"The Catt Question is at http://www.ivorcatt.co.uk/cattq.htm

A CAPACITOR IS A TRANSMISSION LINE

The leads to a capacitor are connected to one end of the capacitor plates, not to their centre, as a capacitor is always wrongly drawn. The energy is a TEM wave that enters the capacitor sideways. The fields of a Transverse Electromagnetic (TEM) Wave are sideways, normal to the capacitor plates, and there is no forward magnetic field. So Maxwell's Displacement Current, which causes a magnetic field in a plane parallel with the plates, is incompatible with the TEM Wave.

Classical electromagnetic theory therefore is internally inconsistent, unless we exclude the TEM Wave from the theory. But surely the energy travelling in a USB cable is easily seen to be TEM.

A useful illustration of this point was in Wireless World, December 1978, now at: **http://www.ivorcatt.org/icrwiworld78dec1.htm**

Ivor Catt

Electronics World January 2015, p44

IVOR CATT'S ARGUMENTS

As a published electronic engineer and former professor I have received several requests for comment on theories and ideas. I have responded to all of them and attempted to be open minded and honest in my replies.

After initially rejecting Ivor Catt's arguments I now see some merit in some of his statements.

The analysis of reflections in wave guides is traditionally based on EM or ExH radiation. A coax cable is often analyzed as a wave guide.

The experiment he described is repeated daily by digital PC board designers, who routinely have to control the signal qualities along the various high-speed (GHz) traces in electronic systems where a trace of a couple of inches must be treated as a transmission line.

These and other strip lines can have many taps and stubs, and keeping the signals synchronized everywhere on a board can require complex trace patterns to equalize the time delays and reflections. This type of waveform is commonly observed; you only have to look at your PC's motherboard to see them.

This is also a common problem in any cable system, including power lines.

The rejection of the use of pulse generators is ridiculous, as there is no such thing as DC. The power source had to be turned on sometime, and then turned off, resulting in a very low frequency AC signal, or if it is done only once, i.e. there was no further experimentation, which is doubtful, it is a unit pulse which, after Fourier analysis, is also AC.

The phenomenon Catt is examining is demonstrated in schools: http://web.physics.ucsb.edu/~lecturedemonstrations/Composer/Pages/76.18.html which I found using a 30s Google search.

There are plenty of ICs available, capable of driving a transmission line at these speeds, priced at a few pennies.

From the experimental point of view the use of a reed relay in such an application is surprising as the contact noise in these normally lasts for several milliseconds and can be observed with any scope. I can only assume that the initial bounce and subsequent arc was conveniently long.

As for the experiment, this type of observation is easily carried out on a twin lead cable such as 300-ohm antenna cable, which can be tapped anywhere along their length, and can even be set up as open lines with movable taps.

In his earlier paper, 34 years ago, Catt referred to the signal in a transmission line travelling in a dielectric at less than c, at c as claimed in this paper.

The idea of the two fields may provide a useful representation to explain some phenomena, but the fact remains that if one of the conductors breaks the resulting arc is made up of electrons and/or ionized material. Further, by logical extension one must consider the case where the fields are infinite, but almost cancel each other.

On other point is why do we need a conductor?

Years ago, an English teacher at school stated that an aircraft wing works by deflecting air downward. As every technically-minded student knows it is Bernoulli's theorem and a vacuum above the wing that makes planes fly: but both are partially true. A wing which is of zero thickness also works, but it is a little weak.

It makes you think though.

Finally the change in field at the switch travels to the shorted end and then back to the switch before the information at the other end of the line can influence the signal at the switch. It has to pass down the line twice. Until that happens the switch end sees the characteristic impedance of the cable and forms a voltage divider with the termination resistor.

Poor old Ocham gets blamed for everything.

David German

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Ivor Catt

KEEP UP THE GOOD WORK

I have just read Myk Dormer's '*Experiments with a UART*' article in the October issue of Electronics World and it is brilliant!

Every month I first turn to Myk's articles, read them and then chuckle. Myk has a great writing style that both entertains and educates just as Lord Reith (BBC) would probably advocate.

Keep up the good work!

Mike Meakin

Click here; http://www.ivorcatt.org/icrwiworld78dec1.htm

Electronics World