HAMS Haywire News
August 2010
www.marc.org.za
PO Box 1076, Hilton, 3245

MIDLANDS AMATEUR RADIO CLUB

AFFILIATED TO THE SARL & IN ASSOCIATION WITH THE NATAL CARBINEERS

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The Chairman's Report

The future of the club and amateur radio in the Midlands is looking good. I have had about 10 possible new candidates who wish to write the ZU exams in October, many of them from Howick, well done to Rachel Marx for promoting the hobby . Over the last year we have had 13 new hams pass the ZU exams and of those 8 have gone on to write and pass the class "A" exams , two of which have moved on the complete their ZS licences, with a number expected to join them in the near future. This bodes well for the future of ham radio as the average age of this group was 38 and it would seem that most of the next group are also fairly young. Long may this trend continue.

We will be starting lectures on the Sunday 22nd August at the Carbineers beginning at 1.30, the closing date for application is the 24th September and the exams will be written on the 21st October. Any one wishing to join this group is well come to come along on the 22nd August.

It is with interest that I read an article from a recent SARL publication on a move to promote innovation in amateur radio, by the South African Amateur Radio Development Trust, and I quote, "While Amateur Radio is one of the oldest and still the most rewarding of all the scientific hobbies, there comes a time when one has to look at innovation, new ideas and new technologies to keep the activities relevant and exciting". This is the view of Hannes Coetzee, ZS6BZP,a technologist and a member of the Board of Trustees of SAARDT.

Radio amateurs and technologists are invited to submit projects that will innovate amateur radio whether it is software, amateur radio and the Internet, the development of compact HF antennas for flat and complex dwellers or innovation in Emergency Communications. Hannes says that innovation is needed in the area of disaster communication such as incorporating high speed images and data transmission utilising amateur radio equipment and frequencies and interfacing all the networks available to amateur radio. Out-of-the box ideas are required to solve some of the problems and challenges faced by the 21st century radio amateurs. The innovation project is in the form of a competition to stimulate the creative side of hams to develop those solutions that will make the hobby more enjoyable to amateurs all over the world. Even old ideas improved with modern design techniques and modern components can generate a "wow" factor. Solutions will be judged by their uniqueness, e.g. not having been previously published. Entry of paper designs are invited by 30 September 2010. The designs must be innovative but also practically implementable. Three entries will be chosen to go to the final stage of the competition which requires the entrant to develop and build a prototype. The three winners of the first stage will be announced at the annual awards function on 17 May 2010.

Would any of our members like to consider an entry I am sure there are many really good ideas out there waiting to come to fruition!

I would like to remind our members that the AGM will take place on the 18th September, please keep this date open .

My thanks to Roger ZS5EV for again arranging the clubs involvement in the Capital Climb, and thanks to all those that took part, well done to you all.

Till next months my greetings to you all
Mike Z5BGV

Diary of Events

21 August MARC General Meeting
21/22 August International Lighthouse Weekend
29 August SATNET at 19:30 on the air
31 August Closing date for submission of proposals for the 211 SARL Contest Manual
28 September MARC Annual General Meeting
30 September Closing date for phase 1 of the innovation project

The M.A.R.C. Infrastructure

Voice Repeaters (FM) *Visit www.marc.org.za/pages/freq.htm for updates of this list*

VHF	Tx	Rx	Equipment
Hilton	145.6625MHz CTSS 88.5	145.0625 MHz	SCR200 20W, Diamond X-200 rx and tx
Estcourt	145.700 MHz	145.100 MHz	Emcom SA256 25W, Diamond X-200 rx
Franklin	145.725 MHz	145.125 MHz	GE MVP 10W
Worlds View	145.750 MHz CTSS 88.5	145.150 MHz	Emcom SA256 25W, Diamond X-200 rx and tx
Greytown	145.775 MHz	145.175 MHz	Home Brew @ 20w, Diamond X-200 rx and tx
Underberg	145.7875MHz CTSS 88.5	145.1875MHz	Q8000 30W
Windy Hill	145.700MHz	145.100MHz	Hamnet repeater.
UHF			
Mt Gilboa	439.225 MHz	431.625 MHz	Vertex Standard VXR-9000, Diamond X-200 rx and tx
Zwartberg	438.775 MHz CTSS 110.9	431 .175 MHz	GE MVP 15W

APRS
The national APRS frequency is 144.800 MHZ (Tx & Rx). The I-Gate is at Hilton (ZR5S). Fixed stations should beacon at approximately 30min intervals with a path of WIDE5-5. Mobile stations should beacon at approximately 1min intervals with a path of "WIDE1-1, WIDE5-5". We have aprs digi's throughout KZN. A PBBS (mailbox) is on ZS0PMB-1 for emergency use. A KA-NODE is on ZS0PMB-7

Packet Radio
No packet radio frequency. However, limited packet radio facilities are available on 144.800MHz

ECHO-LINK "voip"
Our node number is 244279 Call Sign ZS5PMB. This Echo-link facility is available on the Midlands linked Repeater network.

E-QSO "voip"
We are in the "101ENGLISH" virtual room, on the "repeater.dns2go.com" server. This is linked to RF at Hilton on 433.000 MHz simplex.

BEACONS
Greytown 50.321 MHz (Tx) ZS5SIX FSK (off air)

WEB SITES
MARC'S very own website www.marc.org.za
SARL's website www.sarl.org.za
HAMNET website www.hamnetkzn.org.za

Regular Events

The KwaZulu Natal Net (Early Birds):
Starts at 06h00 on 7.055 MHz. in winter and 3.650Mhz in summer and continues until 07h40. Colin ZS5CF hosts the net from 06h00 & Gary Potgieter (ZS5NK)-takes over later on.

