RECEIVING 10 GHz EME WITH SMALL EQUIPMENT
by Hans van Alphen PA0EHG

DL0SHF beacon

- In December DL0SHF starts with the 10 GHz beacon
- Using 7.6 mtr dish and 50 W output
- 10368.025 MHz transmit, Using vertical polarization
- First start in CW only
- On request QRO power ~600 W out

My first RX test

- January 2014 my first RX test with my 3 mtr system
- Good signal and requested for QRO for a test with my portable 10 GHz station using 50 cm dish
- Per responded immediately. QRO after 1 hr

Test with portable station

- Short preparation time
- Clouded, no visible moon
- Freq not stable
- Could hear QRO very strong on the 3 mtr dish
- Aiming the 50 cm dish to the moon was the most difficult part
- Heard the signal report M to O copy

Lessons learned

- Aiming dish to the moon is more difficult then expected
- Opening angle 5 degrees, so what!!
- Portable station not optimized for EME
- Mechanical construction was not easy for vertical polarization
- Needed an optimized EME setup

New system

- Found a small gearbox at very reasonable price, sold for astronomical purposes for mounting a small telescope
- Cost about $200

Two version of gearbox

- Using GPS for position finding
- No GPS but about $100 cheaper
- Started with GPS gearbox
- Worked fine but found that at start up elevation must be at 90 degrees so GPS will be blocked by the dish

- Decided to use the gearbox without GPS

The dish, 48 cm

- Procom dish, prime focus
- F/D ~0.4
- Feed needed using vertical polarization
- Weight as small as possible
- Found an AL taper from rectangular to square waveguide
- Almost optimal illumination for F/D 0.4

Receive system

- Using DB6NT pre amp waveguide input with 0.7 dB noise figure
- Short cable to DB6NT transverter to 432 MHz IF
- Possibility to lock to 10 MHz reference

Mechanical setup

- Using a dovetail connection to the gearbox
- Dish over the centre of gearbox
- Needed a counterweight to balance the elevation drive

System testing

- First test measuring solar noise
- Measure 3.3 dB solar noise
- 4 dB ground noise

Using gearbox

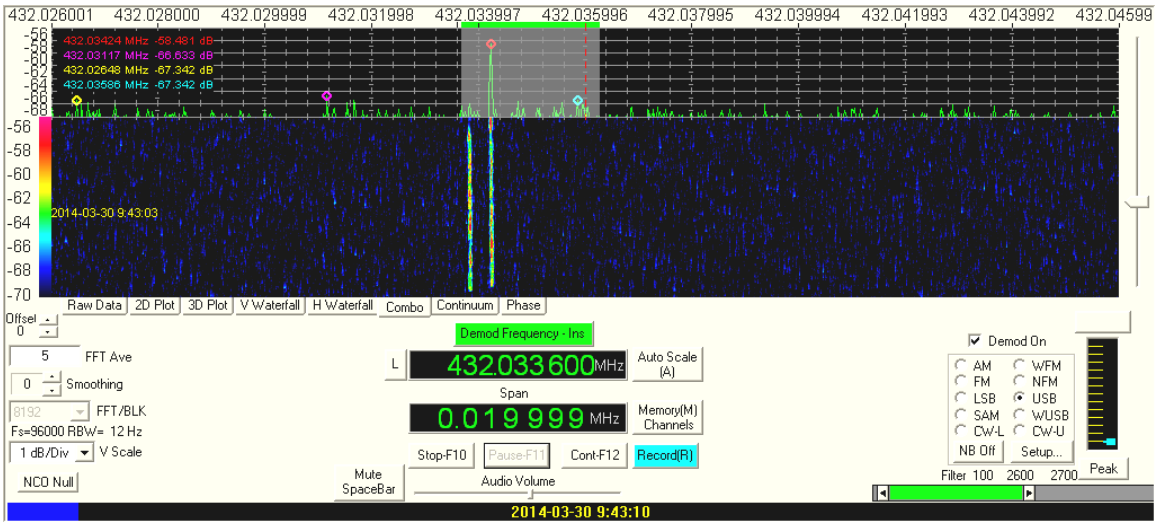
- At start up, first setup, at 90 degrees elevation and aiming south
- Enter location, Lat, Long
- Then enter the date and time into the computer
- Go to, sun or moon
- Possible to correct for line up errors
- First aim at the sun and optimize solar noise, then “go to Moon”, ready to liste

