THE NEWSLETTER OF
THE KINGS COUNTY RADIO CLUB

KCRC

January 2018 *The Semi-Ridiculously Abridged Edition* Volume 5, Issue 1[A]

Minutes of the January 2018 KCRC Meeting,
January 3rd, 2018

Our January "Pre-Meeting Question and Answer Session" was a very lively affair this month. Once again, no specific topic took center stage with many topics being discussed.

The monthly meeting was called to order at 8:10 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 Member At Large Howard K2IGJ, Dan KC2TRX, Lloyd K2JVX, John WB2LFU, Joe AC2AE, Sam KC2LJC, Alan KD2OMG, Berlotte KD2MYF, Al, and our newest member Axel KD2OVM!

Treasurer Report—Richard KA2KDQ, reported that our Treasury currently has $626.40 in assets in our bank account, with $213.01 in our Club PayPal account, for a total of $839.41. Since last month Eugene KD2MDV, and Axel KD2OVM have joined our Club—our Club presently has 65 members in good standing, and 44 members have paid their 2018 year dues!

2 Meter Report—Richard KA2KDQ reported approximately a dozen check-ins to recent Nets.

10 Meter Report—Our Net Control operator, Joe AC2AE reported that the 10 Meter Net was once again a local affair, due to 10 Meter's poor propagation conditions. Recent Nets have accrued 13+ check-ins a week. If you arrive after the Net closes, throw out your call anyway—we have a lively, informal "Net-After-The-Net", which has been known to last as late at 3 PM.

KCRC TechNet —Our Net Control Operator and Host, Roy AC2GS, reported that the TechNet is doing well—this past month Roy AC2GS presented an overview of Software Defined Radio (SDR) on the first episode in December and a more technical discussion of SDR on the second episode. Roy asked for suggestions on what topics should receive a similar treatment. Roy, once again, urged Club members to participate with either questions, answers, or comments. Technical Nets are NOT dusty lecture sessions, they are living, breathing reflections of the interests or disinterests of their participants. Please listen to our TechNet and PARTICIPATE!

KC2RC FusionNet—Our Backup Net Control Operator Joe AC2AE reported tonight, while Jason KD2LQE is not available. Work persists in trying to get an analog FM Fusion Net connection going. In the past, the Wires-X box locked up consistently, and Mitch N2RGA is going to acquire another Wires-X box, to see if the problem is in our present Wires-X boxes, or the underlying software.

Field Day 2018 Committee Report—Our Field Day Committee Chairman James KB2FMH reported in absentia, that he was considering running a small Winter Field Day at the Scout Camp on Staten Island, and asked interested members to contact him for details. There was some discussion of arranging to tour other locations for Filed Day 2018, and to report back our Club member's findings at a later meeting.

Old Business: Our next VE session will be January 21st, 2018 at 1 PM in Room 6B of Wesley House 501 6 Street, between 7th and 8th Avenue. For the time being we decided to hold our VE Sessions in room 6B of the Wesley House, due to it's large space, that it can be separated into two exam rooms, and because food and beverages

are allowed, as opposed to our new Carruthers's Conference Room, inside the Hospital. The Club is always looking for new VE's to join our VE Sessions. 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 will be moving our monthly meeting to the Carruthers's Conference Room, between the Hospital Gift Shop and its Cafeteria, for February's meeting. After we evaluate what the new conference room has to offer, we will decide whether we will continue to meet there, or regroup to room 6B in the Wesley House. Our annual 2018 Holiday Party will be held at Wesley House, no matter what will be our decision for our monthly meeting location.

Repeater status was reported by Mitch N2RGA—Our Arcom controller remains disconnected and we continue without a courtesy tone and the other extras that the controller gives our repeater. Friend of our Club and master Technician (that's not his license class, which is Extra) Andy WA2CDL offered to check out the Yaesu DR-2X and our Arcom controller in his lab. Mitch N2RGA and Joe AC2AE will disassemble them and transport them back and forth to Andy's lab for a thorough testing, followed by a new firmware update, and reassembly. The pair continue to work out the kinks of a possible analog FM route into our FusionNet.

All Club members that paid their 2018 dues were given their new laminated Club membership cards. Those not present at this January's meeting will have their cards mailed to them by Richard KA2KDQ.

New Business: We are promoting the Long Island CW Club, W2LCW www.LongIslandCWClub.org. a new, local organization dedicated to the promotion of Morse Code. They intend to offer web based classes for new members to learn Morse Code, as well as arrange for events for club members to use their new CW skills.

