New Zenith

Monthly Newsletter of the Vectis Astronomical Society

Vol 22 Issue 9 — October 2014 *When Printed, this Newsletter costs VAS at least £1*

Society News

AGM

There were no changes to the Committee or Society officers at the recent AGM but there is still a vacancy for a Secretary. The position involves minute taking at monthly meetings and answering correspondence. If you can spare a couple of hours each month, please contact any Committee Member.

Brian Curd

Annual Subscriptions are Due

At the recent VAS Annual General Meeting I had the pleasure in announcing the good news that your committee has decided to hold the Annual Subscription Rates unchanged for a further year.

The rates for 2014/15 are therefore still only	
Ordinary members	£24.00
Senior (Over 60 years)	£20.00
Student	£10.00

And as you may recall from last year, all subscriptions are due 1 October.

Honorary Members and members who established Standing Orders have nothing more to do.

To retain all the benefits of VAS membership all other members need to forward payments by the end of October. Payment by cheque payable to Vectis Astronomical Society should be sent to me at the address below.

Membership Secretary
Butterflies
9 Woodside Avenue
Alverstone Garden Village
PO36 0JD

members@wightastronomy.org

Alternatively, if you wish to save time and effort and pay by bank transfer or by establishing a Standing Order please email me for the VAS bank details.

Norman Osborn

VAS Website: www.wightastronomy.org

Submissions or letters to New Zenith are always welcome and should be sent to:

The Editor New Zenith
35 Forest Road
Winford
Sandown PO36 0JY

Tel: **01983 864303** or email: **editor@wightastronomy.org**

Material for the next issue by the 6th of the month please.

VAS Registered Office

35 Forest Road, Winford, Isle of Wight, PO36 0JY

The Vectis Astronomical Society and the Editor of the New Zenith accept no responsibility for advice, information or opinion expressed by contributors.

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Observatory Diary

Monday, 19.30hrs	Members Only by arrangement Telescope and night sky training. Contact Barry Bates 01983 872979
Thursday, 19.30hrs	Members and Public. Informal meeting and observing

Contents this Month

Monthly Meeting Calendar 2014

Date	Subject	Speaker
26 Sep	Mysteries of the Solar System	Dr Stuart Eves Airbus Defence and Space
24 Oct	Asteroids, Comets, Impacts. Should we worry?	Robin Catchpole
28 Nov	Lucky Planet: Is the Earth Special and Are we Alone in The Universe?	David Waltham

2015

Date	Subject	Speaker
23 Jan	The Star of Bethlehem	Stephen Tonkin FRAS
27 Feb	TBA	Jane A Green
27 Mar	TBA	Bob Mizon BAA
24 Apr	Our Dynamic Sun	Helen Mason
22 May	Photographing the Aurora	Elizabeth Cunningham
26 Jun	TBA	Haley Gomez
24 Jul	Astronomical Applications of Spectroscopy	James Fradgley
28 Aug	TBA	TBA
25 Sep	TBA	Stephen Tonkin FRAS
23 Oct	TBA	TBA
27 Nov	TBA	James Fradgley

Observatory Visits Booked

None this month

It would be appreciated if members could avoid using the observatory at these times.

VAS Contacts 2014/15

President	Barry Bates president@wightastronomy.org
Chairman	Bryn Davis chairman@wightastronomy.org
Secretary	Vacancy secretary@wightastronomy.org
Treasurer	David Kitching treasurer@wightastronomy.org
Observatory Director	Brian Curd director@wightastronomy.org
Programme Organisers	Elaine Spear & Chris Wood progorg@wightastronomy.org
NZ Editor	Brian Curd editor@wightastronomy.org
Membership Secretary	Norman Osborn members@wightastronomy.org
NZ Distribution	Brian Bond distribution@wightastronomy.org
Others	Mark Williams & Nigel Lee

Important:

Members using the observatory outside normal Thursday meetings MUST enter a line or two in the Observatory Log Book.

