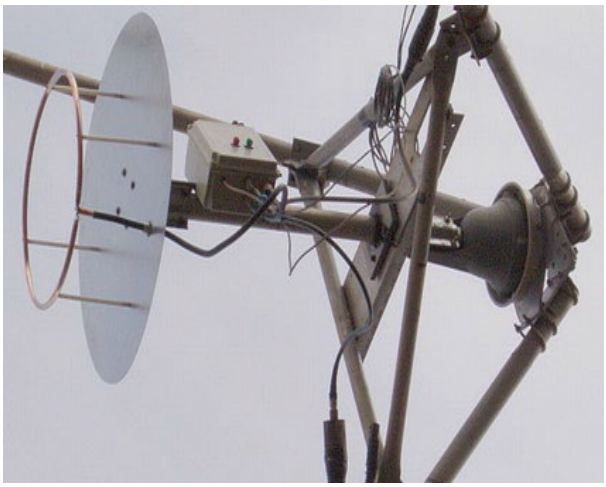
- Central States VHF Society Conference Proceedings
- QST & ARRL, The National Association for Amateur Radio
- Peter Shelton, VE7PS, for supplying the K5FF 220 MHz Newsletters
- Wikipedia
- Ham Radio Magazine – Joe Reisert, W1JR
- Northeast Weak Signal Group (NEWS) Conference, 1992, W1JR

# Appendix 1
# EME Array Photos

N0AKC 2x222 7WL $M^2$ EME Array

N9HF 4xFO16 222 MHz EME Array

W5ZN 2xFO16 222 MHz EME Array



WA4NJP 222 MHz Dish Feed

**WB6NMT's 220 MHz EME Array**
**Circa 1983**


**Paul WA4LYS and Fred W5FF in 1984**

# Appendix 2 - 220 MHz EME Expeditions from K5FF EME Notes

220 EME DXPEDITION
TO OR/NV & WY/ID
BY WB0TEM & W0SD

I hope Marc & I gave you some excitment on 220 with 4 states in 4 days. We thought you might be interested in a few details of the trip and some observations we had. First of all we feel things went really well. We worked a total of 41 different contacts on the trip which is far above any other EME Expedition I've ever heard about. From NV/OR we worked 16 on 220 and 15 on 432. From WY/ID we made 10 contacts on 220 and never tried it on 432.

As you probably remember we had planned on Gene-KD6R going to Nevada/Oregon and we would go to Wy/ID. Unfortunately Gene had trouble and had to abort the operation and return home. We made a quick decision to try and go to all four states. I went to Marc's place on Tuesday evening, Oct. 25th and we worked on finishing up the 432 antennas, put lights on the trailer, finishing phasing lines, and packing. When Marc got home frome work on Wed. we finished packing, ate, and took off. It took us 30 hours to get to our proposed site on the NV/OR border near McDermit, Nev. We expected more people calling us on 3.818 and 14.345 on the way out as we called on the freq. a good deal and monitored them 24 hours a day. We did talk with K6PVS, W5FF, W0PUF, VE7BQH, and N6AMG on the way out. We forwarned them that we had an excellent chance of being on a day early.

When we got near the site we made contact with WA7BRE-Pete on a repeater and found out about our proposed site and got specific information on where to operate. Upon arriving at McDermit 30 hours after leaving Akron, Ia having driven straight thru we found a sheriff's deputy. We wanted a place where we would not be asked to leave. He showed up where the state line was in the abandoned part of the airport west of town about 1/4 mile. We started the generator and set up by trouble light. We were on shortly after moon rise and tried to hear echo's with no luck. We called and called on 3.818 and echo tested on the moon. Toward morning we did get ahold of K7ND on 3.818 and at 1200 z heard our first signal from W0VB. We then worked K5FF and W5FF. Next was KA0Y. We now were on 14.345 and talking with W5FF. Lee K5FF was telephoning like mad to try and get others on which we really appreciated. On Friday we had no schedules we just called CQ and listened up.

We also worked in order K9HMB, VE3EMS, K7ND. We had a good deal of moon time left but Lee could find no one else to get on.

We got on Saturday at moon rise and worked W0SD on randoms (operator WB0PJB) followed by WB5LUA, K9KFR, W1JR, K9XY, WB0TEM, K1WHS, and W4WD. As we could hear no one else and no one was on 20 meters indicating they were trying we went QRT on 220 Mhz and set up for 432 Mhz.

We had many local visitors at the site. We also were right by the staging area for their homecoming parade on Friday which the deputy sheriff had forgotten about. Everyone was very nice and some came back several times. Pete-WA7BRE came and visited us which we appreciated. Our calibration was very good and we were always right on the moon. We had 1000 watts out of the 8877 and had the pre-amp antenna mounted. We heard very well. We used all homebrew equipment that Marc put togeter. We had lots of back up for absolutely everything except the generator. Fortunately it gave us very little trouble. We had to replace a cotter pin on the throttle once and re-gap the plug once.

We did not have ignition noise and local noise was very low. We operated out of a tent. It was quite cold at night being about 15 degrees. We did not have snow, but did have rain on Sunday. The WX was very nice during the day on Friday and Saturday getting very pleasant out.

We got very little sleep and eat about 1 meal a day at best. We did drink lots of coffee. Liason got much better on 3.818 and 14.345 as time went on. We want to

thank all of you who got on these frequencies.

