

Californium-252

Spontaneous Fission Neutron Sources

Nuclear Data

Californium-252 decays by α -emission and spontaneous fission emitting neutrons.

Half-life (α -decay):	2.73 years
Half-life (spontaneous fission):	85.5 years
Half-life (effective):	2.65 years
Neutron emission:	2.3×10^9 n/sec per mg
Average neutron energy:	~2MeV
Equilibrium γ -exposure rate (from unshielded source):	1.6×10^2 mR/h at 1m per mg ~Air kerma rate at 1m of 1.4mGy/h per mg
Neutron dose rate:	~2.3rem/h at 1m per mg ~23mSv/h at 1m per mg
Specific activity:	~20GBq/mg, ~536mCi/mg

Composition

Californium-252 is incorporated in ceramic material.

Encapsulation

The radioactive material is doubly-encapsulated in welded stainless steel capsules.

Nominal ²⁵² Cf content	Nominal ²⁵² Cf content activity	Nominal activity*	Emission n/sec*	Capsule	Code
0.01 μ g	0.2MBq	5 μ Ci	0.023×10^6	X.1	CVN.101
0.1 μ g	2MBq	54 μ Ci	0.23×10^6	X.1	CVN.1
0.5 μ g	10MBq	268 μ Ci	1.15×10^6	X.1	CVN.2
1.0 μ g	20MBq	536 μ Ci	2.3×10^6	X.1	CVN.3
2.0 μ g	40MBq	1.07mCi	4.6×10^6	X.1	CVN.4
5 μ g	100MBq	2.7mCi	1.15×10^7	X.1	CVN.5
10 μ g	200MBq	5.4mCi	2.3×10^7	X.1	CVN.6
20 μ g	400MBq	10.7mCi	4.6×10^7	X.1	CVN.7
50 μ g	1GBq	27mCi	1.15×10^8	X.1	CVN.10
100 μ g	2GBq	54mCi	2.3×10^8	X.1	CVN.11
200 μ g	4GBq	107mCi	4.6×10^8	X.1	CVN.12

*Tolerance -10, +20%

Recommended working life: 15 years

Quality Control

- Wipe test A
- Bubble test D
- Immersion test L

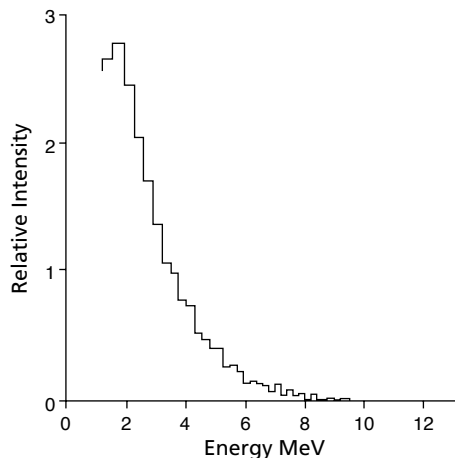
Neutron emission measured against standard using BF₃/wax moderator system.

The test report includes a statement of the neutron emission.

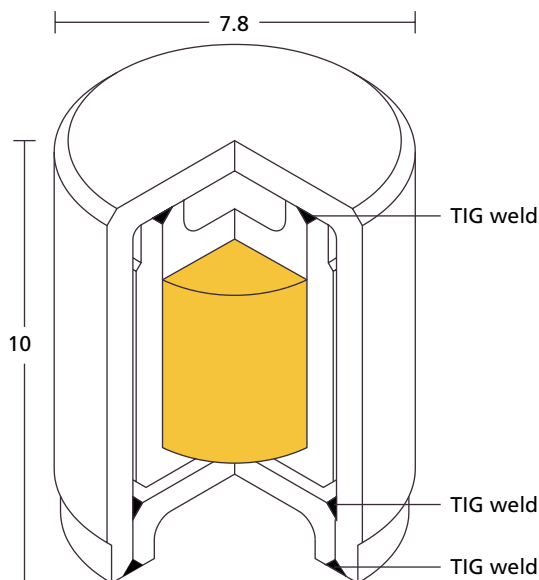
Neutron spectrum

Americium 241/beryllium source made and measured at AEA Technology using a stilbene crystal and pulse shape discrimination.

Spectrum reproduced by courtesy of: LORCH, E.A. Int. J. Appl. Radiat. Isotopes, 24, 588-9, 1973.



X.1



Safety performance testing

ANSI/ISO classification	IAEA special form	Model no.
C66545	GB/007/S-85	CVN.CY2

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Nominal ²⁵² Cf content*	Nominal ²⁵² Cf content	activity	Emission n/sec	Capsule	Code and model number
500µg	10GBq	268mCi	1.15 x 10 ⁹	X.33	CVN.330
1mg	20GBq	536mCi	2.3 x 10 ⁹	X.33	CVN.331
2mg	40GBq	1.07Ci	4.6 x 10 ⁹	X.35	CVN.352
3mg	60GBq	1.61Ci	6.9 x 10 ⁹	X.35	CVN.353

*Tolerance -10, +20%

Recommended working life: 15 years

Quality Control

Wipe test A

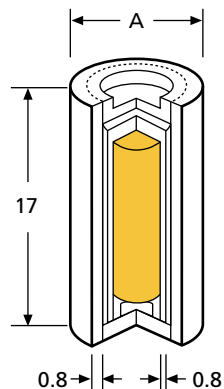
Bubble test D

Neutron emission measured against standard using BF₃/wax moderator system.

The test report includes a statement of the neutron emission.

Sources up to 1.5mg can be manufactured in the Savannah River capsule design - X224, X2034. Inquires invited.

X.33, 35

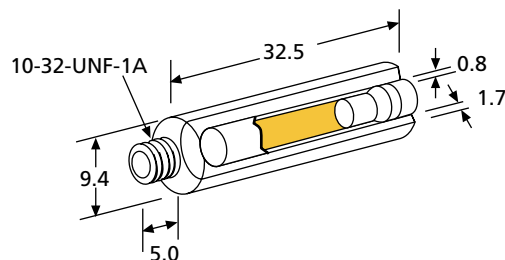


Safety performance testing

Capsule	diam. 'A' mm	IAEA / ISO classification	IAEA special form
X33	7.8	C66545	GB/174/S
X35	9.5	C64545	GB/175/S

X.224 - stainless steel capsule

X.2034 - zircalloy capsule



Safety performance testing

ANSI/ISO classification	IAEA special form	Model no.
C64545	GB/204/S	CVN.CY6