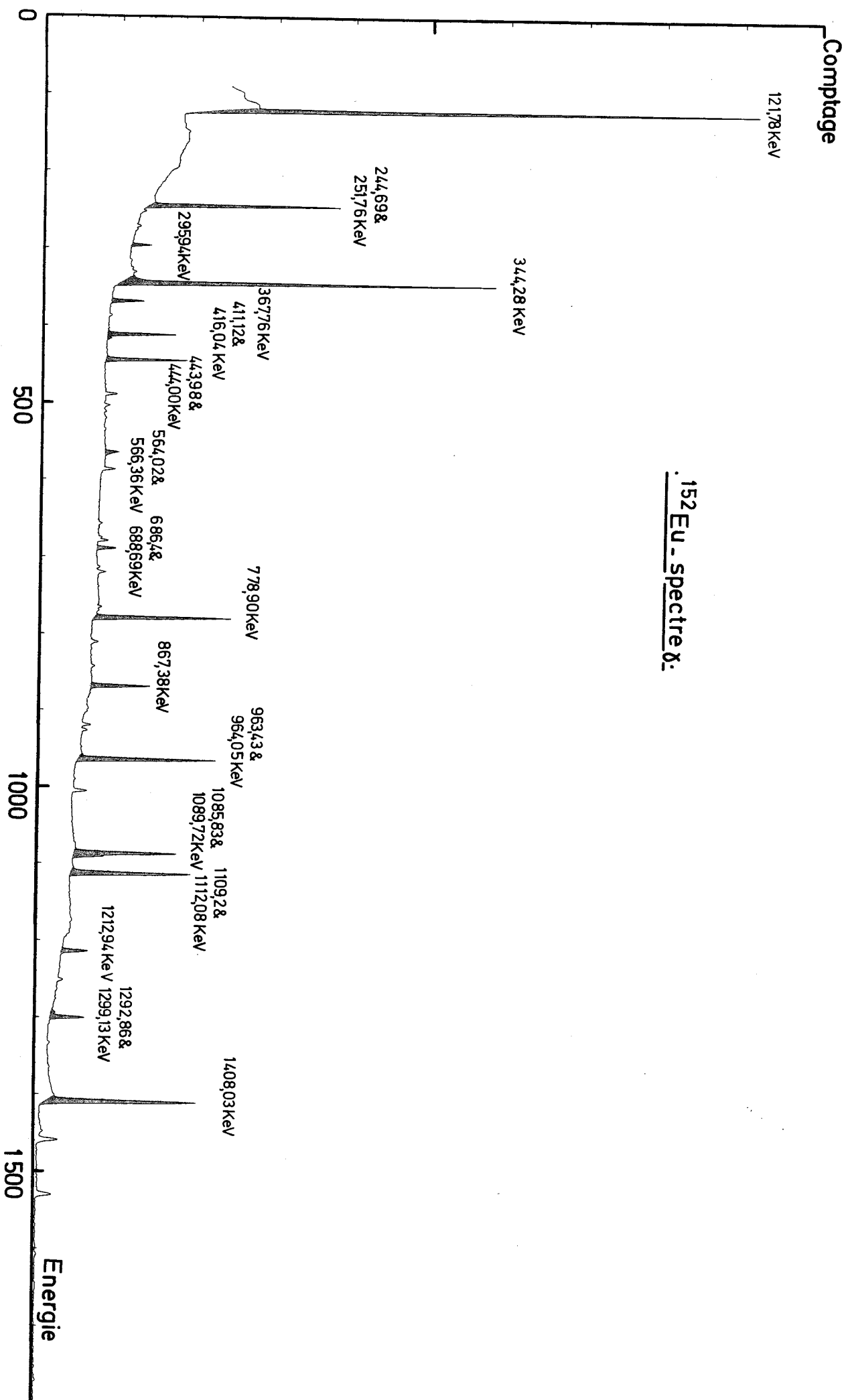
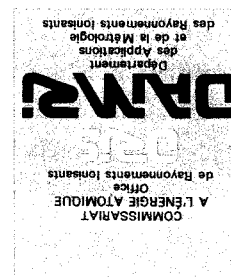




¹⁵²Eu_spectre δ.





LABORATOIRE
de Métrologie
des Rayonnements
Ionisants

Bureau National
de Métrologie

ETALON MULTIGAMMA 452 EU

source étalon EU452-EGM010 N° : 25
 date de référence : le 04-10-89 à 12H00 TU. (6)

