Moonbounce for the Masses

By:

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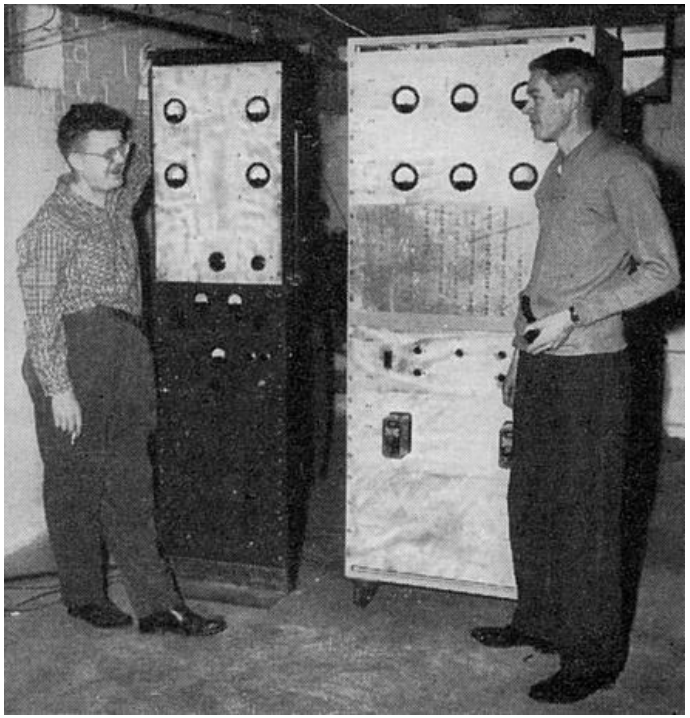
History of Moonbounce

- Project Diana, US Army FT Monmouth, NJ in 1946
- 3000 watts
- 24 dB collinear

First Amateur EME

- January 1950 between W4AO and W3GKP
- 2 meters, 32 element array
- 1 kw output power
- Echoes only
- First 2-way in 1960



