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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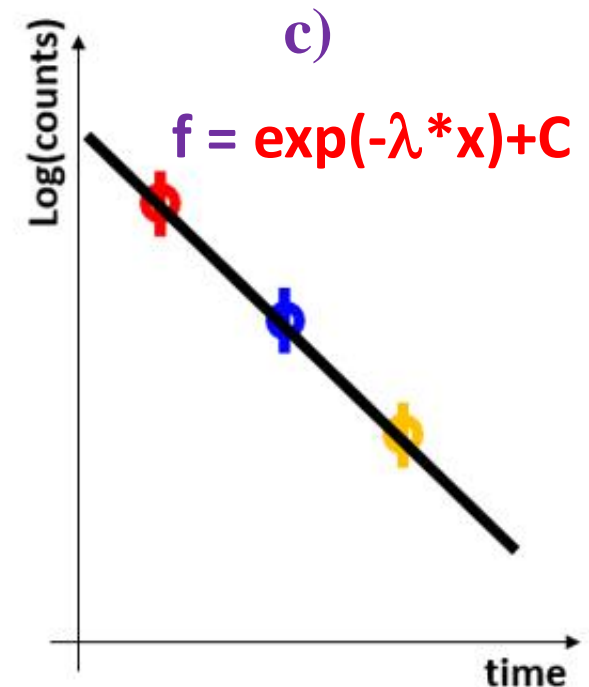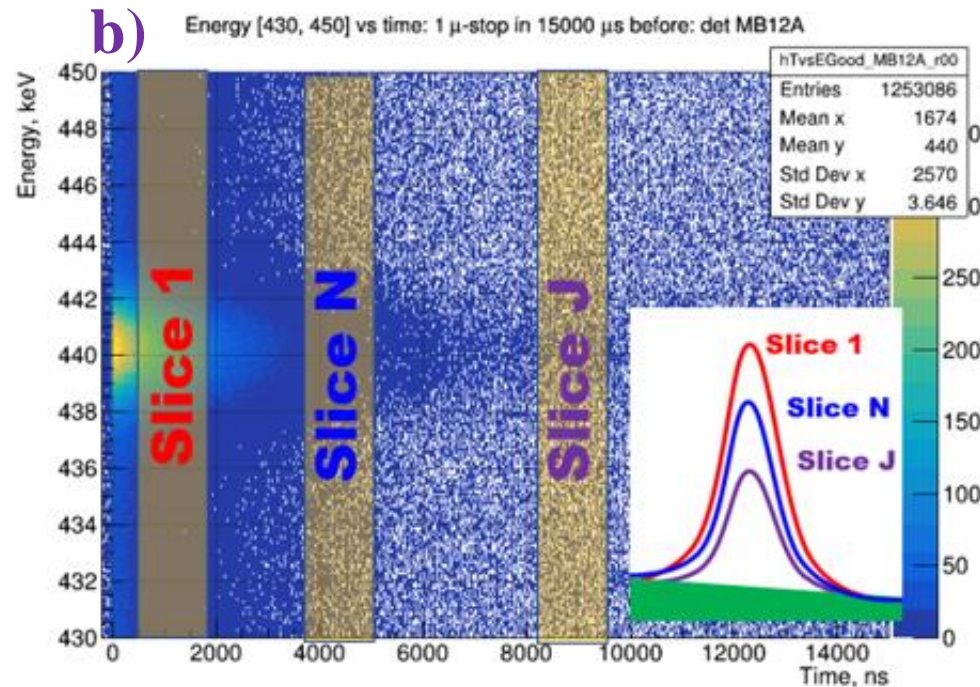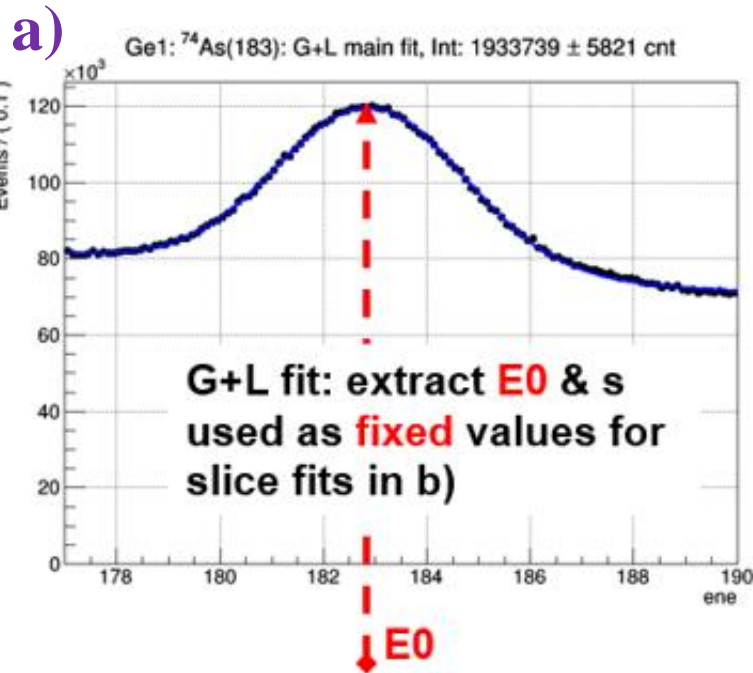# Se-76 data: processing statistics

