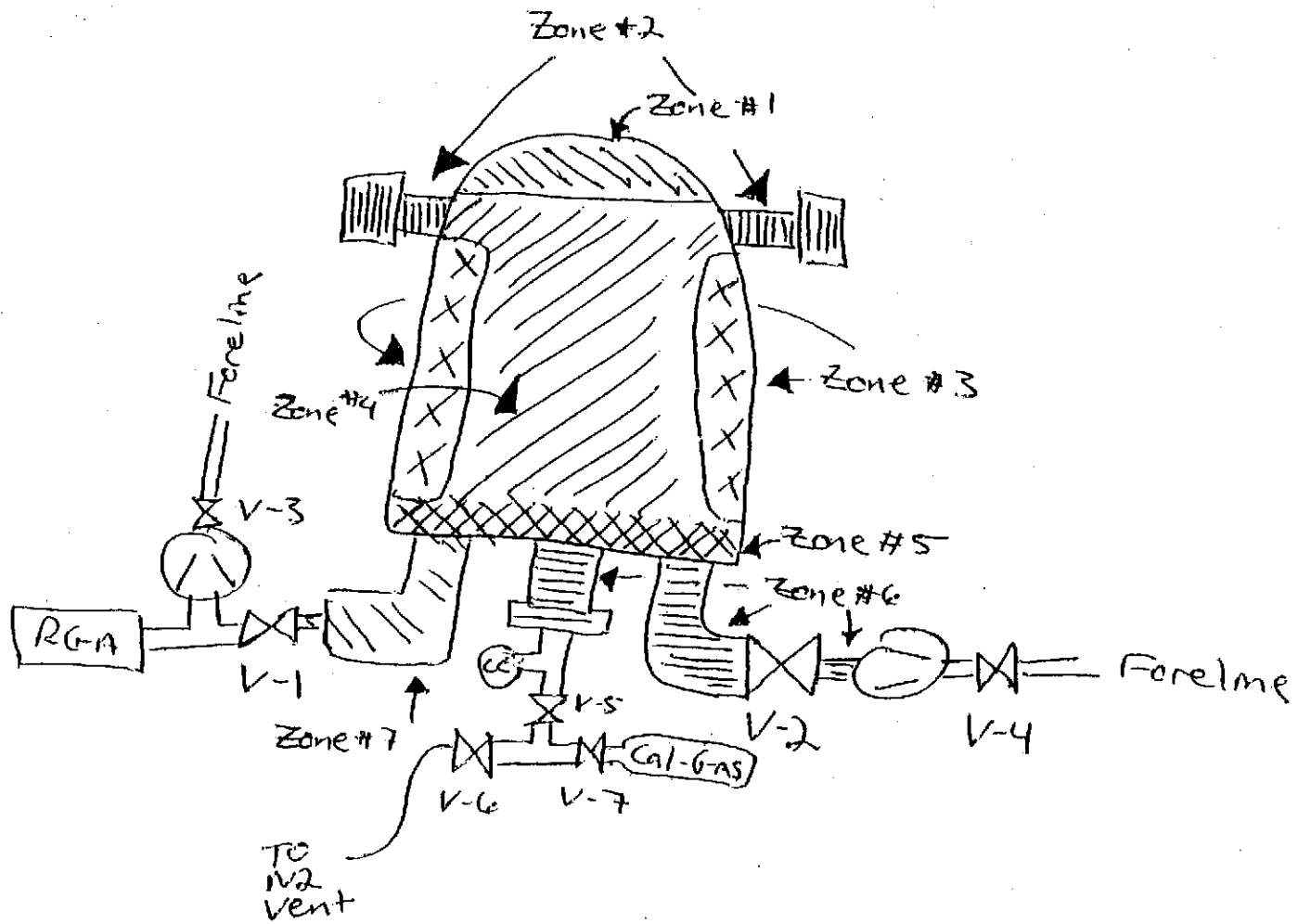# Summary of LHO Vacuum Bake Oven A RGA Data Generation

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.

