The Abdus Salam
International Centre for Theoretical Physics

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IAEA
International Atomic Energy Agency

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Workshop on Understanding and Evaluating Radioanalytical Measurement Uncertainty

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Alpha Spectrometry: Exercise 1

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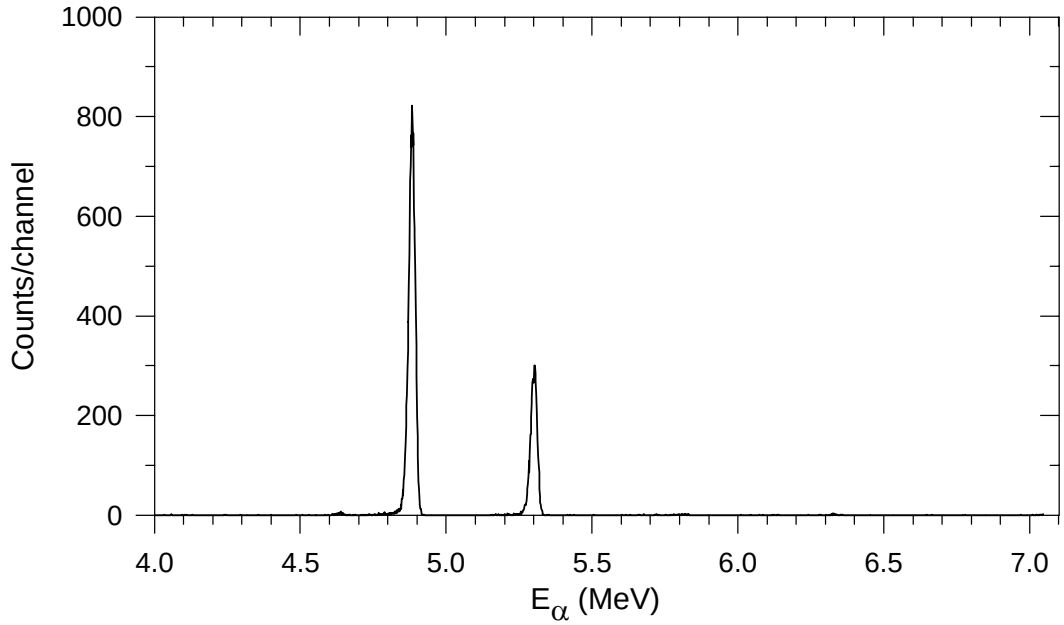
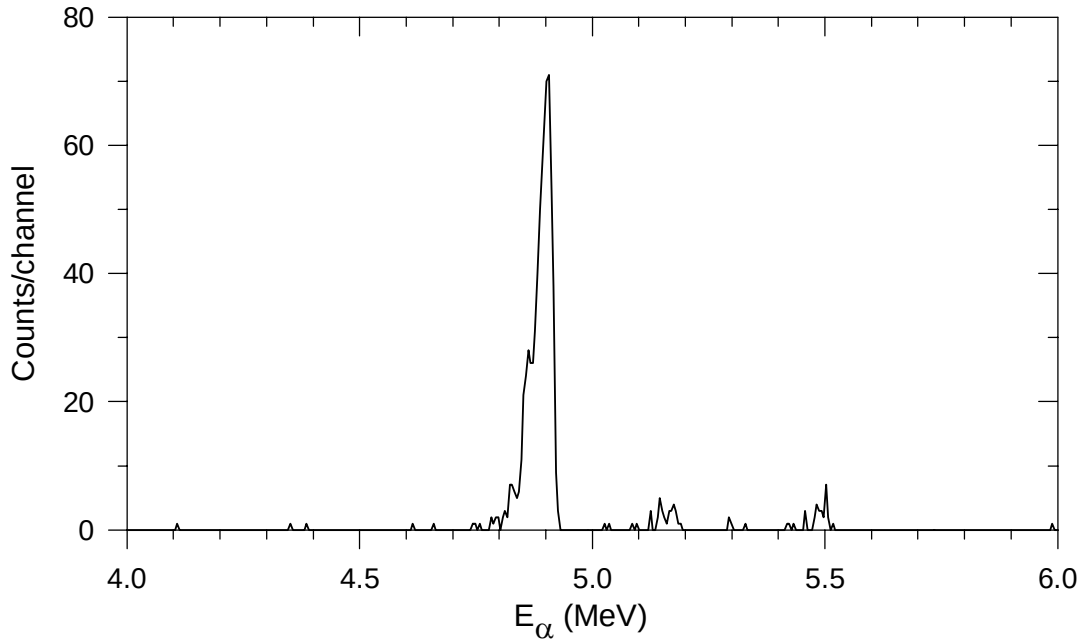
Alpha Spectrometry: Exercise 1

