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Decay data evaluator

Job : to produce evaluated data which will be proposed in various Tables of Radionuclides, more especially in the Monographie BIPM-5

For that :

- Look for, read, try to understand all available papers published in scientific journals
- Extract the available measured values, compare them as well as their respective uncertainty

In order to derive the evaluated value.

BUT, we have often some problems:

- Some uncertainties are drastically lower than the others,
- Detailed budget of uncertainty is not given,
- No clear explanations of these low uncertainties given in the paper,
- etc.

➡ This GS WG is the opportunity to ask you some questions and to express some wishes

Questions about:

- uncertainties
- Some results

Wishes about:

- Budget of uncertainties
- The way to present measurement results

Example for the same nuclide and the same gamma line:

Lab	Uc on Efficiency calibration, in %
A	0,5
B	0,2
C	0,07
D	1,2

These results were obtained by well-known laboratories, using the same kind of measurement set-ups and at the same period of time.

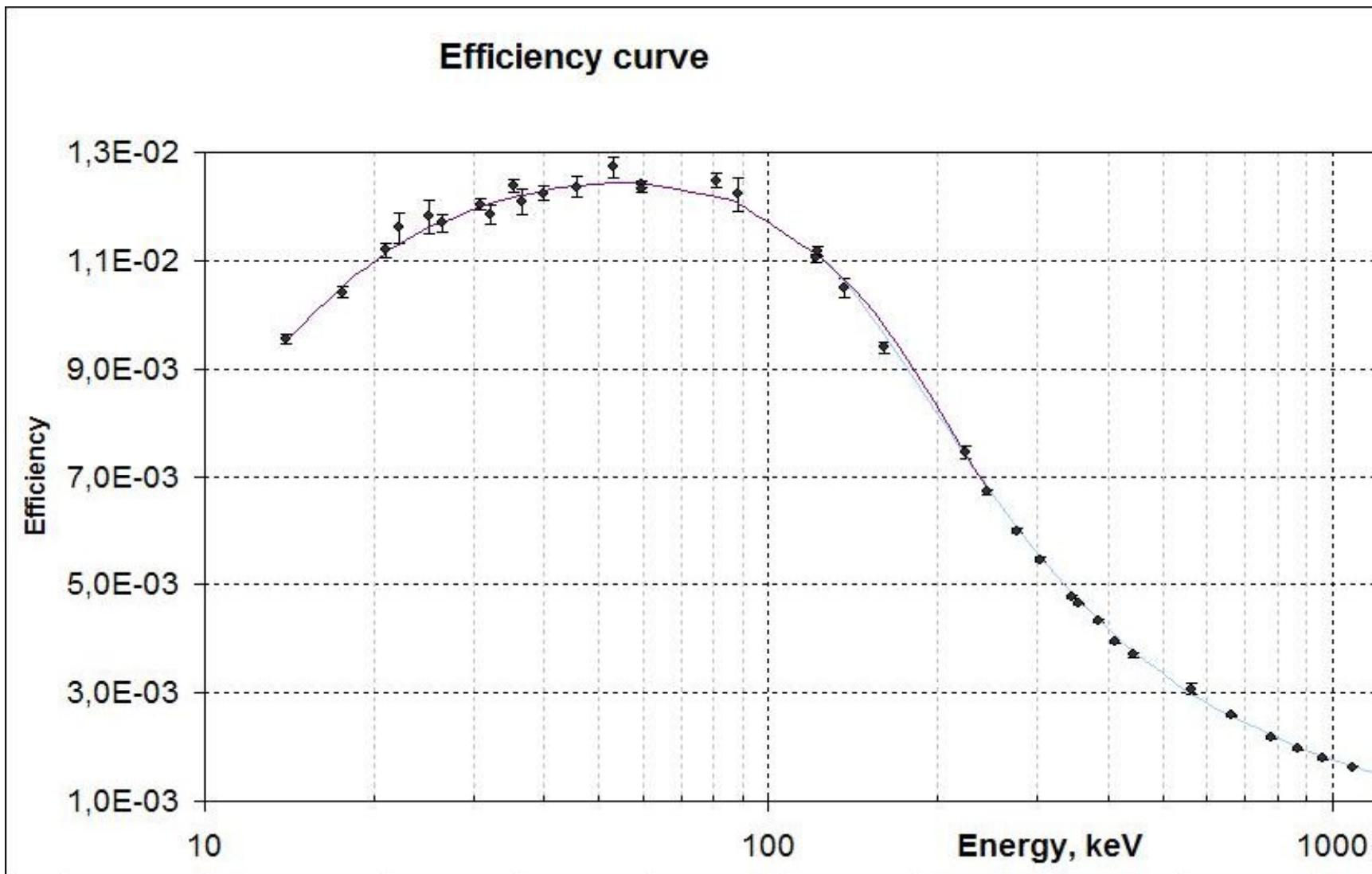
→ What reasonable uncertainty can we expect on the efficiency calibration ?