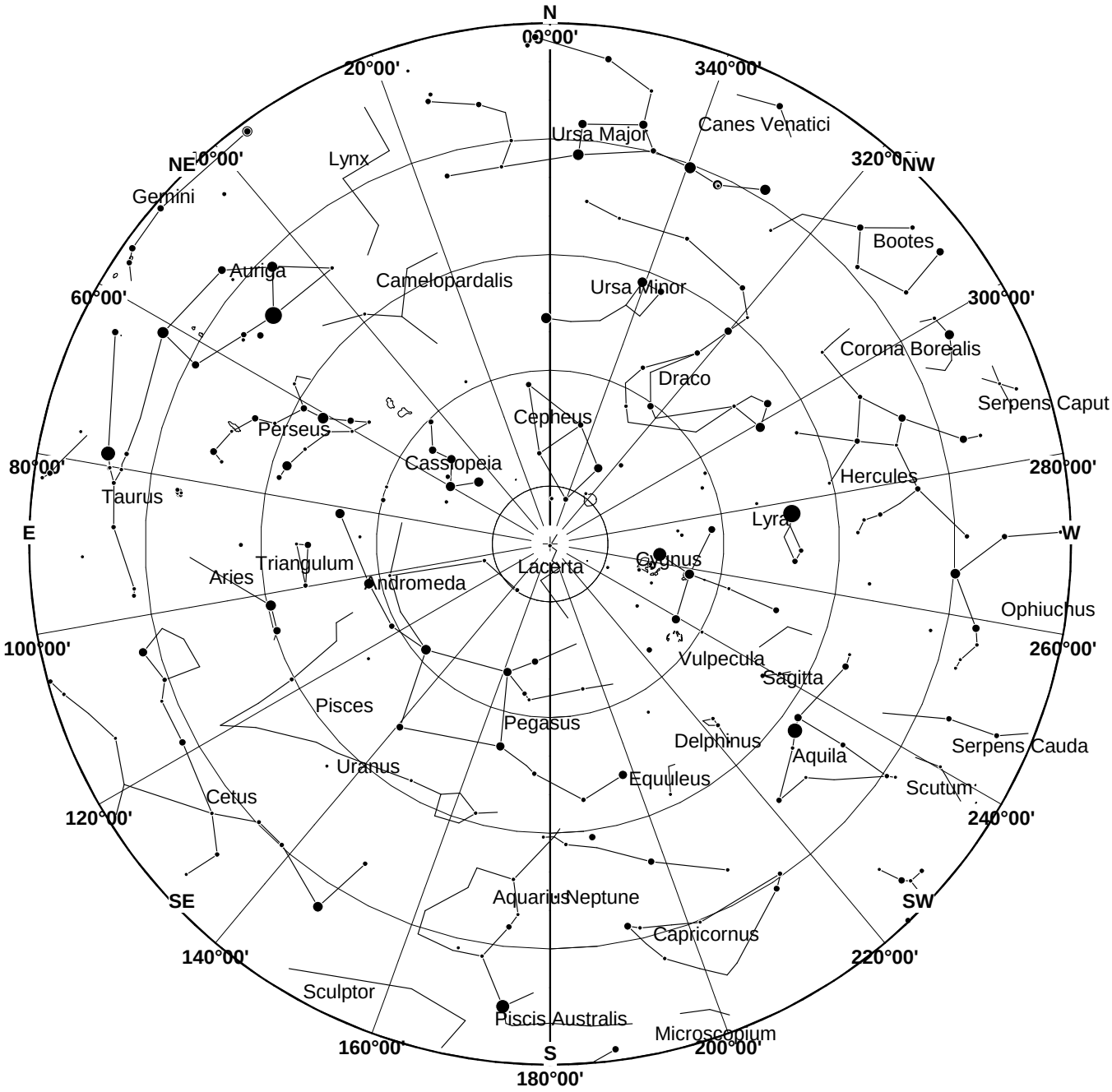
On several recent occasions, lights, heaters and the Meade LX200 have been left on!

When you leave the observatory please ensure it is secure and all lights, heaters and telescopes are TURNED OFF.

Telescope Training

Any member who would like training on the observatory Meade LX200 should contact **Barry Bates on 872979**

October 2014 Sky Map



View from Newchurch Isle of Wight UK - 2200hrs - 15 October 2014

NGC 6946, (*also known as the Fireworks Galaxy, Arp 29, and Caldwell 12*), is an intermediate spiral galaxy about 22.5 million light-years away, in the constellations Cepheus and Cygnus.

It was discovered by William Herschel on September 9, 1798. NGC 6946 is highly obscured by interstellar matter of the Milky Way galaxy, as it is quite close to the galactic plane. Nine supernovae (SN 1917A, SN 1939C, SN 1948B, SN 1968D, SN 1969P, SN 1980K, SN 2002hh, SN 2004et, and SN 2008S) in the last 60 years or so, have been observed in NGC 6946.

October 2014 Night Sky

Moon Phases

New	First Qtr	Full	Last Qtr
			
23rd	1st/31st	8th	15th

Planets

Mercury - During the last few days of the month sharp eyed observers may spot Mercury low in the east-south-east as it begins to appear from the morning twighlight for the start of a good early morning apparition that lasts into November.

Venus - This month Venus passes behind the Sun and is not available for observation until December when it will again be visible as the Evening Star.

Mars - As the sky darkens, Mars can be found about a hand's width above the south-south-western horizon. It will maintain this position in the sky for the next couple of months fading only slightly.

Jupiter - From the time it rises at about 2am until sunrise Jupiter is the most obvious object in the eastern sky as it moves from Cancer into Leo, finishing the month just under the lions nose.

Saturn - Saturn is now all but lost in the evening twighlight and by the end of the month it will have disappeared.

Uranus - Uranus is at opposition this month and can be due south at midnight. At the start of the month it makes an equilateral triangle with Delta and Epsilon Piscium and by the end of the month has moved to make a right angled triangle with the hypotenuse between Uranus and Epsilon. Don't be fooled by 96 Piscium which is the same brightness as Uranus, but a little closer to Delta.

