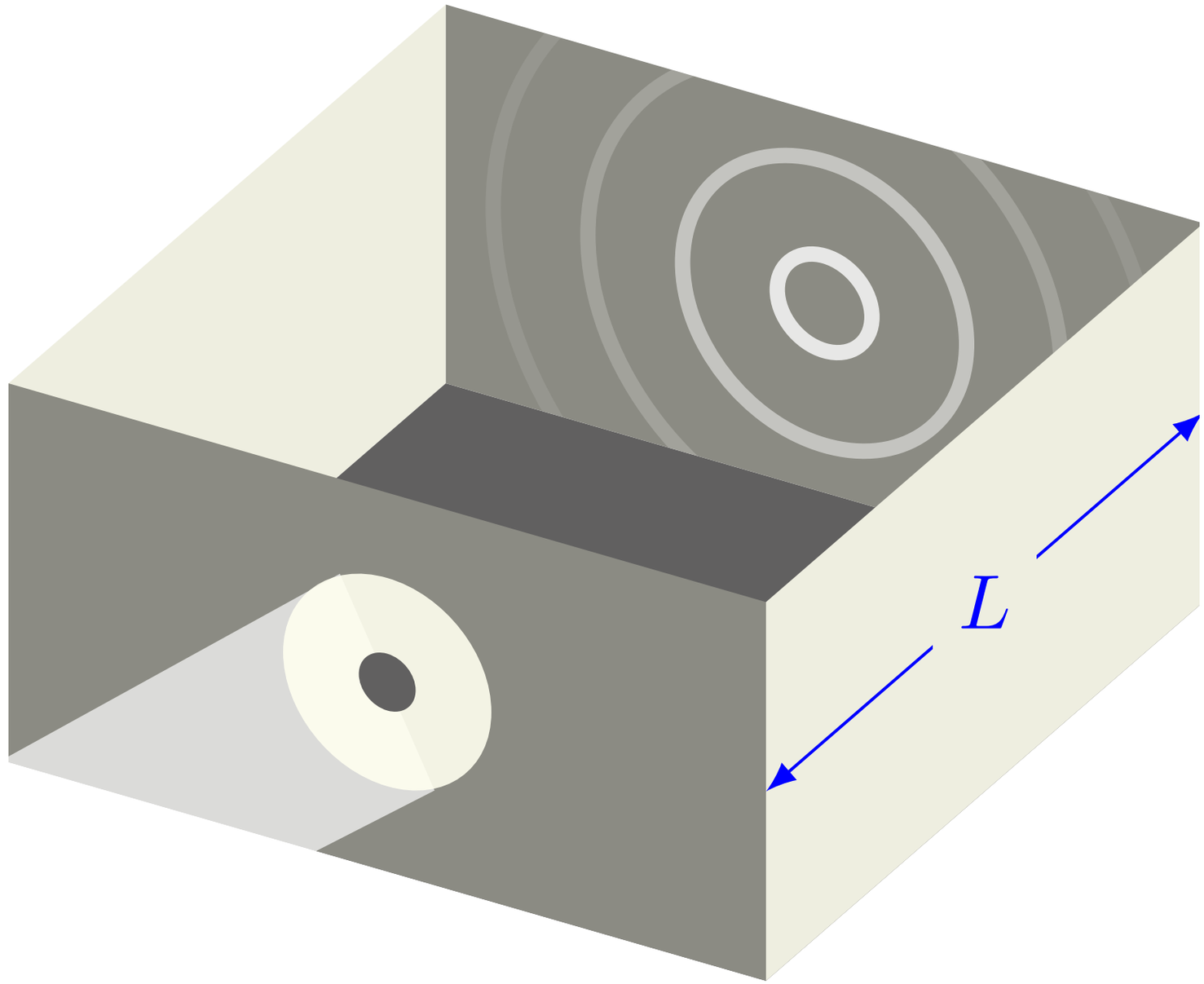
Física IV

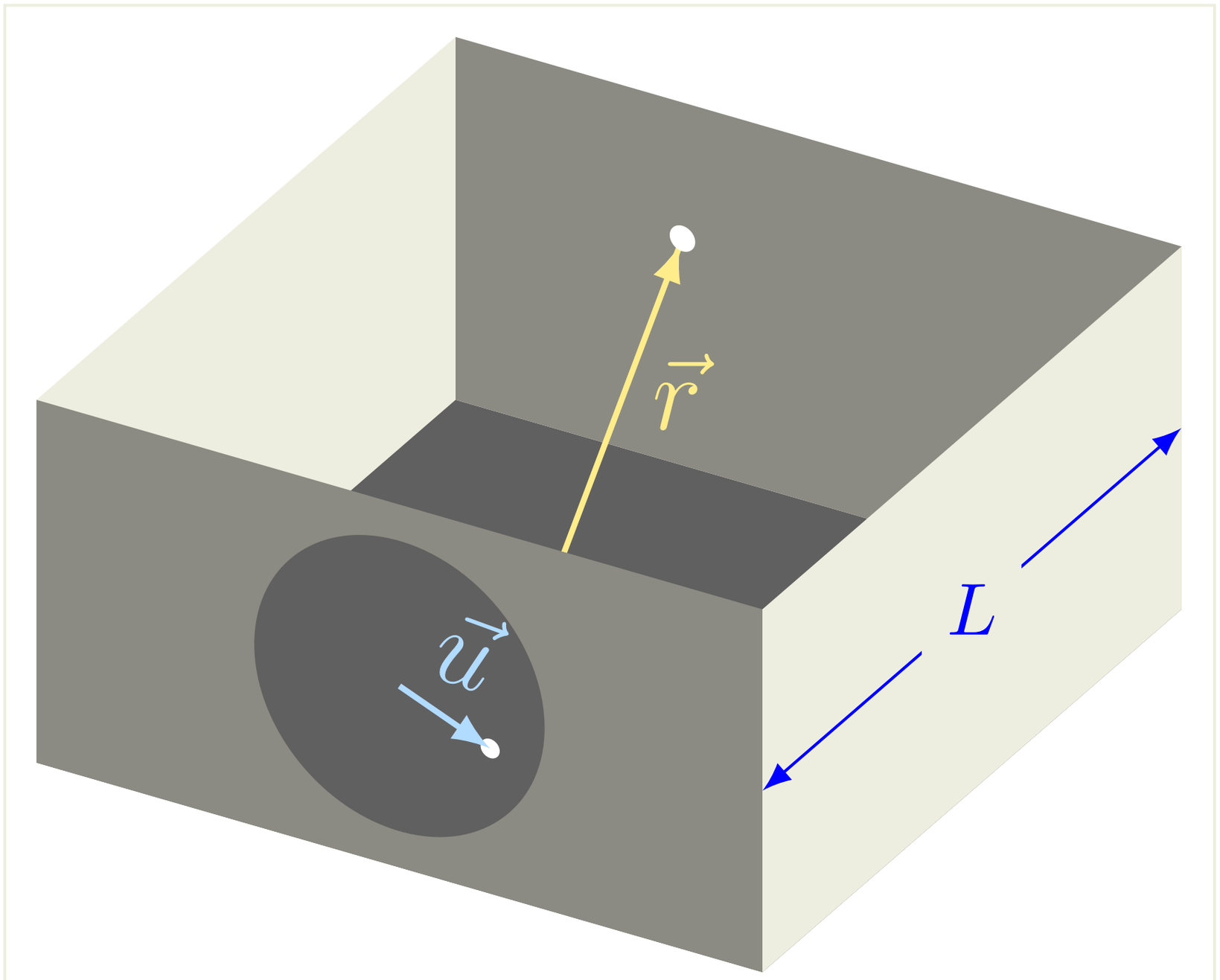
23 novembro 2020

Ótica

Difração

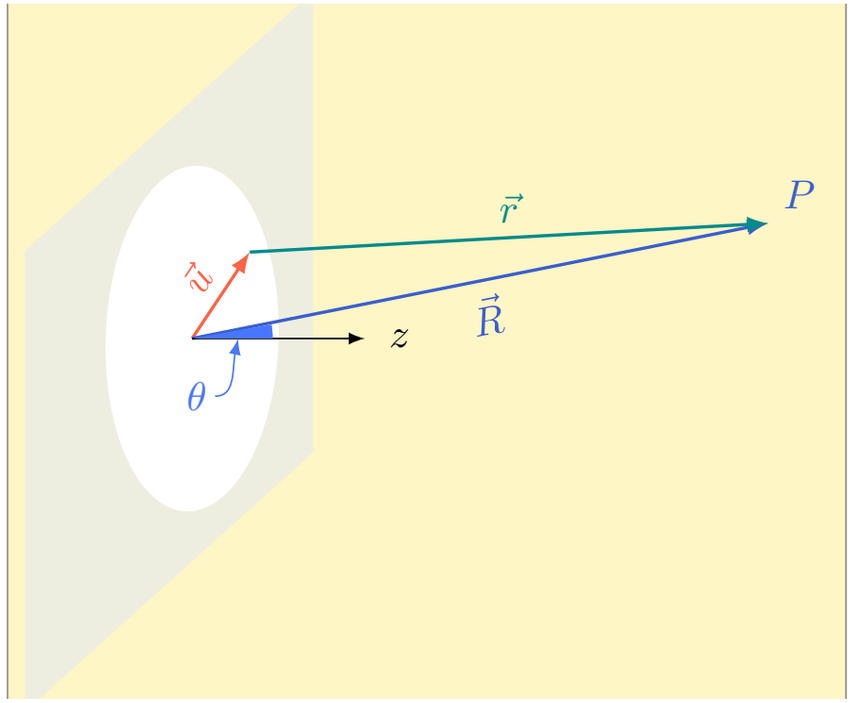


