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Neutron intruder structures in heavy Ti isotopes

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Isotopes below Nickel about N=40 are known to exhibit enhanced collectivity, instead of signatures of an N=40 sub-shell closure which is evident in 68Ni. The enhancement of collectivity has been seen in Fe and Cr isotopes in the region through the lowering of 2+1 energies as well as rise in B(E2) excitation strengths, mainly due to an early population of the neutron g9/2 orbital. We intend to test the persistence of this onset of collectivity to lower-Z isotopes, namely Ti, just above the Ca Z=20 magic shell closure. Shell model calculations from different groups predict a siginificant lowering of the neutron d5/2 orbit and a presence of a new “island of inversion” in the region, or rather significant populations of the g9/2 orbital. In either case this would lead to a softening of the N=50 shell closure, and thus an enhanced collectivity in heavy Ti isotopes.

To study the single particle structure of heavy Ti isotopes up to A=62, energies of the lowest excited states in even-even nuclei are important, as well as their B(E2) excitation strength, and effective single-particle energies of the relevant orbitals may be deduced from the odd-A Ti isotopes. While in the lighter Ti’s up to about A=60 Coulomb excitation to the first excited states should be possible with RIBF intensities and using DALI2. Excited states in the heavier isotopes, especially those higher than the first excited state, can only be reached via knockout reactions. The availability of MINOS in conjunction with DALI2 would offer a steep rise in cross-section for this type of experiments.

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