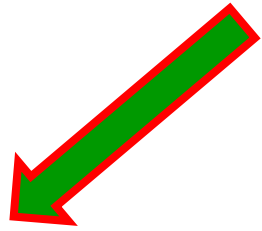
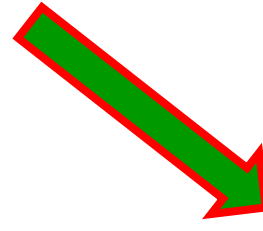


## *Analyses in FOOT in the last year*

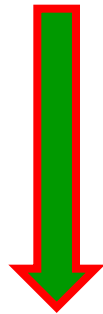


To extract physics information



To improve detector performance

COVID did not get the possibility to  
acquire data from 3/2020 to 5/2021



Analysis of:

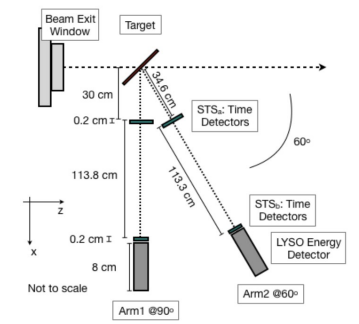
- ❑ already acquired data (2017 – 2/2020)
- ❑ after june 2021

3 september 2021  
r. spighi, on behalf FOOT Coll

**Physics data taking**

CNAO

2017



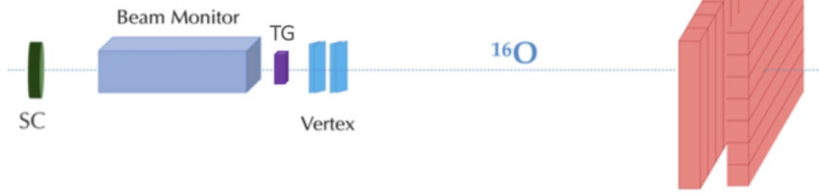
FOOT prototype

$^{12}\text{C}$  ( $\neq$  energies) on C, O, H

FOOT improved

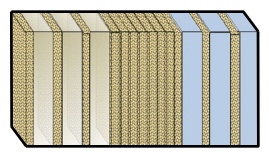
2019

ELECTRONIC SETUP



EMULSION

AND



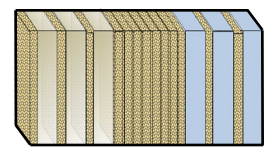
$^{16}\text{O}$  (400 MeV/u) on C  
 $60 \cdot 10^3$  events (only few% interacting)

$^{16}\text{O}$  (200 & 400 MeV/u) on C and  $\text{C}_2\text{H}_4$   
 $\sim 300 \cdot 10^3$  interacting events

FOOT improved

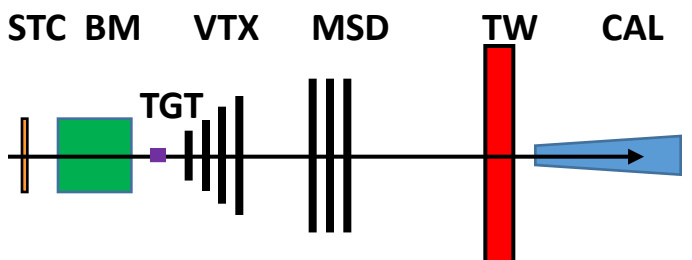
2020

EMULSION



$^{12}\text{C}$  (700 MeV/u) on C and  $\text{C}_2\text{H}_4$   
 $\sim 300 \cdot 10^3$  interacting events

ELECTRONIC SETUP



$^{16}\text{O}$  (200 and 400 MeV/u) on C and  $\text{C}_2\text{H}_4$   
 **$41 \cdot 10^6$  events acquired** (also with Trigger)

GSI

July 2021

+ 2 Neutron detector prototypes

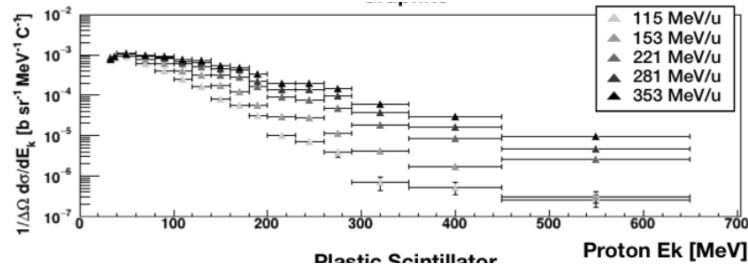
**CNAO (2017)**

### Measurement of <sup>12</sup>C Fragmentation Cross Sections on C, O and H in the Energy Range of interest for Particle Therapy Applications.

