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Generation of high-density positron pulses at NEPOMUC for production of an electron-positron plasma

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A pair plasma produced of electrons and positrons will enable novel studies of many facets of fundamental plasma physics, in addition to being of great astrophysical relevance. The main bottleneck in producing this exotic system in a laboratory is the command over a sufficient number of positrons. We are therefore using the NEPOMUC positron beam line at FRM II for our project. For our plasma experiments, the beam is injected into a toroidal magnetic confinement volume where it will be mixed with electrons. The general layout of this experiment, and an update about its status will be presented.

In order to provide a sufficiently high positron flux to our experiment, we have engaged in a series of systematic studies of the NEPOMUC beam properties, results of which will be detailed. We have succeeded in guiding the primary beam (which has a higher intensity than the commonly used remoderated beam) to the open beam port and further injecting it into our plasma device. We expect to achieve further substantial improvement by temporally bunching the positron flux. Towards this end, we will install at NEPOMUC a buffer gas trap, which can store up to 10^8 positrons and deliver them within 10^{-7} seconds to an experiment. We expect that this will enable a number of novel experiments in diverse areas of positron physics.

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