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**ETM TransMon Telescope\_SUS Installation Plan**

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## 1 Introduction

The purpose of this document is to provide information on the scope and procedures involved in the assembly and installation of the ETM Transmon\_Telescope\_SUS

### **First Assembly and Testing of the Trans Mon Suspension:**

The suspension will be tested at Caltech in room 318, this ~~test~~ will test the modified Quad suspensions with a dummy load to see if it meets the TransMon control system requirements. The suspension will be taken apart and shipped to the Hanford Observatory where it will be cleaned and reassembled as a first article.

### **First Assembly and Testing of the TransMon Telescope:**

1. Testing of the first article TransMon Telescope will be done at Caltech to verify the alignment procedure. We will be using dedicated tooling, to be used later on the full production of six additional units. The telescope will be taken apart and cleaned at CIT, then shipped to the site and reassembled and aligned at the site.

2. Assembly of the Transmon Optical Table:

The Transmon Optical Table will be assembled and aligned at MIT, then tested to verify the Transmon optical performance. The assembly will be taken apart and shipped to the site, where it will be cleaned and re assembled and realigned as a First Article.

### **Sub-Assembly of the TransMon\_Telescope,\_Optical\_Table, and SUS at the site:**

These assemblies will be accomplished in advance of the needed installation date, and therefore clean storage for the sub assemblies will be needed.

At the Hanford Observatory the TransMon Telescope, Optical Table, and SUS will be individually assembled and aligned in series using individual clean facilities.

The TransMon Telescope and Optical Table will be mated and aligned using tooling made for this task in a clean room next to the Cartridge assembly, while hanging by wires from a temporary fixture to simulate the same stress the assembly will see as when it is installed on the ISI Table on the cartridge.

### **Cartridge Assembly of the TransMon\_Telescope\_Optical\_Table:**

Weight Specification:

1. The telescope and Optical Table combined weight is 80kg.
2. The suspension frame and top mass weight is approx. 80 kg

**Tooling:**

Support Brackets to provide stabilization and suspension wire strain relief will be attached to the Telescope \_Optical Table assembly; to relieve the suspension springs and wire loading during installation, and cartridge transport.

**Procedure:**

1. Use a Genie Lift to roughly position the suspension frame assembly to the ISI optical table in the cartridge.
2. Precision-locate the suspension frame assembly to the ISI optical table, using pusher tooling.
3. Secure the suspension frame assembly with clamps.
4. Attach the installation tooling to the suspension frame.
5. Use the Genie Lift to support and position the Transmon Telescope assembly, and attach to the installation tooling.
6. Connect the suspension wires from the suspension frame to the Transmon Telescope assembly.
7. Remove the installation tooling.

**Pre-alignment procedure on the Cartridge:**

1. Enable active suspension control.
2. Align the TransMon Telescope SUS to the ETM HR surface, using a test laser beam apparatus.
3. Re-attach the installation tooling prior to installation of the cartridge in the chamber.

**Cartridge Installation in chamber**

1. Use the installation tooling to move the TransMon\_Telescope and integral Optical Table up and back away from the ETM, with slack suspension wires. (The installation tooling is mounted to the ISI optics table; therefore, provision must be made to account for this extra weight on the ISI structure. If the tooling is mounted to the '0' stage, the 80kg mass of the Transmon Telescope and Optics table will have been temporarily removed from the ISI table and provision must be made to account for this weight removal.)
2. Install cartridge in chamber.
3. Remove the installation tooling.
4. Activate the control system and re-check the alignment using the test laser beam apparatus.

**Personnel & Equipment:**

There will be 2-3 people required to do the tasks; a genie lift will be necessary for the attachment of the Quad to the cartridge, and the attachment of the TransMon Telescope and

Optical Table to the Quad. The TransMon Telescope and Optical Table will be supported by stabilization tooling for the move to the BSC.

#### Safety:

There will be a laser generated beam required for the alignment procedure in the BSC, and a laser safety procedure will be produced to this task.

The TransMon\_Telescope SUS assembly task involves moving the large size and weight of the sub-assemblies, handling will have to be done with the assistance of tooling and lifts, specific to the task.

The delicate final aligned telescope/ optical table cannot be bumped in transport to the BSC.

#### Site Manpower requirement:

##### Sub-Assembly of the TransMon\_Telescope,\_Optical\_Table, and SUS

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|--|----------------------|
| 1. SUS assembly                                    | 2 people 4 days each |
| 2. Optical Table                                   | 2 people 4 days each |
| 3. TransMon Telescope                              | 2 people 4 days each |
| 4. Joining of Optical Table and TransMon Telescope | 2 people 4 days each |

##### Cartridge Assembly of the TransMon\_Telescope\_Optical\_Table

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|-------------------------------------|----------------------|
| 1. Cartridge Assembly and alignment | 3 people 4 days each |
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##### Cartridge Installation in chamber

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| 1. Chamber alignment | 2 people 4 days each |
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