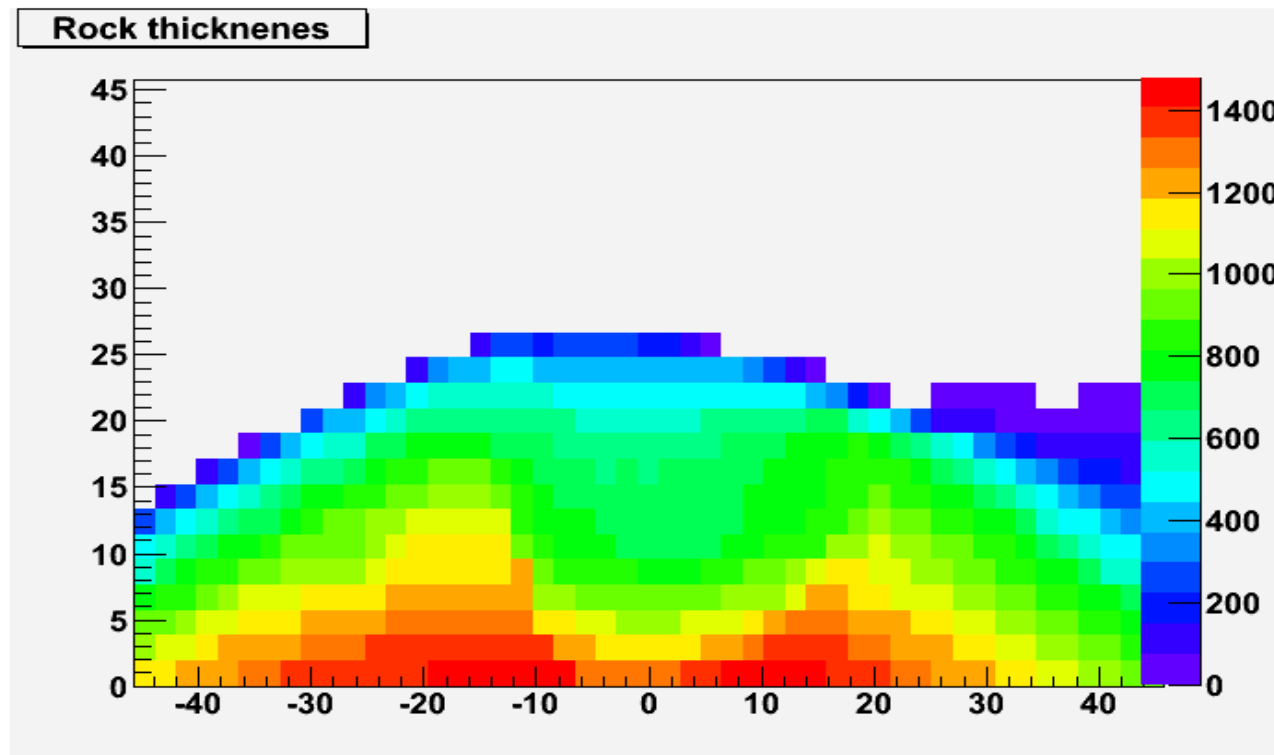


Analisi spettri di energia dei muoni a valle del Vesuvio

La simulazione

- Casina Imbò a quota 970 s.l.m.
- Risoluzione 32 mrad (589 bins)



Stopping Power

$$\frac{dE}{dX} = a(E) + b(E)E$$

ionizzazione

Processi radiativi:

- ✓ Bremsstrahlung
- ✓ Produzione di coppie
- ✓ Interazione phononucleare

Le funzioni $a(E)$ e $b(E)$ variano molto lentamente con E .

Per $E < 100$ GeV: $b(E)E < 1\%$ di $a(E)$.

Ad alte energie $a(E)$ e $b(E)$ possono essere considerate costanti.

