

Precision Mechatronics

Academic and Research Staff

Prof. David Trumper

Graduate Students

Ben Cannon

Technical and Support Staff

Ms. Makiko Wada, Ms. Denise Stewart

Power Electronics Research Overview

The focus of our group is on the design of novel precision electromechanical systems. We have current focuses on applying these designs in precision positioning for semiconductor lithography, in nanoimaging systems, and in biological assays.

1. Nanoimager

Sponsors:

EECS Fellowship supports student

Project Staff:

Ben Cannon, M.S. student

This work is joint with Prof. Jeffrey Lang and Prof. Markus Zahn.

We have conducted preliminary studies on the design of an electromagnetic nanoimager. In this project, theory and preliminary experimental results have been developed for a novel electromagnetically-driven imager which can create images of the surface and near-surface volume of samples of interest, including integrated circuit structures.

Ben Cannon completed his Master's thesis this year, and we are currently developing proposals for follow-on funding.

Publications

Journal Articles, Published

Yong Zhao, David L. Trumper, Ralf K. Heilmann, Mark L. Schattenburg, "Optimization and temperature mapping of an ultra-high thermal stability environmental enclosure," *Precision Engineering: Journal of the International Societies for Precision Engineering*, Volume 34, Issue 1, January 2010, pp. 164-170.

Meeting Papers, Published

Amin-Shahidi, D., Ljubicic, D.M., Overcash, J.L., Hocken, R.J., and Trumper, D.L., "High-Accuracy Atomic Force Microscope Using a Self-Sensing Probe," ASPE spring topical meeting, MIT, Cambridge, MA, April, 2010

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Amin-Shahidi, D., Ljubicic, D.M., Overcash, J.L., Hocken, R.J., and Trumper, D.L., "High-Accuracy Atomic Force Microscope Head for Dimensional Metrology," 2010 IFAC Symposium on Mechatronic Systems, Cambridge, MA, September, 2010

Kluk, D., Boulet, M., and Trumper, D.L., "A High-Bandwidth, High-Precision, Two-Axis Steering Mirror with Moving Iron Actuator," 2010 IFAC Symposium on Mechatronic Systems, Cambridge, MA, September, 2010

Amin-Shahidi, D., Ljubicic, D.M., Overcash, J.L., Hocken, R.J., and Trumper, D.L., "High-Accuracy Atomic Force Microscope Probe and Measuring Machine," 25th Annual Meeting of the American Society for Precision Engineering, Atlanta, GA, October, 2010

Theses

Cannon, Benjamin, "Electroquasistatic Sensors for Surface and Subsurface Nano-Imaging of Integrated Circuit Features," MIT, Electrical Engineering, June 2010, co-supervised with Jeff Lang and Markus Zahn, M.S. Thesis

Patents Granted

Kendale, A., and Trumper, D.L., "Microcontact Printing," #7,665,983, February, 2010.

Trumper, D.L., and Cuff, D., "Magnetic micropositioner and method of providing the same," #7,765,905, August, 2010.

Trumper, D.L., and Kluk, D., "Variable reluctance fast positioning system and methods," #7,772,947, August, 2010.

Patents Applied For

Trumper, D.L., Lang, J., Zahn, M., Cannon, B., "Electromagnetic Microscope," utility application submitted January, 2010.