STARLITE

The Award Winning Newsletter for Members and Friends of

G6OI
1938

Stourbridge and District Amateur Radio Society

G6SRS
1938

incorporating

Old Swinford Hospital School Radio Club

G4CVK

1969

ISSUE 11/2015

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MEETINGS

Visitors always welcome
The Society holds its full meetings on the
1st and 3rd Monday of each month at

Old Swinford Hospital School
Heath Lane
Stourbridge
(8.00pm – 10.00pm)

Additionally the shack is open during the same times on the intermediate Mondays

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(01562) 700513

Or by e-mail to :-

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DY10 3ND

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www.g6oi.org.uk

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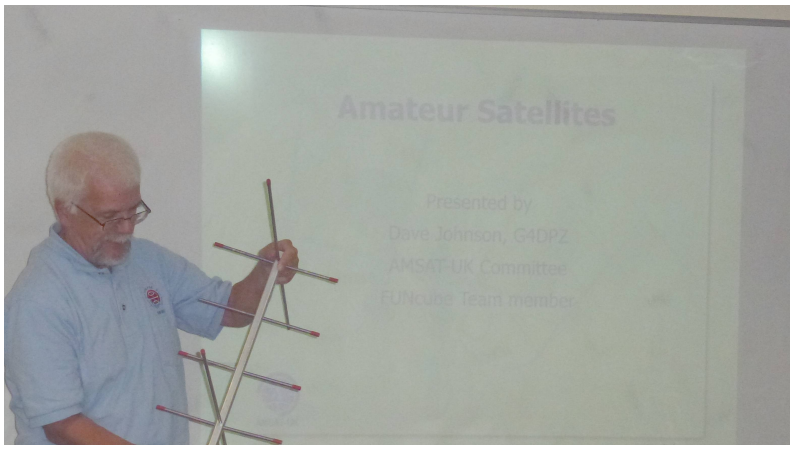
MESSAGE FROM THE PRESIDENT



As you may be aware we have had to make a change to the location of the final two sessions of the foundation course. Despite making enquires beforehand it turned out that the school were not happy with the existing DBS checks that the Duke or Edinburgh students already had. Very kindly, Nick agreed we could host the final two sessions at his shop in Quarry Bank. The exam will be held in the school as this is the registered location for foundation exams to take place. We need to consider how we can fit in future foundation courses within the terms of the requirements of Safeguarding Children. It must be remembered that we are effectively (free and non paying) guests every week within the school and therefore must work to their requirements and needs. The annual renewal of deceleration of the DBS checks is currently underway. The vast majority were undertaken at the recent Satellite talk. Can you please ensure that you have completed the form and either return it to John (Hon. Sec.) or myself or post directly to the school.

The satellite talk given by local man Dave Johnson (G4DZP) was a whole new world of amateur radio to many of us. I am sure Dave only scratched the surface with what he covered within his talk. During his presentation, Dave offered to expand on specific areas of satellite communication at a furture date. There was a noticably large audience of club members for the talk.. Further information on amateur satellites can be found at the links below.

http://www.amsat-uk.org/
http://www.amsat.org
http://www.amsat-dl.org/
http://www.funcube.org.uk
http://www.amsat.org/?page_id=1113

November sees the annual (quality) surplus sale, this can make a big impact on club funds! Please have a good look around for quality items to sell or find some money to buy some of the quality items at the sale!

EDITORIAL

Thanks to John Haddleton (M0OBU) for the final part of his article on SWR meters and ATUs. I think most hams know how to use an SWR meter and possibly how to use an ATU, but if questioned on the detail as to how it actually works, start to become less sure on the subject. There is also a possible tendency to know enough to pass the exam and move on without a clear understanding.

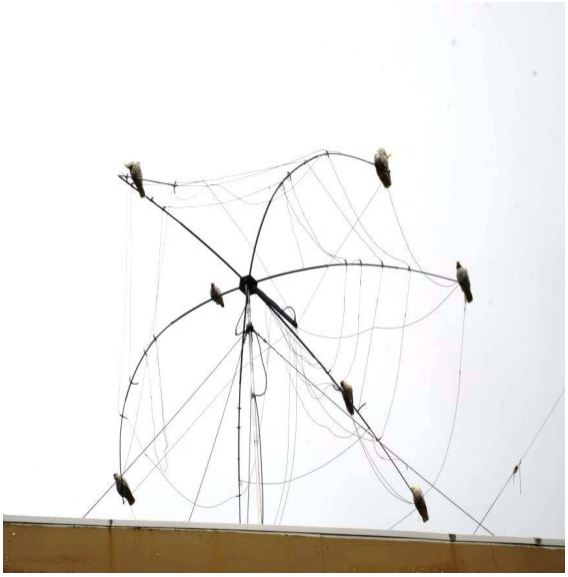
The final article in Starlite on 80 Plus Power Supplies follows on from the tutorial on switched mode power supplies from earlier in the year. I was struck by the parallels between Power Factor Correction in PC power supplies and the role of ATUs and SWR in RF circuits. I would be interested to know if any other better qualified in electronics can confirm if this view is correct.