Zone #2

Zone #1

Zone #3

Zone #4

Zone #5

Zone #6

Zone #7

Foreline

Foreline

V-3

V-1

V-2

V-4

V-5

V-6

V-7

RGA

Cal-Gas

TC
N2
Vent

LHO VACUUM BAKE OVEN A:
CONTENTS LOAD #67

B.S.C. BELLOW SERIAL NUMBER D972122-015

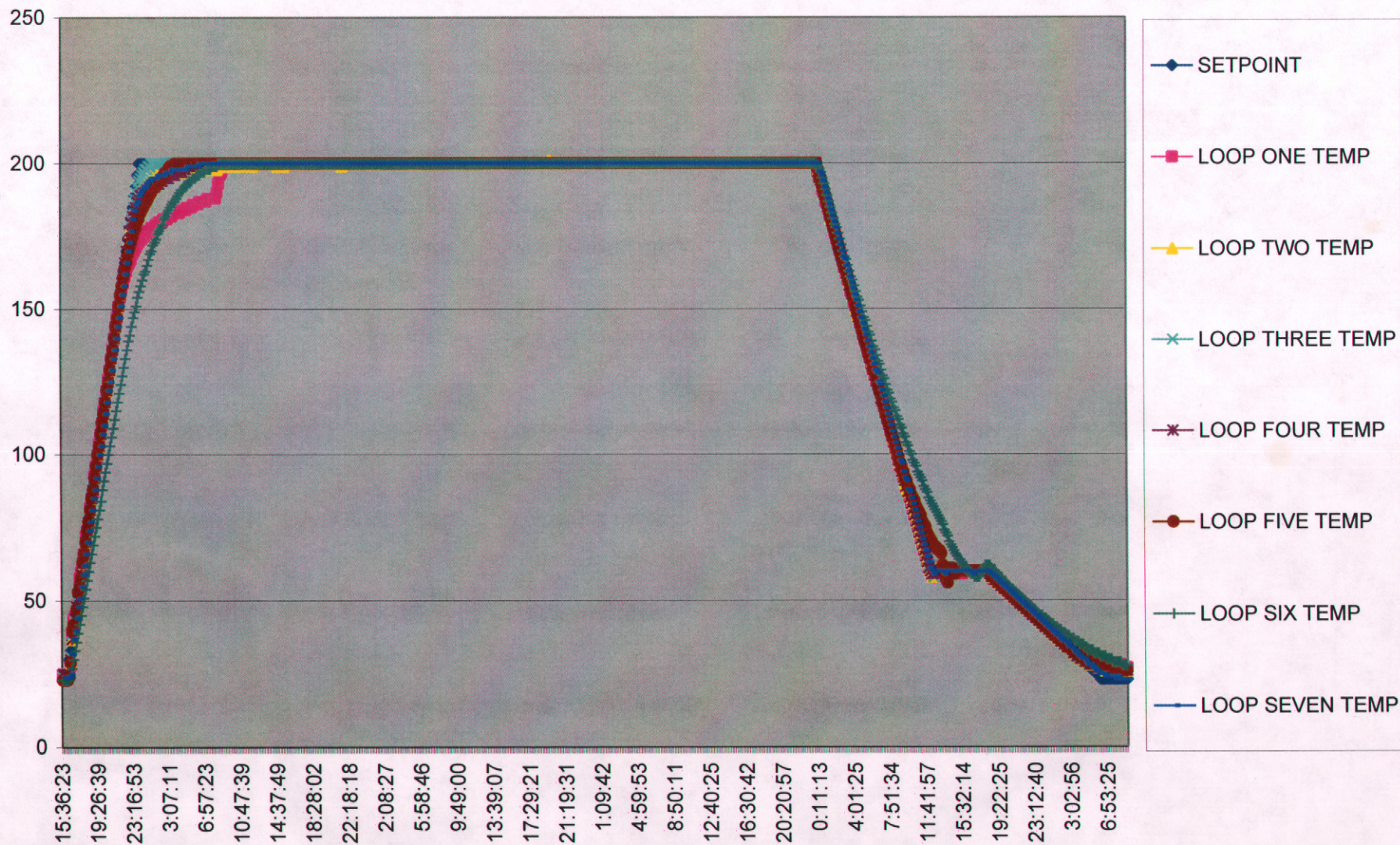**B.S.C. BELLOW SERIAL NUMBER D972122-055**

