Contribution ID: 13

Type: Semi-plenary talk (30 min + 5 min questions)

STUDY OF THE BETA DECAY STRENGTH FUNCTION STUCTURE BY TAGS AND HIGH RESOLUTION NUCLEAR SPECTROSCOPY METHODS

Thursday, 14 July 2022 13:00 (30 minutes)

The β -decay strength function $S_{\beta}(E)$ governs [1-3] the nuclear energy E distribution of elementary chargeexchange excitations and their combinations like proton particle (πp) -neutron hole (νh) coupled into a spinparity $I^{\pi}: [\pi p \otimes \nu h]I^{\pi}$ and neutron particle (νp) -proton hole (πh) coupled into a spin-parity $I^{\pi}: [\nu p \otimes \pi h]I^{\pi}$. The strength function for the Gamow–Teller (GT) β -transitions describes $[\pi p \otimes \nu h]1^+$ or $[\nu p \otimes \pi h]1^+$ excitations. Successful applications of the total absorption γ -spectroscopy (TAGS) for the $S_{\beta}(E)$ resonance structure study and methods of TAGS spectra analysis were summarized in [1]. Development of the experimental technique allows application of methods of nuclear spectroscopy with high energy resolution for the $S_{\beta}(E)$ fine structure measurement [2-5]. It was demonstrated [2-6] that the high-resolution nuclear spectroscopy methods give conclusive evidence of the resonance structure of $S_{\beta}(E)$ for GT and First Forbidden (FF) β -transitions. High-resolution nuclear spectroscopy methods [3-6] made it possible to observe the reveal splitting of the peak in the $S_{\beta}(E)$ for the $GT \beta^+ / EC$ -decay of the deformed nuclei into two components. Resonance structure of the $S_{\beta}(E)$ for β -decay of halo nuclei was analyzed in [7-9]. It was shown that when the parent nucleus has nn Borromean halo structure, then after $GT \beta^-$ - decay of parent state or after M1 γ -decay of Isobar Analogue Resonance (IAR) the states with np tango halo structure or mixed np tango + nnBorromean halo structure can be populated.

In this report the fine structure of $S_{\beta}(E)$ is analysed. Resonance structure of $S_{\beta}(E)$ for the GT and $FF \beta^{-}$ - decays, structure of $S_{\beta}(E)$ for halo nuclei, quenching [9] of the weak axial-vector constant g_{A}^{eff} , and 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 $GT \beta^{+}/EC$ -decay) or of protons against neutron holes (peaks in $S_{\beta}(E)$ of $GT \beta^{-}$ – decay) are discussed.

- 1. Yu.V. Naumov, A.A. Bykov, I.N. Izosimov, Sov. J. Part. Nucl., 14,175 (1983). https://www.researchgate.net/publication/233832321
- 2. I.N. Izosimov, Physics of Particles and Nuclei, 30, 131 (1999). https://www.researchgate.net/publication/259820759
- 3. I.N. Izosimov, et al, Phys. Part. Nucl., 42,1804(2011). DOI:10.1134/S1063779611060049
- 4. I.N. Izosimov, et al, Phys. At. Nucl., 75,1324(2012). DOI: 10.1134/S1063778812110099
- 5. I.N. Izosimov, et al, Phys. Part. Nucl. Lett., 15, 298 (2018). DOI:10.1134/S1547477118030081
- 6. I.N. Izosimov, et al, JPS Conf. Proc., 23,013004 (2018). DOI: 10.7566/JPSCP.23.013004
- 7. I.N. Izosimov, JPS Conf. Proc., 23,013005 (2018). DOI: 10.7566/JPSCP.23.013005
- 8. I.N. Izosimov, Phys. Part. Nucl. Lett., 15,621(2018). DOI:10.1134/S1547477118060092

The speaker is a student or young scientist

No

Section

1. Nuclear structure: theory and experiment

Primary author: IZOSIMOV, Igor (JINR) Presenter: IZOSIMOV, Igor (JINR) Session Classification: Plenary session