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Single-particle state evolution along the N = 127 isotone chain using the $d(^{212}\text{Rn},p)^{213}$Rn reaction

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The study of single-particle states can provide insight into properties of nuclear structure. In light neutron-rich systems, features of single-particle states along isotonic chains have highlighted changes in shell closures, such as the weakening of N = 20 and formation of N = 16 [1, 2]. In heavier closed-shell stable nuclei, trends have been seen in the behaviour of high-*j* states from the filling of other high-*j* orbitals, the effects of which have been attributed to the tensor interaction [3]. From the availability of radioactive beams at ISOLDE, these studies can be extended in the region around N = 126. Currently, states up to Z = 84 are known with spectroscopic factors and assignments [4, 5]. Above this, there is very little information on the single-particle properties of nuclei. Only the energies of states are available with tentatively assigned orbital configurations and no spectroscopic information. In order to probe single-particle nature beyond this, the reaction $d(^{212}\text{Rn},p)^{213}$Rn has been performed at the ISOLDE Solenoidal Spectrometer (ISS) with a 7.63 MeV/u radioactive beam at an intensity of ˜10^6 pps. States have been identified up to ˜4 MeV and single-particle centroids have been extracted for the neutron outside of N = 126, providing information on the magnitude of monopole shifts caused by the interaction between the neutron and protons filling the $\pi 0h_{9/2}$ orbital. These data will also be used to inform modern shell-model calculations in this region of the nuclear chart. Preliminary data from measurements will be presented.

References

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