EME activity on 1296 MHz with QRP equipment

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www.ok2kkw.com

Amateurs were among first to experiment with EME communications above 1GHz

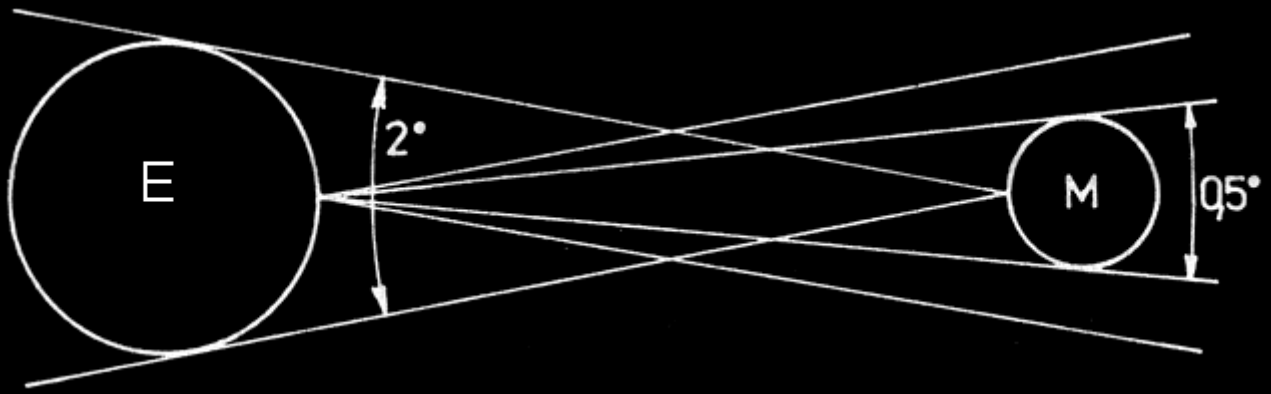
- first EME echoes reported (on 144 MHz) in 1953
- first 2-way contact (1296 MHz) in 1960
- all continents worked on 432 MHz in 1976
- 10 GHz EME in 1989
- 47 GHz EME in 2002
- 76 GHz EME echoes detected in 2012

Why work EME?

- It’s exciting!
- Most fun in ham radio is making rare, unusual or difficult contacts
- EME allows you to work worldwide DX even in microwave bands
- EME will learn you many new things about space communications, preciosity of HW construction and importance of patience so you’ll be happy with each EME contact in log

EME – fascinating propagation

- Communication over 760 000km (2,4s delay)
- Path loss on 23cm 271dB
- Distance to Moon Varies (2,2dB)
- Moon apparent size ~0.5º
- Moon reflects only ~7% of signal
- Sky noise change with Moon location (on 23cm ~ 10K)
- Doppler shift ($\Delta f = 2\ v / \lambda$) moves frequency (on 23cm up to 2,4 kHz)
- Faraday rotates polarization
- Moon libration effect signal quality (important >2,4 GHz)



EME CHALLENGE – path loss

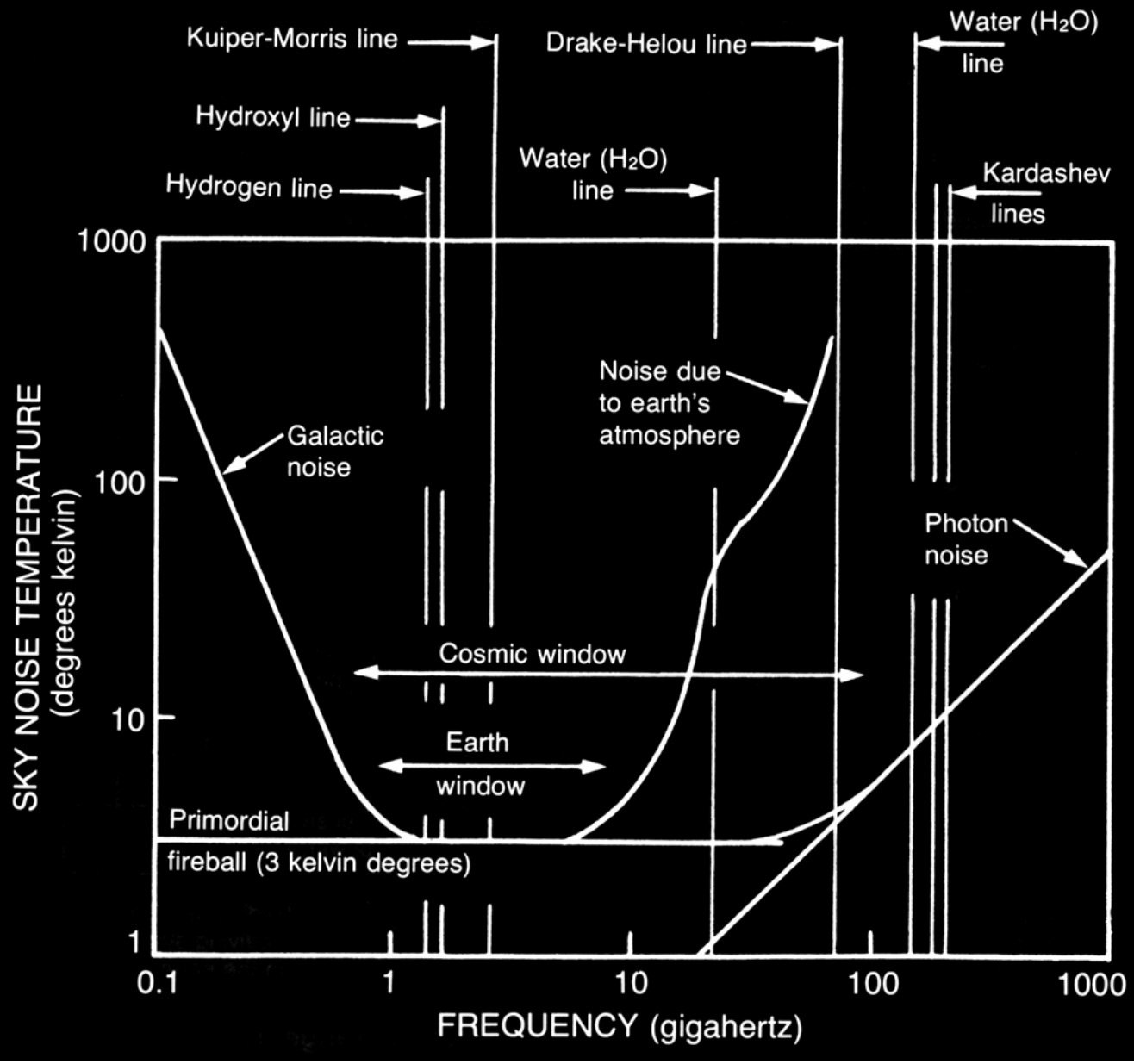
Path loss for Perigee :

b = 207 + 20,5 log f [dB, MHz]

