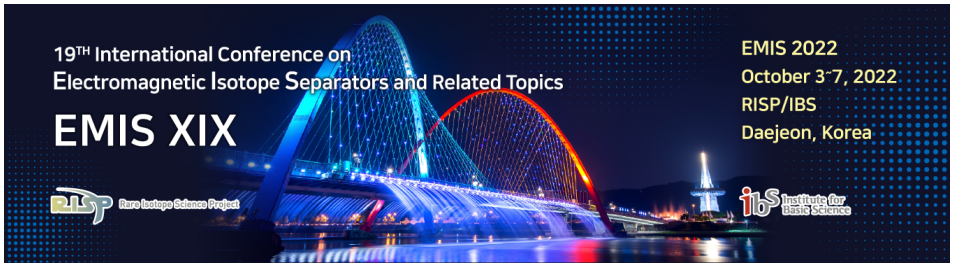


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# Br-defined isochronous mass spectrometry: a new tool for precision mass measurements of short-lived nuclei

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Nuclear mass spectrometry is an intensively developing field in modern experimental physics. Among all the state-of-the-art methods, isochronous mass spectrometry (IMS) at storage rings plays an important role in broadband mass measurements of short-lived nuclei. However, high mass resolving power can be achieved only in a limited m/q-range with good isochronicity with the conventional IMS. To improve the situation, we have developed a brand new technique, the Bρ-defined IMS, at the cooler storage ring CSRe in Lanzhou, and used it in mass measurements of neutron-deficient, fp-shell nuclides produced by the fragmentation of a 58Ni beam. Using the simultaneously determined revolution times and velocities of the stored ions, the relation between ions'magnetic rigidities and orbit lengths is established, allowing to determine the magnetic rigidity of any stored ion according to its orbit length. Consequently, m/q values of the unknown-mass nuclides are determined. High mass resolving power has been achieved covering a large m/q-range over the full Bρ-acceptance of the storage ring, starting a new era of the IMS. The masses of a series of nuclides are determined with high precision in one single setting. Among them, masses of 46Cr, 50Fe, 54Ni are determined with relative uncertainties of (5~6)*10-8, providing important input data for weak interaction physics.

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