OMC-2021 data & analysis

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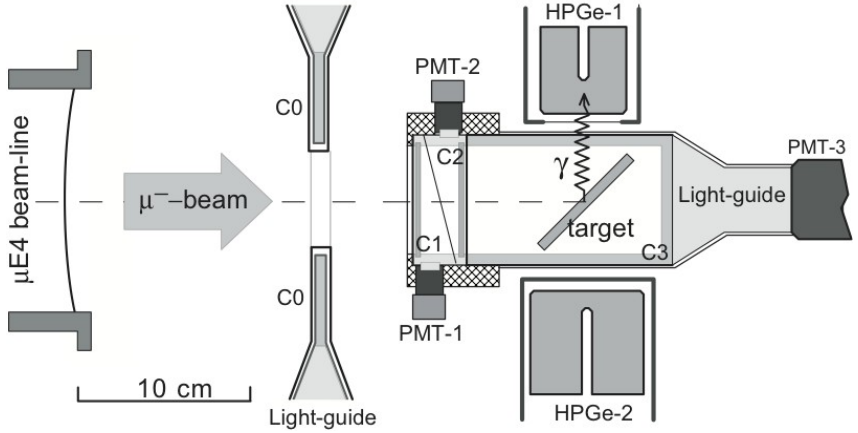
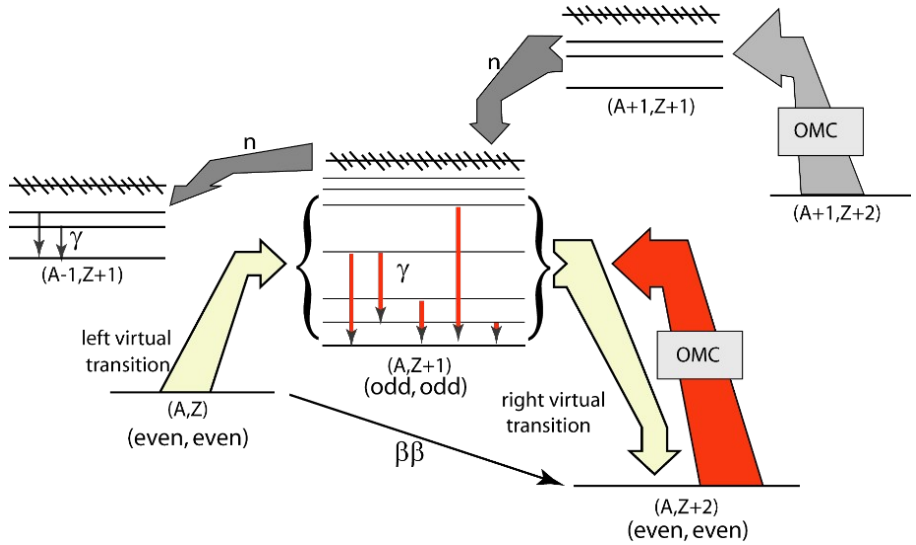
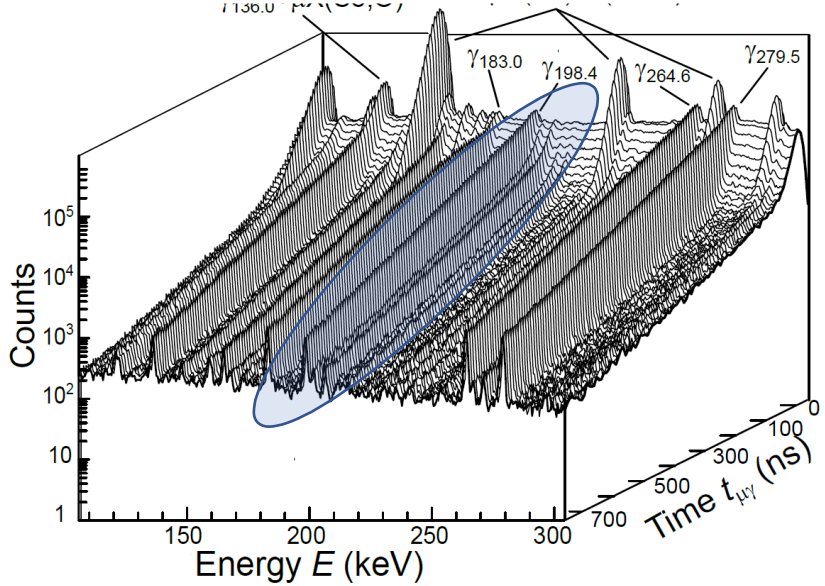
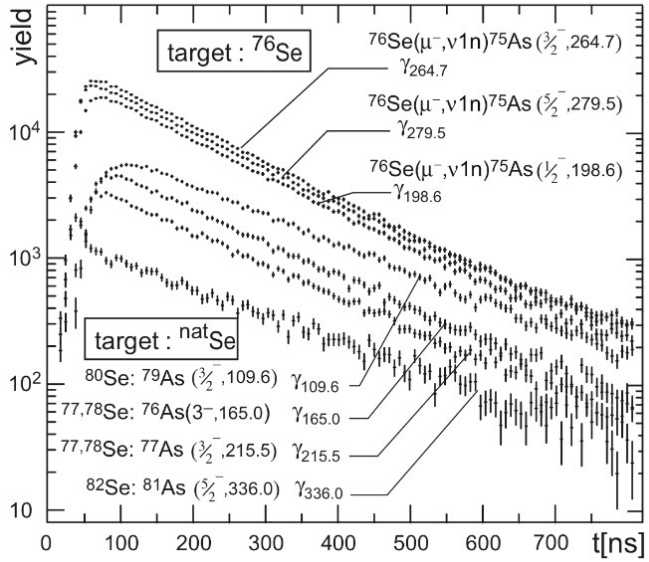
Experimental method of OMC





