Carrier Wave

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Club News

We have reached the end of another year in the Club, the 60th anniversary of the AARS. The AGM took place on 23 rd November at 8.00 pm. Congratulations to Graham, GM4OBD, Allan, GM4ZUK, Mike, 2M0RND, Phil, MM0MSP and Norman, GM3WIJ who were awarded the cups/trophies for, work for the Club, the best talk, the best novice/listener, Construction and the VHF foxhunt respectively.

The retiring president gave a brief resume of the year ' s activities and the treasurer presented the statement of accounts and explained any matters arising. The committee for the next year is President—Colin Burnet, GM4TVB, Vice President—Lorraine Haynes, MM0BCR and ordinary members—George Anderson, GM0VGI,Adam Davidson, MM0KZV, Lewis Donaldson, GM4AJR, Robert Duncan, 2M1HRS and Ian Munro GM4GVK. The new committee looks forward to the continued support of the ordinary

Inside this issue:

Coming up soon:-

- Party
- AFS Contests
- Construction nights continue
- More about your G5RV in next newsletter.

Outside activities have been winding down as we move from Autumn to Winter. CW practice sessions continue on 3.575 MHz on Monday evenings at 2000 local time for the competent operators and on Wednesday evenings at 1930 local time for the beginners/ improvers. As long as we have at least three participants or more this is likely to continue until further notice. Junk sales have continued to be a major attraction thanks to Ian, GM8MHU, who does his best to extract the maximum amount of money from the audience. Please keep the junk coming as it is an excellent way of raising some money for the Club. Donations of gear are frequent and much appreciated. We had a small outside event at the tree planting at Foggieton Woods on Saturday 25th November. GM3BSQ/P was active from about 10.30 am. until about 4.00 pm. A 132 ft end-fed was used at about 35 feet agl. and a TS440S supplied with a 12 V leisure battery provided 100W of RF. Band condx. were very odd with long skip on both 40 m and 80 m. A typical contact was Belgium at 59 + 20 dB. Some QSOs were made above 7.100 MHz until the commercial stations made things difficult into the afternoon. Norman, GM3WIJ tried out a new system of feeding the end-fed. A balun was placed between the ground rod and the end of the antenna and the balun was fed through an SWR bridge from a small MFJ tuner. This worked particularly well on 10 MHz as it brought in a continuous stream of contacts. Thanks to Norman for supplying the accommodation, the power source the enthusiasm for the CW contacts on 10 MHz and the rope for pulling Ellis' car out of the mud pool. A passing motorist/tree-planter provided the pulling power with his 4 WD Toyota. 200 trees were planted at the event. Varieties were wild cherry, mountain ash, alder and willow. Construction of the BALUNs and dummy loads is well under way. Money should be paid to Graham, GM4OBD as soon as possible.

CLUB PROJECT: THE 1:1 BALUN

So, you want to make a balanced to unbalanced transformer?. The fount of all wisdom regarding baluns is Dr. Jerry Sevick, whose book “Transmission Line Transformers “ is required reading for anyone undertaking any work of this sort.

Let’s start with 1:1. There are two types, the Guanella, developed in 1944, and the Ruthroff, from 1959. The latter is the one you are probably familiar with. The W2AU balun is the most obvious example. However, the Guanella design has several advantages. It depends only on having the source in parallel and the load in series, whereas the Ruthroff design uses signal phasing to achieve the transformation. This leads to a more complicated construction and significantly less bandwidth than the Guanella design.

The core is chosen for a moderate permittivity, 125 (type 61) to around 300 (the unobtainable type 66) is a good choice. Iron dust types (red type -2, yellow type -6 etc) give a very poor LF response. High μ mixtures (type 43) give too much loss at HF. This design should be good from 3.5MHz to around 50Mhz, maybe more. Fewer turns improves the HF end, more, the LF end.

Because it is a transmission line transformer it is made from a transmission line, which seems fairly obvious. As it is working in a 50Ω system it requires 50Ω balanced line, and you will not find this in any catalogue. (You can use co-ax, but it needs a large core to get a satisfactory winding, even with the outer sleeve off, and the large core is three time the price of the small core). We therefore have to make our own. Sevick gives the usual equations and some practical advice but eventually the only way is to wind one and measure it.

Take two lengths of enamelled copper wire and wind a bifilar coil of, say, 12 turns. Measure the inductance of one coil: it should have sufficient inductance to present an impedance of around 500Ω at the lowest frequency it will be used at. I chose 3.5MHz. Top band operators will have to wind their own. How to measure the characteristic impedance?

When a transmission line, parallel or co-ax, is terminated in its characteristic impedance it looks like a pure resistor of that value. This is for any length, not half or quarter wave or anything special. Obviously, 12 turns of wire on an FT140-61 toroid is very short in terms of HF wavelength. Terminate the line with a resistor of, say, 39Ω and measure on an impedance bridge. Just like that…

Well, of course not. The bridge must be well constructed so as to give a deep notch when balanced. The difference between no load and perfectly balanced is called directivity. I used surface mount components and a trimmer pot and achieved a directivity of over 60dBs, which is phenomenal. It requires a very pure signal source to achieve this: I used a well filtered 12MHz oscillator I had built to calibrate my power meter, which I was using as the detector.

