



giugno '09

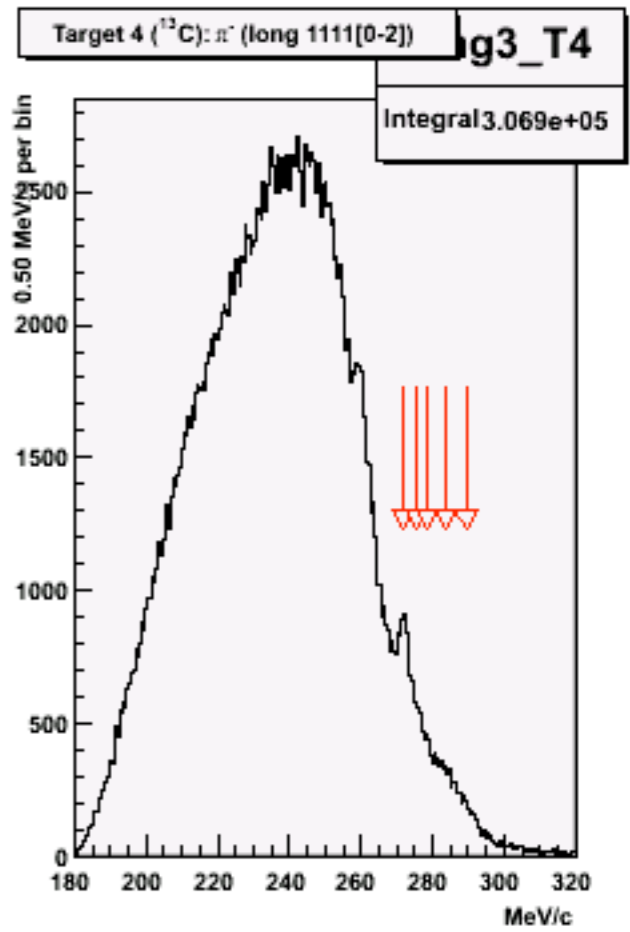
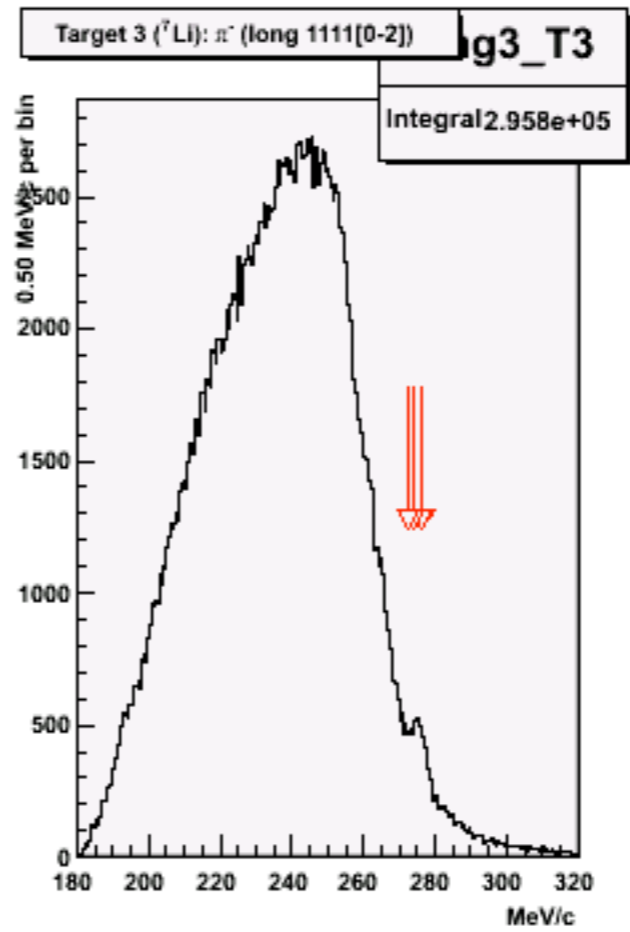
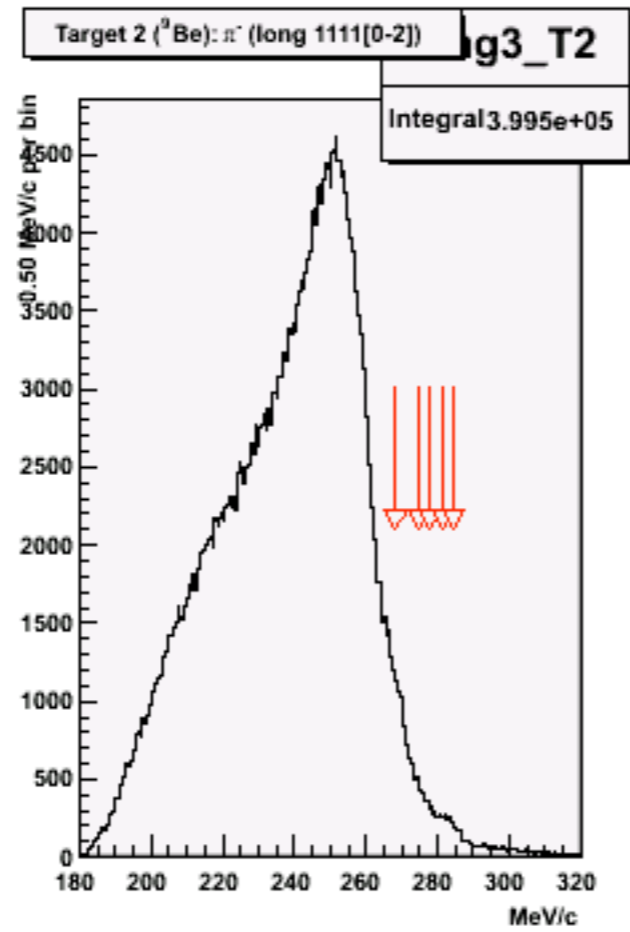
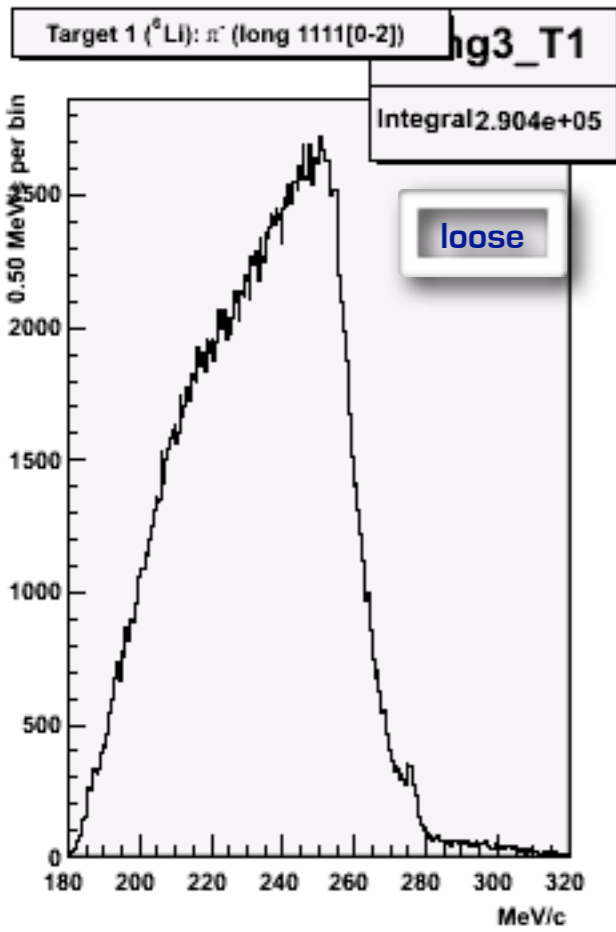
spettroscopia - prod gen⁰⁹

data⁰⁶⁻⁰⁷ [3500-15332]

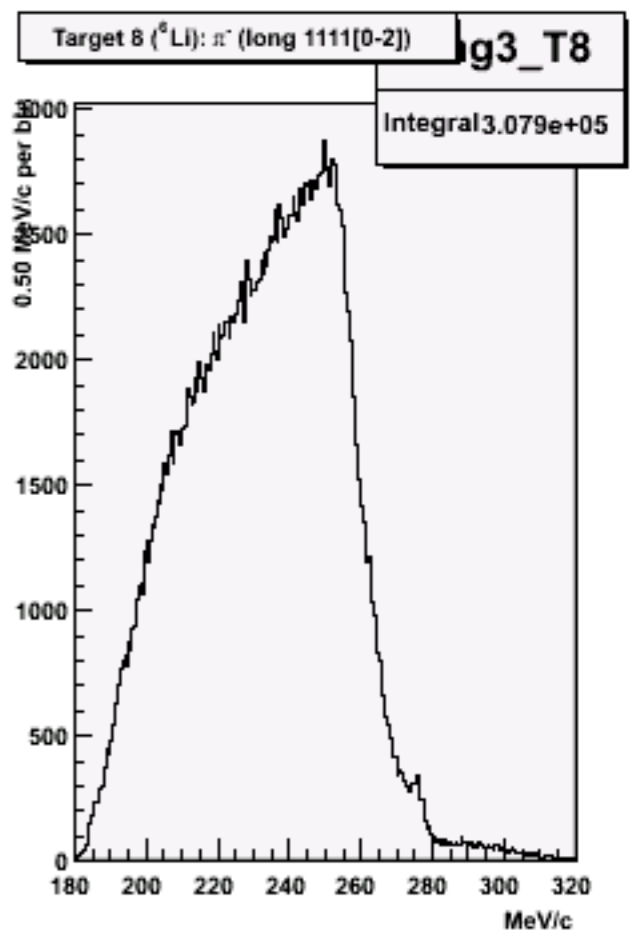
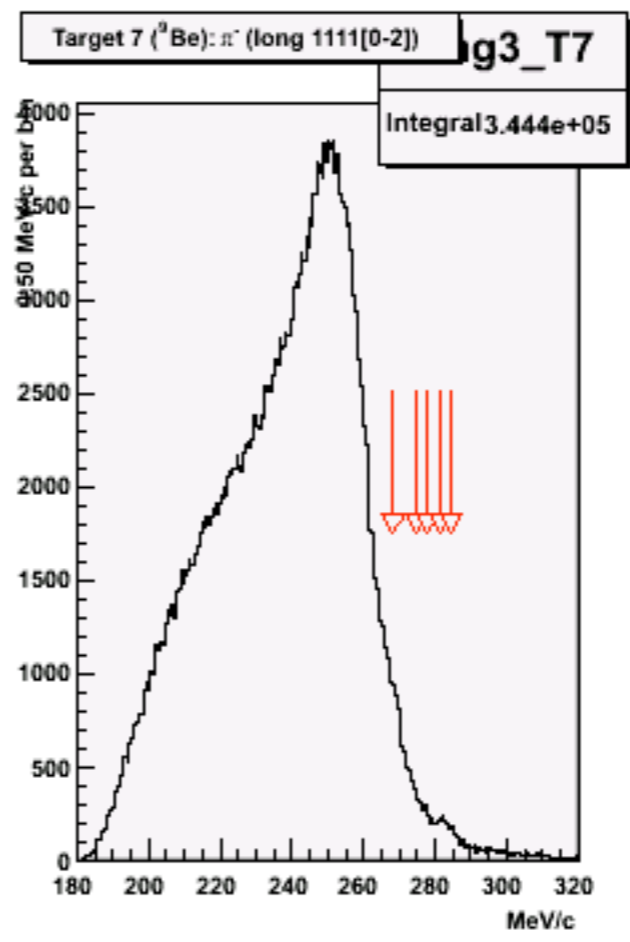
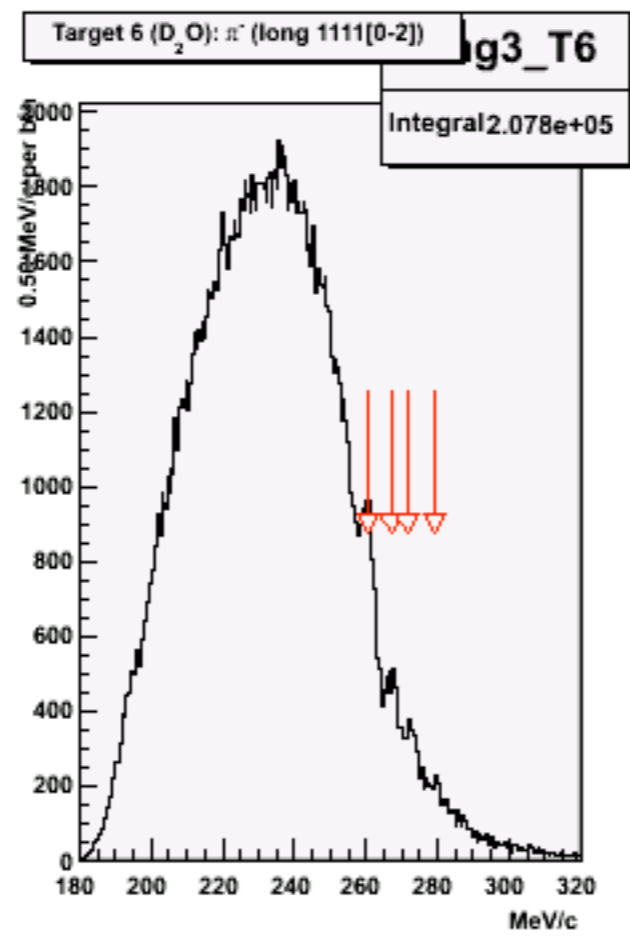
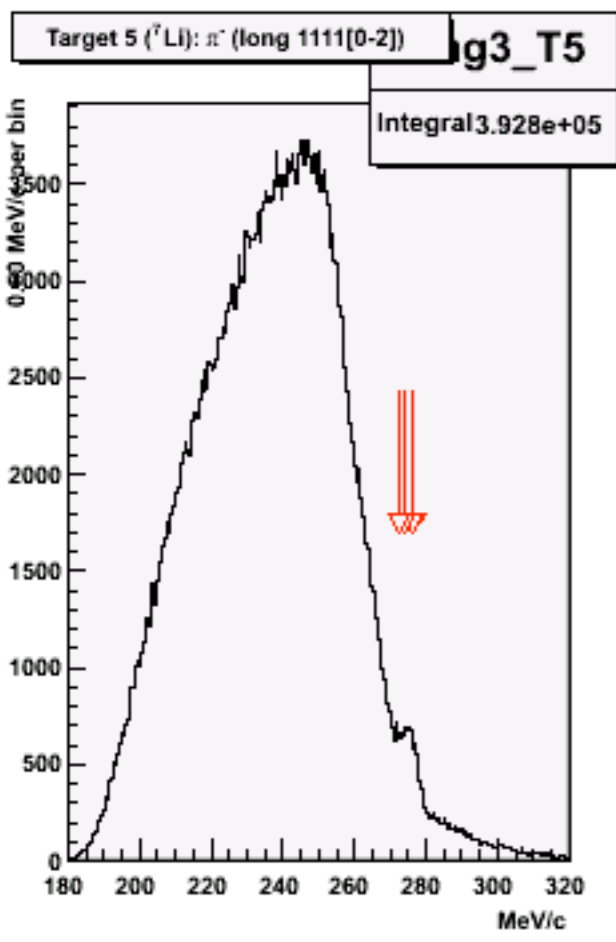
germano.Bonomi, fabio.Moia

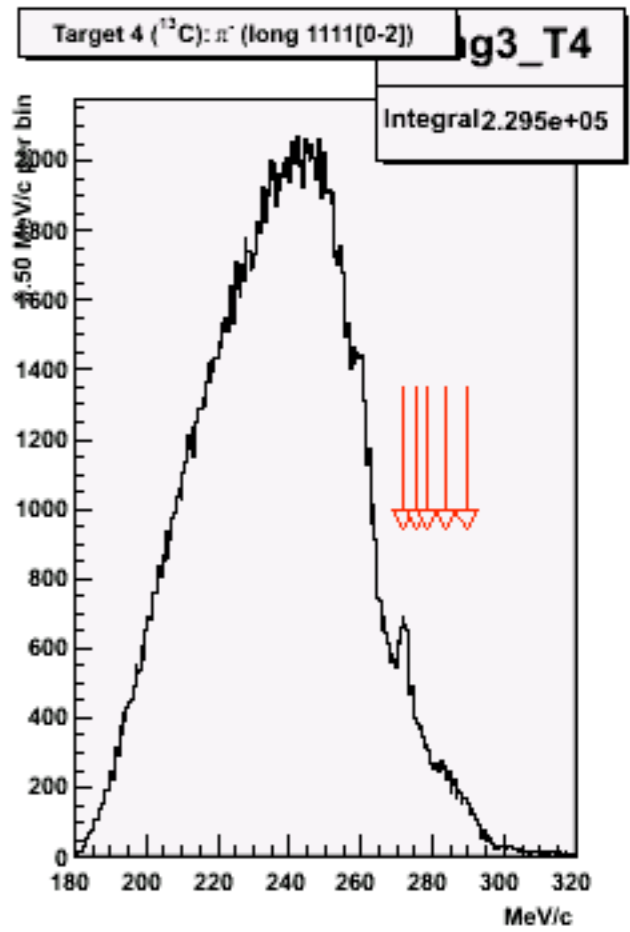
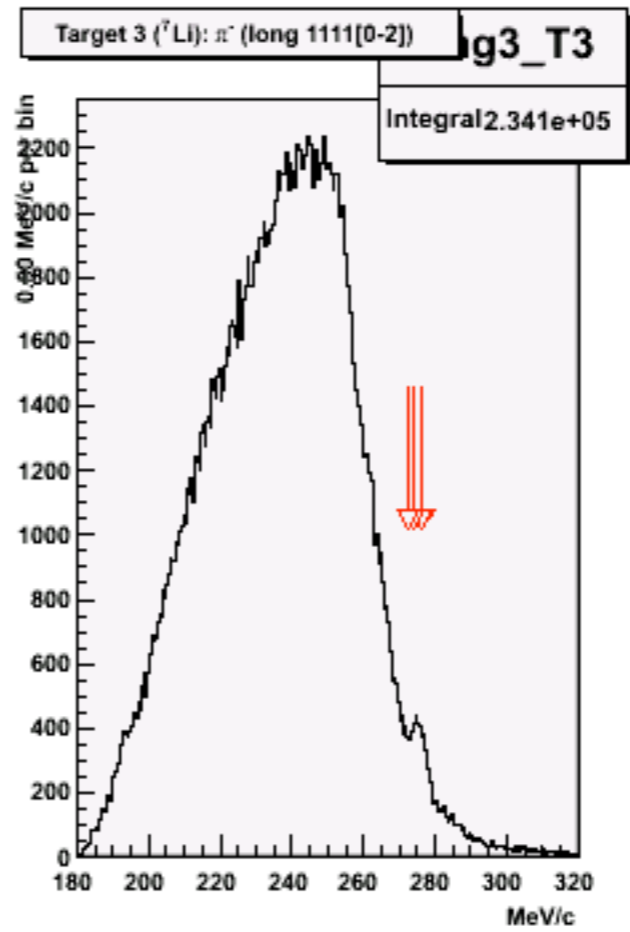
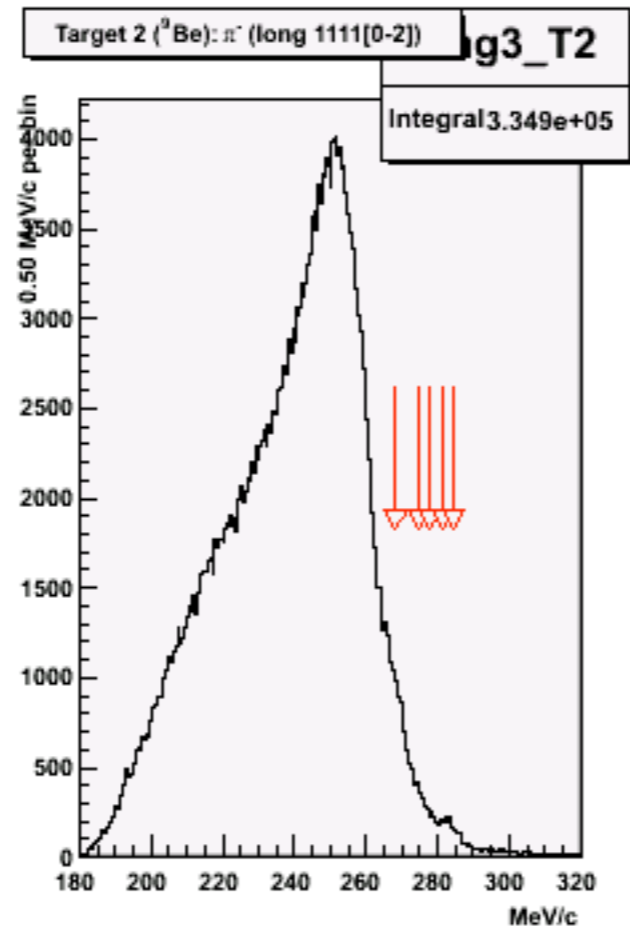
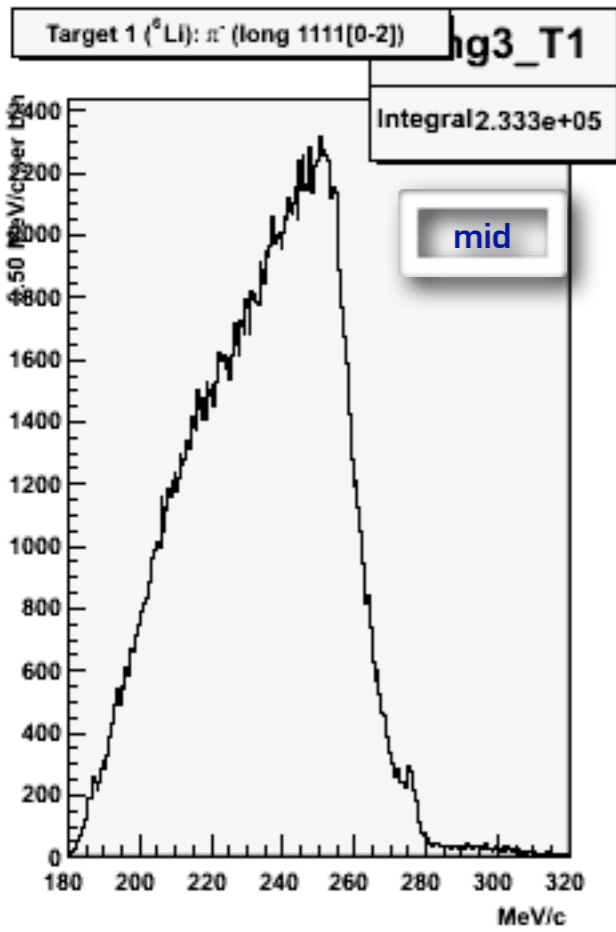
Indice:

- spettri in impulso (studio su 3 set di tagli, differenza back-forw)
- i fondi (differenze back-forw, fit "grezzi" per capire se riusciamo a riprodurre gli andamenti)
- descrizione delle procedure di fit
- **risultati preliminari**

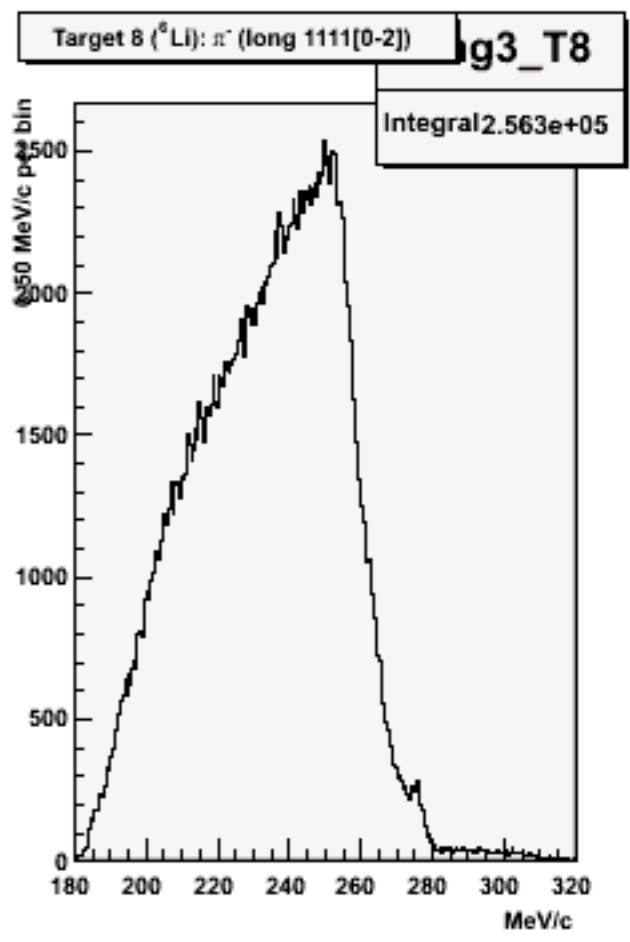
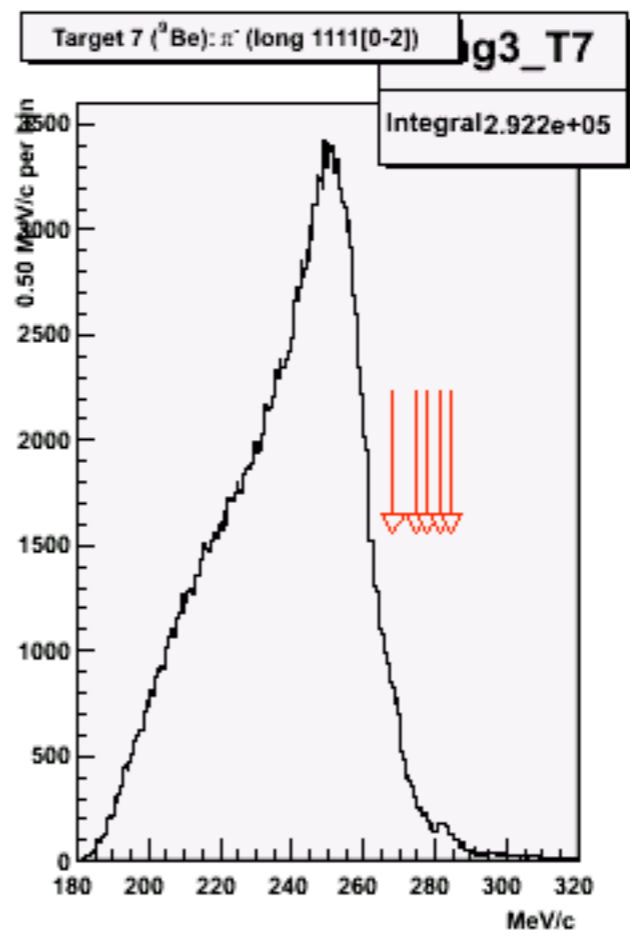
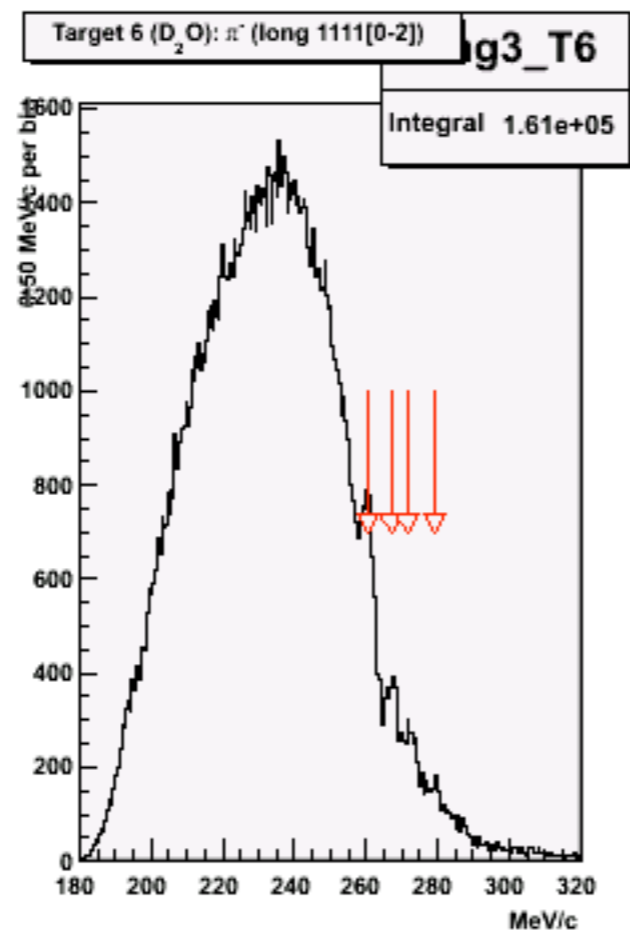
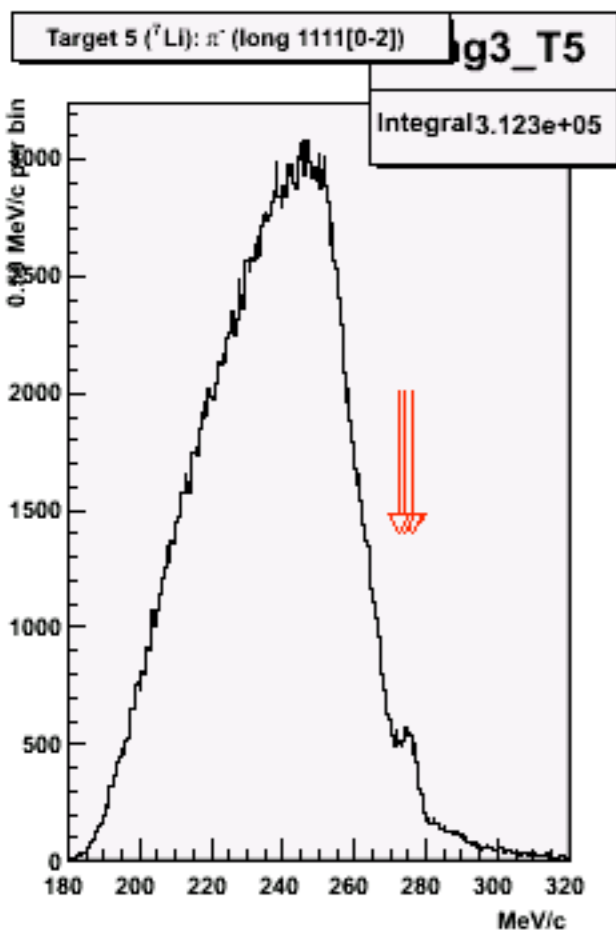


