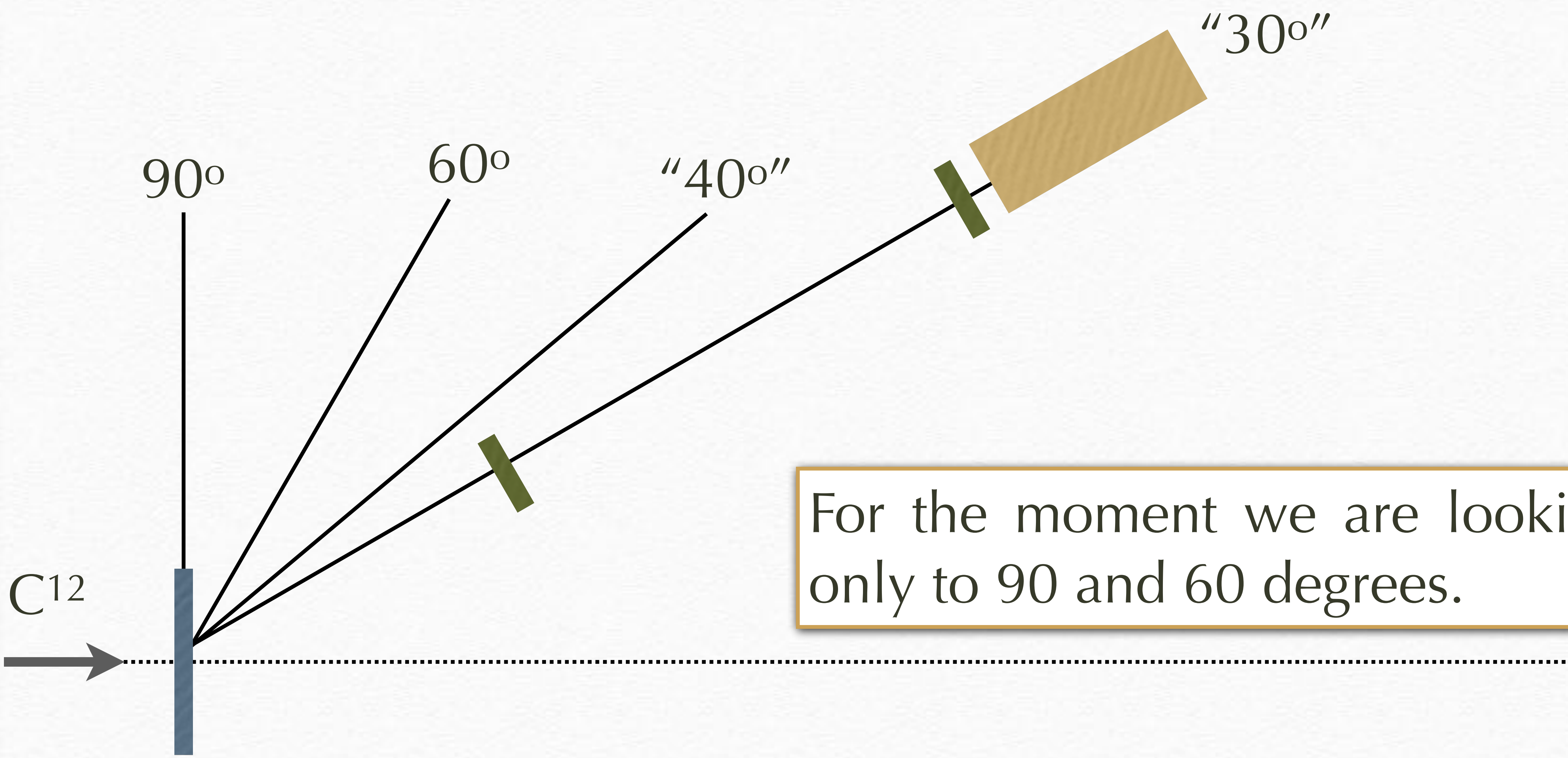
Charged Fragmentations
in C,PMMA,SCINT

IlaMi, Novembre 2017

Experimental SETUP

- STS 2 mm for TOF measurements
- LYSO 8 cm for PID

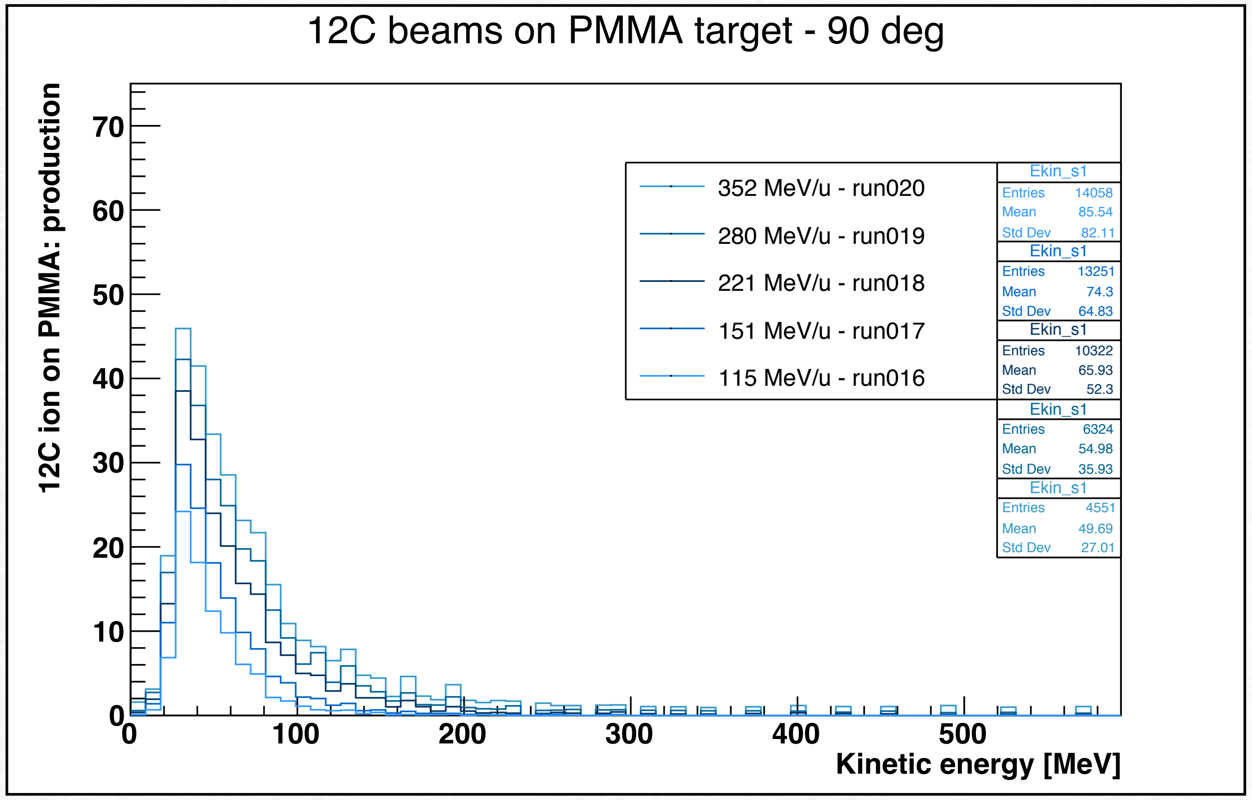


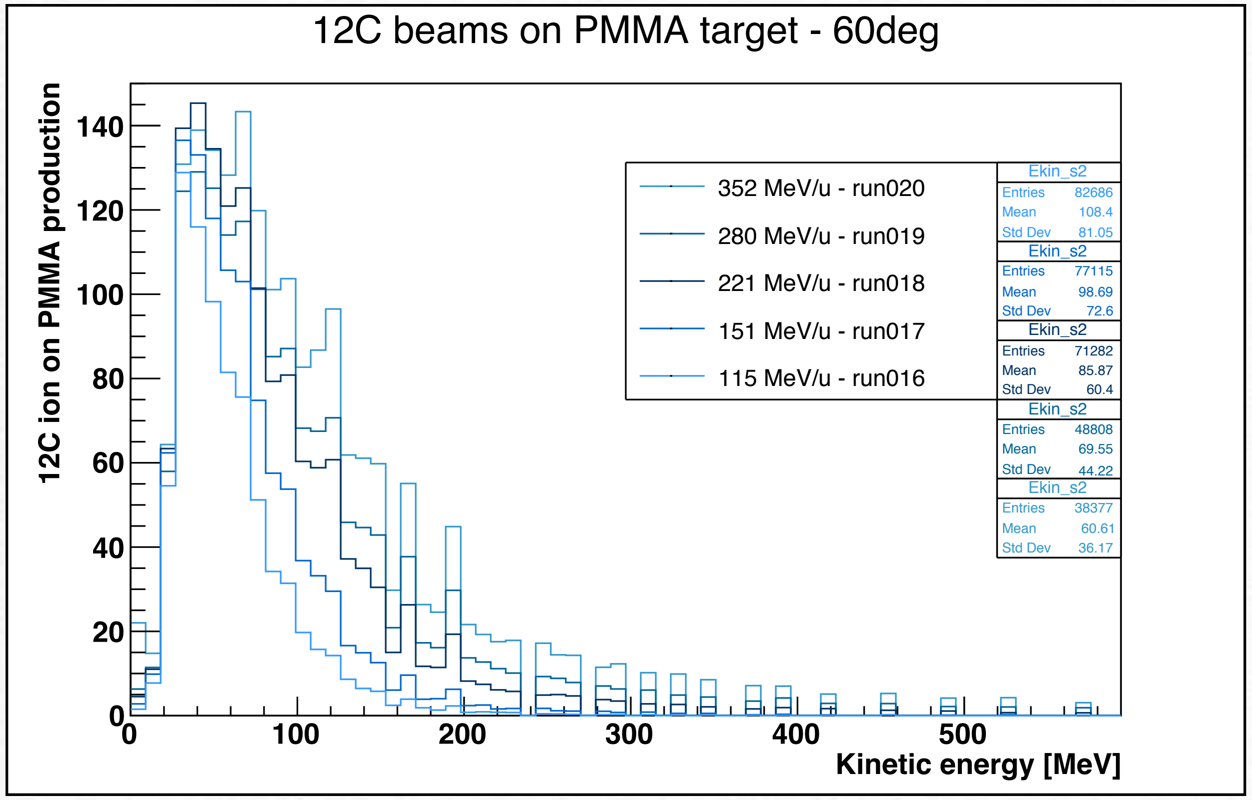
For the moment we are looking only to 90 and 60 degrees.

Targets based on C,H and O elements: C,C_bH_a,$C_5O_2H_8$

PMMA Target

NO DETECTION EFFICIENCY!





* **Assuming all protons** (that is not true, see later for PID analysis);
* The 60 degree production is about twice the 90 degree one;
* Production is normalised to the number of primary carbon ions impinged on the targets;

- PMMA = $C_5O_2H_8$
- thickness 2 mm
- density* 1.19 g/cm3

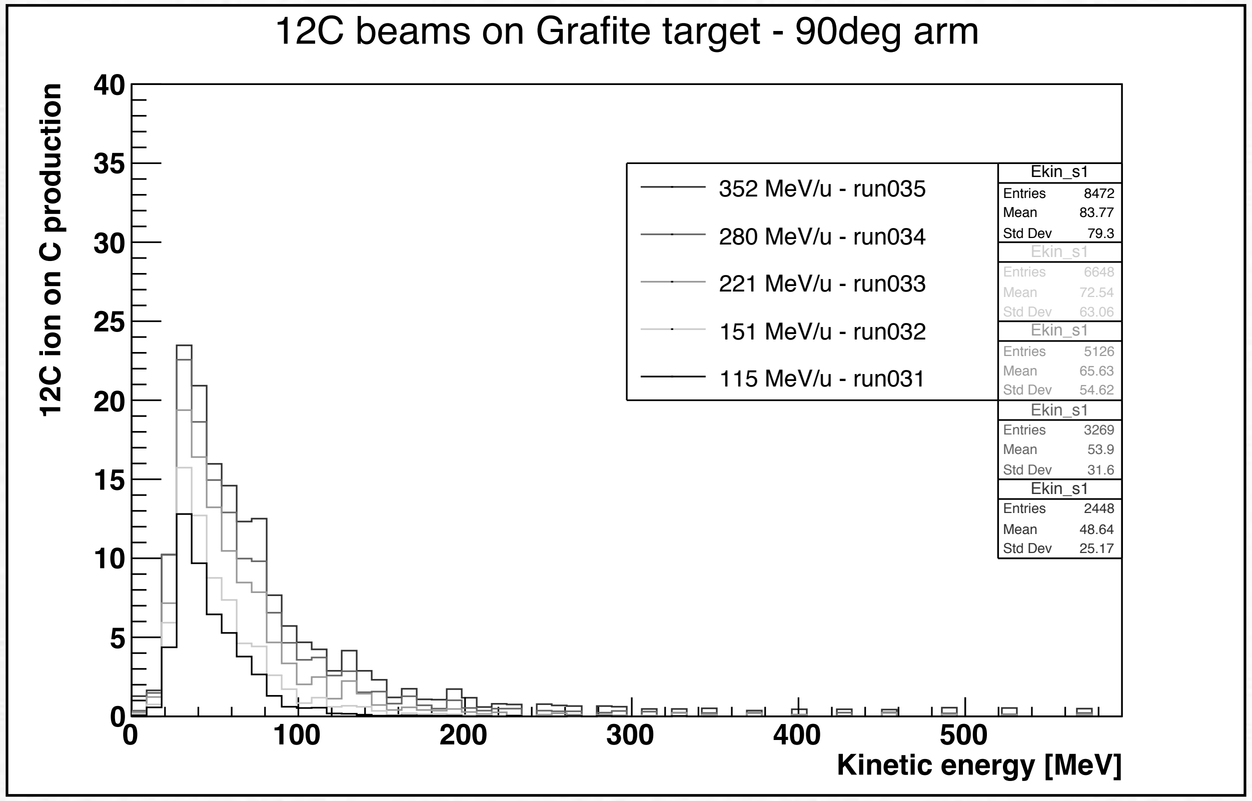
MilanoMisure

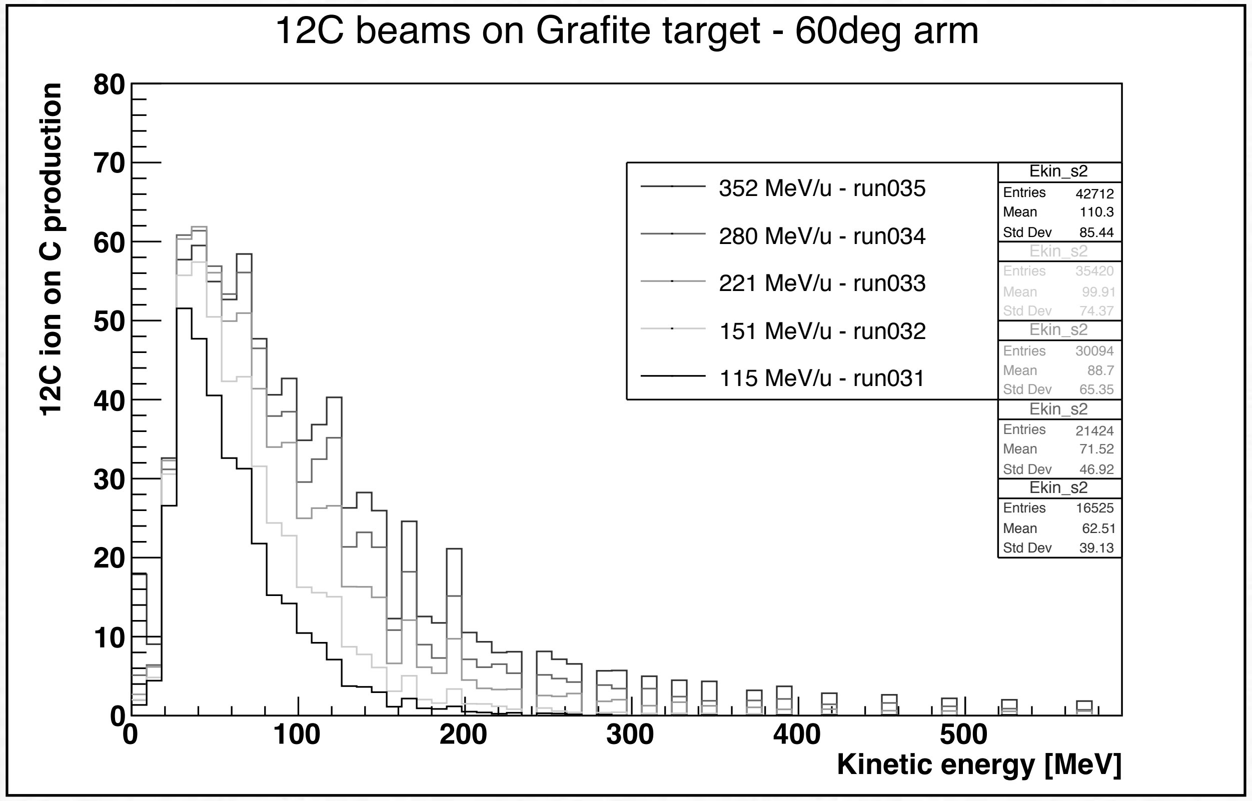
peso = 6.25 g
Volume = 5.30 cm^3
rho = 1.18 g/cm^3 (aspettata 1.19)

* From Catania

Graphite Target

NO DETECTION EFFICIENCY!





