BVS 2691

DATE 20 March 1992

REV -

ORIGINATOR
J. Scilipoti

F12

OLS #12 BEARING RETROFIT

ACCEPTANCE TEST REPORT
VOLUME I OF III
SUMMARY AND SPECIFICATION REQUIREMENTS

(CDRL 006A1)

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Prepared For

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Headquarters, Space Division
Los Angeles, California

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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 #12 Testing..................................... 1-8

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

1.5 Thermal Vacuum Profiles.. 1-20

1.6 Test History Calendar.. 1-24

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........... 2-43

2.2.3 Smooth Geometric Resolution - Infrared............... 2-62

2.2.4 Smooth Geometric Resolution - Daytime Visual......... 2-75

2.2.5 Smooth Geometric Resolution - Nighttime Visual......... 2-88

2.2.6 Data Sampling.. 2-101

2.3 Geometric Accuracy... 2-102

2.4 Radiometric Accuracy... 2-108

2.4.1 T Channel Radiometric Accuracy....................... 2-108

2.4.2 Daytime Radiometric Accuracy......................... 2-165

2.4.3 Nighttime Radiometric Accuracy......................... 2-170

2.4.4 Gain Control Accuracy................................ 2-172

2.4.5 Gain Control Adjustability........................... 2-173

2.4.6 A/D Conversion & Algorithms.......................... 2-175

2.5 Radiometric Resolution... 2-176

TABLE OF CONTENTS (Cont'd.)

PAGE

2.6 Noise.. 2-178

2.6.1 T Channel Noise.. 2-178

2.6.2 L Channel Noise - Day.................................... 2-181

2.6.3 L Channel Noise - Night.................................. 2-183

2.6.4 Dark Current... 2-185

2.6.5 Stability.. 2-186

2.6.6 Along-Track Noise Integration............................ 2-187

2.6.7 Glare Suppression.. 2-188

2.7 Survivability.. 2-189

2.8 Scan Angle... 2-190

2.9 Data Collection Rate... 2-191

2.10 Power... 2-192

2.11 Mass.. 2-194

2.11.1 Total Mass.. 2-194

2.11.2 Component Mass.. 2-197

2.12 Cooler Transient Margin....................................... 2-198

2.13 Design Features... 2-199

2.14 Redundant and Fallback Subsystems............................. 2-200

2.15 Environment... 2-202

2.16 Electromagnetic Compatibility 2-203

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 #12 Acceptance Test Report contains the technical data pertinent to the OLS #12 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. A special test of T channel stability was also performed during retrofit. Results of this testing are compiled in BVS 2698, "OLS 12 Stability Testing".

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 K41477-- and K40502--.

It is intended that this report provide a complete summary of OLS 12 performance relative to all requirements. Therefore, data showing performance for requirements not verified as part of bearing retrofit are also provided. When data from previous tests are provided it will be so noted.

This Acceptance Test Report consists of 3 volumes as follows:

BVS 2691	OLS #12 Summary and Specification Requirements
BVS 2692	OLS #12 Acceptance Vibration Report
BVS 2693	OLS #12 Alignment & Synchronization Curves

1.1 Summary of System - Specific Parameters

OLS software Program = OLSP02J.FS

Gain Constants and Sensor Switch Points

P(0) = 9.375 dB
P(1) = 51.75 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) = 3.634 volts ± .250V

Cone Cooler S/N 024 with T detector S/N K-5

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

T Cold Patch EST Voltage = 2.211V ± .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 -22 Redun -23

Encoder Simulator Separation Constant = Prime -7 Redund -6

T COLD PATCH TEMP VS EST VOLTS
CONE COOLER S/N 024
T DETECTOR S/N K-5

T (deg k)	EST (Volts)
95	5.655
96	5.248
97	4.874
98	4.529
99	4.212
100	3.920
101	3.651
102	3.403
103	3.174
104	2.963
105	2.768
106	2.588
107	2.422
108	2.268
109	2.125
110	1.993
111	1.871
112	1.757
113	1.651
114	1.553
115	1.462
116	1.377
117	1.298
118	1.225
119	1.156
120	1.092
121	1.032
122	0.976
123	0.924
124	0.875
125	0.829

OLS #12
TLEVEL VS M1 TEMPERATURE RANGE
T DETECTOR S/N K-5

TL	M1 TEMP(°C)		
1111	-26.019°	to	-21.069°
1110	-21.069°		-16.120°
1101	-16.120°		-11.170°
1100	-11.170°		-6.221°
1011	-6.221°		-1.271°
1010	-1.271°		3.678°
1001	3.678°		8.628°
1000	8.628°		13.577°
0111	13.577°		18.527°
0110	18.527°		23.476°
0101	23.476°		28.426°
0100	28.426°		33.375°
0011	33.375°		38.325°
0010	38.325°		43.274°
0001	43.274°		48.224°
0000	48.224°		53.173°

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 #12 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	
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	

DEVELOPMENT SPEC. PARAGRAPH NUMBER		PASS	FAIL
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	

1.3 Summary of OLS #12 Testing

03-25-91	Began RDS testing per BVS 2600
04-26-91	OSU(x) and SPS(x) vibration
05-20-91	Began Bearing Retrofit testing per BVS 2579
05-23-91	SSS(x,y,z) vibration
05-29-91	Testing stopped to use OLS 12 units with BTM SSS for special BTM T channel testing per BVS 2654
06-09-91	PSU(x) vibration per BVS 2657 (repair of broken wire)
06-26-91	Resumed Bearing Retrofit testing
07-01-91	Began Thermal Vac testing
07-20-91	Break vacuum due to PMT failure
08-06-91	OLS 12 to Blue Room
08-07-91	Replaced PMT with PMT from OLS14
08-09-91	Replaced EST/LMD with unit from OLS14
08-13-91	SSS sine and random vibration
08-16-91	Thermal Vacuum ambient testing
08-19-91	Restarted Thermal Vacuum testing
09-19-91	Thermal Vacuum testing complete
10-27-91	Final Blue Room testing complete

1.4 Configuration and Serialized Assemblies

The configuration listing on the following pages includes the current configuration of the OLS #12 as of 12-03-86.

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
Key Drawing	536R500G01	F	5007
SSS Assembly	640R800G08	AM	5007
OSC Assy	623R765G06	AC	5007
HRD Assy	623R754G04	AB	0006
PWR Bd	623R758G03	R	0006
Pre Amp Bd	623R506G03	U	0006
T-Chan	633R049G04	R	0006
T-Chan Bd	633R178G03	AD	0006
Module	623R727G01	B	5009
Module	623R727G01	B	5010
VDGA/Lin Log	644R150G03	F	5007
Lin Log	644R127G03	P	5007
VDGA	644R152G03	P	5007
VDGA	644R153G03	N	5007
Enc. OPT	688R705H01	C	009
PMT	644R909G04	P	0007
EMR Bd	644R905G03	D	0007
Switch Bd	644R903G04	M	0007
Doubler Bd	644R907G02	F	0007
Regulator Bd	644R807G03	H	0006
Pre Amp Bd	644R935G03	J	5008
HRD Post Amp	644R220G04	G	5007
Post Amp Bd	644R228G04	AB	5007
EST/LMD	644R219G03	D	0007
EST/LMD Bd	758R142G02	E	0007
Heater Cont	633R053G09	J	5015
Elect Assy	633R052G03	V	5015

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
Heat Cont	633R053G10	J	5016
Elect Assy	633R052G03	V	5016
Heat Cont	633R053G11	J	5017
Elect Assy	633R052G03	V	5017
Heater Cont	633R053G12	J	5018
Elect Assy	633R052G03	V	5018
Rel Mech I	640R701G02	F	5007
Rel Mech II	640R753G02	H	5007
Rel Mech III	640R381G02	H	5007
T-Clamp	623R821G01	G	-
T-Cal	623R920G01	B	-
Aux Encd	640R846G04	G	5007
Bd Assy	640R825G04	F	5006
Bd Assy	640R844G04	J	5006
Wire Dia	682R239G03	K	-
Wire Tab	318R708	B	-
Wire Tab	315R386	C	-
Wire Tab	318R709	(-)	-
Motor Assy	623R894G01	B	73L0993
IMC/M3	623R858G02	D	5007
Cover, Cooler	640R320G01	(-)	5007
Cone Cooler	9RA5216H01	J	024
ENPA	682R215G03	M	5007
A1 Bd	682R167G03	H	5008
A2 Bd	682R110G03	T	5007
A3 Bd	682R112G03	P	5007
Aux Encd B/U	682R300G03	C	5007

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
A1 Bd	682R149G03	E	5007
A2 Bd	682R151G03	E	5007
<u>BB1</u>	KG43		026
<u>BB2</u>	KG43		027
<u>BB3</u>	KG43		028
<u>Ther. Blk. Kit</u>	661R564G03	J	5007
<u>GSSA/DOC</u>	640R790G03	H	5007
<u>GSSB</u>	633R906G01	A	5007
PR1	688R461H01	E	040
PR2	688R461H01	E	042
PR3	688R461H01	E	043
PR4	688R461H01	E	041
Cable Assy	9RA5255H09	T	006
Cable Assy	9RA5255H02	T	006
Cable Assy	9RA5255H03	T	007
Cable Assy	9RA5255H04	T	006
Cable Assy	9RA5255H10	T	003A
Cable Assy	9RA5255H07	T	006
Cable Assy	9RA5255H06	T	501
Cable Assy	9RA8118G01	F	-
Coax Assy	644R327G01	B	-
Coax Assy	644R327G02	B	-
Coax Assy	644R327G03	B	-
Coax Assy	644R328G01	C	-
Coax Assy	644R328G02	C	-
Coax Assy	644R328G03	C	-
Coax Assy	644R328G04	C	-

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
Coax Assy	644R328G05	C	-
Coax Cable	644R328G06	C	-
Coax Assy	644R329G01	C	-
Coax Assy	644R329G02	C	-
Coax Assy	644R329G03	C	-
Coax Assy	644R329G04	C	-
Coax Assy	644R329G05	C	-
Coax Assy	644R329G06	C	-
Coax Assy	644R329G07	C	-
Coax Assy	644R329G08	C	-
SPS	651R390G01	AC	5007
Matrix	651R342G03	AV	-
R/B	644R665G04	AE	5012
Matrix	644R081G03	L	-
A1 Bd	640R618G03	F	5014
A2 Bd	640R518G02	P	5013
A3 Bd	640R520G03	P	5013
R/B	644R665G04	AE	5013
Matrix	644R081G03	L	-
A1 Bd	640R618G03	F	5014
A2 Bd	640R518G03	P	5014
A3 Bd	640R520G03	P	5014
CU 1	640R612G02	J	5013
CU 1	640R612G02	J	5014
CU2	640R614G02	J	5012
CU 2	640R614G02	K	5013
AU 1	640R608G02	D	5013

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
AU 1	640R608G02	D	5014
AU 2	640R610G02	D	5012
AU 2	640R610G02	D	5013
MC1X	640R560G03	L	5014
MC1X	640R560G03	L	5015
MC2X	640R562G03	U	5014
MC2X	640R562G03	U	5015
ROM	640R530G03	T	5012
ROM	640R530G03	T	5013
Core	644R910H03	K	013
Core	644R910H03	K	014
SDS2	640R442G03	T	5012
SDS2	640R442G03	N	5013
SDS3	640R444G03	N	5012
SDS3	640R444G03	N	5013
SDS4	640R446G03	T	5012
SDS4	640R446G03	T	5013
SDS5	640R498G03	P	5012
SDS5	640R498G03	P	5013
CLSD	640R458G03	AD	5012
CLSD	640R458G03	AD	5013
SDS1X	640R660G04	AP	5012
SDS1X	640R660G04	AP	5013
FC-1	640R450G03	AA	5012
FC-1	640R450G03	AA	5013
FC-2	640R454G03	V	5012
FC-2	640R454G03	V	5013

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
FC-3	640R456G03	Y	5012
FC-3	640R456G03	Y	5013
SDF-1	640R474G03	AH	5012
SDF-1	640R474G03	AH	5013
SDF-2	640R476G03	AH	5012
SDF-2	640R476G03	AH	5013
SDF-3X	640R540G03	H	5012
SDF-3X	640R540G03	H	5013
SDF-4X	640R542G03	H	5012
SDF-4X	640R542G03	H	5013
SDF-5X	640R544G03	N	5012
SDF-5X	640R544G03	N	5013
SDS-6	640R538G03	U	5012
SDS-6	640R538G03	U	5013
SDS-7	640R546G03	P	5012
SDS-7	640R546G03	P	5013
4B	640R412G03	P	5012
4B	640R412G03	P	5013
7A	640R414G03	AB	5012
7A	640R414G03	AB	5013
7B	640R416G04	AR	5012
7B	640R416G04	AR	5013
1A	640R400G03	AK	5014
1A	640R400G03	AK	5015
1B	640R402G03	AD	5012
1B	640R402G03	AD	5013
FBC	640R448G03	N	5012

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
FBC	640R448G03	N	5013
RAM	640R558G03	L	5025
RAM	640R558G03	L	5026
RAM	640R558G03	L	5027
RAM	640R558G03	L	5028
2A	640R488G03	Y	5012
2A	640R488G03	Y	5013
2B	640R410G03	W	5012
2B	640R410G03	W	5013
3A	640R404G03	Y	5012
3A	640R404G03	Y	5013
10X	640R572G03	J	5012
10X	640R572G03	J	5013
CLCL	640R406G03	AD	5012
CLCL	640R406G03	AD	5013
WF-1X	640R566G03	P	5012
WF-1X	640R566G03	P	5013
WF-2	640R432G03	Y	5012
WF-2	640R432G03	Y	5013
WF-3	640R622G02	E	5012
WF-3	640R622G02	E	5013
WF-4	640R436G04	L	5012
WF-4	640R436G04	L	5013
WF-5	640R438G03	W	5012
WF-5	640R438G03	W	5013
9A	640R420G03	AE	5013
9A	640R420G03	AE	5014

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
9BX	640R586G04	F	5013
9BX	640R586G04	F	5014
9CX	640R570G03	N	5013
9CX	640R570G03	N	5014
WF-6	640R568G03	H	5013
WF-6	640R568G03	H	5014
OSU	640R960G03	Y	5007
Matrix	522R783G02	Y	5007
A1	640R522G03	T	5007
A2	640R524G03	N	5007
Bottom	644R047G03	T	5007
Top	644R046G02	P	5007
SPU	758R040G01	L	5007
Matrix	640R927G02	V	-
SSP-8	640R552G03	E	5014
SSP-8	640R552G03	E	5015
RTD-1	640R508G03	AH	5012
RTD-1	640R508G03	AH	5013
RTD-2	640R510G03	AP	5012
RTD-2	640R510G03	AP	5013
RTD-3	640R512G03	K	5012
RTD-3	640R512G03	K	5013
RTD-4	640R526G03	N	5013
RTD-4	640R526G03	N	5014
RTD-5	640R514G03	R	5012
RTD-5	640R514G03	R	5013
SSP-1X	640R550G03	J	5012

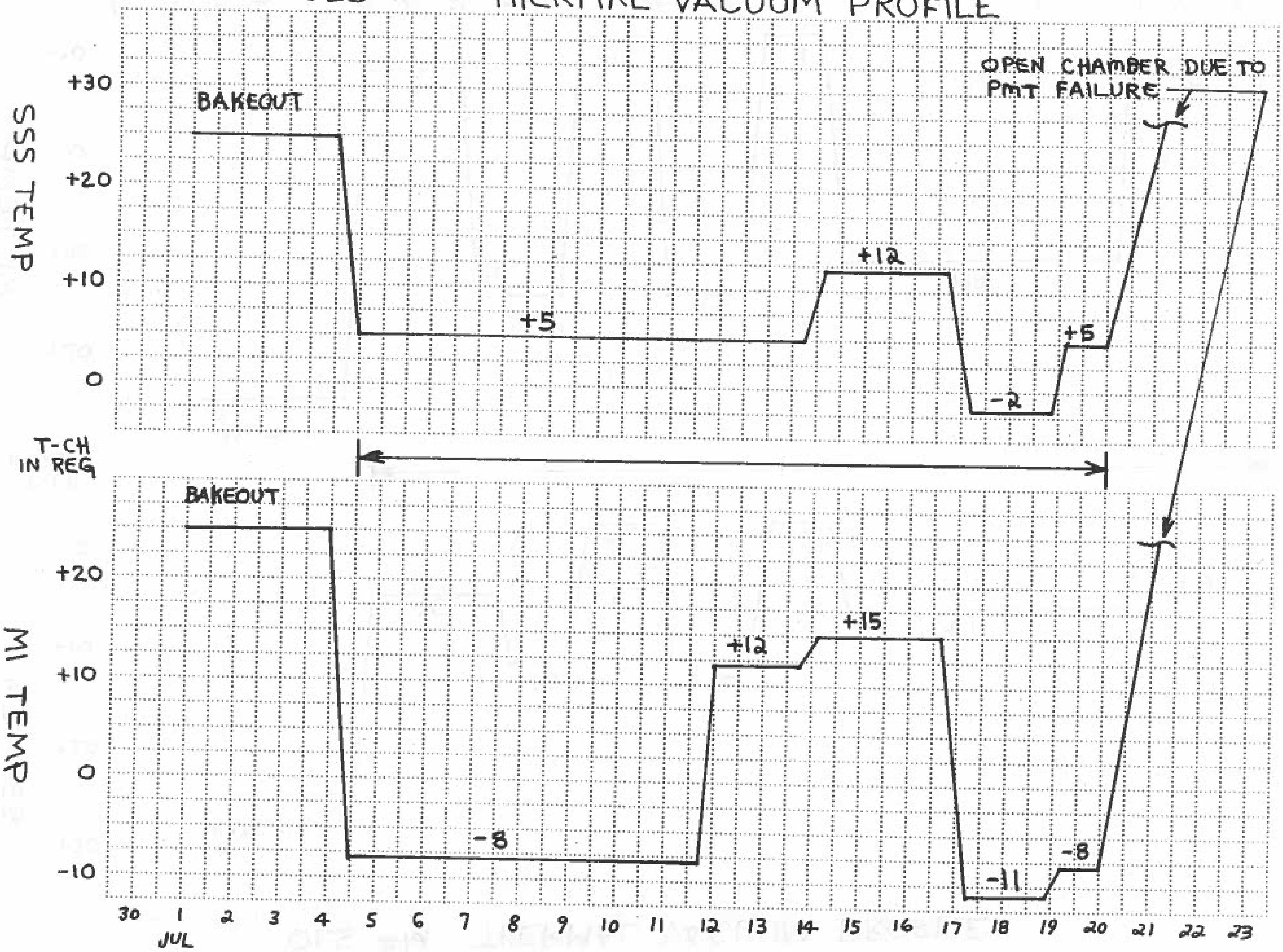
DESCRIPTION	ASSEMBLY NO.	REV.	S/N
SSP-1X	640R550G03	J	5013
SSP-2	640R462G03	V	5012
SSP-2	640R462G03	V	5013
SSP-3	640R464G03	U	5012
SSP-3	640R464G03	U	5013
SSP-4	640R466G03	M	5012
SSP-4	640R466G03	M	5013
SSP-5	640R468G03	P	5012
SSP-5	640R468G03	P	5013
SSP-6	640R470G03	R	5012
SSP-6	640R470G03	R	5013
SSP-7	640R472G03	V	5012
SSP-7	640R472G03	V	5013
SSP-9	640R554G03	J	5013
SSP-9	640R554G03	J	5014
PSU	758R050G02	Y	5007
Matrix	640R620G01	F	0004
RFI Plate	690R891G01	A	5007
Reg Assy	682R089G03	L	5004
Misc Bd	644R302G03	R	5007
T-Chan CG	688R483G03	G	5007
T-Left	688R485G03	F	5007
T-Rgt	688R487G03	G	5007
T-Chan BU	688R489G03	F	5007
T-Ana Fil	688R491G03	H	5012
T-Ana Fil	688R491G03	H	5013
L-Ana Fil	688R493G03	G	5012

DESCRIPTION	ASSEMBLY NO.	REV.	S/N
L-Ana Fil	688R493G03	G	5013
PSU TRA BLK	640R998G03	H	5013
PSU TRA BLK	640R998G03	H	5014
DME	688R481G03	G	5013
DME	688R481G03	G	5014
IMC	644R864G03	E	5007
Relay-1	688R501G03	E	5007
+5V	644R078G03	P	5007
Relay-2	688R502G03	D	5007
+12VDA	688R499G03	D	5013
+12VDA	688R499G03	D	5014
Dual ENPA	640R616G02	J	5007
Relay-3	688R503G03	C	5007
-12V	644R069G03	N	5007
Relay-5	688R505G03	C	5007
Relay-4	688R504G03	C	5007
+12V Vm	688R500G03	C	5007
MC	688R495G03	F	5013
MC	688R495G03	F	5014
CPH	688R497G03	D	5007
Wire Tab	318R249	N	-
Enable	682R381G03	D	5007

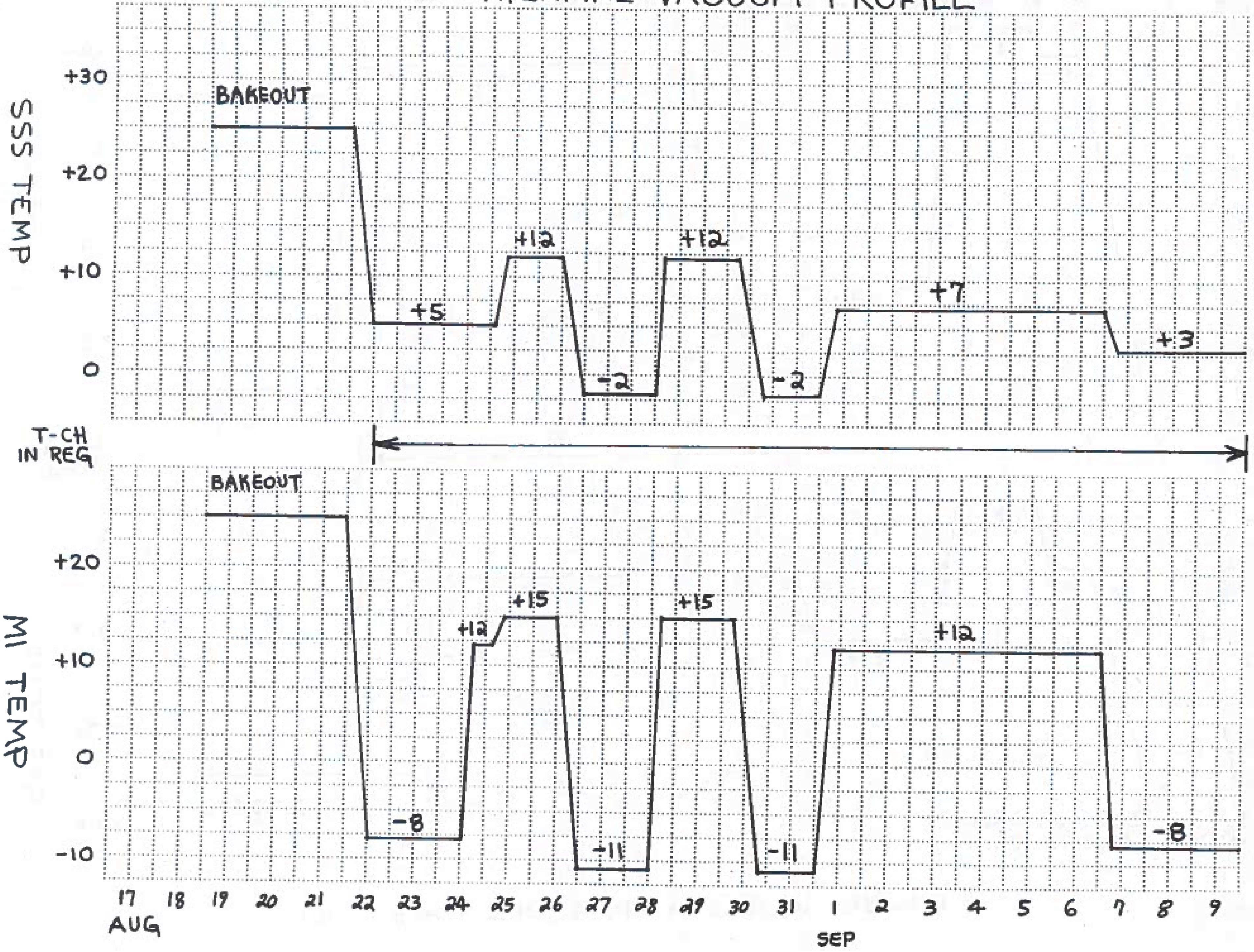
1.5 Thermal Vacuum Profiles

The OLS #12 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 #12 AVE.

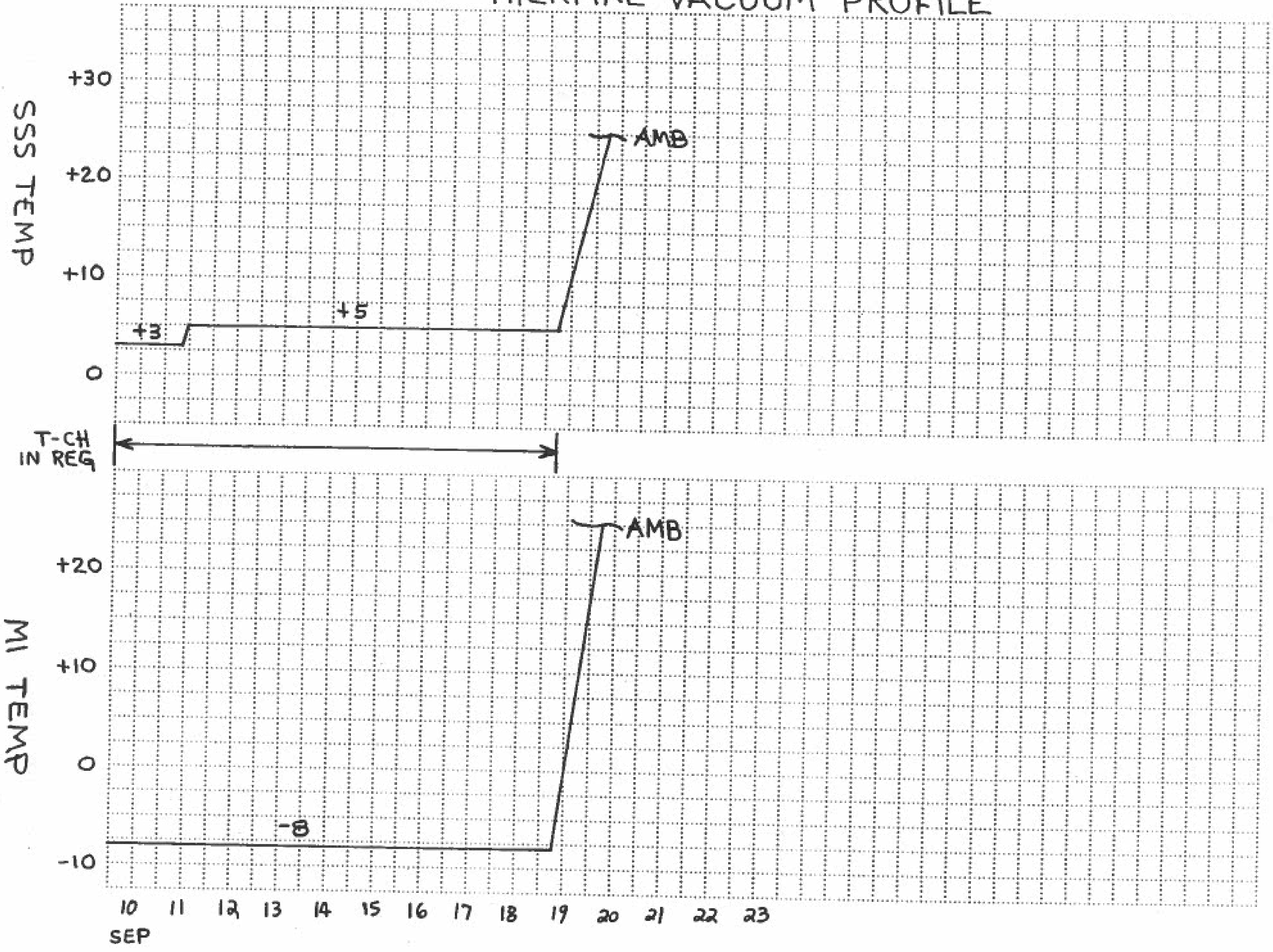
OLS #12 THERMAL VACUUM PROFILE



OLS #12 THERMAL VACUUM PROFILE



OLS #12 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 #12 AVE throughout its testing period at WEC.

UNIT **OLS #12** TEST HISTORY DATE **MAR '91**

31					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 RDS Test BVS 2600 Amb sub-System Tests	26 Amb sub-system Tests	27 OLS#16 Testing	28 OLS#16 Testing	29 RDS Testing stopped because of lack of government funding	30

UNIT **OLS #12** TEST HISTORY DATE **APR '91**

	1	2	3	4	5	6
7	8	9	10	11 Restarted BVS 2600 Amb sub- system tests	12 T/S RDS anomally	13 12A102 failure BVS 2646
14 →	15 →	16 →	17 →	18 →	19 →	20 →
21 →	22 →	23 12A102 failure BVS 2646	24 Restarted BVS 2600 Testing	25 Amb sub- system tests	26 SPS & OSU Vib	27 Amb sub- system tests
28 Amb sub- system tests remcved 2A204 for repair	29	30				

UNIT OLS #12 TEST HISTORY DATE MAY '91

☐	☐	☐	1	2 2A204 reinstalled	3 Amb sub- System Tests To Hot Cycle #1 @ 2215	4 Hot Cycle #1 @ 0615 To Cold Cycle #1 @ 0920 Cold Cycle #1 @ 1345 To Hot Cycle #2 @ 1740 Hot Cycle # 2 @ 2200
5 To Cold #2 @ 0130 Cold @ 0320 To Hot #3 @ 0900 Hot @ 1315 To Cold #3 @ 1525 Cold @ 1925 To Hot #4 @ 2133 Hot #4 @ 2335	6 To Cold #4 @ 0425 Cold #4 @ 0845 To Hot #5 @ 1800 Hot @ 2150	7 To Cold #5 @ 1335 Cold #5 @ 1810	8 To Hot #6 @ 1930 Hot Cycle #6 @ 2330	9 To Cold #6 @ 0320 Cold @ 0700 To Hot #7 @ 1145 Hot @ 1700 To Cold #7 @ 2230	10 Cold Cycle #7 @ 0400 To Hot #8 @ 0900 Hot Cycle # 8 @ 1330	11 To Cold #8 @ 0500 Cold Cycle #8 @ 0915
12 Cold Cycle #8	13 Cold Cycle #8	14 Cold Cycle #8 To Hot @ 1200	15 To Cold @ 0010	16 Cold to Amb @ 2215	17 Units moved to Blue Rm	18
19	20 Began Bearing Retrofit BUS 2579 Testing	21 6x2x1 6x3x1 AHC11PT	22 AHSFB11PT MHC11PT 6x5x1 6x3x5 AHSF11PT 6x7x1 6x7x2 6x3x2 6x9	23 APC11PT 7x8 SSS Vib	24 7x8 Funct Tests	25
26	27 6x2x1 6x3x1 6x6x2 MHA7PT AHSF3PTI AHSF7PT Funct Tests	28 Funct Tests AHSFB9PT APC7PT 6x2x4 6x7x2 7x5 MPA7PTA 6x4x3A 4x9x1	29 AHSFB9PT Removed 12A102 12A103, 12A104 for BUS 2653	30 Installed BTM 12A102 12A103, 12A104	31	☐

UNIT OLS #12 TEST HISTORY DATE JUNE '91

30 SIMFLT 7-9 7-10 Pumpdown @ 2000						1
2	3 OLS #12 Digital Boxes used to support BTM T-Ch Test BVS 2654	4 →	5 →	6 →	7 →	8 →
9 →	10 →	11 →	12 →	13 →	14 →	15 →
16 →	17 →	18 →	19 →	20 →	21 →	22 →
23 →	24 →	25 BTM BVS 2654	26 Restarted BVS 2579 Testing Funct Tests	27 6-2-2 6-3-1 Funct Tests AHSF7PT	28 MHA7PT 6-5-1 6-6-1 6-6-2 6-6-3 6-7-1 Funct Tests	29 Funct Tests 6-3-4 6-9

UNIT OLS #12 TEST HISTORY DATE JULY '91

	1 72 Hour Bake-Out	2 72 Hour Bake-Out	3 72 Hour Bake-Out	4 7x7 Funct Tests	5 AHSF3PTI 6x2x3A TDCRM2G 4x9x1	6 ASV 210 Q 6x2xY 6x7x3 Funct Tests T123T229A AHC11PT T125T227A 6x2x2 6x6x2 6x2x5 6x3x1 T123T225A ASV 270
7 T129T223A ASV 290 AHSF3PTI T131T221A ASV 210 310 6x6x2 MTC11PT Funct Tests T121T2215 ASVCROSS 6x7x1 6x5x1	8 T119T220A TDCRM3A ATC11PT APC11PT 6x9	9 AHSFB9PT MPA11PT 6x5x2 7x12 6x3x4 9x1x1 6x3x5 9x1x4	10 SIMFLT TSTABILITY Runs 1 — 7	11 TSTABILITY Runs 8 — 13 M1 to +12 @1820 M1=+12 @2400	12 6x2x3A T121T231H ASV 210 310 AHSF7PT APC7PT T121T231H MHC7PT	13 T123T229B ASV 240 6x3x3 6x5x1 6x5x2 ATSF7PT T125T227B ASU270 MPA7PT MTC7PT T119T226B TDCRM3B TDCRM3K To +12/+15 @ 2030 9x1x6
14 +12/+15 @0300 6x2x2 T121T231B	15 SIMFLT Funct Tests	16 Funct Tests MSPTEST To Cold Soak @ 1915 9x1x3	17 Cold Soak #1 @ 0915 Funct Tests SIMFLT	18 Funct Tests T121T231B 6x2x2 PMT Problem	19 To +5/-8 7x4B +5/-8 @0545 TSTABILITY 14 — 21	20 TSTABILITY 22 — 25 Chamber Warm-up & Vent
21 T/S PMT Problem AM12C-29	22 T/S PMT Problem SSS removed from chamber	23 STDTLMTST	24 MSPTST	25 No System Tests →	26 →	27 →
28 →	29 →	30 →	31 No System Tests			

UNIT OLS #12 TEST HISTORY DATE AUG '91

				1 No System Tests	2 →	3
4 →	5 No System Tests	6 Digital Units moved to Blue Rm	7 Cabled up System OLS #14 PMT Assy now on OLS #12 4x3x1	8 Funct Tests	9 OLS #14 EST/LMD Assy now on OLS #12 4x3x1 4x5x1 4x7x1	10 6x6x2 MPA11PT 6x2x1 6x3x1 6x6x3
11 6x7x1 6x7x2 APC11PT 7x8 6x6x1 6x3x2	12 APC11PT	13 AHC11PT SSS Vib Funct Tests	14 APC7PT AHSF7PT AHSF3PTI 6x2x1 6x3x1 MHA7PT 6x6x2	15 AHSFB9PT 6x7x2 MPA7PT Funct Tests 7x8 7x5	16 Moved System to TV Funct Tests 4x11x1	17 Funct Tests AHSF7PT 6x5x1 6x2x2 6x3x1 6x3x4 6x3x5 6x7x1 MPA7PT
18 APC7PT 6x2x2 7x9 7x10 Pumpdown @ 1600	19 72 Hour Bake-Out	20 72 Hour Bake-Out	21 72 Hour Bake-Out	22 +5/-8@0000 7x7 APC11PT MPA11PT 6x2x2 6x2x3A T121T231G ASV 210	23 TSTABILITY 26 -38	24 MI to +12 @ 0015 9x1x1 +5/+12 @ 0630 APC7PT 6x2x3A T121T231H TDCRM3K To HOT SOAK @ 1545 9x1x2 HOT SOAK #1 @1900
25 SIMFLT Funct Tests T121T231B	26 To Cold Soak @ 0020 9x1x3 COLD SOAK #1 @ 1200 6x2x2 T121T231B	27 SIMFLT Funct Tests	28 To Hot Soak @ 0030 7x4B HOT SOAK #2 @ 0415 6x6x2 6x2x2 Funct Tests	29 SIMFLT STS software problem Funct Tests To Cold Soak #2 @ 1800 9x1x3	30 Cold Soak #2 @ 0700 6x2x2 T121T231B Funct Tests	31 SIMFLT Funct Tests To Hot Limits @ 1330 9x1x6 +7/+12@ 2100

UNIT OLS #12 TEST HISTORY DATE SEPT '91

1 Funct Tests 6x2x3A ASV 210, 310 T121T231B T123T229B T125T227B	2 T119T231B 6x10 6x2x2 AHSF3PTI 6x3x1 Funct Tests TDCRM3B	3 AHC7PT 6x2x4 6x2x5 6x3x3 6x6x1 MPA7PT 6x6x2 6x6x3 6x3x5 MHC7PT	4 6x11x1 6x11x2 6x11x3 6x11x4 6x3x4 WTD Barker Error problem ATS7PT 9x1x4	5 AHSFB9PT MTC7PT 9x1x1 T/s WTD problem 6x11x2 SIMFLT	6 6x11x2 To Cold Limits @ 1100 7x4A 9x1x5 +3/-8 @ 1900 Funct Tests	7 Funct Tests AHSF3PI AHC7PT 6x2x5 6x2x3A ASV 210, 310 T121T231B 6x2x2 6x3x1 T123T229B 6x3x3 APC7PT T125T227B
8 Funct Tests AHSFB9PT ATS7PT 6x2x4 T119T231B TDCRM3B 6x10 6x6x1 MHC7PT MPA7PT 6x6x2 6x6x3 MTC7PT	9 9x1x1 6x11x1 6x11x2 6x11x3 6x3x5 PRY problem	10 SIMFLT 6x11x4 6x3x4 Funct Tests 9x1x4 To +5/-8 @ 2020 9x1x6	11 +5/-8 @ 0010 TSTABILITY Runs 39-46 Funct Tests	12 TSTABILITY Runs 47-51 Funct Tests 6x2x3A 6x2x2 T121T231C ASV 210, 310 T122T230C 6x3x1 6x3x3 T123T229C MHC7PT 6x2x5 T124T228C	13 T125T227C AHC7PT T126T226C APC7PT MPA7PT T128T224C 6x2x4 6x3x4 T130T222C T119T220C 6x3x5 TDCRM3C MPA7PT	14 SIMFLT ATS7PT 6x10 6x6x1 6x6x2 6x6x3 MTC7PT 9x1x4
15 AHSFB9PT 6x11x1 6x11x4 9x1x1 TSTABILITY Runs 52-57	16 TSTABILITY Runs 58-63 GEP16	17 SIMFLT GEP16	18 TSTABILITY Run 64 Began chamber Warm-up @ 1830	19 Vented Chamber Open @ 1850 T/s RTD Problem	20 T/S RTD Problem	21 MSPTEST
22 MSPTEST	23 MSPTEST	24 MSPTEST	25 T/S RTD	26 T/S RTD	27 T/s RTD	28 No Testing
29 No Testing	30 T/S RTD					

UNIT OLS#12 TEST HISTORY DATE Oct '91

		1 T/S RTD Support for OLS#13 BB anomally	2 T/S RTD	3 MSPTEST	4 MSPTEST System removed from TU chamber	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26 Funct Tests 6x4x3A TSET 6x2x1
27 TSET 4x5x1 AHSFIIPT 7x5 Funct Tests	28 Funct Tests 7x8	29 Funct Tests	30 RDS Encryption Tests	31		

UNIT OLS#12 TEST HISTORY DATE NOV '91

					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20 OLS #12 to GE	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 original OLS #12 Channel spectral responses were 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.

Since the original publication of OLS #12 spectral response, more current data has become available for HRD and PMT spectral response. The HRD total spectral response has been recalculated using average telescope data for OLS #13 thru OLS #16, measured data for the OLS 16 relay optics and a typical HRD detector response.

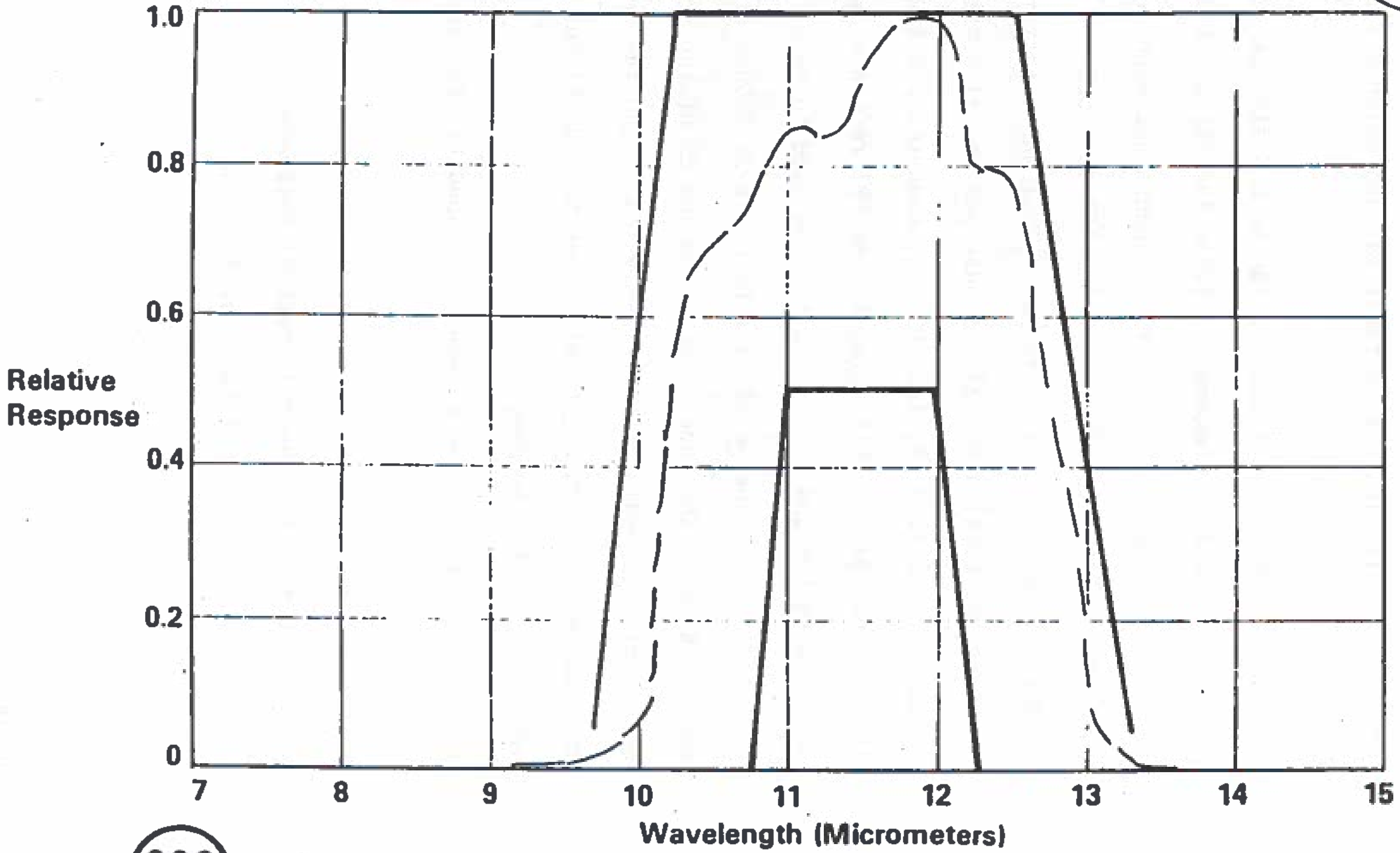
The PMT total spectral response was re-calculated using replacement PMT (S/N 16) from OLS 14, measured OLS #16 ORA and OLS #16 telescope data. This total system PMT response, which is out of spec between 500 and 530 nm, is the one used to report the degree of spec compliance. The worst case point is at 520nm, where the PMT response exceeds the specified maximum by 8% of the maximum response. The out-of-spec region is relatively small, and the increased response in the 500nm region will have no significant effect on the night time visible imagery.

The OLS #12 T channel and L Day spectral responses are within specification.

ATTACHMENTS: OLS #12 HRD Channel Spectral Response.
OLS #12 PMT Channel Spectral Response.
OLS #12 T Channel Spectral Response.

