

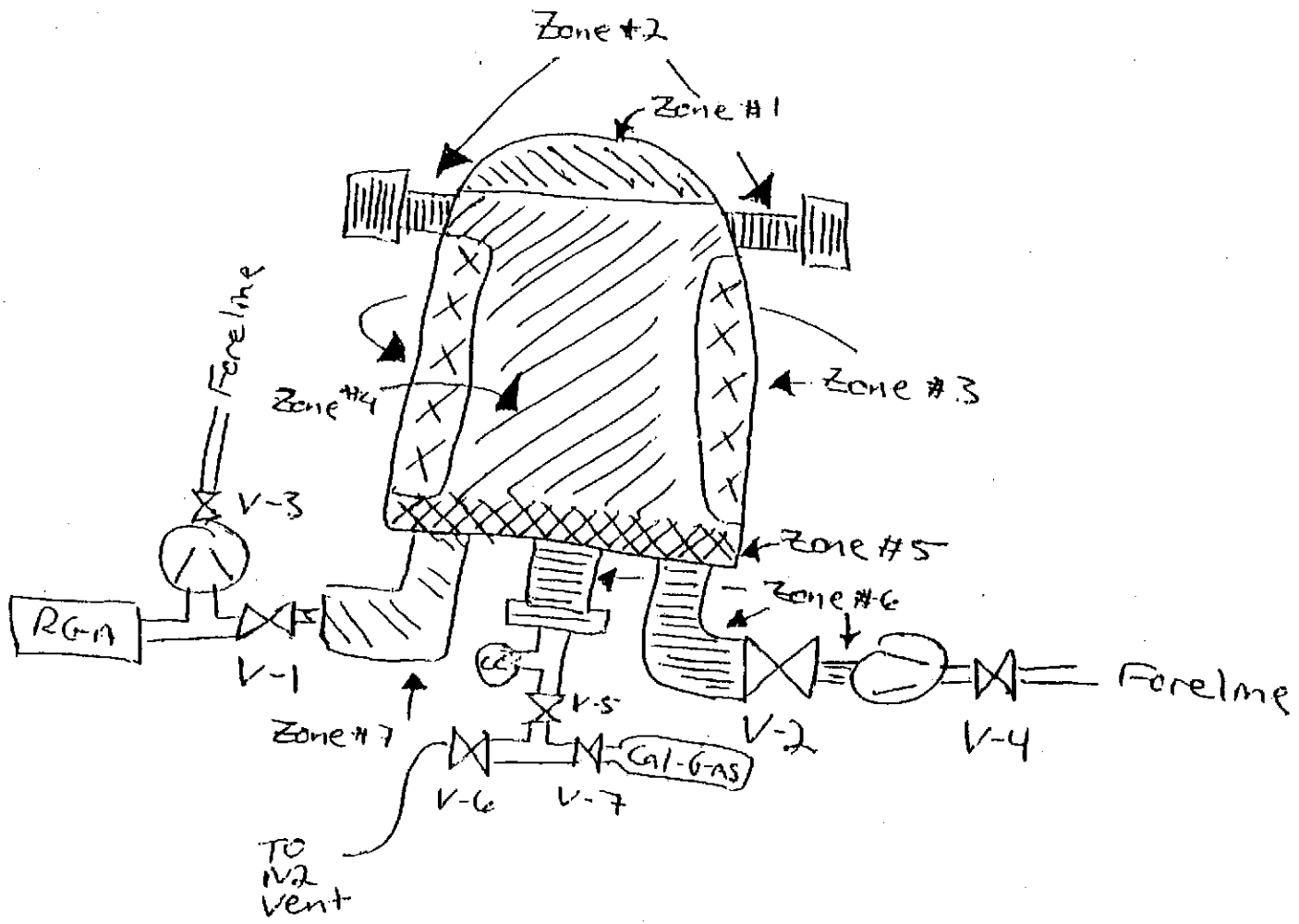
## Summary of LHO Vacuum Bake Oven A RGA Data Generation

The individual parts which comprise a "load" are cleaned as per LIGO-E960022 or as allowed by waiver(s) and loaded into the bake oven. The oven is then pumped down through the main pump "arm" (through V-2, RGA arm is valved off at this point). A heating profile is programmed and baking of the system begins. A typical "heating profile" consists of ramping up to material type soak temperature, soaking for approximately 48 hours, ramping down to approximately 70C, soaking and then ramping down to near room temperature. While soaking at 70C, an RGA background scan is taken. V-1 is then opened and V-2 closed. Enough time is allowed for the system to come into pressure equilibrium and then an elevated load temperature RGA scan is taken. V-1 is then closed and V-2 opened. Following this elevated temperature scan, the load is ramped down to near room temperature and the baking portion of the process is complete. Throughout the baking, temperature data is taken to verify the actual temperatures in the various "heat zones" of the bake oven system.

Once at near room temperature, another RGA background (V-1 closed) scan is taken. Next, V-1 and the cal-gas are opened and V-2 closed. After a 30 minute pressure equilibration time, a "calibration" scan is taken. The calculated pressure of Argon (constituent of the "mixed" calibration gas) is determined using the leak rate of Argon and the pump speed of the RGA arm port as seen by the oven chamber and compared (ratio) to the maximum amp value measured for Argon in the calibration scan. This "torr/amp" ratio becomes the Calibration Factor for the given load, converting measured current to pressure.

Finally, the cal-gas is valved out and enough time is allotted to allow all traces of it to be pumped away. A "post-bake" scan is then taken. Approval of the post-bake scan is a collective "pass/fail" determination made by either Dennis Coyne (CalTech) or Stan Whitcomb (CalTech). The data collected during the "elevated temperature scan" is entered into a spreadsheet which then calculates what the outgassing rates of AMUs 41, 43, 53, 55 and 57 ought to be at room temperature. These calculations are used to determine the room temperature outgassing rates when the signals are below the RGA's sensitivity (noise floor).

