



Happy
New Year!

The President,
Secretary, and all the
office bearers of the
AMATEUR RADIO
SOCIETY OF INDIA
greet all the members,
wishing lots of DX
and best propagation!



PRESIDENT'S MESSAGE



Since writing in September, the HFI 2016 was held in Mount Abu. Being the 25th HFI since inception, it was a well awaited event.

The organizers spared no effort in making it a great success and more than 500 delegates attended.

Radio amateurs who have been active over 25 years were all given mementos and certificates. The 2017 HFI has been decided for Kolkata, details will follow.

ARSI participated in the opening ceremony and had an opportunity to let the delegates know of the efforts being continuously made to get rid of the irksome and antiquated radio regulations that exist in India.

The abolishment of security clearance was a major step in that direction and new entrants to our wonderful hobby now get their licenses in just a few weeks after qualifying.

Removing restrictions on mobile and portable operation is the next target and we are working on it, but there seems to be some resistance for this at the governmental level. They have assured us in writing of quick clearance of temporary shifts in QTH for demos, field trips etc. but prior permission is still required.

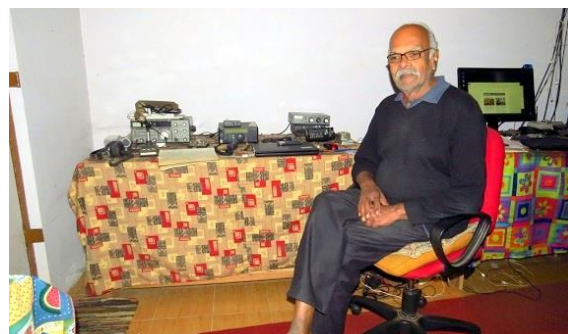
A few weeks ago I attended the Triennial conference of IARU Region 2 which was held in Vina del Mar in Chile, South America. IARU Director Shizuo Endo accompanied me. It was a well-attended conference, with most of the proceedings in Spanish (simultaneous translation to English).

ARSI has just announced plans for the annual Hill Topping exercise and the Field day and all are urged to participate in these fun filled, but very useful excercises.

May I wish all of you a very happy festive season and a happy, prosperous and most importantly, healthy 2017 and the years to come?

Gopal Madhavan VU2GMN

FROM THE EDITOR'S DESK



HAPPY NEW YEAR TO ALL!

Propagation has been poor throughout the year. As I am writing this, the Sun is spotlessly clean. During the year, the Sun was spotless for 31 days. For the last 18 months solar activity has been in a disciplined downtrend with well-defined activity bounds. There was a small jump up in the lower bound of activity in July 2015 but still maintaining the same slope.

The current solar cycle, #24, is the weakest solar cycle in more than a century and it is now heading towards the next solar minimum phase which would be the beginning of solar cycle #25. Some solar scientists are already predicting that the next solar cycle will be even weaker than this current one which has been historically weak.

I have included elsewhere in this issue, some information on the impact of such low solar activity where amateurs are concerned.

73, Ganesh VU2TS

NEWS FROM THE CAPITAL

A 'Ministry of Communications' was carved out of the erstwhile *Ministry of Communications and Information Technology* on 19 July 2016. It consists of two departments - Department of Telecommunications and Department of Posts. The erstwhile Ministry of Communication and Information Technology was bifurcated into (1) Ministry of Communications and (2) Ministry of Electronics and Information Technology.

The Department of Telecommunications is also known as the **Door Sanchar Vibhag**, and concerns itself with policy, licensing and coordination matters relating to telegraphs, telephones, wireless, data, facsimile and telematics services and other like forms of communications. Needless to mention, the WIRELESS PLANNING & CO-ORDINATION WING comes under this department. It looks into the administration of laws with respect to any of the matters specified, namely:

- The [Indian Telegraph Act](#), 1885 (13 of 1885)
- The [Indian Wireless Telegraphy Act](#), 1940 (17 of 1933)
- The [Telecom Regulatory Authority of India Act](#), 1997 (24 of 1997)

ARSI

**VHF Hill Topping Contest 2017 on
28 & 29 January**



ARE YOU READY?

WHAT IS HILL TOPPING?

