Analysis of ^{76}Se: total OMC rates from time evolution of γ-lines followed the OMC: study of some systematic errors

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Se-76 data: processing statistics

- **1411 runs (~ 86 h) in the data list:**
- **We analyzed spectra of individual detectors, with the exception of Ge2 and Ge6, which have problems with determining the t0 signal.**

Muon logic:

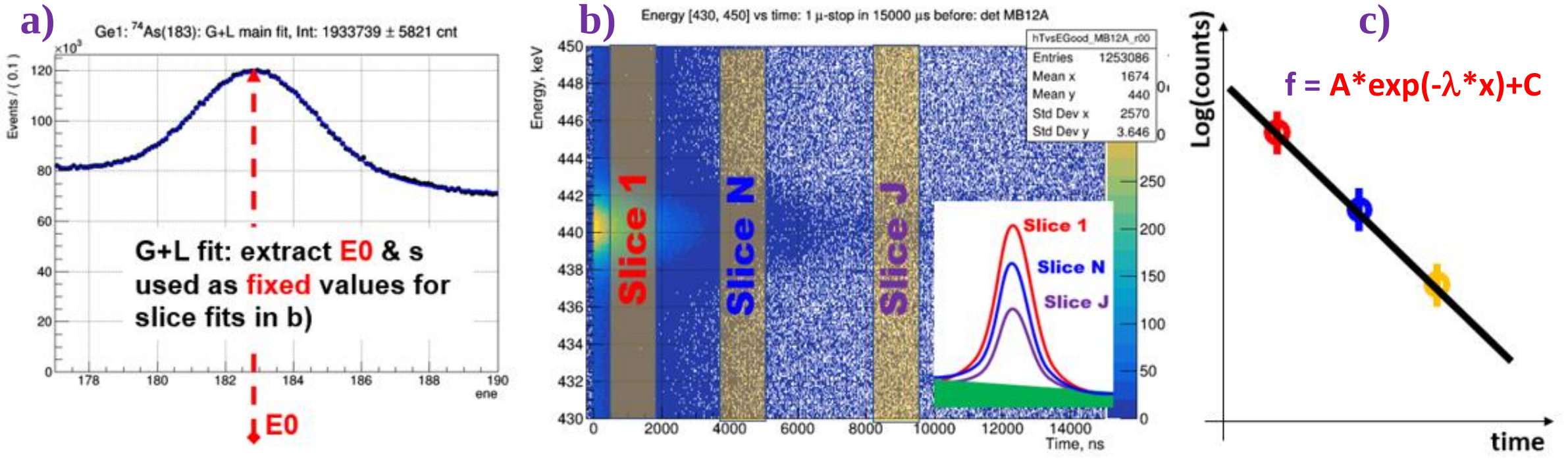
“Incoming muon” – C_1 & not(C_0) hit

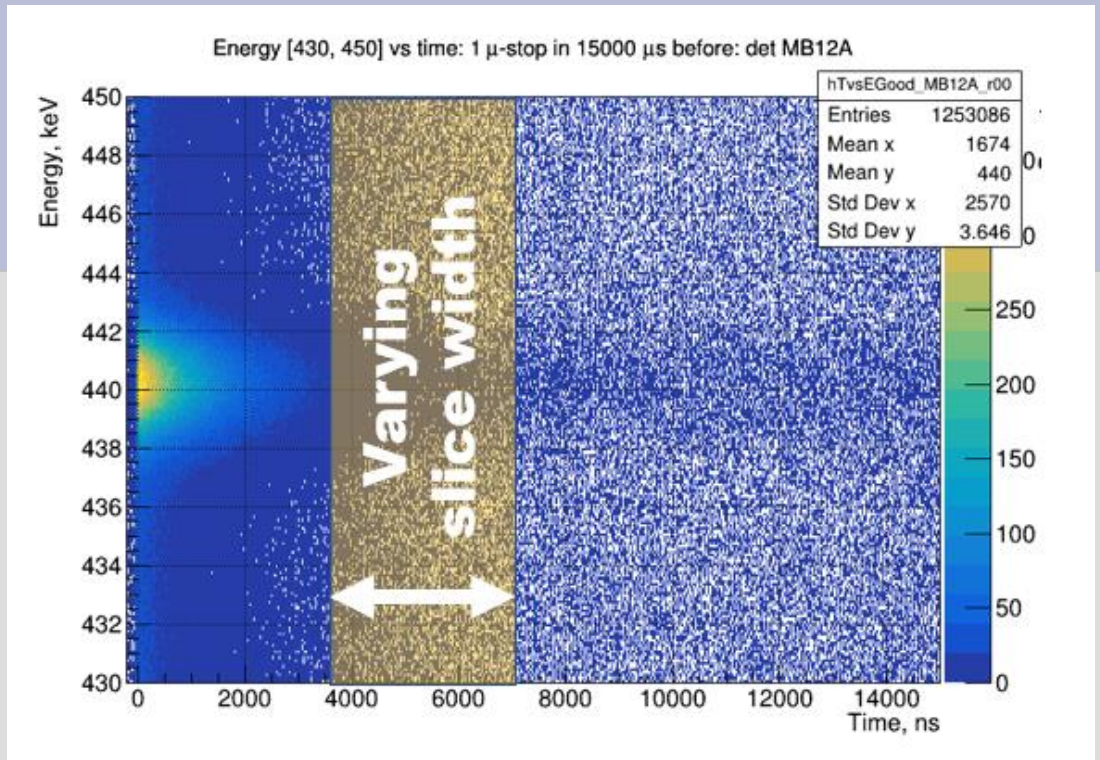
Method

a) Making projection of 2D-histo on energy axis, fit by G+L model, extract Gaus position & sigma

b) Making energy slices of 2D histo along time range, fit each slice by G+L model with fixed Gaus peak position and sigma, determined in a)