B.S.C. BELLOW SERIAL NUMBER D972122-057

ELLIPTICAL BAFFLE COUNTERWEIGHT SERIAL NUMBER D990173

ELLIPTICAL BAFFLE MOUNTING SCREW SERIAL NUMBER D990174

MISC. STAINLESS STEELE FASTNERS SERIAL NUMBER N/A
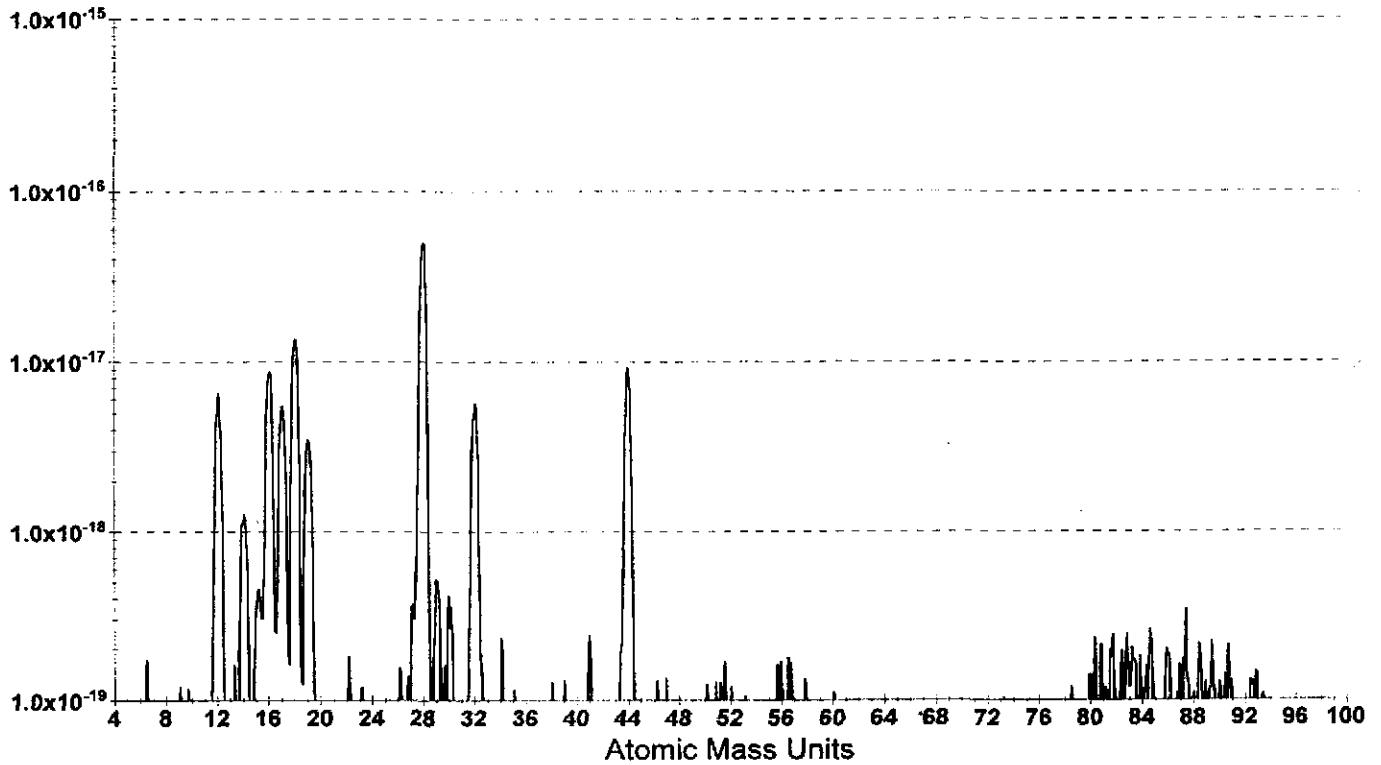
LHO VACUUM BAKE OVEN A LOAD 67

Legend:
- SETPOINT
- LOOP ONE TEMP
- LOOP TWO TEMP
- LOOP THREE TEMP
- LOOP FOUR TEMP
- LOOP FIVE TEMP
- LOOP SIX TEMP
- LOOP SEVEN TEMP

Y-axis: 0, 50, 100, 150, 200, 250

X-axis (time): 15:36:23, 19:26:39, 23:16:53, 3:07:11, 6:57:23, 10:47:39, 14:37:49, 18:28:02, 22:18:18, 2:08:27, 5:58:46, 9:49:00, 13:39:07, 17:29:21, 21:19:31, 1:09:42, 4:59:53, 8:50:11, 12:40:25, 16:30:42, 20:20:57, 0:11:13, 4:01:25, 7:51:34, 11:41:57, 15:32:14, 19:22:25, 23:12:40, 3:02:56, 6:53:25