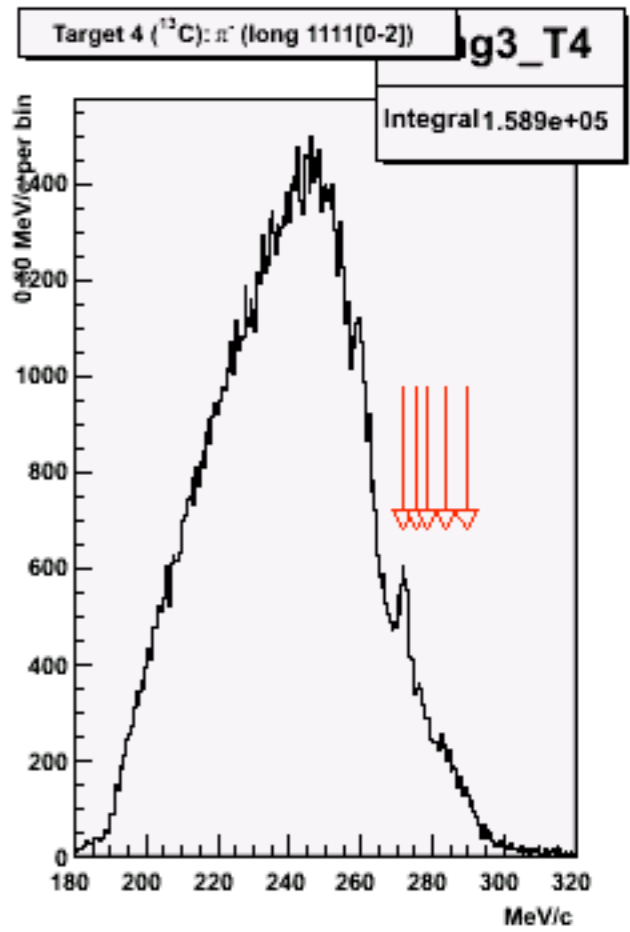
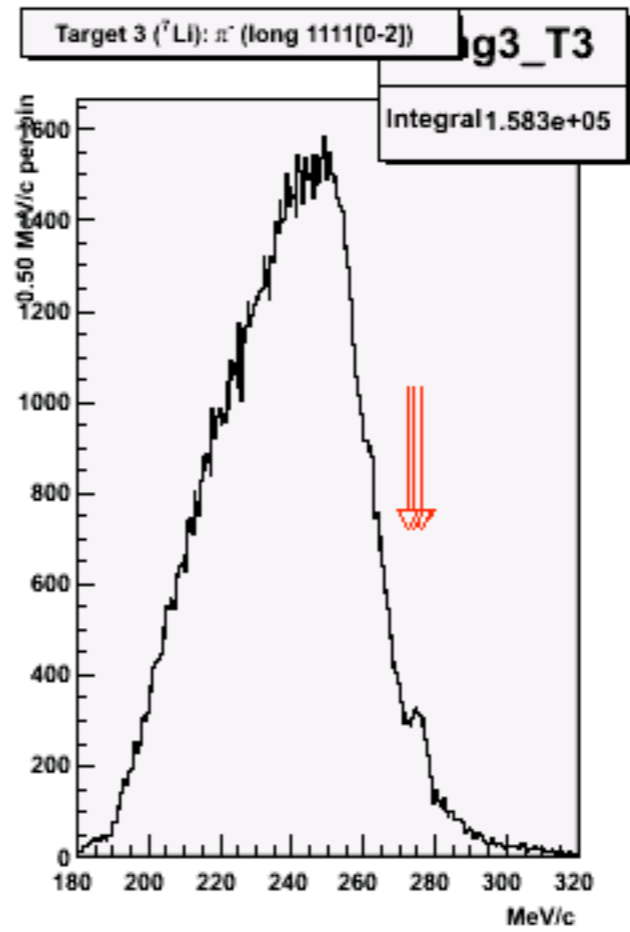
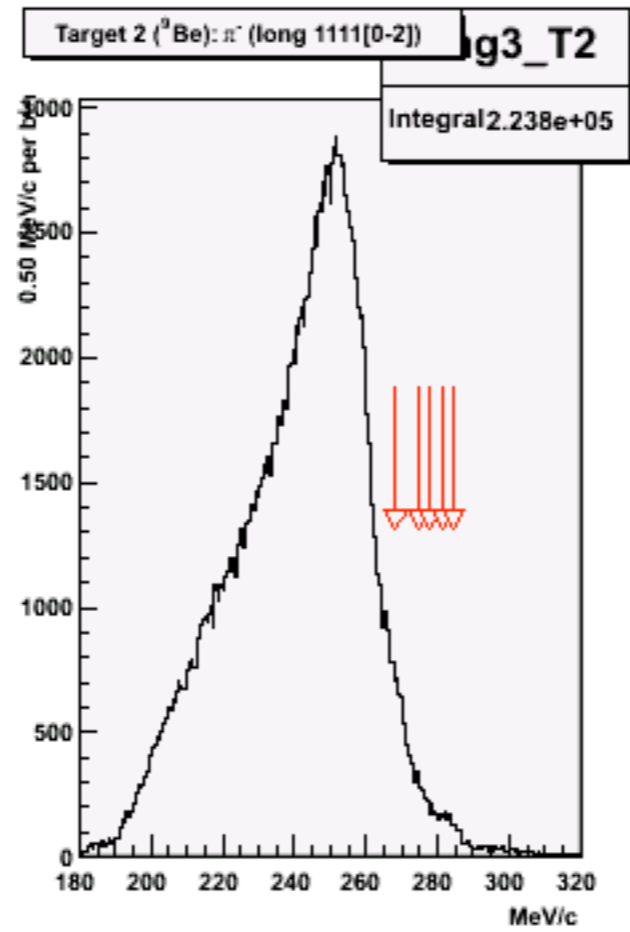
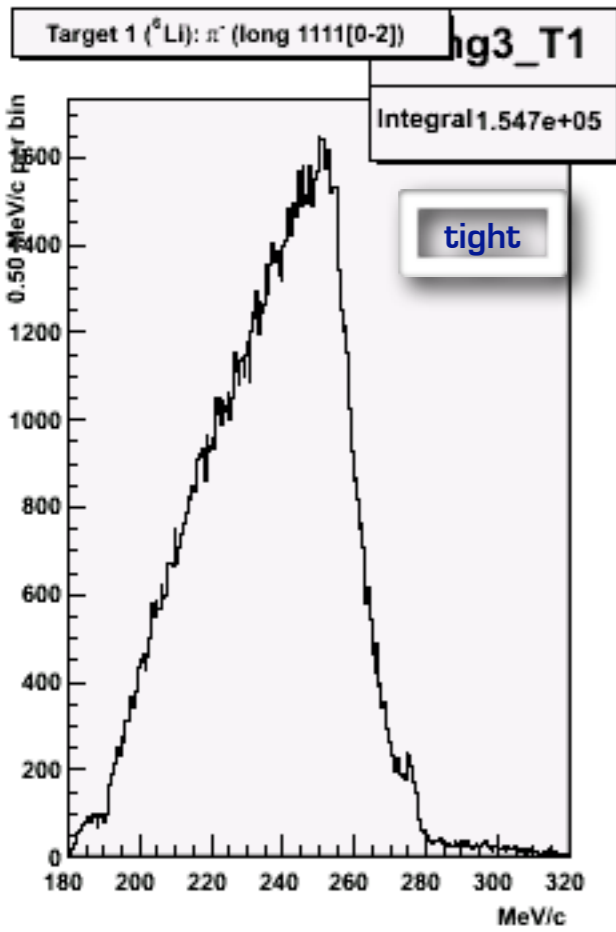
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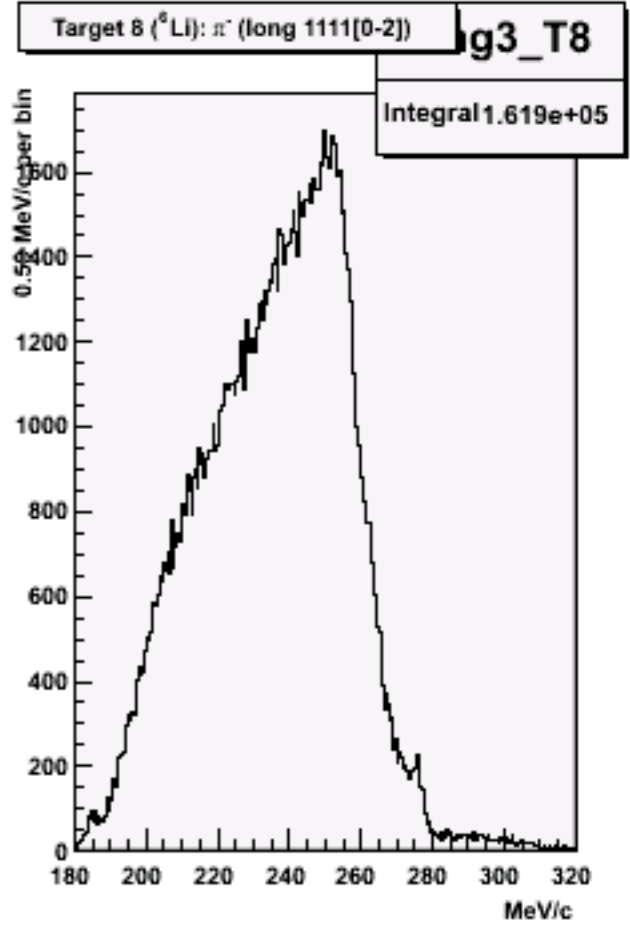
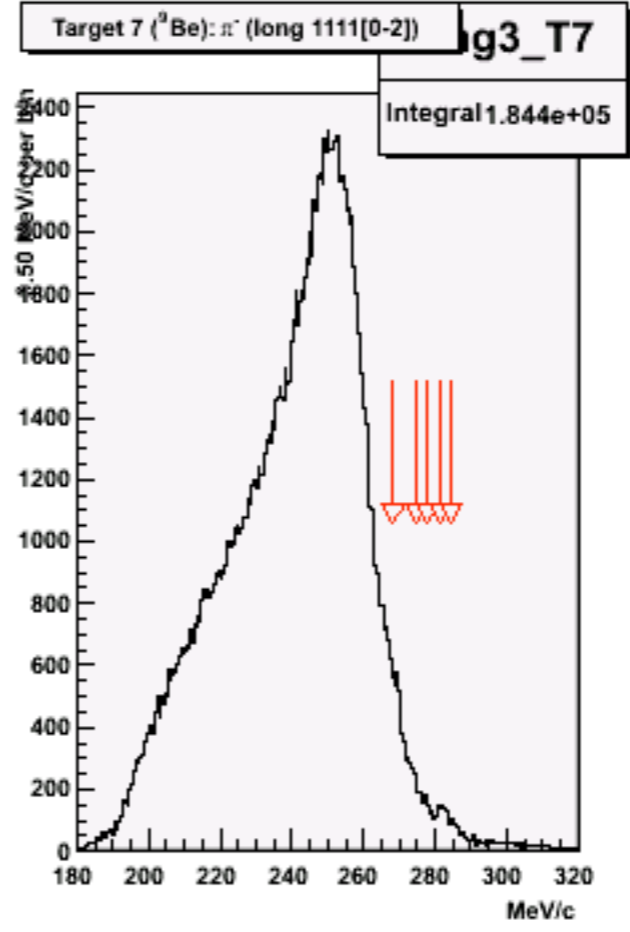
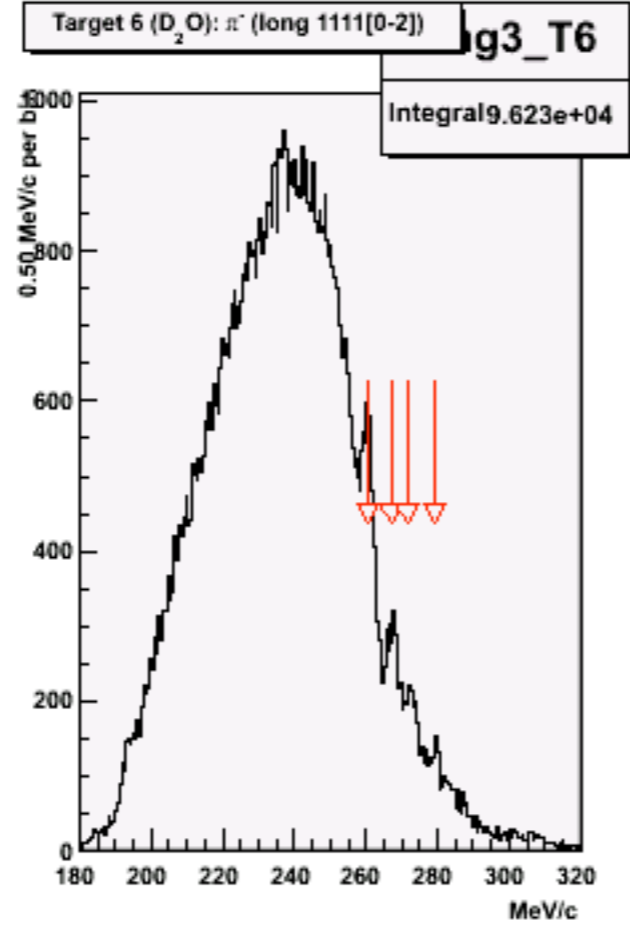
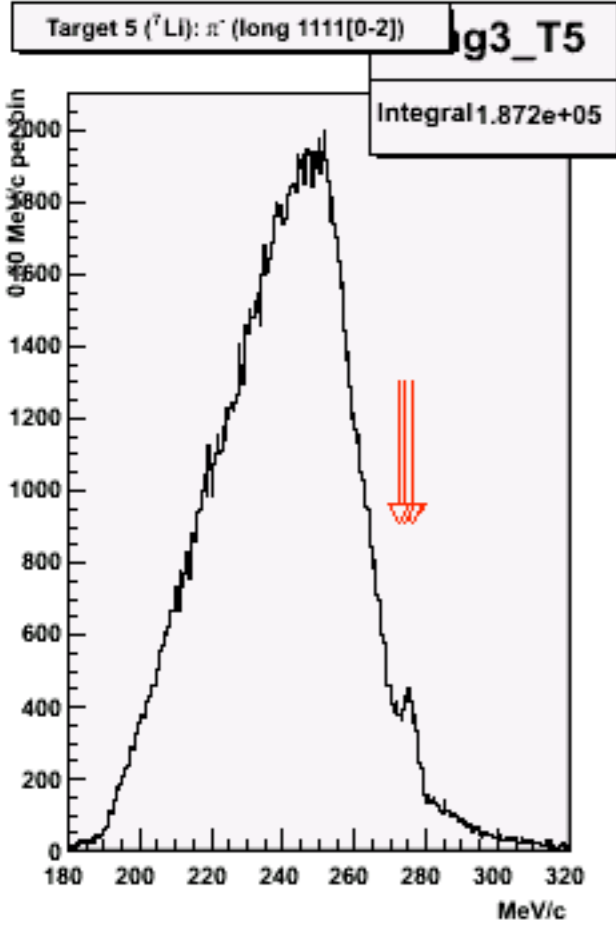


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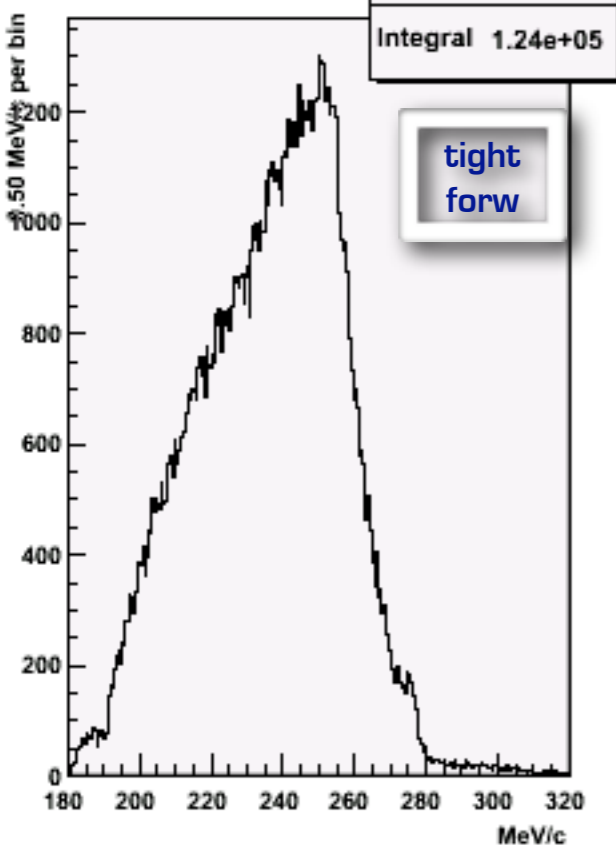




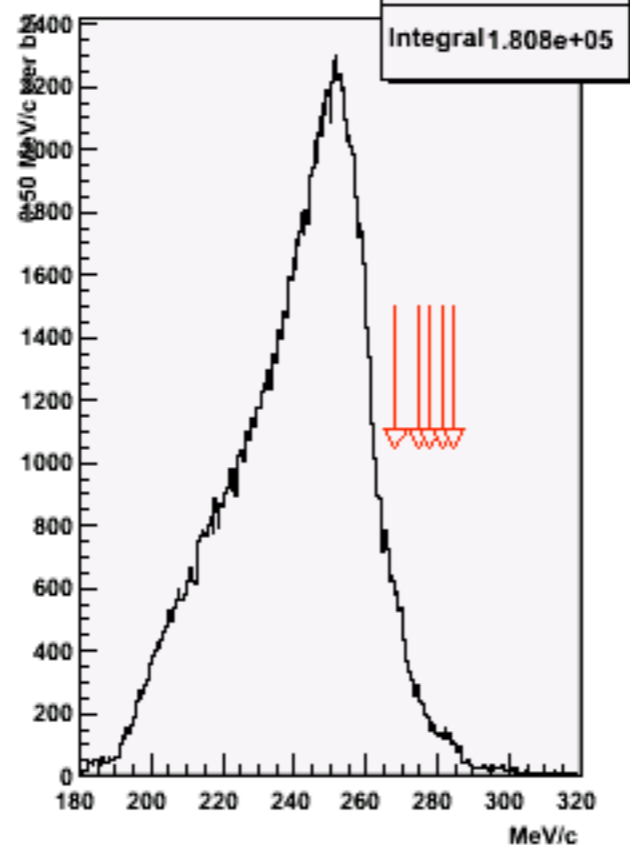
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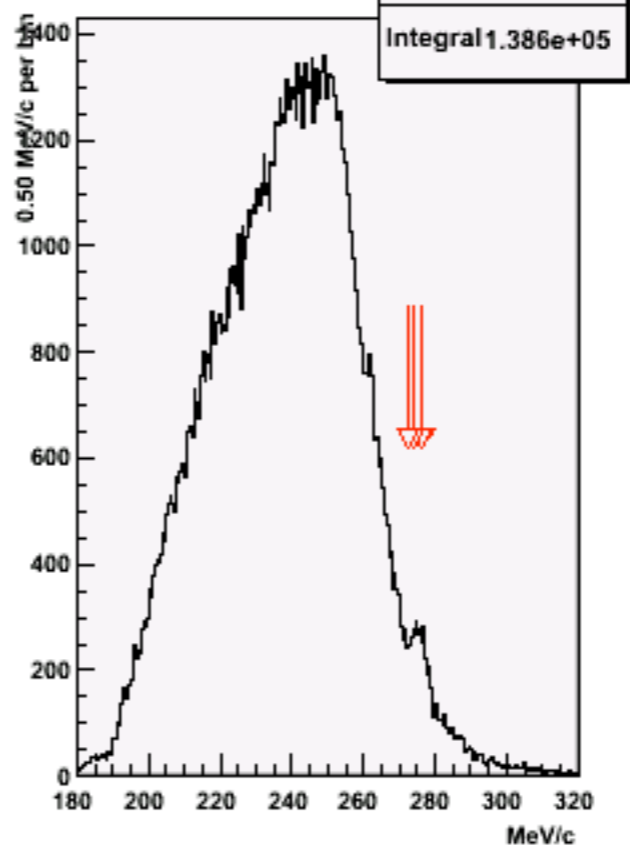
Target 1 (${}^6\text{Li}$): π^- (long 11110 forward) **g3f_T1**



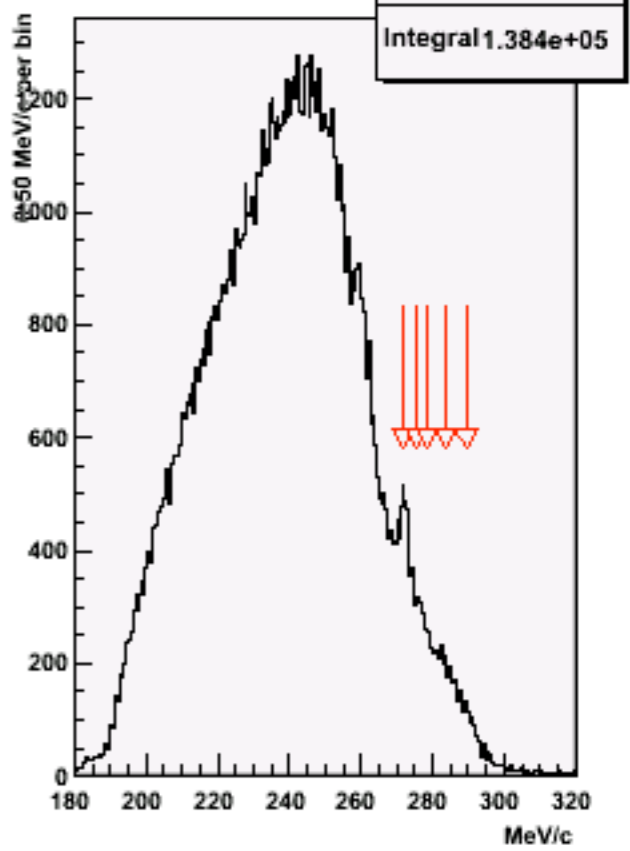
Target 2 (${}^9\text{Be}$): π^- (long 11110 forward) **g3f_T2**



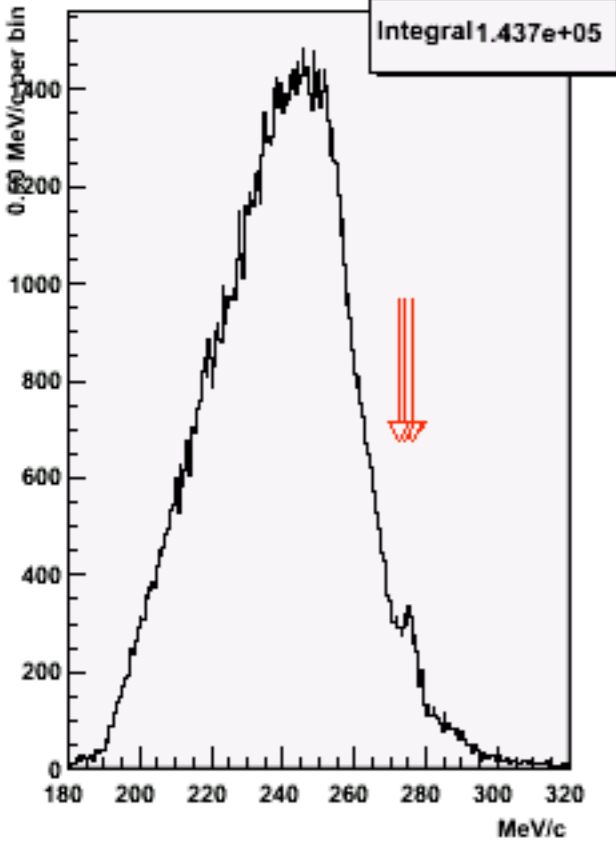
Target 3 (${}^7\text{Li}$): π^- (long 11110 forward) **g3f_T3**



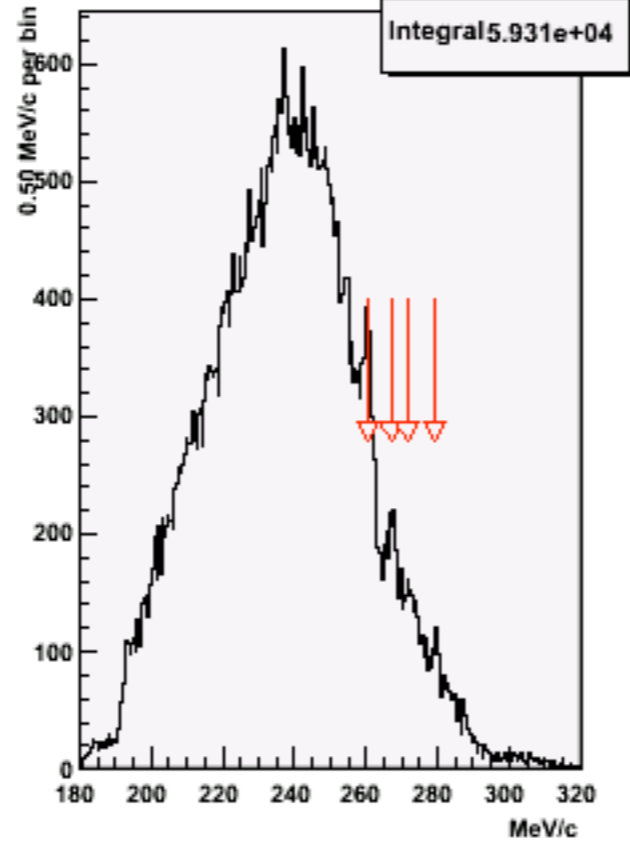
Target 4 (${}^{12}\text{C}$): π^- (long 11110 forward) **g3f_T4**



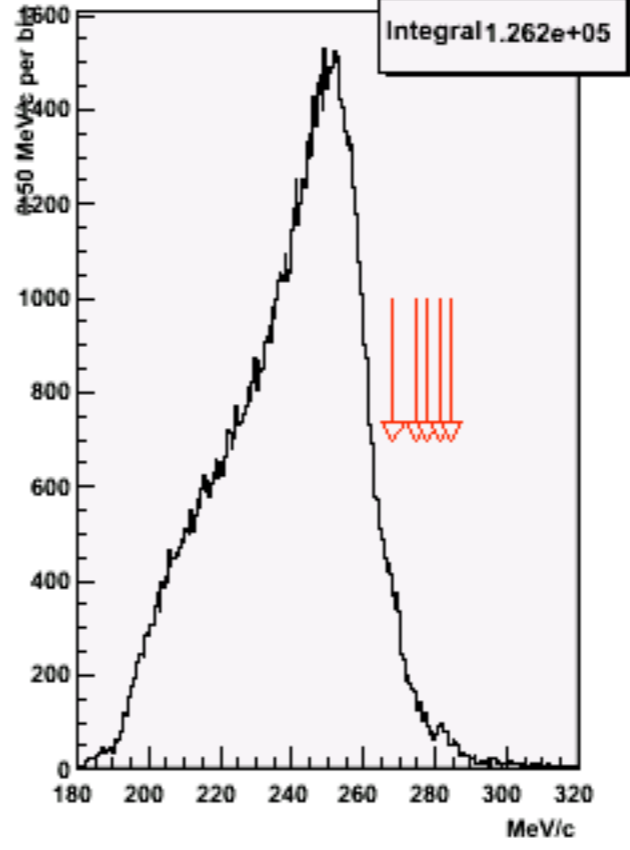
Target 5 (${}^7\text{Li}$): π^- (long 11110 forward) **g3f_T5**



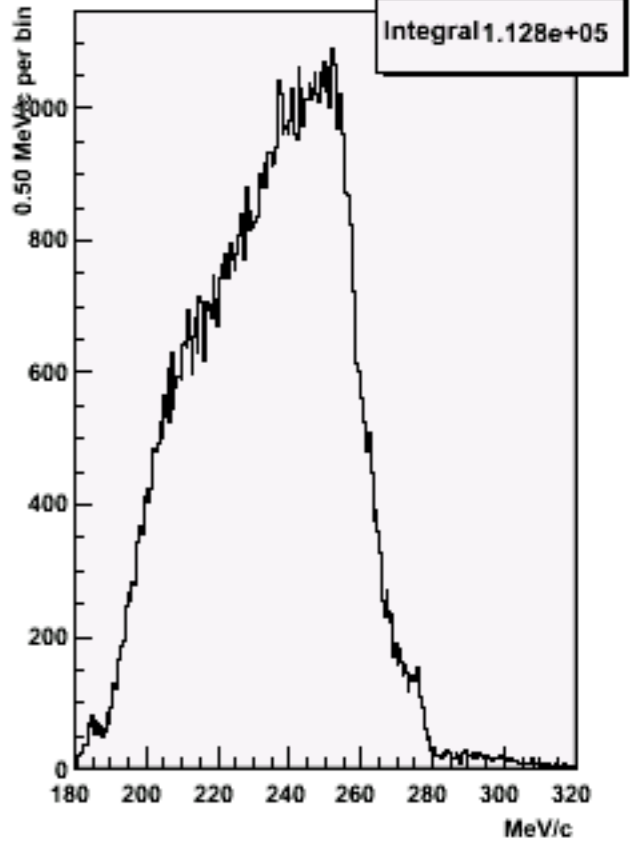
Target 6 (D_2O): π^- (long 11110 forward) **g3f_T6**



