

SMALL STATION EME

By Al, K2UYH

Most hams think it takes a big antennas and high power to work EME. This talk will focus on 1296 and 432 and try to change this impression by showing examples of how little it take to make QSOs off the Moon. It really does not take much more than a single yagi and a transceiver. The addition of a 100 W *brick* and a preamp make it easy.

K6CLS, Cliff is a good example of a new small station on 70 cm EME; here is his story follows: "I was thrilled to make my first EME QSOs this month. I am still smiling ear to ear as I write this, three days later. I want to encourage other folks to try EME, even a small station can work. My station consists of a Yaesu FT-847 with Kuhne QH-40 crystal heater, a Mirage D3010 100W amp, a Daiwa CN-103NL wattmeter, an ARR MSP432VDG-160 pre-amp (birthday present from my wife), and an M2 432-12EME 12 el yagi. The antenna is mounted on 1" PVC set in a TV antenna tripod, using "Armstrong rotation". The RF is wired with some 2 m LMR400 cables from the local electronics surplus store (halted.com), and an 8 m 1318 I got from Ham Radio Outlet to move the antenna away to a safe RF exposure distance. I am not much of a CW operator, so I use WSJT9 on an old computer. Also, I have to say the HB9Q 432 EME logger is an essential piece of the puzzle! I'd be lost without it. The entire adventure started when, on a lark, I bought the antenna at a ham flea market. I listened for several months, got a few decodes. I built a preamp, but it didn't help much, just increased the noise. I tried TXing with the 50 W from the FT-847, and only got one decode. I then bought the Mirage amp. On Friday 26 Nov (local) I moved the cars out of the driveway, set up the antenna and station, and tuned in, just hoping to get some decodes, but nothing. I listened real sincerely for 4 hours, never got anything, and went to bed. Saturday morning, I heard a rumor that on Friday some other folks had trouble with horizontal polarization, so I rotated the antenna to vertical and set up to try again. As it turned out, I think conditions Saturday evening were really excellent! That evening, I1NDP agreed to stay up for me. My moonrise was 0800 (28 Nov). We started trying on 432.090. Nothing for a few minutes... darn. Then Nando suggested I try H-pol again, and we realized that we were both calling first. OK, reset all that. I called CQ. Bingo!! I got a great decode in the first interval! Nando was (22DB) with nice audio tones. My fingers were shaking as I hit the button for OOO... I1NDP came back with RO. I was so thrilled, I jumped up and down, and hit the button for 73. Oops! Set it to RRR after a few minutes, and I1NDP finally came back with 73. Wow, My first EME QSO! Sent CQ again and heard some tones, but no decode. A few minutes later, UA3PTW shows up with an astonishing (17DB) decode and clear tones. Hey, now I am an expert, worked right through, no flubs in the message sequence. Next DL7APV shows up at (20DB) and the QSO went like clockwork. Next up was DK3WG (22DB). This QSO took a few rounds to complete the sequence as conditions seemed to vary a little. Last on 090 was K2UYH at (24DB). This was challenging for me, because our Doppler was +600 Hz, and my FT-847 had drifted -200 Hz. I got everything adjusted, and we had a good QSO. By this time I am really wired. This evening, I expected nothing and got 5 QSOs! Reading the logger, I returned to where people were calling and tried to get some more decodes. I heard I1NDP easily, but couldn't hear any others. I found EB5EEO and spent another half hour calling, but he

never heard me. I stayed up and called CQ for another hour, but no more QSOs because by that time it was moonset for EU, bedtime for NA, and too early for the VK/JAs. Finally I noticed I was really cold and tired! The station is outdoors, in the garage, it was 4 degs C and 80% humidity, bone-chilling cold. What a thrill, EME is the biggest thrill ever in ham radio.”



K6CLS with rig and 12 el yagi use on 70 cm EME

You think you have a bad QTH for EME? Try the Anatartic and on 1296?



DP1POL – Felix & 67 el yagi. It is winter at the South pole!