The VHF / UHF end of the radio spectrum is by nature a line of sight band under normal weather conditions. Well, line-of-sight plus - maybe a third of the distance is the normal range, however there are conditions that do exist sporadically that offer the keen operator the fun of working many hundreds of kilometers.

Sporadic E and Tropospheric ducts occur from time to time, and these offer good long propagation conditions on VHF. Areas of high pressure over land often contribute to this condition. Of course, Meteor trails caused by meteor showers also help propagate what is normally a line of sight frequency over several hundred kilometers. Temperature inversion gives us the opportunity to contact stations up to a thousand kilometers. This type of propagation occurs during differences in temperature between the sea and the surrounding atmosphere.

There is always a loss of signal strength on V.H.F. between the transmitter and the receiver, so, to counteract this physical fact we use a directional antenna, typically a YAGI which not only helps increase the effective radiated power, but also amplifies the incoming signal.

Most hill tops are not thickly populated, therefore no amateur stations found, except in cases like 'yours truly' who lives on a hilltop, HI. That's the reason why working DX on V.H.F. is possible if you engage in this activity during certain organized events. Contests and other planned events including field days offer the chance for amateurs to cover larger distances with their equipment. Portable stations are set up well away from urban areas where masts can be erected and larger beam antennas can be utilised. Linear amplifiers are used to boost the outgoing signal. Once you head for higher ground during these events, you will be amazed how many contacts can be made from a hilltop location. Higher, the better.

I remember the good old days when VHF activity was still in it's infancy in Bengaluru, we used to take-off for NANDI HILLS that is about 50 kilometers from the city, and at an elevation of about 1,400 meters above sea level - the old gang - VU2AK, VU2CAP, VU2DEN, VU2GX, VU2LBW, VU2POP, VU2RQ, VU2SF, VU2ZAP, and yours truly used to have lots of fun. *(Kindly excuse if I have not included any name/callsign in the list)* Our best DX on 2 meter 2-way simplex was Mumbai; followed by Belgaum, Chitradurga, Kohlapur, Mangalore, and Bhadravathi and so on.

If you've never been on a hill-topping, now is the time to start! Join a local group and have fun!!

/de VU2TS

*[By the way, did you know that Hill-topping is a **mate-location behaviour** seen in many insects including butterflies, dragonflies, bumblebees, wasps, beetles and flies. Males of many butterfly species may be found flying up to and staying on a hilltop - for days on end if necessary. HI]*



HAMFEST INDIA 2016 was conducted between November 5 and 6th, 2016 at Mt.Abu, Gujerat.

The morning started with a refreshing yoga session, followed by a self-discovering session by Rajyogini Geeta Didi, the Senior Rajyoga Faculty in the Brahmakumaris. Post breakfast, the inauguration of the festival convened, followed by the presentation of a wonderful video prepared specially for that occasion by the organizing committee. Next, we had addresses by the dignitaries, starting with a speech by D.R. Kaarthikeyan, IPS Chairman and by

B.K. Mruthyunjaya, VU3UXC IPS Vice-Chairman.

The lectures began, with the first lecture by OM Dennis Egan (W1UE), a pioneer in HAM Radio who had been on air for the past 40 year, on HAM Radio in USA and another by OM Ramon Perez Brett - YV5EED, yet another pioneer who is known as the master of HAM Expeditions, on the propagation of HAM Radio in Venezuela.

Post lunch, we had a lecture on Super Capacitors. The lecturer, a pioneer in electrical engineering and a specialist in super capacitors, began with technicalities, and explained the technical difference between a capacitor and a super capacitor. He then pointed out the usefulness of these tiny devices, their immense efficiency, and their environmental friendly nature which would benefit mankind in a number of ways. He rested his speech by showing us the appliances that he had customized to run using super capacitors - an LED that ran for 5 minutes without a battery and a motor starter that utilized a third as much power as the ones we now use in automobiles and is much more environmental friendly.

The evening ended with a Cultural event organized by the Brahmakumaris which saw some beautiful performances of Garba.

