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How can Oliver Heaviside's solution to the transatlantic cable problem undermine Lenz's law? [closed]

electromagnetism physics

Closed. This question is off-topic. It is not currently accepting answers.

Want to improve this question? Update the question so it's on-topic for Electrical Engineering Stack Exchange.

Closed 40 mins ago.

Improve this question

The way in which the transatlantic cable problem was explained to me, is that the amps traveled slower than the volts and, thus, was delayed in arriving. Now this is normally described as back EMF, namely: a coil inductively resists the flow of current in an oppositional manner which although true is not really what's happening.

If I'm traveling down the freeway at 100 miles an hour and overtake somebody doing 80 miles an hour it looks like he's traveling backwards relative to me. In other words the amperage looks like it's back EMF relative to the voltage moving forward when in fact both are moving forward at different rates due to the fact that we choose copper as our method of conduction for both the electric field and the magnetic field.

But Oliver Heaviside took the approach of wrapping the copper insulated wire with a ribbon of iron and although the copper was connected to both ends of the cable, the iron ribbon was not connected to anything. It simply surrounded the copper insulated wire. This picked up the magnetic field at the transmitting end and carried it all the way keeping pace with the electric field at the receiving end so that both the electric field and the magnetic field could arrive at the same time and give a crisp signal.

Each pulse of a dot or a dash would begin but it would not terminate on time. It would begin on time but the termination of the pulse would be delayed and this is easily seen to be the case if we have back EMF, in other words retardation of current, that appears to be going backwards because this is a DC pulse that's being sent and the pulse is much like a square wave in that this is also a type of pulse in which the rise of the pulse is no problem because both fields are moving forward. But when it's time for the pulse to drop and terminate itself, then is the problem. The current now has to go backwards relative to what it had been looking like it was doing formally but does this in order to terminate the pulse. And because it's wave is traveling slower (the magnetic field is traveling slower than the electric field), it gets a boost in the backwards direction which means the pulse is drawn out to a longer duration!

So, my question is concerning Lenz's law (and the so-called conservation of energy consequence) - of eliminating the retardation of current, namely: the retardation of the magnetic field relative to the electric field, by strengthening the magnetic field as Oliver Heaviside had suggested. And Oliver Heaviside's solution worked to such a degree, that there was no retardation of current relative to voltage. Both arrived on time all the time!

So, where is the retardation of current? Where is Lenz's law in all of this? I don't see it taking place all because of a modification to the construction of how we send current down a wire.

Currently, we make the same mistake as we did 150 years ago in that we exclusively put all the responsibility upon copper as our means of conductivity.

It's kind of like what Oliver Heaviside did, was take a transformer and unwind it and stretch the transformer core out all along the unwound straight piece of copper wire!

This encourages the transmission of the magnetic field along the stretched out core of the transformer to keep pace with the unraveled copper winding of that transformer transmitting the electric field and both at the same rate of transmission, thus, making it look like Lenz's law has been defeated!

Where did I make a mistake in my attempt to understand this?

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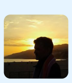

Vinyasi
7 • 6

asked
2 hours ago

4 "the amps travel slower than the volts" that's nonsense. – **Marcus Müller** 2 hours ago

1 It's absolutely not clear what specific problem you're referring to. Could you cite sources, maybe? Also, it feels like you're looking at transmission lines, but haven't read any of transmission line theory (which has about 170 years of history). – **Marcus Müller** 2 hours ago

You're right I don't know anything about transmission line theory. When I say amps versus volts I mean the magnetic field versus the electric field or the consequences of these fields when we measure them. – **Vinyasi** 2 hours ago

yes, and that's nonsense. You seem to know what an electromagnetic wave is, so I need only to remind you of the very basics: Maxwell. You'll instantly feel reminded of the fact that the derivative in one field can't exist without the other. – **Marcus Müller** 2 hours ago

Andy aka... Eric Dollard – **Vinyasi** 2 hours ago

1 @Vinyasi took me four and a half second of googling: that guy is full of made-up pseudoscientific shit (yes, that's the technical term among engineers who have not lost their marbles), sorry. Don't believe a word he's saying. – **Marcus Müller** 2 hours ago

4 I'm voting to close this question because it's based on the "teachings" of a pseudoscience hack, and has no relation to real physics. – **Marcus Müller** 2 hours ago