Neptune - Neptune can be found in the constellation of Aquarius located about 0.5° west of the star Sigma Aquarii.

Deep Sky

M39 Open Cluster RA 21h 32m Dec 48° 26' mag 4.6

An open cluster with an apparent diameter equal to that of the full moon, it is rather sparsely populated triangular shaped grouping with around 30 magnitude 7 to 9 stars. This like many galactic clusters is an object best enjoyed through binoculars or a low powered telescope.

NGC6946 Galaxy RA 20h 35m Dec 60° 11' mag 9.7

Located just off the plane of the Milky Way, the intervening material in our own galaxy helps makes this face on spiral galaxy represents a rather challenging object. At a distance of about 10M light years it is relatively close by galactic standards, but this does not make it any easier to see. Use as large an instrument as you can on this galaxy to reveal the structure in the spiral arms. This galaxy has hosted 8 supernovae in the past 90 years, something of a record. After observing this galaxy or if the sky or your eyes fail you with this target, stop by at the nearby open cluster NGC6939. At low power both object will be in the same field of view.

Melotte 20 Open Cluster RA 3h 20m Dec 49° 2' mag 1.2

Centred on Mirfack, Alpha Persei and easily visible to the naked eye this magnificent cluster is best observed using binoculars. The view is that of a multitude of dazzlingly bright blue stars centred on the bright Mirfack. This cluster is rather too large for a telescope but ideal for binoculars.

Peter Burgess

Stellarium is a free open source planetarium for your computer. It shows a realistic sky in 3D, just like you see with the naked eye, binoculars or a telescope.

Available for Linux, Mac (OS X) and Windows, the extensive feature list ensures this is probably the most popular astronomy program of all. You can even use it to control a motorised telescope!

Download it from: ***http://www.stellarium.org/en_GB/***

Artificial Light At Night (ALAN) Conference – DeMonfort University 2-4th Sept 2014

I attended the ALAN2014 conference at DeMonfort University 2-4th Sept 2014. The conference examined the full use of artificial lighting at night, as well as the spectrum of adverse effects that artificial outdoor light at night may cause, often known collectively as "light pollution". The conference brought together around one hundred international representatives from scientific, social science and legal academia, as well as regulators and lighting professionals from around the world.

The conference, hosted by Leicester De Montfort Law School, De Montfort University, was co organised with the EU COST Action LoNNe (Loss of the Night Network), and in association with the International Dark Sky Association.

The three day event programme was crammed full of the most fascinating and engaging talks and presentations from both plenary speakers and streams focusing on current research and current state of the art in all aspects of artificial lighting. Presentations were given on the following major themes: **Biology and Ecology, Society, Health, Measurement and Modelling, Technology and Design.**

Our DarkWightSkies Initiative work was emphasised to the international audience during a very enjoyable stream presentation of the ground-breaking CPRE National Office survey document "Shedding Light" given by Emma Marrington, Senior Rural Policy Campaigner of CPRE National Office.

Along with Jim Dougherty IDA President, Martin Morgan Taylor IDA Director, CfDS Committee members and around twenty other conference delegates, I attended a lunch-time inaugural meeting of a proposed "IDA Europe". It was agreed at this meeting that a circulation email list would be created of those present, along with the setting up of an initial small steering group with a view to setting out the parameters and goals of a European IDA Committee and Group.

The conference was notable for the many examples of clear results of current research beginning to show that light in the blue end of the spectrum was proving to be responsible for serious biological affects and measurable disruption of many important animal and plant natural rhythms (eg circadian rhythms). It seemed that one of the main conclusions of the conference was that there was now a significant need for far more wide-ranging and immediate research to properly evaluate the full significance, dangers and long-term impact of artificial lighting, as the current trend for accelerated adoption of new artificial lighting technologies such as LED was proceeding perhaps without full knowledge of the possibly dire consequences.

Further information:

- http://www.dmu.ac.uk/documents/business-and-law-documents/alan-2014-draft-master-timetable-august.pdf
- http://www.cpre.org.uk/resources/countryside/dark-skies/item/3608-shedding-light

Chis Wood

NOAA and the Garlic Festival

At last month's Garlic Festival we rigged up a very quick weather satellite receiving station. and managed to capture a couple of NOAA polar orbiting satellite passes.

Equipment Used

- A turnstile antenna
- A 2m (144MHz) receiver (modified)
- A MacBook laptop
- WXtoImg software

The choice of computer is pretty much irrelevant as the WXtoImg software is available for Mac OSX, Windows and Linux. The only real requirement is that the machine should have an available sound card input.

