Interface Control Document, ICD
Trans Mon Suspension (TMS) to Interferometer Sensing and Control (ISC), Suspension (SUS) and Systems (SYS)

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v2 - is a draft prepared for TMS weekly meeting on 21st July 2010
v1 - prepared for initial feedback from ISC and TMS via e-mail

1 Introduction

This ICD covers the interfaces between the TMS subsystem and primarily ISC. However, it also discusses the interface between TMS an SUS (the ETM / ITM suspension is the direct neighbor of the trans monitor suspension in each chamber.) as well as TMS to SYS (Systems).

2 TMS - ISC

2.1 Physical Interfaces

2.1.1 Table Dimensions

Requirement:

The dimensions of the TMS optics table, which interfaces with the ISC optical components, is 30 inch x 30 inch (square). ISC have a restricted zone on the table for the wire clamps, as indicated in the sketch in figure below.

Explanation/description/references:

None

Historical Notes:

TMS (Ken)- The restricted zone will come from Sam when the layout is finished

ISC (Sam) - I understand that Ken provides restricted zones, after which ISC gets to do whatever. Not the other way around. I will not be setting any restricted zones

Need feedback from TMS / ISC on this?

2.1.2 Table Levelness and flatness

Requirement:

TBD

Explanation/description/references:

Is this required, need feedback from TMS / ISC on this?

Historical Notes:

None

2.1.3 Centre of Gravity

Requirement:

The CG location in both X and Y is at the center of the wire pattern, as shown in the figure below. ISC will make an effort to have the CG of the ISC components (as defined above) at the center of the wire pattern. There is provision for to adjust this with adjustable mass on the table.

Explanation/description/references:

None.

Historical Notes:

None.

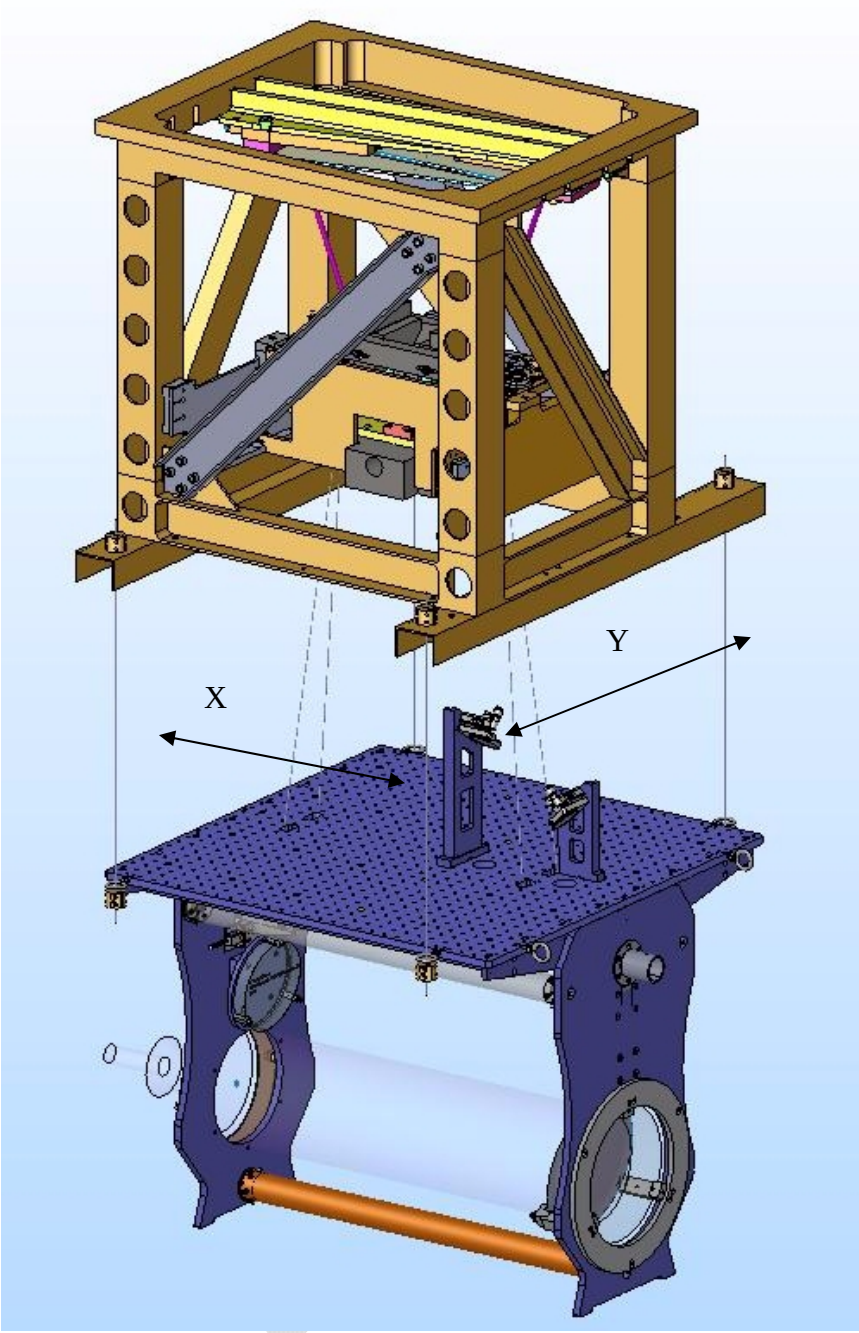

Figure 1 Figure of Top level TMS assembly, D0902083. Please note X and Y indicators were added by systems to explain CG requirement in section 2.1.3 only.

