Load #54
LIGO-E990324-00-X

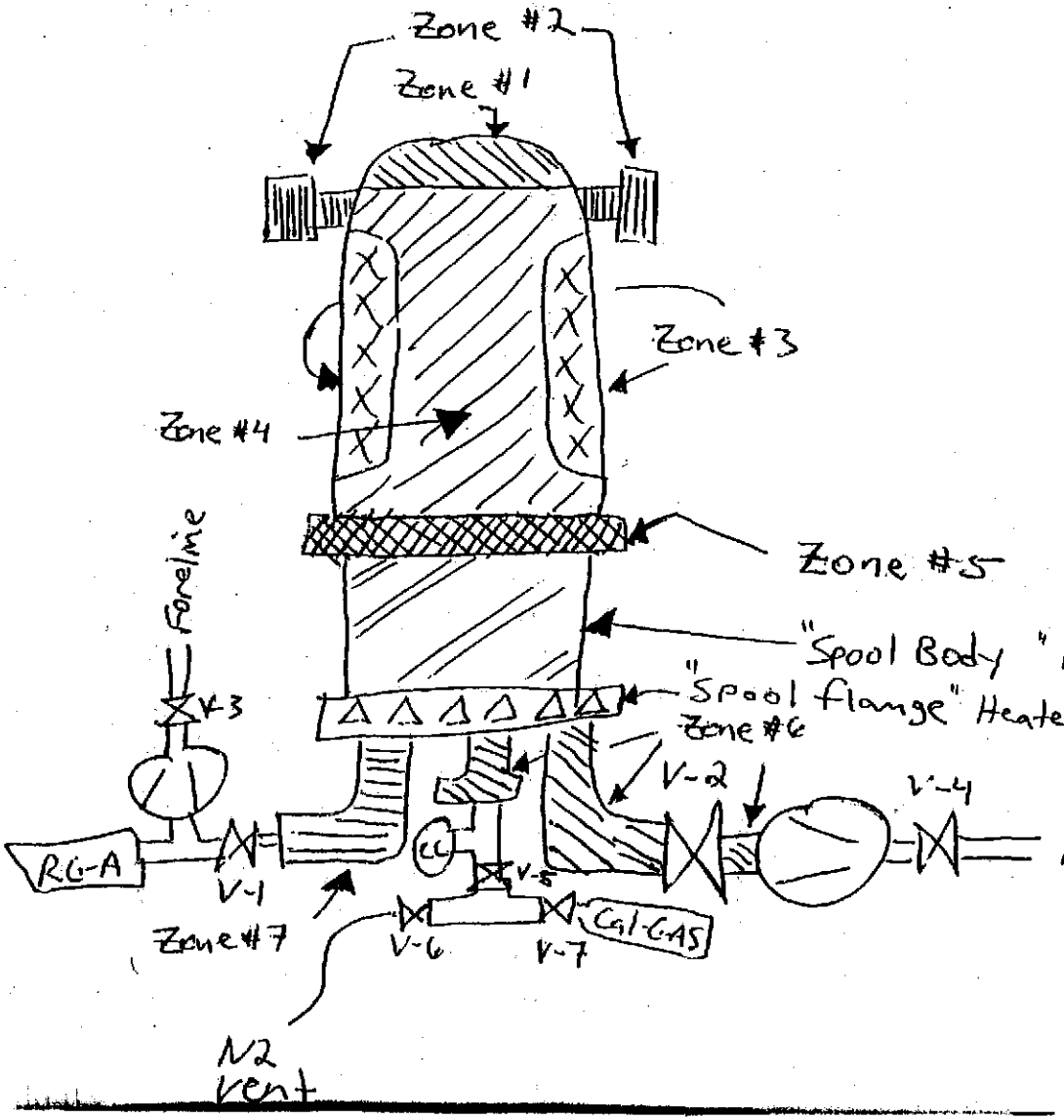
Summary of LHO Vacuum Bake Oven A RGA Data Generation

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 Bake Oven A logbook for the actual ordered events of the load # of interest.


Zone #2
Zone #1
Zone #3
Zone #4
Zone #5
"Spool Body" Heated via manual Variac
"Spool flange" Heated via manual Variac
Zone #6
Foreline
V-3
V-1
V-2
V-4
V-5
V-6
V-7
RG-A
Cal-GAS
Zone #7
N2 vent
Foreline

