VI COLLABORATION MEETING

@CNAO 4-5-6/06/19

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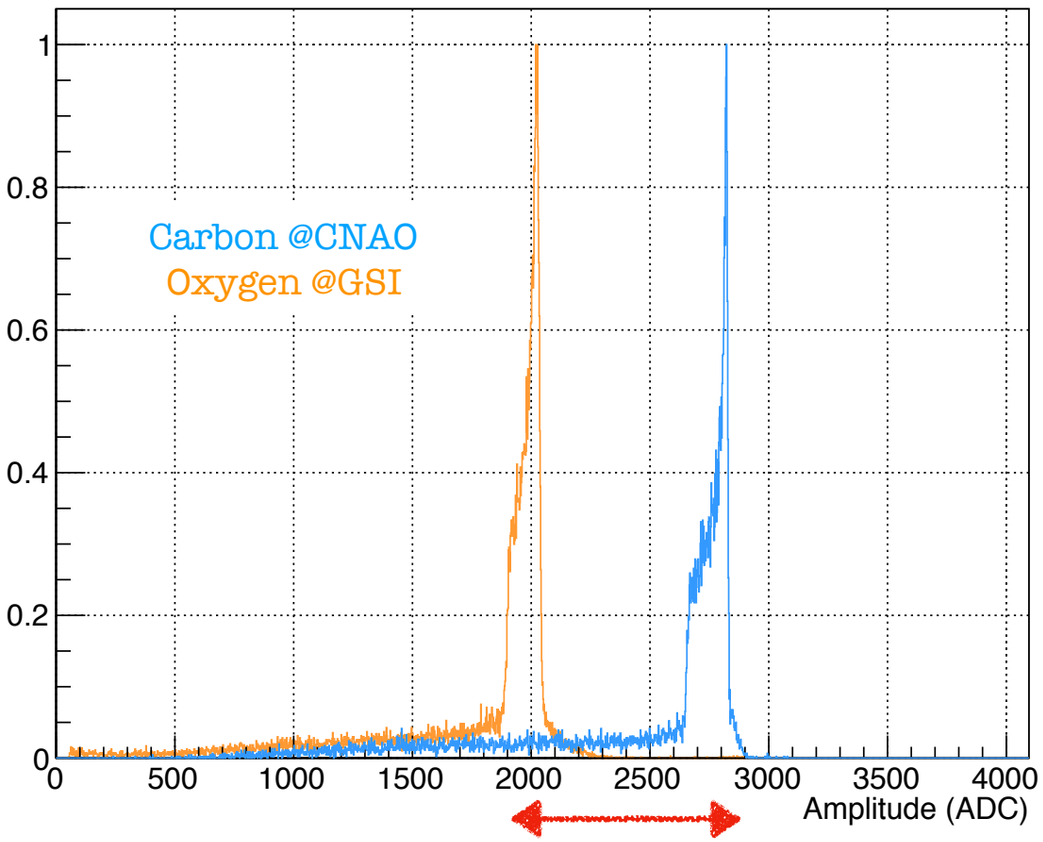
Outline

- Proton/Carbon (CNAO) vs Oxygen (GSI) Analysis
- Fluka Simulations
- Status of Calorimeter (see also Piergiorgio's presentation)

