

A desert landscape featuring several tall saguaro cacti in the foreground and middle ground. In the background, there are blue-toned mountains under a sky with soft, white clouds. The overall scene is a typical desert environment.

EME IN THE DESERT SUMMARY

Barry Malowanchuk VE4MA

NLRS Aurora Conference

April 25, 2015 White Bear Lake, Minnesota

Summary of EME in the Desert

- ▣ Arizona EME efforts by Band
- ▣ Antenna Solutions
- ▣ Transmitter Power
- ▣ Operating Results
- ▣ Further Work to be Done

Summary of EME in the Desert

- ▣ Arizona EME efforts by Band
- ▣ Antenna Solutions
- ▣ Transmitter Power
- ▣ Operating Results
- ▣ Further Work to be Done

EME in the Desert- Planning

- ▣ AZ EME Activity Levels Currently “Low”
- ▣ 902, 3400, 5.7 & 24 GHz Never Activated
- ▣ 1296 MHz Always a Good Choice for Activity & Big Signals
- ▣ Simulation with VK3UM EME Calc Program
- ▣ Reasonable Results Predicted for 5-6 ft Dish
- ▣ WSJT mode easier & CW QSOs need more power

EME in the Desert- Dish

- ▣ 10 ft TVRO dish procured but No mount.
- ▣ Uses 8 Petals for full dish, but only 3 needed for 5 ft Offset dish
- ▣ Original feed pipe used to support Offset Feeds
- ▣ Lightweight Aluminum construction allows one person installation/ removal after use
- ▣ For 902 & 1296 Use Pairs of Dipoles and added Hybrid Coupler for Circular Polarity
- ▣ Other bands use “Large 1.8 WL” W2IMU Feed Horn