On the way out, at various times on 3.818 and 14.345 as well as on the 70CM net we mentioned we would try for WY/ID on Monday. We packed up on Sunday after making 15 contacts on 432 and left for our next location going North into Oregon. We made a wrong turn just before leaving Oregon. We tried to cut across to Nampa on a gravel road through the Mountains only to find the road washed out just beyond a big silver mine near Silver City, ID. We had to backtrack about 20 miles for a total loss of 40 miles. It was a rough mountain road with hair pin turns which made 30 mph a maximum speed. It was very pretty but it did get dark and was frustrating to waste the precious time. We made it to Nampa and had to eat. We then spent a very, very miserable night driving. We were both shot, we could not stay awake, and it was raining. Our 75 meter resonator was out of resonance, so for the first time, we could not work any one mobile. For about the last 100 miles to the WY/ID border it absolutely poured. I put in gas just before leaving I-15 and going on Hwy 30 and got very wet. We did get 15 gallons for the generator at this point which proved to be smart as we never found another gas station.

Fortunately when we got about 10 miles from Border, Wy the rain let up. I still can't believe we could have been so lucky as it had poured for hours previously to this. We arrived where W0RGU had operated and did not like the spot because it was wet, very close to the road, and the trucks were kicking the water up off the road and it would shower over the proposed operating site. We decided to look for another spot. We found one in about 45 minutes to the North. It was east of a town called Geneva, Id and had a nice paved turn out, marker, and much less traffic. We began setting up. It was misting and the clouds were right on the ground. We were amazed we did not get soaked. We were mixed up in directions by about 1/4 of a turn. We gave out the word on 14.345 that we were on site and setting up. It took us about 3 hours to set up. We could not see the moon or sun so we set azimuth and elevation with a compass and level. I'm please to say when we turned the receiver on there were loud signals immediately so we were right on the moon. The site was in a big valley with no roads or fences to indicate direction. I'm sure I'll never get a tougher test to find the moon. I was very pleased to be right on the very first time. As most of you know it would have been nicer if we had been on earlier but it was just humanly not possible. Marc and I spent a really terrible night driving. I've never been any worse off until the next night when on the way home we chucked it in.

Signals were fantastic. I am really disappointed we did not have a tape recorder. I have never heard any thing like it. It has to be the most QRM there has ever beeen on 220. Everybody was loud. Most of you were piled up. I copied 4 signals on one freq. We tried to work those near moon set or nearly out of a window. I'm not sure that is fair or not but being we worked everyone except K7ND it turned out to be a great decision.

For those of you that fixed your system to work from horizon to horizon and who got off work to try and work us I hope you were not to badly offended when I tried to work those with limited windows and moonset problems. I can appreciate you were all under a lot of pressure and I want to assure you I felt the pressure. I called on all my DX experience, contest experience(top 10 in the nation on 10 meters and sweepstakes), and moon bounce experience. If it was a little confusing who I was working is because if you did not come back after one call I assummed faraday was not letting you hear us and I called someone else. On nearly every listening period I could copy call sets from all of you!!! I want to expecially compliment K1WHS and W3GPY. They went way up in freq. and were really in the clear. The rest of you were killing each other being all over each other. Let me assure you as a DXer for years on the Honor Roll I tune 5 up plus some all the time.

In 180 minutes, 3 hours I was able to work 10 of you for an average of 1 every 18 minutes. From my end they were all very good contacts with absolutely no question

as to what was being sent. We could hear very well on all the contacts for the whole trip. We did not work K7ND even though we tried for 2 hours and 10 minutes. Jim was very loud for a long time but faraday was so slow he gave up before he heard us. We had KB9NM call his house and when there was no answer we quite after another 20 minutes. We called CQ awhile longer, checked 20 meters to see if anyone would tell us they were still trying. We got no response so we went QRT at 2145z and started packing up. We left about 3 hours later. We really appreciate the company of KA0Y, K9HMB, WD0FOY, WB0PJB, N6AMG, K6PVS and anyone else I may have missed that last night. During the whole trip I want to specially note K6PVS who checked with us several times everyday, W5FF, and from late Friday on W1JR who also checked on us a lot.

We average 1.33 meals a day, we slept an average of 3.5 hours per day. During the first 48 hours we got 2 hours of sleep. We got a total of 15-20 hours of sleep for the total 6 day trip. We drove 1506 miles to the first site in 30 hours and the total round trip was 3100 miles. We got 13.5 MPG and run the generator 60 hours. It took about 1 gallon per hour. We were on the moon a total of 29-30 hours so we averaged a contact every 44 minutes we were on the moon.

How did we stack up with other Dxpeditions. N6NB/7 at the Utah/NV border worked 10 stations. WB4EXW and K4PKV worked 19 stations from Tenn. in 3 days. We feel we did OK making 41 contacts in 4 days using nearly all homebrew equipment and still leaving complete stations back home. The only commercial equipment was the HF rig for 220 and the TS-600 and 432 microwave module. Absolutely all the rest was designed by Marc and built by him and I. A special thanks should go to Marc for all his work as he did a lot more of it than I did in the advance preparation. I did spend several week ends at Marc's but Marc did most of the building. A special thanks to Barry-WB0PJB who drove 200 miles to operate both our stations. As you may of noticed we did not schedule our own stations so Barry had to monitor 3.818 and 14.345, hear us on random and work us.

What about the future. There is a lot more! We are going to go several places in the next few weeks if at all possible so check the 70CM net and 3.818 CSVHF net if you are interested. All I can say is if something happens and you miss it don't complain. You have been warned. When we are on the road check 3.818 and 14.345 for the latest details AS WE ARE THERE. Don't blame anybody but yourself if you miss us from a stop if you don't check and call us on these two freq.

