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Shell evolution toward the island of inversion with ^{29}Mg

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The "Island of Inversion" refers to a group of very neutron rich nuclei centred on ^{30}Ne and ^{32}Mg, in which the gap in energy at N=20 between the $1s0d$ and $0f1p$ shells has become sufficiently small to allow the latter configurations to dominate the ground states, effectively favouring particle-hole configurations. One of the keys to understanding the "Island of Inversion" lies in the evolution of the orbital energies as we move from stable nuclei into this region.

The ^{28}Mg(*d*,*p*)^{29}Mg reaction offers detailed probing of the neutron orbitals and interactions that determine the properties of the more neutron-rich isotopes where the "Island of Inversion" becomes fully developed. The details that are hidden in the properties of ^{32,34}Mg are exposed and quantified in the structure of ^{29}Mg.

The changes in the relative energies of shell model orbits, depending on the neutron/proton balance in the nucleus, cause level energies to evolve and therefore change the shell gaps and their corresponding magic numbers, effectively replacing N=20 by N=16. This can be studied most effectively by means of single nucleon transfer reactions.
The (*d*,*p*) reaction is an ideal tool to probe this behaviour, as it allows the transfer of a neutron into the $0d3/2$, $0f7/2$, $1p3/2$ and higher lying orbitals, and the energies of the observed states relate directly to the spacing between the sd and fp orbitals at N=20.

We will present results obtained recently at TRIUMF in inverse kinematic, using a ^{28}Mg beam produced and reaccelerated by the ISAC-II facility. The ^{29}Mg spectroscopy was studied via the missing mass method and particle-gamma coincidences obtained from the combination of SHARC and TIGRESS arrays.
Recently obtained results on ^{29}Mg spectroscopy studied via (*d*,*p*) using the SHARC and TIGRESS arrays will be presented. The ^{28}Mg(*d*,*p*)^{29}Mg reaction offers detailed probing of the neutron orbitals and interactions that determine the properties of the more neutron-rich isotopes where the "Island of Inversion" becomes fully developed. The details that are hidden in the properties of ^{32,34}Mg are exposed and quantified in the structure of ^{29}Mg.

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