

LIGO-T940024-00-B



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FACSIMILE MESSAGE

Fax No. is: 815 439 6010
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October 11, 1994

To: Rai Weiss
LIGO Project - MIT

Fax No. (617)253-7014

From: M. L. Tellalian Phone (815)439-6517

Plainfield Engineering - PAE

RE: Section Leak Test - October 11
LIGO Design & Qualification Test - Caltech Contract C146

Rai,

Attached are the lab notes from our test today on the assembly composed of sections 21-A and 21-D. The most significant change in the procedure for this test was the bagging and purging of the mass spectrometer with nitrogen. The helium signal on the HMS dropped when nitrogen purge inside the bagged HMS started. The helium signal continued to fall during the initial part of the test as well. Other than an unexplained rise in the background from approximately 2×10^{-10} to 4×10^{-10} , the helium pressure remained relatively constant for the entire duration of the test. This increase in helium pressure happened so quickly that no one was observing the scale when it was actually rising. After a half hour, the 4.7×10^{-10} leak was opened to confirm the sensitivity and measure the response time.

The annulus between the inflatable seal and the primary seal was purged with nitrogen during the test. After the test was completed, this annulus was evacuated and a bag was constructed outside of the inflatable seal and filled with helium with out producing an increase in the helium signal.

The pumps have been stopped and the chamber is isolated. The heads will be removed tomorrow and the sections will be positioned for steam cleaning. Chuck Sherlock will be working with the circumferential leak test box tomorrow.

As I have discussed with Larry, the pumpdown readiness review meeting is tentatively scheduled for October 27. We should have no difficulty in having the sections cleaned, assembled, and on the supports at that time.

Regards,

M. L. Tellalian
Plainfield Engineering

cc: Larry Jones - LIGO Project
FAX # (818)304-9834

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1838 Closed 10" ϕ slide valve to isolate can section.
Background is 2.5×10^{-9} ; can pressure is 2.5×10^{-6} t.

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0720 Can pressure 8.0×10^{-4} t; HMS calibration - reads
0740 Cooled 10" ϕ cold trap. 3.3×10^{-8} for 2.0×10^{-8} std leak
0750 Opened 10" ϕ slide valve; HMS background 1.25×10^{-9} .
0805 Can pressure 6.3×10^{-6} t; foreline 2 mt;
HMS background 1.4×10^{-9} .
0821 4.0×10^{-6} can pressure; HMS background 15
 1.65×10^{-9} Injected He into bag around HMS.
0822 HMS signal rising.
0824 1.2×10^{-7} HMS signal peaked
0831 5.6×10^{-9} HMS signal
0832 Isolated HMS, vented. HMS manifold and
to 0836 metal hose, repumped HMS; HMS signal is
 5.3×10^{-9} , gained a little on background.
0837 HMS signal back to 5.6×10^{-9} ; didn't gain any the
HMS definitely most, if not all, of our problem.
0845 Started purging bag around HMS with N_2 ; HMS
signal (background) still rising. 7.8×10^{-9} HMS signal
0853 HMS signal at 9.8×10^{-9} ; still purging bag around
HMS with N_2 .
0856 Can pressure 2.8×10^{-6} t; foreline at 1 mt.
0904 HMS background signal 1.2×10^{-8} ; still N_2 purging HMS.
Can pressure is 2.7×10^{-6} t.
0908 $\frac{1}{2}$ Isolated HMS from system; background 1.25×10^{-8}
before isolating; backing system DP with mech pump.
0928 Can pressure 2.4×10^{-6} t; HMS background signal
 9.1×10^{-9} ; HMS cleaning up; foreline 3 mt.
0934 Can pressure 2.3×10^{-6} t, HMS signal 8.4×10^{-9} ;
foreline 3 mt.
0943 Can pressure 2.2×10^{-6} t; HMS signal 7.5×10^{-9} ;
foreline 3 mt.
0944 Can pressure 2.1×10^{-6} t.