* **Assuming all protons** (that is not true, see later for PID analysis);
* The 60 degree production is about twice the 90 degree one;
* Production is normalised to the number of primary carbon ions impinged on the targets;

- Graphite = C
- thickness 1 mm
- flexible graphite 99,8%
- density* 0.9-1.3 g/cm3

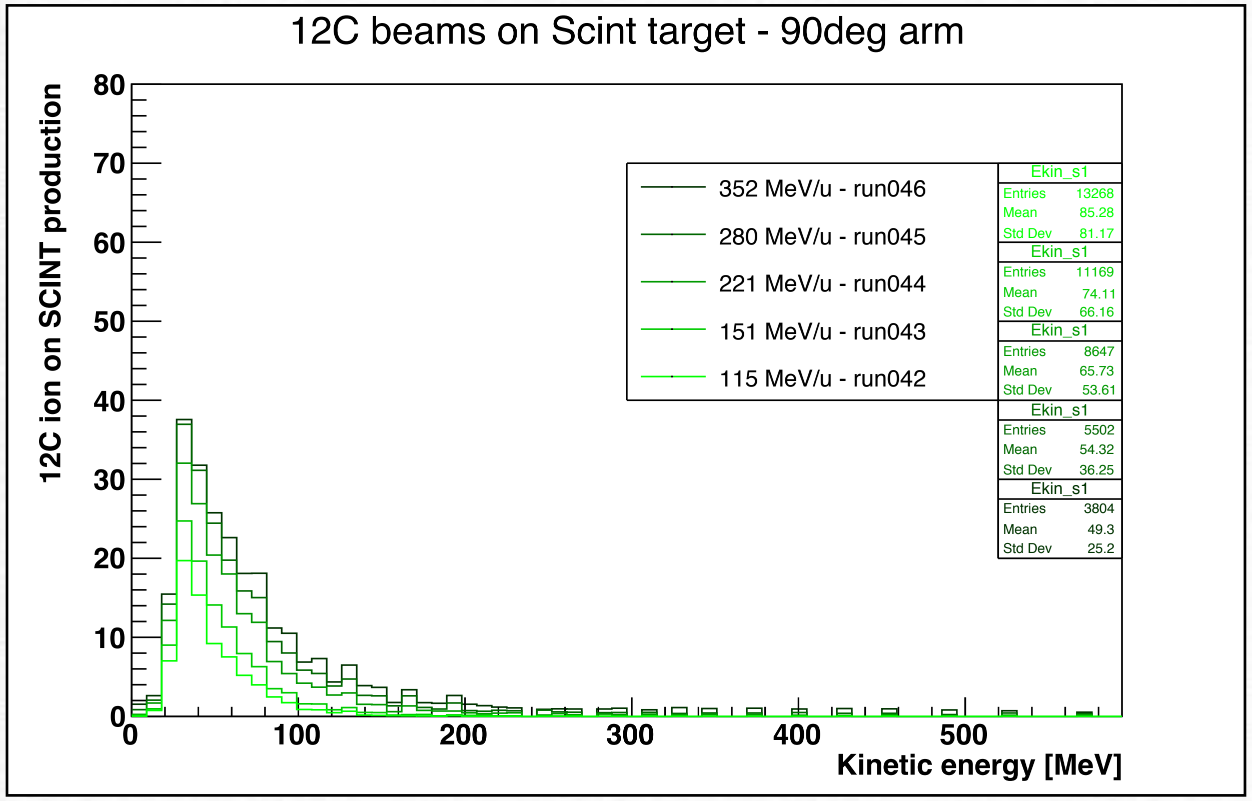
MilanoMisure

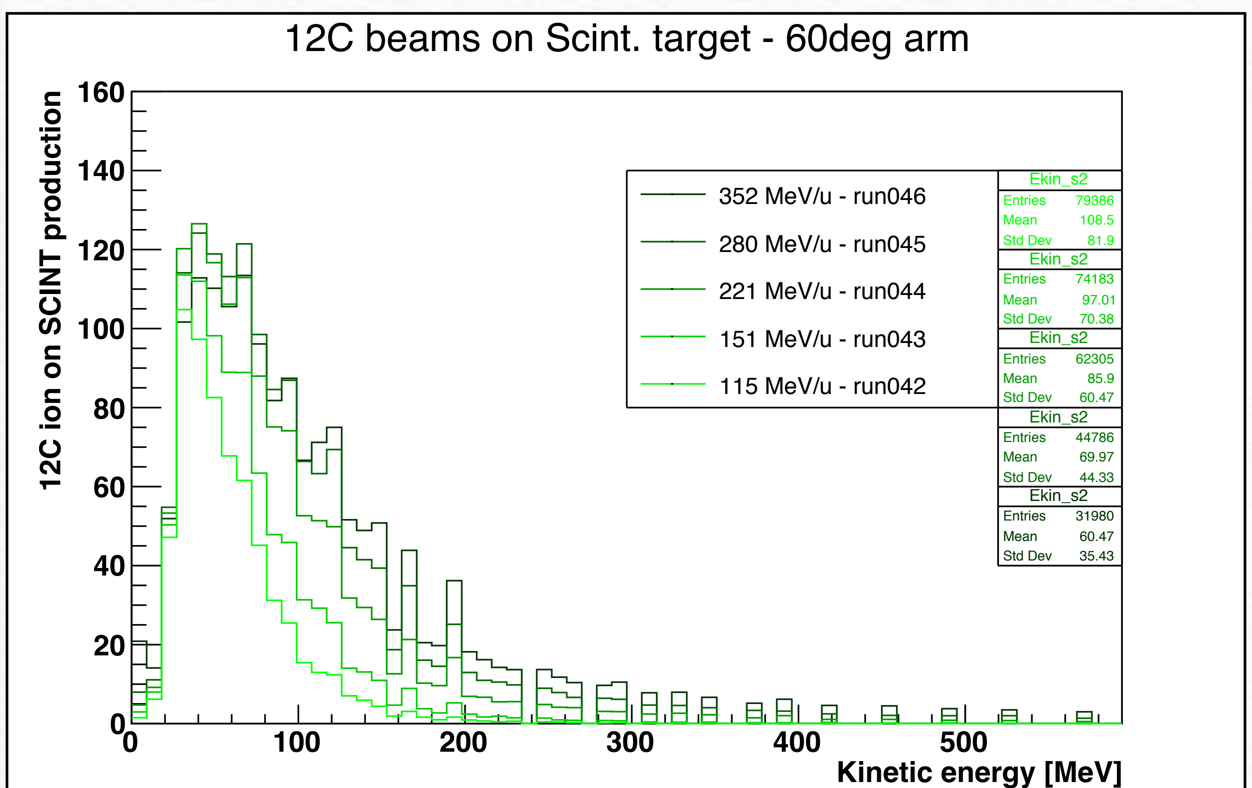
peso = 2.65 g
Volume = 2.83 g/cm^3
rho = 0.94 g/cm^3

* From Catania

Scintillator Target

NO DETECTION EFFICIENCY!





- **Assuming all protons** (that is not true, see later for PID analysis);
- The 60 degree production is about twice the 90 degree one;
- Production is normalised to the number of primary carbon ions impinged on the targets;

- EJ-212 = C_bH_a
- a: 5.17 10^{22} H/cm3
- b: 4.69 10^{22} C/cm3
- thickness 2 mm
- density* 1.023 g/cm3

MilanoMisure

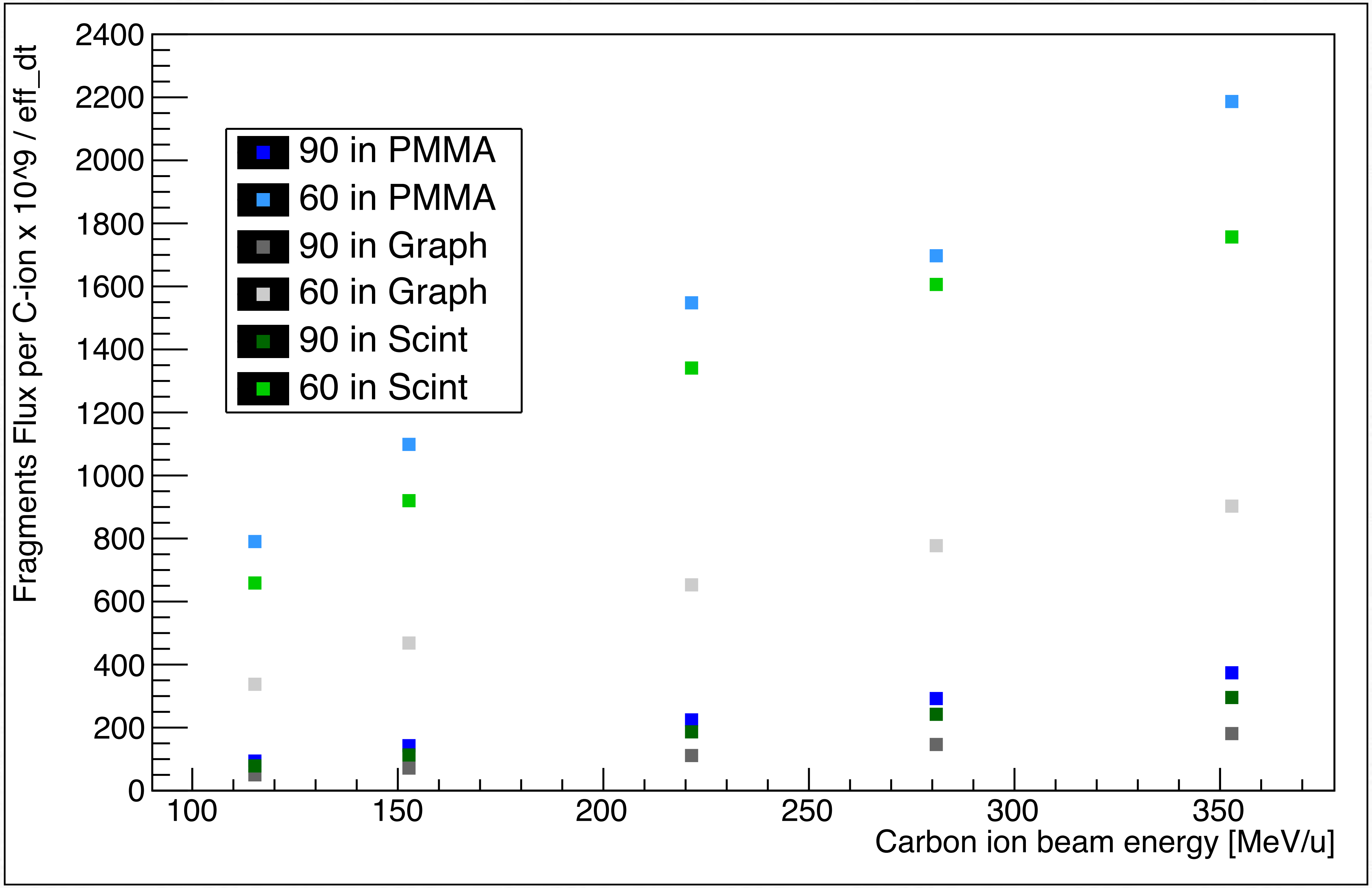
peso = 5.05 g
Volume = 4.93 cm^3
rho = 1.024 g/cm^3 (aspettata 1.023)

* From Sciubba

Charged fragments (H=1)

NO DETECTION EFFICIENCY!

All fragments have been considered. A preliminary dead time efficiency correction is included.



Only statistical errors included.

Charged fragments (H=1)

NO DETECTION EFFICIENCY!

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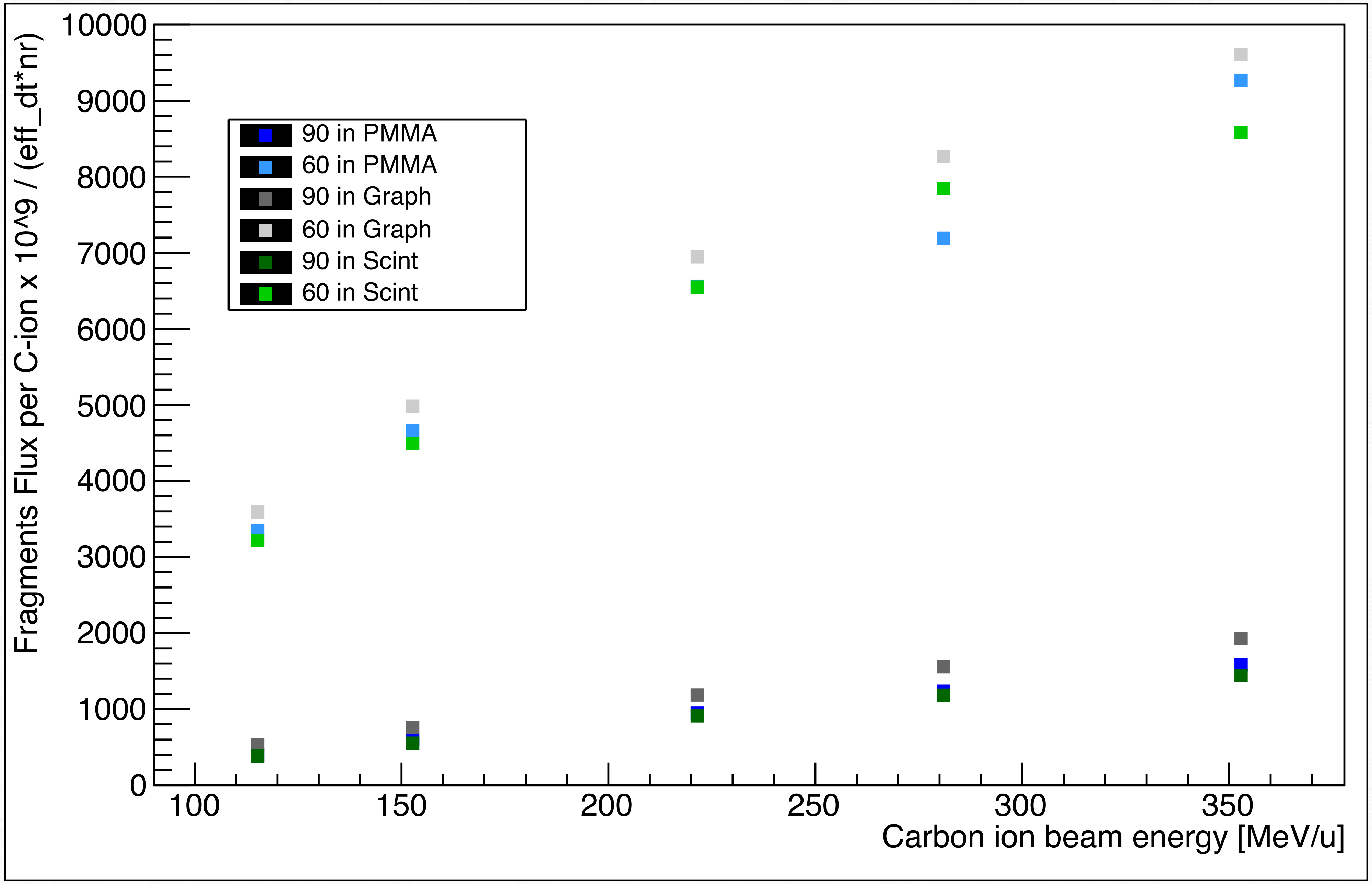
Fragments flux is normalised to target density and thickness.