MARC Sunday Morning Net:
Times: 07h45. Club bulletin is presented at 08h0.
Frequencies: VHF: 145.750MHz, 145.6625MHz, 145.775MHz, 145.725MHz, 145.7875MHz, 145.700MHz
UHF: 439.225MHz

Hamnet Bulletins: Sundays at 07h00 on 145.625MHz and 3.670MHz
Wednesdays at 19h30 on 145.625MHz and 3.670MHz

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The History of MARC - a work in progress by Gudrun (ZS5GEL)

It is time for another HHN but before continuing with snippets out of the archives of the Minute Books I would firstly like to extend my sincere thanks to those who (a) took the time and effort to read through what I have summarised to date, but (b) more importantly, made the effort to respond and offer such valuable and constructive criticism. I have taken all points made on board and it has definitely been of assistance to me.

Pending feedback, I had put the work on hold but resumed with reading through the old Minutes over the course of this past weekend. The war obviously interrupted the work of the then Pietermaritzburg Branch of the S.A.R.R.L with the Section closing their affairs in June of 1940. The next Minutes on record are dated 13 September 1945 and relate to a Special General Meeting held to resuscitate the Section. Meetings, however, only resumed on a more regular basis from July 1946. Here now are some snippets of the goings-on in the club during this time:

EVERY meeting, as is reflected in the records, closed with "A hearty vote of thanks to the Chair". In this regard, my sincere apologies to OM's Wessels, Seale and Boast for this tradition not having been carried on to present days... And in retrospect my sincere vote of thanks for all the meetings I have attended where you had the Chair.

October 1946 : "Silent Keys: It was proposed and seconded by OM's Johnson and Somers that Call Signs of deceased amateurs be allowed to lapse permanently but may be re-issued to a near relation on request."

October 1946 : General Meeting : "The Treasurer was authorised to negotiate for the purchase of either a Collins or Dainty Set for use as Branch equipment.... and that the Treasurer be allowed to purchase such equipment if available to the value of £25."

November 1946 : General Meeting : "As the Treasurer had not had the opportunity of negotiating for equipment, the Secretary was instructed to submit Tender for the Equipment required by this Branch to the War Stores Disposal Bard."

April 1947 : General Meeting : "The Meeting closed with a vote of thanks to the Chair, followed by a very interesting lecture and demonstration on "Electric Shocks" by OM Johnson....I wonder who volunteered to be the one on whom this was demonstrated! Other topics offered up for discussion at meetings included, "a talk on 'How a Valve Works', the bringing of an Oscillator and a talk on same, and 'a most interesting chat by Dr. Markham on his experiences on a Trawler and radio contacts maintained during the trip to South Africa.'

June 1947 : General Meeting : "OM Johnson proposed a hearty vote of thanks be recorded in the Minutes to the Treasurer and the Committee for their prompt action in obtaining the Collins Equipment which was on view, for the use of this Branch." The Chairman's report dated July of the year expands on this equipment stating that it was a Collins TCS 10 transmitter receiver outfit .... and was a 12 volt battery operated job.

June 1947 : General Meeting : "BULLETIN ..... the meeting was asked to decide whether the Bulletin should be continued..... it was carried unanimously that the Bulletin be continued..."

And so the journey through our history continues.

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Baluns: What They Do And How They Do It by Roy Lewallen W7EL ***Part 1 of 2***

I've always been a bit bothered by baluns since I was never sure what they are supposed to do, let alone how they might go about doing it. The majority of articles deal with various ways of building and testing baluns, or the advantages of one type over another, but almost never a word about when or why a balun is necessary, if at all. Like most amateurs, there have been few occasions when I have been able to tell if a balun has any effect on an antenna system, and when it has,

the effect hasn't always been good! The turning point came when I was trying to measure the resonant frequency of a folded dipole through a one-wavelength coaxial line. The bridge null varied a great deal as I moved my hand around the coaxial cable, or if the line or bridge was moved. A hastily constructed balun installed at the center of the dipole eliminated the problem. But why?

I found a brief, but clear explanation of one phenomenon involved in a paper by Maxwell, W2DU [*1]. However, many questions remained. This led me to an investigation of just how baluns are supposed to work, and what problems they are supposed to cure. One surprising conclusion I found from my research is that one popular type of balun, when properly designed and used in an antenna system, may not solve the problems that baluns are expected to solve. Other rcsults indicated that the type of feed line (balanced or unbalanced) has little to do with how well a system is balanced. In order to verify, or refute, the theoretical results, several experiments were carefully set up and run, and the data analyzed. The result is a much clearer view of the operation of baluns in antenna systems, and some definite "dos" and "don'ts" regarding their use.

What Problems are Balun Supposed to Solve?

Baluns usually solve problems caused by an imbalance. An imbalance of what? To answer this question, we need to look at current flow in transmission lines.

In a coaxial cable, the currents on the inner conductor and the inside of the shield are equal and opposite. This is because the fields from the two currents are confined to the same space [*2]. With the presence of skin effect, a different current flows on the outside of the shield than on the inside [*3]. The current on the outside, if significant, causes the feed line to act like an antenna, radiating afield that is proportional to this current.

A twin-lead feed line has similar properties, despite its different physical nature. Since it is physically symmetrical, if the currents flowing through the conductors are equal and opposite, the radiation from the line is minimal (assuming that the conductor spacing is very small relative to a wavelength). However, several factors may cause the currents in the two conductors to be imbalanced, that is, other than equal and opposite. If this happens, the balanced feed line will radiate like a coaxial cable that has current on the outside of the shield. This occurs because the components of the currents on the two conductors that are equal and opposite create fields which cancel. But the field from any remaining component on either conductor (called a common-mode, secondary-mode, or antenna current) will cause radiation [*4,5,6]. In this article, the current on the outside of the coaxial shield, or the antenna current on the twin lead, will be called the imbalance current: They are caused by the same things and produce the same effects.