Gamma	Intensité	Flux d'émission	photonique	stabilité	Key
1	28.40 ± 0.45	1.47E+03	1	3.4	124.7842 ± 0.0004
1	7.54 ± 0.05	3.40E+02	1	3.6	244.6989 ± 0.0010
1	0.443 ± 0.006	4.82E+04	1	5.5	295.939 ± 0.008
1	26.52 ± 0.48	4.09E+03	1	3.7	344.284 ± 0.002
1	2.246 ± 0.046	9.68E+04	1	3.7	411.445 ± 0.005
1	0.440 ± 0.002		1		446.052 ± 0.006
1	0.32 ± 0.04	4.27E+02	1	3.6	443.983 ± 0.007
1	2.78 ± 0.02		1		443.983 ± 0.007
1	0.049 ± 0.002	3.55E+04	1	4.8	686.678 ± 0.006
1	0.846 ± 0.010		1		688.678 ± 0.006
1	42.94 ± 0.07	5.34E+02	1	3.5	778.903 ± 0.006
1	4.23 ± 0.03	4.74E+02	1	3.7	867.388 ± 0.008
1	0.437 ± 0.008	5.99E+02	1	3.4	964.434 ± 0.009
1	44.46 ± 0.08		1		964.434 ± 0.009
1	40.09 ± 0.04	4.86E+02	1	3.2	1085.944 ± 0.043
1	4.737 ± 0.008		1		1089.700 ± 0.045
1	0.495 ± 0.020	5.65E+02	1	3.3	1409.480 ± 0.042
1	43.56 ± 0.06		1		1412.446 ± 0.047
1	4.423 ± 0.040	5.84E+04	1	3.7	1212.950 ± 0.042
1	0.098 ± 0.006	7.40E+04	1	3.9	1292.784 ± 0.020
1	4.630 ± 0.040		1		1299.424 ± 0.042
1	20.80 ± 0.42	8.54E+02	1	3.5	1408.044 ± 0.045

() GAMMA : VOLTAGE POINTS

J. LEGRAND
 J.F. SIMONEN
 L. GUERIN

Le Chef du DMRI
 Le Chef du LMRI
 Le Responsable du Service Relations

() renvoie à voir note jointe
 Sachet le 04-10-89

I	Observations				
I					
I					
I					
I	Incertitude (4)	Incertitude globale relative (k = 3)	4 %		
I					
I					
I					
I	Periods (3)		43.53 ± 0.03 a		
I					
I					
I	Impuretes (2)		434eu = 0.34%		
I					
I					
I	Descendants				
I					
I					
I	Reference	EU452-EGM040	Source station n° 25		
I					
I					
I	Activite (1)	4.44E+03 Bq	Le 04-10-89 a 12h00 TU (6)		

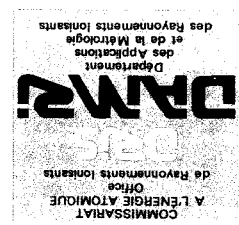
estimation : CIS DIAGNOSTICI
 commande : 6367 du 02-10-89

Radionuclides : 432Eu

CERTIFICAT D'ETALONNAGE

Bureau National de Métrologie

laboratoire de Métrologie des Rayonnements Ionisants



NOTES ON THE USE OF CALIBRATION CERTIFICATES

(1) Activity : the quoted activity is the activity of the parent radionuclide with the exclusion of daughters (in filtration cases) and of identified impurities.

(2) Impurities : identified radiochemical and radioclastic impurities are quoted as a percentage of the activity of the principal radionuclide at the reference time and date.

(3) Half life : the figures quoted stem from LMI's own measurements or from selected published data.

(4) Uncertainty : following the recommendations of the Bureau International des Poids et Mesures / P. GIACOMO, 1981, LMI has adopted the following procedure for estimating the overall uncertainty $\Delta \mu$ on the final result $\hat{\mu}$ of the measurement of μ :

1 - the individual uncertainties on the quantities x_j are divided into two categories, depending on the way by which they are obtained :

A - those which, in the measurement process applied, are estimated by applying statistical methods to repeated series of measurements. They are characterized by the estimated standard deviations s_j of the mean values \bar{x}_j of the related quantities x_j and by the numbers ν_j of degrees of freedom (if necessary, covariances are also given).

B - those which are appreciated by other means. They are characterized by the appreciated standard deviations u_j associated with the value \hat{x}_j of the related quantities x_j , which can be obtained by the following formula :

$$u_j = \Delta x_j / 3$$

where Δx_j is the overall uncertainty on the value of x_j .

2 - the combined uncertainty is expressed as a combined standard deviation S obtained by application of the usual rule of combination of variances. It is recalled that when all the components s_j , u_j can be considered as independent they add quadratically and S is then calculated with the relation :

$$S = \sqrt{\frac{1}{2} \left(\frac{\partial x}{\partial a} \right)^2 + \frac{1}{2} \left(\frac{\partial x}{\partial b} \right)^2 + \frac{1}{2} \left(\frac{\partial x}{\partial c} \right)^2 + \dots + \frac{1}{2} \left(\frac{\partial x}{\partial x_j} \right)^2 + \frac{1}{2} \left(\frac{\partial x}{\partial y} \right)^2 + \frac{1}{2} \left(\frac{\partial x}{\partial z} \right)^2 + \dots + \frac{1}{2} \left(\frac{\partial x}{\partial u_j} \right)^2}$$

3 - the overall uncertainty $\Delta \mu$ on the final result is calculated by multiplying the combined uncertainty S by a conventional security factor k :

$$\Delta \mu = k.S$$

The value of k used by LMI is : $k = 3$

- P. GIACOMO, 1981, News from the BIPM, Metrologia, Vol. 17, 1981

(5) Uniformity : the emission uniformity is measured with a Na(I) scintillation detector, by a spiral scanning covering the total area of the source. It is quoted as the standard deviation of the distribution of the results of a large number of individual measurements along the spiral.

METHOD OF TESTING
 Ref. ISO 1677, ISO/TR 4826 NF 61003

A - WIRE TEST

Wipe all exposed external surfaces of the sealed source with a piece of filter paper moistened with a solvent which will not attack the material of which the capsules are made. Measure the activity on all the paper. If the detected activity is less than 185 Bq (5 nCi), the sealed source is considered to be free from surface contamination.