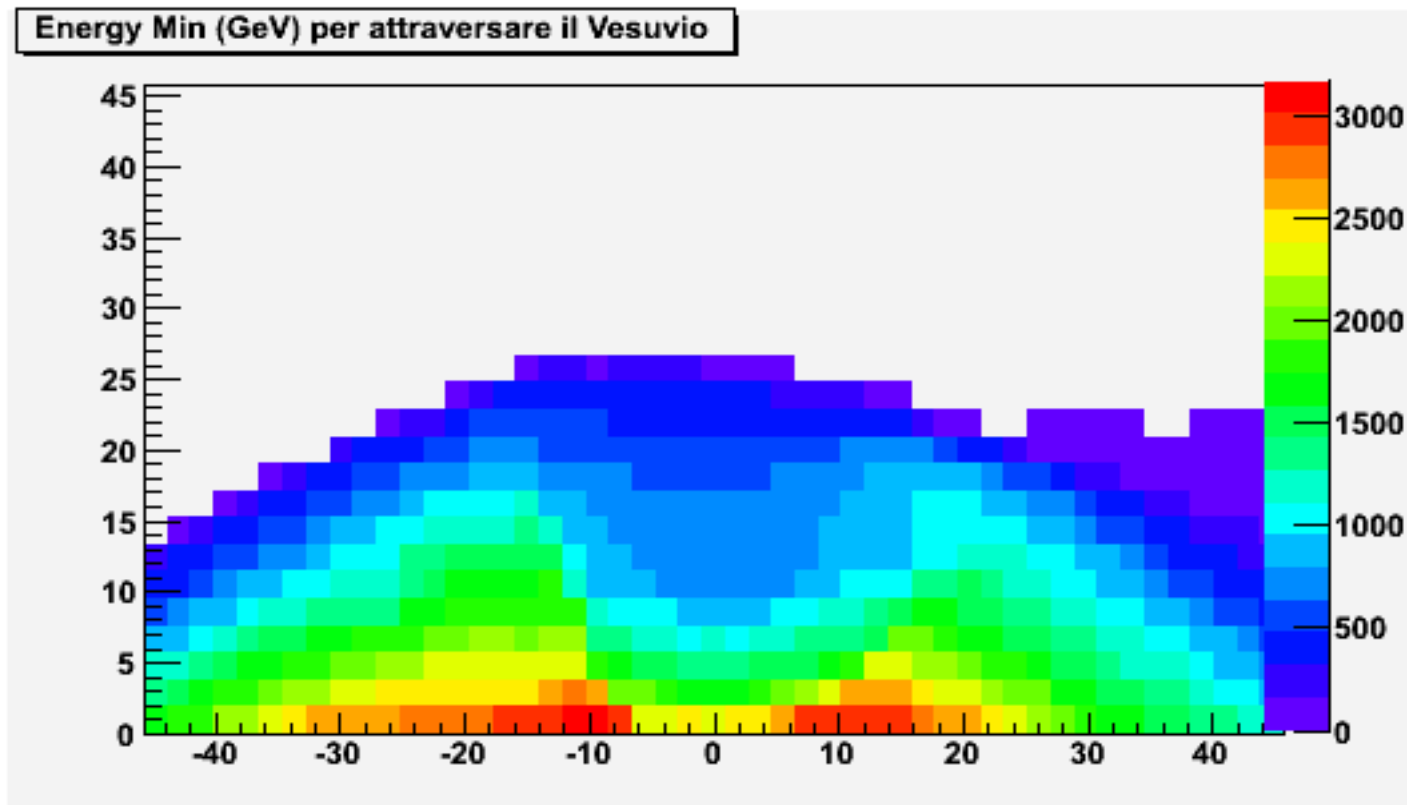
La perdita di energia è lineare in E .

Approssimando la roccia del Vesuvio alla Standard rock (2.650 g/cm^3) ho effettuato il calcolo della perdita di energia utilizzando le tabelle che potete prendere al seguente link:

<http://pdg.lbl.gov/2014/AtomicNuclearProperties/>

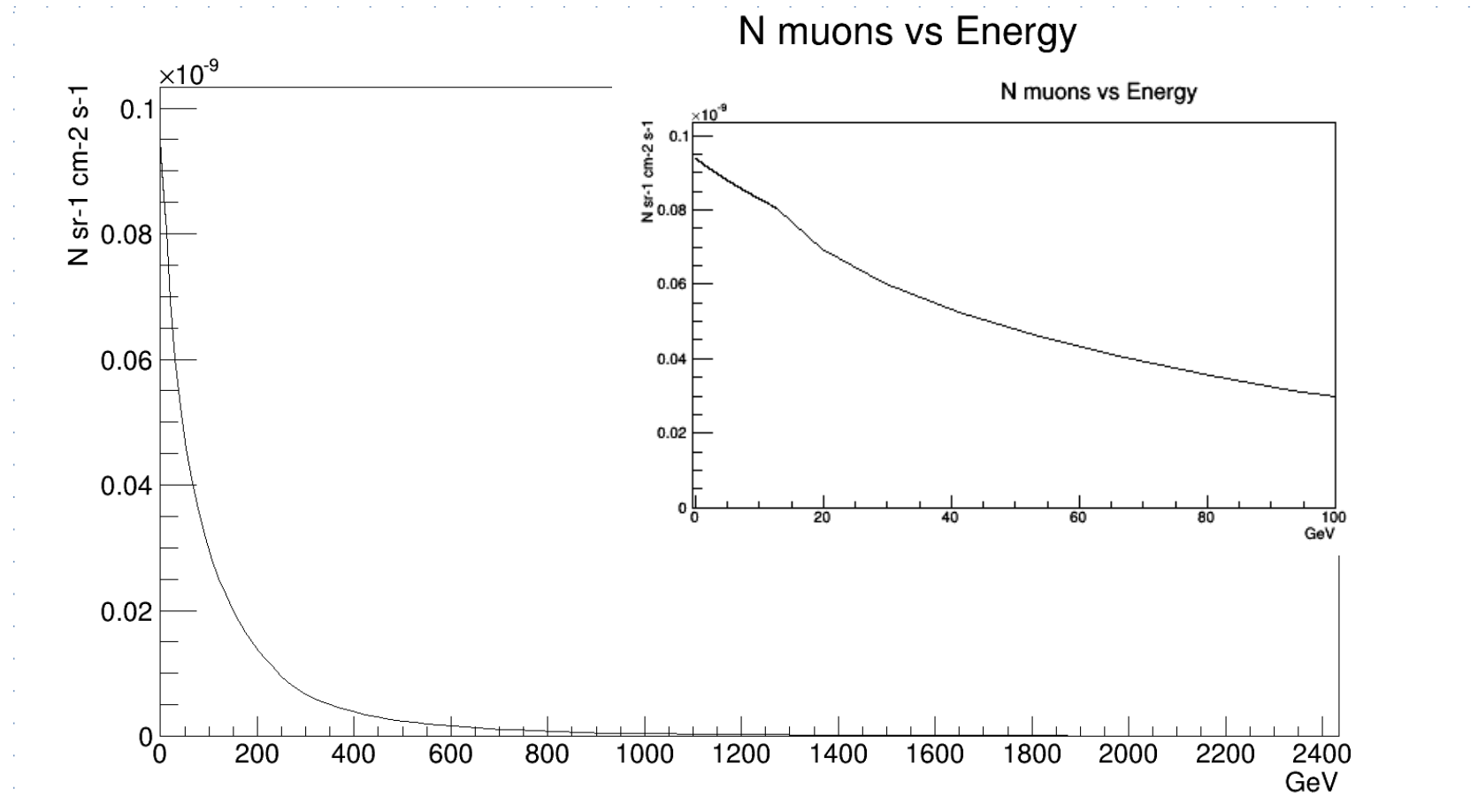
Energia minima per superare il Vesuvio

La prima parte dell'algoritmo è finalizzata alla ricerca dell'energia minima necessaria per oltrepassare il Vesuvio

