Joint Event

Deepak Kumar Singh

VBS Purvanchal University
India

Performance of optical fiber communication link with optical soliton transmission

Abstract:

Fiber optic communication is renowned for its ability to transmit signals at higher frequencies, boasting greater bit rates and larger data capacity compared to copper wire electrical communication. Additionally, it provides enhanced security over long distances, with lower loss and interference. However, various factors are impacting optical fiber transmission performance, such as group velocity dispersion (GVD), attenuation, and nonlinearity including self-phase modulation (SPM), must be considered. Therefore, the concept of "Optical Soliton Transmission," which mitigates dispersive effects, presents a compelling solution. This proposition holds promise for achieving fast and stable optical communication in long-haul systems. Soliton pulses constitute signals capable of traversing extensive distances without experiencing distortion due to fiber nonlinearities. This study delves into the comparative analysis of fiber performance between soliton and non-soliton based fibers. The simulation explores the impacts of group velocity dispersion (GVD), self-phase modulation (SPM), optical soliton formation, and fiber loss. The findings from eye diagram analysis and bit error rate analysis conducted using Optisystem-18 software reveal that fiber systems utilizing solitons exhibit minimal distortion, while non-soliton fiber systems demonstrate noise within the system. This study emphasizes the importance of achieving a balance between group velocity dispersion (GVD) and self-phase modulation (SPM) to generate solitons capable of traversing long distances without distortion. Furthermore, it is observed that the reduction in soliton amplitude is influenced by fiber loss, with this signal decay amplifying over propagation distance.