

Injecting positrons into an electron cloud – the next step towards a confined pair plasma

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Unlike classical electron-ion plasmas, systems where the charge carriers have the same masses (i.e. pair plasmas) are still comparably unexplored experimentally. The APEX project aims to confine the world's first long-lived low-energy pair plasma, by combining positrons from the high-flux source NEPOMUC (NEutron induced POsitrone Source MUniCh) with electrons in a levitated magnetic dipole geometry. As an intermediate step, we performed experiments in a trap where the field is produced by a permanent magnet. Positrons are delivered to the trap with a guide field and injected into the dipole field using an ExB drift, induced by a pair of electrodes. In this contribution, we describe the first experiments in which positrons are injected into a dense electron cloud with a Debye length in the centimeter range and a space potential of -42V. It was found, that despite the electron space charge, lossless injection capabilities were not only preserved, but the parameter range permitting injection was extended. These results represent an important step enroute to producing a confined pair plasma in which we plan to produce a target electron plasma in a superconducting levitated dipole trap into which positron pulses will be injected.