BVS 2731

DATE 28 May 1993

REV -

ORIGINATOR
J. Scilipoti

F13

OLS #14 BEARING RETROFIT

ACCEPTANCE TEST REPORT
VOLUME I OF III
SUMMARY AND SPECIFICATION REQUIREMENTS

(CDRL 006A1)

Contract F04701-90-C-0028

Prepared For

UNITED STATES AIR FORCE
Headquarters, Space Division
Los Angeles, California

Prepared By

WESTINGHOUSE ELECTRIC CORPORATION
Defense and Electronics Center
Baltimore, Maryland

TABLE OF CONTENTS

PAGE

1.0 Introduction.. 1-1

1.1 Summary of System - Specific Parameters......................... 1-2

1.2 Specification Pass-Fail Summary................................. 1-5

1.3 Summary of OLS #14 Testing...................................... 1-8

1.4 Configuration & Serialized Assemblies 517....................... 1-9

1.5 Thermal Vacuum Profiles... 1-21

1.6 Test History Calendar... 1-25

2.0 Development Specification Requirements.......................... 2-1

2.1 Spectra... 2-1

2.2 Geometric Resolution.. 2-5

2.2.1 Fine Geometric Resolution - Infrared.......................... 2-5

2.2.2 Fine Geometric Resolution - Daytime Visual.................... 2-29

2.2.3 Smooth Geometric Resolution - Infrared........................ 2-48

2.2.4 Smooth Geometric Resolution - Daytime Visual.................. 2-57

2.2.5 Smooth Geometric Resolution - Nighttime Visual................ 2-70

2.2.6 Data Sampling... 2-83

2.3 Geometric Accuracy.. 2-84

2.4 Radiometric Accuracy.. 2-90

2.4.1 T Channel Radiometric Accuracy................................ 2-90

2.4.2 Daytime Radiometric Accuracy.................................. 2-147

2.4.3 Nighttime Radiometric Accuracy................................ 2-152

2.4.4 Gain Control Accuracy... 2-154

2.4.5 Gain Control Adjustability.................................... 2-155

2.4.6 A/D Conversion & Algorithms................................... 2-157

2.5 Radiometric Resolution.. 2-158

TABLE CONTENTS (continued)

PAGE

2.6 Noise........ 2-160

2.6.1 T Channel Noise........ 2-160

2.6.2 L Channel Noise - Day........ 2-163

2.6.3 L Channel Noise - Night........ 2-165

2.6.4 Dark Current........ 2-167

2.6.5 Stability........ 2-168

2.6.6 Along-Track Noise Integration........ 2-169

2.6.7 Glare Suppression........ 2-170

2.7 Survivability........ 2-171

2.8 Scan Angle........ 2-172

2.9 Data Collection Rate........ 2-173

2.10 Power........ 2-174

2.11 Mass........ 2-176

2.11.1 Total Mass........ 2-176

2.11.2 Component Mass........ 2-179

2.12 Cooler Transient Margin........ 2-180

2.13 Design Features........ 2-181

2.14 Redundant and Fallback Subsystems........ 2-182

2.15 Environment........ 2-184

3.0 INTERFACE SPECIFICATION REQUIREMENTS........ 3-1

3.1 SSS Alignment Axes........ 3-2

APPENDIX A - BVS 2579 - "Bearing Retrofit and Retest Plan for OLS 12 thru 16" A-1

APPENDIX B - BVS 2600 - "RDS Rework and Retest Procedure for OLS 12, 13, 14, 15 and 16" B-1

1.0 INTRODUCTION

The OLS #14 Acceptance Test Report contains the technical data pertinent to the OLS #14 AVE system. This document is intended to present the Acceptance Test data in terms of the requirements of the Prime Item Development Specification (DMSS-OLS-300) and Interface Specification (IS-YD-810A) for testing associated with bearing retrofit (BVS 2579). A copy of the signed-off BVS 2579 is included in this report as Appendix A. During this same period, BVS 2600 "RDS Rework and Retest Procedure" was performed. Testing for BVS 2600 was done at the functional level only. Therefore, no test results are included as part of this ATR. However, a copy of the signed-off BVS 2600 is included in this report as Appendix B.

Test results and data have been reviewed and verified by Westinghouse Electric Corporation and USAF representatives. System performance data, test histories, data summaries and system analyses are included in this report. In addition, a complete set of system log books are on file at the contractor's facility and are available for review. The Test History is in log books K32956--, and K40096-- and K42327--.

It is intended that this report provide a complete summary of all areas of OLS 14 requirements. Therefore, requirements not tested as part of bearing retrofit are also provided. When previously tested data is provided it will be so noted.

This Acceptance Test Report consists of 3 volumes as follows:

BVS 2731	OLS #14 Summary and Specification Requirements
BVS 2732	OLS #14 Acceptance Vibration Report
BVS 2733	OLS #14 Alignment & Synchronization Curves

1.1 Summary of System - Specific Parameters

OLS software Program = OLSP02J.FS

Gain Constants and Sensor Switch Points

P(0) = 9.875 dB
P(1) = 50.00 dB
P(2) = 0 dB
P(3) = 29.75 dB
S(1) = 59.875 dB
S(2) = 22 dB
S(3) = 33.75 dB

(These may change during Early Orbit Calibration.)

PMT HV EST (A532) = 3.635 volts ± .250V

Cone Cooler S/N 026 with T detector S/N J-5

T Cold Patch EST (A549) curve - see Table next page.

T Cold Patch EST Voltage = 2.18V ± .200V

TGAIN Left = 4
Right = 4
Both = 4

TLEVEL vs M1 temperature range - see second page following for table

VDGA constant for PMTCAL = $(0440)_8$

Encoder Simulator Bias Constant = Prim -18 Redun -17

Encoder Simulator Separation Constant = Prime +8 Redund +8

T COLD PATCH TEMP VS EST VOLTS
CONE COOLER S/N 026
T DETECTOR S/N J-5
OLS-14

T (deg k)	EST (Volts)
95	5.935
96	5.513
97	5.124
98	4.766
99	4.435
100	4.129
101	3.847
102	3.587
103	3.346
104	3.124
105	2.919
106	2.729
107	2.553
108	2.390
109	2.239
110	2.100
111	1.970
112	1.850
113	1.738
114	1.635
115	1.538
116	1.448
117	1.365
118	1.287
119	1.215
120	1.147
121	1.084
122	1.025
123	0.970
124	0.919
125	0.870

OLS #14
TLEVEL VS M1 TEMPERATURE RANGE
T DETECTOR S/N J-5

TL	M1 TEMP(°C)		
1111	-22.032°	to	-16.513°
1110	-16.513°		-10.993°
1101	-10.993°		-5.474°
1100	-5.474°		0.045°
1011	0.045°		5.564°
1010	5.564°		11.034°
1001	11.034°		16.603°
1000	16.603°		22.122°
0111	22.122°		27.641°
0110	27.641°		33.161°
0101	33.161°		38.680°
0100	38.680°		44.199°
0011	44.199°		49.718°
0010	49.718°		55.238°
0001	55.238°		60.757°
0000	60.757°		66.276°

TLEVEL command changes should be uplinked to the OLS as a function of M1 temperature to maximize T Channel output accuracy.

1.2 Specification Pass-Fail Summary

The following sections of this Acceptance Test Report contain the test results as they pertain to the Development Specification requirements. Each Test Report paragraph heading is followed by the corresponding Segment Spec paragraph number in parentheses.

The table on the following page summarizes the OLS #14 pass-fail status vs. Development Spec. paragraph number.

DEVELOPMENT SPEC. PARAGRAPH NUMBER	PASS	FAIL
3.2.1.1.1.1 Infrared Spectrum	X	
3.2.1.1.1.2 Vis-Day Spectrum	X	
3.2.1.1.1.3 Vis-Night Spectrum	X	
3.2.1.1.2.1 Fine Geometric Resolution - HRD	X	
3.2.1.1.2.1 Fine Geometric Resolution - T	X	
3.2.1.1.2.2 Smooth Geometric Resolution - HRD	X	
3.2.1.1.2.2 Smooth Geometric Resolution - T	X	
3.2.1.1.2.2 Smooth Geometric Resolution - PMT	X	
3.2.1.1.2.3 Data Sampling	X	
3.2.1.1.3.1 Along Track Geometric Accuracy	X	
3.2.1.1.3.2/3 Along Scan Geometric Accuracy	X	
3.2.1.1.4.1.a T Channel Radiometric Accuracy Repeatability	X	
3.2.1.1.4.1b T Channel Radiometric Accuracy - Stability	X	
3.2.1.1.4.1c T Channel Radiometric Accuracy - Fixed	X	
3.2.1.1.4.2 Daytime Radiometric Accuracy	X	
3.2.1.1.4.3 Nighttime Radiometric Accuracy	X	
3.2.1.1.4.5.1 Terminator Location	X	
3.2.1.1.4.5.2 Gain Change Rate	X	
3.2.1.1.4.5.3 Maximum Gain Settings	X	
3.2.1.1.4.5.4 Commandable T-Channel Gain	X	

DEVELOPMENT SPEC. PARAGRAPH NUMBER	PASS	FAIL
3.2.1.1.4.5.5 Commandable T-Channel Level	x	
3.2.1.1.4.6.2/3 A/D Conversions & Algorithms	x	
3.2.1.1.5 Radiometric Resolution	x	
3.2.1.1.6.1 T Channel Noise	x	
3.2.1.1.6.2 L Channel Noise (Day)	x	
3.2.1.1.6.3 L Channel Noise (Night)	x	
3.2.1.1.6.4 Dark Current	x	
3.2.1.1.6.5 Stability	x	
3.2.1.1.6.6 Along-Track Noise Integration	x	
3.2.1.1.6.7 Glare Suppression	x	
3.2.1.1.7 Survivability	x	
3.2.1.1.8 Scan Angle	x	
3.2.1.1.9 Data Collection Rate	x	
3.2.1.2 Data Management	x	
3.2.1.3.1 28V Power	x	
3.2.1.3.2 5V Power	x	
3.2.2.1 Total Mass	x	
3.2.2.2 Component Mass	x	
3.2.2.3 Cable Harness Mass		x*
3.2.2.4 Dimensional Limits	x	
3.3 Design Features	x	
4.1/2 Environment	x	
5.1 Shipping & Storage	x	
INTERFACE SPEC PARAGRAPH NUMBER		
3.1.3 Alignment	x	

* This was not tested as part of Bearing Retrofit.

1.3 Summary of OLS #14 Testing

Aug-91	Returned to WEC for Bearing Retrofit & RDS rework and testing
09-17-92	RDS (BVS 2600) - Began RDS Testing
09-21-92	SPS (x) Vibration
09-21-92	OSU (x) Vibration
09-30-92	Completed RDS Testing
11-04-92	Began System Testing per BVS 2579
12-11-92	SSS (x,y,z) Vibration
12-17-92	Post-Vibration Testing
01-27-93	OLS 14 to Thermal VAC Chamber
02-02-93	Thermal Vac Ambient Testing
02-05-93	Shim Replacement in SSS (Ref. AM 14A-12)
02-11-93	Thermal Vacuum Testing
03-04-93	Break VAC for Troubleshooting
03-11-93	Resume Thermal Vac Testing After STS Repairs
04-04-93	Thermal Vac Testing Complete
04-07-93	Adjusted T Gain Pots for Nominal Gain of 4

1.4 Configuration and Serialized Assemblies

The configuration listing on the following pages includes the configuration of OLS #14 as of 03-02-88. It also includes the PMT replacement of October, 1992.

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
Key Drawing	536R500G03	L	5009
<u>SSS Assembly</u>	<u>758R750G02</u>	L	5009
Cable Assy	644R320G03	M	501
<u>OSC Assy</u>	623R765G08	AD	5009
<u>HRD Assy</u>	623R754G05	AB	0008
PWR Bd	623R758G04	R	0008
Pre Amp Bd	623R506G04	U	0008
<u>T-Chan</u>	765R048G02	E	5001
T-Chan Bd	762R539G02	C	5002
Module	623R727G01	B	5015
Module	623R727G01	B	5016
<u>VDGA/Lin Log</u>	644R150G05	G	5009
Lin Log	644R127G05	P	5009
VDGA	644R152G04	P	5009
VDGA	644R153G04	N	5009
<u>Enc. OPT</u>	688R705H01	C	011
<u>PMT</u>	644R909G05	T	6001
PMT Tube	640R920G02	J	0019
EMR Bd	644R905G03	D	0009
LED Assy	536R916G01	D	0009
Switch Bd	644R903G05	M	0009
Doubler Bd	644R907G02	F	0009
Regulator Bd	644R807G04	H	0009
Pre Amp Bd	644R935G04	L	5010
<u>HRD Post Amp</u>	644R220G05	K	5009
Post Amp Bd	644R228G05	AB	5009

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
EST/LMD	644R219G04	D	5007
EST/LMD Bd	758R142G03	E	0007
Heater Cont	633R053G13	J	5023
Elect Assy	633R052G04	Y	5023
Heat Cont	633R053G04	J	5033
Elect Assy	633R052G04	Y	5033
Heat Cont	633R053G15	J	5025
Elect Assy	633R052G04	Y	5025
Heater Cont	633R053G16	J	5026
Elect Assy	633R052G04	Y	5026
Solenoid Mech	758R620G02	D	5001
Optical Relay	701R717H01	A	014
Rel Mech I	640R701G02	F	5009
Rel Mech II	640R753G02	H	5009
Rel Mech III	640R381G02	H	5009
T-Clamp	623R821G01	H	-
T-Cal	623R920G01	B	-
Aux Encd	640R846G05	L	5009
Bd Assy	640R825G05	F	5010
Bd Assy	640R844G05	J	5010
Motor Assy	623R894G01	B	002
IMC/M3	623R858G02	D	5011
Cover, Cooler	640R320G01	(-)	5009
Cone Cooler	9RA5216H01	K	026

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
ENPA	682R215G06	N	5009
A1 Bd	682R167G04	H	5010
A2 Bd	682R110G06	U	5009
A3 Bd	682R112G04	R	5009
Aux Encd B/U	682R300G04	C	5009
A1 Bd	682R149G04	E	5008
A2 Bd	682R151G04	E	5008
BB1	KG43		026
BB2	KG43		027
BB3	KG43		028
Ther. Blk. Kit	661R564G03	J	5009
GSSA/DOC	640R790G03	M	5009
GSSB	633R906G01	A	5009
PR1	688R461H01	E	044
PR2	688R461H01	E	045
PR3	688R461H01	E	056
PR4	688R461H01	E	057
Cable Assy	9RA5255H09	V	501
Cable Assy	9RA5255H02	V	502
Cable Assy	9RA5255H04	V	501
Cable Assy	9RA5255H10	V	503
Cable Assy	9RA5255H06	V	503
Cable Assy	9RA5255H11	V	501
Cable Assy	9RA5255H12	V	501
Cable Assy	9RA8118G01	G	-
Coax Assy	644R327G01	C	-
Coax Assy	644R327G02	C	-

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
Coax Assy	644R327G03	C	-
Coax Assy	644R328G01	D	-
Coax Assy	644R328G02	D	-
Coax Assy	644R328G03	D	-
Coax Assy	644R328G04	D	-
Coax Assy	644R328G05	D	-
Coax Cable	644R328G06	D	-
Coax Assy	644R329G01	D	-
Coax Assy	644R329G02	D	-
Coax Assy	644R329G03	D	-
Coax Assy	644R329G04	D	-
Coax Assy	644R329G05	D	-
Coax Assy	644R329G06	D	-
Coax Assy	644R329G07	D	-
Coax Assy	644R329G08	D	-
SPS	651R390G03	AF	5009
Matrix	651R342G04	AW	0004
R/B	644R665G05	AF	5016
Matrix	644R081G03	M	0007
Al Bd	640R618G03	G	5019
A2 Bd	640R518G03	R	5018
A3 Bd	640R520G03	R	5017
Bus Bar	640R714G01	N	5009
Bus Bar	640R714G02	N	5009

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
R/B	644R665G05	AF	5017
Matrix	644R081G03	M	0002
A1 Bd	640R618G03	G	5020
A2 Bd	640R518G03	R	5017
A3 Bd	640R520G03	R	5019
CU 1	640R612G03	L	5017
CU 1	640R612G03	L	5018
CU 2	640R614G03	L	5016
CU 2	640R614G03	L	5017
AU 1	640R608G03	F	5017
AU 1	640R608G03	F	5018
AU 2	640R610G03	F	5016
AU 2	640R610G03	F	5017
MC1X	640R560G03	N	5018
MC1X	640R560G03	N	5019
MC2X	640R662G02	A	5002
MC2X	640R662G02	A	5003
ROM	640R530G03	V	5016
ROM	640R530G03	V	5017
Core	644R910H03	K	020
Core	644R910H03	K	021
SDS2	640R442G03	U	5016
SDS2	640R442G03	U	5017
SDS3	640R444G03	P	5016
SDS3	640R444G03	P	5017

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
SDS4	640R446G03	U	5016
SDS4	640R446G03	U	5017
SDS5	640R498G04	T	5016
SDS5	640R498G04	T	5017
CLSD	640R458G04	AG	5016
CLSD	640R458G04	AG	5017
SDS1X	640R660G03	F	5002
SDS1X	640R660G03	F	5003
FC-1	640R450G03	AC	5016
FC-1	640R450G03	AC	5017
FC-2	640R454G04	W	5016
FC-2	640R454G04	W	5017
FC-3	640R456G03	AA	5015
FC-3	640R456G03	AK	5017
SDF-1	640R474G04	AK	5016
SDF-1	640R474G04	AK	5017
SDF-2	640R476G04	AK	5016
SDF-2	640R476G04	AK	5017
SDF-3X	640R644G03	A	5002
SDF-3X	640R644G03	A	5003
SDF-4X	640R646G03	A	5002
SDF-4X	640R646G03	A	5003
SDF-5X	640R648G03	F	5016
SDF-5X	640R648G03	F	5017
SDS-6	640R650G03	A	5002

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
SDS-6	640R650G03	A	5003
SDS-7	640R546G03	R	5016
SDS-7	640R546G03	R	5017
4B	640R412G03	R	5016
4B	640R412G03	R	5017
7A	640R414G03	AC	5016
7A	640R414G03	AC	5017
7B	640R416G05	AY	5016
7B	640R416G05	AY	5017
1A	640R400G03	AL	5018
1A	640R400G03	AL	5020
1B	640R402G03	AF	5016
1B	640R402G03	AF	5017
FBC	640R448G04	P	5016
FBC	640R448G04	P	5017
RAM	640R626G03	D	5002
RAM	640R626G03	D	5003
2A	640R488G03	AA	5016
2A	640R488G03	AA	5017
2B	640R410G03	Y	5016
2B	640R410G03	Y	5017
3A	640R404G03	AA	5016
3A	640R404G03	AA	5017

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
10X	640R572G03	K	5016
10X	640R572G03	K	5017
CLCL	640R406G05	AH	5016
CLCL	640R406G05	AH	5017
WF-1X	640R664G02	-	5016
WF-1X	640R664G02	-	5017
WF-2	640R432G03	AA	5016
WF-2	640R432G03	AA	5017
WF-3	640R622G03	G	5016
WF-3	640R622G03	G	5018
WF-4	640R436G04	M	5016
WF-4	640R436G04	M	5017
WF-5	640R438G03	AA	5016
WF-5	640R438G03	AA	5017
9A	640R654G02	A	5002
9A	640R654G02	A	5003
9BX	640R656G02	A	5002
9BX	640R656G02	A	5003
9CX	640R658G02	-	5002
9CX	640R658G02	-	5003
WF-6	640R568G03	J	5017
WF-6	640R568G03	J	5018

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
OSU	640R960G04	AE	5009
Matrix	522R783G02	G	0001
A1	640R522G04	V	5010
A2	640R524G03	R	5009
Bottom	644R047G04	V	5009
Top	644R046G03	R	5009
SPU	758R040G03	P	5009
Matrix	640R927G03	W	0003
Bus Bar	640R912G01	L	5011
SSP-8	640R638G03	D	5002
SSP-8	640R638G03	D	5003
RTD-1	640R508G04	AK	5016
RTD-1	640R508G04	A	5017
RTD-2	640R510G04	AU	5016
RTD-2	640R510G04	AU	5018
RTD-3	640R512G03	L	5016
RTD-3	640R512G03	L	5017
RTD-4	640R526G03	P	5016
RTD-4	640R526G03	P	5017
RTD-5	640R514G03	T	5016
RTD-5	640R514G03	T	5017
SSP-1X	640R636G02	C	5002
SSP-1X	640R636G02	C	5003
SSP-2	640R462G04	Y	5016
SSP-2	640R462G04	Y	5017
SSP-3	640R464G04	V	5016

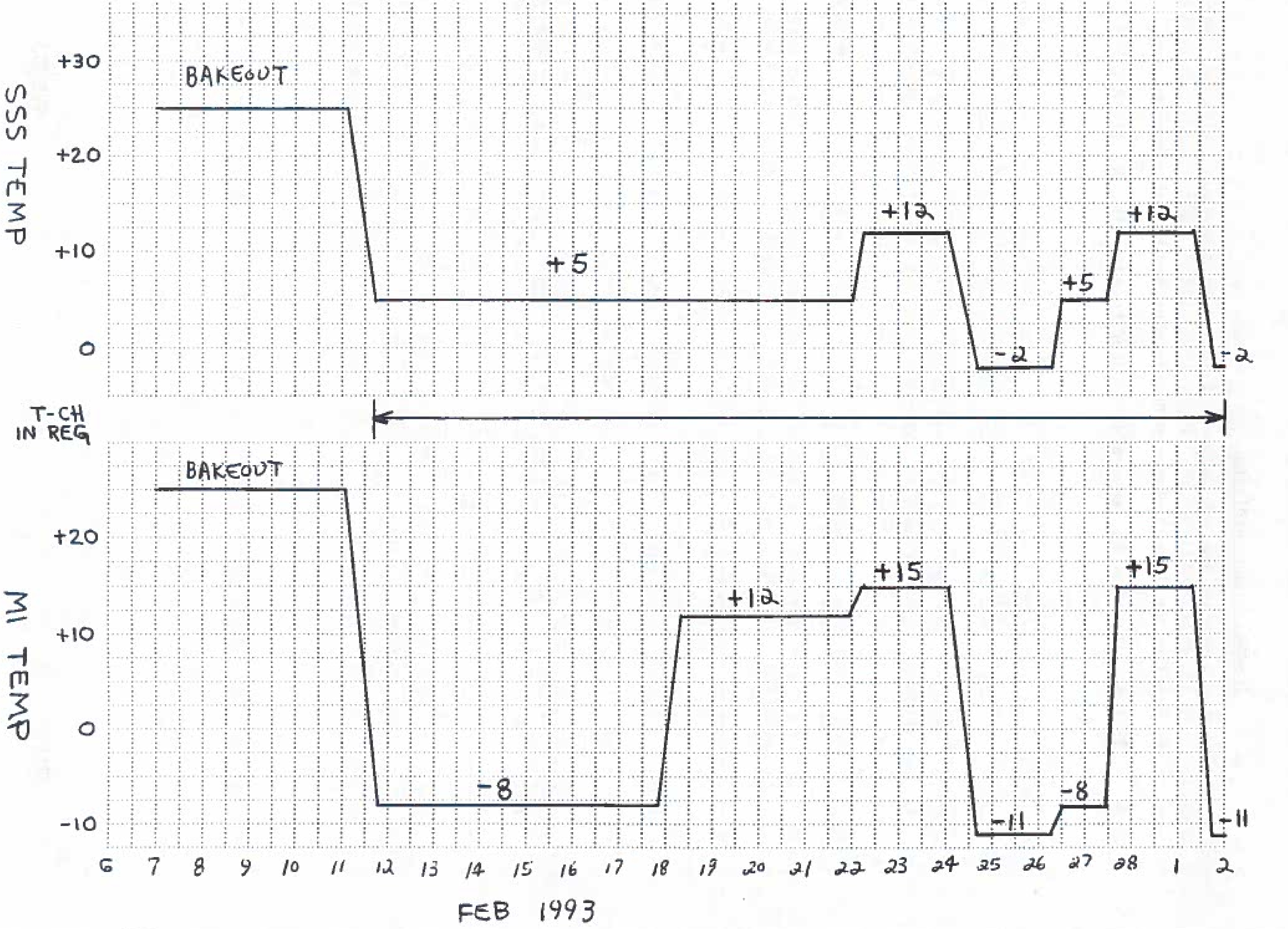
DESCRIPTION	ASSEMBLY NO.	REV.	S/N
SSP-3	640R464G04	V	5017
SSP-4	640R642G02	F	5014
SSP-4	640R642G02	F	5003
SSP-5	640R468G04	U	5016
SSP-5	640R468G04	U	5017
SSP-6	640R470G04	U	5016
SSP-6	640R470G04	U	5017
SSP-7	640R472G04	Y	5016
SSP-7	640R472G04	Y	5017
SSP-9	640R554G03	K	5017
SSP-9	640R554G03	K	5018
PSU	758R050G04	AG	5009
Matrix	758R569G01	C	0004
RFI Plate	690R891G01	B	5007
Reg Assy	682R089G03	N	5006
Misc Bd	756R609G02	D	5000
T-Chan CG	688R483G04	K	5009
T-Left	688R485G04	J	5009
T-Rgt	688R487G04	J	5009
T-Chan BU	688R489G04	H	5009
T-Ana Fil	688R491G04	K	5016
T-Ana Fil	688R491G04	K	5017
L-Ana Fil	688R493G04	H	5016
L-Ana Fil	688R493G04	H	5017

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
PSU TRA BLK	640R998G05	K	5017
PSU TRA BLK	640R998G05	K	5018
DME	688R481G05	H	5019
DME	688R481G04	H	5018
IMC	644R864G04	F	5008
Relay-1	756R589G02	D	5009
+5V	644R078G04	R	5009
Relay-2	688R502G04	E	5009
+12VDA	688R499G04	F	5017
+12VDA	688R499G04	F	5018
Dual ENPA	640R616G02	J	5009
Relay-3	688R503G04	D	5009
-12V	644R069G04	R	5008
Relay-5	688R505G04	D	5009
Relay-4	688R504G04	D	5009
+12V Vm	688R500G04	D	5009
MC	688R495G04	G	5020
MC	688R495G04	G	5018
CPH	688R497G04	E	5009
Enable	682R381G04	E	5009
Driver	756R593G02	E	5000

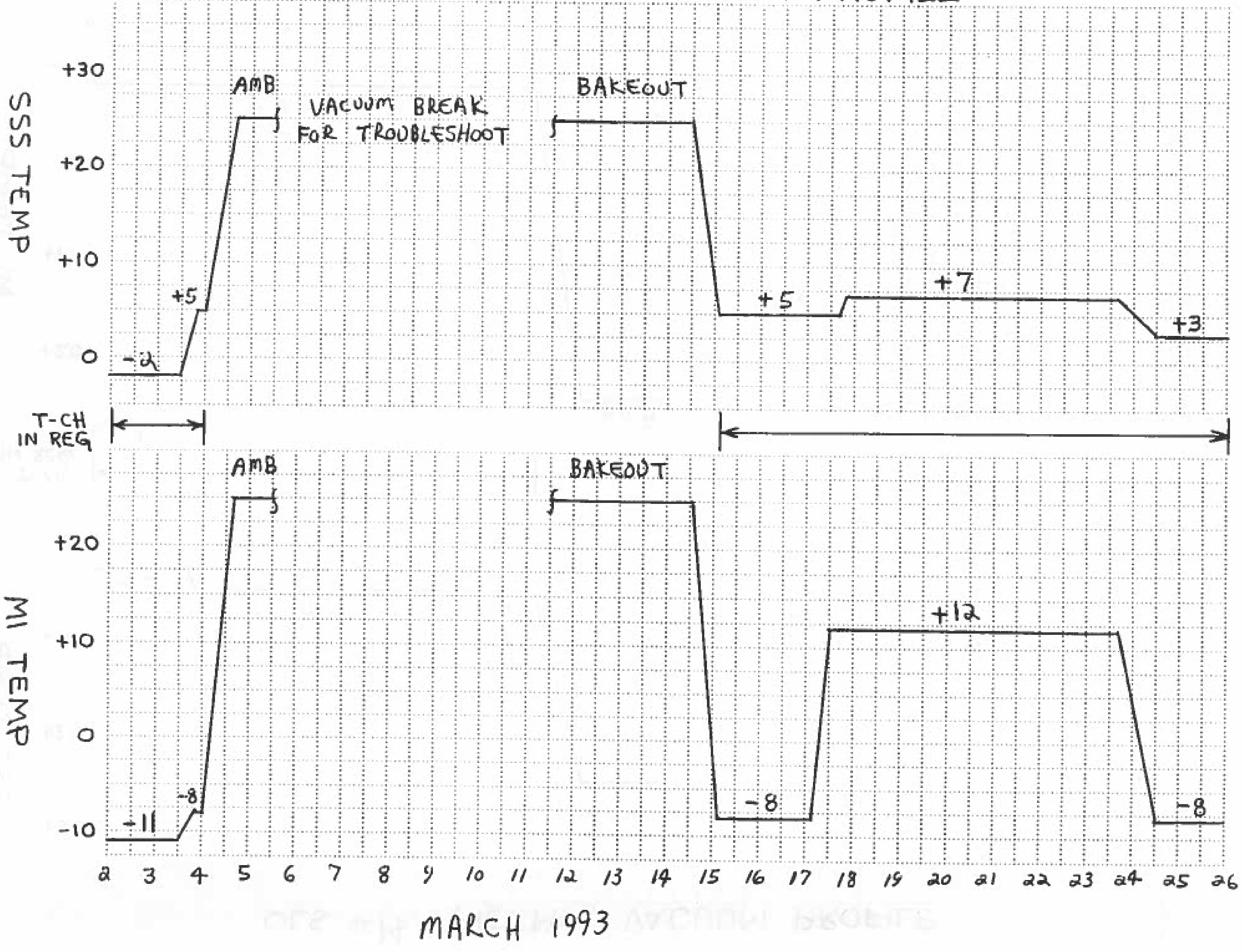
1.5 Thermal Vacuum Profiles

The OLS #14 AVE underwent a series of Thermal Vacuum Tests. The profiles on the next pages represent the history of pumpdowns, SSS temperature and M1 temperatures experienced by the OLS #14 AVE.

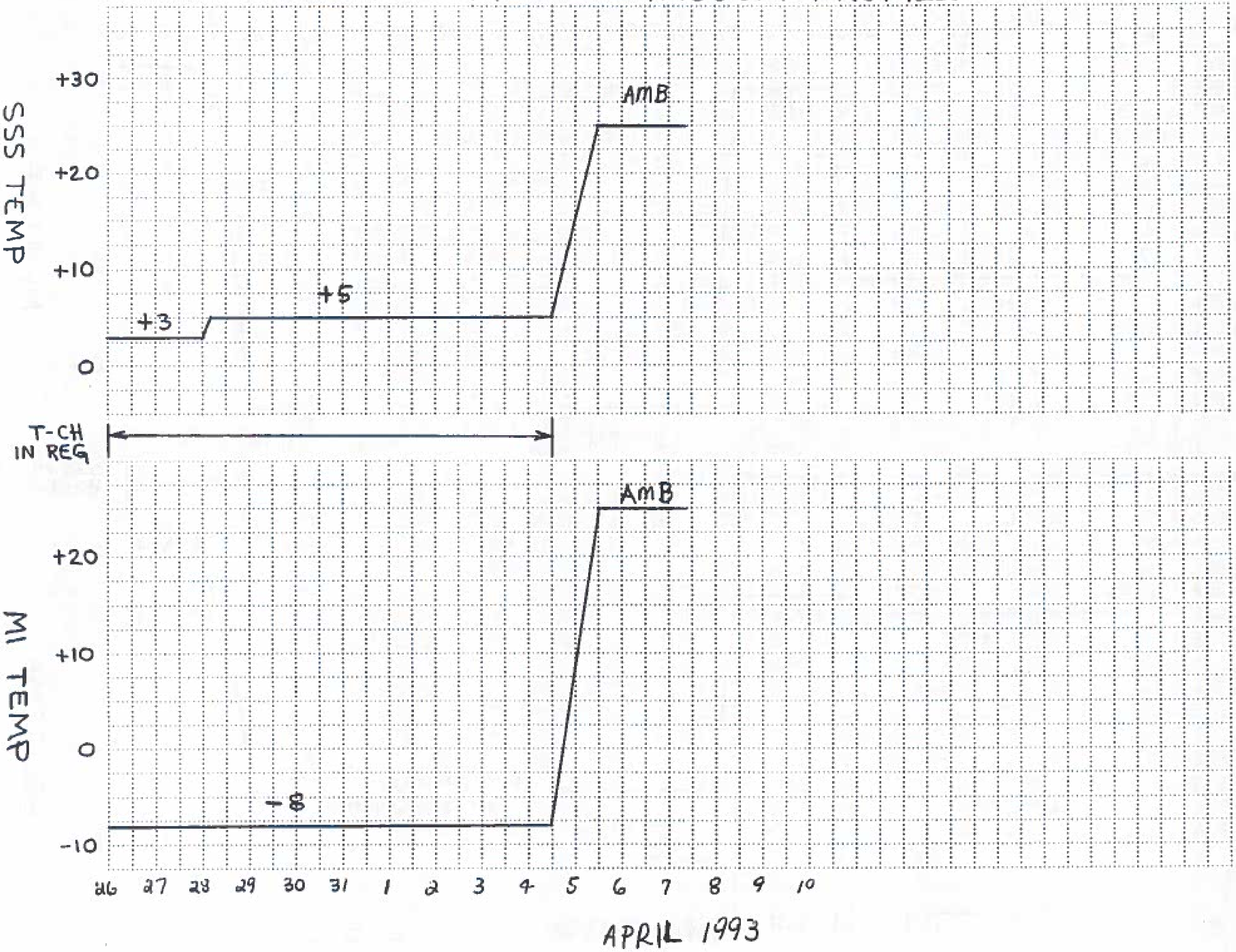
OLS #14 THERMAL VACUUM PROFILE



OLS #14 THERMAL VACUUM PROFILE



OLS #14 THERMAL VACUUM PROFILE



1.6 Test History Calendar

The test history calendar is a capsule look at the day-to-day progress of the OLS #14 AVE throughout its testing period at WEC.

UNIT OLS #14

TEST HISTORY

DATE SEP. '92

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17 BUS 2600	18	19
20	21 SPS & OSU Vib.	22 BUS 2600 Amb Tests	23 BUS 2600 HoT Tests	24 BUS 2600 Cold & HoT Tests	25 BUS 2600 Cold Tests	26 BUS 2600 HoT Tests
27 No Tests	28 BUS 2600 Cold Tests	29 BUS 2600 Hot Tests	30 BUS 2600 Tests Complete			

UNIT OLS #14 TEST HISTORY DATE OCT. '92

☐	☐	☐	☐	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

BVS
2579

UNIT OLS #14 TEST HISTORY DATE Nov. '92

1	2	3	4 Began System Tests BUS 2579	5	6	7
8	9 Cabled up System Funct Tests	10 Funct Tests	11 4x9x1	12 Funct Tests	13 6x2x1	14 No Tests
15 No Tests	16 4x3x1	17 4x3x1	18 4x5x1	19 4x7x1 6x2x1	20 6x3x1 4x13	21 No Tests
22 No Tests	23 AHCIIPT	24 AHSFBIIPT 6x5x1 6x7x1 6x7x2 6x6x2	25 APCIIPT MPAIIPT Funct Tests MHCIIPT 6x9 7x8 6x6x1 4x7x1 6x6x2 6x3x5	26 No Tests	27 No Tests	28 No Tests
29 No Tests	30 No Tests					

UNIT OLS #14 TEST HISTORY DATE DEC. '92

		1 6x2x1 6x3x1 6x3x2	2 SIMFLT	3 SIMFLT 4x10x1 Incoming PR S/N030 Tests	4 6x7x1 6x7x2	5 SDSBER
6 SDSBER	7 No Tests	8 No Tests	9 No Tests	10 No Tests	11 SSS Vib	12 No Tests
13 No Tests	14 No Tests	15 No Tests	16 No Tests	17 Funct Test	18 Funct Tests MHA7PT AHSF3PTI AHSF7PT	19 6x2x1 6x3x1 6x7x2
20 APC7PT AHSFB9PT 6x2x4 6x4x3A	21 7x5	22 No Tests	23 No Tests	24 No Tests	25 No Tests	26 No Tests
27 No Tests	28 No Tests	29 No Tests	30 No Tests	31 No Tests		

UNIT OLS #14 TEST HISTORY DATE JAN. '93

31 T/U optical test facility alignment					1	2
3	4	5 MPA7PT 6x6x2	6 T/S EST#45 problem	7 T/S Core Memory Test	8 No Tests	9 No Tests
10 No Tests	11 Core Memory Tests	12 T/S Core Memory Error	13 T/S Core Memory Error	14 Funct Tests	15 Core Memory Tests	16 No Tests
17 No Tests	18 No Tests	19 No Tests	20 No Tests	21 No Tests	22 No Tests	23 No Tests
24 No Tests	25 No Tests	26 Uncabled System	27 Moved system to TV	28 Waiting for TCP	29 No Tests	30 T/V optical test facility alignment

UNIT OLS#14 TEST HISTORY DATE FEB. '93

	1 SSS installed	2 Funct Tests 4x11x1	3 AHSF7PT Funct Tests 6x5x1 6x2x2 MHA7PT 6x2x5 6x3x1 6x6x1 6x6x2 6x6x3 6x7x1	4 6x3x5 6x9 6x3x4 SIMFLT	5 6x5x1 shim added to HRD Detector 6x5x1	6 6x2x2 MHA7PT 6x3x1 6x3x5
7 7x9 7x10 Pumpdown @ 1015	8 72 HR Bake-Out	9 72 HR Bake-Out	10 72 HR Bake-Out	11 +5/-8 6x2x2 6x3x1 Funct Tests	12 Funct Tests 6x2x5 6x3x4 6x6x2 6x9 6x7x1 6x2x3A AHSF3PTI 4x9x1	13 AHC11PT AHSFB9PT Funct Tests APC11PT 6x5x1 MHC11PT 6x3x5
14 MPA11PT T121T231G 6x2x4 6x2x3A ASU 210 Q 6x7x3 7x12 T123T229A T125T227A MTC11PT	15 T127T225A ATC11PT ASU 270, ASU 290 T129T223A T131T221A ASU 210, 310 T121T221S	16 ASVCROSS T119T220A TDCRM3A Funct Tests TSTABILITY#1	17 TSTABILITY#2 thru #13 M1 to +12 @2215 9x1x1	18 9x1x4 6x2x3A AHSF7PT	19 APC7PT MHC7PT 6x5x1 MPA7PT T121T231H	20 SIMFLT Chamber pressure problems ASV 210, 310 T123T229B ATSF7PT T125T227B ASV 270, 290
21 6x3x3 6x5x2 MTC7PT T119T220B TDCRM3B TDCRM3K TDCRM3A To Hot SOAK #1	22 9x1x6 HOT SOAK #1 @ 0645 6x2x2	23 SIMFLT Funct Tests T121T231B	24 Funct Tests To Cold Soak #1 @0225 9x1x3 6x2x2	25 SIMFLT T121T231D Funct Tests	26 TSTABILITY#14 thru #17 To Nom Limits @ 0912 +5/-8 @ 1400 TSTABILITY #14 thru #17	27 TSTABILITY#18 thru #26 9x1x2 To Hot Soak #2
28 T121T231B Funct Tests						

UNIT OLS #14 TEST HISTORY DATE MAR. '93

	1 SIMFLT To Cold Soak @ 1030 9×1×3 Cold Soak #2 @ 2050	2 T/S Mission Sensor T121T231B	3 SIMFLT Funct Tests To +5/-8 @ 2200 7×4B	4 Shuting. down for repairs @ 0130 Door Open @ 1600 T/S SPU	5 T/S SPU	6 T/S SPU
7 T/S SPU	8 T/S SPU	9 T/S SPU	10 T/S SPU	11 Pumpdown @ 1008	12 72 HR Bake-Out	13 72 HR Bake-Out
14 72 HR Bake-Out	15 7×7 9×1×6 @ +5/-8	16 Funct Tests 6×2×3A T121T231G	17 ML to +12 @ 0320 +5/+12 @ 1145 6×2×3A T121T231H To Hot Limits @ 1628 +7/+12 @ 2130	18 Funct Tests 6×2×3A 6×2×5 6×2×2 6×2×4	19 T121T231B ASV 210, 310 AHSFB9PT T123T229B Funct Tests T125T227B	20 T119T231B TDCRM3B Funct Tests ASV210 6×3×5 6×6×2 6×3×1 6×3×3 6×3×4 6×3×1 MHC7PT AHSF3PTI AHC7PT 6×6×3
21 APC7PT ATS7PT MTC7PT 6×11×1 6×6×1 6×11×2 6×11×3 6×11×4	22 6×10 T125T227B TDCRM3B ATS7PT SIMFLT	23 9×1×1 9×1×4 To Cold Limit @ 1618 7×4A 9×1×5 +3/-8 @ 2350	24 Funct Tests 6×2×3A ATS7PT 6×2×5 6×2×2 MHC7PT 6×3×1 T121T231B AHC7PT 6×3×3	25 APC7PT ASV 210, 310 6×3×4 6×2×4 T123T229B T125T227B T119T231B 6×11×1 6×3×5 TDCRM3B 6×6×1 6×6×2 6×6×3 MPA7PT	26 6×11×2 6×11×3 6×11×4 MTC7PT Funct Tests 6×10 AHSF3PTI	27 AHSFB9PT SIMFLT 9×1×1 9×1×4
28 To +5/-8 @ 0026 +5/-8 @ 0300 9×1×6 T Stability #27 thru #32	29 T Stability #33 thru #39 6×2×3A Funct Tests AHC7PT T121T231C ASV 210	30 Funct Tests ASV 310 6×2×4 AHSFB9PT 6×11×1 T122T230G T123T226C T124T228C T125T227C T126T226C	31 ATS7PT T128T224C 6×11×1 6×2×5 MHC7PT 6×2×2 T130T222C Funct Tests T119T220C TDCRM3C 6×3×1 ASV 310 6×3×3 6×3×5			

UNIT OLS #14 TEST HISTORY DATE APR. '93

				1 MTC7PT ATS7PT 6x11x4 9x1x1 9x1x4 Funct Tests APC7PT 6x6x2 MPA7PT 6x3x4	2 SIMFLT 6x10	3 T Stability #40 thru #51
4 T Stability #52 Began Chamber Warm-up	5	6 TCP T/S	7 Adjusted TG and T.L pots. Moved to Blue Room	8	9	10
11	12	13 6x2x1 7x5	14 7x8 AHSF11PT Adjusted PMT Gain Balance 6x2x1	15	16	17 6x5x1
18	19	20	21	22	23	24
25	26	27	28	29	30	

2.0 DEVELOPMENT SPECIFICATION REQUIREMENTS

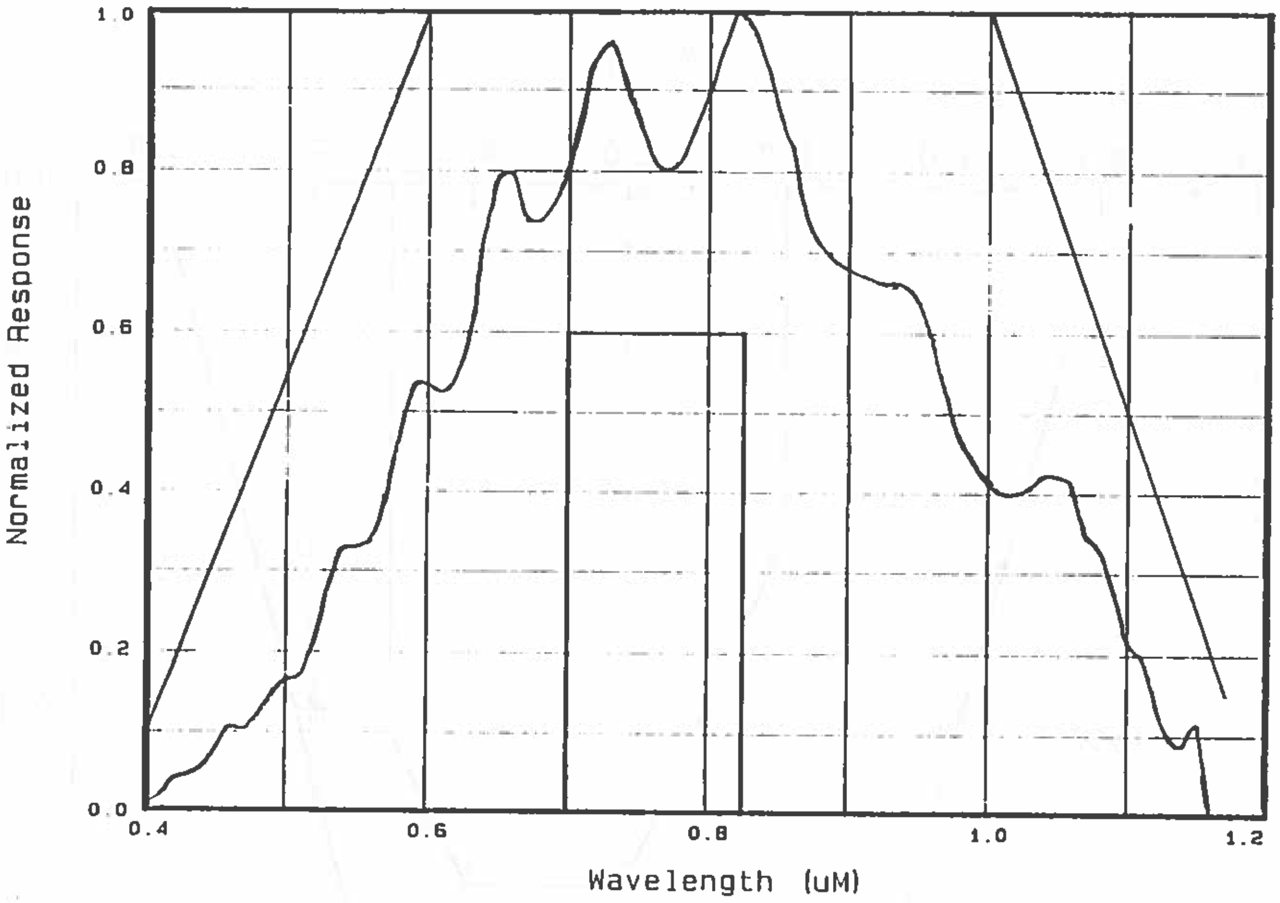
2.1 Spectra (3.2.1.1.1.1, 3.1.1.1.2, 3.1.1.1.3)

The OLS #14 Channel spectral responses are calculated by computer programs (GAINSET for L Channel and TGAIN for T channel) utilizing vendor spectral response data for the detectors, mirror and lens transmissivities/ reflectivities, and solar & lunar spectral radiance.

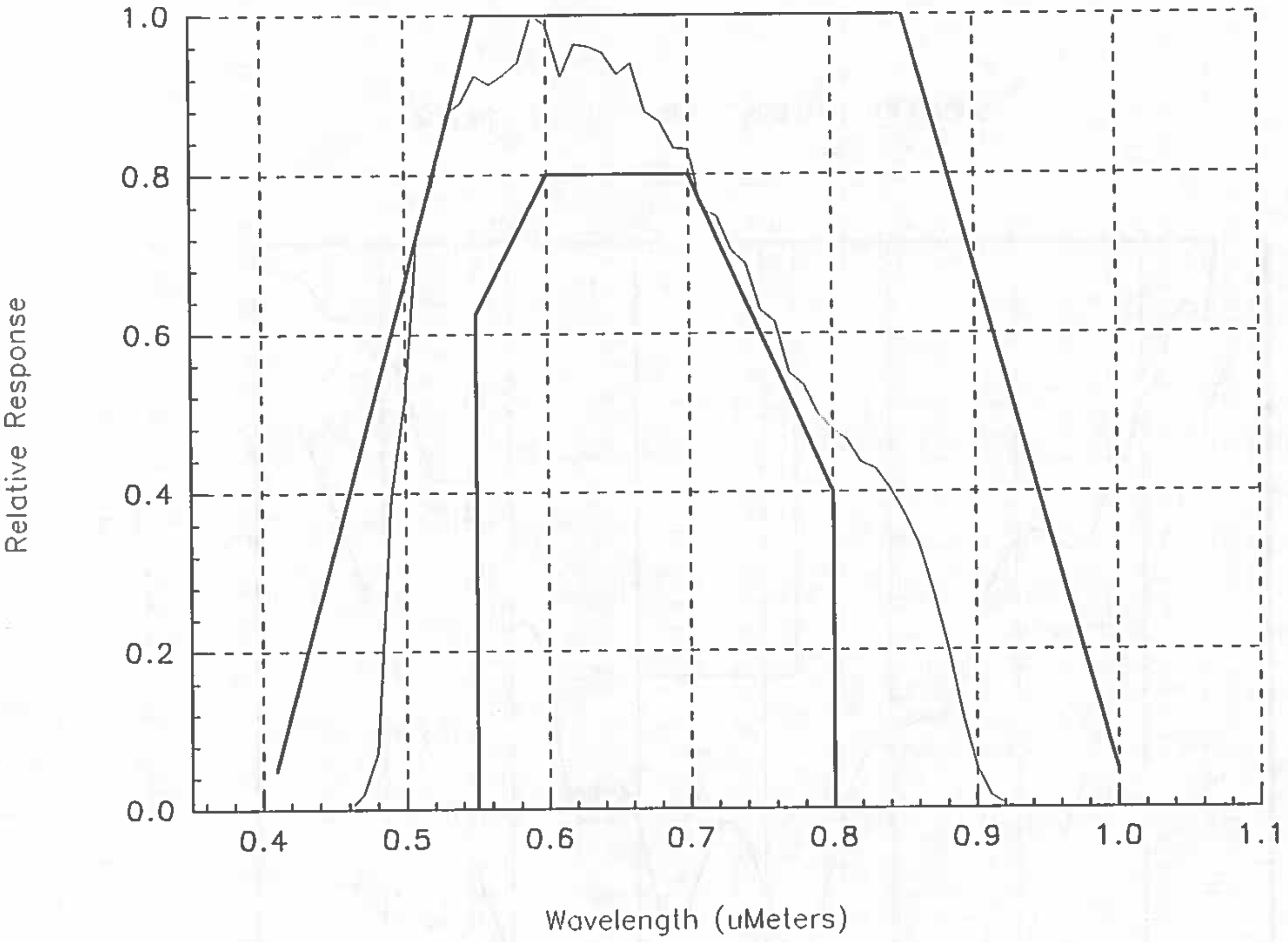
The HRD & T spectral responses are unchanged and those of the original ATR (BVS 2367) are included here. Due to the replacement of the PMT assembly, the PMT spectral response was recalculated using current data and replaces the spectral response of the original ATR.

All OLS #14 spectral responses are within specification.

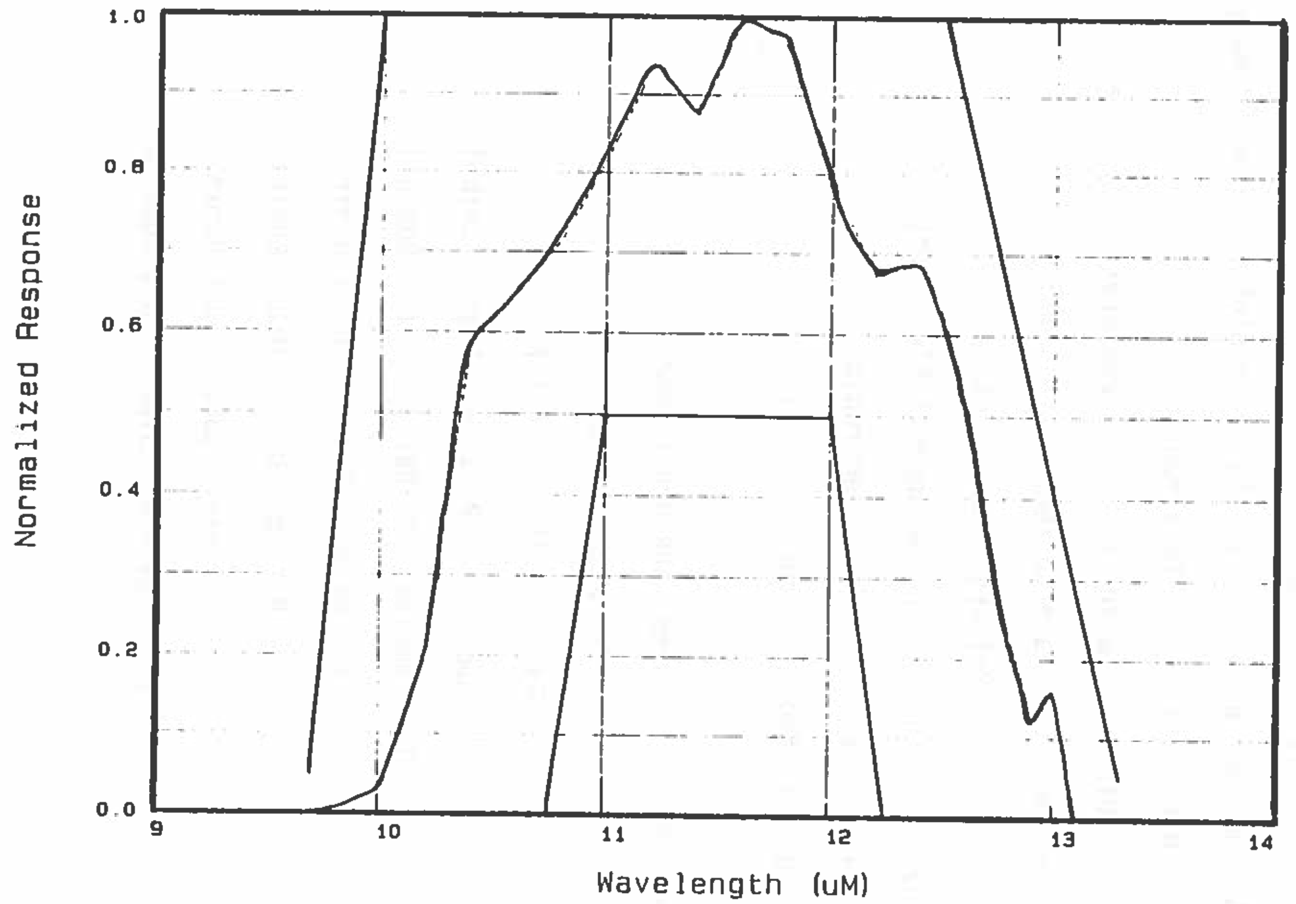
ATTACHMENTS: OLS #14 HRD Channel Spectral Response.
OLS #14 PMT Channel Spectral Response using assumed IRA/ORA.
OLS #14 T Channel Spectral Response.



OLSI4 HRD CHANNEL SPECTRAL RESPONSE



OLS14 VISIBLE NIGHTTIME SPECTRUM



OLS 14 T CHANNEL SPECTRAL RESPONSE

2.2 GEOMETRIC RESOLUTION

2.2.1 Fine Geometric Resolution - Infrared (3.2.1.1.2.1)

2.2.1.1 Baseline (Orbit Nominal)

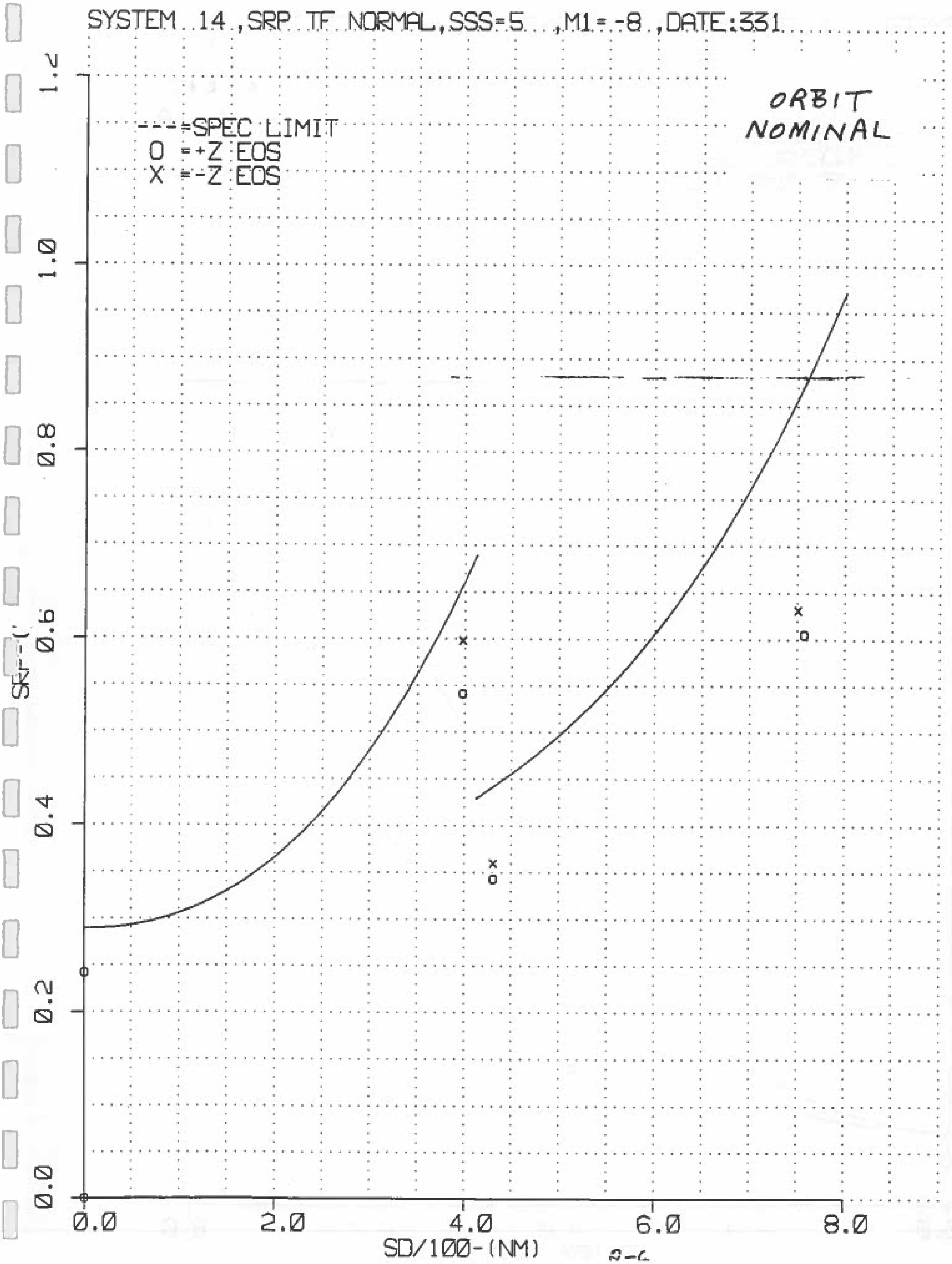
The TF Surface Resolution Parameter (SRP) is within the development specification limits.

