H.A.R.S. Journal

Journal of the Hereford Amateur Radio Society

Issue No 6 • February 2017

Editorial

It is little late, and maybe just off the cusp perhaps, but nevertheless the *Journal* wishes all of its readers a Happy New Year! May the year 2017 be full of great radio opportunities of all kinds and may everyone embrace their hobby and each other wholeheartedly.

Last year Ryan Ing involved the Club and the *Journal* in the launch of the balloon which ascended to great heights and which recorded much atmospheric data. Now, in this first issue of 2017, we have a brilliant planetary article by Club member Norman Pomfret M0SXF. Read all about the *Schumann Resonance*, a physical phenomena generating VLF.

Ed

Club AGM 2017

7.30 pm
Friday 7th April

Curry night at the Club

January 6th 2017

There were about 22 members and some lovely XYLs at the Club night on the 6th January which was billed as a "Curry Night" but *bring your own plate and hardware*! It was really good to see everyone and it was a wonderful evening. Early-on Geoff G8BPN made a list of members' requirements, phoning the list through to the *Jalalabad* in Leominster, and then setting off to collect the feast. Thank you Geoff.

At this point, Matt G8XYJ, stood up and with the aid of a screen and projector, gave a revealing short talk on Minos, the VHF & UHF Contest logging software. Now contesting is very much a developing Club strength and Matt showed how the software is used as a real and past event diary, especially useful in real-time scoring of points per QSO and points based upon distance, the latter aided by the Maidenhead location calculator which is incorporated. Thanks Matt.

Minos submissions are accepted by the Contest adjudicators.

QRV..... Here comes the food!.....Ed

Members well into dining mode!

Distant Writing

In 1820 the local telegraph office in Commercial Road, Hereford, advertised for an employee.

An intrepid candidate, whom we shall call Cyril, went along to the office and entered. Inside there was a great amount of clatter amid a very busy atmosphere.

He was handed a form to fill in and told to take a seat down the corridor next to the manager's office, from which came the constant clatter of a telegraph machine. Along the corridor there were seven other candidates, all seated and all waiting to be interviewed for the one position.

After taking his seat Cyril suddenly jumps up unannounced and goes into the manager's office. The other candidates could not believe what was going on and were greatly rattled to the point of exasperation for they had been waiting for what seemed like ages.

Then the manager appears and says to the confused waiting applicants "sorry gentlemen but the position has just been filled!" "What!" they exclaimed in unison, "we haven't even been interviewed". "I know" the manager said, "but my telegraph has been sending over and over the following message, ***If you can read this go immediately into the office!****"*

G8EPR

Dave, well known to many radio enthusiasts, will have been in hospital come this past January for twelve months after receiving a very bad injury when he fell off a ladder at work. David is a keeper of the Pye Museum and is a very well known PMR exponent. We all wish him well in 2017 and we all hope for his speedy recovery.

Ed

Dear Member

Please note that the *Journal* will be issued more regularly based upon available content.

Please think about submissions/projects you might like to send in or see.

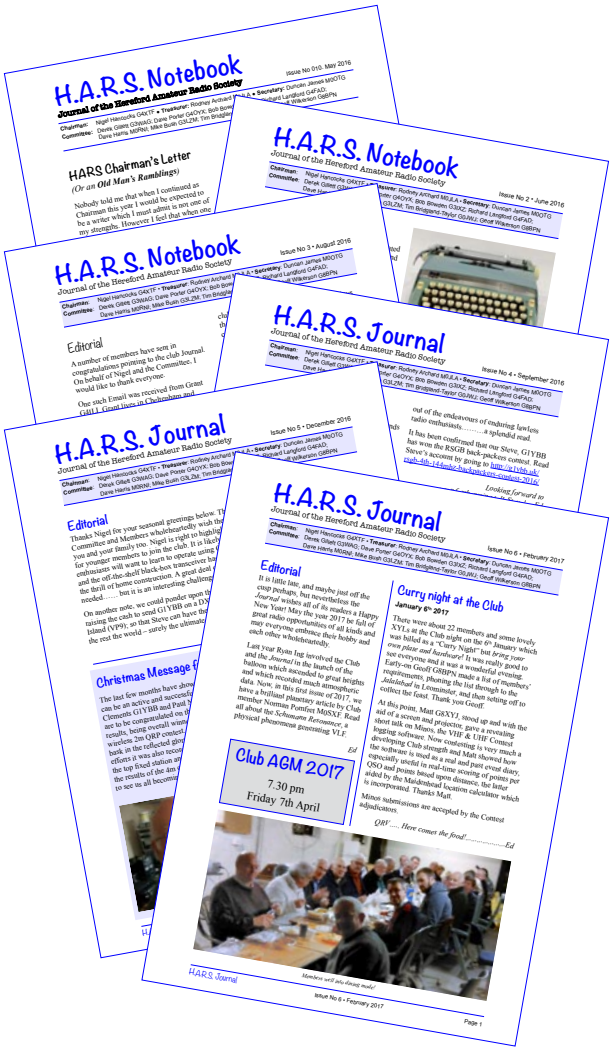
General topics and key words are listed below.

