

Analysis of alpha event

2019/03/25
Jae Jin Choi

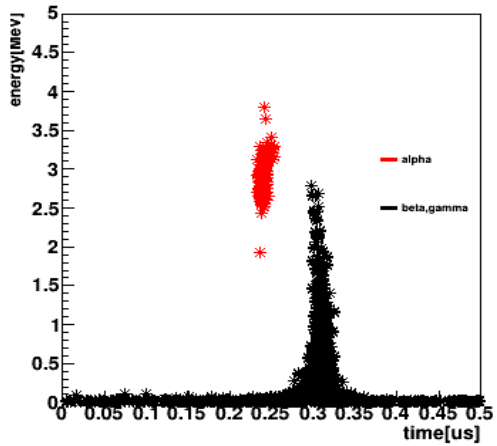


Motivation

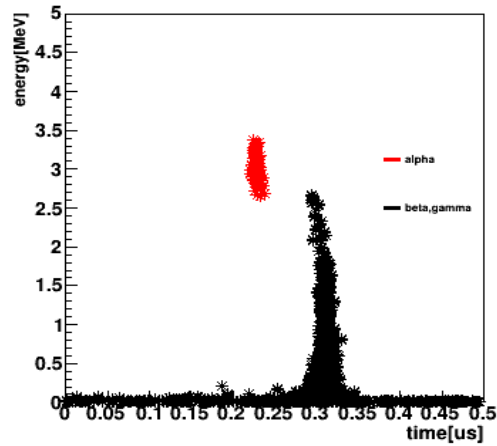
- To figure out quenching factor of alpha particles in NaI crystal
- To estimate contamination of U-238 and Th-232 in NaI crystal
- Where are dominant two peak alpha events from?
 - One peak could be Pb-210 decay, what is the other?

