

$$A = 4\pi \underbrace{\sigma_x^* \sigma_y^*}_{\text{rms radii Gaussian}}$$

rms radii Gaussian

$$r = \frac{\gamma m v}{B q}$$

$$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$$

$$\frac{m v^2}{r} = q v B$$

$$r = \frac{m v}{q B}$$