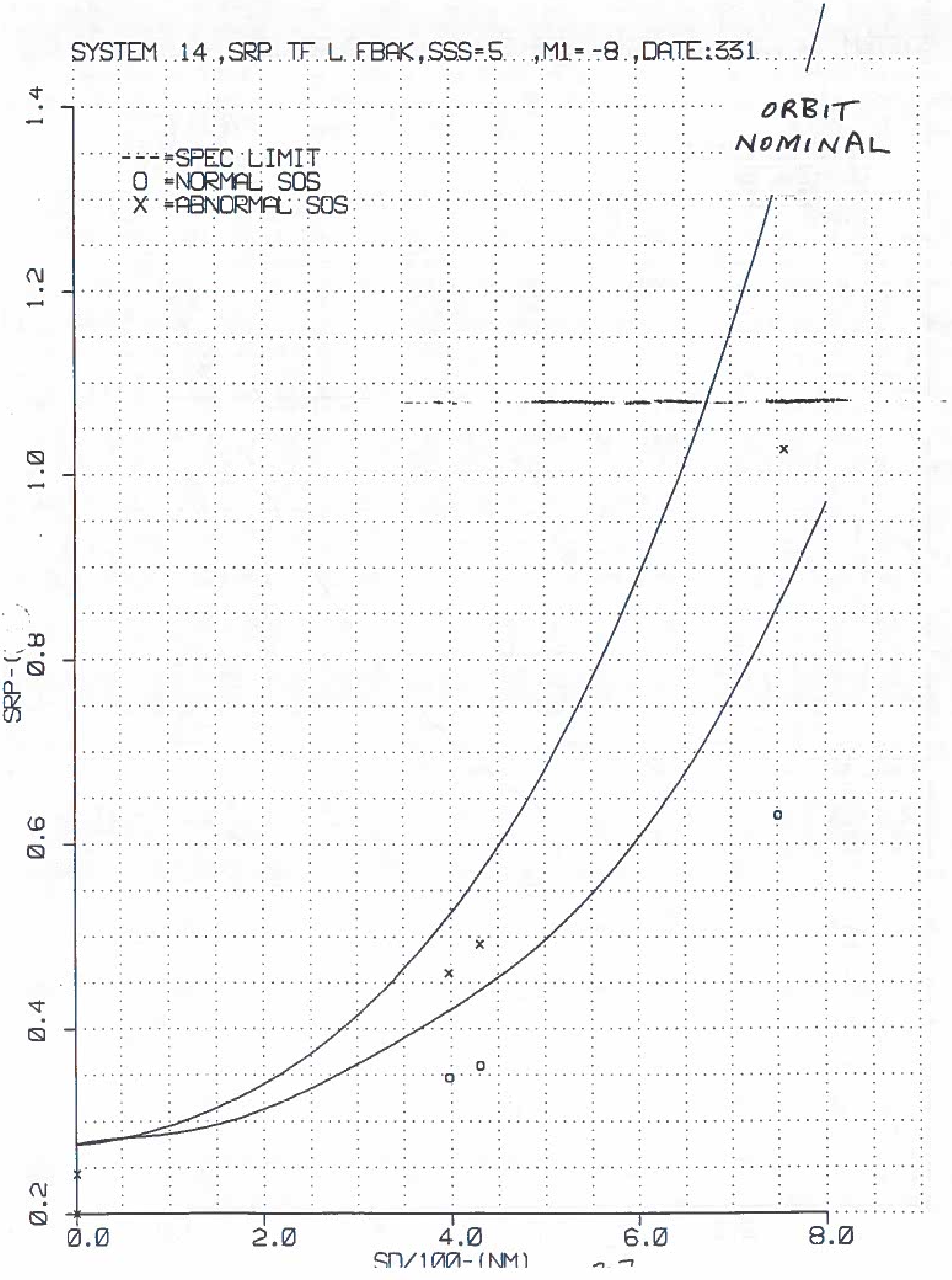
The VAX Computer programs calculate and plot the Fine Primary SRP, and the T Right & Left Fallback modes. In addition, all Specification required modes are tabulated and presented. The designations on the graphs are defined as follows:

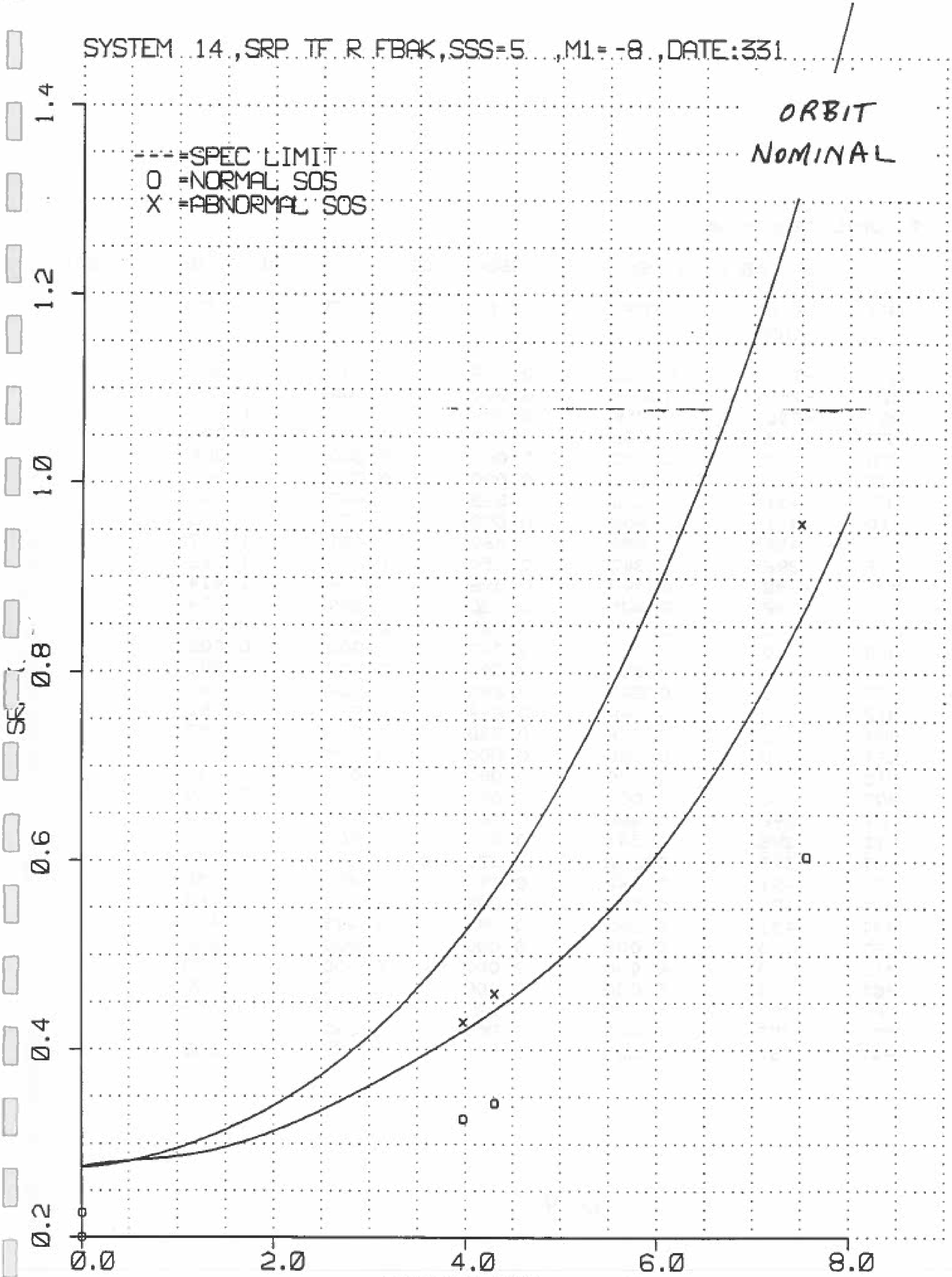
TFP	T Fine Primary Electronics
TFB	T Fine Backup (Redundant) Electronics
TSP	T Smooth Primary Electronics
TSB	T Smooth Backup Electronics

ATTACHMENTS:

TF	Normal SRP Orbit Nominal	
TF	Left Fallback Orbit Nominal	
TF	Right Fallback Orbit Nominal	
T	Complete SRP Tables	Orbit Nominal
T	Complete SRP Ratios	Orbit Nominal
T	Left Primary Tables	Orbit Nominal
T	Left Backup Tables	Orbit Nominal
T	Right Primary Tables	Orbit Nominal
T	Right Backup Tables	Orbit Nominal


SYSTEM 14 ,SRP TF NORMAL,SSS=5 ,M1=-8 ,DATE:331
ORBIT
NOMINAL
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
1.2
1.0
0.8
0.6
0.4
0.2
0.0
SRF-(
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)


SYSTEM 14 ,SRP TF L FBAK,SSS=5 ,M1=-8 ,DATE:331
ORBIT
NOMINAL
----=SPEC LIMIT
O =NORMAL SOS
X =ABNORMAL SOS
1.4
1.2
1.0
0.8
0.6
0.4
0.2
SRP-(
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)



SYSTEM 14, SRP TF R FBAK, SSS=5 , M1= -8 , DATE:331

ORBIT NOMINAL

```
T, COMPLETE, SRP(NM)

        FLT.  NO. = 14   ENV. =  4   SSS=  3DEGC   M1= -8DEGC   DATE:    331

 SEG     SUR. DIST.      TFP          TFB           TSP          TSB
           (NM)

 LFT      -750.        0.632        0.632        1.685        1.680
 MID      -750.        1.209        0.000        1.802        1.791
 RGT      -750.        0.958        0.958        1.731        1.724
 LFT         0.        0.000        0.000        0.000        0.000
 MID         0.        0.000        0.000        0.000        0.000
 RGT         0.        0.000        0.000        0.000        0.000
 LFT      -431.        0.360        0.363        1.447        1.443
 MID      -431.        0.602        0.000        1.478        1.473
 RGT      -431.        0.459        0.460        1.451        1.447
 LFT      -398.        0.347        0.350        1.396        1.392
 MID      -398.        0.598        0.598        1.419        1.414
 RGT      -398.        0.429        0.430        1.398        1.394
 LFT         0.        0.000        0.000        0.000        0.000
 MID         0.        0.000        0.000        0.000        0.000
 RGT         0.        0.000        0.000        0.000        0.000
 LFT         0.        0.243        0.245        0.964        0.961
 MID         0.        0.242        0.244        0.964        0.962
 RGT         0.        0.226        0.228        0.959        0.957
 LFT         0.        0.000        0.000        0.000        0.000
 MID         0.        0.000        0.000        0.000        0.000
 RGT         0.        0.000        0.000        0.000        0.000
 LFT       398.        0.460        0.461        1.396        1.392
 MID       398.        0.541        0.541        1.406        1.402
 RGT       398.        0.326        0.330        1.390        1.386
 LFT       431.        0.492        0.492        1.457        1.452
 MID       431.        0.550        0.000        1.470        1.465
 RGT       431.        0.343        0.347        1.445        1.441
 LFT         0.        0.000        0.000        0.000        0.000
 MID         0.        0.000        0.000        0.000        0.000
 RGT         0.        0.000        0.000        0.000        0.000
 LFT       757.        1.028        1.027        1.763        1.754
 MID       757.        1.428        0.000        1.882        1.866
 RGT       757.        0.605        0.606        1.673        1.668
```

```
T, COMPLETE, SRP RATIO

SEG    SUR. DIST.     TFP        TFB         TSP        TSB
         (NM)

LFT     -750.       0. 736     0. 736      0. 749     0. 747
MID     -750.       0. 000     0. 000      0. 801     0. 796
RGT     -750.       0. 725     0. 725      0. 770     0. 767
LFT        0.       0. 000     0. 000      0. 000     0. 000
MID        0.       0. 000     0. 000      0. 000     0. 000
RGT        0.       0. 000     0. 000      0. 000     0. 000
LFT     -431.       0. 815     0. 822      0. 904     0. 901
MID     -431.       0. 000     0. 000      0. 923     0. 920
RGT     -431.       0. 809     0. 810      0. 906     0. 904
LFT     -398.       0. 826     0. 834      0. 910     0. 907
MID     -398.       0. 910     0. 910      0. 925     0. 922
RGT     -398.       0. 820     0. 823      0. 912     0. 909
LFT        0.       0. 000     0. 000      0. 000     0. 000
MID        0.       0. 000     0. 000      0. 000     0. 000
RGT        0.       0. 000     0. 000      0. 000     0. 000
LFT        0.       0. 883     0. 891      0. 918     0. 915
MID        0.       0. 836     0. 843      0. 919     0. 916
RGT        0.       0. 822     0. 830      0. 913     0. 911
LFT        0.       0. 000     0. 000      0. 000     0. 000
MID        0.       0. 000     0. 000      0. 000     0. 000
RGT        0.       0. 000     0. 000      0. 000     0. 000
LFT      398.       0. 881     0. 882      0. 910     0. 908
MID      398.       0. 824     0. 824      0. 917     0. 914
RGT      398.       0. 778     0. 786      0. 906     0. 904
LFT      431.       0. 865     0. 866      0. 910     0. 907
MID      431.       0. 000     0. 000      0. 918     0. 915
RGT      431.       0. 777     0. 785      0. 902     0. 900
LFT        0.       0. 000     0. 000      0. 000     0. 000
MID        0.       0. 000     0. 000      0. 000     0. 000
RGT        0.       0. 000     0. 000      0. 000     0. 000
LFT      757.       0. 766     0. 765      0. 780     0. 776
MID      757.       0. 000     0. 000      0. 833     0. 826
RGT      757.       0. 694     0. 695      0. 740     0. 738
```

```
TF, LEFT, PRIMARY

        FLT.  NO. = 14   ENV. =  4   SSS=  5DEGC  M1= -8DEGC  DATE:    331

        SUR. DIST. (NM)     SRP ACTUAL(NM)     SRP RATIO

           -750.               0.632             0.736
              0.               0.000             0.000
           -431.               0.360             0.815
           -398.               0.347             0.826
              0.               0.000             0.000
              0.               0.243             0.883
              0.               0.000             0.000
            398.               0.460             0.881
            431.               0.492             0.865
              0.               0.000             0.000
            757.               1.028             0.766
```

```
TF, LEFT, BACKUP

        FLT.  NO. = 14   ENV. =  4   SSS=  5DEGC  M1= -8DEGC  DATE:    331

        SUR. DIST. (NM)     SRP ACTUAL(NM)     SRP RATIO

           -750.               0.632             0.736
              0.               0.000             0.000
           -431.               0.363             0.822
           -398.               0.350             0.834
              0.               0.000             0.000
              0.               0.245             0.891
              0.               0.000             0.000
            398.               0.461             0.882
            431.               0.492             0.866
              0.               0.000             0.000
            757.               1.027             0.765
```

```
TF, RIGHT, PRIMARY

        FLT.  NO. = 14   ENV. =   4  SSS=   5DEGC   M1= -8DEGC   DATE:    331

        SUR. DIST. (NM)   SRP ACTUAL(NM)    SRP RATIO

           -750.             0.958            0.725
              0.             0.000            0.000
           -431.             0.459            0.809
           -398.             0.429            0.820
              0.             0.000            0.000
              0.             0.226            0.822
              0.             0.000            0.000
            398.             0.326            0.778
            431.             0.343            0.777
              0.             0.000            0.000
            757.             0.605            0.694


TF RIGHT, BACKUP

        FLT.  NO. = 14   ENV. =   4  SSS=   5DEGC   M1= -8DEGC   DATE:    331

        SUR. DIST. (NM)   SRP ACTUAL(NM)    SRP RATIO

           -750.             0.958            0.725
              0.             0.000            0.000
           -431.             0.460            0.810
           -398.             0.430            0.823
              0.             0.000            0.000
              0.             0.228            0.830
              0.             0.000            0.000
            398.             0.330            0.786
            431.             0.347            0.785
              0.             0.000            0.000
            757.             0.606            0.695
```

2.2 Geometric Resolution (Cont'd)

2.2.1 Fine Geometric Resolution, Infrared (Cont'd.) (3.2.1.1.2.1)

2.2.1.2 Acceptance - Vibration

Consistant with the test philosophy established in BVS 2579, no vibration data was taken for the T-channel as part of Bearing Retrofit since stability of the T alignment for the common optics can be inferred from H alignment testing. Non-common optics were verified to be stable during the original OLS 14 testing.

ATTACHMENTS: N/A

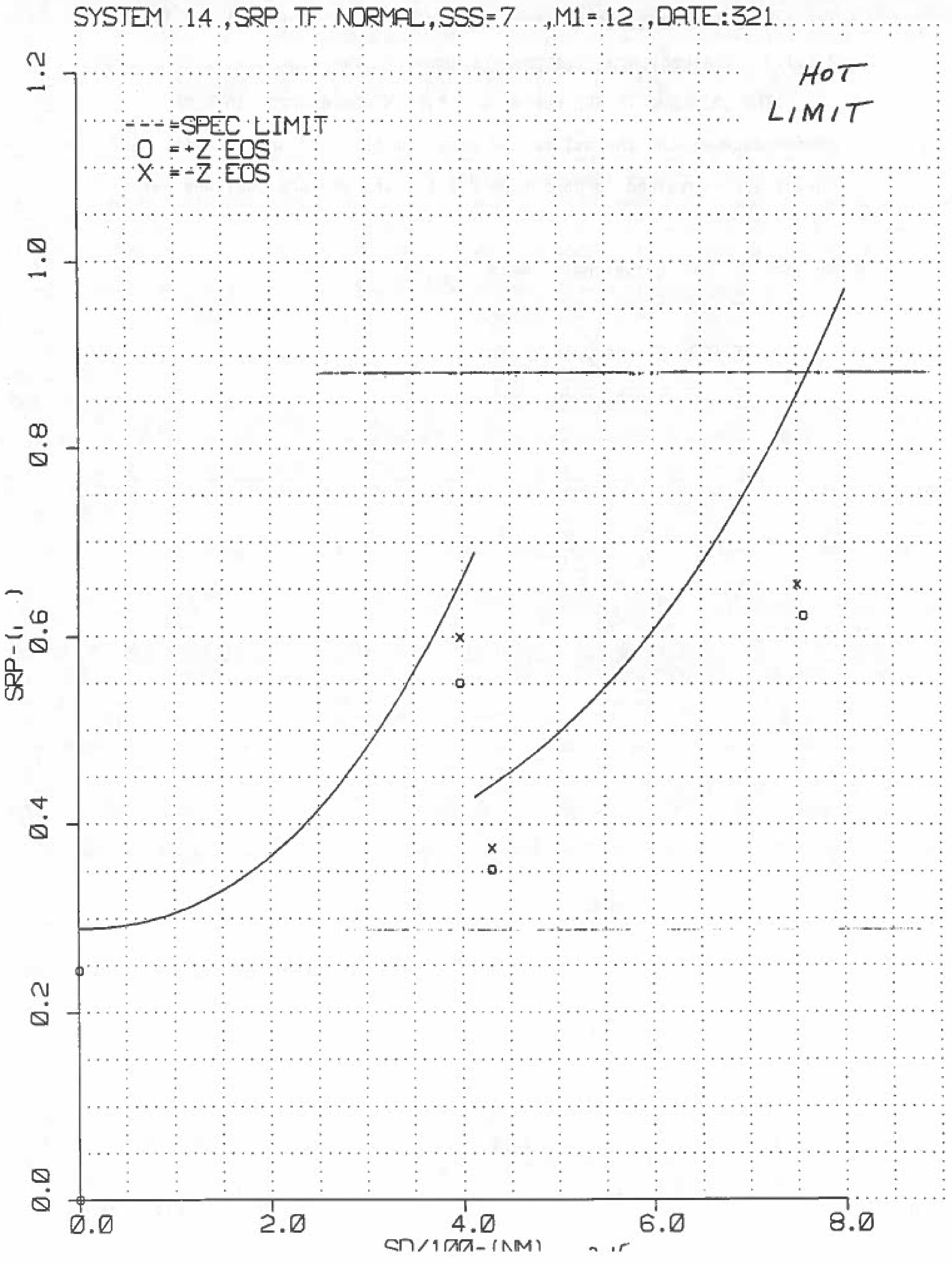
2.2 Geometric Resolution (Cont'd)

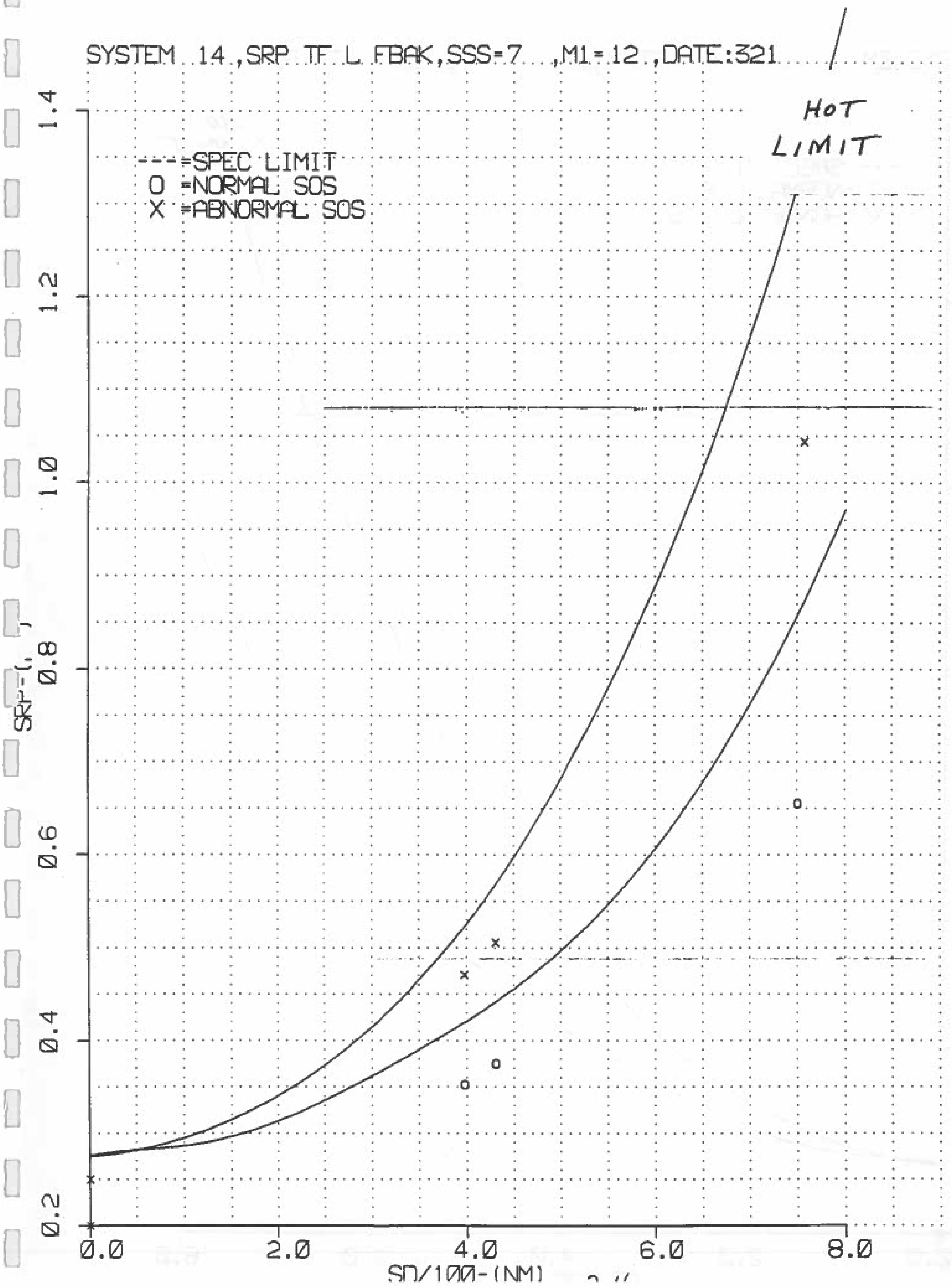
2.2.1 Fine Geometric Resolution, Infrared (Cont'd) (3.2.1.1.2.1)

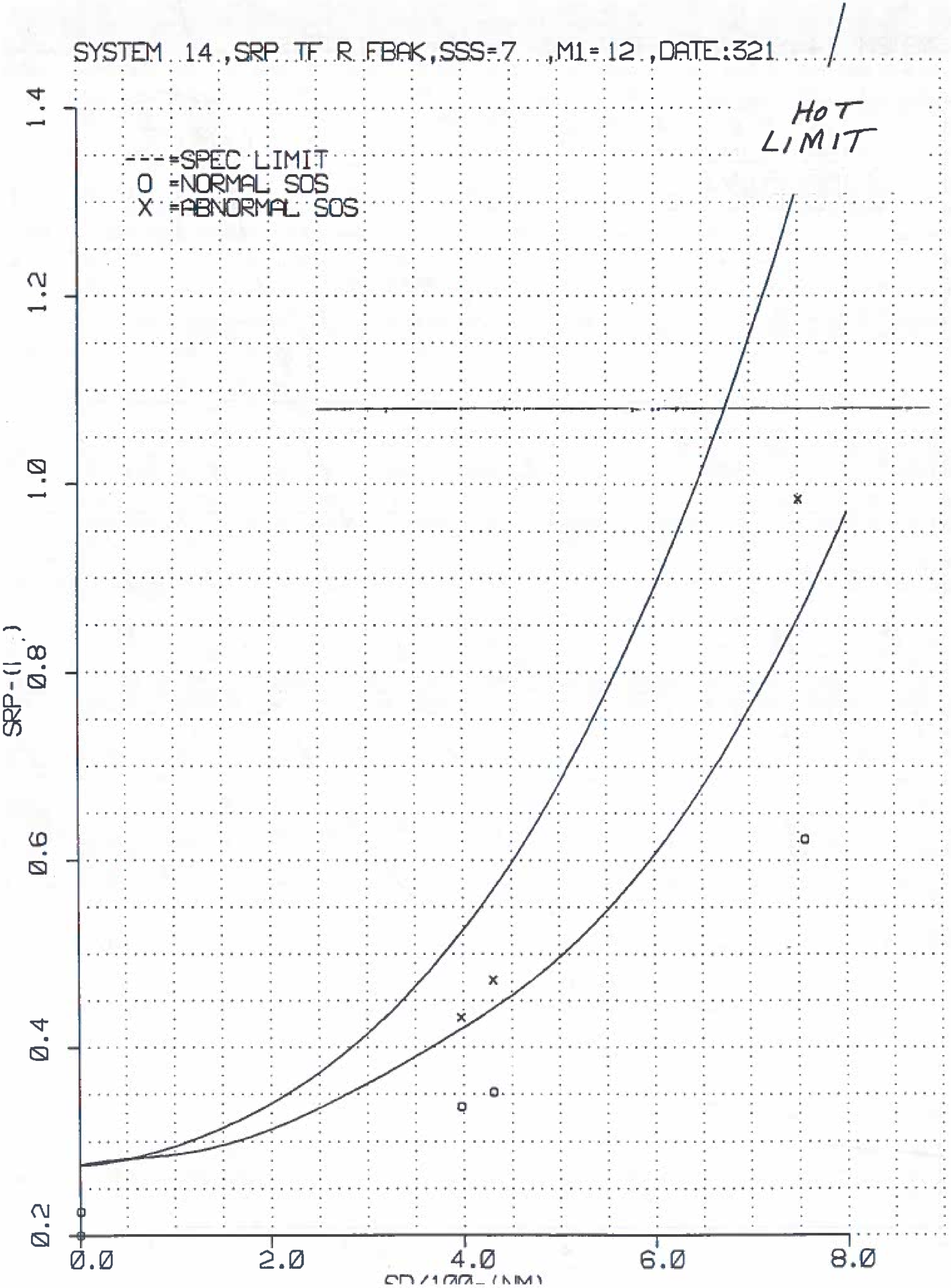
2.2.1.3 Acceptance - Thermal Vacuum

The attached TF SRP curves and tables demonstrate in-spec performance at the thermal vacuum test limits. The Orbit Nominal SRP curves are contained in paragraph 2.2.1.1 and are not included here.

ATTACHMENTS: TF SRP Curves Hot Limits
TF SRP Tables Hot Limits
TF SRP Curves Cold Limits
TF SRP Tables Cold Limits


SYSTEM 14 ,SRP TF NORMAL,SSS=7 ,M1=12 ,DATE:321
HOT LIMIT
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-( )
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)


SYSTEM 14 ,SRP TF L FBAK,SSS=7 ,M1=12 ,DATE:321
HOT LIMIT
----=SPEC LIMIT
O =NORMAL SOS
X =ABNORMAL SOS
1.4
1.2
1.0
0.8
0.6
0.4
0.2
SRP-(,)
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)


SYSTEM 14 ,SRP TF R FBAK,SSS=7 ,M1=12 ,DATE:321
HOT LIMIT
----=SPEC LIMIT
O =NORMAL SOS
X =ABNORMAL SOS
1.4
1.2
1.0
0.8
0.6
0.4
0.2
SRP-(I
0.0
2.0
4.0
6.0
8.0

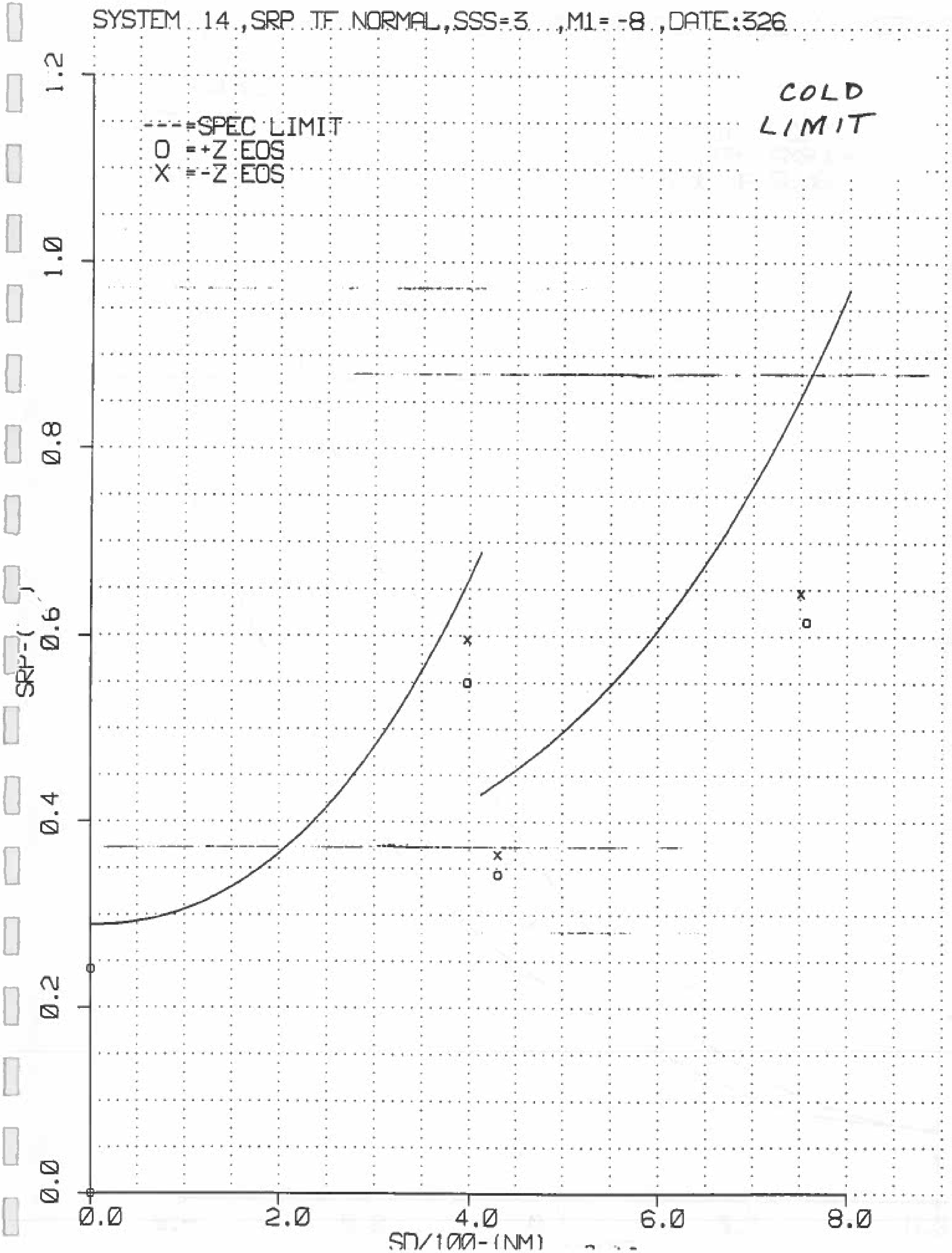
```
T, COMPLETE, SRP(NM)

        FLT.  NO. = 14   ENV. = 14   SSS=   7DEGC   M1= 12DEGC   DATE:     321

 SEG    SUR. DIST.     TFP          TFB           TSP          TSB
          (NM)

 LFT   -750.        0. 655       0. 653        1. 698       1. 699
 MID   -750.        1. 201       0. 000        1. 798       1. 795
 RGT   -750.        0. 985       0. 983        1. 746       1. 745
 LFT      0.        0. 000       0. 000        0. 000       0. 000
 MID      0.        0. 000       0. 000        0. 000       0. 000
 RGT      0.        0. 000       0. 000        0. 000       0. 000
 LFT   -431.        0. 375       0. 376        1. 450       1. 451
 MID   -431.        0. 610       0. 000        1. 478       1. 478
 RGT   -431.        0. 472       0. 472        1. 450       1. 452
 LFT   -398.        0. 352       0. 353        1. 392       1. 393
 MID   -398.        0. 600       0. 596        1. 420       1. 421
 RGT   -398.        0. 432       0. 432        1. 394       1. 395
 LFT      0.        0. 000       0. 000        0. 000       0. 000
 MID      0.        0. 000       0. 000        0. 000       0. 000
 RGT      0.        0. 000       0. 000        0. 000       0. 000
 LFT      0.        0. 250       0. 250        0. 958       0. 959
 MID      0.        0. 244       0. 245        0. 960       0. 961
 RGT      0.        0. 225       0. 227        0. 953       0. 955
 LFT      0.        0. 000       0. 000        0. 000       0. 000
 MID      0.        0. 000       0. 000        0. 000       0. 000
 RGT      0.        0. 000       0. 000        0. 000       0. 000
 LFT    398.        0. 470       0. 470        1. 395       1. 397
 MID    398.        0. 551       0. 548        1. 405       1. 407
 RGT    398.        0. 337       0. 339        1. 387       1. 389
 LFT    431.        0. 506       0. 505        1. 453       1. 454
 MID    431.        0. 566       0. 000        1. 472       1. 472
 RGT    431.        0. 352       0. 354        1. 447       1. 449
 LFT      0.        0. 000       0. 000        0. 000       0. 000
 MID      0.        0. 000       0. 000        0. 000       0. 000
 RGT      0.        0. 000       0. 000        0. 000       0. 000
 LFT    757.        1. 044       1. 043        1. 767       1. 765
 MID    757.        1. 450       0. 000        1. 889       1. 882
 RGT    757.        0. 622       0. 621        1. 683       1. 685
```

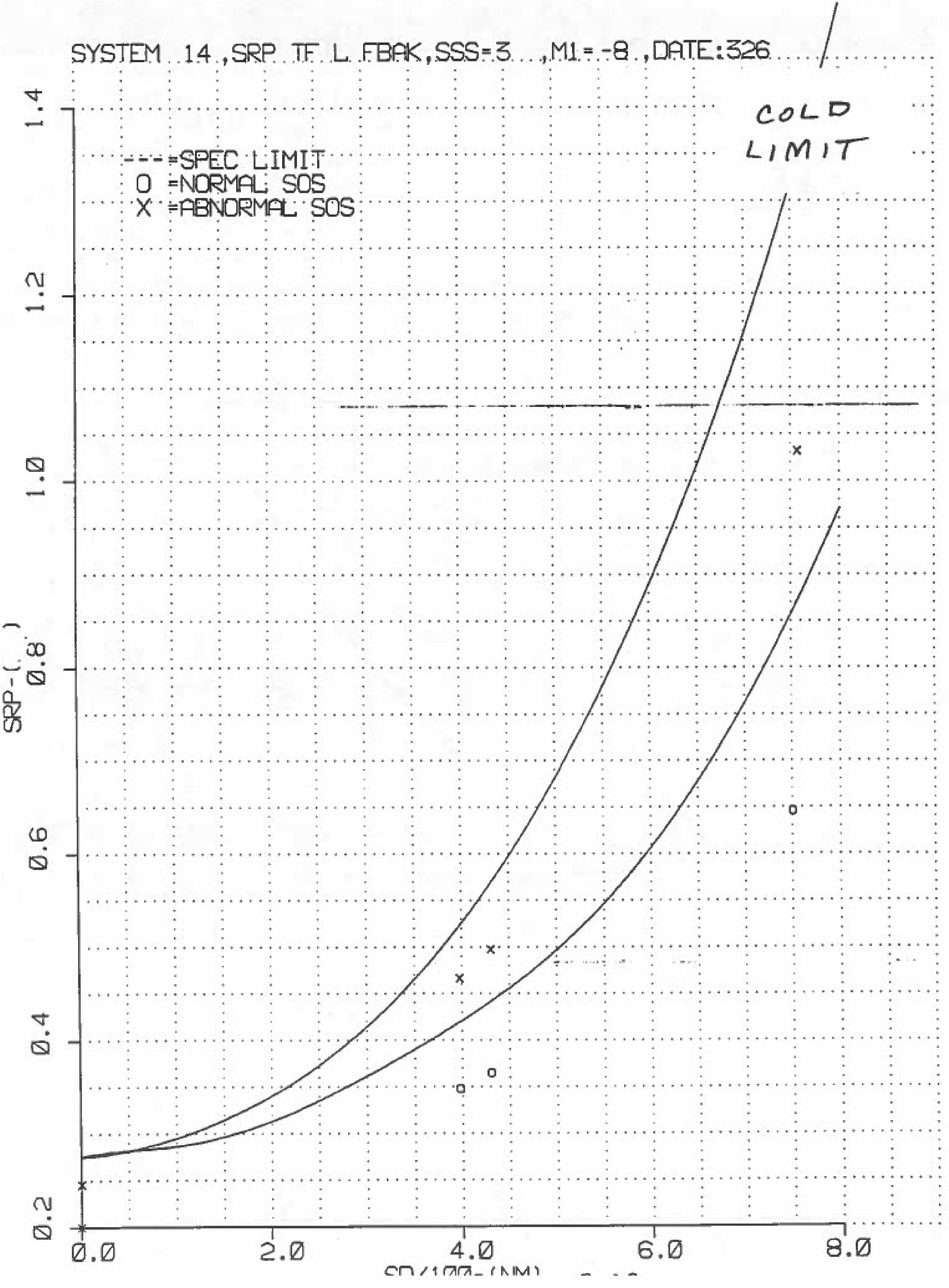
T, COMPLETE, SRP RATIO

SEG	SUR. DIST. (NM)	TFP	TFB	TSP	TSB
LFT	-750.	0. 763	0. 760	0. 755	0. 756
MID	-750.	0. 000	0. 000	0. 799	0. 798
RGT	-750.	0. 745	0. 744	0. 776	0. 776
LFT	0.	0. 000	0. 000	0. 000	0. 000
MID	0.	0. 000	0. 000	0. 000	0. 000
RGT	0.	0. 000	0. 000	0. 000	0. 000
LFT	-431.	0. 849	0. 851	0. 905	0. 906
MID	-431.	0. 000	0. 000	0. 923	0. 923
RGT	-431.	0. 831	0. 831	0. 906	0. 907
LFT	-398.	0. 839	0. 842	0. 907	0. 908
MID	-398.	0. 912	0. 908	0. 926	0. 926
RGT	-398.	0. 826	0. 827	0. 909	0. 910
LFT	0.	0. 000	0. 000	0. 000	0. 000
MID	0.	0. 000	0. 000	0. 000	0. 000
RGT	0.	0. 000	0. 000	0. 000	0. 000
LFT	0.	0. 908	0. 910	0. 913	0. 914
MID	0.	0. 844	0. 846	0. 914	0. 916
RGT	0.	0. 820	0. 825	0. 908	0. 909
LFT	0.	0. 000	0. 000	0. 000	0. 000
MID	0.	0. 000	0. 000	0. 000	0. 000
RGT	0.	0. 000	0. 000	0. 000	0. 000
LFT	398.	0. 900	0. 900	0. 910	0. 911
MID	398.	0. 839	0. 835	0. 916	0. 917
RGT	398.	0. 803	0. 807	0. 905	0. 906
LFT	431.	0. 890	0. 889	0. 907	0. 908
MID	431.	0. 000	0. 000	0. 919	0. 919
RGT	431.	0. 797	0. 801	0. 904	0. 905
LFT	0.	0. 000	0. 000	0. 000	0. 000
MID	0.	0. 000	0. 000	0. 000	0. 000
RGT	0.	0. 000	0. 000	0. 000	0. 000
LFT	757.	0. 777	0. 777	0. 782	0. 781
MID	757.	0. 000	0. 000	0. 836	0. 833
RGT	757.	0. 714	0. 712	0. 745	0. 745

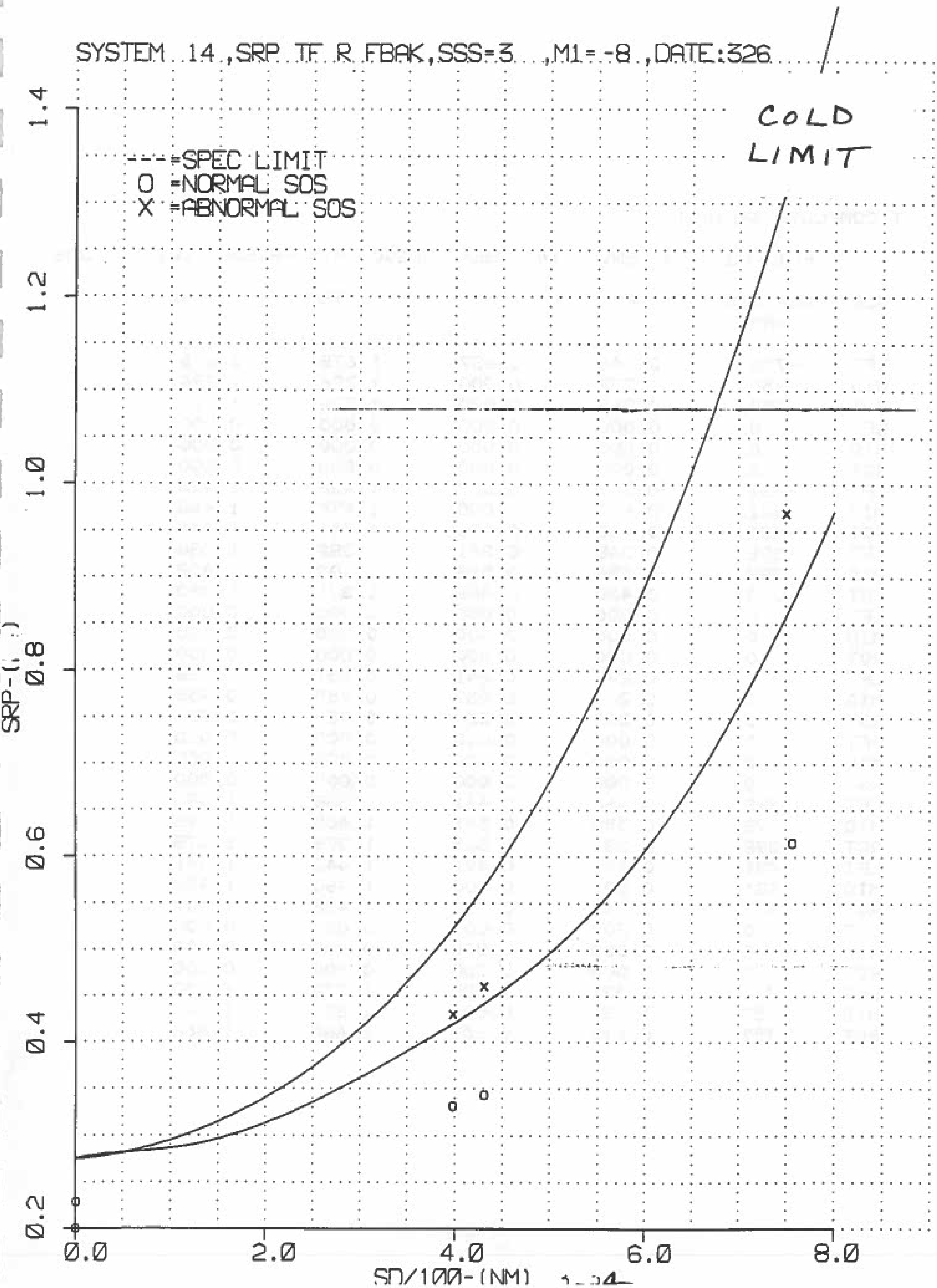
```
TF, LEFT, PRIMARY

       FLT.  NO. = 14   ENV. = 14   SSS=   7DEGC   M1= 12DEGC   DATE:    321

       SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

          -750.                 0. 655              0. 763
             0.                 0. 000              0. 000
          -431.                 0. 375              0. 849
          -398.                 0. 352              0. 839
             0.                 0. 000              0. 000
             0.                 0. 250              0. 908
             0.                 0. 000              0. 000
           398.                 0. 470              0. 900
           431.                 0. 506              0. 890
             0.                 0. 000              0. 000
           757.                 1. 044              0. 777


TF, LEFT, BACKUP

       FLT.  NO. = 14   ENV. = 14   SSS=   7DEGC   M1= 12DEGC   DATE:    321

       SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

          -750.                 0. 653              0. 760
             0.                 0. 000              0. 000
          -431.                 0. 376              0. 851
          -398.                 0. 353              0. 842
             0.                 0. 000              0. 000
             0.                 0. 250              0. 910
             0.                 0. 000              0. 000
           398.                 0. 470              0. 900
           431.                 0. 505              0. 889
             0.                 0. 000              0. 000
           757.                 1. 043              0. 777
```

```
TF, RIGHT, PRIMARY
          FLT.  NO. = 14   ENV. = 14   SSS=  7DEGC   M1= 12DEGC   DATE:    321

          SUR. DIST. (NM)       SRP  ACTUAL(NM)       SRP  RATIO

             -750.                  0. 985             0. 745
                0.                  0. 000             0. 000
             -431.                  0. 472             0. 831
             -398.                  0. 432             0. 826
                0.                  0. 000             0. 000
                0.                  0. 225             0. 820
                0.                  0. 000             0. 000
              398.                  0. 337             0. 803
              431.                  0. 352             0. 797
                0.                  0. 000             0. 000
              757.                  0. 622             0. 714


TF  RIGHT, BACKUP
          FLT.  NO. = 14   ENV. = 14   SSS=  7DEGC   M1= 12DEGC   DATE:    321

          SUR. DIST. (NM)       SRP  ACTUAL(NM)       SRP  RATIO

             -750.                  0. 983             0. 744
                0.                  0. 000             0. 000
             -431.                  0. 472             0. 831
             -398.                  0. 432             0. 827
                0.                  0. 000             0. 000
                0.                  0. 227             0. 825
                0.                  0. 000             0. 000
              398.                  0. 339             0. 807
              431.                  0. 354             0. 801
                0.                  0. 000             0. 000
              757.                  0. 621             0. 712
```


SYSTEM 14 ,SRP TF NORMAL,SSS=3 ,M1= -8 ,DATE:326
COLD LIMIT
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-( )
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)


SYSTEM 14 ,SRP TF L FBAK,SSS=3 ,M1=-8 ,DATE:326

COLD LIMIT


SYSTEM 14 ,SRP TF R FBAK,SSS=3 ,M1=-8 ,DATE:326
COLD LIMIT
----=SPEC LIMIT
O =NORMAL SOS
X =ABNORMAL SOS
SRP-( )
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

```
T, COMPLETE, SRP(NM)

         FLT.  NO. = 14   ENV. = 14   SSS=   3DEGC   M1= -8DEGC   DATE:    326

SEG      SUR. DIST.     TFP         TFB          TSP          TSB
           (NM)

LFT      -750.         0.646       0.637        1.678        1.676
MID      -750.         1.237       0.000        1.796        1.794
RGT      -750.         0.969       0.970        1.723        1.721
LFT         0.         0.000       0.000        0.000        0.000
MID         0.         0.000       0.000        0.000        0.000
RGT         0.         0.000       0.000        0.000        0.000
LFT      -431.         0.365       0.357        1.436        1.435
MID      -431.         0.604       0.000        1.470        1.468
RGT      -431.         0.460       0.456        1.441        1.440
LFT      -398.         0.348       0.341        1.382        1.380
MID      -398.         0.596       0.588        1.409        1.408
RGT      -398.         0.430       0.426        1.391        1.390
LFT         0.         0.000       0.000        0.000        0.000
MID         0.         0.000       0.000        0.000        0.000
RGT         0.         0.000       0.000        0.000        0.000
LFT         0.         0.246       0.241        0.957        0.956
MID         0.         0.241       0.237        0.955        0.955
RGT         0.         0.228       0.224        0.955        0.954
LFT         0.         0.000       0.000        0.000        0.000
MID         0.         0.000       0.000        0.000        0.000
RGT         0.         0.000       0.000        0.000        0.000
LFT       398.         0.466       0.461        1.388        1.386
MID       398.         0.550       0.541        1.400        1.398
RGT       398.         0.331       0.325        1.379        1.378
LFT       431.         0.497       0.491        1.443        1.441
MID       431.         0.554       0.000        1.460        1.458
RGT       431.         0.343       0.336        1.438        1.437
LFT         0.         0.000       0.000        0.000        0.000
MID         0.         0.000       0.000        0.000        0.000
RGT         0.         0.000       0.000        0.000        0.000
LFT       757.         1.031       1.035        1.752        1.750
MID       757.         1.434       0.000        1.870        1.867
RGT       757.         0.615       0.607        1.668        1.666
```

T, COMPLETE, SRP RATIO

SEG	SUR. DIST. (NM)	TFP	TFB	TSP	TSB
LFT	-750.	0.752	0.742	0.746	0.745
MID	-750.	0.000	0.000	0.799	0.798
RGT	-750.	0.734	0.735	0.766	0.766
LFT	0.	0.000	0.000	0.000	0.000
MID	0.	0.000	0.000	0.000	0.000
RGT	0.	0.000	0.000	0.000	0.000
LFT	-431.	0.826	0.809	0.897	0.896
MID	-431.	0.000	0.000	0.918	0.917
RGT	-431.	0.810	0.802	0.900	0.899
LFT	-398.	0.829	0.812	0.901	0.900
MID	-398.	0.907	0.894	0.919	0.918
RGT	-398.	0.822	0.814	0.907	0.906
LFT	0.	0.000	0.000	0.000	0.000
MID	0.	0.000	0.000	0.000	0.000
RGT	0.	0.000	0.000	0.000	0.000
LFT	0.	0.893	0.876	0.912	0.911
MID	0.	0.834	0.818	0.910	0.909
RGT	0.	0.830	0.815	0.909	0.908
LFT	0.	0.000	0.000	0.000	0.000
MID	0.	0.000	0.000	0.000	0.000
RGT	0.	0.000	0.000	0.000	0.000
LFT	398.	0.892	0.882	0.905	0.904
MID	398.	0.837	0.824	0.913	0.912
RGT	398.	0.790	0.774	0.899	0.898
LFT	431.	0.875	0.863	0.901	0.900
MID	431.	0.000	0.000	0.912	0.911
RGT	431.	0.777	0.761	0.898	0.897
LFT	0.	0.000	0.000	0.000	0.000
MID	0.	0.000	0.000	0.000	0.000
RGT	0.	0.000	0.000	0.000	0.000
LFT	757.	0.768	0.771	0.775	0.774
MID	757.	0.000	0.000	0.827	0.826
RGT	757.	0.705	0.696	0.738	0.737

```
TF, LEFT, PRIMARY

          FLT.  NO. = 14   ENV. = 14   SSS=  3DEGC  M1= -8DEGC  DATE:   326

          SUR. DIST. (NM)      SRP ACTUAL(NM)      SRP RATIO

               -750.               0.646              0.752
                  0.               0.000              0.000
               -431.               0.365              0.826
               -398.               0.348              0.829
                  0.               0.000              0.000
                  0.               0.246              0.893
                  0.               0.000              0.000
                398.               0.466              0.892
                431.               0.497              0.875
                  0.               0.000              0.000
                757.               1.031              0.768
```

```
TF, LEFT, BACKUP

          FLT.  NO. = 14   ENV. = 14   SSS=  3DEGC  M1= -8DEGC  DATE:   326

          SUR. DIST. (NM)      SRP ACTUAL(NM)      SRP RATIO

               -750.               0.637              0.742
                  0.               0.000              0.000
               -431.               0.357              0.809
               -398.               0.341              0.812
                  0.               0.000              0.000
                  0.               0.241              0.876
                  0.               0.000              0.000
                398.               0.461              0.882
                431.               0.491              0.863
                  0.               0.000              0.000
                757.               1.035              0.771
```

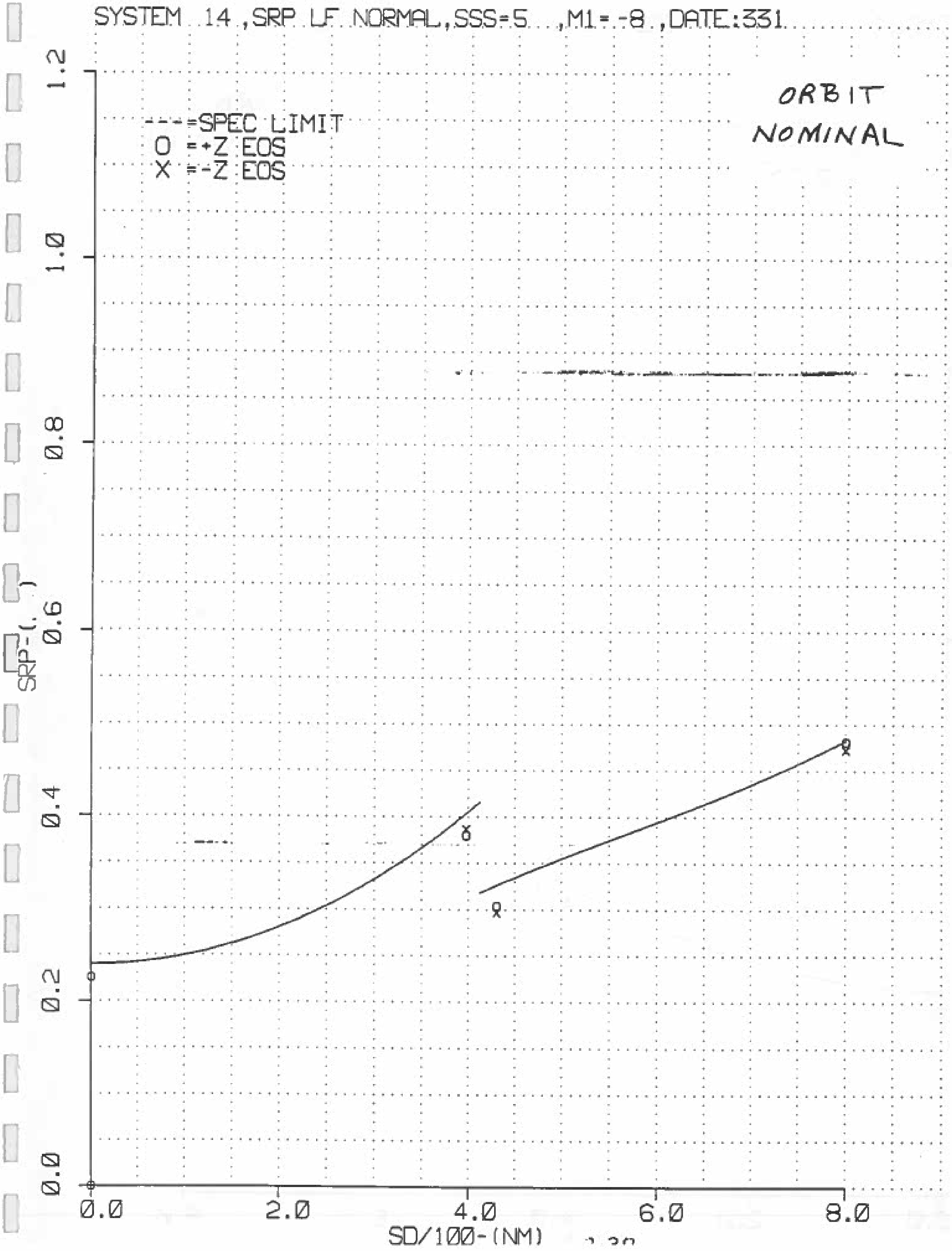
```
TF, RIGHT, PRIMARY

        FLT.  NO. = 14   ENV. = 14   SSS=  3DEGC   M1= -8DEGC   DATE:    326

        SUR. DIST. (NM)      SRP  ACTUAL(NM)     SRP  RATIO

           -750.               0. 969             0. 734
              0.               0. 000             0. 000
           -431.               0. 460             0. 810
           -398.               0. 430             0. 822
              0.               0. 000             0. 000
              0.               0. 228             0. 830
              0.               0. 000             0. 000
            398.               0. 331             0. 790
            431.               0. 343             0. 777
              0.               0. 000             0. 000
            757.               0. 615             0. 705


TF  RIGHT, BACKUP

        FLT.  NO. = 14   ENV. = 14   SSS=  3DEGC   M1= -8DEGC   DATE:    326

        SUR. DIST. (NM)      SRP  ACTUAL(NM)     SRP  RATIO

           -750.               0. 970             0. 735
              0.               0. 000             0. 000
           -431.               0. 456             0. 802
           -398.               0. 426             0. 814
              0.               0. 000             0. 000
              0.               0. 224             0. 815
              0.               0. 000             0. 000
            398.               0. 325             0. 774
            431.               0. 336             0. 761
              0.               0. 000             0. 000
            757.               0. 607             0. 696
```

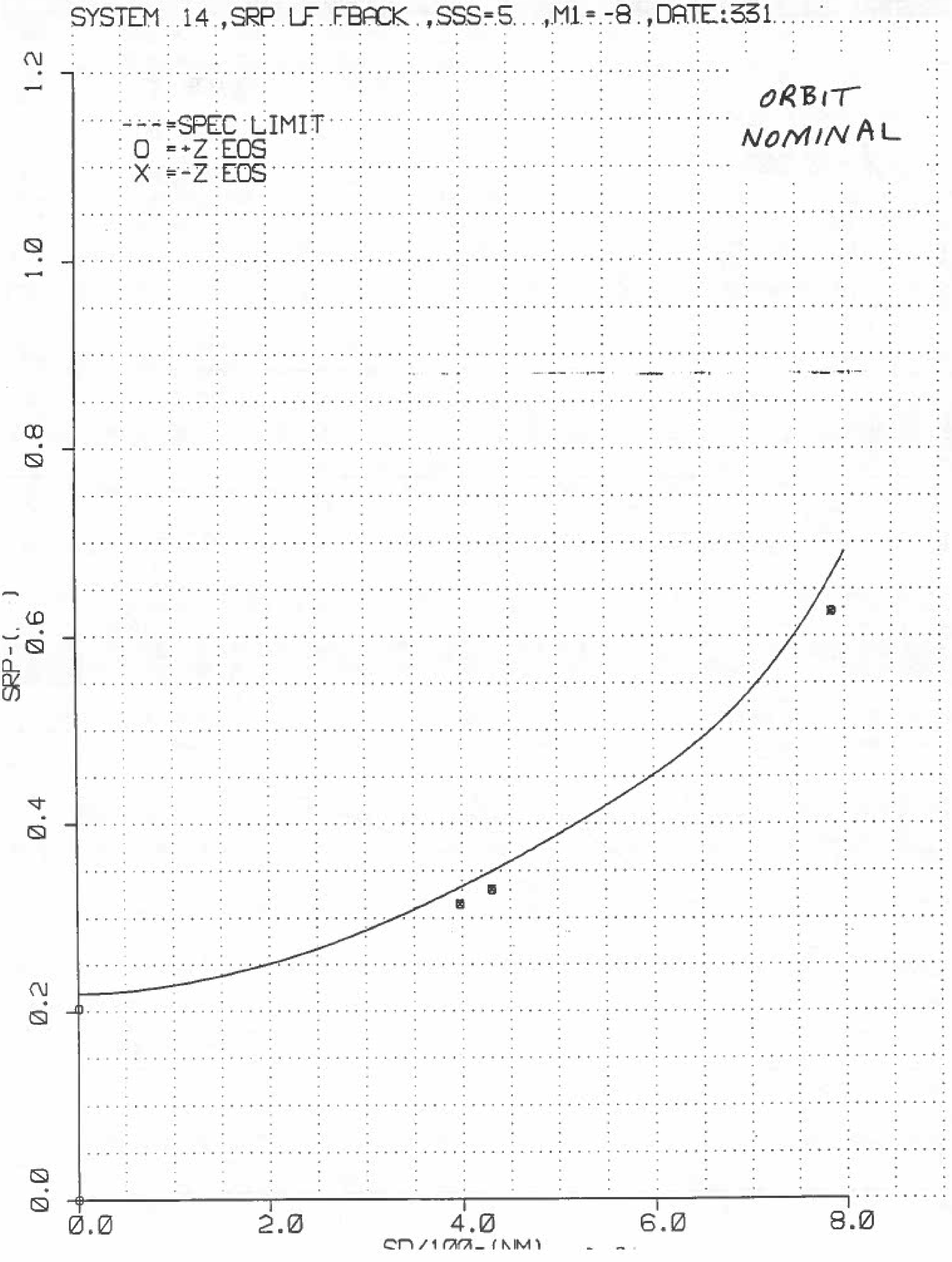
2.2.2 Fine Geometric Resolution - Daytime Visual (3.2.1.1.2.1)

2.2.2.1 Baseline (Orbit Nominal)

The LF SRP is within the specification limits in both Primary and Redundant configurations.