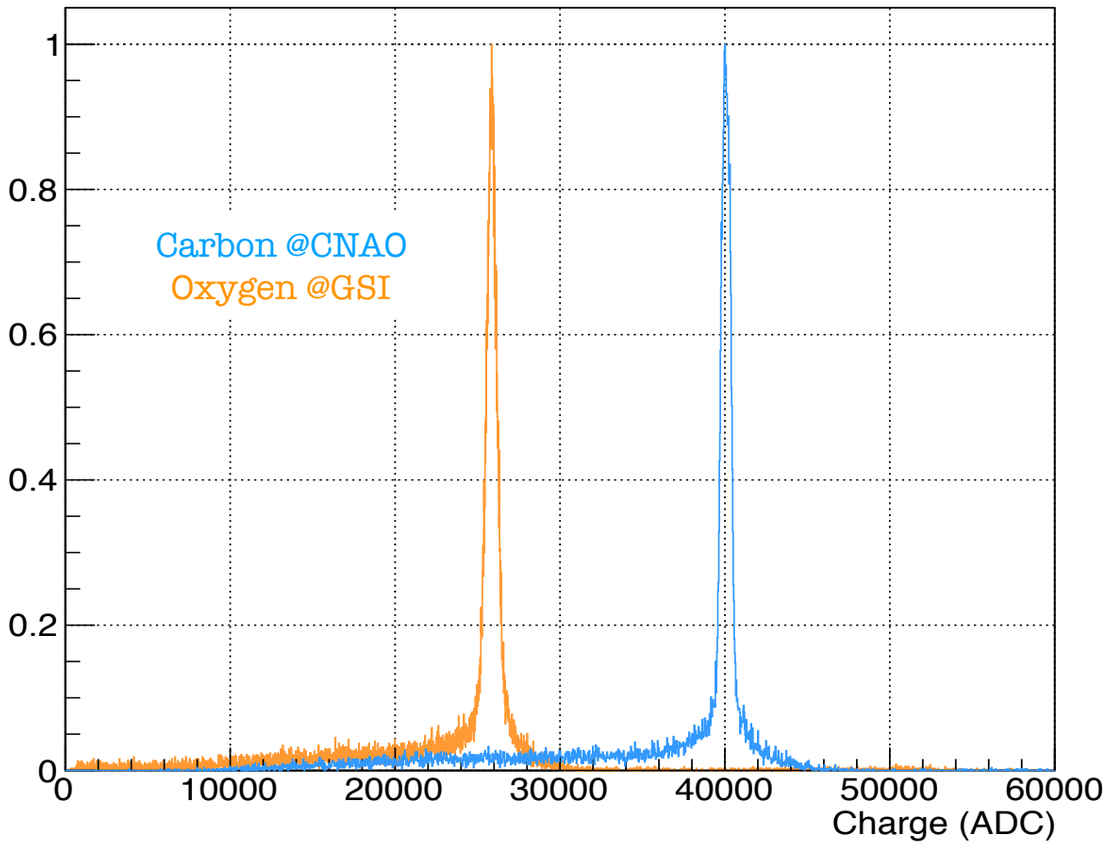
CNAO vs GSI Analysis

400 MeV/u

Amplitude Distribution



Charge Distribution



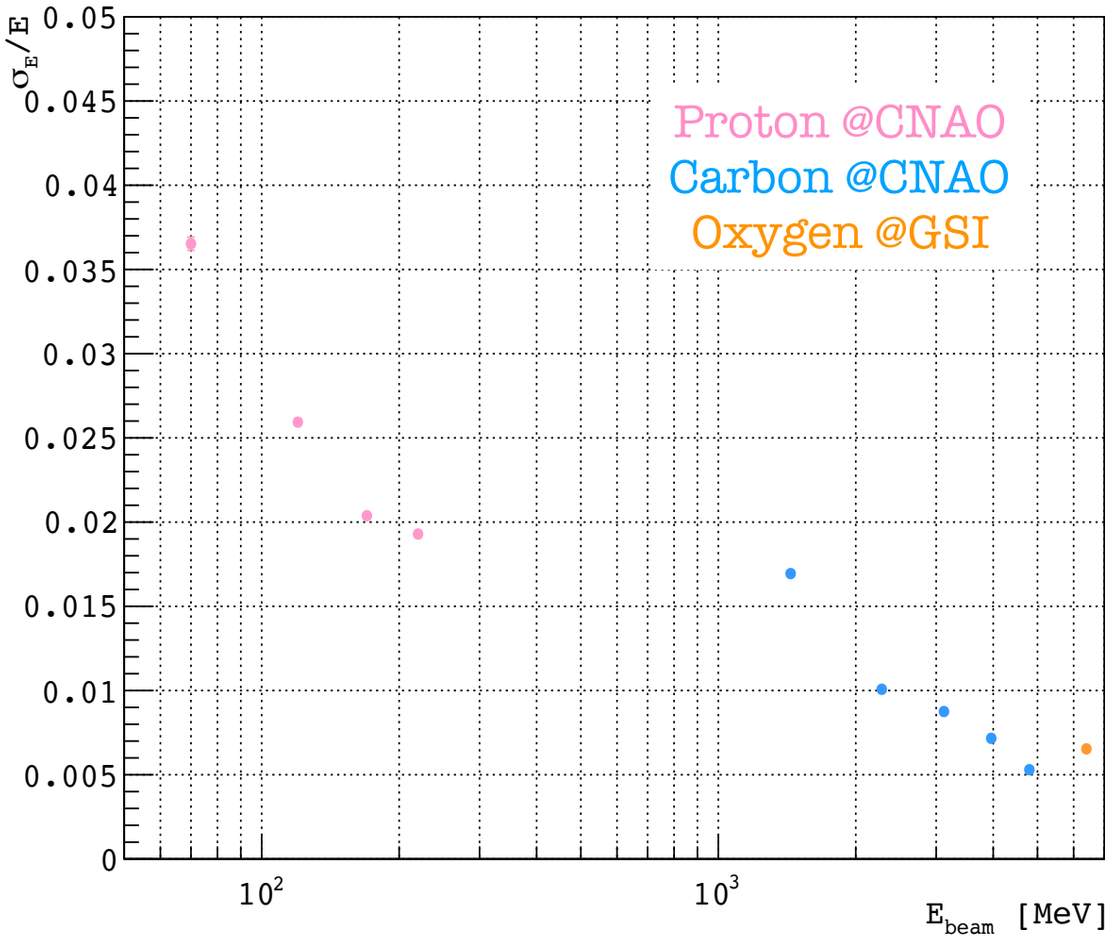
- Different HV
- Detectors in front of BGO at GSI

