# Eletromagnetismo Avançado

3º ciclo
Aula de 19 de novembro

# Radiação de dipolo

$$q(t) = q_0 \cos(\omega t)$$

$$r \gg \lambda \gg d$$

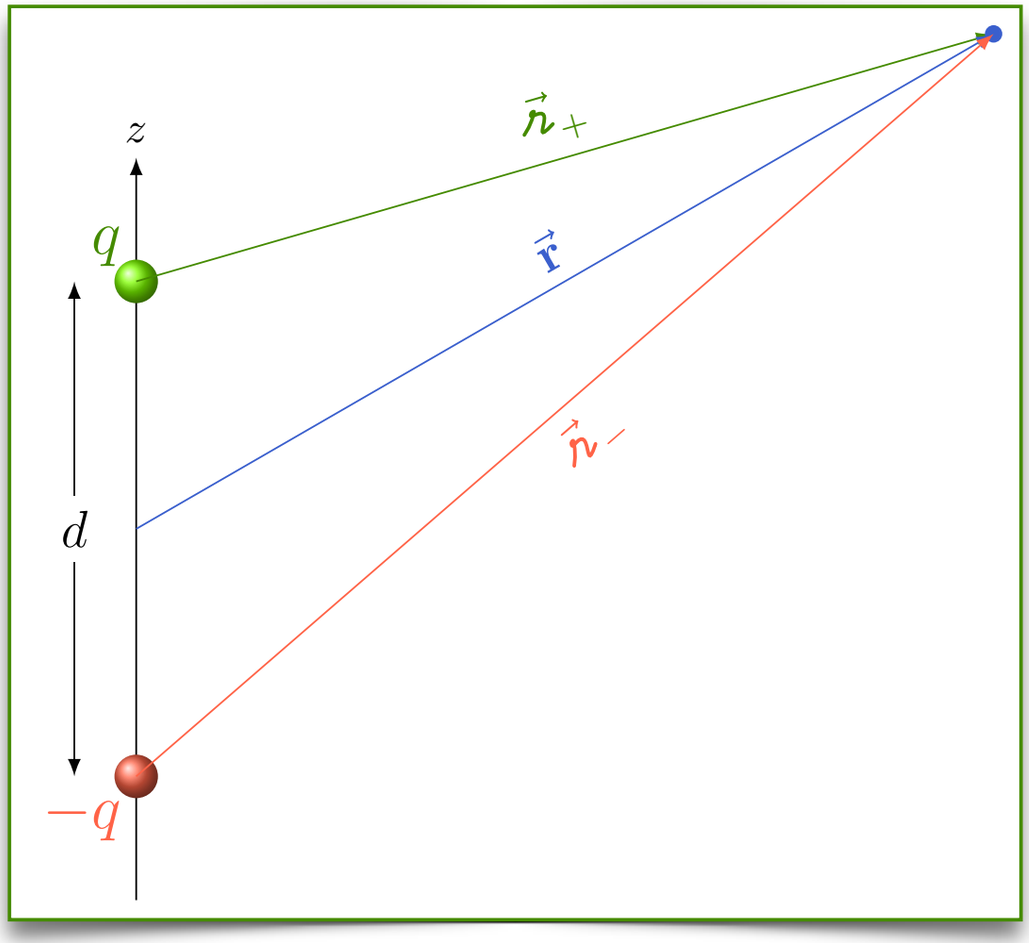
$$V(\vec{\mathbf{r}}, t) = -\frac{p_0 \omega}{4\pi\epsilon_0 c} \frac{\cos\theta}{r} \sin\omega(t - \frac{r}{c})$$

$$\vec{\mathbf{A}}(\vec{\mathbf{r}}, t) = -\frac{\mu_0 p_0 \omega}{4\pi r} \sin\omega(t - \frac{r}{c})\, \hat{\mathbf{z}}$$

$$\vec{\mathbf{E}}(\vec{\mathbf{r}}, t) = -\frac{\mu_0 p_0 \omega^2}{4\pi} \frac{\sin\theta}{r} \cos\omega(t - \tfrac{r}{c})\, \hat{\theta}$$

$$\vec{\mathbf{B}}(\vec{\mathbf{r}}, t) = -\frac{\mu_0 p_0 \omega^2}{4\pi c} \frac{\sin\theta}{r} \cos\omega(t - \tfrac{r}{c})\, \hat{\phi}$$

$$\langle \vec{\mathbf{S}} \rangle = \frac{\mu_0 p_0^2 \omega^4}{8\pi c} \frac{\sin^2\theta}{4\pi r^2}\, \hat{\mathbf{r}}$$



