Contribution ID: **3196** Type: **not specified**

P1.4005 Design and progress toward realization of a high Tc superconducting levitated dipole experiment for electron-positron plasma studies

Monday, 8 July 2019 14:00 (2 hours)

See the full abstract here:
http://ocs.ciemat.es/EPS2019ABS/pdf/P1.4005.pdf

Theory predicts that a magnetically confined electron-positron plasma with short Debye length will be remarkably stable and exhibit unique wave physics. The APEX (A PositronElectron eXperiment) project is progressing toward an experimental realization of such a system to test some of those predictions. In this contribution, we report on the design and progress toward realization of, what will be the world's smallest levitated dipole experiment to date. It will employ a magnetically levitated high-Tc superconducting coil with a radius of 7.5 cm and a mass of 1.6 kg. With field strengths approaching 1 T on the inboard region of the dipole, well-confined positronelectron plasma with temperatures in the range of 5 eV and densities of order 10^7 cm^-3 with short Debye lengths compared to the system size (minor radius of 5 cm) are targeted. Positrons from a reactor-based source will be accumulated in a buffer-gas trap, injected into the dipole trap in pulses where an electron plasma will be prepared in advance. Diagnostics that take advantage of 511 keV annihilation gamma rays are in the design stage. Experiments with a prototype permanent magnet trap have demonstrated successful positron injection using ExB drifts and well-confined single-particle orbits, giving us confidence that the levitated dipole experiment concept is sound.

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Session Classification: Poster P1

Track Classification: BSAP