High-Spin States of ^{84,85}Br: Mapping the Proton Sub-Shells towards ^{78}Ni

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The characterization of the N=50 shell gap, particularly its evolution with a very-large neutron excess, represents currently an intense effort of the nuclear physics community. In this intermediate-mass region the shell-model calculations suffer from a fragmentary determination of some basic inputs, i.e. the single particle energies and the two-body matrix elements. For instance the prediction of the evolution of the N=50 gap at very large neutron excess needs the knowledge of the residual interaction energies for various πν configurations, issued from the *fp* protons (28<Z<38) and the *dg* neutrons (N~50), which are mainly not known at the present time. Measurements of the level structure of some moderately neutron-rich nuclei provide data which can be compared with the results of state-of-the-art shell-model calculations, leading to the determination of these crucial parameters.

Whereas the lack of suitable stable beam-target combinations prevents the use of fusion-evaporation reactions in order to populate high-spin states of these neutron-rich nuclei, fusion-fission reactions –combined to a powerful prompt γ-spectroscopy– prove to be fruitful. We have thus undertaken the high-spin state study of many isotopes ($_{37}$Rb, $_{36}$Kr, $_{35}$Br, and $_{34}$Se) located around the N=50 shell closure. One can for instance refer to our previous publications concerning $^{84}Se_{50}$ [1] and $^{87}Kr_{51}$ [2]. Recently, the ^{84,85}Br isotopes have been thoroughly examined. These nuclei have been produced as fission fragments in the fusion reaction $^{18}O+^{208}Pb$ at 85 MeV bombarding energy and studied with the Euroball IV array. High-spin states of the odd-odd $^{84}Br_{49}$ nucleus have been identified for the first time. The level scheme of $^{85}Br_{50}$ has been extended up to 5.4 MeV excitation energy and spin I~21/2. From angular correlation analysis, spin values have been assigned to most of the ^{85}Br excited states up to 4 MeV [3].

In this talk, all our new results will presented and discussed. We will show that the excited states observed in ^{85}Br can be interpreted in terms of proton excitations within the $\pi f_{5/2}$-$\pi p_{3/2}$ sub-shells, possibly added to the $\pi g_{9/2}$ sub-shell. Similarly, the excited states of the odd-odd ^{84}Br nucleus will be discussed in terms of both neutron and proton excitations, involving the sub-shells located close to the Fermi levels, $\nu g_{9/2}$ and $\pi f_{5/2}$, $\pi p_{3/2}$, $\pi g_{9/2}$.

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