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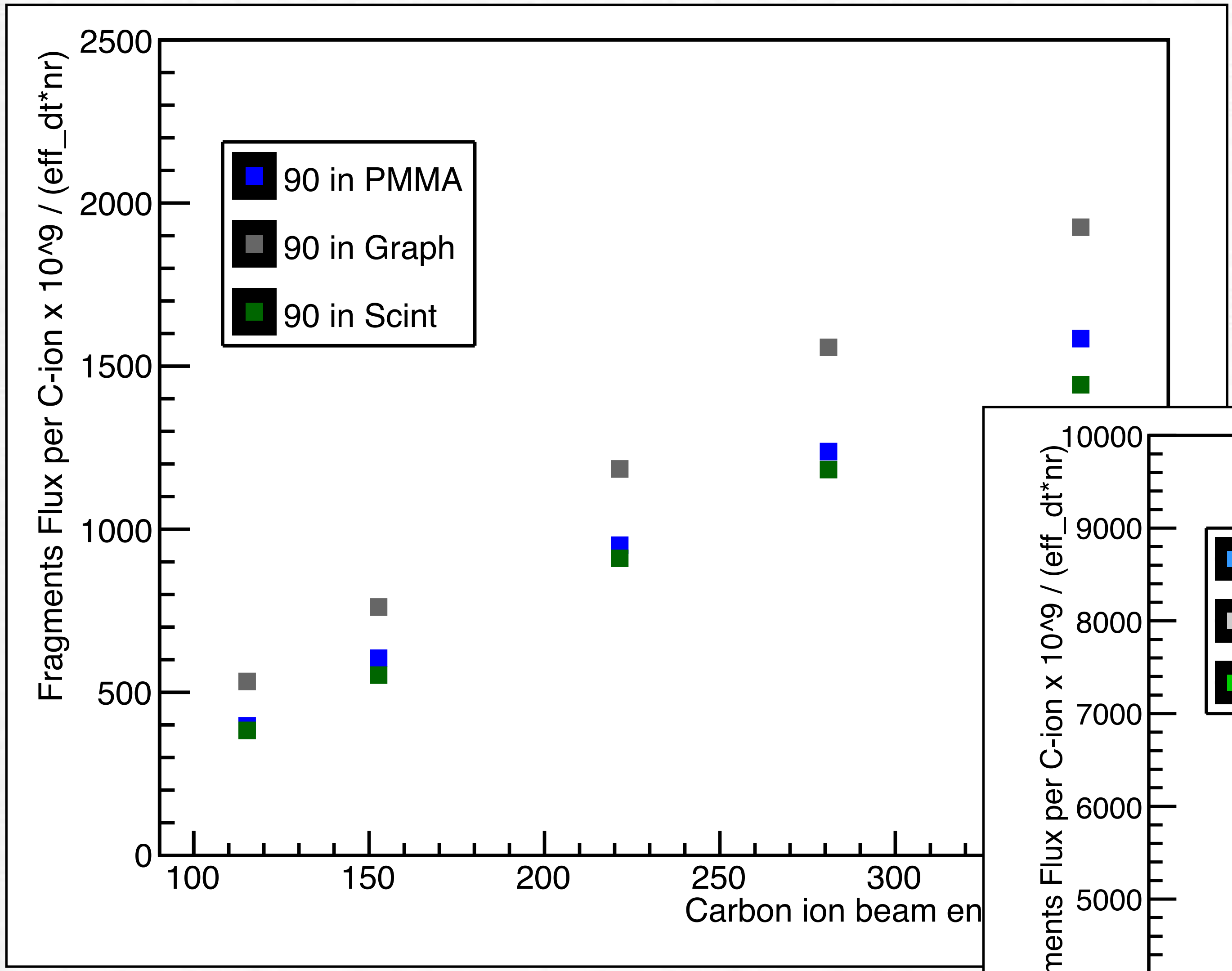
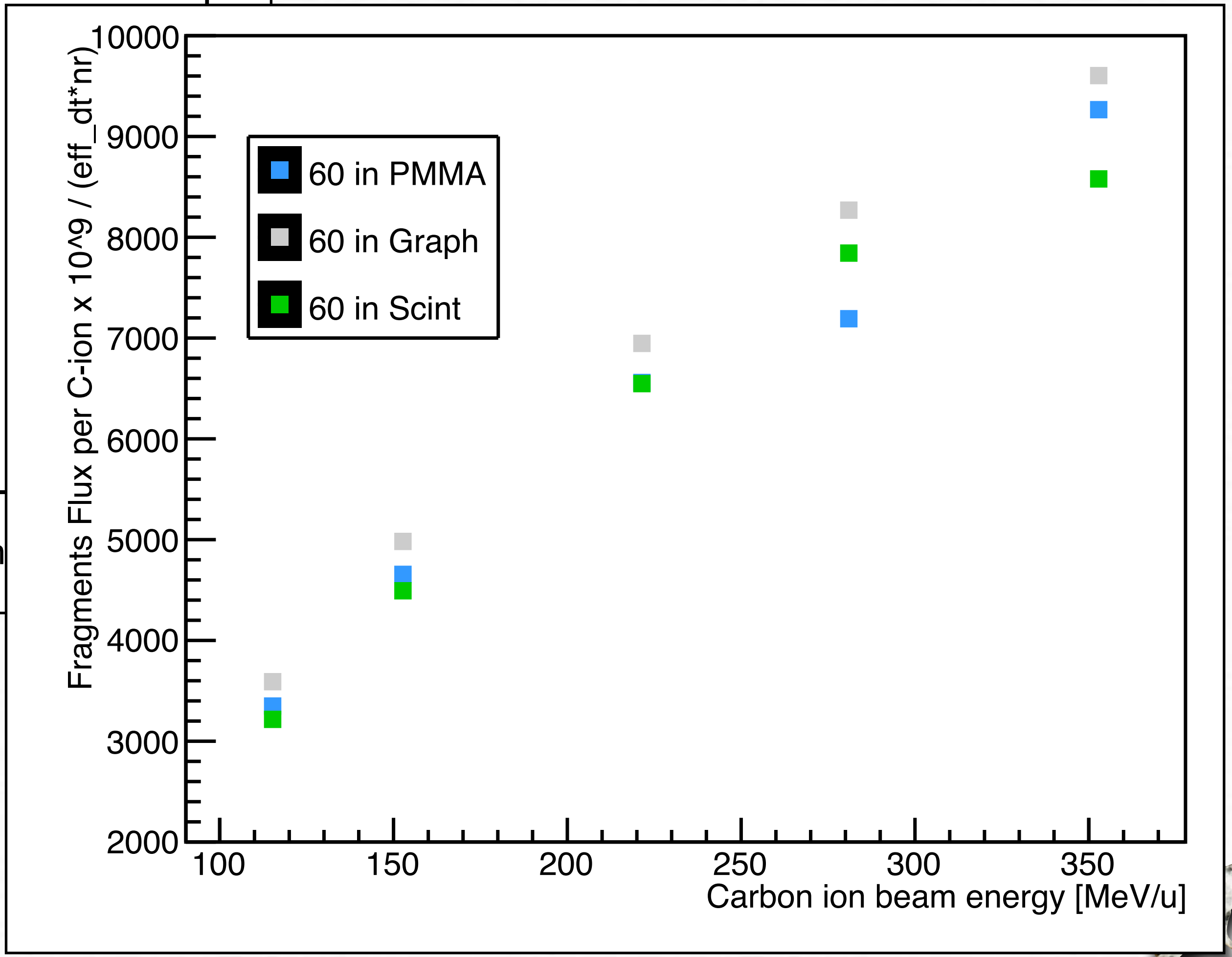
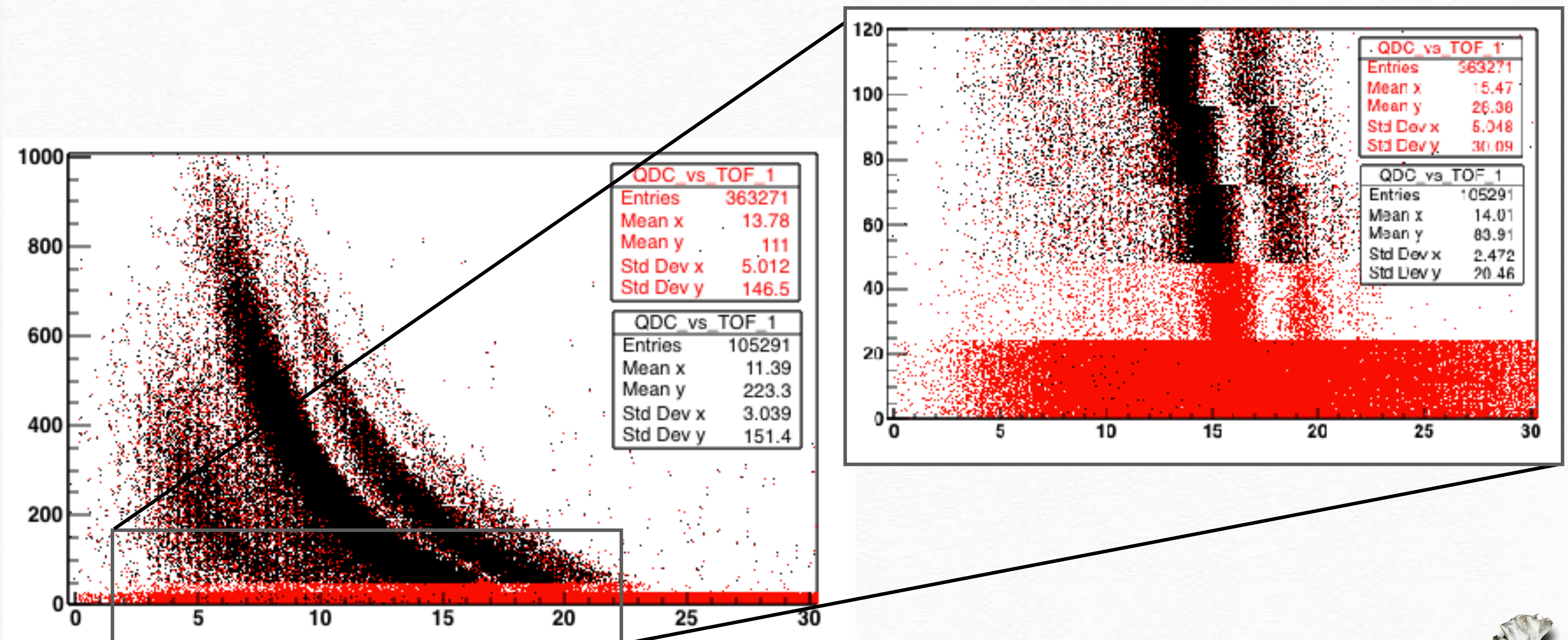




Only statistical errors included.

Particle IDentification

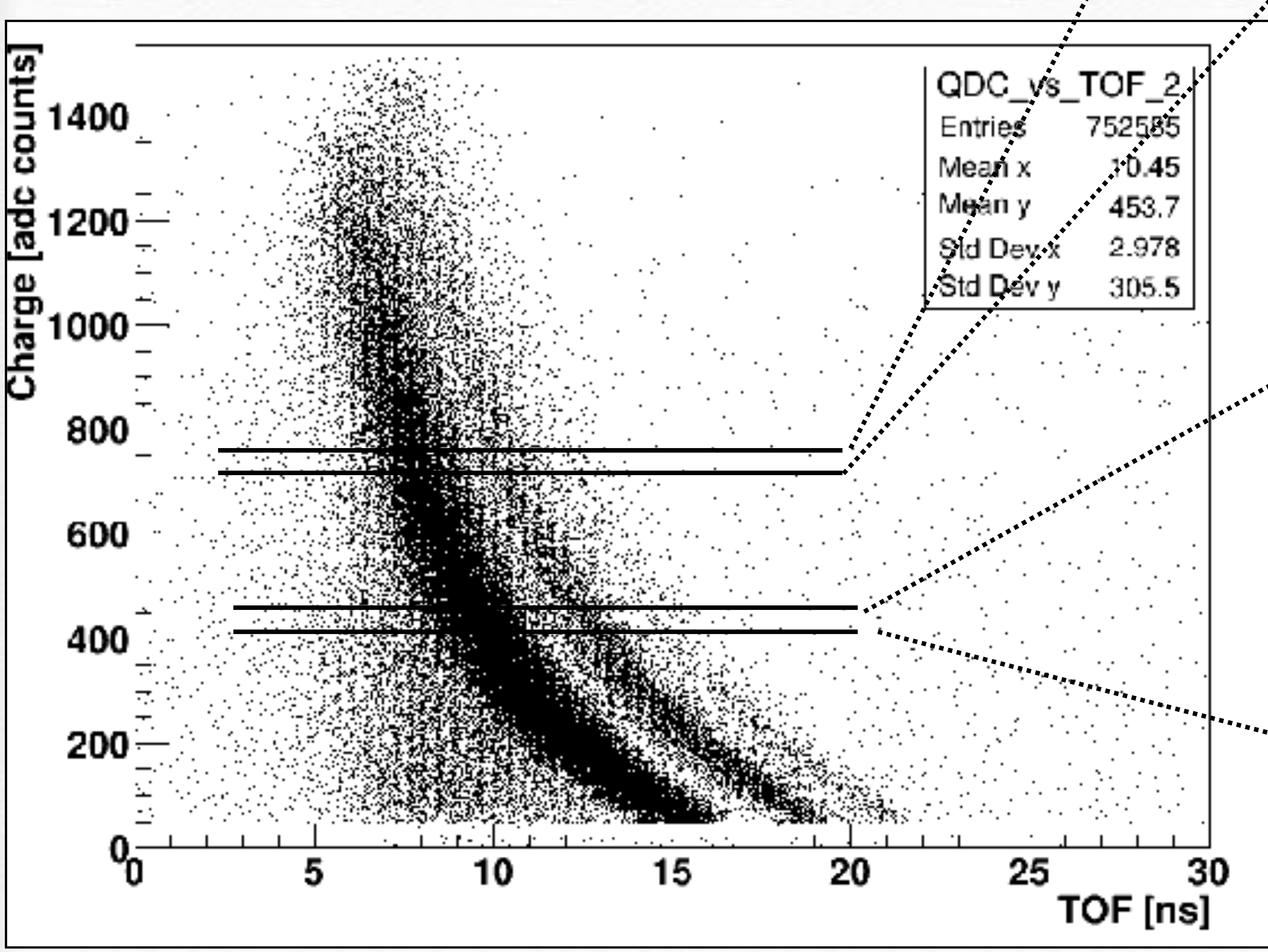
- Protons and Deutons are selected with the standard methods of "ARPG analysis";
- The PID is performed on the fragmentation produces by all targets (protons are generated at the same position and regardless the target material);
- For the moment we are selecting ''clean'' data: a triple coincidence is required (we lose some low energy fragments: LY discriminator).. => To do list: we can improve it recovering events. [from 30 MeV down to 20 MeV, see later]

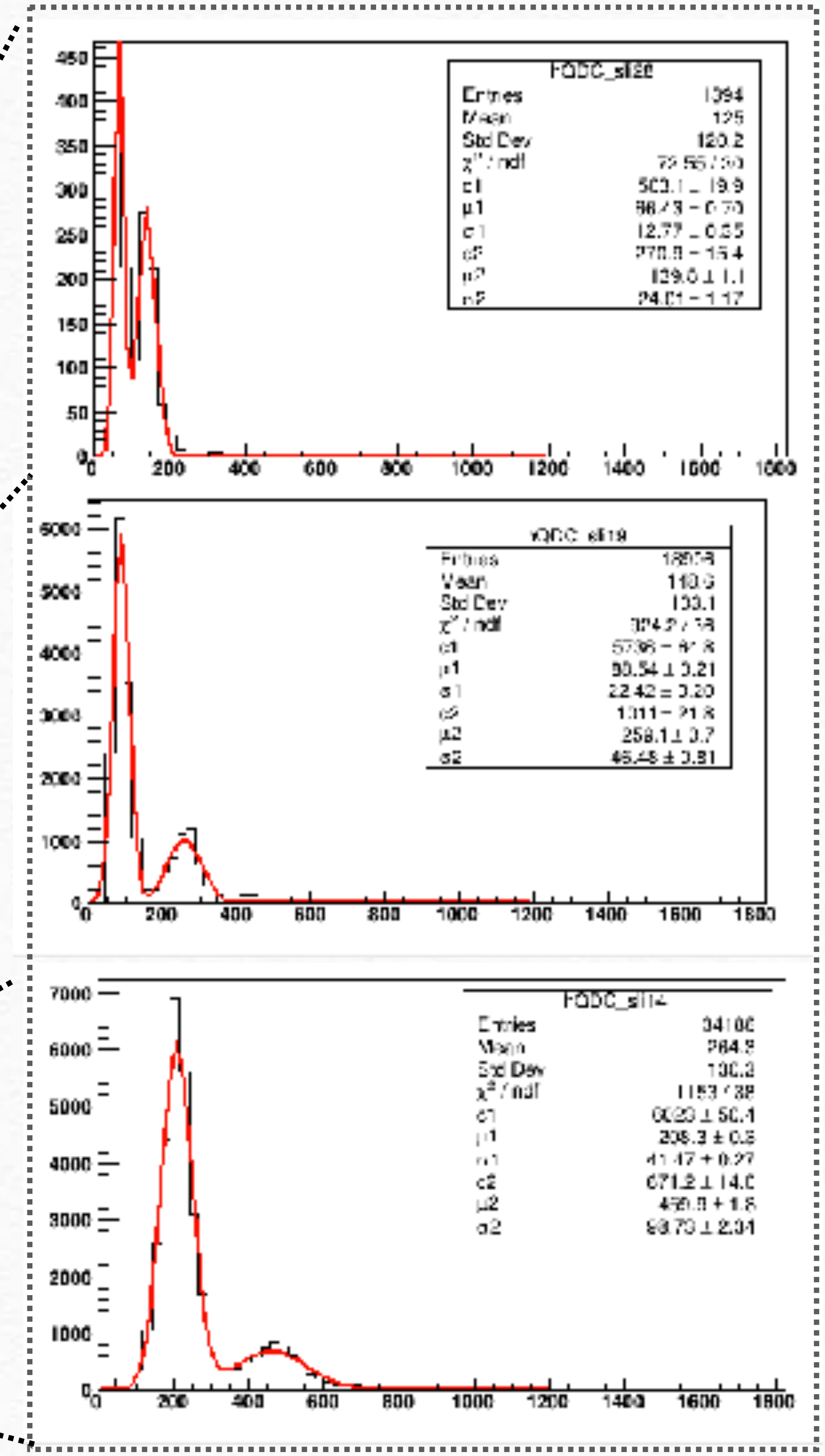


PID

Those are only EXAMPLEs

- Protons and Deutons are selected with the standard methods;