VE4MA/W7 5 ft Offset Dish



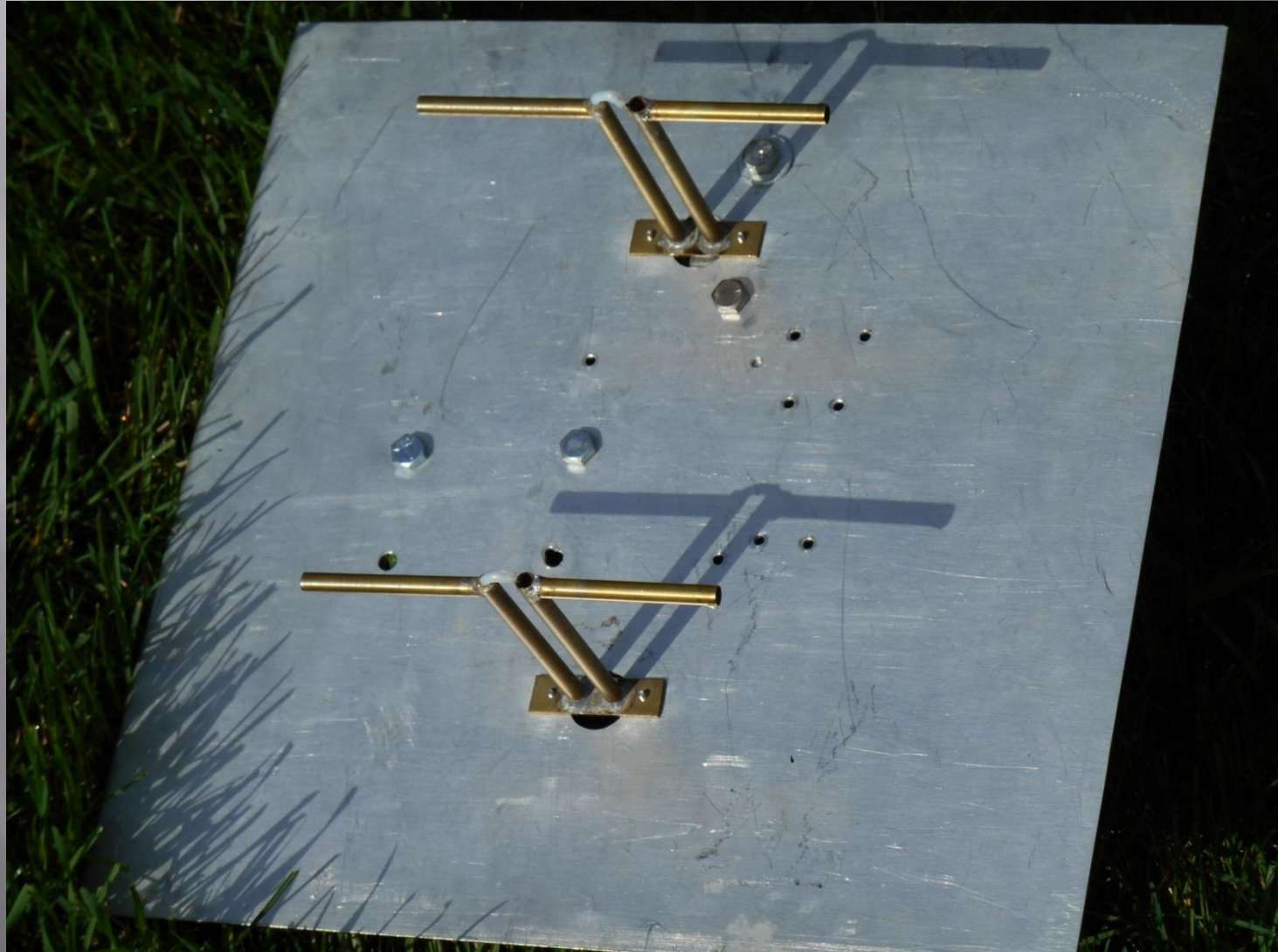
EME in the Desert- Station Equip



VE4MA/W7 902 MHz Operation