Imbalance current, on either kind of line, is the cause of a number of undesirable effects:

- pattern distortion (caused by the feed-line radiation adding to the antenna—radiated field, or by unequal currents in the antenna halves)
- TVI (radiation from a feed line coupling into nearby television sets, house wiring, and so on
- RF in the shack (caused by a "hot" radiator - the feed line - residing in the shack)

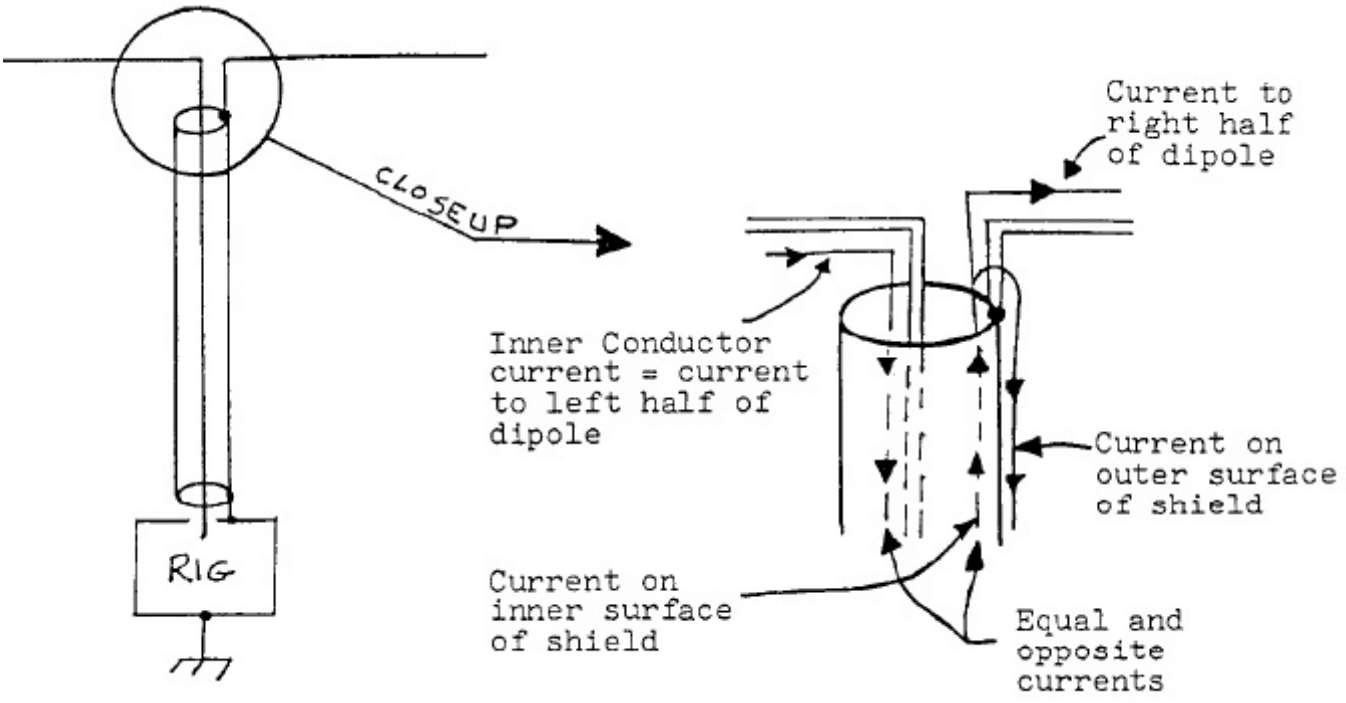


Fig. 1 – Imbalance caused by another path to ground from only one side of the dipole

If you have read other articles on baluns, you'll recognize these as the problems baluns are supposed

to solve. What isn't usually too clear is that they are all caused by **current imbalance, on either coaxial or twin-lead feed line**. Of course, if the imbalance current is sufficiently small to begin with, a balun is not necessary at all. Or it can be said that a properly designed balun will not solve the problem being experienced.

What Causes System Imbalance?

The first cause of imbalance currents was explained by Maxwell. It will be repeated here for completeness. When a balanced antenna is fed with coaxial cable (Fig. 1), the outside of the shield appears as an extra, separate conductor connected to the right side of the antenna at the feed point. The current in the cable's center conductor flows into the left half of the dipole. The equal and opposite current on the inside of the shield flows partly into the right half of the dipole, and partly along the outside of the shield. The proportion of current which flows each way is determined by the relative impedances of the two paths. The current on the outside is the greatest when the total effective length of the path along the outside of the coaxial cable from the antenna to ground is an integral number of half wavelengths, since this makes the impedance presented by the undesirable path relatively low. If the rig is effectively an odd number of quarter wavelengths from actual ground, it is at a voltage maximum and can be hot. On the other hand, there are other combinations of lengths for which the imbalance current will be negligible - cases where a balun does not make any noticeable difference.

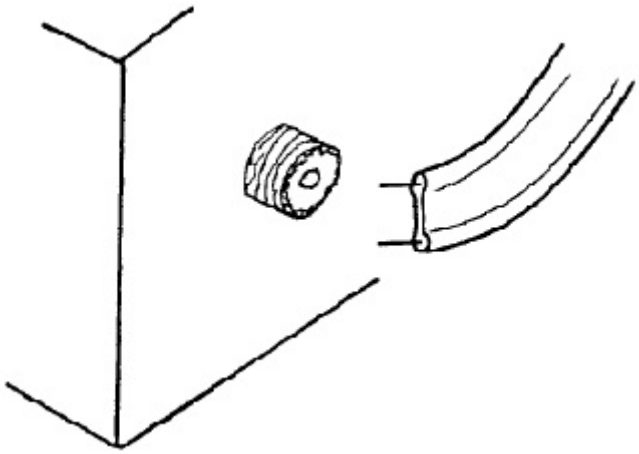
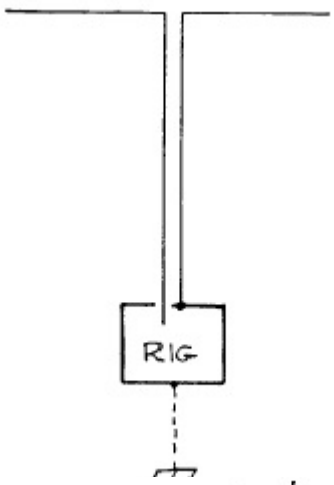


Fig. 2 – One solution to the imbalance problem is to feed the balanced antenna with a balanced feed line – twin lead.