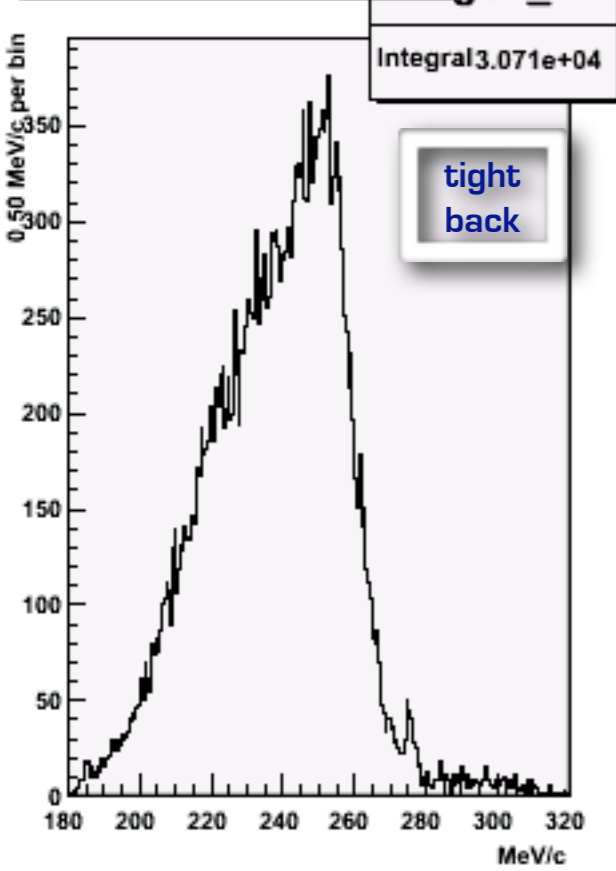
Target 7 (${}^9\text{Be}$): π^- (long 11110 forward) **g3f_T7**



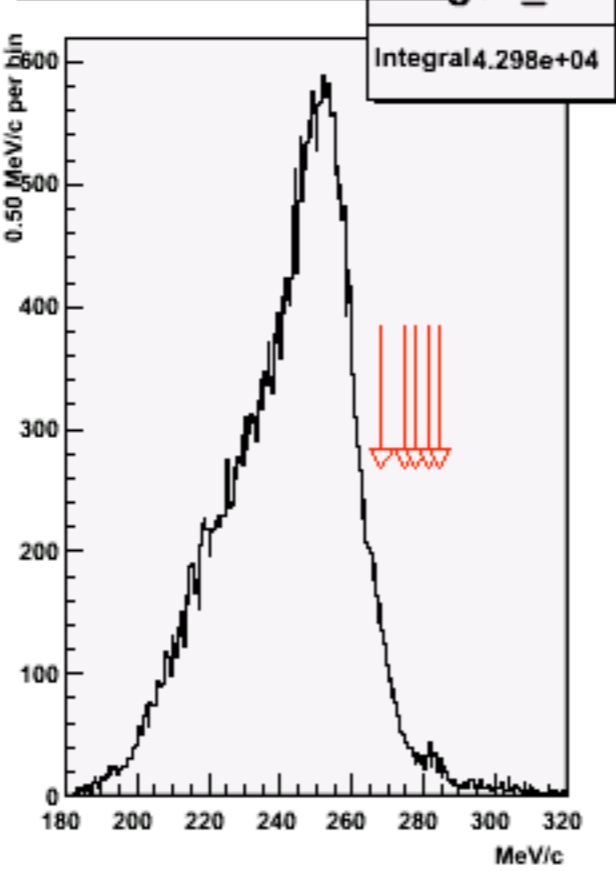
Target 8 (${}^6\text{Li}$): π^- (long 11110 forward) **g3f_T8**



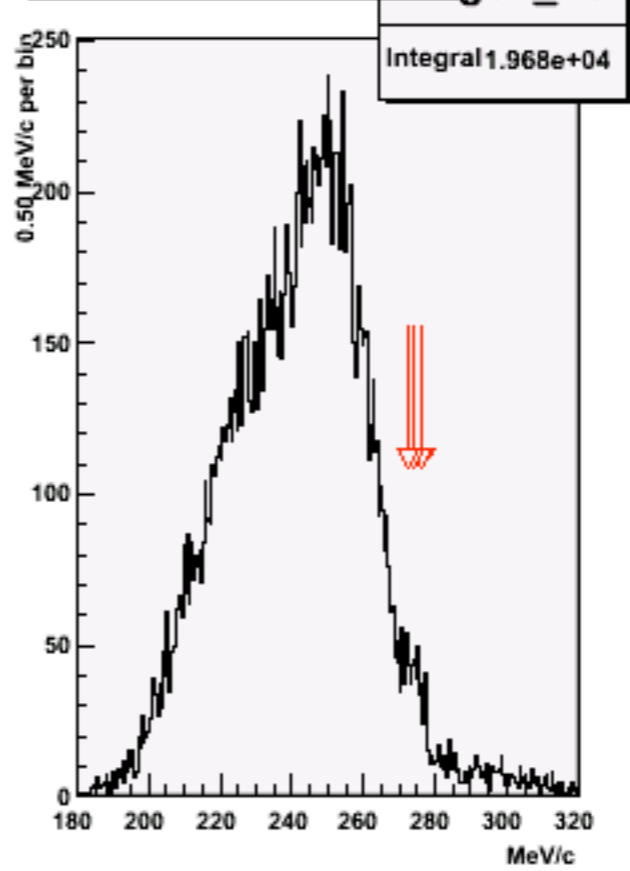
Target 1 (${}^6\text{Li}$): π^- (long 11112 backward) **g3b_T1**



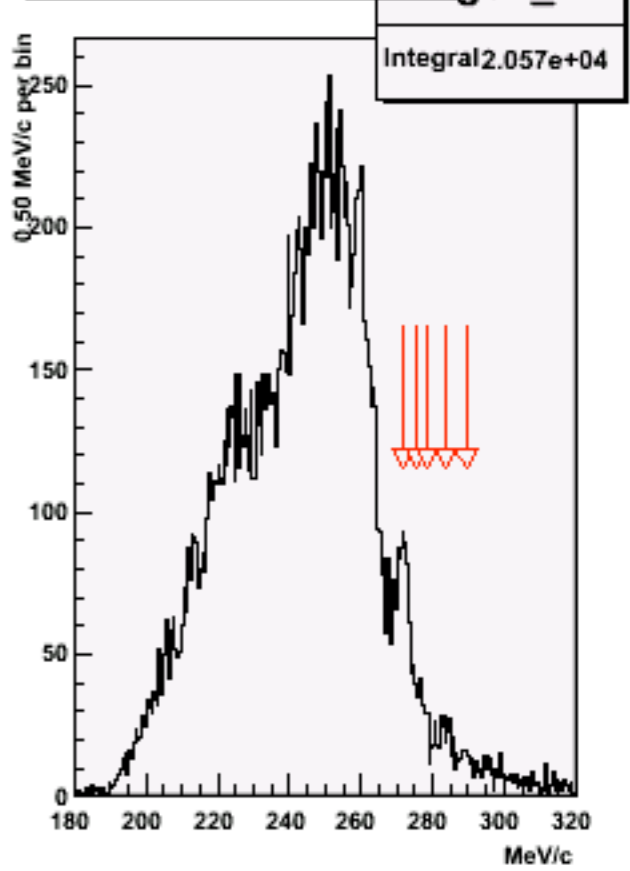
Target 2 (${}^9\text{Be}$): π^- (long 11112 backward) **g3b_T2**



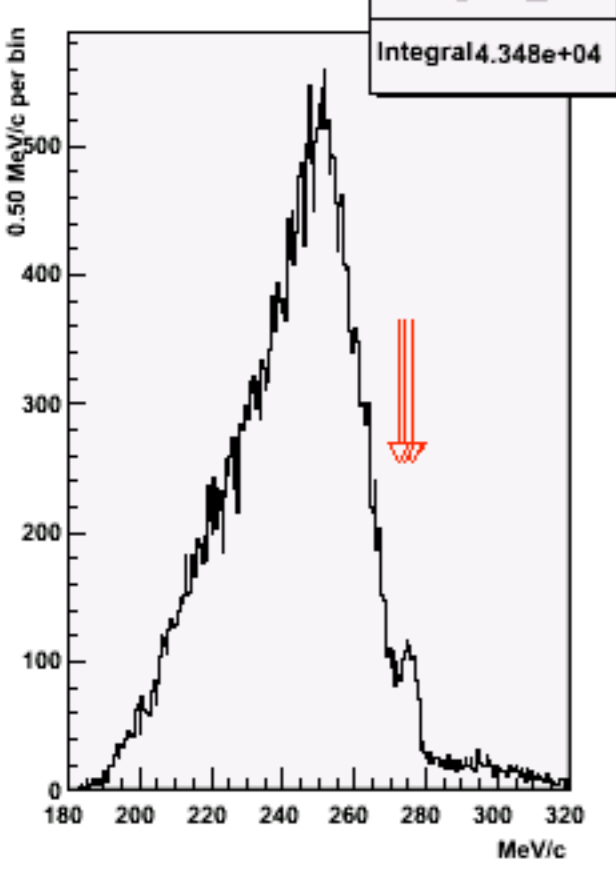
Target 3 (${}^7\text{Li}$): π^- (long 11112 backward) **g3b_T3**



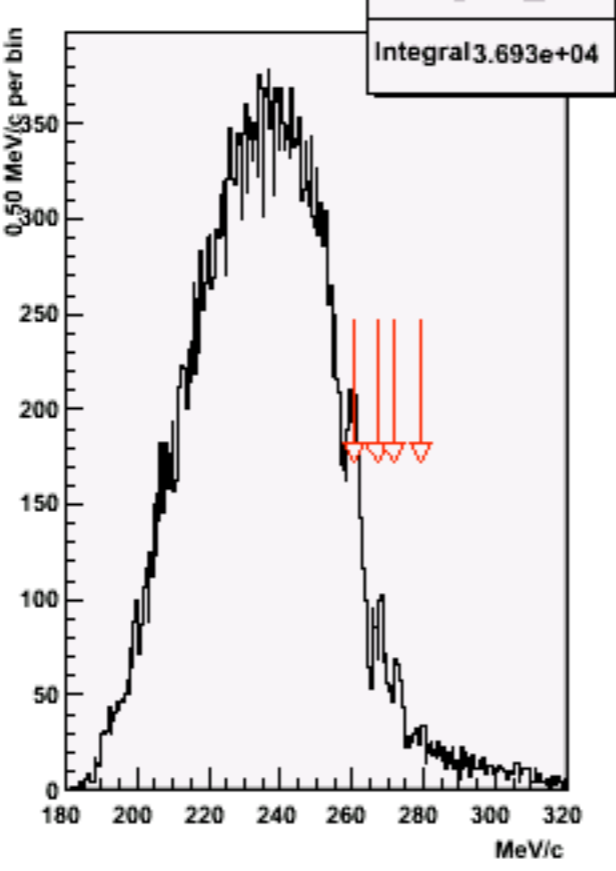
Target 4 (${}^{13}\text{C}$): π^- (long 11112 backward) **g3b_T4**



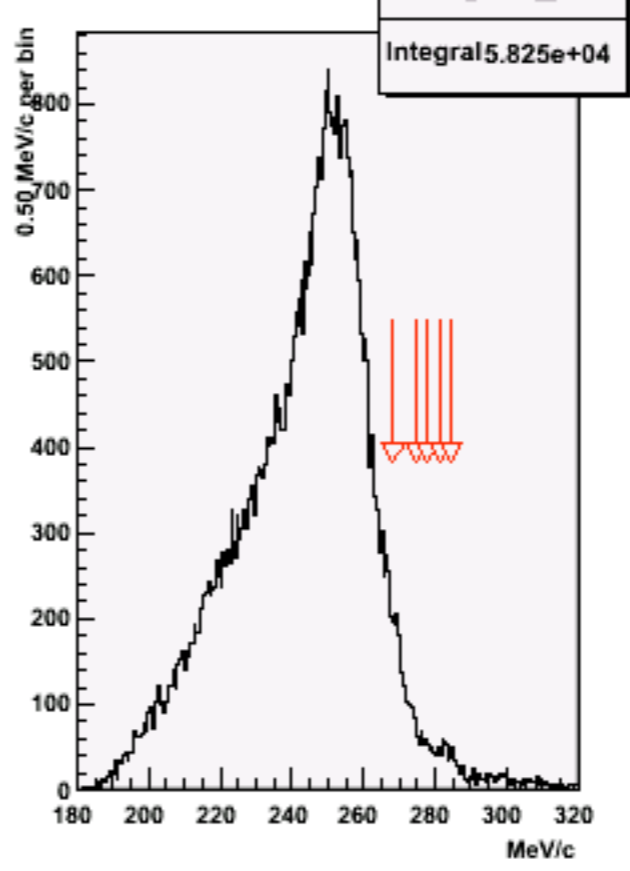
Target 5 (${}^7\text{Li}$): π^- (long 11112 backward) **g3b_T5**



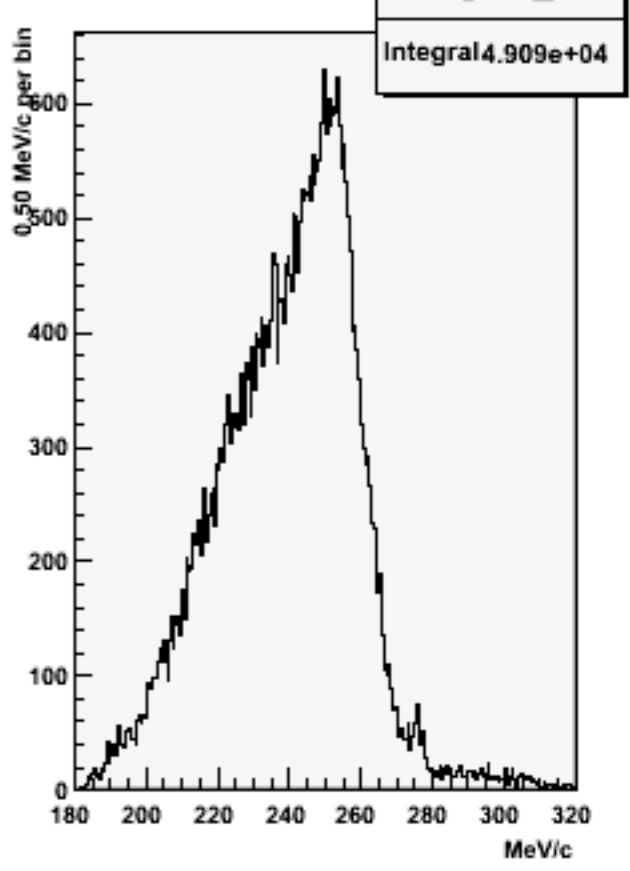
Target 6 (D_2O): π^- (long 11112 backward) **g3b_T6**



Target 7 (${}^9\text{Be}$): π^- (long 11112 backward) **g3b_T7**



Target 8 (${}^6\text{Li}$): π^- (long 11112 backward) **g3b_T8**



i fondi

generazione MC del background

pablo.Genova

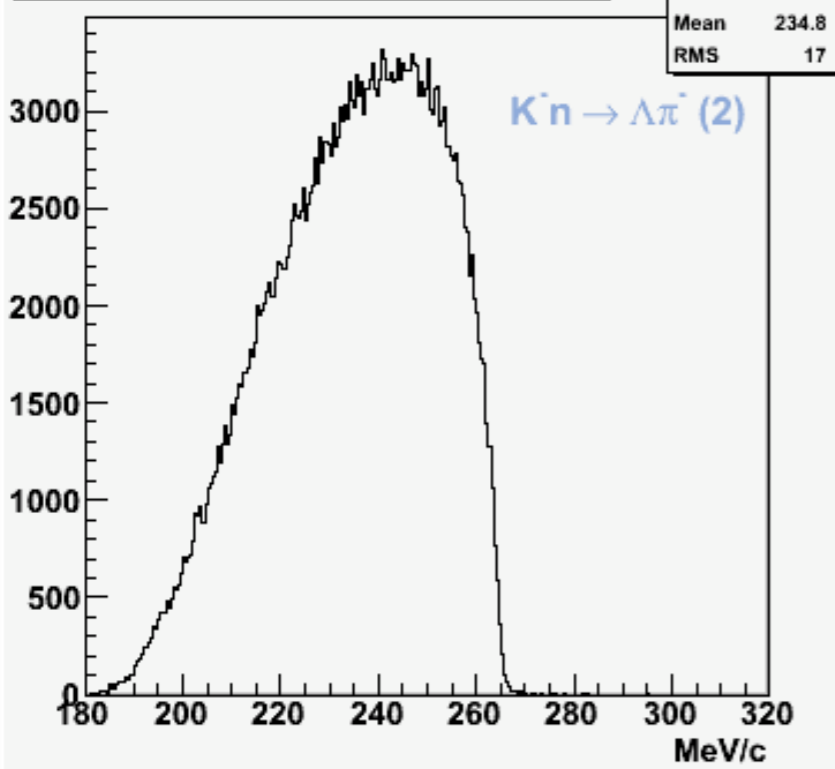


K⁻ in-flight decays

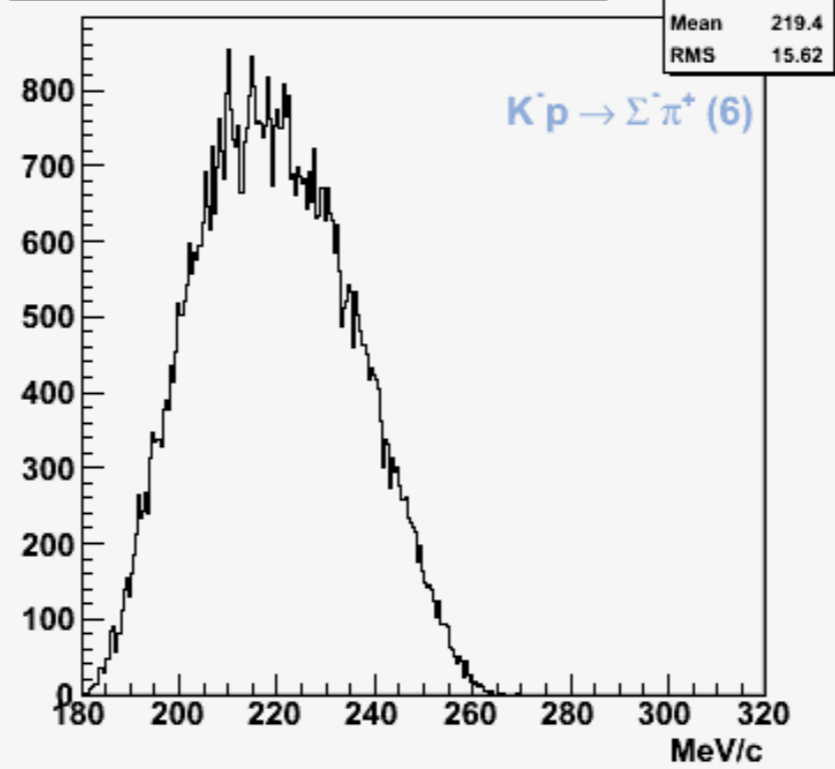
per il MC Sigma- pi+ 750 run da 30.000 eventi pari a $2.25 \cdot 10^7$ (ca 22 milioni)
per il MC Sigma- p 792 run da 30.000 eventi pari a $2.376 \cdot 10^7$ (ca 24 milioni)
per il MC Lambda pi- 734 run da 30.000 eventi pari a $2.202 \cdot 10^7$ (ca 22 milioni)

Questi numeri si riferiscono agli eventi simulati come in scheda dati
(variabile TRIG della scheda dati fidamc).

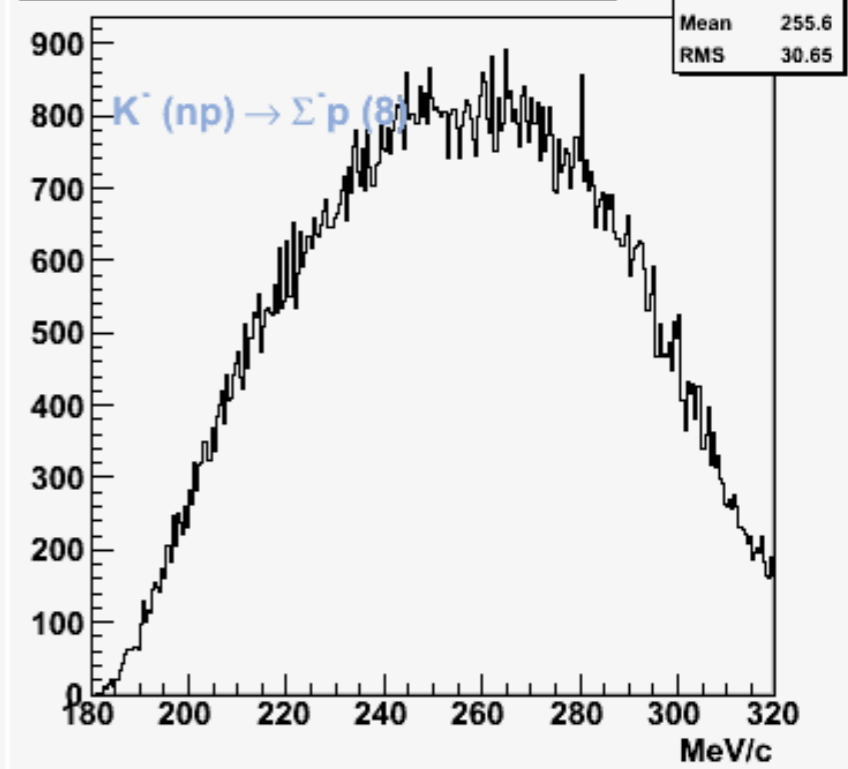
Target 6 (D₂O): π⁻ (long 1111[0-2])



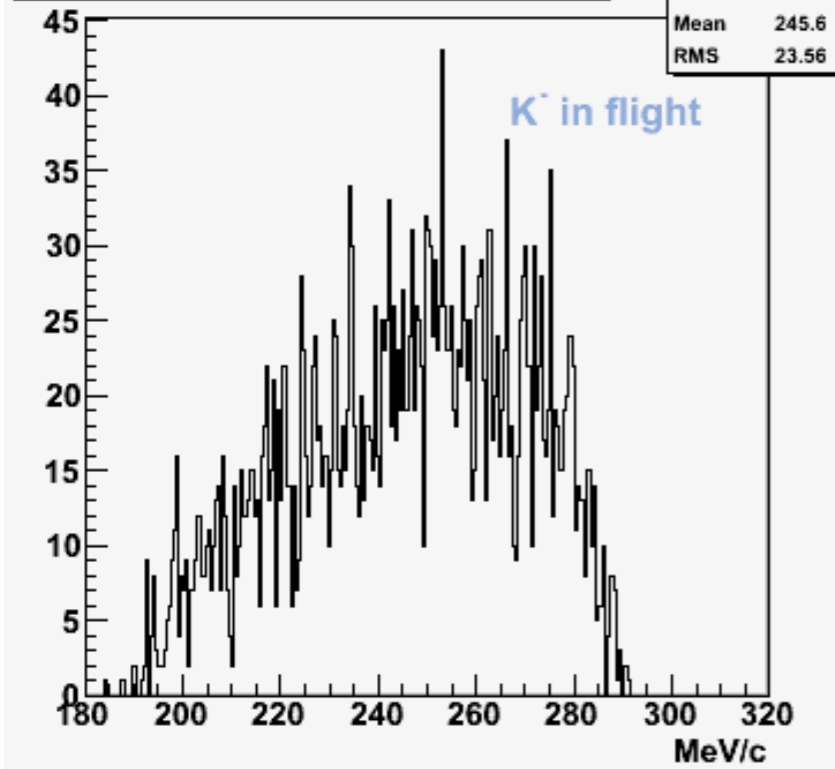
Target 6 (D₂O): π⁻ (long 1111[0-2])



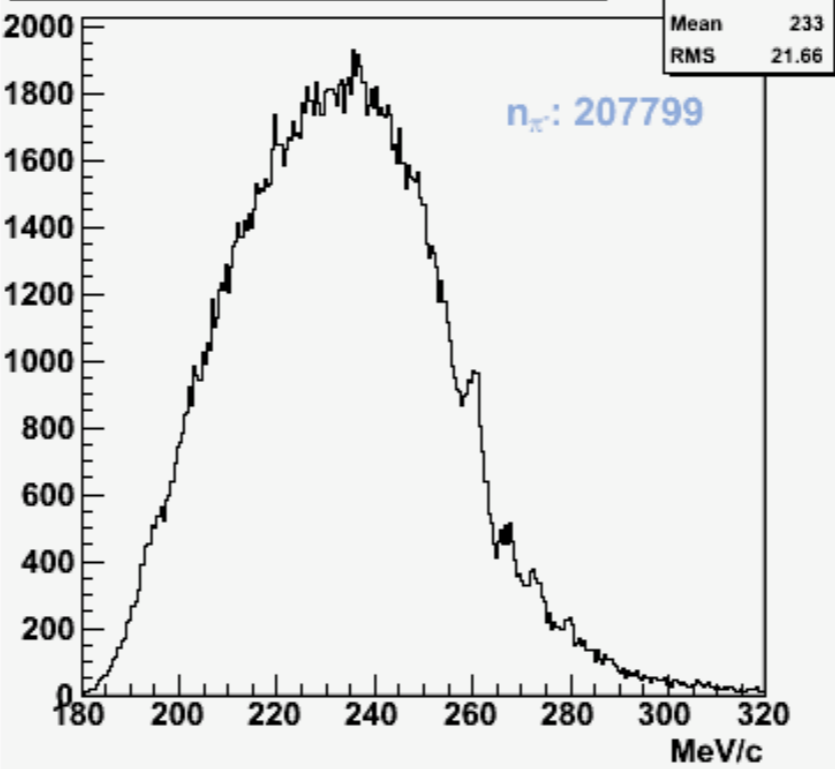
Target 6 (D₂O): π⁻ (long 1111[0-2])



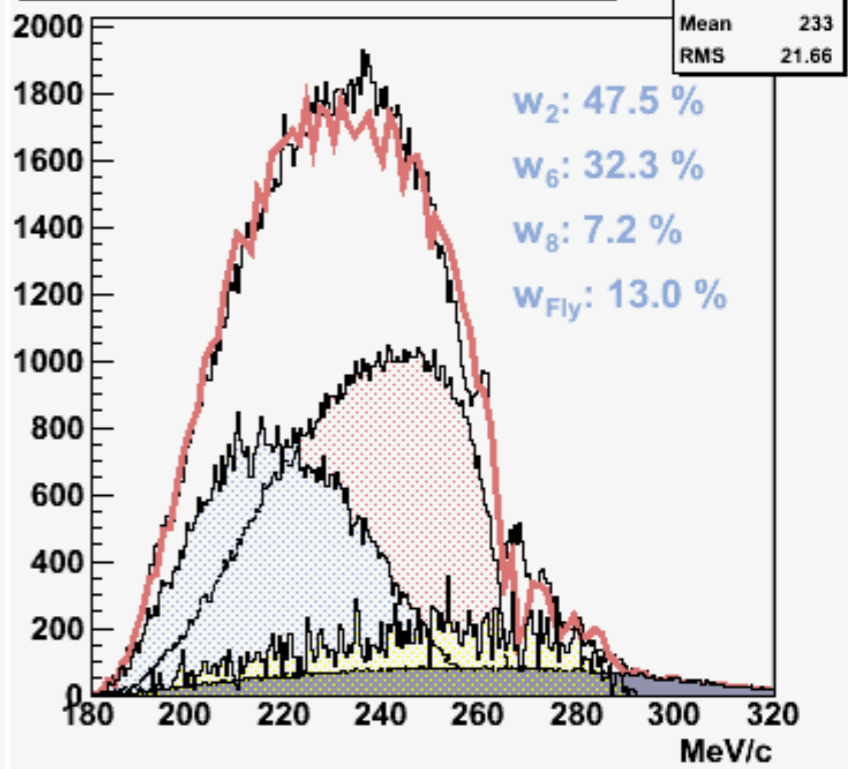
Target 6 (D₂O): π⁻ (long 1111[0-2])