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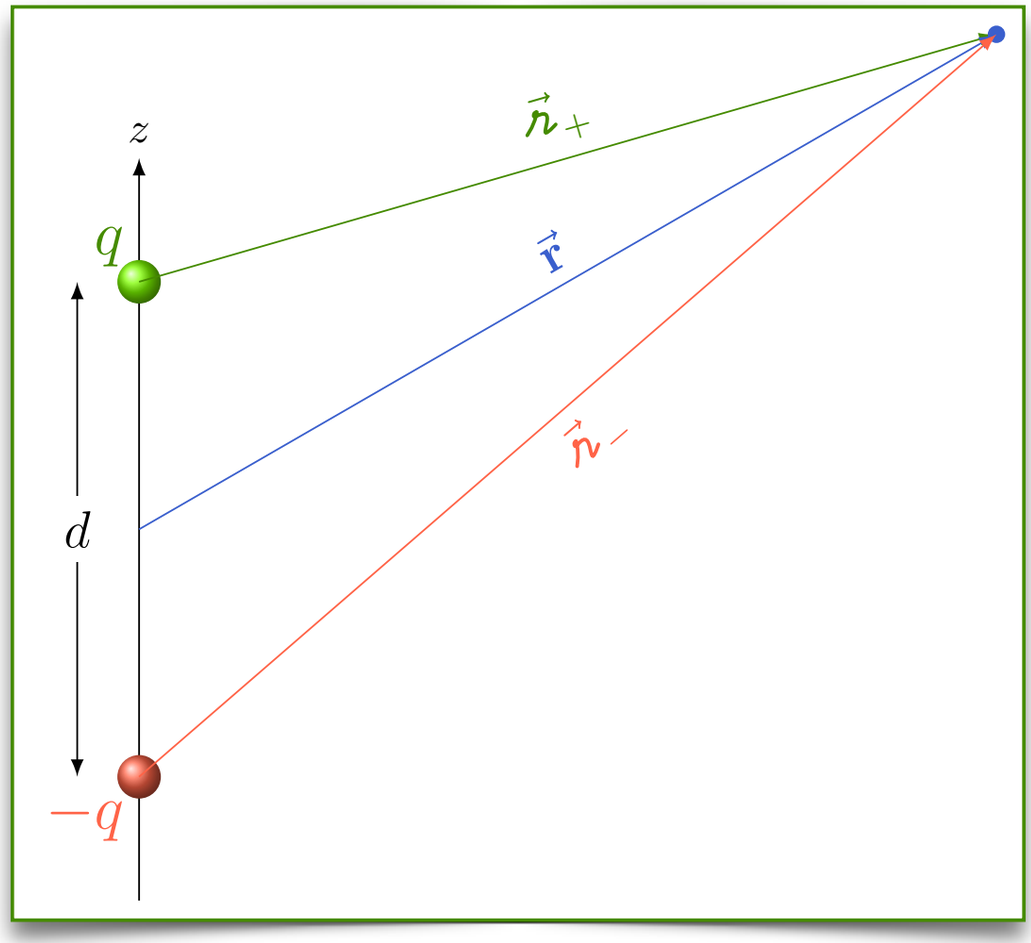
# Pratique o que aprendeu

$q(t) = q_0 \cos(\omega t)$ $\qquad r \gg \lambda \gg d$

Qual é a resistência radiativa do fio?



