

THE NEWSLETTER OF THE KINGS COUNTY RADIO CLUB

KCRC



October 2017

The Semi-Ridiculously Abridged Edition

Volume 4, Issue 10^A

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

Our October “Pre-Meeting Question and Answer Session” was a lively affair this month. Impedance transforming Ununs, verticals and their counterpoise/radials, earth ground for RF equipment, best *first* radios, best strategy to pass FCC license exams and radio technology for those starting out in the hobby were just some of the topics discussed!

The monthly meeting was called to order at 8:25 PM, by our President, Mitch N2RGA. Also present at tonight’s meeting were Vice President Howard N2GOT, Treasurer Richard KA2KDQ, General Secretary Roy AC2GS, Gene KY2MY, Berlotte KD2MYF, Dan KC2TRX, Lloyd K2JVX, John WB2LFU, our semi-regular visitor Bob KD2NVB and a new visitor tonight was Thomas, new to this hobby and very curious about it all!

Treasurer Report—Richard KA2KDQ, reported that our Treasury currently has \$580.63 in assets in our bank account, and \$11.84 in our Club PayPal account, for a total of \$592.47. Since last month Dan KC2TRX has returned to the Club and Aaron KB2ZGA has joined our Club—our Club presently has 59 members in good standing.

2 Meter Report—Richard KA2KDQ reports a range of 12 to 20 participants for the Net. Technical issues have been addressed.

10 Meter Report—Our Net Control operator, Milen KG2C reported in absentia that he was unable to participate in last week’s Net, because he was in the midst of a move to his new apartment. He intends to rig a temporary antenna, which he hopes will allow his participation in next week’s Net, but does not believe that he will be able to act as Net Control Operator for this next Net—He hopes to be fully operational soon. Roy AC2GS handled the 10 Meter Net last week, and will be NCO for this coming weekend’s Net. We all look forward to Milen KG2C’s return on 10 Meters!

KCRC TechNet —Our Net Control Operator and Host, Roy AC2GS, reported that the TechNet is doing well—he asked members to consider participating, either with questions, answers, or even technical observations that they have discovered recently. A technical Net requires participants to make it a success—it isn’t a lecture series.

KC2RC FusionNet—Our Net Control Operator Jason KD2LRX and back-up NCO were not able to attend this meeting. The Secretary reported that last week there were 7 participants. Although for a few weeks the Fusion Net was transmitted on analog FM mode, last week they returned to Fusion Digital mode. The Fusion “Room” , analog FM access to the Room, and live audio stream were still experiencing some technical difficulties but it is hoped that these will be ironed out soon.

Field Day 2018 Committee Report—James KB2FMH reported in absentia that nothing definitively new had been decided since last month’s report. The members present at tonight’s meeting discussed other outdoor venues that might be better than Floyd Bennet Field, i.e. Marine Park and, Fort Tilden.

Old News: Our most recent VE Session was September 17th. We had 4 participants. Two examinees earned their Technician licenses, 1 person upgraded to a General license, and one upgraded to his Extra license. Our next scheduled VE exam will be November 19th of this year. 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!

Howard was not able to discuss our planned meeting place's location in 2018 yet with Damian NY2P, but he will try to iron out the details by next month's meeting.

Repeater status was reported by Mitch N2RGA—We replaced our Yaesu DR-1X Repeater with their new DR-2X model. Unfortunately, as it arrived, it was NOT compatible with our Arcom Controller (which provides, courtesy tones, voice ID, squelch tail, as well as other useful features). Yaesu has engineered a modification to solve this deficiency and Mitch N2RGA will arrange with Yaesu to have our unit modified. Any further information regarding our repeater will be posted on our Club website, www.KingsCountyRadioClub.com. The Astron 35 Amp power supply, which powered our repeater's RF amplifier, failed recently. (Two power transistors and a SCR that operated the crowbar power safety circuit suffered cascade failures—producing lower current, and poorly regulated power. All four pass transistors and the SCR are being replaced).

The September Club Picnic at Manhattan Beach, scheduled for September 24th went very well.

Our semi-annual mail membership drive will be mailed out within the next few weeks.

Our new Club Bylaws have been posted on our Club website, and the final vote has been tabled for our December meeting.

New Business: The 2017 Year End Holiday Party was discussed. It will December 6th, 2017. Details have yet to be finalized.

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 (via Roy AC2GS) has been streaming events over the Internet using <http://live.KC2RC.com> !

At 10:10 PM the meeting was adjourned.

See ya' all in November!

