The Early EME history in Europe

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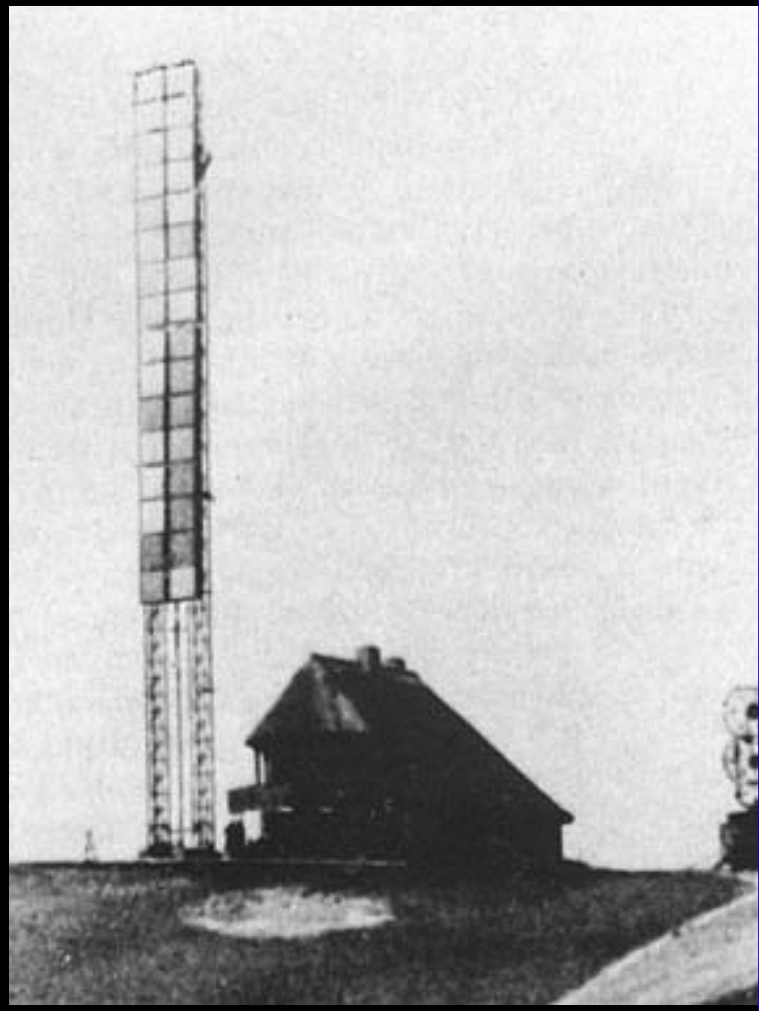
The first official moonbounce test
U.S Army project Diana - 10th January 1946

- Power 3kW on 111,5 MHz with 1,4s pulses from modified SCR-271 radar
- 24dBd „bedspring“ dipole array
- LNA noise figure close to 3,5dB
- Antenna could be rotated in azimuth only so it was able to work EME just during moonset and moonrise
- About 40minutes of observation was availabe
- The first successful echo detection came on 10th January 1946 at 11:58am
- The project leader were John H. De Witt W4FU and his cheiev scientis Edwin K. Stodola W3IYF + H. P. Kauffman W2OQU

The first unofficial moonbounce test
German Würzmann radar - January 1944

- The radar frequency - 564 MHz
- QTH Rugen island in Baltic sea (JO64UI)
- The codename of the radar was Wurzmann a combination of names of Wuerzburg Radar with increased power to 120kW in peek and Wassermann radar. The used tube was LD7 - later popular as GI7.
- Collinear antenna mounted on two towers 36m high, The antenna area was 45m^2, pulse duration about 1,5uS, signal was horizontal polarized.
- During January 1944 the radar was inadvertently beamed towards the rising Moon while some radar measurements were on the way. Suddenly there were observed strange series of pulses just 2,5 seconds after the transmission. This effect disappeared after a short time as Moon missed the antenna lobe.
- This Moon echo effect was tested during next day at moonrise time with positive result.

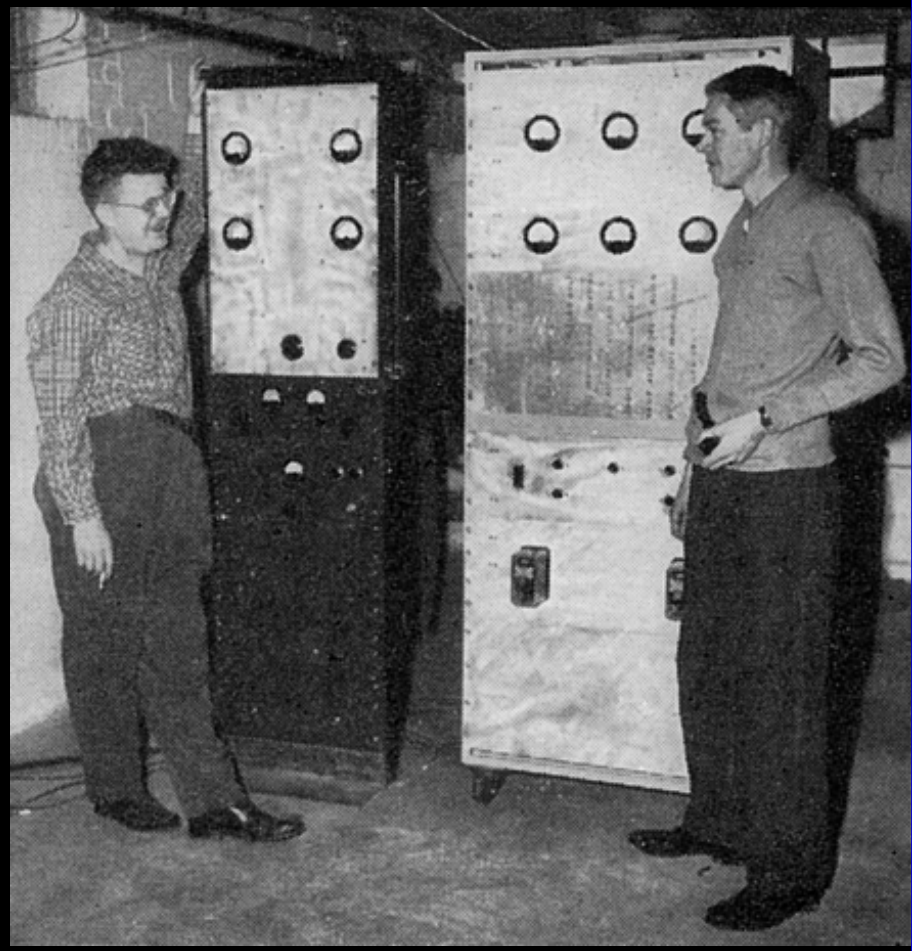


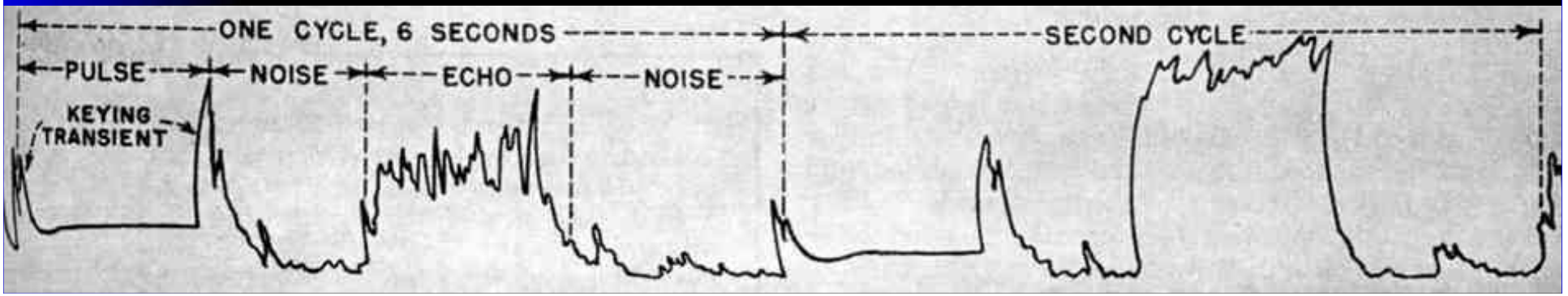
1953 – first one way EME on 144 MHz

- While professionals like US NAVY and radio astronomers were studying moonbounce at Jodrell Bank telescope for possibilities of data transfer, amateurs were interested in their first EME contact.

- First one way echo on 144 MHz between W4AO and W3KGP. Main antenna had gain of about 20dBd and consisted of 20WL stacked rhombicks + 1kW PA. RX NF close to 4dB. First sounds like faint echo were heard on 15th July 1950.

