L’esercitazione: come NON fare

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L'esercizio proposto consiste nell'elaborazione ed analisi di spettri gamma resi disponibili nel 2002 dall'Agenzia Internazionale per l'Energia Atomica nell'ambito di un programma di interconfronto.

IAEA 2002 Test Spectra

Home Page | Test Spectra Page

These spectra were created at the Technical University of Delft by Menno Blaauw and used in the 1995 IAEA intercomparison of software for gamma-ray spectrum analysis. The references to this are below.

Brief details of the spectra are given on the TUD website. There is more detail in the downloadable files. Please note that these spectra, and the associate companion material, are made available to you on this site by permission of Menno Blaauw as a private person, not under the aegis of the IAEA.

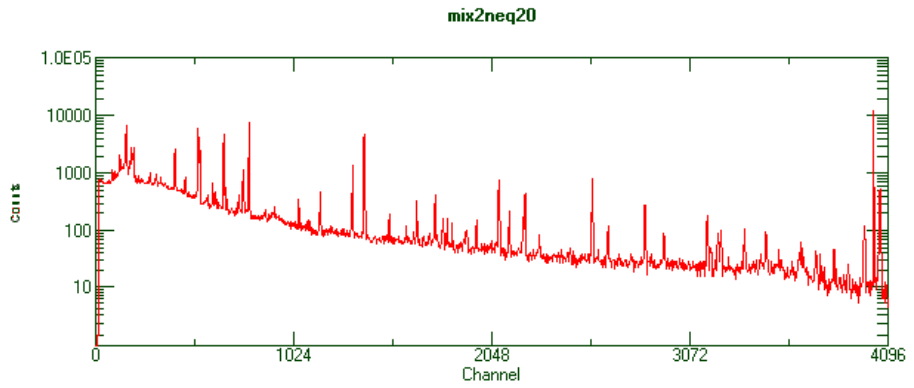
The spectrum set is very comprehensive and this is no place to go into full details. Spectra were created in a variety of different spectrum formats (SPE, CHN and ASC), They were obtained by measuring sources in Marinelli and pillbox geometries. Calibration spectra in both geometries are provided with a number of point source spectra of individual nuclides intended to allow true coincidence summing corrections to be made (in fact, the only set of test spectra to do that). There is also a special calibration spectrum to allow GammaVision to perform those corrections using the algorithms developed by Menno Blaauw and colleagues.

The documentation is very full, with description of the source geometries and copies of the nuclide supplier's calibration certificates. An interesting aside.

The following files are available for download. With the exception of the textual ReadMe file, all are .ZIP files containing all the original files plus converted spectra in the specified format.

- The ReadMe file
- The full Package (1.5 Mb)
- Documentation (pdf 887 kB)
- Publication on the spectra (pdf 67 kB)
- The Intercomparison (pdf 125 kB)

- Primary dowload site



Practical Gamma-Ray Spectrometry

L'esercitazione: come NON fare

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Taratura

	E (keV)	P %	T1/2
AM-241	59.5409 (1)	35.92 (17)	432.6 (6) a
CD-109	88.0336 (10)	3.66 (5)	461.9 (4) d
CO-57	122.06065 (12)	85.49 (14)	271.81 (4) d
CO-57	136.47356 (29)	10.71 (15)	271.81 (4) d
CE-139	165.8575 (11)	79.90 (4)	137.641 (20) d
HG-203	279.1952 (10)	81.48 (8)	46.594 (12) d
SN-113	391.698 (3)	64.97 (17)	115.09 (3) d
CS-134	563.246 (3)	8.342 (15)	2.0644 (14) a
CS-134	569.330 (2)	15.368 (21)	2.0644 (14) a
CS-134	604.720 (3)	97.63 (8)	2.0644 (14) a
CS-137	661.657 (3)	84.99 (20)	30.05 (8) a
CS-134	795.86 (1)	85.47 (9)	2.0644 (14) a
CS-134	801.950 (6)	8.694 (16)	2.0644 (14) a
MN-54	834.848 (3)	99.9752 (5)	312.19 (3) d
Y-88	898.042 (11)	93.7 (3)	106.63 (5) d
ZN-65	1 115.539 (2)	50.22 (11)	244.01 (9) d
CS-134	1 365.194 (4)	3.019 (8)	244.01 (9) d
Y-88	1 836.070 (8)	99.346 (25)	106.63 (5) d

http://www.nucleide.org/DDEP_WG/DDEPdata.htm
http://www.nucleide.org/Laraweb/index.php

6200

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

CERTIFICATE OF CALIBRATION
Standard Radionuclide Source

64922A-11

100 mL Solid in 125 mL PP Nalgene Jar

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. The Am-241 was calibrated by liquid scintillation counting. All other radionuclides were calibrated in an ion chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

U.S. Patent 4,430,258; U.K. Patent GB2,149,194B; CA. Patent 1,196,776.
Density of solid matrix 1.15 g/cc.

CALIBRATION DATE: November 1, 2002 12:00 EST

ISOTOPE	ACTIVITY (dps)	HALF-LIFE	TOTAL UNCERTAINTY (%)	SYSTEMATIC UNCERTAINTY (%)	RANDOM UNCERTAINTY (%)
Am-241	5403	4.322 E2 y	5.0	4.0	1.0
Cd-109	63190	462.6 d	5.0	4.7	0.3
Ce-139	2136	137.6 d	5.0	4.7	0.3
Co-57	1424	271.79 d	5.0	4.7	0.3
Cs-134	8909	754.2 d	5.0	4.7	0.3
Cs-137	1782	3.007 E1 y	4.8	4.5	0.3
Hg-203	4297	46.61 d	5.0	4.7	0.3
Mn-54	2519	312.1 d	5.0	4.7	0.3
Sn-113	3853	115.1 d	5.0	4.7	0.3
Y-88	6306	106.6 d	5.0	4.7	0.3
Zn-65	5142	244.3 d	5.0	4.7	0.3

*99% confidence level.

Impurities: γ-impurities <0.1%

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Campione

	E (keV)	P %	T1/2
BA-133	80.9979 (11) *	35.94 (36)	10.539 (6) a
EU-152	121.7817 (3)	28.41 (13)	13.522 (16) a
EU-152	244.6974 (8)	7.55 (4)	13.522 (16) a
BA-133	302.8508 (5)	18.31 (11)	10.539 (6) a
CR-51	320.0835 (4)	9.89 (2)	27.704 (4) d
EU-152	344.2785 (12)	26.59 (12)	13.522 (16) a
BA-133	356.0129 (7)	62.05 (19)	10.539 (6) a
BA-133	383.8485 (12)	8.94 (6)	10.539 (6) a
EU-152	411.1165 (12)	2.238 (10)	13.522 (16) a
EU-152	443.965 (3)	3.120 (28)	13.522 (16) a
EU-152	778.9045 (24)	12.97 (6)	13.522 (16) a
EU-152	867.380 (3)	4.243 (23)	13.522 (16) a
EU-152	964.079 (18)	14.50 (6)	13.522 (16) a
EU-152	1 085.837 (10)	10.13 (6)	13.522 (16) a
EU-152	1 089.737 (5)	1.73 (1)	13.522 (16) a
EU-152	1 112.076 (3)	13.41 (6)	13.522 (16) a
CO-60	1 173.228 (3)	99.85 (3)	5.2711 (8) a
EU-152	1 212.948 (11)	1.416 (9)	13.522 (16) a
NA-22	1 274.537 (7)	99.94 (13)	2.6029 (8) a
EU-152	1 299.142 (8)	1.633 (9)	13.522 (16) a
CO-60	1 332.492 (4)	99.9826 (6)	5.2711 (8) a
EU-152	1 408.013 (3)	20.85 (8)	13.522 (16) a

* 33.31 (30) +2.63 (19)

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CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

64924A-11

100 mL High Density Solid in 125 mL PP Nalgene Jar

This standard radionuclide source was prepared gravimetrically from calibrated master solutions. The Eu-152 was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 25200. All other radionuclides were calibrated in an ion chamber that was calibrated by the National Physical Laboratory, Teddington, U.K., and is directly traceable to national standards.

Radionuclide purity and calibration were checked by germanium gamma-ray spectrometry and liquid scintillation counting. The nuclear decay rate and assay date for this source are given below.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

Density of solid matrix 1.6 g/cc.

CALIBRATION DATE: November 1, 2002 12:00 EST

ISOTOPE	ACTIVITY (dps)	HALF-LIFE	TOTAL UNCERTAINTY (%)
Ba-133	1253	10.54 y	5.0
Co-60	799	5.271 y	5.0
Eu-152	2827	1.352 E1 y	5.0
Cr-52	7827	27.70 d	5.0
Na-22	1063	950.4 d	5.0

*99% confidence level.

Impurities: γ-impurities <0.1%

Page 1 of 2

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BIG Deotetor.

QUALITY ASSURANCE DATA SHEET

GEM Series HPGe (High-Purity Germanium) Coaxial Detector System

Model and Serial Numbers

Detector Model No. GEM-90210-P

Cryostat Configuration Pop Top

Dewar Model —

Important Reference Data

Ship Date 12-11-90

Serial No. 30-TPH0190A

When calling Customer Service, always reference this Detector Serial No.

Cryogenic Information

Dewar Capacity — Static Holding Time — Detector Cool-Down Time 12 Hrs.

