

## **Tesla vs. Poynting Waves, a letter of discussion.**

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In a message dated 1/20/99 9:06:48 PM Pacific Standard Time,  
ke3ij@tricity.net writes:

**Subj: Question on Transverse EM waves**  
**Date: 1/20/99 9:06:48 PM Pacific Standard Time**  
**From: ke3ij@tricity.net (Rick Andersen)**  
**To: Quark137@aol.com**

Hi again Jerry----

I have a question for you if you have the time to look into it...I have not gotten a straight answer out of anyone of whom I have asked this question, and several textbooks just leap-frog right over the issue. I think the question is somewhat relevant to your view that Tesla's waves were 'scalar' due to the E and B fields being out of phase rather than in phase (time phase, not spatially orthogonal) as are electromagnetic waves.

My question is this: How/why do we say that a transverse EM wave has its E and B vectors **IN PHASE** time-wise, when the voltage and current in the transmitting antenna from which they were launched, are 90 degrees out of phase? After all, a dipole antenna is cut to resonate at 1/2 wavelength, fed at the center by a low impedance transmission line, so the current "flaps" largest in the middle of the antenna, zero at the far ends. The voltage "flaps" largest at the ends, zero at the feed-point; the current is at + or - MAX when the voltage is at zero; current is at zero when voltage is at + or - MAX. Because the wave on a resonant dipole is a standing wave, and the V & I nodes are 90 degrees apart in a standing wave, due to the mechanisms in reflection back from the ends of the antenna, etc. How does a E --- chasing---> I --- chasing ---> E --- chasing ---> I (etc.) , clearly a sequence of events that are not simultaneous, somehow become a simultaneous E X B cross product (vector) once the wave is launched from the antenna? It's like two people clapping at different times; if I move some distance away, I do NOT hear the 2 separate handclaps magically merge together into one combined handclap! Of course this has implications for POWER, since E X B fields give the Poynting vector which describes the total energy radiating outward in the 3rd direction (orthogonal to both E and B). If E and B are not synchronized in time phase, we don't have real power in the wave, only imaginary or reactive power.

Secondary question: If someone can clear up for me how a 90 degree phase shift between E and I in the antenna leads to an **IN-phase** traveling wave, then what

about Tesla's setup? **Does a traveling wave with alternating E and B fields (hence not having real power) come from an antenna in which E and I are IN phase???**

Any thoughts? --Rick Andersen

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**REPLY:**

After some thought on the matter (years previous to your question in the first part above), the H field (due to Maxwell's theory) is created by the changing E field and visa-versa. They are coincidentally created by each other simultaneously after leaving the antenna proper. Thus they must be in phase in free space. The Tesla coil situation is somewhat different in does not allow for an open H field to be created. (Think of the Tesla coil as an antenna wrapped into a vertical coil which effectively forms a solenoid.) Then you can see that the H field is parallel to the E field (seperated in time by 90 degrees) where both extend from the top of the coil to the ground. For the Tesla coil, both the E and H fields take part in the formation of the total near and far field. Compare this to the normal antenna where the H field circulates the antenna 90 degrees to the E field at the outset. So, for the normal antenna case, the H and E fields, not in phase at the antenna, are also 90 degrees to each other spatially. They become in phase timewise in space due to Maxwell's law of induction. Also, I suggest that the E field is not propagated from the antenna as the H field is. The E-field in the antenna is an induction field that is part of the mechanics of forming the antenna resonance. It does not have to radiate with the H field. After the H field (which carries the momentum of the field) leaves the antenna, it generates the coincidental E field as per Maxwells equations. The Poynting vector equation is  $S = (E \times B)/2 \mu_0$  where  $\mu_0$  is the permeability of free space. (MKS system of units.) The H field is the momentum action carrier as I see it. The E field is created by the H field coincidentally.

The Tesla coil, (also in contrast to the normal antenna), has the H and E fields inline (parallel) even though they are separated timewise by 90 degrees. Since they do not propagate, (they form a standing wave train), they are alternately +E, -H, -E, +H, etc., they may not carry real power over time as described by the Poynting vector but that indeed is the real beauty of it all. They CAN exert force at a distance per unit time in a companion Tesla coil receiver. In fact due to the resonant conditions, a real power gain is possible. (I am implying that a resonant condition in the fields is able to somehow extract energy from energy space to maintain field inertia if the field loses power through loading, etc.) Over time, the field builds in intensity.

