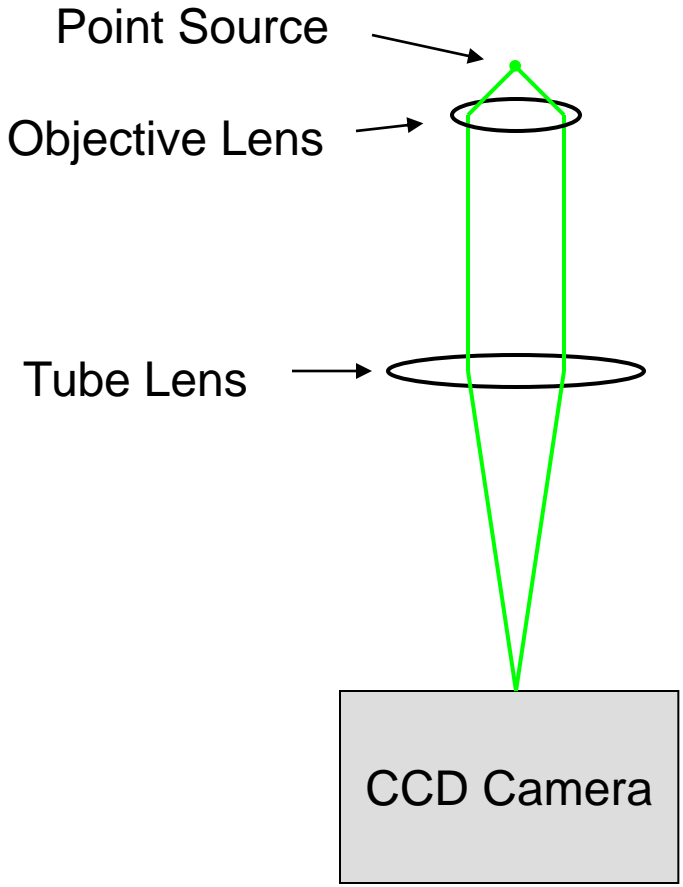
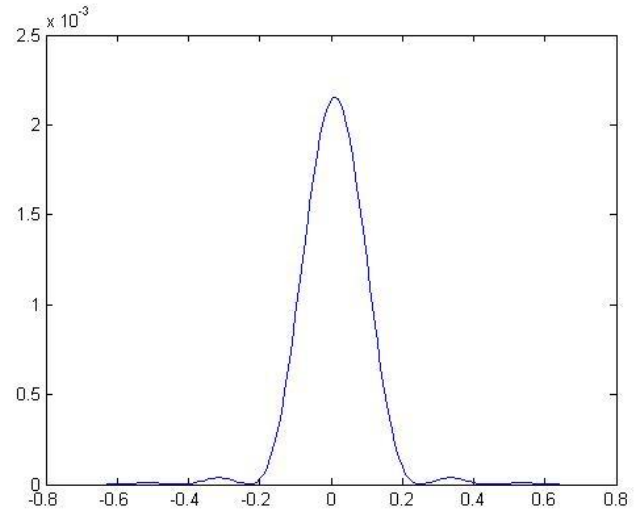
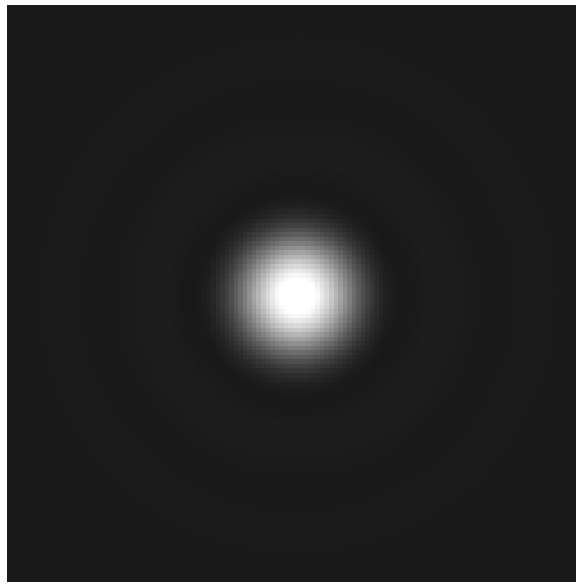


# Imaging in a light microscope



$n=1.5$   
 $NA=n \sin(\theta)=1.4$   
 $\lambda=.55$

# Point Spread Function (PSF)



If an ideal, noise-free camera is used, will it always record this pattern even if the exposure time is extremely small?