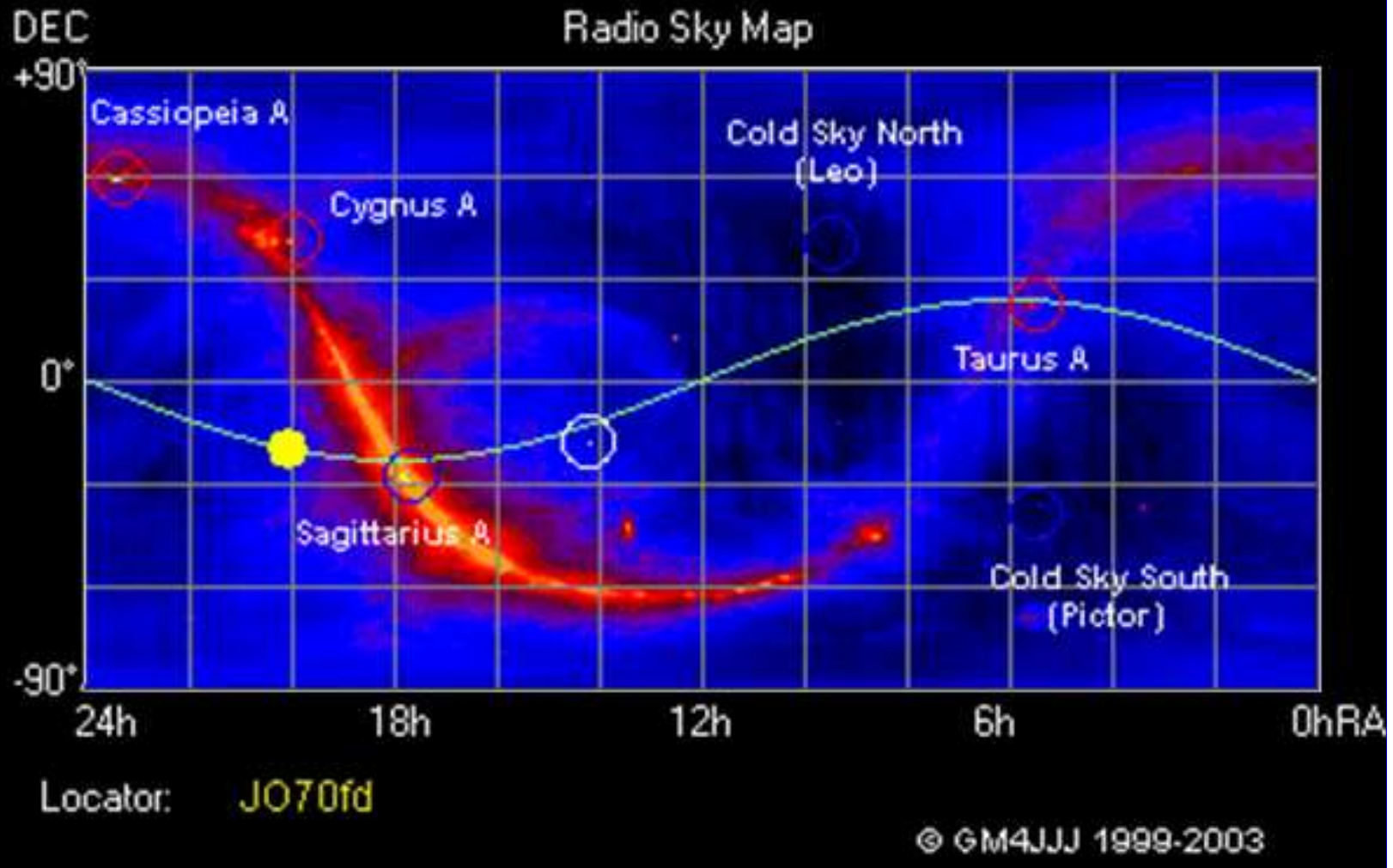
- 50 MHz -242 dB
- 144 MHz -251 dB
- 432 MHz -261 dB
- 1296 MHz -271 dB
- 2320 MHz -276 dB
- 3400 MHz -279 dB
- 5760 MHz -284 dB
- 10 GHz -289 dB
- 24 GHz -297 dB
- 47 GHz -303 dB

2,2dB is difference between Moon in Apogee (405 696 km) and Perigee (363 104 km)

EME CHALLENGE – sky noise

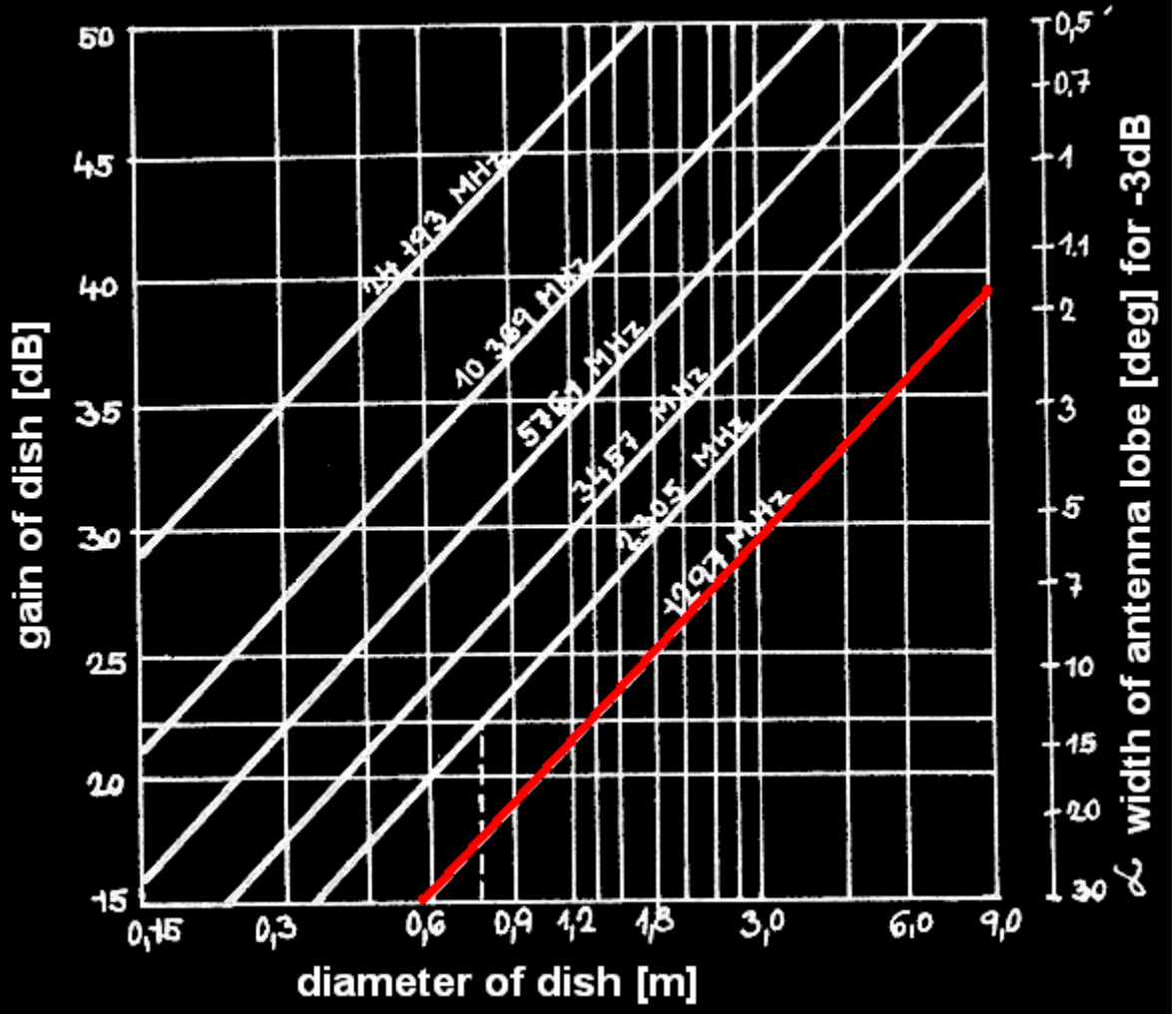


EME CHALLENGE – sky noise



EME - Technical challenge

- the largest antenna as possible?
- the biggest amplifier as possible for long time maximal output without failure?
- minimized RX path loses – lowest NF essential?
- High accurate tracking of antenna?