- **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.**
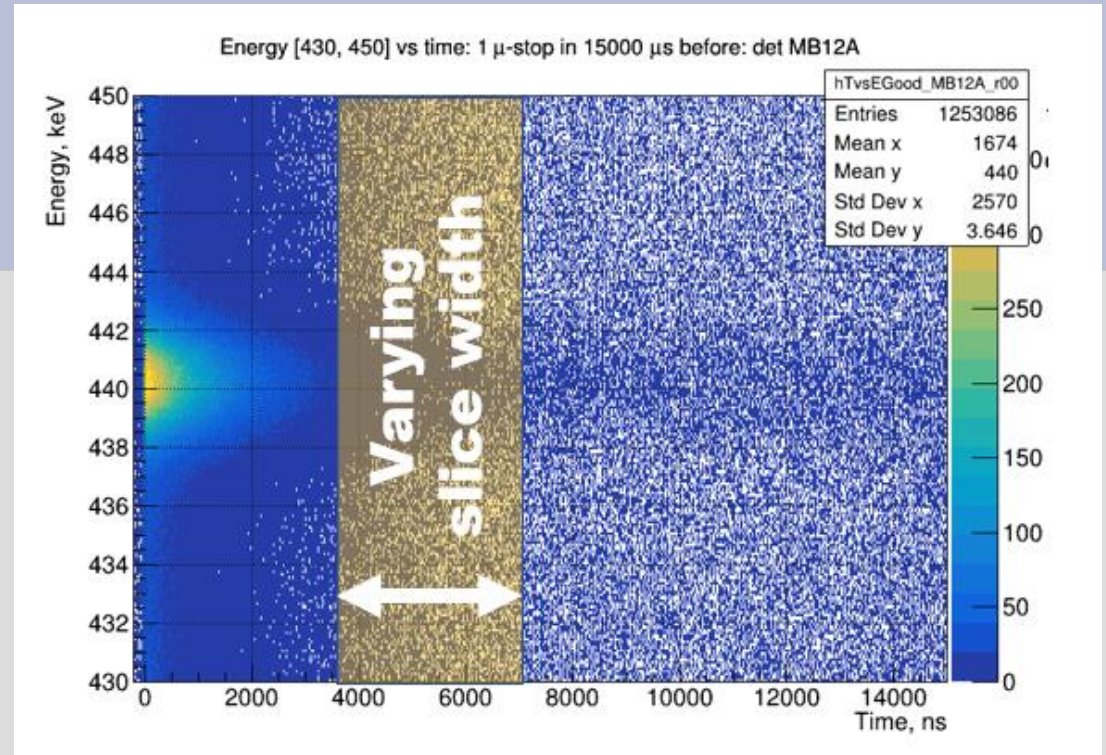
Muon logic:

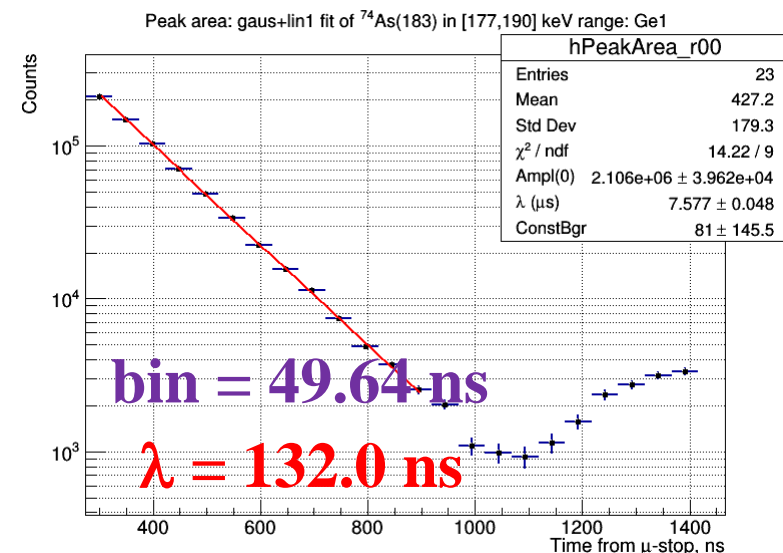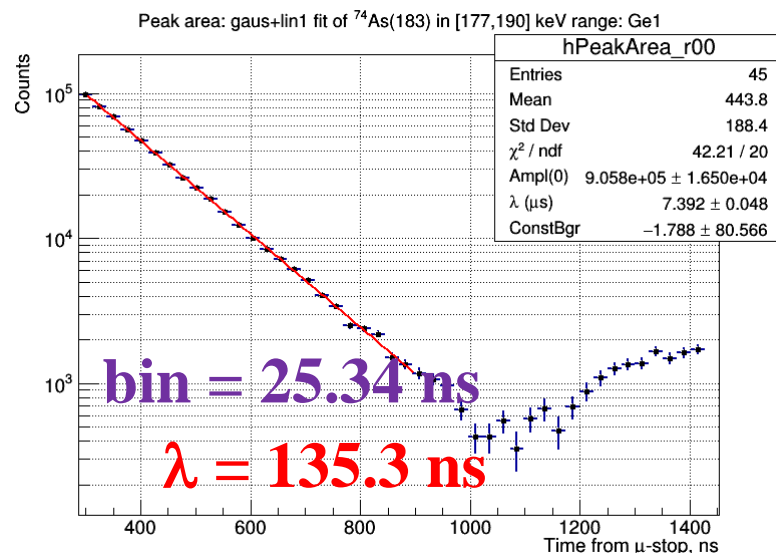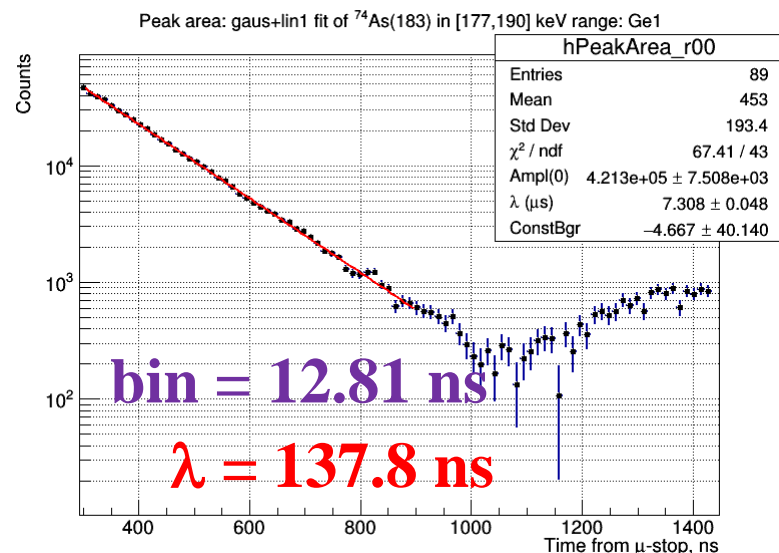**"Incoming muon" – C_1 & not(C_0) hit**