A. Yes

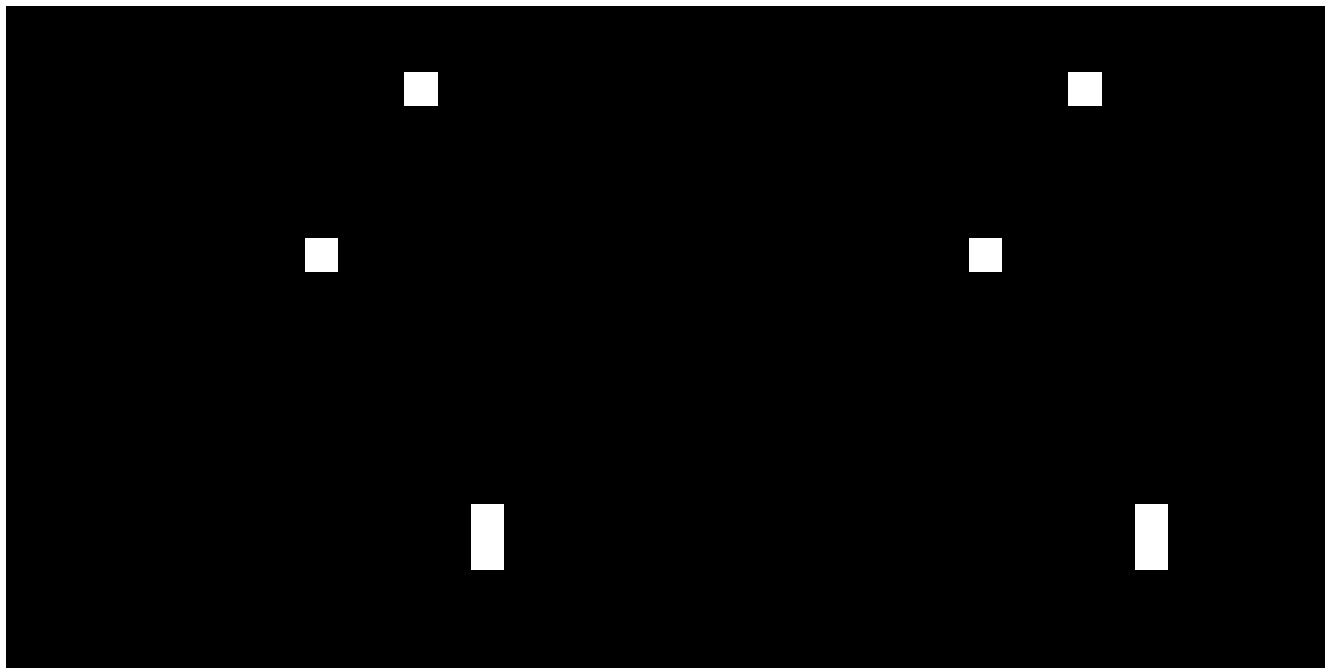
B. No



# CCD camera run at high speed

Single Photon Events

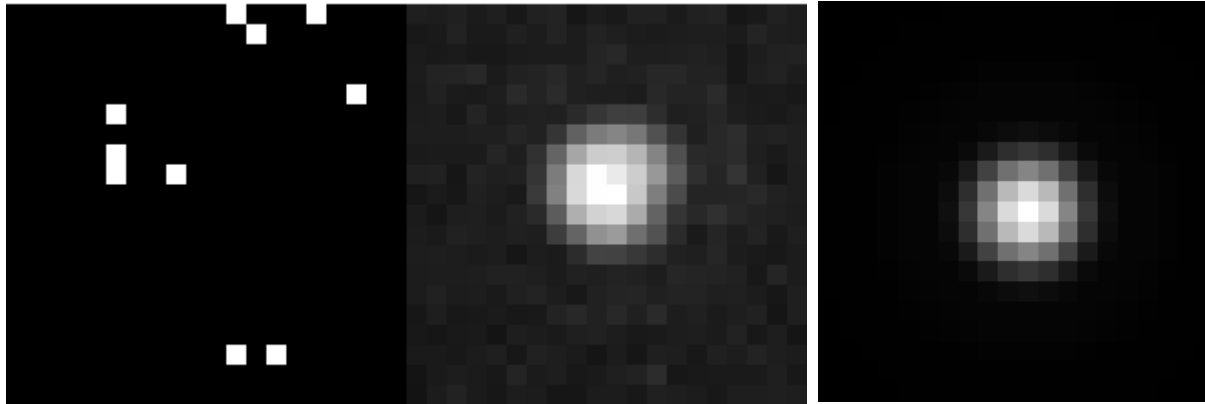
Accumulated Signal



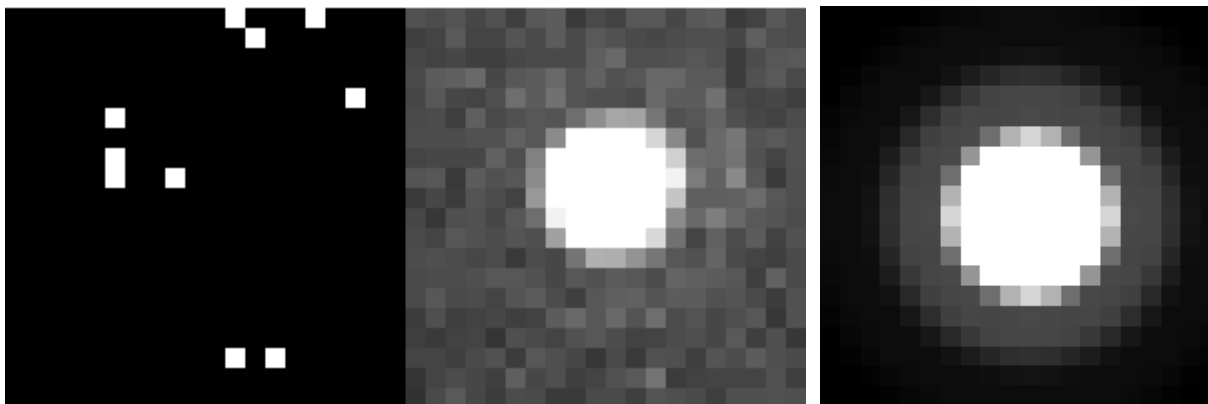
After 5000 frames...

Accumulated  
Photon Counts

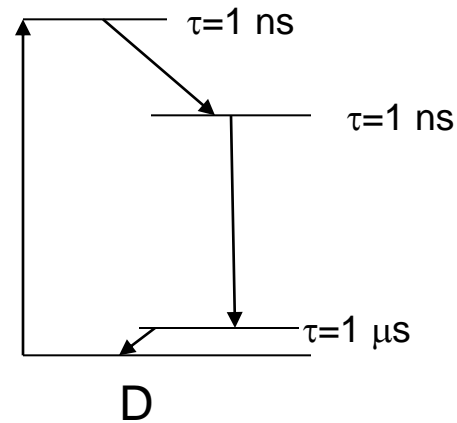