→ HV
@CNAO = 34 V
@GSI = 33 V

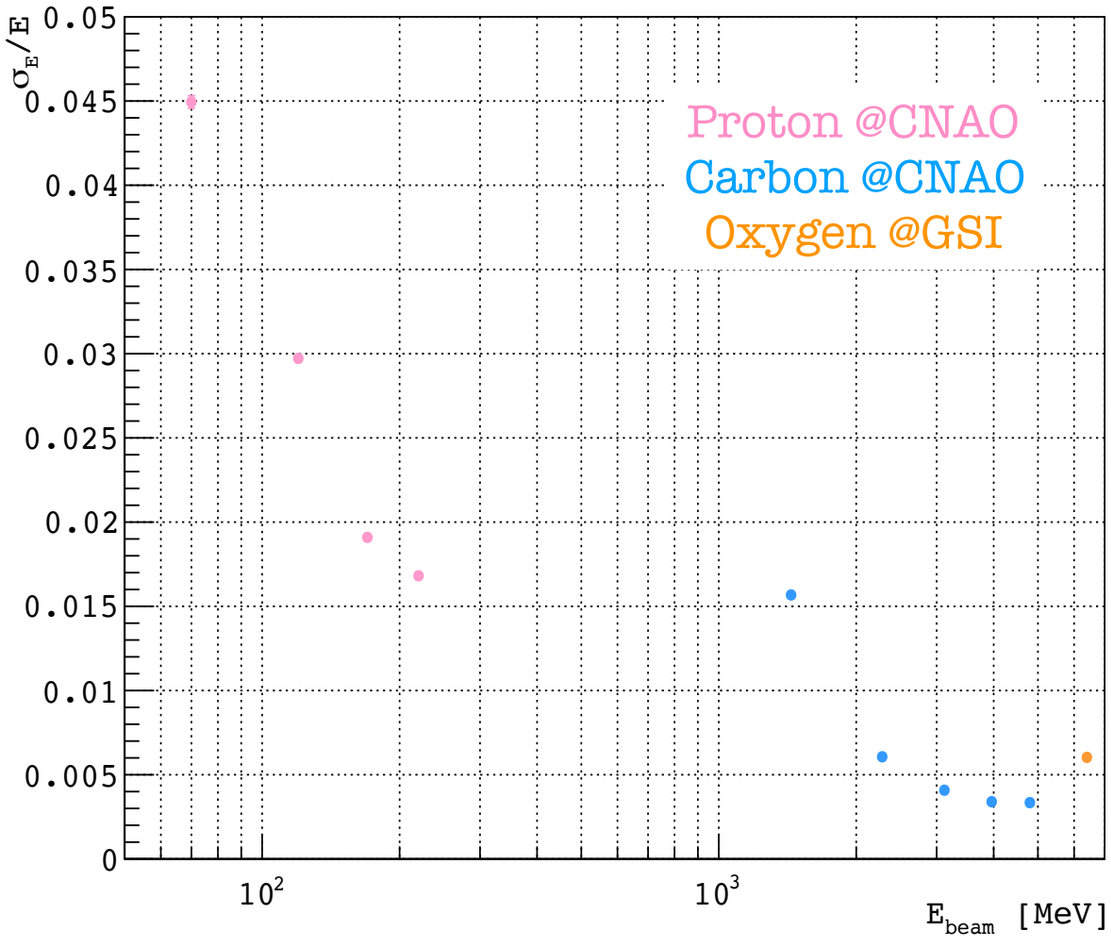
→ Gain
@CNAO 4.92E+05
@GSI 4.29E+05

Energy Resolution

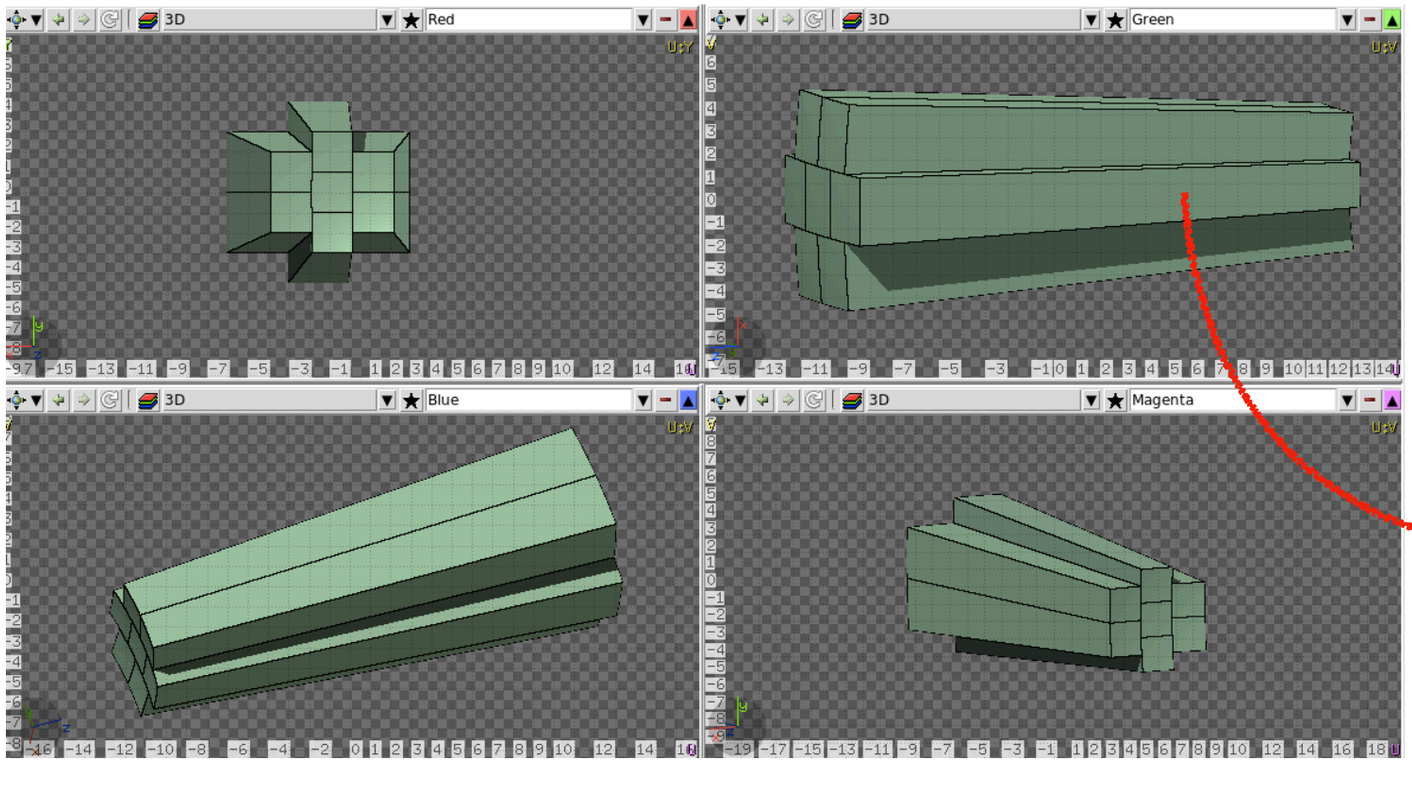
Amplitude Analysis



Charge Analysis



Calo on FLUKA



Module

Truncated Pyramid

Initialization of 1 BGO Crystal:

SPH	b	x: 0 R: 20	y: 0	z: -20
SPH	B	x: 0 R: 44	y: 0	z: -20

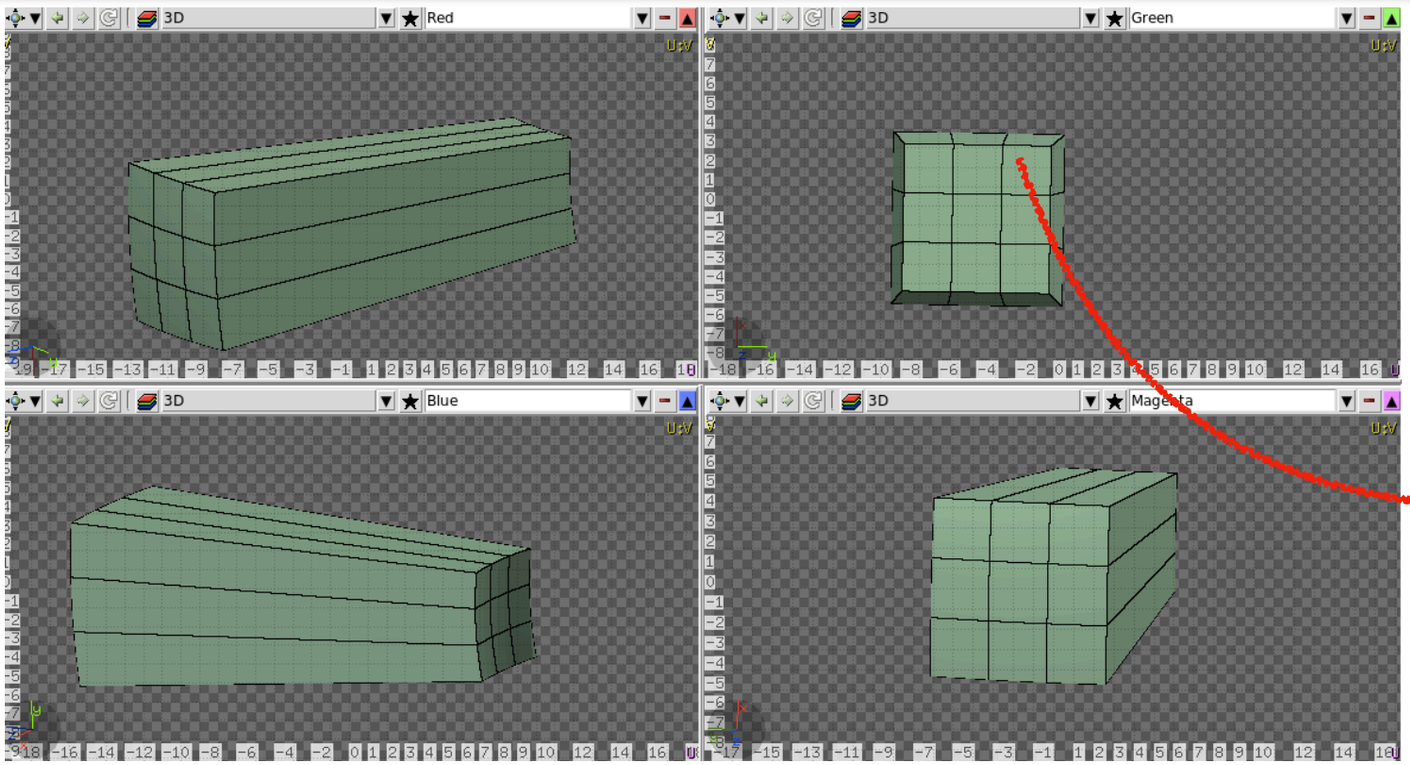
PLA	u1	Nx: 0.999783056 x: 1	Ny: 0 y: 0	Nz: -0.020828813 z: 0
PLA	d1	Nx: -0.999783056 x: -1	Ny: 0 y: 0	Nz: -0.020828813 z: 0
PLA	f1	Nx: 0 x: 0	Ny: 0.999783056 y: 1	Nz: -0.020828813 z: 0
PLA	k1	Nx: 0 x: 0	Ny: -0.999783056 y: -1	Nz: -0.020828813 z: 0

Void around
REGION VOID Neigh: 5

expr: +void -(+u4 +d4 +f4 +k5 -b +B -taglio) -(+u6 +d6 +f6 +k7 -b +B -taglio)-(+u1 +d1 +f2 +k3 -b +B -taglio)

Too many parentheses!!

Calo on FLUKA



Matrix

Truncated Pyramid

3x3 Matrix:

SPH	b	x: 0 R: 20	y: 0	z: -20
SPH	B	x: 0 R: 44	y: 0	z: -20
PLA	taglio	Nx: 0	Ny: 0	Nz: -1
definizione dei piani orizzontali				
PLA	o0	Nx: -0.998048075 x: 4.497396963	Ny: 0 y: 0	Nz: 0.062450295 z: 23.87505423
PLA	o1	Nx: -0.999783056 x: 1	Ny: 0 y: 0	Nz: 0.020828813 z: 0
PLA	o2	Nx: -0.999783056 x: -1	Ny: 0 y: 0	Nz: -0.020828813 z: 0
PLA	o3	Nx: -0.998048075	Ny: 0	Nz: -0.062450295
definizione dei piani verticali				
PLA	v0	Nx: 0 x: 0	Ny: -0.998048075 y: 4.497396963	Nz: 0.062450295 z: 23.87505423
PLA	v1	Nx: 0 x: 0	Ny: -0.999783056 y: 1	Nz: 0.020828813 z: 0
PLA	v2	Nx: 0 x: 0	Ny: -0.999783056 y: -1	Nz: -0.020828813 z: 0
PLA	v3	Nx: 0 x: 0	Ny: -0.998048075 y: -4.497396963	Nz: -0.062450295 z: 23.87505423
Void around				
REGION	VOID			Neigh: 5
expr: +void -(+taglio -b +B -o0 +o3 -v0 +v3)				

