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Generation of directed neutrino beams through electron capture β-decay and recoil force measurement using atomic force microscopy CHRISTINA DEANGELIS, LORCAN M. FOLAN, VLADIMIR I. TSIFRINOVICH, Polytechnic Institute of NYU, Brooklyn, NY 11201, NYU POLY PHYSICS DEPARTMENT TEAM — Neutrino beam generation and detection methods are important for the understanding of weak interactions and possible future applications in communication systems. In this work we suggest a beam generation method which exploits Gamow Teller transitions in electron capture β-decay with a decrease of the nuclear spin by one unit. In the simplest case, nuclei are assumed to be totally spin polarized by a magnetic field along the z-axis. To conserve the z-component of angular momentum, the spins of the remaining electron shell and neutrino must compensate for the decrease of the nuclear spin, and because of the negative helicity, all neutrinos must be emitted in the same direction along the z axis. In the general case of partial polarization, the occupation probabilities for each value of the z-component of the nuclear spin are calculated and the branching fractions for each value are determined. The neutrino excess in one direction is computed. Calculations are done for samples of ^{57}Co and ^{119}Sb. We show that atomic force microscopy is a possible method for measuring the recoil force on the sample. The AFM cantilever tip can be replaced with a radioactive sample, and acceptable sample masses are shown to be comparable with typical tip masses.

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