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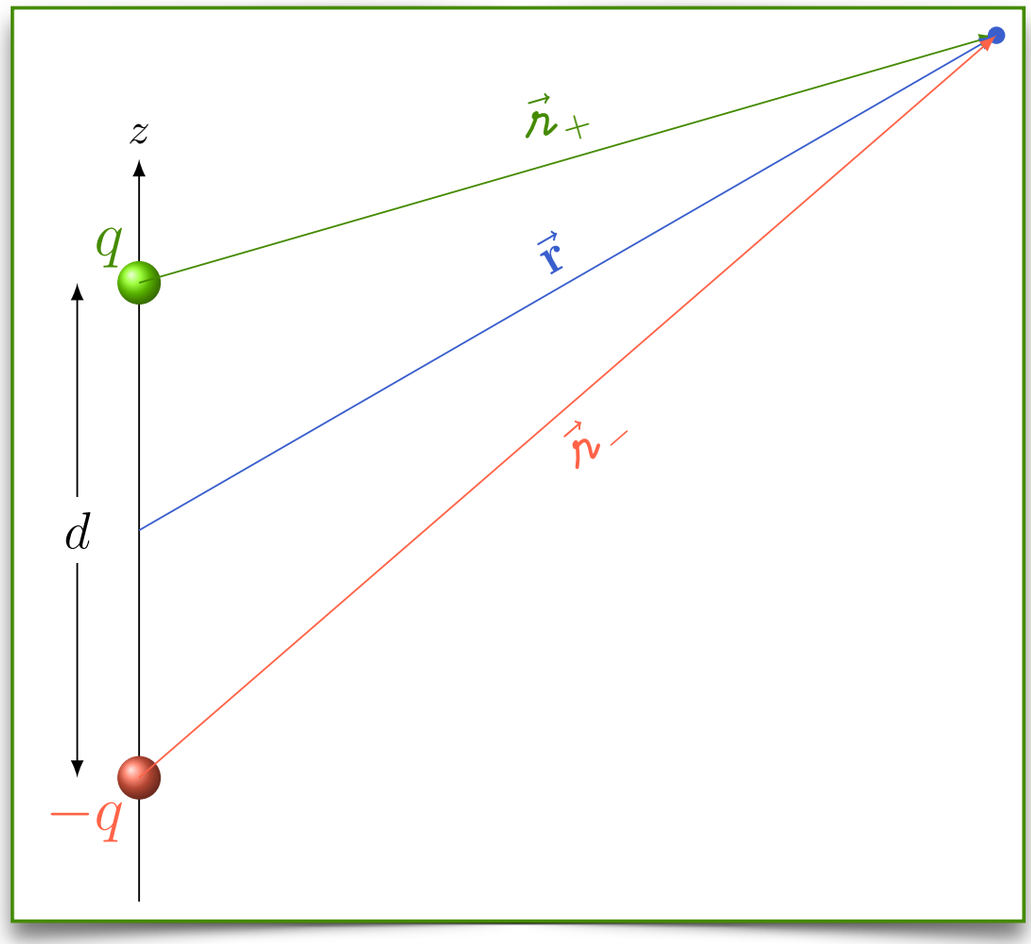
$$P = RI^2$$

