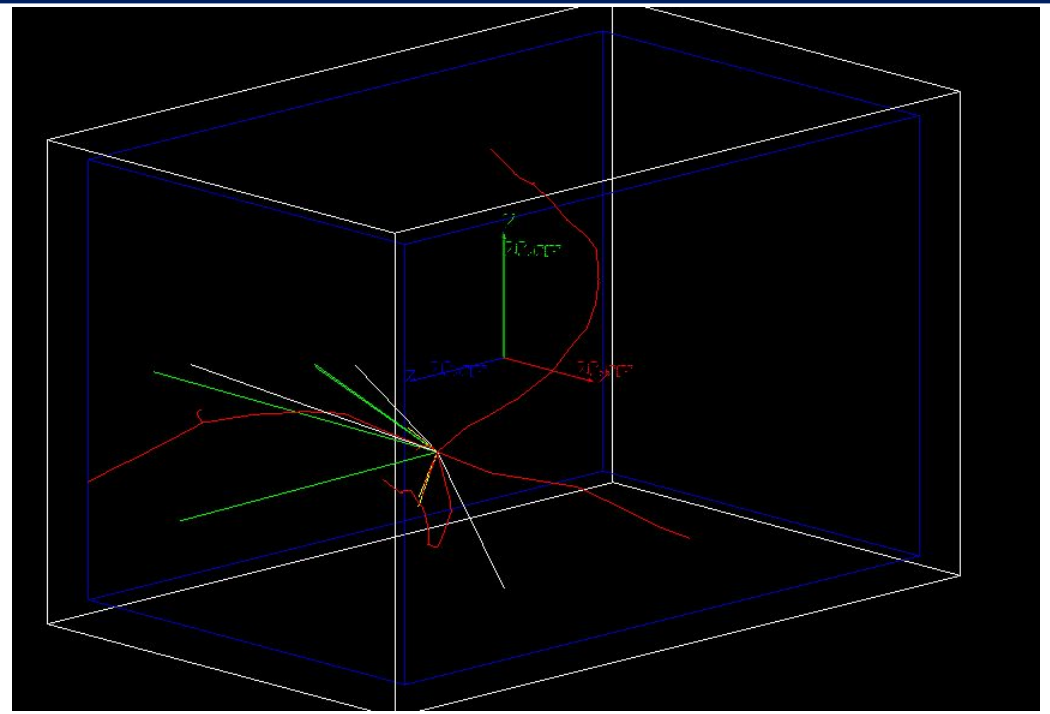
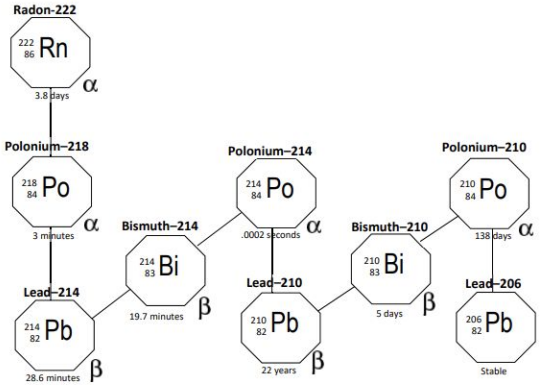
222Rn deposit in 'LIME'
0.9 atm
19/09/2024

Introduction





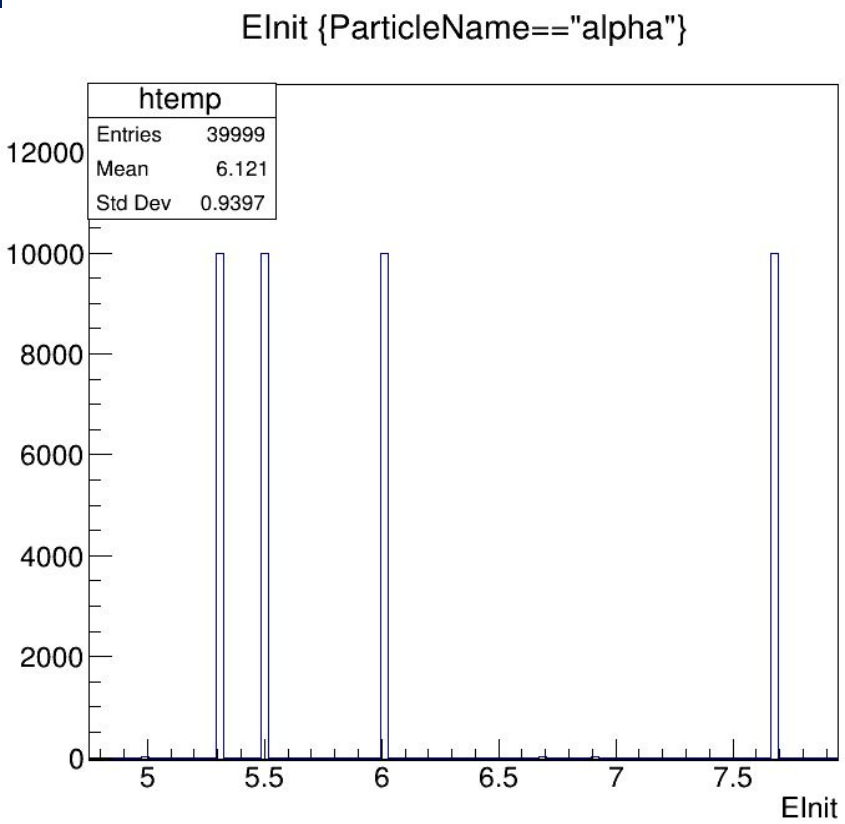
- 222Rn source is randomly generated inside the gas box **35x35x55cm**
- All the decay products are generated in that position **NO neg/pos ion dirft**
- 10k dacays
- the isotopes can be supposed in secular equilibrium **but**
  - **210Po**(138 days) maybe in equilibrium but with a concentration 36 times higher than 222Rn
  - **210Pb**(22.3 years) for sure not in equilibrium (concentration in equilibrium 2140 time larger than Rn
- In this case, **everything is supposed to be in secular equilibrium** so take it with a grain of salt

