

Re: E field Angle

Source: <http://sci.tech-archive.net/Archive/sci.physics.research/2006-07/msg00068.html>

- *From:* Jos Bergervoet <Jos.Myname@xxxxxxxxxxxx>
 - *Date:* Fri, 14 Jul 2006 18:56:44 +0000 (UTC)
-

Bill Miller wrote:

Theoretically, the Electrical (E) field associated with a conductor is at exactly 90 degrees with respect to that conductor.

Only for a perfect conductor, or for a DC field.

It appears, however, that real conductors behave differently and that the E field associated with a real conductor is at an angle that is slightly displaced from 90 degrees.

It is pointing slightly forward for an AC current, in a way that gives a Poynting vector slightly inwards to the material. This inward component of the energy flux corresponds to the losses in the material.

What are the parameters that govern this angle, and what is the range of angles that is likely to be encountered with typical conductors such as Cu, Al, Ag and others? What angular difference (if any) is there between a DC field and an AC field with the same peak V/M amplitude?

The inward energy flux vs. forward flux (from the Poynting vector) gives you the angle. For a linear wire, for instance, you can easily integrate the values. So it comes down to knowing the losses in the wire, compared to the total AC power transported. I leave the details to you!

— Jos

Thanks!

Bill Miller

Re: E field Angle