Answer on Question #51219, Physics, Other

How much mass does an electron gain when it is accelerated to a kinetic energy of 500 keV?

Answer:

The total energy E of an electron defines by it's mass as:

$$E = mc^2$$

Where m electrons mass, and c is the speed of light in vacuum.

From another hand the energy consists of the energy of rest and kinetic energy:

$$E = m_0c^2 + T$$

Where m_0 is the mass at rest

Then:

$$mc^2 = m_0c^2 + T$$

$$m - m_0 = \Delta m = \frac{T}{c^2} = \frac{500 \cdot 10^3\ eV}{9 \cdot 10^{16}\frac{m^2}{s^2}} = \frac{500 \cdot 10^3 \cdot 1.6 \cdot 10^{-19}\ eV}{9 \cdot 10^{16}\frac{m^2}{s^2}} \approx 8.9 \cdot 10^{-31}\ kg$$

This kinetic energy value very close to electron's rest energy value. Electrons with such energy have to be defined as relativistic particle.