FIVE AND NINE PLUS

THE OFFICIAL NEWSLETTER OF THE APPLEDORE AND DISTRICT AMATEUR RADIO CLUB

Club Callsigns: G2FKO and GX2FKO Web Site : www.adarc.co.uk

CLUB'S OFFICERS					
	President	John Jeffers	GOUNB		
	Chairman	Terry Adams	G4CHD		
	Vice Chairman	Dave Lawrence	GOPGK		
	Secretary	Alan Fisher	M6CCH	01237 422833	Email: fisheralan@btinternet.com
	Treasurer	Laurence Soutter	G4XHK		
	Committee	Mike Hammond	G3PGA		
		John Lovell	G3JKL		
		Graham Bailey	G1ZTJ		
	QSL Manager	John Lovell	G3JKL		
	Web Master	John Lovell	G3JKL		
	Editor	Terry Adams	G4CHD		



EDITORIAL

TEUR RADIO



Well, it's that time of year again which seems to come around all too quickly! So, this **month's Meeting** is of course our

Christmas Party which as per last year, **is free** and promises to be even better. There will be food and tea/coffee plus crackers and Xmas music. The usual Raffle will be held and Dave has promised to do his Christmas Quiz.

Welcome to another Newsletter.

So I look forward to seeing as many of you as possible and please remember that your xyl is very welcome. There will be a super Raffle and any offers of prizes to add to those provided by the Club are always welcome and much appreciated.

The informal **Christmas lunch at South Molton**, run by the Tuesday morning coffee group, was a great success with approx 25 people attending. Many thanks to Helen and Laurence for doing all the organising. A few photos are included later in this Newsletter.

I have included an **article on Baluns** which I have hurriedly cobbled together which I hope is not full of too many mistakes and any postscripts you may feel members would be interested in are very welcome for the next

Newsletter.



So, get those letters into Santa with your wish list (Kenwood and Yaesu eg will be delighted!) Enjoy your Newsletter

Terry (G4CHD)

CLUB MEETINGS

Unless otherwise stated, Meetings are held at the Appledore Football Social Club starting at 7.30pm for 8.00pm.

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December, 2013

December 16th	Club Christmas Party
January 20th	Audio Recording - Practical Demo by Laurence (G4XHK) & John (G3JKL)
February 17th	Radio Quiz by John (G3JKL)
March 17th	Club AGM
April 21st	'Plan B' by Steve (G6SQX)

Visitors are always welcome. For further information, contact Alan (M6CCH)





by Terry (G4CHD)

The talk began by tracing the important radio related events from the early 1800s to the early 1900s in which familiar famous names such as Fleming and Marconi featured



prominently. However, it was Edwin Armstrong shown in the picture opposite who was responsible for the development of the principle of the Superhet. With the aid of a

projector and screen kindly provided by Dave (M0JAP), a series of slides were presented which explained how the superhet solved the problems of the day by achieving most of the gain and selectivity at a single (IF) frequency. The following diagram was shown which demonstrated the principle for a single superhet receiving a ssb usb signal.



The advantages of Double and Triple Superhet designs were explained and block diagrams shown of a couple of modern receivers including the Yaesu FT450 shown below.



This lead neatly into the modern use of Digital Signal Processing (DSP) and to SDR designs.

The Meeting ended with a lively discussion particularly with respect to DSP and SDRs and hopefully provided

those members present with an entertaining but informative evening.



Terry (G4CHD)

LOCAL SKEDS



LOCAL REPEATERS

70cm Handy Cross Repeater/Echolink (#221334) Gateway (GB3ND)

User: Listen 433.35MHz– Transmit 434.95MHz Access 1750Hz Tone (Timeout 4.25 mins)/ 77Hz CTCSS Repeater keeper is Jeff (G4SOF)

2m Stibb Cross Repeater (GB3DN) http://www.g0rql.co.uk/gb3dn.htm

User: Listen 145.6375MHz - Transmit 145.0375 MHz. Access 1750 Hz Tone or 77 Hz CTCSS Repeater keeper is Tony (G1BHM). Yahoo users group for general chat and banter at :http://groups.yahoo.com/group/GB3DN/

SUDOKU PUZZLE

The aim is to enter a number into each cell so that any column, or any row, or any block of cells contains all numbers from 1 to 9.





CROSSWORD

This month's Crossword by Stuart (M1FWD). The answers will be published in the next month's Newsletter. Good luck !