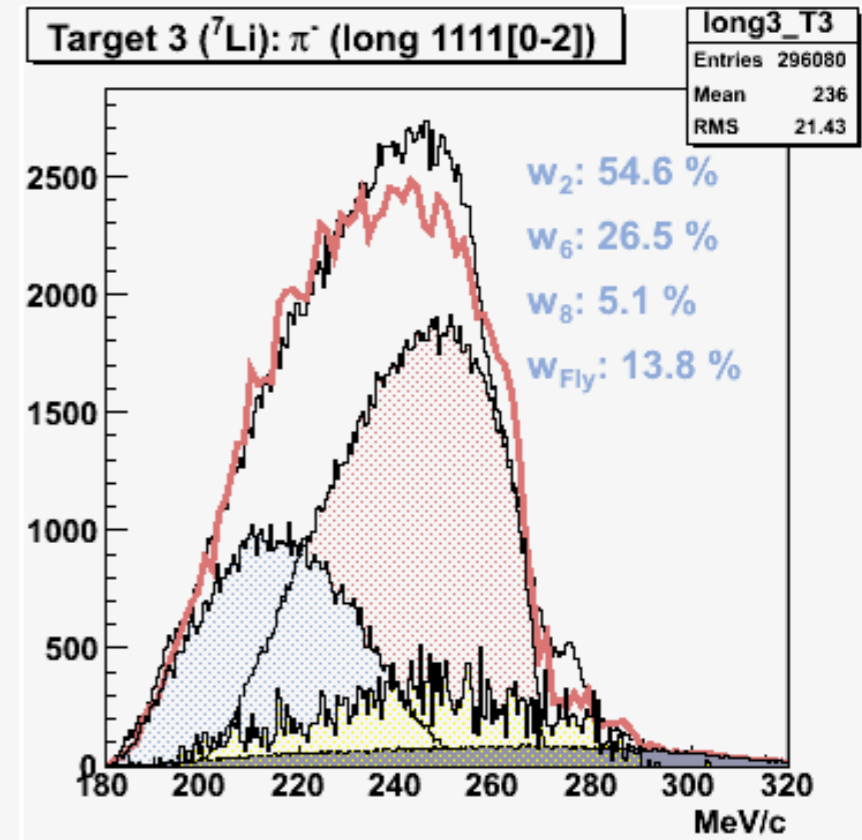
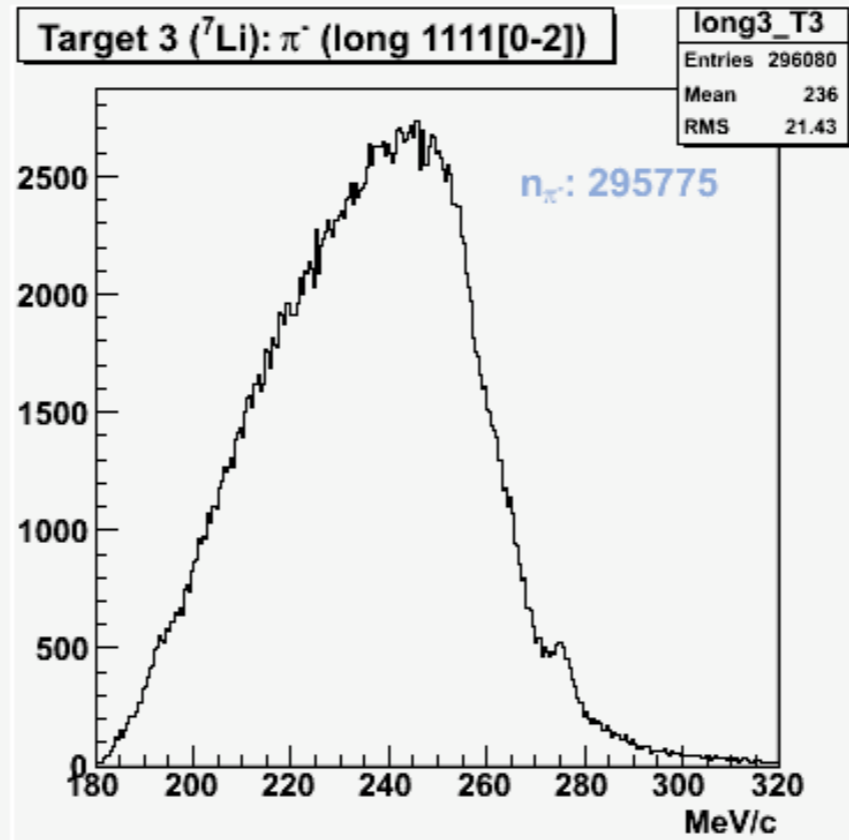
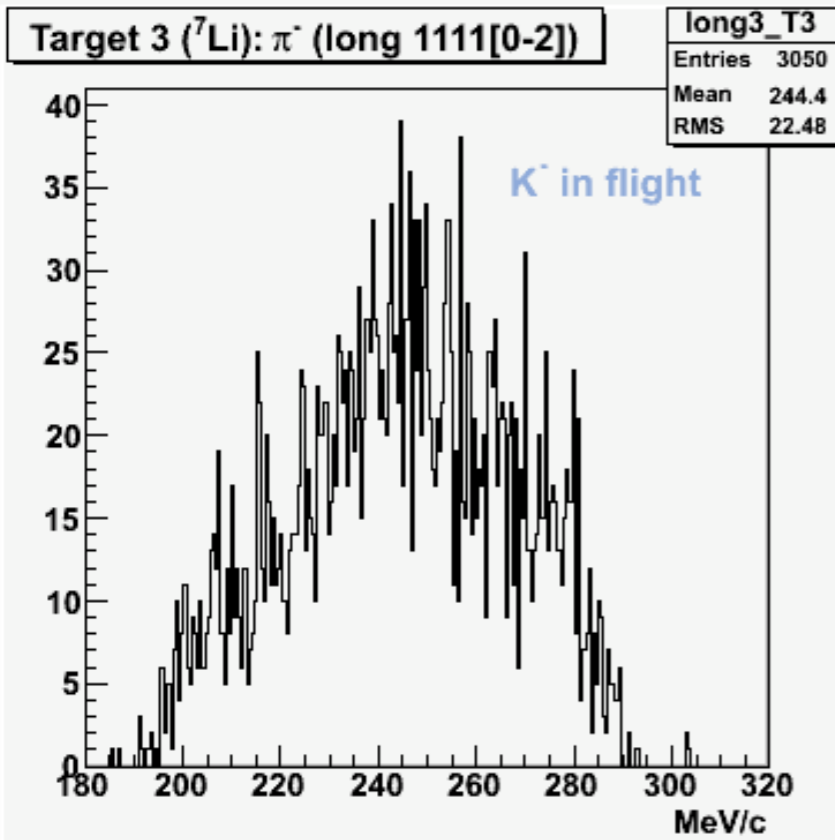
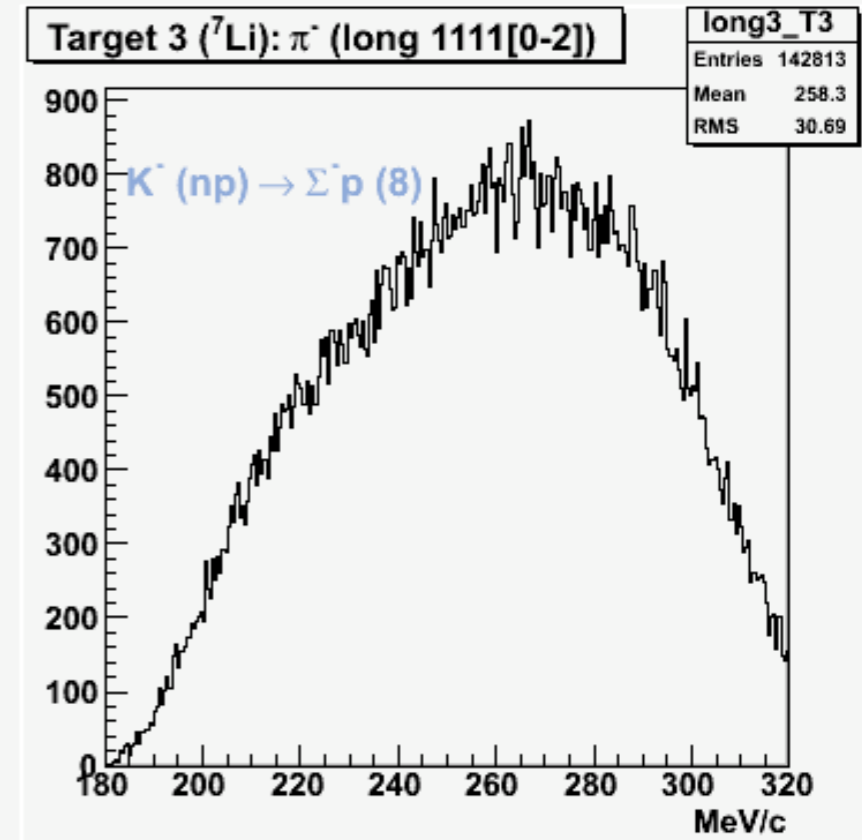
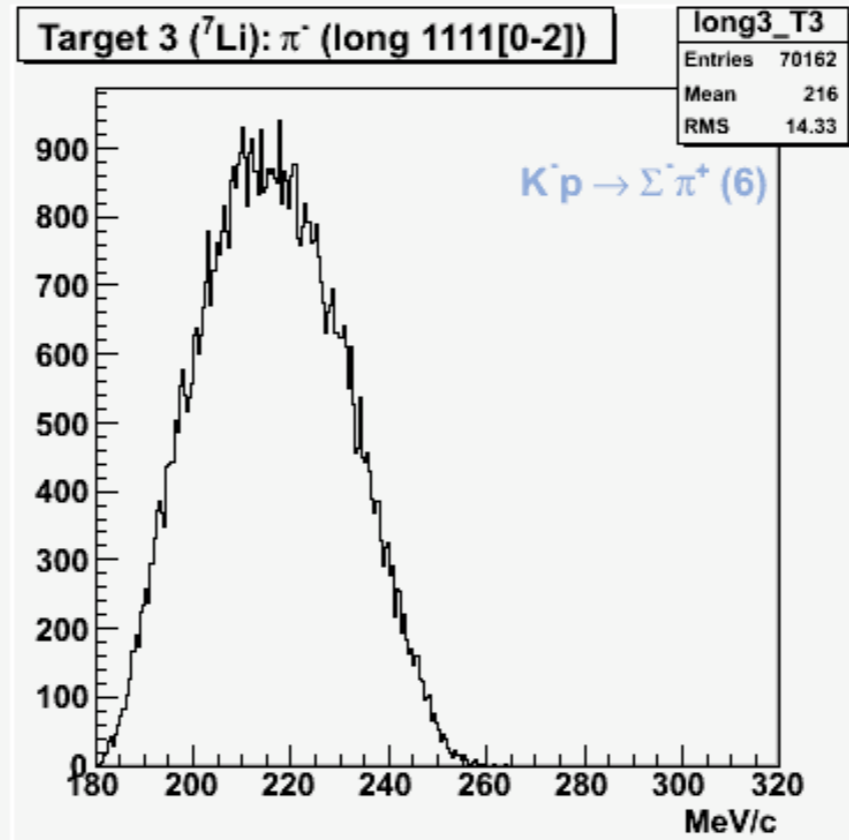
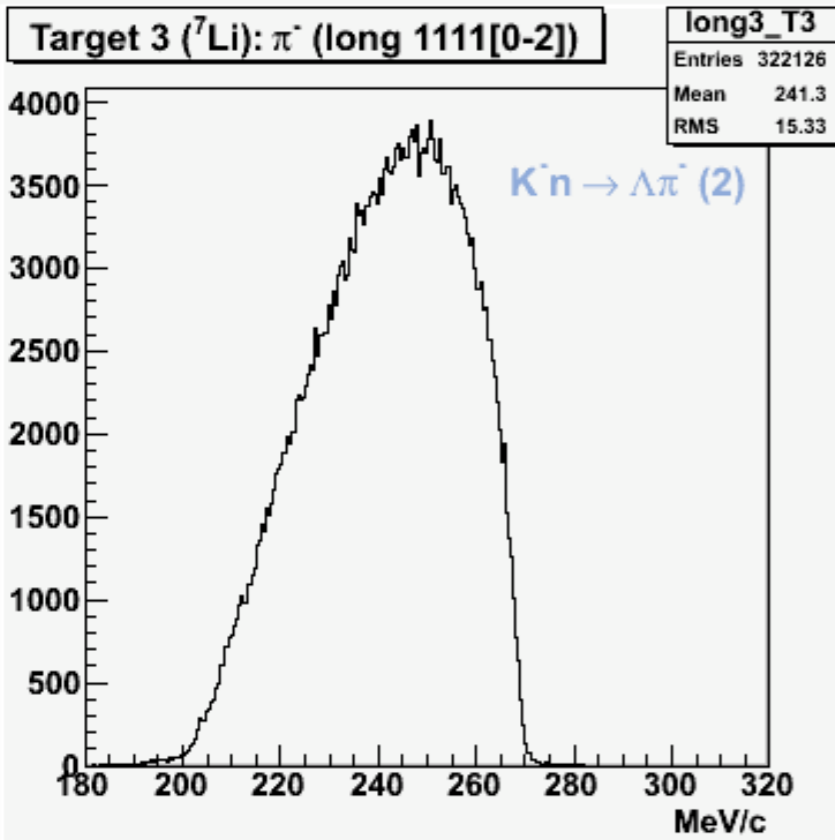


Target 6 (D₂O): π⁻ (long 1111[0-2])

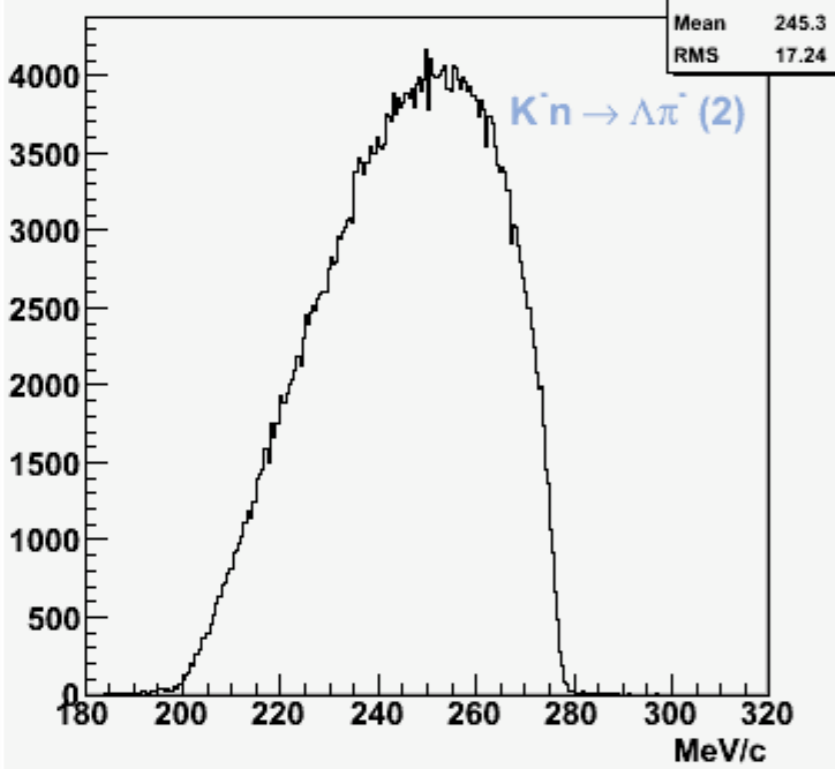


Target 6 (D₂O): π⁻ (long 1111[0-2])

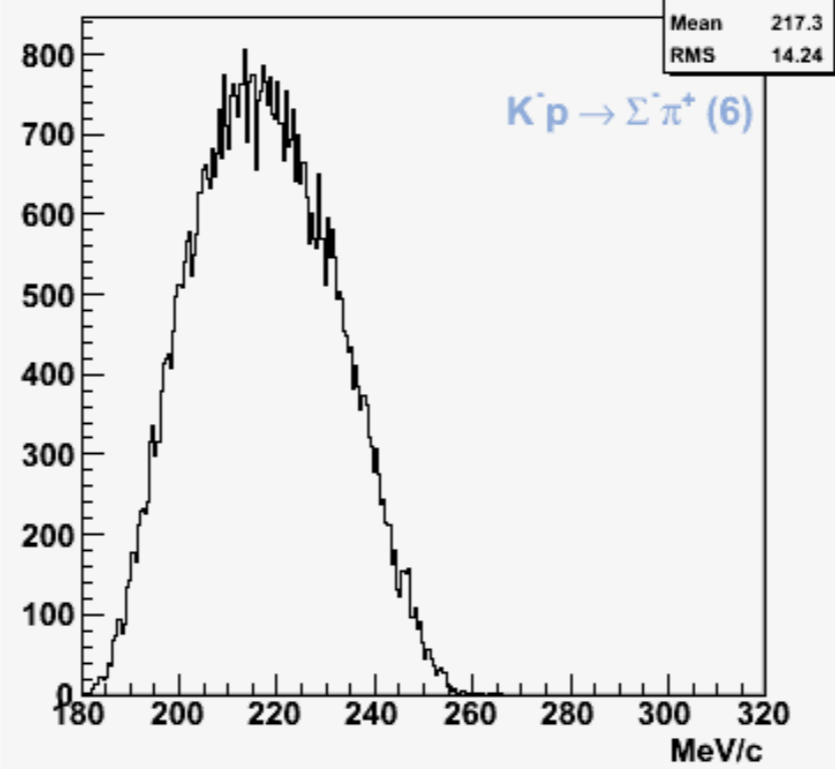




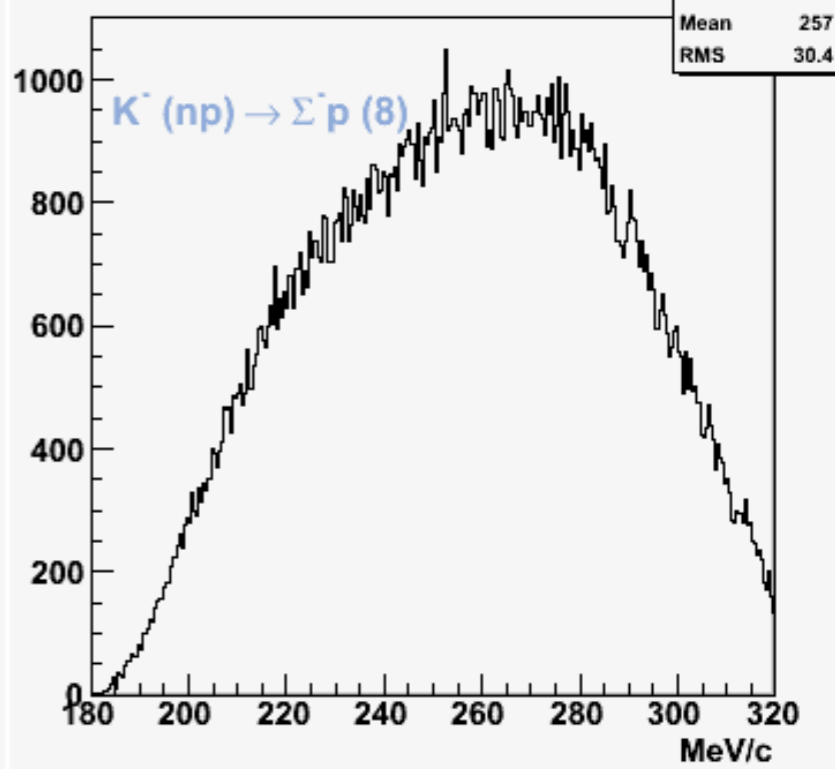
Target 7 (^9Be): π^- (long 1111[0-2])



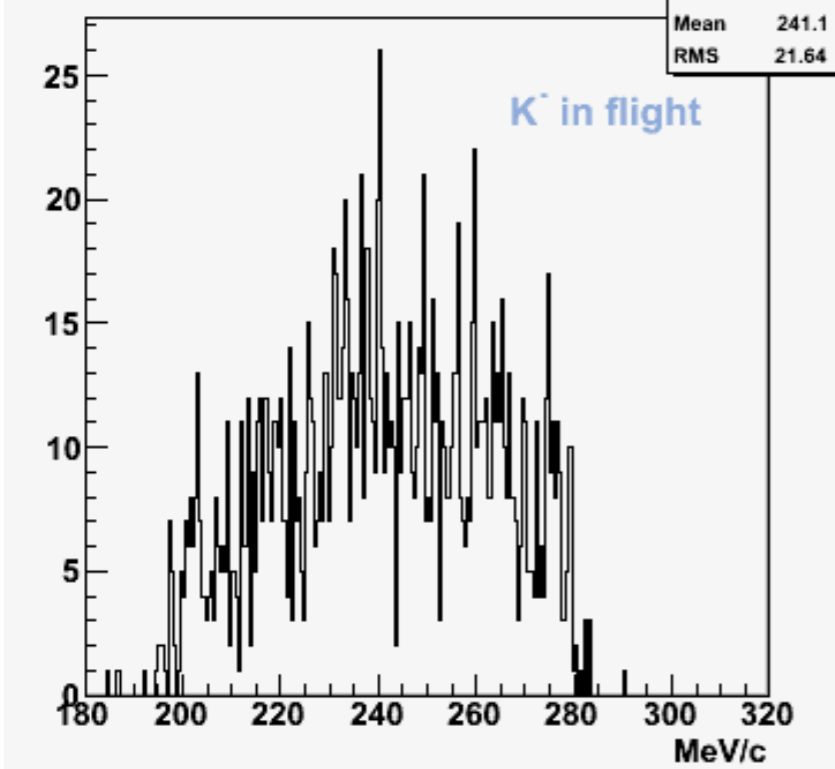
Target 7 (^9Be): π^- (long 1111[0-2])



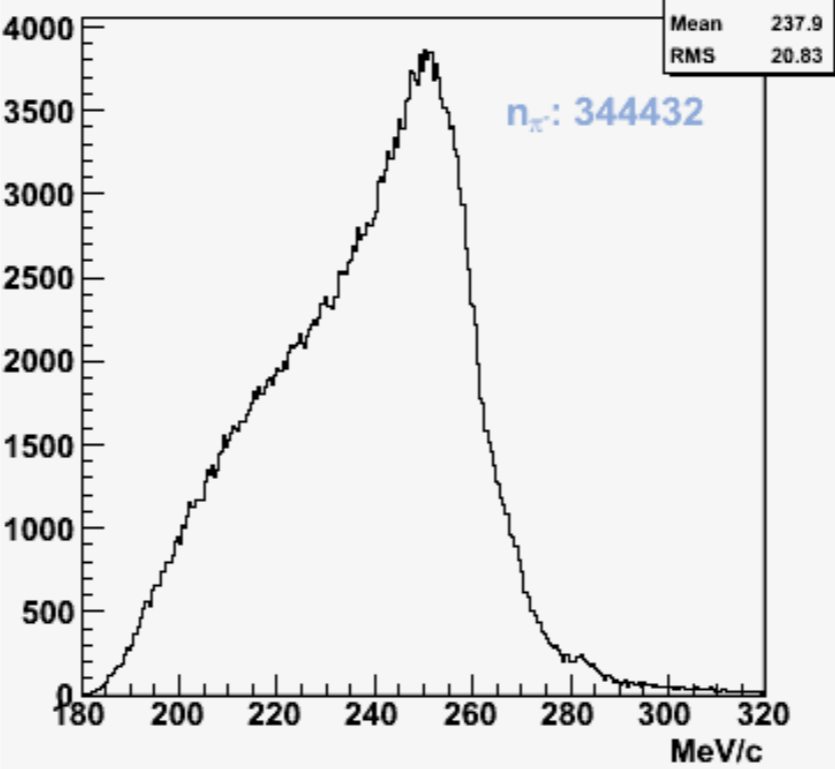
Target 7 (^9Be): π^- (long 1111[0-2])



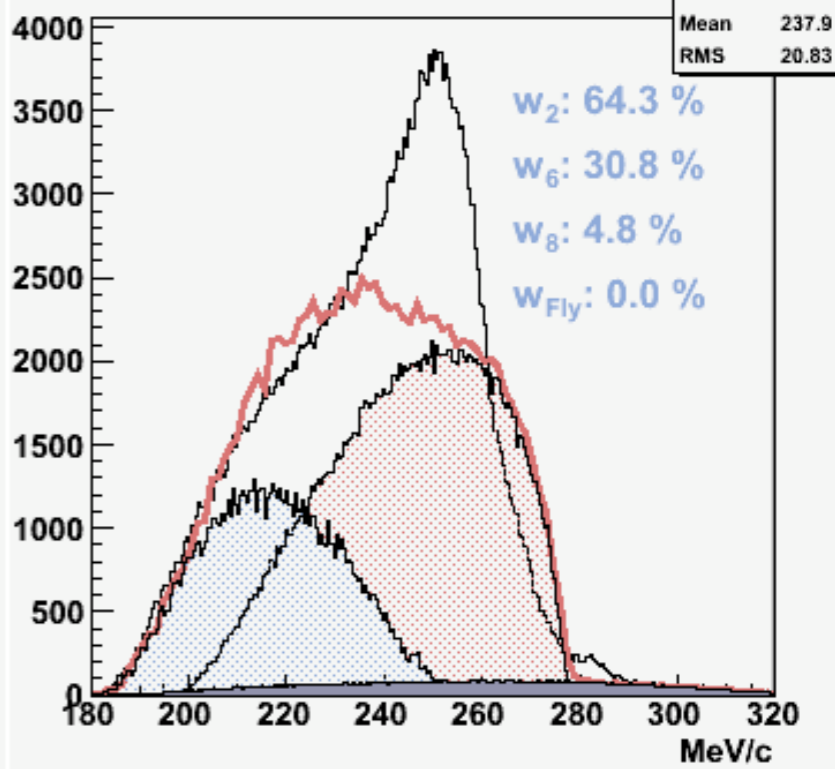
Target 7 (^9Be): π^- (long 1111[0-2])



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alcune considerazioni:

- per alcuni bersagli i nostri fondi riproducono bene l'andamento generale, per altri (^9Be) meno
- la percentuale relativa dei fondi è diversa tra bersaglio e bersaglio e tra forw e back (cambia il contributo di quelli in volo)

fit "fondi + segnale" nella regione del segnale

- segnale (Gaussiane)
- fondo (3 reazioni + decadimenti K^- in volo)

fondo

- uso degli istogrammi (alcuni con lo smooth)
- percentuali relative libere di muoversi, ma non possono superare alcuni limiti (dettati dai fit globali) - vedi next

