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New limits on spin-dependent Lorentz and CPT-violating interactions

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Violation of Lorentz symmetry naturally arises in many extensions of the Standard Model aiming to include quantum gravity. One of the recurring features of such models is a coupling to particle spins violating local Lorentz invariance. I will describe new constraints placed on such coupling for neutrons using a K-^{3}He co-magnetometer. The co-magnetometer measures the difference between spin interactions of electrons and ^{3}He nuclei, effectively eliminating the effects of ordinary magnetic fields. By rotating the co-magnetometer apparatus every 20 sec relative to a preferred frame we are also able to eliminate long term drifts and gyroscopic signal due to Earth rotation. We place limits on neutron interaction energy with a background Lorentz-violating field below 10^{-32} GeV, which represents the most sensitive test of Lorentz and CPT symmetry for fermions, improving previous limits by more than an order of magnitude.