LHO VACUUM BAKE OVEN A LOAD #67 ELEVATED TEMPERATURE BACKGROUND SCAN

V-1 Closed

Amps

112299a

Nov 22, 1999 04:17:05 PM

Atomic Mass Units

LHO VACUUM BAKE OVEN A LOAD #67
ELEVATED TEMPERATURE SCAN

V-1 Open, Cal-Gas and V-2 Closed, $60^{o}C$

Amps

112299b

Nov 22, 1999 04:51:41 PM

1.0×10^{-15}

1.0×10^{-16}

1.0×10^{-17}

1.0×10^{-18}

1.0×10^{-19}

4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100

Atomic Mass Units
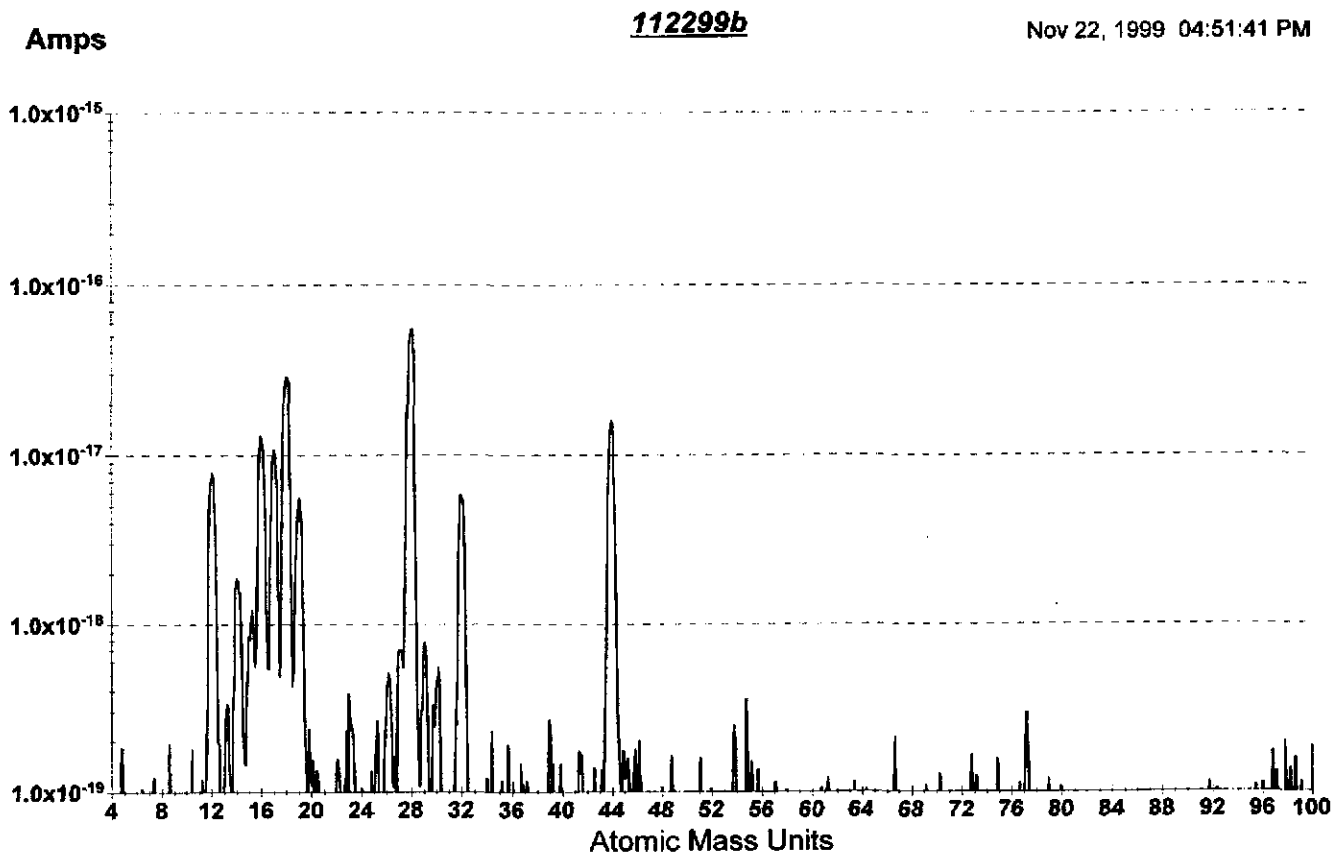
LHO Bake Oven A Load # 67

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

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	9.60E-20	1.40E-19	1.00E+07	3.33E+02	2.96E+02	13000	1.67E-14
1	5	43	4.00E-19	8.90E-19	1.00E+07	3.33E+02	2.96E+02	8000	1.22E-12
1	5	53	1.00E-19	below noise	1.00E+07	3.33E+02	2.96E+02	13000	#VALUE!
1	5	55	0.00E+00	3.50E-19	1.00E+07	3.33E+02	2.96E+02	15000	6.28E-14
1	5	57	1.70E-19	below noise	1.00E+07	3.33E+02	2.96E+02	15000	#VALUE!