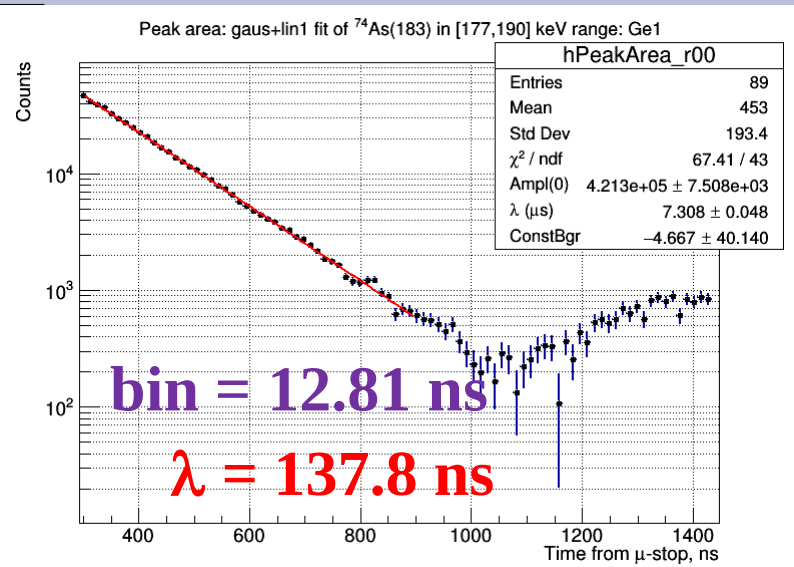
c) Fit peak intensities vs time with f = A*exp(-λ*x)+C, where λ is searched parameter