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, October 3rd, in the two thousandth and seventeenth year of our Lord of Propagation...

Electromagnetic Energy - As Simple As α , β , γ ?

All of us Hams use **Electromagnetic Energy** every time we press that key down on our transmitter, but do we really know what the heck it really is?

In an earlier article, I wrote:

All charged particles at rest produces an electric field excitation. All charged particles traveling at a constant (linear or angular) velocity produces a magnetic field excitation. All charged particles traveling at an always changing velocity produces an electromagnetic field excitation!

From our own radio waves, to microwaves, to visible light, to X-rays and all the way to those deadly gamma rays that many of my old comics suggested were the quick and easy route to super powers - they are ALL electromagnetic waves - they only differ in the frequency of their field excitations!

But the one kind of electromagnetic wave that is dear to us Hams are in the radio spectrum - radio waves! Hams have all kinds of interesting ideas, what radio waves mean to them - I have heard fellows swear that their radio waves were pure unadulterated waves, all that "particle" photon talk one hears concerns those high falutin higher frequency electromagnetic waves. I have heard other, thoughtful, Hams discussing electromagnetic energy as some kind of Jekyll/Hyde contrivance - traveling as a pure wave, and only transforming into a particle when it smacks into some matter that it finds in its path!

So, is electromagnetic energy a wave or a particle?

Both..., or neither.

Electromagnetic energy can be examined in many experiments where it demonstrates wave-like characteristics in some experiments, and particle-like characteristics in other experiments - so it might be both, a wave-particle duality, or it might be something our limited brains cannot quite wrap our heads around yet - the best we can do right now is to describe it as two very different things rather than another thing that acts as a wave or as a particle depending upon test conditions. What is this more complex thing that electromagnetic energy might really be?

I don't have a clue, but if you do there's a Nobel Prize waiting for you in Stockholm <grin>!

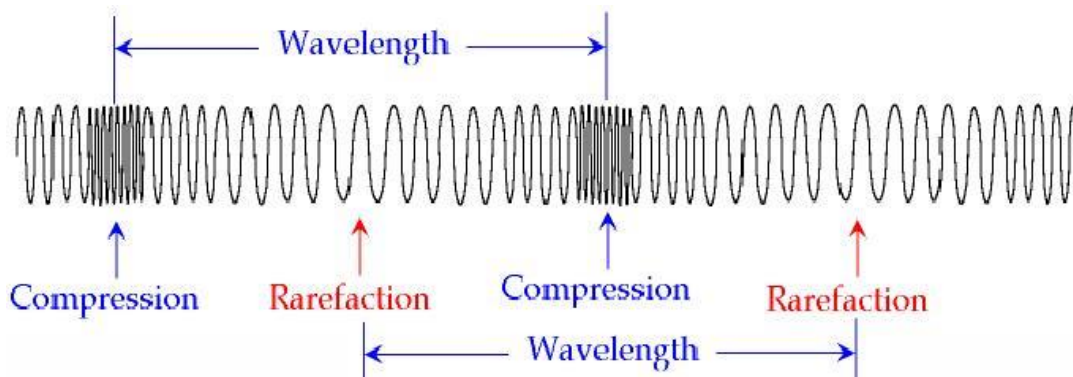
Do we care?

Some do, some don't.

I care.

Generally speaking, there are two completely different types of waves in nature - Longitudinal Waves and Transverse Waves.

Longitudinal Waves are the simplest type -

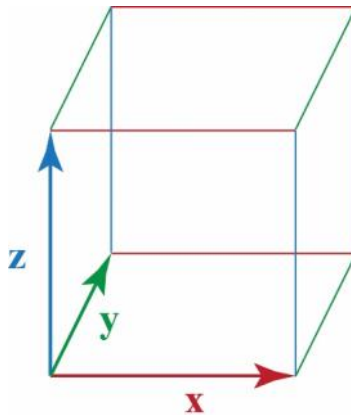


Longitudinal waves are waves that displace a medium in the same direction or the opposite direction to the propagation of that wave. Sound waves are a perfect example of this phenomenon - the medium is air and the displacement produces areas of compression of the gas in air as well as areas of rarefaction where the gas is expanded or “thinned out” out farther away than usual in room air.

