LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
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Document Type LIGO-T950168-00 - D 8/16/95

Naming Convention and Interface Definition for the COC

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Distribution of this draft:

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1 NAMING CONVENTION FOR THE CORE OPTICS COMPONENTS

Physically, the core optics subsystem consists of the following components as shown in Fig. 1:

- Test masses (TM) of two types: input TM (ITM) and end TM (ETM) These are fused quartz cylinders
- Beam splitter (BS) substrate: fused quartz cylinder
- Pick off mirrors (PO): Fused quartz cylinders
- Recycling mirror (RM) substrate: fused quartz cylinder.
- Fold mirror (FM)$^{\$\$}$ substrates: fused quartz cylinder.
- Anti reflection coating (ARxx) applied to one surface ("surface 2") of each optic: e.g. ARRM= anti-reflection coating on RM2 surface of recycling mirror
- Enhanced reflectance coating (ERxx) applied to one surface ("surface 1") of each optic, **except POs:** e.g. ERITM = reflector coating on ITM1 surface of input test mass.
- Anti-static coating to be applied to non optically sensitive optic surface areas $^{\$}$

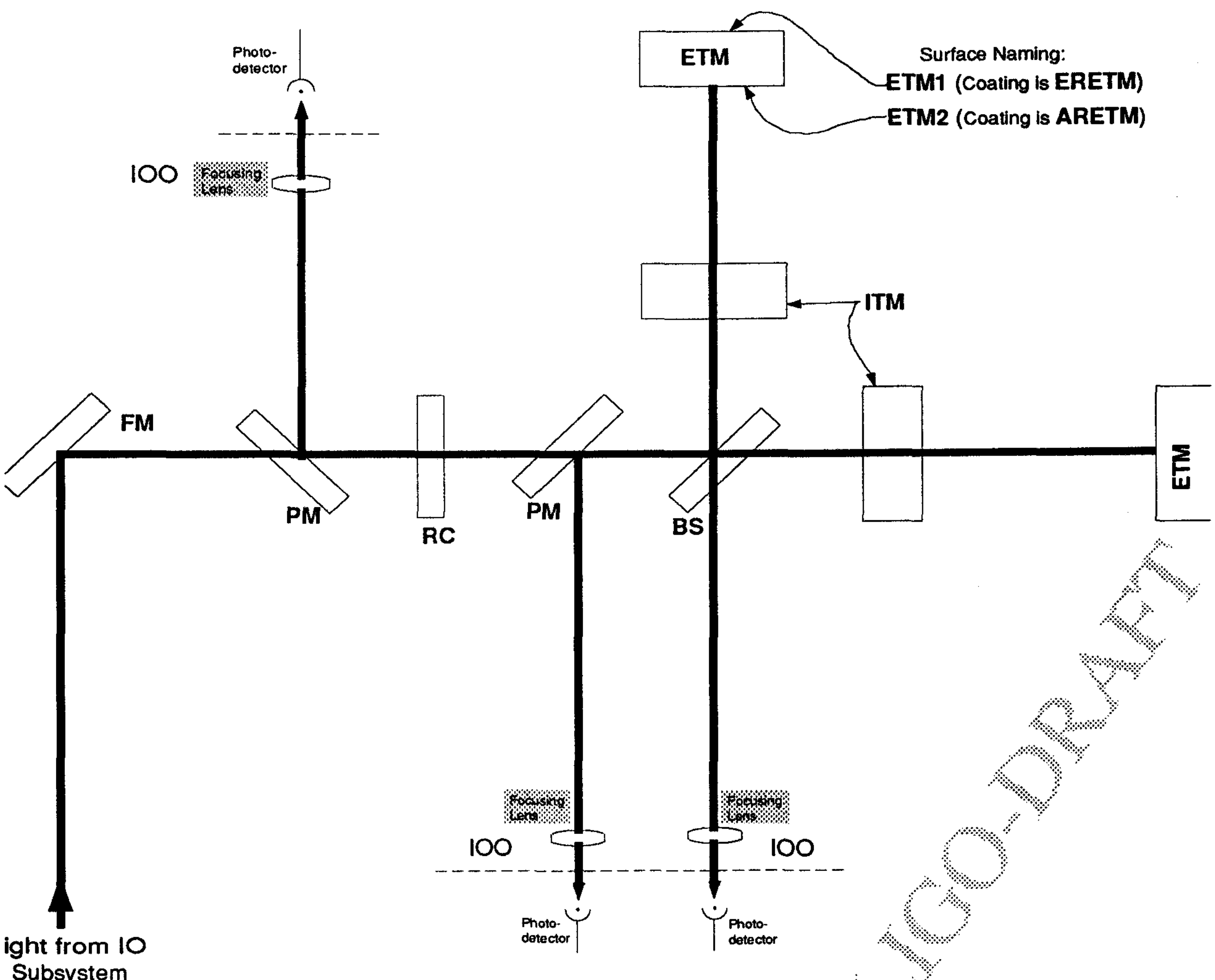

Figure 1: Naming Convention for the COC.