Alpha Monitoring

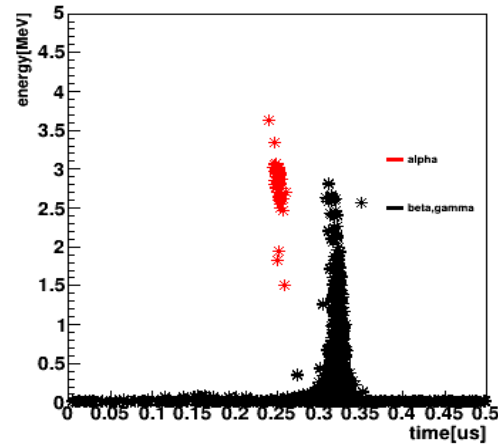
crystal1 alpha cut



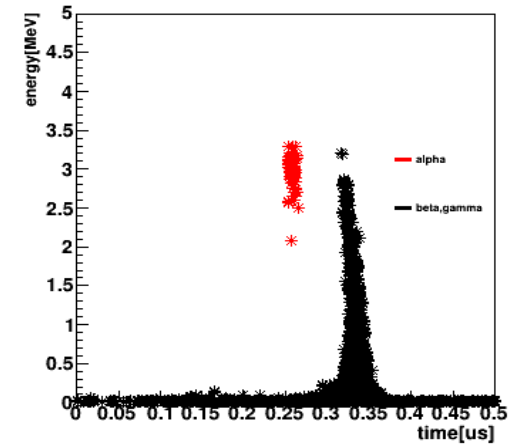
crystal2 alpha cut



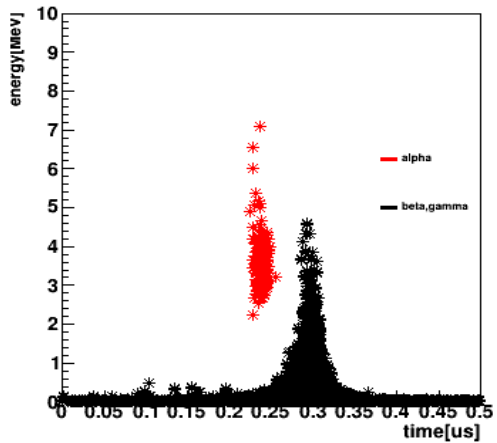
crystal3 alpha cut



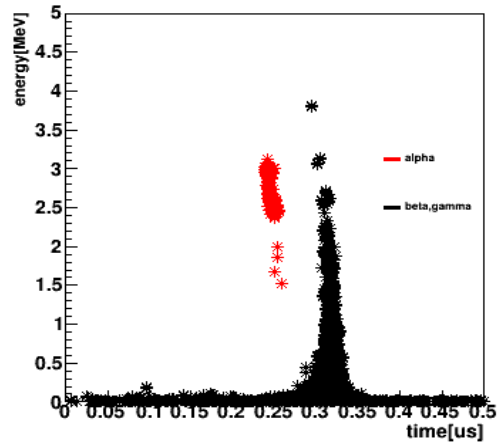
crystal4 alpha cut



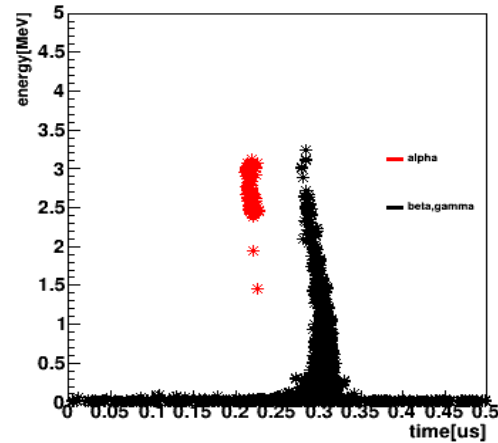
crystal5 alpha cut



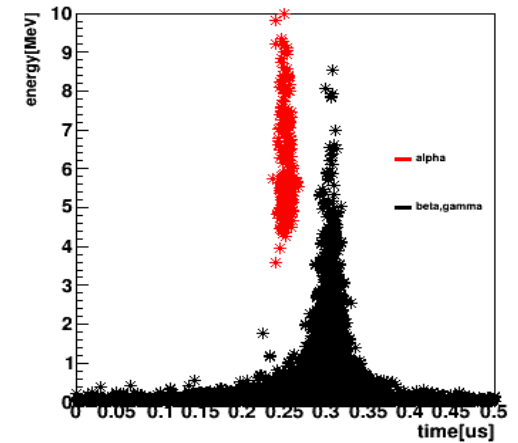
crystal6 alpha cut



crystal7 alpha cut

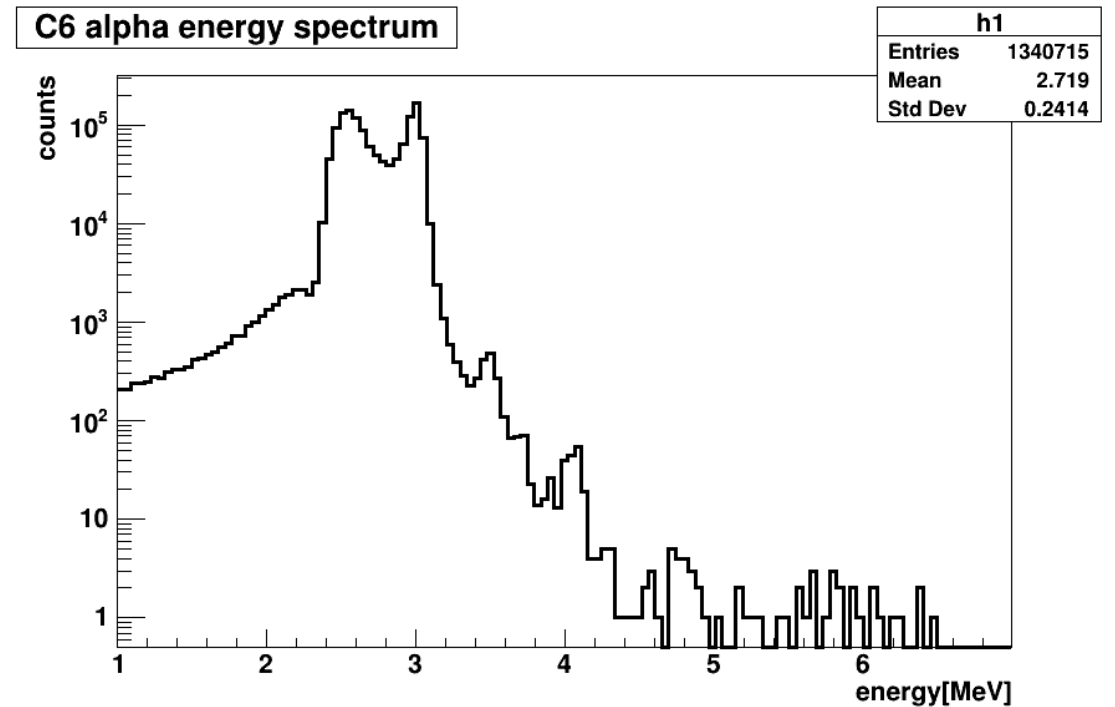
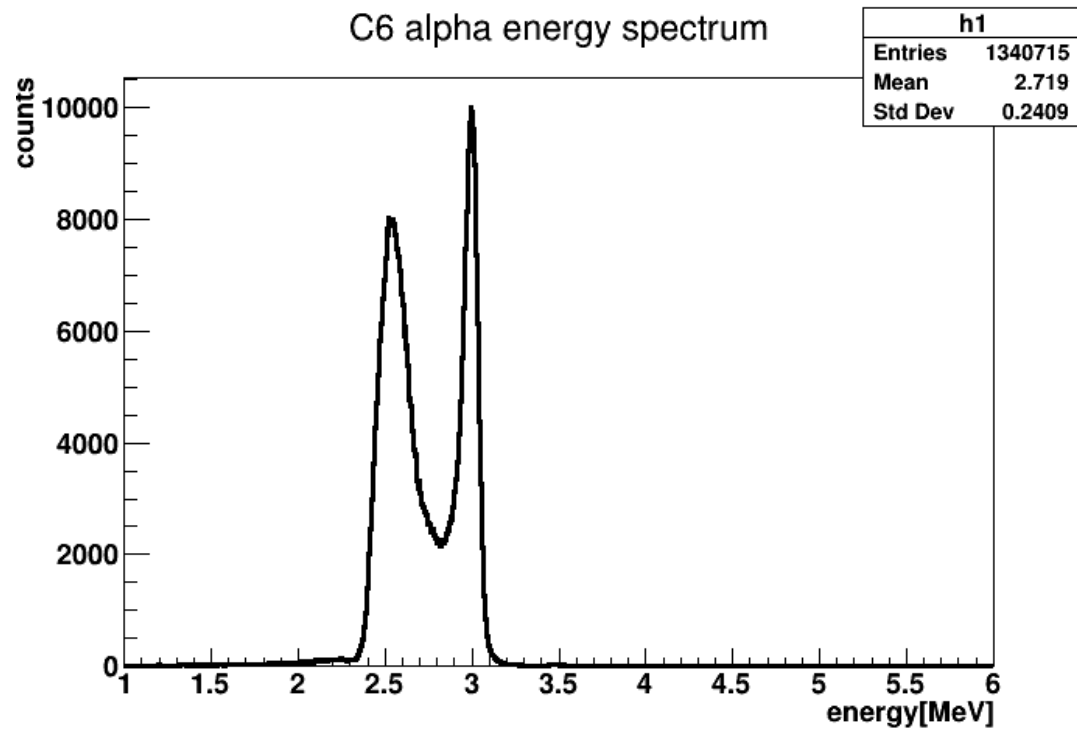


crystal8 alpha cut



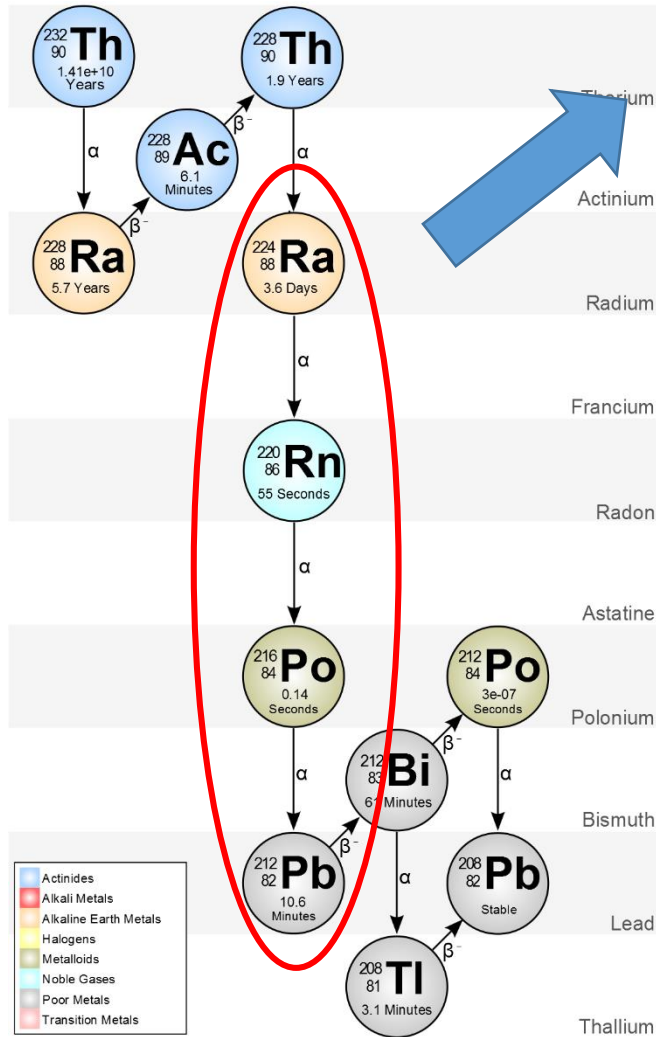
Meantime vs energyD

Alpha Analysis(C6)



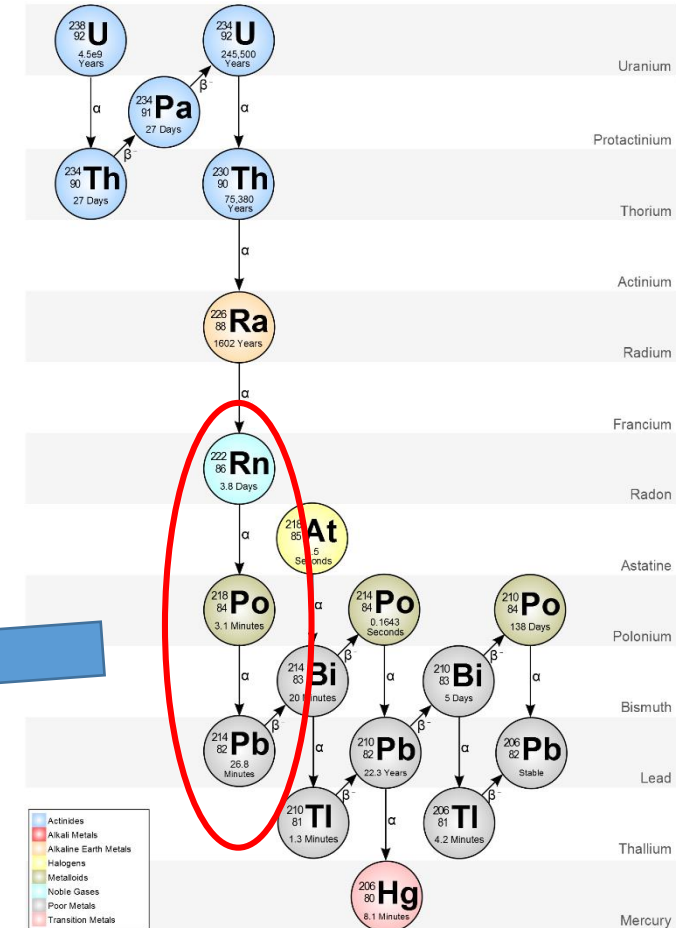
Crystal 6 alpha energy spectrum for 2 years