The obvious solution to this problem is to feed the balanced antenna with a balanced feed line - twin lead. This solves the problem neatly, until you encounter the problem which most of us have today, illustrated in Fig. 2. Suppose that we went ahead and connected the line as shown schematically in Fig. 3. If the rig could be totally isolated from ground, the feed-line conductor currents would be equal and opposite, just as they would be if coaxial cable were used; the imbalance current would be zero, and the feed line would not radiate [*7]. However, when we connect the rig to ground, as shown by the broken line, we've again provided a third conductor in parallel with the right side of the feed line, and the same problem occurs as with the coaxial cable (see Fig. 4). So either type of line is unbalanced if a direct path to ground is provided from one side, and both can be a balanced, non- radiating line if the imbalance current is eliminated.



Imbalance current can be caused also by situations where the two sides of the antenna are not precisely symmetrical: Coupling to nearby objects, the tilt relative to ground, or slight differences in lengths of the two antenna halves [*8]. Another cause of imbalance currents is induction. If the feed line is not exactly placed at a right angle to the antenna, a net current is induced into it by the antenna field. This current appears as an im balance current. At UHF, where the diameter of coaxial cable is a substantial fraction of the length of the antenna elements, coaxial line is more difficult to place symmetrically relative to the antenna than twin lead is (this is sometimes given as the only reason for using a balun!). The problem is negligible at VHF (except perhaps with very large diameter coaxial cable) or below.

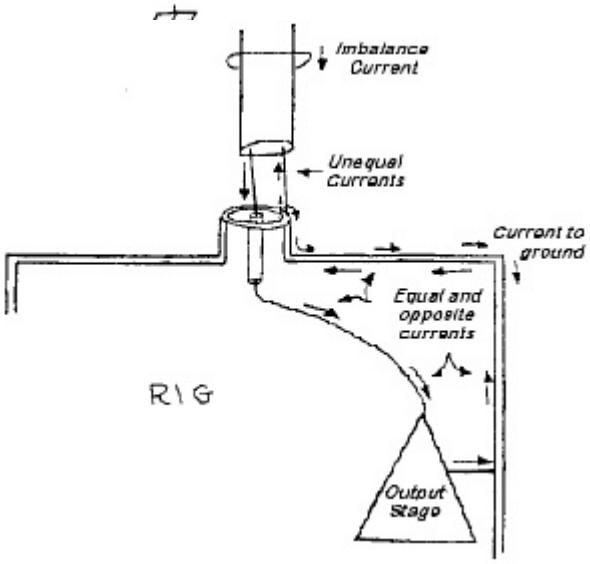


Fig. 4 – When the rig is connected to ground, a third conductor in parallel with the right side of the feed line is introduced. This causes an imbalance in both coaxial cable and twin lead feed lines

What Baluns Do

Let's recall what we want a balun to do: cause the currents in the feed-line conductors to be equal in magnitude and opposite in phase, resulting in a zero imbalance current. How well do the popular balun types do this?

One type of balun is known as a transformer-type balun or balun with A tertiary winding (Fig. 5) [*9]. This type is commonly used for providing single-ended to differential conversion for driving balanced mixers, push-pull amplifiers, and so on. It seems to be suitable for our purpose. An analysis of its operation (see Appendix 1) shows that it does indeed perform an unbalanced-to-balanced conversion. The voltages at the balanced port are caused to be equal, and opposite, in phase relative to the cold side of the unbalanced port. Thus, the use of this sort of balun will eliminate the problem of current flow on the outside of a line only if the antenna is perfectly balanced. There is nothing gained by forcing the voltages of the two antenna halves, whether balanced or not, to be equal and opposite relative to the cold side of the balun input (usually connected to the shield of a coaxial feed line), since the antenna field is proportional to the currents in the elements, not the voltages at the feed point. I will call this type of balun a voltage balun to emphasize that it

balances the output voltages regardless of load impedances.

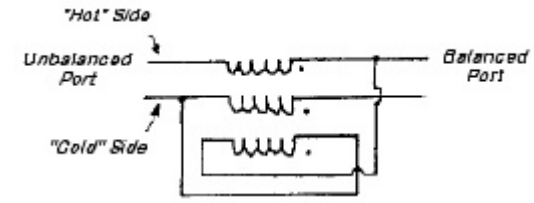


Fig. 5 — Voltage balun (see text) . The bottom winding is sometimes referred to as a tertiary winding. All windings are closely coupled.

Another type of balun that appears in the literature has been called a choke—type balun (Fig. 6) [*10]._ It resembles the voltage balun, except that the tertiary winding is missing. The analysis of both types of balun in Appendix 1 shows that the effect of a tertiary winding is not a minor one. The two types of baluns produce fundamentally different results. The voltage balun causes equal and opposite voltages to appear at the balanced port regardless of load impedances, but the second type of balun causes equal and opposite currents on the conductors at both ports for any load impedances. For this reason, I will call this type of balun a current balun. intuitively, the current balun produces the sort of effect we would expect. When wound with twisted pair or twin lead, it is nothing but a bifilar RF choke that impedes any net current which tries to flow through it. When wound with coaxial cable, it can be visualized as an RF choke acting only on the outside of the coaxial-cable shield, reducing the current to a very small value. This is the exact function a balun needs to accomplish when used in an antenna system.

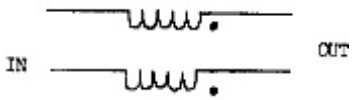


Fig. 6 –Current balun (see text). Both windings are closely coupled.

A current balun can be constructed by winding coaxial feed line into a coil, winding either type of feed line onto a core, or by stringing ferrite cores along either type of line [*11]. Even if the balun is mediocre, there will be no effect on the desired properties of the line itself (impedance, electrical length, SWR, and so on). A less-than-perfect voltage balun can have a profound effect on the impedance seen at its input because of the tertiary winding. Impedance-transforming (4:1) baluns are discussed in Appendix 3.

