

# THE ELECTRO-MAGNETIC SPECTRUM

Radio waves, light and magnetism explained:

By Walter F. Kunz Sr.

Amateur Call Sign AA3FC

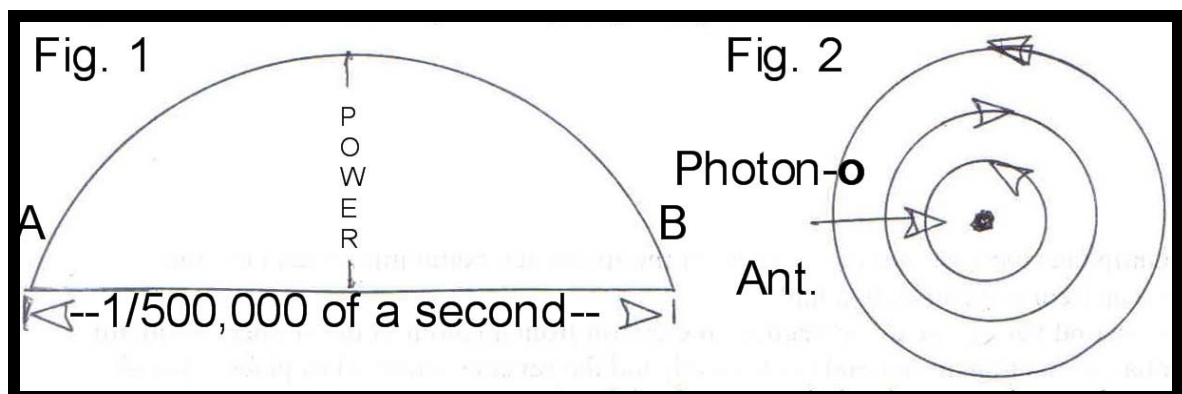
Dear Friends

While doing research on the propagation of radio waves I made an amazing discovery, which is, that EVERYTHING has an alternating current flowing on its surface (skin) that is emitting photons, under the influence of light or heat, and in the form: of waves, at various frequencies, some of which we can see and others we cannot.

Now my daunting task is to explain to you, so that you can understand as clearly as I do how I came to this conclusion. So first let's look at how radio waves are transmitted.

In order to transmit radio waves we need an antenna. A material that is a good conductor of electricity. The popular choices are copper and aluminum. What makes copper a good conductor is the fact that the copper molecules have atoms that have 29 electrons, one of which is in the outer orbit and is easily detached. When an electron enters the copper atom, under the influence of an electro-motive force such as a transmitter, it causes an electron to move to a higher orbit, which, releases energy in the form of a photon and causes the electron in the outer orbit to be released. The released electron enters another atom and the same process takes place along the length of the wire (antenna). This causes a current flow from one end of the antenna to the other. Most of the electron movement is along the outer surface (skin) of the conductor. This is referred to as "skin effect". The photons that are released on the skin of the conductor have no adjacent atom to enter so they go into orbit around the conductor according to the "right hand rule". See Fig 2. This all happens at the speed of light.

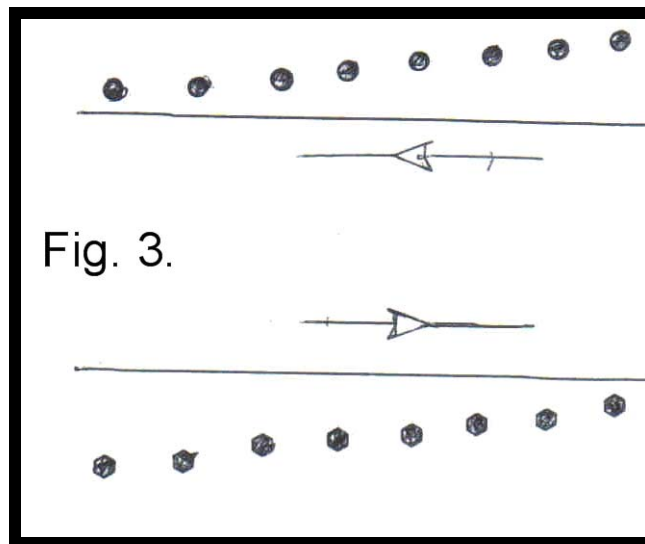
For explanation purposes let's assume the use of an unmodulated signal at a frequency of 1000 kHz, or one million cycles per second. Referring to Fig. 1 we can see that the first half cycle takes  $1/500,000$  of a second to travel from point A to point B. Therefore the length of the antenna has to be adjusted to allow the current to travel its length in exactly that amount of time.