Alpha-alpha coincidence

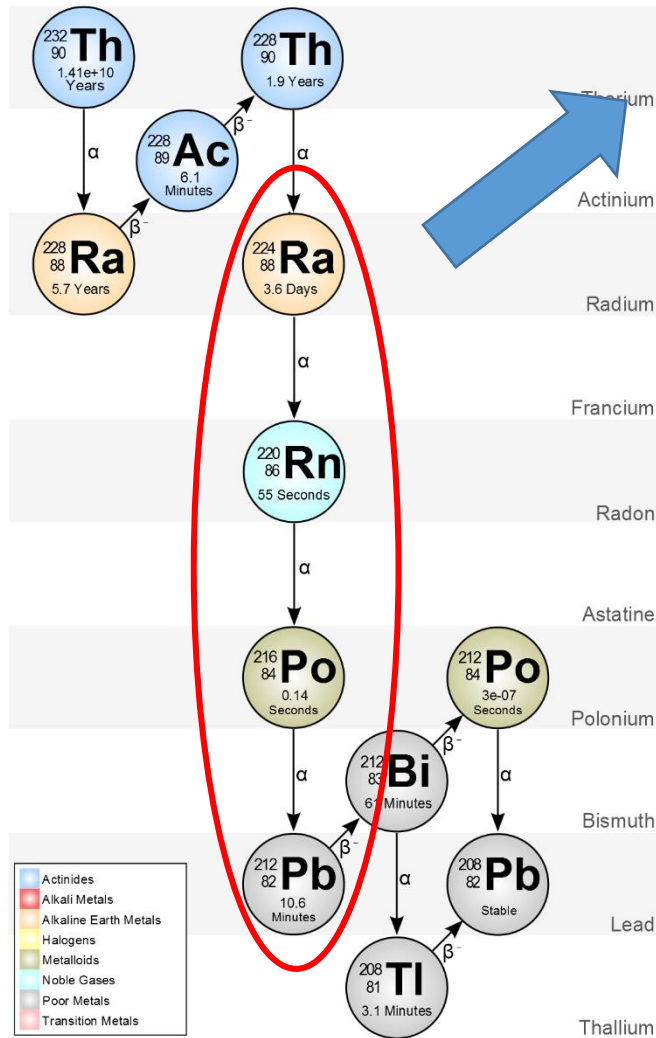


- Ra-224 : 3.66d , 5.789MeV
- Rn-220 : 55.6s , 6.405MeV
- Po-216 : 0.145s , 6.906MeV

- Rn-222 : 3.82d , 5.590MeV
- Po-218 : 3.1m, 6.115MeV

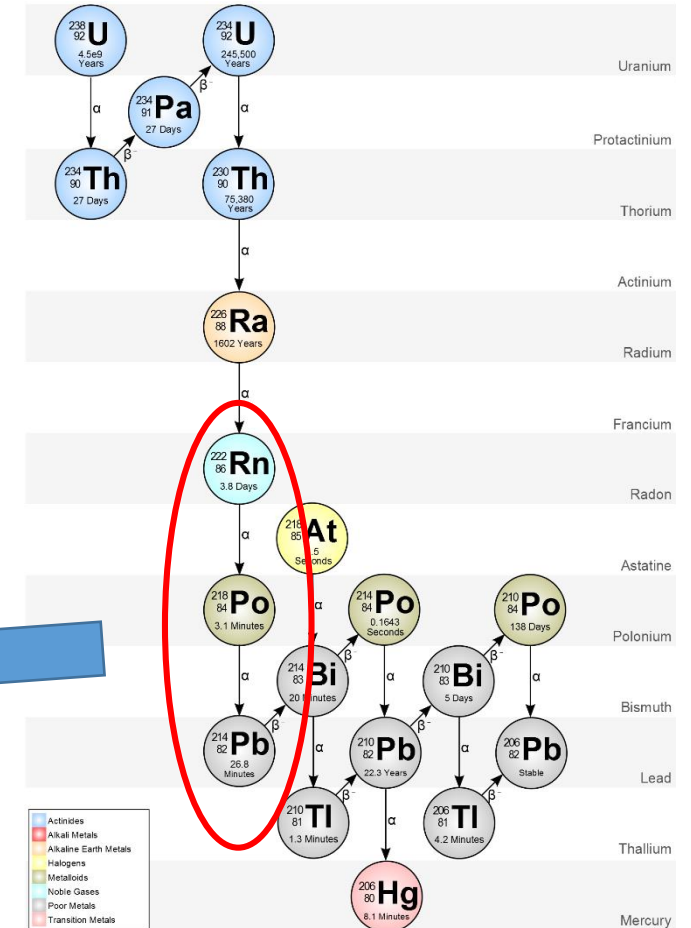


Alpha-alpha coincidence



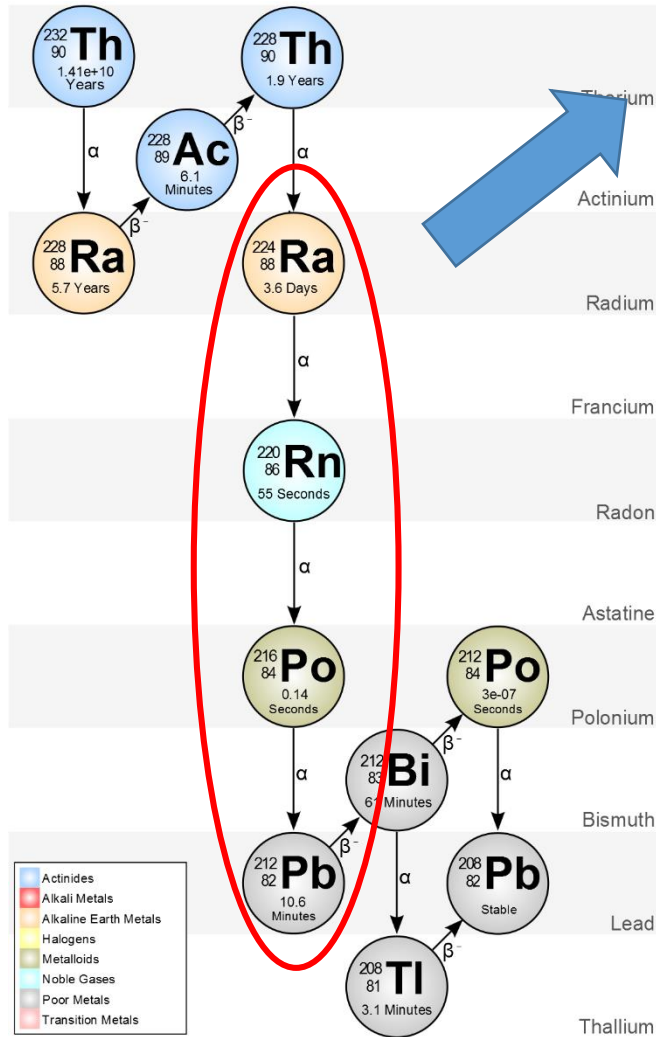
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difficult to select these alpha-alpha coincidence
(Po-210 decay time: ~1evt/min)