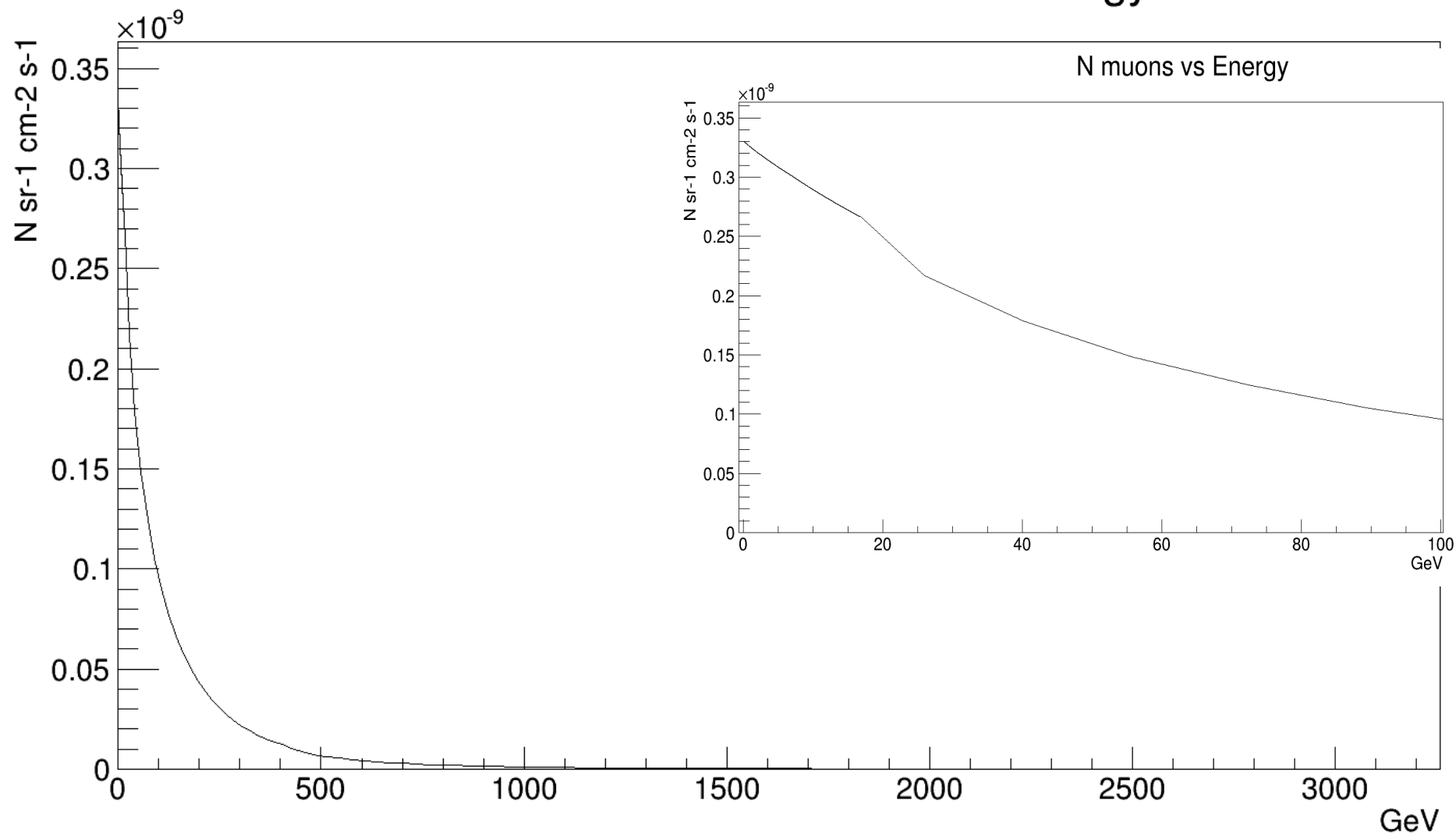


Spettri energia

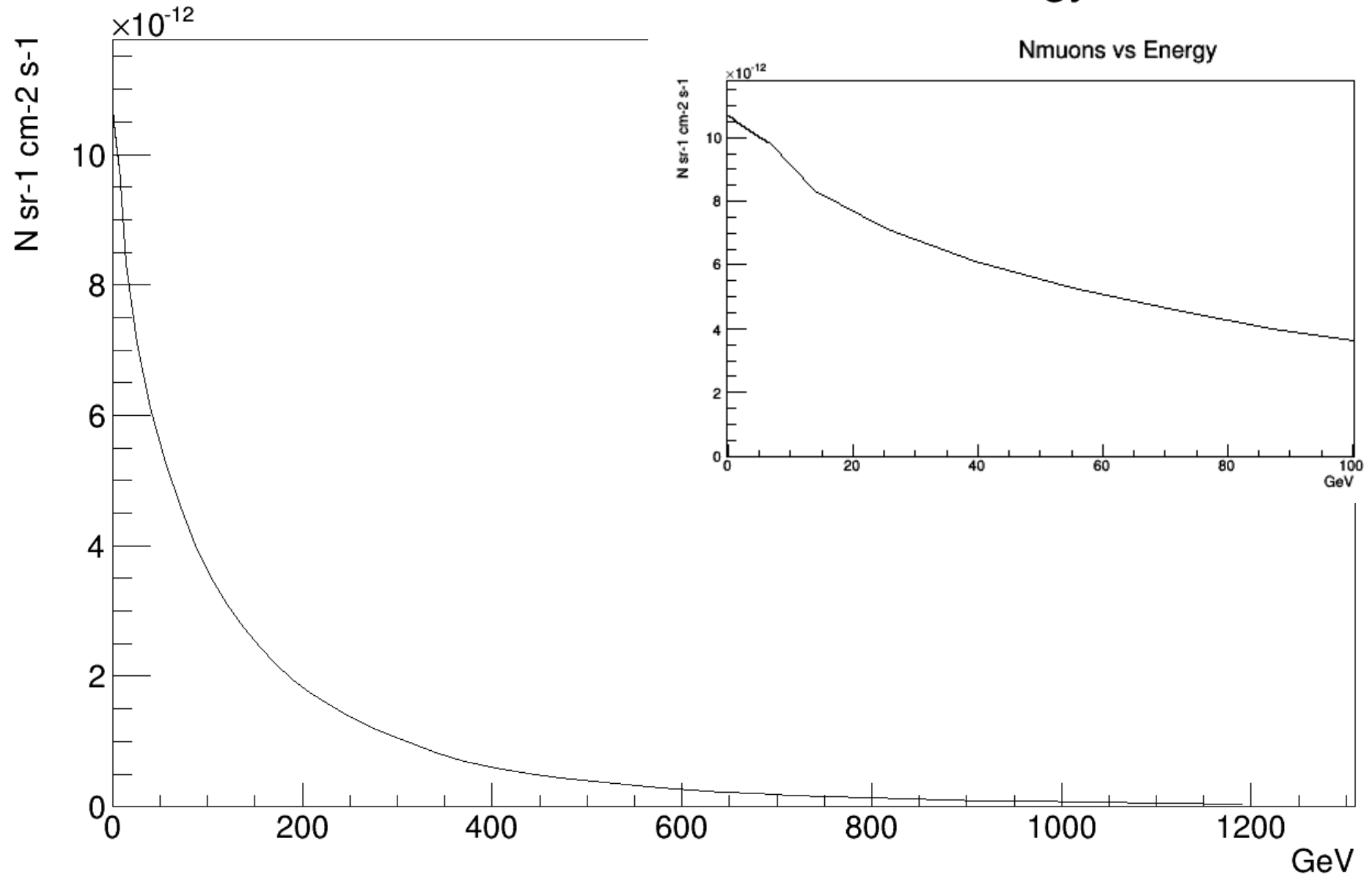
Calcolata la minima energia si procede “iniettando” muoni con energia maggiore.



