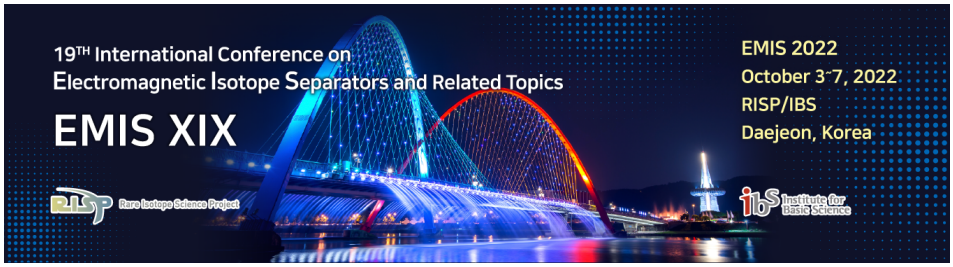

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Construction of the Multi-reflection time-of-flight mass spectrograph (MRTOF-MS) at RAON

Tuesday, 4 October 2022 21:12 (8 minutes)

The MRTOF-MS, which is allowed for the high precision (nuclear) mass measurement as one of the experimental devices of Rare isotope Accelerator complex for ON-line experiment (RAON), has been recently installed in the very-low energy experimental beamline of RAON. It will be utilized to measure the masses of the short-lived isotopes which are produced via proton-induced reactions at the ISOL ion source.
Based on the design of the MRTOF-MS at KISS (KEK Isotope Separation System) built in 2018, it was constructed in 2020, off-line commissioned on the next year, and will receive rare isotopes from the ISOL ion source at the end of 2022.
It mainly consists of gas cell cooler-and-buncher (GCCB) to cool down the incident ions of less than 60 keV with helium buffer gas and manipulate the delivered ions - bunching and minimizing the emittance, and mass analyzer which receives ion bunches provided by the GCCB and makes multiple reflections of the ion bunch by using the electrostatic mirror potentials. Therefore, it allows for high mass resolving power due to the extension of the flight length or much longer TOF.
During the off-line commissioning using thermal ion sources such as Cs and Rb, all subsystems have got optimized, from which all necessary parameters of the RF carpet system for the efficient ion extraction from the gas cell were obtained and those of the ion guide and the RFQ trap system as well.
For the mass resolving power of our request, i.e., Rm ~ 100,000, all related parameters, in particular the voltages of MRTOF mirror electrodes were carefully tuned, and as a preliminary result Rm ~ 98,000 at 300 laps (equally TOF ~ 6 ms) has been achieved.
We will perform online beam commissions using low-current beams provided by the ISOL ion source (133Cs and 23Na) to obtain the specification of the MRTOF-MS under actual experimental circumstances.
In this contribution, the results of the off- and online optimization efforts of the MRTOF-MS system will be presented.

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