

# THE DUMMY LOAD

Official Bulletin of The Cambridge A.R.C. (Swarc Inc)  
*-serving the community since 1964*

## Club Executive

### President

Dave Lott VE3BHZ  
51 Lincoln Ave Cambridge On N1R 4W6  
621 4396

### Vice President

Scott Buell VE3ANT  
15 Woodland Dr Cambridge On N1R 2X7  
623 4924

### Treasurer

Fraser Cooper VE3FC  
336 Kitchener Rd Cambridge On N3H 1A6  
650 0342

### Secretary

Gerry Allen VE3NXV  
100 Gordon St Cambridge On N1S 4K8  
623 4494

### Bulletin Editor

Dave Lott VE3BHZ

### Member at Large and Club Historian

Mike Pap VA3MP  
80 Attwood Dr Cambridge On N1T 1L4  
624 1120

### Call Custodians

#### VE3SWA

Fraser Cooper VE3FC  
336 Kitchener Rd Cambridge On N3H 1A6  
650 0342

#### VE3SWR

Tom Franks VE3MAH  
264 Fearnwood St Cambridge On N3C 3W9  
658 1462

### Past President

Clarence Fatt VA3CF  
290 Golf Course Rd Conestoga On N0B 1N0  
664 3859

## Meetings

Meetings held at 8:00pm on the second Monday of each month, Board Room Preston Arena (Bishop St at Hamilton St) No meetings in July or August. Visitors always welcome.

## Club Net

on the  
VE3SWR repeater 146.790 Mhz  
every Wednesday  
at 2100R

Issue No. 112 Dec 2010



**VE3SWA  
DXCC HONOR ROLL  
(332/332)  
WAZ, WAC, WAS.**

## Next Meetings

**Mon Dec 13th 2010**

**Mon Jan 10th 2011**

**Mon Feb 14th 2011**

**Mon Mar**

**usual location and time**

## CLUB NEWS

Reasonably good attendance for our November meeting with 10 members seated at the tables as follows : VA3CBE Calvin, VA3MP Mike, VA3QF Keith, VE3ANT Scott, VE3BGG Bert, VE3BHZ Dave, VE3FC Fraser, VE3IHM Hugh, VE3NXV Gerry and VE3USP Steve. Secretary Gerry read the minutes of the

October meeting and these were accepted as read, Treasurer Fraser then gave us a brief financial report indicating we are still very well in the black, this report was also accepted as read.. In the matter of old business a long discussion took place on the merits of various portable antennae for Fox Hunting. Keith showed us a collapsible portable 2 element yagi and demonstrated the ease of use. Fraser added 1 element and produced a 3 element yagi constructed from coat hangars. This was followed by more talk on Fox Hunting and indicated a desire by many present to have this activity arranged for the spring. Talk of the RAC Winter Contest Dec 18th followed and Calvin, Mike, Steve and Dave indicated willingness to participate. USP Steve went home with \$8.50 more than he arrived with. The question was raised about Robin's absence from not only the meeting but also morning Old Fogeys net. **As you all now know, Robin was laid low with Flesh Eating disease on Nov 1st and was in the ICU at Cambridge Memorial Hospital until Nov 22nd when he was moved to Room 480, on the surgery recovery floor. He is in for a long recovery time and has had to resign from his ARES duties.**

## PLASMA PHYSICS FOR THE RADIO AMATEUR, PART VI

### The Bigger Picture

*By Eric Nichols, KL7AJ*

It's always difficult to know when or how to end an article like this. Six parts is a nice round number, though in Roman numerals, V seems "cleaner." On the other hand, there's really no need to end it at all, as new information comes out almost continually. But six sections seems at least a good point to take a break and allow my rapt readers some time for rumination, cogitation, and consideration.

The question arises, fairly enough, as to why scientists even CARE about the ionosphere. One reader asked something like this. "Even if a lot of hams COULD get some good scientific information about the ionosphere after all these years, what would anyone DO with it?"

Let me address two quite different aspects of this. At the beginning we mentioned that most of the Universe is plasma. The ionosphere is in a unique position of being right in our back yard, cosmologically speaking, but far enough away to POSSIBLY be representative of the universe as a whole. It's a nearly ideal laboratory for exploring astronomical phenomena and disciplines such as MHD (magnetohydrodynamics), and even heavy particle physics. We can "ping" the ionosphere for information in ways we could never hope to interact with more distant objects. Several planets have something resembling an ionosphere. It's probably safe to say that if there are planets around other stars, they could, likewise have ionospheres. We see Nebulae and other deep space clouds from huge distances. We can (almost) get right up close and personal with our ionosphere.

