**Johnson County Radio Amateurs Club, Inc.**
P.O. Box 93
Shawnee Mission, KS 66201

# FEEDBACK

**August 2015**

## Eddy Paul, KYØF Earns W1AW-WAS

JCRAC member **Eddy Paul, KYØF** earned and showed his W1AW Worked All States award at the July 24 club meeting. A variety of guest operators conducted QSOs using the ARRL's W1AW call sign. The multi-state operation was a part of the ARRL centennial celebration.

Eddy reported that the most challenging HF contact came from Kansas. Eddy could hear, but was not heard. As his Overland Park neighbor prepared to sign-off, Eddy cranked up the power and made the reached out several hundred yards to complete the contact.


*The July 24 "annex meeting" and the Club Wheatshocker nets the following Wednesday and Thursday were abuzz with enthusiastic commentary on* ***John Raydo's, KØIZ*** *annual Field Day video. See the full video at :*
https://www.youtube.com/watch?v=l52_9PV4zVU&feature=youtu.be

## AUGUST MEETINGS

***Aug 14*** *– Show and Tell: Bring a project you are working on.*

***Aug 28*** *– Field Day Antennas*

The Johnson County Radio Amateurs Club normally meets on the 2nd and 4th Fridays of each month at 7:30 PM at the Overland Park Christian Church (north entrance), 7600 West 75th Street (75th and Conser), west of the Fire Station.

Much of the membership travels to the Pizza Shoppe at 8915 Santa Fe Drive for pizza buffet and an informal continuation/criticism/clarification of the topics raised at the meeting ... or anything else.

*Leave the church, turn right (west) on 75th. Turn left (south) on Antioch. Turn right (west) on Santa Fe. Pizza Shoppe is just past the Sonic on your left.*

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*A publication of the*
*Johnson County Radio Amateur Club, Inc.*

**Bill Gery, KA2FNK, President**

**Aaron Boots, AAØRN, Vice President**

**Ted Knapp, NØTEK, Secretary**

**Cal Lewandowski, KCØCL,Treasurer**

* * *

**Chip ACØYF and Deb KDØRYE Buckner, Editors**

*All email addresses are available at w0erh.org*

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# *Show and Tell*

The JCRAC boasts a number of supremely talented engineers who always have something fun and interesting to show the club. At its August 14, meeting the club will give them an opportunity to show--and the rest of us an opportunity to see--what they have been working on.

We rightly celebrate our tech gurus who speak of impressive test equipment, help us tweak our gear, and explain the finer points of radio theory.

Expertise--whether in CW, project engineering, EME communication or any other facet of the hobby--is not innate. It is learned. It is learned by people who start with small successes--and small failures.

If we leave show-and-tell to the wizards, we risk creating a environment in which the rest of us--confident that we cannot compete--fear to try.

Fear not! This is the AMATEUR radio service. Show us what you are doing. Impress us with your willingness to tackle something new. Show our new hams that, because technical curiosity comes at all levels, this is something that they can do, too.

Oh, and then take a picture and write up what you did for the FEEDBACK!

***-- Chip and Deb***

## *PRESIDENT'S CORNER*

After a wetter than normal July let us hope for a normal August. Maybe I can get caught up with the outside yard work. Besides cutting the grass and trimming, I have an HF antenna in much need of repairs. Every time I think I will have time to do the work, a thunderstorm arrives in the area, which is not a good thing to have near when you are working on an antenna.

September it is our club's time up to support the tours at Ensor. It is only a few hours on Saturday and Sunday, so please sign up for one of the time slots.

Speaking of Ensor, the auction is on the horizon. Please look through your shack for any item that you thought you needed, but have not touched for years. Someone else may be looking for it.