I. Mattei<sup>1</sup>, A. Alexandrov<sup>6</sup>, L. Alunni Solestizi<sup>21,7</sup>, G. Ambrosi<sup>7</sup>, S. Argirò<sup>8,9</sup>, N. Bartosik<sup>8</sup>, G. Battistoni<sup>1</sup>, N. Belcarì<sup>10,11</sup>, S. Biondi<sup>12,13</sup>, M.G. Bisogni<sup>10,11</sup>, G. Bruni<sup>12</sup>, N. Camarlinghi<sup>10,11</sup>, P. Carra<sup>10,11</sup>, E. Catanzani<sup>21,7</sup>, E. Ciarrocchi<sup>10,11</sup>, P. Cerello<sup>8</sup>, A. Clozza<sup>14</sup>, S. Cozzani<sup>15</sup>, M. De Simoni<sup>5,2</sup>, A. Di Crescenzo<sup>17,6</sup>, M. Donetti<sup>18,8</sup>, Y.

**Pub: 2020**

diff Xsec for *p, d, T* @ 60 and 90° in C,O,H

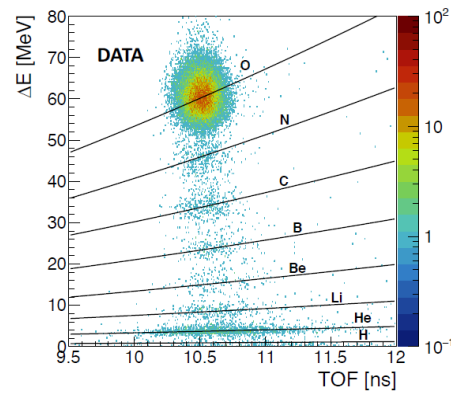
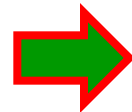


ongoing

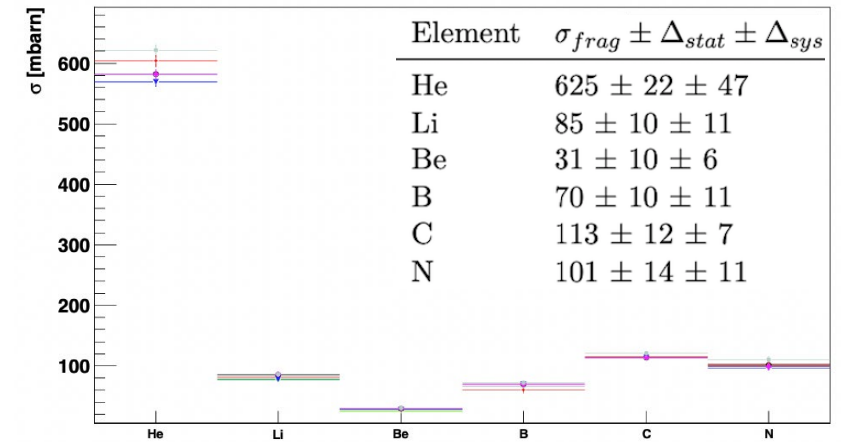
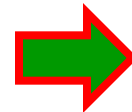
Diff Xsect at lower angles

**GSI (2019)**

**ELECTRONIC SETUP**



Ongoing Xsect measurement



**EMULSION CHAMBERS**

Marco Toppi, Giacomo Traini, Serena Marta Valle, Marie Vanstalle, Mauro Villa, Ulrich Weber, Roberto Zarrella, Antonio Zoccoli, and Giovanni De Lellis

