SOME FEATURES OF BETA DECAY OF EXOTIC NUCLEI AND K-ISOMERS

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The probability of the β-transition to the nuclear level with excitation energy E is proportional [1] to the product of the lepton part described by the Fermi function f(Qβ − E) and the nucleon part described by the β-decay strength function Sβ(E). At excitation energies E smaller than Qβ (total β-decay energy), Sβ(E) determines the characters of the β-decay. For higher excitation energies that cannot be reached with the β-decay, Sβ(E) determines the charge exchange nuclear reaction cross sections, which depend on the nuclear matrix elements of the β-decay type [1-3].It was shown [2-5] that the high-resolution nuclear spectroscopy methods give conclusive evidence of the resonance structure of Sβ(E) both for GT and first-forbidden (FF) β-transitions in spherical, deformed, and transition nuclei. The splitting of the peaks in the Sβ(E) for the GT β+/EC-decay of the deformed nuclei into two components was demonstrated [3-6]. Resonance structure of the Sβ(E) for β-decay of halo nuclei was analyzed in [7-9].
Fission and alpha-decay of the high-spin isomers are rather strongly forbidden, while the beta-decay of the high-spin isomers can populate high-spin levels near the yrast-band [10]. Than after a few gamma-decays the yrast-band levels may be populated. The prediction of the energies of the levels of the corresponding yrast-band can be done by using the model proposed in [11]. Such prediction is extremely useful in planning and carry out experiments, especially in the region of heavy and superheavy nuclei [12,13].
In this report the fine structure of Sβ(E) is analysed. Resonance structure of Sβ(E) for GT and FF β-decays, structure of Sβ(E) for halo nuclei, quenching [9] of the weak axial-vector constant gAeff, splitting of the peaks in Sβ(E) for deformed nuclei connected with the anisotropy of oscillations of proton holes against neutrons (peaks in Sβ(E) of GT β+/EC-decay) or of protons against neutron holes (peaks in Sβ(E) of GT β− − decay), and Sβ(E) for the high-spin isomers [10] β-decays in heavy and superheavy nuclei are discussed.

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