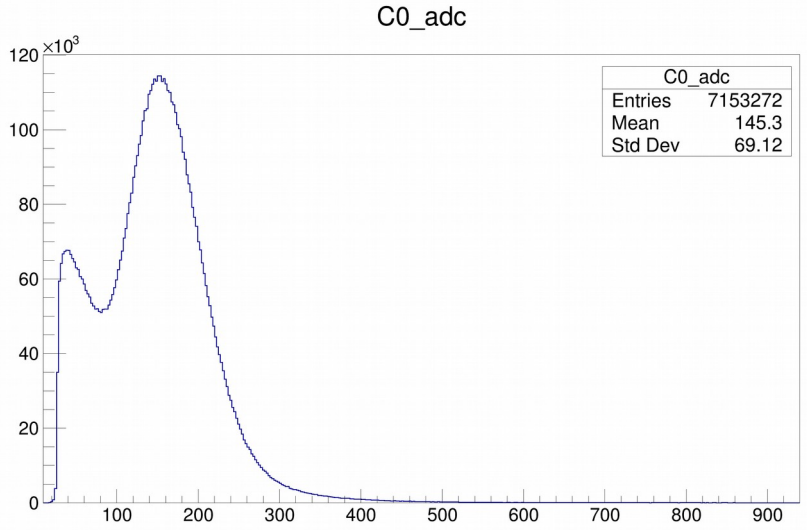
PSI: μE4 beam-line
Number of μ-stop = (8 – 25) x 10³ with 20 – 30 MeV/c

