The Repeater

Next Club Meeting
Thursday,
April 7, 2016, 7:00 PM

Red Cross Building,
60 Hawthorne St., Medford, OR
Across from Hawthorne Park

Program: Precision Surplus Frequency and Time References and Demo

Volume 2016, Issue 4 **April 2016**

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Club Web Page:			http://w7dta.org	

President's Report

Another month has flown by and spring has sprung! We are nearing summer and plans are being made for the club's annual outing.

My President's letter will be brief. All I can say is Field Day, Field Day, Field Day.

Our next meeting will be focused on this upcoming event. Please put some thought into what you can do to help out.

Also, the April presentation by Tom and Mike should be very interesting, enough that last month's QST had an article on the very subject! I'm looking forward it!

Scott, NA7OM

The Repeater is the official newsletter of the Rogue Valley Amateur Radio Club, Inc. It is published 10 times a year—once per month excluding July and August.

Secretary's Report

RVARC - Minutes for MARCH 3, 2016

The meeting was called to order at 1905PDT by Scott Cummings, NA7OM in the meeting room of the Red Cross building in Medford, OR.

Visitors included:

- Doug Ferrell, KF5LTQ
- Jim Brendle, KG7JUO
- Darrell Barker, KE7FNV

Treasurer's report

Bob Deuel, K2GLO, reported a balance of $3400.91 in the club treasury. There was no activity in the last month.

Old Business

There was another brief discussion about the estate of Ed Vaughn, K7YLO. The possibility of moving the club's annual swap meet to an earlier date, or even conducting two

(Continued on page 2)

President's Report, Continued

Secretary's Report, Continued

swap meets this year were considered. Alternate options included taking some of the estate equipment to the Northwestern Division Convention in Seaside, OR in June.

New Business

Don Bennett, KG7BP announced there were 8 new Technicians from the last exam session. Additionally, there were 4 General, and 2 Extra class upgrades.

Tom, N5EG stated that some members did not receive the latest newsletter by email. Therefore Tom has been working to update the email list. Any further problems or updates need to be brought to Tom's attention.

Jim Brendle, KG7JUO, spoke about an upcoming race, which goes 219 miles from Applegate Lake to Brookings in June. He is looking for people to help with radio communications, which is critical to keeping track of the runners. Anyone interested in assisting Jim should contact him.

The meeting was put on hold at 1915 PDT for "eyeball QSOs" and coffee. The meeting was called back into session at 2000 PDT.

Presentation

Another very interesting presentation was given by Lud Sibley, KB2EVN, on unique and significant vacuum tubes. Lud gave us a look inside the early tube industry practices and tactics. He discussed subjects such as the odd 7-pin base tube and miniature tubes, as well as Metal cased tubes. Lud also passed around many samples, including some Russian-made tubes that were remarkably similar to American tubes.

The meeting was adjourned at 2035 PDT

Submitted by Carl VanOrden, W7BRO Secretary

This Month's Programs

Precision Surplus Frequency and Time References

Program: Mike Bach, WB6FFC and Tom McDermott, N5EG will tag-team a demonstration and discussion on high accuracy time and frequency references. Some inexpensive surplus references will be shown, including an oscilloscope display of phase wander between sources. Also discussed will be what frequency stability means and a bit of history of time keeping and measurement.

Biography: Mike has extensive experience in RF power amplifier design, development, and test. Mike is an Applications Engineer for Kathrein/Scala. He worked for many years as an Advanced Product Engineer at EIMAC in Vacuum Tube and amplifier production and test.

Tom McDermott, N5EG, is the RVARC newsletter editor. He owns a surplus GPS Disciplined crystal oscillator, and a surplus CDMA2000 stabilized rubidium oscillator. He has developed a badly performing test setup to measure oscillator stability. He is not quite a time nut.