Adrian (G0NLA) Starlite Editor

THE SULPHUR CRESTED COCKATOO

This month one of Jim's Australian colleagues, Patrick (VK2PN) emailled to complain of aerial problems.

Patrick is a very dedicated CW man so his antenna is a very big part of his setup. This is what the sulphur crested cockatoos did to it, they can be so destructive..



It is tempting to think that it can't happen here, but green parrots are common in Greater London and the south-east. Some estimates have the parrot population growing at 30% each year

Thanks to Jim (G4AO) for this article.

ADVERTISMENT - ITEMS FOR SALE

Drake TR7A Transceiver with matching P.S.U. And speaker - £350 o.n.o

AL-811 Amplifier £500 o.n.o. (Ameritron 600 Watt Linear Amplifier)

Both in perfect working order

Please Contact – John Raybould (G4PQI) on 01384 566341

Googling "images Drake TR7A" provides hundreds of pictures of this iconic radio which clearly has a large following amongst the ham radio community. One can find large numbers of articles for suggested improvements, product reviews, mods and troubleshooting information on the net. (Editor)

SWR AND ANTENNA TUNERS

Foreword

John Haddleton has kindly donated this article for inclusion in Starlite. The article below is the final installment of two articles and should be instructive and entertaining to newcomer and experienced ham alike.

Re-cap from last month

Last month we looked at what is measured to determine SWR and in particular what happens when there is mismatch between the transmitter and the antenna. We touched on some of the misconceptions about antenna tuners. In our particular example we started to look at what happens when there is an SWR of 4:1.

When using an antenna tuner, the antenna itself is more important than antenna system (radiator, feed line and surroundings). The tuner is a circuit that transforms our load into the desired impedance of the transmitter. This is usually the 50 Ohms required by modern transmitters.

To adjust the tuner, one applies or transmits power from the transmitter and using a SWR meter between the transmitter and to adjust the tuner settings for lowest SWR. Once this is done then the transmitter will be happy seeing a good load (50 Ohms) and the SWR working into a good load.

However, the antenna has not changed. It still has a 4:1 SWR and for every 100W going up to it the antenna reflects 36W back toward the transmitter.

So how does a tuner help ?

When the power going up to the antenna gets there, some goes into the antenna and is radiated and some is reflected back down the coax as in our 100W forward / 36W reflected example. This 36W reflected travels back down the feed line to the antenna tuner. When this power gets to the tuner there is an infinite SWR or it acts this way and all of the 36W is reflected from the tuner back up the coax. (I am not going into how this is done, but it mainly has to do with the phase of the voltage and currents in the reflected 36W)

When this 36W gets back to the antenna with 4:1 SWR 64% goes into the antenna and 36% of it is reflected (64% of 36W=23W into the antenna and 36% of 36W=13W reflected).

At this point the total power that has gone into the antenna is 64W + 23W = 87W.

Now the 13W reflected repeats this same scenario with it going down to the antenna tuner and all being reflected back up to the antenna with 64% (8.3W) going into antenna and 36% (4.7W) being reflected. We now have 64W + 23W + 8.3W = 95.3W going into the antenna. This process continues until all the power goes into the antenna.

We need to take a breath and note some other things that are happening.

1. The example is assuming there are no coax losses, that is if we put 100W into the coax then all of that power will get to the antenna. We know in the real world this does not happen for we know some of the power will be lost and converted to heat. This is for all the power including the 100W,

the 36W reflected, 23 W, 9W, the 8.3W, etc. But for our demo we ignore this loss just to make the point. In real life one wants to use the lowest practical loss coax feed line.

2. Another issue in real life is that the tuner is not perfect, so some power is lost due to the tuner not being able to tune to a perfect 1:1 SWR at the transmitter. Many automatic tuners tune until they get a 1.5:1 SWR and quit. This is often good enough for most transmitters. A 1.5:1 SWR means if 100W forward we have 4W reflected and is hardly a power level we need to be concerned with.

3. The antenna itself has not been changed thus the tuner did not tune the antenna. It did tune the "antenna system" and provided an impedance the transmitter can handle. The tuner did tune the antenna system keeping in mind the antenna system is the radiator, feed line, connectors and the surroundings such as buildings, gutters, fence post, garage doors, cans, and of course the Earth ground. In the case of a vehicle antenna it can also include the people walking around and the vehicle itself and where it is mounted. The antenna characteristic can be changed in a moment affecting what the tuner must do.

