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Low-lying structure of 15C : information on the N=8 shell gap

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The low-lying structure of ^{15}C has been investigated via the neutron-removal d(^{16}C, t) reaction. The experiment was performed at GANIL using a secondary ^{16}C beam produced by fragmentation in the LISE spectrometer at 17.2 MeV/nucleon with an intensity of 5 × 10^4 pps and 100\% purity. The angle and energy of the light ejectile were detected by three MUST2 telescopes [1,2]. The missing mass technique was used to reconstruct the excitation energy of ^{15}C. In this spectrum, two states were observed below the neutron separation threshold, and in the unbound region two resonances were located. From the differential cross sections information on the angular momentum of the transferred nucleon and spectroscopic factors were deduced.

The excitation energies and the deduced spectroscopic factors of the negative parity states placed above the neutron separation energy are an important measure of the 2p-3h configurations in ^{15}C. Our results reveal an increasing shell gap at N=8 as protons are added to the $1p_{1/2}$ orbital. This effect is well reproduced by state of the art shell model calculations such as SFO-tls [3].

References

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