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New Limit on Lorentz-Invariance- and CPT-Violating Neutron Spin Interactions Using a Free-Spin-Precession 3He-129Xe Comagnetometer

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We performed a search for a Lorentz-invariance- and CPT-violating coupling of the 3He and 129Xe nuclear spins (each largely determined by a valence neutron) to posited background tensor fields that permeate the Universe. Our experimental approach is to measure the free precession of nuclear spin polarized 3He and 129Xe atoms in a homogeneous magnetic guiding field of about 400 nT using LTC SQUIDs as low-noise magnetic flux detectors. As the laboratory reference frame rotates with respect to distant stars, we look for a sidereal modulation of the Larmor frequencies of the co-located spin samples. As a result we obtain an upper limit on the equatorial component of the background field interacting with the spin of the bound neutron bn< 8.4 * 10^-34 GeV (68% C.L.). Our result improves our previous limit by a factor of 30 and the world's best limit by a factor of 4. In the talk we will give an overview of the principle of measurement, data evaluation and results.
Finally, estimations based on current data regarding the sensitivity of future measurements testing CP symmetry (Xe-EDM) will be presented.

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