One other tip. I'd try and increase your window. We always end up with 4 or 5 hours of moon time left and no one on the band. What a waste when you drive 1500 miles to put something on the air!!! When you design future systems I'd sure try hard to increase your window time. I realize this is a problem but Marc has very, very small yard and he can operate 3 eme bands from horizon to horizon so if there is a will there may well be a way to increase your window time.

What is possibly coming up? Tune in to find out!!! I assure you it is good !!!

## ########## 220 MHZ EXPEDITION TO HAWAII #########
(Nov 13, 1983 - Nov 23, 1983)

by W0RGU Carl Laumann Jr and W0VB Terry Van Benschoten

The trip to Hawaii proved to be the most difficult of all our DXpeditions so far. The logistics of transporting a complete EME station to KH6 land was the cause for consternation. If I were to document all the expectations/fears of operating moonbounce from "over there" it would be lengthy, confusing, and inaccurate. Therefore, I'll identify the events as they happened - with a few comments where the perceived was far from reality.

First, the equipment used was that of the station operated by W0SD and WB0TEM on the Ore/Nev and Id/Wy borders. This station was made up of TEM's ICOM 730, homebrew Transverter, remote mounted Gasfet preamp, control box for sequencing the remote antenna mounted preamp, an 8877 amplifier with a 3500V Power Supply, RF attenuator for the 28 MHZ drive (100 watts down to 600 mw), into TEM's 8 - 15 element yagies (homebrew). The H - frame, tripod to support the antennas, and the elevation rotor and manual azimuth position and readout were provided by W0VB and W0ANH. The intermediate amplifier was a Mirage 10-120 watt 220 solid state amp provided by W0RGU. Also provided by W0RGU was a backup MMT220/28 Transverter. An AEA keyer was provided by K0SE. Much time and effort during the expedition was expended by Carl, W0RGU, more on this later.

Second, the Hawaiian location was arranged by a phone call for help by W0VB to KH6BFZ (another I.B.M. employee who was unknown to W0VB). Have you ever tried to invite yourself over to a stranger's house? Joe Keola, KH6BFZ, consented to the operation from his home QTH during the week preceding Thanksgiving. Several phone calls were required to confirm just how much equipment was to be transported to Joe's QTH from the Honolulu airport. As it ended, a little over 600 pounds were shipped over and back from Hawaii. That's 600 !!!!! pounds.

Oh, the equipment was not just sitting in W0VB's garage when the plans were being made..... off to WB0TEM's house for the portable EME station by W0RGU and W0VB - 5 and 1/2 hours each way (525 miles roundtrip). All this on the week end after W0SD and WB0TEM's western EME trip and the weekend end prior to the Hawaii DXpedition!!!!!!

Third, turns out to be the saga of shipping the complete station to Hawaii. Enter Northwest Airlines. After several trips to the Rochester airport to discuss the allowable sizes that will be permitted for shipment with the ticketing agents, the equipment was disassembled and put in boxes. Oh if it were only as simple as that. Each antenna broke into only 2 pieces. Ten foot long and 5 foot long each with the elements attached. Thus, a new hobby was started.... searching through thrown out cardboard boxes large enough to contain the antenna pieces. The result, two refrigerator boxes did the job nicely. Cardboard was used since the cost per pound Airfreight is $1.20 per pound..... ONE WAY!!!!

Also, the H.V. power supply was taken apart to reduce the possibility of damage during shipment..... but the transformer alone weighed 108 pounds. A wooden box was constructed by W0RGU along with a set of welded handles to facilitate shipping.

All in all, shipping related, the real thrill or surprise came when Northwest Airlines permitted all the equipment to be shipped as "CHECKED BAGGAGE" !

The arrival at Honolulu airport created a chuckle when the "Checked Baggage" came up the chute for the passengers.....and they all watched as the 12 foot long poles came up the chute like the lance being wielded by one of the Knights of the Round Table. It appeared they had no end to them as they came out. Following that came the "H-FRAME" followed by the transformer. All 13 items appeared as checked.

Fourth is the actual operation in Hawaii. The transportation to KH6BFZ's house was provided by KH6BFZ and KH6KL, two vehicles - both needed. The 40 minute trip to Kaneohe was enjoyable and immediately followed by the assembly of antennas, H-Frame, tripod, and H.V. power supply. Darkness fell on us and the activity was moved inside to the operating position within the house. All the equipment was set-up and the outdoor work was putoff for daylight the following day (Monday November 14th, 1983). On Monday the tripod was mounted on the roof..... yes the roof. It was the only spot that was open enough and as such made it necessary to climb a ladder every 15 minutes to change the azimuth (W0RGU's main activity) during the operating times (the azimuth was moved manually, a disc was used to provide the readout). The entire antenna, feedlines, and station set-up was completed at about 5 P.M. local time.

The equipment was turned on, adjusted, and tuned up. Output looked good, about 700 watts out, 30 watts reflected..... Now, does the receiver work? A beacon for 220 MHZ was brought along but the ham who had it (KH6KL) was not home from work. Oh well, the antennas are pointed at the moon..... DAH DAH DAH DAH..... back came dah dah dah dah .... Eureka! It's operational !!!!!!!