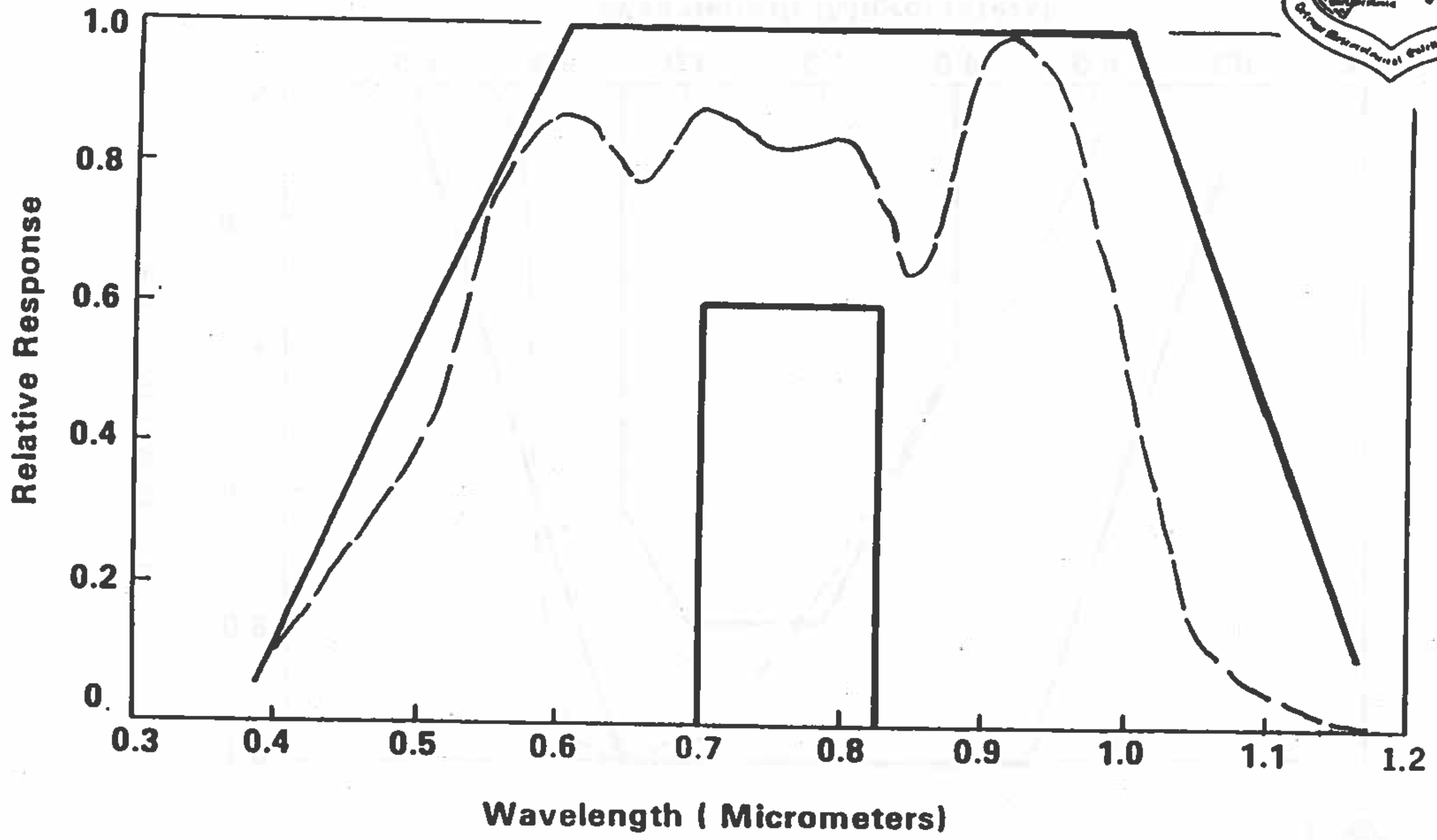
OLS12

5D-3 T Channel Spectrum



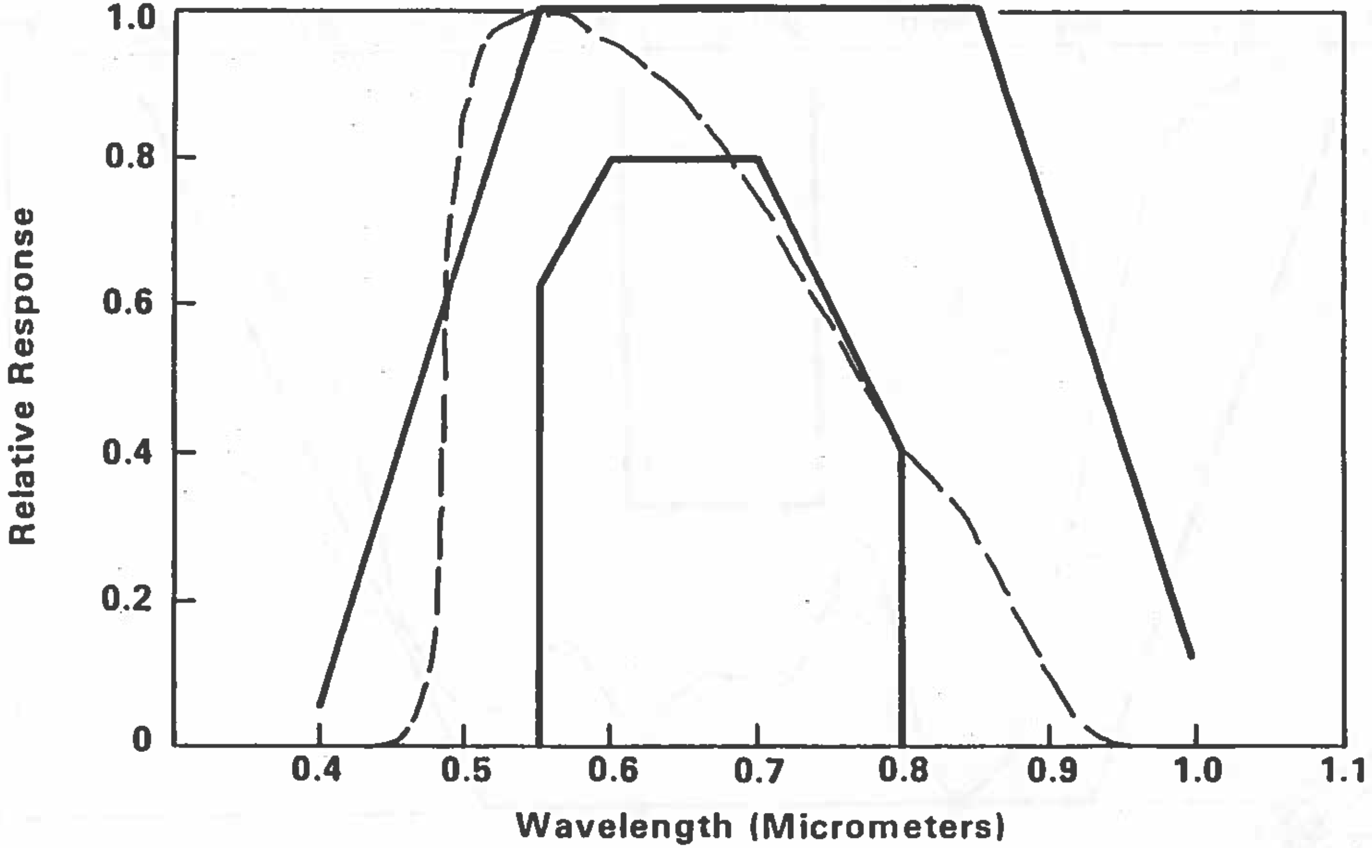
OLS12

5D-3 HRD Channel Spectrum



OLS12

5D-3 PMT Channel Spectrum



2.2 GEOMETRIC RESOLUTION

2.2.1 Fine Geometric Resolution - Infrared (3.2.1.1.2.1)

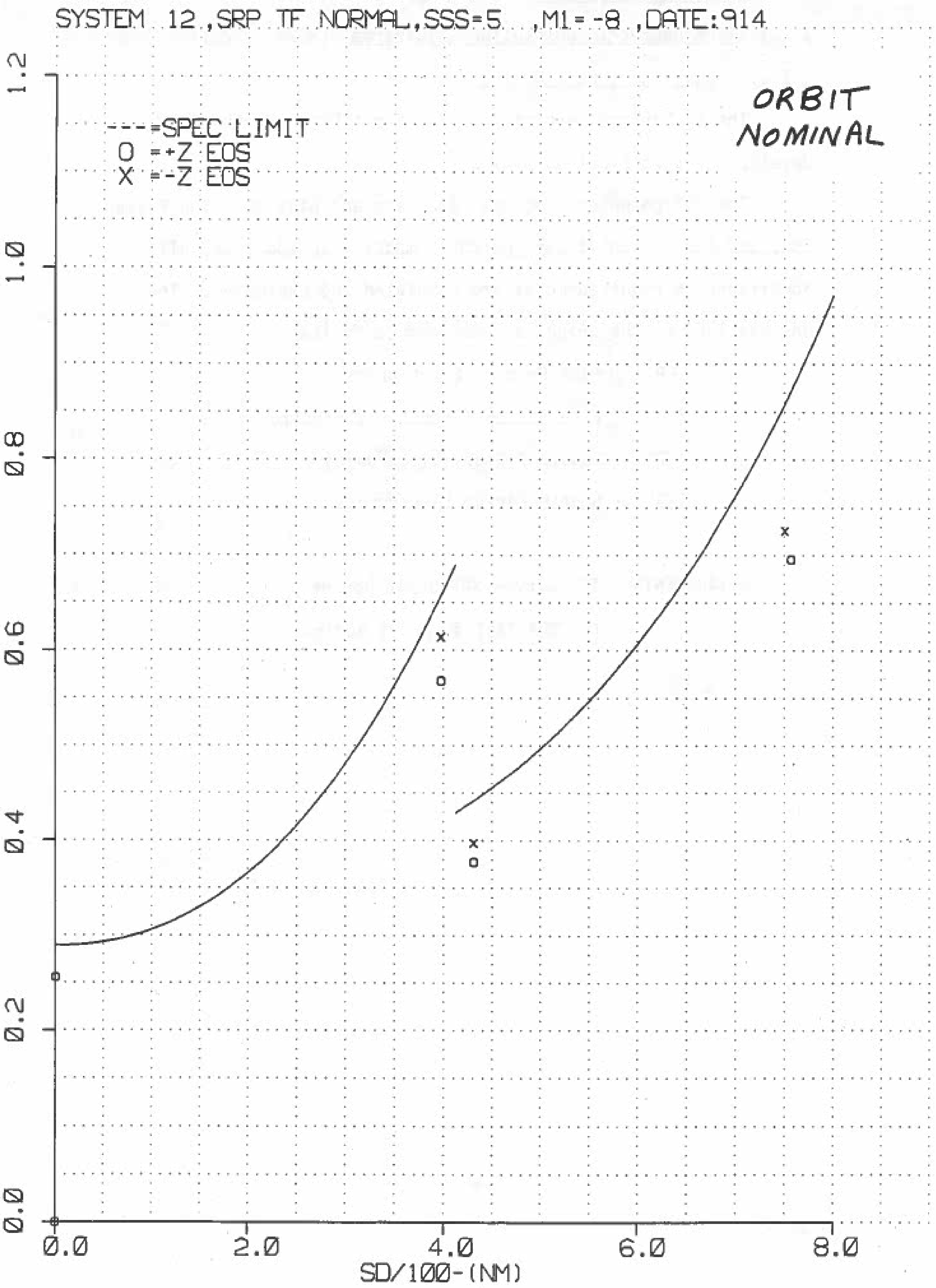
2.2.1.1 Baseline (Orbit Nominal)

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

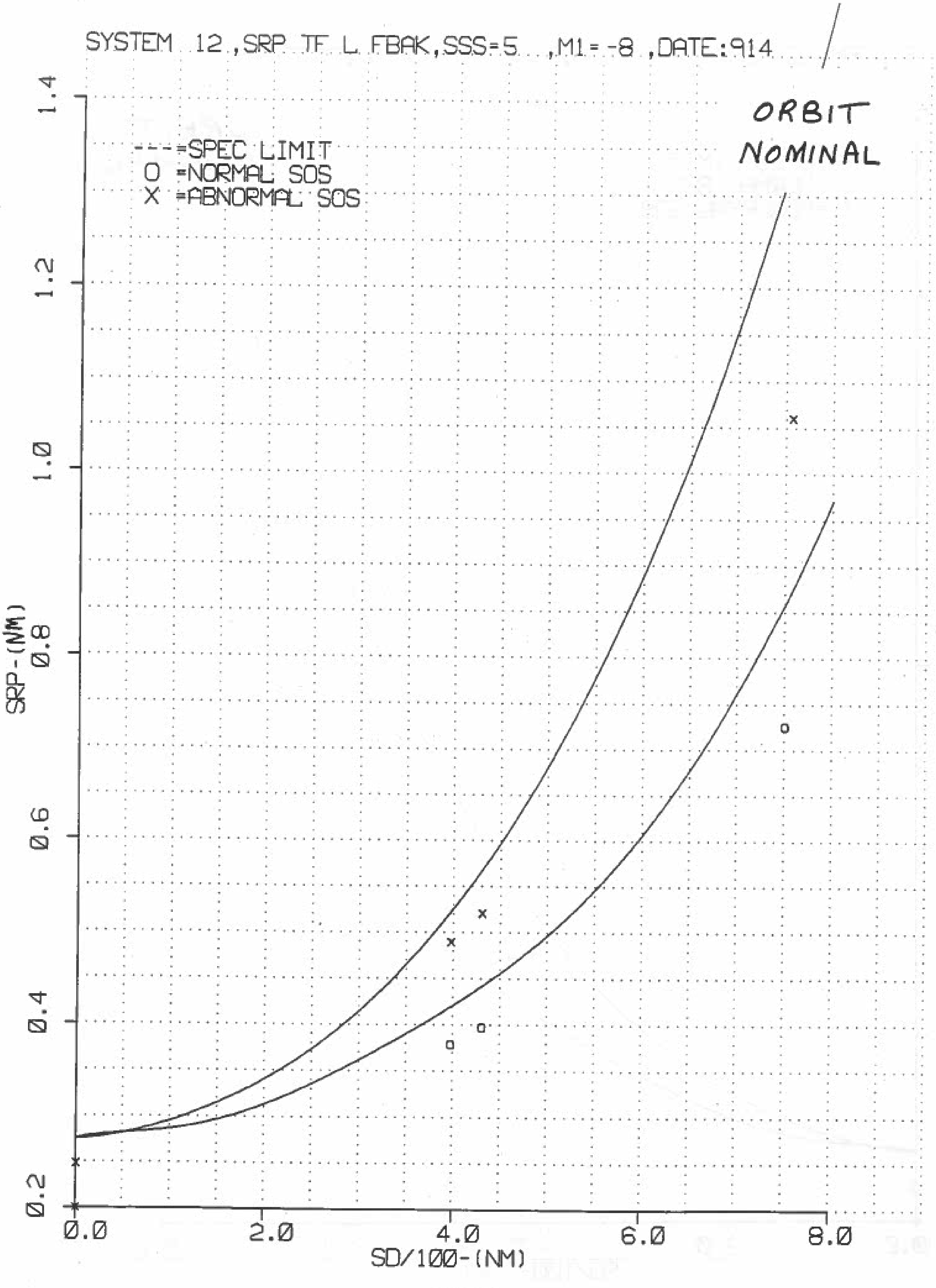
The VAX Computer programs calculate and plot the Fine Primary SRP, and the T Right & Left Fallback modes. In addition, all Specification required modes are tabulated and presented. The designations on the graphs are defined as follows:

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

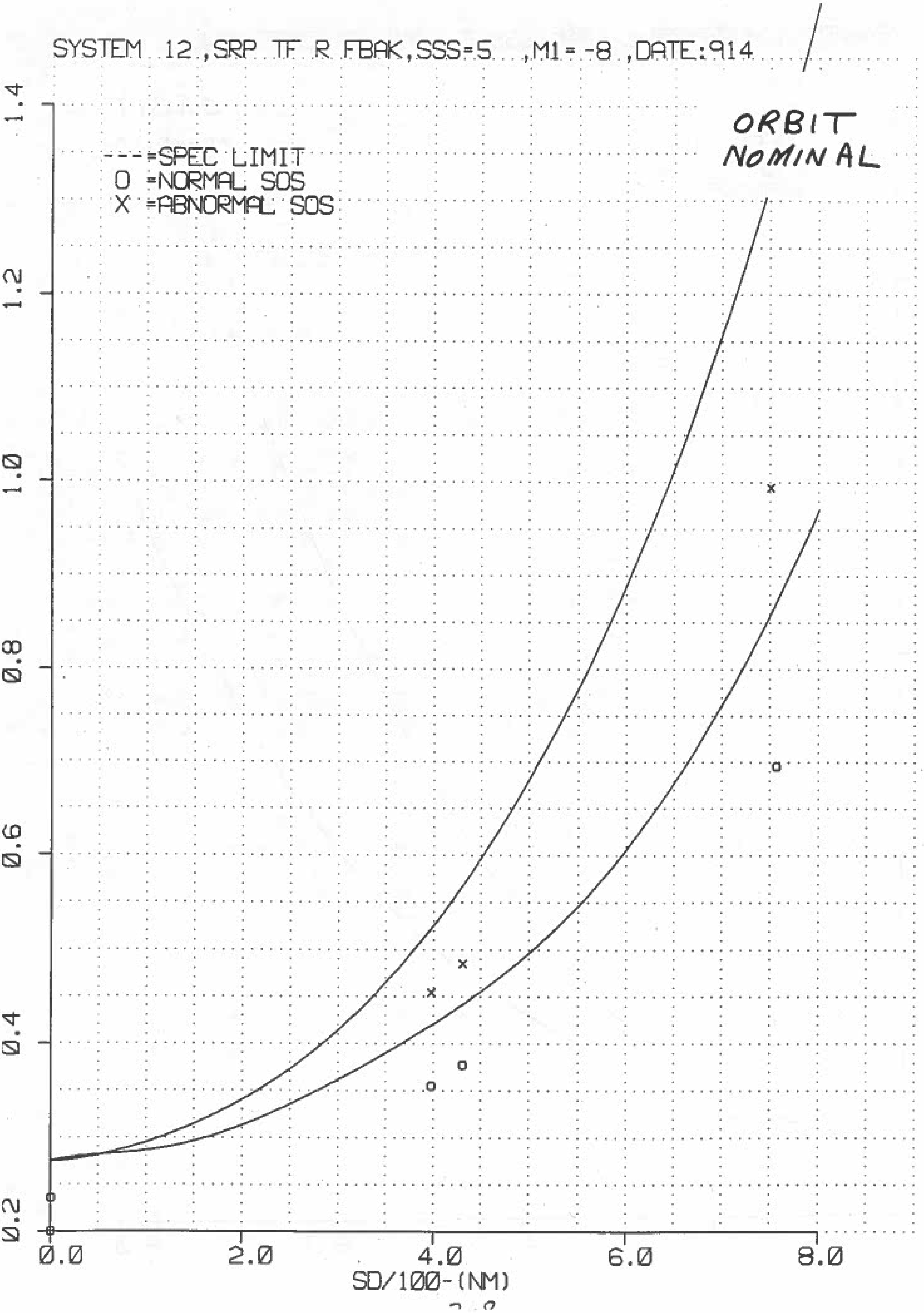
ATTACHMENTS: TF Curves SRP Orbit Nominal
TF SRP Tables Orbit Nominal



ORBIT NOMINAL



ORBIT
NOMINAL



ORBIT
NOMINAL

```
T, COMPLETE, SRP(NM)

        FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:     914

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

 LFT     -750.        0. 725       0. 722        1. 732       1. 675
 MID     -750.        1. 253       0. 000        1. 828       1. 782
 RGT     -750.        0. 995       0. 989        1. 766       1. 713
 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. 397       0. 391        1. 461       1. 410
 MID     -431.        0. 631       0. 000        1. 488       1. 439
 RGT     -431.        0. 485       0. 479        1. 461       1. 410
 LFT     -398.        0. 379       0. 373        1. 408       1. 359
 MID     -398.        0. 614       0. 611        1. 429       1. 382
 RGT     -398.        0. 454       0. 447        1. 406       1. 357
 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. 248       0. 245        0. 968       0. 935
 MID        0.        0. 255       0. 252        0. 968       0. 935
 RGT        0.        0. 236       0. 234        0. 966       0. 932
 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. 489       0. 484        1. 411       1. 363
 MID      398.        0. 568       0. 565        1. 420       1. 372
 RGT      398.        0. 355       0. 351        1. 397       1. 348
 LFT      431.        0. 521       0. 515        1. 466       1. 415
 MID      431.        0. 573       0. 000        1. 479       1. 430
 RGT      431.        0. 377       0. 373        1. 455       1. 405
 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. 061       1. 054        1. 785       1. 735
 MID      757.        1. 449       0. 000        1. 900       1. 860
 RGT      757.        0. 695       0. 692        1. 715       1. 658
```

T, COMPLETE, SRP RATIO

SEG	SUR. DIST. (NM)	TFP	TFB	TSP	TSB
LFT	-750.	0. 845	0. 841	0. 770	0. 745
MID	-750.	0. 000	0. 000	0. 813	0. 793
RGT	-750.	0. 753	0. 749	0. 785	0. 762
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. 900	0. 885	0. 912	0. 881
MID	-431.	0. 000	0. 000	0. 929	0. 899
RGT	-431.	0. 854	0. 843	0. 912	0. 881
LFT	-398.	0. 903	0. 888	0. 918	0. 886
MID	-398.	0. 934	0. 930	0. 932	0. 901
RGT	-398.	0. 869	0. 855	0. 916	0. 885
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. 902	0. 892	0. 922	0. 890
MID	0.	0. 882	0. 871	0. 922	0. 890
RGT	0.	0. 857	0. 852	0. 920	0. 888
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. 936	0. 925	0. 920	0. 889
MID	398.	0. 865	0. 860	0. 926	0. 894
RGT	398.	0. 846	0. 838	0. 911	0. 879
LFT	431.	0. 916	0. 906	0. 915	0. 884
MID	431.	0. 000	0. 000	0. 924	0. 893
RGT	431.	0. 854	0. 844	0. 909	0. 877
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. 790	0. 785	0. 790	0. 768
MID	757.	0. 000	0. 000	0. 840	0. 823
RGT	757.	0. 797	0. 793	0. 759	0. 734

```
TF, LEFT, PRIMARY

        FLT.  NO. = 12   ENV. =  4   SSS=   5DEGC   M1= -8DEGC   DATE:    914

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

           -750.                0.725             0.845
              0.                0.000             0.000
           -431.                0.397             0.900
           -398.                0.379             0.903
              0.                0.000             0.000
              0.                0.248             0.902
              0.                0.000             0.000
            398.                0.489             0.936
            431.                0.521             0.916
              0.                0.000             0.000
            757.                1.061             0.790
```

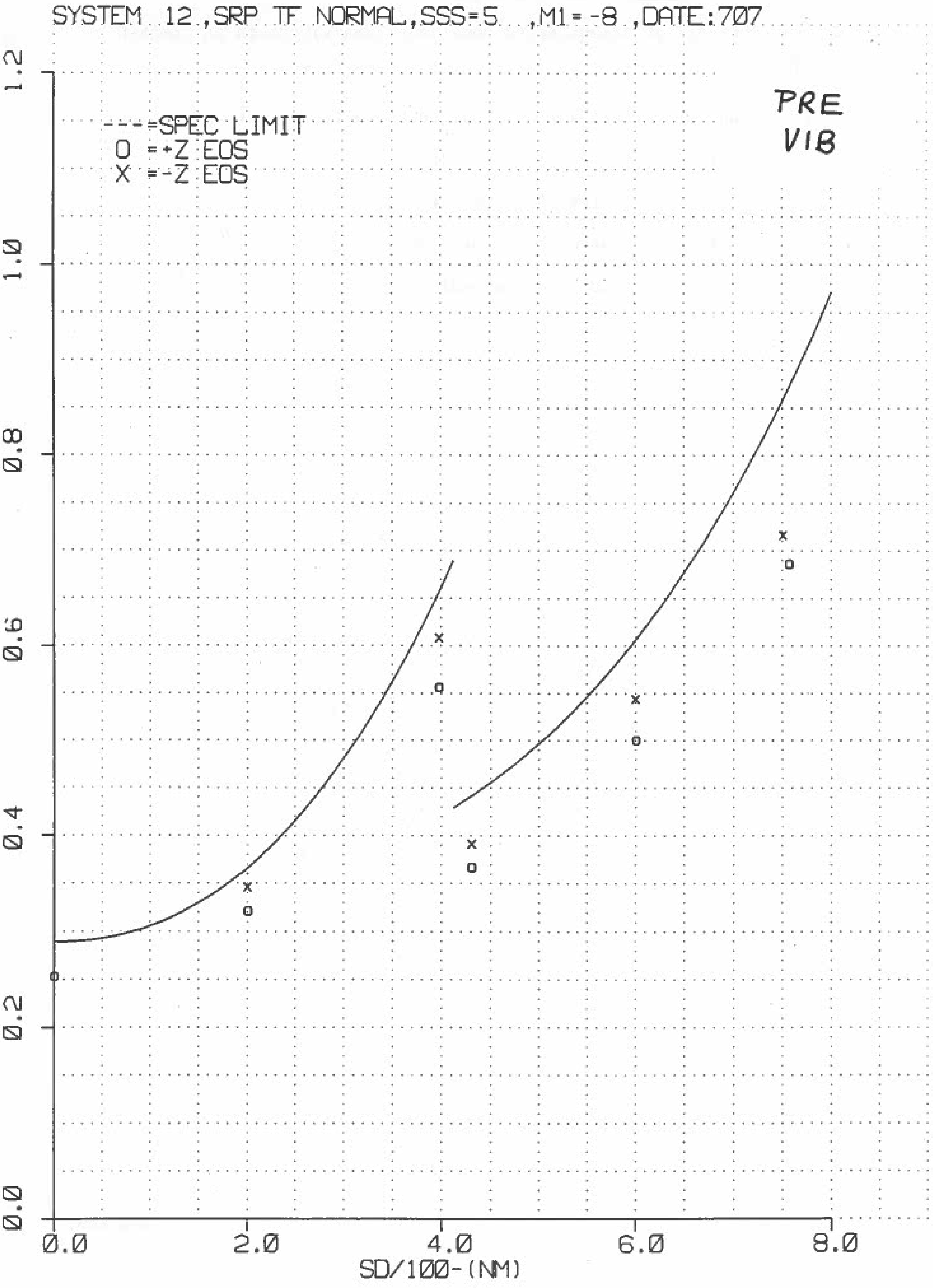
```
TF, LEFT, BACKUP

        FLT.  NO. = 12   ENV. =  4   SSS=   5DEGC   M1= -8DEGC   DATE:    914

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

           -750.                0.722             0.841
              0.                0.000             0.000
           -431.                0.391             0.885
           -398.                0.373             0.888
              0.                0.000             0.000
              0.                0.245             0.892
              0.                0.000             0.000
            398.                0.484             0.925
            431.                0.515             0.906
              0.                0.000             0.000
            757.                1.054             0.785
```

```
TF, RIGHT, PRIMARY

        FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    914

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

           -750.                 0.995               0.753
              0.                 0.000               0.000
           -431.                 0.485               0.854
           -398.                 0.454               0.869
              0.                 0.000               0.000
              0.                 0.236               0.857
              0.                 0.000               0.000
            398.                 0.355               0.846
            431.                 0.377               0.854
              0.                 0.000               0.000
            757.                 0.695               0.797


TF  RIGHT, BACKUP

        FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    914

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

           -750.                 0.989               0.749
              0.                 0.000               0.000
           -431.                 0.479               0.843
           -398.                 0.447               0.855
              0.                 0.000               0.000
              0.                 0.234               0.852
              0.                 0.000               0.000
            398.                 0.351               0.838
            431.                 0.373               0.844
              0.                 0.000               0.000
            757.                 0.692               0.793
```

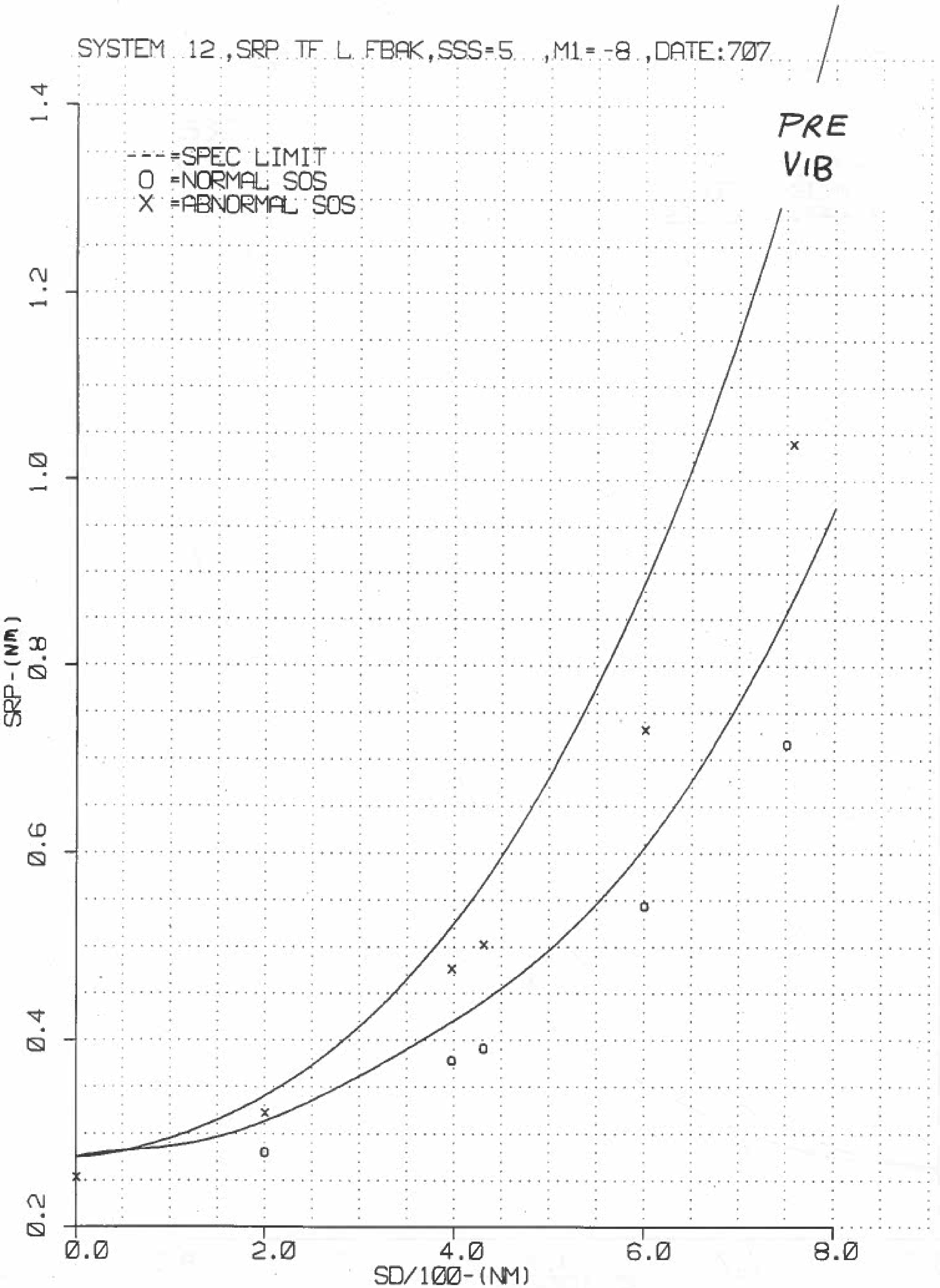
2.2.1.2 Acceptance - Vibration

OLS #12 underwent acceptance level SSS vibration per DMSS-OLS-300 with cone cooler S/N 024 on May 23, 1991. The pre-to-post vibration SRP performance is shown on the attached curves and tables.

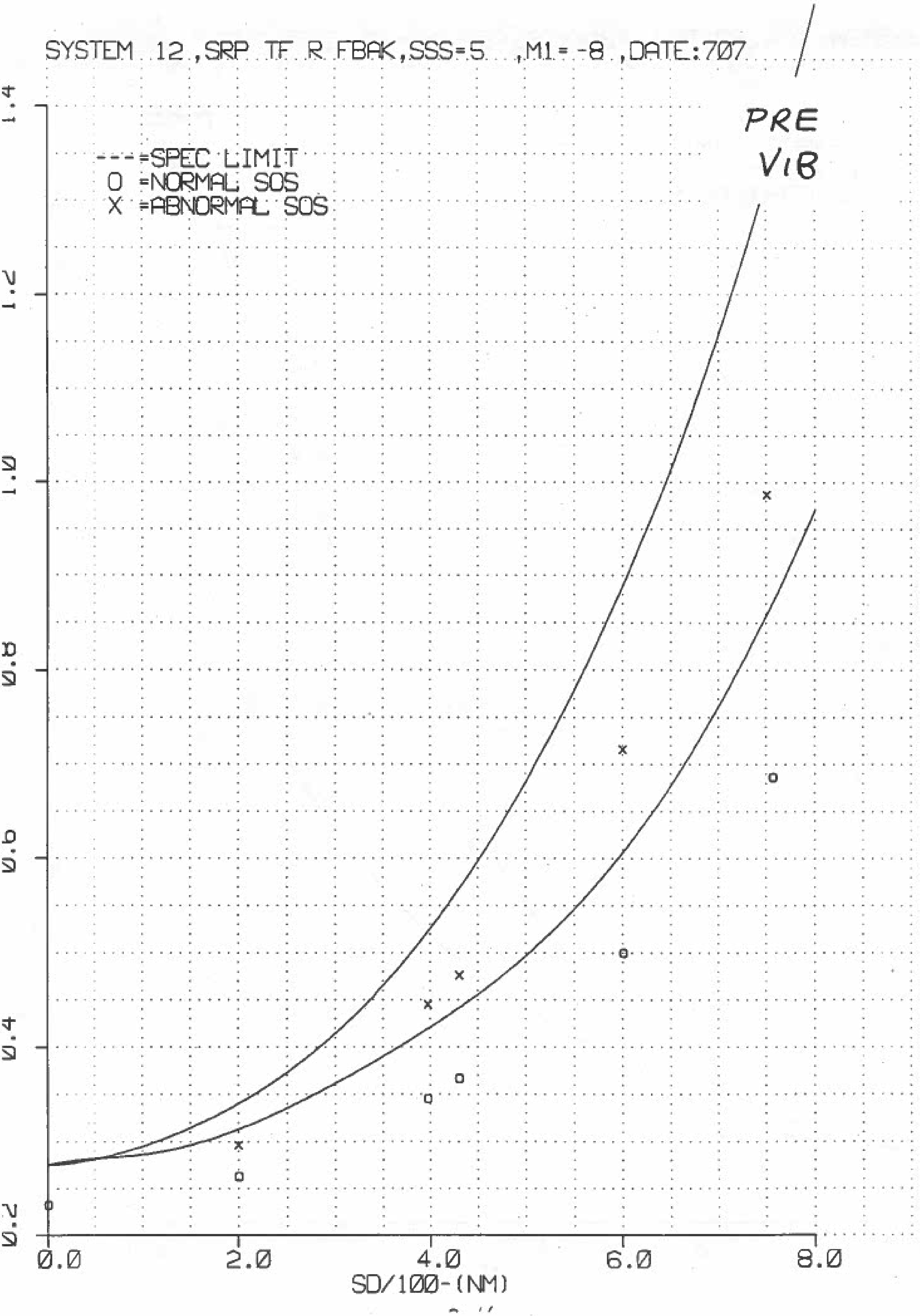
ATTACHMENTS:	TF	SRP Curves Previbration.
	TF	SRP Tables Previbration.
	TF	SRP Curves Postvibration.
	TF	SRP Tables Postvibration.


SYSTEM 12 ,SRP TF NORMAL,SSS=5 ,M1=-8 ,DATE:707
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
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)

PRE
VIB


SYSTEM 12 ,SRP TF L FBAK,SSS=5 ,M1=-8 ,DATE:707
---=SPEC LIMIT
O =NORMAL SOS
X =ABNORMAL SOS
SRP-(NM)
0.2
0.4
0.6
0.8
1.0
1.2
1.4
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

PRE VIB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----=SPEC LIMIT
O =NORMAL SOS
X =ABNORMAL SOS
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)

PRE
VIB

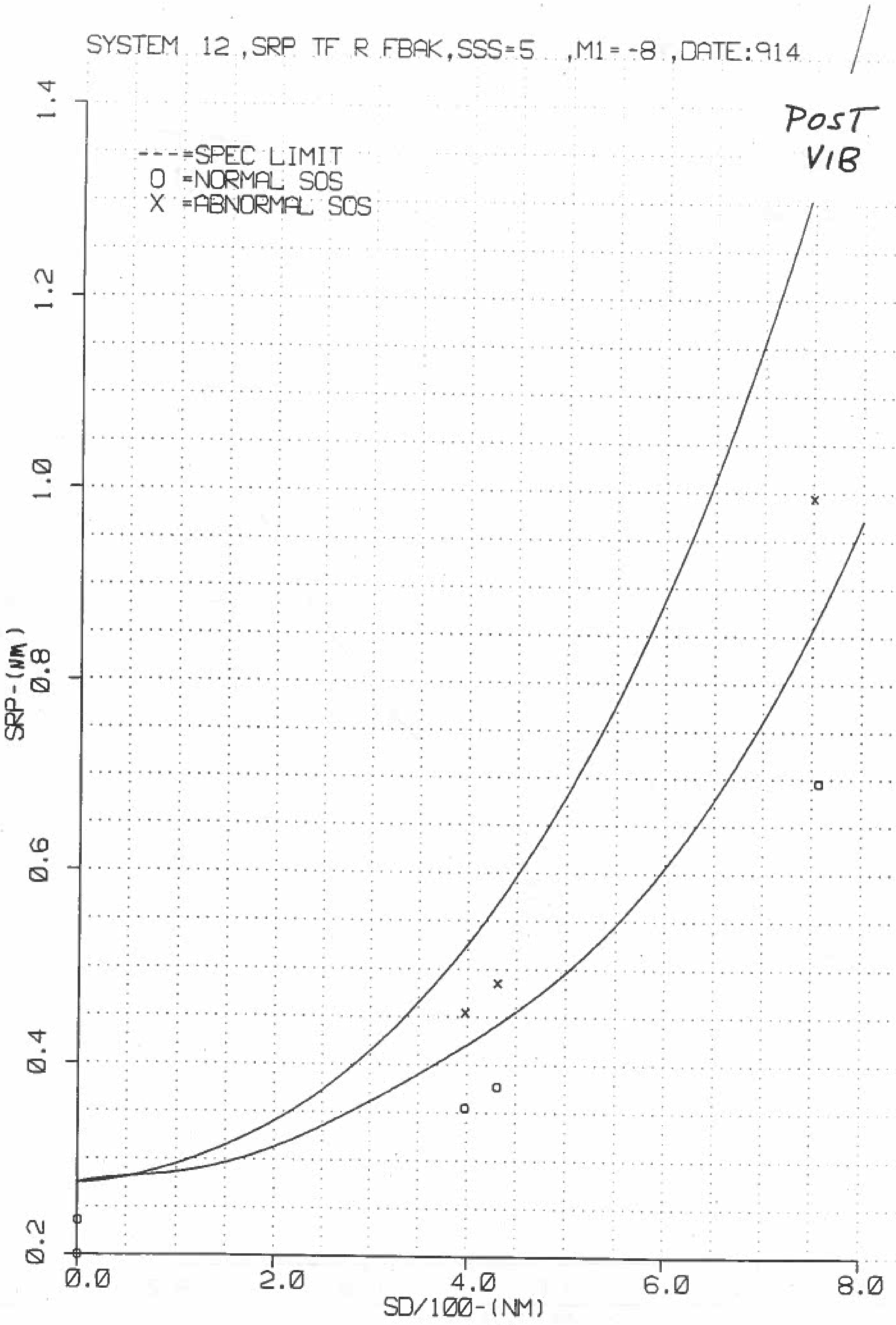
```
T, COMPLETE, SRP(NM)

         FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:     707

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

  LFT     -750.         0. 716       0. 708        1. 730       1. 665
  MID     -750.         1. 299       0. 000        1. 846       1. 793
  RGT     -750.         0. 987       0. 983        1. 764       1. 703
  LFT     -600.         0. 544       0. 534        1. 715       1. 648
  MID     -600.         1. 008       0. 000        1. 786       1. 726
  RGT     -600.         0. 716       0. 708        1. 725       1. 660
  LFT     -431.         0. 391       0. 387        1. 459       1. 403
  MID     -431.         0. 621       0. 000        1. 489       1. 433
  RGT     -431.         0. 476       0. 469        1. 463       1. 407
  LFT     -398.         0. 378       0. 374        1. 406       1. 351
  MID     -398.         0. 608       0. 602        1. 429       1. 375
  RGT     -398.         0. 445       0. 438        1. 410       1. 356
  LFT     -200.         0. 280       0. 278        1. 100       1. 057
  MID     -200.         0. 346       0. 341        1. 105       1. 063
  RGT     -200.         0. 296       0. 293        1. 102       1. 059
  LFT        0.         0. 253       0. 251        0. 971       0. 933
  MID        0.         0. 253       0. 251        0. 971       0. 934
  RGT        0.         0. 232       0. 232        0. 968       0. 931
  LFT      200.         0. 322       0. 317        1. 104       1. 061
  MID      200.         0. 321       0. 316        1. 106       1. 063
  RGT      200.         0. 263       0. 263        1. 096       1. 054
  LFT      398.         0. 477       0. 469        1. 408       1. 354
  MID      398.         0. 556       0. 549        1. 419       1. 365
  RGT      398.         0. 345       0. 344        1. 398       1. 344
  LFT      431.         0. 503       0. 495        1. 465       1. 408
  MID      431.         0. 561       0. 000        1. 482       1. 426
  RGT      431.         0. 367       0. 365        1. 456       1. 399
  LFT      601.         0. 732       0. 724        1. 726       1. 661
  MID      601.         0. 924       0. 000        1. 766       1. 704
  RGT      601.         0. 500       0. 492        1. 704       1. 639
  LFT      757.         1. 039       1. 035        1. 780       1. 722
  MID      757.         1. 424       0. 000        1. 894       1. 845
  RGT      757.         0. 686       0. 678        1. 717       1. 653
```

T, COMPLETE, SRP RATIO

SEG	SUR. DIST. (NM)	TFP	TFB	TSP	TSB
LFT	-750.	0.834	0.825	0.769	0.740
MID	-750.	0.000	0.000	0.821	0.797
RGT	-750.	0.747	0.744	0.784	0.757
LFT	-600.	0.897	0.882	0.871	0.837
MID	-600.	0.000	0.000	0.907	0.876
RGT	-600.	0.805	0.797	0.876	0.843
LFT	-431.	0.886	0.877	0.911	0.876
MID	-431.	0.000	0.000	0.930	0.895
RGT	-431.	0.838	0.826	0.914	0.879
LFT	-398.	0.901	0.891	0.917	0.881
MID	-398.	0.926	0.917	0.932	0.897
RGT	-398.	0.851	0.838	0.920	0.884
LFT	-200.	0.894	0.889	0.917	0.882
MID	-200.	0.946	0.931	0.922	0.886
RGT	-200.	0.870	0.862	0.919	0.883
LFT	0.	0.921	0.914	0.925	0.889
MID	0.	0.873	0.866	0.925	0.889
RGT	0.	0.845	0.844	0.922	0.886
LFT	200.	0.946	0.932	0.921	0.885
MID	200.	0.877	0.864	0.922	0.886
RGT	200.	0.839	0.838	0.914	0.878
LFT	398.	0.912	0.898	0.918	0.883
MID	398.	0.847	0.837	0.925	0.890
RGT	398.	0.823	0.820	0.912	0.876
LFT	431.	0.884	0.871	0.915	0.879
MID	431.	0.000	0.000	0.926	0.891
RGT	431.	0.831	0.827	0.909	0.874
LFT	601.	0.821	0.813	0.876	0.843
MID	601.	0.000	0.000	0.896	0.865
RGT	601.	0.823	0.811	0.865	0.831
LFT	757.	0.774	0.771	0.788	0.762
MID	757.	0.000	0.000	0.838	0.816
RGT	757.	0.787	0.777	0.760	0.731

```
TF, LEFT, PRIMARY

      FLT.  NO. = 12  ENV. =  4  SSS=  5DEGC  M1= -8DEGC  DATE:    707

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

         -750.               0. 716             0. 834
         -600.               0. 544             0. 897
         -431.               0. 391             0. 886
         -398.               0. 378             0. 901
         -200.               0. 280             0. 894
            0.               0. 253             0. 921
          200.               0. 322             0. 946
          398.               0. 477             0. 912
          431.               0. 503             0. 884
          601.               0. 732             0. 821
          757.               1. 039             0. 774


TF, LEFT, BACKUP

      FLT.  NO. = 12  ENV. =  4  SSS=  5DEGC  M1= -8DEGC  DATE:    707

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

         -750.               0. 708             0. 825
         -600.               0. 534             0. 882
         -431.               0. 387             0. 877
         -398.               0. 374             0. 891
         -200.               0. 278             0. 889
            0.               0. 251             0. 914
          200.               0. 317             0. 932
          398.               0. 469             0. 898
          431.               0. 495             0. 871
          601.               0. 724             0. 813
          757.               1. 035             0. 771
```

```
TF, RIGHT, PRIMARY

     FLT.  NO. =  12   ENV. =   4  SSS=   5DEGC   M1=  -8DEGC   DATE:     707

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

        -750.                 0. 987                0. 747
        -600.                 0. 716                0. 805
        -431.                 0. 476                0. 838
        -398.                 0. 445                0. 851
        -200.                 0. 296                0. 870
           0.                 0. 232                0. 845
         200.                 0. 263                0. 839
         398.                 0. 345                0. 823
         431.                 0. 367                0. 831
         601.                 0. 500                0. 823
         757.                 0. 686                0. 787


TF  RIGHT, BACKUP

     FLT.  NO. =  12   ENV. =   4   SSS=   5DEGC   M1=  -8DEGC   DATE:     707

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

        -750.                 0. 983                0. 744
        -600.                 0. 708                0. 797
        -431.                 0. 469                0. 826
        -398.                 0. 438                0. 838
        -200.                 0. 293                0. 862
           0.                 0. 232                0. 844
         200.                 0. 263                0. 838
         398.                 0. 344                0. 820
         431.                 0. 365                0. 827
         601.                 0. 492                0. 811
         757.                 0. 678                0. 777
```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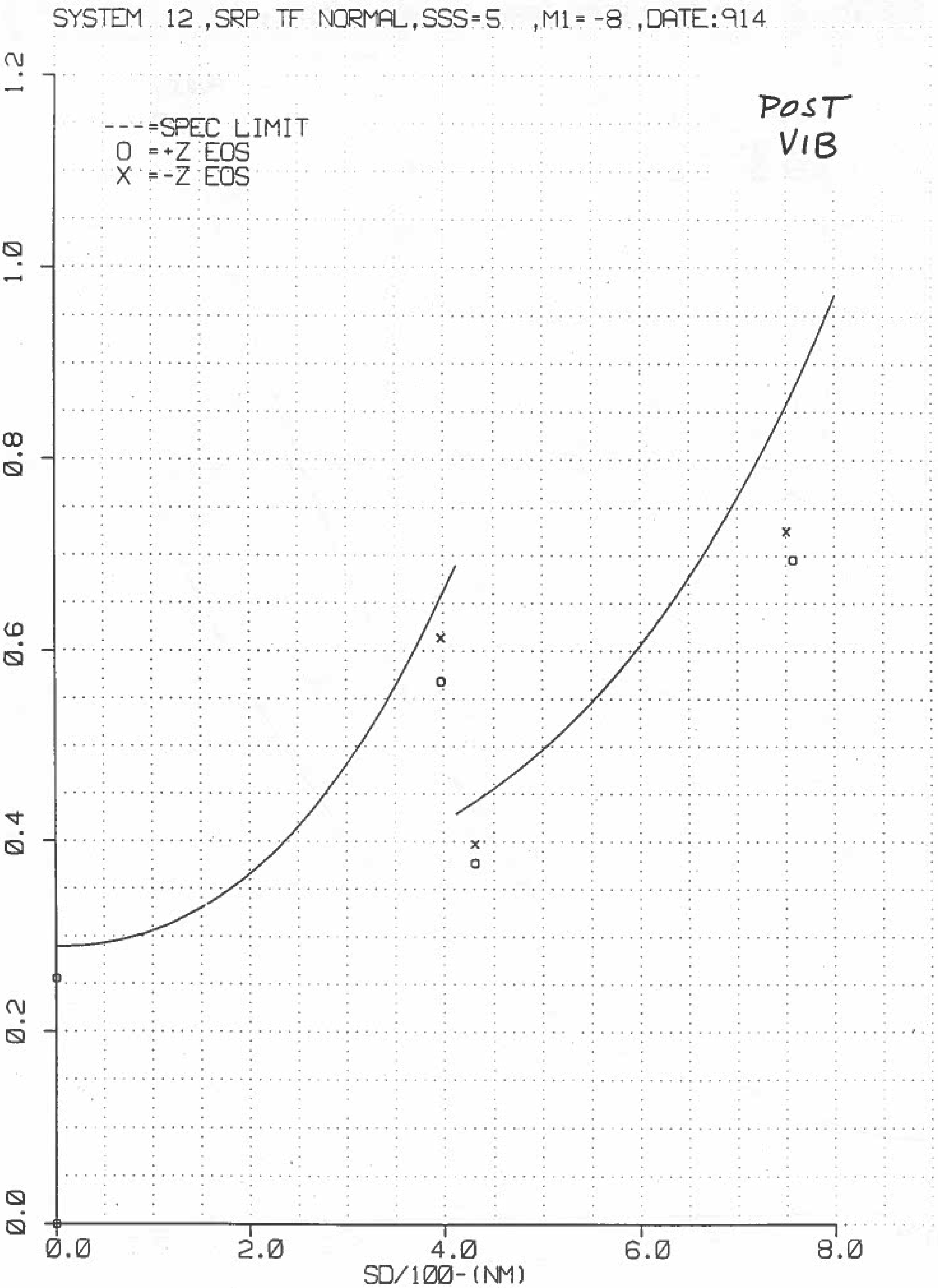
O =NORMAL SOS
X =ABNORMAL SOS
SRP-(NM)
SD/100-(NM)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2.0
4.0
6.0
8.0

POST VIB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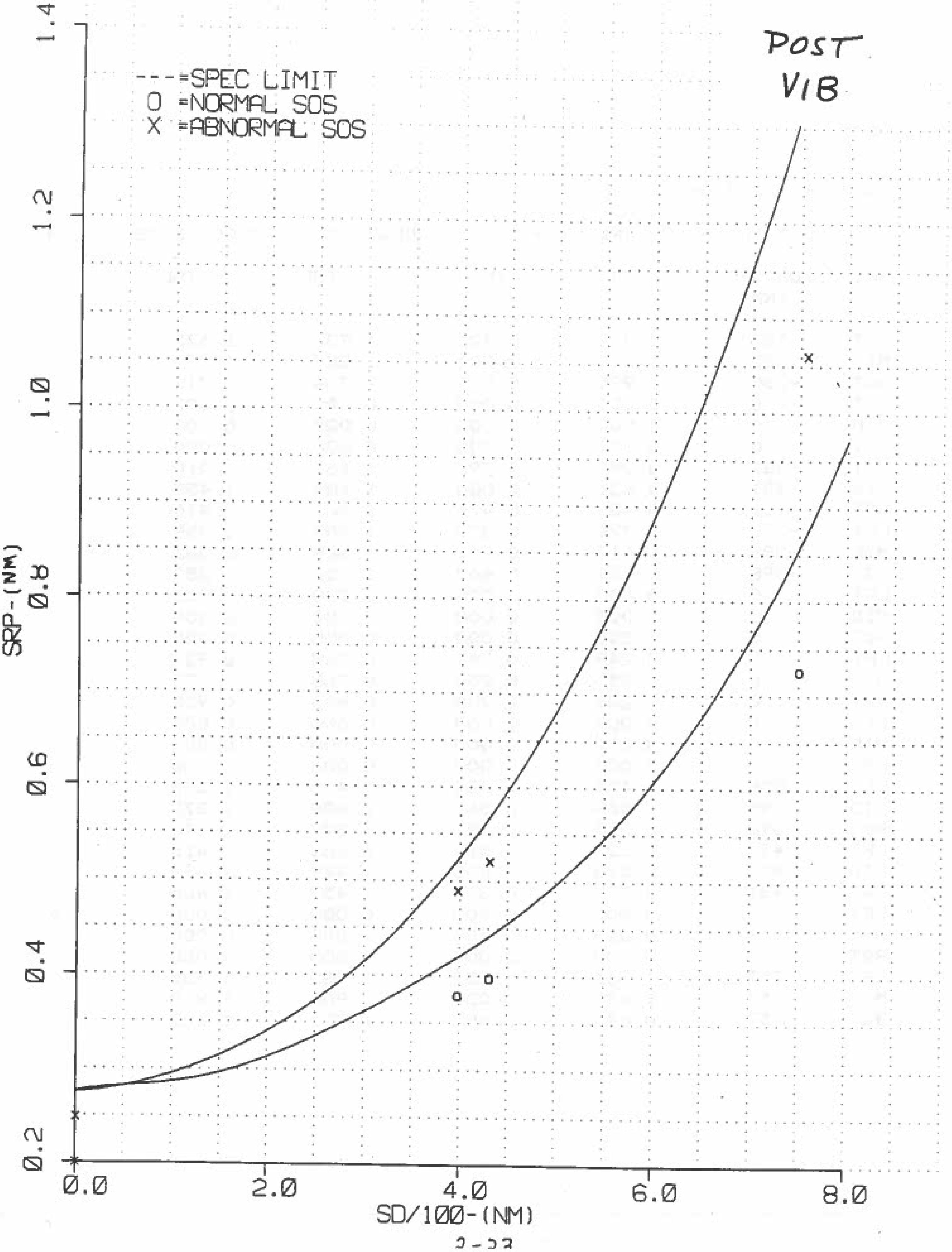
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
POST VIB
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

SYSTEM 12 ,SRP TF L FBAK,SSS=5 ,M1=-8 ,DATE:914



POST VIB

```
T, COMPLETE, SRP(NM)

        FLT.  NO. =  12   ENV. =   4   SSS=   5DEGC   M1=  -8DEGC   DATE:    914

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

 LFT      -750.        0. 725       0. 722        1. 732       1. 675
 MID      -750.        1. 253       0. 000        1. 828       1. 782
 RGT      -750.        0. 995       0. 989        1. 766       1. 713
 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. 397       0. 391        1. 461       1. 410
 MID      -431.        0. 631       0. 000        1. 488       1. 439
 RGT      -431.        0. 485       0. 479        1. 461       1. 410
 LFT      -398.        0. 379       0. 373        1. 408       1. 359
 MID      -398.        0. 614       0. 611        1. 429       1. 382
 RGT      -398.        0. 454       0. 447        1. 406       1. 357
 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. 248       0. 245        0. 968       0. 935
 MID         0.        0. 255       0. 252        0. 968       0. 935
 RGT         0.        0. 236       0. 234        0. 966       0. 932
 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. 489       0. 484        1. 411       1. 363
 MID       398.        0. 568       0. 565        1. 420       1. 372
 RGT       398.        0. 355       0. 351        1. 397       1. 348
 LFT       431.        0. 521       0. 515        1. 466       1. 415
 MID       431.        0. 573       0. 000        1. 479       1. 430
 RGT       431.        0. 377       0. 373        1. 455       1. 405
 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. 061       1. 054        1. 785       1. 735
 MID       757.        1. 449       0. 000        1. 900       1. 860
 RGT       757.        0. 695       0. 692        1. 715       1. 658
```

T, COMPLETE, SRP RATIO

SEG	SUR. DIST. (NM)	TFP	TFB	TSP	TSB
LFT	-750.	0. 845	0. 841	0. 770	0. 745
MID	-750.	0. 000	0. 000	0. 813	0. 793
RGT	-750.	0. 753	0. 749	0. 785	0. 762
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. 900	0. 885	0. 912	0. 881
MID	-431.	0. 000	0. 000	0. 929	0. 899
RGT	-431.	0. 854	0. 843	0. 912	0. 881
LFT	-398.	0. 903	0. 888	0. 918	0. 886
MID	-398.	0. 934	0. 930	0. 932	0. 901
RGT	-398.	0. 869	0. 855	0. 916	0. 885
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. 902	0. 892	0. 922	0. 890
MID	0.	0. 882	0. 871	0. 922	0. 890
RGT	0.	0. 857	0. 852	0. 920	0. 888
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. 936	0. 925	0. 920	0. 889
MID	398.	0. 865	0. 860	0. 926	0. 894
RGT	398.	0. 846	0. 838	0. 911	0. 879
LFT	431.	0. 916	0. 906	0. 915	0. 884
MID	431.	0. 000	0. 000	0. 924	0. 893
RGT	431.	0. 854	0. 844	0. 909	0. 877
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. 790	0. 785	0. 790	0. 768
MID	757.	0. 000	0. 000	0. 840	0. 823
RGT	757.	0. 797	0. 793	0. 759	0. 734

```
TF, LEFT, PRIMARY

          FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    914

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

               -750.               0. 725             0. 845
                  0.               0. 000             0. 000
               -431.               0. 397             0. 900
               -398.               0. 379             0. 903
                  0.               0. 000             0. 000
                  0.               0. 248             0. 902
                  0.               0. 000             0. 000
                398.               0. 489             0. 936
                431.               0. 521             0. 916
                  0.               0. 000             0. 000
                757.               1. 061             0. 790


TF, LEFT, BACKUP

          FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    914

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

               -750.               0. 722             0. 841
                  0.               0. 000             0. 000
               -431.               0. 391             0. 885
               -398.               0. 373             0. 888
                  0.               0. 000             0. 000
                  0.               0. 245             0. 892
                  0.               0. 000             0. 000
                398.               0. 484             0. 925
                431.               0. 515             0. 906
                  0.               0. 000             0. 000
                757.               1. 054             0. 785
```

```
TF, RIGHT, PRIMARY

        FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    914

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

            -750.                0. 995             0. 753
               0.                0. 000             0. 000
            -431.                0. 485             0. 854
            -398.                0. 454             0. 869
               0.                0. 000             0. 000
               0.                0. 236             0. 857
               0.                0. 000             0. 000
             398.                0. 355             0. 846
             431.                0. 377             0. 854
               0.                0. 000             0. 000
             757.                0. 695             0. 797
```

```
TF  RIGHT, BACKUP

        FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    914

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

            -750.                0. 989             0. 749
               0.                0. 000             0. 000
            -431.                0. 479             0. 843
            -398.                0. 447             0. 855
               0.                0. 000             0. 000
               0.                0. 234             0. 852
               0.                0. 000             0. 000
             398.                0. 351             0. 838
             431.                0. 373             0. 844
               0.                0. 000             0. 000
             757.                0. 692             0. 793
```