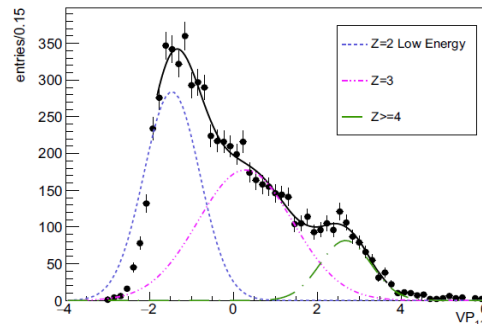
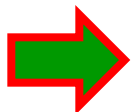
### Charge identification of fragments with the emulsion spectrometer of the FOOT experiment

https://doi.org/10.1515/phys-2021-0032  
received December 03, 2020; accepted April 21, 2021

**Abstract:** The FOOT (FragmentatiOn Of Target) experiment is an international project designed to carry out the fragmentation cross-sectional measurements relevant

for charged particle therapy (CPT), a technique based on the use of charged particle beams for the treatment of deep-seated tumors. The FOOT experiment consists of an electronic setup for the detection of fragments and an emulsion spectrometer for the first data taking was

**Pub: 2021**

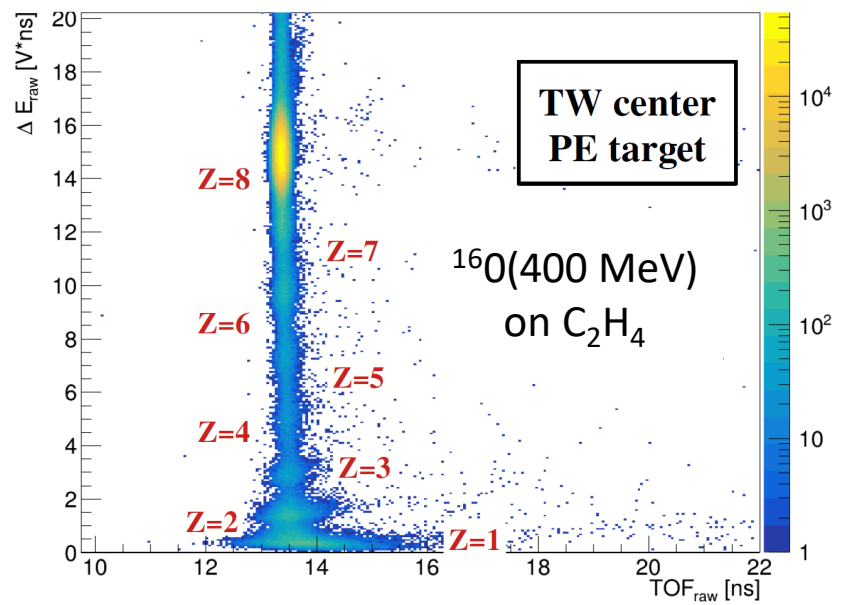


ongoing

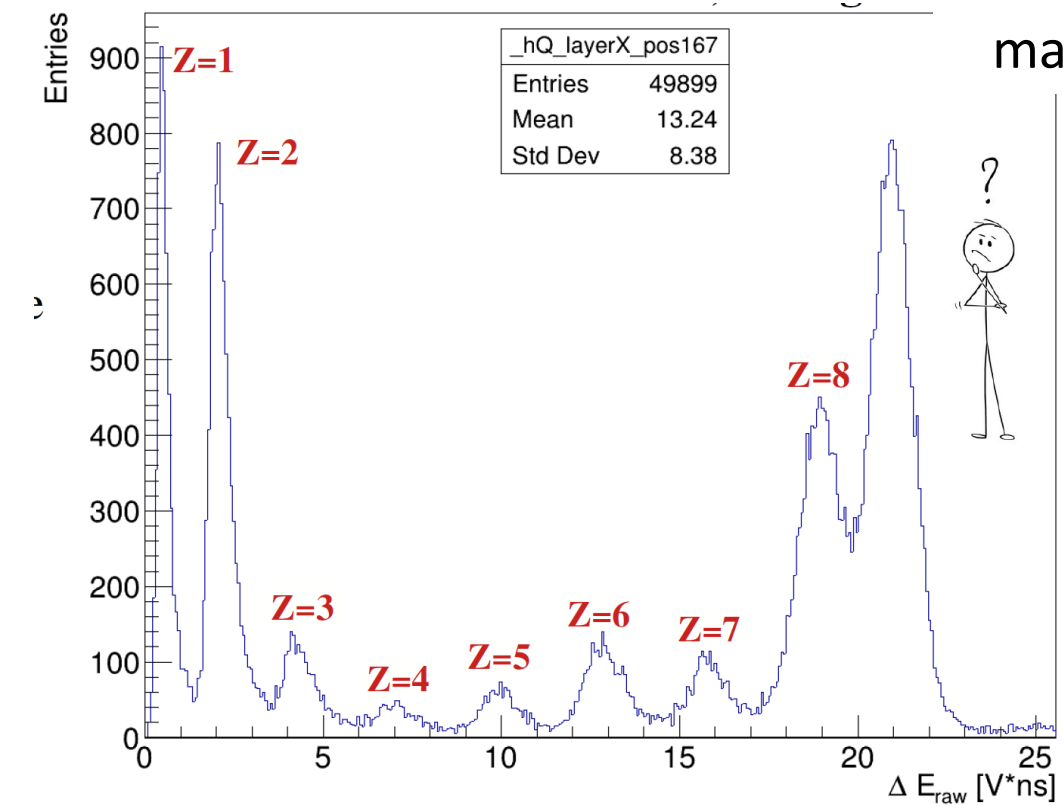
Xsect of both 2019 and 2020 samples

First charge identification

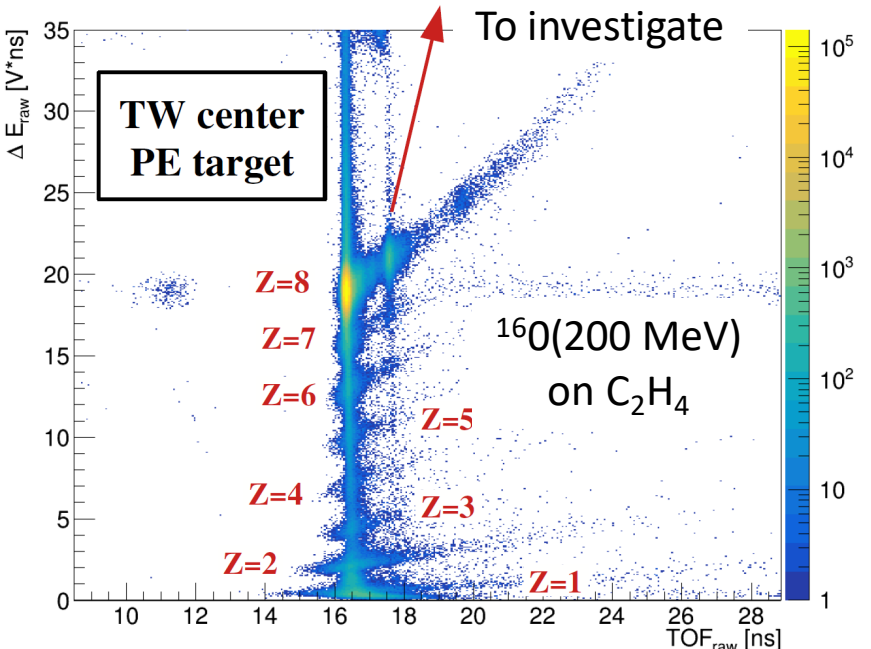
GSI data taking july 2021



protons are visible!!!