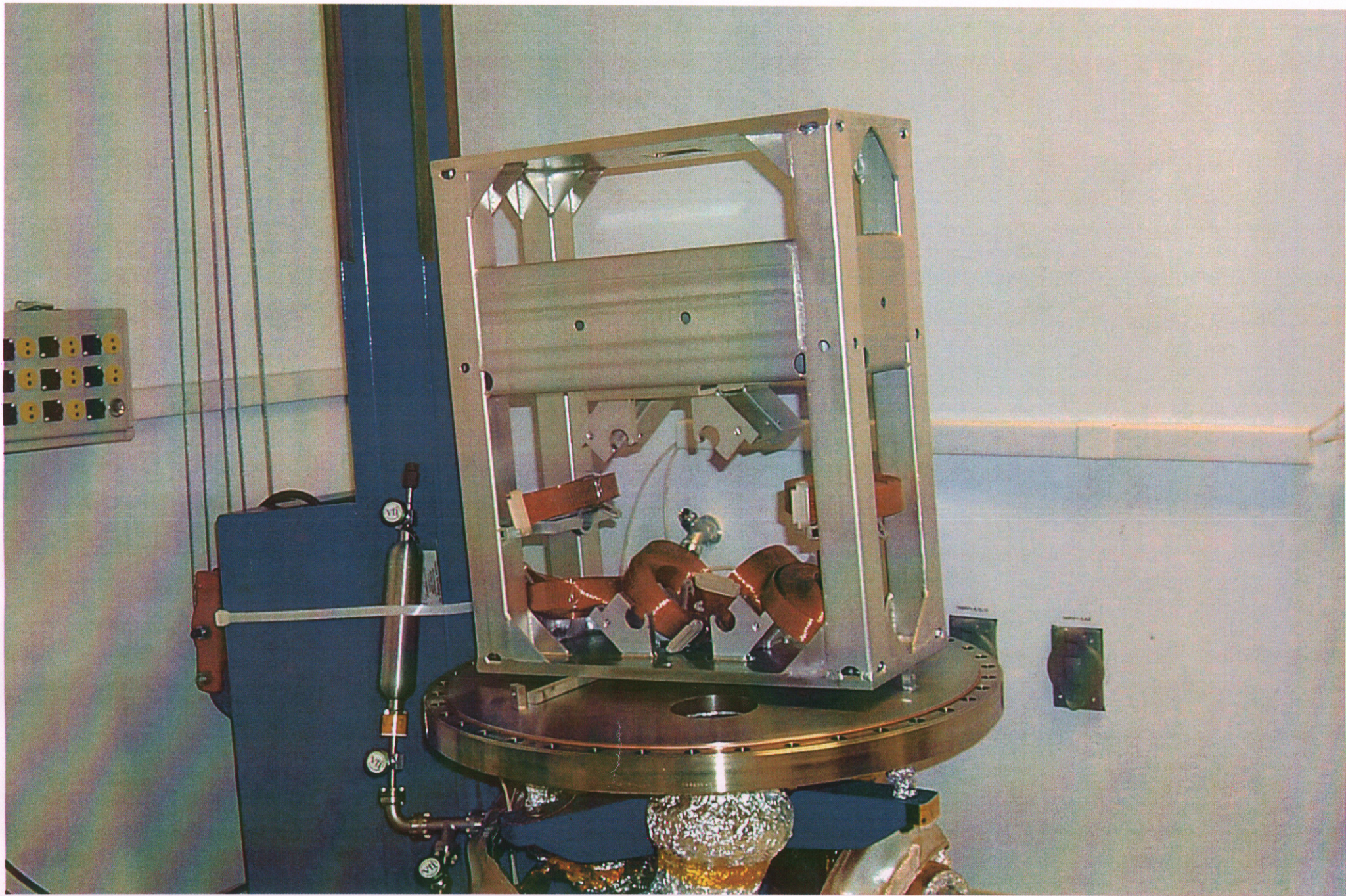
Refer to the LHO Vacuum Bake Oven A logbook for the actual ordered events of the load # of interest.