Members projects	Events	Training
Members station	Notices	QRP/QRO
Construction	Help	Illustrations
Items wanted	News	Photographs
Items for sale	DX	Early radio
Hints and kinks	Militaria	Restoration...

... or anything else that you think might be of interest to HARS members. If you have an idea for a submission, but don't know how to present it, feel free to ask for advice.

Please submit anything and everything to topix@hars.wagnet.co.uk or talk with Mike at the Club meetings.

73s es GDX, G3LZM
Mike Bush (Editor)



The Journal Welcomes Our New Radio Licences!

It is with great pleasure that the Club Journal is able to report on the five newly issued radio licences.

2E0GCJ Graham Jacks tells us that he operates mostly on VHF with his IC2725 but at his location in Ludlow, he finds the bands a bit quiet. For HF listening he uses a Yeasu receiver (which has been kindly loaned by Dave Porter) coupled to a long wire antenna.

Graham spent many happy years as a member of the Ludlow CB fraternity.

2E0RPW Richard Webb lives in Tenbury Wells and says that his QTH is surrounded by tall conifers. Nevertheless he does receive the occasional 2M signal on his hand-held transceiver. Richard says that he would like to sit with an accomplished operator, to learn the ropes, before he spends serious money on an all-band rig.

Richard is definitely interested in all aspects of construction.

M6HYB Geoff Marfell's QTH is located in Weston Under Penyard which is three miles west of Ross on Wye. At this QTH Geoff is putting up a Clark pump-up mast. Usefully he has another location in Drybrook (230m ASL) which could take another mast for remote operation if he chooses!

Geoff says that his main interest is vintage military radio and one of his first projects is to fit his No 19 transceiver (HF AM) into an Austin Champ and tour the rallies. He also has an 817 transceiver and is interested in construction.

2E0NPC In the earliest days, like most of us, Neil Collins saved his pocket money and bought a Lafayette HE30 valves receiver and his listening career began.

Nowadays, Neil, who is semi retired, operates VHF mobile and has a TS850 coupled to a G5RV antenna. More HF activity is planned with a new 60 foot tower completed with a beam and rotator. Neil has many pieces of equipment at his QTH at Tenbury Broadheath. He says that he is interested in transmission data modes, slow scan TV and SDR dongles.

Neil also says that he has a caravan camp site which would be suitable for a field-day should this be of interest.

2E0EDO Andy Gray's QTH is in Southern Leominster. Not having too much garden space, Andy makes do with a dipole situated in his loft and a sloping wire to the end of the garden….. neither of the aerials would have been acceptable when he was a Radio Operator in the Army!

Andy's main interest is in CW HF operating with a self built Pixie at the moment and he hopes to QSO his brother G0RKD, who is presently building his own Pixie kit.

Thanks also to Dave Porter and his team for making all of this possible. Ed.

Graham Jacks, Andy Gray, Neil Collins, Geoff Marfell, Richard Webb

FUNcube 1, The Tiny Satellite.

At the last meeting Eddie (G6UQI) introduced to me the FUNcube 1 satellite which is easily received on the most modest of antennae.

Engineered by the Dutch and known by them as AO73, this satellite measures only an amazing 10cm x 10cm x 10cm and weighs 1kg. It was launched from Russia in 2013 and is in a low 670km orbit passing almost overhead three times in the morning and three times in the afternoon. Whilst in eclipse it reduces power.

