Abstract

This thesis deals with the properties of Erbium-doped fiber amplifiers (EDFAs). The EDFA is an optical amplifier that is used in the 1550 nm window of optical fibers. The objective of this work is to analyze and optimize the performance of E DFA systems with single and multi-wavelengths input sources. The Performance of optical communication systems is enhanced by the use of EDF. EDFA is an important element in Coarse Wavelength-Division Multiplexing (CWDM) and Dense Wavelength Division Multiplexing (DWDM) networks.

The study can achieve gain by modeling the dynamic characteristics of an EDFA, and presents basic EDFA model operating on single (1550 nm) and multi (1525- 1565 nm) wavelength operation with their simulation results, then numerical simulations are used to evaluate the amplifier performance as function of manufacturing parameters and operating conditions, using this numerical model a computer program is developed to calculate the amplifiers gain and noise figure under certain conditions.

A study is made on the amplification mechanism in the amplifier. These results in a software program called optisystem 7.0, by changing in the operation or design parameters such as input signal power, pump power, pump wavelength, length of active fiber and single stage or two stages EDFAs; different performance parameters (gain and noise figure) can be optimized.

The focus in this work is to study deeply EDFAs and then to improve the design for best performance (maximizing gain and reducing noise figure). Moreover, a study is performed to find the best amplifier parameters that advice power level of the pump which will maximize gain and improve the performance of the device.

Therefore, this study investigates in details the optimization process of EDFAs in optical communications networks.

Detailed view of the monograph

Title: Characterization and Optimization of Erbium- Doped Fiber Amplifiers used in optical communication systems

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