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Michigan Institute for Plasma Science and Engineering

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Room 1311
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Complex Phenomena in Magnetized Plasmas in the Presence of Electron Emission

Low pressure laboratory and technological plasmas are always bounded by walls. The electron flux to the wall is determined by the electron velocity distribution function (EVDF) and by the sheath potential, which are consistent with the wall properties. The plasma-wall interaction in the presence of secondary electron or thermionic emission from the wall has been studied theoretically and experimentally both as a basic phenomenon and in relation to numerous plasma applications. Some of these applications are magnetic fusion devices, various gas discharges and dusty plasmas, Langmuir probes and plasma thrusters. The electron emission from the wall reduces the electric potential drop in the sheath between the plasma and the wall and, thereby, weakens electrical and thermal insulating properties of the sheath. Beginning with basic concepts for the strong effects of electron emission into the plasma with a Maxwellian EVDF, this talk discusses more complex situations for collisionless and magnetized plasmas. Under such conditions, electron kinetic effects can substantially alter the plasma-wall interaction and change transport properties of the magnetized plasma. This situation can be relevant to various cross-field electric discharge devices such as Hall thrusters, sputtering magnetrons, magnetized plasma-beam systems and magnetic mirrors.

About the Speaker: Yevgeny Raitses is a Principle Research Physicist at the Princeton Plasma Physics Laboratory (PPPL) at Princeton University. He received his PhD degree from the Technion–Israel Institute of Technology. At PPPL, he is leading research on plasma thrusters. His research interests include plasma-wall interactions in gas discharges, physics and applications of low temperature magnetized plasmas, plasma diagnostics, and plasma-based nanotechnologies. Dr. Raitses is a Fellow of the American Physical Society and an Associate Fellow of the American Institute of Aeronautics and Astronautics.