

FRED for Carbon Ions: State of Art



Micol De Simoni

05/10/2020

Risolti problemi con ^{12}C su:

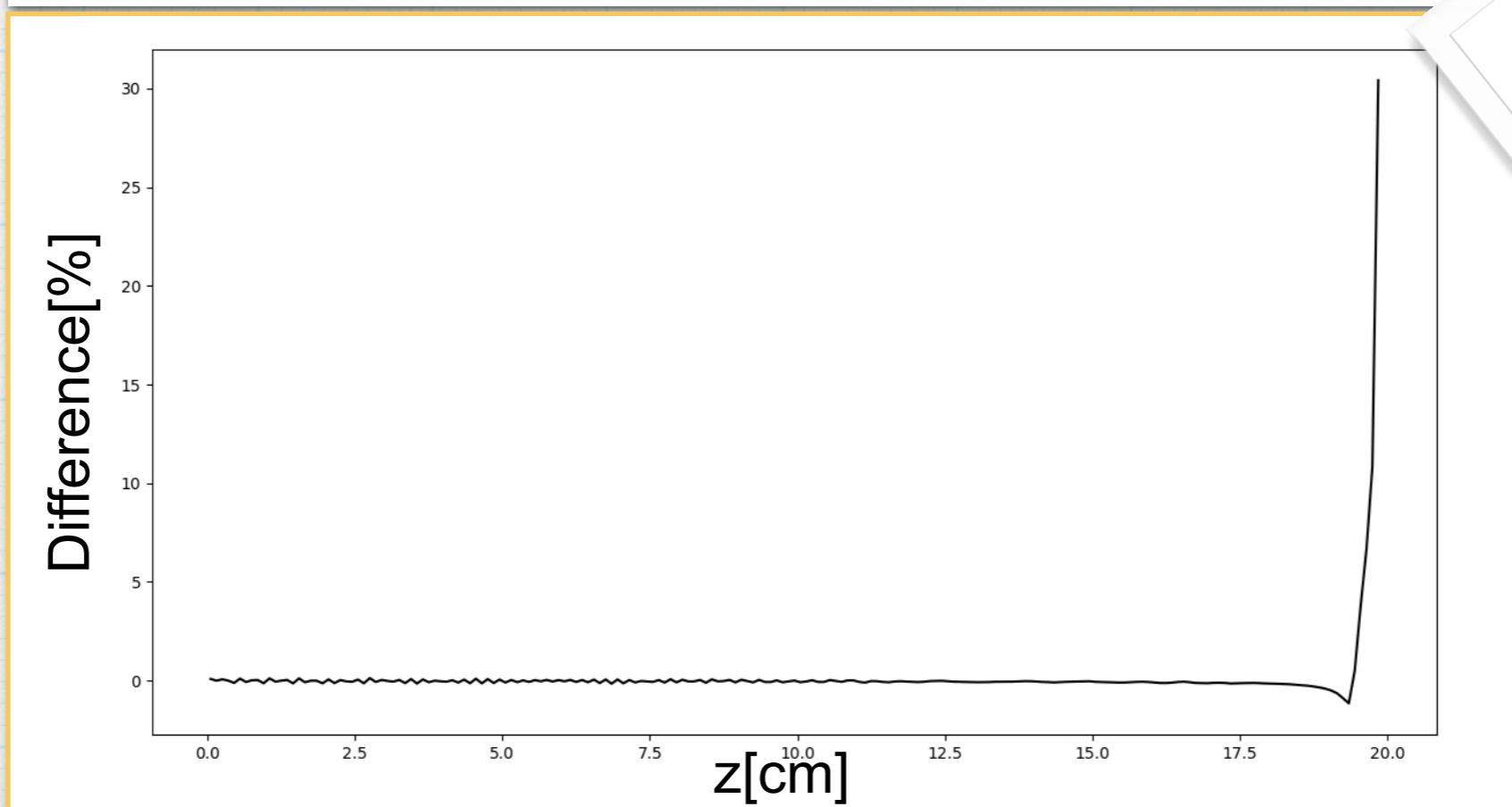
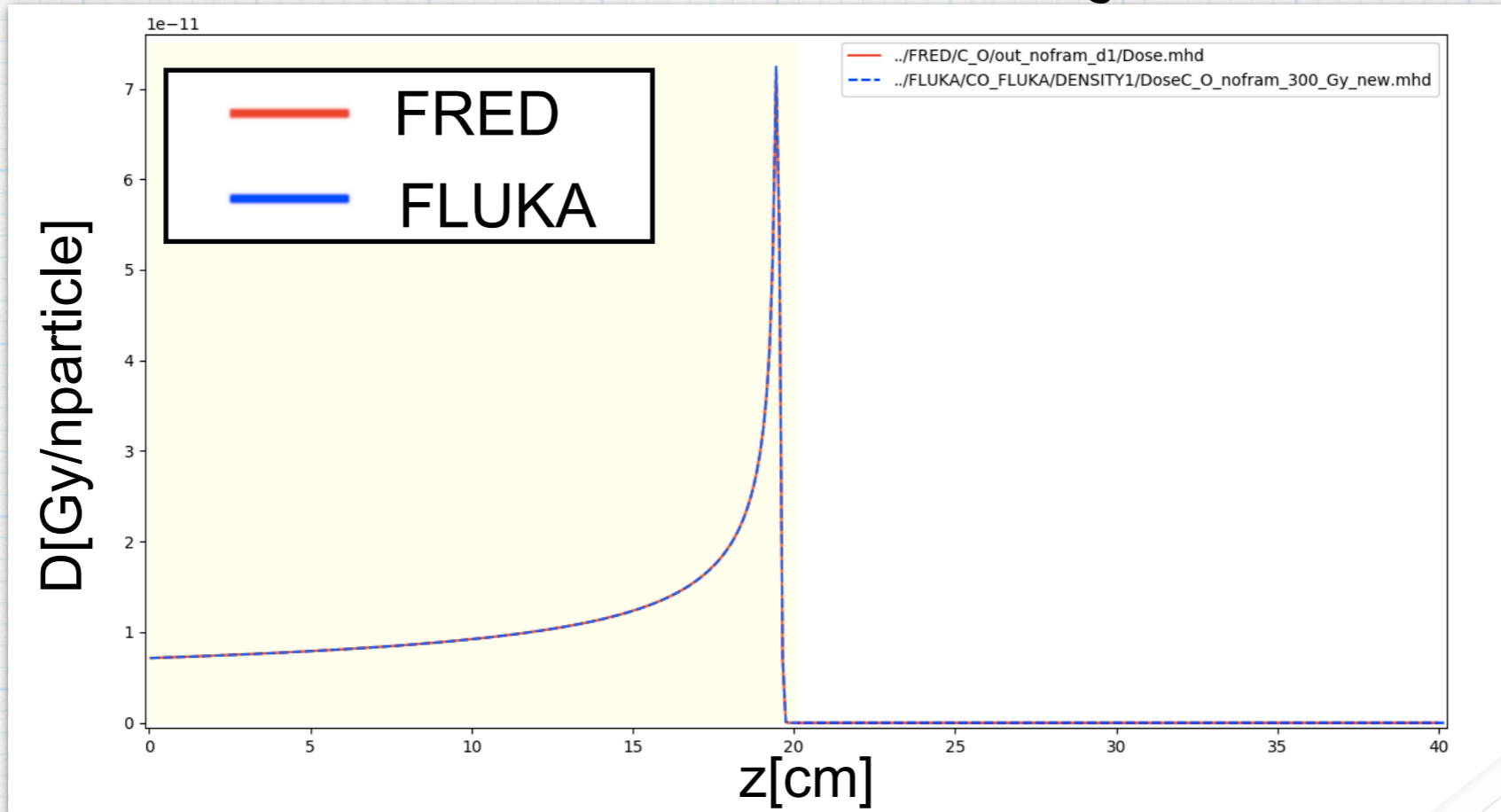
- * Ossigeno (senza frammentazione)
- * Idrogeno (senza frammentazione)
- * Carbonio (senza frammentazione)

Problemi con frammentazione di C su H

Ancora qualche problema di C-C e C-O con frammentazione

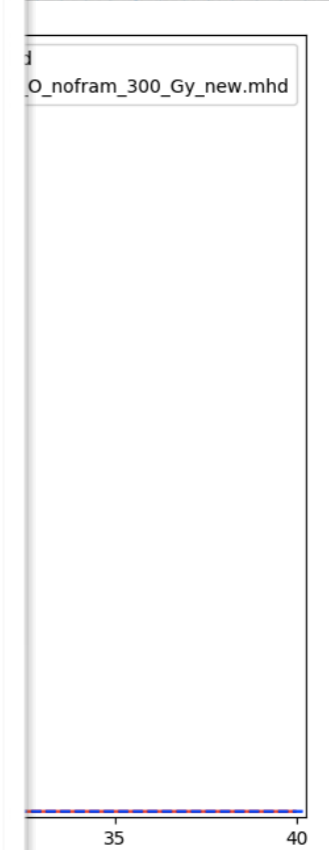
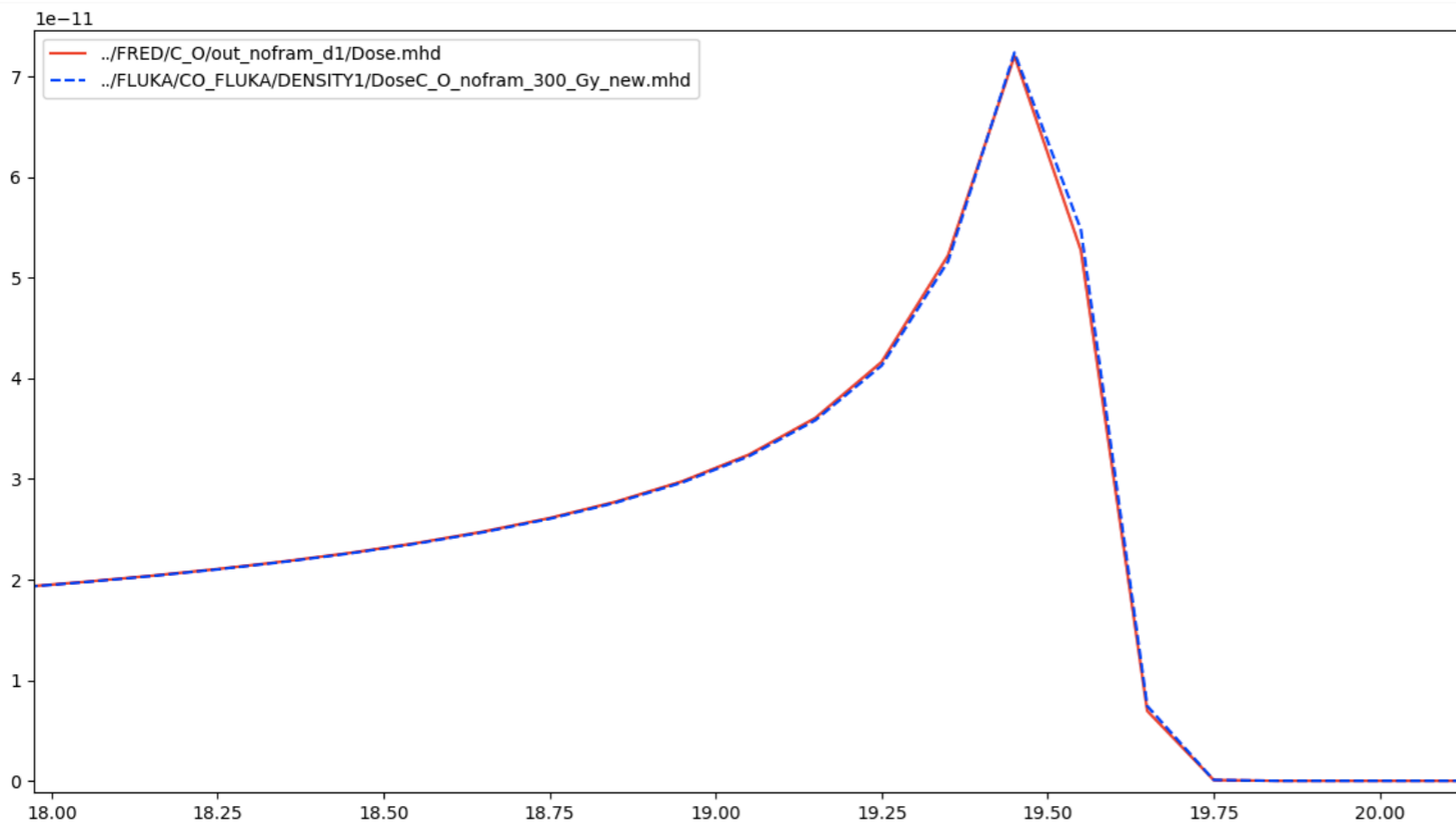
DDD Carbonio su Ossigeno

300MeV/u
 $\rho = 1\text{g/cm}^3$

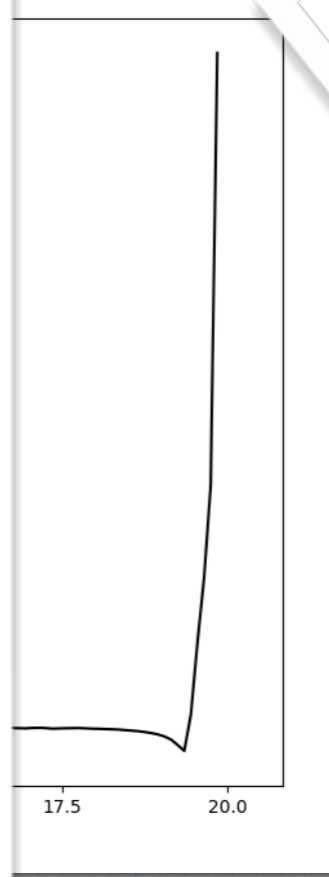
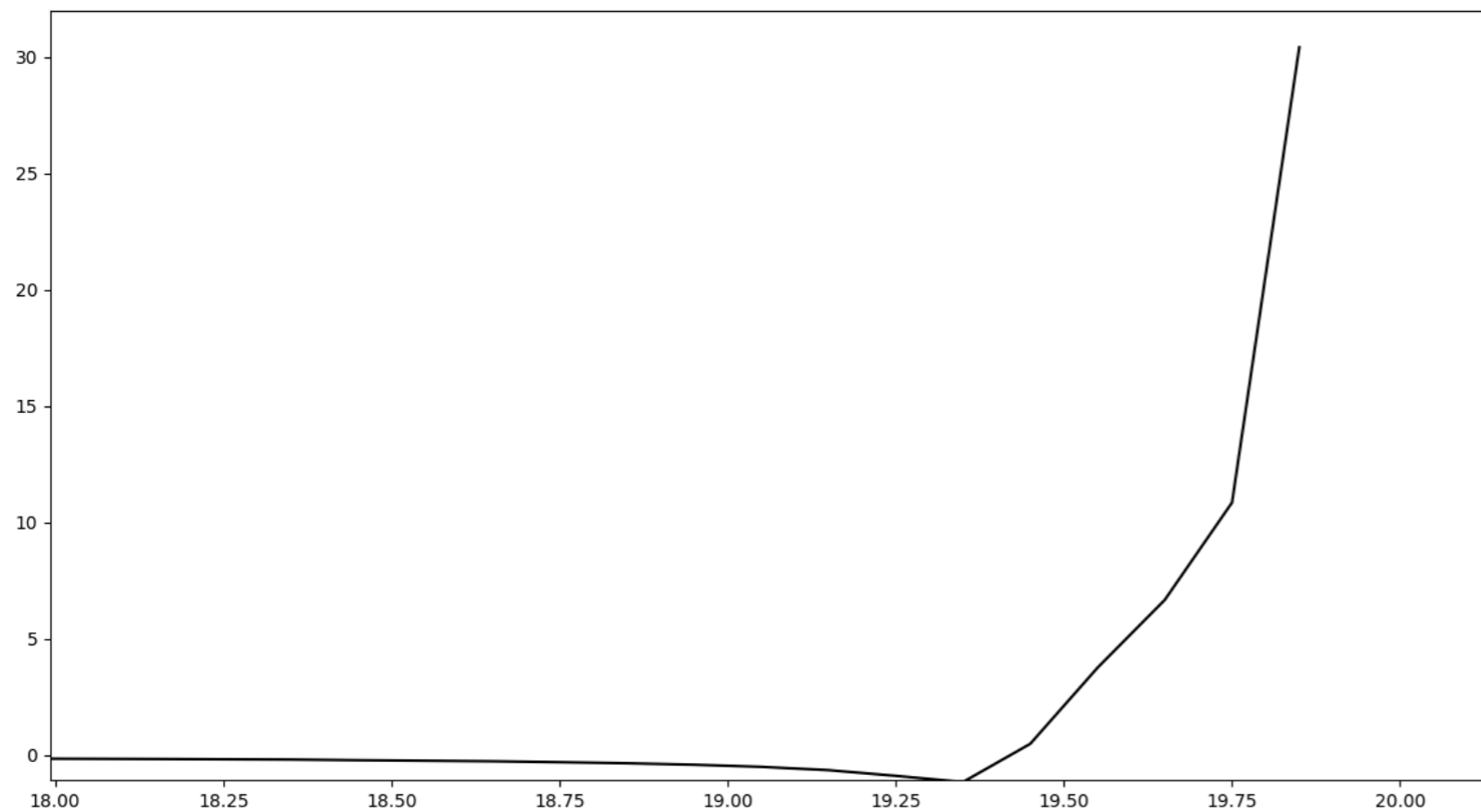


