504. Title:Wavelength-selective directional couplers as ultrafast optical differentiators
Authors:Ahn, Tae-Jung (1); Azaña, José (2)
Source title:Optics Express
Abbreviated source title:Opt. Express
Volume:19
Issue:8
Issue date:April 11, 2011
Publication year:2011
Pages:7625-7632
Language:English
Document type:Journal article (JA)
Abstract:Wavelength-selective directional couplers with dissimilar waveguides are designed for ultrafast optical differentiation within the femtosecond regime (corresponding to processing bandwidths > 10 THz). The theoretically proposed coupler-based differentiators can be produced by wavelength matching of the propagation constants of two different waveguides in the coupler at the center wavelength. A single directional coupler can be designed to achieve either a 2nd-order differentiator or a 1st-order differentiator by properly fixing the product of coupling coefficient and coupling length of the coupler. We evaluated the differentiation errors (∼2%) and energetic efficiency (∼11% for 1st order differentiation) of the designed optical differentiators through numerical simulations. The proposed design has a strong potential to provide a feasible solution as an integrated differentiation unit device for ultrafast optical signal processing circuits.