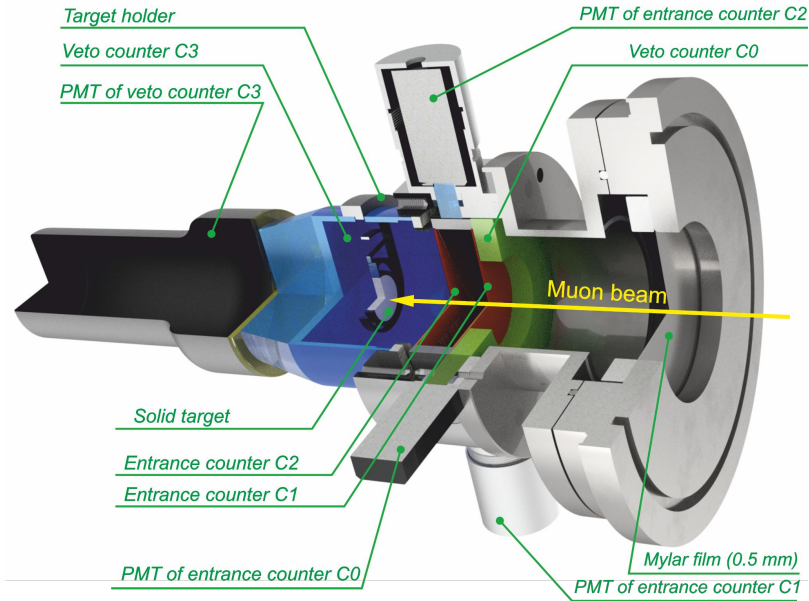


MUON TRIGGER DEFINITION IN ALPACA



Elisabetta - 14 Feb 2023

THE MUON TRIGGER



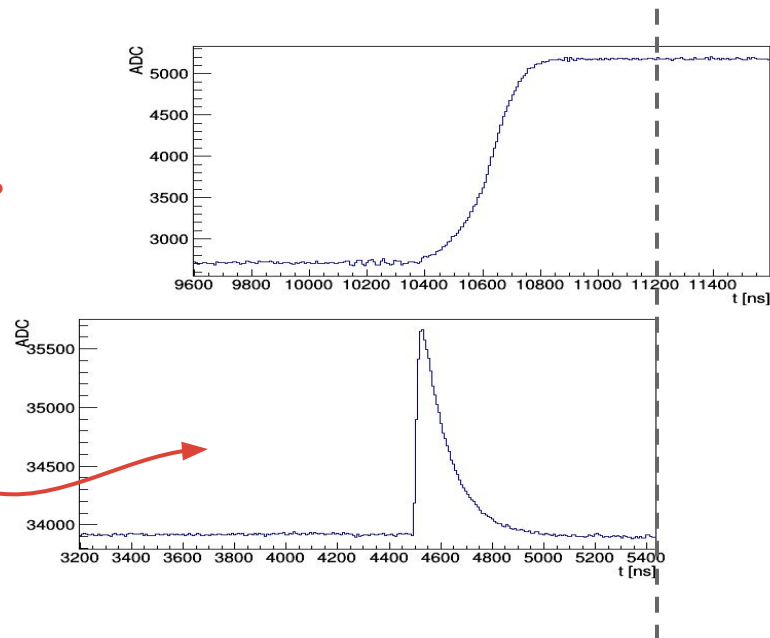
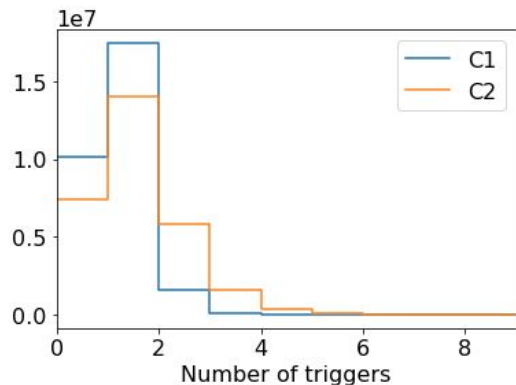
Ideal: $\text{not}C0 \wedge C1 \wedge C2 \wedge \text{not}C3$