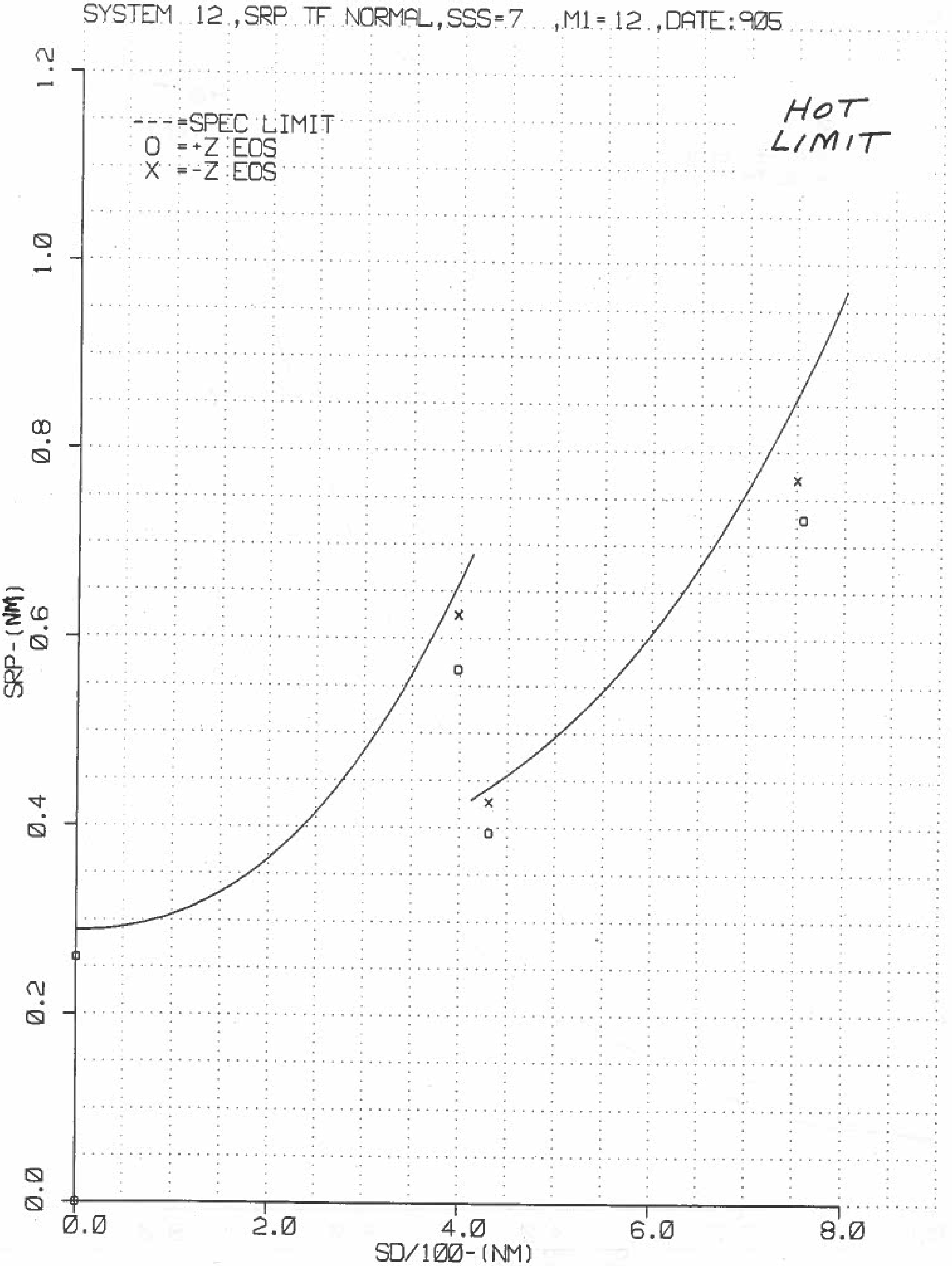
2.2 Geometric Resolution (Cont'd)

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

2.2.1.3 Acceptance - Thermal Vacuum

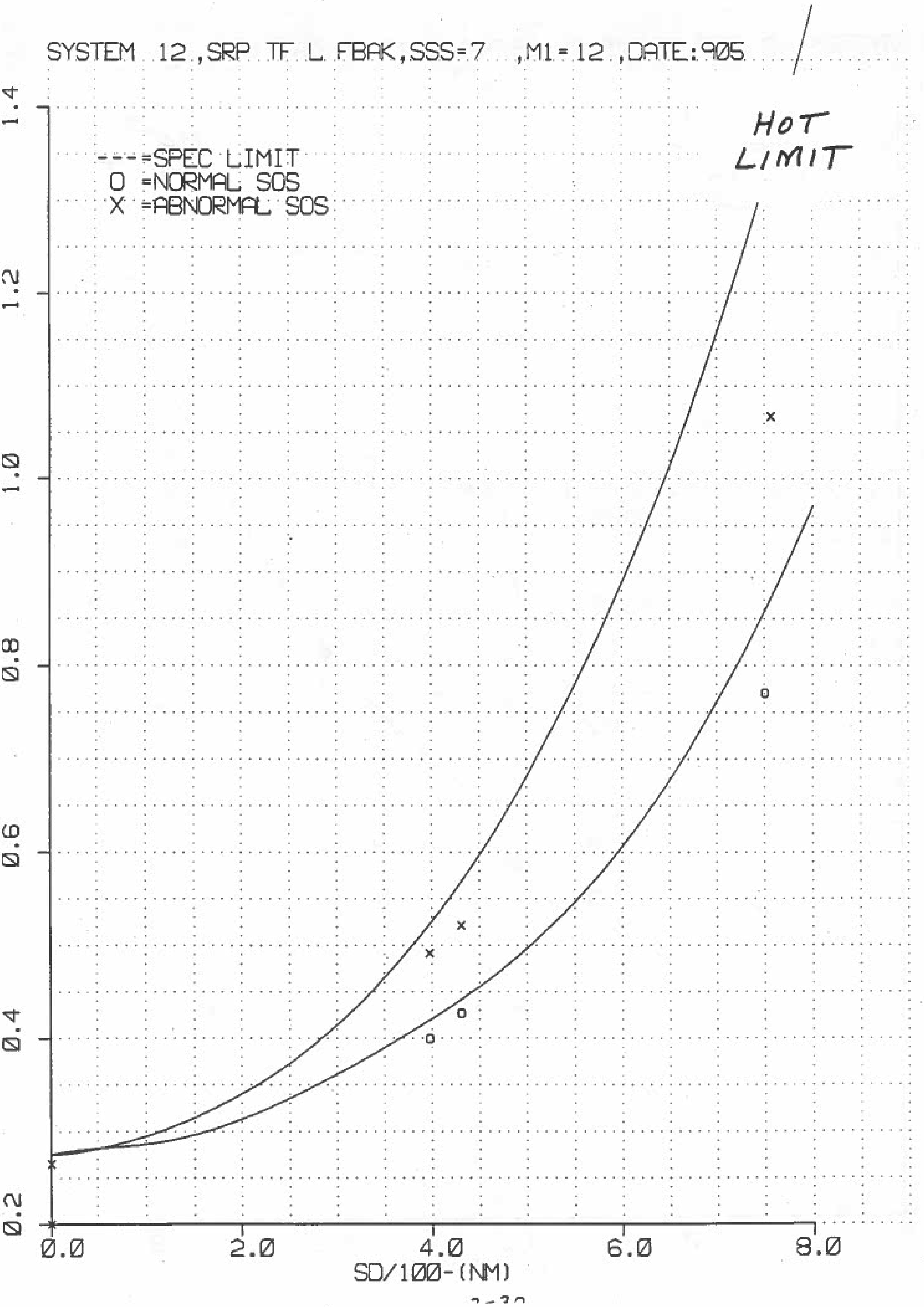
The attached TF SRP curves and tables demonstrate in-spec performance at the thermal vacuum test limits. The Orbit Nominal SRP curves are contained in paragraph 2.2.1.1 and are not included here.

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



SYSTEM 12 ,SRP TF NORMAL,SSS=7 ,M1=12 ,DATE:905

HOT LIMIT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O =NORMAL SOS
X =ABNORMAL SOS
HOT LIMIT
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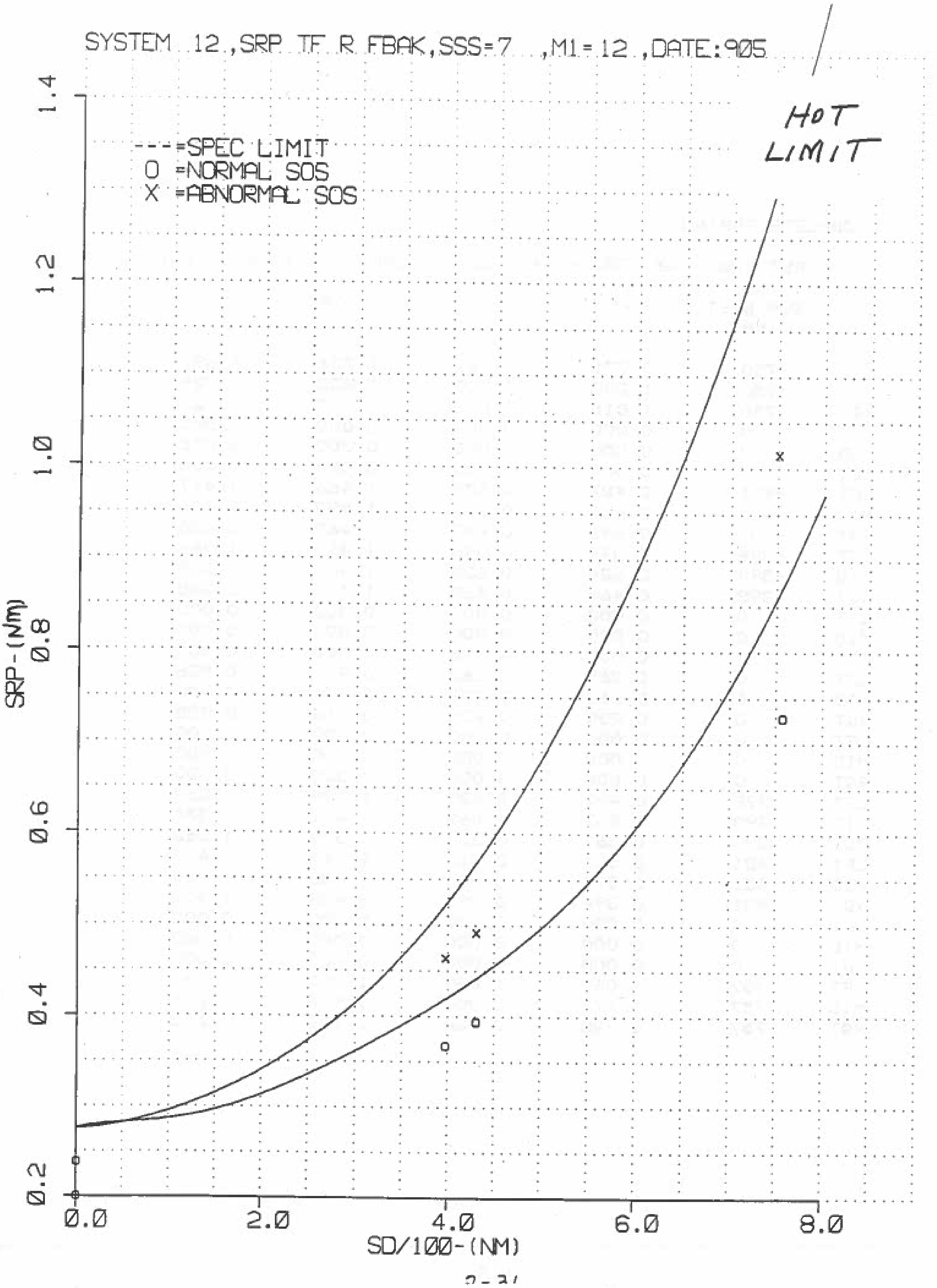
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)


SYSTEM 12 ,SRP TF R FBAK,SSS=7 ,M1=12 ,DATE:905
HOT LIMIT
---=SPEC LIMIT
O =NORMAL SOS
X =ABNORMAL SOS
SRP-(NM)
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. =  12   ENV. =   4   SSS=   7DEGC   M1=  12DEGC   DATE:     905

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

LFT      -750.        0.771        0.767        1.751        1.697
MID      -750.        1.252        0.000        1.833        1.789
RGT      -750.        1.015        1.016        1.777        1.727
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.        0.427        0.424        1.466        1.417
MID      -431.        0.642        0.000        1.493        1.446
RGT      -431.        0.491        0.489        1.469        1.420
LFT      -398.        0.399        0.396        1.413        1.366
MID      -398.        0.624        0.622        1.433        1.388
RGT      -398.        0.464        0.462        1.413        1.365
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.        0.265        0.263        0.971        0.938
MID         0.        0.260        0.258        0.971        0.938
RGT         0.        0.238        0.236        0.968        0.935
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.        0.491        0.489        1.409        1.362
MID       398.        0.567        0.563        1.421        1.374
RGT       398.        0.367        0.363        1.399        1.352
LFT       431.        0.521        0.518        1.468        1.419
MID       431.        0.579        0.000        1.483        1.435
RGT       431.        0.394        0.390        1.458        1.409
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.        1.067        1.069        1.792        1.744
MID       757.        1.475        0.000        1.916        1.876
RGT       757.        0.728        0.724        1.728        1.673
```

T, COMPLETE, SRP RATIO

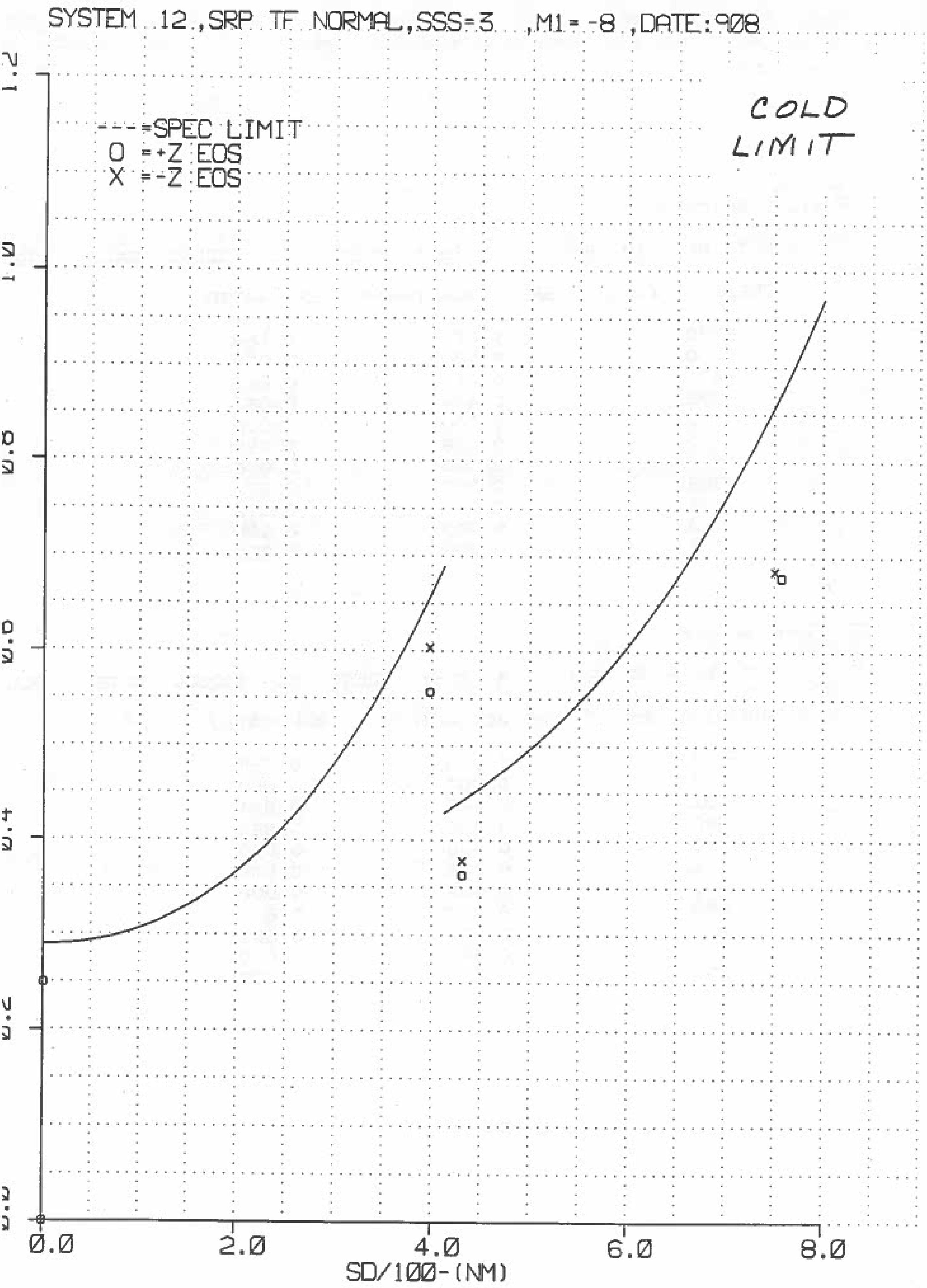
SEG	SUR. DIST. (NM)	TFP	TFB	TSP	TSB
LFT	-750.	0.897	0.893	0.779	0.755
MID	-750.	0.000	0.000	0.815	0.795
RGT	-750.	0.768	0.769	0.790	0.768
LFT	0.	0.000	0.000	0.000	0.000
MID	0.	0.000	0.000	0.000	0.000
RGT	0.	0.000	0.000	0.000	0.000
LFT	-431.	0.966	0.960	0.916	0.885
MID	-431.	0.000	0.000	0.932	0.903
RGT	-431.	0.865	0.861	0.918	0.887
LFT	-398.	0.952	0.944	0.922	0.890
MID	-398.	0.950	0.946	0.934	0.905
RGT	-398.	0.887	0.883	0.921	0.890
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.	0.965	0.956	0.924	0.893
MID	0.	0.899	0.890	0.925	0.894
RGT	0.	0.865	0.858	0.922	0.891
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.	0.940	0.935	0.919	0.888
MID	398.	0.863	0.858	0.927	0.896
RGT	398.	0.876	0.866	0.912	0.882
LFT	431.	0.917	0.911	0.917	0.886
MID	431.	0.000	0.000	0.926	0.896
RGT	431.	0.892	0.883	0.910	0.880
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.	0.795	0.796	0.793	0.772
MID	757.	0.000	0.000	0.848	0.830
RGT	757.	0.835	0.830	0.764	0.740

```
TF, LEFT, PRIMARY

      FLT.  NO. = 12   ENV. =  4   SSS=  7DEGC  M1= 12DEGC  DATE:    905

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

         -750.               0.771              0.897
            0.               0.000              0.000
         -431.               0.427              0.966
         -398.               0.399              0.952
            0.               0.000              0.000
            0.               0.265              0.965
            0.               0.000              0.000
          398.               0.491              0.940
          431.               0.521              0.917
            0.               0.000              0.000
          757.               1.067              0.795
```

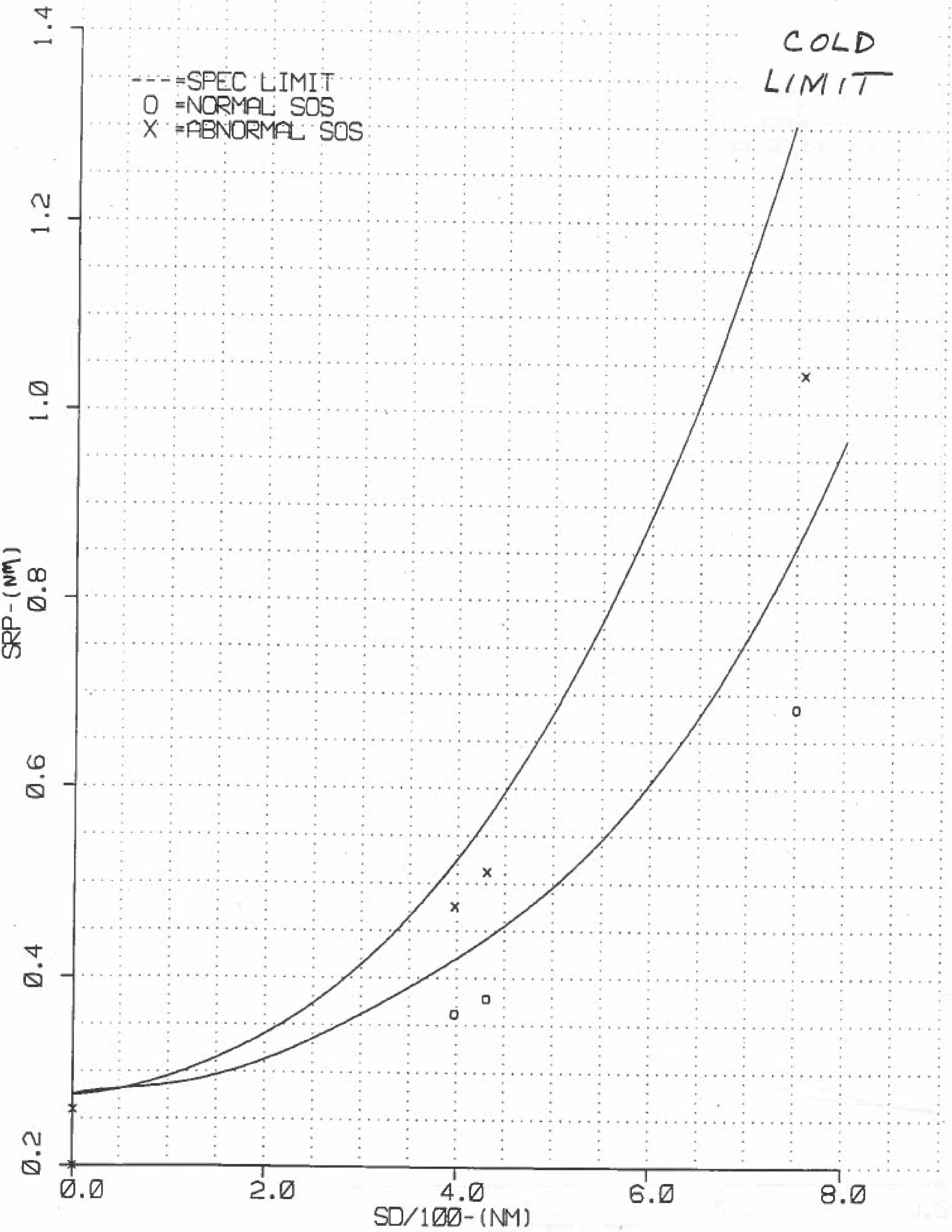
```
TF, LEFT, BACKUP

      FLT.  NO. = 12   ENV. =  4   SSS=  7DEGC  M1= 12DEGC  DATE:    905

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

         -750.               0.767              0.893
            0.               0.000              0.000
         -431.               0.424              0.960
         -398.               0.396              0.944
            0.               0.000              0.000
            0.               0.263              0.956
            0.               0.000              0.000
          398.               0.489              0.935
          431.               0.518              0.911
            0.               0.000              0.000
          757.               1.069              0.796
```

```
TF,RIGHT,PRIMARY

          FLT.  NO. = 12   ENV. =  4  SSS=  7DEGC  M1= 12DEGC  DATE:    905

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

              -750.               1.015            0.768
                 0.               0.000            0.000
              -431.               0.491            0.865
              -398.               0.464            0.887
                 0.               0.000            0.000
                 0.               0.238            0.865
                 0.               0.000            0.000
               398.               0.367            0.876
               431.               0.394            0.892
                 0.               0.000            0.000
               757.               0.728            0.835
```

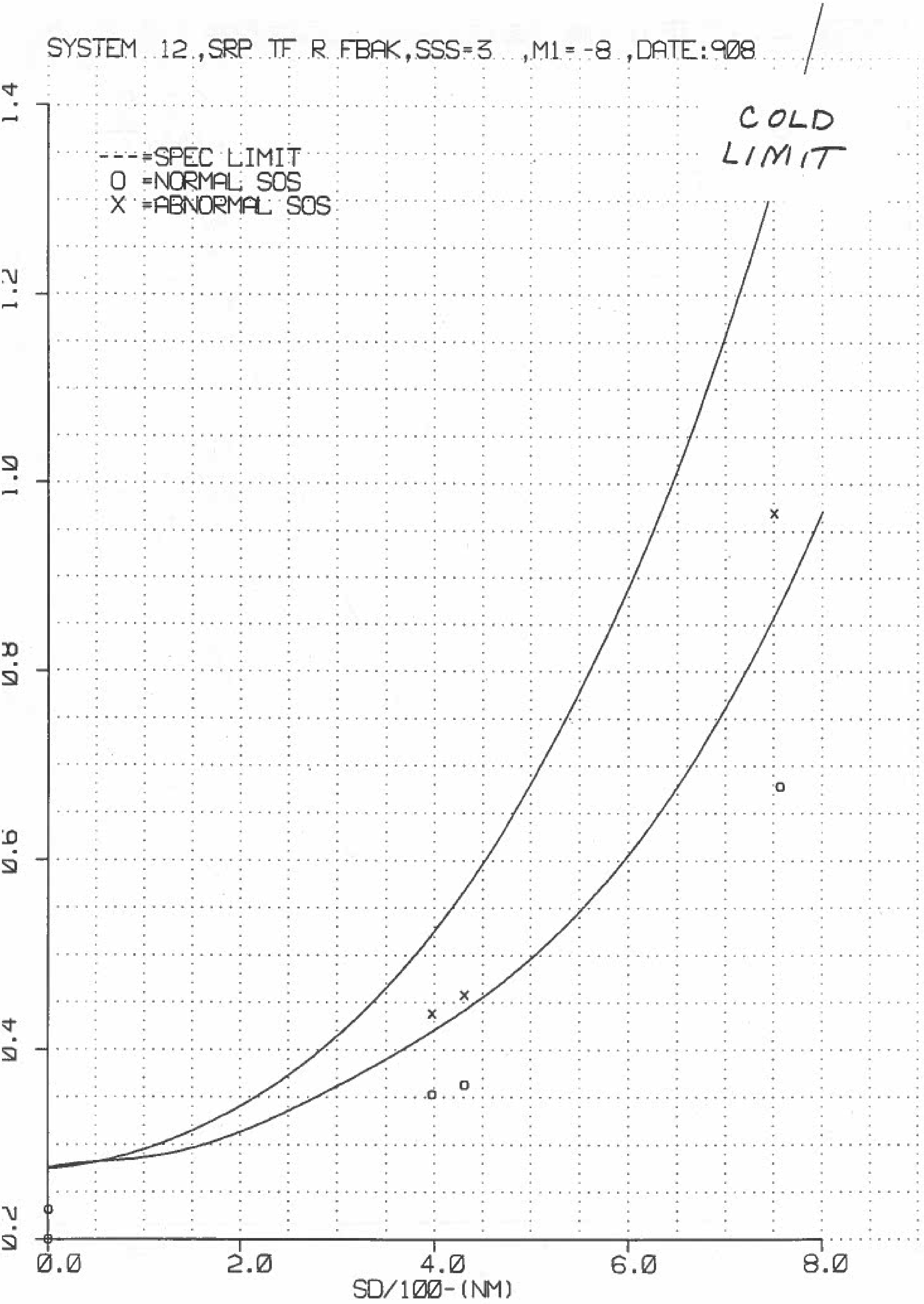
```
TF RIGHT,BACKUP

          FLT.  NO. = 12   ENV. =  4  SSS=  7DEGC  M1= 12DEGC  DATE:    905

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

              -750.               1.016            0.769
                 0.               0.000            0.000
              -431.               0.489            0.861
              -398.               0.462            0.883
                 0.               0.000            0.000
                 0.               0.236            0.858
                 0.               0.000            0.000
               398.               0.363            0.866
               431.               0.390            0.883
                 0.               0.000            0.000
               757.               0.724            0.830
```


SYSTEM 12, SRP TF NORMAL, SSS=3 , M1= -8 , DATE: 908
COLD LIMIT
---- =SPEC LIMIT
O =+Z EOS
X =-Z EOS
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 12 ,SRP TF L FBAK,SSS=3 ,M1=-8 ,DATE:908



COLD LIMIT



SYSTEM 12 ,SRP TF R FBAK,SSS=3 ,M1=-8 ,DATE:908
----=SPEC LIMIT
O =NORMAL SOS
X =ABNORMAL SOS
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)

COLD LIMIT

```
T, COMPLETE, SRP(NM)

        FLT.  NO. = 12   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:     908

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

LFT      -750.         0. 685        0. 678         1. 713        1. 645
MID      -750.         1. 248        0. 000         1. 818        1. 764
RGT      -750.         0. 969        0. 962         1. 752        1. 688
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. 378        0. 375         1. 453        1. 395
MID      -431.         0. 614        0. 000         1. 480        1. 423
RGT      -431.         0. 458        0. 455         1. 455        1. 397
LFT      -398.         0. 362        0. 358         1. 398        1. 342
MID      -398.         0. 604        0. 597         1. 424        1. 369
RGT      -398.         0. 438        0. 436         1. 407        1. 350
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. 259        0. 257         0. 973        0. 934
MID         0.         0. 249        0. 247         0. 968        0. 929
RGT         0.         0. 231        0. 230         0. 965        0. 926
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. 476        0. 472         1. 406        1. 350
MID       398.         0. 556        0. 551         1. 415        1. 359
RGT       398.         0. 353        0. 349         1. 394        1. 339
LFT       431.         0. 512        0. 508         1. 461        1. 403
MID       431.         0. 567        0. 000         1. 477        1. 419
RGT       431.         0. 363        0. 359         1. 451        1. 393
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. 040        1. 032         1. 775        1. 715
MID       757.         1. 443        0. 000         1. 893        1. 845
RGT       757.         0. 678        0. 671         1. 706        1. 639
```

T, COMPLETE, SRP RATIO

SEG	SUR. DIST. (NM)	TFP	TFB	TSP	TSB
LFT	-750.	0. 798	0. 790	0. 762	0. 731
MID	-750.	0. 000	0. 000	0. 809	0. 784
RGT	-750.	0. 734	0. 728	0. 779	0. 751
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. 857	0. 848	0. 907	0. 871
MID	-431.	0. 000	0. 000	0. 925	0. 889
RGT	-431.	0. 806	0. 801	0. 909	0. 872
LFT	-398.	0. 862	0. 854	0. 912	0. 875
MID	-398.	0. 918	0. 909	0. 928	0. 892
RGT	-398.	0. 838	0. 833	0. 917	0. 880
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. 943	0. 934	0. 926	0. 889
MID	0.	0. 861	0. 852	0. 922	0. 885
RGT	0.	0. 841	0. 835	0. 919	0. 882
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. 910	0. 903	0. 917	0. 880
MID	398.	0. 847	0. 839	0. 923	0. 886
RGT	398.	0. 841	0. 833	0. 909	0. 873
LFT	431.	0. 901	0. 894	0. 912	0. 876
MID	431.	0. 000	0. 000	0. 922	0. 886
RGT	431.	0. 822	0. 813	0. 906	0. 869
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. 774	0. 768	0. 785	0. 759
MID	757.	0. 000	0. 000	0. 837	0. 816
RGT	757.	0. 778	0. 769	0. 755	0. 725

```
TF, LEFT, PRIMARY

        FLT.  NO. = 12   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    908

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

           -750.                0. 685             0. 798
              0.                0. 000             0. 000
           -431.                0. 378             0. 857
           -398.                0. 362             0. 862
              0.                0. 000             0. 000
              0.                0. 259             0. 943
              0.                0. 000             0. 000
            398.                0. 476             0. 910
            431.                0. 512             0. 901
              0.                0. 000             0. 000
            757.                1. 040             0. 774
```

```
TF, LEFT, BACKUP

        FLT.  NO. = 12   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    908

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

           -750.                0. 678             0. 790
              0.                0. 000             0. 000
           -431.                0. 375             0. 848
           -398.                0. 358             0. 854
              0.                0. 000             0. 000
              0.                0. 257             0. 934
              0.                0. 000             0. 000
            398.                0. 472             0. 903
            431.                0. 508             0. 894
              0.                0. 000             0. 000
            757.                1. 032             0. 768
```

```
TF, RIGHT, PRIMARY

          FLT.  NO. = 12   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    908

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

             -750.                 0. 969            0. 734
                0.                 0. 000            0. 000
             -431.                 0. 458            0. 806
             -398.                 0. 438            0. 838
                0.                 0. 000            0. 000
                0.                 0. 231            0. 841
                0.                 0. 000            0. 000
              398.                 0. 353            0. 841
              431.                 0. 363            0. 822
                0.                 0. 000            0. 000
              757.                 0. 678            0. 778
```

```
TF RIGHT, BACKUP

          FLT.  NO. = 12   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    908

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

             -750.                 0. 962            0. 728
                0.                 0. 000            0. 000
             -431.                 0. 455            0. 801
             -398.                 0. 436            0. 833
                0.                 0. 000            0. 000
                0.                 0. 230            0. 835
                0.                 0. 000            0. 000
              398.                 0. 349            0. 833
              431.                 0. 359            0. 813
                0.                 0. 000            0. 000
              757.                 0. 671            0. 769
```

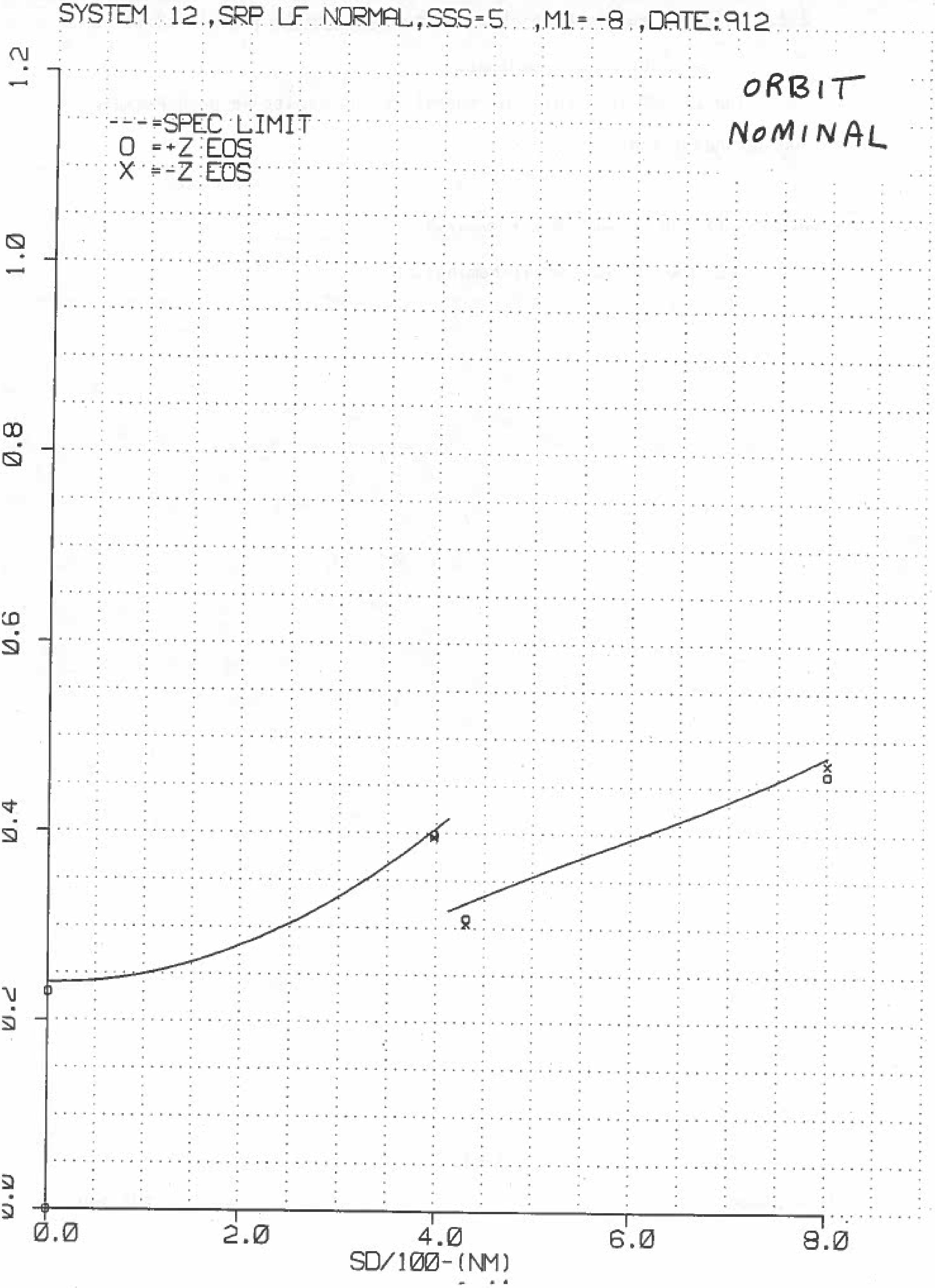
2.2 Geometric Resolution (Cont'd)

2.2.2 Fine Geometric Resolution - Daytime Visual (3.2.1.1.2.1)

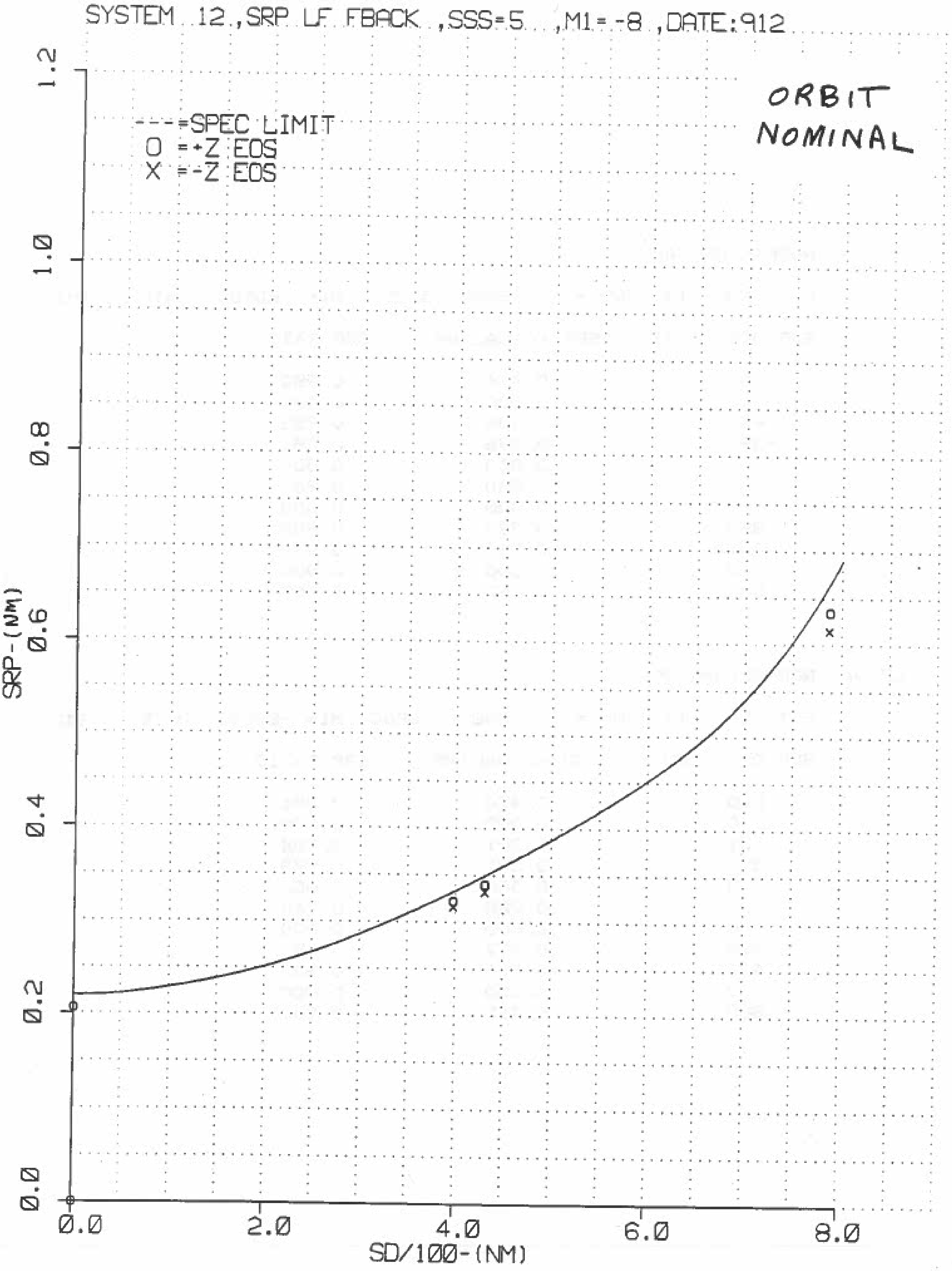
2.2.2.1 Baseline (Orbit Nominal)

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



ORBIT
NOMINAL


SYSTEM 12 ,SRP LF FBACK ,SSS=5 ,M1=-8 ,DATE:912
ORBIT
NOMINAL
---=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(NM)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
SD/100-(NM)
0.0
2.0
4.0
6.0
8.0

```
LF, DAY, NORMAL, PRIMARY

        FLT.  NO. = 12  ENV. =  4  SSS=  5DEGC  M1= -8DEGC  DATE:   912

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

           -800.                0. 474          0. 982
              0.                0. 000          0. 000
           -431.                0. 304          0. 933
           -398.                0. 396          0. 980
              0.                0. 000          0. 000
              0.                0. 230          0. 957
              0.                0. 000          0. 000
            398.                0. 398          0. 987
            431.                0. 310          0. 949
              0.                0. 000          0. 000
            800.                0. 462          0. 958


LF, DAY, NORMAL, BACKUP

        FLT.  NO. = 12  ENV. =  4  SSS=  5DEGC  M1= -8DEGC  DATE:   912

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

           -800.                0. 474          0. 981
              0.                0. 000          0. 000
           -431.                0. 301          0. 924
           -398.                0. 395          0. 978
              0.                0. 000          0. 000
              0.                0. 228          0. 949
              0.                0. 000          0. 000
            398.                0. 397          0. 985
            431.                0. 306          0. 939
              0.                0. 000          0. 000
            800.                0. 462          0. 956
```

```
LF, DAY, FALLBACK, PRIMARY

       FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC  DATE:    912

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

          -787.                0. 615             0. 926
             0.                0. 000             0. 000
          -431.                0. 332             0. 950
          -398.                0. 316             0. 951
             0.                0. 000             0. 000
             0.                0. 205             0. 938
             0.                0. 000             0. 000
           398.                0. 322             0. 969
           431.                0. 340             0. 972
             0.                0. 000             0. 000
           788.                0. 635             0. 954
```

```
LF, DAY, FALLBACK, BACKUP

       FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC  DATE:    912

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

          -787.                0. 614             0. 925
             0.                0. 000             0. 000
          -431.                0. 329             0. 941
          -398.                0. 313             0. 942
             0.                0. 000             0. 000
             0.                0. 203             0. 928
             0.                0. 000             0. 000
           398.                0. 319             0. 959
           431.                0. 337             0. 963
             0.                0. 000             0. 000
           788.                0. 634             0. 953
```

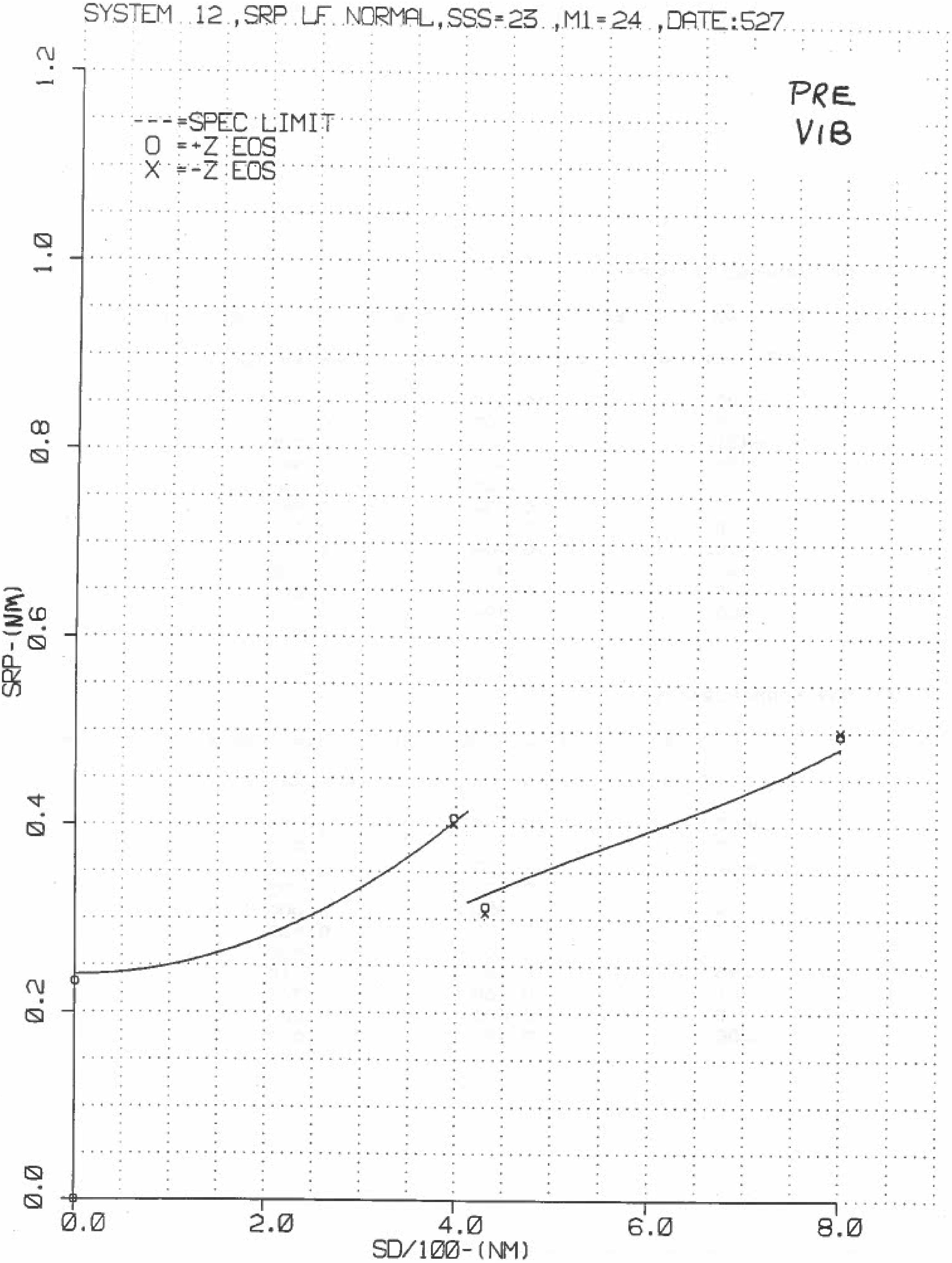
2.2.2 Fine Geometric Resolution - Daytime Visual (Cont'd)

(3.2.1.1.2.1)

2.2.2.2 Acceptance - Vibration

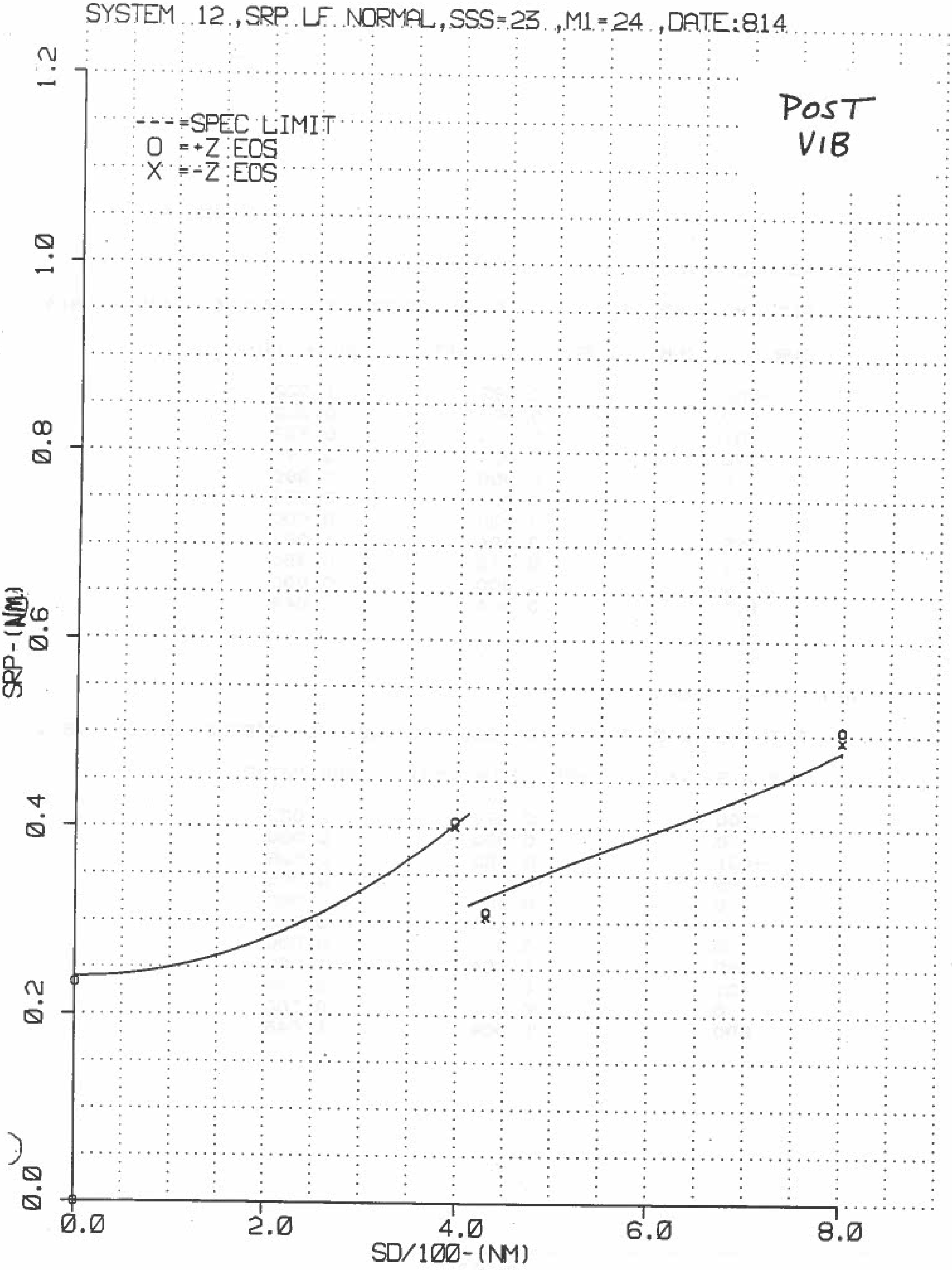
OLS #12 underwent Acceptance-level SSS vibration on May 23, 1991. The Pre-to-Post Vibration SRP performance is within Specification requirements and is shown on the attached curves and tables. No changes in SRP performance occurred as a result of vibration.

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


SYSTEM 12 ,SRP LF NORMAL,SSS=23 ,M1=24 ,DATE:527
PRE
VIB
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(NM)
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)