LHO VACUUM BAKE OVEN A: CONTENTS LOAD #54

3/8 x 1.00 SOCKET HEAD SCREW-OVL PT AG/SS S/N N/A

MIRROR TABLE CLAMP PART NUMBER 990443

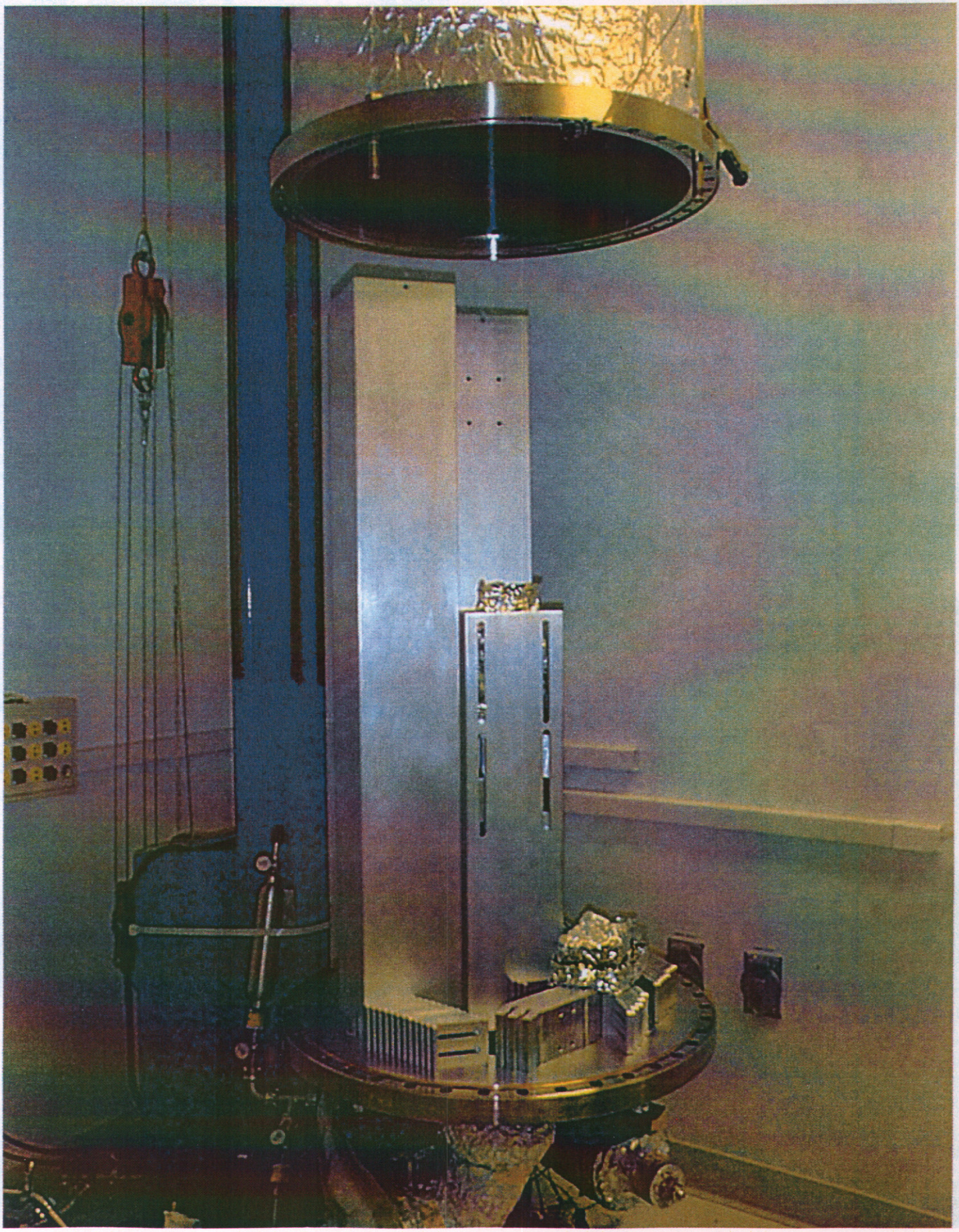
LIFTING ARMS S/N N/A

LIFTING ARM PEDISTALS S/N N/A

¼-20 X 1 ½ SHOULDERED SHCS S/N N/A

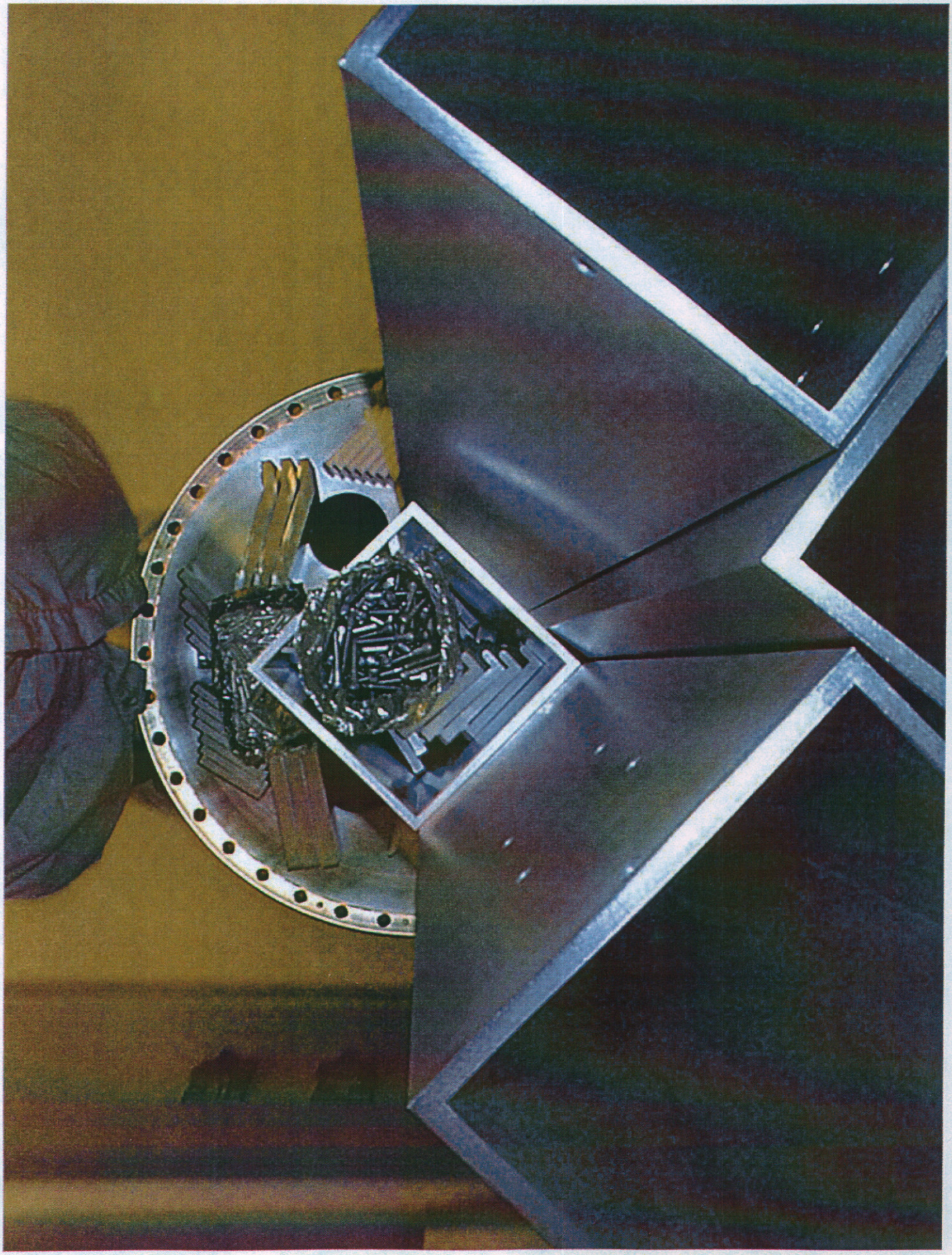
¼-20 X 1 ¼ FULLY THREADED SHCS S/N N/A

Untitled



00988.jpg

Untitled



Dcp00686.jpg

LIGO PROCESS TRAVELER

DCC Number: E990308-00-X
Date Prepared: 8/6/99

Originator	Cognizant Engineer	Ext./Phone#	Project	Account Number
Michael Smith	Michael Smith	2062	COS	5F515

Dwg/Part Number	Rev	Part Description	Serial Number	Qty
D990443	B	clamp, table	020-150	130

Used In (next higher assembly):	

Data Package, Receiving/Inspection Remarks:

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/ Initials	Date Comp.

Process Flow:

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
1	Control Point	NA	NA		NA	NA
2	Clean		LHO	per LIGO-E960022, as applicable	B. Weaver	
3	wrap and bag		LHO	per LIGO-E960022	B. Weaver	
4	Vacuum Bake		LHO	per LIGO-E960022 B. Rivera	B. Weaver	9.2075 8.30.99
5	Control Point		LHO	Review/approve RGA: VBO Load# 52 scan # 080999C.RGA VBO Load# 54 scan # 083099C.RGA VBO Load#___ scan #___ VBO Load#___ scan #___ VBO Load#___ scan #___ VBO Load#___ scan #___ Note: attach RGA scan(s) to this traveler.	B. Weaver MEW	9/14/99

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.

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
6	Box for shipment to LLO & CIT		Valley Engravers			

No.	Qty per package	Part
1	20	clamps
2	120	clamps
3	10	clamps

(see also qty. for each shipping destination below)

LIGO PROCESS TRAVELER

DCC Number: E990308-00-X

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
7	Ship		Valley Engravers			

No.	Ship Qty. LHO	LLO	CIT	Part Description
1	20			clamps
2	120			clamps
3			10	clamps

	LHO:	Attn: Betsy Weaver, COS LIGO Hanford Observatory (LHO) Specific Purpose: beam dump BSC8
	LLO:	Attn: Jonathan Kern LIGO Livingston Observatory (LLO) Specific Purpose: beam dump BSC8

END: Go to Traveler associated with next higher assembly processing

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

DATE	NAME	DESCRIPTION
8/6/99	Mike Smith	Attention: Betsy Weaver, hold cleaned baked parts for use by COS.
8/20	B. Weaver	S/N 098, 049, 033, 072, 043, 093, 100, 106, 114, 035 101, 120, 089, 045, 031, 065, 024, 122, 044, 111, 084 066, 088, 081, 059, 080, 098, 131, 135, 061, 138, 069 Baked in VBO Load 52.
8/30	B. Weaver	Rest of clamps baked in VBO Load 54.

Table 1: ACTION ITEMS CON'T.

