LASERS ON SILICON

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Growing lasers on silicon has eluded scientists for decades and has been referred to as the Holy Grail of photonics [1]. The fundamental issue preventing the integration of III-V based laser diodes on silicon (or other) substrates is the lattice mismatch between the material systems. This mismatch results in dislocations in the grown III-V material which degrades the performance and lifetime of the resulting laser diodes. There is however an exception to this limitation: Nanorods. In this case, dimensions are < 1 µm, which allows the dislocations to relax, allowing the growth of high quality Quantum Wells. Nanorod LEDs [2], vertically emitting lasers [3] and cleaved edge emitting geometries [4] have all been fabricated.

Compared to previous geometries of nanorod lasers the approach presented here lases in the plane of the substrate, doesn't require cleaved end facets, can be scaled to useful output powers and allows for integration with other components or Photonic Integrated Circuits generally.

I present a straightforward design and simulation results for fabricating III-V laser diodes on silicon substrates: A linear array of Bragg-spaced Quantum-Well Nanorods.

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Biography

Dr. Doug Dykaar is the founder of DifTek Lasers, Inc. He received the PhD in Electrical Engineering from the University of Rochester in 1987 in Gerard Mourou's Ultrafast Science group. He was a member of technical staff at AT&T Bell Labs Murray Hill, Research manager at DALSA, and Research Scientist at Thalmic/North. Doug also taught at Conestoga College in their 4-year Bachelor of Engineering Program. At last count, he had over 100 patent applications and 60 publications. His research interests span lasers to superconductivity to materials science to composite electronics.