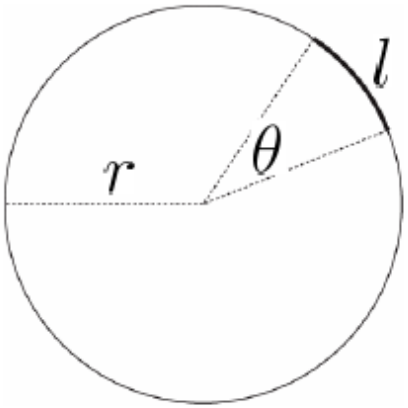
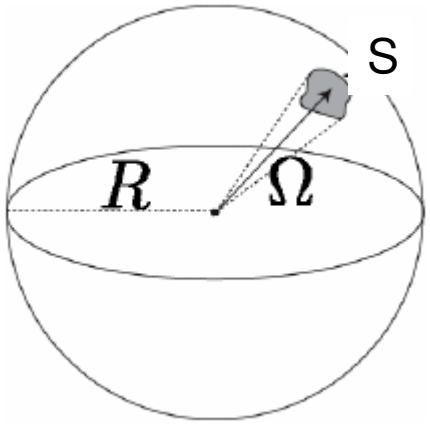
Lekcija IV

Fotometrija:

Deo optike koji se bavi zakonitostima svetlosnog fluksa i kvantitativnim karakteristikama svetlosnih pojava