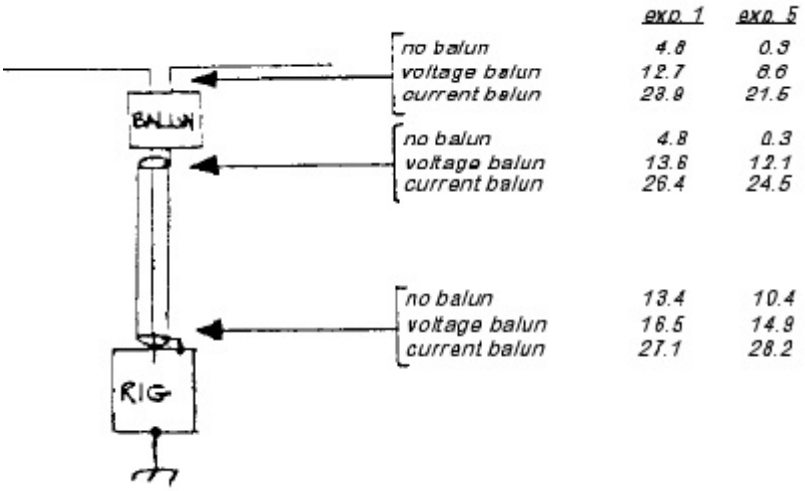


Fig. 8 – Setup and results of experiments 1 and 5. Numbers are measured

Experiments

A series of experiments was designed to test the validity of the results of the theoretical investigation. A 10-meter dipole was set about 12 feet above the ground, and about five feet above the edge of an elevated wooden deck (Fig. 7). One-half wavelength from the center of the dipole, a 4-foot rod was driven into the ground, which was completely saturated with water at the time the experiments were run (during November, in Oregon). To further lower ground-system impedance, six radials were placed on the ground around the ground rod. Two feed lines were cut to a half wavelength: one of RG-59/U coaxial cable, and one of 72-ohm transmitting twin lead. The velocity factors of the cables were not taken into account, since the intent was to have the outside of the coaxial cable, or the two parallel conductors of the twin lead, be an electrical half- wavelength long. A low-power 10-meter transmitter located at, and connected to, the ground system was used as a signal source. Current probes and baluns were built as de- scribed in Appendix 2. Two of the current probes were permanently wired into each side of the dipole near the feed point, and a third was used for all feed-line measurements. A single detector was used for all measurements, and it was calibrated over the range of encountered output levels by using a signal source and precision attenuator. The results of the experiment have been corrected to account for the measured nonlinearity of the detector.

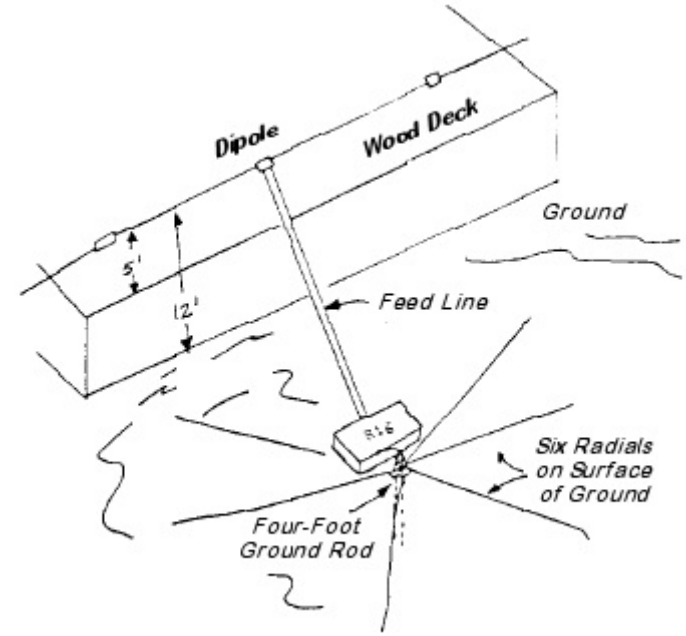


Fig 7. Experimental Setup

No attempt was made to keep the power level or impedance match constant from one test to another. When running an experiment with no balun, a current balun, and a voltage balun, the only variation in the system was to change the balun. Initially, the intent was to use the antenna current probe readings as a measure of current balance in the antenna halves. However, a case was encountered in which the antenna halves showed equal currents, but a large imbalance current was measured in the feed line at the antenna feed point - a seemingly impossible combination! (The equal antenna currents were even more suspicious because no balun was being used, and the antenna had intentionally been made

nonsymmetrical for that test.) A bit of thought provided the answer. The imbalance current is measured by placing the feed line through the current-probe toroid. In conjunction with the detector, it measures the magnitude of the vector sum of all currents flowing through the toroid. Each antenna current probe, with the detector, measures the magnitude of the current in each half of the antenna, at the feed point. What must be happening is that the currents in the dipole halves are equal in magnitude, but not 180 degrees out of phase. A check of the current-probe outputs with a good quality dual-channel oscilloscope confirmed the hypothesis: The currents were 230 degrees, rather than 180 degrees, apart, although equal in magnitude. What an interesting pattern that dipole would have! But this illustrates how misleading the magnitudes of element currents can be when judging balance. Measuring the imbalance current in the feed line at the feed point does, however, provide a good indication of the balance of the currents in the antenna halves. If the imbalance current is very small, the currents in the sides of the antenna must be nearly equal in magnitude and opposite in phase. A significant imbalance current, on the other hand, indicates that one or both conditions have not been met.

