New 10 GHz EME World Record [2017]

On 9 September 2017 VK7MO and WA3LBI completed a 18951 km QSO with QRA64D to extend the existing World Record held by DL7FJ and ZL1GSG, using CW, of 18337 km by around 600 km.

The key to this result was to find locations with almost zero degrees take-off which essentially means across water. VK7MO operated from OF76NK00MB at Meelup Western Australia and WA3LBI operated from FM28LO01VE in Delaware on the East coast of the USA. Both stations operated portable to maximize the distance at locations with good take-offs over water. It is of interest to note that "Meelup" is a native aboriginal word meaning "Place of the rising Moon" because they could see the Moon rising out of the water, so the native people were well aware of the potential of this location for EME.

Stations

VK7MO ran 50 watts to a 1.13 metre dish, linear polarization, as shown in Photo 1. WA3LBI ran 150 watts to a 2.2 metre dish, circular polarization, mounted on a trailer as shown in Photo 2. The loss in going from linear to circular is somewhat less than the expected 3 dB due to depolarization at the Moon surface (probably around 2 dB).

Photo 1: VK7MO's 1.13 metre dish set up at Meelup beaming across the water

Photo 2: WA3LBI's portable 2.2 metre dish on location

Conditions

The time was chosen to maximize the Moon window when spreading was low at 35 Hz and Lunar degradation low at 0.8 dB as shown below:

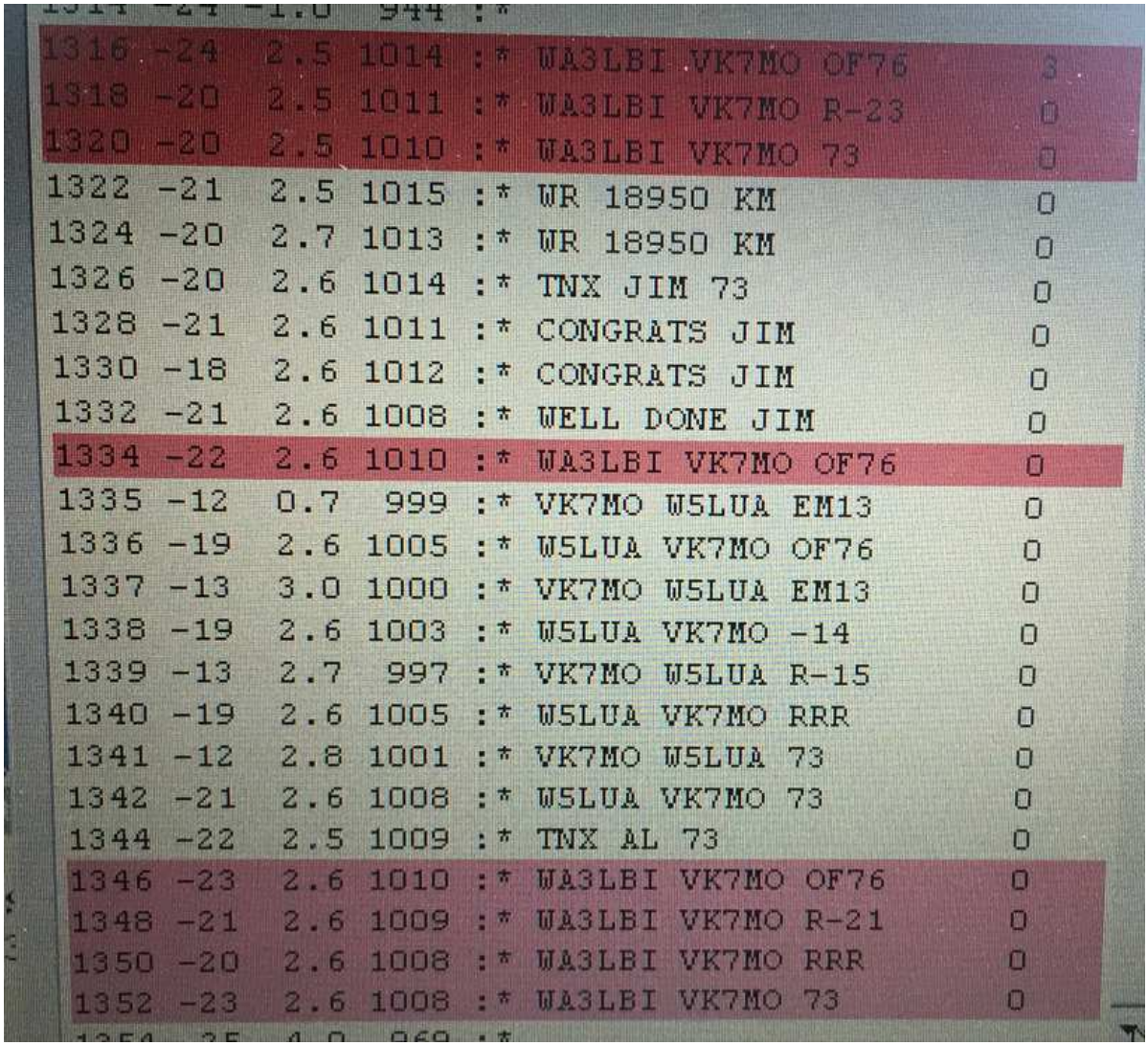
DATE	UTC	AZ A	EL A	MNR	POL	AZ B	EL B	GHA	DEC	DGR	TSky	RGE Km	DOP	Echo ...
2017-09-09 Saturday	13:16	082°	-0°	0 dB	-3°	273°	+7°	160°	+6°	0.8dB	3°K	374224	+124...	34 Hz
2017-09-09 Saturday	13:17	082°	-0°	0 dB	-3°	273°	+6°	160°	+6°	0.8dB	3°K	374223	+123...	34 Hz
2017-09-09 Saturday	13:18	082°	+0°	0 dB	-3°	273°	+6°	160°	+6°	0.8dB	3°K	374221	+123...	34 Hz
2017-09-09 Saturday	13:19	081°	+0°	0 dB	-3°	273°	+6°	161°	+6°	0.8dB	3°K	374220	+122...	34 Hz
2017-09-09 Saturday	13:20	081°	+0°	0 dB	-3°	273°	+6°	161°	+6°	0.8dB	3°K	374218	+122...	34 Hz
2017-09-09 Saturday	13:21	081°	+1°	0 dB	-3°	274°	+6°	161°	+6°	0.8dB	3°K	374217	+121...	34 Hz
2017-09-09 Saturday	13:22	081°	+1°	0 dB	-3°	274°	+5°	161°	+6°	0.8dB	3°K	374215	+121...	34 Hz
2017-09-09 Saturday	13:23	081°	+1°	0 dB	-3°	274°	+5°	162°	+6°	0.8dB	3°K	374213	+120...	34 Hz
2017-09-09 Saturday	13:24	081°	+1°	0 dB	-3°	274°	+5°	162°	+6°	0.8dB	3°K	374212	+120...	34 Hz
2017-09-09 Saturday	13:25	081°	+1°	0 dB	-3°	274°	+5°	162°	+6°	0.8dB	3°K	374210	+119...	34 Hz
2017-09-09 Saturday	13:26	080°	+2°	0 dB	-3°	274°	+5°	162°	+6°	0.8dB	3°K	374209	+119...	34 Hz
2017-09-09 Saturday	13:27	080°	+2°	0 dB	-3°	274°	+4°	163°	+6°	0.8dB	3°K	374207	+118...	34 Hz
2017-09-09 Saturday	13:28	080°	+2°	0 dB	-3°	274°	+4°	163°	+6°	0.8dB	3°K	374206	+117...	34 Hz
2017-09-09 Saturday	13:29	080°	+2°	0 dB	-3°	275°	+4°	163°	+6°	0.8dB	3°K	374204	+117...	34 Hz
2017-09-09 Saturday	13:30	080°	+2°	0 dB	-3°	275°	+4°	163°	+6°	0.8dB	3°K	374203	+116...	34 Hz
2017-09-09 Saturday	13:31	080°	+3°	0 dB	-3°	275°	+4°	164°	+6°	0.8dB	3°K	374201	+116...	34 Hz
2017-09-09 Saturday	13:32	080°	+3°	0 dB	-3°	275°	+3°	164°	+6°	0.8dB	3°K	374200	+115...	34 Hz
2017-09-09 Saturday	13:33	080°	+3°	0 dB	-3°	275°	+3°	164°	+6°	0.8dB	3°K	374198	+115...	34 Hz
2017-09-09 Saturday	13:34	079°	+3°	0 dB	-3°	275°	+3°	164°	+6°	0.8dB	3°K	374197	+114...	34 Hz
2017-09-09 Saturday	13:35	079°	+3°	0 dB	-3°	275°	+3°	164°	+6°	0.8dB	3°K	374195	+114...	34 Hz
2017-09-09 Saturday	13:36	079°	+4°	0 dB	-3°	275°	+3°	165°	+6°	0.8dB	3°K	374194	+113...	34 Hz
2017-09-09 Saturday	13:37	079°	+4°	0 dB	-3°	276°	+2°	165°	+6°	0.8dB	3°K	374192	+113...	34 Hz

