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CERTIFICATE OF CALIBRATION

Electroplated Alpha Standard

S.O.# 7267
P.O.# 13-0065

Description of Standard:

Model No. DNS-11 Serial No. 5648-06 Isotope Th-230

Electroplated on polished SS disc, 0.79 mm thick.

Total diameter of 4.77 cm and an active diameter of 4.45 cm.

The radioactive material is permanently fixed to the disc by heat treatment without any covering over the active surface.

Measurement Method:

The 2pi alpha emission rate was measured using an internal gas flow proportional chamber. Absolute counting of alpha particles emitted in the hemisphere above the active surface was verified by counting above, below, and at the operative voltage. The calibration is traceable to NIST by reference to an NIST calibrated alpha source S/N 75322-201

Measurement Result:

The observed alpha particles emitted from the surface of the disc per minute (cpm) on the calibration date was:

8,090 ± 404

The total disintegration rate (dpm) assuming 1.5% backscatter of alpha particles from the surface of the disc, was:

15,900 ± 797 (0.00718 μCi)

The uncertainty of the measurement is 5%, which is the sum of random counting error at the 99% confidence level, and the estimated upper limit of systematic error in this measurement.

Calibrated by: ART REUST

Reviewed by: [Signature]

Calibration Technician: [Signature]

Q.A. Manager: [Signature]

Calibration Date: 9-24-2012

Reviewed Date: 24 SEP 12



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CERTIFICATE OF CALIBRATION

Electroplated Alpha Standard

S.O.# 6396
P.O.# 06-456

Description of Standard:

Model No. DNS-11 Serial No. 5648-06 Isotope Th-230

Electroplated on polished SS disc, 0.79 mm thick.

Total diameter of 4.77 cm and an active diameter of 4.45 cm.

The radioactive material is permanently fixed to the disc by heat treatment without any covering over the active surface.

Measurement Method:

The 2pi alpha emission rate was measured using an internal gas flow proportional chamber. Absolute counting of alpha particles emitted in the hemisphere above the active surface was verified by counting above, below, and at the operative voltage. The calibration is traceable to NIST by reference to an NIST calibrated alpha source S/N 4001-02.

Measurement Result:

The observed alpha particles emitted from the surface of the disc per minute (cpm) on the calibration date was:

8,780 ± 263

The total disintegration rate (dpm) assuming 1.5% backscatter of alpha particles from the surface of the disc, was:

17,300 ± 518 (0.00779 μ Ci)

The uncertainty of the measurement is 3 %, which is the sum of random counting error at the 99% confidence level, and the estimated upper limit of systematic error in this measurement.

Calibrated by: ART REUST

Reviewed by: Alan Hardy

Calibration Technician: Art Reust

Q.A. Representative: Anthony W. Jota

Calibration Date: 2-28-2006

Reviewed Date: 2-28-06

Analytical Services

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LEAK TEST CERTIFICATE

Customer: CABRERA SERVICES

P.O. # 13-0065 SO: 7267

Source# 5648-06 Isotope: Th-230 Model: DNS-11

Standard wipe test

A leak test was performed to determine the integrity of the Radioactive source listed above. The source is gently swabbed over the entire surface, then counted. The activity removed by this test must be <0.005 uCi.

INSTRUMENT: SAC-4

MEASURED ACTIVITY OF THE SOURCE

SWIPE COUNT

0.00718 uCi ALPHA

GROSS Swipe CPM 3

Background CPM 1.2

<0.005 uCi

Calibration Technician: Art Reust

Date: 9-24 2012



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SHIPPER'S CERTIFICATION FOR RADIOACTIVE MATERIALS

"This package conforms to the conditions and limitations specified in 49 CFR 173.421 for radioactive material, excepted package - limited quantity of material, UN 2910 and 49 CFR 173.422 for radioactive material, excepted package - instruments or articles, UN 2910."

I hereby certify that this package also conforms to all packaging requirements of the U.S. Department of Transportation and the International Air Transport Association (IATA) Rules and Regulations regarding the shipment of radioactive materials.

The materials are packed in strong, tight packages that will not leak during normal transport conditions, the radiation level on the exterior surface of the package does not exceed 0.5 mrem/hr., non-fixed (removable) contamination does not exceed applicable limits, and the outside of the inner container bears the marking "Radioactive".

No other labels are required.

SOURCE INFORMATION

Model No.	Isotope	Total Activity	Total Quantity	Serial No.
DNS-12SP	Tc 99	0.00804 μ Ci	1	2889-01
DNS-12	Tc 99	0.00643 μ Ci	1	3649-06
DNS-11	Tu 230	0.00718 μ Ci	1	5648-06

Customer: CARRERA

PO# 13-0065

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SO# 7267

Authorized Signature Ant Rest

Date 9.24-12