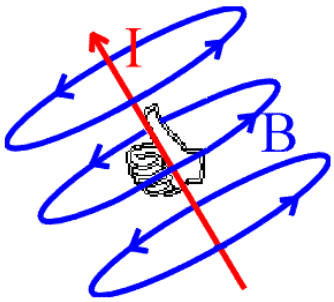
Answer on question #51112, Physics, Electromagnetism

Find the magnetic field position 2.25 m away from a long wire carrying a current of 15.0A.

ANSWER:

Magnetic field of a long wire.

Magnetic fields arise from charges, similarly to electric fields, but are different in that the charges must be moving. A long straight wire carrying a current is the simplest example of a moving charge that generates a magnetic field. We mentioned that the force a charge felt when moving through a magnetic field depend on the right-hand rule. The direction of the magnetic field due to moving charges will also depend on the right hand rule. For the case of a long straight wire carrying a current I, the magnetic field lines wrap around the wire. By pointing one's right thumb along the direction of the current, the direction of the magnetic field can be found by curving one's fingers around the wire.



The strength of the magnetic field depends on the current *I* in the wire and *r*, the distance from the wire.

$B = \frac{\mu_0 I}{2\pi r}$,

$\mu_0 = 4\pi \cdot 10^{-7}$ $(\frac{Tm}{A})$ - the magnetic permeability.

$B = \frac{\mu_0 I}{2\pi r} = \frac{4\pi \cdot 10^{-7} Tm/A \cdot 15\ A}{2\pi \cdot 2.25\ m} = 13.3 \cdot 10^{-7}\ T = 1.33 \cdot 10^{-6}\ \mu T$