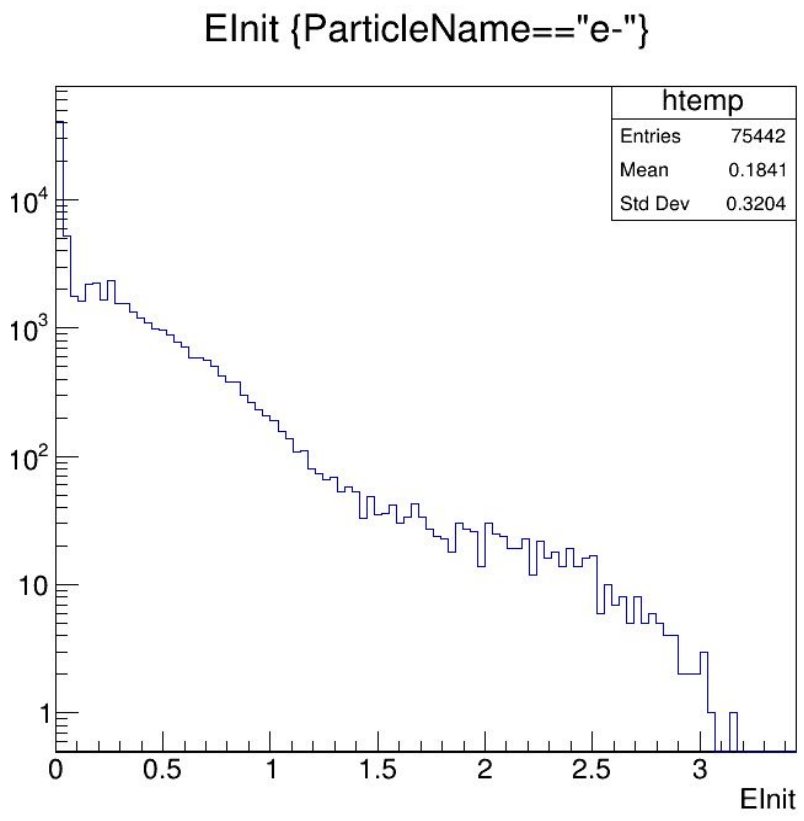
Decay Process	Maximum Beta Energy (MeV)	Branching Ratio (%)
$^{214}Pb \rightarrow ^{214}Bi$	1.024	100
$^{214}Bi \rightarrow ^{214}Po$	3.272	99.98
$^{210}Pb \rightarrow ^{210}Bi$	0.0635	100
$^{210}Bi \rightarrow ^{210}Po$	1.162	100

