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Team Members: Emily Kruckeberg

Jack Derby

Mary Purvis

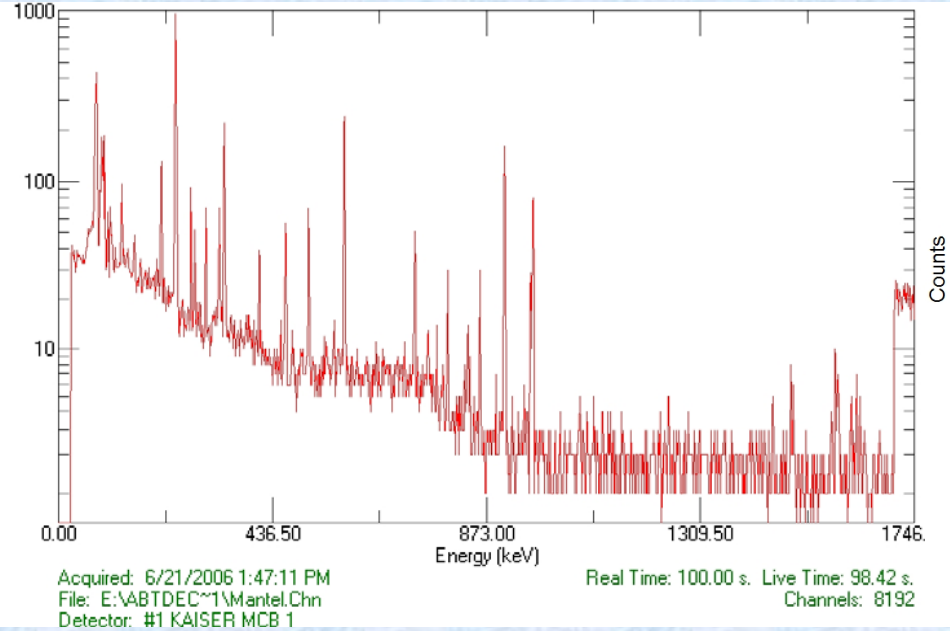
Spiritual & Academic Leaders:

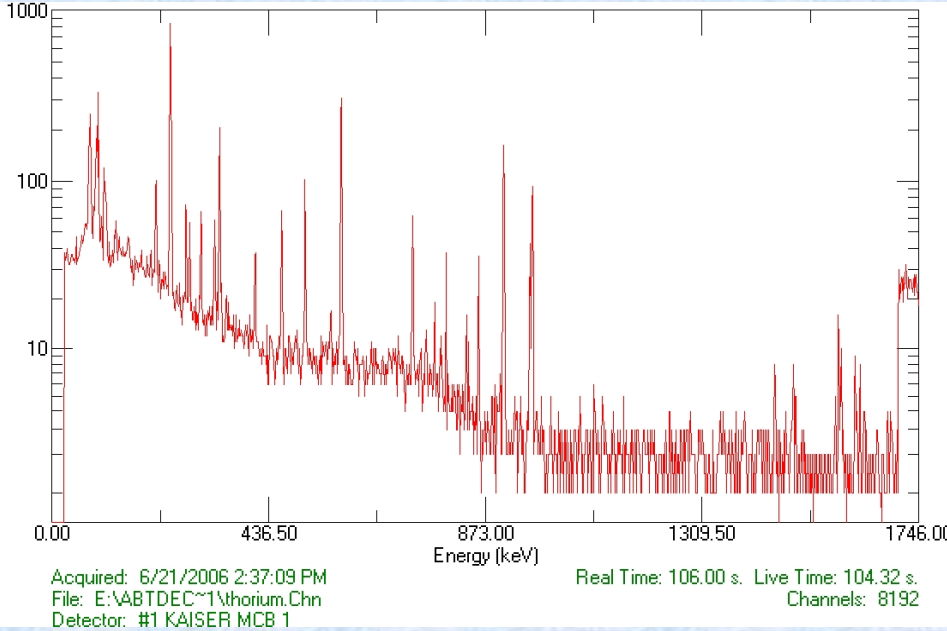
Mr. Blombach

Mr. Derby

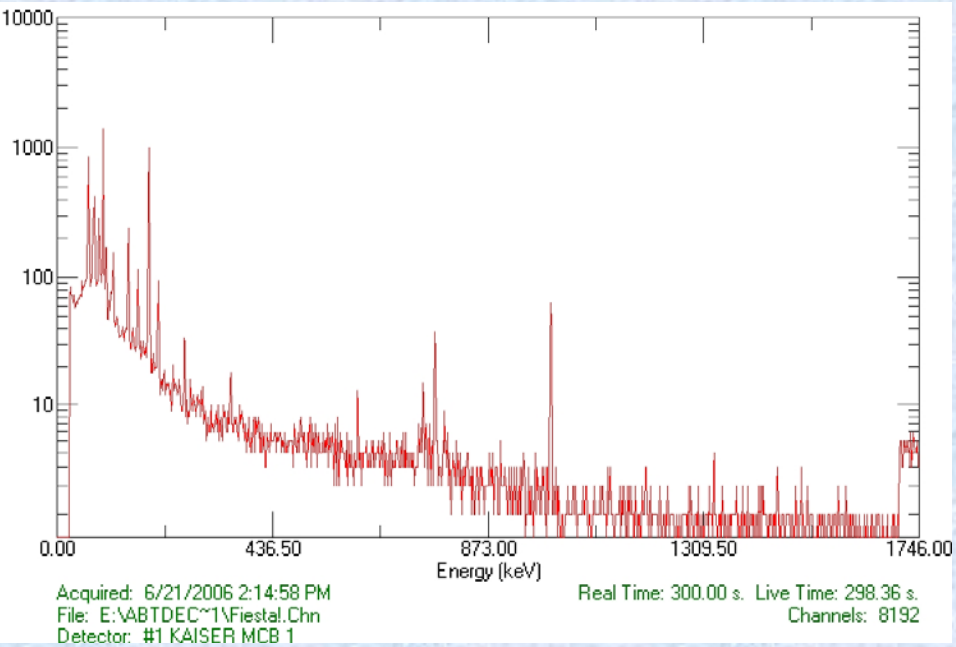
Measuring Natural Radioactivity

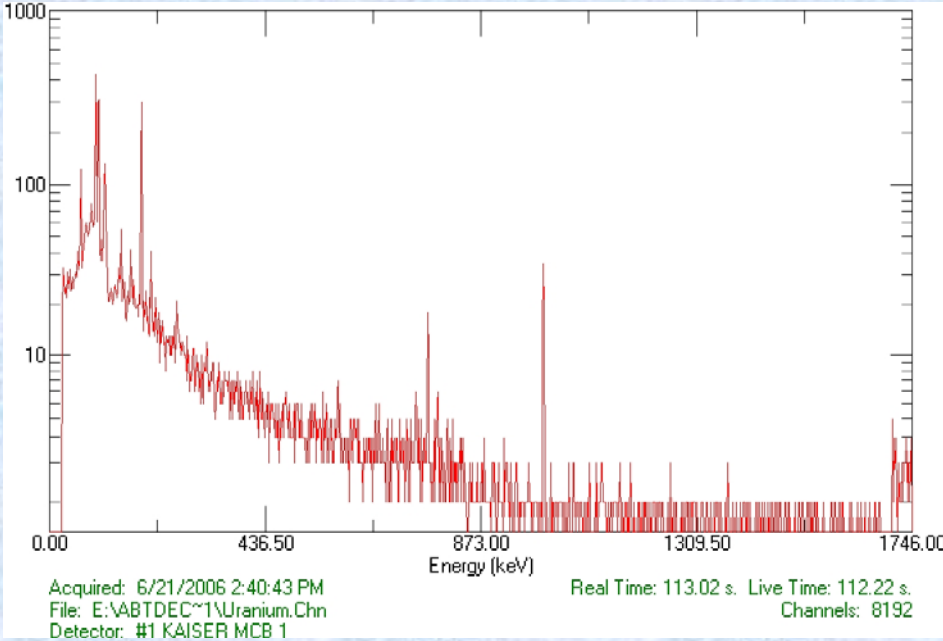
Mantel vs. Thorium



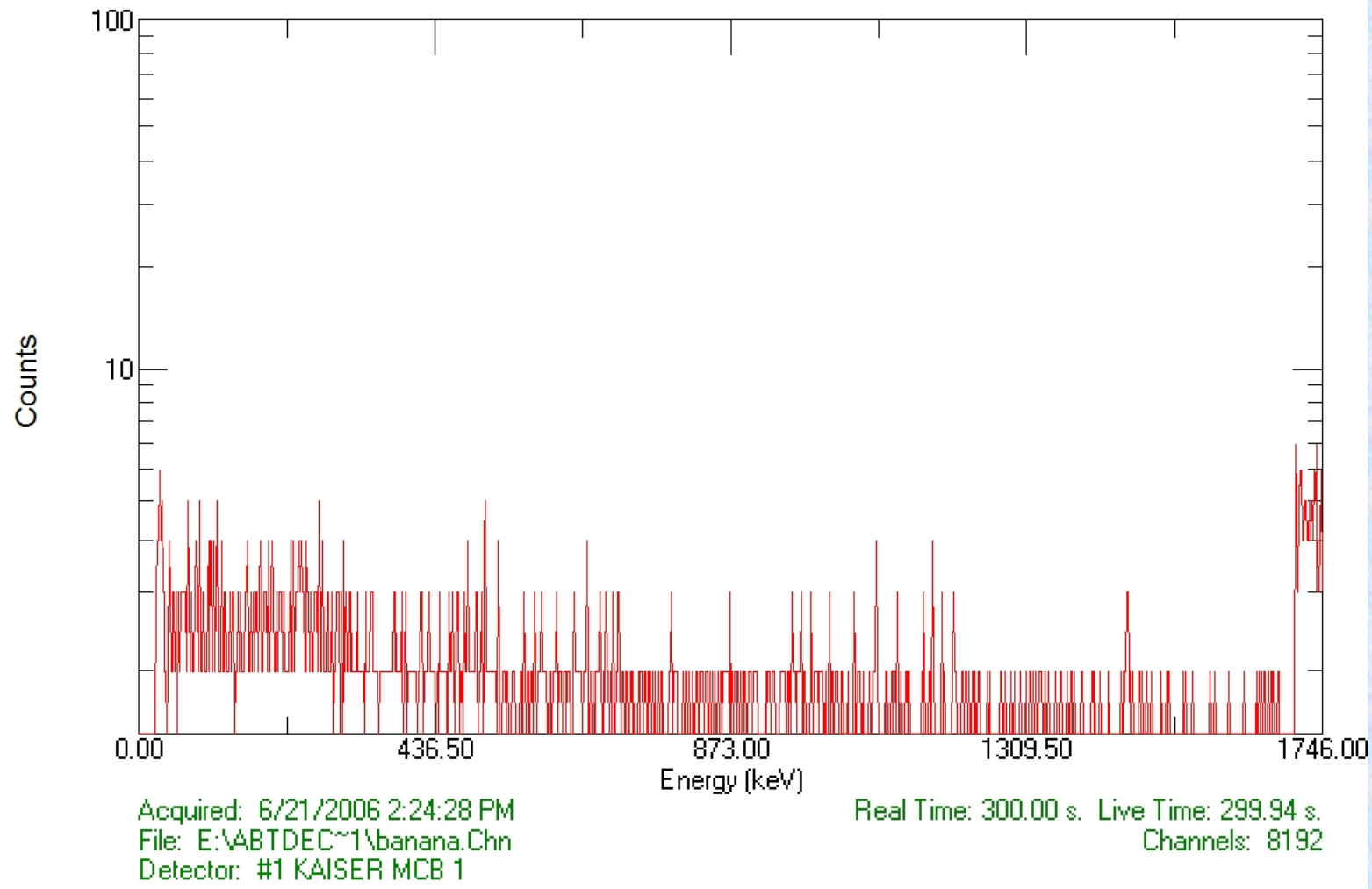


Fiesta Ware vs. Uranium

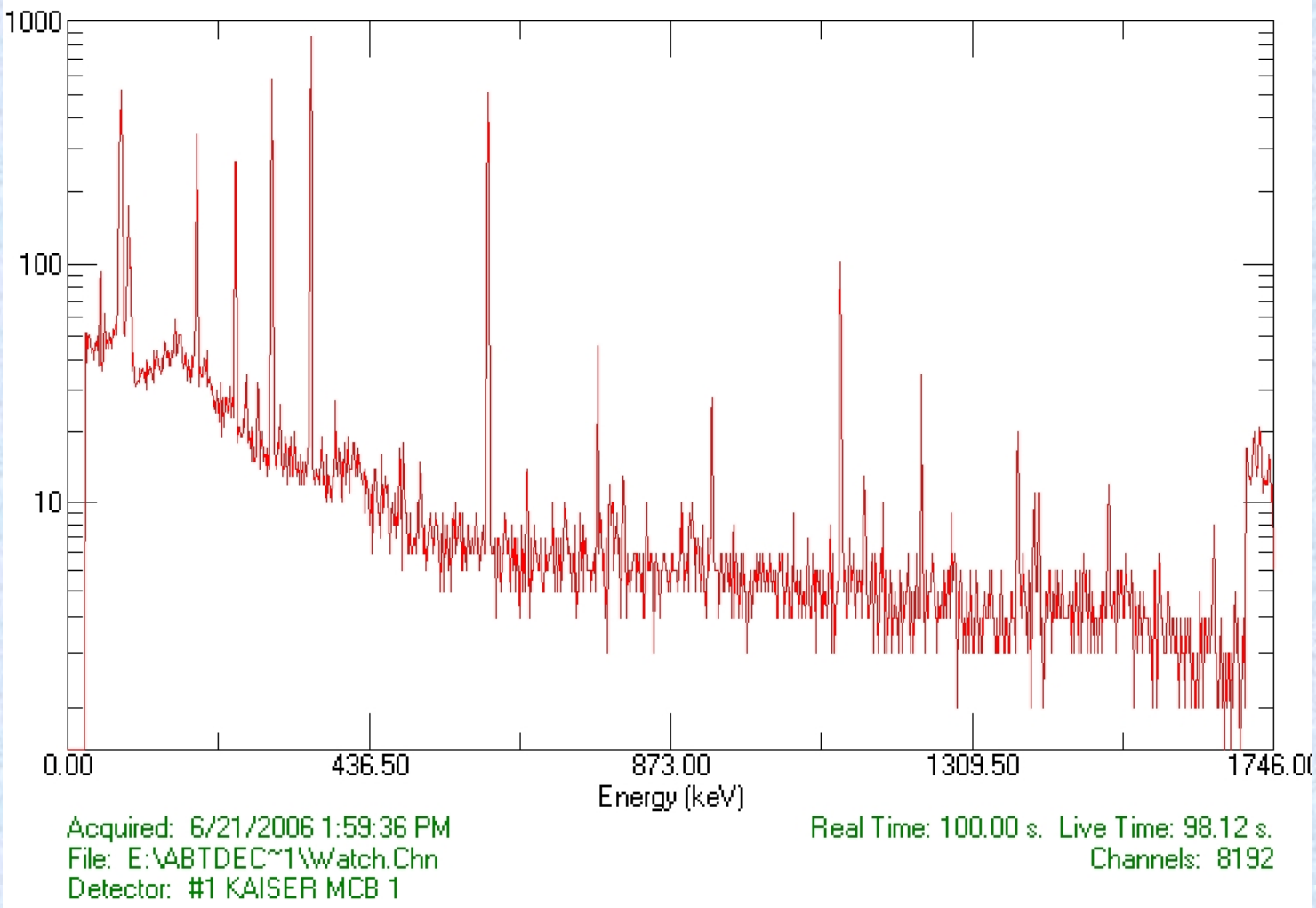




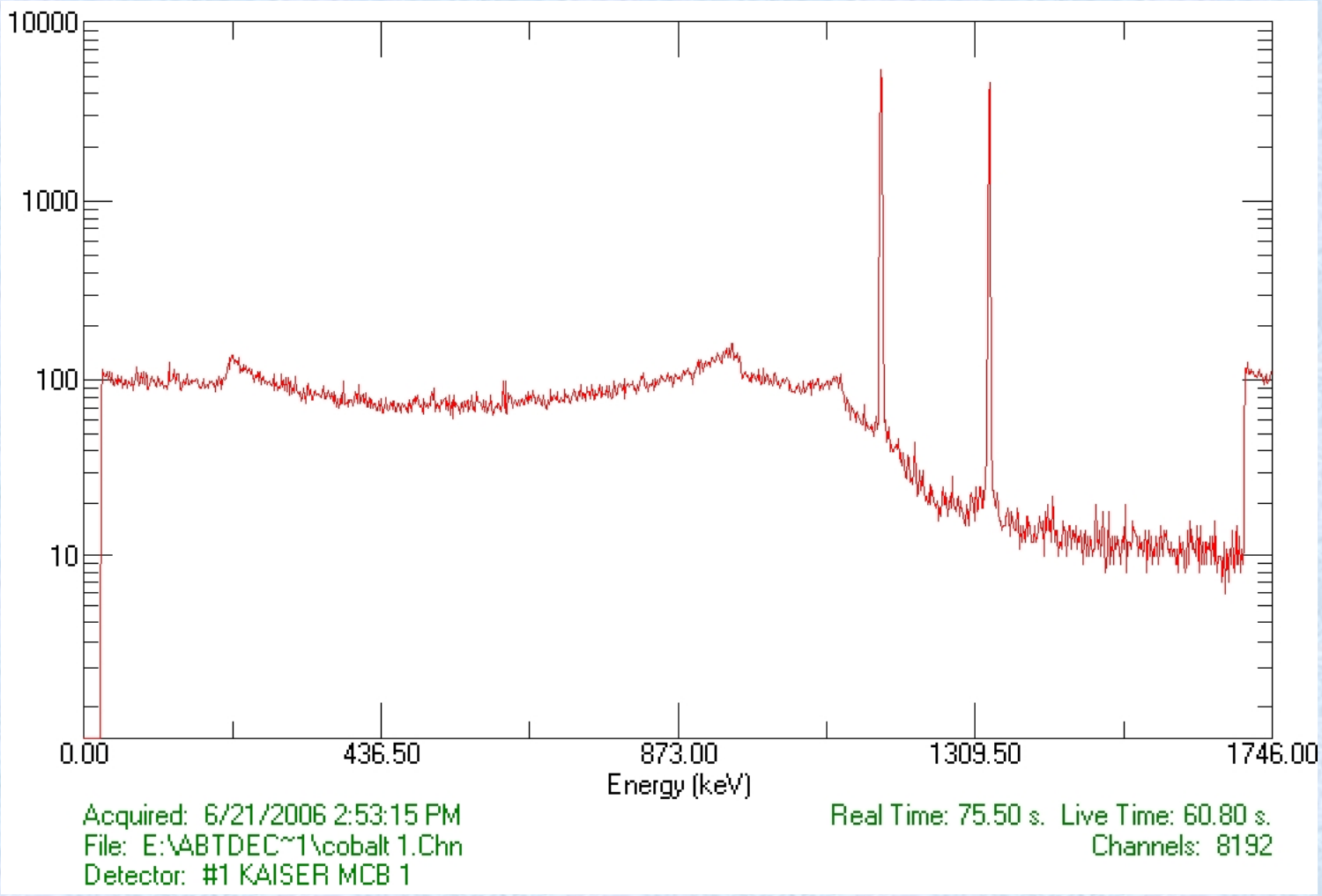
Banana


100
10
Counts
0.00
436.50
873.00
1309.50
1746.00
Energy (keV)
Acquired: 6/21/2006 2:24:28 PM
File: E:\ABTDEC~1\banana.Chn
Detector: #1 KAISER MCB 1
Real Time: 300.00 s. Live Time: 299.94 s.
Channels: 8192

Watch with Radium

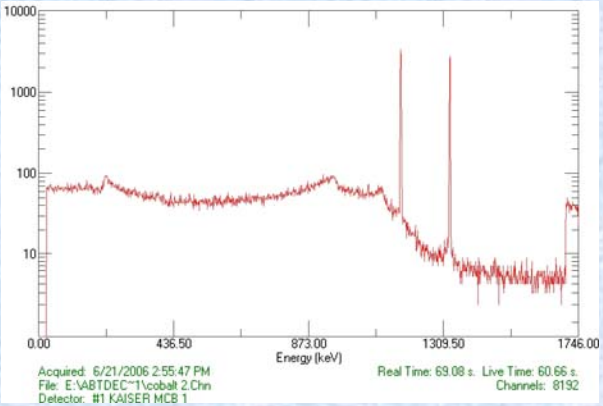


Co 60 (1st slot)

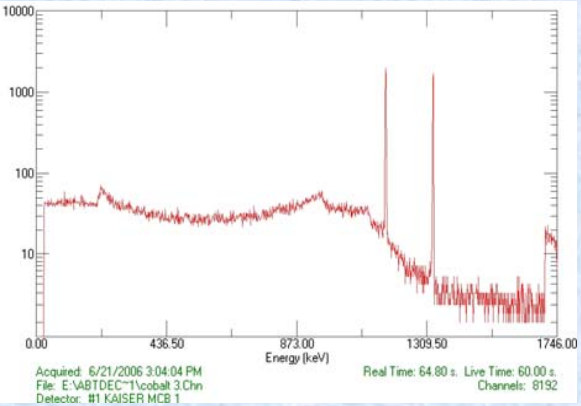


Co 60 at various distances