Simple (?) End Fed Antennas

Often new hams will start out with as simple and unobtrusive an antenna as they can find. Unfortunately in many cases this leads to poor results, RFI, and perhaps a lot of frustration. A simple dipole usually has reasonable performance and is relatively insensitive to it's immediate surroundings, but seems difficult to install in many situations.

One antenna that appears to be simple to install is the end-fed wire. One end of the antenna can be right outside the hamshack, and the other end tucked into a tree or somewhere barely visible. So the antenna is installed.

Then the end fed antenna starts to spring it's long list of *gotchas* on the poor unsuspecting ham. The antenna can be made to work if one is either very lucky, or else follows a careful set of requirements that turn out to be far more involved than just putting up the dipole in the first place.

Let's look at some of the issues with the end fed antenna.

Any antenna is composed to two halves. You can pretend that only one half is needed, but actual physics gets in the way, and physics ALWAYS wins. No matter what.

One common approach is to neglect ground completely, and connect the center conductor of the feedline from your transmitter to the end fed wire. Simple, we just don't even hook up the shield of the coax to anything. How can there be a second half to the antenna? In this case, currents can flow on the outside of the coaxial cable. Where do they come from? The current inside the coax contains a portion on the center conductor, and an exactly equal and opposite current on the inside of the shield. Wait, the shield isn't hooked to anything, how can current flow into it? What happens is the current on the inside hits the end of the cable, and turns around and flows on the outside of the coaxial cable braid. Yes, there are two separate currents on the shield. You can actually measure them independently. See Figure 1.

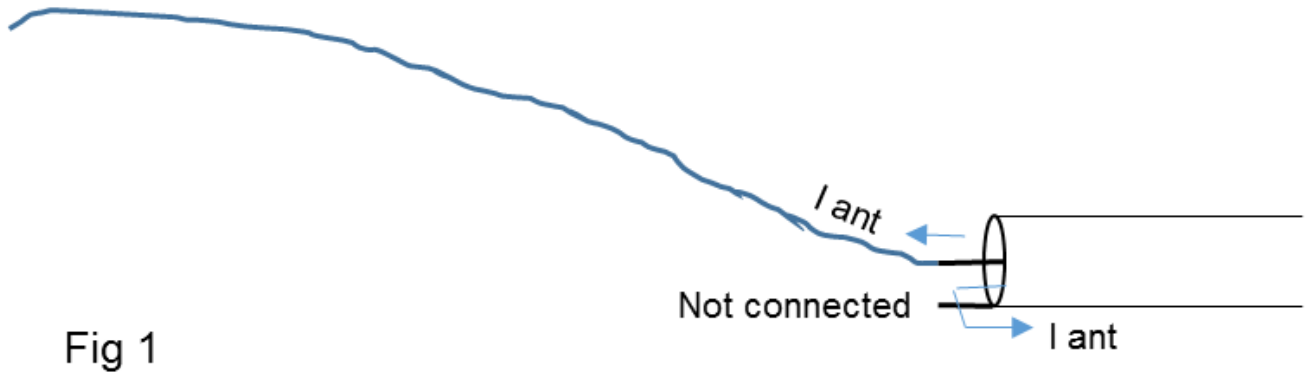

Fig 1

The current on the outside of the coax doesn't affect the current on the inside of the shield — they're completely separate. The velocity of propagation is even different for the two currents as well, about 0.66c (c = speed of light) for the inside current, and about 0.95c for the outside current.

So now we have the second half of our long-wire antenna, it's the outside of the coax shield (we have a dipole, it just isn't apparent). We run this cable to our transmitter where we screw the PL259 connector into our transceiver chassis. Hmmm, that means we just connected the high-voltage end of the second antenna wire right to our transceiver chassis! Yikes, that's terrible for the antenna radiation pattern, brings all the transmit RF indoors and places it on the radio chassis, and worst of all puts high RF

voltage right on the transceiver chassis. When you touch the MIC or chassis, you can get an nasty RF burn because you are in fact touching the high-voltage part of one of the (two) antenna wires.