```
LF, DAY, NORMAL, PRIMARY

       FLT.  NO. = 12   ENV. =   2   SSS= 23DEGC   M1= 24DEGC   DATE:     527

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

          -800.                0. 500             1. 035
             0.                0. 000             0. 000
          -431.                0. 306             0. 939
          -398.                0. 401             0. 994
             0.                0. 000             0. 000
             0.                0. 232             0. 968
             0.                0. 000             0. 000
           398.                0. 408             1. 011
           431.                0. 313             0. 958
             0.                0. 000             0. 000
           800.                0. 496             1. 028
```

```
LF, DAY, NORMAL, BACKUP

       FLT.  NO. = 12   ENV. =   2   SSS= 23DEGC   M1= 24DEGC   DATE:     527

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

          -800.                0. 499             1. 034
             0.                0. 000             0. 000
          -431.                0. 303             0. 928
          -398.                0. 401             0. 993
             0.                0. 000             0. 000
             0.                0. 230             0. 960
             0.                0. 000             0. 000
           398.                0. 407             1. 010
           431.                0. 309             0. 947
             0.                0. 000             0. 000
           800.                0. 496             1. 027
```


SYSTEM 12 ,SRP LF NORMAL,SSS=23 ,M1=24 ,DATE:814
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(NM)
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)

POST
VIB

```
LF, DAY, NORMAL, PRIMARY

        FLT.  NO. = 12   ENV. =   2   SSS= 23DEGC   M1= 24DEGC   DATE:     814

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

           -800.                0. 493               1. 022
              0.                0. 000               0. 000
           -431.                0. 305               0. 937
           -398.                0. 401               0. 993
              0.                0. 000               0. 000
              0.                0. 234               0. 974
              0.                0. 000               0. 000
            398.                0. 406               1. 007
            431.                0. 310               0. 950
              0.                0. 000               0. 000
            800.                0. 504               1. 044
```

```
LF, DAY, NORMAL, BACKUP

        FLT.  NO. = 12   ENV. =   2   SSS= 23DEGC   M1= 24DEGC   DATE:     814

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

           -800.                0. 494               1. 023
              0.                0. 000               0. 000
           -431.                0. 303               0. 928
           -398.                0. 401               0. 995
              0.                0. 000               0. 000
              0.                0. 233               0. 970
              0.                0. 000               0. 000
            398.                0. 406               1. 008
            431.                0. 307               0. 940
              0.                0. 000               0. 000
            800.                0. 504               1. 045
```

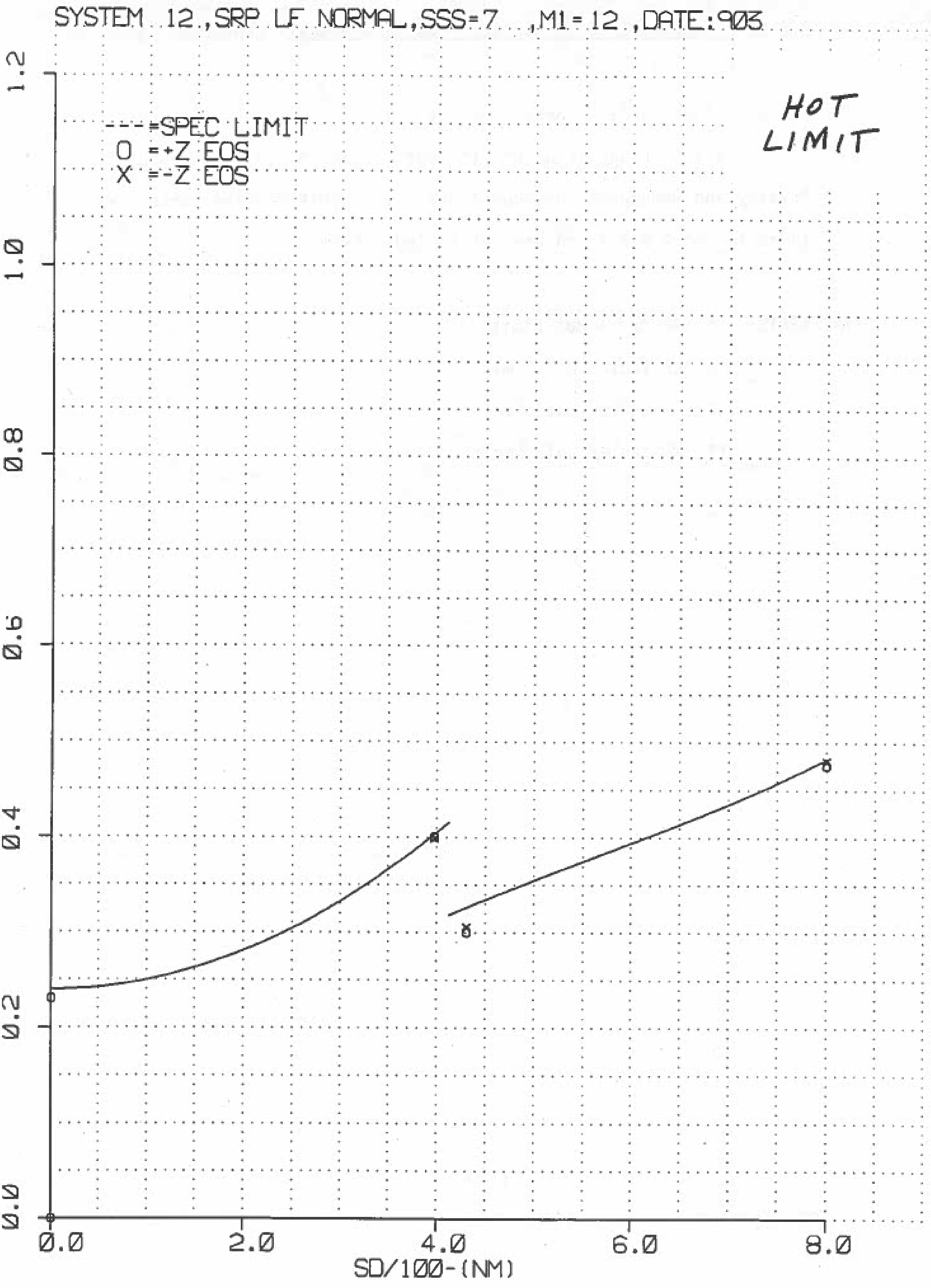
2.2 Geometric Resolution (Cont'd)

2.2.2 Fine Geometric Resolution - Daytime Visual (Cont'd) (3.2.1.1.2.1)

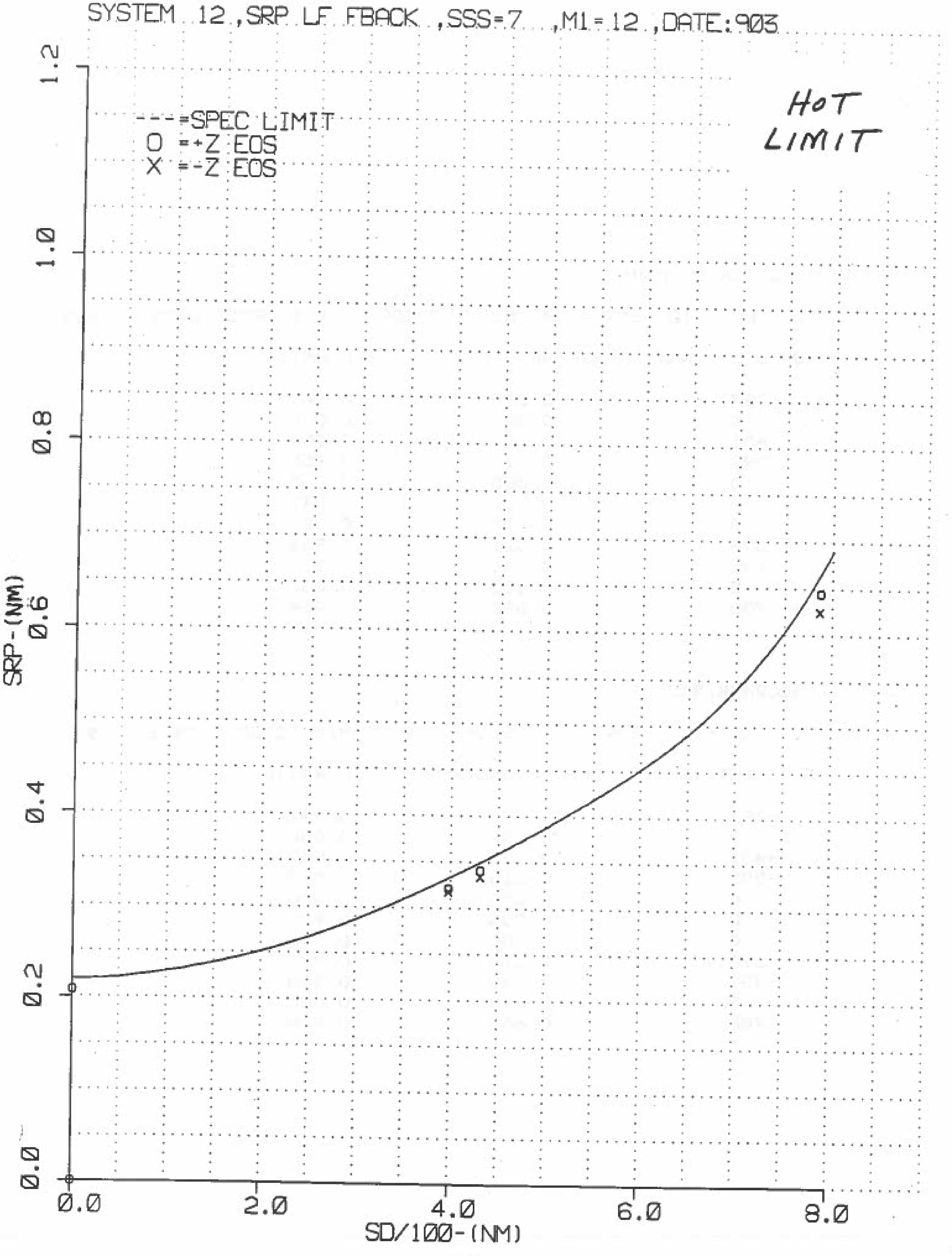
2.2.2.3 Acceptance - Thermal Vacuum

OLS #12 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

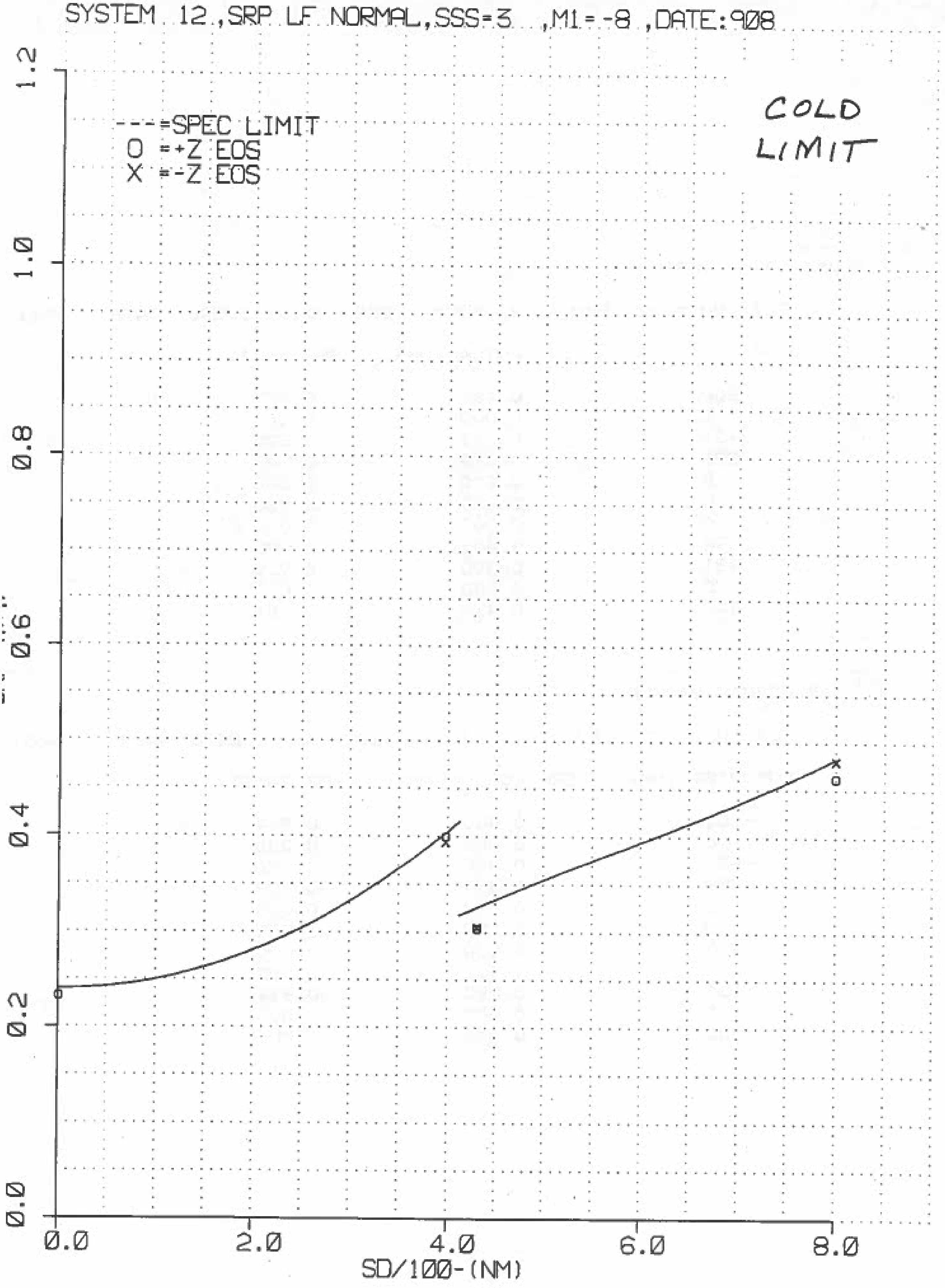

SYSTEM 12.,SRP LF NORMAL,SSS=7 ,M1=12 ,DATE:903
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

HOT LIMIT

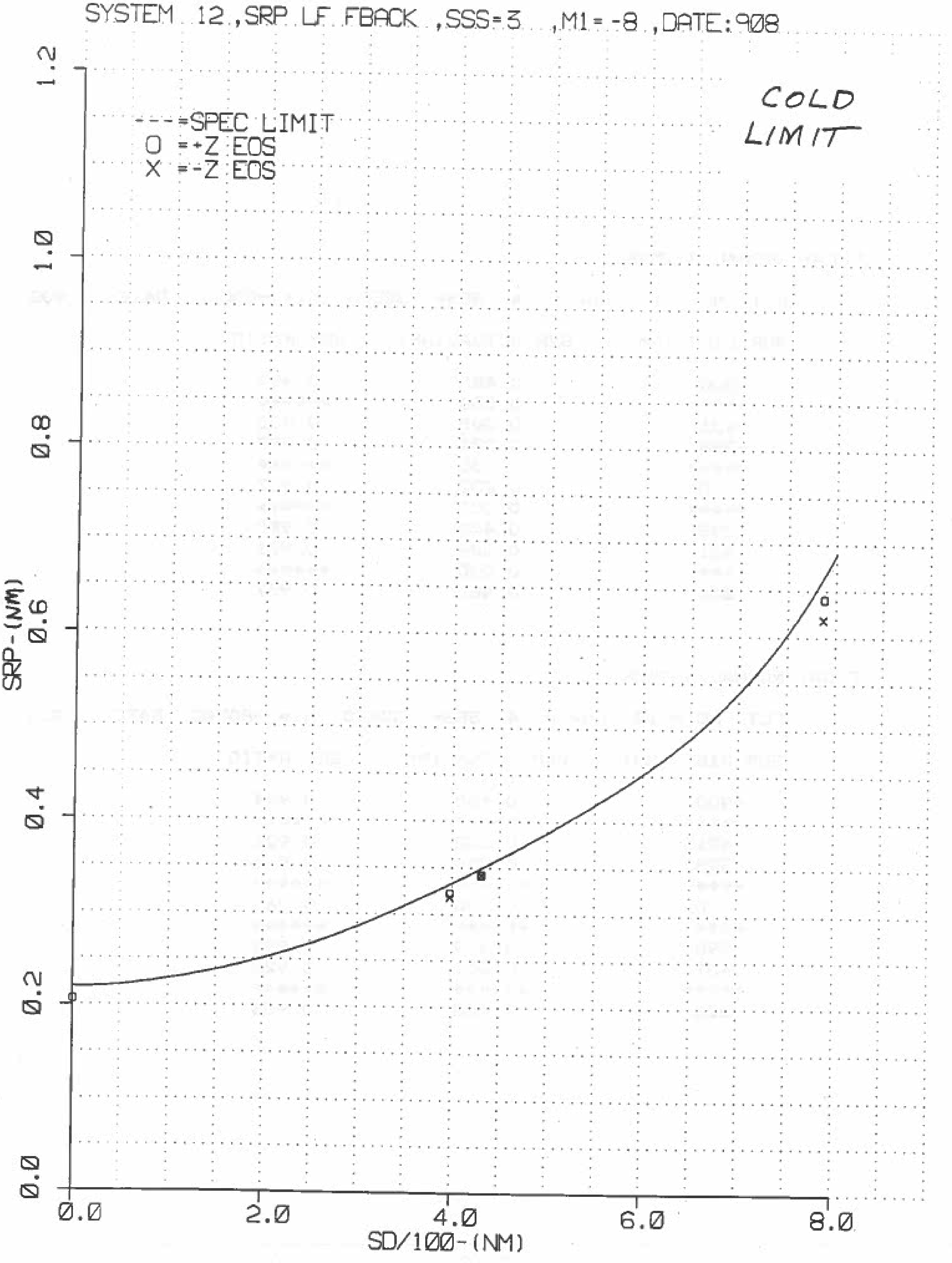

SYSTEM 12 ,SRP LF FBACK ,SSS=7 ,M1=12 ,DATE:903
---=SPEC LIMIT
O =+Z EOS
X =-Z EOS
HOT LIMIT
SRP-(NM)
0.0
0.2
0.4
0.6
0.8
1.0
1.2
SD/100-(NM)
0.0
2.0
4.0
6.0
8.0

```
LF. DAY, FALLBACK, PRIMARY

          FLT.  NO. = 12   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:    903

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

              -787.               0. 625             0. 941
                 0.               0. 000             0. 000
              -431.               0. 334             0. 954
              -398.               0. 317             0. 955
                 0.               0. 000             0. 000
                 0.               0. 207             0. 947
                 0.               0. 000             0. 000
               398.               0. 321             0. 965
               431.               0. 341             0. 975
                 0.               0. 000             0. 000
               788.               0. 645             0. 969


LF. DAY, FALLBACK, BACKUP

          FLT.  NO. = 12   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:    903

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

              -787.               0. 625             0. 942
                 0.               0. 000             0. 000
              -431.               0. 331             0. 947
              -398.               0. 315             0. 947
                 0.               0. 000             0. 000
                 0.               0. 206             0. 939
                 0.               0. 000             0. 000
               398.               0. 318             0. 957
               431.               0. 339             0. 968
                 0.               0. 000             0. 000
               788.               0. 645             0. 969
```

```
LF, DAY, NORMAL, PRIMARY

        FLT.  NO. = 12   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:    903

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

            -800.                0. 480             0. 995
               0.                0. 000             0. 000
            -431.                0. 305             0. 935
            -398.                0. 399             0. 989
               0.                0. 000             0. 000
               0.                0. 230             0. 960
               0.                0. 000             0. 000
             398.                0. 401             0. 993
             431.                0. 300             0. 920
               0.                0. 000             0. 000
             800.                0. 476             0. 986

LF, DAY, NORMAL, BACKUP

        FLT.  NO. = 12   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:    903

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

            -800.                0. 480             0. 994
               0.                0. 000             0. 000
            -431.                0. 302             0. 926
            -398.                0. 399             0. 989
               0.                0. 000             0. 000
               0.                0. 229             0. 953
               0.                0. 000             0. 000
             398.                0. 400             0. 993
             431.                0. 297             0. 911
               0.                0. 000             0. 000
             800.                0. 476             0. 985
```


SYSTEM 12 ,SRP LF NORMAL,SSS=3 ,M1=-8 ,DATE:908
---=SPEC LIMIT
O =+Z EOS
X =-Z EOS
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)

COLD LIMIT


SYSTEM 12 ,SRP LF FBACK ,SSS=3 ,M1=-8 ,DATE:908
COLD LIMIT
---=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(NM)
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)

```
LF, DAY, NORMAL, PRIMARY

        FLT.  NO. = 12  ENV. =   4  SSS=  3DEGC  M1= -8DEGC  DATE:   908

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

           -800.              0. 480            0. 994
           *****              0. 000           ******
           -431.              0. 305            0. 935
           -398.              0. 394            0. 977
           *****              0. 000           ******
              0.              0. 232            0. 967
           *****              0. 000           ******
            398.              0. 400            0. 990
            431.              0. 304            0. 931
           *****              0. 000           ******
            800.              0. 462            0. 957
```

```
LF, DAY, NORMAL, BACKUP

        FLT.  NO. = 12  ENV. =   4  SSS=  3DEGC  M1= -8DEGC  DATE:   908

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

           -800.              0. 480            0. 994
           *****             ******            ******
           -431.              0. 302            0. 926
           -398.              0. 394            0. 975
           *****             ******            ******
              0.              0. 230            0. 960
           *****             ******            ******
            398.              0. 399            0. 990
            431.              0. 301            0. 922
           *****             ******            ******
            800.              0. 462            0. 956
```

```
LF, DAY, FALLBACK, PRIMARY

       FLT.  NO. = 12   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    908

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

          -787.                 0. 619             0. 932
          *****                 0. 000            ******
          -431.                 0. 342             0. 979
          -398.                 0. 318             0. 957
          *****                 0. 000            ******
             0.                 0. 206             0. 940
          *****                 0. 000            ******
           398.                 0. 322             0. 970
           431.                 0. 343             0. 979
          *****                 0. 000            ******
           788.                 0. 641             0. 963
```

```
LF, DAY, FALLBACK, BACKUP

       FLT.  NO. = 12   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    908

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

          -787.                 0. 620             0. 933
          *****                ******             ******
          -431.                 0. 340             0. 972
          -398.                 0. 316             0. 949
          *****                ******             ******
             0.                 0. 204             0. 931
          *****                ******             ******
           398.                 0. 320             0. 962
           431.                 0. 340             0. 972
          *****                ******             ******
           788.                 0. 642             0. 964
```

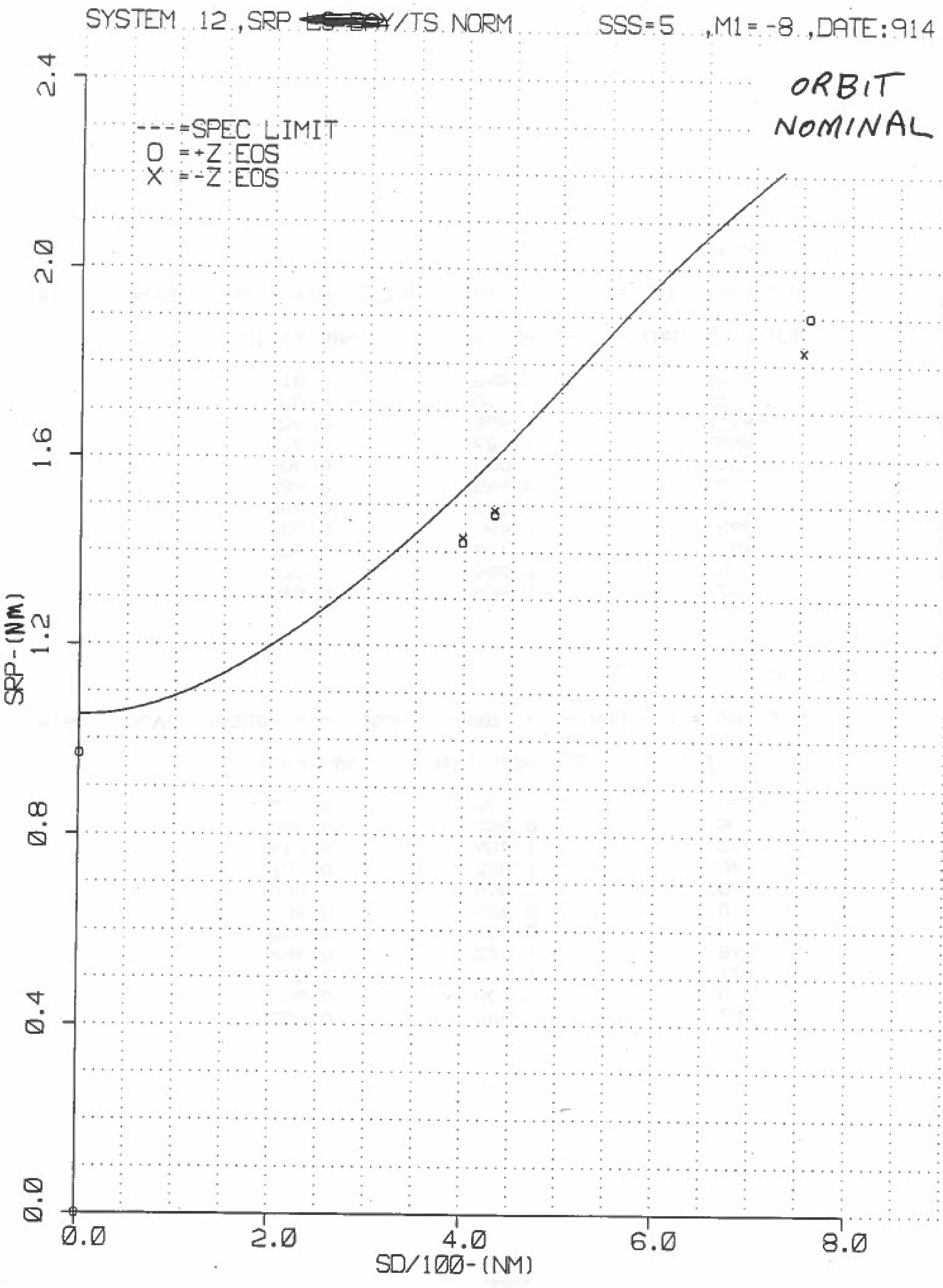
2.2 Geometric Resolution (Cont'd)

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



ORBIT
NOMINAL

```
TS, MID, PRIMARY

        FLT.  NO. =  12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    914

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

           -750.                1. 828             0. 813
              0.                0. 000             0. 000
           -431.                1. 488             0. 929
           -398.                1. 429             0. 932
              0.                0. 000             0. 000
              0.                0. 968             0. 922
              0.                0. 000             0. 000
            398.                1. 420             0. 926
            431.                1. 479             0. 924
              0.                0. 000             0. 000
            757.                1. 900             0. 840
```

```
TS, MID, BACKUP

        FLT.  NO. =  12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    914

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

           -750.                1. 782             0. 793
              0.                0. 000             0. 000
           -431.                1. 439             0. 899
           -398.                1. 382             0. 901
              0.                0. 000             0. 000
              0.                0. 935             0. 890
              0.                0. 000             0. 000
            398.                1. 372             0. 894
            431.                1. 430             0. 893
              0.                0. 000             0. 000
            757.                1. 860             0. 823
```

2.2.3 Smoothed Geometric Resolution - Infrared (Cont'd)

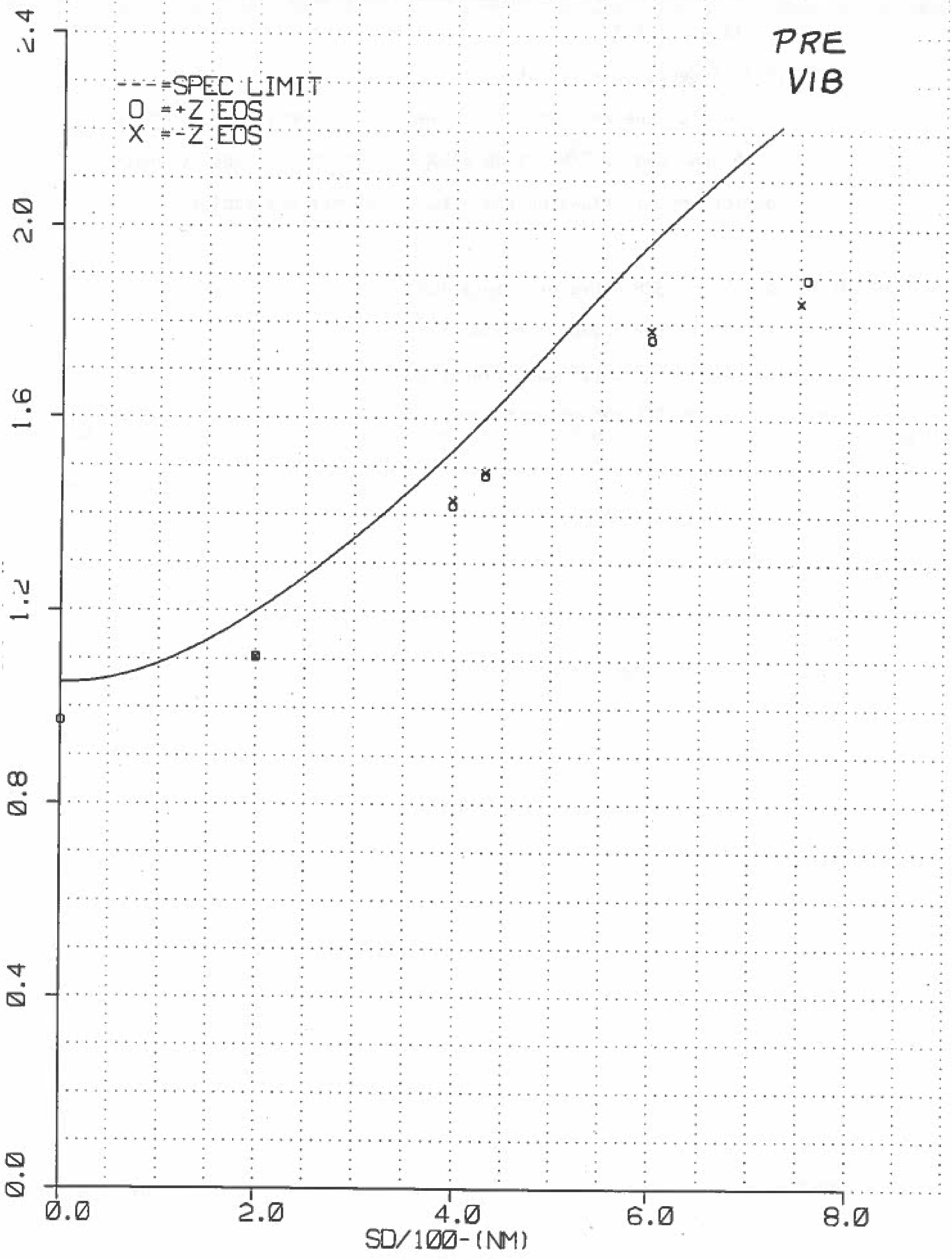
(3.2.1.1.2.2)

2.2.3.2 Acceptance - Vibration

OLS #12 underwent acceptance level SSS vibration per DMSS-OLS-300 with cone cooler S/N 024 on 5/23/91. The pre-to-post vibration SRP performance is shown on the attached curves and tables.

ATTACHMENTS:	TS	SRP curve pre-vibration
	TS	SRP tables pre-vibration
	TS	SRP curve post-vibration
	TS	SRP tables post-vibration

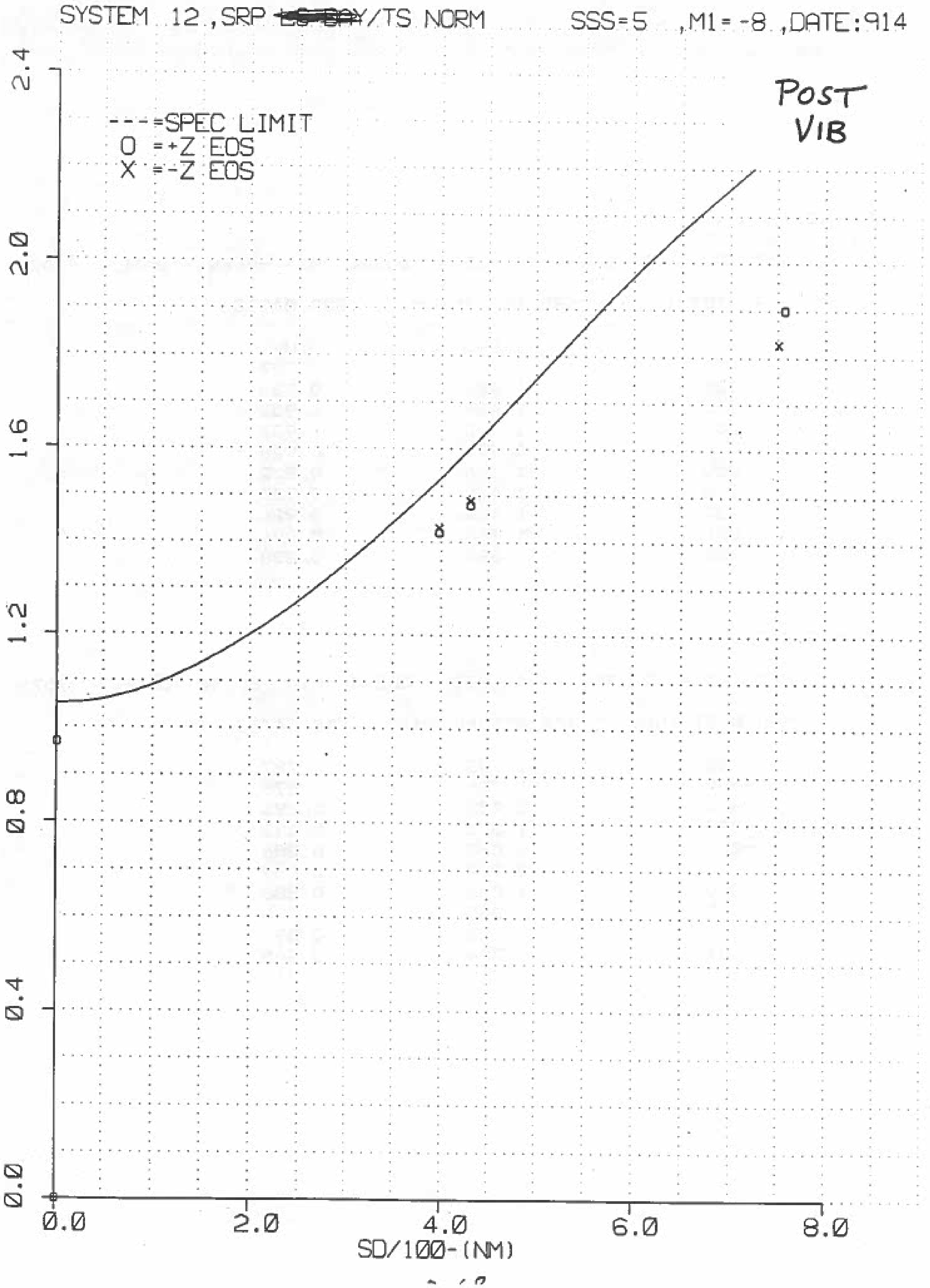
SYSTEM 12,SRP [redacted]Y/TS NORM SSS=5 ,M1=-8 ,DATE:707



PRE
VIB

```
TS, MID, PRIMARY

       FLT.  NO. = 12  ENV. =  4  SSS=  5DEGC  M1= -8DEGC  DATE:    707

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

          -750.               1. 846             0. 821
          -600.               1. 786             0. 907
          -431.               1. 489             0. 930
          -398.               1. 429             0. 932
          -200.               1. 105             0. 922
             0.               0. 971             0. 925
           200.               1. 106             0. 922
           398.               1. 419             0. 925
           431.               1. 482             0. 926
           601.               1. 766             0. 896
           757.               1. 894             0. 838
```

```
TS, MID, BACKUP

       FLT.  NO. = 12  ENV. =  4  SSS=  5DEGC  M1= -8DEGC  DATE:    707

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

          -750.               1. 793             0. 797
          -600.               1. 726             0. 876
          -431.               1. 433             0. 895
          -398.               1. 375             0. 897
          -200.               1. 063             0. 886
             0.               0. 934             0. 889
           200.               1. 063             0. 886
           398.               1. 365             0. 890
           431.               1. 426             0. 891
           601.               1. 704             0. 865
           757.               1. 845             0. 816
```


SYSTEM 12, SRP ~~LS BAY~~/TS NORM
SSS=5, M1=-8, DATE:914
POST VIB
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
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)

```
TS, MID, PRIMARY

          FLT.  NO. = 12   ENV. =   4  SSS=   5DEGC   M1= -8DEGC   DATE:     914

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

              -750.                 1. 828             0. 813
                 0.                 0. 000             0. 000
              -431.                 1. 488             0. 929
              -398.                 1. 429             0. 932
                 0.                 0. 000             0. 000
                 0.                 0. 968             0. 922
                 0.                 0. 000             0. 000
               398.                 1. 420             0. 926
               431.                 1. 479             0. 924
                 0.                 0. 000             0. 000
               757.                 1. 900             0. 840
```

```
TS, MID, BACKUP

          FLT.  NO. = 12   ENV. =   4  SSS=   5DEGC   M1= -8DEGC   DATE:     914

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

              -750.                 1. 782             0. 793
                 0.                 0. 000             0. 000
              -431.                 1. 439             0. 899
              -398.                 1. 382             0. 901
                 0.                 0. 000             0. 000
                 0.                 0. 935             0. 890
                 0.                 0. 000             0. 000
               398.                 1. 372             0. 894
               431.                 1. 430             0. 893
                 0.                 0. 000             0. 000
               757.                 1. 860             0. 823
```

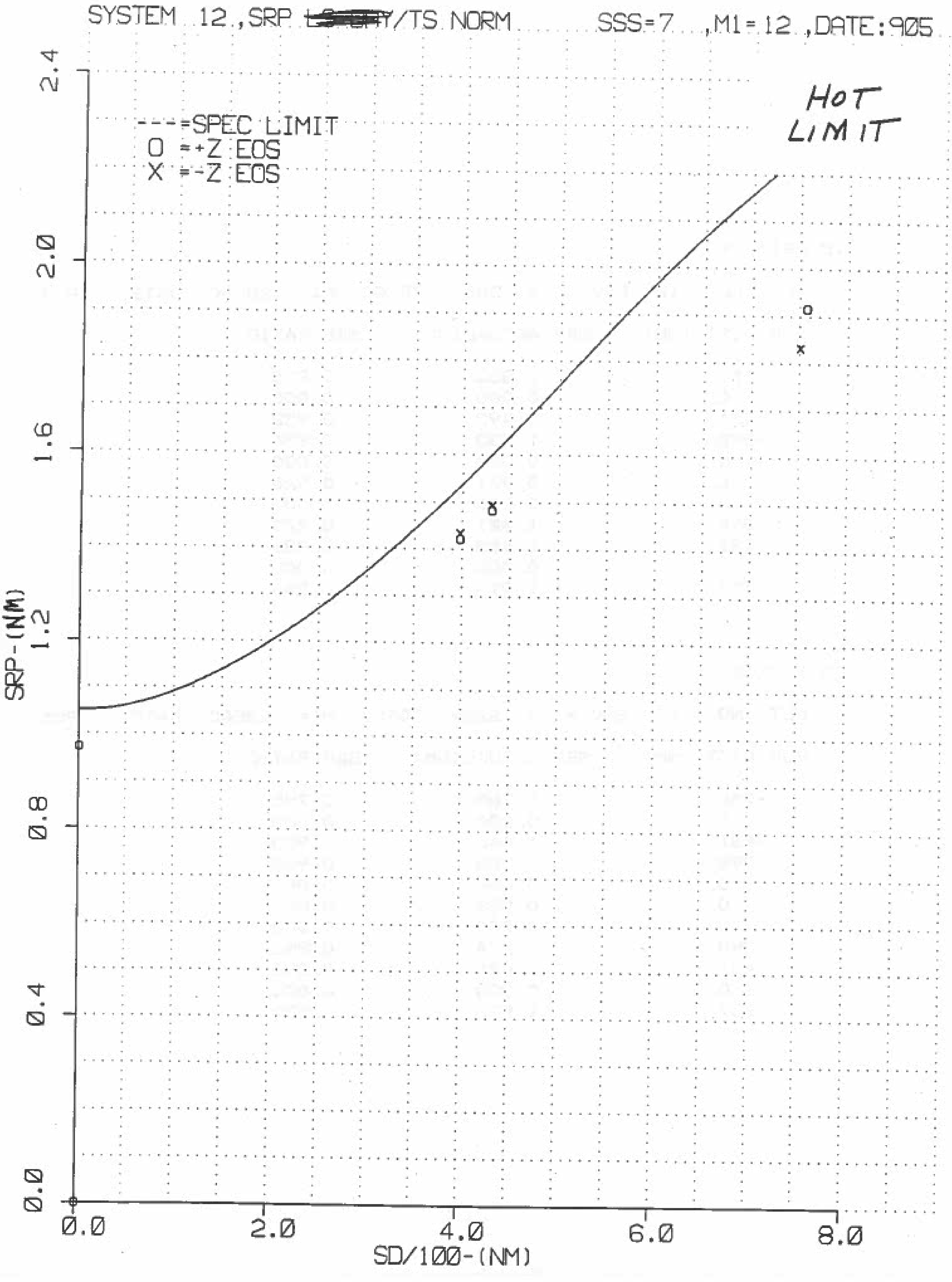
2.2 Geometric Resolution (Cont'd)

2.2.3 Smoothed Geometric Resolution - Infrared (3.2.1.1.2.2)

2.2.3.3 Acceptance - Thermal Vacuum

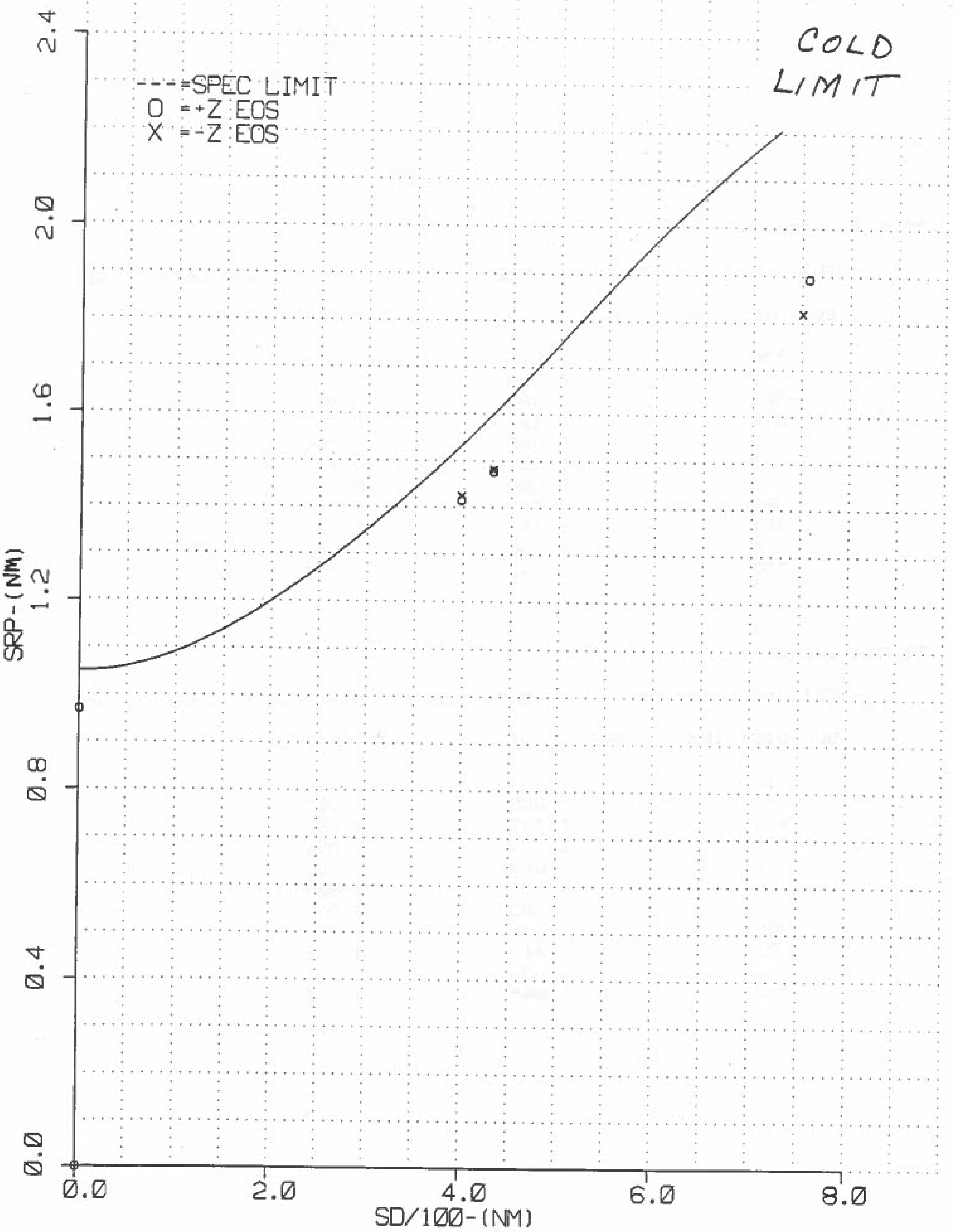
The TS SRP is within spec for the extremes of hot and cold Thermal Vacuum limit testing.

ATTACHMENTS:	TS SRP Curve	Hot Limits
	TS SRP Tables	Hot Limits
	TS SRP Curve	Cold Limits
	TS SRP Tables	Cold Limits


SYSTEM 12 ,SRP [redacted]/TS NORM
SSS=7 ,M1=12 ,DATE:905
HOT LIMIT
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(NM)
SD/100-(NM)
0.0
0.4
0.8
1.2
1.6
2.0
2.4
0.0
2.0
4.0
6.0
8.0

```
TS, MID, PRIMARY

        FLT.  NO. = 12   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:    905

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

           -750.               1. 833             0. 815
              0.               0. 000             0. 000
           -431.               1. 493             0. 932
           -398.               1. 433             0. 934
              0.               0. 000             0. 000
              0.               0. 971             0. 925
              0.               0. 000             0. 000
            398.               1. 421             0. 927
            431.               1. 483             0. 926
              0.               0. 000             0. 000
            757.               1. 916             0. 848


TS, MID, BACKUP

        FLT.  NO. = 12   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:    905

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

           -750.               1. 789             0. 795
              0.               0. 000             0. 000
           -431.               1. 446             0. 903
           -398.               1. 388             0. 905
              0.               0. 000             0. 000
              0.               0. 938             0. 894
              0.               0. 000             0. 000
            398.               1. 374             0. 896
            431.               1. 435             0. 896
              0.               0. 000             0. 000
            757.               1. 876             0. 830
```

SYSTEM 12 ,SRP [redacted]Y/TS NORM SSS=3 ,M1=-8 ,DATE:908



```
TS, MID, PRIMARY

         FLT.  NO. = 12   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    908

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

            -750.                 1. 818              0. 809
               0.                 0. 000              0. 000
            -431.                 1. 480              0. 925
            -398.                 1. 424              0. 928
               0.                 0. 000              0. 000
               0.                 0. 968              0. 922
               0.                 0. 000              0. 000
             398.                 1. 415              0. 923
             431.                 1. 477              0. 922
               0.                 0. 000              0. 000
             757.                 1. 893              0. 837
```

```
TS, MID, BACKUP

         FLT.  NO. = 12   ENV. =   4   SSS=   3DEGC   M1= -8DEGC   DATE:    908

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

            -750.                 1. 764              0. 784
               0.                 0. 000              0. 000
            -431.                 1. 423              0. 889
            -398.                 1. 369              0. 892
               0.                 0. 000              0. 000
               0.                 0. 929              0. 885
               0.                 0. 000              0. 000
             398.                 1. 359              0. 886
             431.                 1. 419              0. 886
               0.                 0. 000              0. 000
             757.                 1. 845              0. 816
```

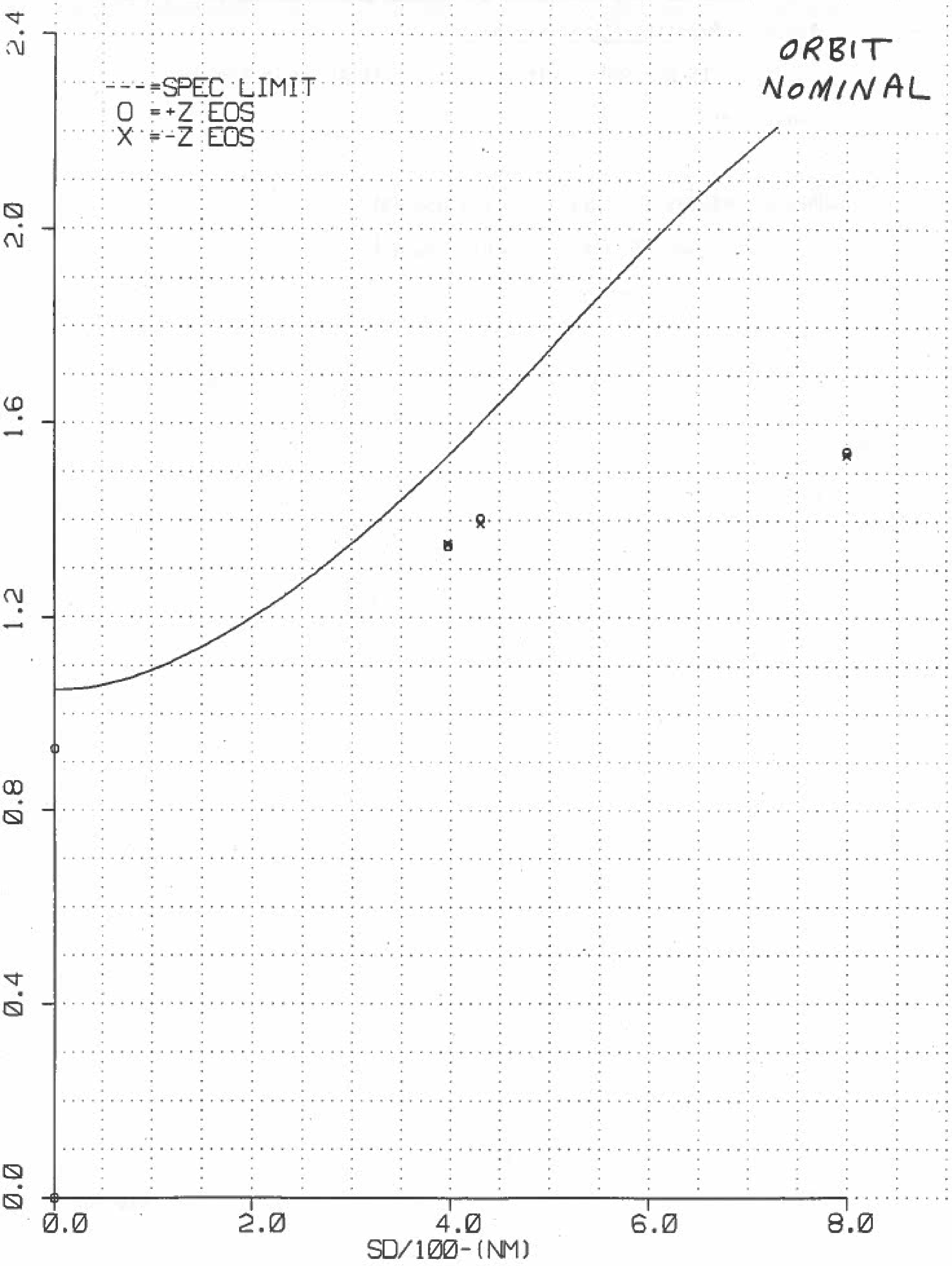
2.2.4 Smoothed Geometric Resolution - Daytime Visual (3.2.1.1.2.2)

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 12 ,SRP LS DAY/~~IC NORM~~ SSS=5 ,M1=-8 ,DATE:912



ORBIT
NOMINAL