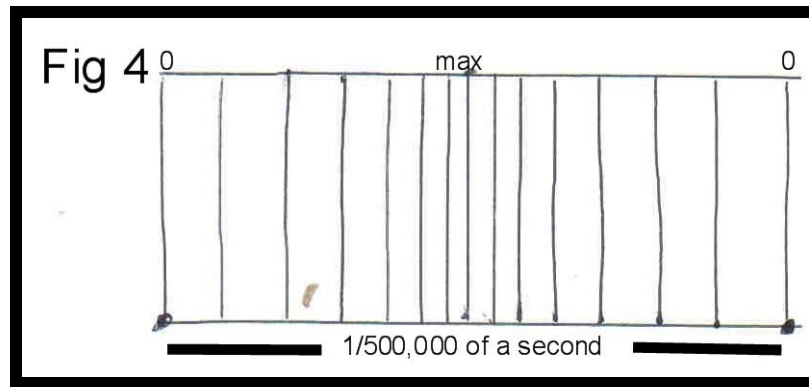


This completes the first half of the cycle and current comes to a halt. As the second half of the cycle begins an electron from an atom in the conductor (antenna) at the transmitter end is removed and the reverse action takes place completing one cycle. This all happens in millionths of a second depending on the frequency being used. If the transmitter power is cut off at this time the photons in orbit around the conductor will fall back and re-enter the conductor causing a momentary reverse flow of current. As the alternating frequency being supplied by the transmitter continues the photons in orbit around the conductor keep getting forced into a higher orbit until they reach a point where they are "free" of the conductor and radiate out into space. Now from this it can be seen that low frequencies cannot be transmitted because the photons in orbit around the conductor fall back into the conductor before the next half of the cycle occurs, and it can also be seen that the higher you go in frequency the easier it is to release energy from the conductor and with less power.

Next let's look at the photon. In the scientific community's quest to find the smallest it was discovered that the electron was composed of smaller parts one of which is the photon. The main four characteristics of the photon are, it has no at-rest weight, travels at the speed of light, has orbital tendencies, and has full spin. The orbital tendencies explain why it goes into orbit around the conductor it is being emitted from and the spin explains why it does so according to the right hand rule.

Up to this point I have only been referring to one electron and one photon to keep the explanation simple. Please keep in mind that at any given moment there can be millions of electrons flowing and millions of photons being released into space depending on the frequency and the power being applied. Looking at Fig 3 it can be seen how the photons are released as the current flows from one end of the antenna to the other traveling out into space in a string with a time delay between the first released and the last, the time delay depends upon the frequency. In our example the time delay would be 1/500,000 of a second. As these waves arrive on your receiving antenna, which is adjusted to the proper length to receive this frequency, the current flow is reproduced exactly as it was when leaving the transmitting antenna. In Fig 4 you will see a simplistic example as to how the photons are released with the current flow in the antenna starting at zero, going to maximum at midpoint in the half cycle, and then returning to zero at the end of the half cycle





Next: The electro-magnetic spectrum.

The electro-magnetic spectrum is a series of frequencies emitted from the surface (skin) of the sun which is called the CHROMOSPHERE. The chromosphere is about two thousand kilometers deep and in comparison to the size of the sun itself it is really “the skin” of the sun. How this occurs is not fully understood and various explanations have been suggested. It’s not just our sun that is emitting waves of various frequencies, but all the suns in the universe. In other words, this phenomenon is universal. So let’s take a look at what these frequencies are.

