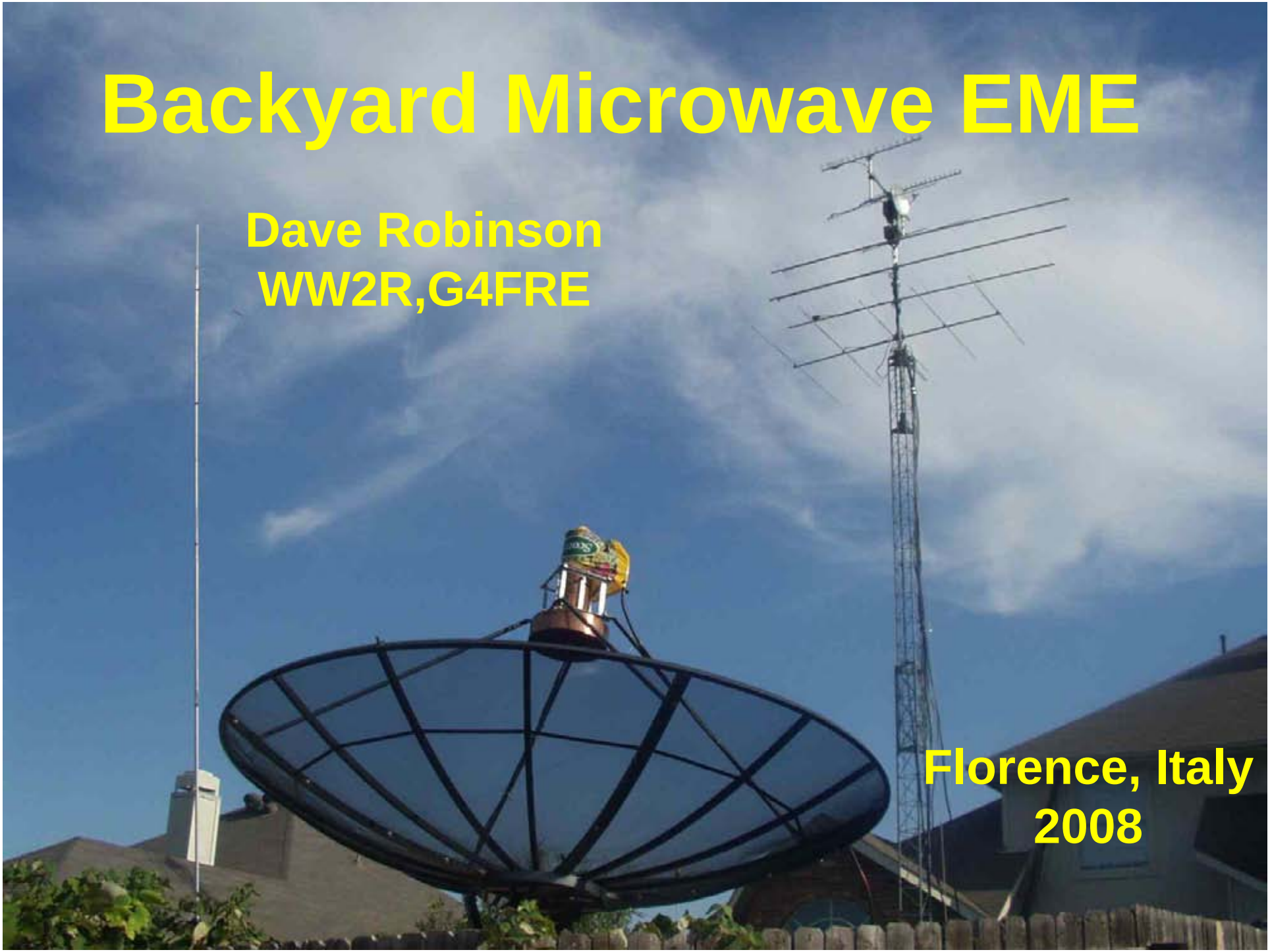
Backyard Microwave EME

Dave Robinson
WW2R,G4FRE



Florence, Italy
2008

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EME History

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- First Introduced to EME on 432 by G3YGF/G3WDG
- 10/85 Persuaded by DL9KR to work him as G4FRE on 432 after meeting him at Weinheim (JO01)
- 1999 worked 21 initials as WG3I from NJ (FN21)
- 04/04 Worked 6 on 432 including DL9KR from 3B9C (MH64)

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Been Inspired for a long time by the KD5RO article in MUD Proceedings 1989 “Microwave EME using a Ten Foot TVRO antenna”

Searched for a dish for a long, long time with no success, then one day N5PYK announced he was moving to College Station to persue a career as a “TV weatherman”….

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N5PYK Dish Location

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Transportation

Luckily the dish came apart in 4 pieces. Tied to the roof of my truck and moved the 5km home.

Joe said he had a heavy duty “polar” mount which I could have. Wouldn’t fit in truck so we dropped the tailgate and strapped it in place using the rear seat belts. Joe followed me home in case it fell off!

Commissioning

- Visited the hardware store and obtained stainless steel bolts to replace all those holding dish together. Assembled dish. Got 24” Superjack Actuator
- Jan 2005: Got metalwork kit via G4HUP for OK1DFC 1296 Feed. Spent many weekends trying to get it to match. Failed. All those who I spoke to about feed said” Built it and it worked” Gave up!
- Aug 2005: Learnt VE1ALQ was making a batch of VE4MA feeds. Ordered one. Match and circularity excellent

Feed mount

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Inspired by G4NNS description of his cage mount at Martlesham RT.

