

Mass and Energy Relation

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$$E = mw^2 = \frac{hcf}{w}$$

$$m = \frac{E}{c^2} \frac{kE^2 + h^2c^2}{h^2c^2}$$

$$\Delta E = \frac{c^4 h^2 \Delta m}{3kE^2 + h^2c^2}$$

For charged particles with low energy:

$$\Delta E = c^2 \Delta m$$

For the proton $E = 938.27231 \text{ MeV}$

$$\Delta E = \frac{c^2}{1.00034} \Delta m$$

$$\frac{\Delta E}{\Delta m} = c^2 \frac{c^2 - kf^2}{2kf^2 + c^2}$$

