STARLITE

THE JOURNAL FOR THE STOURBRIDGE AND DISTRICT A.R.S.

G6OI

G6SRS

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STOURBRIDGE & DISTRICT AMATEUR RADIO SOCIETY

INFORMAL MEETINGS ARE HELD AT:
NORTON SOCIAL CLUB,
OSMASTON ROAD, STOURBRIDGE, DY8 2AL
[8:00 TO 10:00 PM]

MAIN MEETINGS (3RD MONDAYS) ARE HELD AT:
NORTON COMMUNITY CENTRE
KEMPTON WAY, STOURBRIDGE, DY8 3AP
[8:00 TO 10:00 PM]

VISITORS ALWAYS WELCOME

CLUB NET: 145.325MHZ THURSDAY 8PM

RSGB AFFILIATED SOCIETY

STARLITE

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www.g6oi.org.uk

StARS Facebook Page:-
https://www.facebook.com/groups/stourbridge.ars/

All correspondence/enquiries should be addressed to the Hon Secretary at:-

StARS
c/o 188 The Broadway
Stourbridge
West Midlands
DY8 3HZ

Forthcoming Meetings

October 7th	Club Meeting at Norton Social Club. 8pm
October 14th	Club Meeting at Norton Social Club. 8pm
October 21st	**PRESIDENT'S DINNER @ THE FOLEY ARMS. 7pm**
October 28th	Club Meeting at Norton Social Club. 8pm
November 4th	Club Meeting at Norton Social Club. 8pm
November 11th	Club Meeting at Norton Social Club. 8pm
November 18th	**ANNUAL SURPLUS SALE @ Norton Community Centre. 8pm**
November 25th	Club Meeting at Norton Social Club. 8pm
December 2nd	Club Meeting at Norton Social Club. 8pm
December 9th	Club Meeting at Norton Social Club. 8pm
December 16th	Club Meeting at Norton Community Centre. 8pm
December 23rd	Club Meeting at Norton Social Club. 8pm
December 30th	Club Meeting at Norton Social Club. 8pm
January 6th 2025	Club Meeting at Norton Social Club. 8pm

From The Editor's Desk [Editor: g4xom@g6oi.org.uk]

In this issue:

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Please remember

"The StARS Club Net"

Thursday evenings @ 8pm

145.325MHz FM ± QRM

Earth–Moon–Earth Communication (aka Moon bounce)

Earth–Moon–Earth communication (**EME**), also known as **Moon bounce**, is a radio communications technique that relies on the propagation of radio waves from an Earth-based transmitter directed via reflection from the surface of the Moon back to an Earth-based receiver.

History

The use of the Moon as a passive communications satellite was proposed by W.J. Bray of the British General Post Office in 1940. It was calculated that with the available microwave transmission powers and low-noise receivers, it would be possible to beam microwave signals up from Earth and reflect them off the Moon. It was thought that at least one voice channel would be possible.[1]

Radar reflections off the moon were received and recognized as such in 1943 during German experiments with radio measurement equipment, as reported by Dr. Ing. W. Stepp in *Der Seewart* magazine. Stepp noted a "perturbation", which "appeared, had a duration of several impulses, and larger impulse strength than the strongest nearby targets. It didn't appear until about two seconds after switching on the transmitter and disappeared (pulsatingly) correspondingly later after switching it off. But the rest of the echo image appeared and disappeared at the instance of switching the transmitter on/off. The 'perturbation' only occurred when the antenna was aimed to the east, and it disappeared immediately upon a major change of direction, but reappeared only about two seconds after rotating back to the original direction. Apparently we had detected the rising moon behind the clouds with the equipment. It explained the gradual disappearance of the impulses by the reflecting body slowly moving out of the strongly focussed, horizontally aimed beam, as it rises above the horizon."[2]

It was not until the close of World War II, however, that techniques specifically intended for the purpose of bouncing radar waves off the moon to demonstrate their potential use in defense, communication, and radar astronomy were developed. The first successful attempt was carried out at Fort Monmouth, New Jersey, on January 10, 1946, by a group code-named Project Diana, headed by John H. DeWitt.[3] It was followed less than a month later, on February 6, 1946, by a second successful attempt, by a Hungarian group led by Zoltán Bay.[4] The Communication Moon Relay project that followed led to more practical uses, including a teletype link between the naval base at Pearl Harbor, Hawaii and United States Navy headquarters in Washington, D.C. In the days before communications satellites, a link free of the vagaries of ionospheric propagation was revolutionary.