With WSJT a big station is not needed!

DP1POL – Felix & 67el YAGI
Winter at South pole

QSO'D DF3RU, DJ9YW, ES5PC, ES6RQ, G4CBW, G4CCH, K2UYH, LZ1DX, OE9ERC, OK1DFC, OK1KIR, PA3CSG, RD3DA & W5LUA.

RA0ACM’s single 49el YAGI & 75W from apartment window

PORTABLE EME – DL3OCH style

- Bodo uses IC-706, DB6NT transverter + 80 W SSPA and a 59el dl6wu (5m long 18.7 dBd) from his car
- Besides DL, he has operated from TF, 3A, HB0, EA8, 5N0...
- More QRP EME pictures at http://www.g4cch.com

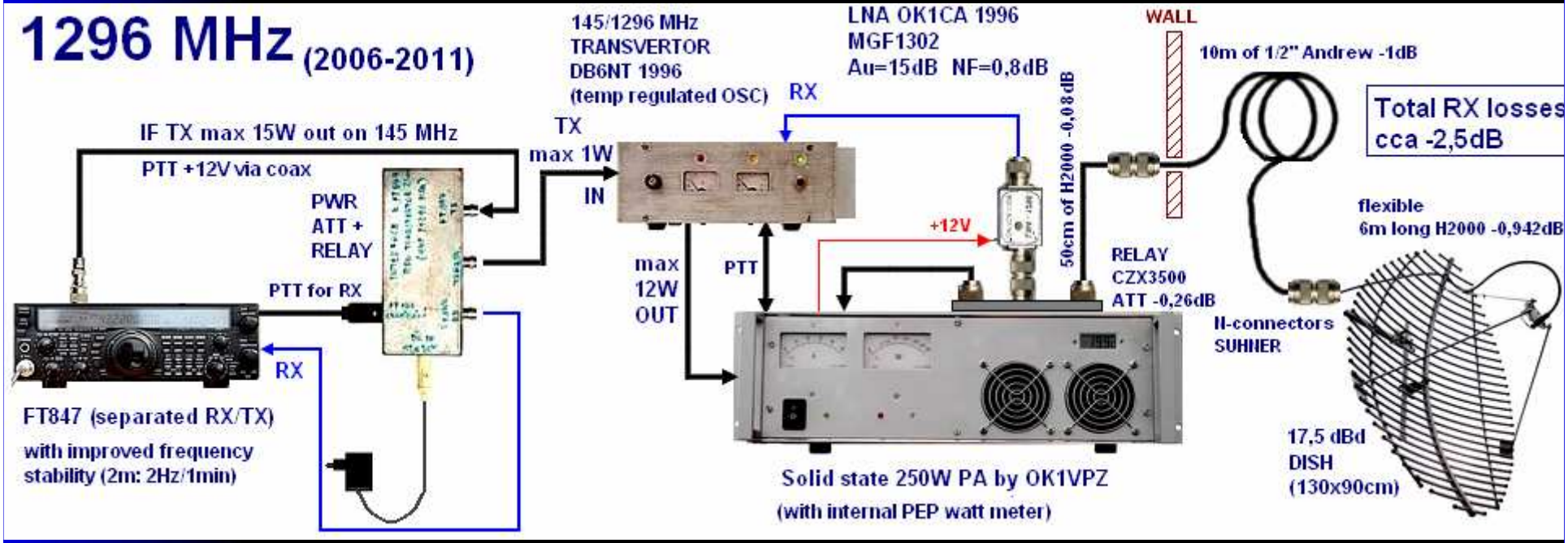
3A/DL3OCH on 23cm from Monaco

- One of most successful EME DXpedition op uses single yagi, no LNA,80 W!

DIGITAL BASICS

- CHALLENGE TO DEVISE THE MOST EFFECTIVE SYSTEM
- JT65 BY JOE TAYLOR, K1JT MOST POPULAR (JT65C for 23cm)
- EACH TRANSMISSION IS 60 SECONDS LONG AND CONSISTS OF MESSAGE AND SYNC INFORMATION.
- THE SYNC IS INTERSPERSED WITH THE MESSAGE AND SENT ABOUT HALF THE TIME.
- USES ERROR CORRECTING CODE -6 BITS/SYMBOLE (64TONE FSK) + SYNC = 65!