The first Wednesday in July will be the Fourth of July, so we decided to move our July meeting to Tuesday, the 3rd of July.

Mitch N2RGA voiced the need for a new weather resistant container to hold Club supplies being stored at his house. He will price different models before our next meeting and we will all be involved in the final decision at that time.

Roy AC2GS offered a possible design for a new KCRC patch and an embroidered baseball cap. Mitch N2RGA will discuss this design with people that create these items and get a n idea of the prices and options available and report back by our next meeting.

At 10:15 PM the meeting was adjourned.

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

But What the Heck Is '*Impedance*', Anyway.

Or

How Complex Can a Complex Number Get?

Impedance.

Many of us Hams spend a lot of time and effort thinking about impedance and making sure that their antenna systems have just the right amount of impedance…

But what the heck does that mean? Different people, at various times, will describe the same exact impedance in all kinds of different ways:

"You'll want to have an impedance of as close to 50 ohms as possible."

"The best load for your transmitter is 50 ohms of purely resistive impedance."

"You need to 'aim' for an impedance of 50 ohms with a zero-phase angle."

"Your impedance, Z, should be 50 + 0j."

They're all talking about the same impedance, but they don't sound like the same value. What the heck is an impedance value anyway, and why can you express it in so many very different ways…

I have tried to explain this in other ways over the years, but this time let's explain it in a novel way, a more general explanation than usual – something you might hear from a '*weekend mathematician*', rather than a fellow amateur radio operator (assuming that you might find yourself chatting with a '*weekend mathematician'*).

Mathematics requires numbers, but numbers come in all kinds of forms.

The earliest representation of numbers where *whole numbers.* An example of those, although nowhere near the earliest example, are those Roman Numerals that many of us were taught in grade school (but that's now just as rare as learning to write in script in school, today).

Symbol	Latin name	Value
I	*unum*	1
V	*quinque*	5
X	*decem*	10
L	*quīnquāgintā*	50
C	*centum*	100
D	*quingenti*	500
M	*mille*	1,000

Ah, yes MCMLV was a wonderful year, right?

Whole numbers start with 'one', and go on and on…

But not to infinity, because they didn't have infinity back then. Surprisingly, they didn't even have zero back then!

Around the same time, we figured out the zero, we figured out negative numbers, and with them, the idea of integers was 'born':

…,-5,-4,-3,-2,-1,0,1,2,3,4,5,…

Then we figured out numbers that included the ratio of integers, and called those *rational numbers*!

…,-3,-2 ½,-2,-1 ½,-1,-1/2, 0,1/2,1,1 ½,2,2 ½,3,…

But what about those wacky numbers that can't be written as simple ratios or fractions? Quite logically numbers that can be described by ratio are *Rational Numbers*, and those numbers that cannot be described as ratios are called *Irrational Numbers*! The square root of two $\sqrt{2}$, is a great example of an irrational number. The value of the square root of two cannot be written as a fraction or a decimal number that doesn't continue forever. Pi (π) is sometimes written as 3.14159, or 22/7, but those are just approximations. Its real value in decimal units goes on for infinity. The same goes for *Euler's number*, ***e***. There are many *irrational numbers* for your new number line.

Now you have the ***Real Number Line***, which you often see represented on a Cartesian Graph (you know, the graphs with the X and Y axis's). (We'll get to *Unreal Numbers later.)*

Most of the time we only need to be bothered with real numbers. We have all grown very comfortable with them. You can think of them as one-dimensional units since they are completely unambiguously defined by a single value…

But are all units of measurement one dimensional?

Of course not! When you go out to buy some paint, the guy in the store will not be very happy if you tell him that you need enough paint to cover an 8 feet high wall – he needs its length as well, a two-dimensional value. Sure, you can multiply one by the other and tell him the square foot area, but sometimes that simplification is insufficient. You certainly know If a guy needs to move a sofa into your house, giving him the area of your opening to that room is not sufficient. An area is often best described as a two-dimensional value.

And so is impedance!

I will spare you the tedious details, but it is very useful to use something called *Complex Numbers* for impedance values, and again, in Mathematics, this is a very well-chosen name. *Complex Numbers* are a "complex" (a whole made up of interrelated parts) of numbers.

Complex Numbers, used to describe *Impedance* are numbers made up of distinct types of numbers:

$$Z = R + jX$$

Z is the *complex impedance*

R is the *pure resistance*

X is the *pure reactance*

And '*j*' makes everything interesting (or confusing).