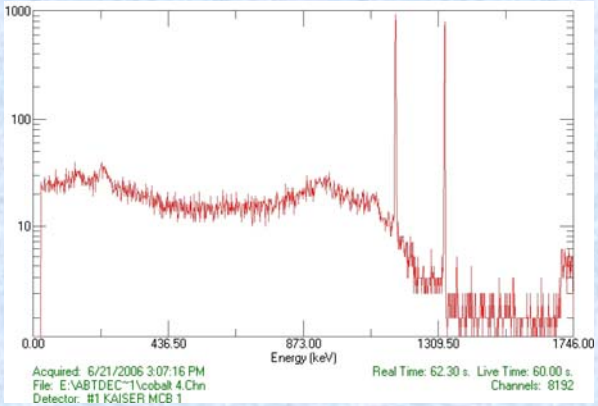
2nd slot



3rd slot

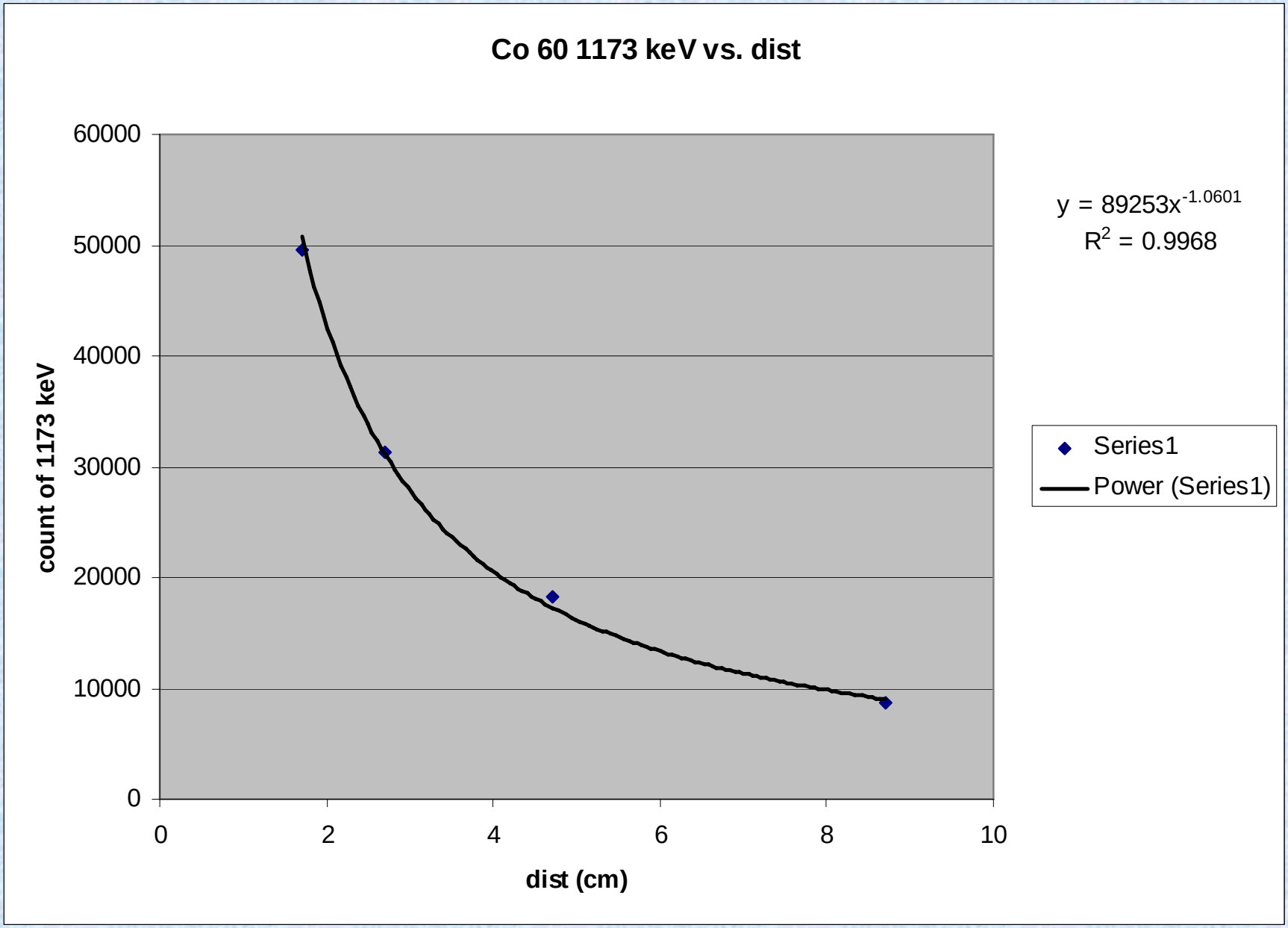


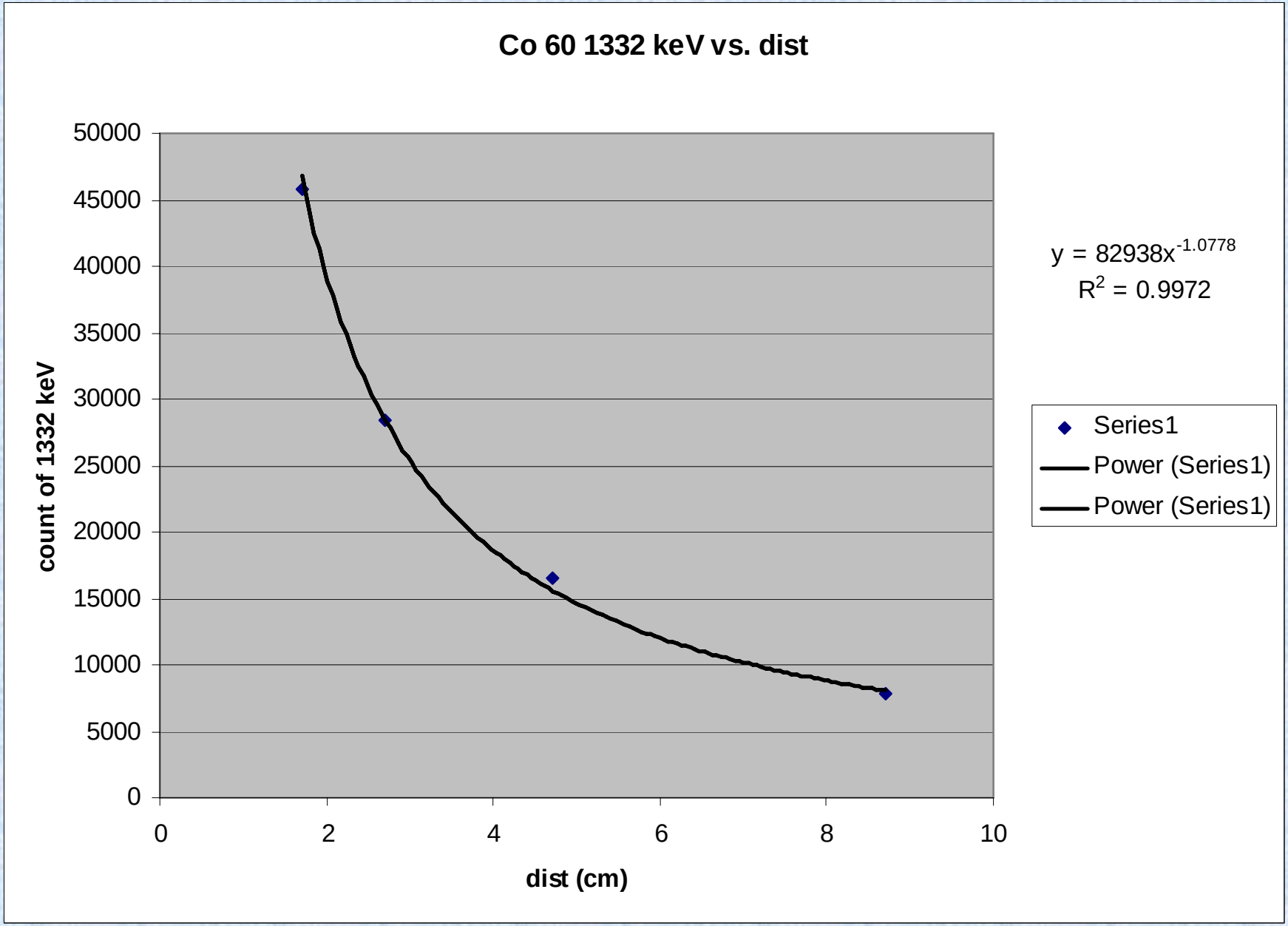
4th slot



Data

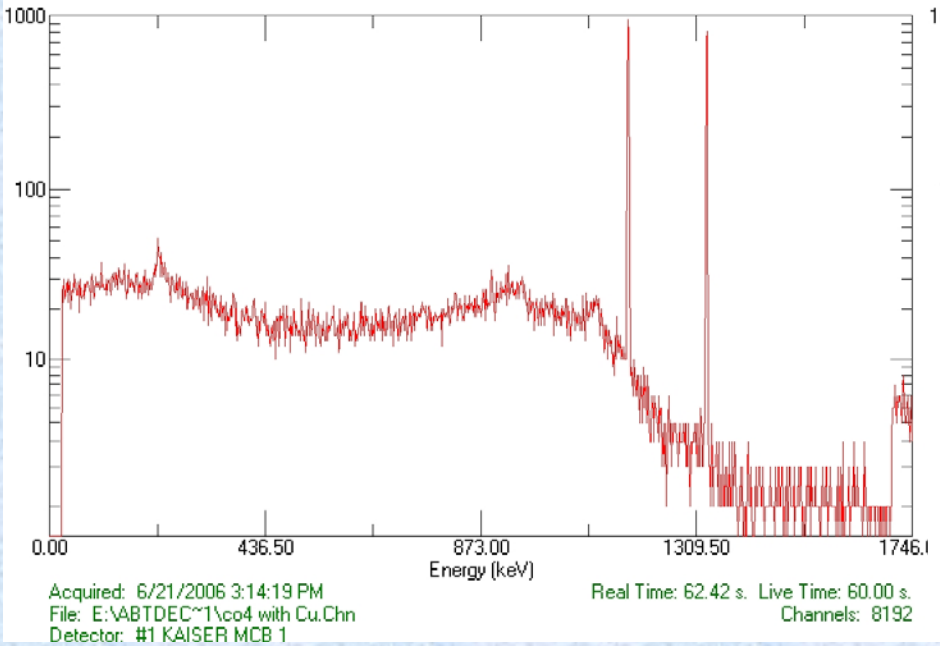
	1173keV		1332 keV
dist	count	dist	count
1.7	49546	1.7	45854
2.7	31334	2.7	28403
4.7	18326	4.7	16564
8.7	8677	8.7	7778


Co 60 1173 keV vs. dist
60000
50000
40000
30000
20000
10000
0
count of 1173 keV
0
2
4
6
8
10
dist (cm)
y = 89253x^-1.0601
R^2 = 0.9968
Series1
Power (Series1)

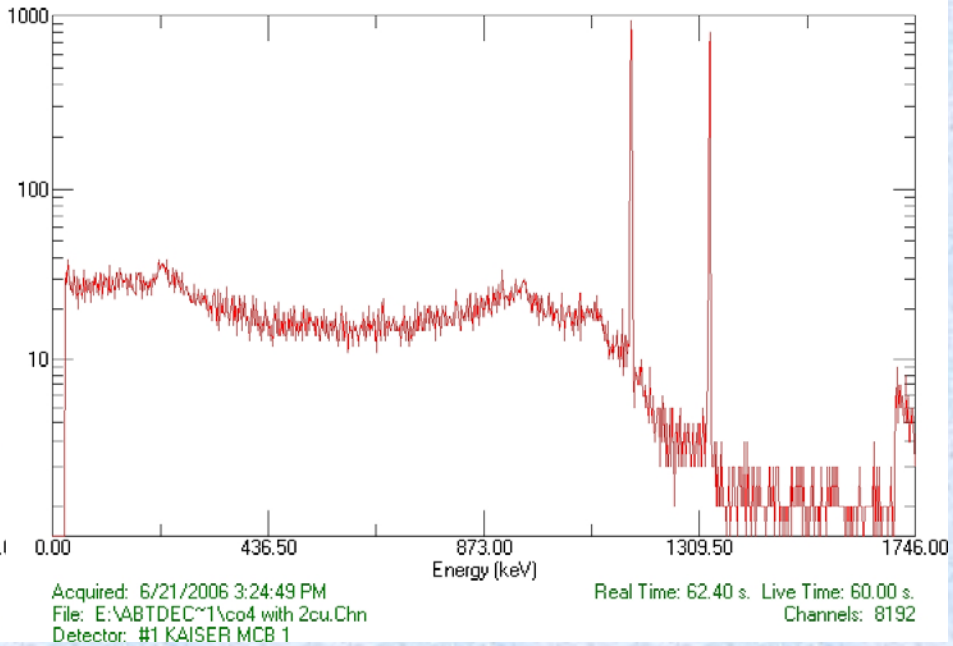

Co 60 1332 keV vs. dist
count of 1332 keV
dist (cm)
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
2
4
6
8
10
y = 82938x^-1.0778
R^2 = 0.9972
Series1
Power (Series1)
Power (Series1)

