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Neutrino Mass Measurement Using a Directed Mono-Energetic Beam VLADIMIR TSIFRINOVICH, LORCAN FOLAN, NYU Polytechnic School of Engineering — It was shown [1] that a directed mono-energetic neutrino beam can be generated by electron capture beta-decay in a sample with a strong hyperfine field at the radioactive nuclei. We study the conditions required to measure the neutrino rest mass using the recoil force produced by a directed neutrino beam. We consider the displacement of an atomic force microscope cantilever due to such a recoil force. We find the change in the cantilever displacement associated with the non-zero neutrino mass, as a function of nuclear half-life $T_{1/2}$, cantilever spring constant, and temperature. We consider the opportunity to increase the sensitivity of the neutrino mass measurement using averaging of the measurement signal. We show that the optimal time for the signal accumulation is, approximately, $1.8T_{1/2}$. We compute the optimal signal-to-noise ratio for ^{119}Sb nuclei decaying to ^{119}Sn with a decrease in the nuclear spin from $I = 5/2$ to $I = 3/2$, and $T_{1/2} = 38.2$ hours. Finally, we present the parameters values required for detection of sub-eV neutrino rest mass, and estimate the angular distribution of neutrino radiation as a function of temperature.

[1] C. DeAngelis et al., Phys. Rev. C86, 034615 (2012).

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