Prototyping a Compact Multi-Format Optical Transmitter for Next Generation Regional and Long Haul Terabit Networks

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The last two decades have seen 60% annual growth rate (AGR) in the global IP traffic and it is expected that the AGR will keep the exponential growth in the next five years. Recent advances in digital signal processing enabled the implementation of the dual polarization (DP) optical coherent digital receivers, which substantially improved their performance. The goal of this research is to develop a prototype of a compact superchannel flexible DP M-ary quadrature amplitude modulation (MQAM) optical transmitter and demonstrate its reconfigurability to accommodate baud rates ranging from 8-32 Gbaud⁄s to achieve 1 Tb/s and beyond using the same hardware. The research work consists of three phases; Phase I is the study of transmitter electrical and optical parts; Phase II investigates the potential configurations for frequency comb generator circuit; Phase III deals with the superchannel experimental prototype. The results obtained so far are pertaining to phase I and phase II with some preliminary experimental validation pertaining to phase III. The experimental results show that the measured component characteristics are matched with the components specifications data sheets. Additionally, the designed frequency comb generator was able to create up to 9 optical subcarriers with flat gain of 0.5 dB amplitude. Transmission over optical subcarriers has been attempted using standard optical transmitter. These results show promise towards the generation of a variable data rate up to 1Tb⁄s. IEEE and ITU-T standardization effort considered these data rates to appear around 2017, and are intended for Next Generation Regional/Long-haul Networks.