Task: Identify as many peaks as you can in these spectra

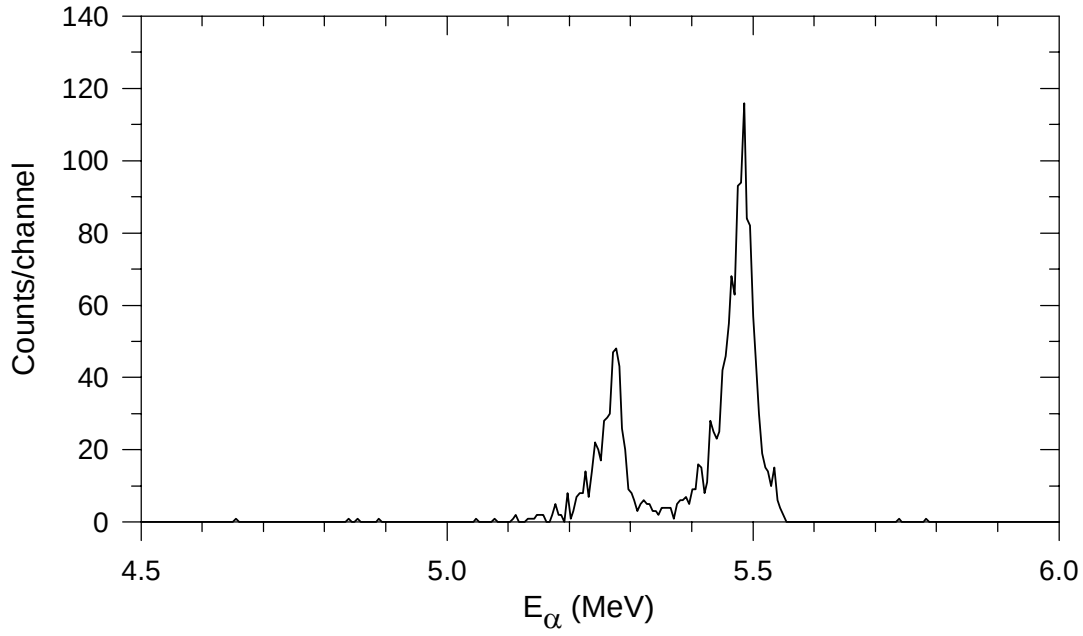
Spectrum 1: Polonium (Tracer: ^{209}Po)



Spectrum 2: Plutonium (Tracer: ^{242}Pu)



Spectrum 3: Americium (Tracer: ^{243}Am)



Decay data for ^{243}Am

(From NuDat2.4 database http://www.nndc.bnl.gov/nudat2/)