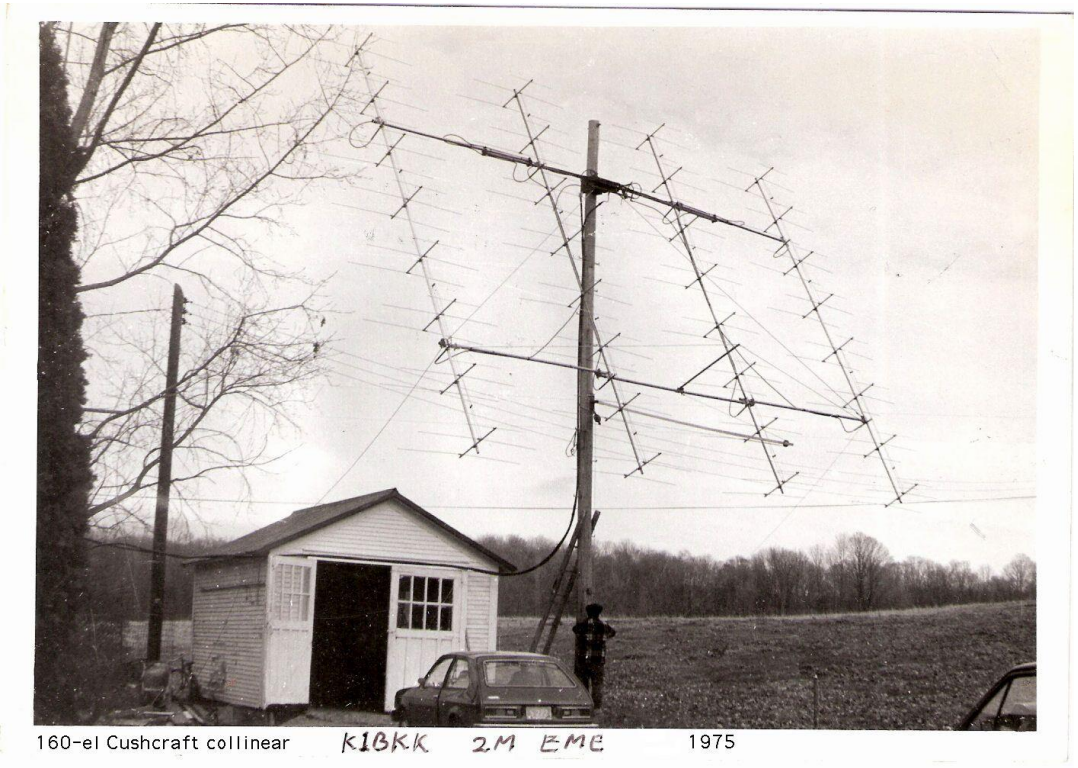
EME in Vermont

•Al Parrish K1KKP made two 60 foot helix antennas in 1965 and worked moonbounce from Peru, VT for Vermont's first EME effort.