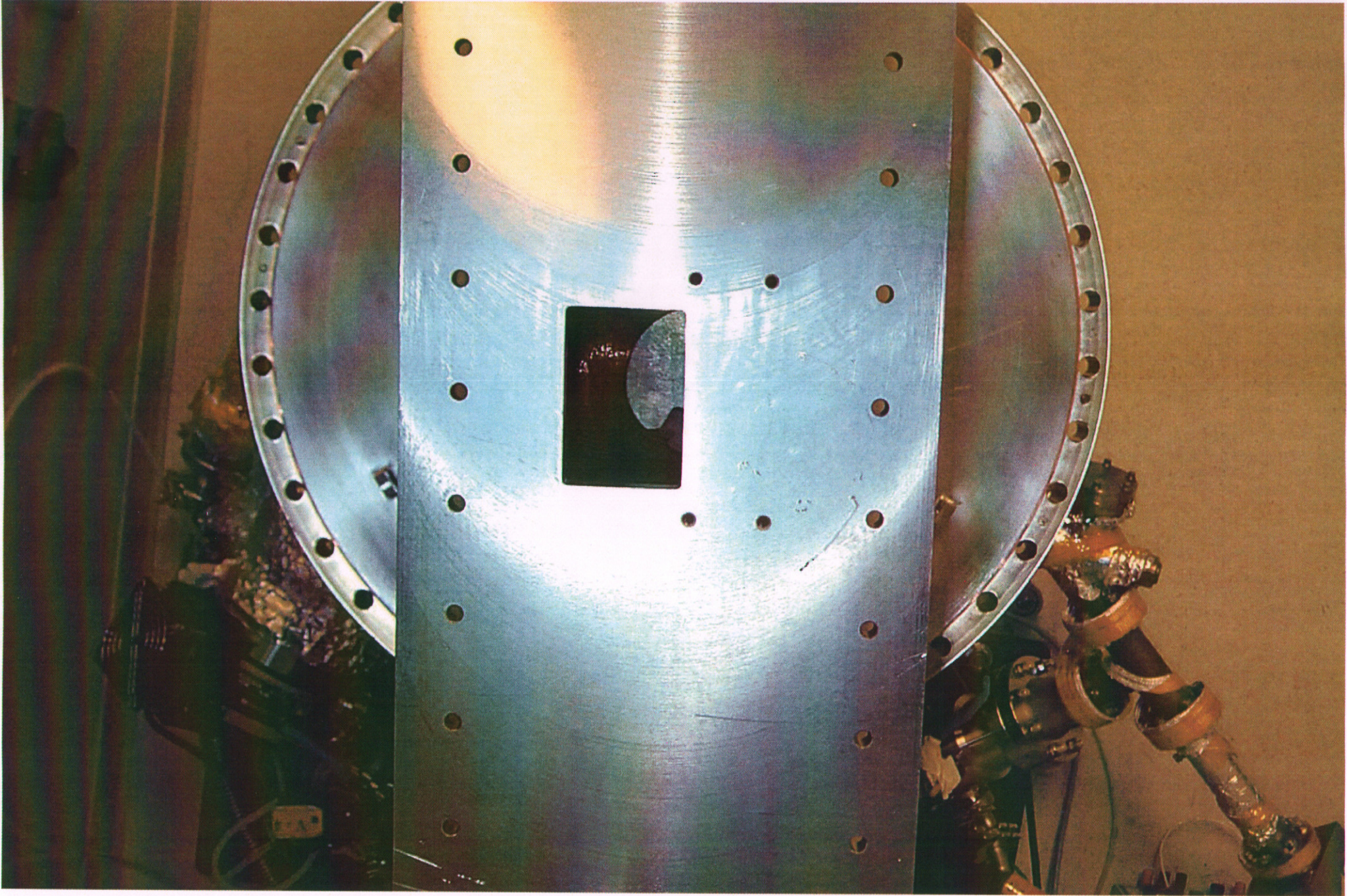


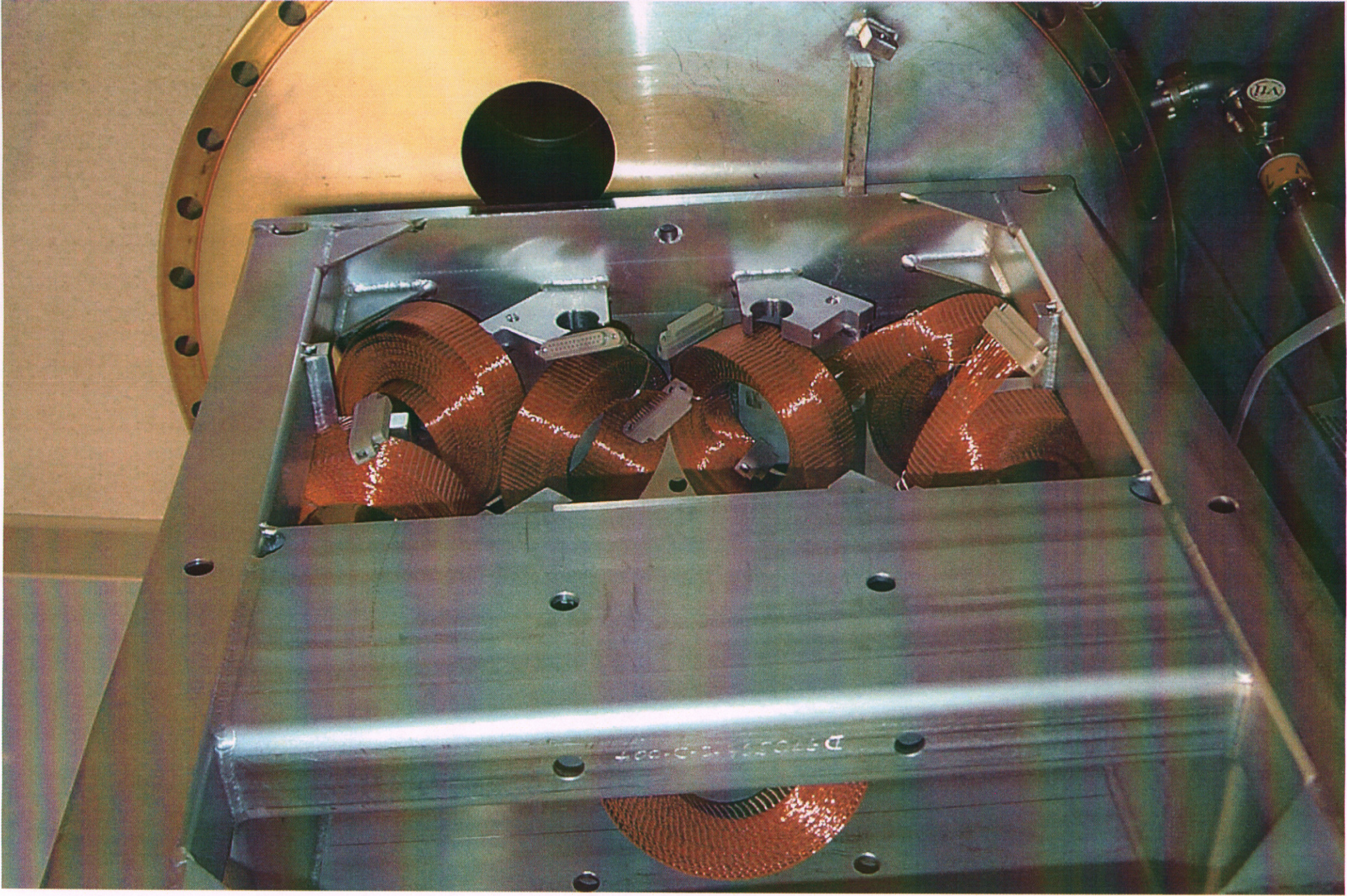
**LHO VACUUM BAKE OVEN A:  
CONTENTS LOAD #58**