The modification to the radio receiver is possible on most 2m amateur equipment as it just opens the receive range slightly to include 137MHz (most amateurs will be familiar with modding their equipment and a Google search for mods along with the radio's model number will usually get you the information you need). We used an ICOM IC 229H which was "opened up" by cutting a diode on the main board - *Note: this also extends the transmit range of the transceiver, so please ensure you are careful and "in band" when using the equipment after any mods are made.*

Cabling

As this was a "quick and dirty" installation, no specialised cables were used.

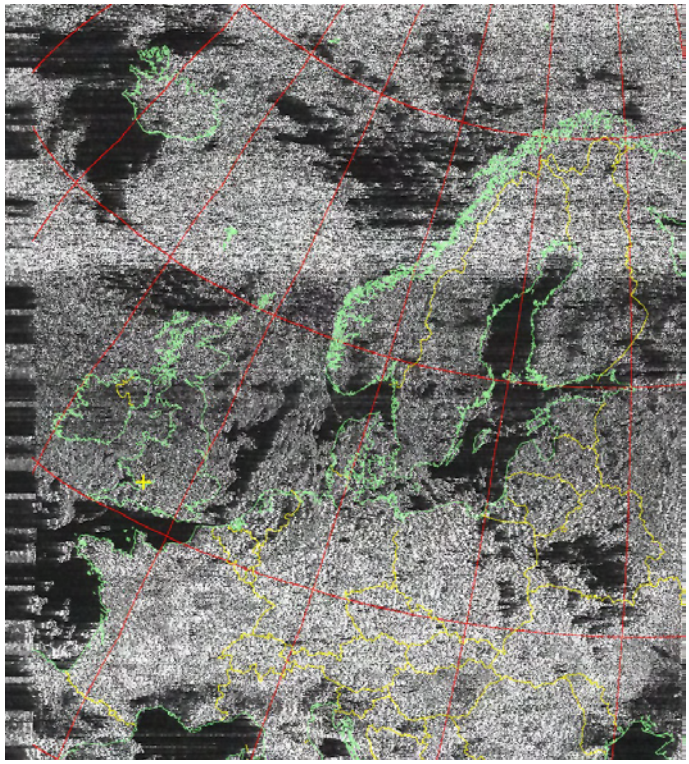
Power to the equipment was provided by a portable generator and a 12V regulated DC supply for the ICOM.

The antenna was lashed to either a pole on our tent or on Sunday (windy) to the side of the van.

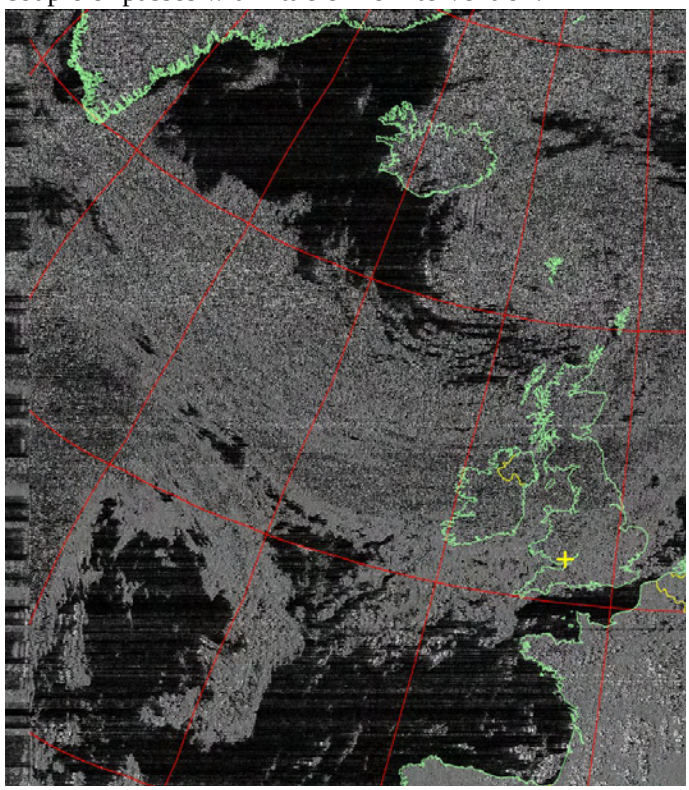
- The antenna was connected to the receiver using a spare length of coaxial cable.
- The audio output from the receiver was connected to the sound input on the computer.

Software

The WXtoIMG software was downloaded from: ***http://www.wxtoimg.com/downloads/***, and installed on the MacBook. The correct sound input and the approximate location of the MacBook were setup in the preferences section and set everything else to automatic!



The software then detected and decoded the following couple of passes with little or no intervention.



WXtoImg automatically adds the outline map when it has decoded the pictures so the location can be identified.

A bit more tweaking should enable us to receive colour pictures but we didn't really have time to play with that too much this time. You can though see that we didn't have the best of conditions this year!