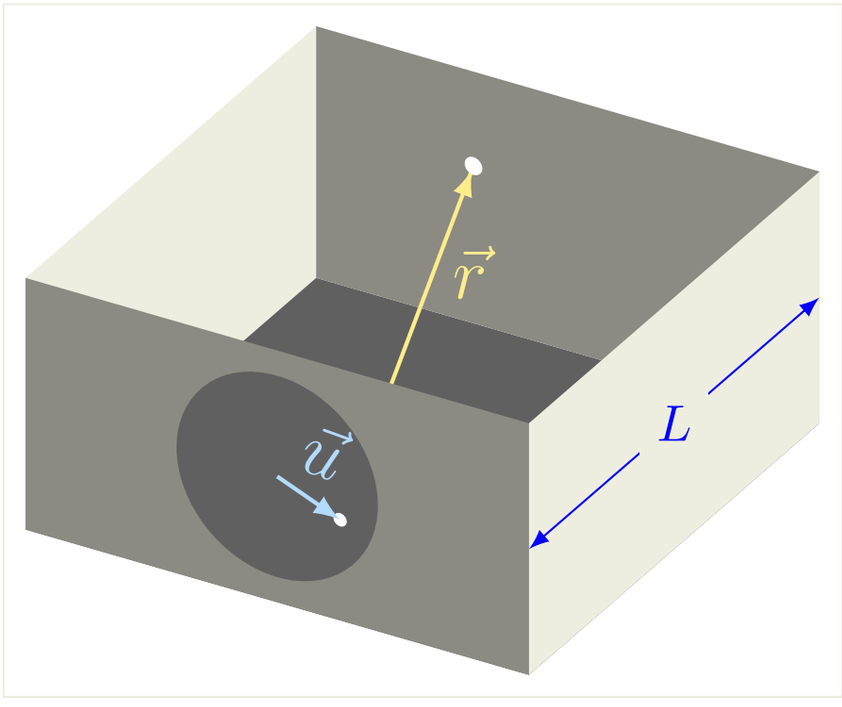
Difração



Difração

$$E(P) = \frac{E(O)\cos\theta}{S}\int_S \frac{\cos(kr-\omega t)}{kr}\,\mathrm{d}^2u$$





