New Folder Name Proposed Alternate Leak Check Method for Beam Tube Module T950025

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CALIFORNIA INSTITUTE OF TECHNOLOGY

Laser Interferometer Gravitational Wave Observatory (LIGO) Project

To/Mail Code: Distribution
From/Mail Code: J. Worden
Phone/FAX: 4438

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Subject: BeamTube Leak Check Proposal

The current plans for the Beam Tube module leak check call for an RGA air signature test to determine the leak tightness level of each module after the month long water bakeout. There can be three outcomes from the air signature measurements:

1. The beam tube module is judged to be leak tight to the required level. No further action is required.
2. The beam tube module is found to have leaks to atmosphere and their approximate locations are determined. Helium leak checking will follow.
3. The RGA air signature test does not provide the required confidence to make a decision on leak tightness level. Helium leak checking will follow.

Items 2 and 3 provide significant uncertainty in cost estimating due to the nature of He leak detection at high sensitivity. The costs incurred will be largely labor costs. I believe this is (or will be), in part, responsible for CBI's reluctance to bid this portion of the beam tube job. Any He leak detection activity (at the sensitivities required by LIGO) would likely involve CBI (or other contractor) staff standing around waiting for background and real signals to drop to acceptable levels before proceeding with further He spraying.

Alternate plan or fall back position.

What follows can be taken as either an alternate method or a backup plan in case of contractor failure.

The Beam tubes are maintained under vacuum for approximately two years before they are put into service. This time could be used efficiently for He leak checking by resident LIGO staff. The procedure for leak checking the module follows:

1. One turbo pump station and He leak detector are moved to the appropriate beam tube pump port (nearest the suspected leak if known). This will be the only pumping location until the scope of the He leak search moves to the next 250 meter portion.

2a. Large Enclosure - Bagging of a length of tube proceeds. A suitable unit for bagging would be some multiple of a beam tube section as this corresponds to the support spacing.

2b. Small Enclosure - Bagging is not required. The enclosure would serve as the bag. Two enclosure sections would be removed leaving some number of enclosure sections in place to serve as the "bag". The exposed ends would be sealed off.

3. Either the bag (2a.) or the sealed off portion of the small enclosure (2b.) would be purged or filled with He until the required concentration is obtained.
4. The He signal indication on the leak detector is monitored to determine the presence or absence of leaks.
5. It is at this point that patience is typically required before moving on to the next step. Once a signal appears on the He leak detector it may be some time before the signal decays to a low enough level to repeat a He spray. In the case of the beam tube, the large evacuated volumes as well as the large volumes of trapped spaces in the insulation could cause these decay times to be several hours or even days in length. If resident LIGO staff are performing this task then they are free to return to other tasks associated with the site commissioning. Several days later the He leak check can then proceed with a cleaned up mass spectrometer. There need not be a tight schedule imposed on this operation.

The above assumes that a proven method of leak repair exists and that CBI (or other contractor) can be provided with suitable incentives to perform without knowing how many leaks are present.

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