

REVISIONS

Letter	ECO No.	Description	Checked	Approved	Date
A	30-031	INITIAL RELEASE			

NAME	DATE	MASSACHUSETTS INSTITUTE OF TECHNOLOGY CENTER FOR SPACE RESEARCH			
Drawn:		RADIOACTIVE SOURCE, Fe₅₅			
Checked:					
Approved:					
Released:					
		Size	Code Identification No.	Drawing No.	Rev.
		T	80230	30-00104	A
		Scale: NONE			Sheet: 1 of 5

1 Scope

This specification details the design, performance, test, and packaging requirements for Iron (Fe⁵⁵) sources to be used for ground testing of the AstroE2 X-Ray Imaging Spectrometer (XIS) Instrument.

1.1 Purpose

The AstroE2 X-ray Imaging Spectrometer (XIS) Instrument requires radioactive Iron 55 (Fe⁵⁵) calibration sources during ground testing of the detectors and assembled instruments.

One source is to be mounted on the inside of the XIS detector vacuum cover and the second will be used inside one of the MIT-CSR calibration chambers.

The principal purposes of these sources are to monitor the soft x-ray detection efficiency and the energy scale of selected XIS CCD detectors. This will be done during ground testing only and not used on orbit. For these purposes, it is essential that the source produce a known, temporally stable photon output in the Mn K (5.9 and 6.5 keV) and Mn L (0.64 and 0.65 keV) characteristic X-ray lines. The goal is to measure the ratio of the L-line to K-line output with an accuracy of one percent (1%).

The source must function in a hard vacuum $<1 \times 10^{-6}$ torr over a broad temperature range, without detectable leakage. The source must not contaminate the XIS CCD detectors with either particulates or molecular contaminants, and is therefore subject to contamination control requirements.

2 Applicable Documents

The following documents form a part of this specification to the extent specified herein.

2.1 Standards

MIL-STD-129
MIL-STD-1246B

Marking for Shipment and Storage
Cleanliness Requirements for Contamination Sensitive Space Equipment

2.2 Other

30-50102.05
49 CFR 171-179

MIT AstroE2 Drawing: Fe⁵⁵ Source Assembly
Department of Transportation Rules and Regulations for the Transportation of Explosives and Other Dangerous Materials.

3 Requirements

3.1 Source Construction and Geometry

Fe⁵⁵ shall be deposited on a nickel substrate. The substrate shall be mounted in a standard A-2 capsule as detailed in 30-50102.05. See figure 1. The Fe⁵⁵ shall be overcoated with a protective layer of sputtered gold with a thickness of 50 ± 10 micrograms/cm². When the source is installed in the A-2 capsule, the radioactive Fe⁵⁵ shall be contained within a 1.0 mm diameter circle, concentric with the symmetry axis of the capsule. The thickness of the gold coating shall be verified by the manufacturer.

3.1.1 Plating

Fe⁵⁵ shall be plated by the electro-plating process using Isotope Products Laboratories (IPL) process number LP3-4.

3.2 Radioactivity

Sources shall be procured at two (2) activity levels, as specified below. Aside from the specified differences in activity, and associated marking differences, the sources shall be identical.

Type 1 Activity : 0.25 micro-curies $\pm 20\%$.
Type 2 Activity : 1.0 micro-curies $\pm 20\%$

The activity of the source shall be verified by the manufacturer.

3.3 Leakage

The source must be leak tested and must be leak free at a level of 2×10^{-4} micro-curies. Leak testing shall be done by the liquid immersion method.

3.4 Contamination Control

The source must be capable of being cleaned to Level 100A of MIL-STD-1246B. Cleaning will be performed by MIT.

3.5 Environmental

Sources must survive thermal-vacuum operation without leakage or change in photon output.

3.5.1 Temperature

The temperature range shall be -70°C to +60°C.

3.5.2 Vibration

Fe⁵⁵ sources shall survive shipping conditions from the factory to MIT-CSR.

3.5.3 Humidity

Fe⁵⁵ sources shall withstand storage in air with relative humidity between 30% and 80%.

3.6 Identification

3.6.1 Part Number

The MIT part number of the Fe⁵⁵ sources shall be as follows:

30-00104.01	Type 1 Source (0.25 µCi)
30-00104.02	Type 2 Source (1.0 µCi)

3.6.2 Serialization and Marking

Each Fe⁵⁵ source shall be individually marked with project name, serial number starting with 101, source type, activity and reference date, per MIT CSR Drawing 30-50102.05. Marking shall be engraved, etched or vibro-etched on the side of the A2 capsule.

In addition, each Fe⁵⁵ source storage container shall be identified with the MIT part number, activity level, month, day, and year of activity verification, the manufacturers name or logo, and the manufacturers part number (if applicable).

4 Quality Assurance Provisions

4.1 Responsibility for Inspection

Unless otherwise specified in this document, the Fe⁵⁵ Source manufacturer is responsible for all inspection requirements and examinations as specified herein.