2.1.4 Periscope

Requirement:
TMS are providing the Periscope.
Explanation/description/references:
None
Historical Notes:
None

2.1.5 Mass Properties

Requirement:
The suspended package, 2nd stage, (table, telescope, components and balance mass) should weigh 80 kg. The 80 kg comes from the quad (ETM / ITM) lower two masse, since the TMS is essentially a re-work of the TM / ITM. The 80 kg breaks down as follows: -

- 45 kg (telescope) - TMS
- 11 kg (table) - TMS
- 13 kg to 16kg (table components) - ISC
- 11 kg down to 8 kg, depending on above (counter balance mass) - TMS

Explanation/description/references:

Historical Notes:
Full mass properties are covered in the systems section later in this document.

2.1.6 Attachment

Requirement:
Describe how are optical components attached to the table.
Explanation/description/references:
Is this an issue, need feedback from TMS / ISC on this?
Historical Notes:
None

2.1.7 Alignment Reference Marks

Requirement:
None known.
Explanation/description/references:
Are these required need feedback from TMS / ISC on this?
Historical Notes:
None

2.1.8 Tooling & handling (install) fixtures

Requirement:
Describe tooling required (if any) to get components onto table.
Explanation/description/references:
Need feedback from TMS / ISC on this?
Historical Notes:
None

2.2 Electronic/Electrical Interfaces & Software

None known

2.3 Environmental

None

2.4 Safety

Requirement:
None
Explanation/description/references:
ISC / TMS will follow all safety plans and procedures.
Historical Notes:
None

2.5 Operational Limits

None

2.6 ICD Verification Matrix

TBD

3 TMS to SUS / SEI

3.1 Physical Interfaces

3.1.1 Dog clamps

Requirement:
TMS to provide specialized dog clamps and tooling to fit dog clamps for both the quad and trans monitor suspension.

3.1.2 Cabling

Requirement:
TMS to cable up back of chain, away from the quad suspension.

3.1.3 Baffle

Requirement:
The location of the TMS baffle on front of telescope (and design) to be discussed with suspensions i.e. Janeen Romie, Norna Robertson et al.

Explanation/description/references:
Need feedback from TMS / ISC on this?

3.1.4 Tooling

Requirement: (SYS) Calum - The TMS suspension should be designed such that tooling (from TMS) can move the TMS a minimum of 24 inches, refer to LIGO-T1000420-v1. Need feedback from TMS / ISC on this?
Explanation/description/references:
This move is required to service the quad in a repair scenario and to add remove first contact from the AR coating of the reaction test mass in the quad.
Historical Notes:
This came up as part of TMS final design review. Systems indicated suspension needed 2 ft at a minimum. TNS indicated 12 " at the review and have subsequently asked for 10".

3.1 Electronic/Electrical Interfaces & Software

None

3.2 Environmental

None

3.3 Safety

Requirement:
None
Explanation/description/references:
ISC / TMS will follow all safety plans and procedures.
Historical Notes:
None

3.4 Operational Limits

See tooling section else none.

3.5 ICD Verification Matrix

TBD

4 TMS - SYS

4.1 Location of TMS on seismic table

Requirement:
Quoted in LIGO-E1000040-v2, are these finalized. Would like feedback from TMS / ISC on this at meeting?
Explanation/description/references:
TMS can you confirm final positions of 4 TMS suspensions on table.

Historical Notes:
None

4.2 Mass Properties

Requirement:

Please provide a full breakdown of the mass properties of a TMS in both the suspended and non-suspended configurations as follows: -

	SUSPENDED	NON-SUSPENDED
Top Mass *	44.1 kg	
Suspended package (2nd stage) *	80 kg (45kg telescope + 11kg table + 11kg counter balance mass + 13kg ISC components)	
Dog clamps	10 kg	10 kg
Upper structure with top stage	60 kg (2x9.77kg top stage + 33kg upper structure + 1/2x12kg table cloth)	60 kg
TOTAL	194 kg	70 kg
* Also confirm +/- on masses above?		

Numbers quoted extracted from, LIGO-T1000304-v1.

Would like feedback from TMS / ISC on this at meeting?

Explanation/description/references:

None

Historical Notes:

(SYS) Calum - I believe the total is ~ 194kg as quoted. However I am not convinced this is what TMS have in the top level assemblies and should be checked.

4.3 Overall layout (reference)

Requirement:

All TMS top level assemblies should be part of the overall systems layout. The ISC sub-assembly should be a child of each TMS parent assembly.

Explanation/description/references:

None

Historical Notes:

Top level assembly, D0902083 with D0901880 and D100069

Can you confirm / provide DCC numbers for all 4 TMS assemblies, 3 levels only?

Are ICD using real assembly for SolidWorks work, if not can we structure assembly to give them required access? Would like feedback on these items from TMS / ISC?

4.4 E-stops

Requirement:

Are these finalized wrt the chamber. Would like feedback from TMS / ISC on this?

Explanation/description/references:

None

Historical Notes:

None