EE119 Lab 6: Microscopes and Photodiodes

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Photodetectors

1. Turn on the strobe lamp and the photodiode. Turn off the main room lights but keep the smaller fluorescence lights on. Plug the BNC cable from the phodiode into channel 1 of the oscilloscope. Set the trigger source (in the upper right-han corner) to channel 1 and set the coupling to DC coupling with 50 Ω input impedance. Set the voltage scale on the oscilloscope to 5 mV (the smallest spacing). Adjust the time step on the oscilloscope until you can see the pulses from the strobe. The frequency of the strobe should be 60 Hertz. Is it?

2. Now zoom in to one pulse from the strobe. Can you measure the duration of one pulse from the strobe? How long is it?

3. now change the input coupling from 50 Ω to 1 MΩ. You will need to change the trigger level and adjust the voltage scale from 5mV to 1 V (why?) What happens to the measured duration of the pulse? When you are trying to make fast measurements with a photodiode, would you use low or high impedance?

4. The photodiode has an on and off switch that reverse-biases the p-n junction (you can take apart another photodiode box and take a look at the circuit)? What is the purpose of this?

5. Now turn on the photomultiplier tube and repeat parts (a) and (b). How is the photomultiplier tube different from the photodiode? How is it different?

Microscopes

1. Examine the standard microscope in the lab. What are the magnifications of the eyepiece and objective? What are the numerical aperture? What is the total magnification of each lens? What is the working distance (at what distance from the objective lens is the image in focus?) How would you calculate the focal length of each lens? Why is there a lamp in the microscope?

2. Build a compound microscope using the lenses available in the lab. (Probably use f=100mm and f=76.2mm, or other combinations if you're curious to try out different lenses) What is the system magnification? Is it diffraction limited? Where is the exit pupil? What is the working distance?