***– Bill Gery – WA2FNK***

# AUGUST CALENDAR

| SUN | MON-TUE-WED-THU | FRIDAY | SATURDAY |
|---|---|---|---|
| | | | 1<br>Johnson County Fair Parade - Steve Rainey, WDØDPB - wd0dpb@gmail.com |
| 2<br>Sunflower to Roses Bike Tour - www.sunflowerstoroses.org - Steve Lester, KDØEKS - 913-390-3570 - stevekd0eks@gmail.com | 3-4-5-6 | 7 | 8<br>@9:00 W5YI Testing Independence EOC 950 N Spring Street Norma Libby, WØKC – (816)353-8408 (816) 536-0469 normalibby@sbcglobal.net |
| | 10- 11- 12-13 | 17<br>@22:00 Lenexa Moonlight Bike Ride - Steve Rainey, WDØDPB - 913-829-6438 - serainey@juno.com<br>Warrensburg Hamvention www.waarci.org/hamfest.htm | 18<br>@ 09:00 VE Testing -- Johnson Co. Library, 151st & Antioch -- Jim Lee, NØKCB - 913-745-5121 - jimlee@kc.rr.com<br>Warrensburg Area ARC Hamfest |
| 16<br>Jackson County Triathlon (Longview Lake) - Steve Lester, KD?EKS - 913-390-3570 - Stevekd0eks@gmail.com<br>Central KS ARC - Salina Hamfest - Tom Blackshere, N0MOK - 785-452-1873 - salinahamfest@cox.net<br>www.centralksarc.com | 17-18-19-20<br>20 @ 19:00 VE Testing - Raytown ARC -- Community of Christ -- 63rd and Manning - Steve Lufcy, KØOU - 816-353-6705 - k0ou@comcast.net | 21<br>Joplin Hamvention | 22<br>Joplin Hamvention<br>@09:00 W5YI Testing - Mid-Continent Library, 850 NW Hunter Drive, Blue Springs, MO. - Jim Arnold, NØSAK - 816-229-3209 - arnold-j@swbell.net |
| 23<br>Summer Breeze Bike Ride (Longview Lake to Drexel)<br>Herb Fiddick, NZ0F - hfiddick@gmail - 913-744-0586 | 24-25-26-27 | 28<br>@ 18:00 W5YI EXTRA CLASS Independence, MO. Fire Station #1 - normalibby@sbcglobal.net cell 816-536-0469 | 29<br>@ 08:00 W5YI EXTRA CLASS<br>Independence, MO. Fire Station #1 - normalibby@sbcglobal.net cell 816-536-0469 |
| 30<br>@ 08:00W5YI EXTRA CLASS<br>- continued | 31 | | |

