

State-of-the-art simulation for silicon photonics

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Abstract – Silicon photonics is now a proven technology with a wide range of applications including datacoms, sensing, artificial intelligence and even quantum information processing. Remaining challenges for datacoms and high performance computing (HPC) involve improving performance through higher speed, coherent and multi-channel systems while simultaneously reducing cost and total power consumption. In silicon photonics, there is also a need for a laser source, either on- or off-chip, which is intimately related to performance, cost and power. To meet these challenges, there is a need for simulation software at a range of scales: from the individual photonic components all the way to the full system level, including electrical, optical and packaging effects.

We show a number of recent advances and ongoing research in simulation tools that specifically address these challenges: new inverse design methods that allow the performance of photonic components to be improved, while increasing manufacturability; electro-optical co-simulation of circuits and systems; the development and maintenance of high quality photonic compact model libraries for PDKs; advances in laser simulation coupled with circuits; and approaches to statistical modeling of photonic systems to predict and improve yield.

Bio – Dr. James Pond is the CTO and co-founder of Lumerical Inc. and is a driving force behind the company's core software algorithms, technology, and advanced photonic modeling capabilities. He has almost two decades of experience in optical and photonic simulation, and is the author of numerous papers, patents and conference presentations.