NEURTON-PROTON MULTIPLETS IN THE NUCLEUS ^{88}Br

Michał Czerwiński, University of Warsaw, Warsaw, Poland

M. Czerwiński[1], T. Rząca-Urban[1], W. Urban[1], P. Bączyk[1], J. Kurpeta[1], A. Płochocki[1], J. Wiśniewski[1], K. Sieja[2], A. Blanc[3], M. Jentschel[3], P. Mutti[3], U. Köster[3], T. Soldner[3], G. de France[4], G. S. Simpson[3], C.A. Ur[5], H. Penttilä[6], A. Jokinen[6], S. Rinta-Antila[6], I. D. Moore[6], L. Canete[6], V. S. Kolhinen[6], B. M. Nyakò[7], J. Timàr[7], I. Kuti[7], T. G. Tornyi[7]

1 University of Warsaw, Warsaw, Poland
2 Universitè de Strasbourg, Strasbourg, France
3 Institut Laue-Langevin, Grenoble, France
4 Grand Accèlèrateur National d'Ions Louds (GANIL), Caen, France
5 LNL Legnaro, Legnaro, Italy
6 University of Jyväskylä, Jyväskylä, Finland
7 Hungarian Academy of Sciences, Debrecen, Hungary

The study of the neutron-rich nuclei with mass number A < 92 and proton number Z < 38 is motivated by the question about the structure of those very exotic nuclei. They are located near the path of the astrophysical r-process and close to ^{78}Ni, which is expected to be a doubly magic nucleus. In particular, it is of interest to study the development of collectivity close to ^{78}Ni, which may influence the r -process path by increasing binding energies, for example.

In our recent study of the N=53 isotones [1] we found clear signs of collectivity building up in them below Z=36, resulting in so called j-1 anomaly in the neutron $(d_{5/2})^3$ multiplet, which produces the $3/2^+$ ground states in ^{89}Kr and ^{87}Se. The state-of-the-art Shell Model calculations [2] performed for the N=53 isotones reproduce well the collective effects in these nuclei [1] and predict collectivity also in the N=52 isotones [3].

Experimental trends seen in our study of N=53 isotones and the Shell Model predictions both suggested existence of a similar $(d_{5/2})^3_{j-1,j}$ doublet also in the ^{85}Ge isotone. Such a doublet has been indeed observed experimentally [4] with the amplitude of the splitting as foreseen in our work [1]. However, it has not been determined experimentally which of the two levels has spin $3/2^+$ and which is the $5/2^+$ member of the $(d_{5/2})^3$ multiplet.

We studied excited levels in ^{88}Br populated in two types of experiments. In the first one excited states were populated in fission of ^{235}U induced by cold neutrons from the reactor at ILL Grenoble. Measurement of the multiple coincidences was performed at the cold neutron facility PF1B of ILL using the advanced array of Ge spectrometers EXILL [5] in a triggerless mode and delivered a few dozens of Terabytes of data. In the second case excited levels of discussed nucleus were populated in β^- decay of ^{88}Se and they were studied by means of β-γ and γ-γ spectroscopy methods. Neutron-rich ^{88}Se nuclei produced in the proton-induced fission of ^{238}U were separated with the IGISOL mass separator coupled to a Penning trap [6] at the Accelerator Laboratory of the University of Jyväskylä.

Data sorted into multidimensional histograms allowed us to find the members of proton-neutron multiplets in ^{88}Br, which can be used to test the Shell Model in this region. Talk will present the new excitation scheme of ^{88}Br and compare it to the Shell Model predictions.

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