Minutes of the May 2017 KCRC Meeting,  
May 3rd, 2017

Our May “Pre-Meeting Question and Answer Session” was a bit scattered because of the need to secure another meeting place in the hospital during the planned renovations to the Executive Dining Room. Some technical topics were touched upon regarding repeater technology, receiver technology and published books to assist in passing the Amateur Radio Exams.

The monthly meeting was called to order at 8 PM, by our President, Mitch N2RGA. Also present at tonight’s meeting were Vice President Howard N2GOT, Treasurer Richard KA2KDQ, General Secretary Roy AC2GS, Executive Board Members at Large Howard K2IGJ and Milen KG2C, John WB2LFU, Simon KD2LQE, Andy WA2GDS, Lloyd K2JVX, our guest and friend of the club Damien KY2P, and our new members Steve KC3INA, Tommy KD2KGD, and Al and Nova, who are both studying for their licenses!

Treasurer Report—Richard KA2KDQ, reported that our Treasury currently has $885.41 in assets in our bank account, and 0.00 in our Club PayPal account, for a total of $885.41.

2 Meter Report—Richard KA2KDQ reported that the 2 Meter Net was doing well, with an average of a 8 to 10 check-ins each week. John WB2LFU is planning to replace Richard’s old UHF/VHF antenna, so that our Net Control Operator’s signal will be loud and clear throughout the 2 Meter Net!

10 Meter Report—Our Net Control operator, Milen KG2C reported that the 10 Meter Net is thriving, and recently broke a record, with the Net continuing uninterrupted for almost 4 hours! Propagation conditions continue to be poor and all of our contacts have been confined to New York and New Jersey. If you can put out a 10 Meter signal, please consider checking into our weekly Sunday 10 Meter Net and participating in it with us! Remember that the 10 Meter Net as well as all other club Nets are simulcast over the Internet—just point your browser at bit.do/KC2RC.

KCRC TechNet—Our Net Control Operator and Host Roy AC2GS reported that the TechNet has continued to be active, lasting for 1 1/2 hours last time, with a good amount of participation for both questions, comments and the regular TechNet puzzle! In addition to regular promotion during club functions we have arranged with local ARES, Big Apple NTS, and LIMARC to promote the KCRC TechNet!

Old News: Our next VE Session will be on May 21st, at 1PM. The venue has been changed for the next two VE Sessions. They will be given at 501 6th Street, called Wesley House, in room 6B on the 6th floor (an elevator is available). Simon KD2LQE has acquired his own VE credentials and has joined our VE Team. John WK2J has too many professional responsibilities to be involved with the next series of VE Sessions, so it was decided that he will be passing the baton to Milen KG2C, who will be our Club VE Liaison Officer. The Club is always looking for new VE’s to join our VE Sessions, as well as assistant and/or co-Liaison VE Officers. For ANY interested individuals, please contact any Executive Member of the Club, or the return email address for these emails of our Club Meeting’s minutes. People took time out of their busy lives to help get you licensed - pass on the favor!
We presently have 46 Club Members in good standing!

Repeater status was reported by Mitch N2RGA—he would like to send the repeater back to Yaesu for an upgrade that cannot be done in the field. A friend of the Club, Andy WA2CDL will be advised of this and asked if he would like to give the repeater a check up before or after the update. The repeater seems to be experiencing very rare lock-ups when used for long periods in its digital mode. We will need to further investigate this problem.

Field Day was discussed. Milen KG2C will not be in the City for this year’s Field Day event, but he will continue to assist as much as he can, until he leaves on his vacation. Methods to stabilize the antennas were discussed and we agreed to invest in some large empty pails which could be filled up with local sand for weights and that some clever knots and duct tape will suffice to maintain the guy ropes in place. People volunteered for set-up and break-down, but more people are always welcome! James KB2FMH has volunteered to be in charge of Press Relations for Field Day. As always our most scarce resource are hams sitting in front of the radios making those important contacts—PLEASE sign up for a shift on one of our three radio stations that will be operating throughout the 24 hour event! Please keep up to date with the Field Day 2017 spreadsheet, and volunteer what you can to make this Field Day our most successful one!

Our 2017 Club Roster was emailed last month to every Club member in good standing along with our monthly minutes.

New News: From May 15th to July 31st the Executive Dining Room will be unavailable due to renovation work. Thanks to our great Friend of the Club, Damien KY2P, we will be holding all our Club events in room 6B, on the sixth floor of 501 6th Street—The Wesley House, just across the street from the Methodist Hospital. Thanks Damien!