POTÊNCIA IRRADIADA



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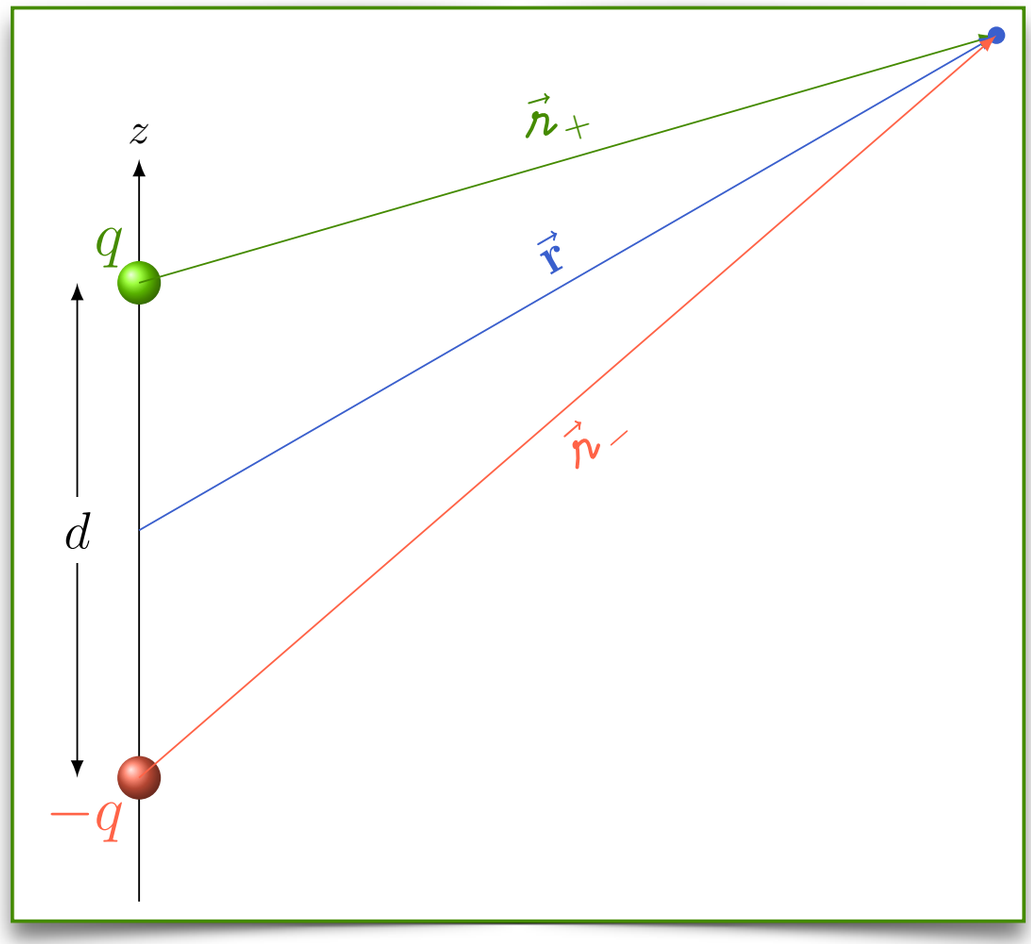

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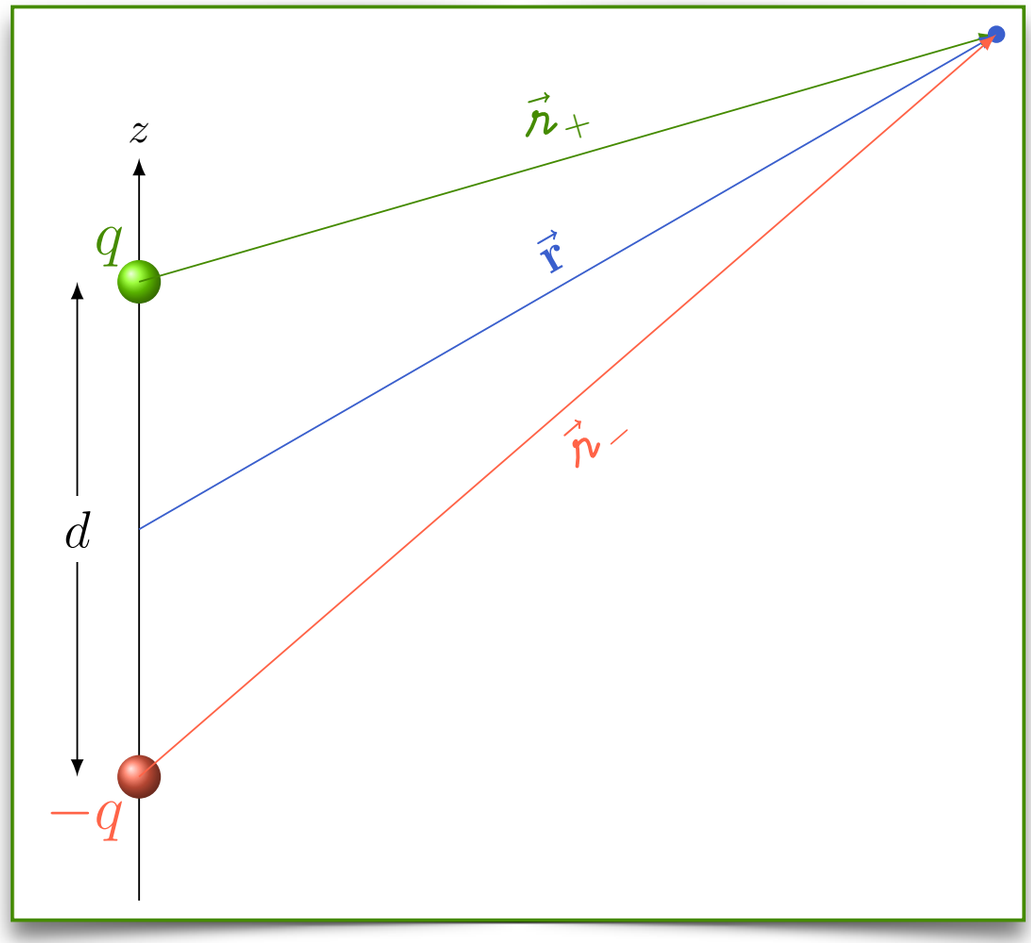
$$I^2(t) = \omega^2 q_0^2 \sin^2(\omega t)$$

