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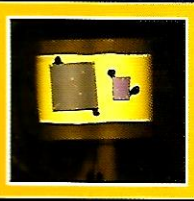

TECHNOLOGY
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ALSO IN THIS ISSUE: LETTERS • TIPS 'N' TRICKS • THE TROUBLE WITH RF

THE CATT QUESTION

In the October 2008 edition of Electronics World, on page 29 there's an article written by John Ellis titled "*Transmission Line Model; An Introduction to the World of RF*". His transmission lines contain only sine waves. His article ends with a simulated transmission line into which he injects a sine wave. He is not alone. The non-sinusoidal excitation is generally excluded from electromagnetic theory by the use of the mantra: "Any (periodic) waveform can be broken down into sine waves of various frequencies". Alternatively: "Any (periodic) waveform can be represented by sine waves of various frequencies" or even that physical reality consists of a series of sine waves.

When I made the above statement recently to a professor, omitting the word "periodic", he corrected me. However, recently in an email to me Nobel Prize winner Brian Josephson wrote that for a non-periodic waveform we used the "Fourier Integral". When I questioned him as to what that meant, he replied that we could handle a non-periodic waveform if we repeated it. Josephson introduces the idea of frequency (sine waves) when he discusses "The Catt Question". ("The Catt Question" is as follows: When a voltage step travels down a transmission line at the speed of light guided by two conductors, where does the negative charge come from on the bottom conductor to terminate the electric field between the conductors?)

When he writes about "The Catt Question", Sir Michael Pepper, "knighted for services to physics", also introduces frequency. Remember that "The Catt Question" is about a single voltage step.

There is a general idea, stated to me by Professor Howie, then Head of the Cavendish, that "physical reality is composed of sine waves". The entrenched idea that classical electromagnetic theory refers only to sine waves is very important, since it submerges "The Catt Question" in complexity and confusion. The truth is that "The Catt Question" exposes a fundamental problem for classical electromagnetism which has been hidden by the general commitment to sine waves. It is very simple, and discusses a single voltage step travelling at the speed of light guided by two conductors. Unfortunately, experts in electromagnetic theory cannot "see" a single step, but in their brains they convert it into an array of sine waves. This makes it too difficult for them to grasp the fundamental, simple problem – "The Catt Question".

For decades, none of the results of my pioneering work on interconnecting high speed logic, beginning in the 1960s, including the extensive material published in Wireless World and later in Electronics World has gained a foothold in university text books, or college or university curricula. This includes all of the content of books on my websites, including the one published by Macmillan.

I decided to jettison my experience and ask a very simple question about classical electromagnetism, now called "The Catt Question". It took some years to get any response at all from leading academic luminaries or from the relevant learned institutions, but in the end I got response from Sir Michael Pepper FRS and Dr Neil McEwan, Reader in Electromagnetism, later replaced by Nobel Prize winner Brian Josephson. Pepper and Josephson are both professors at The Cavendish and both Fellows of Trinity College, Cambridge. In their replies, they totally contradicted each other. Josephson said the negative charge came from the west and managed this somehow without any charge travelling at the speed of light. Pepper said that charge from the west would have to travel at the speed of light, which was impossible. He said that actually the negative charge came from the south, from inside the conductor.

I took this contradiction to the Master of Trinity College, Lord Rees, asking him to do something about it in his administrative capacity. He replied: "I shall however need to get up to speed on the scientific question you raise before being able to respond intelligently..." I replied that I approached him in his administrative capacity, not in his technical capacity. That was two years ago, and he has done nothing.

I wrote to the President of The Royal Society, who also happened to be Lord Rees, saying that two Fellows of the Royal Society totally contradicted each other in their responses to "The Catt Question". In that capacity, Rees has not replied.

The behaviour of the IEE (now IET) and also of the New York IEEE, was similarly irresponsible. On 4 September '95, Professor Secker, chosen by the Chief Executive of the IEE to deal with "The Catt Question", wrote: "...The favoured explanation aligns with the statement to which you refer, attributed to Professor Pepper...", but seven weeks later, on 25 October '95, he wrote: "Dr McEwan really has the answer." Thus, he was backing both the views whose contradiction was the cause of Catt writing to Secker's boss in the first place, and his boss instructing Secker to reply!