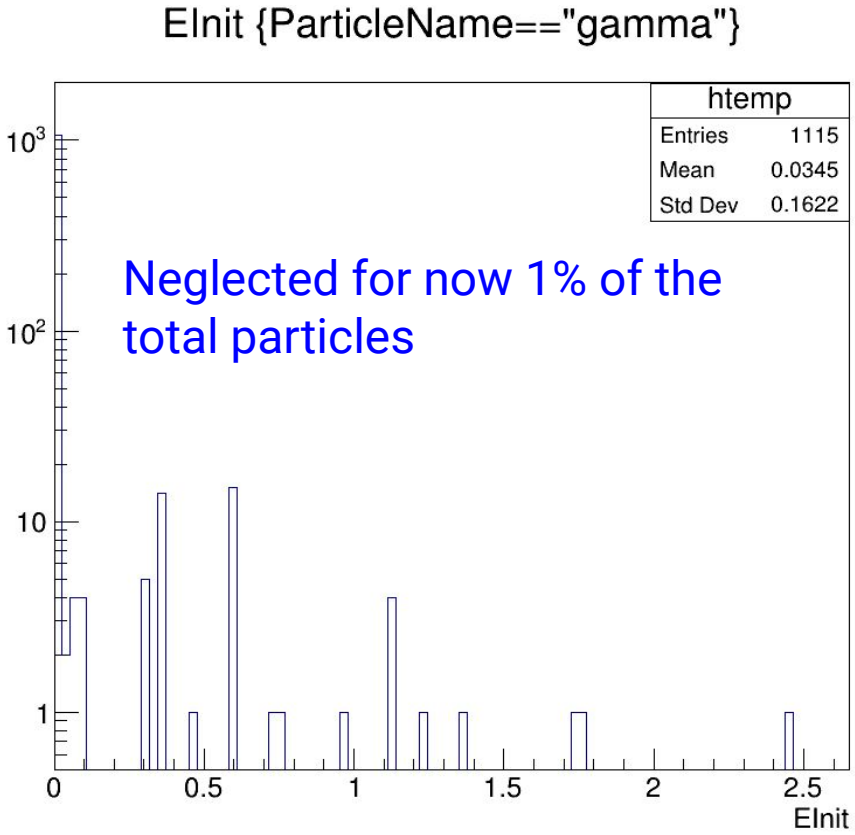
Product of the decay

Initial Energy of the particles from decay processes (no secondaries) with Initial energy greater than 1keV

Only particles generated by the decay processes (generating process== “Radioactivation”)! → no secondaries



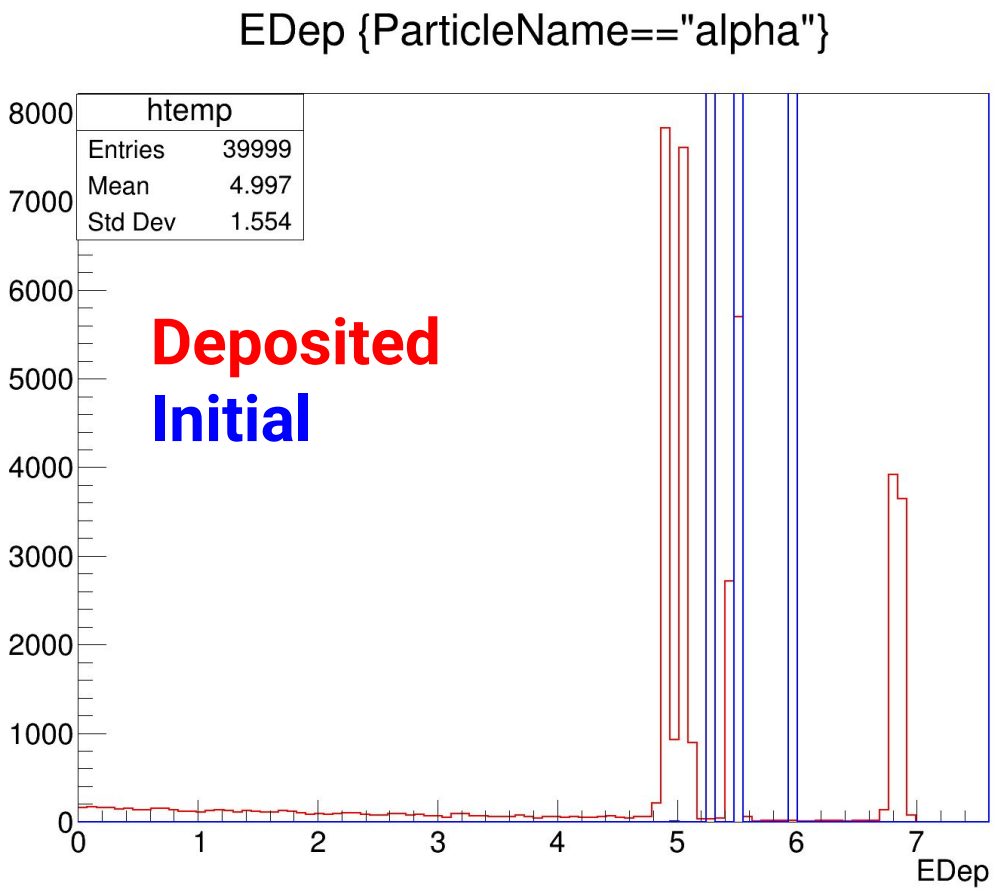




MeV

Product of the decay
-ALPHA-

Energy deposit by the particles from decay processes (no secondaries) with Initial energy greater than 1keV



Loss in binding energy:

7.7-6.8 = **1.1MeV**

6-5.5 = **0.5MeV**

5.5-5.1 = **0.4MeV**

5.3-4.9 = **0.4MeV**

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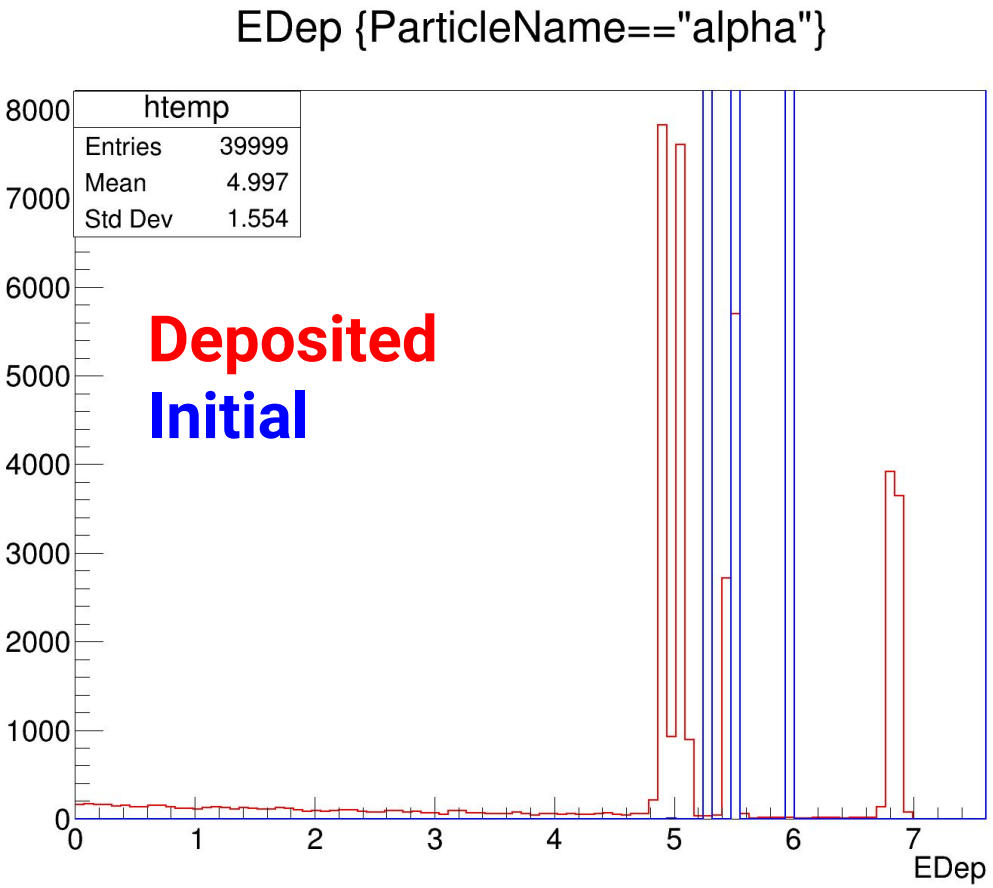

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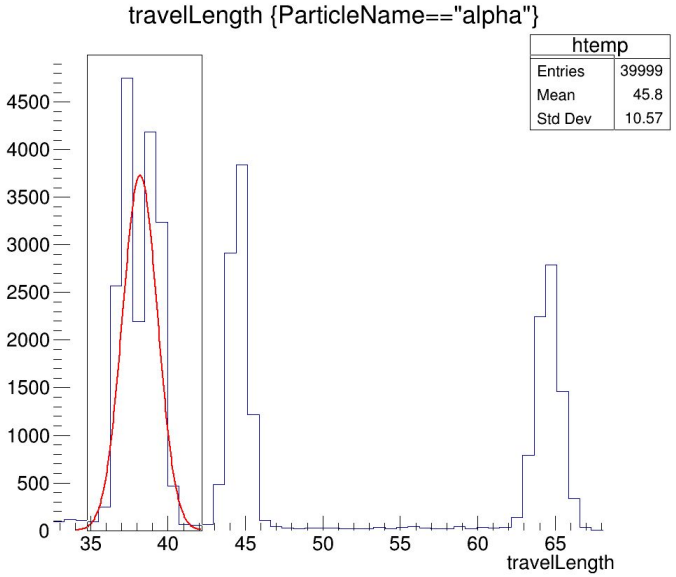
measured range in **mm**:

- 64.5
- 44.5
- 38.1(double peak)