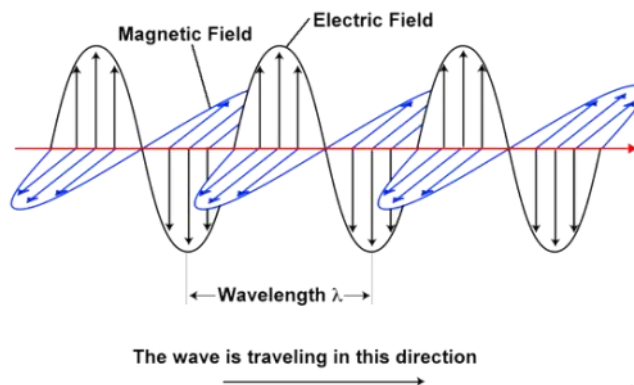
Electromagnetic waves aren't longitudinal waves - they are a different animal entirely - they are transverse waves!

Electromagnetic waves (EMW) are complicated things, and they have distinct parts that combine to form those EMW's that we love so much. All EMW's consist of a fluctuating excitation in the Electric Field, in addition it has a fluctuating excitation in the Magnetic Field at a right angle from the first field excitation. Then, there is the so-called Poynting Vector, which is the propagation of the EMW, again at a right angle to both field excitations!

You can only have three directions that are simultaneously 90 degrees from each other. The easiest way to visualize this, is to consider the three “legs” coming off a corner of a wire frame cube, or a three-dimensional graph with an X, Y, and Z axis.



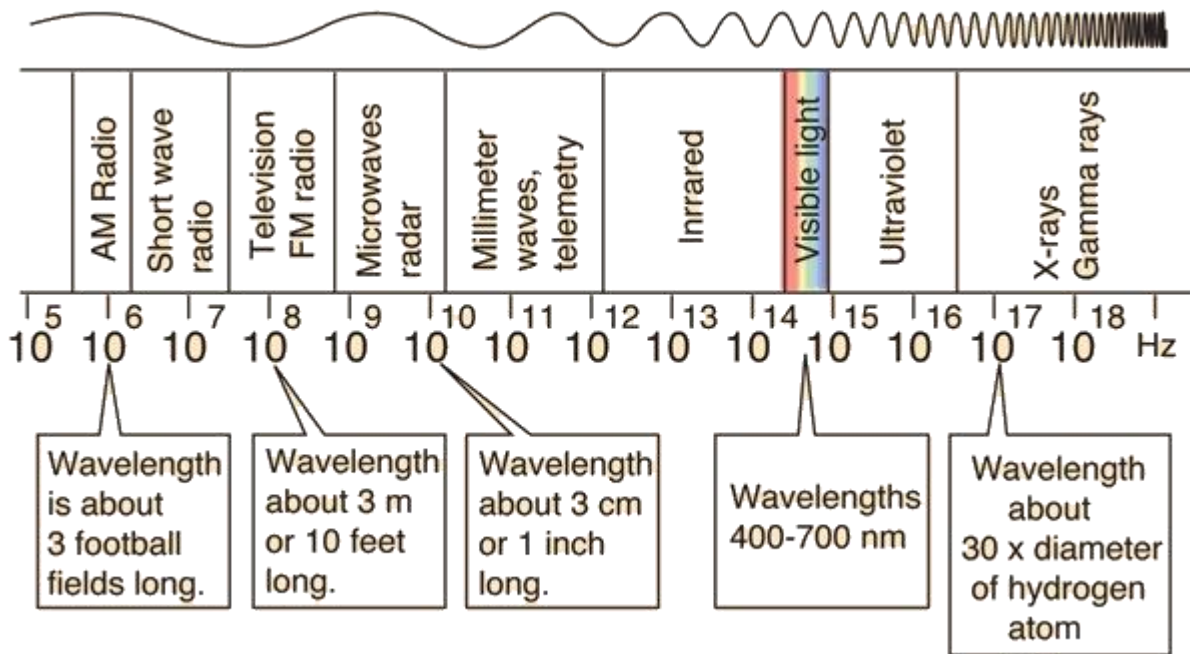
Electromagnetic Waves



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What are the characteristics of a given electromagnetic wave?

Well, one important characteristic is its frequency - its rate of fluctuating from its highest excitation to its next peak. The more rapid the fluctuation, the more intrinsic energy contained within it and the more force it can apply to matter when it collides with it. We modulate a signal's frequency when we transmit using frequency or phase modulation methods.



Some of the lowest frequency electromagnetic waves we deal with everyday are the 60 cycle/sec (Hertz - Hz) EMW from our nationwide alternating current power source. In other parts of the world it is 50 Hz, but here in the U.S. of A. it is 60 Hz. Most people notice it in the 60-cycle audio hum made manifest by problematic ground loops.