Reality: time resolution \rightarrow a coincidence/anticoincidence is defined if the time distance between the triggers in two different counters is $< W$ (for example $W=100\text{ns}$)

IMPLEMENTATION IN ALPACA

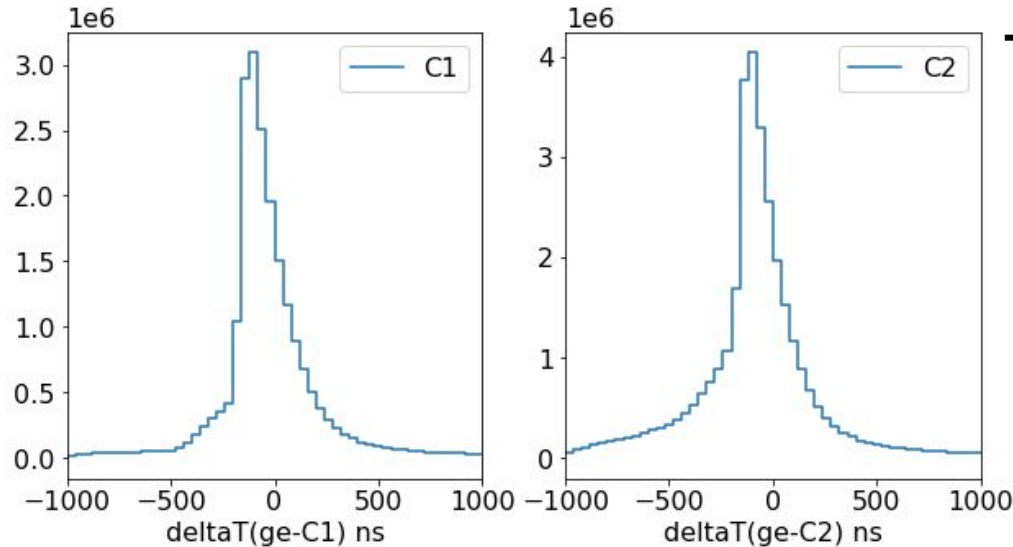
- Use HF trace: better time resolution (8ns sampling) and covers a large enough window (~2 us before the germanium trigger)

What if there is more than one trigger in this window?



C1C2 COINCIDENCE

- Distribution of ΔT (considering all the triggers in the window)

