

Answer on Question #46010, Physics, Electromagnetism

A rectangular coil of dimensions 20cm by 15cm lies with its plane parallel to a magnetic field of 0.5Wb/m^2 . The coil, carrying a current of 10A experiences a torque of 4.5Nm in the field. How many loops has the coil?

Torque on N rectangular loops:

$$\tau = NIAB \sin \theta$$

Where I – current in a coil, A – rectangular area, B – magnetic field, $\theta = \frac{\pi}{2}$ – angle between normal and magnetic field.

Then, the number of loops in the coil is (suppose that in the task magnetic field is $B = 0.5 \frac{\text{Wb}}{\text{m}^2}$):

$$N = \frac{\tau}{IAB} = \frac{4.5\text{Nm}}{10\text{A} \cdot 0.20\text{m} \cdot 0.15\text{m} \cdot 0.5 \frac{\text{Wb}}{\text{m}^2}} = 30$$

Answer: the number of loops in the coil is: **$N = 30$ loops**