RCNP EXPERIMENT E164

Proposal of Experiment at RCNP using WS course and Grand Raiden

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High Resolution Study of Spin Dipole Excitation in ^{16}F via the (^{3}He,t) Reaction at 135 MeV/u

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1 Summary of Experiemnt :

• Proposed experiment:

Of the many spin isovector resonances empirically studied via charge exchange reactions such as the spin monopole (Gamow-Teller), spin dipole and spin quadrupole, there is one resonance for which we still don't have a good empirical angular distribution shape, the $\Delta L = 1$, $\Delta S = 1$, $\Delta J = 0^-$ spin dipole transition known in beta decay as a unique first forbidden decay. We propose to measure the angular distribution of the ^{16}O(^{3}He,t)^{16}F reaction leading to the 0^-, g.s. at 405 MeV incident energy in the scattering angle range from 0° to 18° corresponding to a momentum transfer of q = 0.14 - 2.0 fm^{-1}.

The 0^- ground state, the 1^-, $E_x = 0.193$ MeV and the 2^-, $E_x = 0.420$ MeV excited states in ^{16}F are formaing a triplet. In order to get a reliable angular distribution, these states should be separated. A high resolution of about 50 keV will be seeked in the measurements at the spectrometer Grand Raiden. The recently commissioned WS course will be used to realize dispersion and angular dispersion matching conditions for the high resolution as well as high angle resolutions.

• Targets: In the dispersive beam transportation, a beam will spread widely at the target. Because of the low density of the beam, Mylar target can probably be use. We also think of using Li oxide. In order to maintain energy resolution $\leq$ 50 keV, target thickness will be $\leq$ 2 mg/cm^2.

• Apparatus and Beam Properties:

Spectrometer Grand Raiden and the standard VDC focal plane detector system will be used for the detection of outgoing tritons. We request $\approx$ 2 nA of good quality single-turn extracted ^{3}He beam. In order to realize various matching conditions, the WS course will be fully utilized. More information on matching conditions including dispersion matching, angular dispersion matching and focus matching will also be accumulated through the experiences in the experiments.

• Beam time request:

The total beam time consists of two sets of following package; a) one day for beam preparation and basic study on matching conditions, b) 3 days measurement + 0.5 day retuning of beam property. In total 2 days development beam time and 7 days measurement beam time.

• Budget request:

for the preparation of targets: 0.2 Million yen.
for the travel expense: 0.5 Million yen.