The rest is history..... KH6IJ, Katashi Nose, was there the entire day on Monday, and the first contact was completed between KH6IJ and W0VB at 0540Z on the 15th of November, 1983. (Tuesday GMT, Monday local time). This contact took an hour and forty minutes! Perhaps operating during apogee accounted for the long QSO time. W0VB's station was being operated by W0OHU, Ed, (who had never made an EME contact before), assisted by WD0ETA, Al, K0TS, Joe, and the very nervous and excited XYL of W0VB, Barbara, (all whom had also never made an EME contact). The other end of the contact was made up of KH6IJ, KH6BFZ, W0RGU, and W0VB. All the subsequent contacts were made using KH6BFZ as the Hawaiian call.

220 TRIP TO NE/KS
BY WOSD, WB0TEM, AND WB0PJB

Hi Hams
If you let me know what states you need, I'll publish them. 73 Lee K5FF

We said we would return! Return to Nebraska we did. Way back, well it seems way back, we went on our first EME trip to Nebraska and learned a lot! Actually it was in October only about 3 months ago. I think you'll all agree that 220 has taken the spot light for activity the past few months.

We wish the KH6 trip well on 144 and 432!

All of our trips have been very challenging with many surprises. They have all been very tough from a physical standpoint. This one was no exception! It started off with some really cold WX. We had -20 F weather the whole week preceeding the trip. The camper which belonged to Barry's Dad would not start. We had to dig it out of a tremendous drift by hand. In fact we were ready to go back to the old set up when the camper finally started late Friday after trying for several days.

Because of not knowing we would get the camper going we had some last minute work to do. We finally left Sioux Falls for Akron and got there about 9:00 PM and had a lot more work to do. We mounted tropo antenna's on the roof of the camper in -20 F. weather. The generator was only wired for 110 volts which really took us by surprise as we had checked the name plate and it had a 220 type plug. We could not get at it to rewire without tearing the camper half apart so we rewired the transformer primary in the 8877 supply rather than pull our other generator.

We had a lot of fun working grid squares on 220 and 144 mhz on the way down and back. We operated from 9 grid squares. We did shorten our two meter beam up on a low bridge.

On the way down we finally stopped about daylight and got a couple of hours of sleep. Marc cooked a great breakfast! We got to Smith Center, KS shortly after dinner to meet N0LL who had found us a spot on the border. The table with all the equipment on other than the 8877 and PS broke just before we got to Larry's and everything crashed to the floor. Fortunately all that broke were wires. We did get some scratches on the equipment. At Larry's we fixed the table, had a great tour of his shack, and even worked a few stations on 144 mhz. We also fixed a recieve problem we had on 144.

Larry-N0LL then led us to our site which was fantastic. It was a great tropo location and right on the state line. Be sure and thank Larry! He did a super job! We set up quickly and things were falling into place. We got the HF station up and about that time Marc and Barry discovered we had an 8877 problem. That was pretty serious as it was the only thing we did not have backup for other than a tube and diodes. After some trouble shooting the bad news was the 8877 was shorted! We were pretty sick but we always carry a spare so out it came and before long we had power. Marc had lost an 8877 in his HF amp just the week before so it was especially dis-heartening. The 8877 in the 220 amp was brand new when we started in Oct. Marc had bought it brand new several years ago and used it for the first time. Hopefully he can get an adjustment on it as it should have never went bad with so few hours.

We started off great working WB5LUA on tropo which spoke well of Larry's choice of a location! We then started on EME and heard nothing for awhile and then we started hearing all kinds of signals. It was great. We copied 6 or 7 stations at once. One time we copied 4 signals on about the same frequency. It soon became apparent that no one was sending ZERO'S and the word on 3818 soon confirmed no one was hearing us. We were getting good echo's and hearing well so we knew faraday was the problem. We did work K9KFR when no one else could hear us. We were happy for Bob as he really had been shut out by faraday when we were out west and again on the east coast. We had a terrible time working nines on the previous two trips.

WE of course worked K5FF and W5FF with the polarization again pointing out faraday was the problem. We had conditions like this before but never shutting so many out. Finally at daybreak things started to move and we worked WA3GOO, W3GPY, VE3EMS, W4WD, and WB5LUA. The ones that made it were those that were persistant and called all night. My hat is off to you guys! We heard K1WHS several times for long periods but he could not hear us. It was a shame Dave wasn't on when daylight came. Joe-W1JR had to limited a window for the kind of faraday conditions we had.

Not working Joe and barely working some of the rest of you brought home again the fact that the stations having polarization rotation have a tremendous advantage. If you don't have polorization you better have a big window as you may need it when faraday locks up! As is our custom we worked right up to our moonset.

KA0HPK's parents visited us and brought some great coffee. Marc's half coffee and water was giving me heart burn. Marc did cook another fantastic breakfast.

Larry-N0LL helped us tear down and get us on our way! We got back to Marc's about 48 hours after we had left. We had a lot of unloading to do. Barry and I then went on to Sioux Falls and unloaded some more. I got home about 2 AM and had some more unloading to do.

QSL CARDS

I went right to work on the cards and they are all out! We were holding up for pictures and finally gave up waiting! We still have hopes of sending out some pictures! For sure you can see them at the CSVHF conference or Dayton!

SUMMARY

This will end our trips until this summer. We ended up with just under 150 EME qso's. We operated from 14 states and traveled thru 24 states in the process. Good luck to you in finishing up WAS! Congratulations to K9HMB on #4! Frank you better get on that paper work so you don't make me a liar.

We are looking for schedules for new grid squares. We sure would appreciate calls of stations active on 220. We'll give any mode a try!