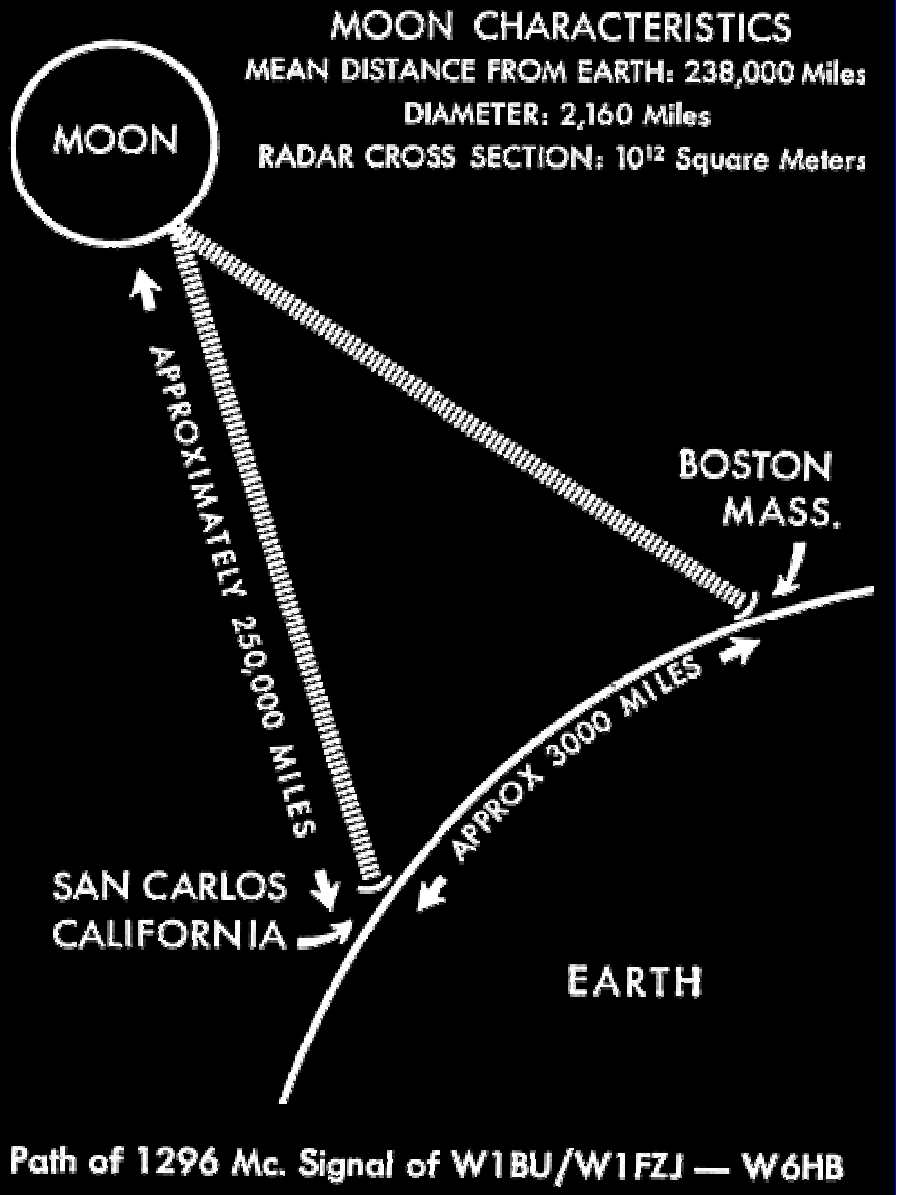
- First fully documented 2m one way QSO between W4AO and W3GKP was established on 27th January 1953. It took another 10 years of tests before 2 was QSO was made because of only one 1kW amplifier.





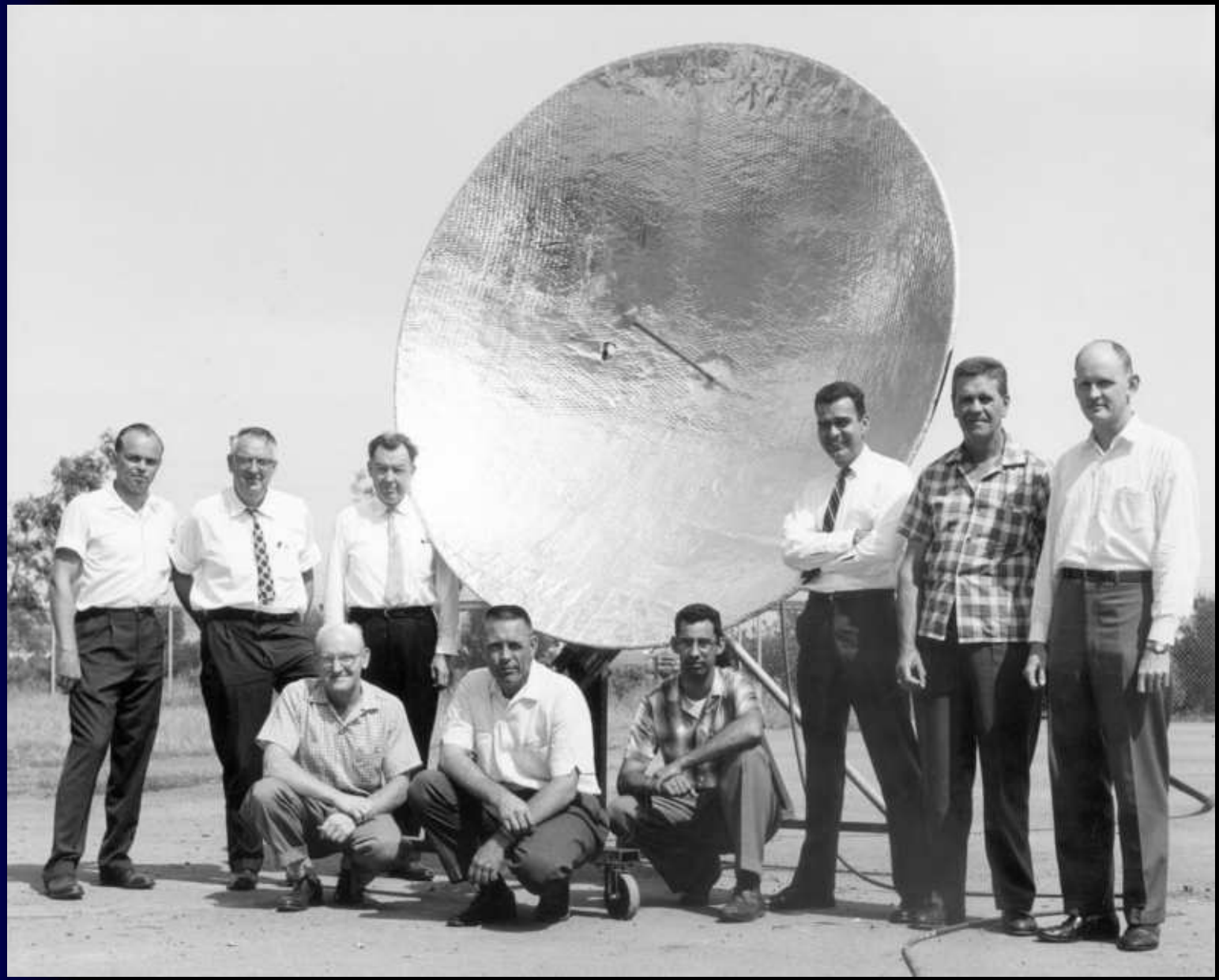
1960 – first EME contact on 1296 MHz

- The first EME contact on 1296 MHz between W6HB (California) and W1BU (Massachusetts) was achieved on 21st July 1960 at 7-8h on distance of 4340km.
- In the moon bounce project were involved at W6HB 25 and at W1BU 15 club members.
- W6HB used 2,3m dish and W1BU 5m dish and output on both side was close to 400W (1kW input klystrons). The driving power was 2C39A/3CX-100A5 multiplier with 20W out.
- As RX were used parametric amplifiers, delivering receiver noise figures close to 1 dB.
- Signals were just 2 dB above noise level.



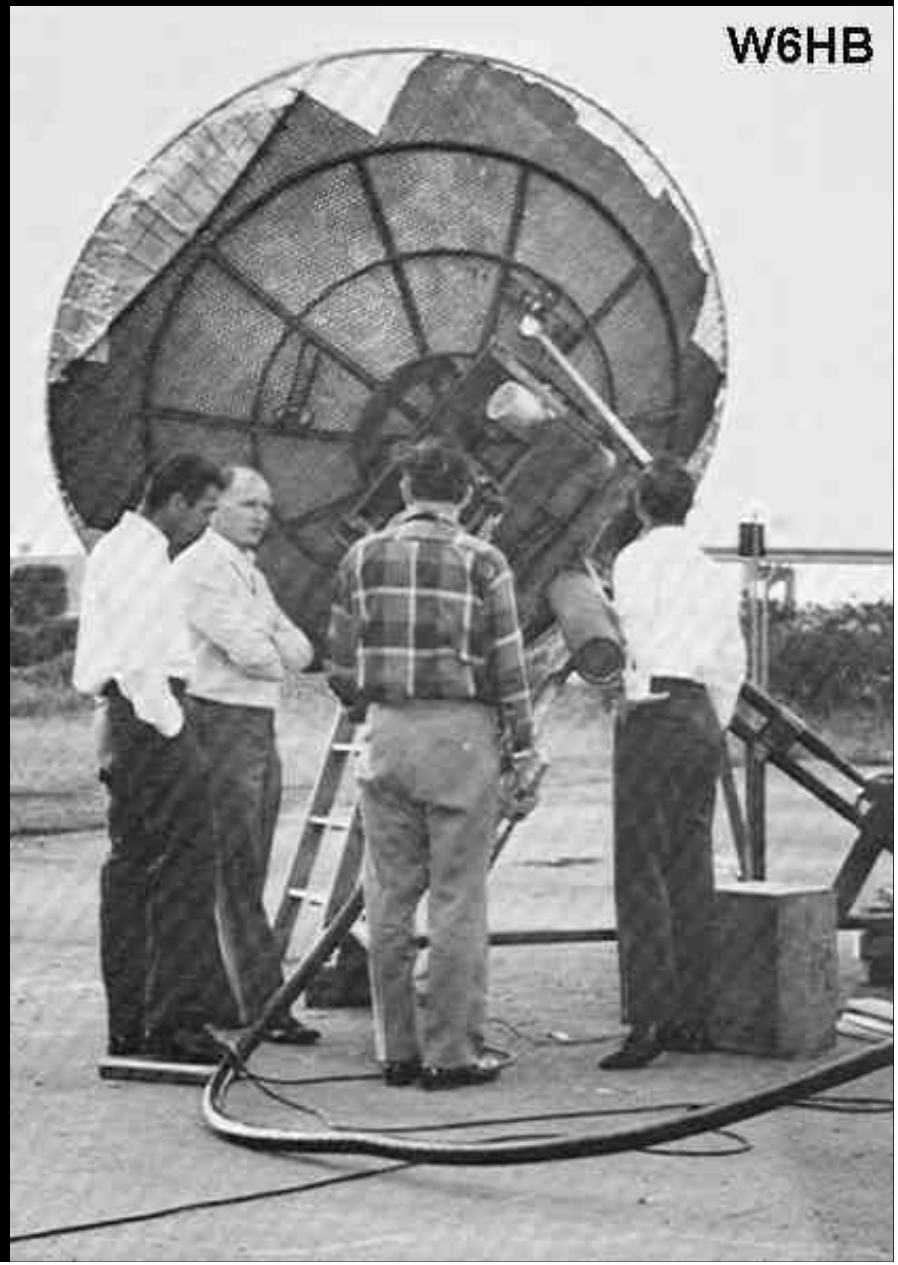
Path of 1296 Mc. Signal of W1BU/W1FZJ — W6HB

