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Cascaded Fabry-Perot cavity Photodetector for Flat-top steep-edge spectral Response

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Abstract: This paper discussed a novel photodetector with a flat-top and steep-edge response, which is promising for WDM application. The novel detector utilizes an inclined mirror and a multi-cavity filter and is proposed based on the ITMTMC (Inclined Top Mirror and Three-Mirror-Cavity) photodetector. This structure uncouples the quantum efficiency and the spectral response linewidth which has the properties of high response speed, high quantum efficiency and narrow linewidth. Effects of the device parameters such as area, inclined angle and layer-thickness error on the response are investigated. Finally, the tuning ability of this device is also analyzed.

Key Words: WDM; Photodetector; Quantum Efficiency; Flat-top steep-edge spectral response

1. Introduction

With the developing of optical fiber communication technology, WDM has taken over as the leading technology in high-speed point-to-point transmission links for its large capacity and flexibility. De-multiplexing detecting is a key technology in WDM system and is traditionally implemented by means of the combination of optical filter and photodetector. The combination of filter and photodetector means high cost and extra insertion loss decreasing the total responsivity. Integrated de-multiplexing photodetector is a good candidate to solve these problems. Presented integrated de-multiplexing photodetectors mainly include resonant cavity enhanced (RCE) structure [3, 4], parallel multi-cavity structure[5] and one-mirror-inclined three-mirror-cavity structure[1]. The spectral shape of these photodetectors resembles the transmission of a Fabry-Perot cavity and the quantum efficiency is a strong function of wavelength, decreasing significantly as the operating wavelength deviates from the center wavelength, which will cause a high crosstalk from adjacent detector channels. Slightly

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