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Unlocking Precision Mass Measurements with the Rare-RI Ring

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The Rare-RI Ring, located at the RI Beam Factory within RIKEN, represents a breakthrough in the field of Isochronous Mass Spectrometry. Specifically designed to cater to the high-precision mass measurement needs of rare isotopes characterized by low production yields and exceedingly short half-lives, the Rare-RI Ring distinguishes itself as a cyclotron-like storage ring. Its unique capability allows for the selective acceptance of pre-identified rare isotopes on an event-by-event basis, ensuring the attainment of precise mass measurements for the rarest of isotopes within a broad momentum acceptance range.

This novel operational mode has successfully surmounted the challenge of achieving mass measurements at the parts-per-million (ppm) level for the rarest isotopes. The recent accomplishment in determining the new mass of a palladium isotope, situated 15 neutrons away from stability revealed the impact on precision mass measurements in the modeling of the r-process abundance.

In this presentation, the technological accomplishments will be highlighted, and the forthcoming rich scientific program intended for the Rare-RI Ring will be discussed.

[1] H.F. Li et al., Phys. Rev. Lett. 128 (2022)

[2] S. Naimi et al., Eur. Phys. Jour. A, 59 (2023)

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