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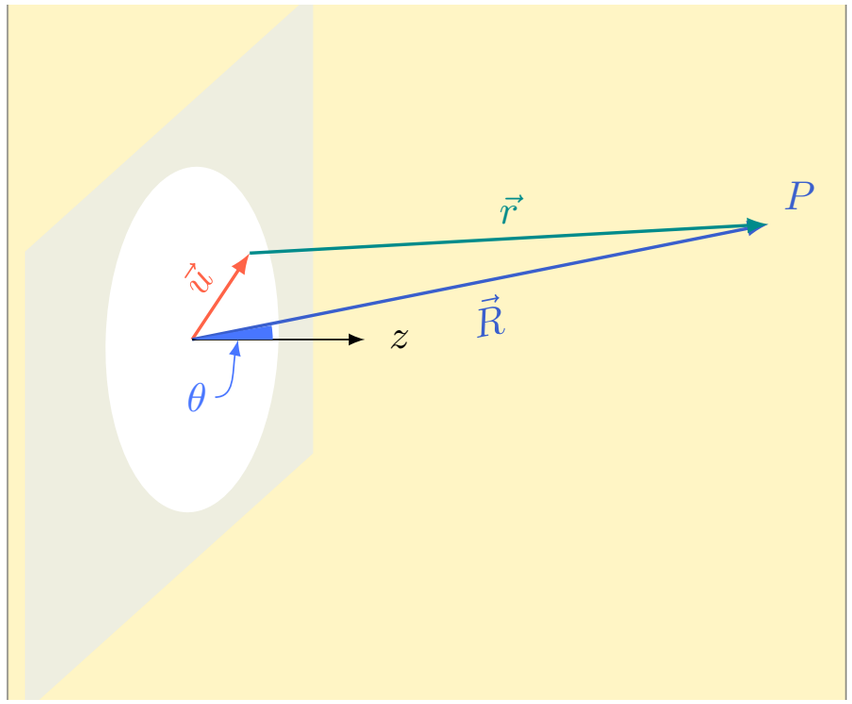
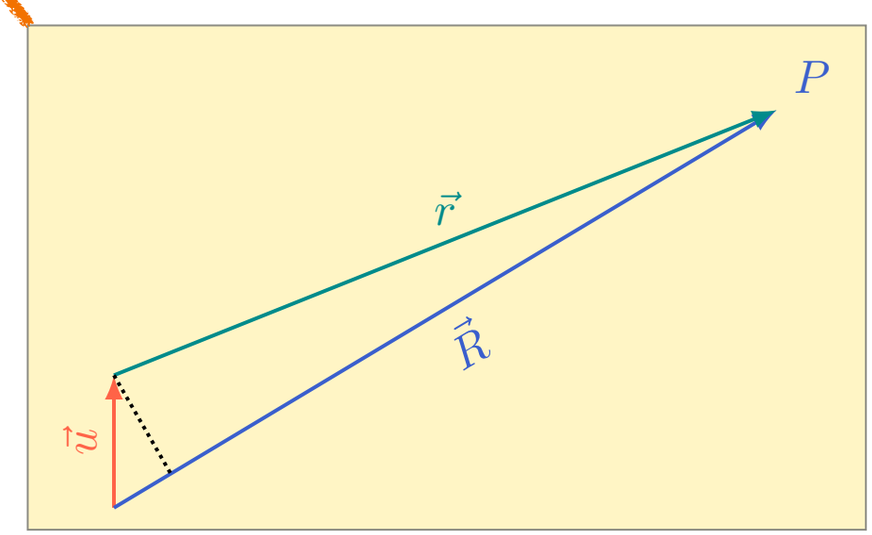
$$r \approx R - \vec{u}\cdot\hat{R}$$





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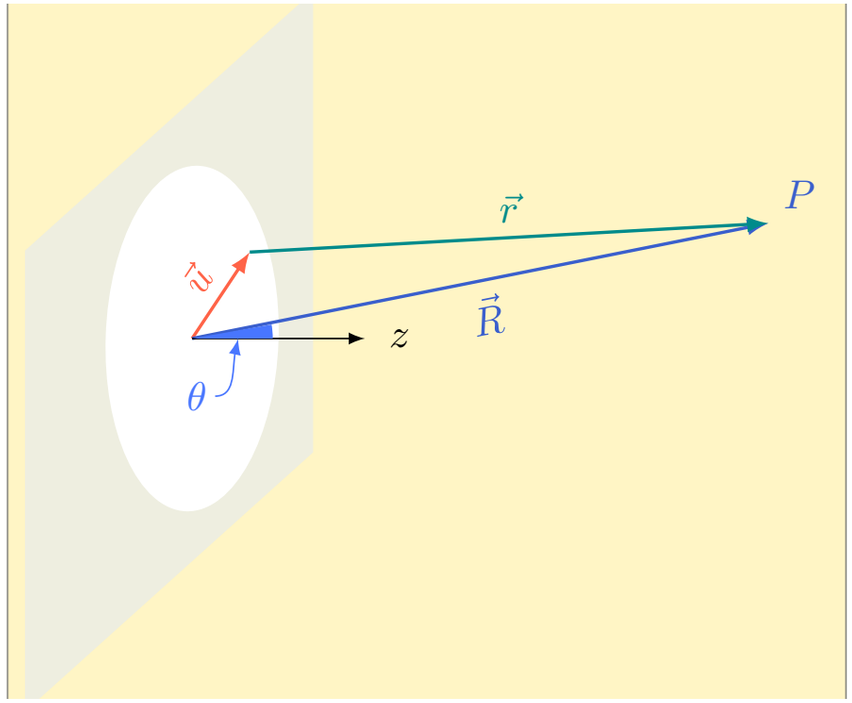