1960 – first EME contact on 1296 MHz – W6HB



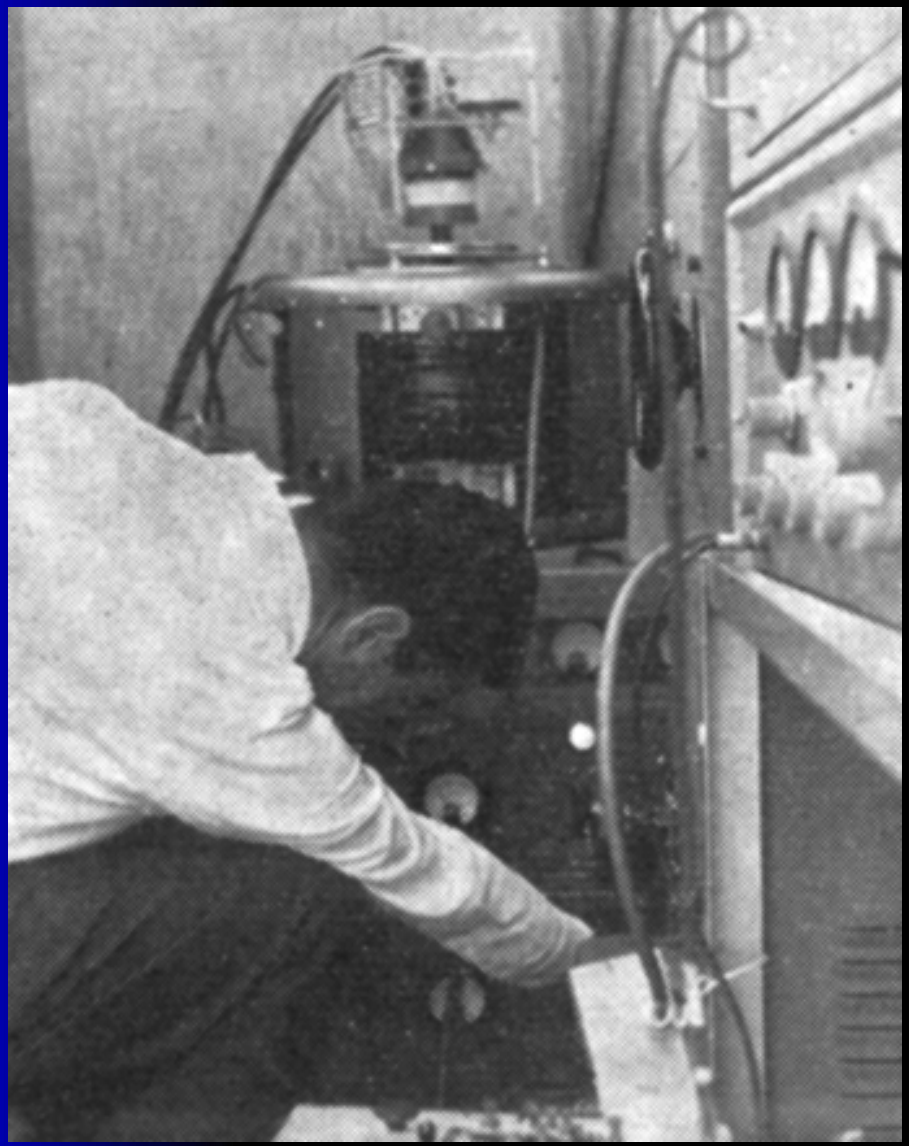
Eimac gang - from left to right: W6UOV, W6HB, W6UF, W6RXW, W6MUC, K6GJF, W6KEV, W6IVZ, K6GSO.

1960 – first EME contact on 1296 MHz – W6HB

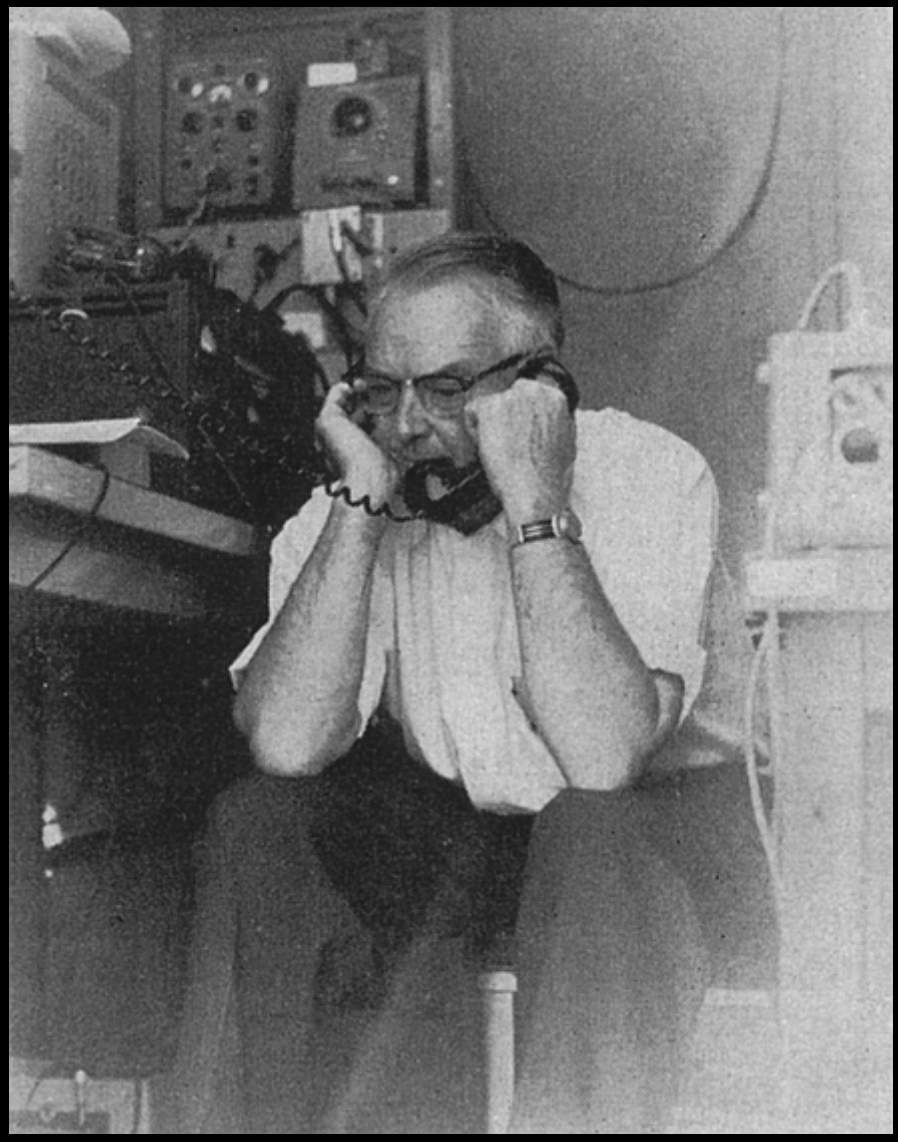


Eimac gang - Pretty tough to work fast break-in with this 2”t.r. switch! (man made coaxial relay :)