Wanted design to allow either 23/13/9cm feed to be mounted in Cage

Version 1: Mount interfered with feed flange

Version 2: worked OK but All aluminum construction too flimsy

Version 3 (final): Ali / steel construction fine (shown below)

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Tracker/Sequencer/Z3801

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23cm

1296MHz

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Equipment 23cm

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- G4DDK Preamp. 0.26dB NF
- 20 year old 2x2C39A EME Electronics PA 200W
- 50’ LDF5 TX feeder
- G4DDK Xverter (2 IF outputs)
- RA18H1213G Predriver (7W)
- FT847
- PIC Sequencer
- L.O. locked to GPS with DFS9096

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1296 Transverter

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1296 Dish Configuration

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Tracking

- Initially pointed dish due south and adjusted threaded (latitude) rod until elevation of dish matched predictions
- Quickly discovered that something was very wrong with this. To track the moon the mount basically used as a manually controlled az el mount
- In a long conversation with G4DDK he said I had discovered in a month what had taken him 2 years to discover. Satellite dish mounts are not close to Polar mounts, they have to be modified.
- Found W4OP Paper from SEVHFS conference 2002 "**POLAR MOUNTS FOR EME DISHES** " which explained problem pictorially

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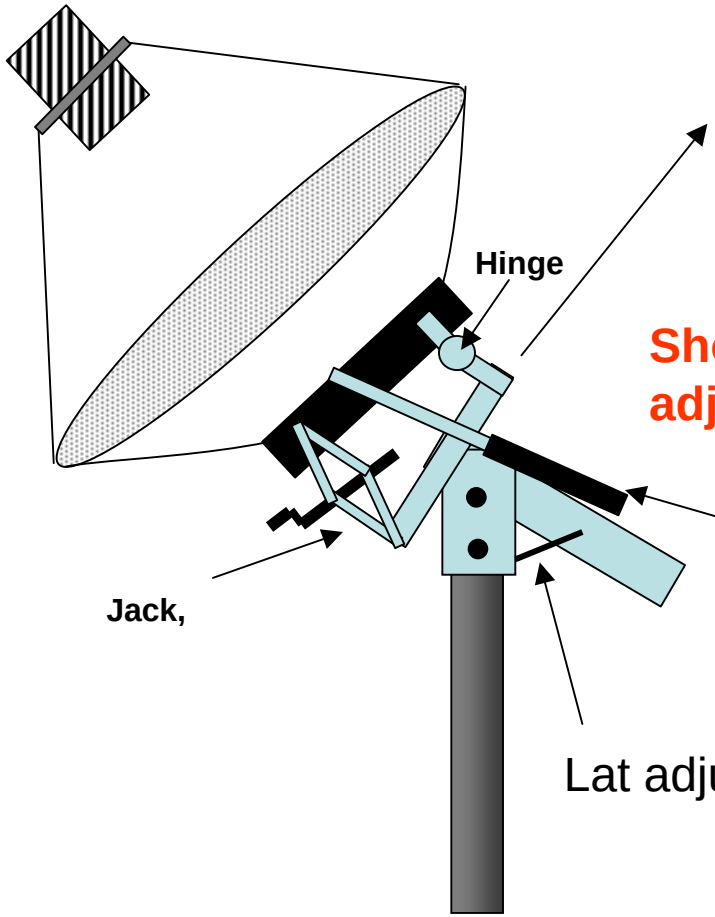

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Shows positive declination adjustment

Mount modified with saw and angle grinder using lots of stainless steel hardware and a scissor Jack

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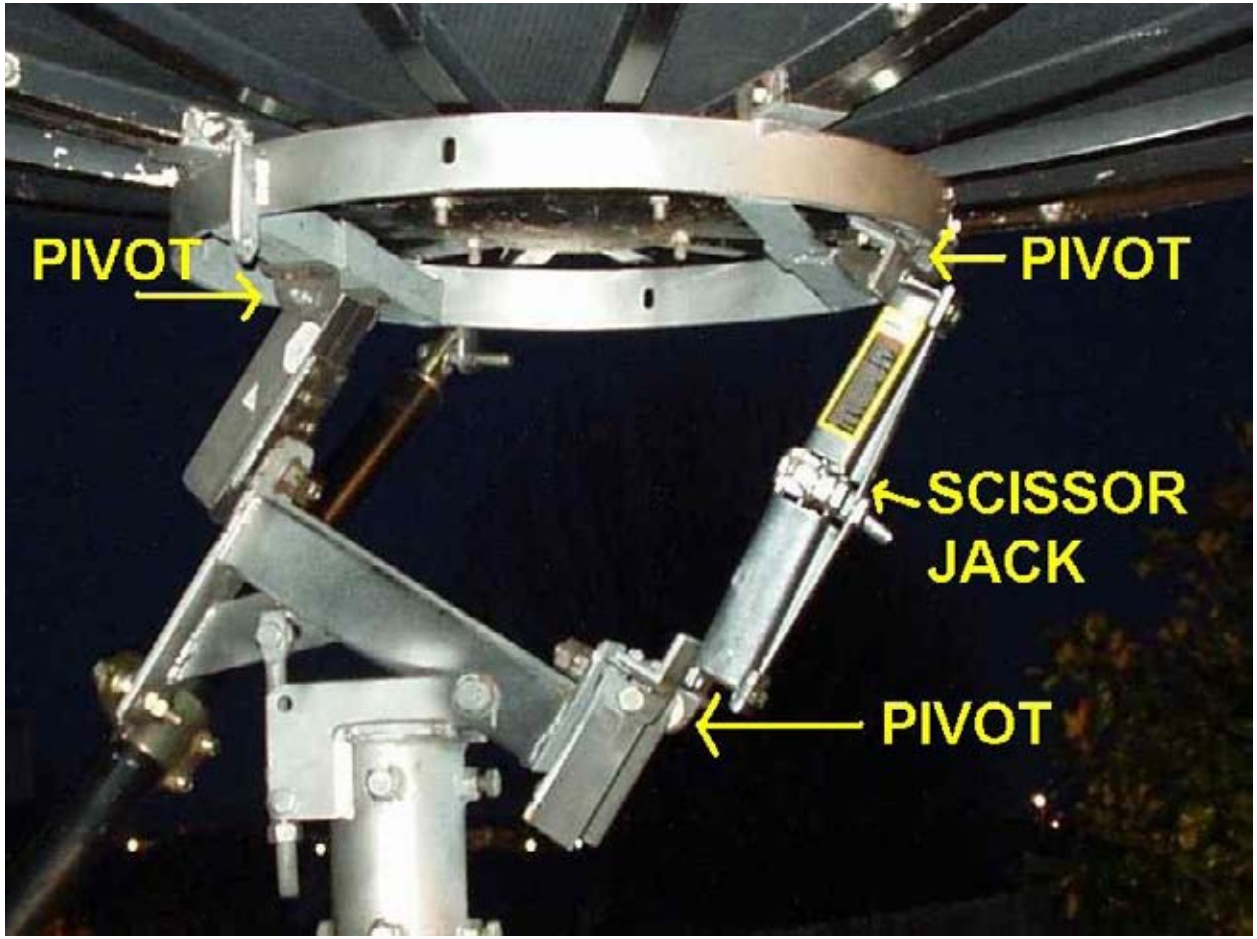
Modified Mount