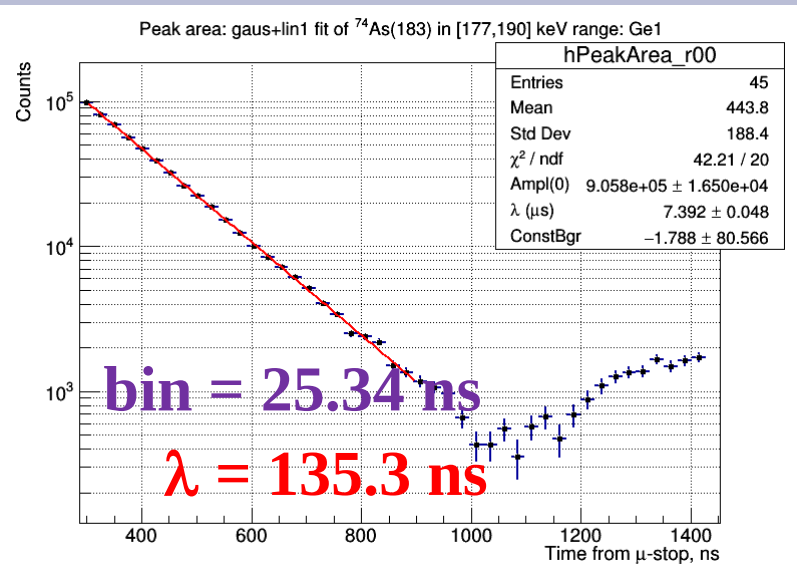


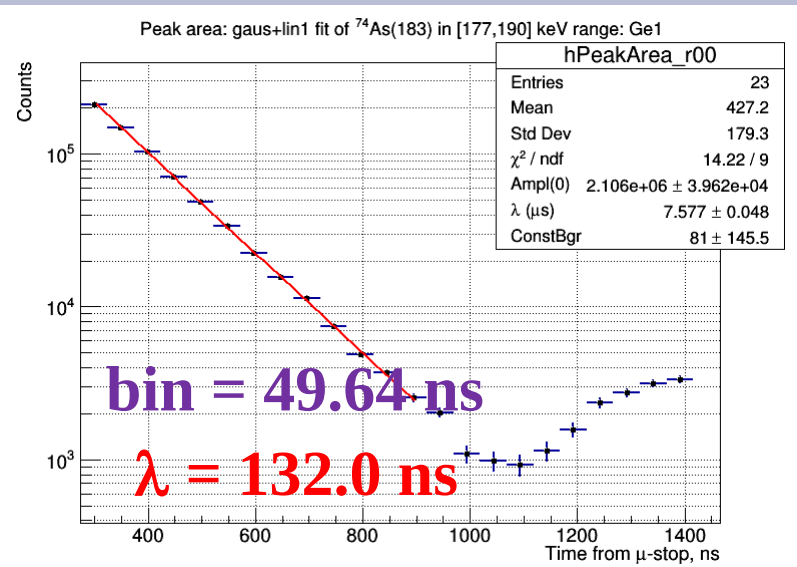


SYSTEMATICS DUE TO TIME BIN WIDTH

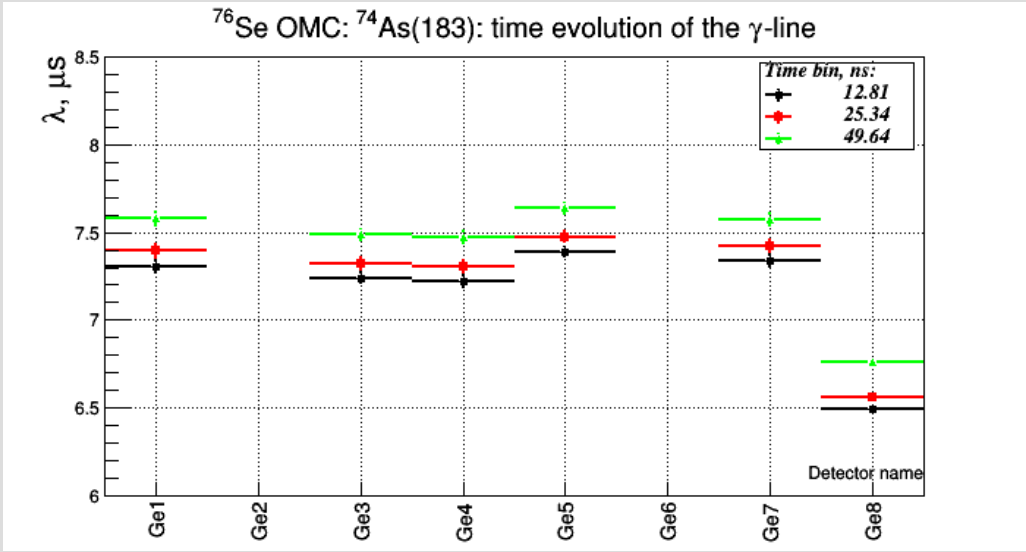
Impact of the bin width



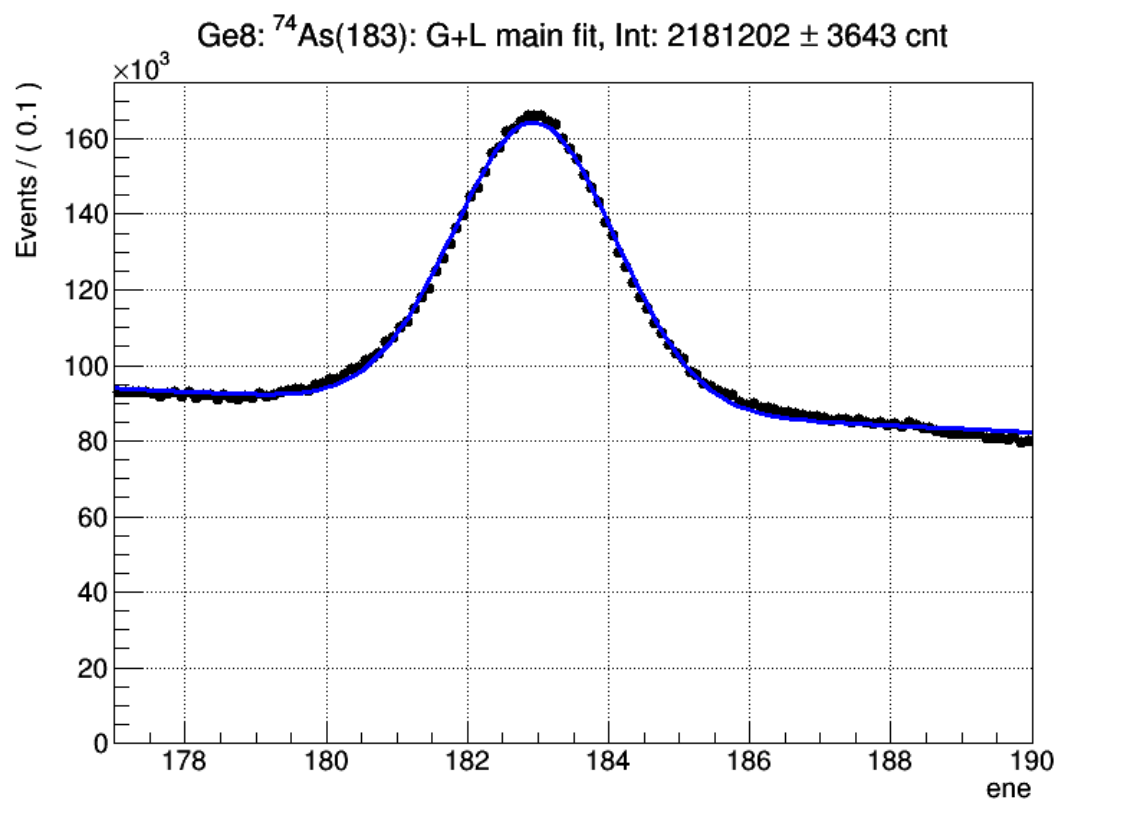


