|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **AUTHOR:** | **CHECKED:** | **DATE** | **APPROVALS** | | |
| **DCN NO.** | **REV** | **DATE** |
| **See DCN for approvals** |  |  |  |  |  |

|  |  |
| --- | --- |
| **Type** | **BBS** |
|  |  |
| **Applicable Documents** |  |
| **Blank Specification** | E1900150-v1 |
| **Polish Specification** | E1900151-v1 |
| **Polish Drawing (Fabricate from)** | D1900151-v2 |
|  |  |
| **General to Surfaces 1 & 2** |  |
| **Figure Change Before / After Coating** | Over a 250 mm diameter aperture, coating uniformity & stress from the coating process shall not change the Sagitta more than 10 nanometers, and shall not add surface figure Zernike terms higher than second order with amplitude > 0.5 nanometers.  Confirming measurements are to be made on both sides of the optic, by the coating vendor, and need to be demonstrated only once, on a single part, unless there has been significant reconfiguration of the coating tool.  The vendor is responsible for communicating that there has been such a change to the tool, and must repeat the confirming measurements. |
| **Optical Performance Uniformity** | On both surfaces, the specified single surface reflectance or transmittances at the specified wavelengths must be maintained over a 250 mm diameter aperture. |
| **Coating Deposition Method** | Ion Beam Sputtered |
| **Coating Area**  **(note 1)** | To Bevel |
| **Witness Sample Durability Testing** | On one witness piece per run, coating to resist:   1. Adhesion test per MIL-C-48497A 4.5.3.1 Adhesion (snap tape). 2. MIL-C-4.5.3.2 Humidity (120F 95% RH for 24 hours), combined with before/after reflectance & transmittance spectrophotometer scans from 350 - 2500 nm in about 1 nm increments, marking the specimen ensure the same area is scanned. The scans will be provided in an Excel spreadsheet as columnar data. There should be no measurable spectral shift. 3. MIL-C-4.5.3.3 Moderate Abrasion (cheesecloth rub). |
|  |  |
| **Surface 1** | ***ARROWS ON OPTIC SIDE POINT TO SURFACE 1*** |
| **Coating Type**  **(note 2)** | P-State Beamsplitter at 1064nm |
| **Angle of Incidence** | 45 degrees on the air side, incident light is 100% p-polarized. |
| **Transmission at 1064 nm** | 0.5 ±0.005 requirement for p-polarized incident light, incident from the air side. |
| **Absorption at 1064 nm** | <1 ppm |
| **Transmission at 532 nm** | Goal: between 30% and 70% for S-polarization |
| **Transmission and reflection goals in a band around 840nm**  **(note 3)** | |  |  |  | | --- | --- | --- | | Wavelength | Polarization | Transmission | | 840±10nm | P | ≥90% | | 840±10nm | S | ≥75% | |
| **Max Scratches Surface 1 inside 250mm diameter (units of sq. microns)** | 500,000 |
| **Max Scratches Surface 1 outside 250mm to 360mm diameter (units sq. microns)** | 1,500,000 |
| **Max Point Defects Surface 1 inside 250mm diameter** | 50 |
| **Max Point Defect Density Surface 1 inside 250mm diameter** | 5 per sq. millimeter |
|  |  |
| **Surface 2** |  |
| **Coating Type** | Antireflection |
| **Angle of Incidence** | Design for the range of possible angles of incidence when mounted in the end user application. This range extends from min: 44.9707 to max: 44.9760 degrees, on the air side.  The incident light is 100% p-polarized. |
| **Reflection at 1064 nm** | < 50 ppm requirement for p-polarized incident light, incident from the air side. |
| **Absorption at 1064 nm** | < 1 ppm |
| **Transmission at 532 nm** | Goal >90% |
| **Transmission and reflection goals at specified wavelengths (note 1)** | |  |  |  |  | | --- | --- | --- | --- | | Wavelength | Polarization | Reflectivity | Transmission | | 790±5nm | P | ≥35% | NA | | 790±5nm | S | ≥60% | NA | | 840±5nm | P | NA | ≥80% | | 840±5nm | S | NA | ≥60% | |
| **Max Scratches Surface 2 inside 250mm diameter (units of sq. microns)** | 1,000,000 |
| **Max Point Defects Surface 2 inside 250mm diameter** | 100 |
|  |  |
| **Other** |  |
|  |  |
| **Additional Deliverables** |  |
| **Witness Samples** | SURFACE 1 & 2:  Two 1-inch witness samples per run required + as many 1-inch witness pieces that can be fit additionally per run (provided by vendor). |
| **Layer Thickness Information** | For all layers in the design, measured thickness data from the deposition for each run, designed thicknesses, and measured indices of refraction at 1064 nm for both coating materials (based on individual layers). |
| **Surface 1 Spectral Scans** | On a representative witness piece for each run, nominal 45.0 degree angle of incidence p-polarized spectrophotometer scans of reflectance and transmission of Surface 1 (BS coating) from 350-2500 nm before it is coated, between Surface 1 and Surface 2 coating, and after coating is completed.  All spectrophotometer data to be provided in Excel spreadsheet format with columnar data in increments of approximately 1 nm. |
| **Surface 2 Spectral Scans** | On a representative witness piece for each run, nominal 45.0 degree angle of incidence p-polarized spectrophotometer scans of reflectance and transmission of Surface 1 (AR coating) from 350-2500 nm before it is coated, between Surface 1 and Surface 2 coating, and after coating is completed.  All spectrophotometer data to be provided in Excel spreadsheet format with columnar data in increments of approximately 1 nm. |
| **Surface Defect Analysis**  **Methods 1 and 2 are required.** | METHOD 1.  The surface is examined visually by two observers independently. The examination is done against a dark background using a fiber optic illumination system of at least 150 W lamp-power if halogen, or a similar LED source. A 100% inspection of the surface is carried out. Pits and scratches down to 2 micrometers in width can be detected using this method of inspection. The length of any scratches or sleeks that are detected will be measured using a suitable calibrated eyepiece.  METHOD 2.  Further inspection will be done with a minimum 6X eyeglass using the same illumination conditions, again with two observers. Sleeks down to 0.5 micrometers wide can be detected using this method. The surface will be scanned along one or two chords from center to edge, then at ten positions around the edge, and ten to fifteen positions near the center.  Data to be supplied as a hand sketch from both Methods 1 & 2. |
| **Durability Test Data & Samples** | All samples from the durability tests and data, including transmittance and reflectance spectrophotometer scans of the representative coating on each side in an Excel spreadsheet with columnar data spaced by approximately 1 nm from 350 - 2500 nm. |
| **Note 1** | Minor exceptions allowed, avoiding areas near the horizontal center line (see D1900151-v2) |
| **Note 2** | The design wavelength is 1064.15nm. Deviations from this are negligible and design uncertainty shall be associated with R & T. |
| **Note 3** | The coating design is to be reviewed by the customer before giving the go-ahead for production. |