



# National Institute of Standards & Technology

## Certificate Standard Reference Material 2023

### Second Surface Aluminum Mirror for Specular Reflectance from 250 to 2500 nm

Serial No.

This Standard Reference Material (SRM) is intended for use in calibrating the photometric scale of specular reflectometers. SRM 2023 is 51 mm in diameter and 6 mm thick. It is composed of an aluminum film which is vacuum deposited on a 4 mm thick fused quartz substrate and protected with a clear cover plate of fused quartz, epoxied to the fused quartz substrate. See the attached Figure 1 for diagram. The figure illustrates the SRM as it should be stored, mirror side down in the aluminum holder.

The specular reflectance of the mirror was measured at 50-nm intervals from 250 nm to 1000 nm, at 100-nm intervals from 1000 nm to 1300 nm, and at 200 nm intervals from 1300 to 2500 nm.

The certified reflectance values in table 1 were determined in the following way: The reflectance of a master mirror was measured at the above specified wavelengths with a highly accurate specular reflectometer-spectrophotometer at angle of incidence of 6°. These measurements were made for both vertically and horizontally polarized incident beams. The specular reflectance of the SRM second surface mirror was measured relative to the master mirror on a high-precision reflectometer for 6° incidence only and with a spot size of 3 mm by 10 mm. The certified values are listed in table 1 and are assigned an uncertainty of  $\pm 0.005$ . Graph 1 shows the spectral distribution of a typical second surface aluminum mirror. The wavelength scale of this graph emphasizes the absorption features. Note that the absorption band at 800 nm is an inherent characteristic of aluminum mirrors. The small absorption bands near 1400 nm and 2200 nm are absorption features of the fused-quartz plate that protects the aluminum coating.

The technical measurements leading to certification were performed by P. Y. Barnes of the Radiometric Physics Division. The overall direction and coordination of the technical measurements leading to certification were provided by J.J. Hsia of the Radiometric Physics Division.

The technical and support aspects involved in the certification and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.C. Colbert.

#### CAUTION AND HANDLING:

It is strongly recommended that shear force be avoided. SRM 2023 cannot be cleaned without adversely affecting the surface; therefore it should not be cleaned by physical contact methods. The mirror must be handled carefully and should be stored in its container when not in use. If and only if dust must be removed, use a very clean air bulb with great care, in such a way as to avoid generating condensation by a high velocity air flow over the mirror's calibrated surface.

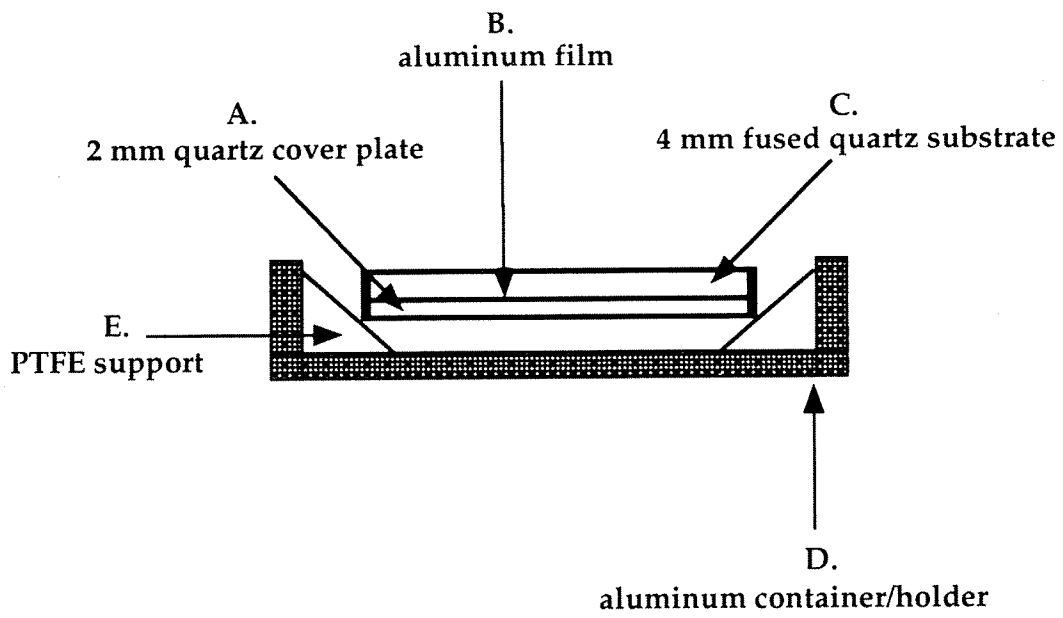
It is strongly recommended that a face mask be worn to prevent fogging or contaminating the mirror with vapors or particles from the nose or mouth.

It is further recommended that, when handling the mirror, a lint-free glove, i.e. nylon or latex type, be worn to prevent latent fingerprints on mirror surfaces. If wearing a whole glove prevents easy/flexible movements, then cut it and use only the finger/thumb sections in order to safely handle the mirror.

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William P. Reed, Chief  
Standard Reference Materials Program

Figure 1. SRM 2023  
Diagram of Second Surface Aluminum Mirror in Holder



Graph 1.