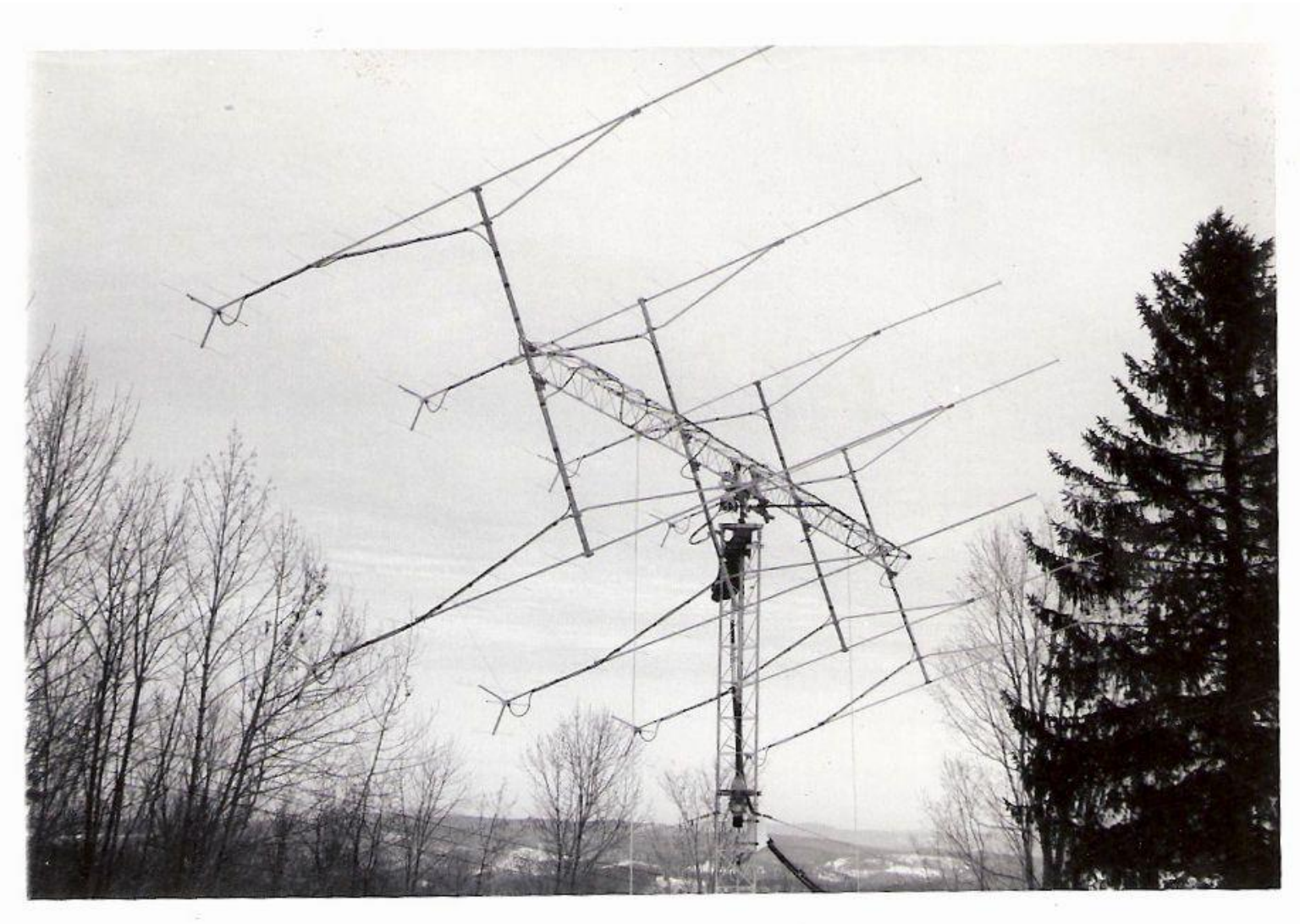
EME in Vermont

Warren, K1BKK was Vermont's second EME op circa 1975 with a 160 element collinear array running1 kw from a pair

of 4CX250Bs in a K2RIW-design amplifier from his home in Charlotte, VT



Lance, WA1JXN, (now W7GJ) was third from Bridgewater VT
Now, from Montana, he is the undisputed 6 meter EME king.



Fast forward to 2010

