KARAN MEHTA

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EDUCATION

Georgia Institute of Technology, Atlanta, Georgia, USA *2014-2019*
Doctor of Philosophy in Electrical and Computer Engineering

Thesis: Design of III-N Vertical-Cavity Surface-Emitting Lasers by Numerical Simulation

NMIMS University, Mumbai, India *2010–2014*
Bachelor of Technology in Electronics Engineering

WORK EXPERIENCE

Founder and Principal Investigator *2025-present*
Rashmirathi Photonics Design Consultancy, Guwahati, Assam, India

Laser R&D Engineer *2019–2025*
Integrated Photonics Solutions, Intel Corporation, Santa Clara, California, USA

- Responsible for enhancing the design and theoretical understanding of on-chip hybrid III-V/Si DFB lasers, semiconductor optical amplifiers (SOAs), and superluminescent diodes (SLDs) through design, layout, test, and data analysis
    - Designed record-performance on-chip SLD for a fiber-optic gyroscope
    - Developed an optical test methodology to accurately characterize the nonlinear loss in ring resonators using a pump-probe measurement setup
    - Designed test structure layouts and data analysis methodologies to measure the performance of on-chip optical components on 300-mm SOI wafers
    - Enhanced wafer-level test code to extract laser and SOA parameters from the test data
    - Contributed to the design and development of quantum dot lasers integrated with 300 mm silicon photonics (first ever demonstration)
    - Worked on design, analysis, and measurement of Relative Intensity Noise (RIN) and coherence collapse of on-chip DFB lasers
    - Worked on measurement and simulation of four-wave mixing in integrated SOAs
- Designer and chip integrator in 3 custom silicon photonics mask tape-outs
- Co-led the effort to reduce the layout time and potential errors in layout through the creation of optical component and photonics integrated circuit (PIC) libraries in a schematic-driven layout flow

- Collaborations with different teams across Intel such as *Intel Labs, Quality and Reliability, Assembly Test Technology Development*, etc. for R&D on optical component and system design, reliability, and characterization

Laser Simulation Intern *2018*

Silicon Photonics Product Division, Intel Corporation, Santa Clara, California, USA

- Physics-based process and device co-simulations to understand and quantify the effects of certain processing steps on the hybrid laser's performance and reliability
- Designed an experiment on an internal R&D multi-project wafer to validate physics-based hypotheses and simulations
- Results from this experiment led to insights which were used to improve the design of the hybrid lasers in all of Intel's silicon photonics products

Graduate Research Assistant *2015–2018*

Georgia Institute of Technology, Atlanta, Georgia, USA

- Funded by DARPA's ACES research program to design and develop UV lasers for compact Yb-based atomic clocks
- Designed UV III-Nitride vertical-cavity surface-emitting lasers (VCSELs) aided by self-consistent electro-opto-thermal simulations
- Developed UV lasers in collaboration with two other professors' groups: a crystal growth group (MOCVD) and a device fabrication team within Georgia Tech's ECE department
- Key achievements in UV-VCSEL development:
    - Design of electron blocking layers (EBL) based on the application and operating current density of the III-N laser of LED
    - Designed UV-transparent lateral hole current-spreading layers
    - Designed several different types of UV distributed Bragg reflectors
    - Thermal design strategies to mitigate self-heating in III-N VCSELs

PEER-REVIEWED JOURNAL PUBLICATIONS

1) D. Huang, X. Wu, S. Yerkes, G.-L. Su, **K. Mehta**, M. Cramer, S. Dobek, C. Mackos, T. Ward, P. Patel, R. Kumar, S. Liu, X. Wang, J. Gao, M. Isenberger, H. Frish, and H. Rong, "Feedback tolerant quantum dot lasers integrated with 300 mm silicon photonics," J. Lightwave Technol 43 (4), 1855-1860 (2025).
2) **K. Mehta**, R. Kumar, M. Tanzid, D. Gold, H. Rong, and R. Jones, "Measurement of the Nonlinear Loss and Effective Free Carrier Lifetime in Silicon Microring Resonators," J. Lightwave Technol 42 (9), 3300-3305 (2024).
3) **K. Mehta**, O. Dosunmu, P. Merani, K. Sikder, C. Wu, P. Patel, J. Davis, D. Gold, S. Huang, K. Subramaniam, A. Bowles, A. Ghetmiri, S. Yerkes, W. O'Brien, and R. Jones, "High-Power

Heterogeneously Integrated III-V/Silicon Superluminescent Diode," IEEE Photonics Technology Letters 35 (7), 365-368 (2023).

4) K. Mehta and P. D. Yoder, "Philosophy of Approaching a Laser Design Problem: Illustrated by the Design of Ultraviolet Vertical-Cavity Laser Diodes," physica status solidi (a) **217**, 2000154 (2020).

5) K. Mehta, Y.-S. Liu, J. Wang, H. Jeong, T. Detchprohm, R. D. Dupuis, and P. D. Yoder, "Thermal Design Considerations for III-N Vertical-Cavity Surface-Emitting Lasers Using Electro-Opto-Thermal Numerical Simulations," IEEE J Quantum Electron 55 (5), 1–8 (2019).

6) E. A. Clinton, E. Vadiee, S.-C. Shen, K. Mehta, P. D. Yoder, and W. A. Doolittle, "Negative differential resistance in GaN homojunction tunnel diodes and low voltage loss tunnel contacts," Appl Phys Lett 112 (25), 252103 (2018).