Dimensions

Crystal Diameter 75.5 mm

Crystal Length 97.1 mm

End Cap to Crystal 4 mm

Total Active Volume — cc

Absorbing Layers

Aluminum 1.0 mm

Inactive Germanium 0.7 mm

High Voltage Bias

Recommended Operating Bias, POSITIVE 3500 V

Performance Specifications*

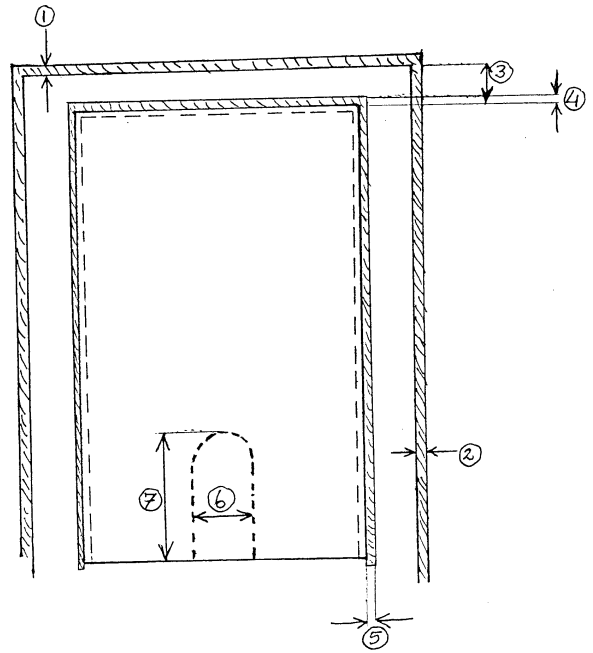
	Warranted	Measured	Amplifier Time Constant
Resolution (FWHM) at 1.33 MeV, ^{60}Co	2.10 keV	1.82 keV	6 µs
Peak-to-Compton Ratio, ^{60}Co	80:1	97.1	6 µs
Relative Efficiency at 1.33 MeV, ^{60}Co	90 %	96.3 %	6 µs
Peak Shape (FWTM/FWHM), ^{60}Co	2.00	1.84	6 µs
Peak Shape (FWFM/FWHM), ^{60}Co	3.00	2.41	6 µs
Resolution (FWHM) at 122 keV, ^{57}Co	1200 eV	964 eV	

Other Capsule NUCA #1854
Cryo PH-2 #2332

Data Certified By GBarrow Date 12-11-90

*Measured at a nominal rate of 1000 counts/s unless otherwise specified.

Wanted specifications



1mm ① thickness top of end_cap

1.6mm ② thickness side of end_cap

4mm ③ distance from inside end_cap to top of crystal

0,05mm ④ thickness top of mounting-cup

0,5mm ⑤ thickness side of mounting-cup

10,85mm ⑥ width of removed core

85.3 ⑦ height of removed core

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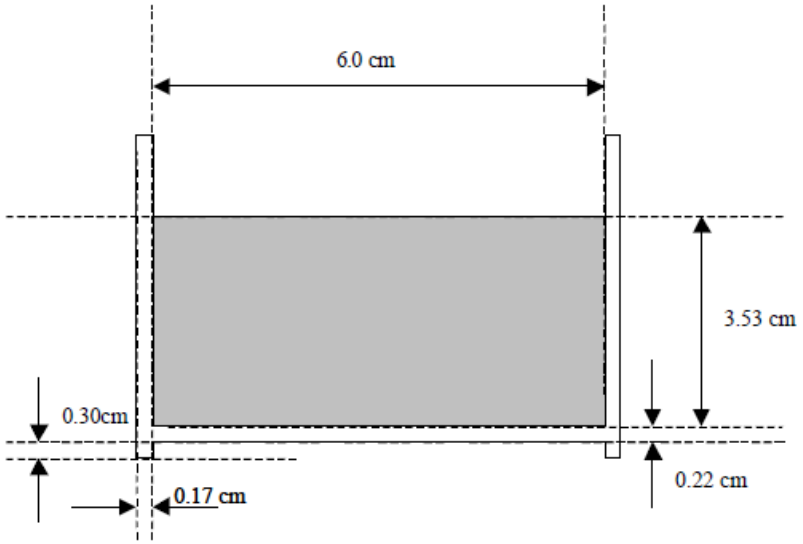

Sono inoltre forniti gli spettri delle sorgenti puntiformi di radionuclidi mono-gamma emettitori di cui alcuni software necessitano per potere effettuare la taratura "peak-to-total" necessaria per implementare l'algoritmo che esegue le correzioni per somma in coincidenza.

Campione

Densità: 1.6 g/cm3

Composizione chimica: C 40.5% - H 2.85% - O 35.6% - Ca 21% (poliestere + carbonato di calcio)

Taratura

Densità: 1.15 g/cm3

Composizione chimica: C 72.1% - H 6.0% - O 21.9% (poliestere)

L'esercitazione: come NON fare

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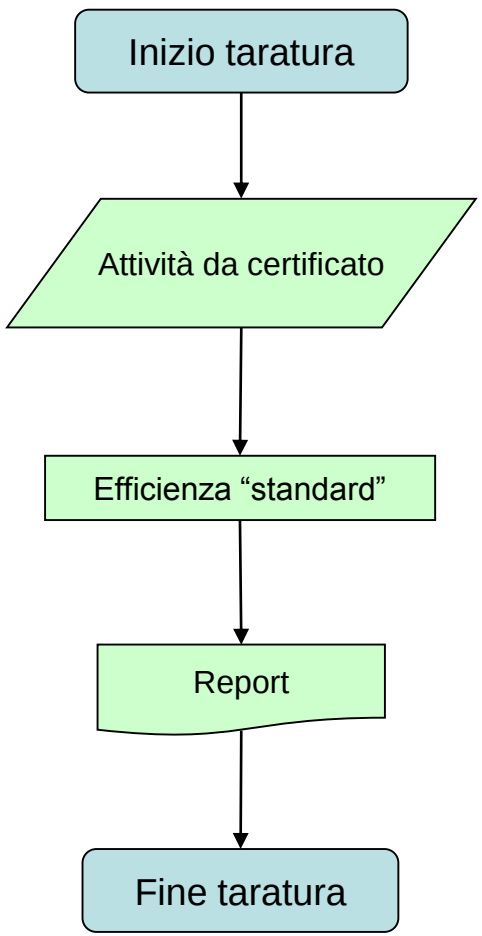

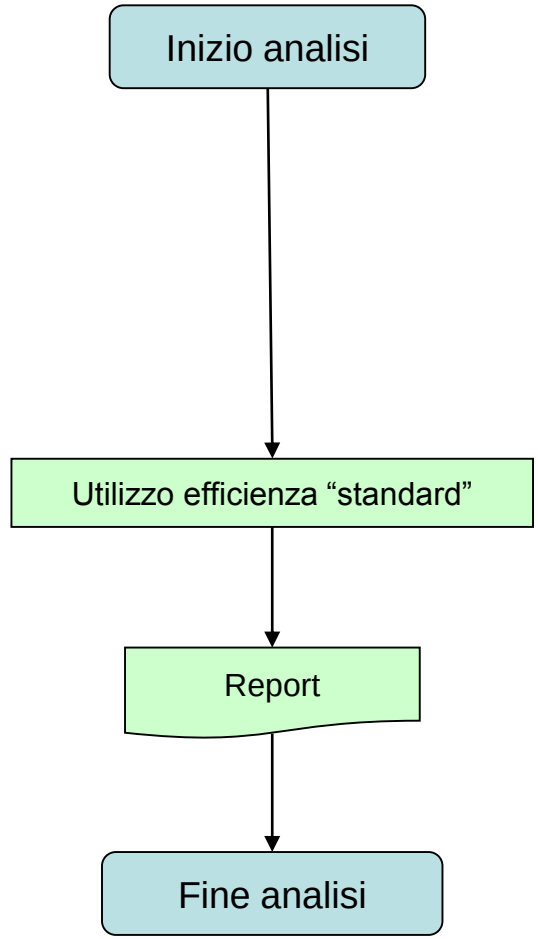

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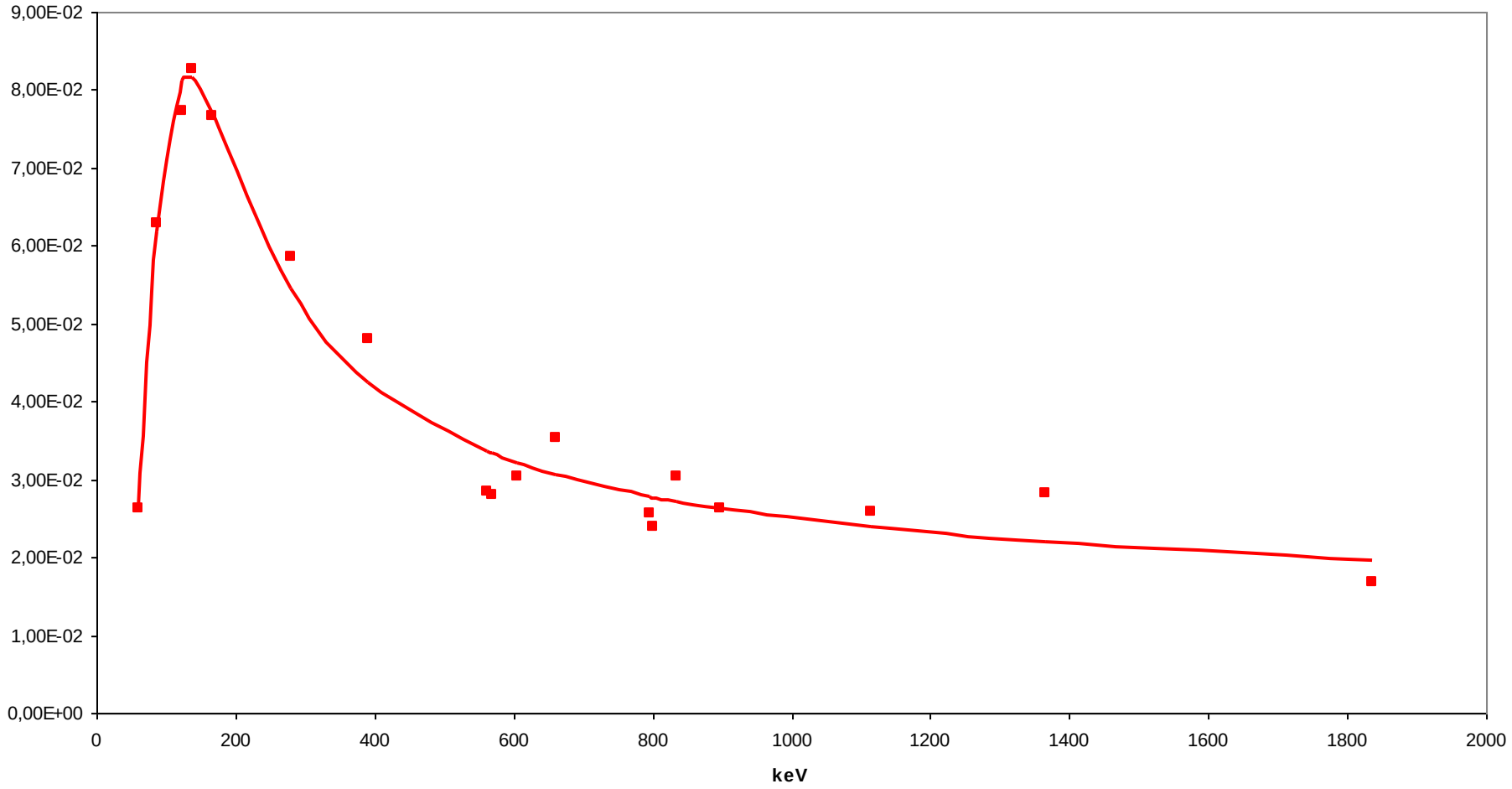

