



Electromagnetics:
Electromagnetic Field Theory

Example 3 – Getting a Feel
for the Numbers

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Example #3 – The Numbers



Suppose there is a 22 AWG wire carrying 1 A of current.

What is the magnetic field \vec{H} at a distance of 1 cm from the wire?

Plug these numbers into the expression for \vec{H} around an infinite conductor.

$$\begin{aligned}\vec{H} &= \frac{I}{2\pi\rho} \hat{a}_\phi \\ &= \frac{(1 \text{ A})}{2\pi(0.01 \text{ m})} \hat{a}_\phi \\ &= \boxed{(15.92 \text{ A/m}) \hat{a}_\phi}\end{aligned}$$

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Example #3 – The Numbers



Suppose there is a 22 AWG wire carrying 1 A of current.

What is the magnetic field \vec{H} at a distance of 1 cm from the wire?

$$\vec{H} = (15.92 \text{ A/m}) \hat{a}_\phi$$

It follows that \vec{B} is

$$\begin{aligned} \vec{B} &= \mu_0 \mu_r \vec{H} \\ &= (1.2566 \times 10^{-6} \text{ H/m})(1.0)[(15.92 \text{ A/m}) \hat{a}_\phi] \\ &= \boxed{(20 \mu\text{T}) \hat{a}_\phi} \end{aligned}$$

This is around 1000× weaker than the field generated by a kitchen magnet (5 to 10 mT).