## *Laser Guidance for Accurate Drilling* - *Tom Wheeler, NØGSG*

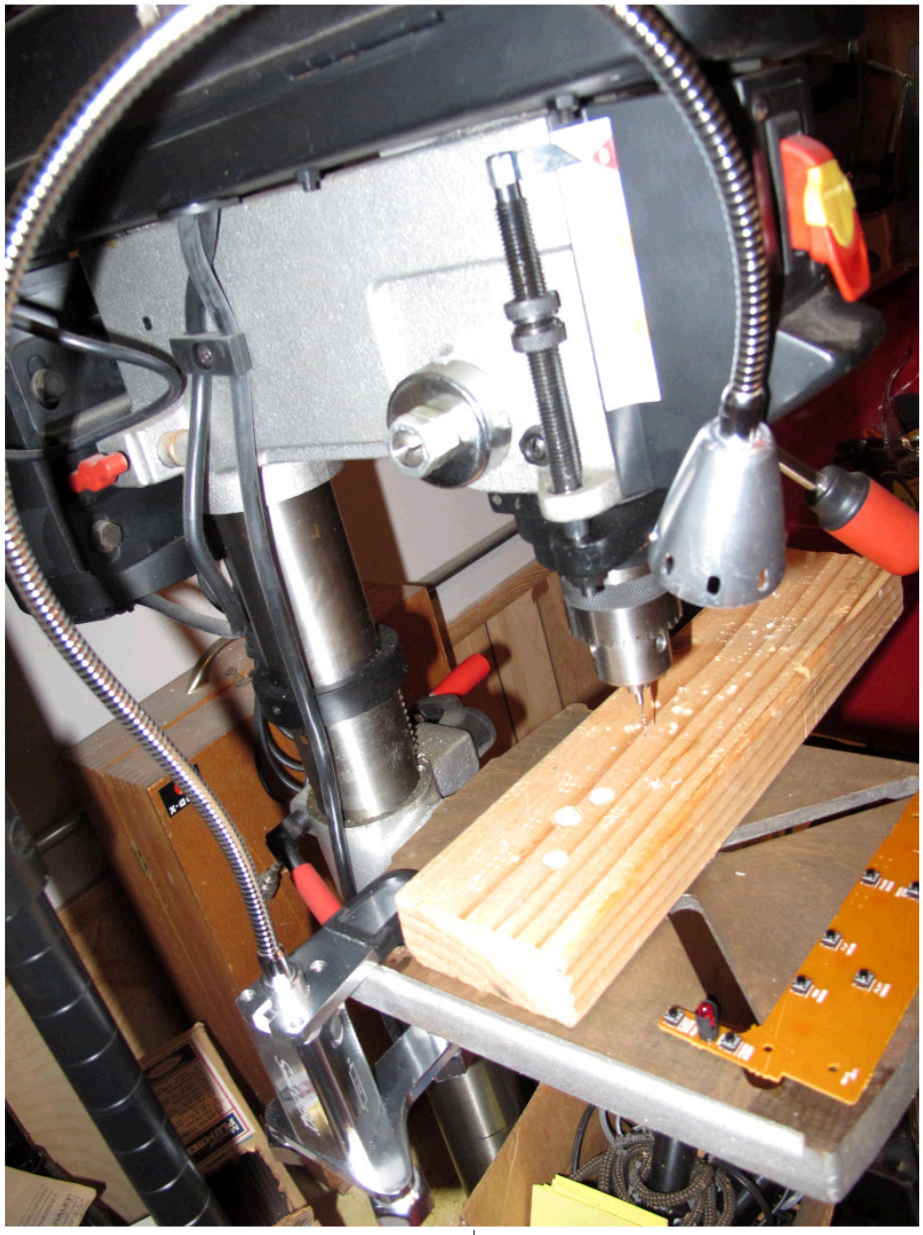
A lot of amateur radio build projects involve making holes. In many cases, only approximate location is needed--for example, a few thousands of an inch makes little difference if you're mounting a connector on the outside of a project box. However, circuit boards are a different story. Good accuracy and repeatability are a must for professional-looking results!

Commercially-manufactured circuit boards are drilled by computer numerical controlled (CNC) drills. This allows the process to be driven by computer data files, which are generated by a designer using a printed circuit (PC) board CADD package. At home, most of us have to drill by hand, and it's tricky to drill PC boards accurately this way!

One way of achieving improved accuracy is to simply aim a laser dot at the work piece. In fact, I happened to have an extra laser diode module that I'd purchased through eBay a few years back, and I was getting ready to throw out a gooseneck "grill light" as it had died quite a long time ago.

If you're thinking that I married the two pieces of hardware, you're right. I simply removed the LED light bulb from the "grill light" and glued the laser module in its place. (The laser module is a 3 volt general purpose type that can be purchased through many sellers on eBay; just search for "laser diode modules.")

I left the "shade" on the end of the gooseneck to help protect the laser module from hard knocks in the shop.



The "grill light" is a perfect platform for this. It's got both a clamp for attaching it to tables and other surfaces, as well as three very strong magnets to clamp it onto steel surfaces. The setup is shown above.

To use the system, set up the drill bit and workpiece in the usual manner. Before drilling your first hole, simply lower the drill down to the work surface *with the drill stopped*, then move the laser dot until it's in exactly the same spot.

Be sure the laser is focused accurately so that you get a nice clean dot. The more vertical you can keep the laser, the more accurate you'll be.

A word to the wise - - drill presses vibrate, and the one in Figure 1 is probably too heavy for drilling PC boards. After you've set the laser dot, turn on the drill press and let it run a minute; then re-check the position of the dot (*again, with the machine stopped*). Correct any error and you should be good to go.

***see DRILLING on page 5***

***from DRILLING on page 4***

In the preceding photograph you can see the gooseneck snaking its way up from the table, then back down to the laser head. There's nothing wrong with securing the top of the gooseneck to the drill press with an extra clip so that the effect of vibration is limited.

