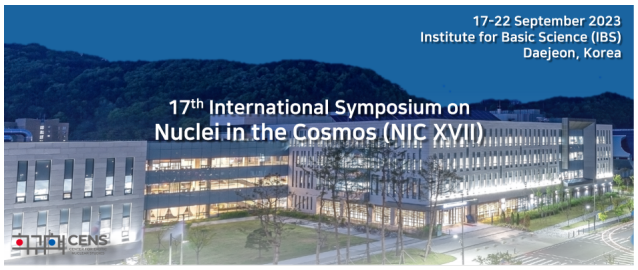

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Mass measurements of neutron-rich nuclei along the r-process path using Bρ-TOF method

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The sensitivity studies of r-process nucleosynthesis performed in recent years [1-3] have pointed out that nuclear masses are of fundamental importance in r-process modeling. The results indicate that independently of the mass models and astrophysical scenarios used, the most sensitive mass regions are along and near the r-process path, particularly around N=50 and N=82 closed shells. Consequently, in our approved experiment with 6.5-days of beam time, we plan to utilize the time-of-flight (TOF) technique at FRIB to measure the masses of 24 neutron-rich nuclei on and around the r-process path beyond the closed shell of N=50 for the first time. Furthermore, the precision of four mass values will be improved. New mass measurements of these neutron-rich nuclei will play a crucial role to understand better the first r-process abundance peak.
The experimental setup includes a 70-m flight path between the ARIS fragment separator and the S800 spectrograph. The TOF will be measured using fast-timing scintillators located at the focal planes of ARIS and S800. The relative measurement of magnetic rigidity, Bρ, will be obtained via position measurement using a microchannel plate detector (MCP) located at the target position of S800. Moreover, we developed a position-sensitive large-area MCP detector system that consists of two MCPs with 120 mm active diameter and delay-line anode [4]. This detector system has the potential to improve the resolution of the Bρ measurement, which is one of the factors currently limiting the mass resolution of the experimental setup.
In this talk, the physics motivation of our measurement, as well as an overview of the experimental setup will be presented. Additionally, we will report the properties and characteristics of the newly developed MCP detector system and future updates.

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