Receiving DL0SHF QRO

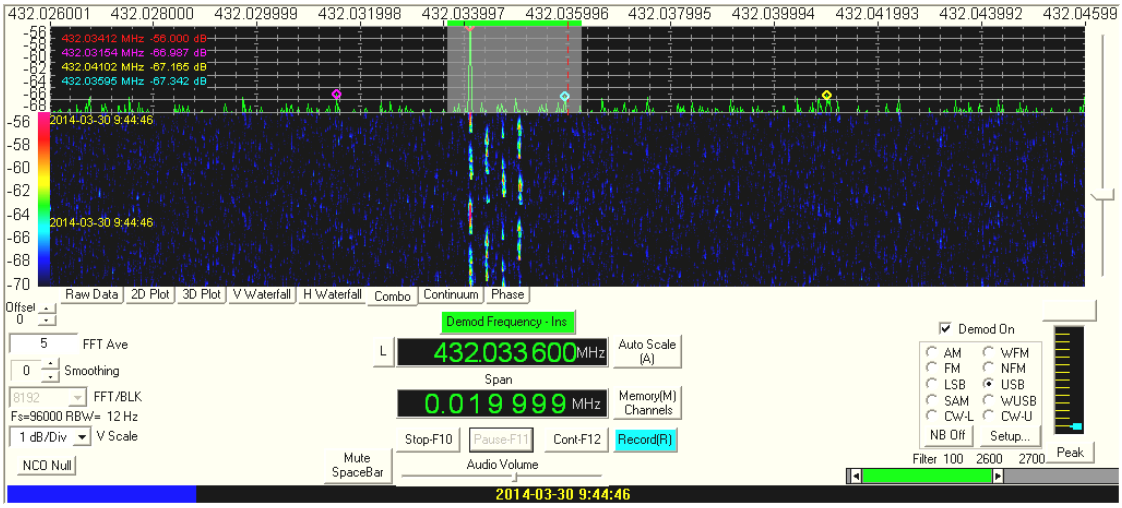
- 30-3-2014 DL0SHF in QRO
- This was the time for my test of the new system
- WX was fine
- First check and align gearbox on the sun
- Then to the moon

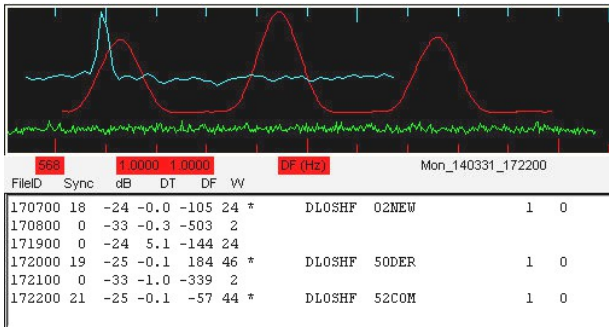
CW signal

- 2 dB/div 14 dB S/N in 12 Hz BW



WSJT JT4G





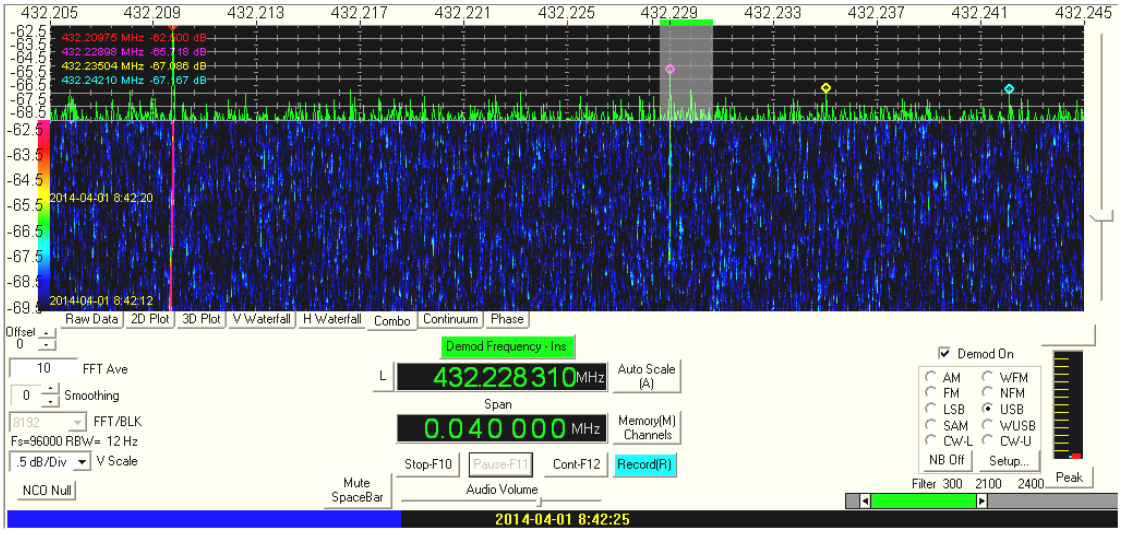
DL0SHF non QRO

- Test with low power, no result
- Should be possible to receive
- After contact with Per it was confirmed that power was down to 8 Watt instead of 50 Watt
- Test with G3WDG using 3 mtr dish and 50 Watt output

