



LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

RECORD OF DECISION/AGREEMENT (RODA)

Document	LIGO-M 080038-03 -Y	
Date:	26 Mar 2008	
Title:	RODA: <u>Responsibilities for Elements of the Stable Recycling Cavities</u>	
To the Attention of:	aligo_sys, aligo_coc, aligo_io, aligo_aos	
cc:	Carol Wilkinson, David Shoemaker	
From/signatories:	Name/Title: Norna Robertson (SUS Leader)	Signature: _____
	Name/Title: GariLynn Billingsley (COC Leader)	Signature: _____
	Name/Title: David Reitze (IO Leader)	Signature: _____
	Name/Title: Mike Smith (AOS Leader)	Signature: _____
	Name/Title: Dennis Coyne (Systems Engineer)	Signature: _____
	Name/Title: _____	Signature: _____
System(s) affected:	<input type="checkbox"/> Initial LIGO <input checked="" type="checkbox"/> Advanced LIGO <input type="checkbox"/> Other: _____	
Nature/Scope:	<input type="checkbox"/> Design Decision <input type="checkbox"/> Requirements Decision <input checked="" type="checkbox"/> Work Scope Decision <input type="checkbox"/> Working Agreement between Groups <input type="checkbox"/> Other _____	
Subsystem(s) affected	<input checked="" type="checkbox"/> Relevant Subsystem(s)/Component(s): SUS, COC, IO, AOS _____ _____	
Primary Contacts	Group or Affiliation and Contact: SYS, Dennis Coyne	
Reference Documents:		

DECISION/AGREEMENT STATEMENT:

This RODA addresses the various responsibilities within the subsystems SUS, COC, IO, AOS for the following recycling cavity mirrors and their suspensions: PRM, PR2, PR3, SRM, SR2, SR3 (which replace the functions of the previously defined mirrors IMMT1, IMMT2, IMMT3, PRM, OMMT1, OMMT2, OMMT3, SRM).

In conjunction with the decision to employ stable recycling cavities (RODA pending), we resolve that:

- a) COC should define the requirements (in particular the polishing and coating requirements) for all optics in the recycling cavities including the mode matching telescopes now set within the power and signal recycling cavities. This will ensure a consistent loss budget and commonality of surface and substrate quality/requirements. [To date, the requirements for the power recycling mode matching telescope (MMT) in the IO DRD only addresses coupling efficiency, alignment and beam steering.] IO team members should assist COC. The COC requirements should cover all optical elements of the power and signal recycling cavities.
- b) IO should have the lead design responsibility for the mode-matching telescopes (MMT) for the power and signal recycling cavities (in particular IO should define the ROC for these optical elements and examine the impact ROC uncertainties due to manufacturing & measurement, whereas COC should provide polishing and coating specifications).
- c) AOS will have no scope in design or procurement of the signal recycling cavity MMT. It is noted however that AOS will use SR2 as an injection port for a Hartmann probe beam. As a consequence AOS will have requirements on transmission vs wavelength characteristics of the SR2 coating as well as access to the AR side of SR2. These requirements will be defined in a separate RODA.
- d) COC will have procurement scope for the large MMT elements, i.e. PR3 and SR3, and
- e) IO will have the procurement scope for the small MMT elements (i.e. PRM, PR2, SRM, SR2).
- f) SUS has the responsibility to design all the suspensions for the recycling cavity mirrors. The small elements (i.e. PRM, PR2, SRM, SR2) will be suspended on small triple suspensions (the same design as used for the input modecleaner mirrors) and the large elements (PR3 and SR3) will be suspended on large triple suspensions (the design formerly known as the recycling mirror triple suspension). SUS also has the responsibility for procuring all parts of these suspensions with the exception of the optics.
- g) The responsibilities for assembling these suspensions are TBC. It is expected that SUS will have full responsibility for the large triples. The responsibility for assembling the small triples may be shared with the IO group.

Each of the involved groups (COC, IO, SUS and AOS) should identify appropriate cost book and WBS dictionary changes to be proposed in a Change Request to the AdL Configuration Control Board (CCB).

BACKGROUND:

It has been decided (7 Feb 2008) that the power and signal recycling cavities will be stable designs (shown schematically in Figure 1). As a consequence, the mode matching telescopes (MMT) which were outside of the recycling cavities are now within the cavities.

In the original marginally stable recycling cavity designs, the input MMT was the responsibility of the IO group and was envisioned to be 3 elements supported by single pendulum suspensions and on separate HAM optics tables. The output MMT was envisioned to be a compact off-axis parabolic telescope provided by AOS and not suspended.

Now that the MMT elements are within the recycling cavities, it seems prudent to include the requirements under the purview of the COC group so that a common loss budget can be established and consistent requirements for surface errors established. However, the design of the power and signal recycling telescopes should be IO's scope since IO has had the most experience in developing these designs and establishing tolerances.

Since COC is procuring large optics, it makes sense that COC procure the large optical elements of the power and signal recycling telescopes, PR3 and SR3 respectively. Likewise, since IO is procuring small suspended optics (for the mode cleaner and steering mirror suspensions), it makes sense that IO procure the small optical elements of the power and signal recycling telescopes, i.e. PRM, PR2, SRM and SR2.

Since there is no longer a compact off-axis parabolic telescope in the output (signal, or antisymmetric) port of the interferometer, there is no longer a role for AOS in the output MMT.

Figure 1: Stable Power & Signal Recycling Cavities