Probably some material on beam

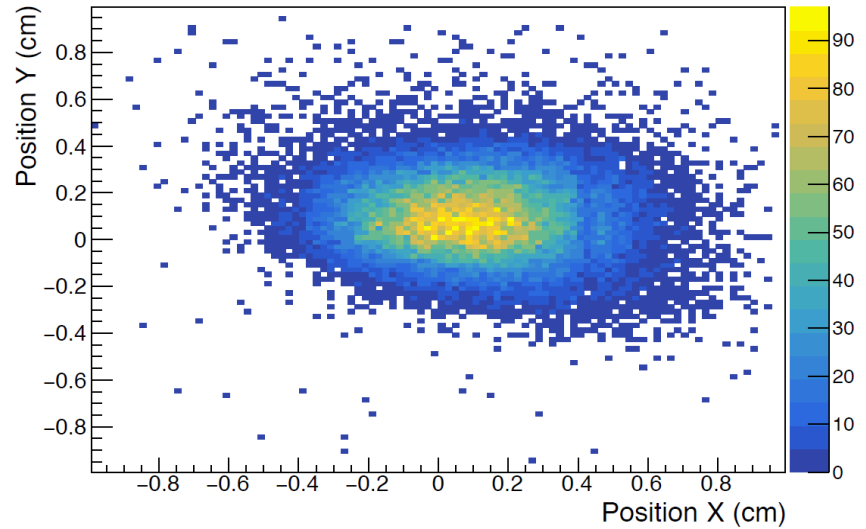


Analysis ongoing

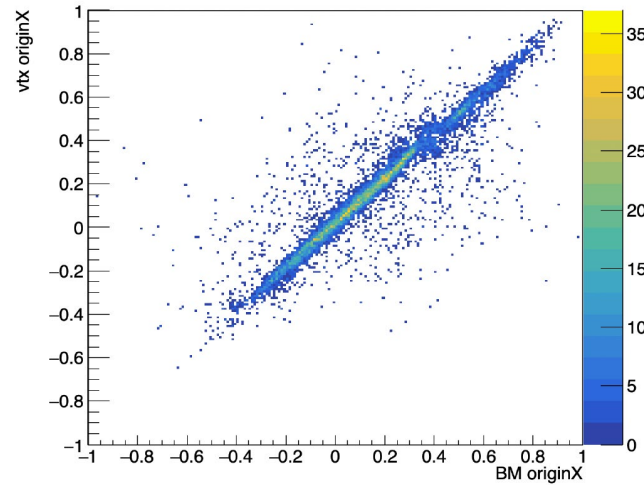
# Tracking system

# GSI data taking july 2021: detector performance

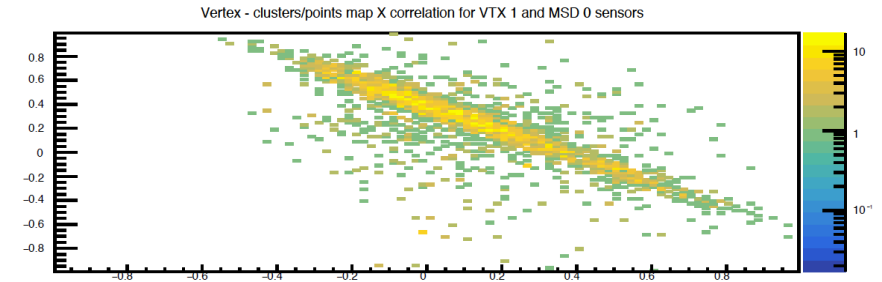
### Beam profile on VTX



### Correlation BM- VTX

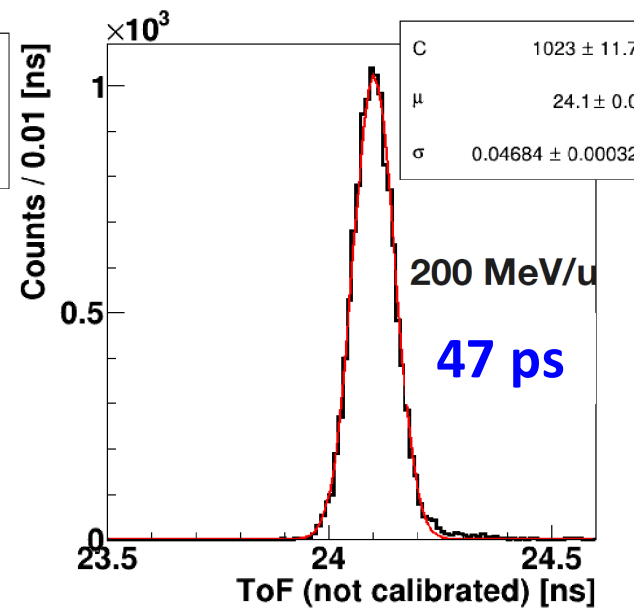
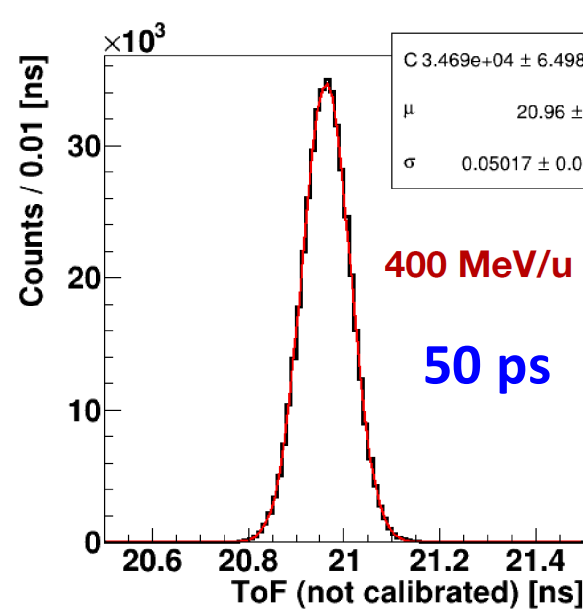


