

Isovector and isotensor forces in sd -shell

Wednesday, 22 August 2018 15:40 (15 minutes)

Isochronous mass spectrometry has been applied in the storage ring CSRe to measure the masses of the $T_z = -3/2$ nuclei ^{27}P and ^{29}S in sd -shell. The new mass excess value is 66(52)-keV larger than the result of the previous $^{32}\text{S}(^3\text{He}, ^6\text{He})^{29}\text{S}$ reaction measurement in 1973 and a factor of 3.8 more precise. The new result for ^{29}S , together with those of the $T = 3/2$ isobaric analog states (IAS) in ^{29}P , ^{29}Si , and ^{29}Al , fit well into the quadratic form of the Isobaric Multiplet Mass Equation IMME. The mass excess of ^{27}P has also been remeasured. By analyzing the linear and quadratic coefficients of the IMME in the $T_z = -3/2$ sd -shell nuclei, it was found that the ratio of the Coulomb radius parameters is $R \approx 0.96$ and is nearly the same for all $T = 3/2$ isospin multiplets. Such a nearly constant R -value, apparently valid for the entire light mass region with $A > 9$, can be used to set stringent constraints on the isovector and isotensor components of the isospin non-conserving forces in theoretical calculations.

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Session Classification: YSS