If all else fails there might be radio!? But in case that doesn’t work out so well and technical issues lessen your radio experience, keep in mind that the club has been streaming events over the Internet using the http://bit.do/KC2RC. In addition, we now offer a chat facility on the lower right hand corner of our club website: www.KingsCountyRadioClub.com.

An email request from Lew N2RQ was discussed, regarding helping the Brooklyn Tech High School Amateur Radio Club. Simon KD2LQE an alumni of that school, will contact them, and we have suggested that we would be more than happy to arrange for any VE exams that they might need, if a mutually acceptable time and day could be found.

Roy AC2GS attempted to entertain with the quickest “Show and Tell” in the history of the Club—this time the item he asked people to guess its purpose was a DX Engineering PaddlePad—used to keep your Morse code key stable on your desk, and not allow your key to ride about. A short discussion of Morse code keys quickly ensued!

At 10:08 PM the meeting was adjoined.

See ya’ all in June (in Room 6B)! (There’s a rumor that we might talk about Field Day...)

Disclaimer: The views and opinions expressed in this publication are those of the author and do not necessarily reflect the official policies or positions of the Kings County Radio Club, its Executive Board, nor its General Membership.

These minutes were respectfully recorded and submitted by Roy AC2GS on this day, May 3rd, in the two thousandth and seventeenth year of our Lord of Propagation...

(AC2GS would like to thank all the people that maintain the program and the keyboard used to type these minutes, as well as those that supply his food and shelter. )
Common Mode?

What is it? Why is it? When is it? And what do I do with it?

You’ve all heard it on the radio, you’ve probably read about it in QST, or CQ Magazine, or at least some guy’s weblog.

Ferrite beads or clamps are the aspirin of the Ham world – when in doubt try ferrite clamps. But why do we seem to need them? When are they needed and what the heck do they actually do?

I’m glad ya asked!

I could give you the simple answer, or get into some of the details and you might end up with a better idea of what’s actually going on!

First, let’s discuss the skin effect – as the frequency of alternating current goes higher and higher, the current travels more and more on the very edge of the surface of a conductor, leaving most of the metal, current free!

But why?

Perhaps this will help: All charged particles at rest produce an electric field excitation. All charged particles traveling at a constant (linear or angular) velocity produce a magnetic field excitation. All charged particles traveling at an always changing velocity produce an electromagnetic field excitation!

If you apply a direct current through a loop of wire, you induce a constant surrounding magnetic field – that’s how you can make an electro-magnet. The constant magnetic field lets you play around with temporary magnets – and they have an off switch, where permanent magnets don’t.

But what happens if you change that constant direct current for a rapidly alternating one?

Magic happens (well, actually science happens)!

An alternating electric current produces that electric and magnetic field mentioned above, and that makes a BIG difference. The electric field induced, opposes the change of the original alternating current – reacting to this always changing current, producing something that we call Reactance! The faster the current changes the greater the opposing induced field, the greater the Inductive Reactance. You can also consider it as an induced eddy current opposing the initial current. This repulsive current force blocks the current from flowing in a very interesting way – It has its greatest effect in the pathways that have a lot of conducting metal on all its sides, like the center of a cylindrical wire. The farther away it is from the surrounding current on all sides, like the very surface of a cylindrical wire, the less it is opposed. As you increase the frequency of the alternating current more, the more the total current moves closer and closer to the surface of a cylindrical wire – all the current can travel a mere millionth of a millimeter of depth from a wire’s surface – you might say that it would only travel on the wire’s skin!

(If you are allergic to math you can skip the following colored text)

This skin effect has an equation (as most terms used by Engineers) and this skin effect is no exception:

$$\delta = \frac{2\rho}{\omega \mu} \sqrt{1 + (\rho \omega \epsilon)^2 + \rho \omega \epsilon}$$

It would be very impressive for a T-shirt at a Physics Convention, but for today we can simplify this by promising not to use ridiculously high frequency radio signals:
\[ \delta = \sqrt{\frac{2\rho}{\omega\mu}} \]

Where

\( \delta \) = skin depth

\( \rho \) = resistivity of your conductor

\( \omega \) = angular velocity of current = \( 2\pi \times \text{frequency} \)

\( \mu \) = relative magnetic permeability of the conductor/the permeability of free space

Suffice it to say (and simplifying even more) – “the faster the frequency of the alternating current, and the greater the conductivity of the conductor, the thinner and thinner the depth where ALL the current is traveling through”!

Just consider all the RF as \textit{riding} on a metal’s surface!

So, how does this look in your own coaxial cable as you transmit your words of wisdom?