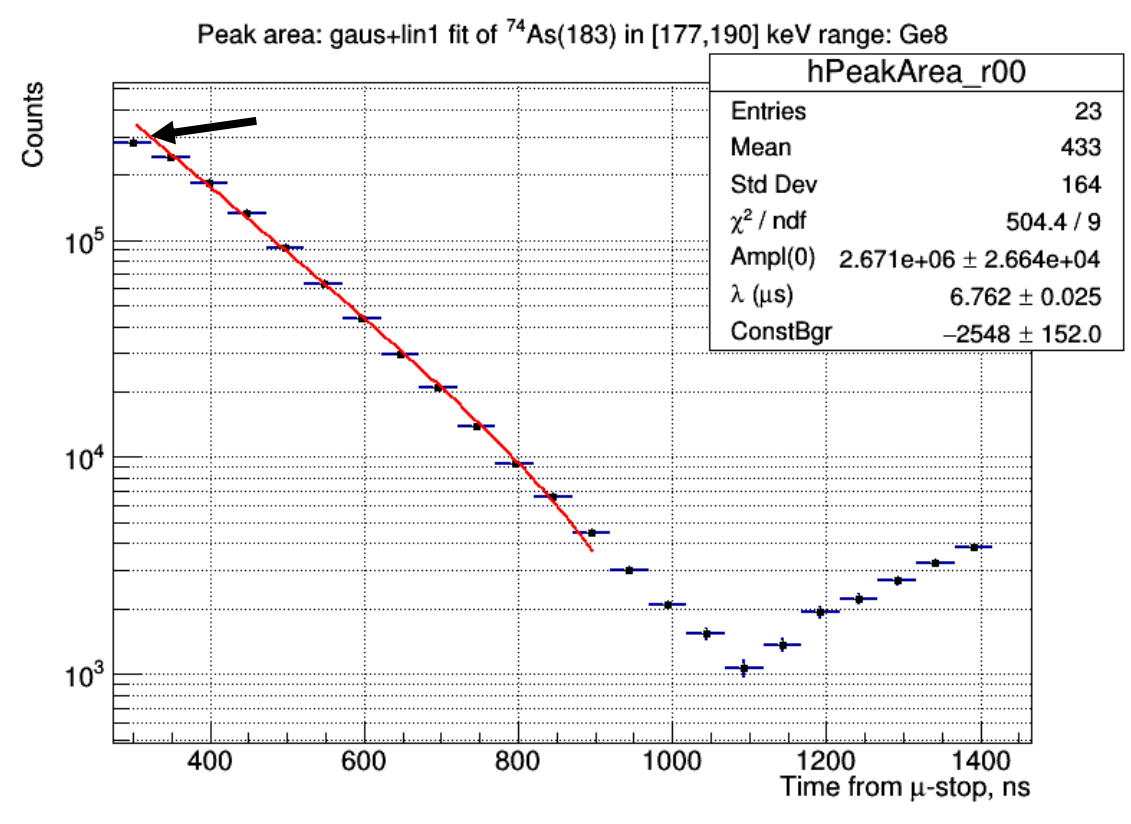


- **The more bin width, the less muon lifetime.**
- Problem on detector Ge8

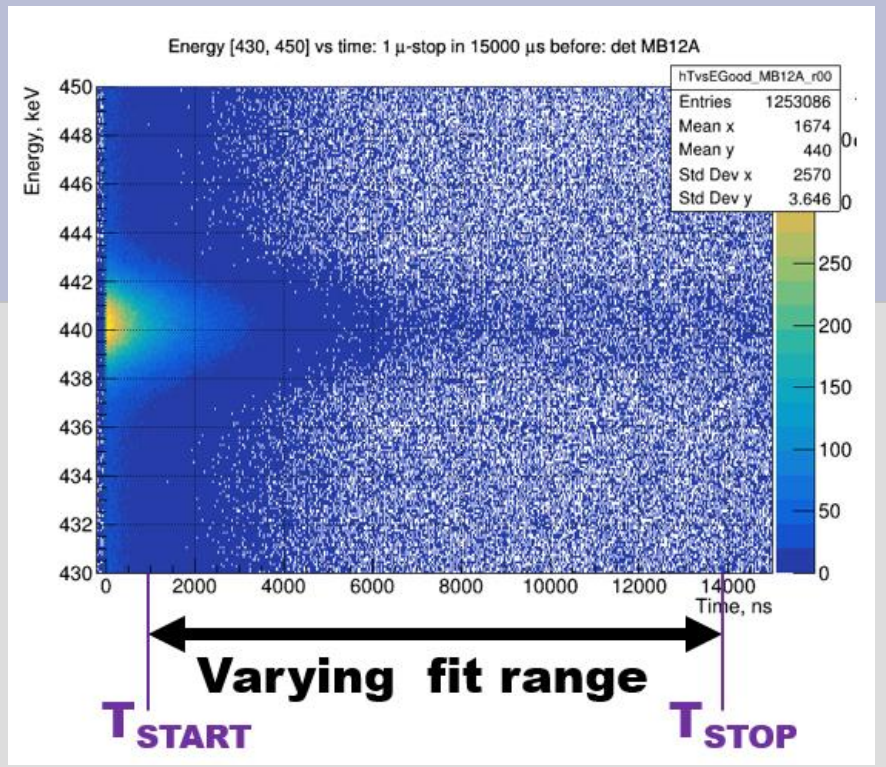


^{74}As(183 keV): Ge8