Horizontal Planes

Vertical Planes

Status of Calorimeter

- DAQ
- ReadOut
- PhotoDetector

see Piergiorgio's presentation

Test on digitizer

Digitizer **V1742** CAEN

12 bits

1 Ghz

1024 samplings

V_{pp} = 1V

Impedance 50Ω

Digitizer **V1740** CAEN

12 bits

62.5 Mhz

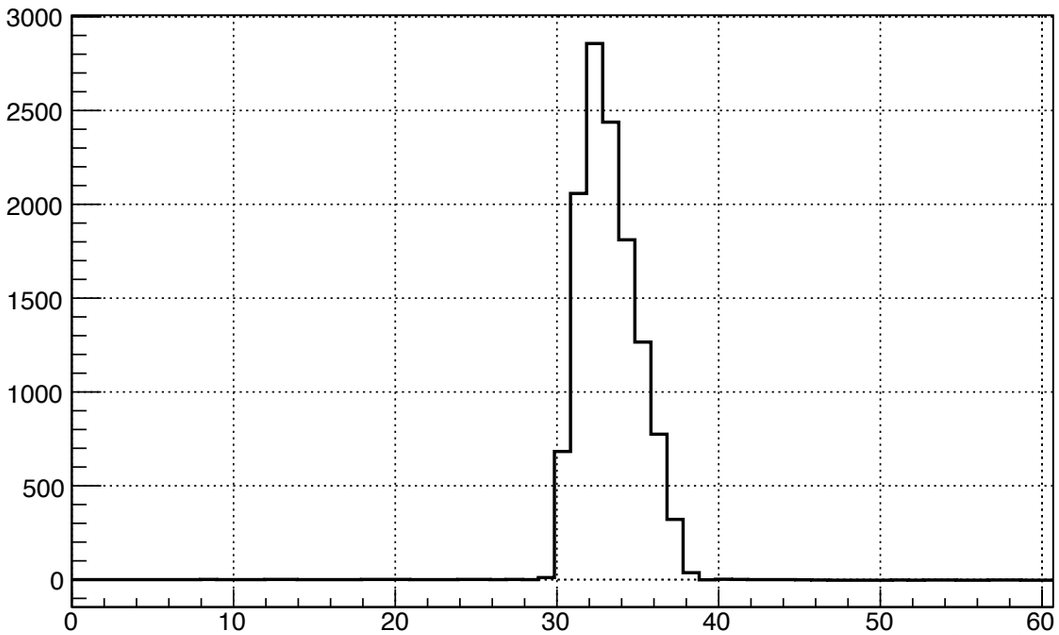
192 samplings

V_{pp} = 10 V

Impedance 1kΩ

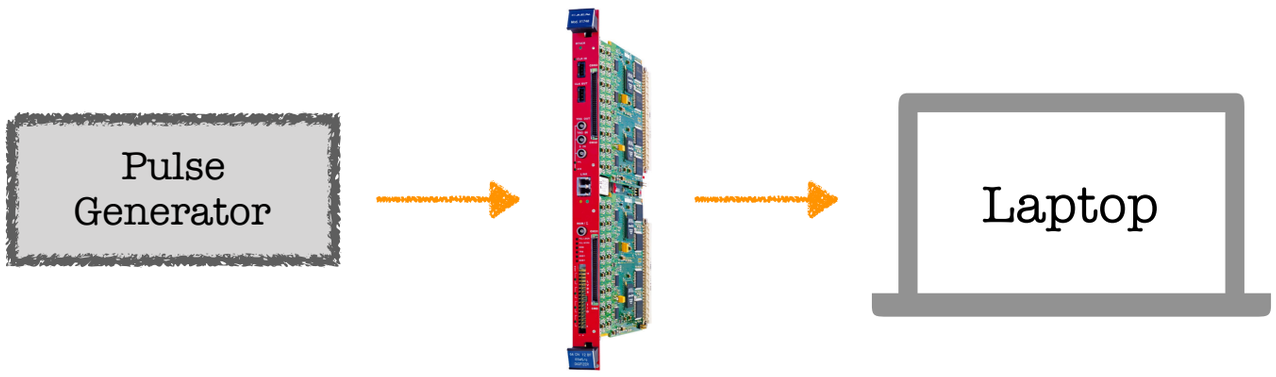
V1740 - Amplitude Analysis

Signal

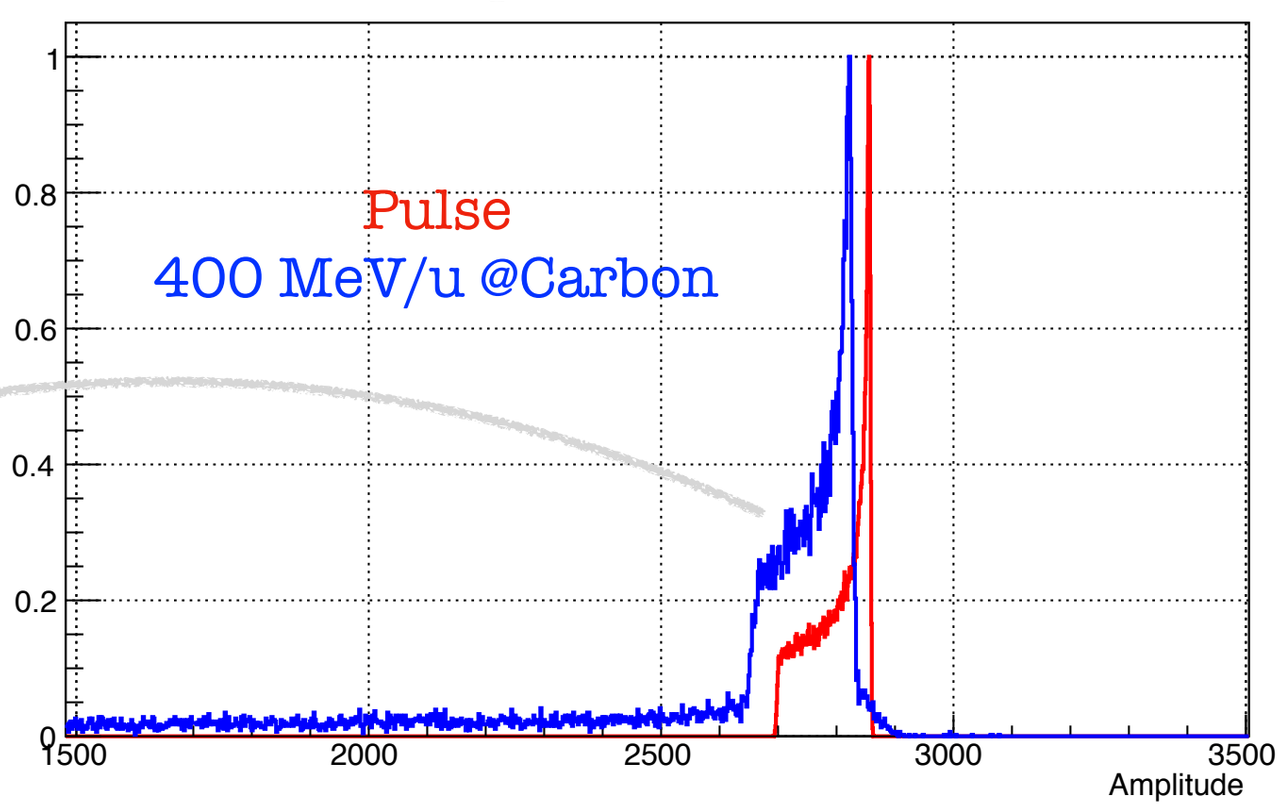


Rising time: 40 - 50 ns

Pulse sent from pulse generator to the Digitizer



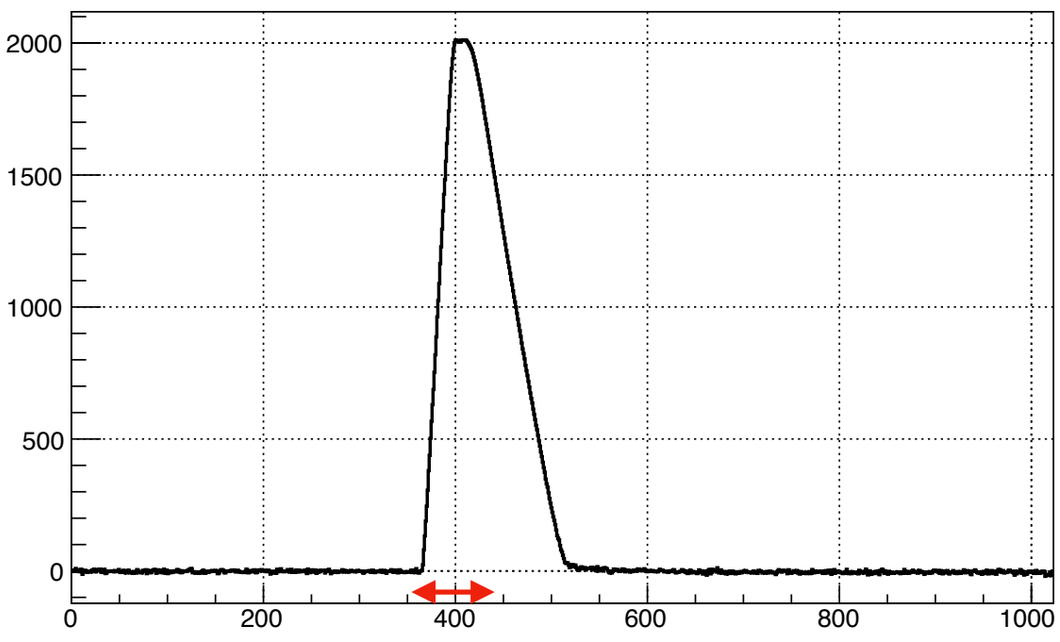
Amplitude Distribution



Plateau due to low sampling rate

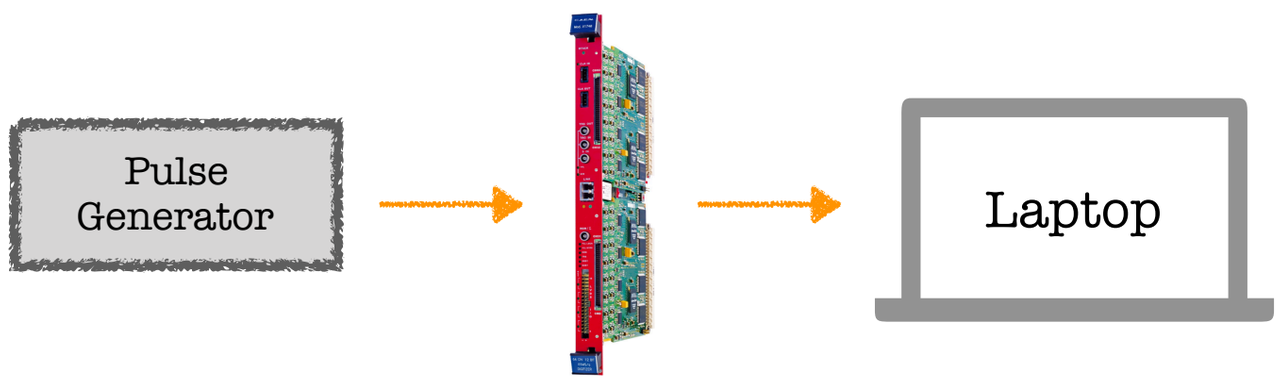