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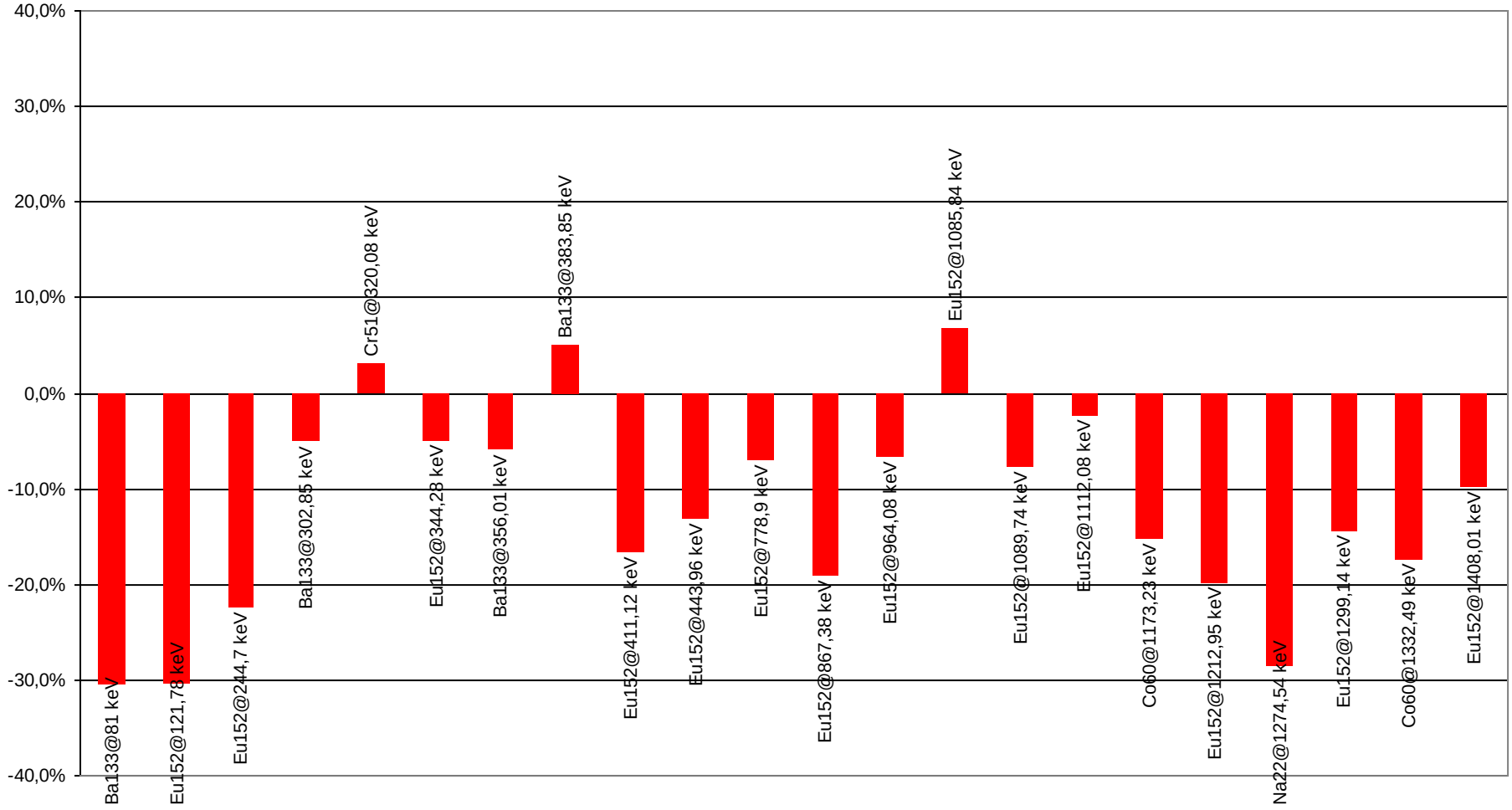
Campione



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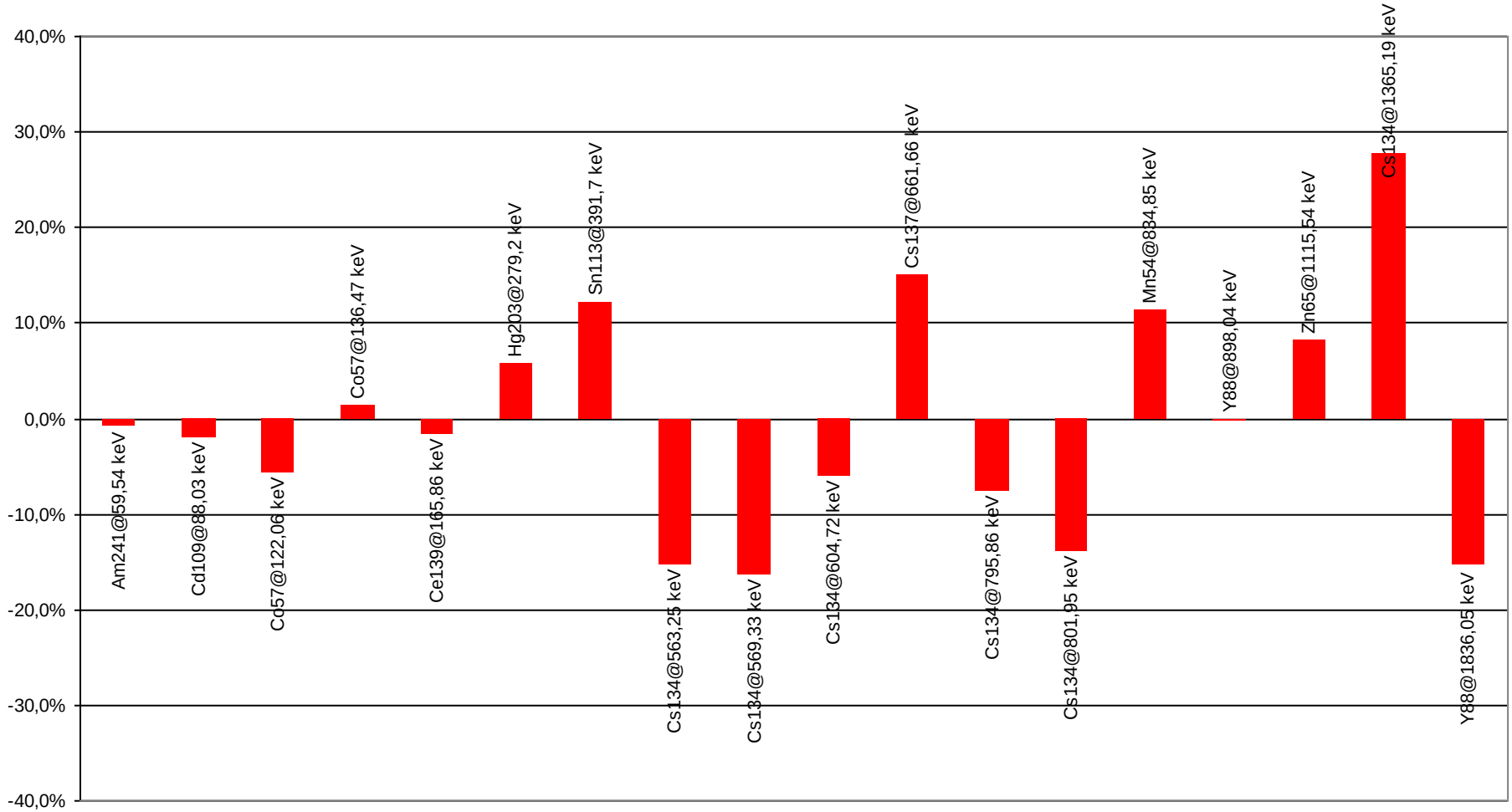
Taratura