1960 – first EME contact on 1296 MHz – W6HB

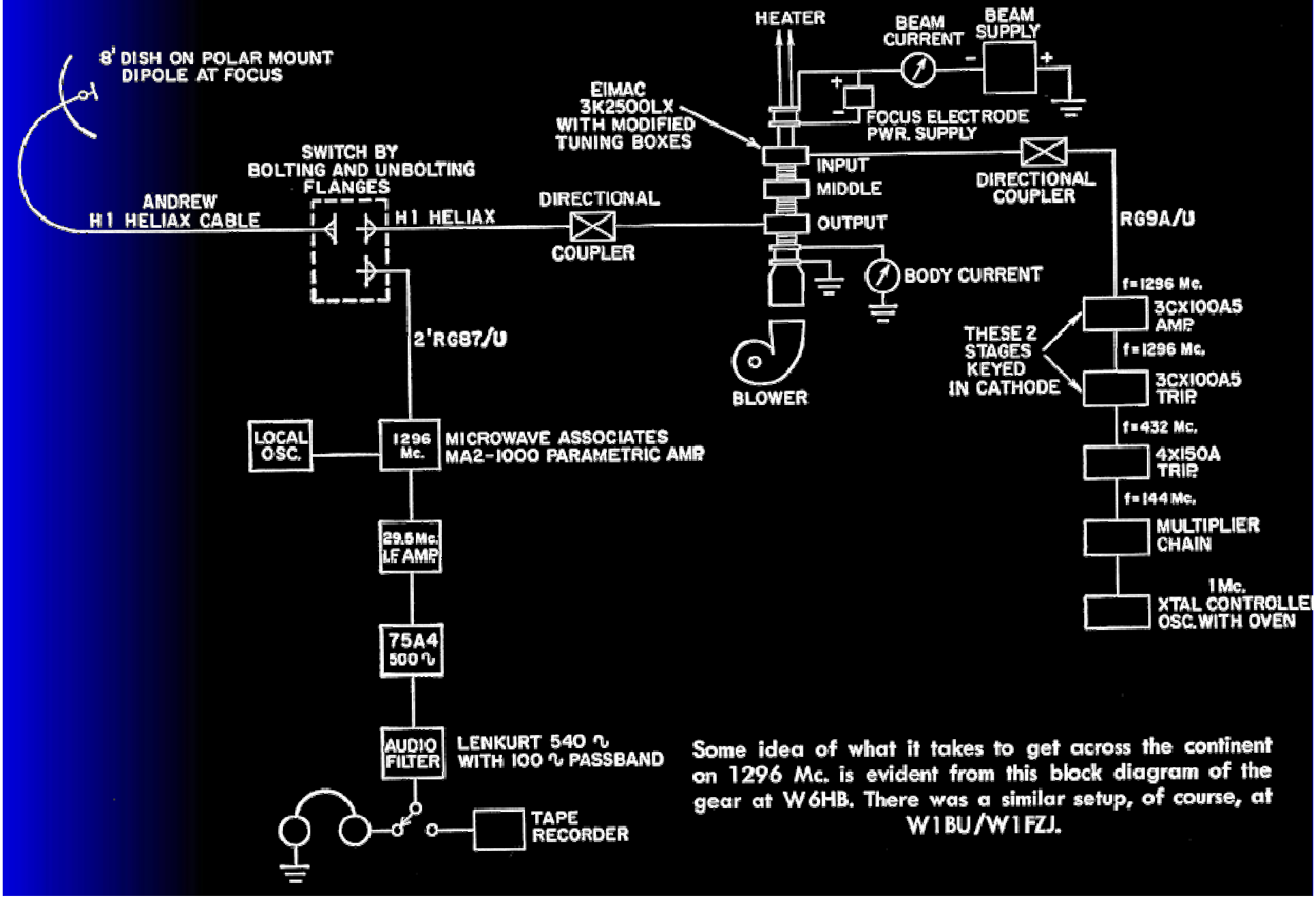


W6RXW tuning 3K2500LX klystron



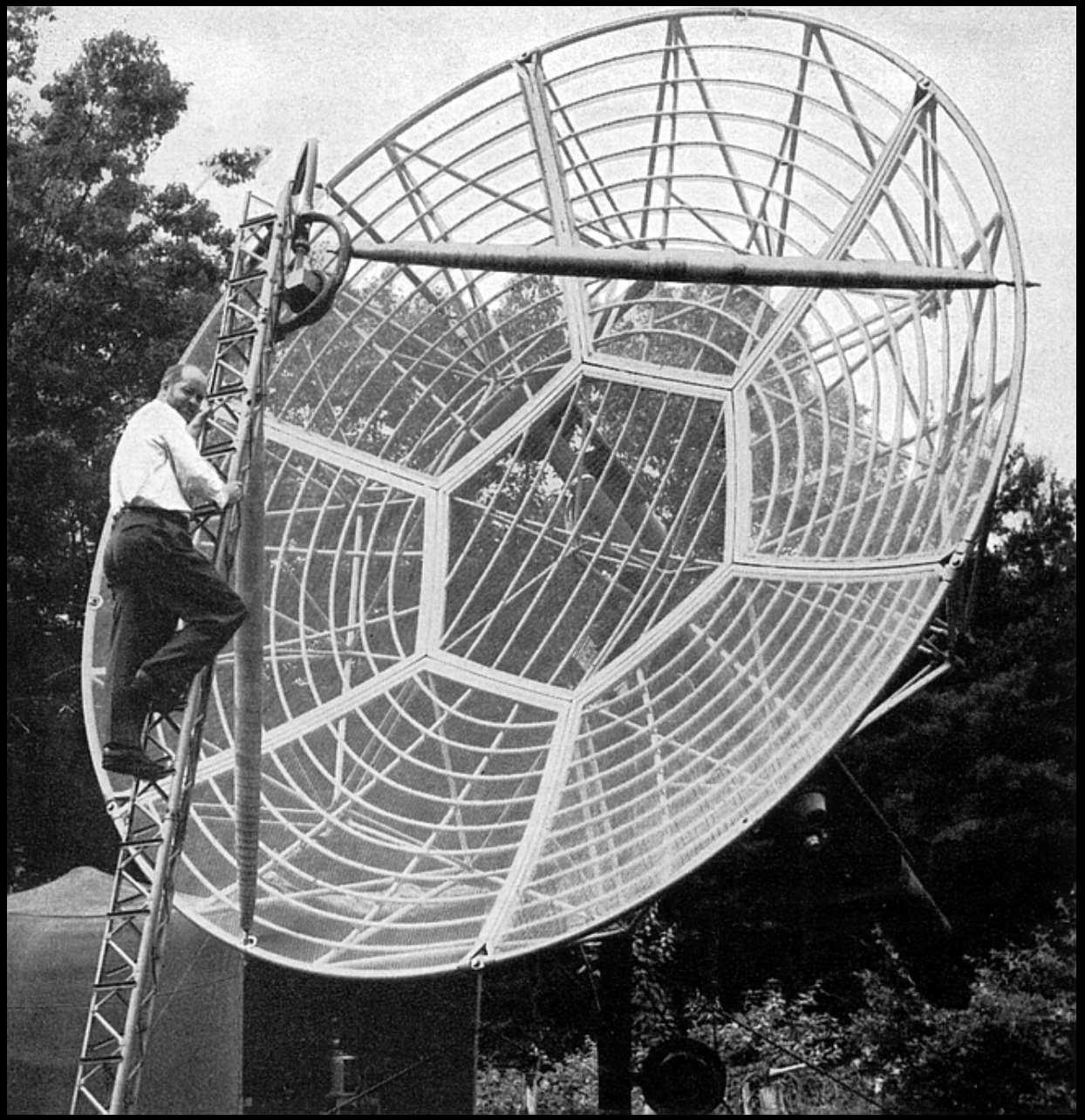
Hank Brown, W6HB, anxiously awaits word from the east coast that 1296 Mc signals are getting through.

1960 – first EME contact on 1296 MHz – W6HB



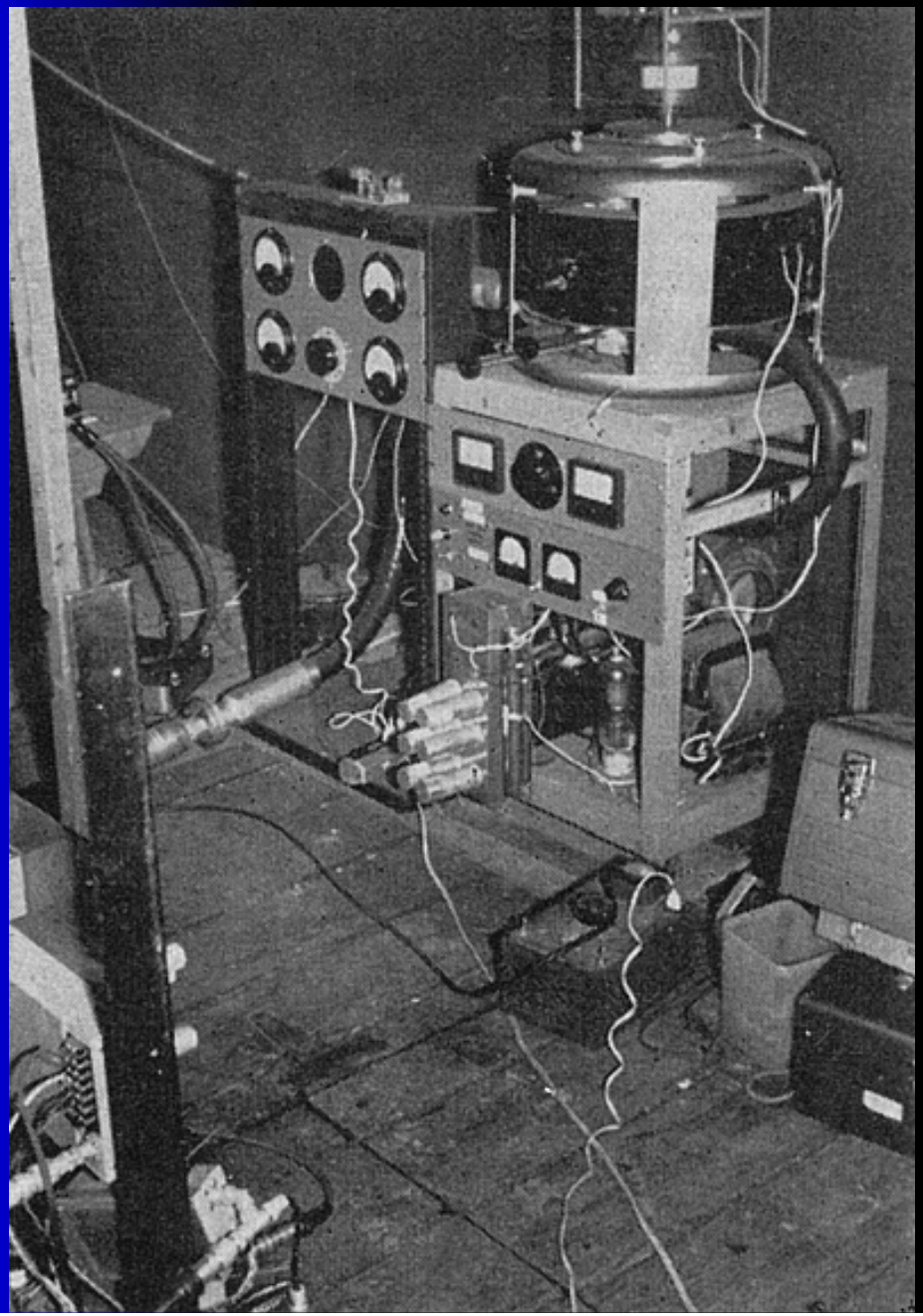
Some idea of what it takes to get across the continent on 1296 Mc. is evident from this block diagram of the gear at W6HB. There was a similar setup, of course, at W1BU/W1FZJ.