**Senza
Frammentazione**

300MeV/u
 $\rho = 1\text{g/cm}^3$

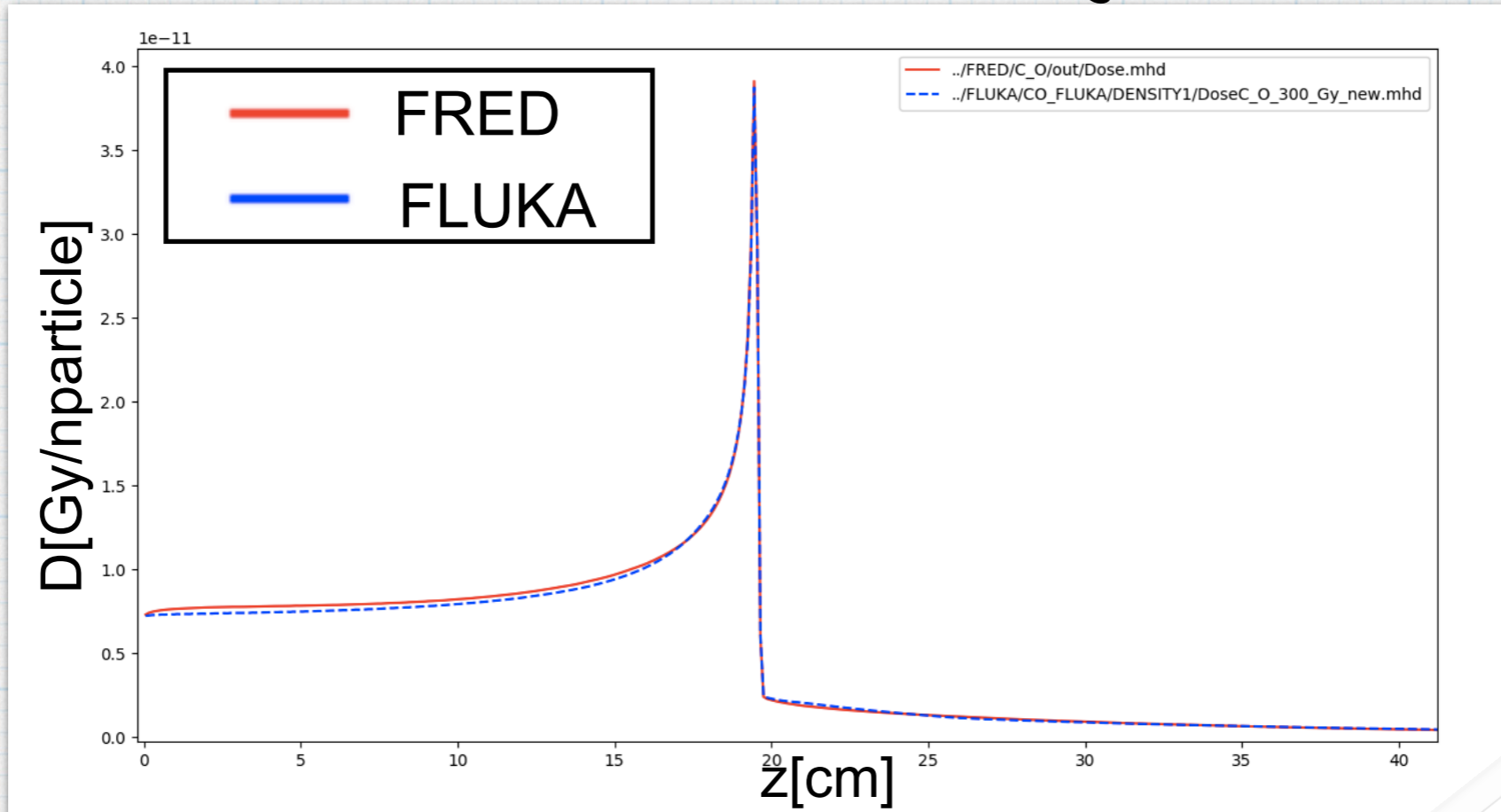


**Senza
Frammentazione**

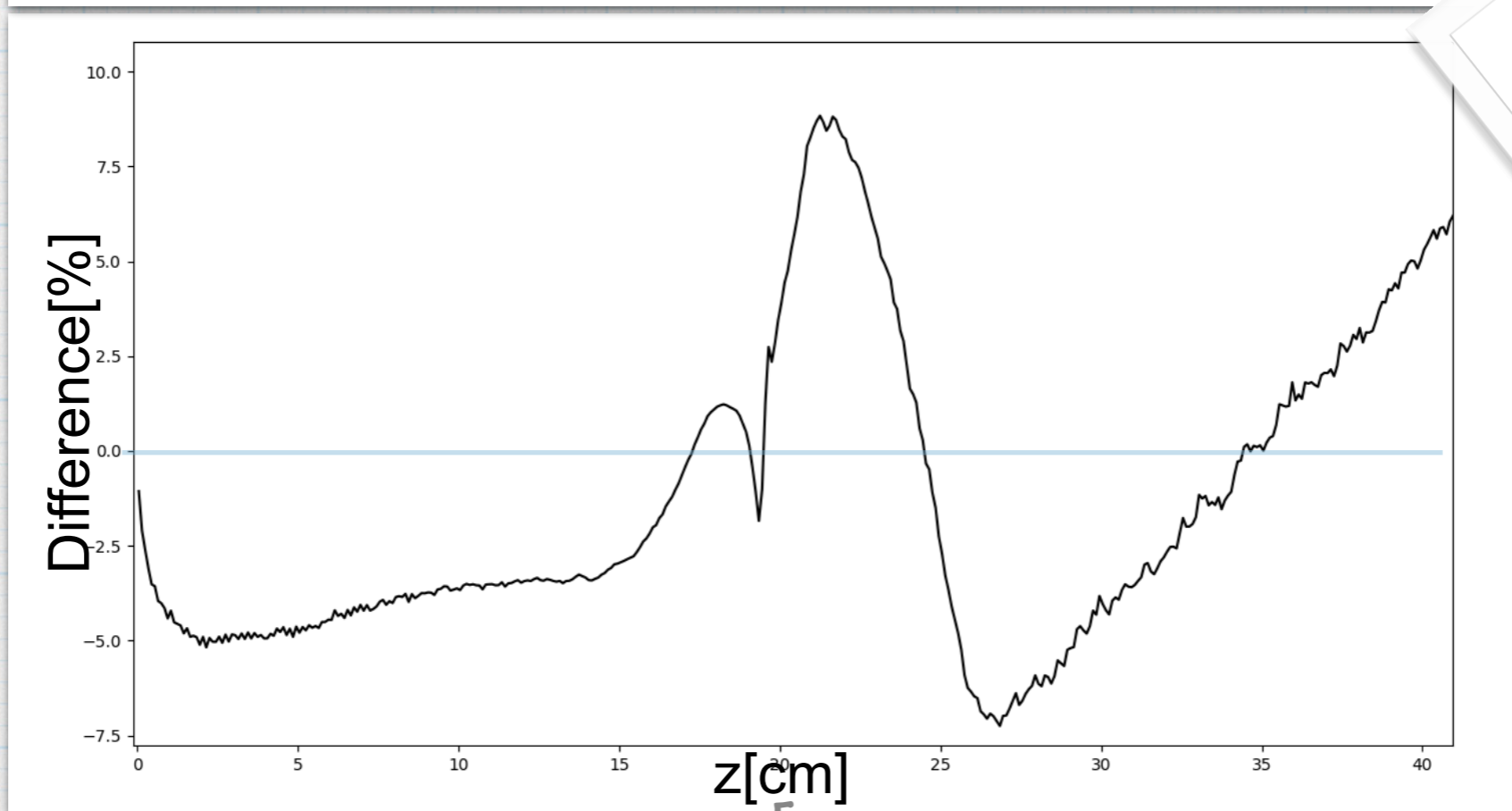


DDD Carbonio su Ossigeno

300MeV/u
 $\rho = 1\text{g/cm}^3$

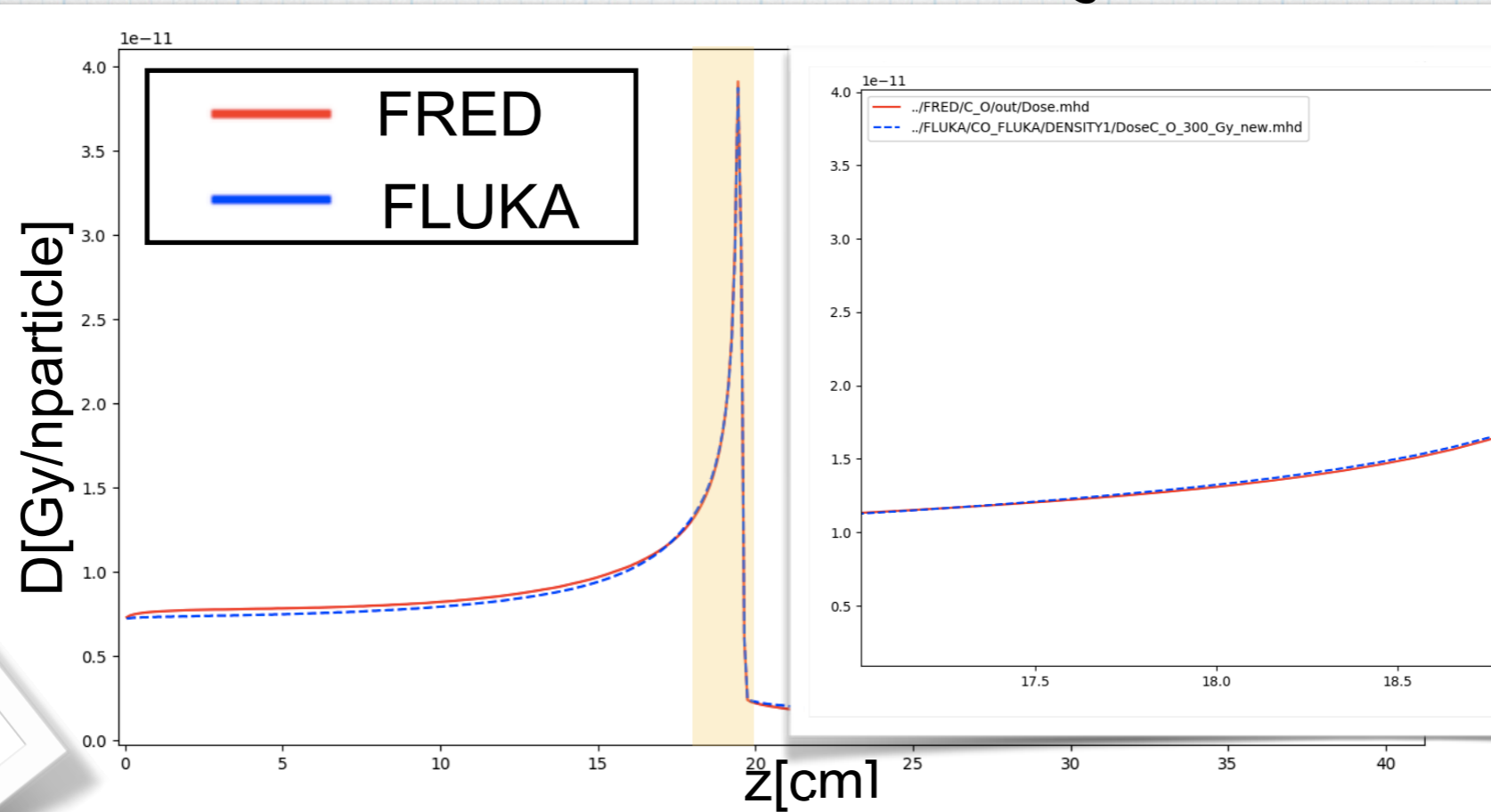


**Con
Frammentazione**

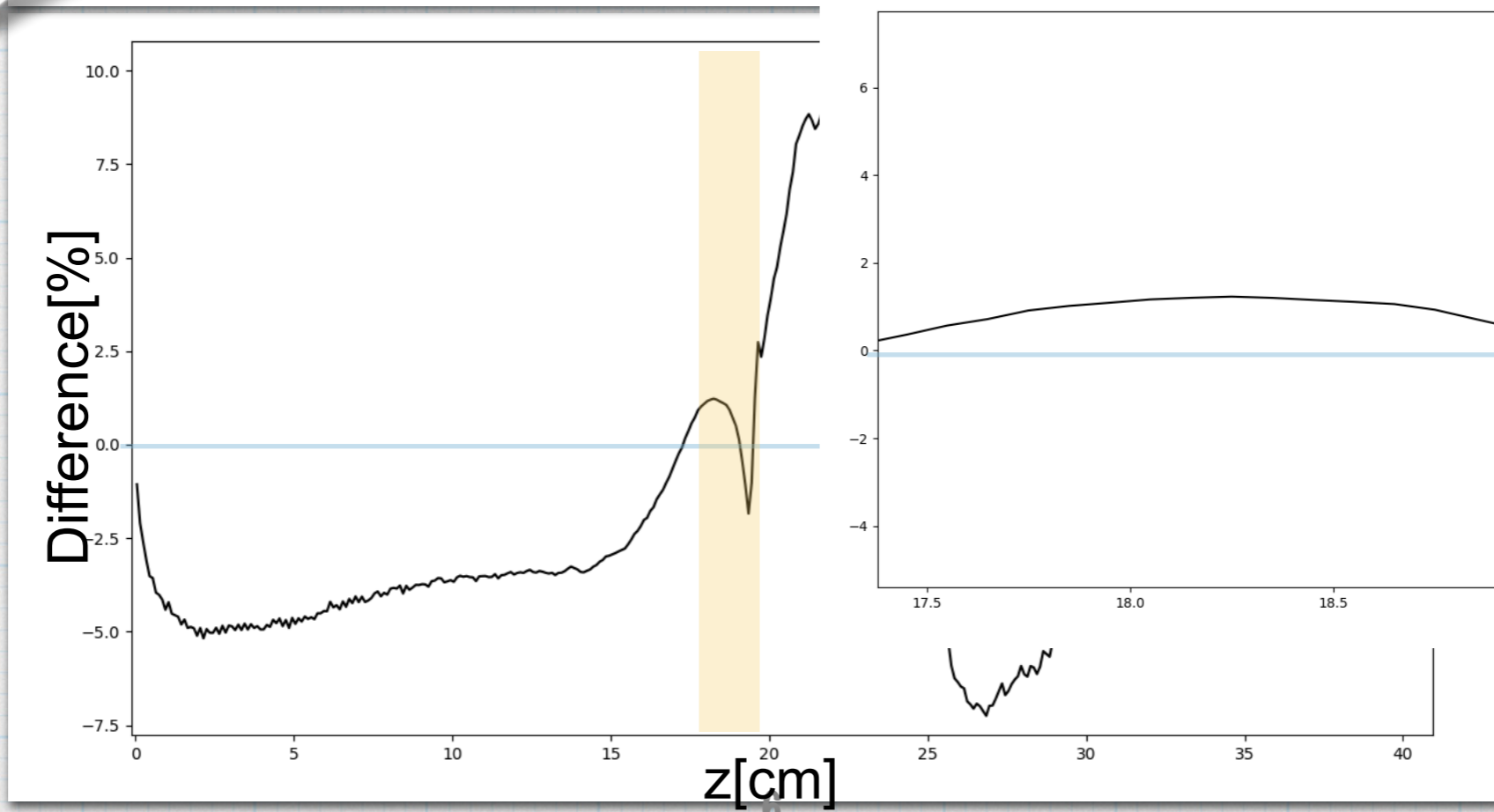


DDD Carbonio su Ossigeno

300MeV/u
 $\rho = 1 \text{ g/cm}^3$

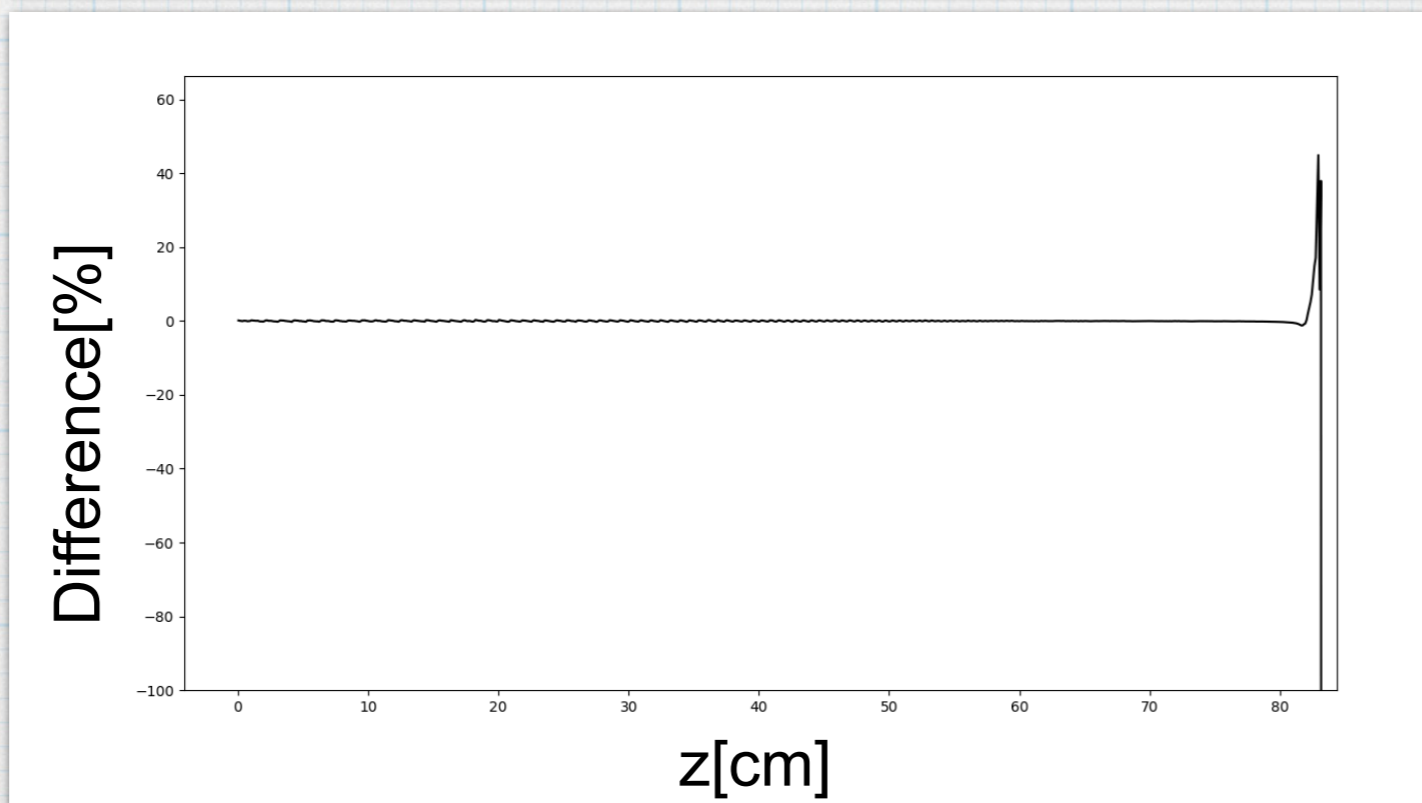
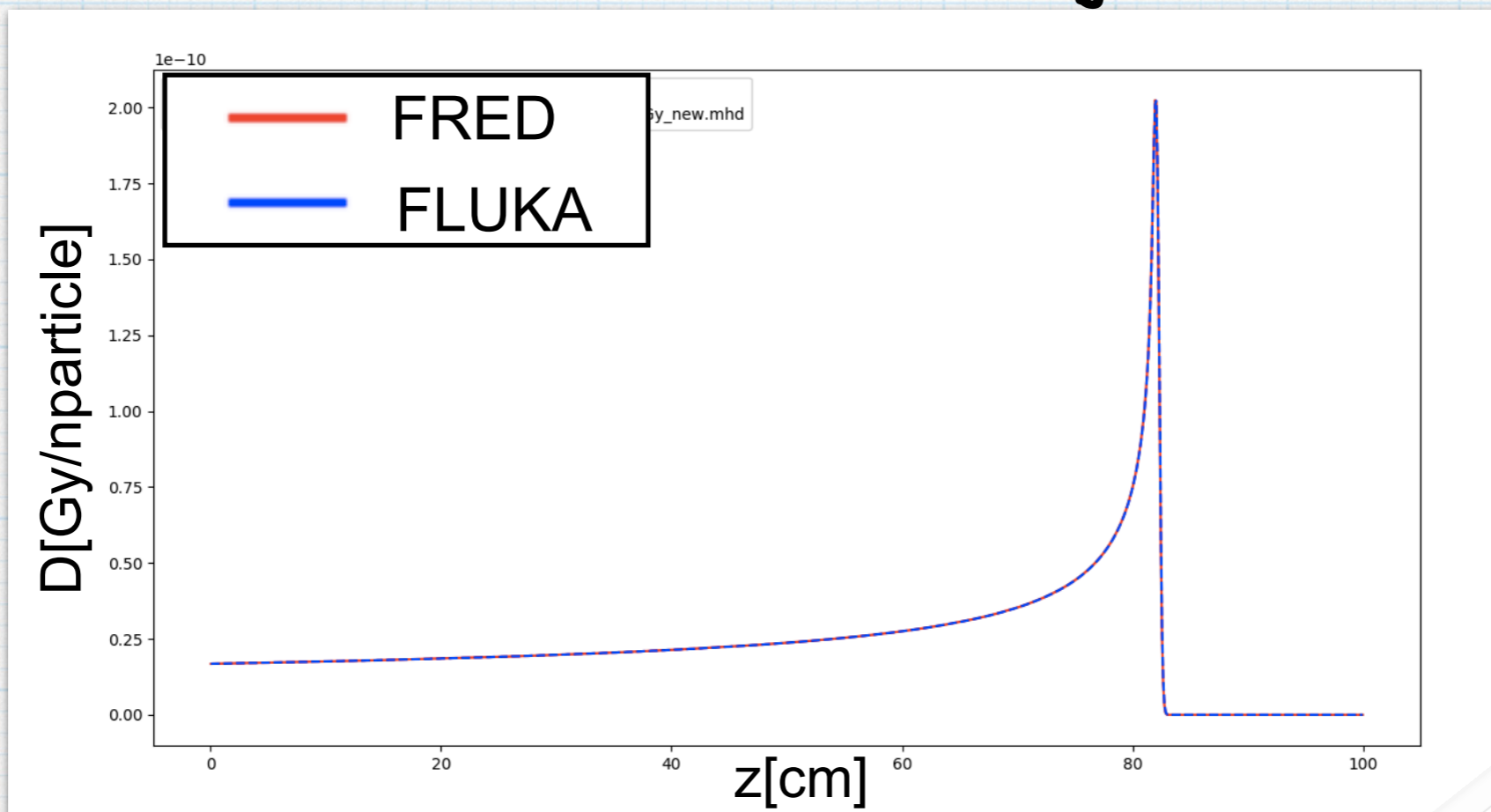


Con
Frammentazione



DDD Carbonio su Idrogeno

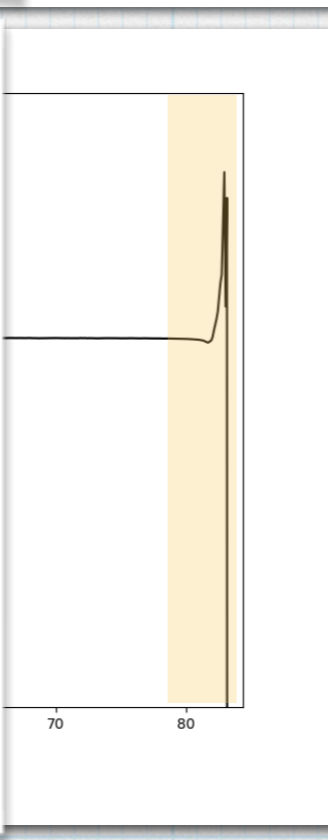
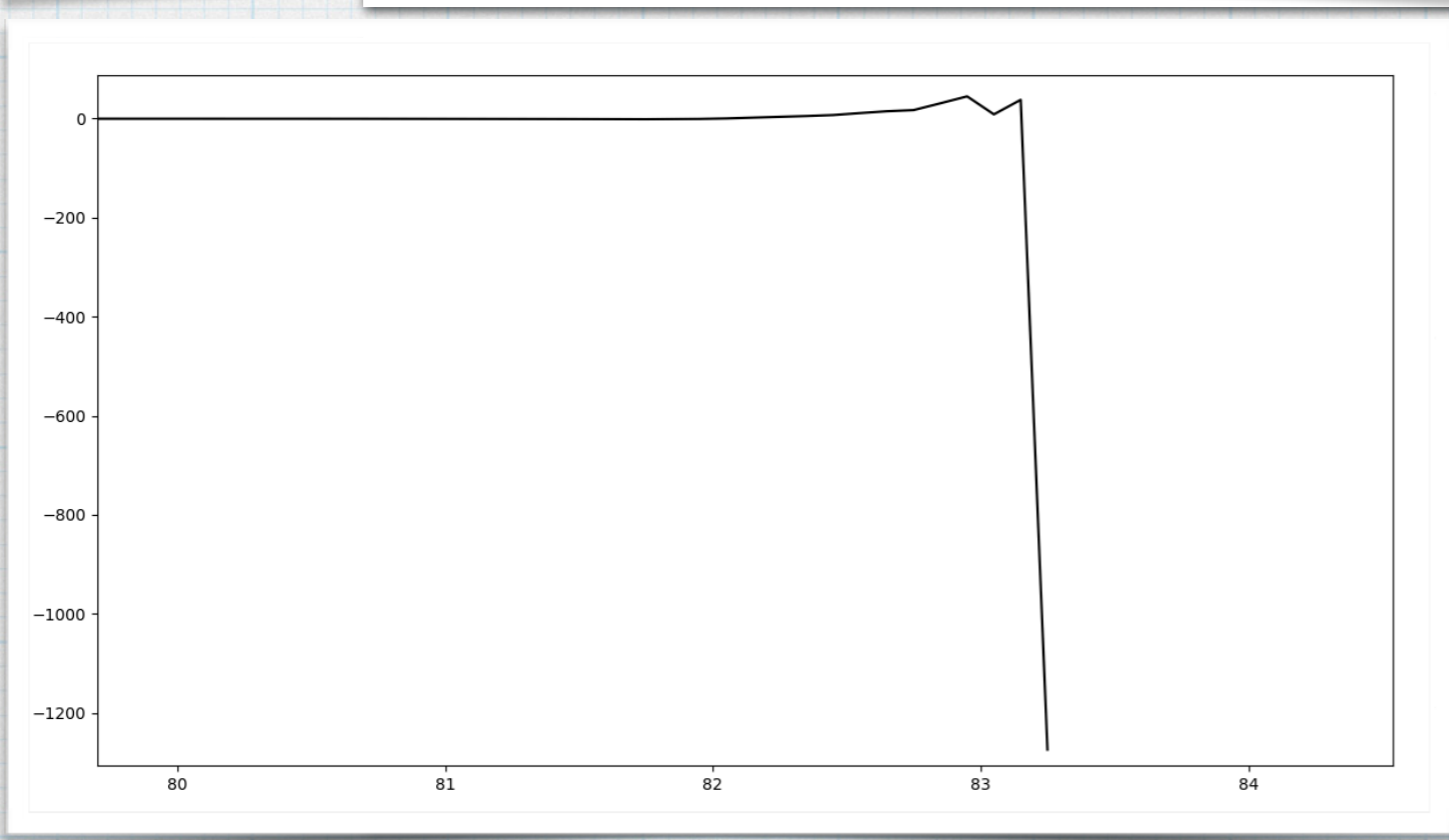
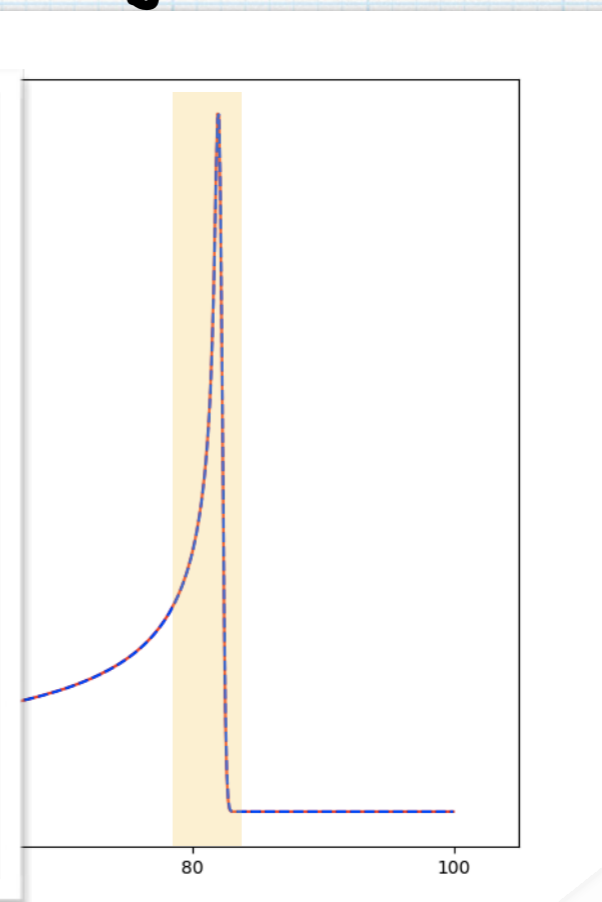
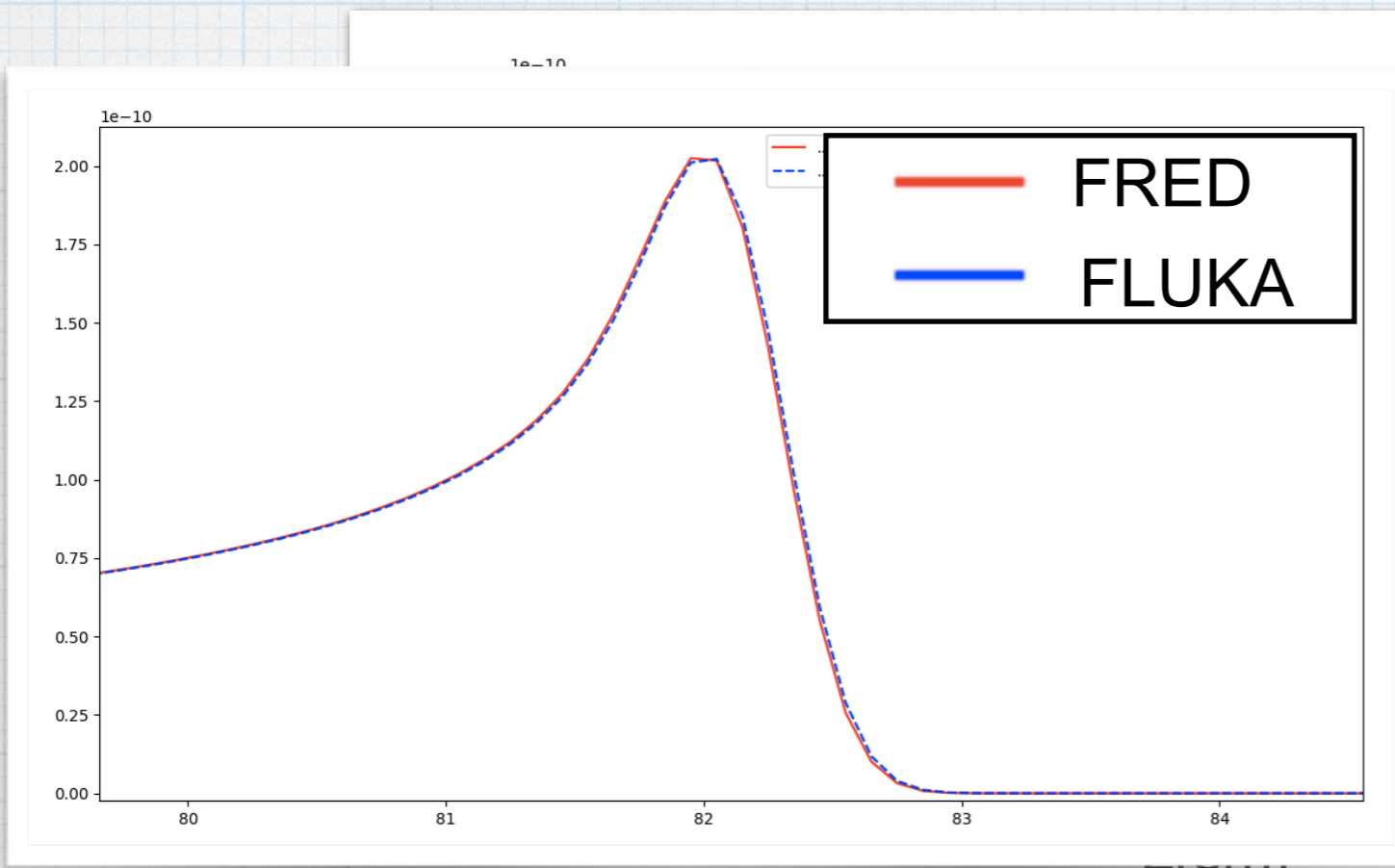
300MeV/u
 $\rho=0,1\text{g/cm}^3$



Senza Frammentazione

DDD Carbonio su Idrogeno

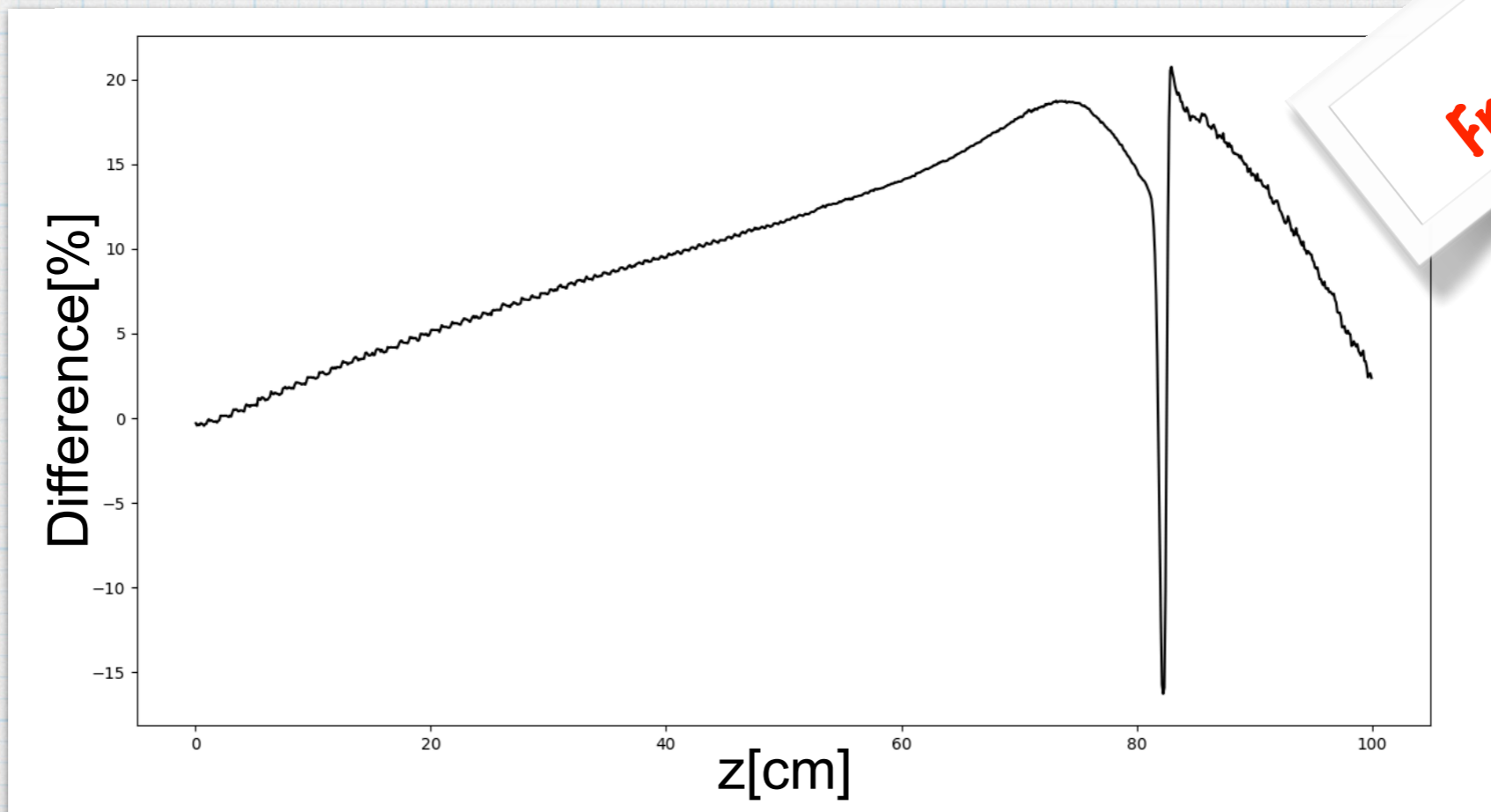
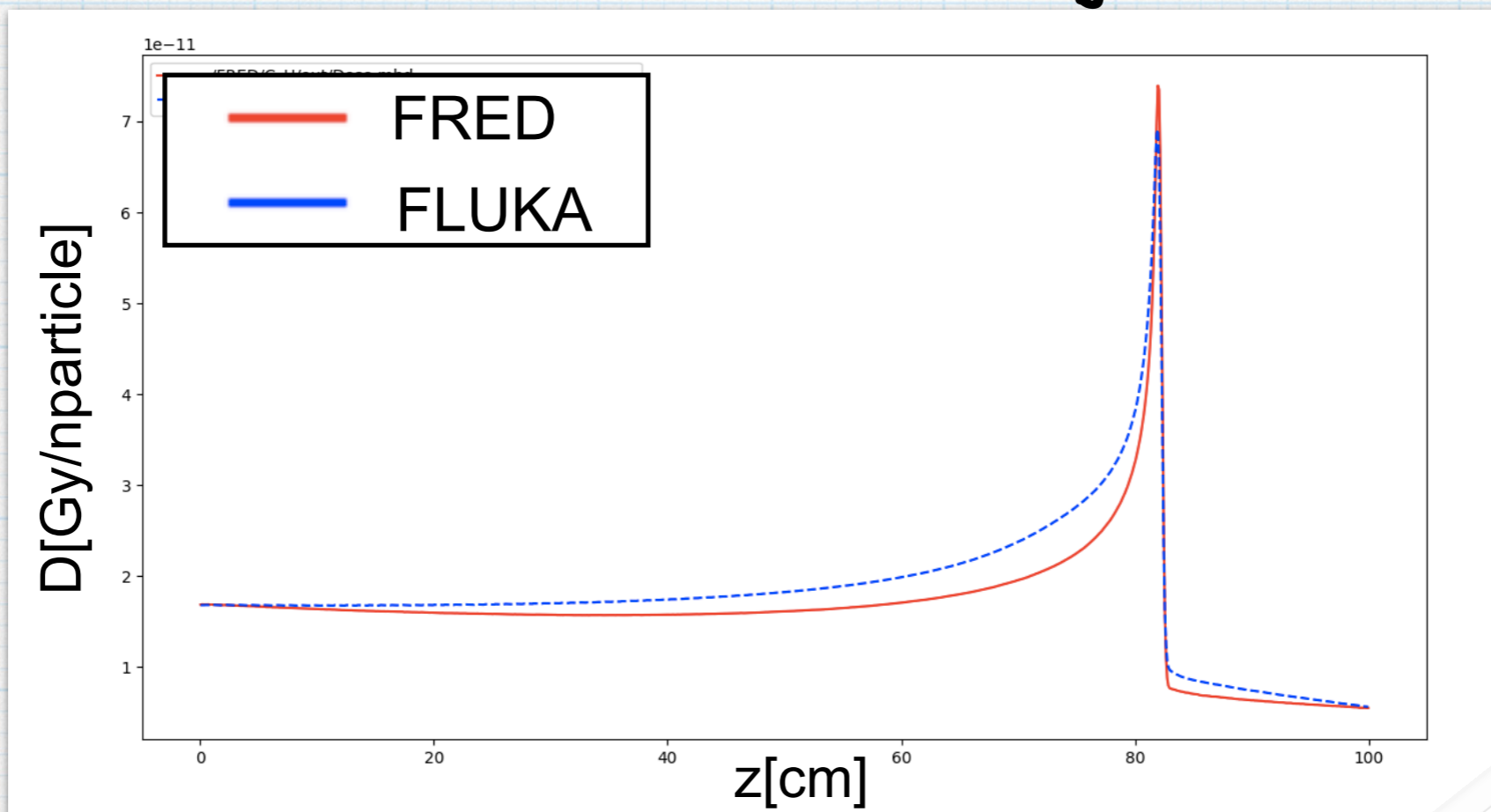
300MeV/u
 $\rho=0,1\text{g/cm}^3$



Senza Frammentazione

DDD Carbonio su Idrogeno

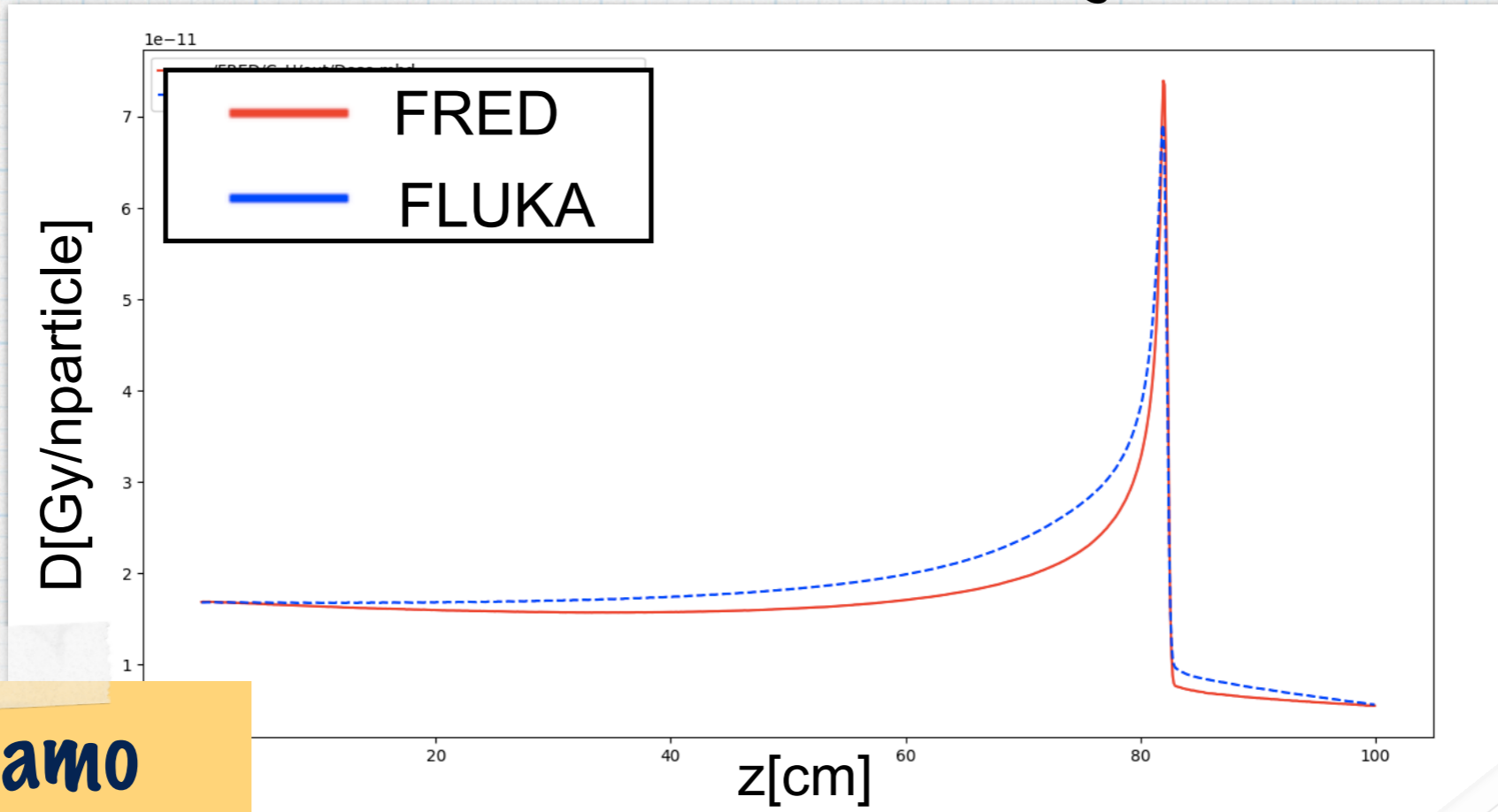
300MeV/u
 $\rho=0,1\text{g/cm}^3$



**Con
Frammentazione**

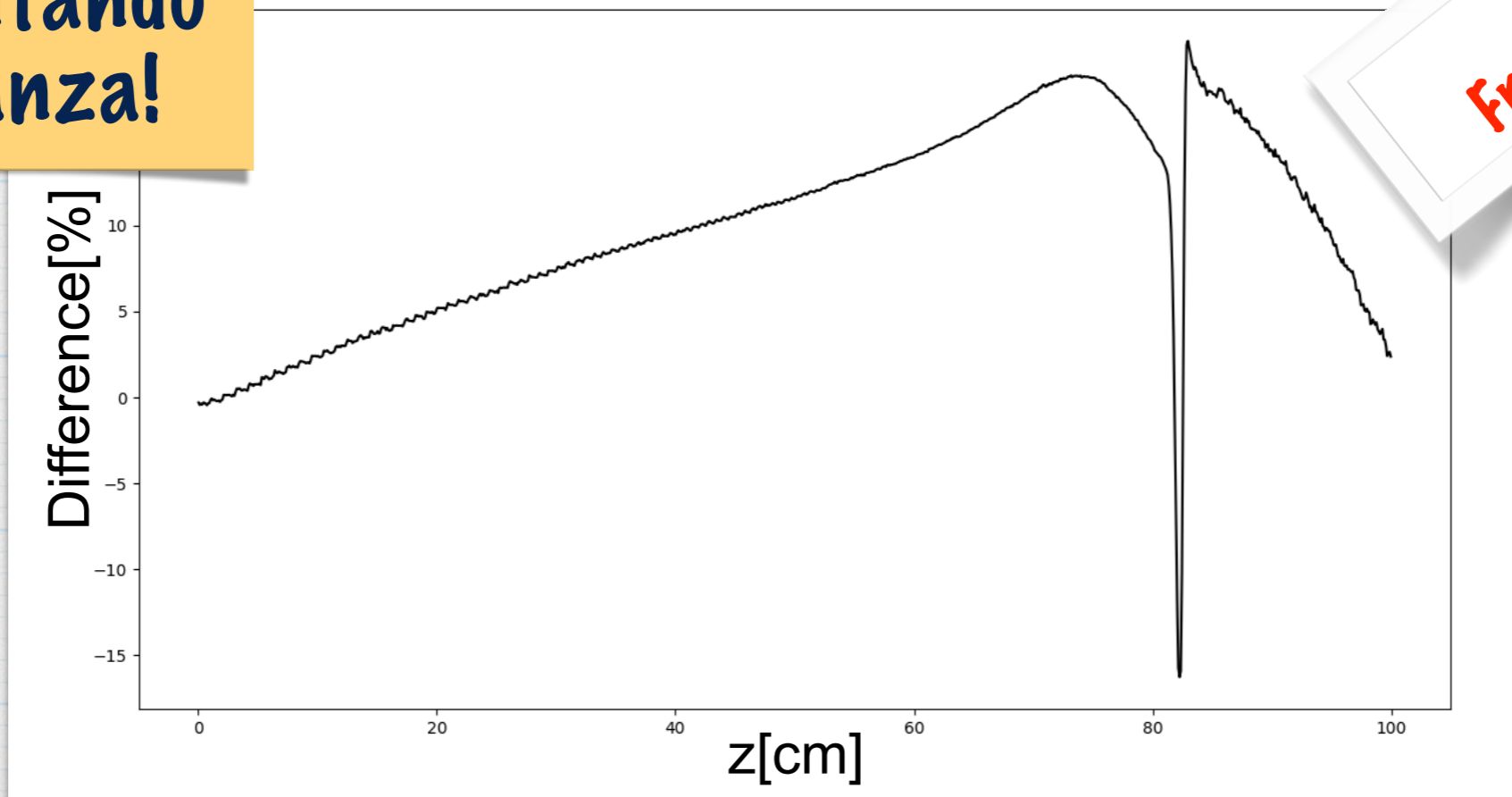
DDD Carbonio su Idrogeno

300MeV/u
 $\rho=0,1\text{g/cm}^3$



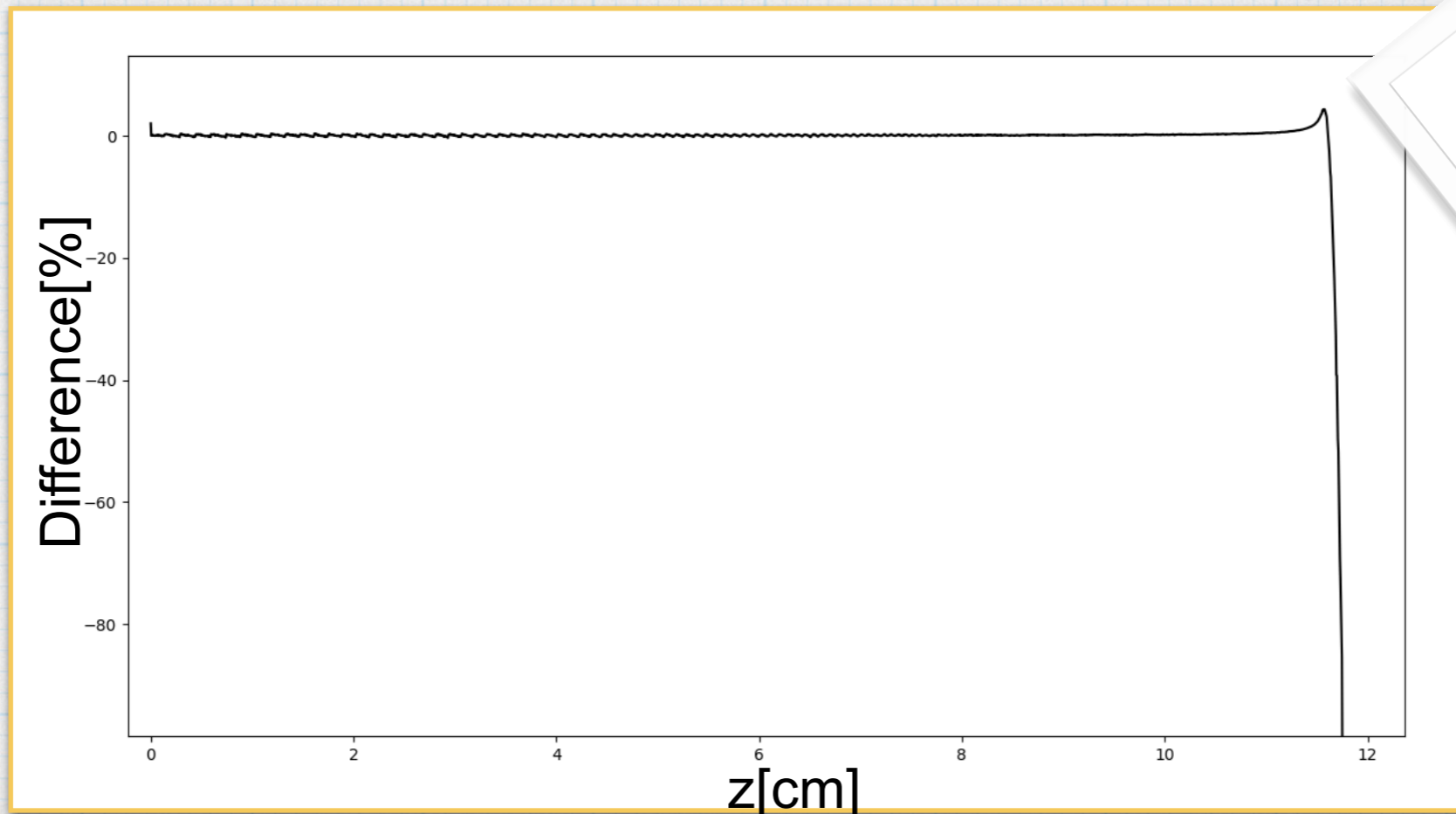
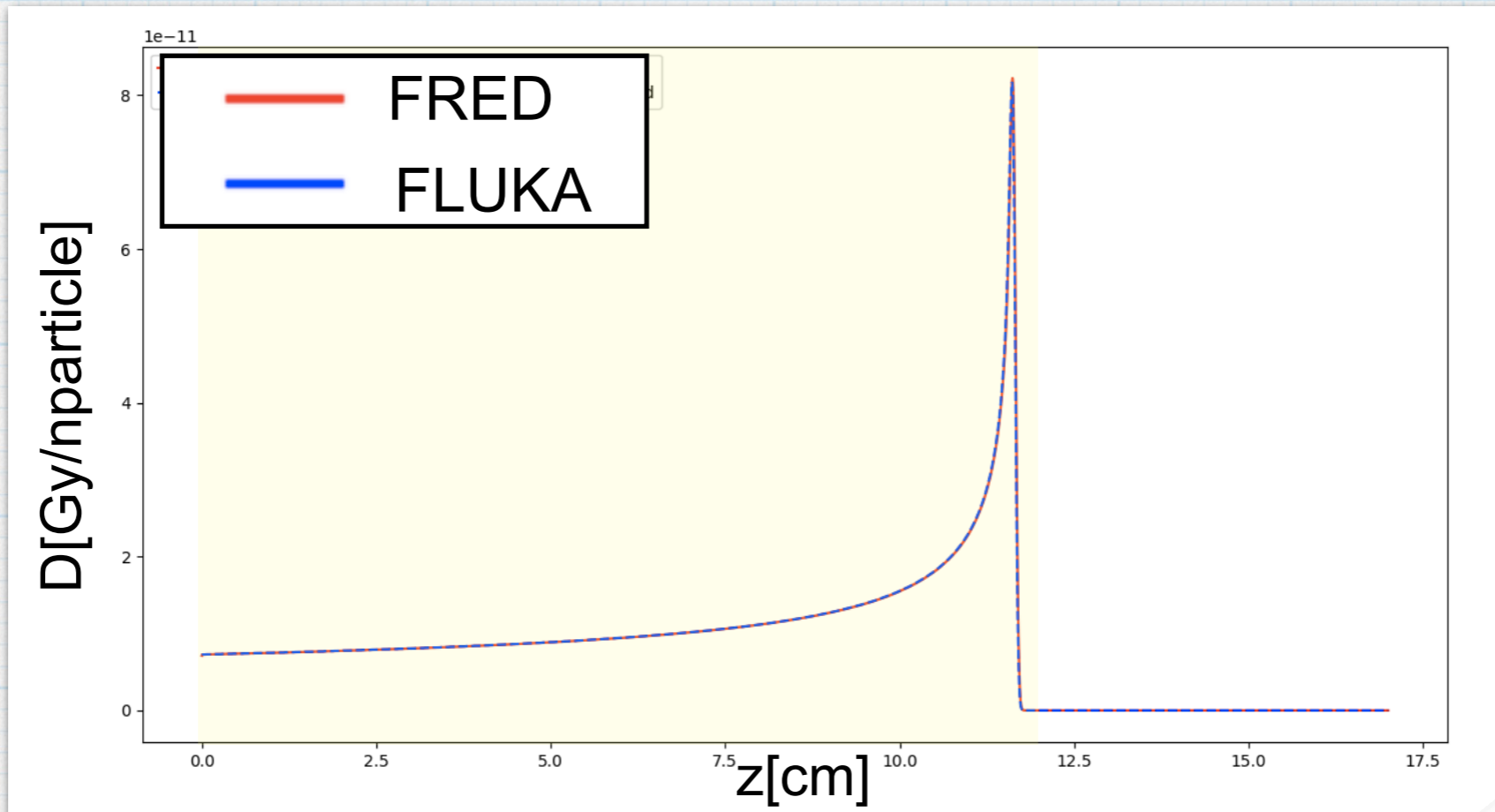
Non stiamo frammentando abbastanza!

