THEORY OF THE EH AND H_Z ANTENNAS

by

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This document has been prepared to explain the theory of the EH Antenna and the H_Z antenna. This document also presents, in layman's terms, a new form of radiation. For those who enjoy pure theory, you are encouraged to read "**STRUCTURE OF ELECTROMAGNETIC FIELDS – WAVES , THE DYNAMIC ELECTRON (mass - charge)"** by Vladimir.I.Korobejnikov in the theory section of this web site.

Several years of practical operation of EH Antennas have demonstrated very unusual properties of these antennas compared to the properties of conventional Hertz antennas. In particular, experiments have proven much greater penetrating abilities (less attenuation) of signals between EH Antennas compared to those of Hertz antennas in various media including water. The full explanation as to why this has taken place is due to the unusual electromagnetic field created by the EH-antenna. The mathematical explanation for this is defined by enhanced Maxwell's equations, which are detailed in the document referenced in the first paragraph.

The outstanding feature of Vladimir's mathematical work is the realization that the electric charge in dynamic electrons always has two components - forward and rotary. As a result, the electromagnetic field of this dynamic charge consists of two complex components: **two (2) separate and distinct electromagnetic fields**. The properties of these two electromagnetic fields are very different in space. Conventional Hertz antennas work on the forward progress of electric charges (current) in the conductors. A feature of the EH Antenna is that the cylinders have some conventional forward electron progress (current) but the ROTARY movement of the electrons is dominant. This sets up a condition to create magnetic streams counter to those of the tuning coil of the EH Antenna. The magnetic field from the tuning coil penetrates the non-ferrous cylinders in phase opposition (anti-phase) to the magnetic field caused by currents in the antenna phasing coil. Figure 1 exhibits the full structure of an electromagnetic field of a dynamic electric charge. The six (6) equations presented in Figure 1 are a result of taking Maxwell's first two equations (defining the electric and magnetic fields) and enhancing them by applying them in three dimensions, as compared to the planer rectilinear motion of an electron used by Maxwell.

Vectors shown in Figure 1 represent a physical interpretation of the components defined by the enhanced Maxwell's equations for an electromagnetic field of a dynamic charge in space. Black vectors represent the common standard interpretation of an electromagnetic wave in space due to the PROGRESS (current)of a charge. The blue vector represents a magnetic component due to ROTARY movement of an electric charge. It is important to note that the vector shown in blue has not previously been known and is therefore not in the textbooks. This is a new physics concept.

$$\dot{H}_x = \frac{\gamma' m\pi}{\lambda_x\left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]} \dot{H}_0 \sin\left(\frac{m\pi x}{\lambda_x}\right) \cos\left(\frac{n\pi y}{\lambda_y}\right) \exp\left(i\cdot\omega t - \gamma' z\right) ;$$

$$\dot{H}_y = \frac{\gamma' n\pi}{\lambda_y\left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]} \dot{H}_0 \cos\left(\frac{m\pi x}{\lambda_x}\right) \sin\left(\frac{n\pi y}{\lambda_y}\right) \exp\left(i\cdot\omega t - \gamma' z\right) ;$$

$$\dot{H}_z = \dot{H}_0 \cos\left(\frac{m\pi x}{\lambda_x}\right) \cos\left(\frac{n\pi y}{\lambda_y}\right) \exp\left(i\cdot\omega t - \gamma' z\right) ;$$

$$\dot{E}_x = \frac{i\cdot\omega\mu\mu_0 n\pi}{\lambda_y\left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]} \dot{H}_0 \cos\left(\frac{m\pi x}{\lambda_x}\right) \sin\left(\frac{n\pi y}{\lambda_y}\right) \exp\left(i\cdot\omega t - \gamma' z\right) ;$$

$$\dot{E}_y = -\frac{i\cdot\omega\mu\mu_0 m\pi}{\lambda_x\left[\omega^2 \mu\mu_0 \varepsilon\varepsilon_0 + \left(\gamma'\right)^2\right]} \dot{H}_0 \sin\left(\frac{m\pi x}{\lambda_x}\right) \cos\left(\frac{n\pi y}{\lambda_y}\right) \exp\left(i\cdot\omega t - \gamma' z\right) ;$$

$$\dot{E}_z = 0 .$$

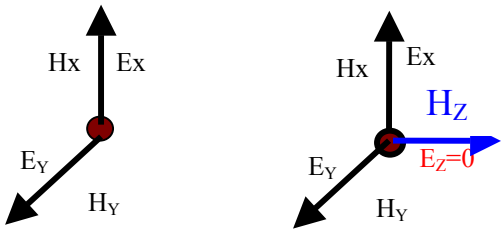


FIGURE 1 – Structure of an electromagnetic field of a dynamic electric charge. The red vector is a result of rotary motion and is a new concept in the physics world.