1960 – first EME contact on 1296 MHz – W1BU



Sam Harris, W1FZJ and his 5,5m dish – the head of the W1BU team

1960 – first EME contact on 1296 MHz – W1BU

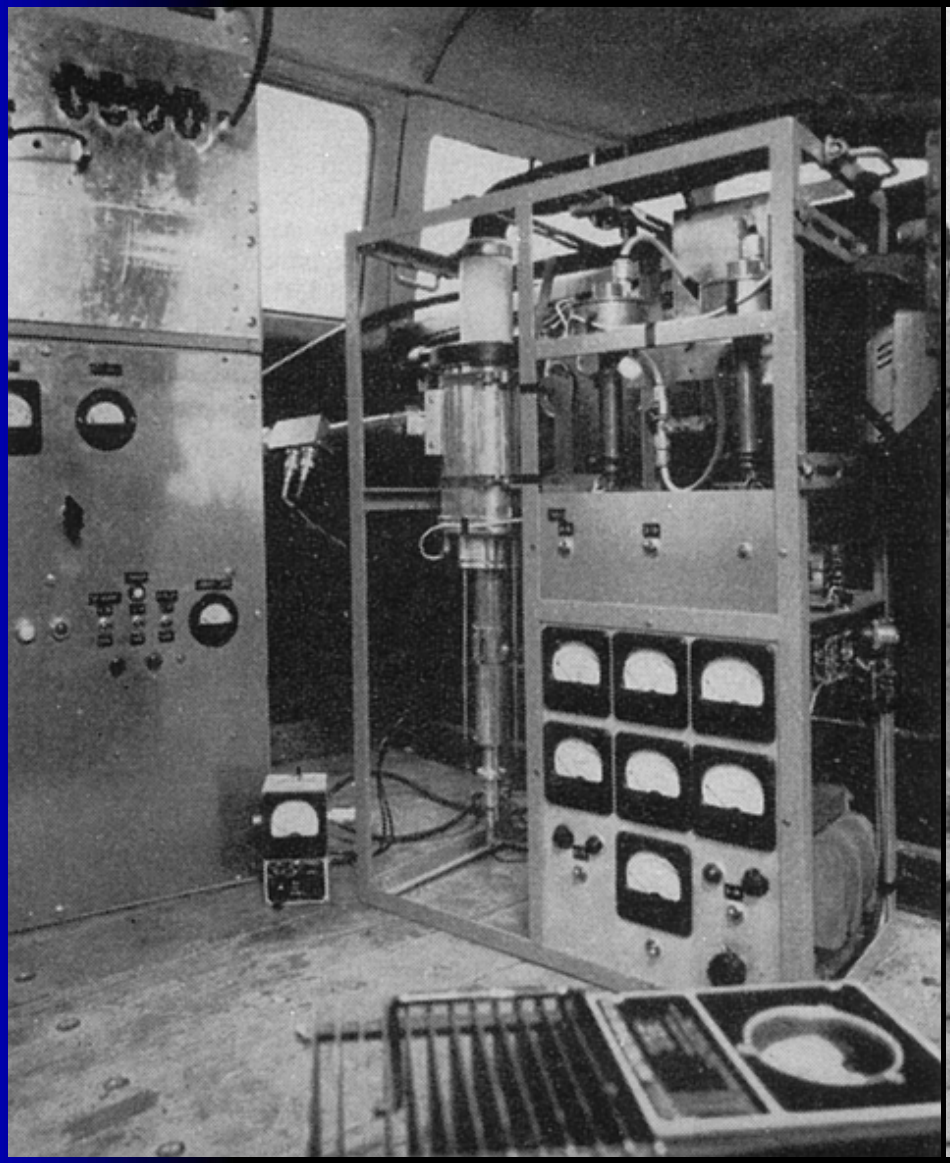


W1BU - Rhododendron Swamp V.H.F. Society.

Kilowatt Eimac 3K2500LX klystron amplifier used in the 1296 Mc moon bounce setup at W1FZJ / W1BU delivers 400 watts output. The entire station was housed in a tent directly below the dish antenna, and remotely controlled.

The multiple conversion receiver at W1FZJ employs a Microwave Associates MA-2-1000 Parametric Amplifier having a noise figure of less than 2 dB. Nominal receiver bandwidth was 100 cycles, with the choice of an additional “moonbounce” 35 cycle passband.

The first EME echo on 1296 MHz in Europe
22th April 1962 – HB9RF's group



- PA with RCA7650 400W out, 3m dish; members: DL9GU, DJ3EN, DJ4AU, HB9RF, HB9RG

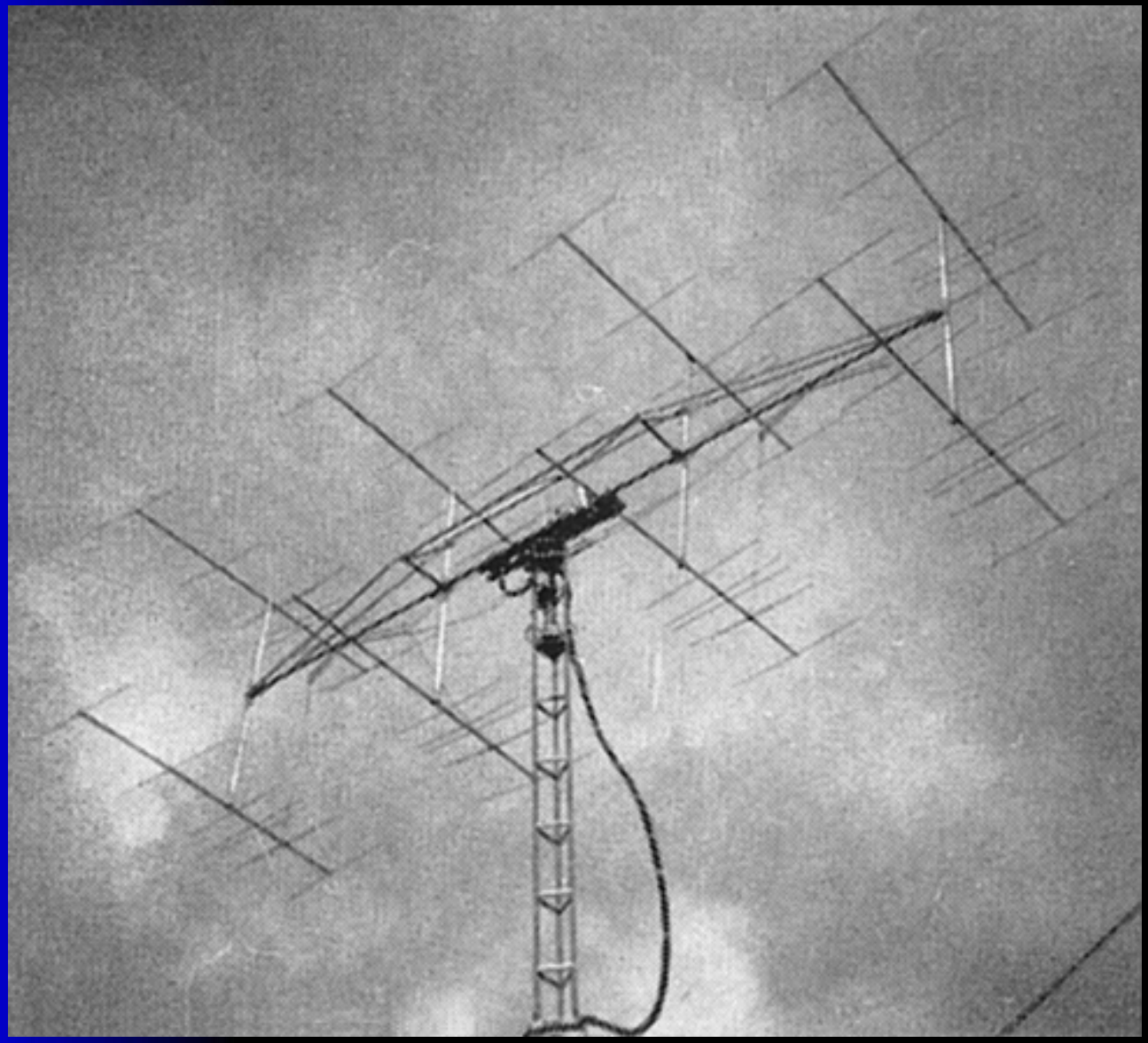
1964 – first 2m EME QSO in Europe OH1NL – W6DNG

On April 11, 1964, W6DNG of Long Beach, California and OH1NL of Nakkila, Finland established two - way 144 Mcs contact via moon-bounce for first ever transatlantic QSO >50 MHz.

