

Master 2012

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Investigations on Nonlinearities in Optical Fibers

ABSTRACT - Masterthesis

The rapid development of fiber-optic communication systems requires higher transmission data rates and longer distances. This thesis deals with the limiting factors in design of long-haul optical fiber communication systems. This thesis is devoted to a thorough investigation on various nonlinear phenomena in single mode optical fibers. It covers Self Phase Modulation, Cross Phase Modulation, Four Wave Mixing, Stimulated Brillouin Scattering and Stimulated Raman Scattering. This research work mainly focuses on investigation on the Stimulated Brillouin scattering being the strongest optical nonlinearity in optical fibers and discusses as well Stimulated Raman scattering. The basic principle behind Brillouin scattering is discussed in detail and its relevant parameters are simulated using Matlab as software tool. In this thesis work Stimulated Brillouin scattering is observed with an experimental setup which consists of DFB laser source, optical attenuator, optical coupler, single mode fiber and power meters. The used components are discussed in this work. The relation between the length of fiber and the SBS threshold power is shown by conducting various experiments employing different lengths of optical fibers. The relation between the SBS and the source linewidth is shown by another experiment in which we used a TLS. Both experiment results are verified and compared using Matlab simulations. It also gives first insight into Stimulated Raman scattering by literature research.