Figure 2 displays a schematic diagram of an AM Broadcast version of the EH Antenna. High voltage is created across the resonant tuning coil which is terminated by the cylinders. This sets up an intense E field between the cylinders. This in turn sets up a very large voltage between the ends of each cylinder, which causes the progress of electric charges (current) along the surface of the cylinders, as in a conventional antenna. These currents allow the EH Antenna to produce the same type of radiation as any conventional Hertz antenna, even though the antenna is very small compared to a wavelength (less than 2% λ).

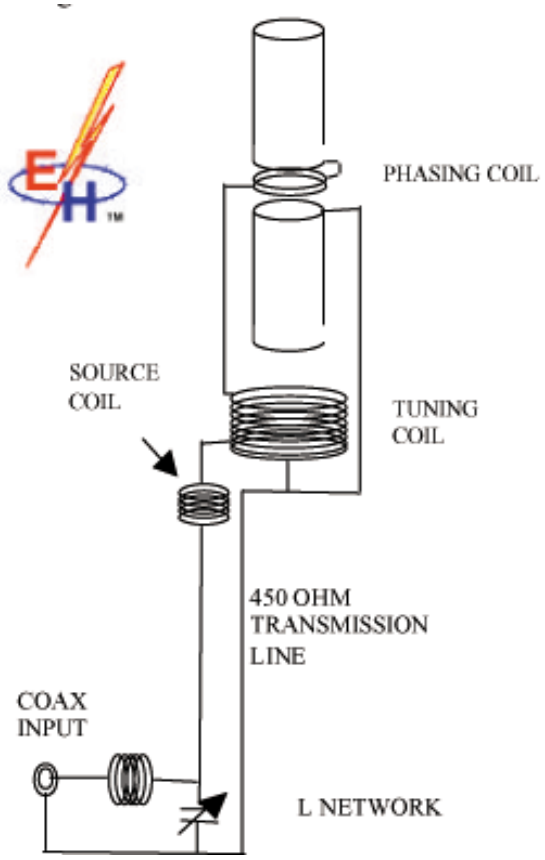


FIGURE 2 Schematic Diagram of the *STAR* version of an EH Antenna as used for AM Broadcast

Figure 3 compares the currents and electric fields on the surface of the cylinders that create an electromagnetic field in space to those from a conventional Hertz antenna. Note that the differential voltage across each cylinder creates a large

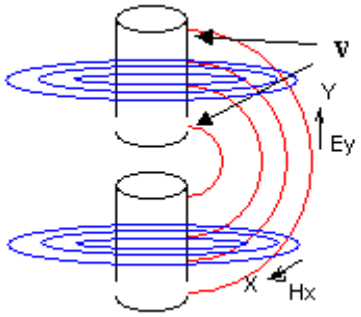
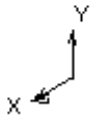


FIGURE 3 – VOLTAGE ON THE CYLINDERS CAUSES HIGH CURRENT, THUS A LARGE H FIELD SURROUNDING EACH CYLINDER. .



current and resulting magnetic field. The differential voltage on each cylinder is high, the resistance of the cylinders is low, and therefore the current is high, which causes a large magnetic field in spite of the small size of the antenna. The proper amplitude ratio between the E and H fields is automatically established resulting in a very large radiation resistance.

An electromagnetic field in space is created by any conventional antenna, such as a vertical or a dipole. We have shown the commonality between the EH Antenna and conventional antennas. Now comes the interesting and fascinating part. We will now provide the difference that essentially distinguishes the EH-antenna from conventional antennas.