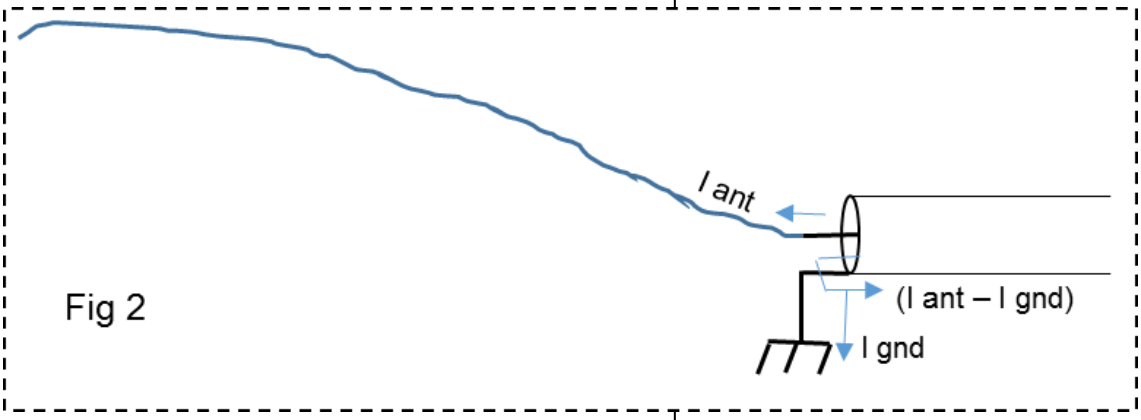

Fig 2

Further, it's likely the most effective way possible to induce RFI into our radio, microphone, or almost anything else nearby. If you wanted to intentionally cause the worst possible RFI, this is exactly the design that you would pick to create the problem.

The answer? A balun (!?!) Yeah, that's the ticket. Let's just put a balun at the end of the coax to choke off the shield currents. Hmm, we only have one wire to hook to it. How much choking impedance must the balun have to look higher Z than no wire at all? More than we can ever wind onto a core. The RF still travels back our coax cable shield (where else can it go?). Current through the balun plus high-Z balun = high core dissipation, and maybe high RF voltages. Our balun core quickly fractures, or else the wires inside it arc over. Either way our balun is destroyed.

OK, so let's make things a little better, we'll connect a ground rod and wire to the end of the coax cable right next to where it hooks to the end fed wire. That means of course the end of the antenna wire is right down near ground level, not up in the air where we want it. A typical ground rod is about 25 ohms resistance at 60 Hertz, and probably 25-50 ohms at RF. At RF there may also be interconnect inductance as well. We might get some current to flow in that ground, it would depend on how long our coaxial cable was. If the cable was short, then much of the current is still going to flow back on the shield of the coax, and perhaps only a portion of the current will flow into our ground rod. If much of the current flows into the coax braid, we haven't done anything to fix the problem. Good luck, feedline length, equipment chassis bonding, operating frequency, etc. determine how much shield current flows. It's almost completely unpredictable. The antenna might work or it might not,

