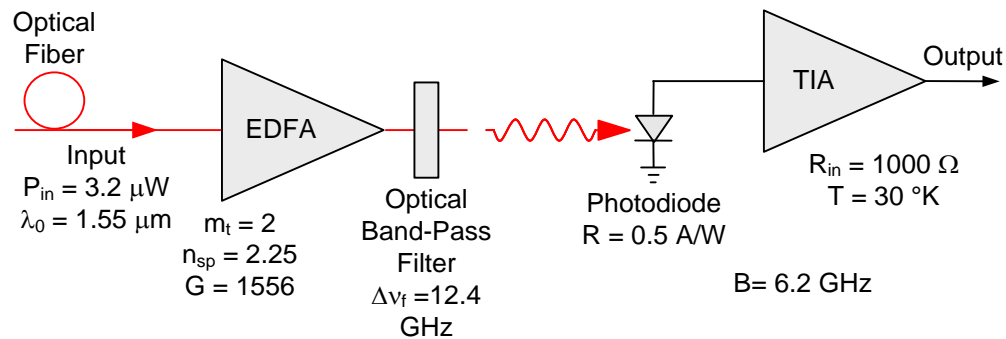


OPTI 500, Fall 2011  
Homework #3  
Due November 23, 2011



Consider the calculations covered in class for the comparison of an optical receiver with and without an optical pre-amplifier. For this problem, take the input impedance of the transimpedance amplifier to be 1000 ohms and the temperature to be 10 K. Calculate the signal-to-noise ratio with and without the use of a pre-amplifier. Does the pre-amplifier improve the signal-to-noise ratio?

Note1 : Do not assume that you can neglect shot noise for the case where the receiver is used without a pre-amplifier.

Note 2: R is the photodiode responsivity.  $R_{in}$  is the input impedance of the transimpedance amplifier.

**Extra credit:** What are possible disadvantages for the use of a high input impedance and low temperature?