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- 958 Can pressure 2.0×10^{-6} t; foreline 2 mt;
HMS background 6.6×10^{-9} .
- 115 Can pressure 1.9×10^{-6} t; foreline 2 mt;
HMS background 5.3×10^{-9} .
- 135 Can pressure $1.7/1.8 \times 10^{-6}$ t; foreline 2 mt;
HMS background 6.6×10^{-9} .
- 146 Can pressure 1.7×10^{-6} t; foreline 2 mt;
HMS background 4.1×10^{-9} .
- 100 Can pressure 1.6×10^{-6} t; foreline 2 mt;
HMS background 3.6×10^{-9} .
- 115 Can pressure 1.6×10^{-6} t; foreline 2 mt;
HMS background 3.2×10^{-9} .
- 119 Can pressure 1.5×10^{-6} .
- 132 Can pressure 1.5×10^{-6} ; foreline 2 mt;
HMS background 2.6×10^{-9} .
- 145 Opened HMS to 10^{-4} p DP; closed off mech pump
from 10^{-4} p DP, HMS background of system 4.1×10^{-9} .
- 300 Can pressure $1.4/1.5 \times 10^{-6}$ t; foreline 0 mt;
HMS background 3.7×10^{-9} .
- 315 Can pressure $1.3/1.4 \times 10^{-6}$; foreline 0 mt;
HMS background 3.35×10^{-9} .
- 345 Can pressure 1.3×10^{-6} ; foreline 0 mt;
HMS background 3.0×10^{-9} ; nulled to 3.1×10^{-10} .
- 345 to
1402 Bagged HMS in polyethylene; purged bag with N_2
Continued N_2 purge in bag around HMS.
Connected O_2 meter in can section bag near
top and near one end. HMS manifold pressure
at 2×10^{-5} .
- 402 Started helium into can section bag
HMS background signal 3.5×10^{-10} .
- 404 Oxygen level 20.7%. HMS signal 3.5×10^{-10} .
- 404 1/2 Oxygen level 19.6%. HMS signal 2.7×10^{-10} .
System cleaning up due to N_2 in HMS bag.
- 406 Oxygen level 8.0%; HMS signal 2.9×10^{-10} .

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- 1407 Oxygen level 7.0%; HMS 2.2×10^{-10} ; changing Helium bottles. 1407 1/2 started next bottle.
- 1409 Oxygen level 5.9%; HMS 2.0×10^{-10} ; compress 1.3×10^{-10} ft.
- 1410 " " 5.8%; " 2.0×10^{-10}
- 1411 " " 5.2%; " 2.0×10^{-10}
- 1412 " " 4.6%; " 2.0×10^{-10}
- 1413 " " 3.9%; " 2.0×10^{-10}
- 1414 " " 3.6%; " 2.0×10^{-10}
- 1415 " " 3.6%; " 2.0×10^{-10}
- 1416 " " 3.6%; " 2.0×10^{-10} ; second Helium bottle empty.
- 1418 Oxygen level 3.6%; HMS 1.9×10^{-10}
- 1419 " " 3.7%; HMS 1.8×10^{-10}
- 1420 " " 3.7%; HMS 1.7×10^{-10}
- 1421 " " 3.8%; HMS 1.9×10^{-10}
- 1423 " " 4.0%; HMS 1.9×10^{-10}
- 1425 " " 4.2%; HMS jumped to 3.9×10^{-10} .
(No logical reason)
- 1427 " " 4.3%; opened system standard leak. Signal stabilized at 1.2×10^{-9} .
Closed standard leak.
- 1433 Oxygen level 5.3%; HMS signal stable at 4.0×10^{-10} ; opened system standard leak again. HMS signal stable at 1.05×10^{-9} .
Closed standard leak. HMS signal stabilized at 4.0×10^{-10} ; response time was 55 seconds; signal increase was 6.5×10^{-10} for a 5×10^{-10} std c/s Helium leak.
- 1437 Oxygen level 6.1%.
- 1438 Opened system standard leak; HMS signal stable at 1.05×10^{-9} .
- 1440 Closed standard leak; stable at 3.8×10^{-10} in 55 seconds; net signal of 6.7×10^{-10} for a 5.0×10^{-10} std c/s leak.
Oxygen level 6.9%; can test complete.

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1441 to 1447 Removed N₂ purge from can end seal space on equipment end. Inflated outer seal and evacuated seal space. Bagged outer seal.

1455 HMS background signal 2.5×10^{-10} ; can pressure 1.3×10^{-6} t. Injected helium into bag around outer seal on equipment end.

1457 HMS signal cleaning up.

1459 " " " " " "

1500 " " " " " "

1505 " " 1.9×10^{-10} . End of test for this seal.

1506 to 1512 Inflated outer seal on end away from equipment. Stopped N₂ purge. Evacuated space between seals on this end. Bagged seal.

1512 HMS background signal cleaned to 1.5×10^{-10} . Injecting helium into bag around outer seal.

1519 System still cleaning. HMS signal 0.7×10^{-10} .

1522 " " " " " " 0.5×10^{-10} . End of test for this seal.

1400 Isolated can section by closing 10" ϕ slide valve. Calibrated HMS. Reading 2.6×10^{-5} for a 2.0×10^{-9} std cells helium leak.

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