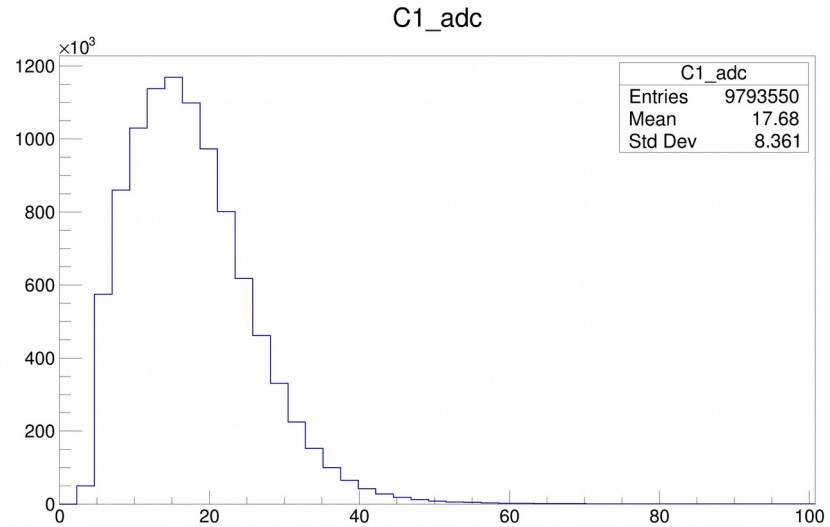


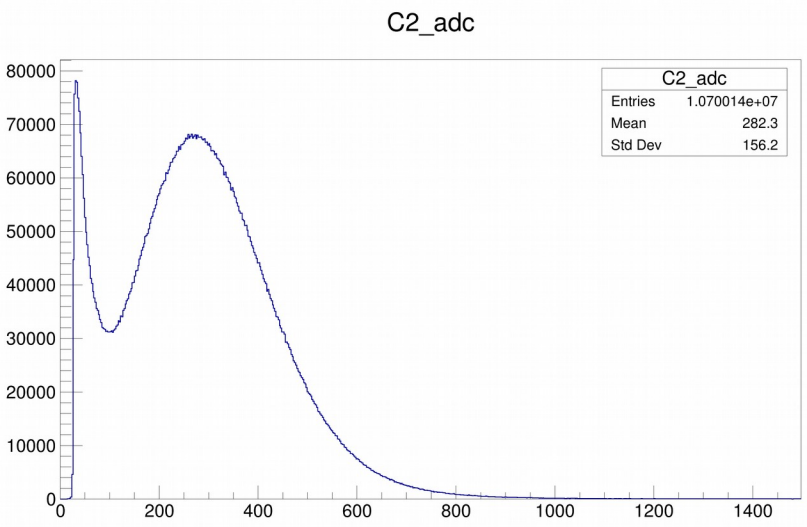


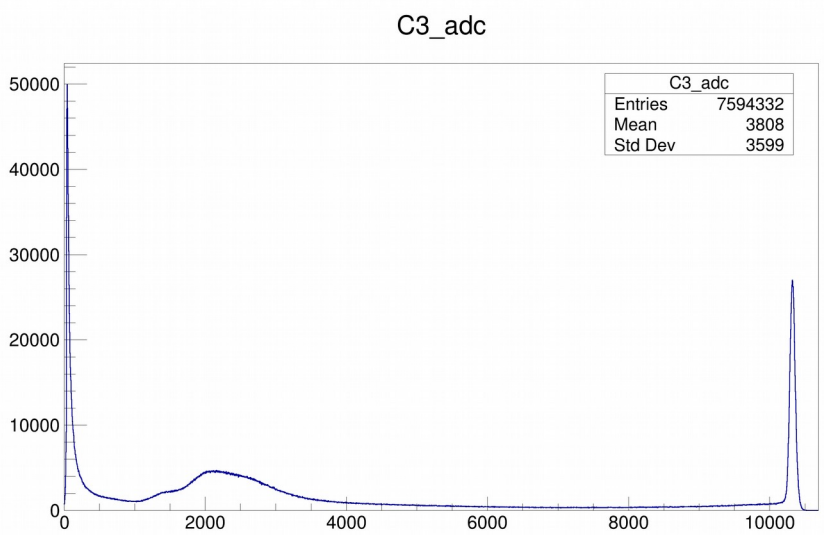
D. Zinatulina, V. Egorov et al. // Phys. Rev. C 99(2019)024327