For a lot of us, sheer curiosity about the universe is enough reason to get up in the morning. Sadly, there are a few amongst us...even radio amateurs, shockingly enough, for whom that, in itself, is no motivation whatsoever. We must both pity and accommodate those artless souls. To accommodate such pragmatic folks, let's address the second major point.

Since its very beginning, the study of plasma physics has been closely tied with the prospect of sustainable nuclear fusion. Now the pursuit of this Holy Grail has obviously led to a lot of other interests, and even entire industries. Nowadays, just about everyone knows what a plasma is, even if it's only a component of their home entertainment system. Or, at least they THINK they know what a plasma is. The term sounds cool, anyway. We have plasma cutting torches, plasma sputtering and other manufacturing processes, and compact fluorescent lamps. All of these are familiar detours along the way to the REAL prize, nuclear fusion. A small number of scientists and visionaries have NOT been so distracted by the mundane.

One of the big problems in achieving sustained nuclear fusion is the confinement of plasma...without a container.

Containers are bad for a number of reasons, not the least of which is that the container would summarily evaporate upon the successful ignition of the desired plasma. So it's a lot better to start out without the container in the first place. How can one keep a plasma in a stable state without a can? The ionosphere is the closest thing we have to a containerless plasma. The more we know about what keeps it stable...as well as what factors disrupt this stability...the closer we will be to obtaining nuclear fusion...in a form we can actually USE.

Now, this is a gross oversimplification of the matter. But it does show that we have a very vested interest as human beings in understanding what makes the ionosphere work. Big science is expensive. Building fusion reactors is expensive. Building particle accelerators is expensive.

By comparison, ionospheric research is dirt cheap. And we can learn a lot of the same stuff. The ionosphere has the potential to act as a huge particle detector. It's likely that a lot of the exotic particles we are trying to

create at great expense in the world's atom smashers already exist in the wild...they're just rare. But the ionosphere is BIG enough that it has a much larger chance of encountering such curious entities, and potentially allowing us to identify them. But to spot something that's UNUSUAL, requires that we have a really good grasp on what's NORMAL.

Wouldn't it be "The Bomb" if you could confirm the existence of a Magnetic Monopole, the so-called "God Particle" in your own back yard with your ham radio station? This is the stuff of Nobel Prizes. And it's not out of the realm of the possible.

Or you can get on 75 meters and talk to another ham across town about your prostate surgery.

The choice is yours.

## **UPCOMING DXPEDITIONS**

DEC 2 - DEC 9  
CHATHAM ISLAND  
JF1OCQ/ZL7  
All bands & modes

DEC 5 - DEC 19  
NORFOLK ISLAND  
VK9NN  
All bands & modes  
QSL LOTW or PA3LEO

DEC 19 - JAN 7  
SIERRA LEONE  
9L  
Small op by G7BXU  
QSL info not available

DEC 21 - JAN 23  
TEMOTU  
H40FN by DK9FN  
H40FK by DG1FK  
All bands and modes  
QSL H40FN via HA8FW  
QSL H40FK via DG1FK

JAN 6 - JAN 24  
SPRATLEY ISLANDS  
DX0DX  
Large scale operation  
QSL via N2OO

**It's not the years in your life that count. It's the life in your years.**

## COUNT THOSE CYCLES

VA3CBE

You just read the header and thought oh no, another solar cycle article with the hope, promise and prediction of endless propagation on the ten meter band. However the cycles I am talking about are of the A/C mains, which many of our shacks rely on.

This came about a while ago when the main service panel was going to up-graded at work. On the day the switchover was to occur the electrician informed us that they would rig up a temporary portable generator to provide the bare essentials such as lights, battery charging, corded hand tools and our office computers server and internet. I had asked the electrician if the generator produced a stable voltage and frequency to be “computer friendly” and with a shrug of the shoulders with the reply of “it has a gas engine and makes electricity” I had soon realized we were headed for potential disaster, so in the “be prepared” motto I decided to bring in a “stable” generator.

On the day of the disconnect all was hooked up as promised, and our office electronics did not like the “non stable” power at all, the internet would drop out, UPS units continuously were switching and warning of power failure, with all of the warning beeps it sounded like a fast food restaurant during the lunch rush HI. Using a graphing meter I followed voltage and frequency and they were both up and down so much it looked like a stock market report.