Anyway, measure the level of the null and change to the next value resistor, 43Ω. If the null is lower, after tweaking the trimmer, you are going the right way. Keep this up until the null is not so deep, the previous value will be the characteristic impedance of the line.

Suppose it's 44Ω (You get quite good at making any value with two resistors in series). This means the wires must be moved further apart in order to raise the impedance. Thinner wire has the same effect, but then the power handling decreases. How do you space them? The easiest way (a relative term) is to cover one or both with insulation. PVC has poor properties at RF; the depths of null were greatly reduced, a sure sign something is amiss. Heat shrink sleeving was even worse, although it survived the microwave oven test. (So did PVC). Sevick used PTFE sleeving, famous for its RF properties. I found some in a chemistry suppliers catalogue, but only in 30m rolls, at around £40, too much for something that might not quite work.

Graham had provided me with some rolls of PTFE plumber's tape, used for threaded pipe joints. It's only 0.075mm thick (thin)?, not the easiest stuff to handle, but it gave me great flexibility in terms of thickness changes.

After many, many trials I achieved the necessary impedances.(I was working on the 1:4 baluns at the same time). The final result uses 1.25mm enamelled copper wire with one wire wrapped with a single layer of tape and then both wires taped together to form a pair for winding.

Things you might not know.

Ferrite is an insulator; you could use bare wire if the turns don't touch.

When the load is close to 50Ω there is very little magnetizing current. The core is there mainly to support the wire and provide a choke to common mode currents. Therefore, the core does not limit the power handling of the device, the wire diameter does. A small balun like this should handle hundreds of Watts. Sevick rates his at 1kW, the low impedance ones even higher.

The insulation is there to space the wires, although it certainly helps with the voltage rating.

And finally, a balun is not just some wire wound onto some core.

by Tony Langton GM4HTU

In the next issue Tony will discuss the 1:4 balun.

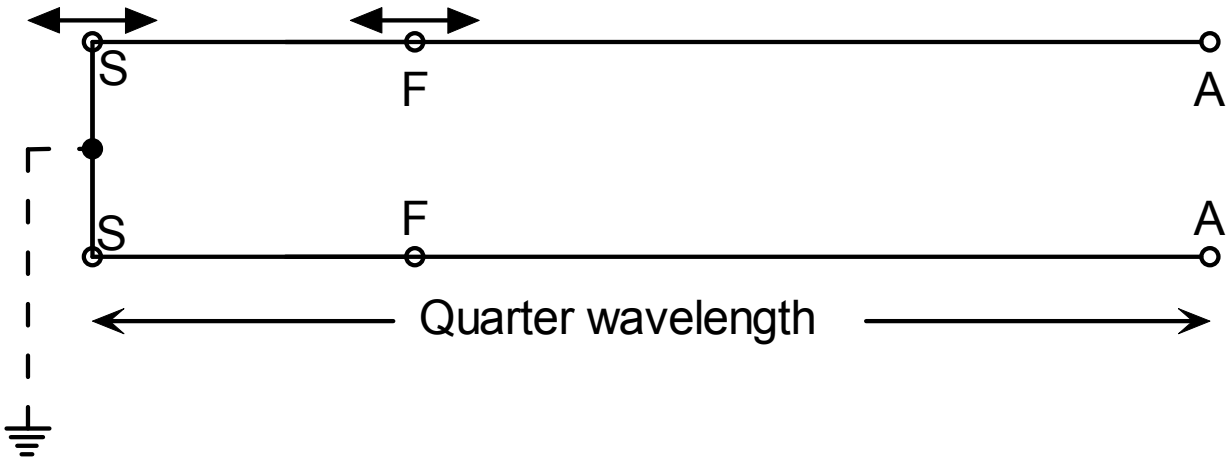
SNIPPETS

A big sunspot has appeared at the limb of the Sun. It exploded on Tuesday but will move in to the centre of the Sun to face the Earth in the next few days so get ready for some interesting effects on radio wave propagation.

Teams need to be fixed up for the AFS contests at the start of 2007. We need a log coordinator for the CW event and for the SSB event. Please offer your services to someone on the committee.

Technical

In the last C.W. of October, I described how to make a BALUN to transform a 50 ohm unbalanced line to a 200 ohm balanced line. Although these are band specific it should be possible to use one built for 40 m on 15 m as the harmonic relationship is a factor of 3.
The idea now is to take the 200 ohm balanced output and transform it to any impedance that might appear at the feed-point of an antenna. A quarter wave line transformer does this job perfectly. This is also very easily made.



A “U” shaped wire is made just longer than a quarter wavelength. A and A are connected to the centre of the balanced antenna. The 200 ohm output of the coax balun is connected to the feed-points F and F and a shorting bar is placed between S and S. The centre of the shorting bar can be earthed to ground to remove static or provide some discharge protection. Points F can now be slid to or fro to find the matching length. If a perfect match is not found the sliding short SS is moved and the FF adjustment repeated. I used this matching system on a 2 m collinear array and worked UA1XM with 5 watts. It was the best 2 antenna I have tried so far……..***GM4OBD***

73 from GM3BSQ