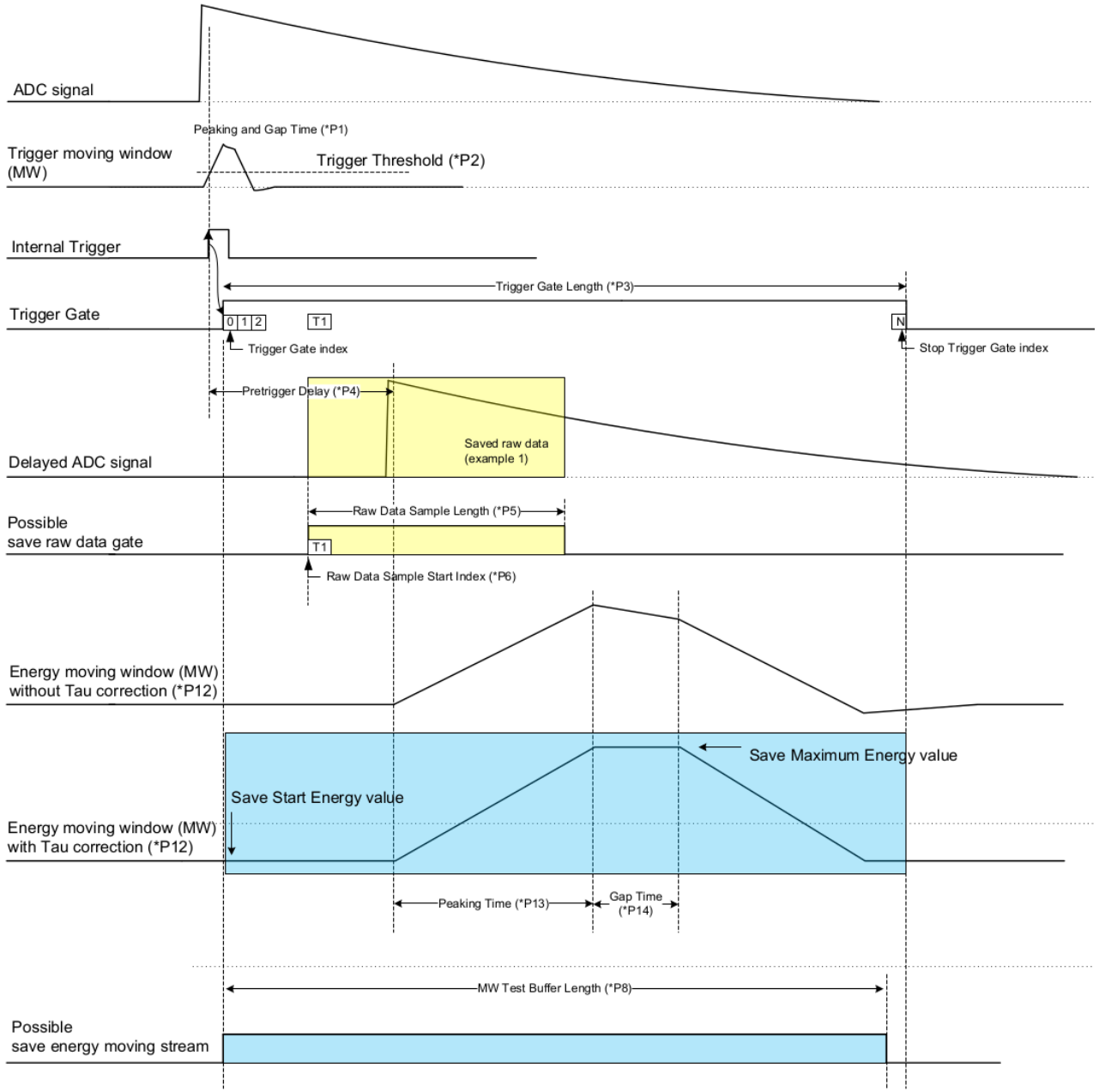
C# detectors

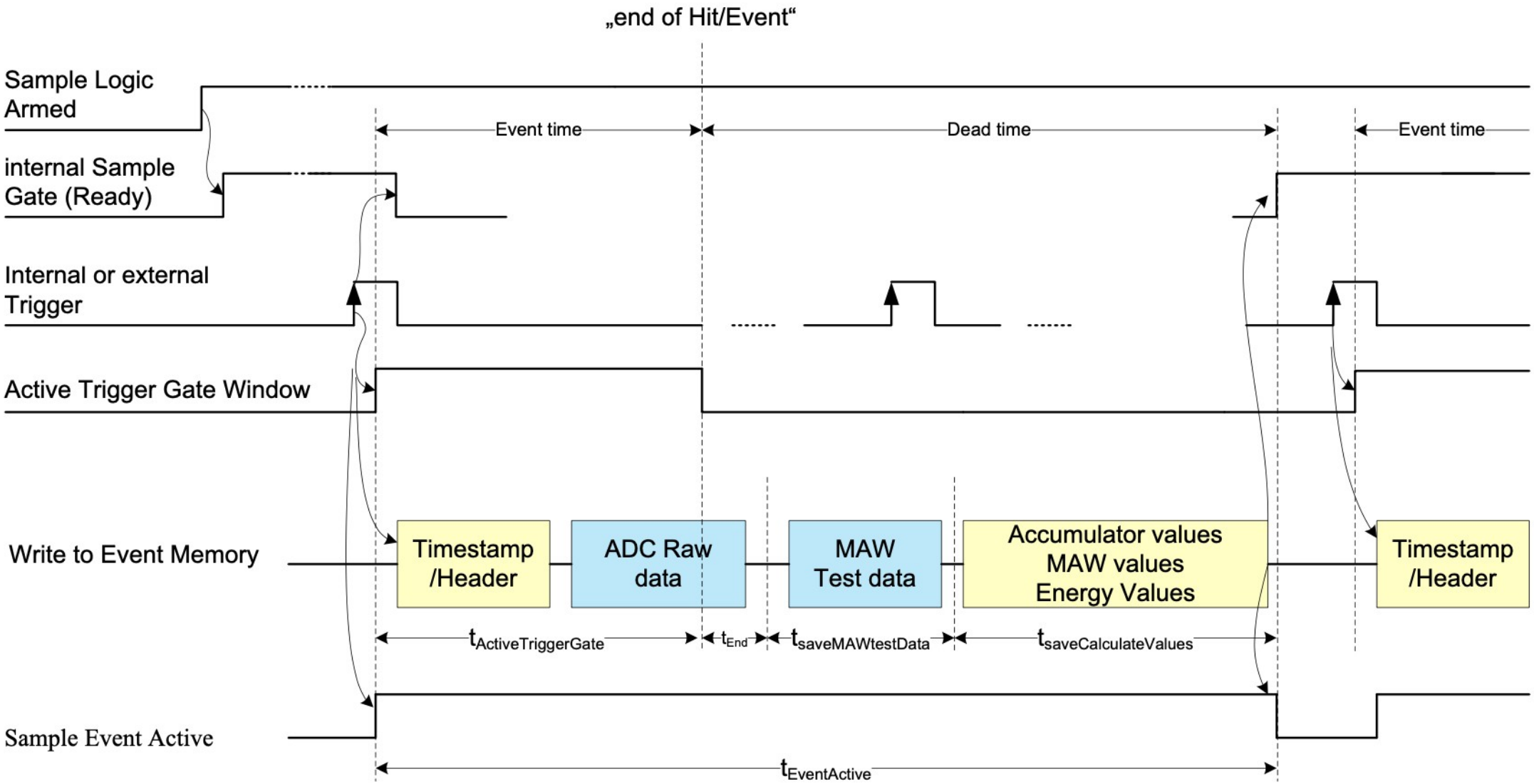

C0_adc
×10^3
C0_adc
Entries 7153272
Mean 145.3
Std Dev 69.12


C1_adc
×10^3
C1_adc
Entries 9793550
Mean 17.68
Std Dev 8.361

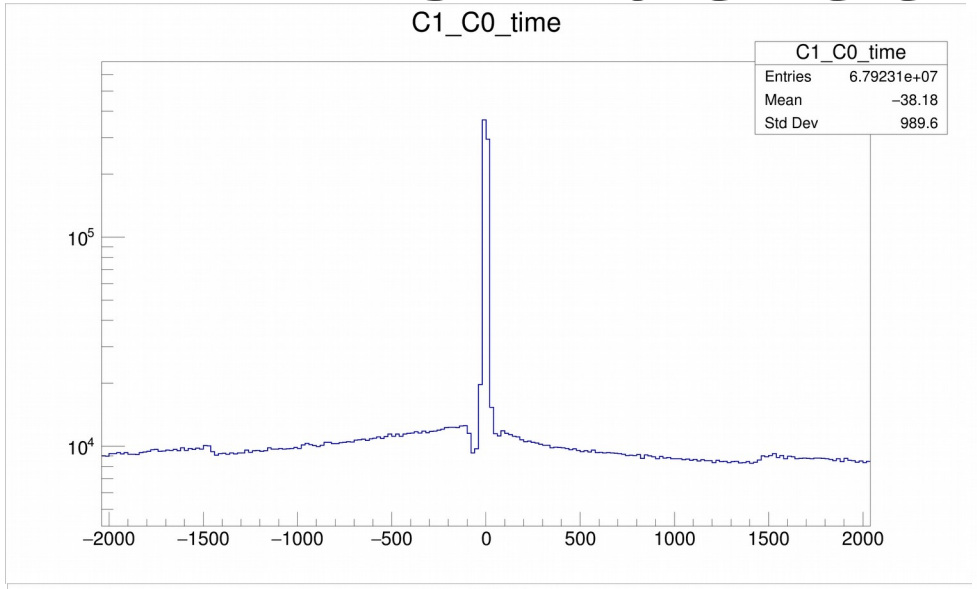

C2_adc
C2_adc
Entries 1.070014e+07
Mean 282.3
Std Dev 156.2

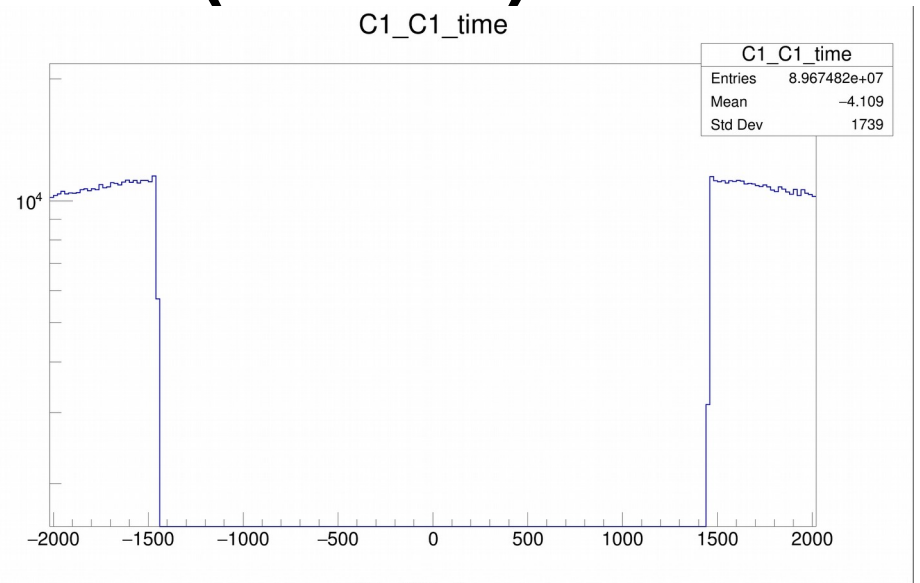

C3_adc
C3_adc
Entries 7594332
Mean 3808
Std Dev 3599

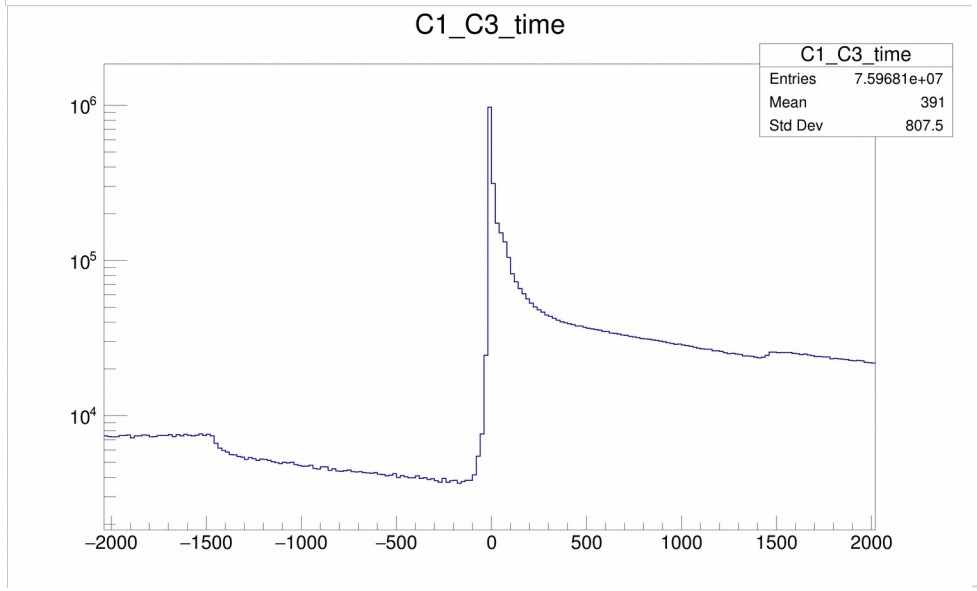

ADC signal
Peaking and Gap Time (*P1)
Trigger moving window (MW)
Trigger Threshold (*P2)
Internal Trigger
Trigger Gate Length (*P3)
Trigger Gate
0 1 2
T1
N
Trigger Gate index
Stop Trigger Gate index
Pretrigger Delay (*P4)
Saved raw data (example 1)
Delayed ADC signal
Raw Data Sample Length (*P5)
Possible save raw data gate
T1
Raw Data Sample Start Index (*P6)
Energy moving window (MW) without Tau correction (*P12)
Save Maximum Energy value
Save Start Energy value
Energy moving window (MW) with Tau correction (*P12)
Peaking Time (*P13)
Gap Time (*P14)
MW Test Buffer Length (*P8)
Possible save energy moving stream

