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CERTIFICATE OF CALIBRATION

MODEL CAL2600 GAMMA STANDARD

Radionuclide: Ba-133 **Activity:** 4.529 kBq (122.4 nCi)
Serial Number: 129789 **Reference Date:** 1200 PDT July 1, 2008
Half Life⁽¹⁾: 10.54 ± 0.03 years

PRINCIPAL EMISSIONS⁽¹⁾

Type	Energy (keV)	Intensity (%)
gamma	80.989	34.2
gamma	276.388	7.09
gamma	302.851	18.4
gamma	355.999	62.2
gamma	383.841	8.92

SOURCE DESCRIPTION

Active Diameter: 1 mm **Backing:** 1 mm plastic
Overall Diameter: 25.4 mm **Cover:** 1 mm plastic
Thickness: 3.2 mm

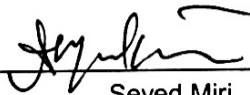
METHOD OF CALIBRATION

The source was calibrated on a high purity germanium detector using a Ba-133 efficiency at 355.999 keV. This efficiency was established and verified through ongoing intercomparisons with the National Institute of Standards and Technology. This standard is indirectly (implicitly) traceable to the National Institute of Standards and Technology.

North American Scientific, Inc. participates in the Radioactivity Measurements Assurance Program conducted by the National Institute of Standards and Technology in cooperation with the Nuclear Energy Institute.

TOTAL UNCERTAINTY (99% Confidence Level)

Systematic uncertainty	3.00%
Random uncertainty	0.93%
Total uncertainty (quadratic sum)	<u>± 3.14%</u>



Seyed Miri
Calibration Laboratory Manager

June 30, 2008

Date

REFERENCES

(1) Table of Radioactive Isotopes, 7th edition, 1986.

• LEAK TEST CERTIFICATION ON REVERSE •

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LEAK TEST METHODS

Serial Number: 129789

1. **Soak (Immersion) Test** (ISO 9978:1992 (E) Section 5.1.1)
The source is immersed in water or other suitable liquid at 50°C for at least 4 hours and the activity in the liquid measured. Acceptance limit: 0.001 μCi alpha, 0.001 μCi beta-gamma.
2. **Immersion Test** (ANSI N542-1977, Appendix A2.1.3) (ISO 9978:1992 (E) Section 5.1.2)
The source is immersed in water at 100°C for 10 minutes. The water is removed and the source cooled and rinsed using fresh water. These operations are repeated twice, boiling in the water from the previous rinsing operation. Acceptance Limit: 0.001 μCi alpha, 0.001 μCi beta-gamma.
3. **Wipe (Smear) Test** (ANSI N542-1977, Appendix A2.1.1) (ISO 9978:1992 (E) Section 5.3.1)
All external surfaces of the source are wiped with a piece of filter paper or other absorbent material which has been moistened with an appropriate solvent and the activity removed is measured. Acceptance Limit: 0.001 μCi alpha, 0.001 μCi beta-gamma.
4. **Leak Test Not Applicable**
For sources with no covering or a delicate covering over the radioactive portion, or gas standards and sources, the inactive portions or containment vessel are wipe tested as in Method 3 above. Acceptance Limit: 0.001 μCi alpha, 0.001 μCi beta-gamma.
5. **Other**

Leak Test Certification

The source(s) was/were leak tested in accordance with the Leak Test Method checked above. The source(s) should be leak tested every six months or as specified in a specific NRC or Agreement State License.

Andy
Health Physics

7/09/2008
Date