Con Frammentazione



DDD Carbonio su Carbonio

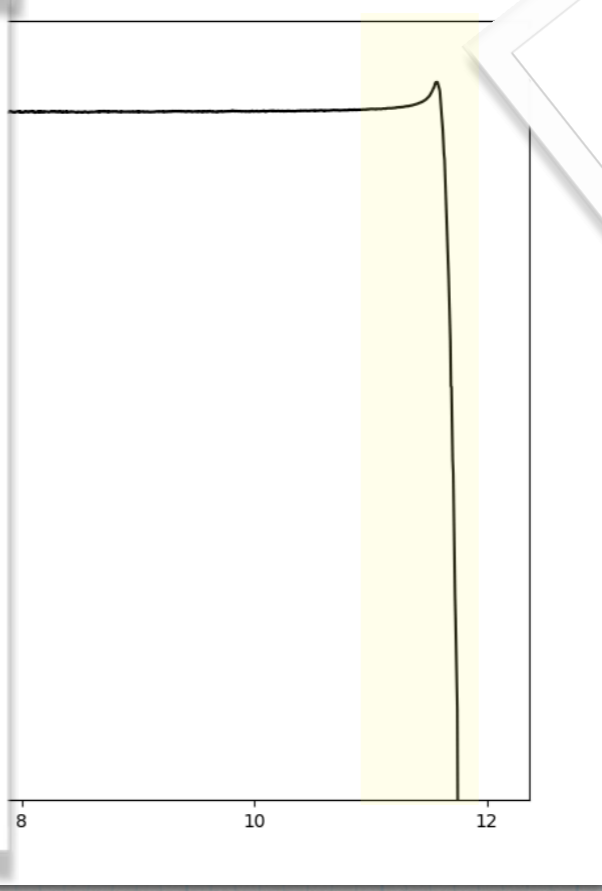
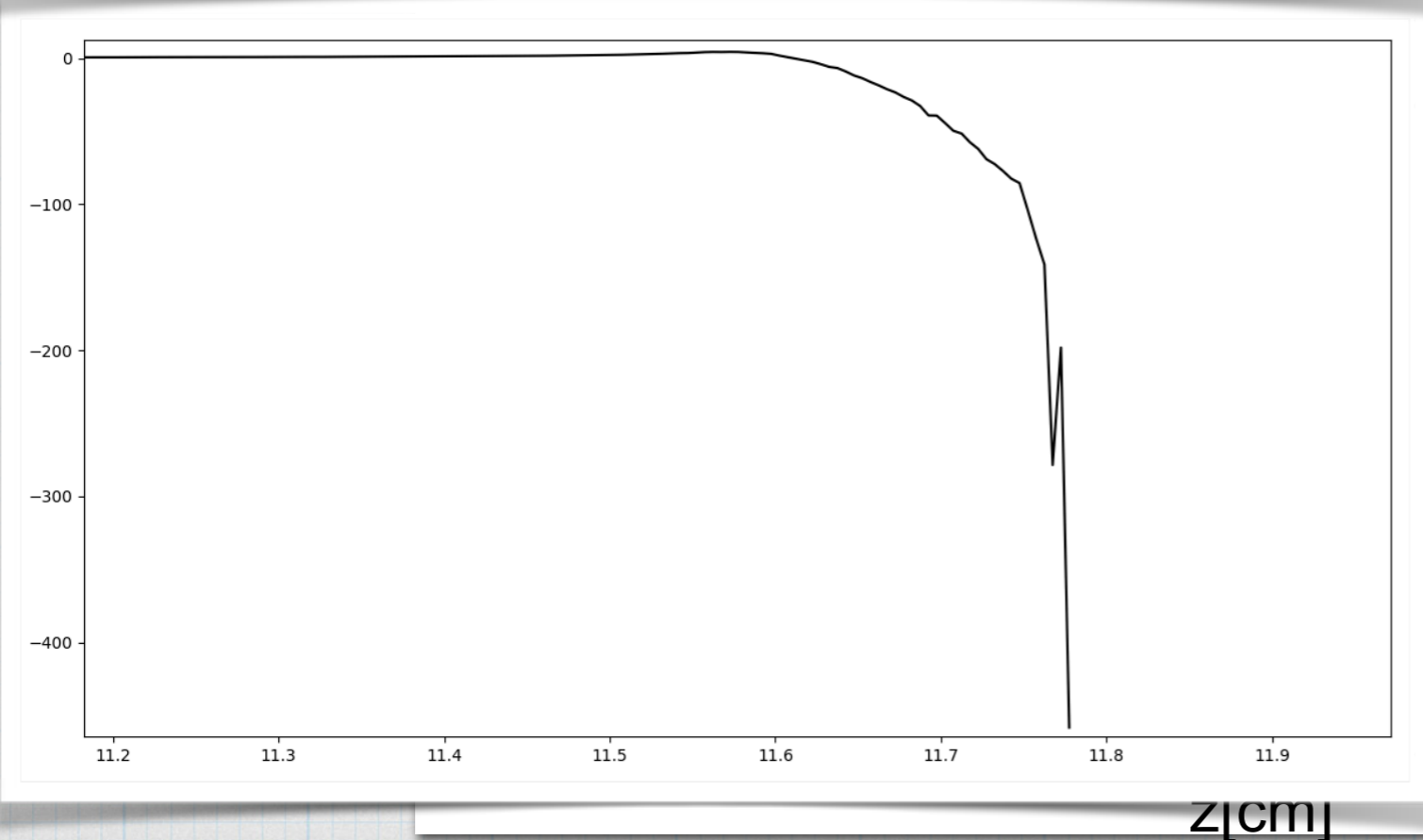
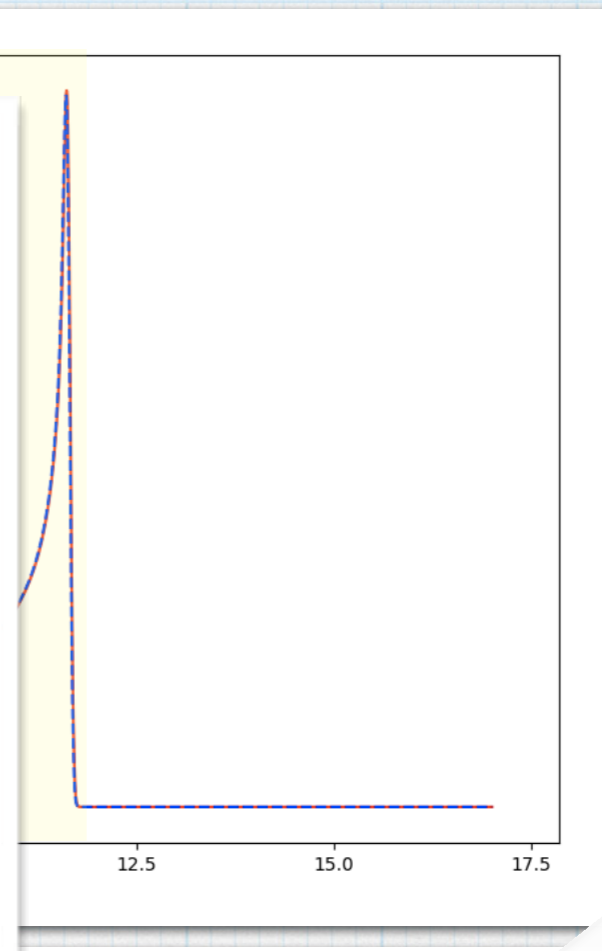
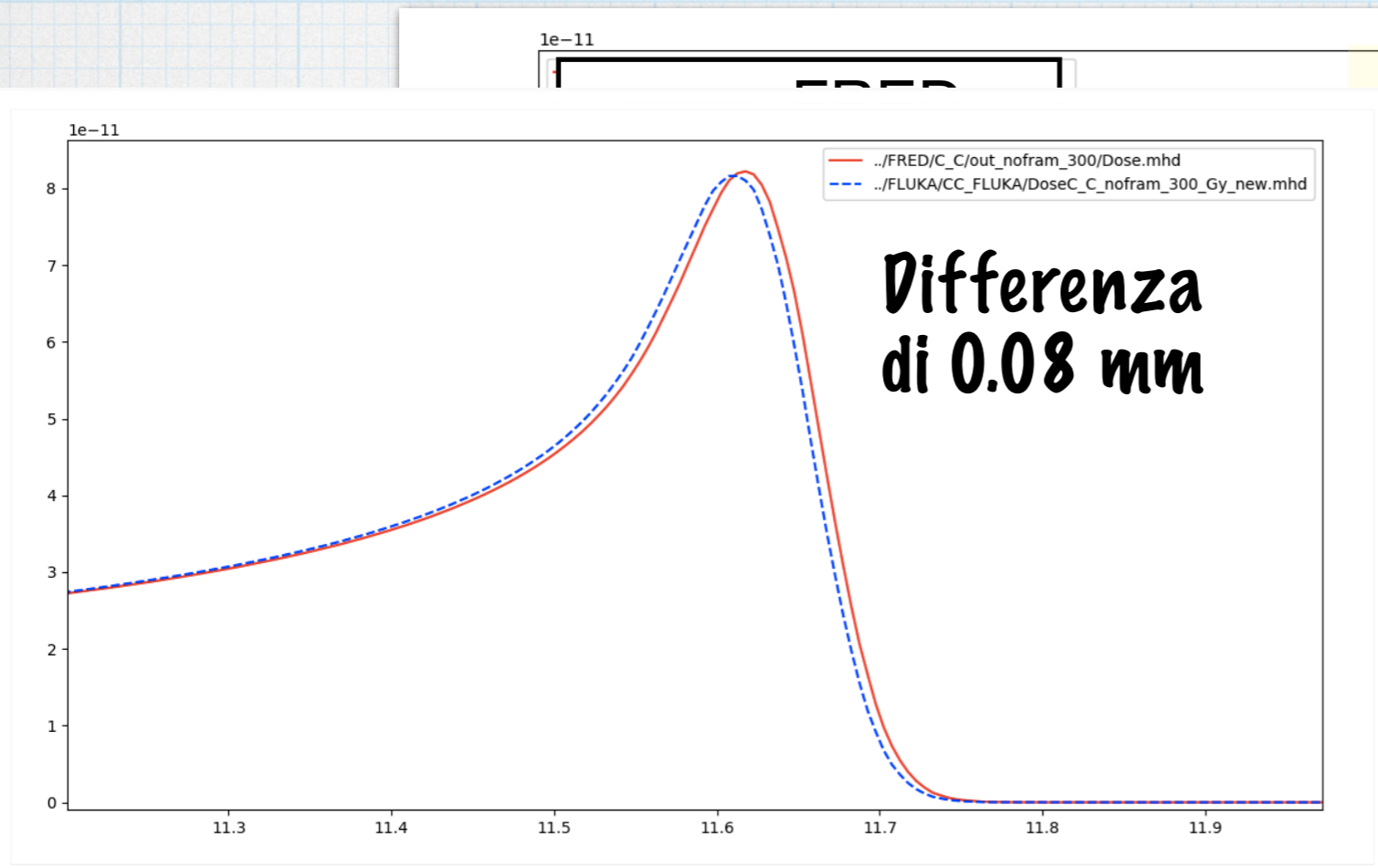
300MeV/u
 $\rho=1.644\text{g/cm}^3$
 $\text{bin}_z:0.05\text{mm}$



**Senza
Frammentazione**

DDD Carbonio su Carbonio

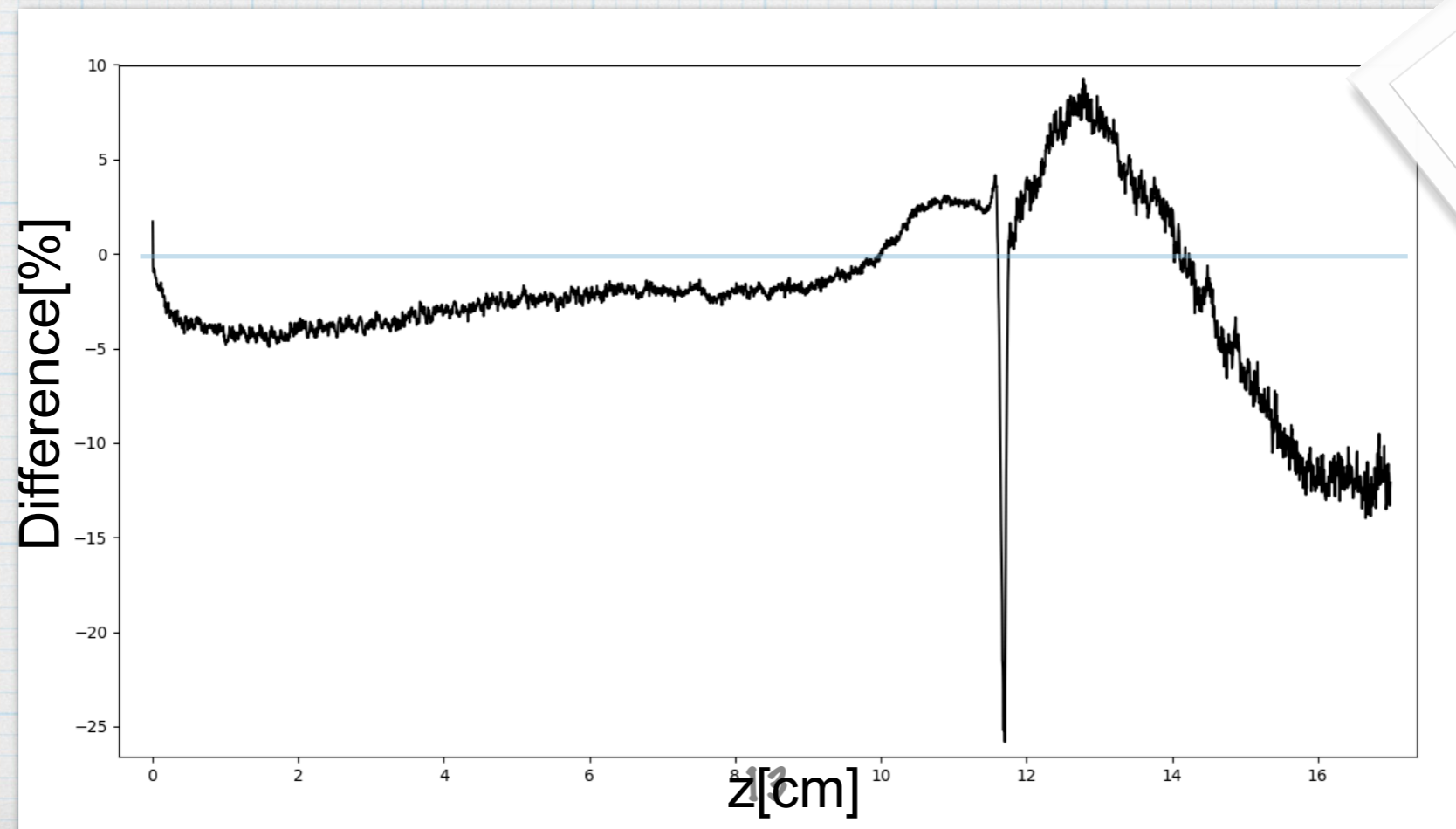
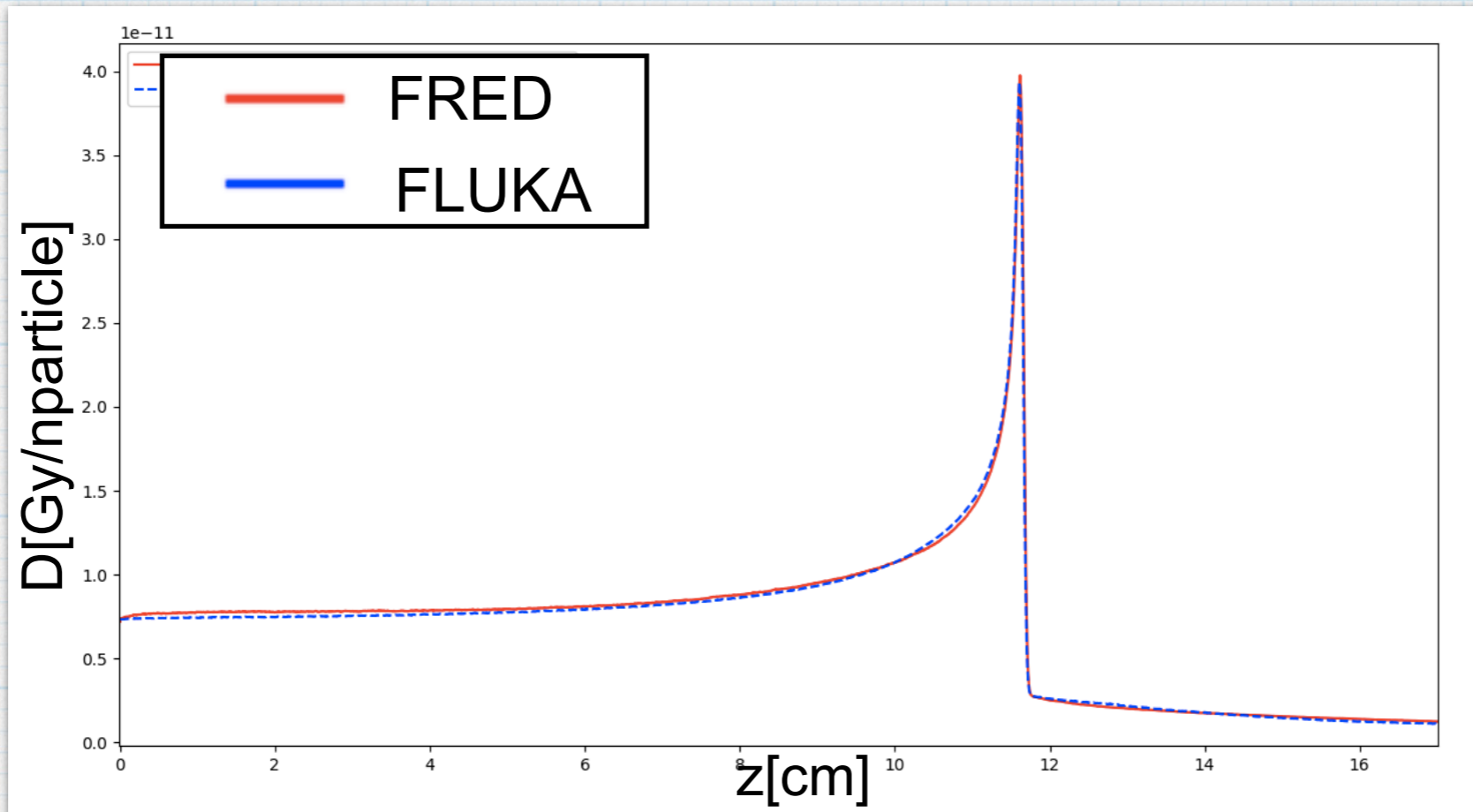
300MeV/u
 $\rho=1.644\text{g/cm}^3$
 $\text{bin}_z:0.05\text{mm}$



Senza Frammentazione

DDD Carbonio su Carbonio

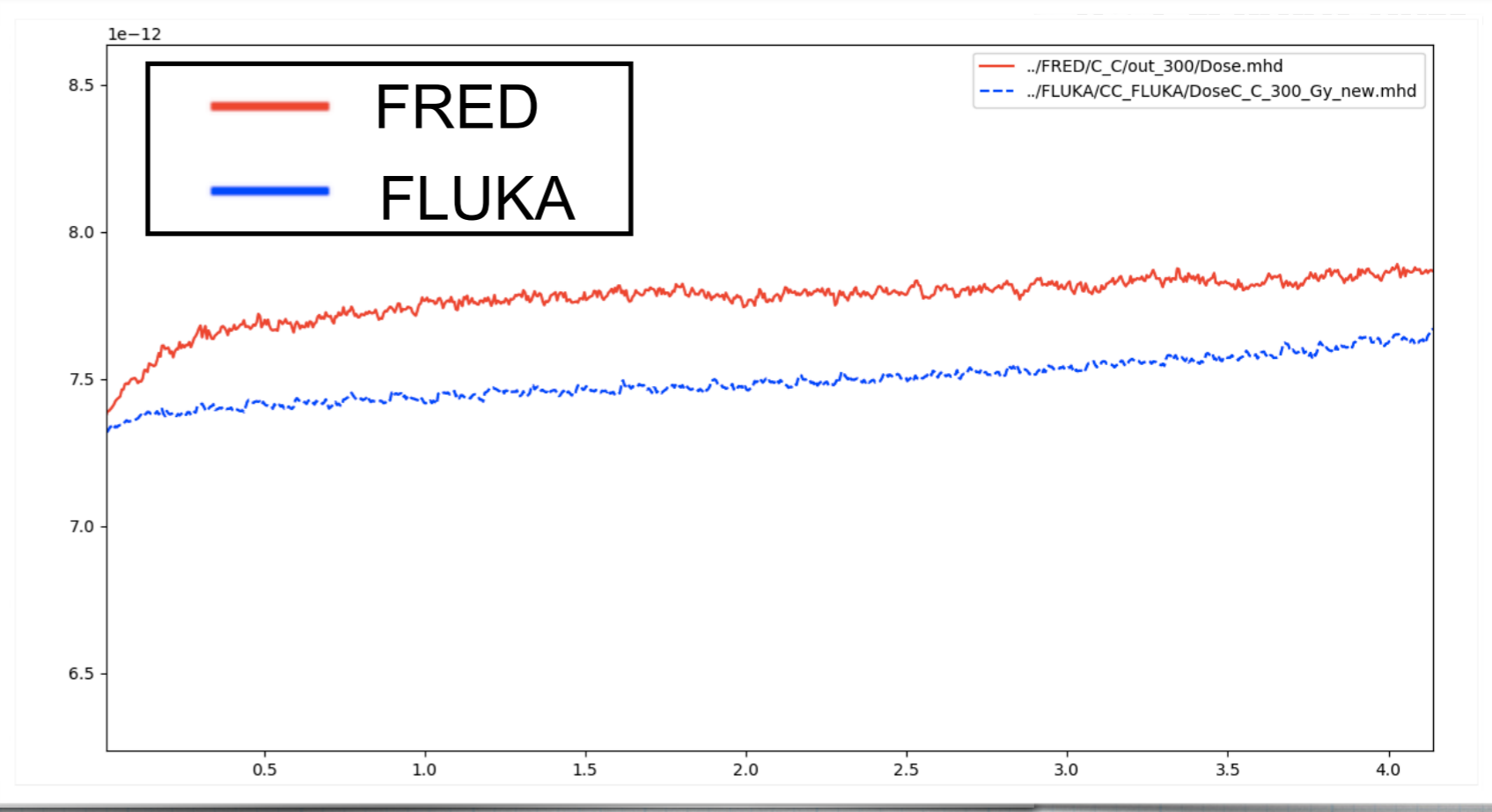
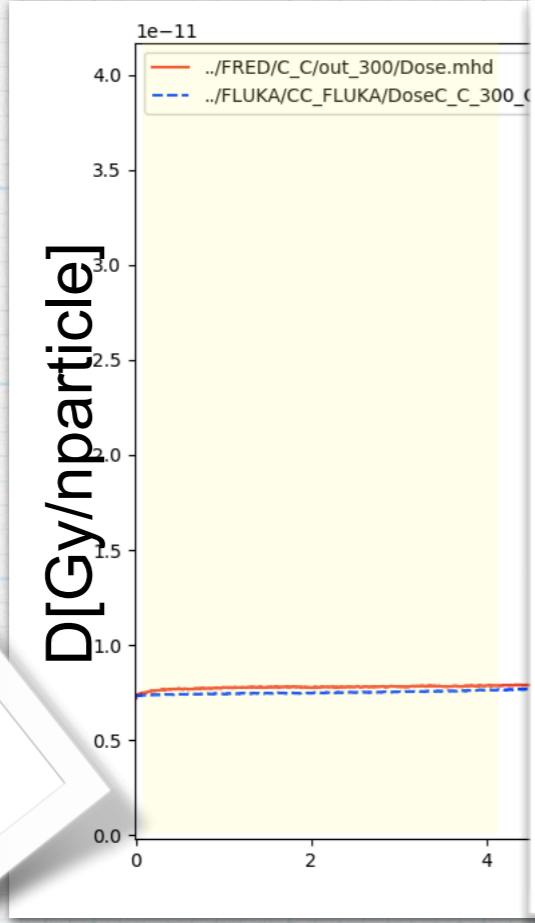
300MeV/u
 $\rho=1.644\text{g/cm}^3$
 $\text{bin}_z:0.05\text{mm}$



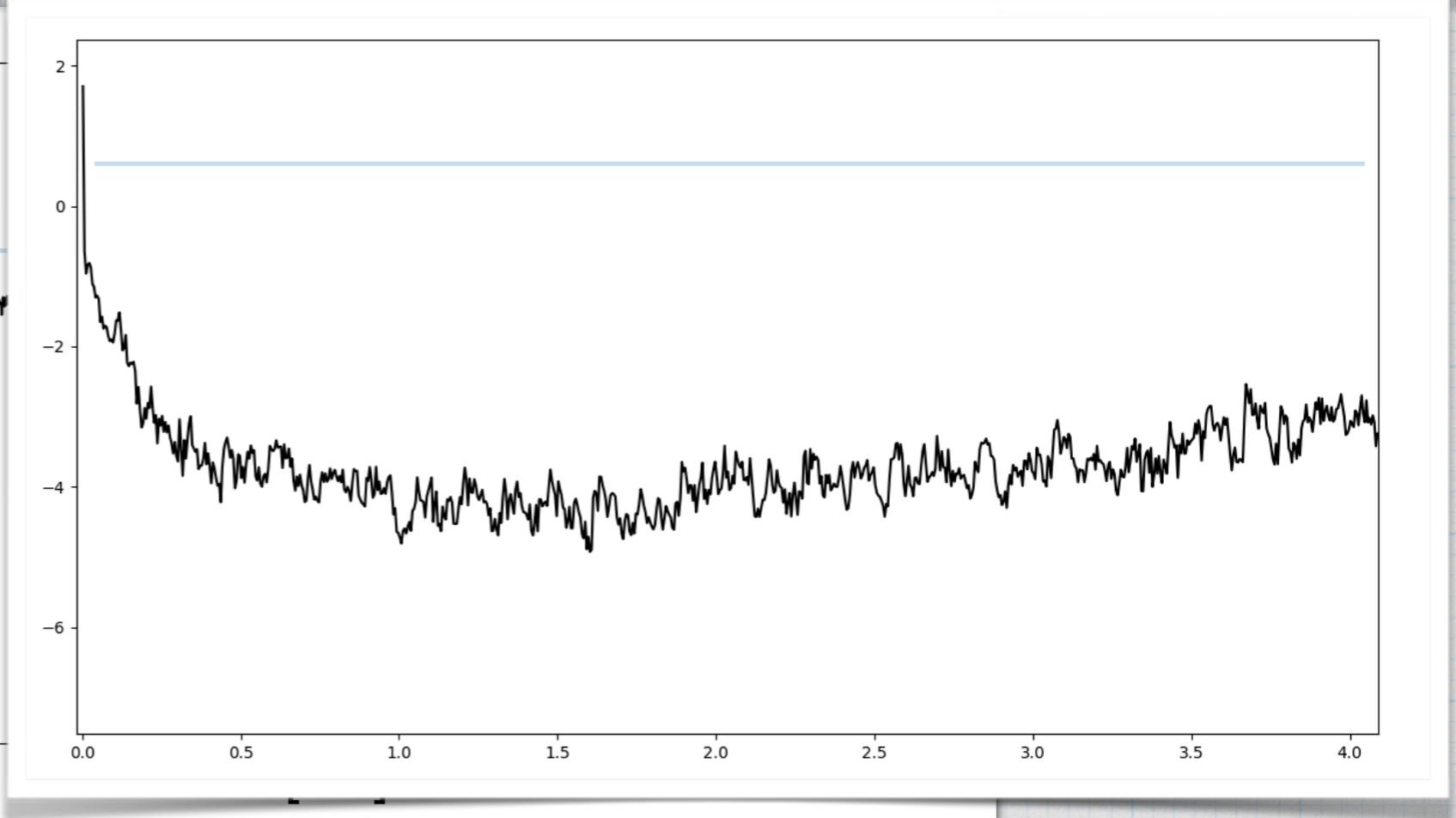
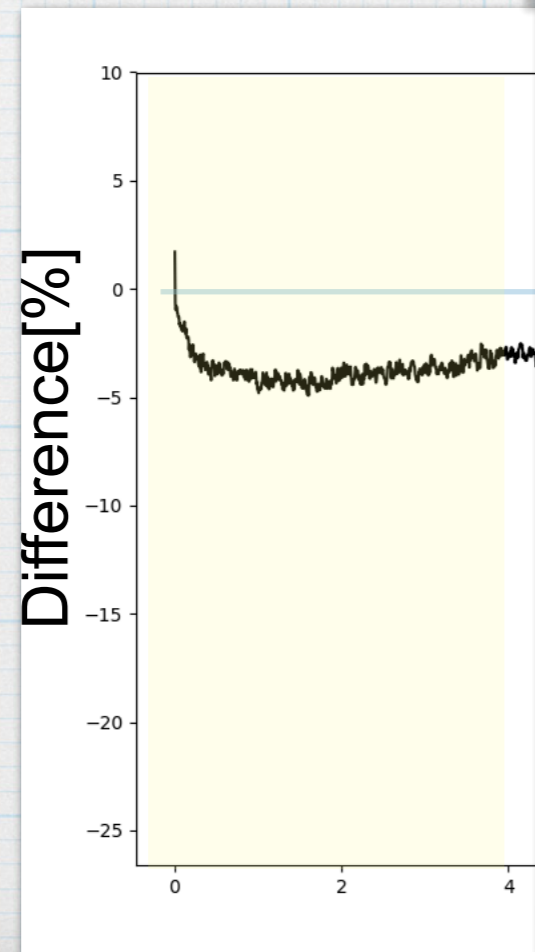
**Con
Frammentazione**