Why? Well let’s take a look at how the portable generator does its job. You know the type, those inexpensive off shore units that can be bought for peanuts at any hardware store, we see ads for them all the time. Have you ever heard them running? Sounds like they are really revving, in fact they are, 3600 revolutions per minute to be exact. Why? Well our mains produce 60hz. So 60 cycles per second multiplied by 60 seconds in a minute equals 3600 cycles per minute, see the connection? Now to keep the cost down the electrical part of most cheap generators do not have a regulator. They rely upon a constant rpm to maintain voltage. Now when the generator is heavily loaded, or is subjected to on/off cycling of resistive loads such as heaters, lights, and inductive loads such as drills, furnace fan motors etc. the engine speed control can not react fast enough when the load is applied or removed and because of this the engine will sag, flare and sometimes “hunt” for its ideal speed. The result of this is both frequency and voltage fluctuations, which wreck havoc on electronics. If an engine sags to 3000rpm that is frequency sag to 50hz, a flare-up to 4200rpm is an increase to 70hz both with a corresponding voltage sag or spike.

Our radio club has a portable generator for field day use, and it runs at less than 25% capacity and even at that duty cycle during the heat of battle one can hear the engine flare and the desk lamp flicker from time to time. (Personally I like to hear it loaded down with transmitters sending our club call HI)

When considering a generator keep in mind what loads it will be handling. Always provide a good ground. Keep the engine in a good state of tune and burn clean fresh fuel to help maintain a constant RPM. Many of us have portable generators just in case we need them but please note many furnaces, and even some fridges have logic boards within them.

One final tidbit, some cheap DC to AC inverters produce a noisy “modified” sine wave and not a pure sine wave, if you have one scope it for fun and see how it is.

73 de va3cbe

**Never look down on anybody, unless you're helping them up**

Twass the month before Christmas\*

\*When all through our land,\*

\*Not a Christian was praying\*

\*Nor taking a stand.\*

\*See the PC Police had taken away,\*

\*The reason for Christmas - no one could say.\*

\*The children were told by their schools not to sing,\*

\*About Shepherds and Wise Men and Angels and things.\*

\*It might hurt people's feelings, the teachers would say\*

\* December 25th is just a ' Holiday '.\*

\*Yet the shoppers were ready with cash, checks and credit\*

\*Pushing folks down to the floor just to get it!\*

\*CDs from Madonna, an X BOX, an I-pod\*

\*Something was changing, something quite odd! \*

\*Retailers promoted Ramadan and Kwanzaa\*

\*In hopes to sell books by Franken & Fonda..\*

\*As Targets were hanging their trees upside down\*

\* At Lowe's the word Christmas - was no where to be found.\*

\*At K-Mart and Staples and Penny's and Sears\*

\*You won't hear the word Christmas; it won't touch your ears.\*

\*Inclusive, sensitive, Di-ver-is-ty\*

\*Are words that were used to intimidate me.\*

\*Now Daschle, Now Darden, Now Sharpton, Wolf Blitzen\*

\*On Boxer, on Rather, on Kerry, on Clinton !\*

\*At the top of the Senate, there arose such a clatter\*

\*To eliminate Jesus, in all public matter.\*

\*And we spoke not a word, as they took away our faith\*

\* Forbidden to speak of salvation and grace\*

\*The true Gift of Christmas was exchanged and discarded\*

\*The reason for the season, stopped before it started.\*

\*So as you celebrate 'Winter Break' under your 'Dream Tree'\*

Sipping your Starbucks, listen to me.\*

\*Choose your words carefully, choose what you say\*

\*Shout MERRY CHRISTMAS ,

Not Happy Holiday !\*

Please, all Christians join together and

Wish everyone you meet during the

Holidays a

**MERRY CHRISTMAS**

**Christ is The Reason for the Christ-mas Season!**

## **Degrees of Antenna Occupied by a Loading Coil**

*Cecil Moore, W5DXP, Rev. 1.0, 11/15/2010*

### **Introduction**

The purpose of this article is to provide a procedure for determining the number of degrees of antenna occupied by a loading coil. A later article will explain how that value applies to inductively loaded mobile antennas.

Assume we have a vertical 1/4 wavelength resonant wire monopole over a ground plane. The vertical monopole is obviously electrically 90 degrees long because one wavelength is defined as 360 degrees. Let's say we want to reduce the length of the monopole to 1/8 wavelength, i.e. one half of the original length, and make the shortened monopole resonant on the same original resonant frequency. We can obviously install a loading coil to perform that function. The shortened wire monopole is physically 45 degrees long but resonance requires the same 90 electrical degrees as before. The question arises: **How many degrees of the original 90 degree wire monopole does the loading coil replace?** There are two extreme opinions:

Opinion 1. When part of a wire antenna is replaced with an inductive loading coil, the loading coil does not supply any of the missing degrees. (This is in agreement with the lumped-circuit model.)

