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A buffer-gas trap for the NEPOMUC positron beam

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Buffer-gas traps (BGT) can efficiently accumulate positrons from a continuous source into a dense, low-energy nonneutral plasma. Inelastic collisions between positrons and nitrogen molecules promote capture of the former in the electric potential minimum created by a series of cylindrical electrodes in a uniform magnetic field. Usually, the positron source is a neon-moderated radioisotope of sodium. Here, we describe our plans to install a BGT at the NEPOMUC positron facility. Neutron-induced pair production and tungsten remoderation deliver a mono-energetic beam of $\sim 10^8 \sim e^+/\text{s}$ (i.e., ten times more intense than a typical moderated β^+ beam). The BGT will accumulate hundreds of millions of positrons from the NEPOMUC beam every 30~s. Together with a high-field multi-cell trap, the BGT will be a crucial component of the APEX low-energy electron-positron pair plasma experiment. The trap-based pulsed positron beam will extend the capabilities of the NEPOMUC and will facilitate a range of new applications, including (almost) background-free positron-annihilation-induced Auger-electron spectroscopy.

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