



EBERLINE SERVICES

CERTIFICATE OF CALIBRATION

Electroplated Alpha Standard

S.O.# 6652
P.O.# 07-870

Description of Standard:

Model No. DNS-11 Serial No. 5802-07 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:

6,640 ± 265

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

13,100 ± 523 (0.00589 μCi)

The uncertainty of the measurement is 4%, 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: Anthony W. Toth

Calibration Date: 7-25-2007 Reviewed Date: 7-26-07

Source Manufacturing Lab
7021 Pan American Freeway NE
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EBERLINE SERVICES

CERTIFICATE OF CALIBRATION

Electroplated Beta Standard

S.O.# 6652

P.O.# 07-870

Description of Standard:

Model No. DNS-12 Serial No. 5803-07 Isotope Tc-99

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 beta emission rate was measured using an internal gas flow proportional chamber. Absolute counting of beta 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 beta source S/N 4002-02.

Measurement Result:

The observed beta count rate from the surface of the disc per minute (cpm) on the calibration date was:

8,710 ± 261

The total disintegration rate (dpm) assuming 25% backscatter of beta particles from the surface of the disc, was:

13,900 ± 417 (0.00627 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: *Art Reust*

Calibration Technician: *Art Reust* Q.A. Manager: *Anthony W. Toth*

Calibration Date: 7-26-2007

Reviewed Date: 7-26-07

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Rev. 6/15/99

DETECTOR SPECIFICATION AND PERFORMANCE DATA

Specifications

DETECTOR MODEL GR6019 SERIAL NUMBER 08056303
 CRYOSTAT MODEL 7500SL PREAMPLIFIER MODEL 2002CSL

The purchase specifications, and therefore the warranted performance, of this detector are as follows:
 (Electric cooling may degrade performance by as much as 10%.)

Active Volume _____ cc Relative Efficiency _____ %
 Resolution _____ keV (FWHM) at 1.33 MeV
 _____ keV (FWTM) at 1.33 MeV
 _____ keV (FWHM) at _____
 _____ keV (FWTM) at _____

Peak/Compton _____ :1 Cryostat well diameter N/A mm Cryostat well depth N/A mm

Cryostat description (if special) 3.25" Ø End cap

Physical Characteristics

Geometry Reverse -Electrode Closed-end coaxial
 Diameter 67 mm Active Volume N/A cc
 Length 72 mm Well Depth N/A mm
 Distance from window 5 mm Well Diameter N/A mm

Electrical Characteristics

Depletion voltage (-)3200 V dc
 Recommended bias voltage (-)3500 V dc
 Test point voltage at recommended bias (-)0.08 V dc (RC preamp only)
 Reset interval at recommended bias --- sec. (Reset preamp only)
 Capacitance at recommended bias ~40 pF

Resolution and Efficiency

With amp time constant of 6 microseconds

Isotope	⁵⁷ Co	⁶⁰ Co		
Energy (keV)	122	1332		
FWHM (keV)	0.89	1.95		
FWTM (keV)	1.65	3.65		
Peak/Compton		69.4:1		
Rel. Efficiency %		63.5		

Cool Down Time 8 hours. Cryostat Liquid Nitrogen Consumption Rate <1.8 Liters per Day.

Tested by: *Stephen B. ...* Date: 06/06/08
 Approved by: *Robert ...* Date: 06/06/08