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Search for a permanent electric dipole moment of 129Xe

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A permanent electric dipole moment (EDM) of the isotope 129Xe would imply a breakdown of both parity P and time reversal symmetry T and, through the CPT theorem, a breakdown in CP, the combined symmetries of charge conjugation C and parity P. Our goal is to improve the present experimental limit (dXe < 3 ·10−27 ecm) by about three orders of magnitude. The most precise EDM limit on diamagnetic atoms was measured on 199Hg (dHg < 7·10−30 ecm). To get more stringent limits, we perform a 3He/129Xe clock comparison experiment with the detection of free spin precession of gaseous, nuclear polarized 3He or 129Xe samples with a SQUID as magnetic flux detector. The precession of co-located 3He/129Xe nuclear spins are used as an ultra-sensitive probe for non-magnetic spin interactions of type $\Delta\nu \sim$ dXe ·E. With our experimental setup at the Jülich research center we are able to observe spin coherence times of about 1 day for both species. We report on first experimental results achieved within the MIXed-collaboration.

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