```
LS, DAY, NORMAL, PRIMARY

       FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    912

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

          -800.                1. 537              0. 654
             0.                0. 000              0. 000
          -431.                1. 394              0. 871
          -398.                1. 350              0. 880
             0.                0. 000              0. 000
             0.                0. 927              0. 883
             0.                0. 000              0. 000
           398.                1. 347              0. 878
           431.                1. 403              0. 876
             0.                0. 000              0. 000
           800.                1. 542              0. 656
```

```
LS, DAY, NORMAL, BACKUP

       FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    912

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

          -800.                1. 547              0. 658
             0.                0. 000              0. 000
          -431.                1. 403              0. 876
          -398.                1. 359              0. 886
             0.                0. 000              0. 000
             0.                0. 933              0. 888
             0.                0. 000              0. 000
           398.                1. 355              0. 884
           431.                1. 412              0. 882
             0.                0. 000              0. 000
           800.                1. 552              0. 660
```

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

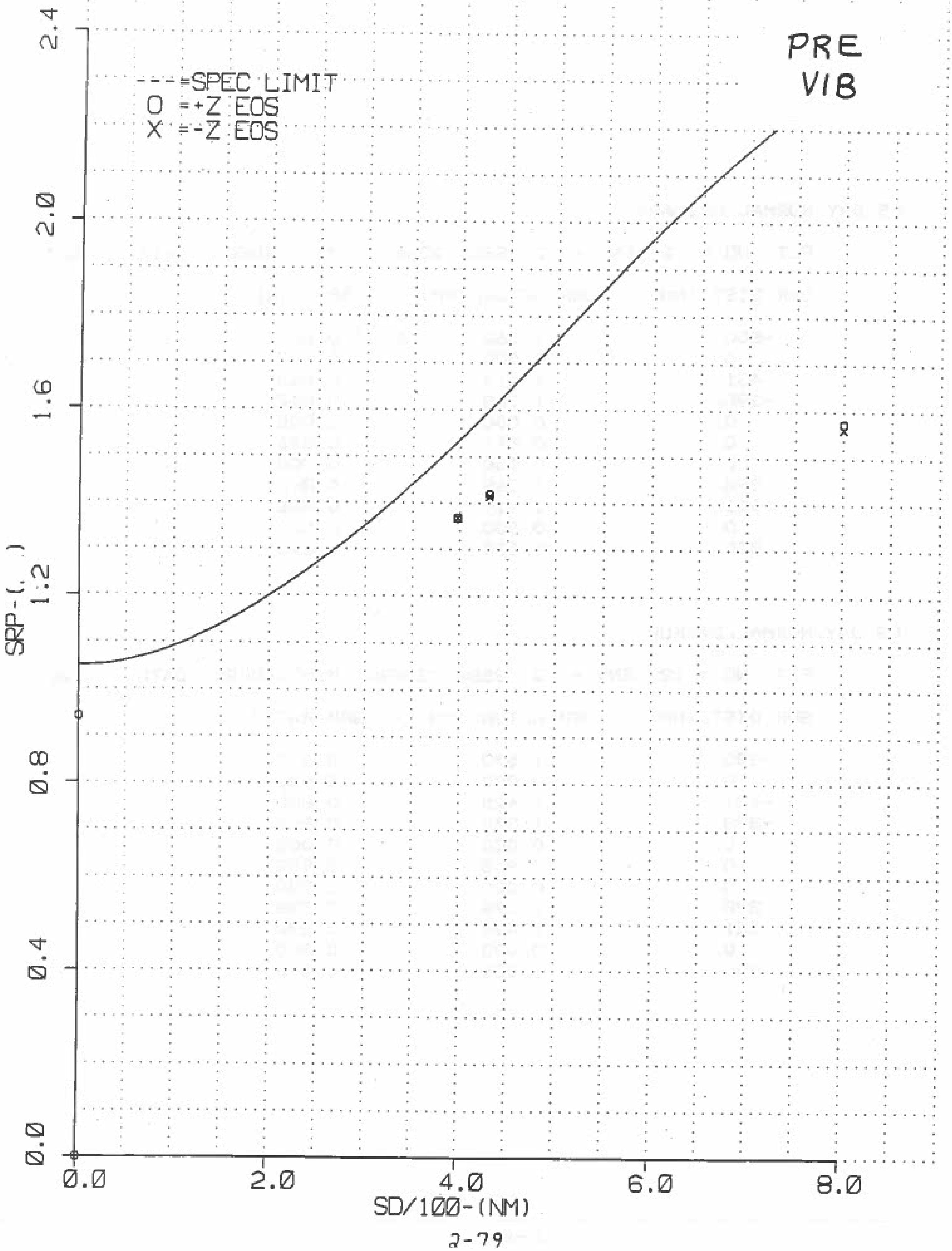
(3.2.1.1.2.2)

2.2.4.2 Acceptance - Vibration

The OLS #12 SSS underwent acceptance level SSS vibrations per DMSS-OLS-300 on May 23, 1991. The LS Day SRP is within specification both before and after SSS vibration. No vibration-related changes in SRP were observed.

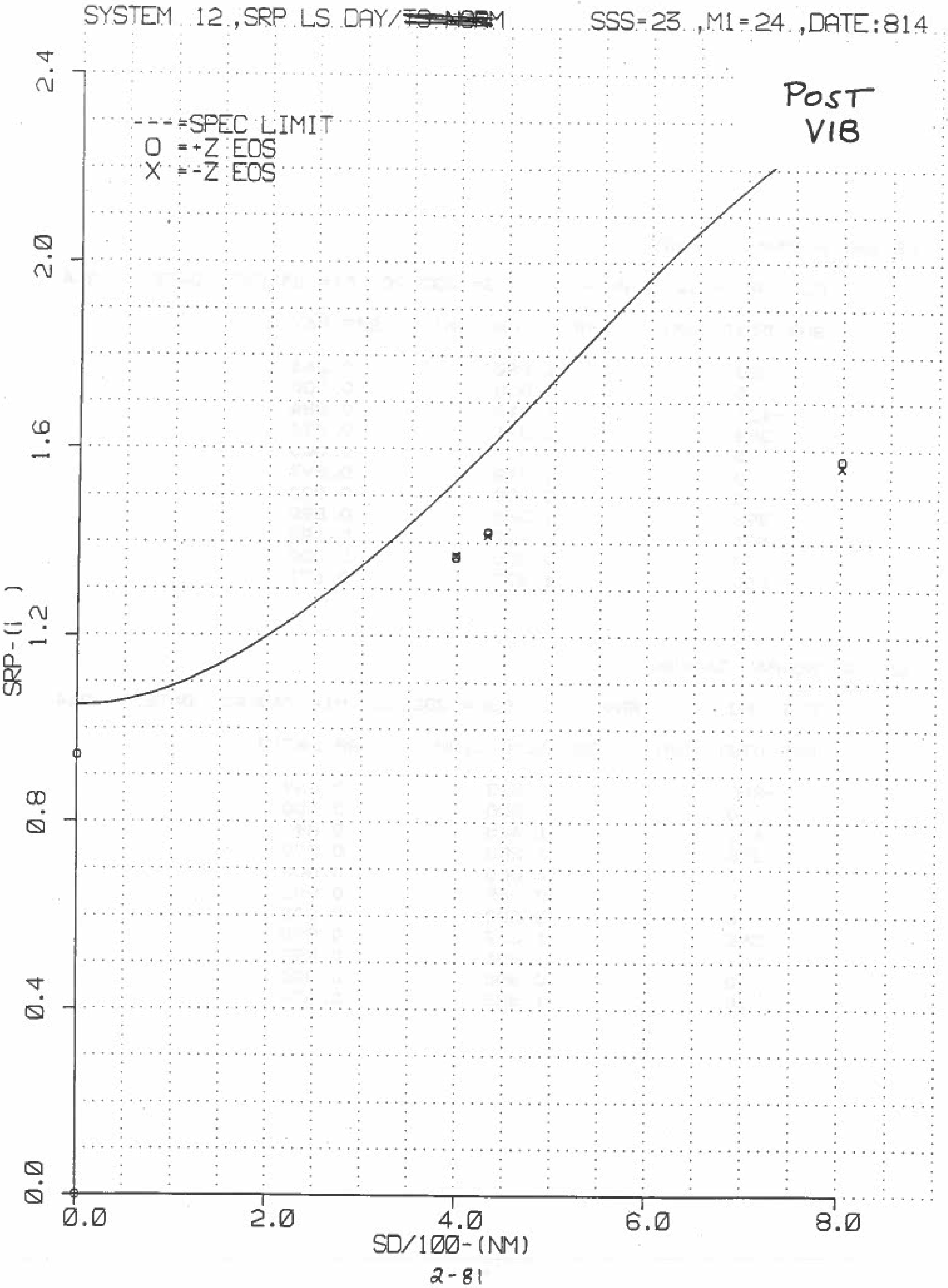
ATTACHMENTS:	LS Day SRP Curve	Pre-Vibration
	LS Day SRP Tables	Pre-Vibration
	LS Day SRP Curve	Post-Vibration
	LS Day SRP Table	Post-Vibration

SYSTEM 12, SRP LS DAY/[redacted] SSS=23, M1=24, DATE:527



PRE VIB

```
LS, DAY, NORMAL, PRIMARY

         FLT.  NO. =  12   ENV. =   2   SSS= 23DEGC   M1= 24DEGC   DATE:    527

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

             -800.                1. 562              0. 665
                0.                0. 000              0. 000
             -431.                1. 414              0. 883
             -398.                1. 368              0. 892
                0.                0. 000              0. 000
                0.                0. 941              0. 896
                0.                0. 000              0. 000
              398.                1. 368              0. 892
              431.                1. 419              0. 886
                0.                0. 000              0. 000
              800.                1. 574              0. 670


LS, DAY, NORMAL, BACKUP

         FLT.  NO. =  12   ENV. =   2   SSS= 23DEGC   M1= 24DEGC   DATE:    527

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

             -800.                1. 573              0. 670
                0.                0. 000              0. 000
             -431.                1. 425              0. 890
             -398.                1. 378              0. 898
                0.                0. 000              0. 000
                0.                0. 948              0. 902
                0.                0. 000              0. 000
              398.                1. 378              0. 898
              431.                1. 429              0. 892
                0.                0. 000              0. 000
              800.                1. 586              0. 675
```


SYSTEM 12,SRP LS DAY/~~TS NOR~~M
SSS=23 ,M1=24 ,DATE:814
POST VIB
----=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
SD/100-(NM)

```
LS, DAY, NORMAL, PRIMARY

    FLT.  NO. =  12   ENV. =   2   SSS= 23DEGC   M1= 24DEGC   DATE:     814

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

       -800.                1. 562              0. 665
          0.                0. 000              0. 000
       -431.                1. 416              0. 884
       -398.                1. 371              0. 894
          0.                0. 000              0. 000
          0.                0. 942              0. 897
          0.                0. 000              0. 000
        398.                1. 368              0. 892
        431.                1. 422              0. 888
          0.                0. 000              0. 000
        800.                1. 577              0. 671
```

```
LS, DAY, NORMAL, BACKUP

    FLT.  NO. =  12   ENV. =   2   SSS= 23DEGC   M1= 24DEGC   DATE:     814

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

       -800.                1. 573              0. 669
          0.                0. 000              0. 000
       -431.                1. 425              0. 890
       -398.                1. 380              0. 899
          0.                0. 000              0. 000
          0.                0. 948              0. 903
          0.                0. 000              0. 000
        398.                1. 377              0. 898
        431.                1. 431              0. 893
          0.                0. 000              0. 000
        800.                1. 588              0. 676
```

2.2 Geometric Resolution (Cont'd)

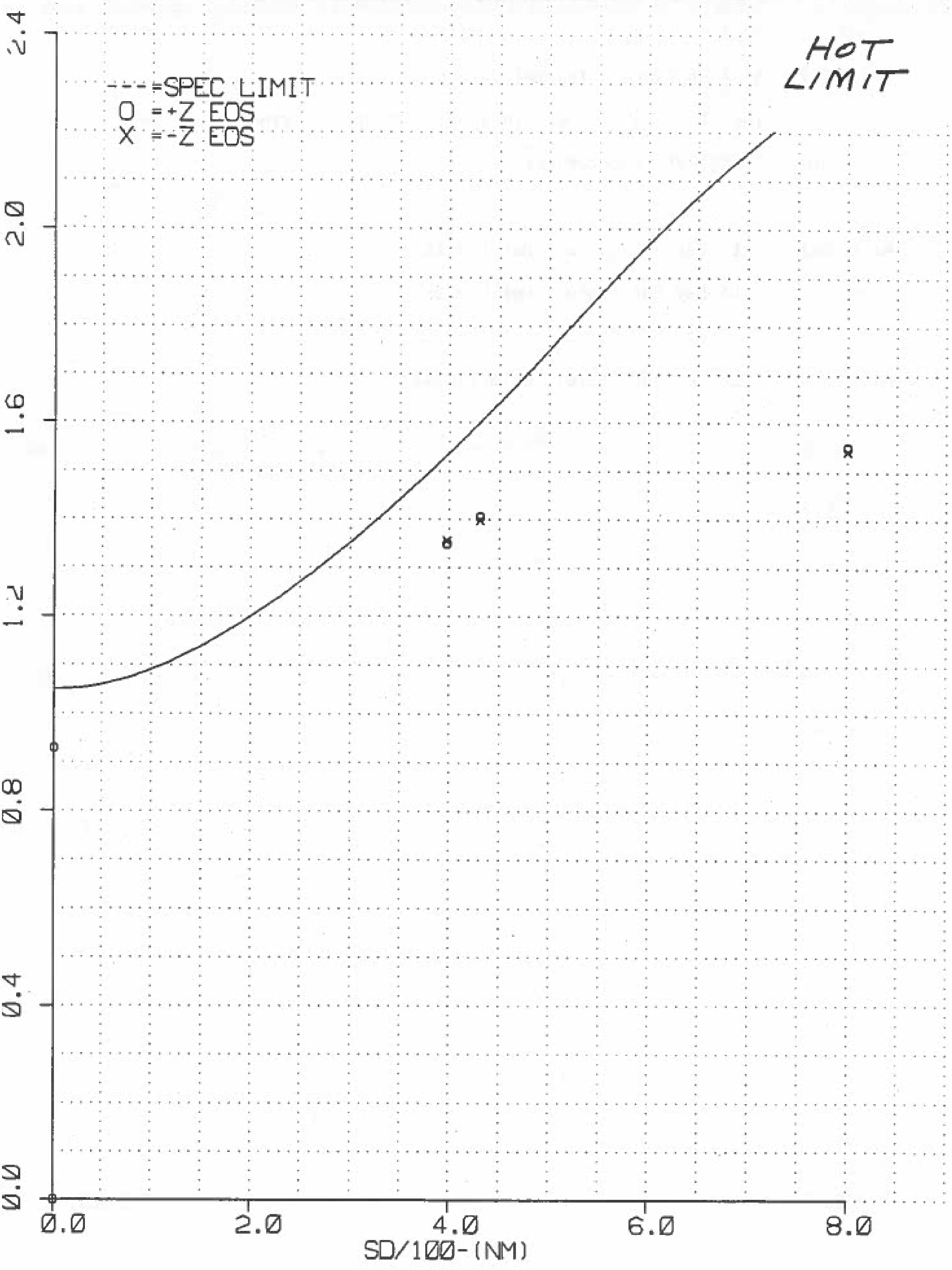
2.2.4 Smoothed Geometric Resolution - Daytime Visual (Cont'd) (3.2.1.1.2.2)

2.2.4.3 Acceptance - Thermal Vacuum

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

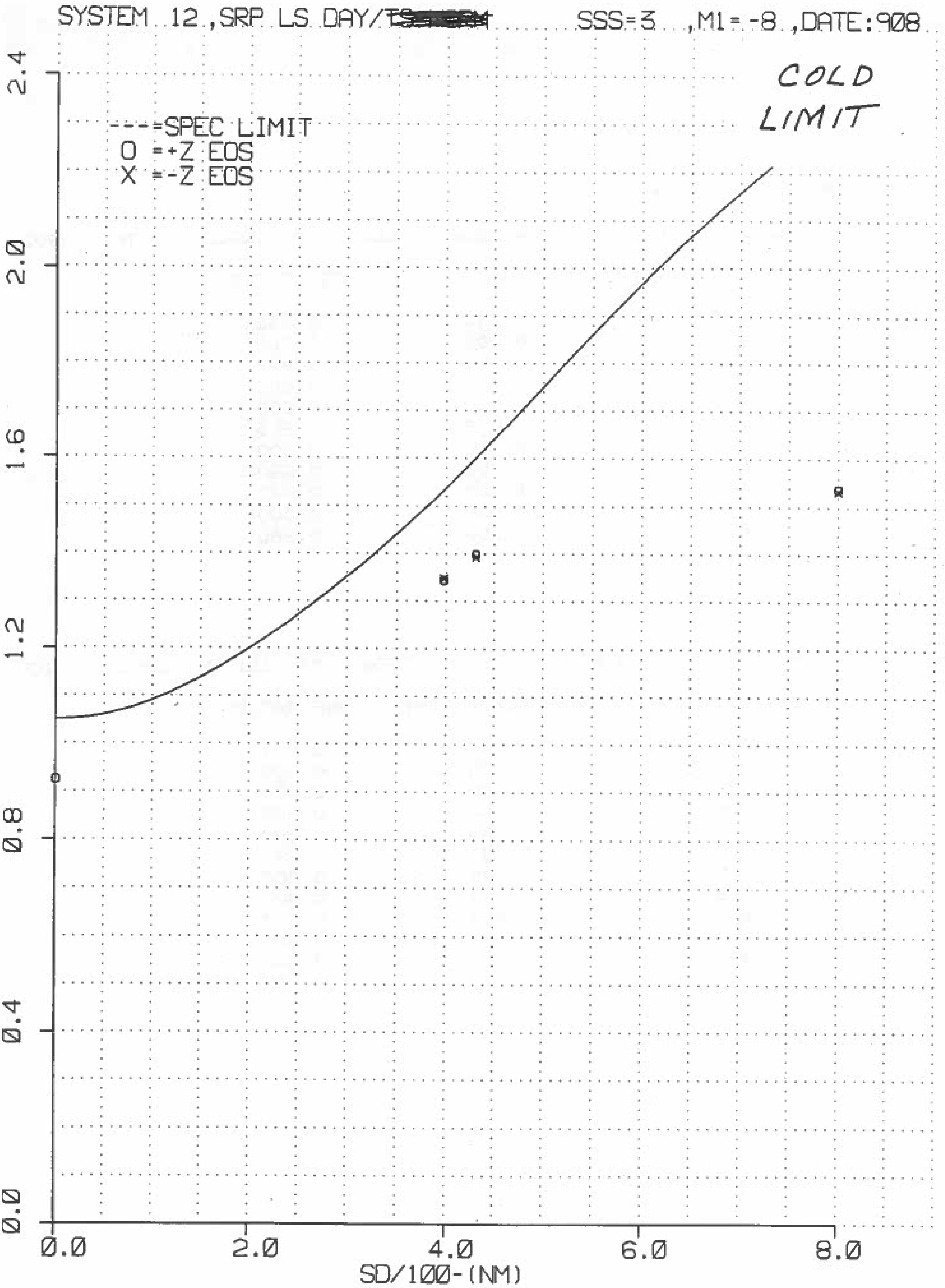
ATTACHMENTS:		
	LS Day SRP Curve	Hot Limits
	LS Day SRP Tables	Hot Limits
	LS Day SRP Curve	Cold Limits
	LS Day SRP Tables	Cold Limits

SYSTEM 12 ,SRP LS DAY/T[redacted]M SSS=7 ,M1=12 ,DATE:903



```
LS, DAY, NORMAL, PRIMARY

        FLT.  NO. = 12   ENV. =  4   SSS=  7DEGC   M1= 12DEGC   DATE:    903

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

            -800.                 1. 543              0. 656
               0.                 0. 000              0. 000
            -431.                 1. 398              0. 873
            -398.                 1. 355              0. 883
               0.                 0. 000              0. 000
               0.                 0. 929              0. 885
               0.                 0. 000              0. 000
             398.                 1. 350              0. 880
             431.                 1. 405              0. 877
               0.                 0. 000              0. 000
             800.                 1. 550              0. 660
```

```
LS, DAY, NORMAL, BACKUP

        FLT.  NO. = 12   ENV. =  4   SSS=  7DEGC   M1= 12DEGC   DATE:    903

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

            -800.                 1. 553              0. 661
               0.                 0. 000              0. 000
            -431.                 1. 408              0. 879
            -398.                 1. 364              0. 889
               0.                 0. 000              0. 000
               0.                 0. 935              0. 890
               0.                 0. 000              0. 000
             398.                 1. 359              0. 886
             431.                 1. 414              0. 883
               0.                 0. 000              0. 000
             800.                 1. 561              0. 664
```


SYSTEM 12 , SRP LS DAY/[redacted]
SSS=3 , M1= -8 , DATE:908
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
2.4
2.0
1.6
1.2
0.8
0.4
0.0
0.0
2.0
4.0
6.0
8.0
SD/100-(NM)

COLD LIMIT

```
LS, DAY, NORMAL, PRIMARY

       FLT.  NO. = 12  ENV. =  4  SSS=  3DEGC  M1= -8DEGC  DATE:   908

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

          -800.              1. 533            0. 652
          *****             ******            ******
          -431.              1. 393            0. 870
          -398.              1. 348            0. 878
          *****             ******            ******
             0.              0. 925            0. 881
          *****             ******            ******
           398.              1. 344            0. 876
           431.              1. 398            0. 873
          *****             ******            ******
           800.              1. 537            0. 654
```

```
LS, DAY, NORMAL, BACKUP

       FLT.  NO. = 12  ENV. =  4  SSS=  3DEGC  M1= -8DEGC  DATE:   908

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

          -800.              1. 543            0. 657
          *****             10. 897           ******
          -431.              1. 402            0. 876
          -398.              1. 357            0. 884
          *****             10. 897           ******
             0.              0. 931            0. 886
          *****             10. 897           ******
           398.              1. 353            0. 882
           431.              1. 408            0. 879
          *****             10. 897           ******
           800.              1. 548            0. 659
```

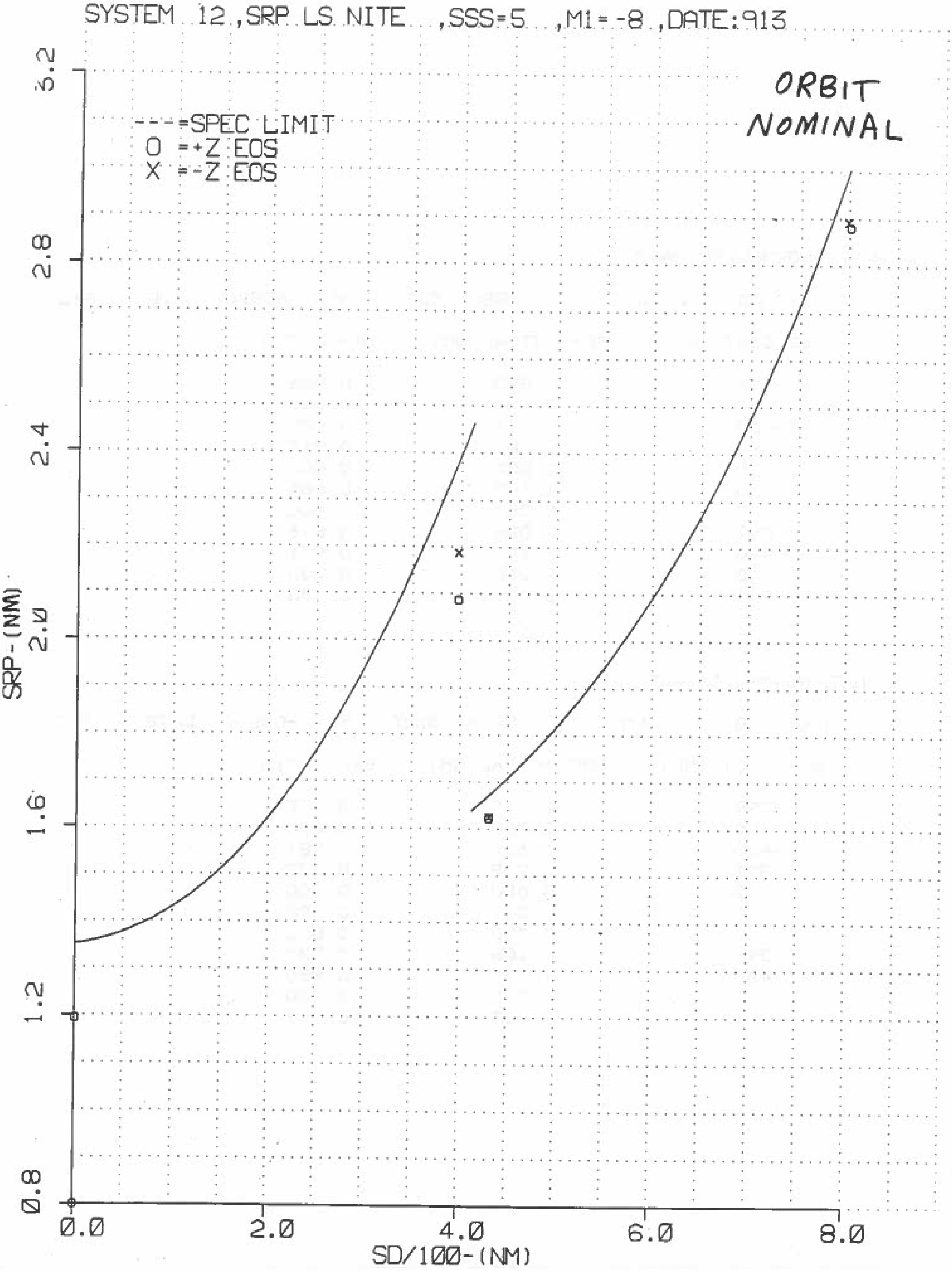
2.2.5 Smoothed Geometric Resolution - Nighttime Visual (3.2.1.1.2.2)

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 12 ,SRP LS NITE ,SSS=5 ,M1=-8 ,DATE:913
ORBIT NOMINAL
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-(NM)
3.2
2.8
2.4
2.0
1.6
1.2
0.8
SD/100-(NM)
0.0
2.0
4.0
6.0
8.0

```
LS, NITE, NORMAL, PRIMARY

          FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    913

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

              -799.                2. 893               0. 966
                 0.                0. 000               0. 000
              -430.                1. 624               0. 972
              -397.                2. 187               0. 918
                 0.                0. 000               0. 000
                 0.                1. 193               0. 884
                 0.                0. 000               0. 000
               397.                2. 086               0. 876
               430.                1. 622               0. 971
                 0.                0. 000               0. 000
               801.                2. 881               0. 958
```

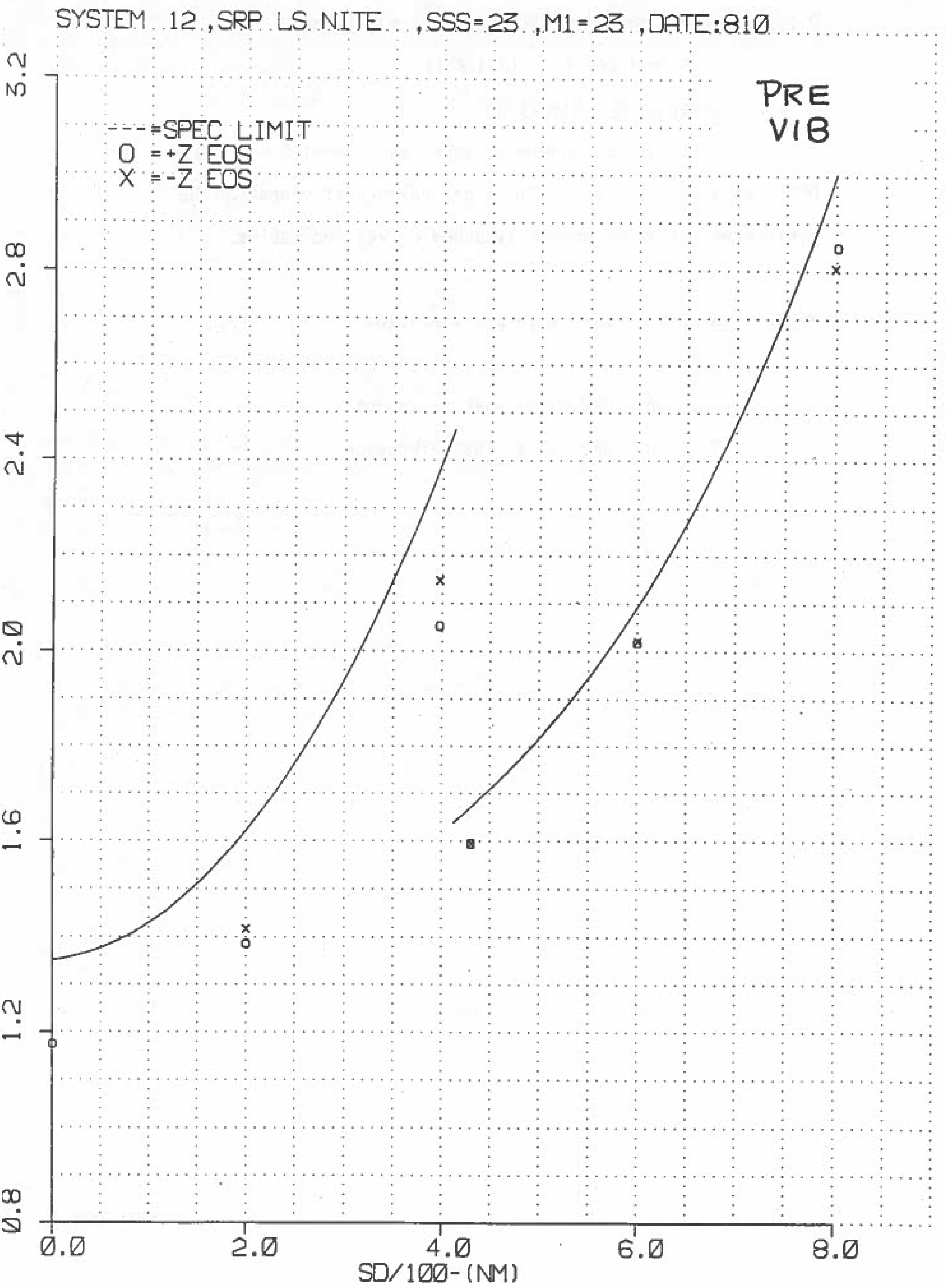
```
LS, NITE, NORMAL, BACKUP

          FLT.  NO. = 12   ENV. =   4   SSS=   5DEGC   M1= -8DEGC   DATE:    913

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

              -799.                2. 919               0. 975
                 0.                0. 000               0. 000
              -430.                1. 639               0. 981
              -397.                2. 209               0. 927
                 0.                0. 000               0. 000
                 0.                1. 205               0. 892
                 0.                0. 000               0. 000
               397.                2. 108               0. 885
               430.                1. 637               0. 980
                 0.                0. 000               0. 000
               801.                2. 907               0. 967
```

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

2.2.5.2 Acceptance - Vibration

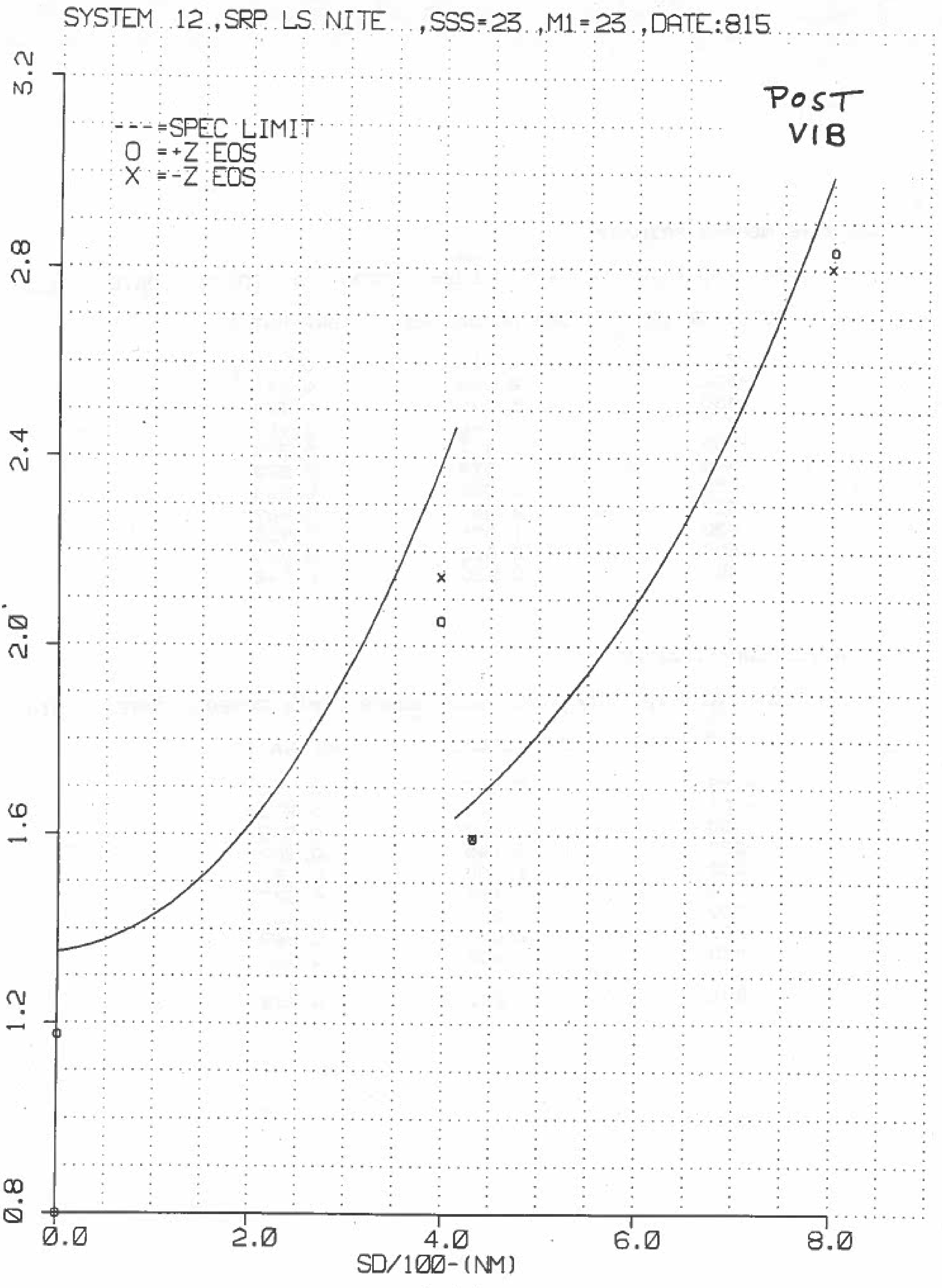
The OLS #12 SSS underwent Acceptance level SSS vibration per DMSS-OLS-300 on May 23, 1991. The pre-to-post vibration SRP performance is shown on the attached curves and tables.

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 12 ,SRP LS NITE ,SSS=23 ,M1=23 ,DATE:810
---=SPEC LIMIT
O =+Z EOS
X =-Z EOS
PRE
VIB
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. = 12   ENV. =  2  SSS= 23DEGC  M1= 23DEGC  DATE:   810

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

            -799.               2. 806              0. 937
            -601.               2. 022              0. 965
            -430.               1. 595              0. 954
            -397.               2. 148              0. 902
            -200.               1. 417              0. 874
               0.               1. 174              0. 870
             200.               1. 386              0. 855
             397.               2. 053              0. 862
             430.               1. 596              0. 955
             600.               2. 018              0. 964
             801.               2. 850              0. 948
```

```
LS, NITE, NORMAL, BACKUP

        FLT.  NO. = 12   ENV. =  2  SSS= 23DEGC  M1= 23DEGC  DATE:   810

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

            -799.               2. 828              0. 944
            -601.               2. 039              0. 973
            -430.               1. 607              0. 962
            -397.               2. 165              0. 909
            -200.               1. 430              0. 882
               0.               1. 184              0. 877
             200.               1. 398              0. 863
             397.               2. 070              0. 869
             430.               1. 608              0. 962
             600.               2. 036              0. 972
             801.               2. 871              0. 955
```


SYSTEM 12 ,SRP LS NITE ,SSS=23 ,M1=23 ,DATE:815
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
POST
VIB
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. = 12   ENV. =   2  SSS= 23DEGC  M1= 23DEGC  DATE:     815

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

              -799.                2.802              0.936
                 0.                0.000              0.000
              -430.                1.595              0.955
              -397.                2.146              0.901
                 0.                0.000              0.000
                 0.                1.175              0.870
                 0.                0.000              0.000
               397.                2.053              0.862
               430.                1.593              0.953
                 0.                0.000              0.000
               801.                2.839              0.944
```

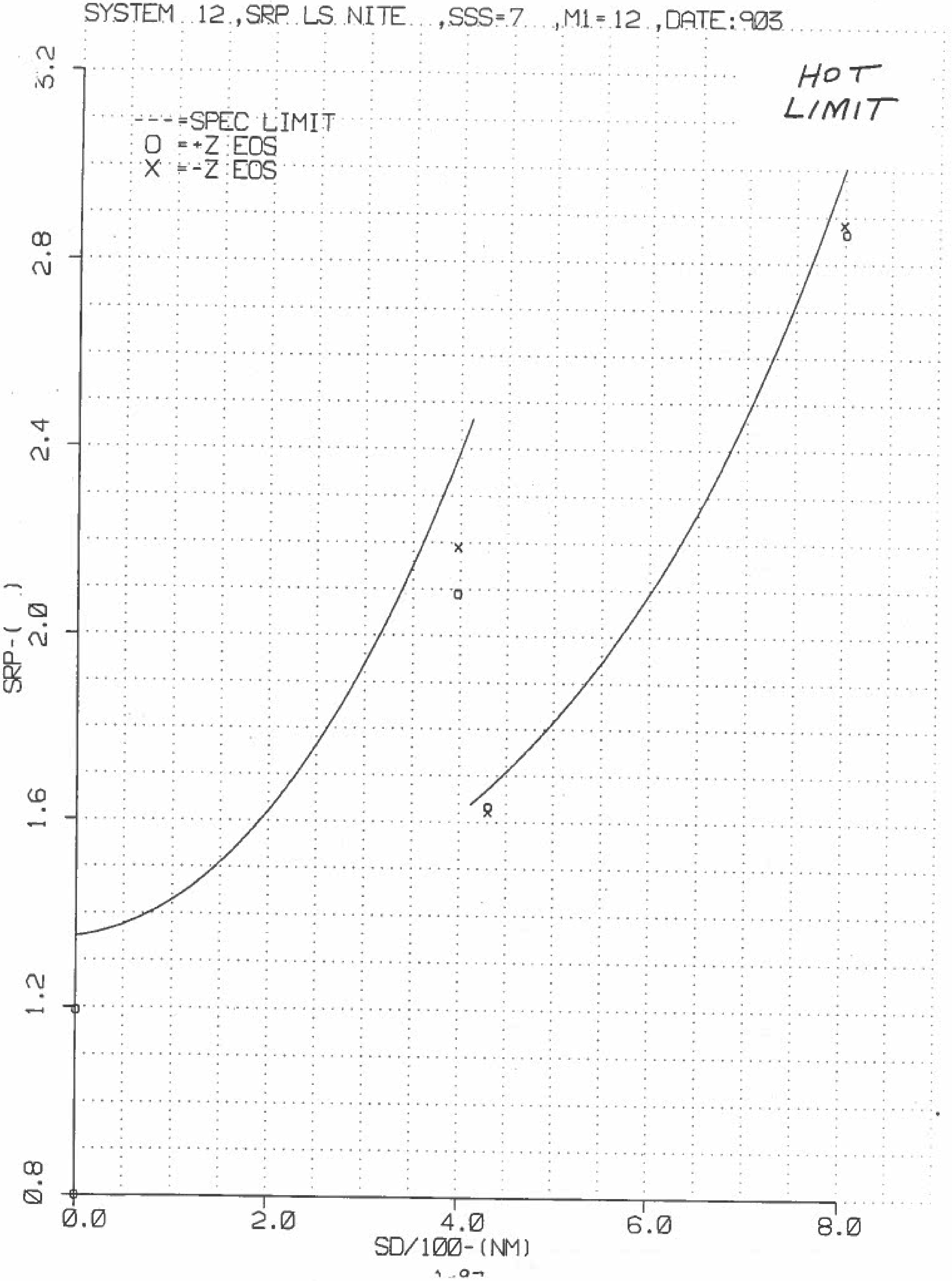
```
LS, NITE, NORMAL, BACKUP

          FLT.  NO. = 12   ENV. =   2  SSS= 23DEGC  M1= 23DEGC  DATE:     815

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

              -799.                2.825              0.944
                 0.                0.000              0.000
              -430.                1.608              0.962
              -397.                2.163              0.908
                 0.                0.000              0.000
                 0.                1.185              0.878
                 0.                0.000              0.000
               397.                2.070              0.869
               430.                1.605              0.961
                 0.                0.000              0.000
               801.                2.862              0.951
```

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

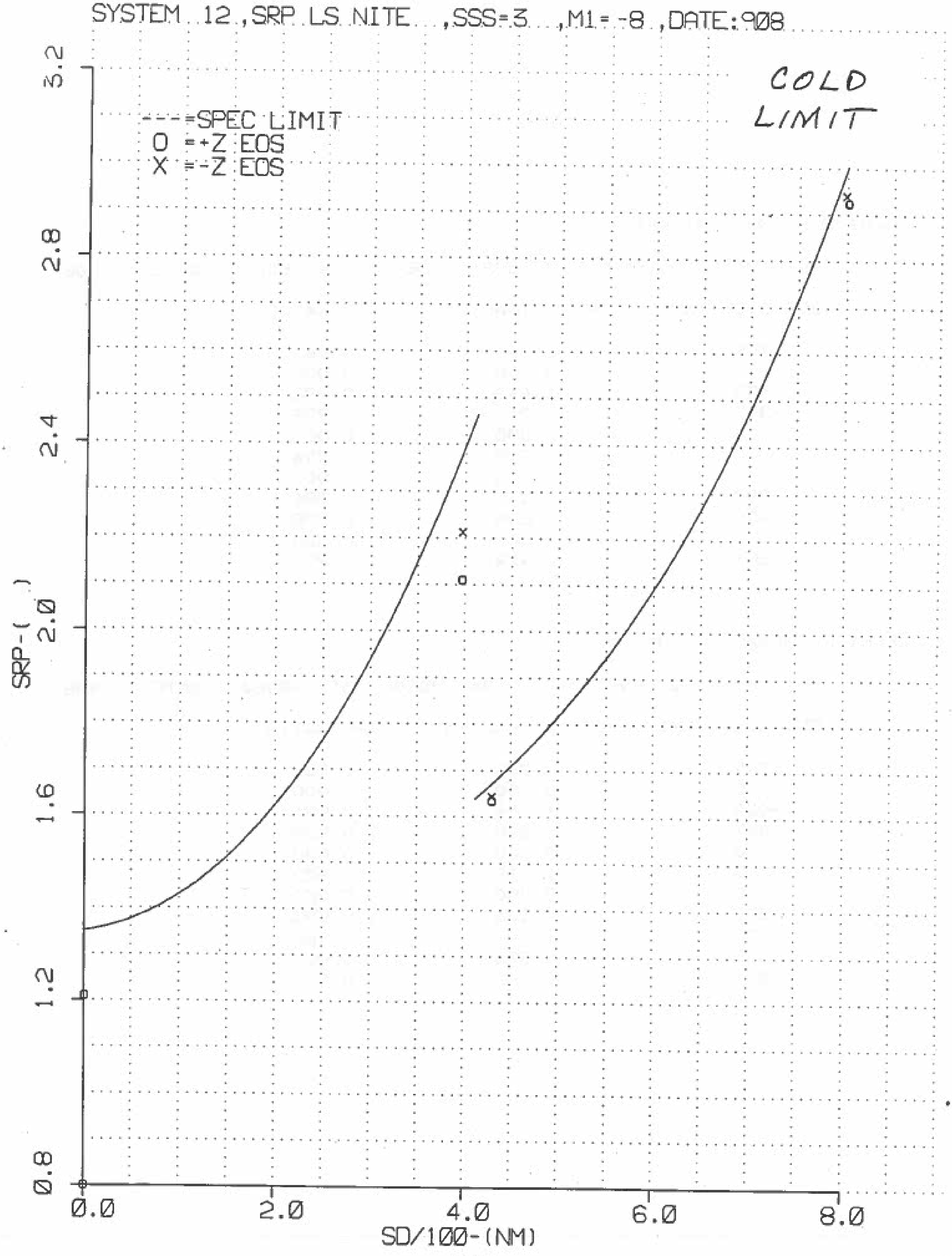
2.2.5.3 Acceptance - Thermal Vacuum

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 12 ,SRP LS NITE ,SSS=7 ,M1=12 ,DATE:903
HOT 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. = 12   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:    903

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

              -799.                2.883             0.963
                 0.                0.000             0.000
              -430.                1.622             0.971
              -397.                2.190             0.919
                 0.                0.000             0.000
                 0.                1.194             0.884
                 0.                0.000             0.000
               397.                2.090             0.877
               430.                1.632             0.977
                 0.                0.000             0.000
               801.                2.863             0.952


LS, NITE, NORMAL, BACKUP

          FLT. NO. = 12   ENV. =   4   SSS=   7DEGC   M1= 12DEGC   DATE:    903

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

              -799.                2.904             0.970
                 0.                0.000             0.000
              -430.                1.636             0.979
              -397.                2.208             0.927
                 0.                0.000             0.000
                 0.                1.204             0.891
                 0.                0.000             0.000
               397.                2.108             0.885
               430.                1.647             0.985
                 0.                0.000             0.000
               801.                2.884             0.959
```


SYSTEM 12 ,SRP LS NITE ,SSS=3 ,M1=-8 ,DATE:908
----=SPEC LIMIT
O =+Z EOS
X =-Z EOS
SRP-( )
SD/100-(NM)
3.2
2.8
2.4
2.0
1.6
1.2
0.8
0.0
2.0
4.0
6.0
8.0

COLD LIMIT

```
LS, NITE, NORMAL, PRIMARY

          FLT.  NO. =  12   ENV. =   4   SSS=   3DEGC   M1=  -8DEGC   DATE:     908

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

              -799.                  2. 941               0. 982
                 0.                  0. 000               0. 000
              -430.                  1. 643               0. 983
              -397.                  2. 212               0. 929
                 0.                  0. 000               0. 000
                 0.                  1. 210               0. 896
                 0.                  0. 000               0. 000
               397.                  2. 110               0. 886
               430.                  1. 634               0. 978
                 0.                  0. 000               0. 000
               801.                  2. 924               0. 972


LS, NITE, NORMAL, BACKUP

          FLT.  NO. =  12   ENV. =   4   SSS=   3DEGC   M1=  -8DEGC   DATE:     908

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

              -799.                  2. 958               0. 988
                 0.                  0. 000               0. 000
              -430.                  1. 656               0. 991
              -397.                  2. 228               0. 935
                 0.                  0. 000               0. 000
                 0.                  1. 219               0. 903
                 0.                  0. 000               0. 000
               397.                  2. 126               0. 893
               430.                  1. 647               0. 986
                 0.                  0. 000               0. 000
               801.                  2. 942               0. 978
```

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).

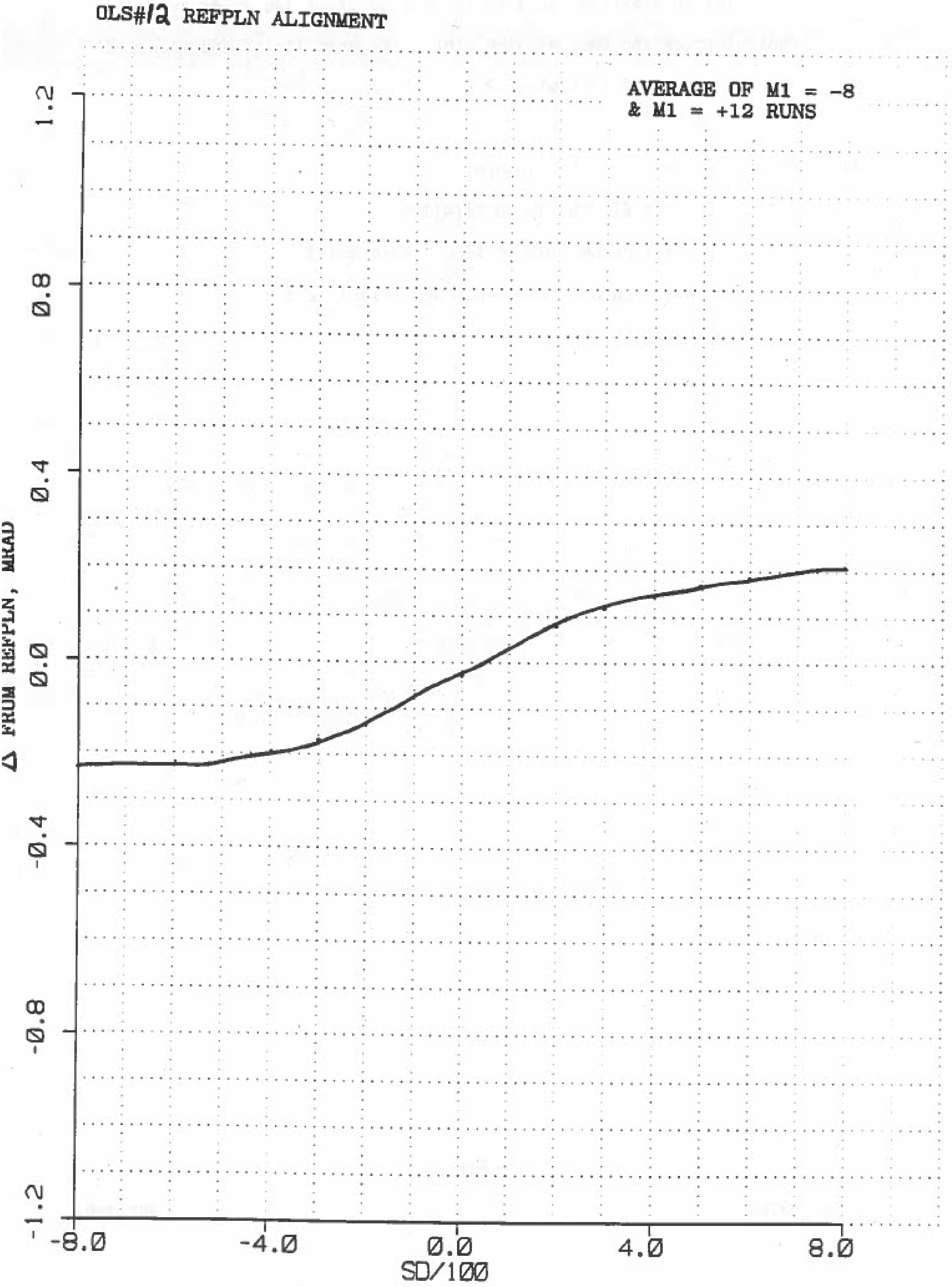
There was an observed shift in alignment between the extremes of M1 temperature of -8°C and +12°C on the order of 0.16 milliradians or less for all channels. There was also an observed shift in synchronization in all modes in OLS #12 of approximately 0.1 milliradians or less between M1 temperature extremes 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 #12) 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 #12 SSS are in BVS 2693, 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.