Opinion 2. When part of a wire antenna is replaced with an inductive loading coil, the loading coil supplies 100% of the missing degrees. (Some seem to think this is in agreement with the distributed network model.)

Unfortunately, both of the above opinions are incorrect. The loading coil does replace some, but not all, of

the degrees missing from the shortened antenna.

### The Hamwaves Inductance Calculator

This inductance calculator is one of the most sophisticated available and corrects some problems with earlier inductance calculators. If inductance, reactance, and RF resistance values are needed, this calculator will provide them. The coil data is entered in metric (mm) but that is a small problem since multiplying inches by 25.4 will yield millimeters. There is one output parameter from this calculator that will allow us to easily estimate the number of degrees occupied by the coil at any particular frequency, i.e. the number of degrees of antenna replaced by the loading coil.

### 80m Loading Coil Example

Let's assume the following loading coil with dimensions given in inches. Since the calculator requires a metric input, we will convert inches to millimeters by multiplying by 25.4. Here are the specifications on our loading coil to be entered into the Hamwaves Inductance Calculator:

2 inches in diameter (50.8 mm)

100 Total Turns

10 inches long (254 mm)

#18 wire (1.024 mm in diameter)

Design Frequency = 3.5 MHz

Entering these values into the calculator yields a lot of useful information about inductance, reactance, and RF resistance, but the one we are most interested in is the Axial Propagation Factor in radians/meter.

The 1.8118 radians/meter Axial Propagation Factor is associated with how fast the RF signal is traveling through the length of the coil. We can change the radians/meter to degrees/inch by multiplying by 1.4553.

$$(57.296 \text{ degrees/radian}) / (39.37 \text{ inches/meter}) = 1.4553$$

$$(1.8118 \text{ radians/meter}) (1.4553) = 2.6367 \text{ degrees/inch}$$

Since the coil is 10 inches long, the number of degrees occupied by the coil at 3.5 MHz is 26.4 degrees.

We can also calculate the velocity factor (VF) of the coil. One wavelength at 3.5 MHz is 281 feet which is 360 degrees. So at the speed of light, 26.4 degrees would be a length of  $(281 \text{ ft})(26.4/360) = 20.607$  feet or 247.3 inches.

The coil is 10 inches long so if we divide  $10"/247.3"$ , we get the VF of the coil. That VF value is 0.04, i.e. the speed of light through the medium of the coil is 4% of the speed of light in free space. In free space, it takes light 0.8486 ns to travel 10 inches. With  $VF = 0.04$ , we can calculate the length of time it takes RF to travel the length of the coil is  $0.8486/0.04 = 21.2$  ns

Finally, the Hamwaves Inductance Calculator tells us that the characteristic impedance ( $Z_0$ ) of the coil is 4747 ohms.

Given that we know the characteristic impedance, velocity factor, and number of degrees occupied by the coil, we are in position to perform a complete analysis of an inductively loaded mobile antenna. The next article will present that analysis.





## CODE PRACTICE

*Steve VE3USP*

The Code Practice is held twice a week at my house from 6 P.M. to 7 P.M. So far it is only three people, Tony (VA3AVR), Innes Cathcart and Trevor Johnston. Innes and Trevor are colleagues at COMDEV. There are two other people at COMDEV who have shown interest in HAM Radio, one of them even had a license and a call sign, although he had it lapsed. Shame on him! I also offered Ryan (VA3OEA) to take part in Code Practice, he will let me know when he is ready for it.

We started this spring and had practice only once a week at Trevor's house. The summer went by and we learned all the letters in the alphabet. Now I am trying to 'hammer it in' shall we say, hence the two sessions a week. The numbers will be pretty easy and they progress very well with the characters. I used a straight key when we started so that I could adjust the speed on the fly... I now use a vibroplex, watch as they copy the code and increase the speed so as to keep'em busy... We do about 15-20WPM, mixed characters but no numbers yet. They should be ripe for an exam soon and we will have two more licensees in Cambridge...!

*Ed note nice to see somebody has taken up the task again. It's been a few years since Fraser and I stopped the nightly code practice on our repeater. Thanks Steve and good luck.*

**While creating Husbands, God promised Women that good and ideal Husbands would be found in all corners of the world.**

**---- and then He made the earth round.**

*(VE3IBI)*