$$P = R\frac{q_0^2\omega^2}{2}$$

MÉDIA NO TEMPO



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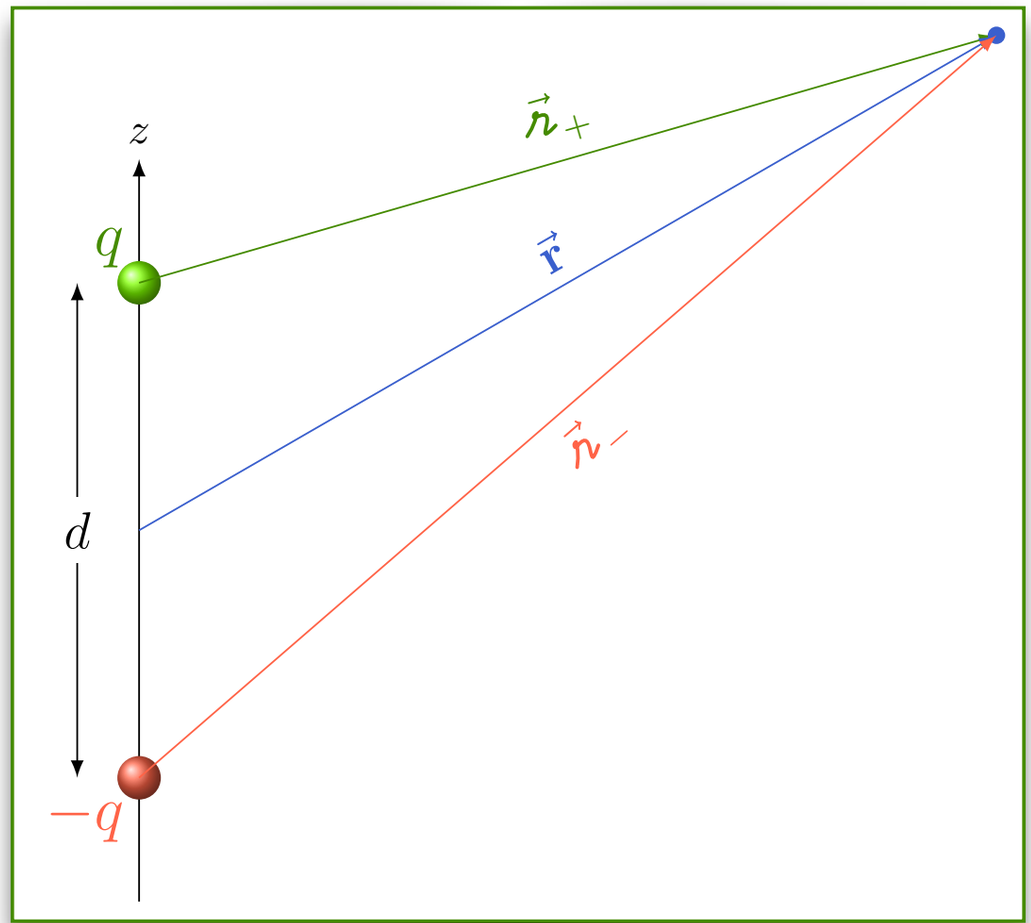