**I think that we have been led down a primrose path concerning the value of the transverse electromagnetic wave as being the only wave of importance. (It may however guarantee that we don't blow ourselves apart with too much Tesla standing wave power if the Poynting wave is the only allowed method of communication, etc.) Further thought: vector potential action may be enhanced by a frequency modulated standing wave train, and if standing waves are associated with mass, then  $F=MA!$ )**

**The transverse electromagnetic wave travels at the velocity of light in free space but the vector potential of an E or B field taken by themselves, may make their field force apparent at a velocity that may approach infinity.**

**Concerning your question in the second part, many years ago I thought about the condition where electrons would be caused to oscillate back and forth in an evacuated glass tube, and if that would be a sort of mass-effect radiation wave generator. A normal antenna has the E and B fields seperated by 90 degrees in phase, (time), but the electron bunching antenna in an evacuated glass rod would have the charge (E) and associated magnetic field (B) at 0 degrees in phase, (time). If the radiated wave has a B component, it would tend to be akin to the Tesla form of "wave" in that a mass-wave would likely be the result. Then the E field would exist in time 90 degrees from the H field. I would like to build that free electron mass-wave antenna some day. I feel that it might have some very interesting results as far as action at a distance is concerned. (Especially how it might affect a similar antenna at some point distant.) I wonder if it could be shielded against?**

**I hope that I answered your questions above to your satisfaction. By the way, this is very near to my own thoughts concerning the difference between the regular antenna action verses the Tesla standing wave transmitter. Can I post this letter as a discussion letter for the Associates in Electrogravitation page?**

**--- quark137@aol.com, Jerry E. Bayles.**

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**Subj: Re: Question on Transverse EM waves  
Date: 1/20/99 10:53:54 PM Pacific Standard Time  
From: ke3ij@tricity.net (Rick Andersen)  
To: Quark137@aol.com<BR>**

**Thanks so much for helping to clear this up! As I said before, nobody I have asked could answer it, and textbooks jumped right from the antenna to free**

space while never addressing the issue of how quadrature time phase begets in-phase E x B fields.

I also must add that your view of the alternating E and B fields comprising a "Tesla" wave seems quite different from the "summed to zero vector" waves of Thomas Bearden, the biggest promoter of "Scalar EM". Of course, he has never made it unambiguously clear as to what exactly is zeroed----the E and B fields only, or also the Poynting vector---- and this is further complicated by the fact that he does not believe in the transverse wave in vacuum--- he insists on longitudinal waves ala Tesla.

Anyway, thanks again and please always feel free to post these discussions for others to see

--- no problem with that at all! --Rick Andersen

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Date: 1/21/99 9:58:27 PM Pacific Standard Time

From: Quark137

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CC: Quark137

**REPLY: Thanks Rick,**

The transverse waves in a vacuum are a result of empirical data gathered in far and near field measurements done in many experiments by many people. They are not just a theory. :-)

As an added note, I see the standing waves coming from a Tesla coil as forming a transmission line, where part of the line is above ground and the counterpart is below ground. Then the magnetic field lines tend to counter balance each other while the electric field lines sink each other. Thus the waves exist as non-radiating, (in the conventional sense of electromagnetic radiation), standing waves with a direction along the "line" that is between the transmitter and the end of the line. (Wherein the two may be separated by quite a distance.)

**I remember suspending an open wire (two conductor) 300 ohm line in electronics lab one day and feeding it from a transmitter operating at reduced plate voltage and measuring the effects of that open ended line with a current loop and neon bulb. Every 180 degrees, the current loop and small attached incandescent lamp glowed while 90 degrees from those nodes and every 180 degrees apart, the neon bulb would glow at the voltage nodes. We even picked up this effect on the window frames and light fixtures! I suspect that the area around a Tesla coil would also exhibit this characteristic. (High and low voltage nodes separated 90 degrees apart from high and low current nodes.) At the nodes, there exists pure current or pure voltage. In contrast, a conventional electromagnetic wave radiates due to the nodes being in sync timewise with no phase shift and there exist no near field sinks. Again, the  $1/\epsilon_0 \mu_0 = c^2$  also has a bearing on this. A standing wave on the other hand has the  $\epsilon_0$  and  $\mu_0$  as alternating, and at times, totally separate terms. Hmmmm.....?**

**Final thought: --- What would happen if we phased two or more Tesla coils in the near field and phased them such that a rotating standing wave pattern was generated? Would we generate a rotating mass field? Would the Philadelphia experiment be recreated? Anybody want to try this? I am willing to help in the design and testing.**

**-- Jerry E. Bayles.**