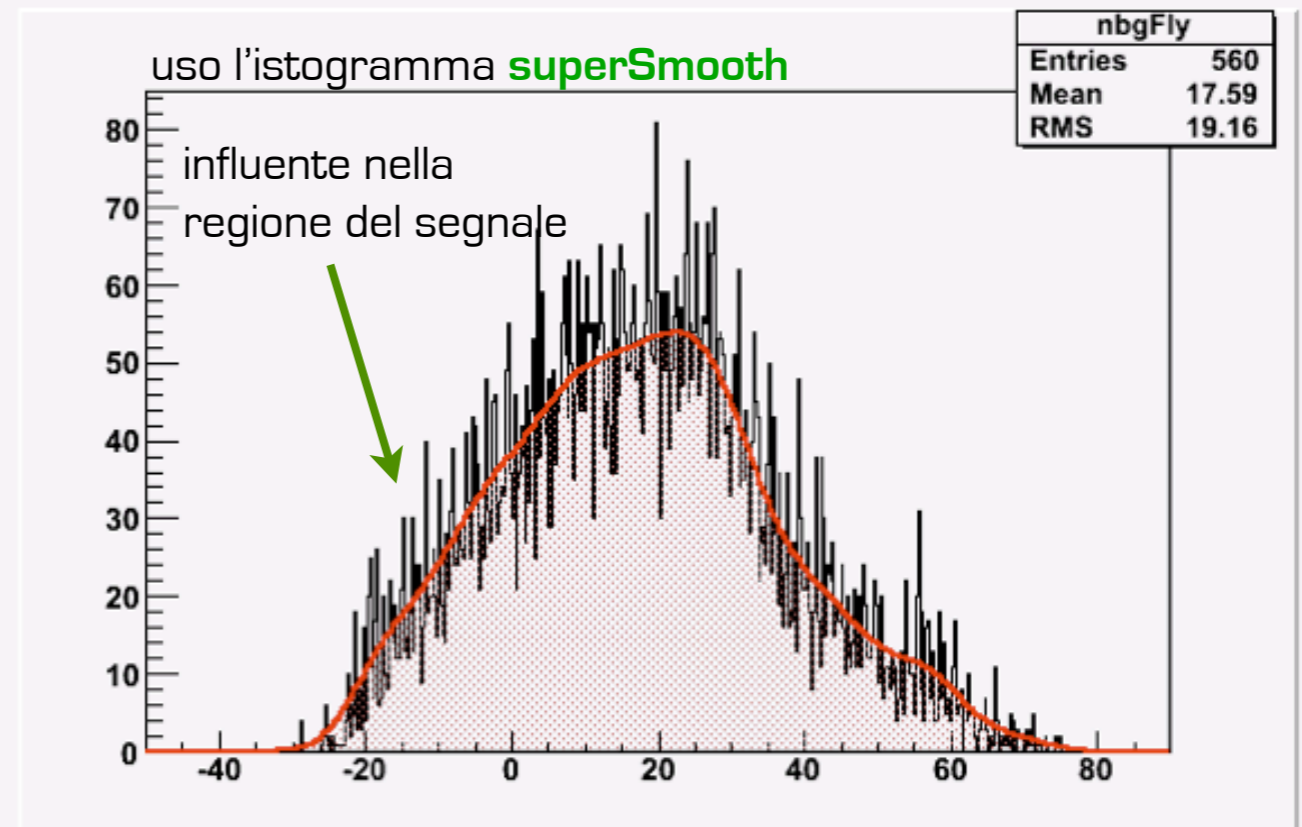
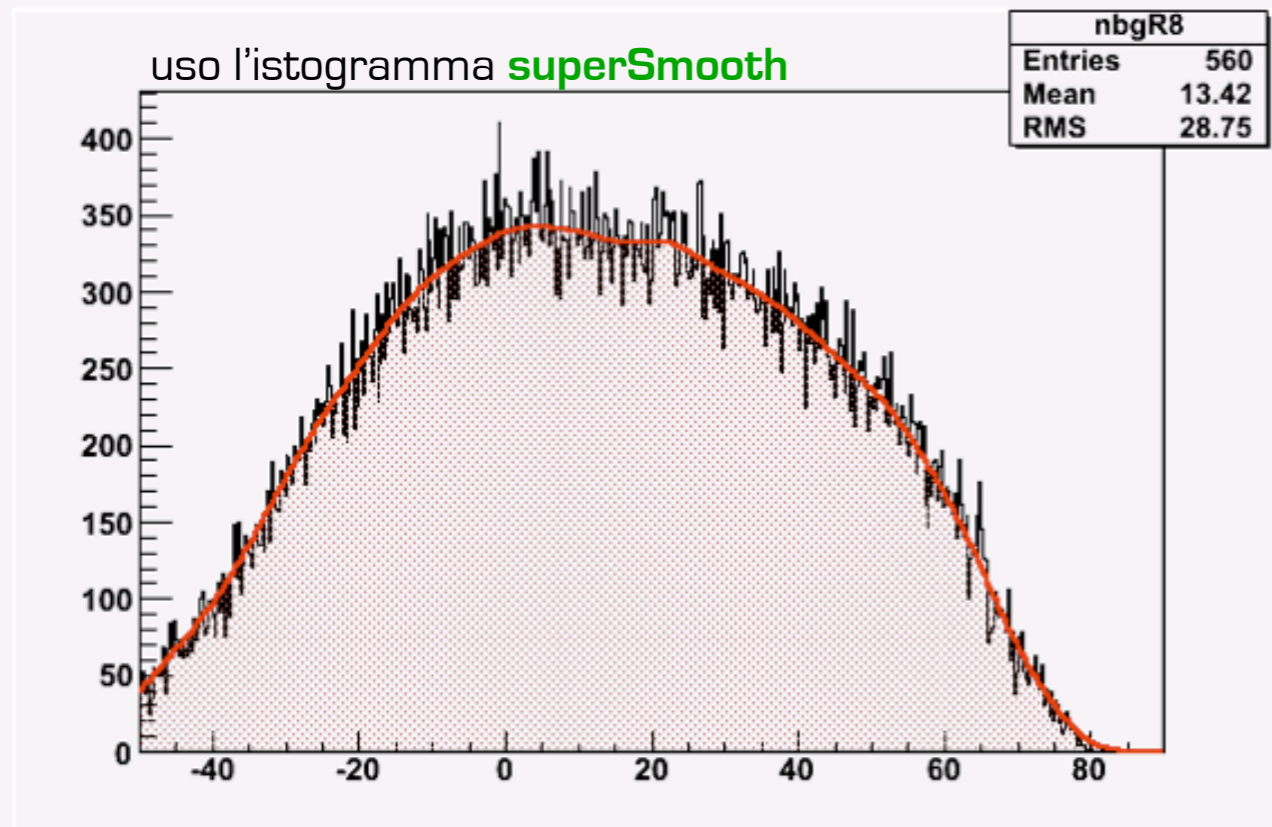
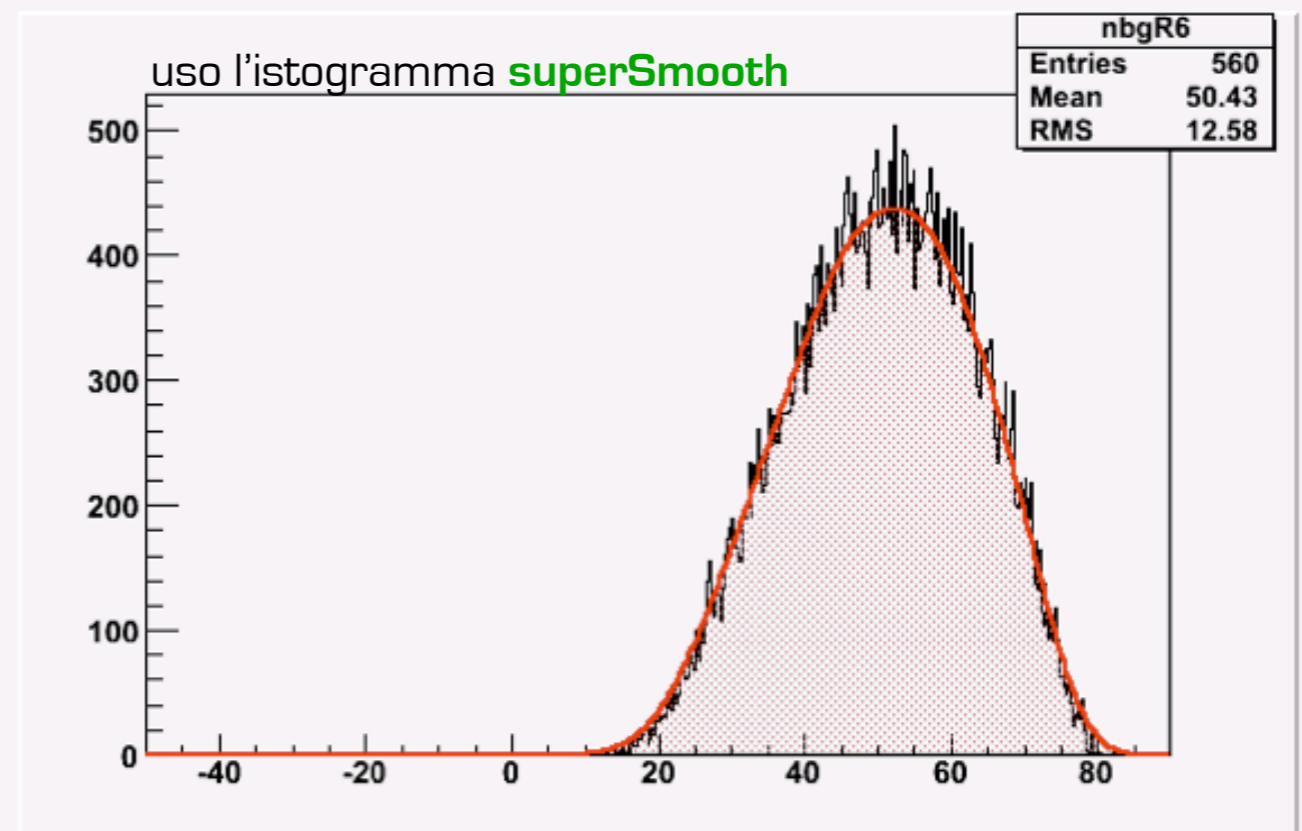
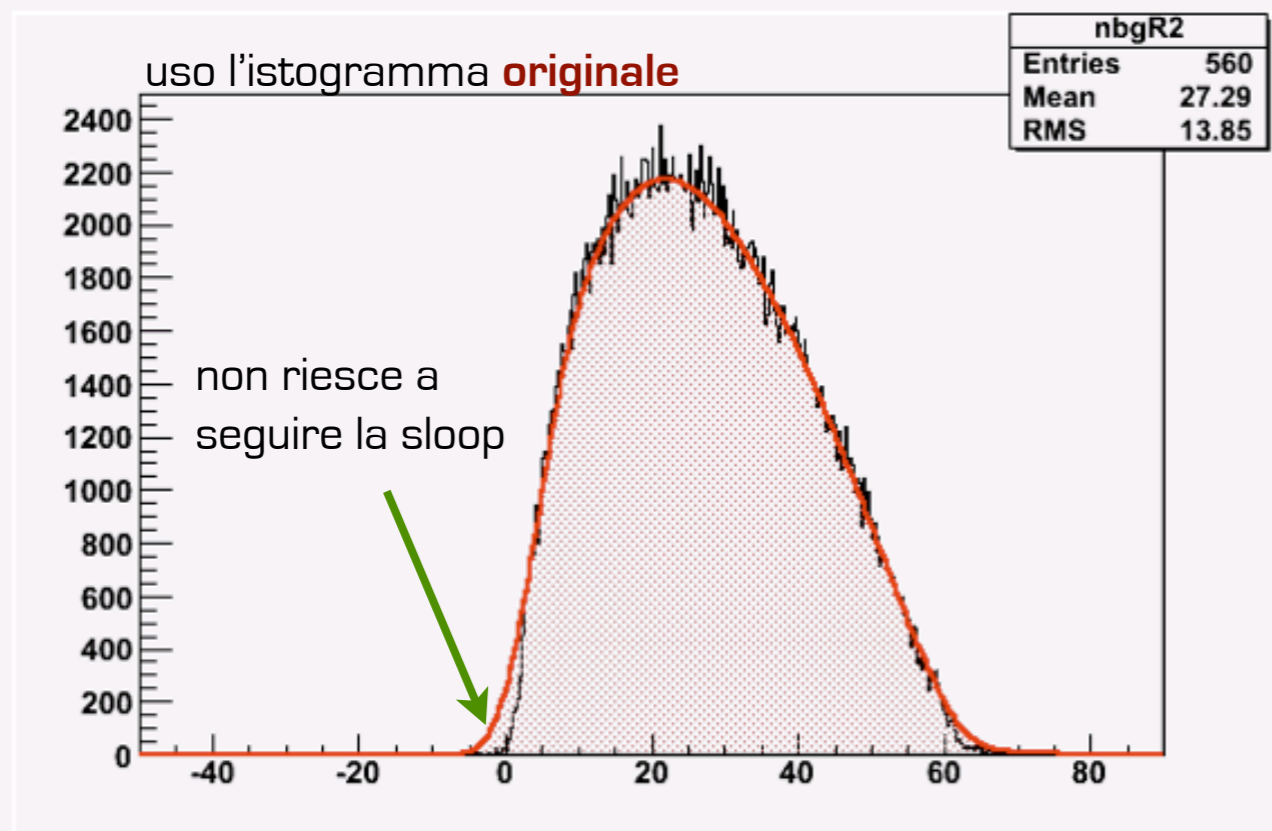
segnale

- numero di Gaussiane e media della Gaussiane dalla letteratura
- sigma delle Gaussiane [libere di muoversi all'interno di un certo intervallo] - vedi next

FONDO

per limitare gli effetti della statistica (sono stati generati già più di 60M di eventi) abbiamo usato

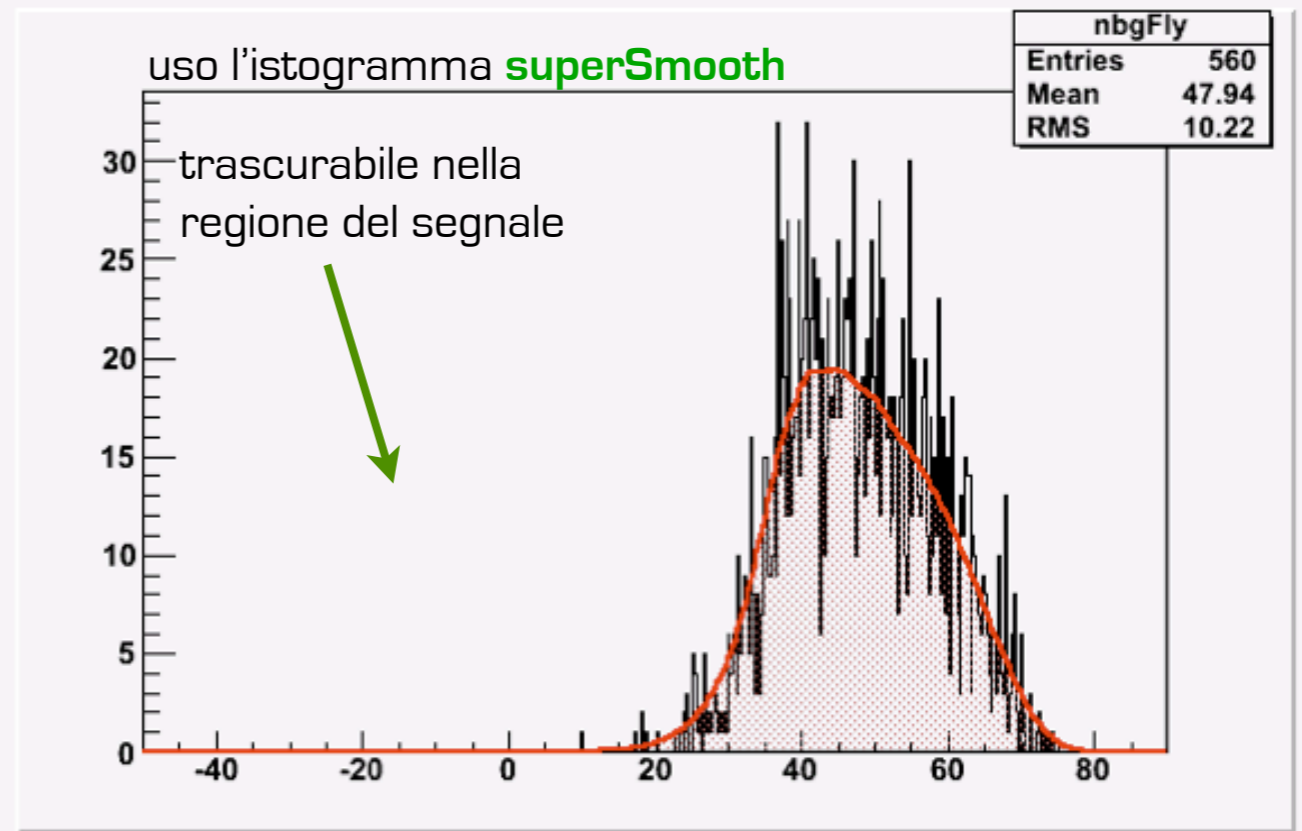
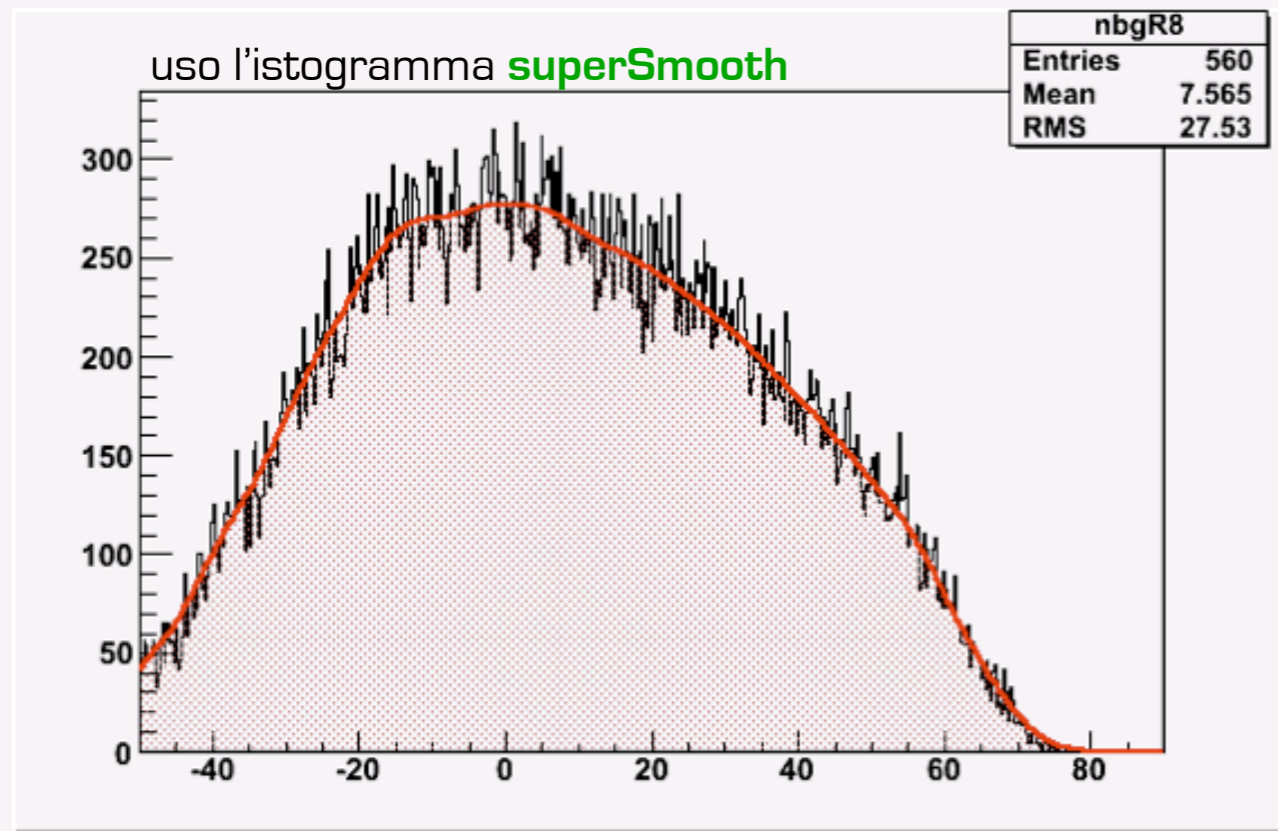
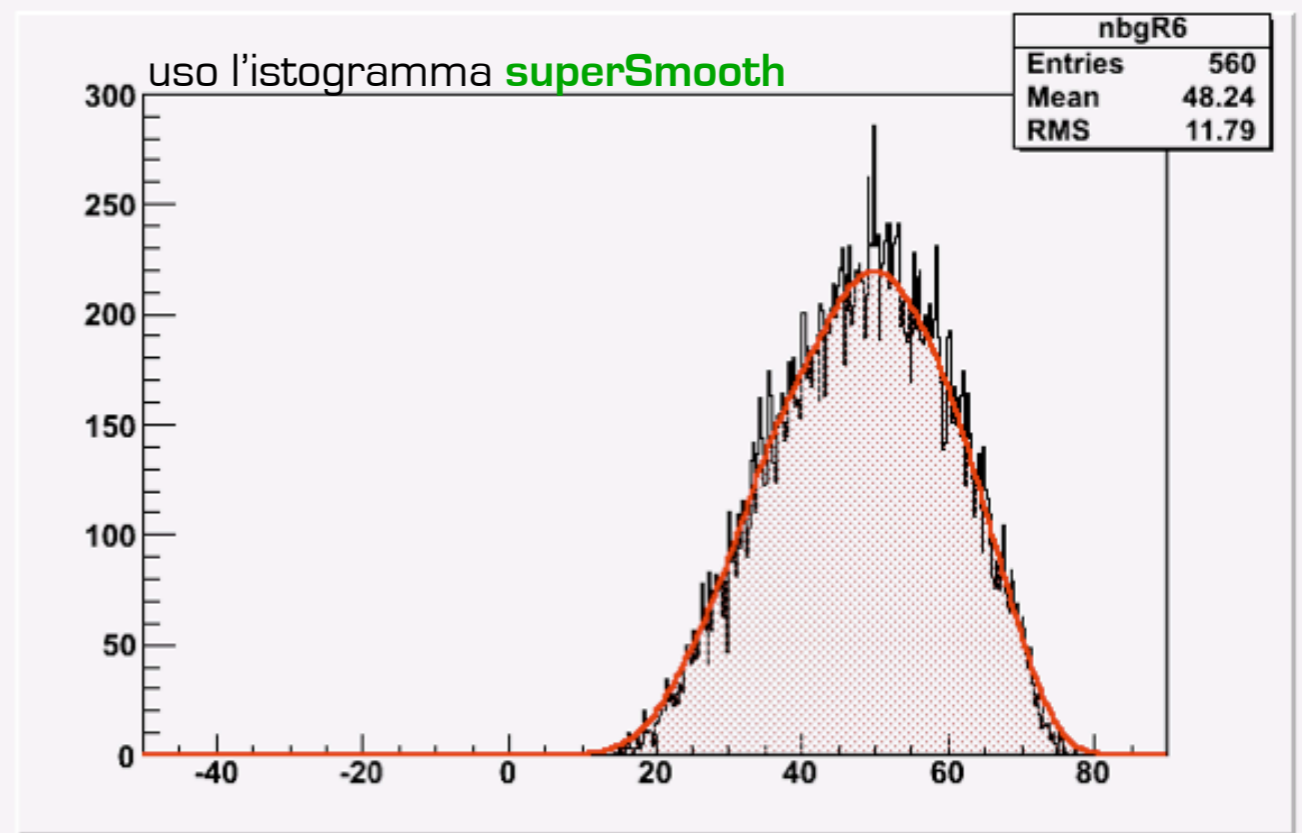
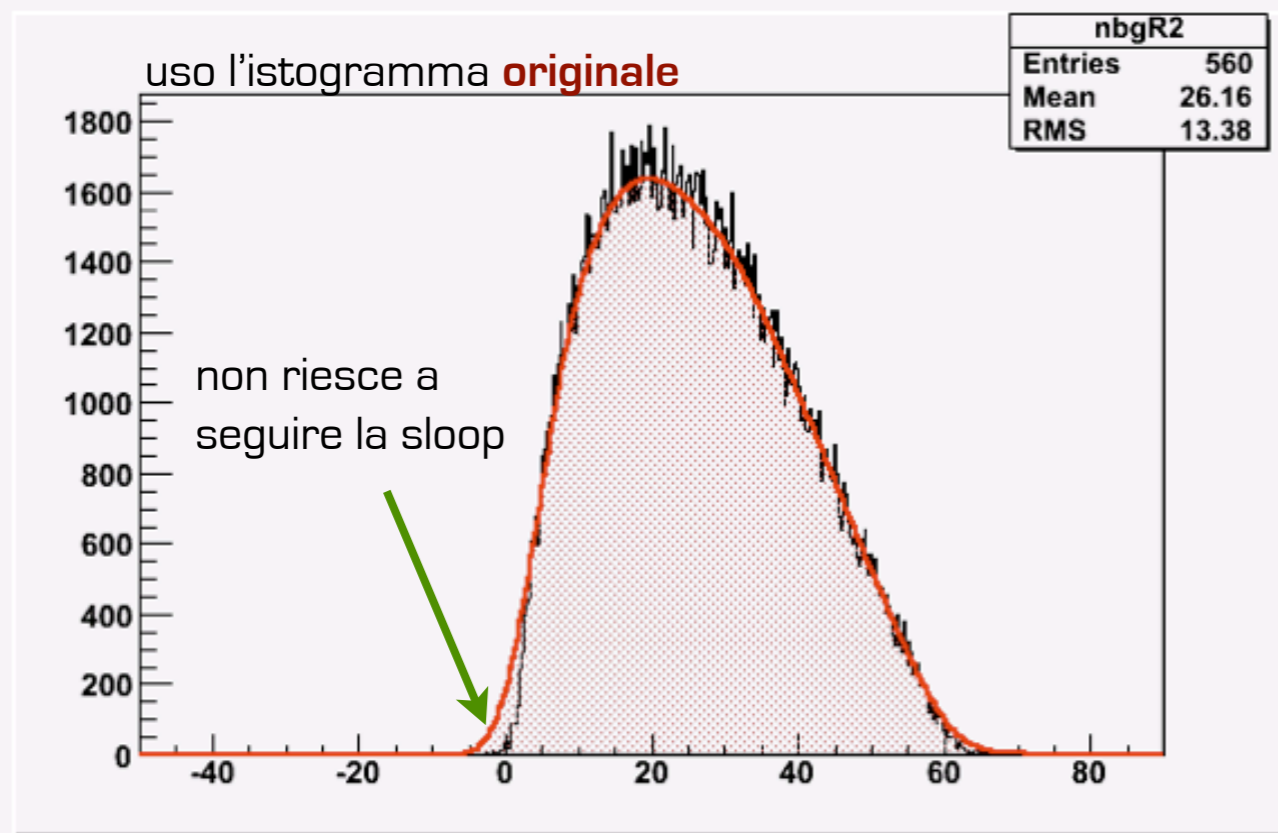
SmoothSuper di ROOT Ref: Friedman, J. H. (1984) A variable span scatterplot smoother. Laboratory for Computational Statistics, Stanford University Technical Report No. 5.



FONDO

per limitare gli effetti della statistica (sono stati generati già più di 60M di eventi) abbiamo usato

SmoothSuper di ROOT Ref: Friedman, J. H. (1984) A variable span scatterplot smoother. Laboratory for Computational Statistics, Stanford University Technical Report No. 5.



SEGNALE

bisogna fissare la sigma delle Gaussiane (ovvero la risoluzione dell'esperimento)

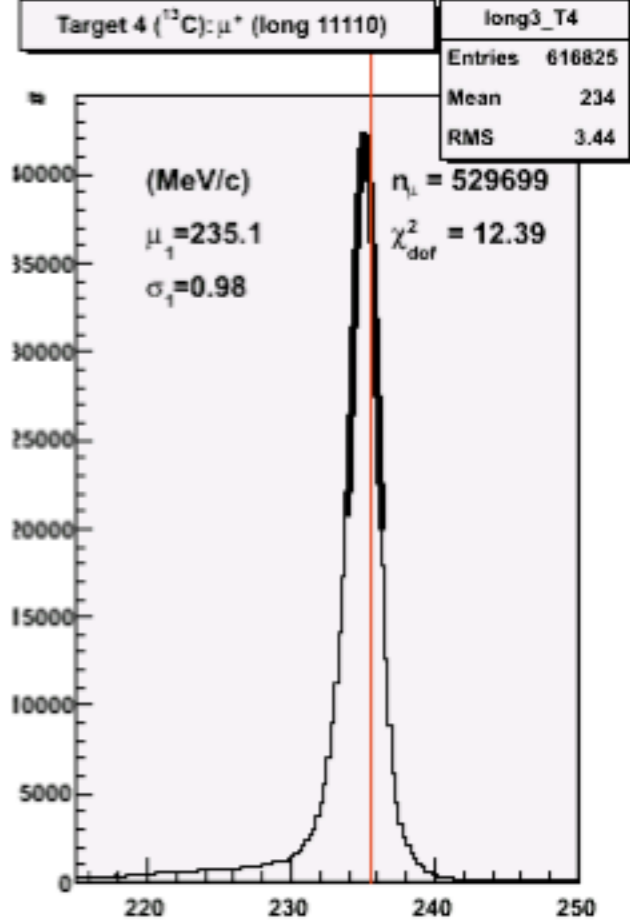
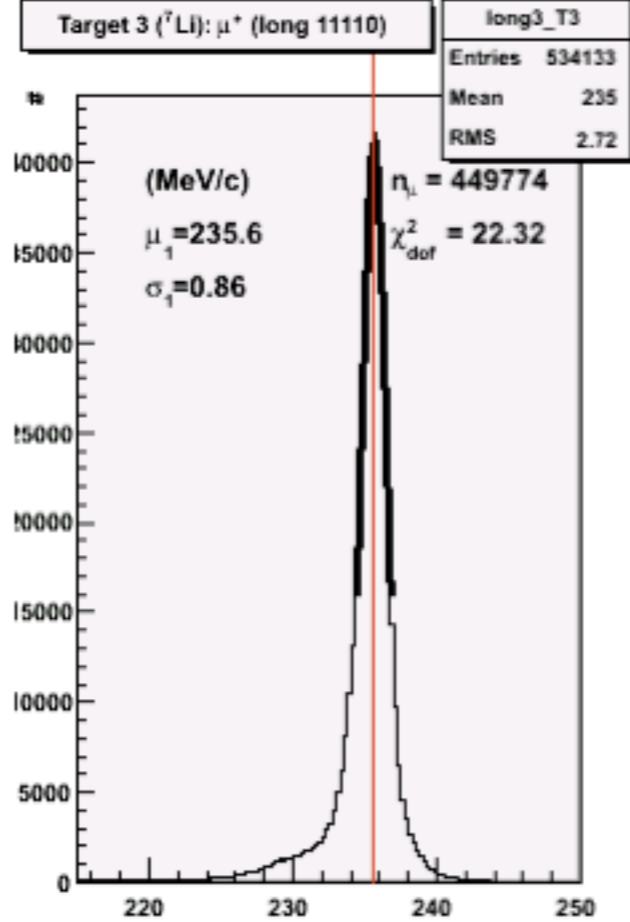
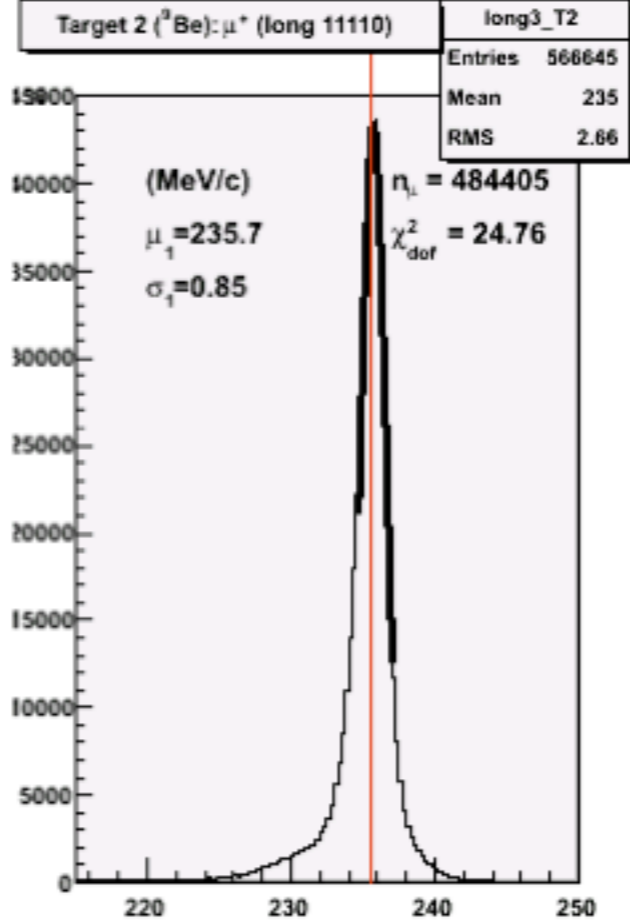
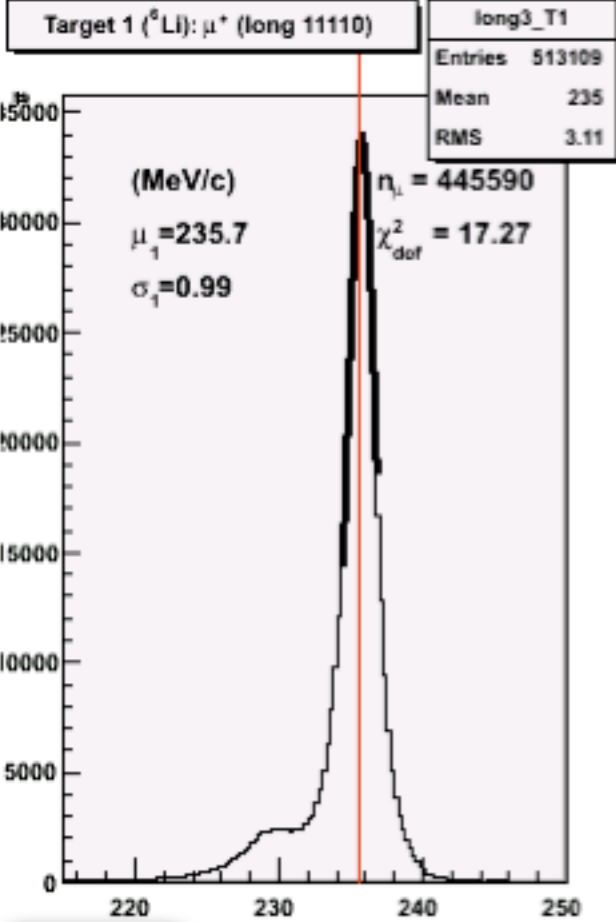
per i 3 set di tagli

