Joint Press Release

Lumerical's Photonic Inverse Design Reduces CompoundTek's Silicon Photonics Grating Coupler Footprint by 20X

Design Cycle Time to Tape Out Reduced to Two Weeks

Singapore, and Vancouver, BC, 8 November 2019 – CompoundTek, a global foundry services leader in emerging silicon photonic solutions (SiPh), today announces the tapeout of a reduced footprint grating coupler for photonic I/O. The grating couplers were designed and optimised using photonic inverse design (PID) in conjunction with Lumerical's industry leading FDTD nanophotonic simulator. Lumerical's PID capability enables photonic designers to rapidly develop entirely new functionality with improved performance, reduced footprint, and more robust manufacturability.

"With this successful tapeout in partnership with Lumerical, customers will be able to access Lumerical's PID solution with confidence when taping-out to CompoundTek in the future. The integration into our design flow, design partners and open SiPh manufacturing platform ecosystem will accelerate the adoption of SiPh solutions for various applications ranging from datacom transceivers, smart sensor, bio-medical, automotive LiDAR, quantum computing and artificial intelligence," said KS Ang, Chief Operating Officer, CompoundTek.

The SiPh grating coupler is a key functional block for photonic I/O, enabling light to be coupled from fibre into and out of a photonic integrated circuit. Unlike end-fire edge couplers, grating couplers can be located anywhere on chip, enabling additional applications such as sense and test. With this flexibility comes the requirement for reduced footprint while maintaining high coupling efficiency. However, with over 100 design parameters, grating couplers are geometrically complex, rendering traditional optimisation techniques impractical. Lumerical's PID technology enables designers to automatically and reliably generate optimal grating couplers with hundreds of free parameters. Testimony to its effectiveness, CompoundTek's SiPh new grating couplers have been reduced in size by 20x and promise improved coupling efficiency.

"These new grating couplers will enable our customers to create improved commercial designs with higher yields and faster time to market," said Lumerical CTO, James Pond. "PID's powerful optimisation algorithms leverage adjoint sensitivity analysis to explore design spaces that are impractical by other means. Coupled with Lumerical's industry leading FDTD solver, PID enables designers to efficiently explore and optimise designs with hundreds or more design parameters. In contrast, traditional design approaches are limited to a small number of established device designs, exploring much smaller parameter spaces, typically fewer than ten parameters."

CompoundTek's SiPh MPW platform offers a highly flexible solution for photonic integrated circuit developers requiring rapid design and manufacture, necessitating multiple variants of the new grating couplers. New capabilities introduced with Lumerical's 2020a release allow PID to run efficiently on HPC resources, and include job checkpointing, support for Amazon Linux, and online self activation for FDTD Burst Packs (see https://www.lumerical.com/products/fdtd/#HPCFDTDB) Other notable PID features such as global optimisation allow designers to efficiently explore a broad design space and co-optimise for process and packaging variation for the creation of robust designs. Rapidly scaling up with Lumerical's HPC cloud deployment reduced the design cycle for the optimised grating couplers for all eight variants to under two weeks.

The Python based open source PID implementation is packaged together with Lumerical FDTD for ease of deployment. Alternatively, the original source code is freely available on GitHub at https://github.com/chriskeraly/lumopt . To help new users get started with PID, examples are included in Lumerical's application gallery to speed designers' time to implementation. (See https://apps.lumerical.com/inverse-design-grating-coupler.html) More information on Lumerical's Automation API, required to run PID, can be found at https://www.lumerical.com/products/aapi .

To find out more about CompoundTek's Silicon Photonics platform, MPW schedule and PDK, contact enquiries@compoundtek.com .

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About CompoundTek Pte Ltd

Founded and supported by industry veterans and technologists, Singapore-based CompoundTek combines world-class commercial foundry with pioneering silicon photonics (SiPh) research institutes to provide cutting-edge SiPh technologies that enhance foundry services capabilities. As one of the elites offering SiPh solutions internationally, CompoundTek brings to the marketplace revolutionary semiconductor applications designed to meet critical requirements in high bandwidth and high data transfer solutions particularly in emerging connectivity driving Industry 4.0. The company's in-depth know-how includes end-to-end technologies – from proprietary fabrication process expertise to product design support with strategic partners and extended services for end-product manufacturing. CompoundTek's global customers span leading brands and FORTUNE 500 companies in high-growth industries including artificial intelligence, automotive, bio-medical diagnostics, data centre, lidar, smart sensor, telecommunication and quantum optical computing. Visit www.compoundtek.com for more information.

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About Lumerical

Lumerical develops photonic simulation software – tools which enable product designers to understand light, and predict how it behaves within complex structures, circuits, and systems. Since being founded in 2003, Lumerical has grown to license its design tools in over 50 countries and its customers include 13 of the top 15 technology companies in the FORTUNE Global 500 index, and 46 of the top 50 research universities as rated by the Times Higher Education rankings. Lumerical's substantial impact on the photonic design and simulation community means its tools are among the most widely cited in the scientific press, with references in more than 10,000 scientific publications and patents. Lumerical enables its customers to achieve more with light and establish a leading position in the development of transformative technologies employing photonics.

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