

El campo de la corona en el eje z

$$E_z(z\hat{z}) = -2\pi \frac{k\sigma_0 z}{\sqrt{z^2 + r'^2}} \Big|_a^b = 2\pi k\sigma_0 z \left(\frac{1}{\sqrt{z^2 + a^2}} - \frac{1}{\sqrt{z^2 + b^2}} \right)$$

En el límite

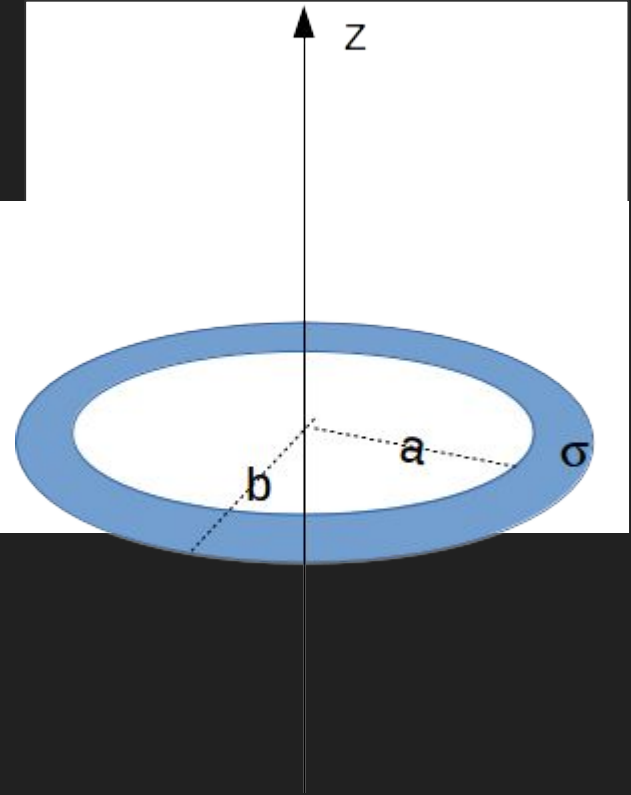
$$\sigma_0 * \pi(b^2 - a^2) = 2\pi\lambda b$$

$$\sigma_0 * \pi(b - a)(b + a) = 2\pi\lambda b$$

$$a \rightarrow b$$

$$\sigma_0(b - a) * \pi 2b = 2\pi\lambda b$$

$$\sigma_0(b - a) \rightarrow \lambda$$



En el límite

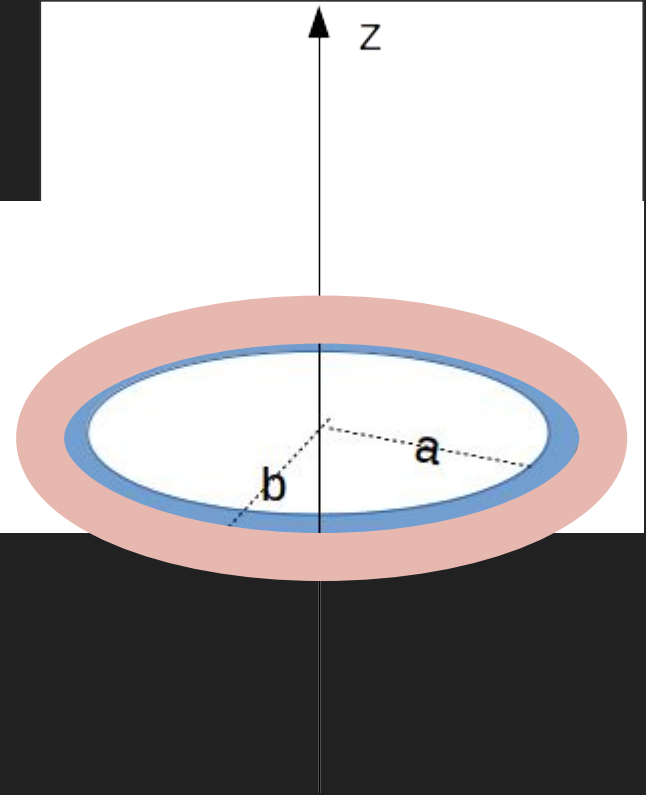
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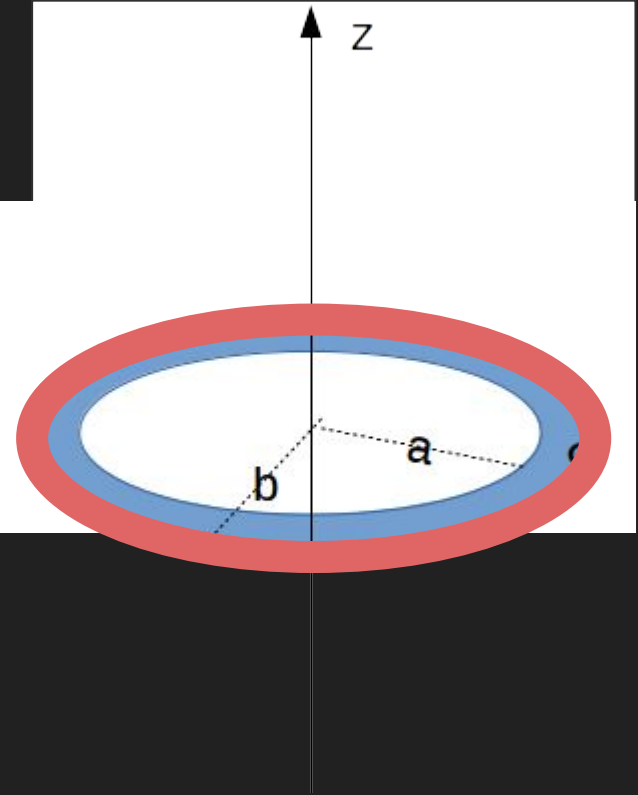
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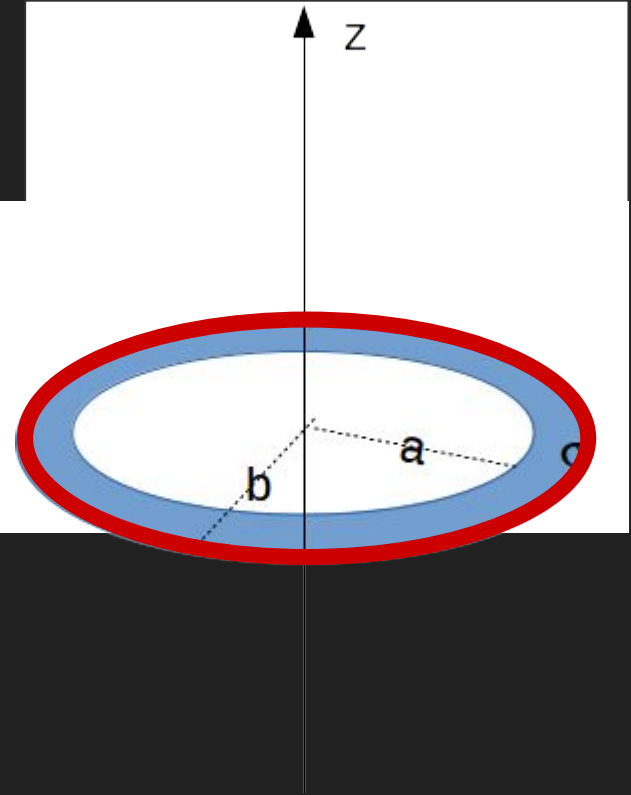
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En el límite