DDD Carbonio su Carbonio

300MeV/u



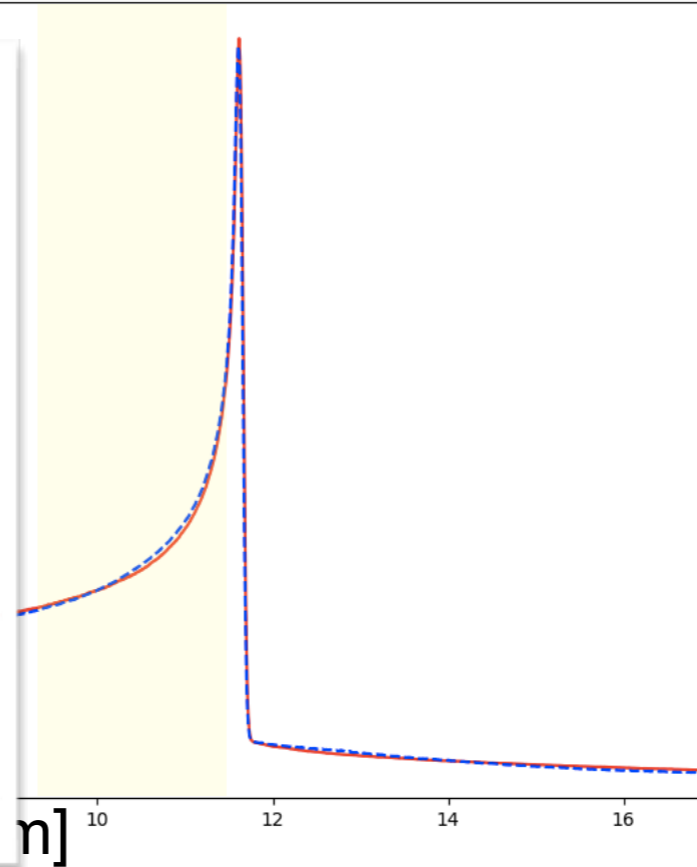
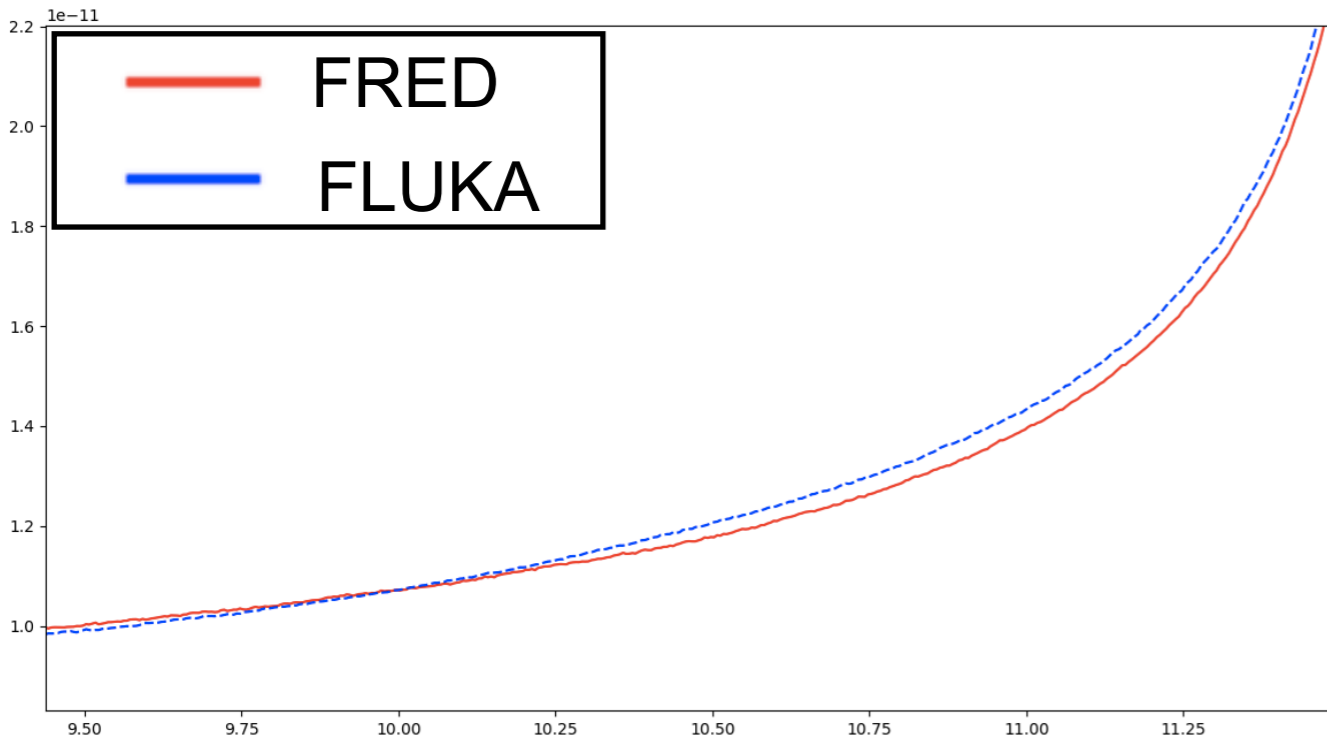
Con
Frammentazione



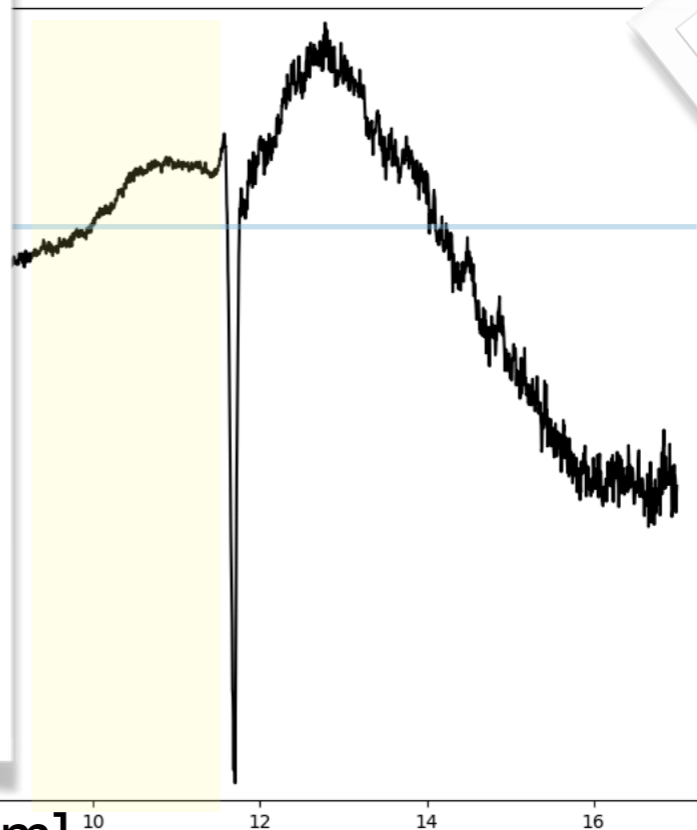
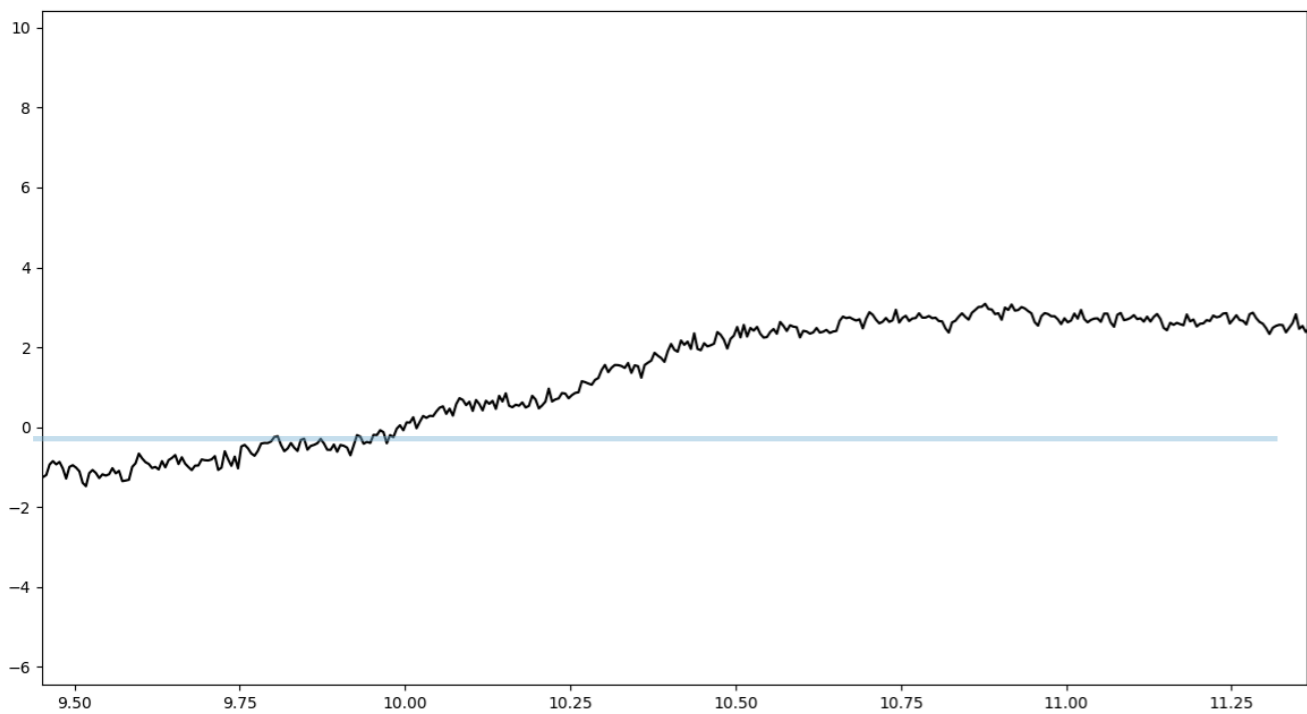
DDD Carbonio su Carbonio

300MeV/u
 $\rho=1.644\text{g/cm}^3$
 $\text{bin}_z:0.05\text{mm}$

4.0
1e-11
./FRED/C_C/out_300/Dose.mhd



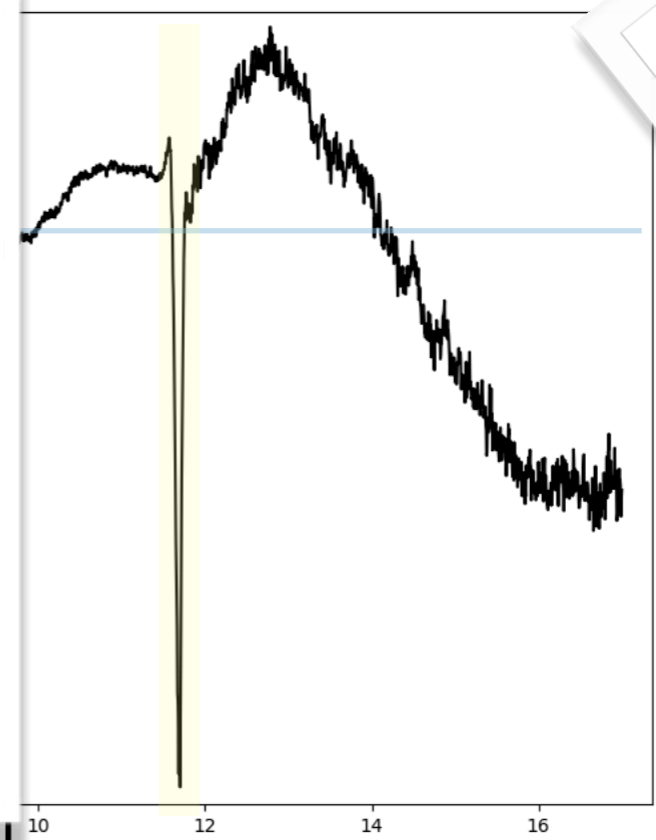
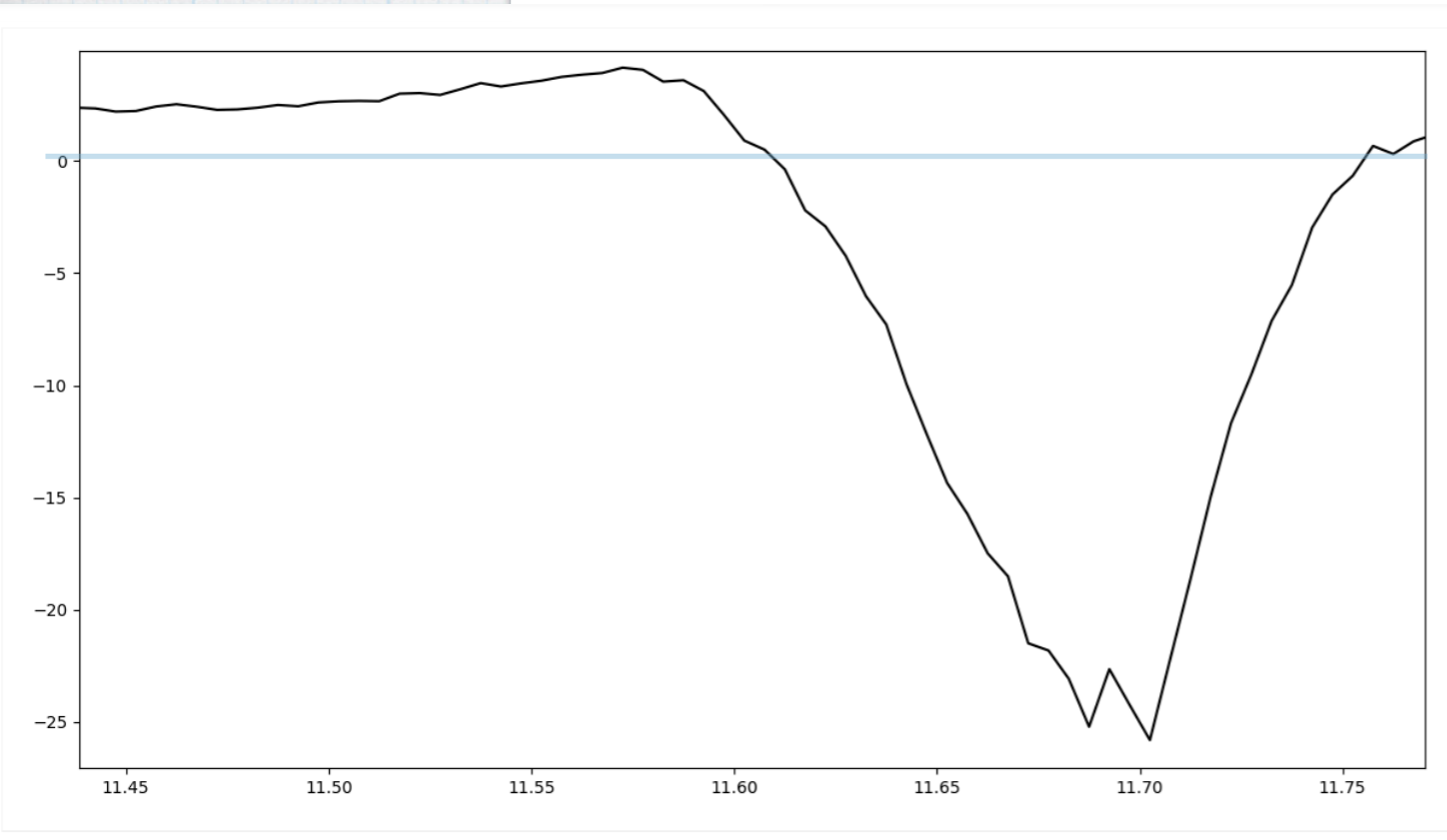
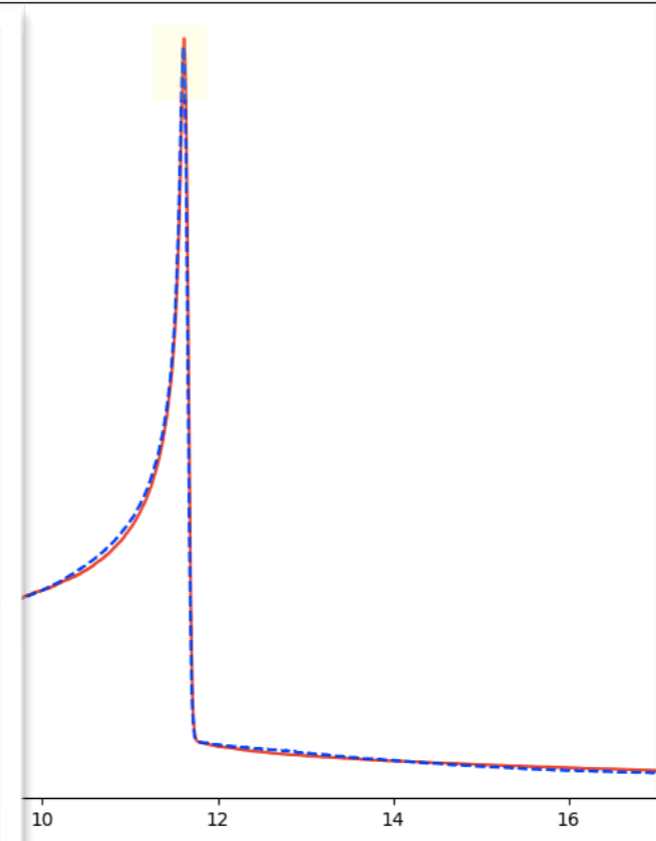
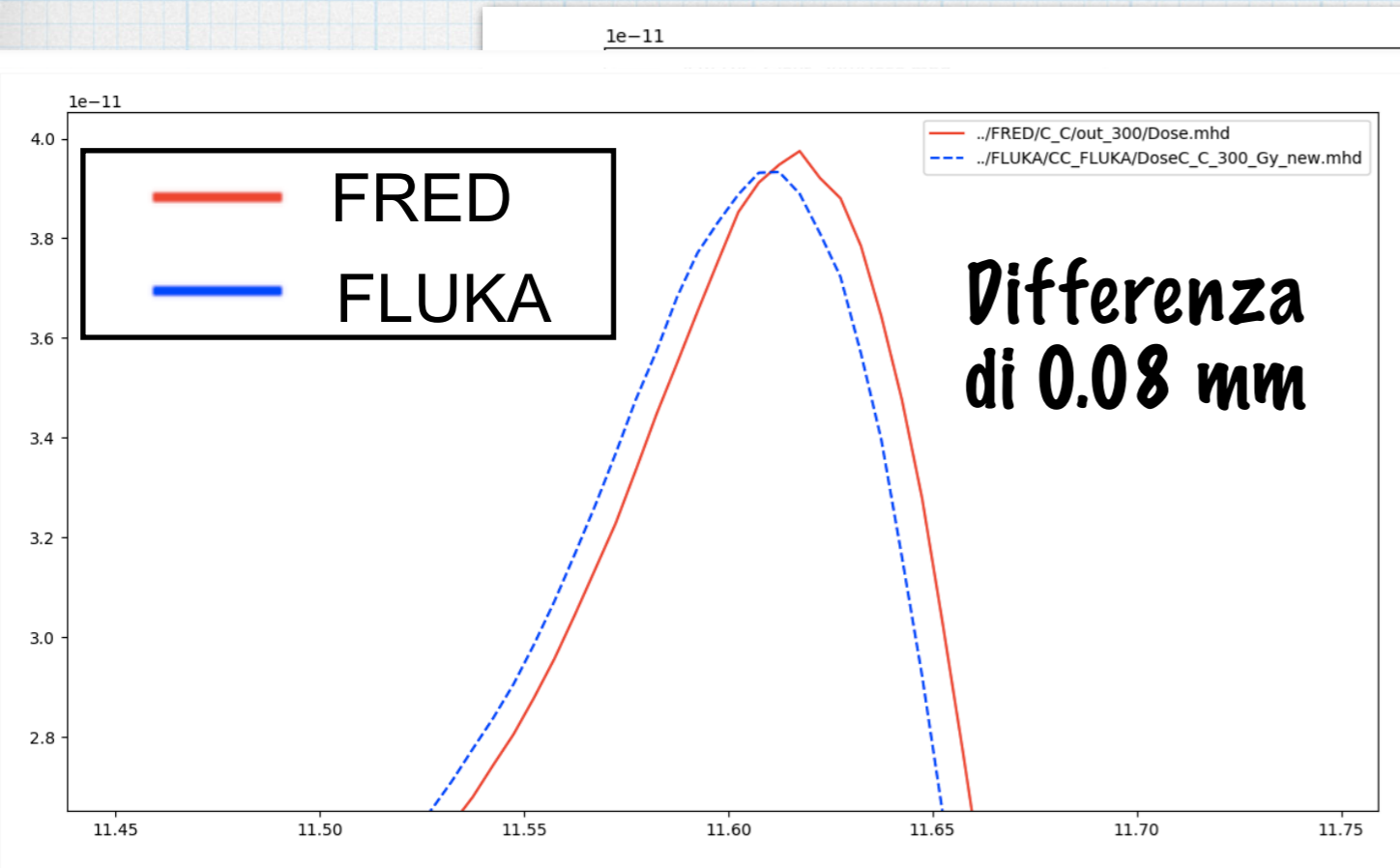
Con
Frammentazione



z[cm]

DDD Carbonio su Carbonio

300MeV/u
 $\rho=1.644\text{g/cm}^3$
 $\text{bin}_z:0.05\text{mm}$

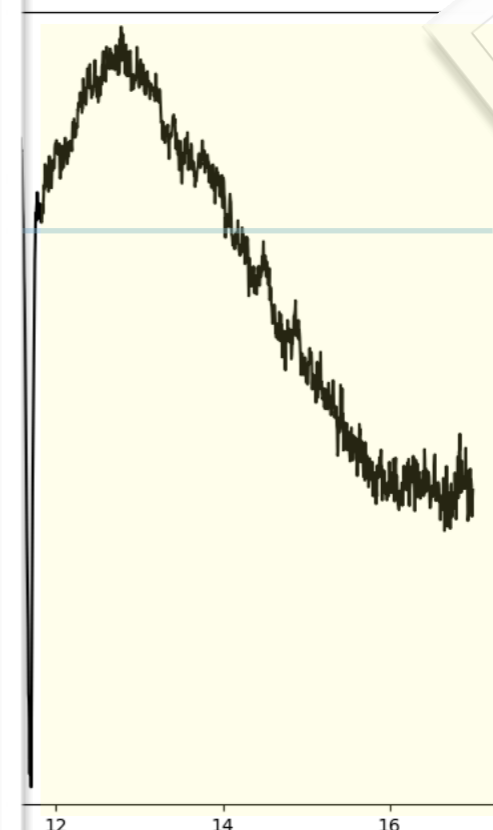
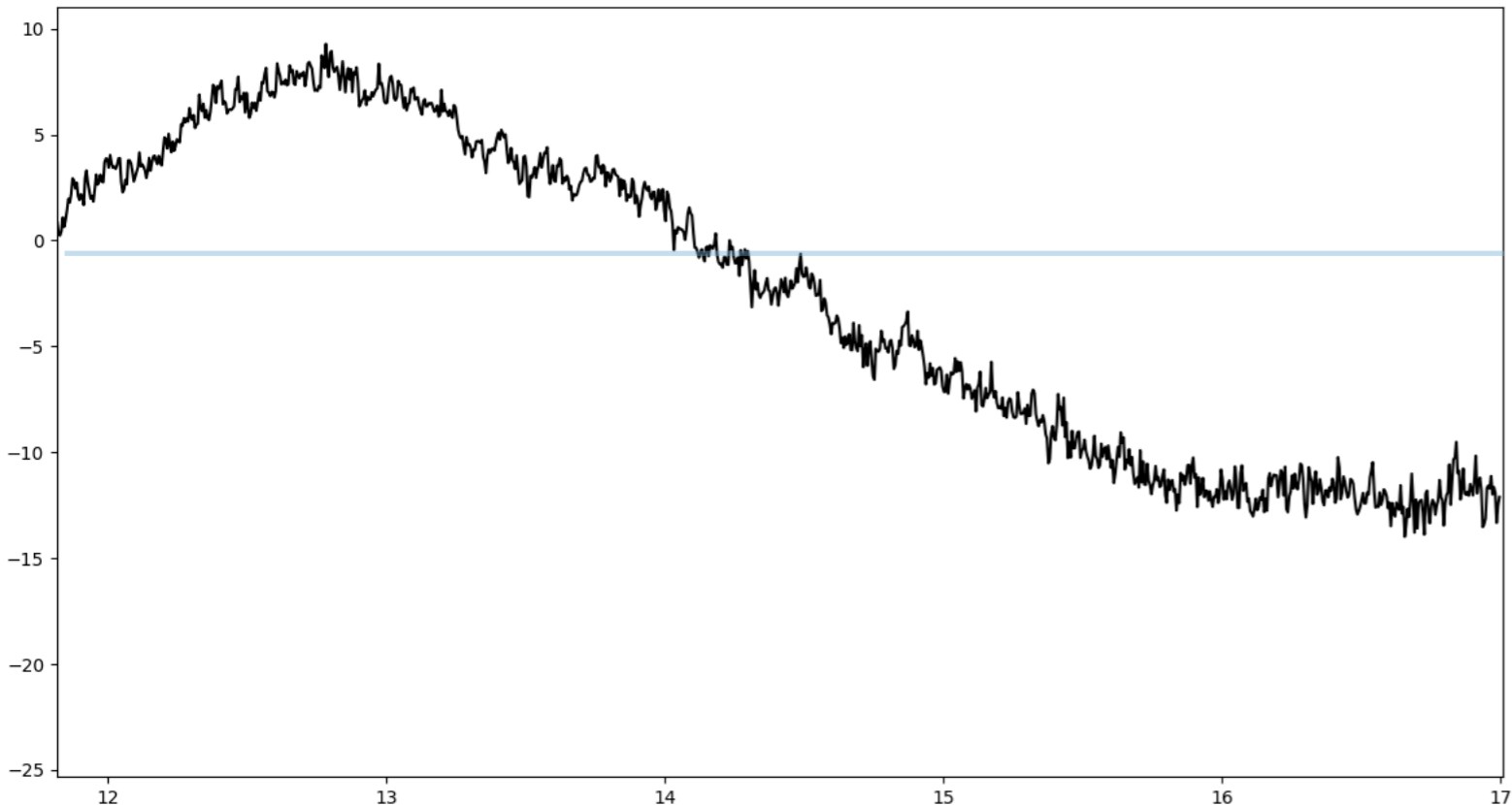
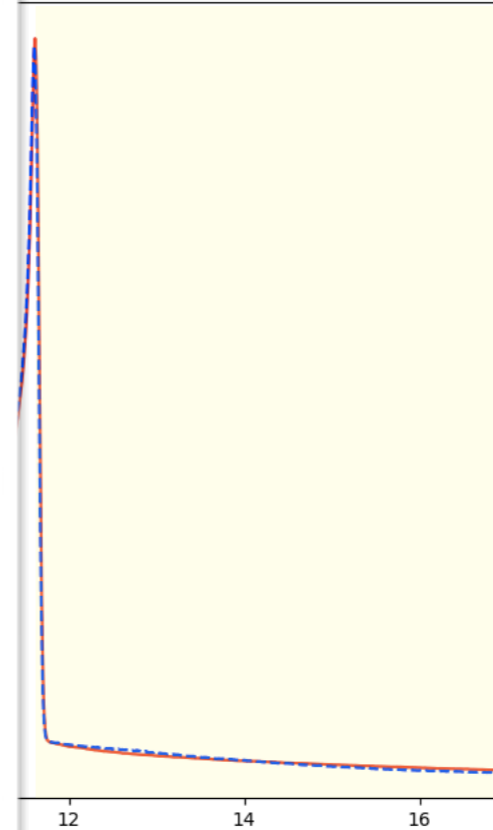
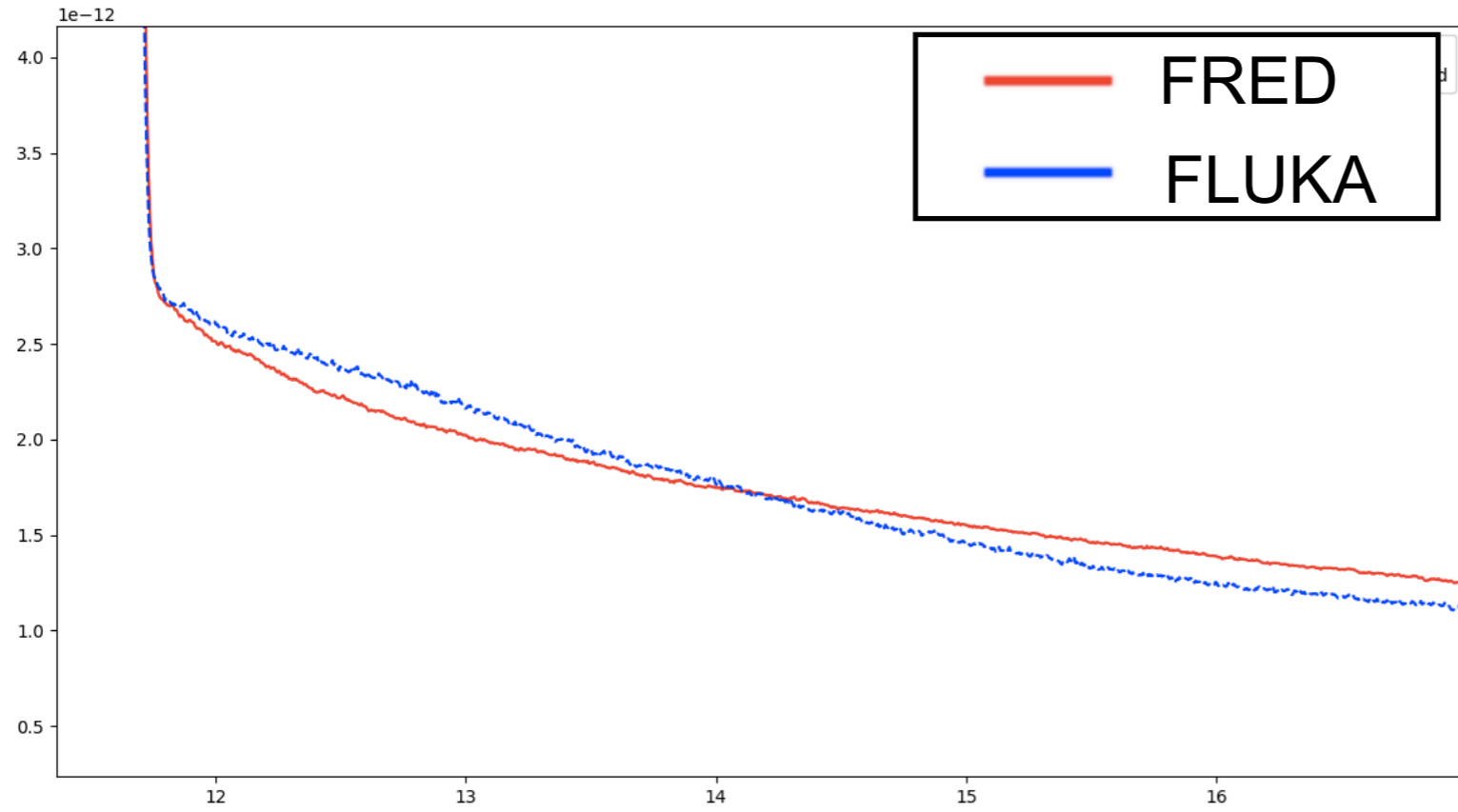


Con Frammentazione

$z[\text{cm}]$

DDD Carbonio su Carbonio

300MeV/u
 $\rho=1.644\text{g/cm}^3$
 $\text{bin}_z:0.05\text{mm}$

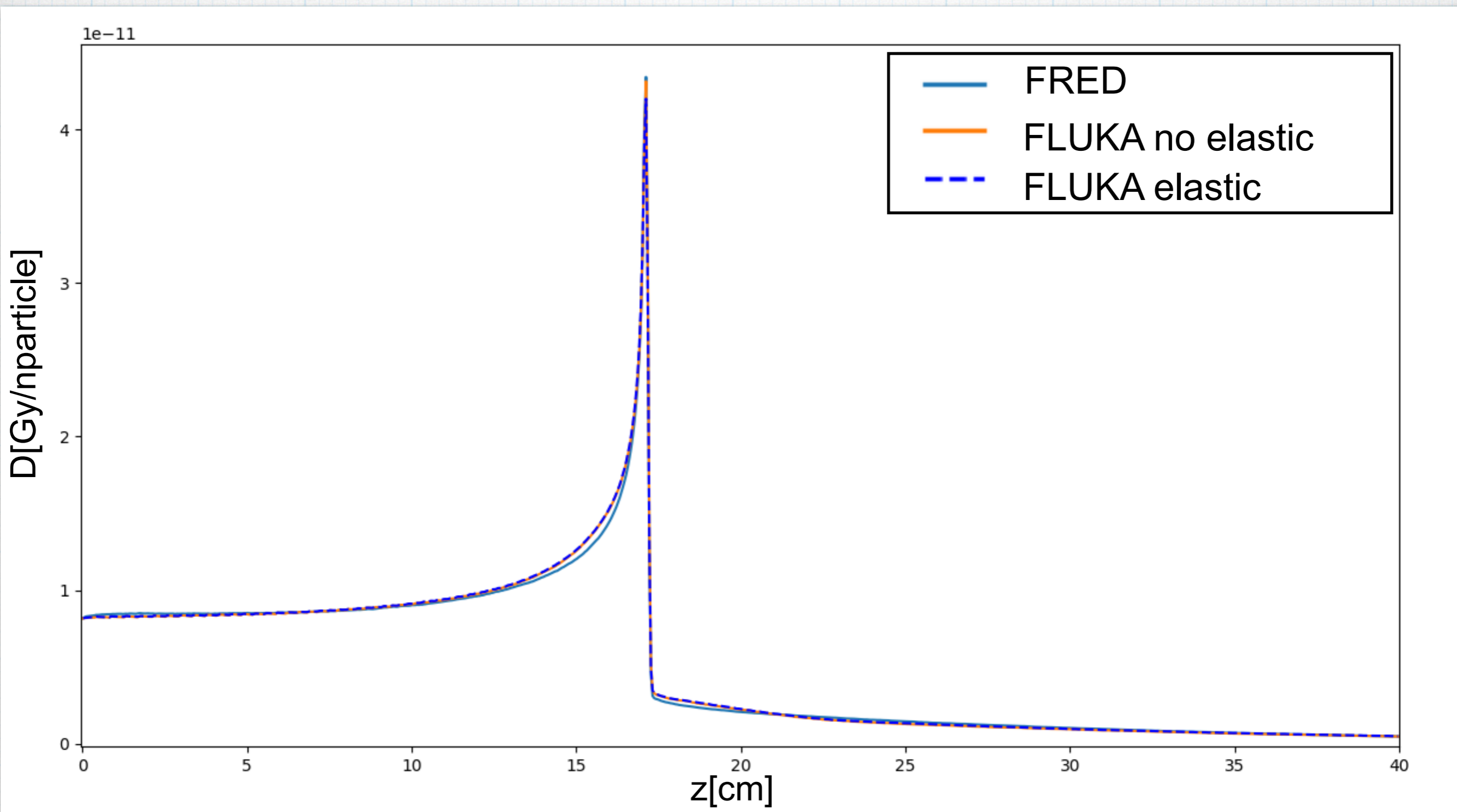


**Con
Frammentazione**

Carbonio su Acqua:
test per capire a cosa sono
dovute le discrepanze sulla
salita e sul plateau.
Tutti i test sono con la
frammentazione attivata.