LHO Vacuum Bake Oven A Load #67 RGA Background

V-1 closed, room temperature

Amps   *112499a*   Nov 24, 1999 08:36:29 AM

Atomic Mass Units
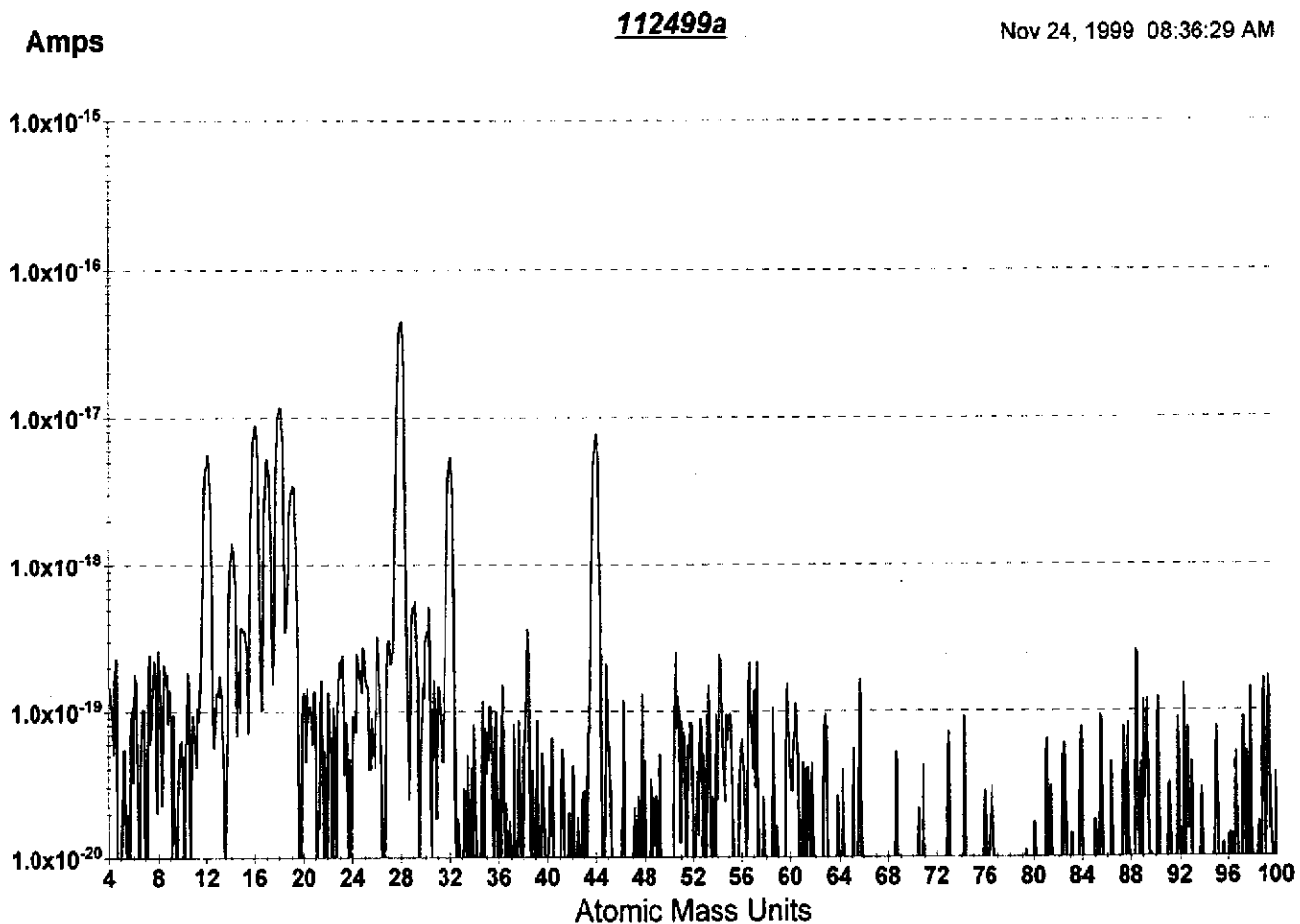
LHO Vacuum Bake Oven A Load #67 Calibration

