



CALIBRATION
No. 0146

**Certificate of calibration
of alpha emitting
radioactive reference source**

A 3461

Description Principal radionuclide: Americium-241, Curium-244,
Plutonium-239 Product code: AMR.43
Source number: 0047RN

Measurement Reference time: 1200 GMT on 16 October 1990
Rate of emergence of alpha particles
from the front surface: 1.63×10^5 alpha particles per minute
Estimated disintegration rate of
the active material: 3.19×10^5 disintegrations per minute
Measured ratios of the activities
of Am-241/Cm-244/Pu-239: 1.000/1.144/1.347

Method of measurement:
The rate of emergence of alpha particles was measured in a proportional counter under conditions of 2-pi geometry.
The ratios of the activities of the radionuclides were measured using a gold surface barrier alpha spectrometer.

Accuracy The overall uncertainty in the rate of emergence of alpha particles quoted above was: $\pm 2.0 \%$
The overall uncertainty in the ratio of the activities of any two radionuclides was: $\pm 2.0 \%$
The limits of uncertainty were taken as the arithmetic sum of the uncertainty due to random variations, calculated at the 99.7% confidence level, and the estimated systematic uncertainties in the measurement.

Physical Data	Radionuclide	Recommended half life	PK	Important alpha particle energies MeV
	Americium-241	433 years	2°	5.442(12.5%), 5.484(85.2%)
	Curium-244	17.8 years	3°	5.763(23.6%), 5.806(76.4%)
	Plutonium-239	24,100 years	1°	5.103(11%), 5.142(15%), 5.155(73%)

Remarks The ratio of the disintegration rate to the rate of emergence of alpha particles was estimated to be 1.96. This ratio includes the conversion from 2-pi to 4-pi geometry and the backscatter in the source. It assumes that there is no self-absorption in the active material.
The disintegration rate so derived does not include the disintegration rate of any traces of radioactive material that may be present in the source other than that on the front face. (Such activity is normally less than 5% of the total activity.)
A gold surface barrier alpha spectrometer was used to show that the measured alpha resolution (full width at half maximum height) was less than 20 keV.
This product meets the quality assurance requirements of NRC Regulatory Guide 4.15 for achieving implicit NBS traceability as defined in NCRP 58 (1985).

Approved Signatory

G.D.M.Parker

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Amersham

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