$$E_z(z\hat{z}) = 2\pi k\sigma_0 z \left(\frac{1}{\sqrt{z^2 + a^2}} - \frac{1}{\sqrt{z^2 + b^2}} \right)$$

$$a \rightarrow b \quad \sigma_0 \rightarrow \infty \quad y \quad \left(\frac{1}{\sqrt{z^2 + a^2}} - \frac{1}{\sqrt{z^2 + b^2}} \right) \rightarrow 0$$

En el límite

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Debemos salvar la indeterminación '0.∞'.

En el límite

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$$E_z(z\hat{z}) = 2\pi k\sigma_0 z \left(\frac{\sqrt{z^2 + b^2} - \sqrt{z^2 + a^2}}{\sqrt{z^2 + a^2}\sqrt{z^2 + b^2}} \right)$$

$$\left(\frac{\sqrt{z^2 + b^2} - \sqrt{z^2 + a^2}}{\sqrt{z^2 + a^2}\sqrt{z^2 + b^2}} \right) = \left(\frac{\sqrt{z^2 + b^2} - \sqrt{z^2 + a^2}}{\sqrt{z^2 + a^2}\sqrt{z^2 + b^2}} \right) \left(\frac{\sqrt{z^2 + b^2} + \sqrt{z^2 + a^2}}{\sqrt{z^2 + b^2} + \sqrt{z^2 + a^2}} \right)$$

$$\left(\frac{\sqrt{z^2 + b^2} - \sqrt{z^2 + a^2}}{\sqrt{z^2 + a^2}\sqrt{z^2 + b^2}} \right) \left(\frac{\sqrt{z^2 + b^2} + \sqrt{z^2 + a^2}}{\sqrt{z^2 + b^2} + \sqrt{z^2 + a^2}} \right) = \left(\frac{(z^2 + b^2) - (z^2 + a^2)}{(\sqrt{z^2 + a^2}\sqrt{z^2 + b^2})(\sqrt{z^2 + b^2} + \sqrt{z^2 + a^2})} \right)$$

En el límite

$$E_z(z\hat{z}) = 2\pi k\sigma_0 z \left(\frac{b^2 - a^2}{(\sqrt{z^2 + a^2}\sqrt{z^2 + b^2})(\sqrt{z^2 + b^2} + \sqrt{z^2 + a^2})} \right)$$

$$E_z(z\hat{z}) = 2\pi k\sigma_0 (b - a)z \left(\frac{b + a}{(\sqrt{z^2 + a^2}\sqrt{z^2 + b^2})(\sqrt{z^2 + b^2} + \sqrt{z^2 + a^2})} \right)$$

$$a \rightarrow b \quad \sigma_0(b - a) \rightarrow \lambda$$

$$a \rightarrow b \quad E_z(z\hat{z}) \rightarrow 2\pi k \left(\frac{\lambda z b}{(z^2 + b^2)^{3/2}} \right)$$

Verifiquen calculando el campo del anillo de radio b y densidad de carga λ por definición.

En el límite

$$\left(\sigma_0 \frac{(b+a)(b-a)}{\sqrt{z^2+a^2}\sqrt{z^2+b^2}} \right) \rightarrow \frac{\lambda(2b)}{z^2+b^2}$$