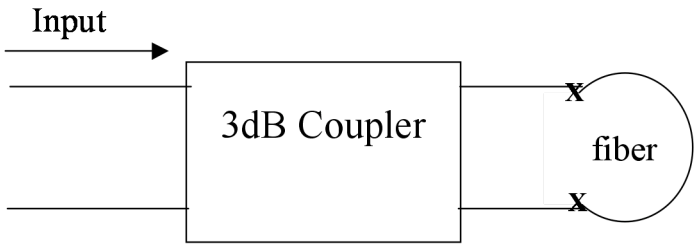
University of California, Santa Barbara Winter 2008
Department of ECE

ECE228B
Fiber Optic Components and Systems
Homework #2

Problem 1:

For the 3dB 2x2Coupler shown below, assume the outputs are connected with a section of optical fiber as shown and that the polarizations are preserved through the coupler and the fiber. A light signal is input as shown. Derive the field transfer function for the device and describe what happens. This device is called a loop mirror similar to what we studied in class.



Problem 2:

Derive the power transfer function of a Mach-Zehnder Interferometer (MZI) assuming only one of the two input ports are active.

Problem 3:

Consider the Rowland Circle construction we discussed in class. Show that the difference in path lengths between a fixed input waveguide and any two successive arrayed waveguides is constant. Assume that the length of the arc on which the arrayed waveguides are located is much smaller than the diameter of the Rowland Circle.

Problem 4:

Consider the fiber Bragg-grating (FBG) based add/drop multiplexer configuration shown below. Assume that a 5% tap is used to couple the added signal into the output port and that the FBG induces 0.5dB loss for transmitted signals and no loss for reflected signals. Assume the recirculator has 1dB loss per pass. Compute the loss seen by a channel that is dropped, for a channel that is added, and a channel that is passed through. Now assume the input power per channel is -15dBm, what should the power of the add channel be so that the power in all channels at the output is the same?