N muons vs Energy

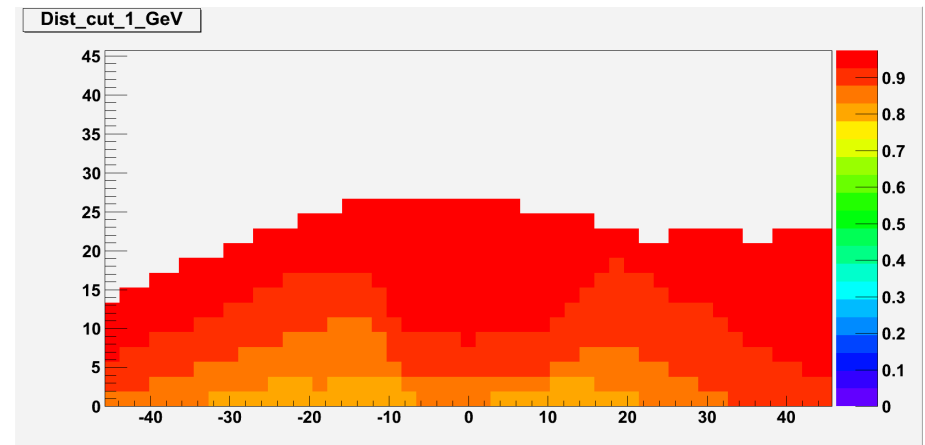
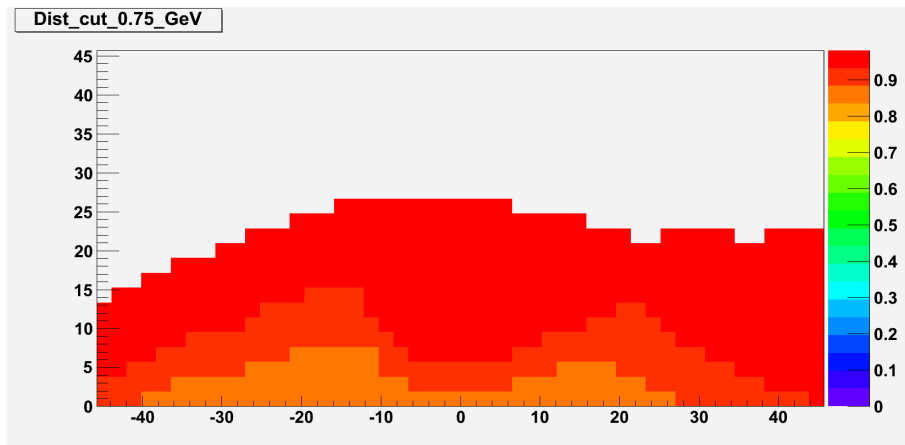
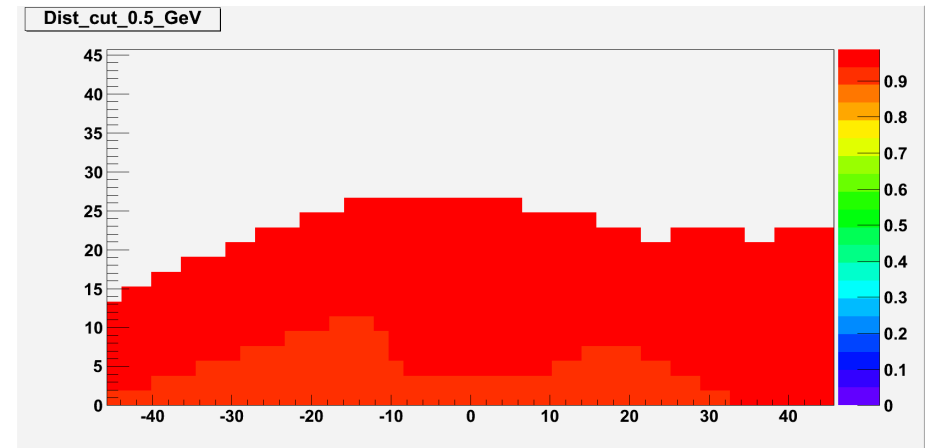
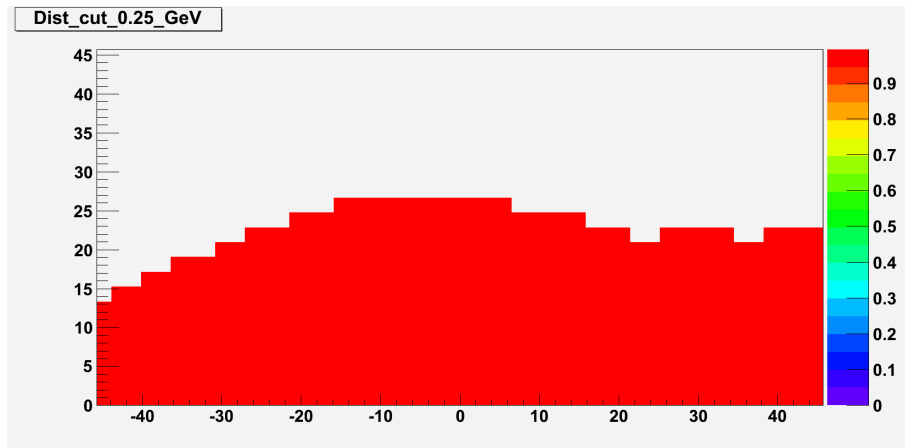