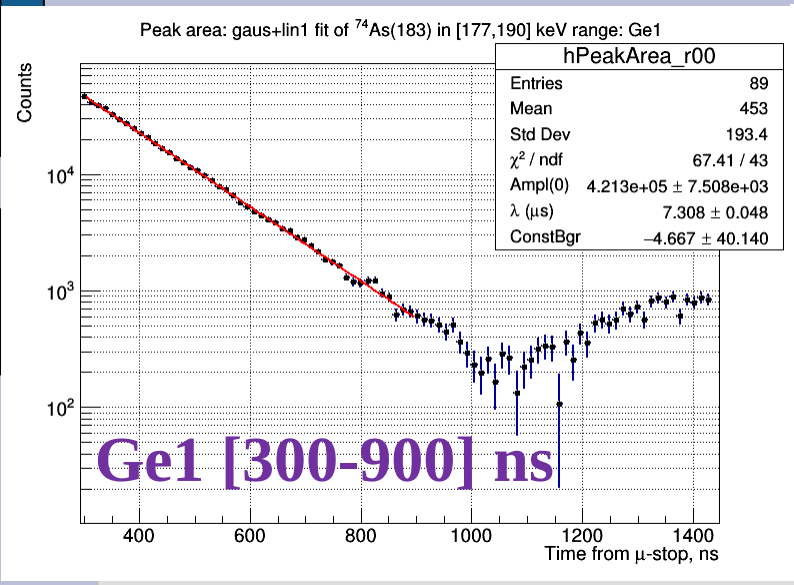


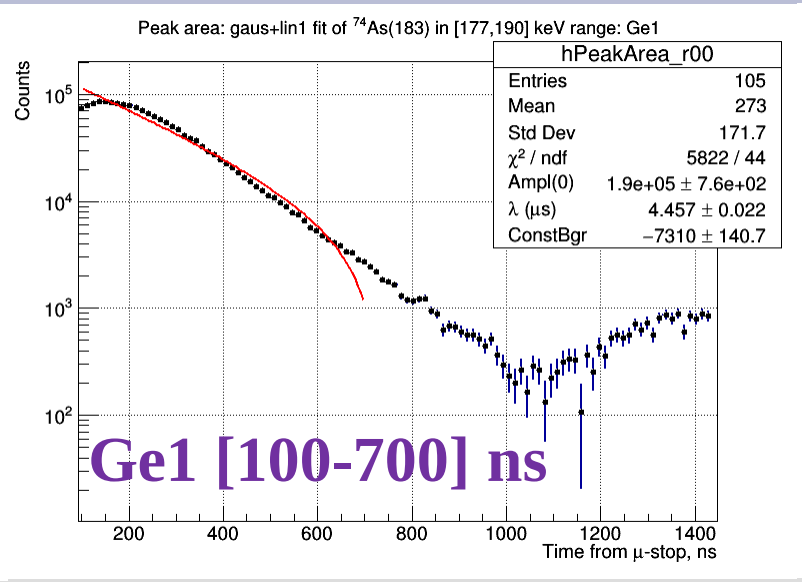
Line shape (detector response) is ok, but slice drop is NOT exponential at small times. We will se this problem further in the next section…