One final thought! Some have wondered a bit that we would not make any schedules. I feel our record shows that our system worked well! If someone thinks they can do better from portable locations using schedules I challenge them to go out and prove it! One qso for every 40 minutes of operating for three trips counting every minute we were on the moon is what they have to shoot for. We have nothing against schedules but in DX-peditions we feel it is far better to not use them. Some reasons for this is:

1. Helps defeat faraday polorization as faraday is just about always right between Dxpedition and someone so Dxpedition can maintain a steady rate. Ours was one qso every 40 minutes.

2. Gets away from being accursed of favoratism on who gets schedules and when they get them.

3. Gives lots of signals on at once so everybody has a chance to know things are working and that they are on the moon.

4. Hearing lots of signals creates excitement and is good for activity on the band, also helps Dxpedition station know they are on moon, can peak antenna.

5. Permits stations to call as much as they want whenever they want.

6. Gives everyone a chance to be calling when faraday peaks for an area, especially good for small stations.

7. Takes care of problems with changing ETA's, breakdowns on both ends, high winds, ice, etc. at schedule time.

8. Permits DXpedtion to always be trying to work someone every minute the moon is up which can't be done with schedules. Time after successful schedule and next schedule is very hard to utilize very effeciently.

9. Prevents wasting a lot of time with schedules with the home stations, you'll note we did not have schedules with the home stations. In a couple of locations one of our home stations was the next to last station worked.

10. If you can only be on for a short time at least you have a shot at it and if you have polorization rotation you really have a shot at it.

11. If you have a schedule and polorization isn't right you have missed the DXpedition it is all over!

12. It seems so many have limited windows around the Univeral Window. Everybody wants a schedule then. This permits everybody to call during what ever window they have for the complete time they have that window.

I assure you if we would have had schedules we would have worked a lot fewer of you. If you were not worked the primary reason was faraday rotation. We could easily hear four yagi stations. They were super loud when faraday was correct. So if you have been feeling blue if you did not make it don't blame it on not having a schedule. Sure it takes a heck of a lot of work to call for hours sometime but no one said getting WAS on 220 would be easy. Even though we said we would tune up 5 khz we always tuned up 7 khz so there was plenty of chance to get out in the open! Marc, Barry and I have a lot of fun dis-agreeing but when it comes to this system of operation we can speak from experience it works. We did have some schedules on 432 from Or/NV and they were a disaster!!!

Some have said if I had a schedule I would only have to spend a half hour or hour and then go about my business. My question is what is your guarentee you are going to work us. You can say if I do fine and if I don't fine but the problem is we have wasted a half hour or hour when we could have worked someone because most of the time the faraday is right to someone from the dxpedition for a two way. Occasionally it isn't but generally. If it isn't right for anyone then schedules to anyone would be worthless as well!

Certainly everyone is entitled to there opinions and can do it anyway they want when they go on a DXpedition but we wanted to elaborate a little on some of the reasons why we did it the way we did.

CLOSING REMARKS

It took each and everyone of you hanging in there, fighting the problems on your end, keeping track of us, hanging in there until faraday was right, and the list goes on! You can take pride in really putting 220 in the spotlight. We may well have more WAS on 220 than 432! We also want to thank W1JR for all the help on the 70 CM net. With out that source of information to keep everyone posted we would not have had near the success we did.

Last but certainly most of all thanks to Lee-K5FF for a newsletter which always had the word out on our trips in plenty of time! Tnx Lee and Fred and good luck on #50!

To the rest of you good luck on WAS!

The following stations were logged;

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| K1WHS | WA3GOO | K4PKV | W5FF | KD6R | K9KFR | K9XY | W0DHU | WB0TEM | KA0Y |
| VE3EMS | WA3GPY | K5FF | WB5LUA | K9HMB | W9UD | WD0FDY | W0SD | W0VB | K0ZK |

Heard but not worked:

| | | | |
|---|---|---|---|
| W1JR | K2OS | W4WD | K7ND |

The results showed that: 22 contacts were completed.
20 different calls were worked.
12 states were contacted.
2 countries were worked. (Canada and the U.S.)

The Hawaiian hospitality given us by Joe, KH6BFZ, was exceptional. His style of Amateur Radio always provided us with new people to meet and talk with. There always seemed to be at least 3 to 4 local hams at his QTH each evening. Included was KH6P (Dan) and WH6AMX (Jim), two people actively putting a Two Meter Moonbounce station together. Equipment consists of four Jr. Boomers, a Lunar Gasfet preamp, and a pair of 8874s (Tempo 2002).

Many thanks to W0SD, WB0TEM, W7HAH, WD0GNK (KC0P at the mike) for their fine efforts in providing continuous communications back to the mainland during the expedition. For those that we did not complete with, it is hoped that the dedicated skeds on the last evening of operation at least gave everyone an equal shot at a contact.

During the first 5 days of the expedition, all stations were worked randomly. Only during the last day did we run skeds. The equipment was torn down on Sunday, November 20th, 1983 in order to ensure that the expedition that W0SD has planned for mid December would indeed take place. The airport requested us to bring the equipment in one day prior to the flight. On Monday, the equipment was brought to the Honolulu airport, inspected by the Agriculture inspectors, final tape applied by KH6BFZ and W0VB, tagged by Northwest Airlines, and left for shipment for the next day's flight.