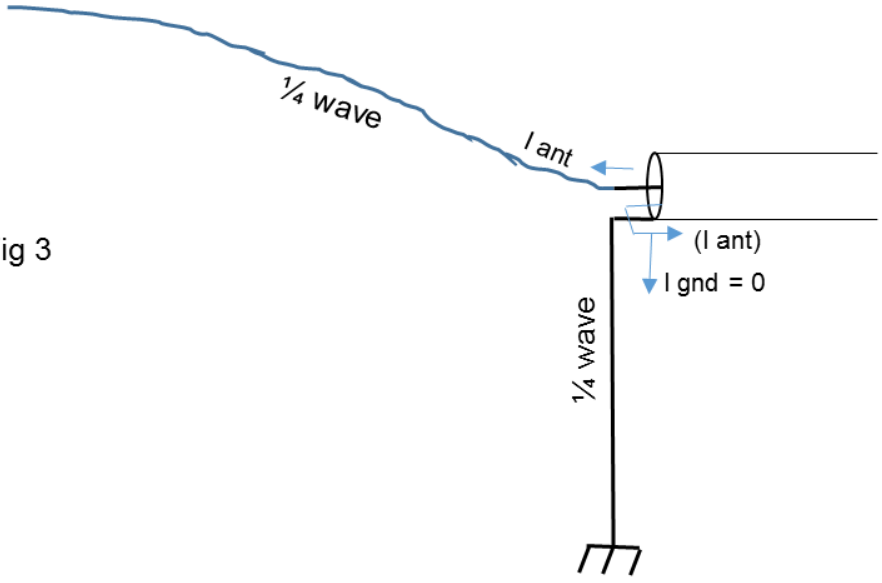

Fig 3

and there's little to explain why. It's magic, not science. See Figure 2.

If we could just reduce the resistance and connection inductance of the ground rod, more of the current would flow there rather than back onto our coax. We could add a bunch of radial wires to the ground rod. That would reduce the RF resistance. Even better, we would try to tilt the far end of the antenna wire up vertically were it will do us some good. We've just invented the ground mounted vertical plus ground plane.

So on to a different fix, we want the end of the end fed wire up in the air where it will do us some good, so we run the coax up there to the end point, and also run a long wire down to our ground rod. Here's where strange things start to happen.

If that wire is 1/4 wave long (i.e. 33 feet at 40 meters), and it's grounded at the bottom end, then it looks like a high RF impedance up in the air where we bring the coax, end fed wire and ground wire all together. How much current flows into a high impedance? Not very much. See Figure 3.

If we just disconnected that ground wire from the ground rod, it would be high impedance, 1/4 wave up in the air it would look like a low impedance, and our antenna current would want to flow into that wire rather than the outside shield of our coax cable. By this point we've actually constructed a real dipole! Bent up kind of strange, with one leg vertical, and one horizontal, but it's a dipole. See Figure 4

Even better, we can straighten out that vertical wire and make it horizontal, now we have a for-real dipole. And the current on the coaxial cable braid starts to reduce if we make the length of that second wire 1/4 wave, and run the coax cable vertical, perpendicular to the new 1/4 wave wire (the second half of the dipole).

