Novel Segment Deformable Mirror Based Adaptive Attenuator Used In Wavelength Division Multiplexed Optical Communications Network

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ABSTRACT
In wavelength division multiplexed (WDM) optical communication networks, signals are amplified periodically by optical amplifiers. Since the gain profiles of optical amplifiers are not flat, equalizers are usually used to maintain signal powers at different wavelengths in equal to avoid crosstalk and data loss. However, fixed attenuation can only compensate fixed input power and amplification. In active network, input power and amplifier gain change with time. Active level compensation at each wavelength is needed. An adaptive attenuator is a device with a chromatically variable transmissivity used to equalize channel powers in wavelength-division multiplexing (WDM) fiber-optic communication lines. In this thesis, a method of Fourier analysis of multi-beam interference is developed. It is shown that the total electric field and relative phase delay of each beam form a Fourier transform pair. Thus methods and properties of Fourier analysis are applicable in multi-beam interference analysis and design. Fourier transform based design is presented. Novel devices that apply such design principles are introduced. Principles and structures of novel adaptive attenuators based on various technologies such as segment deformable mirror, liquid crystal, phase modulation array are given. Simulation results for segment deformable mirror based adaptive attenuator are presented.
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