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The LSym experiment: a CPT symmetry test in the leptonic sector

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The LSym experiment is a new cryogenic Penning trap experiment currently being designed at the Max-Planck-Institut für Kernphysik of Heidelberg. The goal of LSym is to conduct a stringent CPT test by comparing the properties of matter and antimatter with unprecedented sensitivity by trapping simultaneously one electron and one positron in a Penning trap, which allows performing a *decoherence-free* measurement. This project will present a few challenges, for instance the optimisation of positron production and accumulation, given a rather weak radioactive ^{22}Na source (about 15 MBq).

The positrons from the β^+ decay of ^{22}Na have to be moderated to become trappable. Here, following [1], we utilize a tungsten foil to produce positronium in a high Rydberg state, which can be field-ionised inside the Penning trap. The trapped positrons are then cooled to the motional ground state in a deep-cryogenic microwave cavity trap operated at about 300mK. This presentation illustrates the principles and techniques that will be used at LSym.

[1] S Fogwell Hoogerheide et al. “High efficiency positron accumulation for high-precision magnetic moment experiments”. In: *Review of Scientific Instruments* 86.5 (2015)

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