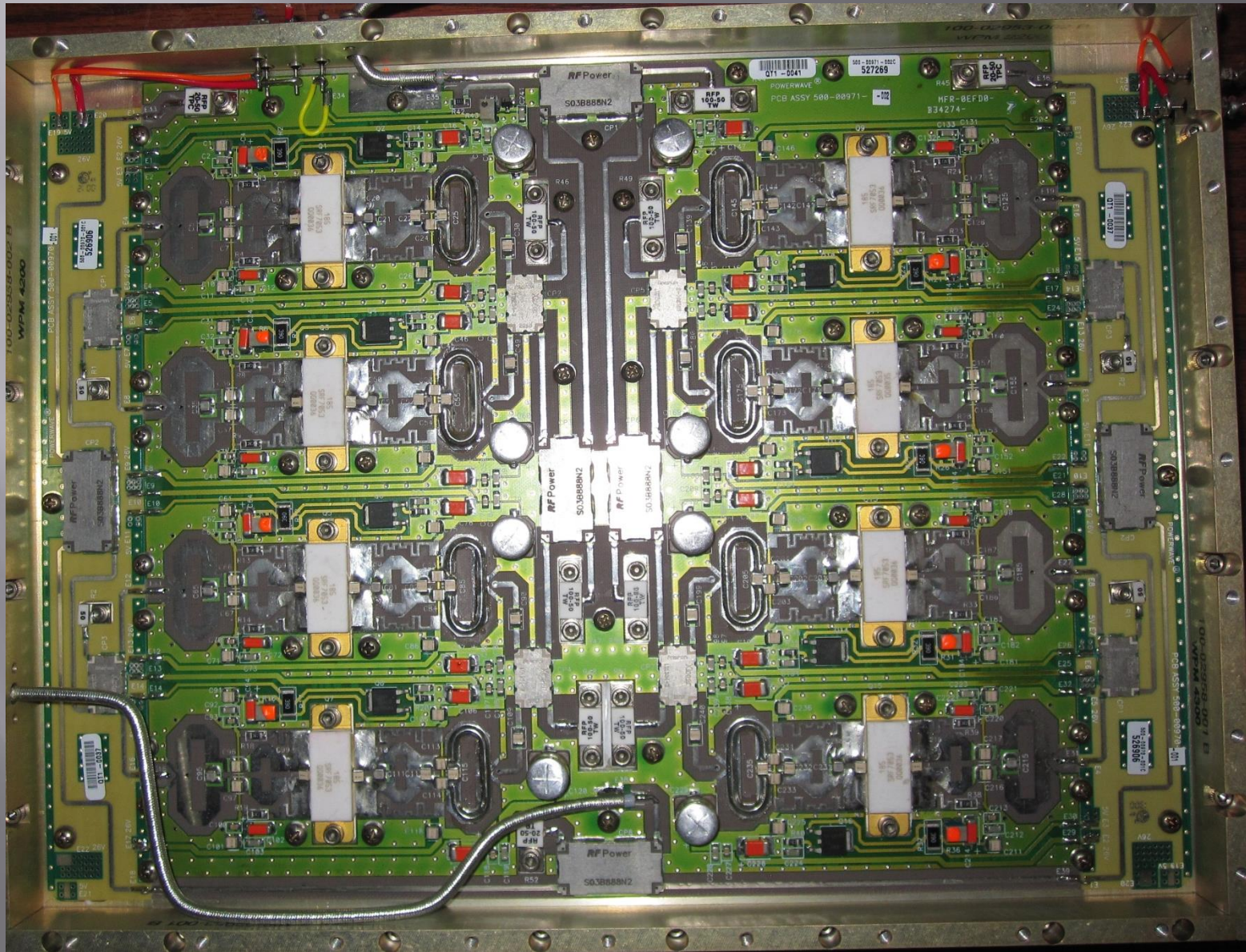


VE4MA/W7 902 MHz Feed



902 MHz EME PA Challenges

- BIG PA Obtained 8 x 150 W Transistors !