Let us concentrate our attention on the simplest question: That will be, does an electric charge (electron) rotate? Such rotary dynamics of an electric charge (electron) will somehow be reflected in an electromagnetic field of this charge in space. Much to our regret, consideration of such processes are absent in textbooks. There is also another applicable question: How to twist an electric charge (electron)? It is valid; it is in fact not child's play! Once again we shall remind you that consideration of such electrodynamics of an electric charge in textbooks does not exist! You are reading a new concept in physics with very far reaching implications. To allow most everyone to understand this new concept we shall consider this process in the most simplified form.

From Figure 2 please note that the bottom cylinder is located between the tuning coil and phasing coil. Magnetic fields of these coils cross each other. These counter magnetic streams cross a surface of the bottom cylinder. This is displayed in Figure 4. A shaped line where there are magnetic streams is named "plane of Coulomb ". This changing counter magnetic field also creates electric charges on the bottom cylinder having a rotary component.

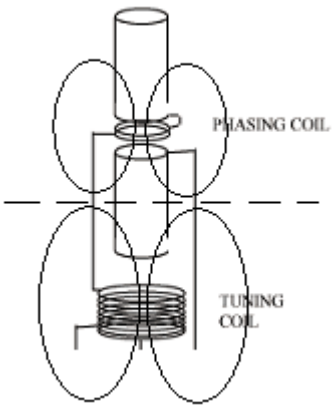


Fig. 4 Counter magnetic streams cross the bottom cylinder.

Figure 5 shows the influence of changing counter magnetic streams from coils on electric charges on the bottom cylinder. Two counter changing magnetic streams create a pair of Lorentz's forces which operate on electric charges on the cylinder. Lorentz's forces act on an electric charge causing it to change its direction of travel. Under action of this pair of Lorentz's forces electric charges on the cylinder rotate. The direction of the lines of the magnetic field change each half cycle. The direction of the pair of Lorentz's forces also varies in a similar manner. Rotation of electric charges on the cylinder also varies on alternate half cycles. Rotary dynamics of electric charges of the cylinder can be compared to periodic rotation of a pendulum of a clock around an axis.

The mathematics (the enhanced equations of Maxwell) show that the magnetic vector H_Z does not propagate at the speed of light. In space, magnetic waves whose length is equal to infinity on any frequency are created. Therefore the penetrating ability of this magnetic field is very high. This is common knowledge. For example, a permanent magnet attracts objects even under water and through other media.

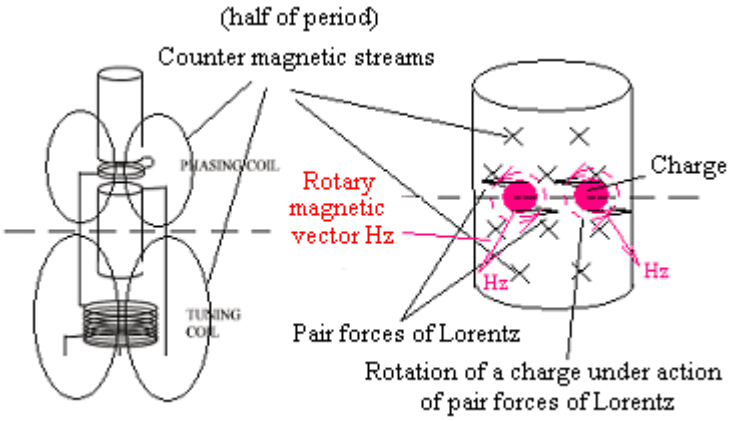


Figure 5 Counter rotating magnetic fields cause rotary motion of electric charges on the cylinders.

With that background, the electromagnetic field of the EH-antenna can now be presented and is shown in Figure 6. E_Y, H_X comprise an electromagnetic field from forward dynamics of charges (as from a conventional antenna). H_Z is the magnetic component of a field from rotary movement of charges.

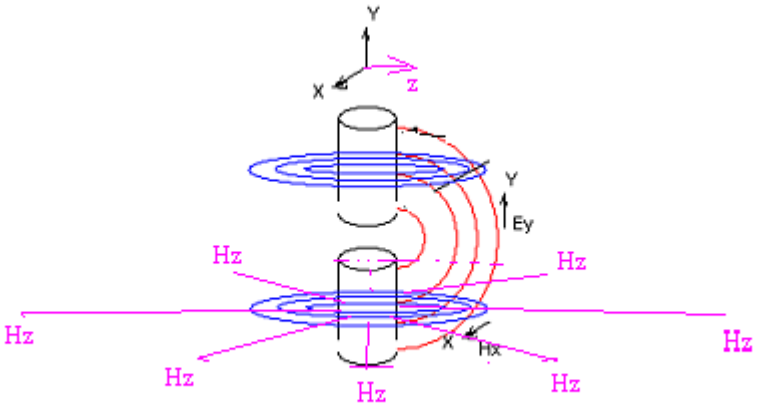


Figure 6 The Electromagnetic field of the EH-antenna.