As a note of interest to those who would also like to make "EARTH SHAKING" contacts, look into W0SD's December DXpedition. This antenna system was first used by W0SD and WB0TEM on the Oregon and Nevada border. Hours later an earthquake measuring 6.7 on the Richter Scale took place in Idaho and Montana. The day after KH6BFZ was activated, a neighboring island had an earthquake measuring 6.4 on the Richter Scale. Watch out East Coast...

Many thanks to Barbara, my wife, for supporting me in the entire effort necessary to achieve "FIRST WORKED ALL STATES ON 220 MHZ" and to Carl, W0RGU for his continued support throughout the quest.

73's

Terry, W0VB

As a quick note, there is no box on the W.A.S. application for 220. Guess we'll just have to keep creating our own box to check off or request the ARRL to have the form updated!!!!!

HI HAMS,

HERE'S THE SUMMARY OF THE HAWAII DXPEDITION FROM TERRY

Lee K5FF

WB0TEM, W0SD, WB0PJB EAST COAST DXPEDITION

Seventy five EME qso's and 19 tropo qso's was the final total for the record breaking East coast 220 DXpedition!

Top honors go to K5FF, W5FF, WB5LUA, W0SD, and WB0TEM who made qso's at every stop! Following is a box listing of the EME qso's.

| | WV | VA | MD | DE | NY | VT | RI | CT |
|---|---|---|---|---|---|---|---|---|
| W5FF | X | X | X | X | X | X | X | X |
| K5FF | X | X | X | X | X | X | X | X |
| WB5LUA | X | X | X | X | X | X | X | X |
| W0SD | X | X | X | X | X | X | X | X |
| WB0TEM | X | X | X | X | X | X | X | X |
| KD6R | X | X | X | X | X | X | X | |
| KA0Y | | | X | X | X | X | X | X |
| W4WD | | | X | X | X | X | X | X |
| VE3EMS | X | X | X | X | | | X | |
| K9XY | X | X | X | X | | | | |
| K9KFR | | | X | X | | | X | |
| K9HMB | | | X | X | | | | |
| WD0FOY | | | | | | | | X |
| WB0PJB | | | | | | | | X |

WA3GOO reached us via tropo from VA, WV, MD, DE, RI and CT and W1JR from VA, WV, NY, VT and RI. Other stations worked on tropo were W3GPY, W2WW, W1GCI, WB2EIF, K4LHB, and N2BJ.

TRIP OUT

Barry-WB0PJB and myself left Marc's-WB0TEM in a severe snowstorm at 11:00 pm Wednesday, Dec 14th. After waiting since Sept. my new Citation came in late in the day on Monday, Dec. 12th. It was really hectic rigging the new car for the trip. We had to install a hitch, trailer light hook up, HF antenna, two meter fm Antenna, HF rig, TWO meter rig with amp., car carrier, etc, etc. We also had to get another tank on the generator.

The first part of our trip saw very bad visibility and then it turned to very icy roads on I-80 in Iowa. There were over 50 eighteen wheelers in the ditch that were wrecked. If we would have ever slipped in I know we could not have gotten a tow truck for days. We talked to Ken-KA0Y on the way through. The roads finally shaped up near Peoria, Ill. We talked to Fred-W5FF and Edith-WA0UFS. We found that our home qth's were having blizzard conditions.

We did have to reposition the antenna's and masting on the roof as it was scratching the roof of the new car. I'm not very popular in regards to those scratches on the new car! We made about 24 MPG for the trip. We did not have enough power in 4th gear a lot of the time and 3rd gear was geared to low. We sure could have used a gear between 3rd and 4th.

We had good road conditions except on the Pa turnpike where we hit a bad snow storm and ice for about 100 miles. I have never seen such crazy drivers in my life. It wasn't safe to go 40 and trucks were passing us at 80 MPH and absolutely blinding us. We contacted our liason-WB3LJK at the MD border on simplex and arrived at his house about 3:30 am and had a tour of his shack! We slept on the floor as they had company and the beds were all full!

VW/VA BORDER

We got up about 8 am. Paul-K3EUG joined us for a hearty breakfast prepared by Mike and we headed for the WV/VA border site which Mike and Paul had previously arranged for us. We operated on the state line North of Berrysville, VA from Mikes

van. We had a good time, the WX was super, and we had lots of visitors. One even went home and got his son and brought us brownies and hot choc. We seemed to work the band dry as we called CQ toward our setting moon for 2 or 3 hours without hearing anyone.

We packed up at daybreak and headed out.

MD/DE BORDER

We stopped for breakfast and said good bye to Mike and Paul and headed for the MD/DE border. We had a very difficult time finding a spot on the border. There are two huge power lines on the MD/DE border. We finally found a spot where the power line wasn't quite on the border which looked good. We asked a number of people, braved some mean looking dogs and got permission. It was on an English riding course for a horse club.

An interesting thing is the stone boundary marker where we operated said M on one side for Maryland and P on the other side which according to a elderly man nearby stood for Penn. before Delaware became the first state. He said there was a marker like this about every mile and that they were over 200 years old!

We had great luck here! Our noise level was virtually zero and conditions were good. As everyone needed Delaware we were pleased. To the best of our knowledge we worked nearly everyone. We certainly worked everybody we heard!

We packed up at moonset while listening to WB0TEM AND K9HMB ragchew. Frank announced that he knew we had the car door open with the volume up listening to their every word. He was absolutely correct!

We stopped for breakfast! You'll note the only time I mention eating is breakfast because that was the only time we ate. We always ate one meal a day which was breakfast!