THE "CATT QUESTION" EXPOSES A FUNDAMENTAL PROBLEM FOR CLASSICAL ELECTROMAGNETISM WHICH HAS BEEN HIDDEN BY THE GENERAL COMMITMENT TO SINE WAVES"

Further, although in that September the Chief Executive of the IEE chose him as the appropriate expert to reply, after seven weeks of repeated pontification and obfuscation, Secker wrote in October '95: "I should explain that I am no expert in the area to which the 'Catt Anomaly' refers...". The Chief Executive refused to supply a replacement for Secker.

As I wrote to Lord Rees, it appeared that he and the rest had four options:

1. Say that you have no relevant administrative duties or power in The Royal Society. In which case, please advise me as to who has administrative responsibility.
2. Say that you regard the matter as unimportant.
3. Say that the two parties, Josephson and Pepper, or in the case of The Royal Society Howie and Pepper, have told you that either: (a) they do not in fact disagree, or (b) the matter is unimportant.
4. Say that a conference is required."

This has been reiterated to all administrators concerned for more than a decade. Obviously, a conference is required.

(I noted that G De Santillana, in his book "The Crime of Galileo", published in 1955, writes that the main mistake in handling Galileo [the Earth moves] was to approach it administratively, which is your mistake over The Catt Anomaly. ".... If a decision had to be taken, a council was in order. To deal with the question on an administrative level was not only an arbitrary procedure, it was an inexcusable mistake, which is the necessary premise to the graver mistake of the trial sixteen years later...." - De Santillana, p137)

Even the mere announcement of a conference would give courage to such as May Chiao, who so far will not answer my letters, let alone publish something about "The Catt Question" in her journal "Nature Physics".

For decades, the same fear, leading to suppression, has been demonstrated by all other journal editors throughout the world.

The decades-long exercise called "The Catt Anomaly" arose because it is impossible to publish advances in electromagnetic theory. The referee system ensures that. Referees are wedded to the status quo, which is the basis for their careers and reputations.

Had it been possible to publish advances in electromagnetic theory resulting from the experience of interconnecting high speed logic 40 years ago, the need for "The Catt Question" exercise would not have arisen. So what is the major advance, "Theory C"?

Traditionally, under "Theory N", when a battery is connected via two wires to a resistor or lamp, the battery delivers electric current/charge into the wires. Once the wires gain current/charge, they create magnetic and electric fields between the two wires. Now more than a century ago, when confronting a challenge similar to that of interconnecting high speed logic, Heaviside said: "We reverse this ...." [Theory H]. The battery delivers electromagnetic field between the connecting wires. In its turn, the field causes electric current/charge in/on the wires. He called the field, travelling at the speed of light, "energy current". However, Heaviside's work on electromagnetic theory disappeared from the record. He was unreferenced in any text book for more than half a century.

There the matter rested for a century, until I realised that the core problem was for the battery to deliver energy/power to the resistor or lamp. If the battery delivered the electromagnetic field, it was generally agreed that the field carried the energy/power directly into the resistor or lamp. (After all, sunlight is "Energy Current".) Under the new "Theory C", electric current/charge played no role in the key activity, that of delivering energy/power from battery to resistor or lamp.

So, under "Theory C", what are electric current and electric charge? What is the role of the interconnecting wires? The answer is that when travelling along in the dielectric between the wires, some of the energy current (or electromagnetic field) penetrates into the wires. Since the dielectric constant of copper or any other conductor can be shown to approach infinity, the velocity of penetration, which depends on the inverse of the dielectric constant, approaches zero. Also, the impedance of a conductor approaches zero, so that very little of the energy current enters the conductors (in the same way as, if we have large and small resistors connected in series, very little power is dissipated in the small resistors). Maxwell's Equations link field and electric current/charge, and the so-called (but non-existent) current and charge are merely mathematical manipulations of the electromagnetic field.

Now let us analyse the situation that has developed. Today's Electromagnetic Theory remains as if digital computers and high-speed logic never existed. It is frozen in around 1950. My work on high-speed logic interconnection in the 1960s and beyond could have been expected to bring new insights into electromagnetic theory, and it did. However, none of these insights could be published, including all of the contents of my two books now on the Internet. They failed to get past journal referees, who are all frozen in the era before digital electronics.