Intended for students, it sends the readings from on-board experiments in the form of BPSK at 1200 Bauds on 145.935MHz. This transmission is also acts as its beacon. For those amateurs wishing to communicate by SSB or CW, using the transponder, the uplink is on 435,150MHz, and the downlink is on 145.950MHz at 300mW output power in the sunlight.

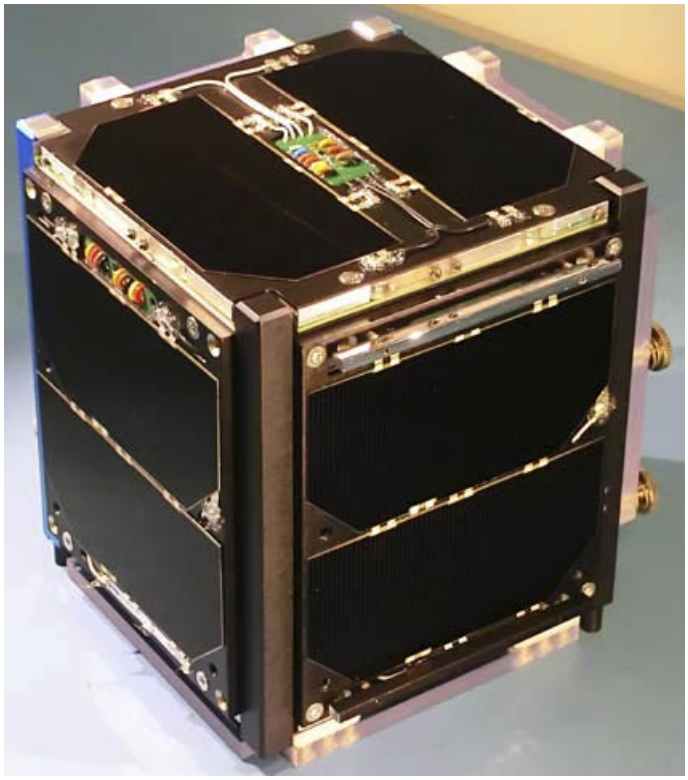
A receiver dongle is available for £150 from www.funcubedongle.com ,which plugs into your PC and which has an SMA connector for your antennae.

FUNcube 2

This is the UK engineered satellite properly known as UKube 1 and was launched from Russia in 2014. Professional experiments were successfully carried out after which the satellite was allowed to be used by radio amateurs. The satellite measures 30cm x 30cm x 10cm. The experiment telemetry is on 145.840MHz and its beacon is on 145.915MHz.

For radio amateurs wishing to make use of the linear transponder, the uplink is on 435.080 – 435.060MHz. The downlink is 145.930 – 145.950MHz (400mW).

But where is the satellite at any one time? Go to www.N2YO.com and here you will see in real-time, an active pictorial of the satellite position relative to your location



FUNcube 1

Note: N2YO also has a list of some 250 amateur radio satellites currently in orbit.

Thanks Eddie……..Ed

See www.funcube.org.uk/ for more information.

WSPR

We have to thank Club member Matt G8XYJ who is undoubtedly a leading light and exponent of the fascinating WSPR (*Whisper*) mode of our amateur radio hobby. He has been heard in Australia radiating with just 0.2W on the 14MHz HF band. Truly amazing!

But, what in heavens name is WSPR? This is what many of us would like to know!

First of all, WSPR activity is not new. It stands for Weak Signal Propagation Reporter. Being software based, it relies an amateurs in far-off locations inputting data on transmitting stations heard, into the computer software originated by K1JT (Joe Taylor). The data is shared amongst like-minded amateurs and the best propagation paths of the day, are clearly identified.

In simple terms Matt had a 14MHz Beacon in operation, radiating just 200mW.

Thanks Matt, extraordinary .....Ed

Schumann Resonance

By Norman M0SXF

As radio amateurs we have been allocated the lowest frequency band 135.7kHz to 137.8kHz where we can use a power of 1W or 30dBm. The band is very noisy and consequently QRSS, which means send very slowly, is the order of the day.

If you think this is VLF, and low power, continue to read Norman's description of VVLF.