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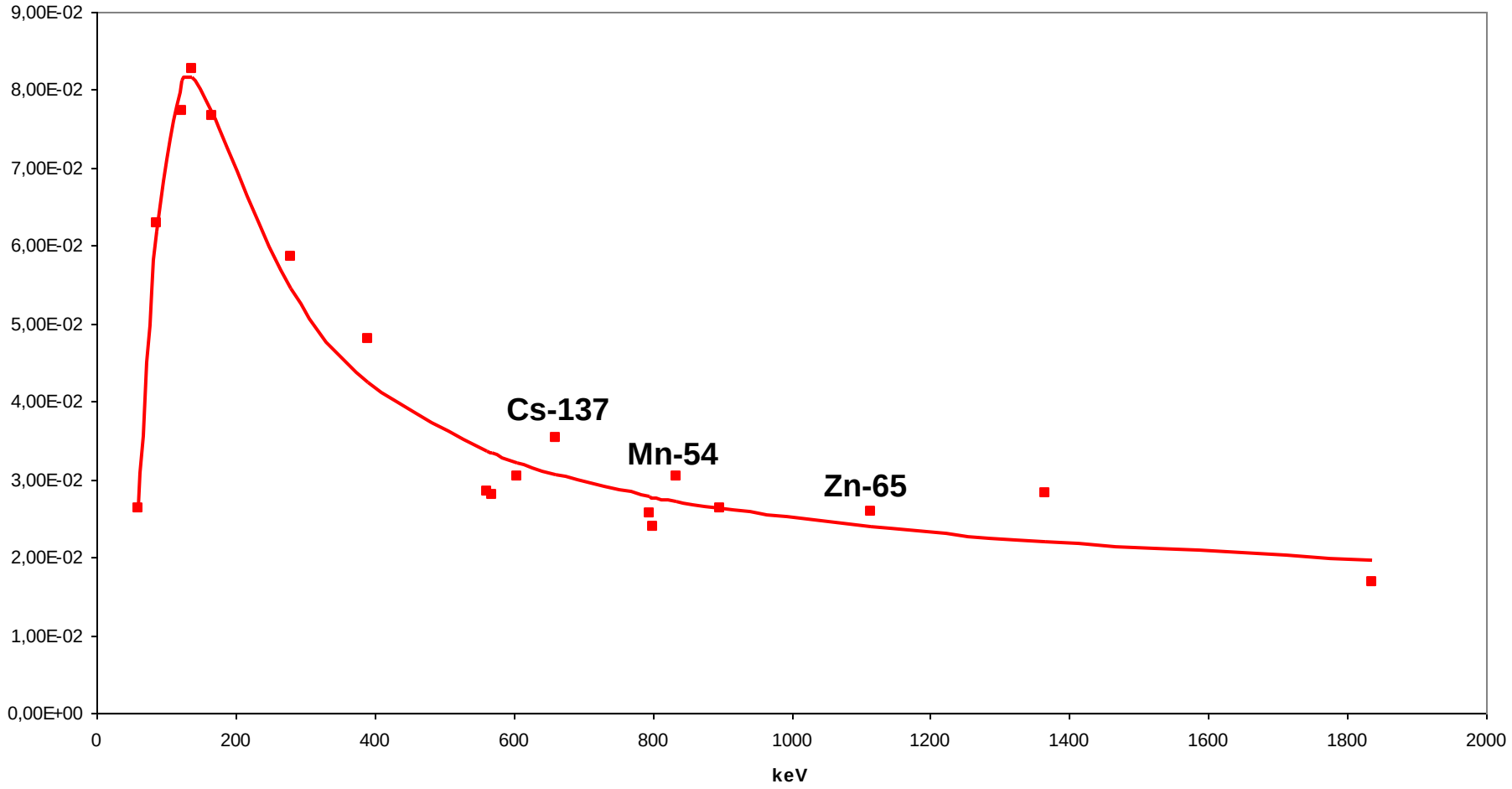

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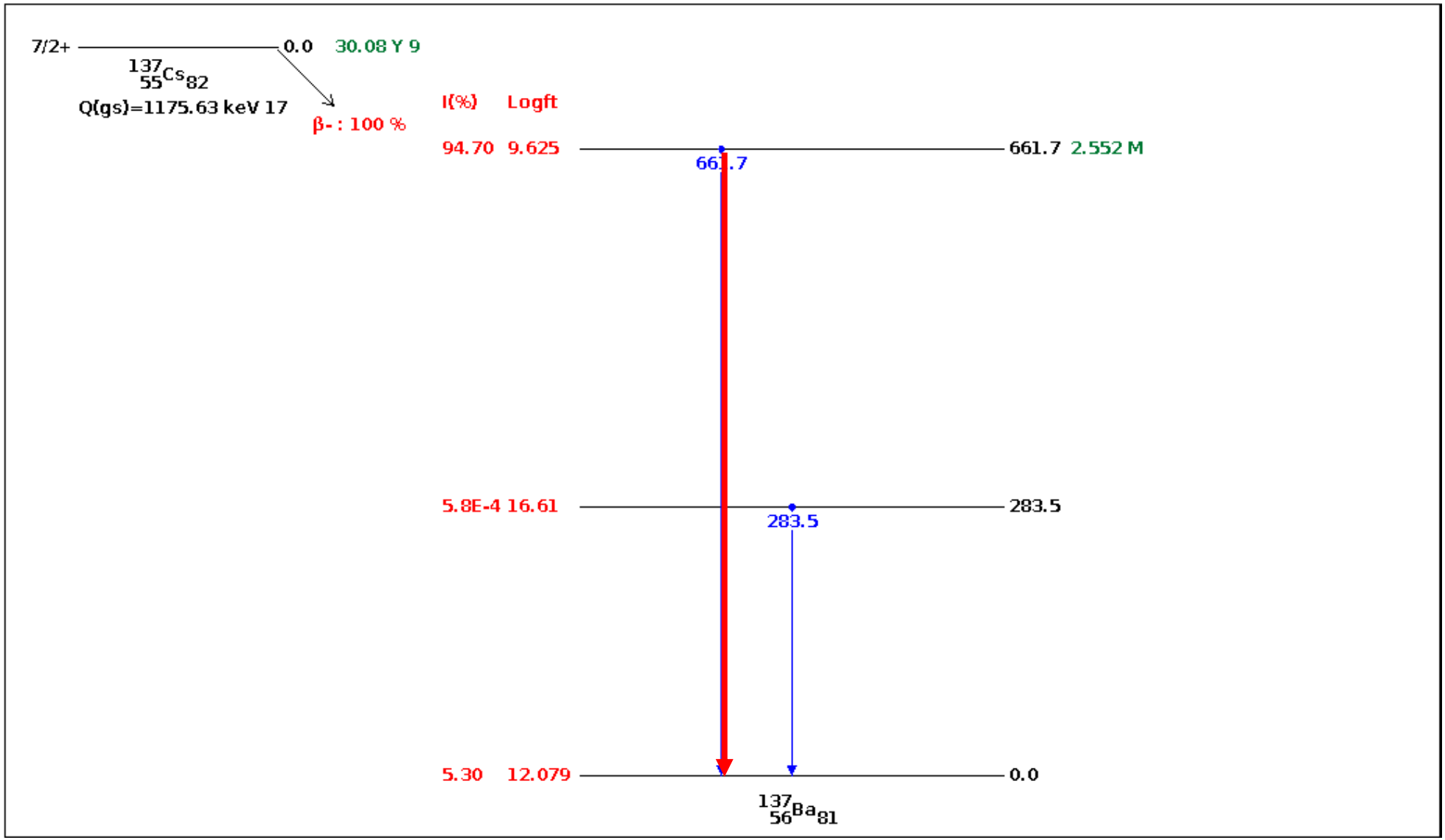

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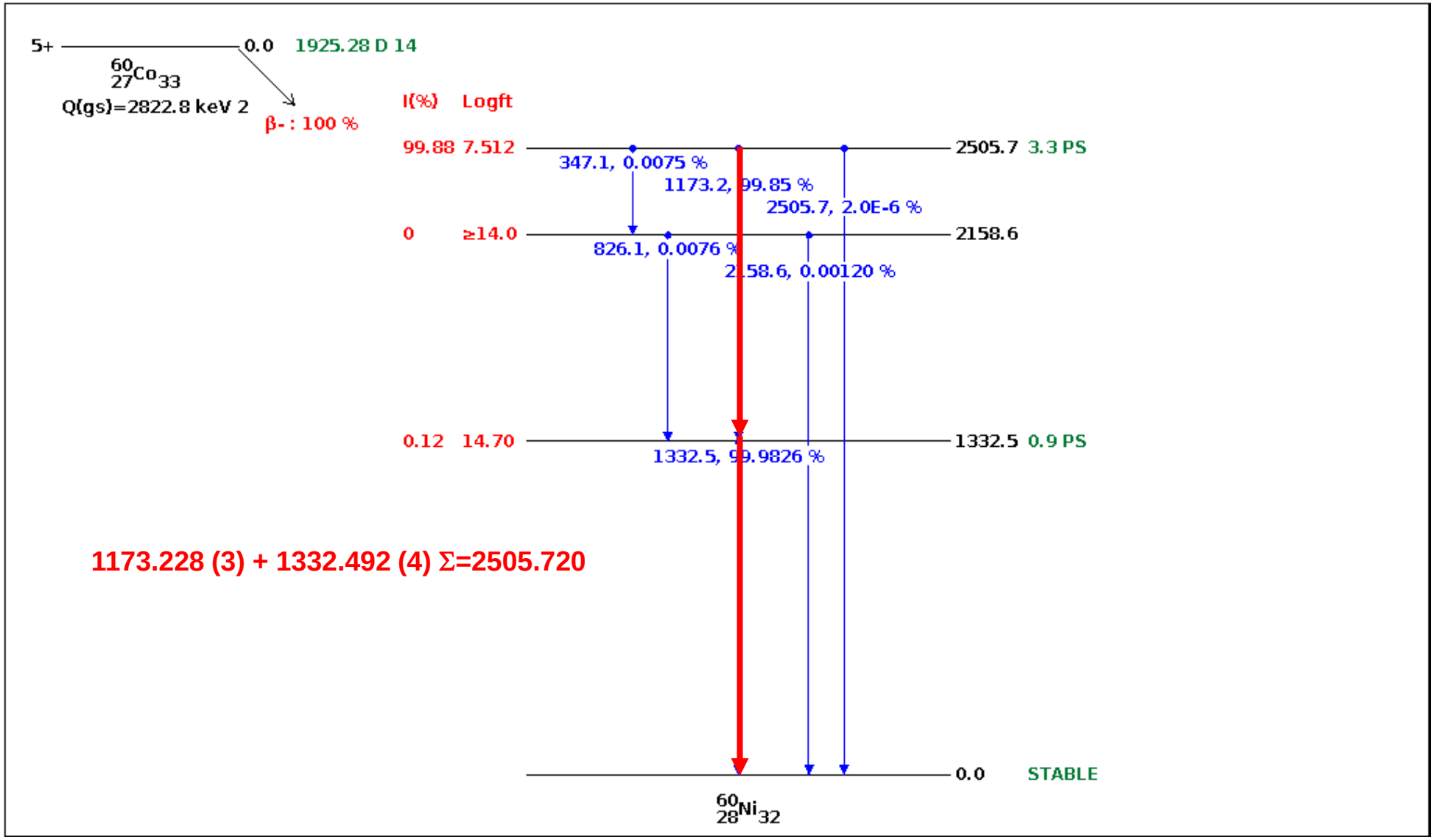