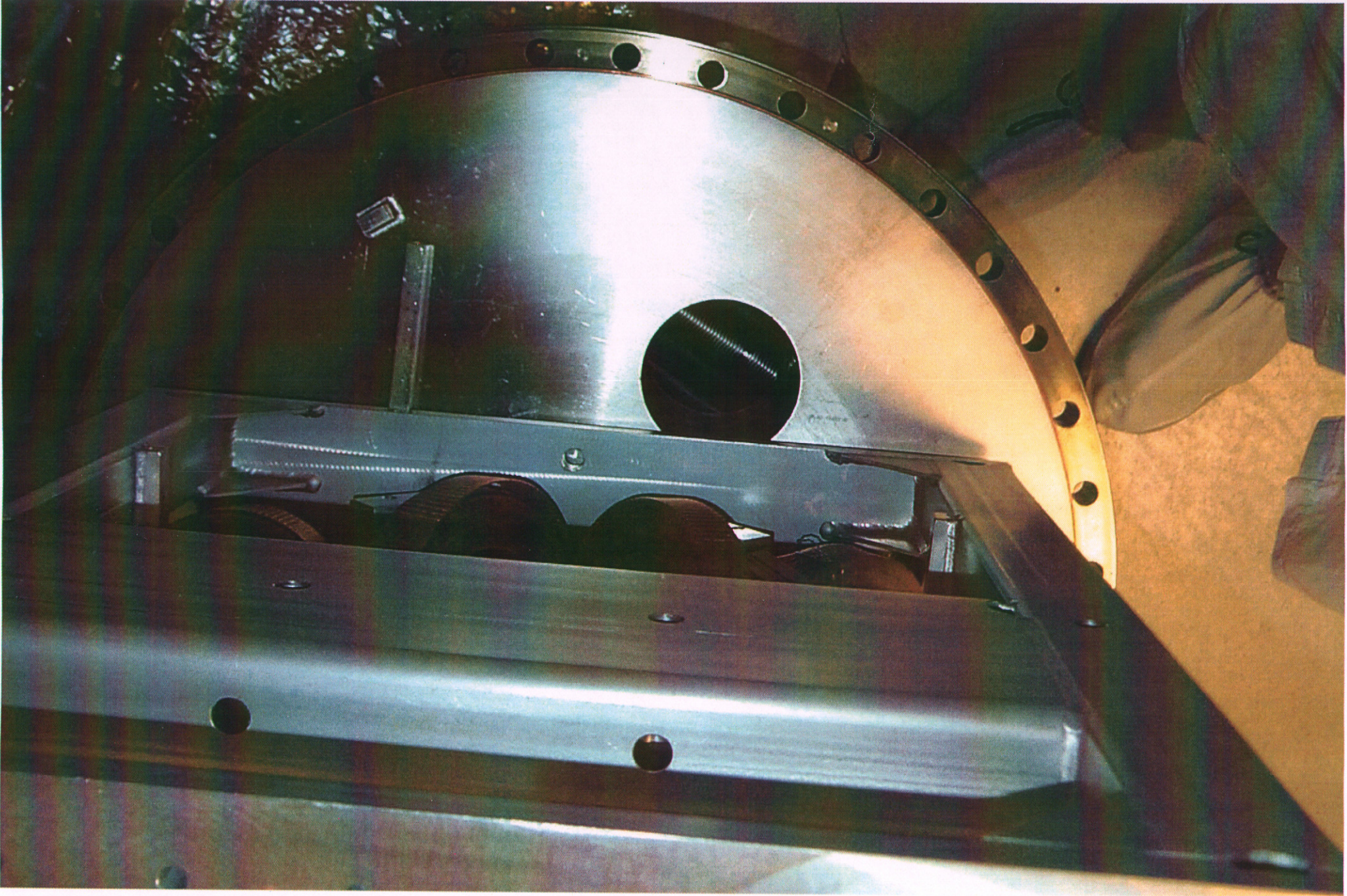
**L.O.S. STRUCTURE SERIAL NUMBER D970506-004**

**KAPTON CABLES (7ea) SERIAL NUMBER N/A**









# LIGO PROCESS TRAVELER

DCC Number: E990357-00-X

Date Prepared: 9-28-99

<b>Originator</b>	<b>Cognizant Engineer</b>	<b>Ext./Phone#</b>	<b>Account Number</b>
Janeen Romie - for Betsy Weaver	Janeen Romie	#8445	5F518=LIGO.5F500,2.8, NSFLIGO.5F500

Dwg/Part Number	Rev	Part Description	Serial Number	Qty
D970506	C	LOS Structure 304 Stainless LOS2 Structure Assembly, Beamsplitter	004	1
<b>Used In (next higher assembly):</b>		Suspension Top Assemblies: D970506 for BS; D970505 and D970539		

<b>Vendor Name</b>	<b>PO/Contract Number</b>
Brookfield Machine, West Brookfield MA	PC253684

**Data Package, Receiving/Inspection Remarks:**

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/Initials	Date Comp.
Y	N	See Attached Procedure. Dip a cotton swab in acetone and swab the inside of one of the legs. If swab comes out overly contaminated (rust-colored), consult S. Whitcomb or D. Coyne. Another pickle operation may be required.		

**Process Flow:**

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
1	Clean		LLO	See Attached Procedure. The weldments have been pickled and wrapped, therefore, rinse thoroughly with DI water. Take care to clean out the hollow legs. Use dry nitrogen to dry off the weldments.	B.R.VeGA	9-24-99
2	Request Waiver	8-28-98		A waiver from the full cleaning procedure of E960022 has been requested from the Vacuum Board. Waiver has been approved. See LIGO-E980250-00-D	J. Romie/ JHR	4-16-99

*N.B.: A copy of this traveler must be submitted to the DCC each time the original is shipped with the associated part(s) and when the traveler has been completed.*



# LIGO PROCESS TRAVELER

DCC Number: E990357-00-X

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp
3	Bake	9.24.99	LLO	Bake per E960022 for stainless parts. Bake in vacuum at 200 deg C for 48 hours.	R. RIVERA	9.28.99
4	Control Point			Review/approve RGA scan #092899C.RGA	D. Coyne/S. Whitcomb (Signature)	9/28/99
5	Wrap & Tag vacuum clean parts per E960022-A	9.28.99	LLO	Wrap parts as appropriate to prevent contamination. Double wrap with clean foil and wrap in CP Stat bag. Tag the outside CPStat bag with the part number.	R. RIVERA	9.29.99
6	Store		LLO	Store at LH0 for suspensions. <b>Note: Copy this traveler and give to the DCC Keep original traveler with these parts.</b>		