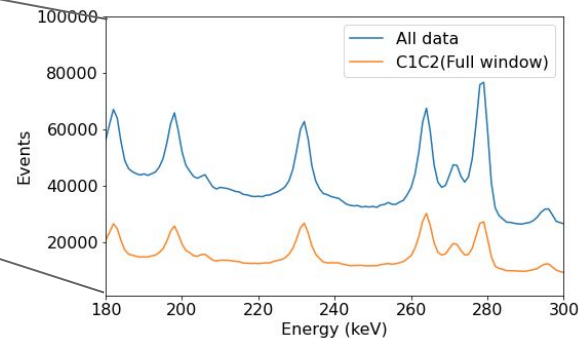
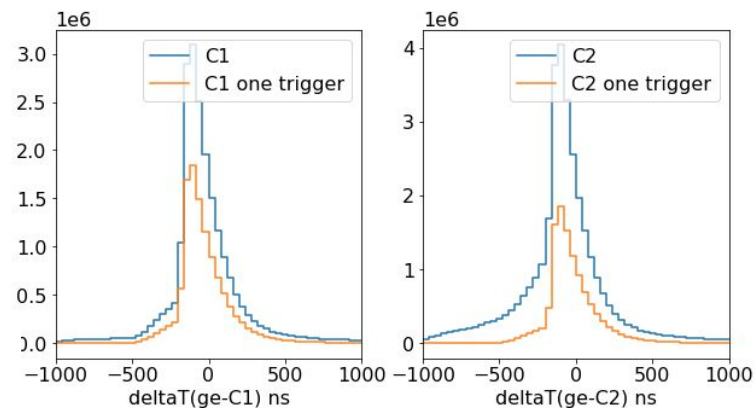
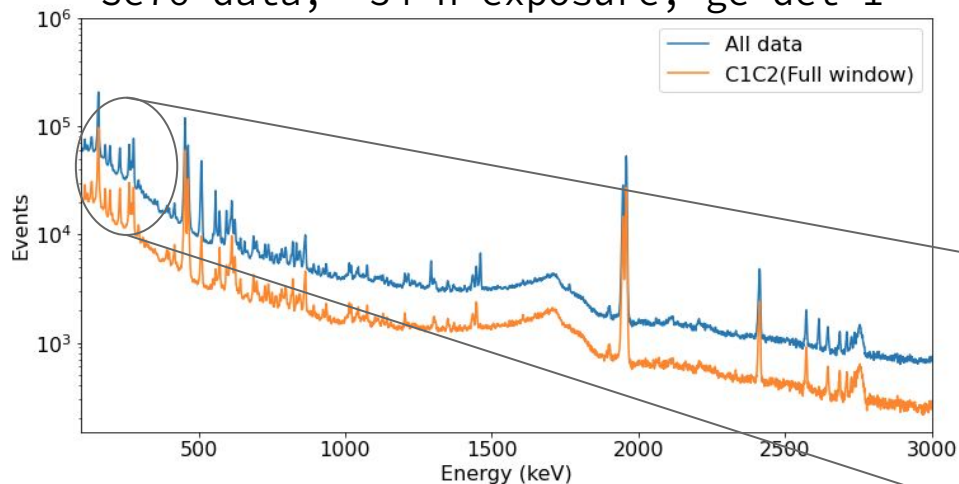


→ To define a coincidence between C1 and C2 and to associate a unique $\Delta T(\text{ge-C1C2})$ to the ge event, I need only one trigger in C1 and C2

C1C2 COINCIDENCE

- Select only one trigger in the full window:

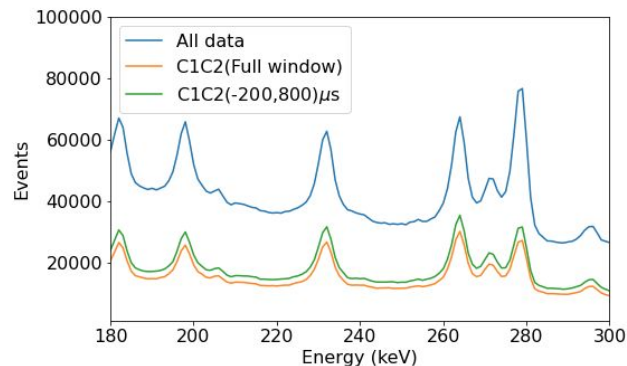
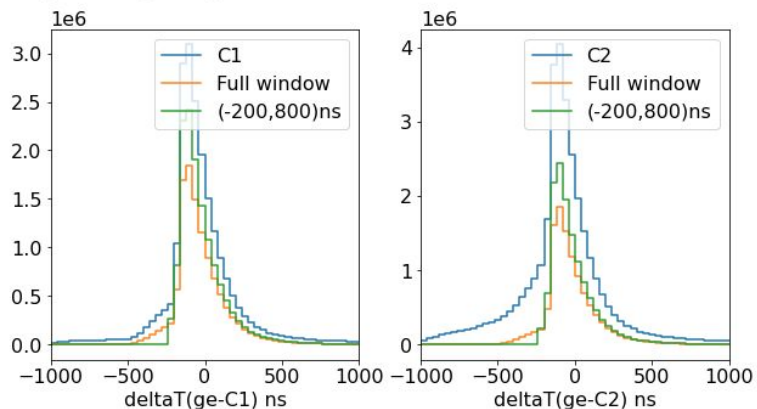
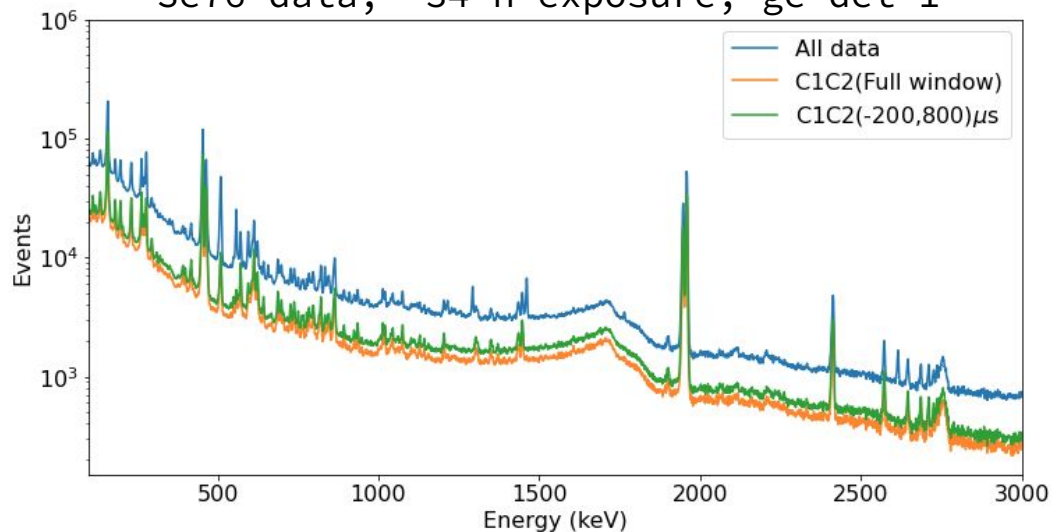
Se76 data, ~34 h exposure, ge-det 1



C1C2 COINCIDENCE