### Correlation VTX-MSD



Optimize Alignment

# Time of flight



Analysis ongoing

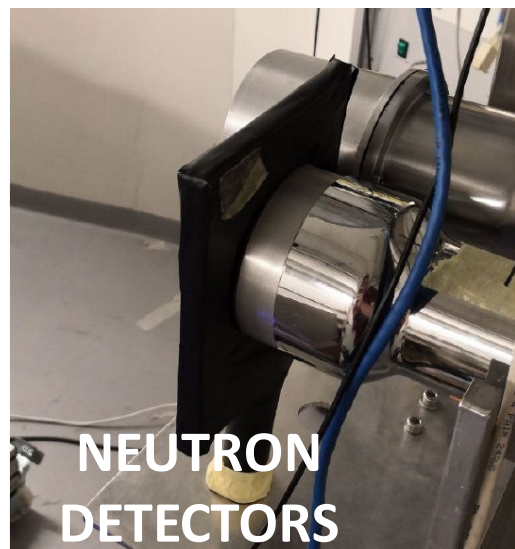
# Test beam 1: Trento 3-5/6/2021

## MSD and Neutron detectors

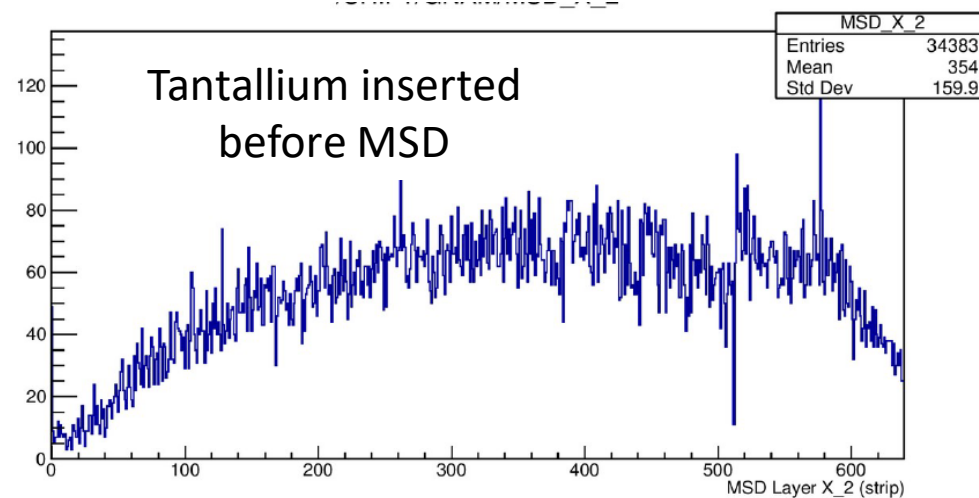
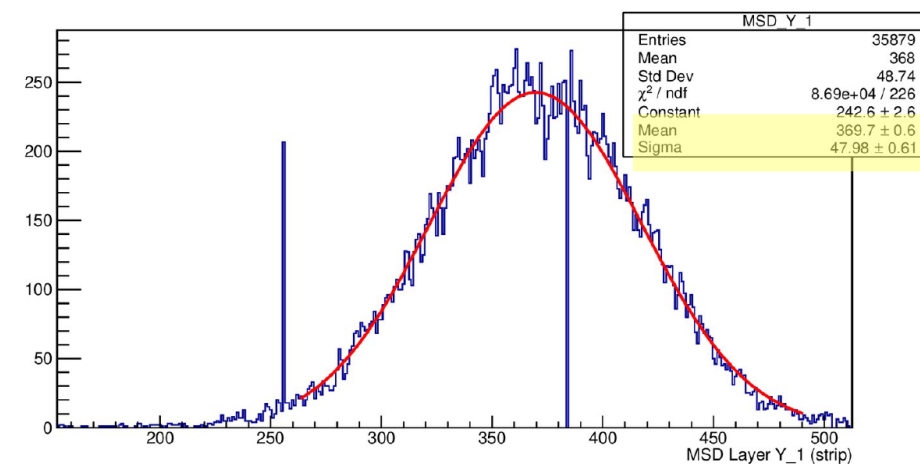
