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A buffer-gas trap for the NEPOMUC high-intensity low-energy positron beam

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The APEX collaboration aims to produce a neutral pair plasma, comprised of equal quantities of electrons and positrons, confined by the magnetic field of a levitated dipole. More than 10^{10} positrons are needed to achieve a short-Debye-length plasma with a volume of 10 litres and a temperature of ~ 1 -eV, which necessitates new advances in positron accumulation. Buffer-gas positron traps have dramatically extended the scope for atomic and non-neutral plasma physics experiments involving antimatter. In these devices, a continuous beam of positrons enters a Penning-Malmberg trap, wherein inelastic collisions with low-density molecular gases promote the efficient capture of the antiparticles. We present our plans for the installation of a buffer-gas trap at the NEPOMUC neutron-induced positron source in Munich. Beyond the pair plasma experiments, an intense trap-based positron beam will also facilitate new applications, for example, the background-free measurement of positron-annihilation-induced Auger-electron spectra.

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