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

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 $f(Q\beta - E)$ and the nucleon part described by the β -decay strength function $S\beta(E)$. At excitation energies E smaller than $Q\beta$ (total β -decay energy), $S\beta(E)$ determines the characters of the β -decay. For higher excitation energies that cannot be reached with the β -decay, $S\beta(E)$ 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 $S\beta(E)$ both for GT and first-forbidden (FF) β -transitions in spherical, deformed, and transition nuclei. The splitting of the peaks in the $S\beta(E)$ for the GT β^+/EC -decay of the deformed nuclei into two components was demonstrated [3-6]. Resonance structure of the $S\beta(E)$ 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]. Then 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 $S\beta(E)$ is analysed. Resonance structure of $S\beta(E)$ for GT and FF β -decays, structure of $S\beta(E)$ for halo nuclei, quenching [9] of the weak axial-vector constant g_{Aeff} , splitting of the peaks in $S\beta(E)$ for deformed nuclei connected with the anisotropy of oscillations of proton holes against neutrons (peaks in $S\beta(E)$ of GT β^+/EC -decay) or of protons against neutron holes (peaks in $S\beta(E)$ of GT β^- - decay), and $S\beta(E)$ for the high-spin isomers [10] β -decays in heavy and superheavy nuclei are discussed.

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Notes

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