DATE	NAME	DESCRIPTION

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: E99180-00-X
Date Prepared: 8/24/99

Originator	Cognizant Engineer	Ext./Phone#	Project	Account Number
Betsy Weaver	JDoug Cook	(509) 372-8107	SUS	5F518

Dwg/Part Number	Rev	Part Description	Serial Number	Qty
		Teflon Blocks		2
		Lifting Arms		3
		Lifting Arm Pedistals		3
		1/4-20 x 1½" Standard SHCS		150
		1/4-20 x 1¼" Fully threaded SHCS		150
Used In (next higher assembly):				

Vendor Name	PO/Contract Number
	P

Data Package, Receiving/Inspection Remarks:

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/ Initials	Date Comp.

Process Flow:

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
1	Clean & Vacuum Bake per LIGO Vacuum Prep. Form		LHO	Clean as Class A Hardware as per E960022. CLASS B	B. Rivera BRivera	
2	Control Point		NA	NA		
3	Wrap & Tag vacuum clean parts per E960022-A		LHO	VBO Load# 54 Scan# 083099C.KLA VBO Load#____ Scan#_____ VBO Load#____ Scan#_____	B. Rivera BRW	9/14/99

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: E99180-00-X

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
4			LHO	**Note: Copy this traveler and give to the DCC**	NA	
END: Go to Traveler associated with next higher assembly processing						

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

DATE	NAME	DESCRIPTION
8/19	B. Rivera	Cleaned & Airbaked Teflon Blocks & Lifting Arm Pedistals as per E960022 - CLASS B.
8/31	B. Rivera	Cleaned & Baked Lifting Arms as CLASS A.

LIGO PROCESS TRAVELER

DCC Number: E990324-00-X
Date Prepared: 8/17/99

Originator	Cognizant Engineer	Ext./Phone#	Project	Account Number
Michael Smith	Michael Smith	2062	COS	5F515

Dwg/Part Number	Rev	Part Description	Serial Number	Qty
		Beam Dump Assemblies, BSC4		NA
TOP-1616-NA		3/8-16 X 1.00 SOCKT SET SCRW-OVL PT AG/SS		40

Used In (next higher assembly):	D990230, BSC Beam dump Installation, top assembly

Data Package, Receiving/Inspection Remarks:

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/ Initials	Date Comp.
y		Inspect for breakage during shipment		

Process Flow:

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
1	Control Point	NA	NA		NA	NA
2	Clean		LHO	per LIGO-E960022, as applicable	B. Weaver	
3	wrap and bag		LHO	per LIGO-E960022	B. Weaver	
4	Vacuum Bake		LHO	per LIGO-E960022 B.2.1.N2.RGA	K. Ryan	8.30.99
5	Control Point		LHO	Review/approve RGA: VBO Load# 54 scan #D830999.RGA VBO Load#____ scan #____ VBO Load#____ scan #____ Note: attach RGA scan(s) to this traveler.	K. Ryan KEW	9/14/99

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.