G3WDG

- Started with carrier, 1dB/div, 3 to 4 dB S/N

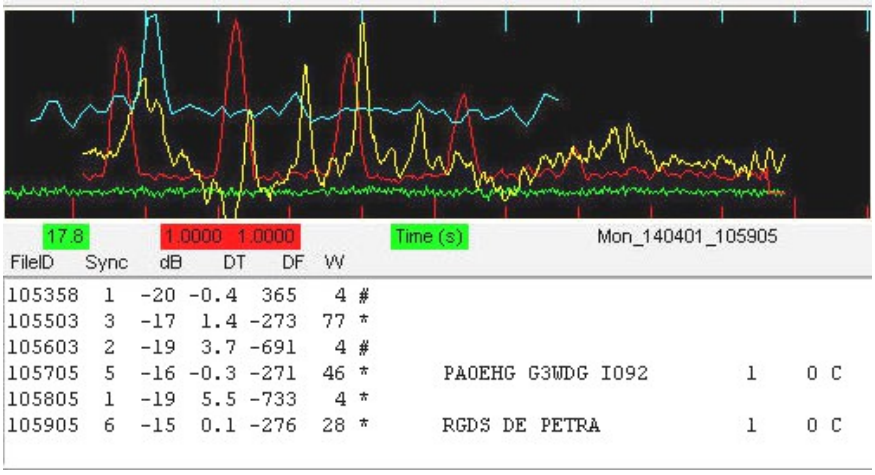
G3WDG on CW



- Easy visible on SDR
- Audible CW tone
- Just a bit to weak to copy the CW

G3WDG WSJT JT4F

- Good direct decodes
- Test showed that with 3 dB degradation I still could get averaged decodes



Test during DUBUS EME contest

- During DUBUS EME contest looked for other signals
- Found OK1KIR
- Found SP1JLW strong signal
- DL0SHF on QRO

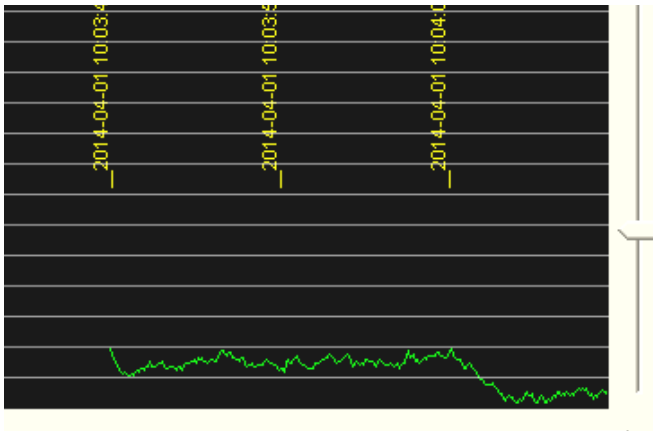
SDR and weak signals

- Good experience with Spectravue
- Finding signals is easy when using FFT Averaging

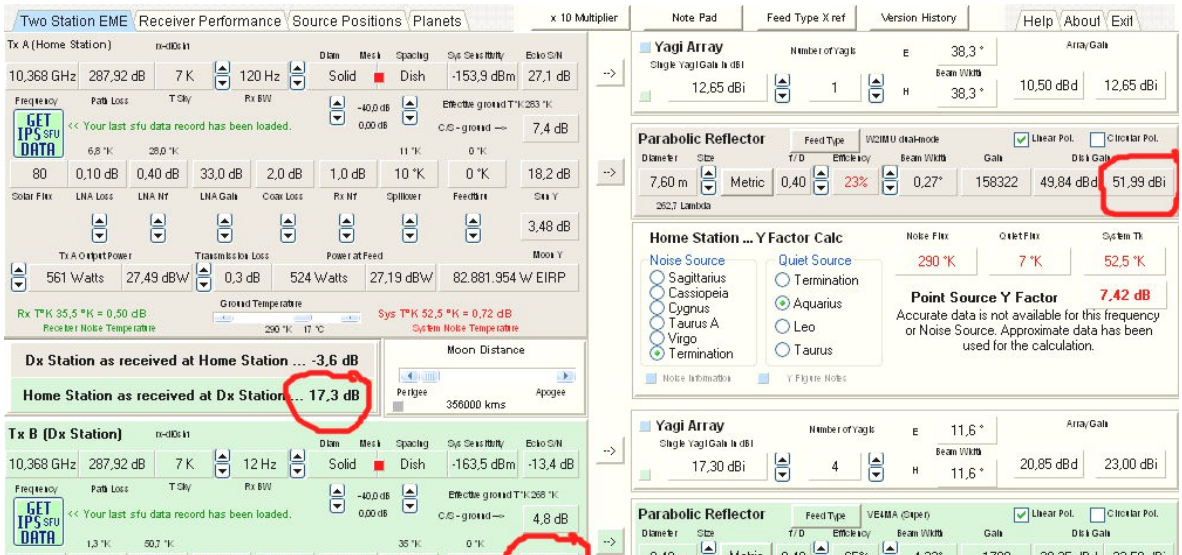
- Using continuum mode for noise measurements
- Even possible to measure the 0.1 dB moon noise