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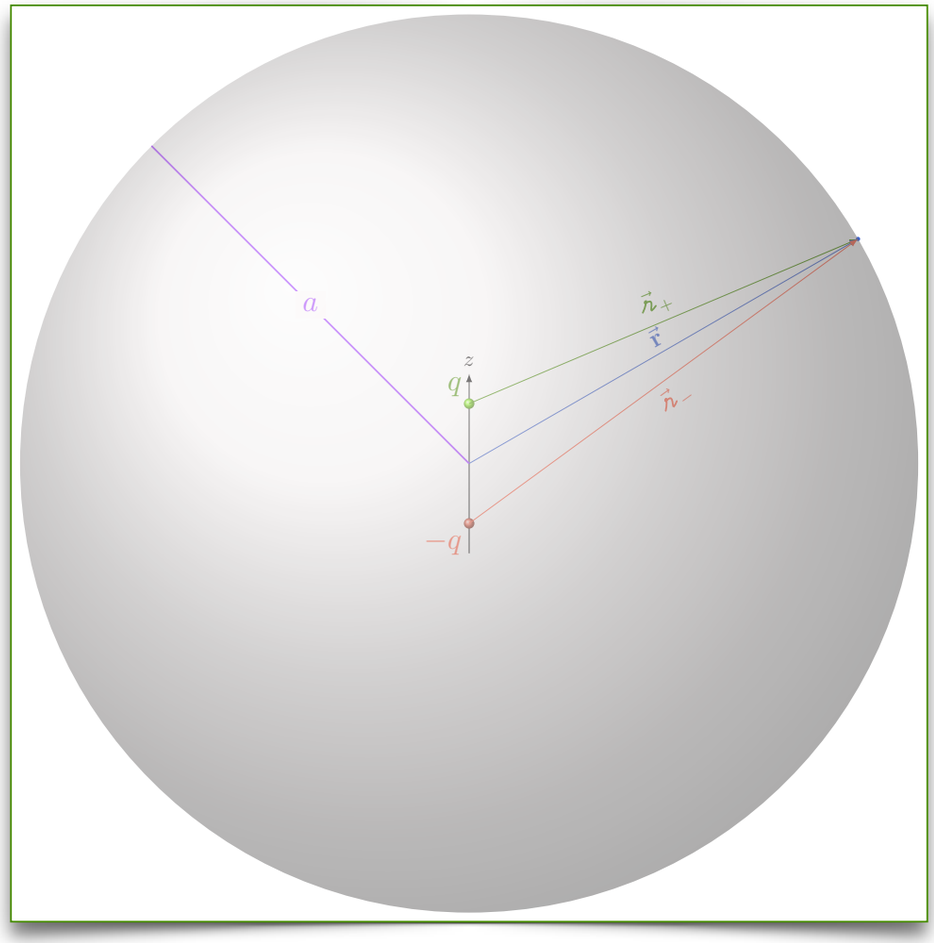

