

The Energy Flow of Linear and Circular Dipoles

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The energy flow lines of radiation emitted by a linear dipole in free space are radially straight. This is observed by analyzing the field lines of the Poynting vector. When a linear dipole is placed in an energy absorbing medium, such as water, the field lines begin to exhibit a partial curvature. Our research shows that due to the damping in a dielectric medium, the direction of the energy flow lines are altered in the near field. However, the curved field lines in the near field do not contribute to the energy flow in the far field. For a circular dipole in a dielectric medium the field lines possess a vortex feature in the near field, and then the field lines become radially straight approaching the far field. This paper also studied how the center vortex structure changes when the dipole is embedded in different dielectric materials.