Measurement of the imbalance current on the feed line also indicates how much the feed line will radiate. The imbalance current at the rig provides a measure of RF in the shack. In the following tests, the magnitude of the current was measured in each conductor, then the magnitude of the imbalance current was measured by placing the complete feed line through the current-probe toroid. A single figure of merit, balance, was calculated as:

$$\text{balance (dB)} = 20 \log \left[\frac{\text{(average of magnitudes of currents in each conductor)}}{\text{(magnitude of imbalance current)}} \right].$$

Experiments 1 through 4 were done using a nominally symmetrical dipole, although results indicate that some asymmetry was present. For experiments 5 through 7, the dipole was intentionally made nonsymmetrical by lengthening one side by five inches, and shortening the other side by the same amount.

Experiments 1 and 5:
See Fig. 8. The dipole was symmetrical for experiment 1, nonsymmetrical for experiment 5.

Discussion
If the dipole balance (symmetry) were indeed perfect for experiment 1, we would expect the currents in the sides of the dipole to be unbalanced, resulting in imbalance current on the feed line. This is because the outside of the coaxial shield appears as a conductor in parallel with half of the dipole. Also, either a current or voltage balun should reduce the imbalance to zero. Since the feed line is placed symmetrically relative to the antenna, no additional current should be induced into the feed line, so the imbalance should also be quite small at the end of the line when either type of balun is used. With the nonsymmetrical dipole (experiment 5), we would expect the voltage balun to do worse than in experiment 1. We would also expect the current balun to do about the same, and the no-balun case to be considerably worse.

Results
In experiment 1, the voltage balun did not perform as well as the current balun, indicating some asymmetry in the dipole. At the frequency chosen, the small differences in connections and a slight tilt of the antenna could easily account for what happened. When no balun is used, a curious result is the much better balance at the rig end than at the antenna end of the feed line. This may be because the feed lines weren't exactly an effective half wavelength long, because there was a wire of about six inches in length connecting the rig to the ground system, or because the feed line was doubled back on itself for a short distance near the rig to provide strain relief. Perhaps the doubling back generated enough inductance to cause a current balun, or RF choking effect. The better balance at the rig end can be seen in the results of all experiments.

The no-balun result was worse with the non- symmetrical dipole than the symmetrical one, as expected, and the current balun did about the same in both cases. The voltage balun, although slightly worse with the nonsymmetrical antenna, was better than expected, but still definitely inferior to the current balun.

To be continued in the next edition

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SI Units and others

by Mike ZS5ML

SI Units were introduced to standardise units of measure between countries. Quoting from the "SI Guide" published by the International Organization for Standardization: *"ISO is the International Organization for standardization. It is made up of national standard institutes from countries large and small, industrialized and developing in all regions of the world. ISO develops voluntary technical standards which add value to all types of business operations. They contribute to making the development, manufacturing and supply of products and services more efficient, safer and clearer. They make trade between countries easier and fairer. ISO standards also serve to safeguard consumers, and users in general, of products and services – as well as to making their lives simpler."*

"What is the SI

SI denotes Systéme International d'Unités i.e. the International System of Units. The letters SI are used in all languages to denote this system. The SI is a system of units adopted by the highest international authority on units, i.e. the General Conference on Weights and Measures (Conferénce Général des Poids et Mesures, CGPM). It is founded on older metric systems, and has been designed to be suitable for use in every context – customary, technical, and scientific. The SI is built in such a way that only one unit is used for each kind of quantity. This makes the number of units less and the system becomes easier to learn and to use. The structure of the system also makes calculations easier. The benefits of the SI are most evident when its rules are applied consistently."

On 5th July 1974, our Government published Notice Number 4326 in the Government Gazette, making the use of SI in RSA mandatory. For some this was a difficult move, as it was difficult to suddenly think in minute milimeters instead of practical inches. Fortunately we had already progressed to the metric Rands and cents in our financial world. Europe had adopted these units without too much fuss, but England procrastinated, and America wasn't going to be dictated to and stuck to their own unique units with "stolen" names. Before we compare the different units, let's run through the basic SI units which we encounter regularly

length	metre	m
mass	kilogram	kg
time	second	s
electric current	ampere	A
thermodynamic temperature	kelvin	K
luminous intensity	candela	cd
amount of substance	mole	mol

The last two are not well known or used by the amateur radio fraternity

The above units are used in formulas for further derived quantities, and here are some examples:

energy	joule	J	1 J = 1 N*m = 1 Nm
pressure	pascal	Pa	1 Pa = 1 N/m^2 = 1 Nm^{-2}
power	watt	W	1 W = 1 J/s = 1 Js^{-1}
electric charge	coulomb	C	1 C = 1 A/s = 1 As^{-1}
electric potential	volt	V	1 V = 1 W/A = 1 WA^{-1}
electric resistance	ohm	Ω	1 Ω = 1 V/A = 1 VA^{-1}
electric conductance	siemens	S	1 S = 1/Ω = 1 $Ω^{-1}$
frequency	hertz	Hz	1 Hz = 1/λ = 1 $λ^{-1}$
inductance	henry	H	1 H = 1 Wb/A = 1 WbA^{-1} = 1 Ωs
capacitance	farad	F	1 F = 1 C/V = 1 CV^{-1}
force	newton	N	1 N = 1 kg*m/s^2 = 1 $kgms^{-2}$
magnetic flux	weber	Wb	1 Wb = 1 Vs
magnetic flux density	tesla	T	1 T = 1 Wb/m^2 = 1 Wbm^{-2}
thermodynamic (absolute) temperature	kelvin	K	1 K = 1 °C + 273.15

In spite of the metric system, other units are still being used by some of our old timers, and of course, the Americans. When the Americans set up their units, they used the British notations like gallons and barrels, but got the quantities "wrong" in many cases, and as such there is often confusion with their quantities. Let's list a few imperial conversions :

1 inch = 25.4 mm
1 statute mile = 1.609 km (8 / 5 km is often used)
1 nautical mile = 1.852 km
1 Fahrenheid [°F] = 1 °C * 9/5 + 32
1 Gallon (imperial) = 4.546 litres (10 pounds of water at 62 °F)
1 Gallon (US liquid) = 3.785 litres (231 cubic inches)
1 Gallon (US dry) = 4.405 litres (one eighth of a US Winchester bushel)
1 barrel (imperial) = 46 imp gal
1 barrel (US crude oil) = 42 US gal ≈35 imp gal
1 pint US (pt) = 473.1765ml
1 pint imperial = 468.26ml
1 quart US (qt) = 2 US pt = 946.35ml
1 quart imperial = 1136.52ml
1 pound = 0.45359237kg (1kg = 2.2lb)
1 ton imperial = 2240 pounds = 1016kg
1 ton US short = 2000 pounds = 907.2kg
1 ton metric = 1000kg

Confused yet? Now you can understand why we did not have American text books at university. Having some text books from the UK with imperial units and formulas was bad enough. Adding American units would have unnecessarily confused matters even further. They also can't agree with the English what a trillion or billion is...