Ravanski i prostorni ugao





Ravanski ugao $\theta = l / r$

$l = r$ $[\theta] = 1rad$

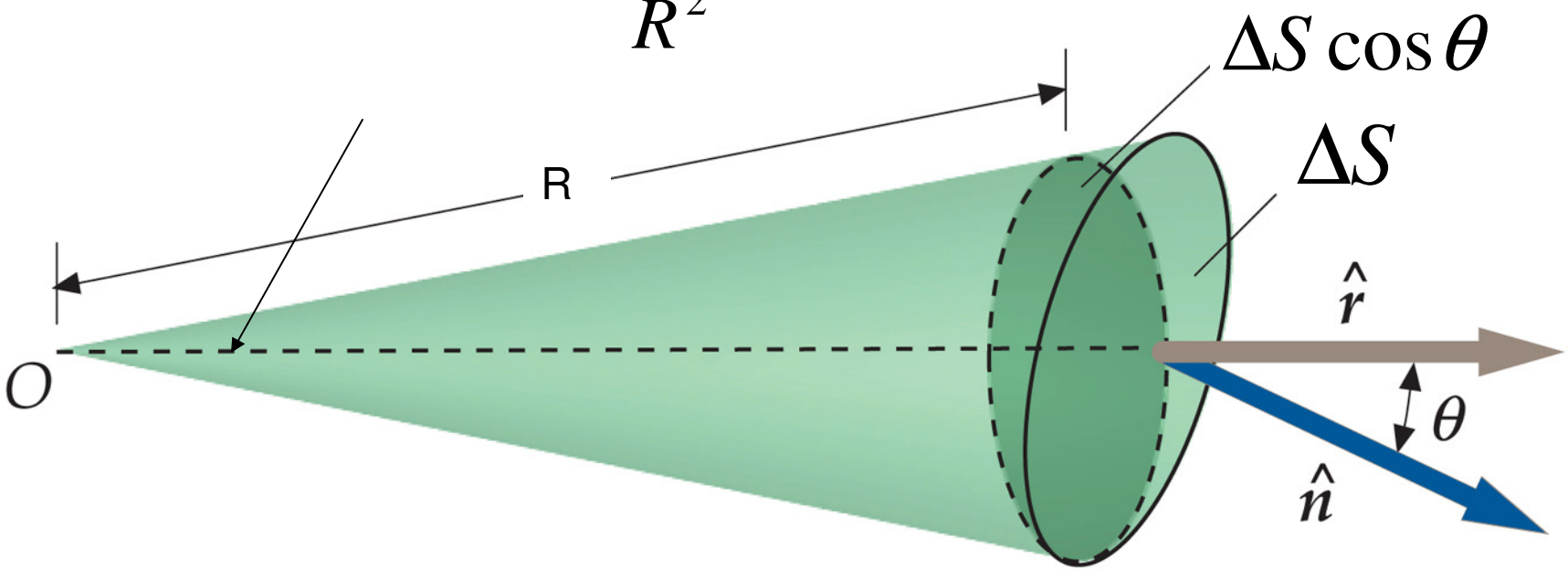
Ceo krug ima $2\pi rad$

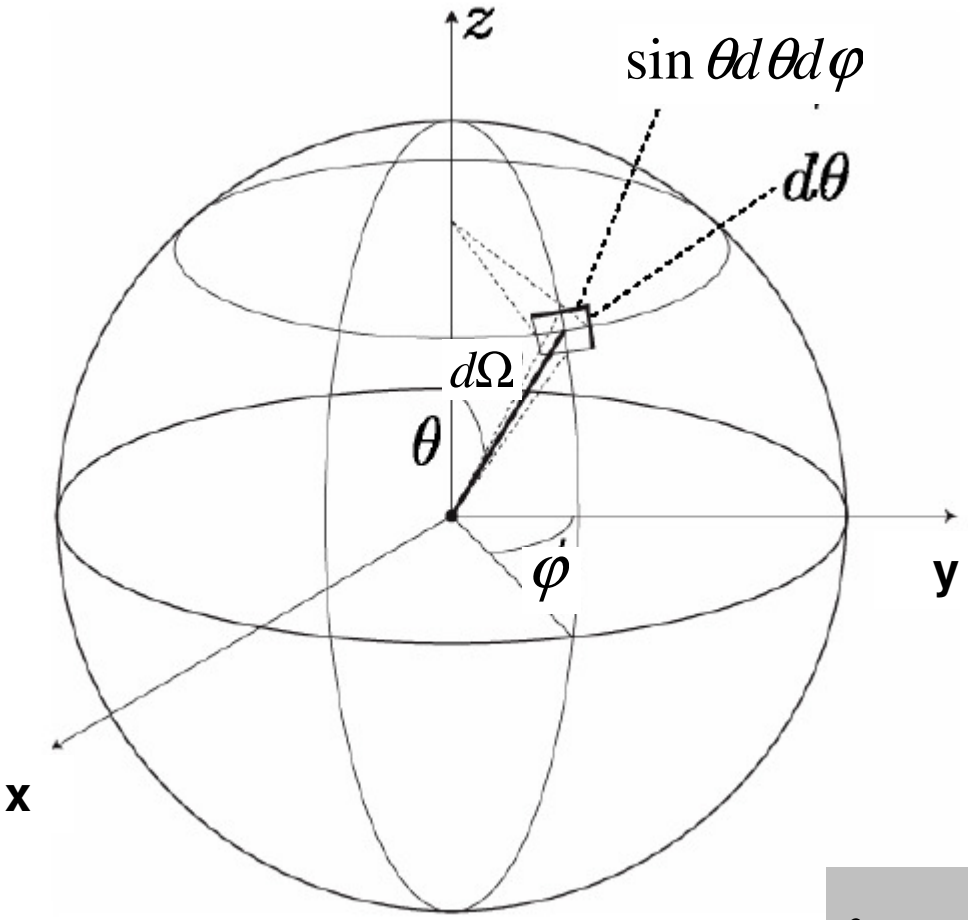
Prostorni ugao $\Omega = \frac{S}{R^2}$

$S = R^2$ $[\Omega] = 1ster\ \text{rad}$

Cela sfera ima 4π ster rad

$$\Delta\Omega = \frac{\Delta S \cos\theta}{R^2}$$





Diferencijalni prostorni ugao

$$d\Omega = \sin\theta d\theta d\varphi$$

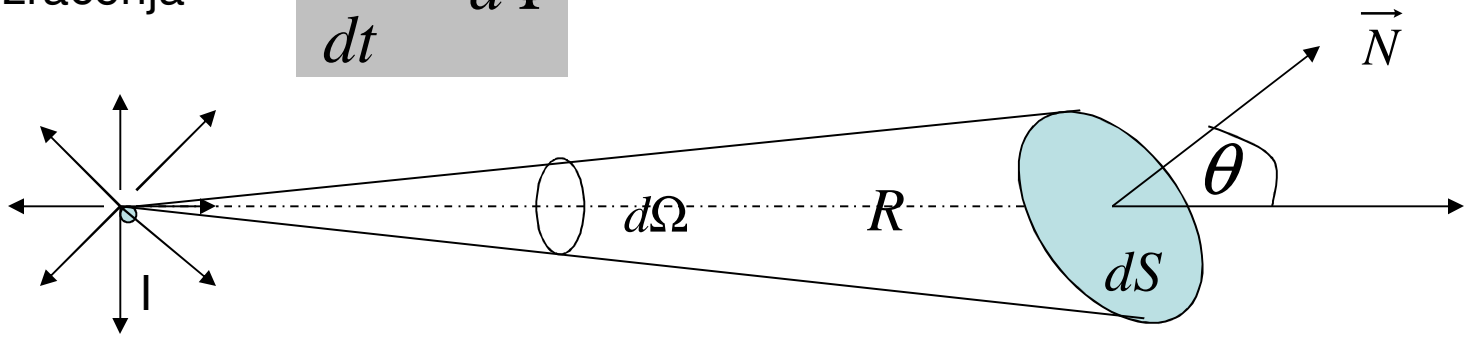
$$\int_S d\Omega = \int_0^{2\pi}\int_0^{\pi} \sin\theta d\theta d\varphi = 4\pi$$

