

Specification: Silicon Test Mass HR/AR Coatings, 40m Mariner phase I

APPROVALS	DATE	REV	DCN NO.	CHECK
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1 Description

A list of the high reflectivity (HR) and anti-reflective (AR) coatings for 40m Mariner Phase I Silicon test masses.

2 General Specifications

Wavelengths: 2128.2 nm and 1418.8 nm

Polarization: S

Coating Scatter: < 5 ppm

Type: low absorption, ion beam sputtered deposition

Diameter: 7 cm around optic center

3 HR Coatings

Coating A: (HR: ETMX / ETMY) [requirements stated in decreasing order of importance]

Requirement 1: (absolute value)

- 2128.2 nm / AOI: 0 degrees
 - $T_{ETMX} = 10 \pm 5$ ppm
 - $T_{ETMY} = 10 \pm 5$ ppm

Requirement 2: (differential value)

- 2128.2 nm / AOI: 0 degrees
 - $|T_{ETMX} - T_{ETMY}| < \pm 100$ ppm, best effort $< \pm 10$ ppm

Requirement 3: (absolute value)

- 1418.8 nm / AOI: 0 degrees
 - $T_{ETMX} = 50 \pm 50$ ppm, best effort ± 20 ppm
 - $T_{ETMY} = 50 \pm 50$ ppm, best effort ± 20 ppm

Requirement 4: (differential value)

- 1418.8 nm / AOI: 0 degrees
 - $|T_{ETMX} - T_{ETMY}| < \pm 100$ ppm, best effort $< \pm 10$ ppm

Coating B: (HR: ITMX / ITMY) [requirements stated in decreasing order of importance]

Requirement 1: (differential value)

- 2128.2 nm / AOI: 0 degrees
 - $|T_{ITMX} - T_{ITMY}| < \pm 100$ ppm, best effort $< \pm 10$ ppm

Requirement 2: (absolute value)

- 2128.2 nm / AOI: 0 degrees
 - $T_{ITMX} = 2000 \pm 200$ ppm
 - $T_{ITMY} = 2000 \pm 200$ ppm

Requirement 3: (absolute value)

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- 1418.8 nm
 - $T_{ITMX} = 50 \pm 50$ ppm, best effort ± 20 ppm
 - $T_{ITMY} = 50 \pm 50$ ppm, best effort ± 20 ppm

Requirement 4: (differential value)

- 1418.8 nm / AOI: 0 degrees
 - $|T_{ETMX} - T_{ETMY}| < \pm 100$ ppm, best effort $< \pm 10$ ppm

4 AR Coatings

Coating C: (AR: ETMX / ETMY) [requirements stated in decreasing order of importance]

Requirement 1: (absolute value)

- 2128.2 nm / AOI: 0.5 degrees
 - $R_{ETMX} < 2000$ ppm
 - $R_{ETMY} < 2000$ ppm

Requirement 2: (absolute value)

- 1418.8 nm / AOI: 0.5 degrees
 - $R_{ETMX} < 1000$ ppm
 - $R_{ETMY} < 1000$ ppm

Coating D: (AR: ITMX / ITMY) [requirements stated in decreasing order of importance]

Requirement 1: (absolute value)

- 2128.2 nm / AOI: 0.5 degrees
 - $R_{ITMX} < 1000$ ppm
 - $R_{ITMY} < 1000$ ppm

Requirement 2: (absolute value)

- 1418.8 nm / AOI: 0.5 degrees
 - $R_{ITMX} < 1000$ ppm
 - $R_{ITMY} < 1000$ ppm

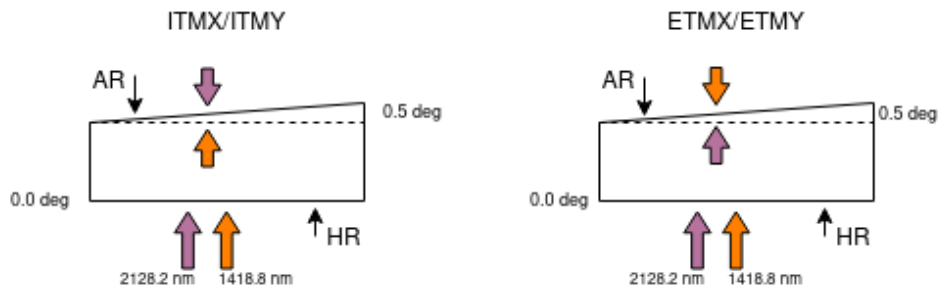
5 Metrology

Coating vendor to provide:

1. Two 1" witness samples from each coating run
2. Spectrophotometer graphs of the reflectance and transmittance of the HR
3. Spectrophotometer graphs of the reflectance of the AR coating

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6 Drawings



7 Supplementary information

Attached are example stacks with 46 layers demonstrating similar to the required performance. The documents are:

1. [ETM_Layers.pdf](#) showing the ETM HR coating normalized E-field amplitude from the incident surface in the top, and the stack layer thicknesses in the bottom.
2. [ETM_R.pdf](#) showing the ETM HR spectral R and transmission T for the example stack.
3. [ITM_Layers.pdf](#) showing the ITM HR coating normalized E-field amplitude from the incident surface in the top, and the stack layer thicknesses in the bottom.
4. [ITM_R.pdf](#) showing the ITM HR spectral R and transmission T for the example stack.
5. [test_mass_HR_stacks-2.xlsx](#) which contains the raw data for the aforementioned example stacks.