2 COC INTERFACES

Interfaces between COC and other subsystems are divided into four categories:

- Mechanical interfaces
- Optical interfaces
- Signal interfaces
- Interfaces with systems external to the detector

2.1. Mechanical Interfaces

The Core Optics Components have mechanical interfaces with other subsystems as shown in table 1 (Ref. Fig. 2). It should be noted that with the possible exception of an electrostatic shield coating applied to the COCs and the influence of outgassing, all mechanical interfacing items belong to the SUS subsystem.

Table 1: Mechanical interfaces between COC and other Detector subsystems

Mechanical Interfacing Points			*Drawing/ Doc#*
COC Element/ Surface	*Other Subsystem Element*	*Contact/Connection method*	
All Elements/ Cylindrical side	SUS-Suspension wire	Constrained slip fit	
All Elements/ Cylindrical side	SUS-Wire standoff	Adhesive	
All Elements/ Cylindrical side & Surface 1 or 2	SUS-Magnet/Vane assembly	Adhesive	
AllElements$^{\$\$}$/ Cylindrical side	$^{\$\$}$-Electrostatic contact	Electrostatic shield coating$^{\$\$}$	
All Elements/All surfaces	All Subsystems Surfaces	Outgassing from all elements	
Critical Dimension/Size			*Drawing/ Doc#*
Offset of COC element optical axis relative to the top surface of the HAM Optics platform (= d_1 in SEI DRD). Offset of COC element optical axis realative to the bottom surface of the BSC Optics platform (=d_2 in SEI DRD			

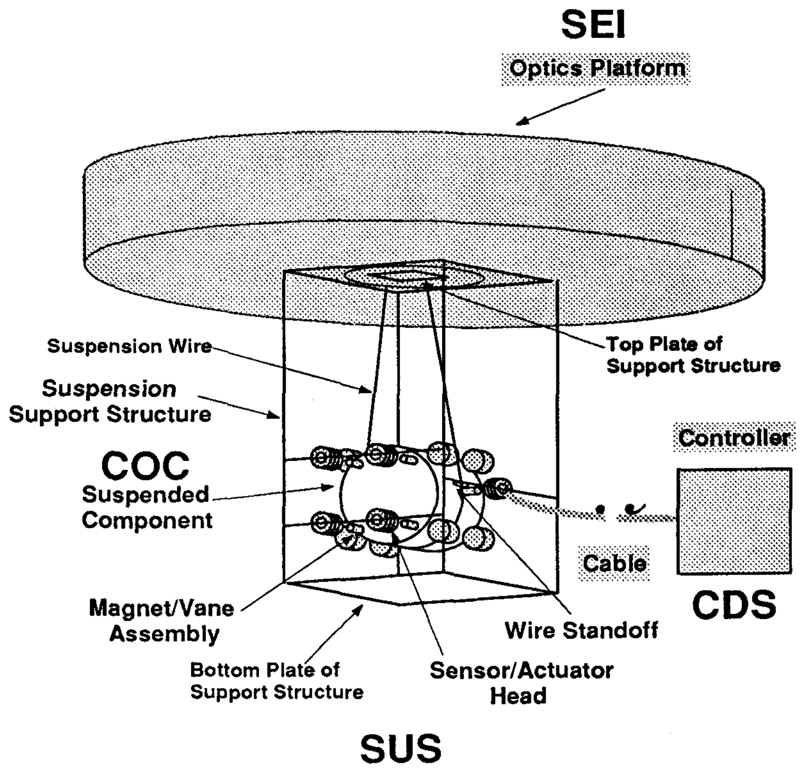

Figure 2: Mechanical interfaces of COCs

2.2. Optical interfaces

Optical interfaces are represented in figure 1. The optical interfaces to the COC may be divided into two categories:

- Primary IFO beams received from and delivered to the COC subsystem from the IOO subsystem. These beams are to have vertical polarization, to within $\pm 1^{o}$ $$, with respect to the plane defined by the two IFO arms. The optical properties of the BS (non-normal incidence of beams) are therefore specified as S incidence polarization.
- Diagnostic beams which interface to the ASC subsystem and are either input to COC from the ASC or derivative from the primary IFO beams (as ,e.g., ghost beams off wedged AR surfaces.