In this photograph you can see the system in action. There's a clear dot on the workpiece where the hole is going to be drilled. The drill is slightly above the board, so the dot appears slightly to the left of the bit due to the camera angle.

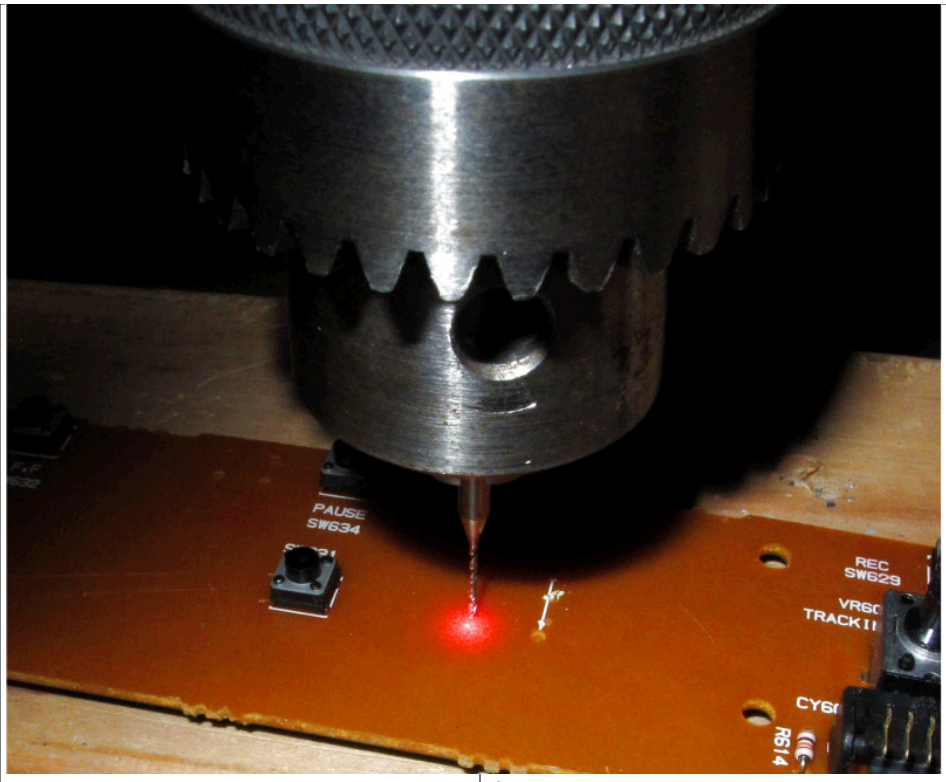
*Cautions and Limitations*

It goes without saying that you should follow all safety rules when using power tools. Wear eye protection, keep your body clear of moving parts (restrain loose hair), and remove any jewelry before starting the job.

If you've mounted your laser system like mine (where the laser head is not perfectly vertical), be aware that it will only be accurate in one plane, and that's the one you aligned it on. You must make sure that the board remains flat and within this plane while you're drilling or accuracy will be degraded.

Don't use a high power laser module. A 1 to 5 mW, FDA Class I module is sufficient; these are very safe. Don't stare directly into the laser beam.

Be sure to work with adequate illumination on the work surface. This will actually make your work more accurate by making the laser dot appear sharper and more distinct to your eyes.




*Conclusion*

It's easy to set up a laser system on a drill press or other manually operated equipment--and there are many other uses for this little device that you will discover as you use it. If you're repairing PC boards, you'll quickly find that the laser is great for pinpointing component leads on the bottom of boards. Simply shine the laser up through the board from the component side and the leads will be clearly marked.

Cross-type laser modules are available. The use of this type might improve your accuracy even further by producing a better-defined target.

Happy building!

***-- JCRAC FEEDBACK --***

***from HAMBONE on page 8***

"Professor Berner is trying to teach you the details you need to actually design something useful some day. Maxwell's Equations, daunting as they are, show how the electric and induction and electromagnetic fields interact and depend on each other much like current and voltage do in Ohm's Law.

