

PHY 303 : Assignment 6

Submit by 23 November 2024 midnight

1. Starting with Lorentz transformation rules for the Electric and magnetic fields derive Biot Savart law for a charge q moving along the y - axis with a velocity v . Find out the first relativistic correction to it.
2. Starting with Lorentz transformation rules for the Electric and magnetic fields derive Lorentz Force law for a charge q moving along the x - axis with a velocity v in presence of electric field \mathbf{E} and magnetic field \mathbf{B} as seen from the lab frame. Find out the first relativistic correction to it.
3. From Lorentz transformations of the electric and the magnetic fields, argue that $\mathbf{E}^2 - c^2\mathbf{B}^2$ is a Lorentz invariant quantity. Find out the transformation properties of $\mathbf{E} \cdot \mathbf{B}$ and $\mathbf{E} \times \mathbf{B}$.
4. Starting with the Liénard Weichert potential find out the Electric field set up by a moving charge e on a circular trajectory of radius R with a constant speed $c\beta$.
5. In the previous problem, what is the acceleration field radiation Poynting vector ? What is the velocity field Poynting vector ?