SHELL EVOLUTION STUDY OF NEW MAGIC NUMBER N=32 IN SCANDIUM ISOTOPES VIA NUCLEAR MASS MEASUREMENTS

Dr Xing XU[1]

[1]Institute of Modern Physics, Chinese Academy of Sciences

Nuclear shell evolution with extreme proton-to-neutron ratios toward the drip lines is one of the research frontiers in nuclear physics. A prominent new shell closure at neutron number N=32 has been unambiguously established in potassium and calcium isotopes by several experiments. However, the shell evolution of new magic number N=32 above Z=20 is still controversial. The results from in-beam gamma-ray spectroscopy reveal the persistence of new magic number N=32 in titanium and chromium isotopes while nuclear mass measurements for these isotopes tend to a contrary conclusion. However, in the mass region of Z ~ 20 and N ~ 32, the uncertainties of nuclear masses are quite large. We performed re-measurements for $^{52\text{-}54}$Sc isotopes by means of isochronous mass spectrometry based on the HIRFL-CSR facility in Lanzhou. Our results show that ^{53}Sc and ^{54}Sc are more bound by 0.8
MeV and 1.0 MeV than the literature values in the latest evaluation AME2012. Our results agree quite well with two other experiments, which are not adopted in the evaluation. The large increase in binding energies of ^{53}Sc and ^{54}Sc suggests the persistence of the new neutron magic number N=32 in Scandium isotopes. Further experimental and theoretical investigations are highly recommend for a coherent understanding of results from in-beam gamma-ray spectroscopy as well as nuclear mass measurement and determination of the boundary of new magic number N=32.