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 = $exp(-\lambda*x)+C$, where λ is searched parameter

a) Ge1: ^{74}As(183): G+L main fit, Int: 1933739 ± 5821 cnt

G+L fit: extract **E0** & s used as **fixed** values for slice fits in b)

b) Energy [430, 450] vs time: 1 μ-stop in 15000 μs before: det MB12A

hTvsEGood_MB12A_r00	
Entries	1253086
Mean x	1674
Mean y	440
Std Dev x	2570
Std Dev y	3.646

c) f = $exp(-\lambda*x)+C$

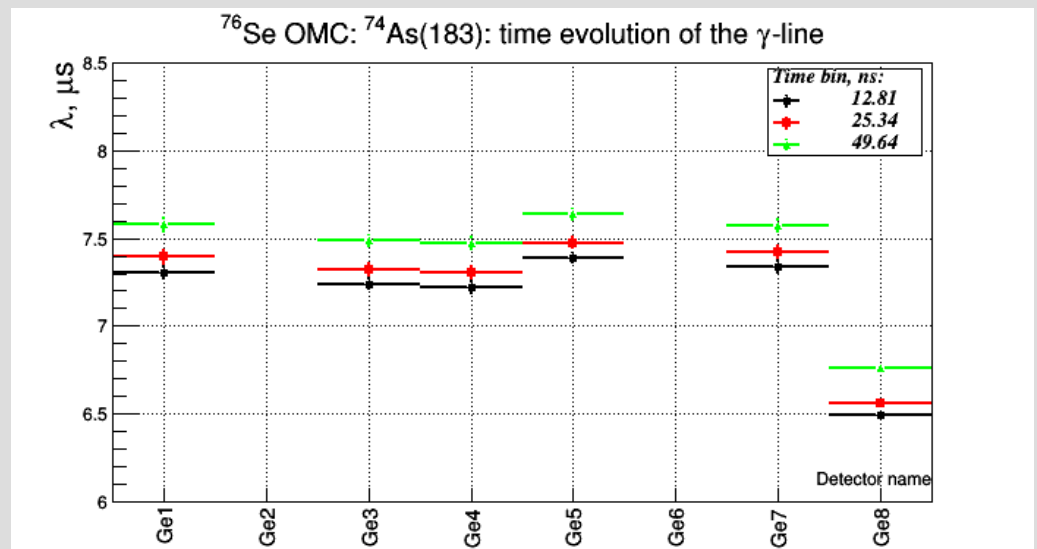Energy [430, 450] vs time: 1 μ-stop in 15000 μs before: det MB12A
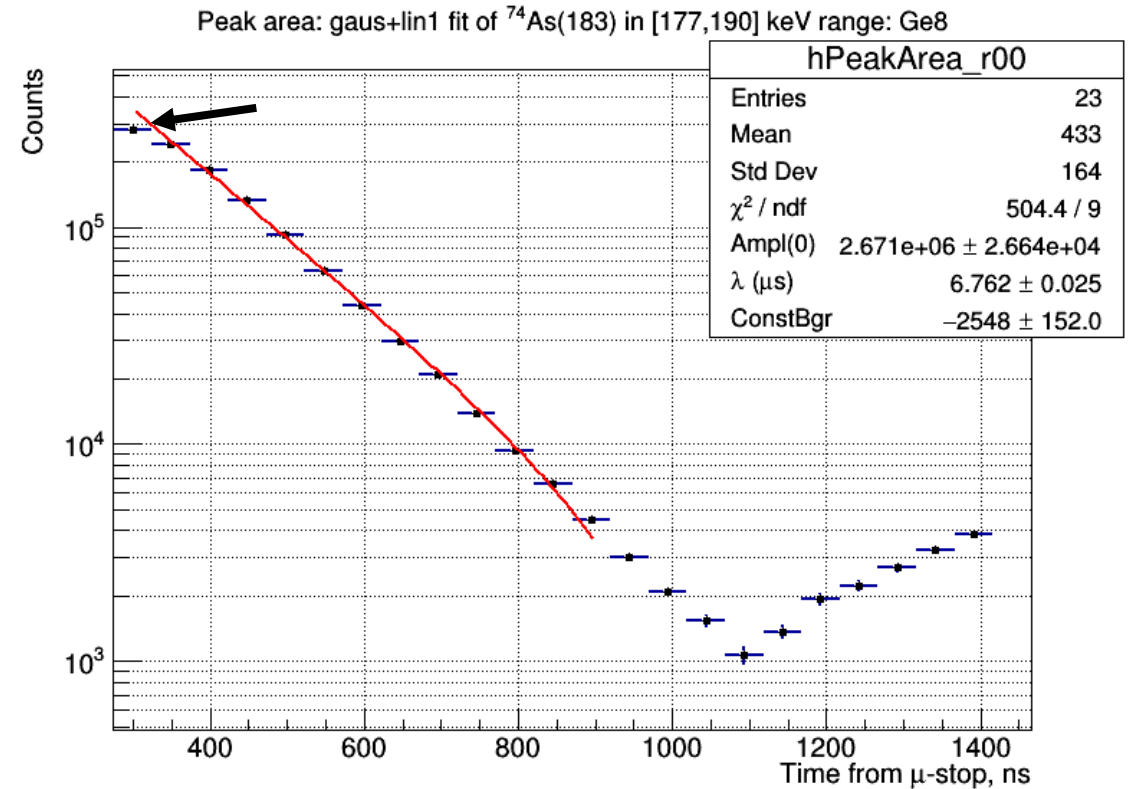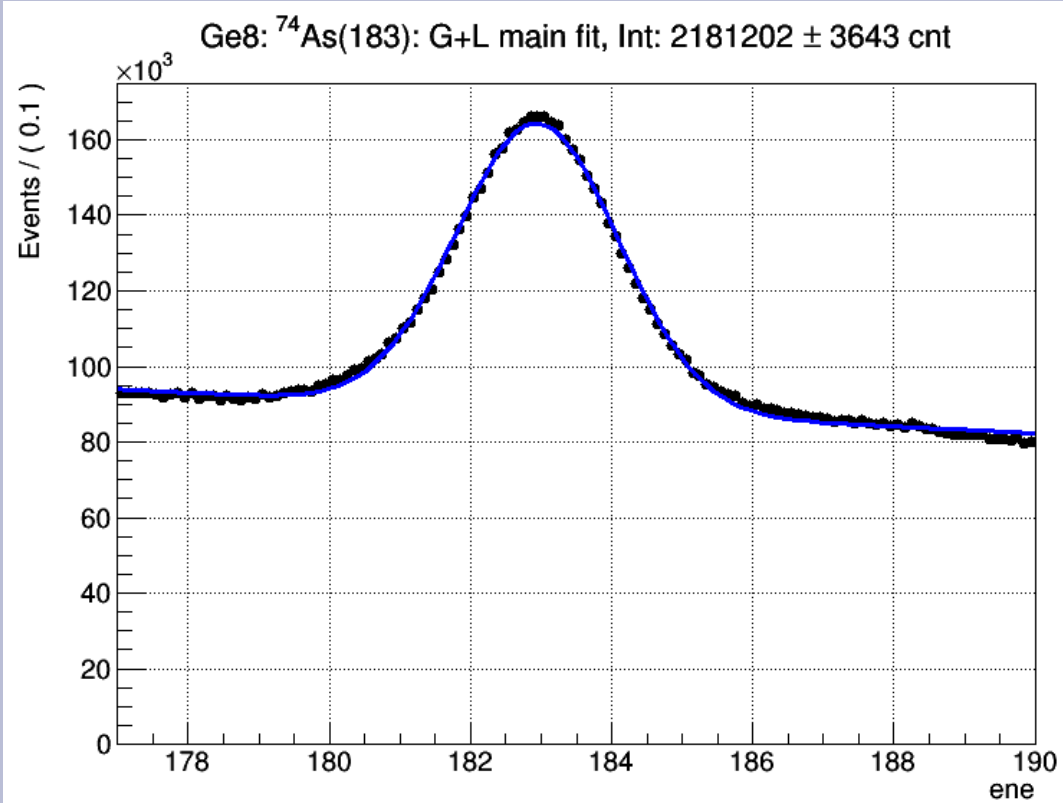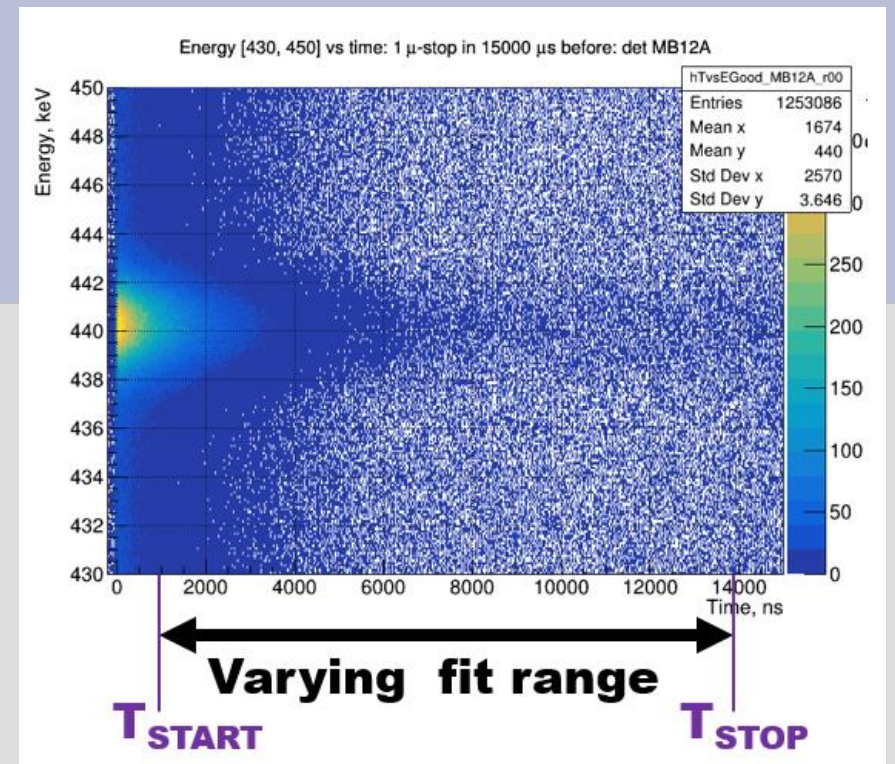
SYSTEMATICS DUE TO TIME BIN WIDTH