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
	Box for shipment to LHO			Ship in LIGO-provided container (see also qty. for each shipping destination below)		
7	Ship					
			LHO:	Attn: Betsy Weaver, COS LIGO Hanford Observatory (LHO) Specific Purpose: beam dump BSC8		
			LLO:	Attn: Jonathan Kern LIGO Livingston Observatory (LLO) Specific Purpose: beam dump BSC8		
END: Go to Traveler associated with next higher assembly processing						

No.	Qty per package	Part
ALL		TOP-1616-NA

No.	Ship Qty. LHO	Ship Qty. LLO	Ship Qty. Other	Part Description
	all			TOP-1616-NA

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

Attention: Betsy Weaver, Jonathan Kern, hold cleaned and baked parts for COS assembly. 8/23/99 M. Smith

DCC Number: E98____-00-X

LIGO PROCESS TRAVELER

Date Prepared:

Originator	Cognizant Engineer	Ext./Phone#	Project	Account Number
Michael Smith	Michael Smith	2062	COS	5F515

Dwg/Part Number	Rev	Part Description	Serial Number	Qty	Rec. 8/2	VBO load	VBO Load
		PO Mirror Assembly					
D990443	B	MIRROR TABLE CLAMP	001-020	20	20		
Used In (next higher assembly):		PO Mirror Assembly					

Vendor Name	PO/Contract Number
Valley Engravers	P

Data Package, Receiving/Inspection Remarks:

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/ Initials	Date Comp.
Y	N		B. Weaver	8/2/99

Process Flow:

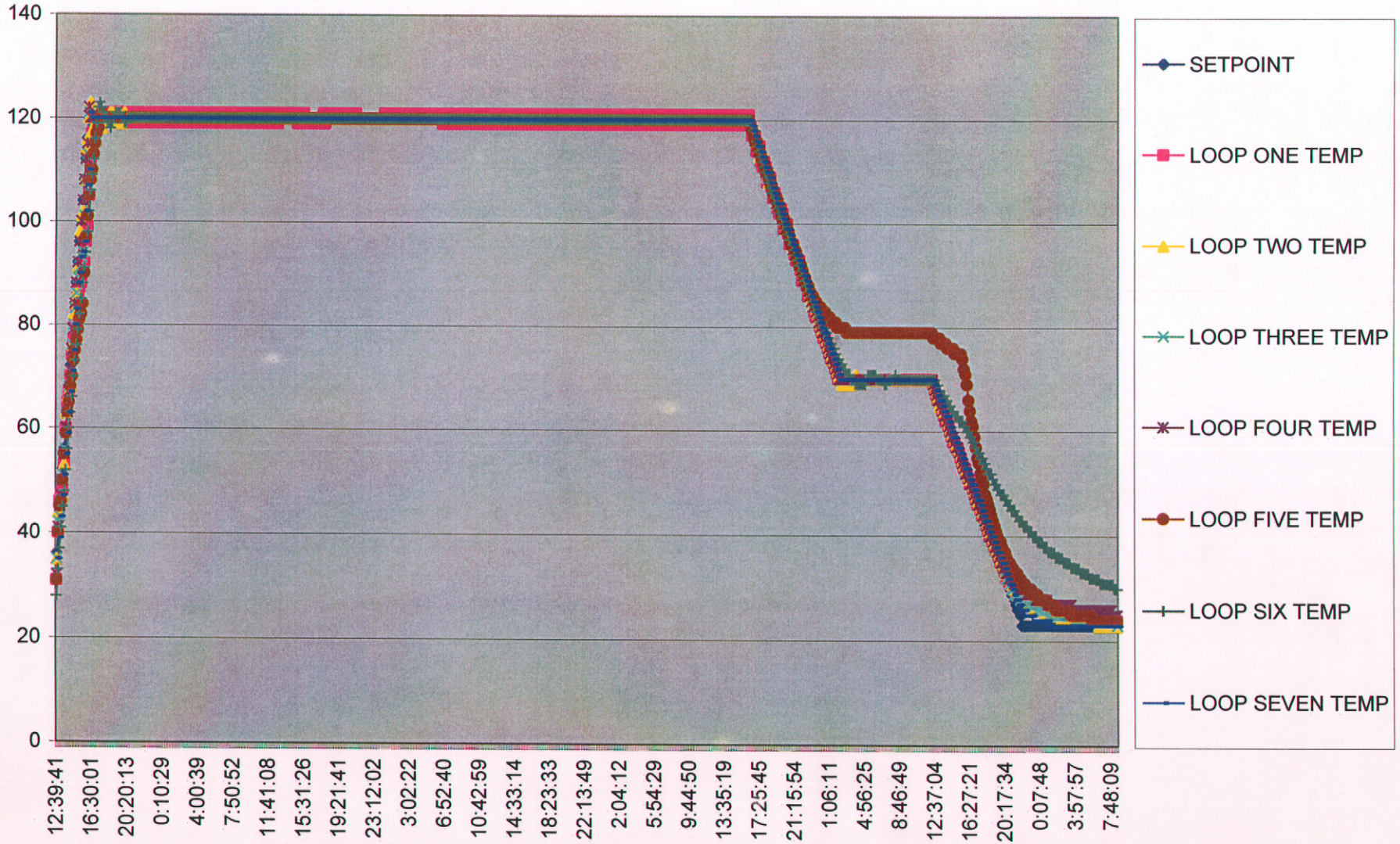
#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
1	Clean & Vacuum Bake per LIGO Vacuum Prep. Form		LHO	per E960022-A	B. Weaver	8-30-99
2	Control Point		NA	Review/approve RGA scan # 083099CRGA VBOLoad#54	REW	9/14/99
3	Wrap & Tag vacuum clean parts per E960022-A		LHO	______ per package		
4			LHO	**Note: Copy this traveler and give to the DCC**		
END: Go to Traveler associated with next higher assembly processing						

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.