ATTACHMENTS: LF SRP Curves Orbit Nominal
LF SRP Tables Orbit Nominal


SYSTEM 14 ,SRP LF NORMAL,SSS=5 ,M1=-8 ,DATE:331
ORBIT
NOMINAL
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-( )
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)



ORBIT
NOMINAL

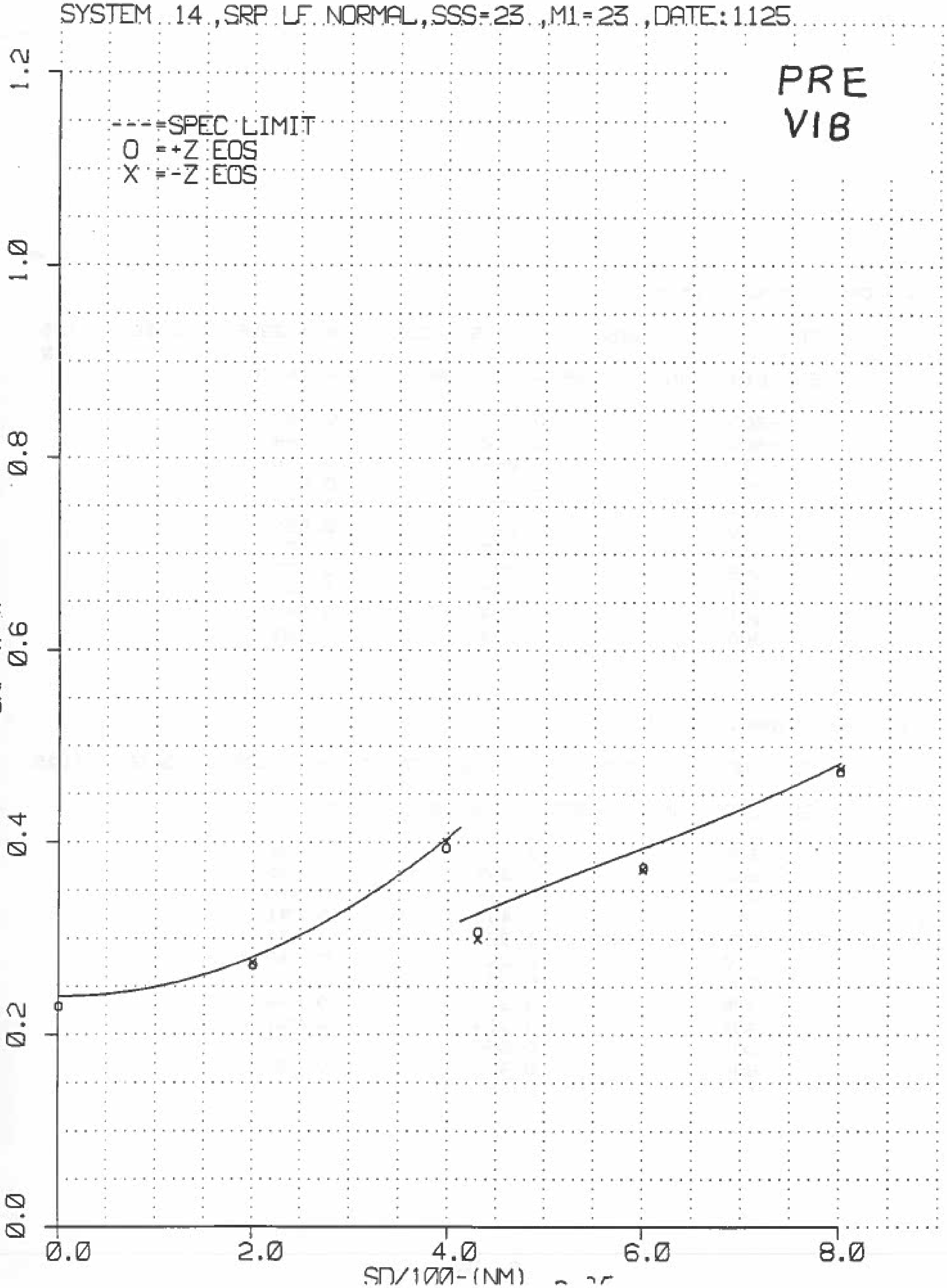
```
LF, DAY, NORMAL, PRIMARY

        FLT.  NO. = 14  ENV. =  4  SSS=  5DEGC  M1= -8DEGC  DATE:   331

        SUR. DIST. (NM)     SRP ACTUAL(NM)    SRP RATIO

           -800.              0.472             0.978
              0.              0.000             0.000
           -431.              0.297             0.909
           -398.              0.387             0.959
              0.              0.000             0.000
              0.              0.225             0.940
              0.              0.000             0.000
            398.              0.380             0.941
            431.              0.303             0.930
              0.              0.000             0.000
            800.              0.481             0.996


LF, DAY, NORMAL, BACKUP

        FLT.  NO. = 14  ENV. =  4  SSS=  5DEGC  M1= -8DEGC  DATE:   331

        SUR. DIST. (NM)     SRP ACTUAL(NM)    SRP RATIO

           -800.              0.473             0.981
              0.              0.000             0.000
           -431.              0.296             0.909
           -398.              0.388             0.961
              0.              0.000             0.000
              0.              0.225             0.939
              0.              0.000             0.000
            398.              0.381             0.944
            431.              0.303             0.929
              0.              0.000             0.000
            800.              0.482             0.998
```

```
LF, DAY, FALLBACK, PRIMARY

          FLT.  NO. = 14   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:     331

          SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

              -787.              0. 626              0. 942
                 0.              0. 000              0. 000
              -431.              0. 330              0. 944
              -398.              0. 315              0. 947
                 0.              0. 000              0. 000
                 0.              0. 203              0. 926
                 0.              0. 000              0. 000
               398.              0. 314              0. 945
               431.              0. 330              0. 943
                 0.              0. 000              0. 000
               788.              0. 626              0. 941


LF, DAY, FALLBACK, BACKUP

          FLT.  NO. = 14   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:     331

          SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

              -787.              0. 625              0. 942
                 0.              0. 000              0. 000
              -431.              0. 330              0. 944
              -398.              0. 315              0. 946
                 0.              0. 000              0. 000
                 0.              0. 203              0. 925
                 0.              0. 000              0. 000
               398.              0. 314              0. 945
               431.              0. 330              0. 943
                 0.              0. 000              0. 000
               788.              0. 626              0. 941
```

2.2.2.2 Acceptance - Vibration

OLS #14 underwent Acceptance-level SSS vibration on December 11, 1992. The Pre-to-Post Vibration SRP performance is within Specification requirements and is shown on the attached curves and tables. No changes in SRP performance occurred as a result of vibration.

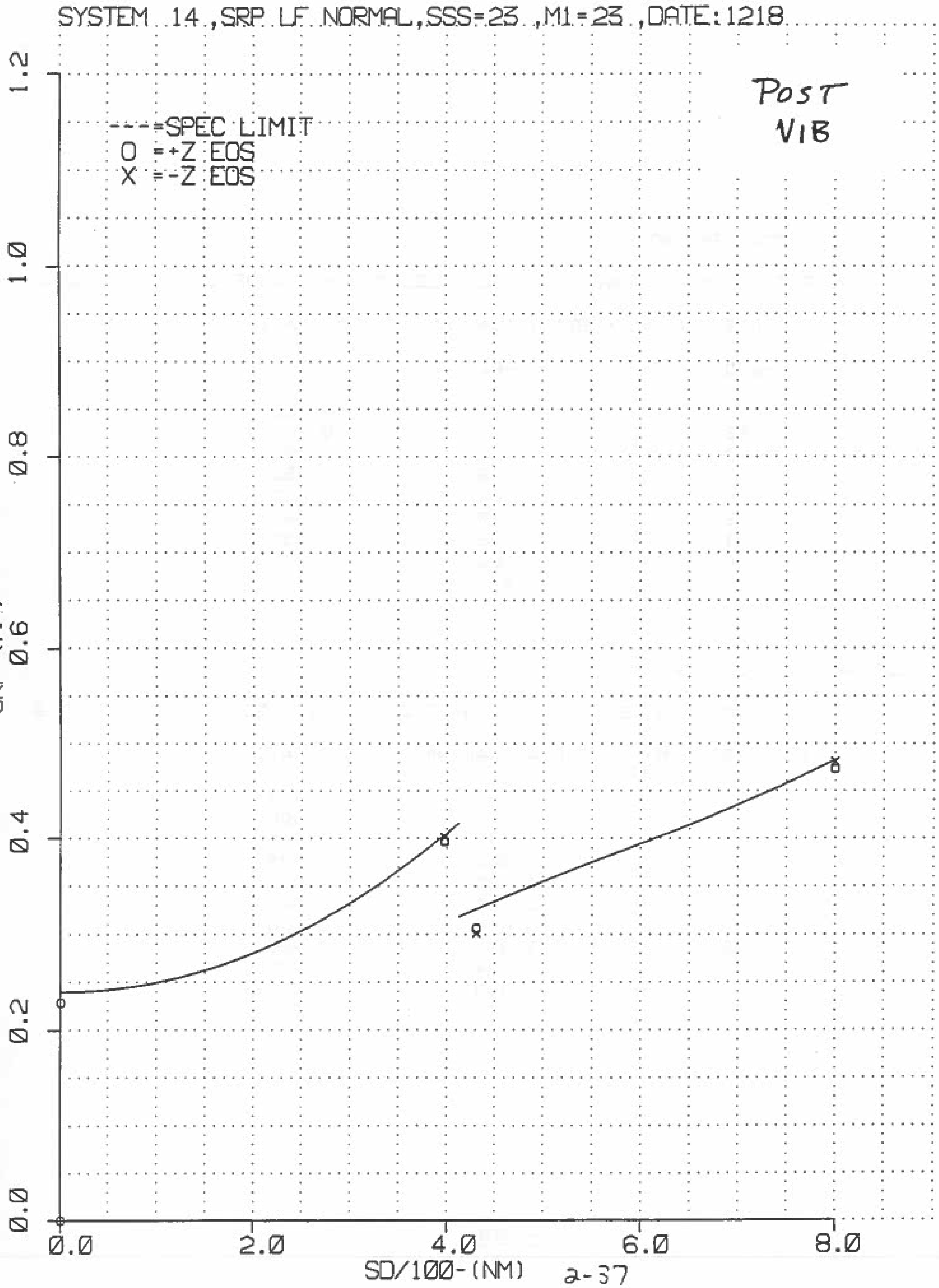
ATTACHMENTS:
- LF SRP Curves Pre-Vibration
- LF SRP Tables Pre-Vibration
- LF SRP Curves Post-Vibration
- LF SRP Tables Post-Vibration


SYSTEM 14 ,SRP LF NORMAL,SSS=23 ,M1=23 ,DATE:1125
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

PRE
VIB

BLRm

```
LF, DAY, NORMAL, PRIMARY

        FLT.  NO. = 14   ENV. =   2   SSS= 23DEGC   M1= 23DEGC   DATE:   1125
                                                                          1992
        SUR. DIST. (NM)       SRP  ACTUAL(NM)      SRP  RATIO

            -800.                 0. 477             0. 987
            -600.                 0. 372             0. 944
            -431.                 0. 299             0. 918
            -398.                 0. 400             0. 992
            -200.                 0. 275             0. 980
               0.                 0. 229             0. 955
             200.                 0. 272             0. 971
             398.                 0. 394             0. 977
             431.                 0. 307             0. 940
             601.                 0. 374             0. 948
             800.                 0. 474             0. 981


LF, DAY, NORMAL, BACKUP

        FLT.  NO. = 14   ENV. =   2   SSS= 23DEGC   M1= 23DEGC   DATE:   1125

        SUR. DIST. (NM)       SRP  ACTUAL(NM)      SRP  RATIO

            -800.                 0. 476             0. 986
            -600.                 0. 369             0. 935
            -431.                 0. 297             0. 910
            -398.                 0. 400             0. 991
            -200.                 0. 273             0. 975
               0.                 0. 227             0. 948
             200.                 0. 271             0. 965
             398.                 0. 394             0. 976
             431.                 0. 304             0. 931
             601.                 0. 370             0. 938
             800.                 0. 473             0. 980
```


SYSTEM 14 ,SRP LF NORMAL,SSS=23 ,M1=23 ,DATE:1218
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(N..)
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

POST
VIB

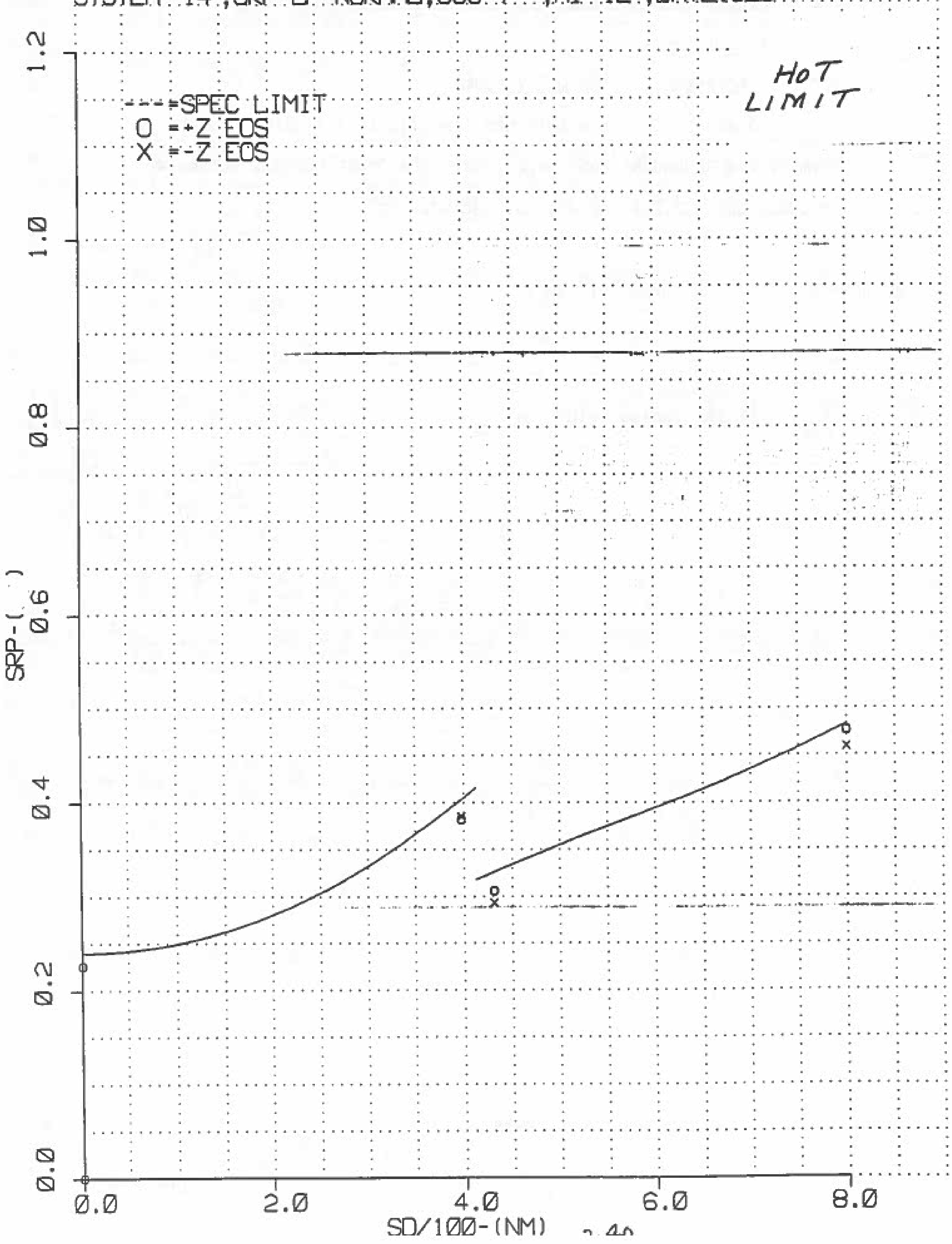
```
LF, DAY, NORMAL, PRIMARY

        FLT.  NO. = 14   ENV. =   2  SSS= 23DEGC  M1= 23DEGC   DATE:   1218

        SUR. DIST. (NM)      SRP ACTUAL(NM)     SRP RATIO

            -800.               0. 481            0. 996
               0.               0. 000            0. 000
            -431.               0. 301            0. 923
            -398.               0. 401            0. 993
               0.               0. 000            0. 000
               0.               0. 228            0. 952
               0.               0. 000            0. 000
             398.               0. 397            0. 984
             431.               0. 306            0. 938
               0.               0. 000            0. 000
             800.               0. 473            0. 979


LF, DAY, NORMAL, BACKUP

        FLT.  NO. = 14   ENV. =   2  SSS= 23DEGC  M1= 23DEGC   DATE:   1218

        SUR. DIST. (NM)      SRP ACTUAL(NM)     SRP RATIO

            -800.               0. 482            0. 998
               0.               0. 000            0. 000
            -431.               0. 299            0. 916
            -398.               0. 402            0. 995
               0.               0. 000            0. 000
               0.               0. 227            0. 946
               0.               0. 000            0. 000
             398.               0. 397            0. 985
             431.               0. 304            0. 931
               0.               0. 000            0. 000
             800.               0. 474            0. 982
```

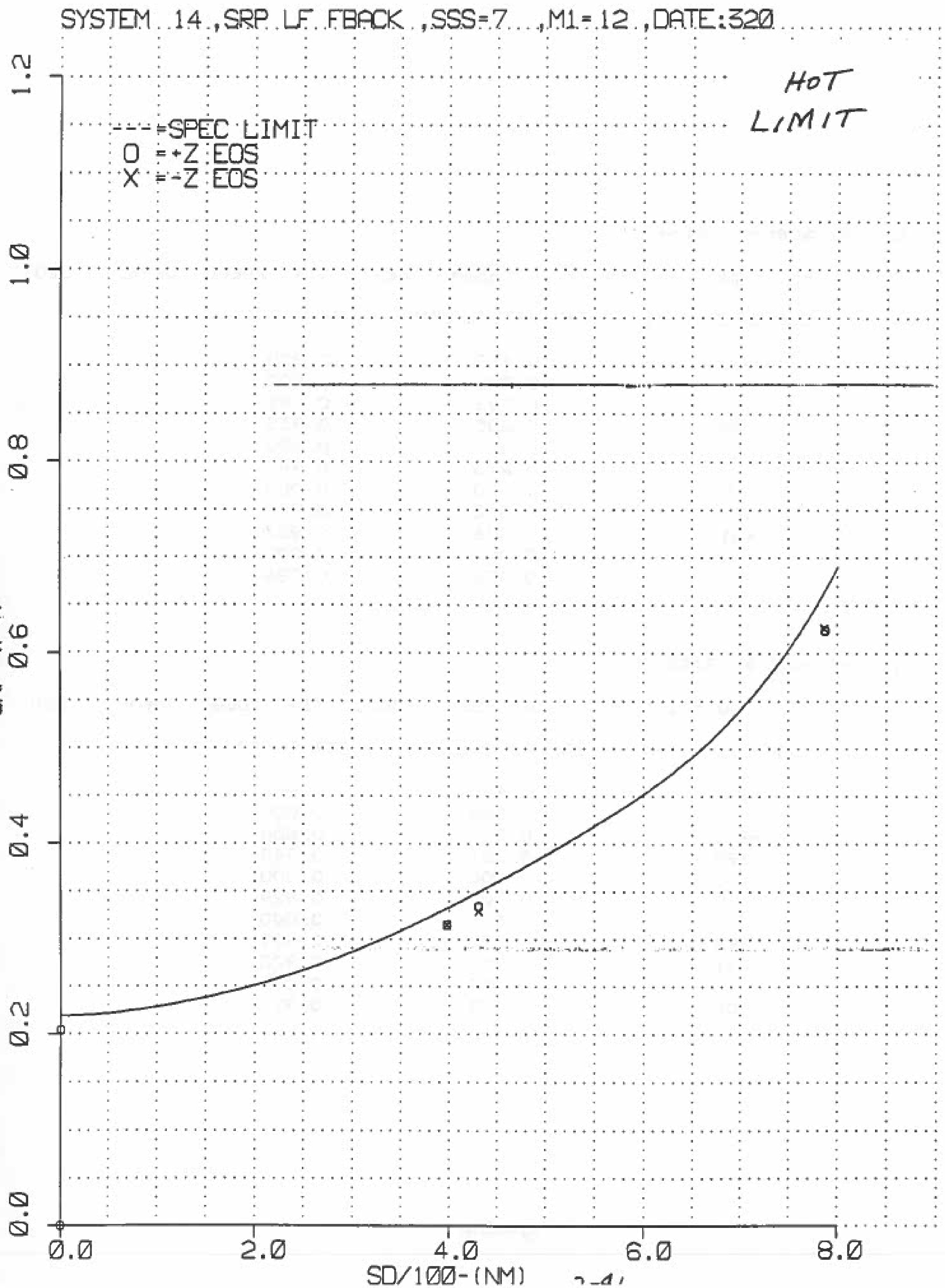
2.2.2.3 Acceptance - Thermal Vacuum

OLS #14 LF SRP is within the specification limits in both Primary and Redundant configurations. The Orbit Nominal curves are in paragraph 2.2.2.1 and are not included here.

ATTACHMENTS: LF SRP Curve Hot Limit
LF SRP Tables Hot Limit
LF SRP Curves Cold Limit
LF SRP Tables Cold Limit

SYSTEM 14 ,SRP LF NORMAL,SSS=7 ,M1= 12 ,DATE:320

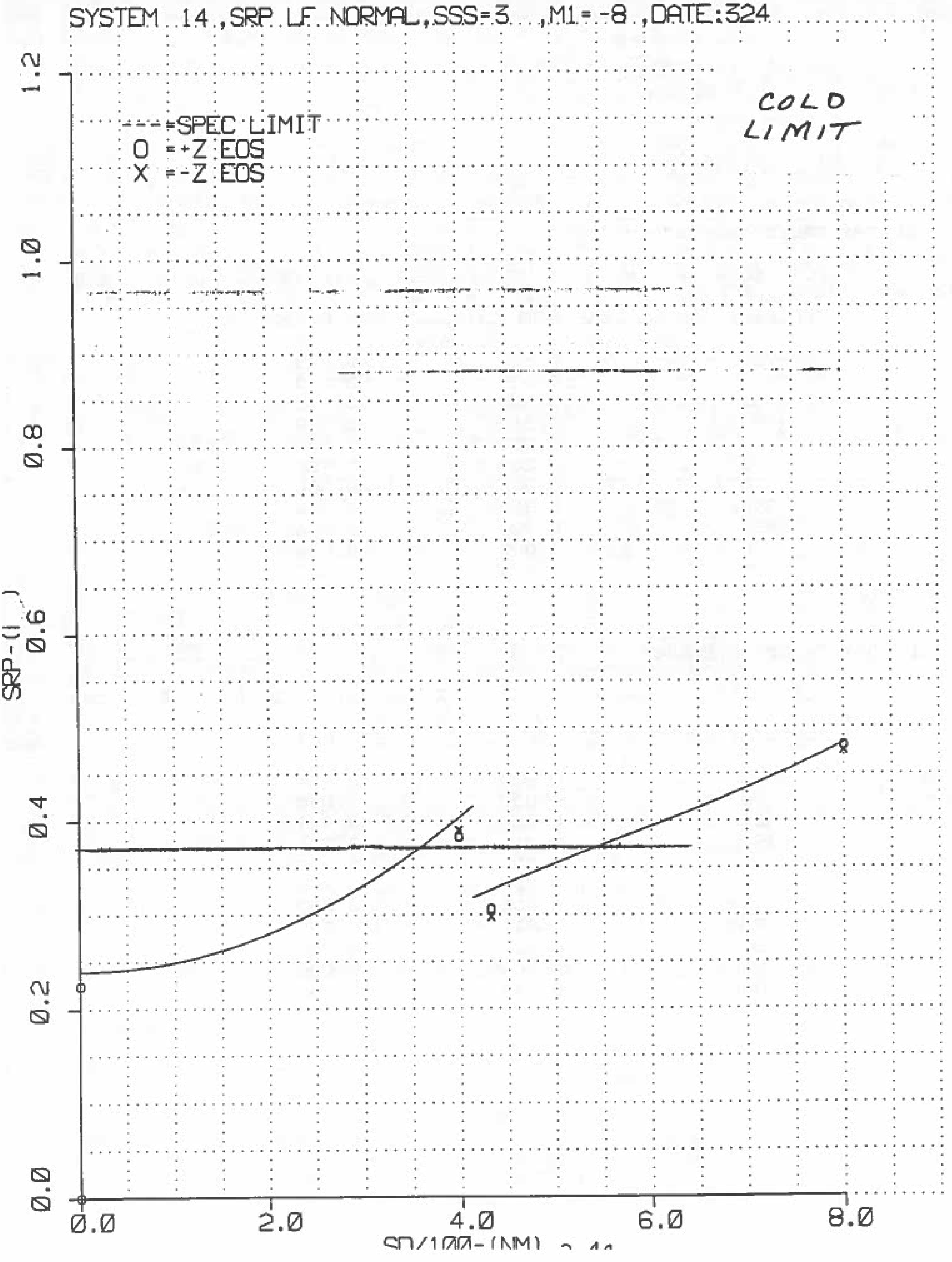



SYSTEM 14 ,SRP LF FBACK ,SSS=7 ,M1=12 ,DATE:320
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-( )
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

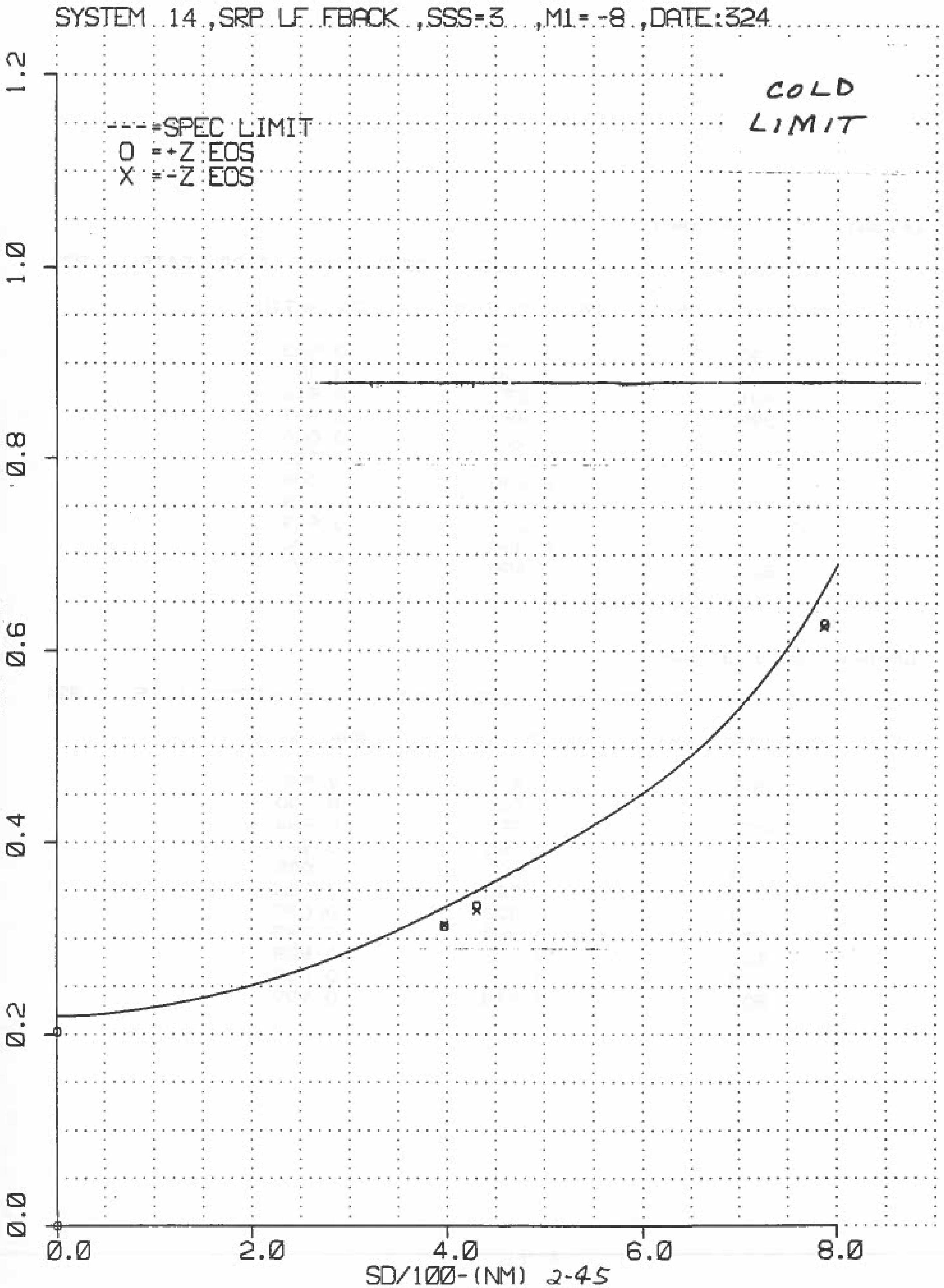
HOT LIMIT

```
LF, DAY, NORMAL, PRIMARY

       FLT.  NO. = 14   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:     320

       SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

           -800.                0. 459              0. 950
              0.                0. 000              0. 000
           -431.                0. 293              0. 899
           -398.                0. 385              0. 955
              0.                0. 000              0. 000
              0.                0. 226              0. 942
              0.                0. 000              0. 000
            398.                0. 382              0. 947
            431.                0. 306              0. 937
              0.                0. 000              0. 000
            800.                0. 476              0. 986


LF, DAY, NORMAL, BACKUP

       FLT.  NO. = 14   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:     320

       SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

           -800.                0. 454              0. 940
              0.                0. 000              0. 000
           -431.                0. 289              0. 886
           -398.                0. 381              0. 945
              0.                0. 000              0. 000
              0.                0. 223              0. 929
              0.                0. 000              0. 000
            398.                0. 378              0. 937
            431.                0. 301              0. 923
              0.                0. 000              0. 000
            800.                0. 471              0. 975
```

```
LF, DAY, FALLBACK, PRIMARY

        FLT.  NO. = 14   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:     320

        SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

           -787.                 0. 626              0. 943
              0.                 0. 000              0. 000
           -431.                 0. 330              0. 943
           -398.                 0. 315              0. 948
              0.                 0. 000              0. 000
              0.                 0. 204              0. 930
              0.                 0. 000              0. 000
            398.                 0. 315              0. 948
            431.                 0. 334              0. 956
              0.                 0. 000              0. 000
            788.                 0. 624              0. 937


LF, DAY, FALLBACK, BACKUP

        FLT.  NO. = 14   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:     320

        SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

           -787.                 0. 620              0. 934
              0.                 0. 000              0. 000
           -431.                 0. 325              0. 929
           -398.                 0. 311              0. 934
              0.                 0. 000              0. 000
              0.                 0. 201              0. 916
              0.                 0. 000              0. 000
            398.                 0. 311              0. 935
            431.                 0. 330              0. 942
              0.                 0. 000              0. 000
            788.                 0. 619              0. 930
```


SYSTEM 14 ,SRP LF NORMAL,SSS=3 ,M1=-8 ,DATE:324
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(I_)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

COLD LIMIT


SYSTEM 14 ,SRP LF FBACK ,SSS=3 ,M1=-8 ,DATE:324
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-( )
0.0
0.2
0.4
0.6
0.8
1.0
1.2
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

COLD LIMIT

```
LF, DAY, NORMAL, PRIMARY

      FLT.  NO. = 14   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    324

      SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

         -800.               0. 475              0. 983
            0.               0. 000              0. 000
         -431.               0. 297              0. 912
         -398.               0. 390              0. 967
            0.               0. 000              0. 000
            0.               0. 224              0. 935
            0.               0. 000              0. 000
          398.               0. 383              0. 949
          431.               0. 306              0. 937
            0.               0. 000              0. 000
          800.               0. 480              0. 994


LF, DAY, NORMAL, BACKUP

      FLT.  NO. = 14   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    324

      SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

         -800.               0. 472              0. 978
            0.               0. 000              0. 000
         -431.               0. 295              0. 904
         -398.               0. 388              0. 961
            0.               0. 000              0. 000
            0.               0. 222              0. 926
            0.               0. 000              0. 000
          398.               0. 380              0. 943
          431.               0. 303              0. 928
            0.               0. 000              0. 000
          800.               0. 478              0. 989
```

```
LF, DAY, FALLBACK, PRIMARY

        FLT. NO. = 14  ENV. =  4  SSS=  3DEGC  M1= -8DEGC  DATE:    324

        SUR. DIST. (NM)     SRP ACTUAL(NM)     SRP RATIO

           -787.              0. 625             0. 941
              0.              0. 000             0. 000
           -431.              0. 330             0. 944
           -398.              0. 314             0. 944
              0.              0. 000             0. 000
              0.              0. 202             0. 925
              0.              0. 000             0. 000
            398.              0. 313             0. 941
            431.              0. 334             0. 955
              0.              0. 000             0. 000
            788.              0. 628             0. 943


LF, DAY, FALLBACK, BACKUP

        FLT. NO. = 14  ENV. =  4  SSS=  3DEGC  M1= -8DEGC  DATE:    324

        SUR. DIST. (NM)     SRP ACTUAL(NM)     SRP RATIO

           -787.              0. 621             0. 936
              0.              0. 000             0. 000
           -431.              0. 327             0. 934
           -398.              0. 311             0. 935
              0.              0. 000             0. 000
              0.              0. 201             0. 916
              0.              0. 000             0. 000
            398.              0. 310             0. 932
            431.              0. 331             0. 946
              0.              0. 000             0. 000
            788.              0. 624             0. 937
```

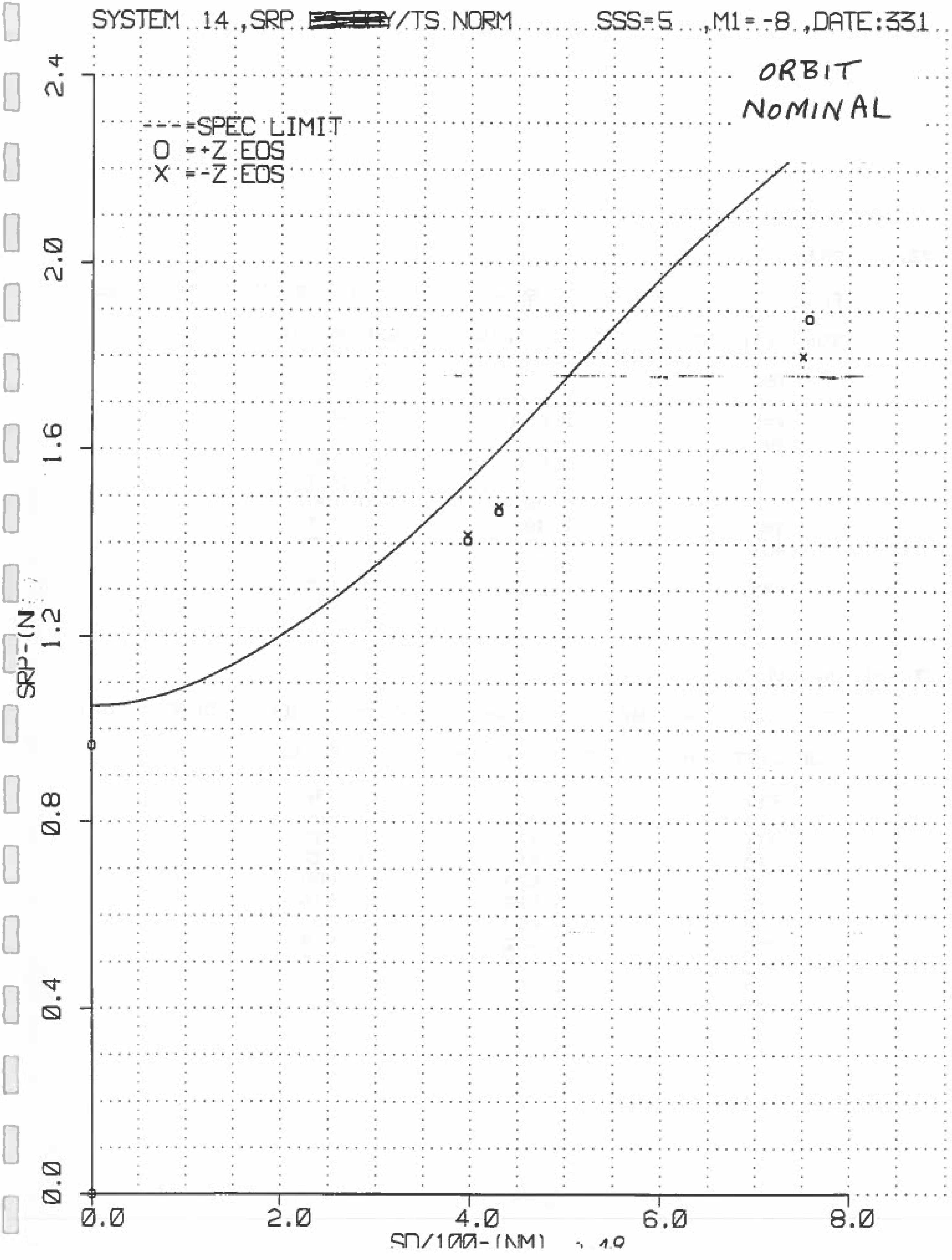
2.2 Geometric Resolution (Cont'd)

2.2.3 Smoothed Geometric Resolution - Infrared (3.2.1.1.2.2)

2.2.3.1 Baseline (Orbit Nominal)

The TS SRP is within spec for all measured scan angles.

ATTACHMENTS:	TS SRP Curve	Orbit Nominal
	TS SRP Tables	Orbit Nominal


SYSTEM 14 ,SRP [redacted]/TS NORM SSS=5 ,M1=-8 ,DATE:331
ORBIT
NOMINAL
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
2.4
2.0
1.6
1.2
0.8
0.4
0.0
SRP-(N
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

```
TS, MID, PRIMARY

      FLT.  NO. = 14   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    331

      SUR. DIST. (NM)      SRP ACTUAL(NM)      SRP RATIO

         -750.               1.802               0.801
            0.               0.000               0.000
         -431.               1.478               0.923
         -398.               1.419               0.925
            0.               0.000               0.000
            0.               0.964               0.919
            0.               0.000               0.000
          398.               1.406               0.917
          431.               1.470               0.918
            0.               0.000               0.000
          757.               1.882               0.833


TS, MID, BACKUP

      FLT.  NO. = 14   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    331

      SUR. DIST. (NM)      SRP ACTUAL(NM)      SRP RATIO

         -750.               1.791               0.796
            0.               0.000               0.000
         -431.               1.473               0.920
         -398.               1.414               0.922
            0.               0.000               0.000
            0.               0.962               0.916
            0.               0.000               0.000
          398.               1.402               0.914
          431.               1.465               0.915
            0.               0.000               0.000
          757.               1.866               0.826
```

2.2.3.2 Acceptance - Vibration

Consistant with the test philosophy established in BVS 2579, no vibration data was taken for the T channel as part of Bearing Retrofit since stability of the T alignment for the common optics can be inferred from H alignment testing. Non-common optics were verified to be stable during the original OLS 14 testing.

ATTACHMENTS: N/A

2.2 Geometric Resolution (Cont'd)

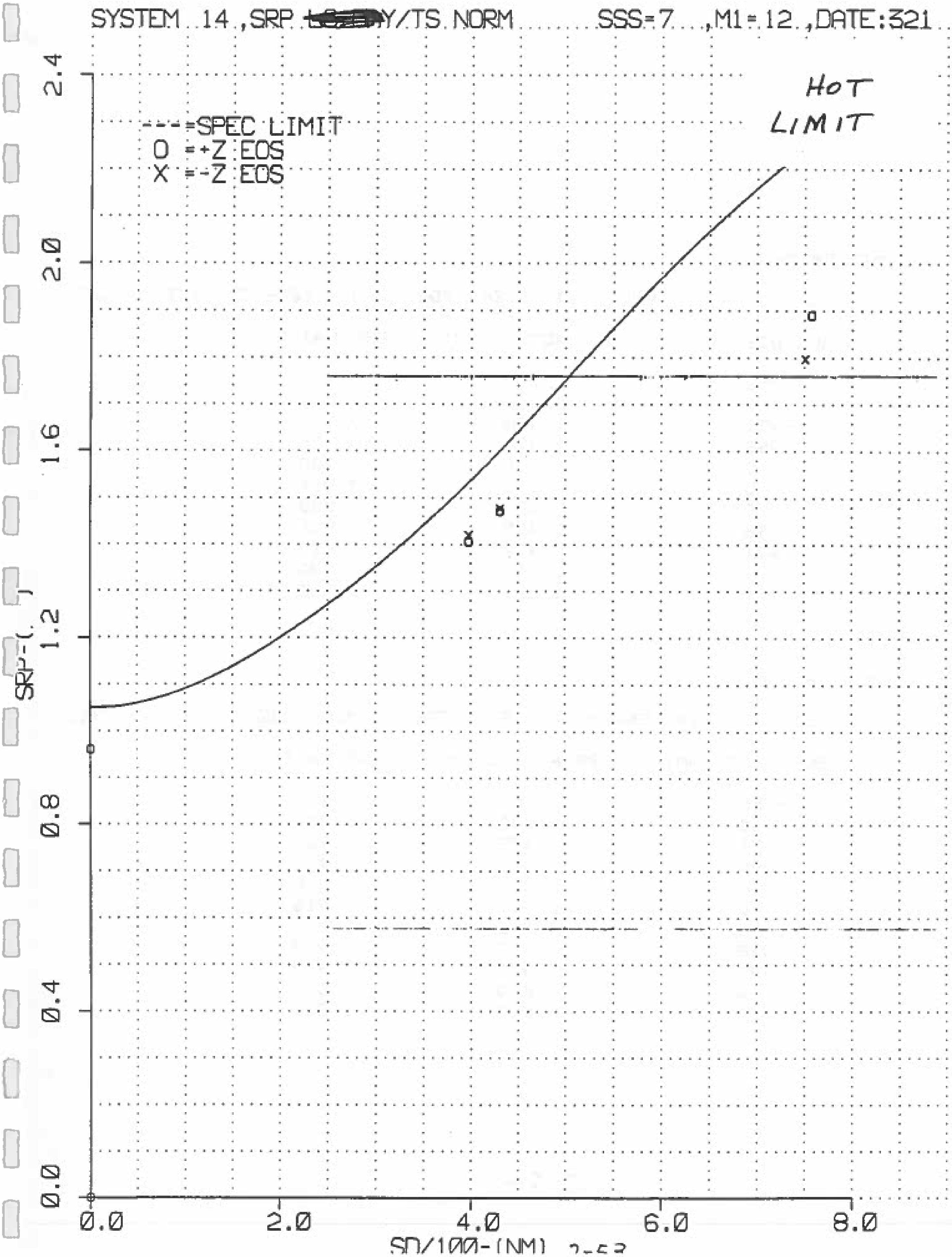
2.2.3 Smoothed Geometric Resolution - Infrared (3.2.1.1.2.2)

2.2.3.3 Acceptance - Thermal Vacuum

The TS SRP is within spec for the extremes of hot and cold Thermal Vacuum limit testing.

ATTACHMENTS:

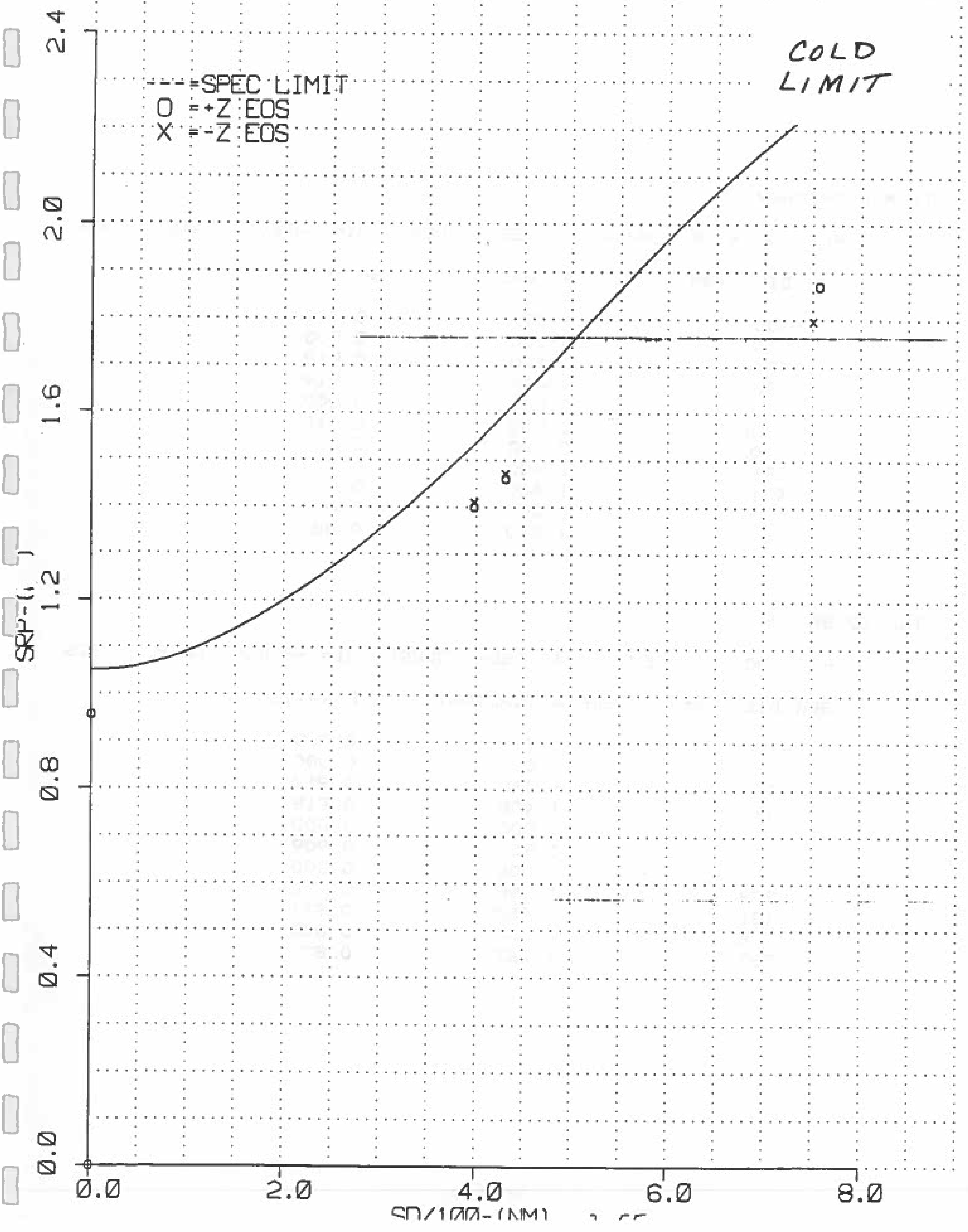
TS SRP Curve	Hot Limits
TS SRP Tables	Hot Limits
TS SRP Curve	Cold Limits
TS SRP Tables	Cold Limits


SYSTEM 14 ,SRP [redacted]Y/TS NORM SSS=7 ,M1=12 ,DATE:321
HOT LIMIT
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
2.4
2.0
1.6
1.2
0.8
0.4
0.0
SRP-( )
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

```
TS, MID, PRIMARY

        FLT.  NO. = 14   ENV. = 14   SSS=   7DEGC   M1= 12DEGC   DATE:     321

        SUR. DIST. (NM)     SRP  ACTUAL(NM)      SRP  RATIO

           -750.               1.798              0.799
              0.               0.000              0.000
           -431.               1.478              0.923
           -398.               1.420              0.926
              0.               0.000              0.000
              0.               0.960              0.914
              0.               0.000              0.000
            398.               1.405              0.916
            431.               1.472              0.919
              0.               0.000              0.000
            757.               1.889              0.836
```

```
TS, MID, BACKUP

        FLT.  NO. = 14   ENV. = 14   SSS=   7DEGC   M1= 12DEGC   DATE:     321

        SUR. DIST. (NM)     SRP  ACTUAL(NM)      SRP  RATIO

           -750.               1.795              0.798
              0.               0.000              0.000
           -431.               1.478              0.923
           -398.               1.421              0.926
              0.               0.000              0.000
              0.               0.961              0.916
              0.               0.000              0.000
            398.               1.407              0.917
            431.               1.472              0.919
              0.               0.000              0.000
            757.               1.882              0.833
```

SYSTEM 14 ,SRP [redacted]Y/TS NORM SSS=3 ,M1= -8 ,DATE:326



```
TS, MID, PRIMARY
        FLT.  NO. = 14   ENV. = 14   SSS=   3DEGC   M1= -8DEGC   DATE:    326

        SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

           -750.                 1.796              0.799
              0.                 0.000              0.000
           -431.                 1.470              0.918
           -398.                 1.409              0.919
              0.                 0.000              0.000
              0.                 0.955              0.910
              0.                 0.000              0.000
            398.                 1.400              0.913
            431.                 1.460              0.912
              0.                 0.000              0.000
            757.                 1.870              0.827
```

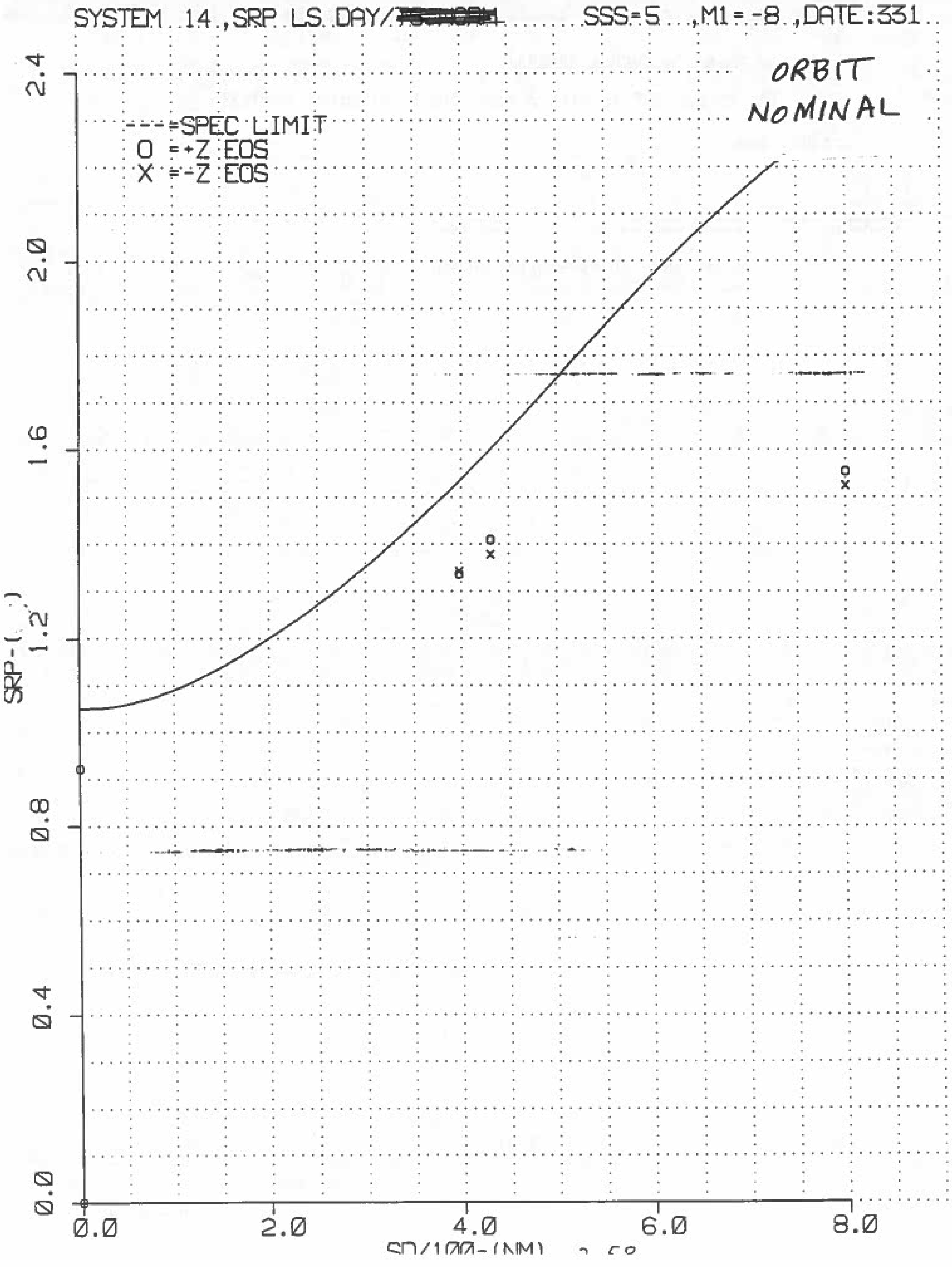
```
TS, MID, BACKUP
        FLT.  NO. = 14   ENV. = 14   SSS=   3DEGC   M1= -8DEGC   DATE:    326

        SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

           -750.                 1.794              0.798
              0.                 0.000              0.000
           -431.                 1.468              0.917
           -398.                 1.408              0.918
              0.                 0.000              0.000
              0.                 0.955              0.909
              0.                 0.000              0.000
            398.                 1.398              0.912
            431.                 1.458              0.911
              0.                 0.000              0.000
            757.                 1.867              0.826
```

2.2.4 Smoothed Geometric Resolution - Daytime Visual (3.2.1.1.2.2)

2.2.4.1 Baseline (Orbit Nominal)

The LS Day SRP is within spec limits at Orbit Nominal conditions.

ATTACHMENTS: LS Day SRP Curve - Orbit Nominal
LS Day SRP Tables - Orbit Nominal


SYSTEM 14.,SRP LS DAY/
SSS=5 ,M1=-8 ,DATE:331
ORBIT
NOMINAL
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(1.2)
0.0
0.4
0.8
1.2
1.6
2.0
2.4
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

```
LS, DAY, NORMAL, PRIMARY

        FLT.  NO. = 14   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    331

        SUR. DIST. (NM)       SRP  ACTUAL(NM)      SRP  RATIO

            -800.                 1.524              0.649
               0.                 0.000              0.000
            -431.                 1.379              0.861
            -398.                 1.342              0.875
               0.                 0.000              0.000
               0.                 0.922              0.878
               0.                 0.000              0.000
             398.                 1.337              0.872
             431.                 1.409              0.880
               0.                 0.000              0.000
             800.                 1.554              0.661
```

```
LS, DAY, NORMAL, BACKUP

        FLT.  NO. = 14   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    331

        SUR. DIST. (NM)       SRP  ACTUAL(NM)      SRP  RATIO

            -800.                 1.514              0.644
               0.                 0.000              0.000
            -431.                 1.370              0.856
            -398.                 1.334              0.870
               0.                 0.000              0.000
               0.                 0.916              0.872
               0.                 0.000              0.000
             398.                 1.328              0.866
             431.                 1.400              0.874
               0.                 0.000              0.000
             800.                 1.542              0.656
```

2.2 Geometric Resolution (Cont'd)

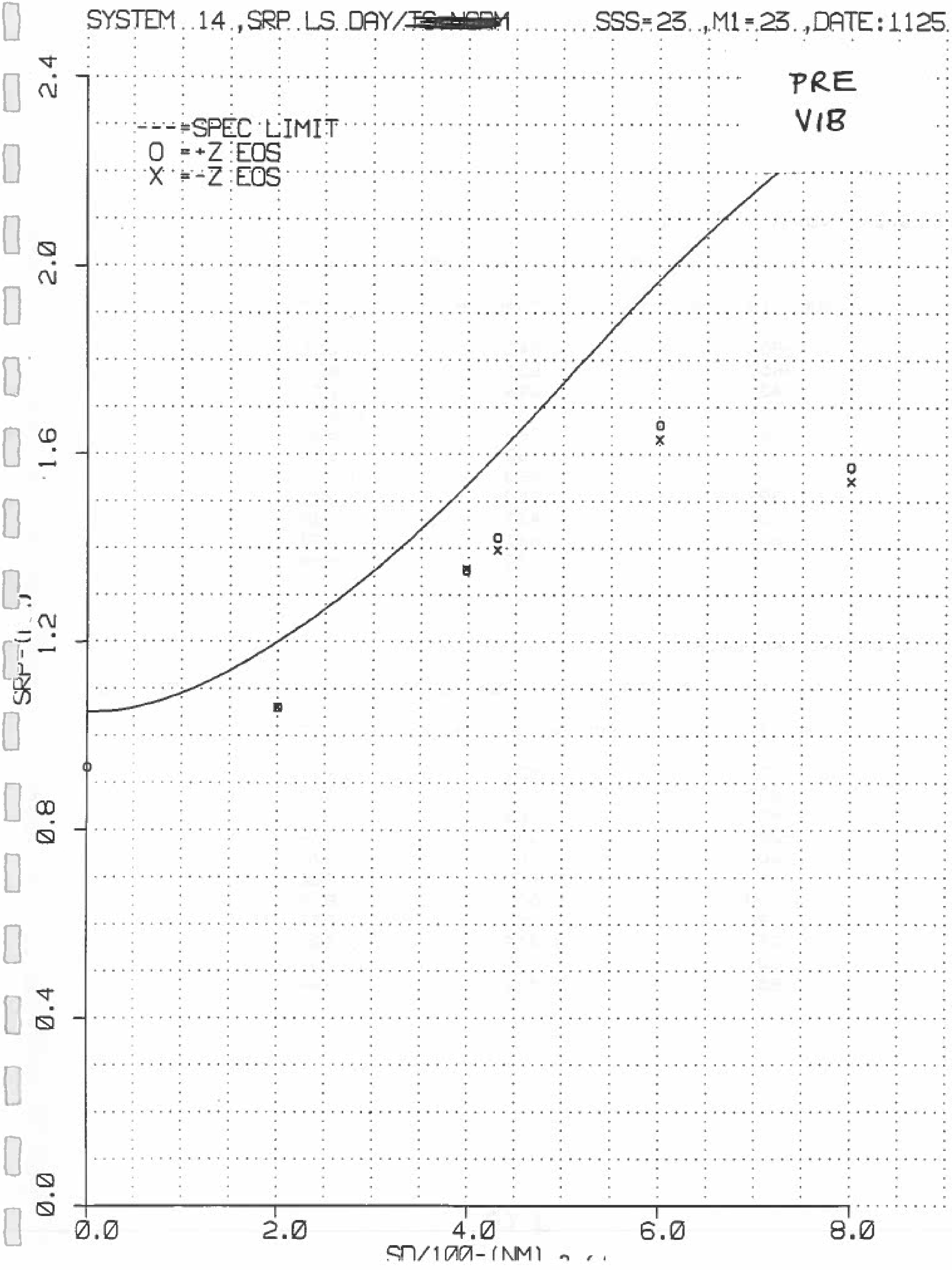
2.2.4 Smoothed Geometric Resolution - Daytime Visual (Cont'd)

(3.2.1.1.2.2)

2.2.4.2 Acceptance - Vibration

The OLS #14 SSS underwent vibrations on December 11, 1992. The LS Day SRP is within specification both before and after SSS vibration. No vibration-related changes in SRP were observed.