Impact of the bin width

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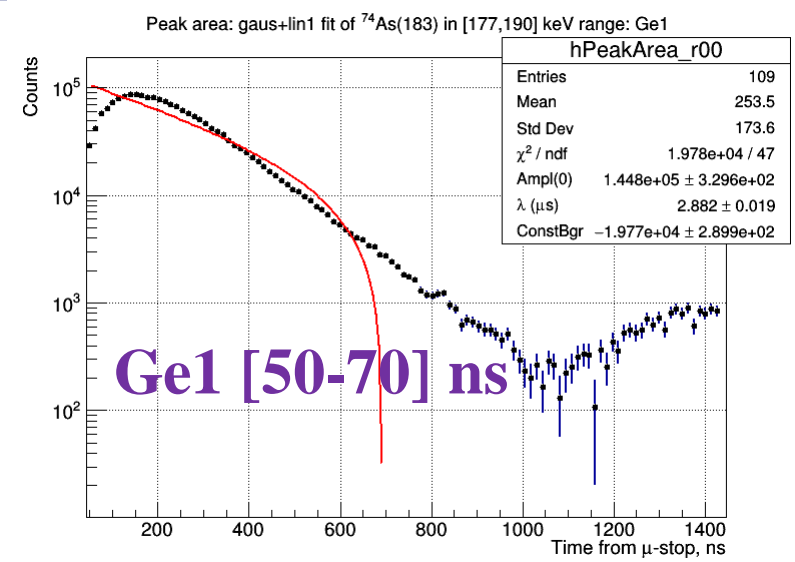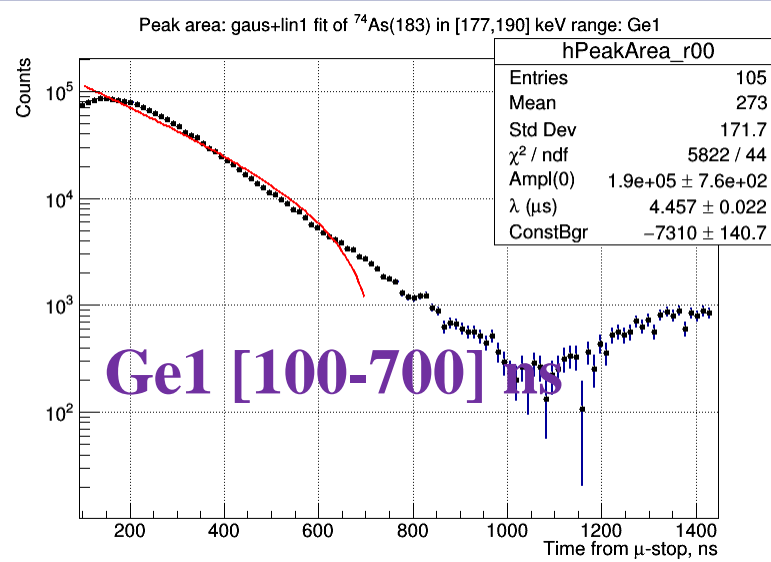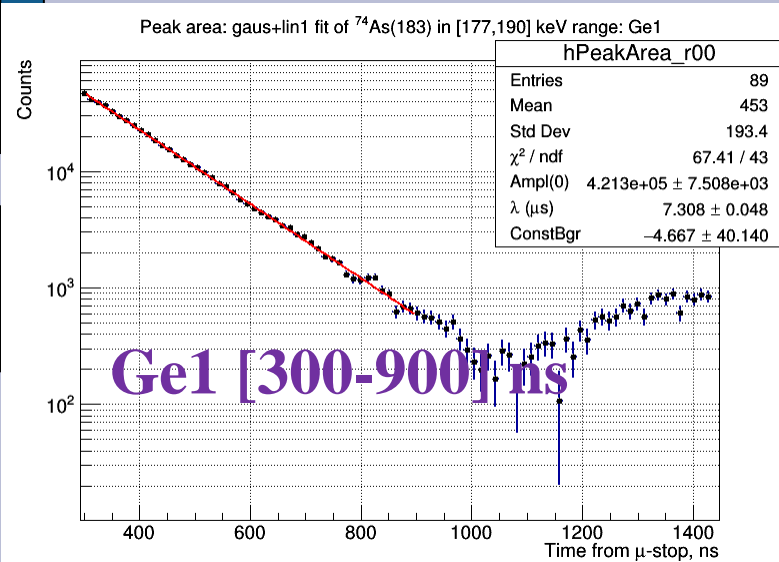- Problem on detector Ge8

