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.

Acknowledgements

I would like to thank my academic and research advisor Dr. Anbo Wang for his valuable suggestions, information and encouragements. And I would like to express my deepest gratitude to Dr. Anbo Wang. Without his generous and constant support, I could not finish my study program in Center of Photonics Technologies.

I would like to thank Dr. Ahmad Safaai-Jazi and Dr. Ioannis M. Besieris for serving as my committee members.

I would like to thank Dr. Jiangdong Deng and Dr. Ming Han for providing me valuable information and help.

Also, I would like to thank all the people around me in Center of Photonics Technologies for their friendship and help. They made my stay a memorable one.

Finally, I would like to thank my father, Ning Sheng, my mother, Minzhong Han and my girlfriend, Hao Wang for their love and encouragement. I wouldn't have been in this position if I hadn't had the support and best wish from my family, especially my parents to whom I owe everything.

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