ABT at Decay I

Co 60 with copper shielding

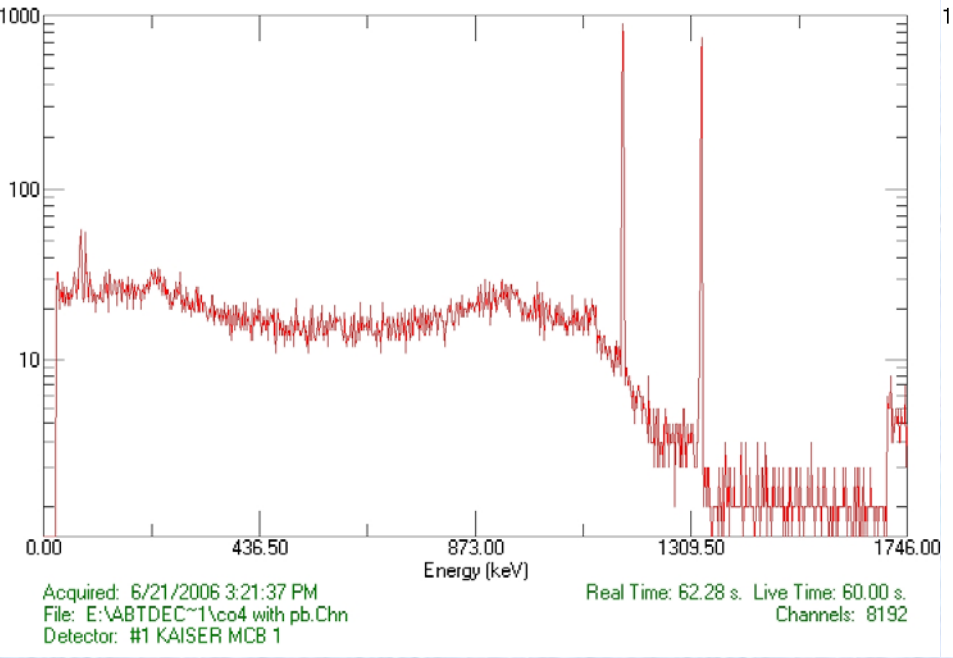


1 sheet

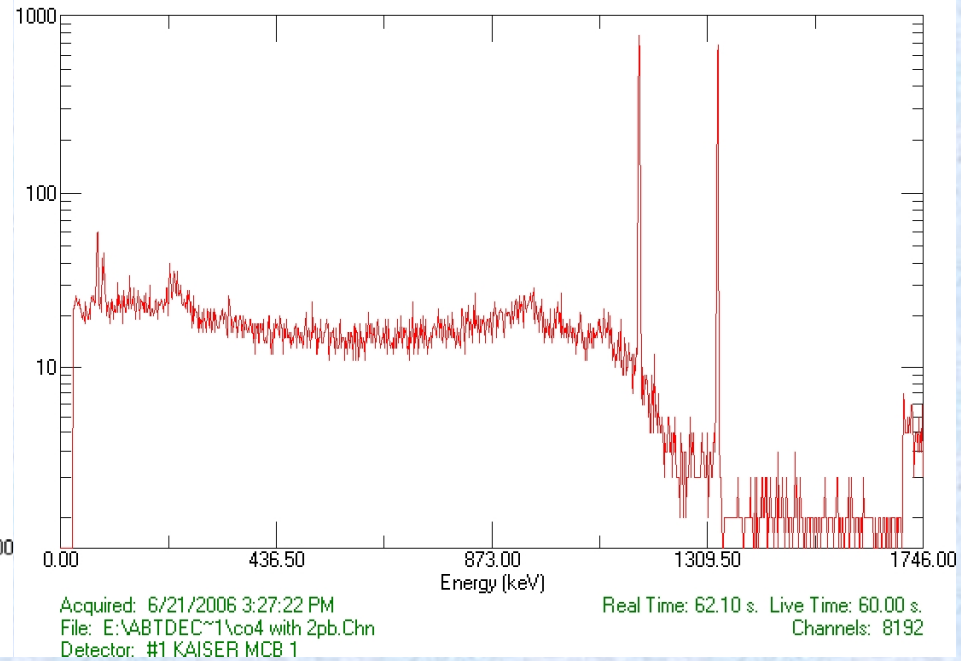


2 sheet

Co 60 with Pb shielding

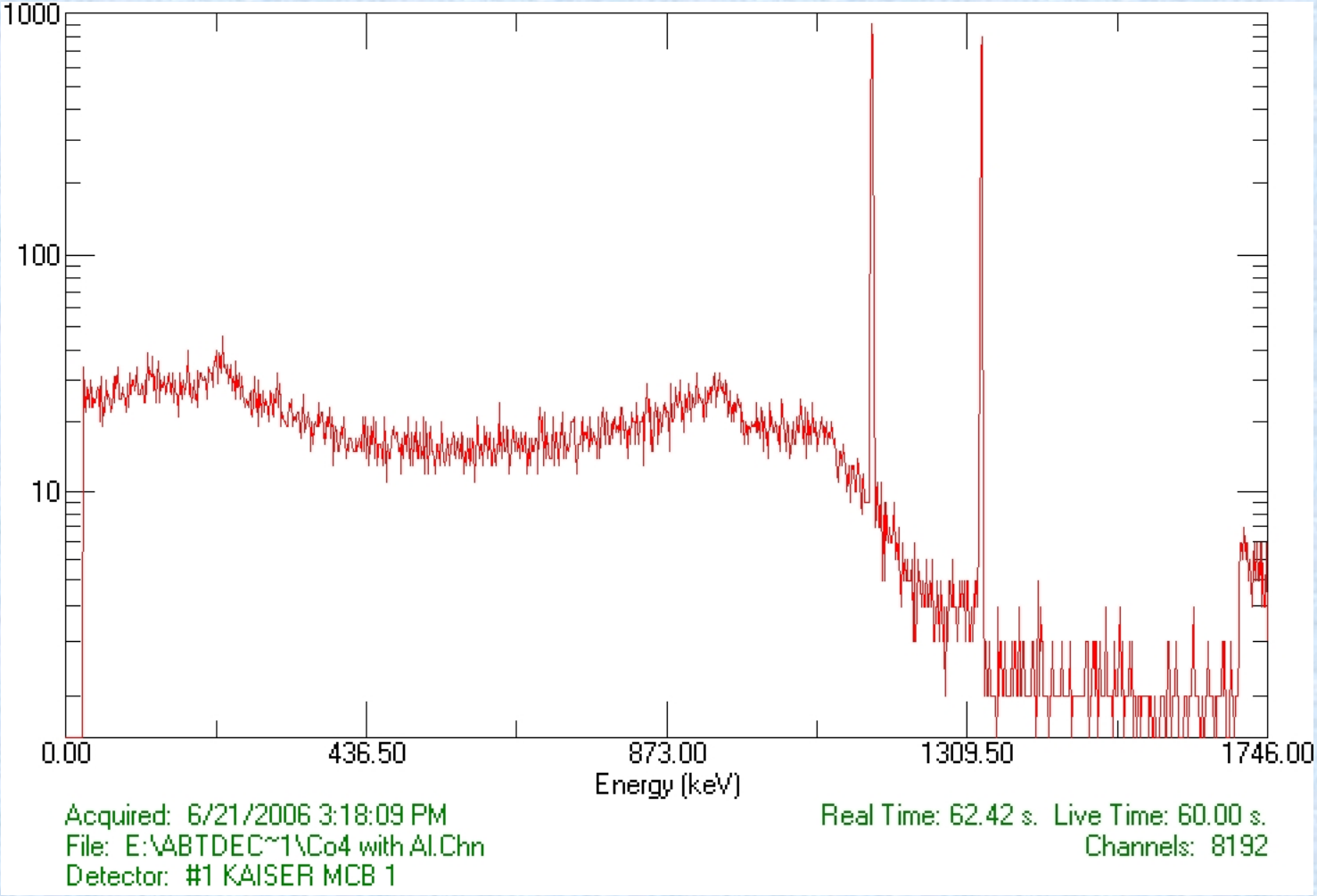


1 sheet of lead

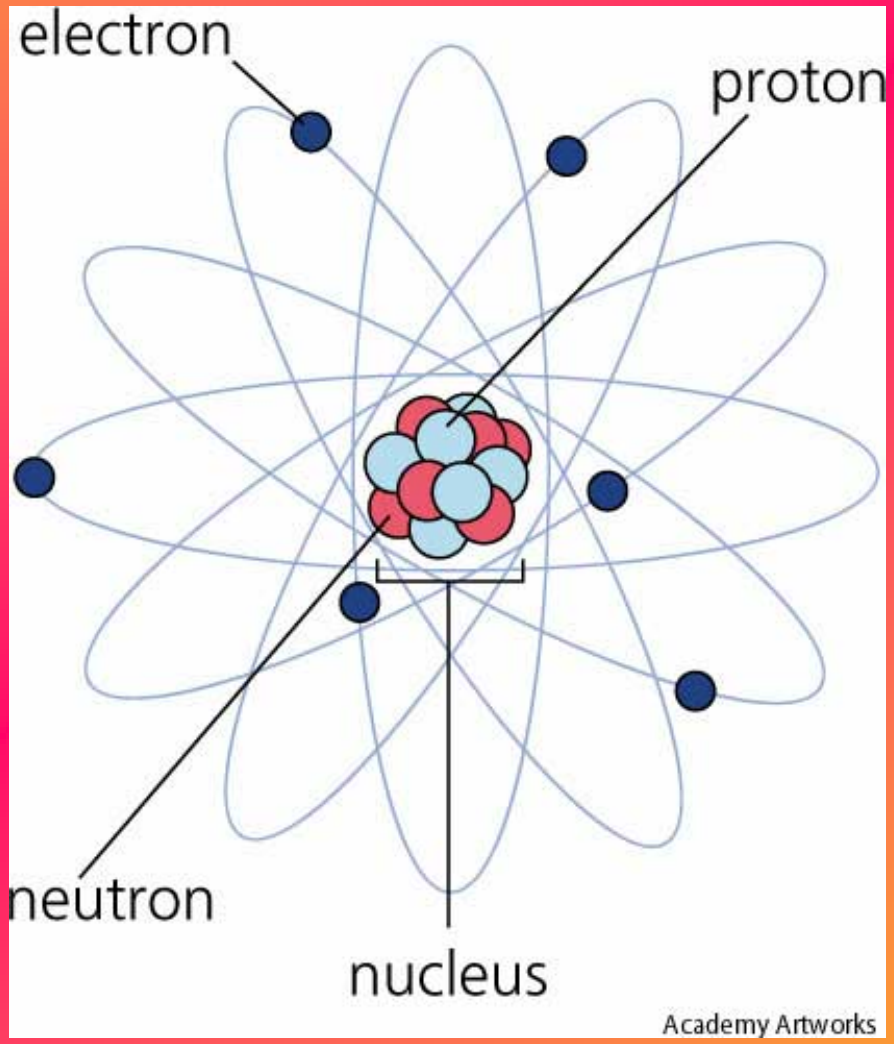


2 sheets of lead

Co 60 with Al


1000
100
10
0.00
436.50
873.00
1309.50
1746.00
Energy (keV)
Acquired: 6/21/2006 3:18:09 PM
File: E:\ABTDEC~1\Co4 with Al.Chn
Detector: #1 KAISER MCB 1
Real Time: 62.42 s. Live Time: 60.00 s.
Channels: 8192

