# TAGS SPECTRA ANALYSIS AND BETA DECAY STRENGTH FUNCTION STRUCTURE

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The probability of the $\beta$ transition is proportional to the product of the lepton part described by the Fermi function $f(Q_\beta - E)$ and the nucleon part described by the β transition strength function $S_\beta(E)$. There are two methods of the TAGS spectra analysis and $S_\beta(E)$ extraction from TAGS spectra. **In the first** one it is necessary to identify the total absorption peaks in TAGS spectra and have 4π-spectrometer with **exponential** energy dependence of the photoefficiency. This method gives good results, but can be applied for nuclei with total β-decay energy $Q_\beta$ less than 5-6 MeV. Quantitative characteristics may be obtain as a rule only for one ($\beta^-$- decay) peak and for two peaks ($\beta^+$/EC-decay) in $S_\beta(E)$. **The second** method is based on so called response function application, but a lot of assumption must be done for extraction the $S_\beta(E)$ shape from the TAGS spectrum shape. Analysis depends on the assumptions about the decay scheme which as a rule is not known. It is very difficult to estimate the associated systematic errors of such analysis and only qualitative information about $S_\beta(E)$ may be obtained.**TAGS can't distinguish the GT and FF transitions and don't take into account the conversion electron emission, which give the systematic uncertainties, especially for high *Z***

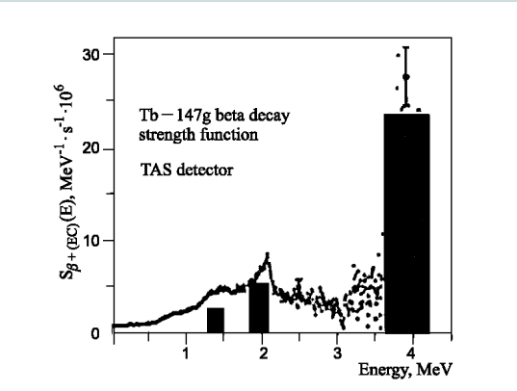


Fig1. $S_\beta$(E) TAGS measurements. Peak 1 obtained by ferst method, Peak 2 by second method. Errors for peak 1 were estimated from comparision with Fig.2A. **Only peak 1 corresponds to GT strength**

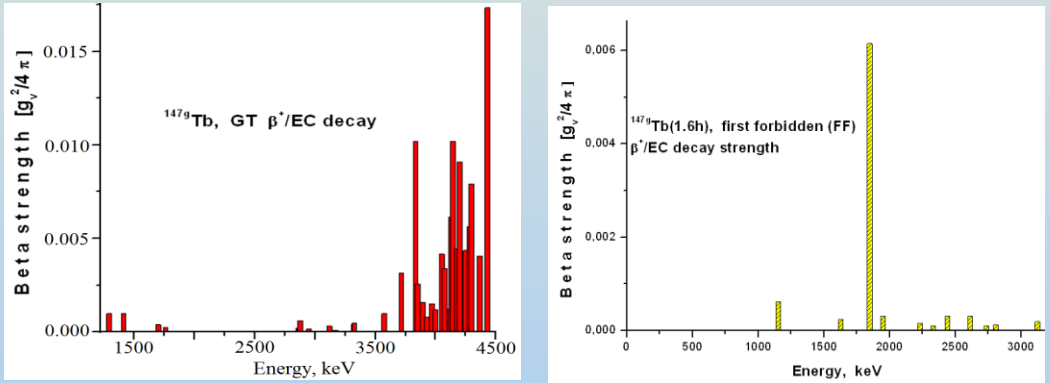


Fig.2. $S_\beta$(E) measurements with high energy resolution spectroscopy. A) the **GT** strength, B) the **FF** strength. Results of the $S_\beta(E)$ fine structure study were summarized in I.N. Izosimov, et al, *Phys.Part. Nucl.*, **42**, 963 (2011).

Successful applications of the total absorption γ-spectroscopy (TAGS) for the β-decay strength function $S_\beta(E)$ resonance structure study, methods of TAGS spectra interpretation, and results of analysis of $S_\beta(E)$ structure for the Gamow-Teller (GT) $\beta^+$/EC and $\beta^-$-decays were summarized in Yu.V. Naumov, A.A. Bykov, I.N. Izosimov, *Sov. J. Part. Nucl.*, **14**, 175(1983) www.researchgate.net/publication/233832321 and in I.N. Izosimov, *Physics of Particles and Nuclei*, **30**, 131 (1999).

1. Only combination of TAGS with high resolution nuclear spectroscopy methods may give the **quantitative** information about $S_\beta(E)$.
2. When one analyze the TAGS spectra it is necessary to indicate **systematic** errors **for $S_\beta(E)$ and for decay heat** evaluation **especially** by using the second method of TAGS spectra analysis.