NY/VT BORDER

We drove north thru PA on the turnpike. We checked into the 70 CM net just as we had the day before and were very appreciative of the opportunity to give out information on our plans! It was a long drive to the NY/VT location. We hit bad WX in NY and had a lot of trouble with finding the right roads in the Schenectady, Rotterdam, Troy area. We almost slid into the back of a car on an extremely icy street. It was the only close call of the trip. We finally got to the border at about 0015z Monday, Sunday night local. We were very fortunate to find a spot we could operate from the very first time. We set up in the snow! It was quite nasty wx. We had a nice visit with some visiting skiers from Ohio who were staying with the people we asked if it would be okay if we operated. We asked the surroundiong people everyplace we operated from. A while later when the Highway patrolman stopped it felt good to have permission. He just could not believe we brough all the stuff on the car but he was nice and told us to have fun. We explained to him three times what we were doing but I don't think he ever did understand!

This was the only location we had trouble working home. For awhile we thought we might have to stay a second night. It was getting desperate so we cranked the generator up to all it was worth. On test conditions we were able to pin our bird with the 2500 watt slug in it with about 10 watts of reflected power. We were using 1/2 inch heliax. I know some of you wish you would have heard us better but let me assure you it was conditions.

Marc finally got his car started and headed for W0SD's QTH where he had polorization rotation! It was terrible WX conditions in the mid-west. Sioux Falls SD was constantly making the news. It was the coldest wx in 50 years. It was -30 degrees with wind chill down to -90 degrees. We were able to work Marc quickly from W0SD and Marc headed back for Akron. Al-WD0FOY saved the day. Marc's

elevation motor decided to work and I was able to work Al- from WB0TEM's very easily.

The fatigue really set in at VT/NY. Barry said the display was fading in and out. I did great until after we worked WB0TEM and then I had a terrible time. If you heard some really terrible CW it was because I was really sending some! I'd fall asleep on the zero and just keep sending dashes until I'd wake up.

RHODE IS

We then packed up at daybreak after some tropo work and headed for RI and W1UHE. We arrived at paradise (Norm-W1UHE) the middle of Monday afternoon, December 19th. Norm took two days of vacation so he could host us! I hope you will all thank him! Norm showed us around Tiverton and Barry got some nice pictures. We then set the array up in the driveway. We worked a couple of people shortly after moonrise then the moon went behind the house so Norm took us out to supper. That was great! We then came back and worked some tropo as it was 220 activity night. We worked quite a few! The moon by now was out from behind the house and we were on the moon the rest of the night. Norm-W1UHE stayed up all night and did a good deal of operating. He worked K5FF and W5FF! At moonset we went to bed. It was the first time Barry and I had been in a real bed for 6 days. What sleep we had was in the car seat.

We decided to stay an extra day in RI to help out K9KFR and VE3EMS. It turned out that it also gave Marc-WB0TEM a chance to get some rest as he had been going night and day like us and was having a horrible battle with his elevation motor and of course the coldest WX in 50 years.

I also talked to John-W1XX at the ARRL and found our previous request to operate 220 EME from W1AW was welcomed. John was absolutely thrilled about the idea. He told us we could set up right in the station, we could use HF liason, we could call out or be called on the telephone, they would provide us with the proper 220 VAC outlet, etc. Anything we needed they would do their very best. The staff at W1AW was at our disposal for any help we needed! At this point I called a number of you and asked you to call others to be sure everyone got the word we would be on from W1AW!

The second night at RI we did work K9KFR and VE3EMS. We tried very hard to work K9HMB and K9XY for about 5 hours and could not do it. We could hear them but faraday would not let them hear us! The quote of the trip was at moonset when Barry called Frank on 3.818 and Frank came back and said "this really sucks". This was our coldest tear down at 6 degrees above zero.

W1AW OPERATION

We got all the QSL's from Norm and headed for W1AW. We ate breakfast and arrived at W1AW about noon. Dave-K1ZZ General Manager came running up and showed us where we could pull right up to the W1AW building. John-W1XX was in the lobby waiting for us. I turned Marc-WB0TEM and my cards in for WAS on 220 and my BY8AA card at DXCC. We then set up the station which we had down to a science at this point. It took us just over one hour! We then had a grand tour of Hq. by John-W1XX. It certainly was great. We seen everything and got to talk to everybody. It was just like we were visiting royalty! We also got a huge supply of contest forms, seen the VUCC certificate, and the calls from the list W5LFL had just sent that day along with the tapes from the space shuttle. I was impressed with how well all the offices were using micro's and the mainframe.

We then got the great news that our WAS cards were OK and that Marc and I would recieve plaques for WAS # 2 on 220 mhz. We tied so the next number will be FOUR.

John-W1XX then got us a key for W1AW and took us to his home station and then out to supper! We got back to W1AW and got a visual sighting on the moon to

confirm the array was right on. I had good luck with my borrowed $200 compass except it did not work if it got cold so I had to warm it up before it would work!

We now run into a problem! The other W1AW transmitters were giving us problems and there was general power line noise. When John said W1AW was at our disposal he really meant it. He talked to Chuck the Station manager and they shut down one transmitter at a time to help us determine where the intermod was coming from. Two meter and ten meter were the worse so they turned them off! They cut the rest back to about 20 watts with the exception of 20 meters which was cut back to 600 watts. That pretty well cleared it up and we were able to work people. As the evening went on the power line noise decreased and we were able to work most of you right through what noise was left. At 12:45 pm eastern time W1AW went off the air what small amount of interference left was completely gone. The big difference was on 80 meters where we had a lot of interference because of only being about 175 khz away from the xmit freq.