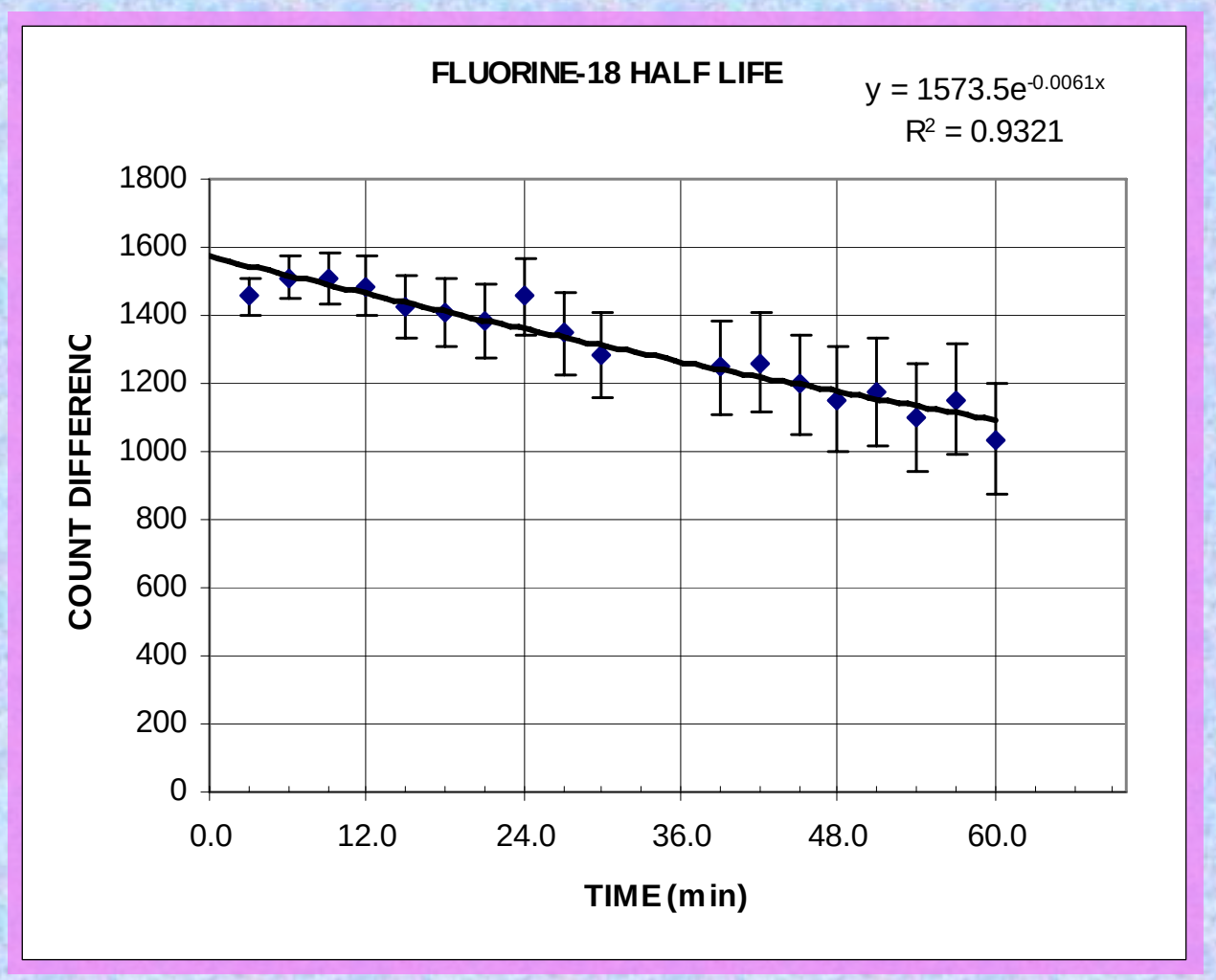
Decay Lab II



Determining the Half-life of Fluorine-18

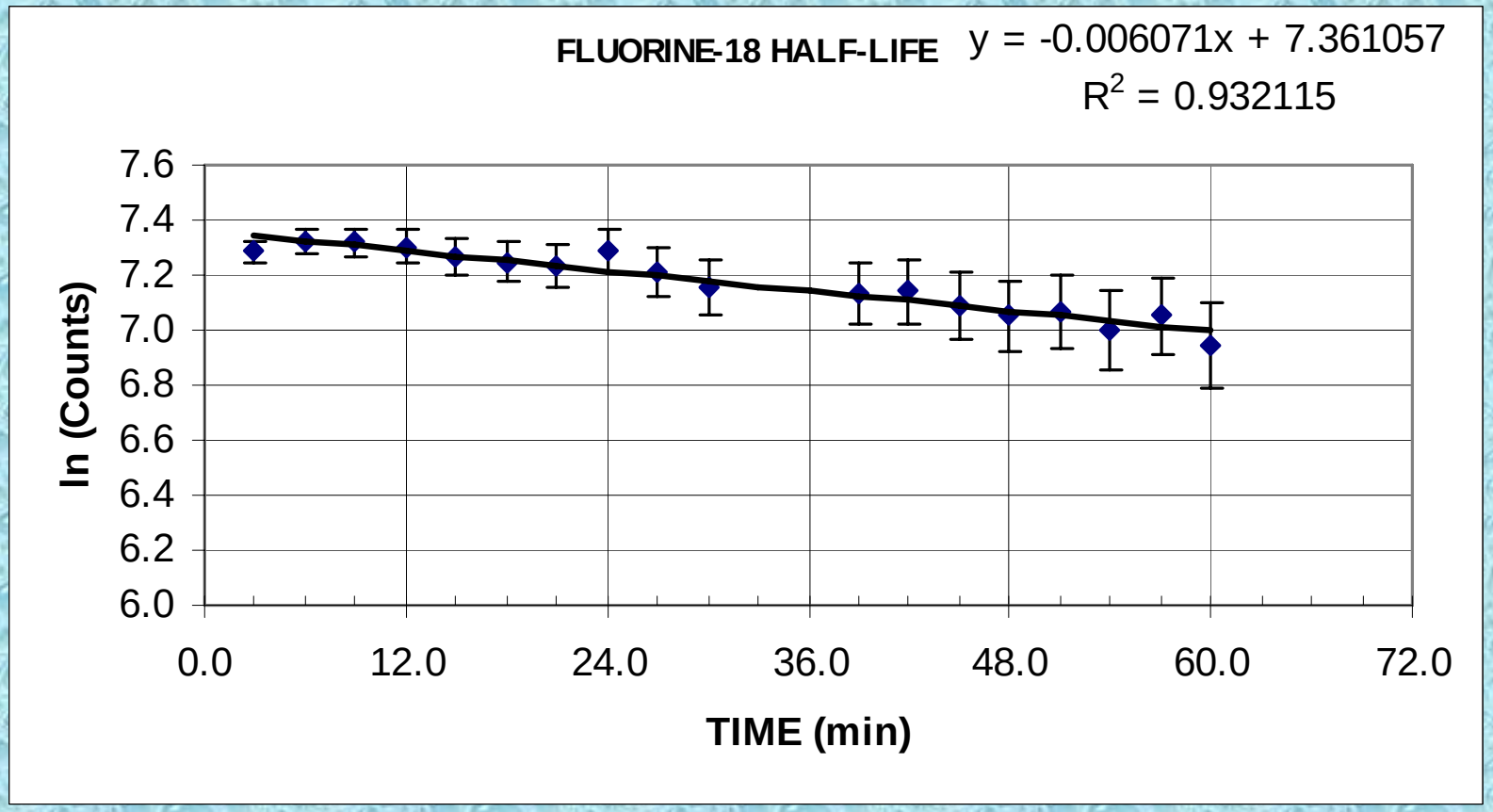
TIME HR:MIN:SEC	COUNTS DECT #1	COUNTS DECT #2	COUNTS
13:18:00	3,881	5,288	1,275
13:21:00	8,223	11,465	2,731
13:24:00	12,732	17,814	4,242
13:27:00	17,188	24,076	5,750
13:30:00	21,508	30,087	7,237
13:33:00	25,757	35,948	8,664
13:36:00	29,972	41,937	10,072
13:39:00	33,984	47,522	11,454
13:42:00	38,139	53,392	12,911
13:45:00	42,100	58,878	14,259
13:48:00	45,839	64,128	15,542
13:51:30	50,291	70,320	17,039
13:54:00	53,476	74,775	18,160
13:57:00	57,098	79,954	19,408
14:00:00	60,820	84,923	20,669
14:03:00	64,389	89,969	21,865
14:06:00	67,830	94,762	23,018
14:09:00	71,206	99,488	24,192
14:12:00	74,536	104,142	25,294
14:15:00	77,922	108,761	26,448
14:18:00	81,015	113,128	27,485

Current Number of Decays vs. Time (Linear Scaling)



ABT performing Decay Lab II

Natural Log of the Count vs. Time



Figuring Half-λife

$$\lambda = 0.0061 \text{ min}^{-1}$$

$$t_{1/2} = (-\ln 0.5)/(0.0061 \text{ min}^{-1})$$

$$t_{1/2} = 114 \text{ min}$$

Percent Error

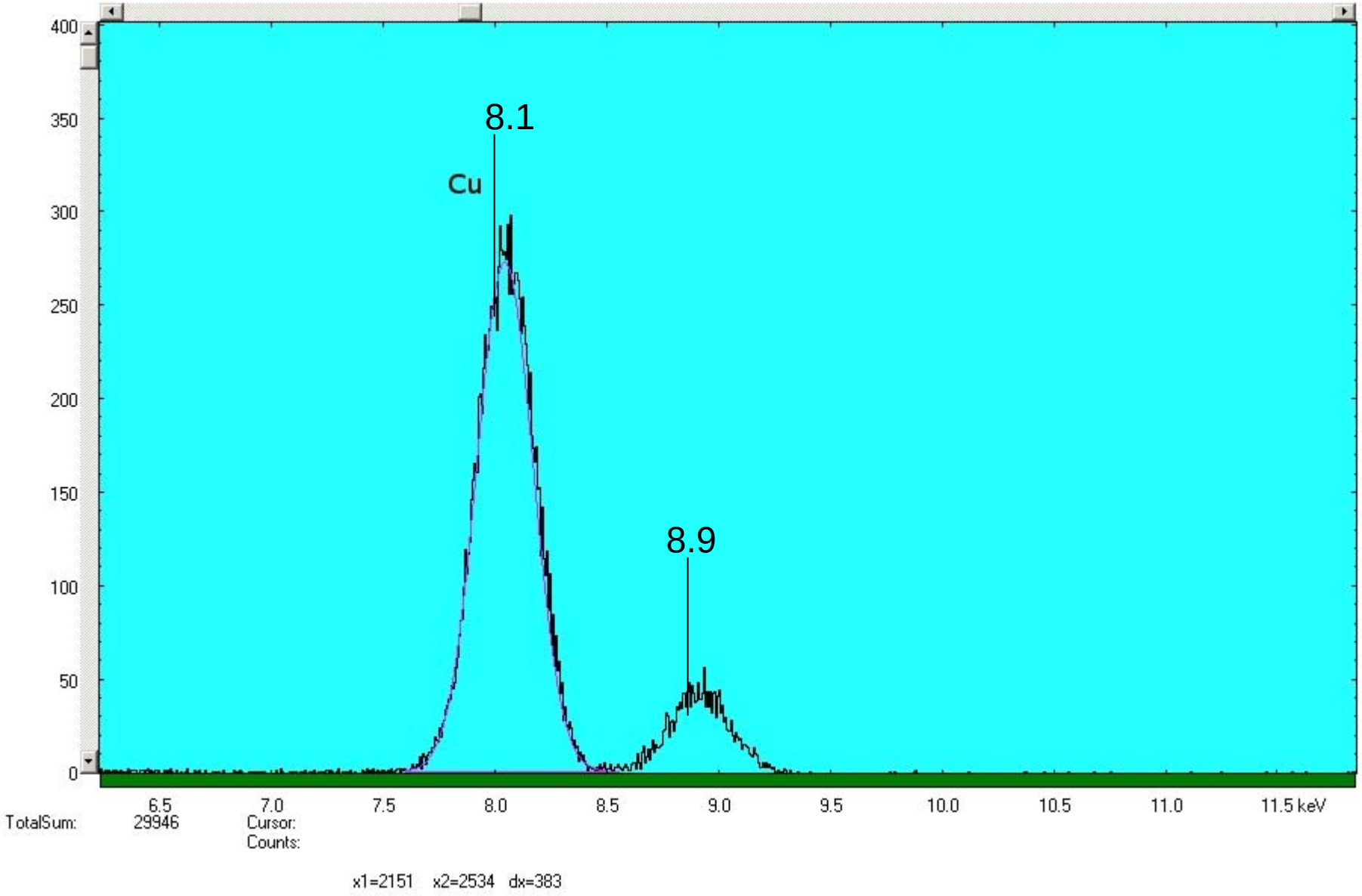
% error= (114-109)/109 X 100

% error= 4.6%

PIXE

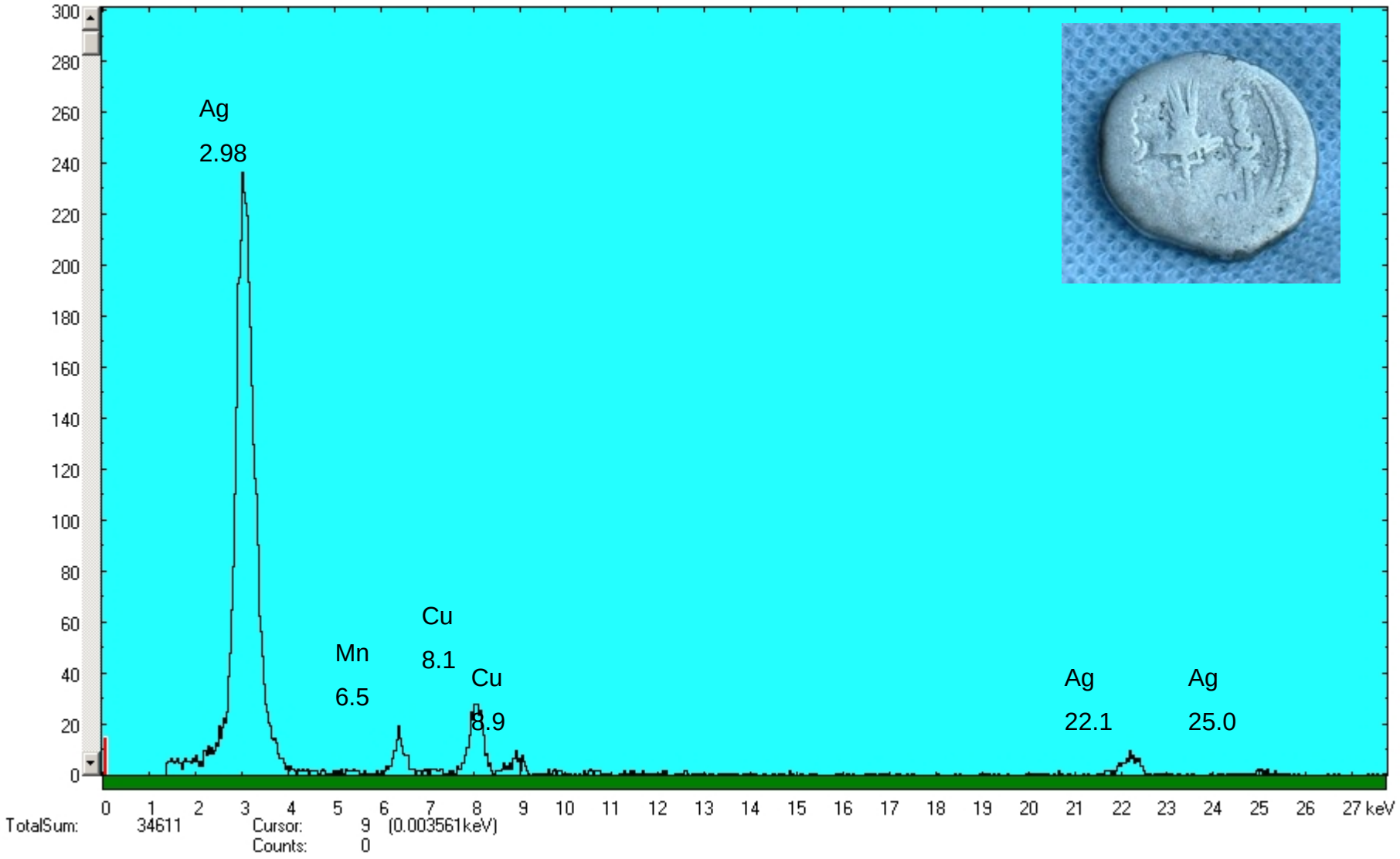
Particle Induced X-Ray Emission

Cu calibration



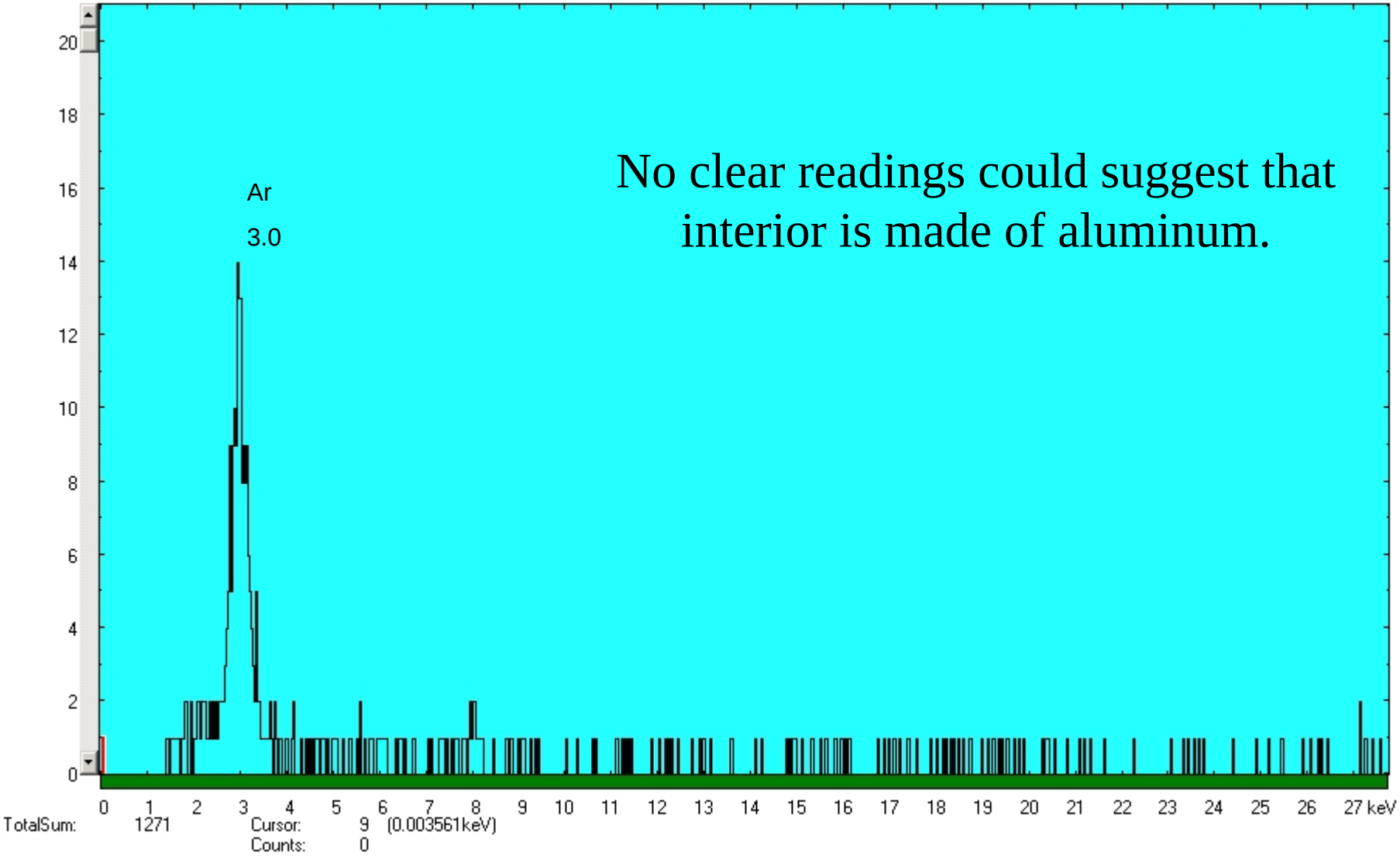
Marc Antony silver denarius

003



Inner circle of Euro

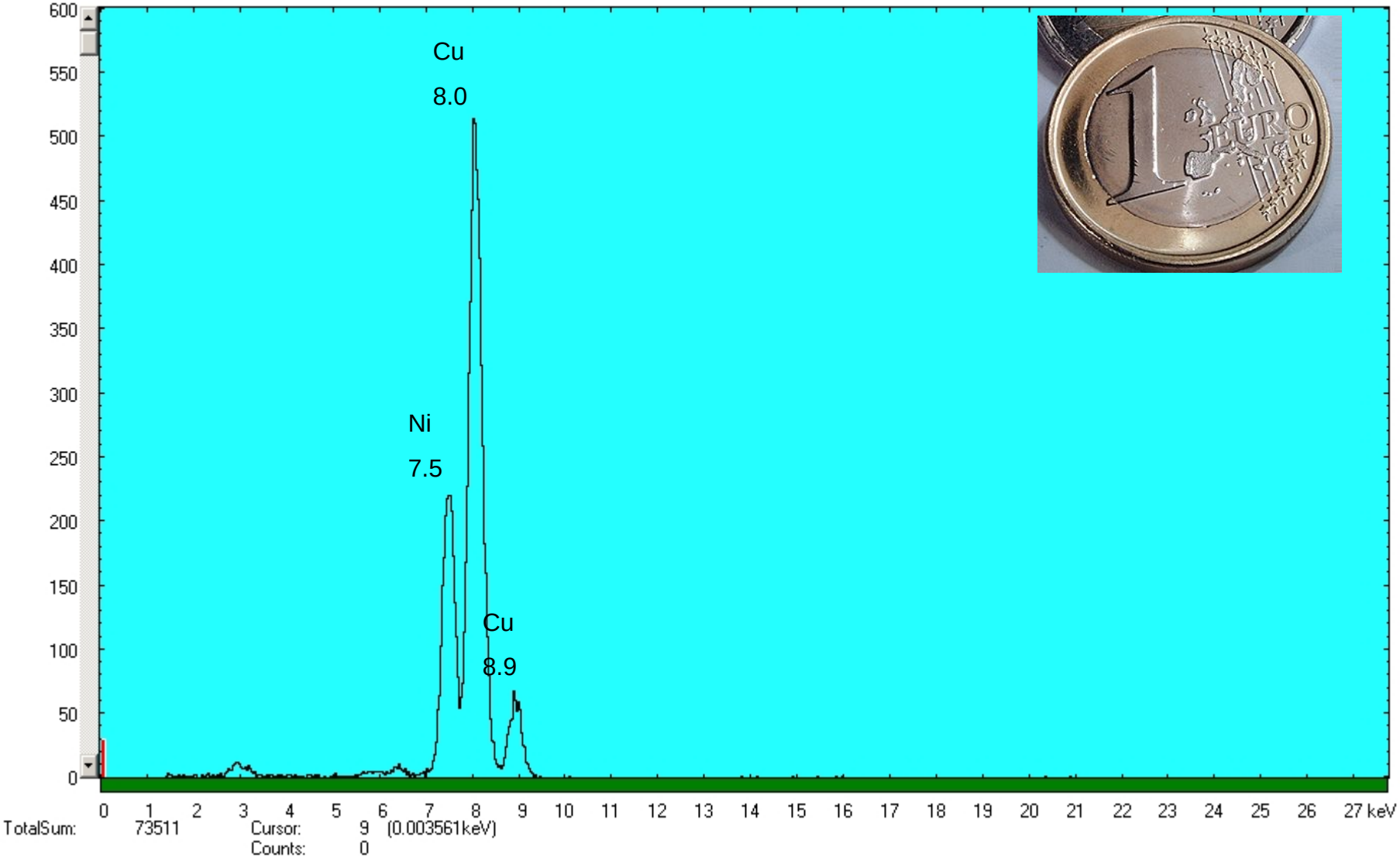
004



No clear readings could suggest that interior is made of aluminum.