First 1296 MHz EME at OK1TEH

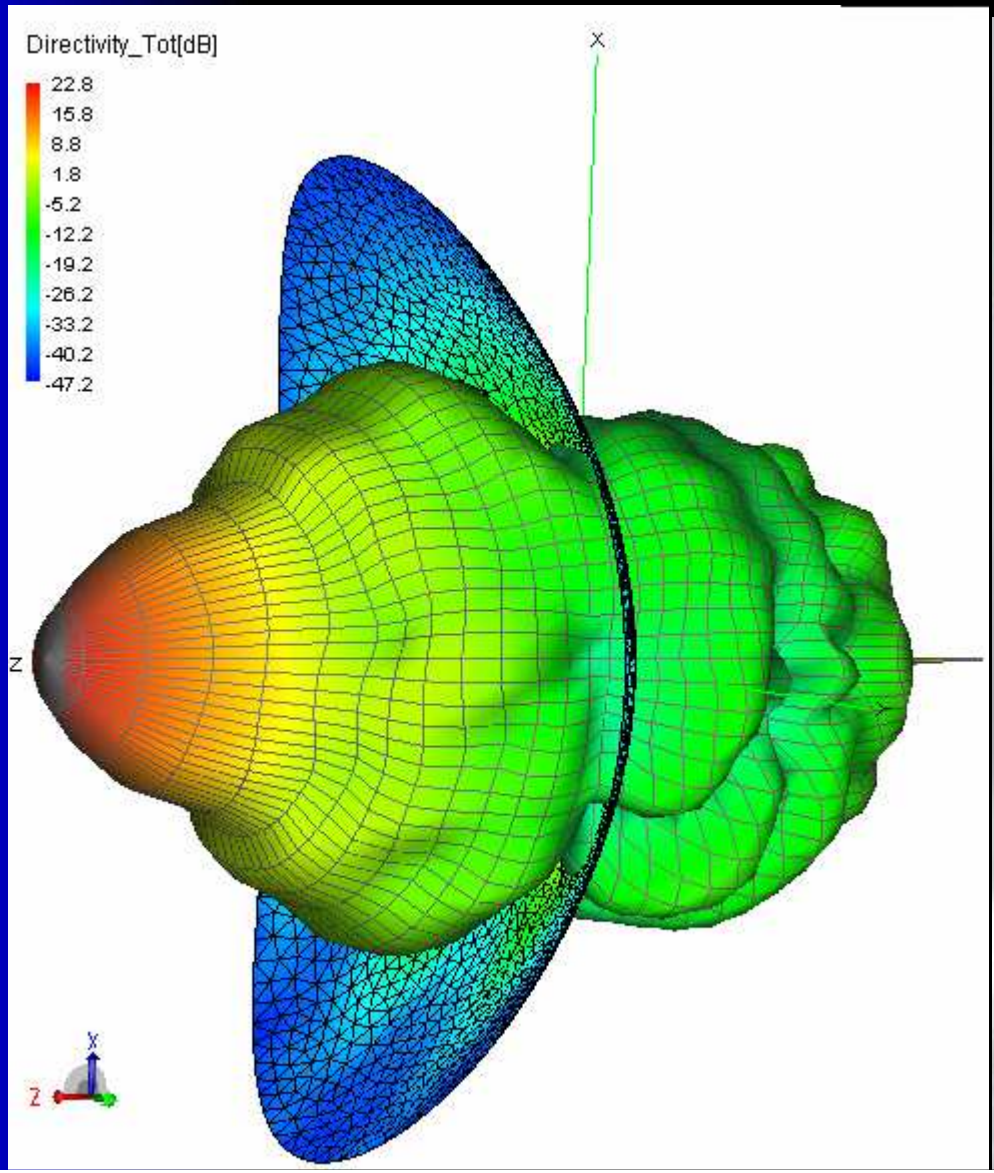


- FT847 on IF (145 MHz) with separated ports for RX/TX
- Transverter with DB6NT's module made in 1995
- Solid state PA with DB6NT module, about 250W out for WSJT
- LNA MGF1302 1dB NF in shack and 2,5dB path loss to antenna!
- Worked with my dead RX in JT65: K2UYH, G4CCH, HB9HAL, OE9ERC, HB9Q, F2TU, PIC9CAM, I1NDP, PY2BS + one CW QSO with PI9CAM

First 1296 MHz EME at OK1TEH

- 130x90cm dish for Wifi - gain around 17dBd

First 1296 MHz EME at OK1TEH

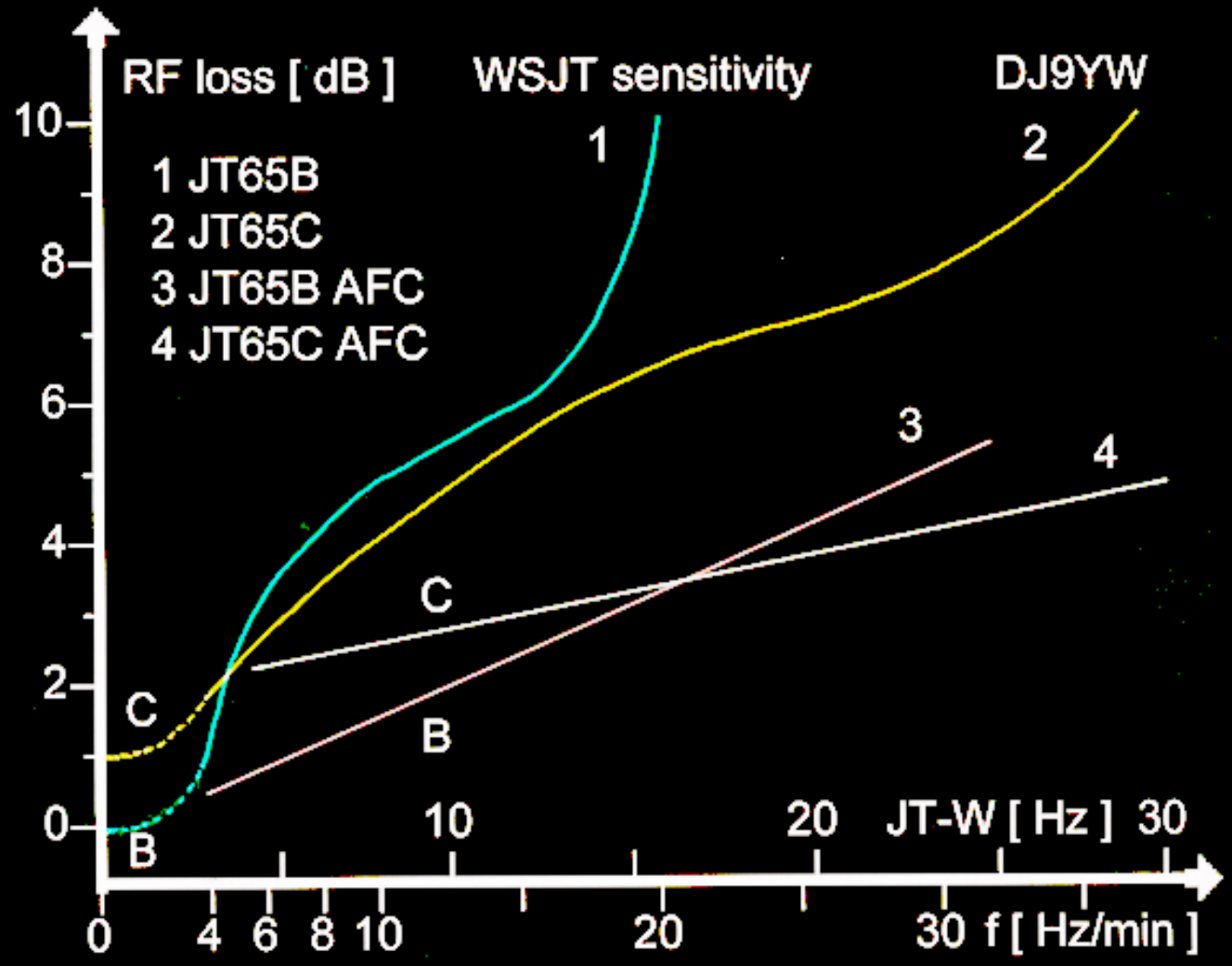


First 1296 MHz EME at OK1TEH

- **Ring feed based on DL4MEA's design**

- The antenna radiator is roll from wire of diameter 2,7mm (Cu wire of cross section of 6mm), the shape of antenna radiator is a bit elliptic for better exposure of our elliptic dish. The shape of antenna radiator is relatively ellipse with wider size in horizontal plane. The inside size between wires is cca 73mm (H) and 68mm (V). The diameter of circular reflector is 118mm. We tested 114 - 116 - 116 and the best match was moving for 1 MHz on 1mm of diameter. 118 is the best for 1296 MHz (the return attenuation is better then -26dB). The distance of antenna radiator's wire from reflector is cca 33-34mm. From N connector is managed about 29mm long coaxial line with impedance 50 Ω.