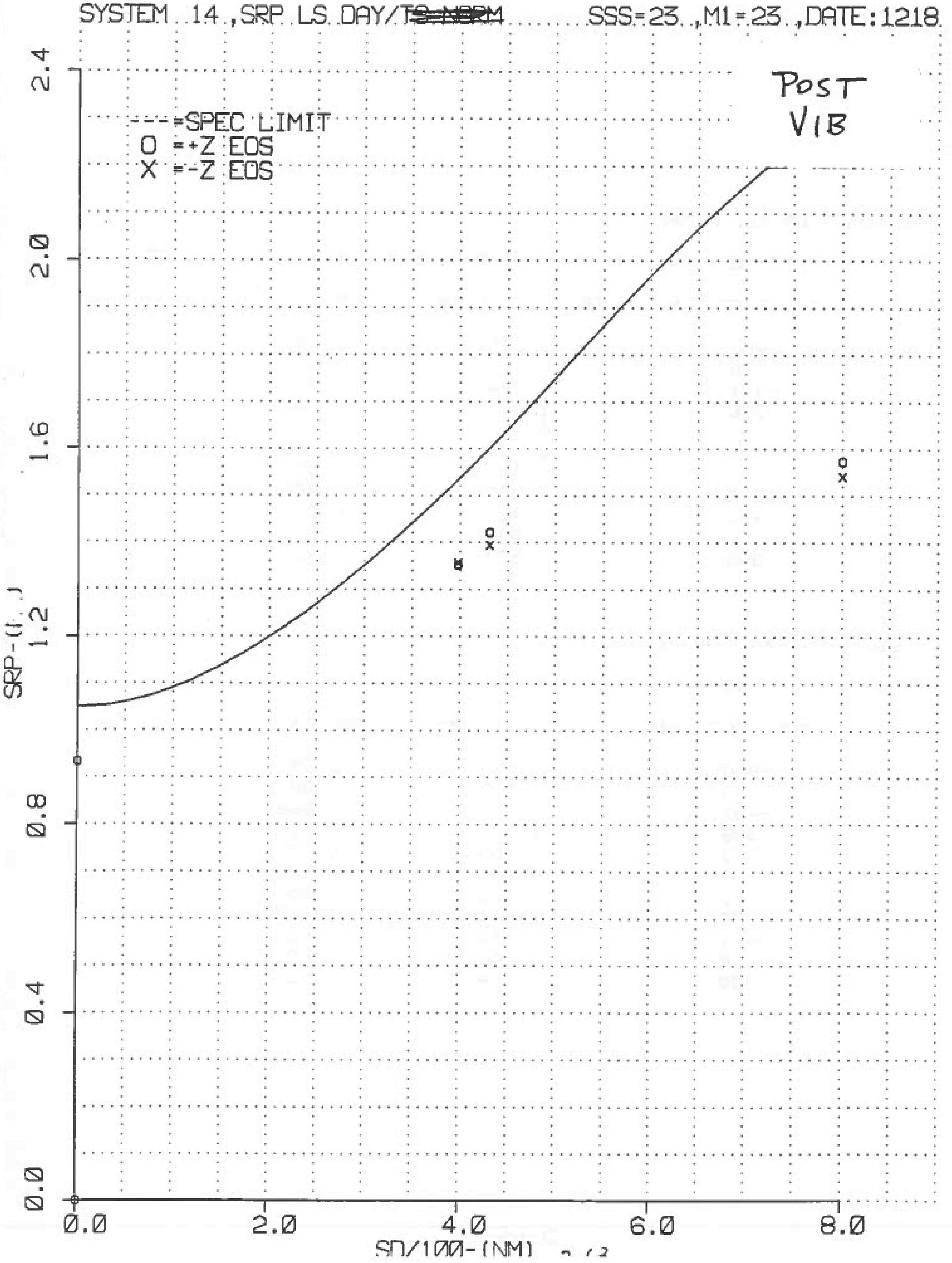
ATTACHMENTS:	LS Day SRP Curve	Pre-Vibration
	LS Day SRP Tables	Pre-Vibration
	LS Day SRP Curve	Post-Vibration
	LS Day SRP Table	Post-Vibration


SYSTEM 14 ,SRP LS DAY/[redacted] SSS=23 ,M1=23 ,DATE:1125
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
2.4
2.0
1.6
1.2
0.8
0.4
0.0
SRP-(I_)
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

PRE
VIB

```
LS, DAY, NORMAL, PRIMARY

        FLT.  NO. = 14   ENV. =   2   SSS= 23DEGC   M1= 23DEGC   DATE:   1125

        SUR. DIST. (NM)      SRP  ACTUAL(NM)     SRP  RATIO

            -800.              1. 542              0. 656
            -600.              1. 631              0. 828
            -431.              1. 396              0. 872
            -398.              1. 356              0. 884
            -200.              1. 060              0. 884
               0.              0. 932              0. 888
             200.              1. 060              0. 883
             398.              1. 353              0. 882
             431.              1. 422              0. 888
             601.              1. 661              0. 843
             800.              1. 572              0. 669
```

```
LS, DAY, NORMAL, BACKUP

        FLT.  NO. = 14   ENV. =   2   SSS= 23DEGC   M1= 23DEGC   DATE:   1125

        SUR. DIST. (NM)      SRP  ACTUAL(NM)     SRP  RATIO

            -800.              1. 532              0. 652
            -600.              1. 621              0. 823
            -431.              1. 388              0. 867
            -398.              1. 348              0. 879
            -200.              1. 053              0. 878
               0.              0. 926              0. 882
             200.              1. 053              0. 878
             398.              1. 344              0. 877
             431.              1. 412              0. 882
             601.              1. 650              0. 837
             800.              1. 561              0. 664
```


SYSTEM 14 ,SRP LS DAY/T~~S=NORM~~
SSS=23 ,M1=23 ,DATE:1218
POST
VIB
---=SPEC LIMIT
O =+Z EOS
X =-Z EOS
2.4
2.0
1.6
1.2
0.8
0.4
0.0
SRP-(I)
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

```
LS, DAY, NORMAL, PRIMARY

        FLT.  NO. = 14   ENV. =  2  SSS= 23DEGC  M1= 23DEGC  DATE:   1218

        SUR. DIST. (NM)      SRP  ACTUAL(NM)     SRP  RATIO

            -800.               1. 541            0. 656
               0.               0. 000            0. 000
            -431.               1. 394            0. 870
            -398.               1. 356            0. 884
               0.               0. 000            0. 000
               0.               0. 933            0. 886
               0.               0. 000            0. 000
             398.               1. 352            0. 882
             431.               1. 420            0. 887
               0.               0. 000            0. 000
             800.               1. 573            0. 669
```

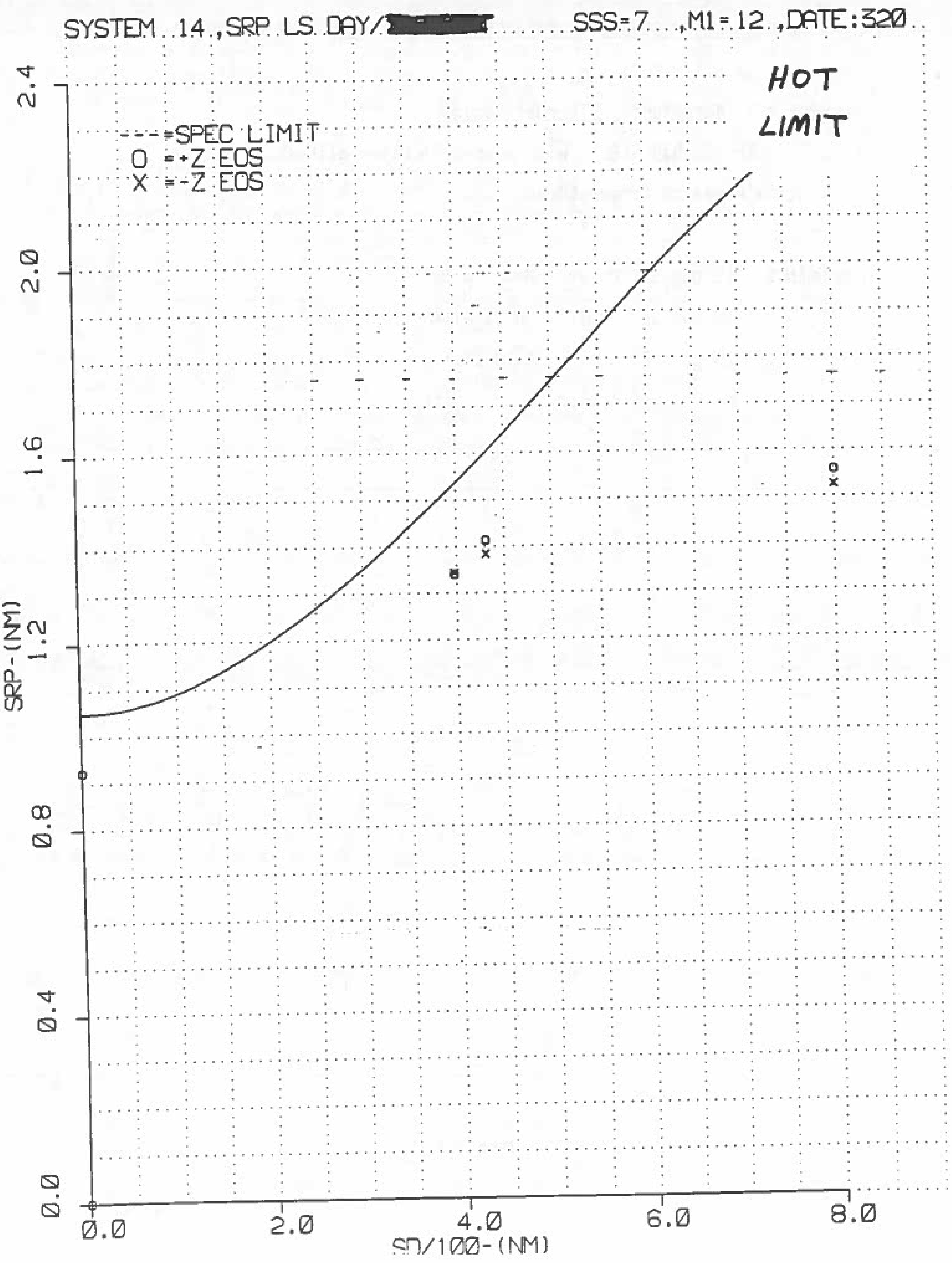
```
LS, DAY, NORMAL, BACKUP

        FLT.  NO. = 14   ENV. =  2  SSS= 23DEGC  M1= 23DEGC  DATE:   1218

        SUR. DIST. (NM)      SRP  ACTUAL(NM)     SRP  RATIO

            -800.               1. 533            0. 652
               0.               0. 000            0. 000
            -431.               1. 387            0. 866
            -398.               1. 349            0. 879
               0.               0. 000            0. 000
               0.               0. 928            0. 884
               0.               0. 000            0. 000
             398.               1. 345            0. 877
             431.               1. 413            0. 882
               0.               0. 000            0. 000
             800.               1. 564            0. 665
```

2.2.4 Smoothed Geometric Resolution - Daytime Visual (Cont'd) (3.2.1.1.2.2)

2.2.4.3 Acceptance - Thermal Vacuum

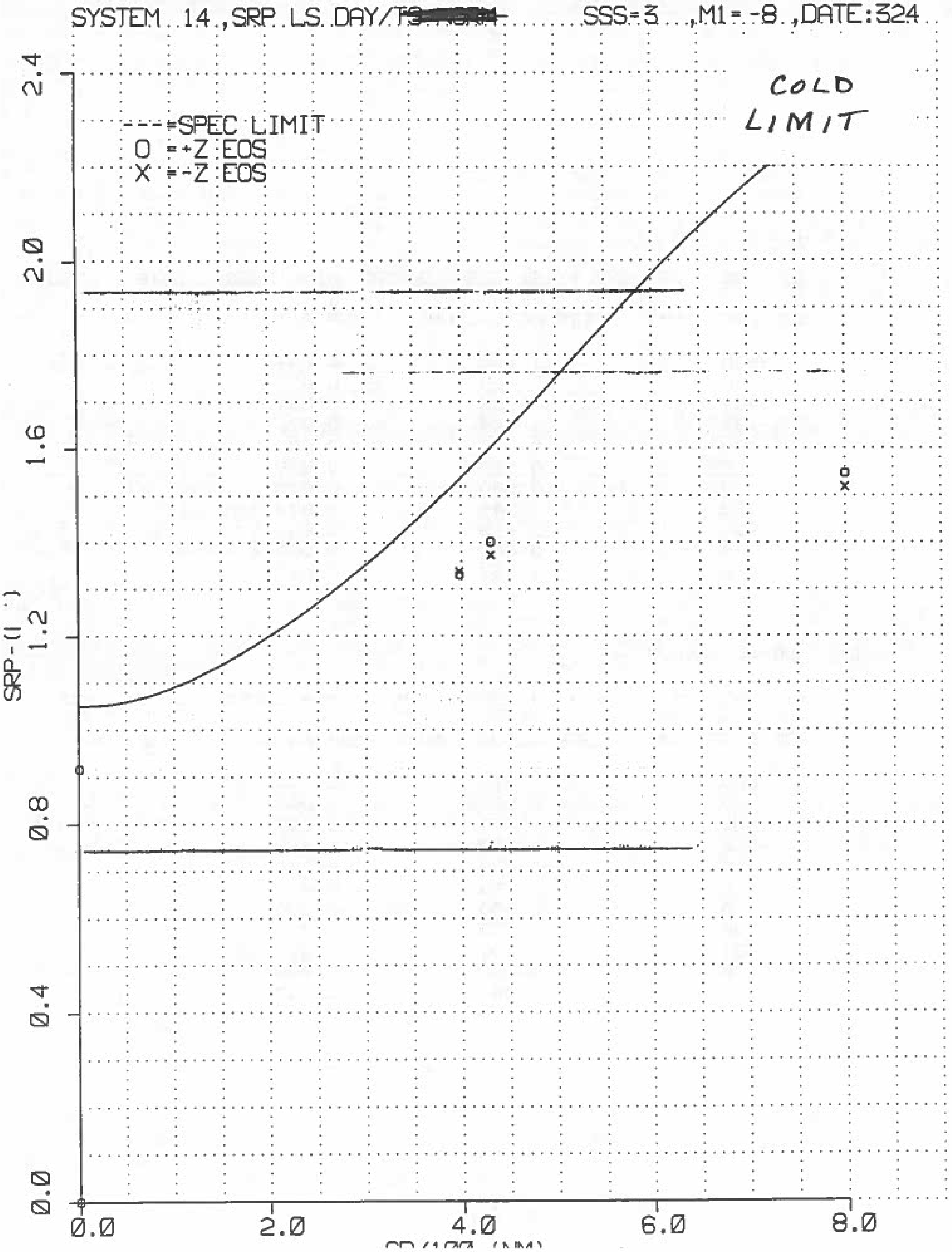
The LS Day SRP is within specification allowance over the entire range of temperatures.

ATTACHMENTS:	LS Day SRP Curve	Hot Limits
	LS Day SRP Tables	Hot Limits
	LS Day SRP Curve	Cold Limits
	LS Day SRP Tables	Cold Limits


SYSTEM 14, SRP LS DAY/[redacted] SSS=7, M1=12, DATE:320

HOT LIMIT

```
LS, DAY, NORMAL, PRIMARY

        FLT.  NO. = 14   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:     320

        SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

            -800.                1. 525              0. 649
               0.                0. 000              0. 000
            -431.                1. 383              0. 864
            -398.                1. 344              0. 876
               0.                0. 000              0. 000
               0.                0. 923              0. 879
               0.                0. 000              0. 000
             398.                1. 340              0. 874
             431.                1. 413              0. 882
               0.                0. 000              0. 000
             800.                1. 557              0. 663


LS, DAY, NORMAL, BACKUP

        FLT.  NO. = 14   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:     320

        SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

            -800.                1. 513              0. 644
               0.                0. 000              0. 000
            -431.                1. 373              0. 857
            -398.                1. 333              0. 869
               0.                0. 000              0. 000
               0.                0. 916              0. 873
               0.                0. 000              0. 000
             398.                1. 330              0. 867
             431.                1. 401              0. 875
               0.                0. 000              0. 000
             800.                1. 544              0. 657
```


SYSTEM 14 ,SRP LS DAY/T3[redacted] SSS=3 ,M1=-8 ,DATE:324
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(I ')
2.4
2.0
1.6
1.2
0.8
0.4
0.0
0.0
2.0
4.0
6.0
8.0

COLD
LIMIT

```
LS, DAY, NORMAL, PRIMARY

        FLT.  NO. = 14   ENV. =  4   SSS=  3DEGC  M1= -8DEGC  DATE:    324

        SUR. DIST. (NM)      SRP ACTUAL(NM)     SRP RATIO

           -800.               1.518              0.646
              0.               0.000              0.000
           -431.               1.373              0.858
           -398.               1.337              0.871
              0.               0.000              0.000
              0.               0.916              0.873
              0.               0.000              0.000
            398.               1.331              0.868
            431.               1.401              0.875
              0.               0.000              0.000
            800.               1.547              0.658


LS, DAY, NORMAL, BACKUP

        FLT.  NO. = 14   ENV. =  4   SSS=  3DEGC  M1= -8DEGC  DATE:    324

        SUR. DIST. (NM)      SRP ACTUAL(NM)     SRP RATIO

           -800.               1.510              0.643
              0.               0.000              0.000
           -431.               1.366              0.853
           -398.               1.330              0.867
              0.               0.000              0.000
              0.               0.912              0.869
              0.               0.000              0.000
            398.               1.324              0.863
            431.               1.393              0.870
              0.               0.000              0.000
            800.               1.538              0.654
```

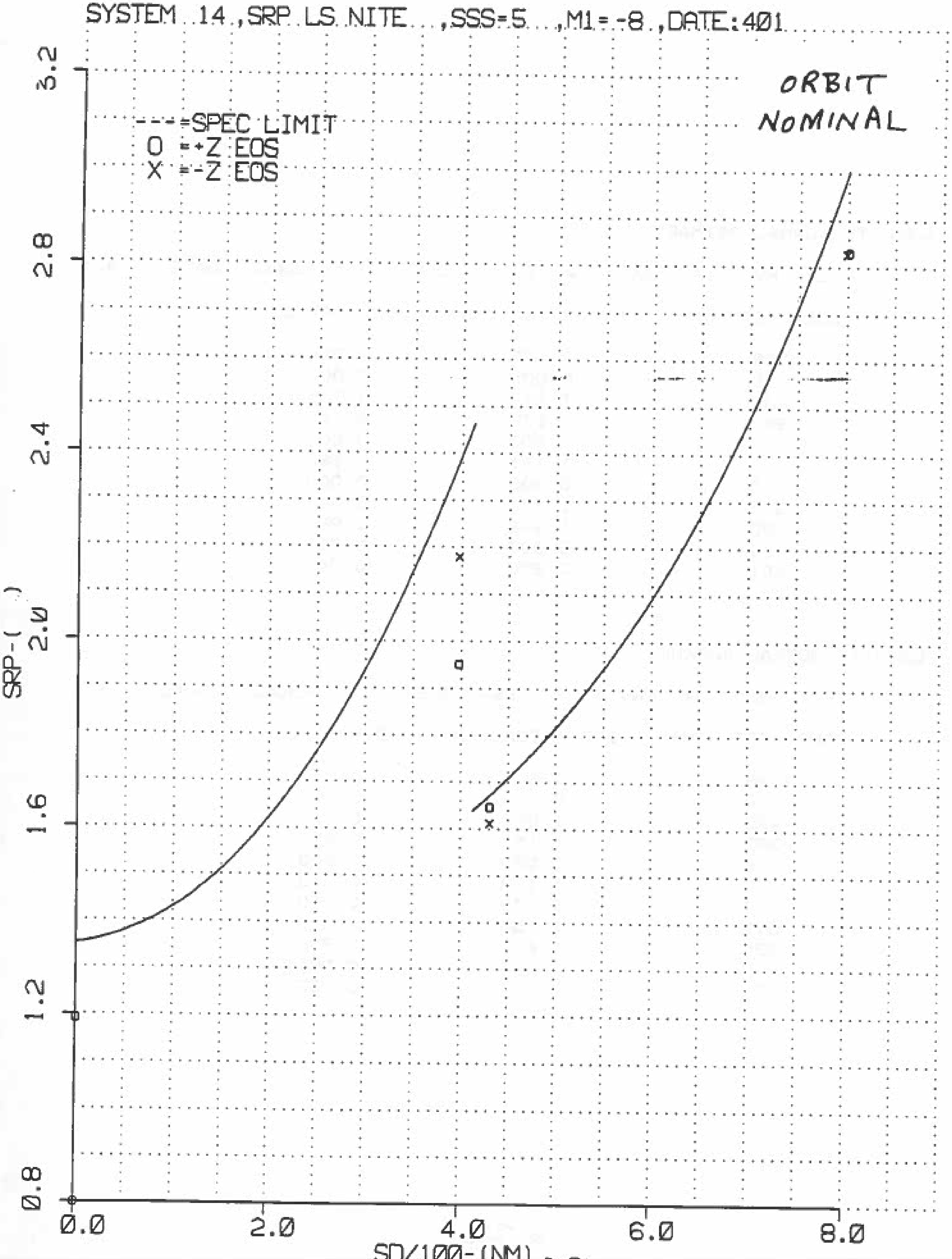
2.2.5 Smoothed Geometric Resolution - Nighttime Visual (3.2.1.1.2.2)

LS Night SRP routinely is deliberately adjusted to be close to spec limit during system integration in order to optimize PMT signal-to-noise ratio, at the expense of SRP margin.

2.2.5.1 Baseline (Orbit Nominal)

The LS Night SRP is within spec for all measured scan angles

ATTACHMENTS: LS Night SRP Curve - Orbit Nominal
LS Night SRP Table - Orbit Nominal



SYSTEM 14 ,SRP LS NITE ,SSS=5 ,M1=-8 ,DATE:401

ORBIT NOMINAL

```
LS, NITE, NORMAL, PRIMARY

      FLT.  NO. = 14   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    401

      SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

          -799.               2. 827              0. 944
             0.               0. 000              0. 000
          -430.               1. 612              0. 965
          -397.               2. 179              0. 915
             0.               0. 000              0. 000
             0.               1. 191              0. 882
             0.               0. 000              0. 000
           397.               1. 951              0. 819
           430.               1. 646              0. 985
             0.               0. 000              0. 000
           801.               2. 830              0. 941


LS, NITE, NORMAL, BACKUP

      FLT.  NO. = 14   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    401

      SUR. DIST. (NM)      SRP  ACTUAL(NM)      SRP  RATIO

          -799.               2. 800              0. 935
             0.               0. 000              0. 000
          -430.               1. 599              0. 957
          -397.               2. 156              0. 905
             0.               0. 000              0. 000
             0.               1. 179              0. 873
             0.               0. 000              0. 000
           397.               1. 930              0. 810
           430.               1. 631              0. 976
             0.               0. 000              0. 000
           801.               2. 804              0. 932
```

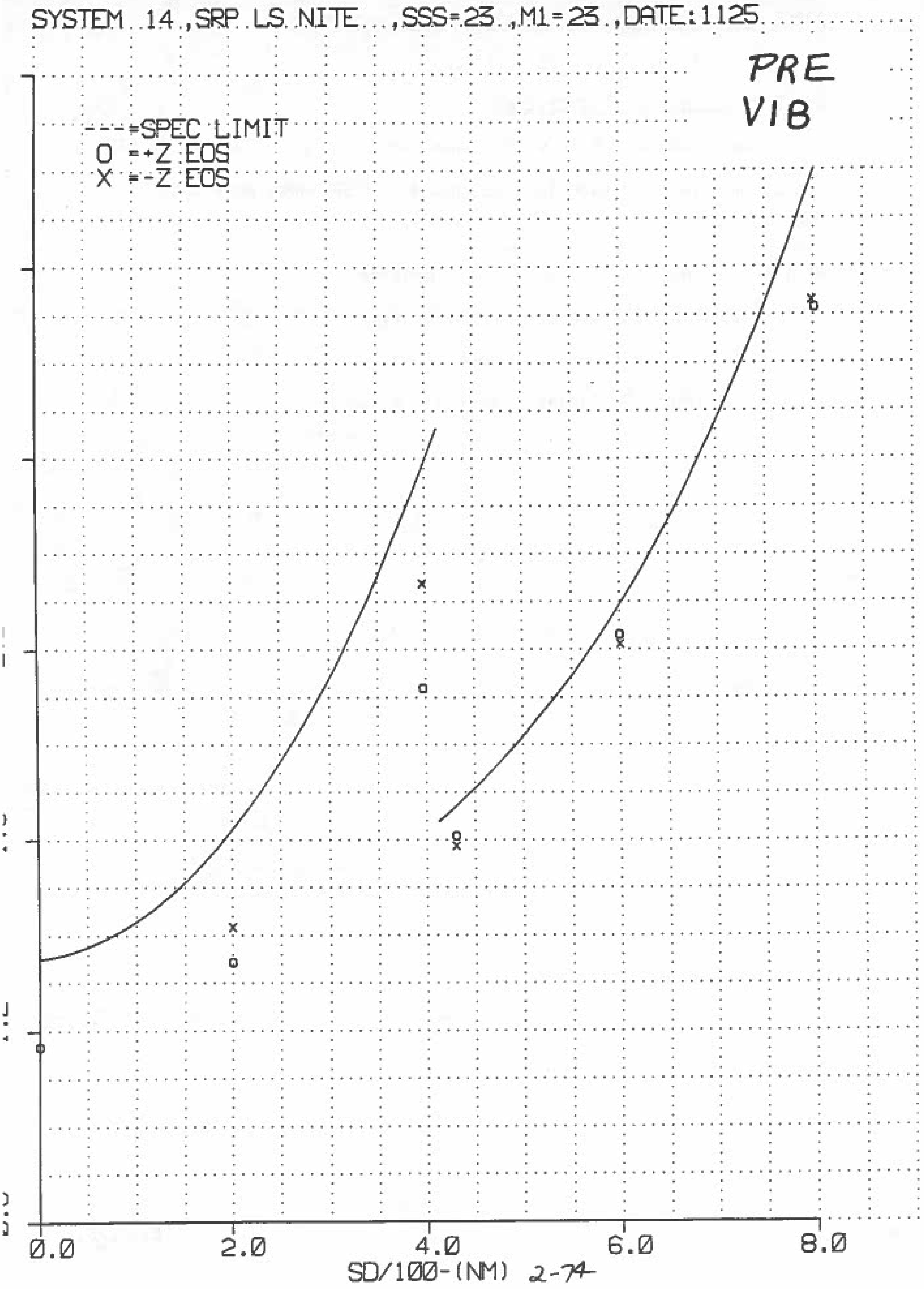
2.2 Geometric Resolution (Cont'd)

2.2.5 Smoothed Geometric Resolution - Nighttime Visual (Cont'd) (3.1.2.2)

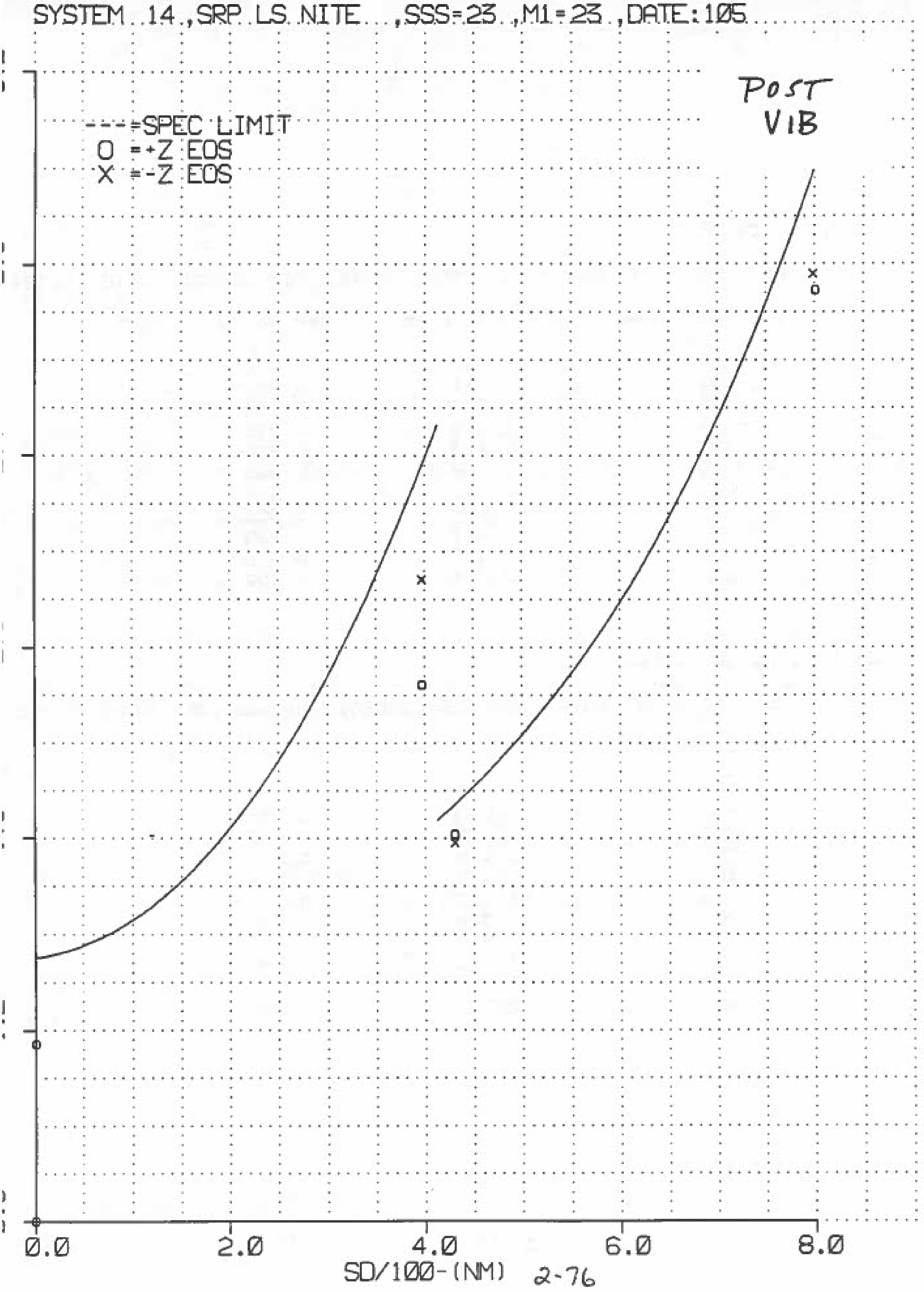
2.2.5.2 Acceptance - Vibration

The LS Night SRP is within specification before and after SSS vibration. No vibration-induced changes in SRP were observed.

ATTACHMENTS:	LS Night SRP Curve	Pre-Vibration
	LS Night SRP Tables	Pre-Vibration
	LS Night SRP Curve	Post-Vibration
	LS Night SRP Tables	Post-Vibration


SYSTEM 14 ,SRP LS NITE ,SSS=23 ,M1=23 ,DATE:1125
PRE VIB
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
0.0
2.0
4.0
6.0
8.0
SD/100-(NM) 2-74

```
LS, NITE, NORMAL, PRIMARY

        FLT.  NO. = 14   ENV. =  2   SSS= 23DEGC   M1= 23DEGC   DATE:   1125

        SUR. DIST. (NM)       SRP ACTUAL(NM)      SRP RATIO

           -799.                2.730              0.912
           -601.                2.011              0.959
           -430.                1.588              0.950
           -397.                2.138              0.898
           -200.                1.417              0.874
              0.                1.168              0.865
            200.                1.343              0.829
            397.                1.919              0.806
            430.                1.609              0.963
            600.                2.030              0.970
            801.                2.714              0.902


LS, NITE, NORMAL, BACKUP

        FLT.  NO. = 14   ENV. =  2   SSS= 23DEGC   M1= 23DEGC   DATE:   1125

        SUR. DIST. (NM)       SRP ACTUAL(NM)      SRP RATIO

           -799.                2.720              0.908
           -601.                2.003              0.955
           -430.                1.582              0.947
           -397.                2.129              0.894
           -200.                1.411              0.870
              0.                1.163              0.861
            200.                1.338              0.825
            397.                1.910              0.802
            430.                1.603              0.959
            600.                2.022              0.966
            801.                2.704              0.899
```


SYSTEM 14 ,SRP LS NITE ,SSS=23 ,M1=23 ,DATE:105
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
POST VIB
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

2-76

```
LS, NITE, NORMAL, PRIMARY

        FLT.  NO. = 14   ENV. =  2  SSS= 23DEGC  M1= 23DEGC  DATE:   105

        SUR. DIST. (NM)      SRP ACTUAL(NM)      SRP RATIO

              -799.              2.779             0.928
                 0.              0.000             0.000
              -430.              1.591             0.952
              -397.              2.142             0.899
                 0.              0.000             0.000
                 0.              1.171             0.867
                 0.              0.000             0.000
               397.              1.921             0.807
               430.              1.608             0.962
                 0.              0.000             0.000
               801.              2.745             0.913


LS, NITE, NORMAL, BACKUP

        FLT.  NO. = 14   ENV. =  2  SSS= 23DEGC  M1= 23DEGC  DATE:   105

        SUR. DIST. (NM)      SRP ACTUAL(NM)      SRP RATIO

              -799.              2.774             0.927
                 0.              0.000             0.000
              -430.              1.586             0.949
              -397.              2.135             0.896
                 0.              0.000             0.000
                 0.              1.167             0.864
                 0.              0.000             0.000
               397.              1.914             0.803
               430.              1.603             0.959
                 0.              0.000             0.000
               801.              2.739             0.911
```

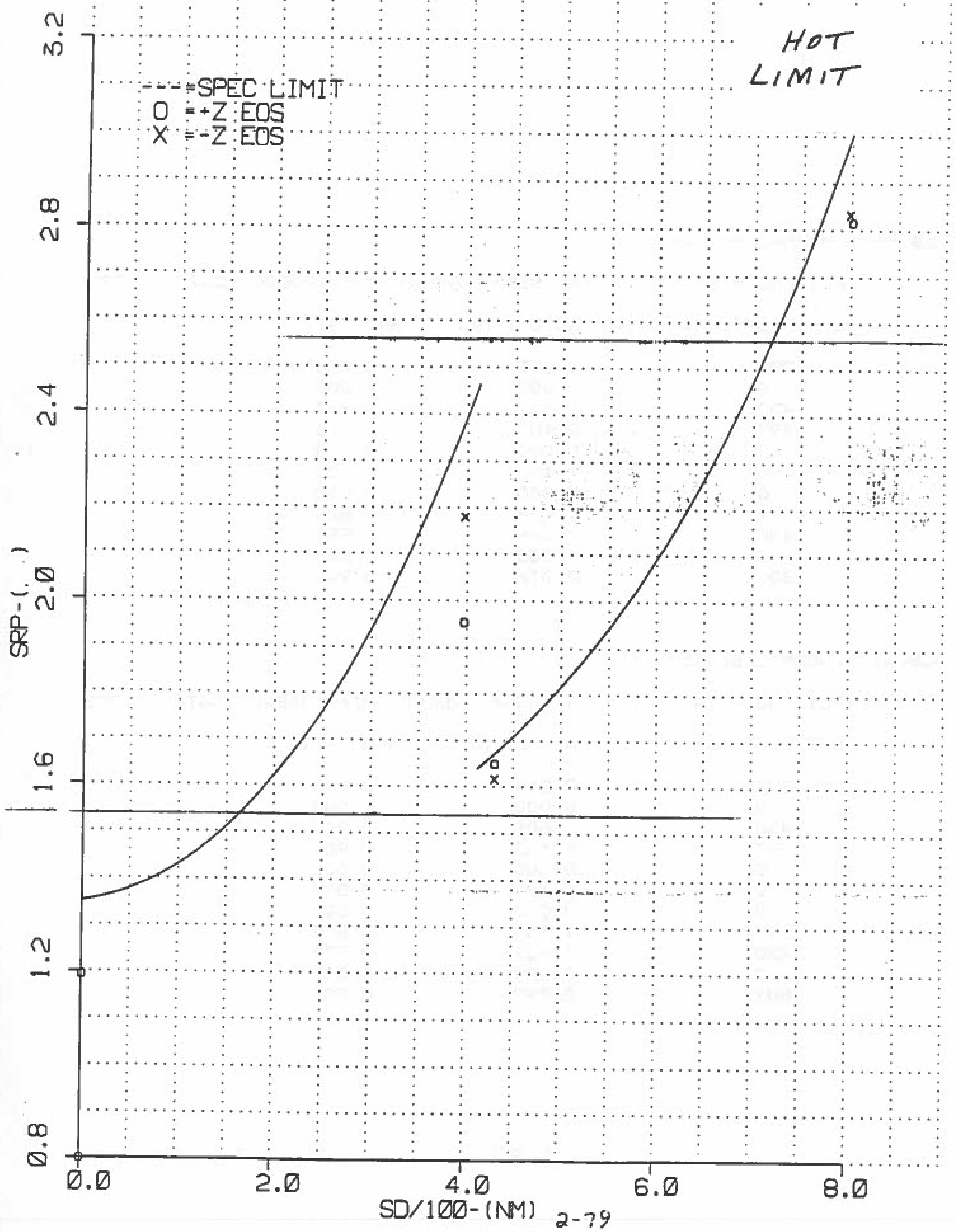
2.2.5 Smoothed Geometric Resolution - Nighttime Visual (Cont'd) (3.1.2.2)

2.2.5.3 Acceptance - Thermal Vacuum

The LS Night SRP is within specification limits over the Acceptance temperature range. No temperature-related changes in SRP over the Acceptance temperature range were observed.

ATTACHMENTS:	LS Night SRP Curve	Hot Limits
	LS Night SRP Tables	Hot Limits
	LS Night SRP Curve	Cold Limits
	LS Night SRP Tables	Cold Limits

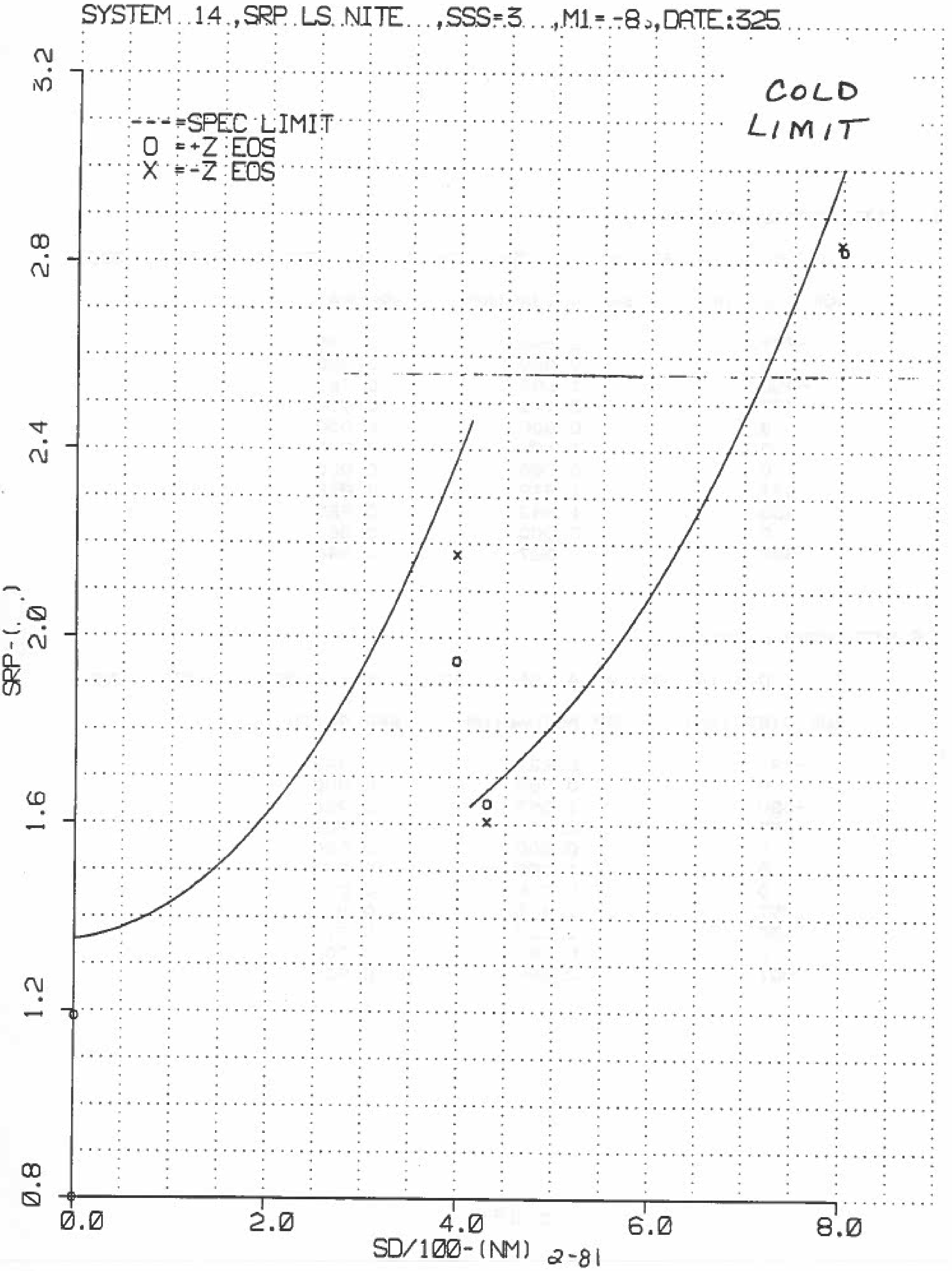
SYSTEM 14 ,SRP LS NITE ,SSS=7 ,M1=12 ,DATE:393



HOT LIMIT

```
LS, NITE, NORMAL, PRIMARY

          FLT.  NO. = 14   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:    393

          SUR. DIST. (NM)       SRP  ACTUAL(NM)      SRP  RATIO

              -799.                 2. 833              0. 946
                 0.                 0. 000              0. 000
              -430.                 1. 616              0. 967
              -397.                 2. 180              0. 915
                 0.                 0. 000              0. 000
                 0.                 1. 193              0. 883
                 0.                 0. 000              0. 000
               397.                 1. 954              0. 820
               430.                 1. 648              0. 986
                 0.                 0. 000              0. 000
               801.                 2. 816              0. 936
```

```
LS, NITE, NORMAL, BACKUP

          FLT.  NO. = 14   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:    393

          SUR. DIST. (NM)       SRP  ACTUAL(NM)      SRP  RATIO

              -799.                 2. 814              0. 940
                 0.                 0. 000              0. 000
              -430.                 1. 606              0. 961
              -397.                 2. 163              0. 908
                 0.                 0. 000              0. 000
                 0.                 1. 184              0. 877
                 0.                 0. 000              0. 000
               397.                 1. 939              0. 814
               430.                 1. 637              0. 979
                 0.                 0. 000              0. 000
               801.                 2. 797              0. 930
```


SYSTEM 14 ,SRP LS NITE ,SSS=3 ,M1=-8,DATE:325
COLD LIMIT
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-( )
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

```
LS, NITE, NORMAL, PRIMARY

        FLT.  NO. = 14   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    325

        SUR. DIST. (NM)      SRP  ACTUAL(NM)     SRP  RATIO

           -799.              2. 840             0. 949
              0.              0. 000             0. 000
           -430.              1. 605             0. 961
           -397.              2. 176             0. 914
              0.              0. 000             0. 000
              0.              1. 188             0. 880
              0.              0. 000             0. 000
            397.              1. 949             0. 818
            430.              1. 643             0. 983
              0.              0. 000             0. 000
            801.              2. 827             0. 940


LS, NITE, NORMAL, BACKUP

        FLT.  NO. = 14   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    325

        SUR. DIST. (NM)      SRP  ACTUAL(NM)     SRP  RATIO

           -799.              2. 821             0. 942
              0.              0. 000             0. 000
           -430.              1. 597             0. 956
           -397.              2. 161             0. 907
              0.              0. 000             0. 000
              0.              1. 180             0. 874
              0.              0. 000             0. 000
            397.              1. 935             0. 812
            430.              1. 633             0. 977
              0.              0. 000             0. 000
            801.              2. 808             0. 934
```

2.2.6 Data Sampling (3.2.1.1.2.3)

The sampling frequency ratios for all modes of the 5D-3 OLS satisfy the specification requirements. The calculations are contained in the 5D-3 OLS System Summary Report. The results are summarized below. The worst-case sampling frequency ratio for each mode is given.

MODE	SAMPLING FREQ. RATIO (Spec: > 2.4)
LF Day - Normal	2.58
LF Day - Fallback	2.61
LS & TS Day - Normal	2.50
LS Night - Normal	2.66
TF - Normal	3.44
TF Fallback - Normal Side of scan	3.28
TF Fallback - Abnormal Side of Scan	3.28

2.3 Geometric Accuracy (3.2.1.1.3.1, 3.2.1.1.3.2, 3.2.1.1.3.3)

The alignment and synchronization of the SSS determine the Geometric Accuracy. Geometric accuracy is specified in 3 categories (Repeatability, Stability & Fixed Errors). Within these categories, accuracy is further specified for Along Track, Along Scan (Stored Data), Along Scan (Direct Data), and Along Scan (with digital delphi generation, i.e., the Encoder Simulator locked mode).

There was an observed shift in alignment between the extremes of M1 temperature of -8•C and +12•C on the order of 0.2 milliradians or less for all channels. There was also an observed shift in synchronization in all modes in OLS #14 of approximately 0.1 milliradians or less between M1 temperature extremes of -8•C and +12•.

The Repeatability error is calculated using the rms difference of the measured alignment/synchronization (as a function of the variation of M1 temperature on orbit) from the hot-to-cold average values of alignment/ synchronization. The total Repeatability contribution for synchronization is determined by rss'ing the wow-flutter error (as measured in test 6x11.ST) and the jitter error (which was negligible on OLS #14) with the repeatability shift between the Hot and Cold Limits.

The Primary Alignment Reference Axes (REFPLN) are calculated in a computer program using HRD & T channel Alignment and Sync data from several Orbit Nominal tests. The data determine a best-fit alignment with respect to the Interface Mounting Axes. The REFPLN Alignment and REFPLN Synchronization curves are included here. The remainder of the Alignment and Synchronization data for the OLS #14 SSS are in BVS 2733, Vol. III of this Acceptance Test Report.

The 5D-3 System has a Fallback mode utilizing an encoder control track and Encoder Simulator. The spec limits and measured results are shown in Table 2.3-2.

Note that stability errors for the T-channel are not presented. This is because in bearing retrofit testing no thermal vacuum adjustment testing is performed. Therefore, no pre-vibration data for the T-channel exists. However, note that all T-channel data taken is within spec.

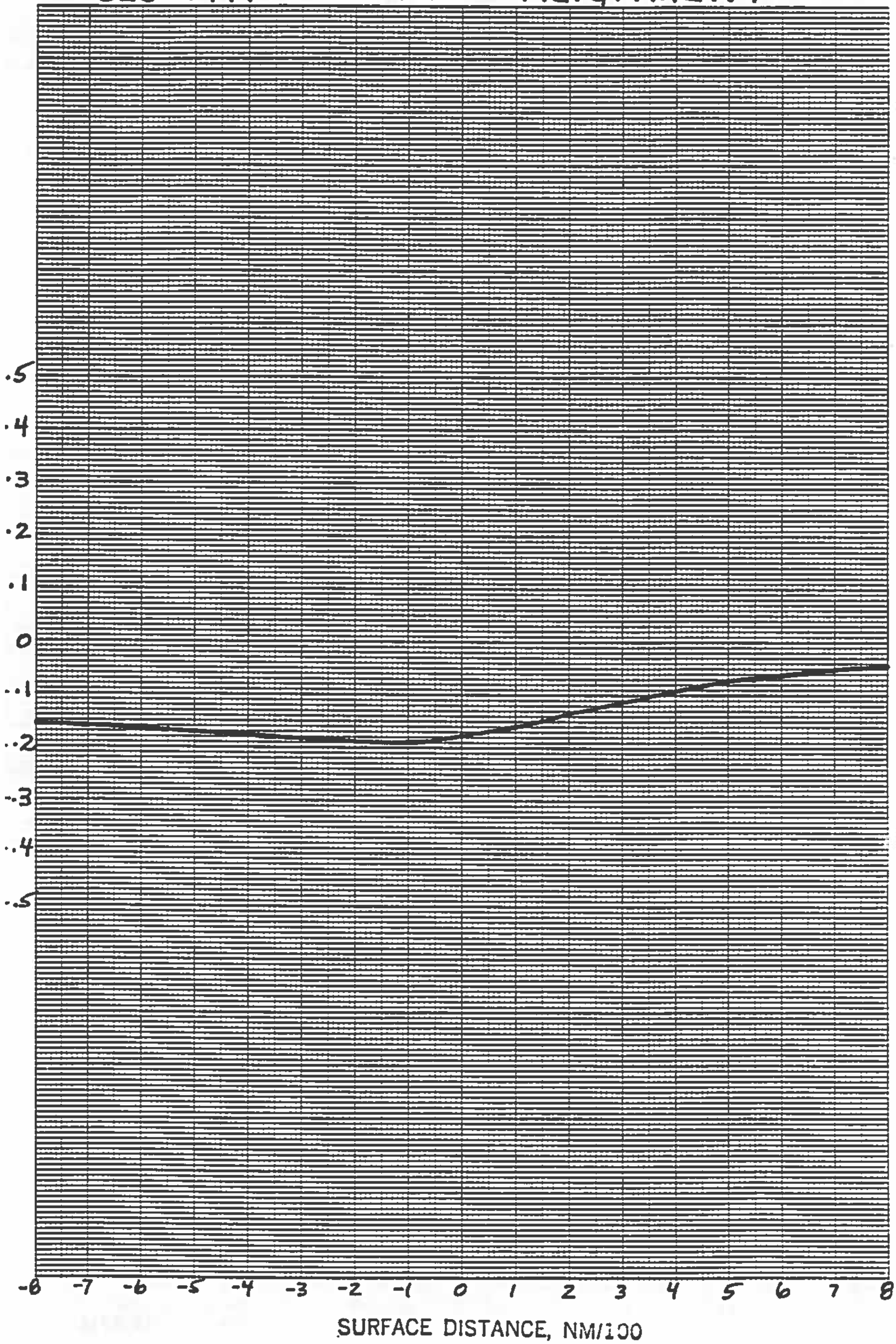
ATTACHMENTS: OLS #14 REFPLN ALIGNMENT

OLS #14 REFPLN SYNCHRONIZATION

OLS #14 ALIGN/SYNC vs SPEC, Table 2.3-1

OLS #14 Encoder Simulator Sync, Table 2.3-2

OLS #14A REFPLN ALIGNMENT



OLS #14A REFPLN SYNCHRONIZATION

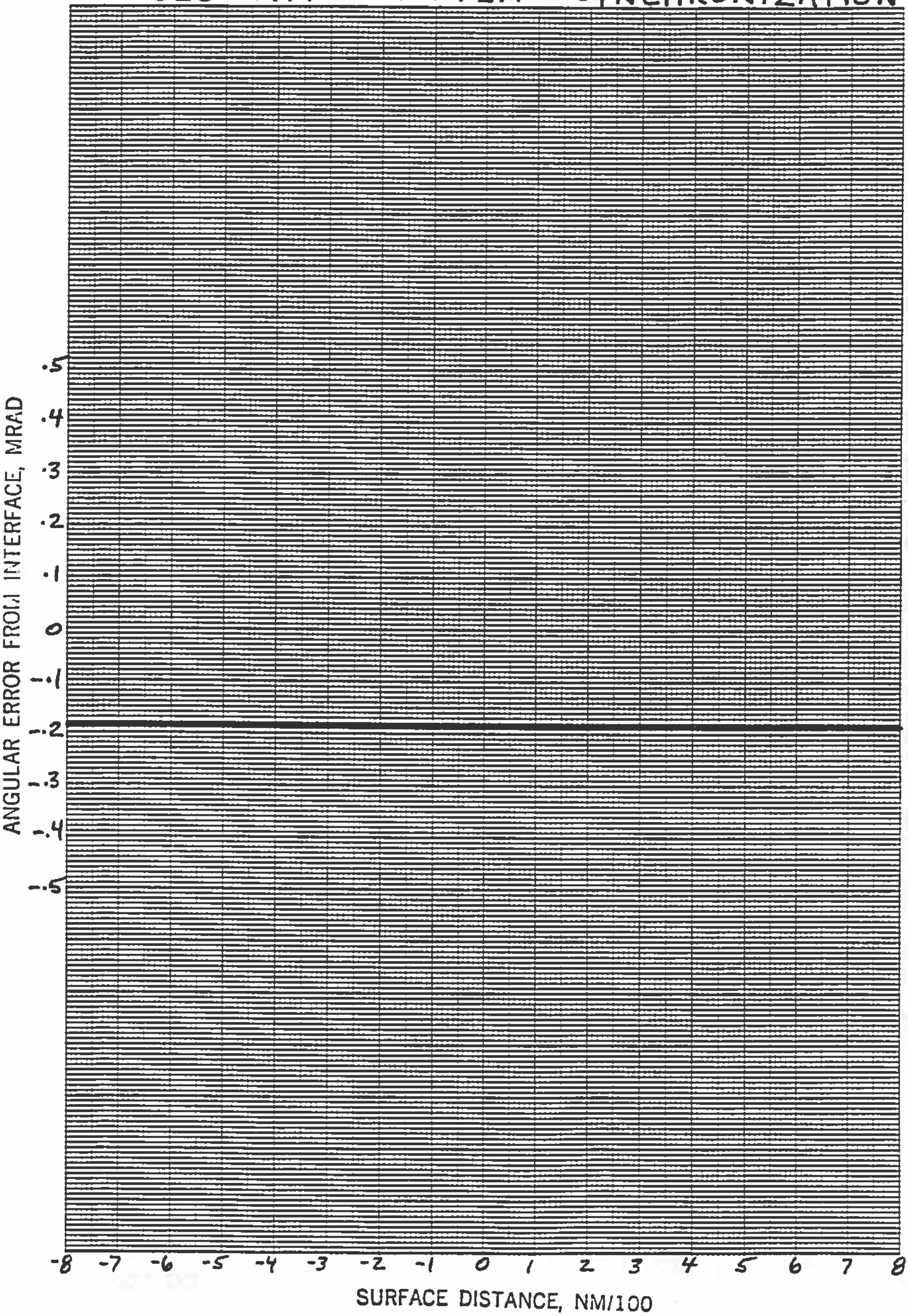


Table 2.3-1

OLS #14 ALIGN/SYNC vs. SPEC

all numbers in milliradians

	HRD	T	PMT
FIXED - Delta between "REFPLN" & Optic Hot - Cold Average			
AT SPEC	0.45	0.70	0.60
Measured (worst-case)	0.13	0.19	0.43
AS STORED SPEC	0.80	0.80	1.90
Measured (worst-case)	0.33	0.23	0.64
AS DIRECT FINE SPEC	0.80	0.80	1.90
Measured (worst-case)	0.31	0.25	N/A
AS DIRECT SMOOTH SPEC	0.80	0.80	1.90
Measured (worst-case)	0.37	0.23	0.88
STABILITY - Delta Between Pre & Post - Vibration			
AT SPEC	0.50	0.55	0.55
Measured (worst-case)	0.04	N/A	0.08
AS STORED SPEC	0.20	0.25	0.25
Measured (worst-case)	0.04	N/A	0.04
AS DIRECT FINE SPEC	0.20	0.25	0.25
Measured (worst-case)	0.04*	N/A	N/A
AS DIRECT SMOOTH SPEC	0.20	0.25	0.25
Measured (worst-case)	0.04*	N/A	0.04
REPEATABILITY - Delta between TV Hot & Cold Limits			
AT SPEC	0.20	0.22	0.20
Measured (rms)	0.07	0.05	0.07
AS STORED SPEC	0.30	0.30	0.30
Measured (rms)	0.10	0.07	0.11
AS DIRECT FINE SPEC	0.50	0.50	0.50
Measured (rms)	0.09	0.07*	N/A
AS DIRECT SMOOTH SPEC	2.00	2.00	2.00
Measured (rms)	0.10	0.07*	0.09
TOTAL -			
AT SPEC	1.00	1.30	1.20
Calculated	0.21	N/A	0.54
AS STORED SPEC	1.16	1.19	2.29
Calculated	0.44	N/A	0.76
AS DIRECT FINE SPEC	1.34	1.36	2.46
Calculated	0.41	N/A	N/A
AS DIRECT SMOOTH SPEC	2.81	2.82	3.92
Calculated	0.48	N/A	0.98

N/A = not applicable   * = Inferred from AS Stored number.

Table 2.3-2
ALONG-SCAN GEOMETRIC ACCURACY WITH ENCODER SIMULATOR

	Stored	Direct Fine	Direct Smooth
Repeatability-Spec, mrad	1.0	1.1	2.2
Measured	0.10	0.08	0.10
Stability - Spec, mrad	0.50	0.50	0.50
Measured	0.08	0.08*	0.08*
Fixed - Spec, mrad	10.0	10.0	10.0
Measured	0.94	0.94*	0.94*
Total - Spec, mrad	11.1	11.2	12.3
Calculated	1.07	1.05	1.07

*Inferred from stored number

2.4 RADIOMETRIC ACCURACY

2.4.1 T Channel Radiometric Accuracy (3.2.1.1.4.1 a,b,c)

The overall one sigma accuracy of the OLS #14 T Channel DC response is 0.71•K compared to a 1.1•K spec and therefore OLS #14 does meet this specification requirement.

Table 2.4.1-1 presents the overall summary of performance, which is discussed more fully in sections 2.4.1.1, 2.4.1.2 and 2.4.1.3.

