Workshop speaker	
Full Name	Daehwan Jung
Affiliation	UC Santa Barbara
Presentation Title	Efficient, scalable, and reliable III/V quantum dot lasers monolithically integrated on silicon

Biography

Dr. Jung has received his B.S. from UT Dallas in Electrical and Computer Engineering with an honor of Summa Cum Laude in 2010. He then started his Ph.D. in Electrical Engineering at YaleUniversity in 2011 and has received his Ph.D. degree in 2016 under supervision of Prof. Minjoo Larry Lee. During his Ph.D. course he worked on molecular beam epitaxy of III/V nanostructures for metamorphic mid-infrared lasers and high efficiency solar cells. He is currently working with Prof. John Bowers and Arthur Gossard to develop high efficiency low threshold InAs quantum dot lasers epitaxially grown on silicon for photonic integrated circuits.

200 words abstract

InAs quantum dots (QD) have been extensively studied as a gain material for efficient, scalable, and reliable light source on Si. Compared to quantum well lasers on Si that have maximum lifetimes of a hundred hours when grown on Si, QDs can make the lasers much less sensitive to threading dislocations by effectively localizing injected carriers for efficient radiative recombination. To be fully CMOS-compatible, QD lasers have recently been migrated from offcut (4-6 degree) to on-axis (001) Si, and we have demonstrated 1.3 μm quantum dot lasers with CW threshold currents as low as 4.8 mA, output powers up to 185 mW, max CW operation temperature of 85 °C, and extrapolated lifetimes at 35°C of more than 10 million hours. This enabled us direct modulation of QD lasers up to 12.5 Gbps at 20 °C, single-section mode-locking with a 490 fs pulse width at 31 GHz, and a very small alpha-factor of 0.1 near thresholds. Furthermore, due to the effective carrier localizations in individual QDs, ultra-small foot-print mirroring 1.3 μm QD lasers have been demonstrated on Si with CW thresholds less than 0.5 mA at room-temperature.