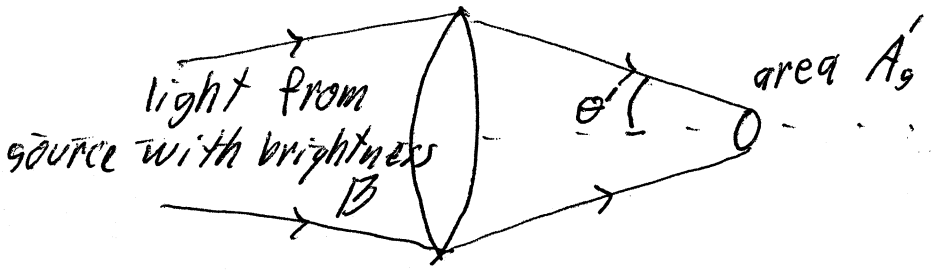
Brightness is important because it measures the ability to focus light to a small area.



$$B = \frac{P}{A_s' \Omega'} = \frac{I'}{\Omega'}$$

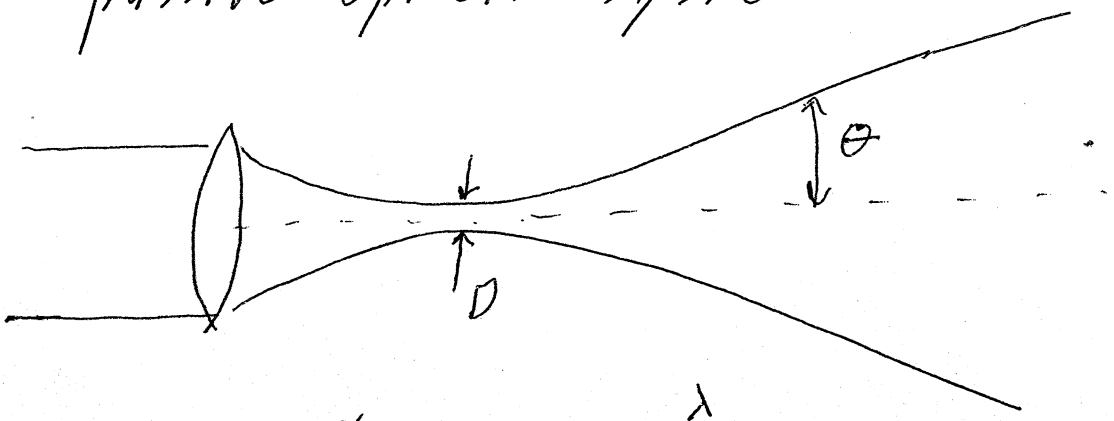
$I' = \frac{P'}{A_s'}$ intensity at focus

Ω' limited by lens

high brightness $\Rightarrow$ high intensity possible

Brightness Theorem

"Brightness is conserved in a lossless, passive optical system"



Coherent Light : $\theta \sim \frac{\lambda}{D}$

"Source" area : $A_s \sim D^2$

Solid angle : $\Omega \simeq \pi \theta^2$

Then $$B \sim \frac{P}{A_s \Omega} = \frac{P}{D^2 \pi \left(\frac{\lambda}{D}\right)^2} = \frac{P}{\pi \lambda^2}$$