ACTION ITEMS

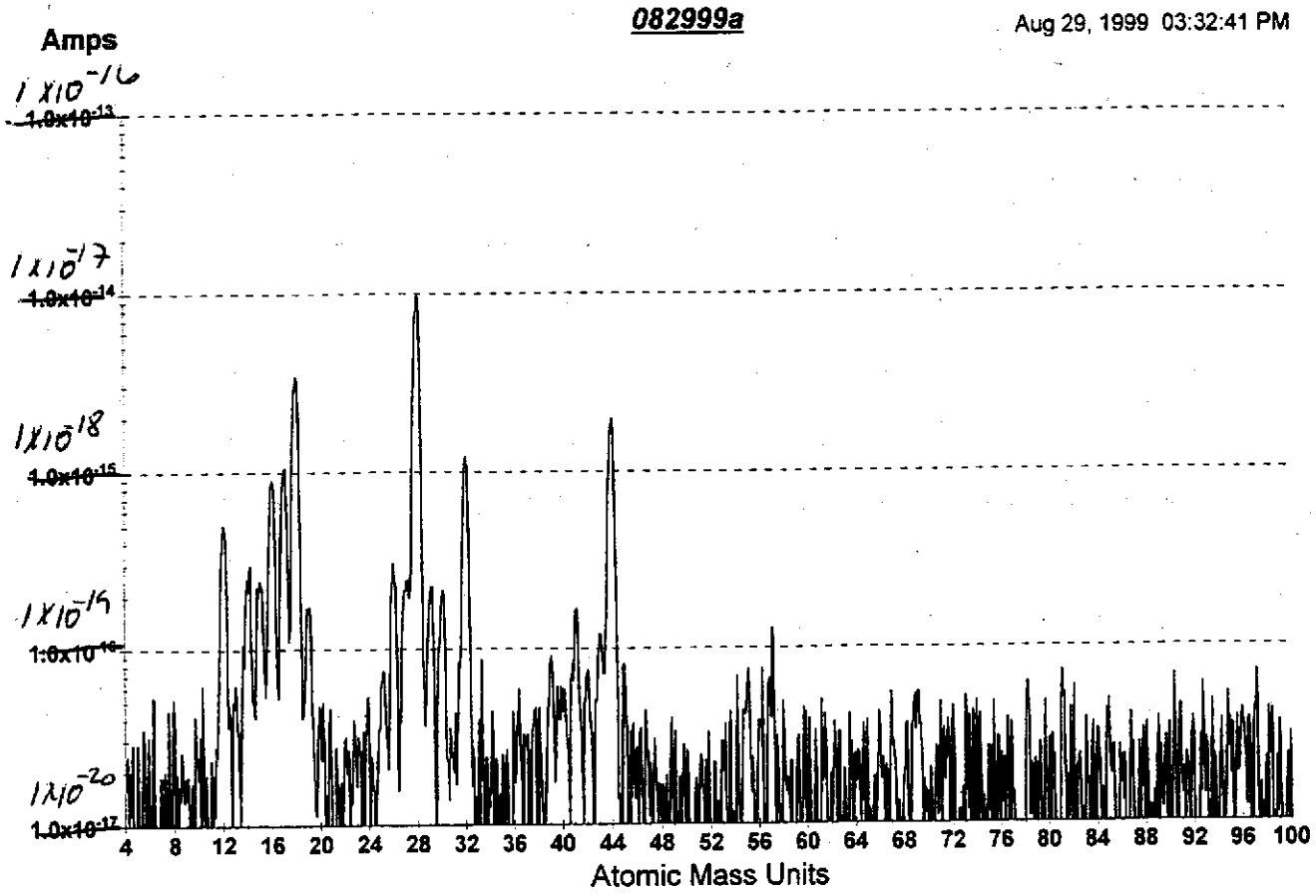
Special Instructions (Handling/Packaging Constraints, Remarks, etc.) or Notes:

LHO VACUUM BAKE OVEN A LOAD 54



LHO VACUUM BAKE OVEN A LOAD #54 ELEVATED TEMPERATURE BACKGROUND SCAN

V-1 Closed

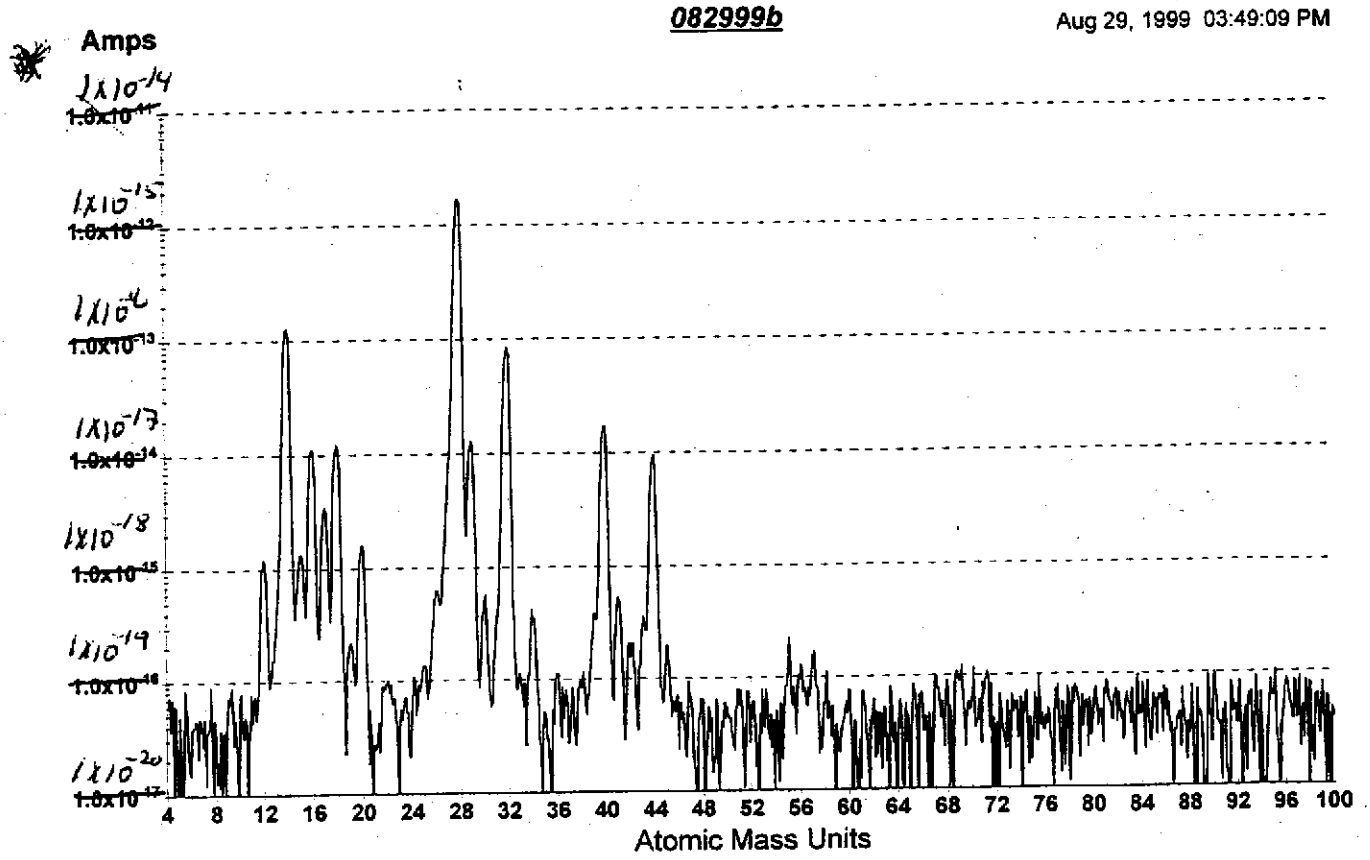


* Known Software "Bug" of not updating axis when switching Between screens

KDR
10-12-99

LHO VACUUM BAKE OVEN A LOAD #54
ELEVATED TEMPERATURE SCAN

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



* Known Software "Bug" AXIS Interval Humidity fails to update when alternating between Displays. KDR 10-12-99

