

## **Realization of high capacity transmission in fiber optic communication systems using Absolute Polar Duty Cycle Division Multiplexing (AP-DCDM) technique.**

### **ABSTRACT**

An electrical multiplexing technique, namely Absolute Polar Duty Cycle Division Multiplexing (AP-DCDM) is reported for high-speed optical fiber communication systems. It is demonstrated that 40 Gb/s ( $4 \times 10$  Gb/s) AP-DCDM system shows a clear advantage over conventional 40 Gb/s RZ-OOK with 50% duty cycle in terms of dispersion tolerance and spectral efficiency. At 40 Gb/s its tolerance to chromatic dispersion (CD) is 124 ps/nm and 194 ps/nm for the worst and the best user, respectively. These values are higher than that of 40 Gb/s RZ-OOK, which is around 100 ps/nm. The spectral efficiency, receiver sensitivity and OSNR for different number of channels are discussed. Comparison against other modulation formats namely duobinary, Non-Return-to-Zero (NRZ)-OOK and RZ-Differential Quadrature Phase-Shift Keying (RZ-DQPSK) at 40 Gb/s are made. It is shown that AP-DCDM has the best receiver sensitivity ( $-32$  dBm) and better CD tolerance ( $\pm 200$  ps/nm) than NRZ-OOK and RZ-DQPSK. In reference to duobinary, AP-DCDM has better receiver sensitivity but worse dispersion tolerance.

**Keyword:** Chromatic dispersion; Duty cycle; Multiplexing; Optical communication.