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Power penalties of silicon photonic modulators in PAM and QAM transmission links

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Abstract – Higher modulation formats can effectively increase the spectral efficiency for higher bit rates per wavelength channel at the cost of more stringently required signal to noise ratio. Understanding the power penalties induced by optical modulators is essential to the design and optimization of silicon photonics links. Penalty sources in silicon modulators are intrinsically intertwined and have to be considered simultaneously to achieve optimal performance that depends on baud rate and modulation format. Through a practice towards 400 Gb/s and beyond using a general-purpose silicon photonics process, we present guidelines for the joint optimization of silicon modulator design and system-level operation for pulse-amplitude modulation (PAM) with direct detection and quadrature amplitude modulation (QAM) with coherent detection.

Bio – Dr. Wei Shi is an Associate Professor in the Department of Electrical and Computer Engineering, Université Laval, Québec, QC, Canada. He received the Ph.D. degree in electrical and computer engineering from the University of British Columbia, Vancouver, BC, Canada, in 2012, where he was awarded the BCIC Innovation Scholarship for a collaboration entrepreneurship initiative. Before joining Université Laval in 2013, he was a researcher at McGill University, Montreal, QC, Canada, where he held a Postdoctoral Fellowship from the Natural Sciences and Engineering Research Council of Canada (NSERC). His current research focuses on integrated photonic devices and systems, involving silicon photonics, nanophotonics, CMOS-photonics co-design, high-speed optical communications, chip-scale lasers, and optical sensors. He currently directs multiple research projects including an NSERC Strategic Partnership Grants (SPG) project on hybrid photonic integration and an NSERC Collaboration Research and Development Grants (CRD) project on high-speed silicon photonic transmitters for advanced modulation formats.