LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY
- LIGO -
CALIFORNIA INSTITUTE OF TECHNOLOGY
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Statement of Work: Installation of the New 40m suspension

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This is an internal working note
of the LIGO Project.

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1 OBJECTIVES/SCOPE

Install the first prototype of the new 40m Test Mass (TM) suspension system into the South-Vertex (EV) chamber of Mark II and characterize the system for input to the LIGO suspension final design.

2 PROCEDURE

1. Characterization of the existing EV suspension (Jun. 21)
2. Preparation of the suspension parts (- Jun. 28)
3. Disassembly of the existing EV suspension (Jul. 2 - Jul. 3)
4. Preparation of TM (Jul. 8 - Jul. 10)
5. Assembly of the new TM suspension (Jul. 11 - Jul. 22)
6. Installation of the new TM suspension (Jul. 23 - Jul. 24)
7. Characterization of the new TM suspension (Jul. 25 - Aug. 7)

2.1. Characterization of the Existing EV Suspension (1 day)

Measure the following parameters of the EV suspension:

- Pendulum, pitch, and yaw resonance frequency
- Control block pitch and yaw resonance frequency and Q
- Wire vertical resonance frequency
- Orientation sensor sensitivity
- Orientation actuator efficiency and range

2.2. Preparation of the Suspension Parts (- Jun. 28)

1. Clean and Bake the suspension parts
2. Glue the magnets to the standoffs (1 day)

2.3. Disassembly of the Existing EV Suspension (2 days)

1. Adjust and maintain the global/local optical levers
2. Vent and open the tank
3. Mark the position of the TM
4. Disassemble the EV suspension

2.4. Preparation of TM (3 days)

1. Scrape the wire standoffs off the TM
2. Clean the TM
3. Glue the magnet/standoffs to the TM
4. Glue the guide rods to the TM

2.5. Assembly of the new TM suspension (8 days)

1. Assemble the suspension support structure
2. Hang and balance the test mass
3. Bake the TM
4. Clean the TM
5. Measure the reflectivity and transmissivity of the TM
6. Re-hang the TM

2.6. Installation of the new TM suspension (2 days)

1. Clamp the TM using the safety stop
2. Transfer the assembly into the EV chamber
3. Install the cable and the electronics
4. Close and pump down the tank

2.7. Characterization of the new TM suspension (10 days)

- Optimize the electronics parameters
- Check damping
- Check saturation
- Try locking with the LSC input

Measure:

- Pendulum, pitch, and yaw resonance frequency
- Control block pitch and yaw resonance frequency and Q
- Wire vertical resonance frequency
- Sensor sensitivity
- Actuator efficiency and range
- Transfer function of the pendulum
- Loop gain
- Sensor noise
- Driver noise
- Q of the wire violin mode
- Q of the TM internal mode

3 MANPOWER

- Seiji Kawamura (Task Leader)
- Janeen Hazel (Key Person for mechanical installation)
- Rich Abbot (Key Person for electronic installation)