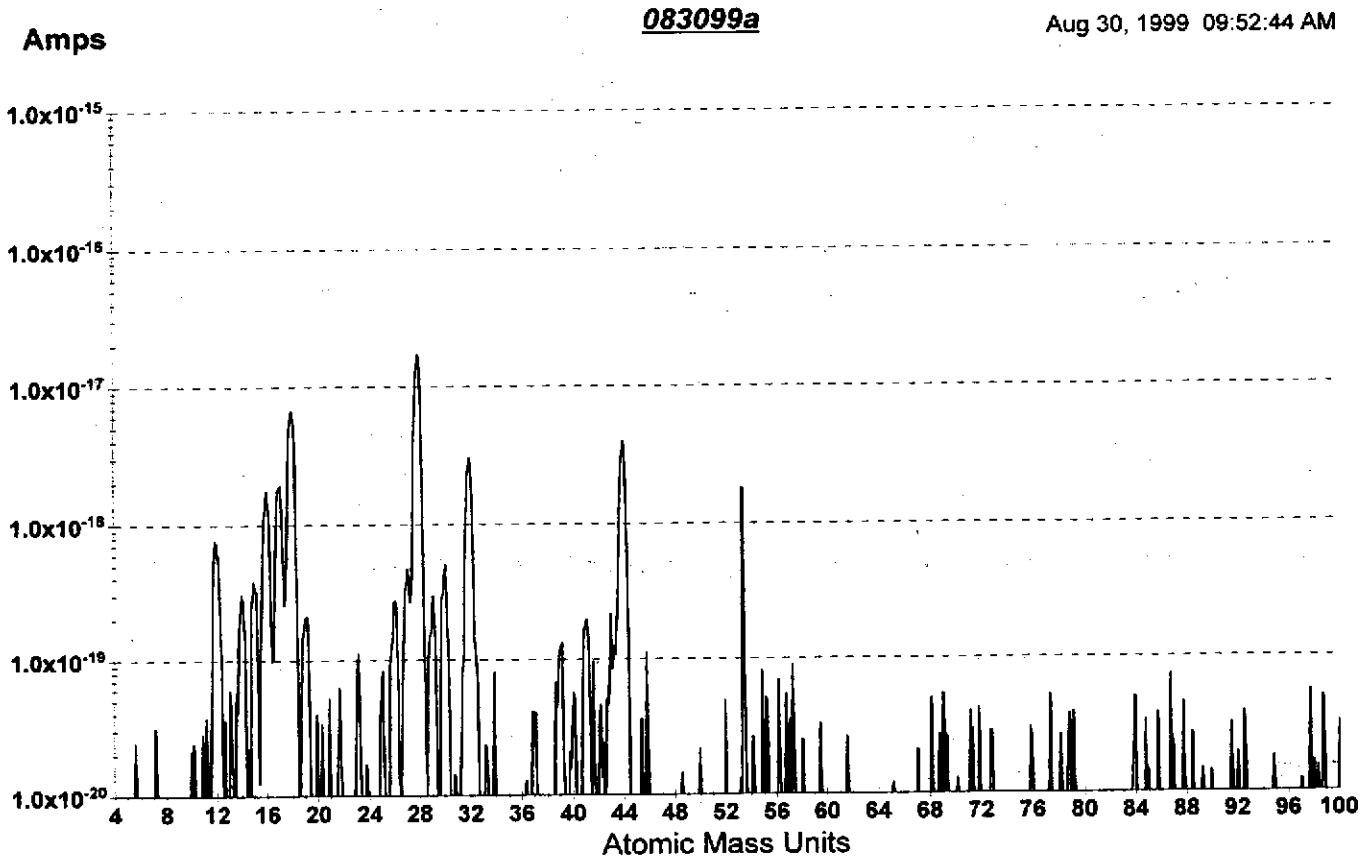
LHO Bake Oven A Load # 54

1st 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_{low}
1	5	41	1.60E-19	5.30E-19	2.00E+07	3.23E+02	3.00E+02	13000	1.69E-12
1	5	43	1.20E-19	3.60E-19	2.00E+07	3.23E+02	3.00E+02	8000	3.59E-12
1	5	53	0.00E+00	6.10E-19	2.00E+07	3.23E+02	3.00E+02	13000	2.79E-12
1	5	55	6.30E-20	2.20E-19	2.00E+07	3.23E+02	3.00E+02	15000	4.46E-13
1	5	57	1.30E-19	1.70E-19	2.00E+07	3.23E+02	3.00E+02	15000	1.14E-13

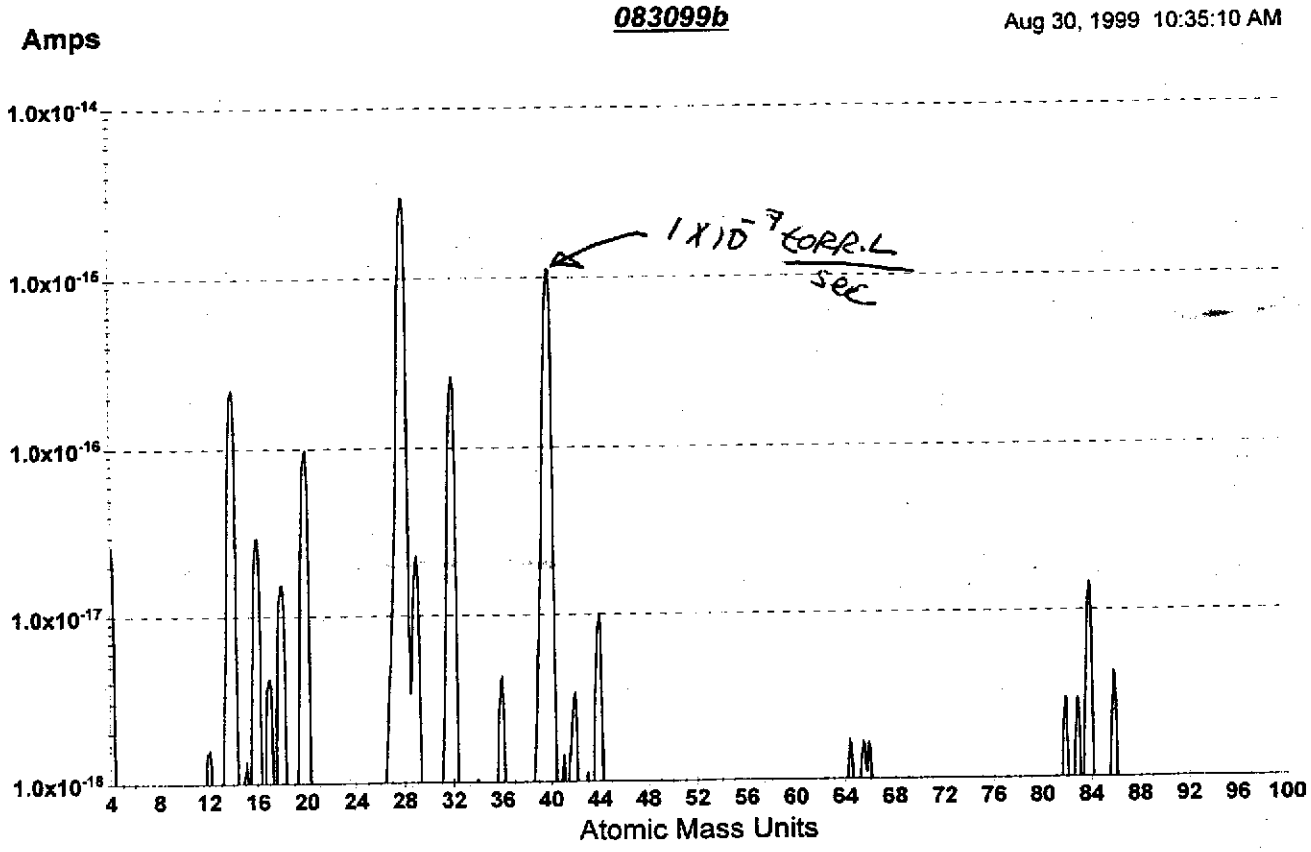
LHO Vacuum Bake Oven A Load #54 RGA Background