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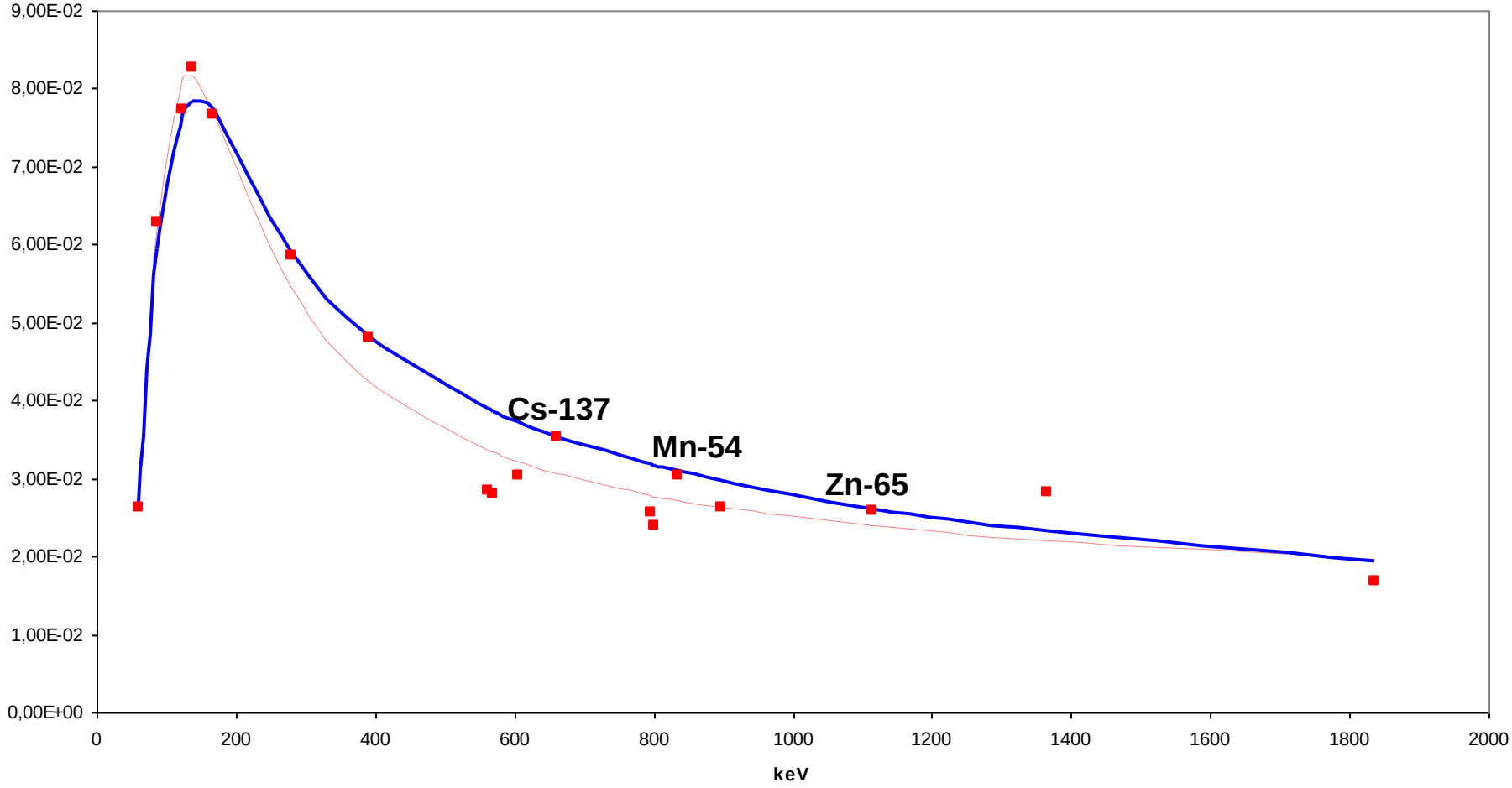

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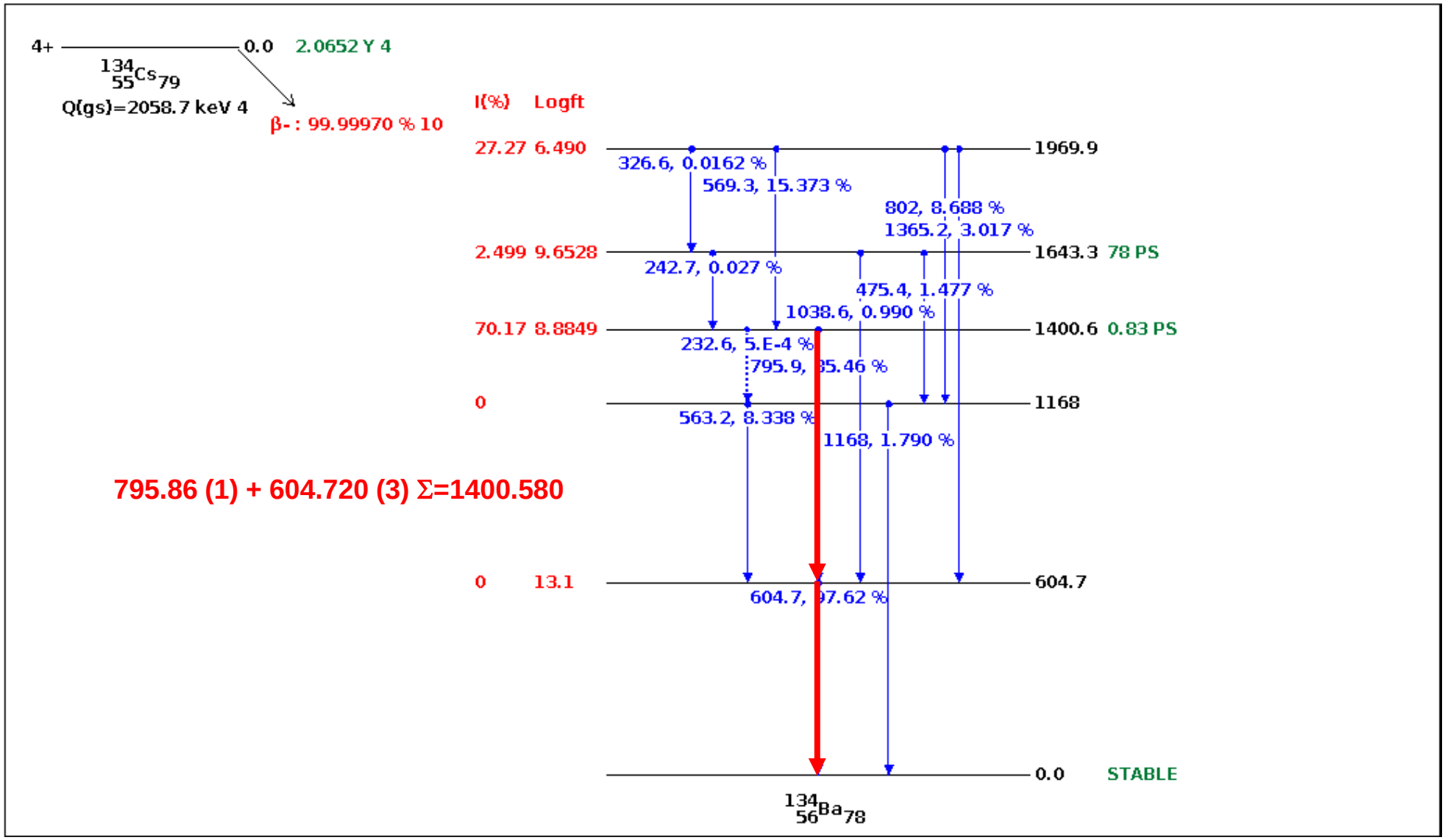

795.86 (1) + 604.720 (3) Σ=1400.580

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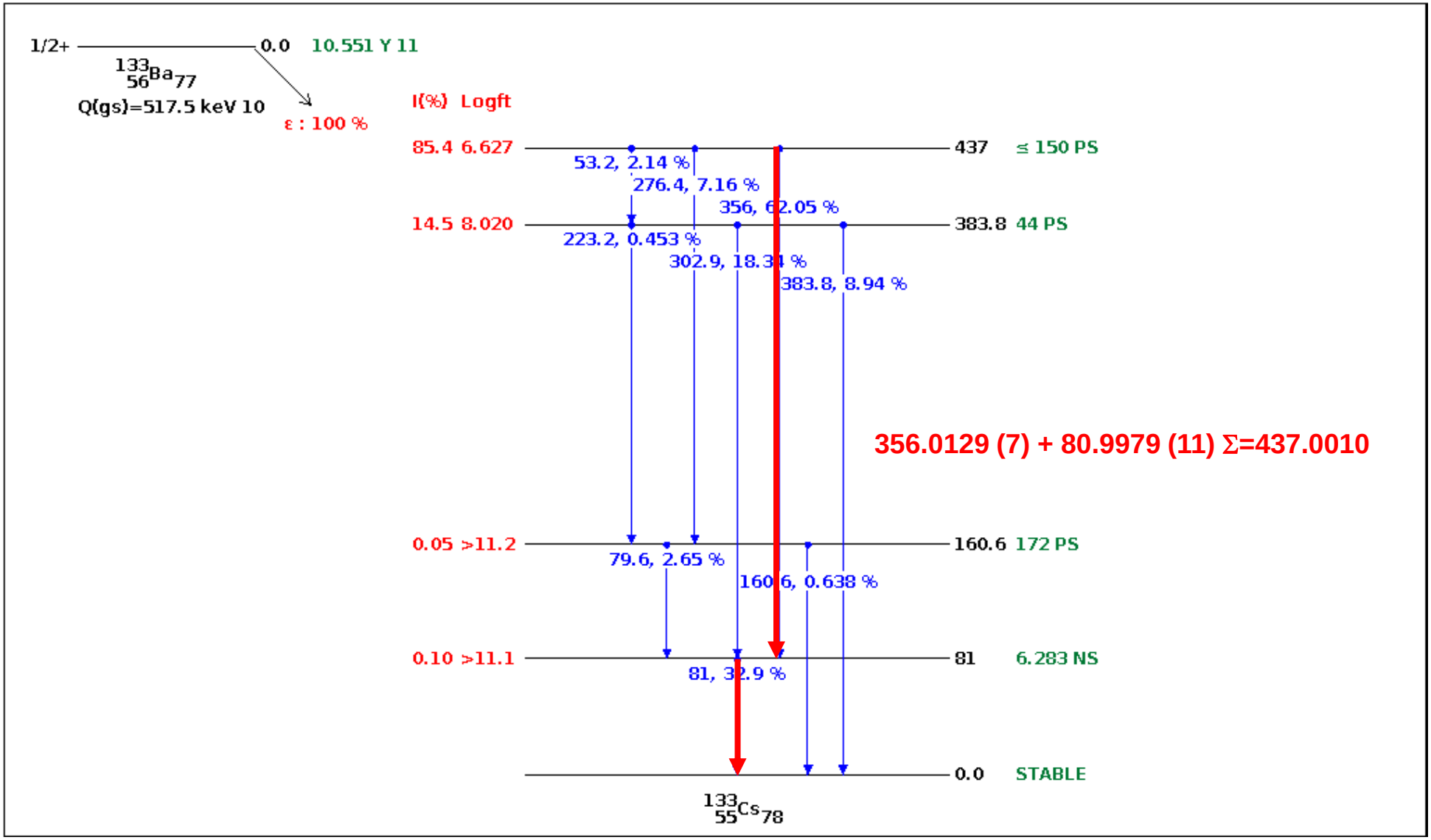