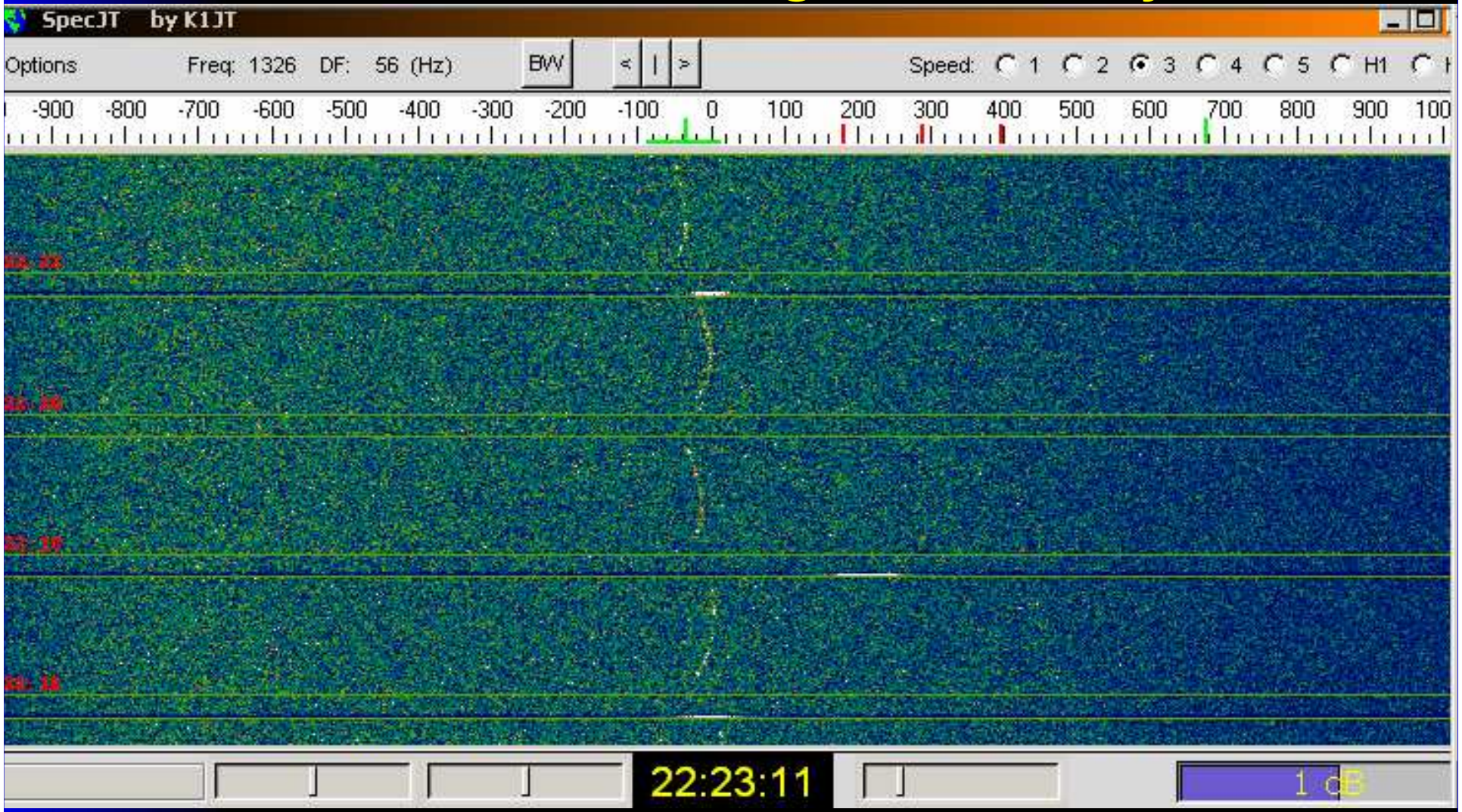
Problem with signal stability



Problem with signal stability

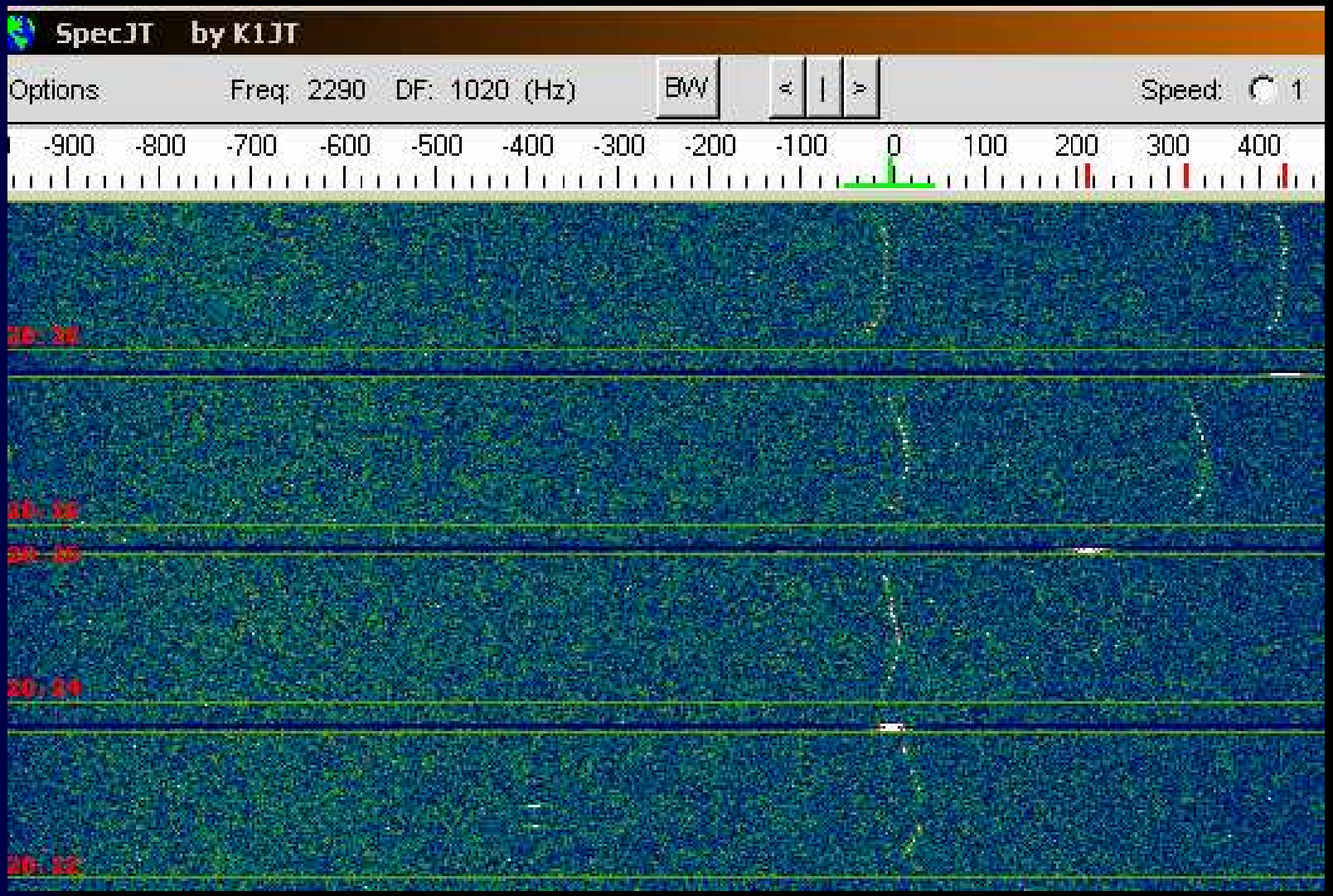
FileID	Sync	dB	DT	DF	W				
200900	0	-27	3.3	320	6	*	HA/DL3OCH K2UYH	0	10
201000	0	-33	4.4	320	48				
201100	0	-30	3.5	-5	32	*	HA/DL3OCH K2UYH	0	8
201200	0	-33	2.9	0	49				
201300	1	-26	3.5	-30	10	*	HA/DL3OCH K2UYH	0	10
201400	0	-33	1.1	3	13				
201400	1	7/23							
201400	2	7/19					HA/DL3OCH K2UYH	1	10