Unfortunately, it is very difficult to use the basic field equations to solve everyday antenna problems, even for Professor Berner.

"Electromagnetic waves and antennas seem to be simple, especially as they are described in popular ham radio books. But in reality, there's a lot going on that we don't see."

"Well, Uncle Elmer, you can go get lunch, but I'm getting back to studying. I don't want to end this course with a D," said Hambone.

"But wait, Unck! I have a question, how does an antenna receive?"

"That's another story for another time, Dude. Right now, I'm heading to the refrigerator."

*A Hambone and Elmer Story - Jaimie Charlton, ADØAB*

# Where Do Radio Waves Come From?

"But Uncle Elmer, I think there is something wrong with this guy. This class is supposed to be about radio waves, but all he talks about are fields and forces and stuff like that," whined Hambone--home from college on mid-term break--as his Uncle confronted him with an Electrodynamics 101 quiz bearing a big letter D.

"I think I know something about radio waves. After all, I've read the 'Antenna Handbook' and I do have a General Class Radio Amateur License. That proves I know a thing or two about radio waves, right? I think big old Professor Bunzen J. Berner should shape up and read that book."

Sensing a hiatus in young Hambone's rant, Uncle Elmer mused, "I do know Professor Berner from my school days. We were both in many classes together, but we have since gone our separate ways. Although he was an excellent engineer, Bunzen chose a career in academia and has become very well known and respected in the field of electrodynamics. He's not quite the Luddite you make him out to be. You would do well to listen to him. If, for no other reason, to pass his class with a better grade than this D."

"Uncle, I just don't understand all this stuff. Curl, Div and all these strange symbols, I don't get it. This math blows me away. Where are the dipoles and Yagis?"

"Professor Berner is teaching you the basic physical foundation upon which all the antenna, waveguide and transmission line operation is based.

Because as hams we work with dipoles, verticals and beams over a limited range of frequencies, we think that's all there is. But there is so much more. I bet you didn't know that the theory your learning, or maybe not learning all that well, can be applied to DC, light, X-rays, power lines and almost everything else that uses electricity."

"Fine," replied Hambone getting a bit tired of his Uncle's pontificating. "But right now, I just need to know where radio waves come from."

"Okay, let's start there. Everything you need to know about radio waves was described in the middle 1800s by James Clerk Maxwell, a Scottish scientist and mathematician."

"Whoa, Uncle, let's stop there. I know you're a Scot, too, and I get that for some reason Maxwell's equations are important. But, I don't understand why they are important or why I should care.

"As far as I know, electrons come out of my transmitter and run up through my antenna. There they run along at nearly the speed of light until they hit the ends of the elements and fly off as radio waves."

"I see," replied Elmer. "Based on that, I think Professor Berner was being generous when he gave you a D. Here's what really happens. First, we are going to use the correct terminology. Technically, radio waves are electromagnetic waves or fields. For this discussion, it is important to realize that we will be dealing with two other fields, the electric or coulomb field and the magnetic field. I'll call the magnetic field by its other name, induction field, to avoid confusion.

All three fields arise from electrons. The coulomb and induction fields are known as "near fields" because they don't extend more than a couple of wavelengths from the antenna. The electromagnetic field is known as the "far field" and is the one we are interested in."

"Stop again, Uncle. What's a field?"

"Good question. Short answer, nobody knows. The definition I like is that a field is a mathematical construction that allows us to explain action at a distance. For example, if you take your comb and charge it up with static electricity by running it through your hair--an experiment I can no longer perform effectively--and bring it near some small bits of paper, they will be attracted to it. In essence, the comb is somehow exerting a force on the bits of paper without touching them. So, to explain that weird no-touch force effect, we say the charge on the comb created an electric field that attracted the bits of paper. See, that answers the question and nobody gets hurt."

***see HAMBONE on page 7***

*from HAMBONE on 6*

"So, your buddy Professor Berner has made a career out of combs and bits of paper?" asked Hambone.

"Well, yes, but there's a lot more to it. What I have just described is an electric field. Every electron in the universe carries a negative charge and is surrounded by an electric field. It's part of what it is. This will be important later."