END: Go to Traveler associated with next higher assembly processing

**Special Instructions (Handling/Packaging Constraints, Remarks, etc.) or Notes:**

Date	Name	Instructions/Comments

# LIGO PROCESS TRAVELER

DCC Number:

# LIGO PROCESS TRAVELER

DCC Number: **E990335-00-X**

Date Prepared: **8/31/99**

Originator	Cognizant Engineer	Ext./Phone#	Project	Account Number
L. Jones	L. Jones	2970	LIGO	5F611
Dwg/Part Number	Rev	Part Description	Serial Number	Qty
(MDC) KAP-R25-300SC2		Kapton Ribbon Cable (with PEEK connectors)	N/A	7
Used In (next higher assembly):		Suspension control system		
Vendor Name			PO/Contract Number	
MDC Vacuum Products Corp.			PP297789-75LJ	

**Data Package, Receiving/Inspection Remarks:**

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/Initials	Date Comp.
Y		Rework required to provide adequate clearance at connector corners Reassembly required to correct mirrored pin condition	LARRY JONES JOHN MEYERS	9/1/99 7/1/99

**Process Flow:**

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
1	Control Point	NA	NA	Hold for completion of the inspection (above) if required	NA	NA
2	Clean	8.14.99	LHO	per LIGO-E960022- (also see special instructions below)	B. RUWEKA	9.14.99 9.20.99
3	Vacuum Bake	9.24.99	LHO	per LIGO-E960022- (also see special instructions below)	B. RUWEKA	9.28.99
4	Control Point		NA	Review/approve RGA: scan # <u>5099 C. R. C. ID</u> <i>SEW</i> scan # _____ scan # _____ Note: attach RGA scan(s) to this traveler.	D. Coyne or S. Whitcomb	9/28/99

*N.B.: A copy of this traveler must be submitted to the DCC each time the original is shipped with the associated part(s) and when the traveler has been completed.*

# LIGO PROCESS TRAVELER

DCC Number: **E990335-00-X**

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
5	Check continuity		LHO	Confirmation of continuity after bake		
6	Wrap & Tag parts		LHO	per LIGO-E960022- ; Use LIGO "UHV clean warning" and "UHV parts label" stickers		
				<table border="1"> <thead> <tr> <th>No.</th> <th>Qty per package</th> <th>Part</th> </tr> </thead> <tbody> <tr> <td>(1)</td> <td>1</td> <td>Kapton ribbon cable</td> </tr> </tbody> </table>		
No.	Qty per package	Part				
(1)	1	Kapton ribbon cable				
7	Store		LHO	(see also qty. for each shipping destination below)		
				place parts in LHO Vacuum Prep Lab cabinet		
				<b>Note: Copy this traveler and give to the DCC</b>		

END: Go to Traveler associated with next higher assembly processing

**Special Instructions (Handling/Packaging Constraints, Remarks, etc.) or Notes:**

SOME MAKING FROM PEER CONNECTORS USED B. RIVERA 9.14.99, 9.20.99 RECLEANED  
 CABLES IN METHANOL AS INSTRUCTED BY STAN WHITCOMB, SOLVENT SOLUTION CLEAR  
 AFTER ULTRASONIC BATH B. RIVERA