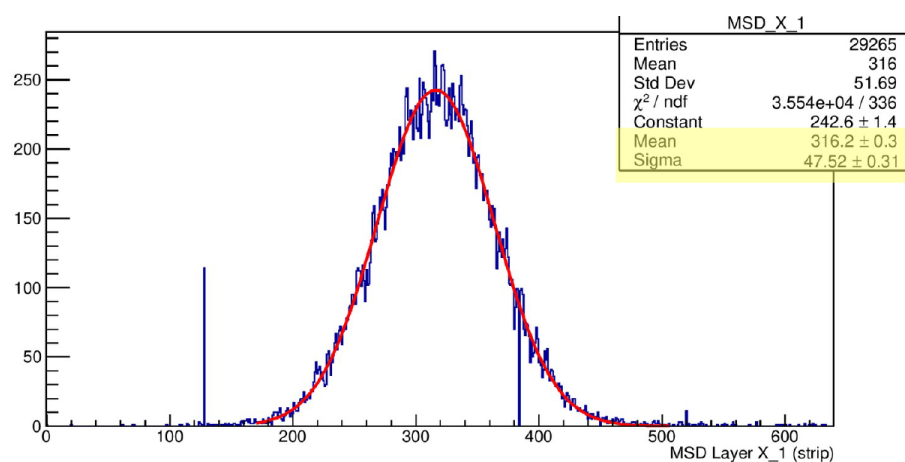
- First time on beam

## Beam scan

- p (70, 112, 159, 228 MeV)
- 32 Mevents acquired



## x & y beam profile @ 70 MeV



Analysis ongoing



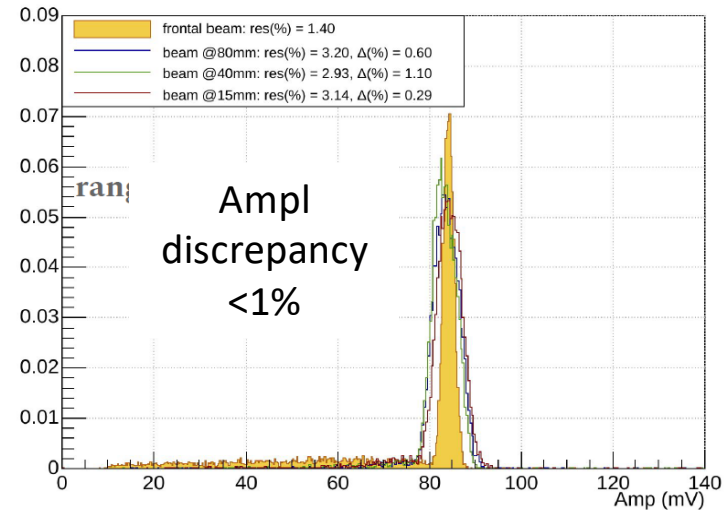
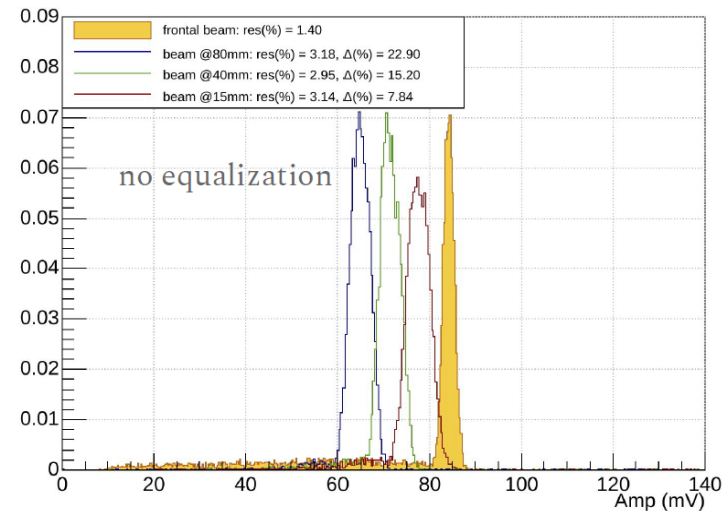
# Test beam 2: CNAO 27-28/6/2021