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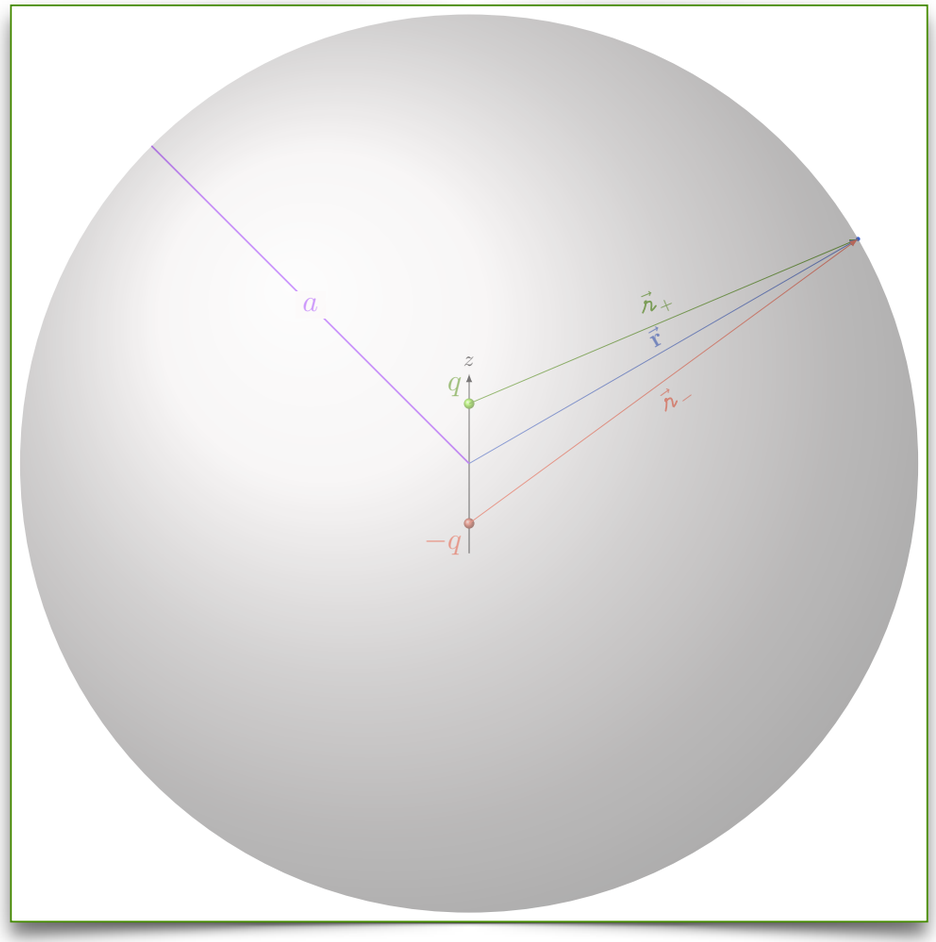
$\sin^2\theta \to 1 - u^2$



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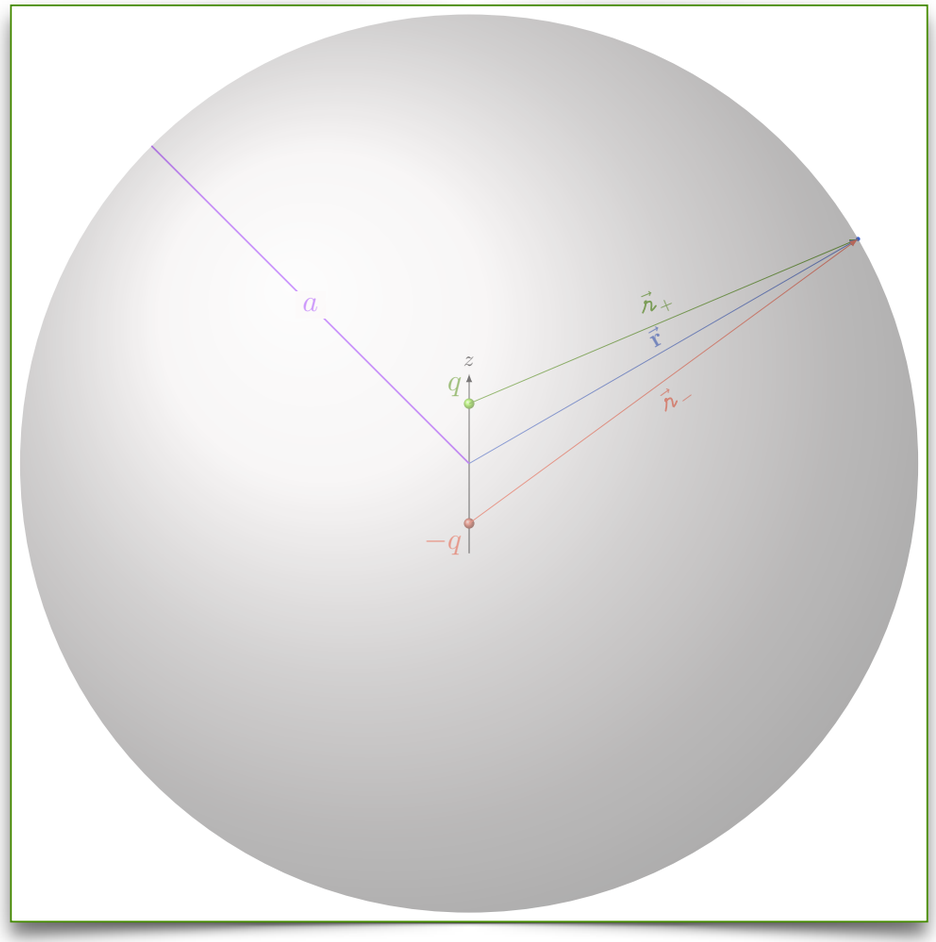


