DCC

CALIFORNIA INSTITUTE OF TECHNOLOGY

Laser Interferometer Gravitational Wave Observatory (LIGO) Project

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Subject: COC Interfaces

I recommend adoption of the following interface definitions for the Core Optics Components task.

Definitions:
Surface 1 = Reflection-coated surface (RCS)
Surface 2 = Anti-reflection-coated surface (ARCS)

Optical surfaces naming convention:
4 km interferometer:
2 km interferometer:

- Recycling mirror: RCS, ARCS
- Pick off mirror: ARCS1, ARCS2
- Beamsplitter: RCS, ARCS
  - In-line arm:
    - Fold mirror(2 km only): RCS, ARCS
    - Input test mass: RCS, ARCS
    - End test mass: RCS, ARCS
  - Perpendicular arm:
    - Fold mirror(2 km only): RCS, ARCS
    - Input test mass: RCS, ARCS
    - End test mass: RCS, ARCS

Performance requirements flow-down:
SYS to COC

For each optic:

1. Substrate material
2. Substrate diameter and tolerance (with sphericity and tolerance)
3. Substrate thickness and tolerance
4. Minimum Q of internal vibrational mode resonances of bare test mass (no attachments)
5. Substrate inhomogeneity limit
6. Substrate birefringence limit and spatial variation limit
7. Radius of curvature of surface 1 and tolerance
8. Radius of curvature of surface 2 and tolerance
9. Surface irregularity specification for surface 1
10. Surface irregularity specification for surface 2
11. Micro-roughness limit for surface 1
12. Micro-roughness limit for surface 2
13. Absorption limit and allowed variation for surface 1
14. Absorption limit and allowed variation for surface 2
15. Reflectivity or transmission of surface 1, including tolerance and allowed spatial variation (at both 514 nm and optical lever wavelength)
16. Reflectivity or transmission of surface 2, including tolerance and allowed spatial variation (at both 514 nm and optical lever wavelength)
17. Maximum number, size and location of defects in surface 1
18. Maximum number, size and location of defects in surface 2
19. Maximum number, size and location of bulk substrate defects

COC:SUS

Physical interface:

At surface of test mass. Magnet standoffs, wire release rods, guide rods, epoxy, suspension wires, etc. are on the SUS side of the interface.

COC:IOO

Optical interface:

i) Input - Main input beam to interferometer (514 nm): At ARCS of recycling mirror.

ii) Output - (if output mode cleaner is required) (514 nm): At ARCS of beamsplitter.

COC:ASC

Optical interface:

i) Alignment beams (HeNe?): At specific surface(s) of optical components TBD.

ii) Signal beams (514 nm): At specific surfaces (TBD) of optical components.

Note: Mirrors that steer the beam out of the vacuum vessel and the vacuum window are on the ASC side of the interface.

COC:LSC

Optical interface:

i) Signal beams (514 nm): At specific surfaces (TBD) of optical components.

Note: Mirrors that steer the beam out of the vacuum vessel and the vacuum window are on the LSC side of the interface.

rls:rls

cc:
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