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Subtask 1.1.3

Covariance generation for the (n,n'γ) technique

Definition: if *q* and *r* are two random variables then:

$$Cov(q,r) = E\left[\left(q - E(q)\right)\left(r - E(r)\right)\right]$$

If we can **repeat the measurement n times** then:

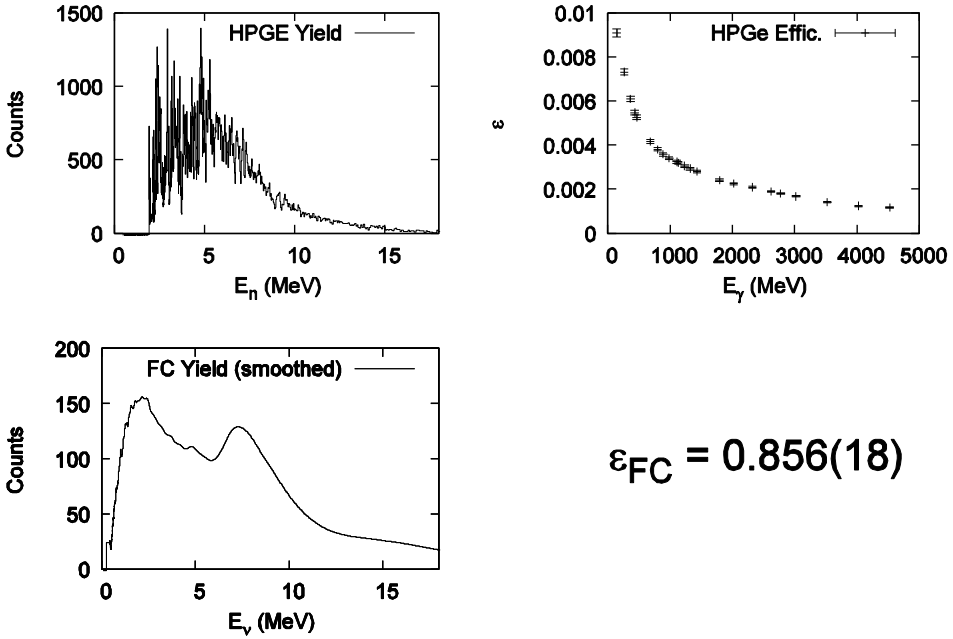
$$Cov(\bar{q},\bar{r}) = \frac{1}{n(n-1)}\sum_{k=1}^{n}\left(q_k - \bar{q}\right)\left(r_k - \bar{r}\right)$$

Subtask 1.1.3

Covariance generation for the (n,n'γ) technique

$$Cov(\bar{q},\bar{r}) = \frac{1}{n(n-1)} \sum_{k=1}^{n} (q_k - \bar{q})(r_k - \bar{r})$$

We simulate the experiment n times by varying the observables used in the calculation of the cross sections:



ε_{FC} = 0.856(18)

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Subtask 1.1.3

Covariance generation for the (n,n'γ) technique

The code generating HPGe yields

Procedure and code generating the HPGe efficiencies

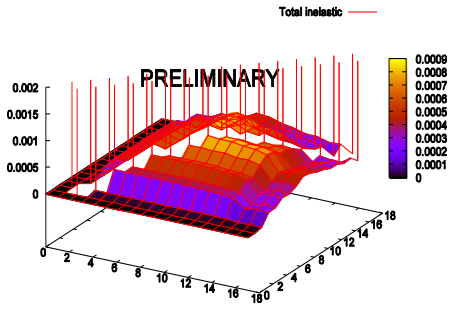
The code generating FC yields

The code generating FC efficiency

Run the normal analysis procedure *n* times

The code generating covariances

Covariance matrices



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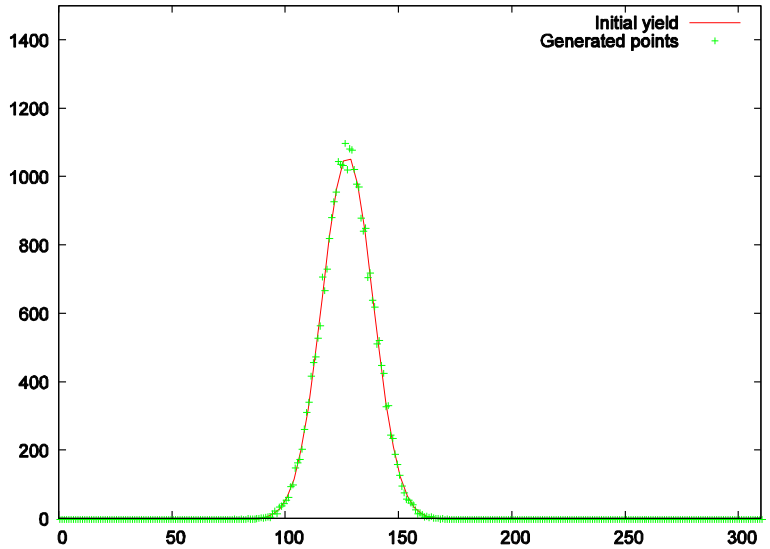
Subtask 1.1.3