- Select only triggers in $(-200, 800)$ ns

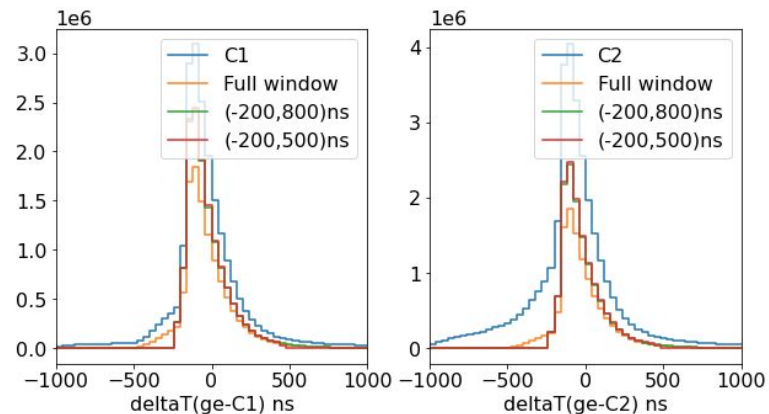
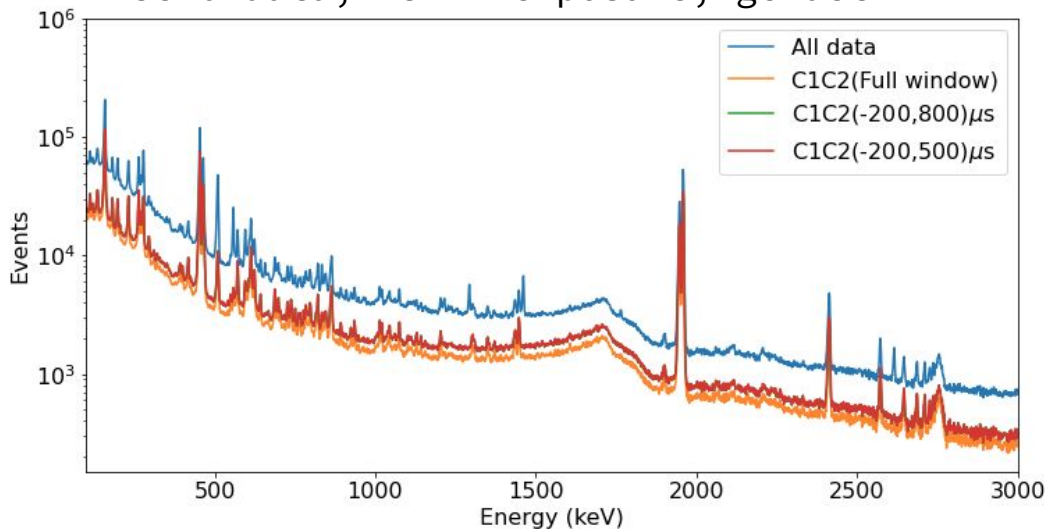
Se76 data, ~34 h exposure, ge-det 1