4.2 Responsibility for Compliance

All items submitted for acceptance to MIT shall meet all requirements of this specification,

4.3 Acceptance

Each Fe⁵⁵ Source shall be subjected to the measurements, tests and inspections in paragraphs 3.1, 3.2, and 3.3. Conformance to the requirements shall be recorded on a test data sheet which contains the part number, the order number, the serial number of the part tested, the date of the test, and the test results. The test data sheet may be in the manufacturer's standard format and shall be stamped or signed by the manufacturer's representative.

4.4 Inspection and Test Records

Test data for all acceptance tests shall be submitted to MIT with the delivery of each Fe⁵⁵ source. In addition, the source manufacturer shall maintain inspection and test records for 36 months after hardware delivery to MIT.

4.5 MIT Source Inspection

MIT does not plan to perform a source inspection for the procurements related to this specification.

4.6 Product Uniformity

All Fe⁵⁵ sources delivered to a single part number shall be made with the same design, materials, processes, and procedures, and shall be tested and inspected to the same criteria conforming to this specification.

5 Preparation for Delivery

5.1 *Packaging, level C*

The radioactive source shall be packaged to afford adequate protection against deterioration and damage in shipment from the supply source to MIT for immediate use. Packaging shall be in compliance with applicable rules and regulations of the Department of Transportation (DOT) and the Atomic Energy Commission (AEC).

5.2 *Packing, level C*

The radioactive sources, packaged as specified in 41 above, shall be packed in accordance with applicable requirements specified in DOT regulation 49 CFR 171-179, to insure carrier acceptance and safe delivery to MIT. Containers shall comply with Uniform Freight Classification rules or regulations of other carriers applicable to the mode of transportation.

5.3 *Marking*

In addition to any special marking required by this specification, unit packages shall be marked in compliance with DOT regulation 49 CFR 171-179, AEC, and MIL-M-19590 requirements.

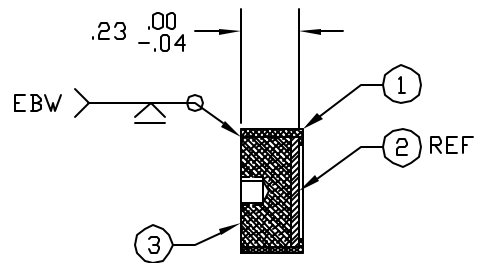
6 Notes

6.1 *Approved Source of Supply*

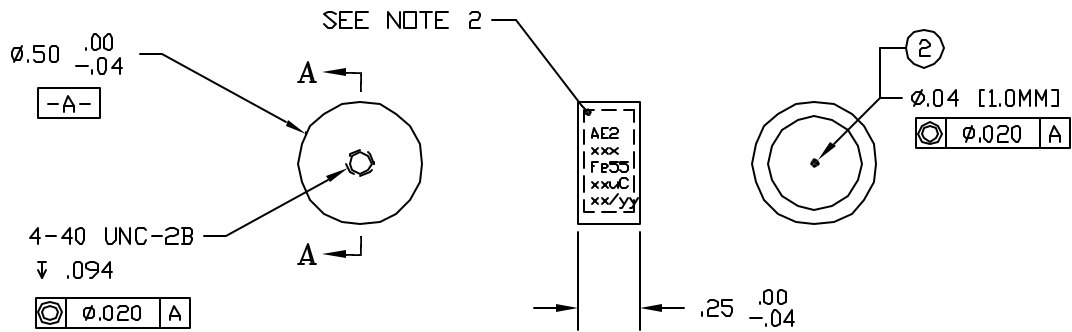
The manufacturer listed below is the only approved source for products described herein.

Isotope Products Laboratory Inc.
1800 N. Keystone Street
Burbank, CA 91504

REVISIONS					
REV.	ECD NO.	DESCRIPTION	CHECKED	APPROVED	DATE
A	30-031	INITIAL RELEASE			



SECTION A-A



NOTES:

1. REFERENCES ARE TO 30-00104
2. MARK PER PARA 3.6.2.
 PROJECT "AE2"
 S/N "10x"
 SOURCE TYPE "Fe55"
 ACTIVITY "1uCi" or ".25uCi"
 DATE CODE (MO/YR) "XX/YY"

QTY	DESCRIPTION	MATERIAL	PART NO.	FIND NO.
1	PLUG	ALUMINUM	30-50102.0503	3
1	ACTIVE ELEMENT	SEE PARA. 3.1	30-50102.0502	2
1	CAPSULE	ALUMINUM	30-50102.0501	1

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE: ANGLES ± 1° 3 PLACE DECIMALS ± .005 2 PLACE DECIMALS ± .01	NAME	DATE	MASSACHUSETTS INSTITUTE OF TECHNOLOGY CENTER FOR SPACE RESEARCH CAMBRIDGE, MA 02139			
			DRAWN		Fe55 SOURCE ASSEMBLY			
			CHECKED					
			APPROVED					
30-50102	ASTROE2	MATERIAL AS NOTED	RELEASED		SIZE	CAGE CODE	DWG. NO.	REV.
30-00104	ASTROE2		WEIGHT		B	80230	30-50102.05	A
NEXT ASSEMBLY	USED ON				SCALE	2/1	SHEET	1 OF 1
APPLICATION								

Figure 1.0 A-2 Capsule Package Drawing