The development of communication satellites in the 1960s made this technique obsolete. However, radio amateurs took up EME communication as a hobby; the first amateur radio moonbounce communication took place in 1953, and amateurs worldwide still use the technique.

Current EME communications

Amateur radio (ham) operators utilize EME for two-way communications. EME presents significant challenges to amateur operators interested in weak signal communication. EME provides the longest communications path any two stations on Earth can use.

Amateur frequency bands from 50 MHz to 47 GHz have been used successfully, but most EME communications are on the 2 meter, 70-centimeter, or 23-centimeter bands. Common modulation modes are continuous wave with Morse code, digital (JT65) and when the link budgets allow, voice.

Recent advances in digital signal processing have allowed EME contacts, admittedly with low data rate, to take place with powers in the order of 100 watts and a single Yagi–Uda antenna.

World Moon Bounce Day, June 29, 2009, was created by Echoes of Apollo and celebrated worldwide as an event preceding the 40th anniversary of the Apollo 11 Moon landing. A highlight of the celebrations was an interview via the Moon with Apollo 8 astronaut Bill Anders, who was also part of the backup crew for Apollo 11. The University of Tasmania in Australia with their 26-meter (85') dish were able to bounce a data signal off the surface of the Moon which was received by a large dish in the Netherlands, Dwingeloo Radio Observatory. The data signal was successfully resolved back to data setting a world record for the lowest power data signal returned from the Moon with a transmit power of 3 milliwatts, about 1,000th of the power of a flashlight lamp. The second World Moon Bounce Day was April 17, 2010, coinciding with the 40th anniversary of the conclusion of the Apollo 13 mission.

In October 2009 media artist Daniela de Paulis proposed to the CAMRAS radio amateur association based at the Dwingeloo Radio Observatory to use Moon bounce for a live image transmission performance. As a result of her proposal, in December 2009 CAMRAS radio operator Jan van Muijlwijk and radio operator Daniel Gautchi made the first image transmission via the Moon using the open source software MMSSTV. De Paulis called the innovative technology "Visual Moonbounce" and since 2010 she has been using it in several of her art projects, including the live performance called OPTICKS, during which digital images are sent to the Moon and back in real time and projected live.

Echo delay and time spread

Radio waves propagate in vacuum at the speed of light *c*, exactly 299,792,458 m/s. Propagation time to the Moon and back ranges from 2.4 to 2.7 seconds, with an average of 2.56 seconds (the average distance from Earth to the Moon is 384,400 km).

The Moon is nearly spherical, and its radius corresponds to about 5.8 milliseconds of wave travel time. The trailing parts of an echo, reflected from irregular surface features near the edge of the lunar disk, are delayed from the leading edge by as much as twice this value.

Most of the Moon's surface appears relatively smooth at the typical microwave wavelengths used for amateur EME. Most amateurs do EME contacts below 6 GHz, and differences in the moon's reflectivity are somewhat hard to discern above 1 GHz.

Lunar reflections are by nature quasi-specular (like those from a shiny ball bearing). The power useful for communication is mostly reflected from a small region near the center of the disk. The effective time spread of an echo amounts to no more than 0.1 ms.

Antenna polarization for EME stations must consider that reflection from a smooth surface preserves linear polarization but reverses the sense of circular polarizations.

