E389

RCNP EXPERIMENT E

PROPOSAL FOR EXPERIMENT AT RCNP

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TITLE:

Test experiments for the measurement of the γ ray branching ratios of the first 3^- state in ^{12}C

SPOKESPERSON:

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EXPERIMENTAL GROUP:

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H. Yamaguchi	CNS, Univ. of Tokyo, Japan	Lecturer
T. Yamamoto	RCNP, Osaka Univ., Japan	M1

RUNNING TIME: Installation time without beam — 7 days
Data runs — 4 days

BEAM LINE: Ring : WS course, AVF: WS course

BEAM REQUIREMENTS:

Type of particle	^{4} He^{2+}
Beam energy	200 MeV, 65 MeV
Beam intensity	50 pnA, 75 pnA
Energy resolution	$\leq$ 300 keV

BUDGET: Experimental expenses — 1300,000 yen
Travel plans - 7 participants should be support by RCNP

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SUMMARY OF THE PROPOSAL

We propose test experiments for the measurement of the γ - ray branching ratios of the first 3^- state in ^{12}C.
Triple - α reaction play important role to produce ^{12}C at around 10^8 K in helium burning stars. Since there is the second 0^+ state of ^{12}C at 7.65 MeV above its ground state, this reaction successfully describes the present abundance of ^{12}C.
However, the formation process of ^{12}C in a higher temperature condition at around 10^9 K which is reached in supernova explosion is not clear yet. Although several excited states above the Hoyle state were reported by several experiments, γ - decay widths of these states are not cleared.
Especially, the first 3^- state can make a strong contribution to a formation of ^{12}C at 10^9 K. However γ decay width is poorly known. We try to measure the γ ray branching ratio using a γ ray detector and a spectrograph in RCNP.
One of difficulty of the experiment is a large background suppression under a high intensity beam condition. However, the complete numerical estimation of the background is too difficult. In addition, if there are high rate backgrounds, a pileup phenomenon occurs. In order to analyze a pileup event, a pulse shape analysis method is used. Investigation is needed before the main experiment to confirm a background suppression and the pulse shape analysis method.
The purposes of the test experiments are the measurement of the background condition and test of a new DAQ system for the pulse shape analysis.
This test experiment is the first step of rare decay measurements at RCNP cyclotron facility.