ATTACHMENTS:

Table 2.4.1-1	Overall Contributors
Table 2.4.1-2	210• to 310•K Best Straight Line Calibrations
Table 2.4.1-2A	210• to 310•K Best Straight Line Calibrations with Gain Compensation
Table 2.4.1-3	T DC Response Compilation of Test Runs
Table 2.4.1-3A	T DC Response Compilation of Test Runs with Gain Compensation
Table 2.4.1-4	BSL Equation T Right, Run #11
Table 2.4.1-5	BSL Equation T Mid, Run #11
Table 2.4.1-6	BSL Equation T Left, Run #11
Figure 2.4.1-1	T DC Response Plots, Run #1 - Primary
Figure 2.4.1-2	T DC Response Plots, Run #1 - Redundant
Figure 2.4.1-3	T DC Response Plots, Run #2 - Primary
Figure 2.4.1-4	T DC Response Plots, Run #2 - Redundant
Figure 2.4.1-5	T DC Response Plots, Run #9 - Primary
Figure 2.4.1-6	T DC Response Plots, Run #9 - Redundant
Figure 2.4.1-7	T DC Response Plots, Run #10- Primary
Figure 2.4.1-8	T DC Response Plots, Run #10- Redundant
Figure 2.4.1-9	T DC Response Plots, Run #11- Primary
Figure 2.4.1-10	T DC Response Plots, Run #11- Redundant

TABLE 2.4.1-1

OLS #14

OVERALL CONTRIBUTORS TO T-CHANNEL RADIOMETRIC ACCURACY

SPECIFICATION PARA. 3.1.4.1	RMS DEVIATION (•K)	SPECIFICATION MAX ONE SIGMA ERROR (•K)
a) Repeatability (<1 day)	0.24	0.42
b) Stability (>1 day)	0.61	0.80
c) Fixed Deviations	0.27	0.60
TOTAL (RSS) ACCURACY	0.71	1.10

Discussion of T DC Response Test and Overview

The measurement of T DC Response is accomplished in the thermal vacuum chamber because the T detector must be cooled to its operating temperature of near 110•K. Two controlled blackbody targets variable in temperature over the dynamic range of 190•K to 310•K provide the absolute infrared radiance reference. The temperature of each target is measured by five thermocouples which have been calibrated against a precision platinum resistance temperature standard. The five thermocouples provide target temperature gradient information to indicate target stability as well as the capability to average the five for the reference target temperature. T Channel DC Response consists of comparing the average target temperature to the channel output voltage at the input to the A/D converters for several target temperatures.

Eleven vacuum runs were made on OLS #14. The T DC Response data from vacuum runs (1 through 11) is compiled in Table 2.4.1-2 and -3, which show the equipment temperature environments and characteristics of each run. The column headed "Data Points" indicates how many target temperatures were in that run. The characteristics of the response itself are indicated in three columns each for T LFT, T MID and T RGT. The compared channel response to target temperature results in a difference for each data point. This difference is corrected for M1 Temperature so that all data for a given run reflect the same M1 temperature and the expected shaper circuit difference is subtracted. In this form the difference data for a given run should ideally be a linear function to target temperature. A linear least- squares fit to the corrected data is used to determine the equation of the best straight line (BSL). In Table 2.4.1-2 the slope error, the 210°K ordinate and the RMS data fit values for these different BSL's are listed in the columns headed Slope, Ordinate at 210°K, and RMS Dev.

In order to distinguish between gain and bias type effects caused by environment, the 310•K value that results when the 210•K BSL value is forced to zero difference is also calculated. Table 2.4.1-3 shows the pre-shaper % gain Difference from Nominal, the Bias Diff. from Nominal (at 190•K) where the pre-shaper Gain is forced to nominal, and the M1 temperature coefficient (K factor); in three columns each for TRGT, TMID and TLEFT.

Tables 2.4.1-4, -5 and -6 show the STS computer processed T DC Response Data of the final "Orbit Nominal" Run (Run #11) for TRGT, TMID, and TLEFT respectively. The fourth line down in the body of the Best Straight Line Equation, "RMS Deviation", is the RMS error (for 210•K to 310•K) of the data points fitted to the best straight line. "FP" is T Fine Primary; "FB" is T Fine, Backup (Redundant); "SP" is T Smoothed, Primary; "SB" is T Smoothed, Backup (redundant). The SP and SB are not used for T Right Only or for T Left Only in the Primary or Redundant normal modes; these are utilized only in the Fallback (slightly degraded) modes of operation. SP and SB are applicable to T Mid in normal Primary or Redundant modes.

Runs 1 and 2 together indicate the changes which accompany operation over the foreoptics cold-to-warm temperature range as indicated by M1 temperature.

Runs 3 and 4 or runs 5 and 6 together indicate the magnitude of the variation over the extremes of SSS temperature, (+11• to -3•C); when compared to the +4•C and +5•C SSS run pairs with the corresponding M1 temperatures, (Runs 2 and 1, respectively). However, changes between these runs are not only due to SSS temperature differences. The PSU, which contains the shaper networks was varied in temperature along with the SSS, from a low of -0.4•C to a high of +38.2•C.

Figures 2.4.1-1 through 2.4.1-10 inclusive show, for Runs No. 1 and 2, and runs No. 9 through 11, (respectively), the test data points for Targets 1 and 2 and the BSL plots for Right, Mid, and Left. (No BSL data plot was obtained for Runs 3 through 8).

The OLS #14 average M1 coefficient (coupling factor) measured for the final run (#11) was 0.185•K at 210•K scene per 1•C temperature change of M1. The lower the M1 coefficient value, the better the performance. The T Clamp leakage was +0.150% T LEFT and +0.083% Tu RIGHT.

The Orbit Nominal BSL differences (from Table 2.4.1-4,5 and 6) between Fine Primary and Fine Backup are small, the largest being 0.43•K for T Left, at the 310•K end. In the Smooth Primary and Backup modes, T Left differs by 0.39•K (at 310•K).

The difference between T LEFT and T RIGHT segments calibration (from Tables 2.4.1.3-4 and 5) is 0.63•K worst-case, vs. a spec limit of 1.0•K.

At the completion of testing, the T channel gain pots were readjusted to set $T_{RGT} = T_{LFT} = 4$ and to eliminate the channel gain imbalance.

TABLE 2.4.1-2
OLS #14
210° TO 310°K BEST STRAIGHT LINE CALCULATIONS

DATE	RUN#	R/L TG	TL	# OF DATA POINTS	TEMPERATURE °C			T RIGHT			T MID			T LEFT			COMMENTS
					SSS	M1	PSU	SLOPE	ORD. @ 210°	RMS DEV	SLOPE	ORD. @ 210°	RMS DEV	SLOPE	ORD. @ 210°	RMS DEV	
2/14/93	1	3/3	14	14	5.1	-8.0	26.2	.0006	0.00	0.05	.0039	-0.05	0.06	.0104	-0.63	0.08	Cold Optic Limit
2/20/93	2	3/3	11	6	4.1	12.1	25.8	-.0059	0.50	0.05	-.0052	0.59	0.05	.0011	0.12	0.03	Hot Optic Limit
2/23/93	3	3/3	11	2	11.2	15.1	37.7	-.0080	0.59	0.00	-.0067	0.52	0.00	-.0005	-0.14	0.00	Hot Soak #1
2/25/93	4	3/3	14	2	-2.4	-10.5	-0.4	.0021	0.52	0.00	.0043	0.58	0.00	.0112	-0.01	0.00	Cold Soak #1
2/28/93	5	3/3	11	2	11.0	15.6	38.2	-.0098	0.63	0.00	-.0079	0.55	0.00	-.0028	0.03	0.00	Hot Soak #2
3/02/93	6	3/3	14	2	-3.3	-11.1	0.2	-.0002	0.64	0.00	.0030	0.65	0.00	.0094	0.07	0.00	Cold Soak #2
VACUUM BREAK																	
3/16/93	7	3/3	13	2	5.0	-6.9	23.8	.0010	0.05	0.00	.0033	0.03	0.00	.0103	-0.64	0.00	Cold Optic Limit
3/17/93	8	3/3	10	2	3.7	12.4	23.6	-.0088	0.81	0.00	-.0094	0.99	0.00	-.0029	0.43	0.00	Hot Optic Limit
3/18/93	9	3/3	10	7	5.9	12.2	33.3	-.0079	0.64	0.11	-.0072	0.73	0.09	-.0018	0.27	0.04	Hot Limit
3/24/93	10	3/3	13	7	2.2	-8.0	4.5	.0017	0.37	0.04	.0034	0.40	0.02	.0094	-0.12	0.08	Cold Limit
3/31/93	11	3/3	13	18	4.8	-7.8	23.7	-.0020	0.24	0.03	-.0001	0.24	0.04	.0063	-0.35	0.05	Nominal

T DC RESPONSE COMPILATION OF TEST RUNS W/O GAIN COMPENSATION

DATE	RUN #	R/L TG	TL	# OF DATA POINTS	TEMPERATURE °C			T RIGHT			T MID			T LEFT			COMMENTS
					SSS	M1	PSU	% GAIN DIFF. FROM NOM.	BIAS DIFF. FROM NOM.	K FACTOR	% GAIN DIFF. FROM NOM.	BIAS DIFF. FROM NOM.	K FACTOR	% GAIN DIFF. FROM NOM.	BIAS DIFF. FROM NOM.	K FACTOR	
2/14/93	1	3/3	14	14	5.1	-8.0	26.2	0.08	0.02	.176	0.52	0.08	.183	0.93	-0.65	.190	Cold Optic Limit
2/20/93	2	3/3	11	6	4.1	12.1	25.8	-0.40	0.61	.176	-0.20	0.82	.183	0.28	0.27	.190	Hot Optic Limit
2/23/93	3	3/3	11	2	11.2	15.1	37.7	-0.62	0.64	.176	-0.49	0.59	.183	-0.21	-0.29	.190	Hot Soak #1
2/25/93	4	3/3	14	2	-2.4	-10.5	-0.4	0.82	1.00	.176	1.21	1.18	.183	1.66	0.43	.190	Cold Soak #1
2/28/93	5	3/3	11	2	11.0	15.6	38.2	-0.86	0.62	.176	-0.65	0.58	.183	-0.39	-0.10	.190	Hot Soak #2
3/02/93	6	3/3	14	2	-3.3	-11.1	0.2	0.59	1.11	.176	1.08	1.25	.183	1.47	0.49	.190	Cold Soak #2
VACUUM BREAK																	
3/16/93	7	3/3	13	2	5.0	-6.9	23.8	0.19	0.13	.177	0.51	0.20	.187	0.91	-0.66	.192	Cold Optic Limit
3/17/93	8	3/3	10	2	3.7	12.4	23.6	-0.52	1.05	.177	-0.44	1.34	.187	-0.01	0.64	.192	Hot Optic Limit
3/18/93	9	3/3	10	7	5.9	12.2	33.3	-0.55	0.77	.177	-0.35	0.97	.187	-0.01	0.40	.192	Hot Limit
3/24/93	10	3/3	13	7	2.2	-8.0	4.5	0.61	0.73	.177	0.90	0.87	.187	1.28	0.20	.192	Cold Limit
3/31/93	11	3/3	13	18	4.8	-7.8	23.7	-0.06	0.34	.177	0.21	0.42	.187	0.59	-0.35	.192	Nominal

TABLE 2.4.1-4

OLS NUMBER 14

T RGT DATA OF 03/29/93
SSS AT 4.8°C
M1 AT -7.8°C
PSU TEMP = 23.7°C
M1 Coefficient = 0.177 K/C
T GAIN = 3
T LEVEL = 13
V2 <T Clamp> = 1.64497
K9 <TL Step Size> = .9237

BEST STRAIGHT LINE EQUATION

	FP	(Δ)	FB	SP	(Δ)	SB
BSL SLOPE	-0.0020	-	-0.0040	-0.0019	-	-0.0046
BSL AT 190K<K>	0.28	(.14)	0.14	0.29	(.09)	0.20
BSL AT 210K<K>	0.24	(.18)	0.06	0.25	(.14)	0.11
BSL AT 310K<K>	0.04	(.38)	-0.34	0.06	(.41)	-0.35
RMS DEVIATION<K>	0.03	-	0.03	0.04	-	0.05
BSL AT 310K; 190 AT OV<K>	-0.05	-	-0.39	-0.03	-	-0.42
% CHANGE FROM NOM GAIN	-0.06	-	-0.54	-0.04	-	-0.58
BIAS DIFF FROM NORMAL 190K<K>	0.34	-	-0.08	0.36	-	-0.02

TABLE 2.4.1-5

NUMBER 14
T MID DATA OF 03/29/93
SSS AT 4.8°C
M1 AT -7.9°C
PSU TEMP = 23.7°C
M1 Coefficient = 0.187 K/C
T GAIN = 0
T LEVEL = 13
V2 <T Clamp> = 1.62435
K9 <TL Step Size> = 0.9237

BEST STRAIGHT LINE EQUATION

	FP	(Δ)	FB	SP	(Δ)	SB
SLOPE	-0.0001	-	-0.0030	-0.0005	-	-0.0032
AT 190K<K>	0.24	(.07)	0.17	0.30	(.08)	0.22
AT 210K<K>	0.24	(.13)	0.11	0.30	(.14)	0.16
AT 310K<K>	0.22	(.41)	-0.19	0.25	(.41)	-0.16
DEVIATION<K>	0.04	-	0.05	0.05	-	0.05
AT 310K; 190 AT OV<K>	0.15	-	-0.24	0.16	-	-0.23
HANGE FROM NOM GAIN	0.21	-	-0.33	0.22	-	-0.32
S DIFF FROM ORMAL 190K<K>	0.42	-	0.07	0.51	-	0.14

TABLE 2.4.1-6

OLS NUMBER 14

T LFT DATA OF 03/29/93
SSS AT 4.8°C
M1 AT -8.0°C
PSU TEMP = 23.7°C
M1 Coefficient = 0.192 K/C
T GAIN = 3
T LEVEL = 13
V2 <T Clamp> = 1.61241
K9 <TL Step Size> = .9237

BEST STRAIGHT LINE EQUATION

	FP	(Δ)	FB	SP	(Δ)	SB
BSL SLOPE	0.0063	-	0.0025	0.0055	-	0.0027
BSL AT 190K<K>	-0.48	(.02)	-0.46	-0.41	(.04)	-0.45
BSL AT 210K<K>	-0.35	(.06)	-0.41	-0.30	(.10)	-0.40
BSL AT 310K<K>	0.27	(.43)	-0.16	0.26	(.39)	-0.13
RMS DEVIATION<K>	0.05	-	0.04	0.04	-	0.02
BSL AT 310K; 190 AT 0V<K>	0.43	-	-0.02	0.39	-	0.01
% CHANGE FROM NOM GAIN	0.59	-	-0.02	0.54	-	0.02
BIAS DIFF FROM NORMAL 190K<K>	-0.35	-	-0.62	-0.28	-	-0.58

New K FACTORS
CORRECTED TO TLVL=14

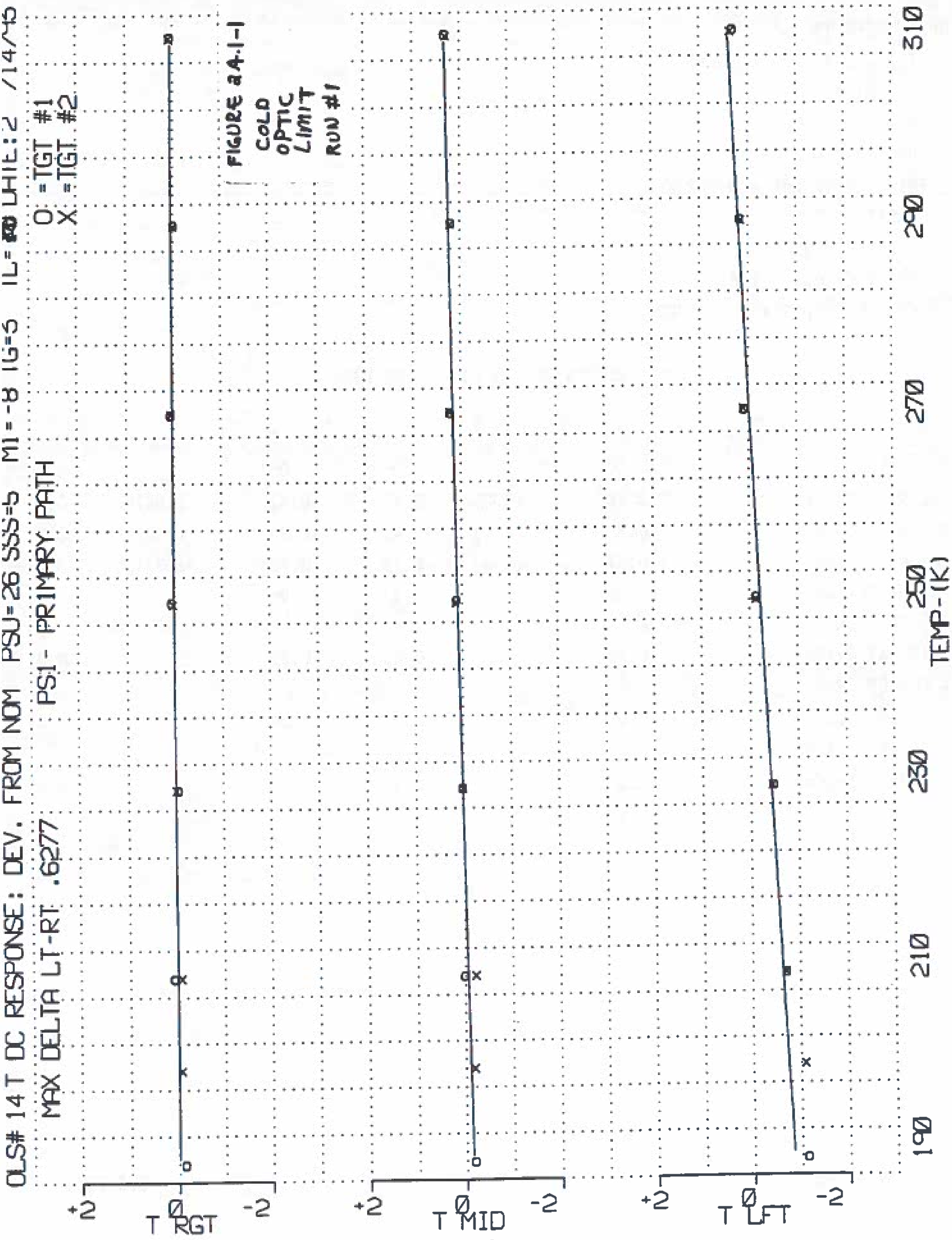


FIGURE 2.4.1-1
COLD
OPTIC
LIMIT
RUN #1

2-100

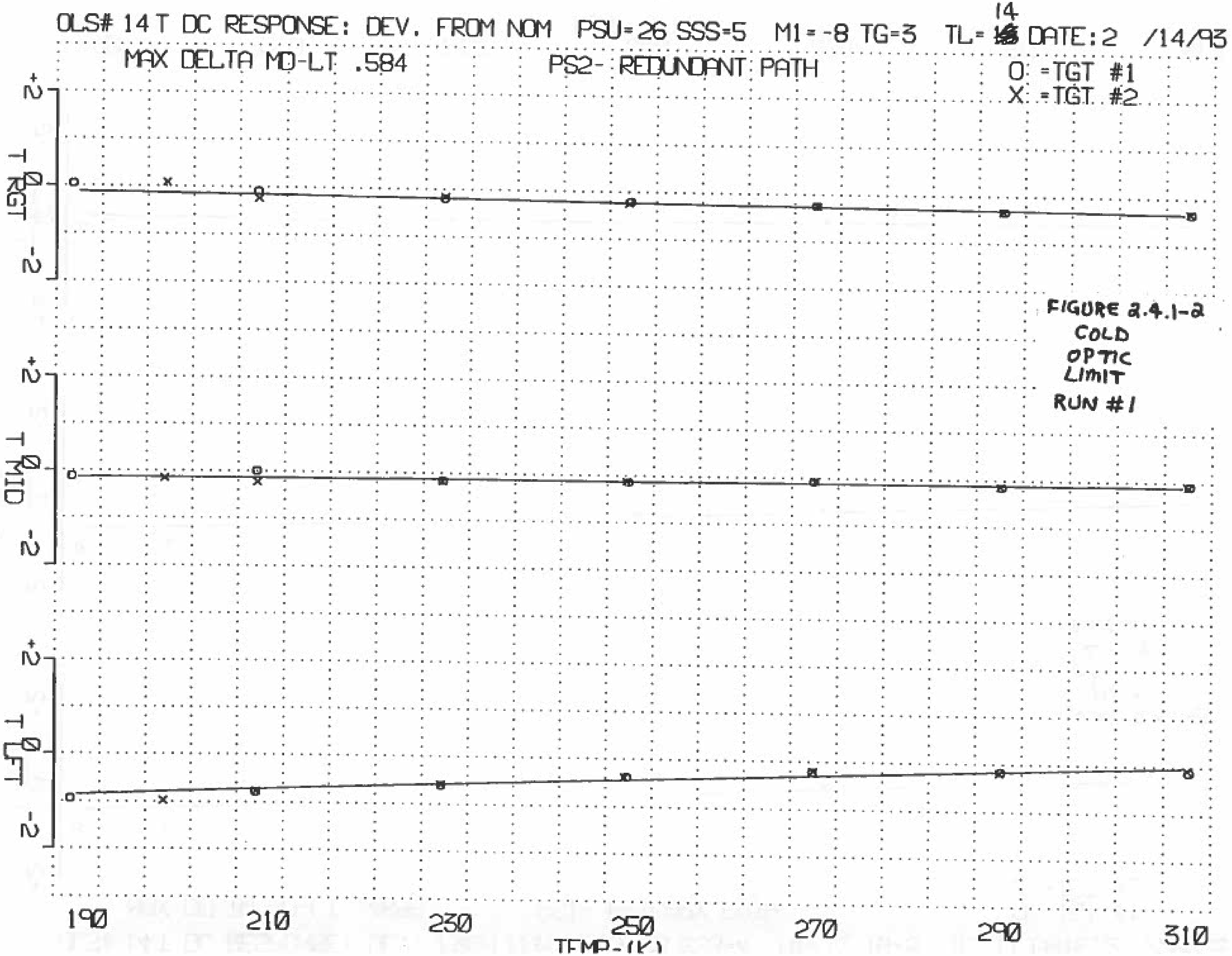


FIGURE 2.4.1-2
COLD
OPTIC
LIMIT
RUN #1

New K factors
corrected to $T_{LVL}=14$

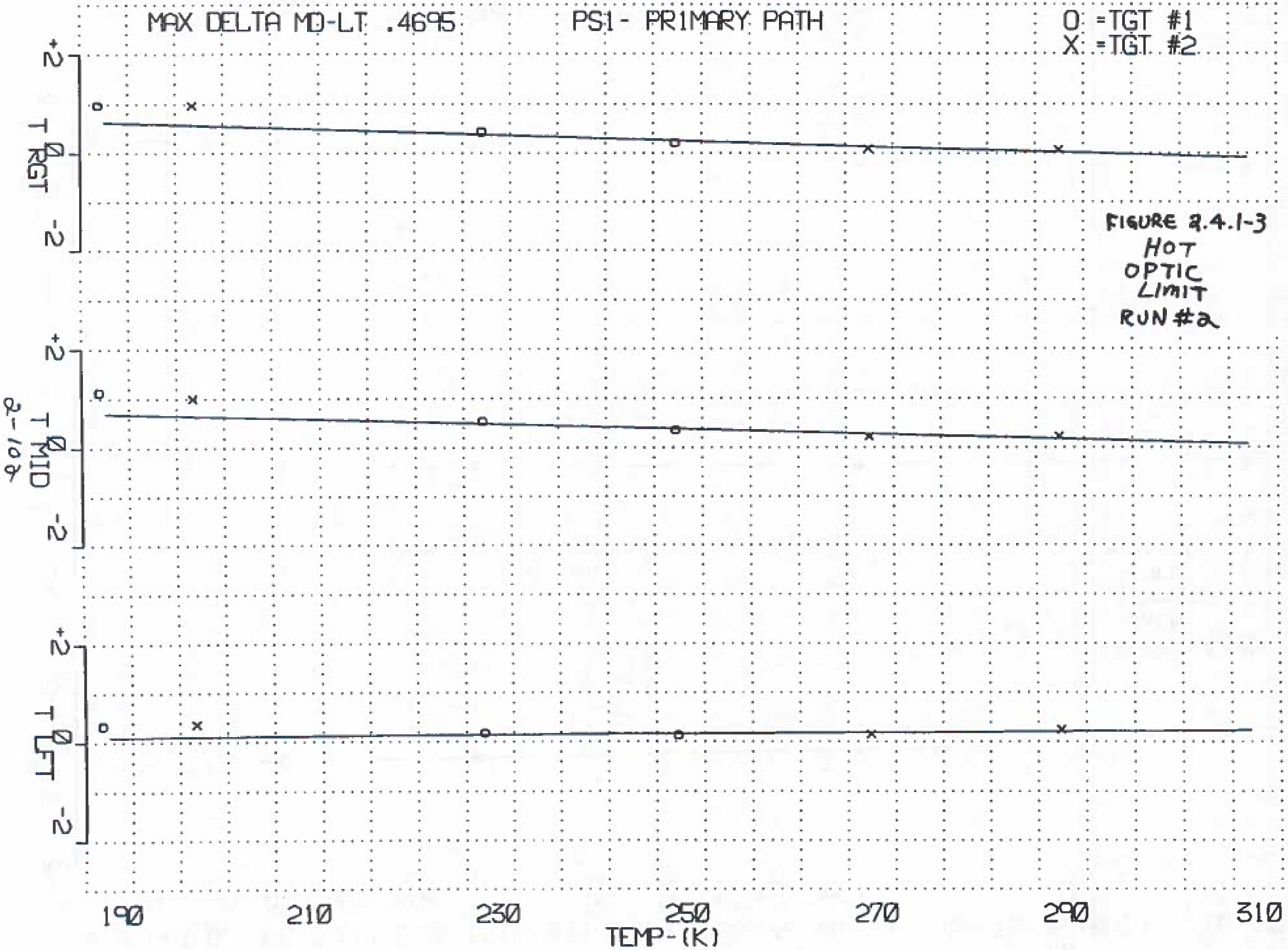


FIGURE 2.4.1-3
HOT
OPTIC
LIMIT
RUN #2

OLS# 14 T DC RESPONSE: DEV. FROM NOM PSU=26 SSS=4 M1=12 TG=3 TL=11 DATE:2 /20/93

MAX DELTA MD-LT .4311 PS2- REDUNDANT PATH

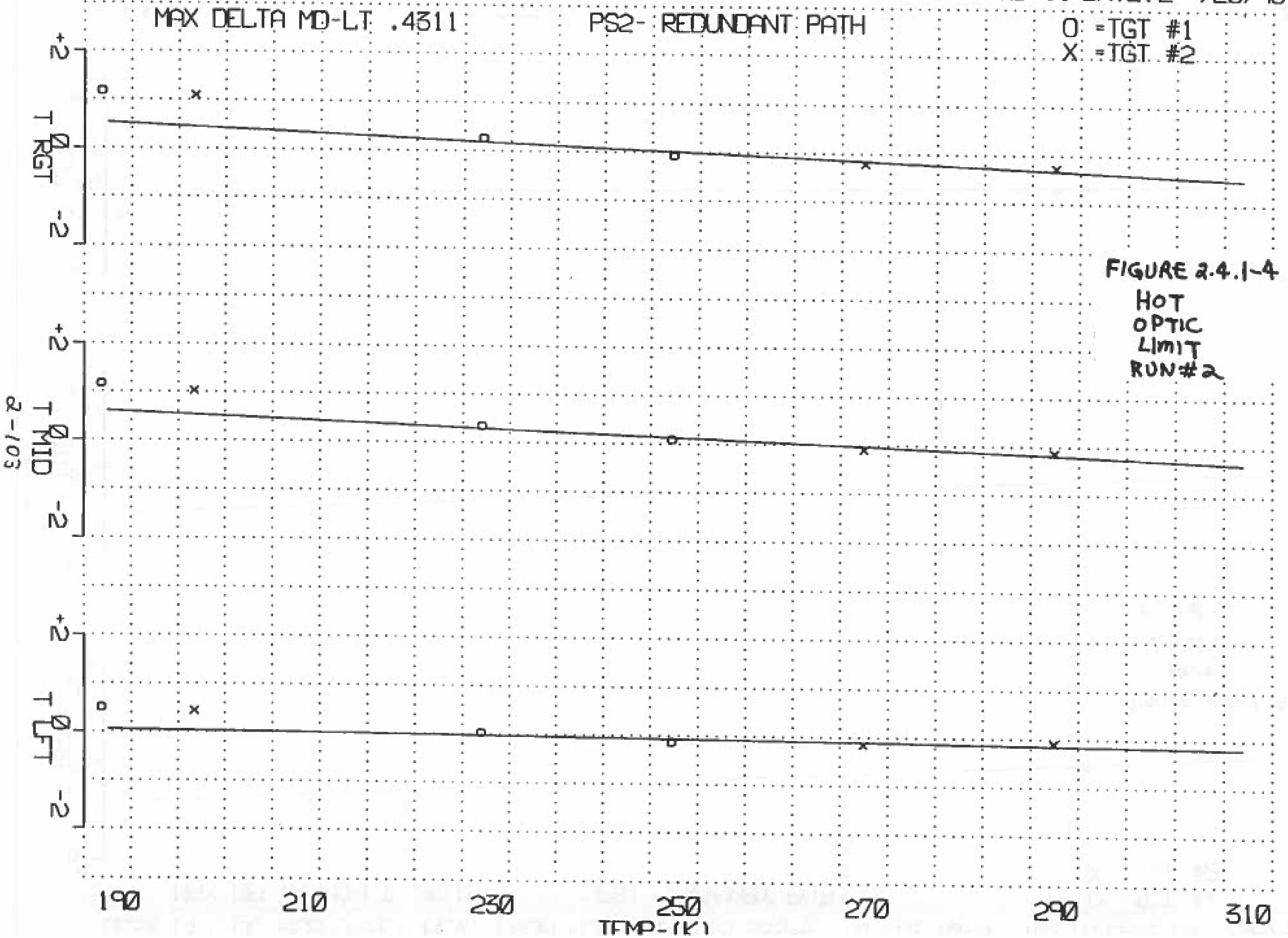


FIGURE 2.4.1-4
HOT
OPTIC
LIMIT
RUN#2

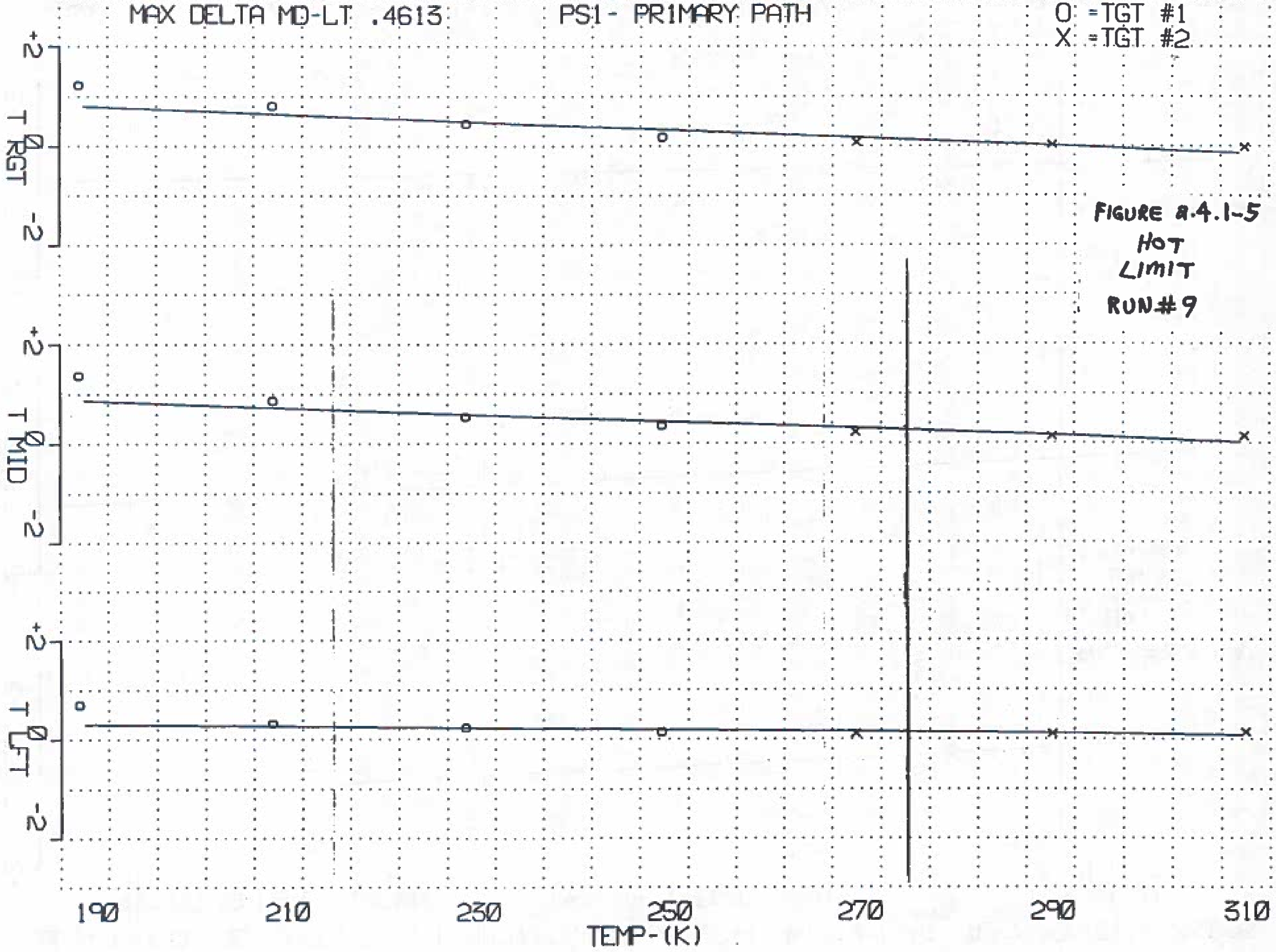


FIGURE 2.4.1-5
HOT
LIMIT
RUN#9

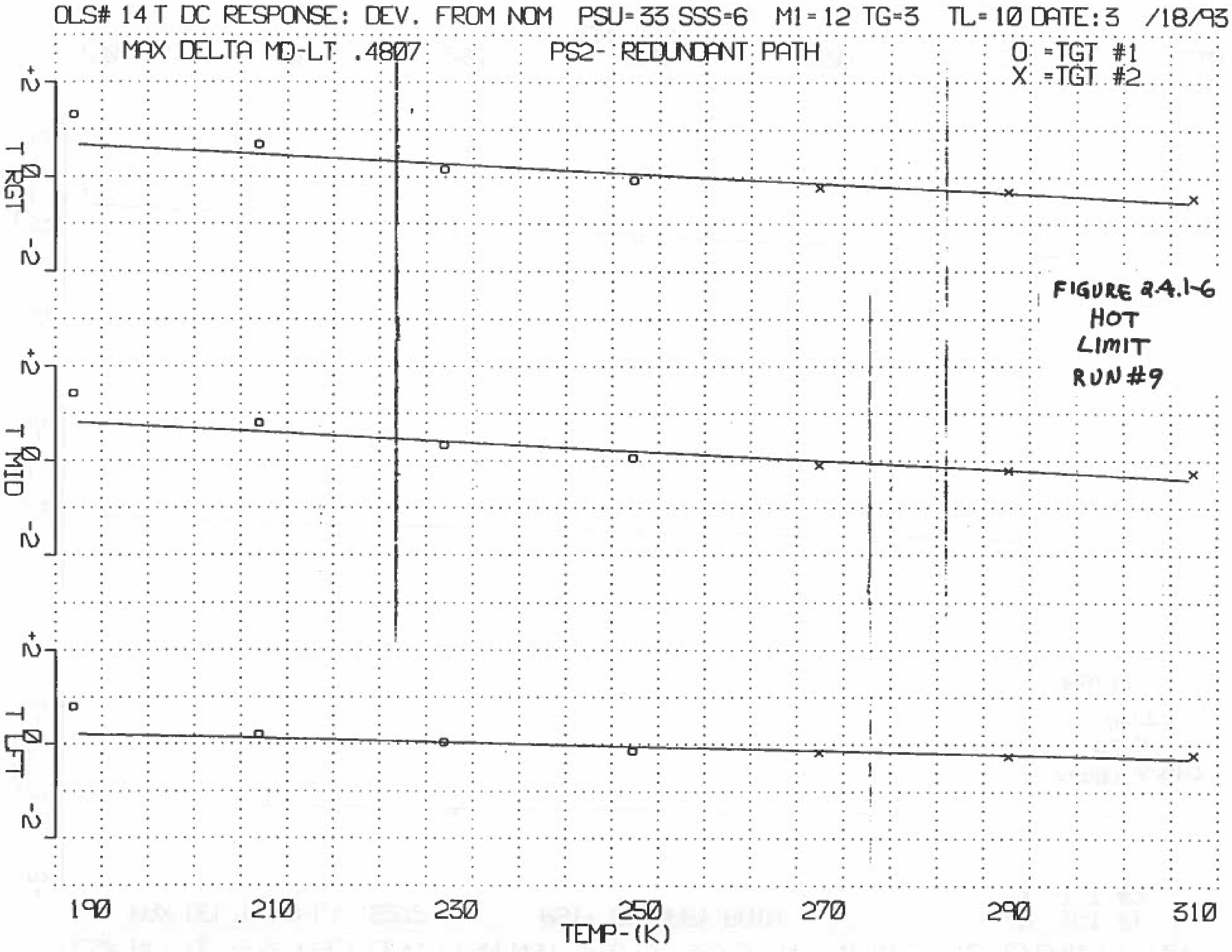


FIGURE 2.4.1-6
HOT
LIMIT
RUN #9

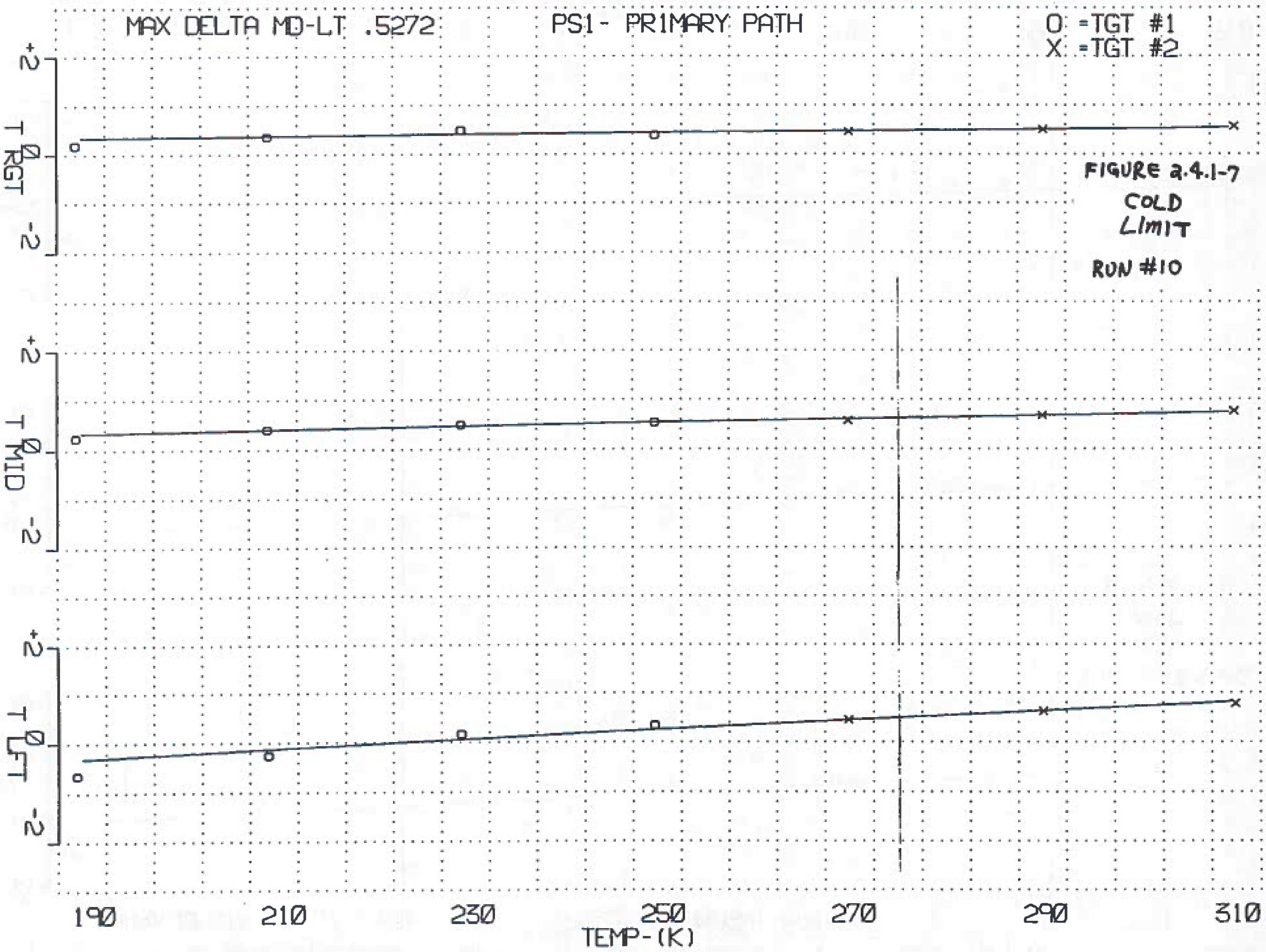


FIGURE 2.4.1-7
COLD
LIMIT

RUN #10

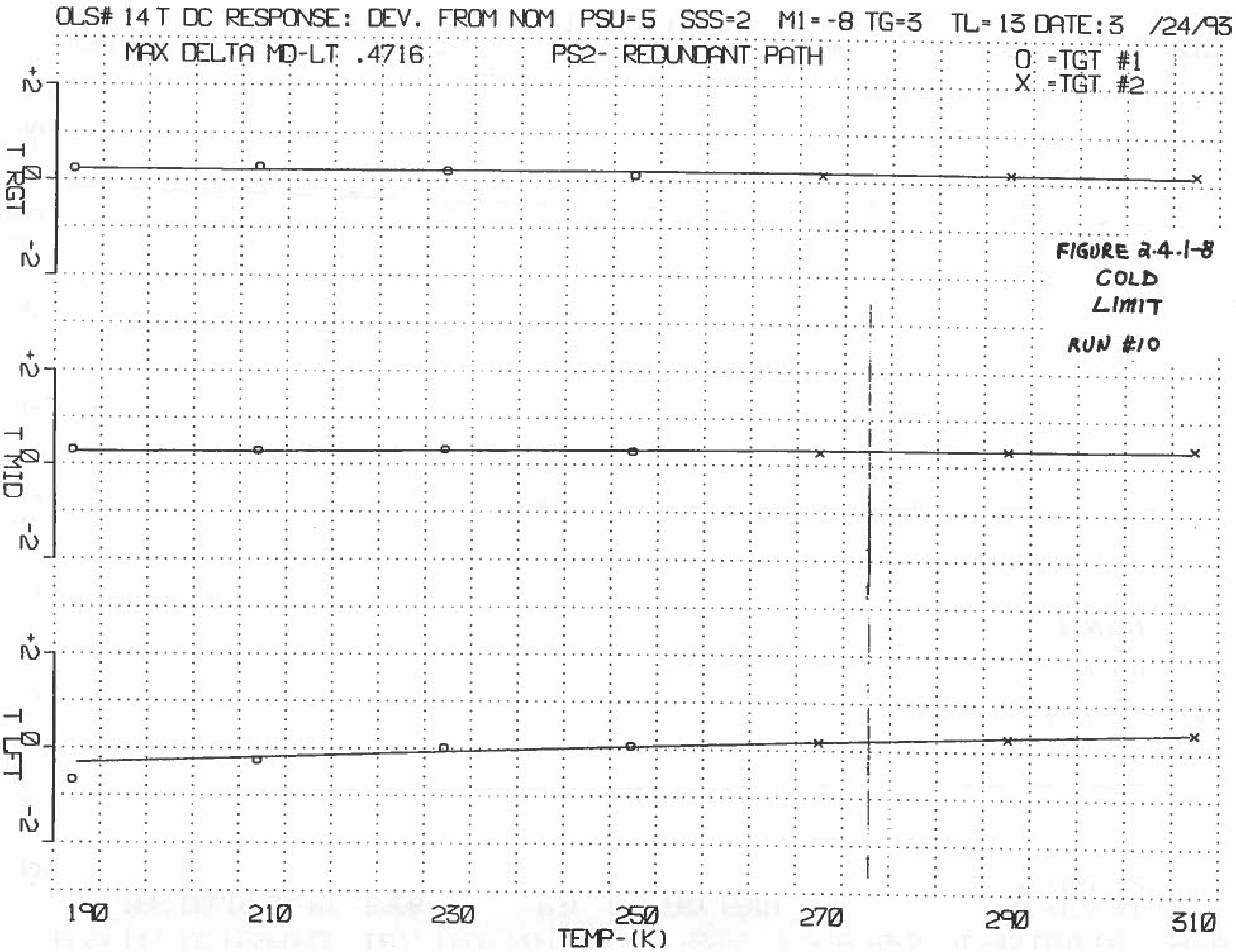


FIGURE 2.4.1-8
COLD
LIMIT

RUN #10

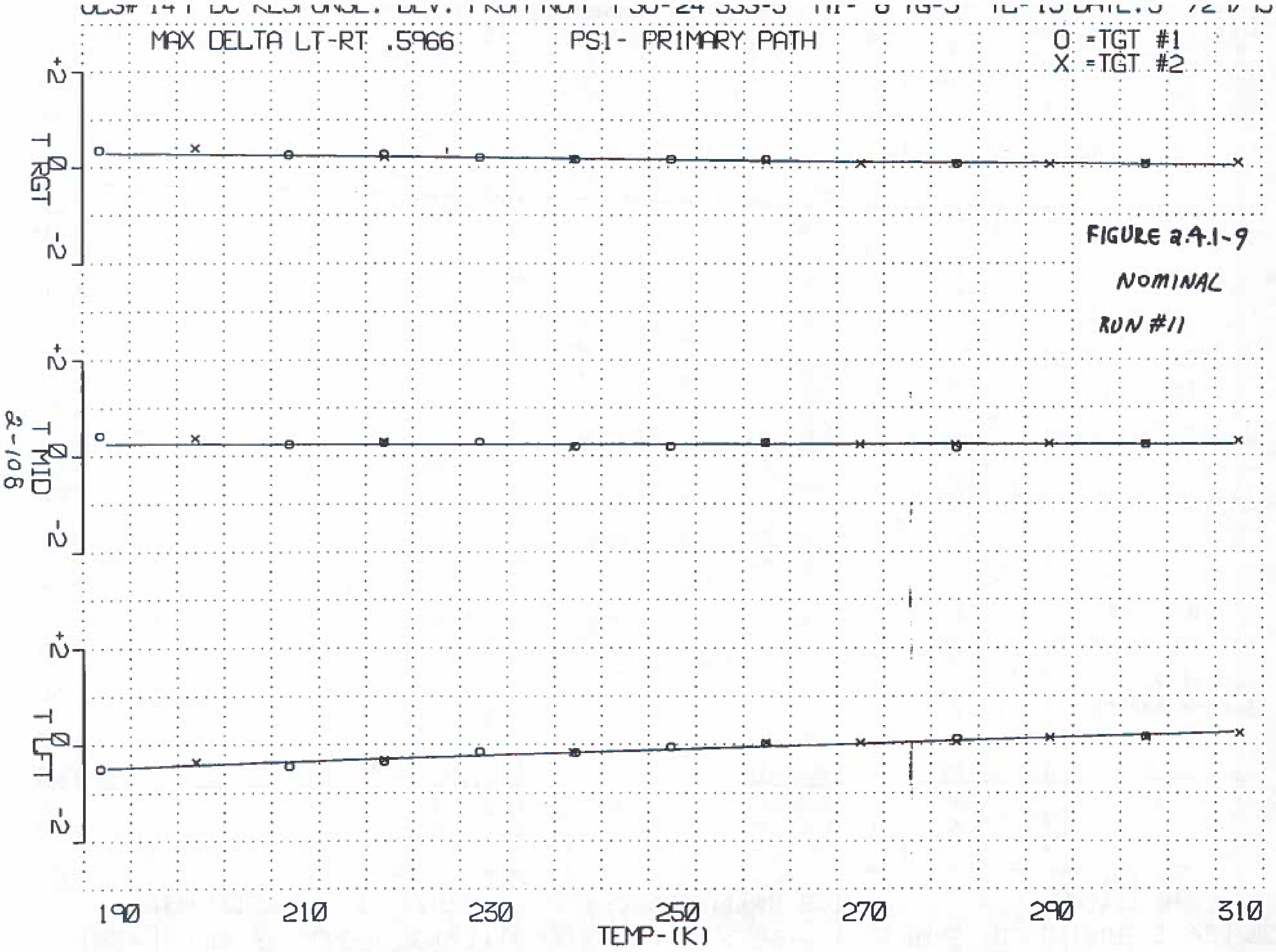
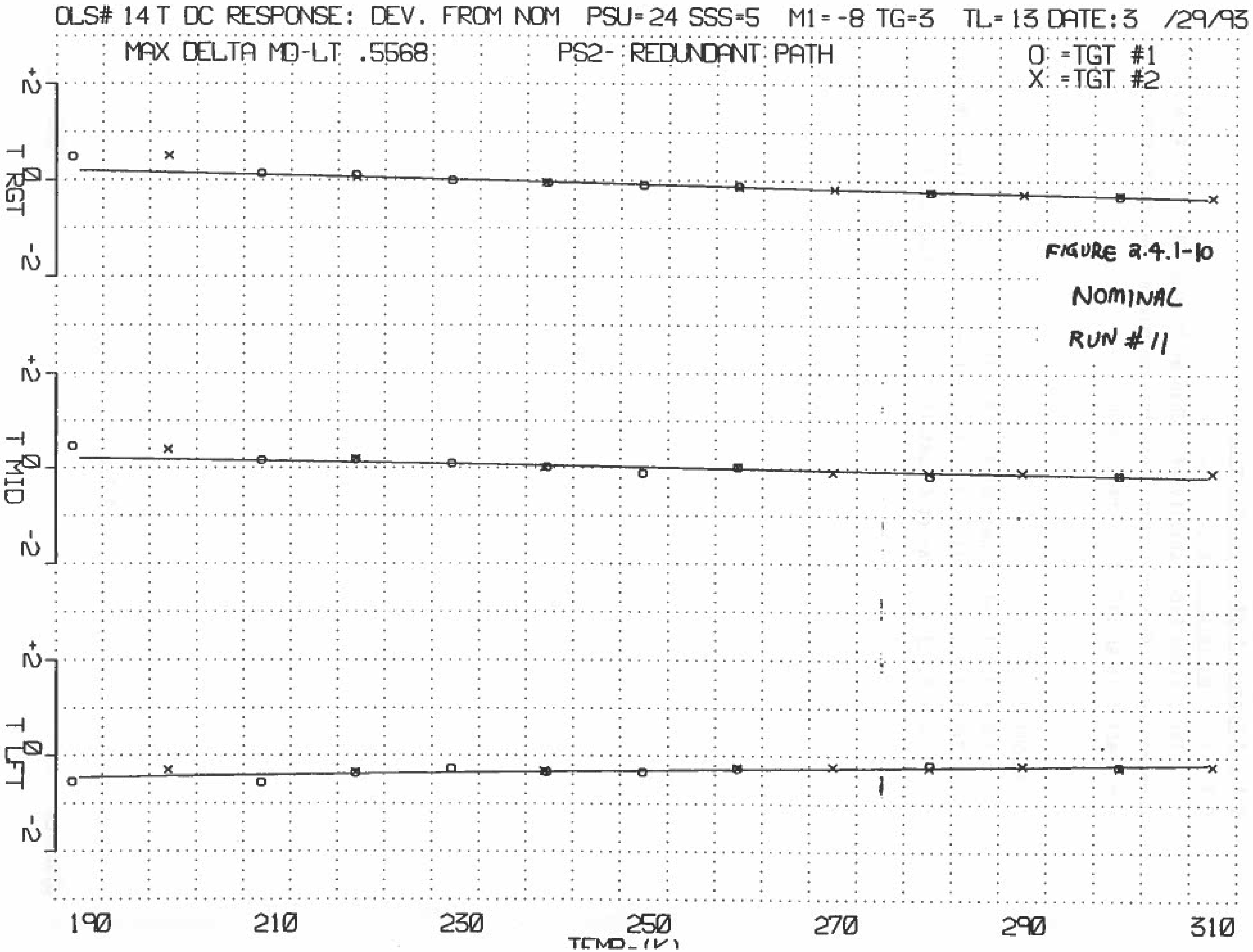


FIGURE 2.4.1-9
NOMINAL
RUN #11



OLS# 14 T DC RESPONSE: DEV. FROM NOM PSU=24 SSS=5 M1=-8 TG=3 TL=13 DATE:3 /29/93

MAX DELTA MD-LT .5568 PS2- REDUNDANT PATH

FIGURE 2.4.1-10

NOMINAL

RUN #11

2.4 RADIOMETRIC ACCURACY

2.4.1 T Channel Radiometric Accuracy (Cont'd)

2.4.1.1 Repeatability (3.2.1.1.4.1a)

The 1 sigma Repeatability of T Channel DC Response is 0.241•K compared to a 0.42•K one sigma specification maximum and therefore OLS #14 does meet this specification requirements.

ATTACHMENTS

Table 2.4.1.1-1	Repeatability Contributors
Table 2.4.1.1-2	Gain and Bias Variations with Temperature Change
Table 2.4.1.1-3	Target Crosstalk, T Clamp Leakage Data

TABLE 2.4.1.1-1
OLS #14
REPEATABILITY CONTRIBUTORS SUMMARY

ERROR SOURCE	ONE SIGMA ERROR (K•)
1. Diurnal M1 Temperature Change (4•C)	
A. Quantization of T Level Command	0.17
B. Inability to Compensate Actual Effect Exactly	0.060
2. Temperature Change PSU ± 4.5•C, SSS ± 1•C	
A. Effect due to Gain Change	0.033*
B. Effect due to Bias Change	0.043*
3. T Clamp Shaper Compensation	0.08
4. T Clamp Leakage	0.128*
TOTAL RSS REPEATABILITY ERROR (•K)	0.241
SPECIFICATION LIMIT, •K, ONE SIGMA	0.42 MAXIMUM

*FROM TEST DATA (REDUCED)

Discussion of Repeatability Calculations

1. Dinurnal M1 Temperature Change

A. The effects of M1 temperature (more properly the foreoptics temperature) are a Repeatability error source. The foreoptics thermal time constant is short enough to permit significant diurnal temperature variations. The ability to compensate for foreoptics temperature using the T Level command greatly reduces this error but does not eliminate it. Although calculations enabling ground compensation smaller than the quantization of the T Level command are possible, it is herein assumed that they will not generally be made. Therefore an error is ascribed due to the T Level quantization as follows:

0.294°K RMS T Level Cmd. Quantization Error at 210°K (1.02° x $1/\sqrt{12}$)
x 0.564 RMS Temperature Linearity Effects over 210-310°K dynamic range
= 0.17°K RMS error

B. The fact that foreoptics temperature effect cannot be accurately predicted by the single monitor of M1 temperature means that in times of sharp transition the ability to compensate is impaired. It has been assumed that this error may be represented by a 1°C lag in M1 temperature during the 1/3 of the orbit that sharp transistions occur. Therefore the inability to compensate the actual effect is ascribed the following error:

	1°C___	Lag in M1 Temperature
x	$1/\sqrt{3}$	RMS Over total orbit
x	0.185	T Left T Mid T Right average sensitivity coefficient of video at 210K to M1 temperature change for OLS #14 (K factor)
x	0.564	Temperature Linearity Effects over dynamic range.
=	0.060°K	RMS error

Discussion of Repeatability Calculations

Total T channel gain change with temperature may be broken down into two components as follows:

$$\text{Total Gain } \Delta = [(\text{PSU } \Delta T) \times P_G] + [\text{SSS } \Delta T) \times S_G]$$

where:

P_G = PSU coefficient of gain, % per •C.

S_G = SSS coefficient of gain, % per •C.

Similarly for bias changes with temperature:

$$\text{Total Bias } \Delta = [(\text{PSU } \Delta T) \times P_B] + [(\text{SSS } \Delta T) \times S_B]$$

where:

P_B = PSU coefficient of bias, •K per •C.

S_B = SSS coefficient of bias, •K per •C.

Data from two pairs of runs designated A and B, were used to solve these equations simultaneously:

$$\begin{aligned}
\text{Gain } \Delta, \text{ Run A} &= G_A = (T_{PA})(P_G) + (T_{SA})(S_G) \\
\text{Gain } \Delta, \text{ Run B} &= G_B = (T_{PB})(P_G) + (T_{SB})(S_G) \\
\text{Bias } \Delta, \text{ Run A} &= B_A = (T_{PA})(P_B) + (T_{SA})(G_B) \\
\text{Bias } \Delta, \text{ Run B} &= B_B = (T_{PB})(P_B) + (T_{SB})(S_B)
\end{aligned}$$

where:

G = Total Gain change over temperature

B = Total Bias change over temperature

T_P = PSU Temperature change

T_S = SSS Temperature change

Solved simultaneously for the temperature sensitivity factors, these equations can be reduced to the following:

$$S_G = \frac{(T_{PA})(G_B) - (T_{PB})(G_A)}{(T_{PA})(T_{SB}) - (T_{PB})(T_{SA})}$$

$$P_G = \frac{G_A - (T_{SA})(S_G)}{T_{PA}}$$

$$S_B = \frac{(T_{PA})(B_B) - (T_{PB})(B_A)}{(T_{PA})(T_{SB}) - (T_{PB})(T_{SA})}$$

$$P_B = \frac{B_A - (T_{SA})(S_B)}{T_{PA}}$$

2. SSS and PSU Temperature Change: Effect On Gain Change

The effects of SSS and PSU temperature change on gains were determined from parametric analysis of the four runs in Table 2.4.1.1-2. Solving simultaneous equations yielded sensitivity coefficients of gain change for both SSS and PSU temperature change. Temperature data from 5D-2 systems currently on-orbit indicates that the worst case SSS temperature variations are 1•C while worst case PSU temperature variations are 4.5•C. Using the worst-case factors yields:

S_G = .035% Gain change per degree SSS change
x 1•C temperature change
x .31•K RMS over 210K to 310K range
x $1/\sqrt{3}$ for uniform temperature distribution
= .006 deg

P_G = -.040% Gain change per degree PSU change
x 4.5• temperature change
x .31•K RMS over 210K to 310K range
x $1/\sqrt{3}$ for uniform temperature distribution
= -.032 deg

RSS'ing these two contributors yields 0.033 degree total.

3. SSS and PSU Temperature Change, Effect On Bias Change

From Table 2.4.1.1-2:

S_B = .049 deg Bias change per degree SSS change
x 1• temperature change
x 0.564 RMS Temperature Linearization Effects, 210K to 310K
x $1/\sqrt{3}$ for uniform temperature distribution
= -.016 deg

P_B = -.027 deg Bias change per degree PSU change
x 4.5• temperature change
x 0.564 RMS Temperature Linearization Effects, 210K to 310K
x $1/\sqrt{3}$ for uniform temperature distribution
= -.040 deg

RSS'ing these two contributors yields 0.043 degree total.

4. T Clamp Shaper Compensation

The SSS temperature changes throughout each orbit are expected to cause a one sigma error of 0.146°K at 210K due to the compensation for T clamp temperature variation from 228K to 253K. This times the 0.564 RMS Temperature Linearitation Effect over the dynamic range equals 0.08°K RMS error.