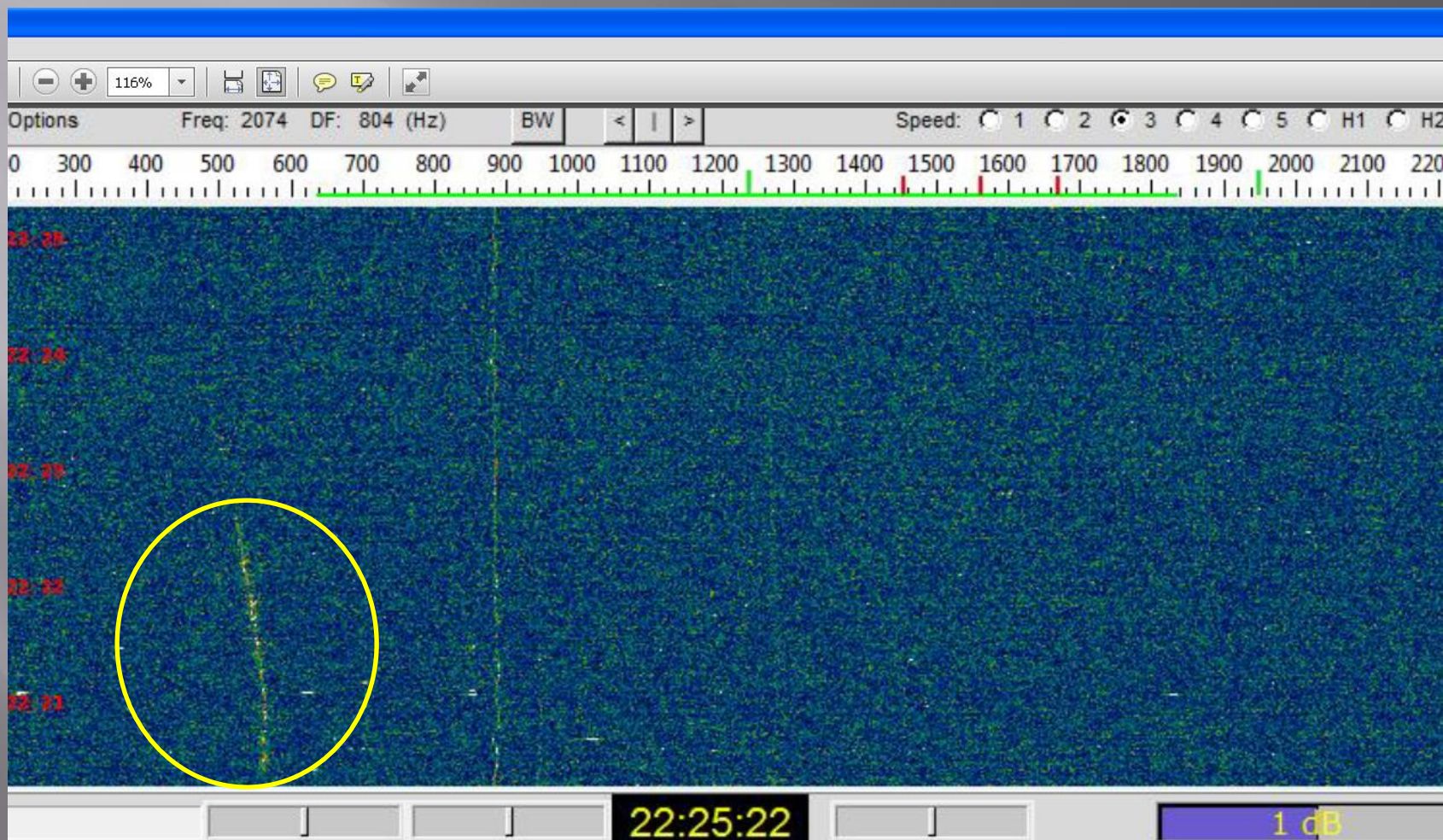


902 MHz EME PA Challenges

- ▣ Does 900 W output with Short Duty Cycle !!
- ▣ Output Combiner only Rated for 300W CW
- ▣ Operated at 500 W Ham CW mode (not WSJT)
- ▣ Survived OK !
- ▣ Need to Modify to Use External Final Combiner!

902 MHz EME Challenges

- ▣ First CW Signals from VE6TA Jan 4, 2014 !