The point of the previous discussion is to explain that \textit{ALL} of the RF current is flowing along the \textit{surface} of the conductor, penetrating far less than the width of the finest sheet of paper. The rest of the metal is \textit{not} involved in any current, but at best, supplying some heat dissipation for the heat created from the transmission loss turned into waste heat throughout the \textit{conductor}.

\textit{All} of the RF going up your coaxial cable to your antenna is traveling very close to the surface of the center conductor and the \textit{inner} surface of the coaxial cable’s shield. When your center conductor is \textit{positive} the opposing segment of the inner surface of your shield is \textit{negative}. They are always opposite in polarity and they operate in \textbf{The Differential Mode}! In this \textit{differential mode}, your RF is contained within your coaxial cable, unable to radiate away into space.

If this were a perfect world, all of the current supplied in the \textit{differential mode} would be transferred to your resonant standing wave antenna, where it would radiate all of its energy into space for all your fellow Hams to hear!

But who said this is a perfect world?
If there is a problem with the energy exchange – an impedance mismatch, or an unbalanced to balanced circuit mismatch, something *naughty* can happen – the differential mode current traveling up to the top of your coaxial cable shield’s inner surface can *loop around* onto the shield’s *outer surface* and run down the outer shield surface all the way *back* to your radio! Since it is going in the reverse direction to the original differential mode current, the resultant current is identical to the polarity of the center conductor – it is operating in the *common mode*, and is free to radiate as if it were another antenna!

The reasons that common mode currents are such a pain in the arse and the bane of all Ham’s existence is that when common mode transmissions run down your transmission line *in the opposite direction* down to your shack, your radio, and your computer – whatever energy that isn’t dissipated in heat or poorly directed radiated RF, drives all your shack equipment insane and can give you RF burns as sparks fly from your microphone to your lips!
Is there any way that you can get rid of all this common mode current?

The closer to the antenna feed you **choke** this common mode RF, the better! Fortunately, common mode current is **much** easier to block than differential mode currents. Any decent transformer based **balun** (balanced-to-unbalanced) or **unun** (unbalanced-to-unbalanced) transformer will also greatly diminish common mode currents from running down your transmission line into your shack, but relatively simple 1:1 RF chokes can do the job as well. They all amount to a means to place an inductive impedance on the common mode current on your coaxial cable’s outer surface of its shield. You can simply wind a **poor man’s balun** – an air core helically wound coil – 5 or 6 turns of a 5 or 6-inch coil, or you can place a few loops of your coaxial cable around a selected ferrite toroid, or you could place a series of ferrite beads or clamps – 5 to 10 in a row on your coaxial cable, covered with heat-shrink tubing for weather protection – a so-called W2DU balun (named for its late designer).

A short precaution about coiling coaxial cable in tight turns/small diameter turns – solid polyethylene dielectric coaxial cables tolerate tight turns a lot better than the slightly lower loss closed cell foam dielectric cables, like the venerable LMR series cables. If you put too tight a turn on these foam dielectric cables, their center conductor can **migrate** towards the outer shield area – if they touch your shield, your coax is shorted, but even if they don’t, you still might have local impedance changes that will complicate your RF transmission – leave the tight corners for solid dielectric coax like Belden 9913 and alike.
How to get the most out of one Ferrite Clamp

So, am I done on the subject?

Not yet (have you read any of my articles before<grin>?)...

Many Hams have their own favorite ferrite sources, and their own favorite mix compositions. As always, try not to find the cheapest price available - they may very well be mislabeled mix types. Ferrites come in numerous, different compositions/mix types. Stay clear of imported ferrites with dubious mix compositions – the wrong mix can make an RF choke worthless! I will spare you what differing ferrite mixes are made of, or what characteristics are different for each mix – that information is easily Google-able to those that are curious. Mixes #43, #52, and #61 are better suited for a transformer based balun devices. Mixes #31, #75, and #77 are more suitable for common mode chokes. Mix #75 is great for the lower HF bands, but for a compromise choice, for all of your HF bands, mix #31 would work great for Ham’s to use as RF chokes.

Do these devices block every last bit of common mode current? No, but it will diminish it to a degree that the remaining common mode RF may be inconsequential!

The closer you choke your common mode current to the antenna’s feed point, the better!

You can still add all the ferrite chokes that you want to, inside your shack to address any stray RF problems you might still have, but following the above guidelines will greatly lessen your need for shack based RF choking. I have known Hams that have ferrite clamps on EVERYTHING in their shack (they probably have a few clamps firmly attached onto their own fingers and toes, for all that I know)!

So, that’s the “what, who, where, when and why” about Common Mode currents.

I hope that you found it informative, and helpful.

Now, go and educate the next guy! Spread the word!

73,

Roy AC2GS