Veličine i jedinice (*fizičke, objektivne*)

- Fluks svetlosne energije

Snaga zračenja $\frac{dE}{dt} = d\Phi$

$$d\Omega = \frac{dS\cos\theta}{R^2}$$



$$\Phi = \int d\Phi$$

$$[\Phi] = W$$

Veličine i jedinice (fiziološke subjektivne)

Svetlosni fluks

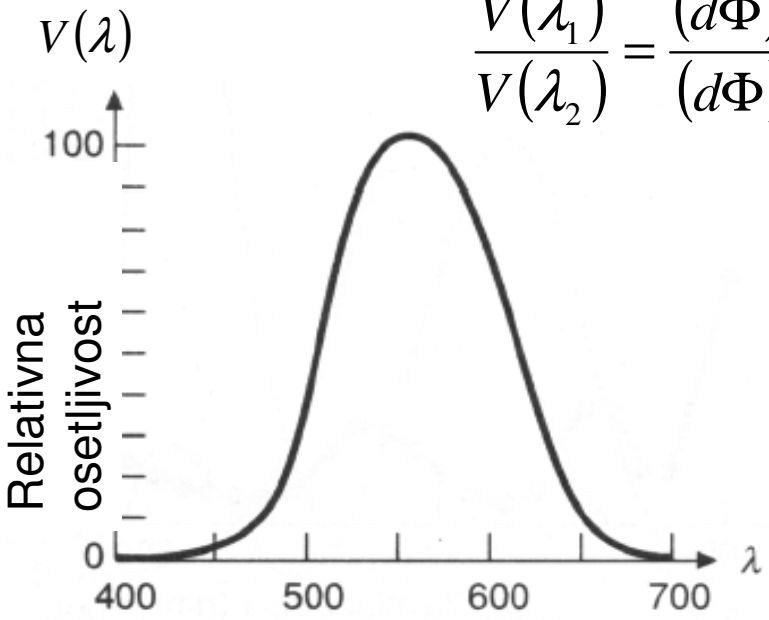
Φ_{SV}

$V(\lambda)$

Kriva "viđenja"

$$\varphi(\lambda) = \frac{d\Phi}{d\lambda} \qquad \Rightarrow \Phi = \int_{\lambda_1}^{\lambda_2} \varphi(\lambda) d\lambda$$

$$\frac{V(\lambda_1)}{V(\lambda_2)} = \frac{(d\Phi)_2}{(d\Phi)_1} \qquad d\Phi_{SV} = V(\lambda) d\Phi$$