- valutare la risoluzione con i μ^+

- trasformare la risoluzione in impulso in risoluzione in binding energy

- le risoluzioni dipendono dal momento a cui si calcolano, dal bersaglio e dai tagli applicati

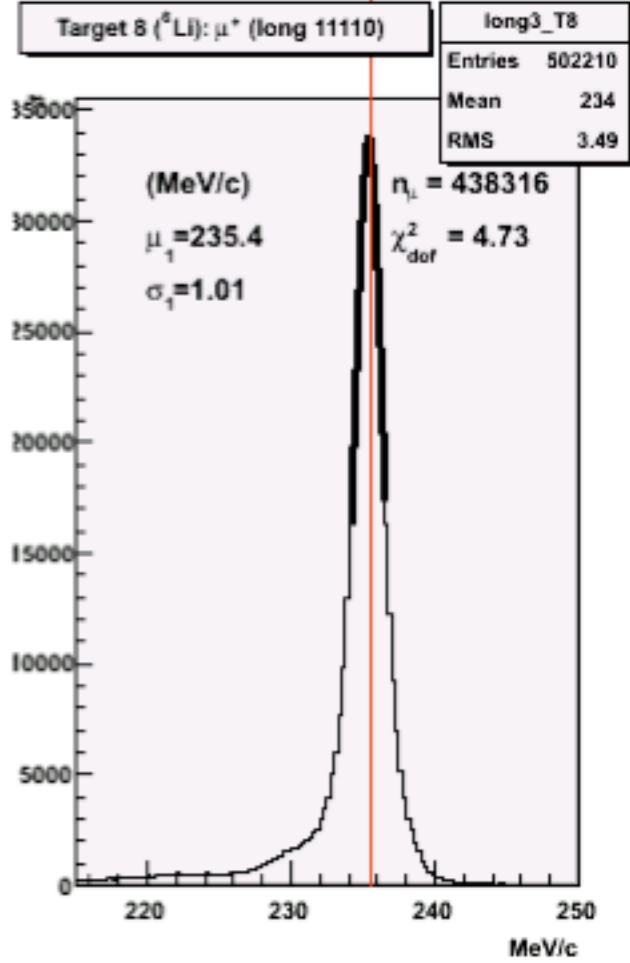
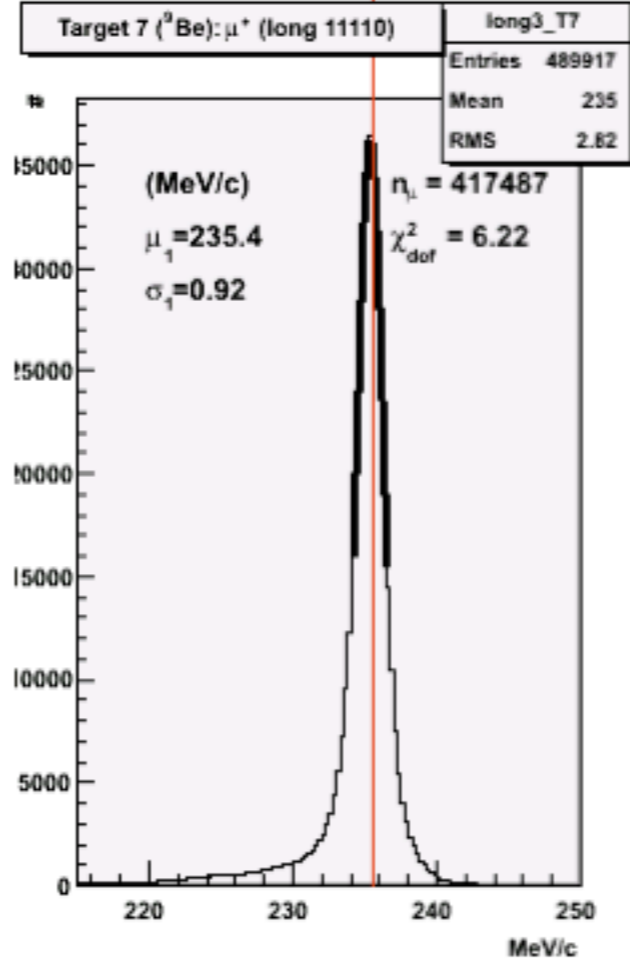
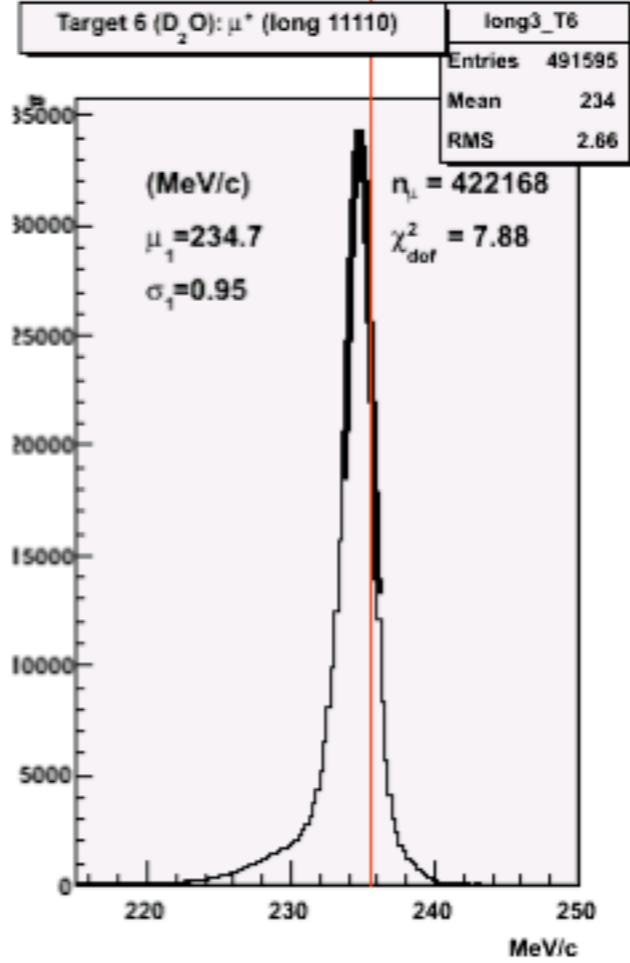
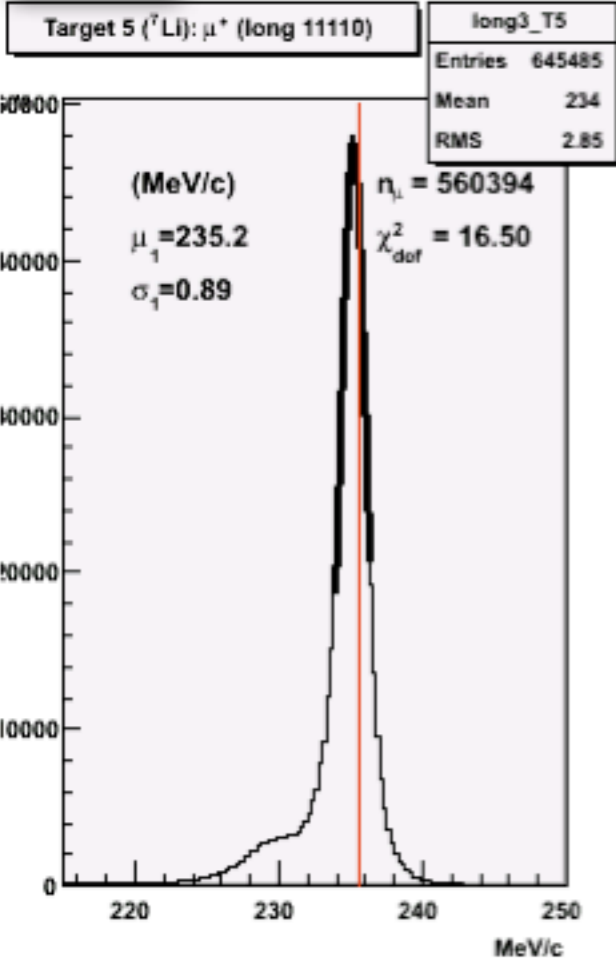
in via preliminare l'intervallo di risoluzione è stato fissato tra [0.75-0.95]

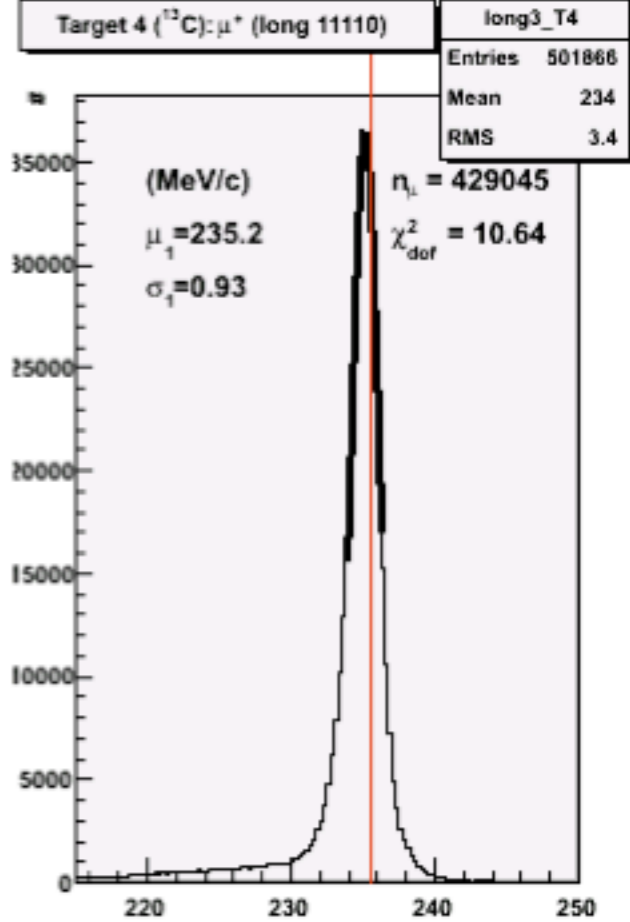
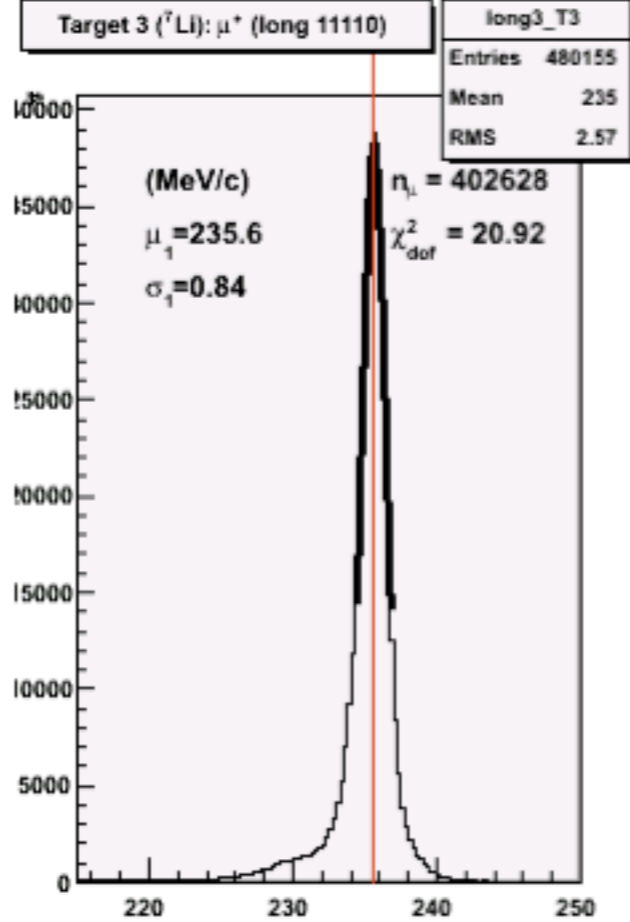
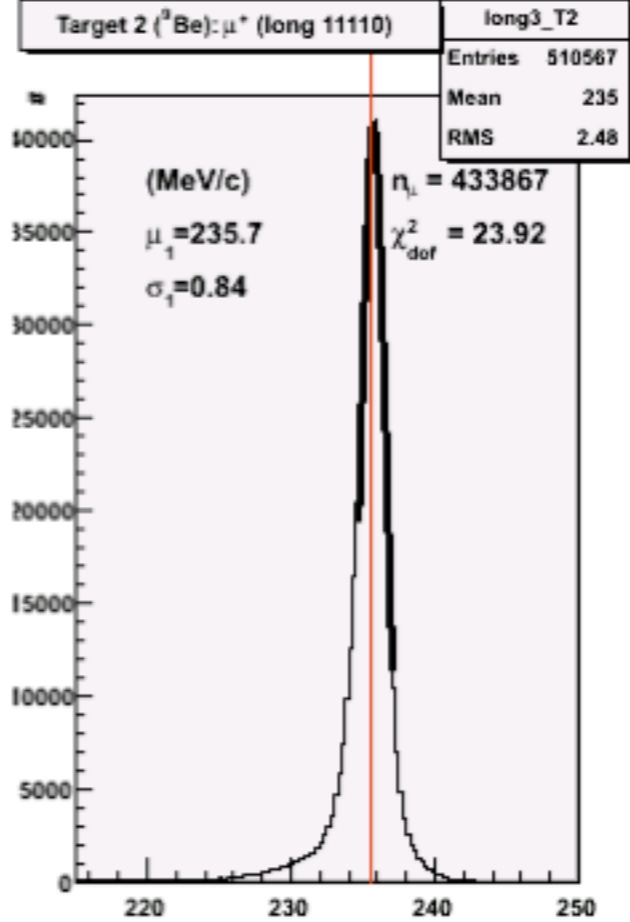
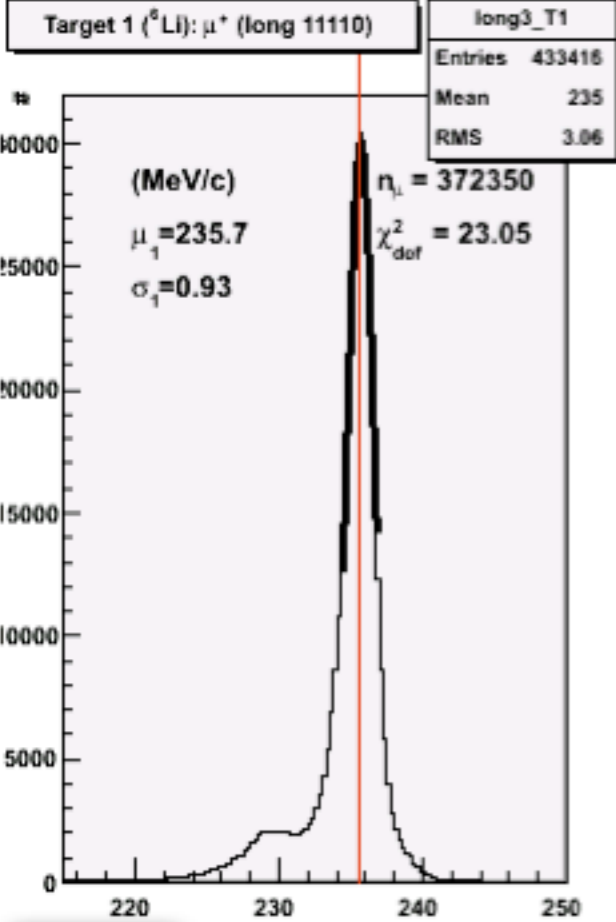


loose

$\sigma_{\text{BL}} (p = 270 \text{ MeV/c}) = [0.88-1.09]$

$\sigma_{\text{BL}} (p = 280 \text{ MeV/c}) = [0.93-1.14]$

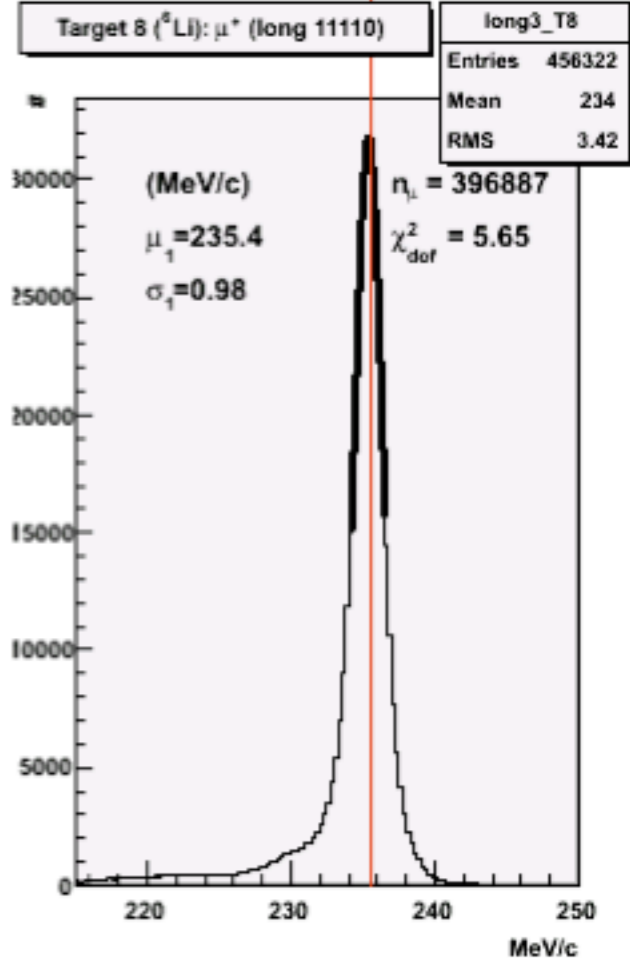
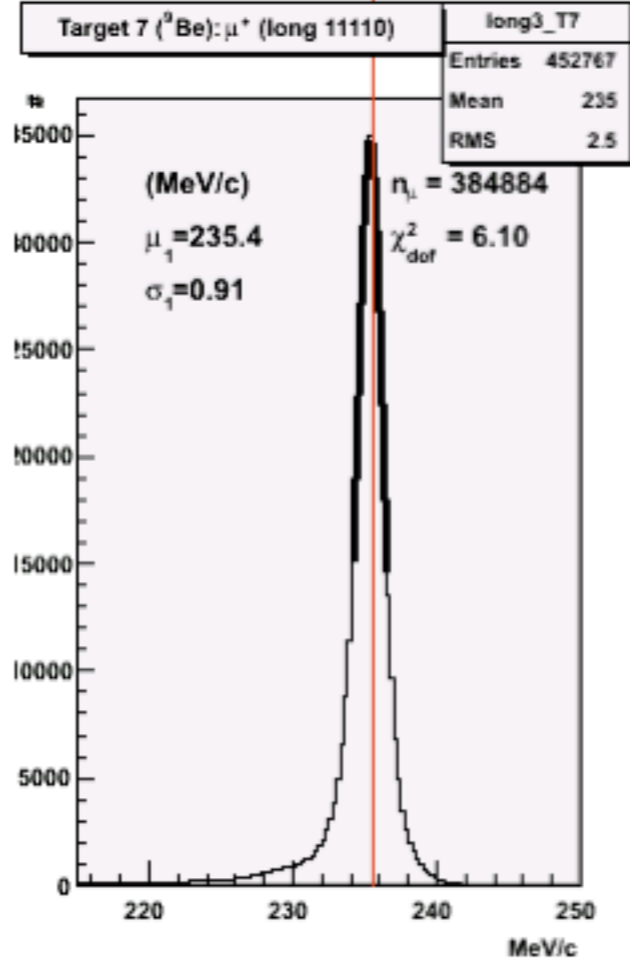
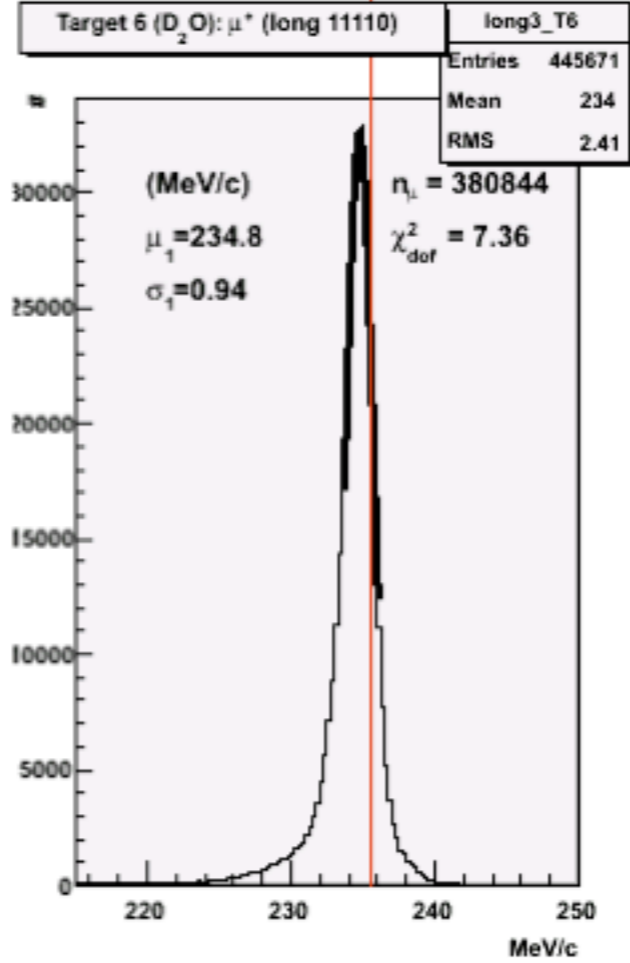
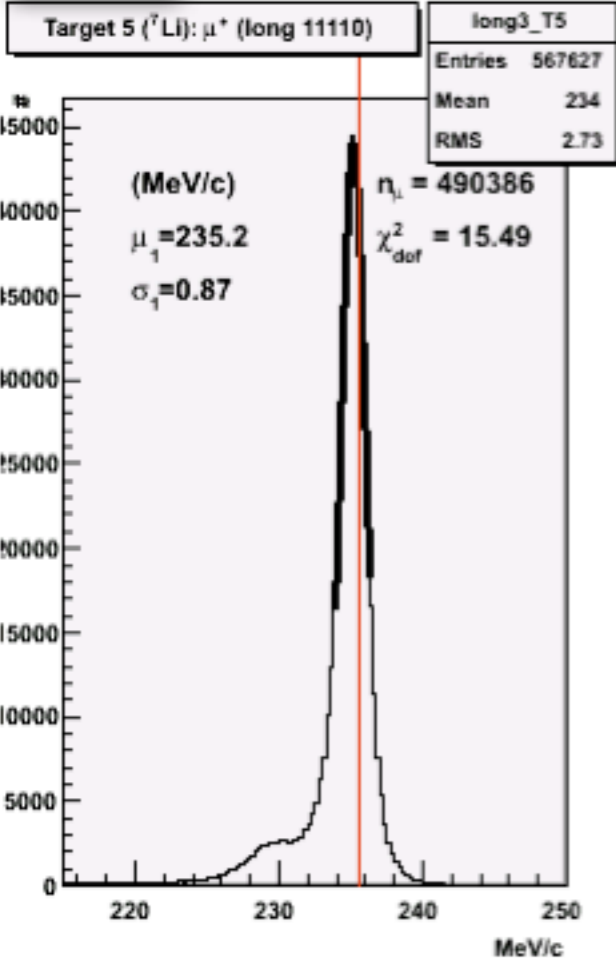


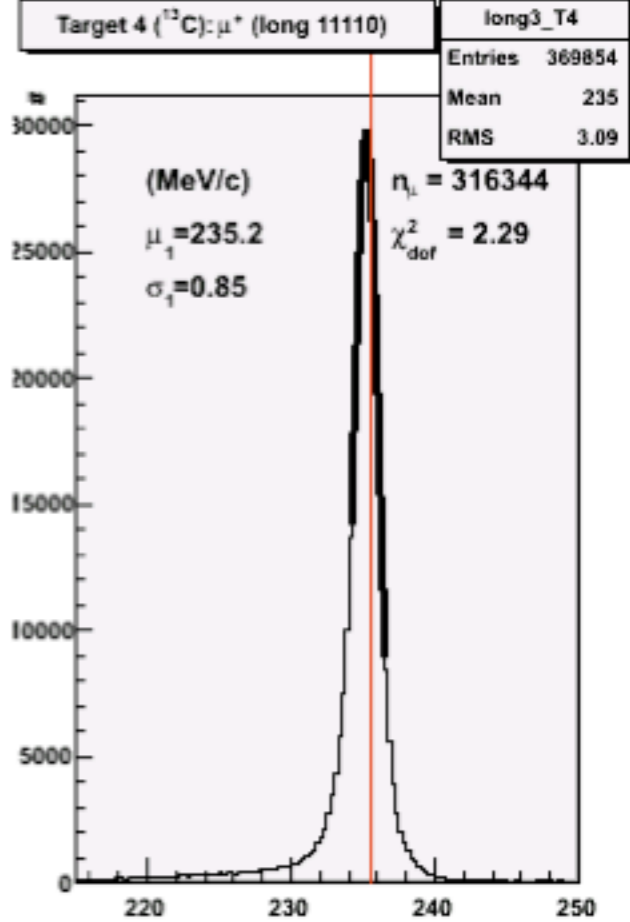
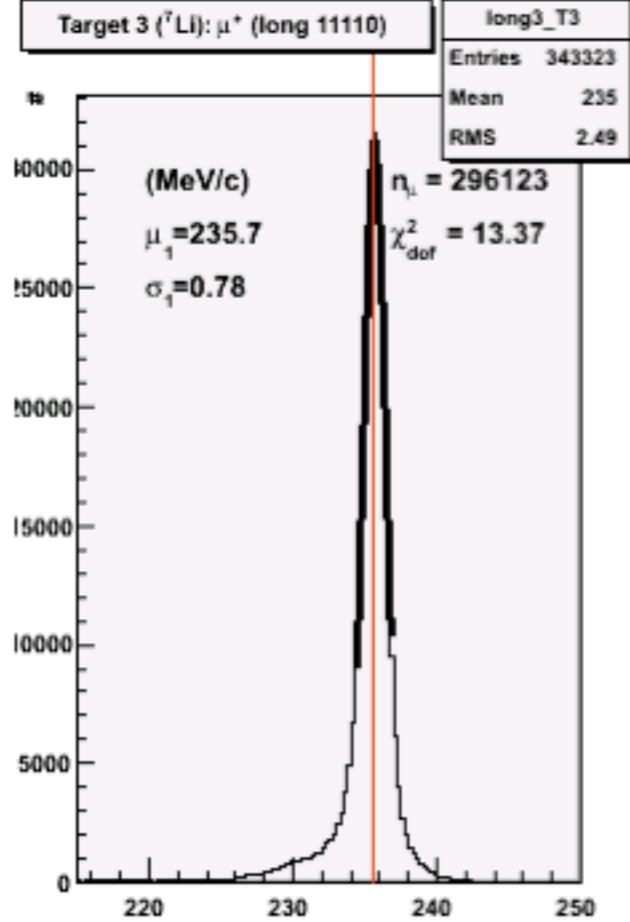
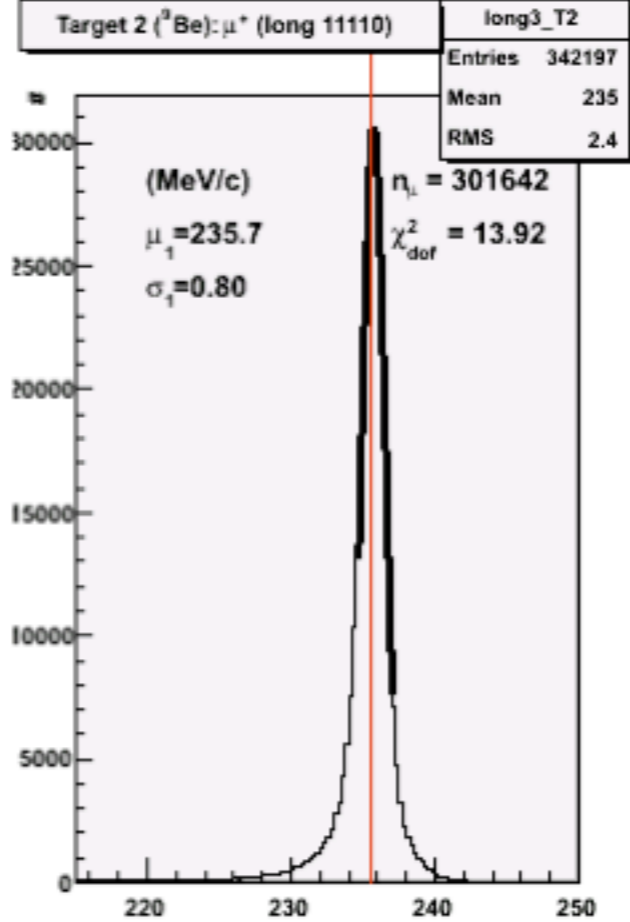
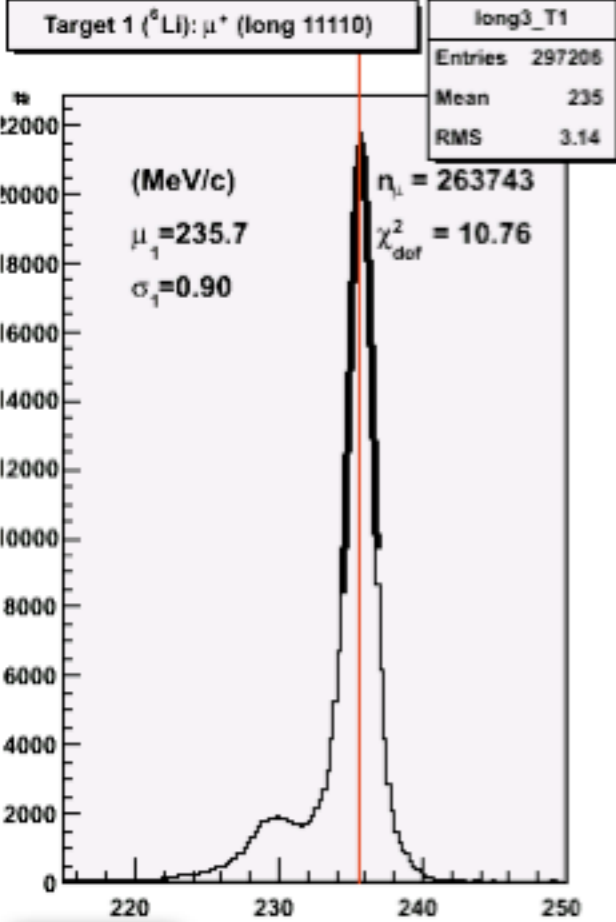


