

Answer on Question #55884, Physics / Electromagnetism

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

100

60

30

20

Solution:

Ampere's force law for one side: $F = IBa$, where a is side's length of coil, B is magnetic field, I is current.

Considering that we have 2 sides and N loops: $F = 2IBNa$.

Therefore torque equals:

$$M = 2IBaNb/2 = IBNab$$

And number of loops:

$$N = \frac{M}{IBab} = 30$$

Answer: 30