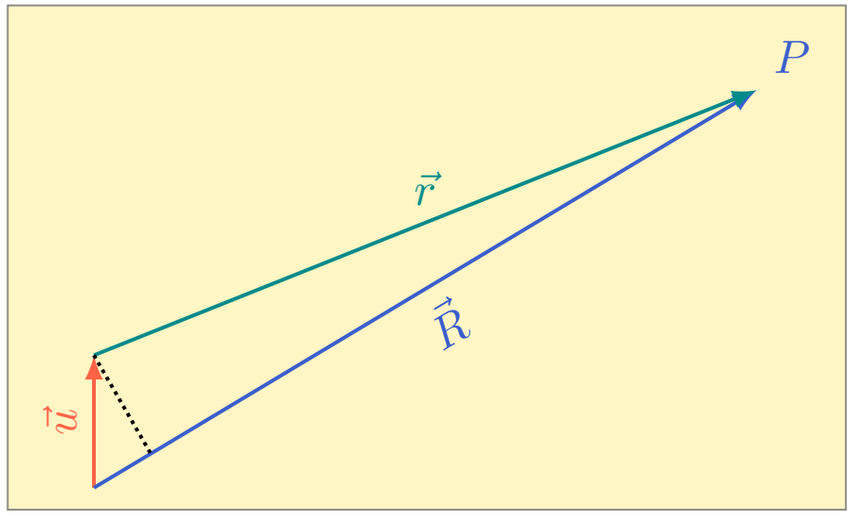

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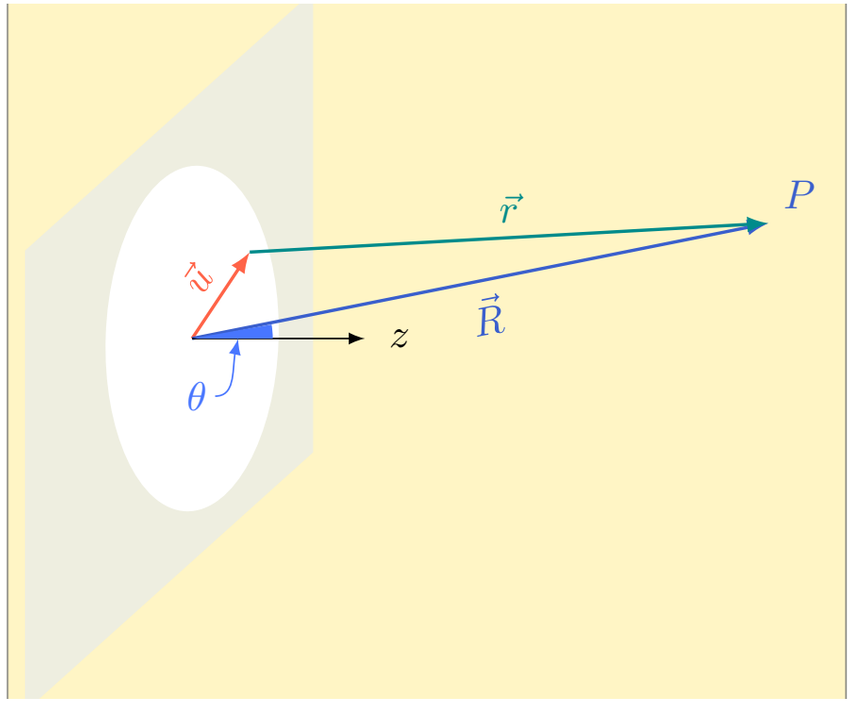

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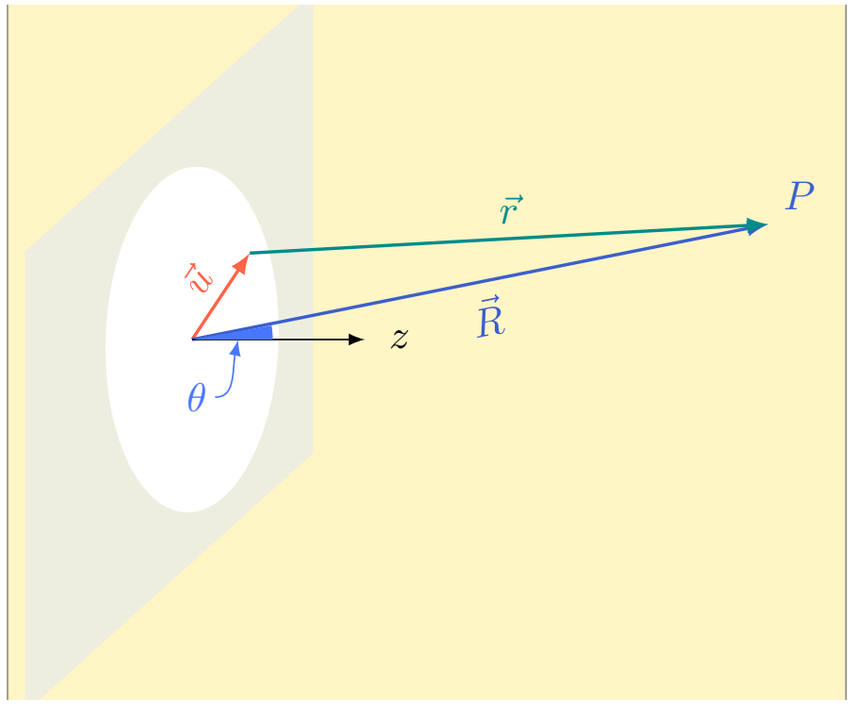