Problem with signal stability



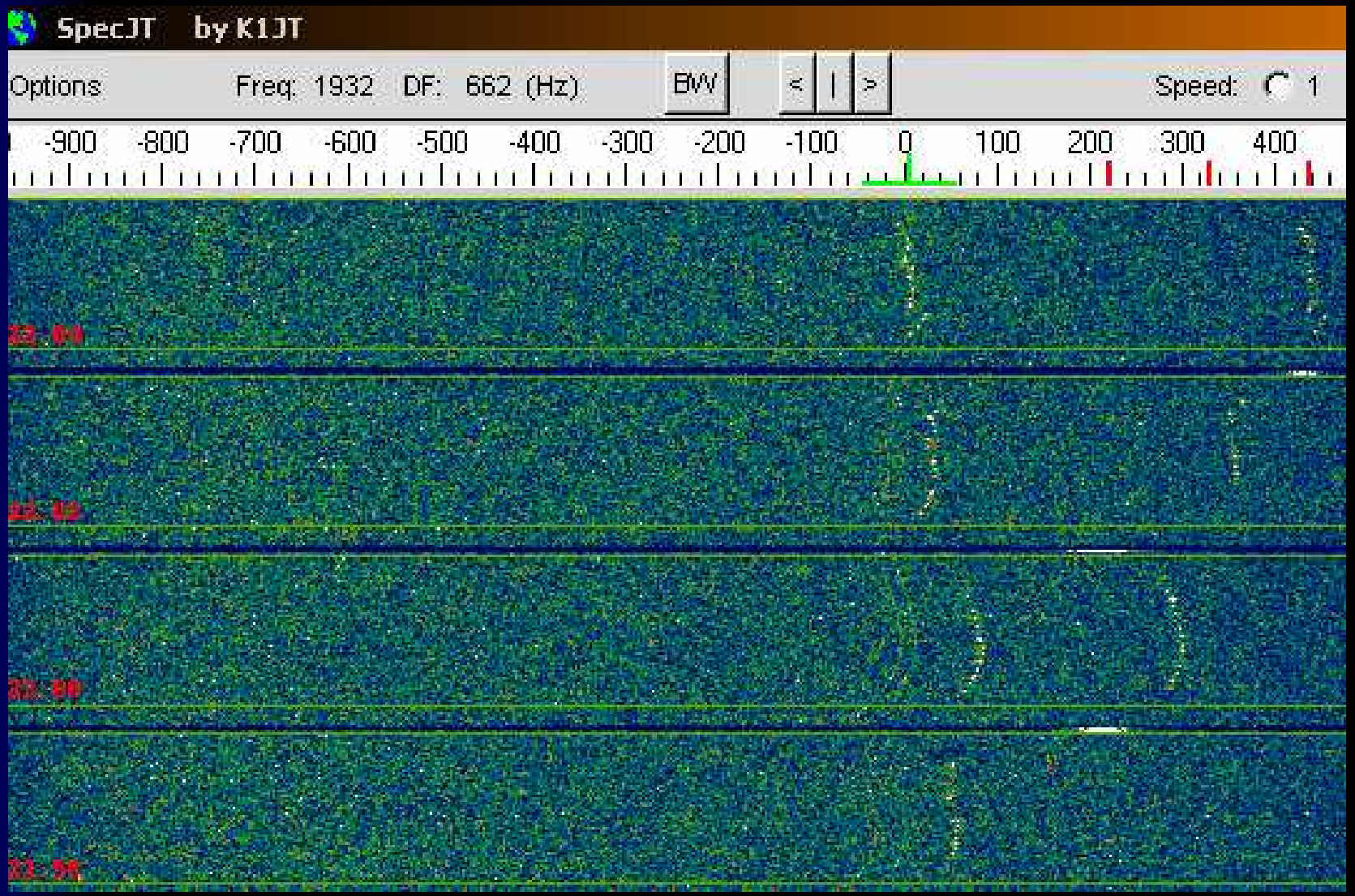
- HB9MOON at OK1TEH – real signal 1dB/N, at WSJT -27dB !

Problem with signal stability



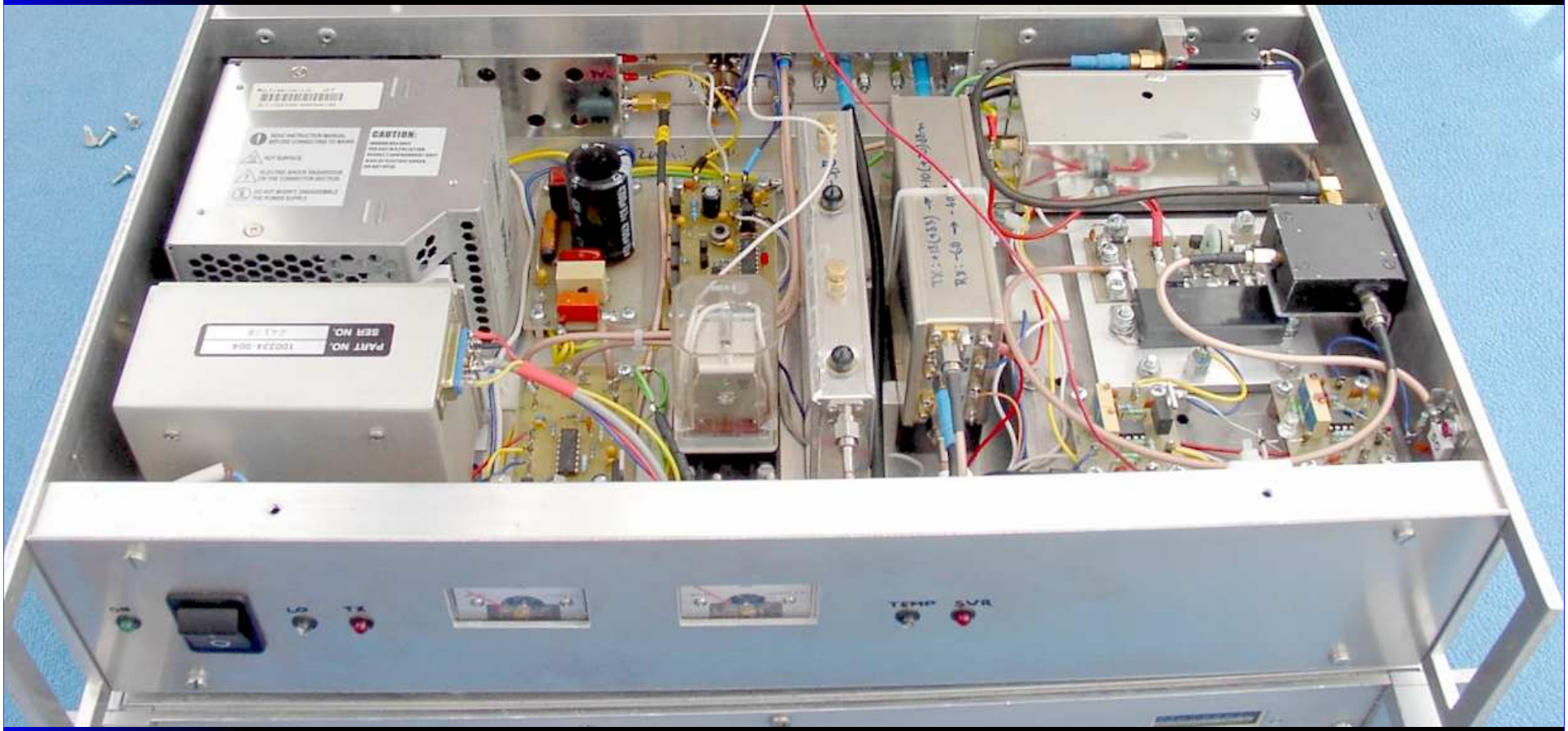
- OE9ERC at OK1TEH – real signal 1dB/N, at WSJT -29dB !

