FIRST ONLINE MASS MEASUREMENTS OF ISOBAR CHAINS VIA MRTOF-MS: TOWARD DIRECT IDENTIFICATION OF SHE

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Using a multi-reflection time-of-flight mass spectrograph (MRTOF-MS) located after a cryogenic gas cell coupled with the new gas-filled recoil ion separator GARIS-II, the masses of several heavy nuclei have been directly and precisely measured. The nuclei were produced via fusion-evaporation reactions, e.g. ^{40}Ar(^{169}Tm, 4n)^{205}Fr, and separated via GARIS-II before being stopped in the helium-filled gas cell. High-energy ions entering the gas cell were converted to a low-energy ion beam, with a combined stopping and extraction efficiency of more than 30% at room temperature. The low-energy ions were then transported a few meters to an experimental room where time-of-flight measurements were performed by MRTOF-MS. Time-of-flight spectra for isobar chains, e.g. ^{205}Fr-^{205}Rn-^{205}At-^{205}Po, were observed spectrographically and precision atomic mass values were determined for several isotopes. Identifications of some isotopes were made with less than 10 detected ions, representing a first step toward the use of mass spectrometry to identify exceedingly low-yield species such as superheavy element ions. Based on these successes, we are going to upgrade the system performance and measure various non α-decaying isotopes and superheavy elements. The latest results and the status will be presented.