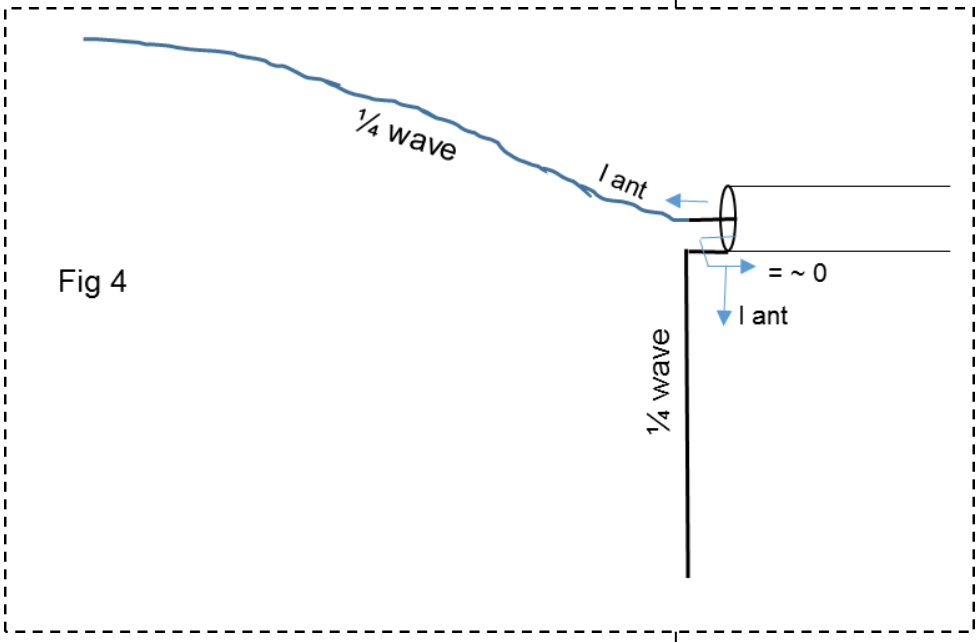

Fig 4

In figure 4 we see that the coax current is only approximately zero, due to coupling and finite impedances, there will be some current. We can reduce that current to near zero by adding a feedline choke (a 1:1 common mode current balun) to the antenna feedpoint.

Strange — in our journey to make an end-fed wire work well and reduce the problems of RFI in the shack and RF bites and burns, we end up converting it to either a vertical plus ground plane, or a horizontal dipole.

April 2016

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5 • Women Hams Net	6	7 • **RVARC Meeting** • Women Hams Net • ARES Net	8	9
10	11	12 • Women Hams Net	13	14 • Women Hams Net • ARES Net.	15	16
17 • ARRL Rookie Roundup	18	19 • Women Hams Net	20	21 • **RVARC Newsletter Deadline** • Women Hams Net • ARES Net.	22	23
24	25	26 • Women Hams Net	27	28 • Women Hams Net • ARES Net.	29	30 • Florida QSO Party

Events

- Thursday April 7th - 7:00 PM RVARC Club Meeting
- Tuesdays & Thursdays 7:00 PM—Women Hams Net K7RVM Repeater 147.000 (+) [PL 123.0]
- Thursdays 7:30 PM - ARES Net. K7RVM repeater 147.000 (+) [PL 123.0]
- Next Newsletter: May Issue. Deadline for input: April 21st.
- Apr 17: ARRL Rookie Roundup http://www.arrl.org/rookie-roundup
- Apr 30—May 1: Florida QSO Party http://www.floridaqsoparty.org/rules.html

RVARC Membership

RVARC membership dues run from January 1 through December 31. Please bring cash or a check payable to RVARC to a club meeting, or mail (checks only) to:

RVARC Membership
c/o 1058 Linda Ave.
Ashland OR 97520

Regular Member:	$20.00
Senior Member (62 and over):	$15.00
Family Member:	$20.00
Student Member:	$10.00

For Sale

2016 Amateur Radio Examinations

In the Rogue Valley, amateur radio exams are provided by the RVARC and the SOARC. New exam participants need to provide identification, while upgrading amateurs need to **provide a copy of their current license** as well as show identification. The exam fee for 2015 remains $15.00. All license candidates must provide a picture ID. Upgrading amateurs must also provide a photocopy of their current license to send in with their application. To search for other exam locations, see:
http://www.arrl.org/arrlvec/examsearch.phtml or our club webpage: http://w7dta.org

Medford—Phoenix, OR

Time: Saturdays, Registration 8:30 AM. Exam session at 9:00 AM. Walk-ins welcome.
Location: Fire District 5 HQ. 5811 South Pacific Highway, Phoenix, Oregon 97535
Dates 2016: Jun 18 Oct 29
Contact: Don Bennett, Email: kg7bp@rfwarrior.com Phone: (541) 973-3625

Grants Pass

Time: Fridays Registration 6:00 PM. Exam session at 6:30 PM. Walk-ins welcome.
Location: Fruitdale Grange. 1440 Parkdale Dr., Grants Pass OR 97527-5288
Dates 2016: May 20 Aug 19 Nov 18
Contact: John Stubbe, K7VSU, email: jstubbe7@gmail.com Phone: (541) 218-2244

Roseburg, Bend, Redding, Brookings, Crescent City — Please see our club webpage, http://w7dta.org for updates as we receive schedules for these cities.

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