

Displacement current (electric displacement): a current that does not involve the motion of charges, but rather the changing of electric field lines.

Displacement current is proportional to the rate of change of electric field lines. What is important to remember is that the displacement current, like the conduction current, has a magnetic field associated with it!

As the electric field lines build up their rate of change determines the displacement current and the displacement current determines the magnetic induction associated with the electric field.

If the electric lines of force change non uniformly (ie. Radio energy), with time so also will the magnetic field change non uniformly with time.

Applying this principle to an electromagnetic wave we see that once started the EM wave is self supporting. Changes in the magnetic field continuously set up changes in the electric field and vice versa, so that the wave travels outward from the source (antenna) with the speed of light.

The wave is not a wave in material medium, like ripples on a pond or waves on a stretched out string but a variation of the electric field strength and magnetic induction in space. These fields are as real as water and string and changes in them are just as truly waves as the waves on water or string.

Definition of terms:

Conduction Current the power flow parallel to the direction of propagation expressed in Siemens per metre caused by charge carrier motion in a conductor.

Displacement Current a current which exists in addition to ordinary conduction current in AC circuits. It is proportional to the rate of change of the electric field. The current at right angles to the direction of propagation determined by the rate at which the field energy changes. No charge carrier motion is involved.

Radiation Field the electromagnetic field that breaks away from a transmitting antenna and radiates into space as an electromagnetic wave. The electric and magnetic fields are in phase and thus self supporting.

Induction Field that portion of the electromagnetic field of a transmitting antenna which acts as if it were permanently associated with the antenna, and into which energy is alternately stored and removed. Also the electromagnetic field of a coil carrying alternating current, responsible for the voltage induced by that coil in itself or in a nearby coil (transformer action). In the induction field the electric and magnetic fields are 90 out of phase.