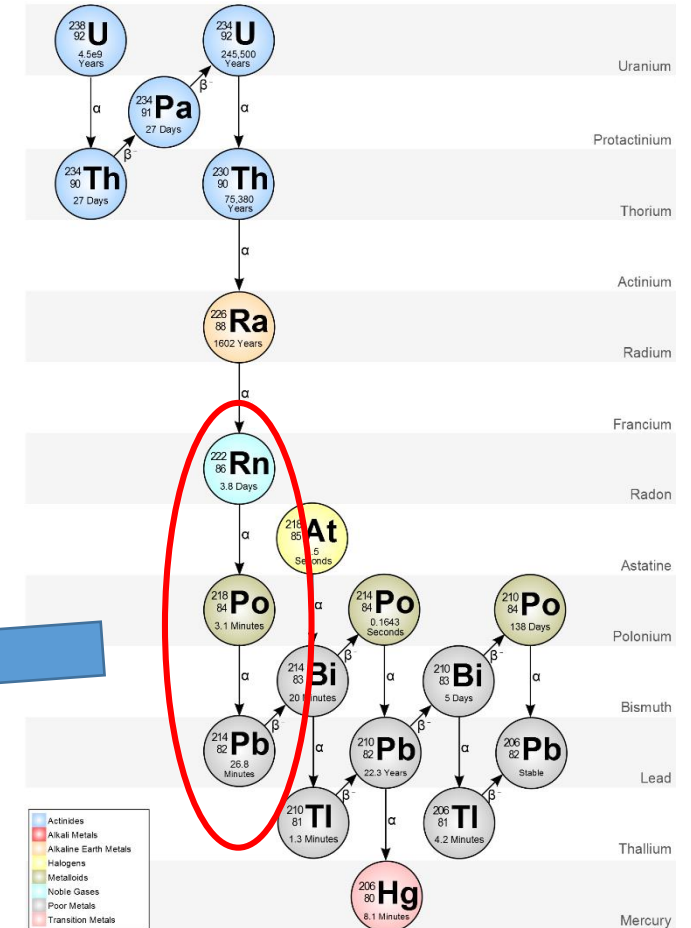
Alpha-alpha coincidence



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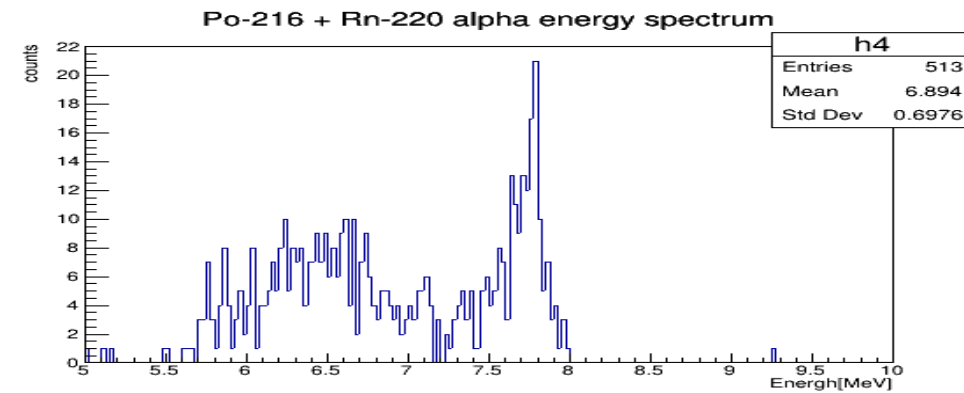
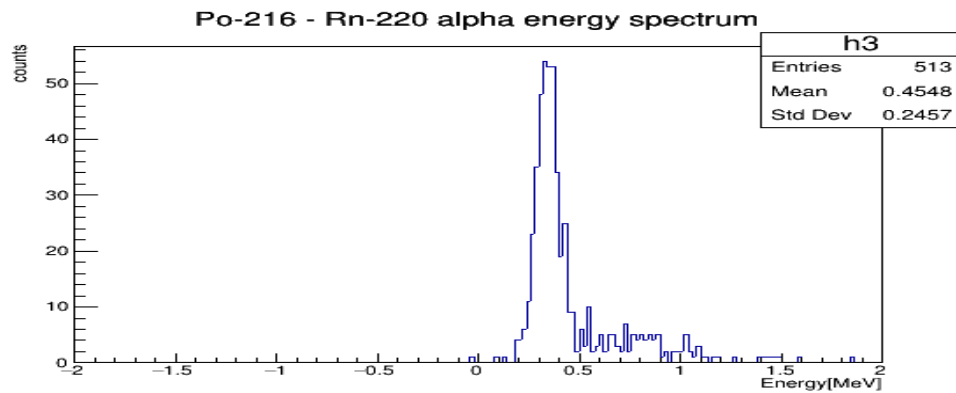
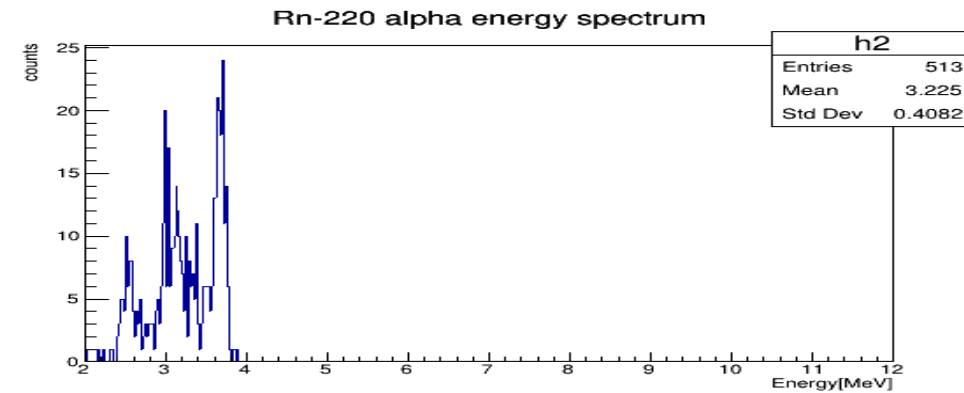
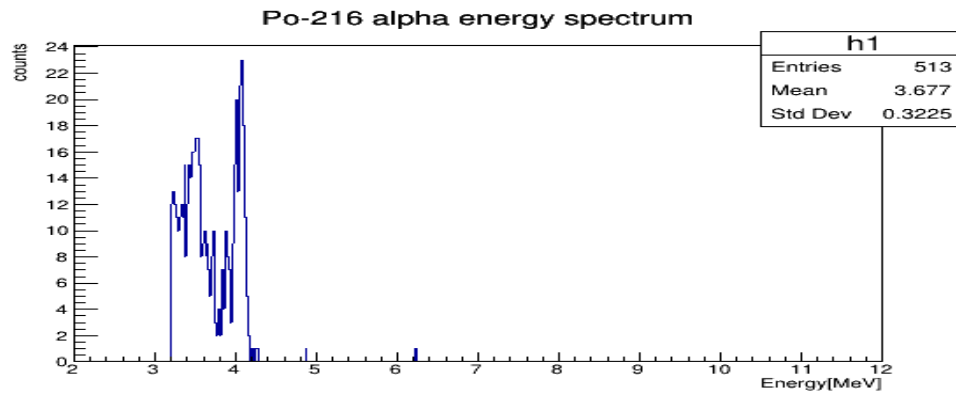
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Alpha-alpha coincidence