At shorter wavelengths the lunar surface appears increasingly rough, so reflections at 10 GHz and above contain a significant diffuse component as well as a quasi-specular component. The diffuse component is depolarized, and can be viewed as a source of low level system noise. Significant portions of the diffused component arise from regions farther out toward the lunar rim. The median time spread can then be as much as several milliseconds. In all practical cases, however, time spreading is small enough that it does not cause significant smearing of CW keying or intersymbol interference in the slowly keyed modulations commonly used for digital EME. The diffused component may appear as significant noise at higher message data rates.

EME time spreading does have one very significant effect. Signal components reflected from different parts of the lunar surface travel different distances and arrive at Earth with random phase relationships. As the relative geometry of the transmitting station, receiving station and reflecting lunar surface changes, signal components sometimes add and sometimes cancel, depending on their phase relationship, creating large amplitude fluctuations in the received signal. These "libration fading" amplitude variations are well correlated over the coherence bandwidth (typically a few kHz). The libration fading components are related to the time spread of reflected signals.

Modulation types and frequencies for EME

VHF

- CW
- JT65A, JT65B, Q65

UHF

- CW
- JT65, Q65
- SSB

Microwave

- CW
- SSB
- Q65

Other factors influencing EME communications

Doppler effect at 144 MHz band is 300 Hz at moonrise or moonset. The doppler offset goes to around zero when the Moon is overhead. At other frequencies other doppler offsets will exist. At moonrise, returned signals will be shifted approximately 300 Hz higher in frequency. As the Moon traverses the sky to a point due south or due north, the Doppler effect approaches zero. By Moonset, they are shifted 300 Hz lower. Doppler effects cause many problems when tuning into, and locking onto, signals from the Moon.

Polarization effects can reduce the strength of received signals. One component is the geometrical alignment of the transmitting and receiving antennas. Many antennas produce a preferred plane of polarization. Transmitting and receiving station antennas may not be aligned from the perspective of an observer on the moon. This component is fixed by the alignment of the antennas and stations may include a facility to rotate antennas to adjust polarization. Another component is Faraday rotation on the Earth-Moon-Earth path. The plane of polarization of radio waves rotates as they pass through ionized layers of the

Earth's atmosphere. This effect is more pronounced at lower VHF frequencies and becomes less significant at 1296 MHz and above. Some of the polarization mismatch loss can be reduced by using a larger antenna array (more Yagi elements or a larger dish).[5]

References

1. Pether, John (1998). *The Post Office at War*. Bletchley Park Trust. p. 25.
2. ^ Stepp, Ing. "cq-DL 7/79, p. 328". *PA4FWM's homepage*. Translated by de Boer, Pieter-Tjerk.
3. Butrica, Andrew J. (1996). *To See the Unseen: A History of Planetary Radar Astronomy*. NASA. Archived from the original on 2007-08-23.
4. "Bay, Zoltán". *omikk.bme.hu*. OMIKK. Retrieved 2017-01-13.
5. Larry Wolfgang, Charles Hutchinson, (ed), *The ARRL |Handbook for Radio Amateurs, Sixty Eighth Edition* , American Radio Relay League, 1990 ISBN 0-87259-168-9, pages 23-34, 23-25,

Foundations of Amateur Radio

Can you build an all HF band concurrent WSPR transmitter?

It is in my nature to ask questions. It's been hammered into me from an early age and it often brings me new friends, new ideas and new projects. After spending quite some time mulling over my understanding of radio, I came up with this question: "Is it possible to build a single radio transmitter that is capable of emitting a WSPR signal at the same time on all the HF bands?"

Before we look at the hardware, let's contemplate for a moment what this transmission might look like.

Imagine a WSPR transmission as a normal audio signal. It sounds like a couple of warbling tones for two minutes. Unpacking it, the audio signal is about 6 Hz wide and sits somewhere between 1400 and 1600 Hz. If you were to draw a power chart of this, displaying the frequencies horizontally and power vertically, you'd see a completely flat chart with a little spike, 6 Hz wide, somewhere between 1400 and 1600 Hz.