The next day again began with a yoga session followed by a self-discovering session, this time by Rajyogini Indira Behn, the Senior Rajyoga Faculty in the Brahmakumaris. The day saw a lecture by a scientist on the Integration of GPS and HAM Radio technology - transforming the old to new. Through this lecture he told us of how we can combine these two technologies together to save people during disasters, by using HAM Radio as a help beacon, detectable with the GPS technology that would then pinpoint the location of the distress signal.

After the lecture, we went through all the stalls that sold HAM Radios, both commercial and home-brewed, and other accessories related to the Radio. There were two stalls who stood out in the hive – one was selling preparatory books for HAM Radio and another was the Home-brewing stall, that sold kits teaching how to homebrew Radios! I was instantly attracted to them and spent a lot of time there, trying to make sense of the complicated electronics floating around, catching some aspects of it. The book stall was also highly informative, as I learnt many aspects of HAM Radio unfamiliar to me. After lunch, we had an SWR meter workshop, which taught us how to homebrew an SWR meter. An informative workshop, it also gave us the components to make the accessory!

[Tnx: Tejit Pabari's blog.]

[Brahma Kumaris is a worldwide spiritual movement dedicated to personal transformation and world renewal. Founded in India in 1937, Brahma Kumaris has spread to over 110 countries on all continents and has had an extensive impact in many sectors as an international NGO. However, their real commitment is to helping individuals transform their perspective of the world from material to spiritual. It supports the cultivation of a deep collective consciousness of peace and of the individual dignity of each soul. -Ed]



PUNE:

The **Jamboree on the Air & Jamboree on the Internet** (JOTA. JOTI) 2016 was successfully conducted by VU2VPR, OM Vilas, VU2DVW, OM Deepak and SWL Dilip Bapat on the week-ending October 15, 2016.

More than 80 Scouts participated in Radio Scouting. They exchanged patriotic songs and activity details with other scouts on the air.



VU2VPR at the mike

Vilas says: "I thank OM Sanjay VU2SIJ for sparing some time for the JOTA, and acknowledge SWL Arvind, VU2AVG OM Avi and VU2CKI OM Chanduji for full support in Antenna installation.

The band conditions were not favourable on HF, very few stations heard. However, JOTI activity was in full swing on Echolink.

Thanks for the excellent support from Bharat Scouts and Guides Pune as well.

73, Vilas-Rabde, VU2VPR

The monthly PUNE HAMS EYEBALL QSO organized by the **PUNE HAMS & AMATEUR RADIO CLUB - VU2PHQ** was held on Sunday, 13th November 2016 at the Pune Hams & Amateur Radio Club Station (VU2PHQ) C/o Office QTH of VU2UPQ / Udaya Patil - #203 Vijay House, 599 Sachapir Street, Above Cosmos Bank, (Next to Andhra Bank and Oasis Restaurant, off M. G. Road) Camp, Pune 411001.

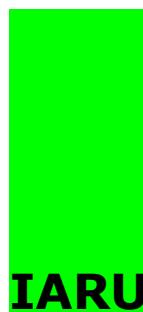
It was a very interesting eyeball QSO & the discussion included of power supplies for radio equipment including solar power backup. VU2UPQ while congratulating those that had got results of their ASOC exam that was held at the PHARC Club Station in August 2016, thanked all those that had helped in the project right from of collecting the forms for the exam to assistance in the required logistics on the day of the exam.

Ashok Joshi / VU2ASH gave an update on how he now has successfully modified the SMD Bitex Kit developed by Farhan of Hyderabad to make it into a tribander for 7, 14 & 21 Mhz and is expected to drive a 50W output liner.



The eyeball was followed by lunch & a continuation of the vhf tape Yagi antenna workshop. The group dispersed after tea @ 4pm.

The December 2016 meet was on Sunday, 4th December 2016 at 10.30 AM at the the PUNE HAMS & AMATEUR RADIO CLUB STATION-VU2PHQ c/o MQTH of VU2UPQ / Udaya Patil at the same venue.



As you are probably aware, the XIX General Assembly of IARU Region 2 was held on October 10 – 14 in Viña del Mar, Chile. **Radio Club de Chile** was the host Member Society. Your president, Gopal VU2GMN attended the meet, here is a photo of the Administrative Council of IARU with Rod Stafford after the Michael Owen Award was presented to him.