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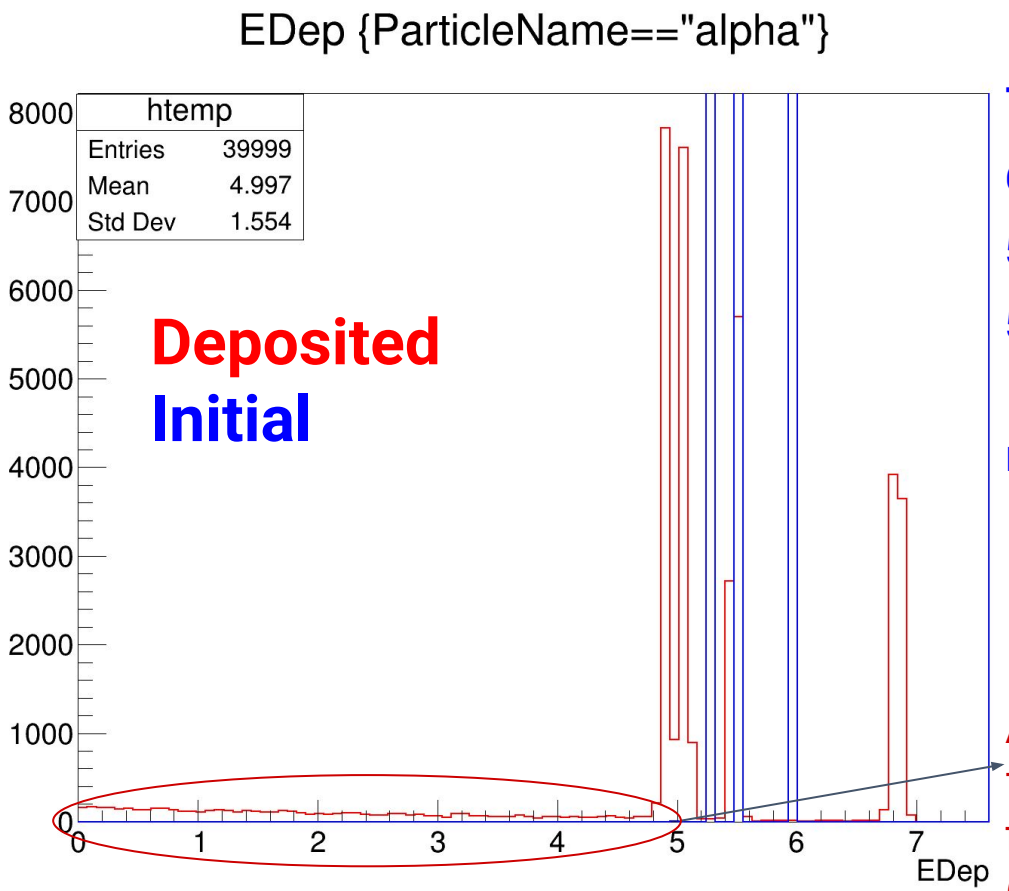

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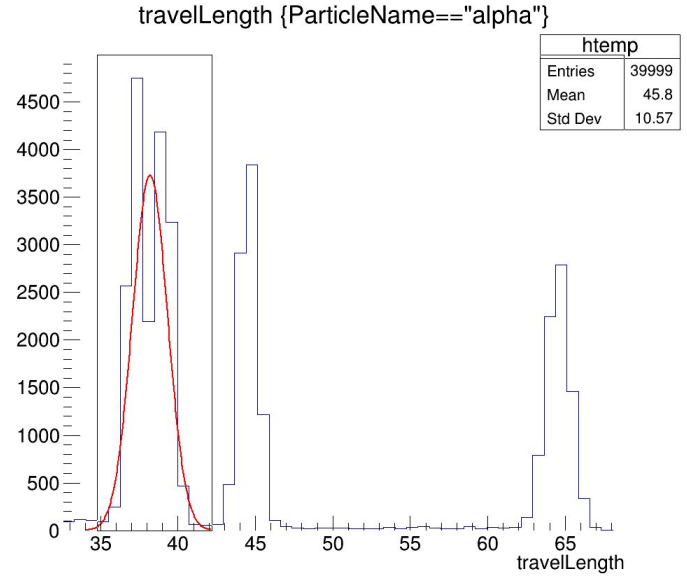
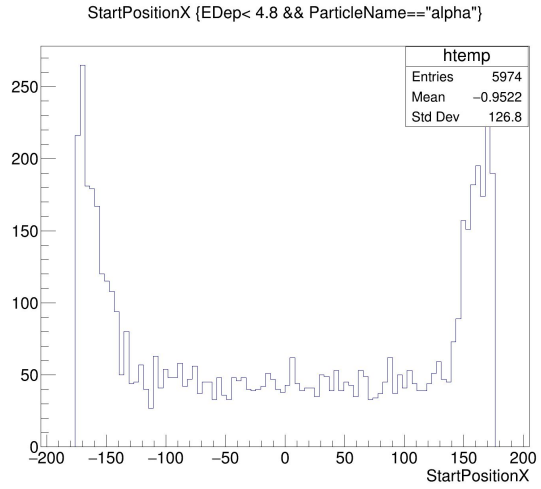
All deposits that are different from peak energy can be fiducialized and removed (30mm)