ATTACHMENTS: OLS #12 REFPLN ALIGNMENT
OLS #12 REFPLN SYNCHRONIZATION
OLS #12 ALIGN/SYNC vs SPEC, Table 2.3-1
OLS #12 Encoder Simulator Sync, Table 2.3-2



OLS#12 REFPLN ALIGNMENT
AVERAGE OF M1 = -8
& M1 = +12 RUNS
Δ FROM REFPLN, MRAD
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
-8.0
-4.0
0.0
4.0
8.0
SD/100

OLS#12 REFPLN SYNCHRONIZATION

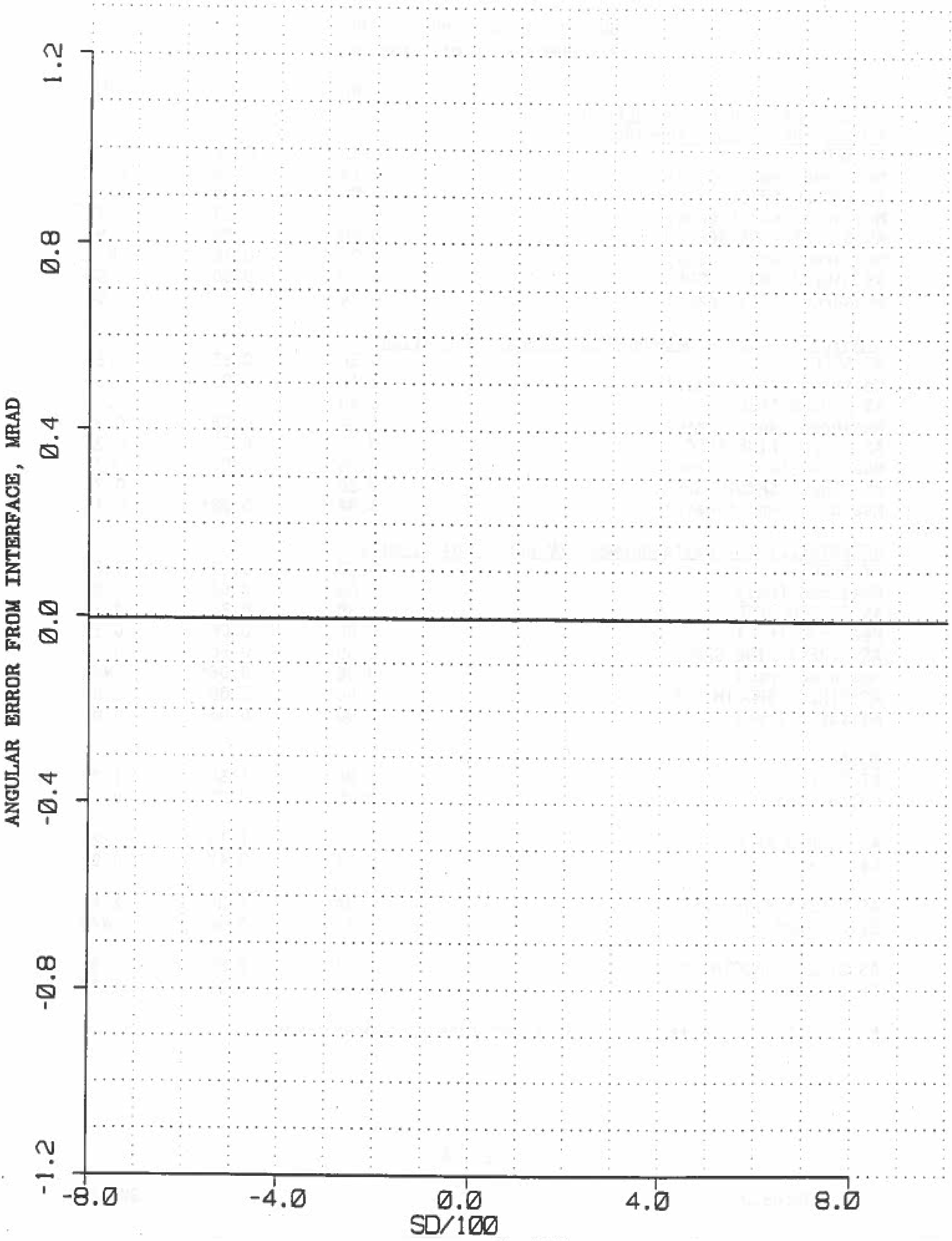


Table 2.3-1

OLS #12 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)	0.19	0.25	0.14
AS STORED SPEC	0.80	0.80	1.90
Measured (worst-case)	0.26	0.33	.76
AS DIRECT FINE SPEC	0.80	0.80	1.90
Measured (worst-case)	0.24	0.36	N/A
AS DIRECT SMOOTH SPEC	0.80	0.80	1.90
Measured (worst-case)	0.24	0.36	0.97
STABILITY - Delta Between Pre & Post - Vibration			
AT SPEC	0.50	0.55	0.55
Measured (worst-case)	0.10	0.03	0.09
AS STORED SPEC	0.20	0.25	0.25
Measured (worst-case)	0.04	0.08	0.14
AS DIRECT FINE SPEC	0.20	0.25	0.25
Measured (worst-case)	0.04*	0.08*	N/A
AS DIRECT SMOOTH SPEC	0.20	0.25	0.25
Measured (worst-case)	0.04*	0.08*	0.14
REPEATABILITY - Delta between TV Hot & Cold Limits			
AT SPEC	0.20	0.22	0.20
Measured (rms)	0.03	0.02	0.02
AS STORED SPEC	0.30	0.30	0.30
Measured (rms)	0.02	0.06	0.10
AS DIRECT FINE SPEC	0.50	0.50	0.50
Measured (rms)	0.06	0.06*	N/A
AS DIRECT SMOOTH SPEC	2.00	2.00	2.00
Measured (rms)	0.08	0.06*	0.08
TOTAL -			
AT SPEC	1.00	1.30	1.20
Calculated	0.29	0.29	0.23
AS STORED SPEC	1.16	1.19	2.29
Calculated	0.31	0.43	0.93
AS DIRECT FINE SPEC	1.34	1.36	2.46
Calculated	0.31	0.46	N/A
AS DIRECT SMOOTH SPEC	2.81	2.82	3.92
Calculated	0.33	0.46	1.13

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	0.08	0.08	0.10
Stability - Spec, mrad	0.50	0.50	0.50
Measured	0.20	0.20*	0.20*
Fixed - Spec, mrad	10.0	10.0	10.0
Measured	0.88	0.88*	0.88*
Total - Spec, mrad	11.1	11.2	12.3
Calculated	1.10	1.10	1.10

*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 #12 T Channel DC response is 0.73°K compared to a 1.1°K spec and therefore OLS #12 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 2.4.1-3	T DC Response Compilation of Test Runs
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 #12

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)	0.262	0.42
b) Stability (>1 day)	0.62	0.80
c) Fixed Deviations	0.29	0.60
TOTAL (RSS) ACCURACY	0.73	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 #12. 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. At the completion of testing, the T channel gain pots were readjusted to set T_{RGT} = T_{LFT}= 4. 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 and gain compensated 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 together indicate the magnitude of the variation over the extremes of SSS temperature, (+11° to -3°C); when compared to the +3.2°C and +4.6°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 0.5°C to a high of +38.2°C.

Figures 2.4.1-1 through 2.4.1-10 inclusive show, for Runs No. 1 through No. 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 since they contain only 2 points).

The OLS #12 average M1 coefficient (coupling factor) measured for the final run (#11) was 0.207°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 -0.027% T LEFT and -.104% 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 0.38°K for T RGT, at the 310°K end. In the Smooth Primary and Backup modes, T RGT differs by 0.40°K (at 310°K).

The difference between T LEFT and T RIGHT segments calibration (from Tables 2.4.1.3-4 and 5) is 0.56°K worst-case, vs. a spec limit of 1.0°K.

TABLE 2.4.1-2
OLS #12
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	
TDCRM3A 07/08/91	1	5/6	13	14	4.6	-8.1	23.8	.0030	.16	.09	-.0056	.87	.05	-.0011	.44	.08	COLD OPTIC LIMIT
TDCRM3A 07/13/91	2	5/6	9	8	3.2	12.4	23.5	-.0063	.43	.05	-.0160	1.25	.07	-.0134	.88	.05	HOT OPTIC LIMIT
T121T231B 07/14/91	3	5/6	9	2	10.9	15.3	38.2	-.0096	.12	.00	-.0194	.94	.00	-.0176	.57	.00	HOT SOAK #1
T121T231B 07/18/91	4	5/6	13	2	-2.4	-10.8	0.5	-.0008	.63	.00	-.0072	1.40	.00	-.0042	1.01	.00	COLD SOAK #1
07/23/91																	VACUUM BREAK PMT FAILURE
T121T231B 08/25/91	5	5/6	9	2	10.8	16.0	37.9	-.0199	.50	.00	-.0269	1.34	.00	-.0208	.75	.00	HOT SOAK #1 REPEAT
T121T231B 08/26/91	6	5/6	13	2	-3.9	-10.4	0.6	-.0066	.90	.00	-.0110	1.53	.00	-.0032	1.02	.00	COLD SOAK #1 REPEAT
T121T231B 08/28/91	7	5/6	9	2	11.0	15.1	38.0	-.0223	.71	.00	-.0275	1.37	.00	-.0214	.75	.00	HOT SOAK #2
T121T231B 08/30/91	8	5/6	13	2	-2.7	-10.6	0.5	-.0088	1.03	.00	-.0120	1.57	.00	-.0043	1.04	.00	COLD SOAK #2
TDCRM3C 09/02/91	9	5/6	9	7	5.6	12.2	33.4	-.0211	.79	.04	-.0273	1.51	.08	-.0197	.94	.02	HOT LIMIT
TDCRM3B 09/08/91	10	5/6	13	7	2.4	-7.4	4.8	-.0138	.98	.02	-.0179	1.54	.07	-.0111	1.11	.04	COLD LIMIT
TDCRM3C 09/13/91	11	5/6	13	18	4.8	-7.8	23.6	-.0185	.97	.05	-.0222	1.50	.07	-.0148	1.03	.05	NOMINAL

TABLE 2.4.1-3
OLS #12
T DC RESPONSE COMPILATION OF TEST RUNS

	RGT/LFT				TEMPERATURE °C			T RIGHT			T MID			T LEFT			
DATE	RUN #	TG	TL	# OF DATA POINTS	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	COMMENTS
TDCRM3A 07/08/91	1	5/6	13	14	4.6	-8.1	23.8	.62	.56	.198	.04	1.28	.209	.27	.78	.209	COLD OPTIC LIMIT
TDCRM3B 07/13/91	2	5/6	9	8	3.2	12.4	23.5	-.52	.35	.198	-1.17	1.22	.209	-1.14	.68	.209	HOT OPTIC LIMIT
T121T231B 07/14/91	3	5/6	9	2	10.9	15.3	38.2	-1.34	-.66	.198	-2.00	.14	.209	-2.10	-0.49	.209	HOT SOAK #1
T121T231B 07/18/91	4	5/6	13	2	-2.4	-10.8	0.5	.76	1.24	.198	.33	2.18	.209	.39	1.64	.209	COLD SOAK #1
07/23/91																	VACUUM BREAK PMT FAILURE
T121T231B 08/25/91	5	5/6	9	2	10.8	16.0	37.9	-2.51	-.83	.204	-2.72	.28	.206	-2.40	-.41	.210	HOT SOAK #1 REPEAT
T121T231B 08/26/91	6	5/6	13	2	-3.9	-10.4	0.6	-.08	1.28	.204	-.13	2.18	.206	.55	1.71	.210	COLD SOAK #1 REPEAT
T121T231B 08/28/91	7	5/6	9	2	11.0	15.1	38.0	-2.67	-.61	.204	-2.79	.29	.206	-2.48	-.44	.210	HOT SOAK #2
T121T231B 08/30/91	8	5/6	13	2	-2.7	-10.6	0.5	-.30	1.37	.204	-.24	2.18	.206	.40	1.69	.210	COLD SOAK #2
TDCRM3B 09/02/91	9	5/6	9	7	5.6	12.2	33.4	-2.41	-.15	.204	-2.62	.81	.206	-2.04	.27	.210	HOT LIMIT
TDCRM3B 09/08/91	10	5/6	13	7	2.4	-7.4	4.8	-1.11	.88	.204	-1.15	1.69	.206	-.56	1.34	.210	COLD LIMIT
TDCRM3C 09/13/91	11	5/6	13	18	4.8	-7.8	23.6	-1.83	.48	.204	-1.85	1.24	.206	-1.20	.87	.210	NOMINAL

TABLE 2.4.1-4

OLS NUMBER 12

T RGT DATA OF 09/12/91

SSS AT 4.8C

M1 AT -7.8C

PSU TEMP = 23.6C

M1 Coefficient = .204 K/C

T GAIN = 5

T LEVEL = 13

V2 <T Clamp> = 2.05404

K9 <TL Step Size> = .9237

BEST STRAIGHT LINE EQUATION

	FP	(Δ)	FB	SP	(Δ)	SB
BSL SLOPE	-0.0185	-	-0.0215	-0.0183	-	-0.0215
BSL AT 190K<K>	1.34	(.01)	1.33	1.31	(.02)	1.29
BSL AT 210K<K>	0.97	(.07)	0.90	0.94	(.08)	0.86
BSL AT 310K<K>	-0.88	(.38)	-1.26	-0.89	(.40)	-1.29
RMS DEVIATION<K>	0.05	-	0.06	0.06	-	0.07
BSL AT 310K; 190 AT OV<K>	-1.30	-	-1.67	-1.30	-	-1.70
% CHANGE FROM NOM GAIN	-1.83	-	-2.36	-1.83	-	-2.40
BIAS DIFF FROM NORMAL 190K<K>	0.48	-	0.09	0.43	-	0.01

TABLE 2.4.1-5

OLS NUMBER 12

T MID DATA OF 09/12/91

SSS AT 4.8C

M1 AT -7.8C

PSU TEMP = 23.6C

M1 Coefficient = .206 K/C

T GAIN = 0

T LEVEL = 13

V2 <T Clamp> = 2.06055

K9 <TL Step Size> = .9237

BEST STRAIGHT LINE EQUATION

	FP	(Δ)	FB	SP	(Δ)	SB
BSL SLOPE	-0.0222	-	-0.0244	-0.0224	-	-0.0242
BSL AT 190K<K>	1.94	(.09)	1.85	1.93	(.08)	1.85
BSL AT 210K<K>	1.50	(.14)	1.36	1.48	(.12)	1.36
BSL AT 310K<K>	-0.72	(.36)	-1.08	-0.76	(.30)	-1.06
RMS DEVIATION<K>	0.07	-	0.09	0.08	-	0.09
BSL AT 310K; 190 AT 0V<K>	-1.31	-	-1.65	-1.35	-	-1.63
% CHANGE FROM NOM GAIN	-1.85	-	-2.32	-1.91	-	-2.29
BIAS DIFF FROM NORMAL 190K<K>	1.24	-	0.79	1.19	-	0.80

TABLE 2.4.1-6

OLS NUMBER 12

T LFT DATA OF 09/12/91

SSS AT 4.9C

M1 AT -7.9C

PSU TEMP = 23.7C

M1 Coefficient = .210 K/C

T GAIN = 6

T LEVEL = 13

V2 <T Clamp> = 2.06706

K9 <TL Step Size> = .9237

BEST STRAIGHT LINE EQUATION

	FP	(Δ)	FB	SP	(Δ)	SB
BSL SLOPE	-0.0148	-	-0.0154	-0.0147	-	-0.0154
BSL AT 190K<K>	1.32	(.16)	1.16	1.31	(.18)	1.13
BSL AT 210K<K>	1.03	(.18)	0.85	1.02	(.19)	0.85
BSL AT 310K<K>	-0.45	(.24)	-0.69	-0.45	(.26)	-0.71
RMS DEVIATION<K>	0.05	-	0.05	0.05	-	0.04
BSL AT 310K; 190 AT 0V<K>	-0.85	-	-1.05	-0.85	-	-1.06
% CHANGE FROM NOM GAIN	-1.20	-	-1.48	-1.19	-	-1.50
BIAS DIFF FROM NORMAL 190K<K>	0.87	-	0.47	0.87	-	0.42

FIGURE 2.4.1-1
COLD OPTIC
LIMIT
RUN #1

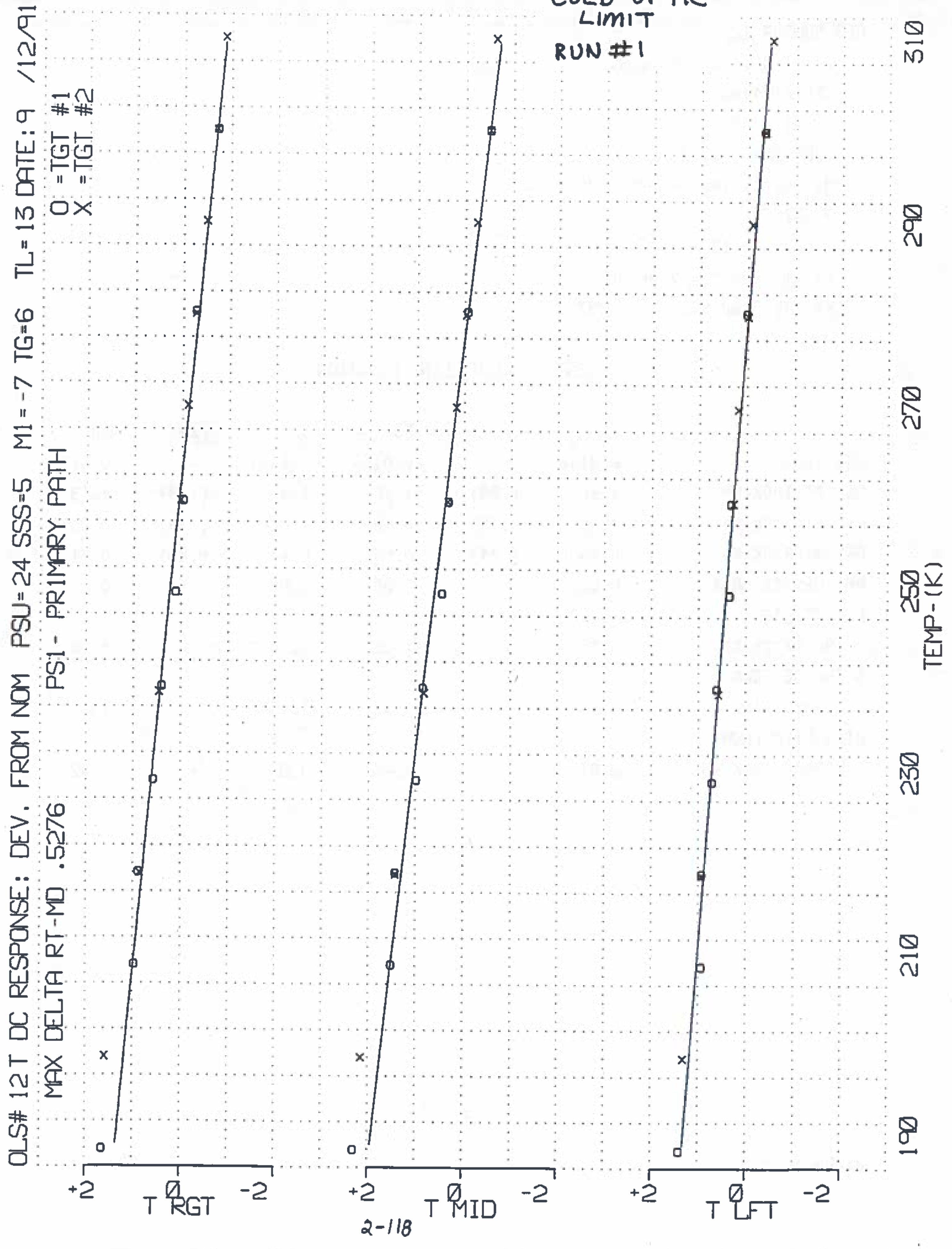
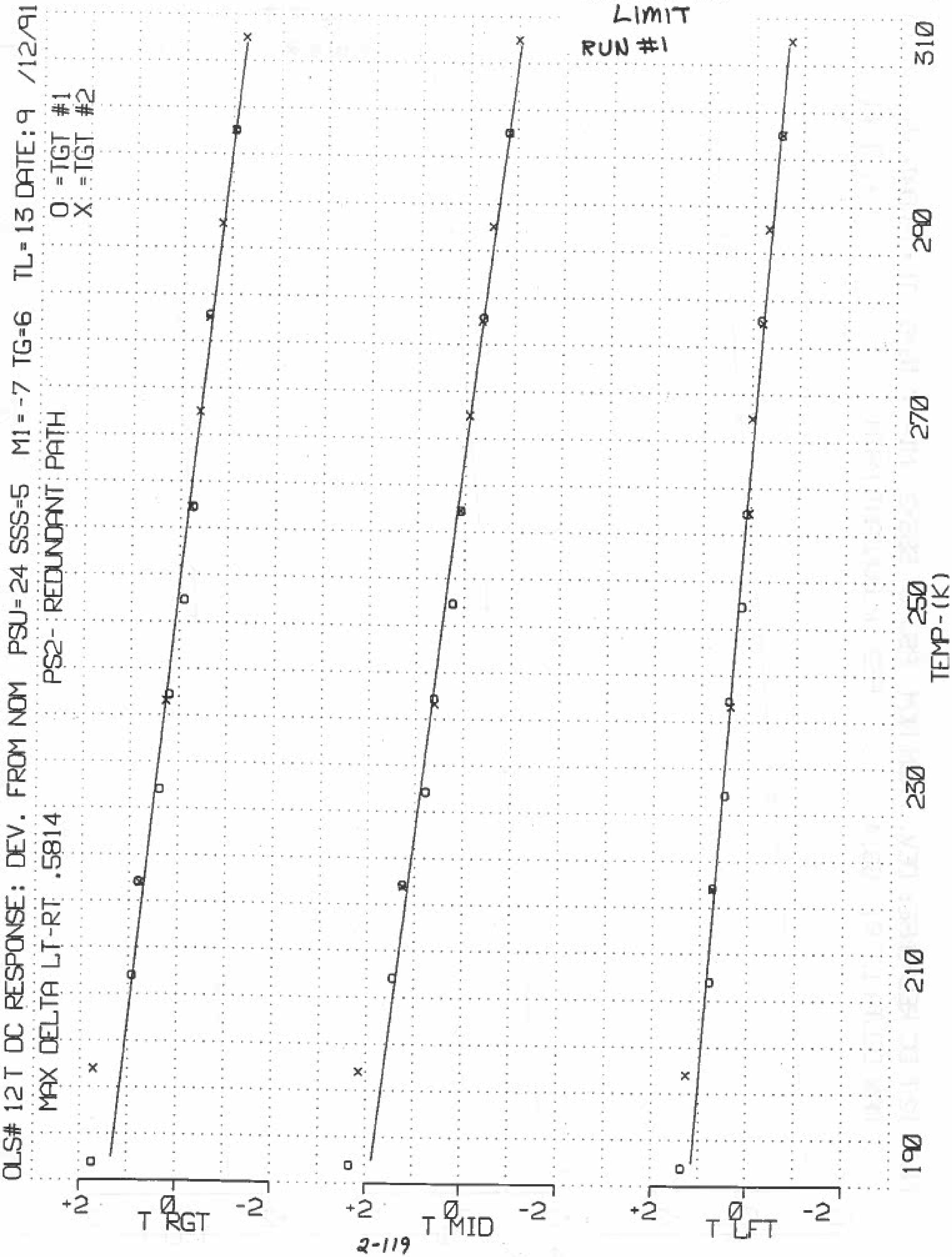


FIGURE 2.4.1-2

COLD OPTIC
LIMIT

RUN #1



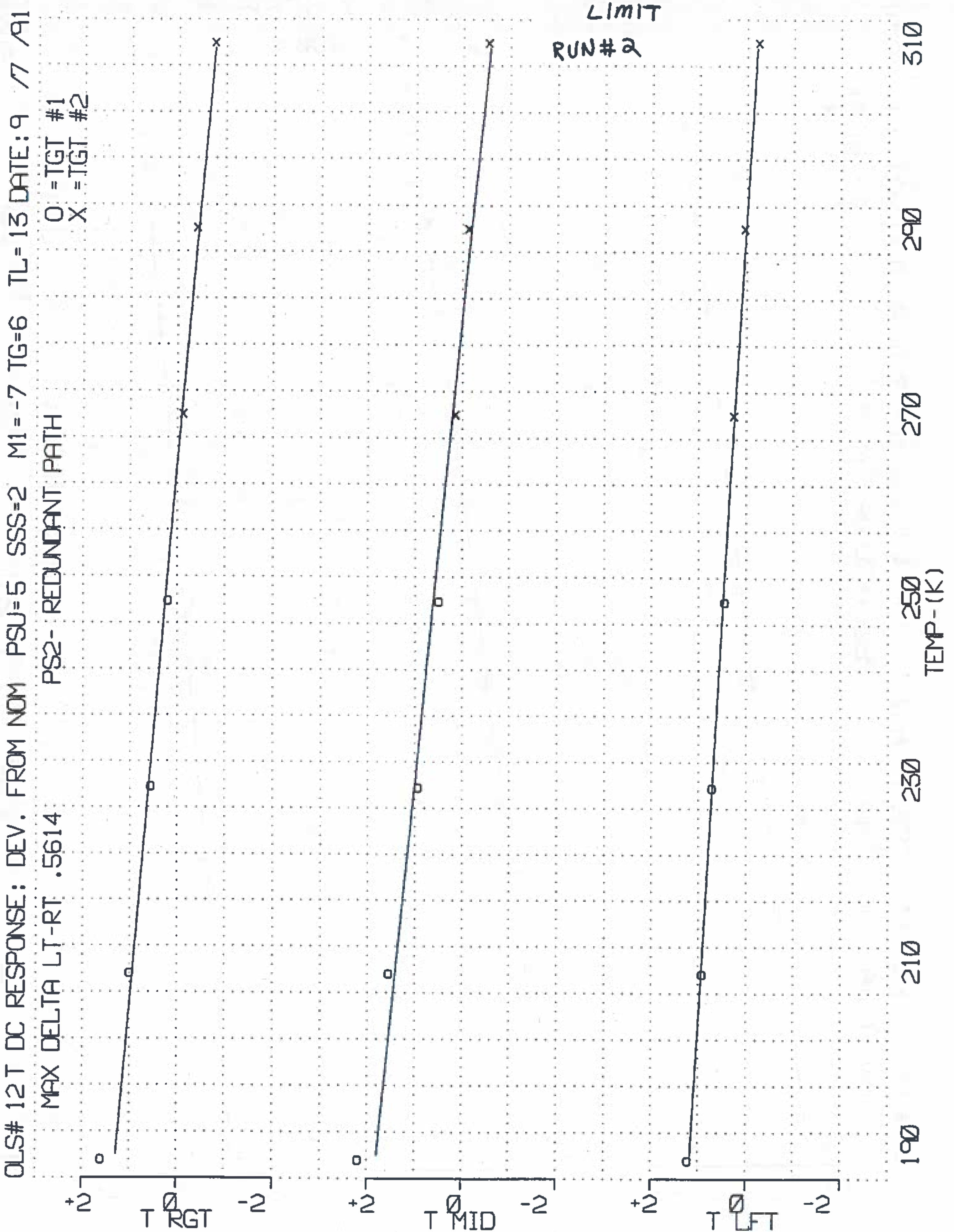


FIGURE 2.4.1-3
HOT OPTIC
LIMIT
RUN#2

FIGURE 2.4.1-4

HOT OPTIC
LIMIT

RUN #2

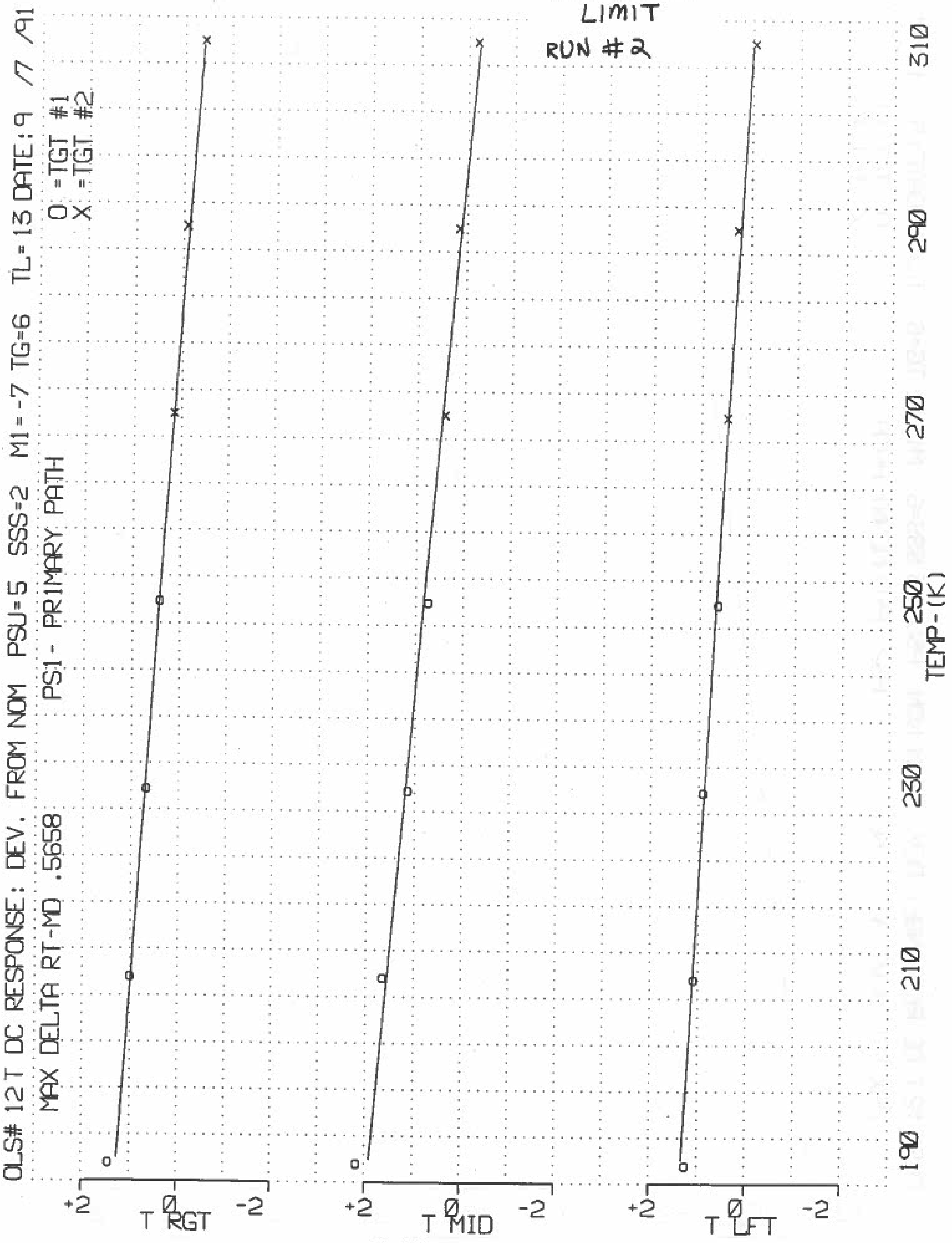
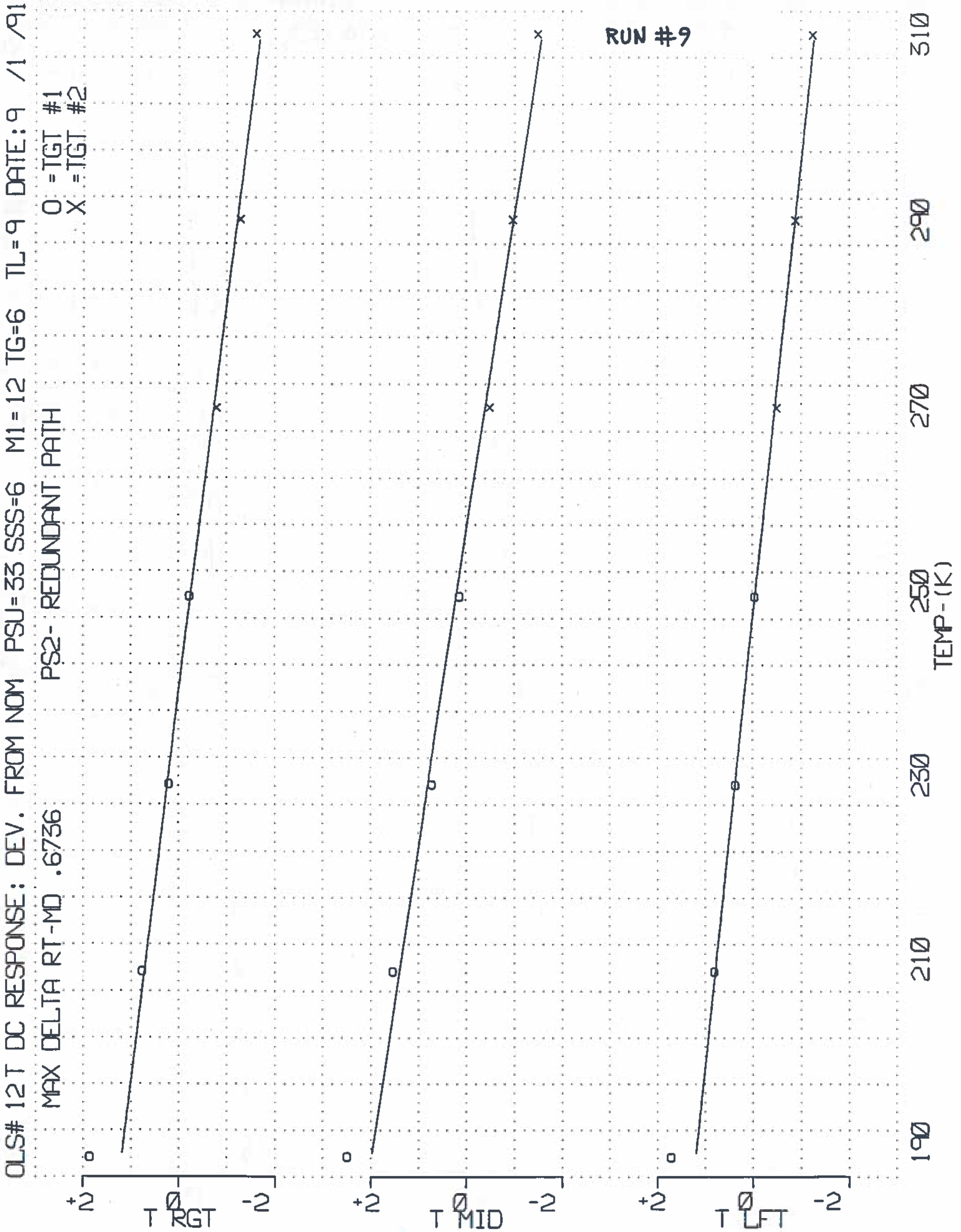


FIGURE 2.4.1-5

HOT LIMIT

RUN #9



2-122

FIGURE 2.4.1-6

HOT LIMIT

RUN #9

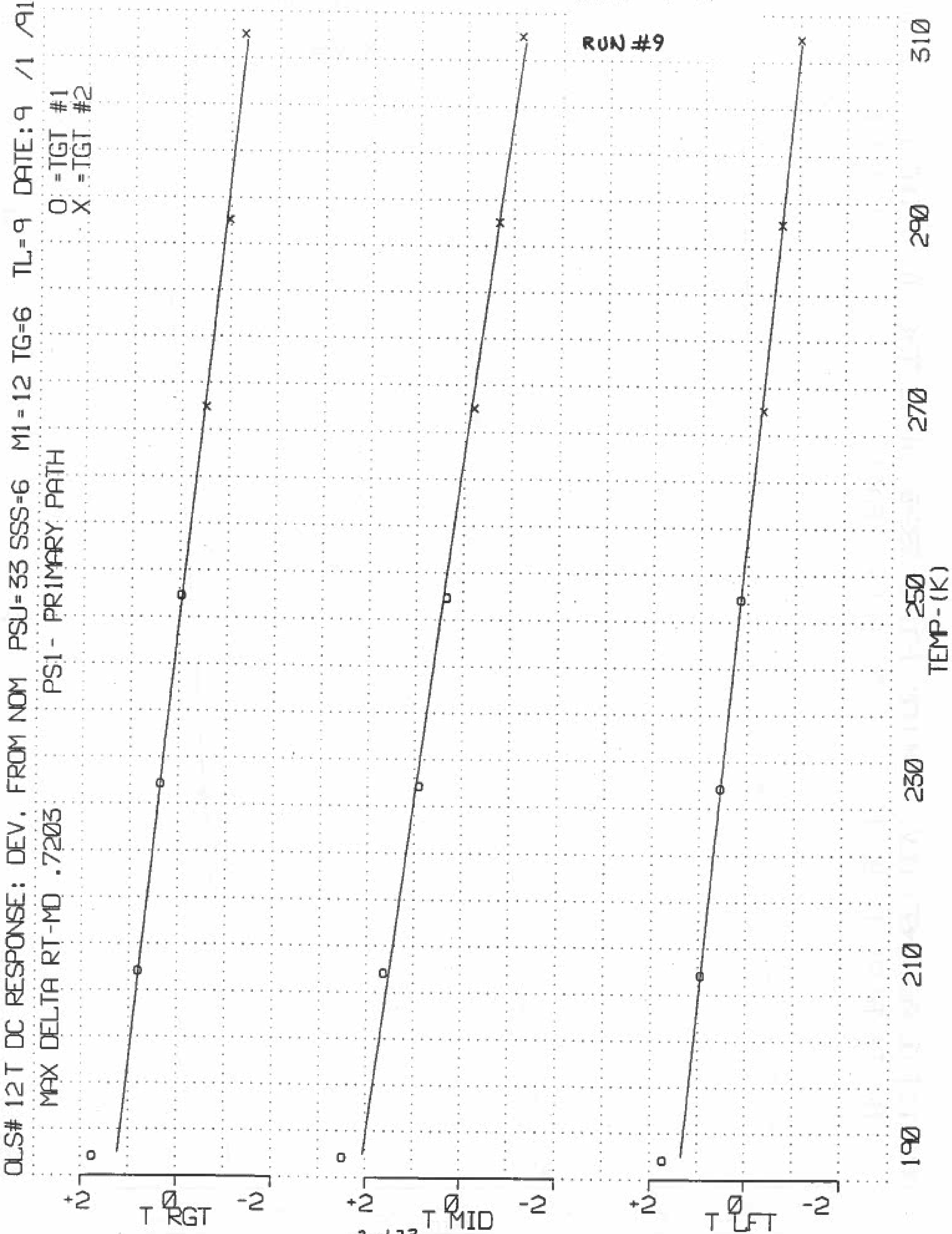


FIGURE 2.4.1-7

COLD LIMIT

RUN #10

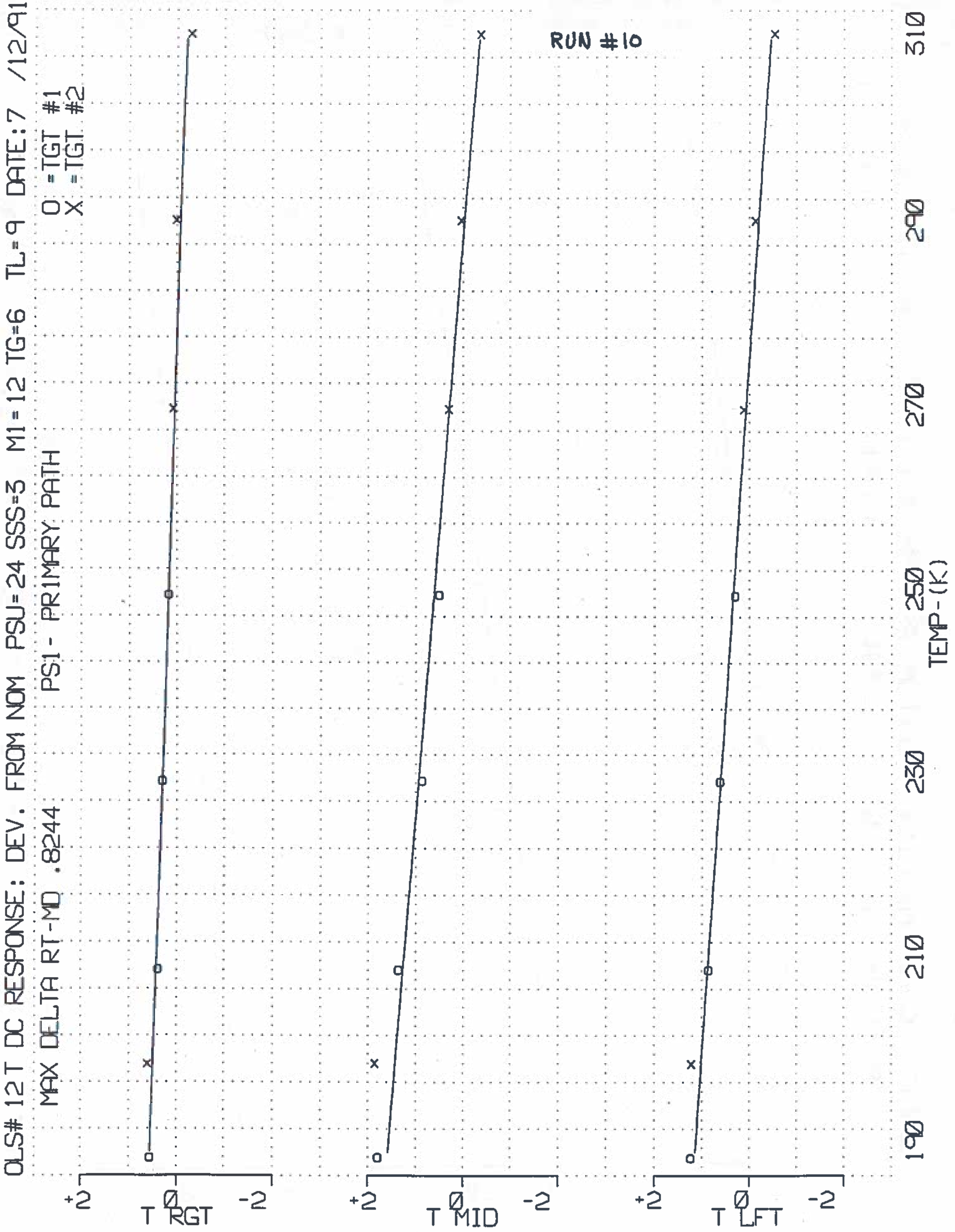


FIGURE 2.4.1-8

COLD LIMIT

RUN # 10

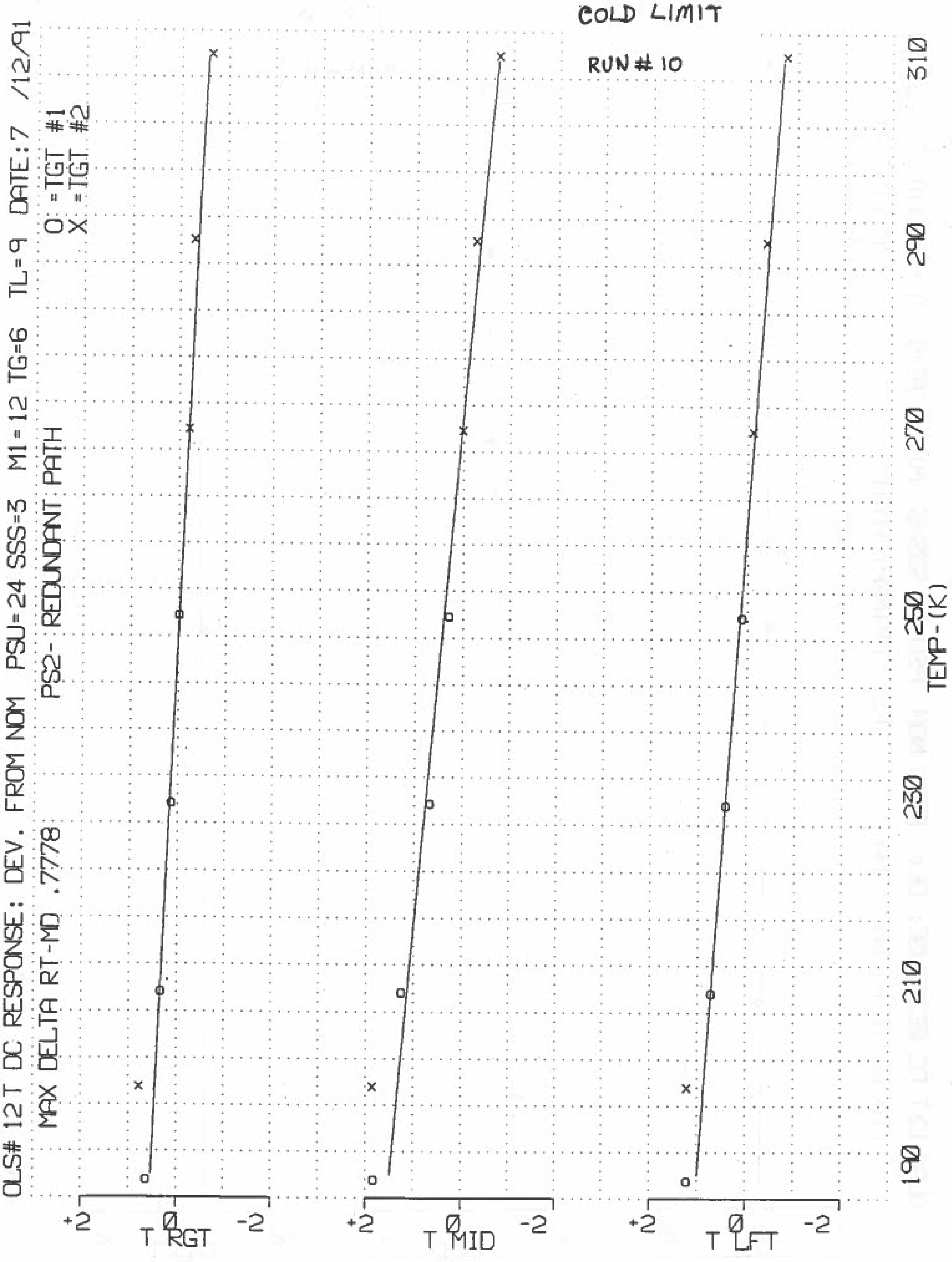


FIGURE 9.4.1-9

NOMINAL

RUN # 11

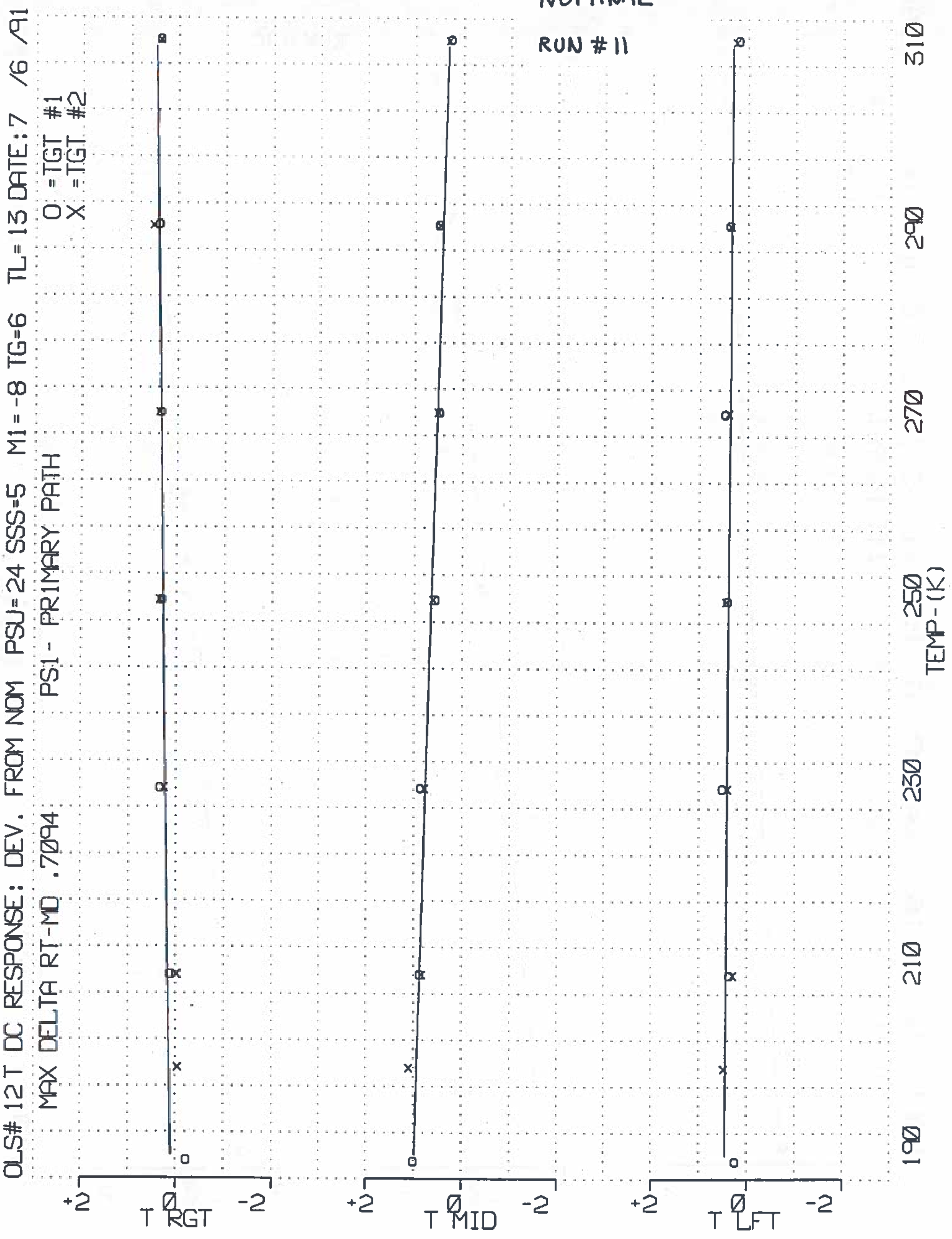
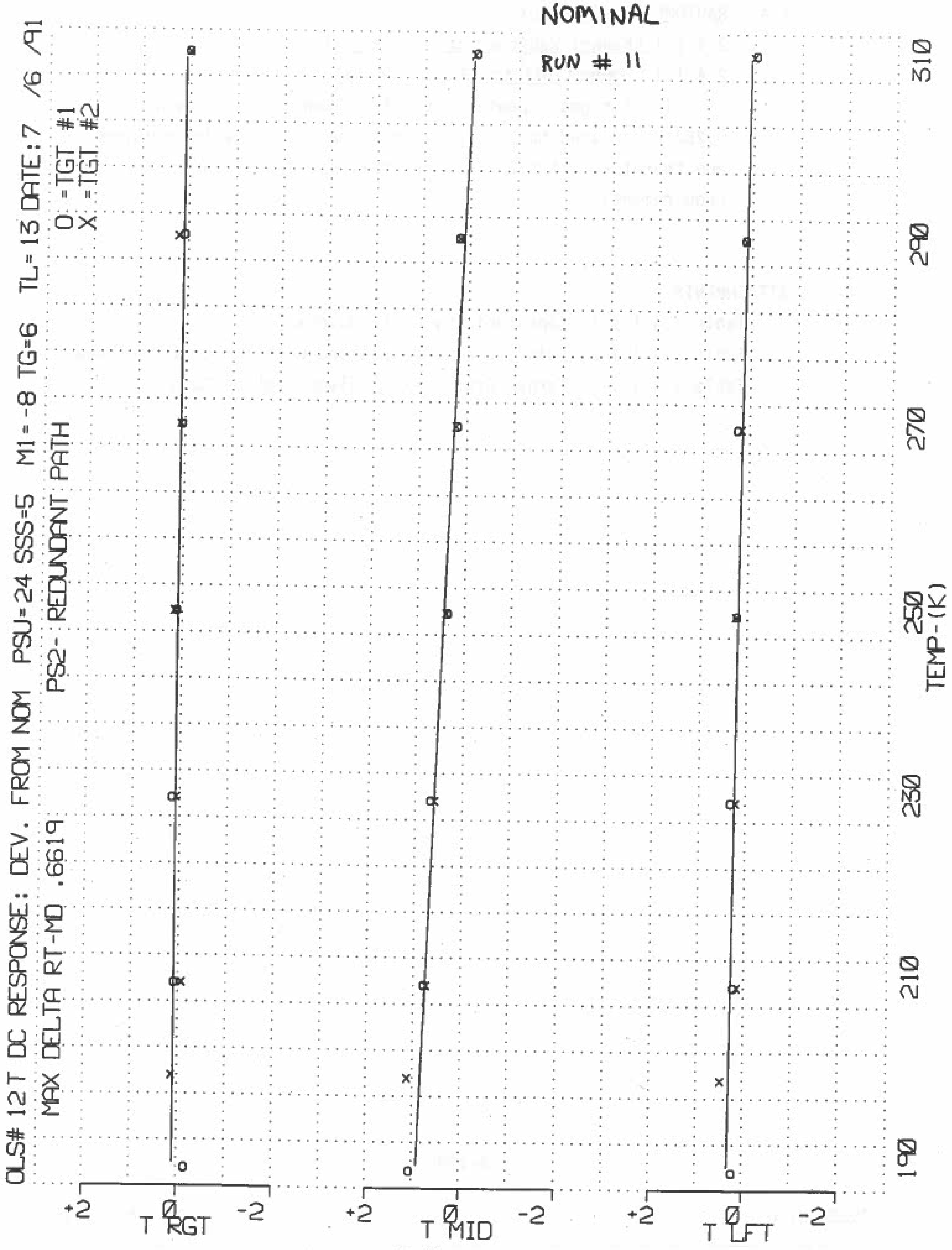


FIGURE 2.4.1-10

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 0.262°K compared to a 0.42°K one sigma specification maximum and therefore OLS #12 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 #12
REPEATABILITY CONTRIBUTORS SUMMARY

ERROR SOURCE	ONE SIGMA ERROR (K°)
1. Diurnal M1 Temperature Change (4°C)	
A. Quantization of T Level Command	0.19
B. Inability to Compensate Actual Effect Exactly	0.077
2. Temperature Change PSU ± 4.5°C, SSS ± 1°C	
A. Effect due to Gain Change	0.066*
B. Effect due to Bias Change	0.058*
3. T Clamp Shaper Compensation	0.09
4. T Clamp Leakage	0.104
TOTAL RSS REPEATABILITY ERROR (°K)	0.262
SPECIFICATION LIMIT, °K, ONE SIGMA	0.42 MAX.

