

16.4: Coulomb's Law and Relativity

The equation 16.1.1 for the scalar potential of a point charge is valid only in the reference frame in which the charge q is stationary. By symmetry, the vector potential must be zero. Since ϕ is actually the timelike component of the four-potential, we infer that the four-potential due to a charge is tangent to the world line of the charged particle.

A consequence of the above argument is that a moving charge produces a magnetic field, since the four-potential must have spacelike components in this case.

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