

Answer on Question #45914, Physics, Astronomy

An electron is moving with a speed of $0.9c$ in a magnetic field of strength $(10)^6$ G. Calculate the peak frequency at which the electron will radiate

Solution

We will use formula for maximum:

$$\omega = \omega_H \left(\frac{E}{mc^2} \right)^3$$

where

$$\omega_H = \frac{|q|B}{mc}$$

is cyclotron resonance frequency and $E = \frac{mc^2}{\sqrt{1-v^2/c^2}}$ is full energy of electron.

Hence we have

$$\omega = \frac{|q|B}{mc} \frac{1}{(1 - v^2/c^2)^{3/2}} = \frac{0.9 \cdot 10^6}{9.1 \cdot 10^{-31}} \frac{1}{0.19^{3/2}} \approx 1.2 \cdot 10^{37} \text{ Hz}$$