Felix. DP1POL shows that you can do EME from just about any where – “After 23 years of hamming, I completed my first ever moonbounce QSO with DJ9YW on 21 Aug! This was quite exciting for me. I am currently working at the German research station "Neumayer III" in Antarctica (DXCC CE9). My 23 cm EME station will be set up at least until Oct, maybe longer. I run about 500 W to a single 67 el yagi. DJ9YW's JT65c signal was (18DB). Although most my QSOs to date have been on JT65c, I should be very workable on CW by the bigger stations. Thus far I have worked DF3RU, DJ9YW, ES5PC, ES6RQ, G4CBW, G4CCH, K2UYH, LZ1DX, OE9ERC, OK1DFC, OK1KIR, PA3CSG, RD3DA, and W5LUA”.



Felix's operating location.

RA0ACM in NO76 is another example of what can be done with a really small antenna and low power. Sergey is QRV on 23 cm using a single 49 el yagi, 75 W from 2 x RA18H1213G SSPA, G4DDK LNA, DB6NT transverter/TS-2000. During the ARI Digital EME Contest, he worked OK1DFC (22DB/26DB) on JT65c out of a window of his house..



RA0ACM's single yagi used on 23 cm EME aimed a Moon

The king of small antenna EME has to be DL3OCH. I am sure Bodo has been active from more countries on EME than anyone else. Last year he was on 432 from Nigeria running a 6 m yagi with a 100 W PA and no preamp into IC706! He worked HB9Q (21DB/26DB), DL7APV (20DB/27DB), PA3CSG (24DB/27DB) on JT65B and DL9KR on CW. Later he worked K2UYH and a lot more stations. (BTW he was also active on 23 cm from Nigeria with a big station by Bodo's standards. He used a 2.4 m dish with patch feed (CP) and about 90 W out from his DJ9YW transverter. He did not have a preamp but used a short cable. Please keep in mind that he has to move his dish (and yagi) by hand, which may lead some QSB. His operating site has its own generator but the installation is very bad and often creates problems. If you work him and he just disappears, please keep calling until the QSO is finished. He may have just lost the power for a while. Bodo says that he is often asked about a sked in the night. It is really a problem because his lights attract thousands of bugs. If he opens the door to go out and adjust the antenna, his situation becomes really terrible. He therefore is trying to limit EME operation to only daytime hours.



5N0EME 70 cm yagi pointed to Moon (DL3OCH Nigeria)

My most difficult QSO last year was BX1AD. I have trees to the west and I had to work Edward through them because of his location in Taiwan. It took me almost a year of trying. He is running a ICOM 910H, 75 W and 2 yagis on 432 EME. Besides me he has worked HB9Q, DL7APV probably a few more by now. I am working to get him on 1296 as well.



BX1AD 2 yagi array used on 70 cm EME

There are now many successful small station 432 EME stations. Some are running a single yagi and 50 W. The smallest power wise is W5RZ. He worked DL7APV using JT65B using only 2 x 9 el yagis and 5 W at the feedpoint!

OK1TEH has to be at the top of the list of small antenna EMEers. Matej does not run QRP, but has logged more than 50 mixed (CW & JT) initials on 432 with almost half his initials on CW. Matej reported working on 70 cm CW UA3PTW for his 20th CW initial with 400 W and a single 5.7 m long 23 el DK7ZB yagi. But his real QRP EME is on 1296 where he runs only a 1 m dish and 100 W. On 23 cm he has worked K2UYH, G4CCH, HB9HAL, OE9ERC, HB9Q and F2TU and PI9CAM (on CW).

UA9FAD is another small dish station now QRV on 1296 EME. Victor uses a 1.2 m dish with 0.25 f/d and linear pol with 120 W at the feed. He has completed 23 cm QSOs with OK1KIR, G4CCH and K2UYH on JT65c and possibly more by now.



OK1TEH's antennas including dish used on 23 cm EME

Probably the greatest fun of small station EME is the ability to operate portable EME without a huge amount of effort to provide rare, had to work locations. As already noted, DL3OCH has done more of this kind of operation than anyone else. Below is a picture of typical *Bodo* operating location.



