SEMINAR NOTICE

Department of Physics and Engineering Physics
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SPEAKER: Mikhail Tuishev, PhD candidate,
Physics and Engineering Physics

TOPIC*:* *Plasma Flows and Structures in Magnetic Mirror and Magnetic Nozzle.*

DATE: Tuesday January 21st, 2025

TIME: 3:30-4:30 p.m.

PLACE: ***Physics 103***

Abstract:

The converging-diverging magnetic fields, such as magnetic mirrors and nozzle configurations, are used in open mirror systems for controlled fusion and electric propulsion applications. Similar configurations are created by the dipole magnetic field of Earth and are responsible for the confinement of energetic charged particles around Earth - the so-called Van Allen radiation belts. A function of the magnetic nozzle in propulsion is somewhat similar to the de Laval nozzle in gas dynamics: convert the thermal (random) energy into the kinetic energy of the accelerated plasma flow thus creating thrust. For fusion applications, the mirror configurations are used to confine the plasma, as well as to manage energy losses and spread them evenly over a larger area. Despite different applications and seemingly opposite goals—accelerate the plasma in propulsion vs confined plasmas for fusion, the physics of the magnetic mirror and magnetic nozzle have many commonalities.

This talk presents the basic mechanisms of plasma confinement and acceleration in the converging-diverging magnetic field of the magnetic mirrors and magnetic nozzle and discusses plasma and energy losses in the mirror. The methodology of numerical kinetic simulations to describe the complex nonlinear processes in plasmas will be described. Results of numerical one-, two-, and three-dimensional simulations will be presented with emphasis on plasma and energy losses, the formation of azimuthal structures, and their effects on plasma behavior in magnetic mirror and magnetic nozzle systems.

Coffee and Cookies will be available in Phys 177 at 3:00pm for those attending the seminar.