Beta Neutrino Correlation and T-Violation Experiment in Nuclear Beta Decay

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Construction of new facilities producing stopped or slow radioactive nuclei at RIKEN-RIBF and KEK-TRIAC are going to be completed soon. Our project is aiming to utilize these new devices for a precision test of weak interactions. Production of very slow RI in vacuum as supersonic gas jet makes us possible to detect low energy beta-recoil nuclei. At RIKEN, a great deal of effort has been put into producing such slow RI atomic beam from secondary RI beam produced by projectile fragmentation reactions, using noble gas catcher and electric transporting system. Two facilities of SlowRI and RIABR are under construction now.

By detecting the beta-recoil nuclei, neutrino momentum can be determined as missing momentum when electron momentum is measured. By constructing a planer drift chamber as the electron tracking detector, we are trying to determine the decay vertex position, and to measure beta-neutrino angular correlation parameter *a*, defined as, $W \propto 1 + a\frac{\vec{p}_e \cdot \vec{p}_\nu}{E_e E_\nu} + R\vec{\sigma}_e \cdot \frac{\langle \vec{J}_I \rangle}{J_I} \times \frac{\vec{p}_e}{E_e} + \cdots$, without using ion traps. For *a* depends on nuclear transition matrix elements, measurement of F/GT ratio of nuclei far from stability, assuming standard V-A interaction will be performed at first. Finally, testing the standard weak interaction using pure F/GT transition will be challenged.

In addition, recently we start a new project measuring T-violating electron transverse polarization *R* from stopped polarized radioactive nuclei. Secondary RI beam polarization via fragmentation reaction is widely used as a standard polarization method at RIKEN to measure magnetic moment of unstable nuclei using beta-NMR. Also at TRIAC, recently low energy 8Li beam has been successfully polarized by tilted foil method. To overcome the relatively small polarization and production rate, an electron polarimeter with very high sensitivity is required. We have developed an electron polarimeter using Mott scattering asymmetry using drift chamber, in order to achieve enough acceptance and detection efficiency for the "V-track" of scattering electron by a thin metal foil set inside the polarimeter. At the conference, construction status of the slow RI facilities, detector R&D, Mott polarimetry, preliminary results of test experiments and Monte-Carlo simulation results on physics sensitivities will be presented.

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