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$$E(P) = \frac{E(O)\cos\theta}{S}\int_S \frac{\cos(kR - k\hat{R}\cdot\vec{u} - \omega t)}{kR}\,\mathrm{d}^2u$$

$$\cos(kR - \omega t - k\hat{R}\cdot\vec{u}) = \cos(kR - \omega t)\cos(k\hat{R}\cdot\vec{u}) + \sin(kR - \omega t)\sin(k\hat{R}\cdot\vec{u})$$

Difração

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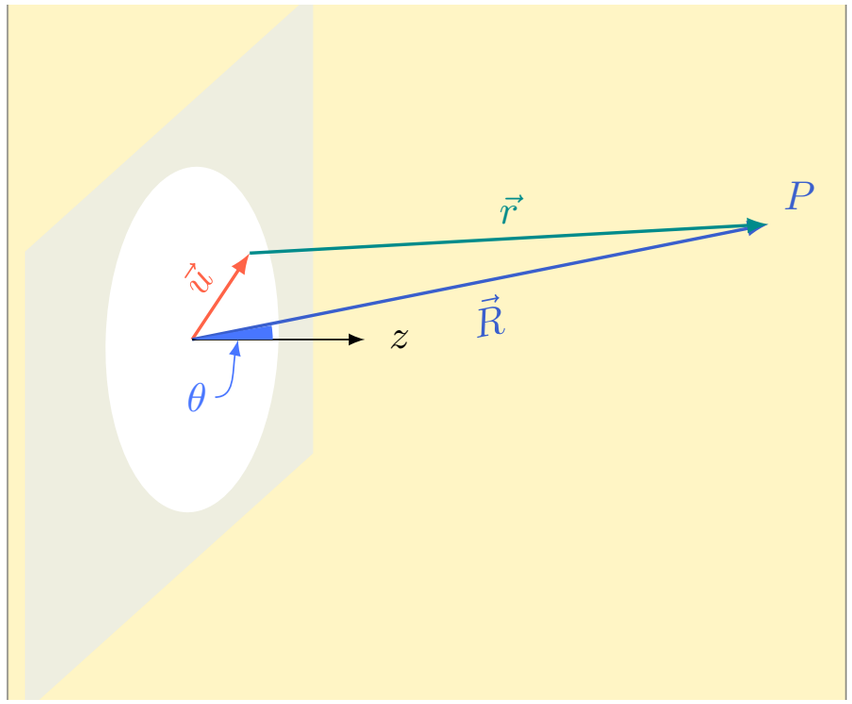

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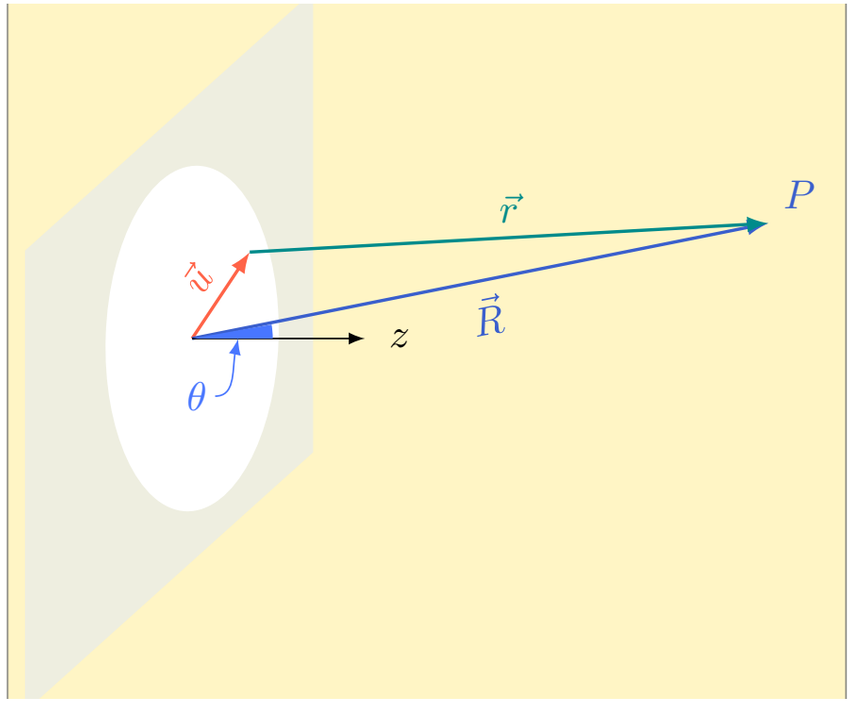

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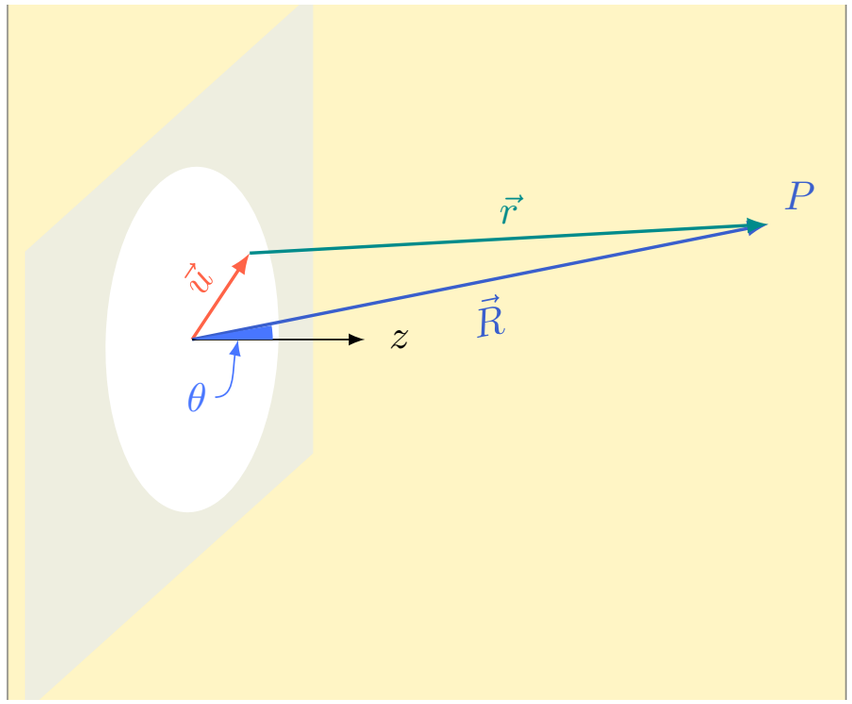
$$E(P) = E(O)\,\cos\theta\,\frac{\cos(kR - \omega t)}{kRS}\int_S \cos(k\hat{R}\cdot\vec{u})\,\mathrm{d}^2u$$