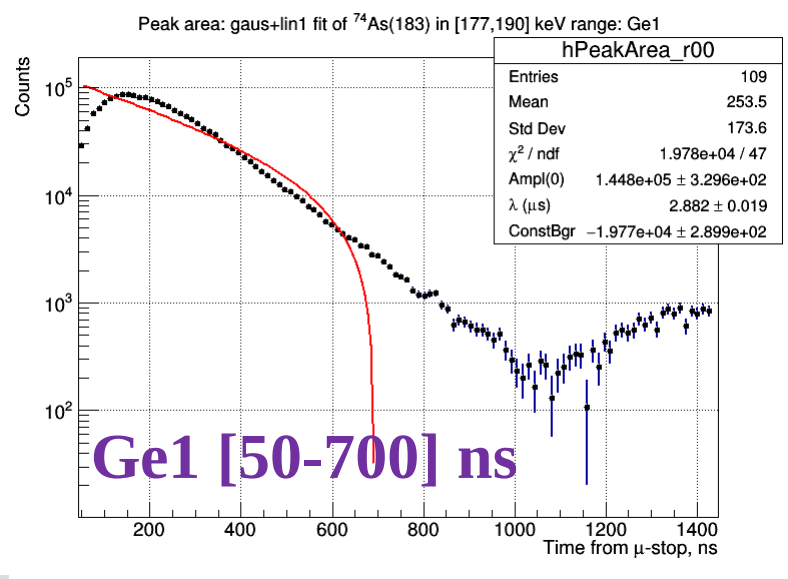


SYSTEMATICS DUE TO FIT RANGE

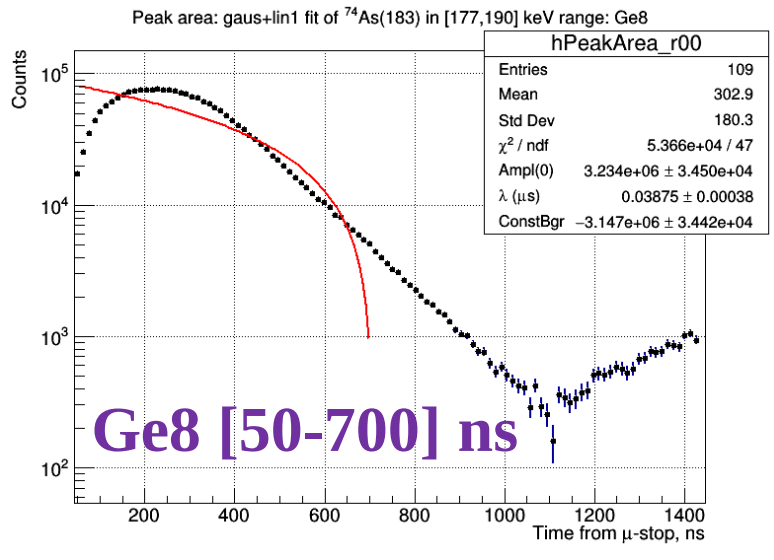
Impact of the fit range



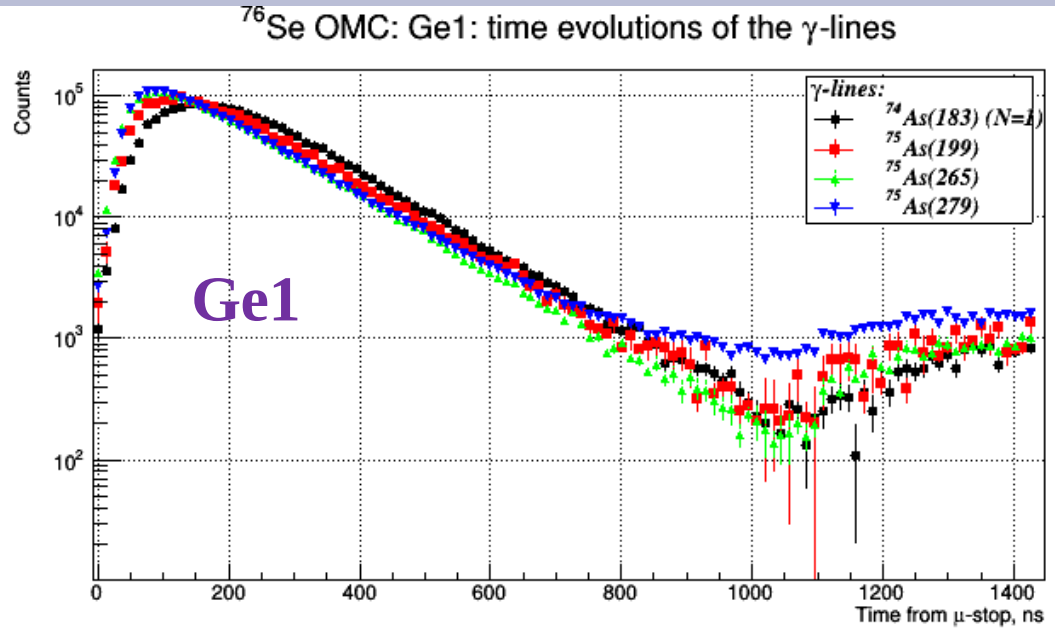


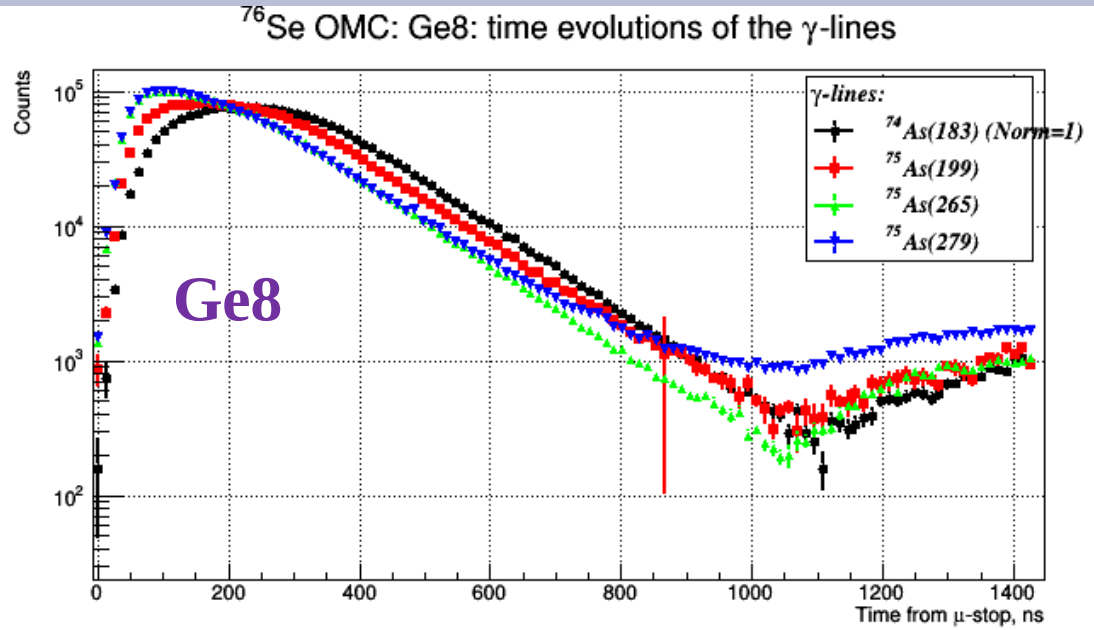


It can be seen that at the beginning of the time window (200 ns or more for other detectors), the curve is clearly not exponential. Timing problem for large HPGe detectors?



