PROPOSAL FOR EXPERIMENT AT RCNP

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TITLE:
Charged particle decay from analog of excited alpha-cluster state in $^6,^7\text{He}$
(Update proposal of E164)

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RUNNING TIME:
Test running time for experiment not including beam preparation 5 days

BEAM LINE:
WS-course, Grand RAIDEN

BEAN REQUIREMENTS:
Type of particle $^7\text{Li}^{3+}$
Beam energy 65 AMeV
Beam intensity $\sim 6 \text{nA or more}$
Other requirements Energy resolution $\sim 400 \text{keV}$
Beam must be halo-free
Energy stability over experimental run is required

BUDGET: Travel plans 9 participants should be supported by RCNP
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(Updated proposal of E164)

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SUMMARY OF THE PROPOSAL

In order to investigate the cluster structure of $^{6}\text{He}$ we studied a charged particle decay from highly excited energy region of $^{6}\text{He}$ populated via the ($^{7}\text{Li}$, $^{7}\text{Be}$) reaction in the E164 experiment. We found a binary triton decay from a resonance at $E_x \approx 18$ MeV, which suggests a di-triton cluster structure of this resonance. We also investigated, a charged particle decay from the resonance at $E_x = 25$ MeV which was very recently reported by Nakayama et al. to be an analogue of an $\alpha$ cluster excitation in a nucleus. However, due to small energies of the decaying particles (less than 3 MeV) and due to high threshold discrimination level for Si - SSD detector we could not clearly identify the decaying particles from the 25 MeV resonance.

In this proposal, we focus our attention to a re-measurement of the charged particle decay from the analog of $\alpha$ cluster excitation at $E_x = 25$ MeV in $^{6}\text{He}$ and a new measurement of $^{7}\text{He}$. The decaying charged particles are detected by Si-SSD's located at a distance about 30 cm from a target. Particle identification is performed by using a time of flight method. This method was well established in our E172 experiment. Thus, we aim to clarify the decay mode of the analog of $\alpha$ cluster excitation.