As Hams we are involved in a large swath of the radio spectrum:

135.7-137.8 KHz LF (Low Frequency) 2200 Meter Band

472-479 KHz MF (Medium Frequency) 600 Meter Band

1.8-2.0 MHz HF (High Frequency) 160 Meter Band

3.5-4.0 MHz HF 80 Meter Band

5.275-5.4 MHz HF 60 Meter Band

7.0-7.3 MHz HF 40 Meter Band

10.10-10.15 MHz HF 30 Meter Band

14.0-14.35 MHz HF 20 Meter Band

18.068-18.168 MHz HF 17 Meter Band

21.0-21.45 MHz HF 15 Meter Band

24.89-24.99 MHz HF 12 Meter Band

28.0-29.7 MHz HF 10 Meter Band

50.0-54.0 MHz HF 6 Meter Band

144.0-148.0 MHz VHF 2 Meter Band

222.0-225.0 MHz VHF 1.25 Meter Band

420.0-450.0 MHz UHF 70 cm Band

902.0-928.0 MHz UHF 30 cm Band

1.24-1.30 GHz L Band Microwave

2.30-2.31 GHz S Band Microwave

2.39-2.45 GHz S Band Microwave

3.30-3.50 GHz S Band Microwave

5.65-5.925 GHz C Band Microwave

10-10.5 GHz X Band Microwave

24.0-24.25 GHz K Band Microwave

46.9-47.2 GHz V Band Microwave

76-81 GHz W Band Microwave

122.25-123.00 GHz Microwave
134-141 GHz Microwave
241-250 GHz Microwave
275-3000 GHz Microwave (unallocated free for all)

A veritable wealth of frequency spectrums, and you **already** have your ticket for a ride on any of these frequencies - your amateur radio license! Some frequencies are ours alone, and others we have to share with non-amateur users, but consider getting out of your comfort zone and look into some bands that you are less familiar with!

Electromagnetic Waves aren't that harmful to living things until you get up to ultra-violet light waves. Below that they might bang against a given atom and "heat things up", but at the frequency of ultra-violet light they can rip the electrons right off of an atom and damage cells in your body - the higher the frequency, the deeper they can rip your electrons out of your atoms!

Another quality of electromagnetic waves is their wavelength for each peak-to-peak *cycle*. A wave's wavelength, λ is inversely related to its frequency:

$$\text{Wavelength (in meters)} \lambda = \frac{\text{Wave Velocity } 299,792,458 \text{ meter/second}}{\text{Frequency (in Hz)}}$$

A quick approximation is the equation:

$$\text{Wavelength in Meters } \lambda = 300/\text{Frequency in MHz}$$

Remember that this is the velocity of electromagnetic waves *in a vacuum* - if you are measuring what's going on in something like a coaxial cable, you need to factor in the *velocity factor* of that piece of cable. Electromagnetic waves have a *maximum velocity*, but depending upon the medium they are traveling in, their *effective* transmission velocity can be a **lot** slower than 300 million meters per second.

By the way, did you ever wonder why Hams very often describe their activity on a ***Band's wavelength***, rather than just their frequency?

Well, like many things, it goes all the way back to the dawn of this hobby and the technology that spawned it!

You see, in the early days of radio, no one had a clue what was really going on - People would **spray** RF in as wide a range of frequencies as they could, using a contraption called a ***Spark Gap Transmitter***. If government officials hadn't made such devices illegal the invisible *aether* would be opaque to every legitimate transmission throughout most bands!

Eventually, people started to realize that they were trying to *thread a needle* with a sledge hammer, but they still had no equipment to measure a signal's frequency! The way around that problem was that antenna resonance was detectable - when your antenna was cut for a resonance on the 40 Meter band, you were...

On 40 Meters!

Later, when everyone figured out how to measure radio frequencies, the custom of describing bands as wavelengths, was strongly entrenched.

To this this very day!

But what about another RF wave's characteristic - amplitude!

Amplitude modulation, better known as AM is a very popular modulation method and is used in single sideband transmissions as well.

Something that seems to bother some people, is a characteristic of any ***force carrier*** like the photon. It *carries* electric and magnetic field excitations, but it is not *affected* by either of them! Some people would be more comfortable if a strong magnetic field or and electric charge would deflect a radio wave or a light ray from its

original path, but they don't - photons, or electromagnetic waves, simply do not interact with external magnetic or electric field excitations - they don't even interact with each other! Position two laser beams to intersect with each other and they just slip right pass each other unaffected. Indeed, unlike matter you can place an infinite number of photons into the exact same place in space at the same time! There is no theoretical limit where you can't *pack* another photon into that space!

