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MRTOF for high-precision mass measurements at RIKEN

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At RIKEN, a multi-reflection time-of-flight mass spectrograph (MRTOF) has been developed for mass measurements of short-lived ($T_{1/2} \ll 100$ ms) and low-yield nuclei. By using a pair of electrostatic mirrors which create an energy isochronous condition, the flight path for an ion pulse could be extended indefinitely and it's possible to achieve reasonably large resolving powers ($m/\Delta m > 150,000$) in shorter observation time, e.g., $\sim$2.3 ms for $A/q = 40$ [1], than could be achieved by other techniques. Recently, online mass measurements of unstable nuclei using single-reference method were performed [2] and an advanced wide-band mass measurement technique have been developed [3]. Based on these developments and the success of experiments, two MRTOF projects are now ongoing at RIKEN: mass measurements of trans-Uranium nuclei at GARIS-II and of r-process nuclei at BigRIPS/SLOWRI. We hope that with mass measurements with the MRTOF over the wide region from light to superheavy, one can drastically extend the mass information, and understand nuclear structures and astrophysical process in detail. We will present current status and future outlook.

[1] P. Schury et al., Nucl. Instrum. Meth. B 335, 39 (2014)
[2] Y. Ito et al., Phys. Rev. C 88, 011306 (2013)
[3] P. Schury et al., Int. J. Mass Spectrom. 359, 19 (2014)