Brian Curd

Recent Experiment to Detect Meteor Trails

Introduction

The VAS committee decided that becoming involved with radio astronomy would provide additional interest for members, presenting an alternative branch of astronomy for all, including visitors. Optical astronomy can obviously not be accomplished in cloudy conditions whereas radio astronomy can be available at any time day or night. Talks about amateur radio astronomy by Paul Hyde indicated that simple equipment could provide interesting results capable of scientific analysis. Naturally and artificially generated Radio Frequency (RF) sources can play a part in amateur radio astronomy for example detection of:

1. Noise produced by Jupiter and it moons (naturally generated RF)
2. Noise produced by our sun (naturally generated RF)
3. Hydrogen line (naturally generated RF)
4. Cygnus A (naturally generated RF)
5. Cassiopeia A (naturally generated RF)
6. Detection of radio emissions from the earth's environment (naturally generated RF)
7. Radio signals reflected by meteor plasma trails (artificially generated RF on earth)

Members interest in the radio astronomy project indicated that very simple equipment should be assembled 'just to get something going'. As a consequence Software Defined Radio dongles costing about £10 were considered adequate to initiate the project as low cost procurement is a vital factor. These dongles, which perform over a very wide frequency range of 24MHz to 1800MHz, can be connected to a computer USB port for processing the received signals. Unfortunately the dongles are comparatively insensitive and require a high gain amplifier to increase the signal level at the dongle input. The receiver is required to process low level signals but as the dongles are wideband then transmissions from high power broadcast transmitters can cause significant distortion, sufficient to corrupt the wanted signal. Much of this limitation can be mitigated by rejecting out of band, high level signals with a suitable filter in the signal path before the dongle.

Item 7 was chosen as a suitable candidate for experimentation. High temperatures attained by a meteor from space entering the earth's atmosphere causes vaporisation. Atoms from meteor resulting from the vaporisation, whilst maintaining the speed of the parent body, collide with air molecules to produce a plasma trail. Plasma is an electrical conductor and an efficient reflector of low frequency electromagnetic energy or radio waves. Plasma trails may be detected by implementing radar techniques using a suitable RF transmitter to illuminate the plasma whilst a receiver system detects the reflected signals. A few professional high power transmitters, deployed world wide for detecting space debris, emit signals that when reflected by plasma, can be detected with amateur receiving equipment. The VAS experiment exploits signals from one of these transmitters.

Transmitter

A suitable transmitter entitled Grand Réseau Adapté à la Veille Spatiale (GRAVES) is located in Broye-les-Pesmes, central France, as part of a bistatic radar installation intended to detect man made objects in space. The transmitter generates a continuous wave at a constant frequency of 143.05MHz, producing a power output purported to be greater than one megawatt. Signals from the transmitter are beamed in a southerly direction over an arc of ±90°, therefore reflections will only occur from objects south of the transmitter at high altitudes.

Fig 1: Deployment of Yagi antenna

Receiver

A low noise amplifier and filter, constructed earlier this year to interface with the dongle, facilitates signal amplification at the frequency of interest whilst significantly attenuating out of band signals. Tests indicated the sensitivity of the complete receiver subsystem had improved significantly with the amplifier. Additionally, a homebuilt 6 element Yagi antenna required tuning to 143.05MHz thus providing a directional capability for receiving the signals.

Software

Several free computer programmes exist that are compatible with the particular dongle being used for the experiment. The particular program chosen for the task is SDR#, pronounced SDR sharp. SDR# provides a plot of signal magnitude vs frequency and shows history of the events. In conjunction with the receiver the computer processing might be considered a spectrum analyser.

Experiment

On the 21st August 2014, at the Watery Lane observatory, the receiving equipment was set up with the Yagi antenna about 1m above the observatory roof and pointing SE. See Fig 1. Deployment was not ideal as the antenna was too close to the roof and also too close to the 11kV power lines, thus likely to receive interfering signals. Finally, SDR# was installed in the observatory computer and the receiver frequency set to be offset from GRAVES transmitter frequency by -800Hz. It is unknown exactly how close the GRAVES transmission frequency is to the stated frequency of 143.050MHz but it is known that the dongle frequencies are inaccurate, possibly in excess of 20kHz. After all the dongles are cheap! For this reason it has been necessary to measure the frequency offset of the dongle.

During the experiment short duration bursts of signals typical of reflections from meteorite trails were observed on the screen. Fig2 illustrates just one of the plots recorded during the experiment.