7) K. Mehta, Y.-S. Liu, J. Wang, H. Jeong, T. Detchprohm, Y. J. Park, S. R. Alugubelli, S. Wang, F. A. Ponce, S.-C. Shen, R. D. Dupuis, and P. D. Yoder, "Theory and Design of Electron Blocking Layers for III-N-Based Laser Diodes by Numerical Simulation," IEEE J Quantum Electron 54 (6), 1–11 (2018).

8) K. Mehta, Y.-S. Liu, J. Wang, H. Jeong, T. Detchprohm, Y. J. Park, S. R. Alugubelli, S. Wang, F. A. Ponce, S.-C. Shen, R. D. Dupuis, and P. D. Yoder, "Lateral Current Spreading in III-N Ultraviolet Vertical-Cavity Surface-Emitting Lasers Using Modulation-Doped Short Period Superlattices," IEEE J Quantum Electron 54 (4), 1–7 (2018).

9) K. Mehta, T. Detchprohm, Y. J. Park, Y.-S. Liu, O. Moreno, S. R. Alugubelli, S. Wang, F. A. Ponce, S.-C. Shen, R. D. Dupuis, and P. D. Yoder, "High Reflectivity Hybrid AlGaN/Silver Distributed Bragg Reflectors for Use in the UV-Visible Spectrum," IEEE J Quantum Electron 53 (6), 1–8 (2017).

10) T. Detchprohm, Y.-S. Liu, K. Mehta, S. Wang, H. Xie, T.-T. Kao, S.-C. Shen, P. D. Yoder, F. A. Ponce, and R. D. Dupuis, "Sub 250nm deep-UV AlGaN/AlN distributed Bragg reflectors," Appl Phys Lett 110 (1), 011105 (2017).

11) Y.-S. Liu, A. F. M. S. Haq, K. Mehta, T.-T. Kao, S. Wang, H. Xie, S.-C. Shen, P. D. Yoder, F. A. Ponce, T. Detchprohm, and R. D. Dupuis, "Optically pumped vertical-cavity surface-emitting laser at 374.9 nm with an electrically conducting n-type distributed Bragg reflector," Applied Physics Express 9 (11), 111002 (2016).

12) Y.-S. Liu, S. Wang, H. Xie, T.-T. Kao, K. Mehta, X. J. Jia, S.-C. Shen, P. D. Yoder, F. A. Ponce, T. Detchprohm, and R. D. Dupuis, "Strain management of AlGaN-based distributed Bragg reflectors with GaN interlayer grown by metalorganic chemical vapor deposition," Appl Phys Lett 109 (8), 081103 (2016).

13) Y.-S. Liu, A. F. M. S. Haq, T.-T. Kao, K. Mehta, S.-C. Shen, T. Detchprohm, P. D. Yoder, R. D. Dupuis, H. Xie, and F. A. Ponce, "Electrically conducting n-type AlGaN/GaN distributed Bragg reflectors grown by metalorganic chemical vapor deposition," J Cryst Growth 443, 81–84 (2016).

PATENTS AND PENDING PATENT APPLICATION

1) K. Mehta, R. Jones, O. Dosunmu, “Superluminescent Diode With Integrated Absorber And Photodetector,” U.S. Patent No. US Patent 12,356,758, July 2025.

2) K. Mehta, R. Jones, R. Kumar, GL. Su, D. Huang, H. Rong, “Multi-Wavelength Laser Generator Using Ring Filter,” U.S. Patent No. 12,088,060, Sept. 2024.

3) D. Huang, G-L. Su, **K. Mehta**, S. Yerkes, R. Dehghannasiri, S. Dobek, M. Cramer, H. Frish, H. Rong, "Hybrid silicon quantum dot lasers (hsqdl) with reduced thermal resistance," U.S. Patent Application 18,399,484, filed Dec. 2023.

CONFERENCE PRESENTATIONS AS PRESENTER

1) **K. Mehta**, O. Dosunmu, P. Merani, K. Sikder, C. Wu, P. Patel, J. Davis, D. Gold, S. Huang, K. Subramaniam, A. Bowles, A. Ghetmiri, S. Yerkes, W. O'Brien, and R. Jones, "Heterogeneously Integrated Hybrid III-V/Silicon Superluminescent Diode with> 10 mW Output Power," CLEO, San Jose, CA (2023).
2) **K. Mehta**, Y.-S. Liu, J. Wang, H. Jeong, T. Detchprohm, S.-C. Shen , R. D. Dupuis, and P. D. Yoder, "Thermal Management Strategies for III-N VCSELs Using Electro-Opto-Thermal Numerical Simulations," ICNS-13, Bellevue, WA, USA (2019).
3) **K. Mehta**, T. Detchprohm, Y. J. Park, Y.-S. Liu, S.-C. Shen, R. D. Dupuis, and P. D. Yoder, "Analysis and Design of Electron Blocking Layers for III-N Based Laser Diodes by Numerical Simulation," Device Research Conference, Santa Barbara, CA, USA (2018)
4) **K. Mehta**, T. Detchprohm, Y.-J. Park, Y.-S. Liu, O. Moreno, S. Wang, H. Xie, S.-C. Shen, F. A. Ponce, R. D. Dupuis, and P. D. Yoder, "High Reflectivity Ultraviolet AlGaN-Metal Hybrid Distributed Bragg Reflectors," ISSLED 2017, Banff, Alberta, Canada (2017).
5) **K. Mehta**, Y.-S. Liu, T.-T. Kao, T. Detchprohm, Y.-J. Park, S. Wang, S.-C. Shen, R. D. Dupuis, F. A. Ponce, and P. D. Yoder, "Solutions to Carrier Leakage in III-N Based Light Emitters by Numerical Simulation," IWN 2016, Orlando, FL, USA (2016).