V1742 - Amplitude Analysis

Signal

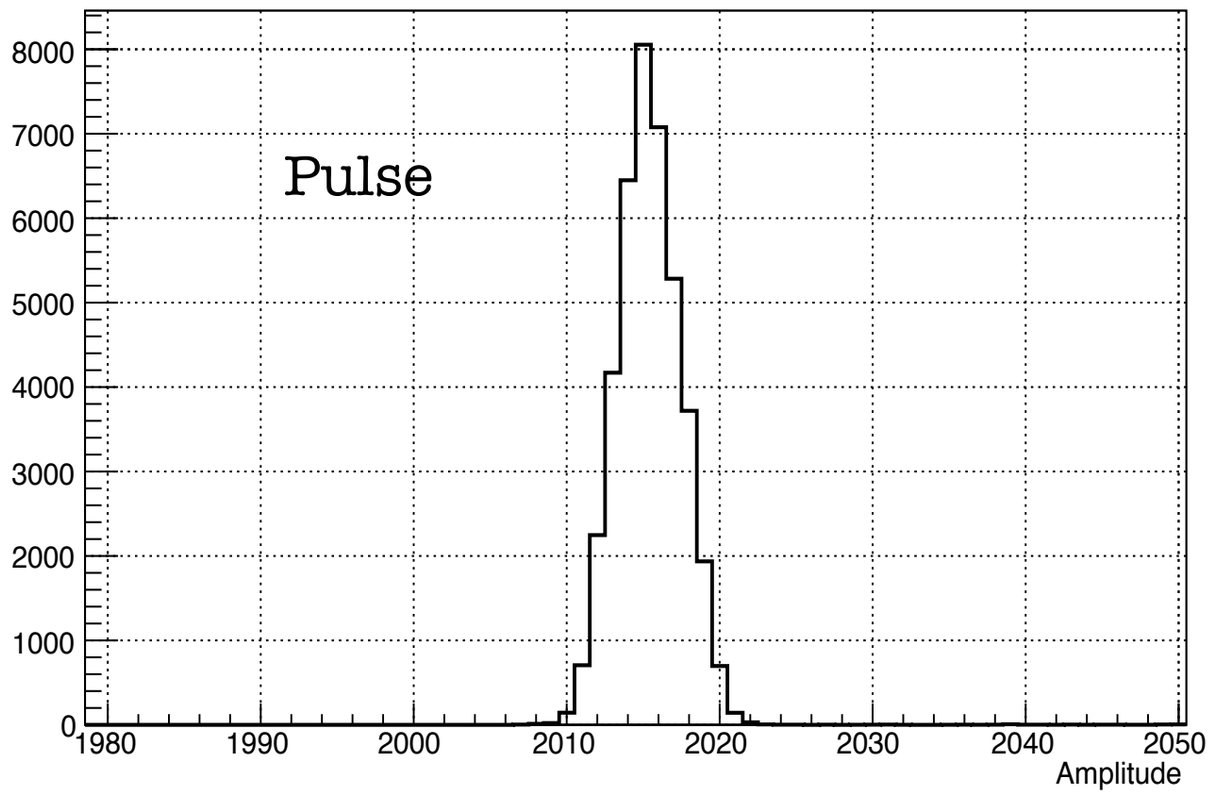


Rising time: 40 - 50 ns

Pulse sent from pulse generator to the Digitizer

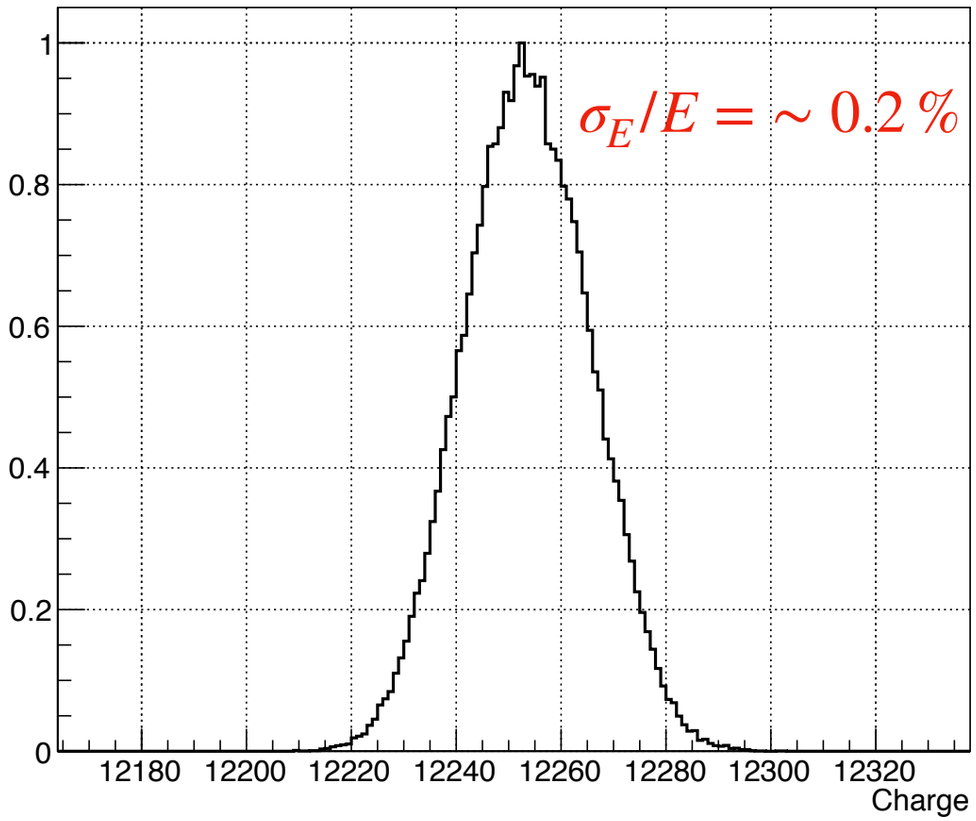


Amplitude Distribution

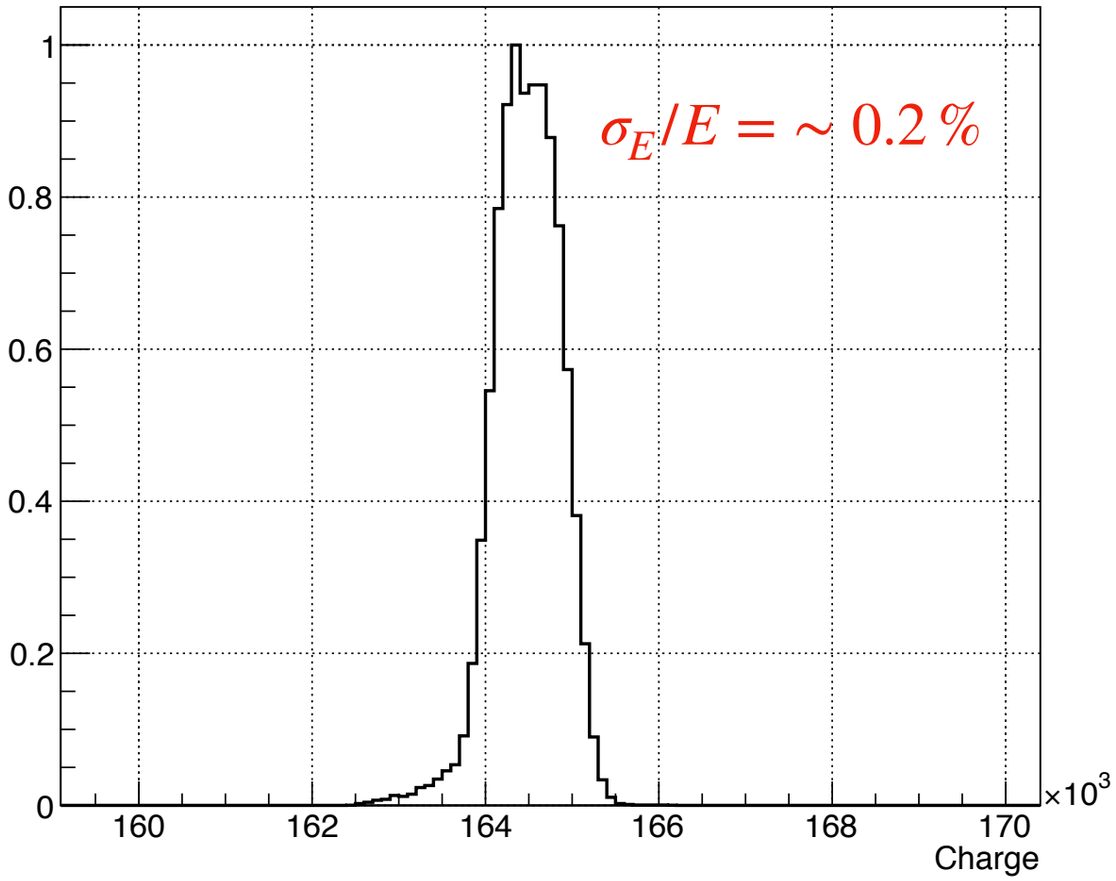


V1740 & V1742 - Charge Analysis

Charge Distribution V1740



Charge Distribution V1742



Conclusions

- CNAO vs GSI Analysis:
  - ✓ Resolution below 1% w/ amplitude and charge analysis
  - ✓ Resolution at GSI worse than CNAO due to other detectors in front of BGO
- Fluka Simulations
- Status of Calorimeter (DAQ)

Conclusions

- CNAO vs GSI Analysis:
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- Fluka Simulations:
  - ✓ Implemented two modules of the calorimeter with pyramid trunks geometry
  - ✓ Next step: simulation and construction of the whole calorimeter
- Status of Calorimeter (DAQ)

Conclusions

- CNAO vs GSI Analysis:
  - ✓ Resolution below 1% w/ amplitude and charge analysis
  - ✓ Resolution at GSI worse than CNAO due to other detectors in front of BGO

- Fluka Simulations:
  - ✓ Implemented a module of the calorimeter with pyramid trunks geometry
  - ✓ Next step: simulation and construction of the whole calorimeter

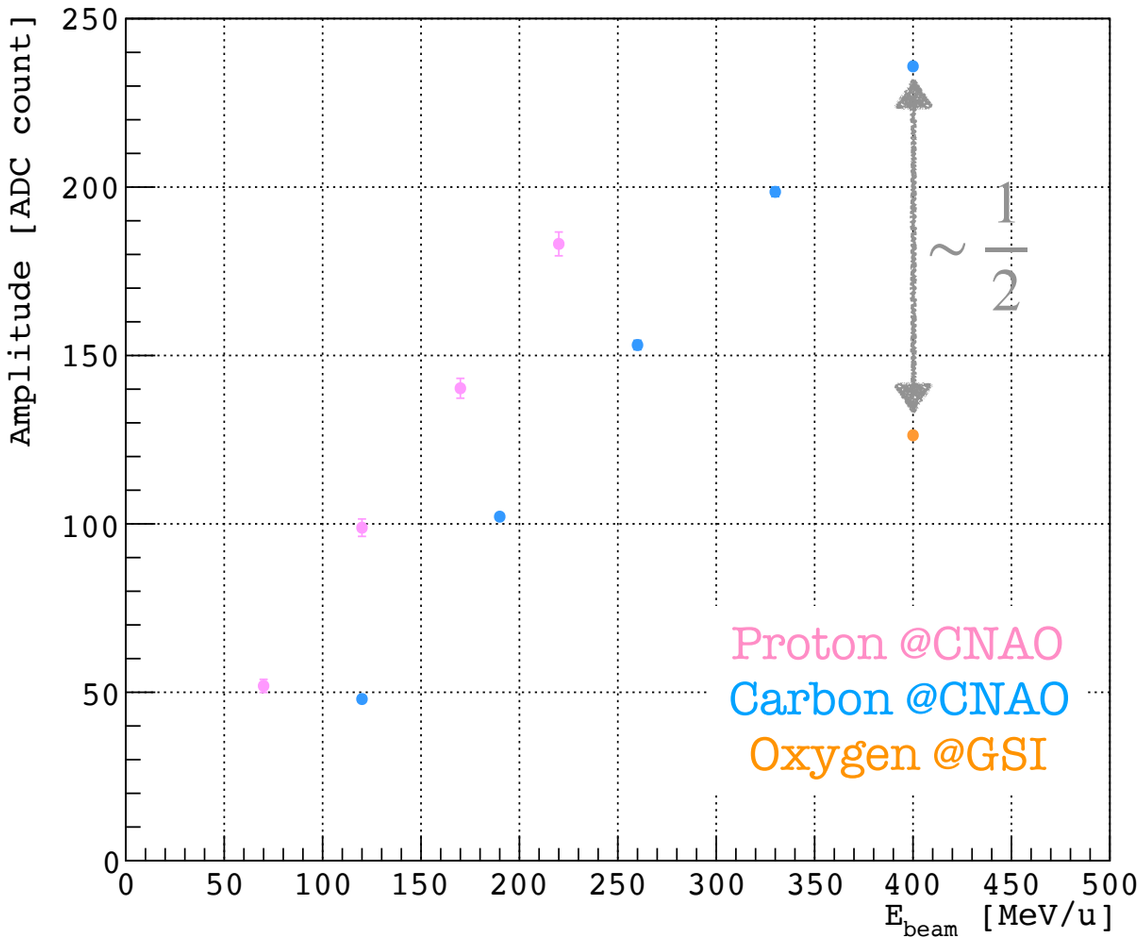
- Status of Calorimeter (DAQ):
  - ✓ Digitizer V1740 can't be used w/ Amplitude Analysis