5. T Clamp Leakage

An along scan variation (ASV) effect may be caused by some of the scene radiance being viewed at the time of T clamp during the overscan period getting into the reference T Clamp value. This can happen if the T detector sensitivity extends slightly beyond the boundaries of M4′ during the clamp time. The test performed for leakage is to view one target at 210°K during active scan while the other target (which is at the T Clamp angle) is varied over the 210° to 310°K dynamic range. This data is presented in Table 2.4.1.1-3. The effect on the response to the active scan target is attributed to the T clamp optical leakage.

Using the OLS #14 T data from Table 2.4.1.1-3, the T clamp leakage contribution can be calculated as follows:

$$\text{T clamp leakage ratio (LR)} = 100\% \times \Delta T \times \frac{\left.\frac{\partial P}{\Delta T}\right|_{214}}{\Delta P}$$

$$= \Delta T \times .50552\%$$

This calculation is performed in the MODE 4 data reduction of T121T221S. The ratio calculated is:

0.150% T LEFT

0.083% T RIGHT

The peak error from T clamp leakage (due to the 310• background) can be calculated as follows:

$$\text{peak error} = LR \times \Delta N \times \left(\frac{\partial P^{-1}}{\Delta T_{210}}\right) -1$$

$$= \Delta T \times \frac{\Delta N}{\Delta P} \times \frac{\frac{\partial P}{\Delta T}_{214}}{\frac{\partial P}{\Delta T}_{210}}$$

$$= \Delta T \times 0.8156 \times 1.0788$$
$$= \Delta T \times 0.880$$

where:

ΔP = Difference in radiance between 210• and 310•K

$= 16.742\ E\text{-}4\ w\ cm^{-2}\ sr^{-1}$ @ 310•K
$\underline{-\ 2.3468E\text{-}4}\ w\ cm^{-2}\ sr^{-1}$ @ 210•K

$= 14.395E\text{-}4\ \ w\ cm^{-2}\ sr^{-1}$

and: ΔN = Difference in radiance between 240• and 310•K

$= 16.742\ E\text{-}4\ w\ cm^{-2}\ sr^{-1}$ @ 310•K
$\underline{-\ 5.001\ E\text{-}4}\ w\ cm^{-2}\ sr^{-1}$ @ 240•K

$11.741\ E\text{-}4\ w\ cm^{-2}\ sr^{-1}$

$\frac{\partial P}{\Delta T_{210}}$ = slope of radiance curve at 210•K = 6.7452 E-6

$\frac{\partial P}{\Delta T_{214}}$ = slope of radiance curve at 214•K = 7.277 E-6

ΔT = measured change in response to 210• target as the background is varied from 210• to 310•K.

RMS ERROR = PEAK ERROR
x 0.7605 for RMS distribution of leakage radiance over dynamic range.
x 0.564 RMS Temperature Linearization Effect

FROM MODE 4 Data reduction:

Calculated RMS leakage error = 0.128•K T LEFT
= 0.071•K T RIGHT

The worst-case contribution to repeatability error by T-clamp leakage is therefore 0.128•K RMS.

TABLE 2.4.1.1-2

OLS #14

GAIN AND BIAS VARIATIONS WITH TEMPERATURE CHANGE (M1 TEMP CORRECTED TO +12·C OR -8·C)

		SSS TEMP	PSU TEMP	T RGT		T MID		T LFT	
				% GAIN DELTA (%)	BIAS CHG. @ 190·K (·K)	% GAIN DELTA (%)	BIAS CHG. @ 190·K (·K)	% GAIN DELTA (%)	BIAS CHG. @ 190·K (·K)
MI = -8·C (Run A)	RUN 11 (NOMINAL)	4.8	23.7	-0.06	0.34	0.21	0.42	0.59	-0.35
	RUN 10 (COLD LIMIT)	2.2	4.5	0.61	0.73	0.90	0.87	1.28	0.20
	RUN 11-RUN 10	2.6 T_{SA}	19.2 T_{PA}	-0.67 G_A	-0.39 B_A	-0.69 G_A	-0.45 B_A	-0.69 G_A	-0.55 B_A
M1=+12·C (Run B)	RUN 3 (HOT SOAK #1)	11.2	37.6	-0.62	0.64	-0.49	0.59	-0.21	-0.29
	RUN 2 (HOT OPTIC LIMIT)	4.1	25.8	-0.40	0.61	-0.20	0.82	0.28	0.27
	RUN 3-RUN 2	7.1 T_{SB}	11.8 T_{PB}	-0.22 G_B	0.03 B_B	-0.29 G_B	-0.23 B_B	-0.49 G_B	-0.56 B_B
Calculated Sensitivity Factors		SSS:	S_G (%/·C) S_B (%/·C)	0.0349*	0.0490*	0.0244	0.0085	-0.0120	-0.0403
		PSU:	P_G (%/·C) P_B (%/·C)	-0.0396*	-0.0269*	-0.0392	-0.0246	-0.0343	-0.0232

*WORST CASE VALUES

TABLE 2.4.1.1-3
OLS #14
TARGET CROSSTALK, T CLAMP LEAKAGE DATA*

SSS = +5°
M1 = -8°

	T RIGHT	T MID	T CPL	T CPR	T LEFT	
T1 210° [T2 @ 310°] (T121T231G)	-1.10	-1.16	-1.77	-0.78	-1.90	02-14-93
Difference, ΔT	0.07	0.11	0.01	0.00	0.18	
T1 210° [T2 @ 210°] T121T221S	-1.03	-1.05	-1.77	-0.78	-1.72	02-15-93
Worst Case Data From T121T221S.ST Mode 4 Data Reduction: 2/15/93						
T clamp leakage ratio is			0.150%	0.083%		
Peak leakage error at 210°K is			0.261 K	0.145 K		
RMS leakage error at 210°K is			0.128 K	0.071 K		

*Data is FP Deviation in °K

2.4 Radiometric Accuracy

2.4.1 T Channel Radiometric Accuracy (Cont'd)

2.4.1.2 Stability (3.2.1.1.4.1b)

The T Channel Radiometric Accuracy (Stability) analysis in the OLS 5D-3 System Summary Report Paragraph 3.5.1.2, predicts 0.61•K 1 sigma error in stability compared to the 0.8•K maximum specification requirement. This calculation is applicable to all 5D-3 systems with 190-310•K total range.

ATTACHMENTS

Table 2.4.1.2-1	Stability Contributors Summary
Table 2.4.1.2-2	Change in BSL 210•, 310•K Points Between Runs
Table 2.4.1.2-3	Change in 210•, 310• Output Deviation From Nominal (•K) between Power Supply 1 and Power Supply 2

TABLE 2.4.1.2-1

STABILITY CONTRIBUTORS SUMMARY

			ONE SIGMA ERROR (•K)
Shaped Bias			
a) Open Loop Mirror Emissivity		0.1	
b) T Clamp Shaper Compensation	- Temperature	0.23	
	- Age	0.17	
RSS Total		0.30•K	
X RMS Temperature Linearization Effect		0.564	
= RMS Shaped Bias Errors			0.17•K
Bias			
a) Preshaper Gain	- Inner Stage Temperature	0.28	
	- Bias Current	0.24	
	- Amplifiers	0.22	
b) Post Shaper DC Drift		0.12	
RSS Total = RMS Bias Error			0.45•K
Gain			
Postshaper Gain Changes	- Amplifier		
over the 210-310K range, •K RMS Error			0.38
TOTAL RSS Stability Error (Total Dynamic Range)			0.61
Stability Error Specification (•K, 1 Sigma)			0.80 Maximum

Discussion of Stability Errors

The experimentally derived RMS change of the BSL(s) between runs was calculated to be 0.11•K, 0.07•k and 0.13•K for TRGT, TMID and TLEFT respectively. The two runs used were Run #3 and run #5. The results verify the analytical estimate of the stability over time intervals greater than one day. This data is tabulated in Table 2.4.1.2-2.

As an additional check of stability, the Fine-Primary outputs of the three segments as a deviation from nominal (•K) at 210• and 310• were compared using power supply 1 data of TDCRM3C.ST and power supply 2 data of 6X2X3A.ST. (Both from Run #11). This data is tabulated in Table 2.4.1.2-3. The deltas were calculated and RMS'd over the temperature range. The results are comparable to the "Change Between Runs" data.

TABLE 2.4.1.2-2

OLS #14

CHANGE IN BSL 210, 310K POINTS BETWEEN RUNS

SSS = 11•C, M1 = 15•C

	TG R/L	TL	T RGT		T MID		T LFT	
			210	310	210	310	210	310
T121T231B 02-23-93	3/3	11	0.59	-0.21	0.53	-0.15	-0.14	-0.19
T121T231B 02-28-93	3/3	11	0.63	-0.36	0.55	-0.24	0.03	-0.25
Change Between Runs			0.04	-0.15	0.02	-0.09	0.17	-0.06
RMS Change			0.11•K		0.07•K		0.13•K	

TABLE 2.4.1.2-3

OLS #14

T CHANNEL DC RESPONSE

DIFFERENCE BETWEEN POWER SUPPLIES 1 and 2

From Orbit Nominal (Run #11), SSS = +5•C, M1 = -8•C

	RIGHT		MID		LEFT	
	TGT-1 210•K	TGT-2 310•K	TGT-1 210•	TGT-2 310•	TGT-1 210•	TGT-2 310•
FP DEV [K] Power Supply 1 TDCRM3C.ST 03/31/93	0.25	0.09	0.23	0.30	-0.45	0.24
FP DEV [K] Power Supply 2 6X2X3A.ST 03/29/93	0.18	0.09	0.25	0.24	-0.41	0.23
Change •K	0.07	0.00	-0.02	0.06	-0.04	0.01
RMS •K	0.05		0.04		0.03	

2.4 RADIOMETRIC ACCURACY

2.4.1 T Channel Radiometric Accuracy (Cont'd)

2.4.1.3 Fixed Deviations (3.2.1.1.4.1c)

The Fixed deviations for OLS #14 are 0.27•K, 1 sigma, compared to the 0.6•K specification maximum. The portion of the fixed deviations which is calibrateable is 0.14•K RMS compared to the 0.4•K RMS specification maximum. The Fixed deviation calibration for separate detector segments is 0.63•K (worst case) compared to the 1•K spec. maximum. The maximum along scan variation was 0.12•K RMS for TF (Right) and 0.10•K RMS for TS compared to the 0.2•K RMS specification maximum.

ATTACHMENTS

Table 2.4.1.3-1	Fixed Deviations Contributors
Table 2.4.1.3-2	T Shaper Error Tabulation
Table 2.4.1.3-3	Target Deviation from Mean of Both Targets
Table 2.4.1.3-4	BSL Calibration Equations
Table 2.4.1.3-5	Fixed Deviation Calibration Differences for Separate Segments
Table 2.4.1.3-6	Along Scan Variation (265• to 310•K) within a Separate Segments
Table 2.4.1.3-7	Cone (Inner Stage) Patch Temp EST
Table 2.4.1.3-8	Cone Cooler Outer Stage Temp EST
Figure 2.4.1.3-1	5D3 Nominal Shaper Curve
Figure 2.4.1.3-2	Along Scan Variation, T Right, M1 = 12•C
Figure 2.4.1.3-3	Along Scan Variation, T Mid, M1 = 12•C
Figure 2.4.1.3-4	Along Scan Variation, T Left, M1 = 12•C
Figure 2.4.1.3-5	Along Scan Variation, T Right, M1 = -8•C
Figure 2.4.1.3-6	Along Scan Variation, T MID, M1 = -8•C
Figure 2.4.1.3-7	Along Scan Variation, T Left, M1 = -8•C
Figure 2.4.1.3-8	Along Scan Variation, T Auto M1 = 12•C
Figure 2.4.1.3-9	Along Scan Variation, T Auto M1 = -8•C

TABLE 2.4.1.3-1

OLS #14

FIXED DEVIATION CONTRIBUTORS

DEVIATION SOURCE	ONE SIGMA ERROR (°K)
1. Foreoptics Mirror Emissivity	0.11*
2. T Clamp Shaper Compensation	0.09
3. Transfer Function	
A. Non-Linearity	0.14* 0.4°K Spec Max
B. Shaper Components Variation	0.10
C. Detector Spectrum Variation (included in 3A)	-
4. Test Targets	
A. Temperature	0.10
B. Emissivity	0.10
C. Repeatability	0.04*
TOTAL (RSS) FIXED DEVIATION	0.27
FIXED DEV. SPECIFICATION LIMIT, °K ONE SIGMA	0.60 Maximum

* FROM TEST DATA ANALYSIS

	DATA	SPEC MAX
5. Fixed Deviation BSL Calibrations Match for Separate Segments (Worst Case)	0.63°K	1.°K
6. Along Scan Varations within a segment (265° to 310°K) Worst Case	0.12°K RMS	0.2°K RMS

Discussion of Fixed Deviation Tests and Calculations

1. Foreoptics Mirror Emissivity

The foreoptics mirror emissivity is a source of Fixed deviations as well as of Repeatability and Stability deviations. The correction in operation is made on M1 temperature only; whereas the entire foreoptics causes the offset phenomena. The ground calibration is made in the thermal vacuum chamber, where M1 is cooled radiatively via a cold tunnel, which fills the M1 view beyond the optical field of view of the system. Thus the foreoptics temperature distribution in the chamber differs somewhat from operation in space, especially in that M2 is colder in the chamber. It is not possible to determine accurately this effect based upon present knowledge. It is therefore assumed that it is equivalent to a 1•C difference in M1 temperature, or about 0.185•K at 210• using the actual OLS #14 M1 coefficient (K factor). The RMS Temperature Linearization Effect, 0.564, transforms this to a 0.11•K RMS contribution to fixed deviation.

2. T Clamp Shaper Compensation

The T Clamp shaper compensation contribution arises as follows. If the T Clamp emissivity were initially only 0.98 rather than the 0.995 used to calculate the compensation for T Clamp temperature, the error at 242•K would be 0.70•K. Although this error would be compensated for when the T channel adjustments were made, a change in T Clamp temperature to 256•K or 230•K would result in an error of 0.78•K, producing an uncompensated error of 0.08•K. Over the dynamic range this is equivalent to 0.09•K RMS.

3. Transfer Function

A. The departure of the T channel radiometric transfer function from a linear relationship is not an error as such because it is known and compensation can be made for it. However, this type of deviation is included within the constraints of the Fixed deviation portion of the T channel radiometric accuracy spec. The nominal T Channel non-linear transfer function (shaper) error is tabulated in Table 2.4.1.3-2 and plotted in Figure 2.4.1.3-1. The nominal shaper error is 0.13•K RMS. This calculation is made with the 5D-3 shaper, which is also used on OLS #14. The worst-case reduced test data (from Tables 2.4.1-4,5 & 6) RMS Deviations of the points from the BSL for OLS #14, are 0.05•K for T Right (Smooth Backup), 0.05•K for T MID (Fine Backup and Smooth Primary and Backup) and 0.05•K for T Left (Fine Primary). The analytic value, (0.13•K RMS) and the worst-case test value of 0.05•K are RSS'ed to become 0.14•K RMS for this Fixed deviation source versus the 0.4•K maximum spec allowance for the calibrateable portion of the Fixed deviations.

B. Departure of shaper components from design nominal values may cause additional peak errors of 0.25•K and are assigned a one sigma error of 0.1•K. These deviations would not be included in the measured deviation, because the data points are not close enough together to adequately detect them.

C. The T detector spectrum difference from unit to unit is included in the calibration data and is therefore included in 3A, the non-linearity of transfer function.

4. Test Targets

The deviation of the reference test target indicated blackbody temperature from absolute is the result of contributions from three Fixed deviation sources.

A. The measurement of the averaged target temperature using the 5 thermocouples immersed in the target baseplate is subject to the accuracy of the PQL/Block V Thermocouple Aquisition and Control System calibrated per procedure MCS0116801B. A review of the calibration procedure and the equipment used has led to ascribing 0.1•K RMS to these sources.

B. The actual effective blackbody temperature of the target also deviates from that measured because of differing emissivity from that assumed and because the "true" radient temperature differs from the measured temperature using the thermocouples. The effective emissivity is a combination of true emissivity (which is better than 0.996 according to Eppley) and reflectance of up to 0.004. An average emissivity of 0.998 is corrected for along with the thermocouple calibration. This source of deviation has been assigned 0.1•K RMS.

C. Actual measurements with OLS #14 system of the two Eppley IR Reference test targets over the 210• to 310•K range reveal small differences between the targets. These differences, as tabulated in Table 2.4.1.3-3, represent the target differences from the mean of both targets for T LFT and T RGT averaged from file TDCRM3C.ST (Run #11). The eleven differences when RMS'ed yield 0.04•K RMS deviation for this source.

Fixed Deviation Calibrations for Separate Segments

The calibrations are represented by the best straight line (BSL) equations for the separate segments. The BSL deviation expressions (from ideal), in y = mx + b form for the segments are tabulated in Table 2.4.1.3-4. In T Smooth the Right and Left detector segments are averaged and used across the entire scan line.

In order to determine the differences in calibrations for separate segments, (for comparison to the specification) the T Fine BSL deviation equations of Table 2.4.1.3-4 were evaluated at 210•K and 310•K. The 3 possible segment differences were then calculated. Also, the worst-case deviations between segments were taken from the Best Straight Line Plots (Figures 2.4.1-1 thru 2.4.1-12). These results are tabulated in Table 2.4.1.3-5. The calibration differences for separate segments are within the 1•K maximum spec throughout the dynamic range of 210 to 310K for OLS #14.

Along Scan Variation (265•K to 310•K) Within a Segment

The Along Scan Variation (ASV) in T DC Response is considered to be a Fixed deviation, since as a function of scan angle it does not vary as a function of time per se. Figures 2.4.1.3-2, 3, 4, 5, 6, 7, 8 and 9 show the deviations along-scan vs. surface distance (nmi/100) for T RGT, T MID, TLFT, and T AUTO. The vertical scale factor is 1.0•K per cm. Four figures are for M1 = -8•c and four are for M1 = +12•C. The computer printed number to the right of each curve is the computed RMS deviation in millidegrees K for the associated ASV plot. the RMS ASV values are only printed for the target temperatures above 265•K, i.e., the 270•, 290•, and 310•K plots.

The T DC response BSL calibrations are taken using test scan angles of -50• (-600nmi) for T LFT, +50• (+600nmi) for T RGT, and +0• (0 nmi) for T MID.

The OLS #14 has some ASV, but is within spec. The worst case (max) ASV RMS value within a segment for OLS #14 was 0.12•K and is entered in Table 2.4.1.3-6 to compare with the specification limit.

TABLE 2.4.1.3-2

T SHAPER ERROR LIST

The 190 to 310•K 5D3 T Shaper used for OLS #13 and up has 6 straight line segments of decreasing slope and 5 (inflections) diode break points. The significant features in the shaper curve are tabulated below:

T (•K)	ERROR (•K)	REMARKS
190	0	End point adjusted to be an Ideal Curve
195	-0.38	1st slope is parallel to Radiance (Smooth) Curve
201.5	0	
205	+0.26	1st diode cut-in
210	0	
215	-0.18	2nd slope is parallel to Radiance (Smooth) Curve
220.5	0	
224	+0.20	2nd diode cut-in
228.5	0	
235	-0.20	3rd slope is parallel to Radiance Curve
240.5	0	
245	+0.19	3rd diode cut-in
251.5	0	
257	-0.21	4th slope is parallel to Radiance Curve
263	0	
267	+0.165	4th diode cut-in
272	0	
279	-0.195	5th slope is parallel to Radiance Curve
284.5	0	
291	+0.16	5th diode cut-in
296	0	
303	-0.13	6th slope is parallel to Radiance Curve
310	+0.023	

The largest plus and minus errors in the 210K-310•K range are +0.20• and -0.21•K respectively.

The standard deviation = 0.13•K RMS over the 210• to 310•K dynamic range.

TABLE 2.4.1.3-3

OLS #14

TARGET DEVIATION FROM MEAN OF BOTH TARGETS

TARGET TEMP (°K)	DEVIATION (°K)
210	-.06
220	-.02
230	-.04
240	+.00
250	+.02
260	+.00
270	-.01
280	-.04
290	+.04
300	+.02
310	+.06

$$RMS = \sqrt{\frac{\Sigma(Dev.\ ^{\circ}K)^2}{11}} = 0.035^{\circ}K$$

TABLE 2.4.1.3-4

OLS #14

BSL CALIBRATION EQUATIONS

(From Tables 2.4.1-4,5,6)

			EVALUATED	
T FINE (Primary)			@ 210°	@ 310°
T-Right:	Error = -0.0020 (T-190) + 0.28	(°K)	.240	.040
T-Mid:	Error = -0.0001 (T-190) + 0.24	(°K)	.238	.228
T-Left:	Error = +0.0063 (T-190) - 0.48	(°K)	-.354	.276
T FINE (Redundant)				
T-Right:	Error = -0.0040 (T-190) + 0.14	(°K)	.060	-.340
T-Mid:	Error = -0.0030 (T-190) + 0.17	(°K)	.110	-.190
T-Left:	Error = +0.0025 (T-190) - 0.46	(°K)	-.410	-.160
T SMOOTH (Primary - SP MID)	Error = -0.0005 (T-190) + 0.30	(°K)		
T SMOOTH (Redundant - SB MID)	Error = -0.0032 (T-190) + 0.22	(°K)		

TABLE 2.4.1.3-5

OLS #14

FIXED DEVIATION CALIBRATION DIFFERENCES FOR SEPARATE SEGMENTS

Calculated from Run #11 BSL's in Table 2.4.1.3-4:

	DIFFERENCE AT 210•K (•K)	DIFFERENCE AT 310K (•K)	SPECIFICATION (MAX)
PRIMARY			
T Mid to T Right	0.002	0.188	1•K
T Mid to T Left	0.592	0.048	1•K
T Right to T Left	0.594	0.236	1•K
REDUNDANT			
T Mid to T Right	0.050	0.150	1•K
T Mid to T Left	0.520	0.030	1•K
T Right to T Left	0.470	0.180	1•K

Worst Case Differences from Best Straight Line Plots (Figures 2.4.1-1 thru 2.4.1-12):

RUN #	PRIMARY PATH	REDUNDANT PATH	SPEC. MAX.
1	* 0.63• LFT-RGT	* 0.58• MID-LFT	1•K
2	0.47• MID-LFT	0.43• MID-LFT	1•K
9	0.46• MID-LFT	0.48• MID-LFT	1•K
10	0.53• MID-LFT	0.47• MID-LFT	1•K
11	0.60• LFT-RGT	0.56• MID-LFT	1•K

*WORST-CASE DATA

TABLE 2.4.1.3-6

OLS #14

ALONG SCAN VARIATION (265•K to 310•K) WITHIN A SEGMENT

(From ASV Graphs)

T-FINE	ONE SIGMA ERROR (•K RMS)	SPEC LIMIT (•K RMS)
T-Left Segment	0.092	0.2
T-Mid (Sum) Segment	0.102	0.2
T-Right Segment	0.116	0.2
T-SMOOTH		
T-Sum	0.102	0.2

TABLE 2.4.1.3-7

CONE COOLER S/N 026

THERMISTOR S/N KC-50

OLS-14

CONE (INNER STAGE) PATCH TEMP. EST

TEMPERATURE •K	PATCH EST, VOLTS
95	5.935
96	5.513
97	5.124
98	4.766
99	4.435
100	4.129
101	3.847
102	3.587
103	3.346
104	3.124
105	2.919
106	2.729
107	2.553
108	2.390
109	2.239
110	2.100
111	1.970
112	1.850
113	1.738
114	1.635
115	1.538
116	1.448
117	1.365
118	1.287
119	1.215
120	1.147
121	1.084
122	1.025
123	0.970
124	0.919
125	0.870

TABLE 2.4.1.3-8

CONE COOLER OUTER STAGE TEMP EST

OLS #14

T CONE TEMP EST (EST #33)

T (DEG K)	EST VOLTS	T (DEG K)	EST VOLTS
158	4.8221	194	4.1282
159	4.8181	196	4.0328
160	4.8136	198	3.93
161	4.8088	200	3.8195
162	4.8035	202	3.7016
163	4.7978	204	3.5769
164	4.7915	206	3.4468
165	4.7848	208	3.3115
166	4.7775	210	3.1719
167	4.7695	212	3.0292
168	4.7609	214	2.8844
169	4.7515	216	2.7386
170	4.7414	218	2.5924
171	4.7306	220	2.4475
172	4.7188	222	2.305
173	4.7063	224	2.1659
174	4.6926	226	2.0302
175	4.678	228	1.8995
176	4.6622	230	1.7735
177	4.6454	235	1.4832
178	4.6273	240	1.2308
179	4.608	245	1.0159
180	4.5874	250	0.8359
181	4.5654	255	0.6873
182	4.5418	260	0.5650
183	4.517	265	0.4653
184	4.4904	270	0.3842
185	4.4622	275	0.3182
186	4.4323	280	0.2646
187	4.4008	285	0.2207
188	4.3673	290	0.1852
189	4.3322	295	0.1560
190	4.2951	300	0.1320
192	4.2156	305	0.1123

5D-3 Nominal Shaper Error Function

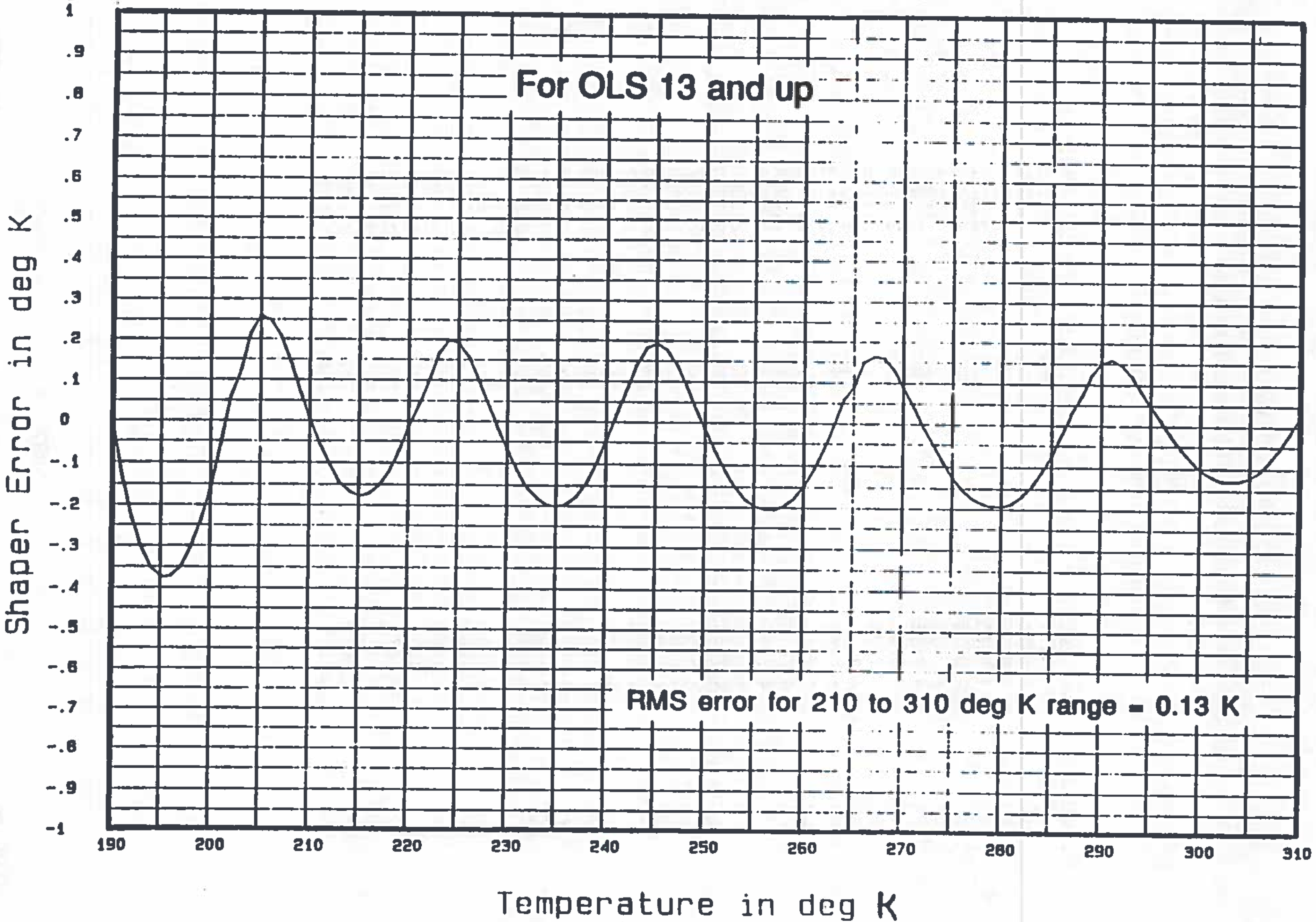


FIGURE 2.4.1.3-1

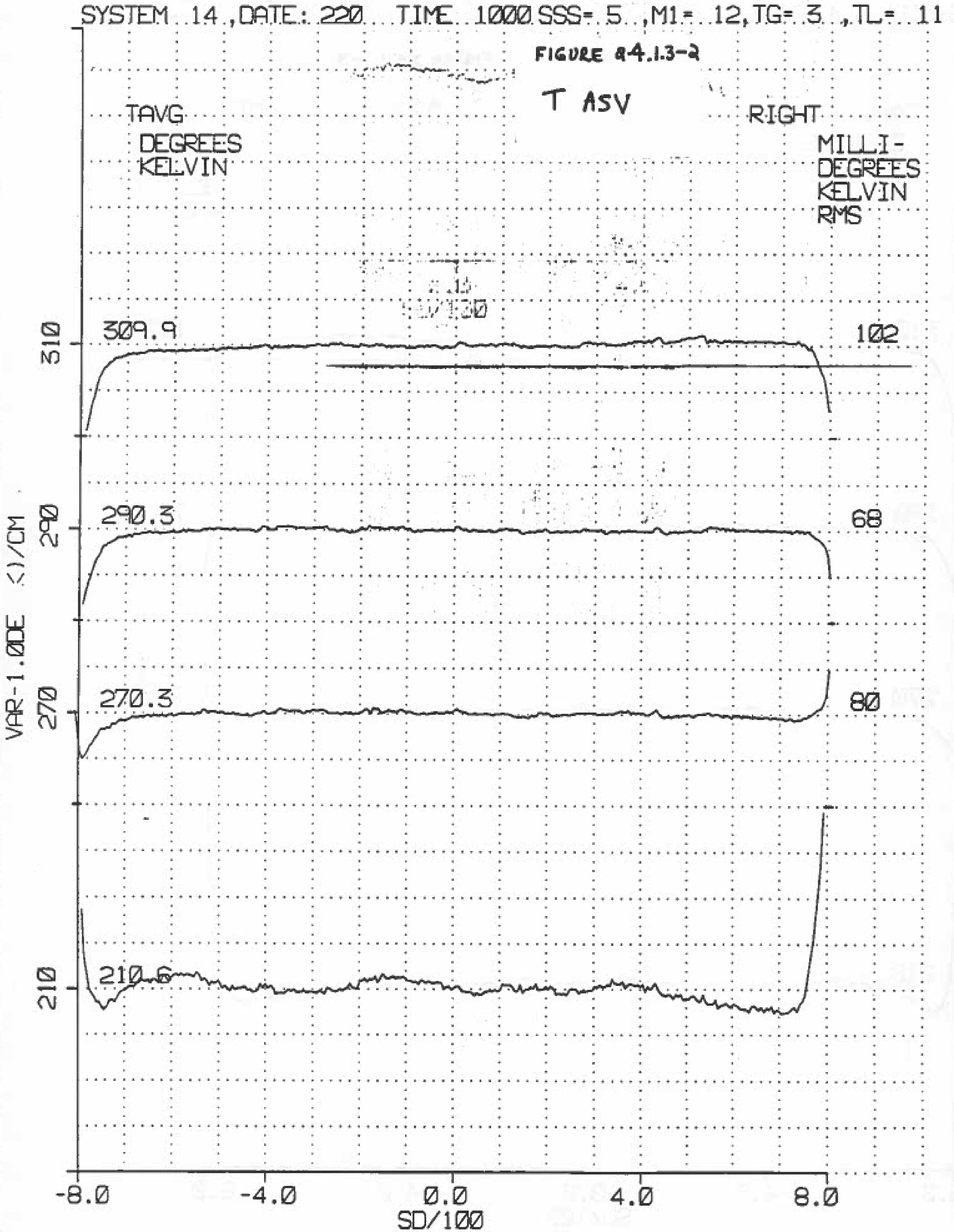


FIGURE 24.1.3-2

T ASV

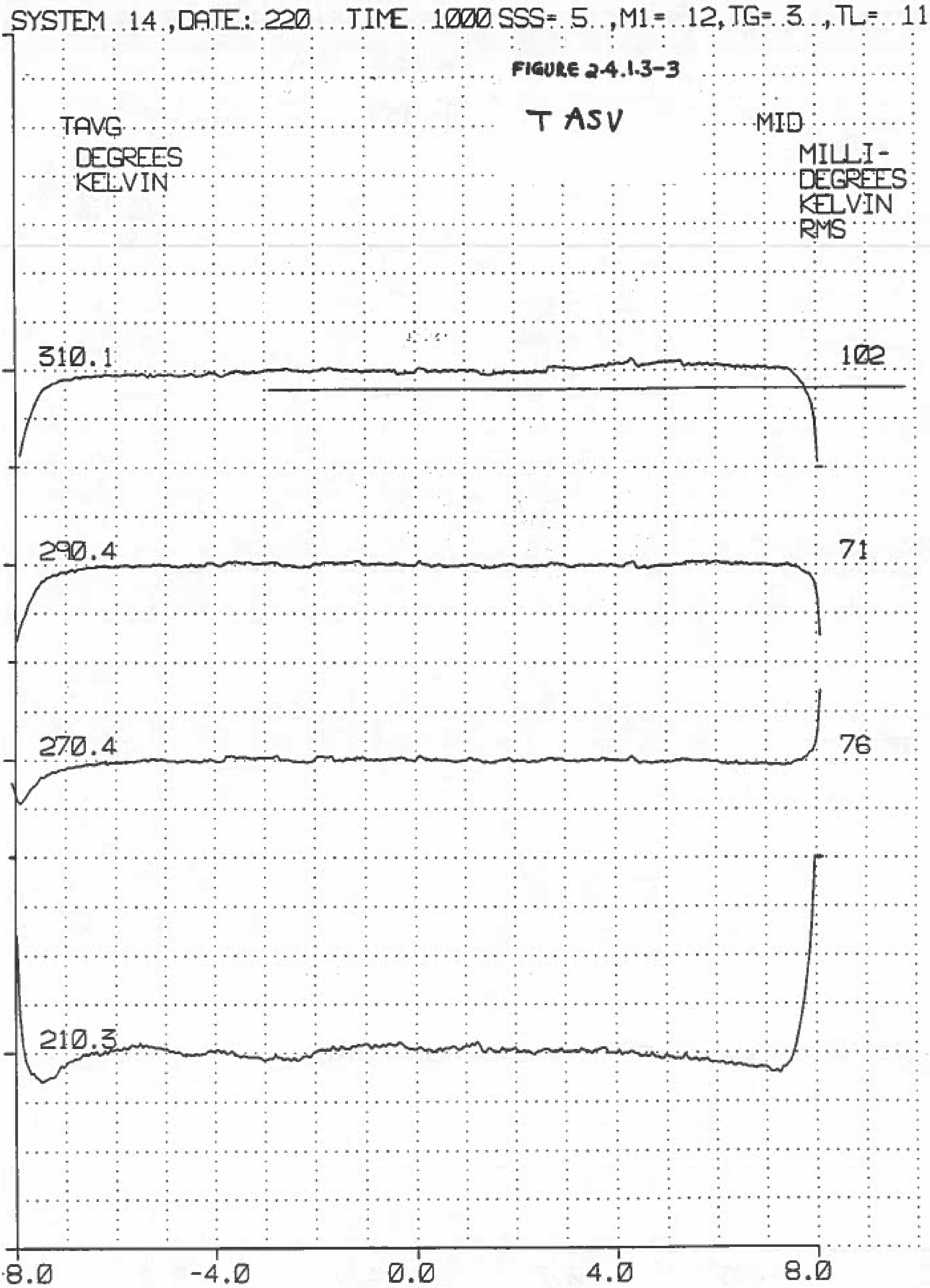


FIGURE 2.4.1.3-3

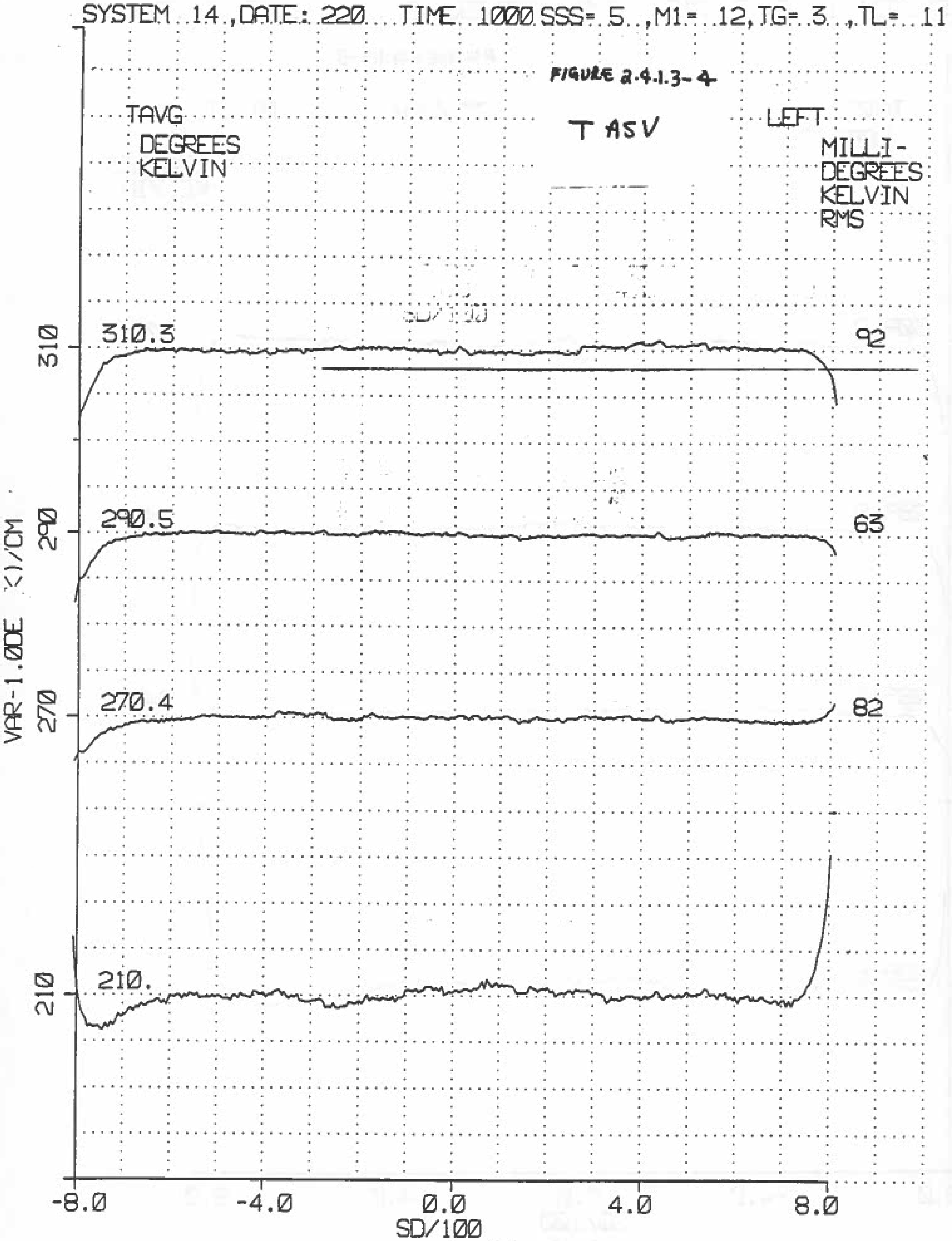
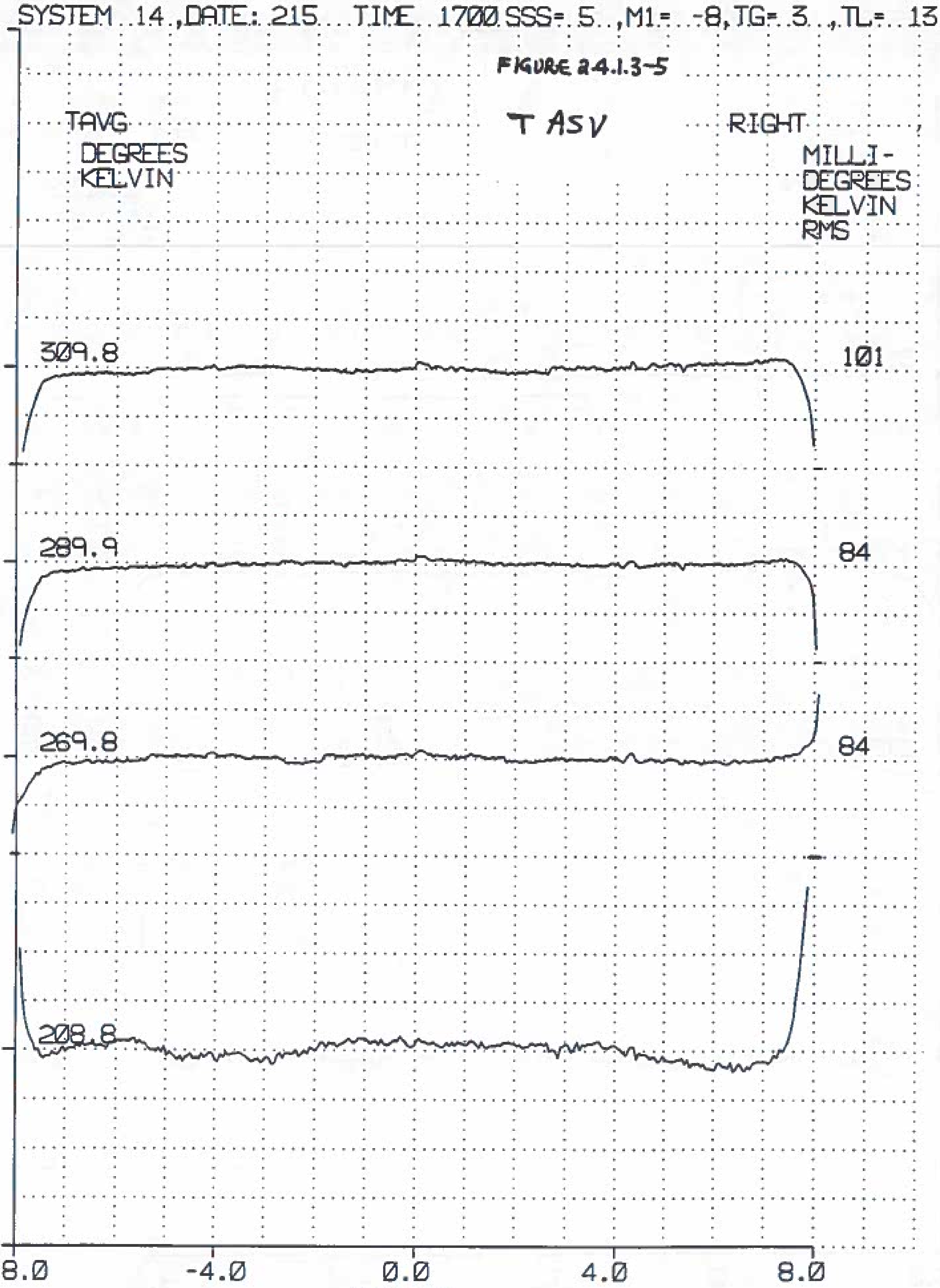


FIGURE 2.4.1.3-4

FIGURE 24.1.3-5



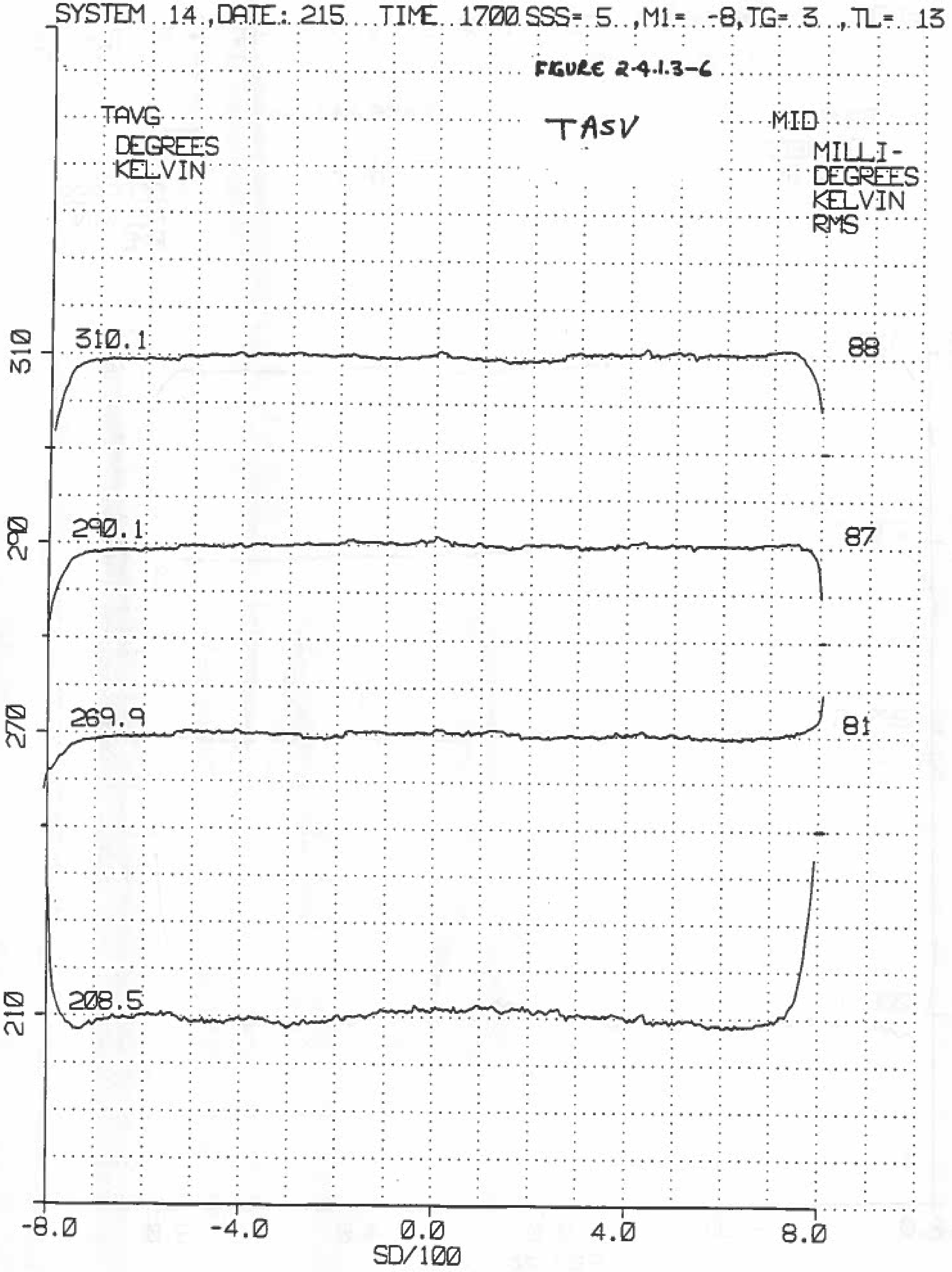


FIGURE 2-4.1.3-6

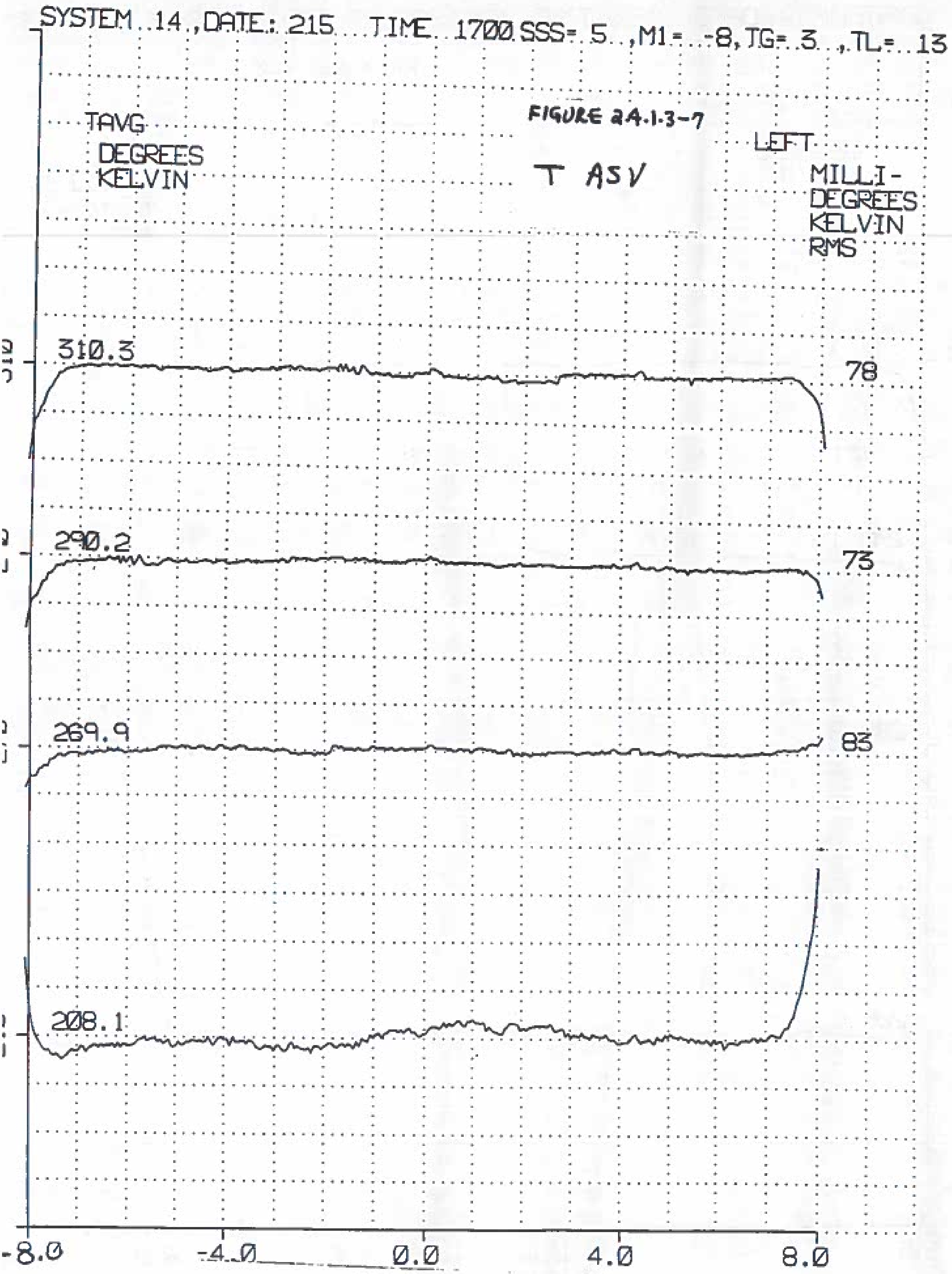


FIGURE 24.1.3-7

T ASV

FIGURE 2-4.1.3-8

T ASV

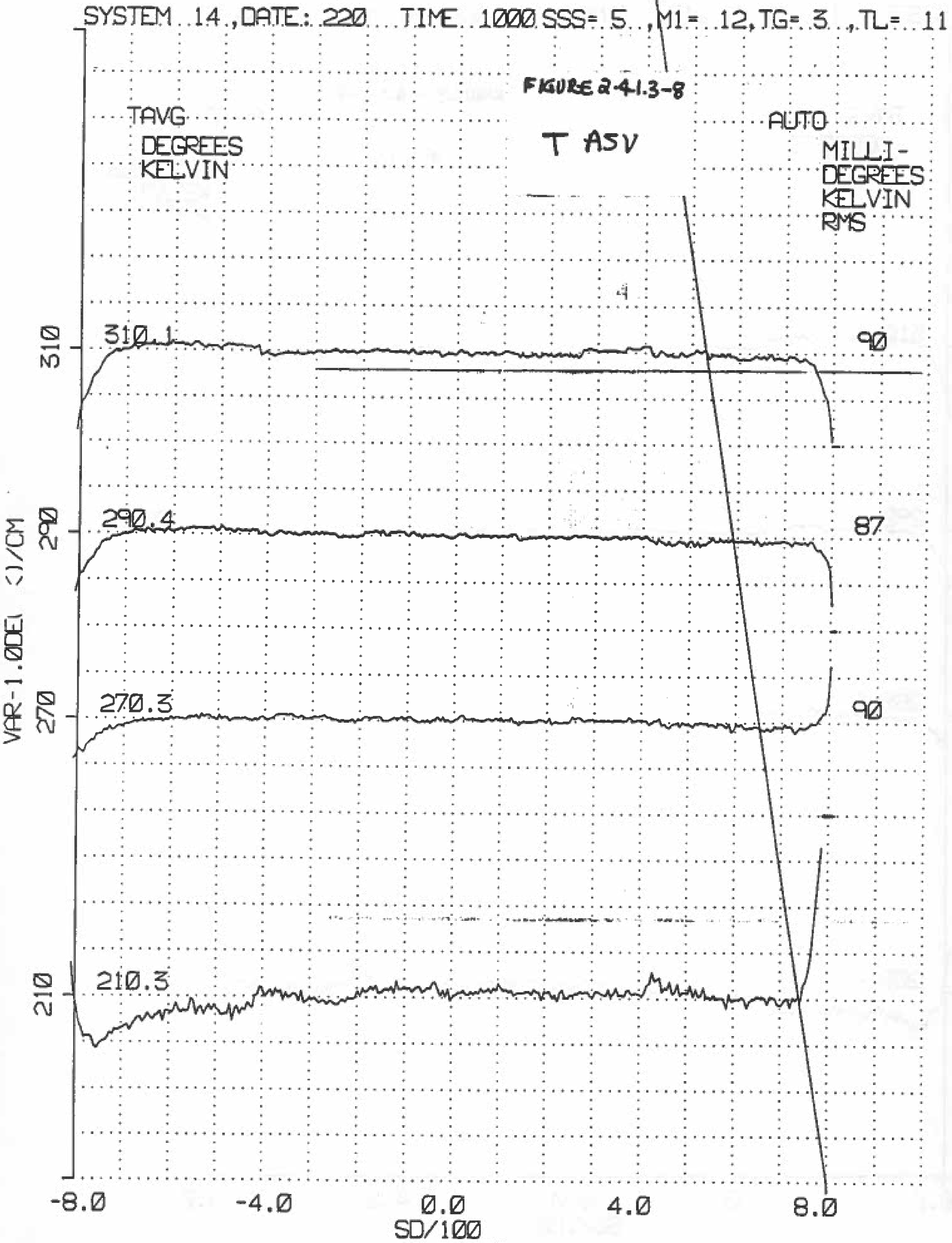
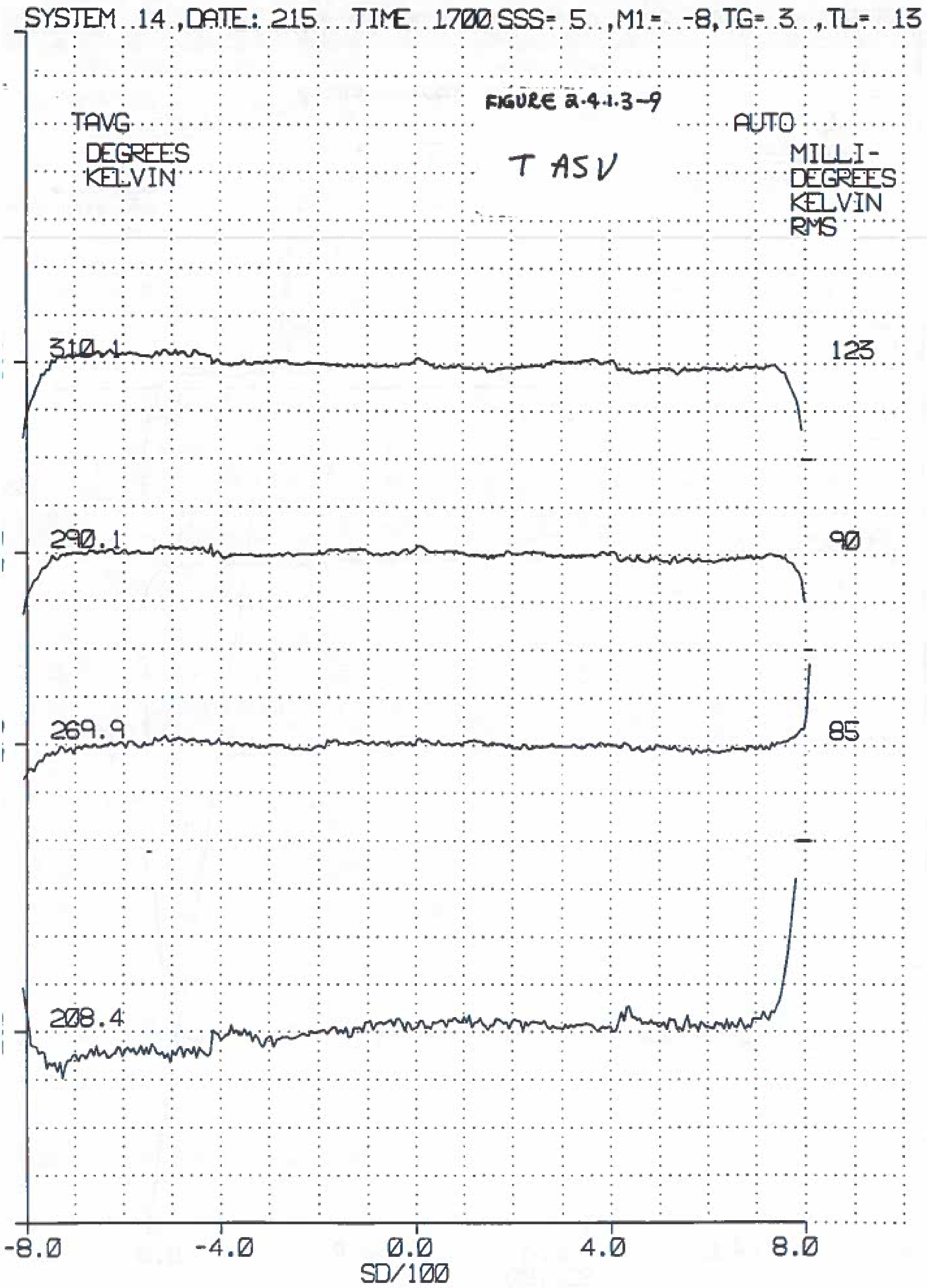


FIGURE 2-4-1.3-9

T ASV



2.4.2 Daytime Radiometric Accuracy (3.2.1.1.4.2)

OLS #14 achieved the 7% absolute radiance requirement by setting the HRD channel gain as shown on the L channel DC Response plot, using the calibrated light source (VULS).

The analysis of the calibration accuracy and the L-Day channel stability show within-specification performance. The gain ratios (PMH/PML, PML/HRD, and PMH/HRD) were measured during bearing retrofit retest using the VULS during Acceptance Test in test 6x2x1.ST, and vary less than 0.9% from the average of the ratios. The gain ratios measured in test 6x2x2.ST using a less accurate test method show greater variation.

