Abstract Submitted
for the APR12 Meeting of
The American Physical Society

Directed Neutrino Beam with Electron Capture Beta Decay
VLADIMIR TSIFRINOVICH, LORCAN FOLAN, CHRISTINA DEANGELIS, Department of Applied Physics, Polytechnic Institute of NYU — We suggest generation of directed neutrino beams using electron capture beta decay sources. The basic idea is the following. Consider a Gamov-Teller transition with a decrease of nuclear spin I of one unit: $I \rightarrow I - 1$. Assume that the nuclear spins are highly polarized by a magnetic field at low temperature. In this case the z-component of the total angular momentum before decay is $F_z = I$. The electron capture beta decay produces an unpaired electron with spin $S = \frac{1}{2}$ and a neutrino with spin $V = \frac{1}{2}$. From conservation of the z-component of the angular momentum we obtain after the decay $I_z = I - 1, S_z = \frac{1}{2}, V_z = \frac{1}{1}$. From the helicity requirement, the emitted neutrino momentum is opposite to the direction of its spin. Thus, the considered source generates a directed neutrino beam propagating in the negative z-direction. We show an opportunity for experimental detection of the average recoil force produced by the neutrino emission with a conventional technique of atomic force microscopy.

Vladimir Tsifrinovich
Department of Applied Physics, Polytechnic Institute of NYU

Date submitted: 06 Jan 2012 Electronic form version 1.4