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MANIFESTATION OF THE FISSION DYNAMICS IN MUON-INDUCED PROMPT FISSION

In muonic atoms of 238U, the nuclei can undergo prompt fission through non-radiative transitions [1] of the muon: 2p –1s, 3p –1s, 3d –1s etc. Main features of the fission dynamics are studied in prompt fission: augmentation of the barrier, dynamics of the saddle-to-scission descent, muonic conversion and characteristic X-rays from fission fragments supply information on the multipolarity of electromagnetic transitions and charge distribution, structure of nuclear transition currents. Revision of the non-radiative transition probabilities comprises my present purpose.

It is commonly accepted that the probability of the non-radiative nuclear excitation in the muonic transition can be expressed in terms of the photoexcitation cross-section and resonance internal conversion coefficients [2]. In this way, satisfactory agreement is attained with experiment [3] for non-radiative transition widths for the 2p–1s transitions in 238U. However, the 3p–1s radiative transition width turns out to be by a factor of 15 larger that experimental one. I undertake detailed analysis of this circumstance on the basis of Ref. [4]. First, this broadening is not only due to the additional contribution of the non-radiative transition, but also the admixed GDR nuclear width gives a contribution. And that width is of the order of MeV. Second, there is level doubling due to the non-radiative interaction, with the related broadening of the second radiative component within MeV scale due to the GDR total width. Moreover, the nucleus gets excited, properly speaking, not in the 3p–1s transition, but rather in the preceding cascade transition to this state, like 4d–3p, even 3d–3p (virtually) or similar. Correspondingly, some missing intensities should manifest themselves in these transitions.

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Section

Nuclear structure: theory and experiment

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