Signal monitoring and performance stability evaluation tool in a high speed optical communication network

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Abstract

The diverse communication systems in South Africa have changed drastically over the last few years and are envisioned to continue to improve as evidenced by the deployment of high speed optical fibre networks, in both access and metro networks. The key task in the design of any communication network is to come up with a tool that monitors and evaluates the performance stability of the entire communication link. A cost effective, reliable and reconfigurable bit error ratio (BER) signal analyzer was designed and implemented to monitor and evaluate the overall performance stability of a high speed optical communication link. The reconfigurable digital signal processing (DSP) assisted optical receiver is an alternative technology to the expensive and complex hardware receivers, based on its ability to be repurposed to adapt to different modulation formats. BER is a figure of merit that allows different optical communication systems to be evaluated in a fair and consistent manner. In this experimental work, a reconfigurable DSP signal analyzer tool was developed and implemented to evaluate the performance stability of an unamplified transmission through a 25 km G. 655 fibre at 1550 nm. The developed DSP algorithm was authenticated and validated by comparing its performance with results obtained from a commercial BER tester. A transmission penalty of 2 dB was attained on comparing the back-to-back to a transmission over 25 km of fibre. The cost effective DSP assisted receiver is a valuable tool to monitor and evaluate the performance fidelity of a high speed optical communication link.