The usual electromagnetic field of vectors E_Y, H_X has in space the length of a

wave $\lambda = CT$, where C - speed of light, T - the period of the dynamic process. The magnetic field from vector H_Z has a wave length in space $\Lambda = \infty$. This is true at all frequencies. Knowing that lines of a magnetic field are always closed, it is difficult to imagine these closed fields extending to infinity.

The difficulty of understanding of an instant radio communication due to the magnetic component of the field created by vector H_Z now begins. Since the length of a wave of this dynamic field is always equal to infinity, any information changes in it occur instantly at any point in space where this field exists. Certainly, the intensity of this field due to the H_Z vector decreases with increase in distance from a source. Features of radio communication using the H_Z vector are obviously distinct from standard radio communication as will be demonstrated below.

It is possible to design antennas which will form only space waves due to the H_Z vector. For this purpose it is obviously necessary that coils with counter inclusion of the field cause only a dominant rotary electric charge and eliminate linear motion electrons (current). This will allow the antenna to provide clean H_Z radio communication. This antenna has the ability to communicate with other H_Z antennas or with a EH Antenna. However, it can not communicate with a conventional Hertz antenna. This antenna consists of two coils and a cylinder. It is shown in schematic diagram form in Figure 7.

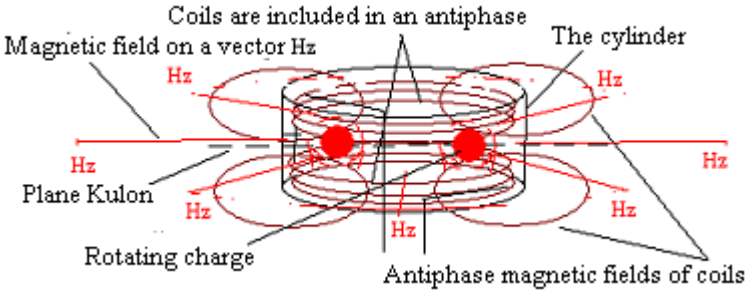


Figure 7 Concept of the H_Z Antenna.

Now it becomes very clear that the EH-antenna takes an intermediate place between conventional radio communication and radio communication based on the H_Z vector. This becomes more obvious by examining the detail in Figure 8. We now know that the EH Antenna produces both conventional radiation and radiation caused by the H_Z vector. This circumstance also has caused much confusion and misunderstanding of performance while using the EH-antenna. The great bulk of radio-electronic experts were able to explain use of the EH antenna only in that part where it works as the usual antenna. Now the huge veil of secret performance of the EH-antenna has disappeared. Many have said that the EH Antenna does not comply with conventional theory. Now we understand why. To fully understand the EH Antenna required new theory; a three dimensional enhancement of Maxwell's equations.

Radio fans (primarily Hams) using the EH-antenna in practice have noticed a number of unusual properties of the radiation field due to the H_Z vector. In several cases when there was no communications while using conventional antennas due to poor propagation conditions, the stations were able to continue communications using EH Antennas. Experiments have been conducted where a large sheet of aluminum was placed close to and both in front of and behind an EH Antenna with no effect on the signal level. This was a very big surprise because it was carried out prior to

learning of the theory presented in this document. Still another feature of the EH antenna that was predicted from the theory and proven in practice is the penetration ability of the H_Z vector. The EH antenna can communicate through water and other media that causes very high attenuation of conventional radiation. This was experimentally proven by placing a small transmitter and EH Antenna encased in plastic under water. Both conventional antennas and EH Antennas were used as receiving antennas. Only the EH Antenna was able to receive the signal from the underwater transmitter. The EH-antenna also can work from a mine shaft under ground and through out large steel reinforced concrete buildings. Such experiments with conventional antennas prove poor penetration capability. EH-antennas placed in extreme conditions prove that H_Z vector radiation has high penetration ability.