The '*j*' defines the X value to a completely different number line than the value of R.

Historically, '*i*' is used most of the time to define *Complex* Numbers, but when it came to electronics, the letter '*i*' was used so often, in-order to limit any more confusion, it was decided to use the designation '*j*' instead.

If you take **any** *real number* and multiply it by itself, the number is **always** a positive number. Five times five is 25. Minus five times minus five is also 25. There is **no *real number*** multiplied by itself that will leave you with a negative number as a resulting solution.

Never.

But this isn't the case for '*j*.'

'*j*' times '*j*' equals -1 (If you can wrap your head around that definition). *j* and any value, *j*X are called *Imaginary Numbers* and exist on an *Imaginary Number Line,* totally different from that *Real Number Line* previously mentioned!

The best way to deal with this curious definition is that *j*X is just another number line than your *Real Number Line*.

Everyone has agreed upon when using Cartesian Coordinates, that the **X** axis is the *Real Number* of the pure resistive component of a given *Impedance*, and the **Y** axis is the *Imaginary Number* of the pure reactance component of a given *Impedance*. Inductive reactance has a positive value; capacitive reactance has a negative value. Since we have yet to discover anything with a *negative resistance*, you can throw way half of your Cartesian graph, where the **X** axis crosses the origin into negative resistance.

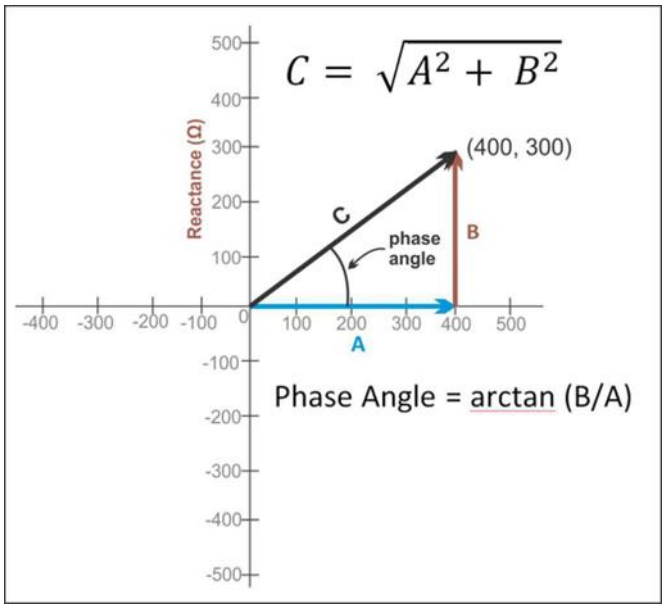
The surface of one half of a Cartesian graph is giving you a great representation of your impedance value(s), and the surface of your Cartesian graph is a two-dimensional surface – which is a good thing since impedance is a two-dimensional number (as I mentioned at the beginning of this journey)!

You can describe a two-dimensional number in a *number* of ways.

You can describe it as a point on the surface of your graph using its **X** (*R)* and **Y** (X) coordinates:

Z = R + *j*X

Or you can describe it in polar coordinates (you remember those, don't you?). The distance of the value on the Cartesian graph from the origin point (the hypotenuse?), along with the angle formed from that line/hypotenuse and the **X** axis baseline. Hypotenuses? Angles? Hello right angle, meet Mr. Pythagoras!



So, the impedance of your dream, Z = 50 + *j***0** can also be written as Z = 50 ohms with a 0-phase angle, or '50 ohms of purely resistive Impedance'.

Six of one, half a dozen of the other…

People shorten it further and describe it more simply as '50 ohms', but that's only half of the story. Take, for example, a purely inductive impedance of 50 ohms:

Z = 0 + *j*50 or Z = 50 ohms with a phase angle of +90 degrees, or 'a purely inductive impedance of 50 ohms'.

You could shorten that value, as well, to simply describe it as 50 ohms of impedance, but the purely resistive impedance and the purely inductive impedance are two very different animals entirely!

Keep in mind that different circuit impedances can all possess the same one-dimensional *scalar* Impedance value, yet also possess any phase angle from -90 degrees to +90 degrees.

So, that's another way to look at electrical impedance.

See! *Complex Numbers* aren't that complex after all!

I hope that this offered you some insight, without too much confusion.

73,

Roy AC2GS