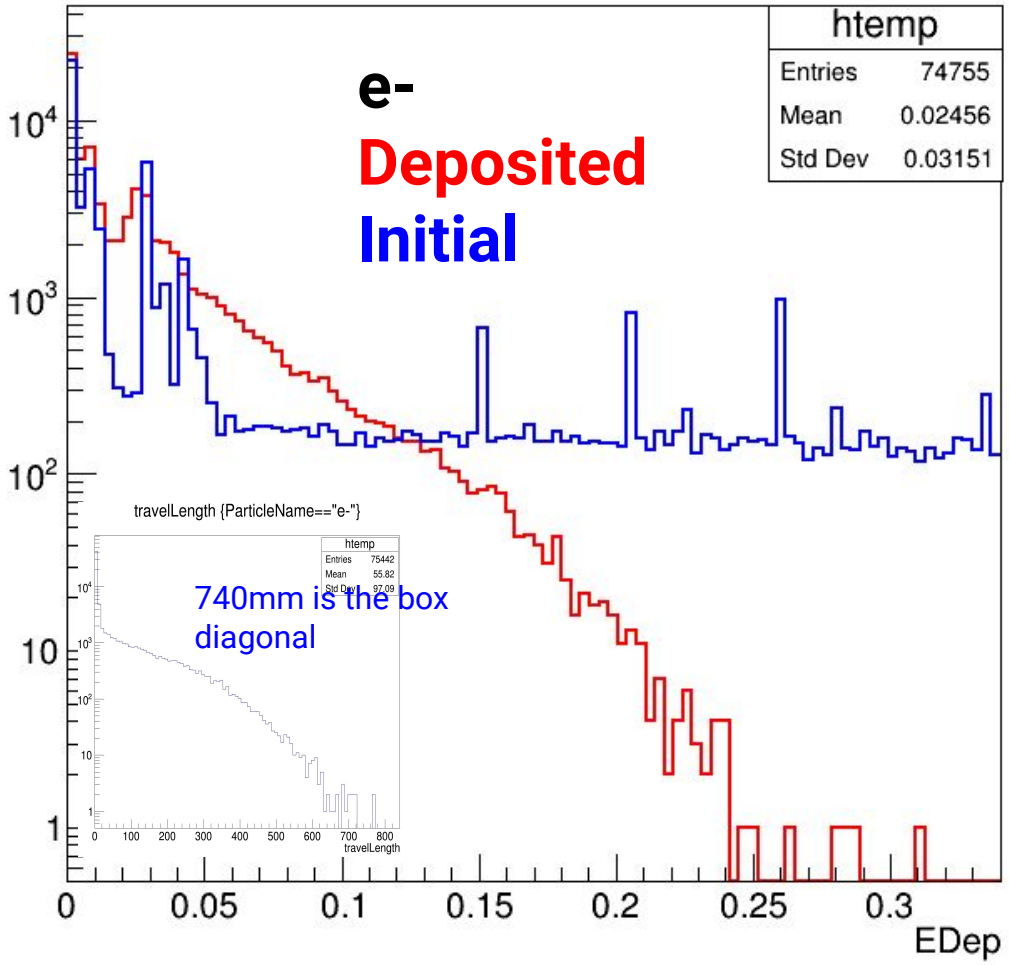




Product of the decay -electrons-

FIDUCIALIZED

Energy deposit by the particles from decay processes (no secondaries) with Initial energy greater than 1keV



