

19. Consider a section of the ribbon of thickness dx located a distance x away from point P . The current it carries is $di = i dx/w$, and its contribution to B_P is

$$dB_P = \frac{\mu_0 di}{2\pi x} = \frac{\mu_0 i dx}{2\pi x w} .$$

Thus,

$$B_P = \int dB_P = \frac{\mu_0 i}{2\pi w} \int_d^{d+w} \frac{dx}{x} = \frac{\mu_0 i}{2\pi w} \ln\left(1 + \frac{w}{d}\right) ,$$

and \vec{B}_P points upward.