Cool!

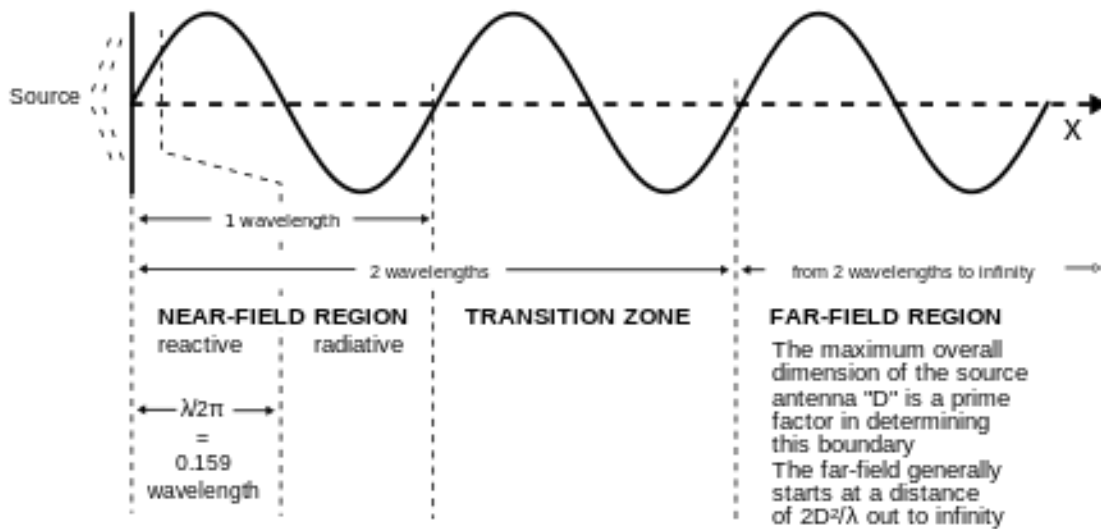
And that is as it should be - if force carriers could be affected by the forces that they carried, they would be infinitely acted upon by them and make a terrible force carrier - see, sometimes Quantum Mechanics actually makes some common sense!

So, that's it, right? All the characteristics of an electromagnetic wave, from A to Z. Nothing more here, move along. Right?

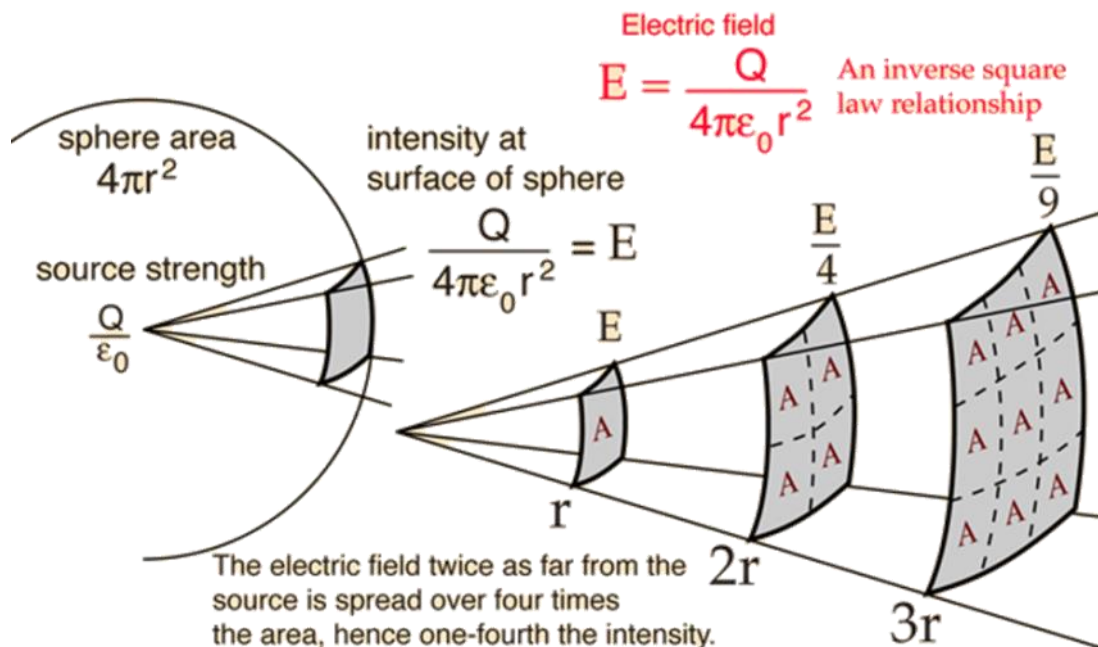
Well, no. There are still a few points to mention before this article is done.