RADIO AMATEURS TO TAKE TECHNOLOGY INTO SPACE

South African Radio Amateurs are set to join other amateur and university groups in the world to build and launch their own CubeSat. This was announced in a presentation at the recently held SA AMSAT Space Symposium in Durban, which was attended by MARC, HARC and DARC members.

The original CubeSat concept came about through a partnership between the California Polytechnique University in San Luis Obispo and Stanford University in Palo Alto, USA. Engineers at the two universities set out to develop a standardised space platform for academic satellite projects. It has since grown to become an international partnership of over 40 institutes that are developing Pico satellites containing scientific and amateur radio communication payloads.

With this many institutes participating in the CubeSat programme, the educational benefits are extensive. Students, through hands on work, are given the opportunity to develop the necessary skills and experience needed to succeed in industry after graduation. The CubeSat programme also benefits private firms and government by providing a low-cost way of flying payloads in space all while creating important educational opportunities for future leaders of industry.

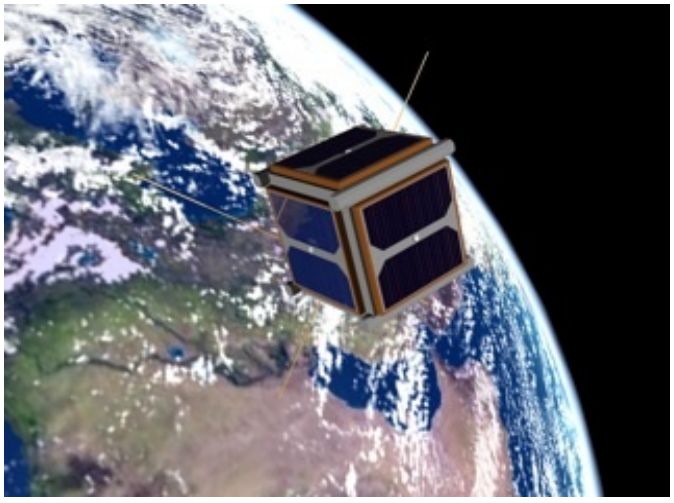
A standard CubeSat is a 10 cm cube with a mass of up to 1 kg. In recent times larger Pico satellites have been developed which are 2 or 3 CubeSat stacked on top of each other, referred as 2Uand 3U CubeSats.

A mission with a Mission

The planned SA AMSAT CubeSat will be single 10x10cm satellite with two payload objectives. The first objective is a mission with a Mission. The world has experienced a long solar minimum which means that ionospheric communication had been very limited and for a few years was almost exclusively the domain of the commercial broadcasters running Megawatts. HF radio communication is very susceptible to noise levels that are created by power lines, electrical installations and overhead lines used by trains and busses and power line telecommunication systems. If fact today there are many installation that do not necessarily comply with internationally agreed emission standards. With increasing solar activity interference signals are propagated over large areas and will interfere with HF communication. The important mission of the SA AMSAT CubeSat is to measure the High Frequency noise levels over South Africa and report these measurement back to a ground station for analysis and action to reduce these unwanted signals. The information from the tiny satellite will identify the areas where the HF frequency polluters are situated and will help "reducing or eliminating the source.The second payload will be amateur radio related and may include a 30 kHz linear transponder and an Automatic Packet Reporting System (APRS). APRS is a two-way tactical real-time digital communication system capable of sharing information about everything going on in a local area. APRS also supports global callsign-to-callsign messaging.

Another interesting payload being discussed is to evaluate the feasibility of using the earths magnetic field to facilitate the storage of energy as apposed to a battery. The principle involves rotating a coil (iron less armature) by applying solar cell energy with a current limiting source to the coil. The coil is mounted on suitable bearings such as magnetic bearings and allowed to rotate to high speed. The armature current is electronically switched to embrace the earths magnetic field and force rotation. Spinning at high velocity the armature will store energy. This energy can be obtained by again using the earth's magnetic field to induce current into the rotating armature coil.

The device will need a discrete rectifier and regulator to make it available for use. Quantity of energy stored referenced to wait, should be far greater than chemical batteries. The very long life time expected, from this device should improve the present power system.



A typical CubeSat in Orbit

RADIO AMATEUR, STUDENT AND LEARNER PARTICIPATION

The aim is to invite radio amateurs, students and learners to join the project and work on one or more of the aspects of the satellite. Interested person are invited to send details of their interest and experience to SA AMSAT with their email address and contact details. Regular email newsletters will be sent to those who register keeping them up-to-date and seeking their input and participation in the project.

The first two immediate tasks are to decide on a name for the project and secondly to make a decision on the payloads. When registering for the mailing list readers are invited to make suggestions for a project name and what payload they would like to see included.

In making payload suggestions, it must be borne in mind that the satellite is small, cannot weigh more than one kilogramme and will ultimately be placed in a polar obit around 550 km above the earth. This means that the satellite will be visible to South Africans, twice in the morning and twice at night roughly in the same time frame every day.

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Editor's Waffle

The AGM is around the corner, and there are some decisions needing to be made, most significantly being that of who you would like as your committee. When you vote, you will not only have to consider who you think will be best for the club, but whether the committee members will work well together as a team. Then there is the question of how you can help the club utilising your specific strengths and interests. Do you believe that the committee members should do the planning and organise the volunteers, or do you expect that they must do all the work themselves? What do you expect them to do if they get no help from the other club members? These are just some of many questions.

