

42. We replace the current loop of arbitrary shape with an assembly of small adjacent rectangular loops filling the same area which was enclosed by the original loop (as nearly as possible). Each rectangular loop carries a current i flowing in the same sense as the original loop. As the sizes of these rectangles shrink to infinitesimally small values, the assembly gives a current distribution equivalent to that of the original loop. The magnitude of the torque $\Delta\vec{\tau}$ exerted by \vec{B} on the n th rectangular loop of area ΔA_n is given by $\Delta\tau_n = NiB \sin\theta \Delta A_n$. Thus, for the whole assembly

$$\tau = \sum_n \Delta\tau_n = NiB \sum_n \Delta A_n = NiAB \sin\theta .$$