"What about protons, aren't they charged, too?"

"Yes, protons are positively charged so they attract electrons. But they are so heavy that they don't move readily and aren't really important in this basic discussion. Electrons are where all the action is.

"Moving on, we call this field that surrounds all electrons, even stationary ones, the electric field. When you say that static electricity is making your clothes cling or you get a shock when you touch something, you are really experiencing an electric field, albeit a very weak one. It is one of our near fields. But, as soon as we move an electron or a whole bunch of electrons, something changes."

"Isn't that what we call an electrical current?" asked Dude, Hambone's younger, but smarter brother who had unobtrusively entered the room.

"It is," replied Elmer. "When the electrons move together in one direction, such as along a wire, we call that current and measure it in amperes. So, what happens then?"

"I know, I know!" shouted Hambone, waving his hand wildly as though he were in a classroom.

"A magnetic field is created around the wire. Just like the electromagnet you can make bywinding wire around a nail."

"Now you're getting it! We just created our second field that I will call an induction field. Toy electromagnets attract iron and steel because they produce weak magnetic fields. Junkyard magnets produce the same field only stronger. It's also a near field."

"So that's how radio waves, er, electromagnetic waves are made," exclaimed Dude. "We have an electric field and a magnetic field together and that makes an electromagnetic field!"

"Not so fast," cautioned Elmer. "It would be nice if that were true. What you have is two separate fields that happen to in the same general area. It's no different than if you had a comb charged with static electricity and a magnet sitting on the table together. They are fun toys, but they aren't making electromagnetic waves.

To make electromagnetic waves we must use AC. More specifically in the ham radio sense, we must apply a radio frequency voltage to a dipole antenna and cause an RF current to flow. All the electrons we need are already in the copper wire antenna. By applying an RF voltage, we cause them to first run one way and then, when the cycle of the RF voltage reverses, run the other way. From the electrons' point of view, they are sloshing back and forth in the antenna wire."

"This is where the electrons run to the ends of the dipole, jump off and become radio waves," added Hambone.

"No," continued Elmer. "Unless you see sparks jumping off your antenna, no electrons are leaving it.

"It is very easy to move electrons around inside copper wire, but it takes a lot of energy to actually pull them out of the wire and into the air. In a typical antenna, the electrons don't move much at all.

"It is very unlikely that even one electron will ever make it to the end of the wire because they move so slowly. In a dipole made of say, #13 copper wire, the average speed, known as drift velocity, of the electrons flowing in one amp of current is only about 0.022 inches per second.

"If we pick our RF frequency as 10 MHz, so our electrons are sloshing back and forth ten million times per second, the average distance traveled during each half-cycle is only about 0.0000000011inches. That's not very far unless you're the size of an electron. Then it's a pretty decent distance."

"Wow," Dude replied. "How did you figure that out?"

"It's not too difficult, but it's tedious. You can find the formula for electron drift velocity in various physics textbooks or just Google it. You can do the same for the skin effect of 10 MHz RF on a copper wire. That's needed because RF current flows mostly near the surface of a wire and not through the center. For now, let's get back to making electromagnetic waves.

"The next part is kind of tricky. Because the RF voltage that is applied to the two legs of the dipole is constantly changing back and forth between positive and negative, it is not only moving the electrons, it is accelerating them."

***see HAMBONE on page 8***

***from HAMBONE on page 7***

"C'mon, Unck," replied Hambone. "Electrons aren't cars, they don't have accelerators."

"I said this part was tricky. Physically and mathematically speaking, when something changes its speed, it is said to be accelerating. It doesn't matter if it is slowing down or speeding up. It's all called acceleration. So, when we say the electrons are sloshing back and forth, we are really saying they are accelerating first in one direction and then reversing and accelerating in the other. This is where the magic comes in. It's not the flow of current or voltage that gives rise to electromagnetic waves, it is the sloshing!