Use Scissor Jack allows -17 to +33 degrees declination coverage.

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System Performance Improvements RX

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- Measured overall NF of protection relay/ connectors/Preamp
- Initial QSOs with Transco N relay & adaptors 0.78dB
- Transco SMA relay, fewer adaptors 0.57dB
- Transco SMA relay, even fewer adaptors 0.45dB

With small system every tenth of a dB helps!

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System Performance Improvements TX

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- 70’ LDF4 + 20’ FSJ4 on dish 2.6dB Loss
- 70’ LDF5 + 20’ FSJ4 on dish 1.8dB Loss
- 50’ LDF5 + 14’ LDF4 on dish 1.1dB Loss
- Increased power at dish from 110 to 155W…41% more power

With small system every tenth of a dB helps!

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Original Actuator mount

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Then came the wind

May 2: 120 kph winds (and driving rain/thunder/ lightning)

Sleeve holding actuator to post slipped. Actuator slipped

Dish swung vertical, bent rim in 4 places damaged 4 panels

Following morning bought 3 G clamps, steel angle, spent 3 hours straightening dish

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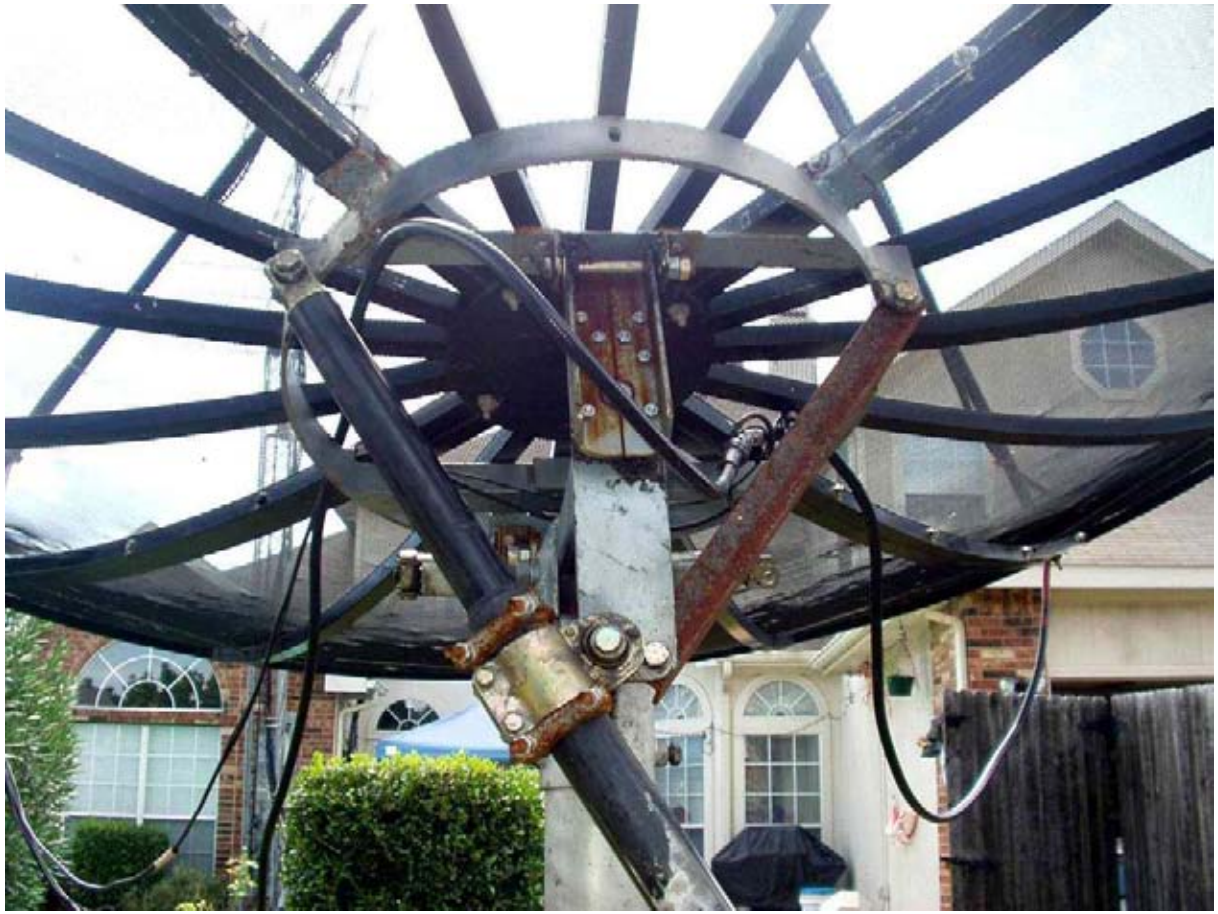
When not in use added extra brace