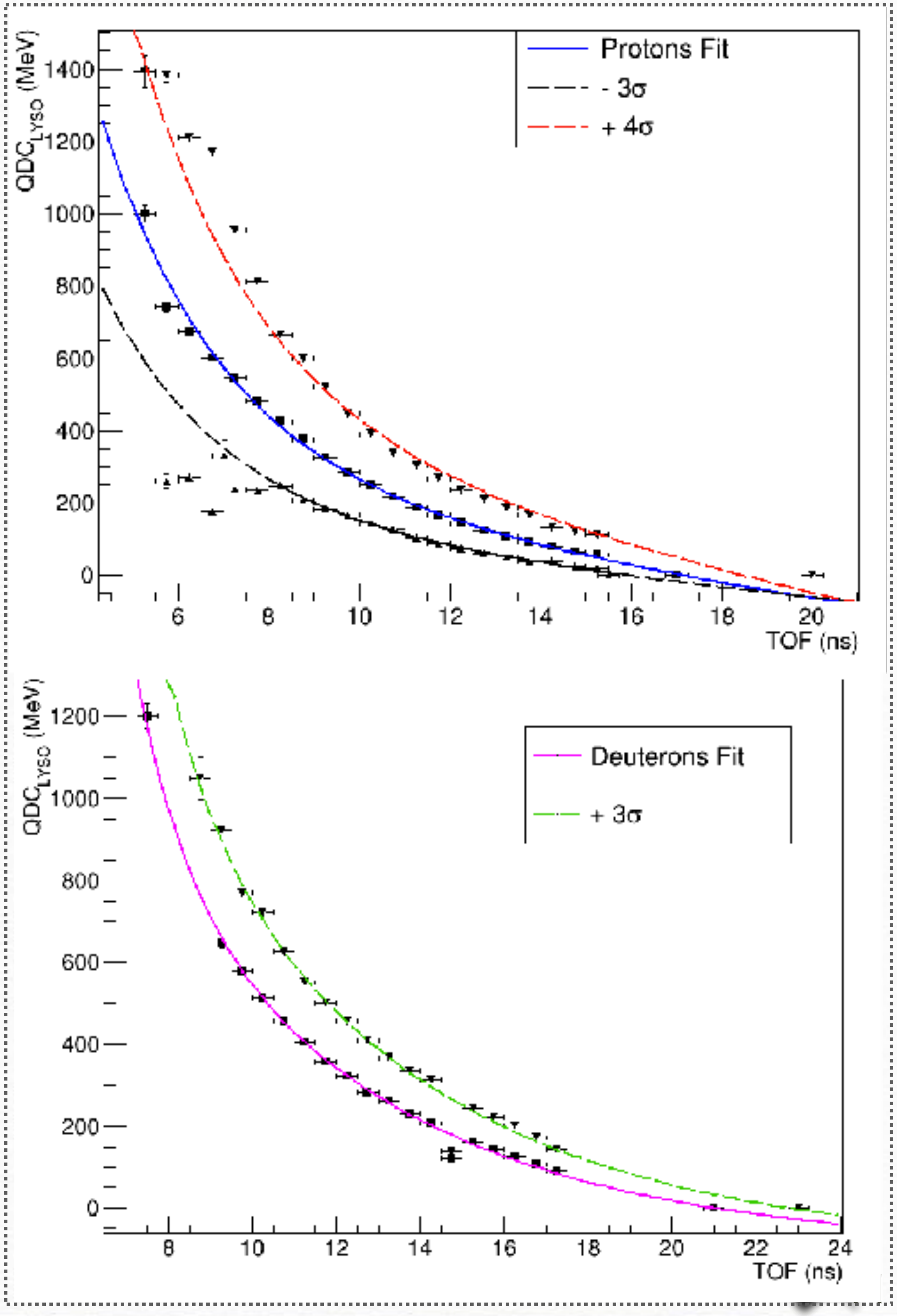




cut at 50 adc counts
(bkg up to 20)

PID

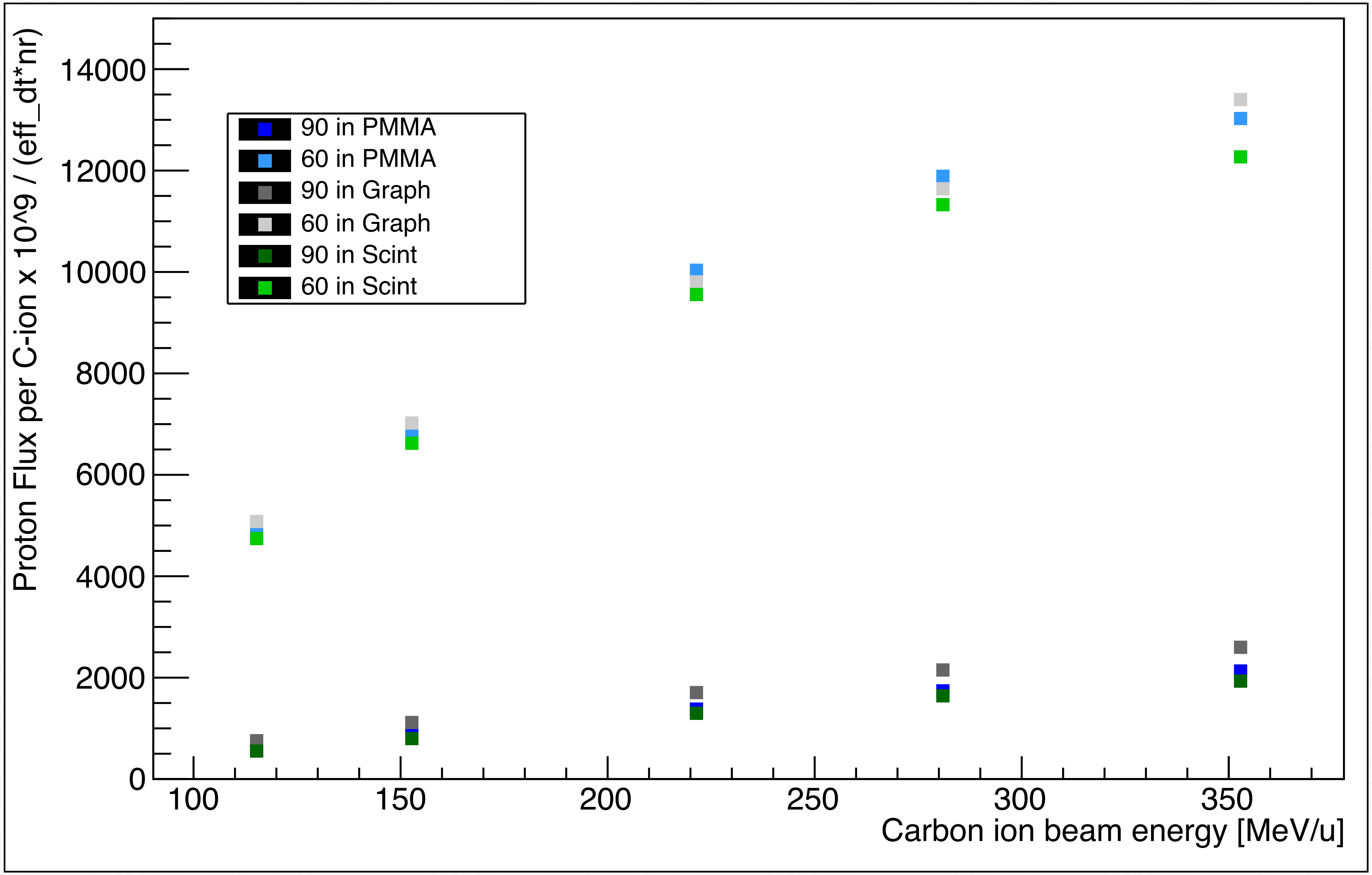
- Protons and Deutons lines for 90 degree analysis;
- Some fits has to be fixed, however, what is really important is the final separation line;



Protons and deutons

NO DETECTION EFFICIENCY!

A preliminary dead time efficiency correction is included. Fragments flux is normalised to target density and thickness.



Only statistical errors included.

Protons and deutons

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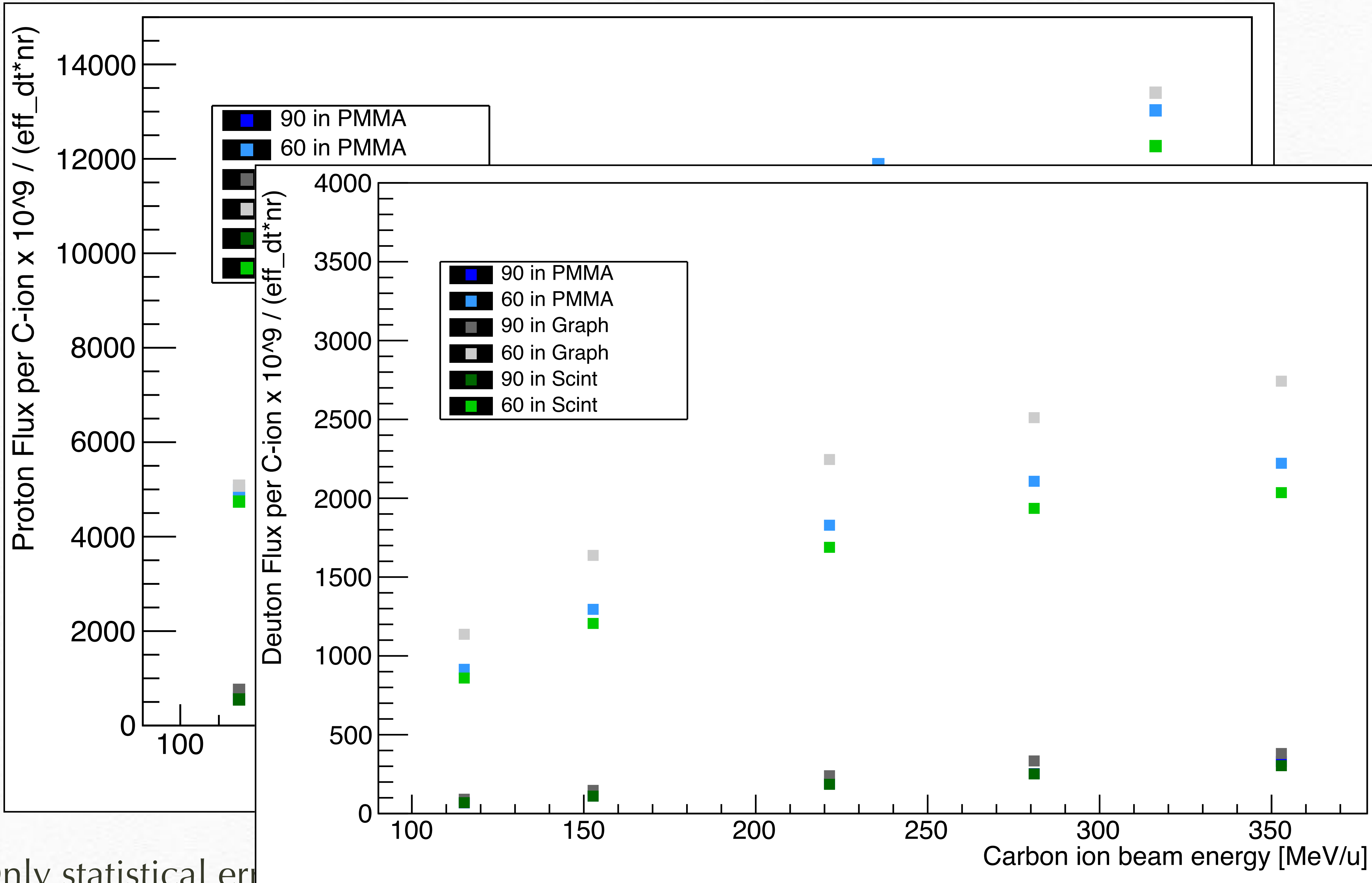

Only statistical er

Protons

NO DETECTION EFFICIENCY!

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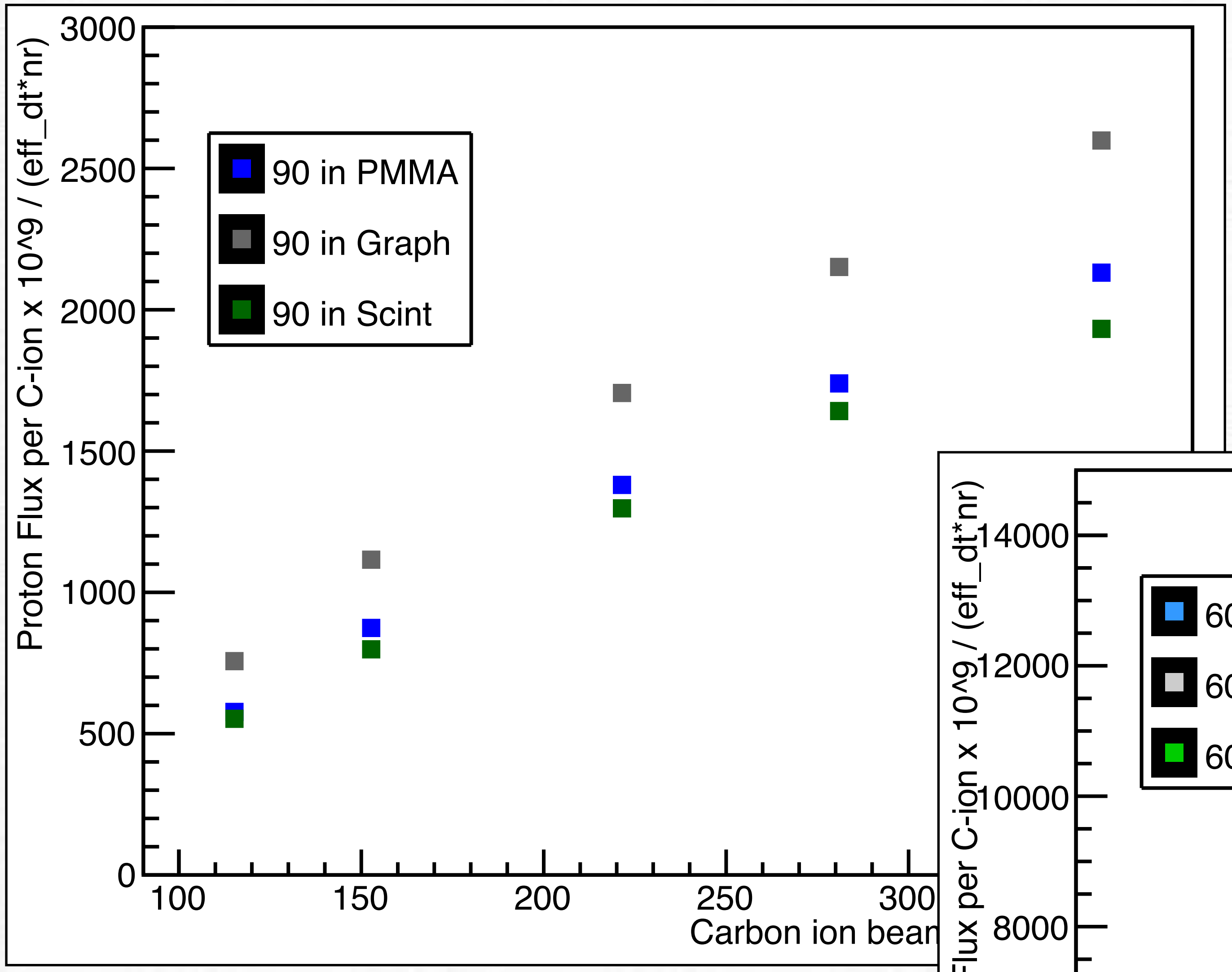
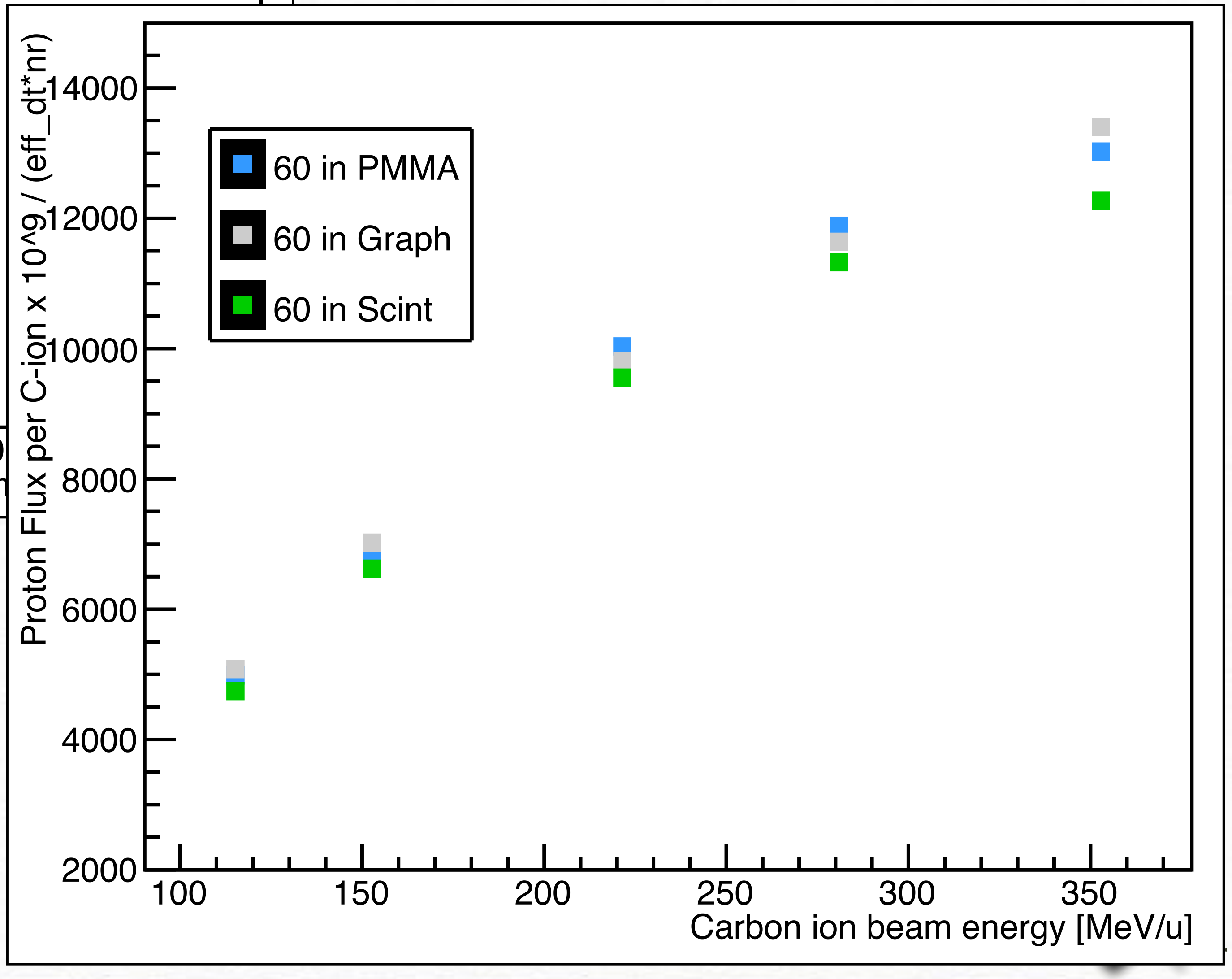