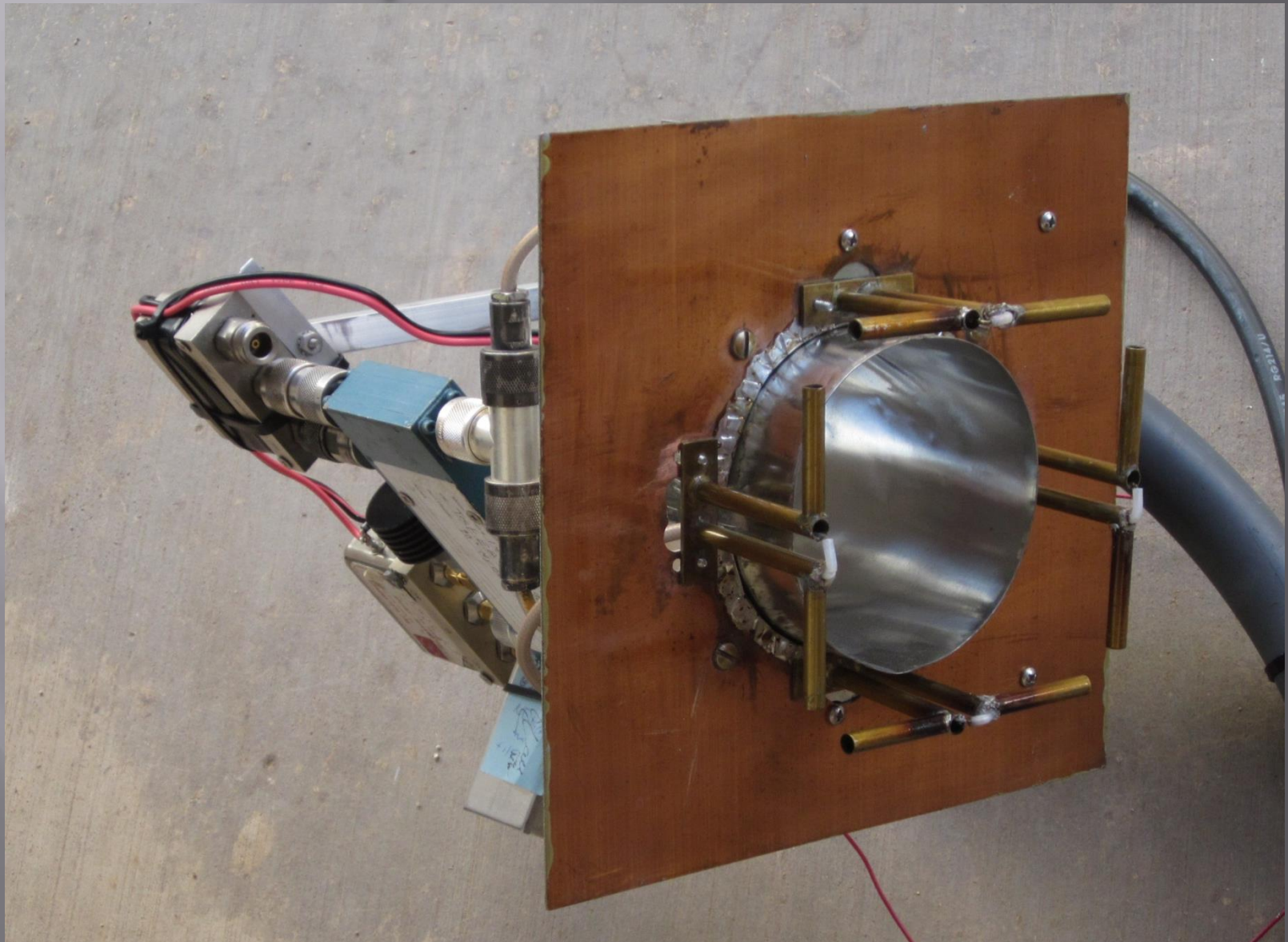
902 MHz EME Operating Results

- ▣ Nice CW QSO on Feb 17 with VE6TA with 250W & 18 ft dish
- ▣ CW QSO with W5LUA Using New un-optimized feed with 500 W & 16 ft Dish
- ▣ Other Stations Operational or Coming Soon
 - WA8RJF 10 ft dish & 500 W
 - K2UYH 28 ft dish & 250 W
 - N8DJB 16 ft dish & 600 W
 - PY2BS 14 ft dish & 300 W
 - KL6M 32 ft Dish & 300 W

VE4MA/W7 1296 MHz Operation



VE4MA/W7 1296 Dish Feed



1296 MHz Station Equipment

- ▣ 1296 Sun Noise tested at 7.5 dB.
 - Using a 55 el loop Yagi with same EME preamp Sun Noise was only 3.5 dB but Linear Polarity
- ▣ Modified old Microwave Modules 1296 Transverter, with 30 W LDMOS driver amp
- ▣ “VE1ALQ” & W6PQL type Amplifiers
(2 x MRF286 s) Combined at 280 W Output
- ▣ G4DDK type Preamp with MGF4917 FET ~0.25 NF
- ▣ 18 ft of 7/8 LDF Heliax plus 6 ft jumper of 1/2 LDF

1296 MHz Operating Results

- ▣ On 1296 MHz Big Station signals were $>10\text{dB/N}$
- ▣ 21 stations worked on CW,
- ▣ 16 stations worked on WSJT including VE3KRP who has $\sim 150\text{ W}$ and a 10 ft dish !
- ▣ Many More WSJT Stations possible...emphasis was on CW QSOs !

VE4MA/W7 3.4 GHz Operation



3.4 GHz Station Equipment

- ▣ DEMI Transverter and Feedhorn/ Preamps, Relays from Home dish
- ▣ Keltek TWT Amplifier with 125 W 6 GHz TWT.
- ▣ 18 ft of 7/8 LDF Heliax plus 6 ft jumper of 1/2 LDF
- ▣ 11.8 dB of Sun Noise (more than expected!)
- ▣ **Operating Results 7 Stations worked (6 on CW), plus one (VK4CDI) on WSJT**
- ▣ TWT/ Transverter Spurious Issue...need Filters

VE4MA/W7 5.7 GHz Operation



VE4MA/W7 5.7 GHz Feedhorn



EME in the Desert- Station Equip.

- ▣ On 5.7 GHz a W2IMU 1.8 WL diameter horn, preamplifiers, relay assembly used from Home.
- ▣ 5.7 GHz Sun Noise Measured at predicted 9.5 dB
- ▣ Used 18 ft of EW52 Elliptical WG + 6 ft of ½ LDF
- ▣ Keltek TWT Amplifier weighing 180 lb with 125 W 6 GHz Varian TWT.

5.7 GHz TWT & Transverter



5.7 GHz Operating Results

- ▣ On 5.7 GHz signals (at Apogee) were 6 – 10dB/N
- ▣ 5.7 GHz Stations worked LX1DB, OK1KIR, K5GW, W5LUA
- ▣ Being Heard Very Well but Problem on RX
 - RX looks good on Bench?
 - WiFi interference ????
 - Need to add Filters?
 - Tests Being Conducted back in Winnipeg