^{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…
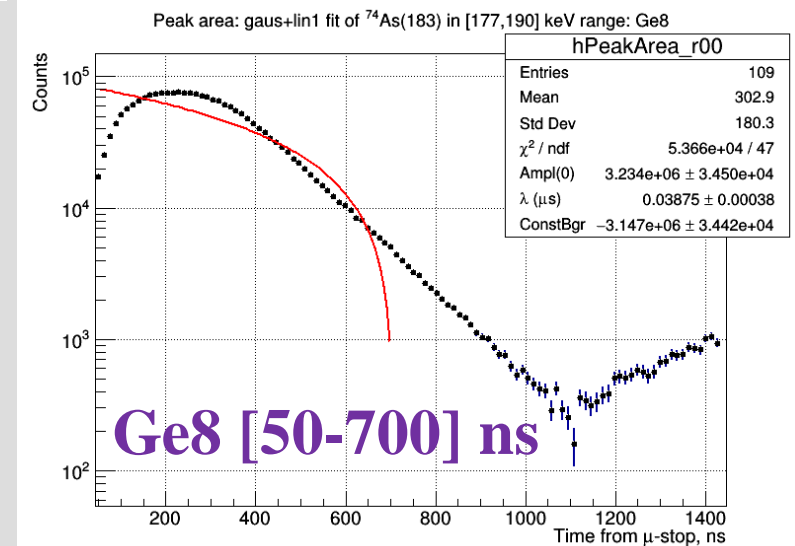
Energy [430, 450] vs time: 1 μ-stop in 15000 μs before: det MB12A

