THE BREAKING THRESHOLDS OF THE COOPER PAIRS OF NUCLEONS IN THE ^{162,164}Dy NUCLEI

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The intensity spectra of the two-step γ-quanta cascades in the ^{162,164}Dy nuclei measured [1] using the high-segmented 4π-calorimeter of γ-rays [2], in the energy interval below the neutron binding energy, were analyzed by our method proposed in [3]. In the framework of generally accepted statistical model of the nucleus, the authors of [1] cannot satisfactorily describe their measured spectra of intensities. Our method with the use of maximum-likelihood procedure allowed us to do this with a percent accuracy. At that, a strongest anti-correlation between the nuclear level density and the partial radiative widths was taken into account in our analysis, necessity of which follows from the developed models of the process of fragmentation of the excited nuclear levels [4].

For ^{162,164}Dy nuclei, in the range of the neutron binding energy, as for more than 40 nuclei investigated by us earlier [5], in the dependences of the level density on their excitation energy there are several (3–4) breaks. As a logarithm of the level density is proportional to the nuclear entropy, these breaks have simple explanation that they are just points of breaking of the Cooper pairs of nucleons in the excited nucleus.

The breaking thresholds of the second and the third Cooper pairs obtained analyzing the experimental data from [1] in comparison with the results for ^{164}Dy nucleus, which was investigated by us earlier, with a capture of neutrons in the heat spot, are shown in the Table. For the data from [1] the breaking thresholds of the second and the third Cooper pairs are presented both for neutron resonances with a spin $J = 2$ and for $J = 3$.

Table. The obtained breaking thresholds of Cooper pairs of nucleons.

Nucleus	The breaking thresholds, MeV			
	of the second Cooper pair		of the third Cooper pairs	
	for $J = 2$	for $J = 3$	for $J = 2$	for $J = 3$
^{162}Dy from [1]	4.33(14)	4.56(7)	6.54(33)	6.35(20)
^{164}Dy from [1]	2.77(4)	2.83(6)	6.47(23)	6.78(3)
^{164}Dy from [5]	2.57(1)		5.48(5)	

1. S.Valenta *et al*. // Phys. Rev. C. 2008. V.96. 064307.
2. R.Reifarth *et al*. // Nucl. Instrum. Methods A. 2004. V.531. P.530.
3. A.M.Sukhovoj *et al*. // Phys.Atom. Nucl. 2016. V.79. №3. P.313.
4. L.A.Malov, V.G.Solov’ev // Sov. J. Nucl. Phys. 1977. V.26. P.384.
5. .D.C.Vu *et al*. // Phys.Atom. Nucl. 2017. V.80. №2. P.237.