Clues Across

- 1) Radio detection and ranging (5)
- 3) Combine two or more sound signals into one (3)
- 6) According to the Holy Bible (*Acts 20:35*) it is better to do this than to receive (4)
- 7) Alpha Four location (4)
- 8) Three Bravo Nine island (9)
- A vessel for containing electrodes within an electrolyte for current-generation (4)
- 14) An inflamed swelling on the edge of an eyelid (4)
- 15) A drink made from the leaves of *Camellia sinensis* (3)
- 16) Christmas hymn (5)

Clues Down

- 1) "Your message has been received and understood" (5)
- 2) King of ancient Israel, successor to Saul (5)
- 4) Yankee India land (4)
- 5) American inventor of an electronic music synthesizer (4)
- 9) Corpulent, very overweight (5)
- 10) ? Poly, suet pudding with jam (4)
- 11) ? Pradesh, a stste in northern Victor Uniform land, capital Lucknow (5)
- 12) In computing, a program which provides an interface between the user and the operating system (5)



Last month's answers :-

Across 1) Spain 5) Orme 6) Aries 8) stable 10) linear 12) Tutti 13) nets 14) Gabon



Down1)Swaziland2)ides3)Aruba4)reception7)stoat9)units11)Ruda

Stuart (M1FWD)

<u>A MESSAGE FROM OUR ITALIAN</u> <u>ASSOCIATE MEMBER</u>



We are at the end of year 2013 and Christmas will come in next few weeks.

As associate foreign member of the Appledore ARC, Merry Christmas and Very Happy & Great New Year 2014 to you and all the participating members, together your families.

All the best from Italy. Greetings. "73/88s".

Cordially Yours, Giorgio (George) SWL IV3 - 57306 Italy 2013

FOR SALE - TS570D

I have a Kenwood ts570d hf set for sale. It is just HF. I am looking for £275 if you know of anyone looking for a set. Ade (M1DBZ)



Email :- ajblandy@rocketmail.com

FEW PHOTOS FROM THE SOUTH MOLTON CHRISTMAS LUNCH

Many thanks to Jim (M3VJM) for some of the photos.















The article on Baluns follows on the next three pages - hope you find it interesting Xmas reading !



So that's it for this month. Enjoy the read

If any member has an article that they feel would be of interest to Club members, please send it in to me and it will make your Club Newsletter all the more interesting.

So, on behalf of your Committee, may we wish everyone a Very Merry Christmas and a Happy Healthy New Year.

Terry (G4CHD)

Merry Thristmas



BACK TO BASICS by Terry Adams (G4CHD)

BALUNS, AND WHAT TO DO WITH THEM

This article made reference to the excellent article by Roy W Lewallen (W7EL) - "Baluns: What They Do and How They Do It".

DEFINITIONS OF TERMS

The term **balun** is an acronym for **bal**anced-to-**un**balanced and provides a means for interconnecting balanced and unbalanced devices.

A **Balanced** system is one where either terminal is isolated from ground and that the signals at each terminal are equal and opposite. An analogy is a seesaw where either end swings up and down in an equal but opposite way to the other end and with respect to the central pivot. Examples are Twin Feeder eg ladder line or a dipole antenna.

An **Unbalanced** system is one where one terminal is held at a fixed potential eg ground. The diagram shows such a system using the seesaw analogy. An example is coaxial cable.





There are two classes of baluns: the **voltage balun** and the **current balun**. The voltage balun forces equal voltage across the two sides of a balanced load and the current balun forces equal current through the two sides of a balanced load.

EXAMPLES OF BALUN USE

a) <u>FEEDING A BALANCED DIPOLE WITH UNBALANCED COAX CABLE</u>

This first example considers the problem of feeding a balanced dipole antenna directly with unbalanced coax cable as shown in the diagram

opposite and how the use of a Balun can solve the resultant problems.

The red central conductor and blue inner shield currents are equal and opposite and constitute transmission line differential currents. It can be seen from the diagram that all

It can be seen from the diagram that all the red central conductor current flows into the dipole right arm wire.



However, the blue inner shield current splits between the light blue dipole left arm wire current and the green outer surface shield current. (This assumes the shield to be thicker than the skin depth). As there is no opposing current to this outer shield current, it constitutes a **Common Mode Current** and can cause both the **antenna radiation pattern to be greatly distorted** and/or **interference within the shack or home due to radiation from the feeder.**

The current on the outer surface of the coax shield will be at a maximum when it sees minimum impedance eg if the electrical length of the screen outer to its ground connection was a multiple of half wavelengths ($\lambda/2$) (Impedance is repeated every $\lambda/2$) thus maximising the above problems.

