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Catt's Anomaly?

The Authors confound The Catt Anomaly with The Catt Question. Although until 2001 The Catt Question was called The Catt Anomaly, it was always a question, about a Transverse Electromagnetic (TEM) wave on a transmission line. The Catt Anomaly concerns the refusal of named academic experts in classical electromagnetic theory (Pepper, McEwan, Josephson, Secker, Mink) [1, 2], who have given different answers to The Catt Question, to talk to one another about their different answers. In the absence of any discussion between themselves, these experts can never come to any agreement on an answer, right or wrong; hence, The Catt Anomaly.

Upon closure of a switch, a TEM wave (step) travels from voltage source to load, between conducting wires of a transmission line. An electric field \mathbf{E} appears between the top and bottom conductors, and orthogonal to them, as the TEM wave propagates at the speed of light for the dielectric in which it travels. Thus, according to classical electromagnetic theory, there are positive charges on the one conductor and negative charges on the other conductor, within the region of the transverse electric field. The Catt Question [1] is: *Where does this new charge come from?* The Authors did not answer this question.

The Authors invoke Gauss' Law [2 §2] to determine the electric field \mathbf{E} between the top and bottom wires of the transmission line. They maintain that electric current in metal wires is the product of charge density and electron drift speed: *“However, current is the product of charge density and speed: where there is a high charge density, the speed could also be very slow”* [2 §3], on the basis that electric current in metal wires is the flow of electrons along the wires, driven by a voltage source in the circuit, which, according to classical electromagnetic theory, produces an electric field in the wires and collinear with them: *“Electrons are the moving charges in metal”* [2 §2]. According to classical electromagnetic theory, electrons move in the opposite direction to an electric field, not orthogonal to that field. Yet the Authors argue, in violation of classical electromagnetic theory, that electrons follow the field \mathbf{E} that is orthogonal to the wires, which they determined by applying Gauss' Law to a wire: *Physically, a current follows the field travelling at the speed c , but this current is due to a great number of slowly moving electrons”* [2 §3].

The Authors attribute to Catt claims that do not appear in any of his writings: *“The ‘Anomaly’ is there because in his view, currents are the source of the TEM wave, and should be there before the wave they cause”* [2 §3].

The Authors published a mathematical version of their article [3], wherein they again violated classical electromagnetic theory [4] in a more detailed fashion: the electric field \mathbf{E} that is orthogonal to the transmission line wires, calculated from a cylindrical Gaussian surface centred on one wire, to drive electrons along the wires.

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References

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