"Yes, it's the acceleration of the electrons as they move back and forth that creates the third, or electromagnetic, field. The electromagnetic field is called the far field because, while the strengths of the near fields drop off rapidly as we move away from the antenna, the electromagnetic wave hangs in there until the ends of the universe--unless it runs into something first." Uncle Elmer leaned back, took a sip of his coffee and enjoyed the looks on the faces of Hambone and Dude. It's as though they have just seen real magic for the first time.

"But Unck, isn't the electromagnetic wave really a combination of a magnetic wave and an electric wave? How is it different from those near-field waves?" asked Hambone.

"The difference is that the fields in an electromagnetic wave are *coupled* together. That is, they can't exist separately.

"The coupling of the fields is the essence of what ol' Jimmy Maxwell defined in his very famous equations. He showed that when we are working with alternating current, or in our case high frequency AC called radio frequency current, the electric and induction fields are inseparable because--now get this--one causes the other! Yes, the magnetic field gives rise to the electric field and the electric field gives rise to the magnetic field.

"Further, they are in phase with each other and their relative strengths are in the ratio of the impedance of free space--377 ohms. An electromagnetic wave is not just a combination of other waves, it's an entirely new thing that we have come to know and love."

"I think I'm starting to understand this, at least, a little. It is the physical characteristic of electrons to emit radio, er, electromagnetic waves when they are accelerated. Electrons don't really run around very much inside the antenna elements, it's their electric, induction and electromagnetic fields that give any antenna its characteristics."

"That's right, Hambone. But there's still one more thing. Although those little electrons are very small and light, there are so many of them that it takes real work to accelerate and decelerate them. They resist being moved. This resistance to movement is caused by the interaction of the electric and induction fields generated by the electrons on the electrons themselves. It is called *radiation resistance*. It is the power, RF volts times RF amps, that your transmitter supplies that overcomes this resistance and accelerates the electrons."

"So Unck, is the impedance of an antenna really the radiation resistance?"

"Good question, Dude. Radiation resistance makes up part of an antenna's impedance. But impedance also includes the ordinary or ohmic, resistance of the wire as well as any inductive or capacitive reactance that may be present.

"Remember, only the power dissipated in the radiation resistance gets radiated as electromagnetic waves. The power dissipated in the ordinary ohmic resistance just goes to heating the wires. That's why antennas that are quite a bit shorter than a quarter wavelength are not very efficient. Their radiation resistance is much lower than their ohmic resistance--which includes both wire and ground resistance--so, most of the transmitter power is dissipated in the ohmic resistances and never gets radiated."

"That explains why my eighty-meter mobile rig doesn't seem to work as well as my full size dipole at home. The radiation resistance of my nine-foot whip is just too low," exclaimed Hambone. "It all seems so simple, now. Why is Professor Berner making it so complicated?"

"Hold your horses, Hambone. We have been discussing a super-simplified view of electromagnetic waves. I've skipped over a lot to shorten this discussion, especially about exactly what happens when we accelerate those electrons. After all, it's getting close to my feeding time.

***see HAMBONE on page 5***

## *Johnson County Radio Amateurs Club - June 12, 2015 Meeting Minutes*

Attendance: Self introduction with name and call sign. 37 signed the check in sheet. This was followed by the Pledge of Allegiance.

The Minutes from the May 22, 2015 meeting were accepted with 1 opposed vote.

There was No Treasurer's report.

Old Business:

- Field Day 2015 – In order to get an accurate count for Dinner on Saturday night, a Sign Up Genius form has been created. Please RSVP with your name and total number coming. A $2 donation will be collected at Dinner in order to help defray the cost.
- Ron Cowan, KBØDTI Kansas ARRL Section Manager was at the meeting to recognize John Morse , N0EI as a National Traffic System Official Relay Station Operator.

New Business:

- Thanks to Don Warkentien, W0DEW as he was able to obtain a Permit from the City of Olathe to conduct Cookout Campfires every Saturday until the end of the year.

Reports:

- 6 m – Yes a couple. One in NY and one in CT.
- 10 m SSB Roundtable – NR.
- 440 Wheat Shocker net – 20 check-ins on June 10 and 18 check-ins on June 3.
- 2m Wheat Shocker net – 18 check-ins on June 11 and 19 check-ins on June 4.
- HF Activity – South Korea, France, Guatemala 20m Mobile, New England 2m SSB.