Nmuons vs Energy

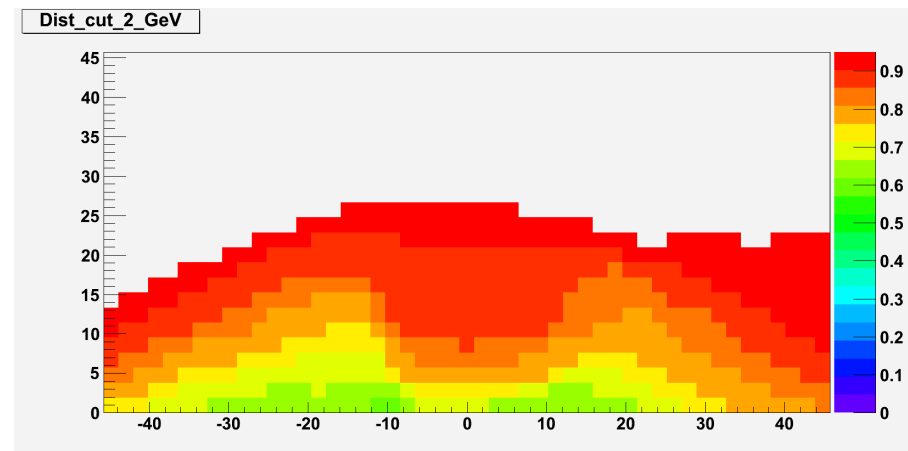
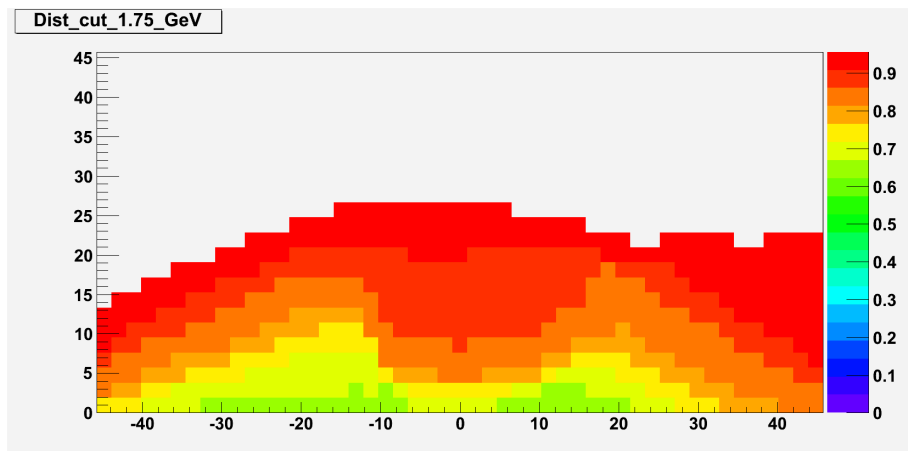
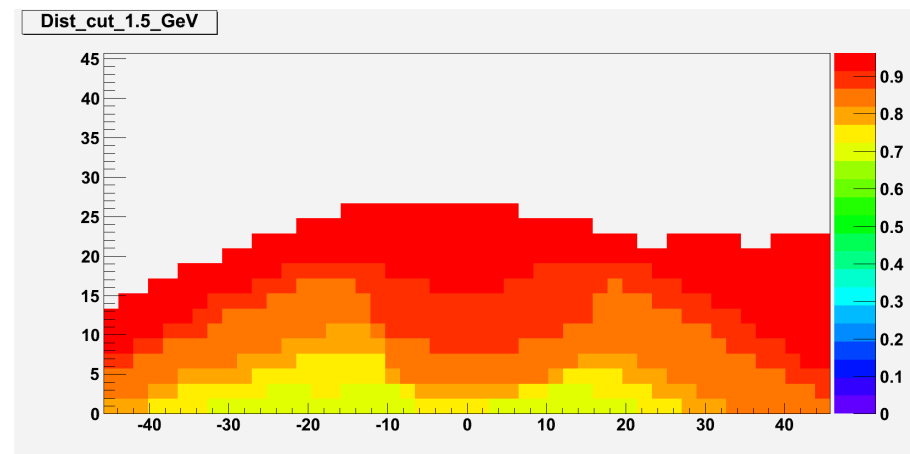
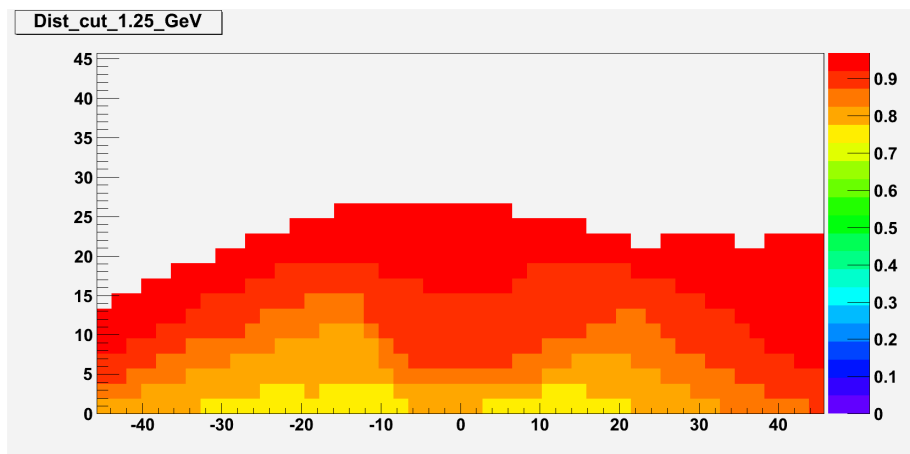