Introduction

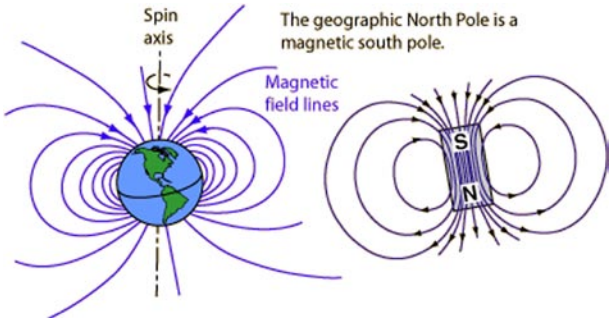
The worldwide geophysical phenomenon known as Schumann Resonance has probably been in existence since our earth gained both an atmosphere and an ionosphere. The German physicist Winfried Otto Schumann is credited as being the prime researcher during the years 1952-1957, for this geophysical phenomenon. The earth's atmosphere allows this resonance to form in the spherical volumetric space between the earth (ground) and the ionosphere, these are both electrically conductive. Thus a wave is continually reflected around the earth as a whole.

Background Physics to the phenomenon

When considered on a global scale the earth is a 'small' electric circuit, albeit of very large dimensions. It comprises of two electrodes: ground is one electrode; and the highly conductive ionosphere is the other. The space (air) between these two electrodes is the world's atmosphere that extends in this context, to an altitude in the order of 55km. The atmosphere on a global scale is a weak electrical conductor, though we often consider it to be an electrical insulator.

To apply some dimensions to this circuit: the, vertical current flow between Earth and the ionosphere is in the region of $3x10^{-12}$ amperes per square metre (Am^{-2}), which is very small. However the earth's surface is, very conveniently, approximately $500x10^{12}$ M^2, giving a total current flow of 1,500 amperes, flowing through an atmosphere that has an effective resistance of 200 ohms. The electrical voltage required for a current flow of this magnitude through a resistance of 200R, is $300x10^3$ V or 300,000 volts. This high electrical charge is dissipated by the many worldwide lightning storms occurring, of which there may be 1,000 at any particular moment. In effect the atmosphere is the dielectric of a capacitor of global proportions that stores this electrical charge in the order of 500,000 coulombs. This describes the direct current (dc) aspect of our earth-ionosphere electrical circuit.

Our earth also has a magnetic field often referred to as the geomagnetic field, it can be simplistically represented as a single bar magnet, that has two poles – north and south, to which we have arbitrarily ascribed the geographic Northern Hemisphere as the North Pole.



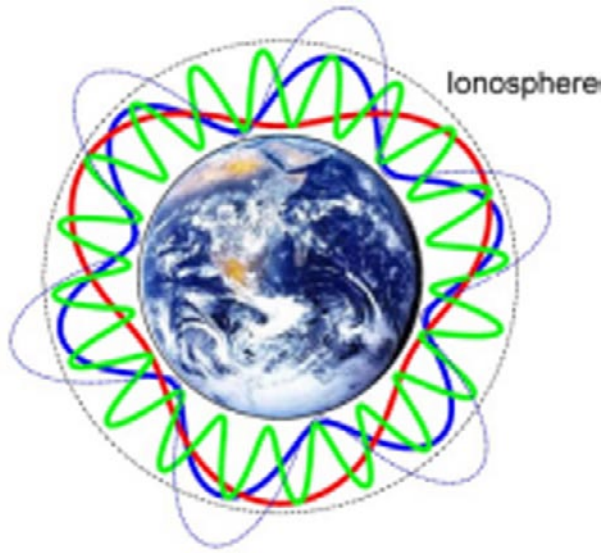
Thus the north 'seeking' pole of a compass needle will be attracted to the geographic north pole. The earth generates this magnetic field through the motion of very fluid metals mainly iron in the outer core, which is driven by heat flow from the core centre, at a temperature of 6,000 degrees. This magnetic field is not constant, and varies in strength within the region of $25\text{-}65.10^{-6}$ Tesla. Variations measured in the 'short term', can be in the order of less than a second, or hundreds-to-millions of years. The former may be the result of solar geomagnetic storms, the latter being the result of changes within the earth itself. e.g. plate tectonics.