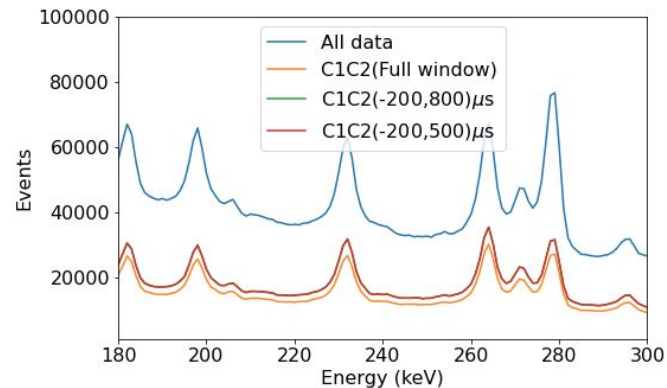
C1C2 COINCIDENCE

- Try with even smaller window $(-200, 500)$ ns

Se76 data, ~34 h exposure, ge-det 1

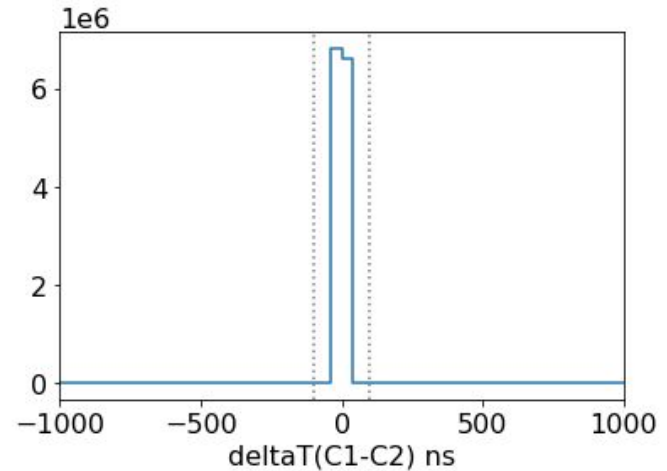


→ No real difference with $(-200, 800)$ ns



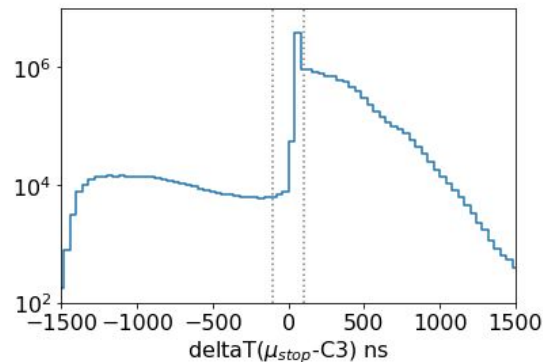
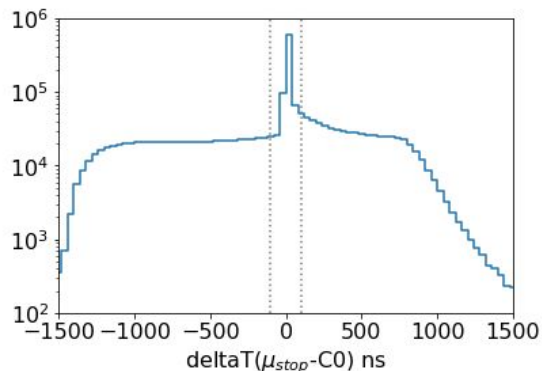
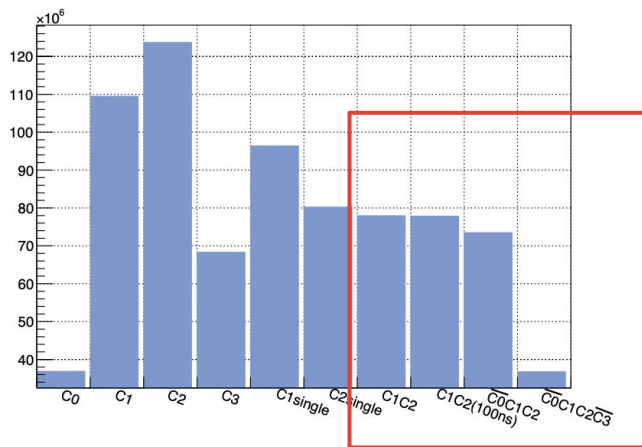
C1C2 COINCIDENCE

- Select events with one trigger in C1 and C2 $(-200,800)$ ns window around ge-trigger
- Select events with $|\text{deltaT}(C1-C2)| < 100$ ns
- Define the muon-stop trigger time as $t_{\mu\text{-stop}} = (t_{C1} + t_{C2}) / 2$