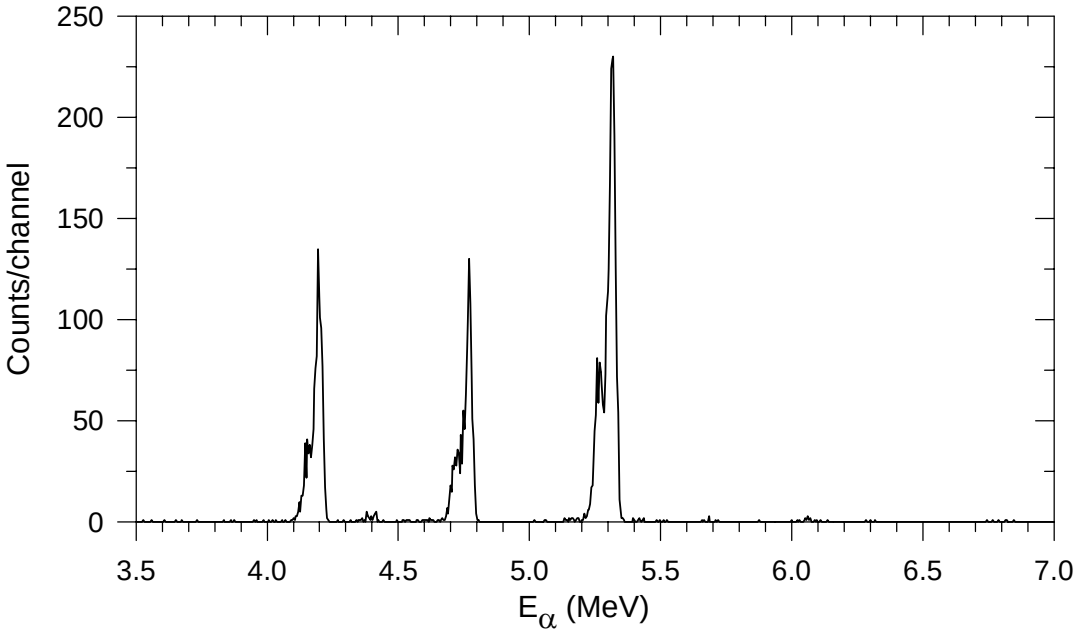
Halflife: 7370 ± 15 years

Main alpha energies:

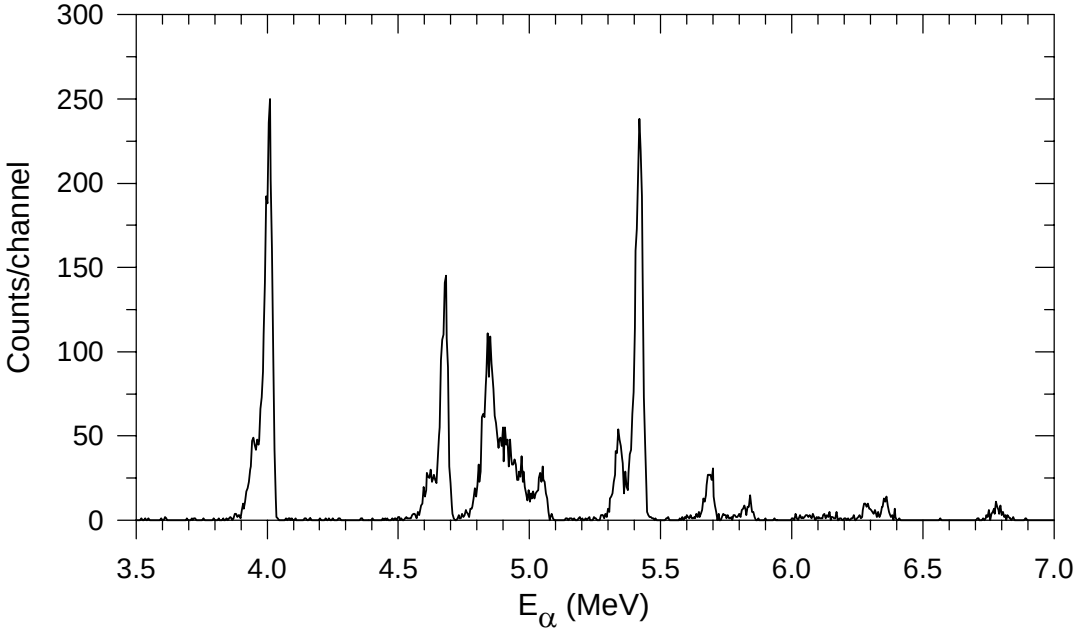
Alpha energy (MeV)	Intensity (%)
5.349	0.16
5.321	0.16
5.275	87.1
5.233	11.2
5.181	1.36
5.113	0.008