Ljubičasta talasna dužina (nm) Crvena

$$\Phi_{SV} = \int_0^{\infty} V(\lambda)\varphi(\lambda) d\lambda$$

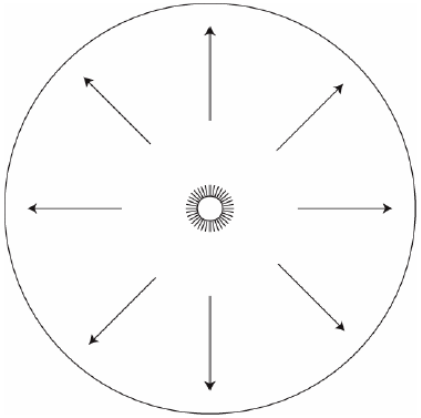
$$[\Phi_{SV}] = lumen(lm)$$

• Jačina svetlosti

Snaga zračenja po jediničnom prostornom uglu

$$I = \frac{d\Phi}{d\Omega} \qquad [I] = W \cdot ster\, rad^{-1}$$

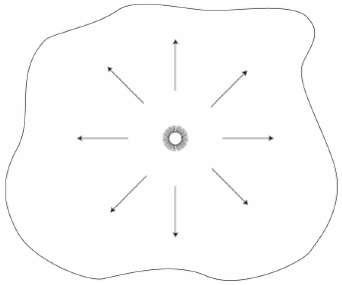
Izotropni svetlosni izvor



$$I = \frac{\Phi}{4\pi}$$

Osnovna jedinica u SI sistemu

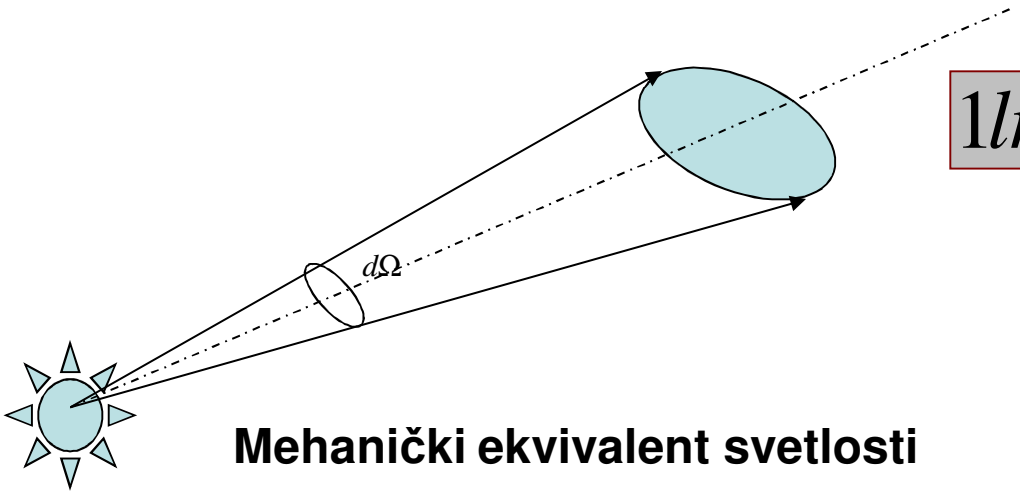
Neizotropni svetlosni izvor $I = I(\theta, \varphi)$



$$\Phi = \int_0^{2\pi} d\varphi \int_0^{\pi} I(\theta, \varphi) \sin\theta d\theta$$