Using an analogue radio, you can play this sound into the microphone or audio port and the radio takes care of transmitting it on the 10m band as a 28 MHz beacon. Tune the radio to 40m and it appears as a 7 MHz transmission.

The two takeaways are that the WSPR signal itself doesn't change between bands or transmissions and the radio does the heavy lifting to make your WSPR transmission come out at the right frequency.

Your radio is moving the audio frequencies to the correct amateur band. The electronics in your radio achieve this move by mixing the audio and the tuning frequencies together.

If you imagine a 28 MHz WSPR signal coming from your transmitter as a power chart, it's essentially silence, except for a little WSPR peak somewhere just off to the right of 28 MHz.

>From a mathematical perspective, the frequency mixer in your radio is performing a multiplication and best of all, you don't need a radio to do this. You could use software to multiply frequencies instead and end up with something that represented their product. If you were to create a power chart of this equivalent multiplication, you'd see a completely flat chart with a little spike near 28.1261 MHz.

Sound familiar?

It gets better.

You can store the result of this calculation in a file as a 28 MHz WSPR signal and you could do this as many times as you want. You could create a file with a 3.5 MHz WSPR signal, one with a 7 MHz one and so-on.

Since we're talking about shuffling numbers only, you could combine all these calculations, and end up with a single file that had several WSPR signals inside it.

The chart picture is again mostly silence, just with little WSPR peaks at frequencies suitable for say transmission on the 80, 40, 15 and 10m bands.

Now all you need is to find a device that's capable of transmitting it.

Turns out that we have such a device. A PlutoSDR, a software defined radio which I've spoken about before. It's capable of transmitting a 56 MHz wide signal, more than ample for what we're doing. We don't need to use the PlutoSDR to calculate the combined signal either, since we can do all that in advance, because as I said, a WSPR signal doesn't change.

So essentially, all we'd need to do is generate a file that has all the WSPR signal information at the right frequencies and send it to the PlutoSDR to transmit.

There are a couple of hurdles to overcome.

When you multiply two frequencies, you end up with two peaks, one at the sum of both frequencies, and one at the difference between them. One you need, the other you don't, so we're going to need to filter this out, something that your analogue radio circuit also does.

Another challenge is around sampling rates. The PlutoSDR needs a specific sampling rate and bit depth, so we're going to have to generate our file just so. I'm going to skip past complex numbers and move on to power output, since all the power from the transmitter will be spread across all of the combined WSPR signals we're attempting to transmit, so we're likely going to need amplification.

There's also the matter of testing before we actually connect this contraption to an antenna and I've glossed over one minor but essential point, the PlutoSDR doesn't do HF.

So, where does this leave us?

We can build a proof of concept using 2m and 70cm. Both those bands are native to the PlutoSDR. I'm currently working on generating the actual WSPR signal file to start the transformation process. A friend has some testing gear that could allow us to see what's coming out of the transmitter without polluting the airwaves and of course, at this point this is all still "What-if". I've not actually made this work, but it's keeping me entertained and that's half the fun.

It gets even better. The Pluto has an FPGA on board, so theoretically at least, we might be able to generate this actual file inside the Pluto in real-time, which opens up a whole other avenue of exploration, but we'll start with crawling before running.

If you have thoughts on this, or any other aspect of the hobby, please get in touch. You can send email to cq@vk6flab.com or you can find me on Twitter and Reddit with my callsign.

In the meantime, you know the drill. Get on air and make some noise.

I'm Onno VK6FLAB

DXpeditions

JW7XK JW6VM JW9DL JW5X Svalbard Islands

JW7XK, JW9DL and JW6VM will be active from Svalbard, IOTA EU - 026, 9 - 14 October 2024.

JW9DL and JW6VM will be active on HF Bands and JW7XK will be on satellites, mostly RS-44.

During SAC Contest they will be active as JW5X in MO Category.

