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Polarization management for coherent optical receivers

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The constant growth of bandwidth requirements in optical communication networks has prompted the evolution from conventional on-off-keying (OOK) transmission techniques to coherent, polarization multiplexed schemes. The higher spectral efficiency afforded by this approach enables per channel data rates of 100–400Gbps over existing fiber infrastructure. Both the transmitters and receivers benefit from monolithic integration, as it reduces costs and offers rugged performance. A block diagram of a coherent polarization multiplex receiver is shown in Fig. 1(a) and basically consists of: i) polarization splitters ii) high performance 90º hybrids and iii) high speed photodiodes. A first monolithically integrated coherent receiver was presented in [1], which, however, required external polarization management. Integration of the polarization managing elements, such as polarization splitters or polarization rotators, is challenging as they exhibit stringing fabrication tolerances. Here, we will review some recent advances in integrated polarization management. Furthermore, we discuss the design of tunable, fabrication tolerant polarization splitters based on Mach-Zehnder structures as shown in Fig. 1(b) [2], carried out in the EU-FP7 Mirthe project. The operation of a monolithically integrated polarization multiplex coherent receiver based on these polarization splitters has been recently demonstrated [3].

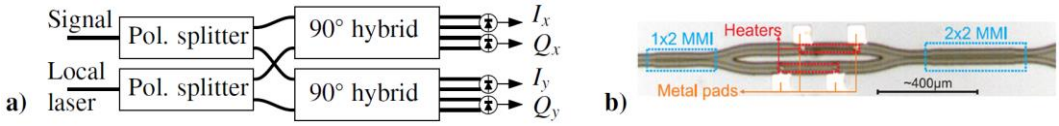

Figure 1. (a) Schematic of a polarization multiplex coherent receiver. (b) Microscope image of the integrated polarization splitter.

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References:

[1] R. Kunkel et al., *"First Monolithic InP-Based 90 degrees-Hybrid OEIC Comprising Balanced Detectors for 100GE Coherent Frontends"*, IRPM, 2009

[2] D. Pérez-Galacho et al., *"Integrated Polarization Beam Splitter for 100/400 GE Polarization Multiplexed Coherent Optical Communications"*, J. Lightwave Technol., 32, p. 361-368, 2014

[3] H. Mardoyan et al, *"PIC-to-PIC experiment at 130Gb/s Based on a Monolithic Transmitter Using Switching of Prefixed Optical Phases and a Monolithic Coherent Receiver"*, OFC 2014