4. The antenna, whatever is used, has a radiation pattern and characteristics. Thus, however we get the power into the antenna and the radiated characteristics will remain the same. The tuner is only helping to get more power into the antenna. What happens to this power depends on the antenna. Some power may actually go to ground and some in a direction we do not need. That is radiate it up or away from the desired receiving station.

Antenna tuners do work. They can make the antenna system more efficient. But again they do not improve the antenna or radiator performance. Just makes it look that way because more power gets into the antenna.

An issue important here is the antenna pattern. Some use a long antenna such as 80 Metre dipole to operate on all the HF and maybe 6 Metres and higher. As an antenna gets longer it tends to radiate more off its ends. So on 80 m the radiation pattern, the way the power leaves the antenna, might be more of a wide figure 8. But at say 10 Metres it might be a very flat figure 8 with 90% of the radiation off the ends in the direction of the dipole wire. So if the antenna wire is mounted to go (say) east/west on 80 Metres it will radiate well north and south, but on 10 Metres will radiate mostly to the east and west. Of course if you want it to do this then you get good results.

The point is just because you have a good SWR and the tuner is getting more power into the antenna it does not mean you are getting the performance you need or want.

How the RF on the Feedline Acts.....
and why it gets reflected from the tuner back up the feedline.

There are two ways to look at the reflected power being reflected from the tuner back up the feed line to again try to go into the antenna and be radiated.

One way is we know we tune the tuner so that an SWR power meter placed between the transmitter and tuner shows no reflected power if the tuner is tuned properly. If we place a SWR power meter between the tuner and antenna we do see power being reflected if the feed line does not match the antenna. Where does this reflected power go? It could go back into the tuner, but since the tuner does not get hot (it may get warm just because it does have some loss) the power cannot be going into the tuner and is not going from the tuner to the transmitter.

So if the SWR power meter between the transmitter and tuner shows no reflected power and the

power is not being absorbed by the tuner and we cannot destroy or create power (law of Physics) then it would seem reasonable to assume the reflected power is going back up the feed line to the antenna.

To try to explain why this is happening.....

First, what happens to the power as it gets to the load/antenna?

To start with, we take a feed line that is open at the load end; no load or antenna connected.

As the RF power goes up the feedline it is made up of a RF voltage and current which are in phase. When this power gets to the open end the current goes to zero since the end is open, but the voltage remains. Since there is nowhere for the power to go it gets reflected back down the feedline toward the source/transmitter/tuner. The reflected voltage will be in phase with the forward voltage coming up the feedline, but the reflected current will be 180 degrees out of phase with the forward current.

Next we take the situation where the feedline is shorted at the load end.

As the forward power reaches this shorted end the voltage goes to zero (a short causes this zero voltage). Again since the power has nowhere to go it gets reflected back down the feedline, but now the reflected voltage is 180 degrees out of phase with the forward voltage and the reflected current is in phase with the forward current.

In both of these cases all of the power is reflected down the feed line.

We can also take a situation where there is a load/antenna not being a short or open, but not a perfect match to the feedline; the load is at a different impedance than the feedline and we have an SWR higher than 1:1.

Here some of the power will go into the antenna. How much depends on the SWR or mismatch between the feedline and antenna. Of this reflected voltage and current one will be in phase and one will be out of phase.

If the load is lower than the feed line impedance the current will be out of phase with the forward current and the reflected voltage will be in phase with the forward voltage.

If the load impedance is higher than the feed line impedance the reflected voltage will be out of phase from the forward voltage and the reflected current will be in phase with the forward current.

The tuner is tuned so as to transform the impedance of the feed line at the tuner output to the transmitter impedance typically 50 Ohms resistive. One way this is done is tuning out the reactance (XL or XC impedance) at the tuner output. The tuner basically tunes to have the opposite L or C from the feed line C or L. So if the feed line has say a XC impedance of 40 Ohms the tuner will provide a XL of 40 Ohms, but these two XL and XC impedances will be 180 degrees difference in phase. This phase relationship will cause the forward current or voltage to be 180 deg out of phase from each other and will cancel.

This effect will make the tuner look like an infinite SWR to the reflected power thus it will be reflected from the tuner back up the feed line to again try to go into the antenna and be radiated. The reflected voltage or current being out of phase with the forward voltage or current is the reason the reflected power gets reflected by the tuner and goes back up the feedline to the antenna.