In a recent paper we can read:

“a coaxial HPGe detector was calibrated using standard point sources of Eu-152 and Ho-166m in the energy range 20 – 1500 keV..... experimental points were fitted above 1500 keV...”

Energy (keV)	I_γ , This work
2078.6	0.028(3)
2090.9	5.15(19)
2099.1	0.045(3)
2108.0	0.051(3)
2182.6	0.042(3)
2203.0	0.030(2)
2224.8	0.019(1)
2283.3	0.023(14)
2293.7	0.080(7)
2323.1	0.010(4)
2454.4	0.009(3)
2682.0	0.007(3)
2693.6	0.005(2)
2808.0	0.007(3)

→ What confidence may we have ?



Ba-133

Reference	53 keV		79 keV		81 keV		Comments
	1 %	Uc	1 %	Uc	1 %	Uc	
Nucléide – Monographie 5	2,14	0,03	2,65	0,05	32,9	0,3	Based on 21 results from international comparison + 20 other published values
Comments	27 input values $\chi^2 / n-1 = 7,2$		20 input values $\chi^2 / n-1 = 5,5$		24 input values $\chi^2 / n-1 = 4$		
ICRM Intercomparaison	2,17	0,02	2,63	0,06	33,9	0,3	Based on a total of 21 results from international comparison
Comments	10 measured values		6 results		9 results		

For the 53 and 79 keV lines the two evaluated values are in agreement, but the original sets of data are discrepant. For the 81 keV line, there is a difference of 1 % in absolute value.

Se-75

References	96,7 keV		121,1 keV		136 keV		Comments
	1 %	Uc	1 %	Uc	1 %	Uc	
Nucléide	3,42	0,03	17,2	0,1	58,2	0,3	13 values CRP ^(a) + 10 others
$\chi^2 / n-1$ ^(c)	6,1		3,72		2,38		
Tecdoc 619	3,41	0,04	17,1	0,1	58,8	0,3	13 values CRP ^(a) + 13 others
92Schotzig ^(d)	3,52	0,04	17,35	0,16	59,3	0,5	
Rani Rao ^(b)	3,004	0,028	16,14	0,15	55,4	0,5	+ recent measurement

^aNIM A 286(1990)462

^bEur.Phys.J.A 26 (2005) 41, absolute ly based on $I_{264} = 58,9 (3) \%$

^cPour Nucléide

^dNIM A312 (1992) 141

Same remarks as for Ba-133.

There is a problem : both for gamma measurements and for the evaluation of data

- What could we do ?
in order to improve the efficiency calibration **and** the evaluated data
- As specialists, could you determine what is a correct budget of uncertainties on gamma measurement results ?
- What are the rules to follow to obtain such budget ?

Often results of gamma emission intensities are published in *relative values*, the main line of the gamma spectra being taken as reference line.

On the other hand, primary laboratories are able to carry out activity measurements and then to publish *absolute values* per 100 % disintegrations.

Problem for the data evaluator: how to extract the greatest quantity of information from those results ?

Often, we convert *your* absolute values into relative values, then we carry out the statistical process with all the relative values.

Afterward we come back to absolute values following the properties of the decay scheme.

My recommendation: publish your results in absolute values and in relative values, take the reference line equal to 100

100 without uncertainty → calculate correctly the uncertainties on the relative values

- **Always give a full and detailed uncertainty budget**
- If your uncertainty is significantly lower than the other uncertainties on results obtained by other people using the same method of measurements, try to explain why ...
- Present your results in absolute and relative values, don't forget to re calculate the uncertainties on relative values