Starting at the top of the scale with the shortest wavelength are Gamma Rays with a wavelength of 0.1 Angstrom. Next we have X-rays at 1 nanometer, ultraviolet at 50nm, visible light between 380 and 750nm, then infrared, followed by long waves, referred to as “radio waves”, whose frequencies continue to an unknown end. These so-called waves are composed of PHOTONS which travel thru space at the speed of light. Each “wave” consists of a string of photons whose length is determined by the frequency being emitted. The string of photons has a time delay between the first photon in the string and the last photon in the string. In addition to the forward motion thru space the photons also rotate at right angles to their forward motion, each succeeding wave rotating in the opposite direction to the preceding one. The number of photons in each string is determined by the strength being emitted. The comparison of this action to “waves” is only to help understand how things work. The waves have no crest or valleys like the waves in the ocean, but only consist of strings of photons following each other in a uniform pattern as described above.

It was at this point that I realized that if the sun is emitting alternating waves of photons from its skin and we can do the same thing from the skin of an antenna wire, why not also from the skin of everything. This would finally offer an explanation as to how we see things of different colors.

Next: The visible part of the spectrum.

When a child is born and opens its eyes for the first time all he/she sees is a blur of images. In time as the eye muscles learn to focus, the images become clear, but have no meaning. As time goes by the child starts to develop a memory by having someone show him/her something and telling the child what it is. Everything we see for the first time someone has to tell us what it is. Without getting into detail as to how the eye works, the simple explanation is that the alternating waves of photons entering the eye impact on the cones and rods, causing electrical impulses to be sent to the brain. The brain “learns” to “recognize” these impulses, along with other senses such as sound, touch etc, to form a meaningful image. The colors

sent to us from the sun are as follows. Red, Orange, Yellow, Green, Cyan, Blue, and Violet. Red has the longest wavelength at 620-750 nanometers, and Violet the shortest at 380-450 nanometers. It is my belief that all other colors that we see are those produced by nature or are man-made. The sun has been showering the earth with these frequencies for billions of years before we came along. It has long been believed that what you see, a sheet of red paper for instance, is the red part of sunlight being reflected off that sheet of paper, but there is no explanation as to how this can happen. Lately it has been proposed that the light is being re-radiated by the paper. Here again there is no explanation as to how this can work. What I am proposing is that on the "skin" of the paper an alternating current is flowing at the frequency for "red" and emitting photons that travel thru space as previously described. This alternating current is sustained by the impulses of the same frequency from the sun. Cut off the light source and the current stops flowing. What makes this paper appear red is the molecular arrangement on its surface (skin). If I take that same piece of paper and spray paint it green I will be changing the molecular arrangement on the surface of the same piece of paper that previously looked red. The bottom line is that everything that looks different from something else is because of the molecular construction of its surface (skin). Let's look at some more examples. If we are looking at a flower that is in full sun some of its petals will be slightly shaded and look a slightly different color. This is due to the effect that temperature has on the surface of the flower, changing its structure slightly. Another example would be two cars parked side by side in full sunshine. One is black and the other white. The hood of the black car gets too hot to touch while the hood of the white car stays cool. The hood of the white car is emitting all the frequencies of the visible spectrum which the brain interprets as white while the black hood is emitting heat, which is thermal energy, and cannot be seen. Paint a black area on the hood of the white car and it will get hot just like the black hood. Now what about all the other colors we see! Look in a paint store and see how many different patches of colors there are to choose from, easily a hundred or more. All man-made colors whose names are chosen by the manufacturer and made by mixing different colors together. Each different color has a molecular arrangement on its surface that distinguishes it from all the other colors. When we look at these "new" colors for the first time we don't know what they are until we read the information on the patch.

Next let's take a look at the mysterious magnetism.

To understand magnetism we will have to establish some facts.

First you will notice that magnetism is not listed as part of the electro-magnetic spectrum. Now I wonder why this is. Let's look at some things that are peculiar to magnetism and hopefully we can draw a conclusion.

