LIGO-T940019-00-B

FACSIMILE MESSAGE

CBI
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Fax No. is: 815 439 6010
Verify No. is: 815 439 6000

Page 1 of 5 October 5, 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 - Day 3
LIGO Design & Qualification Test - Caltech Contract C146

Rai,

Attached are the lab notes on our pump down and leak test today, October 5. The approach taken today was to expose the tube ends and pumping system to the same helium environment as was present yesterday but to prevent an enhanced helium environment from being exposed to the tube section shell. The tube bag was repaired and sealed. Helium was sprayed around the end seal area first without any increase in the chamber helium pressure. The system head was then checked and demonstrated the same helium pressure rise as was experienced yesterday.

In addition, a gage was installed in the back head to measure the pressure in the space between the end seal and the inflatable seal 180 degrees away from the roughing pump. After approximately 3 hours, the pressure stabilized at just over 40 torr. Based on the long response time of our test yesterday and the very similar pattern to the helium pressure rise today, we believe that the leak rate of 1 X 10-10 has been demonstrated. Please give us a call to discuss the test results and our conclusions.

Regards,

Marty

M. L. Tellalian
Plainfield Engineering

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

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To LARRY JONES	From M. TELLALIAN
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15:17 2.7×10^{-9} 15.7 % O_2 N_2 STILL BEING APPLIED TO BAG.

15:18 2.4×10^{-9}

15:19 2.6×10^{-9} 19.6 % BAG SUCKED OUT @ 15:18

15:20 2.8×10^{-9} N_2 STILL ON

~~Late~~ 4" TEAR IN BAG AT TOP OF GUIDED ENDED SUPPORT @ INSTRUMENT END.

15:25 2.5×10^{-9} N_2 STOPPED @ 15:24

15:30 2.7×10^{-9} 15.1 % MACHINE

15:35 3.0×10^{-9} BAG CUT & BLOWN OUT @ AIR

15:40 3.1×10^{-9} STARTED PURGING END SEALS DN_2

15:50 3.1×10^{-9}

16:15 2.9×10^{-9} Can still at 1.0×10^{-6} t Foreline at 1 mt

16:25 Checked MS Calibration - Reading 1.85×10^{-8} for Peak Turned MS to read ——→ 2.0×10^{-8}

17:05 1.0 $\times 10^{-6}$ t, FORELINE 1 mt; isolated DP from vessel; turned off LN_2 to cold trap. Backing DP with mech pump; MS isolated. Total He background after rezeroing for MS Calibration check was 5.0×10^{-9}. With 10" ϕ Slide valve closed, He background was 2.1×10^{-9}. More than half is in can section.

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0658 Can pressure 4.0×10^{-4} t; foreline pressure 8 mt Opened N_2 purge gas to the spaces between both end seals. MS filament burned out. Cooled cold trap.

0700 Opened 10" ϕ Can isolation valve. Can section pressure dropping; foreline pressure rose to 96 mt

0705 9.9×10^{-6} t; foreline 9 mt

2731 2.5×10^{-6} t; foreline 7 mt

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0750 2.0×10^{-6} t ; foreline 6 mt

0800 1.7×10^{-6} t ; foreline 6 mt

0825 1.4×10^{-6} t ; foreline 6 mt

0850 1.3×10^{-6} t ; foreline 6 mt

0955 1.0×10^{-6} t ; foreline 5 mt

1030 9.9×10^{-7} t ; foreline 5 mt ; evacuating seal space

1045 9.8×10^{-7} t ; foreline 5 mt

1100 9.7×10^{-7} t ; foreline 5 mt @ 11:15 tied MS behind DP ; isolated mech pump

1130 9.6×10^{-7} t ; foreline 1 mt

He background of entire system is 5.2×10^{-9} ;

With 10" ϕ valve closed DP He background is 7.2×10^{-10} ; thus the background in chamber is ~~5.5 x 10~~ 4.5×10^{-9}.

1140 9.3×10^{-7} t ; foreline 1 mt

1145 9.1×10^{-7} t ; foreline 1 mt

1220 8.8×10^{-7} t ; foreline 0 mt

Seal space at 4.5 t

1300 8.4×10^{-7} t ; foreline 0 mt

He background 4.1×10^{-9}

1312 8.2×10^{-7} ; foreline 0 mt

TEST TO VERIFY HELIUM BACKGROUND SOURCE

MASS SPEC PRESURE (SOURCE ELEMENT) 2×10^{-5} t

BACKGROUND + NULLING 4×10^{-9} TO 3×10^{-10}

1316.5 3.0×10^{-10} STARTED SPRAYING HELIUM AROUND ROUGH PUMP @ SEAL (OFF PUMP) (NO H_2 IN-BAG OVER TUBE)

1318.0 3.0×10^{-10}

1324.0 2.8×10^{-10}

1325.0 3.0×10^{-10}

1327.0 2.6×10^{-10} APPEARS TO BE CLEANING UP

1330 STARTED SPRAYING SEAL (OPPOSITE PUMP) W/ HELIUM

1.8×10^{-10}

1332.5 1.9×10^{-10}

1334 1.9×10^{-10} 8.0×10^{-7} CHAMBER PRESS

1336 1.8×10^{-10} 43 t @ SEAL

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m Page No.	OCT 5, 1994
.338	2.0×10^{-10}
1340	2.0×10^{-10} STOPPED SPRAYING @ NO PUMP END
1340.5	MOVED TO PUMP CLOSURE HEAD
1342.0	STARTED SPRAYING AT PUMP END 1.6×10^{-10}
1344.0	1.6×10^{-10}
1346.0	1.5×10^{-10}
1348.0	1.6×10^{-10}
1350.0	1.8×10^{-10}
1352.0	2.2×10^{-10} → STOPPED SPRAYING AREA
354.0	2.3×10^{-10}
356.0	4.0×10^{-10}
400.0	4.5×10^{-10}
402.0	5.2×10^{-10}
404.0	5.5×10^{-10}
406.0	6.2×10^{-10}
408.0	6.9×10^{-10}
410.0	7.6×10^{-10}
412.0	8.7×10^{-10}
414.0	9.5×10^{-10}
416.0	~~1.05×10^{-9}~~ 1.05×10^{-9}
418.0	1.2×10^{-9}
	THE BACKGROUND LEAKAGE IS FROM ELBOW ABOVE DIFF PUMP OR END SEAL
420.0	1.3×10^{-9}
	CUT BAG AROUND THE ELBOW TO AIR OUT
422.0	1.5×10^{-9}
424.0	1.7×10^{-9}
426.0	1.9×10^{-9}
428.0	2.1×10^{-9}
430.0	2.3×10^{-9}
432.0	2.4×10^{-9}
434.0	2.6×10^{-9} PURGED BAG @ ELBOW WITH NITROGEN
438.0	2.95×10^{-9}
440.0	3.1×10^{-9}
442.0	3.4×10^{-9}
444.0	3.6×10^{-9}
446	3.4×10^{-9}

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148 3.5×10^{-9}

450 3.5×10^{-9}

TODAYS PATTERN VERY SIMILAR TO PATTERN (DURATION, RATE OF RISE & MAXIMUM SIGNAL) OF 10/4/94 HOWEVER NO He WAS SPRAYED INTO TUBE BAG. ∴ LEAK HAS TO BE OUTSIDE OF BAG.

1955 CHAMBER 7.7×10^{-7} torr SEAL 41 torr

	~~10/3~~	10/4	10/5
START TIME		1405	1342
END TIME		1540	1450
END ~~AM~~ SIGNAL		3.1×10^{-9}	3.5×10^{-9}

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