A solution would appear to be the use of a <u>1:1 Voltage Balun</u> at the interface between the centre of the antenna and the coax feeder as shown schematically in the following diagram :-



Simple mathematical analysis of this system assuming **ideal transformer action** (ie negligible magnetising current and perfect coupling) gives the following :-

For an ideal transformer, the pds across each winding are equal :-

ie
$$(Va - Vc) = (Vb - Vs) = (Vs - Va)$$

Rearranging the 2nd equality gives :-

$$(Vb - Vs) = -(Va - Vs)$$

ie the output voltages on the Balanced terminals are equal and opposite with respect to the coax screen (ground) which would appear to be what is required.

However, the Balanced dipole antenna requires balanced equal and opposite currents since antenna radiation depends upon current and not voltage.

Re analysing the above system now with respect to currents, we get :-

$$Ib = (Is - Io) - (Ic - Ia)$$

However, Ic = Is (transmission line differential currents) and substituting for Ic we get :-

$$Ib = (Is - Io) - (Is - Ia) = Is - Io - Is + Ia) = Ia - Io$$

ie $Io = Ia - Ib$

ie the coax outer screen Common Mode current Io will be zero IF AND ONLY IF the Balanced antenna currents Ia and Ib are equal (and opposite) which with equal and opposite terminal voltages (as shown above) will only occur if the antenna has perfectly balanced equal impedances in each arm.

In practice, this is often not the case due to each antenna arm having a **different coupling to nearby objects and ground** leading to common mode current on the coax screen outer and **resultant feeder radiation**.

Thus, the use of a 1:1 Voltage Balun will not automatically cure feeder radiation unless the antenna is perfectly balanced.

A better alternative is to use a **<u>Current Balun.</u>**

In an ideal transformer having 2 windings of equal number of turns, the currents in each winding are forced to be equal and opposite whatever the load impedances.

Consider the following schematic diagram :-



As stated above, in an ideal transformer with equal number of turns in each winding, Ic = (Is - Io)

Since Ic = Is (transmission line differential currents), substituting we get :- Ic = Ic - Io

ie Io = 0 (whatever the values of Ia and Ib)

Another way to consider the action of the Current Balun is that with equal and opposite currents (Ic and

Is) flowing in each winding, there is no net resultant flux and hence no transformer action. However, the common mode current, Io has no opposing current and is thus 'choked off' due to the inductance of the winding. For this reason, **the Current Balun is often referred to as a Choke Balun**.

The 1:1 current balun is usually nothing more than a simple transmission line (e.g. bifilar winding or coaxial cable) wound on the core.

Now consider a second example :-

b) <u>FEEDING POORLY BALANCED DIPOLE BALANCED RIBBON CABLE</u>

Ideally, the arrangement of feeding a balanced half wave dipole with balanced ribbon cable should maintain the balanced equal and opposite currents in the feeder and so minimise any feeder radiation. 70Ω twin feeder should ideally be used to match the 70Ω feed impedance of the half wave dipole but 300Ω ribbon slotted feeder is more readily available and could be used if the feeder length is kept to a multiple of electrical $\lambda/2$ to reflect the antenna's 70Ω centre feed impedance.

However, in practice, due to differences in antenna arm lengths or coupling to nearby objects, unequal antenna arm currents can more often exist. In addition, if the coax cable is not at right angles to the antenna, then current can be induced onto the coax outer particularly if its electrical length is resonant at the operating frequency. In either case, common mode current in the feeder will lead to feeder radiation.

The solution would appear to be the use of a <u>4:1 Voltage Balun</u> as will be analysed below :-

From the following diagram, it can be seen that (Ic - Ia + Ib) + Io must equal Is

Thus, re arranging, Io = Is - (Ic - Ia + Ib) from which for Io to be zero as required, then Is = Ic which is always true for a transmission line, but also Ia = Ib ie the antenna currents MUST BE BALANCED.



4:1 Voltage Balun



Since an impedance transformation is required, then a Voltage Balun would be required, but should be used in conjunction with a Current Balun to remove any Common Mode Current on the Coax outer.

CONCLUSIONS

Since writing this article I have realised how little I knew about Baluns and how much I still have to learn! I hope that at least it stimulates thought and discussion on the subject and as always, look forward to hearing from any reader with a further article.