QSL info:	JW7XK via LA7XK	JW6VM via LA6VM
	JW9DL via LA9DL	JW5X via LA5X.

V5/HA5AO Namibia

HA5AO will be active as V5/HA5AO from Namibia, 5 - 14 October 2024.

He will operate on 80 - 6m, CW, SSB, FT8.

QSL via home call, OQRS. QTH - Katima Mulilo Region, Namibia.

TO2X Guadeloupe

TO2X Team will be active from Guadeloupe, IOTA NA - 102 in CQ WW DX SSB Contest, 26 - 27 October 2024.

Team - M5RIC, GW4XUM, K1XX, W1MD.

Before and after contest they will be active as FG/M5RIC, FG/GW4XUM, FG/K1XX, FG/W1MD.

QSL via LOTW, ClubLog. QTH Locator - FK96ia.

TO5A Martinique Island

TO5A Team will be active from Martinique Island, IOTA NA - 107, in CQ WW DX SSB Contest, 26 - 27 October 2024.

Team - FM5BH, F8AAN, FM5FJ, F5VHJ.

They will operate in Multi - Two Category.

QSL information:

QSL via F5VHJ, ClubLog OQRS, LOTW.

Address for direct QSL: ALBERT CRESPO, LIMOUSIN, 47120 ST. ASTIER DE DURAS, France.

V63CB Micronesia

Miki, JJ2CJB will be active as V63CB from Weno Island, IOTA OC - 011, Micronesia, 25 - 29 October 2024.

He will operate on HF Bands, including activity in CQ WW DX SSB Contest.

QSL via JJ2CJB direct, LOTW.

Address for direct QSL: SEIICHIRO MIKI, 1810 KIRITO OKEHAZAMA, MIDORI NAGOYA AICHI, 4580922, Japan.

VP2MMM Montserrat Island

N8DL will be active as VP2MMM from Montserrat Island, IOTA NA - 103, 23 - 29 October 2024.

He will operate on HF Bands.

QSL via home call.

VP2MMX Montserrat Island

Dennis, N0SMX will be active as VP2MMX from Montserrat Island, IOTA NA - 103, 23 - 29 October 2024.

He will operate on HF Bands CW, SSB, FT8.

Address for direct QSL: DENNIS W MC KINNEY, 17446 SE 82nd Pecan Terrace, The Villages, FL 32162, USA.

7Q2T Malawi

Gerry, W1VE will be active as 7Q2T from Malawi, 21 - 28 October 2024.

He will operate on HF Bands, mainly CW.

He will be active in CQ WW DX SSB Contest, 26 - 27 October 2024 in Single Operator All Bands Low Power Category.

QSL via LOTW.

QTH - Embangweni Mission Hospital station in Malawi, courtesy of Don, 7Q6M.

3DA0DL Eswatini

3DA0DL Team will be active from Eswatini, 25 October - 9 November 2024.

Team - DK1BT, DL4WK, DL6SAK, DL7BO, DL7UFR.

They will operate on HF Bands.

QSL via DL7UFR.

ZD7W Saint Helena Island

Oliver, W6NV will be active as ZD7W from Saint Helena Island, IOTA AF-022, in CQ WW DX SSB Contest, 26 - 27 October 2024 and CQ WW DX CW Contest, 23 - 24 November 2024.

He will operate in SOAB Category.

QSL via W6NV.

Address for direct QSL: Oliver Sweningsen, III, W6NV, PO BOX 90, Orinda, CA 94563, USA.

DXCC Country - St Helena Island. WAZ Zone - CQ 36.

ITU Zone – 66. QTH Locator - IH74.

5R8WE 5R8CI Nosy Be Island

SP9FIH and SP6CIK will be active as 5R8WE and 5R8CI from Andilana, Nosy Be Island, IOTA AF - 057, Madagascar, 23 October - 6 November 2024.

They will operate on 40 - 10m Bands, CW, SSB, FT8, Super Fox.