We worked 9 stations on EME and WA3GOO on tropo. We also worked quite a few on 75 meters using the rhombic and kw. We filled out all the qsl's and addressed them before we left. I also have photo copies of the log and extra qsl's if anyone needs another if yours got messed up in the mail.

It began to snow during the night getting very heavy at daylight. We tore down in about 8 inches of snow with it coming down in bucketsful. As we were tearing down many of the staff stopped by to see how we had done. When we were finished John had left a message for us to come over for coffee. When we entered the Comunications department we got a standing ovation from everyone for tearing down so fast in the snow! They had been watching out the window.

We got instructions from Leo, the 432 oprator who spent a lot of time with us, on the best way out of town and we're on the road. The front wheel drive worked great pulling us and the generator up the snowy hills. There was nearly a foot of snow with more coming! We decided to head back on I-90. We had snow and bad roads all the way to central Ohio. The snow did let up after the first few hours! We did contact N0AIT-Curt just as we were leaving Mass. and made many contacts with him all the way home! Also checking on us was WA0UFS, WB0TEM, WD0FOY and WB5LUA for which we are truely appreciative of!

We did not have any schedules even with our home stations. We were very appreciative that you all honored our request that just the home stations call down in frequency. That was very helpful!

We did feel the technique of sending zero's worked very well. Everybody we heard doing this we worked immediately!

QSL CARDS

QSL cards for all locations including W1UHE and W1AW will be going out as soon as the pictures are ready which should be soon!

EAST COAST STATISTICS

The east coast dxpedition covered over 4000 miles. We arrived at Marc's on Friday evening only to get snowed in until Saturday afternoon. We got home for Christmas eve but with difficulty. Barry ran out of gas about 15 miles from Sioux Falls and had to catch a ride and go back for his car. I had to walk the last 3 miles to my house as the roads we blocked. It was -30 degrees with a wind chill of -70 degrees. I did freeze my face in a couple of spots but nothing serious as I was very well dressed!

We had only one very small equipment problem losing a tranistor in a low power 28 Mhz IF we had. We had an extra so it was no problem!

We had 1/2 inch hardline on xmit and more power so our transmit should have easily been 3 db more than previous trips.

THANK YOU

A special thank you to W1JR, KA0Y, W3GPY, KD6R, and W0RAP for financial assistance. We also want to thank W1UHE, W1JR, WA3GOO, W3GPY, WB3LJK and K3EUG for support and back up while we were out east.

Also a big thank you to Barry-WB0PJB and my XYL-Edith and Marc's XYL Gloria! It wasn't to neat for the xyl's back home with the worst cold snap in 50 years!

FINAL COMMENTS

It seemed that other than moon rise or moon set times stations working us who could use vertical polorization had much better luck. WB5LUA who worked us at every location both west and east coast said he worked us vertically polorized at every stop! Marc-who operated W0SD when we were on the east coast always worked us vertically polorized.

Another proof of the advantage of polorization rotation is K5FF and W5FF who worked us at every spot both east and west. I don't think we have ever missed a sequence with them. I know we did not on the east coast trip.

The call area that we had the most trouble working was nine land because of the polorization problem! My hat is especially off to K9XY who did not always make it but sure did try!

KA0Y azimuth was frozen so we had to work him when the moon went in front of his dish during a 15-20 minute window.

The recent Dxpeditions by WB0TEM,W0SD, and WB0PJB have covered over 8000 miles, traveled through 23 states, and completed 160 EME qso's operating from 13 states and logged about 90 hours of generator time. We have operated from 5 borders. Our qso rate for the east and west coast was one qso approximately every 40 minutes. This seems like an impossible rate but when you consider we have many stations calling us at once so faraday can rarely prevent us from not hear some of them and they hearing us it is more understandable. If you throw in our tropo qso's it drops to one qso every 30 minutes for our total on the air time.

There is no question that ARRL will accept one qsl for two states or two grid squares if the operation takes place exactly on the state line or grid line and the card clearly indicates this. The station has to straddle the line. We typically put our antenna array right on the state line and John-W1XX said that they would count one card for two qso's as in fact we were in both states or grid squares at once. We have proof with photo's and local witnesses that we were exactly on all 5 borders. I discussed this very thoroughly with John-W1XX who has the final say in these matters. I will send two qsl cards but it is not necessary!

Nebraska/Kansas Trip

WB0TEM, WB0PJB, and W0SD plan to operate from the NE/KS border the night off January 21st local or January 22nd GMT. Liason will be on 3.818 and 14.345. You can check the 70 cm net for the latest information. Everything will be the same as past Dxpedtions.

Spring or Early Summer Trip

Details are tentative but we do plan on going to ND, MT, and possibly WY. We may do some 432 and 144 EME on this trip.

SLIDES FOR CSVHF CONFERENCE

KEN-KA0Y has asked us to put on a slide show at the conference on our trips so we are putting that together.

CONTINUED 220 ACTIVITY

As WAS are completed on 220 I hope you will stay active on the band! I believe collecting grid squares can be a real incentive to continue to be active on the band. The grid square totals will be published in the standings box on 220 in QST. I know I plan on keeping active on this band and I hope you will to. By the way I'd like a schedule from the home station to work a new grid square if we have not worked since Jan. 1, 1983.

73, Ed-WØSD, Marc-WBØTEM and Barry-WBØPJB

Hi Hams,

The 220 MHz newsletter is easy when I have FB Guest Letters to use. Read es enjoy.

73

Lee K5FF