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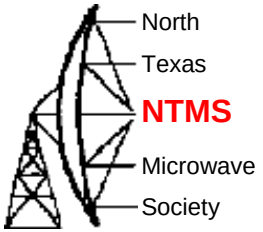
Results so far:1296MHz CW



8N1EME, AD6IW, AL7RT,CT3/DL1YMK, DF3RU, DL1YMK, DL1YMK/CX,DL4MEA, ES5PC,ES6RQ, F2TU,F6KHM, G3LQR,G3LTF, G4CCH,G4DZU, GW3XYW,HB0/DF1SR, HB9BBD,HB9Q, HB9SV,IK2MMB, IK3COJ,IQ4DF, IW2FZR, IZ1BPN, JA6CZD,JR4ZZS, K0YW,K1RQG, K2DH,K2UYH, K4QI,K5GW, K5JL,K5PJR, K5SO, K9SLQ, KH7X, KL6M, LA8LF, LA9NEA, LX1DB, N0OY, N2IQ, N2UO, N9JIM, NA4N, OE5JFL, OE9ERC, OH2DG, OK1CA, OK1DFC, OK1KIR, ON7UN, OZ4MM, OZ6OL, PA0SSB, PA3CSG, RA3AQ, RW1AW, RW3BP, SK0UX, SM2CEW, SM3AKW, SM3LBN, SM4DHN, SM6CKU, SP6JLW, SV1BTR, SV1OE, TF/DL1YMK, VA7MM, VE6TA, VK3UM, W2DRZ, W2UHI, W5LUA, W7BBM, WA5WCP, WA5WCP/id, WA5WCP/ut, WA5WCP/wy, WA6PY, WB2BYP, ZS6AXT

245 Qs 85 Inits 5 Cont 30 DXCC 75 Grids 19 States

Escapees: WA5WCP (CT, RI, VT, MA), P43L, JA8IAD, K9BCT

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Results so far:1296MHz JT65C

SM5LE VK7MO G4DDK RW3BP
G4DZU G4CCH OK1KIR VA7MM
OE9ERC PA0BAT ES5PC K2UYH
GW3XYW ES6RQ UR5LX W5LUA
PA3FXB PA3DZL N9JIM K7XQ
N9JIM VE7BBG RD3DA

30 QSOS 23 Initials 12 DXCC 20 Grids
3 States!

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13cm

2300/2320/2424MHz

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Equipment 13cm

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- G4DDK ATF36077 preamp 0.33dB NF
- Spectrian Amplifier mounted at dish (180W max). 24V operation.
- Homemade VE4MA Superfeed using copper tube mailed by PA3CSG.
- DB6NT Xverter For 2304/2320. Modified for dual RX outputs. IF is FT847
- For 2424MHz RX (JA band) use ADC7133 Satellite down converter to FT847 IF at 168MHz

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PA Housing

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1.Electronics stood off bottom of kennel with plastic case…just in case water gets in.

2. Cable to feed should have droop loop…otherwise water channeled into PSU

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Spectrian Amp

Added remote monitoring capabilities

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13cm Results

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DL1YMK/CX, DL4MEA, ES5PC, F2TU, G3LQR, G3LTF, G4CCH, HB9Q, HB9SV, IW2FZR, K2UYH, K5GW, KL6M, LX1DB, OE9ERC, OK1CA, OK1KIR, OZ4MM, PA3CSG, RW1AW, SM2CEW, SM3AKW, TF/DL1YMK, VE6TA, VK4AFL, WA6PY, W5LUA, WD5AGO

54 QSOS 28 INITIALS 26 Grids 19 DXCC 5 States

Plus W5LUA VK7MO & G4CCH on JT65C

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SDRIQ

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- 0.5kHz – 30MHz
- AM, WFM, USB, LSB, N-FM, DSB, CW demod
- Can record up to 190kHz of spectrum