The International Amateur Radio Union ([IARU](http://www.iaru.org)) has honored past ARRL President and outgoing IARU Secretary Rod Stafford, W6ROD (ex-KB6ZV), with the Michael J. Owen, VK3KI, Memorial Award.

Presenting the award was IARU President Tim Ellam, VE6SH/G4HUA. The award's namesake served as [IARU Region 3](#) chair and as President of the Wireless Institute of Australia ([WIA](#)). Although Stafford is stepping down as IARU Secretary, he will continue to represent the IARU to the ITU Development Sector.

The presentation took place at a dinner on the opening day of the IARU Region 2 General Assembly in Viña del Mar, Chile. The Owen Award is bestowed upon an individual with "an outstanding trajectory of service to Amateur Radio," IARU Region 2 said, in announcing Stafford as the award's recipient.

(Owen, who became SK in 2012, may be best remembered for his WRC-03 work on [Article 25](#) — a [package of revisions](#) to the international Radio Regulations specific to the Amateur and Amateur-Satellite Services.)

The ARRL Board has appointed former ARRL CEO David Sumner, K1ZZ, to succeed Stafford as IARU Secretary, a post he has held previously.

Happy Birthday, ITU Radio Regulations (1906 – 2016)



On Monday, December 12, the ITU paid tribute to 110 years of international cooperation among its members states on the ITU Radio Regulations, an international treaty for governing the use of the radio-frequency spectrum and satellite orbits for ubiquitous wireless communications

The ITU Radio Regulations ensure interference-free operations of radio communication systems and provide all

countries with equitable access to the radio spectrum - a scarce natural resource that does not distinguish between national borders and needs to be harmonized globally.

Houlin Zhao, ITU's Secretary-General, said, "ITU is proud to proclaim the 110th anniversary of the ITU Radio Regulations as a success story of international cooperation through consensus building among its member states with the inestimable support of telecommunication industry partners. With the growing complexity of our interconnected world and ubiquity of wireless systems, it is now more important than ever to maintain the pace and efficiency of radio communication conferences to ensure the timely and responsive evolution of this precious instrument. The ITU Radio Regulations are now more important than ever."

Starting with the signing in Berlin on 3 November 1906 of the first International Radio Telegraph Convention, which brought together 30 maritime states, the Radio Regulations have grown with 110 years of revisions and innovations into the 5-volume treaty of 2000 pages of the 2016 edition. They now cover more than 40 different radio communication services and frequencies ranging from 9 kHz to 3000 GHz, with internationally agreed governing principles and regulations on which the rights and obligations of ITU's 193 Member States to use the spectrum and satellite orbit resources are based. The objective is that these scarce resources be used efficiently and equitably, **free of harmful interference**.

Since 1906, 38 World Radio communication Conferences have revised the ITU Radio Regulations to respond to technological and social development. The 2016 version was adopted by the World Radio communication Conference 2015 (WRC-15). As with previous versions, it was adopted by consensus, which is the guarantee that this treaty as it evolves, will continue to be reflected in national legislations and enforced by

national-governments.

Source:

<http://www.itu.int/en/mediacentre/Pages/2016-PR60.aspx>

CQ WW CONTEST CW, 2016



The Royal Omani Amateur Radio Society (ROARS) Contest Team led by Adnan, A41LP, fielded a multinational group coordinated by A45VA Prasad (VU2PTT), consisting of A41JZ Mohib, A45XR Chris, A45WH San (VU2WH), A45VB Paul (A65DR) and A45VI Pai (VU2PAI) with technical support from several Omani amateurs in the CQWW CW Contest 2016 as a Multi Two M/2 entry from the new A47RS club station using the special contest call A44A.

3830Scores.com reports that *"this station with the contest call A44A is going to create many a "Storm in the Desert" in the contesting world in future - this is just the beginning folks!"*

The team did a wonderful job, and the claimed score was: **14,616,514 with 6961 QSOs**. You want to check all details? Try:

<http://3830scores.com/showrumor.php?arg=dlawzBgifqamB>.

<https://youtu.be/QpCjECNCOVQ>

Scanning the Digital Modes using the Whistler TRX 1

Ham Radio has changed in recent years from the traditional point-to-point communications using CW, Frequency

Modulation, and Single Side-band modes of communication, to **Digital Modes**.

