

Experiment no. 8

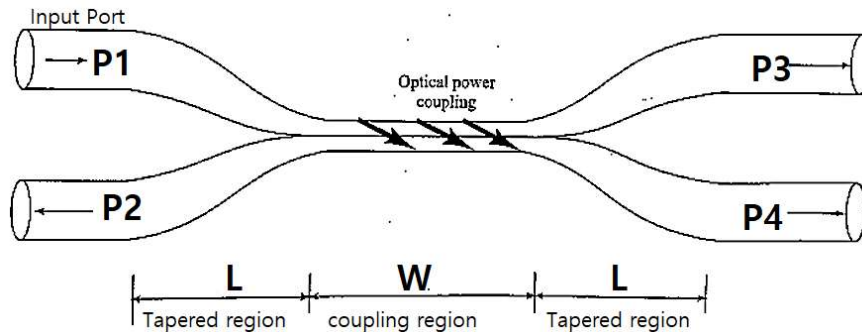
Aim: To study characteristics of FBT Coupler

Lab Outcome: Understand characteristics of optical components.

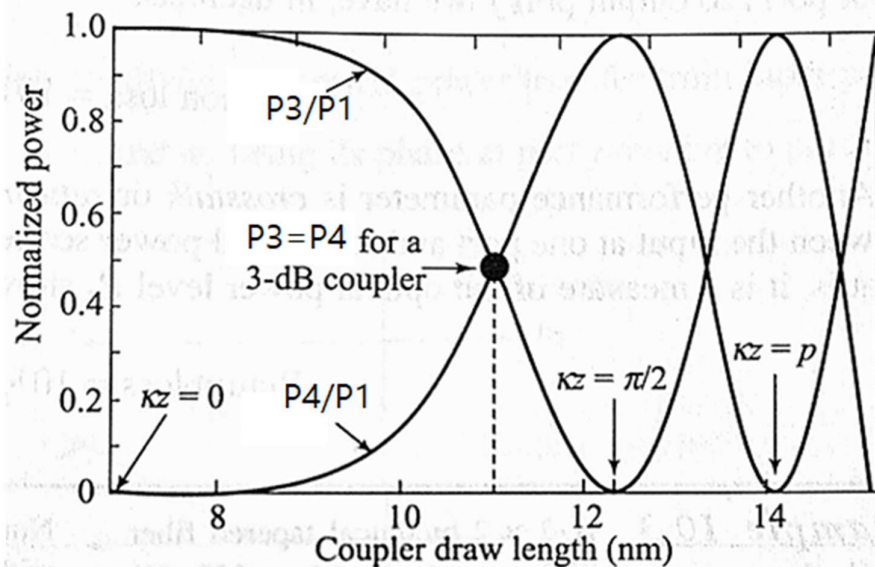
Software: Scilab

Theory:

a) FBT coupler:



FBT coupler, is an optical splitter that uses the Fused Biconic Taper (FBT) technique. The FBT technique is a well-known technology for splitting optical power and/or splitting wavelengths. The fused fiber coupler is created through a process of fusing two bare fibers like an "X" and pulling the fused section to achieve the desired optical characteristics.



$$P_3 = P_1 \cos^2(kz)$$

$$P_4 = P_1 \sin^2(kz)$$

b) Performance and loss parameters for FBT coupler:

$$\begin{aligned}\text{splitting or coupling ratio} &= \left[\frac{P_3}{(P_3 + P_4)} \right] \times 100\% \\ &= \left[1 - \frac{P_4}{(P_3 + P_4)} \right] \times 100\%\end{aligned}$$

$$\text{Excess loss (four-port coupler)} = 10 \log_{10} \frac{P_1}{(P_3 + P_4)} \text{ (dB)}$$

$$\text{Insertion loss (ports 1 to 4)} = 10 \log_{10} \frac{P_1}{P_4} \text{ (dB)}$$

$$\text{Crosstalk (four-port coupler)} = 10 \log_{10} \frac{P_2}{P_1} \text{ (dB)}$$

Problem statement:

1. A four-port multimode fiber FBT coupler has 60μW optical power launched into port 1. The measured output powers at ports 2, 3 and 4 are 0.004, 26.0 and 27.5 μW respectively. Determine the excess loss, the insertion losses between the input and output ports, the crosstalk and the split ratio for the device. Solve and verify your answer with scilab program.
2. The measured optical output powers from ports 3 and 4 of a multimode fiber FBT coupler are 47.0 μW and 52.0 μW respectively. If the excess loss specified for the device is 0.7 dB, calculate the amount of optical power that is launched into port 1 in order to obtain these output power levels. Hence, determine the insertion losses between the input and two output ports, as well as the split ratio for the device. When the specified crosstalk for the coupler is – 45 dB, calculate the optical out-put power level that would be measured at port 2 when the above input power level is maintained.

Program and output

Conclusion: