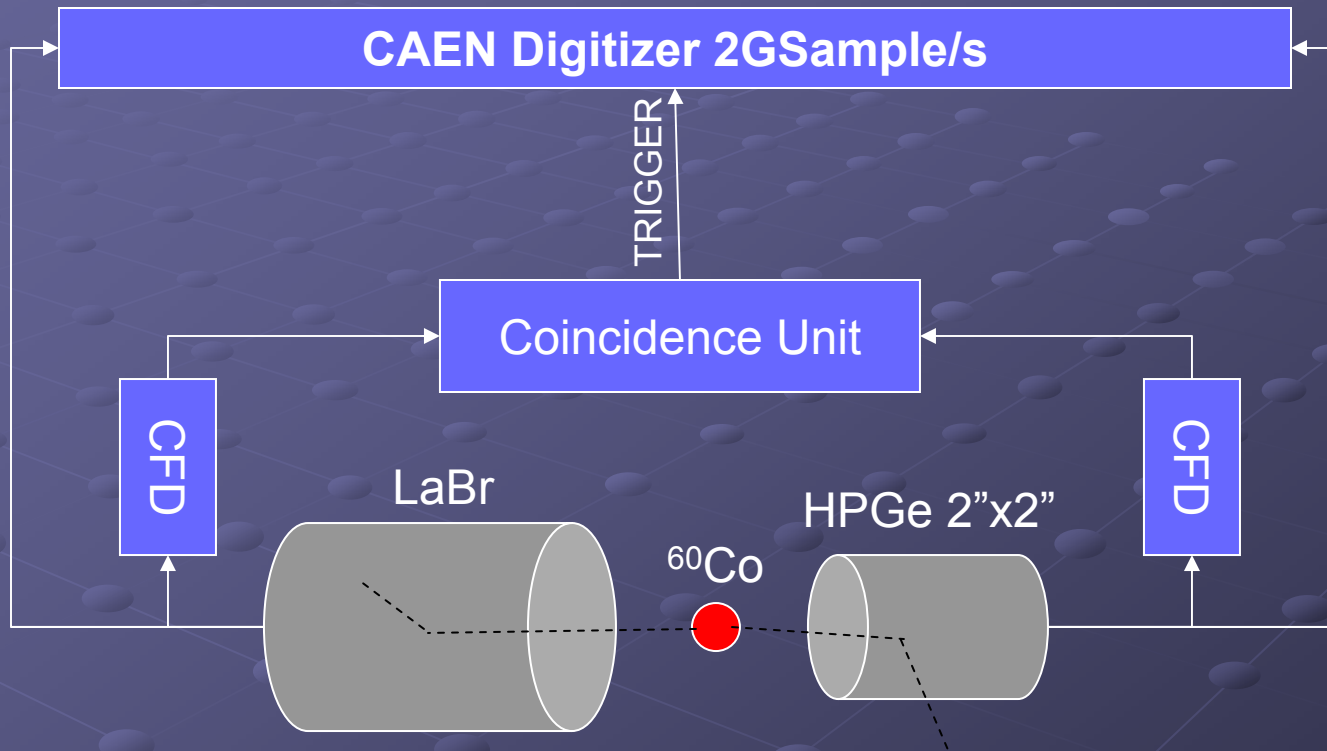


PSA for extracting timing information from HPGe experimental signals

FABIO CRESPI - University of MILANO / INFN MILANO

Description of the Measurement

Sketch of the experimental set-up:

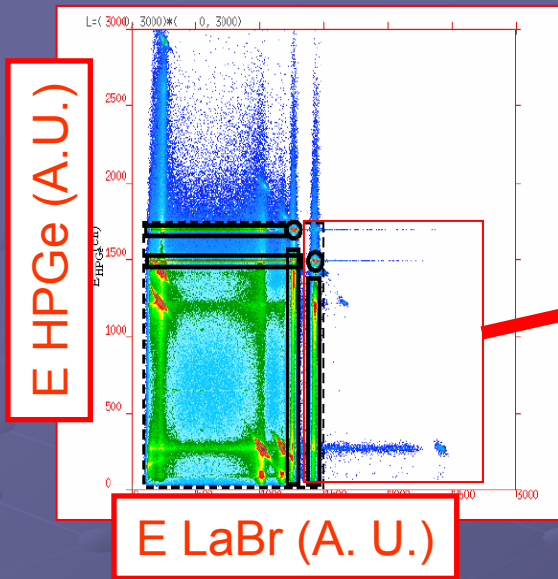


Purpose of the Measurement: Obtain time aligned HPGe signals

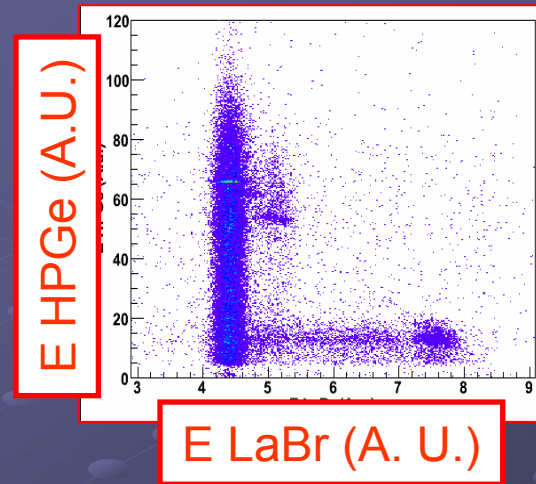
- The signal shapes of both the detectors are acquired at 2 GSample/s (when they fire in coincidence)
- The threshold of the LaBr CFD has been set just below the 1332 keV ^{60}Co peak

Description of the Measurement

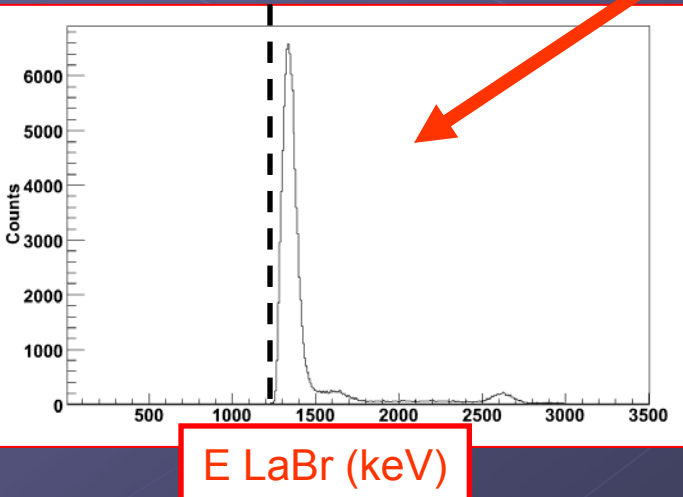
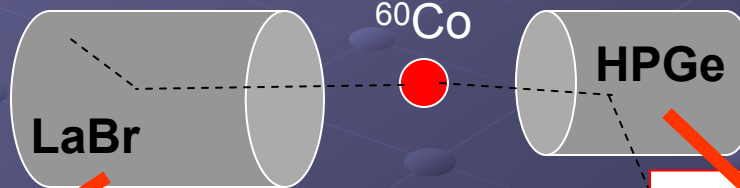
Coincidence Matrix – No Threshold



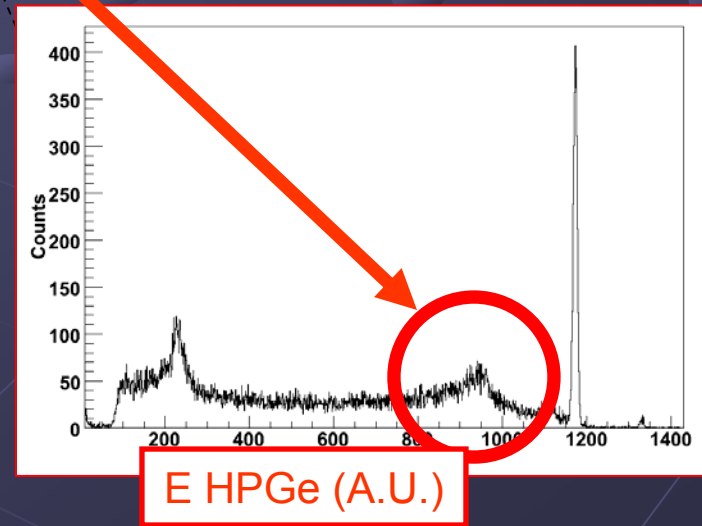
Coincidence Matrix + Threshold



LaBr CFD Threshold



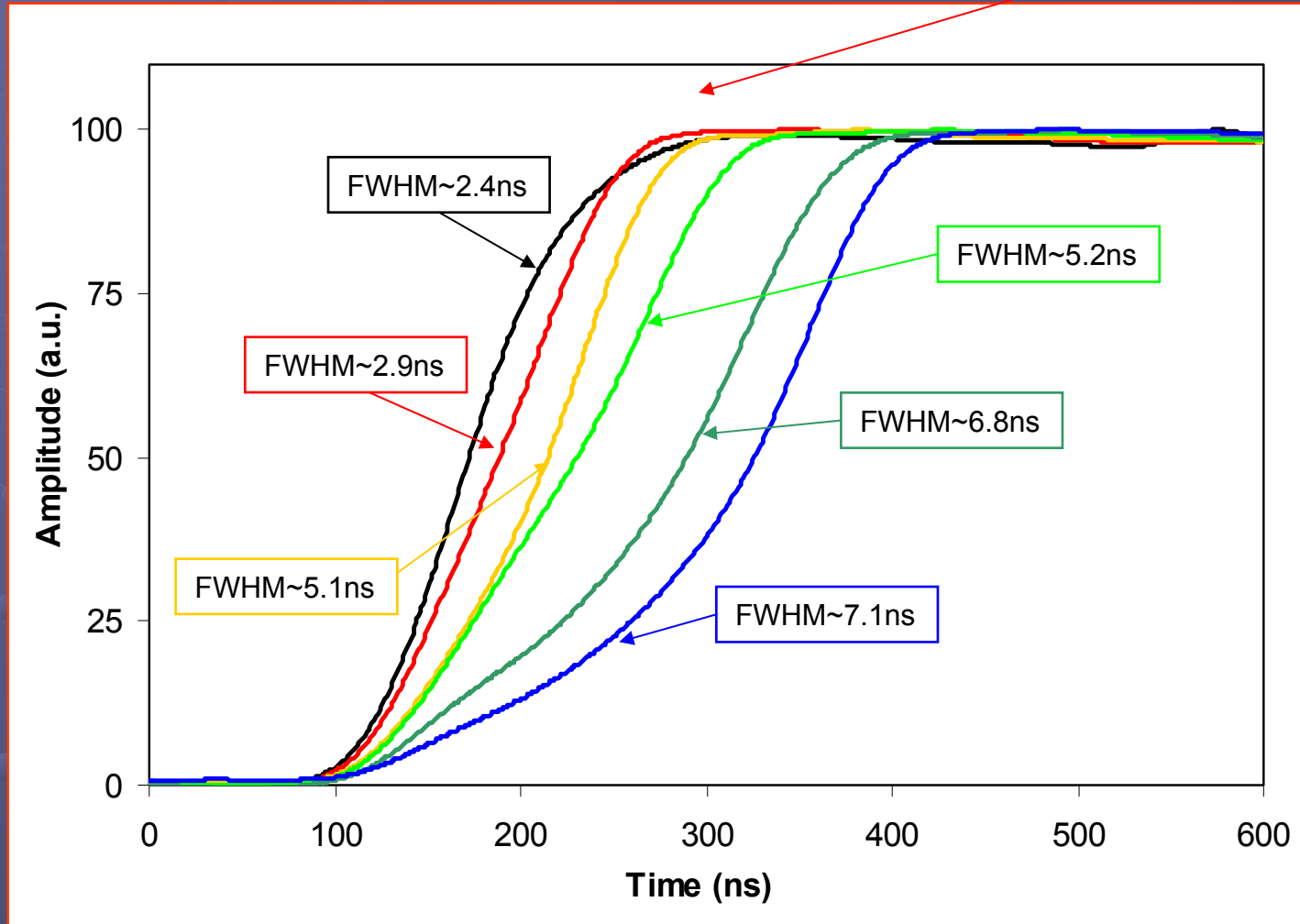
Energy Spectra



CFD timing dependence on signal shape

Digital CFD has been applied to set of signals grouped according to their shape

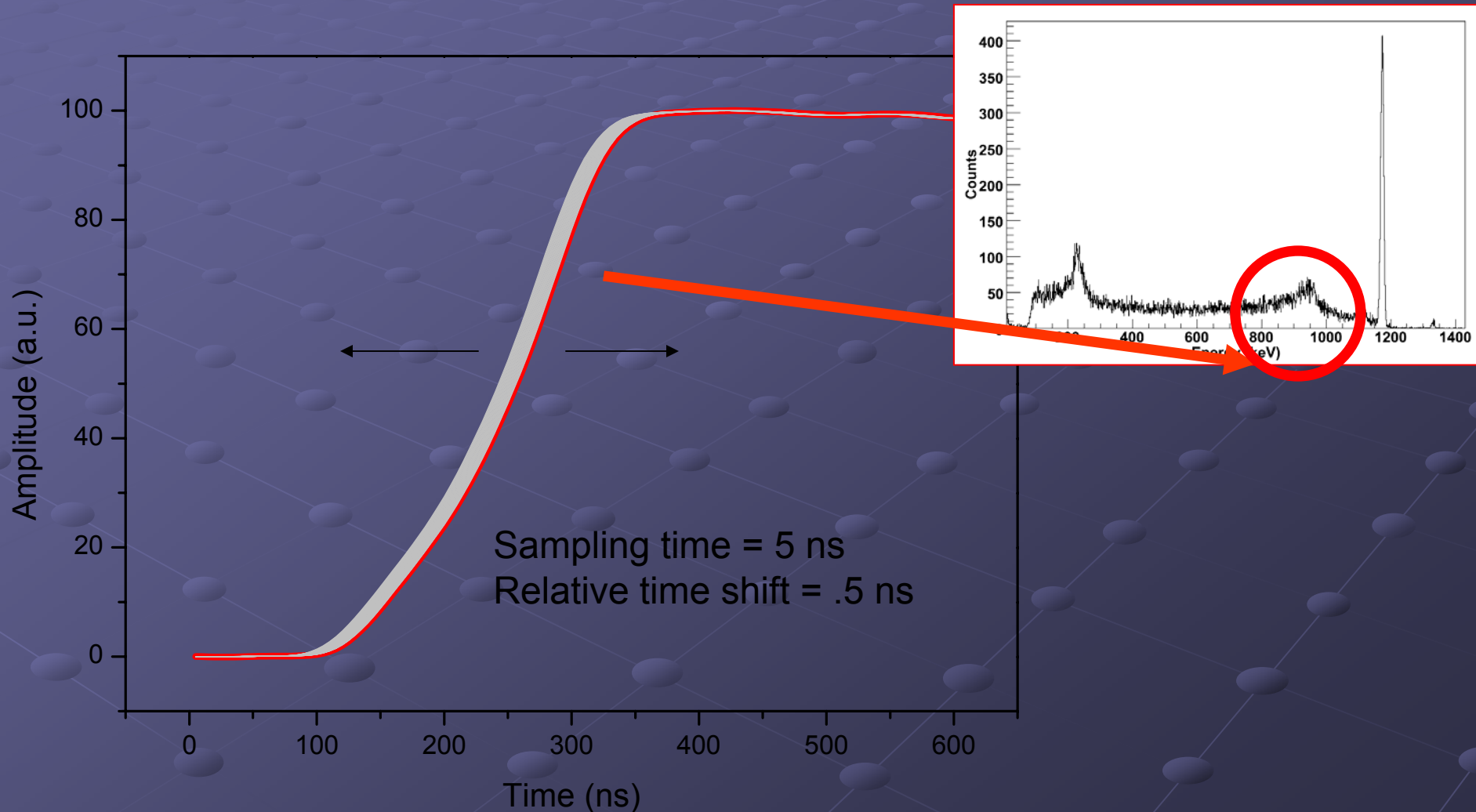
The obtained FWHM is displayed together with a signal shape representative of its set



→ The faster is the rise time (in the very first part of the signal), the better resolution we have

PSA: Signal Basis Generation

- Selecting single interaction events with a “gate” on the Compton edge
- Each trace (2GSample/s) is decomposed in time shifted traces with 5 ns sampling time and relative time shift of 0.5 ns.

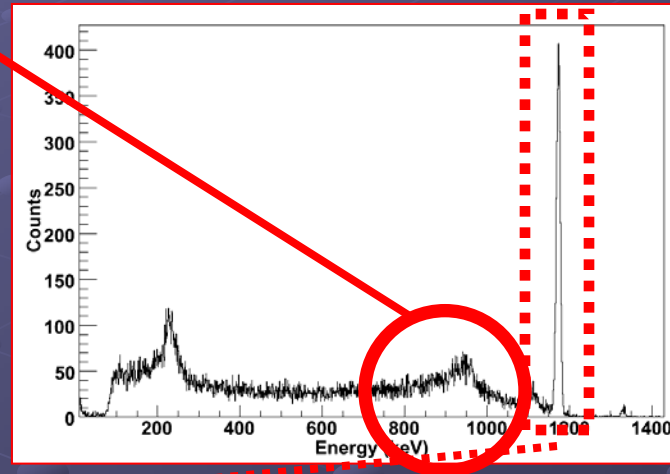


Timing with PSA

Simple Test:

- INPUT DATA = single interaction events (selected with a gate on the Compton Edge)
- No signal decomposition needed in this case, simple χ^2 comparison performed

