



National Institute of Standards & Technology

Certificate

Standard Reference Material 1843

X-Ray Stage Calibration Board

(Z Dimension)

Serial No. Sample

This calibration specimen is intended as a reference standard for checking the Z dimension accuracy of x-ray inspection systems. It was designed especially for producers and users of 1) laminography systems that have a stage that elevates the part in the system's plane of focus, and 2) computed tomography (CT) systems that image a part from multiple orientations.

The specimen is a laminated, triangular-shaped block approximately 3.7 cm x 2.0 cm x 1.2 cm (right triangular prism) constructed of eight fiberglass boards with a thickness near 2.25 mm, each separated by a layer of tantalum (Ta) sheet, near 0.025 mm thick, bonded together with a flexible epoxy. The distance between each Ta layer is measured and certified. The Ta layers attenuate x-rays much more than the fiberglass layers and are easily distinguished in the x-ray image. The certified layer spacings on page 3 of this certificate are compared to the x-ray system's measurements for a check of system accuracy.

It is expected that various x-ray system manufacturers will develop software routines that will perform automatic evaluation of the system and generate a report that can be used to monitor system performance. The manufacturer of a specific system should be contacted to learn if software has been developed for this purpose.

The calibration specimen was developed at NIST under the sponsorship of the U.S. Army Harry Diamond Laboratories, G.K. Lucey, Program Manager. The specimen was designed by T.A. Siewert and M.W. Austin of the NIST Materials Reliability Division. The specimens were produced and calibrated by P.T. Purtscher of the NIST Materials Reliability Division.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, MD 20899
November 2, 1993

Thomas E. Gills, Acting Chief
Standard Reference Materials Program

(over)

This specimen was calibrated by measuring the distance from the base plane (tantalum sheet) to the individual tantalum layers with an optical comparator. Before the final protective coating was applied, the interlayer spacings on both sides of the SRM were measured at 1-mm intervals for a distance of about 5 mm back from the sharp point of the SRM. These 12 readings were pooled (at the top and at 5 more locations, on both sides) to develop the data stated on the certificate. The distance between the planes is the mean of the 12 measurements and the uncertainty is the range in the interlayer spacing, due to variables that include the material variability and the measurement uncertainty.

This SRM has been designed for compatibility with SRM 1842, which covers the X and Y axis calibration of an x-ray system. In fact, SRM 1842 was designed with unused regions, where SRM 1843 can be mounted. In this case, it is suggested that a circular region of the board be removed, forming a hole with a sufficiently small diameter to support the base of SRM 1843 away from the sharp edge but sufficiently large to permit x-rays to pass at the appropriate angles. Alternatively, a large hole can be produced and SRM 1843 can be supported on a material that is relatively transparent to x-rays. This integration of the two boards permits the use of a single inspection technique to verify the X, Y, and Z dimension calibration of an x-ray system.

National Institute of Standards and Technology

Certificate

Standard Reference Material 1843

X-ray Stage Calibration Specimen

Serial Number -- Sample

Z Axis Calibration Data*

Ta Layer	Depth and Standard Deviation (mm)
1	0.00 ± 0.01
2	2.32 ± 0.01
3	4.63 ± 0.01
4	6.94 ± 0.01
5	9.28 ± 0.01
6	11.61 ± 0.01
7	13.94 ± 0.01

* depth measured from the bottom layer (identified on the board).