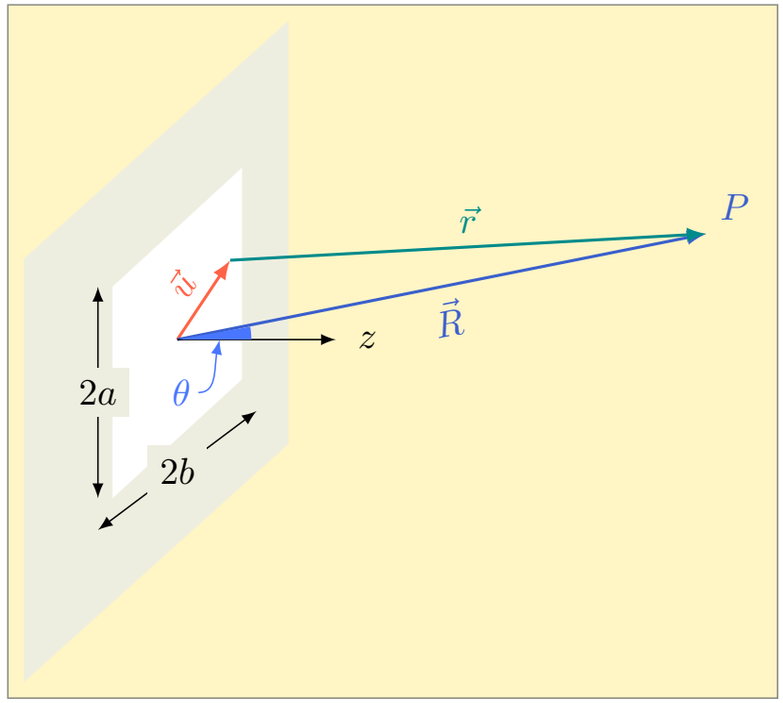
Difração



$$E(P) = E(O)\,\cos\theta\,\frac{\cos(kR-\omega t)}{kRS}\int_S \cos(k\hat{R}\cdot\overrightarrow{u})\,\mathrm{d}^2u$$

Difração
Abertura retangular

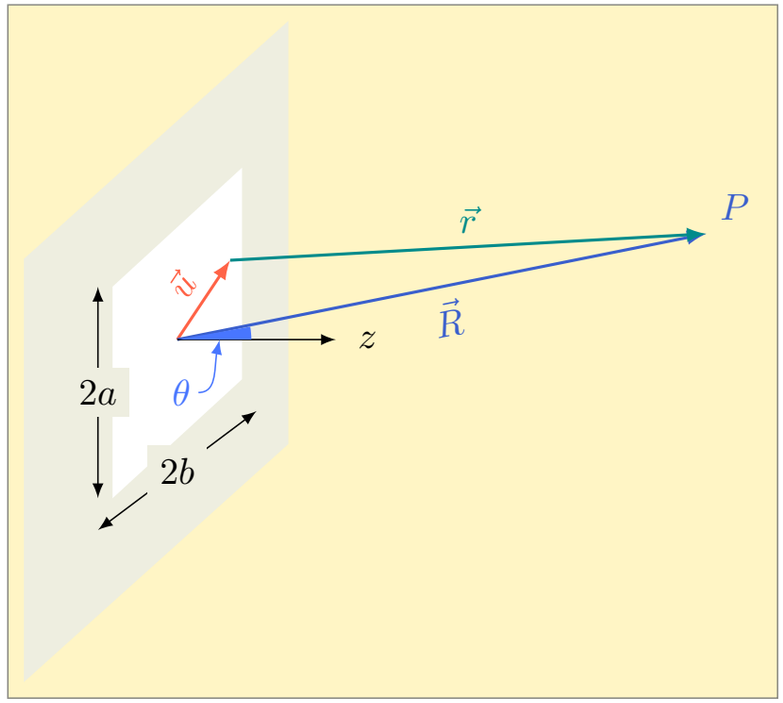
$$E(P) = E(O)\,\cos\theta\,\frac{\cos(kR-\omega t)}{kRS}\int_S \cos(k\hat{R}\cdot\vec{u})\,\mathrm{d}^2u$$



