Answer on Question #46025, Physics, Electromagnetism

A current flows in a wire of circular cross-section with the free electrons travelling with a mean drift velocity v. If an equal current flows in a wire of the same material but of twice the radius, what is the new mean drift velocity?

According to differential form of Ohm law :

$$j = n \cdot e \cdot v$$

Where j is the current density , e elementary charge , v is the drift velocity

Be definition j is :

$$j = \frac{I}{S} = \frac{I}{\pi r^2}$$

Combine each eq. :

$$\frac{I}{\pi r^2} = n \cdot e \cdot v$$

Denote new drift velocity as v_x

Then:

$$\frac{I}{\pi (2r)^2} = \frac{I}{4\pi r^2} = n \cdot e \cdot v_x$$

$$v_x = \frac{v}{4}$$