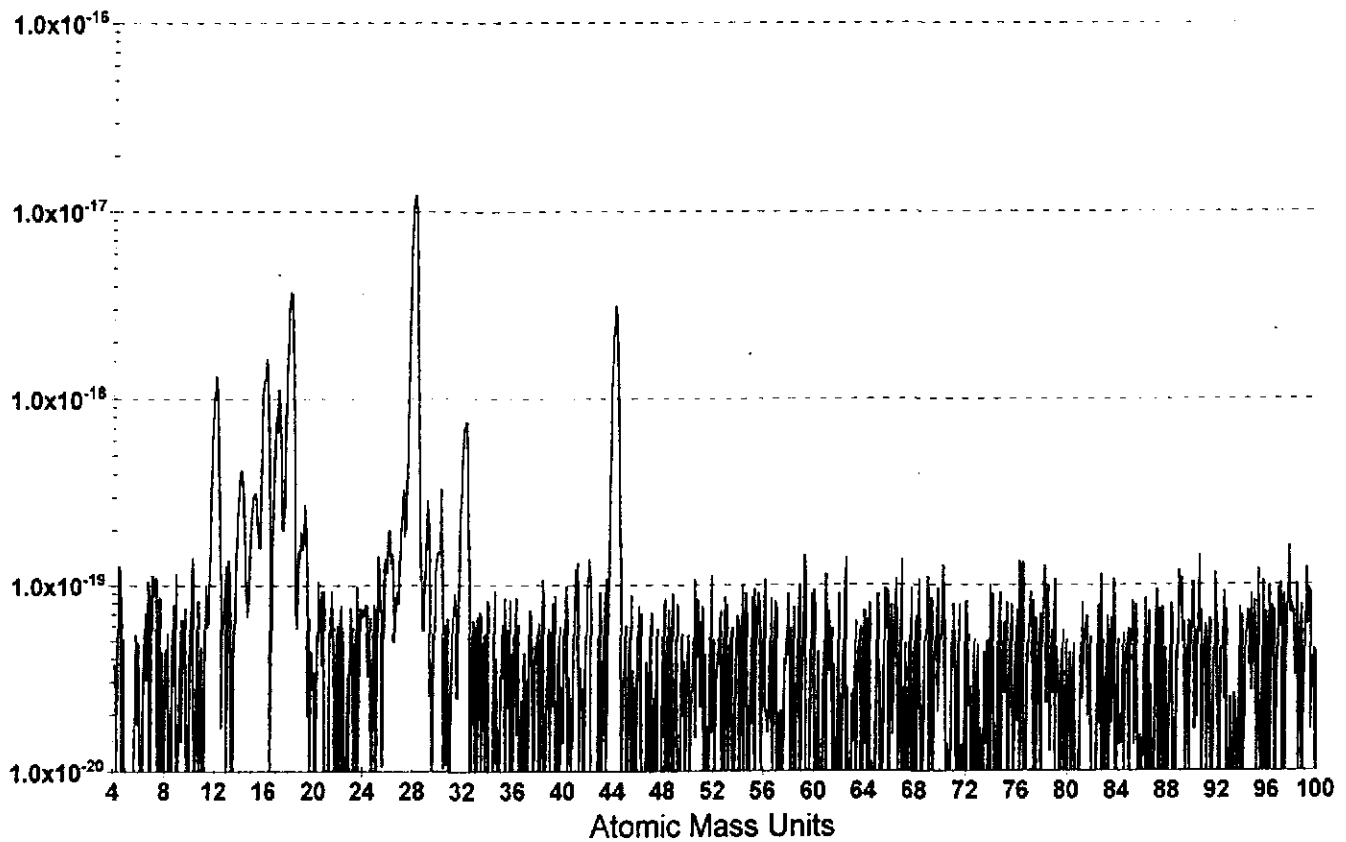
# LHO VACUUM BAKE OVEN A LOAD #58 ELEVATED TEMPERATURE BACKGROUND SCAN

V-1 Closed

Amps

092799a

Sep 27, 1999 03:53:45 PM



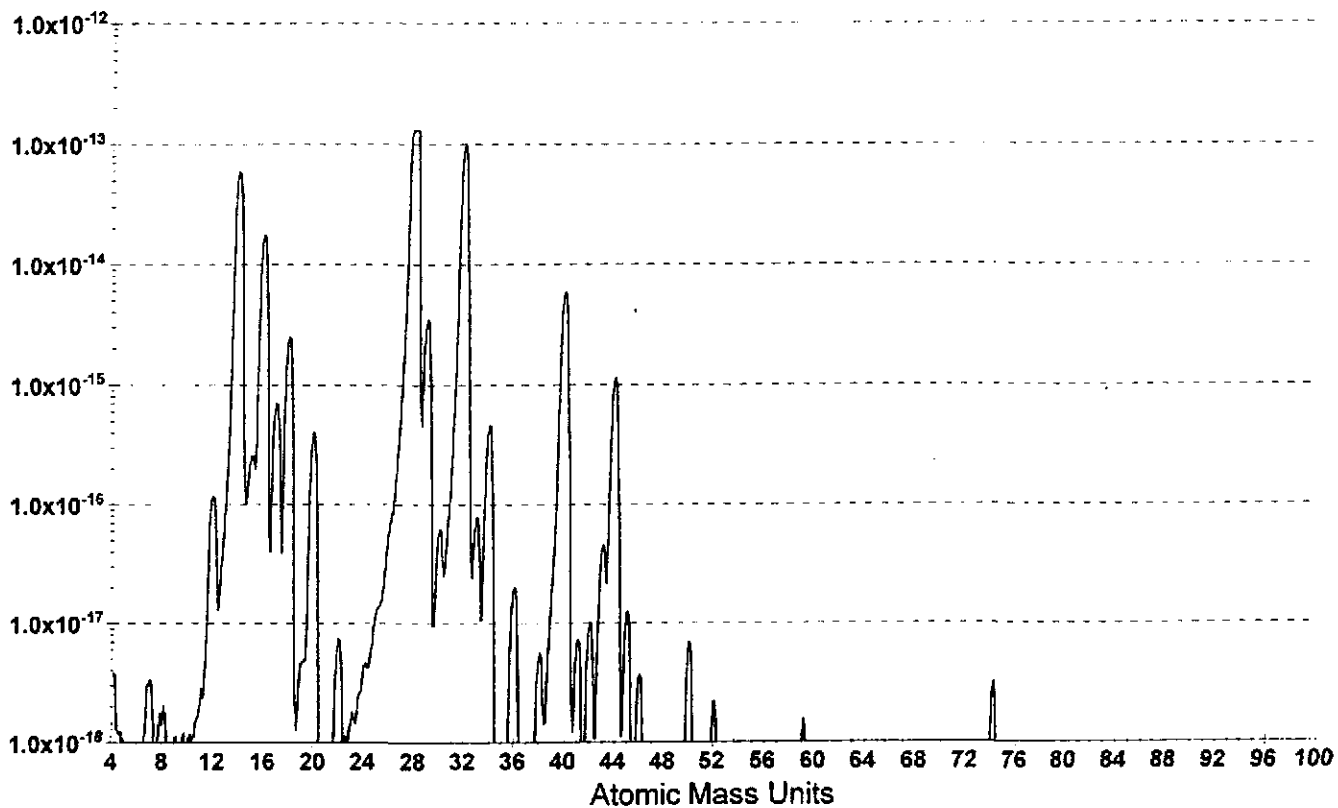
# LHO VACUUM BAKE OVEN A LOAD #58 ELEVATED TEMPERATURE SCAN