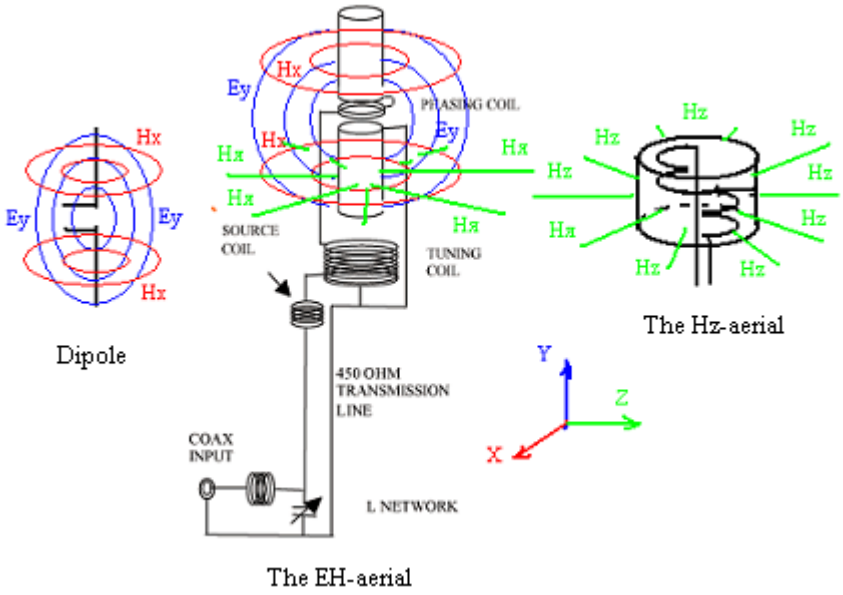


Fig.8 Electromagnetic fields from the Dipole antenna, EH antennas and H_Z antennas.

The EH-antenna has opened the existence of new radio communications capability. To comprehend this fact is very difficult, but it is necessary. Radio communication in extreme conditions is rather complicated with conventional antennas. The EH-antenna has already proved that in those situations when the radio communication on conventional antennas is poor or impossible, it is possible to communicate using EH Antennas.

One other, and the most important aspect of this new theory developed by Vladimir, is that we have shown that the EH Antenna can communicate with either an H_Z antenna or a conventional Hertz antenna. The H_Z antenna can communicate with other H_Z antennas or with EH Antennas but not with Hertz antennas. This led to another experiment that further proved the existence of H_Z vector communications. Two transmitters were equipped, one with a H_Z antenna and the other with a Hertz antenna. Two receivers were equipped, one with a H_Z antenna and the other with a Hertz antenna. All radios were operated on the same frequency. The radios with Hertz antennas were able to communicate with each other but not those with H_Z antennas. Also, the radios with H_Z antennas were able to communicate with each other but not with those using Hertz antennas. Read that very carefully and you will realize that this new form of radiation is totally independent of conventional radiation. This is such an

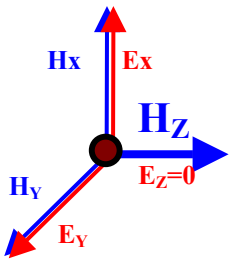
important concept that it needs to be said in another way: **the available radio spectrum has just been doubled**. Simultaneous communications can be carried on the same frequency without interference from each other by using two forms of radiation, the conventional form and the H_Z vector form.

For the historical record, it should be noted that Vladimir developed the mathematics several years before he learned of the EH Antenna. He was not able to prove his theory until he learned of the EH Antenna and performed experiments. We believe this significant development justifies the Nobel prize in Physics be given to Vladimir. We hope the readers will assist in the effort to bring this about.

We expect the new theory to open new views into the scientific world both as to applications of the new theory and by other Physicists exploring changes to basic laws using the concept of dynamic electrons. We expect many applications for communications using the H_Z vector radiation. A new company is being formed to license the patents that have come from this new development. We can not patent a theory, but we can patent the H_Z antenna. Therefore, companies that are interested in a license to use this antenna to enable use of this new form of radiation can contact us. There is more on this subject in the section entitled Hz Antennas.

For a quick study of physics we recommend the following web site. http://www.peoplephysics.com/physics-laws9.htm#28

EH ANTENNA SYSTEMS



H_Z ANTENNA SYSTEMS