Efficienza taglio in energia

250 MeV $\rightarrow$ 1 GeV



1.25GeV $\rightarrow$ 2GeV



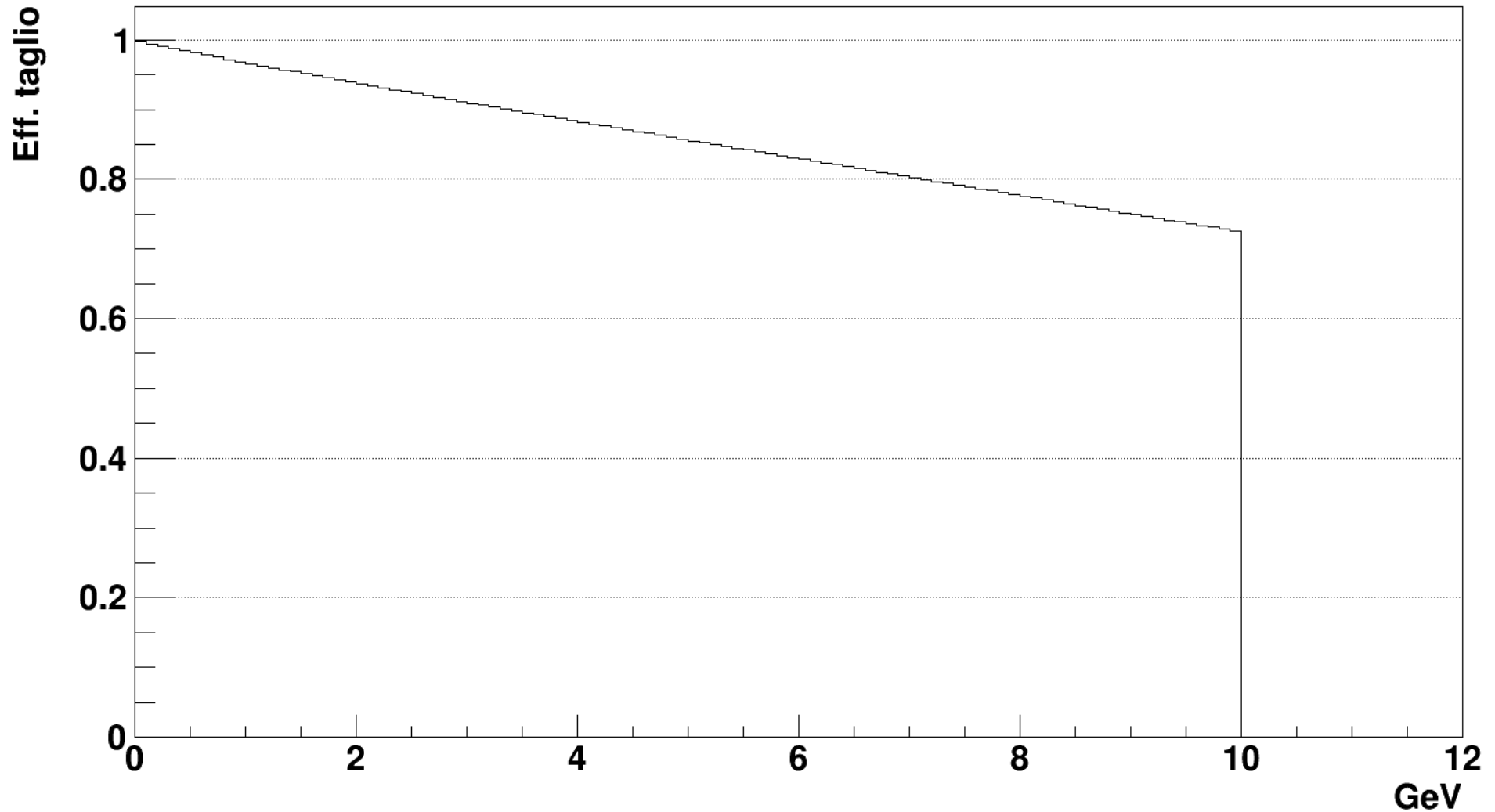
Efficienza del taglio

