ARTHUR F. KIP
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Fundamentals of Electricity and Magnetism

1962

McGRAW-HILL BOOK COMPANY, INC.
New York San Francisco Toronto London 1962

Since this relationship is true for any area $dx\,dy$, we may write

$$\frac{\partial E_y}{\partial x} = -\mu_0 \frac{\partial H_z}{\partial t} \tag{12.19}$$

The next step is to make the converse calculation of the **E** re-

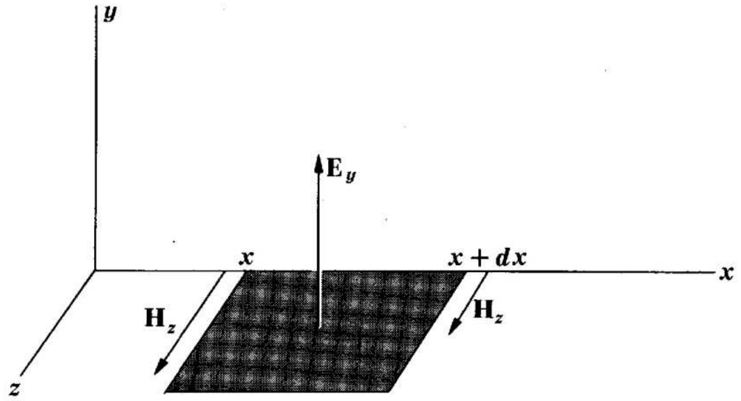

Fig. 12.6 Generation of E_y by a varying H_z.

sulting from a varying **H**, through Eq. (12.6). Using Fig. 12.6, we find by a similar calculation,

$$\oint \mathbf{H} \cdot d\mathbf{l} = [(H_z)_x - (H_z)_{x+dx}]\,dz$$

$$= -\frac{\partial H_z}{\partial x}\,dx\,dz = +\epsilon_0 \frac{\partial E_y}{\partial t}\,dx\,dz$$

or

$$\frac{\partial H_z}{\partial x} = -\epsilon_0 \frac{\partial E_y}{\partial t} \tag{12.20}$$

Equations (12.19) and (12.20) relate the space variation of one field to the time variation of the other, and vice versa. When we differentiate the first with respect to x and the second with respect to t, we can combine the information into one equation as follows:

$$\frac{\partial^2 E_y}{\partial x^2} = -\mu_0 \frac{\partial^2 H_z}{\partial x\,\partial t}$$

$$\frac{\partial^2 H_z}{\partial x\,\partial t} = -\epsilon_0 \frac{\partial^2 E_y}{\partial t^2}$$

$$\therefore\ \frac{\partial^2 E_y}{\partial x^2} = \epsilon_0 \mu_0 \frac{\partial^2 E_y}{\partial t^2} \tag{12.21}$$

“Equations (12.19) and (12.20) relate the space variation of one field to the time variation of the other, and vice versa.” - Kip

They can be rewritten dE/dx= -dB/dt; dH/dx= -dD/dt

What is missing is any statement like dE/dx= -c dE/dt . Nobody ever “relates” the equally valid “space variation of one field to the time variation of” the same field.

They are *willing* the highly ambiguous maths to come up with “The Rolling Wave”. However, the maths also points to “The Heaviside Signal”. Under their reasoning, changing E causes H and changing H causes E. However, we can equally validly say that the maths says that changing E causes E!

We see from http://www.forrestbishop.4t.com/EMTV1/EMTvol1p98-99.jpg that the relationship between dE/dx and dE/dt is c, the velocity. Similarly the relationship between E and B; dE/dx= -dB/dt . E and H remain in fixed proportion. There is no causality between B and E.

Ivor Catt 25 November 2014

Kip claims that two Maxwell Equations http://www.ivorcatt.co.uk/x4bp.pdf validate “The Rolling Wave”. However, they obviously validate “The Heaviside Signal”. See http://www.ivorcatt.co.uk/x18j184.pdf . In particular, see the Appendix.

If the two Maxwell equations map onto “The Heaviside Signal” http://www.ivorcatt.co.uk/x267.pdf and also onto “The Rolling Wave”, which latter Kip thinks they do, then they are too bland to relate, or validate, anything. This is why mathematics, with its ambiguities, should not be “the language of science.”

Let me make the situation clear. Professor Kip comes from a high reputation university – Berkeley. He thinks that the two Maxwell equations describe “The Rolling Wave”, which they do not. However, they do describe “The Heaviside Signal.”

My view is that the decision as to which versioin 0of the TEM Wave to go with, “The Rolling Wave” or “The Heaviside Signal”, is at the core of electromagnetic theory. I cleave to “The Heaviside Signal”, and opposing me, all professors and text book writers keep to “The Rolling Wave”. If we regard |Kip as credible, then the mathematics fails to distinguish between the two. This confirms my view, that mathematics should not be “the language of science”, but rather is merely a shorthand attempt to describe science briefly. Thihs results in ambiguity as shown with the two Maxwell Equations.

Ivor Catt. 29 November 2014