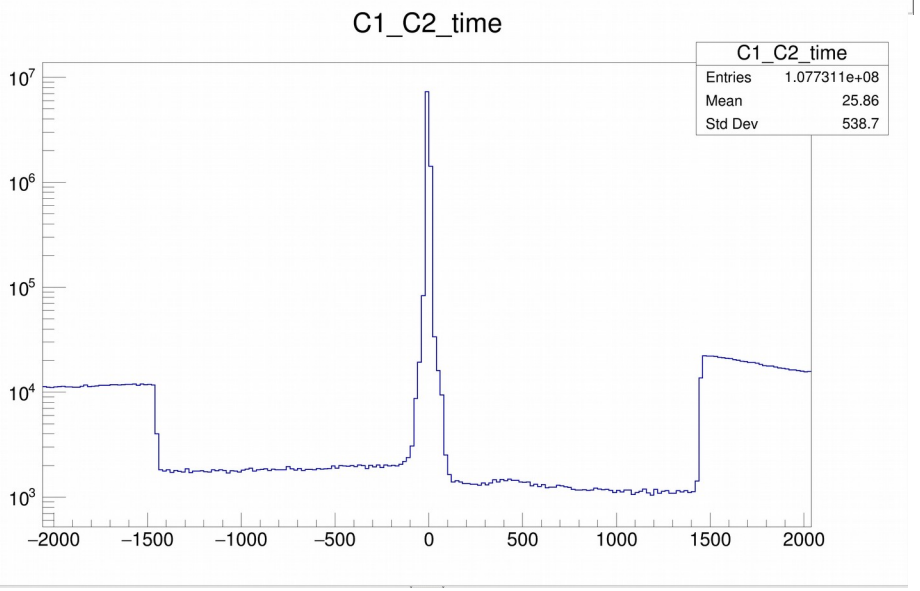

„end of Hit/Event“
Sample Logic Armed
Event time
Dead time
Event time
internal Sample Gate (Ready)
Internal or external Trigger
Active Trigger Gate Window
Write to Event Memory
Timestamp /Header
ADC Raw data
MAW Test data
Accumulator values MAW values Energy Values
Timestamp /Header
$t_{ActiveTriggerGate}$
t_{End}
$t_{saveMAWtestData}$
$t_{saveCalculateValues}$
Sample Event Active
$t_{EventActive}$

C# detectors (time)

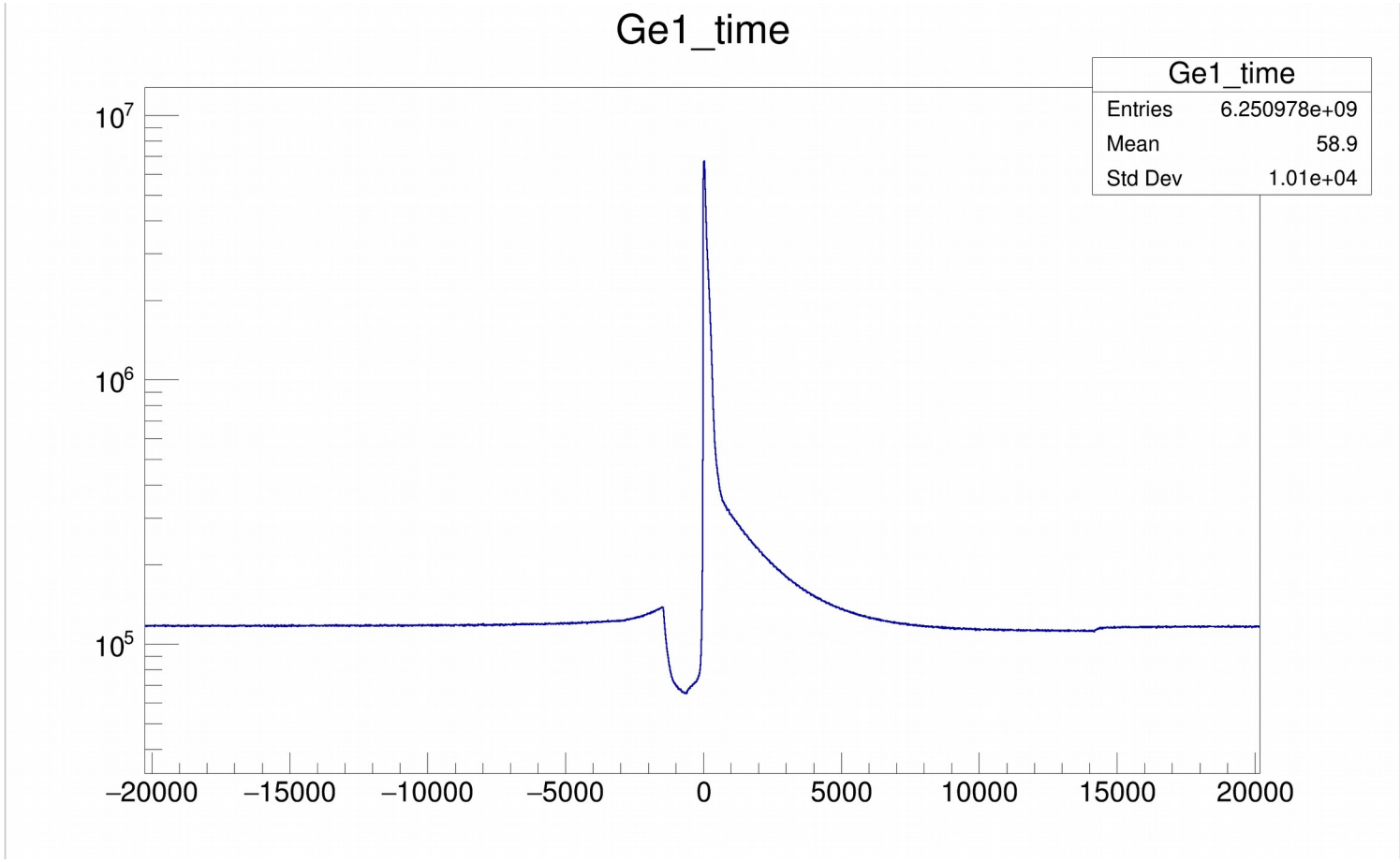








time_Ge1 – time_C1



Dubna version of TTree (simplified)