V-1 Open, Cal-Gas and V-2 Closed, 50°C

Amps

092799b

Sep 27, 1999 04:58:52 PM



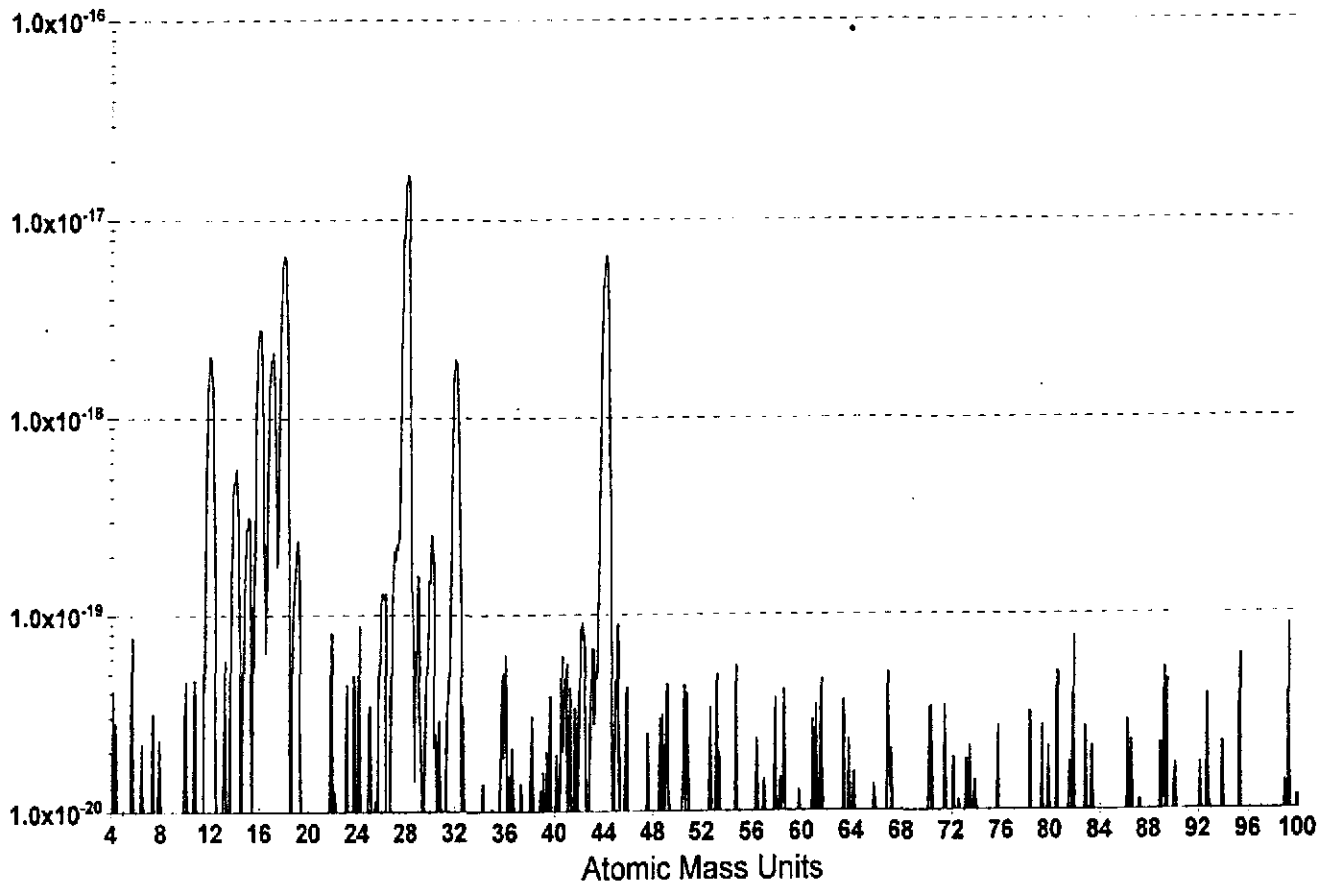
# LHO Vacuum Bake Oven A Load #58 RGA Background

V-1 closed, room temperature

Amps

092899a

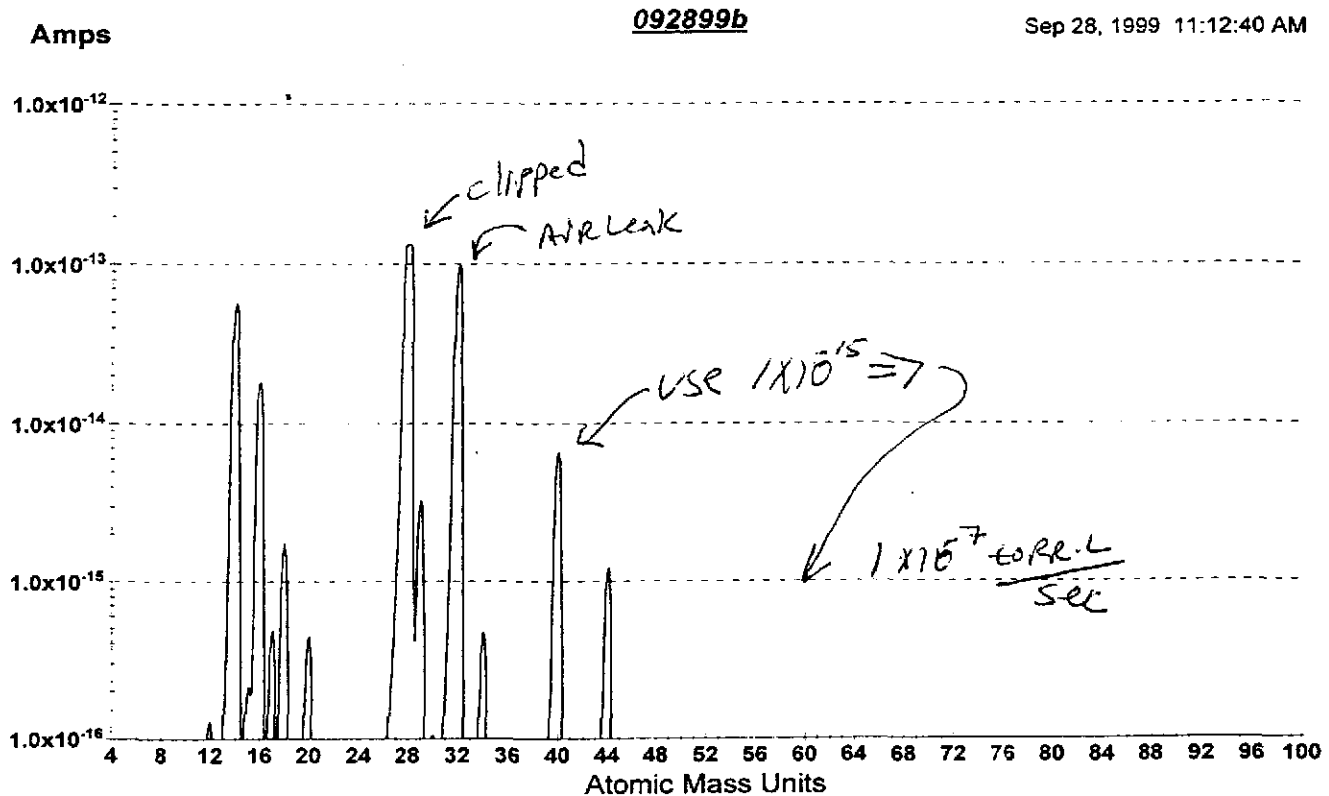
Sep 28, 1999 07:53:43 AM





# LHO Vacuum Bake Oven A Load #58 Calibration

V-1 and cal-gas open V-2 closed in pressure equilibrium at room temperature



CF defined as  $P_{\text{calc}(40)} / I_{\text{meas}(40)}$

$$P_{\text{calc}(40)} = (\text{leak rate}) / (\text{pump speed}) = (1.1\text{E-}7 \text{ torr}\cdot\text{L}/\text{sec})(0.86) / (5 \text{ L}/\text{sec}) = 1.8\text{E-}8 \text{ torr}$$

$$I_{\text{meas}(40)} \sim 1\text{E-}15 \text{ amps} *$$

$$\text{CF} = (1.8\text{E-}8 \text{ torr}) / (1\text{E-}15 \text{ amps}) = 2\text{E}7 \text{ torr}/\text{amps}$$

