

# Frontiers in Gamma Ray Spectroscopy

## FIG18

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## Role for GTOL in Experimental Nuclear Research

### Content :

The most important tool in understanding the structure of nuclei is the building of their level schemes. Identification of  $\gamma$  transitions and building level scheme is the first and most important step in spectroscopic studies. However, when the results are reported by researchers, due to several reasons, the energy levels, which depopulate via newly identified transitions, often get reported with discrepant energy values. The readers of the research work tend to be misled via these mismatched numbers. GTOL developed and widely used by the Nuclear Data Evaluation groups is very helpful in removing these discrepancies and hence is a very useful tool while reporting of experimental results. This paper deals with the advantages and techniques of the software GTOL.

When new  $\gamma$  transitions are identified, the levels de-exciting via these  $\gamma$  transitions are reported. However, if any given level depopulates via more than one path, on several occasions the total energies of different  $\gamma$  transitions of different path do not add up to the same level. This is a result of the tolerances of the measuring devices. If the researcher is not careful it can lead to minor discrepancies in the reported transitions and energy levels.

GTOL ([http://www.nndc.bnl.gov/nndcscr/ensdf\\_pgm/analysis/gtol/](http://www.nndc.bnl.gov/nndcscr/ensdf_pgm/analysis/gtol/)) software, widely used by the people involved in Nuclear Data evaluation, is a program that adds up the energies of  $\gamma$  transitions and using the fitting techniques, arrives at the most appropriate level energy value. It is also useful in identifying a misplaced  $\gamma$  transition or even simple typographical errors in reporting of  $\gamma$  energies.

The researcher needs to transform the  $\gamma$  energy data in the ENSDF format (<https://www.nndc.bnl.gov/nndcscr/documents/ensdf/ensdf-manual.pdf>) and run the GTOL code to give rise to the values of level energies, which are most optimized, especially in the cases where more than one depopulating branches exist. In case a researcher is not familiar with the ENSDF, the researcher can download an existing ENSDF file from the NNDC websites and replace the old data with new information. In case of mismatch in data, the mismatch can be seen in the .err file where the code points out  $\gamma$  transitions whose  $\gamma$  energy value does not match with the difference between the initial and final level energy values, above a user defined threshold value.

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