Ham networks now include DMR or Digital Mobile Radio, and a great hand-held receiver to translate the digital transmissions is the **Whistler T.R.X.-1** and its bigger desk top version the **T.R.X.-2**. These two receivers are capable of allowing DMR to be decoded.



Digital Radio Transmissions are created by a process called TDMA the acronym of **Time Division Multiple Access** and one of the major uses of this technology is the GSM system, or Global System of Mobile often referred to as the cellular network.

Listed below are some of the features of the Whistler receivers.

The Whistler T.R.X.-1 and T.R.X.-2 allow Radio enthusiasts to not only receive Ham Radio they also allow the hobbyist to listen to many commercial transmissions which take place on the V.H.F. and U.H.F. spectrum. The Whistler covers this frequency range, The frequency coverage is: 25-54, 108-136.99, 137-174, 216-512, 764-781.99, 791-798.99, 806-960 (excluding former cellular phone bands) and 1240-1300 MHz These are the Tuning Steps: 2.5, 3.125, 5, 6.25, 7.5, 8.33, 10, and 12.5 plus 25 kHz.

Whistler has also announced that development of NXDN monitoring is underway and the T.R.X.-1 and T.R.X.-2 will include N.X.D.N. as a free upgrade when available. I understand that this upgrade is now available from Whistler, December 2016.

NXDN Common Air Interface (CAI) technical protocol for mobile communications a digital protocol developed jointly by I-COM and Kenwood.

Both the Handheld and Desktop & Mobile models feature a full back-lit alphanumeric keypad in addition to the easy-to-use Scan, Pause, Select and Navigation controls.

The Whistler indicates the time slot and colour code. It also allows monitoring of analogue signals.

Other features include:- Upgradable CPU, DSP, and library Store Favourite Scan lists EZ Scan PC Software I.F. output for connecting to a computer and additional software. Receiver permits recording of channels and saves them into a Windows compatible audio file Clock and calendar function adds date and time info to the recordings Dedicated Weather button Spectrum Sweeper Programmable audio and visual alert system.

Tnx: John Allsopp G4YDM via Southgate ARC

<https://g4ydm.blogspot.co.uk/>

Article-Source:

http://EzineArticles.com/expert/John_Allsopp/1925417

NEW ADDITIONS TO THE 5 MHZ BANDWAGON

The German telecoms regulator, BNetzA, has enabled access to the new WRC-15 60m Amateur Allocation to all German Class 'A' licensees as of 20th December 2016.

The allocation is from 5351.5 to 5366.5 kHz on a Secondary basis with a maximum power of 15W EIRP and a maximum bandwidth of 2.7 kHz. All modes are permitted and the German national amateur radio society, DARC,

recommends the use of USB and the IARU Region 1 provisional band plan for 60m.

Irish regulator ComReg has released the new WRC-15 60m allocation:

*"ComReg has just today published an amended version of the Amateur Station Guidelines in Document ComReg 09/45R2. The main revision is that the WRC-15 band of **5351.5 to 5366.5 kHz** has been released with immediate effect on a secondary basis. No application or fee is necessary for this segment. **The power is 15 watts PEP** (12dBW) measured at the output of the transmitter or amplifier. All modes including digimodes may be used.*

73 and Seasons Greetings

Paul Gaskell G4MWO,
Editor: *The 5 MHz Newsletter*

Norway creates radio history

11th January 2017 is a historic day for the medium of radio.

Norway becomes the first country in the world to move towards fully digital radio transmissions. As a result of this, the national FM network will be switched off.

Read more at:

<https://www.radioinfo.com.au/news/norway-makes-radio-history>

CHINA blocks 7 MHz CW DX

The **IARU-R1 Monitoring System** newsletter reports one of Beijing's HF Over The Horizon Radars has been transmitting on 6.999 MHz spilling over the CW DX in the 40m amateur radio band.

The newsletter says: A jumping Chinese

OTH radar covered the CW DX-edge of our exclusive 7 MHz band on Nov. 17th at about 1500 UTC and later (long lasting). Parameters: 67 sps and 10 kHz wide.

