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Silicon-Plus Photonic Integration for High Performance Computing and Beyond

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Abstract – Since the world first petascale computing system debuted a decade ago, exscale computing became the new Himalayas in high performance computing (HPC) world for multiple nations, regions and thousands of scientist and engineers to climb. In the end of this Moore's Law era, photonics plays an increasingly critical role to enable such a powerful machine with novel architecture and system implementation, full performance potential and affordable cost. Over 15 years of research and commercialization effort have enabled silicon photonics to successfully evolve its potential for more projected share in optical transceiver market, particularly in applications of 400 Gb/s and beyond. Same promise is hold to provide interconnect solutions with energy efficiency, bandwidth, latency, cost, etc. required for next-gen HPC systems. To fulfill this mission, new materials, device structures, design mindset on top of general silicon photonic platform, namely a silicon-plus photonic integration, are necessary.

In this talk I will attempt to first review recent progress to integrate III-V compound semiconductors and other new materials on silicon to enable new or enhanced optical functionalities. A fully integrated DWDM transceiver platform to provide nearly all performance metrics for HPC application will be discussed. Finally I would like to elaborate our vision to build an open silicon photonics ecosystem to better prevail the technical challenges and create more business opportunities.

Bio – Di Liang is a senior research scientist/principal engineer at Hewlett Packard Labs in Hewlett Packard Enterprise (HPE). He is a core technical member to help steering photonic R&D roadmap and portfolio in HPE, and is currently a PI for multiple externally funded R&D programs. Prior to joining HP Labs in 2009, he was a research specialist with Prof. John Bowers at UC-Santa Barbara and involved in the early stage development of the hybrid III/V-on-silicon platform which has been commercialized by Intel and Juniper Networks (Aurrion) recently. His research interests include high-speed diode lasers, modulators and photodetectors, integrated photonics, heterogeneous and monolithic material integration and nanofabrication technology. He has authored and coauthored over 170 journal and conference papers, five book chapters, and was granted by 20+ patents (each with multiple region filing) with another 45+ pending. He received his B.S. degree in Optical Engineering from the Zhejiang University, China, and Ph.D. degree in Electrical Engineering from the University of Notre Dame, USA. He is a senior member of IEEE and a member of OSA and SPIE.