Contribution ID: **67** Type: **Poster contribution**

Development of thin scintillation counter with MPPCs for low-energy nuclear reactions

Tuesday, 21 October 2025 19:04 (1 minute)

Proton-neutron pair correlations in neutron-rich nuclei is one of the attractive topics relating to the structure and dynamics in largely-different-scale nucleon many body systems, nuclei and neutron stars. To investigate such correlations, we are aiming for extracting isoscalar and isovector proton-neutron transfer strengths in neutron-rich nuclei via the proton-neutron transfer reactions such as (^{4}He,^{6}Li), (^{2}H,^{4}He) at a low incident energy around 25-MeV/nucleon at forward angle using magnetic spectrograph such as Grand Raiden or Large Acceptance Spectrometer at RCNP. The scattered particles are measured with multi-wire drift chambers (VDC) and plastic scintillators located in the air. However, they are of low momentum, requiring a small material budget for the particle identification. Presently, the outgoing ^{6}Li particles stop in the first layer of the plastic scintillator and then the charge information from the VDC is required for the particle identification. Although this works, the operation voltage of the VDC should be carefully tuned. For easy and efficient particle identification, a smaller material budget is required. In addition, the magnetic rigidity of inelastically scattered beam particles is very close to that of the outgoing particles of interest, resulting in very high-rate particles at the focal plane. Therefore, a new scintillation detector is needed with low material content that can withstand the injection of low-energy particles at a rate of over one million per second. To cover the large area at the focal plane of the spectrograph, for example 1000×250~mm^2 without the dead space, a large thin monolithic scintillation detector is required. In order to reduce the crosstalk among the photon sensors, many multi-pixel photon counters (MPPCs) will be placed on the longer side of the detector. The position of the MPPCs should be optimized from the viewpoint of the charge resolution, time resolution, multihit discrimination capability and position resolution.
In this talk, the planned detector setup for the proton-neutron pair transfer reaction measurement and the details of the scintillation detector are introduced and the optimization of the MPPCs by using the Monte Carlo simulation will be discussed.

Email address

nishi03s@rcnp.osaka-u.ac.jp

Supervisor's Name

Shinsuke Ota

Supervisor's email

ota@rcnp.osaka-u.ac.jp

Funding Agency

Classification

Primary author: NISHIOKA, Sho (Department of Physics, the University of Osaka)

Co-authors: Mr TAMII, Atushi (Department of Physics, the University of Osaka); Mr ISHII, Daichi (Department of Physics, Kyoto University); Mr FURUKAWA, Fumiya (Research Center for Nuclear Physics, the University of Osaka); TANAKA, Junki (Department of Physics, the University of Osaka); DOZONO, Masanori (Department of Physics, Kyoto University); Ms MAEDA, Naho (the University of Osaka); Prof. SHINSUKE, Ota (Research Center for Nuclear Physics, the University of Osaka)

Presenter: NISHIOKA, Sho (Department of Physics, the University of Osaka)

Session Classification: Poster Session

Track Classification: Ion optics and spectrometers