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

Amps

Nov 24, 1999 10:09:19 AM
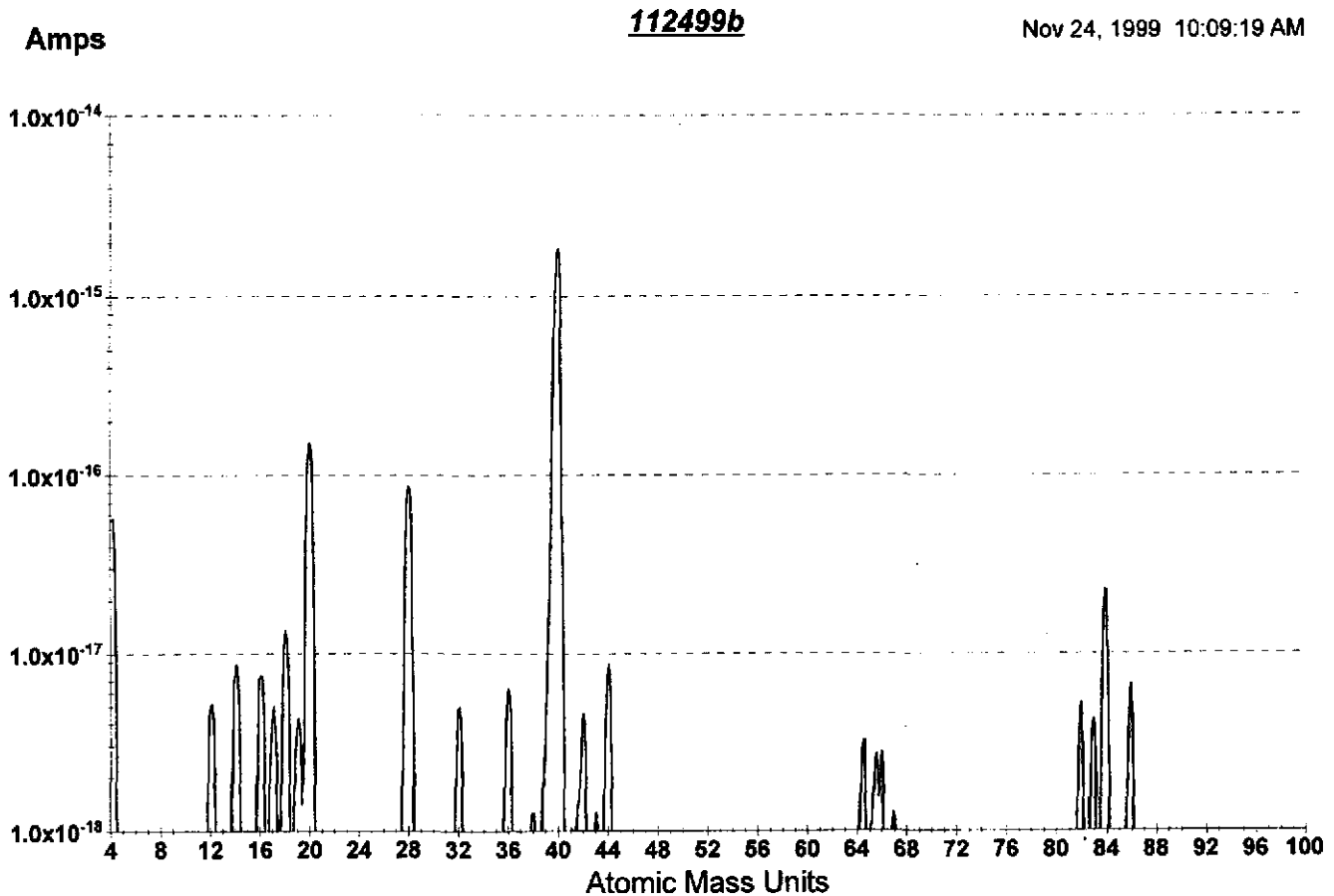
CF defined as $P_{(40)calc} / I_{(40)meas}$

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

$I_{(40)meas} =$ 1.8E-15 amps   (taken from 112499b.asc)

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

LHO Vacuum Bake Oven A Load #67 Post-Bake Scan Room Temp.