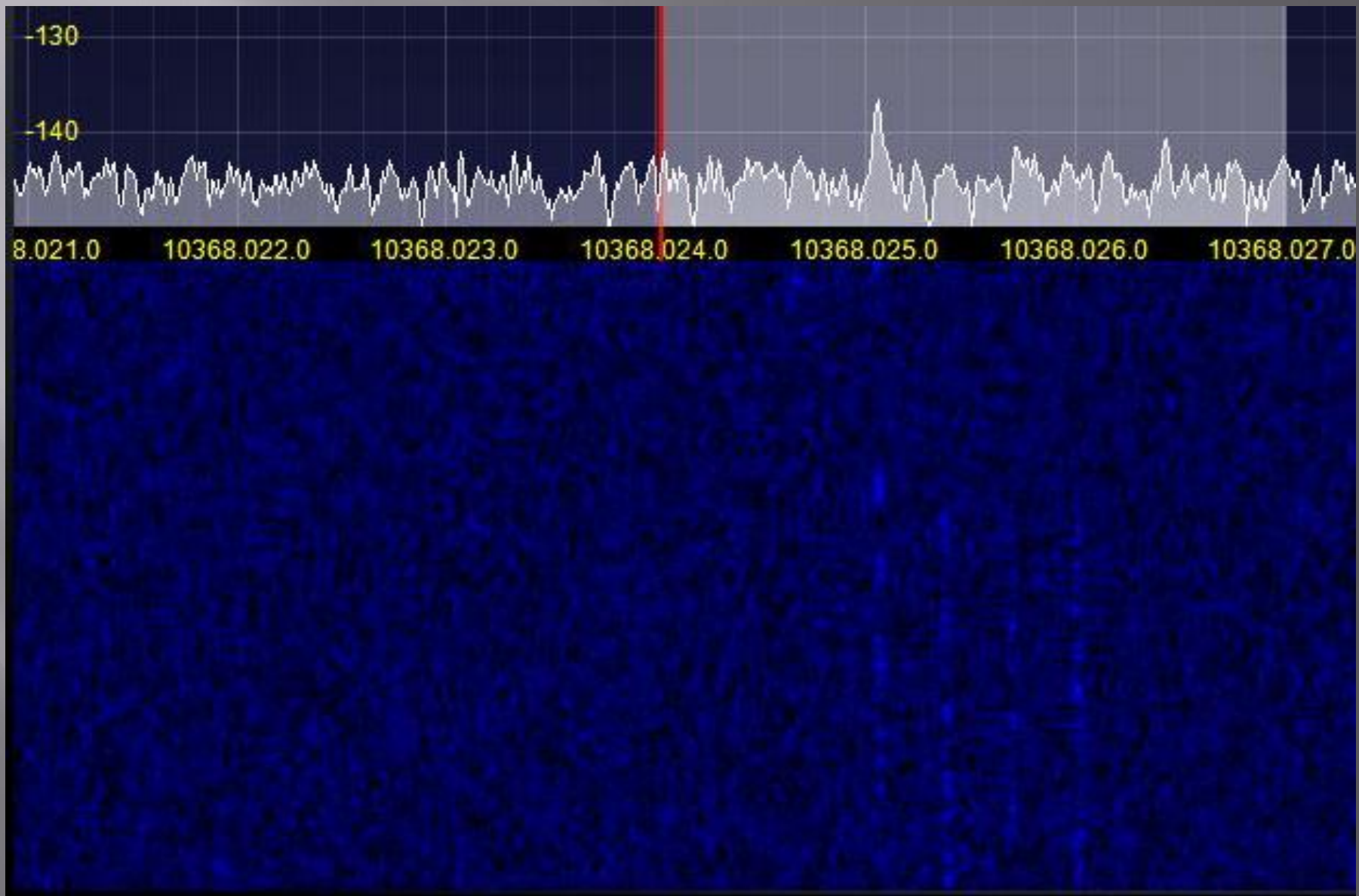
10 GHz Tests

- ▣ Used a Surplus Potter horn, Modified LNB (0.8 dB NF) preamplifier, HB Transverter.
- ▣ Sun Noise Measured at 7 dB (~1 dB low)
 - I see 16 dB at home with 2.4 m dish and 0.65 dB LNA
- ▣ Copied DL0SHF Beacon at -11 in JT4F mode
- ▣ Good Audible copy of Beacon CW & JT4F Tones

