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Shape evolution evidence in the neutron-rich Br isotopes

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Away from the valley of stability, the imbalance between the number of protons and neutrons serves as a magnifying lens for specific components of the nuclear interaction that cannot be studied otherwise. In such regions of the nuclear chart, new phenomena as appearance or disappearance of magic numbers, shape coexistence or transitions, are examples of the manifestation of the influence of those terms, whose understanding is of fundamental importance. The nuclei in the A~100 region show one of the most remarkable example of sudden nuclear shape transition between spherical and well deformed nuclei, associated with a shape-coexistence phenomenon [1].
This presentation reports on new spectroscopic measurements for the neutron-rich odd-even Br nuclei, lying one proton bellow the low-Z boundary of this island of deformation. The analysis is done from the combination of two experiments : the first one from a transfer- and fusion-induced fission experiment at GANIL using the combination of the large acceptance VAMOS++ spectrometer [2] and the new generation γ-ray tracking array AGATA [3], providing a unique opportunity to obtain an event-by-event unambiguous (A, Z) identification of one of the fission fragments, and the prompt γ-rays emitted in coincidence with unprecedented resolution. The second one is a thermal neutron induced fission experiment at ILL using the FIPPS spectrometer [4], allowing for high gamma fold coincidences measurements.
The level schemes from 87,89Br have been extended, and new level schemes are proposed for the first time for 91,93Br. These new spectroscopic information are compared to state of the art Large Scale Shell Model (LSSM) calculations and the recently developed Discrete Non Orthogonal shell model (DNO-SM) approaches [5]. A very good agreement between experiment and LSSM results is obtained and the DNO-SM results suggest an unexpected shape evolution in Br isotopes from N=52 to N=58.

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