Silicon Photonics Systems - Nonidealities and Nonlinearities
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Abstract
In this talk, we will provide an overview of nonlinearities and non-idealities in high-confinement silicon photonic waveguides, focusing in particular on the effects that are most relevant to realistic transceivers.

It’s now been about a decade since Luxtera introduced the first high-index-confinement, CMOS compatible silicon photonics products. Before that, there was another decade of work in the academic community on silicon nanoscale photonics, both using conventional and photonic crystal waveguides. We’re now seeing a large number of new products starting to come to market leveraging high-confinement waveguides in silicon.

As it turns out, the physics in these high-confinement waveguides is relatively complex. A considerable literature has emerged on the characterization of various nonlinearities, and on strategies to overcome or exploit nonlinearities and nonidealities for practical devices. In this talk, we will attempt to provide an overview of the various nonlinearities and nonidealities that show up in practical high-confinement silicon waveguides. We will discuss the strategies that can be used to exploit or mitigate these effects in transceiver-type applications, and provide some practical examples of limitations that these effects impose on the design of silicon photonic systems-on-chip. In addition to limitations imposed by basic physics, we will also talk about some of the limitations imposed by CMOS type manufacturing, and their consequences for design and implementation strategies of practical devices.