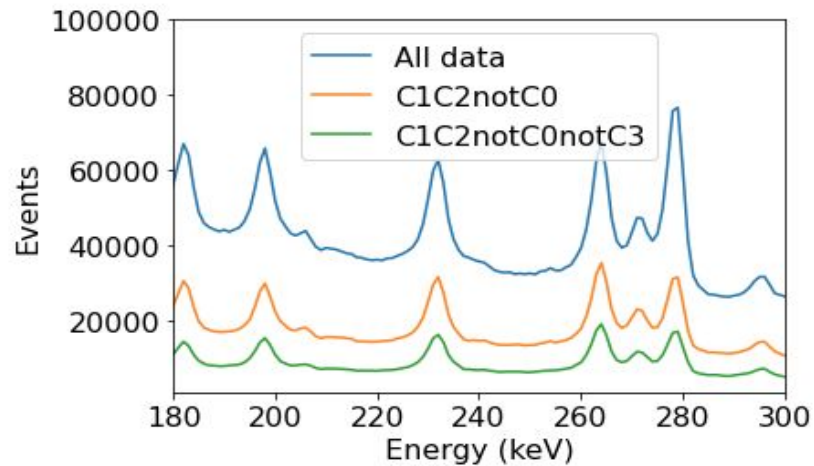
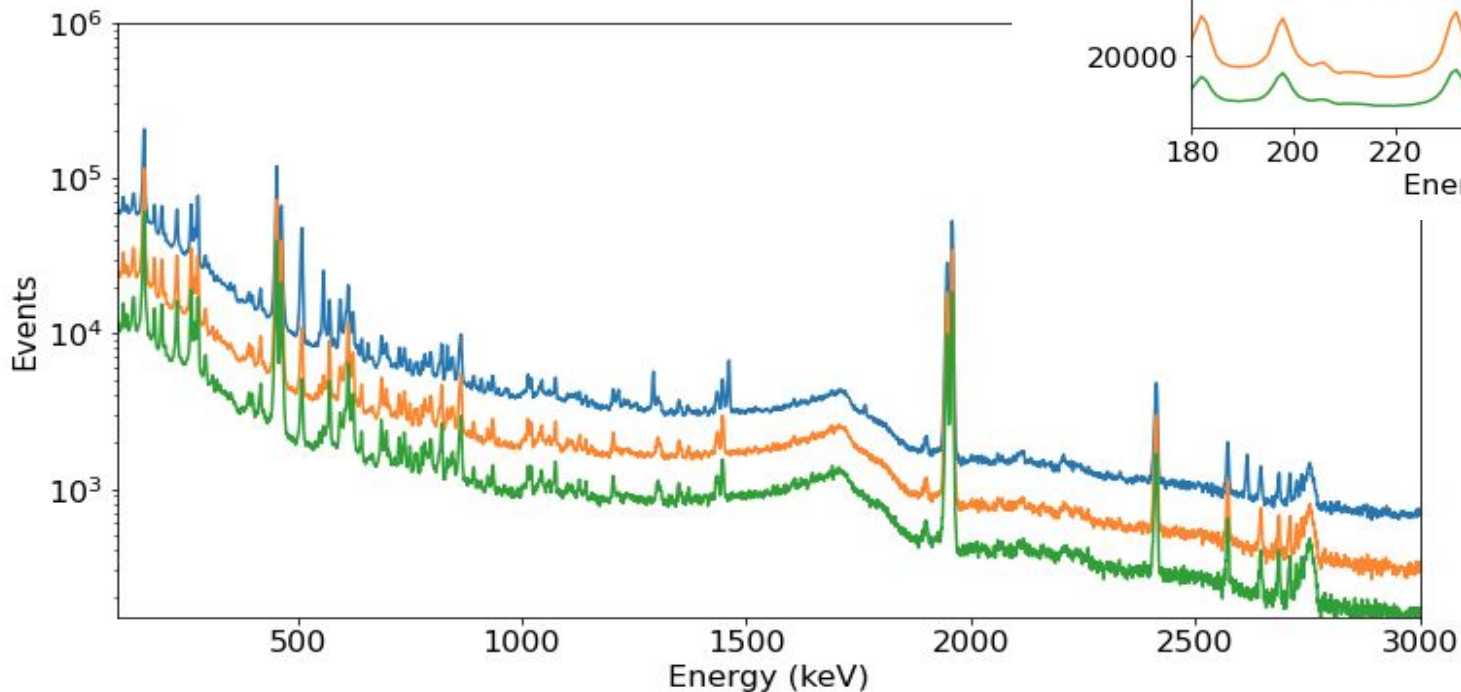
COC3 ANTICOINCIDENCE

- Require that there is no trigger in C0 in ± 100 ns from $t_{\mu\text{-stop}}$ **-> small impact**
- Require that there is no trigger in C3 in ± 100 ns from $t_{\mu\text{-stop}}$ **-> huge impact**



SPECTRA WITH DIFFERENT TRIGGER

Se76 data, ~34 h exposure, ge-det 1



CONCLUSIONS

- C1C2 coincidence trigger: select events with only one trigger in C1 and C2 in $(-200, 800)$ ns from the ge-trigger
- Select $|\text{deltaT}(C1-C2)| < 100$ ns and define the muon-stop trigger time as $t_{\mu\text{-stop}} = (t_{C1} + t_{C2}) / 2$
- Anticoincidence trigger with C0:
 $|\text{deltaT}(\mu\text{-stop}-C0)| < 100$ ns has **small impact** on the interesting gamma lines -> **use for the trigger**
- Anticoincidence trigger with C3:
 $|\text{deltaT}(\mu\text{-stop}-C3)| < 100$ ns has **huge impact** on the interesting gamma lines -> **try to not use it!**

BACKUP

DISTRIBUTIONS

