

Answer on Question #55765, Physics / Electromagnetism

Task: Two long parallel wires carry currents of 1.13 A and 4.59 A. The magnitude of the force per unit length acting on each wire is 7.59×10^{-5} N/m. Find the separation distance of the wires expressed in millimeters.

Solution:

the interaction force between two wires

$$F_{12} = \frac{\mu\mu_0 I_1 I_2 l}{2\pi d}$$

$$I_1 = 1.13 \text{ A}$$

$$I_2 = 4.59 \text{ A}$$

$$F_{12} = 7.59 \cdot 10^{-5} \text{ N/m}$$

$$l = 1 \text{ m}$$

$$\mu = 1$$

$$\mu_0 = 4\pi \cdot 10^{-7} \text{ N/A}^2$$

$$\Rightarrow d = \frac{\mu\mu_0 I_1 I_2 l}{2\pi F_{12}} = \frac{4\pi \cdot 10^{-7} \cdot 1.13 \cdot 4.59 \cdot 1}{2\pi \cdot 7.59 \cdot 10^{-5}} \approx 13.67 \cdot 10^{-3} \text{ m} = 13.67 \text{ mm}$$

Answer: distance of the wires $d=13.67$ mm