TIME-OF-FLIGHT MASS MEASUREMENTS OF NEUTRON-RICH CALCIUM ISOTOPES BEYOND N = 34

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Nuclear mass is one of the fundamental quantities in investigating nuclear structure properties, such as shell closures and new magic numbers. The neutron numbers of 32 and 34 have been theoretically suggested to be candidates of new magic numbers in the Ca isotopes. Recently, the closed-shell character at $N = 32$ was established by measurements of the masses of ^{53}Ca and ^{54}Ca. Moreover, the excitation energy of the first 2^+ state in ^{54}Ca was reported, and the result suggests the existence of an $N = 34$ shell closure in ^{54}Ca. For establishment of the closed-shell nature of ^{54}Ca, mass measurements of the Ca isotopes beyond $N = 34$ are essential. The present work aims at studying the nuclear shell evolution at $N = 32$ and 34 by direct mass measurements of neutron-rich nuclei in the vicinity of ^{54}Ca.

We performed the nuclear mass measurement at the RIKEN RI Beam Factory using the SHARAQ spectrometer. The masses were measured directly by the TOF-$B\rho$ technique. The total yield of ^{55}Ca was approximately 3000. The relative mass resolution of around 1/9000 (σ) has been achieved for ^{54}Ca, which is one of the reference nuclei. It is expected that the masses of ^{55}Ca and ^{56}Ca can be deduced with the precision of a few hundred keV.

In this contribution, details of the experimental setup and the results will be presented.