

InP PICs for Coherent Optical Transmission

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The widespread deployment of digital coherent optics has been underpinned by the development of sophisticated optical components to provide functionality for transmit and local oscillator (LO) laser, dual-polarisation (DP) in-phase and quadrature (I&Q) modulator, and integrated coherent receiver (ICR). Working together with CMOS digital signal processing (DSP), digital optics has transformed long-haul optical transmission over the last few years, and is increasingly attractive for metro and data-centre applications.

A strong trend for recent deployment of digital coherent optics has been the utilisation of analog coherent optics (ACO) – optical functionality is implemented in a standardised pluggable module, while the DSP and other electronics resides on a host board. InP photonic integrated circuits (PICs) are well suited to this application, fulfilling requirements for demanding optical performance together with small size and suitability for volume manufacturing. Building on the development of an InP platform over several decades, Oclaro's PIC technology has enabled early commercial deployment of ACO-CFP2 modules capable of operation beyond 200Gb/s. The first generation of coherent PICs comprise:

- A DSDBR laser PIC providing fullband flexible tuning, narrow linewidth suitable for 16QAM operation, high optical output power and low electrical power dissipation [1]
- A DP I&Q modulator PIC combining an array of 4 Mach-Zehnder modulators together with integrated functionality for monitor and control. Additionally, semiconductor optical amplifier elements are integrated on the PIC to compensate for substantial modulation losses associated with generation of 'Nyquist shaped' optical formats [2]
- A pair of receiver PICs, each combining an MMI-based optical hybrid with 4 integrated waveguide photodetectors, providing high responsivity, close matching and wide bandwidth [3]

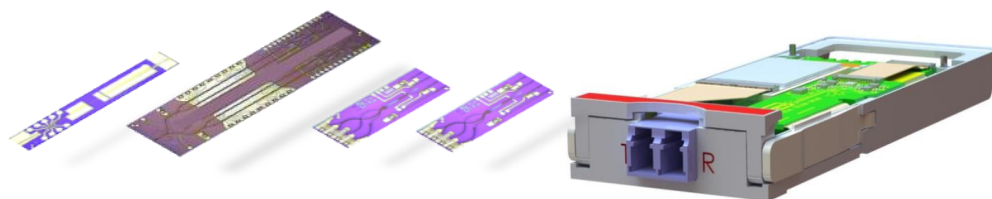


Fig.1. An InP 'chipset' of optical PICs enables implementation of high-performance ACO-CFP2 pluggable modules for 32 GBaud operation

The next generation of InP PICs will further extend capabilities, allowing operation at higher Baud rates, higher constellation density, and with reduced footprint. In conjunction with advances in CMOS technology – which provide greater functionality and reduced power dissipation – these InP PICs will provide improvements in cost/bit and W/bit for optical transmission, and are likely to find ever wider application throughout the optical network.

References

- [1] S. C. Davies, R. A. Griffin, A. J. Ward, N. D. Whitbread, I. Davies, L. Langley, S. Fourte, J. Mo, Y. Xu and A. Carter “*Narrow linewidth, high power, high operating temperature digital supermode distributed Bragg reflector laser*” in Proceedings of 39th European Conference and on Optical Communication, Th.1.B.3, 2013.
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