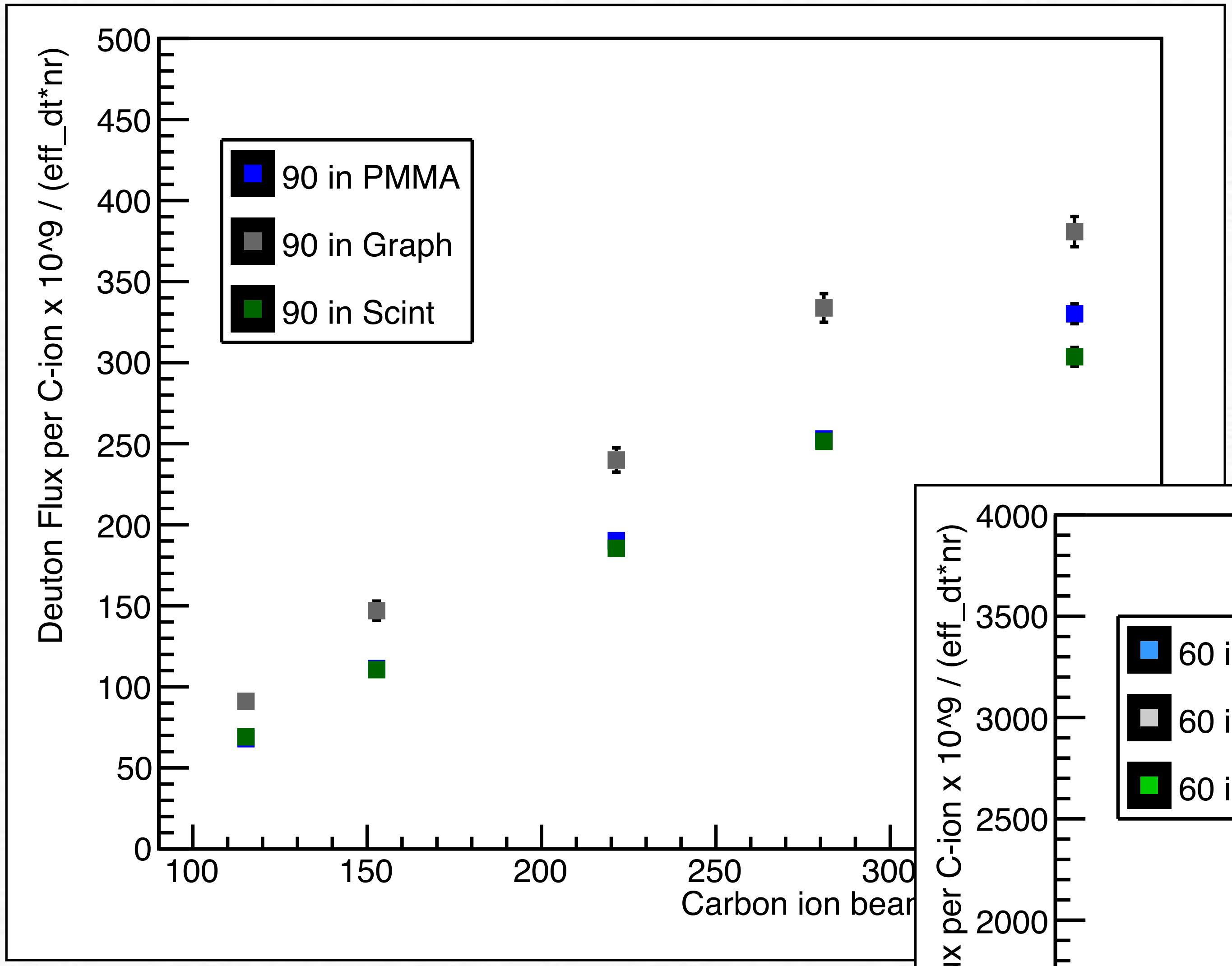


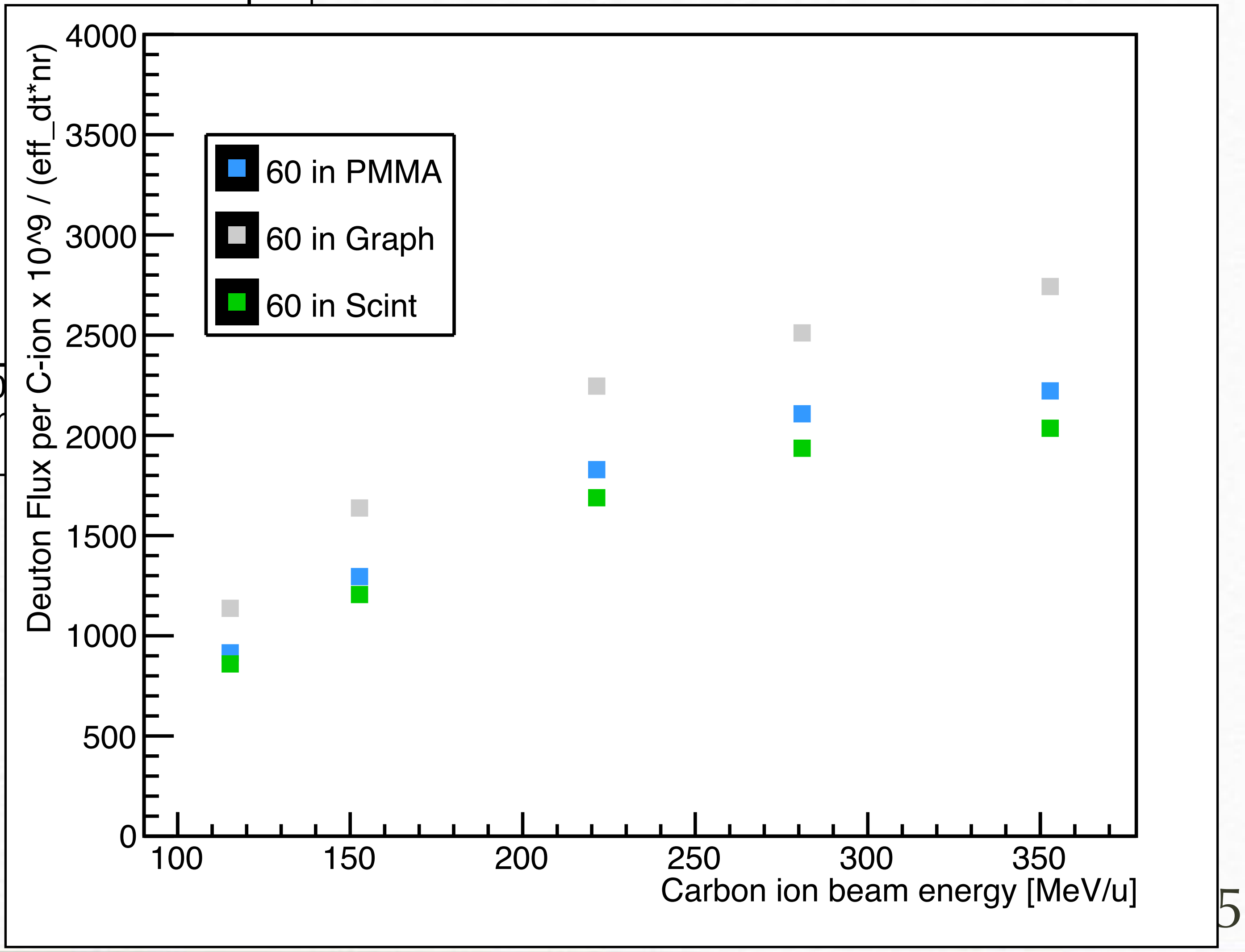
Only statistical errors included.

Deutons

NO DETECTION EFFICIENCY!

A preliminary dead time efficiency correction is included. Fragments flux is normalised to target density and thickness.

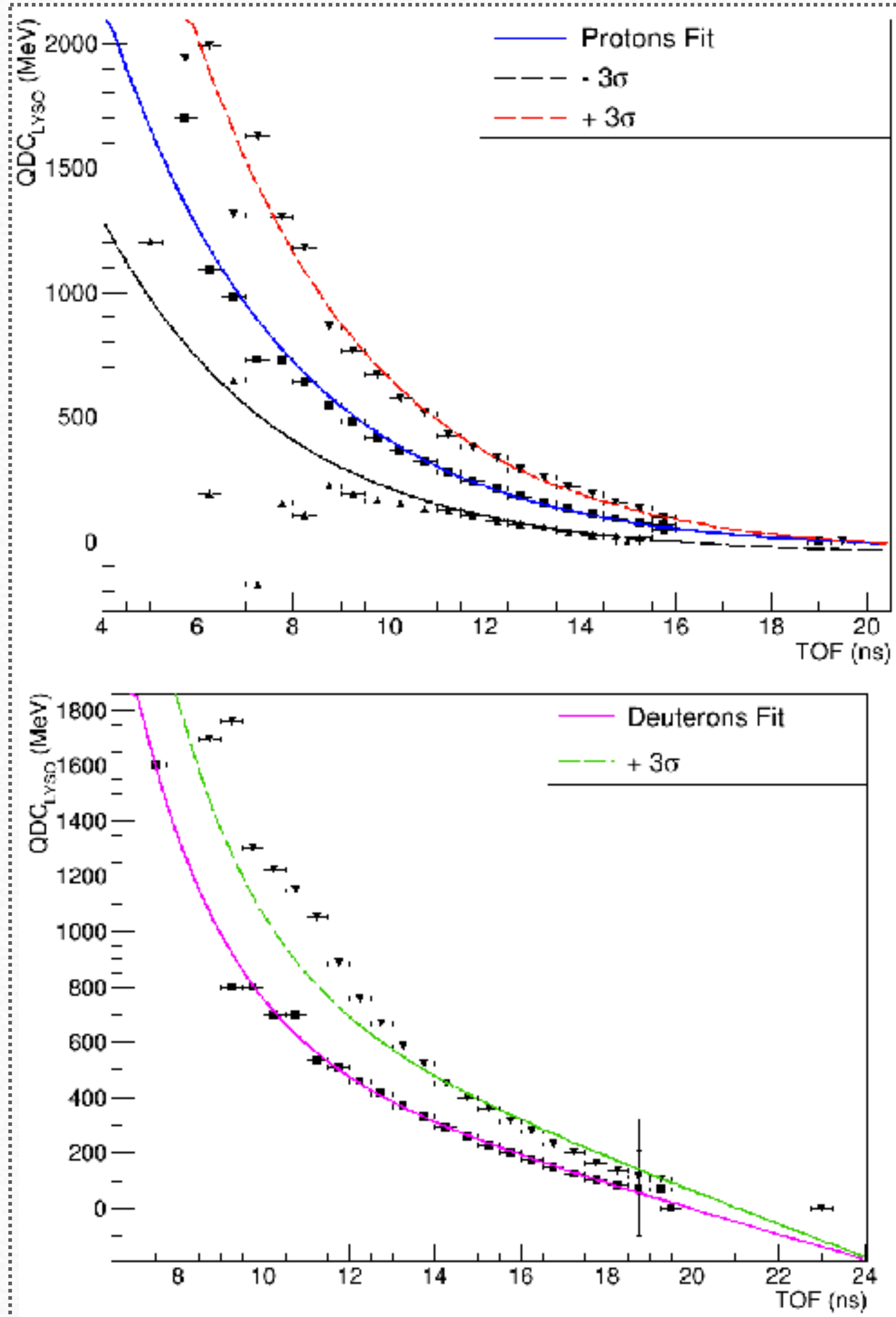




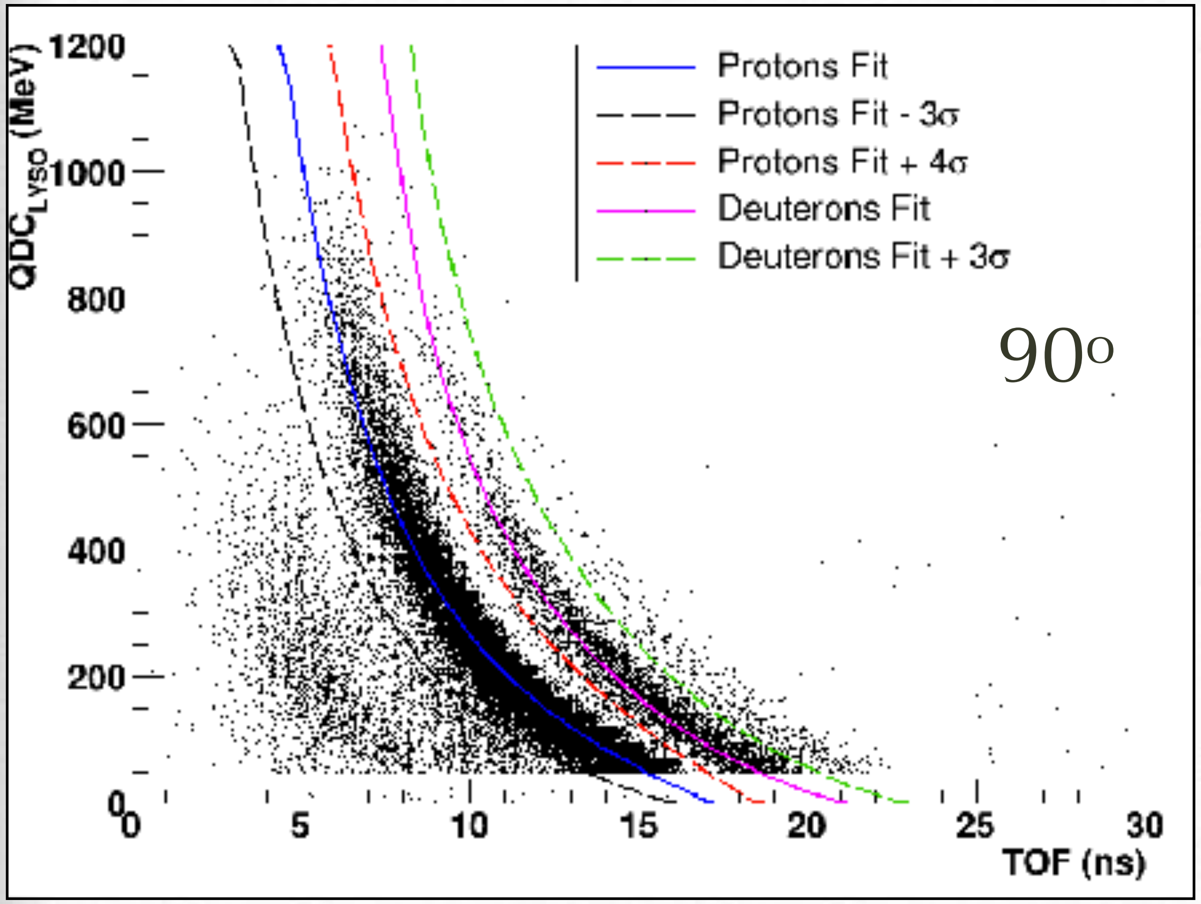
Only statistical errors included.