  Further possibilities:
  - ☐ V1740 w/ Charge Analysis
  - ☐ Use V1740b w/ Charge Analysis (same frequency rate, V_{pp} = 2V, 50Ω)
  - ☐ Adapt readout board to V_{pp} = 1V of V1742
  - ☐ Give up with shape analysis and work with QDC

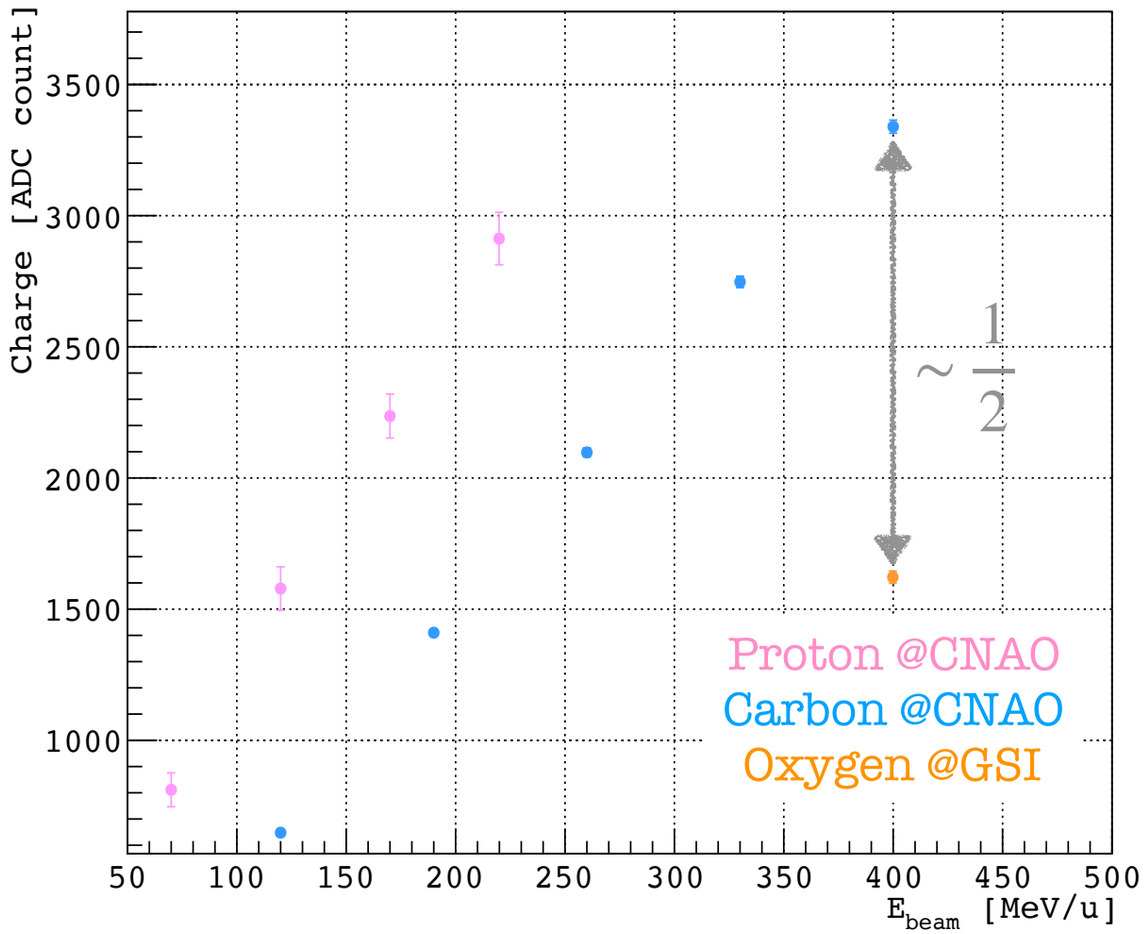
BACKUP

Linearity

Amplitude Analysis



Charge Analysis

