

Zululand Amateur Radio Club News

The newsletter for the discerning Ham

August 2014

ZARC Committee

Chairman: Andrew Jansen ZS5AND

Vice Chairman: Warren Snyders ZS5WOZ

Treasurer: Willie Axford ZS5WI

Secretary: Dawn Snyders ZS5ME

Ham Net: Jo Snyders ZS5PO

Editor: Jo Snyders ZS5PO

Member: Anne Griffiths ZS5FAB

Member: Gerald Scrooby ZS5GS

Webmaster: Chantel

Club Repeaters

Ntumeni 145.675 MHz

Empangeni 145.700

Club Packet Digipeater/Mail-drop & APRS Digipeater

Ntumeni 144.625 (ZS5ZLB Mail, ZS5ZLB-2 Digipeat, ZS5ZLB-7 KA-Node) PBBS: ZS5AND

Club Nets

ZS5PO & ZS6AE Have A Sched On Thursdays Between 17:30 and 18:45
On 7.175 Or 3.645 Depending on propagation
ALL are more than welcome to join us for a "rag chew"

SARL News

08h30 - Sundays - 145.650, 7.066 MHz

NEXT ZARC MEETING

DATE: 12th October 2014 (**Sunday**)

TIME: Meeting will take place ± 13:30, after the customary Braai at 12:00

QTH: At Tattenham Resort on the R102 near Gingindhlovu

E-Mail: dawnjo@telkomsa.net (Secretary)

Club Web site: <http://zs5zlb.zs5and.co.za/>

Editor, Q.R.L.



Greetings & Salutations fellow members, I trust that this news letter finds you all in good health. The next club meeting will be on **12th October 2014**. The venue will be at Tattenham Resort. The meeting will take place at **± 13:30**. Please make a note in your day books and diaries. The time for the customary braai will be at **12:00**, giving everybody a chance to get there after Sunday morning commitments.

**Have you bought insurance to continue enjoying your hobby yet? SARL membership IS that insurance!!!
Is your hobby worth R1.09 per day to you? YES?! Then join the SARL, it's the RIGHT thing to do!!!**

The radical opinions, and rantings of the Editor, are not necessarily the opinions of, or supported by, the ZARC Committee, or it's members.

Wots Potting In The ZARC

Birthday Greetings Go To:



August: Anne, ZS5FAB, on the 2nd, Melissa, daughter of ZS5WOZ, on the 17th, Andrew, ZS5AND, on the 18th, Bridget, daughter of ZS5ME & ZS5PO, on the 20th.

September: Ian, spouse of Chris, ZS6RI, on the 12th, Chris, ZS6RI, on the 17th.

October: Willie, ZS5WI, on the 2nd, Mike, ZS5MB, on the 6th, Kiana, daughter of John, ZS5J, on the 31st.

December: Belinda, spouse of Warren, ZS5WOZ, on the 17th.

Many happy returns to all of you, and may you be spared for many more years.

(If your birthday wishes do not appear here, it is because you have not informed me of your birth date).

Get Well Soon



I have not heard of anyone who has been doctor bothering lately,

Club Happenings

At the AGM meeting, it was decided to bring the club subs **DOWN** for the 2014 – 2015 financial year. Subs for this year will be **R75.00** for SARL members, and **R85.00** for non-SARL members. The joining fee remains **R20.00**

PLEASE NOTE THAT SUBS ARE NOW DUE!! PLEASE PAY ASAP IF YOU HAVE NOT DONE SO YET!!

Account name	Z.A.R.C.
A/c number	602 194 201 50
A/C Type	Savings
Bank	FNB
Branch	Eshowe
Code	22 02 30

Please quote your call sign/s and first name in the reference section.

Please E-mail proof of payment to zs5wi@telkomsa.net.

SARL YL Sprint

During the SARL YL Sprint held on 9 August - only seven radio amateurs sent in logs, of which, five logs were from YLs, and the other two from OMs. Together they all made 144 QSOs.