alpha-alpha Coincidence

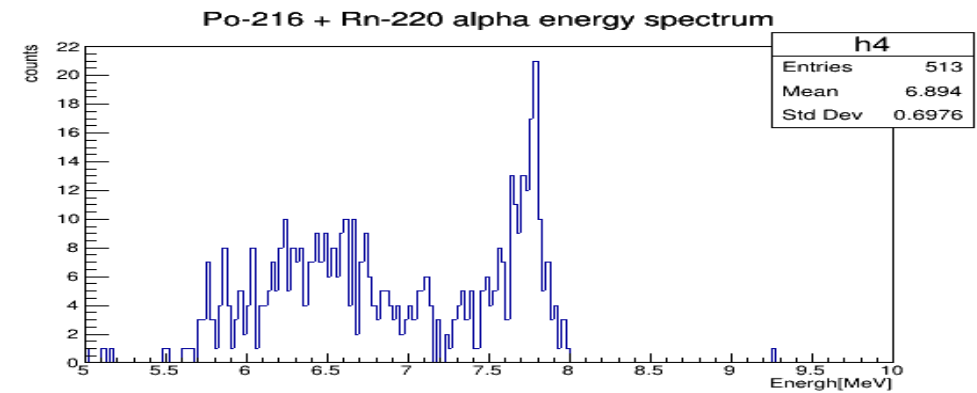
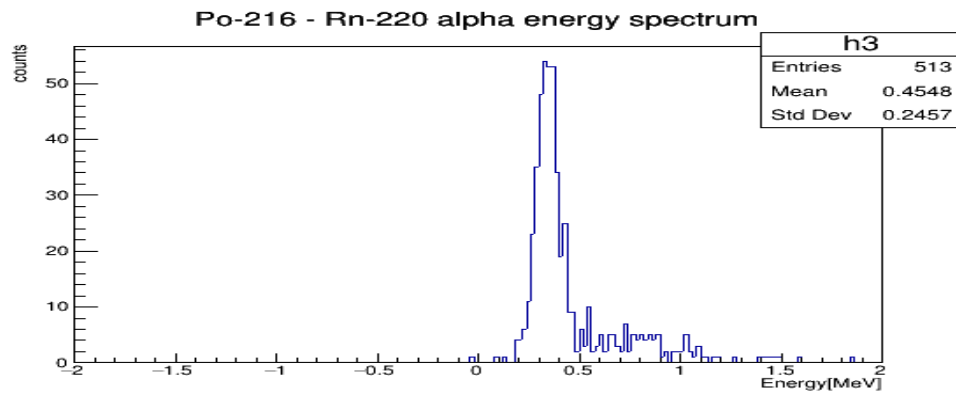
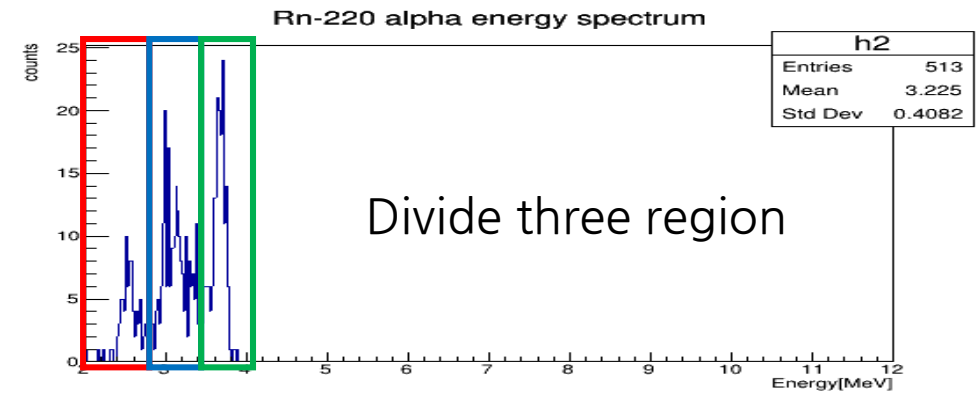
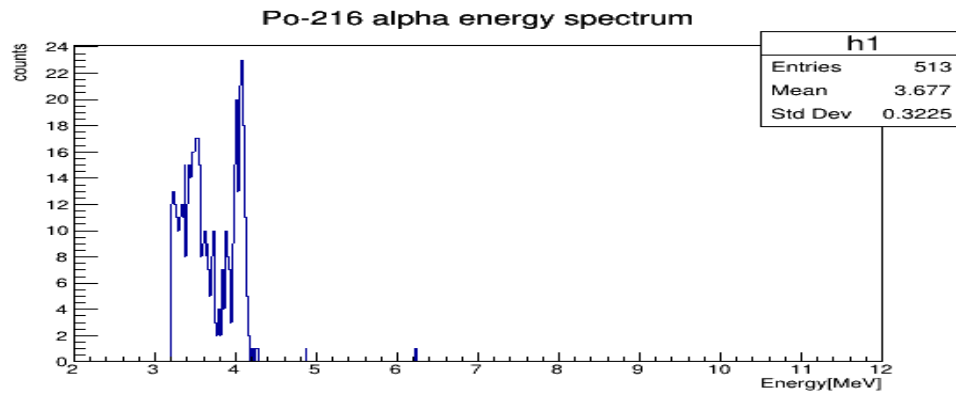
- Rn-220 $\rightarrow$ Po-216
- Condition : $dT < 2$ sec, after alpha deposited energy($energyDA$) > 3.3 MeV



Alpha-alpha coincidence

alpha-alpha Coincidence

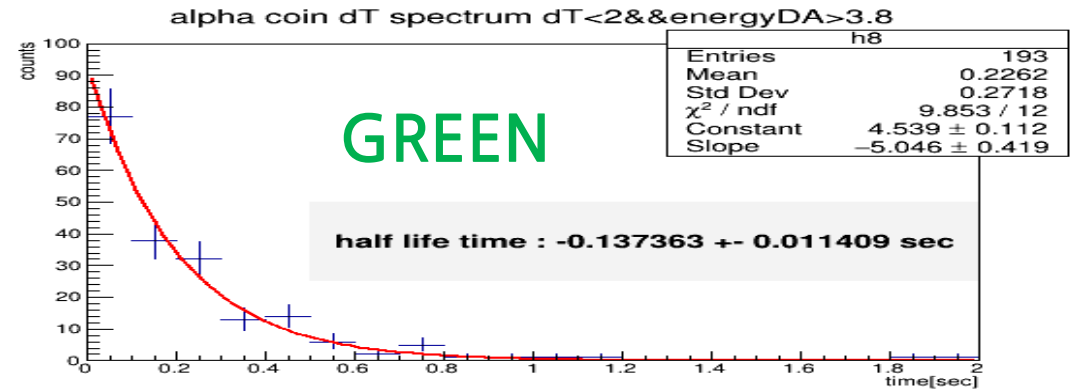
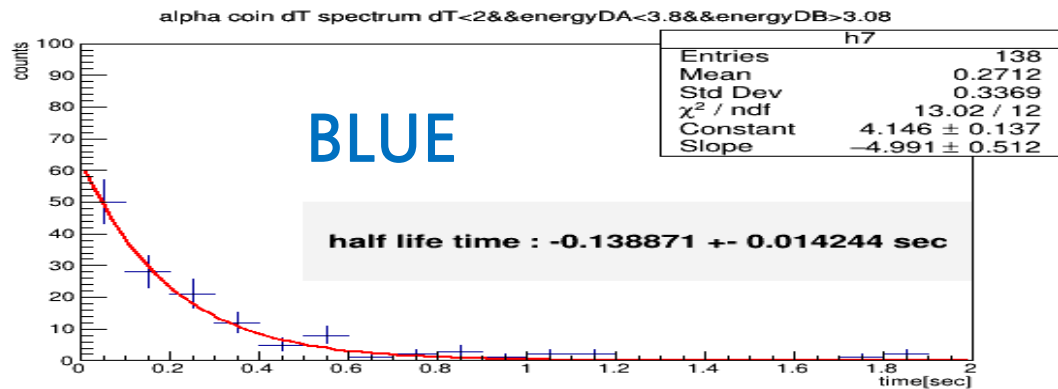
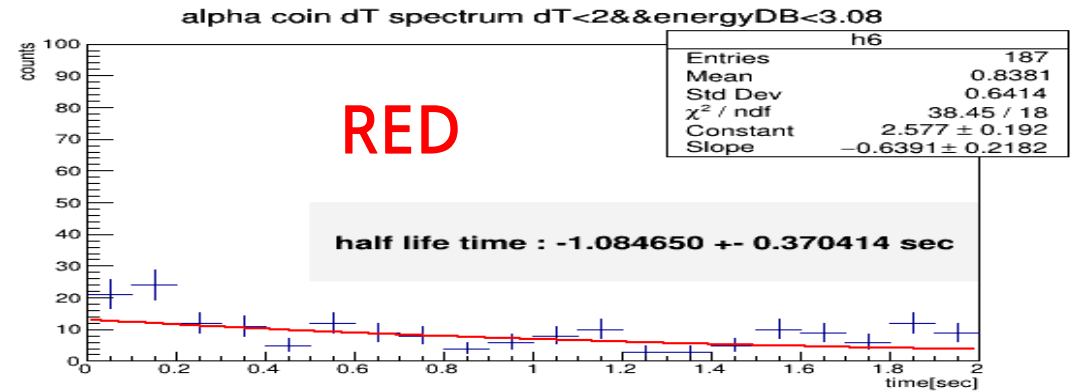
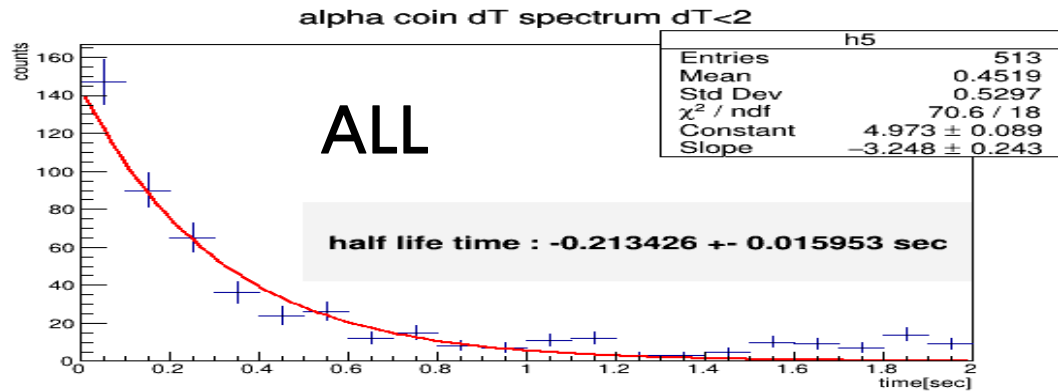
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Alpha-alpha coincidence dT spectrum

alpha-alpha dT spectrum

- Red region : Po-210 events(background)
- Blue & green : alpha-alpha coincidence (two peak like Po-210 events)

