

TPU and the magnetic loop

M.J.Nunnerley

A magnetic loop consists of a circular conductor to which we apply a voltage source. The loop is designed along with a parallel capacitor, to resonate at the frequency of the applied voltage, this will excite and radiate electromagnetic waves. We need to consider the loop as a ring where current passes through the loop due to the applied voltage, the current term means that physical behavior we see when charge moving takes place. The metal (in our case copper) consists of positive ions and negative free electrons moving in random (this is classical free electron theory) and the attractive force between the positive ions and negative electrons makes the metal what it is, harder and more durable.

When we apply a voltage, the gradient of that voltage from the application point to the capacitor, the resonating factor, and back to the application point, will produce an electric field, that electric field will exert a force on the free electrons in the opposite direction to the direction of the field. The electrons which are now moving, will produce an electric current which passes through the loop in a circular manner, the speed of the electron will be very high and therefore we can treat it under the special theory of relativity.

Consider an electron moving in a circular manner in a ring at very high speed, we could convert that type of motion to a simple harmonic motion in a straight line, it's length equal to the circumference of the ring, the line is a metallic wire consisting of free electrons and positive ions. The electrons will move rapidly up and down in an oscillation. Now the electrons can be seen in a relativistic effect, and the length will consequently contract, all positive ions will accumulate creating one very big positive charge and the electrons a very small localized negative charge. This is analogous to the very famous Bohr's model of the Atom (Kepler + coulomb problem), with the motion of the electron ascending and descending being considered as an excitation of the electron to an upper orbit, then back to it's original orbit in an oscillation. The excitation and discharge will produce electromagnetic waves that are the same EM waves which are seen in a magnetic loop.