Design Considerations:

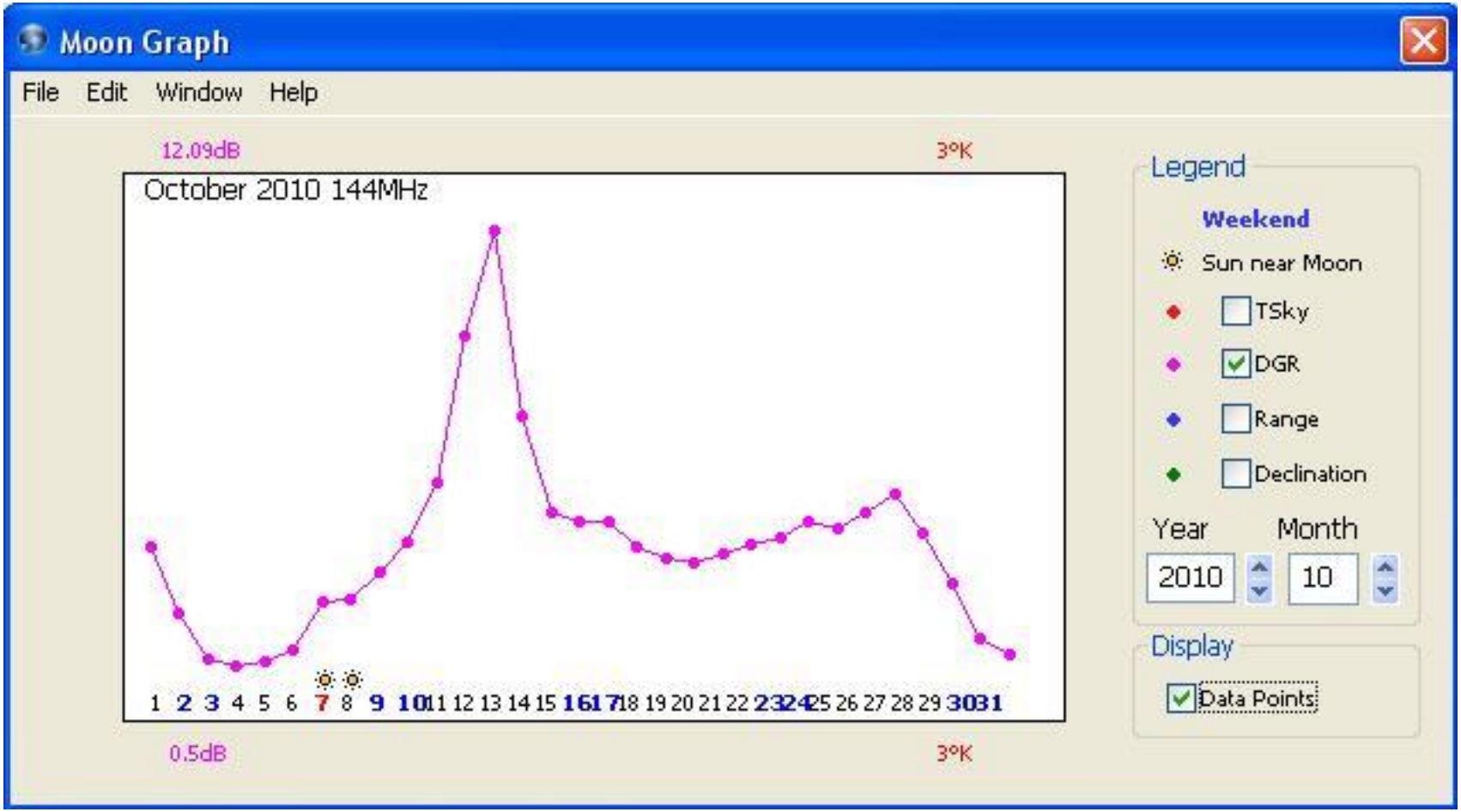
- Antennas small enough to use standard rotors; large enough to get the job done
- Small (less than 500 watt) amplifier to start
- Build as much as possible to save $$$
- Zero dollar investment. Sell off surplus gear to fund the project
- First 10 QSOs made using existing gear to test the concept