This first QSO was result of their 70! EME tests since 1960.

Bill Conkel W6DNG used 8x7el yagi and PA with 4XC250

1964 – first 2m EME QSO in Europe OH1NL – W6DNG

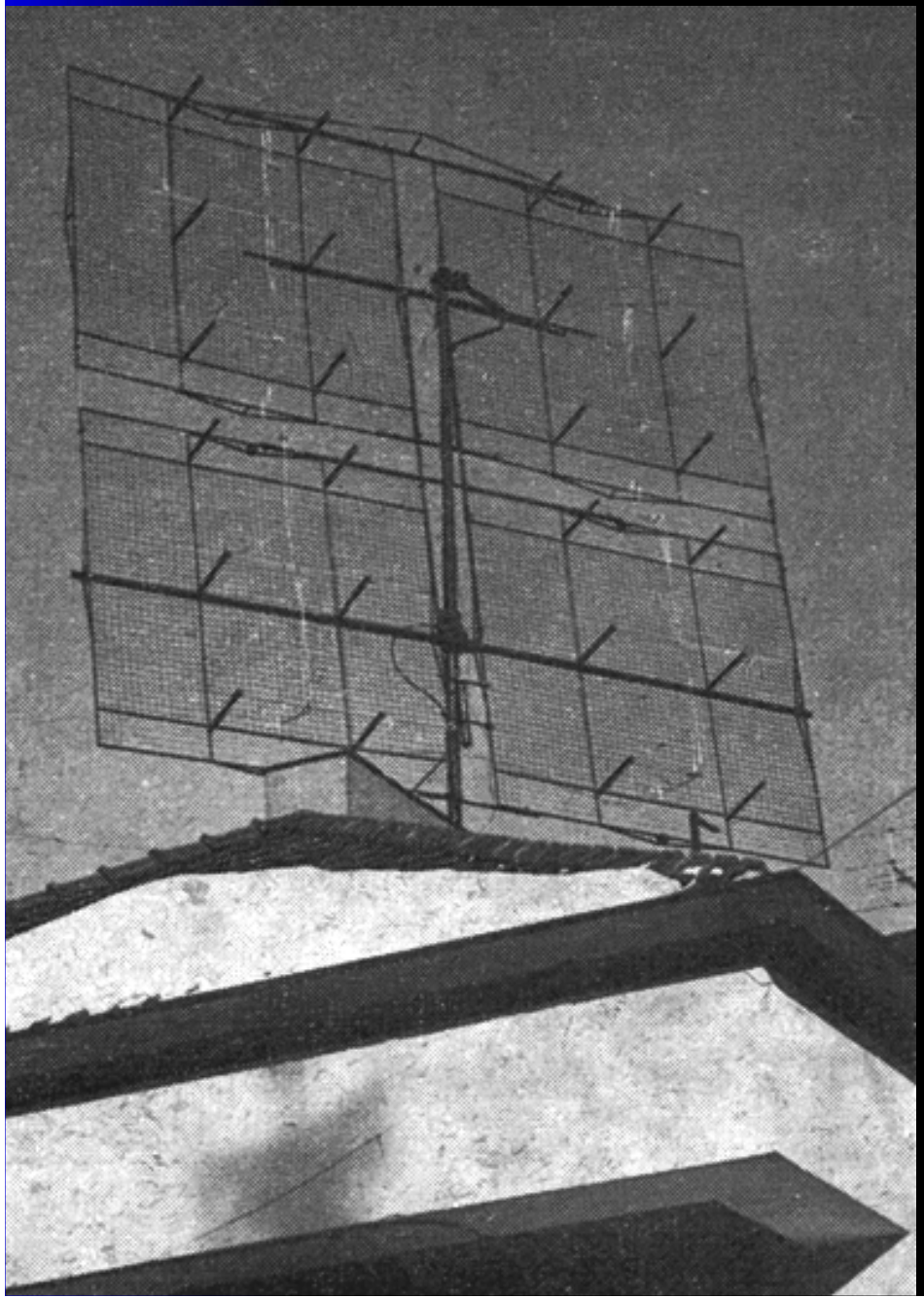


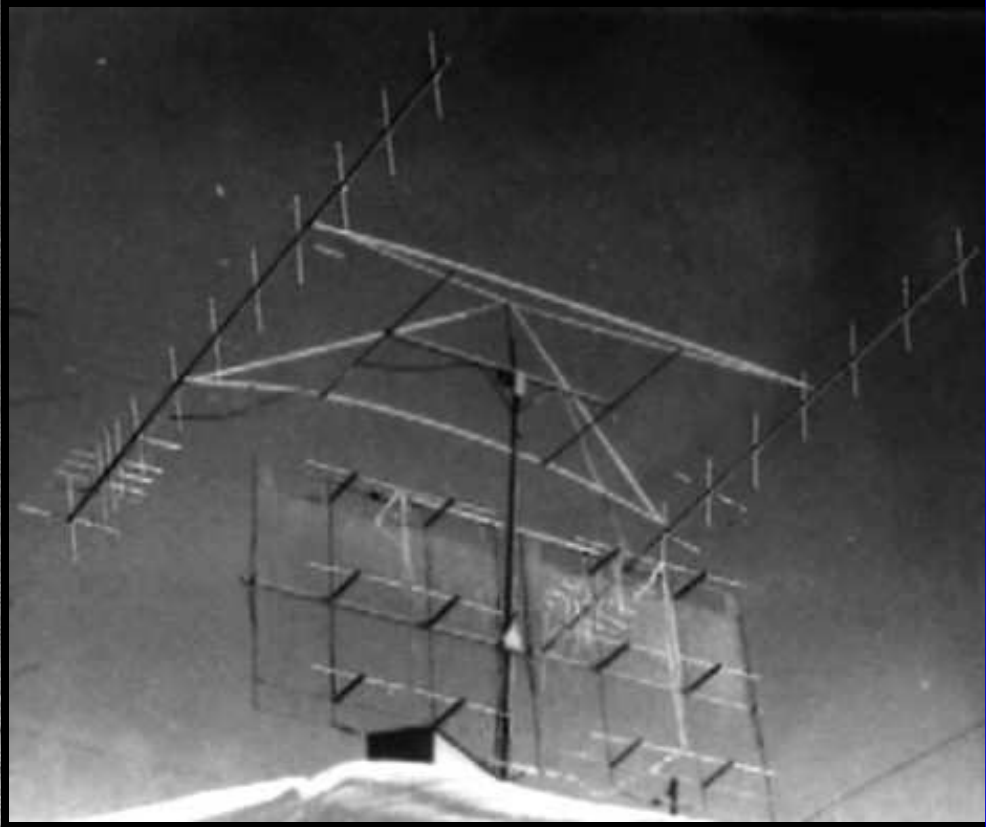
The antenna system shown in these pictures is the 59th in a series of 144 Mc arrays built by W6DNG Long Beach, Calif., for the express purpose of bouncing 2 meter signals off the moon. Eight 7 element Yagis, stacked four wide and two high, are fed in phase. The array was all-metal construction, and can be tilted to any angle above the horizon as well as rotated in azimuth.

1964 – first 2m EME QSO in Europe OH1NL – W6DNG

Lenna Suominem OH1NL pioneer of MS and EME operation in his ham shack..