SYSTEMATICS DUE TO FIT RANGE

Impact of the fit range

Ge1 [300-900] ns

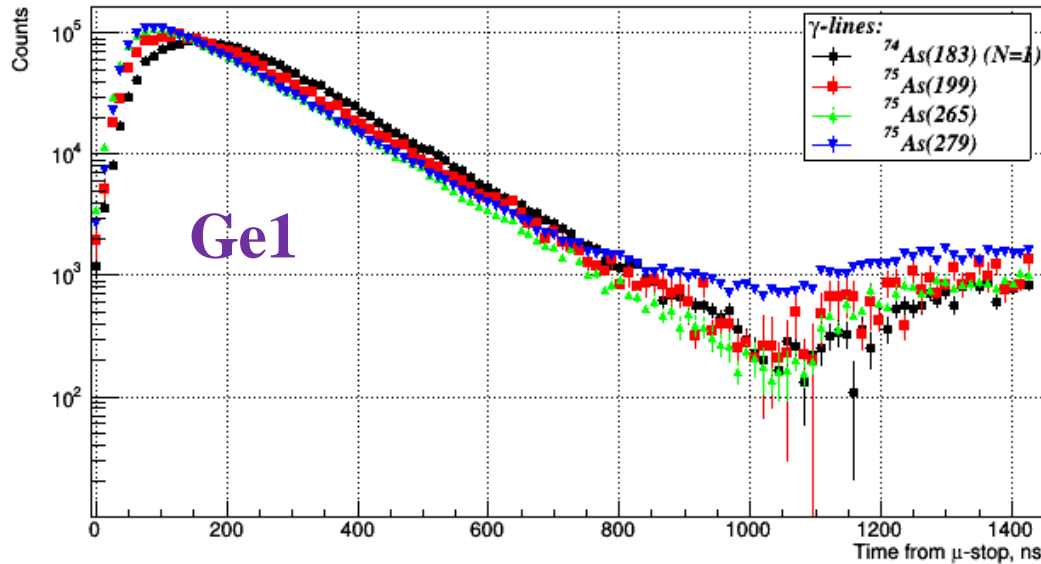Ge1 [100-700] ns

Ge1 [50-70] ns

Ge8 [50-700] ns

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?
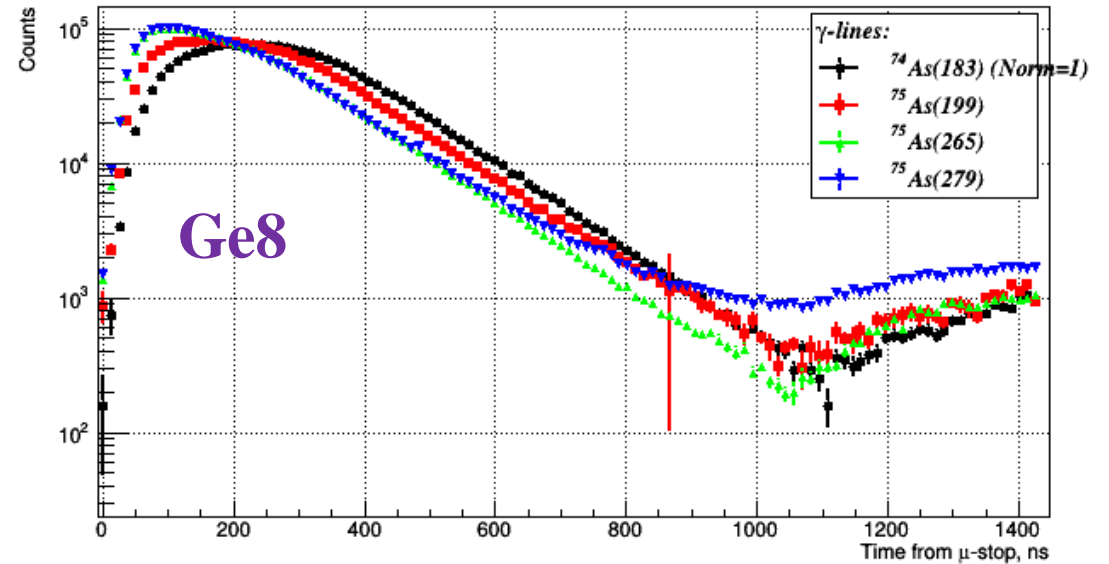
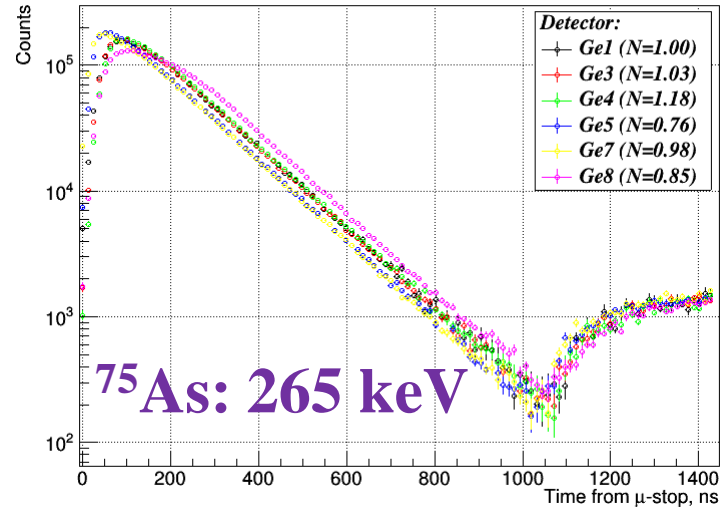# Timing of HPGe detectors vs. energy

- **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).**
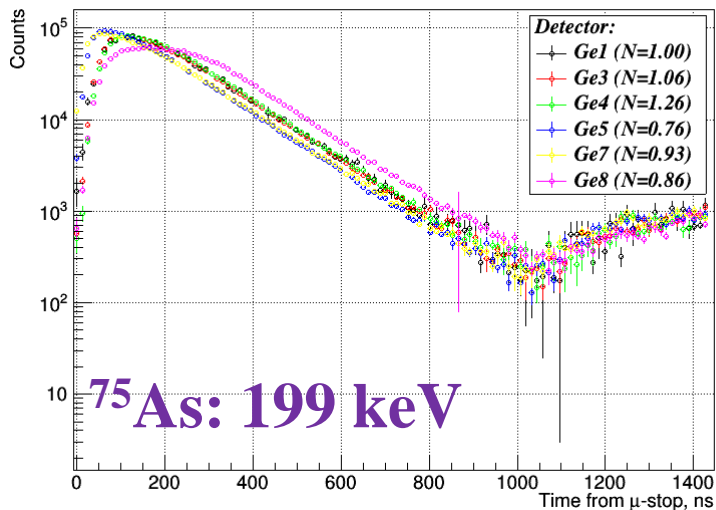
Timing of HPGe vs. detector & energy
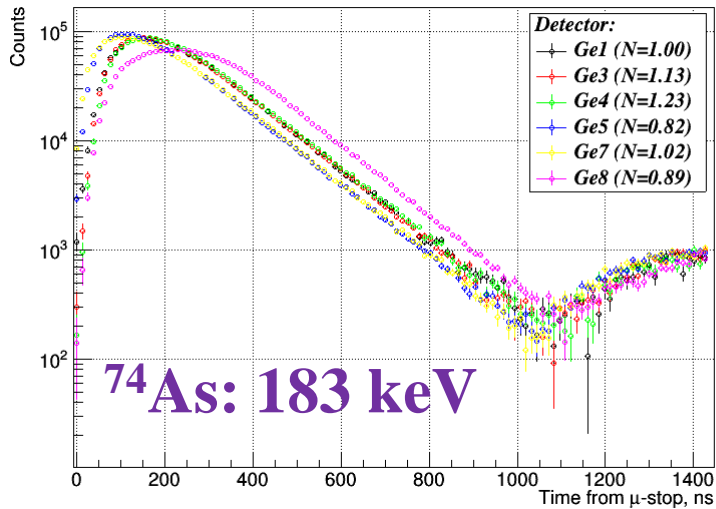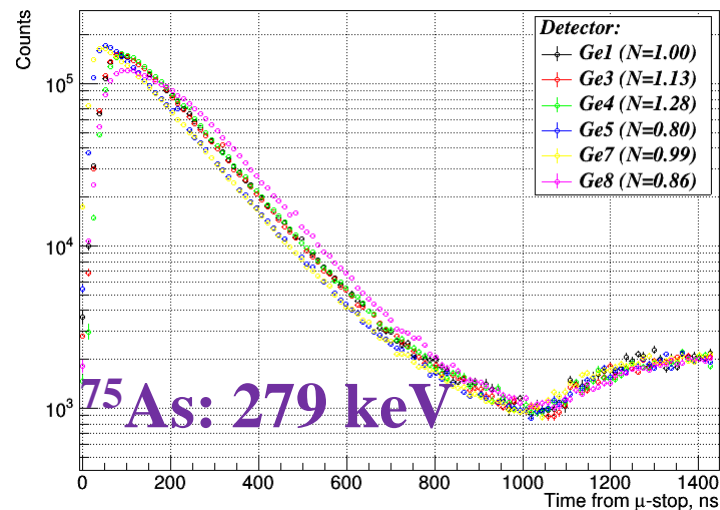
We have three groups of detectors with different timings:

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

This work vs. published: here is the problem!
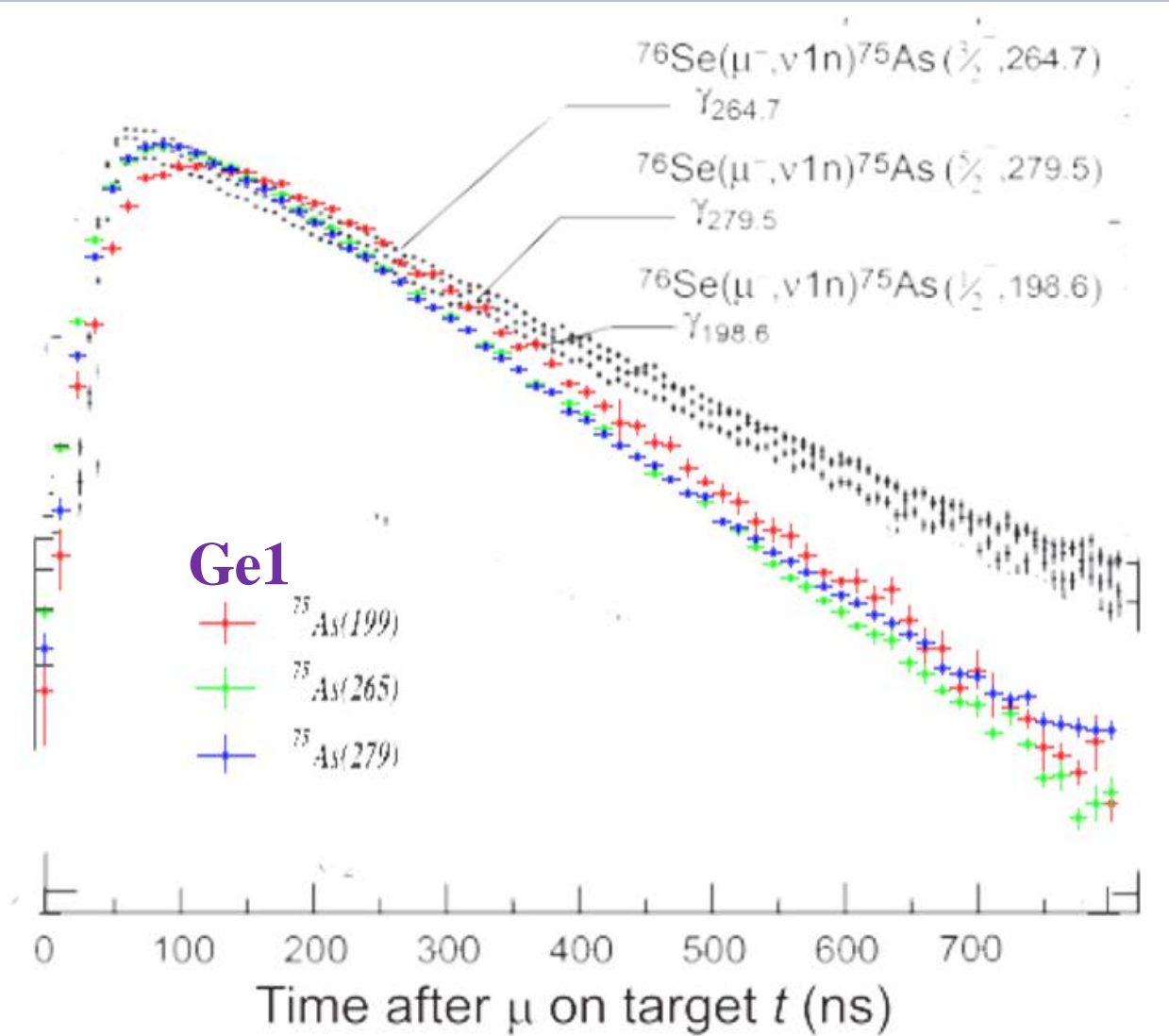
- New (color, Ge1) and old (black) results are on the same plot.

- 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…)**