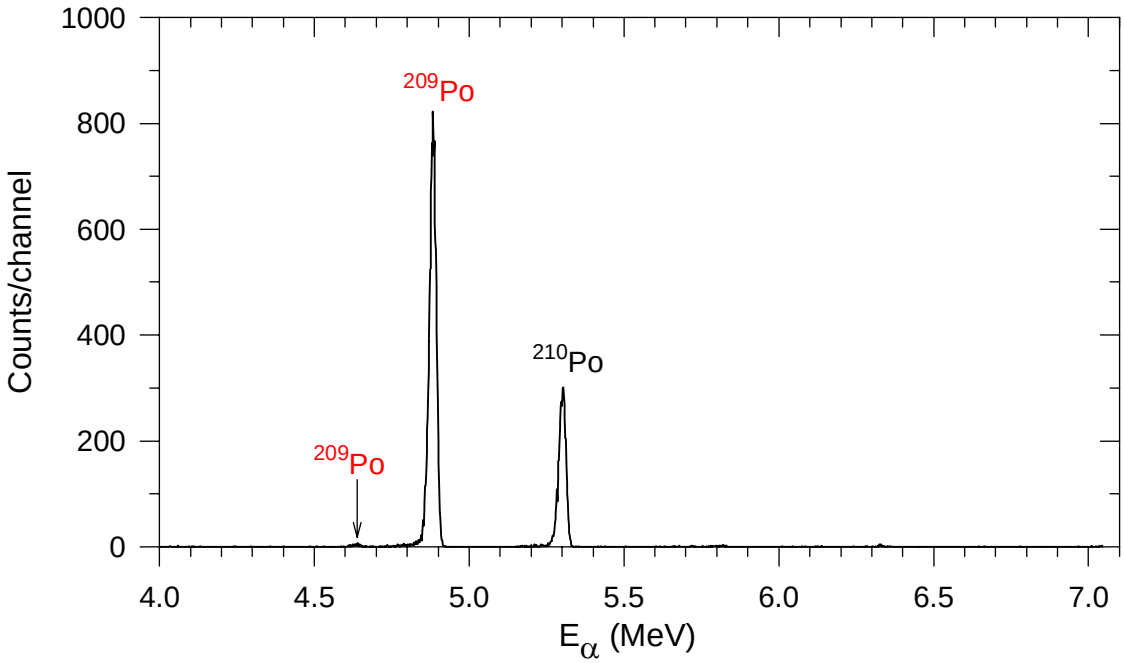
Daughter: ^{239}Np, halflife 2.356 days. ^{239}Np decays by beta decay to ^{239}Pu.

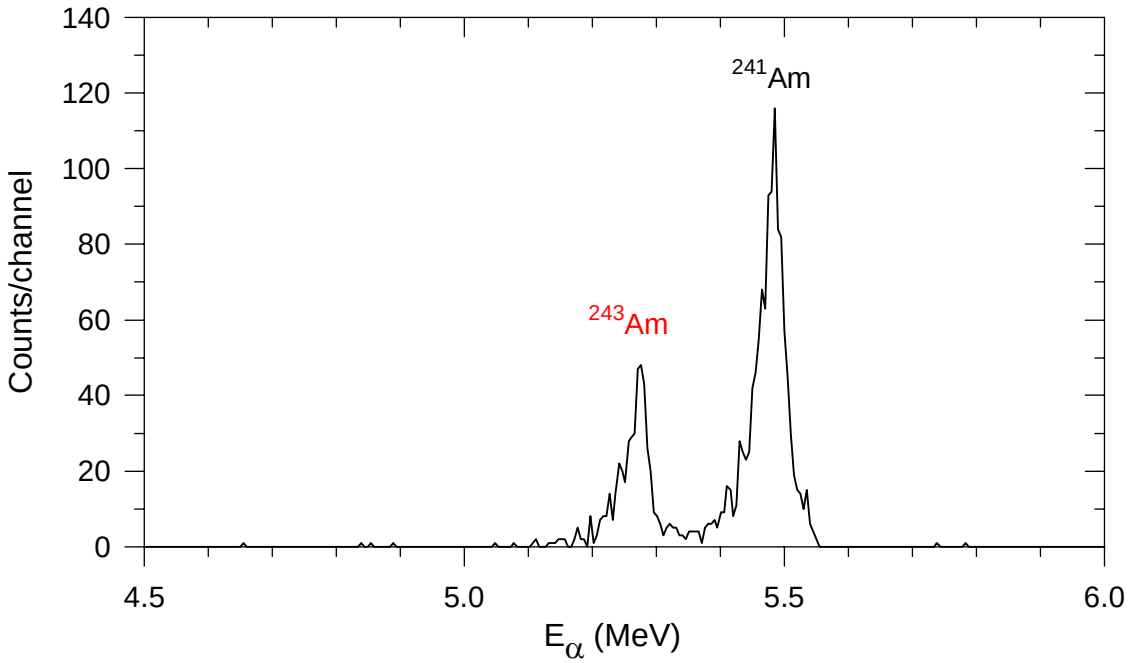
Spectrum 4: Uranium (Tracer: ^{232}U)