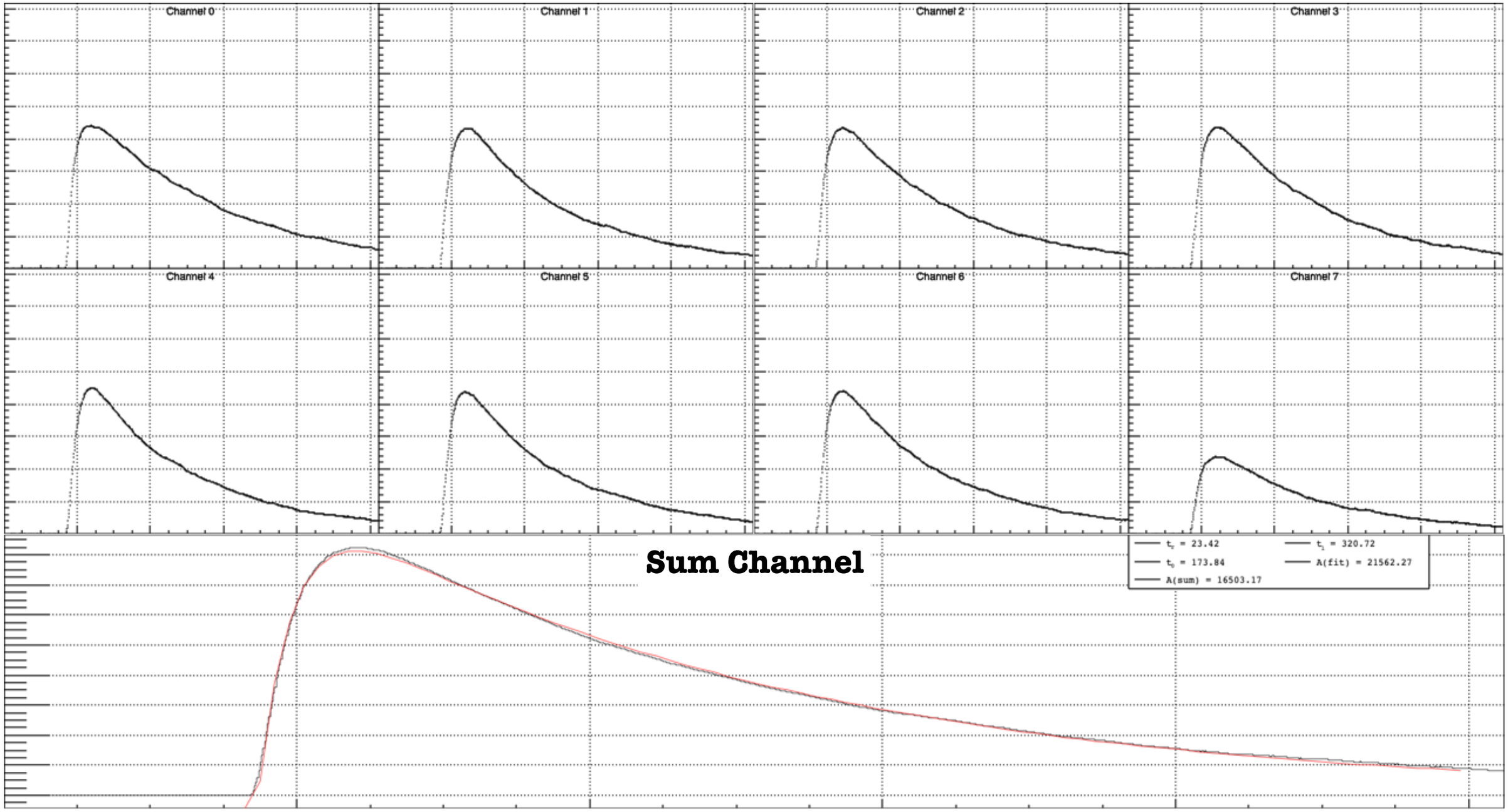


Signal with board_**V0**

Carbon 400 MeV/u

October

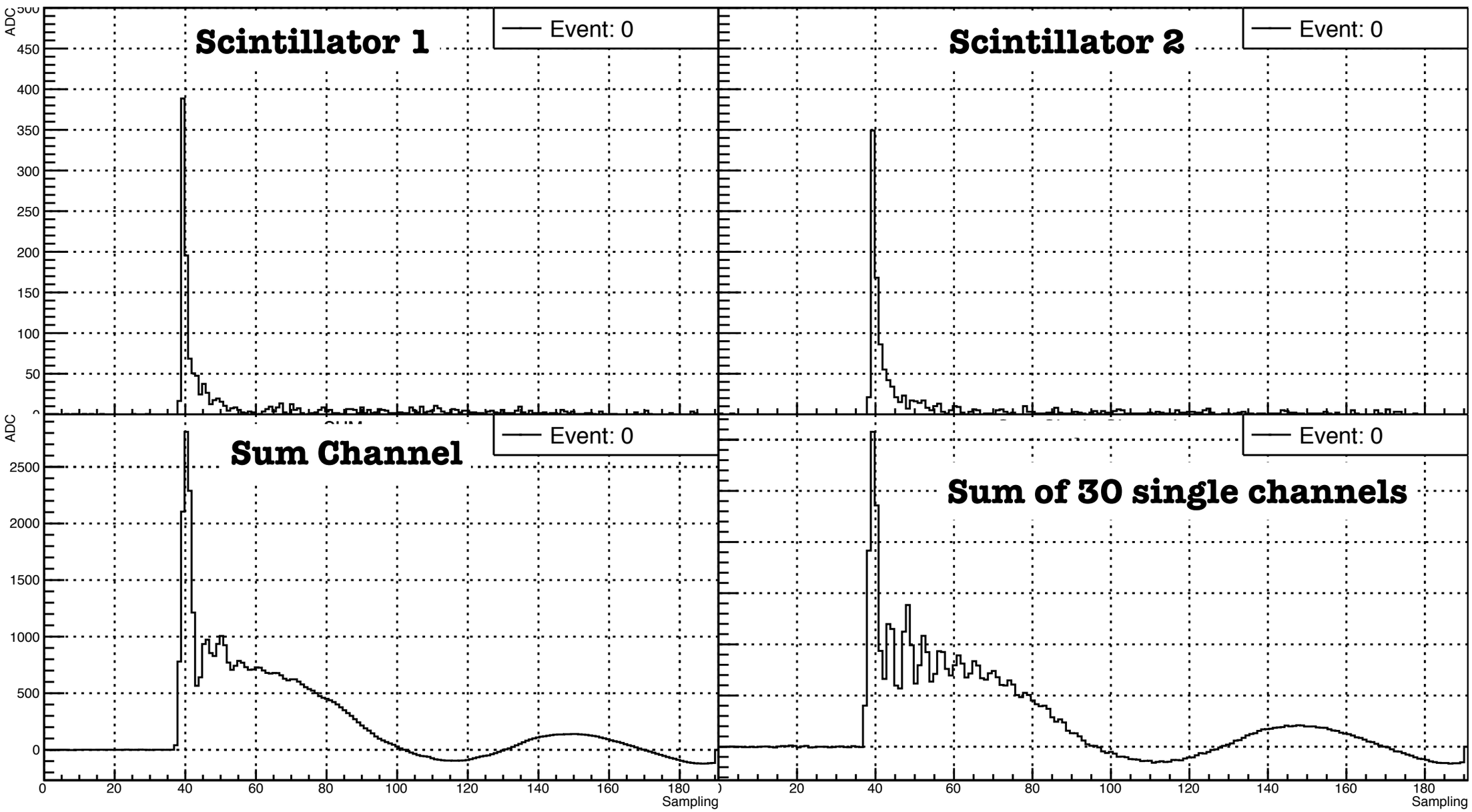
Signals from FAN OUT



Signal with board_**V1**

Carbon 400 MeV/u

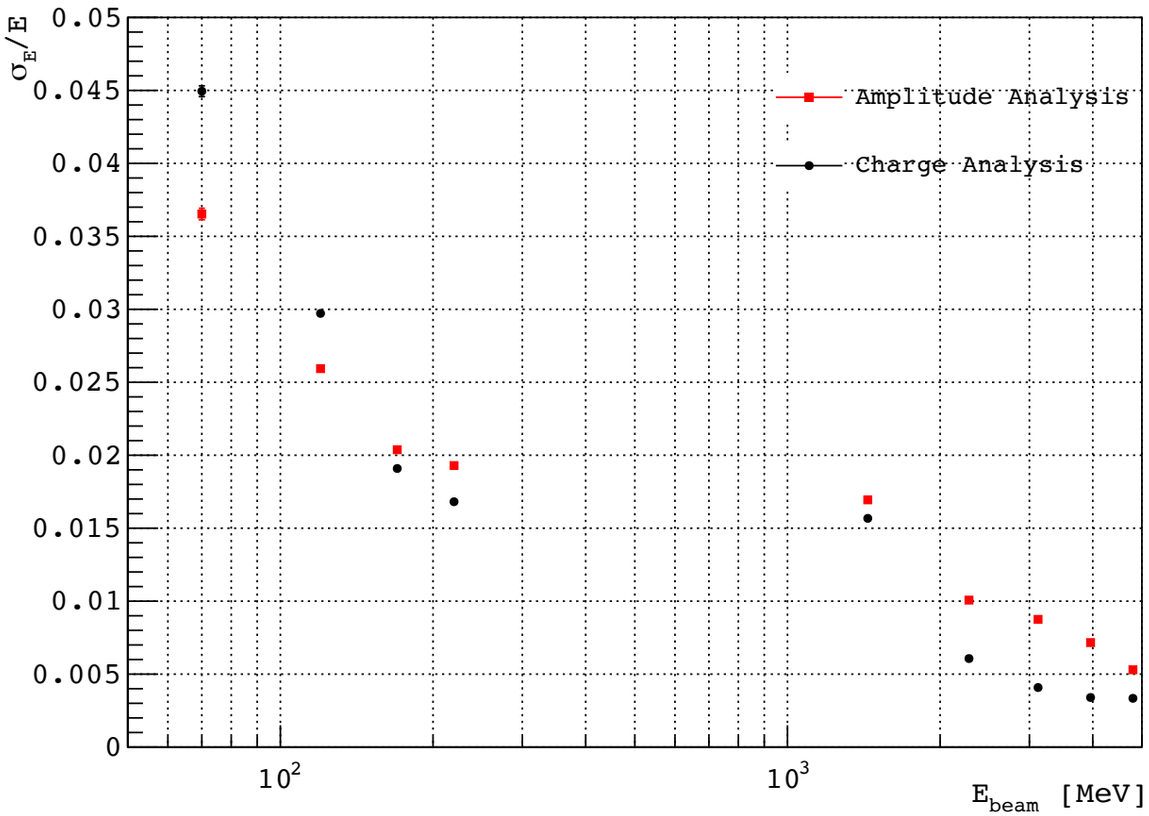
March



Energy Resolution

March Comparison between Amplitude & Charge Analysis: **October**

V1740



V1742