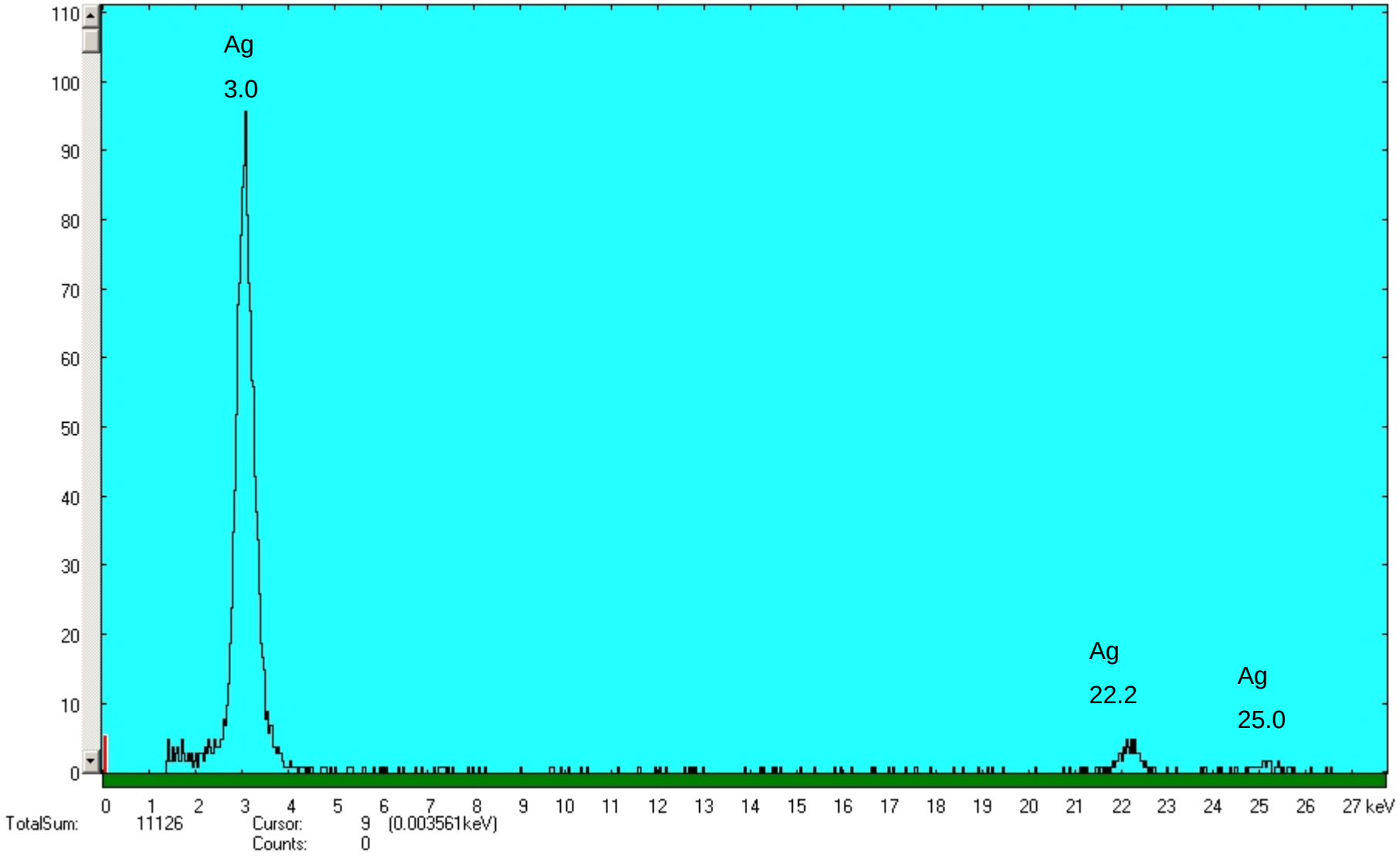
Outer ring of Euro

005



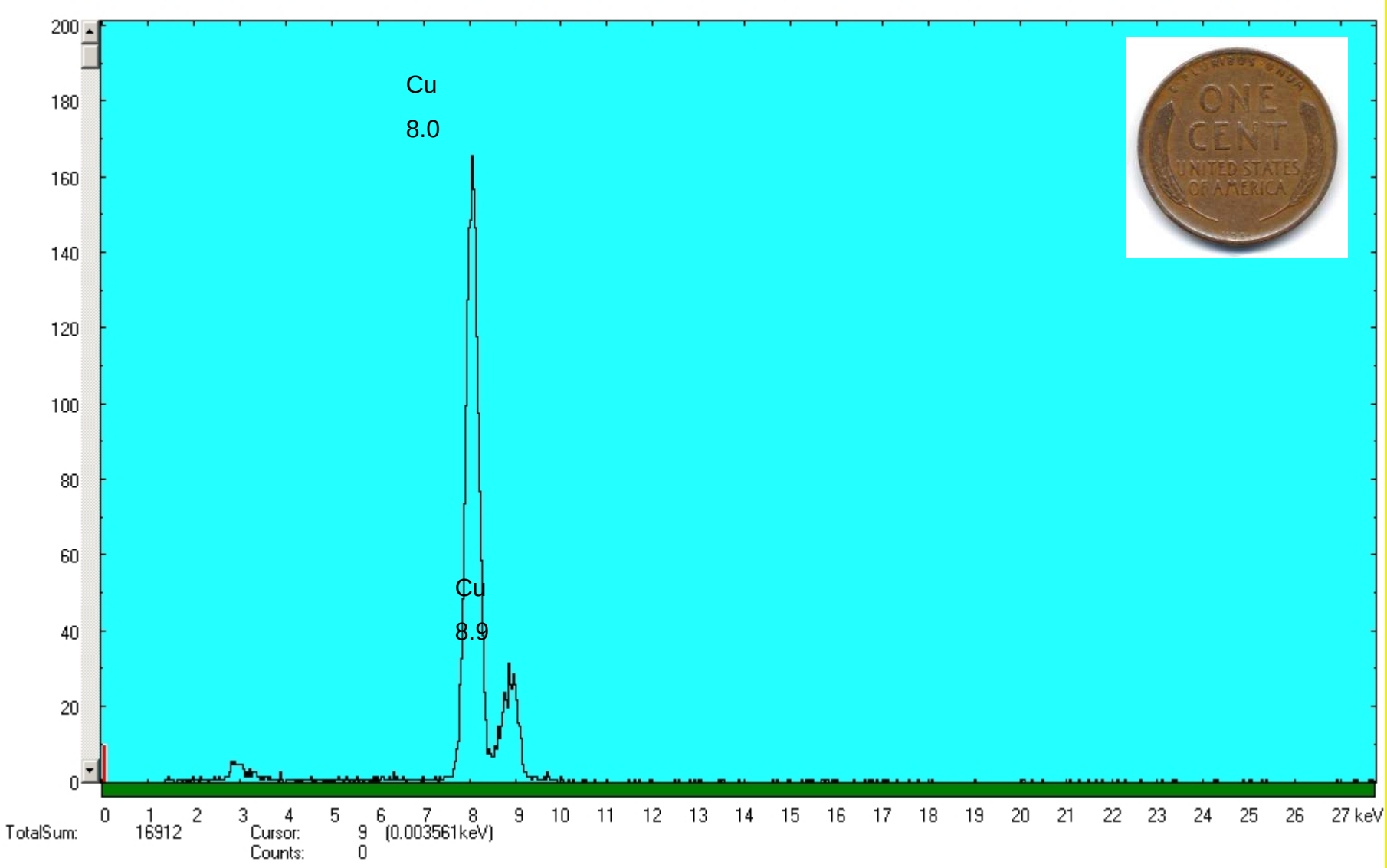
Pure Silver

006



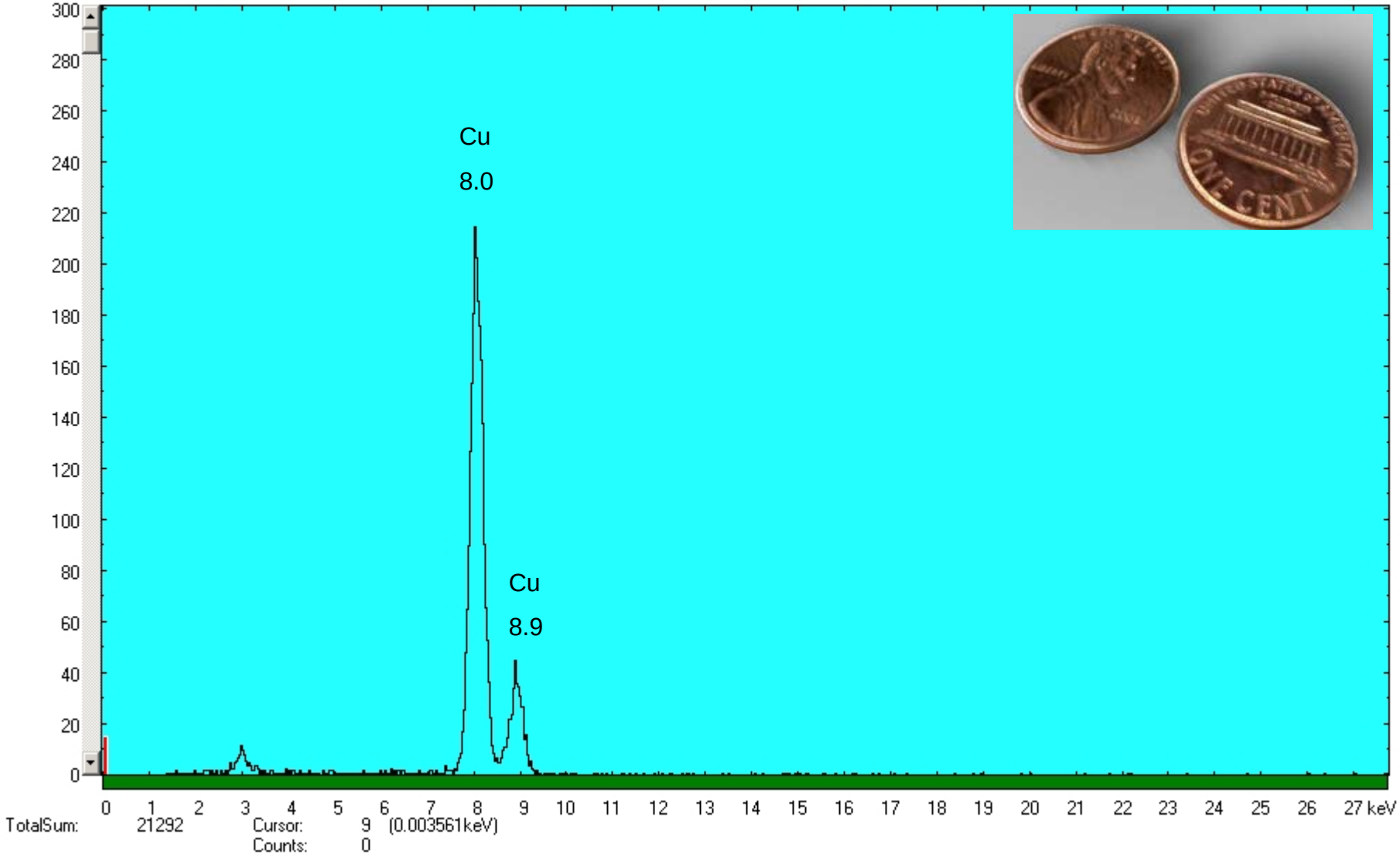
1946 Wheat Penny

007



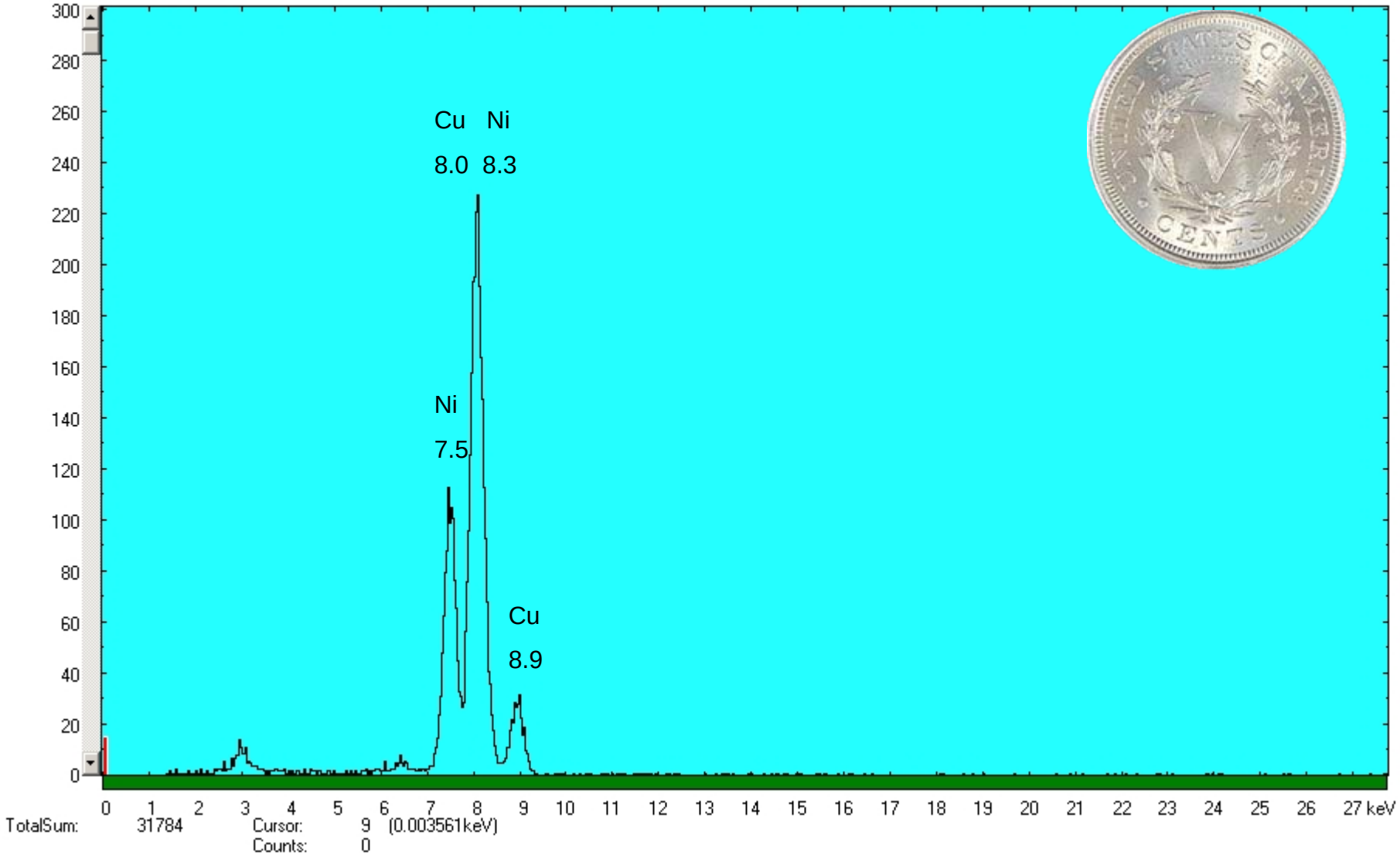
2004 Penny

008



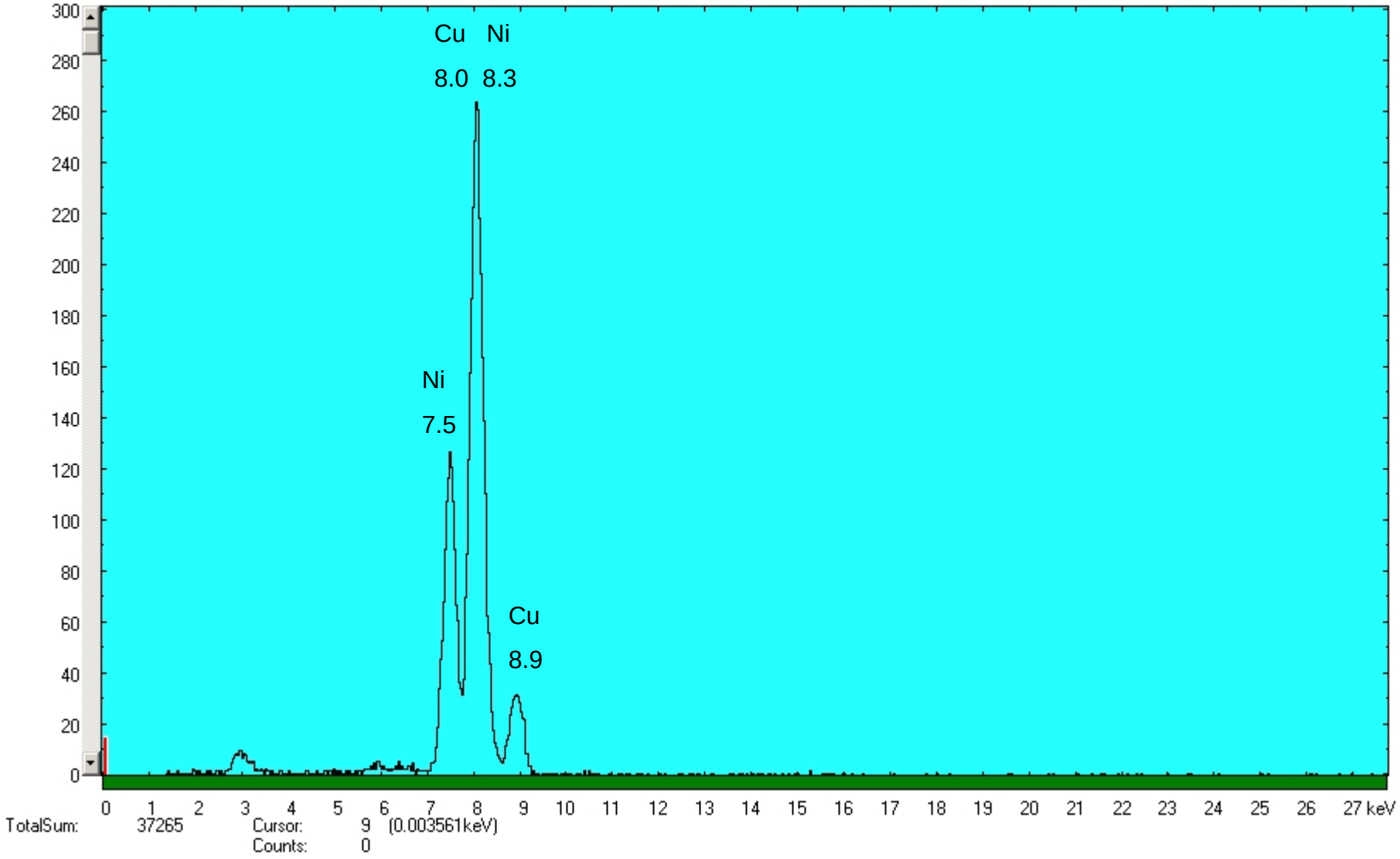
1905 Nickel

009



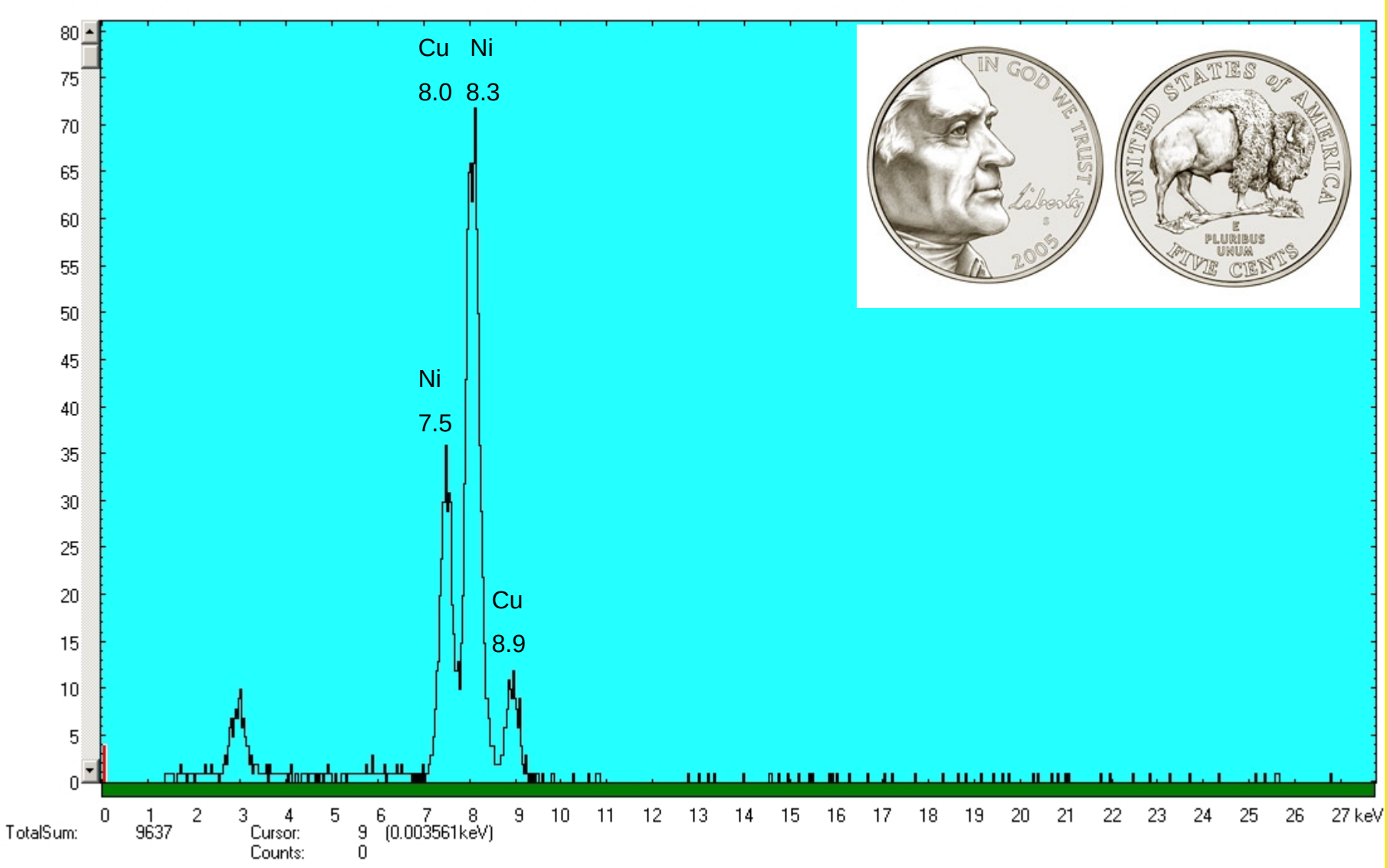
1991 Nickel

010



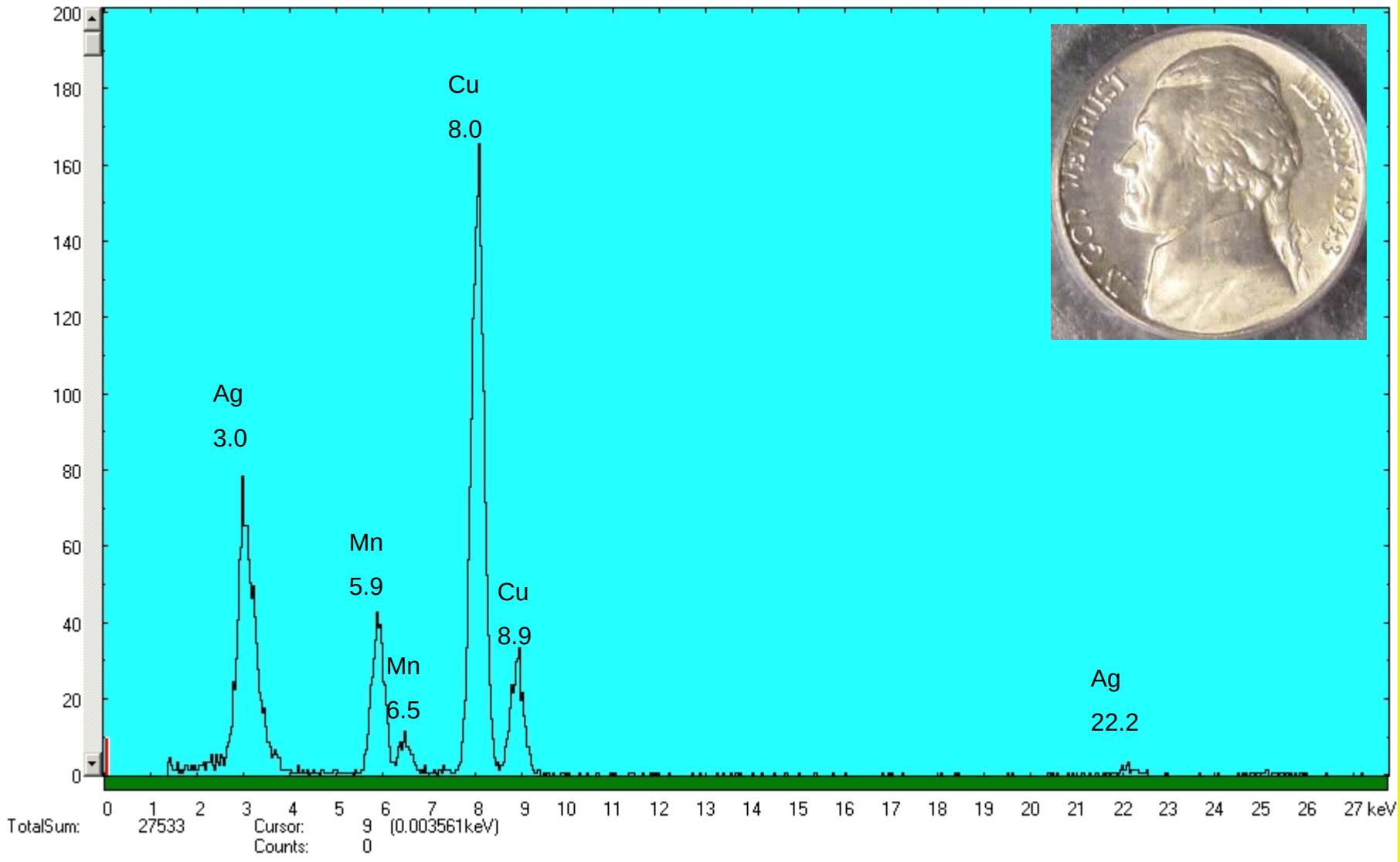
2005 Buffalo Nickel

011



1943 Silver Nickel

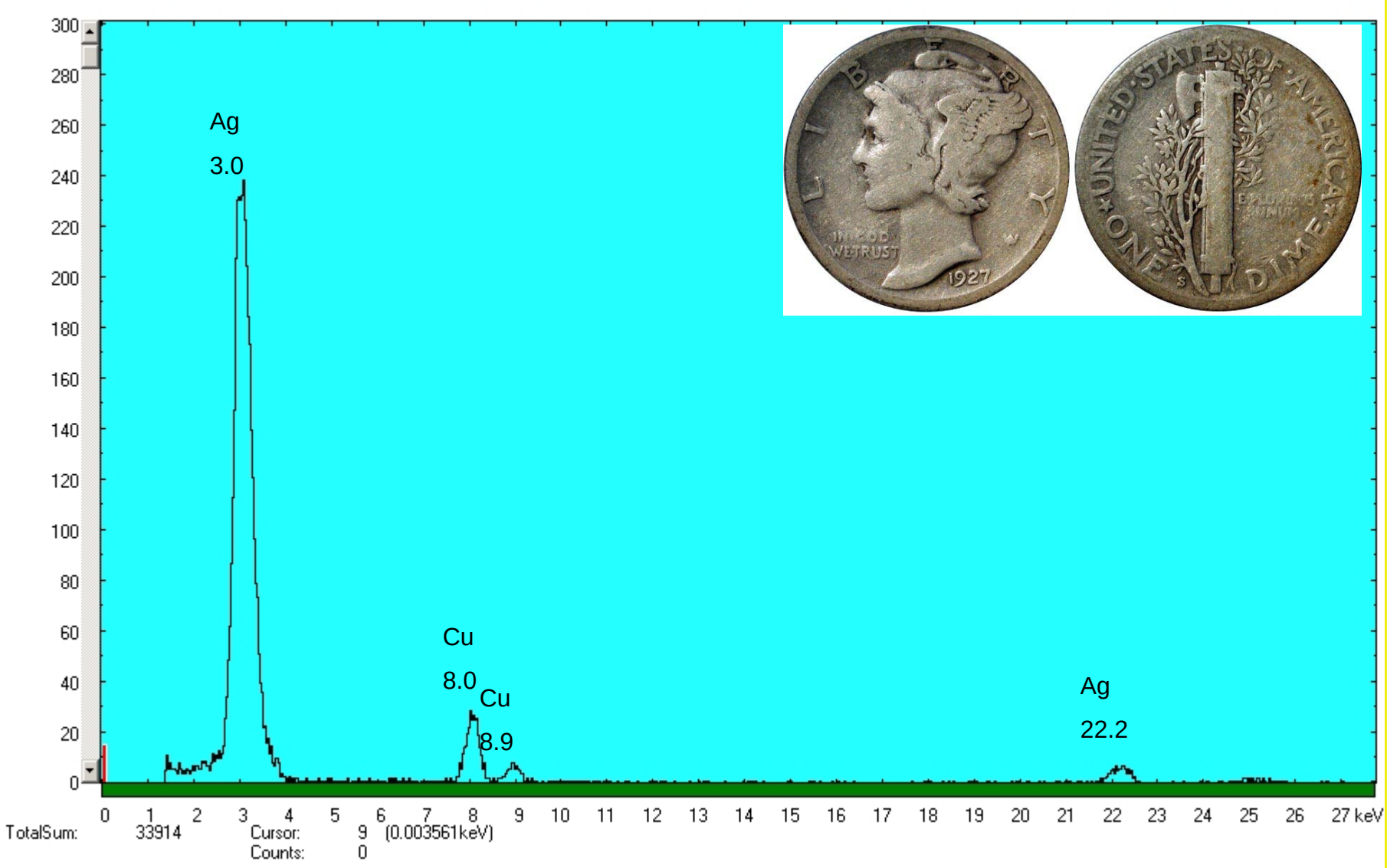
012



ABT doing PIXE

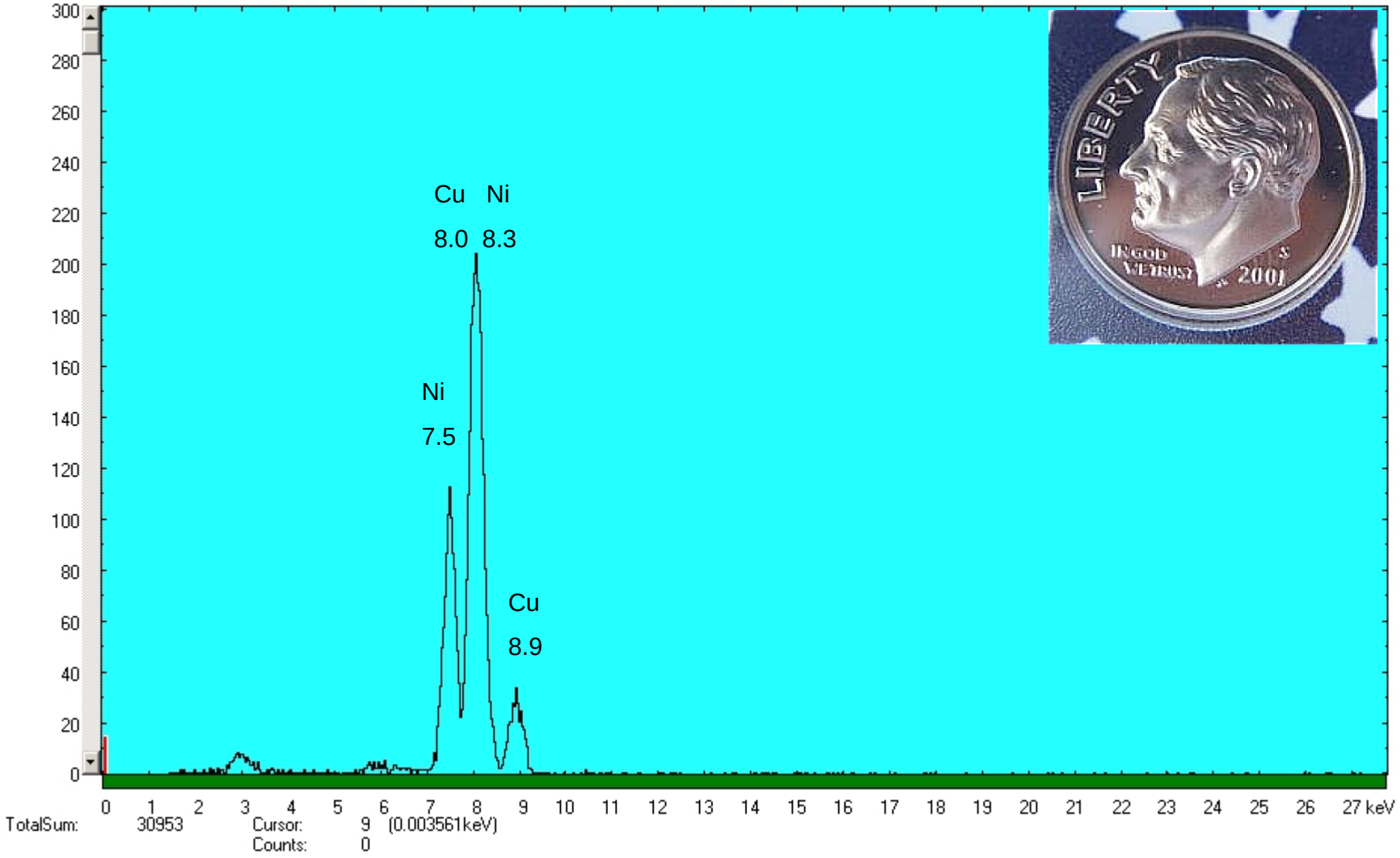
