Contribution ID: **122** Type: **Talk (20 min + 5 min discussion)**

Positrons in a magnetic dipole trap: injection, confinement, and cooling

Thursday 5 December 2024 15:25 (25 minutes)

Many instabilities common to magnetized ion-electron plasmas are expected to be absent or suppressed in electron-positron "pair" plasmas. APEX (A Positron Electron eXperiment) aim to create and confine a low-energy pair plasma by combining non-neutral plasmas of electrons and positrons in a purely magnetic trap [1]. A significant challenge associated with this task is the accumulation and injection of sufficiently many positrons to obtain plasma densities. A lossless E×B-drift technique was recently adapted to inject bunches of positrons into a supported dipole trap [2]. The positron bunches were produced using a buffer-gas trap at the AIST positron facility [3]. An array of 21 gamma-ray detectors [4] was utilized to monitor annihilation events and investigate positron transport, cooling, and loss mechanisms (including Ps-formation) in the inhomogeneous magnetic field. We aim to extend this work by injecting bunches of positrons from the NEPOMUC into a levitating dipole trap [5], with the ultimate goal of producing and studying a low-energy pair plasma.

[1] Stoneking, et al. (2020), J. Plasma Phys., 86, 155860601.
[2] Deller, et al., Phys. Rev. E. (2024) 110, L023201.
[3] Higaki, et al. (2020), Appl. Phys. Express 13 066003
[4] von der Linden, et al. (2023), J. Plasma Physics, 89, 905890511.
[5] Card, et al. IEEE Trans. Appl. Supercond. (accepted) doi: 10.1109/TASC.2024.3462796

Primary author: DELLER, Adam (IPP)

Co-authors: VON DER LINDEN, Jens (IPP); NISSL, Stefan (IPP); Dr MICHISHIO, Koji (AIST); Prof. SAITOH, Haruhiko (The University of Tokyo); Prof. HIGAKI, Hiroyuki (Hiroshima University); STENSON, E. V. (IPP)

Presenter: DELLER, Adam (IPP)

Session Classification: Positrons

Track Classification: Positrons