

Answer on Question #82168 – Physics – Electromagnetism

A proton is located at $y = 0.06 \text{ m}$ and has a velocity of $5 \cdot 10^6 \text{ m/s}$ in the $+x$ direction while an electron is located at $x = 0.08 \text{ m}$ and has a velocity of $7 \cdot 10^6 \text{ m/s}$ in the $+y$ direction. What is the magnetic field generated by these two charges at the origin (magnitude and direction)?

Solution.

The magnetic field is:

$$B = \frac{\mu_0 q[vr]}{4\pi r^3}$$

For proton:

$$B_1 = 10^{-7} \cdot \frac{1.6 \cdot 10^{-19} \cdot 5 \cdot 10^6}{0.06^2} = 2.22 \cdot 10^{-17} \text{ T/m}$$

For electron:

$$B_2 = 10^{-7} \cdot \frac{1.6 \cdot 10^{-19} \cdot 7 \cdot 10^6}{0.08^2} = 1.75 \cdot 10^{-17} \text{ T/m}$$

The resulting field:

$$B = B_1 + B_2 = 2.22 \cdot 10^{-17} + 1.75 \cdot 10^{-17} = 3.97 \cdot 10^{-17} \text{ T/m}$$

If we look at xy –plane from top then the resulting field is directed from us.