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CERTIFICATE

^{152}Eu Source in Epoxy Resin Matrix

Certificate No: **AU-2023-MEU-1** Geometry Type: **Marinelli** Product No: **MEu-1**

Radionuclide	Half-life, years	Activity, Bq	Expanded combined uncertainty (k=2)
^{152}Eu	13.522 ± 0.016	704	23

Matrix Mass: 538.34 g **Density:** 1.14 g.cm^{-3} **Volume:** 481.81 cm^3 **Homogeneity:** 99.1%

Reference date: 15 August 2023 **Validity**: 3 years

Description:

Radioactive material is homogeneously dispersed in epoxy resin. Composition of the matrix: 68.25% C, 14.67 % O, 7.69 % H, 4.56 % N, 1.11 % Ca, 1.48 % Cl, 0.456 % Zn, 1.56 % Si (in mass percentage)

Measuring Method:

Final activity check was performed by using high resolution gamma-ray spectrometry with a HPGe detector.

Note 1: The homogeneity of the material was tested by measuring the activity of 10 randomly selected subsamples of 6 cm^3 using a well-type detector. The uncertainty due to inhomogeneity was determined as the standard deviation of these measurements. The volumes of the subsamples were calculated by using the mass and the density values of the samples.

Note 2: The reference source production method was patented by Turkish Patent and Trademark Office with patent Number: 2019/06947 under the ownership of Ankara University.

The activity of this reference material was also measured with a HPGe detector calibrated using standard reference materials traceable to Czech Metrology Institute (CMI) in the laboratories of TENMAK-NÜKEN, who is the designated institute in the field of ionizing radiation metrology on the behalf of Turkish Metrology Institute-TUBITAK UME in the presence of EURAMET. The reference value was calculated as the power-moderated mean of the values measured by TENMAK-NÜKEN and Ankara University-Institute of Nuclear Sciences.

Date of certificate issue: 26/04/2024

Approved by:

Doç. Dr. Bahadır SAYGI

Director of NÜKEN

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APPENDIX

Uncertainty of declared quantity is processed in accordance with recommendation ISO 1993 " Guide to the Expression of Uncertainty in Measurement".

Standard uncertainty is usually determined by methods another than statistical ones. It is evaluated as a square root of sum of second power of standard uncertainties of quality values which influence results of measurements, e.g. uncertainties of half life, weight, dead time, geometry factor, higher standard etc. Standard uncertainties are in the most cases determined by a qualified estimation (for instance on a basic of long time observation, from a description of used measuring devices etc.).