Schumann Resonances are quasi standing electromagnetic waves that exist in the cavity formed by the earth and ionosphere. As they are standing waves they do not physically travel around the earth, however their effect does. Consider, oscillations of a bell that are

not present all the time; the bell has to be excited for the standing wave to be observed.

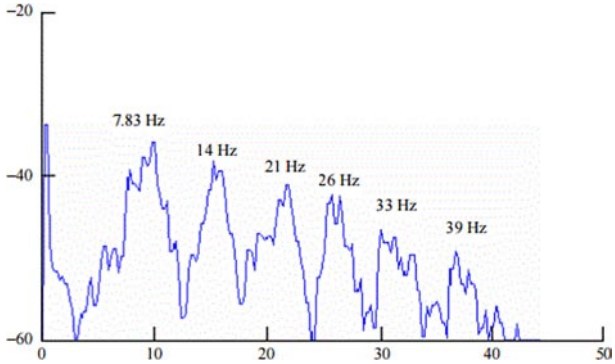
Big Ben in Westminster is well known to many. The sound of Big Ben is created when the bell is struck and energised by a hammer thus causing it to vibrate. Sound is heard because the bell's resonant frequency is within human hearing range. Similarly, in terms of Schumann Resonance, the ionosphere is slowly charged by the absorption of solar radiation, the energy store. When the voltage between the ground and the ionosphere reaches a sufficiently high enough potential, the capacitor's dielectric (the atmosphere), breaks down to produce a lightning stroke. This is the hammer blow that excites the earth-ionosphere cavity to resonate.

The NASA web site has a very good illustration 'icon' that in all its simplicity aptly illustrates the Schumann Resonance. Shown below three such eigenmodes are illustrated. You will note the continuity of the waves (these are depicted at one moment in time) there is no origin or termination as they are 'standing waves' that go on and on and on, though the frequency and amplitude may change a little.



Schumann Resonance: Red 1st Eigenmode, Blue 2nd Eigenmode, Green 3rd Eigenmode

The resonances known as eigenmodes (harmonics) occur at several frequencies of approximately 8, 14, 20, 26, 32, 39 and 45 Hz, their amplitude decreases as the eigenmode frequency increases. These oscillations are not constant and vary in frequency in the order of 0.5Hz; and with an amplitude which is in a state of constant flux.



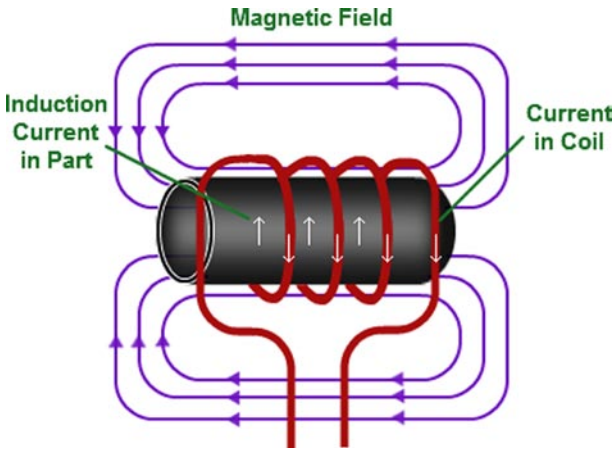
Plot of Schumann Resonance magnitude (dBV) versus frequency.

There are suggestions that solar activity and/or the eleven year sunspot cycle can affect the earth's ionosphere.

Note, the eigenmodes do not have a straight forward harmonic relationship as that of radio or audio waves, in this context the cavity has spherical proportions and is not a linear space. Also: chemistry; air pressure; and density are all significant variables that have an effect: ion density; ionisation; recombination and subsequent re-ionisation too. In comparison to our sun, it is all very quiet it though certainly not a static environment !

Detection

To 'see' the electrical effect of these resonances a sensor is required to detect the very, very, small electrical currents that flow at these eigenmode frequencies.



When an electrical conductor is moved through a magnetic field a voltage will be induced into that conductor. With the conductor in the form of a coil, the induced voltage is proportional to the number of the coil turns.

