| **APPROVALS** | **DATE** | **REV** | **DCN NO.**  | **CHECK**  |
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# Description

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

# 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

# HR Coatings

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

**Requirement 1:** (absolute value)

* 2128.2 nm / AOI: 0 degrees
* TETMX = 10 ± 5 ppm
* TETMY = 10 ± 5 ppm

**Requirement 2:** (differential value)

* 2128.2 nm / AOI: 0 degrees
* | TETMX - TETMY | < ± 100 ppm, best effort < ± 10 ppm

**Requirement 3:** (absolute value)

* 1418.8 nm / AOI: 0 degrees
* TETMX = 50 ± 50 ppm, best effort ± 20 ppm
* TETMY = 50 ± 50 ppm, best effort ± 20 ppm

**Requirement 4:** (differential value)

* 1418.8 nm / AOI: 0 degrees
* | TETMX - TETMY | < ± 100 ppm, best effort < ± 10 ppm

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

**Requirement 1:** (differential value)

* 2128.2 nm / AOI: 0 degrees
* | TITMX - TITMY | < ± 100 ppm, best effort < ± 10 ppm

**Requirement 2:** (absolute value)

* 2128.2 nm / AOI: 0 degrees
* TITMX = 2000 ± 200 ppm
* TITMY = 2000 ± 200 ppm

**Requirement 3:** (absolute value)

* 1418.8 nm
* TITMX = 50 ± 50 ppm, best effort ± 20 ppm
* TITMY = 50 ± 50 ppm, best effort ± 20 ppm

**Requirement 4:** (differential value)

* 1418.8 nm / AOI: 0 degrees
* | TETMX - TETMY | < ± 100 ppm, best effort < ± 10 ppm

# 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
* RETMX < 2000 ppm
* RETMY < 2000 ppm

**Requirement 2:** (absolute value)

* 1418.8 nm / AOI: 0.5 degrees
* RETMX < 1000 ppm
* RETMY < 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
* RITMX < 1000 ppm
* RITMY < 1000 ppm

**Requirement 2:** (absolute value)

* 1418.8 nm / AOI: 0.5 degrees
* RITMX < 1000 ppm
* RITMY < 1000 ppm

# 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

# Drawings

# 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.