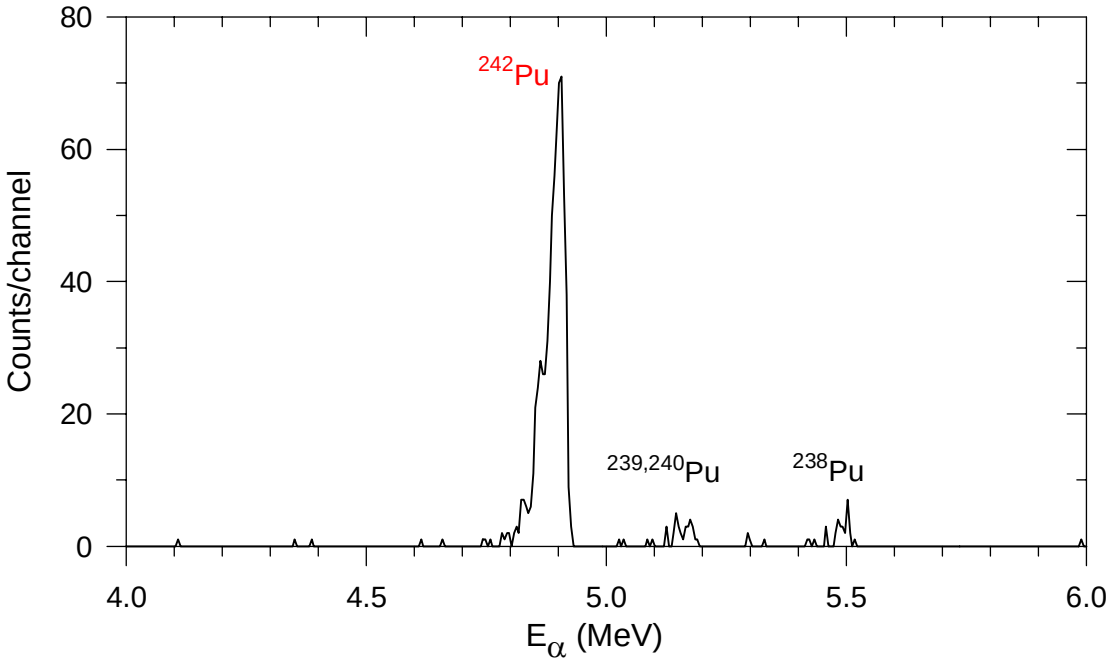


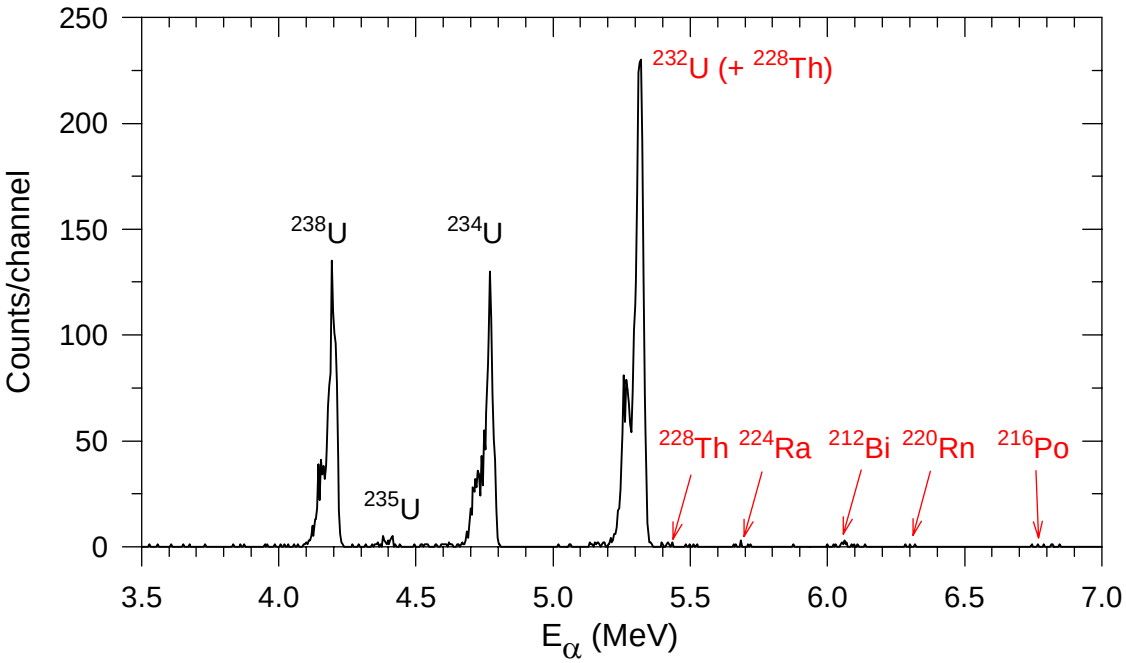
Spectrum 5: Thorium (Tracer: ^{229}Th)