IARUMS also report the Australian Jindalee Operational Radar Network (JORN) has been heard on 10.131 MHz in the amateur 30m band.

The Marconi Radar History site reports JORN was developed by GEC-Marconi HF Systems using staff from Chelmsford, Essex.

The International Amateur Radio Union Monitoring System (IARUMS) Region 1 November 2016 newsletter can be read at

<http://www.iarums-r1.org/iarums/news2016/news1611.pdf>

Reports of Amateur Band intruders can be logged on the IARU Region 1 Monitoring System-Logger-at:

<http://peditio.net/intruder/bluechat.cgi>

Monitor the short wave bands on-line with a web based SDR receiver at
<http://www.websdr.org/>

AO-73 in transponder mode for holiday season

The **FUN cube** team have announced that the **AO-73** satellite will be in continuous transponder mode until 2017Z-on-January-8.

This will give an opportunity for continuous transponder operations over the Holidays. Have FUN with the transponder.

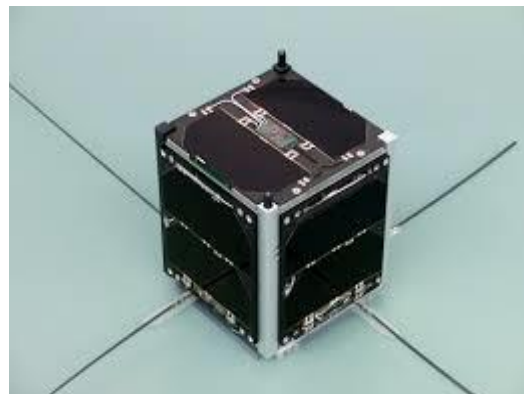
All the best for the holiday season, and for-2017.

73,-the-FUNCube-team

AO-73-information

<https://amsat-uk.org/satellites/communications/funcube-1/>

AO-73



Frequencies are as follows:

- 145.935 MHz BPSK Telemetry 30mW (eclipse) or 300 mW (illuminated)
- Inverting SSB/CW transponder 300 mW PEP (eclipse)
- 435.150 – 435.130 MHz Uplink
- 145.950 – 145.970 MHz Downlink

FM transponder satellite BY70-1

A CZ-2D rocket carrying the amateur radio FM transponder satellite **BY70-1** is expected to be launched on or after December.28th

The launch from the Taiyuan Space Launch Centre into a 530 km orbit had been planned for December 26 but was postponed due to adverse weather.

BY70-1 is a 2U Cube Sat project for school education and amateur radio. It features 3-axis stabilization and deployable solar panels. In addition to the FM transponder BY70-1 has a camera and it is planned to download images and telemetry via a 9600 bps.BPSK-downlink.

The IARU amateur satellite frequency coordination pages list these frequencies:

- 145.920-MHz-uplink
- 436.200-MHz-downlink

GNU Radio decoder for camera images from-BY70-1-satellite:

<http://destevez.net/2016/12/looking-at-by70-1-image-downlink/>

BY70-1.links:

http://www.amsatuk.me.uk/iaru/finishe_d_detail.php?serialnum=531

<https://twitter.com/cnspacelflight/status/802863365013942272>

Follow Mingchuan-Wei BG2BHC
<https://twitter.com/bg2bhc>

Abandoned in space in 1967, a US satellite has started transmitting again

An American satellite abandoned in 1967, now assumed to simply be space junk, has started transmitting again after 46 years.

This was one of the satellites designed and built by Lincoln Laboratory at MIT between 1965 and 1976, only for testing techniques for satellite communication.

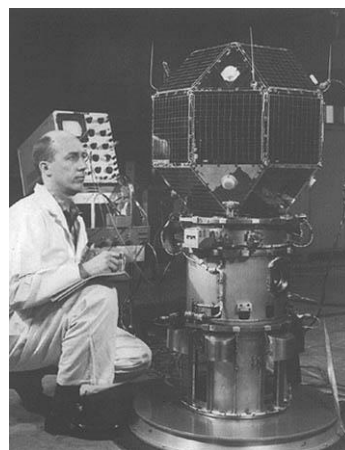
They made the series of satellites easy to recognize by naming them LES1 through to LES9. LES1-LES4 suffered different launch issues. LES1 and LES2 were supposed to be delivered to the same 2800 x 15000 km orbit, but a failure of a boost stage left LES1 in a 2800 km circular orbit.

