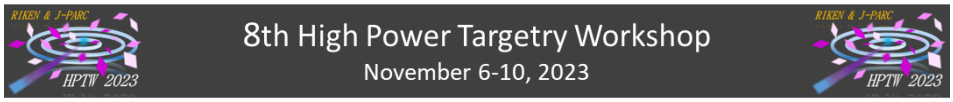

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Experimental study of nuclide production cross sections via the ^{nat}Pb(p,X) reaction with GeV-energy proton incidence

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A variety of research and development related to Accelerator-Driven System (ADS) [1] are in progress spearheaded by Japan Atomic Energy Agency. At the proposed ADS facilities, a high-intensity and high-energy proton beam is supplied to a Lead-Bismuth Eutectic (LBE) alloy target. The neutrons generated by the reactions between incident protons and nuclei of Pb and Bi contained in LBE triggered the transmutation of minor actinides into non-radioactive isotopes or radioactive isotopes with shorter half-lives.
Estimation of residual γ-ray dose rate is important from the viewpoint of radiation safety, as with other accelerator facilities. A nuclide production cross section is key information to evaluate the residual γ-ray dose rate. The activation of the LBE alloy is crucial in ADS facilities. Here, we focus on ^{nat}Pb, which is one of the constituents of LBE. There are some previous studies to measure the nuclide production cross sections via the ^{nat}Pb(p,X) reaction[2,3]. However, the total uncertainty of the preceding studies is rather large, which is mainly attributed to the uncertainty of the monitor reactions, such as the ^{27}Al(p,X)^{7}Be reaction. Thus, further experimental data with as small uncertainty as possible is desired.
To satisfy the demand, a research program was launched at Japan Proton Accelerator Research Complex (J-PARC). The advantage of J-PARC is that the proton intensity can be obtained with smaller uncertainty, due to a high-precision current transformer with an uncertainty of 2% (1σ). We successfully acquired the nuclide production cross sections between primary protons and elements of ^{27}Al, ^{55}Mn, ^{nat}Fe, ^{59}Co, ^{nat}Ni, ^{nat}Zr, and ^{209}Bi [4-8], which are applied to the accelerator components, proton beam window, and neutron-production target at the ADS facilities, with smaller uncertainties compared with previous studies. Thus, we performed a new experiment for the ^{nat}Pb(p,X) reaction. In the poster, we present the measurement and measured excitation functions. In addition, comparison among the present data, results of nuclear reaction models, and evaluated nuclear data libraries are also reported.

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Themes for the contribution

5 Target facility challenges:

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