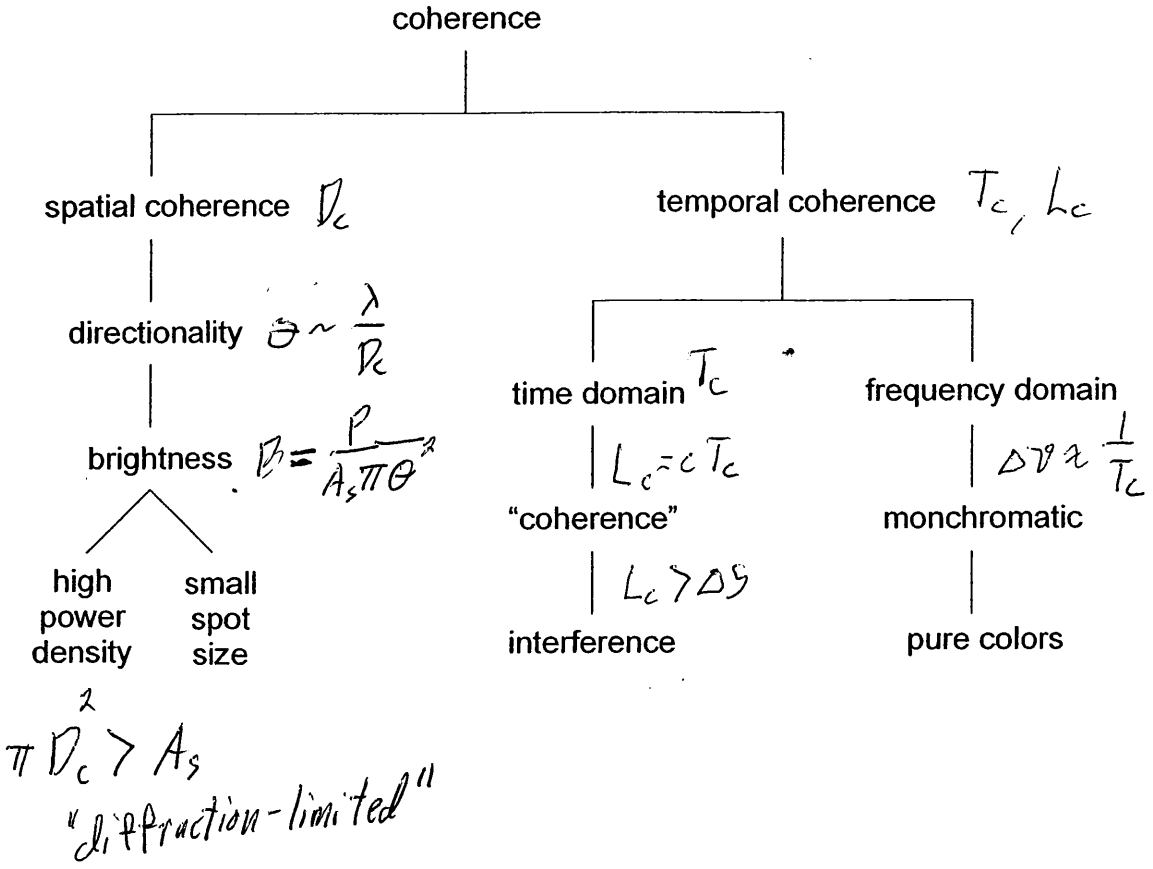
$$\boxed{B \sim \frac{P}{\pi \lambda^2}}$$ Coherent source

Note: independent of D

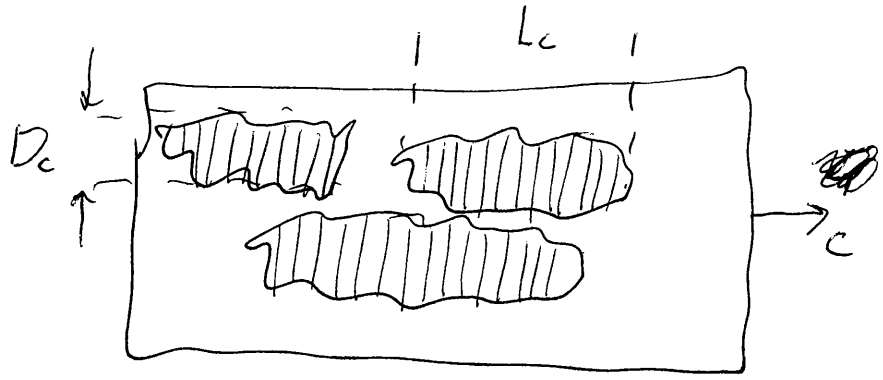
Minimum D limited by diffraction to

$$D_{min} \sim \lambda$$

so $$I_{max} \sim \frac{P}{D_{min}^2} \cong \frac{P}{\lambda^2} \approx \pi B$$



Quimby Fig. 15-10



$L_c = c\,T_c$