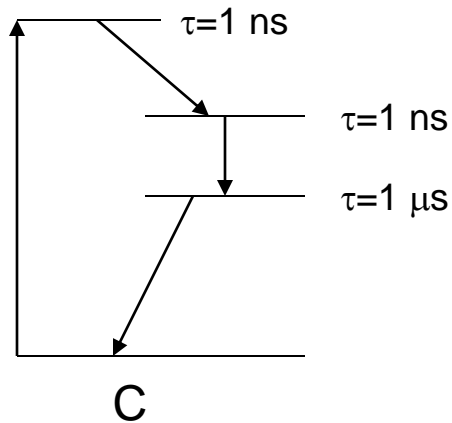
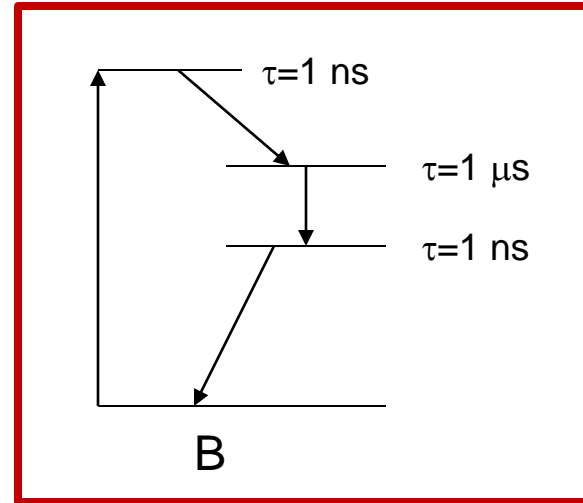
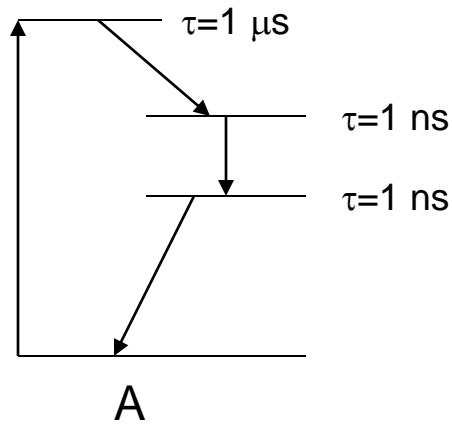
Diffraction Calculation



Contrast  
Stretched



Intensity gives the probability of detecting a photon



Which of the above would make the best laser?  $\tau$  is the lifetime of each state. All lasers are optically pumped.