STATES OF HEAVY NUCLEI STRONG EXCITED THE(n_{th},γ) REACTION: POSSIBLE DOMINANT COMPONENT AT $E_{ex} \leq$ 3-5 MeV

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Two-step cascades between the compound-state (neutron resonance) and certain low-lying levels allow one to determine the influence of intermediate cascade levels or their group in the -γ-decay process of a nucleus. Such information has already been obtained for the following nuclei: ^{114}Cd, ^{124,125}Te, ^{135,137,138,139}Ba, ^{143,144,146}Nd, ^{150}Sm, ^{156,158}Gd, ^{160}Tb, ^{163,164,165}Dy, ^{166}Ho, ^{168}Er, ^{170}Tm, ^{174,175}Yb, ^{177}Lu, ^{178,179,180,181}Hf, ^{183,187}W, ^{192}Ir, ^{196}Pt, ^{198}Au and ^{200}Hg.

The spectra of the most intense cascades, whose intensities $i_{\gamma\gamma}$ were smoothed in the vicinities of their intermediate level energies Eex by the functional dependence

$$f(E) = I_{\gamma\gamma} \times \exp\left(\frac{-(E - E_{ex})}{2\sigma^2}\right) \qquad (3.1)$$

with σ =25-50 keV, have been constructed. The analysis of these "smoothed" distributions, as a function of the excitation energy, clearly showed the presence of equidistant groups of the most intense cascades for a considerable number of the nuclei mentioned above. In some nuclei, there was more than one equidistant group.

The equidistant periods T of these groups, consisting of three or more possible members, were determined by means of the autocorrelation function

$$A(T) = f(E) \times f(E + T) \times f(E + 2T) \qquad (3.2)$$

by its integration over the excitation energy of the intermediate levels. It was found that the T values corresponding to the maximum of A(T) can be described by a linear function of the boson numbers N_b in the unfilled nuclear shells, and that the coefficient k in the possible dependence $T \cong kN_b$ for even-even nuclei is greater than for even-odd and odd-odd nuclei.

The observation of such equidistant phenomena allows the assumption that the structure of the states most strongly excited in the (n,γ) -reaction by the two-step cascades below the excitation energy of 3-5 MeV is determined by one or more phonons, which interact very weakly with quasiparticles. The maximum energy of these phonons is about 0.8 MeV.