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SDRIQ 1296MHz Interface

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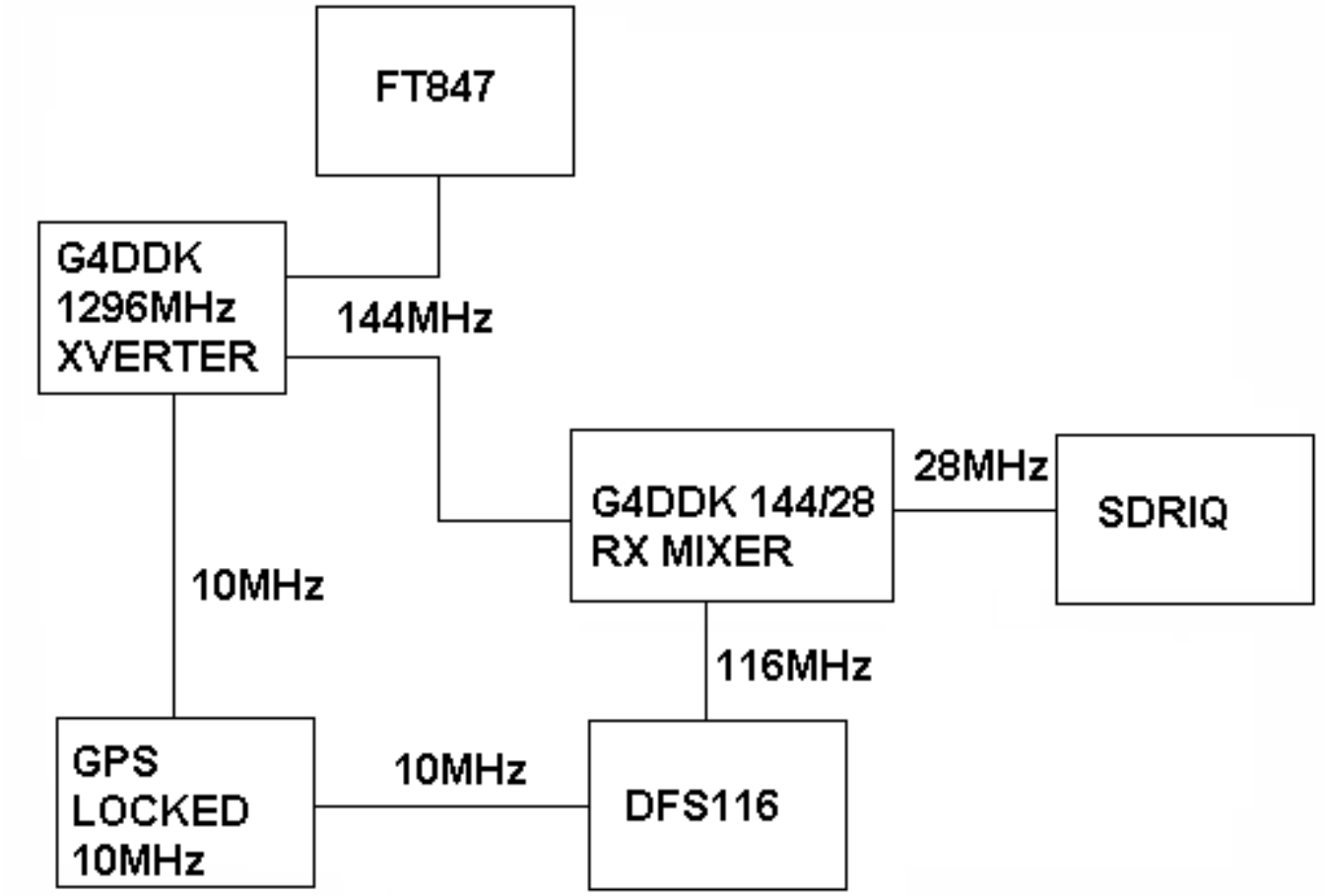

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Dubus contest 1296MHz

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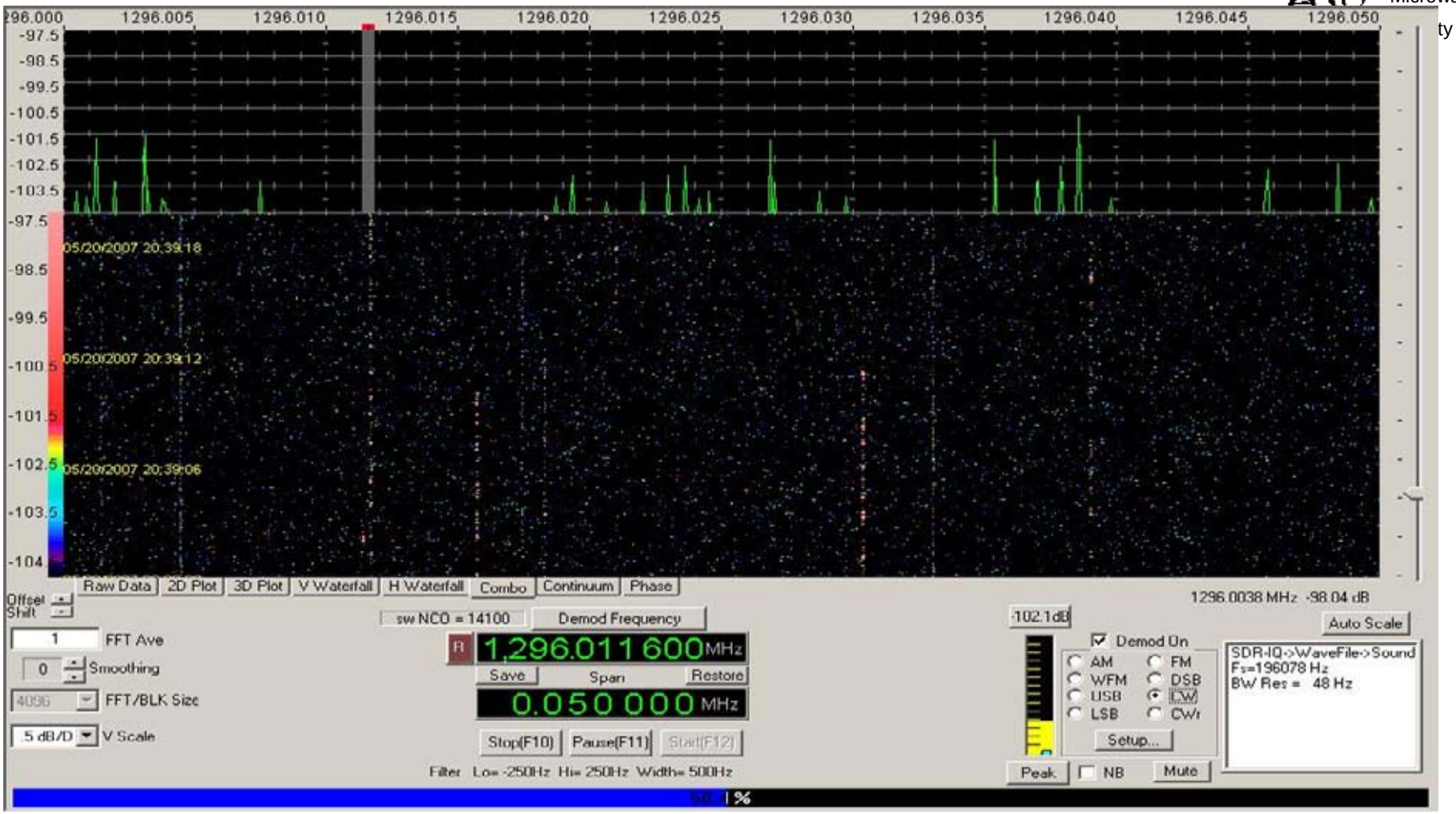