*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 0.642 RMS Temperature Linearity Effects over 210-310°K dynamic range
= 0.19°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 0.207 T Left T Mid T Right average sensitivity coefficient of video at 210K to M1 temperature change for OLS #12 (K factor)
x 0.642 Temperature Linearity Effects over dynamic range.
= 0.077°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:

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

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 = .039% 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
= .007 deg

P_G = -.082% 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
= -.066 deg

RSS'ing these two contributors yields 0.066 degree total.

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

From Table 2.4.1.1-2:

S_B = -.140 deg Bias change per degree SSS change
x 1° temperature change
x 0.642 RMS Temperature Linearization Effects, 210K to 310K

x $1 \sqrt{3}$ for uniform temperature distribution
= -.052 deg

P_B = -.015 deg Bias change per degree PSU change
x 4.5° temperature change
x 0.640 RMS Temperature Linearization Effects, 210K to 310K

x $1 \sqrt{3}$ for uniform temperature distribution
= -.025 deg

RSS'ing these two contributors yields 0.058 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 0.642 RMS Temperature Linearization Effect over the dynamic range equals 0.09°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 #12 T data from Table 2.4.1.1-3, the T clamp leakage contribution can be calculated as follows:

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

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

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

-0.032% T LEFT

-0.122% 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

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

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

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

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

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

$\frac{\partial P}{\Delta T_{210}}$ = 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 0.642 RMS Temperature Linearization Effect

FROM MODE 4 Data reduction:

Calculated RMS leakage error = -0.027°K T LEFT
= -0.104°K T RIGHT

The worst-case contribution to repeatability error by T-clamp leakage is therefore -0.104°K RMS.

TABLE 2.4.1.1-2

OLS #12

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)
M1 = -8°C (Run A)	RUN 11 (NOMINAL TEST)	4.8	23.6	-1.83	0.48	-1.85	1.24	-1.20	.87
	RUN 8 (COLD SOAK)	-2.7	0.5	-.30	1.37	-.24	2.18	.40	1.69
	RUN 11-RUN 8	7.5 T_{SA}	23.1 T_{PA}	-1.53 G_A	-.89 B_A	-1.61 G_A	-.94 B_A	-1.60 G_A	-.82 B_A
M1=+12°C (Run B)	RUN 7 (HOT SOAK #2)	11.0	38.0	-2.67	-.61	-2.79	.29	-2.48	-.44
	RUN 9 (HOT LIMIT)	5.6	33.4	-2.41	-.15	-2.62	.81	-2.04	.27
	RUN 7-RUN 9	5.4 T_{SB}	4.6 T_{PB}	-.26 G_B	-.46 B_B	-.17 G_B	-.52 B_B	-.44 G_B	-.71 B_B
Calculated Sensitivity Factors		SSS: PSU:	S_G (%/°C) S_B (%/°C) P_G (%/°C) P_B (%/°C)	-.011 -.070	-.072 -.015*	.039* -.082*	-.085 -.013	-.031 -.059	-.140* -.010

*WORST CASE VALUES

TABLE 2.4.1.1-3
OLS #12
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)	0.32	1.00	0.08	0.75	0.57	07-06-91
Difference, ∆T	0.25	0.12	0.03	0.07	0.08	
T1 210° [T2 @ 210°] (T121T221S)	0.07	0.88	1.05	0.62	0.45	07-07-91
T2 210° [T1 @ 310°] (T131T221A)	0.30	1.12			0.55	07-07-91
Difference, ∆T	0.14	0.21			0.13	
T2 210° [T1 @ 210°] (T121T221S)	0.16	0.91			0.42	07-07-91
Worst Case Data From T121T221S.ST Mode 4 Data Reduction: T clamp leakage ratio is Peak leakage error at 210°K is RMS leakage error at 210°K is			-0.032% -0.055K -0.027K	-0.122% -0.213K -0.104K		

*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 0.62°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)
1. 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 = RMS Shaped Bias Errors	0.642	0.19°K
2. 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
3. Gain		
Postshaper Gain Changes - Amplifier over the 210-310K range, °K RMS Error		0.38
TOTAL RSS Stability Error (Total Dynamic Range)		0.62
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 0.04°K, 0.04°k and 0.06°K for TRGT, TMID and TLEFT respectively. The two runs used were Run #6 and Run #8. 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 #12

CHANGE IN BSL 210, 310K POINTS BETWEEN RUNS

SSS = +3°C, M1 = -8°C

	TG		T RGT		T MID		T LFT	
	R/L	TL	210	310	210	310	210	310
T121T231B 08-26-91	5/6	13	.90	.25	1.53	0.42	1.02	0.70
T121T231B 08-30-91	5/6	13	1.03	.15	1.57	0.36	1.04	0.61
Change Between Runs			0.13	0.10	0.04	0.06	0.02	0.09
RMS Change			0.12		0.05		0.07	

TABLE 2.4.1.2-3

OLS #12

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 09/13/91	0.97	-0.87	1.51	-0.62	0.94	-0.49
FP DEV [K] Power Supply 2 6X2X3A.ST	0.98	-0.93	1.56	-0.65	1.00	-0.55
Change °K	0.01	0.06	0.05	0.03	0.06	0.06
RMS °K	0.04		0.04		0.06	

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 #12 are 0.29°K, 1 sigma, compared to the 0.6°K specification maximum. The calibrateable portion of the fixed deviations is 0.17°K RMS compared to the 0.4°K RMS specification maximum. The Fixed deviation calibration for separate detector segments is 0.82°K (worst case) compared to the 1°K spec. maximum. The maximum along scan variation was 0.14°K RMS for TF (Right) and 0.12°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 #12

FIXED DEVIATION CONTRIBUTORS

DEVIATION SOURCE	ONE SIGMA ERROR (°K)
1. Foreoptics Mirror Emissivity	0.13*
2. T Clamp Shaper Compensation	0.09
3. Transfer Function	
A. Non-Linearity	0.17* 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	0.29
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)	0.82	1.°K
6. Along Scan Varations within a segment (265° to 310°K) Worst Case	0.14K 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 0.207at 210° using the actual OLS #12 M1 coefficient (K factor). The RMS Temperature Linearization Effect, 0.642, transforms this to a 0.13°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 0.15°K RMS. This calculation is made with the 5D-2 shaper, which is also used on OLS #12. The worst-case reduced test data (from Tables 2.4.1-4,5 & 6) RMS Deviations of the points from the BSL for OLS #12, are 0.07°K for T Right (Smooth Backup), 0.09°K for T MID (Fine and Smooth Backup) and 0.05°K for T Left (Fine Primary & Smooth Backup). The analytic value, (0.15°K RMS) and the worst-case test value of 0.09°K are RSS'ed to become 0.17°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 #12 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 #12.

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 dip in the plots of +5, -8 data for the 290°K target at -550nmi surface distance is due to the inadvertent deletion of a data file. The slight sawtooth effect on the 290°K plots is a result of the missing data's effect on the processing of the data. All data was within spec. 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 #12 has some ASV, but is within spec. The worst case (max) ASV RMS value within a segment for OLS #12 was 0.14°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 T Shaper used for OLS #12 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
195.5	-0.35	1st slope is parallel to Radiance (Smooth) Curve
201.5	0	
205	+0.16	1st diode cut-in
209	0	
214	-0.215	2nd slope is parallel to Radiance (Smooth) Curve
219.5	0	
223.5	+0.215	2nd diode cut-in
228	0	
235.5	-0.28	3rd slope is parallel to Radiance Curve
242	0	
246.5	+0.19	3rd diode cut-in
252	0	
258	-0.205	4th slope is parallel to Radiance Curve
264.5	0	
269.5	+0.23	4th diode cut-in
275.5	0	
282	-0.16	5th slope is parallel to Radiance Curve
285.5	0	
294	+0.205	5th diode cut-in
301	0	
306	-0.06	6th slope is parallel to Radiance Curve
310	0	End point adjusted to be an Ideal Curve

The largest plus and minus errors in the 210K-310°K range are +0.23° and -0.28°K respectively.

The standard deviation = 0.15°K RMS over the 210° to 310°K dynamic range.

TABLE 2.4.1.3-3

OLS #12

TARGET DEVIATION FROM MEAN OF BOTH TARGETS

TARGET TEMP (°K)	DEVIATION (°K)
210	-0.01
220	-0.07
230	-0.02
240	-0.01
250	0.03
260	0.01
270	0.02
280	-0.01
290	0.04
300	0.02
310	0.09

$$RMS = \sqrt{\frac{\Sigma(Dev.\ ^\circ K)^2}{11}} = 0.039^\circ K$$

TABLE 2.4.1.3-4

OLS #12

BSL CALIBRATION EQUATIONS

(From Tables 2.4.1-4,5,6)

			EVALUATED @ 210°	 @ 310°
T FINE (Primary)				
T-Right:	Error = -0.0185 (T-190) + 1.34	(°K)	+.970	-.880
T-Mid:	Error = -0.0222 (T-190) + 1.94	(°K)	+1.496	-.724
T-Left:	Error = -0.0148 (T-190) + 1.32	(°K)	+1.024	-.456
T FINE (Redundant)				
T-Right:	Error = -0.0215 (T-190) + 1.33	(°K)	+.900	-1.250
T-Mid:	Error = -0.0244 (T-190) + 1.85	(°K)	1.362	-1.078
T-Left:	Error = -0.0154 (T-190) + 1.16	(°K)	+.852	-.688
T SMOOTH (Primary - SP MID)	Error = -0.0224 (T-190) + 1.93	(°K)		
T SMOOTH (Redundant - SB MID)	Error = -0.0242 (T-190) + 1.85	(°K)		

TABLE 2.4.1.3-5

OLS #12

FIXED DEVIATION CALIBRATION DIFFERENCES FOR SEPARATE SEGMENTS

Calculated from Run #12 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	0.53	0.16	1°K
T Mid to T Left	0.47	0.27	1°K
T Right to T Left	0.05	0.42	1°K
REDUNDANT			
T Mid to T Right	0.46	0.17	1°K
T Mid to T Left	0.51	0.39	1°K
T Right to T Left	0.05	0.56*	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	0.71° RGT-MID	0.66° RGT-MID	1°K
2	* 0.82° RGT-MID	* 0.78° RGT-MID	1°K
9	0.72° RGT-MID	0.67° RGT-MID	1°K
10	0.57° RGT-MID	0.56° RGT-MID	1°K
11	0.53° RGT-MID	0.58° RGT-MID	1°K

*WORST-CASE DATA

TABLE 2.4.1.3-6

OLS #12

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

(From ASV Graphs)

	ONE SIGMA ERROR (°K RMS)	SPEC LIMIT (°K RMS)
T-FINE		
T-Left Segment	0.121	0.2
T-Mid (Sum) Segment	0.117	0.2
T-Right Segment	0.135	0.2
T-SMOOTH		
T-Sum	0.117	0.2

TABLE 2.4.1.3-7

CONE COOLER S/N 024

OLS-12

CONE (INNER STAGE) PATCH TEMP. EST

TEMPERATURE °K	PATCH EST. VOLTS
95	5.655
96	5.248
97	4.874
98	4.529
99	4.212
100	3.920
101	3.651
102	3.403
103	3.174
104	2.963
105	2.768
106	2.588
107	2.422
108	2.268
109	2.125
110	1.993
111	1.871
112	1.757
113	1.651
114	1.553
115	1.462
116	1.377
117	1.298
118	1.225
119	1.156
120	1.092
121	1.022
122	.976
123	.924
124	.875
125	.829

TABLE 2.4.1.3-8

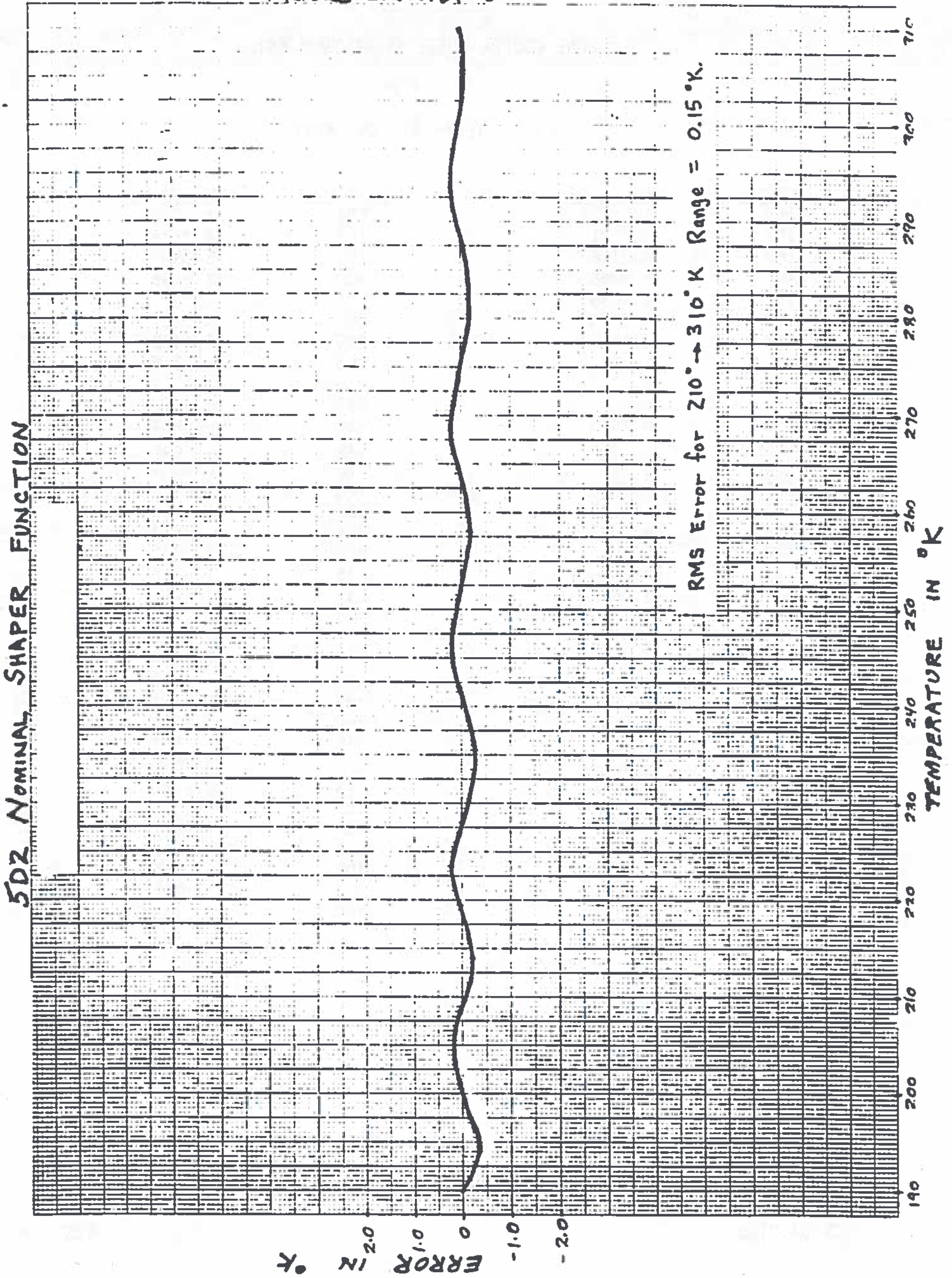
CONE COOLER OUTER STAGE TEMP EST

OLS #12

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

FIGURE 2.4.1.3-1



5D2 NOMINAL SHAPER FUNCTION

RMS Error for 210° → 310° K Range = 0.15 °K.

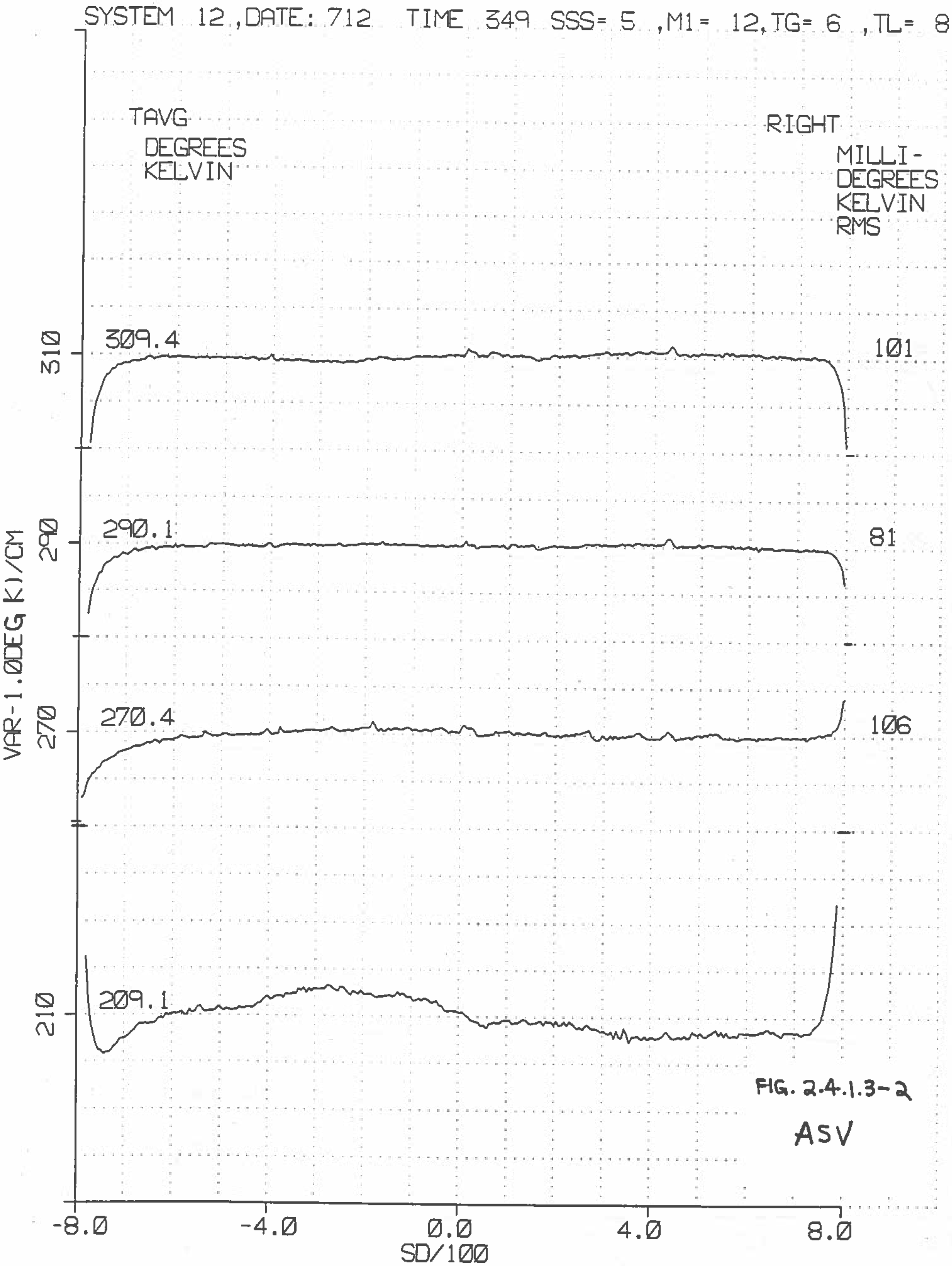


FIG. 2.4.1.3-2

ASV

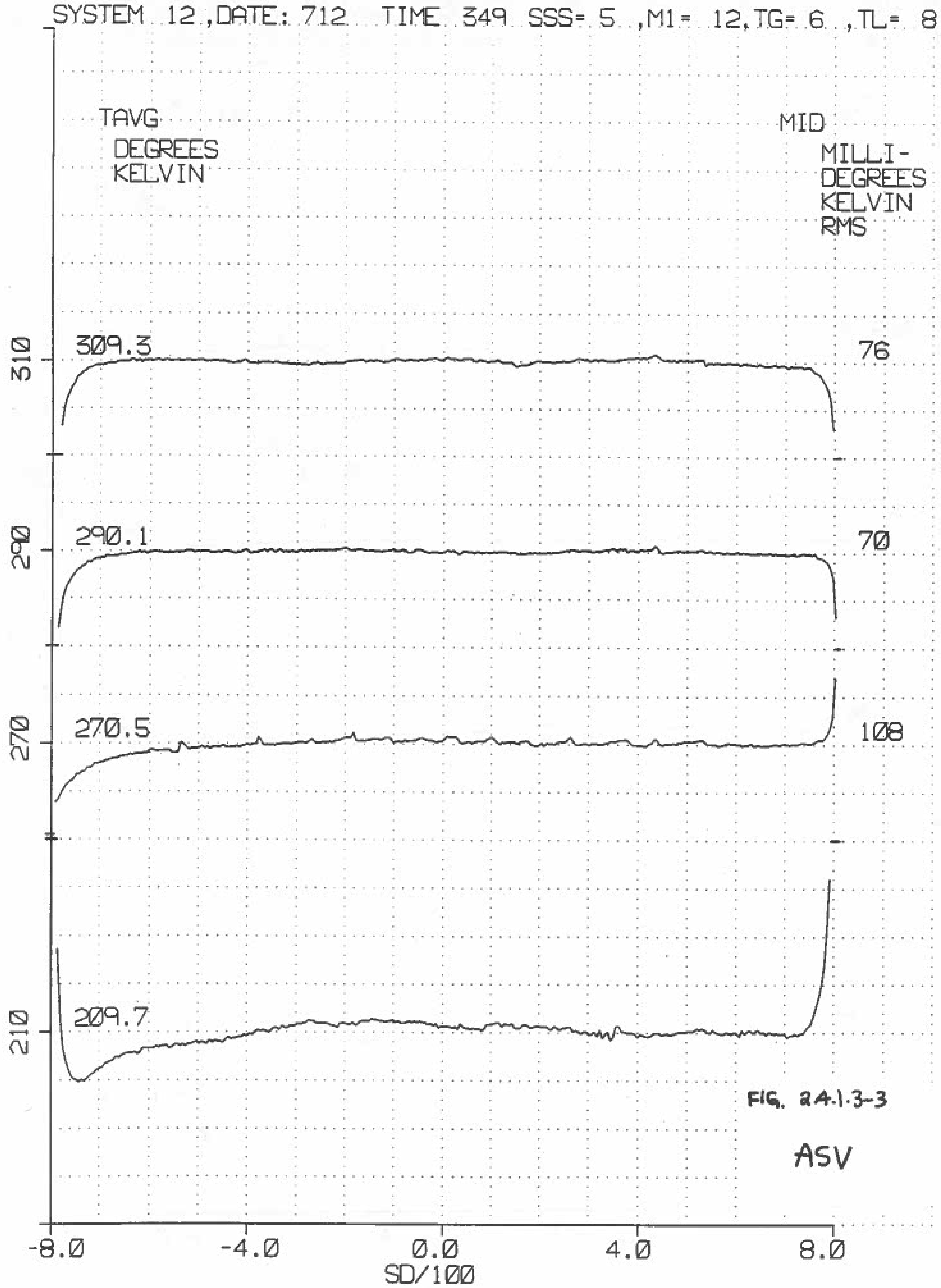


FIG. 24.1.3-3

ASV

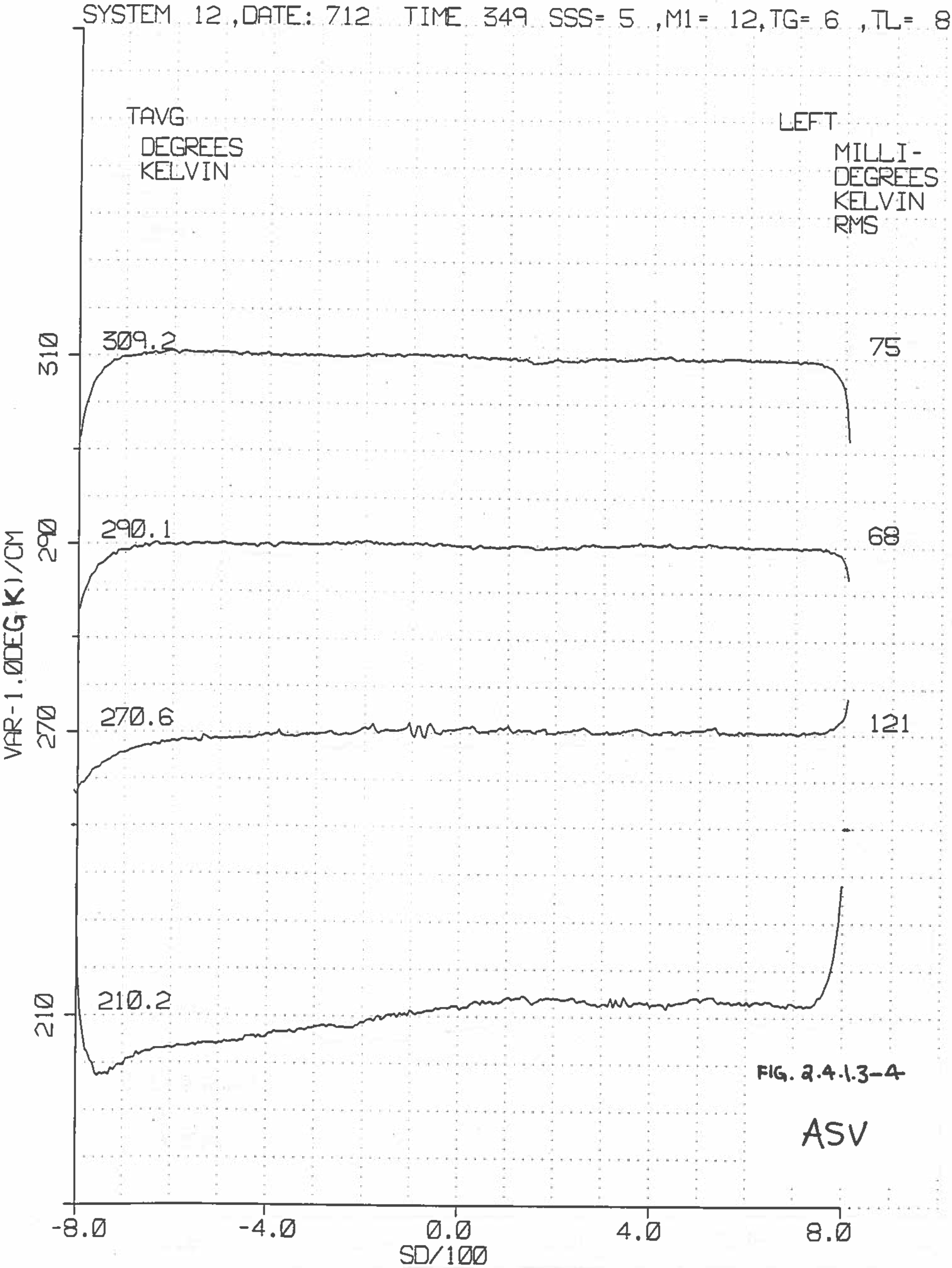


FIG. 2.4.1.3-4

ASV

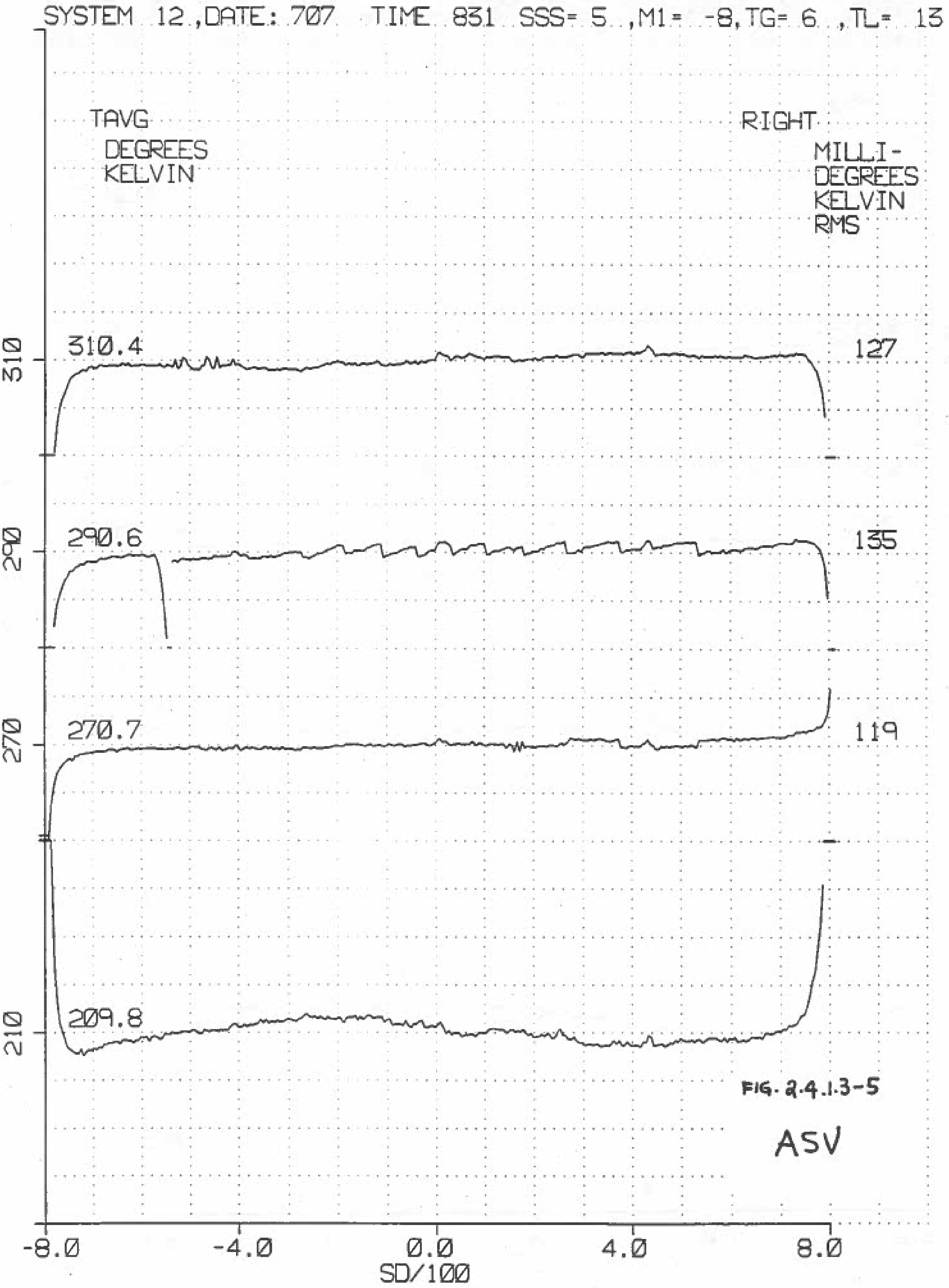


FIG. 2.4.1.3-5

ASV

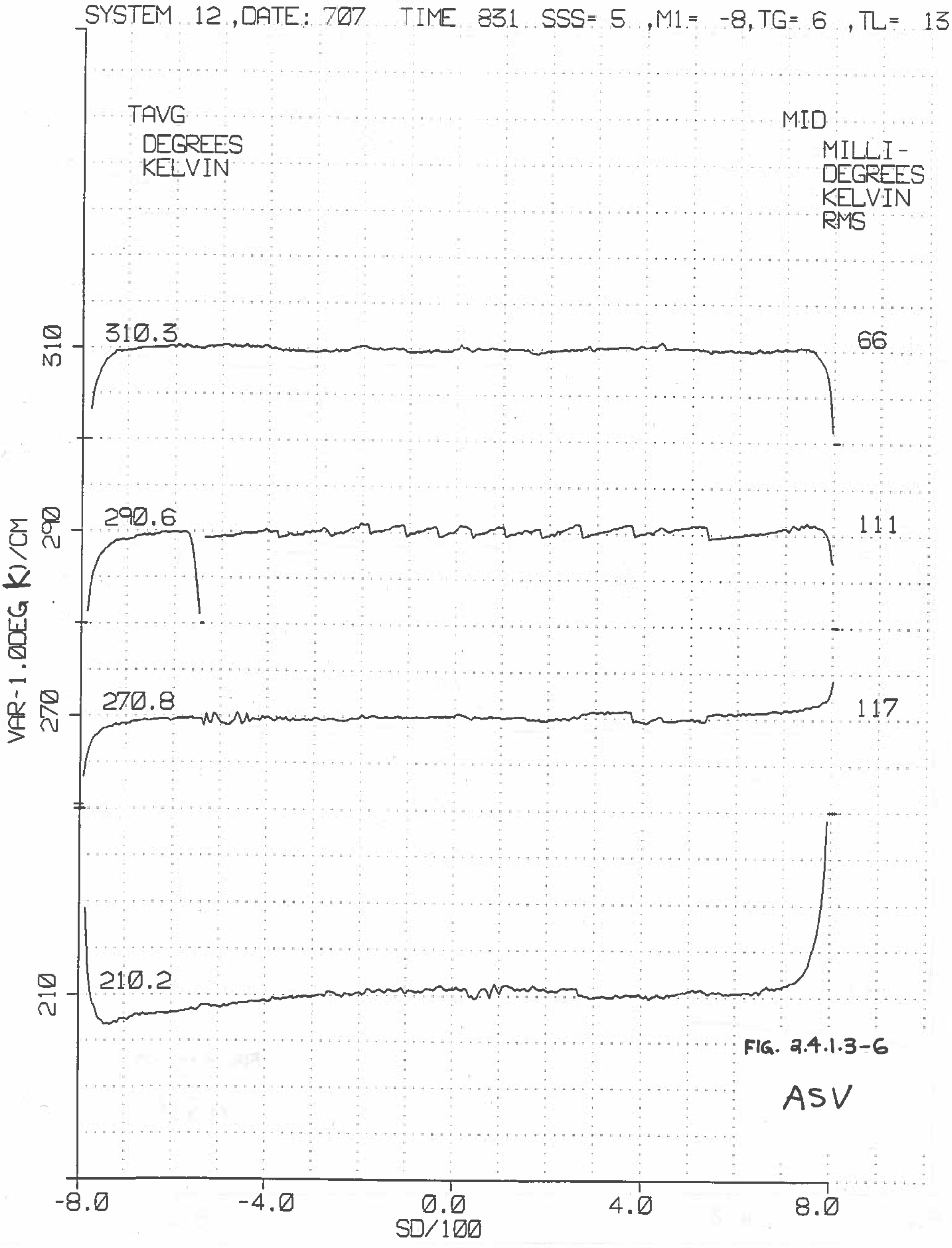


FIG. 2.4.1.3-6

ASV

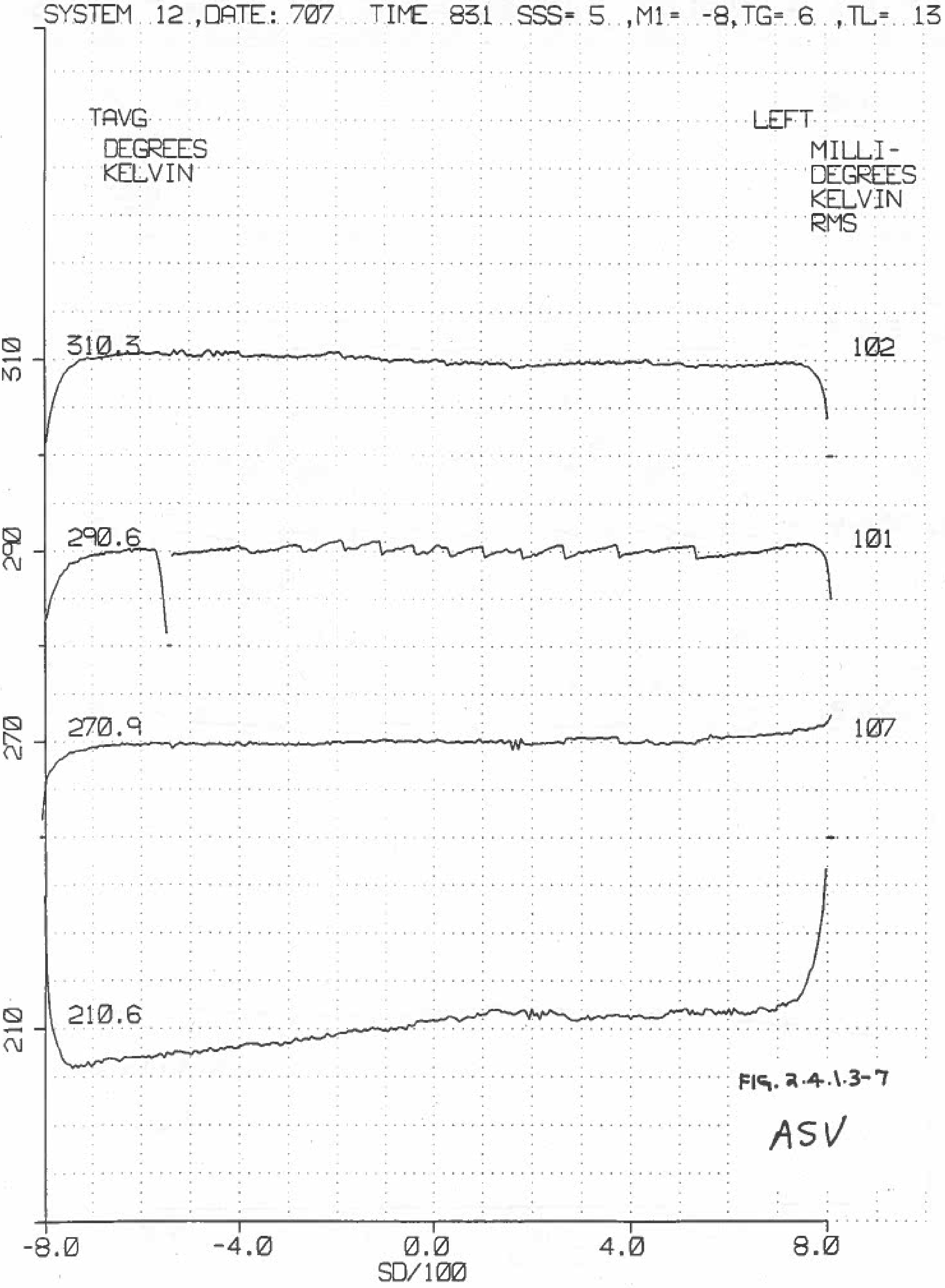


FIG. 2.4.1.3-7

ASV

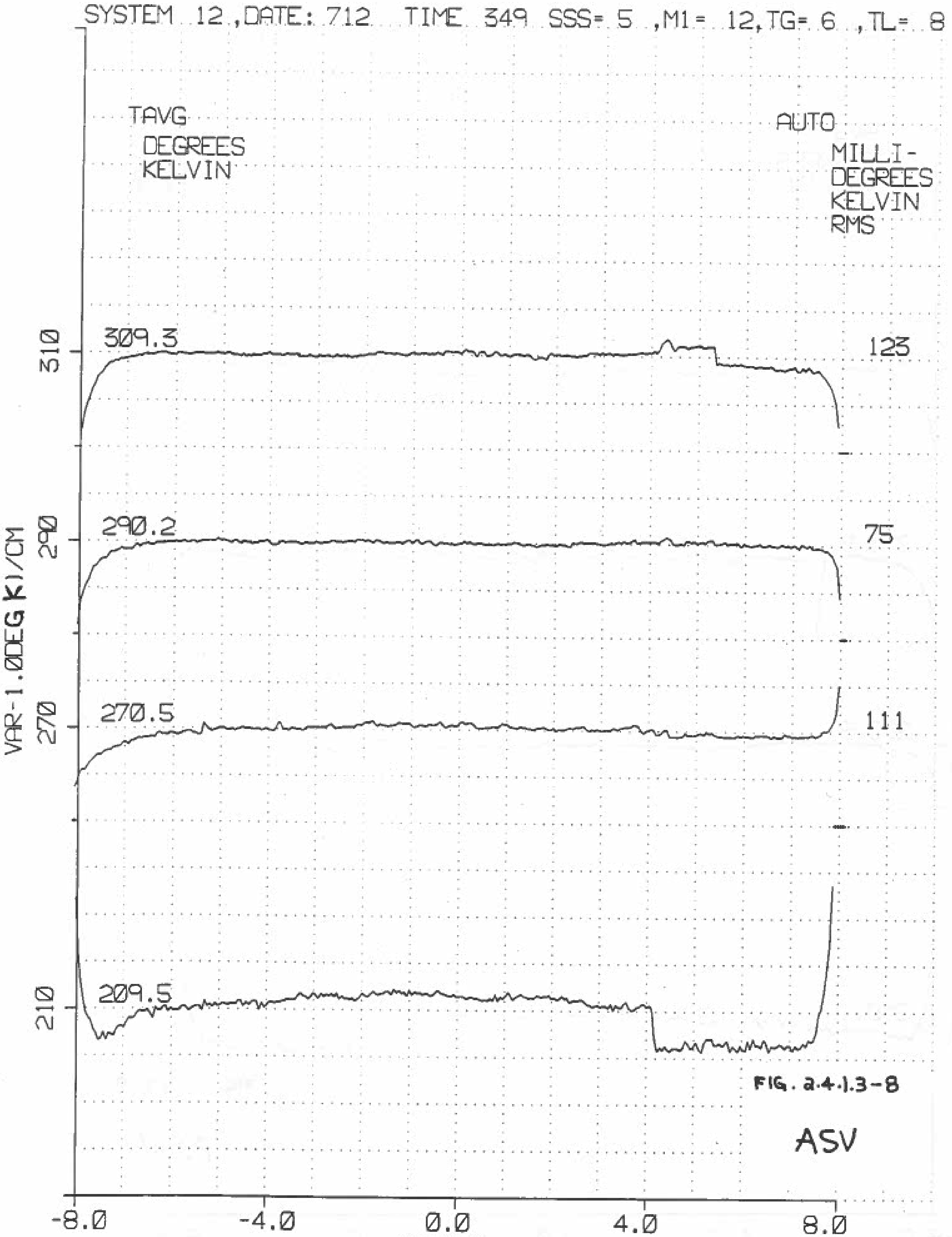


FIG. 2.4.1.3-8

ASV

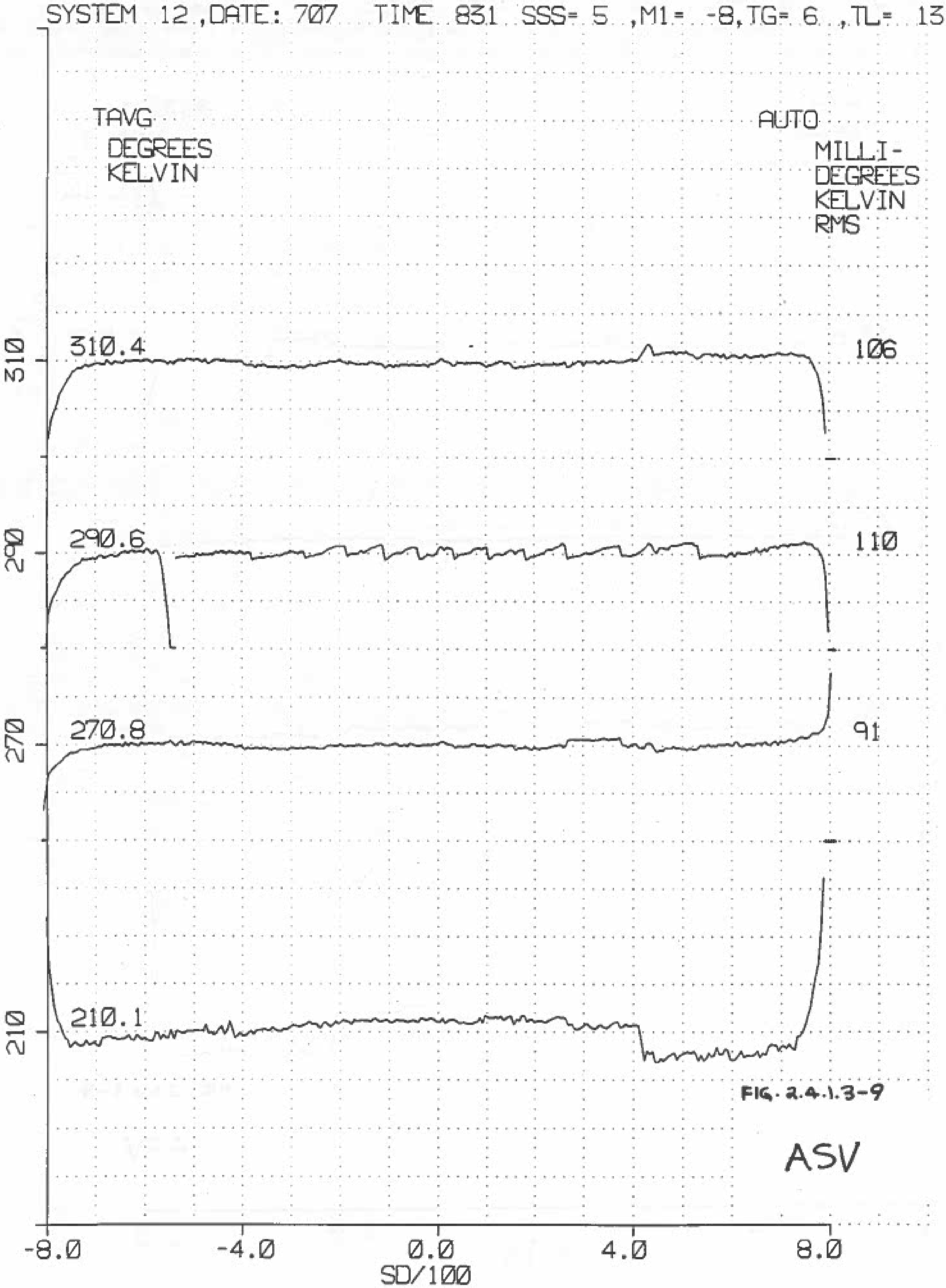


FIG. 2.4.1.3-9

ASV

2.4.2 Daytime Radiometric Accuracy (3.2.1.1.4.2)

OLS #12 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 0.3% 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.