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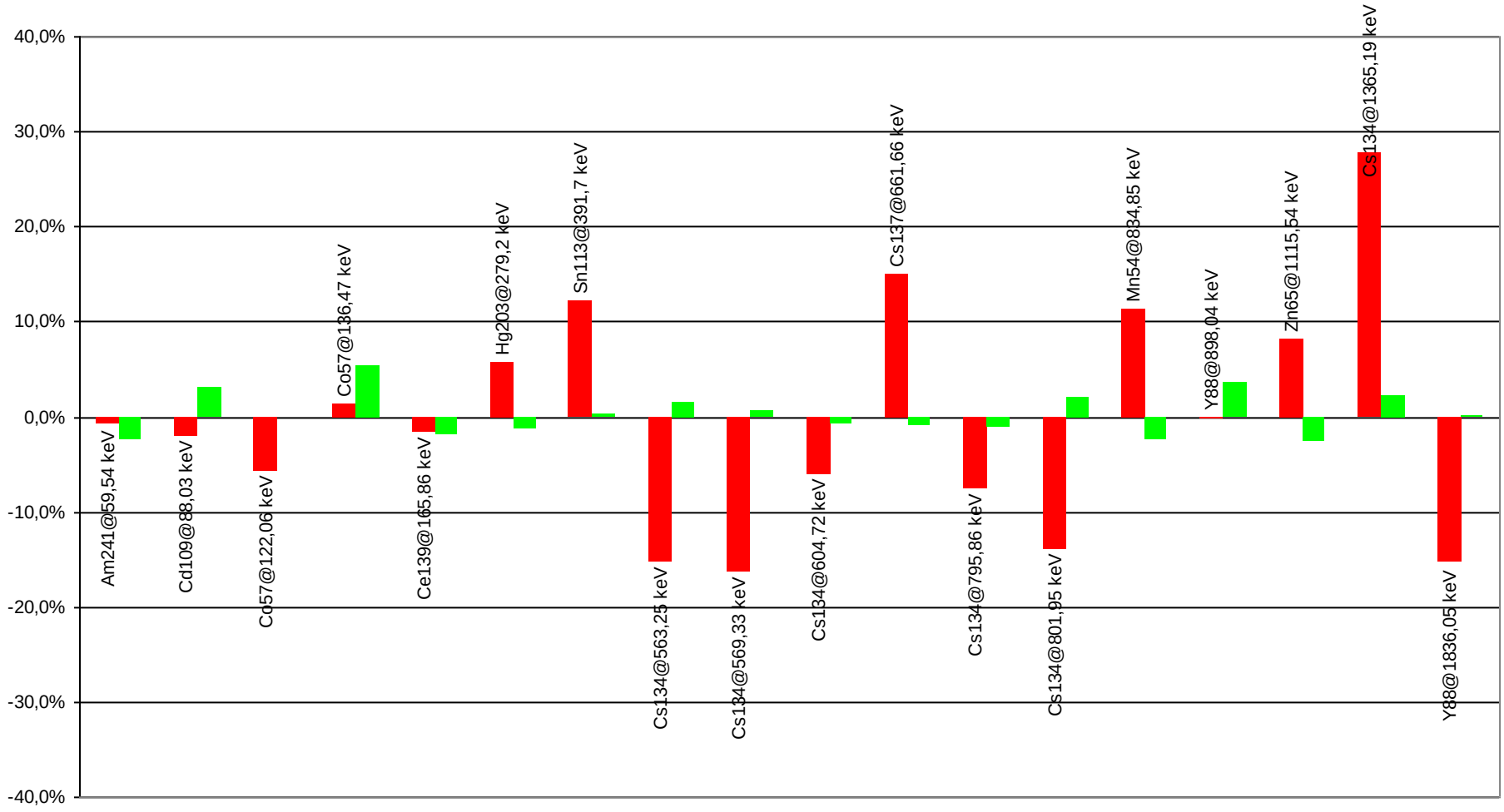

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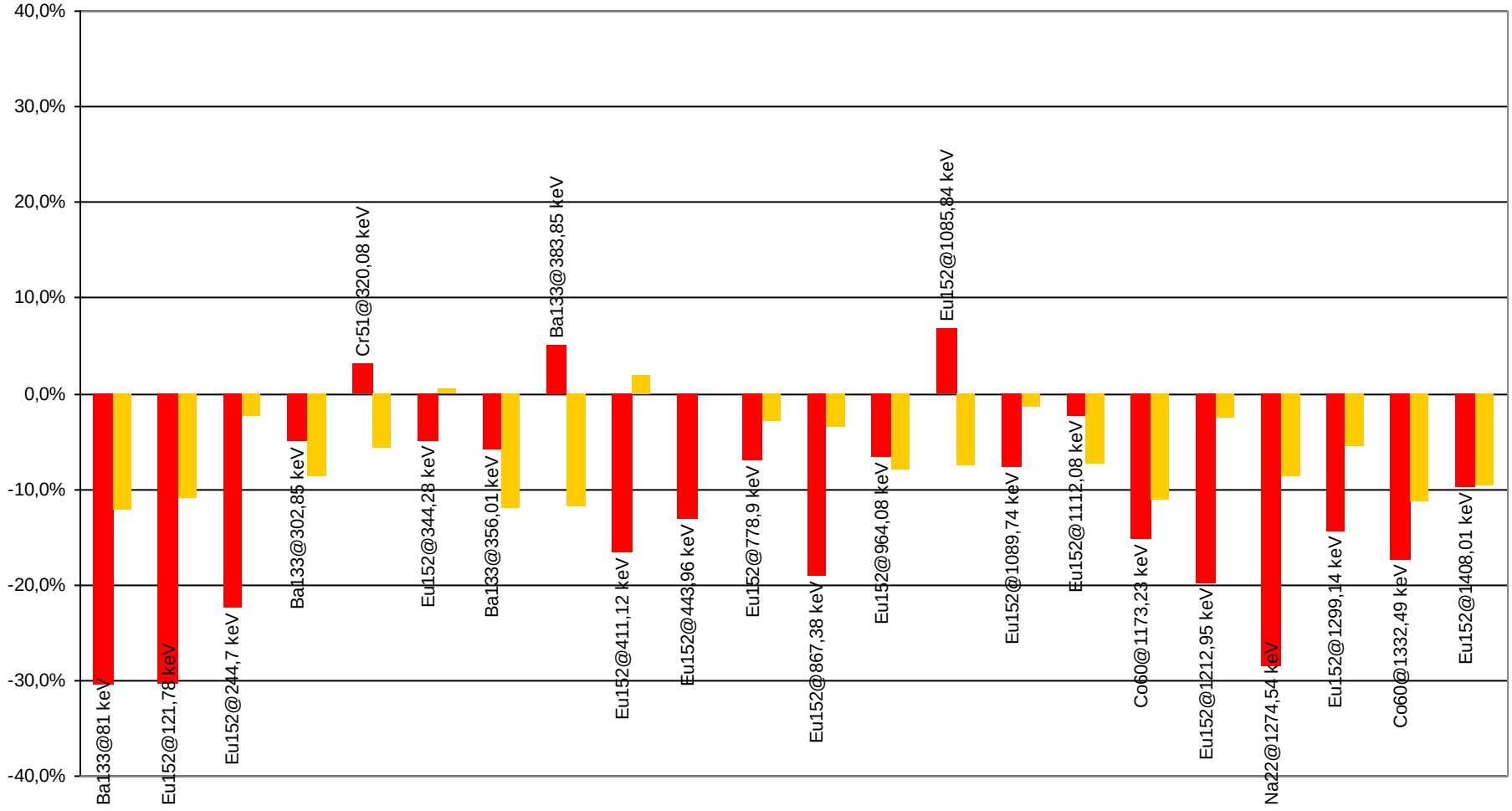
Campione