mid

$\sigma_{\text{BL}} (p = 270 \text{ MeV/c}) = [0.87 - 1.05]$

$\sigma_{\text{BL}} (p = 280 \text{ MeV/c}) = [0.91 - 1.10]$

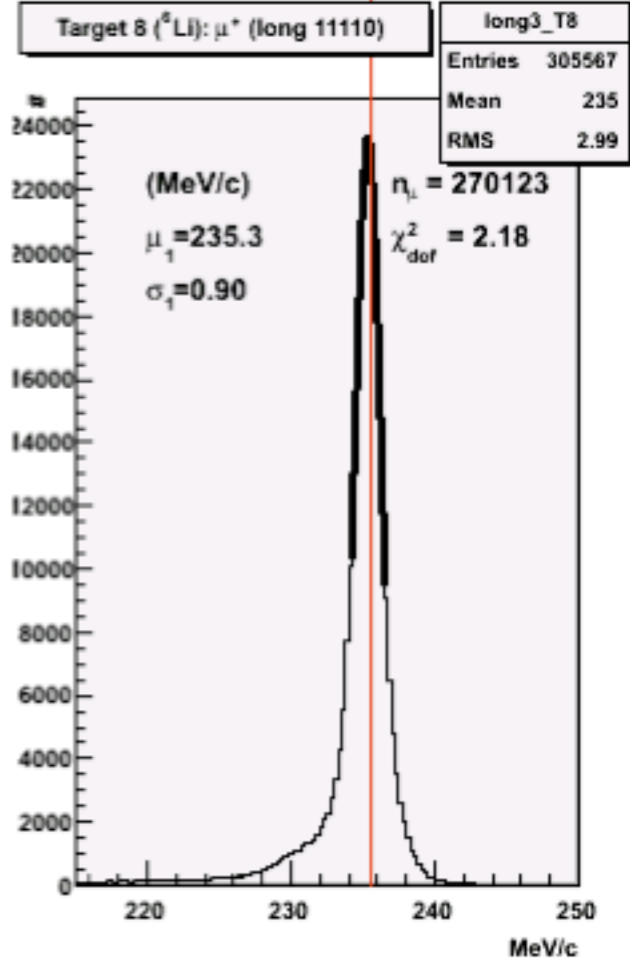
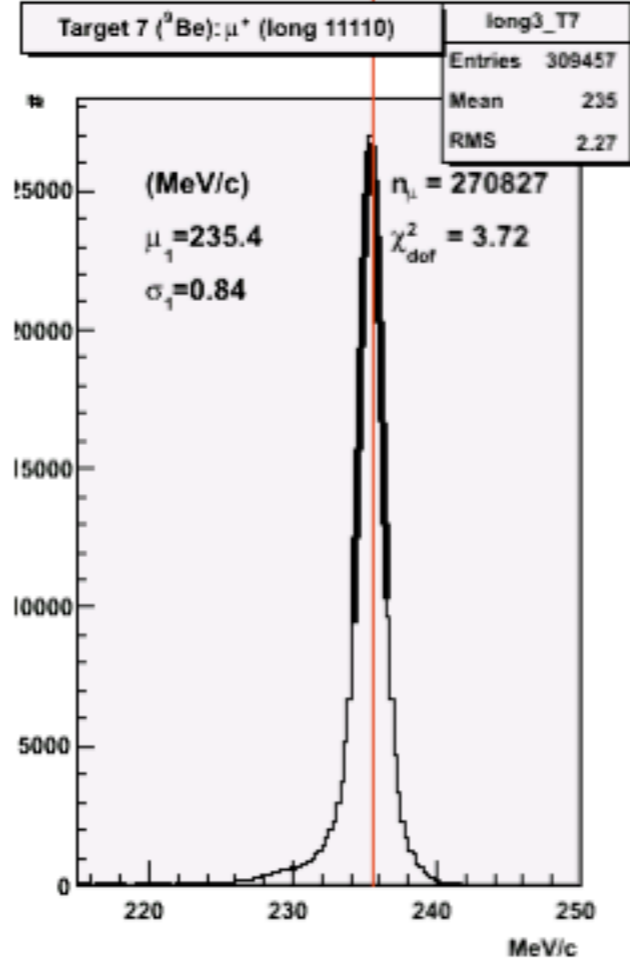
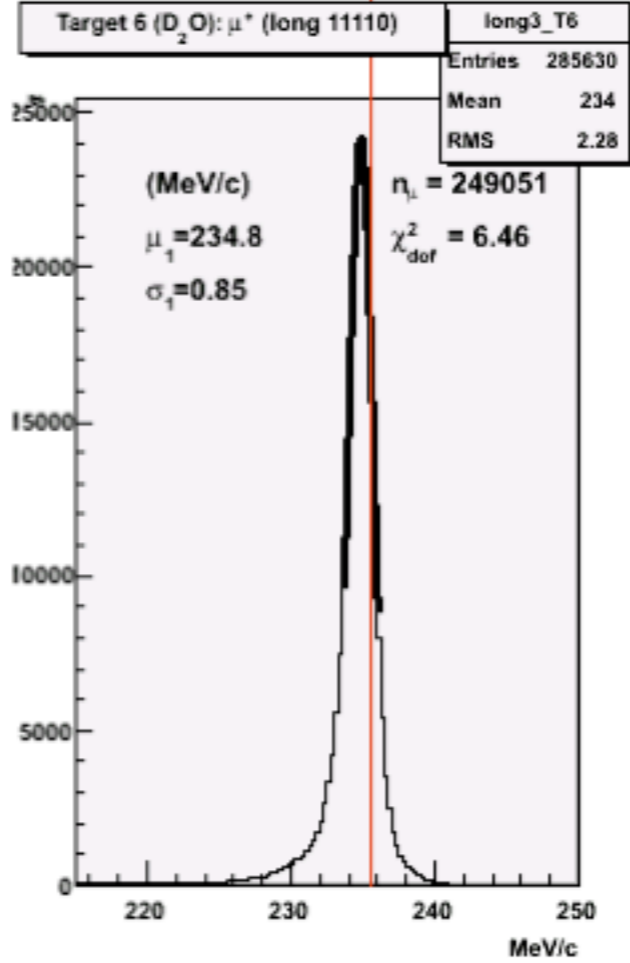
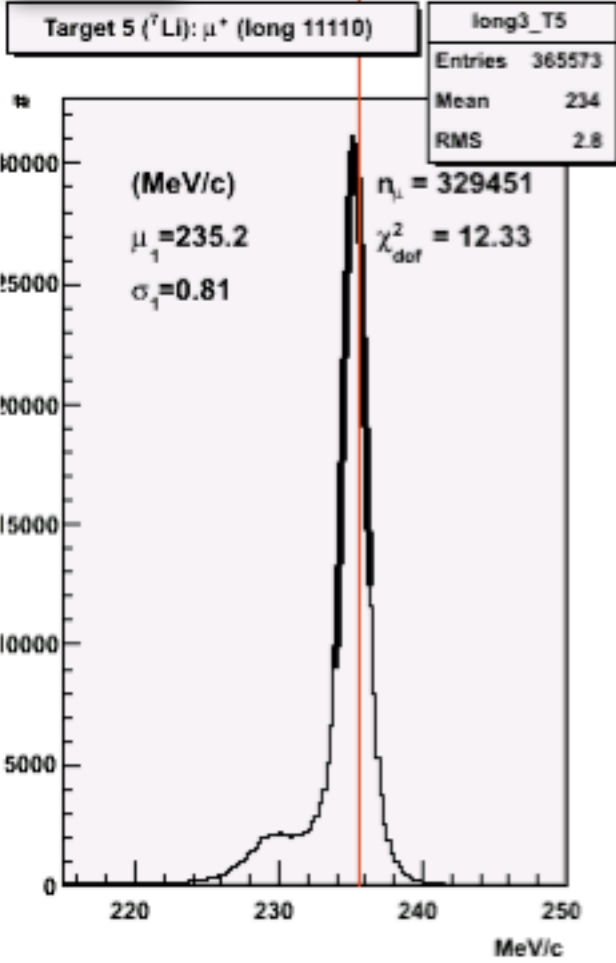




tight

$\sigma_{\text{BL}} (p = 270 \text{ MeV/c}) = [0.81 - 0.97]$

$\sigma_{\text{BL}} (p = 280 \text{ MeV/c}) = [0.85 - 1.0]$



PROCEDURA DI FIT

- definizione della funzione di fit
somma di N Gaussiane + bgR2 + bgR6 + bgR8 + bgFly (istogrammi)
- **1° fit** lasciando liberi i seguenti parametri:
 - sigma delle Gaussiane all'interno dell'intervallo **[0.75; 0.95]** (in via preliminare)
 - medie delle Gaussiane attorno ai valori attesi (**± 0.8 MeV**)
 - altezza delle Gaussiane
 - peso delle reazioni di fondo (limite sul peso totale **w2<65%, w6<40%, w8<15%, wFly<20%**)
- **2° fit** lasciando liberi i seguenti parametri:
 - altezza delle Gaussiane
 - peso delle reazioni di fondo (limite sul peso totale **w2<65%, w6<40%, w8<15%, wFly<20%**)
 - usando TFractionFitter di ROOT

Fits MC fractions to data histogram (a la HMCMLL, see R. Barlow and C. Beeston, Comp. Phys. Comm. 77 (1993) 219-228, and <http://www.hep.man.ac.uk/~roger/hfrac.f>).

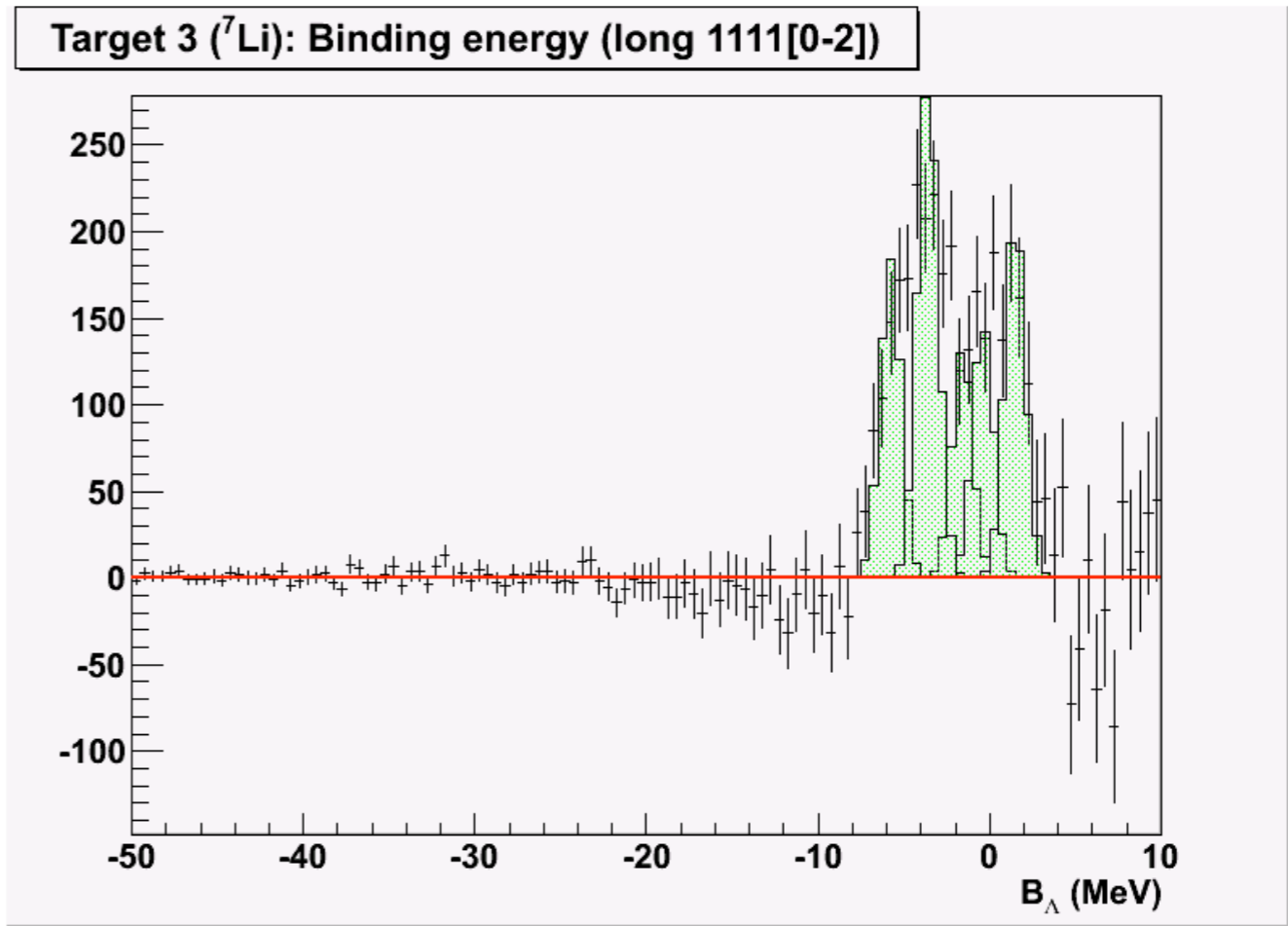
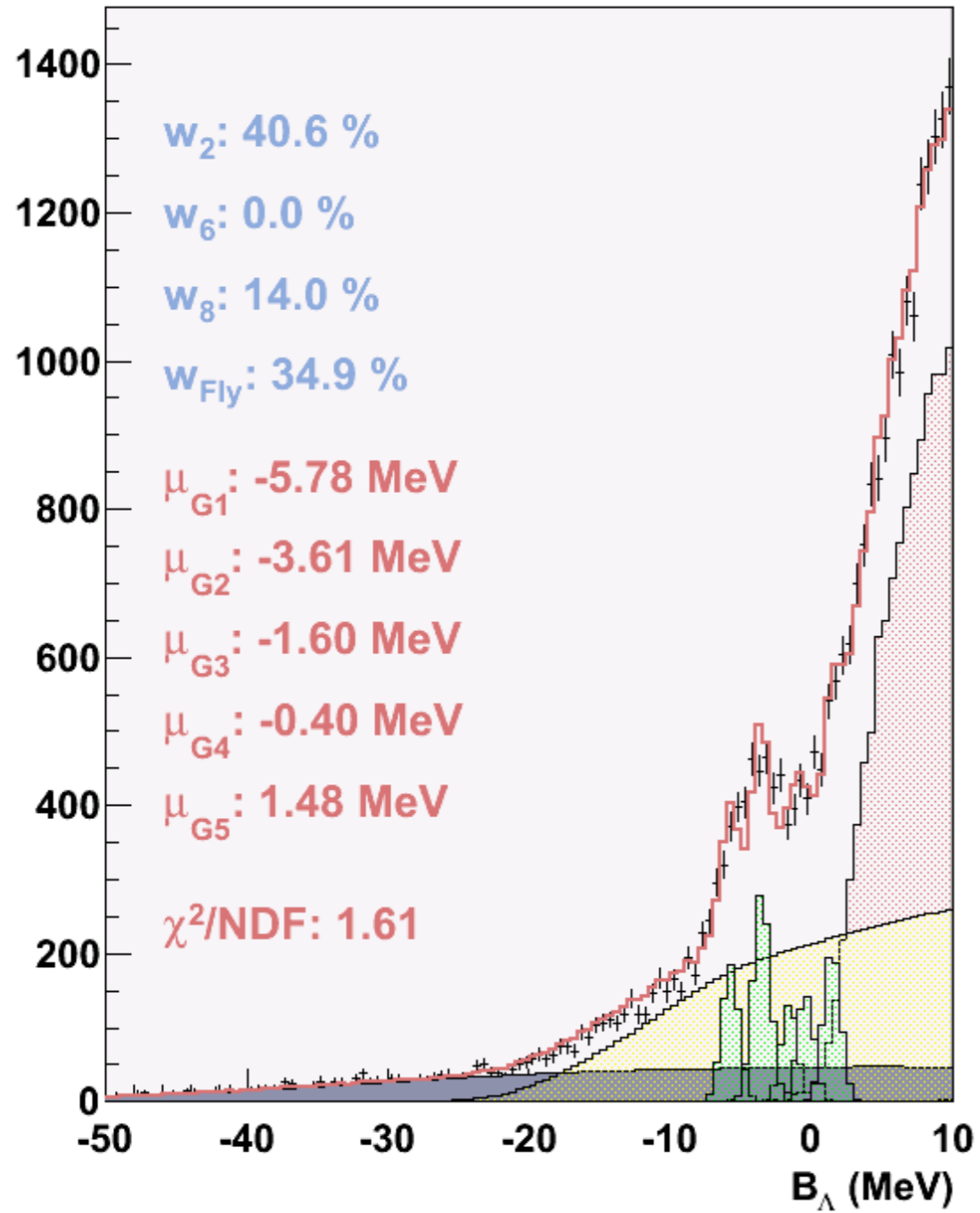
The virtue of this fit is that it takes into account both data and Monte Carlo statistical uncertainties. The way in which this is done is through a standard likelihood fit using Poisson statistics; however, the template (MC) predictions are also varied within statistics, leading to additional contributions to the overall likelihood. This leads to many more fit parameters (one per bin per template), but the minimisation with respect to these additional parameters is done analytically rather than introducing them as formal fit parameters.

-5.22⁽¹⁾ -3.17 -1.34 0.39 2.77 (E336)

-5.58⁽²⁾ -4.89 -3.53 -3.06 -1.70 (Hyperball)



Target 3 (⁷Li): Binding energy (long 1111[0-2])



⁽¹⁾ Ground state misurato dall'esperimento stesso E336

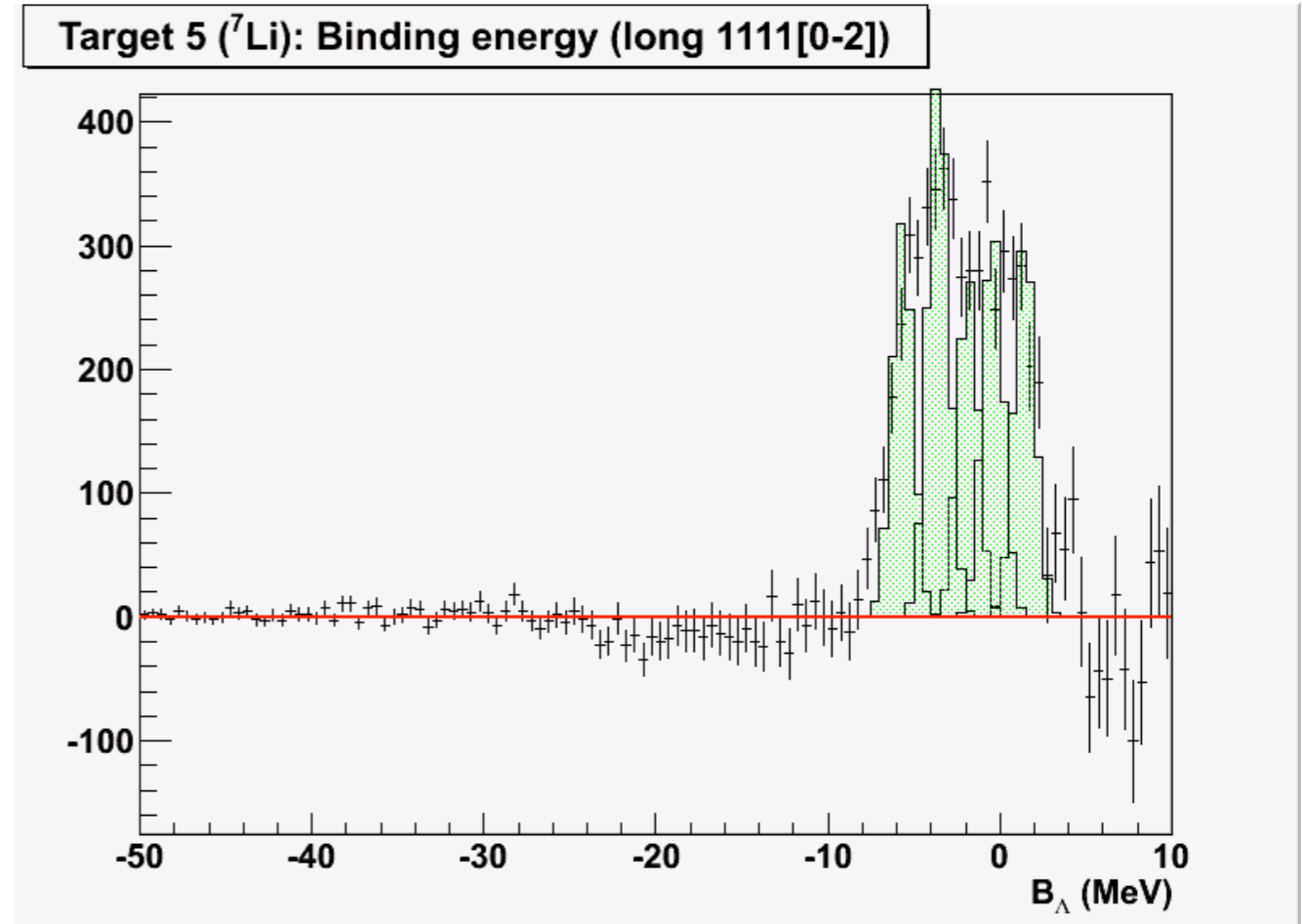
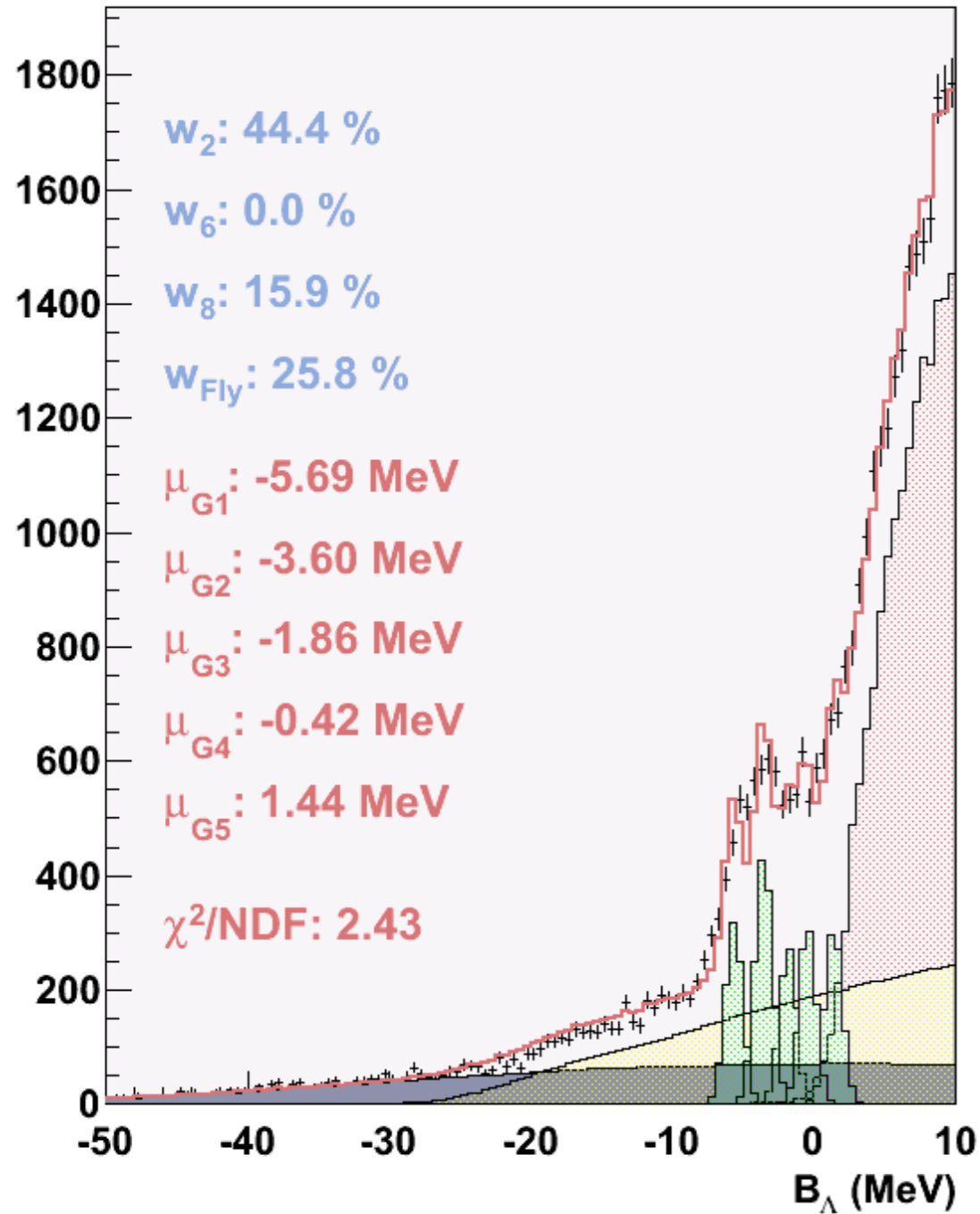
⁽²⁾ Ground state misurato nel 1973 (esperimenti emulsioni) - con valori di massa odierni **5.79 MeV**

-5.22⁽¹⁾ -3.17 -1.34 0.39 2.77 (E336)

-5.58⁽²⁾ -4.89 -3.53 -3.06 -1.70 (Hyperball)



Target 5 (⁷Li): Binding energy (long 1111[0-2])