Ho analizzato 3 configurazioni

- Spessore 400 m : “piccolo”
- Spessore 750 m : “medio”
- Spessore 1250 m : “grande”

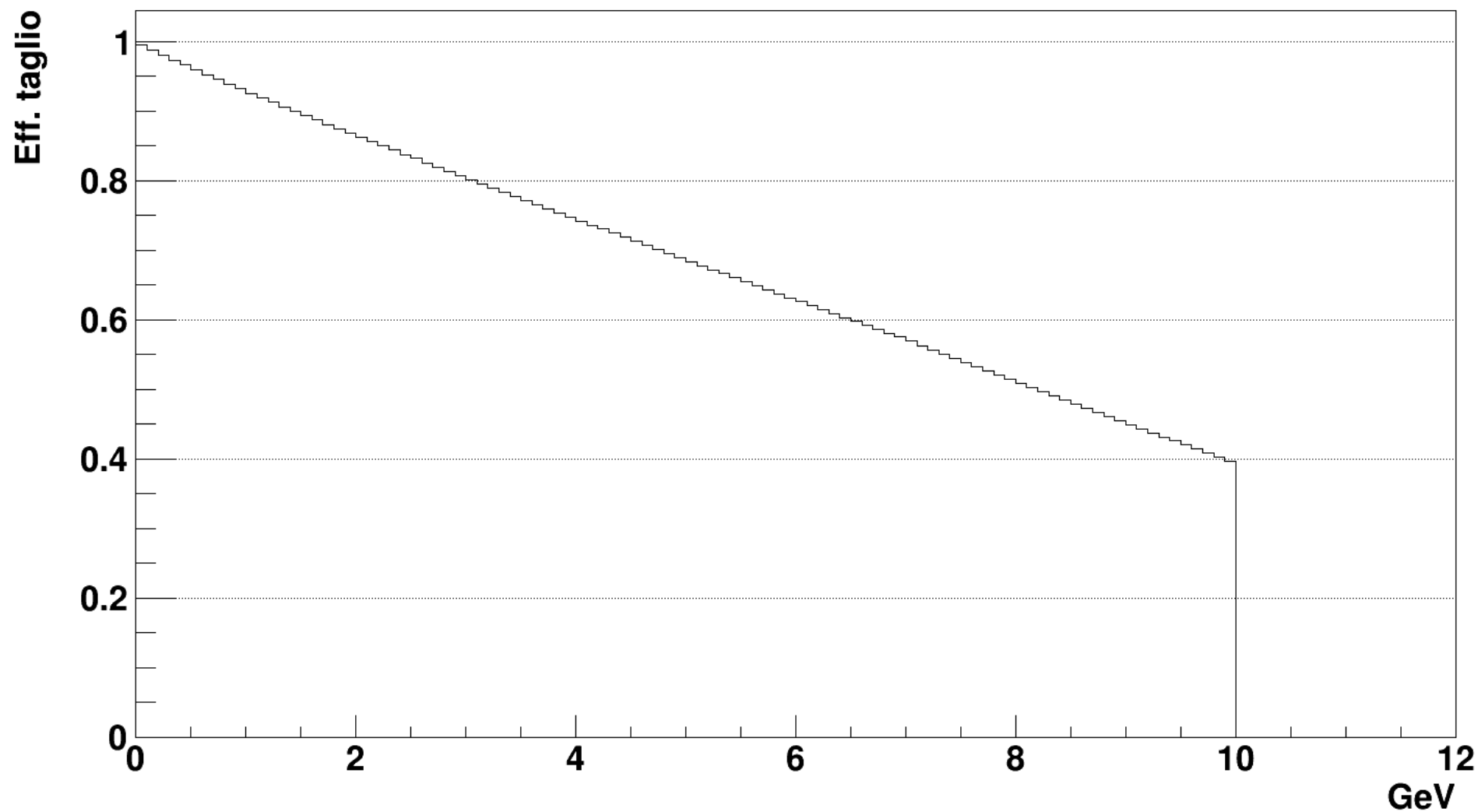
Spessori “piccoli”