1964 – first 2m EME QSO in Europe OH1NL – W6DNG



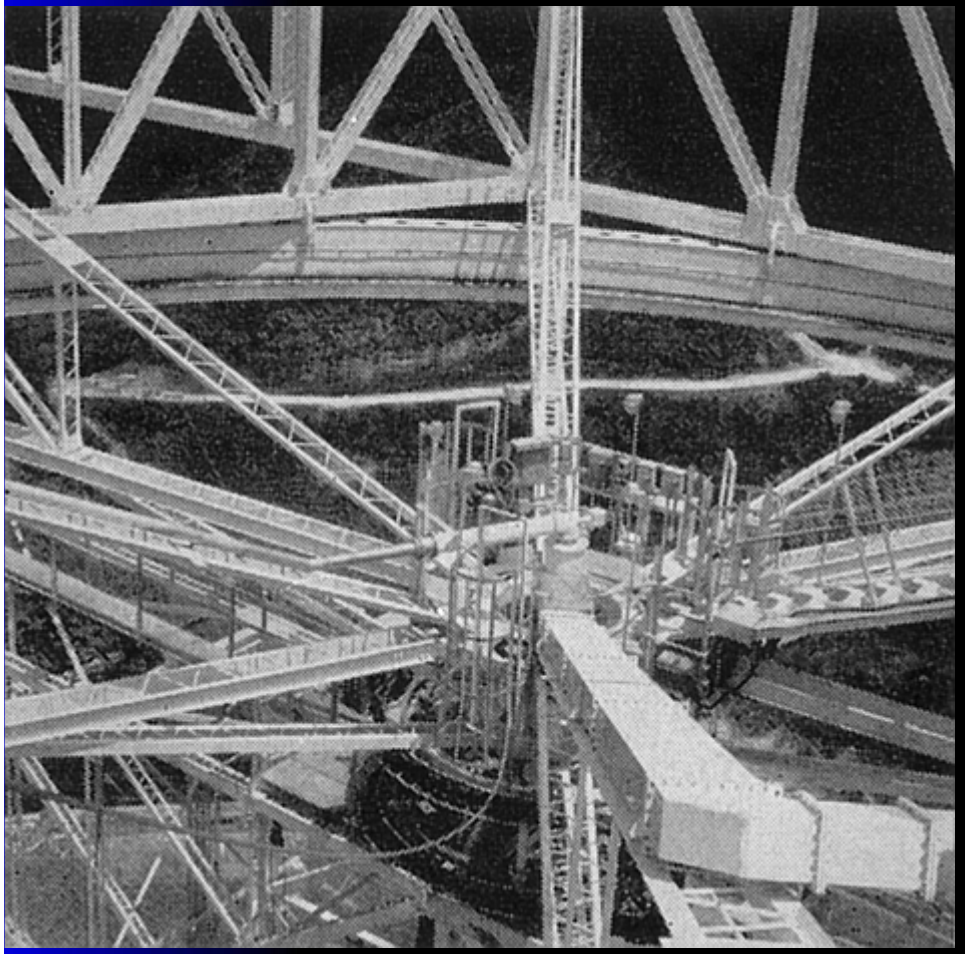


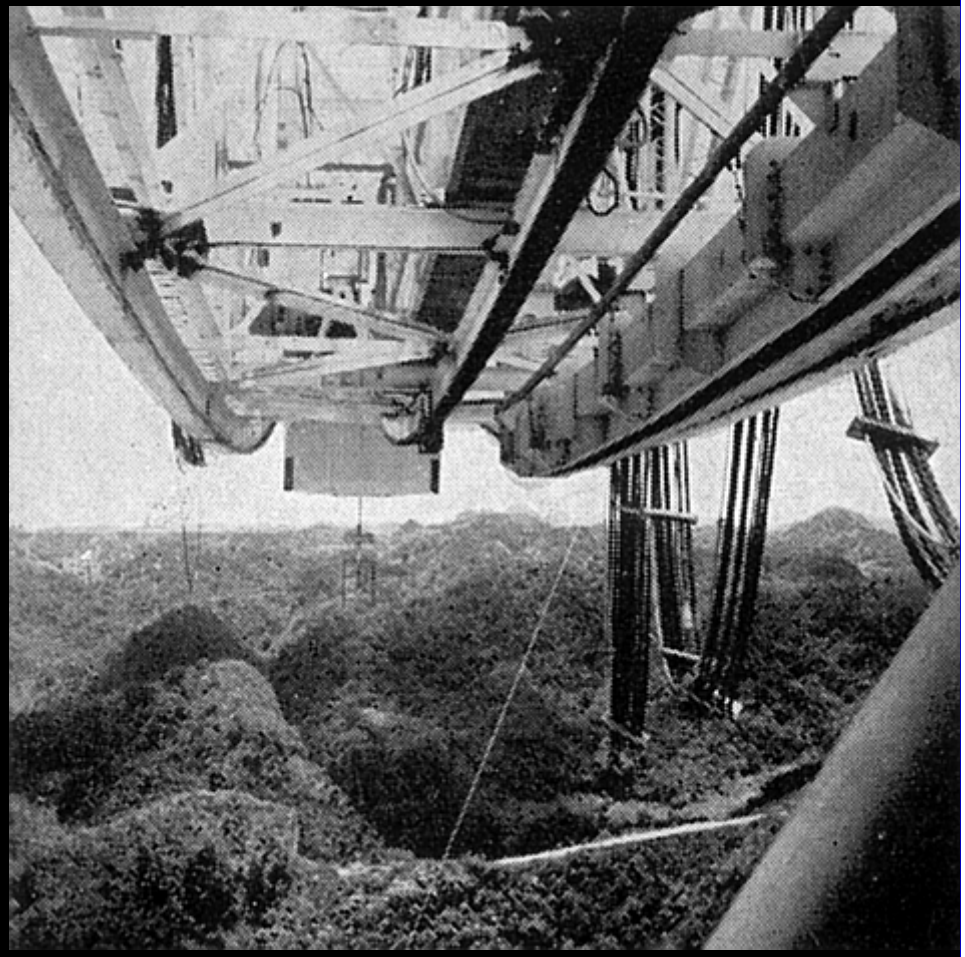
OH1NL's 144 MHz antenna used for first 2m EME cosist of 12 dipoles. The total gain was close to 21dBd. Later he upgraded his system with 2 xpol 13el yagies. PA had output of 800W.

1964/1965 – KP4BPZ Arecibo observatory – 305m dish

On 13th June 1964 had began new era of EME operation thank to activation of 1000 foots dish in Arecibo by Dr. Gordon Pettengill, W1OUN from Cornell university under callsing KP4BPZ which allowed many first EME contacts even with common tropo station. The dish gain is close to 49dBd on 144 MHz and 58 dBd on 432 MHz. First transatlantic EU EME QSO on 70cm was made by HB9RG's team.

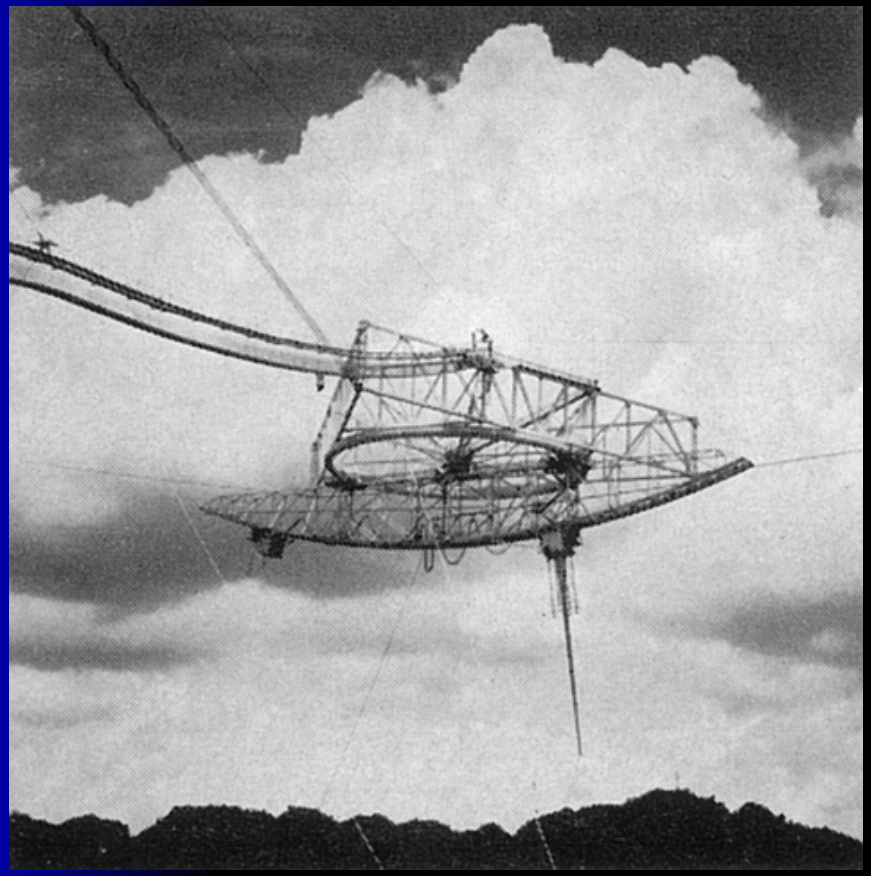
1964/1965 – KP4BPZ Arecibo observatory – 305m dish





A close-up view of the axis of the antenna superstructure. The 430 Mc waveguide is visible in the lower right fore ground. A view of the bottom of the convex track upon which the antenna moves. The mountains in the background are about 2000 feet (690m) high.