Table 2: Optical interfaces between COC and other Detector subsystems

COC Element/ Interface	*Other Subsystem*	*Interface & Characteristics*	*Drawing/ Doc.#*
All COC surfaces except ETM and FM secondary	IOO-primary laser beam	Laser power Laser Beam size	
BS secondary surface and PO	IOO-Focusing lens	Beam power Beam size	
All COC secondary surfaces except POs$$	ASC-Beam centering monitor	Ghost beam pickoff AR coating reflectivity	
All COC secondary$$ surfaces	ASC-Optilever beam centering	Auxillary probe laser beams	

2.3. Signal Interfaces

Signal interfaces between COC and other subsystems are illustrated in Fig. 3 and summarized in Table 11. Strickly there are no input signals directly interfacing to the COC. Those influencing the COC are transmitted to them via the SUS actuator mechanical interface. Signals output from the COC are all in the form of light beams and are therefore simultaneously optical interfaces (see 5.2).

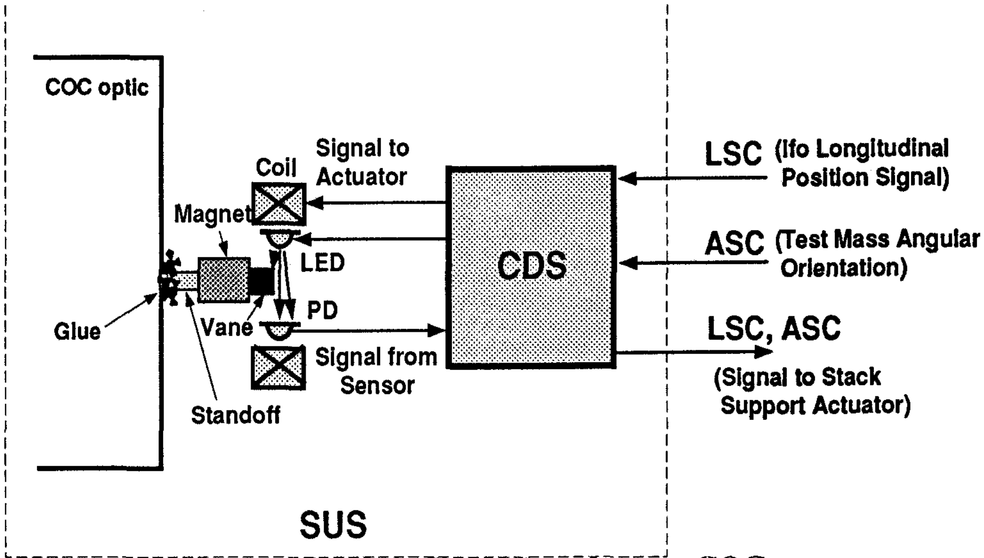

Figure 3: Signal Interfaces to COC

Table 3: Signal interfaces between COC and other detector subsystem

COC Contro Signals		
Other Subsystem	*Signal*	*Signal Flow* COC <--> Subsystem
LSC via SUS	Interferometer Longitudianl Position Signal	(ETM, BS, RM) <--
ASC via SUS	Optical Lever Signal and/or Wavefront Sensing Signal	(ETM, BS, RM) <--
ASC	Optilever Signal	All COC $$ -->
COC Monitor Signals		
ASC	COC centering Signal	All COC except PO -->
SEI via SUS	Stack pushing Signal	Related

2.4. External interfaces.

The COCs are directly coupled (as compared to being indirectly coupled via the SUS subsystem) to the FAC/VE systems via their vacuum environment. The vacuum system is required to be of a quality such that the integral contamination to the COC surfaces over ~year time scale does not degrade the IFO performance. Such degredation can come from three mechanisms:

- Contamination of the primary optical surfaces can distort the cavity beam wavefront, either by adding to low angle scatter or by increasing absorbtion induced substrate distortion.
- Wide angle [for instance particulate] scattering by primary surface contamination can degrade the IFO noise performance via the beam tube rescattering mechanism.
- Surface contamination, even not on the primary surfaces, can degrade the TM mechanical Qs and thus increase the thermal noise contribution to the IFO performance.