عنوان مقاله:

Transmit Power Optimization in Optical Coherent Transmission Systems: Analytical, Simulation, and Experimental Results

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خلاصه مقاله:

In this paper, we propose to use discretized version of the so-called Enhanced Gaussian Noise (EGN) model to estimate the non-linearity effects of fiber on the performance of optical coherent and uncompensated transmission (CUT) systems. By computing the power of non-linear interference noise and considering optical amplifier noise, we obtain the signal-to-noise (SNR) ratio and achievable rate of CUT. To allocate power of each CUT channel, we consider two optimization problems with the objectives of maximizing minimum SNR margin and achievable rate. We show that by using the discretized EGN model, the complexity of the introduced optimization problems is reduced compared with the existing optimization problems developed based on the so-called discretized Gaussian Noise (GN) model. In addition, the optimization based on the disctretized EGN model leads to a better SNR and achievable rate. We validate our analytical results with simulations and experimental results. We simulate a five-channel coherent system on OptiSystem software, where a close agreement is observed between optimizations and simulations. Furthermore, we measured SNR of commercial 100Gbps coherent transmitter over 300 km single-mode fiber (SMF) and non-zero dispersion shifted fiber (NZDSF), by considering single-channel and three-channel coherent systems. We observe there are performance gaps between experimental and analytical results, which is mainly due to other sources of noise such as transmitter imperfection noise, thermal noise, and shot noise, in experiments. By including .these sources of noise in the analytical model, the gaps between analytical and experimental results are reduced

کلمات کلیدی:

Optical Coherent Transmission Systems, Fiber Non-linear Interference Noise, Power Allocation, Minimum Signal-to-

.Noise-Ratio (SNR) Margin, Maximum Achievable Capacity