Problem with signal stability

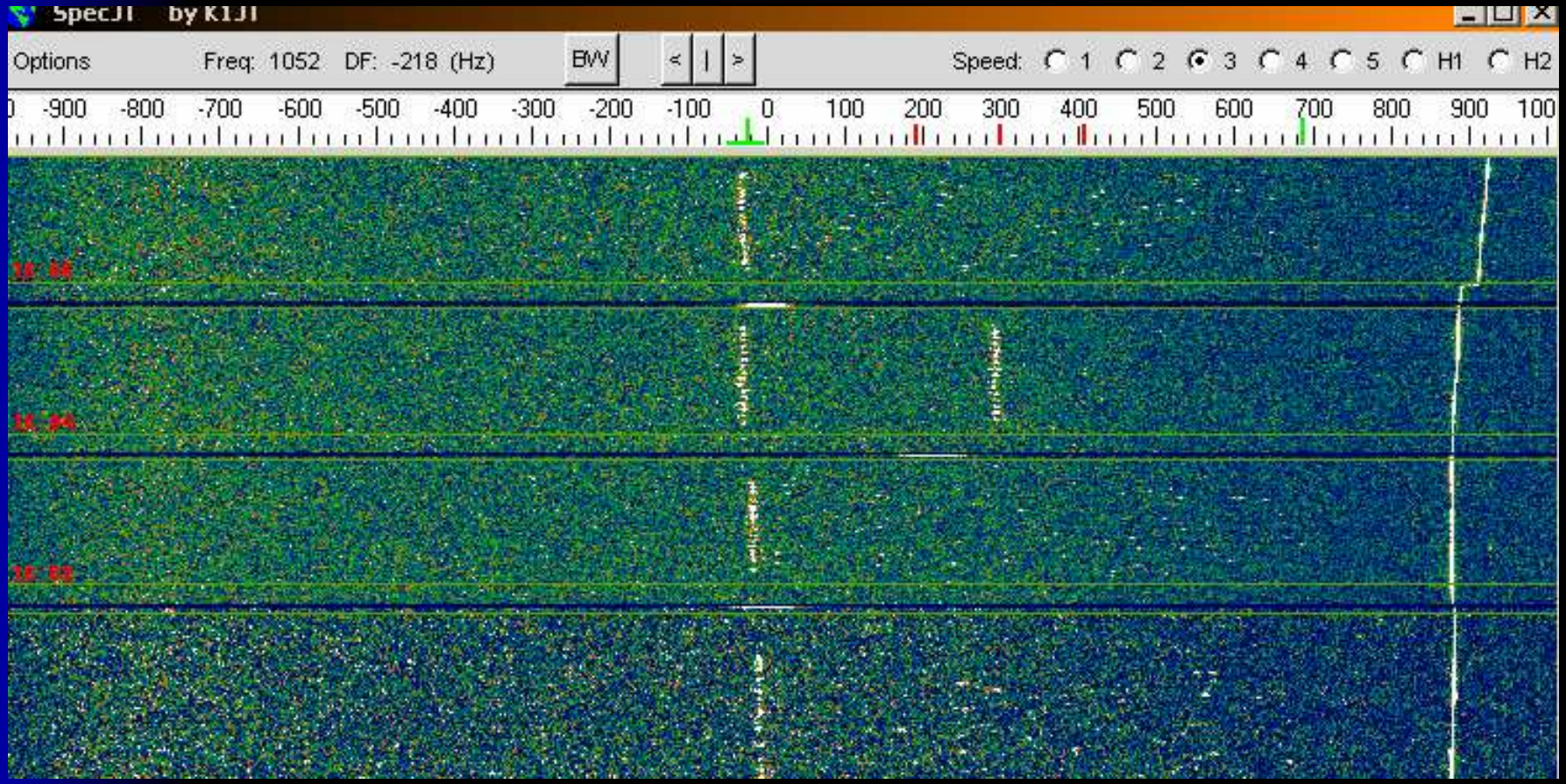


- F2TU at OK1TEH – real signal cca 1dB/N, at WSJT -25dB !

2011 - new transverter with rubidium normal inside for better signal stability



Problem with signal stability is solved



- SK6OSO with OK1TEH – rubidium normal pay off, signal decoded around -17dB

What you need for 23cm JT65 EME?

- Precise built yagi with gain around 17dBd or small 1m WiFi dish
- Transverter with high signal stability
- PA with capability of long TX (WSJT is like FM!)
- LNA with 1dB of NF and better and placed as close to antenna as possible!
- In case that you use 1,5m dish or bigger, septum feed will give you another +3dB
- Experiences with JT65 EME from other band
- Big patience!

What you need for 23cm JT65 EME?

OE5JFL’s W2IMU horn

- An example that another way could be usage of horn antenna made of mesh wire. Horn at picture was built by OE5JFL. It is 2.3m long, the picture shows this ´EME´-antenna in it´s operating position: feedpoint indoors, and the cone looking outside through the shack window.
- On March 19th 2000, he worked on 23cm 10 CW stations random within 3 hours, transmitting with this small antenna. Highlight was the CW QSO with Ivo ZS6AXT, who was using a 5 meter dish.

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Freq	Date	Time	Signal	DF	DT		Call	Loc	Pol	Spotter
1296.068	28-Jul	165100	-10	+302	2.5	CQ	JA6AHB	PM53	CIRC	W6YX
1296.069	28-Jul	162700	-09	- 496	2.5	CQ	JA6AHB	PM53	CIRC	W6YX
1296.058	28-Jul	143200	-13	- 403	3.1	CQ	WB7ABP	CM88	CIRC	W6YX
1296.079	28-Jul	075400	-20	+241	2.9	CQ	RN3A	KO85	CIRC	W6YX
1296.064	28-Jul	073600	-21	+109	2.7	CQ	EA1RJ	IN71	CIRC	W6YX
1296.058	28-Jul	073500	-15	- 254	2.4	CQ	YL3AG	KO26	CIRC	W6YX
1296.077	28-Jul	065600	-15	- 486	2.5	CQ	YL2GD	KO37	CIRC	W6YX
1296.081	27-Jul	072200	-16	+119	2.6	CQ	TI2AEB	EJ79	CIRC	W6YX
1296.082	27-Jul	065000	-15	- 154	2.8	QRZ	TI2AEB		CIRC	W6YX
1296.079	27-Jul	062400	-17	+279	2.5	CQ	IK5EHI	JN53	CIRC	W6YX
1296.050	14-Jul	1346	-15	- 013	3.0	CQ	SK6OSO	JO57	H	YO8RHI
1296.064	30-Jun	100800	-13	- 031	2.1	CQ	IK5VLS	JN53	CIRC	W6YX
1296.069	30-Jun	100400	-08	+216	2.3	CQ	DF3RU	JN59	CIRC	W6YX
1296.058	30-Jun	095200	-14	+145	2.2	CQ	SQ7DQX	JO91	CIRC	W6YX
1296.079	30-Jun	085400	-17	- 264	2.9	CQ	IK5QLO	JN53	CIRC	W6YX
1296.074	30-Jun	082600	-19	- 364	2.6	CQ	IK5QLO	JN53	CIRC	W6YX
1296.065	30-Jun	081600	-17	- 478	2.2	CQ	IK5VLS	JN53	CIRC	W6YX
1296.112	29-Jun	005300	-05	- 161	2.5	CQ	OK1DFC	JN79	CIRC	HB9Q
1296.092	29-Jun	005000	-19	- 244	2.5	CQ	9X0EME	KI58	CIRC	HB9Q
1296.087	29-Jun	082900	-06	+068	2.3	CQ	IK5EHI	JN53	CIRC	HB9Q
1296.087	29-Jun	081800	-18	+273	2.5	CQ	RN3A	KO85	CIRC	HB9Q
1296.077	29-Jun	080800	-07	+186	2.3	CQ	IK5EHI	JN53	CIRC	HB9Q
1296.059	29-Jun	071200	-08	- 338	2.8	CQ	IK5QLO	JN53	CIRC	HB9Q
1296.078	29-Jun	061600	-06	+019	2.5	CQ	IK5EHI	JN53	CIRC	HB9Q