Now the rejection for publication of any of this new material is not an administrative matter, since the decision as to whether such material is valuable or not is technical. However, we then come to the "The Catt Question", which is about classical theory, not Catt theory, the contradictory replies show that the old, pre-1950 Electromagnetic Theory which controls academia is not fully specified. It follows that something has to be done administratively. Following the analysis of Galileo by De Santillana, it is clear that a conference is required. But here we arrive at the core problem, which extends far beyond electromagnetic theory. Lord Rees, Josephson, Sir Michael Pepper have no inkling that with reputation comes responsibility. They have no grasp of the fact that given their high reputation and administrative responsibility, they have a duty to do something to resolve the problem which has arisen, that leading experts totally contradict each other on a rudimentary detail of electromagnetic theory.

"TODAY'S ELECTROMAGNETIC THEORY REMAINS AS IF DIGITAL COMPUTERS AND HIGH-SPEED LOGIC NEVER EXISTED"

More generally, there exists within the scientific community no functioning administrative structure capable of dealing with the problem. All of those whom we expect to be responsible, merely rest on their laurels, basking in fame.

The behaviour of all our institutions when confronted by "The Catt Question" delivers a bleak message for the future of science. Institutionalised failure to deal with "The Catt Question" and other fundamental lacunae threatens the survival of science.

Ivor Catt
UK

PHYSICS OR MATHS PROBLEM?

Ivor writes in Wireless World March 1980: "Consider a high speed (125) railway train with sloping front passing an observer. As the front face passes, the observer will see a negative slope dh/dx."

Ivor has the shape of the depicting diagram as representing a train. He has h axis as vertical and x axis as horizontal; h is a function of x, and the function goes straight along and drops by a slope given by differentiation as dh/dx and he notes it as negative because it slopes down.

Ivor in his second diagram has h as vertical axis and t as horizontal axis, and the function goes straight along before going up as a slope given by differentiation as dh/dt and says it is positive.

All of this is correct so far, and if we multiply these two slopes we have by the chain rule:
(dh/dx)(dx/dt) = (dh/dt)
negative x negative = positive.

But this is where Ivor then goes wrong, instead of doing the above chain rule calculation, he says this dx/dt is positive. He falsely identifies dx/dt as the velocity of the train, when in fact it is only the shape traced out by a point-particle, same as point-particles were tracing out shapes in his two diagrams.

There are many people who don't care about the accuracy of the maths and just bodge it. What Ivor engages in next is to try to bodge to correct the mistake he makes with dx/dt.

When I pointed out the problem, he had to look up what the chain rule meant. Ivor cannot accept that dx/dt is not the velocity of the train and an abuse of maths to use it as such, he thinks it is a physics problem, not a maths problem. He says he accepts the chain rule, but cannot see that dx/dt is not the velocity of the train and continues to insist it is. He then thinks the solution to

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this problem he has manufactured is related with Maxwell's equation as: "What underlies the minus sign in Maxwell's Equations seems to be a mistake in the convention on how we measure time. We seem to think that as time goes by, we gain time. This is indicated in our numbering a series of hours 1, 2, 3, 4 etc. The truth is that every hour we lose time – we lose an hour. So, more rigorously, we should number the hours 12 o'clock, 11 o'clock, 10 o'clock etc."

So, in order to correct the mistake he makes, he thinks time being counted backwards solves it.

Roger Anderton
UK

THE HUNT FOR ELEMENTARY PARTICLES

Basic elementary particles may be calculated from the following formula:

$M = me.(kn\pi)3$,

where M is the searched mass of the particle, me is the electron mass or energy equal to 0.5109 Mev, n is a quantum integer number equal to the series of 1, 2, 3, 4 etc and where k is a small correction factor in the interval of 0.940 to 1.0000 where k = 1 is the normal value.

The equation produces the following series of mass values:

In the interval of n = 1 to 5 in Mev:

16 (WIMP), 105.7 (myon), 420 (kauon, base), 938.3 (proton), 1784.1 (tauon)

N = 6 to 22 in Gev:

3.0 (eta), 5.1 (b-meson), 8.0 (zeta), 11.5, 15.8, 21.1, 27.4, 34.8, 43.5, 53.5, 64.9, 77.8, 92.4 (Z, Nobel prize awarded 1984), 108.7, 126.7, 148.6, 168.6...

The maximum particle mass is dependent of energy available. Observe that this formula is only valid for the base particle in each particle spectra, hence not for the electron, for mesons or for neutral particle forms. For these latter particle forms, see my particle theory Matter Unified on the following website http://oveted.freehostia.com.

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