3A/DL3OCH operating 23 cm EME from Monaco

Bodo reports – “The Moon was bright and clearly visible, but the wind made it very difficult to operate and point the antenna. I had to hold the antenna the whole time during RX and TX and just went very quick to the laptop during seconds 48 to 59. I called CQ once or twice and was still playing with the settings when I saw HB9Q calling. He was -22 dB and would have been stronger if the antenna was pointing the whole period to the moon. The QSO was done very quickly. Then, G4CCH called at -25 dB followed by OK1DFC -22 dB. I continued calling CQ and received PA3CSG, but he had some problems and never responded. I next worked K2UYH at -22 dB with very quick decoding. Just before this QSO, the wind became stronger and I almost lost my mast. My yagi hit the car, but nothing bad happened. So after K2UYH I decided to take everything down. The police showed up at about 0130, but were happy when they saw my license and the document from the telecommunication authorities of Monaco. I was also able to QRV the following night. The weather was very good and I QSO’d OK1DFC (again), PA3CSG and ES6RQ for a total of 6 stations in the log. I do not think this is bad for having only a single yagi and 80 W!” Below is a picture of Bodo operating EME from San Marion.



Bodo at T7/HB9EHJ San Marino operating location

Bodo is not the only one to operate portable 1296 EME with a minimal system. A picture of DJ8MS' QRP 23 cm EME dxpedition to OZ (JO56 and JO66) last March using a

single 67 el yagi and 100 W follows. Tor QSO'd DJ9YW, G4CCH, K2UYH at -21 dB, ES6DO and OE9ERC on JT and CW.



OZ/DJ8MS's mini 23 cm EME dxpedition (JT & CW) QTH

I have also included a picture of my own 1296 dxpedition effort to Bermuda.



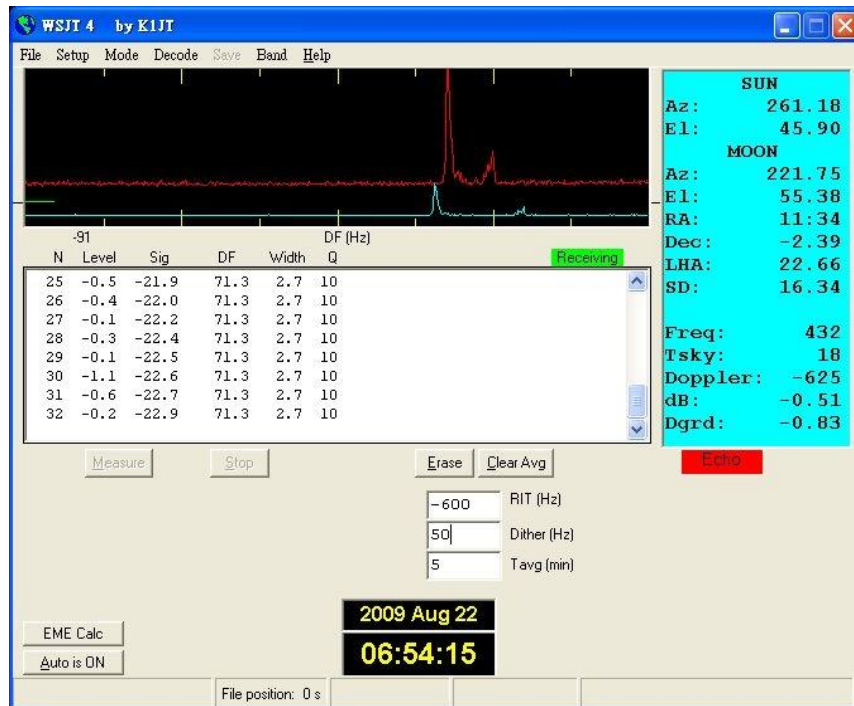
7' compact dish, SSPA and TS2000X

I used a 7' stress dish and a 150 W SSPA. The whole station fit into a small box and a carry-on suitcase.



The complete EME station fit in one box and a carry-on bag.

It should be noted that even with the small antennas and the low power shown here that it is possible to see your echoes using JT's Echo mode. The echo mode is an excellent way to determine if a small EME station is working as expected.



Echoes detected by BX1AD with his small 70 cm system

Conclusion: I have shown examples of some of the QRP EME that has taken place over the last few years. From these examples it should be clear that with 50 W and a small dish (>1 m on 1296) or long yagi, it is possible to make EME QSOs on 70 and 23 cm.