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Engineering & Scientific Consulting

Patrick Schmidt, Ph.D.

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Professional Profile

Dr. Schmidt has extensive experience in the design and implementation of custom optoelectronic solutions, ranging from single molecule fluorescence and atomic force microscope manipulation, to nondestructive wafer defect detection via photoluminescence. He leverages an in-depth knowledge of optics principles, programmatic hardware control and synchronization, simulation, and cutting-edge imaging techniques to build specialized platforms and expand the capabilities of existing optoelectronic systems.

Dr. Schmidt takes a multidisciplinary approach to problem solving with experience in physics, electrical engineering, molecular and cellular biology, and programming. During his years of performing research, each of these were applied to design, build, and program a custom combined fluorescence and atomic force microscope with FPGA-enabled active stabilization and synchronized scanning, allowing for visualization of specific molecular and cellular conformation changes under force at nanometer stability over a broad bandwidth.

After completing his doctorate, Dr. Schmidt applied his expertise in industry, employed as an R&D engineer for three years. He helped redesign the optics and automation of wafer inspection tools to allow higher illumination power and throughput and expanded imaging mode capabilities. In particular, his designs were included in the launch of a UV-capable photoluminescence inspection tool which, in addition to standard microscopy capabilities, allows nondestructive defect detection in silicon carbide wafers.

At Exponent, Dr. Schmidt performs failure analysis for electronics, optical safety testing, and creates custom data collection and analysis platforms. His software/programming tools include OpticStudio, LabVIEW, MATLAB, Python, SPICE, Arduino IDE, and SOLIDWORKS.

Academic Credentials & Professional Honors

Ph.D., Electrical Engineering, Iowa State University, 2020

B.S., Physics and Mathematics, Univeristy of Iowa, 2012

Prior Experience

Research and Development Engineer – Optics, Nanotronics, 2020-2023

Visiting Researcher, University of California, Davis 2018-2020

Research Assistant, Iowa State University, Sivasankar Lab 2013-2020

Undergraduate Research Assistant, University of Iowa, 2010-2012

Publications

P. D. Schmidt, J. G. Lajoie, S. Sivasankar. Robust Scan Synchronized Force-Fluorescence Imaging. Utramicroscopy 221, 113165 (2021)

P. D. Schmidt, B. H. Reichert J. G. Lajoie, S. Sivasankar. Adaptive atomic force microscope. SPIE Proceedings, 11246 (2020

P. D. Schmidt, B. H. Reichert J. G. Lajoie, S. Sivasankar. Method for high frequency tracking and sub-nm sample stabilization in single molecule fluorescence microscopy. Scientific Reports 8, 13912 (2018)

Presentations

Patrick Schmidt, Benjamin Reichert, John Lajoie, Sanjeevi Sivasankar. Adaptive Atomic Force Microscope. Paper, poster and talk, SPIE Photonics West 2020

Patrick Schmidt, John Lajoie, Sanjeevi Sivasankar. Feedback Enabled Pinpoint Force Fluorescence Microscope. Poster, Biomedical Engineering Society, 2019

Patrick Schmidt, John Lajoie, Sanjeevi Sivasankar. Method for High Frequency Tracking and Sub-Nm Sample Stabilization in Single Molecule Fluorescence Microscopy. Talk and poster, Biophysical Society, Nanoscale Biophysics Symposium, 2018

Patrick Schmidt, John Lajoie, Sanjeevi Sivasankar. Method for High Frequency Tracking and Sub-Nm Sample Stabilization in Single Molecule Fluorescence Microscopy. Poster, Midwest Single Molecule Workshop, 2018

Patrick Schmidt, John Lajoie, Sanjeevi Sivasankar. Tip-Referenced Ultrastable AFM (TRU AFM). Poster, Midwest Single Molecule Workshop, 2016

Patrick Schmidt, John Lajoie, Sanjeevi Sivasankar. AFM Tip Tracking for Nanometer Positioning via Fast Feedback. Midwest Single Molecule Workshop, 2014