LES3-LES4 were supposed to land in geostationary orbit, but didn't make it due to a launch problem which left them in transfer orbit. Even though the first four satellites in the series ended up in the wrong orbits, they all produced remarkable results. LES 5, 6, 8, and 9 all ended up where they were supposed to. LES7 never made it anywhere due to the funding drying up and the program being canceled.

In 2013 in North Cornwall, UK, an Amateur Radio Astronomer picked up a

signal which he determined to be the LES1 that was built by MIT in 1965. The satellite never made it to its intended orbit and had been spinning out of control ever since.

Phil Williams, the amateur radio-astronomer from near Cornwall, picked out the odd signal which was transmitting due to it tumbling end over end every four seconds as the solar panels became shadowed by the engine. "This gives the signal a particularly ghostly sound as the voltage from the solar panels fluctuated," Williams said.



It's more than likely the onboard batteries have disintegrated, and something else caused its 237 MHz transmission to resume when it was in sunlight.

This proves that 'electronics' built around 50 years ago, 12 years before Voyager 1, and far before microprocessors and integrated circuits, are still capable of working in the hostile environs of space. Phil refers to his hobby as "Radio-Archaeology".

Re-enactment of 1921 Ham Radio Transatlantic Reception

On December 11, 1921, in Ardrossan, Scotland, reception of a radio signal transmitted from an RCA test station — located in a small shack on the

Greenwich, Connecticut, property of Minton Cronkhite, 1BCG — helped to usher in the age of global communication. In Scotland, American Paul Godley, 2ZE, clearly heard the signal using a receiver of his own design.

ARRL reports radio amateurs in the US and in Scotland have reenacted the first successful transatlantic reception of a shortwave Amateur Radio signal nearly a century earlier.

Special event station N1BCG in Greenwich, Connecticut, and GB2ZE in Ardrossan, Scotland, completed contacts on SSB and on CW during the December 11 event. ARRL, the Radio Society of Great Britain (RSGB), and the Radio Club of America (RCA) partnered to support the activity, organized by ARRL CEO Tom Gallagher, NY2RF, and Clark Burgard, N1BCG, who loaned his history-rich call sign for the occasion.

"These events are fun, because they're timely, cause us to focus on the history and on the people who made history," Gallagher said. "We were very pleased with the tenor of it and with the media coverage, and we were happy to make the connection with GB2ZE, although we would have preferred to have made it on 160 meters, where it would have been closer to the frequency used in 1921." The 1921 transatlantic test, on CW, was conducted on a wavelength of 230 to 235 meters (about 1.3 MHz). The transatlantic tests proved the value of the shorter wavelengths — long considered worthless to long distance communication.

Read the full ARRL story at:

<http://www.arrl.org/news/commemorati-ve-special-event-reenacts-1921-amateur-radio-transatlantic-reception>

IMPACT OF SPACE WEATHER ON COMMUNICATIONS

Space weather impacts radio communication in a number of ways. At frequencies in the 1 to 30 MHz, the changes in ionospheric density and structure modify the transmission path and even block transmission of HF radio signals completely.

The last solar minimum phase lasted from 2007 to 2009 and it was historically weak. In fact, it produced three of the most spotless days on the sun since the middle 1800's (bar graph below). The current solar cycle is the 24th solar cycle since 1755 when extensive recording of solar sunspot activity began. Solar cycle 24 is currently on pace to be the weakest sunspot cycle with the fewest sunspots since cycle 14 peaked in February 1906. Solar cycle 24 continues a recent trend of weakening solar cycles which began with solar cycle 22 that peaked around 1990.

There are several types of space weather that can impact HF radio communication. In a typical sequence of space weather storms, the first impacts are felt during the solar flare itself. The solar x-rays from the sun penetrate to the bottom of the ionosphere (to around 80 km). There the x-ray radiation ionizes the atmosphere and creates an enhancement of the D layer of the ionosphere. This enhanced D-layer acts both as a reflector of radio waves at some frequencies and an absorber of waves at other frequencies. The Radio Blackout associated with solar flares occurs on the dayside region of Earth and is most intense when the sun is directly overhead.