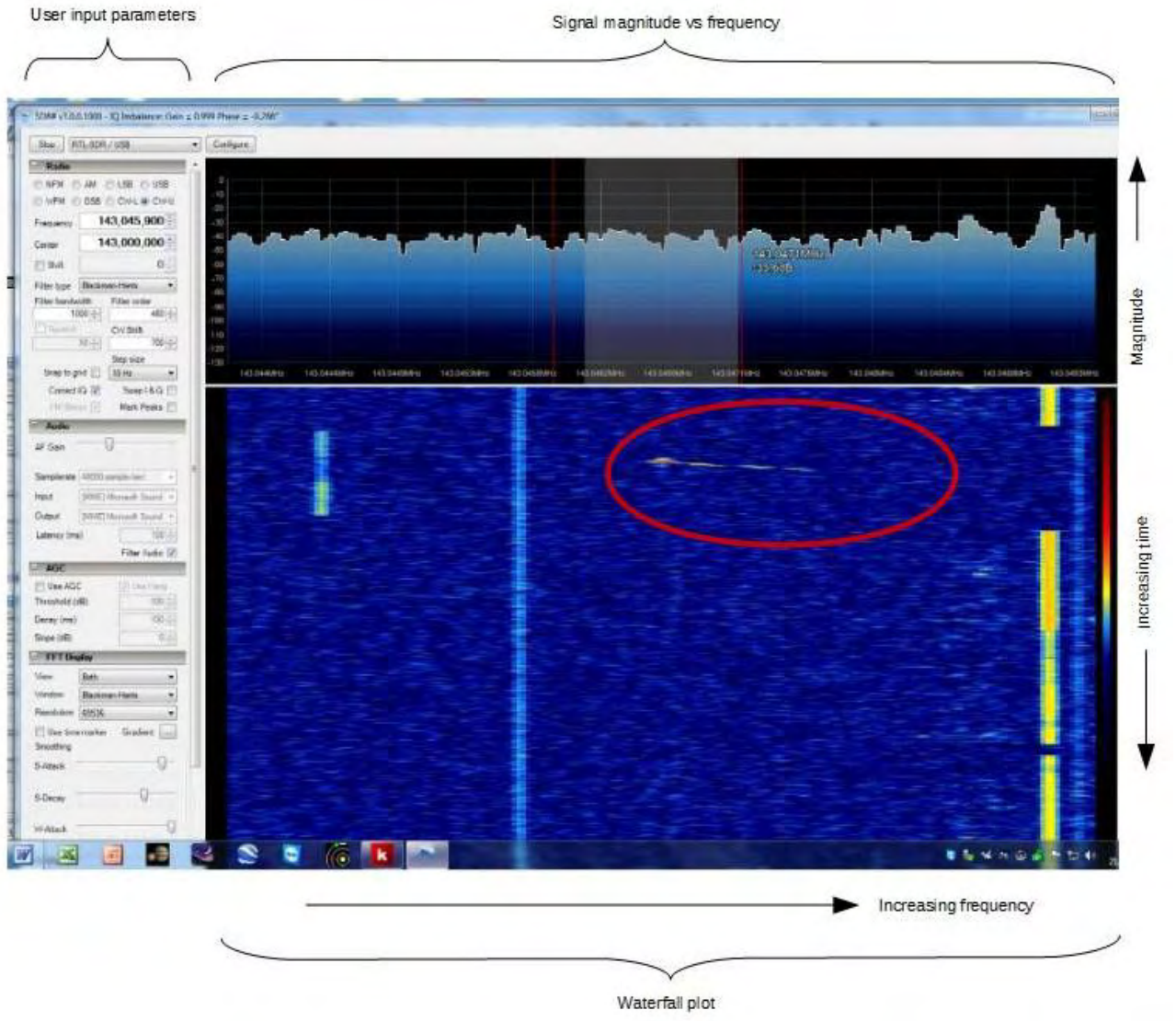


Fig 2: Display showing 'waterfall plot'

Display

Referring to Fig 2, the receiver parameters entered by the user are shown left of the plot whereas the top section shows the magnitude in dB of the sampled signal plotted as a function of frequency. The 'waterfall' plot shown in the lower section displays the history of the signal magnitude and frequency shown in the upper section. Unlike the upper section signal magnitude is represented by various colours although the signal frequency is represented by the position of the event along the horizontal axis. The vertical axis represents increasing time in a downward direction, thus as each horizontal line is generated showing the sampled events, the previous line moves down the display. Successively as each line is generated it adds to the plot as the lowest line is deleted, hence the name 'waterfall plot'. Note both plots use the same frequency axis, that is, increasing frequency is from left to right. At the extreme right hand side of the waterfall plot is a static, vertical line of 'rainbow' colours which provide a reference for the signal magnitude. Due to poor reproduction of the display shown in Fig 2 is not possible to resolve details in the image.

Results

The waterfall plot in Fig 2 shows some vertical light blue and yellow lines that represent interference, thought to emanate from the adjacent power lines (Fig 1). Enclosed in the red ellipse, in between the two interference lines, is a response typical of a signal reflected from the plasma generated by the meteor in the earth's atmosphere. Most noticeable is the Doppler offset frequency. The Doppler offset frequency is about 1kHz thus if the meteor were travelling approximately North in a straight line passing through the transmitter and receiver locations then the radial velocity would be in the order of 3600m/s but the direction is actually unknown thus the speed cannot be estimated. It is even uncertain if the plasma from a meteor 'head on' would be sufficiently reflective to enable detection? As the receiving system is unsophisticated and the GRAVES transmitter only beams Radio Frequency emissions in a southerly direction, that is opposite direction to the British Isles, then many characteristics including velocity, trajectory and reflectivity cannot be determined. It is also unlikely that correlation with optical observations (should they occur) will be possible because the distance between the Isle of Wight and the GRAVES transmitter is about 612km hence the trail is likely too dim.