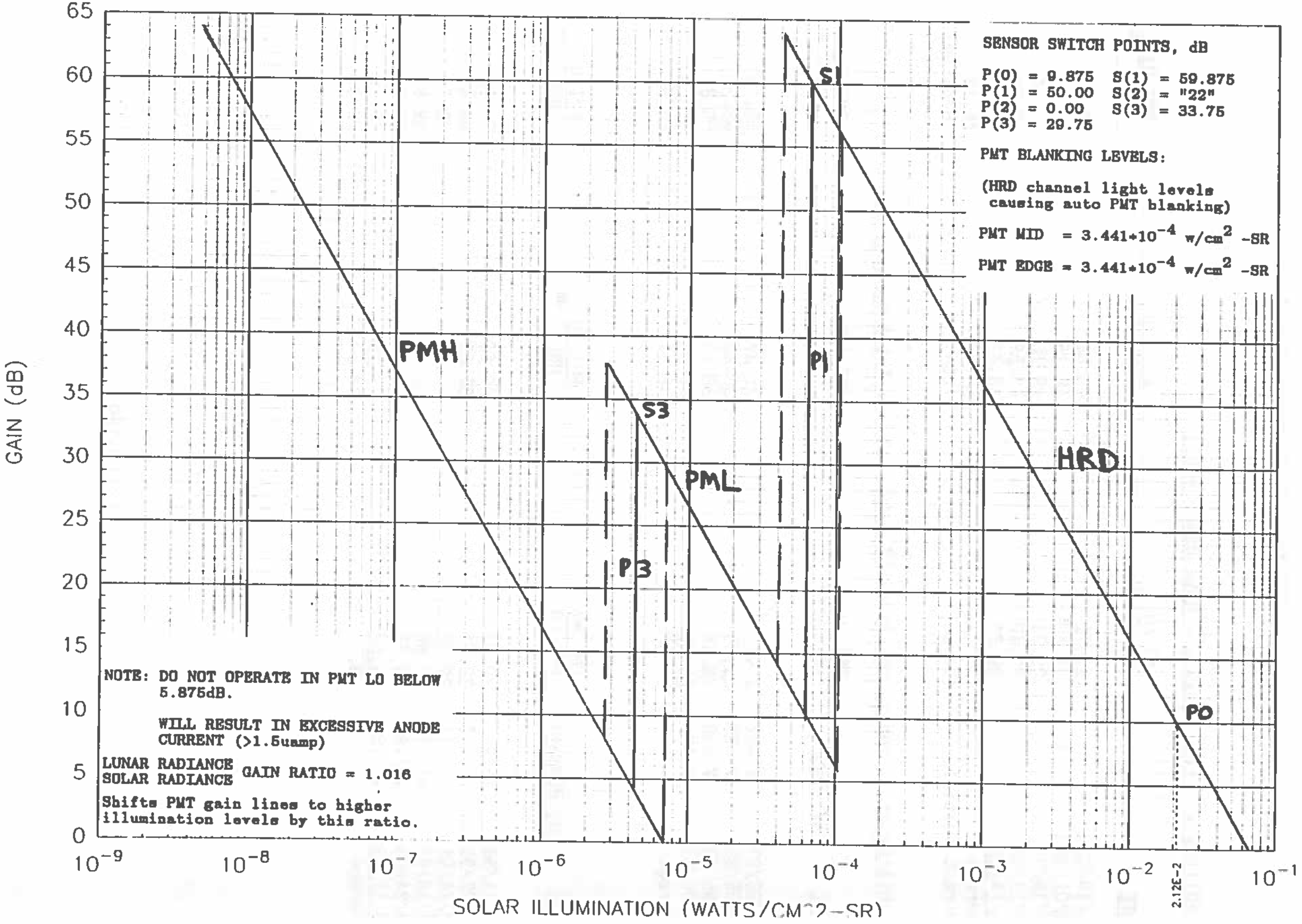
The plot of L DC Response contains the calculated sensor switch points, S(x), and relative gains P(X), which are stored in the OLS Constants Memory page zero, locations 071 through 077. P(2) and S(2) represent the bypass of the PMT 1/9 mode, which is not usually implemented on orbit.

OLS #14 exhibited 1.33dB drop in transmission when varying the SSS from room temperature to +5°C. Additionally, OLS 14 exhibited a lower optics transmission than typical OLS units by approximately 2.5dB in the HRD channel. Thus P(0) must be reset to 6.0 (nom) + 1.33 + 2.5 = 9.83dB. Rounding off to the nearest 1/8 dB gives 9.875dB as the new setting for P(0).

P1 is derived using the PMT LO/HRD average gain value of 48.44dB with a compensation for the HRD Loss and PMT Gain Ratios with temperature from the bearing retrofit retest data as plotted in figure 2.4.2-2 and converted to dB of 1.33 dB and 0.18 dB, respectively. The P1 value is 48.44 + 1.33 + 0.18 = 49.95 (rounded to nearest 1/8th dB = 50.00).

ATTACHMENT: OLS #14 L Channel DC Response Plot
Table 2.4.2-1 OLS #14 DC Response Stability
Table 2.4.2-2 OLS #14 PMT/HRD DC Response vs. SSS Temp.

OLS14 L CHANNEL DC RESPONSE



SENSOR SWITCH POINTS, dB

P(0) = 9.875 S(1) = 59.875
P(1) = 50.00 S(2) = "22"
P(2) = 0.00 S(3) = 33.75
P(3) = 29.75

PMT BLANKING LEVELS:

(HRD channel light levels causing auto PMT blanking)

PMT MID = $3.441 \cdot 10^{-4}$ w/cm^2 -SR

PMT EDGE = $3.441 \cdot 10^{-4}$ w/cm^2 -SR

NOTE: DO NOT OPERATE IN PMT LO BELOW 5.875dB.

WILL RESULT IN EXCESSIVE ANODE CURRENT (>1.5uamp)

$\frac{\text{LUNAR RADIANCE}}{\text{SOLAR RADIANCE}}$ GAIN RATIO = 1.016

Shifts PMT gain lines to higher illumination levels by this ratio.

Table 2.4.2-1

OLS #14 L DC Response Stability

ability vs. Time (6x2x1.ST data using VULS)

TE	PMT HI / PMT LO dB	PMT LO / HRD dB	PMT HI / HRD dB
/19/92	29.72	48.83	78.55
/01/92	29.69	48.15	77.85
/19/92	29.71	48.18	77.84
/13/93	29.70	48.59	78.30
/14/93	29.71	48.43	78.13
erage	29.71db	48.44	78.13
irect Multiple)	(30.58)	(264.24)	(8063.06)

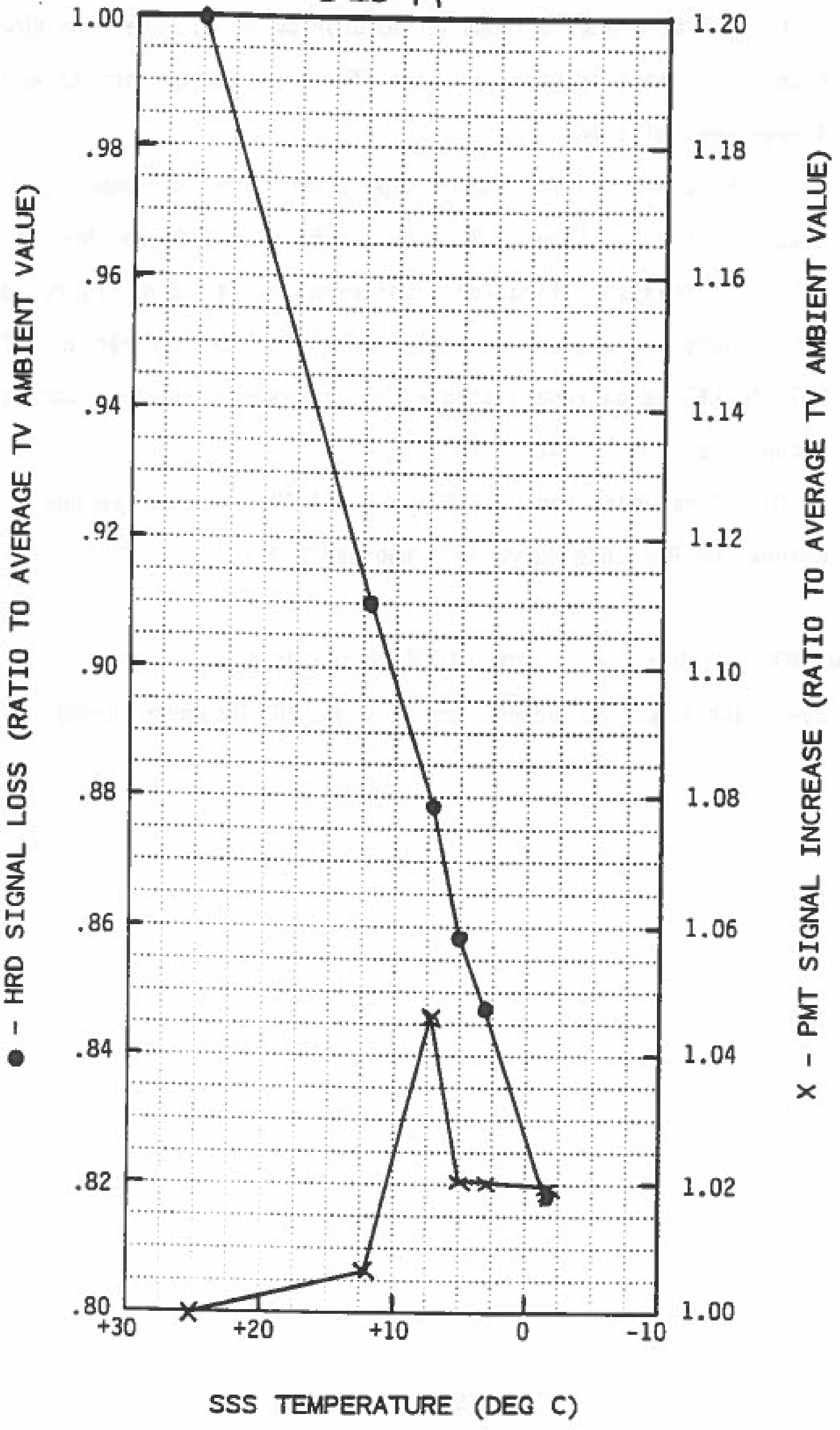
ability vs. Temperature (6x2x2.ST data using half sphere source)

TE	ENVIRONMENT	PMT HI / PMT LO dB	PMT LO / HRD dB	PMT HI / HRD dB
/03/93	TV AMB	29.71	38.37	68.08
/05/93	TV AMB	29.63	38.63	68.26
/06/93	TV AMB	29.69	38.63	68.33
/06/93	TV AMB	29.68	38.51	68.19
erage		29.68	38.54	68.22

TE	ENVIRONMENT	PMT HI / PMT LO dB	PMT LO / HRD dB	PMT HI / HRD dB
/11/93	+5/-8	29.64	40.62	70.26
/22/93	+12/+15	29.64	39.83	69.46
/24/93	-2/-11	29.62	40.93	70.54
/18/93	+7/+12	29.66	40.27	69.93
/24/93	+3/-8	29.63	40.00	69.63
/31/93	+5/-8	29.57	40.58	70.15
erage		29.63	40.37	70.00

TABLE 2.4.2-2. PMT/HRD DC RESPONSE vs. SSS TEMPERATURE

OLS 14



2.4.3 Nighttime Radiometric Accuracy (3.2.1.1.4.3)

The PMT accuracy is required to degrade by no more than 60% from its initial accuracy at time of Acceptance testing to end of 3 year orbital life.

The 5D-3 OLS System Summary Report indicates PMT channel stability to be within 25.7% over the mission life so that the PMT meets this specification requirement. The above figures do not include corrections utilizing on-board LED calibration. The PMT CAL LED is extremely stable, and has an essentially constant output over the mission life.

The DC response curve of the OLS #14 PMT is shown in the L Channel DC Response curve in paragraph 2.4.2.

ATTACHMENT: Table 2.4.3-1 PMT CAL Baseline data

(See para 2.4.2 attachment for L. Chan. DC Response curve)

TABLE 2.4.3-1

PMT CAL BASELINE DATA

The PMT Cal voltage EST is a monitor of PMT sensitivity and stability characteristics. In order to relate on-orbit measurement of PMT CAL to measurement during Acceptance Test, the following data are provided. PMT CAL Voltage (EST #40) and PMT BU (Back-up) CAL V (EST #41) are sampled 500 times in test 6x6x2.ST. The PMT Cal voltage EST output is tabulated below.

TABLE 2.4.3-1

PMT CAL BASELINE DATA

DATE	SSS TEMP	OUTPUT VOLTAGE (mV)	
		PMT CAL V (EST #40)	PMT BU CAL V (EST #41)
11-25-92	+25	2534	2542
01-05-93	+25	2577	2589
02-03-93	+25	2509	2520
02-12-93	+5	2548	2557
03-20-93	+7	2524	2527
03-25-93	+3	2523	2525
04-01-93	+5	2524	2533
	AVERAGE	2534	2542
Max change from AVERAGE		1.30%	1.85%

2.4 RADIOMETRIC ACCURACY. (Cont'd)

2.4.4 Gain Control Accuracy (3.1.4.4)

Along-Scan Gain Control (ASGC) accuracy is within the specification limit of 4dB of the smooth monotonic curve drawn through the nominal values of Gain Value versus Scense Solar Elevation (GVVSSE), tabulated in para 3.2.1.1.1.4 of DMSS-OLS-300.

System Tests 5x6x3.ST and 5x6x6.ST exercise the ASGC function through various combinations of extremes of slope and bias adjustment; and measure channel output for a wide range of values. These are automatically compared against stored test limits which ensure spec compliance.

An analysis using the ASGC software algorithm showing 3.25dB maximum error is summarized in the System Summary Report paragraph 3.5.4.

ATTACHMENTS: None.

2.4.5 Gain Control Adjustability (3.2.1.1.4.4 et al)

The OLS #14 Gain Control Adjustability is the same as for 5D-1 systems. The OLS 5D-3 System Summary Report paragraph 3.5.5 contains the analysis required to demonstrate conformance with the specifications, with additional information below.

TERMINATOR LOCATION (3.1.4.5.1)

The GNC Command (an uplink command) has a sub mode (GNC 10 0 X) which allows the GVVSSE bias (terminator location) to be adjusted by X degrees, where X is a 6-bit 2's complement word with an LSB of 0.5°. This results in the required range of + 15.5 degrees.

GAIN CHANGE RATE (3.1.4.5.2)

The GNC command submode (GNC 10 1 X) allowed the GVVSSE slope to be varied by a factor of 1+X over ± 48% in 1.6% increments where X is a 6-bit 2's complement word with an LSB of 2^{-6}. This results in the required range of ± 48%. However, the BRDF change in the L channel gain calculation required the deletion of this capability to meet timing limitations in the OLSP. The 886 spec must be revised to reflect this change.

MAXIMUM GAIN SETTING (3.2.1.1.4.5.3)

The maximum ASGC gain is commandable. An operational value is determined in Early Orbit Calibrations. The value is stored in the Operational Constants Memory location page 0 Address 104 (BCMAX). The ASGC function & performance are exercised in tests 5x6x3.ST & 5x6x6.ST

COMMANDABLE T-CHANNEL GAIN (3.2.1.1.4.5.4)

The T-Channel Commandable Gain is exercised in test 6x8x2.ST. The channel output is measured for the entire range of commandable gains. The T Channel Gain is required to have the capability of being varied by command to be between 146% and 149% of the established minimum gain value (0 dB).

The actual percentage of TGAIN change was not measured as part of bearing retrofit. However, previously this was measured for OLS #14 as 49.3% for T Right and 48.6% for T Left.

Each step of TGAIN is required to be between 1.7% and 3.7% above the preceeding lower gain value. Measured gain steps on OLS #14 ranged from 1.85% to 3.47%, within specification.

COMMANDABLE T CHANNEL LEVEL (3.2.1.1.4.5.5)

The T Channel Commandable Level is also exercised in test 6x8x2.ST. The specification requires that TLEVEL be variable over at least a 14° range in steps of 1.1°K or less. Measured results during the original OLS 14 testing were 14.96° range and step sizes between 0.942°K to 1.049°K worst-case; all within specification.

2.4 RADIOMETRIC ACCURACY, Cont'd

2.4.6 A/D Conversions & Algorithms (3.2.1.1.4.6.2 & 3.2.1.1.4.6.3)

DMSS-OLS-300 specifies that the Stored Smooth Algorithm accuracy with an ideal A/D shall be verified by analysis. OLS 5D-3 System Summary Report contains the analysis which shows that the LS % Full Scale Deviation does meet the specification. The results are summarized below:

Mode	% Full Scale Deviation	Analysis
LS	≤ ± 2.2%	-1.70%, +2.09%
TS	≤ ± 0.4%	± 0.39%

The Actual A/D Conversion Radiometric Accuracy was measured in system test 6x10.ST. The worst-case results from the OLS #14 Thermal Vacuum runs (Cold Limit & Orbit Nominal) are summarized below:

A/D	BSL SLOPE (% DEV FROM IDEAL)	BSL OFFSET (% OF FULL SCALE)	RMS DEV FROM BSL (% OF FULL SCALE)
SDF-L PRIM	-0.24	+0.04	0.05
RED	-0.10	+0.04	0.05
SDF-T PRIM	-0.29	-0.24	0.10
RED	+0.21	+0.14	0.12
RTD-F PRIM	-0.25	-0.04	0.04
RED	+0.13	-0.04	0.04
SPEC	±1.0	±1.0	0.50
RTD-S PRIM	-0.18	-0.06	0.03
RED	-0.20	-0.04	0.05
SDS-L PRIM	-0.14	-0.16	0.04
RED	-0.29	-0.08	0.03
SDS-T PRIM	-0.21	-0.38	0.05
RED	-0.20	-0.24	0.04
SPEC	±0.5	±0.5	0.25

2.5 RADIOMETRIC RESOLUTION (3.2.1.1.5 et al.)

DMSS-OLS-300 apportions the Radiometric Resolution verification between Test and Analysis.

The Fine and Direct Smoothed Radiometric Resolution (para. 3.2.1.1.5.1), as well as the Stored Smoothed A/D Converter Error (para. 3.2.1.1.5.2), were measured in System Test 6x10.ST during the OLS #14 vacuum runs and are tabulated below:

A/D		PEAK DEV FROM BSL (% OF FULL SCALE)	SPEC
SDF-L	PRIM	-0.07	±0.8%
	RED	+0.09	
SDF-T	PRIM	+0.22	±0.8%
	RED	+0.24	
RTD-F	PRIM	-0.07	±0.8%
	RED	+0.07	
RTD-S	PRIM	+0.06	±0.25%
	RED	-0.07	
SDS-L	PRIM	+0.07	±0.5%
	RED	+0.08	
SDS-T	PRIM	+0.10	±0.5%
	RED	-0.08	

The Stored Smoothed Algorithms Resolution with Ideal A/D (para. 3.2.1.1.5.2.1) are verified by Analysis in OLS 5D-3 System Summary Report, and are summarized in Table 2.5.1.

TABLE 2.5-1
Stored Smoothed Algorithms Resolution With Ideal A/D

ITEM	SPEC	ACTUAL
Accuracy		
LS Algorithm	<±2.2%	-1.70% +2.09%
TS Algorithm	<±0.4%	±0.39%
Resolution		
LS Algorithm	<1.6%	1.57%
TS Algorithm		
Population 1 Density	25%	25%
Quantization	<0.8%	0.78%
Population 2 Density	75%	75%
Quantization	<0.4%	0.39%
Population Distribtution	Uniform	Uniform
Quantization Capability	0.4%	0.4%

2.6 NOISE

2.6.1 T Channel Noise (3.2.1.1.6.1)

The T Channel noise equivalent temperature difference (NETD) is specified between 210K and 310K, although the T channel responsivity extends down to 190K.

The NETD is measured during T Channel DC response tests in the Thermal Vacuum Chamber.

The Channel views a stable blackbody target at 210K (worst-case noise). The channel output is sampled & the noise (std. deviation) of 2000 samples is converted to NETD using the following formula:

NETD = [Avg Noise in Volts * 24 •/Volt] * 1.074 (the shaper slope correction)

The OLS #14 NETD is in-spec. The noise in the T Right segment is 2.1% larger than in the T Left segment.

	TF	TS	TS Fallback
SPEC	2.2•K	0.90•K	1.3•K
Worst-Case Measured NETD	1.22•K	0.47•K	0.67•K
Worst-Case Average NETD	1.03•K	0.40•K	0.55•K

ATTACHMENT: Table 2.6.1-1 OLS #14 NETD

Table 2.6.1-1

OLS #14 PRIMARY SIDE NETD										
DATE	TG				Noise mV					
	SSS	M1	R/L	TL	FINE RGT	SMOOTH RGT	FINE MID	SMOOTH MID	FINE LFT	SMOOTH LFT
2/14/93	5	-8	3/3	13	39.15	20.19	26.83	15.06	38.24	19.79
2/19/93	5	12	3/3	11	37.40	19.56	25.51	13.99	37.55	19.49
2/23/93	12	15	3/3	11	38.20	20.61	25.23	14.26	36.25	18.89
2/25/93	-3	-11	3/3	14	41.09	22.45	27.47	16.50	39.15	19.29
2/28/93	12	15	3/3	11	37.26	21.10	25.11	14.60	36.15	19.12
3/2/93	-3	-11	3/3	14	40.10	23.06	28.08	16.18	38.35	19.74
3/16/93	5	-8	3/3	13	37.45	20.10	26.73	14.94	38.12	20.02
3/17/93	5	12	3/3	10	37.02	20.06	25.24	14.14	36.23	19.22
3/18/93	7	12	3/3	10	36.98	19.29	25.61	13.92	36.61	19.59
3/24/93	3	-8	3/3	13	38.62	20.60	26.67	14.79	37.80	20.32
3/29/93	5	-8	3/3	13	37.58	20.91	26.61	15.80	37.70	20.26
AVERAGE					38.26	20.72	26.28	14.93	37.47	19.61
NETD					0.918	0.497	0.631	0.358	0.899	0.471
NETD Correction for Shaper Slope**					0.986	0.534	0.677	0.385	0.966	0.506

* Worst Case Measured

** Shaper Slope Correction Factor = 1.074

Table 2.6.1-1

OLS #14 REDUNDANT SIDE NETD										
					Noise mV					
DATE		TG			FINE RGT	SMOOTH RGT	FINE MID	SMOOTH MID	FINE LFT	SMOOTH LFT
	SSS	MI	R/L	TL						
2/12/93	5	-8	5/5	11	46.13	25.10	33.19	17.80	46.90*	25.18*
2/18/93	5	+12	3/3	5	47.26*	25.98*	33.66*	18.21*	45.06	23.38
3/16/93	5	-8	3/3	14	37.07	19.98	25.39	14.22	38.24	19.11
3/17/93	5	+12	3/3	11	36.21	19.02	24.54	13.55	34.97	17.93
3/18/93	7	12	3/3	10	37.20	18.93	25.07	13.93	36.53	18.89
3/24/93	3	-8	3/3	13	38.18	20.09	26.19	15.19	37.74	20.46
3/29/93	5	-8	3/3	13	38.49	20.72	27.18	15.02	36.50	20.49
AVERAGE					40.08	21.40	27.89	15.42	39.42	20.78
NETD					0.961	0.514	0.669	0.370	0.946	0.499
NETD Correction for Shaper Slope**					1.033	0.552	0.719	0.397	1.016	0.536
Worst Case Corrected NETD					1.218	0.670	0.868	0.469	1.209	0.649

*Worst Case Measured
**Shaper Slope Correction Factor = 1.074

2.6 NOISE (Cont'd)

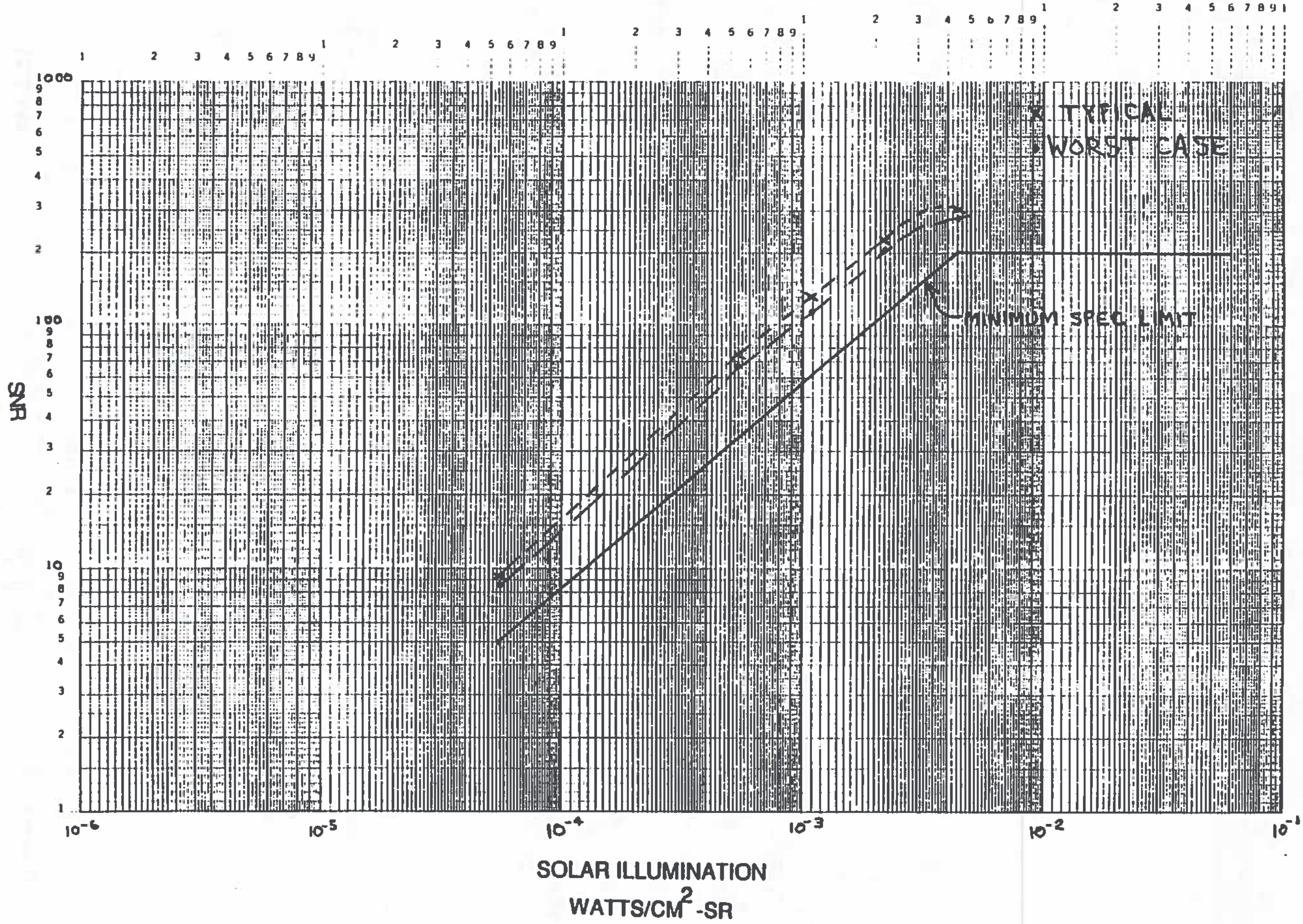
2.6.2 L-Channel Noise (Day) (3.2.1.1.6.2)

The L Channel Noise is measured using the calibrated Variable Uniform Light Source (VULS). Dark noise is measured in test 6x3x1.ST and shot noise is measured in 6x3x5.ST.

The OLS #14 HRD is in-spec for the entire range of illumination. Worst-case HRD SNR exceeds the specification. In summary:

	SNR		
LIGHT LEVEL	SPEC	WORST CASE MEASURED	AVERAGE
5.5×10^{-5}	5	8.6	9.2
5.5×10^{-4}	34.8	68.6	74.9
1.1×10^{-3}	62.3	122.9	133.2
2.2×10^{-3}	112	203.5	213.6
4.4×10^{-3}	200	272.6	300.5

ATTACHMENT: OLS #14 HRD Channel SNR Graph


X TYPICAL
• WORST CASE
MINIMUM SPEC LIMIT
SNR
1000
100
10
1
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
SOLAR ILLUMINATION
WATTS/CM2 -SR

2.6 NOISE (Cont'd)

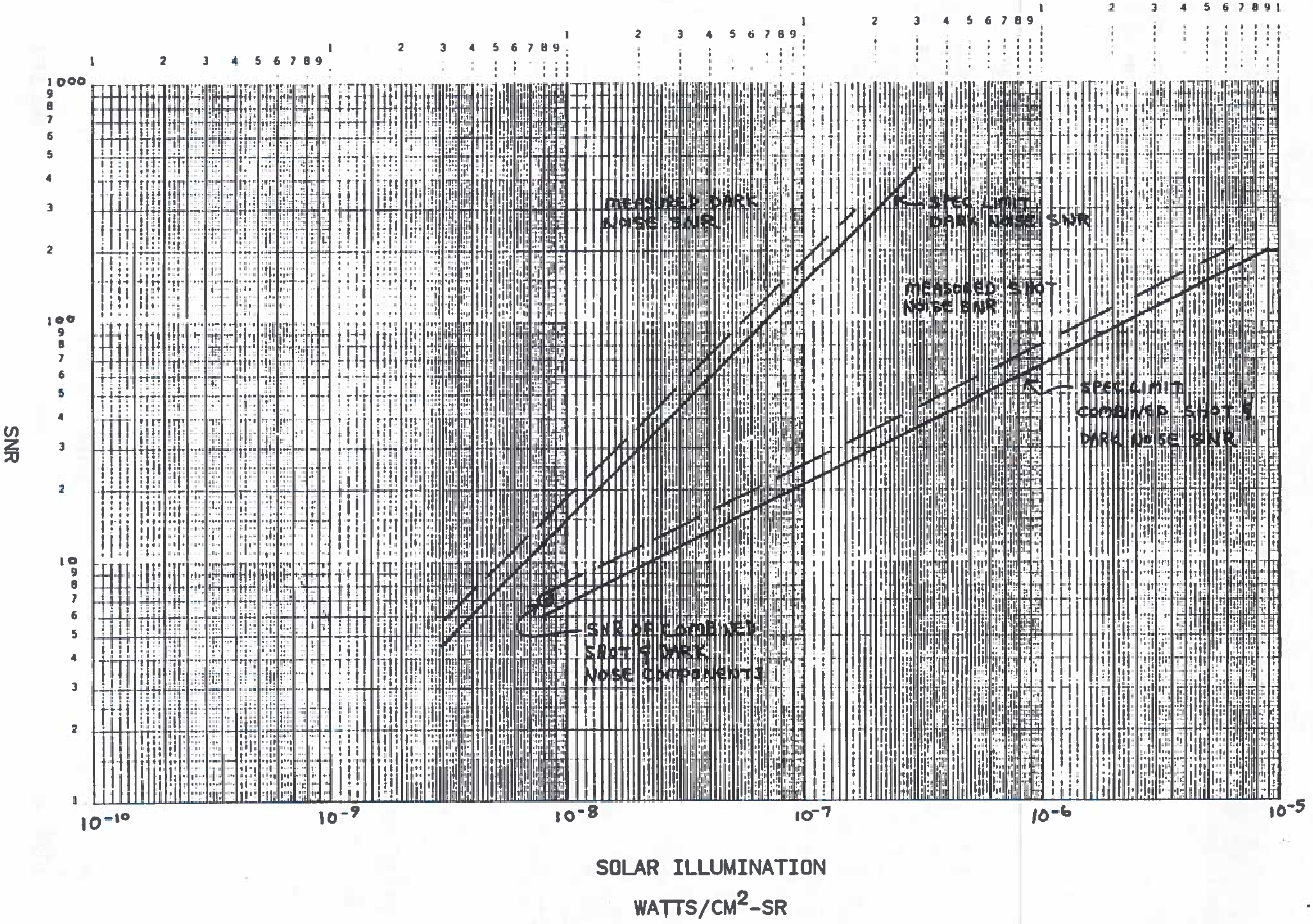
2.6.3 L Channel Noise (Night) 3.2.1.1.6.3)

The PMT dark noise is measured in all environments in Tests 6x3x1.ST, 6x3x2.ST and 6x3x4.ST. The SNR is calculated from the measured noise (std. deviation of multiple voltage samples) vs. light level and compared against spec values.

The minimum (worst case) OLS #14 PMT Shot Noise SNR was 7.6 at 8.0×10^{-9} watts/cm^2-sr. The worst case measured Dark Noise SNR was also better than the specification requirement (15.6 vs. spec of 12). The worst case combined PMT shot noise and dark noise SNR from retest is 6.98 calculated as $SNR=1/\sqrt{1/(SNR\ dark)^2 + 1/(SNR\ shot)^2}$ vs. a specification limit of 6.0.

ATTACHMENT: OLS #14 PMT channel SNR graph.

OLS # PMT CHANNEL SNR



2.6.4 Dark Current (3.2.1.1.6.4)

The Dark Current (the PMT noise with no signal input) is determined from the graph of PMT SNR in paragraph 2.6.3. The Dark Noise SNR is calculated from data gathered during PMT Smoothed Noise measurements. These measurements are made in Test 6x3x1.ST during Thermal Vacuum testing. For the OLS #14 bearing retrofit retest, the average Dark Noise SNR of 6 measurements at 8 x 10^{-9} watts/cm^2-SR is 16.1, or 37.3% of the noise corresponding to an SNR of 6. The MINIMUM Dark Noise SNR measured at 8 x 10^{-9} watts/cm^2-SR was 15.6, or 38.5% of the noise corresponding to a SNR of 6. This is well within the spec requirement for the dark current to be 50% or less of the noise corresponding to an SNR of 6.00.

2.6.5 Stability (3.2.1.1.6.5) (L - Channel (night)

The OLS 5D-3 System Summary Report contains the analysis for this spec requirement.

The loss in sensitivity after 3 years on orbit of the PMT channel will be < 23%. This would require 2.27dB change in VDGA gain to compensate and over 6dB of VDGA gain is available.

ATTACHMENT: None.

2.6.6 Along-Track Noise Integration (3.2..1.1.6.6)

OLS 5D-3 System Summary Report contains the analysis which concludes that the OLS 5D-3 algorithm is consistently above 0.6 times the SNR resulting from perfect integration with 8 bit A/D for T Channel; and above $1/\sqrt{2}$ times the SNR resulting from perfect integration with 6-bit A/D for L channel. Therefore, the Along-Track Noise Integration is in-spec.

ATTACHMENT: None.

2.6 NOISE. (Cont'd)

2.6.7 Glare Suppression (3.2.1.1.6.7)

OLS 5D-3 System Summary Report contains the analysis which verifies that the OLS does provide effective protection against solar glare for sun angles between 75° and 95°.

ATTACHMENTS: None.

2.7 SURVIVABILITY (3.2.7)

The OLS 5D-3 System Summary Report contains calculations of survivability. See BVS 2353 (Verification of Survivability Requirements) for further details.

ATTACHMENTS: None.

2.8 SCAN ANGLE (3.2.1.1.8)

Tests 6x7x1.ST and 6x7x3.ST (End of Scan Vignette for HRD & T channels respectively) measure the delphi number at which 1% vignetting of scene begins to occur. The measured delphis enable calculation of the altitude needed to obtain contiguous coverage at the equator. The contiguous coverage requirement is based on the average of +Z and -Z scan angles.

For OLS #14, the following results were obtained:

CHANNEL	DELPHI	SCAN ANGLE	CONTIGUOUS COVERAGE ABOVE:	
+Z HRD	+988.0	+55.79°	429.50 n. mi.	430.59 avg.
-Z HRD	-987.0	-55.73°	431.68 n. mi.	
+Z T	+978.0	+55.22°	441.58 n. mi.	435.54 avg.
-Z T	-989.0	-55.85°	429.50 n. mi.	

Thus, both the HRD channel and the T channel meet the requirements for contiguous coverage above 440 naut. mi, since both channels will provide contiguous coverage for all altitudes above 435.54 naut. mi.

ATTACHMENTS: None.

2.9 DATA COLLECTION RATE (3.2.1.1.9)

OLS #14 does scan the field of view at the prescribed 11.88 +/- .12 Hz rate. This parameter is measured in Scanner Functional tests 5x12x1.ST (Primary Side) and 5x12x2.ST (Redundant Side).

The test results are summarized below for all TV tests:

	Frequency, Hz	
Date	Primary	Redundant
02-13-93 Optic Limit	11.91	11.91
03-20-93 Hot Limit	11.89	11.89
03-24-93 Cold Limit	11.91	11.91
03-29-93 Orbit Nom.	11.90	11.90

ATTACMENTS: None.

2.10 POWER (3.3.1 and 3.3.2)

Both +28V and +5V power is measured and monitored continuously throughout all of the test sequence.

The power required in the 8 Development-Spec-defined modes is tabulated below. The Development Spec Power Profile is measured in test 5x2x11.ST for modes 1 through 8 and 5x2x2.ST for mode 0.

10V power consumption was not tested on OLS #14. The current system test equipment is not capable of monitoring 10V power. Analysis of the components using S/C supplied 10V power indicates that 5D-3 10V power consumption is in spec.

DMSS-OLS-300 limits 28V power consumed for SSS thermal control to 23 watts maximum. SSS heater power consumption was not measured on OLS #14. Analysis of the heater resistances and tolerances indicates that 5D-3 SSS heater power consumption is in spec.

OLS #14 28V power consumption is in spec for all modes in the primary and redundant configurations. Fallback (dual power) configuration power consumption is also in spec. See the attached table for further details.

ATTACHMENTS: OLS #14 Power Profile

OLS #14 POWER PROFILE

SINGLE POWER				DUAL POWER	
28V MODE/LIMIT	TV +5/-8 03-30-93	TV HOT LIMIT 03-17-93	TV COLD LIMIT 03-24-93	28V LIMIT	**WORST CASE (CALCULATED)
0 88W	55	55	55	131W	89
1 105W	83	85	83	148W	119
2 116W	90	92	90	159W	126
3 125W	96	98	96	168W	132
4 157W	131	134	131	200W	168
5 167W	138	142	138	210W	176
6 198W	166	170	165	241W	204
7 207W	178	182	177	250W	216
8 218W	186	189	184	261W	223
5V MODE/LIMIT					
0 4.8W	3	3	3		
1 4.8W	3	4	3		
2 4.8W	3	4	3		
3 4.8W	3	4	3		
4 4.8W	3	4	3		
5 4.8W	3	4	3		
6 4.8W	3	4	3		

2.11 MASS

2.11.1 Total Mass (3.4.1)

The weight and center of gravity of OLS #14 components were not measured as part of bearing retrofit. Weight data taken on 3-03-88 during the original OLS 14 selloff is provided for reference. The tape recorder and encrypter serial numbers are those belonging to the system at OLS #14 sell-off and may change.

All Westinghouse furnished parts meet their center of gravity specification limits and their maximum specified weight allocation. All Typical encrypters exceed the spec limit in center-of-gravity. The encrypters are GFE to WEC and their weight and C.G. are not controlled by WEC.

The total weight of the OLS #14 AVE is 292.52 pounds, (less BBX's, but including GSSA/DOC & Test Cable), vs. a spec limit of 300 pounds.

ATTACHMENT: OLS #14 Weight and Center-of-Gravity Tables

TABLE 1

WESTINGHOUSE FURNISHED PARTS SUPPLIED WITH OLS 14 SYSTEM
SUMMARY OF WEIGHT AND CENTER GRAVITY

UNIT	UNIT SER. NO.	$\overline{X}$			$\overline{Y}$			$\overline{Z}$			WEIGHT			
		SPEC	MPR	ACT	SPEC	MPR	ACT	SPEC	MPR	ACT	MAX* SPEC	MPR** W/O CONT	MPR** W CONT	ACT
SSS	5009	1.8±.5	1.8±.5	1.74	6.2±.5	6.2±.5	6.19	0.7±.5	0.7±.6	0.69	59.0	54.92	56.02	55.08
SPS	5009	3.0±.5	3.0±.5	2.90	13.8±1.0	13.8±1.0	13.60	8.6±.8	8.6±.8	8.50	70.0	67.60	68.95	69.06
SPU	5009	3.0±.5	3.0±.5	2.92	6.6±.5	6.6±.5	6.72	6.0±.5	6.0±.5	5.81	18.0	17.00	17.34	17.13
PSU	5009	2.3±.5	2.3_.5	2.81	7.0±.6	7.0±.5	6.69	7.2±.5	7.2±.5	7.12	27.0	25.93	26.45	26.63
DSU	5009	1.2±.25	1.2±.25	1.27	4.0±.5	4.0±.5	4.27	3.0±.5	3.0±.5	2.73	4.0	3.47	3.53	3.38
GSSA/DOC	5009	4.2±.5	4.2±.5	4.33	+0.1±.3	+0.1±.3	0.36	2.4±.5	2.4±.5	2.77	9.0	7.83	7.99	7.83
PR1	044	3.45±.25	3.45±.25	3.43	6.36±.25	6.36±.25	6.30	4.23±.25	4.23±.25	4.34	22.75	21.14	21.57	21.20
PR2	045	3.45±.25	3.45±.25	3.37	6.36±.25	6.36±.25	6.27	4.23±.25	4.23±.25	4.28	22.75	21.14	21.56	21.50
PR3	056	3.45±.25	3.45±.25	3.29	6.36±.25	6.36±.25	6.33	4.23±.25	4.23±.25	4.31	22.75	21.14	21.56	21.15
PR4	057	3.45±.25	3.45±.25	3.21	6.36±.25	6.36±.25	6.19	4.23±.25	4.23±.25	4.28	22.75	21.14	21.56	21.15
CABLES	(1)	-	-	-	-	-	-	-	-	-	32.0	24.31	24.79	22.41
TEST CABLE	(2)	-	-	-	-	-	-	-	-	-	6.0	6.0	6.0	6.0
TOTAL WEIGHT											298	286.78	292.36	292.52

*DMSS-OLS-300, SCN 011, 20 Nov. 1987
**5D3 Mass Properties Report, 18 Nov. 1988

(1) SERIAL NUMBERS ARE AS RECORDED ON DATA SHEET
(2) A MASS ALLOCATION OF 6 LBS. HAS BEEN ASSIGNED FOR TEST CABLE
FROM THE TOTAL OLS MASS ALLOCATION.
TEST CABLE IS PROVIDED AND CONTROLLED BY THE SPACECRAFT INTEGRATOR.

TABLE 2

GOVERNMENT FURNISHED PARTS SUPPLIED WITH OLS 14 SYSTEM
SUMMARY OF WEIGHT AND CENTER GRAVITY

UNIT	UNIT SER. NO.	$\overline{X}$			$\overline{Y}$			$\overline{Z}$			WEIGHT			
		SPEC	MPR	ACT	SPEC	MPR	ACT	SPEC	MPR	ACT	MAX* SPEC	MPR** W/O CONT	MPR** W CONT	ACT
BB1	026	1.8±.1	1.8±.1	1.80	2.7±.1	2.7±.1	2.79	2.2±.1	2.2±.1	2.17	3.67	3.34	3.59	3.44
BB2	027	1.8±.1	1.8±.1	1.86	2.7±.1	2.7±.1	2.79	2.2±.1	2.2±.1	2.12	3.67	3.33	3.59	3.50
BB3	028	1.8±.1	1.8±.1	1.86	2.7±.1	2.7±.1	2.79	2.2±.1	2.2±.1	2.12	3.66	3.33	3.59	3.50
										TOTAL WEIGHT	11.00	10.00	10.77	10.44

*DMSS-OLS-300, SCN 011, 20 Nov. 1987

**5D3 Mass Properties Report, 18 Nov. 1988

2.11 MASS (Cont'd)

2.11.2 Component Mass (3.4.2, 3.4.3)

The mass of the individual components of the OLS #14 AVE are tabulated below.

Component	Spec	Measured
SSS	59.0	55.08
SPS	70.0	69.06
SPU	18.0	17.13
PSU	27.0	26.63
OSU	4.0	3.38
GSSA/DOC	9.00	7.83
PR1	22.75	21.20
PR2	22.75	21.50
PR3	22.75	21.15
PR4	22.75	21.15
BB1	3.67	3.44
BB2	3.67	3.50
BB3	3.66	3.50
Cables	32.00	22.41

The cable figure does not include Special Sensor cables which are not supplied by WEC.

2.12 COOLER TRANSIENT MARGIN (3.2.2.5)

The T channel cone cooler transient cooldown cooling capacity margin is tested by the file 7x7.ST. An external power supply provides 1/2 Watt of heating to the outer stage of the cooler during a normal cooldown. On OLS #14 bearing retrofit, cone cooler S/N 026 successfully reached its operating set-point with 1/2 watt of external power applied, demonstrating the required margin.

ATTACHMENTS: None

2.13 DESIGN FEATURES

The following design features of the 5D-3 OLS are addressed in the analyses. The analyses are contained in the OLS 5D-3 System Summary Report. The requirements of the Design Features are met or exceeded in each category.

SUBJECT	SPEC. PARA.
DESIGN INTERFACES	(3.1.2)
RELIABILITY	(3.2.3)
WEAROUT/CONSUMPTION	(3.2.3.3)
STORAGE	(3.2.3.4)
CONTAMINATION CONTROL	(3.2.3.5)
CORROSION OF METAL PARTS	(3.2.3.6)
MAINTAINABILITY	(3.2.4)
INTERCHANGEABILITY	(3.3.5)

ATTACHMENTS: None.

2.14 REDUNDANT AND FALLBACK SUBSYSTEMS (3.2.3.1 & 3.2.3.2)

Paragraph 3.2.3.1 of the development spec requires the OLS to incorporate the following redundant subsystems:

(1) Along-Scan Gain Control

(2) Main Bus Power Supplies

(3) Data Processors

(4) Memories

(5) I/O Interfaces

  a. Bus Controls
  b. I/O Controls
  c. S/C Interfaces
  d. WOW/Flutter Signals/Clock Drivers
  e. Drive Motor Controls
  f. Sensor Controls
  g. Gain Controls
  h. Encoder Processors

(6) Data Channels

  a. Smooth Video Filters
  b. Fine Video Filters
  c. T-Channel Post Amplifiers
  d. SDS Channel
  e. SDF Channel
  f. RTD Channel
  g. Special Sensor Processors
  h. Output Data Multiplexers

(7) Output Switching Unit Oscillator and Clock Circuits

(8) Digital Tape Recorders - (Three of Four Required)

(9) Output Data Channels - (Three of Four Required)

Paragraph 3.2.3.2 requires the OLS to incorporate the following fallback subsystems:

(1) IMC Shut-Off Mode.

(2) HRD - Detector Single Segment Select, with associated electronics.

(3) T-Detector Single Segment Select, with associated electronics.

(4) Digital Generation of Delphi Scanner Clock.

(5) PMT Shut-Off Mode

Redundant and fallback subsystems are verified by test during the normal test flow either by repetition of the relevant test on the alternate subsystem (in the case of a redundant subsystem) or by tests designed to verify the specific subsystem (in the case of a fallback subsystem). In each case, any out-of-specs or anomalies are reported as part of the relevant Test Report paragraph.

2.15 ENVIRONMENT

The following enviromental requirements are addressed in analyses and are contained in the OLS 5D-3 System Summary Report. The Thermal Vacuum (except CHA), Random Vibration, and shock requirements are verified by the sucessful completion of the approved Test Procedure.

The 5D-3 Environmental requirements of the Development Specification are met or exceeded by the OLS #14 AVE.

SUBJECT	SPEC. PARA
GROUND ENVIRONMENT	20.2.1
LAUNCH ENVIRONMENT	20.2.2
THERMAL VACUUM (CHA)	20.2.2.1
ACCELERATION	20.2.2.5
CHARGED PARTICLE ENVIRONMENT	20.2.2.6
LAUNCH PRESSURE PROFILE	20.2.2.8
ACCOUSTIC FIELD	20.2.2.9
TRANSPORATION & HANDLING ENVIRONMENT	20.2.3

ATTACHMENTS: None.

3.0 INTERFACE SPECIFICATION REQUIREMENTS

Electrical Interface parameters are measured in the OLS Detailed Electrical Test (T927989) and the OLS Special Sensor Detailed Electrical Test (T927992). These tests demonstrated conformance with all applicable Interface Specification requirements. The only Interface related system measurements that vary significantly from system to system are the SSS Alignment axes which are included here.

3.1 SSS ALIGNMENT AXES

The OLS #14 SSS Reference Plane axes are within the specification allowances. The results of system test and calculation are given below. The designations are those in Interface Spec IS-YD-810, para. 3.2.7ff.

SECONDARY REFERENCE AXES TO PRIMARY AXES	SECONDARY REFERENCES AXES TO MOUNTING (INTERFACE) AXES
X_{R-P} = 0.708 mrad = 146 arc sec	X_{R-M} = 0.727 mrad = 150 arc sec
Y_{R-P} = 0.621 mrad = 128 arc sec	Y_{R-M} = 0.732 mrad = 151 arc sec
Z_{R-P} = 0.698 mrad = 144 arc sec	Z_{R-M} = 0.509 mrad = 105 arc sec

These are within the specification limits of 600 arc seconds. The Mounting (Interface) Axes to Primary axes are also calculated, using the computer program REFPLN and are given below:

X_{M-P} = 0.257 mrad = 53 arc sec

Y_{M-P} = 0.189 mrad = 39 arc sec

Z_{M-P} = 0.199 mrad = 41 arc sec

These are within the specification limits of 120 arc seconds.

ORIGINAL

OLS - 14

2/8/93 JRH

BVS 2579

DATE 08 February 1993

ORIGINATOR for J. SMUTKO
J. SMUTKO

APPROVED, Q&RA RW Bark/RRV

APPROVED, ENGRG Steve Nichols

REVISION 0

DISTRIBUTION

J. Spangler
M. Barrett
S. Nichols
M. Little
R. Bark
R. Raum
P. Kiefer
V. Williams
G. Pollock
B. Spencer
R. Lieske
J. Scilipoti

BEARING RETROFIT
AND RETEST PLAN
FOR OLS 12 THRU 16

Support and Services Contract No. F04701-90-C-0028

Prepared for

UNITED STATES AIR FORCE
Headquarters, Space Systems Division
Los Angeles, California

Prepared by

WESTINGHOUSE ELECTRIC CORPORATION
Defense and Electronics Center
Baltimore, Maryland

BVS No.: 2579

REVISION SHEET & NOTES PAGE

NOTICE: Unless otherwise instructed, the marked-up pages showing actual changes incorporated in a new Rev. will be maintained in the BVS Master File F future reference and the remainder of the document will be discarded w the new Rev. is filed.

REVISION LETTER	REVISION DATE	AFFECTED PAGES	REVIS MAD
A	4/6/90	1,2, *3-6, 7-11, *12, 13-16, *17-20, 21, 22	J. SMU
B	8/7/90	1, 2, 16, 16a	D. O
C	8/26/90	1, 2, 16b, 17	J. S
D	9/21/90	1, 2, 5, 6, 18, 21	G. POL
E	2/20/91	1, 2, 17-23	R. BAR
F	2/28/91	1, 2, 17	R. B
G	5/20/91	22, 23	M. B
H	5/22/91	22	M. BAR
J	6/28/91	1-3, 22-23	SCIL
K	8/29/91	1-2, 18, 22-23	SCIL
L	11/05/91	1, 2, 23, 24, 25	G. POL
M	7/20/92	1, 2, 12-14	P. KIE
N	9/2/92	1, 2, 16b, 16c, 17, 18, 23	J. S
P	01/27/93	1, 2, 16d	J. S
Q	02/05/93	1, 2, 22, 22a	SCILIP

(* INDICATES PAGE # IS ONLY CHANGE TO THAT PAGE)

Notes:

WP51\JSm01.dl

A-2

1.0 INTRODUCTION

This document describes the detailed rework and test verification plan for replacing the oscillating assembly bearings in the SSS with new bearings having improved lubrication (Nye 188B).

Included are step-by-step instructions, with check-off lines for all inspection, mechanical, optical and electrical test operations.

2.0 REFERENCES

This document references the following Westinghouse procedures:

9RA3681	SSS Assembly Procedure
9RA4026	SSS Handling Procedure
9TA9354	Mechanical Operations for SSS Oscillating Assembly Bearing Retrofit
T927002	SSS/DME Compatibility Test Specification
T927686	OLS System Acceptance Test Procedure

OLS Program Directives:

PD 024
PD 026
PD 027
PD 030
PD 044
PD 045
PD 055

PQL 0735 Vibration Procedure

3.0 REWORK AND TEST PLAN FOR OLS: OLS-14

3.1 Charge labor for this effort to the Block 5 Support and Services contract. Present G.O. number, valid thru 9/30/~~91~~ 92, is ~~53741~~ 53864. Task assignments are as follows:

BAAA	Non-recurring Engineering
BABA	OLS-12
BACA	OLS-14
BADA	OLS-15
BAEA	OLS-16

Material and Travel G.O. is ~~53742.~~ 53865

3.2 The modification is accomplished by working revision notice G9 E

This consists of replacing the two bearing pairs in oscillat r Assembly 623R765.

Special instructions have been written to supplement the RNs ar describe the mechanical operations necessary to retrofit sca e bearings after an SSS has been fully assembled, see 9TA9354.

3.3 For those systems in the field, return the system to WEC, Balti r for rework and retest. Follow all applicable handling proced e including Program Directives 024, 026 and 027. As an option, th PSU and SSS only may be returned if another system is available t support the retest effort.

3.4 INCOMING INSPECTION AND SYSTEM TESTS.

OPERATION	VERIFICATION	DATE
Unpack	GJS.	8-5-91
Record serial nos. of rcvd. units: SSS 640R800G08 S/N N/A or 758R750G02 S/N 5009 PSU 758R050G04 S/N 5009 SPS 651R390G02 S/N 5008 SPU 758R040G03 S/N 5009 OSU 640R960G04 S/N 5009 9RA5255H02 S/N 502; 9RA5255H04 S/N 501; 9RA5255H06 S/N 503; 9RA5255H04 S/N 501; 9RA5255H10 S/N 503; 9RA5255H11 S/N 501; 9RA5255H012 S/N 501; 644R327G01 THRU G03, 644R358G01-G06, 644R339G01-G05	GJS.	8-5-91
Attach copy of incoming DD1149 to this BVS for control purposes	GJS.	8-5-91
WEC Receiving Inspection		8-6-91
AFPRO Inspection		6/115/92

Baseline Electrical Tests - Deleted

3.5 OPTICAL ALIGNMENT BASELINE MEASUREMENTS

Prior to bearing retrofit certain optical tests must be performed in order to accumulate baseline data with which to compare readings taken after the work is completed. This is necessary so that alignment integrity can be verified after the SSS has been partially disassembled and reassembled. These tests will be the same as some of the tests performed in 9RA3681 "Assembly and alignment procedure SSS assembly". However, there may be slight differences in technique because the assembly status of the SSS will not be exactly the same as in the normal building sequence. The steps herein, then, will be excerpts from that procedure and all step numbers referred to will be taken from 9RA3681.

Data should be noted in the applicable flight log book and used for post retrofit alignment comparisons.

In order to perform the necessary tests, the PMT and HRD detector must be removed. The spring assemblies must also be tied in order to permit positioning of the telescope.

STEPS FROM 9RA3681 TO BE PERFORMED

STEPS		VERIFICATION	DATE
8.0	"Adjustment of optical alignment, test and integration facility" - prepares the facility for required tests.	Wth	15 J
9.0	"SSS assembly mounting procedure" - Mounts the SSS to the test facility reference interface for testing.	Wth	15 Ju
11	"Alignment of the oscillating assembly rotating axis with the Moore table axis." - positions the SSS for optical measurements.	Wth	15
12	"Mounting interface alignment measurements" - Determines SSS reference axis position in relation to the OATIF mirrors/SSS mounting interface.	Wth	15 Ju
___	A test will be performed to determine the position of the HRD detector prior to removal as follows: Clamp a Gaertner bench microscope to the T/T table aligning the microscope reticle with the T/T reticle. Observing the HRD detector through the microscope, center the reticle on at least 2 corners of each segment of the detector. Note the T/T Y and Z axis positions for each point observed.	Wth	15 Ju
18	"Oscillating assembly transmission test" - Determines % transmission of telescope prior to retrofit.	Wth	16
___	Inspect mirror M1 to determine if a scatter test should be performed. If, on inspection, M1 appears very dirty perform a scatter test per step 19 of 9RA3681.	No scatter test reqd. Wth	16 Ju

STEPS FROM 9RA3681 TO BE PERFORMED

STEPS		VERIFICATION	DATE
20.4	"HRD detector alignment check" - checks alignment of the HRD in relation to the ORA field splitter. Illumination via the PMT light as described in step 20.4.5 should not be necessary. If the light from the T/T point source is insufficient to view the HRD the PMT must be removed prior to performing step 20.4.	Wdtn	16 Jun 92
___	Before proceeding remove the HRD and PMT if still installed. Mount the PMT and HRD reticles.	Wdtn	16 Jun 92
14.2 to 14.3	"M1 centering test" - verifies that the optical beam is centered on M1 prior to retrofit.	Wdtn	16 Jun 92
16.1.1 to 16.1.4, 16.1.10, & 16.1.19 to 16.1.26	"T-Cal alignment..." Determines pre-retrofit T-Cal end of scan position. Make no adjustments.	Wdtn	16 Jun 92
16.2.1 to 16.2.4, 16.2.11, 16.2.20 to 16.2.27, & 16.2.29	"T-Clamp alignment..." - Determines pre-retrofit T-Clamp end of scan position. Make no adjustments.	Wdtn	17 Jun 92
15.2.2 to 15.2.7 & 15.2.16 to 15.2.18	"Encoder optics alignment" - Determines max. and min. clock voltages. The facet from 15.1.15 referred to in steps 15.2.6 and 15.2.7 will be assumed to be facet 8.	Wdtn	17 Jun 92
15.2.19.6 to 15.2.19.8	Defines minimum allowable voltages and angular displacement on the faceted ring.	Wdtn	17 Jun 92

STEPS FROM 9RA3681 TO BE PERFORMED

STEPS		VERIFICATION	DATE
15.3.1 to 15.3.6 Note: Make NO adjustment in 15.3.6	"Encoder nadir adjustment" - Determines pre-retrofit position of the encoder at the Nadir position W/R to target translater position.	Wdm	17 J
15.3.12	"Encoder nadir alignment error" - Provides a formula for determining nadir alignment error.	Wdm	17 J
15.4.1 to 15.4.26 Omit steps 15.4.18, 15.4.19, 15.4.20 & 15.4.23	"Encoder linearity and signal amplitude measurements." - Determine pre-retrofit position for facets of the encoder W/R to the target translator. In steps 15.4.17, 15.4.22 and 15.4.25 only a sampling of the numbered pulses shall be taken. Sample pulses 15, 60, 97 and 142.	Wdm	17 J
15.5 Note: Make NO adjustments in 15.5.12, 15.5.13 or 15.5.16	"Back-up auxiliary encoder alignment." - Determines pre-retrofit electro-optical position of the back-up aux. encoder.	Wdm	19 J
15.6.1 to 15.6.3	"SSS Preparation for primary aux. encoder alignment." - Prepares SSS for testing of primary aux. encoder.	Wdm	18 June
15.9 Note: Make NO adjustment in 15.9.13 or 15.9.16	"Primary aux. encoder alignment" - Performs tests to determine electro-optical position of the primary aux. encoder.	Wdm	15 June

STEPS FROM 9RA3681 TO BE PERFORMED

STEPS		VERIFICATION	DATE
15.1.1 to 15.1.15 Omit step 15.1.14	"Faceted ring angular measurements" - Determines optical positions of the facets of the polygon ring. In steps 15.1.4, 15.1.8, 15.1.10 and 15.1.13 where the step refers to specific facets, it shall be required to perform the procedure only on a sample of the facets. A facet shall be chosen at the beginning, the middle and as near to the end as can be seen. Perform the procedure on facets 1, 8 and 14 if these are accessible. Step 15.1.14 will be omitted and in step 15.1.15 the facet closest to the mean facet Y axis reading will be assumed to be facet 8.		18 June 92
	Cover the HRD and PMT reticles and ORA parts with lens tissue. Data should be noted in the applicable flight log book and used for post retrofit alignment comparisons.		15 June 92

3.6 MECHANICAL OPERATIONS

Perform the operations outlined in 9TA9354. This proced describes all the mechanical operations necessary to retrofit scanne bearings after an SSS has been fully assembled. This step-by-ste procedure includes check-off lines for each operation and inspect point.