1st Colette Rundle, ZS2CR, **117** Points

2nd Jenni Reilly, ZS4J, **100** points

3rd Dawn Snyders, ZS5ME, 97 points

4th Sheila Coleman, ZS5SC, **77** points

5th Kempton Park Amateur Radio Technical Society, ZS6KTS, **67** points (operated by Lucia Oliver, ZS6LO, and Ronel Rasul, ZS6RR)

6th Geoff Levey, ZS6C, and Keith Liddle, ZS6AGF, **18** points each

Winter QRP Contest

John ZS5J, took part in the Winter QRP contest held on 19th July, and entered in the Ultra Light portable field station category, and raked in 240 points, which netted him third position in that category. Congratulations John, very well done. I also hear a rumor that John will be taking part in a DX-pedition to Botswana during September. Hope you have a brilliant time John!!

Packet

On the packet Mail-Drop scene. The TNC is beaconing out. The coax on this set-up still has to be renewed, and the antenna moved to the east side of the tower

APRS

Your path to any stations in RSA, (or anywhere in the world via the I-Gate on 144.625) will be **ZS5ZLB-2, RELAY4-4**. The I-Gate should be available between the hours of about **09:00** and **22:00**, WHEN I AM AT HOME. People in the Richards Bay/Empangeni area can get into the PMB I-Gate on 144.800.

For those of you Zululanders who have Internet, go and look on the www.aprs.fi web site, and type your call sign into the slot at the top of the column on the right, and press search, and see if your station appears on the map.

Repeaters

145.675: This repeater was replaced after the Xmas meeting & lunch, and the old Storno is working well.

145.700: This repeater is now a DEAD puppy, and needs LOTS of TLC. STILL waiting for ESKOM to open up for us to get into this site.

“SWAP SHOP”



If you have any items you want to get rid of, or if you are looking for something, Please let the Editor know and he will advertise it in the swap column for you.

1 X **Neutec SM-1645** 16 channel 2Mtr VHF radio for sale.
Service, user and reprogramming instruction manuals available.
Reason for selling: Surplus to requirements
Please contact Gerald, ZS5GS on: **071-143 5433**



NB This picture of the radio was found on the internet, and is NOT a picture taken of the actual radio that is for sale

Please contact me if you are looking for a **Hy-Gain TH-MK4** beam antenna, The price being asked is **R4500**, and this one is in very good condition. Brand new they go for around **R9500**.

Home Brewers Hoekie



The Real SWR Pages

Used with the kind permission of Stephen C Ward WC7I www.wc7i.com

This article was written in two parts.

Part 1. Where the energy goes in an antenna system, will a high SWR blow up my transmitter??
(NO, it will not, but POOR TUNING can)

PART 2. Antenna SWR Should NOT measure 1:1 in simple antennas!!

Although this article was written in two parts, it has been serialised by the Editor, over four news letters, as it is too large to be placed in one news letter.

EPISODE 2

The antenna tuner can not change the SWR of your antenna, or its coax, so you will need to follow these 7 steps to see what actually happens with a higher SWR than the SWR meter in coax #1 says is there. The SWR meter is reporting on that very short connection between the tuner and the rig, **not the coax that goes between the tuner and the antenna**, but that is "where the action is."

There are 7 things you need to know. First, I will list the 7 things, and then each one will be explained in detail.

The reason this following information is not well known is because most people do not take the time to understand each step that follows.

Each step is easy if you go slow and draw things out on paper. You will gain quite a lot of understanding of what really happens to a signal in a coax if you go slow, and have patience. **Do not read quickly.** Do not continue on if even one little thing is not clear to you. You will be proud of yourself if you learn this.

