E441

PROPOSAL FOR EXPERIMENT AT RCNP

Jul. 10, 2014

TITLE: The (^{6}Li, ^{6}Li$'$[3.56 MeV]) reaction as a novel probe for studying the inelastic neutrino-nucleus response in astrophysical scenarios

SPOKESPERSON:

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EXPERIMENTAL GROUP:

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CAGRA Collaboration

RUNNING TIME:

Tuning	1 day
Data runs	6 days
Total	7 days

BEAM LINE:

Ring: WS course

BEAM REQUIREMENTS:

Type of particle	$^{6}\mathrm{Li}^{3+}$
Beam energy	$100\,\mathrm{MeV}/u$
Beam intensity	≥ 1 pnA

BUDGET:

Local expense	150,000 JPY

SAFETY CONTROLLED ITEMS:

N/A

RCNP EXPERIMENT E

TITLE: The (^{6}Li, ^{6}Li$'$[3.56 MeV]) reaction as a novel probe for studying the inelastic neutrino-nucleus response in astrophysical scenarios

SPOKESPERSONS: Shumpei Noji & Remco G. T. Zegers

SUMMARY OF THE PROPOSAL

We propose to perform a (^{6}Li, ^{6}Li$'[T = 1, T_z = 0, J^\pi = 0^+, 3.56\,\mathrm{MeV}]$) measurement on ^{12}C, ^{24}Mg, ^{56}Fe, ^{93}Nb, and ^{124}Sn target nuclei at 100 MeV/u with the Grand Raiden spectrometer at 0°, wherein we aim at measuring the pure spin- and isospin-flip excitations in the inelastic channel ($\Delta S = 1, \Delta T = 1, \Delta T_z = 0$). We will identify the reaction channel by tagging the de-excitation γ rays with $E_\gamma = 3.56$ MeV from the ^{6}Li$'$ ejectile with the CAGRA array. This reaction is a unique probe which is most suited to exclusively extract GT_0 strength, namely transitions with the aforementioned spin and isospin changes. The transition strengths [$B(\mathrm{GT}_0)$] are directly connected to the inelastic neutrino-nucleus scattering cross sections, which are related to, for example, nucleosynthesis (r- and ν-processes), SN (supernova) neutrino detection, SN evolution and modeling.

A similar proposal was previously submitted but suspended under experimental number E441. In this updated version, we investigate the efficacy of supplementing the CAGRA array with ten $LaBr_3$ detectors for increased γ-ray detection efficiency.