- Original internal structure of event

```
struct Hit_t {
  float energy
  float energyADC;
  float time; // time relative to the muon
  bool pile_up; // Pile up flag from sis
module
  unsigned short int channel; // channel of
            // struct module
  unsigned short int module;
  //trace
  std::vector<unsigned int> raw_samples;
  float trigger_time;
};
```

- Dubna structs for TTree's

```
struct base_event
{
    Double_t energy;    // for Ge events
only
    Double_t energyADC;
    Double_t time;
    uint16_t module;
    uint16_t channel;
    uint8_t status_flag;
};

TTree * mu_tree = (TTree*)f-
>Get("MuonTree");
TTree * ge_tree = (TTree*)f->Get("GeTree");
```

Constructing spectra for further analysis

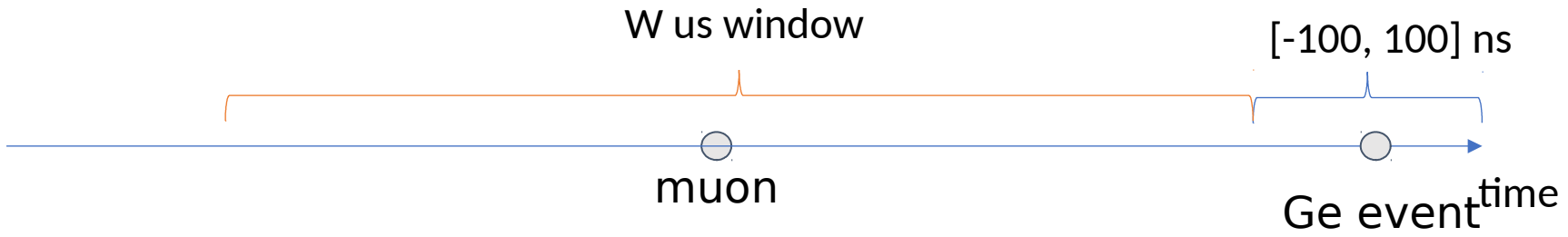
- **all** – all event from Ge detector
- **correlated** - event from Ge detector, if we detected **trigger** event during **W** us before
- **uncorrelated** - event from Ge detector, if we detected **0 C#** events during **W** us before
- **rejected** - event from Ge detector, if we detected **trigger + additional C# events** during **W** us before
- **prompt** - event from Ge detector, if we detected **trigger** event during 100 ns before and after (because time distribution)
- **delayed** - event from Ge detector, if we detected **trigger** event from 100 ns to **W** us before

prompt + delayed = correlated

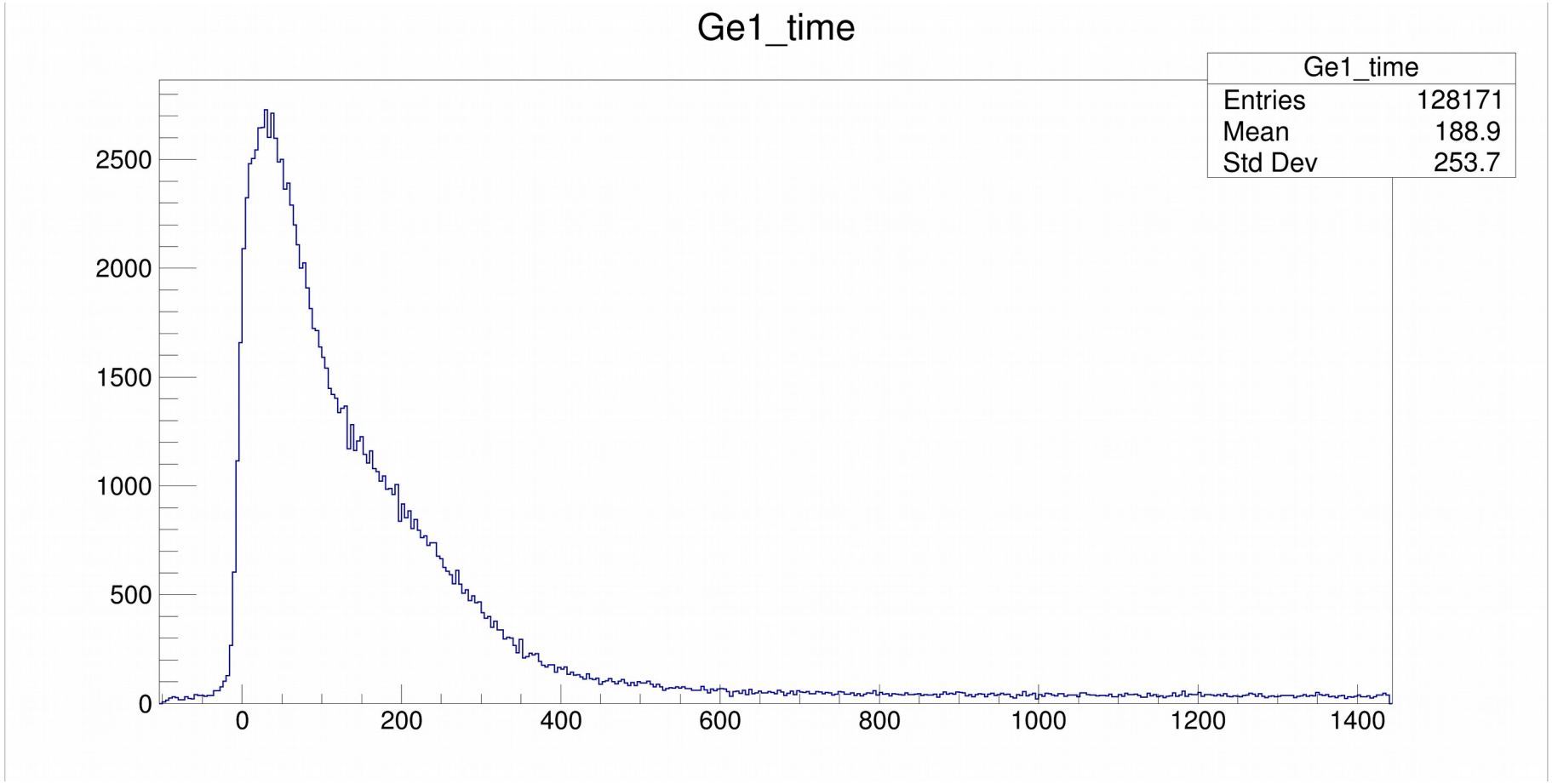
correlated + uncorrelated + rejected = all