- 1) Reflections happen at the coax - antenna connection and **they also happen at the coax - tuner connection.** The last part of this statement seems to be missing from most discussions of SWR and mis-matched conditions. This is why a lot of people think that reflected power gets into the radio and does damage. **That does not happen!**
What does kill radios is at the bottom of this page!
- 2) These reflections do not cause energy loss. **All losses are due to the coax itself.**
- 3) Energy moving backwards in the coax is subject to the exact same losses as energy moving in the forward direction.
- 4) The amount of energy reflected at the coax - antenna connection depends on the amount of impedance mis-match (read SWR) between the antenna and the coax. The greater the mis-match, the greater the reflection.
- 5) The amount of energy re-reflected at the coax - tuner connection is 100% of the energy that gets there, but not all the energy that was originally reflected gets back to the coax - tuner connection. **There will be losses in the coax.** All the reflected energy that reaches the coax - tuner connection is re-reflected back into the coax headed for the antenna. (Yup, another lossy trip in the coax.)
- 6) The re-reflected energy will be in phase with the generator so the two signals will add. This can create more forward power in the coax than the transmitter is actually producing. It is possible to measure 125 Watts forward power from a 100 Watt transmitter because the re-reflected power adds to the transmitter power.
- 7) Coax losses are the only losses in the whole system. These losses can be significant, but they are the **ONLY** losses in the antenna system. If you have been paying attention, you know that this last step is just a re-statement of other steps above.
Here come the details! Do not skip this section. It is full of math, but you can do it. Use a calculator that has X² and square root functions.

- 1) Reflections happen at the coax - antenna connection, and again at the coax - tuner connection. This means that energy will zoom up the coax between the antenna and the tuner and some of it will return down the coax. The "lost" energy is both lost in the coax, and radiated out into space by the antenna.

Another detail must be introduced here. Every time the signal is reflected (or re-reflected) a 180 degree phase shift happens to the current. This means that the current turns around and goes the other way, and it also turns upside down. Both things happen at the reflection points.

Let me say this again. In the case where the impedance of the antenna is greater than the impedance of the coax, [$Z_{\text{Antenna}} > Z_{\text{coax}}$] the reflected voltage will just turn around and go in the other direction, but the reflected current will become upside down as it also travels in reverse. This means that the forward voltage and reverse voltage are in phase with each other, but the forward current and reflected current are 180 degrees out of phase with each other. When the reverse (and upside down) current reaches the tuner, another 180 degree phase reversal and direction change will happen.

Now the re-reflected current is back in phase with the generator current, and the forward and reverse voltage are also in phase. This phase reversal is a good thing because it allows the forward and reverse current to ADD together when the

re-reflection happens at the tuner.

Try drawing a picture of this. Be patient. Go slow.

2) These reflections do not cause energy loss.

Energy losses are caused by heating ($I^2 * R$) or radiation, but not by reflection. The law of conservation of energy tells us that what ever goes into a reflection will come out if there is no radiation and no heating.

3) Energy moving in a coax will have losses due to leakage and ($I^2 * R$) heating.

These losses are well documented by the companies that make the coax. One of my favorite places to find the losses in different kinds of coax is <http://www.kc7hxc.us/links/radio/Coax%20Calc/Coax%20Calculator.html> They have a calculator that will help you convert the dB losses into actual Watts for a better understanding of what is happening.

Follow the zig - zag path of power!

Here is an example of a typical coax with its typical loss in an antenna system with a SWR of 1.4 to 1. Go to the web site listed directly above and scroll down to the calculator. Press the little "down arrow" and pick Belden 9913 (RG-8). It is a high quality coax used by many amateurs. Do not change anything else yet. When you have chosen the Belden 9913 coax, press the "calculate" button.

Do it now.

If you have done this correctly, the calculator will tell you that Belden 9913 has a dB loss of only 0.388 dB and that calculates out to 91.461 Watts output from the coax if you put 100 Watts in to it.

Where did the rest of that power go?

It was lost to leakage inside the coax and to ($I^2 * R$) heating.

4) How much of that 91.461 Watts will be used by the antenna and how much will be reflected?