QSL via LOTW, ClubLog OQRS.

6Y/G0RNU Jamaica

Neil, G0RNU will be active as 6Y/G0RNU from Jamaica, IOTA NA - 097, 23 October - 6 November 2024.

He will operate on HF Bands, SSB, FT8.

QSL via eQSL.

7Q1 Malawi

7Q1 Team will be active from Malawi, during end of the October 2024.

Yes, call sign is 7Q1 with no suffix.

Previousely announced that they will use 7Q7MW call sign.

Team - EA7FTR, CT1BOL, 7Q6M, 7Q7CT.

They will operate on HF Bands, including activity in CQ WW DX SSB Contest, 26 - 27 October 2024.

E6AQ Niue Island

Jacek, SP5EAQ will be active as E6AQ from Niue Island, IOTA OC - 040, 22 October - 9 November 2024.

He will operate on 80 - 10m, including activity in CQ WW DX SSB Contest.

QSL via SP7DQR, LOTW, ClubLog.

FG4KH Guadeloupe

Philippe, F1DUZ will be active again as FG4KH from Guadeloupe, IOTA NA-102, 22 October - 6 November 2024.

He will operate on HF Bands, including activity in CQ WW DX SSB Contest.

QSL via home call direct, LOTW, eQSL.

Address for direct QSL: Philippe LEVRON, Malvaux, 49570 Montjean-sur-Loire, France.

YJ0VV Efate Island, Vanuatu

YJ0VV Team will be active from Port Villa, Efate Island, IOTA OC - 035, Vanuatu, 16 - 30 October 2024.

They will operate on HF Bands, including activity in CQ WW DX SSB Contest.

QSL via N4VGE, LOTW.

ZL7DX ZL7IO Chatham Islands

Holger, ZL3IO will be active from ZL7DX station from Chatham Islands, IOTA OC - 038, 15 - 31 October 2024.

He will operate on HF Bands, including activity in CQ WW DX SSB Contest, as ZL7IO.

He will operate in Single Operator Low Power Category.

QSL via M0OXO.

5H3MB Tanzania

5H3MB. Maurizio Buffoli, IK2GZU will be active again from Tanzania, 10 October - 11 November 2024, as 5H3MB.

He will operate on 80 - 10m, CW, SSB, Digital Modes.

QSL via home call, ClubLog OQRS, LOTW, eQSL.

Address for direct QSL: MAURIZIO BUFFOLI, VIA DEGLI ANGELI 9, 25033 COLOGNE BS, Italy.

CC21MM Nauru

21MM Team will be active from Nauru Island, IOTA OC - 031, 11 - 27 October 2024.

Team - DG2RON Ronny, DJ5IW Gerd, DJ7TO Olaf, DJ9KH Werner, DK3CG Rudolf, DK5WL Joe, DL1KWK Frank,DL2RNS Norbert, DL4SVA Georg, DL6KAC Christian, DL6KVA Axel, DL7JOM Olaf, DL7VEE Rolf, DL8LAS Andree.

They will operate on 160 - 6m, CW, SSB, Digital modes.

Planned operating freqs:

Band	CW	SSB	RTTY	FT8
160m	1.822,5	-	-	1.839
80m	3.533	3.805	-	3.570
60m	5.354	-	-	5.356
40m	7.002	7.092 / 7.192	7.047	7.056
30m	10.102	-	10.147	10.133
20m	14.033	14.210	14.095	14.095
17m	18.085	18.150	18.106	18.097
15m	21.033	21.275	21.095	21.095
12m	24.905	24.975	24.925	24.925
10m	28.033	28.465	28.110	28.095
6m	50.105	50.125	-	50.313

QSL via DL4SVA, LOTW, ClubLog OQRS.

Address for direct QSL: Georg Tretow, DL4SVA, Rehnaer Str. 8, D-23936, Grevesmuehlen, GERMANY.

YOUR COMMITTEE

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