Contribution ID: **89** Type: **Invited talk**

Positron-Electron Plasma –toward creation and study of a novel physical system using the NEPOMUC facility

Tuesday 10 December 2019 16:05 (25 minutes)

A Positron-Electron eXperiment (APEX) aims to produce magnetically confined, low temperature positron-electron plasma to test predictions that such a system with equal mass but oppositely charged species, in contrast to most laboratory and astrophysical plasma, is remarkably stable and exhibits other unique plasma characteristics. The magnetic trap will consist of a levitated superconducting coil (a=7.5 cm, I=30 kAt) that produces a dipolar magnetic field. To reach plasma conditions at a temperature of kT~5 eV, in the confinement volume of V≈15 liters, will require injection of between 10^{10} and 10^{11} positrons (and an equal number of electrons) into the trap (see talk by E.V. Stenson on plans to accumulate positrons from the NEPOMUC beam to create large pulses). In this talk, we will present results of experiments in a prototype trap that uses a supported permanent magnet (0.6 T at the pole surfaces). Positrons are successfully injected with nearly 100% efficiency into the dipole field using a combination of ExB drift, magnetic mirroring, and electrostatic reflection [1]. Once in the trap, some positrons orbits are confined for longer than 1 second, limited by transport associated with collisions with residual neutral gas molecules [2]. Plans for construction of the levitated dipole system at the NEPOMUC facility will also be presented.
[1] E. V. Stenson, et.al., Phys. Rev. Lett. 121, 235005 (2018).
[2] J. Horn-Stanja, et al., Phys. Rev. Lett. 121, 235003 (2018).

Author: STONEKING, Matthew (Max Planck Institute for Plasma Physics)

Presenter: STONEKING, Matthew (Max Planck Institute for Plasma Physics)

Session Classification: Positrons

Track Classification: Positrons