DDD Carbonio su Acqua - Test 1: Controllo del contributo della componente elastica

300MeV/u
bin_z:0.5mm



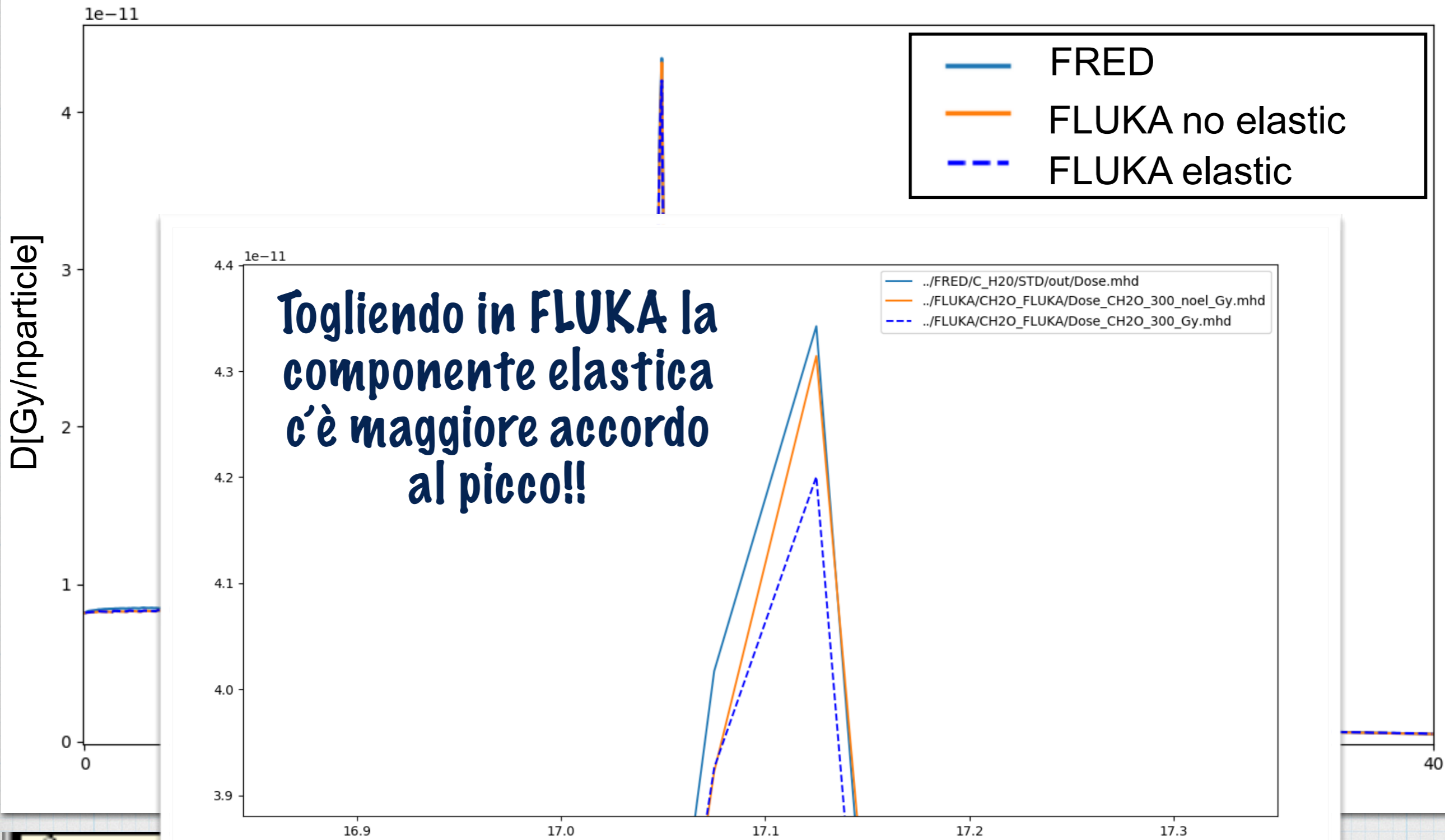
 **THRESHOL**

Elastic: 100

Inelastic:

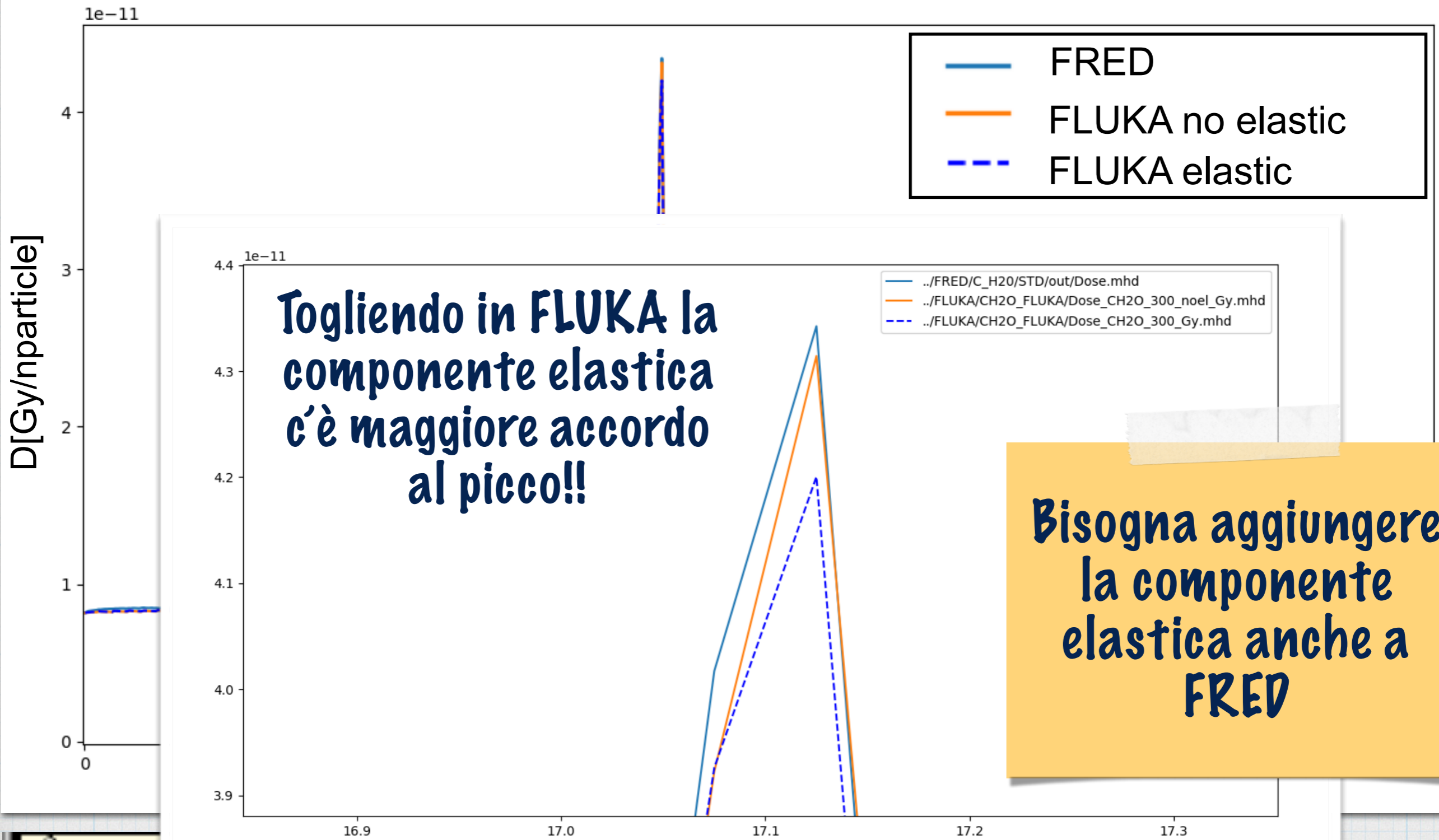
DDD Carbonio su Acqua - Test 1: Controllo del contributo della componente elastica

300MeV/u
bin_z:0.5mm



DDD Carbonio su Acqua - Test 1: Controllo del contributo della componente elastica

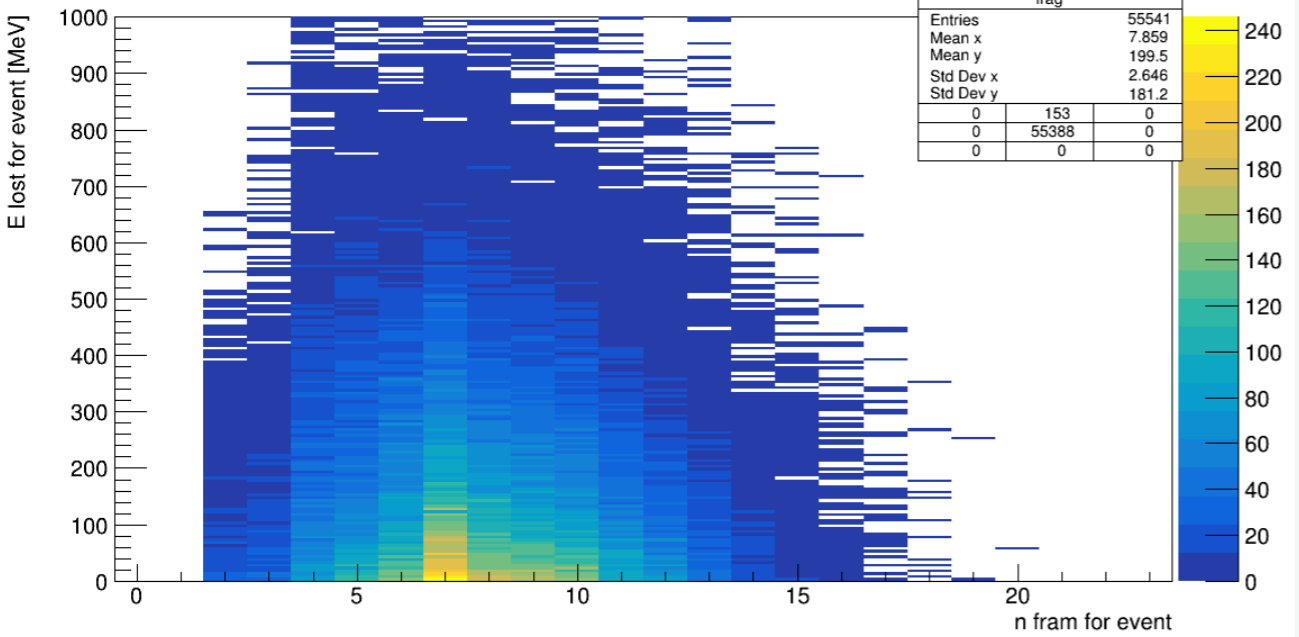
300MeV/u
bin_z:0.5mm



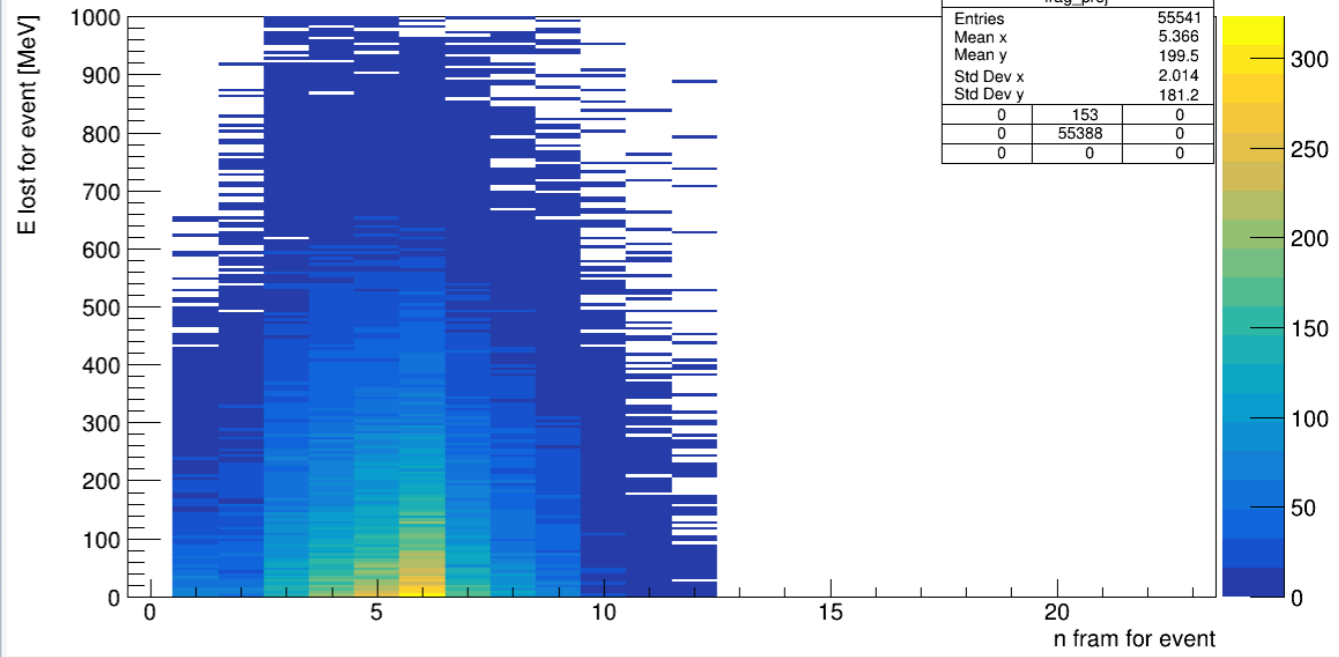
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300 MeV/u
bin_z: 0.5 mm

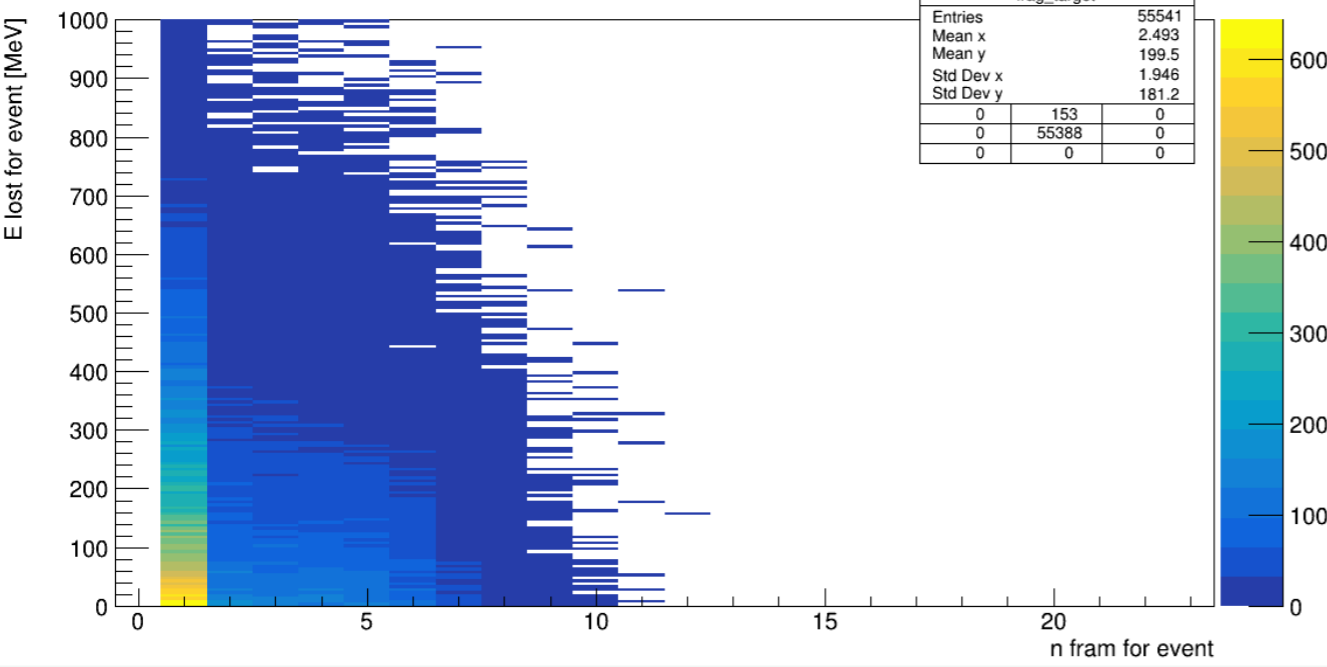
fragments VS energy lost



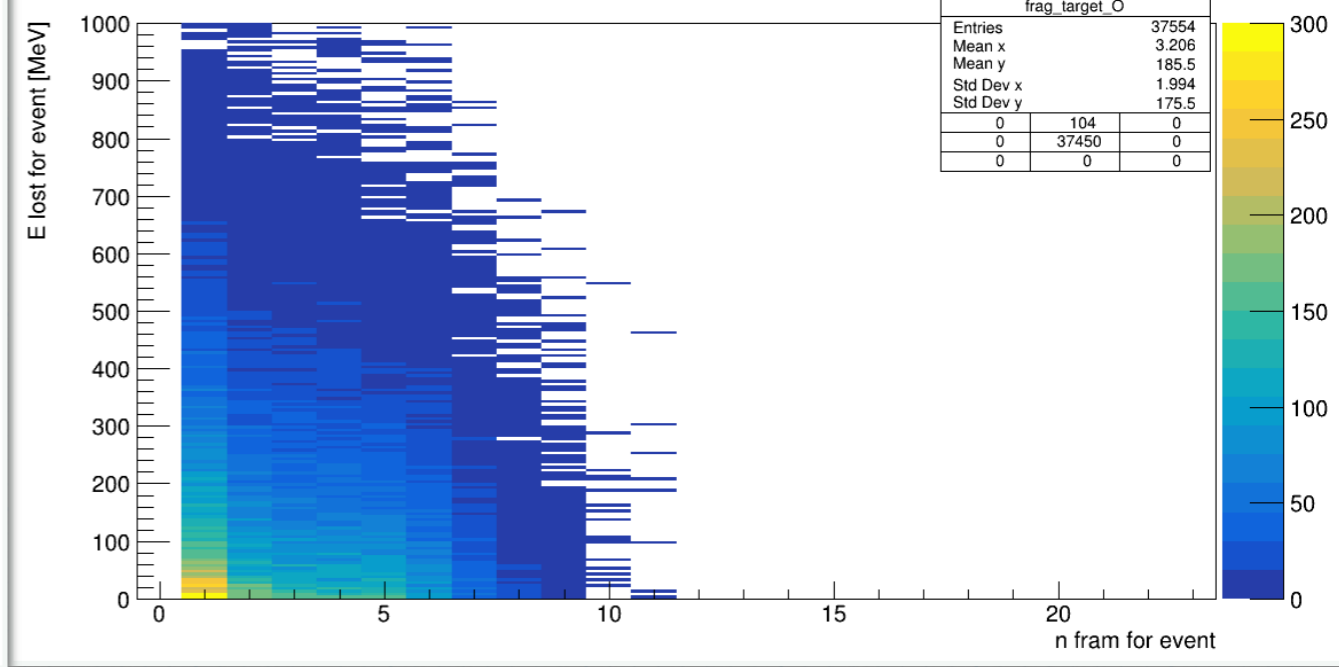
fragments proj VS energy lost



fragments target VS energy lost

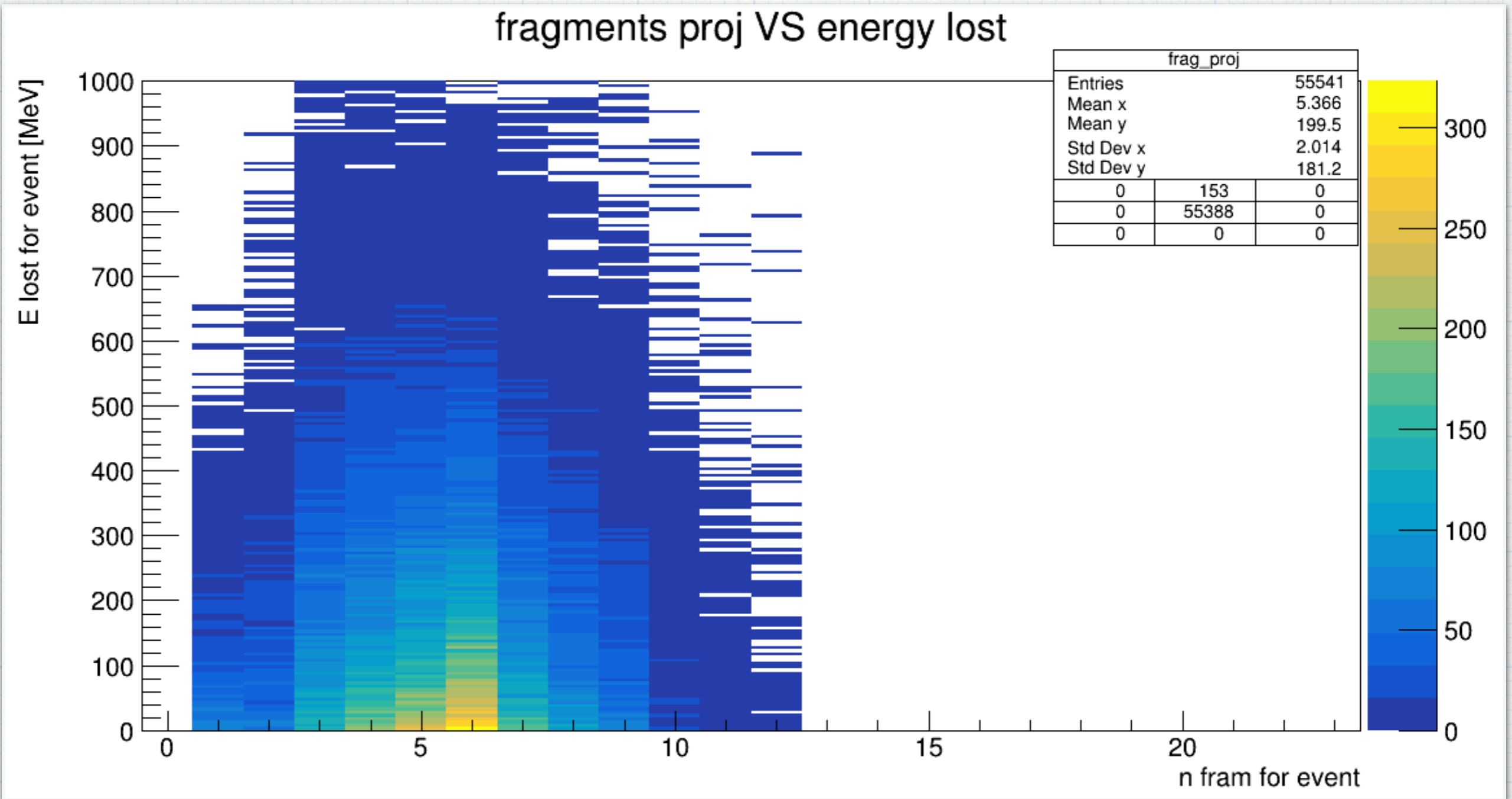


fragments target O VS energy lost



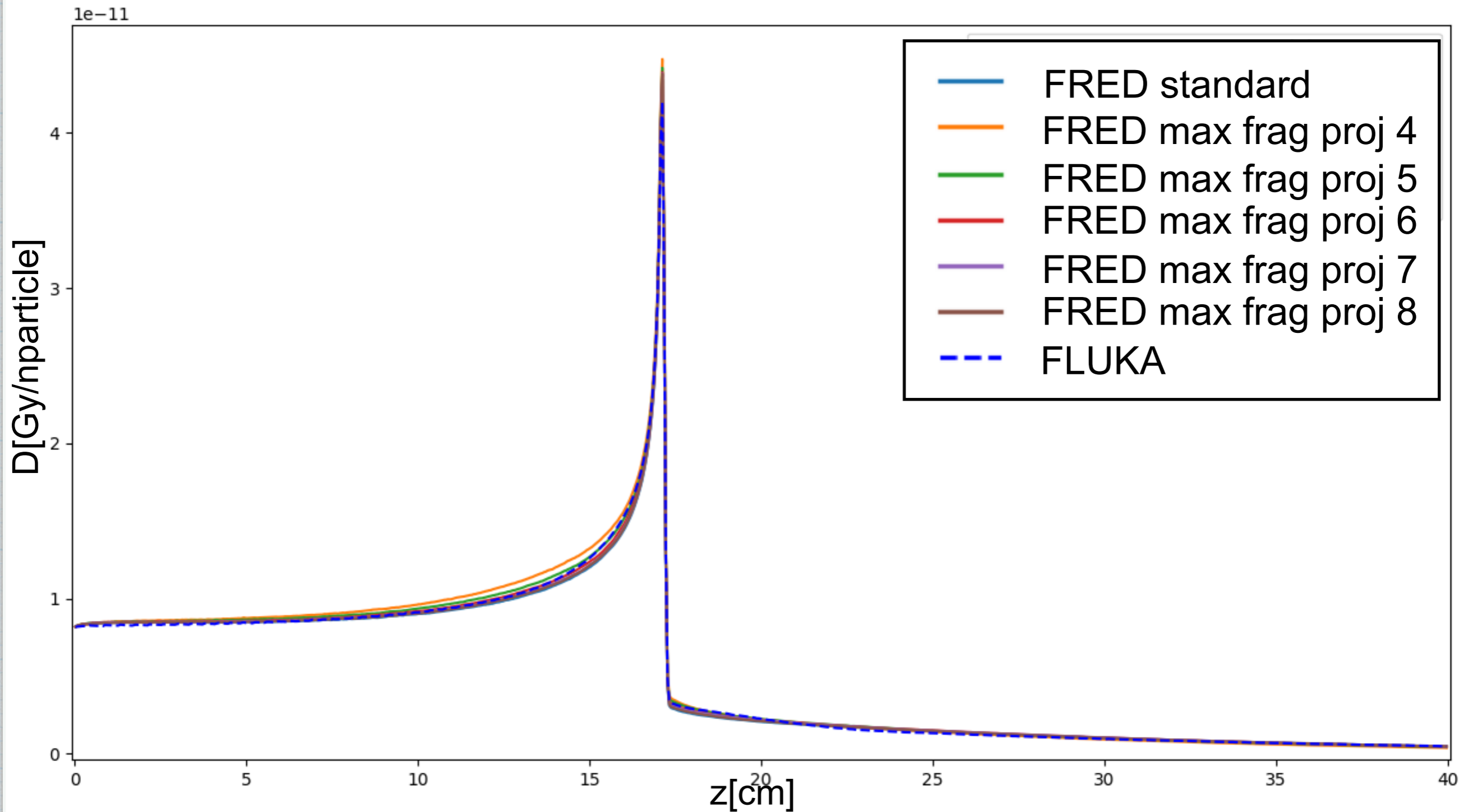
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300 MeV/u
bin_z: 0.5 mm



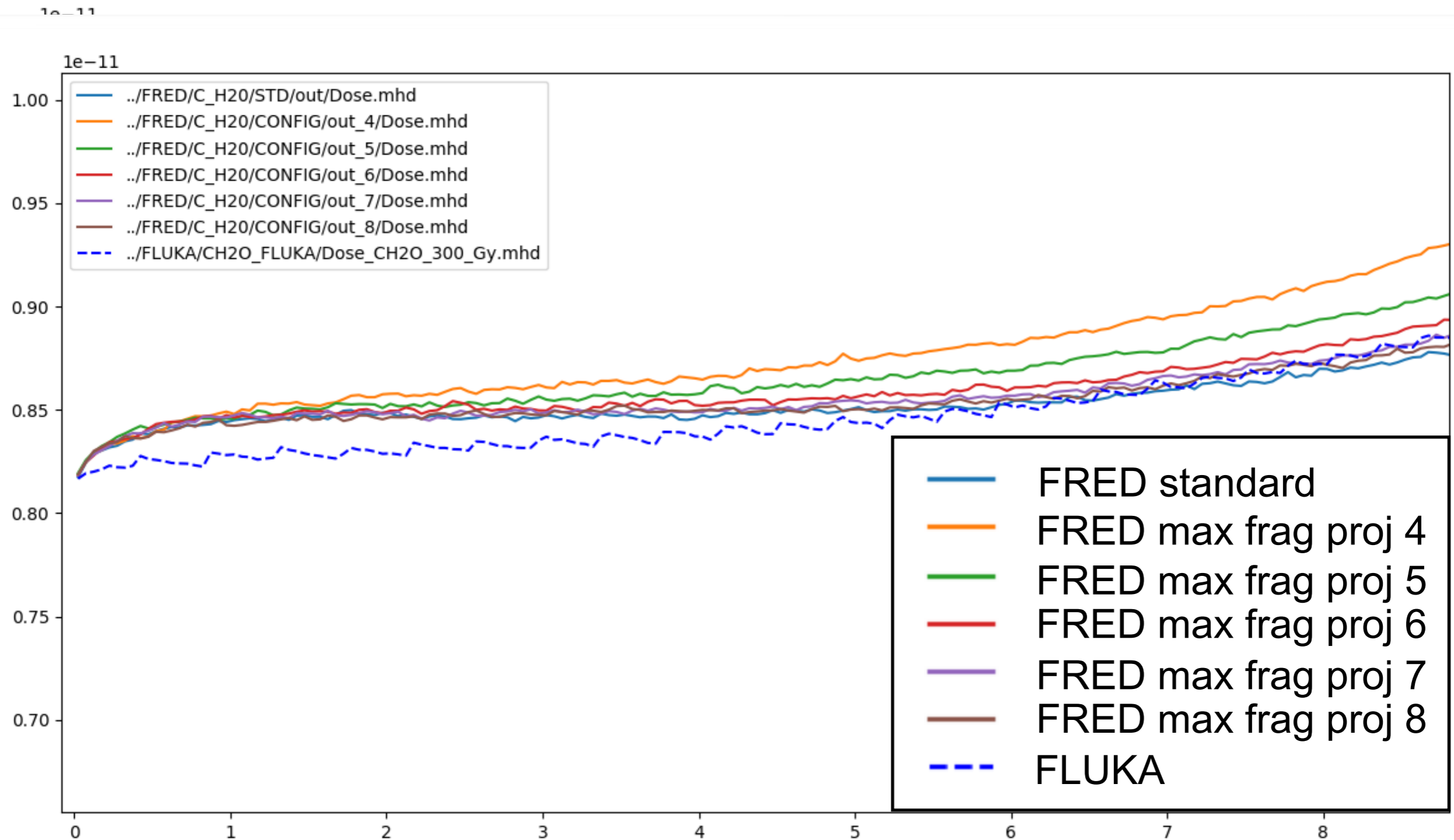
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



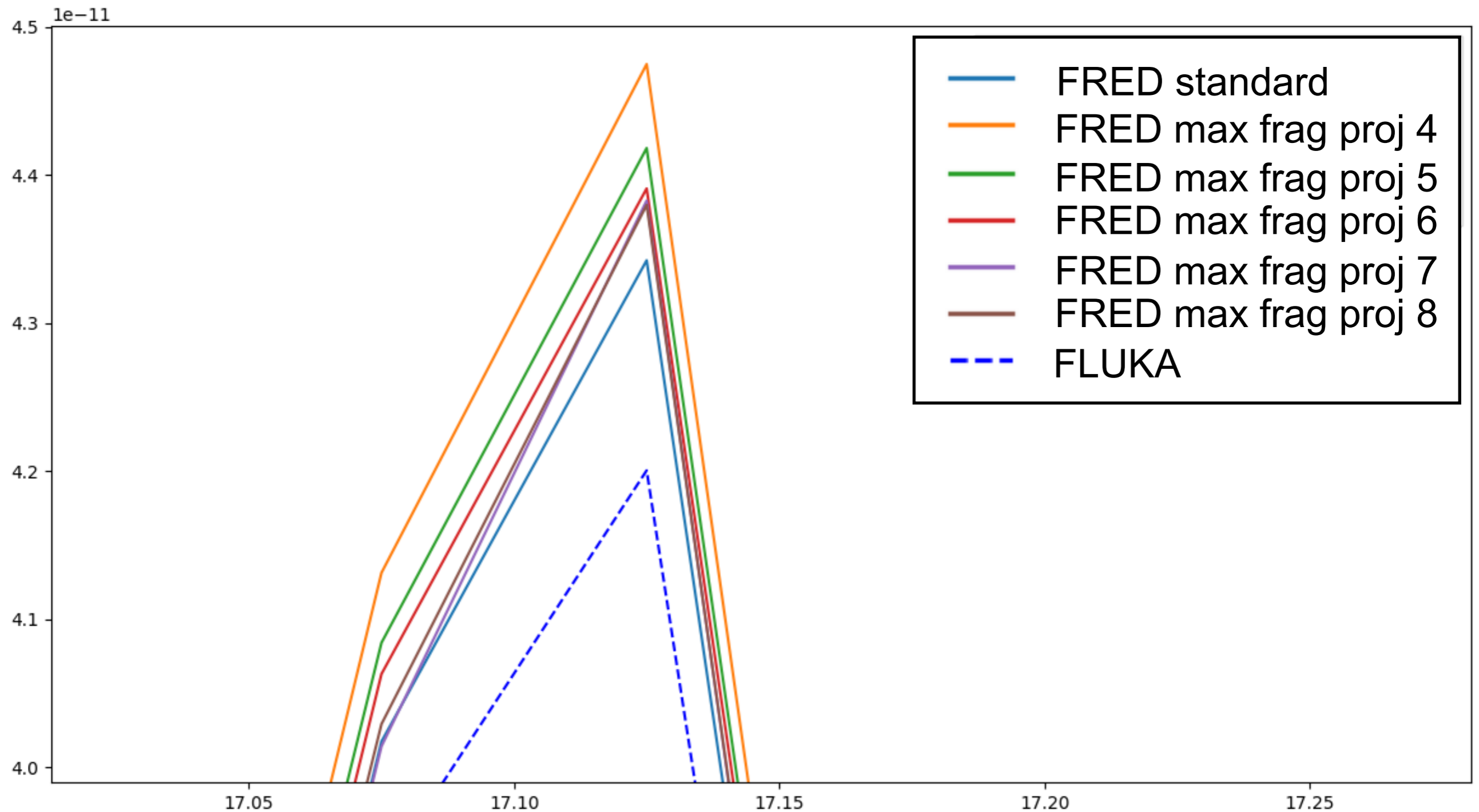
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