W = 1440 ns (1000ns better?),

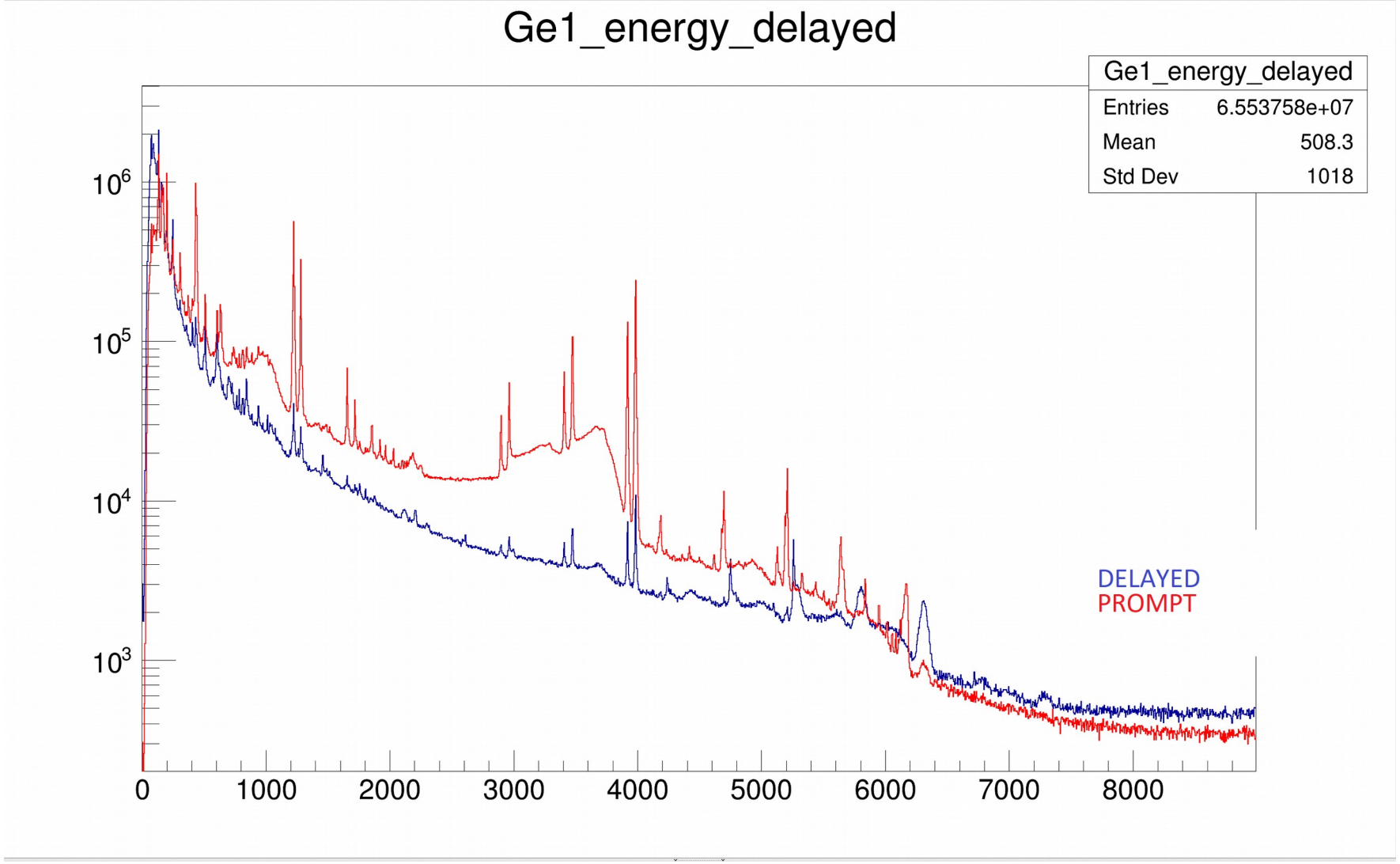
Trigger =



Ge1_time – Trigger_time (Ba136)



Correlated (Ba136)



Correlated vs Uncorrelated (Ba136)