Product of the decay -electrons-

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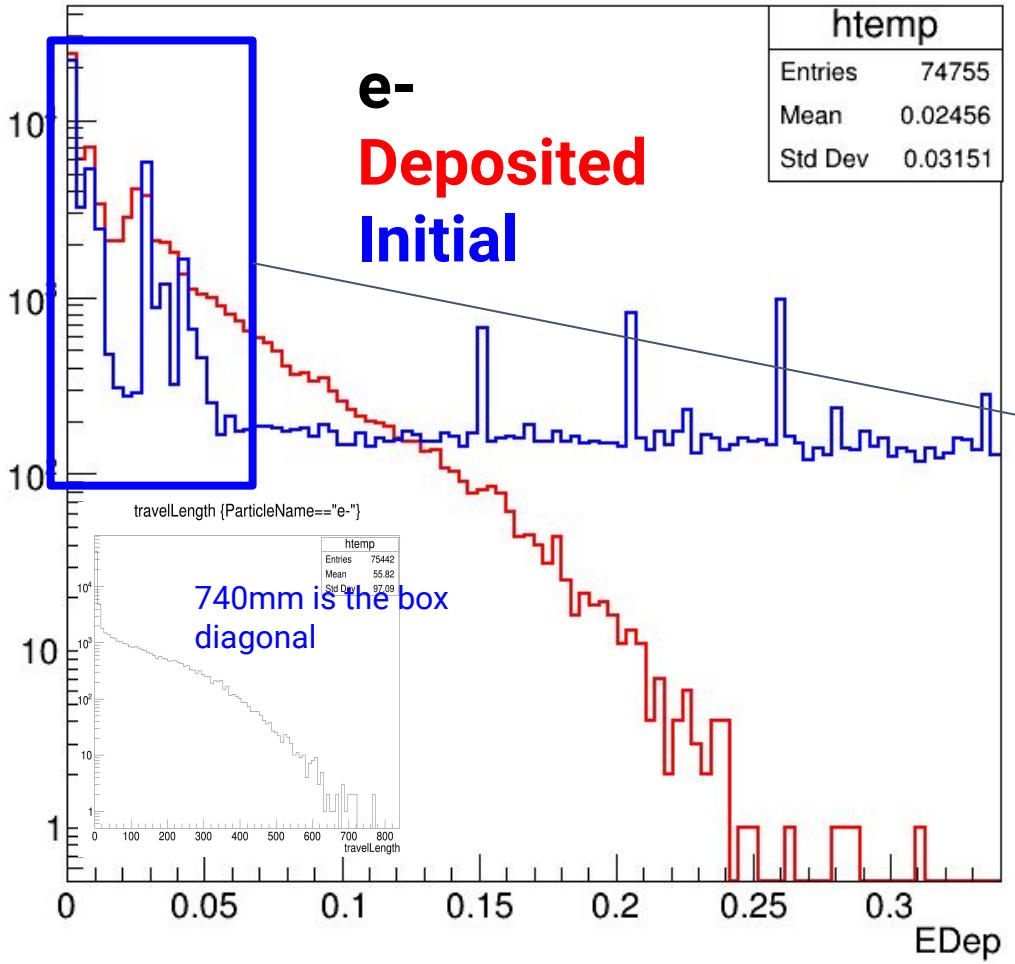
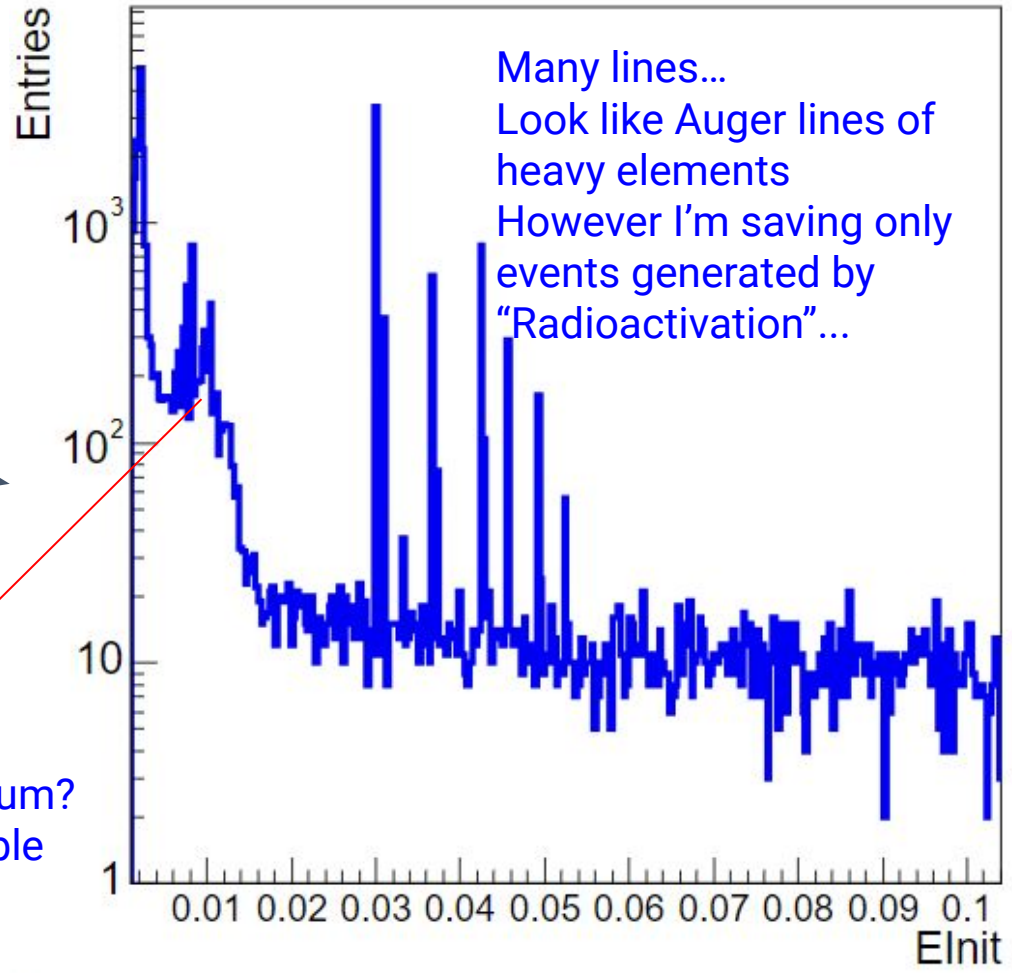
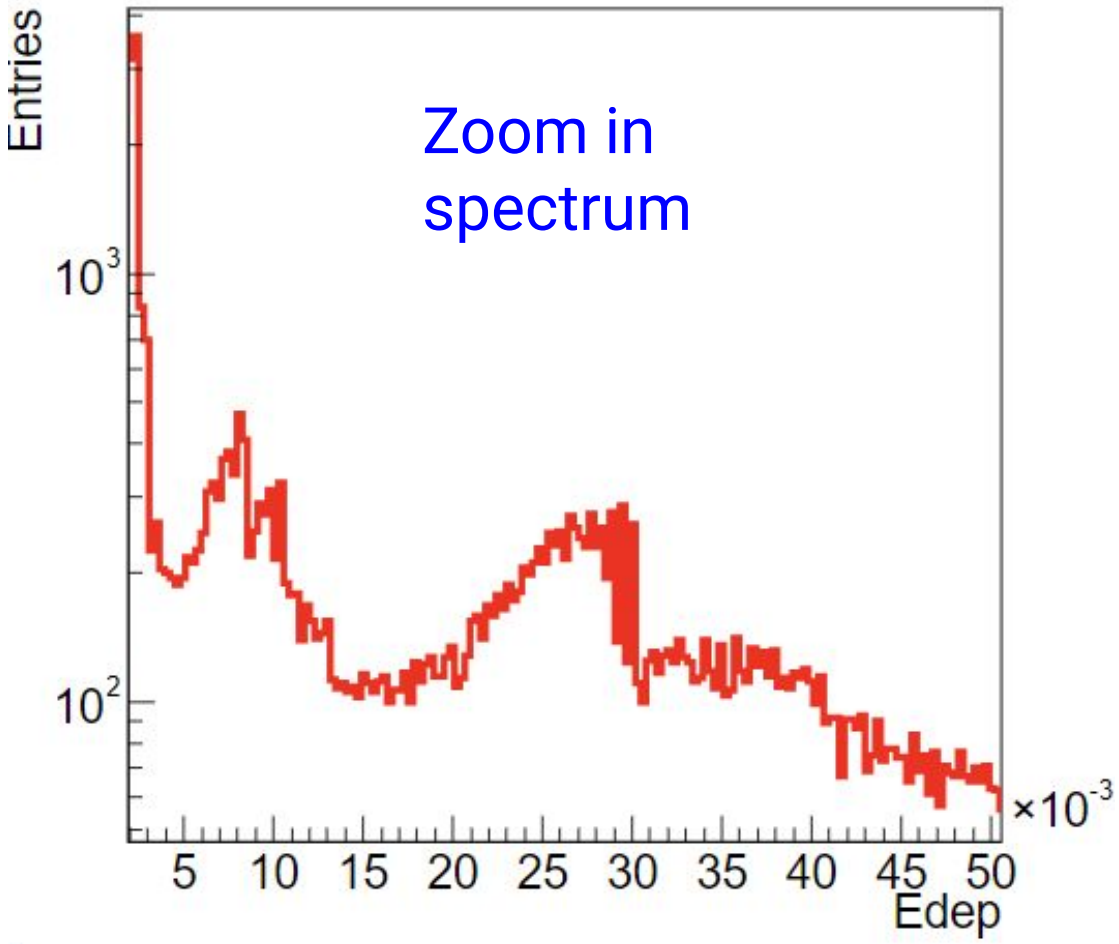