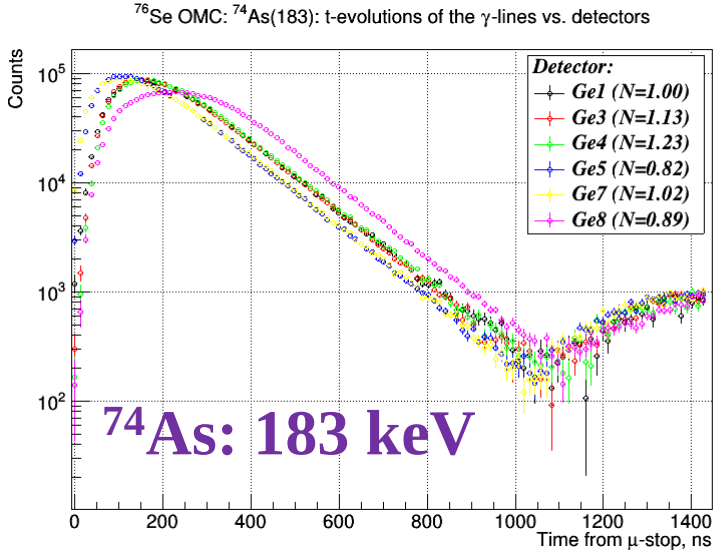
Timing of HPGe detectors vs. energy

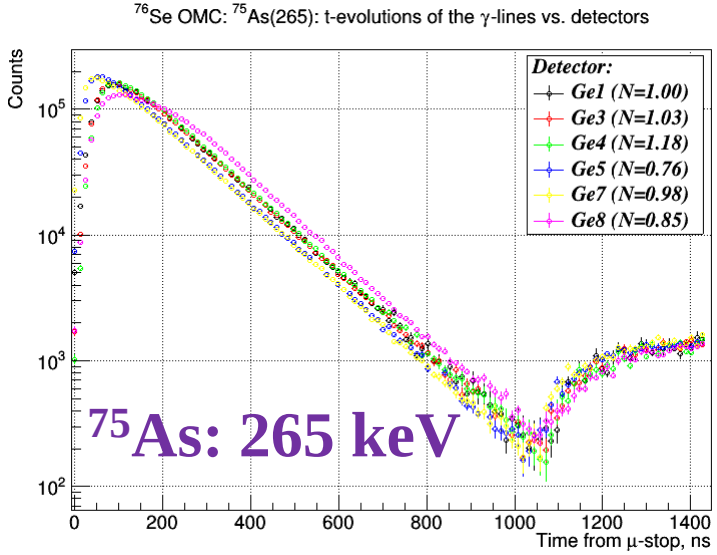


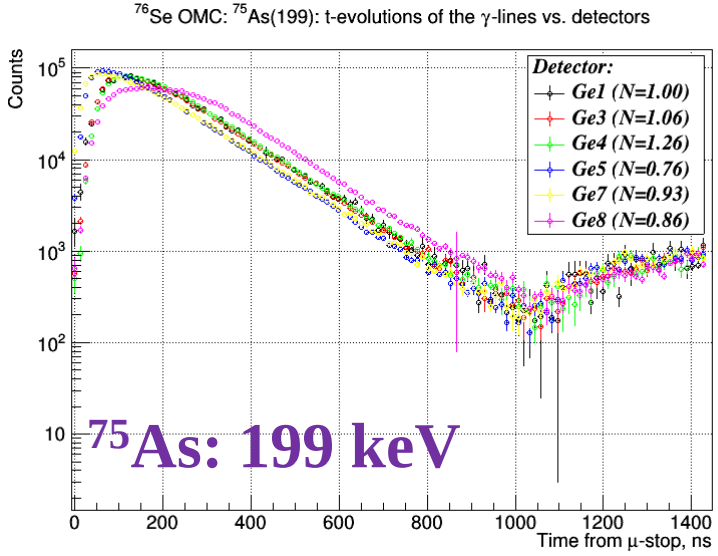


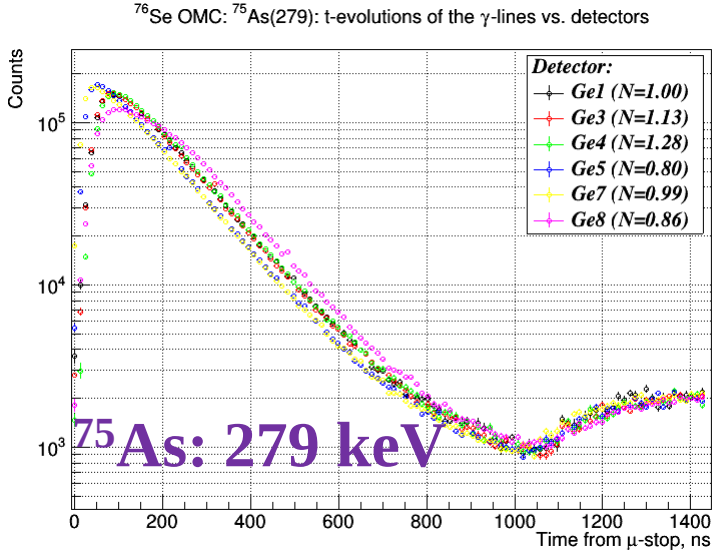
- **Strong difference between the 183 and 199 keV lines**
- **A strong difference between the detectors, for example, the Ge8 is knocked out especially, which explains the difference in its result compared to others detectors – fit should be started from 400 ns (300 ns now).**

