

Modelling and Simulation of Single Mode Optical Fiber Directional Coupler for Medical Application

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Abstract : A single-mode fiber directional coupler is modeled and simulated for its application in medical field. Various fiber devices based on evanescent field absorption, interferometry, couplers, resonators, tip coated fibers, etc, have been developed so far, suitable for medical application. This work focuses on the possibility of sensing by single mode fiber directional coupler. In the preset work, a fiber directional coupler is modeled to detect the changes taking place in the surrounding medium optoelectronically. In this work, waveguiding characteristics of the fiber are studied in depth. The sensor is modeled and simulated by finding photocurrent, sensitivity and detection limit by varying various parameters of the directional coupler. The device is optimized for the best possible output. It is found that the directional coupler shows measurable photocurrents and good sensitivity with coupling length in micrometers. It is thus a miniature device, hence, suitable for medical applications.

Keywords : single mode fiber directional coupler, modeling and simulation of fiber directional coupler sensor, biomolecular sensing, medical sensor device

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