Shell closure N=16 in ^{24}O

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Evolution of magic numbers in neutron-rich nuclei is one of the hot topics in contemporary nuclear structure physics. At RIB in-flight facilities worldwide it was possible to reach the dripline for oxygen isotopes including the access of ^{24}O and its neighboring region by fragmentation of stable Ar and Ca beams. However the available spectroscopic information is still very limited.
The access to this region of the nuclear chart has determined the existence of a new shell closure at N=16, as it was pointed out through the systematical trends on one-neutron separation energy [1]. The appearance of the N=16 shell gap in the O isotopes has been suggested due to an upward shift in energy of the $d_{3/2}$ neutron orbital as an effect of the $(\sigma\cdot\sigma)(\tau\cdot\tau)$ interaction [2]. It has been supported experimentally by in-beam gamma spectroscopy for $^{23,24}O$ [3] and invariant mass spectroscopy [4].
Direct reactions performed on the ^{23}O nucleus, via nuclear and electromagnetic probes, have assigned a spin $1/2^+$ to the ^{23}O ground state [5]. To establish ^{24}O as a new doubly magic nucleus spectroscopic information are required. We report on first direct measurements of the spectroscopic factor of the ground state of ^{24}O. The experiment was performed at the FRS, GSI using a single neutron removal reaction at 920 MeV/u. The large s-wave probability of the removed neutron shows the presence of a spherical shell closure, in good agreement with shell model calculations.

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