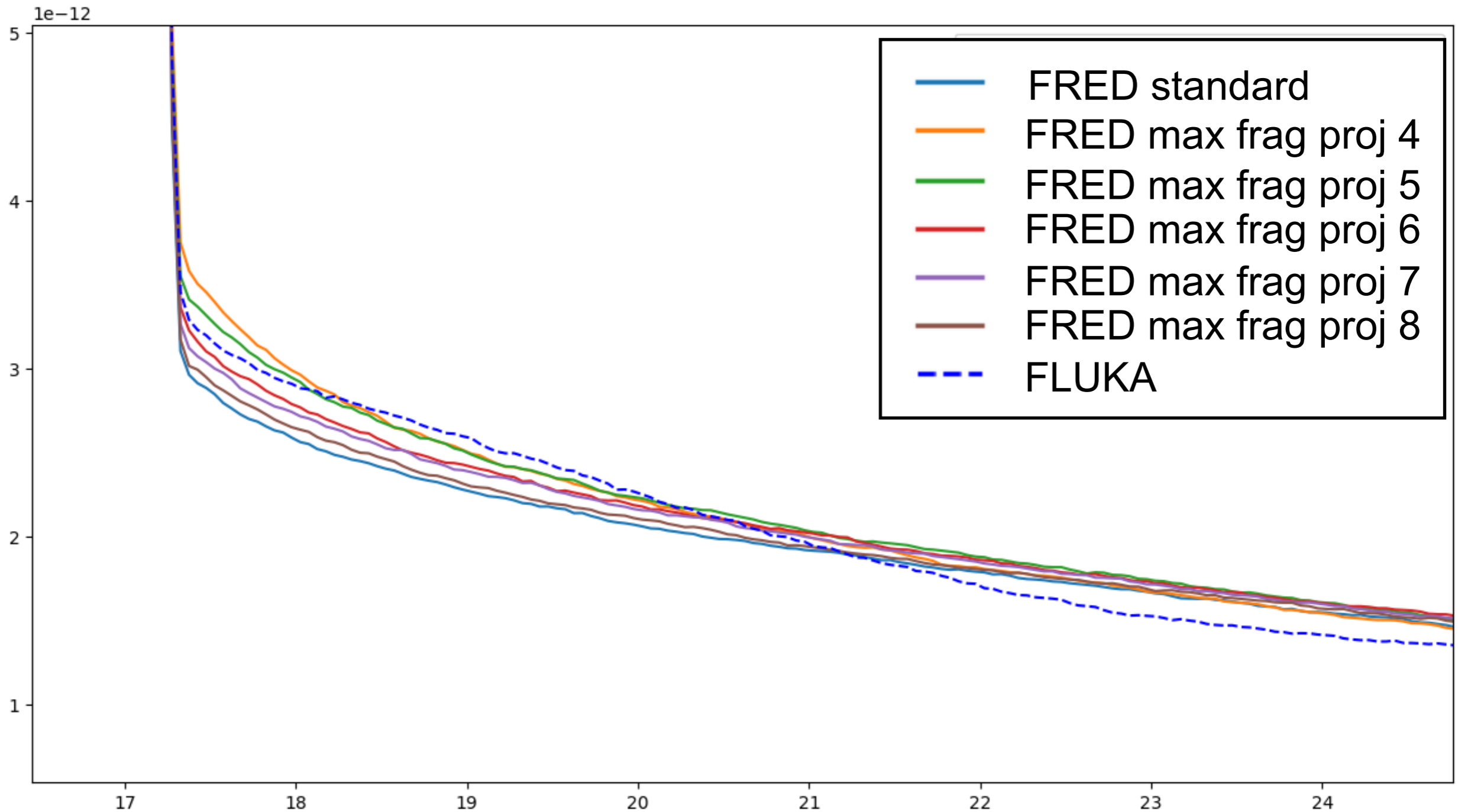
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



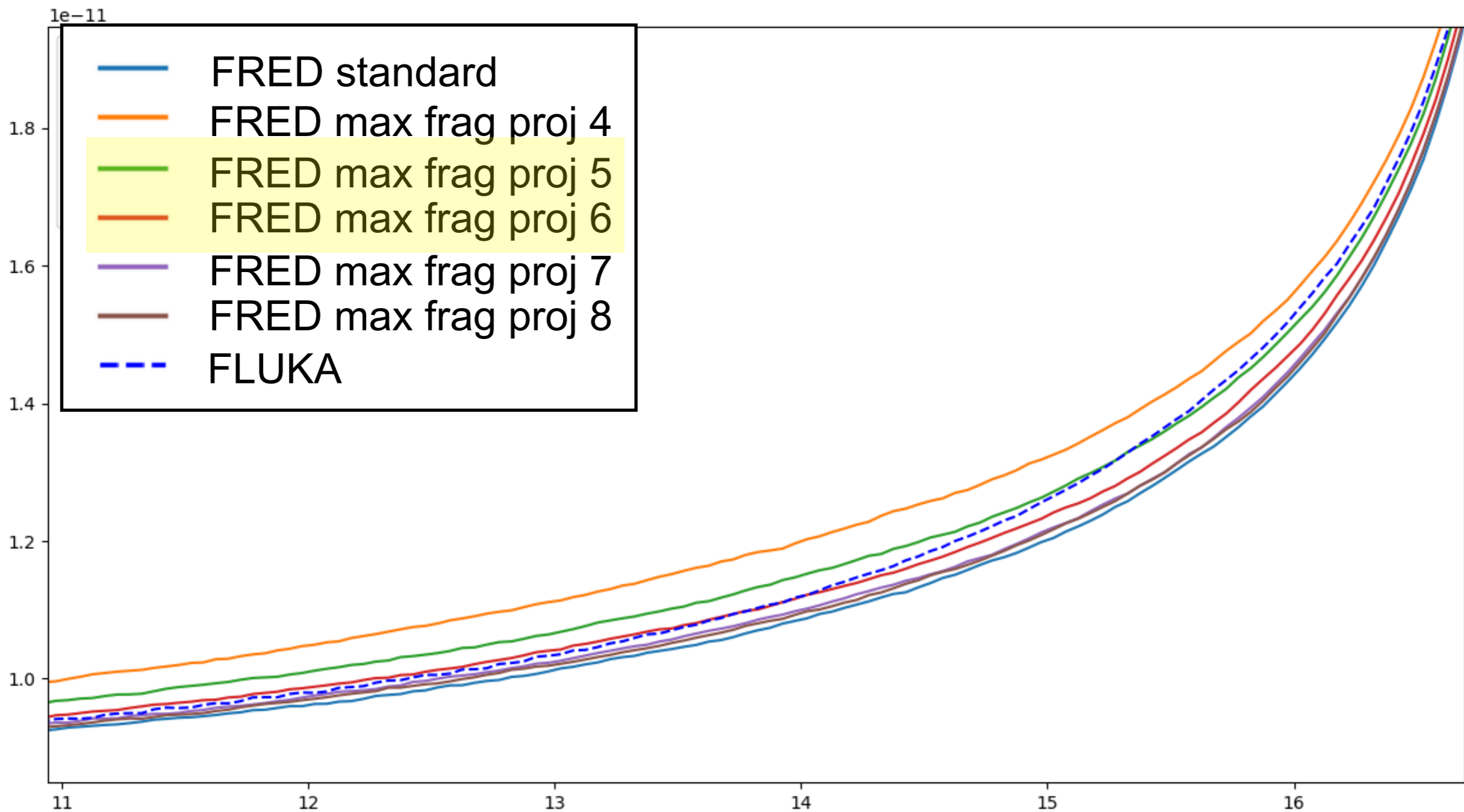
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



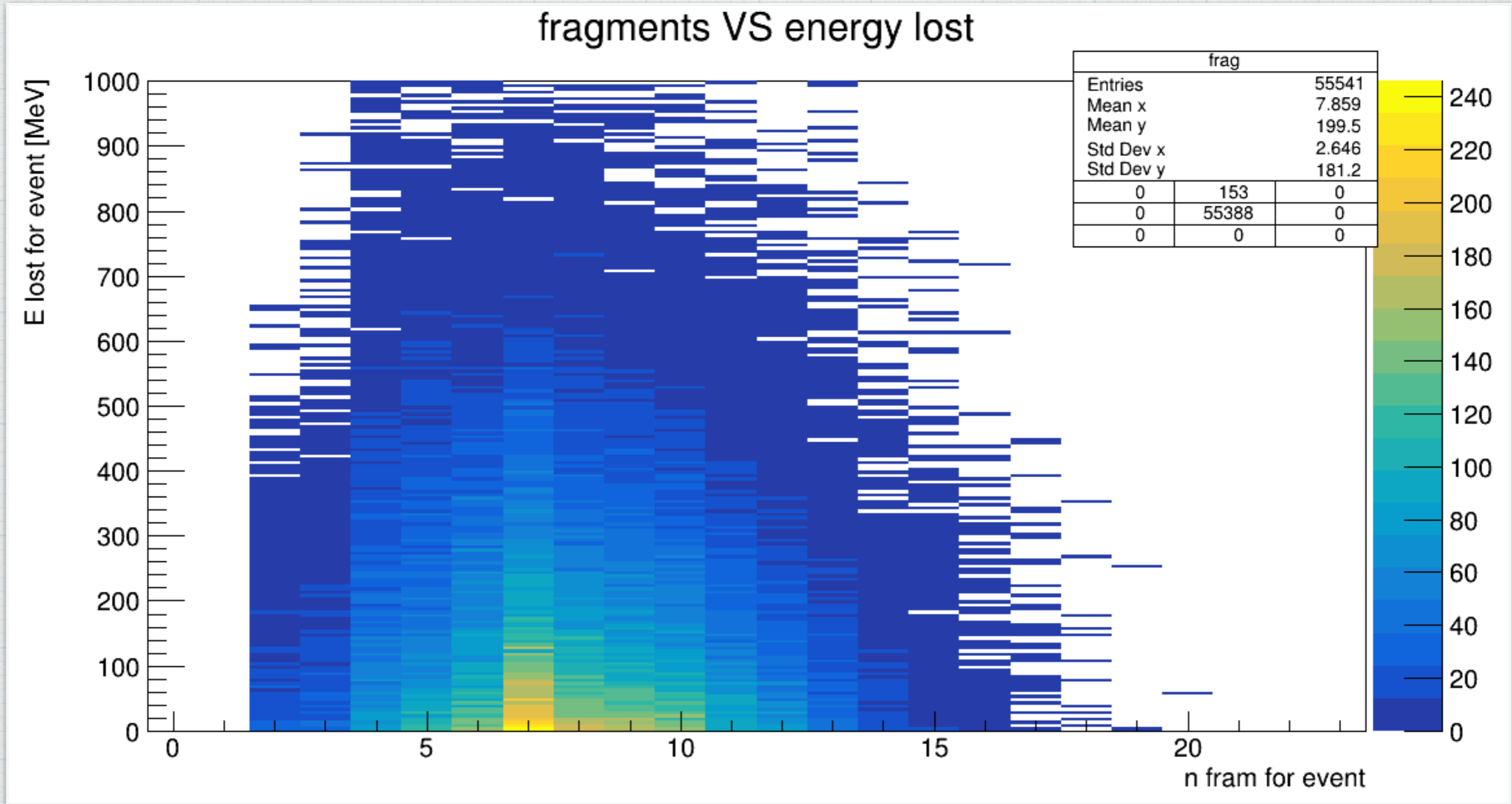
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



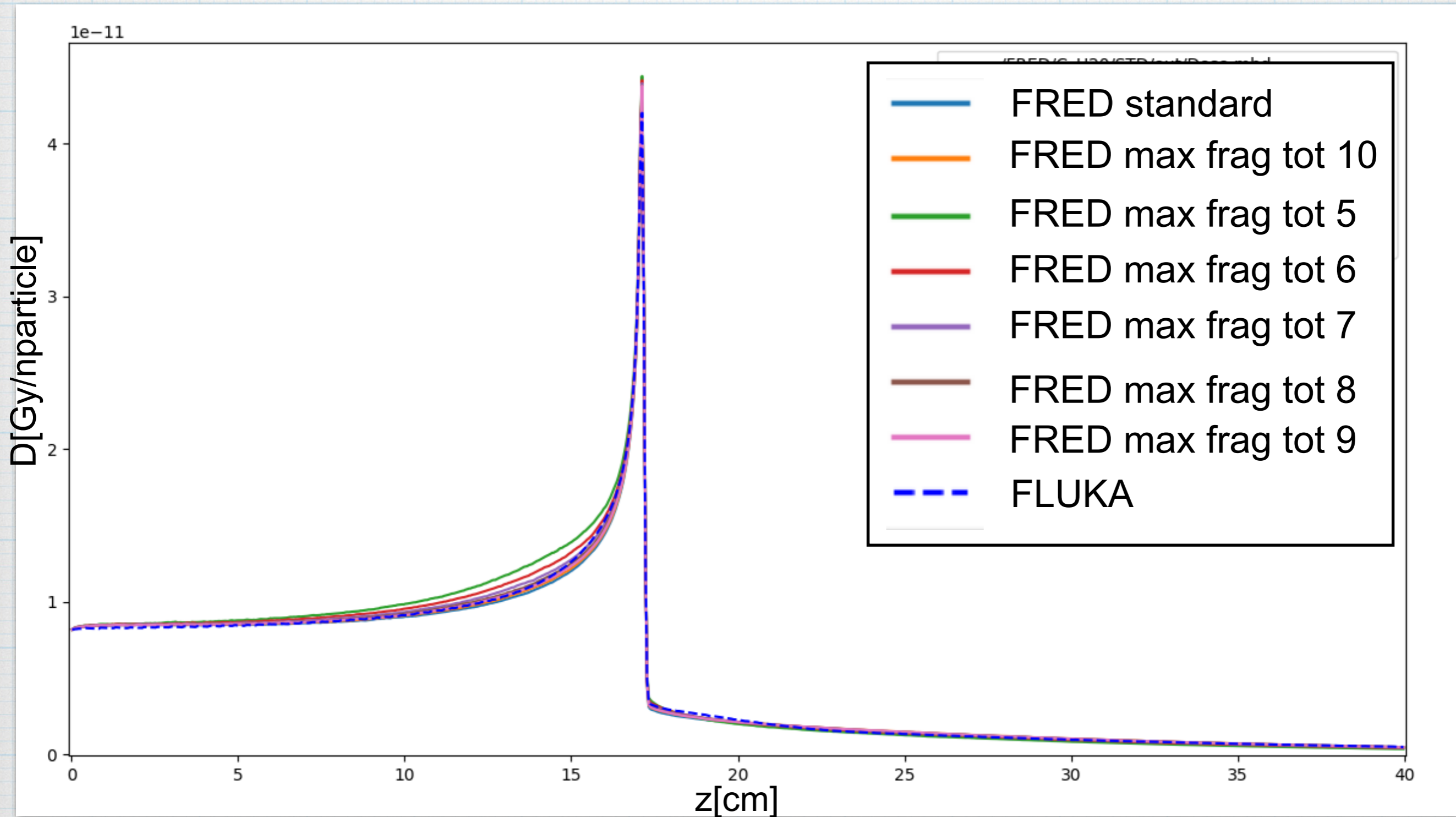
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



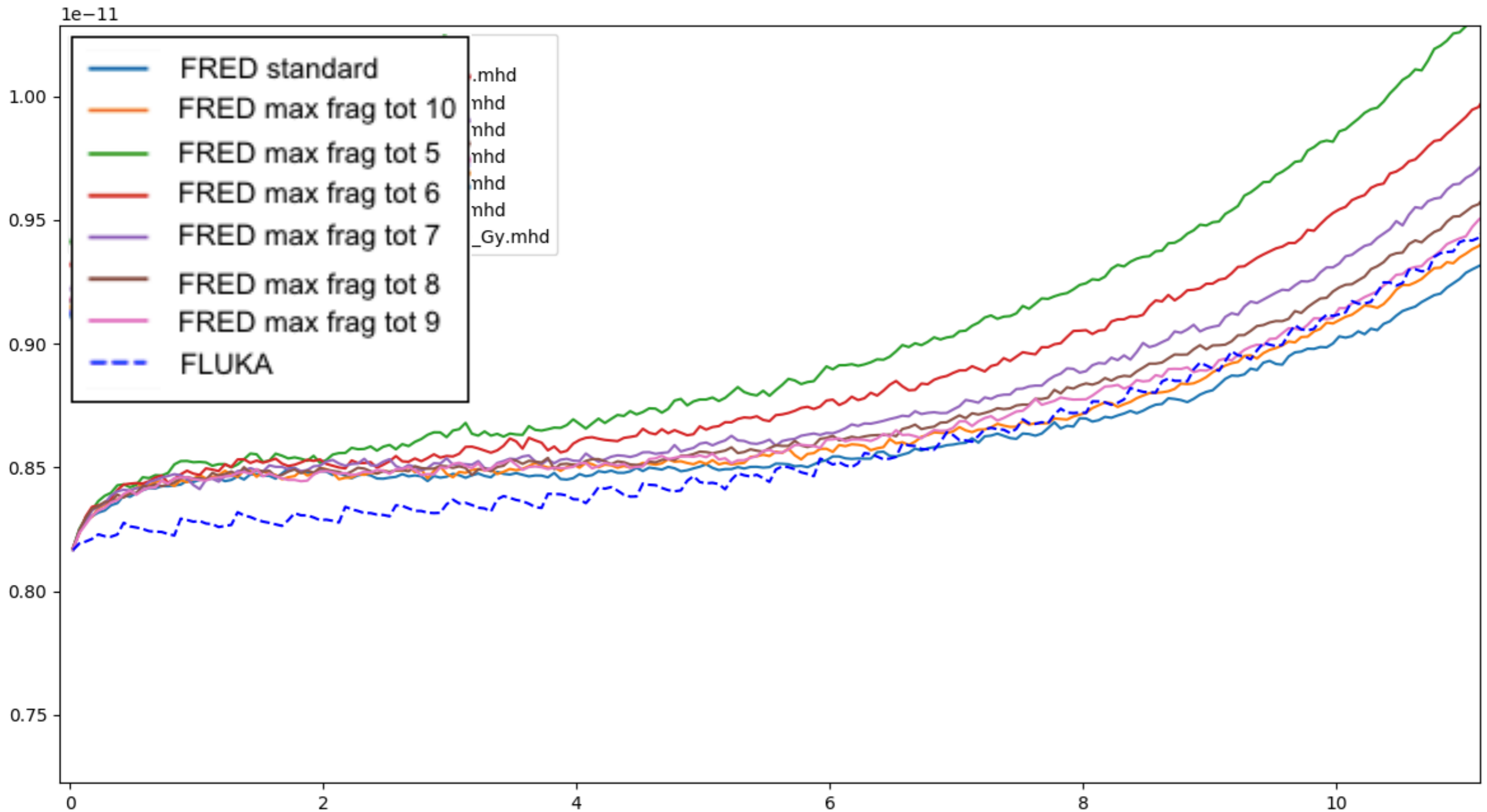
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



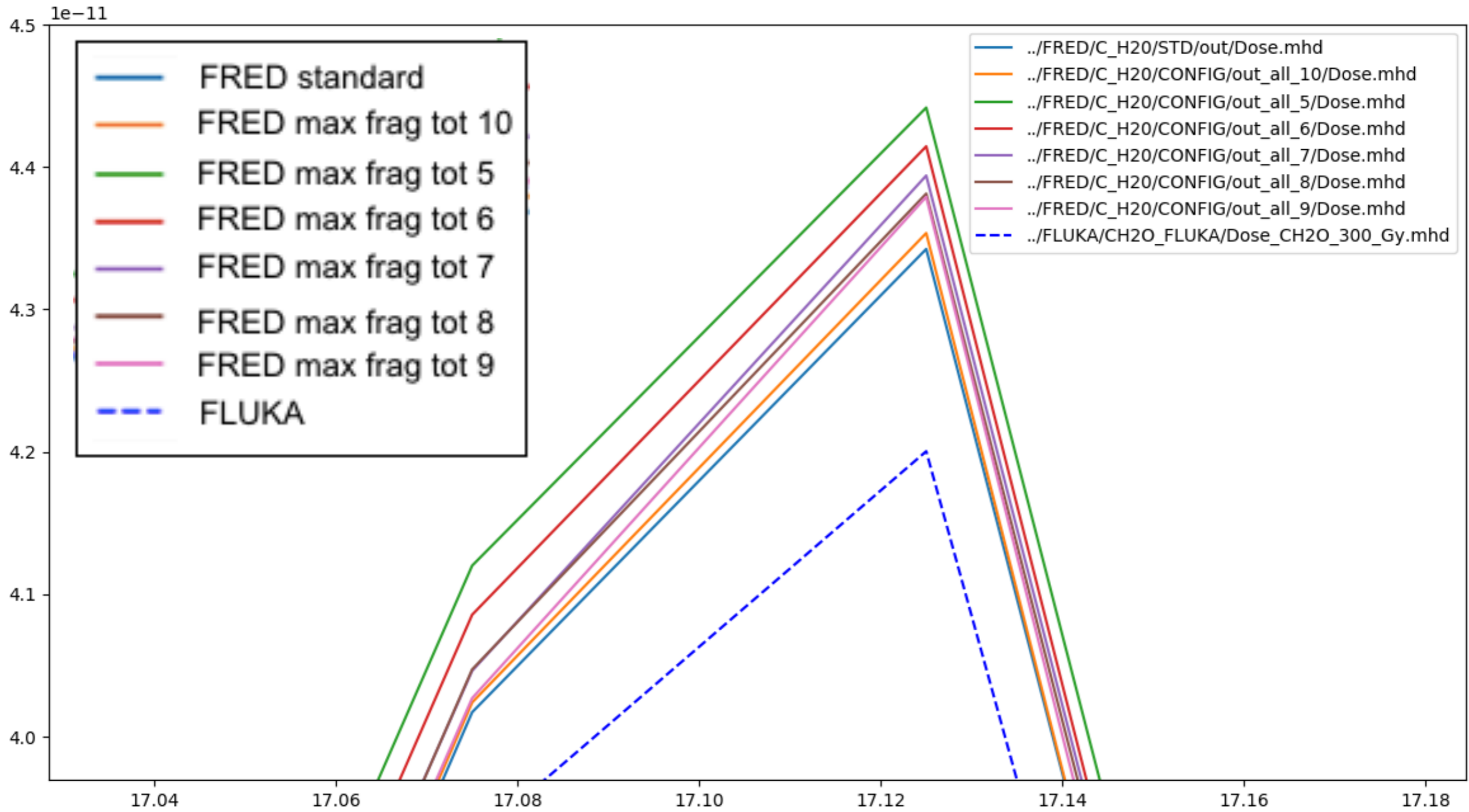
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



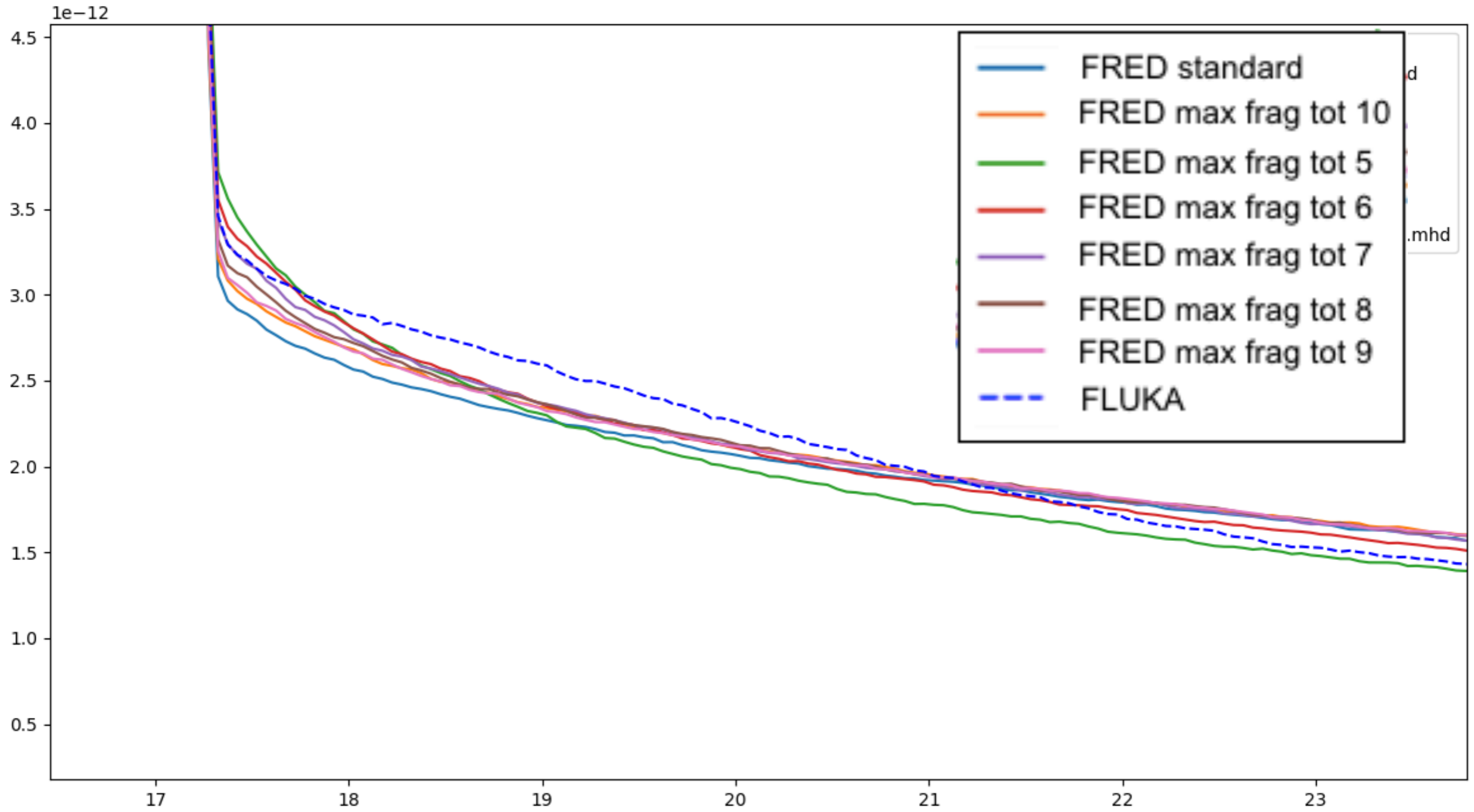
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



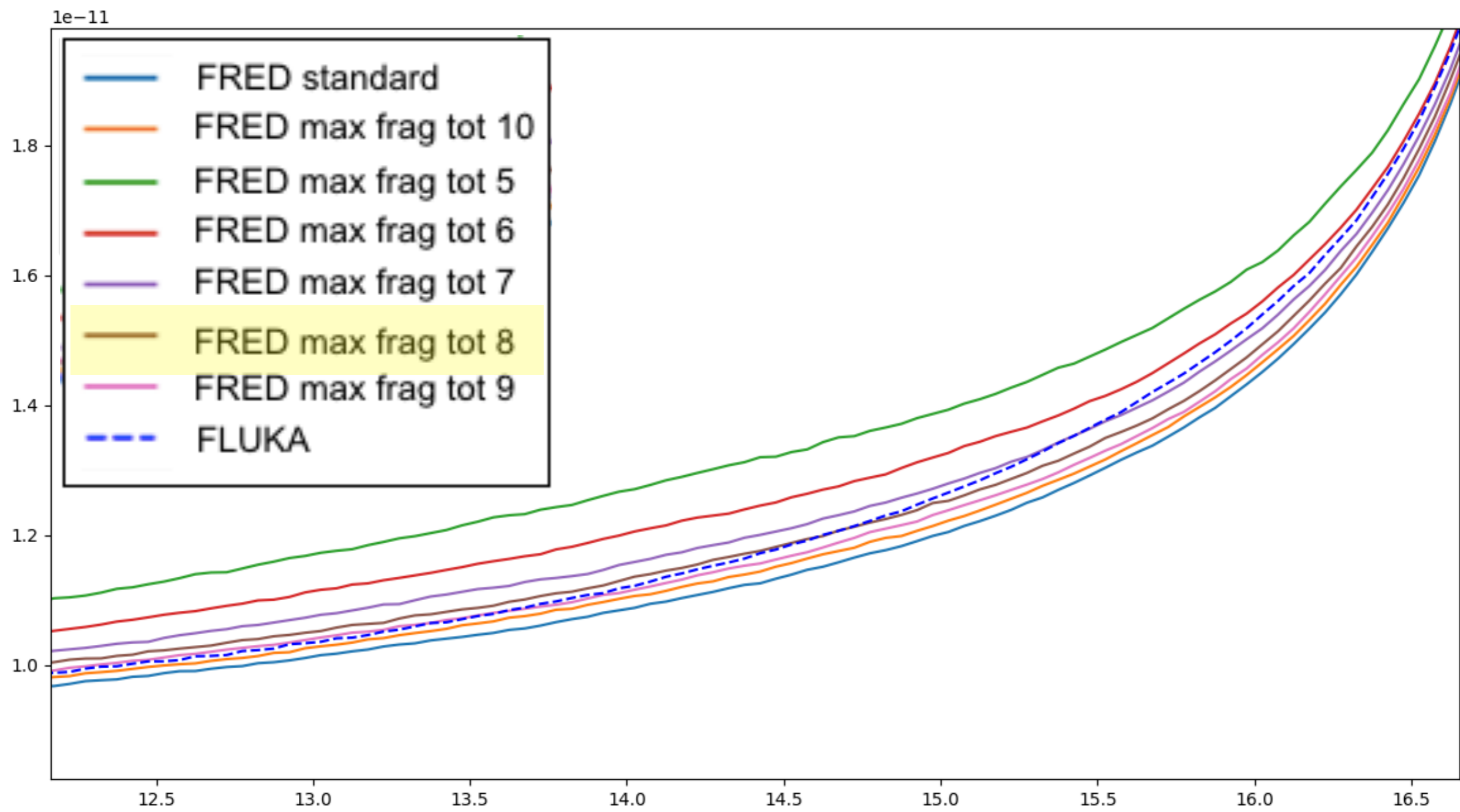
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



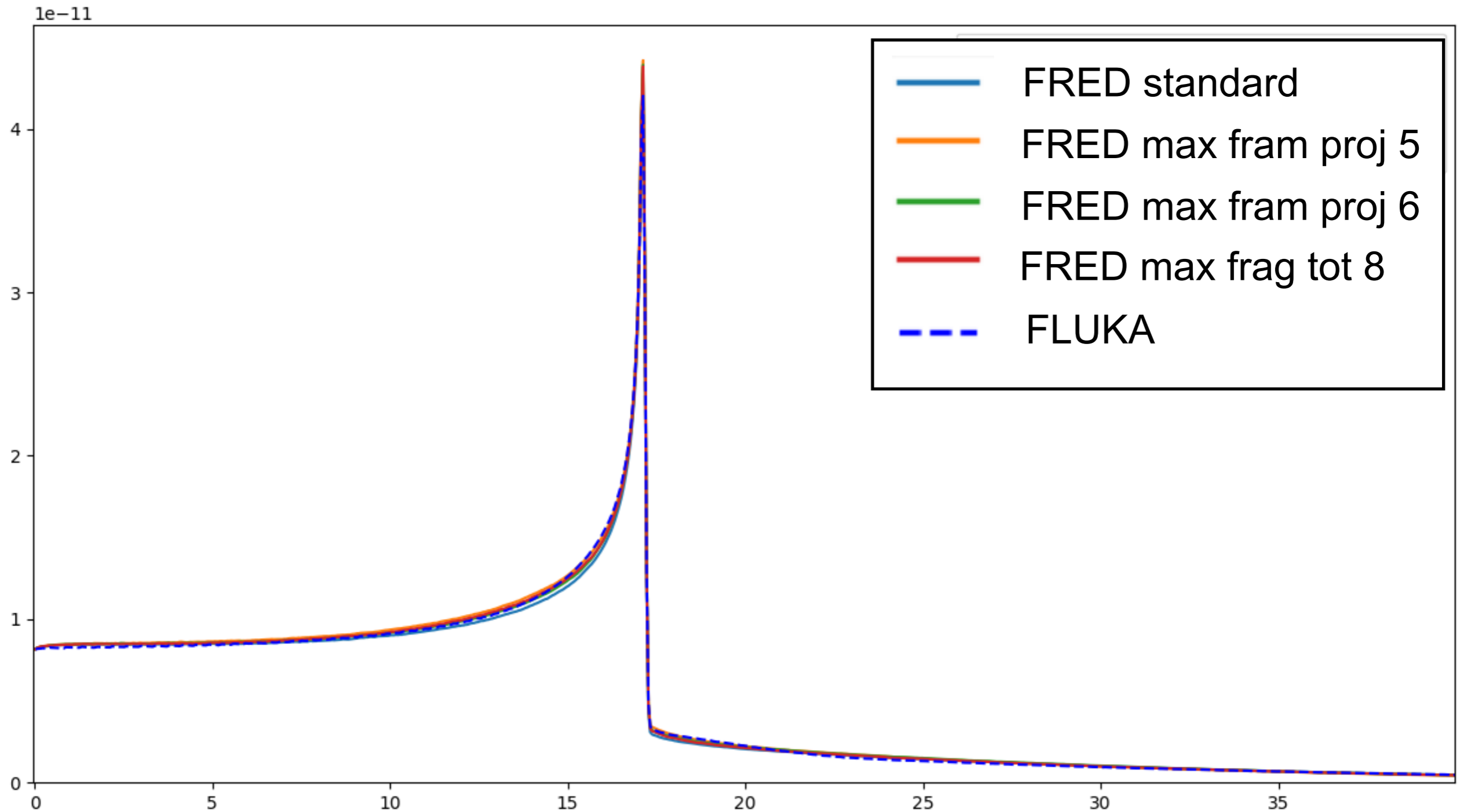
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