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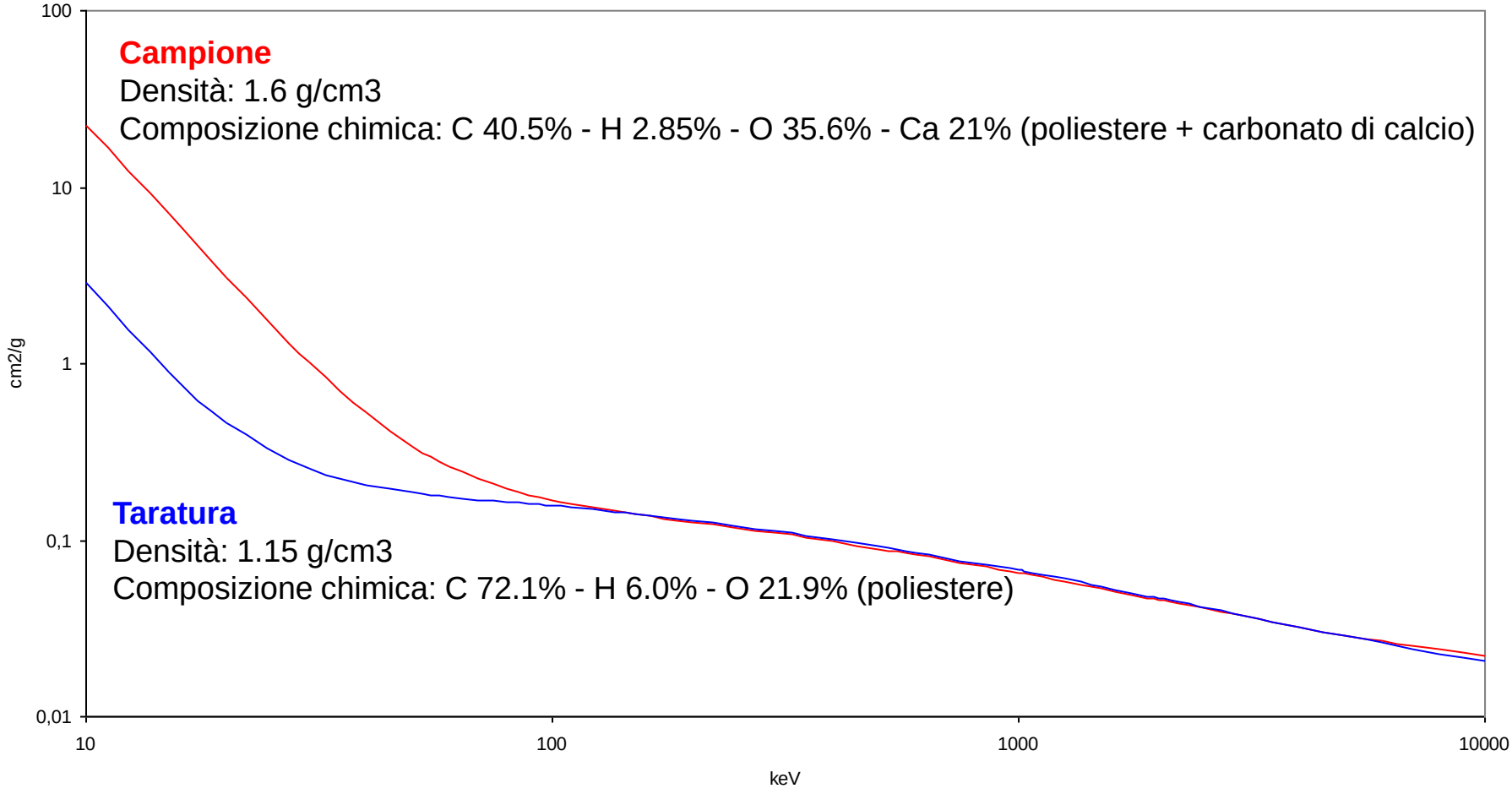

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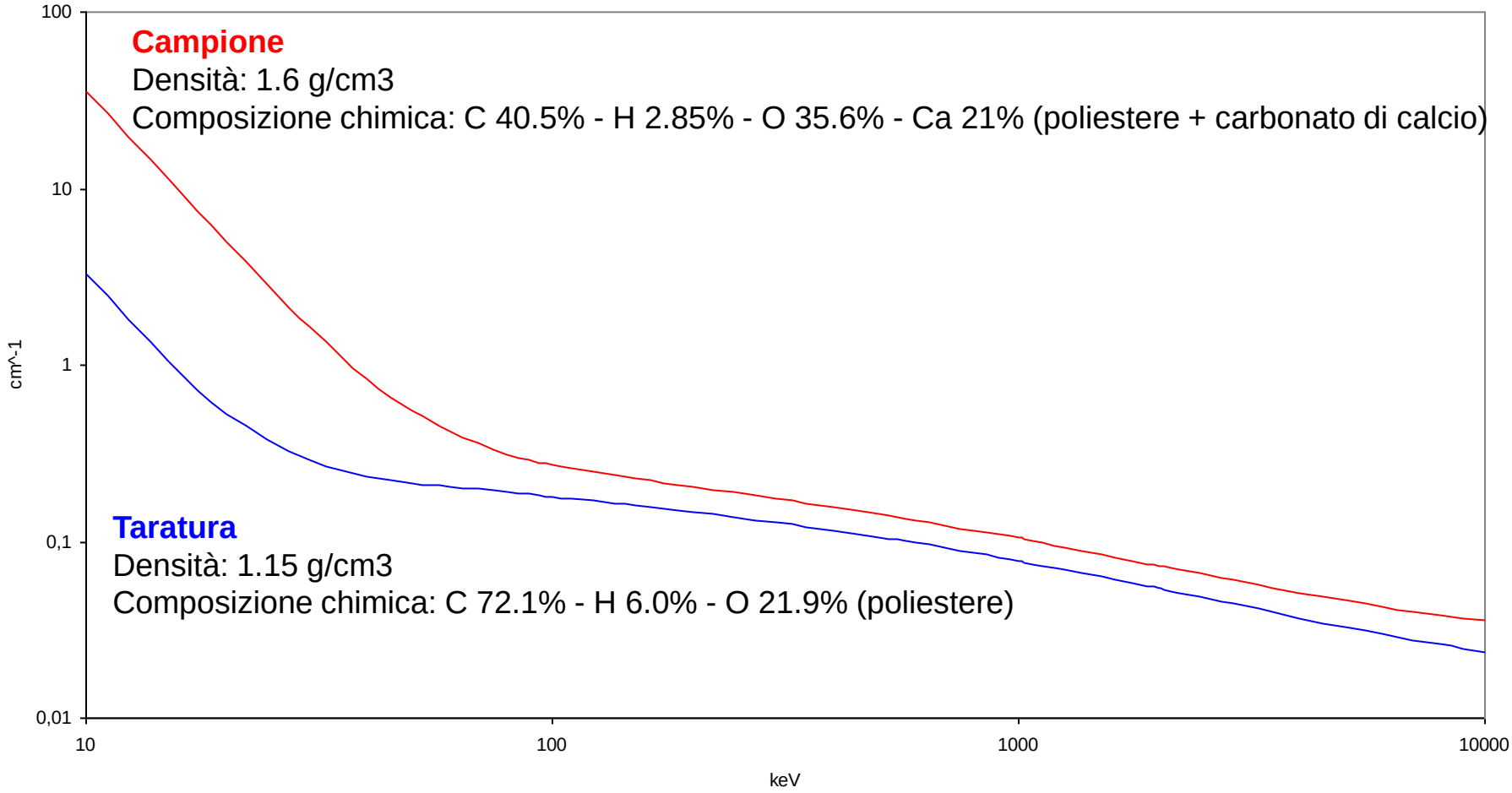

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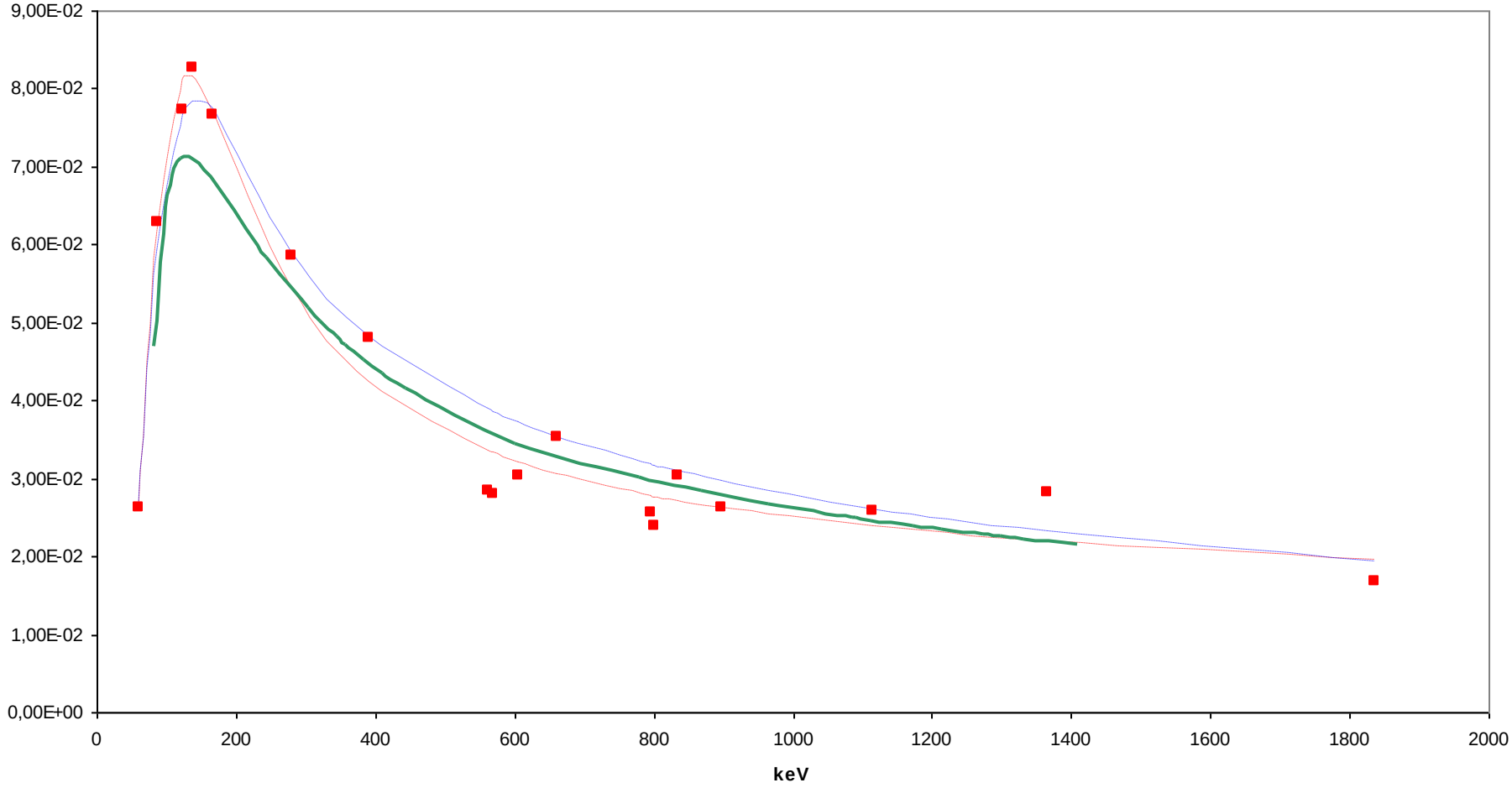