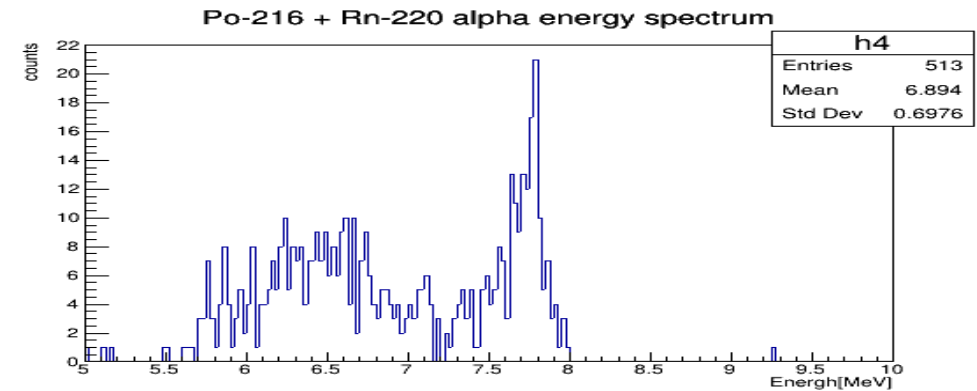
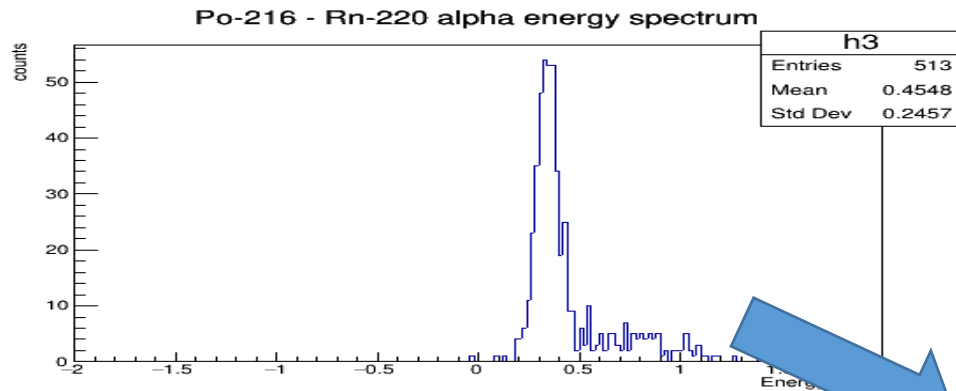
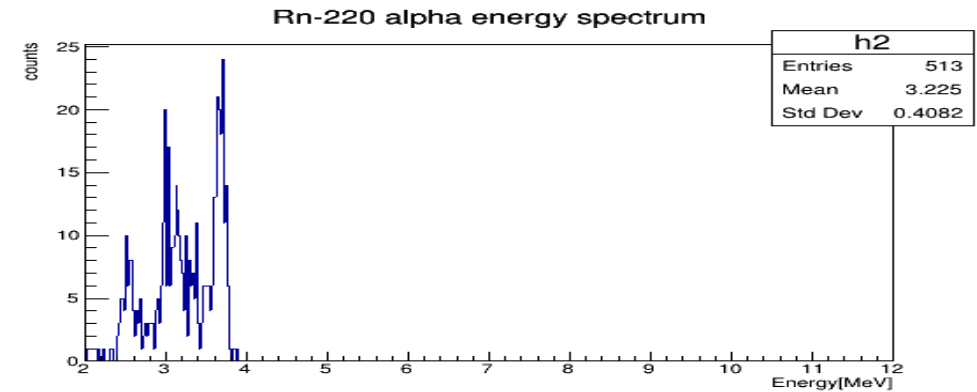
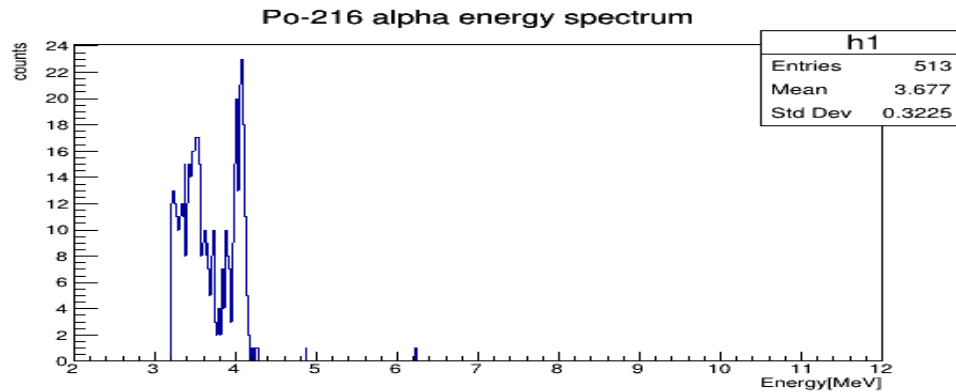