Polarity 0 and 180 = Horizontal
Polarity 90 = Vertical

Info is from manualy input and from MAP65 users and filtered for ONLY CQ QRZ and QRT messages.

NO qso info is given!!

It can be used for WSJT, CW or whatever you want.

This is experimental and made by PE1L, thanks to PE1LWT, PA3FPQ and all spotters

MAP65 users are welcome!, send email to PE1L

November hosting payed by DG0OPK

Donate

EME LOGGER (CW, SSB, JT)

50MHz 144MHz 432MHz **1296MHz** 2304MHz and up

Logout

Say: Submit

HB9Q.CH

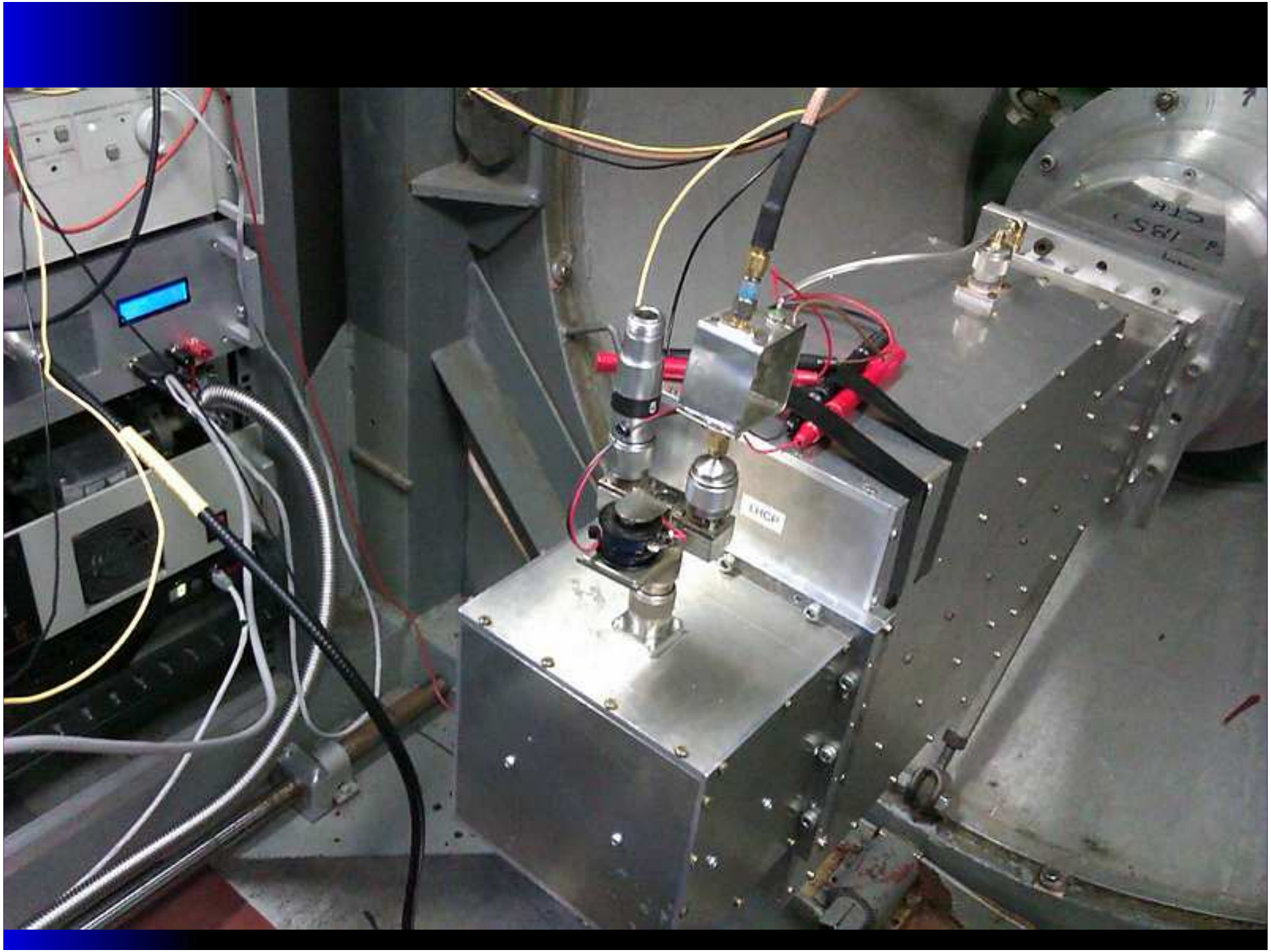
1296Mhz

Online:

OK1TEH
IK5EHI
kg6nub
LU8ENU
N8DJB

Day UTC	Callsign	Name	Comment
15 19:49:46	ON5TA	Eric	IZ2DJP GE Adelio. We made QSO on 13 cm but not yet on 23 cm. Are you QRV?
14 20:54:57	ON5TA	Eric	Yes John, the dish is parked now. Will be on this WE; Hope to CU soon .Very good cond
14 20:54:46	W3HMS	John	73 es QRT
14 20:51:49	W3HMS	John	OK Craig...we can try another day then.....here 3 m and 450 w,
14 20:50:16	N8DJB	Craig	Hi John, I'm still at work; only have low pwr also
14 20:46:35	W3HMS	John	Hi Eric..I read ur dish in the trees now
14 20:44:47	W3HMS	John	Craig...still there?
14 20:43:57	ON5TA	Eric	GA John.
14 20:41:38	W3HMS	John	GN Eric.....Craig..can we try
14 20:40:33	ON5TA	Eric	FB Craig !! Moon in tree now. Many thanks for reports. I hope we will make it in near future. VY 73
14 20:39:29	W3HMS	John	CQ 065 you 1st pls
14 20:38:35	N8DJB	Craig	Eric, yes I did..for several minutes in a row
14 20:36:41	W3HMS	John	GE all...anyone to try JT65?
14 20:35:35	ON5TA	Eric	OK Craig fine ! Here 3.6 m and 250 W. Can you hear my CW on 020 ?
14 20:33:33	N8DJB	Craig	Eric, I have approx 3.7m dish with old 1302 LNA and only 75 watts tx
14 20:32:02	ON5TA	Eric	Craig, moon very low now, my echoes getting weaker and weaker. What is your setup ?

EME expedition SK6OSO 25m DISH



TNX & CU off the Moon