Difração
Abertura retangular

$$E(P) = E(O)\,\cos\theta\,\frac{\cos(kR-\omega t)}{kRS}\int_S \cos(k\hat{R}\cdot\overrightarrow{u})\,\mathrm{d}^2u$$

$$\overrightarrow{k} \equiv k\hat{R}$$



Difração
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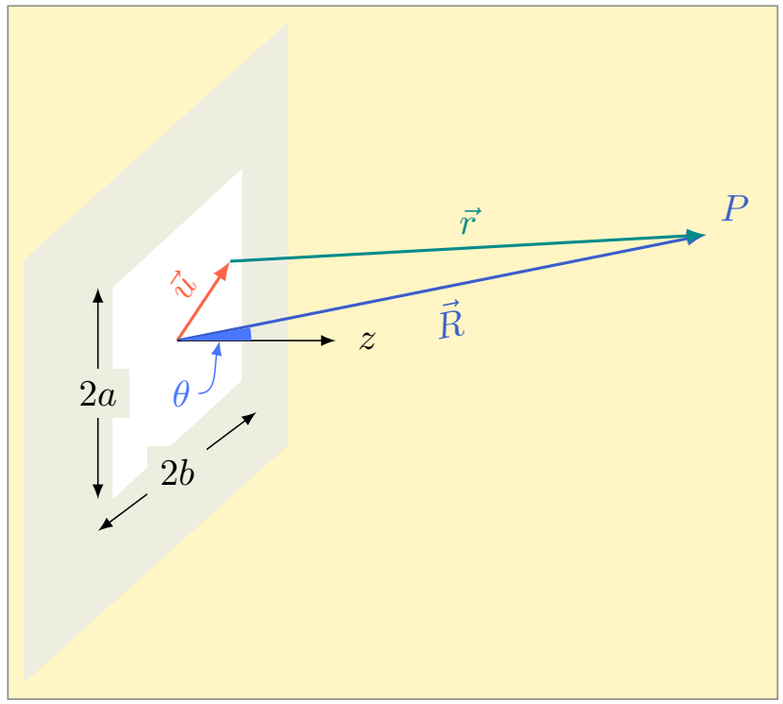
$$E(P) = E(O)\,\cos\theta\,\frac{\cos(kR-\omega t)}{kRS}\int \cos(k_x x + k_y y)\,\mathrm{d}x\mathrm{d}y$$



Difração
Abertura retangular

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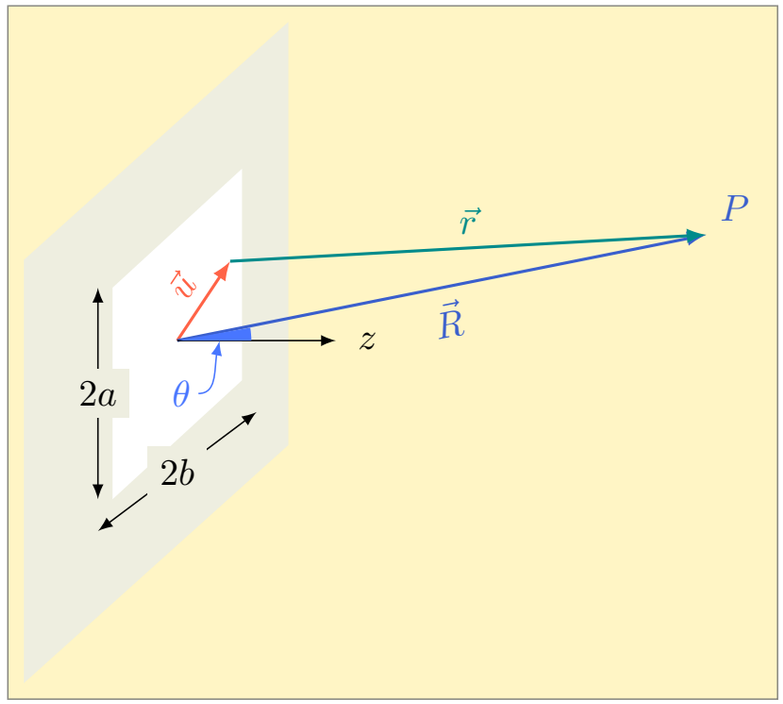

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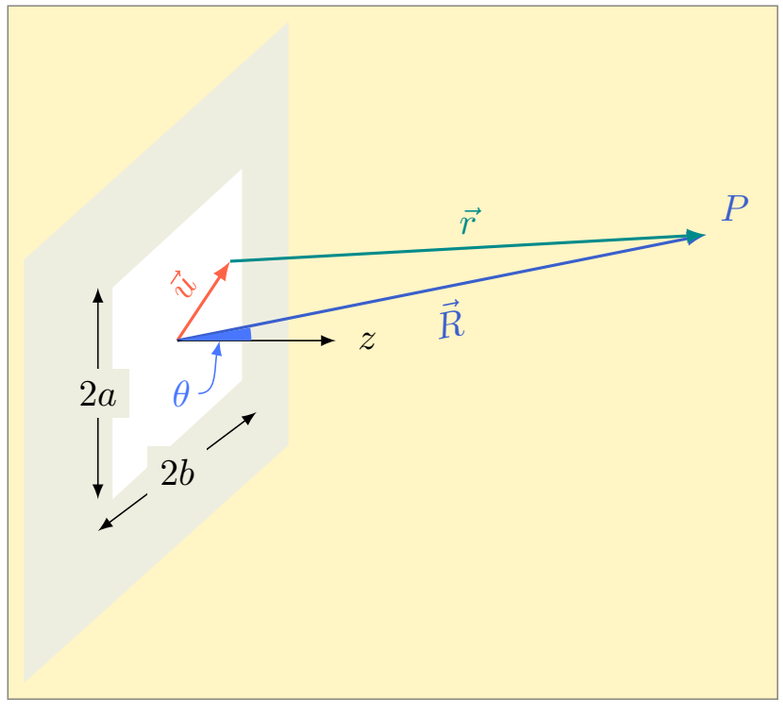

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$$E(P) = E(O)\,\cos\theta\,\frac{\cos(kR-\omega t)}{kRS}\int \cos(k_x x)\cos(k_y y)\,\mathrm{d}x\mathrm{d}y$$

$$E(P) = 4E(O)\,\cos\theta\,\frac{\cos(kR-\omega t)}{kR}\,\frac{\sin(k_x a)}{k_x a}\,\frac{\sin(k_y b)}{k_y b}$$