For OLS-14 only: Reference paragraph 5.5 of 9TA9354. Replace m Rod-413R524H01. Original rod found to have a chipped thread prior t reassembly.

Following completion of the procedure, attach the working copy o 9TA9354 to this BVS.

Verification of completion GJB 10/27/92

Inspection 10/29/9

3.7 OPTICAL RE-ALIGNMENT

Optical Tests after Bearing Retrofit

After the bearing retrofit certain optical tests from 9RA3681 m s be performed both for comparison to baseline tests as well as to ens the unit is ready for integration tests. The bulk of these post bearin retrofit tests are the same as the optical baseline tests discussed i section 3.5. Record data in the applicable system SSS log book.

In order to perform the necessary tests, the PMT and HRD detecto must be removed. The spring assemblies must also be tied in order t permit positioning of the telescope.

STEPS FROM 9RA3681 TO BE PERFORMED

STEPS		VERIFICATION	DATE
8.0	"Adjustment of optical alignment, test and integration facility" - prepares the facility for required tests.		8'3'92
9.0	"SSS assembly mounting procedure" - Mounts the SSS to the test facility reference interface for testing.		8'3'92
11	"Alignment of the oscillating assembly rotating axis with the Moore table axis." - positions the SSS for optical measurements.		8-3-92
12	"Mounting interface alignment measurements" - Determines SSS reference axis position in relation to the OATIF mirrors/SSS mounting interface.		8'3'92
13.0 to 13.3, 13.5	"M3, M5 and M5 Mask Alignment" - Determines whether adjustments are needed in M3 and M5. (Hopefully M5 will not need alignment. If it does, consult an optical engineer because the ORA must be removed to align M5. Then it will be necessary to realign the ORA when it is reinstalled).		8-3-92
	For OLS 14 only: Remove RTV potting from M4, adjust M4 to correct orientation of M2 spider image (found displaced at incoming inspection) and repot M4 with RTV.		8'11 92
18	"Oscillating assembly transmission test" - Determines % transmission of telescope.		8-3'92

STEPS FROM 9RA3681 TO BE PERFORMED

STEPS		VERIFICATION	DATE
___	Inspect mirror M1 to determine if a scatter test should be performed. If, on inspection, M1 appears very dirty perform a scatter test per step 19 of 9RA3681.		[illegible]
20.4	"HRD detector alignment check" - checks alignment of the HRD in relation to the ORA field splitter. Illumination via the PMT light as described in step 20.4.5 should not be necessary. If the light from the T/T point source is insufficient to view the HRD the PMT must be removed prior to performing step 20.4.		[illegible]
___	Before proceeding remove the HRD and PMT if still installed. Mount the PMT and HRD reticles.		[illegible]
14.2 to 14.3	"M1 centering test" - verifies that the optical beam is centered on M1.		[illegible]
16.1.1 to 16.1.4, 16.1.10, & 16.1.19 to 16.1.26	"T-Cal alignment..." Determines T-Cal end of scan position. Make no adjustments.		[illegible]
	For OLS 14 only: Readjust T-Cal mirror per 9RA3681 except align the T-Cal (-)Z edge with the HRD at encoder pulse (1018-26)(Ref. paragraphs 16.1.14 and 16.1.18).		
16.2.1 to 16.2.4, 16.2.11, 16.2.20 to 16.2.27, & 16.2.29	"T-Clamp alignment..." - Determines T-Clamp end of scan position. Make no adjustments.		[illegible]

STEPS FROM 9RA3681 TO BE PERFORMED

STEPS		VERIFICATION	DATE
15.2.2 to 15.2.7 & 15.2.16 to 15.2.18	"Encoder optics alignment" - Determines max. and min. clock voltages. The facet from 15.1.15 referred to in steps 15.2.6 and 15.2.7 will be assumed to be facet 8.		8/12 92
15.2.19.6 to 15.2.19.8	Defines minimum allowable voltages and angular displacement on the faceted ring.		8/12/92
15.3.1 to 15.3.6 Note: Make NO adjustment in 15.3.6	"Encoder nadir adjustment" - Determines position of the encoder at the Nadir position W/R to target translater position.		8/12/92
15.3.12	"Encoder nadir alignment error" - Provides a formula for determining nadir alignment error.		8/13/92
15.4.1 to 15.4.26 Omit steps 15.4.18, 15.4.19, 15.4.20 & 15.4.23	"Encoder linearity and signal amplitude measurements." - Determine position for facets of the encoder W/R to the target translator. In steps 15.4.17, 15.4.22 and 15.4.25 only a sampling of the numbered pulses shall be taken. Sample pulses 15, 60, 97 and 142.		8/14/92
15.5 Note: Make NO adjustments in 15.5.12, 15.5.13 or 15.5.16	"Back-up auxiliary encoder alignment." - Determines electro-optical position of the back-up aux. encoder.		8/[illegible]/92

STEPS FROM 9RA3681 TO BE PERFORMED

STEPS		VERIFICATION	DATE
15.6.1 to 15.6.3	"SSS Preparation for primary aux. encoder alignment." - Prepares SSS for testing of primary aux. encoder.		5/1
15.9 Note: Make NO adjustment in 15.9.13 or 15.9.16	"Primary aux. encoder alignment" - Performs tests to determine electro-optical position of the primary aux. encoder.		5/13
15.1.1 to 15.1.15 Omit step 15.1.14	"Faceted ring angular measurements" - Determines optical positions of the facets of the polygon ring. In steps 15.1.4, 15.1.8, 15.1.10 and 15.1.13 where the step refers to specific facets, it shall be required to perform the procedure only on a sample of the facets. A facet shall be chosen at the beginning, the middle and as near to the end as can be seen. Perform the procedure on facets 1, 8 and 14 if these are accessible. Step 15.1.14 will be omitted and in step 15.1.15 the facet closest to the mean facet Y axis reading will be assumed to be facet 8.		[illegible]
Reinstall HRD & PMT (OLS-16 see next page, 16a)			[illegible]
___	A test will be performed to determine the position of the HRD detector after reinstallation as follows: Clamp a Gaertner bench microscope to the T/T table aligning the microscope reticle with the T/T reticle. Observing the HRD detector through the microscope, center the reticle on at least 2 corners of each segment of the detector. Note the T/T Y and Z axis positions for each point observed.		[illegible]
Inspection			[illegible]

A-16

3.7.1 PMT ASSEMBLY SPECTRAL RESPONSE STABILITY CHECK - OLS-16 Only

With the PMT assembly removed during the optical re-alignment, a check of the PMT spectral response will be performed to check spectral stability for any evidence of a shift since the last PMT spectral response made on 07/30/88.

The test will be performed in accordance with T-361A88, test paragraph 9.12 - Spectral Response and Effective Sensitivity.

STEPS TO BE PERFORMED

STEPS	VERIFICATION	DATE
Inspection of PMT (Damage Verification)	4/20/93 DWS N/A	
Install in Transport Case		
Spectral Response Test from T-361A88, Para. 9.12		
Inspect PMT prior to SSS Installation for Damage		
Reinstall PMT on SSS		
Inspection (W & DPRO)	N/A	

3.7.2 THERMAL BLANKET UPGRADE PER ECP-25 - OLS-16 only

In place of the thermal blanket hardware originally installed on OLS-16, install the following oscillating assembly insulation covers and insulation:

	VERIFICATION	DATE
540R561G01	4/20/93 DWS N/A	
540R561G02		
540R562H01		
540R562H02		
540R563H01		
Inspection	N/A	

3.7.2 (Cont'd.)

Install ECP-25 upgraded bracket on the 1A8 HRD/PMT Postamplifie Assembly as follows:

STEPS	VERIFICATION	DATE
Remove the cover assembly, 644R288, from the HRD/PMT Postamplifier, 644R220 located on the SSS Be careful not to disturb the potentiometer adjustments. It may be necessary to cut the RTV used to stake the potentiometers if it has adhered to the cover.	(OLS-16 only 1/14/93 DJS N/A	
On the cover assembly, 644R288G01, replace mount 522R838G01 and 432R269G01 with items 16 and 17 respectively on the Thermal Blanket Retrofit drawing, 765R630. (540R564G01 and 540R584G01) Re-mark the cover assembly to 644R288G02.		
Inspect modified cover		
Inspect 644R220, OK to re-install cover, WEC & DPRO		
Install modified cover on 1A8 postamplifer		
Inspection (Note - retest of 644R220 postamplifier not required, will be tested at system level).	N/A	

3.7.3 REPLACEMENT OF PMT AND EST/LMD - OLS-14 only

The PMT and EST/LMD assemblies originally delivered on OLS-14 wer transferred to OLS-12 in August of 1991 (with customer approval) t replace a failed PMT assembly. The flight-quality spare PMT assembly 644R909G05, Serial No. 6001, will be installed on OLS-14 as replacement. The EST/LMD from OLS-12 will be re-configured to match th characteristics of the replacement PMT. The PMT will be vibrated it the SSS assembly per paragraph 3.11.

STEPS	VERIFICATION	DATE
PMT S/N 6001 confidence test; 30 day vacuum test per the procedures of T927096, para. 4.13	J.S.	7/26/91 -
PMT post-vacuum test per T927096, para. 4.14	J.S.	8/

3.7.3 (Cont'd.) (OLS-14 only)

STEPS	VERIFICATION	DATE
PMT final electro-optical test at Arpt. Square III per T361A89.	JS for R.L.	10/2/92
Data Review	JS	10/22/92
Inspect PMT	QC 121	OCT 23 '92
DPRO	0382	OCT 23 '92
Modify EST/LMD, 644R219G03, Serial No. 5007 as follows:		
Add system-selected resistor R16 = 825 ohms (9TA8250H89/RNR55C8250FR)		9/14/92
Delete jumper wire from terminal 19 to 21. Add a jumper wire from terminal 18 to 21.		9/14/92
Circuit-check		9/15/92
Inspect EST/LMD	QC 121	9/21/92
Test per T927060, 4.10		9/21/92
Data Review		9/25/92
Inspect EST/LMD	QC 121	10/15/92
DPRO	QC 121	10/23/92
Install EST/LMD, 644R219G03, Serial No. 5007 on OLS-14 SSS.	GJS.	10/27/92
Install PMT assembly, 644R909G05, Serial No. 6001 on OLS-14 SSS.	G.JS	10/27/92

A-19

3.7.4 INSPECTION OF TERMINALS on OLS-14 VDGA - OLS-14 ONLY

STEPS	VERIFICATION	DATE
Remove the 1A6 VDGA assembly from the SSS. The 1A23 Solenoid mechanism will also have to be removed for access, and its cable may have to be unbonded from the HRD and/or SSS structure.	BJ.	1/26/93
Remove the cover from the VDGA assembly and inspect the terminals for solder cracks similar to those observed on OLS-18.	BJ. P 373 R	1/27/93
Terminal inspection complete	BJ. R	1/27/93
WEC inspection - OK to cover		1/28/93
DPRO	0337	1/28/93
Install cover		1/28 93
Final inspection - OK to install		1/28/93
No retest of the VDGA assembly is required. (test will be performed as part of the thermal vacuum ambient testing per paragraph 3.13 of this BVS.)		
Install the VDGA assembly on the SSS. Re-mount the solenoid mechanism and re-bond cables as required.	GB.	1/29/93
Inspection		1/29/93

STEPS		VERIFICATION	DATE
3.8	SSS TEST PER T927002		
	Disconnect SSS main cable connector 1A9P2	(N/A) JS	8/28/92
**	Perform the test procedures of T927002 including 50 hour bearing confidence test, scanner centering, scanner frequency, and limit switch adjustments if required. It is not necessary to repeat paragraph 4.16, T detector bias current measurement.	JS	9/9/92
	Reconnect 1A9P2	~~N/A~~ GJS.	10/27/92
	Data Review		9-10-92
	Inspection (SSS ready for system test) J.S.		10/29/92

LESS OPEN DR # 173 BLANK PROBL

*3.8.1 Perform encoder optics ambient funtional test per T927002, paragraph 4.12.4 JS TECH 9/9/92

*3.8.2 Apply additional adhesive to encoder optics assembly per RNs GL54D and GL62D.

DATE 9/5/92 GJS MANNF 9/22/92 INSP 9/23/92 DPRO

NOTE: Note after 24 hours the SSS may be removed from the handling fixture and installed on the base plate/test block.

*3.8.3 Seven day cure at room temperature.

DATE COMPLETE 9/16/92

*3.8.4 Reinstall cover and torque screws to 4 to 6 in/lbs.

9/23/92 MANUF INSP

DATE 9-23-92

*3.8.5 Repeat step 3.8.1

TECH J.S. DATE 9/23/92

*NOTE: For OLS 16 perform this action after completion of paragraph 3.13 of this BVS.

** CORRECT SCANNER FREQUENCY BY REMOVING 0.095" FROM EACH OF THE FOUR FREQUENCY WEIGHTS ON THE INERTIA WHEEL.

8-31-92 J. SMUTKO

(GJS 9/10/92)

ADD JRH 4X13.ST Scanner Limit Definition JRH 11/20/9

STEPS		VERIFICATION	DATE
3.9	AMBIENT SYSTEM TESTS		
	QUICKTESTN.ST	✓ BEDE	11/10,
	QUICKTESTR.ST	✓ JJB	11/1
	4X9X1.ST	✓ BEDE	11/
	6X2X1.ST 3824 A/A	✓ DJK	12/
	AHC11PT.ST - R	✓ 6889	11/23
	APC11PT.ST - P	✓ RMF	11/2
	AHSFB11PT.ST - R	✓ 2889 A/A	11/2 1,
	6X3X1.ST - P	✓ 12 DJK	12/2
	6X3X2.ST - R	✓ DJK	12/
	6X3X5.ST - R AM14A-4	✓ 2889 A/A	11/25
	MHC11PT.ST - R	✓ RMF	11/2 9
	6X5X1.ST - P	✓ 2889 A/A	11/24
	6X7X1.ST	2889 A/A	11/
	6X7X2.ST	✓ 6889 A/A	11/2
	6X9.ST	✓ RMF	11/25
	7X3.ST	✓	11
	Data Review	DEP	12/1

For OLS 14 only due to the PMT assembly replacement, add the following tests

4X3X1.ST	JRH	11/17/92
4X5X1.ST	✓ JJB	11/15
4X7X1.ST	✓ BEDE	11/25
MPA11PT.ST	✓ RMF	11/25
6X6X1.ST	✓ JRH	11/2
6X6X2.ST	✓ 6889 A/A	11/25/
10X1.ST	✓ JJB	11/2
STDVALTST.ST	✓ 2889 A/A	11/25/9
5X5X2.ST	✓ RMF	11/2 9
SIMFLT1.ST	JRH	12/2/92
SIMFLT2.ST	JRH	12/2/
SIMFLT3.ST	1301	12/3/
SFPDR.ST	1301	12/3
SIMFLT4.ST JRH	1301	12/3

4X10X1.ST M4' + M4" Mirror Adjustment JRH 12/3/

STEPS		VERIFICATION	DATE
3.10	<u>THERMAL VACUUM ADJUST</u>		
	Deleted		
3.11	<u>VIBRATION</u> - SSS Only		
	Inspection per PD045 checkpoint 3a	QC	12/9/92
	checkpoint 3b QC 345		12/11/92
	Notify ~~AFPRO~~ DPRO PRIOR TO VIBRATION		12/11/92
	Vibrate SSS, 3 Axis, acceptance level per T927686 para. 3.5	PQL 243	12/11/92
	WEC Inspection per PD 055	QC 345	12/14/92
	~~AFPRO~~ DPRO POST VIBRATION		12-15-92
	PD 045 Checkpoint #4	QC 345	12/21/92

3.12 POST-VIBRATION, AMBIENT

Perform the test procedures of T927686 paragraph 3.6 except delete paragraph 3.6.5 and in paragraph 3.6.3, only the following test files need to be run:

NOMINAL CONFIGURATION TESTS

		VERIFICATION	DAT
5X1X1.ST	Primary Configuration Power		12/17/
5X1X4.ST	Load Operational Prog. - Processor C		12/1
5X1X6.ST	Initialize Primary Configuration		12/17/
5X2X1.ST	Quiescent Mode Power		12/
5X2X2.ST	Primary Configuration		12/17/
5X2X3.ST	Primary Configuration Dual I/O		12/1
5X2X4.ST	Primary Config. Dual Formatter		12/
5X2X5.ST	Primary Config. Dual Formatters & I/O		12/
5X3X1.ST	Primary Configuration EST Check	RM	12/1
5X5X1.ST	HRD Analog Test	RM	12/18
5X5X2.ST	PMT Analog Test	RM	12/1
5X5X3.ST	T-Channel Analog Test	RM	12/18/
5X6X1.ST	PGC	RM	12/
5X6X2.ST	ATGC	RM	12/18/9
5X6X3.ST	ASGC	RM	12/
5X12X1.ST	Scanner Functional	RM	12/

REDUNDANT CONFIGURATION TESTS

		VERIFICATION	DATE
5X1X2.ST	Redundant Configuration Power	RM	12/15/92
5X1X5.ST	Load Operational Prog. - Processor D	RM	12/15/92
5X1X7.ST	Initialize Redundant Configuration	RM	12/18/92
5X3X2.ST	Redundant Configuration EST Check	RM	12/18/92
5X6X4.ST	PGC	RM	12/18/92
5X6X5.ST	ATGC	RM	12/18/92
5X6X6.ST	ASGC	RM	12/18/92
5X12X2.ST	Scanner Functional	RM	12/18/92
(3.6.4)			
6.1	IMC HRD A/S - Redundant - AHSF3PTI.ST	JRH	12/18/92
6.1.1	HRD A/S - Redundant - AHSF7PT.ST	JRH	12/18/92
6.1.2	PMT A/S - Primary - APC7PT.ST	RM	12/20/92
6.1.4	Backup Encoder HRD Sync—Redundant – AHSFB9PT.ST	RM	12/20/92
6X2X1.ST	L DC Response (must precede 6X3X1.ST)	DM	12/19/92
6X2X4.ST	T Chan Elec DC Response	RM	12/20/92
6X3X1.ST	L Chan Dark Noise - Primary	DM	12/19/92
6.4.1	HRD MTF - Primary - MHA7PT.ST	RM	12/18/92
6.4.2	PMT MTF - Redundant - MPA7PT.ST	JRH	1/5/93
6X4X3A.ST	Ambient T MTF - Redundant	RM	12/20/92
6X6X2.ST	PMT CAL	JRH	1/5/93
6X7X2.ST	990 Test	DM	12/19/92
7X5.ST	Actuator EST Test	JRH	12/21/92

3.13 Thermal Vacuum Acceptance Test

. Perform the Thermal Vacuum Test procedures per T927686, paragraph 3.7. Do not install encrypters, use the BBT simulator box. Attach the system test log sheets to this BVS. ADD 4X11X1.ST to parag

For OLS14 only:

	VERIFICATION	DATE
Add a 0.002" shim at the HRD preamp - relay optics interface.	GJS	2/5/
Perform 6x5x1.ST	OCW	2/5/
Have Systems Engineering review the 6x5x1.ST data	JTS	2/

Based on data analysis determine if:

a. Shim is left in ☑

b. Shim must be removed ☐

JTS 2/6/9

The following tests may be deleted from T927686 for this retest:

In paragraph 3.7.3.1, delete the following test files -

5X4X2	Core Test
5X4X3	Core Test
5X16X2	A/D Test
5X16X4	A/D Test

In paragraph 3.7.3.2 the run of 6X2X2.ST shall be considered a reference run.

Do a T channel electrical adjust by adding test "TSET.ST" to paragraph ~~3.7.3.2~~. 3.7.13.4 JRH

Delete paragraphs 3.7.3.4 and 3.7.3.5.

Add one day of T stabilization testing at the completion of Optics Limit with ml=-8° by performing the following at approximately 2 hour intervals: T1 at -63°C T2 at +37°C

Execute 6X2X3.ST by entering "DSK 6X2X3.ST". When the operator is prompted for the P2S job to be executed, enter "DSK TSTABILITY.ST".

In paragraphs 3.7.5.1.1, 3.7.10.3, 3.7.11.3, and 3.7.12.2, delete the following test files -

5X2X16	BB Signature
5X4X1,2,3,4	Core Tests
5X8X1,2	DMDM
5X10X1,2,3,4	Output Data Switching
5X14X1,2,3,4	SSP Formatter Tests
5X16X1,2,3,4	A/D Tests

Add 4X9X1.ST to paragraph 3.7.5.1.2.

Add a one day nominal temperature T channel stability test between the two soak cycles by performing the following at approximately 2 hour intervals: T1 at -63°C T2 at +37°C

Execute 6X2X3.ST by entering "DSK 6X2X3.ST". When the operator is prompted for the P2S job to be executed, enter "DSK TSTABILITY.ST".

Delete paragraph 3.7.12.~~8~~7.

Add a day at the beginning and a day at the end of the nominal temperature plateau for additional T channel stability by performing the following at approximately 2 hour intervals:

Execute 6X2X3.ST by entering "DSK 6X2X3.ST". When the operator is prompted for the P2S job to be executed, enter "DSK TSTABILITY.ST".

	VERIFICATION	DATE
Verify a minimum of 500 hours of scanner operation with new bearings has been performed in vacuum. Any deficiency should be made up at this time.	JRH	4/7/
Verify completion of Thermal Vacuum	JRH	4/7/9

3.15 OLS-12 Only: SPS Coax Connector repair on J10 due to defective female contact per NR 20250959.

4/26/93
DWS

- Remove top cover of SPS	N/A	(MFG)
- Remove 2 P.C. boards - A241 & A242	N/A	(MFG)
- Remove 640 R913G01 cable	N/A	(MFG)
- Remove coax connector J10 and replace with new connector	N/A	(MFG)
- Circuit check	N/A	(TEST)
- WEC Insp.	N/A	(INSP)
- DPRO Insp.	N/A	(DPRO INSP)

- OK to reinstall 913 cable in SPS
- Reinstall boards A241 & A242
- OK to cover Insp.
- WEC Insp.
- DPRO Insp.
- Install cover
- WEC Insp.
- Reinstall buffer connector

3.16 Due to male contact pin damage on cables 644R329G02 and G03, replace OLS-12 cables with OLS-14 cables.

3.17 Final Ambient

For OLS-16 perform additional adhesive operation pr RN GL54D prior to final ambient. See paragraph 3.8.1 thru 3.8.5.	4/28/93 DWS N/A	
For OLS 12 only perform the following post coax connector repair tests:		
NEWON1.ST	N/A	
QKTESTN.ST	N/A	
5X10X1SS.ST	N/A	
NEWON2.ST	N/A	
QKTESTR.ST	N/A	
5X10X2SS.ST	N/A	
Perform T927686 paragraph 3.8, Final Scan Plane Definition.	JRH	4/15/93
Perform T927686 paragraph 3.9, Inspection, Data Review, and Preparation for Shipment except Delete paragraph 3.9.2, Weight and Center of Gravity.	P 379 R	4/29/93
Pin Retention		4/29/93
Inspection		4/29/93
Data Review	379	4/29/93
AFPRO	337	4/29/93
Pack		4/29/93
Ship		4/29/93

ORIGINAL
07/27/92

BVS 2600

REVISION E

DATE 24 July 92

ORIGINATOR M. Epperly

QUALITY ASSURANCE

MANUFACTURING

5-3659

RDS REWORK AND RETEST PROCEDURE

For OLS 12, 13, 14, 15 and 16

OLS 14

Contract F04701-90-C-0028

Prepared For

UNITED STATES AIR FORCE
Headquarters, Space Division
Los Angeles, California

Prepared By

WESTINGHOUSE ELECTRIC CORPORATION
Electronics Systems Group
Baltimore, Maryland

REVISION SHEET

Revision Letter	Revision Date	Affected Pages	Revision Made by
-	25 Jul 90	Released	
A	14 Aug 90	Pages 2 and 13-27	
B	5 Oct 90	Pages 2-5	Rennenkampf
C	19 Feb 91	Pages 1, 2 and 13-27	Epperly
D	20 Jul 92	Pages 1-4 and 13	Barrett
E	23 Jul 92	All Pages	Epperly

1.0 Introduction

This document describes the detailed rework and retest plan for SPS and OSU units returned from the field for incorporation of Real-time Data Smooth. A copy of this document will serve as a checklist for accomplishing the rework and retest procedures. Because there is a possibility of units being interchanged between systems, it is necessary to work to unit serial numbers rather than system serial numbers.

Incorporation of RD into an OLS requires the modification of the following assemblies:

- 9C and SDF-5 boards in the SPS
- SPS Matrix Plate
- OSU-1 and OSU-2 boards in the OSU
- OSU Matrix Plate
- OSU Top Cover Assembly

For OLS-14 (System S/N 5009) only, the following SPS boards must also be reworked:

FC-2, CLCK and 9BX

Record Serialization of Units to be reworked here:

OLS 536R500G 03 5009
SPS 651R390G 02 5008
OSU 640R960G 04 5009

Record Assembly Serial Numbers here:

SPS Mother Plate Assy	(651R342) G04	SN	8619-0001
Prime 9C Board	(~~640R570~~ or 640R658)G02	SN	5006
Redundant 9C Board	(~~640R570~~ or 640R658)G02	SN	5001
Prime SDF-5 Board	(~~640R544~~ or 640R648)G02	SN	5014
Redundant SDF-5 Board	(~~640R544~~ or 640R648)G02	SN	5015
OSU Mother Plate Assy	(522R783) G02	SN	0001
OSU Top Cover Assy	(644R046) G03	SN	5009
OSU-1 Board	(640R522) G04	SN	5010
OSU-2 Board	(640R524) G03	SN	5009

For OLS-14 (System S/N 5009) only, record the serial numbers of the FC2, CLCK and 9BX Boards are:

Prime FC2	(640R454)	SN	5015
Redundant FC2	(640R454)	SN	5014
Prime CLCK	(640R406)	SN	5014
Red CLCK	(640R406)	SN	5015
Prime 9BX	(640R656)G02	SN	5001
Redundant 9BX	(640R656)G02	SN	5000

ORIGINA
07/

NOTE: For OLS 14 and 15, BVS 2711 describes REU interface modificatio which are to be made at the same time as these changes.

Labor for this task is to be charged as follows:

OLS 14 - A 53864 CACA
OLS 15 - A 53864 CADA

2.0 Rework and Assembly Retest Plan

2.1 Pre-Rework

		Verification Mfg/Date	Verification Insp/Date
Incoming Inspection of Returned Units			
SPS (651R390)	WEC		QC 109 7/10/92
SPS (651R390)	DPRO		QC 109 QC 109 7/10/9
OSU (640R960)	WEC		QC 109 7/10/9
OSU (640R960)	DPRO		QC 109 QC 109 7/10

2.2 Rework and Inspection

The RN numbers listed below are for reference only - All assemblies should be configured to their latest revision. Serial numbers are unit serial numbers.

		Mfg/Date	Insp/Date
System Rework (536R500)	GG42D		
SPS Chassis Rework (651R390)		DWS 8/21/92	QC 109
S/N 5007, 5009-5011	GG36D		
S/N 5008	GG71D		
SPS Mother Plate Assy Rework (651R342)		S&IS 019 8/4/92	QC 109
S/N 5007, 5009-5011	GG35D		
S/N 5008	GG70D (ref. GG16D)		
SPS Matrix Plate Wiring Rework (wiretabs 322R959 or 322R960)		S&IS 019 8/4/92	QC
S/N 5007	GG17D		
S/N 5008-5011	GG16D		
9C board assy rework (~~776R076~~ or 775R077) 5000 5001		DWS 8/14/92	QC 109
S/N 5007	GG10D, GG15D & GG20D		
S/N 5008	GG69D (ref. GG11D, GG15D, GG21D)		
S/N 5009-5011	GG11D, GG15D & GG21D		

ORIGINAL
07/31/92

SDF-5 board assy rework (~~775R078~~ & 775R079) 5014 5015 DWS 8/14/92 — 601 38
S/N 5007 — GG08D, GG14D & GG18D
S/N 5008 — GG68D (ref. GG09D, GG14D, GG19D)
S/N 5009-5011 — GG09D, GG14D & GG19D

<u>NOTE</u>: For OLS 14 and 15, BVS 2711 changes must also be worked. Record work on that BVS.

			Verification Mfg/Date	Insp/Date
OSU chassis rework (640R960)			BJ 8/21/92	QC 21
	S/N 5007, 5009-5011	GG33D		
	S/N 5008	GG67D		
OSU Top Cover Rework (644R046)			BJ 8/21/92	QC 21
	S/N 5007, 5009-5011	GG32D		
	S/N 5008	GG65D		
OSU Mother Plate Rework (522R783)			BJ 8/21/92	QC 21
	S/N 5007, 5009-5011	GG34D		
	S/N 5008	GG66D		
OSU Matrix Plate Wiring Rework (wiretab 322R958)			BJ 8/21/92	QC 21
	S/N 5007, 5011	GG22D		
OSU-1 board assy rework (775R080)			BJ 8/21/92	QC 21
	S/N 5007, 5009-5011	GG12D, GG15D & GG23D GG54A, GG55A & GG56A		
	S/N 5008	GG63D		
OSU-2 board assy rework (775R081)			MY 8/21/92	QC 21
	S/N 5007, 5009-5011	GG13D, GG15D & GG24D		
	S/N 5008	GG64D		

<u>For OLS-14 System S/N (5009) only, record rework and inspection:</u>

FC-2 board assy rework (640R454)	GU351 GU355	DWS 8/13/92	601 38
CLCK board assy rework (640R406)	GR99B	DWS 8/13/92	601 38
9BX board assy rework (640R656)	GU452 GU456	DWS 8/13/92	601 38

ORIGINAL
07/27/92
BY

2.3 Assembly Level Retest

2.3.1 Prime Side 9C Retest (~~775R076~~/775R077) SN 5000

	Date	Verificati
Rework Complete - No open items on ICT	8/6/92	
Room Temperature Retest per paragraph 4.3 of T814A76	8/7/92	3038 A/A
Pre Coat Data Review	8/8/92	
WEC Inspection - OK to Coat	8/8/92	QC
DPRO Inspection - OK to Coat	8/8/92	QC
Conformal Coat	8/8/92	cb. QC
Eight Non-powered Temperature Cycles	8/11/92	3038 A/A
Hi/Low Temperature Test per paragraph 4.7 of T814A76	8/12/92	
Data Review Complete		8-13-9
WEC Inspection - Assembly Complete	8/13/92	QC
DPRO Inspection - Assembly Complete	8/14/92	QC 185 NON SELECT

ORIGINAL
07/27/92

2.3.2 Redundant Side 9C Retest (~~775R076~~/775R077) SN 5001

Rework Complete - No open items on ICT	QC 121	8/9/92
Room Temperature Retest per paragraph 4.3 of T814A76	3088 A/A	8/9/92
Pre Coat Data Review	L.O.	8/10/92
WEC Inspection - OK to Coat	QC 121	AUG 10 '92
DPRO Inspection - OK to Coat		8/10/92
Conformal Coat	S 616 033 QC 121	8/10/92
Eight Non-powered Temperature Cycles	3088 A/A	8/11/92
Hi/Low Temperature Test per paragraph 4.7 of T814A76	0301 A/A	8/13/92
Data Review Complete		8/3/92
WEC Inspection - Assembly Complete	QC 115	8/13/92
DPRO Inspection - Assembly Complete	Select	8/14/92

ORIGIN
07/2

2.3.3 Prime Side SDF-5 Retest (~~775R07~~8/775R079)603 SN 5014

	Date	Verification
Rework Complete - No open items on ICT	8/6/92	109
Room Temperature Retest per paragraph 4.3 of T814A78	8/7/92	3038 A/A
Pre Coat Data Review	8/7/92	QE
WEC Inspection - OK to Coat	8/8/92	QC 109
DPRO Inspection - OK to Coat	8/8/92	QC 109
Conformal Coat	8/10/92	QC
Eight Non-powered Temperature Cycles	8/11/92	3038 A/A
Hi/Low Temperature Test per paragraph 4.7 of T814A78	8/13/92	3224 A/A
Data Review Complete	8/13/92	
WEC Inspection - Assembly Complete	8/13/92	
DPRO Inspection - Assembly Complete	8/14/92	165

2.3.4 Redundant Side SDF-5 Retest (775R078/775R079) SN 50

Rework Complete - No open items on ICT		
Room Temperature Retest per paragraph 4.3 of T814A78	[illegible]	8/2/92
Pre Coat Data Review	[illegible]	8/3/92
WEC Inspection - OK to Coat	QC 185	8/7/92
DPRO Inspection - OK to Coat	[illegible]	[illegible]
Conformal Coat	COB	8/[illegible]/92
Eight Non-powered Temperature Cycles		8/13/92
Hi/Low Temperature Test per paragraph 4.7 of T814A78		8/13/92
Data Review Complete	L.O.	8/14/92
WEC Inspection - Assembly Complete	QC 118	8/14/92
DPRO Inspection - Assembly Complete		8/14/92

ORIGINAL TEST
7/23/92

2.3.5 **OSU-1 Retest (775R080)**G03 SN 5010

	Date	Verific
Rework Complete - No open items on ICT	AUG 7 '92	
Room Temperature Retest per paragraph 4.3 of T814A80	8/2/92	
Pre Coat Data Review	8/3/92	
WEC Inspection - OK to Coat	AUG 7 '92	
DPRO Inspection - OK to Coat	8/7/92	
Conformal Coat	8/9/92	COB
Eight Non-powered Temperature Cycles	8/11/92	A/A
Hi/Low Temperature Test per paragraph 4.7 of T814A80	8/13/92	3224 A/A
Data Review Complete	8/13/92	
WEC Inspection - Assembly Complete	8/14/92	
DPRO Inspection - Assembly Complete	8/14/92	

ORIGINAL
07/27/92

2.3.6 OSU-2 Retest (775R081)G02 SN 5009

	Date	Verification
Rework Complete - No open items on ICT	8/3/92	
Room Temperature Retest per paragraph 4.3 of T814A81	8/5/92	3043 A/A
Pre Coat Data Review	8/5/92	L.O.
WEC Inspection - OK to Coat	8/6/92	SSI QC
DPRO Inspection - OK to Coat	8/~~6~~7/42	0332
Conformal Coat	8/9/92	COB
Eight Non-powered Temperature Cycles	3038 A/A 8/11/92	3038 A/A
Hi/Low Temperature Test per paragraph 4.7 of T814A81	8/13/92	3043 A/A
Data Review Complete	8/14/92	L.O.
WEC Inspection - Assembly Complete	8/14/92	QC
DPRO Inspection - Assembly Complete	8/14/92	QC QC

ORIGINAL
07/27/92

2.3.7 OSU Assembly Retest (640R960)

SN ______

	Date	Verificati
Rework Complete - No open items on ICT	DWS 8/25/92	
Room Temperature Retest per paragraph 4.1 and 4.2 of T814A56	8/26/92	0017 AIA
Hi/Low Temperature Test per paragraph 4.7 of T814A56	8/26/92	3321 AIA
Data Review Complete	8/26/92	
WEC Inspection - Assembly Complete	AUG 28 '92	
DPRO Inspection - Assembly Complete	0380	920828

9/27/92

OLS-14 (SYSTEM S/N 5009) ONLY

2.3.8 Prime Side FC-2 Retest (640R454) SN . 5015

Rework Complete - No open items on ICT	8/6/92	QC
Room Temperature Retest per paragraph 4.3 of T927025	8/7/92	8087 AIA
Pre Coat Data Review	8/7/92	QE
WEC Inspection - OK to Coat	8/8/92	QC
DPRO Inspection - OK to Coat	8/8/92	NON SELECT
Conformal Coat	8/9/92	COB QC
Eight Non-powered Temperature Cycles	8/11/92	3188 AIA
Hi/Low Temperature Test per paragraph 4.7 of T927025	8/11/92	
Data Review Complete	8/12/92	L.O.
WEC Inspection - Assembly Complete	AUG 12 '92	
DPRO Inspection - Assembly Complete	920813	0200

[illegible]
07/27/92

OLS-14 (SYSTEM S/N 5009) ONLY

2.3.9 <u>Redundant Side FC-2 Retest (640R454)</u>	SN	5014
Rework Complete - No open items on ICT	[illegible]	8/6/92
Room Temperature Retest per paragraph 4.3 of T927025	3087 AIA	8/7/92
Pre Coat Data Review	[illegible]	8/7/92
WEC Inspection - OK to Coat	QC 21	AUG 7 '92
DPRO Inspection - OK to Coat	QC 24	8/7/92
Conformal Coat	8/9/92 QC 24	
Eight Non-powered Temperature Cycles	3038 AIA	8/11/92
Hi/Low Temperature Test per paragraph 4.7 of T927025		8/11/92
Data Review Complete	[illegible]	8/12/92
WEC Inspection - Assembly Complete	QC 31	8/12/92
DPRO Inspection - Assembly Complete	0360	92081

OLS-14 (SYSTEM S/N 5009) ONLY

[illegible]

2.3.10 Prime Side CLCK Retest (640R406) SN 3014

Rework Complete - No open items on ICT	[illegible]/92	
Room Temperature Retest per paragraph 4.3 of T927019	8/[illegible]/92	
Pre Coat Data Review	[illegible]	[illegible]
WEC Inspection - OK to Coat	[illegible]/92	
DPRO Inspection - OK to Coat	8/7/92	
Conformal Coat	8/5/5	C.O.B
Eight Non-powered Temperature Cycles	8/11/92	
Hi/Low Temperature Test per paragraph 4.7 of T927019	8/12/92	
Data Review Complete	8/12/92	L.D.
WEC Inspection - Assembly Complete	AUG 13 '92	
DPRO Inspection - Assembly Complete	920813	

ORIGINAL
07/27
AF

OLS-14 (SYSTEM S/N 5009) ONLY

2.3.11 Redundant Side CLCK Retest (640R406) SN 5015

Rework Complete - No open items on ICT		8-6-92
Room Temperature Retest per paragraph 4.3 of T927019	3224 A/A	8/2/9
Pre Coat Data Review		8-3-9
WEC Inspection - OK to Coat	QC 175	8-6-9
DPRO Inspection - OK to Coat	0333	8-7-92
Conformal Coat	h	8/7/9
Eight Non-powered Temperature Cycles	3030 A/A	8/11/92
Hi/Low Temperature Test per paragraph 4.7 of T927019	3043 A/A	8-11-9
Data Review Complete		8-12-9
WEC Inspection - Assembly Complete	QC 103	8-12-92
DPRO Inspection - Assembly Complete	0368	8-13-9

ORIGINAL
07/31/92

OLS-14 (SYSTEM S/N 5009) ONLY

2.3.12 <u>Prime Side 9BX Retest (640R656)</u>	SN	5001
Rework Complete - No open items on ICT	AUG 6 '92	QC
Room Temperature Retest per paragraph 4.3 of T928339	8/5/92	
Pre Coat Data Review	8-6-92	
WEC Inspection - OK to Coat	AUG 7 '92	QC
DPRO Inspection - OK to Coat	8/7/92	QC
Conformal Coat	8/9/92	COB QC
Eight Non-powered Temperature Cycles	8/11/92	AIA
Hi/Low Temperature Test per paragraph 4.7 of T928339	8/12/92	AIA
Data Review Complete	8/12/92	
WEC Inspection - Assembly Complete	8/12/92	QC 107
DPRO Inspection - Assembly Complete	920813	0380

ORIGINAL
07/
92

OLS-14 (SYSTEM S/N 5009) ONLY

2.3.13 <u>Redundant Side 9BX Retest (640R656)</u>	SN	5000
Rework Complete - No open items on ICT	8/6/92	QC 116
Room Temperature Retest per paragraph 4.3 of T928339	8/7/92	[illegible]
Pre Coat Data Review	8/7/92	QE
WEC Inspection - OK to Coat	AUG 7 '92	QC 121
DPRO Inspection - OK to Coat	8/7/92	QC 121 QC 121
Conformal Coat	8/9/92 QC 121	COB
Eight Non-powered Temperature Cycles	8/11/92	3038 A/A
Hi/Low Temperature Test per paragraph 4.7 of T928339	8/12/92	8067 A/A
Data Review Complete	8/12/92	J.O.
WEC Inspection - Assembly Complete	AUG 13 '92	QC 121
DPRO Inspection - Assembly Complete	920813	0360

O L S PROGRAM DIRECTIVE

-CONTINUATION SHEET-

DIRECTIVE NO. 045

DATE 12/12/88

OLS14 BUS2600
9-15-92

CHECKPOINT #A

(Before Subsystem Test, in ~~Block 5 Clean Room~~, per T927000)
THERMAL CHAMBER

			RESP
A.	Area is clean and contains no miscellaneous parts or extraneous hardware.		QE
B.	The anti-static mat and wrist straps are in place and ready for use.		QE
C.	Unit and System cable connector pins are checked and none are bent or pushed in. (NOTE: This can be verified at presystem unit inspection and the buffer connectors are inspected and installed at this point per PD034)		INSP
D.	Verify correct color code on buffer connectors to certify inspected, tested and approved connectors per PD 034 (Appendix B).		INSP
E.	Test equipment configuration checked per Program Directive ~~#022~~ 033 less paragraphs IID and IIE.		QE
F.	Perform Test Equipment Operational Check per ~~PD022~~ PD033 paragraphs IID and IIE.	9/16/92	TD
G.	Review open ICT items on the SPS, ~~SPU~~ N/A, ~~PSU~~ N/A and OSU OSU and evaluate closure prior to moving to subsystem test.		QE
	SPS - TEST RN'S AK to AV to be done @ system test.		TD
			MFG
H.	TCP, SPS, SPU, PSU and OSU are connected to system cable connectors and each is grounded to the ground bus per 9RD7845.	9/16/92	TD
I.	Item annotated on SPS and OSU ICT that units are ready for subsystem test. - SPS and PSU ICTS		QE

NOTE 1:
WHEN APPLICABLE,
RECORD ACTIONS
PERFORMED IN SYSTEM
LOG BOOK.

NOTE 2:
"CAUTION"
BUMP, SHOCK,
ABRUPT MOVEMENT
OF TAPE RECORDERS
CAN CAUSE SEVERE
DAMAGE.

OLS14 9-
SVS2600

CHECKPOINT #8

(Before Sub-system Thermal Test, in PQL, per T927000)

A. PQL thermal chamber is clean and area contains no miscellaneous parts or extraneous hardware.

B. Assembly and cable connectors (buffered and unbuffered) were checked before cabling up, and no damage was found. (**Note**: Where buffer connectors are in-place, check the viewable side; do not remove from assembly.) VERIFY COLOR CODE ON BUFFER CONNECTORS PER PD 034, APPENDIX B.

1/22/92

CONNECTORS
OK ON
SPS AND
OSU OK

C. SPS, ~~SPU~~ N/A, ~~PSU~~ N/A and OSU tranported per 9RA4220.

D. Assemblies SPS, SPU and TCP are connected to system cable connectors and each is grounded to the ground bus per 9R07845.

E. Test equipment is in calibration as required in Program Directive ~~#022~~ 037 less paragraphs IID and IIE.

F. Perform Test Equipment operational check per PD ~~022~~ 037 paragraphs IID and IIE.

4/21/92

NOTE 1:
WHEN APPLICABLE, RECORD ACTIONS PERFORMED IN SYSTEM LOG BOOK.

NOTE 2:
"CAUTION"
BUMP, SHOCK, ABRUPT MOVEMENT OF TAPE RECORDERS CAN CAUSE SEVERE DAMAGE.

3.0 Subsystem Level Retest Procedure

3.1 Ambient Subsystem Verification

AT THERMAL CHAMBER 9-15-92

	Date	Verification
Rework Complete - No unexplained Open Items on ICT	[illegible] 1d '92	
Rework of BVS 2711 complete (OLS 14 and 15 only)	9/16/92	
Checkpoint A of PD 045 (attach copy)	9/15/92	

Run the following Test Files (Room Temperature):

	Date	Verification
NEWON1SS.ST	9/17/92	MEE
QKTESTN.ST	9/17/92	MEE
RDSTSTSS.ST ~~5X18X1SS.ST~~ ~~RDSTSTSS.ST~~	9/17/92	MEE
NEWON2SS.ST	9/17/92	MEE
QKTESTR.ST	9/17/92	MEE
RDSTSTSS.ST ~~5X18X2SS.ST~~ ~~RDSTSTSS.ST~~	9/18/92	AIA
5X18X1SS.ST	9/18/92	2999 AIA
5X18X2SS.ST	9/18/92	2389 AIA
5X18X3SS.ST	9/18/92	
5X18X4SS.ST	9/19/92	

3.1.1 Ambient Encrypter Verification

Note: To allow for scheduling and security constraints the ambient encrypter verification may be performed out of sequence, however, paragraph 3.1:1 must be complete prior to starting paragraph 3.3.9, Thermal Cycle #8.

KG46 is GFE. No KG-46 is available for test. Therefore tests in para 3.1.1 cannot be ran and are not applicable

Install the KG-46 data encrypter and KG-28 decrypter. Check out the KG-28 set-up using the ST-19 verification procedure ______ ______

para. 3.1.1 is Not Applicable MEE 9/14/92

Run the following test files:

	Date	Verification
NEWON1SS.ST		
RDSTST.ST		

NEWON2SS.ST		
RDSTST.ST		
NEWOND1.ST		
RDSTSTSS.ST		
NEWOND2.ST		
RDSTST.ST		

3.2 SPS and OSU Vibration

Note: To allow for scheduling, OSU and SPS vibration may occur before ambient tests per paragraph 3.1. Vibration must be completed prior to starting paragraph 3.3.6. Later vibrations due to rework or RN incorporation shall be recorded on the units ICT.

Pre-Vib Data Review (TEST DIRECTOR)	MEE	9/21/92
WEC Inspection - OK to Vibrate		9/21/92
DPRO Inspection - OK to Vibrate		9/21/92
Vibrate SPS - x-axis, random only 5D3 acceptance level per PQL737, nonpowered	AGS	9/21/92
Vibrate OSU - x-axis, random only 5D3 acceptance level per PQL737, nonpowered	AGS	9/21/92
WEC Inspection - Post Vib		SEP 22 '92
DPRO Inspection - Post Vib	0333	9/22/9

3.3 Thermal Test

Checkpoint B of PD-045 (attach copy)		9-23-9
Install Thermocouples (PQL operation)	KGS	9-23-9

3.3.1 Ambient Verification

Run the following Test Files (Room Temperature):
May be postponed until after Vibration AEE

		Date	Verification
	NEWON1.ST	9/22/92	2589 A/A
	QKTESTN.ST	9/22/92	2589 A/A
	RDSTSTSS.ST	9/22/92	2589 A/A
	NEWON2.ST	9/22/92	2589 A/A
	QKTESTR.ST	9/22/92	2589 A/A
	RDSTSTSS.ST	9/22/92	2589 A/A
Am 14-8	5X18X1SS.ST	9/22/92	U301 A/A 1M08 ERR
	5X18X2SS.ST	9/23/92	U301 A/A
	5X18X3SS.ST	9/23/92	U301 A/A
	5X18X4SS.ST	9/23/92	U301 A/A

3.3.2 Thermal Cycle #1

3.3.2.1 Hot Temperature

	Date	Verificatio
Allow chamber air in the vicinity of the SPS to stabilize at +50°C +4°/-0° for 2 hours. During this time the OLS shall not have power on.	9-19-92	U301 A/A
Run 5x18x1SS.ST	9-19-92	U301 A/A
RDSTSTSS.ST ~~RDSSTSTSS.ST~~	9-19-92	U301 A/A
Enter CON 0 42	9-19-92	U301 A/A
Enter OLS OFF	9-19-92	U301 A/A

3.3.2.2 Cold Temperature

	Date	Verificatio
Allow chamber air in the vicinity of the SPS to stabilize at -10°C +0°/-4° for 2 hours. During this time the OLS shall not have power on.	9-19-92	3146 A/A
Run 5x18x1SS.ST	9-19-92	3146 A/A
RDSTSTSS,ST ~~RDSSTSTSS.ST~~	9-19-92	3146 A/A
Enter CON 0 42	9-19-92	3146 A/A
Enter OLS OFF	9-19-92	3146 A/A

3.3.3 Thermal Cycle #2

3.3.3.1 Hot Temperature	Date	Verification
Allow chamber air in the vicinity of the SPS to stabilize at +50°C +4°/-0° for 2 hours. During this time the OLS shall not have power on.	9/19/92	2839 A|A
Run 5x18x2SS.ST	9/19/92	2839 A|A
RDS$TSTSS.ST	9/19/92	2839 A|A
Enter CON 0 42	9/19/92	2839 A|A
Enter OLS OFF	9/19/92	2839 A|A

3.3.3.2 Cold Temperature	Date	Verification
Allow chamber air in the vicinity of the SPS to stabilize at -10°C +0°/-4° for 2 hours. During this time the OLS shall not have power on.	9/20/92	0301 A|A
Run 5x18x2SS.ST	9/20/92	0301 A|A
RDS$TSTSS.ST	9/20/92	0301 A|A
Enter CON 0 42	9/20/92	0301 A|A
Enter OLS OFF	9/20/92	0301 A|A

3.3.4 Thermal Cycle #3

3.3.4.1 Hot Temperature

	Date	Verification
Allow chamber air in the vicinity of the SPS to stabilize at +50°C +4°/-0° for 2 hours. During this time the OLS shall not have power on.	9-20-92	3146 QA
Run 5x18x3SS.ST	9-20-92	3146 QA
RDS~~S~~TS~~T~~SS.ST	9-20-92	3146 QA
Enter CON 0 42	9-20-92	3146 QA
Enter OLS OFF	9-20-92	3146 QA

3.3.4.2 Cold Temperature

	Date	Verification
Allow chamber air in the vicinity of the SPS to stabilize at -10°C +0°/-4° for 2 hours. During this time the OLS shall not have power on.	9-20-92	3146 QA
Run 5x18x3SS.ST	9/20/92	2859 QA
RDS~~S~~TS~~T~~SS.ST	9/20/92	2859 QA
Enter CON 0 42	9/20/92	2859 QA
Enter OLS OFF	9/20/92	2859 QA

3.3.5 Thermal Cycle #4

3.3.5.1 Hot Temperature

	Date	Verification
Allow chamber air in the vicinity of the SPS to stabilize at +50°C +4°/-0° for 2 hours. During this time the OLS shall not have power on.	9/20/92	2234 A/A
Run 5x18x4SS.ST	9/20/92	2603 A/A
RDS~~S~~TSTSS.ST	9/20/92	2099 A/A
Enter CON 0 42	9/20/92	2235 A/A
Enter OLS OFF	9/20/92	2999 A/A

3.3.5.2 Cold Temperature

	Date	Verification
Allow chamber air in the vicinity of the SPS to stabilize at -10°C +0°/-4° for 2 hours. During this time the OLS shall not have power on.	9/21/92	0301 A/A
Run 5x18x4SS.ST	9/21/92	0301 A/A
RDS~~S~~TSTSS.ST	9/21/92	0301 A/A
Enter CON 0 42	9/21/92	0301 A/A
Enter OLS OFF	9/21/92	0301 A/A

3.3.6 Thermal Cycle #5

3.3.6.1 Hot Temperature	**Date**	**Verification**
Allow chamber air in the vicinity of the SPS to stabilize at +50°C +4°/-0° for 2 hours. During this time the OLS shall not have power on.	9/23/92	3146 Q/A
Run 5x18x1SS.ST	9/23/92	2339 A/A
RDS~~S~~TSTSS.ST	9/23/92	2889 A/A
Enter CON 0 42	9/23/92	2862 A/A
Enter OLS OFF	9/23/92	[illegible]

3.3.6.2 Cold Temperature	**Date**	**Verification**
Allow chamber air in the vicinity of the SPS to stabilize at -10°C +0°/-4° for 2 hours. During this time the OLS shall not have power on.	9/23/92	2969 A/A
Run 5x18x1SS.ST	9/24/92	U301 A/A
RDS~~S~~TSTSS.ST	9/24/92	U301 A/A
Enter CON 0 42	9/24/92	U301 A/A
Enter OLS OFF	9/24/92	U301 A/A

3.3.7 Thermal Cycle #6

3.3.7.1 Hot Temperature

		Date	Verification
Allow chamber air in the vicinity of the SPS to stabilize at +50°C +4°/-0° for 2 hours. During this time the OLS shall not have power on.		9/24/92	U301 A/A
Run	5x18x2SS.ST	9/24/92	3146 A/A
	RDS$TSTSS.ST	9/24/92	3146 A/A
	Enter CON 0 42	9/24/92	3146 A/A
	Enter OLS OFF	9/24/92	3146 A/A

3.3.7.2 Cold Temperature

		Date	Verification
Allow chamber air in the vicinity of the SPS to stabilize at -10°C +0°/-4° for 2 hours. During this time the OLS shall not have power on.		9/24/92	3146 A/A
Run	5x18x2SS.ST	9/24/92	3146 A/A
	RDS$TSTSS.ST	9/24/92	2869 A/A
	Enter CON 0 42	9/24/92	2869 A/A
	Enter OLS OFF	9/24/92	2869 A/A

3.3.8 Thermal Cycle #7

3.3.8.1 Hot Temperature	Date	Verification
Allow chamber air in the vicinity of the SPS to stabilize at +50°C +4°/-0° for 2 hours. During this time the OLS shall not have power on.	9/24/92	289 AIA
Run 5x18x3SS.ST	9/24/92	289 AIA
RDS$TSTSS.ST	9/24/92	289 AIA
Enter CON 0 42	9/24/92	289 AIA
Enter OLS OFF	9/24/92	289 AIA

3.3.8.2 Cold Temperature	Date	Verification
Allow chamber air in the vicinity of the SPS to stabilize at -10°C +0°/-4° for 2 hours. During this time the OLS shall not have power on.	9/25/92	U301 AIA
Run 5x18x3SS.ST	9/25/92	U301 AIA
RDS$TSTSS.ST	9/25/92	U301 AIA
Enter CON 0 42	9/25/92	U301 AIA
Enter OLS OFF	9/25/92	U301 AIA

3.3.9 Thermal Cycle #8

3.3.9.1 Hot Temperature

Allow chamber air in the vicinity of the SPS to stabilize at +50°C +4°/-0° for 2 hours. During this time the OLS shall not have power on.	9/25/92	U301 A/A

Run the following dual prime Test Files:

NEWOND1.ST ✓	9/25/92	U301 A/A
5x3x1SS.ST ✓	9/25/92	U301 A/A
5x3x5SS.ST ✓	9/25/92	3146 A/A
5x5x1SS.ST ✓	9/25/92	3146 A/A
5x6x1SS.ST ✓	9/25/92	3145 A/A
5x8x1SS.ST ✓	9/25/92	3146 A/A
5X9X1SS.ST	9/25/92	[illegible]
5X10X1SS.ST ✓	9/25/92	3145 A/A
5X11X1SS.ST ✓	9/25/92	3146 A/A
5X12X1SS.ST	9/30/92	MEE
5X13X1SS.ST ✓	9/25/92	3146 A/A
5x13x3SS.ST ✓	9/25/92	3145 A/A
5X14X1SS.ST ✓	9/25/92	3146 A/A
5X16X1SS.ST ✓	9/25/92	3146 A/A
5X17X1SS.ST ✓	9/25/92	3145 A/A
~~5X19X3SS.ST~~ MEE	—	—
5X2X1SS.ST	9/26/92	U301 A/A
5X2X2SS.ST	9/27/92	U301 A/A

Run the following dual prime Test Files:

NEWOND2.ST ✓	9/25/92	3146 Q/A
5x3x2SS.ST ✓	9/27/92	U301 Q/A
5x3x6SS.ST ✓	9/27/92	U301 Q/A
5x5x2SS.ST ✓	9/25/92	3146 Q/A
5x6x2SS.ST ✓	9/25/92	U301 Q/A
5x8x2SS.ST ✓	9/27/92	U301 Q/A
5X9X2SS.ST ✓	9/26/92	U301 Q/A
5X10X2SS.ST ✓	9/26/92	U301 Q/A
5X11X2SS.ST ✓	9/25/92	3146 Q/A
5X12X2SS.ST	9/30/92	
5x13x2SS.ST ✓	9/27/92	U301 Q/A
5x13x4SS.ST ✓	9/27/92	U301 Q/A
5X14X2SS.ST ✓	9/27/92	U301 Q/A
5X16X2SS.ST ✓	9/27/92	U301 Q/A
5X17X2SS.ST ✓	9/27/92	U301 Q/A
~~5X19X4SS.ST~~ Deleted	—	—

Paragraph is not applicable MEE
9/30/92

Install the KG-46 data encrypter and KG-28 decrypter. Check out the KG-28 set-up using the ST-19 verification procedure.	KG-46 is GFE and is not available for this test 9/29/92 MEE	

Run the following test files:

NEWOND1.ST		
RDS$TSTSSE.ST		
NEWOND2.ST		
RDS$TSTSSE.ST		
Enter CON 0 42		
Enter OLS OFF		

Remove the KG-46 encrypter and K6-28 decrypter.

3.3.9.2 Cold Temperature

Allow chamber air in the vicinity of the SPS to stabilize at -10°C +0°/-4° for 2 hours. During this time the OLS shall not have power on.	MEE	9/27/92

Run the following dual prime Test Files:

NEWOND1.ST	MEE	9/28/92
5x3x1SS.ST	MEE	9/28/92
5x3x5SS.ST	MEE	9/28/92
5x5x1SS.ST	MEE	9/28/92
5x6x1SS.ST	MEE	9/28/92
5x8x1SS.ST	MEE	9/28/92
5X9X1SS.ST	MEE	9/28/92
5X10X1SS.ST	MEE	9/28/92
5X11X1SS.ST	MEE	9/28/92

5X12X1SS.ST	MEE	9/28/92
5x13x1SS.ST	MEE	9/28/92
5x13x3SS.ST	MEE	9/28/92
5X14X1SS.ST	MEE	9/28/92
5X16X1SS.ST	MEE	9/28/92
5X17X1SS.ST	MEE	9/28/92
~~5X19X3SS.ST~~ DELETED MEE 7-30-92		
5X2X1SS.ST	MEE	9/28/92
5X2X2SS.ST	MEE	9/28/92

Run the following dual redundant Test Files:

NEWOND2.ST	MEE	9/28/92
5x3x2SS.ST	MEE	9/28/92
5x3x6SS.ST	MEE	9/28/92
5x5x2SS.ST	MEE	9/28/92
5x6x2SS.ST	MEE	9/28/92
5x8x2SS.ST	MEE	9/28/92
5X9X2SS.ST	MEE	9/28/92
5X10X2SS.ST	MEE	9/28/92
5X11X2SS.ST	MEE	9/28/92
5X12X2SS.ST	MEE	9/28/92
5x13x2SS.ST	MEE	9/28/92
5x13x4SS.ST	MEE	9/28/92
5X14X2SS.ST	MEE	9/28/92
5X16X2SS.ST	MEE	9/28/92
5X17X2SS.ST	MEE	9/28/92