\* A portion of the AMU40 signal (~4.0% of the AMU32 signal i.e.  $0.04 \times 1\text{E-}13 \text{ amps} = 4\text{E-}15 \text{ amps}$ ) is due to the obvious air leak. Since this configuration has a long history of measured current being  $1\text{E-}15 \text{ amps}$  this value will be used.

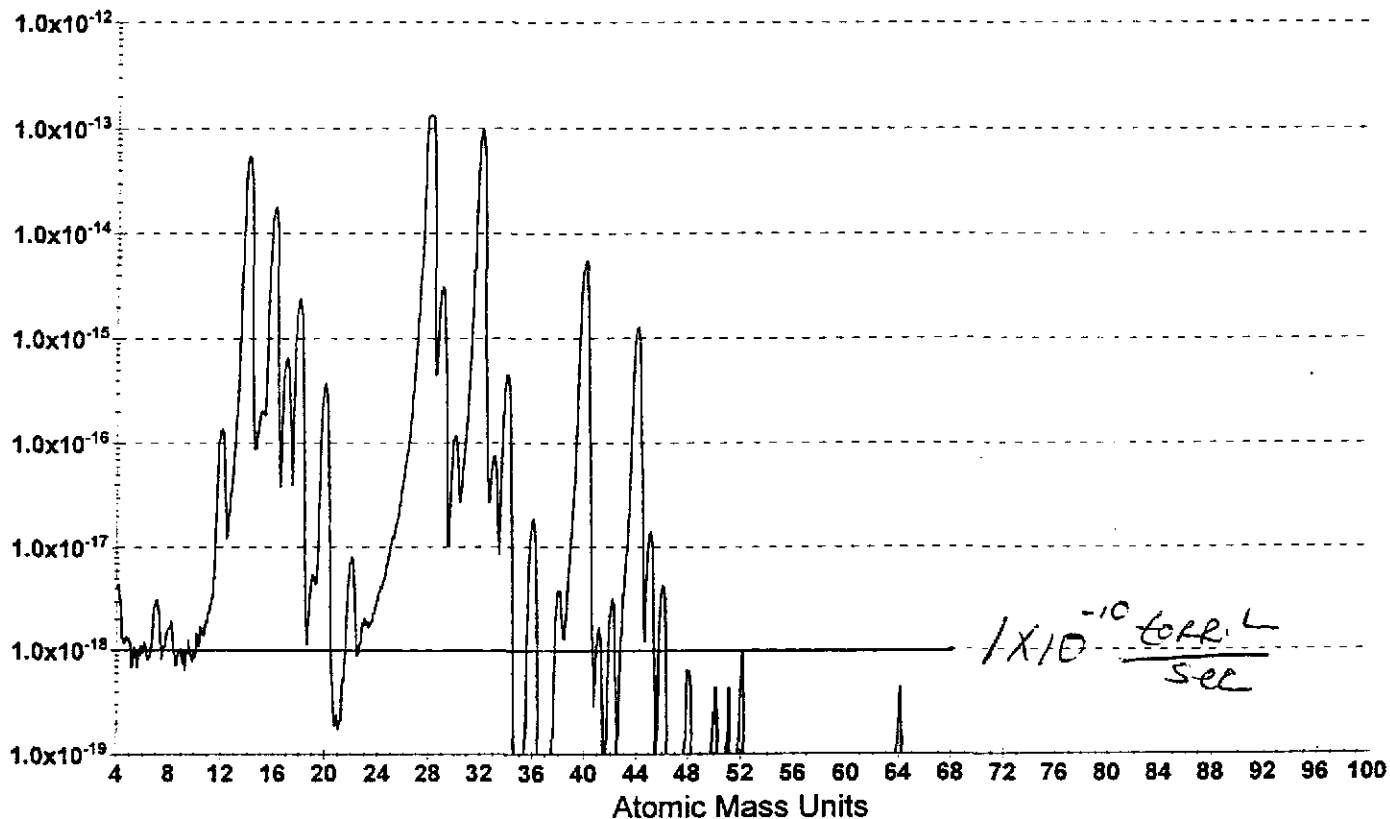
# LHO Vacuum Bake Oven A Load #58 Post-Bake Scan Room Temp.

V-1 open, Cal-Gas and V-2 Closed

Amps

092899c

Sep 28, 1999 11:51:45 AM



## LHO Bake Oven A Load # 58

1<sup>st</sup> Order Desorption Outgassing Rate Estimates using  $Q_{low} = SP_{low} = SP_{high} [e^{-(E_s/kT_{high})}] / [e^{-(E_s/kT_{low})}]$

Number of units in bake load	Pump Speed (L/sec)	AMU	RGA background current (amps)	RGA current (amps) @ High Temp	Calibration Factor CF (torr/amps)	High Temp (K)	Low Temp (K)	Es/k	Extrapolated outgassing rate (torr*L/sec) @ T <sub>low</sub>
1	5	41	5.60E-20	1.70E-18	2.00E+07	3.23E+02	2.97E+02	13000	4.85E-12
1	5	43	6.60E-20	9.30E-18	2.00E+07	3.23E+02	2.97E+02	8000	1.06E-10
1	5	53	0.00E+00	below noise	2.00E+07	3.23E+02	2.97E+02	13000	below noise
1	5	55	0.00E+00	below noise	2.00E+07	3.23E+02	2.97E+02	15000	below noise
1	5	57	0.00E+00	below noise	2.00E+07	3.23E+02	2.97E+02	15000	below noise