Difração
Abertura retangular

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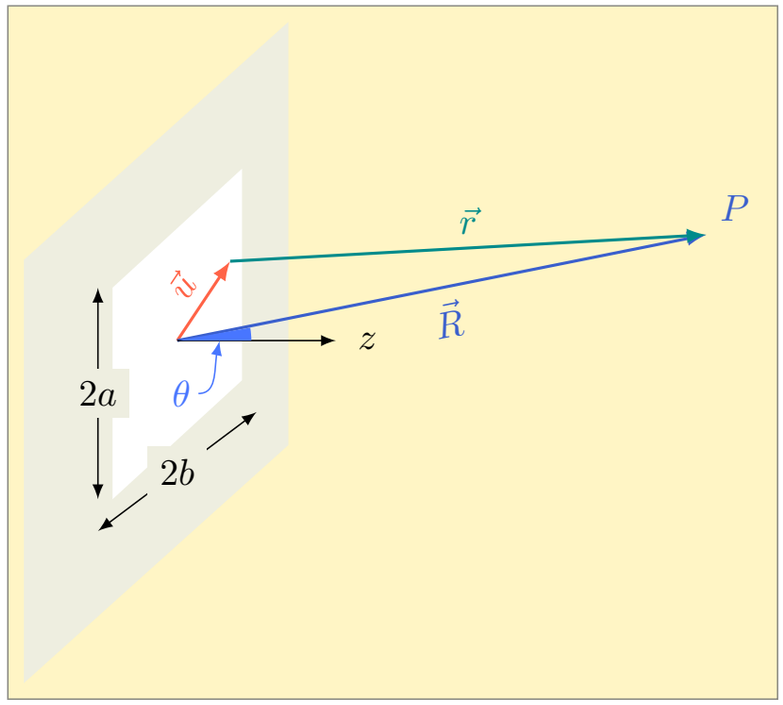

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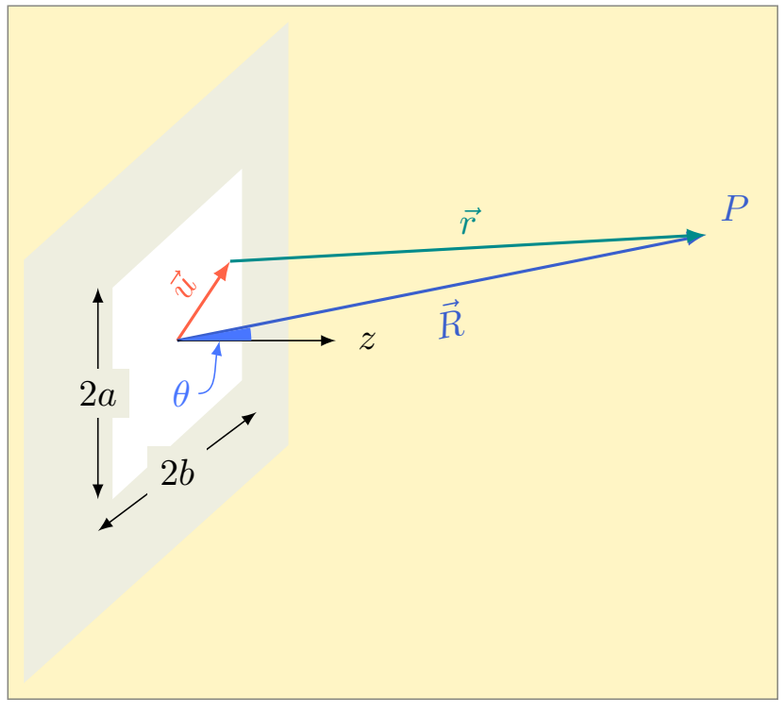

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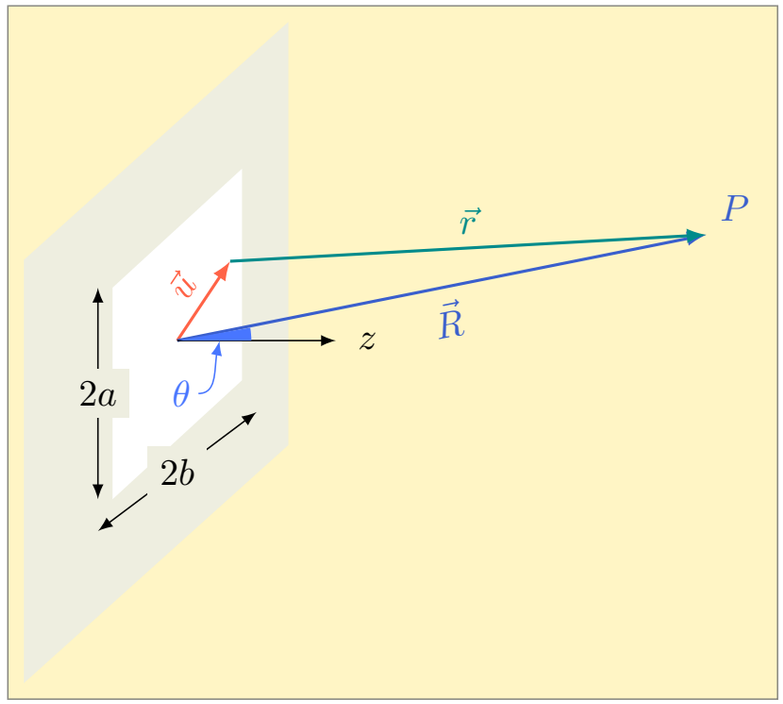

$$\Rightarrow I(P) = I_{max}\,\frac{\cos^2\theta}{R^2}\left(\frac{\sin(k_x a)}{k_x a}\right)^2\left(\frac{\sin(k_y b)}{k_y b}\right)^2$$