Timing of HPGe vs. detector & energy





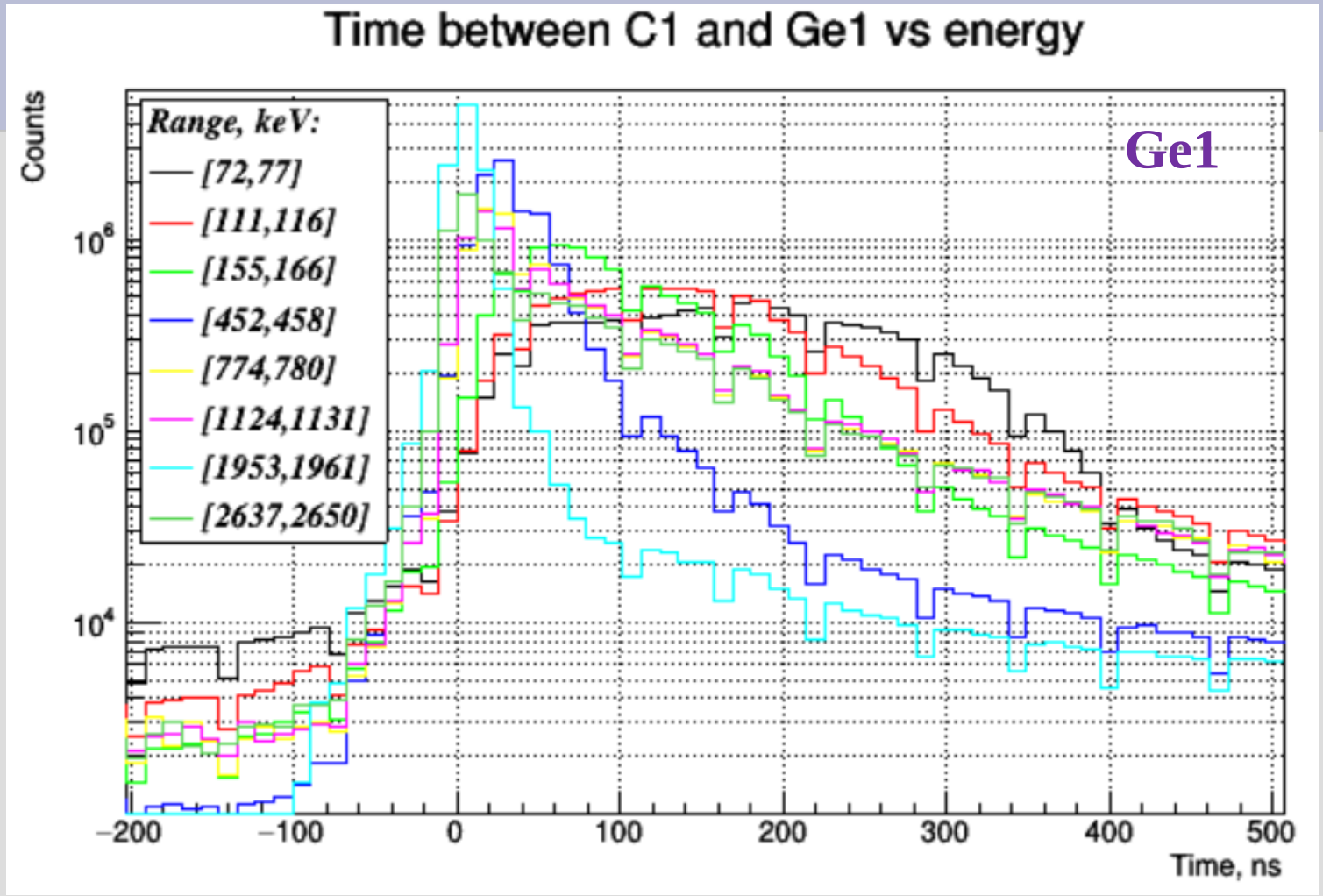




We have three groups of detectors with different timings:

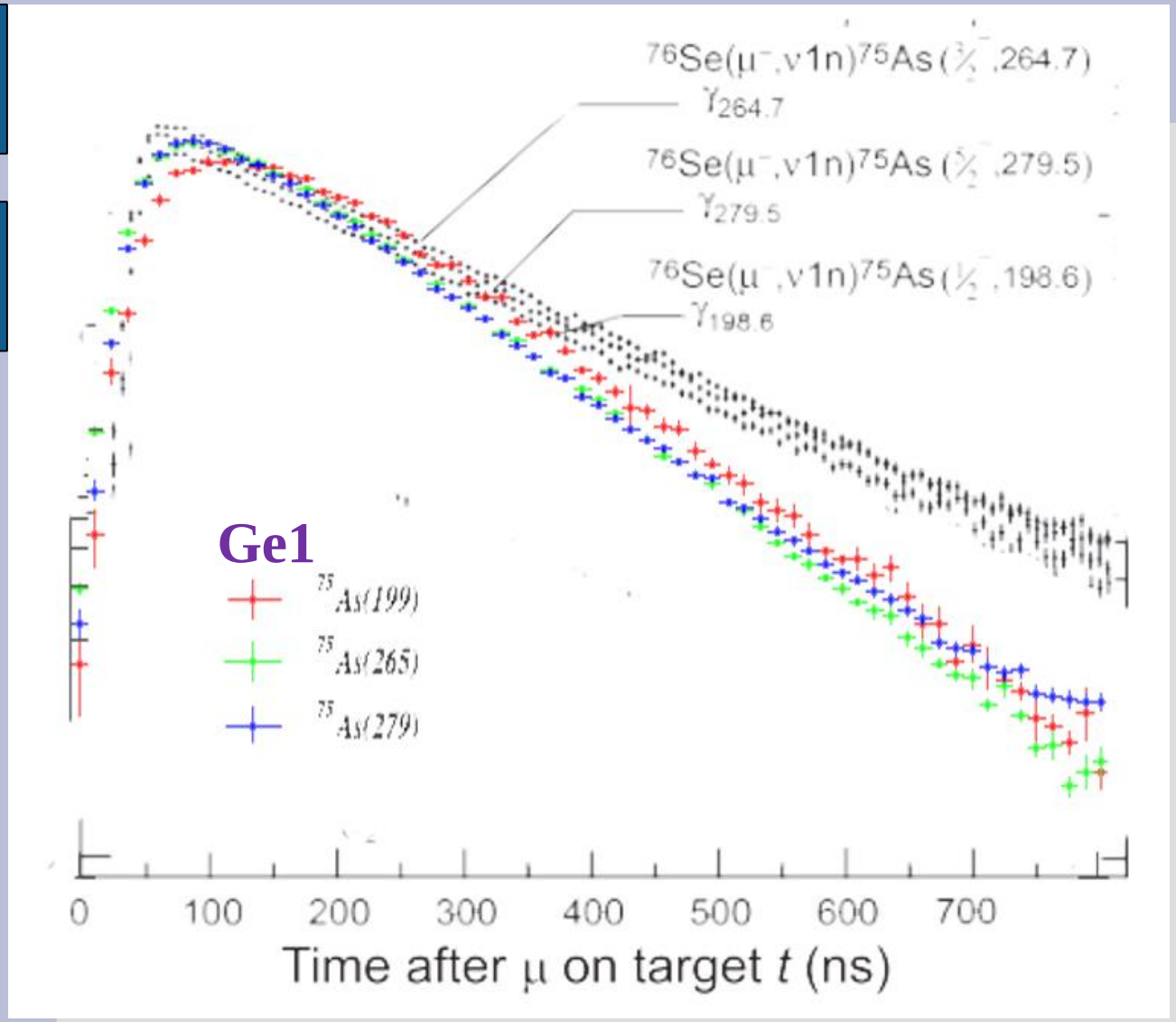
- **5,7 - best timing**
- **1,3,4 - medium timing**
- **8 - worst timing**

Timing of HPGe detectors vs. energy



- **Timing of each detector as function of energy can be determined from C1 & Ge μX coincidences.**

This work vs. published: here is the problem!



- New (color, Ge1) and old (black) results are on the same plot.
- The difference is huge and can't be explained by systematics with binning & fit range
- Wrong timescale? But 1000 ns timestamp with pileup protection is on its place!

Conclusion

- Systematics in binning and fit range choice has been estimated for the time evolutions of g-lines in OMC on Se-76.
- But it can’t explain a difference between the old and new results.
- Results from LAMA DAQ is highly interesting to see.
- Results on muon decay is also interesting and will be soon (analysis is in progress now…)