PID

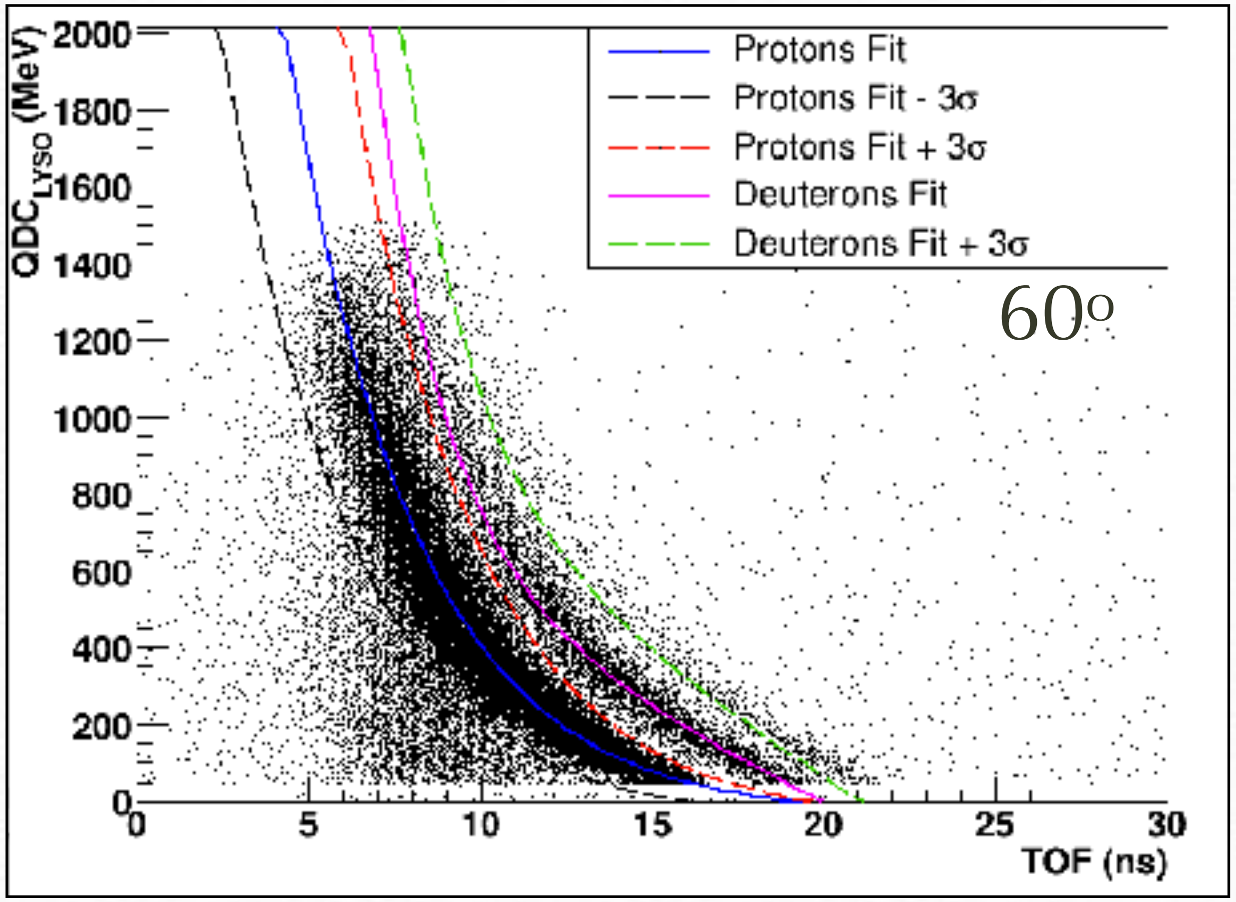
- Protons and Deutons lines for 60 degree analysis;
- Some fits has to be fixed, however, what is really important is the final separation line;



PID

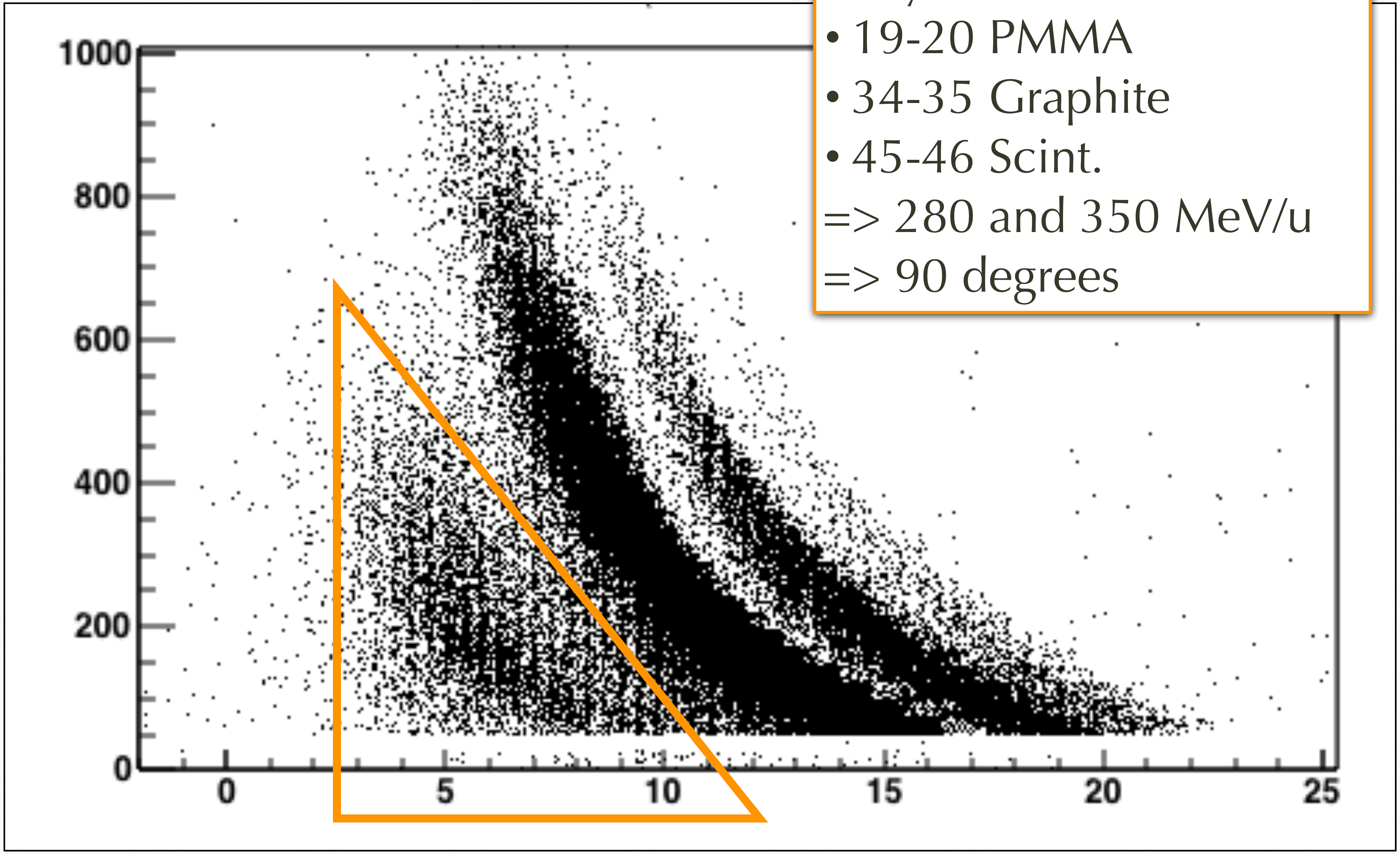


- As expected the deutons production is decreasing with angle;
- For the moment we are neglecting the tritons;



Electrons?

For the moment we neglect them



Only in run:

- 19-20 PMMA
- 34-35 Graphite
- 45-46 Scint.

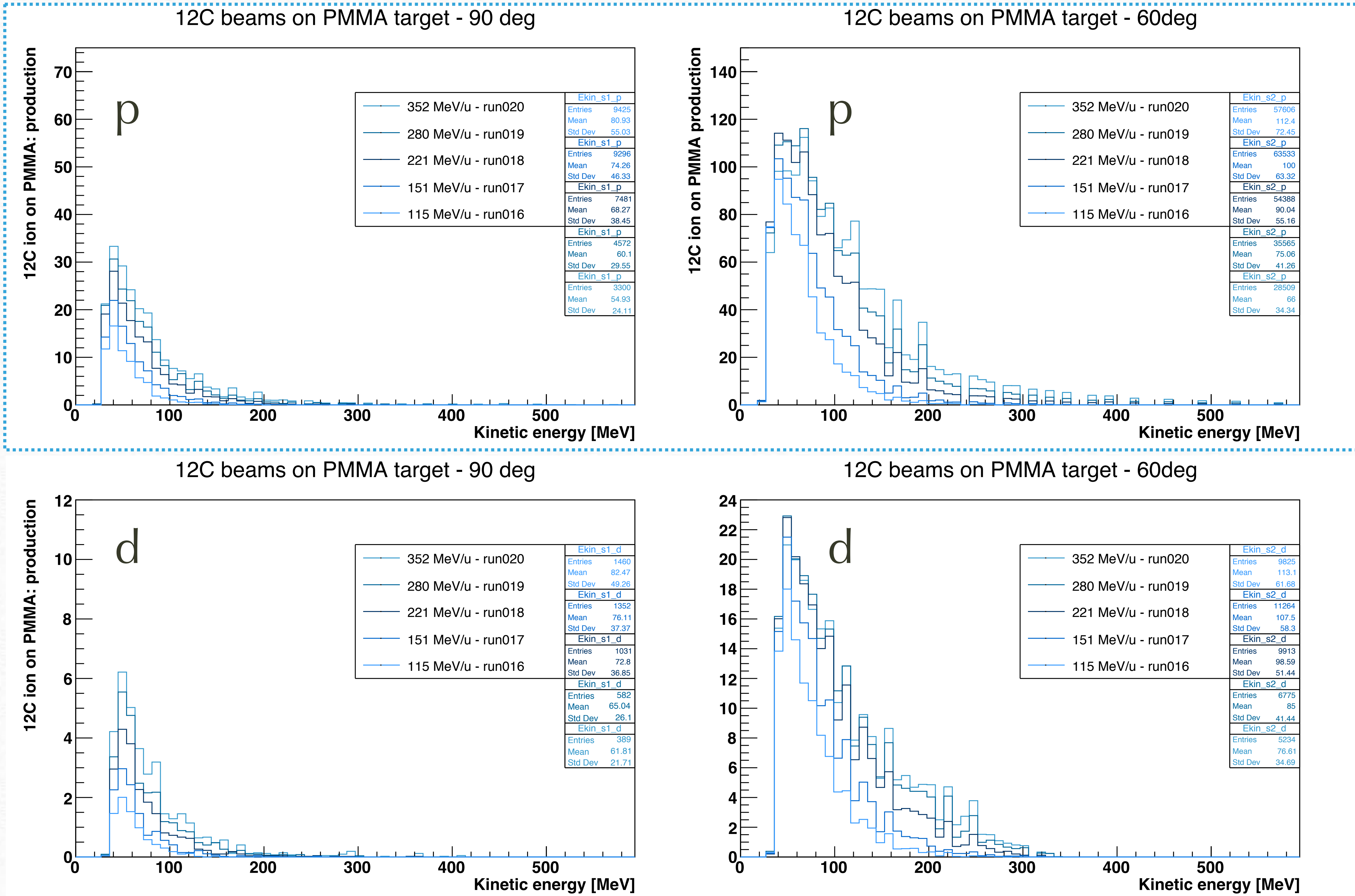
=> 280 and 350 MeV/u

=> 90 degrees

MC will tell us something.. (anche se il Monte Carlo non ti da abbastanza verità)

