Contribution ID: **117** Type: **Poster**

Design, construction, and commissioning of a levitated dipole trap for electron-positron pair plasma studies

Tuesday, 5 December 2023 14:00 (3 hours)

Magnetic dipole traps have demonstrated good confinement properties for both non-neutral and quasi-neutral plasmas, making this a highly suitable type of trap for the creation and study of low-temperature, long-lived electron-positron pair plasmas. To generate such a plasma, the APEX (A Positron-Electron eXperiment) Collaboration is planning to inject positrons (supplied by the reactor-based beam NEPOMUC, then collected into pulses in a buffer-gas trap) into a dipole magnetic field, which is previously loaded with a comparable population of electrons.

The “floating coil” (F coil) is a 15-cm-diameter high-temperature superconducting (HTS) closed coil, which when charged and levitated forms our dipole trap. A second HTS “charging coil” (C coil, I = 151 kAt), which is integrated into the walls of this sub-chamber, inductively charges the F coil to a strength of Baxis = 0.5 T.

By utilizing a feedback-stabilised levitation technique, magnetic field lines from the charged F coil do not intersect material surfaces (e.g. mechanical supports). The current levitation record is 3.5 hrs. The future addition of an actively cooled thermal radiation shield surrounding the trapping region will slow the resistive decay due to thermal warming, therefore increasing levitation time.

Finally, presented is results from first experiments (i.e. magnetic field line visualizations and e- injection) and next steps for making e- plasmas and later injecting cold, dense pulses of e+.

Primary author: CARD, Alexander (Max-Planck-Institut für Plasmaphysik)

Co-authors: DELLER, Adam (IPP); STENSON, E. V.; VON DER LINDEN, Jens; STONEKING, Matthew (Max Planck Institute for Plasma Physics)

Presenter: CARD, Alexander (Max-Planck-Institut für Plasmaphysik)

Session Classification: Poster Session

Track Classification: Positrons