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29 Aug 0440z

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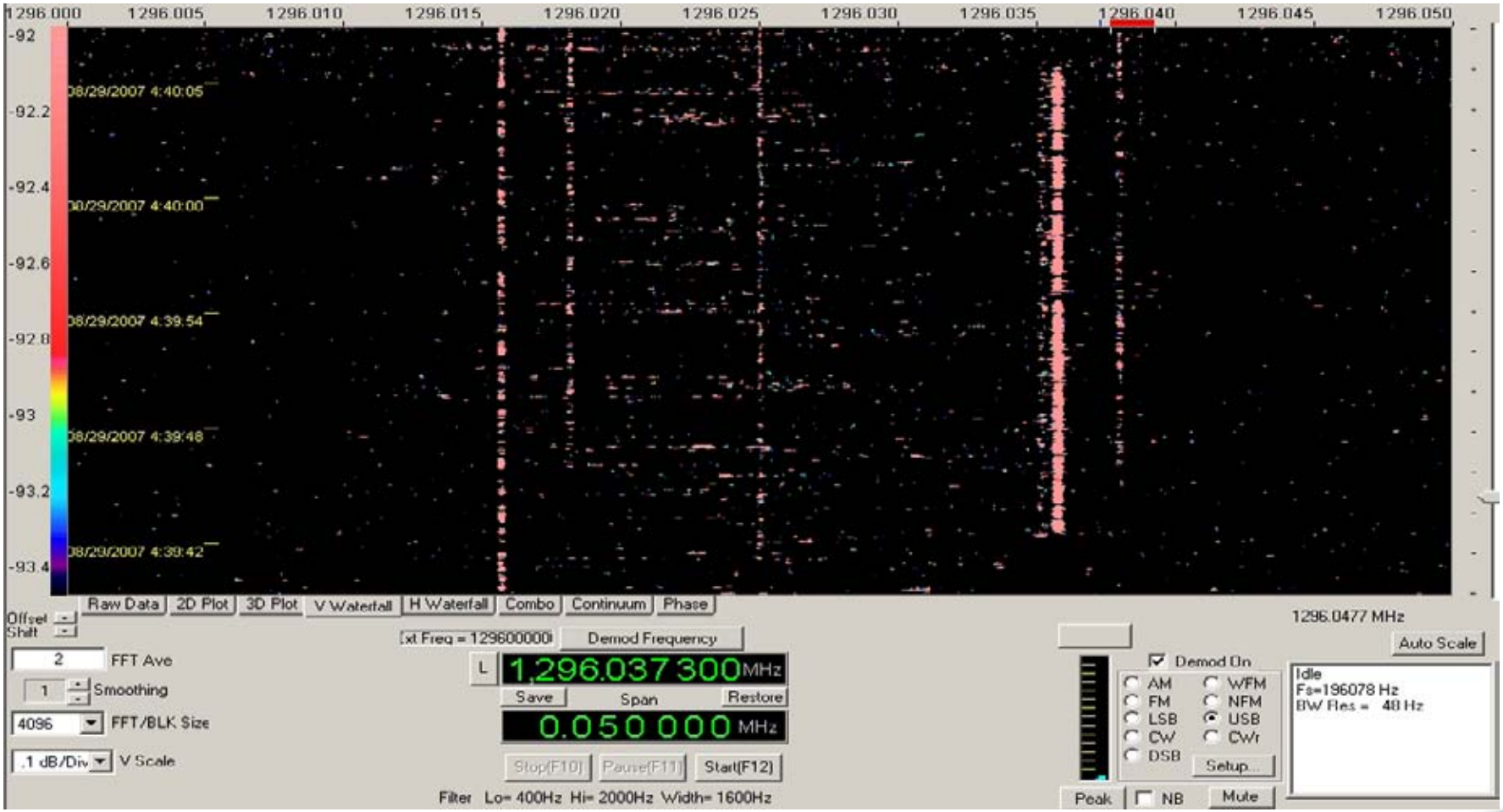
K5SO F2TU W5LUA W5LUA ECHO



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9cm

3400/3456MHz

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9cm

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- Activity weekend announced Jun 16 2007.