How do I find out about Maxwell's perspective without heavily laden with too much math. – **Vinyasi** 2 hours ago

1 Maxwells equations is math. Get googling. – **Andy aka** 2 hours ago

1 @Vinyasi it's not a "perspective". It's physics. And you learn about it when you learn the basics of how electricity works. Really, no way around it. Also, sorry, it's math, because that's how physics works – math, instead of just claiming something. – **Marcus Müller** 2 hours ago

Thank you, Marcus. – **Vinyasi** 2 hours ago

Maxwell for Dummies... duckduckgo.com/… – **Vinyasi** 2 hours ago

1 @Vinyasi you're not a dummie. What you need is an introduction from the grounds up, not something digestible in 15 minutes. Such searches like you did definitely don't bring you forward. Wikipedia "Maxwell's Equations" article's first paragraph is a start, but better would be a simple physics textbook. – **Marcus Müller** 2 hours ago

“ The second equation says that there is no such thing as a magnetic monopole. “.... answers.yahoo.com/question/index?qid=20071108114520AATIAIE ... I think what has been overlooked is that the magnetic field is a floating field just like one of two plates of a capacitor can be a floating plate not connected to anything. This is the significance, to me at any rate, of connecting the iron ribbon that is wrapped around the insulated copper core of the transatlantic cable because the magnetic field (that it helps to transmit) is a floating field. In other words, the result of the E.F. – **Vinyasi** 1 hour ago

Pseudobabble usually has some basis of truth in it, but then goes off the tangent following the quack's inclination. In this case it is possible that the real event on which the above is based is the excessive loss in the transatlantic cable. Heaviside warned the telegraph companies it would have been a problem but they did not listen. The solution came from Pupin who realized that the coefficient of attenuation was proportional to both R'/L' and to G' L' where the prime ' means per unit lenght. Increasing L' by adding discrete coils along the cable reduced the problematic R'/L' term. – **Sredni Vashtar** 1 hour ago

Yes, excessive loss, but loss of what? Not excessive loss of voltage, but excessive loss of amperage; ergo, not excessive loss of the electric field, but excessive loss of the magnetic field by comparison. – **Vinyasi** 1 hour ago

The difference in phase between the electric and the magnetic fields is the..... en.wikipedia.org/wiki/Propagation_constant#Phase_constant – **Vinyasi** 1 hour ago

1 Holy cow! I googled the name. Let me outta here!!! – **Sredni Vashtar** 1 hour ago

@Vinyasi really, you look like a lunatic. Get your basics straight. Dropping more out-of-context citations on us will not fix your understanding. I'm out of here. Good luck! – **Marcus Müller** 1 hour ago

I can see my problem was not limiting my question to D/C excluding A/C which complicates matters beyond my simplistic question, because a changing magnetic field doesn’t specify how much change much less reversal of polarity. – **Vinyasi** 41 mins ago

In fact, Oliver’s solution of wrapping iron ribbon around an insulated copper core exhibits the transfer of D/C power across a transformer core. This demonstrates that we have taken a shortcut to our transformer designs by attempting to eliminate eddy currents within the core of transformer material instead of encouraging them. And this shortcut is probably due to the fact that we never use transformers for DC situations. So our current day model of a transformer is restricted to a special case of AC power transfer only. – **Vinyasi** 30 mins ago

Another consequential question to ask, here, is what happens if we increase the mass of the iron ribbon beyond a certain critical point, does the amplitude of the magnetic field increase beyond that of the matching amplitude of the electric field? According to an obscure quotation from Nichola Tesla, the amplitude of the magnetic field will increase by 1 hp for every 200 pounds of iron added per unknown unit length of the transatlantic cable. I’ll take a guess that the unit length is 50 miles… – **Vinyasi** 20 mins ago

This last comment of mine is based on a quotation from William Lyne’s book, Pentagon Aliens, chapter 18, concerning Tesla‘s special generator whose main coil was 50 miles in length of wire wound around a huge horseshoe core... “...he had calculated that, for every 200 pounds of iron connected to the device, a full horsepower was added to it.” - bibliotecapleyades.net/ciencia/pentagonaliens/… – **Vinyasi** 9 mins ago add a comment

0 Answers

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