The reflection coefficient is a number that tells you the percentage of reflection at the antenna - coax connection. The symbol "p" is used to represent this reflection coefficient. The math is easy to do.

$$p = (SWR - 1) / (SWR + 1)$$

We started by assuming that the SWR is 1.4 to 1. Use that 1.4 value to fill in the formula.

$$p = (1.4 - 1) / (1.4 + 1) = 0.4 / 2.4 = 0.166$$

The reflection coefficient is used for voltage, current, and when squared, it is used for power.

Since the reflection coefficient is 0.166 in this example, the voltage reflected will be 16.6% of what arrives from the generator, and the current reflected will also be 16.6% of what arrives from the generator. The power that is reflected will be the **square of the reflection coefficient**.

To find out how much power is reflected, you will need to use the following formula.

Reflected Power = p^2 times the Power available

Reflected Power = $(.166)^2$ times 91.461 Watts.

Reflected Power = (0.02775) Times 91.461 Watts

Reflected Power = 2.54 Watts

This means that 2.54 Watts of the forward power will be reflected back down the coax toward the tuner, and the rest (91.461 W - 2.54 W = 88.921 Watts) 88.921 Watts will be used by the antenna and be radiated into space.

Try drawing a picture of this. Be patient. Go slow.

Is it break time yet?

The power that reached the coax - antenna connection was 91.461 Watts and 97.25% of that power will be radiated into space, leaving 2.75% to be reflected back down the coax. Both of these percentages come from the Reflection Coefficient that has been squared.

(Reflection Coefficient)² = $(0.166)^2 = .0275$, which means that 2.75 % will be reflected.

Power used by the antenna = 100% - 2.75 % = 97.25%

How much power will be radiated by the antenna?

The antenna will radiate 88.921 Watts into space.

This number will get slightly larger after the reflected power is returned to the antenna, but for now, during the **first cycle**, only 88.921 Watts are transmitted.

How much power is headed toward the tuner?

Only 91.461 Watts was available at the antenna - coax connection, and 2.75 percent of that will be reflected back down the coax toward the tuner.

(91.461 Watts times 2.75% = 2.54 Watts) 2.54 Watts will be returned to the coax to go back to the tuner.

How much power gets to the tuner? <http://www.ocarc.ca/coax.htm>

We must use the calculator again. Put 2.54 Watts in the place of the 100 Watts just above the "calculate" button. Press the "calculate" button.

Do it now please.

Notice that 2.323 Watts gets to the tuner and the rest was lost to heat and leakage.

5) How much power is re-reflected at the tuner?

100 % of the reflected power that gets to the tuner will be re-reflected. In this case, the power that is re-reflected is 2.323 Watts. This 2.323 Watts now starts its way back to the antenna.

6) The re-reflected energy will be in phase with the generator so the two signals will add. [Note: If the two signals were not exactly in phase, the addition still happens, but the method is messy, and the result is not the same. This would be the case if the antenna was not exactly tuned to the operating frequency as it is in this example or if an antenna tuner was not correctly adjusted.]

The generator is producing 100 Watts and now it will have an additional 2.323 Watts added to it, for a total of 102.323 Watts heading for the antenna.

- **This is the official end of the first cycle of the generator.** This first cycle started with a 100 Watt signal leaving the generator, but only 88.921 Watts was transmitted. The total loss so far due to heating and leakage was (100W - 91.46 W = 8.55W) 8.55 Watts on the trip up to the antenna, and (2.54 W - 2.32 W = 0.217 W) 0.217 Watts loss on the way back down the coax. This makes a total of (8.55 W + 0.217 W = 8.76 W) 8.76 Watts actually lost in the form of heat and leakage. There are still 2.32 Watts stored in the coax(and tuner) about to be added to the generator power. All the power is accounted for. This is important because it helps you realize this explanation is correct.

To Be Continued



If you would like to contribute to your Club newsletter, or to contact me for any reason, please use the address / Phone numbers below.

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