Covariance generation for the (n,n'γ) technique

The code generating HPGe yields



For each gamma ray and each neutron energy channel the n "measurements" are generated by considering a Gauss distribution with the central value equal to the number of counts and sigma given by the uncertainty of the number of counts in that channel.

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Subtask 1.1.3

Covariance generation for the (n,n'γ) technique

Procedure and code generating the HPGe efficiencies

The generation of the n sets of efficiencies is done following a Bayesian approach. The likelihood function is chosen to constrain the model to reproduce the measured efficiencies determined with a calibrated point source. This approach implies extensive calculations that make use of the model evaluated for large sets of parameter values. Considering that the model is a sophisticated Monte Carlo simulation, the adequate practical choice is to linearize the model.

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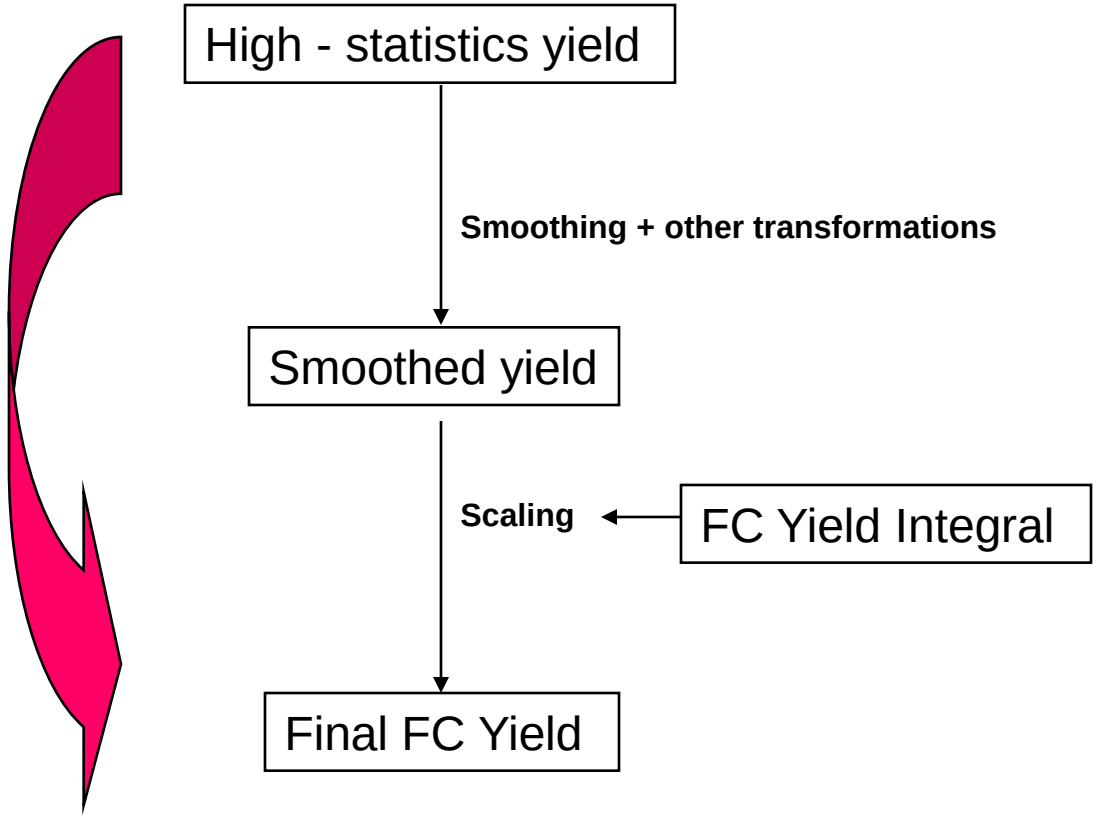
Subtask 1.1.3

Covariance generation for the (n,n'γ) technique

The code generating FC yields



Repeat the procedure *n* times varying the number of counts from the high-statistics yield within uncertainties

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Subtask 1.1.3

Covariance generation for the (n,n'γ) technique

The code generating FC efficiency

The FC efficiency is a number that does not depend on the neutron energy.

The *n* values are generated considering a constant distribution.