Ever hear anyone talk about "near-field" or "far field"?

What's that all about?



Electromagnetic waves, in temporal phase, cause the waves to be self-propagating waves in the far field, and will fly through space forever unless it collides with some matter in space. They obey the inverse square law:



In the near-field things are WAY more complicated, with all manner of phase relationships. Those *stillborn* electromagnetic waves diminish much faster than any inverse square law would cause - they diminish as $1/r^3$, $1/r^4$, even $1/r^5$! They die off in the near field. In the far field, they are nowhere to be detected!

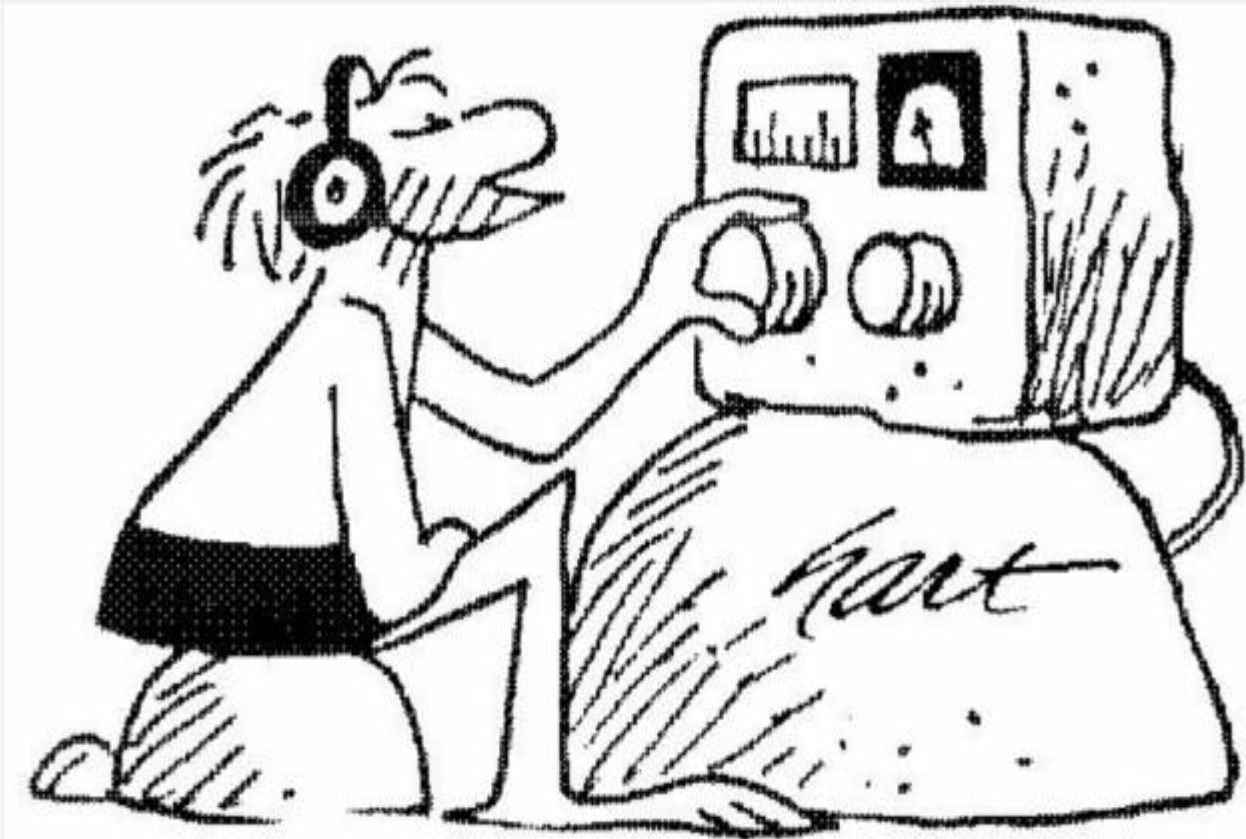
SO, those are just a few of the high points regarding electromagnetic waves.

If I've given you more questions about electromagnetic waves than I have answered for you, good!

That was the point of the exercise!

...and don't forget to have fun!

73,
Roy AC2GS



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