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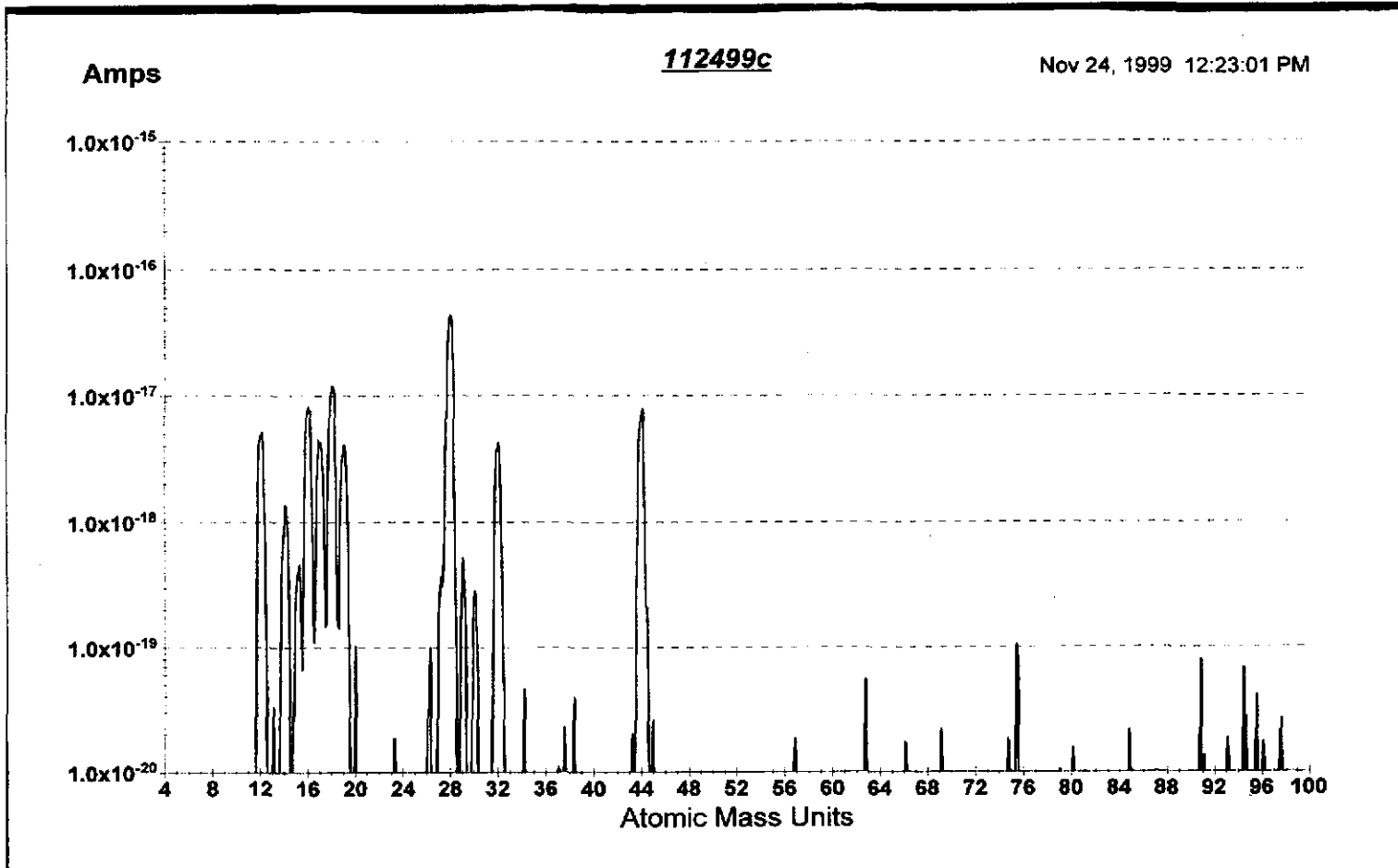
Amps

_112499c_

Nov 24, 1999 12:23:01 PM

Atomic Mass Units

LIG PROCESS TRAVELER

Originator	Cognizant Engineer	Ext./Phone#	Project	Account Number
Michael Smith	Michael Smith	2092	COS	5F515

Dwg/Part Number	Rev	Part Description	Serial Number	Qty
D990173	00	ELLIPTICAL BAFFLE COUNTER WEIGHT ASSY Counterweight, Elliptical Baffle, CRES		1
D990174	00	Mounting Screw, Elliptical Baffle, CRES		2

Used In (next higher assembly):	D990014-A-D, Elliptical LOS Baffle Assembly

Vendor Name	PO/Contract Number

Data Package, Receiving/Inspection Remarks:

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

Process Flow:

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
1	Control Point	NA	NA		NA	NA
2	Pack and ship	4/14/99	CIT		M. Smith	
4	Clean parts		LHO	CRES material, per LIGO-E960022	B. Weaver	4/19/99
5	Vacuum Bake		LHO	CRES material, per LIGO-E960022	Kyle Ryan	4.20.99

CLEAN PER 9C0022 11·18·99 LHO SCAN#

BARTIE RIVERA JR
B.RIVERA   11·18·99

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
6	Control Point		LHO	Review/approve RGA:scan # 1124990 RGA ##6+ scan #_____ scan #_____ scan #_____ scan #_____ scan #_____ scan #_____ Note: attach RGA scan(s) to this traveler.	~~Kyle Ryan~~ BROWERS /KW/	12/10/99
7	Box for shipment					

Table within row 7:

No.	Qty per package	Part
1	1 sets	metal parts

(see also qty. for each shipping destination below)

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
8	Ship					

	Ship Qty.			Part Description
No.	LHO	LLO	Other	
1	1 assy			metal parts

		LHO:	Attn: Betsy Weaver, COS LIGO Hanford Observatory (LHO) Specific Purpose: ITMy elliptical baffle
		LLO:	Attn: __NA_____ LIGO Livingston Observatory (LLO) Specific Purpose: _____

END: Go to Traveler associated with next higher assembly processing

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

Attention: Betsy Weaver, hold cleaned and baked parts for Michael Smith COS assembly on 4/19/99

Recleaning & Baking for cleanliness purposes. (BW) 11/17/99

LIGO PROCESS TRAVELER

DCC Number: E98_____-00-X

Date Prepared: 12.1.99

Originator	Cognizant Engineer	Ext/Phone#	Project	Account Number
Bartie Rivera	MIKE FINE	626.395.3307	LIGO	5FS11

Dwg/Part Number	Rev	Part Description	Serial Number	Qty
D970122		B.S.C. BELLOWS	015, 055, 057	3

Used In (next higher assembly): B.S.C. TOP ASSEMBLY

Vendor Name	PO/Contract Number
SENIOR FLEXONICS	P PC D99000

Data Package, Receiving/Inspection Remarks:

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/Initials	Date Comp.
YES			B.RIVERA	11.17.99

Process Flow:

#	Operation	Start Date	Work Area	Instructions	Name/Initials	Date Comp.
1	Clean & Vacuum Bake per LIGO Vacuum Prep. Form	11.17.99	CIT LHO	per E960022-A	B.Rivera	11.22.99
2	Control Point		NA	Review/approve RGA scan #1249C 12GB #67		12/10/99
3	Wrap & Tag vacuum clean parts per E960022-A		CIT	____1____ per package		
4			CIT	**Note: Copy this traveler and give to the DCC**		

END: Go to Traveler associated with next higher assembly processing

LIGO PROCESS TRAVELER

E99d1D8-00-X

DCC Number: E98_____-00-X

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

LIGO PROCESS TRAVELER

DCC Number: E98____-00-X
Date Prepared: 1·3·99

Originator	Cognizant Engineer	Ext/Phone#	Project	Account Number
B.RIVERA	K.Ryan	8129	LIGO	

Dwg/Part Number	Rev	Part Description	Serial Number	Qty
N/A	N/A	Custom nipples for class 100 purge air connection to Item 6,10 FBSC4 KDR	N/A	9

Used In (next higher assembly):

Vendor Name	PO/Contract Number
NOR-CAL	P N/A

Data Package, Receiving/Inspection Remarks:

Inspection Required Y/N	Visual Damage Y/N	Comments	Name/ Initials	Date Comp.
YES	NO		B.RIVERA	12·23·99

Process Flow:

#	Operation	Start Date	Work Area	Instructions	Name/ Initials	Date Comp.
1	Clean & Vacuum Bake per LIGO Vacuum Prep. Form	12·23·99	CIT LHO	per E960022-A	B.RIVERA	12·29·99
2	Control Point		NA LHO	Review/approve RGA scan #122999C·RGA	KW	1/4/00
3	Wrap & Tag vacuum clean parts per E960022-A	1·3·00	CIT LHO	___1___ per package	B.RIVERA	1·3·00
4			CIT	**Note: Copy this traveler and give to the DCC**		
END: Go to Traveler associated with next higher assembly processing						

LIGO Form traveler-01 (5/98)

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.

Page 1 of 2

LIGO PROCESS TRAVELER

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

DCC Number: E98_____-00-X