Measure Moon noise

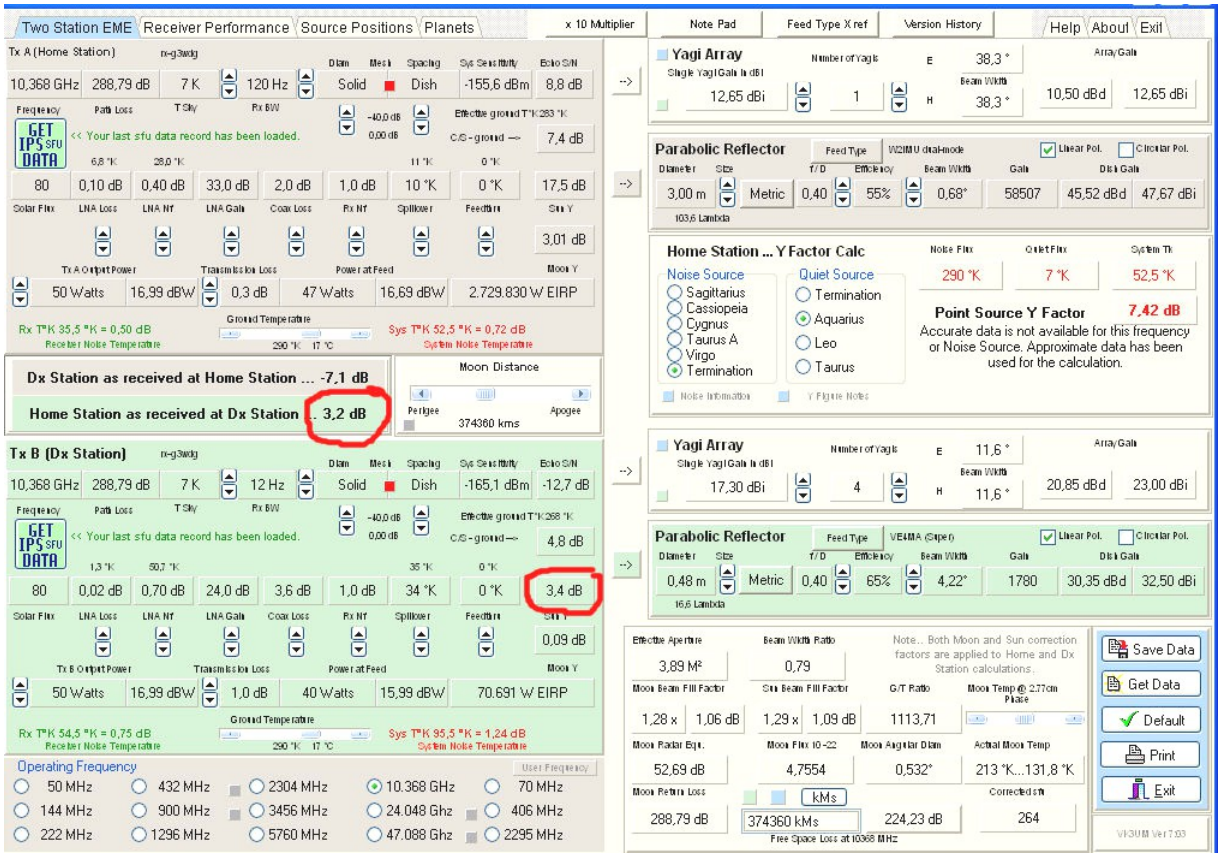
- 0.1 dB/div
- First on the moon
- Then turn away
- Using Spectravue continuum mode



VK3UM calculation on DL0SHF



VK3UM calculation on G3WDG



Conclusion

- It's possible to receive EME with a 50 cm dish
- For CW you need a real QRO station, DL0SHF QRO in CW is easy to copy
- For other stations you need better than 3 mtr dish and more than 50 W output
- JT4F gives good decodes using 3 mtr 50 Watt
- 2 Way QSO is possible in JT4F but not easy, 50 W needed
- Use a small gearbox makes life much less complicated