Another type of space weather, the Radiation Storm caused by energetic solar protons, can also disrupt HF radio communication. The protons are guided by Earth's magnetic field such that they collide with the upper atmosphere near the north and south poles. The fast-moving protons have an affect similar to the x-ray photons and create an

enhanced D-Layer thus blocking HF radio communication at high latitudes.

During auroral displays, the precipitating electrons can enhance other layers of the ionosphere and have similar disrupting and blocking effects on radio communication. This occurs mostly on the night side of the polar regions of Earth where the aurora is most intense and most frequent, typically in the Polar Regions.

A geomagnetic storm is a major disturbance of Earth's magnetosphere that occurs when there is a very efficient exchange of energy from the solar wind into the space environment surrounding Earth. These storms result from variations in the solar wind that produces major changes in the currents, plasmas, and fields in Earth's magnetosphere. The solar wind conditions that are effective for creating geomagnetic storms are sustained (for several to many hours) periods of high-speed solar wind, and most importantly, a southward directed solar wind magnetic field (opposite the direction of Earth's field) at the dayside of the magnetosphere. This condition is effective for transferring energy from the solar wind into Earth's magnetosphere.

The largest storms that result from these conditions are associated with solar coronal mass ejections (CMEs) where billions of tons of plasma from the sun, with its embedded magnetic field, arrives at Earth. CMEs typically take several days to arrive at Earth, but have been observed, for some of the most intense storms, to arrive in as short as 18 hours.

Another solar wind disturbance that creates conditions favorable to geomagnetic storms is a high-speed solar wind stream (HSS). HSSs plow into the slower solar wind in front and create co-rotating interaction regions, or CIRs. These regions are often related to geomagnetic storms that while less intense than CME storms, often can deposit more energy in Earth's magnetosphere over a longer interval.

Storms also result in intense currents in the magnetosphere, changes in the radiation belts, and changes in the ionosphere, including heating the ionosphere and upper atmosphere region called the thermosphere.

During such storms, the currents in the ionosphere, as well as the energetic particles that precipitate into the ionosphere add energy in the form of heat that can increase the density and distribution of density in the upper atmosphere, causing extra drag on satellites in low-earth orbit.

The local heating also creates strong horizontal variations in the ionospheric density that can modify the path of radio signals and create errors in the positioning information provided by GPS. While the storms create beautiful aurora, they also can disrupt navigation systems such as the Global Navigation Satellite System (GNSS) and create harmful geomagnetic induced currents (GICs) in the power grid and pipelines.

The solar radio flux at 10.7 cm (2800 MHz) is an excellent indicator of solar activity. Often called the F10.7 index, it is one of the longest running records of solar activity. The F10.7 radio emissions originates high in the chromosphere and low in the corona of the solar atmosphere. The F10.7 correlates well with the sunspot number as well as a number of UltraViolet (UV) and visible solar irradiance records. The F10.7 has been measured consistently since 1947, first at Ottawa, and then at the Penticton Radio Observatory in British Columbia. Unlike many solar indices, the F10.7 radio flux can easily be measured reliably on a day-to-day basis from the Earth's surface, in all types of weather. Reported in "solar flux units", (s.f.u.), the F10.7 can vary from below 50 s.f.u., to above 300 s.f.u., over the course of a solar cycle.

The F10.7 Index has proven very valuable in specifying and forecasting space weather. Because it is a long record, it provides climatology of solar activity over six solar cycles. Because it comes from the chromosphere and corona of the sun, it tracks other important emissions that form in the same regions of the solar atmosphere. The Extreme UltraViolet (EUV) emissions that impact the ionosphere and modify the upper atmosphere track well with the F10.7 index. Many Ultra-Violet emissions that affect the stratosphere and ozone also correlate with the F10.7 index. And because this measurement can be made reliably and accurately from the ground in all weather conditions, it is a very robust data set with few gaps or calibration issues.

More information on solar activity from an amateur radio operator's perspective is available-at:

<http://www.aoc.nrao.edu/~pharden/hobby/FDIM81.pdf>

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