

## CHAMBER ENTRY/EXIT CHECKLIST

### SCOPE

The tasks listed below are felt to be important in knowing and/or correcting the configuration of LIGO chamber internal components. It should be reviewed for appropriateness and an implementation decision should be made whenever personnel are to enter a vacuum chamber. It's not intended that all of these steps be necessarily performed with each chamber entry. However, chamber entries are sufficiently rare that it's prudent to grasp the opportunity to learn all we can about these generally inaccessible areas. Also included are tasks to be reviewed for chamber exit.

#### **WARNING!**

Any chamber entry is a serious threat to suspended optics, and great care should be taken to preclude touching the optics table, anything on it, and the seismic stacks. Qualified personnel should carefully engage chamfer stops on each optic prior to work being performed in the vicinity of the optics. This sequence would need to be revised, of course, if one of the tasks assigned is to check the current gap at the chamfer stops.

#### **CAUTION**

To provide reasonable assurance against the inadvertent introduction of contaminants, all personnel entering chambers should be familiar with the LIGO Hanford Observatory Contamination Control Plan, LIGO-M990034, and the LIGO Vacuum Compatibility, Cleaning Methods and Qualification Procedures, LIGO-E960022. It is important that proper clean room attire is worn in the chambers and in the surrounding clean rooms.

### OPTICAL LEVER ITEMS

#### **A. Adjustment**

Confirm all optical levers are working and are zeroed or on scale, as appropriate

### OPTICS/SUSPENSION ITEMS

#### **A. Magnet Joint Integrity**

1. Inspect all magnet joints to confirm all appear secure

## **B. Earthquake Stops**

1. Inspect screw tip-to-chamfer clearance at each earthquake stop (16 per optic); nominal expected gap is 1 mm. Record results
2. Take digital photos for record, as possible, of stops and suspension components (requires digital camera with fresh batteries and foil for setting camera down)

## **C. PAM Brackets**

1. Inspect material color of each sensor actuator (OSEM) bracket. There are five OSEMs with 3 to 4 brackets each. The one closest to the back of the head is the PAM bracket. The side OSEM does not have a PAM bracket. After the PAM bracket is a spacer, pin plate and then the pigtail. The brackets will be aluminum, Teflon (white) or PFA 440HP (milky white). Record material for these brackets.
2. Take digital photos for record, as possible (requires digital camera with fresh batteries and foil for setting camera down)

## **D. OSEM Pigtailed**

1. Inspect apparent length (measurement does not need to be precise) of the OSEM pigtailed (5 per optic) and record any deviations from the following intended planned assignment:  
BSC chambers: 3 ea., 3' and 2 ea., 2'  
HAM chambers: 5 ea., 2'
2. Install an additional pigtail connection between the available 3rd position of J2 (b) 25 pin D-connector and the optics table (requires Class B 3/16 Allen wrench, pigtail and 1/4-20 x 1/2 SHCS)
3. Confirm all wiring appears properly secured and is free of the beam path, secured by Class A stainless steel wire
4. Take digital photos for record, as possible (requires digital camera with fresh batteries and foil for setting camera down)
5. For LOS and SOS units with OSEMs using surface mounted devices (SMDs), perform feedthrough tests using the MIT test box per E010070-A, Section 3.3.

## **E. Controller**

1. Confirm that the controller is working properly; refer to Suspension Controller Tuning Procedure, T000003.

## **F. Optics Cleanliness**

1. Check to see if optics need cleaning. If so, clean with CO<sub>2</sub> “snow gun” and 5 lb CO<sub>2</sub> cylinder (requires that the chamfer stops are engaged). Use O<sub>2</sub> monitor to confirm an adequate breathing environment.

# COS ITEMS

TBD

## SEISMIC ITEMS

### A. Ribbon Cable

1. Check for adequate (spec. ?) clearances, cable-to-cable, and cable-to-leg element/table; tuneup, if required & possible (requires Class B, 3/32 & 5/32 Allen wrenches and, for LHO only, a small Phillips screwdriver)
2. Check termination bracket connectors: 13 pin row toward the ends of the bracket forks and 12 pin row away from the fork ends; correct if necessary
3. Perform continuity check of cables (requires Class B 24-pin and 2-pin shorted connectors, Class B 3/32 Allen wrench, and continuity test circuit)
4. Confirm excess cable is coiled & secured (may require Class A copper wire)
5. Confirm screws are secured at feedthrough connector joints (requires Class B 3/32 Allen wrench)
6. Visually inspect all drooping portions of cables to confirm absence of cables touching each other, leg elements, or the tables between clamps; correct if necessary (requires foil-wrapped flashlight plus, for corrections, Class B, 3/32 & 5/32 Allen wrenches and, for LHO only, a small Phillips screwdriver)
7. Take digital photos for record, as possible, of cable positions, especially at potential droop areas (requires digital camera with fresh batteries and foil for setting camera down)

### B. Optics Table

1. WARNING! Prior to checking level, carefully engage the eight chamfer stops to secure each suspended optic in the chamber. Check levelness with a precision level; if previously given clearance by commissioning authority, relevel as required by shifting balance weights. Table should be level within 1/2 bubble, as indicated by the average of both level orientations for each of the X and Y directions (requires precision machinist's level--or equivalent, good for 0.005in/ft--alcohol-wiped, with foil for lining during checks)
2. Take digital photos for record, as possible, of plan view positions of all table components (requires digital camera with fresh batteries and foil for setting camera down)

## CHAMBER EXITING

### A. General

1. Confirm planned baffle installations and beam dump installations have been completed
2. Check log of corrective tasks to confirm that all tasks appropriate for this chamber entry have been completed
3. Confirm that all fixtures, tools, foil, temporary beam blocks, stool, etc. have been removed from the chamber; be sure to check all nozzles.

4. Use a Class B vacuum vacuum system to remove any particles that may have been left on the chamber floor and lower portions of the spools/nozzles; also vacuum lower portions of the spool expansion joint convolutions, if appropriate

## **B. Suspension**

1. Inspect all magnet joints to confirm all appear secure
2. This step is to be performed only by qualified personnel: set screw tip-to-chamfer clearance to 1 mm at each earthquake stop (16 per optic), while visually checking magnet positions in OSEMs
3. Confirm all wiring appears properly secured and is free of the beam path
4. Check that suspension controller properly damps optic(s); refer to LOS Installation Procedures E000061 or E000062

## **C. Closure**

1. Close and secure chamber door(s) per standard procedure

## **D. Data**

1. Log all steps performed, with significant data, in the electronic log.
2. Transfer all digital photographs to hard disk storage; print, identify and file all that are significant in documenting configuration of internals