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Search for a bosonic component in the neutrino wavefunction
W. TORNOW, J.H. ESTERLINE, M.F. KIDD, TUNL, Duke University, A.S. BARABASH, V.I. UMATOV, ITEP — It has been argued by Dolgov and Smirnov [1] that neutrinos may obey a more general symmetry which consists of Fermi-Dirac and Bose-Einstein components. The violation of the Pauli exclusion principle for neutrinos would allow for a Bose condensate of neutrinos, which in turn could explain parts or all of the dark matter in the universe. A violation of the spin-statistics relation for neutrinos must show up in reactions with two neutrinos or two antineutrinos. Thus, two-neutrino double-beta decay is a prime candidate. The "wrong" neutrino statistics not only modifies the energy and angular distributions of the emitted electron, but it also strongly affects the $2\nu\beta\beta$ decay rates to excited states in daughter nuclei [2]. Here we focus on $2\nu\beta\beta$ data of ^{100}Mo to excited states in ^{100}Ru to set bounds on an assumed bosonic component to neutrino statistics. According to [2] the half-life ratio for transitions to the 1st excited 0^+_1 and the 0^+_{gs} ground state is 61 for pure fermionic and 73 for pure bosonic antineutrinos. Using our data for the 0^+_1 transition and the NEMO-3 results for the 0^+_{gs} transition we obtain for this ratio the value 77^{+25}_{-16}. Transitions to excited 2^+ states are about a factor of 100 more sensitive to the assumed neutrino statistics. Searches for such transitions in ^{100}Ru are currently underway. [1] A.D. Dolgov and A.Yu. Smirnov, Phys. Lett. B 621 (2005) 1. [2] A.S. Barabash et al., Nucl. Phys. B 783 (2007) 90.

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