Distribuzione trasmissioni 400 m in funzione del taglio



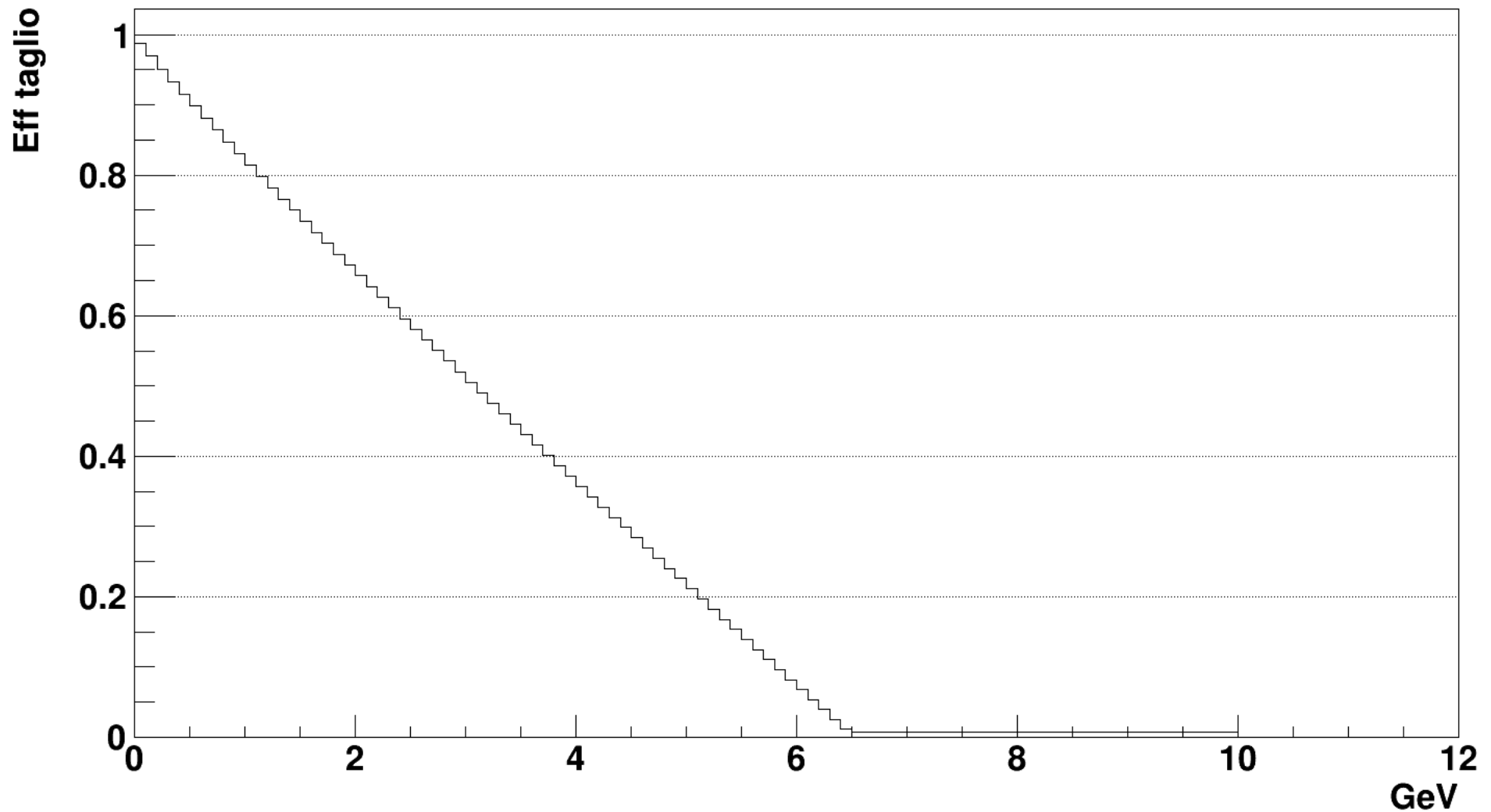
Spessori “medi”

Distribuzione trasmissioni 750 m in funzione del taglio



Spessori “grandi”

Distribuzione trasmissioni 1250 m in funzione del taglio



Range - Stopping Power Piombo

Energy (MeV)	dE/dX (MeV cm ² /g)	Range (g/cm ²)
10	3.823	3.823
20	2.436	4.927
30	1.928	9.600
40	1.666	15.21
50	1.509	21.54
100	1.215	59.43
200	1.124	146.3
300	1.131	235.2
400	1.152	322.8
500	1.175	408.8
600	1.198	493.0
700	1.219	575.8
800	1.238	657.2
900	1.256	737.4
1000	1.272	816.5

$$\rho = 11.365 \text{ g/cm}^3$$

100 MeV

$$\text{Range} = 59.43 / 11.365 = 5.3 \text{ cm}$$

200 MeV

$$\text{Range} = 146.3 / 11.365 = 12.87 \text{ cm}$$

400 MeV

$$\text{Range} = 322.8 / 11.365 = 28.40 \text{ cm}$$

500 MeV

$$\text{Range} = 408.8 / 11.365 = 35.97 \text{ cm}$$

600 MeV

$$\text{Range} = 493.0 / 11.365 = 43.38 \text{ cm}$$

700 MeV

$$\text{Range} = 575.8 / 11.365 = 50.66 \text{ cm}$$

800 MeV

$$\text{Range} = 657.2 / 11.365 = 57.83 \text{ cm}$$

1 GeV

$$\text{Range} = 816.5 / 11.365 = 71.84 \text{ cm}$$