Kinetic Energy

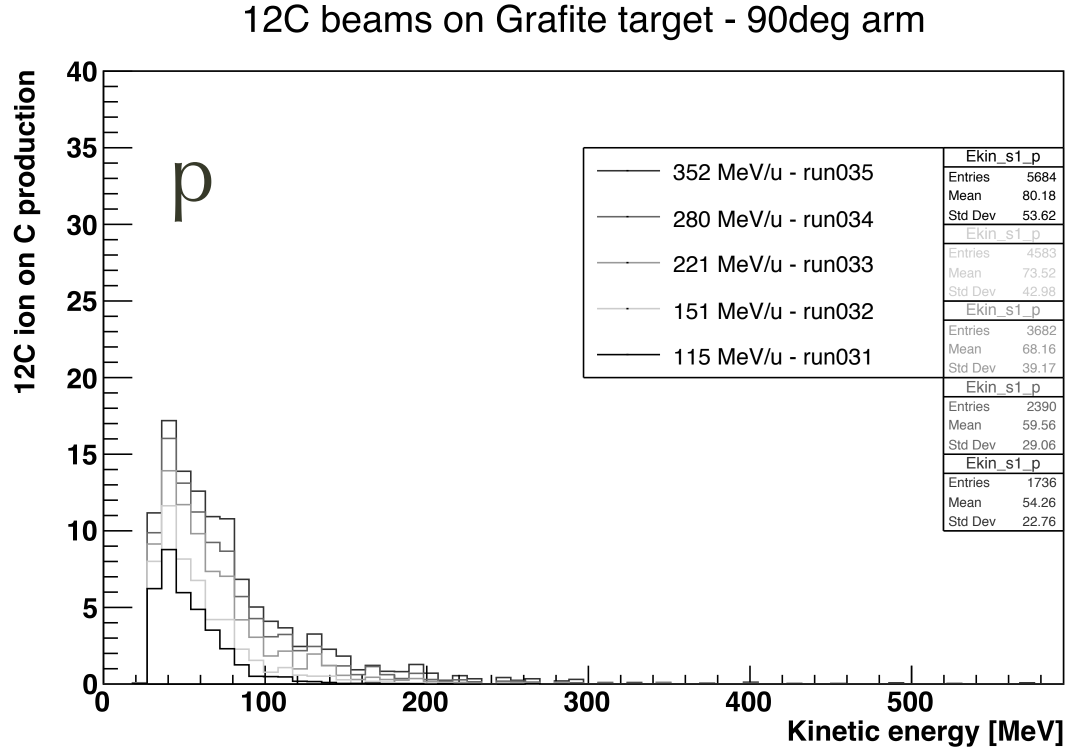
PMMA Target

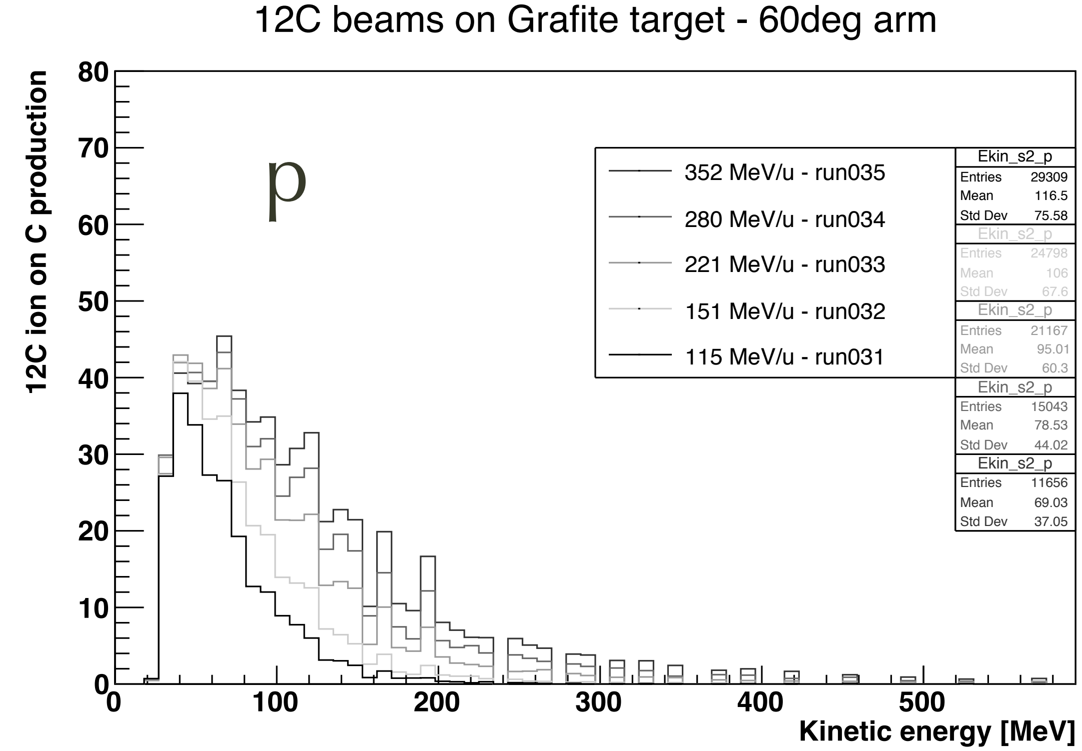


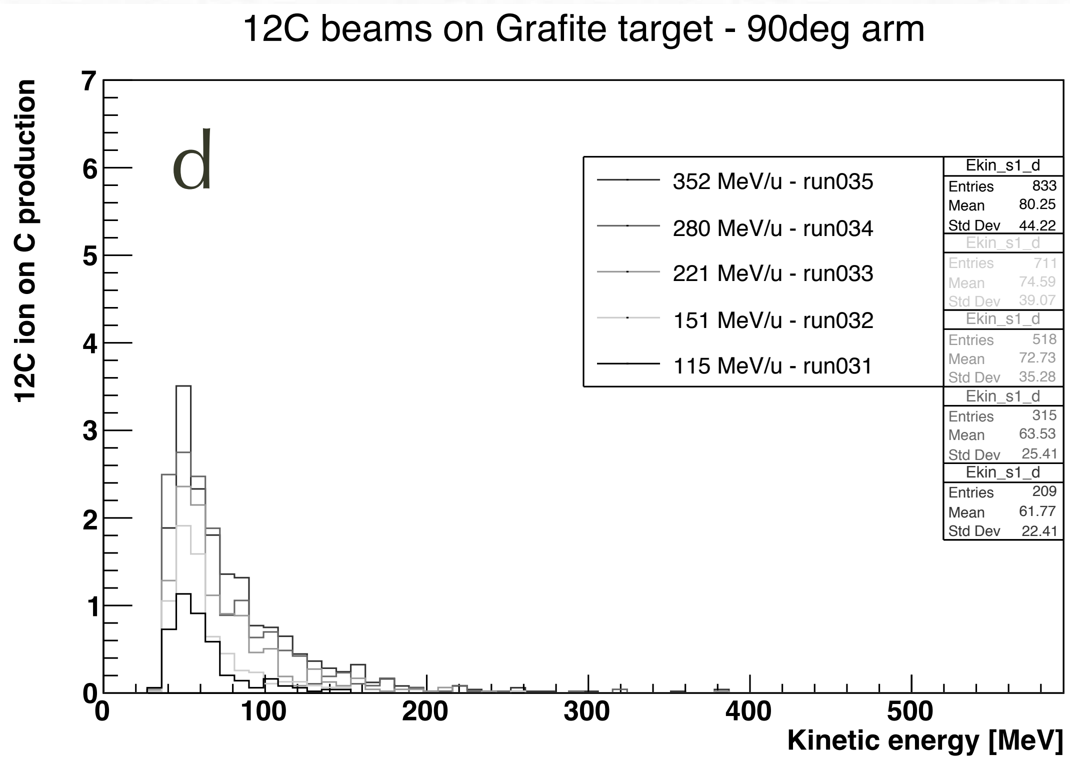
Normalised to 12C

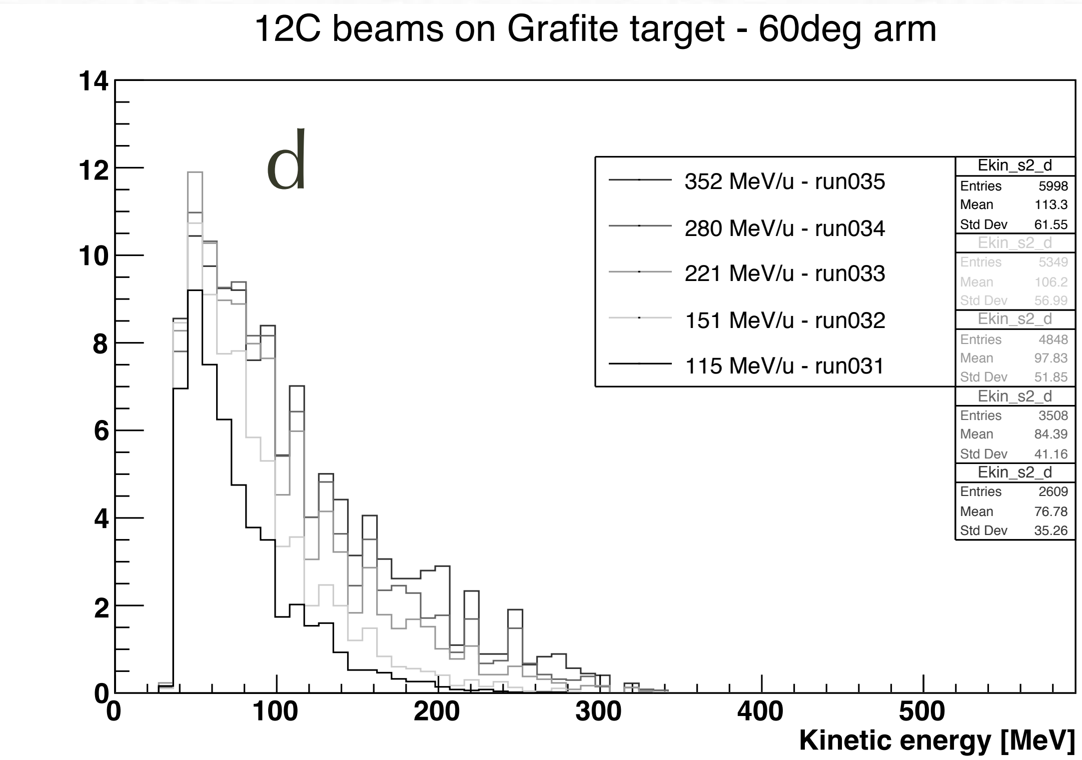
Kinetic Energy

Graphite Target





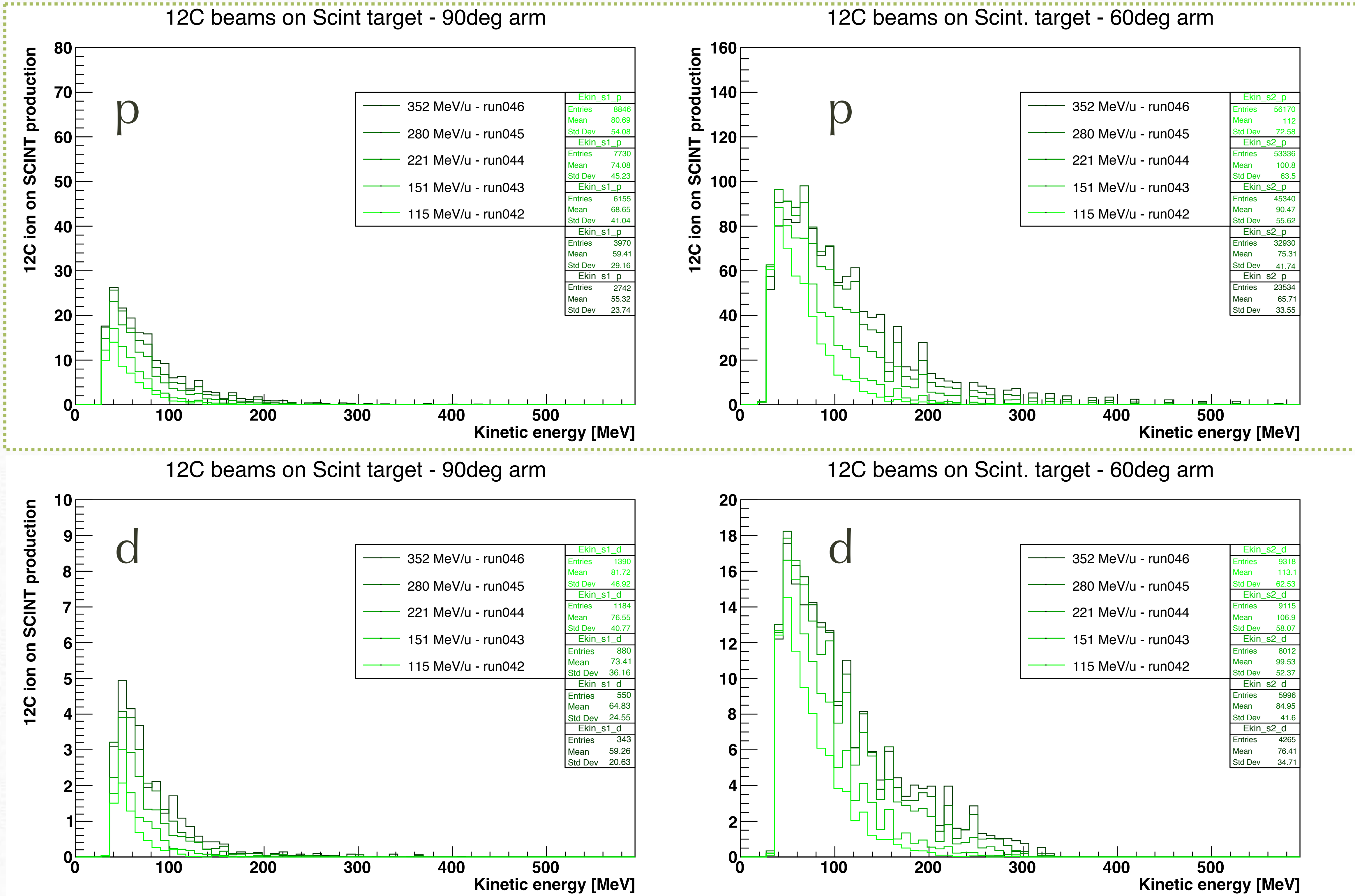




Normalised to 12C

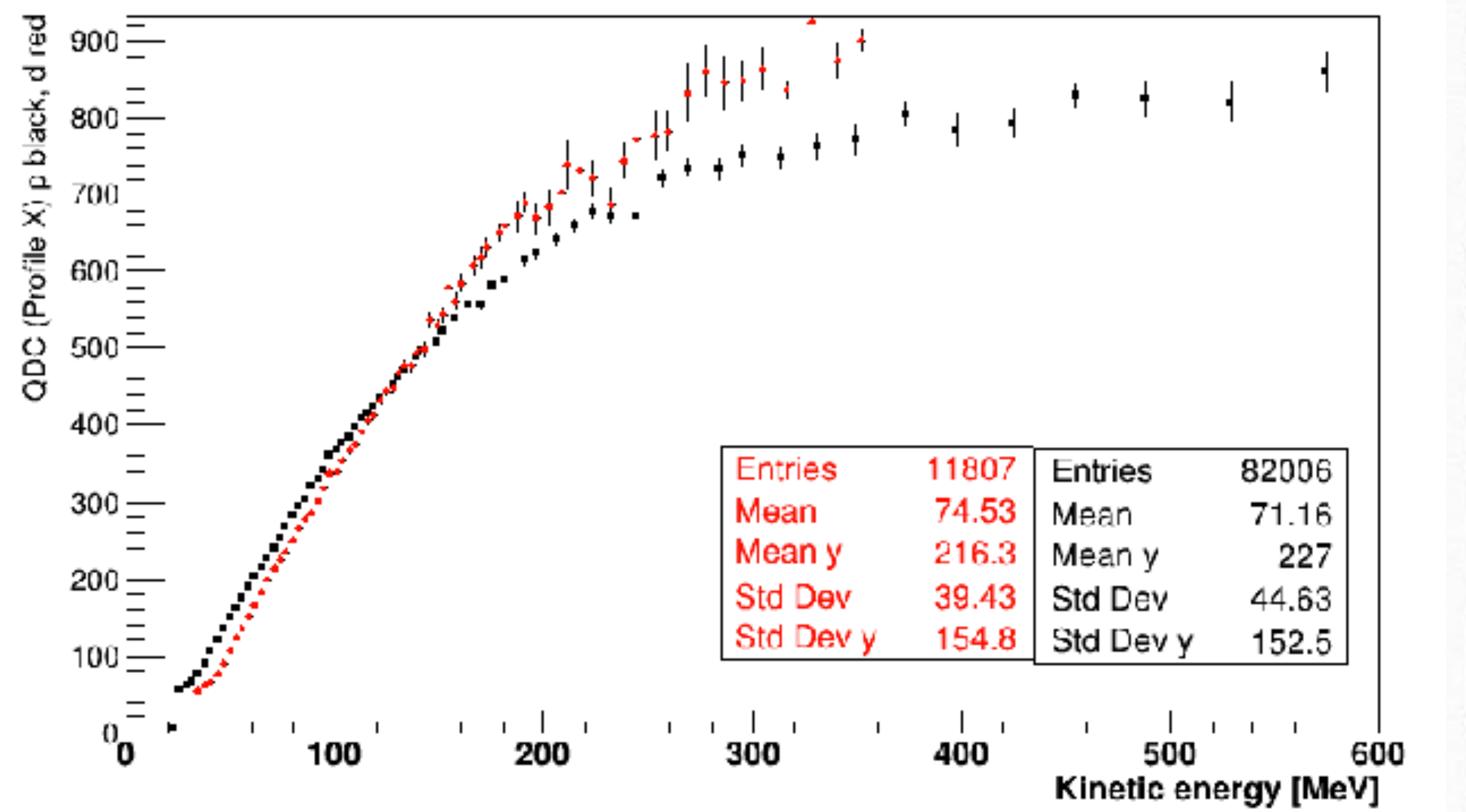
Kinetic Energy

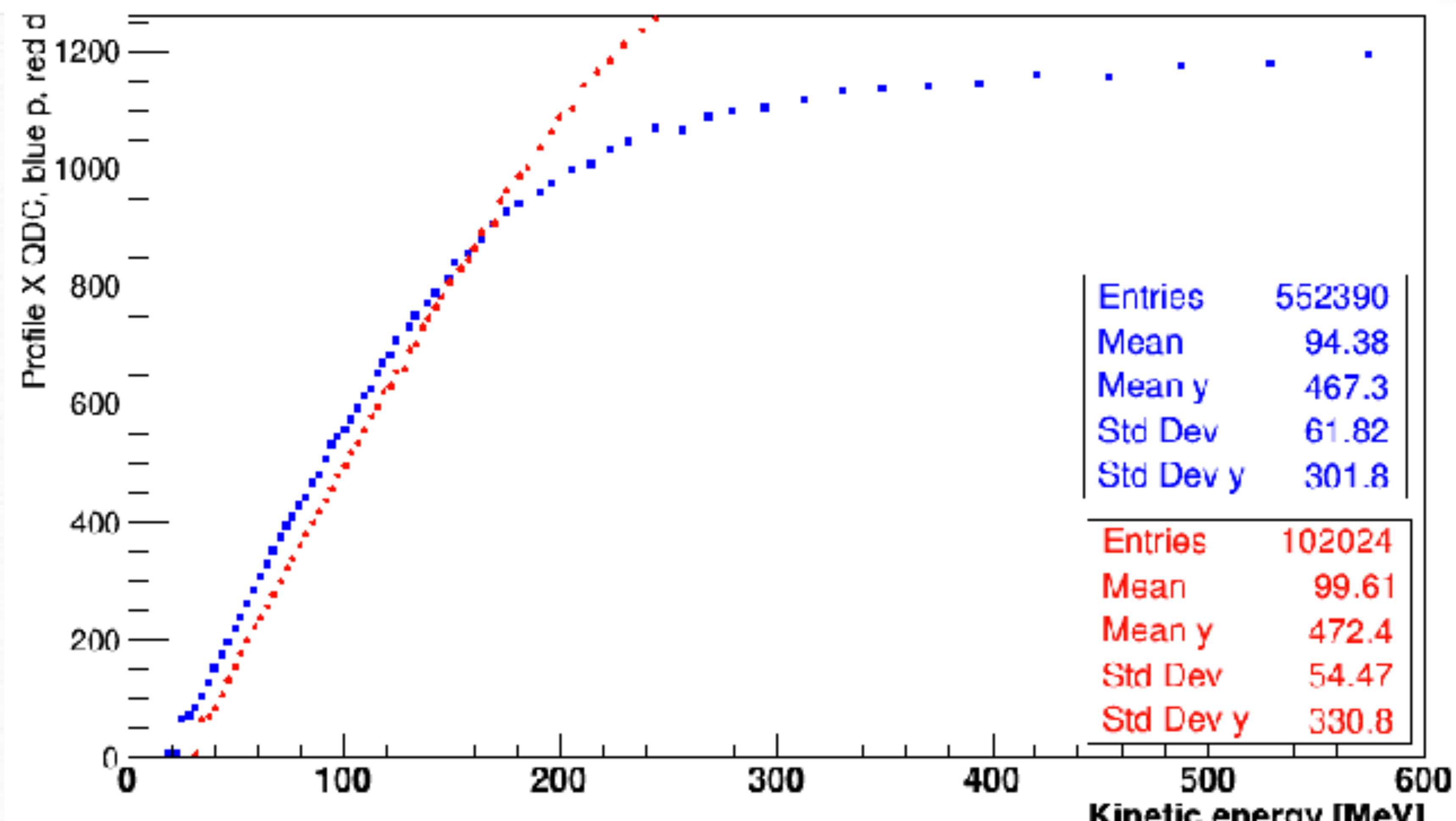
Scint. Target



Normalised to 12C

Calibration

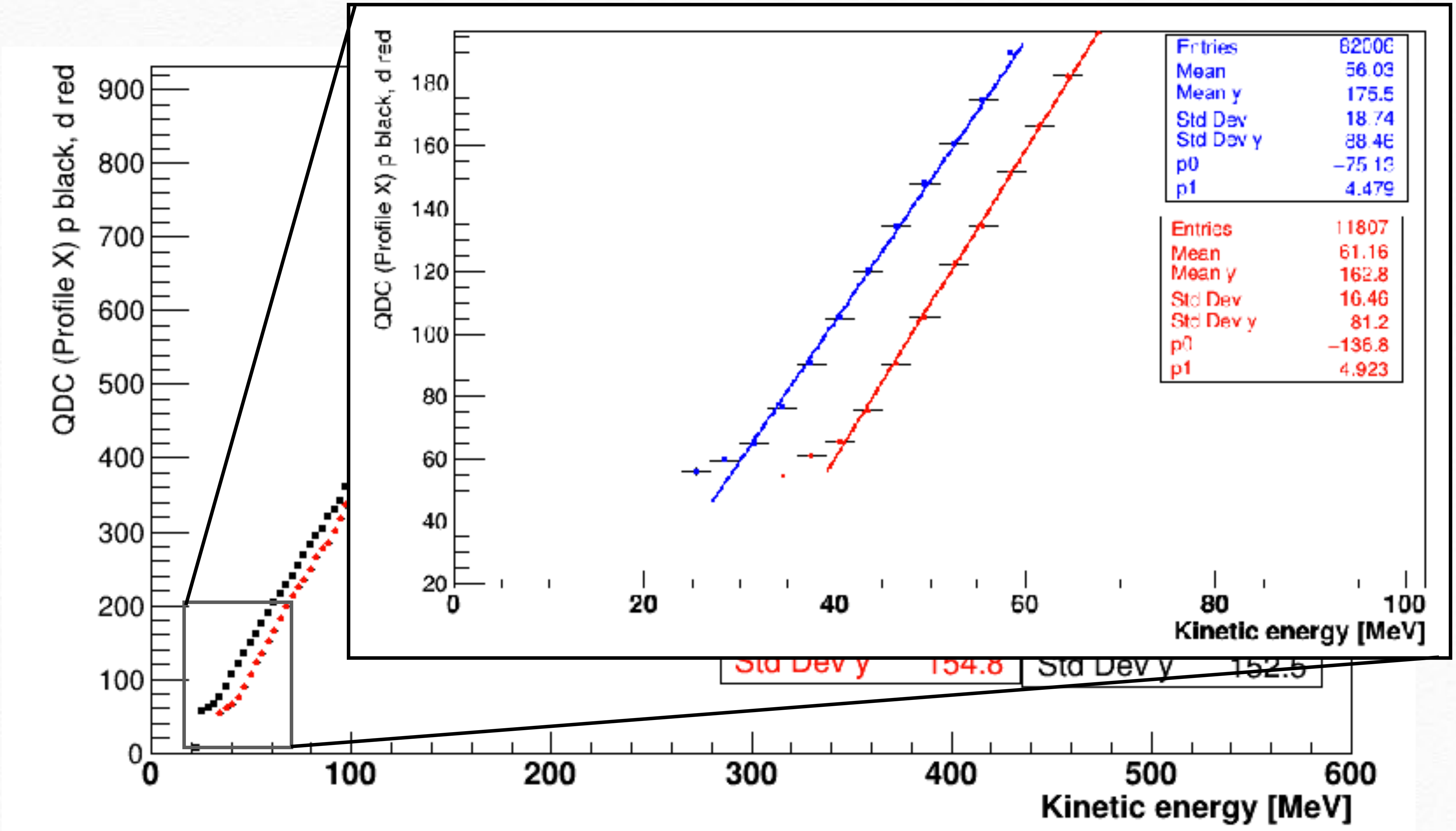




- The response of the LYSO is as expected not linear for high energy;
- I don't remember way p and d have different calibration..

Kinetic Energy: LYSO responce

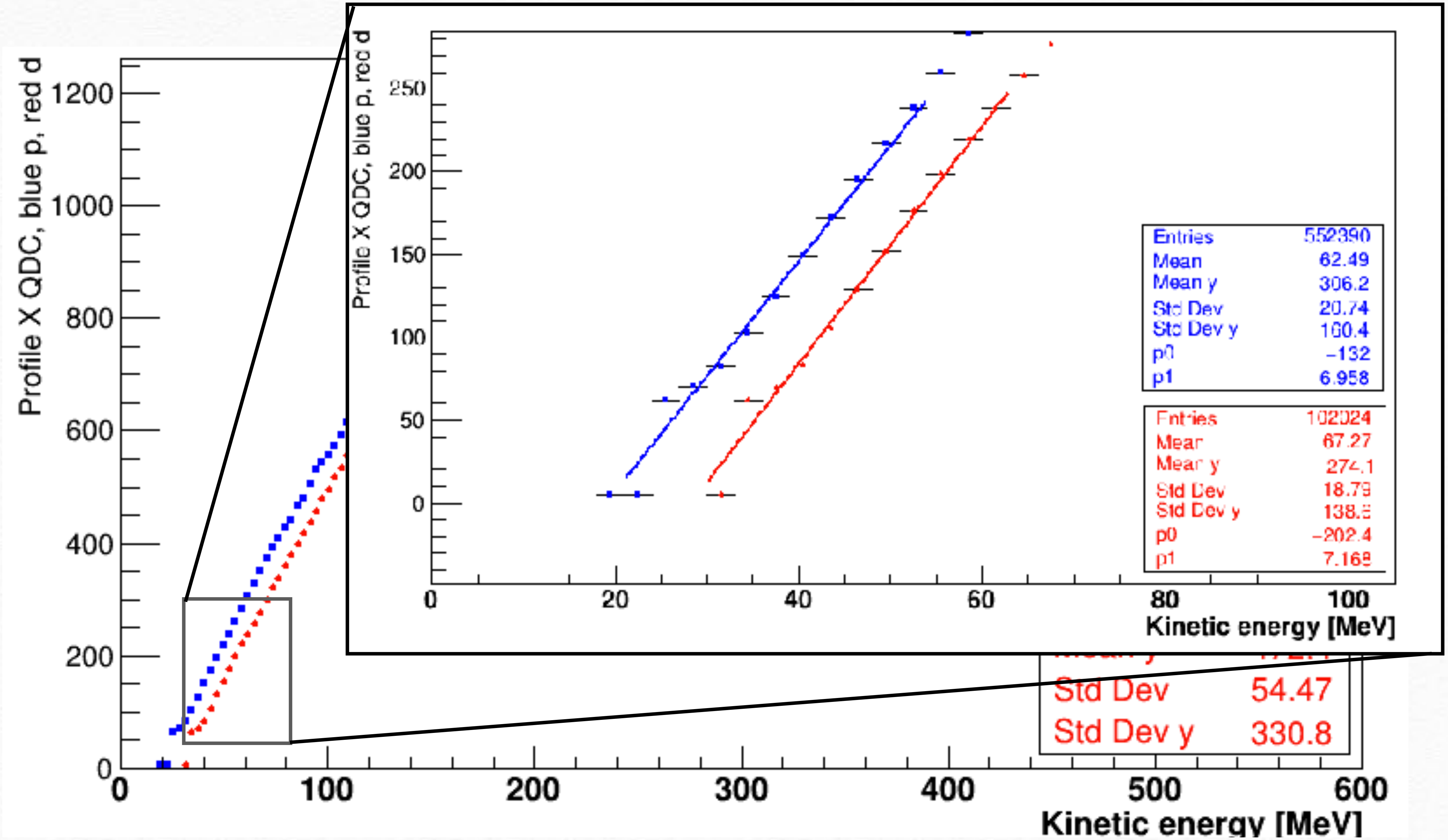
- The response of the LYSO1 is as expected not linear for high energy:



To have un idea of the threshold energy..

Kinetic Energy: LYSO responce

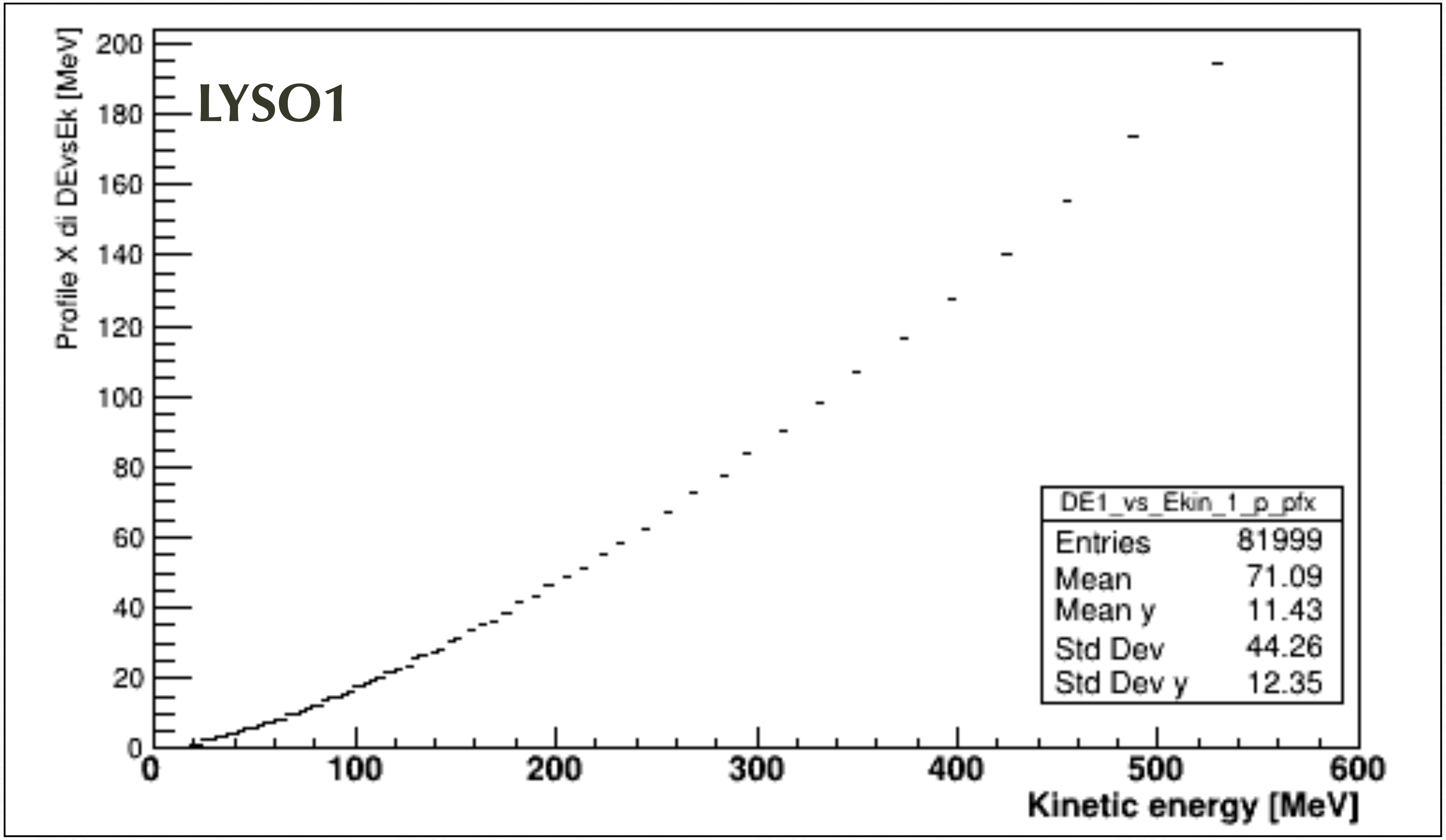
- The response of the LYSO2 is as expected not linear for high energy:



To have un idea of the threshold energy..

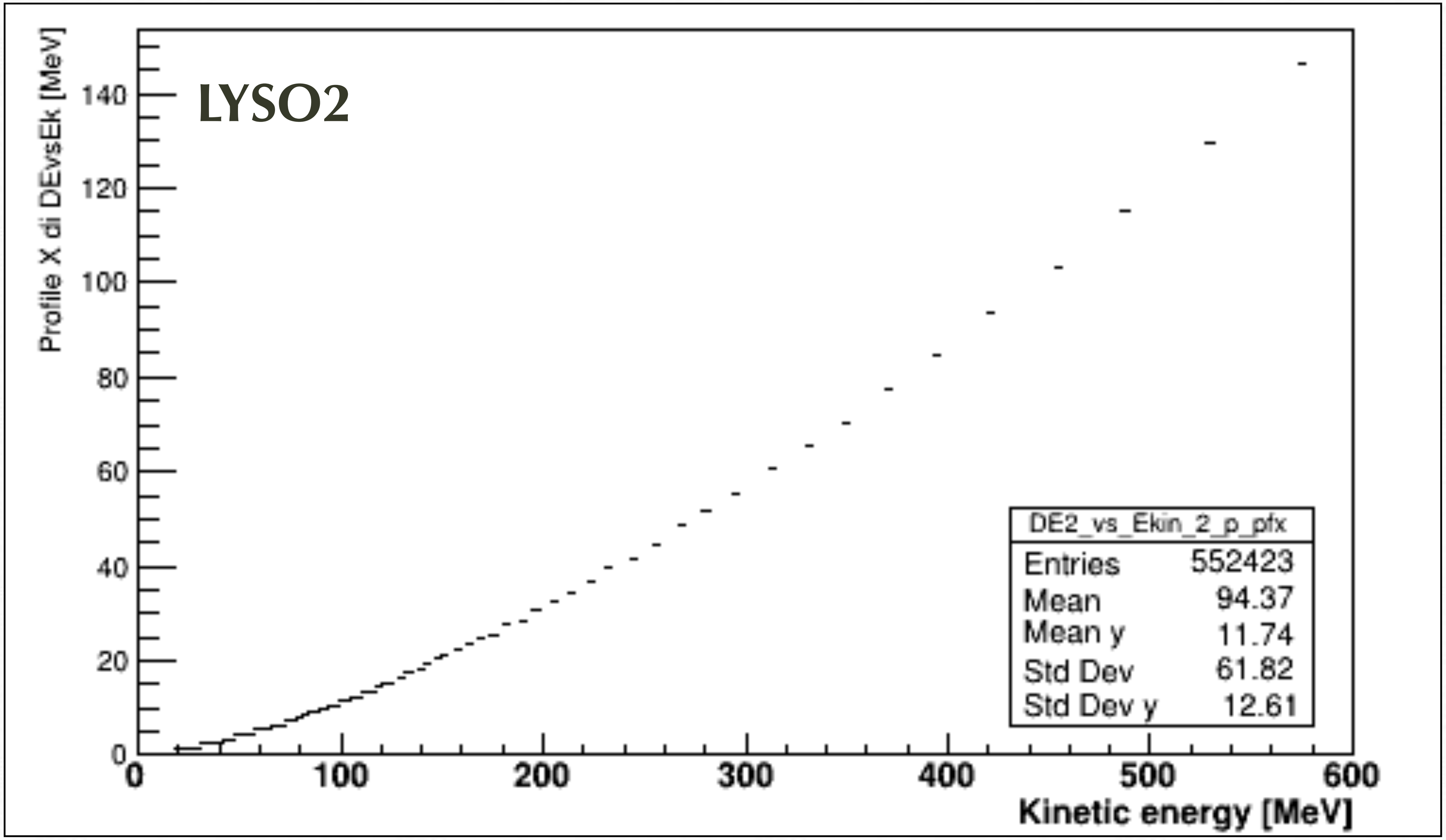
Kinetic Energy: LYSO responce

- The resolution in energy as a function of energy:



Kinetic Energy: LYSO responce

- The response of the LYSO is as expected not linear for high energy:



To Do List: non esaustiva

- MC is coming. We havo to calculate:
  - **geometrical efficiency**
  - **detector efficiency?**
  - ..electrons?
  - Remove the TDC constraints in lyso
- **Tigger Efficiency from data (we took special runs with this aim);**
- **Cross-sections for C,H,O for 90 and 60 degrees;**
- Analysis at 30-40 (tritons will be there);