- One: Only iron is found naturally magnetized. Magnetite, which if found in the earth already magnetized is believed to get it's magnetism from lightning strikes on the surface of the earth.
- Two: If you strike a magnet a sharp blow with a hammer you will de-magnetize it.
- Three: If you bring the magnetic field of a magnet across a copper wire you induce a momentary flow of current into that wire, but the current will not continue to flow if the magnet is held in a stationary position, only if it is moved back and forth across the wire.
- Four: The magnetic field is composed of photons.

The logical conclusion that can be drawn from these facts is that the magnetic field of a magnet is DIRECT CURRENT and not alternating current which the electro-magnetic spectrum is composed of. Also another conclusion that can be drawn from this fact is that the magnetic field of a magnet comes out of the south pole and goes around and enters the north pole. A device that is in perpetual motion.

Next let's see if we can figure out how this takes place.

First the piece of iron has to be magnetized by a strong exterior magnetic force. It is my opinion that this causes the molecules in the iron to all have their orbits facing in the same direction, namely toward the south pole, causing photons to be emitted by the initial "induction" from an exterior" force, to be concentrated in a beam-like pattern.

Why don't the photons just radiate out into space? Because photons are known to have an "orbital" tendency and "spin" as previously described and stay in orbit because of angular momentum.

## In Conclusion

I would like to make some comments about how I think things work in general. First let's look at "capacitive effect." If you put electrons on one plate of a capacitor, the other plate automatically becomes positive (less negative). Now if this capacitor had a perfect insulator between the plates the "charge" would stay there forever. The reason for this is that half of the electrons on the one plate want to move to the other plate to establish equilibrium. This concept is very important in my view because it explains how current can flow in a conductor without a power source connected across both ends, as when transmitting with a vertical or single long wire antenna, and how current can flow on the surface of something and give off photons.

If you have a jar which has no air in it and you open it up, air will go rushing into the jar until it reached equilibrium. And that's the way it is with nature in general. The idea that like charges repel and unlike charges attract is misleading in my view. The reason unlike charges attract is for the same reason as opening the jar with no air in it or putting electrons on one plate of a capacitor. There is no "positive" charge only more or less electrons. As far as like charges repelling, the closer two electrons get to one another the more they resist the intrusion because two objects cannot occupy the same space at the same time. You have to put them in an atom-smasher to do the job. Let's look at a simple explanation of current flow. A battery with a light bulb across it. The battery has two terminals, one labeled positive and the other negative. In a perfect battery the positive terminal has no electrons on it and the negative has all the electrons. The two terminals are separated by a perfect insulator. Let's say that the negative terminal has one million electrons on it and you connect a light bulb across it until the bulb goes out. Now the battery is supposed to be dead. If you put a meter across it you won't get a reading. What happened to the electrons? Half of them flowed to the positive terminal to establish equilibrium. You now have 500 thousand electrons on the negative terminal and the same amount on the positive terminal and there is no difference of potential. Let's look at what happens when you put a resistance in a circuit. It reduces the current flow. What happens to the current (electrons) when they go through the resistor? The explanation is they are dissipated in the form of heat. The only thing that gets dissipated is photons at a frequency that is in the thermal energy part of the electro-magnetic spectrum. The resistor acts the same way as a poor conductor of electricity or a conductor that does not have a sufficient cross section to handle the current. If you try to force current thru it that it can't handle it will get hot.

Did you ever sit around a campfire or in front of a fireplace and watch the wood burning? If you have not you have missed something. The flames dance like fingers, going to sharp points at their ends and occasionally a tiny spark will rise up, carried by the turbulence of the heat waves, only to go out in a second or two. How can a tiny spark emit light? The answer to both questions is the same. The wave length of red light is about 700 millionths of a millionth of a meter in length and the size of a spark is a very large area for the red frequencies to appear on as well as the finger like appearance of the flames.

I would be happy to receive any comments about these ideas expressed above both pro or con.

Please direct these comments to [kunzham@verizon.net](mailto:kunzham@verizon.net).

Thank you.  
Walter