RESULT = 3.2 ns FWHM

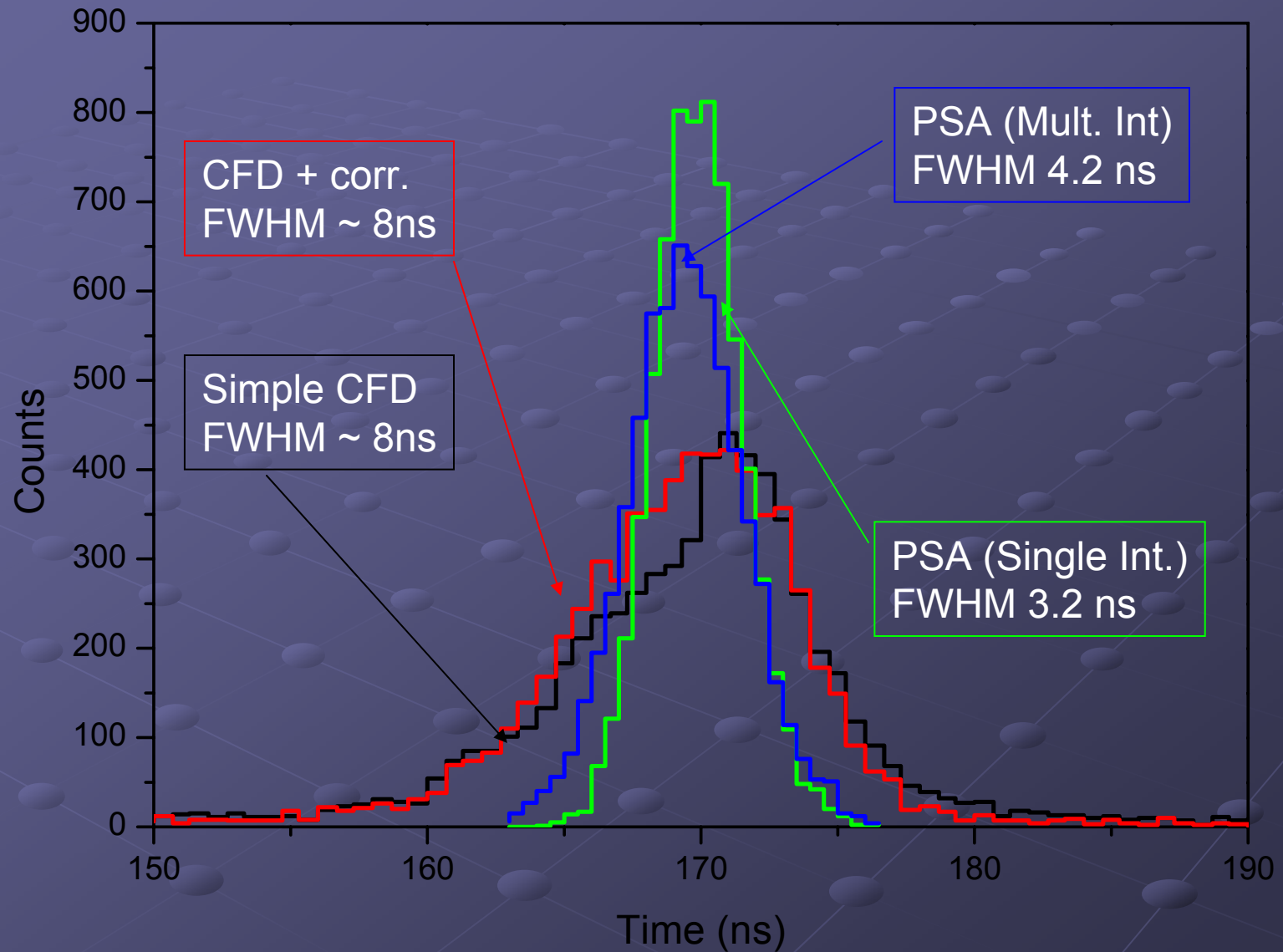


General Case:

- INPUT DATA = Full Energy Peak Events (mostly multiple interaction events)
- PSA for signal decomposition needed:
 - RS algorithm has been used with the previously described signal basis

RESULT = 4.2 FWHM

PSA (RS algorithm) vs CFD timing**



** V. Vandone Master thesis

Conclusions and perspectives:

- ❑ The CFD timing resolution dependence on the signal shape has been studied
- ❑ It has been shown that using PSA timing a significant improvement in resolution can be obtained as compared to standard CFD method.
- Further tests with larger volume/segmented HPGe detectors