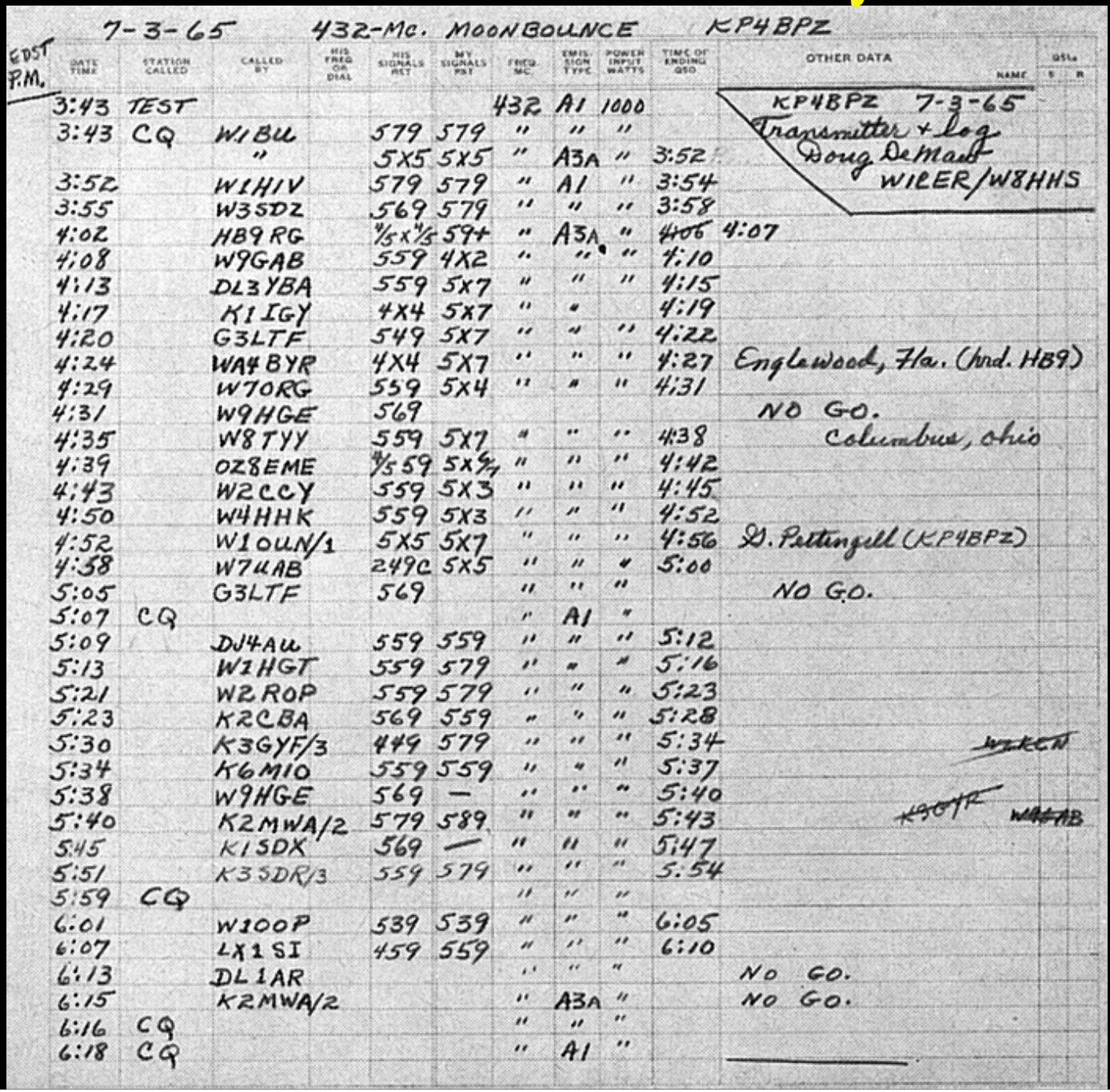
1964/1965 – KP4BPZ Arecibo observatory – 305m dish



Left to right: Doug DeMaw, W1CER (W8HHS); Andres Sanchez, KP4BEU; Sam Harris, W1FZJ; Dr. Roif Dyce, KP4CMO (K6DSJ); Ray Jurgens, W8MSL. Not shown is Walt Zandi, K2KWL. The smile on the faces of the crew reflect the success of the project.

The KP4BPZ signal was transmitted with right-hand circular polarization (in space) and the receiving mode was accomplished in the left-hand circular fashion. Because of the complexity of the system at Arecibo, it is not convenient to switch the transmitter or receiver polarization sense.

1964/1965 – KP4BPZ Arecibo observatory – 305m dish

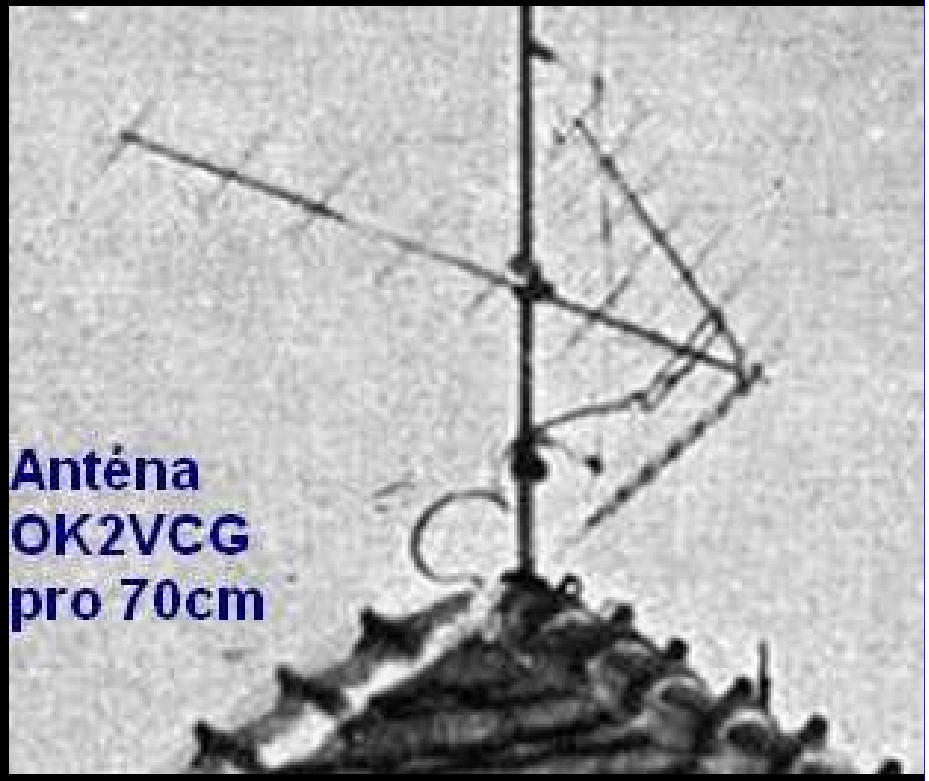


7-3-65 432-Mc. MOONBOUNCE KP4BPZ

EDST P.M.

DATE TIME	STATION CALLED	CALLED BY	HIS FREQ OR DIAL	HIS SIGNALS RST	MY SIGNALS RST	FREQ MC.	EMISSION TYPE	POWER INPUT WATTS	TIME OF ENDING QSO	OTHER DATA	QSLs NAME	S	R
3:43	TEST					432	A1	1000		KP4BPZ 7-3-65 Transmitter + log Doug DeMaw W1LER/W8HHS			
3:43	CQ	W1BU		579	579	"	"	"					
		"		5X5	5X5	"	A3A	"	3:52				
3:52		W1HIV		579	579	"	A1	"	3:54				
3:55		W3SDZ		569	579	"	"	"	3:58				
4:02		HB9RG		4/5x4/5	59+	"	A3A	"	~~4:06~~	4:07			
4:08		W9GAB		559	4X2	"	"	"	4:10				
4:13		DL3YBA		559	5X7	"	"	"	4:15				
4:17		K1IGY		4X4	5X7	"	"		4:19				
4:20		G3LTF		549	5X7	"	"	"	4:22				
4:24		WA4BYR		4X4	5X7	"	"	"	4:27	Englewood, Fla. (Hrd. HB9)			
4:29		W7ORG		559	5X4	"	"	"	4:31				
4:31		W9HGE		569						NO GO.			
4:35		W8TYY		559	5X7	"	"	"	4:38	Columbus, Ohio			
4:39		OZ8EME		4/5 59	5X5/7	"	"	"	4:42				
4:43		W2CCY		559	5X3	"	"	"	4:45				
4:50		W4HHK		559	5X3	"	"	"	4:52				
4:52		W1OUN/1		5X5	5X7	"	"	"	4:56	D. Pettengill (KP4BPZ)			
4:58		W7UAB		249C	5X5	"	"	"	5:00				
5:05		G3LTF		569		"	"	"		NO GO.			
5:07	CQ					"	A1	"					
5:09		DJ4AU		559	559	"	"	"	5:12				
5:13		W1HGT		559	579	"	"	"	5:16				
5:21		W2ROP		559	579	"	"	"	5:23				
5:23		K2CBA		569	559	"	"	"	5:28				
5:30		K3GYF/3		449	579	"	"	"	5:34		~~W1ECN~~		
5:34		K6MIO		559	559	"	"	"	5:37				
5:38		W9HGE		569	—	"	"	"	5:40				
5:40		K2MWA/2		579	589	"	"	"	5:43		~~K9OYR~~ ~~W4EAB~~		
5:45		K1SDX		569	—	"	"	"	5:47				
5:51		K3SDR/3		559	579	"	"	"	5:54				
5:59	CQ					"	"	"					
6:01		W100P		539	539	"	"	"	6:05				
6:07		LX1SI		459	559	"	"	"	6:10				
6:13		DL1AR				"	"	"		NO GO.			
6:15		K2MWA/2				"	A3A	"		NO GO.			
6:16	CQ					"	"	"					
6:18	CQ					"	A1	"					

1965 – KP4BPZ Arecibo observatory was heard by OK2WCG on 70cm



- The KP4BPZ signal was also heard by Ivo Chladek, ex OK2WCG (now well known from SHF EME as ZS6AXT). He heard KP4BPZ with S9 copy on 7el yagi! and LNA with BF180. It was probably first ever EME RX test in middle & east Europe.

1964/1965 – KP4BPZ Arecibo observatory – 305m dish

The end of presentation is followed with movie about HB9RG's group & short movie about Diana project

-> http://www.ok2kkw.com/00003016/sp6kbl/prednaska/diana_1946-01-31.mpeg
-> http://www.ok2kkw.com/00003016/sp6kbl/prednaska/how_high_the_moon.avi
-> http://www.ok2kkw.com/00003016/sp6kbl/prednaska/how_high_the_moon.sub

More at http://www.ok2kkw.com/eme1960/eme1960eng.htm

Big TNX to Christoph HB9HAL (HB9MOON) for providing his HB9RG's movie on DVD.

73 & tnx for your attention
Matej, OK1TEH