## Calorimeter

- Equalize crystal response
- correct by temperature

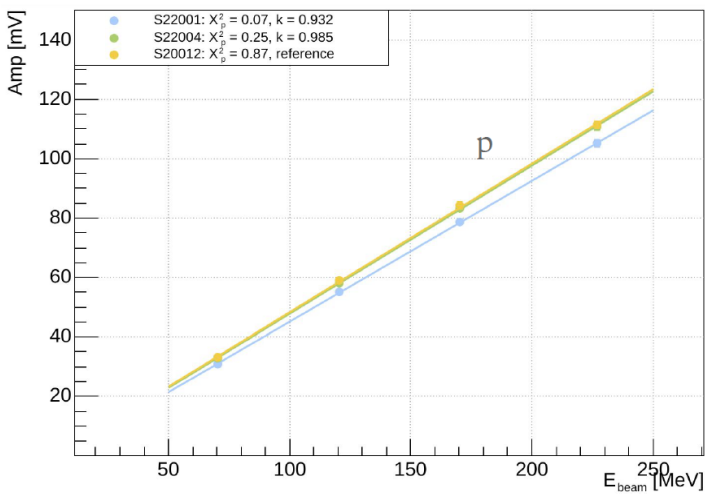
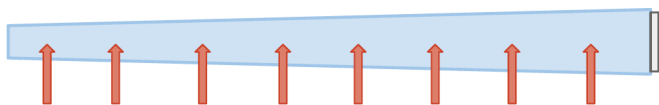
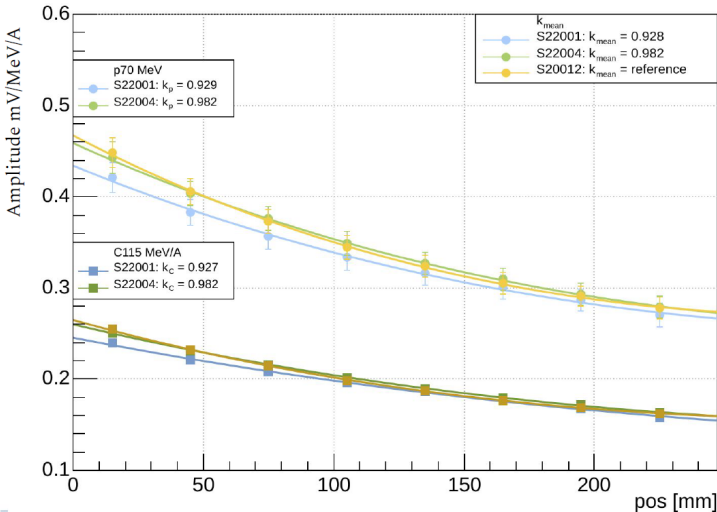
## Test on Calo

- p (70, 120, 170, 227 MeV)
- $^{12}\text{C}$  (115, 190, 260, 330, 400 MeV/U)



Energy Precision  
better 2%

Analysis ongoing



After correction