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$$P = \frac{\mu_0 d^2}{8\pi c} \frac{q_0^2\omega^4}{4\pi} 2\pi(2 - \frac{2}{3})$$

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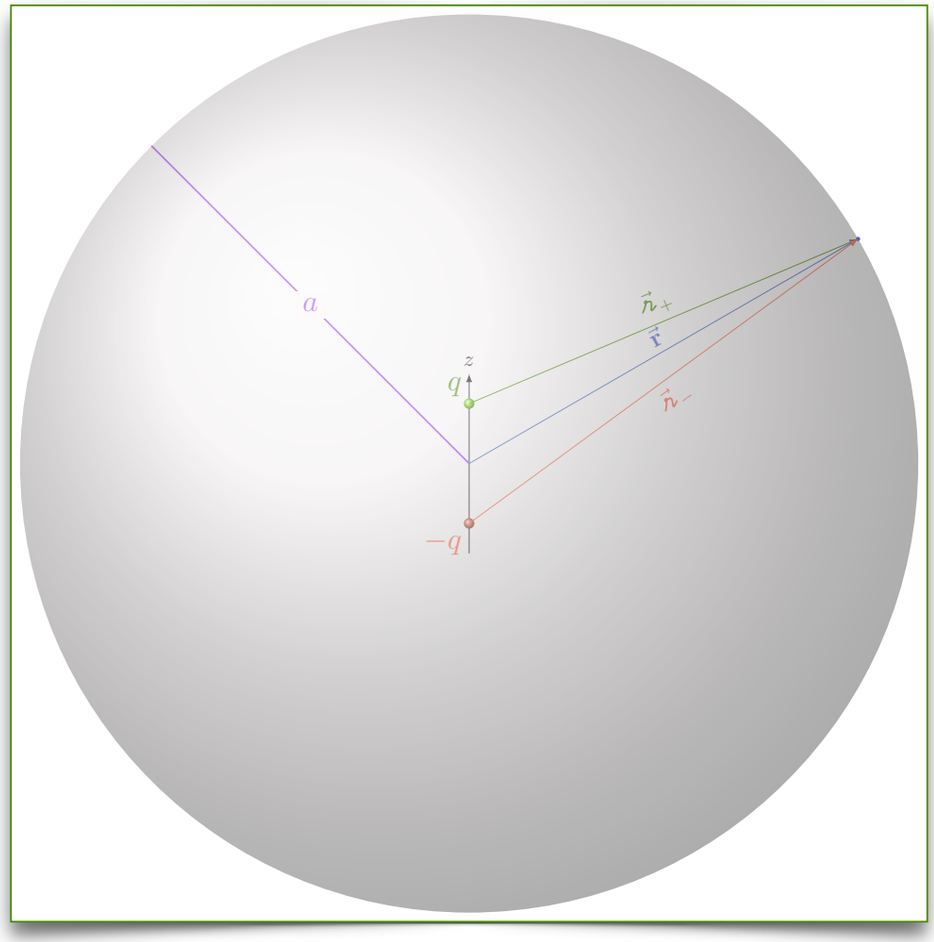


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$$P = \frac{\mu_0 d^2 \omega^2}{6\pi c}\frac{q_0^2\omega^2}{2}$$

$$\omega = \frac{2\pi}{\lambda}c$$

$$R = \frac{2\pi}{3}\sqrt{\frac{\mu_0}{\epsilon_0}}\left(\frac{d}{\lambda}\right)^2$$