Mitigating Third-Order Dispersion and Noise Reduction in High-Speed RoF using Integrated Approach

Saubhagya Kumar Moharana
Electronics and Communication Engineering Department, School of Core Engineering, Shoolini University, Solan, Himachal Pradesh, India

Dr. Ravi Kant
Electronics and Communication Engineering Department, School of Core Engineering, Shoolini University, Solan, Himachal Pradesh, India

Amita Verma
Electronics and Communication Engineering Department, School of Core Engineering, Shoolini University, Solan, Himachal Pradesh, India

Abstract

In this paper, we propose an integrated technique, which combines a dispersion-compensating fiber (DCF), a uniform fiber Bragg grating (UFBG), and an electronic equalizer based on the least mean square (LMS) algorithm to improve a 100 Gbps optical link by efficiently removing the third-order dispersion. The protocol is verified by running extensive simulations over the 140 km optical fiber, and it is found that Model outperforms previous proposals in signal integrity, with a quality factor of 41 and a bit error rate of 0. With a gain of 10.9 dB, Noise Figure (NF) of 29.0655 dB, and OSNR of 31.9004 dB, Model can reduce distortion and noise effects. It also compares the performance of various mode orders, probabilities, and alternate PRBS patterns to determine their individual influence on system performance. The LMS is used for adaptive equalization, in which different PRBS patterns are investigated, and an acceptable quality factor is 7.6 for a 2016 km optical link. This successful combination of DCF, UFBG, and an LMS-based electronic equalizer demonstrates Model's capability to move beyond the current performance limit of high-speed optical communication and drive next-generation network architecture.

Keywords

Third-order Dispersion, Adaptive Equalizer, Q-factor, bit error rate.