1927 Dime

013



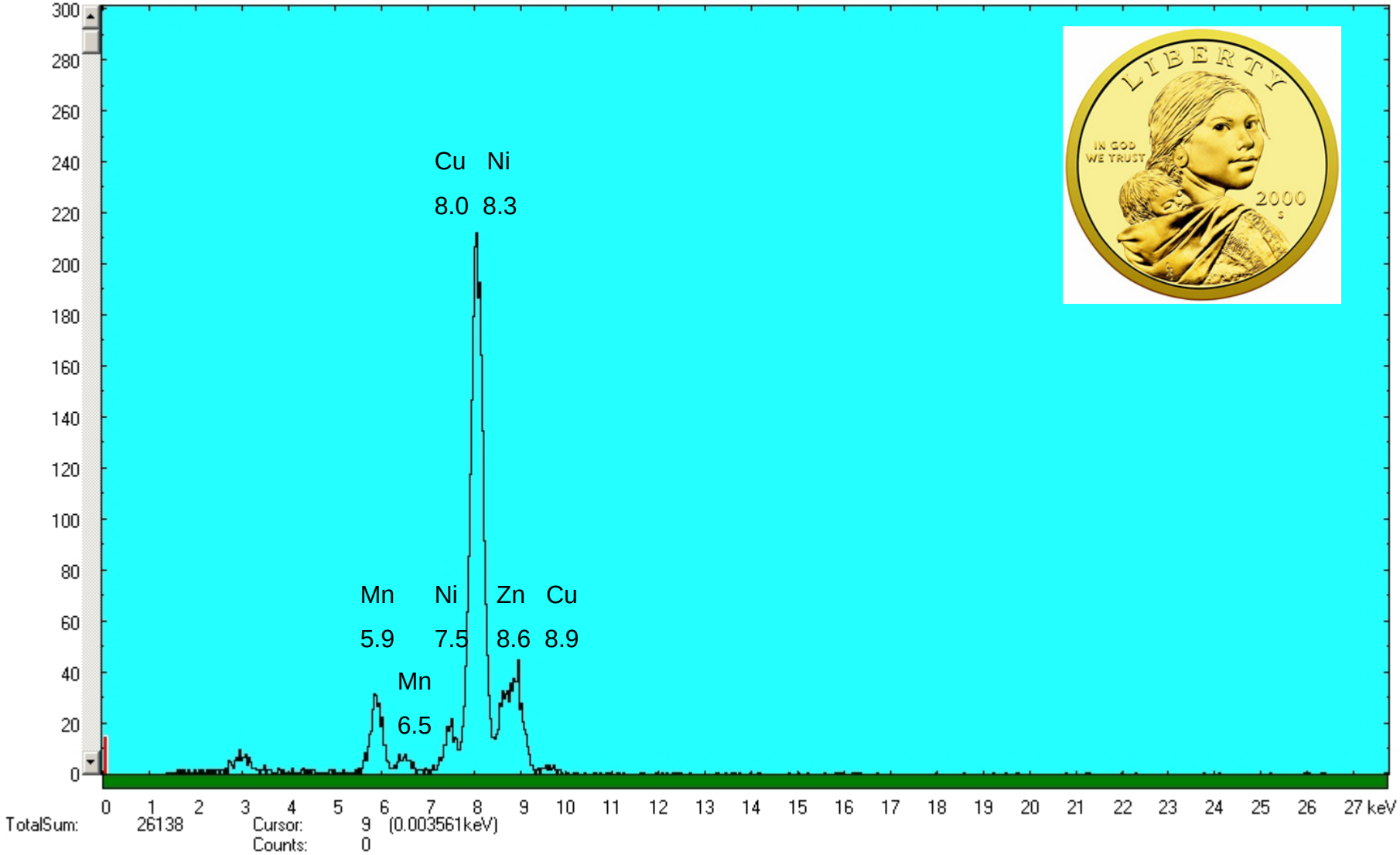
2001 Dime

014



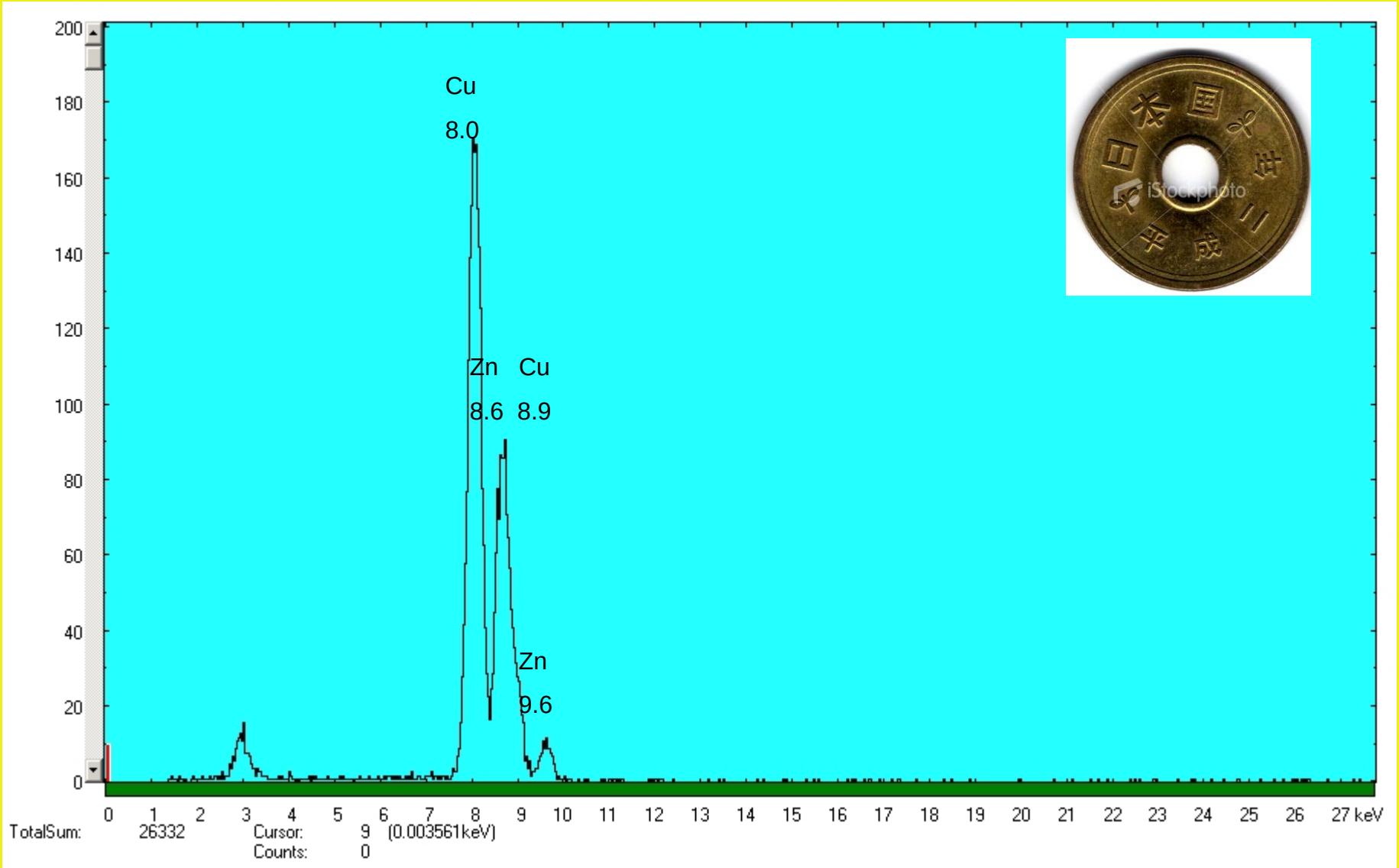
2000 Sacagawea Dollar

015



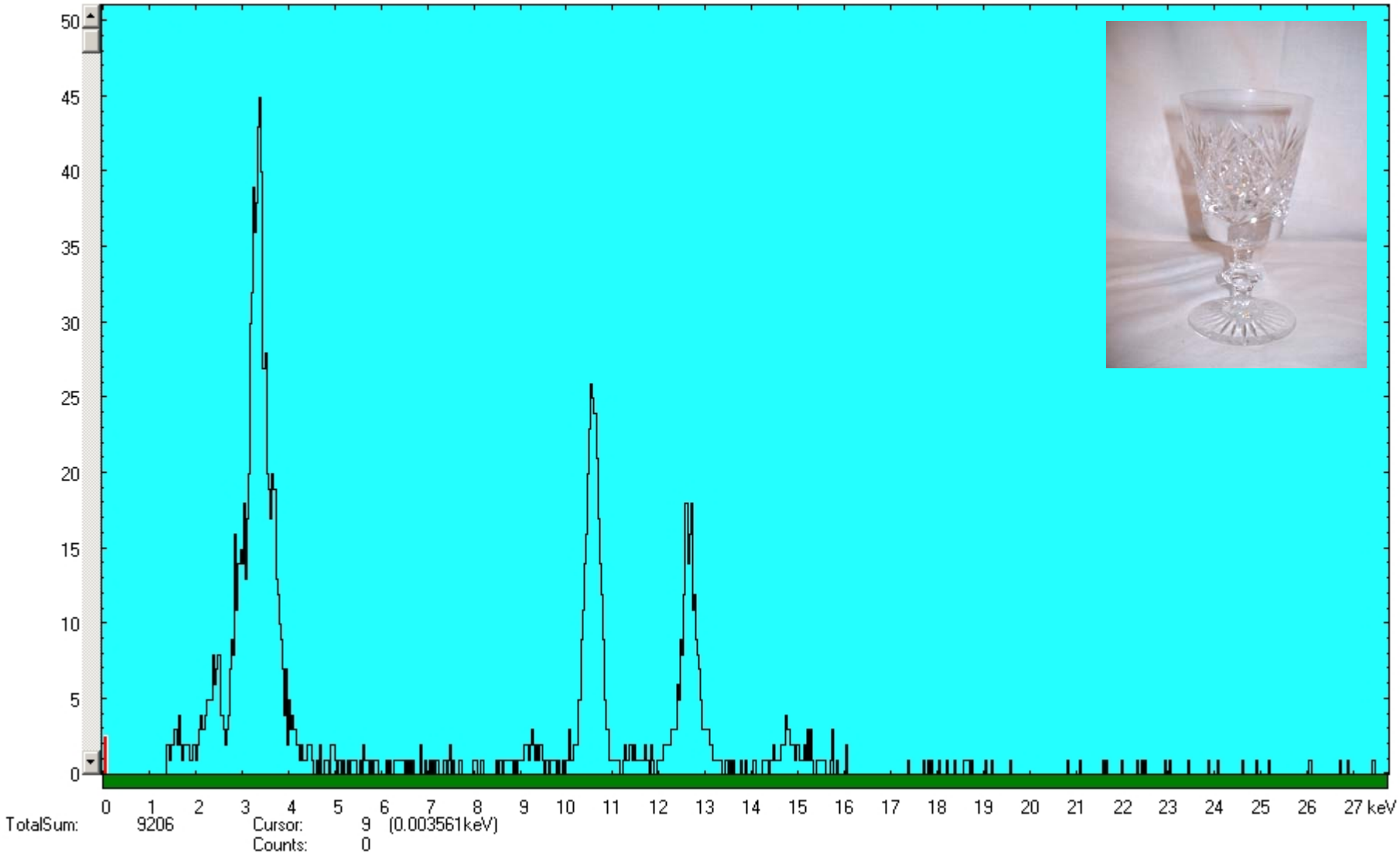
Japanese coin with hole

016



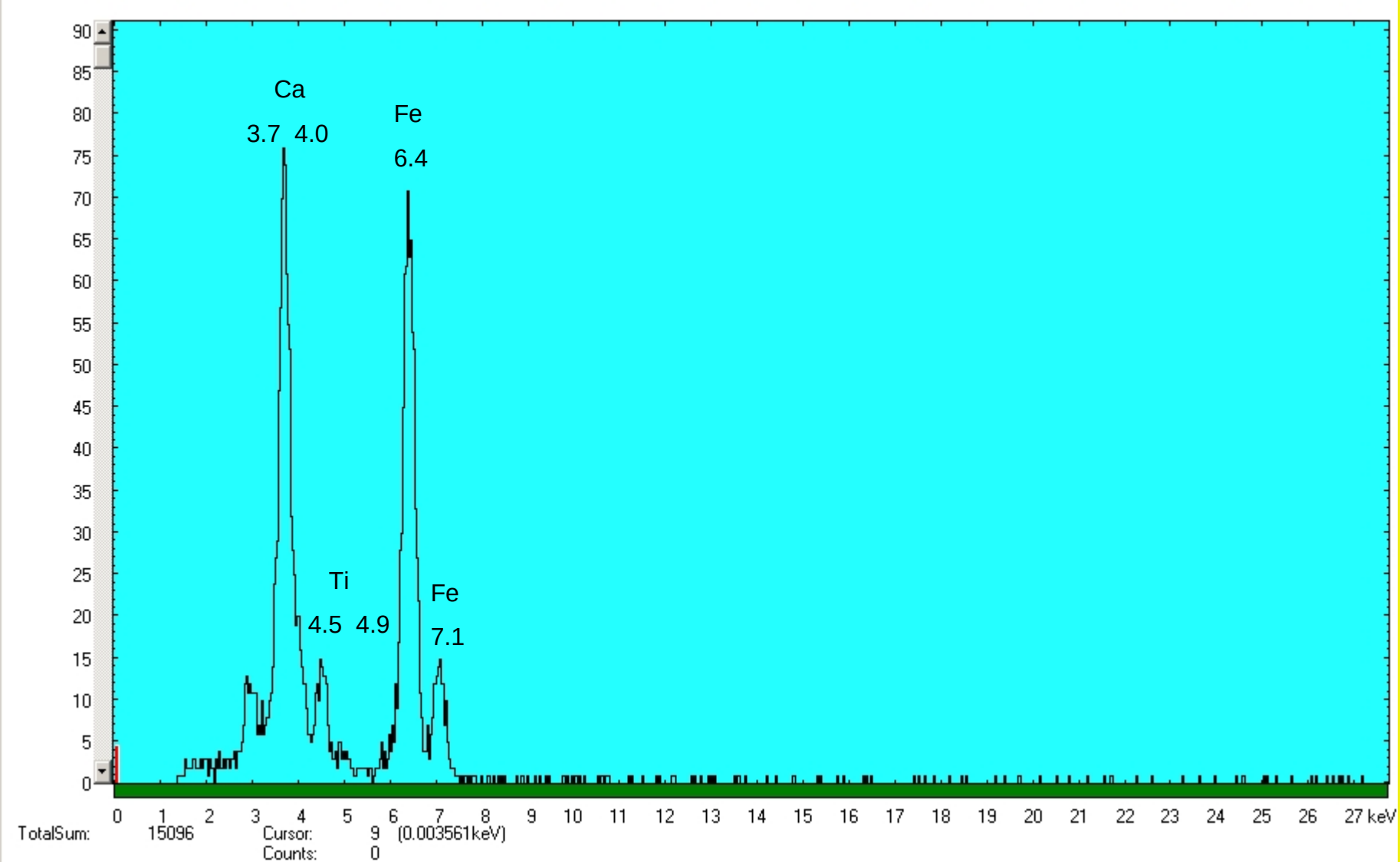
“Leaded” Crystal Glass

017



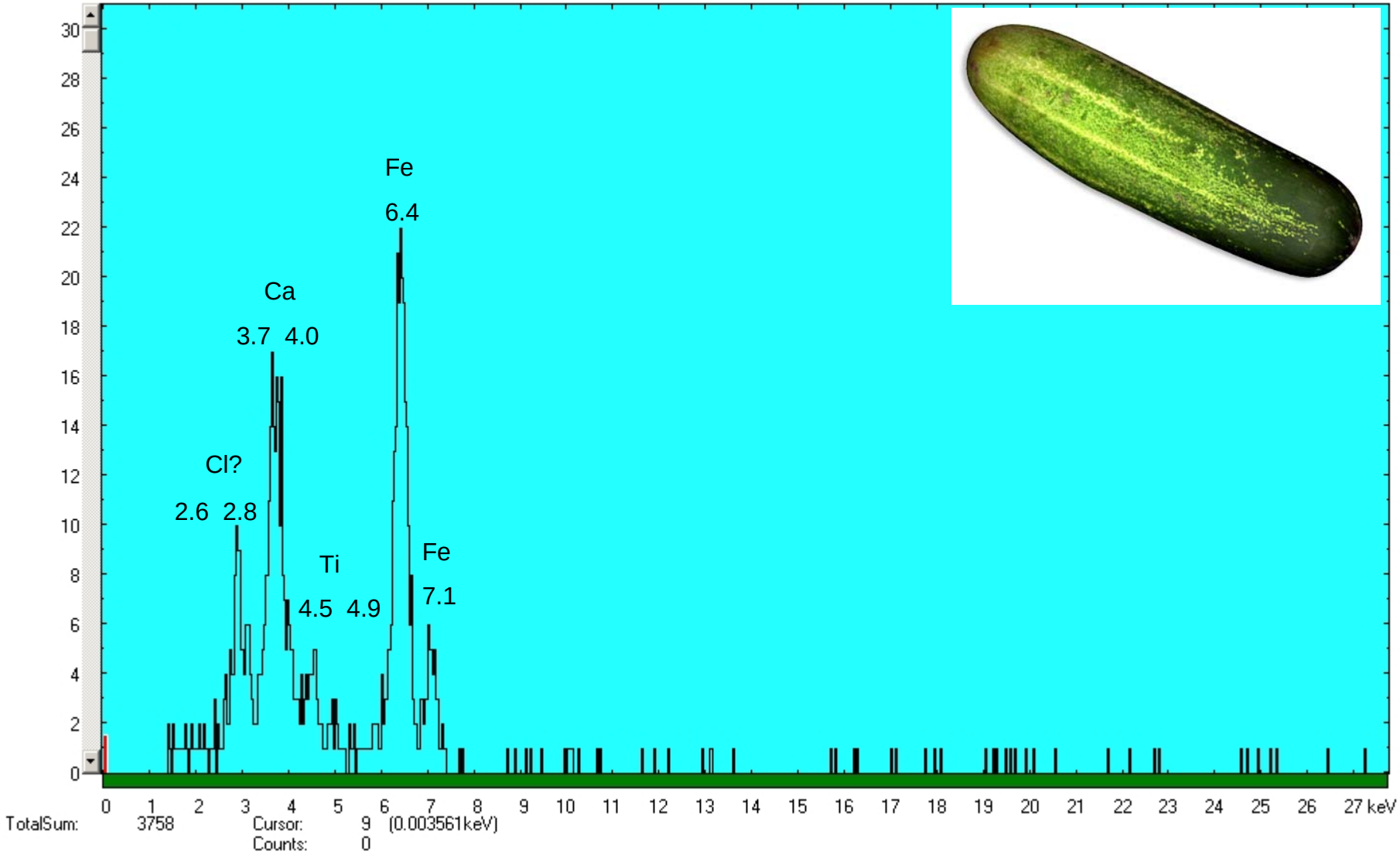
Cucumber Rock (Prof. Lamm's meteorite)

018



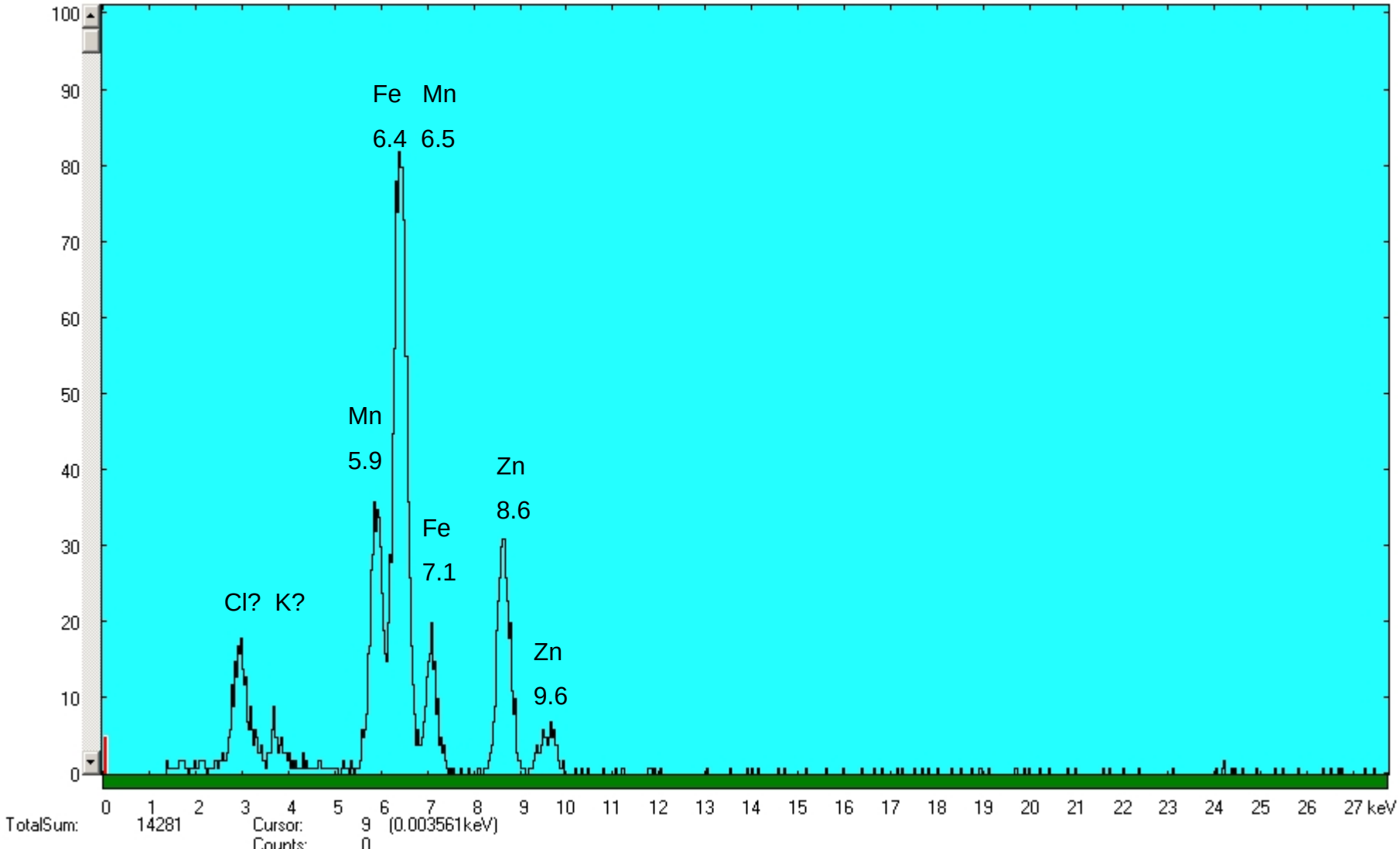
Different spot on Cucumber Rock

019



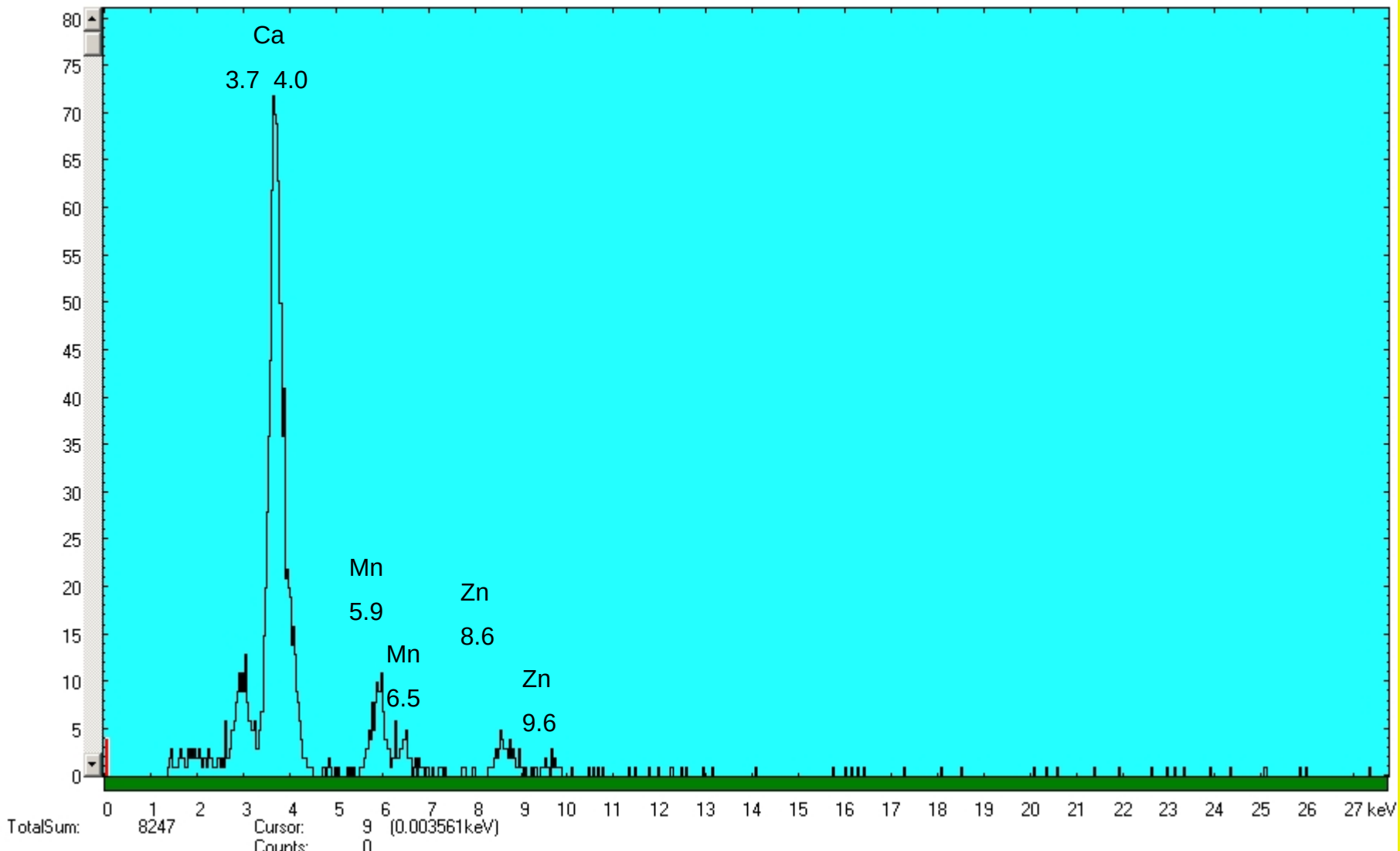
White spot on the Pink Rock

020



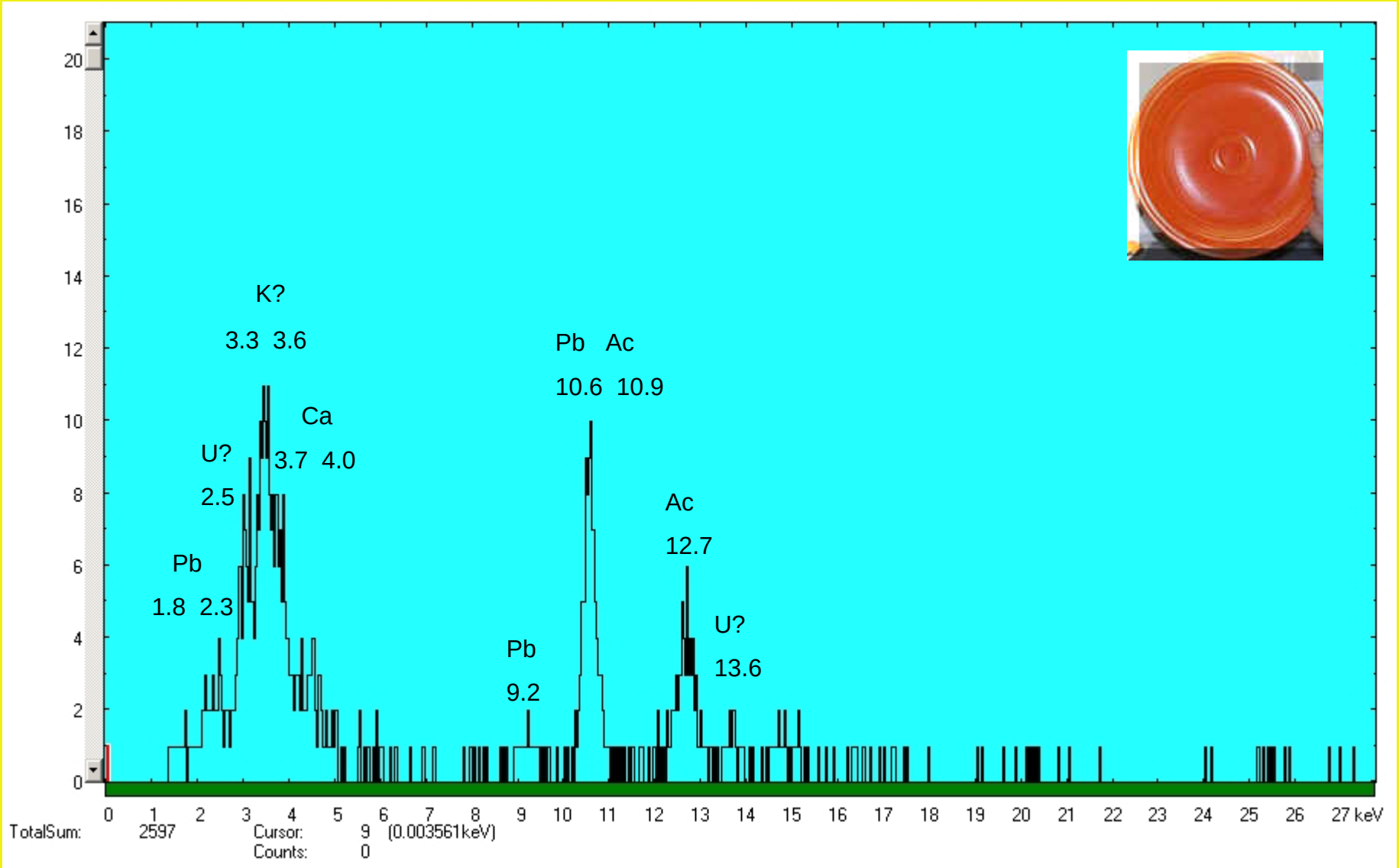
Pink spot on Pink Rock

021



Fiesta Ware (pre-breakage)

022



Thanks to PIXE-PAN…

Decay Lab I:
The fiesta ware's gamma ray signature matched that of a "pure" uranium sample.

Decay Lab II:
We used log paper to graph our exponential data, but the graph still showed a log curve. We're not sure exactly what this indicates, but we suspect it is a profound discovery.

PIXE:
This lab was the most exciting, as we were able to confirm that Emily's class ring contained gold, break a plate, and correctly predict the composition of a Sacagawea dollar.