Limitations

It is not possible to receive signals from meteor trails closer than 612km to the IoW because the transmitter only emits signals in a southerly direction over a 180° sector. Simple geometry demonstrates the limits of detection ranges based on the following assumptions:

- Broye-les-Pesmes is located at 47°20'N and 5°30'E whereas the IoW is located 50°39'N and 1°16'W thus for the purposes of the illustration the transmitter is assumed due South of the IoW
- Propagation of the signals is 'line of sight'
- Both the transmitter and receiver are located at an altitude corresponding to sea level
- Maximum altitude that plasma can be generated is 120km
- Transmissions are propagated in the opposite direction to that of the receive path

Referring to Fig 3, the geometry indicates a minimum detection altitude alt1 = 29km at the transmitter location zenith and a maximum detection distance of 1226km relative to the receiver based on a ceiling height of alt2 = 120km. The minimum detection altitude will increase for objects South of an East-West line through the transmitter location.

Conclusion

A major concern with deploying radio astronomy equipment at Watery Lane is the possibility of interference from the adjacent power lines. Considerable interference was observed over a very wide bandwidth but fortuitously the spectral lines generated by the interference were not co-channel with the wanted signals.

The experiment indicates the possibility of detecting reflected signals from meteor trails but at present without any means of resolving velocity, trajectory or reflectivity. Estimating the detection ranges and altitudes illustrates the limitation of a system that utilises a transmitter so far away and relying on back scatter although the inability to detect aircraft is beneficial.

Another transmitter is active in Belgium, it is closer to the IoW and transmits in all directions thus, instead of relying on back scattered radiation, forward scatter will assist with determining various characteristics. Transmitter power of the Belgium transmitter is only a fraction of that from the French transmitter but as the equipment used in the recent experiment should be capable of detecting reflected signals from the Belgium transmitter it is planned to conduct a further experiment to ascertain viability.

Many aspects of the experiment have not been included in this article, such as antennas, polarisation and aspects of the receiving sub-system but it is hoped in the future to investigate methods that, at least, will resolve velocity, direction, reflectivity and other characteristics. It is further anticipated to involve other members of the Society so enabling access to another branch of astronomy.

