LIGO-T940021-00-B

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To LARRY JONES	From M. TELLALIAN
Co. CALTECH	Co. CBITS
Dept. LIGO	Phone # 815-439-6517
Fax # 818-304-9834	Fax # 815-439-6010

FACSIMILE

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Verify No. is: 815 439 6000

October 3, 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 Repair & Leak Test
LIGO Design & Qualification Test - Caltech Contract C146

Rai,

The leak was repaired by late Friday afternoon and the vessel was pumped to 270 torr Friday evening. The chamber pressure remained essentially the same until Sunday evening when rough pumping was resumed to 72 microns in roughly 3 hours. Pumping was stopped until Monday morning at 6:17 am. The cross over to high vacuum pumping was started at 9:05am. The chamber pressure was 2 X 10-6 at 11:13 when the chamber was swept with N2 at a pressure level of 2 to 3 X 10-4 for about 30 minutes. The chamber pressure was 1.9 X 10-6 at 16:00 when we started to locally bag suspect areas with a helium background of 2.6 X 10-9. The repair and the coil splice did not produce a significant signal. A relatively large leak was found in the convectron gauge in the test head. The gauge was replaced but the background did not come down below 3.3 X 10-8. After another N2 sweep, the bag on the tube was separated into three sections and filled with helium. There was no indication with a background of 3.3 X 10-8. The mass spec was calibrated again and slightly adjusted resulting in a background of 2.7 X 10-8. The chamber valve was closed and the pumping system background cleaned up to 3.6 X 10-9. The chamber pressure was allowed to rise between 18:25 and 19:01 resulting in a chamber pressure of 2.0 X 10-5. The valve was opened and the chamber pressure quickly fell back to 2.0 x 10-6 with a helium background of approximately 7.5 X 10-9. After bagging and spraying the elbow and valve without an indication, the chamber valve was again closed resulting in a background in the diffusion pump of 4.4 x 10-9. No further pumping will be done until tomorrow morning.

Naturally, we are trying to find the source of our background. The chamber appears to be leak tight based on a 9 range sensitivity. As you know, there are many elastomeric seals in our system which may have been contaminated. There is also some question about the condition of the diffusion pump oil and the diffusion pump operation. Our first approach tomorrow will be to sweep the chamber again with N2 but at a higher pressure.

Attached are five pages of the lab notebook which provides information on the pumping done over the weekend and today. Give me a call if you have any questions or have any comments.

Regards,

M. L. Tellalian - Plainfield Engineering

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

21 C CAN SECTION LEAK TEST

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2139 Narrowed leak area to 2π" shut down system by valving in diff pump and not air-releasing pump package (LN2 trap cold). Will [illegible] [illegible] 600 Corp and hold end caps ~~[illegible]~~ on. EB

9/30 LEAK LOCATION

APPLIED 40 KF FITTING TO THE INSIDE OF THE SHELL TO CONFIRM LEAK LOCATION. SEAL TO THE INSIDE OF THE SHELL WAS SUFFICIENT TO REACH A BACKGROUND OF APPROXIMATELY 2.0×10^{-8}. LEAK AT THE REPAIR WAS FIRST INDICATED WITH THE HELIUM PROBE ON THE MASS SPEC FOLLOWED BY THE ATTACHED 40 KF FITTING. THE OUTSIDE SURFACE OF THE TUBE ~~WAS B~~ AT THE REPAIR WAS BUFFED SMOOTH. PRESSURE OF 20 PSI WAS APPLIED TO THE INSIDE SURFACE & SOLUTION FILM WAS APPLIED TO THE OUTSIDE WHICH ~~[illegible]~~ PRODUCED A SMALL AREA OF BUBBLES. THE PROCESS WAS REPEATED ON THE OTHER SIDE WITH THE SAME RESULTS

9/30

1925 FIXED LEAK & RETESTED

SENSITIVITY NOT VERY GOOD @ BKG OF 1×10^{-8} W THROTTLE FULL OPEN & METER @ GREEN/RED LINE NO INDICATION OF LEAK

STARTED EVACUATION WILL EVACUATE TO 300 TORR AND STOP FOR WEEKEND

1935 $P = 2.7 \times 10^{+2}$ t PUMP STOPPED

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?/2/94 (Sunday Evening) (SWP)

19:10 CHAMBER PRESSURE @ $2.6 \times 10^{+2}$ t
1915 OPEN VALVE TO CHAMBER AFTER STARTING ROUGHING PUMP
1917 $2.4 \times 10^{+2}$ t
1930 $1.0 \times 10^{+2}$ t
1945 $3.2 \times 10^{+1}$ t
2000 $1.0 \times 10^{+1}$ t
2015 3.7 t
2030 1.4 t
2045 6.5×10^{-1} t
2100 3.4×10^{-1} t
2115 2.1×10^{-1} t
2130 1.5×10^{-1} t
2145 1.1×10^{-1} t
?200 9.4×10^{-2} t
?215 7.6×10^{-2} t
2220 7.3×10^{-2} t
?221 → CLOSED VALVE & TURNED OFF ROUGH PUMP 7.2×10^{-2} t
?230 7.2×10^{-2} t

?/3/94 (SWP)

?617 8.2×10^{-2} t → STARTED ROUGH PUMP & OPENED VALVES
?620 8.1×10^{-2} t
?630 7.3×10^{-2} t
?655 5.9×10^{-2} t → OPENED VALVE TO DIFFUSION PUMP
?656 2.9×10^{-1} t
?700 2.3×10^{-1} t
?715 1.6×10^{-1} t
?730 1.2×10^{-1} t
?800 8.0×10^{-2} t SWITCHED OUT [illegible] PUMPS TO [illegible]
?815 7.7×10^{-2} STARTED D.P.
?830 7.3×10^{-2} CLOSED ROUGHING VALVE

