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Evolution of the shell structure in medium mass nuclei: search of the neutron 2d5/2 orbital in 69Ni

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The Harmonic Oscillator closed shell at N=40 in 68Ni is weak and loses its strength at two proton-holes distance. This was manifested in 64,66Fe and 60,62Cr nuclei by the deformation of the low-lying states. Calculations performed in this mass region predict a new island of inversion at N=40 similar to the one discovered at N=20. Using a large valence neutron space, the neutron 1g9/2-2d5/2 gap at N=40 is shown to be a crucial ingredient for the understanding of the nuclear structure around N=40. Moreover, its measurment would definitely help to draw preliminary conclusions about the magicity of 78Ni. The neutron 1g9/2-2d5/2 energy difference has been determined in 69Ni using the neutron stripping reaction d(68Ni,p). The experiment has been performed at GANIL in inverse kinematics using the MUST2 array. Angular momenta and spectroscopic factors of the populated states (1g9/2, 2d5/2) were obtained from the comparison between the experimental differential transfer cross-sections as a function of the proton detection angle and DWBA calculations using adiabatic potentials.

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