Therefore, for the sensor, a 'solenoid coil' is proposed and it is estimated that the coil will comprise 100,000 turns of wire wound on a ferrite core of significant length (1,000 mm)

to provide an inductance in the order of 5,000 Henrys (H).

In reality, the induced signal voltage is very, very, small indeed, perhaps in the order of a few tens of nano-volts. The frequency range of the Schumann signal (8-45Hz) is lower than the national power grid at 50Hz in both UK and Europe. These frequencies also encompass the power frequency of European electric trains (16.6Hz).

In all industrialised countries 'The Hum' in the electrical context of power distribution systems pervades everywhere; in cities through the use of Industrial and commercial equipment. In rural areas it is the overhead power line distribution system that is the principle source of 'Hum'. Also, a recent source of interference to emerge is the thousands of 'green energy' generators that have been brought on line.

All of these potential interferences have to be understood and prepared for.

For further reading, the *Schumann Resonance for Tyros* can be considered as the Bible for both amateur and professional student of these phenomena, *Tyros* is Greek for 'Beginners'.

Thank you very much Norman. ...Ed

20M QRP Transceiver

This kit is produced by FreeBytes of Greece. It is based upon the classic Pixie and is known by some as the Pixie II. Look up RADIOKIT-120 on eBay and you will see that it is priced at £20 plus £3.50 postage. You can see the complete, very readable, manual here too.

The Xtal frequency is 14.060MHz (supplied) and it is CW only. Using a 9 volt battery the output power is reckoned to be 165mW and with a 12 volt battery, the output rises to 250mW. There is no side-tone.

Run this into a dipole and you will be amazed.

Ed

Contest Corner

Steve G1YBB's 2017 Contest Dates

144MHz UKAC	50MHz UKAC
All below are 20.00 to 22.30 LOCAL time, not UTC.	*All below are 20.00 to 22.30 LOCAL time, not UTC.*
Tuesday 3rd January	Thursday 12th January
Tuesday 7th February	Thursday 16th February
Tuesday 7th March	Thursday 16th March
Tuesday 4th April	Thursday 13th April
Tuesday 2nd May	Thursday 11th May
Tuesday 6th June	Thursday 15th June
Tuesday 4th July	Thursday 13th July
Tuesday 1st August	Thursday 10th August
Tuesday 5th September	Thursday 14th September
Tuesday 3rd October	Thursday12th October
Tuesday 7th November	Thursday16th November
Tuesday 5th December	Thursday14th December

HARS radio equipment available for loan to Club members

The following list of equipment is available for loan to Club members. The loan period is 3 months and members wishing to use the equipment will have to sign a simple agreement which covers the loan terms. If you wish to borrow then please contact Duncan (Hon Sec) M0OTG.

Grid Dip Meter MFJ-201

Buddipole 10-40M portable antenna with tripod and carrying case.

Yaesu FT450 All bands to 50MHz. Needs a 12V PSU

Pixie 7MHz QRP kit. Needs assembling.

Baofeng UV-5R 70cms/144MHz hand-held complete with accessories.

Go portable with the Buddipole! Ed.

The Major Satellite Earth Station on our Doorstep!

Madley Communications Centre

Why is MCC sited at Coldstone Common? This BT Earth Station site between the Malvern Hills and the Black Mountains, was chosen for its very low RF and Microwave noise profile. Earlier, in WWII, the site was an airfield where bomber crews trained to proficiency.

BT's ownership of the site dates from 1975 and the first satellite link started in 1978. Now Madley has 65 antenna dishes including three main *early* 32m ones each weighing 290 tons. Madley 1, the first of the large dishes, tracks a geostationary satellite 25,000 miles above the equator. All of the other antennas are much smaller mainly because transponder and receiver technology improved so much that it wasn't necessary to capture a large signal any longer.

Nowadays Madley has access to 15 satellites which means that two thirds of the planet Earth is spanned.

MCC transmits and receives a range of services, including International News as it happens, Sporting Events, Corporate Networks, Disaster Relief/Recovery, Internet Gateway Services and Voice Comms. It operates 24/7 and has its own resilient power back-up and terrestrial back-haul networks.

The BT Earth Station/Teleport portfolio includes teleports in Turkey, Brazil, Columbia, Argentina, Venezuela, Mexico, and Peru.

A good place to work..... Ed