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Projet EUROGAM

On line analysis software requirements

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Abstract

This note presents the preliminary reflexions on the on line event analysis of the french community involved in the EUROGAM project. It outlines the main requirements in that field and gives an indication on the conditions the event processor unit has to fulfill.

Description of typical on line analysis procedure during an experiment

The on line analysis has three main purposes:

- 1 Control of the various parameters of the experimental set up
- 2 Checking of the quality of the data.
- 3 Getting maximum available informations for the subsequent off-line analysis.

The first stage can be done with the histogrammer by creating individual raw unconditioned spectra (e.g. gamma-spectra unsuppressed/suppressed, time spectra) as well as raw and Compton Suppressed Ge folds and Ge and BGO Sum Energy. (The energy spectra should be done on source, pulser, then with on-line data).

In addition a selection of the Ge counter pattern may be of interest to the users. It is also necessary to have access permanentely to the rate of events at the aquisition stage.

Functions such as creating, displaying, zeroing, storing into memory should be available.

The second and third stages should be done on the sorter and imply the creation of a set of one and two dimensional spectra, depending on a specific experiment. It is essential to be able to build in direct mode and with multiple conditions on the ADCs (energy, time, fold, sum energy...) different distributions like germanium energy, time, fold, sum-energy, fold versus gamma energy and sum- energy versus gamma energy. These informations should be available for different reaction channels selected either on criteria previously mentionned or by means of additionnal counters (recoil separator, particle detectors...).

It is clear that one should have during the experiment the possibility of analysing high fold events. We have in mind that this sorting processes only after gain matching for the Ge and selection by fold tresholds.

Due to a high number of spectra it is necessary to have a clear interactive display of the various sorting conditions based on lookup tables. First priority must be given to the constitution and the graphic representation of direct and conditionned one dimensional spectra. The second priority would be the constitution and the display of two-dimensional distributions on which we want to be able to define energy gates in order to obtain the corresponding one dimensional spectra.

A typical analysis procedure might imply the following different steps on the sorter:

i) Creation of two matrices Sum energy/Ge energy and Fold/Ge energy which dimensions could be 64 x 4096 channels both. (2 Mbytes total on 4 bytes/channel)

It is to be noticed that those spectra could be done with only one (or some already gain fit) Germanium detector.

ii) - It is important to know the time versus energy relationship in order not to squeeze the low energy lines during the sorting. Therefore 45 128 x 1024 channels matrices should be created at some stages of the experiment (e.g. begining and end). Those matrices do not have to be stored in permanent memory but should be sent to a disk.

iii) - Create 45 spectra gated on Fold, Sum energy and time. Those spectra should be stored and erased regularly in order to check the data.

- The fitting of $\sim$ four peaks and calculating the corresponding gain matching parameters with different options (e.g. linear, quadratic, including or not the Doppler correction dependant on the different angles) might be done on a parallel work station. The resulting parameters should be sent back to the sorter in the form of tables which will be used for creating the next spectra which all imply gain matching. (Those spectra and control tables should include identification tags from a counter storing the block number informations at the begining and end of the spectra construction. The results of the fit and new calibration parameters should be stored in lookup tables which will constituted the logbook of the experiment. These informations would be used for the final sorting.

iv) Sum of projected spectra for 4, 5, 6, 7,....folds Ge events

v) A set of Ge energy spectra (gated on Fold, Sum-energy, time plus one or a sum of transitions energies)and the corresponding background gates.

vi) Different set of Ge energy spectra gated on various combinations of double or triple gates on Ge energies (e.g the energies of SD band). It is to be noticed that a triple condition on the Ge energies would imply considering only folds 4 and higher (such a threshold would be asked anyway at the Event-builder stage for most experiments) all these spectra should be created as a function of the remaining Ge fold.

vii) One Gamma energy versus Gamma energy gated matrices (4096 x 4096 channels = 32 Mbytes on 2bytes/channel).

N.B. The Ge spectra should be stored in subgroups according to their angular position.

The available memory for the sorter (actually 64 Mbytes) allows storage for one-dimension spectra (2 to 16 Mbytes), both matrices in section i) (2 Mbytes) plus one Ge energy * Ge energy (4K x 4K =32 Mbytes) matrix (section vii).

For all the spectra (one or two dimensional) obtained during the measurement we require the possibility to store both on disk and tape. A fast hard copy of the screen is also needed.

It is clear that the data processing on and off line are strongly correlated but in a first stage it is crucial to have access to a minimum of graphic tools to be able to perform a reliable software analysis in order to monitor the quality of stored data.