First EME QSOs from W1ICW

- Used existing satellite antenna (M2 2MCP14) and existing radio (Kenwood TS-2000X) running 100 watts/ SSB mast mount preamp
- First QSO on January 31 2010 with RK3FG (degrade 0.2 dB)
- Second QSO February 3 with Gary, KB8RQ (degrade 2.5 dB)
- Third QSO I2FAK Feb 21 (degrade 3.7 dB)

So what is degrade?

- Combination of background cosmic radiation (sky noise) and extra loss from elliptical orbit of moon
- Predictable and repetitive
- Can be planned for
- Sun noise also effects propagation


Moon Graph
File
Edit
Window
Help
12.09dB
3°K
October 2010 144MHz
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
0.5dB
3°K
Legend
Weekend
Sun near Moon
TSky
DGR
Range
Declination
Year
Month
2010
10
Display
Data Points

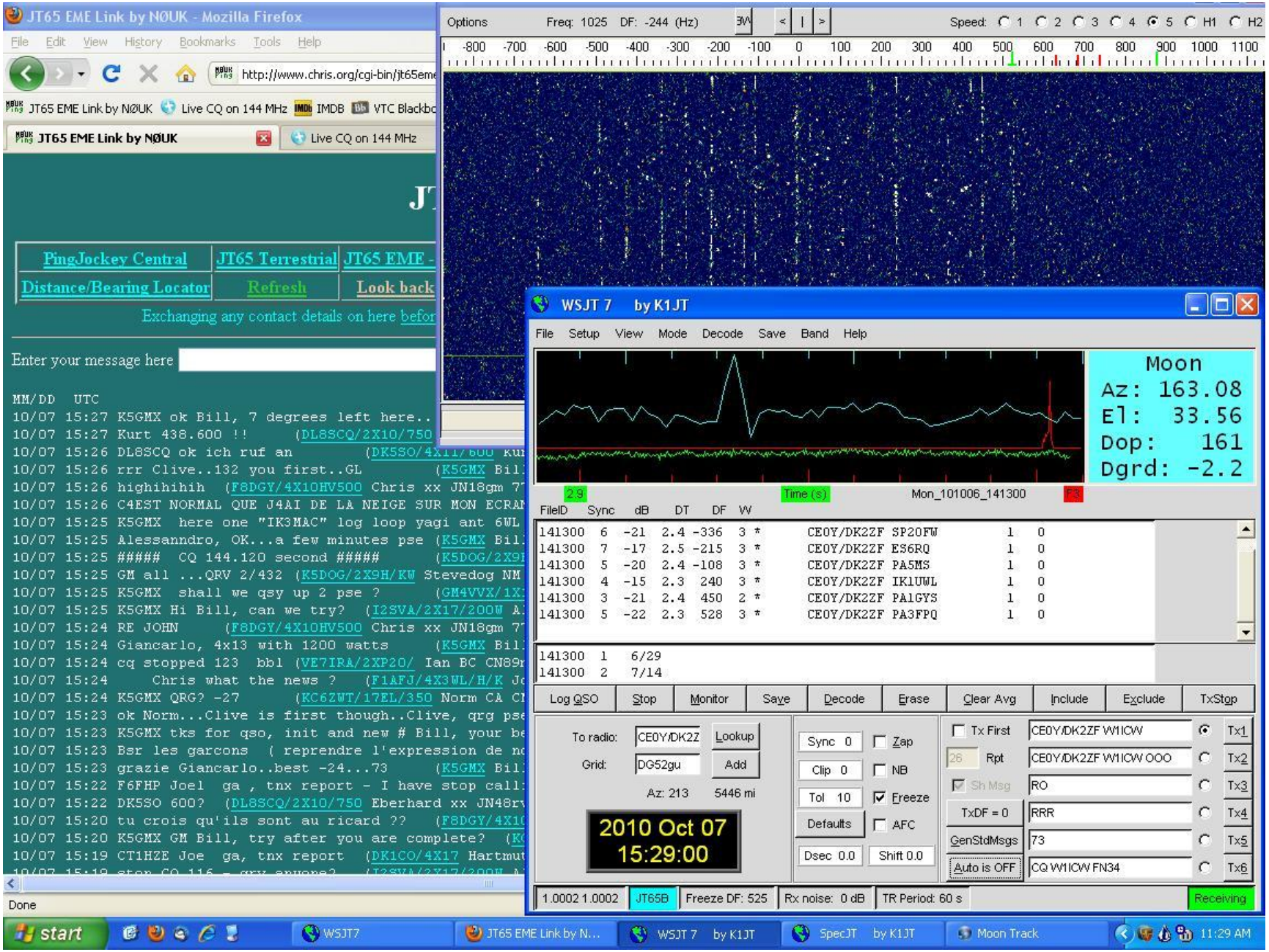
So what has made QRP EME possible?