Maybe a beta spectrum?
I don't find any suitable decay....



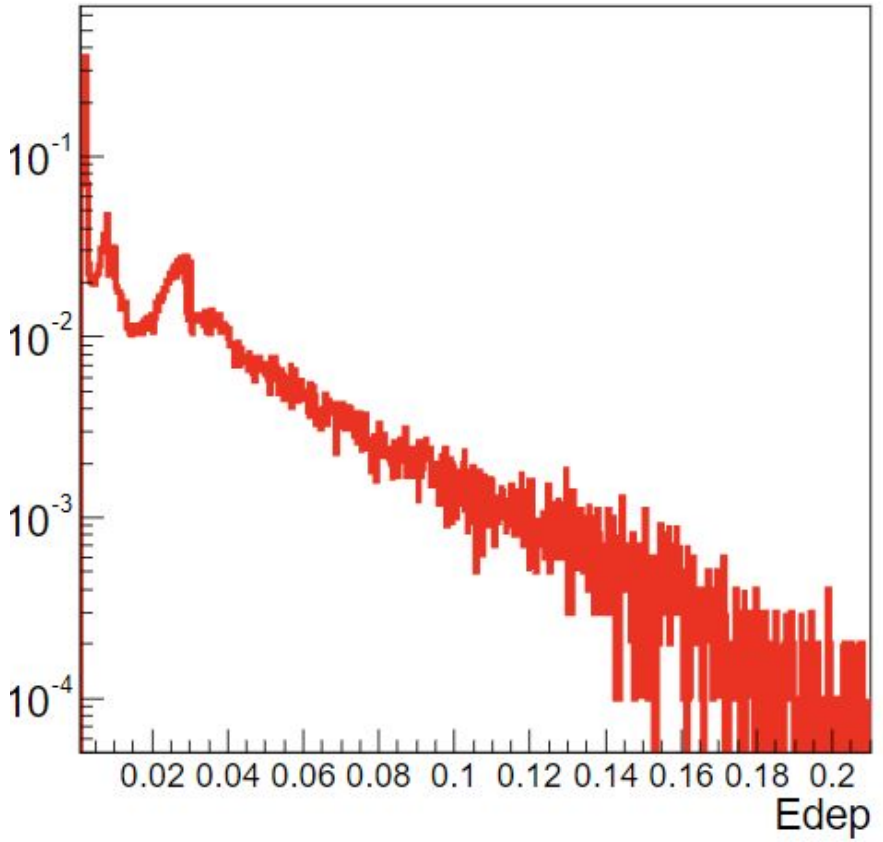
e- peak(s)



Zoom in spectrum

FIDUCIALIZED

Probability of having a certain deposited energy by an electron per decay



Which is not exactly LIME since 210Pb and 210Po are not in secular equilibrium!!!

In Deposited energy 2 peaks

- ≃8keV + ≃27keV