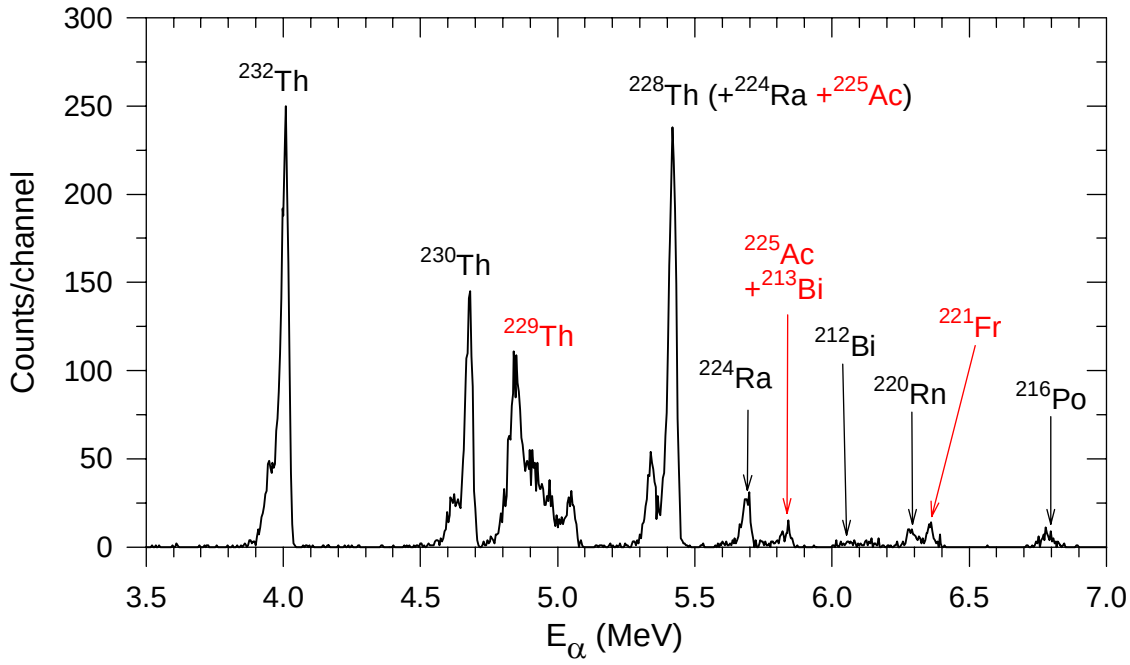



1000
800
600
400
200
0
Counts/channel
209Po
210Po
209Po
4.0
4.5
5.0
5.5
6.0
6.5
7.0
Eα (MeV)


140
120
100
80
60
40
20
0
Counts/channel
241Am
243Am
4.5
5.0
5.5
6.0
Eα (MeV)


80
60
40
20
0
Counts/channel
242Pu
239,240Pu
238Pu
4.0
4.5
5.0
5.5
6.0
Eα (MeV)


Counts/channel
250
200
150
100
50
0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
Eα (MeV)
238U
235U
234U
232U (+ 228Th)
228Th
224Ra
212Bi
220Rn
216Po


Counts/channel
300
250
200
150
100
50
0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
E_α (MeV)
^{232}Th
^{230}Th
^{229}Th
^{228}Th (+^{224}Ra +^{225}Ac)
^{225}Ac
+^{213}Bi
^{224}Ra
^{212}Bi
^{220}Rn
^{221}Fr
^{216}Po