





Rikkyo Univ. / RIKEN Jiro Murata

Introduction of our Early Stage Beta Decay Activity at RIKEN

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Radioactive Beam Production at RIKEN - RARF - RIBF





2994

Cold RI Atomic Beam System



Systematic Free Beta Decay Observation in widespread nuclear chart area





qq'q'

Daughter Nucleus (Recoil Ion)

Parent Nucleus

inpc

2 - 4

q q' a



Physics of Beta Decay in Free Space

RIBF can contribute on the Vud Issue: Lifetime , BR, Mass Measurements Heavy Pure Fermi Emitters 62Ga : 10^8 pps 74Rb : 10^6 pps for Coulomb Correction Evaluation etc.

HOWEVER,

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Cold RI Beam Availability -> Free Beta Decay Experiment Measuring Recoil Ions (in future, Ion Guide + Ion Traps)

Beta – Neutrino Correlation(widespread measurement)Scalar or Tensor InteractionPure F, GT TransitionLeft – Right Symmetry ModelF/GT mixed TransitionF/GT mixing ratio measurement for many nuclei

All the beta-neutrino experiments are using Traps measuring Recoil Energy Spectrum

We Need Other More Sensible Observations

Direct Recoil – Beta Coincident Measurement is not difficult (Large free space) Acceptance for Recoil – Beta is not small (back to back corr.) High sensitivity by complete kinematics Difficulty : Source Volume (Vertex) Ambiguity Restriction in lifetime ~1sec

> Parallel Atomic Beam & Beta-ray Tracking Vertex Position Determination







1st step Experimental Setup for a measurement







Vertex Determination and Systematic Error











Correlations









Simulation Results on Physics Sensitivity





R&D Status









- Construction of the RIKEN-RIBF is well in progress
- Stopped Cold RI beam facility is under construction mainly for g-factor measurements of unstable nuclei far from stability.
- Gas Catcher system succeeded to extract RI at 10[^]-3 efficiency
- Simulation Results show that the Cold RI Beam facility has potential to contribute on beta decay measurement considering statistics and systematics.
- We set direct beta-neutrino correlation measurement as our first trial, also, TOF Recoil energy spectra can be obtained at the same time as independent observable.
- Although we started this project just recently, Detector Buildings for the first step beta neutrino correlation measurement is almost finished
- We can perform the first test experiment soon at RARF, before waiting for RIBF
 aiming practice and one percent level measurement
- Time reversal violation experiments for D-parameter measurement are also in our scope after completing the atomic beam magnetic resonance system.
- Today we report the project as future project, so we hope to report our experimental results at the next INPC conference.