⁽¹⁾ Ground state misurato dall'esperimento stesso E336

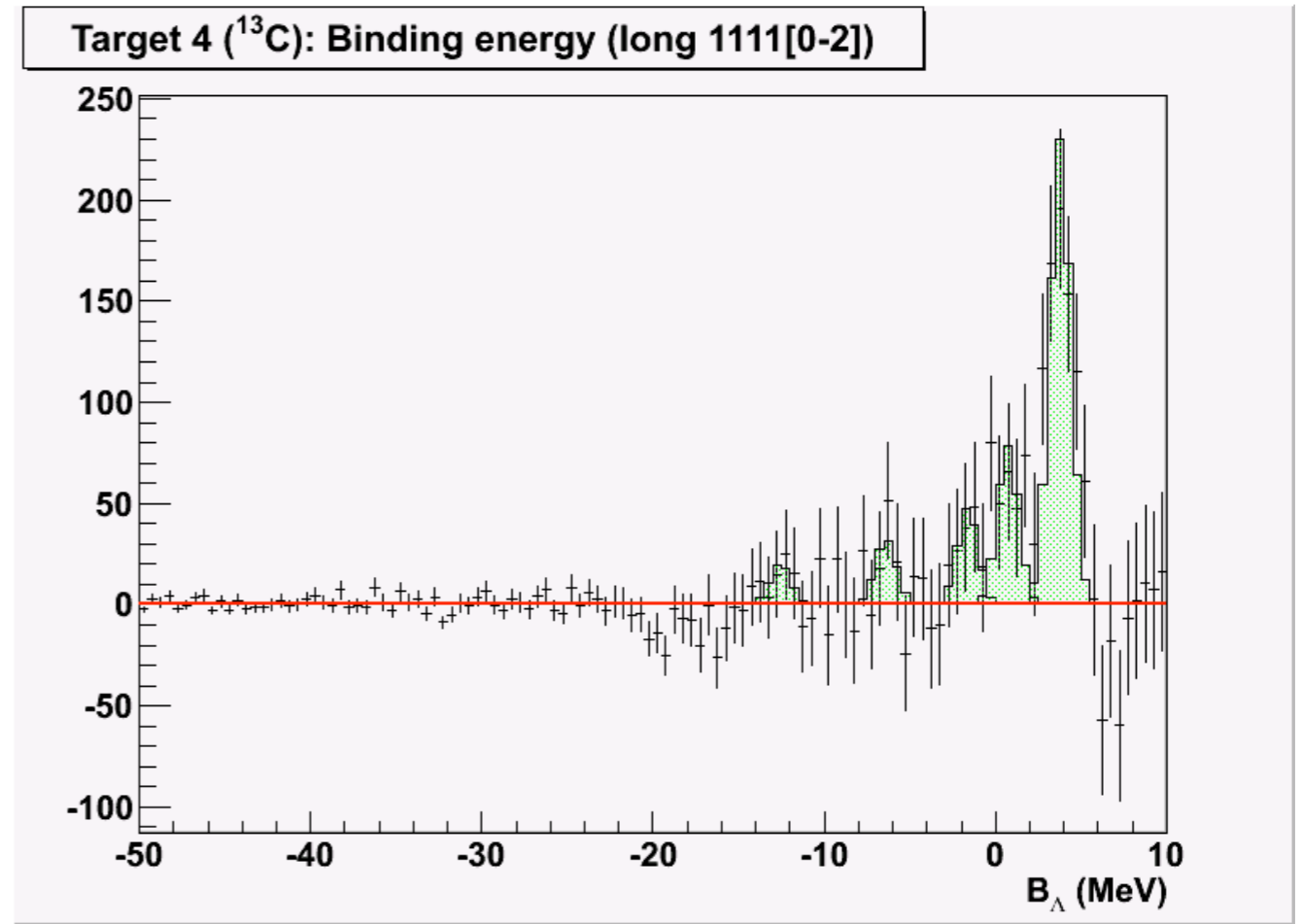
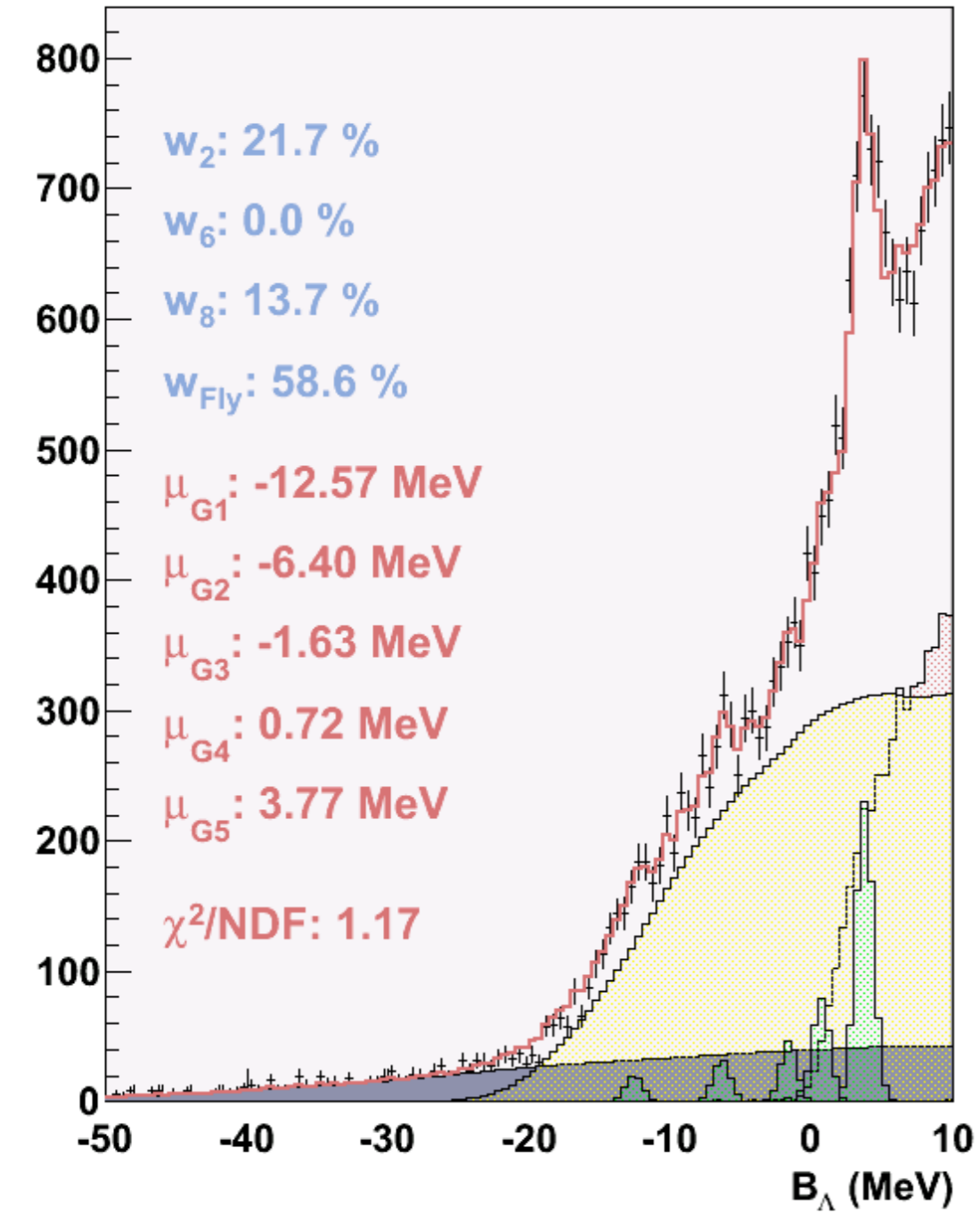
⁽²⁾ Ground state misurato nel 1973 (esperimenti emulsioni) - con valori di massa odierni **5.79 MeV**

-11.38⁽¹⁾ -6.53 -1.65 -0.37 3.93 12.3 14.99 (E336)

-11.69⁽²⁾ -6.81 -0.86 -0.71 (Hyperball)

¹³C

Target 4 (¹³C): Binding energy (long 1111[0-2])



⁽¹⁾ Ground state misurato dall'esperimento stesso E336

⁽²⁾ Ground state misurato in esperimenti con emulsioni

-12.42⁽¹⁾

-6.19

-1.85

4.17

[E336]



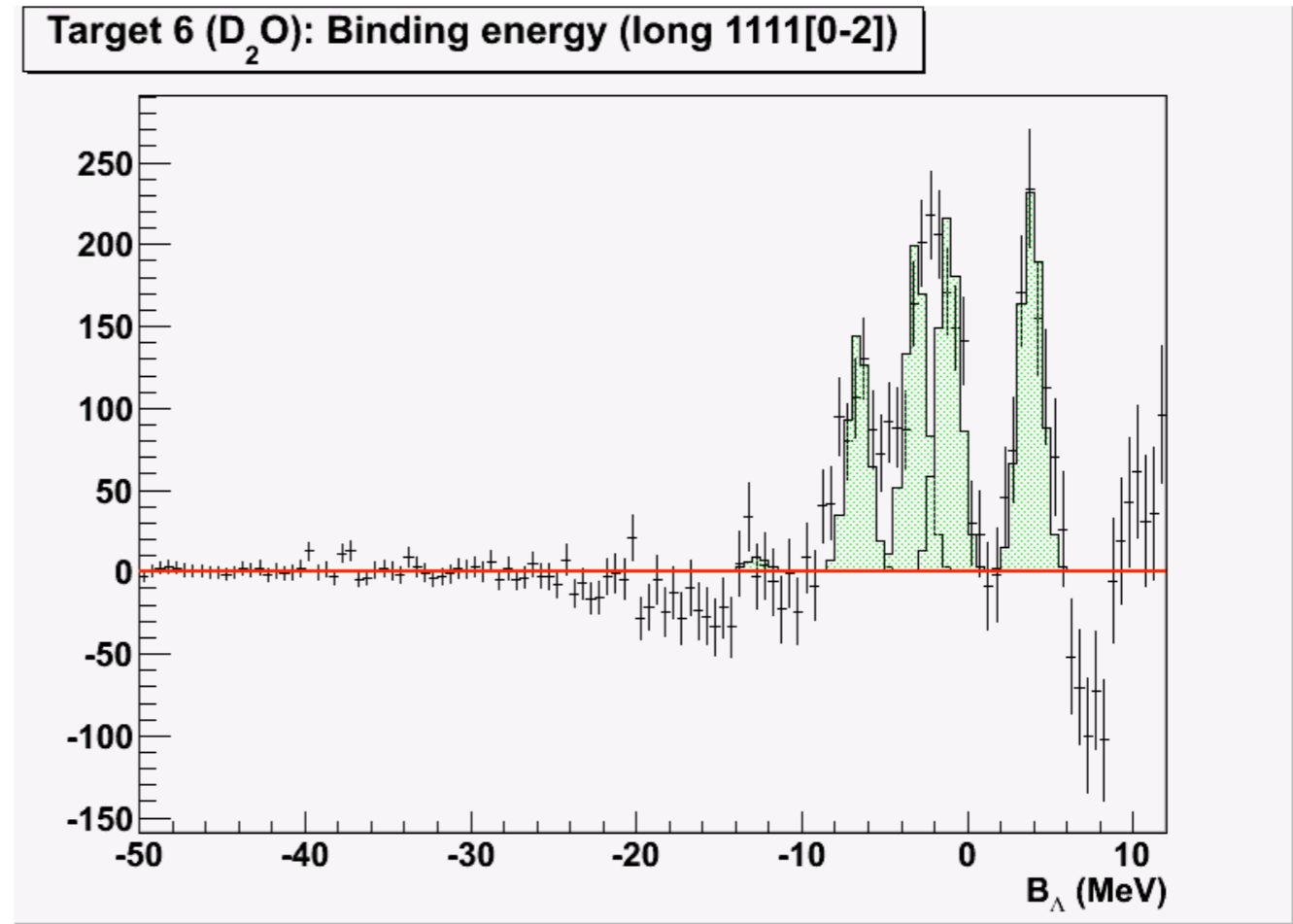
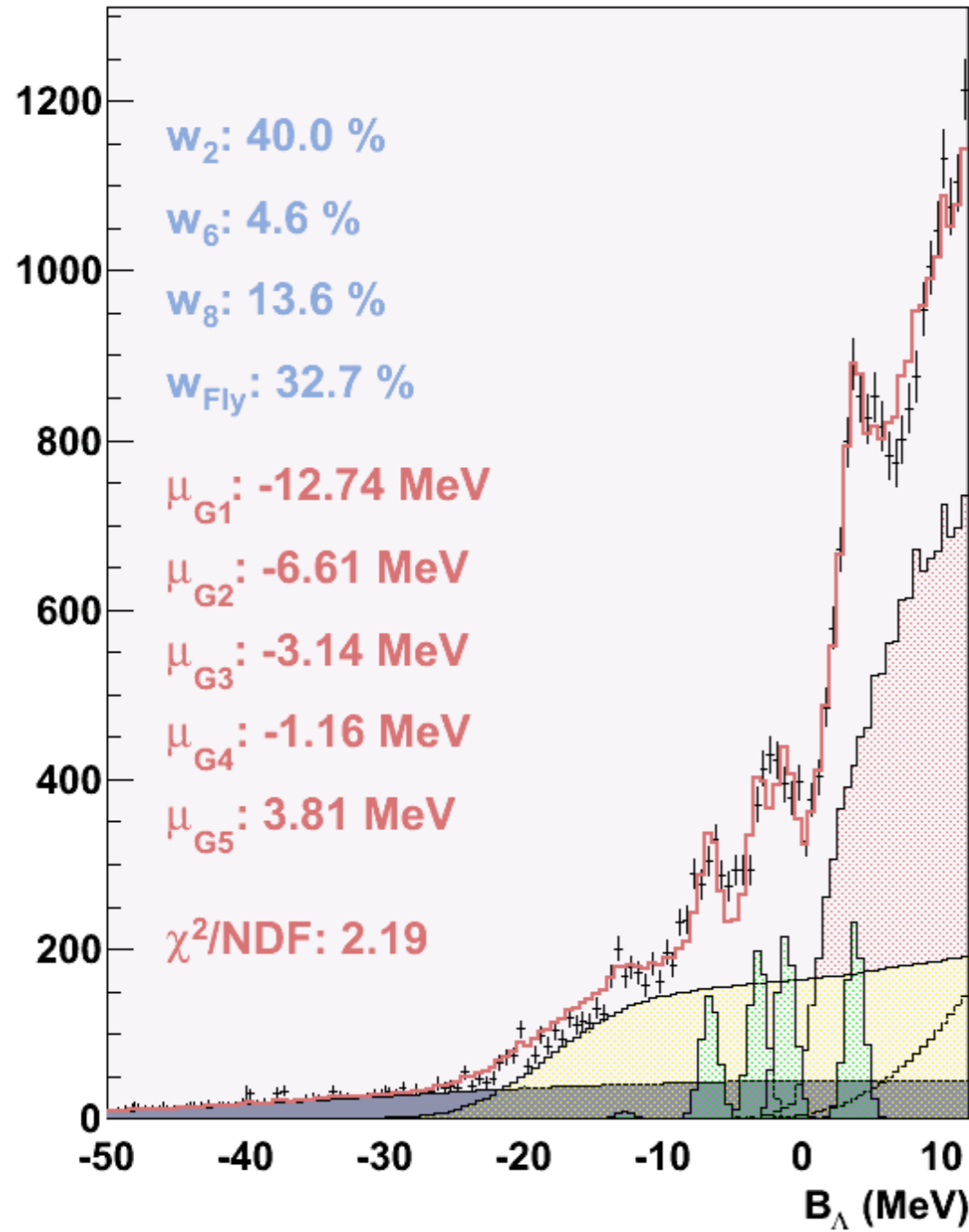
-12.42⁽¹⁾

-5.86

-5.64

[Hyperball]

Target 6 (D₂O): Binding energy (long 1111[0-2])



⁽¹⁾ Ground state misurato dall'esperimento stesso E336

-5.99⁽¹⁾

-3.06

-0.19

3.53

8.89

11.14

13.55

17.41

(E336)

-6.71⁽²⁾

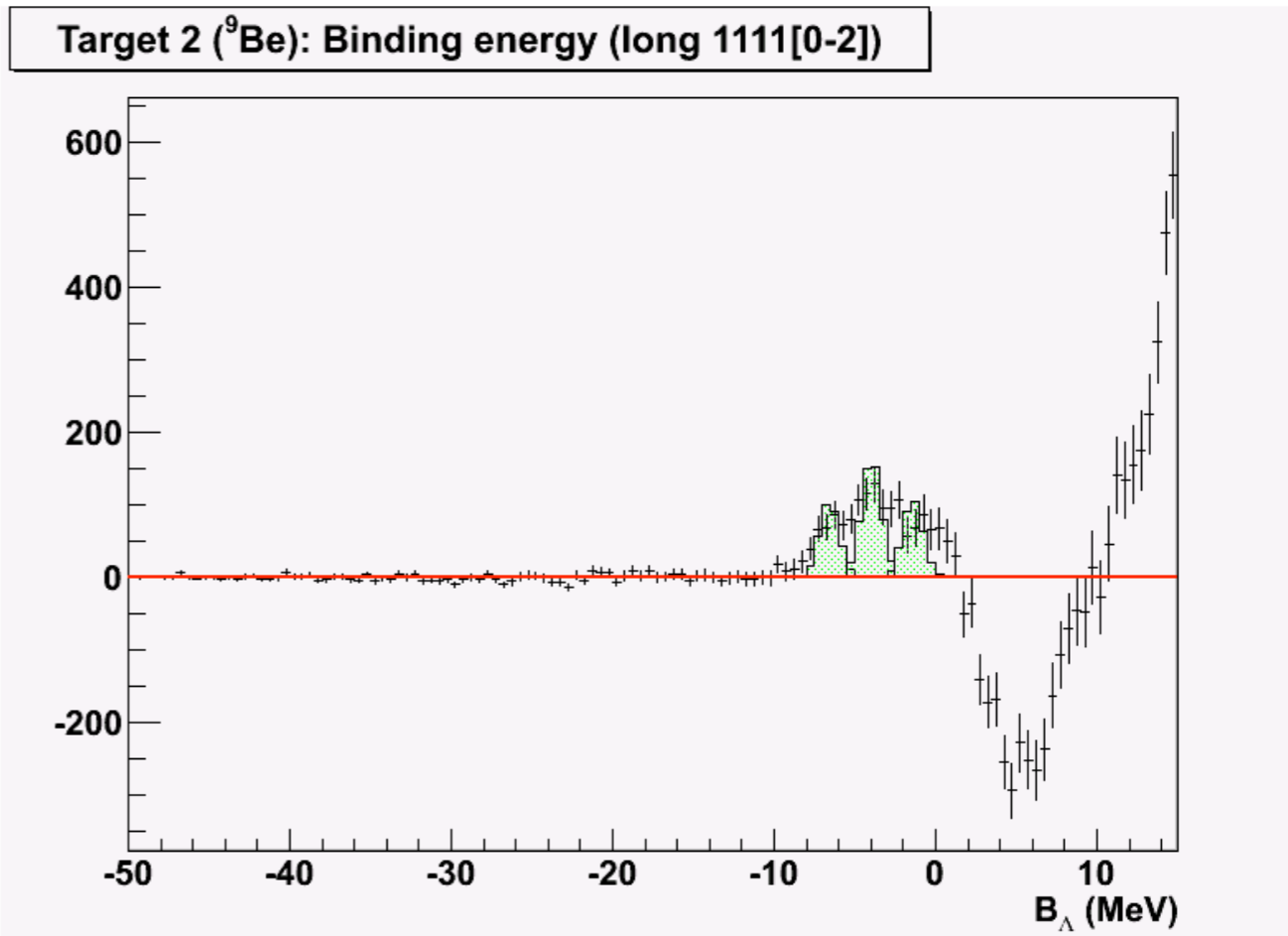
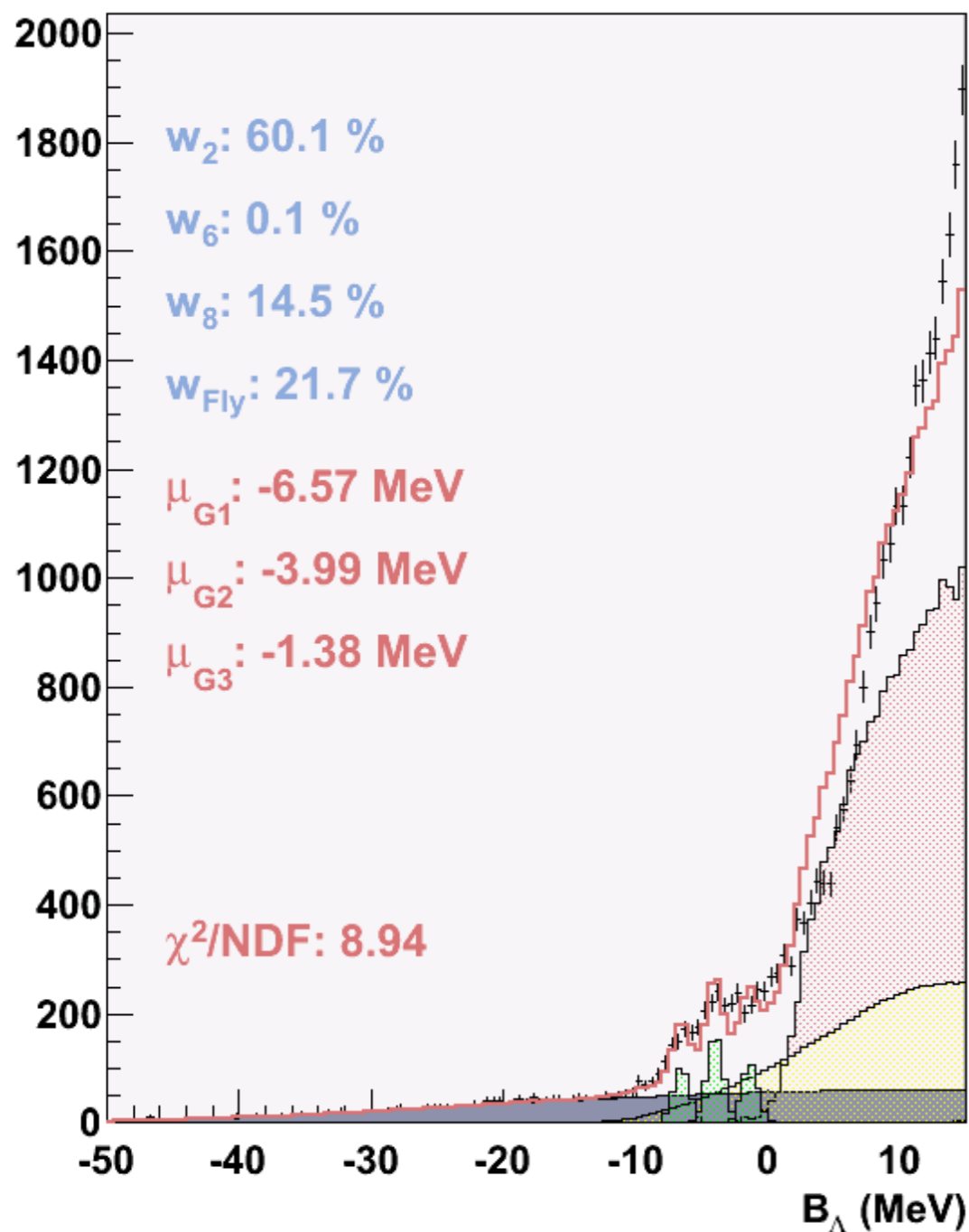
-3.69

-3.26

(Hyperball)



Target 2 (⁹Be): Binding energy (long 1111[0-2])



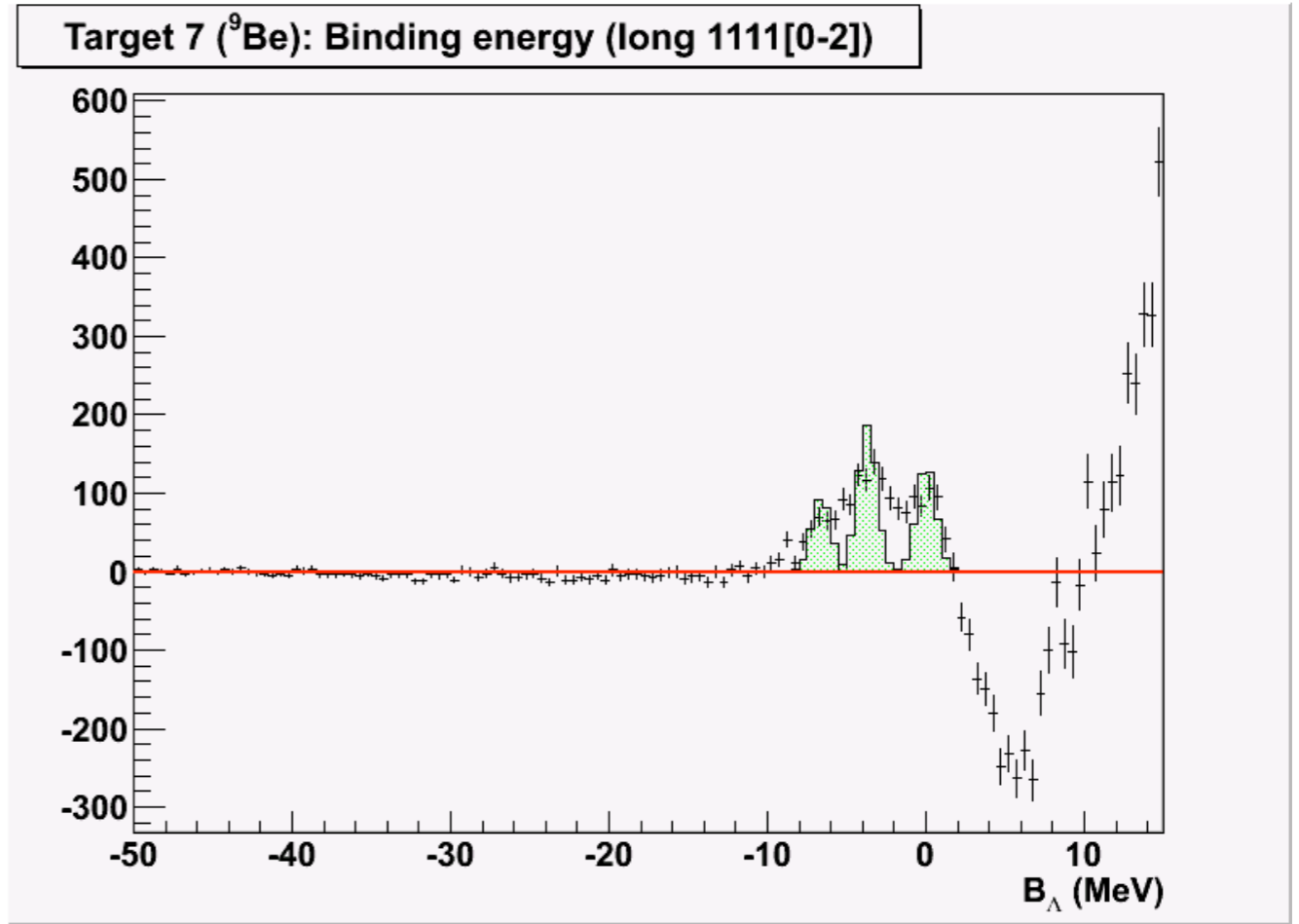
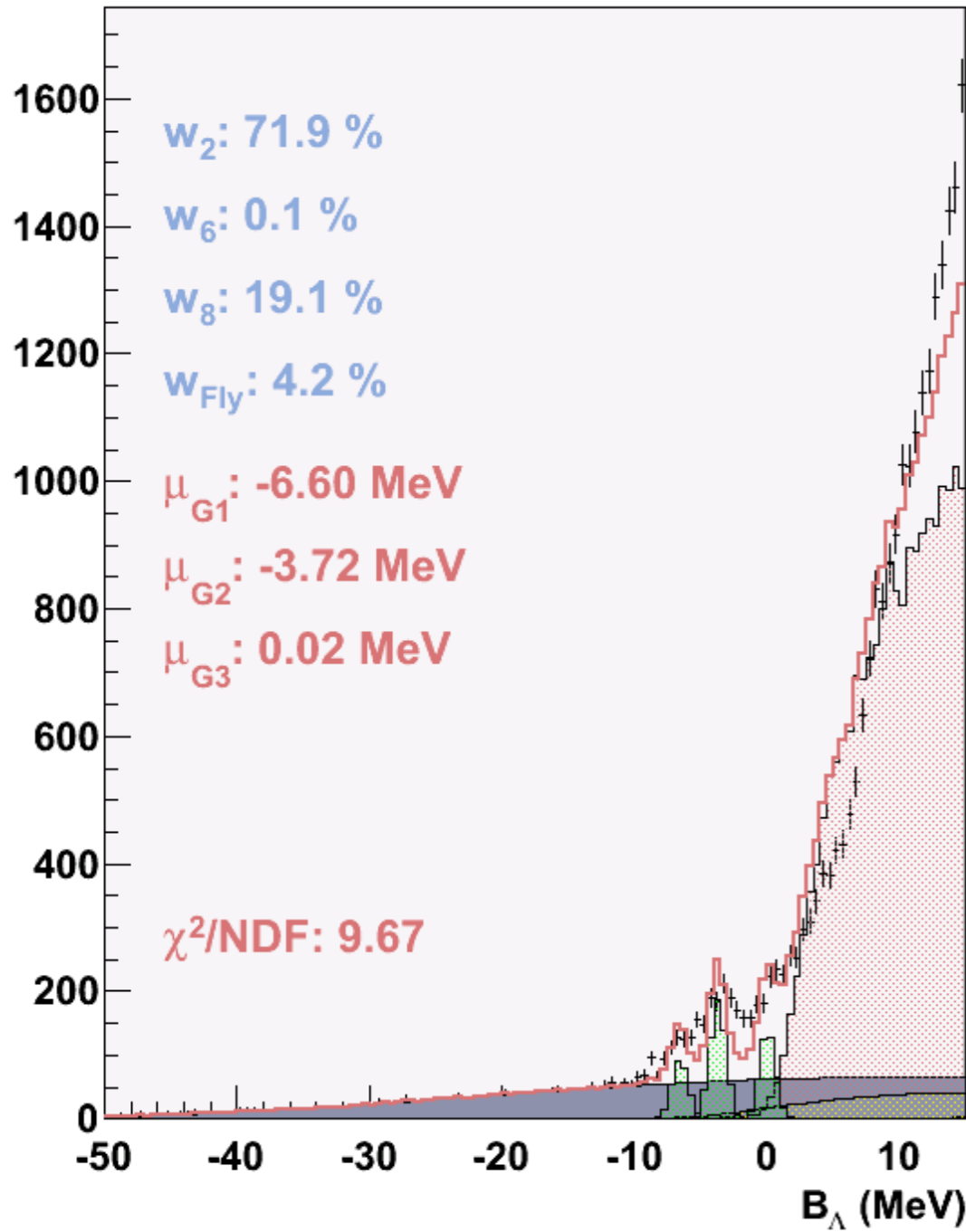
⁽¹⁾ Ground state misurato dall'esperimento stesso E336

⁽²⁾ Ground state misurato in esperimenti con emulsioni

-5.99⁽¹⁾ -3.06 -0.19 3.53 8.89 11.14 13.55 17.41 (E336)
-6.71⁽²⁾ -3.69 -3.26 (Hyperball)



Target 7 (${}^9\text{Be}$): Binding energy (long 1111[0-2])



⁽¹⁾ Ground state misurato dall'esperimento stesso E336

⁽²⁾ Ground state misurato in esperimenti con emulsioni

DA FARE

- i fit sono molto sensibili al numero di Gaussiane e alla loro larghezza

⇒ valutare i sistematici considerando diversi set di tagli, diverse larghezze e numero di Gaussiane

- estendere l'analisi ai dati 2003/04 (i fondi MC per tali bersagli sono stati generati da Pablo)

- calcolare l'andamento del rate di produzione in funzione di A (relativo)

- calcolare (per uno? per tutti?) il rate assoluto