$$[I] = sveća(candel(cd))$$

Veza između jedinica svetlosnog fluksa i jačine svetlosti



$$1lm = 1cd \cdot 1ster\ rad$$

Mehanički ekvivalent svetlosti $\lambda = 555nm$

$$A = 0.0016W / lm$$

- **Osvetljenost**

$$E = \frac{d\Phi}{dS} \qquad [E] = \frac{W}{m^2}$$

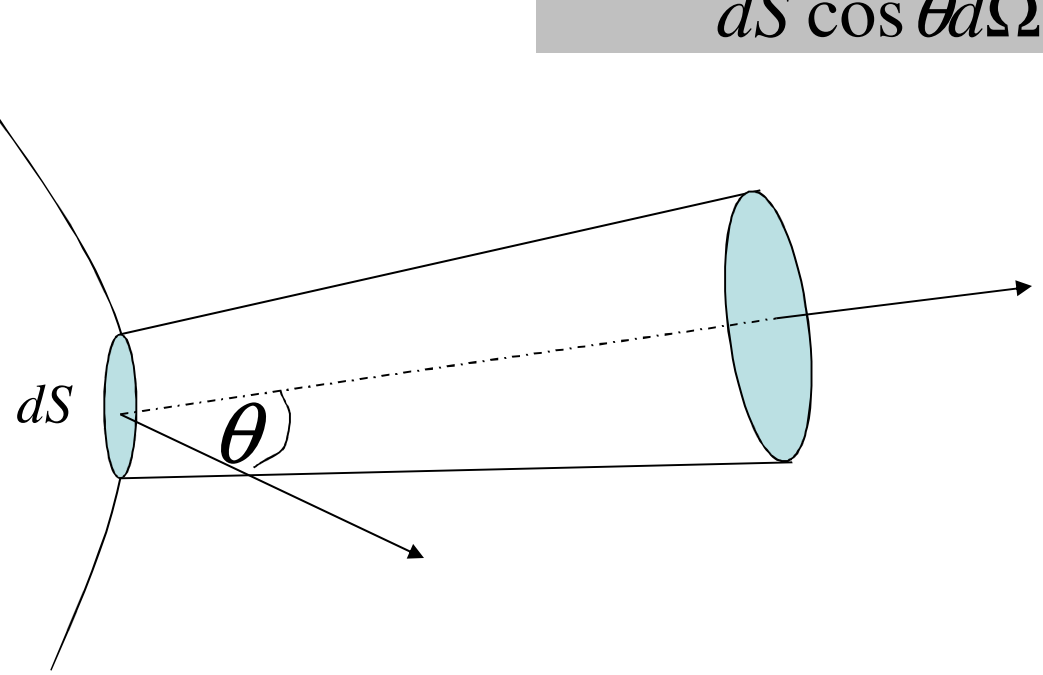
Fluks svetlosne energije koja pada na jedinicu površine od tačkastog izvora

$$E = \frac{d\Phi_{SV}}{dS} = \frac{Id\Omega}{dS} = \frac{I\cos\theta}{R^2} \qquad [E] = 1lx = \frac{1lm}{1m^2}$$

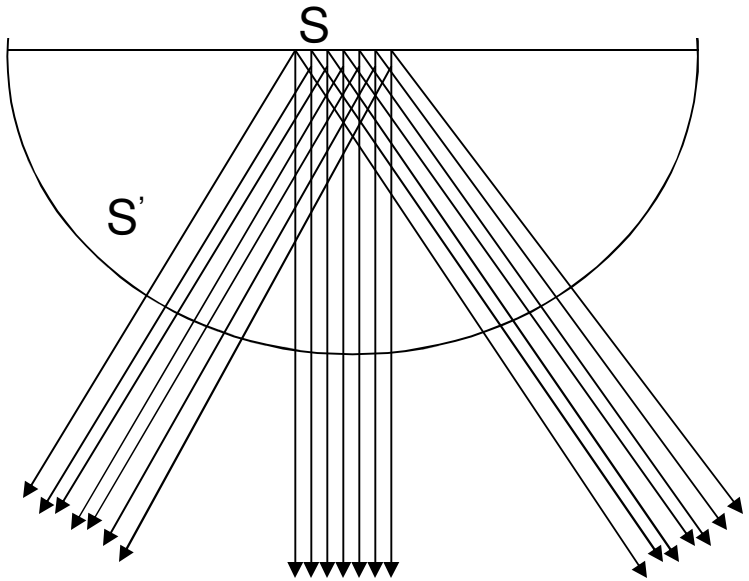
luks

- **Jarkost**

$$B_\theta = \frac{d\Phi}{dS\cos\theta d\Omega}$$



Lambertov izvor



$$B \neq f(\theta)$$

- Sjajnost

$$S = \frac{d\Phi}{dS}$$

Sumarni fluks svetlosne energije koja se emituje sa jedinične površine izvora u poluprostor

Primer (Domaći?)

Naći vezu između jarkosti i sjajnosti kod Lambertovog izvora

FOTOMETAR