As when the reflected voltage or current were made to be 180 deg out of phase with the forward voltage or current, the tuner will now also produce a 180 deg phase shift of the voltage or current. Since the reflected voltage or current was 180 deg out of phase with the forward and it again gets changed 180 deg the voltage or current reflected by the tuner is now in phase with the forward voltage and current.

Restating, the reflected voltage or current became out of phase by 180 deg at the antenna. Then when this reflected voltage or current returned to the tuner it was reflected, but again the reflected voltage or current became out of phase by 180 deg a second time making it now in phase with the forward voltage and current. This power now adds and goes up the feed line.

This process continues until all the power ends up in the antenna. We are ignoring losses here just to keep it simple.

One note is we now see power going up and down the feed line a number of times. How much power makes more than one trip up and down the feed line depends on the antenna mismatch. Since the feed line is now handling more power at any given time than coming out of the transmitter this can affect the power handling of the feed line. We are not creating power, but it is that the same power travels over the feed line a number of times so when selecting a feed line one must make sure it can handle higher power than the specifications for a particular feed line. This is also why a small coax like RG58 can handle say 1,000 watts of power at 80m if one has a low SWR, but cannot if the SWR is high.

John Haddleton (M0OBU)

The full and unedited verion of this article appears on John's web site at m0obu.net

80 PLUS PSUs

In the past I have built my own PCs. The initial reason was cost although presently, there is probably little difference in price between building a PC oneself and going to a high street PC shop. One distinct advantage to DIY is that one is more likely to have the confidence to perform a repair or upgrade oneself. It is sometimes possible to re-utilise existing equipment. The down sides are many not least when you get the components home and you can't get your PC to work.

The annoyance of every new release of the Microsoft operating system needing a more powerful PC seems to have been avoided for the time being with Windows 7 and Windows 10. Since buying an Apple PC I have been introduced to a computer that runs almost silently and I thought it would be interesting to try and make my old PC run a little quieter. The noise on my original PC is caused by noisy 80 mm diameter fans. One I had fitted myself to help improve air circulation was removed which provided some reduction in noise. My noisiest fan was in the PSU. Good practice indicates we should use a case having a modular PSU mounted in the base of the case and two further 120 mm diameter silent fans in front and top of the case.

An additional incentive was that I had built my existing PC with a cheap power supply and subsequently read on the internet that my PSU is likely to break down under full load. The PSU which does not have any recognisable brand from the labelling seems to be rated for 450 Watts although on closer inspection to realistically be capable of delivering 350 Watts.

A little research revealed that an '80 PLUS' rated PSU is 'the way to go'.

80 Plus *(trademarked* ***80 PLUS****) is a voluntary certification program intended to promote efficient energy use in computer power supply units (PSUs). Launched in 2004 by Ecos Consulting, it certifies products that have more than 80% energy efficiency at 20%, 50% and 100% of rated load, and a power factor of 0.9 or greater at 100% load. Such PSUs waste 20% or less electric energy as heat at the specified load levels, reducing electricity use and bills compared to less efficient PSUs. Many branded PSUs can improve on the basic 80 PLUS and are rated in bronze (85%), silver (89%), gold (92%), platinum (94%) and titanium (96%) in order of efficiency.*

Italicised Above - Courtesy of Wikipedia

Fitting the new PSU is a reasonably simple job. I did have some problems as I did not realise that one plug came in a block of eight, but the plug is easily 'broken' in half to form two blocks of four. PSUs are classed as modular and non-modular. Modular PSUs allow connector cables to be plugged in as required and tend to cut down on the 'spaghetti' inside the case which can improve air circulation and hence cooling. Non-modular PSUs come with as many cables as the manufacturer thinks you need and may give a less neat solution. There are some PSUs which contain a mixture of modular and non-modular connector cables.

The replacement PSU runs much quieter in part due to using a larger diameter fan that runs at a slower speed. The next noisiest fan is in the graphics card with the CPU cooler fan running quietly under normal CPU loads although this may change when running CPU intensive jobs. This however is unlikely as the pc would be classed as home/office use.

Adrian – Starlite Editor

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YOUR COMMITTEE

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Starlite Editor	ADRIAN	G0NLA	

CALENDAR OF EVENTS

It should be noted that the Shack will be open every Monday evening unless shown otherwise in the Calendar

November	Mon 9th	Foundation Course - Exam
	Mon 16th	Annual Surplus Sale
	Mon 23rd	Committee Meeting
December	Mon 7th	December Christmas Gathering
2016		
January	Mon 18th	Tim 4x4 Response
February	Mon 15th	Constructors Competition and Quiz by Peter
March	Mon 21st	AGM
April	Mon 18th	To be arranged

Please note in future :-

There will be £2 admission charge to non-members for attending main meeting talks / events. This is refundable against joining the society.