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Testing CPT with the Lepton Symmetry Experiment LSym

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One of the most striking mysteries in our visible universe is the origin of the large asymmetry between matter and antimatter which our standard model, despite the observed charge-parity (CP) violation, seems to be unable to explain. At MPIK we are currently developing the Lepton Symmetry (LSym) experiment. There, we will store a single positron and an electron in a deep-cryogenic Penning trap. Our double-trap system allows determining the spin states of both particles non-destructively and unambiguously in a magnetic bottle, while the extremely homogeneous magnetic field in our so-called cavity trap supports unperturbed precision measurements. After cooling to the ground state of motion, we compare the g-factor, mass and charge with orders of magnitude higher precision than previously possible in order to probe matter-antimatter (charge-parity-time, CPT) symmetry.

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