QSOs and Decodes at VK7MO

UTC	dB	DT	Freq	Message	
1317	-23	2.6	998	:* VK7MO WA3LBI -24	3
1319	-21	2.6	997	:* VK7MO WA3LBI RRR	0
1321	-20	2.6	998	:* VK7MO WA3LBI 73	0
1323	-21	2.6	995	:* CONGRATS REX	0
1325	-21	2.8	1002	:* WR 18950 KM	0
1327	-19	2.6	996	:* WR 18950 KM	0
1329	-20	2.5	996	:* AWESOME REX	0
1331	-19	2.6	997	:* A SPECIAL DAY	0
1333	-21	2.6	997	:* VK7MO WA3LBI FM28	0
1335	-16	0.7	989	:* VK7MO W5LUA EM13	0
1337	-14	2.9	997	:* VK7MO W5LUA EM13	0
1339	-14	2.8	992	:* VK7MO W5LUA R-15	0
1341	-14	2.9	992	:* VK7MO W5LUA 73	0
1343	-14	2.9	995	:* TNX QSO REX	0
1345	-20	2.6	994	:* VK7MO WA3LBI FM28	0
1347	-21	2.6	994	:* VK7MO WA3LBI -24	0
1349	-17	2.6	989	:* VK7MO WA3LBI R-23	0
1351	-19	2.5	991	:* VK7MO WA3LBI 73	0
1353	-23	2.7	988	:* VK7MO WA3LBI 73	3
1355	-22	-1.0	1428	:*	
1357	-23	1.6	1318	:*	
1359	-22	2.4	1114	:*	
1401	-13	2.8	965	:* VK7MO N9JIM CM87	0
1403	-10	2.6	955	:* VK7MO N9JIM R-15	0
1405	-10	2.6	930	:* VK7MO N9JIM 73	0

It is seen that WA3LBI was first decoded at -23 dB at 1317 when the Moon was at zero degrees and only partly visible and ground noise would be an issue. He later peaked at -19 dB when the elevation was around 2 degrees at VK7MO. In addition to the basic requirements of a QSO some text messages celebrating the record were also exchanged. After that W5LUA was worked with strong signals up to -14 dB and then a second QSO completed with WA3LBI when signals peaked at -17 dB dropping to -23 dB at 1353 when WA3LBI lost the Moon. It is seen that it was possible to exchange messages with WA3LBI from 1317 to 1353 which from the Moonsked data above is from zero degrees elevation at the VK7MO end to zero degrees elevation at the WA3LBI end. After the window to WA3LBI closed N9JIM in California was worked with 125 watts to his 4.8 metre dish and signal levels up to -10 dB.

QSO's and Decodes at WA3LBI



1316	-24	2.5	1014	:* WA3LBI VK7MO OF76	0
1318	-20	2.5	1011	:* WA3LBI VK7MO R-23	0
1320	-20	2.5	1010	:* WA3LBI VK7MO 73	0
1322	-21	2.5	1015	:* WR 18950 KM	0
1324	-20	2.7	1013	:* WR 18950 KM	0
1326	-20	2.6	1014	:* TNX JIM 73	0
1328	-21	2.6	1011	:* CONGRATS JIM	0
1330	-18	2.6	1012	:* CONGRATS JIM	0
1332	-21	2.6	1008	:* WELL DONE JIM	0
1334	-22	2.6	1010	:* WA3LBI VK7MO OF76	0
1335	-12	0.7	999	:* VK7MO W5LUA EM13	0
1336	-19	2.6	1005	:* W5LUA VK7MO OF76	0
1337	-13	3.0	1000	:* VK7MO W5LUA EM13	0
1338	-19	2.6	1003	:* W5LUA VK7MO -14	0
1339	-13	2.7	997	:* VK7MO W5LUA R-15	0
1340	-19	2.6	1005	:* W5LUA VK7MO RRR	0
1341	-12	2.8	1001	:* VK7MO W5LUA 73	0
1342	-21	2.6	1008	:* W5LUA VK7MO 73	0
1344	-22	2.5	1009	:* TNX AL 73	0
1346	-23	2.6	1010	:* WA3LBI VK7MO OF76	0
1348	-21	2.6	1009	:* WA3LBI VK7MO R-21	0
1350	-20	2.6	1008	:* WA3LBI VK7MO RRR	0
1352	-23	2.6	1008	:* WA3LBI VK7MO 73	0

Conclusions

Critical factors which made this World Record possible were both stations being able to work portable and select locations with zero take-off, the use of the very sensitive QRA64D mode and selecting a time when the common window was maximized and spreading and lunar libration were low.

Rex, VK7MO