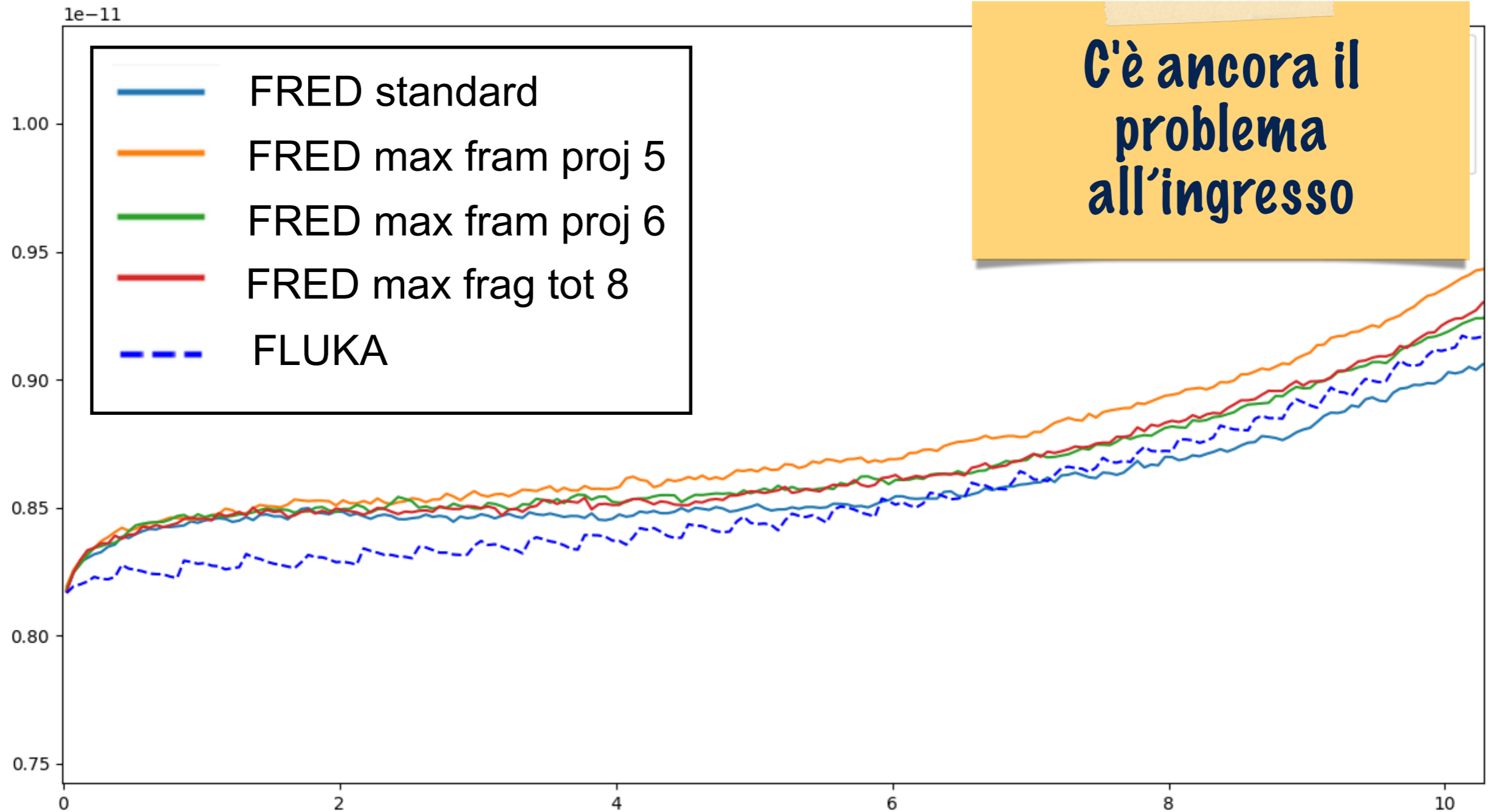
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



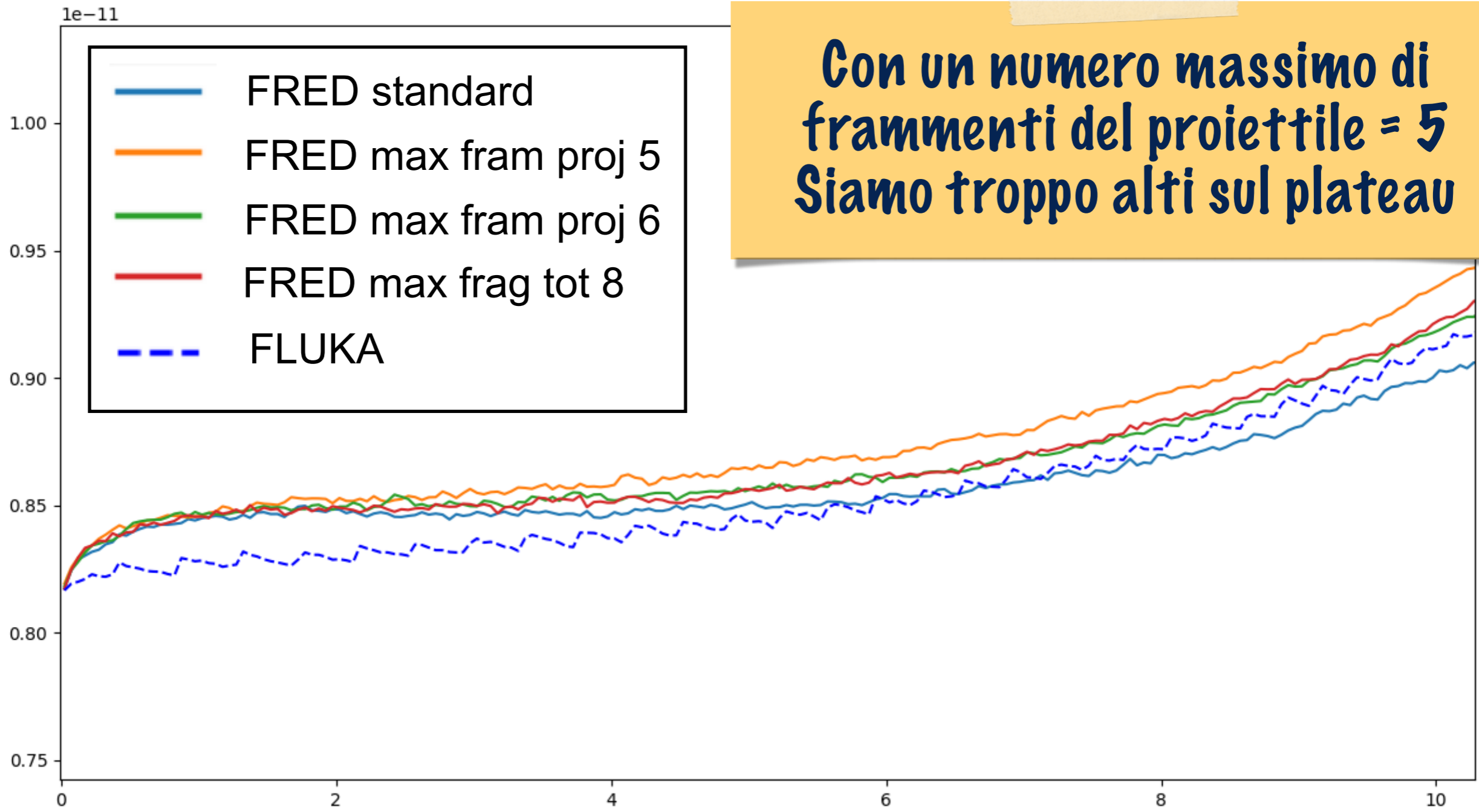
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



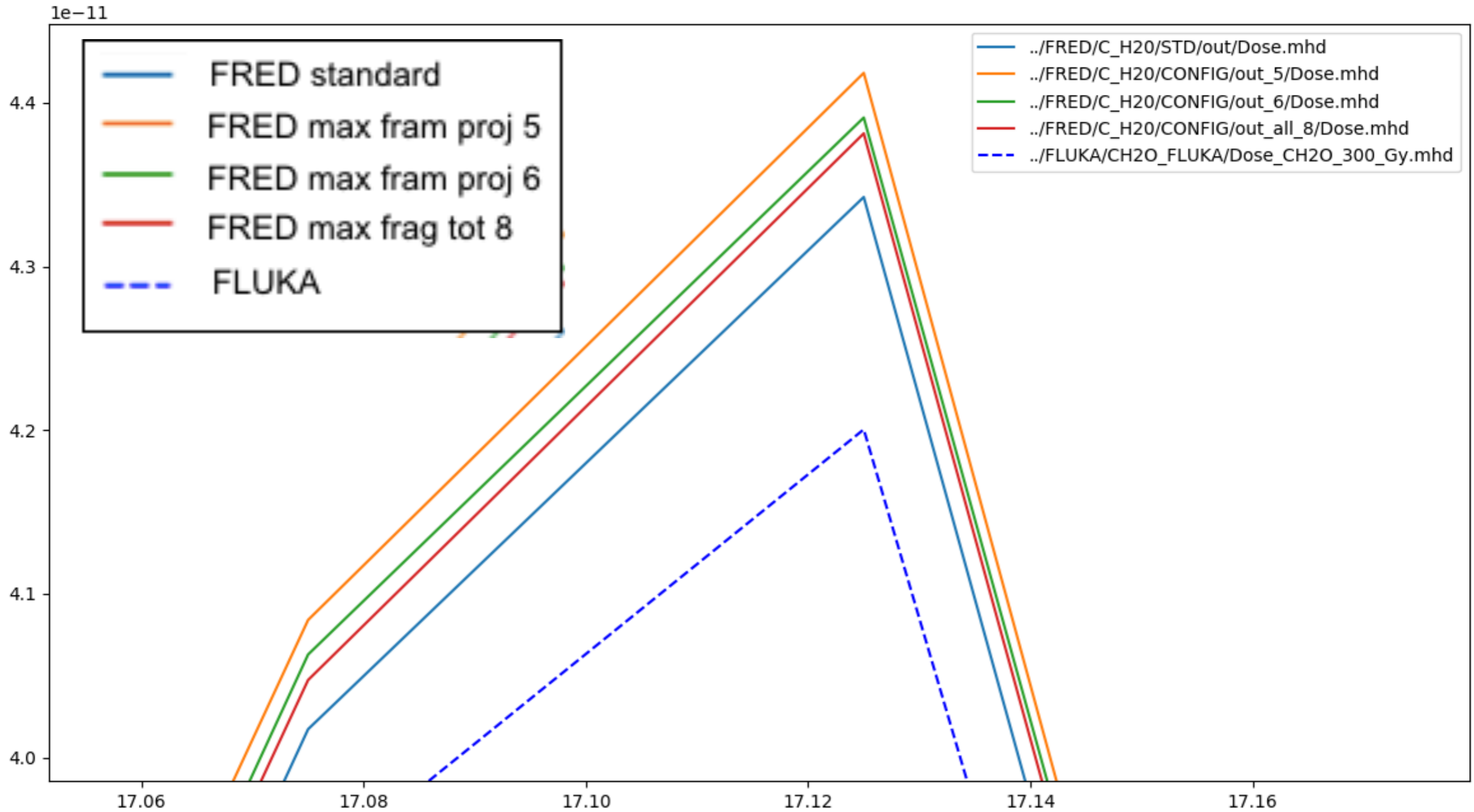
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



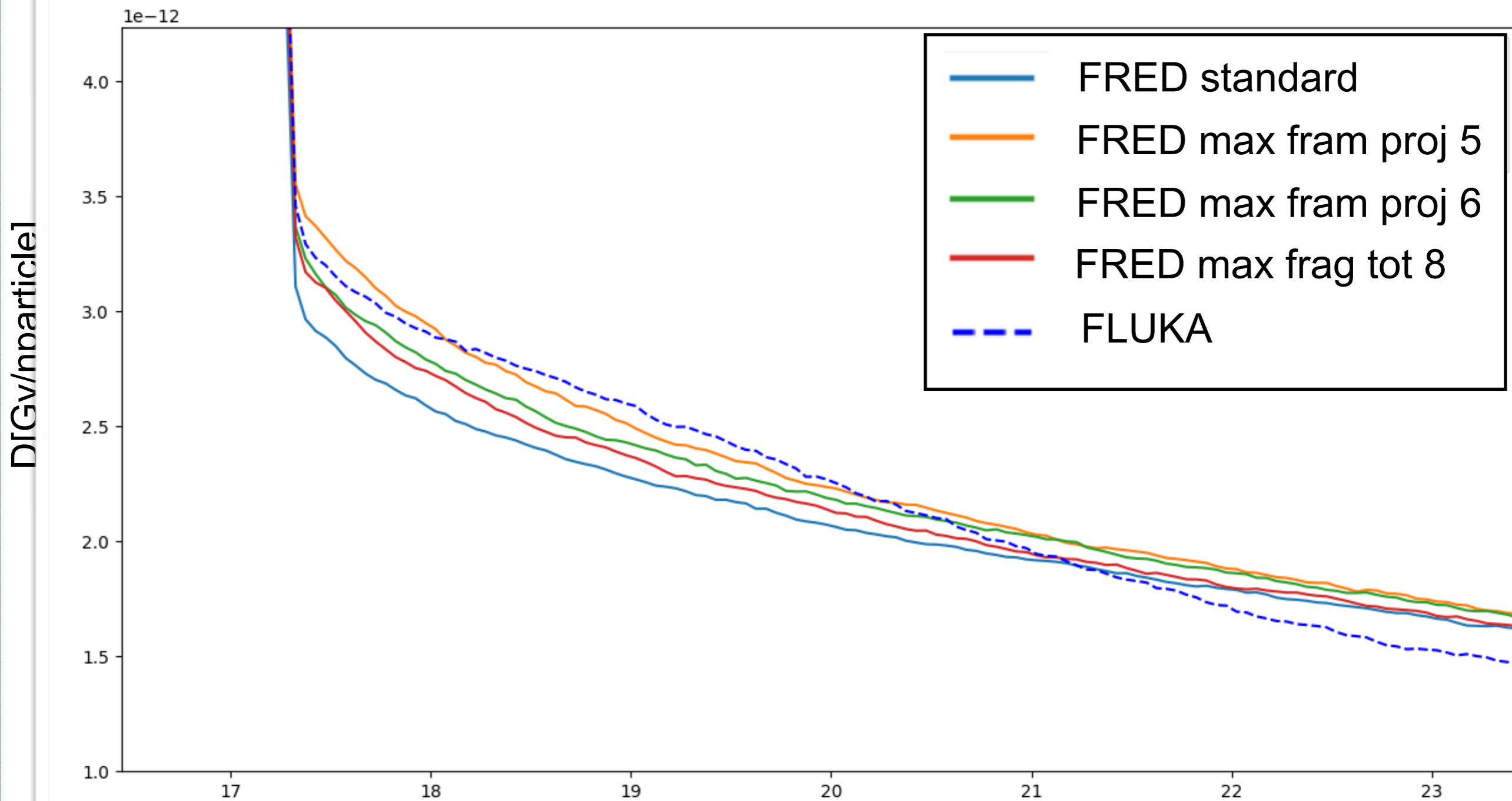
DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

300MeV/u
bin_z:0.5mm



DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

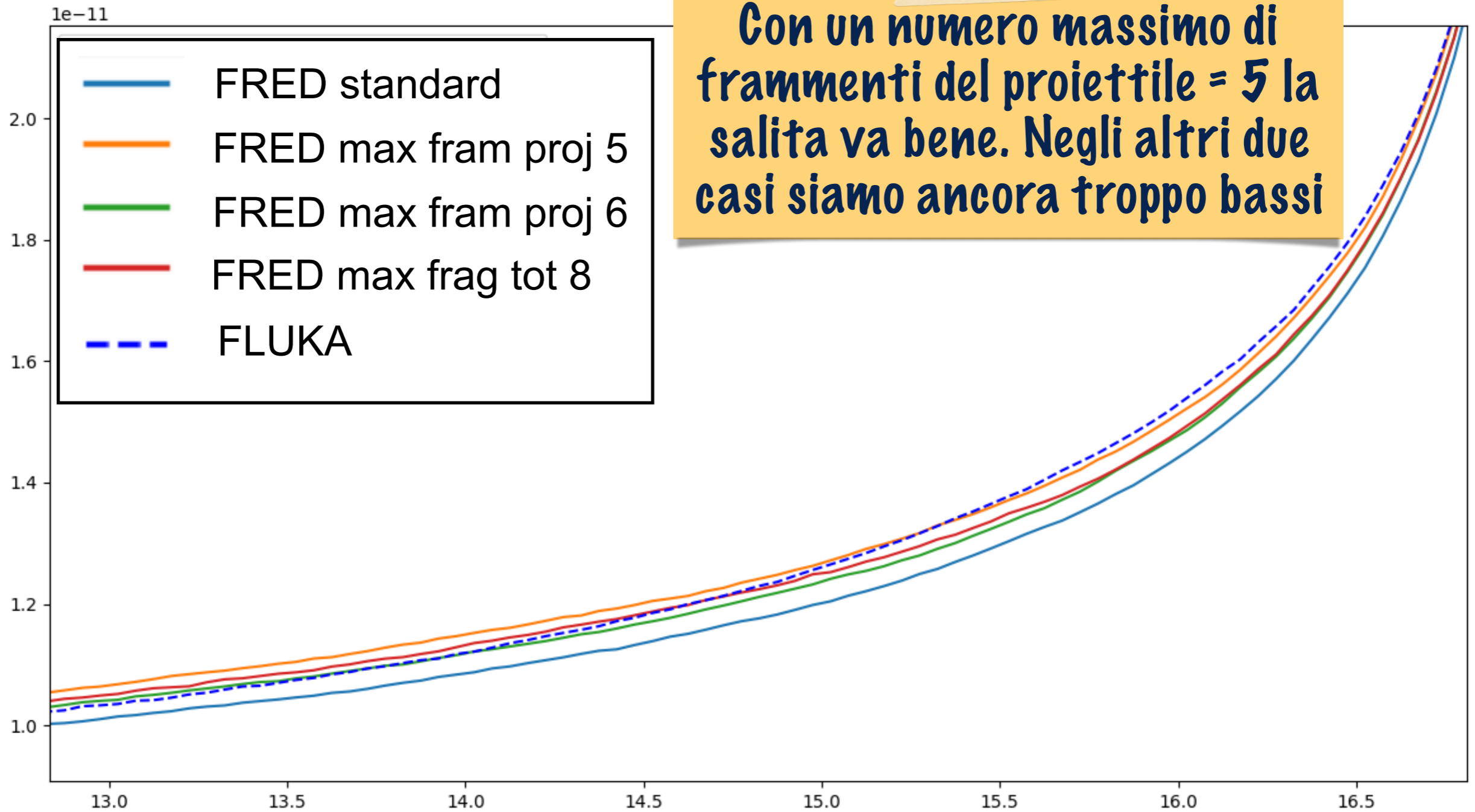
300MeV/u
bin_z:0.5mm



DDD Carbonio su Acqua - Test 2: impostare un numero massimo di frammenti per evento

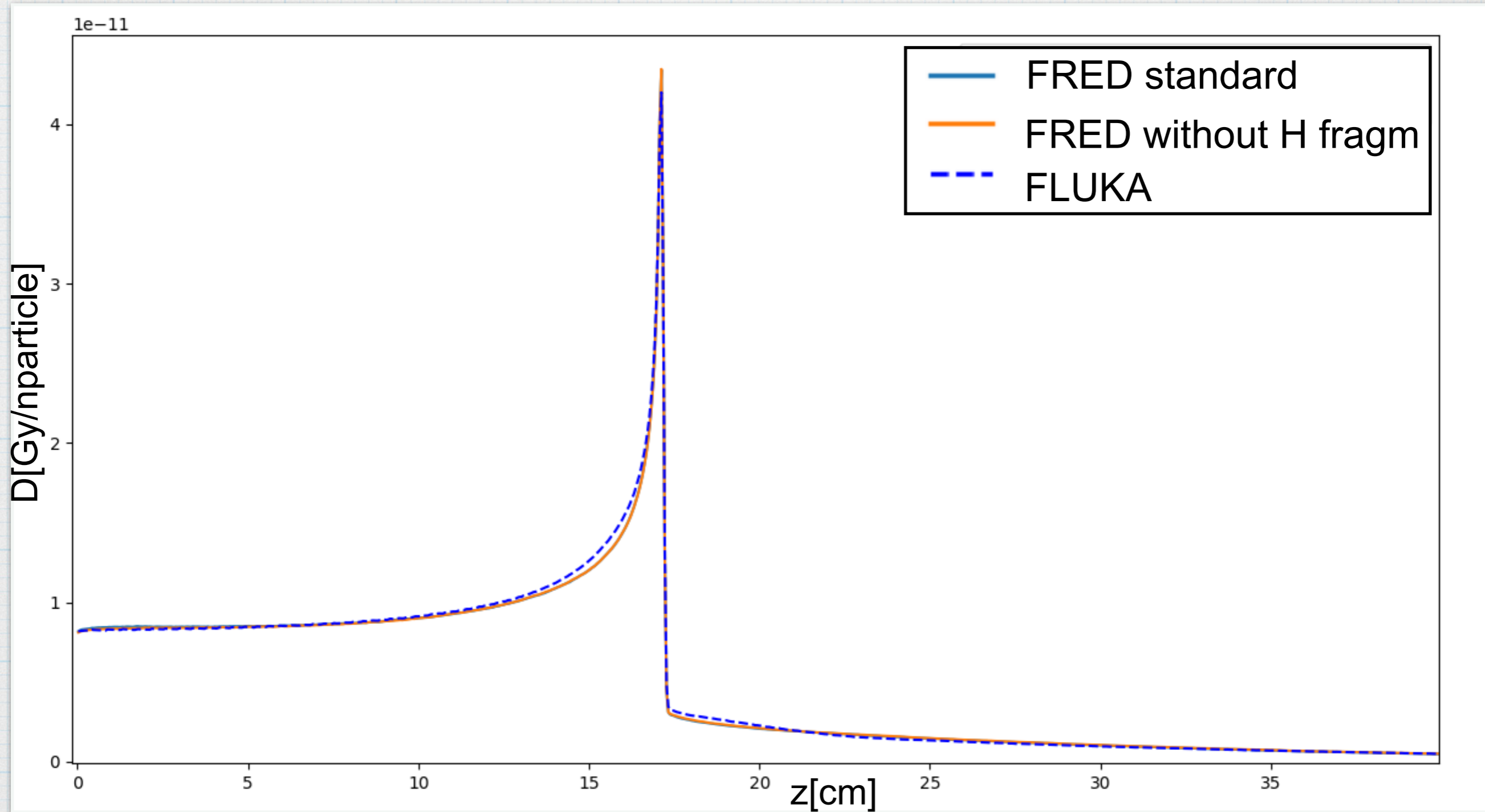
300MeV/u
bin_z:0.5mm

Con un numero massimo di frammenti del proiettile = 5 la salita va bene. Negli altri due casi siamo ancora troppo bassi



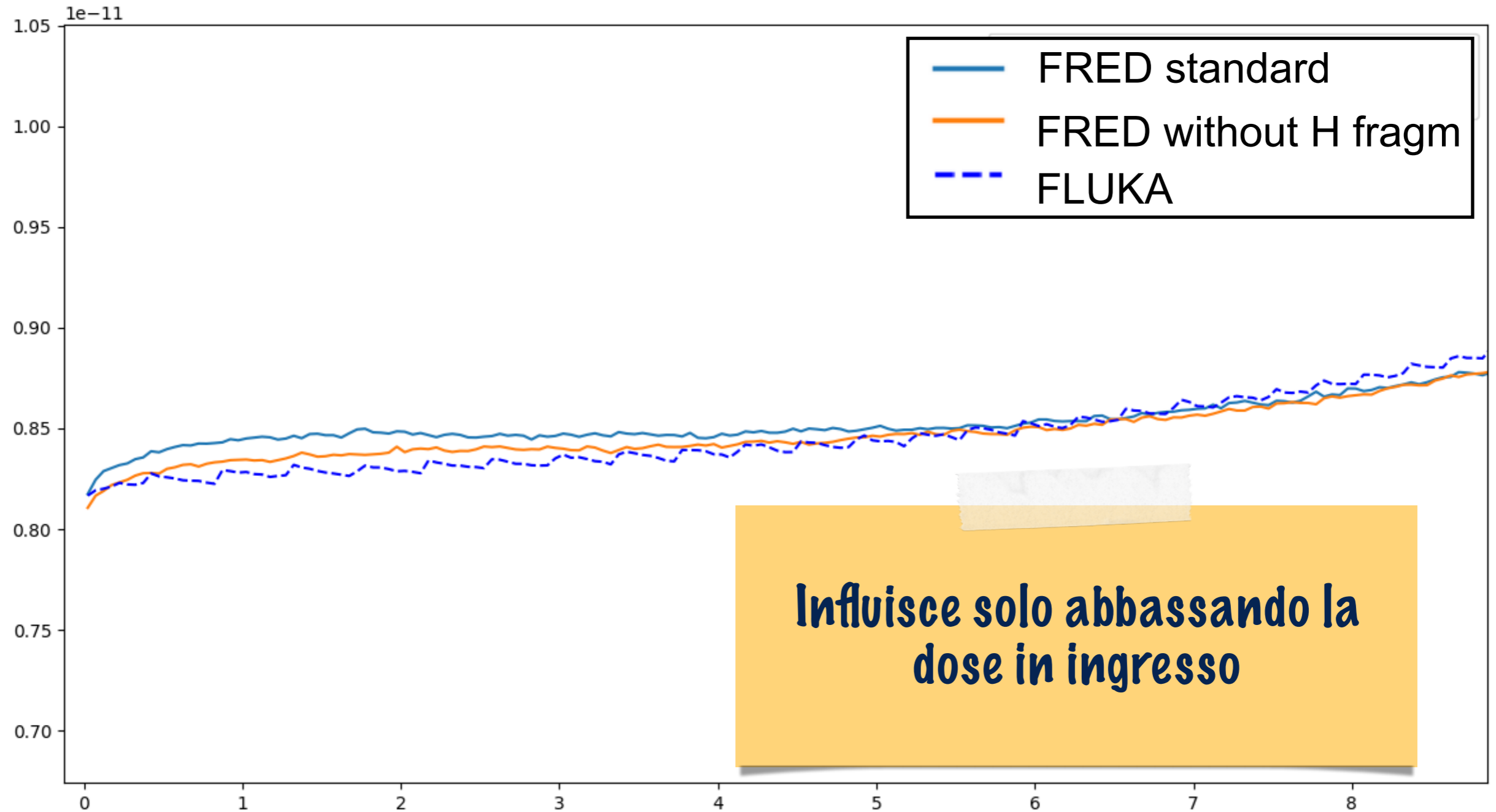
DDD Carbonio su Acqua - Test 3: togliere la frammentazione del target H

300MeV/u
bin_z:0.5mm



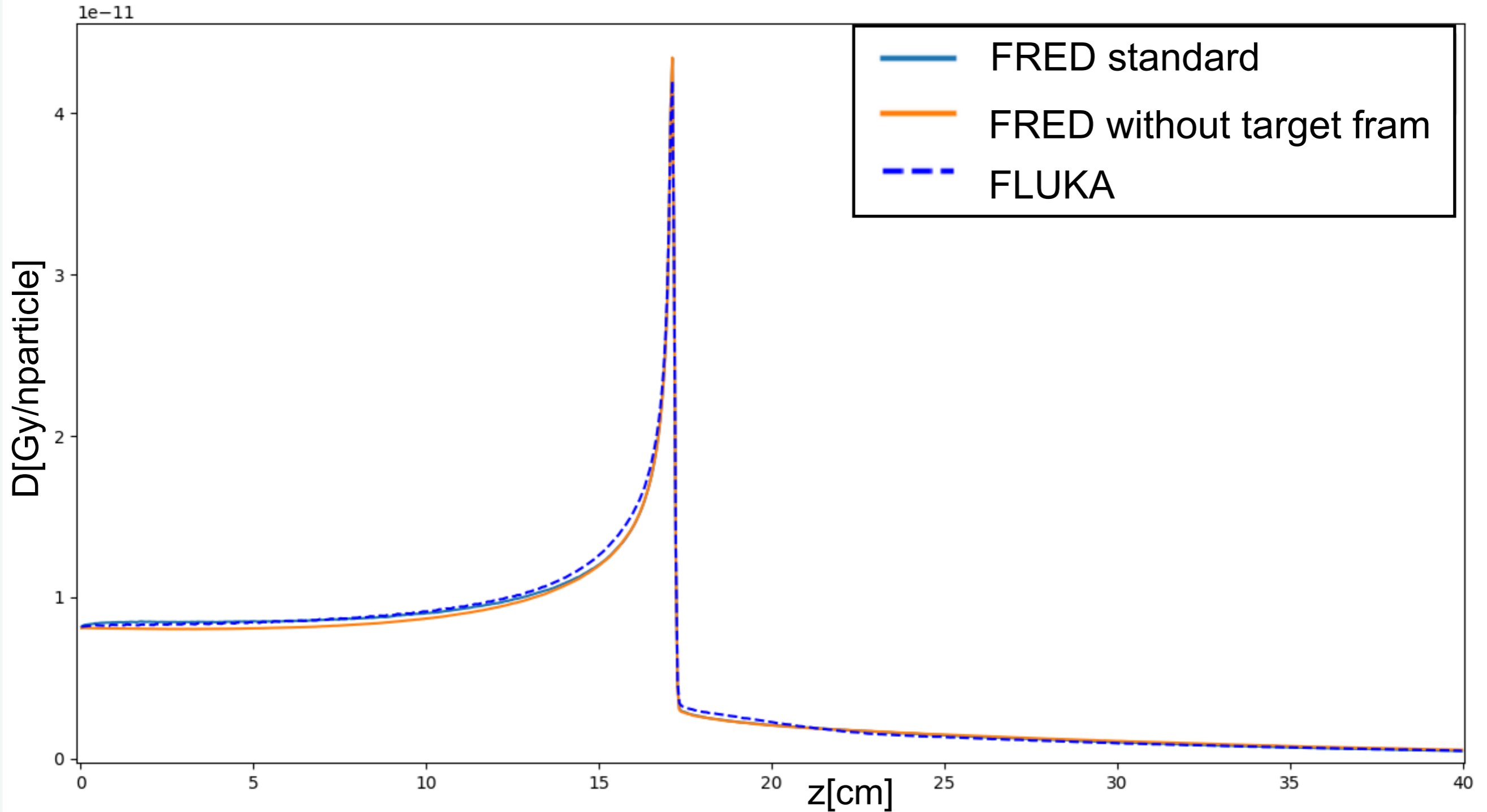
DDD Carbonio su Acqua - Test 3: togliere la frammentazione del target H

300MeV/u
bin_z:0.5mm



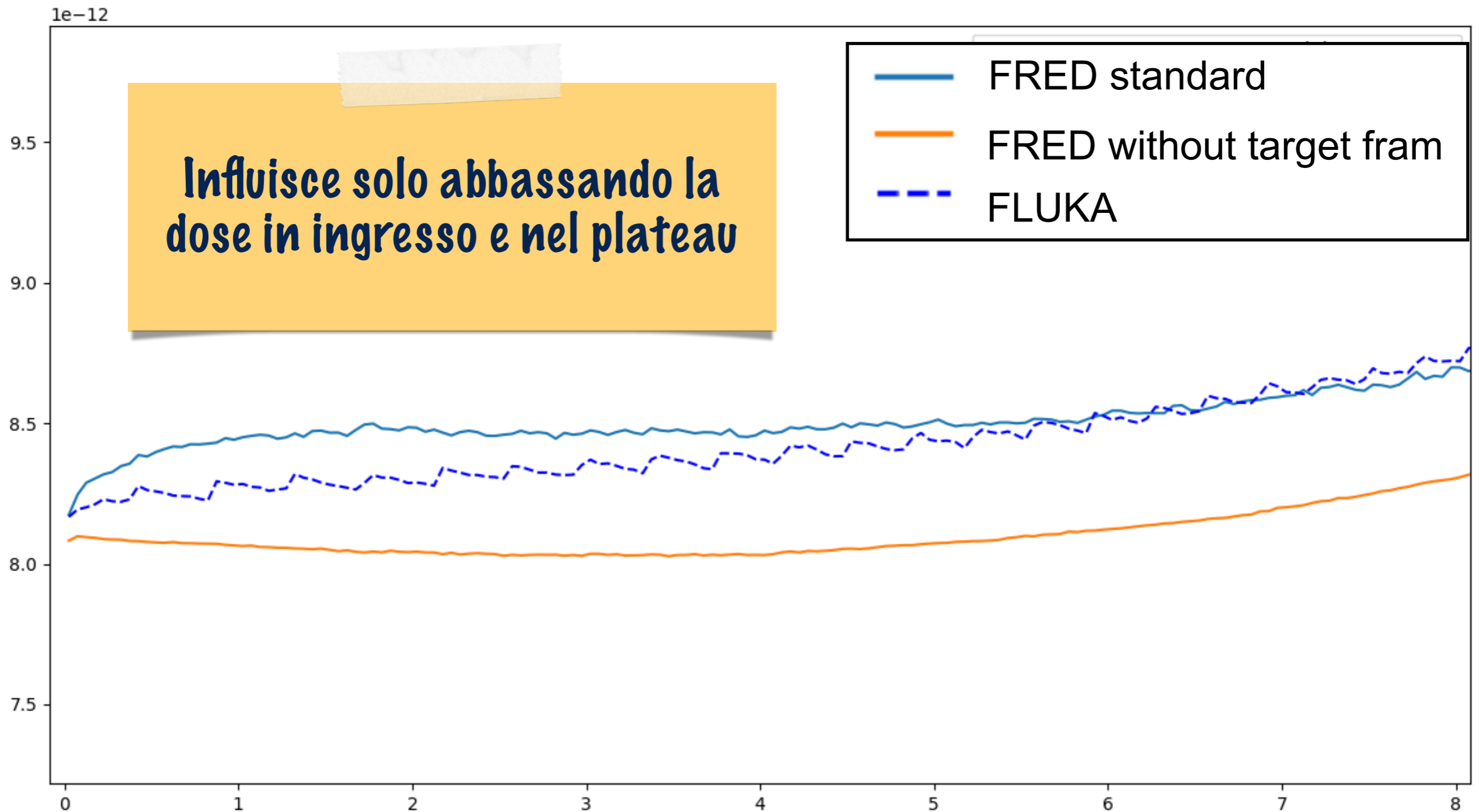
DDD Carbonio su Acqua - Test 3: togliere la frammentazione del target

300MeV/u
bin_z:0.5mm



DDD Carbonio su Acqua - Test 3: togliere la frammentazione del target

300MeV/u
bin_z:0.5mm

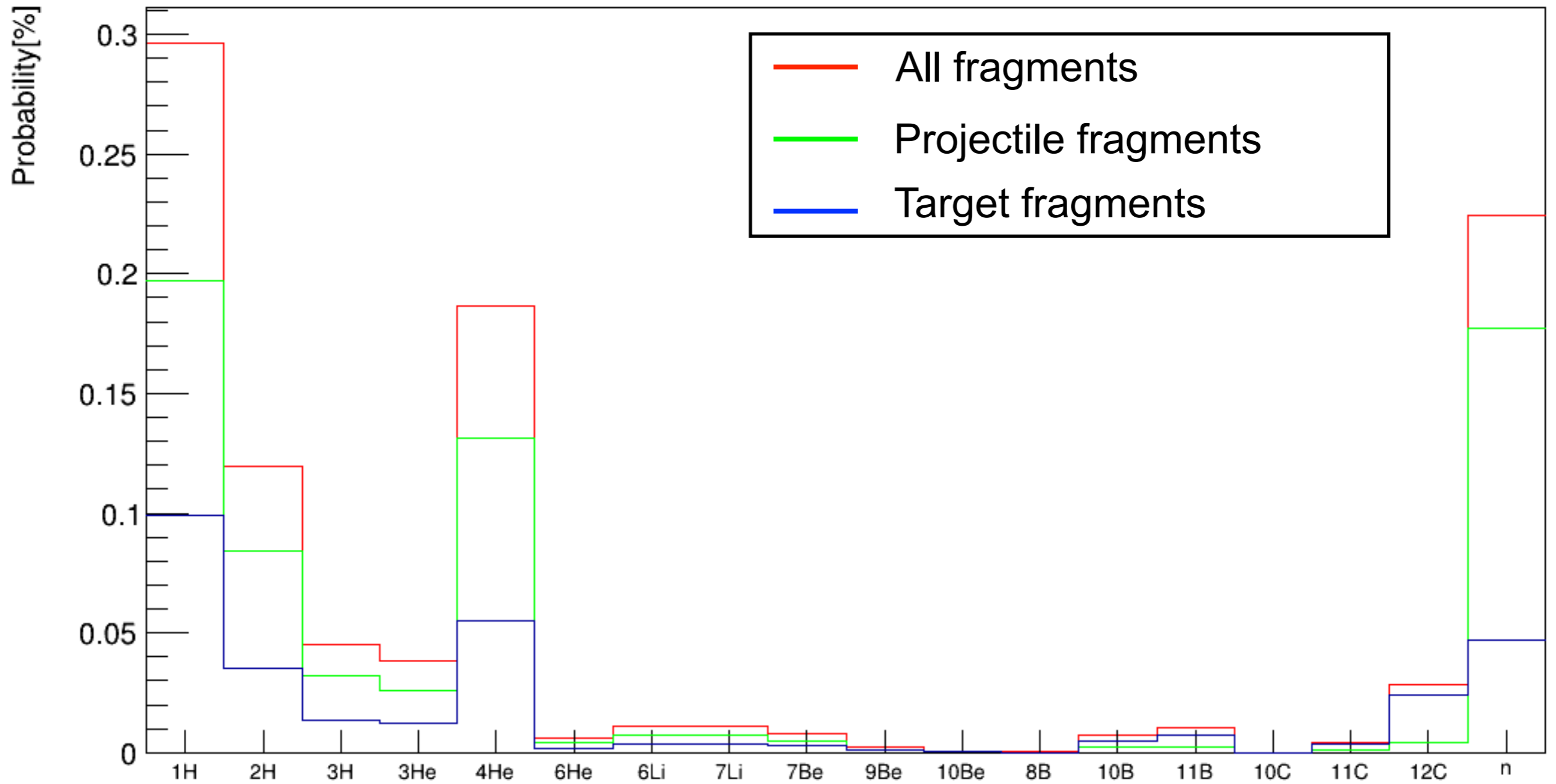


Altre prove fatte:

- * scegliere la combinazione di frammenti e l'energia/angolo separatamente (aumenta il plateau)
- * Imporre un range massimo di energia che è possibile perdere per evento (aumenta il plateau)
- * Cambiare il peso delle cumulative in ingresso (diminuisce la salita)
- * Riassegnare a tutti i frammenti l'energia in avanzo in ogni evento (aumenta plateau e parte iniziale salita)
- * Imporre che tutti i frammenti vengano prodotti a 0° (non cambia nulla)
- * Aggiungere ad ogni frammento il suo 10% prima di fare il check della conservazione dell'energia (non cambia nulla)

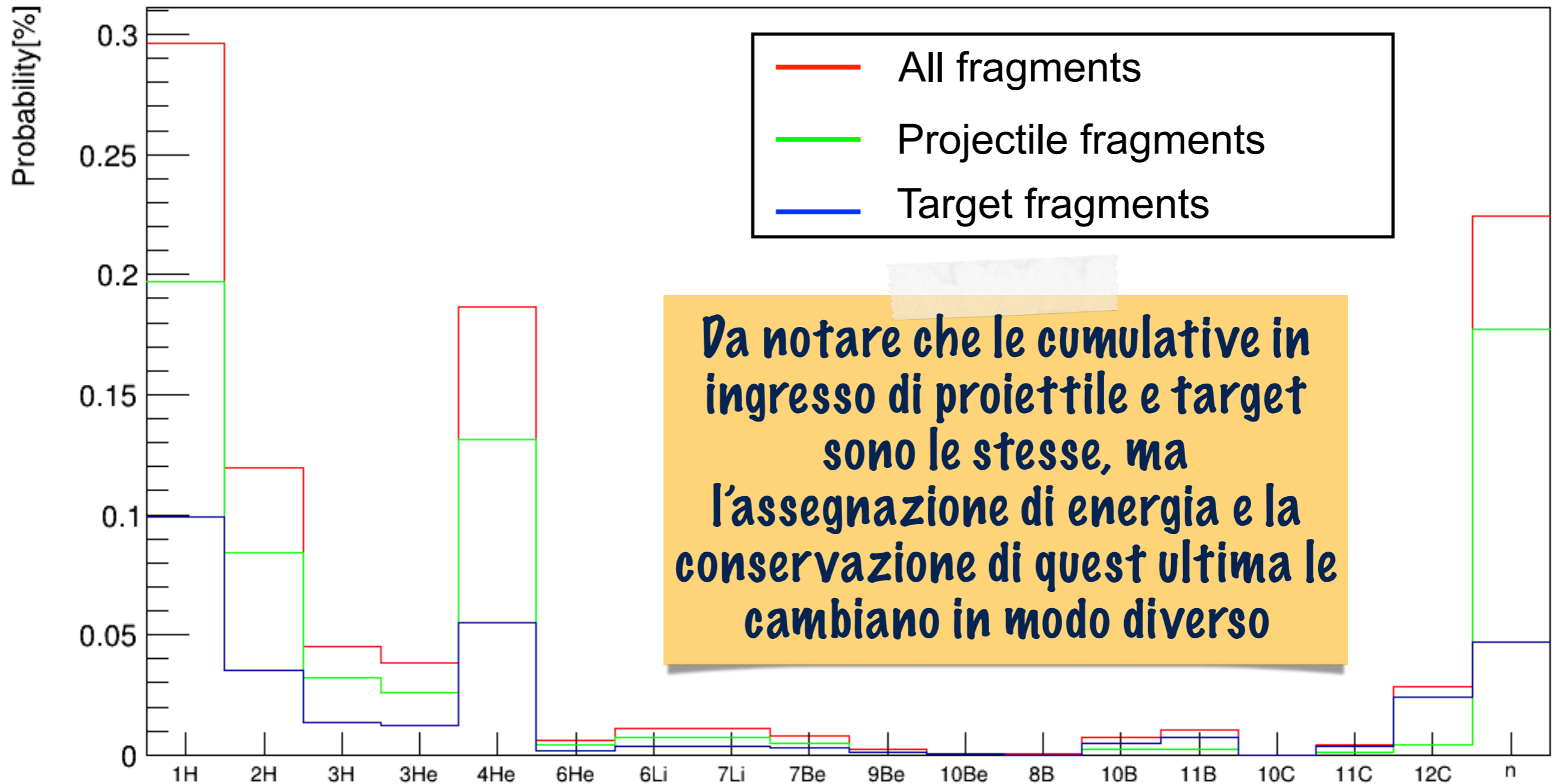
Probabilità di ottenere ogni frammento in un evento

Probability of Fragments



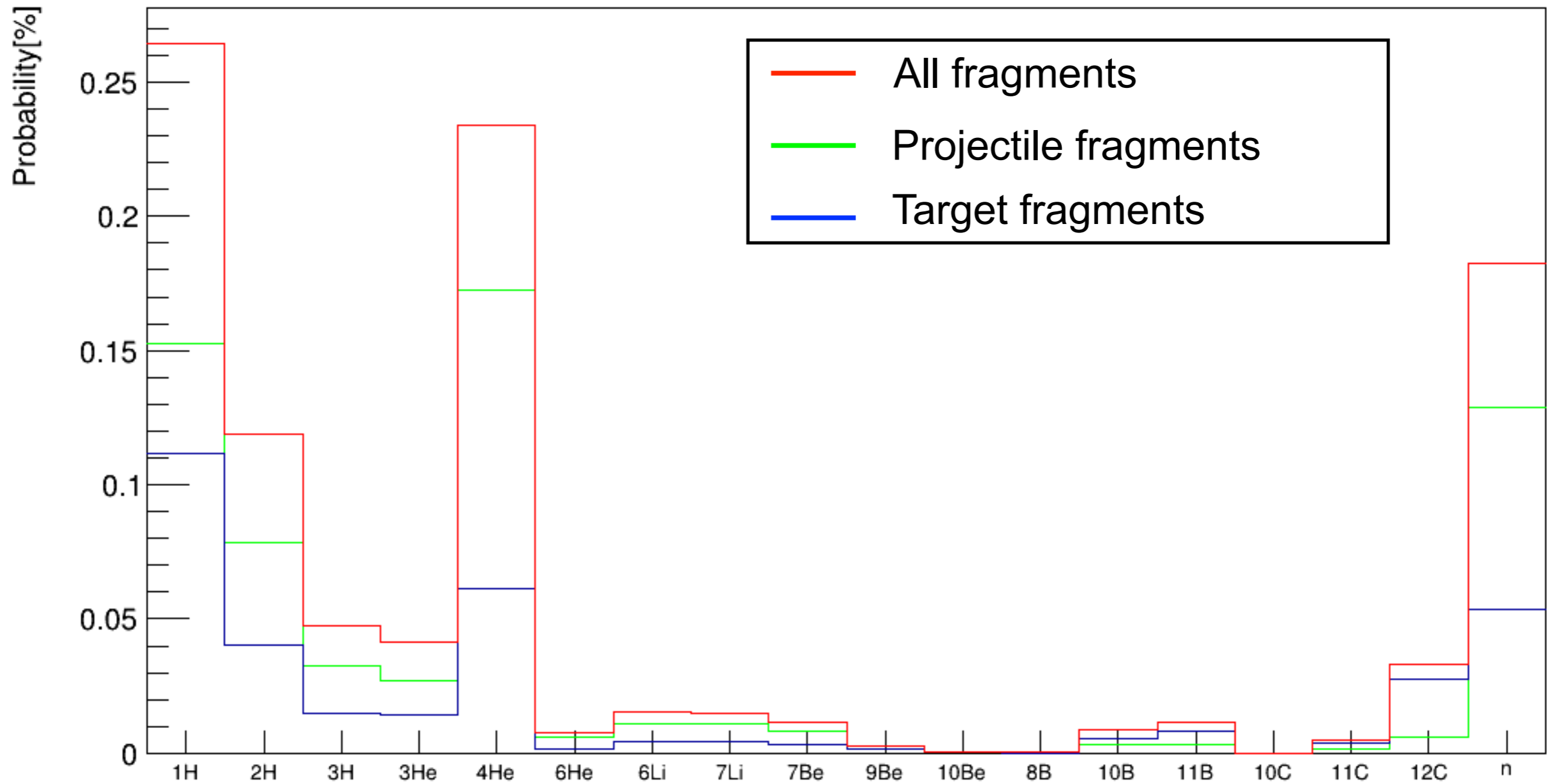
Probabilità di ottenere ogni frammento in un evento

Probability of Fragments



Probabilità di ottenere ogni frammento in un evento

Probability of Fragments



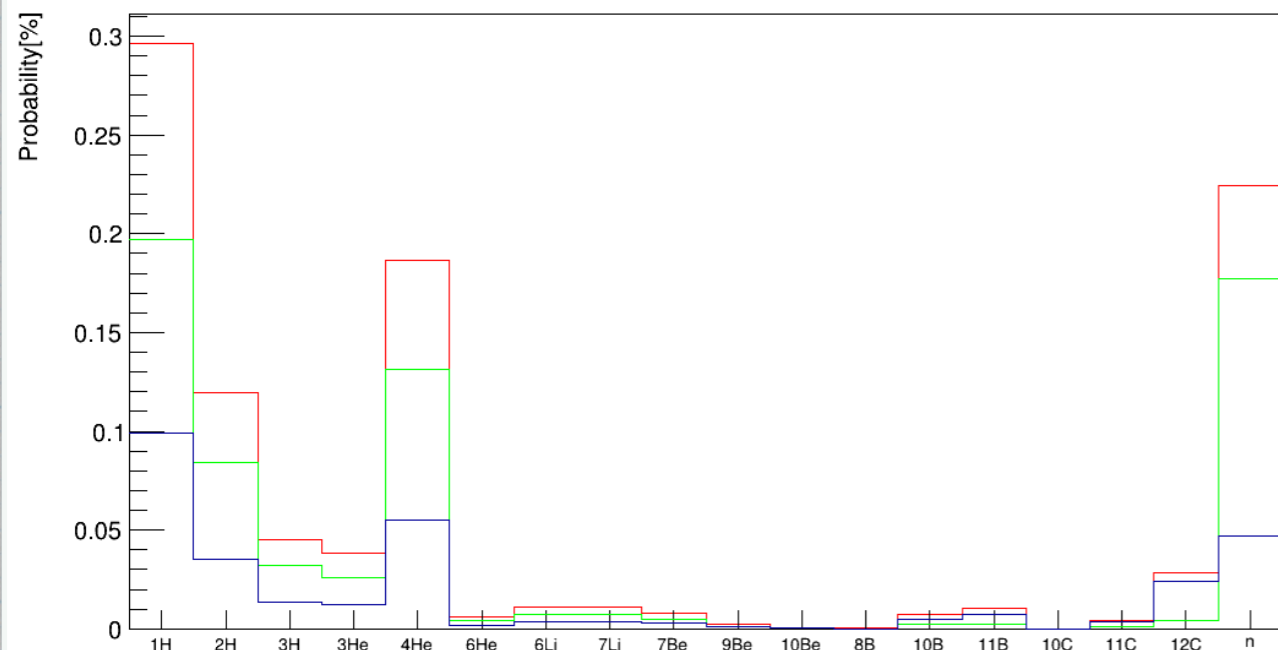
Utilizzando il vincolo "massimo 6 frammenti del proiettile"

Probabilità di ottenere ogni frammento in un evento

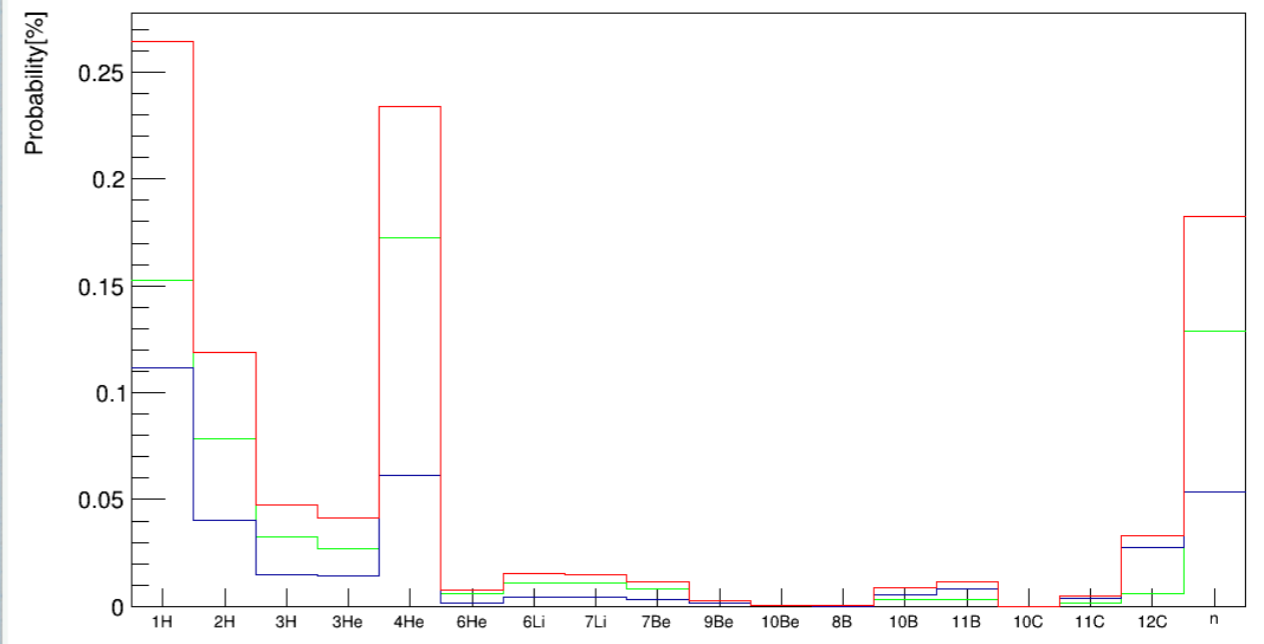
Senza vincoli

Utilizzando il vincolo "massimo 6 frammenti del proiettile"

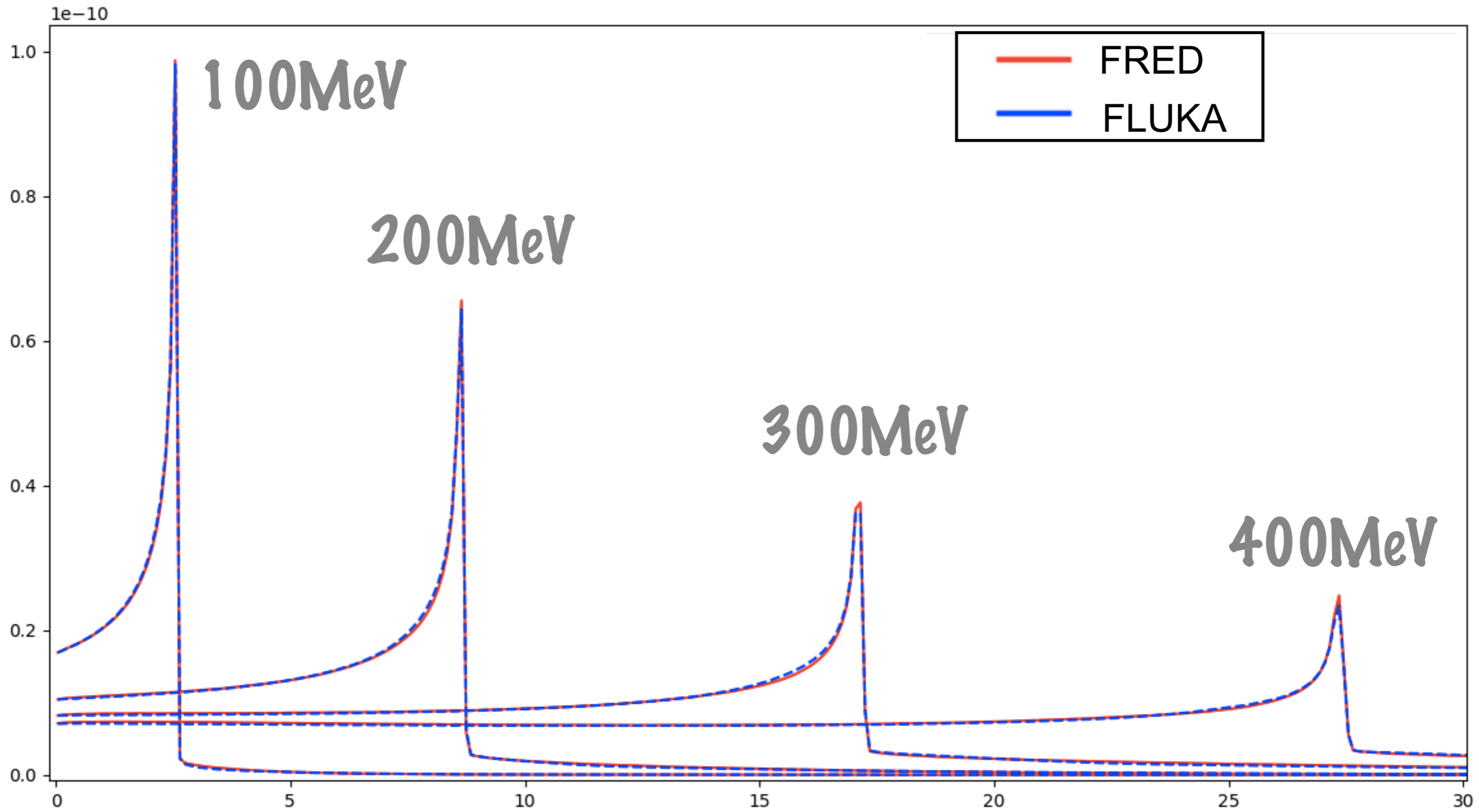
Probability of Fragments



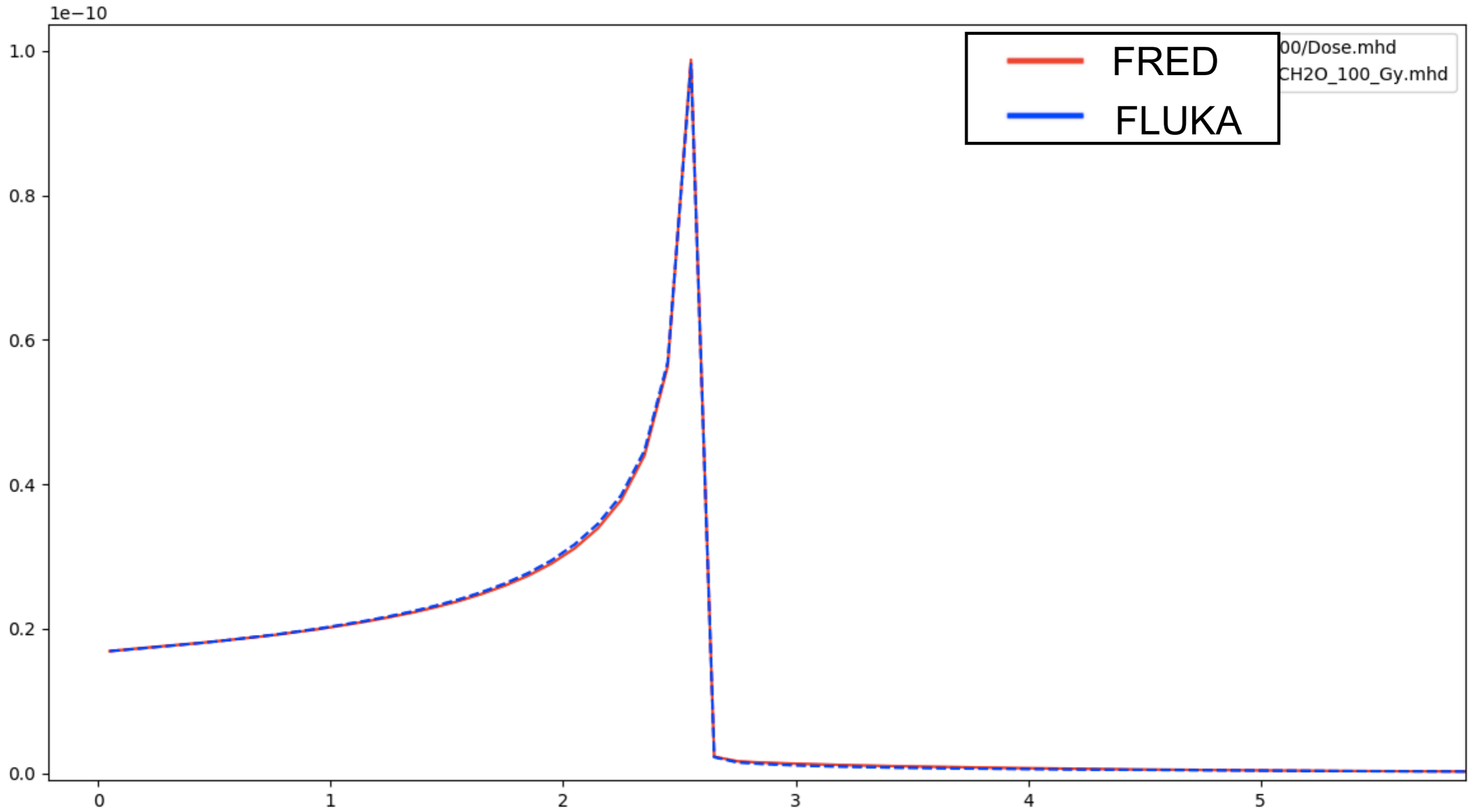
Probability of Fragments



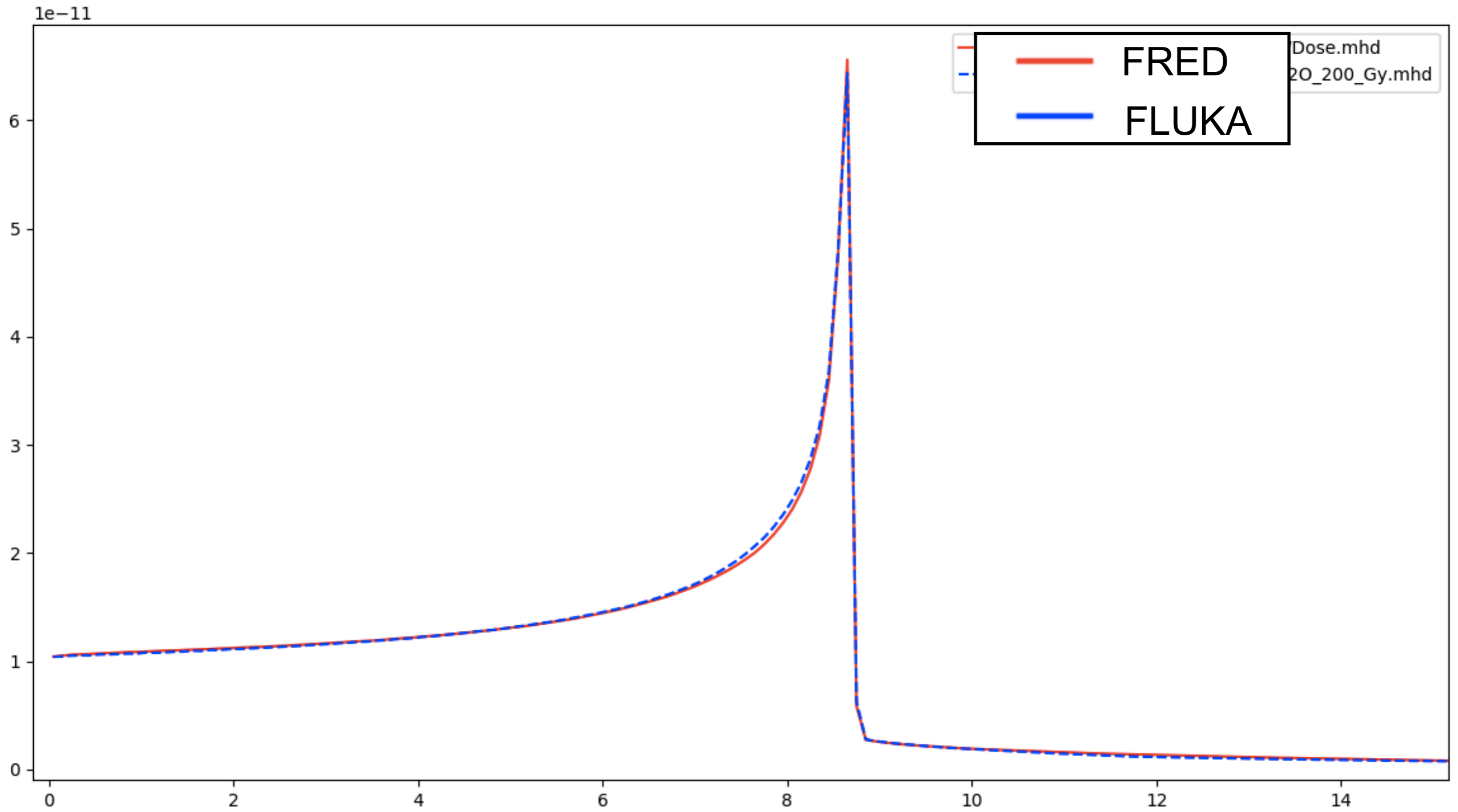
- All fragments
- Projectile fragments
- Target fragments



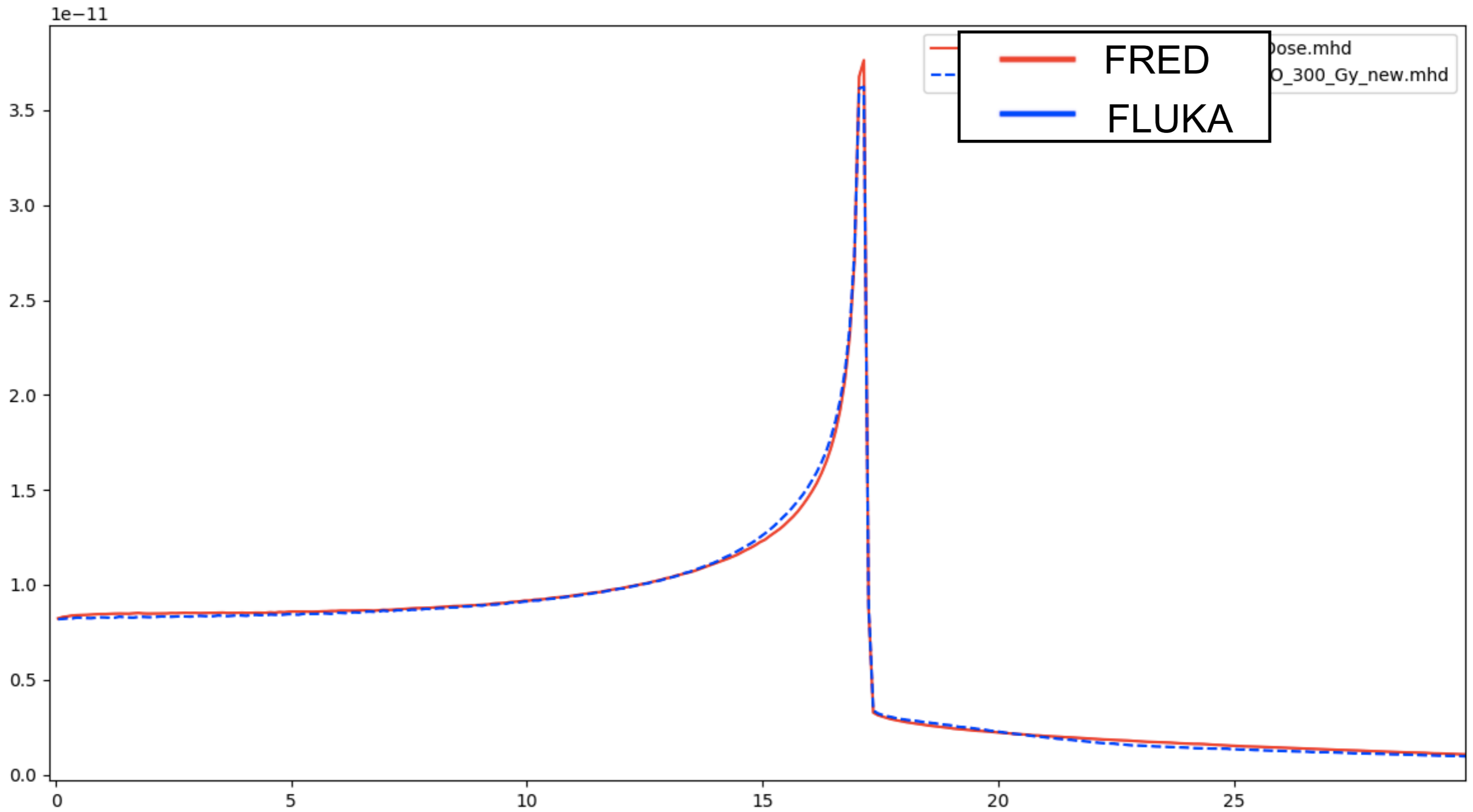
100 MeV/u



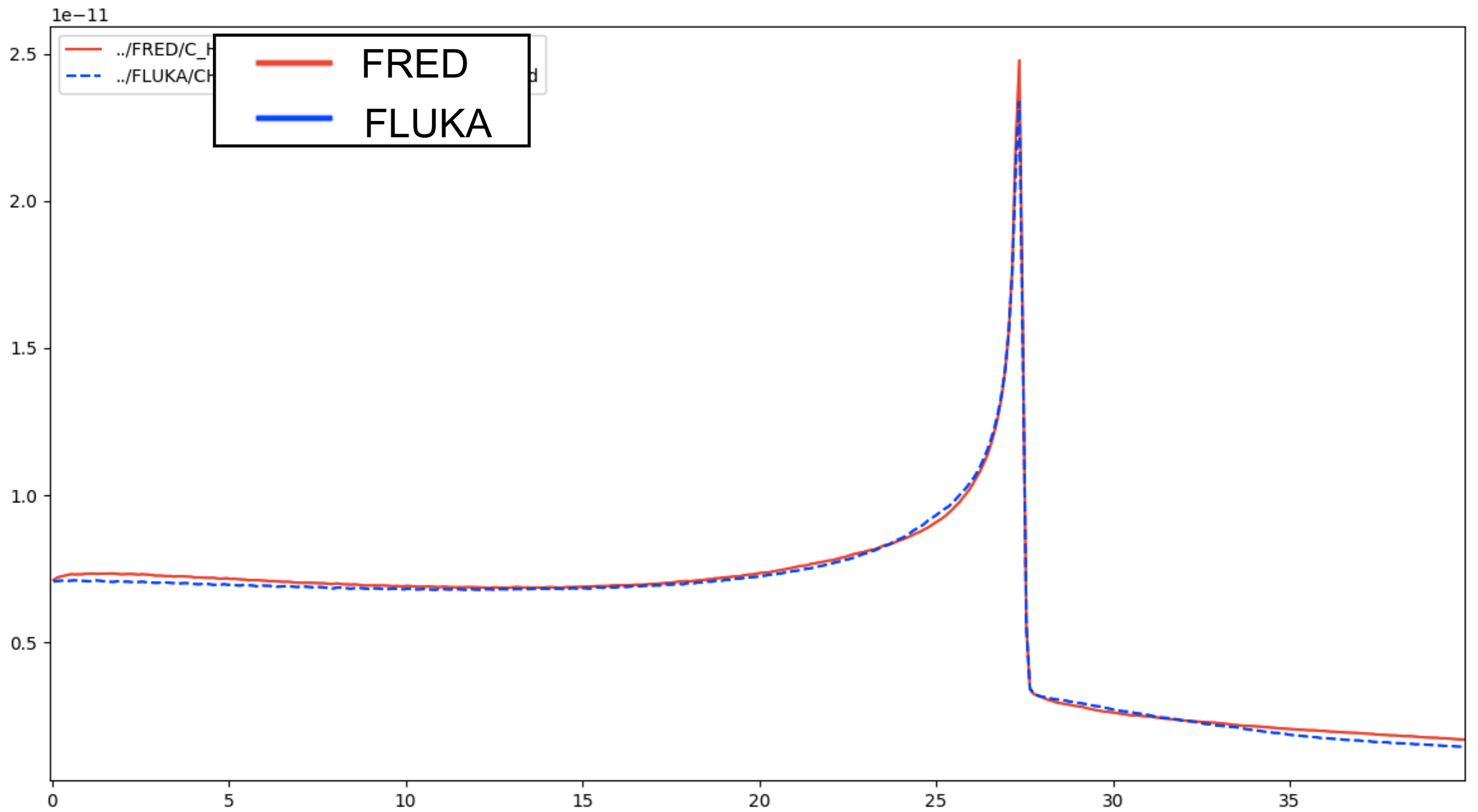
200 MeV/u



300 MeV/u



400 MeV/u



Conclusioni

- * Riguardare frammentazione C-H e in particolare la sezione d'urto
- * Aggiungere la componente elastica in FRED
- * Diminuendo il numero di frammenti per evento c'è un miglioramento.. trovare un andamento che dipende dall'energia?
- * Provare a diminuire il numero massimo di frammenti del target