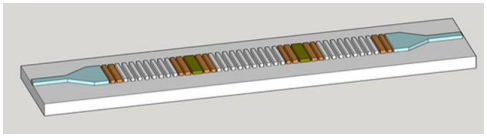
INTEGRATED OPTICAL FILTER BASED ON COUPLED RESONATORS THROUGH STRONG BRAGG NETWORKS WITH GREAT SIDE CONFINATION

Description:

Coupled resonator circuits are well known in the microwave field, where they have been applied to various applications such as filters, diplexers, etc. Likewise, design techniques have been developed to adapt the response of said circuits to a certain objective response. Coupled Resonator Optical Waveguides (CROW) optical filters for coupled resonators respond to the same principles of operation and design, but applied to optical frequencies. Typically, coupled resonator optical filters are made by two alternatives, either by ring resonators, or by resonators based on Bragg reflectors (also known as "Bragg filters" or "Bragg grids. Between these two types, the Bragg reflectors tend to work with the lowest order of resonance, which makes their FSR (FSR, “Free Spectral Range”) much higher than that of resonant rings. Another advantage of Bragg filters is their great flexibility to achieve apodization, that is, for the spectral shaping of a target response. However, there is still a need in the state of the art for filters integrated in waveguides, compact and easy to manufacture, that provide a spectral response high quality in a wide free spectral range. The proposed invention is an integrated optical filter of Bragg resonators coupled on a ‘silicon photonics’ platform. This type of filters allows flexible frequency responses of the 'all poles' type that can be designed to have minimum ripple in the pass band (Butterworth), high rejection (Tchebyshev), etc ... Due to the simplicity of design it is possible to obtain filters compact with high quality factors and, therefore, reduce insertion losses in highly frequency-selective applications. In addition, the filters allow energy efficient thermal tuning.

Keywords:

Optical Communications, Telecommunications, Integrated Optics, Optical Filters, Integrated Silicon Optics, Coupled Resonator Optical Filters



Sectors:

ICT

Areas:

Telecommunications, Hardware / Devices / Components, Internet and Networks, Components, Communications, Technological Improvements

Advantages:

Compared to weak Bragg filters or ring-based coupled resonator filters, this geometry is more compact resulting in smaller filters. Therefore thermal tuning is more energy efficient. Using wide guides with remarkably simple lateral geometry facilitates analysis and design. Due to the width of the guide the transitions between resonators can be designed with low losses resulting in high quality factors in a simple way. The structure allows to make filters with very high periodicity (FSR), being able to make filters with high rejection in very wide bands. Compared to solutions based on strong photonic crystal-type engravings that could potentially also offer miniaturized, high-quality-factor designs, the advantages are much simpler design and more flexible manufacturing requirements (require less precision in engraving manufacturing structure).

Uses and Applications:

Integrated optics sector applied to telecommunications. These integrated filters are useful in any application that pursues miniaturization by means of integrated optics and in which it is required to discriminate the information contained in different bands of the spectrum. Typically they will be of great use in transceivers for optical communications in all types of systems (Telecom, Datacom, Espace, Access networks) and in applications of spectroscopy and optical sensing.

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Applicants: Universidad De Málaga

Inventors: Iñigo Molina Fernandez, Juan Gonzalo Wanguemert Perez, Alejandro Ortega Moñux, Robert Halir , Daniel Pereira Martín

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