# Total absorption $\gamma$-spectroscopy study of the beta decay of $^{100}$Sn

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In this report we are presenting the progress on the analysis of the NP1612-RIBF147 experiment. The goal of this experiment was to study the beta decay of $^{100}$Sn and neighbouring nuclei using the total absorption technique. In our measurement the total absorption spectrometer DTAS[1)] was used in combination with the implantation detector AIDA.[2)] Details of the experiment can be found in Ref. 3).

One key aspect of the work performed was to improve the signal to background ratio of the coincident data as much as possible. The sorting conditions of the data and the number of parameters available for the analysis makes this task daunting without proper quantification of the code optimisations. For that reason we introduced a figure of merit. The figure quantifies the improvements

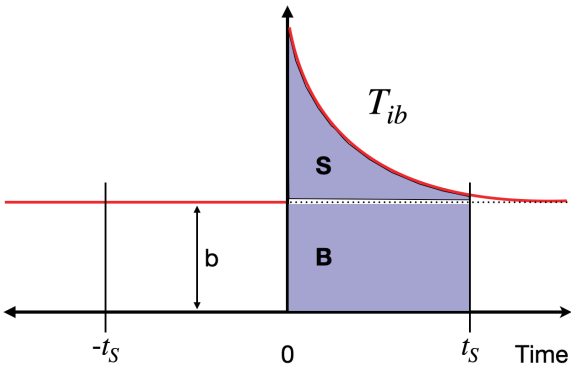


Fig. 1. Parameters employed in the definition of the figure of merit for the time distribution of the $\beta$ particles. The area S stands for signal, B for background, $b$ is the high of the background. B is estimated using the backward correlation time interval $[-t_s, 0]$. $T_{ib}$ stands for implant-$\beta$ time.

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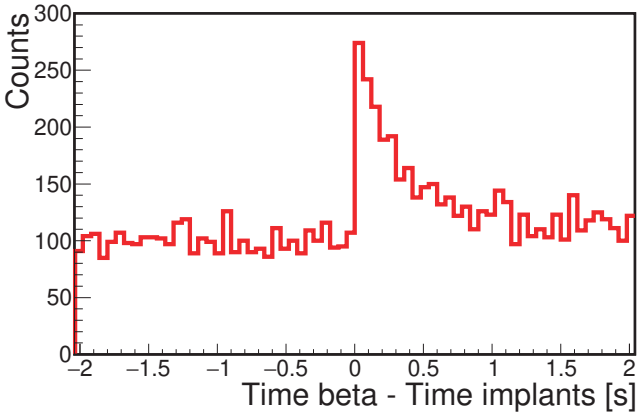


Fig. 2. Time distribution of the $\beta$ particles emitted after the decay of $^{100}$Sn in coincidence with DTAS.

made by the changes in the analysis code looking for the reduction of the accidental correlations associated to the decay of $^{100}$Sn. In our study we changed several sorting parameters and compared the area of the true correlations (S) with the area of the background (B) (see Fig. 1. for an schematic view). The optimisation consisted in looking for conditions that increase the S to B ratio. Note that the correlation time window ($t_s$) is related to the decay half-life of the implanted nucleus of interest. Some improvements on the AIDA sorting code were also necessary.[4)]

In Fig. 2 we show the present status of the implant-$\beta$ time correlation (gated with the condition on the DTAS firing) after implementing all cleaning conditions for the $^{100}$Sn. Thanks to the procedures applied, an increase of the signal to background ratio of the order of 20% was achieved, improving the DTAS gamma correlated data. In the near future we will refine the calibration of the detectors and calculate the response function of the setup, which is mandatory for the total absorption spectrum analysis. Due to technical problems during our run we were only able to take data for 4 days from a total of 10 approved days. The continuation of the experiment is expected to occur in 2021.

References

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