Half life time of Po-216 : 0.145 sec

Alpha-alpha coincidence

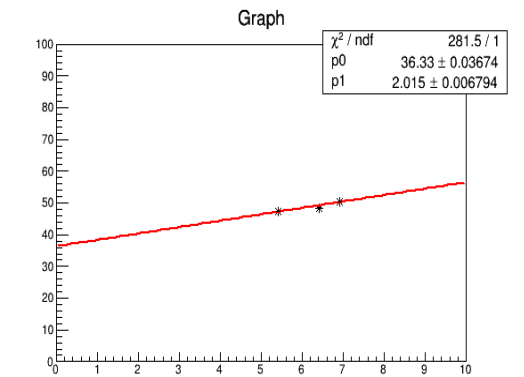
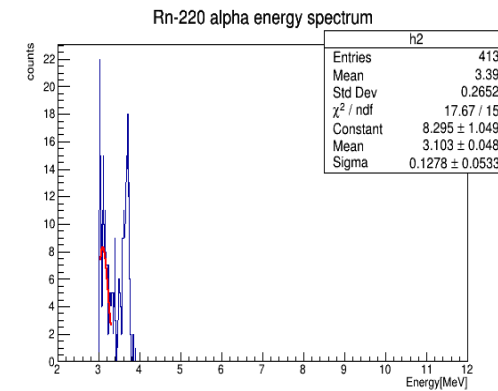
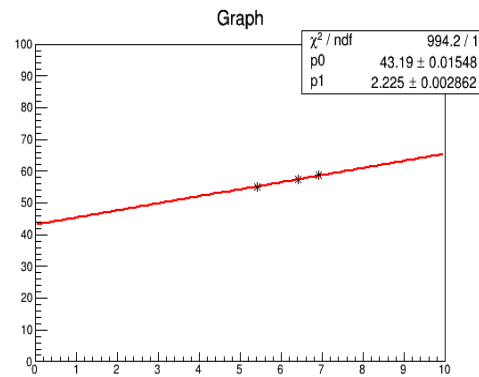
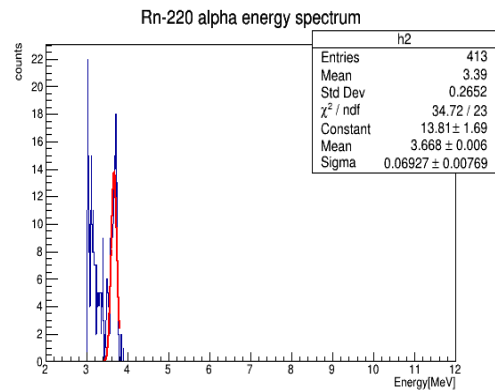
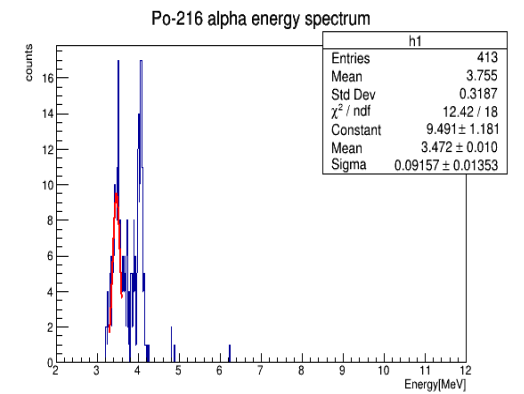
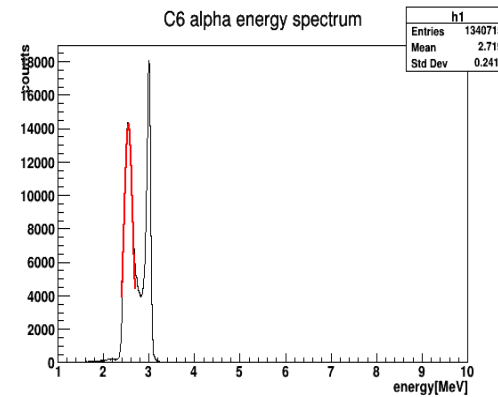
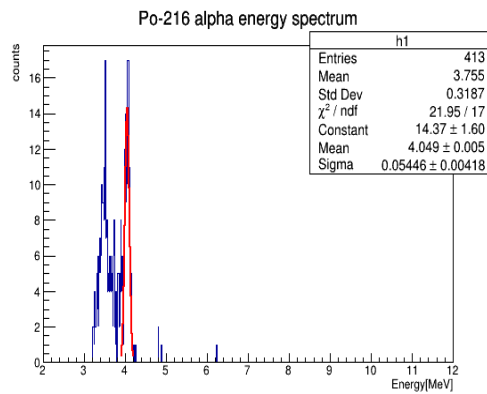
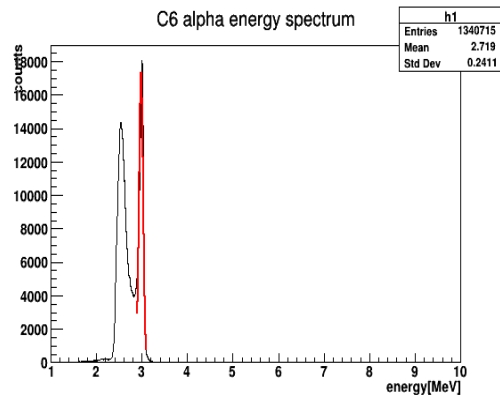
alpha-alpha Coincidence

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Might be not channeling issue

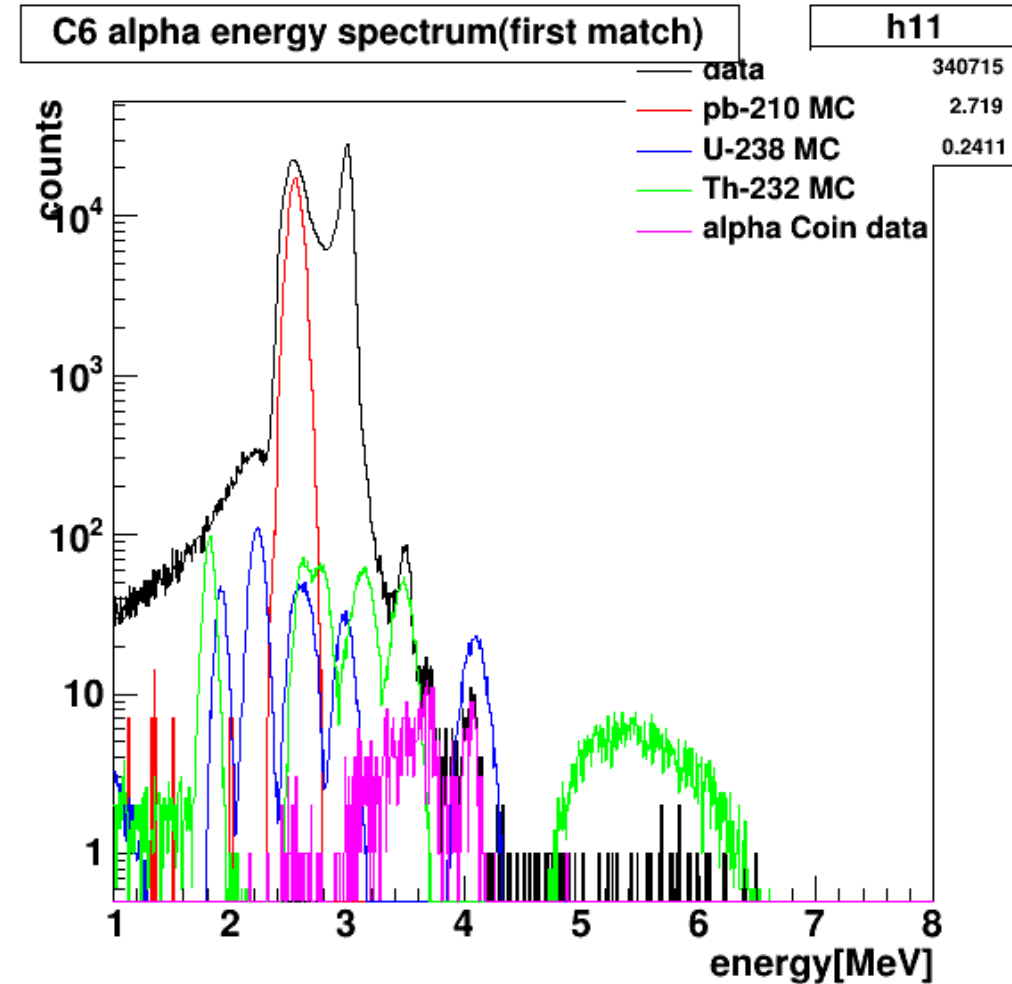
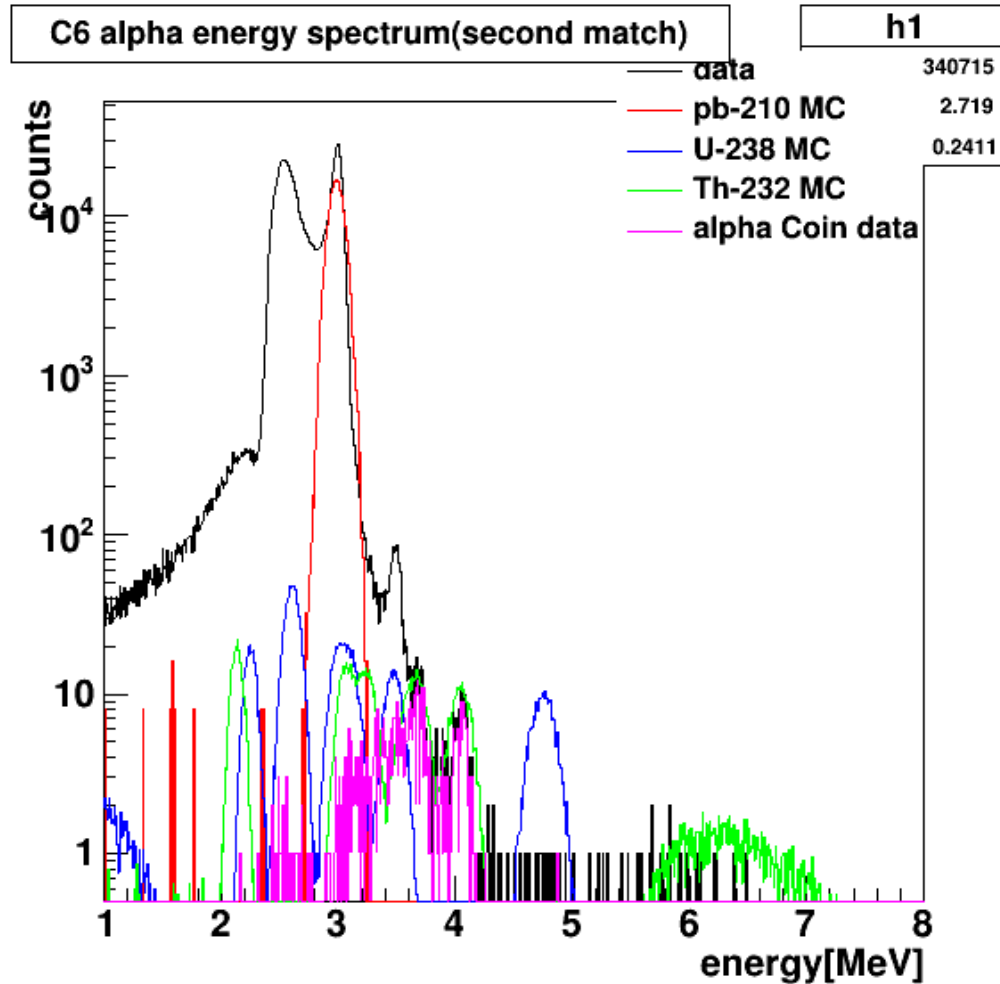
Alpha quenching factor



