Md Imran Khan

imransmailbox@gmail.com · 607-242-5532 · khanimran.com · linkedin.com/in/imrankahn · Portland, OR

PROFESSIONAL SUMMARY

Process and Metrology Engineer with a Ph.D. in optics and nearly 4 years of semiconductor high-volume manufacturing experience at Intel. Proven expertise in hardware characterization, process engineering, structured root cause analysis, and Python-based data automation. Strong foundation in thin film measurement, optical system design, sensor calibration, and cross-functional engineering collaboration.

TECHNICAL SKILLS

Process & Metrology:	CD-SEM, SPC, gauge capability (GR&R / Cp / Cpk), tool-to-tool matching, measurement uncertainty, process qualification, hardware characterization
Characterization & Film:	SEM, Optical Microscopy, TRPL, DSC, DLS, Image Quality Analysis (CNR, Sharpness, FFT, GLCM), thin film properties
Optics & Sensors:	Optical system design & alignment, electron-optical calibration, UV–IR simulation (MFS, Foldy-Lax), TRPL system design
Programming & Data:	Python (PyTorch, OpenCV, scikit-image, NumPy, pandas, Matplotlib), SQL/MySQL, Git, MATLAB, LabVIEW, JMP, Minitab
ML & Image Processing:	Anomaly detection, semantic segmentation (U-Net), SSIM/PSNR/FFT image quality metrics, multivariate statistical pipelines
Fabrication:	Clean room, sputtering, photolithography, nano-fabrication

EXPERIENCE

Metrology Process Engineer — CD-SEM
Intel Corporation · Hillsboro, OR
Nov 2021 – Aug 2025

- Performed hardware characterization and process qualification for 8 CD-SEM systems in high-volume semiconductor manufacturing; executed GR&R studies, Cp/Cpk evaluations, and SPC-driven calibration workflows to sustain measurement stability across process nodes.
- Conducted structured root cause investigations on electron-optical drift and imaging anomalies, coordinating across hardware, software, and process integration teams to diagnose and resolve complex tool-process interactions.
- Designed and deployed a Python-based anomaly detection system monitoring high-dimensional sensor data (beam parameters, sub-system trends), transitioning the team from reactive troubleshooting to proactive, data-driven process control.
- Automated multivariate statistical pipelines for tool performance comparison and precision evaluation; reduced data processing time by 80% (5 hrs to 1 hr) while improving reporting accuracy and fleet-wide consistency.
- Defined measurement sampling strategies and process specifications to qualify new process layers and product lines; led metrology qualification including system calibration, GRR validation, and production release readiness.
- Authored technical documentation including qualification reports, calibration procedures, and process specifications; trained technicians on tool maintenance and SPC interpretation.
- Collaborated with equipment vendors and cross-functional teams on tool integration, troubleshooting, and performance optimization — serving as the primary metrology resource for new process layer bring-up.

Graduate Research Scholar — Optics & Computational Modeling
University of California, Merced · Merced, CA
Aug 2016 – Oct 2021

- Developed a computational simulation platform for modeling light–matter interactions of plasmonic meta-structures using hybrid full-wave methods (MFS and Foldy-Lax theory); performed systematic parameter sweeps to predict scattering, extinction, and broadband cloaking behavior across visible wavelengths.

- Independently executed the full experimental workflow — fabricating core-shell plasmonic meta-structures via clean room processes (sputtering, photolithography), characterizing using SEM, DLS, integrating sphere, and automated spectroscopy, and validating experimental results against simulation predictions.
- Designed and commissioned a high-stability TRPL optical measurement system; defined system specifications, aligned optical components, and developed analysis protocols to quantify photoluminescence lifetime changes.

Mathematics Instructor   Aug 2017 – May 2020
University of California, Merced · Merced, CA
- Taught undergraduate mathematics courses for nearly three years alongside doctoral research; developed course materials, led lab sessions, and mentored students — building strong technical communication skills and the ability to simplify complex concepts for diverse audiences.

Research Associate   2013 – 2014
Universal Instruments Corporation · Kirkwood, NY
- Characterized thermomechanical properties of 92.5Pb-5Sn-2.5Ag solder alloys for high-temperature electronic packaging; used DSC to measure melting point depression and SEM to analyze microstructural changes as a function of Sn surface finish composition.
- Measured mechanical integrity using a Dage 4000 Plus bond tester; co-authored an industry publication presented at the International Microelectronics Assembly and Packaging Society (IMAPS) conference.

TECHNICAL PROJECTS

SEM Semantic Segmentation for Microstructure Analysis | PyTorch, Python, PIL
- Built a multi-class semantic segmentation pipeline (U-Net) for SEM microstructure images to automatically segment 5 material phases; implemented class-weighted CE + Dice loss and per-class IoU/Dice evaluation — enabling quantitative microstructure analysis applicable to process development and materials characterization.

SEM Image Quality Analysis Toolkit | Python, OpenCV, scikit-image
- Developed an imaging sensor characterization toolkit implementing full-reference (SSIM, PSNR) and no-reference (Laplacian sharpness, FFT, variance-based focus) metrics for automated, quantitative image quality assessment — applicable to process tool qualification and imaging system performance monitoring.

EDUCATION

Ph.D., Physics — Optics & Computational Modeling   Oct 2021
University of California, Merced

M.S., Physics   May 2016
Binghamton University (SUNY)

SELECTED PUBLICATIONS

Khan, M.I., et al., "Scattering by nanoplasmonic mesoscale assemblies," JOSA A 42, 1244–1253 (2025).

Khan, M.I., et al., "Modeling broadband cloaking using 3D nano-assembled plasmonic meta-structures," Optics Express (2020).

Schoeller, H., Anselm, M., Khan, I., & Cotts, E., "Effect of Sn Component Surface Finish on 92.5Pb-5Sn-2.5Ag," HITEC Conf. Proc., Vol. 2014, pp. 364–371.

AWARDS & AFFILIATIONS

- NSF-CREST Graduate Scholar, Center for Cellular and Biomolecular Machines (CCBM), UC Merced
- Graduate Scholar Mentor — mentored undergraduate researchers on experimental methods and graduate school preparation