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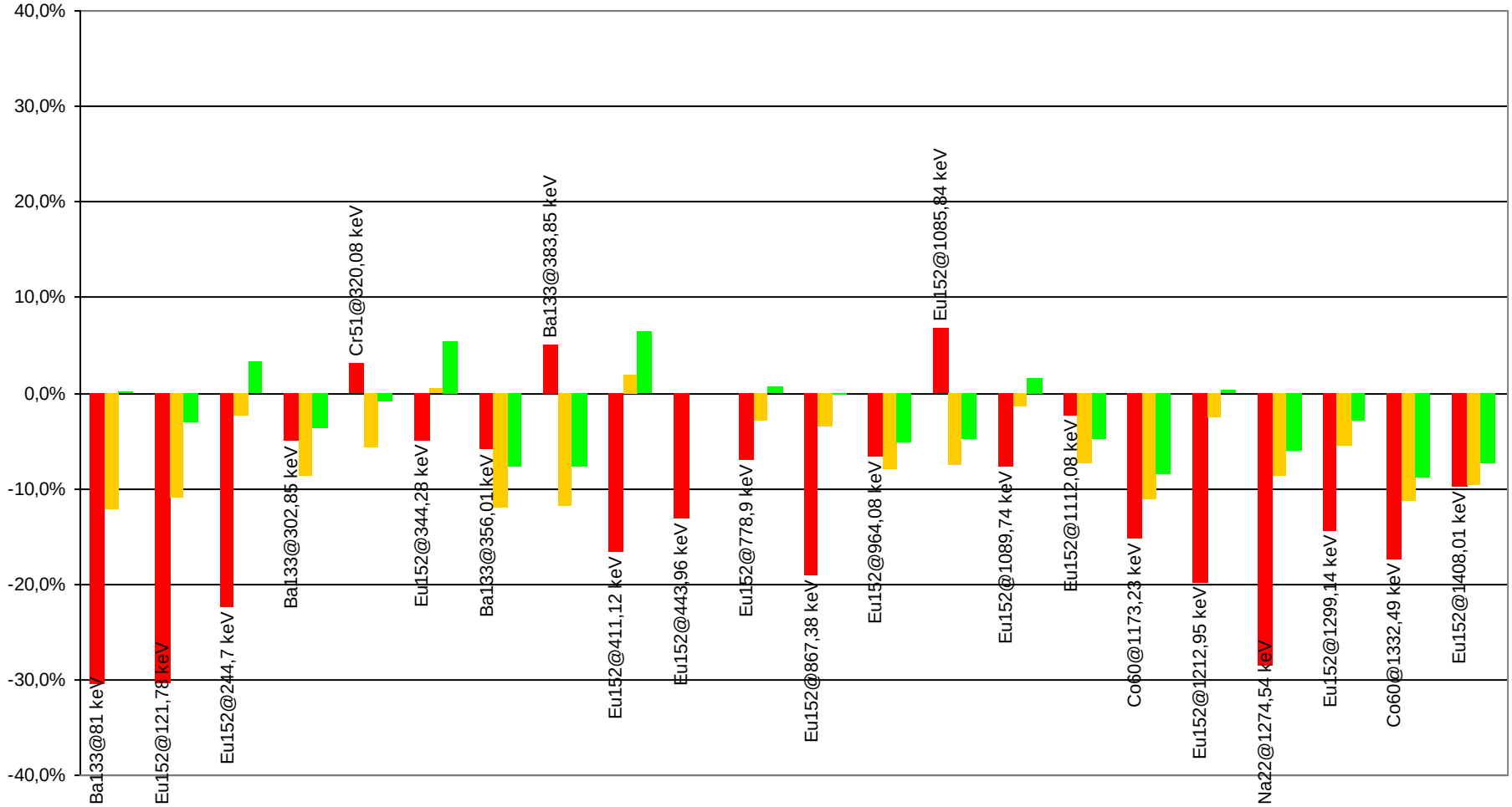

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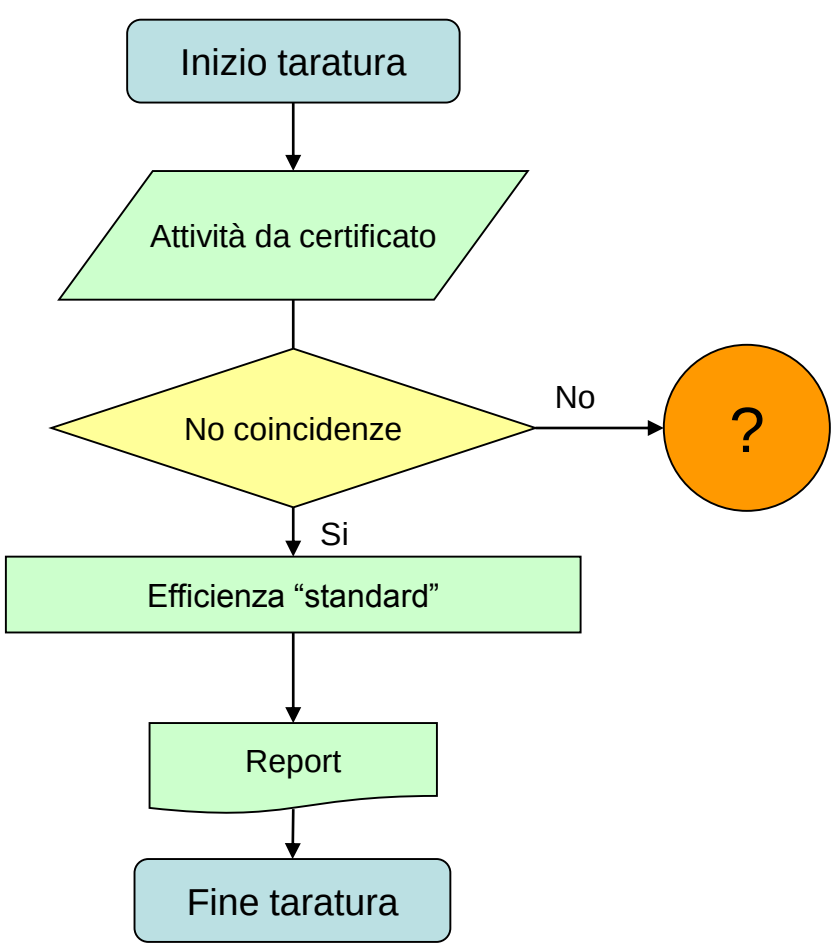

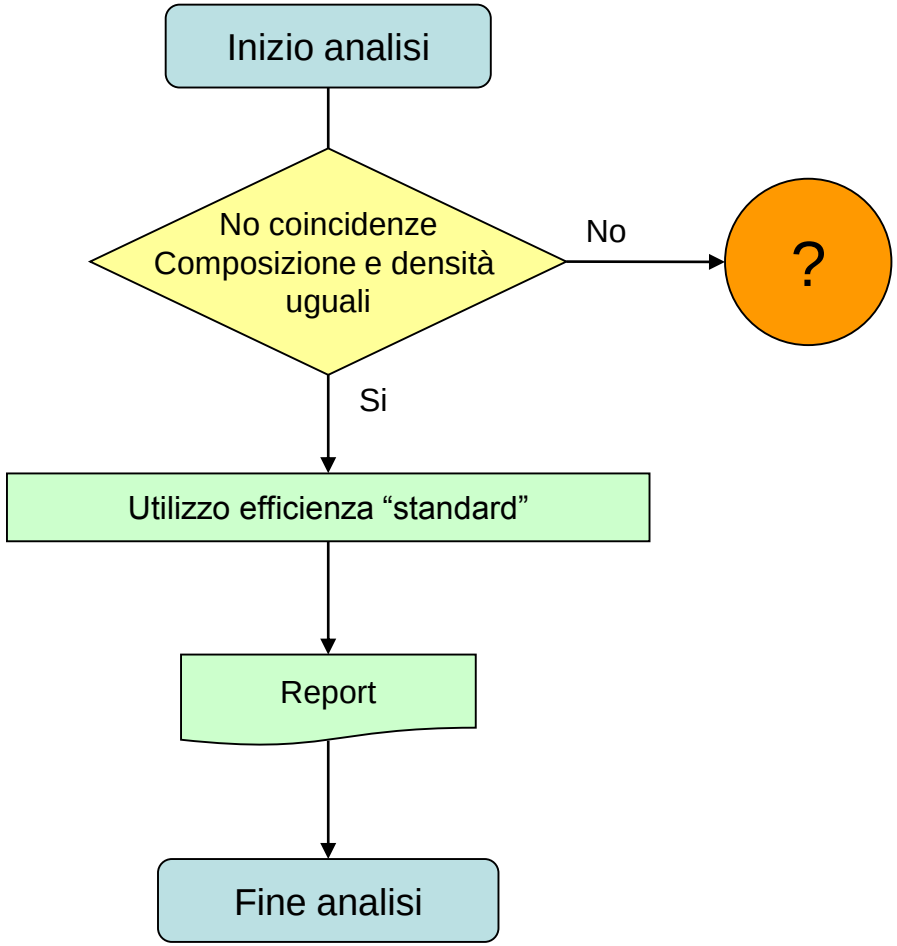

L'esercitazione: come NON fare

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Campione diverso dalla sorgente

Scarti sulla singola emissione fino al 30%

Somma per coincidenza

Scarti sulla singola emissione fino al 20%

Differenti composizioni chimiche e densità

Scarti sulla singola emissione fino al 10%

Le mancate correzioni hanno effetto anche sui limiti di rivelabilità