



LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

LIGO Laboratory / LIGO Scientific Collaboration

LIGO-E1400479-v1

LIGO

December 22, 2014

ISC In-Vacuum Optics Tables: Acceptance Documentation

P. Fritschel

Distribution of this document:
LIGO Scientific Collaboration

This is an internal working note
of the LIGO Laboratory.

California Institute of Technology
LIGO Project

Massachusetts Institute of Technology
LIGO Project

LIGO Hanford Observatory

LIGO Livingston Observatory

<http://www.ligo.caltech.edu/>

1 Requirements documentation

This acceptance package covers the in-vacuum ISC optics tables: HAM1, HAM6, and the ETM Transmission Monitors. ISC components in HAM3 are also included.

Requirements: The transmission monitor design document, [LIGO-T0900385](#), describes the function of the TransMon in the Introduction (section 1). There are also TransMon suspension requirements given in section 7. There are no requirements documents for the HAM tables.

2 Design overview and detailed design documentation

Design documentation is in the aLIGO DCC tree, starting at:

[LIGO-E1200198](#): aLIGO, ISC, Opto-Mechanical Layouts

This entry has links to HAM1, HAM3, HAM6, TransMon.

a) Final Design Document (FDD): The transmission monitor final design is in [LIGO-T0900385](#). For the HAM tables, there are brief functional descriptions in the abstracts of their top-level DCC file cards. Design documents are found in the DCC tree. For each table type, in addition to the main assembly drawing, there are file cards for additional information regarding the H1 and L1 as-builts; e.g., [LIGO-E1200608](#) for the L1 HAM1 as-built.

b) Review reports:

The TransMon design was reviewed as part of the main ISC FDR. FDR report is in [T1000334](#); comments pertaining to the TransMon are on pages 15 & 16. All comments were answered and/or incorporated; we believe there are no outstanding issues from the review.

There was no review of the HAM optics table layouts.

c) Supporting design documents: models, analyses, specifications, etc.

All in the DCC tree, see a) above.

d) Drawings: cite the top level assembly drawing for each major assembly or subsystem.

- HAM1: [LIGO-D1000313](#)
- HAM3: [LIGO-D1000339](#)
- HAM6: [LIGO-D1000342](#)
- TransMon: [LIGO-D1000484](#)

e) Bill(s) of Materials (BOM): cite any collected BOMs. If the BOMs are only to be found on the Assembly and Sub-Assembly drawing sheets, then state so.

Bills of materials are in the assembly drawings.

f) Interface control: cite any documents (such as RODAs) with interface definition/control and/or cite the relevant sections of the DRD and FDD.

ICD between TransMon Suspension and ISC: [LIGO-E1000222](#).

g) Software: cite any software design description documentation.

No software.

h) Design source data:

- Confirm that all mechanical design CAD models are in the SolidWorks/PDMWorks vault, or explain what is not and why.

- Confirm that all electronics design CAD models (schematics and PWB layouts) are backed up and available on LIGO Lab archives, or explain what is not and why.

Confirmed.

3 Materials and fabrication specification

Any special materials, or treatment of materials including preparation for in-vacuum use; this may be integrated into the Design documentation.

No special materials.

4 Parts and in-process spares inventoried

The in-vacuum tables are entered into ICS as Assembly records; e.g. ASSY-D1000313-H1 for the H1 HAM1 assembly.

5 Assembly procedures

HAM1: [LIGO-T1400727](#)

HAM3: [LIGO-T1400371](#)

HAM6: [LIGO-T1400588](#)

For the TransMon, the ISC components are mounted onto the optics breadboard following the assembly drawing, then the fine alignment procedure listed in the next section is followed.

6 Installation procedures

TransMon alignment: [LIGO-E1200453](#)

For the HAMs, the documents listed in the previous section (Assembly) also include installation information.

7 Test documents

Links to the tuning results for the TransMon telescopes and QPD sleds are found in the as-built file cards; e.g. [LIGO-E1201006](#) for the L1 EY TransMon.

8 User interface software

None.

9 Operation Manual

None.

10 Safety

Safety documentation must be in the DCC for all phases of the subsystem development, including any needed for normal use or foreseen maintenance/repair scenarios.

LIGO laser safety procedures apply when working with laser beams during installation and alignment of the ISC in-vacuum tables. The Notes field of the assembly/installation/alignment DCC file card for each table contains a reminder about laser safety protocol.