- 2001 Joe Taylor releases WSJT which is a suite of soundblaster based digital modes for weak signal work.
- They rely on DSP post-processing for increasing the S/N
- Can decode as low as 30 dB BELOW the noise !
- Listen for 48 seconds, process, then tx for one minute in JT65B

What has WSJT done for us?

- First ever single yagi to single yagi EME
- First ever 6 meter EME
- Small stations can now work EME
- 10 elements and 100 watts all you need now
- (I’ve actually done it with 7 elements and 100 watts)
- Revolutionized moonbounce for good and brought it to the masses

What does it look like?

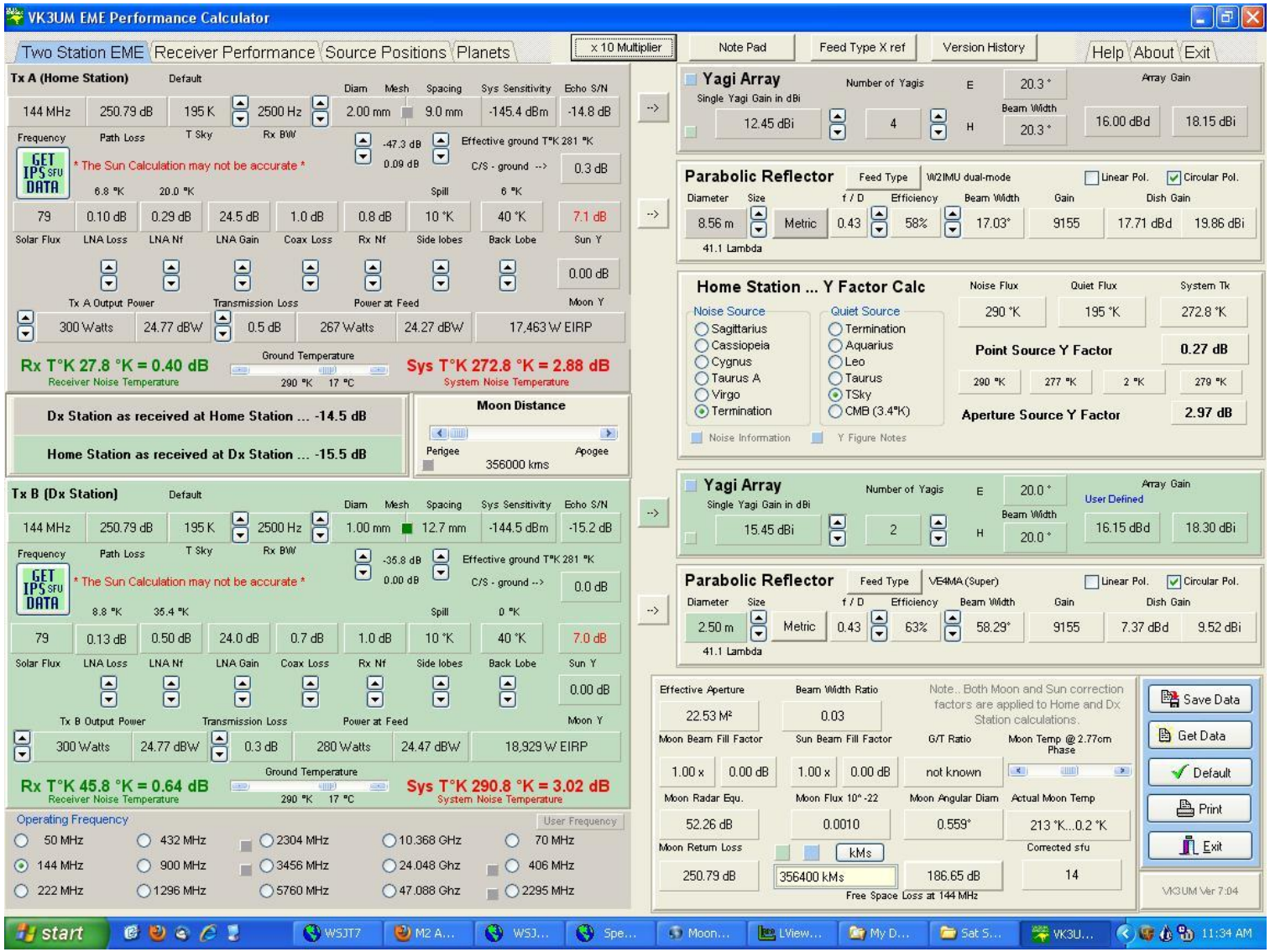


What did it all cost ?