The Initial Plan:-

- Scale 23cm VE4MA feed to 3456MHz using 2.5” copper tube
- Activity on 3400 and 3456MHz: Too much separation for one IF
- Use DB6NT Tropo xverter on one band
- Build receive converter for Crossband
- DEMI preamp 0.6dB/16dB
- Mount 40W Toshiba Amp at feedpoint

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3456MHz Feed

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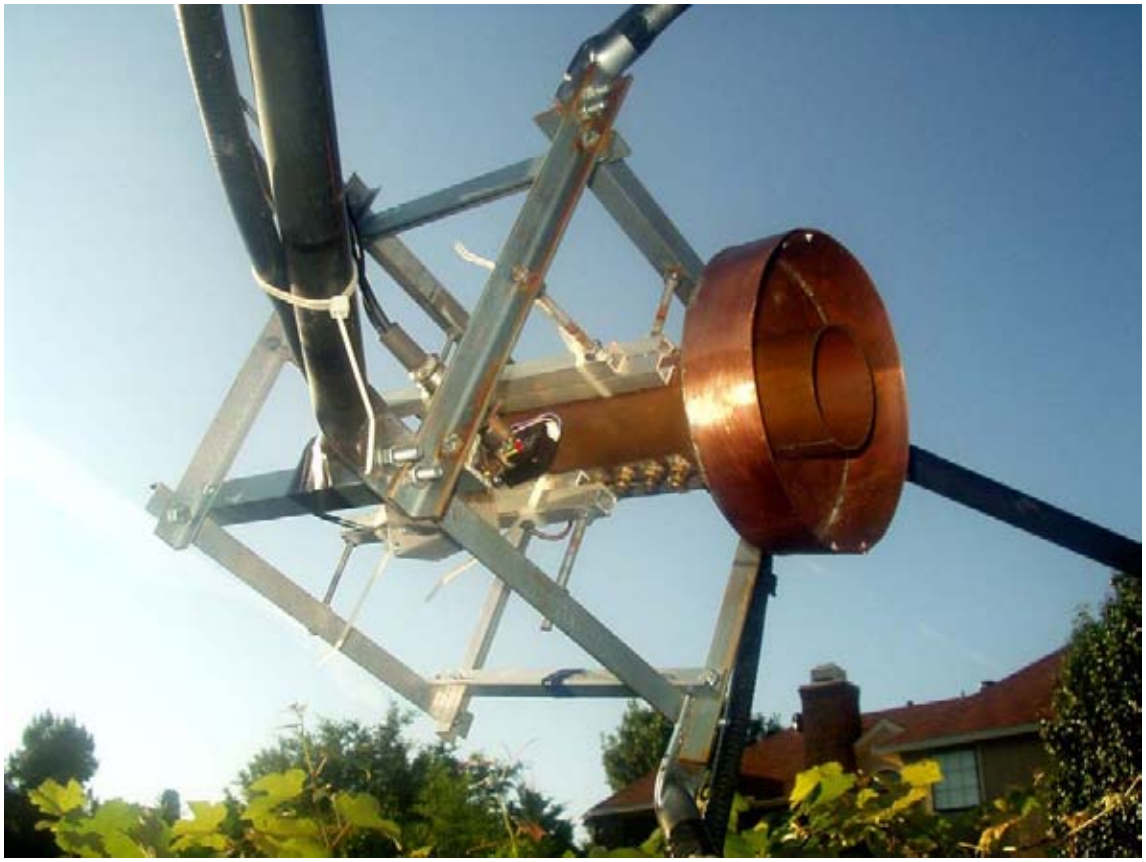

Scaled VE4MA 1296MHz feed

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1st weekend

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3400/144 Rx converter DB6NT 3456/144 Xverter

Heard G4NNS and W5LUA but they couldn't hear me

Toshiba amp at feedpoint destroyed by lightning strike. Will be mounted in Dog kennel in future

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2nd weekend

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Converted 3456 RX converter to Transverter so QRV on both bands

Worked G3LTF on sked: not as loud as 1st weekend

Heard **VK3NX, W5LUA and VE4MA** on skeds, but they couldn't hear me

Just when I thought would only make 1 QSO **worked LX1DB**, just before his moon set

Took feed to W5LUA to measure; circularity acceptable

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DUBUS contest 2008

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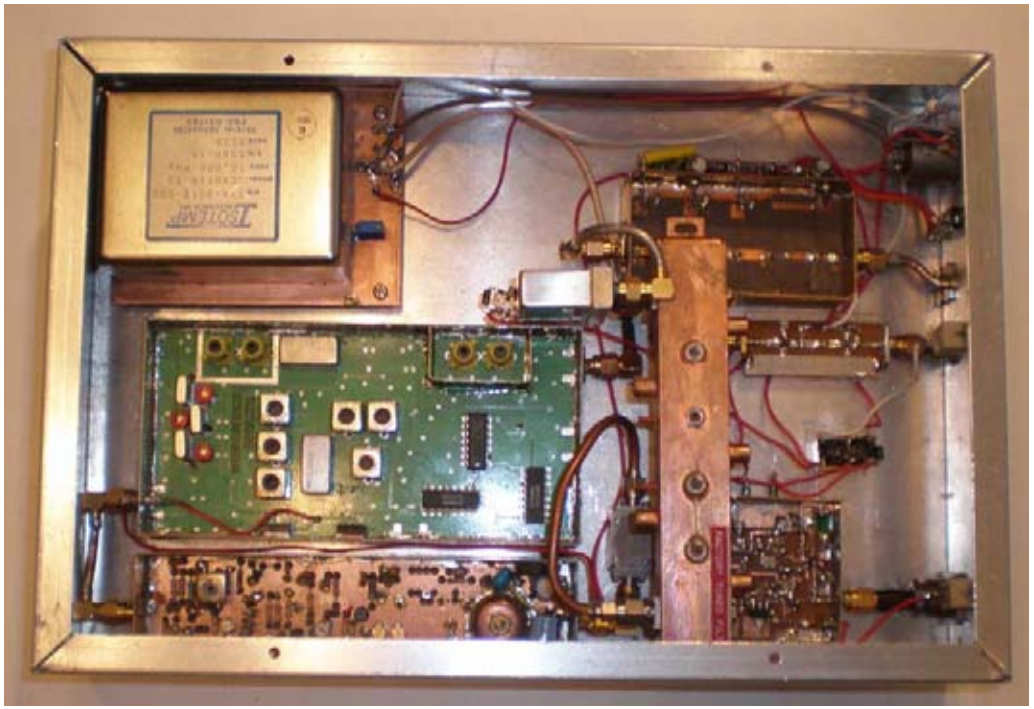
Incorporated G4HUP 101.75MHz GPS locked source into transverter



Changed preamp to G4DDK ATF36077 0.55dB/31dB
Worked W5LUA, OK1CA Heard OK1KIR (couldn't hear me) and VK3NX.