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0905	P = 74 μ	STARTING TO CROSSOVER D.P.
0920	40 μ	
0935	5×10^{-4} t	CROSSOVER COMPLETE
0940	3.3×10^{-5} t	
0950	1.3×10^{-5} t	
1010	8.3×10^{-6} t *	DEGASSED ION GAGE
1020	6.1×10^{-6} t	
1030	5.6×10^{-6} t	
1040	5.0×10^{-6} t	BKG 1.5×10^{-9}
1055	4.0×10^{-6} t	
1105	4.3×10^{-6} t	~~[illegible]~~ BKG 1.8×10^{-9}
1113	2×10^{-4} t	STARTED N_2 SWEEP $2\text{-}3 \times 10^{-4}$ t
1145	2×10^{-4} t	STOP SWEEP
1150	3.7×10^{-6} t	CHANGED LN_2 DEWAR
1155	3.3×10^{-6} t	BKG 1.5×10^{-9}
1205	3.0×10^{-6} t	
1215	3.0×10^{-6} t	
1220	2.9×10^{-6} t	
12:40	2.3×10^{-6} t	
12:45	2.7×10^{-6} t	
13:00	2.6×10^{-6} t	
1310	2.6×10^{-6} t	1.2×10^{-9}
1345	2.4×10^{-6} t	
1400	2.3×10^{-6} t	BKG 1.2×10^{-9}
1425	2.2×10^{-6} t	– PEAKED + ZEROED HMS BKG 2.7×10^{-9}
1510	2.1×10^{-6} t	ALSO SPRAYED N_2 INTO BAG W/
15:25	2.0×10^{-6}	NO EFFECT ALSO SPRAYED LARGE
15:55	2.0×10^{-6}	QUANTITY INTO ELBOW BAG. TO
16:00	1.9×10^{-6}	NO EFFECT

15:25 Sprayed a repair and coil splice at background of 2.6×10^{-9}. Slight upward movement 2.7×10^{-9} but needle is not stable. Sprayed fittings in back head & found leak in N_2 purge/gauge fitting. Background went to a max of 7×10^{-6} leak hunt in progress at 16:00

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16:30	1.7×10^{-6}	LEAK FOUND IN CONVERTRON GUAGE & IKF FITTING ATTACHING CONVERTRON. CLOSED BUTTERFLY VALVE & REPLACED GUAGE & FITTING
2 ~~16:30~~	2.6×10^{-2}	
16:~~40~~35	3.5×10^{-6}	
16:45	2.0×10^{-6}	BACKGROUND 3.4×10^{-8}. N_2
16:47	$2-3 \times 10^{-4}$	N_2 SWEEP STARTED. HELD AT $2-3 \times 10^{-4}$
17:13	3.0×10^{-4}	PURGE STOPPED. BACKGROUND 3.3×10^{-8}
17:18	1.7×10^{-6}	17:30 BAGGED TUBE IN 3 SECTIONS
18:00	1.5×10^{-6}	& FILLED EACH SECTION W/ HELIUM. NO INCREASE IN BACKGROUND!
18:02	6.5×10^{-6} →	HELIUM LEAK OPENED PRESSURE INCREASED TO 6.5×10^{-6} & BACKGROUND WENT TO 6 RANGE
18:05	1.5×10^{-6}	BACKGROUND REMAINS 3.3×10^{-8} (VERY SLIGHT INCREASE W/ 4.7×10^{-10} LEAK OPEN. LEAK CLOSED. ~~AFTER~~
18:10	1.5×10^{-6}	MASS SPEC CALIBRATION
18:25	1.5×10^{-6}	BACKGROUND ~~2.7×10^{-9}~~ 10" VALVE CLOSED.
18:26	2.3×10^{-6}	BACKGROUND 3.6×10^{-9}
18:27	3.1×10^{-6}	
18:28	3.7×10^{-6}	
18:29	4.2×10^{-6}	
18:30	4.7×10^{-6}	
18:31	5.2×10^{-6}	
18:32	5.7×10^{-6}	
18:33	6.2×10^{-6}	
18:34	6.7×10^{-6}	
18:35	7.2×10^{-6}	
18:36	7.7×10^{-6}	
18:37	8.2×10^{-6}	
18:38	8.7×10^{-6}	
18:39	9.2×10^{-6}	
18:40	9.7×10^{-6}	
18:41	1.0×10^{-5}	
18:42	1.0×10^{-5}	
18:42:30	1.1×10^{-5}	
18:46	1.2×10^{-5}	
18:47:30	1.3×10^{-5}	
18:49	1.4×10^{-5}	
18:50:30	1.5×10^{-5}	
18:52	1.5×10^{-5}	
18:53	1.6×10^{-5}	
18:54	1.7×10^{-5}	
18:~~56~~57	1.8×10^{-5}	
18:59	1.9×10^{-5}	
19:01	2.0×10^{-5}	VALVE OPENED
19:03	5.4×10^{-6}	
19:05	3.4×10^{-6}	
19:12	2.2×10^{-6}	
19:15	2.1×10^{-6}	BACKGROUND 7.5×10^{-9}
19:17	2.0×10^{-6}	

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BAGGED & SPRAYED ELBOW, NO RISE IN BACKGROUND.

3 19:17 10" VALVE TO CHAMBER CLOSED. BACKGROUND IN ~~MASS SPEC~~ DIF PUMP 4.4×10^{-9}

19:32 1.2×10^{-5}

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