Abstract Submitted
for the APR13 Meeting of
The American Physical Society

Testing Lorentz invariance in β decay HANS WILSCHUT, AUKE SYTEMA, ELWIN DIJCK, STEVEN HOEKSTRA, KLAUS JUNGMANN, STEFAN MÜLLER, GERCO ONDERWATER, COEN PIJPKER, LORENZ WILLMANN, JACOB NOORDMANS, ROB TIMMERMANS, Rijksuniversiteit Groningen — In theories aiming to unify the Standard Model with gravity, Lorentz invariance may be broken. Although Lorentz symmetry appears to hold well, few experiments have been performed that consider its violation in the weak interaction.We have started a theoretical and experimental research program to this effect. In particular we consider a Lorentz violating correction of the W-boson propagator, characterized by a tensor. With this Standard Model Extension the β-decay rate will depend, for example, on the spin direction of the parent nucleus and the emission direction of the β and ν particles. Specifically, we consider allowed Fermi and Gamow-Teller transitions and explore the spin degrees of freedom in the latter. Experimentally we exploit the Gamow-Teller transition of polarized ^{20}Na, by which we can test the dependence of the β-decay rate on the spin orientation of ^{20}Na. A change in the γ rate when reversing the spin is an indication of Lorentz invariance violation. In addition the decay rate should depend on sidereal time and the polarization direction relative to the earth rotation axis. The method of the measurement will be presented, together with the first results.

Klaus Jungmann
Rijksuniversiteit Groningen

Date submitted: 09 Jan 2013 Electronic form version 1.4