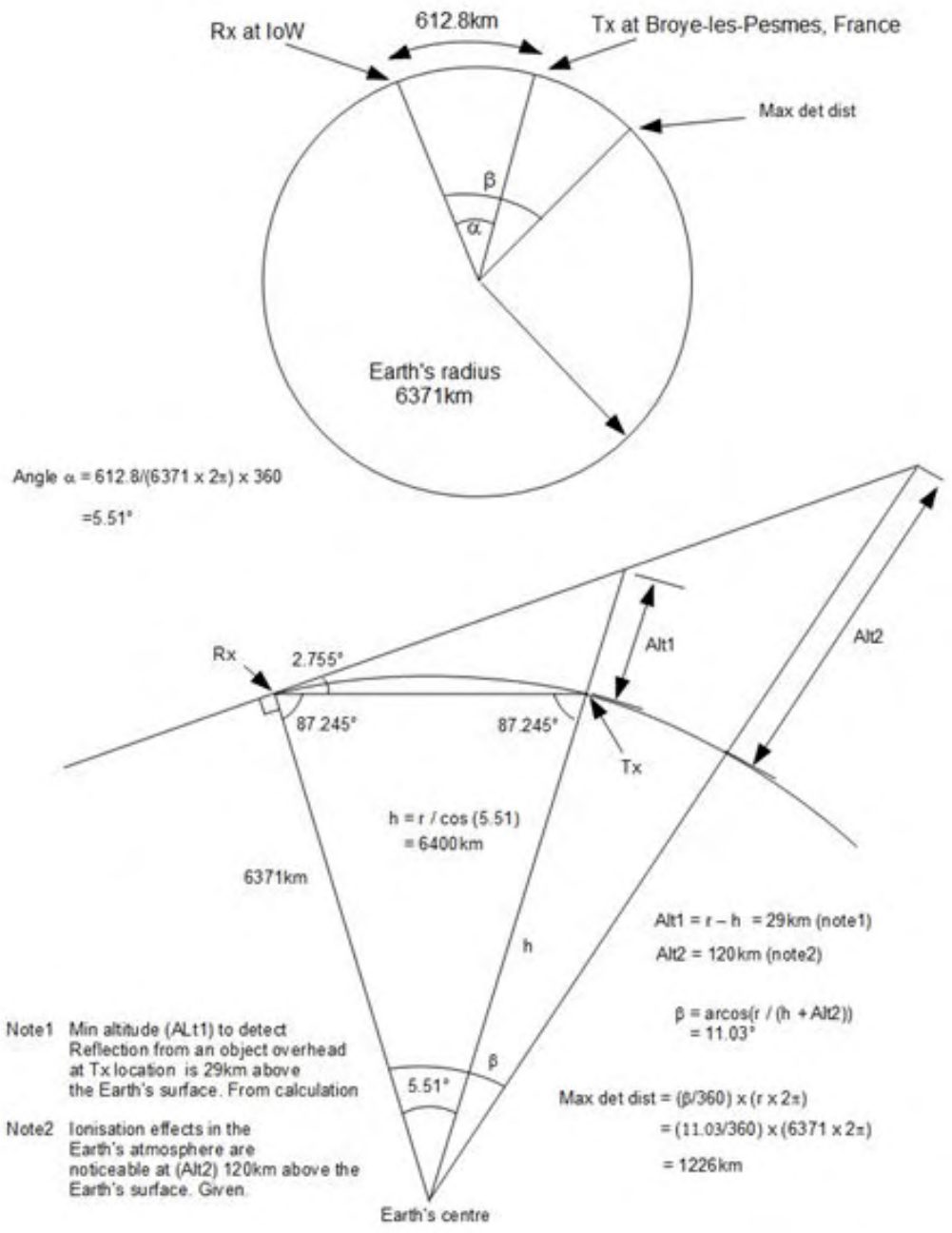


Fig 3: Propagation Geometry

Dudley A Johnson

Dudley has kindly offered to lead a group of VAS members who will build a copy of his equipment for installation at the observatory. This project will be our first step into radio astronomy and the build will take place over a number of weeks to allow all those interested to get involved practically and to document the project for upcoming editions of NZ.

Bestival Photos

The Serious Side

Over the three days we saw about 800 visitors looking through our telescopes and, hopefully, raised the profile of astronomy.

Brian and Madeline's free haircuts!
Complete with dye and sparkles!

...and the Staring Contest (which I won!)

The Lighter Side

It wasn't all work!

Many thanks to all those who helped and get well soon Martyn - you missed a good show

THE BACK PAGE

LINKS, COMMENTS AND OBSERVATIONS

VAS Receives Signals from GRAVES

Introduction

GRAVES (Grand Réseau Adapté à la Veille Spatiale) is a French radar-based space surveillance system, akin to the American NAVSPASUR. Using radar measurements, the French Air Force is able to spot satellites orbiting the Earth and determine their orbit. The GRAVES system took 15 years to develop, and became operational in November, 2005.

GRAVES is a bistatic radar system using Doppler and directional information to derive the orbits of the detected satellites. Its operating frequency is 143.050 MHz, with the transmitter being located on a decommissioned airfield near Broye-lès-Pesmes at 47.3480°N 5.5151°E and the receiver at a former missile site near Revest du Bion on the Plateau d'Albion at 44.0715°N 5.5346°E. Data processing and generation of satellite orbital elements is performed at the Balard Air Complex in Paris, 48.835°N 2.280°E.

How does this apply to VAS?

At the observatory recently, Dudley Johnson demonstrated equipment which receives GRAVES and scattered signals generated by meteors reflecting the radar - See page 7.

Observatory Modifications

We are making some changes at the observatory. These involve extending the main room into the unused area at the end of the storage corridor.

Previous exploration in the building has shown that the construction doesn't always match the plans (!) so we are proceeding with considerable caution.

If all goes to plan, we should gain about 1m which means that benches/desks can be moved clear of the central area and will also allow additional storage above them.

The building's wooden construction allows us to make the changes quite simply but, at some point, we will need to borrow/hire a pair of Acro props while we insert a suitable lintel to replace the existing wall. If you know where we can borrow a couple, or if you have a 3m (ish) Catnick style lintel then please let me know.

Rosetta News

This is a very exciting time for space science in general and for the Rosetta spacecraft in particular. A little more than a month after arriving at comet 7P/Churyumov-Gerasimenko, Rosetta has mapped its surface well enough to help scientists choose a location to set down Philae, the first-ever comet lander. Or, at least, try to. Here to tell us more about the recent mapping of comet 7P/Churyumov-Gerasimenko, the announcement Philae's landing site, and what comes next for the Rosetta spacecraft is Dr. Claudia Alexander of the Rosetta mission.

http://phys.org/news/2014-09-edge-rosetta-lander-philae-plunge.html

Observatory

When visiting the VAS observatory, for your own safety, please bring a torch. Also, please make sure you close and lock the car park gate if you are the last to leave - if you need the combination to the lock, please contact a member of the committee.

Articles Needed

New Zenith needs letters, articles, reviews or pictures related to all aspects of astronomy.
Contributions to the Editor please at the email or postal address on the front page.

"Just because something doesn't do what you planned it to do doesn't mean it's useless"
Thomas A. Edison

"When you have exhausted all possibilities, remember this – you haven't"
Thomas A. Edison

"Man cannot discover new oceans unless he has the courage to lose sight of the shore"
Lord Chesterfield

"The trouble is, you think you have time"
Buddha