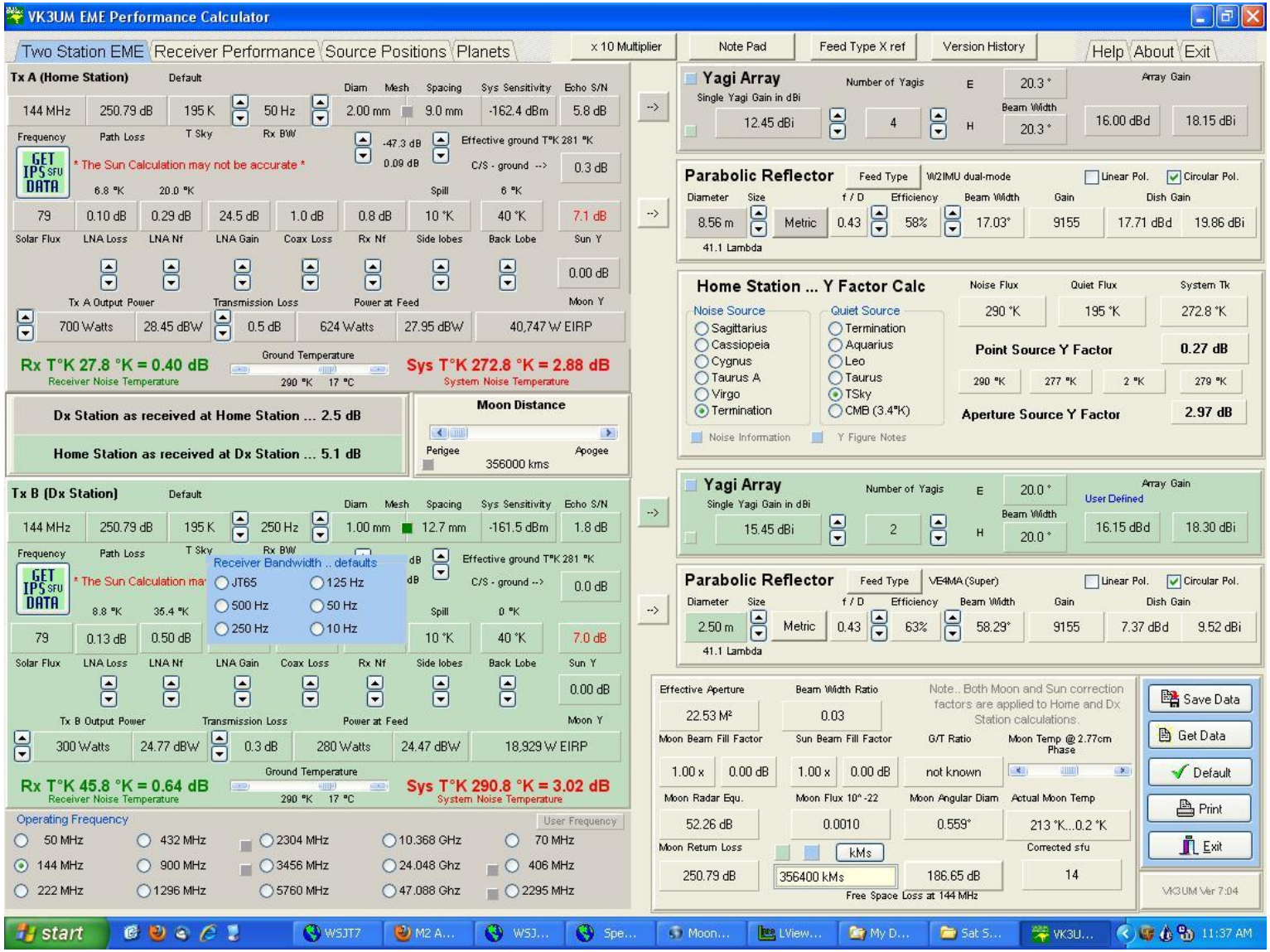
- Yaesu rotors $ 530.00
- 300 watt amplifier and power supply $ 440.00
- 4 M2 2M7 antennas $ 624.00
- DEMI preamp $ 75.00
- Assorted hardware and cable $ 200.00

- Rough total cost was $ 2000
- Entirely funded by sale of surplus gear no longer used

Link Budget calculation:



Bandwidth optimized for cw:



So how has it worked?

- 139 QSOs since erecting new array May 15
- 120 different stations worked
- 103 grid squares worked
- 35 DXCC worked
- 18 states worked
- All worked with 4 7-element yagis, 300 watts, .3 dB NF preamp, and Elecraft K2/XV-144 transverter

Things to consider:

- Choose best times to operate for optimal success
- Choose moonrise or moonset times to get ground gain
- 10 element yagi or better
- 100 watts or better
- Preamp as close to the antenna as possible

Links:

WSJT Home page for WSJT software: http://www.physics.princeton.edu/pulsar/K1JT/

Home page for the VK3UM EME calculator software : http://www.sm2cew.com/download.htm

GM4JJJ MoonSked moon tracking and prediction software: http://www.gm4jjj.co.uk/MoonSked/moonsked.htm

G8KBB Noise Meter software to measure sun noise : http://g8kbb.roberts-family-home.co.uk/NoiseMeter.zip

Project Diana history : http://www.k3pgp.org/1946eme.htm

Amateur EME history : http://www.ok2kkw.com/eme1960/eme1960eng.htm

W7GJ web page (lots of useful information) : http://www.bigskyspaces.com/w7gj/

Moon-Net reflector signup (to sign up for the EME reflector) : http://www.nlsa.com/nets/moon-net-help.html

N0UK JT65B spotter page (online frequency spots plus chat) : http://www.chris.org/cgi-bin/jt65emeA

LiveCQ on 144 (frequency spots from automated receivers) : http://www.livecq144.com/