Second peak matched

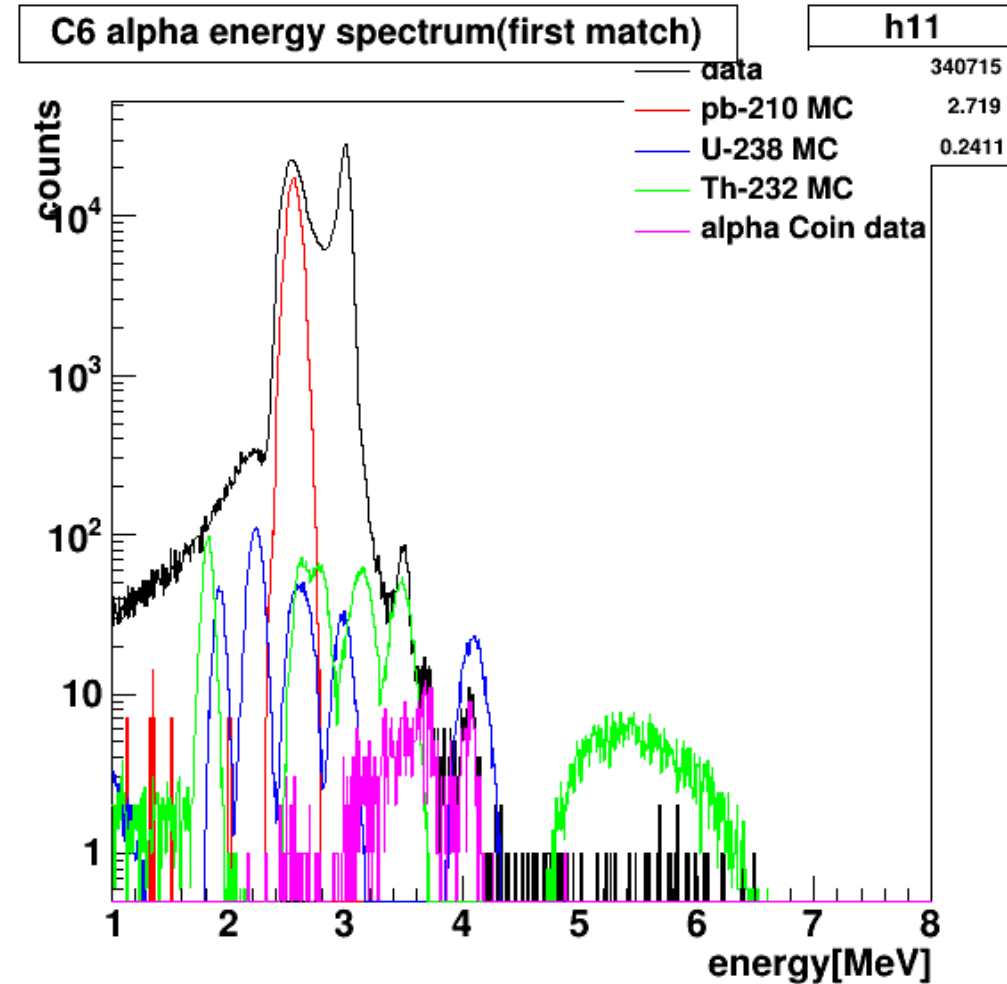
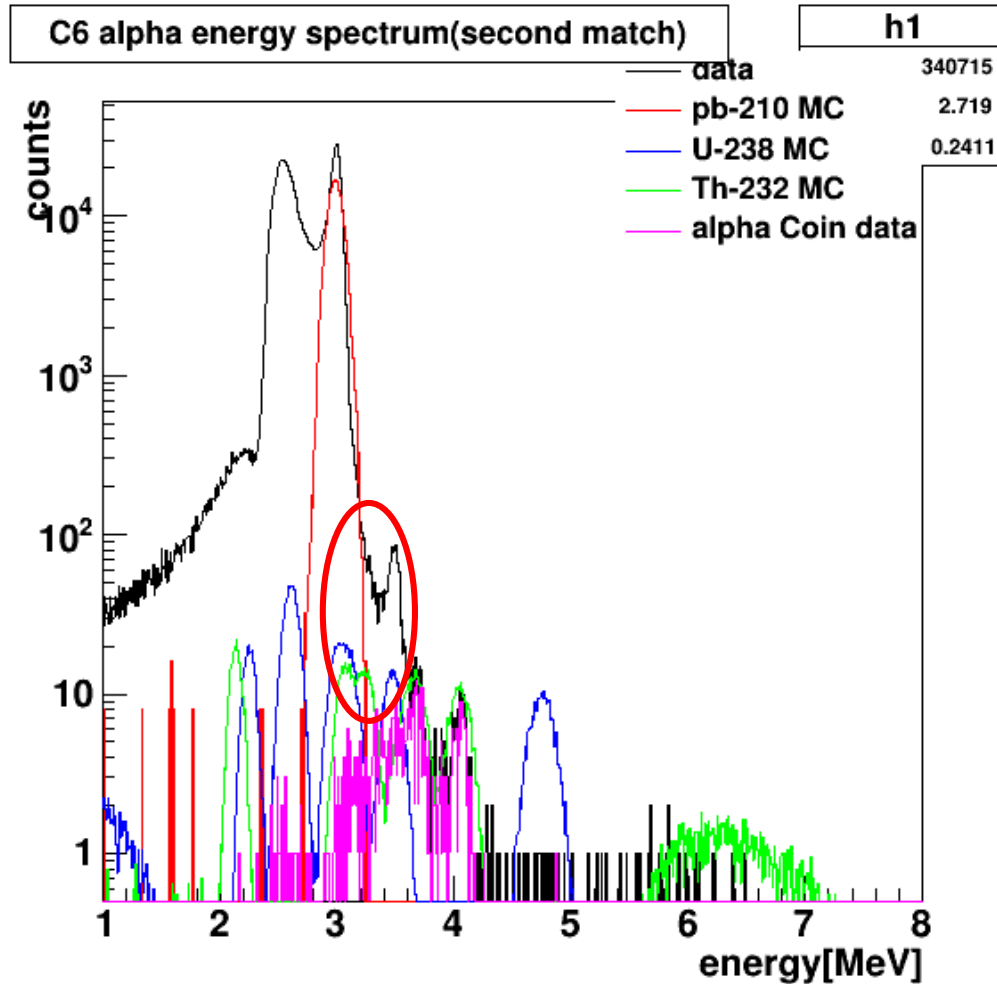
First peak matched

Alpha energy spectrum with MC



Pink line from Rn-220 and Po-216 decay

Alpha energy spectrum with MC



Need to study this peak

Summary

- There are other two peak from alpha-alpha coincidence events(Po-216&Rn-210)
- Get alpha quenching factor using Po-210,Po-216,Rn-210(both two peak)
- Need to figure out around 3.4 MeV peak
- Channeling might be not true, but two peak problem is still existed
 - position dependence?

Backup

Alpha Analysis(C6)

