

University of Rochester
Department of Electrical and Computer Engineering
Colloquia Series

Plasmonic Terahertz Field Effect Transistors

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11:00 AM – 12:00 PM
Computer Studies Building (CSB) 209

Abstract: The field effect transistor feature sizes have shrunk to the point, where ballistic (collisionless) mode of electron transport is becoming dominant. In the ballistic regime, the device physics is completely different. For example, the effective electron mobility becomes proportional to the device feature size. At THz and sub-THz frequencies, the ballistic transport affects devices even with relatively large (submicron scale) feature sizes. THz radiation excites the waves of the electron density (i.e. plasma waves) in transistor channels. These waves have characteristic frequencies in the THz range even for devices with feature sizes exceeding a few hundred nanometers. Rectification of plasma waves can be used for detecting THz radiation and for imaging and in-situ testing of transistor structures. Since propagation of plasma waves is strongly affected by the field distribution in the device channel, plasmonic devices exposed to THz radiation could resolve nanometer feature sizes. In ballistic devices, plasma waves become unstable and cause THz emission. Plasma wave electronics detectors and sources are tunable by applied bias voltage and can be modulated at frequencies up to hundreds of gigahertz. Using synchronized THz transistor arrays instead of single devices is predicted to improve performance of plasmonic THz electronic detectors and sources by several orders of magnitude.

Bio: Michael Shur received MSEE (with honors) from St. Petersburg Electrotechnical Institute, and PhD and Dr. Sc. Degrees from A. F. Ioffe Institute. He is Roberts Professor and Acting Director of Center for Integrated Electronics at RPI. Dr. Shur is Fellow of IEEE, OSA, SPIE, IET, APS (life), ECS, WIF, MRS, AAAS, and member of Eta Kappa Nu, Tau Beta Pi, ASEE, elected member and former Chair of US Commission D of URSI, life member of IEEE MTT, Sigma Xi, and Humboldt Society, Editor-in-Chief of IJHSES, Board Member of *physica status solidi*, Member of the Honorary Board of Solid State Electronics and JSTS International Advisory Committee, Vice-President of IEEE Sensor Council, and Distinguished Lecturer of IEEE EDS. He is co-founder and VP of Sensor Electronics Technology, Inc. His awards include iNEER Award for contribution to long distance education, Tibbetts Award for technology commercialization, St. Petersburg Technical University Honorary Doctorate, IEEE Donald Fink Best Paper Award, IEEE Kirchmayer Award, Gold Medal of Russian Education Ministry, Best Paper Awards, van der Ziel Award, Senior Humboldt Award, Pioneer Award from Compound Semi, RPI Research Award, and Commendation for Excellence in Technical Communications. He is Foreign Member of Lithuanian Academy of Sciences.

Light refreshments will be provided.