Announcements:

- Hamclass June 13 and 20.
- SKCC Sprintathon June 13 7 AM to 7 PM.
- It was suggested that we send a Get Well Card to Larry Staples, W0AIB.
- Watch Larry's List for upcoming events.

Business meeting adjourned at 7:54 PM

Program:
The Program for this meeting was a presentation on "Do's and Don'ts of a New Repeater" by Bill Brinker, WA0CBW.

## *Johnson County Radio Amateurs Club - June 26, 2015 Meeting Minutes*

The meeting tonight was held at the Field Day site (Observation Tower at Shawnee Mission Park).

## *Johnson County Radio Amateurs Club - July 10, 2015 Meeting Minutes*

No meeting was held tonight due to the Church being locked.

## *Johnson County Radio Amateurs Club - July 24, 2015 Meeting Minutes*

Attendance: Self introduction with name and call sign. 31 signed the check in sheet. This was followed by the Pledge of Allegiance.

The Minutes from the June 12, 2015 meeting were accepted unanimously.

The Treasurer's report, as follows, was read and accepted unanimously.

| | | |
|---|---|---|
| Cash on Hand | $ 91.00 | |
| Checking Account | $ 693.03 | |
| Savings Account | $ 6,773.26 | Actuve Members = 134 |
| Total | $ 7,557.29 | |
| Repeater Operating Reserve | $ 853.87 | |
| Memorial Fund | $ 310.00 | |

Old Business:

- Repeater Update – All are working well!
- Jerry Dixon KC0KW, "Van" Van Daveer K0HCV, and Bill Brinker WA0CBW spent some time working on the 146.91 Fusion Repeater. The work included grounding the UPS, adding Lightning Protection, and rebuilding the Duplexer base. This repeater is now 100% Fusion – Digital.
- Field Day 2015 – Thanks to all that help with the organization of Field Day this year. We have reserved this same location for next year.
- WW1USA Update – Clay Wilson, N0WW1 became a Silent Key this month. His leadership of the WW1USA Special Event effort will be greatly missed. Herb Fiddick, NZ0F has volunteered to take over this role and has reported that the Museum is still very committed to the WW1USA Special Events. Upcoming Events are September 12-13 (organized by the Raytown Amateur Radio Club) and December 12-13 (organized by JCRAC).
- It was suggested that we give Emily Klein a Certificate of Appreciation for all the work she did with the Club's Shirt project. Thank you Emily!
- We are again currently looking for volunteer Ensor Tour Guides. Our Club needs to cover the Month of September. On Line Sign-up is available through Sign-Up-Genius. The link can be found on the Club's website

New Business:

- Ensor Auction – Plans are underway for the Ensor Auction in October. More details to follow.
- NWS – SKYWARN Recognition Day will be the first weekend in December.
- Kansas QSO Party is August 29. A motion was made to donate $200 to help with the cost of making the plaques and certificates. The Kansas QSO Party website is http://www.ksqsoparty.org/. After a short discussion a unanimous vote was taken to pass the motion.

Reports:

- 6 m – NR.
- 10 m SSB Roundtable – 5 participated on July 23.
- 440 Wheat Shocker net – 20 check-ins on July 22 and 14 check-ins on July 15.
- 2m Wheat Shocker net – 26 check-ins on July 23 and 30 check-ins on July 16.
- HF Activity – India, Queen Mary W6RO.

Announcements:

- Campfire at Ensor on Saturday July 25.
- ARRL Kansas State Convention August 16.
- Welcome to all the 1st time visitors.
- Summer Breeze Bike Event August 23. See Herb Fiddick NZ0F for details.
- MS Ride September 19 & 20. See Herb Fiddick NZ0F for details.
- Congratulations to Eddy Paul, KY0F for working "All States" during the W1AW Centennial Last year.
- Watch Larry's List for upcoming events.

Business meeting adjourned at 8:22 PM

Program: The Program for this meeting was a video presentation on "Field Day 2015" by John Raydo, K0IZ.