There are other items which we will have to address sometime in the not too distant future. In the last few years volunteers for certain events have declined, while moaning has been on the increase if nothing was done due to the lack of volunteers. The club has certain commitments, like providing comms for the Postnet race. Help is expected from us by race organisers, as it was part of the deal when we acquired the club house, at least as far as I have been led to understand. It is easy to blame the committee if not enough operators can be found. But then again, who is to blame if volunteers fail to turn up for such an event?

Times have changed, as have perceptions. It seems that nowadays you only need to do what you feel like doing, similar to the new upbringing I suppose - "don't discipline or spank kids - let them do what they want". Maybe the club needs to "advance" in this direction too??? Then again, I may be barking totally up the wrong tree. Each member has their own lives and commitments over and above the club, or should I say "before" the club, myself included, and possibly it is this scenario that should be addressed and by virtue of it, our involvement with, and commitment to, certain enterprises? Great things are being done in the club. There is technical advancement again with digital modes and D-Star, not forgetting the hard work which went into the switchable repeater network etc. Also, there is new growth in our club and hobby. So there is definite progress, and in light of this, the things listed above need to be re-evaluated.

Let's look at the support for our three racing events - The Capital Climb and the Postnet Race and the Comrades. In the last 3 years we have not been able to supply a full compliment of operators for these events. Obviously our members do not view these events important enough anymore to warrant supporting them. If so, why do we not consider handing these events over to Hamnet (Comrades is already being organised by Hamnet). The non Hamnet members in our club could still participate should they so wish. At least this way the races will not vital lose radio communication support. Thoughts, ideas, comments and solutions will be greatly appreciated!

Then, oh dear, dare I say it, there is the Sunday Morning Net. I can already hear you shout: "Don't dare and stop this!". And I ask you why not? What reason is there to keep it, and please, don't come with the excuse that there might be listeners out there? If licensed listeners don't have the decency to call in once in a while, then their loss will not be felt in any case. Using Mickey's term "it's like pulling hen's teeth" getting members to come on air in the mornings. It is very seldom that older members come up. Normally only the 2 to 5 regular "newer" members come up. To me this is a clear indication that the bulletin is no longer needed since it is, for the most part, certainly not being supported. The regular decline in numbers has been evident in the last number of years. Maybe we should get rid of this too, or possibly join up with our sister club in Durban? The phrase "Use it or loose it" comes to mind. Again, positive comments will be welcome.

The real question is whether we need the above for the club to survive? Probably not if you are realistic. The club and the hobby is once again growing in spite of the above. Maybe we need to focus more on this, and not so much on trying to revive dying events? Think about what you would like to participate in, be it the Sunday Morning Net, maybe a technical or other net in the evening, or day events during weekends and public holidays or something else. The club needs to move with the times, and your input and help is of utmost importance.

To finish, I really liked what Chris had to say about the approach their committee had in the mid 1980's: Complainers are expected to be part of the solution.

(Please note that the views of the Editor are not necessarily those of the club)

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Ah, The Good Old Days

by Gary Yerby (KS4XV) on April 4, 2010 (taken from : www.eham.net/articles)

Ah for the good old days! Yes we older hams long for the good old days. Days when every operator was kind, professional and abidded by standard operating practices. Days when building equipment was as much a part of ham radio as communications. Days when advancing up to the next class of licenses made you proud and may even gave you a little of the big head. But that was OK because it took a lot of work back then to upgrade.

The days of buying kits and staying in you shack for days soldering. But those days are slowly slipping away and we have to adjust to change. Some say technology is making our hobby obsolete. Not so as many disasters have shown how useful ham radio is. Most people don't understand ham radio and some of the people getting into it now don't either.

There is a lot of anamosity today from some of the older hams because it is so easy to get into the hobby now. I don't feel that way but understand why some do. I know most new hams don't learn the code but they don't realize what they are missing. It is great fun and good for DXing because it will go where voice wont with less power.

I think one difference today is a lot of people jump into ham radio with no help or mentoring. Back in our day most people had a ham to help them along. Clubs are good for this and when I was a kid we had a weekly show on our local PBS station that taught code, theory and operating practices on tv. I first got interested in ham radio in the late 50's but did not get my first ticket untill 1981.

Whatever the case may be the old days are gone and we old hams have to change with the times. But what should not change is good operating practices and it is up to us old guys to mentor the new hams on this and in a nice professonal way and not by talking down to them.

When I first started 30 years ago no matter how big of a mistake I made on air I was treated with respect when told of my mistake and corrected in a nice and professional way and this is how we should treat the new hams of today. I would hate to see ham radio go the way of CB because this would destroy the hobbie. So whenever you get a chance to help out a new ham do so in the way our mentors did years ago.

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If you have any useful articles for this newsletter, please email them to zs5ml@marc.org.za for publication. Any articles of interest to Amateur Radio, both technical and non technical, will be well received.

If you would like your own email address ending with @marc.org.za, please contact me.

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Ham Bulletin Readers

05 September - ZS5ML
12 September- ZS5PJ
19 September- ZS5CID
26 September- ZS5BGV

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Tailpiece

Every Friday evening after work old Van der Merwe would have a huge braai. But his neighbours, being Catholic were reluctant to eat meat on Fridays, and suffered agonies of temptation as the delicious aroma carried over.

They persuaded their priest to try to convert Van. The priest makes a breakthrough and eventually, Van attends Mass. The priest sprinkles holy water over him and says, "You were born a Protestant, raised a Protestant but now you are a Catholic."

Everyone was delighted.

But when next Friday night came along, the aroma of grilled steak again wafted over the neighbourhood. The neighbours called the priest who rushed on over just in time to see him clutching a small bottle of holy water and sprinkling it over the meat and chanting, "You was born a cow, you was raised as a cow, but now you is a snoek!"

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