V-1 Closed, Room Temp



LHO Vacuum Bake Oven A Load #54 Calibration

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



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

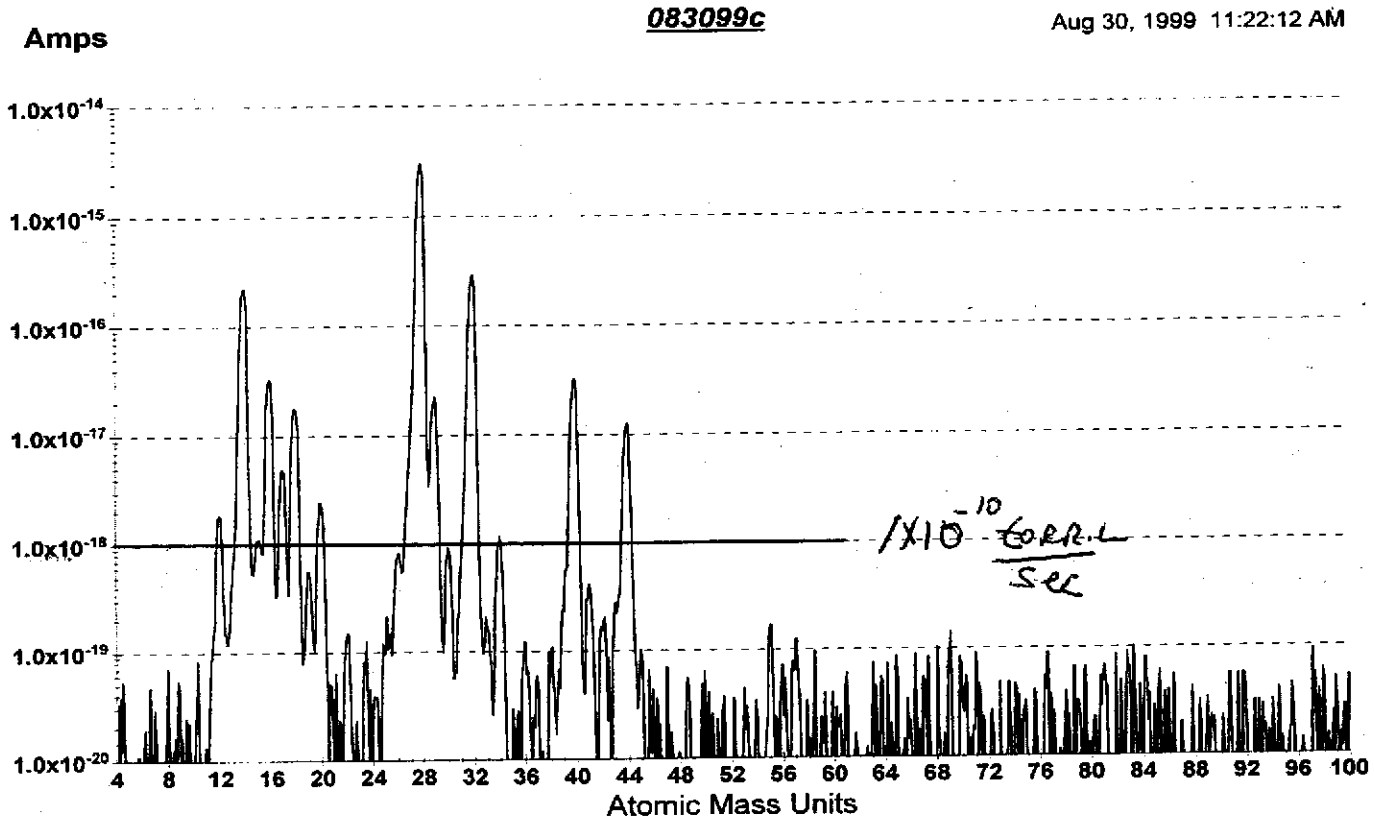
$P_{calc(40)}$ = (leak rate) / (pump speed) = (1.1E-7 torr•L/sec)(0.86) / (5 L/sec) = 1.8E-8 torr

$I_{(meas)}$ = 1E-15 amps

CF = (1.8E-8 torr) / (1E-15 amps) = 2E7 torr/amps

LHO Vacuum Bake Oven A Load #54 Post-Bake Scan Room Temp

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



X-POP3-Rcpt: brivera@apex
Date: Mon, 30 Aug 1999 18:04:01 -0700
From: Dennis Coyne <coyne@ligo.caltech.edu>
Organization: Caltech/LIGO
X-Mailer: Mozilla 3.01Gold (Win95; I)
To: "Bartie J. Rivera" <rivera_b@ligo-wa.caltech.edu>
CC: whitcomb_s@ligo.caltech.edu, coyne_d@ligo.caltech.edu,
ryan_k@ligo.caltech.edu
Subject: Re: scan approval load 54

Bartie,
This load is acceptable. The next load should be a 200C bake.
Dennis

Bartie J. Rivera wrote:
>
> Hi Stan,
>
> I am faxing the scans for load 54 consisting of
> c.o.s. structures and misc. fastners to 225-686-7189
>
> Thanks
> Bartie

Dennis Coyne (Detector Installation Manager)
LIGO Laboratory, Caltech, Physics Department
626.395.2034 @CIT / 225.686.3168 @Livingston / 509.372.8166 @Hanford
cell 626.695.8350

X-POP3-Rcpt: brivera@apex
X-Sender: stan@acrux.ligo.caltech.edu
X-Mailer: QUALCOMM Windows Eudora Light Version 3.0.5 (32)
Date: Thu, 24 Jun 1999 11:52:36 -0700
To: Kyle Ryan <ryan_k@ligo-wa.caltech.edu>, brivera@ligo.caltech.edu
From: Stan Whitcomb <stan@ligo.caltech.edu>
Subject: waiver for mixed loads
Cc: Dennis Coyne <coyne@ligo.caltech.edu>, ljones@ligo.caltech.edu

Kyle and Bartie,

There are several bake loads coming up over the next month that will be prodominantly COS hardware. These loads will consist of a mixture of aluminum, stainless steel, and glass. This email is a waiver to bake these components together, using the bake schedule for aluminum per E960022.

stan