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Triplets!

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Left to right 1296MHz 2304MHz 3456MHz

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What Next?

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5760MHz:

Have WD5AGO cp feed, 0.7db preamp and 55W

10GHz

20W, 0.9dB nf BUT will Need new dish

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New 1296 Amp

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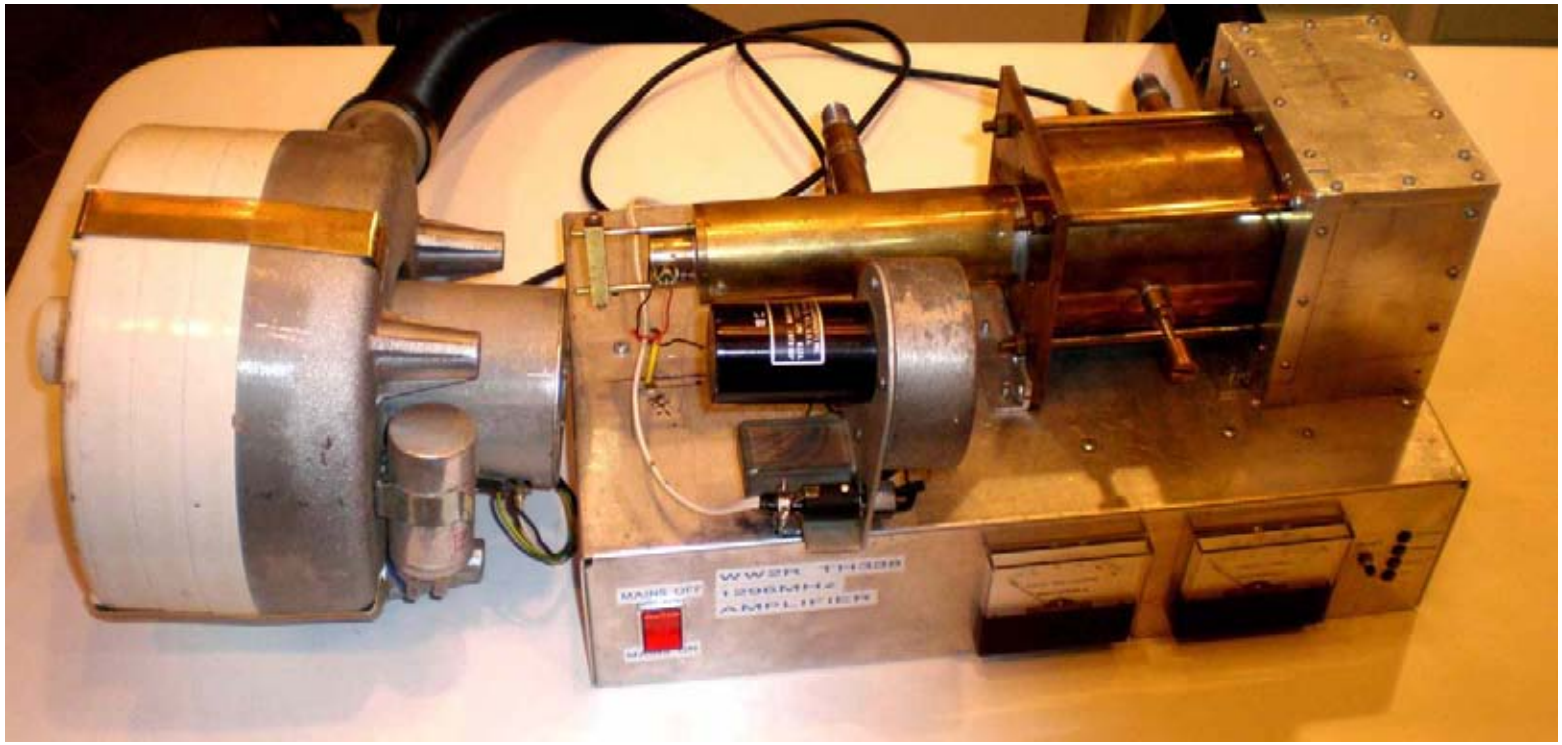
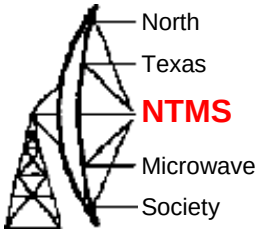


TH338 450W output ~13dB gain

Acknowledgements



- To G4DDK, K5GW, W5LUA, PA3CSG, K1RQG for advice and assistance
- To my wife Meg, N2NQI (M0FRE), for encouraging me to decorate the backyard with the oversize garden ornament
- Finally to N5PYK for moving and donating the dish

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More information

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- DFS9096: http://g4fre.com/dfs9096.pdf
- 1296MHz: http://g4fre.com/1296eme.htm
- 13cm: http://g4fre.com/13cm_eme.htm
- 9cm: http://g4fre.com/3456eme.htm
- SDRIQ: www.rfspace.com
- G4DDK 23cm preamp: http://www.btinternet.com/~jewell/23cmvlna.html
- G4DDK 13cm preamp: http://www.btinternet.com/~jewell/13cmlna.html
- G4HUP dfs101.75: http://g4hup.com/DFS/DFSdoc.html