ELEctromagnetic DIAgnostics Research Center

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SEMINAR:

A Switchable Magnetic Low-Index Metamaterial for use in a Dynamically Reconfigurable Beam-Scanning Lens Antenna With a Single Feed

Speaker: **Dr. Jeremiah P. Turpin**
(Penn State University, PA, USA)

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Note: The seminar will be held in English

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Spatial diversity in communication and remote sensing systems enables re-use of scarce radio-frequency bandwidth by employing highly-directive antennas to focus energy only where it is required. Reconfigurable antennas enable radiation pattern adjustments to optimize the performance of a system. The new properties provided by metamaterials offer enhanced capabilities to reconfigurable antennas including the ability to vary frequency, bandwidth, gain, beam direction, and number of radiating beams. Near-zero-index reconfigurable metamaterials, in particular, with their beamforming capability and relatively broad bandwidth offer substantial benefits for the construction of high-gain lens antennas with near-arbitrary radiation patterns in the azimuthal plane, with extensions to allow scanning in the elevation plane. The radiation patterns of static near-zero-index metamaterial lenses are determined by the boundary contour of the structure – a beam is radiated from each face, with larger faces closer to the central feed producing larger beams. In this way, the effective shape of the near-zero-index slab may be adjusted by changing the states of the metamaterial elements to change the radiation pattern of the lens.

- **About the Speaker**

Jeremiah P. Turpin received the B.S. degree in electrical engineering from Grove City College, Grove City, Pennsylvania in 2009, and the M.S. and Ph.D. degrees in electrical engineering from The Pennsylvania State University (Penn State), University Park, PA in 2011 and 2014, respectively.
He is the president and co-owner of ExH, Inc., a computational software development and consulting firm in State College, PA. He is currently a research assistant in the Computational Electromagnetics and Antennas Research Laboratory in the Department of Electrical Engineering at the Pennsylvania State University, where he has been investigating Transformation Optics designs for antenna applications and developing metamaterials for implementation of reconfigurable TO devices. He has been an Applied Research Laboratory Exploratory and Foundational Graduate Fellow since 2012. He was awarded in 2012 with the IEEE Antennas and Propagation Society Doctoral Research Award. In 2014, he received the A.J. Ferraro Graduate Research Award in Electromagnetics and the Melvin P. Bloom Memorial Outstanding Doctoral Research Award in Electrical Engineering from the Pennsylvania State University. He is a member of the IEEE Antennas and Propagation Society.
Dr. Turpin's other research interests include the investigation of metamaterials for optical and near-infrared systems, optical ray tracer development, and design of volumetric, reconfigurable metamaterials.