

The Mass of light from Coulomb's Law and the Vacuum Permeability

[Coulomb's Force Law](#)

$$F_{Coulomb} = \frac{1}{4\pi\epsilon_0} \frac{q^2}{r^2}$$

[Vacuum Permeability](#)

The force per unit length for two wires is given by:

$$F = \frac{\mu_0 I^2}{2\pi r} = \frac{\mu_0 dq^2}{2\pi dt^2}$$

For a specific value of q and t , and considering only the effect of a single wire:

$$F = \left(\frac{\mu_0 I^2}{4\pi r} \right) = \left(\frac{\mu_0 q}{4\pi r t} \right)$$

For $r = ct$, we have:

$$F_{Permeability} = \frac{\mu_0 c^2}{4\pi r^2} q^2$$

Equating the two, we have:

$$F = \frac{1}{4\epsilon_0} = \frac{\mu_0 c^2}{4}, \text{ so that } c^2 = \frac{1}{(\epsilon_0 \mu_0)}$$

$$1 = (\epsilon_0 \nu_0) c^2 = m_0 c^2$$