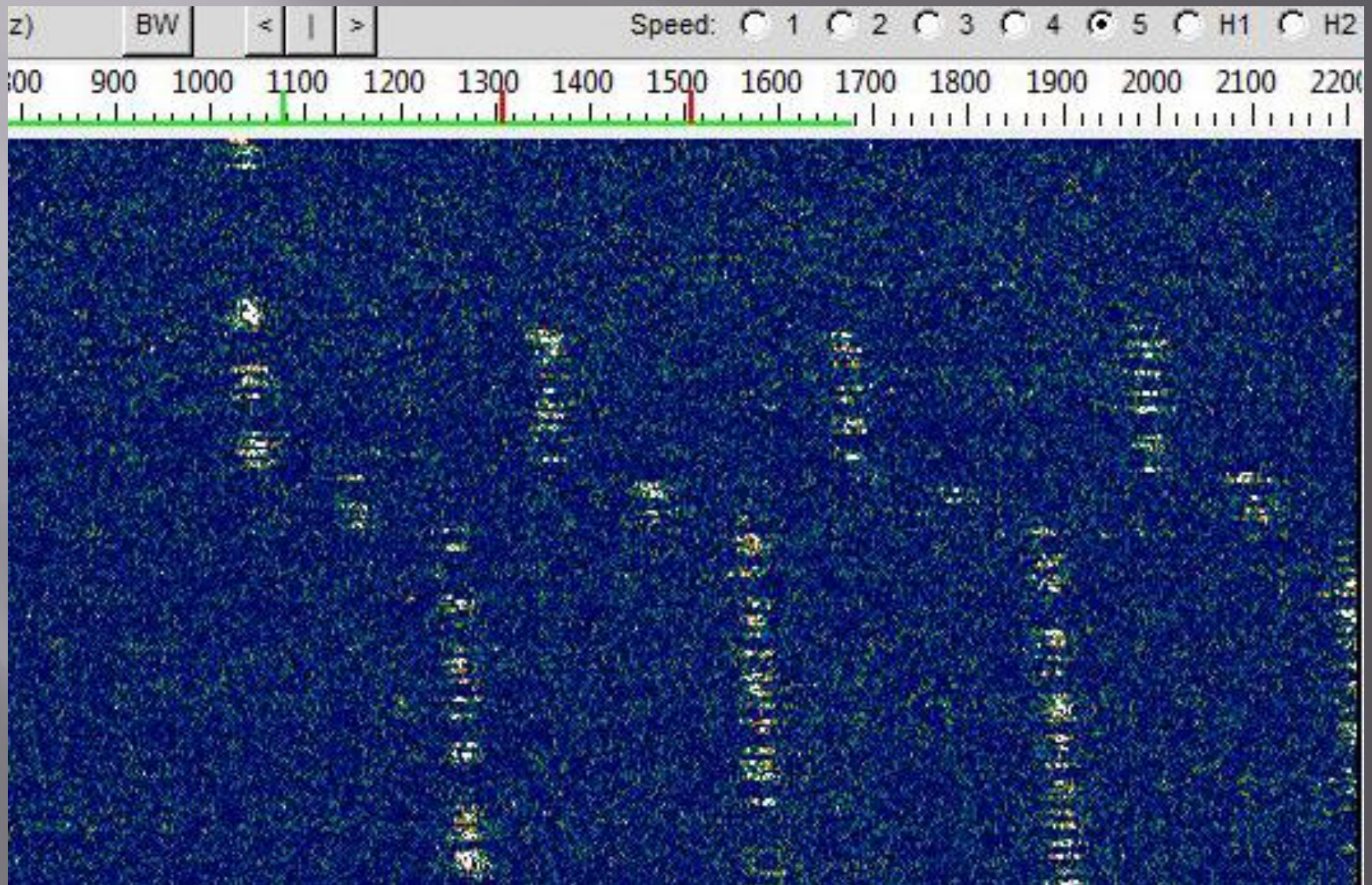
10 GHz Test Feedhorns



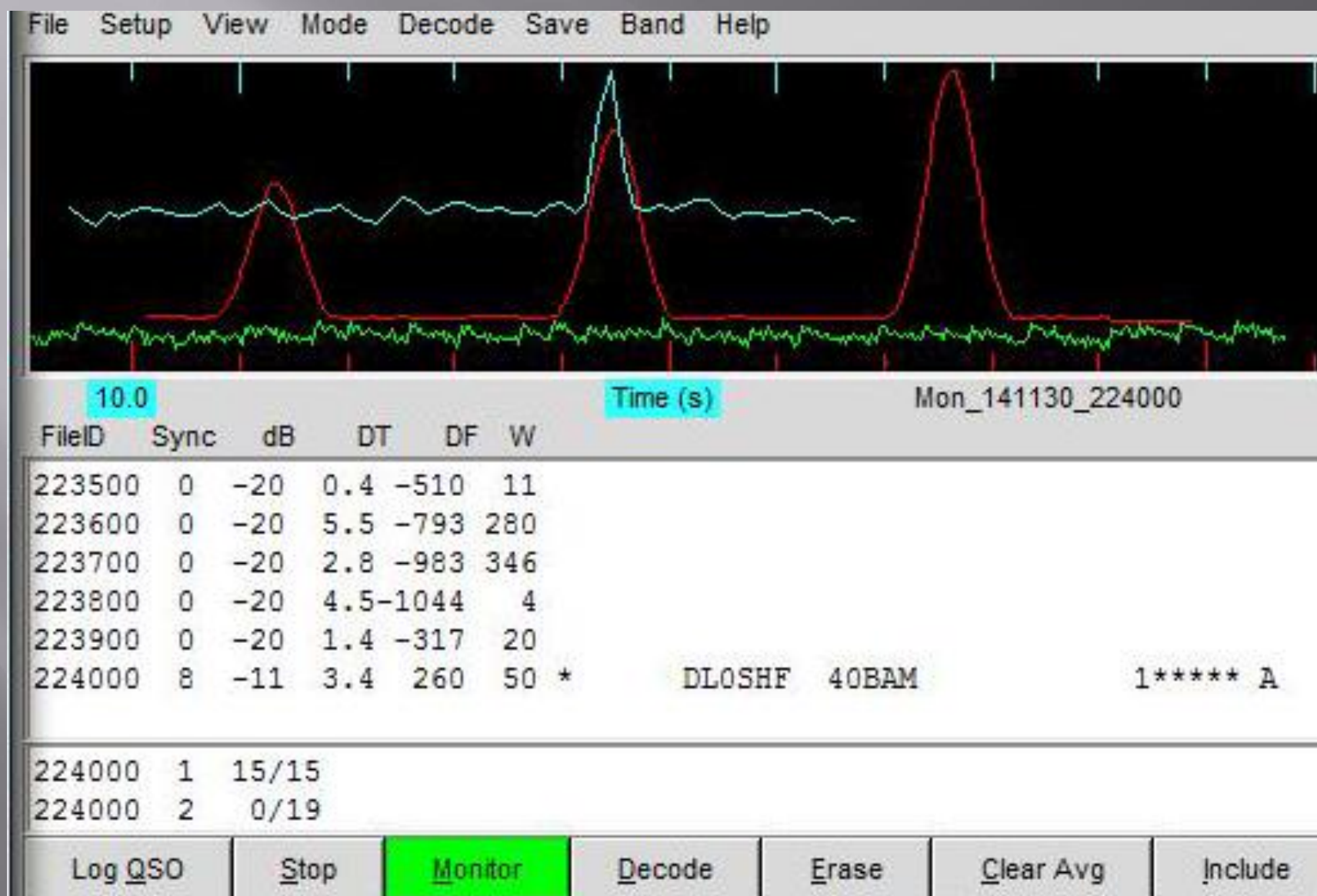
10 GHz DL0SHF Beacon on SDR



10 GHz DL0SHF Beacon SpecJT



10 GHz DL0SHF Beacon WSJT




Further EME Work To Be Done?

- ▣ Tested 1m dish on 10 & 24 GHz
- ▣ Sun Noise on 10 GHz was 7.2 dB
 - Slightly better than 5 ft Offset!
 - Used Surplus Feedhorn & 0.8 dB NF LNA
 - I see 16 dB at home with 2.4 m dish and 0.65 dB LNA
- ▣ Sun Noise on 24 GHz was 8.5 dB
 - I see 14 -16dB at home with 2.4 m dish
- ▣ 10 G TWT Amp gives 100 W out with 0.5 mW input!
- ▣ So 10 & 24 GHz Digital EME certainly possible

Summary of EME in the Desert

- ▣ Arizona EME efforts by Band
- ▣ Antenna Solutions
- ▣ Transmitter Power
- ▣ Operating Results
- ▣ Further Work to be Done

A photograph of a desert landscape. In the foreground, there are green, low-lying desert shrubs and dark rocks. Several tall saguaro cacti are scattered throughout the scene, some with arms. In the background, there are blue mountains under a sky with light, wispy clouds. The overall lighting suggests it might be early morning or late afternoon.

EME IN THE DESERT SUMMARY

Questions?