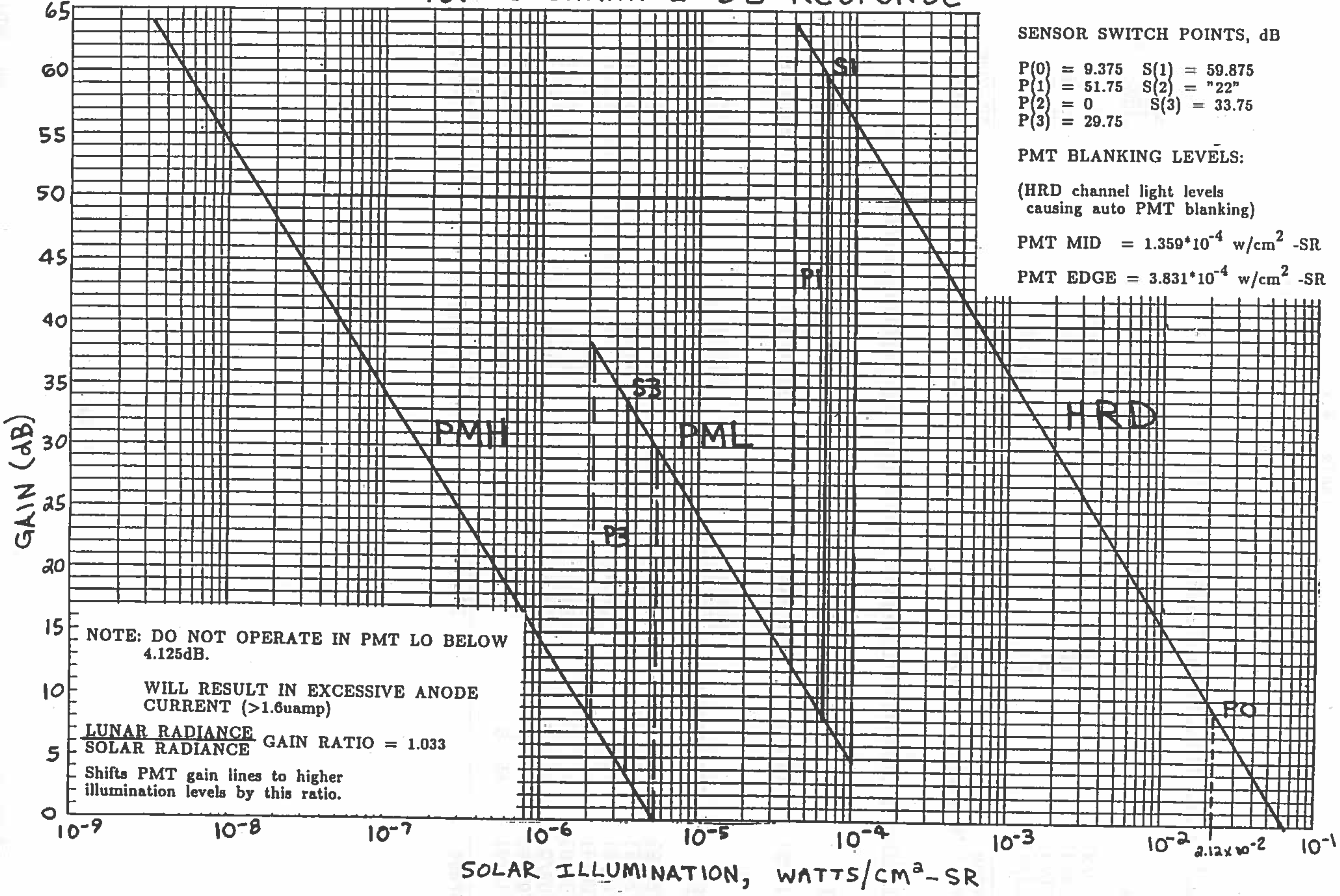
OLS #12 exhibited 1.10dB drop in transmission from room temperature to +5°C. The correct light level corresponding to $2.12x10^{-2}$ w/cm^2 -sr is changed by 3% (0.26dB) relative to factory adjustment based on updated HRD spectral data used in the GAINSET program. Also, OLS #12 exhibited a lower optics transmission than typical OLS units by 2dB in the HRD channel. Thus P(0) must be reset to 6.0 (nom) + 1.10 + 0.26 +2 = 9.36dB. Rounding off to the nearest 1/8 dB gives 9.375dB as the new setting for P(0).

The S1 value used for OLS 12 DC response adjustment is 2.96 v. Also, the G1 value (HRD to PMT gain offset factor due to differing spectra) used was 4.37 db and the lunar/solar gain ratio used was 1.033.

P1 is derived using the PMT LO/HRD average gain value of 49.98 dB 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 1.10 dB and .61 dB, respectively. The P1 value is 49.98 + 0.61 + 1.10 = 51.69 (rounded to nearest 1/8th dB = 51.75).

ATTACHMENT:	OLS #12	L Channel DC Response Plot
	Table 2.4.2-1	OLS #12 DC Response Stability
	Table 2.4.2-2	OLS #12 PMT/HRD DC Response vs. SSS Temp.

OLS #12 L CHANNEL DC RESPONSE



SENSOR SWITCH POINTS, dB

P(0) = 9.375 S(1) = 59.875
P(1) = 51.75 S(2) = "22"
P(2) = 0 S(3) = 33.75
P(3) = 29.75

PMT BLANKING LEVELS:

(HRD channel light levels
causing auto PMT blanking)

PMT MID = $1.359*10^{-4}$ w/cm^2 -SR

PMT EDGE = $3.831*10^{-4}$ w/cm^2 -SR

NOTE: DO NOT OPERATE IN PMT LO BELOW 4.125dB.

WILL RESULT IN EXCESSIVE ANODE CURRENT (>1.6uamp)

$\frac{\text{LUNAR RADIANCE}}{\text{SOLAR RADIANCE}}$ GAIN RATIO = 1.033

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

Table 2.4.2-1

OLS #12 L DC Response Stability

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

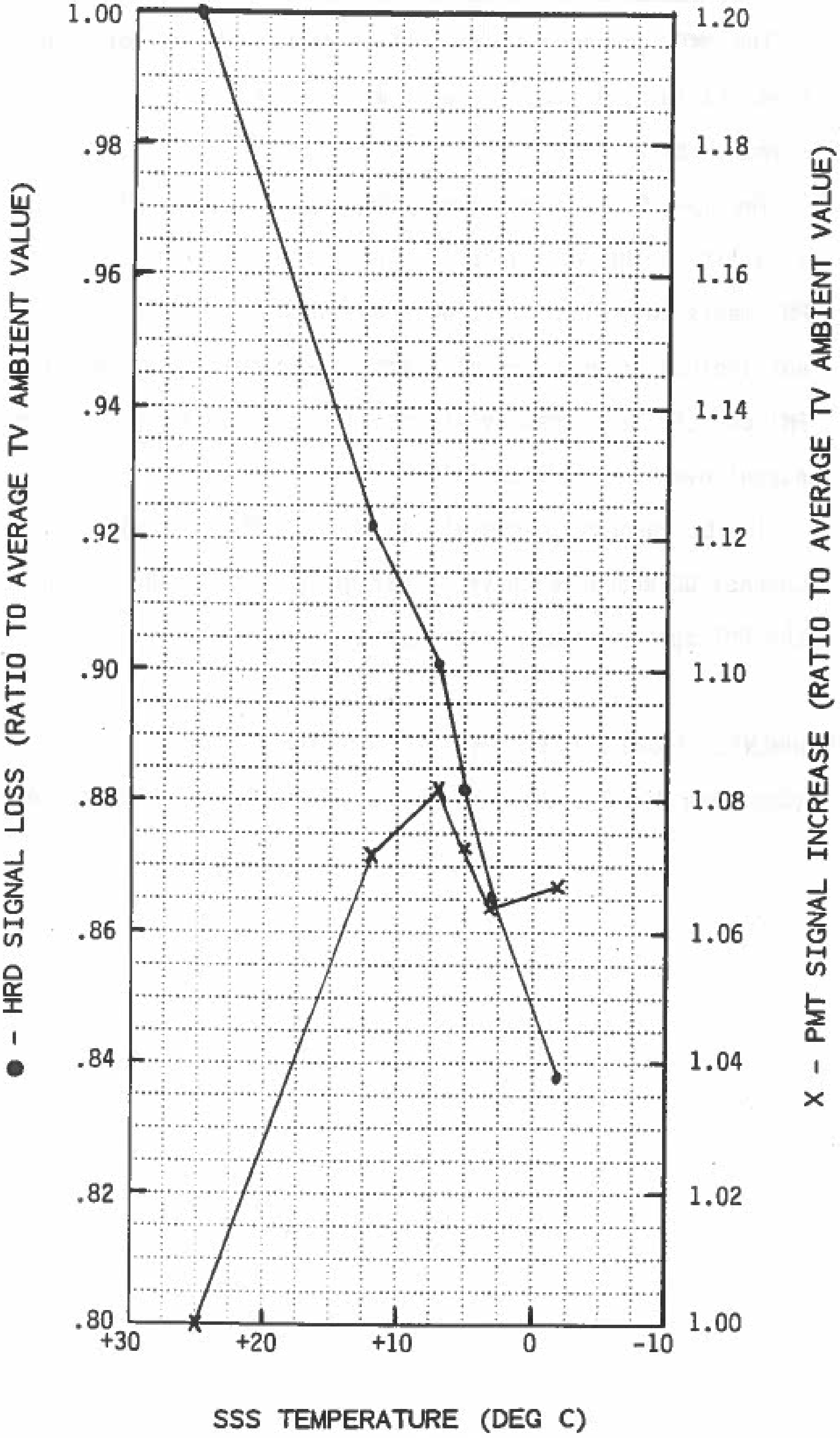
DATE	PMT HI / PMT LO dB	PMT LO / HRD dB	PMT HI / HRD dB
08/10/91	29.74	49.98	79.71
08/14/91	29.73	49.95	79.68
10/26/91	29.73	50.15	79.88
10/27/91	29.71	49.82	79.53
Average	29.73dB	49.98dB	79.70dB
(Direct Multiple)	(30.65)	(315.50)	(9660.51)

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

DATE	ENVIRONMENT	PMT HI / PMT LO dB	PMT LO / HRD dB	PMT HI / HRD dB
08/18/91	TV Amb	29.74dB	39.06dB	68.80dB

DATE	ENVIRONMENT	PMT HI / PMT LO dB	PMT LO / HRD dB	PMT HI / HRD dB
08/22/91	+5/-8	29.65	40.85	70.79
08/25/91	+12/+15	29.69	40.23	69.93
08/26/91	-2/-11	29.63	41.42	71.06
08/28/91	+12/+15	29.76	40.44	70.19
08/30/91	-2/-11	29.78	41.47	71.25
09/02/91	+7/+12	29.68	40.66	70.35
09/07/91	+3/-8	29.68	41.06	70.74
09/12/91	+5/-8	29.69	40.89	70.58
Average		29.70dB	40.88dB	70.57dB

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



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 #12 PMT is shown in the L Channel DC Response curve in paragraph 2.4.2. Unlike the HRD, the PMT optics transmission appears typical.

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 for all runs after PMT replacement.

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)
08-09-91	+25	2478	2475
08-14-91	+25	2499	2487
09-03-91	+12	2378	2372
09-08-91	+3	2361	2356
09-14-91	+5	2381	2376
	AVERAGE	2419	2413
Max change from AVERAGE		3.31%	3.07%

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 #12 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 #12 as 49.8% for T Right and 49.2% 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 #16 ranged from 1.86% 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 12 testing were 15.12° range and step sizes between 0.969°K to 1.027°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 #12 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	-0.33	0.18	0.04
RED	-0.19	0.10	0.03
SDF-T PRIM	0.17	-0.12	0.15
RED	0.38	-0.16	0.17
RTD-F PRIM	-0.33	0.18	0.04
RED	-0.18	0.08	0.05
SPEC	±1.0	±1.0	0.5
RTD-S PRIM	-0.23	0.08	0.02
RED	-0.26	0.06	0.02
SDS-L PRIM	-0.23	0.06	0.04
RED	0.20	0.06	0.06
SDS-T PRIM	0.10	-0.30	0.06
RED	0.50	-0.20	0.08
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 #12 vacuum runs and are tabulated below:

A/D		PEAK DEV FROM BSL (% OF FULL SCALE)	SPEC
SDF-L	PRIM	0.07	±0.8%
	RED	-0.06	
SDF-T	PRIM	0.33	±0.8%
	RED	-0.30	
RTD-F	PRIM	0.08	±0.8%
	RED	0.12	
RTD-S	PRIM	0.04	±0.25%
	RED	-0.04	
SDS-L	PRIM	-0.07	±0.5%
	RED	0.10	
SDS-T	PRIM	-0.10	±0.5%
	RED	-0.16	

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 #12 NETD is in-spec. The noise in the T Right segment is 11.8% 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	0.695°K	0.279°K	0.393°K
Worst-Case Average NETD	0.662°K	0.273°K	0.370°K

ATTACHMENT: Table 2.6.1-1 OLS #12 Primary Side NETD

Table 2.6.1-2 OLS #12 Redundant Side NETD

Table 2.6.1-1

OLS #12 PRIMARY SIDE NETD										
DATE	TG				Noise mV					
	SSS	M1	R/L	TL	FINE RGT	SMOOTH RGT	FINE MID	SMOOTH MID	FINE LFT	SMOOTH LFT
07/06/91	5	-8	5/6	13	26.97*	15.24	17.21	10.14	23.28	12.50
07/14/91	12	15	5/6	9	25.46	13.99	16.93	10.26	21.99	11.63
07/18/91	-2	-11	5/6	13	26.64	15.25*	17.32	10.18	24.28*	12.60
08/22/91	5	-8	5/6	13	26.32	14.00	17.04	10.76	22.90	12.25
08/24/91	5	12	5/6	9	25.38	14.67	16.60	10.50	22.11	11.83
08/25/91	12	15	5/6	9	25.17	13.65	16.60	10.25	22.02	11.45
08/26/91	-2	-11	5/6	13	25.64	14.41	16.60	10.20	22.78	12.52
08/28/91	12	15	5/6	9	24.22	14.01	15.95	10.07	21.94	11.58
08/30/91	-2	-11	5/6	13	26.17	14.63	16.78	10.35	23.27	12.51
09/01/91	7	12	5/6	9	25.60	13.63	16.61	10.61	22.74	11.90
09/07/91	3	-8	5/6	13	25.15	14.49	16.86	10.03	22.03	12.10
AVERAGE					25.70	14.36	16.77	10.30	22.67	12.08
NETD					0.617	0.345	0.402	0.247	0.544	0.290
NETD Correction for Shaper Slope**					0.662	0.370	0.432	0.265	0.584	0.311

* Worst Case Measured

** Shaper Slope Correction Factor = 1.074

Table 2.6.1-2

OLS #12 REDUNDANT SIDE NETD										
DATE	TG				Noise mV					
	SSS	M1	R/L	TL	FINE RGT	SMOOTH RGT	FINE MID	SMOOTH MID	FINE LFT	SMOOTH LFT
07/05/91	5	-8	6/6	12	26.58	14.73	18.53*	10.47	23.56	11.97
07/11/91	5	12	5/6	8	25.77	14.31	17.82	10.84*	23.59	12.72*
09/12/91	5	-8	5/6	13	24.75	13.86	16.03	10.50	22.56	12.24
AVERAGE					25.70	14.30	17.46	10.60	23.24	12.31
NETD					0.617	0.343	0.419	0.254	0.558	0.295
NETD Correction for Shaper Slope**					0.662	0.369	0.450	0.273	0.599	0.317

*Worst Case Measured

**Shaper Slope Correction Factor = 1.074

2.6.2 L-Channel Noise (Day) (3.2.1.1.6.2)

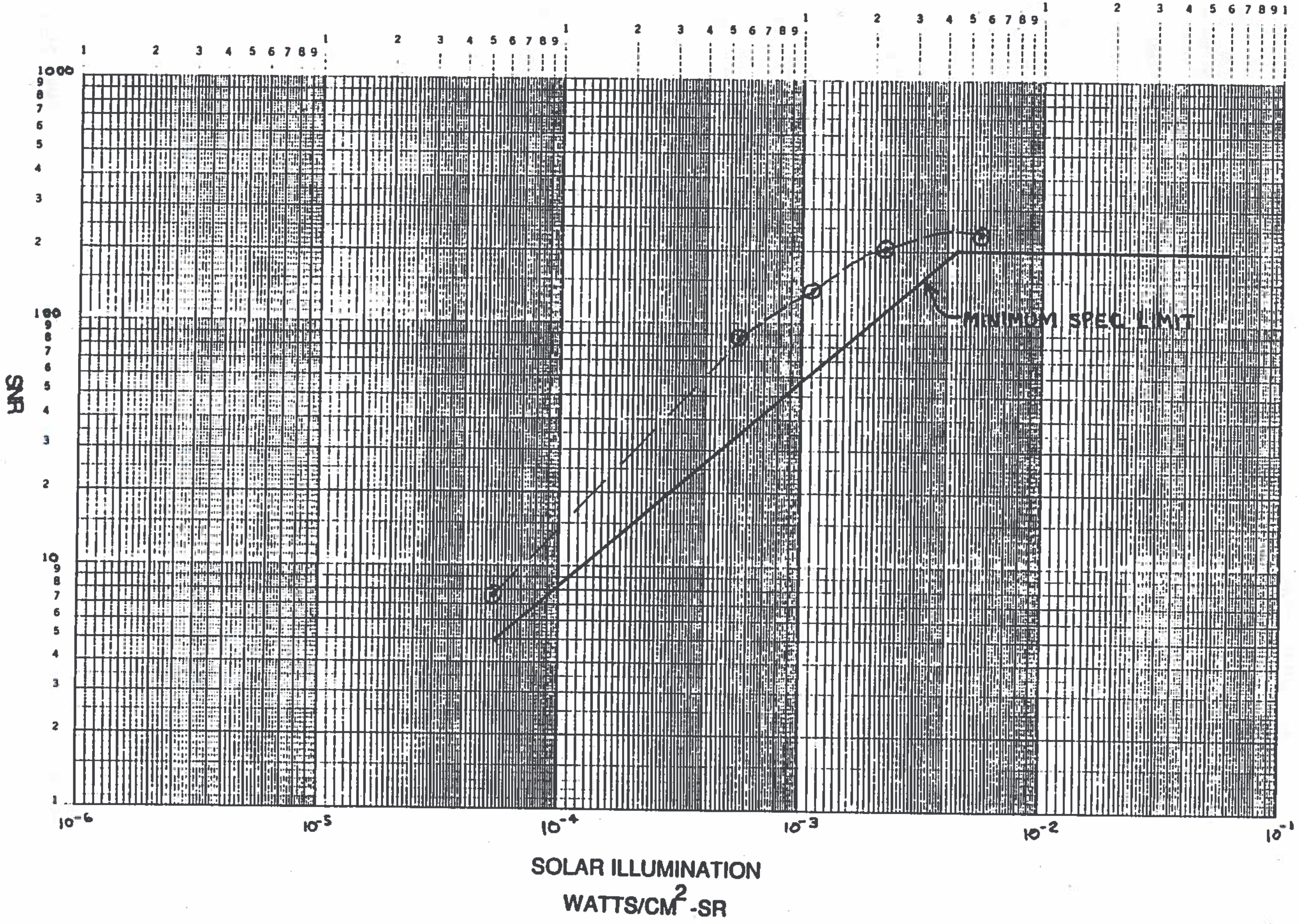
The L Channel Noise is measured using the calibrated Variable Uniform Light Source (VULS). Dark noise is measured in test 6x3x1.ST and shot noise is measured in 6x3x5.ST.

The OLS #12 HRD is in-spec for the entire range of illumination. Worst-case HRD SNR exceeds the specification. In summary:

	SNR		
LIGHT LEVEL	SPEC	PRIOR OLS 12 TESTING WORST CASE MEASURED	RETEST WORSE CASE (FROM GRAPH)
5.5×10^{-5}	5	7.45	7.8
5.5×10^{-4}	34.8	68.1	88.1
1.1×10^{-3}	62.3	116	140
2.2×10^{-3}	112	189	201
5.5×10^{-3}	200	251	235

ATTACHMENT: OLS #12 HRD Channel SNR Graph

OLS #12 HRD CHANNEL SNR



2.6 NOISE (Cont'd)

2.6.3 L Channel Noise (Night) 3.2.1.1.6.3)

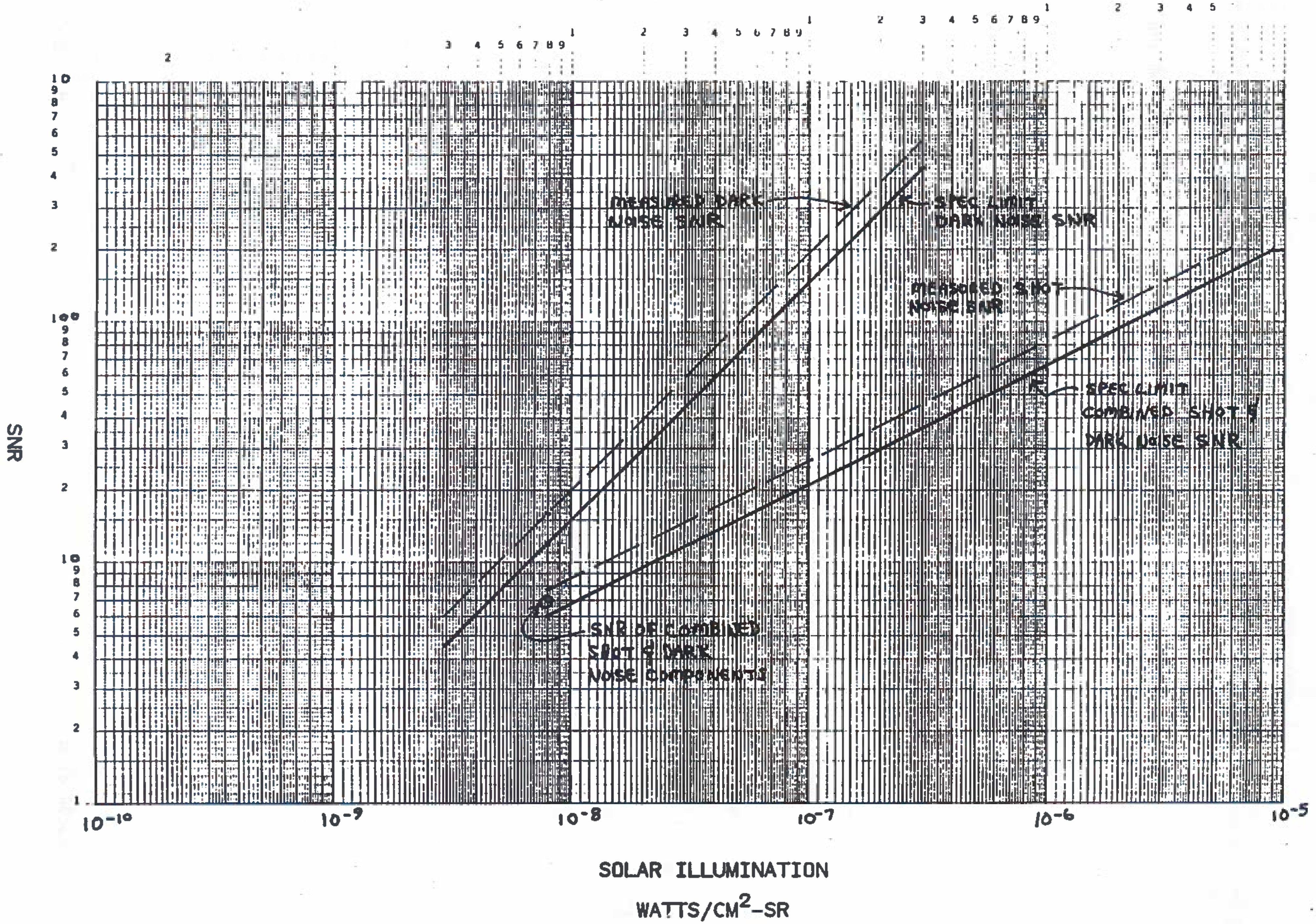
The PMT dark noise is measured in all environments in Tests 6x3x1.ST, 6x3x2.ST and 6x3x4.ST. The SNR is calculated from the measured noise (std. deviation of multiple voltage samples) vs. light level and compared against spec values.

The minimum SNR from Bearing Retrofit retest is 7.8 at 8.0 x 10^{-9} watts/cm^2-sr. The minimum SNR from Bearing Retrofit Retest is 16.0. The worst case combined PMT shot noise and dark noise SNR from bearing retrofit testing is 7.01 calculated as

$SNR=1/\sqrt{1/(SNR\ dark)^2 + 1/(SNR\ shot)^2}$.

ATTACHMENT: OLS #12 PMT channel SNR graph.

OLS #12 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 #12 bearing retrofit retest, the average Dark Noise SNR of 5 measurements at 8 x 10^{-9} watts/cm^2-SR is 16.2, or 37.0% 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 16.0, or 37.5% 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 17dB 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 #12, the following results were obtained:

CHANNEL	DELPHI	SCAN ANGLE	CONTIGUOUS COVERAGE ABOVE:	
+Z HRD	+991.2	+55.97°	427.09 n. mi.	427.67 avg.
-Z HRD	-990.2	-55.91°	428.25 n. mi.	
+Z T	+981.0	+55.39°	438.34 n. mi.	435.52 avg.
-Z T	-986.0	-55.68°	432.70 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 433.38 naut. mi.

ATTACHMENTS: None.

2.9 DATA COLLECTION RATE (3.2.1.1.9)

OLS #12 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
07-06-91 Optic Limit	11.90	11.91
09-02-91 Hot Limit	11.89	11.89
09-06-91 Cold Limit	11.91	11.90
09-11-91 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 #12. 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 #12. Analysis of the heater resistances and tolerances indicates that 5D-3 SSS heater power consumption is in spec.

OLS #12 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 #12 Power Profile

OLS #12 POWER PROFILE

SINGLE POWER				DUAL POWER	
28V MODE/LIMIT	TV +5/-8 07-04-91	TV HOT LIMIT 09-01-91	TV COLD LIMIT 09-06-91	28V LIMIT	WORST CASE (CALCULATED)
0 88W	53	53	53	131W	88
1 105W	82	82	81	148W	117
2 116W	88	89	88	159W	124
3 125W	95	96	93	168W	131
4 157W	131	131	128	200W	166
5 167W	137	139	135	210W	174
6 198W	166	167	162	241W	202
7 207W	178	180	172	250W	215
8 218W	185	187	178	261W	222
5V MODE/LIMIT					
0 4.3W	3	3	3		
1 4.3W	3	4	3		
2 4.3W	3	4	3		
3 4.3W	3	4	3		
4 4.3W	3	4	3		
5 4.3W	3	4	3		
6 4.3W	4	4	3		
7 4.3W	4	4	3		
8 4.3W	3	4	3		

2.11 MASS

2.11.1 Total Mass (3.4.1)

The weights of all OLS #12 components were not measured as part of bearing retrofit. The data taken on 12-03-86 during the original OLS 12 selloff are provided for reference. The tape recorder and encrypter serial numbers are those belonging to the system at OLS #12 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 #12 AVE is 291.01 pounds, (less BBX's, but including GSSA/DOC & Test Cable), vs. a spec limit of 298 pounds.

ATTACHMENT: OLS #12 Weight and Center-of-Gravity Tables

TABLE 1

WESTINGHOUSE FURNISHED PARTS SUPPLIED WITH OLS 12 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	5007	1.8±.5	1.8±.5	1.86	6.2±.5	6.2±.5	6.10	0.7±.5	0.7±.6	0.59	59.0	53.29	54.35	54.64
SPS	5007	3.0±.5	3.0±.5	2.94	13.8±1.0	13.8±1.0	13.76	8.6±.8	8.6±.8	8.56	70.0	68.15	69.50	69.00
SPU	5007	3.0±.5	3.0±.5	3.00	6.6±.5	6.6±.5	6.55	6.0±.5	6.0±.5	5.84	18.0	17.00	17.34	17.32
PSU	5007	2.3±.5	2.3_.5	2.78	7.0±.6	7.0±.6	6.72	7.2±.5	7.2±.5	7.15	27.0	25.60	26.10	26.31
OSU	5007	1.2±.25	1.2±.25	1.27	4.0±.5	4.0±.5	4.35	3.0±.5	3.0±.5	2.72	4.0	3.47	3.53	3.52
GSSA/DOC	5007	4.2±.5	4.2±.5	4.11	+0.1±.3	+0.1±.3	0.15	2.4±.5	2.4±.5	2.37	9.0	7.83	7.99	8.10
PR1	040	3.45±.25	3.45±.25	3.29	6.36±.25	6.36±.25	6.13	4.23±.25	4.23±.25	4.14	22.75	21.14	21.57	21.46
PR2	041	3.45±.25	3.45±.25	3.38	6.36±.25	6.36±.25	6.38	4.23±.25	4.23±.25	4.28	22.75	21.14	21.56	21.44
PR3	042	3.45±.25	3.45±.25	3.32	6.36±.25	6.36±.25	6.19	4.23±.25	4.23±.25	4.29	22.75	21.14	21.56	21.40
PR4	043	3.45±.25	3.45±.25	3.40	6.36±.25	6.36±.25	6.28	4.23±.25	4.23±.25	4.30	22.75	21.14	21.56	21.33
CABLES	(1)	-	-	-	-	-	-	-	-	-	22.0	20.88	21.30	20.49
TEST CABLE	(2)	-	-	-	-	-	-	-	-	-	6.0	6.0	6.0	6.0
										TOTAL WEIGHT	298	286.78	292.36	291.01

*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 12 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	032	1.8±.1	1.8±.1	1.86	2.7±.1	2.7±.1	2.75	2.2±.1	2.2±.1	2.18	3.59	3.34	3.59	3.62
BB2	031	1.8±.1	1.8±.1	1.83	2.7±.1	2.7±.1	2.75	2.2±.1	2.2±.1	2.18	3.59	3.33	3.59	3.66
BB3	046	1.8±.1	1.8±.1	1.83	2.7±.1	2.7±.1	2.79	2.2±.1	2.2±.1	2.20	3.59	3.33	3.59	3.72
										TOTAL WEIGHT	10.77	10.00	10.77	11.00

2.11.2 Component Mass (3.4.2, 3.4.3)

The mass of the individual components of the OLS #12 AVE are tabulated below.

Component	Spec	Measured
SSS	59.0	54.64
SPS	70.0	69.00
SPU	18.0	17.32
PSU	27.0	26.31
OSU	4.0	3.52
GSSA/DOC	9.00	8.10
PR1	22.75	21.46
PR2	22.75	21.44
PR3	22.75	21.40
PR4	22.75	21.33
BB1	3.67	3.62
BB2	3.67	3.66
BB3	3.66	3.72
Cables	32.00	20.49

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 #12 bearing retrofit, cone cooler S/N 024 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 #12 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.

2.16 ELECTROMAGNETIC COMPATABILITY (3.3.2)

OLS #12 EMC testing was conducted per Westinghouse documents BVS 2049 (Block 5D-3 Electromagnetic Compatability Test Plan) and T928546 (Block 5D-3 Electromagnetic Interference Test Procedure) during the original OLS #12 testing. This testing was conducted in two phases. Phase one consisted of testing with the BTM SSS in the unpowered launch configuration on 3/4/85 thru 3/9/85. Phase two consisted of testing using the OLS #12 system conducted 8/22/85 thru 8/29/85. The results of this testing are reported separately in Volume V of the original Qualification Test Report. A summary of the EMC test results is included in table 2.16.1 - EMC Test Results. OLS #12 meets all DMSS-OLS-300 EMC requirements.

ATTACHMENTS: Table 2.16.1 - EMC Test Results

TABLE 2.16.1

ELECTROMAGNETIC COMPATABILITY

TEST RESULTS

Test	T928546 Test Procedure Section	Data Complete	Result
Expose unpowered BTM SSS with all covers and room Temperature T Detector installed to 200 V/m for 5 minutes	5.3	03/09/85	SSS operated correctly following exposure
Measure OLS-12 Radiated Emissions system signature	6.4	08/26/85	Signature measurement completed. This test is for information only - no limits are specified.
Expose operating OLS #12 SSS to .25V/m for 5 min.	5.4	08/28/86	System operated correctly at ambient during and following exposure.
Expose unpowered OLS #12 SSS with all covers installed to 12.5V/m for 5 min.	5.5	08/29/86	System operated correctly in ambient and in post EMI TV testing following exposure. No failures traceable to EMI testing occured.

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 #12 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} = 0.764 mrad = 158 arc sec	X_{R-M} = 0.780 mrad = 161 arc sec
Y_{R-P} = 0.467 mrad = 96 arc sec	Y_{R-M} = 0.496 mrad = 102 arc sec
Z_{R-P} = 0.626 mrad = 129 arc sec	Z_{R-M} = 0.658 mrad = 136 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} = 0.027 mrad = 67 arc sec

Y_{M-P} = 0.272 mrad = 56 arc sec

Z_{M-P} = 0.270 mrad = 56 arc sec

These are within the specification limits of 120 arc seconds.

OLS 12

ORIGINAL
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APPENDIX A
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 for future reference and the remainder of the document will be discarded when the new Rev. is filed.

REVISION LETTER	REVISION DATE	AFFECTED PAGES	REVISION MADE BY
A	4/6/90	1,2, *3-6, 7-11, *12, 13-16, *17-20, 21, 22	J. SMUTKO
B	8/7/90	1, 2, 16, 16a	D. OMETZ
C	8/26/90	1, 2, 16b, 17	J. SMUTKO
D	9/21/90	1, 2, 5, 6, 18, 21	G. POLLOCK
E	2/20/91	1, 2, 17-23	R. BARK
F	2/28/91	1, 2, 17	R. BARK
G	5/20/91	22, 23	M. BARRETT
H	5/22/91	22	M. BARRETT
J	6/28/91	1-3, 22-23	SCILIPOTI
K	8/29/91	1-2, 18, 22-23	SCILIPOTI
L	11/05/91	1, 2, 23, 24	G. POLLOCK

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

Notes:

WP51\JSm01.d1

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: 12

Δ 3.1 Charge labor for this effort to the Block 5 Support and Services contract. Present G.O. number, valid thru 9/30/91, is 53741. 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.

3.2 The modification is accomplished by working revision notice G931B.

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

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

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

3.4 INCOMING INSPECTION AND SYSTEM TESTS.

OPERATION	VERIFICATION	DATE
Unpack	G.S.	9/21/90
Record serial nos. of rcvd. units:		
SSS 640R800G08 S/N 5007		
or 758R750G0N/A S/N ____		
PSU 758R050G0__ S/N ____		
SPS 651R390G0__ S/N ____		
SPU 758R040G0__ S/N ____		
OSU 640R960G0__ S/N ____		
____		
____		
____		
____	____	____
Attach copy of incoming DD1149 to this BVS for control purposes	G.S.	9/21/90
WEC Receiving Inspection	____	9/21/90
AFPRO Inspection	____	9/21/90

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.		1oct 90
9.0	"SSS assembly mounting procedure" - Mounts the SSS to the test facility reference interface for testing.		1Oct90
11	"Alignment of the oscillating assembly rotating axis with the Moore table axis." - positions the SSS for optical measurements.		3Oct90
12	"Mounting interface alignment measurements" - Determines SSS reference axis position in relation to the OATIF mirrors/SSS mounting interface.		5Oct90
—	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.		3Oct90
18	"Oscillating assembly transmission test" - Determines % transmission of telescope prior to retrofit.		3Oct 90
—	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.		3Oct90

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.	WHMcKeon	4Oct90
—	Before proceeding remove the HRD and PMT if still installed. Mount the PMT and HRD reticles.	WHMcKeon	4Oct90
14.2 to 14.3	"M1 centering test" - verifies that the optical beam is centered on M1 prior to retrofit.	WHMcKeon	5Oct90
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.	WHMcKeon	8Oct90
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.	WHMcKeon	8Oct90
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.	WHMcKeon	8Oct90
15.2.19.6 to 15.2.19.8	Defines minimum allowable voltages and angular displacement on the faceted ring.	WHMcKeon	8Oct90

<u>STEPS FROM 9RA3681 TO BE PERFORMED</u>

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.	WHMcKeon	8Oct90
15.3.12	"Encoder nadir alignment error" - Provides a formula for determining nadir alignment error.	WHMcKeon	8Oct90
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.	WHMcKeon	9Oct90
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.	WHMcKeon	10Oct90
15.6.1 to 15.6.3	"SSS Preparation for primary aux. encoder alignment." - Prepares SSS for testing of primary aux. encoder.	N/A WHMcKeon	10Oct90
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.	WHMcKeon	10Oct90

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.		10 Oct 90
	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.		10 Oct 90

3.6 MECHANICAL OPERATIONS

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

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

Verification of completion G.J.S. 1-28-91

Inspection 2/22/91

3.7 OPTICAL RE-ALIGNMENT

Optical Tests after Bearing Retrofit

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

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.	WH McKeon	20 Nov 90
9.0	"SSS assembly mounting procedure" - Mounts the SSS to the test facility reference interface for testing.	WH McKeon	20 Nov 90
11	"Alignment of the oscillating assembly rotating axis with the Moore table axis." - positions the SSS for optical measurements.	WH McKeon	20 Nov. 90
12	"Mounting interface alignment measurements" - Determines SSS reference axis position in relation to the OATIF mirrors/SSS mounting interface.	WH McKeon	20 Nov. 90
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).	WH McKeon	20 Nov. 90
18	"Oscillating assembly transmission test" - Determines % transmission of telescope.	WH McKeon	20 Nov. 90
—	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.	WH McKeon	20 Nov. 90

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.		20 Nov. 90
—	Before proceeding remove the HRD and PMT if still installed. Mount the PMT and HRD reticles.	N/A	—
14.2 to 14.3	"M1 centering test" - verifies that the optical beam is centered on M1.		20 Nov. 90
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.		27 Nov. 90
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.		27 Nov. 90

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.		27 Nov 90
15.2.19.6 to 15.2.19.8	Defines minimum allowable voltages and angular displacement on the faceted ring.		20 Nov 90
15.3.1 to 15.3.6 Note: Make <u>NO</u> adjustment in 15.3.6	"Encoder nadir adjustment" - Determines position of the encoder at the Nadir position W/R to target translater position.		26 Nov 90
15.3.12	"Encoder nadir alignment error" - Provides a formula for determining nadir alignment error.		26 Nov 90
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.		26 Nov 90
15.5 Note: Make <u>NO</u> 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.		11 Dec 90
15.6.1 to 15.6.3	"SSS Preparation for primary aux. encoder alignment." - Prepares SSS for testing of primary aux. encoder.		25 Nov 90

STEPS FROM 9RA3681 TO BE PERFORMED

STEPS		VERIFICATION	DATE
15.9 Note: Make <u>NO</u> 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.		
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.	N/A	
Reinstall HRD & PMT (OLS-16 see next page, 16a)		~~N/A~~	
—	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.	N/A	
Inspection			

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)	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)		

3.7.2 THERMAL BLANKET UPGRADE PER ECP-2B - 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	N/A	
540R561G02		
540R562H01		
540R562H02		
540R563H01		
Inspection		

3.7.2 (Cont'd.)

Install ECP-25 upgraded bracket on the 1A8 HRD/PMT Postamplifier 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.	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).		

STEPS		VERIFICATION	DATE
3.8	SSS TEST PER T927002		
	Disconnect SSS main cable connector 1A9P2	J.S.	2/6/91
	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.	J.S.	2/21/91
	Reconnect 1A9P2	J.S.	2/6/91
	Data Review		2/21/91
	Inspection		2/27/91

*3.8.1 Perform encoder optics ambient funtional test per T927002, paragraph 4.12.4 JS TECH (Done 2/21/91)

*3.8.2 Apply additional adhesive to encoder optics assembly per RN GL54D.

DATE 2-27-91 G.J.S. MANNF P 221 INSP 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 3-6-91

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

G.J.S. MANUF QC 565 INSP

DATE 3-8-91

*3.8.5 Repeat step 3.8.1

TECH J.S. DATE 3/8/91

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

STEPS		VERIFICATION	DATE
3.9	AMBIENT SYSTEM TESTS		
	QUICKTESTN.ST	DMA	5/20/91 12C-5 ~~ok~~
	QUICKTESTR.ST	DMA	5/20/91 ok
	6X2X1.ST	DMA	5/21/91 12D-3
	AHC11PT.ST - R	DMA	5/21/91 12C-5
	APC11PT.ST - P	RMc	5/23/91 ok
	AHSFB11PT.ST - R	RMc	5/22/91 ok
	6X3X1.ST - P	DMA	5/21/91 ok
	6X3X2.ST - R	DMA	5/22/91 ok
	6X3X5.ST - R	JJF	5/22/91 ok
	MHC11PT.ST - R	RMc	5/22/91 12C-10
	6X5X1.ST - P	RMc	5/22/91 ok
	6X7X1.ST	DMA	5/22/91 ok
	6X7X2.ST	DMA	5/22/91 ok
	6X9.ST	DMA	5/22/91 ok
	7X8.ST	JJF	5/23/91 OK
	Data Review	DEP	5/23/91

STEPS		VERIFICATION	DATE
3.10	THERMAL VACUUM ADJUST		
	Deleted		
3.11	VIBRATION - SSS Only		
	Inspection per PD045 checkpoint 3a		5/23/91
	checkpoint 3b		5/23/91
	Notify AFPRO Waived per S. Kirk AFPRO.		5/23/91
	Vibrate SSS, 3 Axis, acceptance level per T927686 para. 3.5		5/23/91
	WEC Inspection per PD 055	121 DD	5/24/91
	AFPRO WAIVED PER C. STUMP	121 DD	5/24/91
	PD 045 Checkpoint #4		5/24/91

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	DATE
mag	5X1X1.ST	Primary Configuration Power	DH	5/24/91
mag	5X1X4.ST	Load Operational Prog. - Processor C	DH	5/24/91
	5X1X6.ST	Initialize Primary Configuration	DH	5/24/91
mag	5X2X1.ST	Quiescent Mode Power	DH	5/24/91 ok
mag	5X2X2.ST	Primary Configuration	DH	5/24/91 ok
mag	5X2X3.ST	Primary Configuration Dual I/O	DH	5/24/91 ok
mag	5X2X4.ST	Primary Config. Dual Formatter	DH	5/24/91 ok
mag	5X2X5.ST	Primary Config. Dual Formatters & I/O	DH	5/24/91 ok
mag	5X3X1.ST	Primary Configuration EST Check	DH	5/24/91 12C-12
mag	5X5X1.ST	HRD Analog Test	DH	5/27/91 ok
mag	5X5X2.ST	PMT Analog Test	DH	5/27/91 ok
mag	5X5X3.ST	T-Channel Analog Test	DH	5/27/91 ok
mag	5X6X1.ST	PGC	RMc	5/27/91 ok
mag	5X6X2.ST	ATGC	RMc	5/27/91 ok
mag	5X6X3.ST	ASGC	QCW RMc	5/28/91 ok
mag	5X12X1.ST	Scanner Functional	DH	5/24/91 ok

REDUNDANT CONFIGURATION TESTS

		VERIFICATION	DATE
5X1X2.ST	Redundant Configuration Power	DAH	5/24/91
5X1X5.ST	Load Operational Prog. - Processor D	DAH	5/24/91
5X1X7.ST	Initialize Redundant Configuration	DAH	5/24/91
5X3X2.ST	Redundant Configuration EST Check	DAH	5/28/91 12C-1
5X6X4.ST	PGC	RMc	5/28/91 ok
5X6X5.ST	ATGC	RMc	5/28/91 ok
5X6X6.ST	ASGC	OCW. RMc	5/28/91 ok
5X12X2.ST	Scanner Functional	DAH	5/24/91 ok
(3.6.4)			
6.1	IMC HRD A/S - Redundant - AHSF3PTI.ST	DAH	5/29/91 ok
6.1.1	HRD A/S - Redundant - AHSF7PT.ST	DAH	5/27/91 ok
6.1.2	PMT A/S - Primary - APC7PT.ST	RMc	5/28/91 ok
6.1.4	Backup Encoder HRD Sync AHSFB9PT.ST	RMc RMc	~~5/25/91~~ 5/29/91
6X2X1.ST	L DC Response (must precede 6X3X1.ST)	DAH	5/27/91 ok
6X2X4.ST	T Chan Elec DC Response	DEP	5/28/91 ok
6X3X1.ST	L Chan Dark Noise - Primary	DAH	5/27/91 ok
6.4.1	HRD MTF - Primary - MHA7PT.ST	DAH	5/27/91 RC-10
6.4.2	PMT MTF - Redundant - MPA7PT.ST	DAH	5/28/91 ok
6X4X3A.ST	Ambient T MTF - Redundant	DAH	5/28/91 ok
6X6X2.ST	PMT CAL	DAH	5/27/91 ok
6X7X2.ST	990 Test	DAH	5/28/91 ok
7X5.ST	Actuator EST Test	DAH	5/28/91 ok
7X8.ST	Scanner Rest	DAH	5/24/91 ok

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.

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

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

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:

Δ 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 P3.7.5.1.2 before any alignment or sync tests

Add a one day nominal temperature T channel stability test between the two soak cycles by performing the following at approximately 2 hour intervals:

Δ 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 3.7.12.6 7

Δ 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:

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.		10/4/91
Verify completion of Thermal Vacuum		10/4/91

3.15 SPS Coax Connector repair on J10 due to defective female contact per NR 20250959.

- Remove top cover of SPS	BJ	11/4/91	(MFG)
- Remove 2 P.C. boards - A241 & A242	BJ	11/4/91	(MFG)
- Remove 640 R913G01 cable	BJ	11/4/91	(MFG)
- Remove coax connector J10 and replace with new connector	BJ	11/4/91	(MFG)
- Circuit check		11/4/91	(TEST)
- WEC Insp.	QC	11/5/91	(INSP)
- DPRO Insp. NON-SELECT PER M. LITTLE	QC	11/5/91	(DPRO INSP)
- OK to reinstall 913 cable in SPS	QC	11/5/91	
- Reinstall boards A241 & A242	CFS QC	11/6/91	
- OK to cover Insp.	QC CFS	11/7/91	
- WEC Insp.	QC	11/7/91	
- DPRO Insp. NON-SELECT PER C. STUMP.	QC	11/7/91	
- Install cover	CFS	11/7/91	
- WEC Insp.	QC	11/7/91	
- Reinstall buffer connector	CFS	11/7/91	QC

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.	NA	NA
For OLS 12 only perform the following post coax connector repair tests:		
NEWON1.ST	116 AA	11/8/91
QKTESTN.ST	116 AA	11/8/91
5X10X1SS.ST	116 AA	11/8/91
NEWON2.ST	116 AA	11/8/91
QKTESTR.ST	116 AA	11/8/91
5X10X2SS.ST	116 AA	11/8/91
Perform T927686 paragraph 3.8, Final Scan Plane Definition.	116 AA	10/28/91
Perform T927686 paragraph 3.9, Inspection, Data Review, and Preparation for Shipment except Delete paragraph 3.9.2, Weight and Center of Gravity.	QC 121	11/18/91
Pin Retention	QC 121	11/18/91
Inspection	QC [illegible]	11/18/91
Data Review	QC 121	11/18/91
AFPRO	0332	11/19/91
Pack		11/20/91
Ship		11/20/91 QC 121

OLS PROGRAM DIRECTIVE

-CONTINUATION SHEET- DIRECTIVE NO. 045 DATE 12/12/88

CHECKPOINT 3.a
(Before Vibration)
Blue Room

			RESP
A.	T channel adjustment tool was removed from PSU per Program Directive #046. PSU was inspected before and after cover was installed.	N/A	MFG
		N/A	INSP
B.	SSS and PSU pots are staked per PS 82560SA.	GJS	MFG
			INSP
C.	SSS mirrors are staked.	GJS	MFG
			INSP
D.	Thrust bearing (9RA3893) and limit switch assembly 758R962 have been removed for vibration. Buffer connectors are to remain installed.	GJS	MFG
			INSP
E.	Pre-vibration inspection of the SSS, SPS, SPU, PSU, OSU, GSSA, GSSB and blankets has been performed. (<u>NOTE</u>: If the covers have not been removed from the SPS, SPU and OSU since unit verification at Checkpoint 2.a, step C, perform only external pre-vibration inspection; do <u>not</u> remove covers.).	SSS only.	INSP
F.	Presented to Air Force for pre-vibration inspection. Waived S. Kirk DPRO.		INSP
G.	Protective connector covers are in place on all unit external connectors and the SSS.	QC 109 SSS only.	INSP

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.

CHECKPOINT 3.b
(Before Vibration, in PQL)

			RESP
A.	Vibration area is clean and PQL procedures 735 and 737 followed.	☒	QE(PQL)
B.	Vibration test equipment is within calibration date.	☒	QE(PQL)
C.	System monitoring equipment is within calibration date.	☒	QE
D.	Clean room hats, gowns, masks and gloves are available and in use.	☐	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.

OLS 12,555

CHECKPOINT #4
(After Vibration)

		RESP
A.	Westinghouse and Air Force post vibration inspection per BVS PD 055 has been performed on all assembles, including GSSA, GSSB and Blankets. (Verify that SSS and PSU pots are staked; or stake per PS 82560SA)	INSP
B.	The thrust bearing (9RA3893) and limit switch assembly 758R962 have been installed for thermal vacuum acceptance test.	MFG INSP
C.	Area is clean and contains no miscellaneous parts or extraneous hardware.	QE
D.	Anti-static mats and wrist straps are in place and ready for use.	QE
E.	Test equipment checked per Program Directive ~~#022~~ 033 less paragraphs IID and IIE.	QE
F.	Perform Test Equipment Operational check per PD ~~022~~ 033, paragraphs IID and IIE.	TD
G.	The SPS, SPU, PSU, OSU, TCP, Recorders and BB's are interconnected with system cable and ground bus per 9RD7845. Handling Procedures 9RA4220, 9RA4225 and 9RA4026 were followed.	TD

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.

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APPENDIX B
RDS REWORK AND RETEST PROCEDURE

For OLS 12, 13, 14, 15 and 16

OLS 12

Contract F04701-90-C-0028

Prepared For

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

Prepared By

WESTINGHOUSE ELECTRIC CORPORATION
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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

OLS12

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.

Incorporation of RDS 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

Record Serialization of Units to be reworked here:

OLS 536R500G01 5007
SPS 651R390G01 5007
OSU 640R960G03 5007

Record Assembly Serial Numbers here:

	SPS Mother Plate Assy	(651R342)	SN	0001
640R570G03	Prime 9C Board	(775R076 or 775R077)	SN	5013
640R570G03	Redundant 9C Board	(775R076 or 775R077)	SN	5014
640R544G03	Prime SDF-5 Board	(775R078 or 775R079)	SN	5012
640R544G03	Redundant SDF-5 Board	(775R078 or 775R079)	SN	5013
	OSU Mother Plate Assy	(522R783)	SN	3076-0001
	OSU Top Cover Assy	(644R046)	SN	5007
640R522G03	OSU-1 Board	(775R080)	SN	5007
640R524G03	OSU-2 Board	(775R081)	SN	5007

OLS12

2.0 Rework and Assembly Retest Plan

2.1 Pre-Rework

Incoming Inspection of Returned Units		Verification Mfg/Date	Verification Insp/Date
SPS (651R390)	WEC		1/4/91
SPS (651R390)	DPRO		
OSU (640R960)	WEC		1/4/91
OSU (640R960)	DPRO		[illegible]

2.2 Rework and Inspection

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

		Mfg/Date	Insp/Date
System Rework (536R500)	GG42D		
SPS Chassis Rework (651R390) OLS-12, 14, 15 & 16 OLS-13	 GG36D GG71D	2/6/91	S&IS C25
SPS Mother Plate Assy Rework (651R342) OLS-12, 14, 15 & 16 OLS-13	 GG35D GG70D	1/29/91 S&IS	1/28/91
SPS Matrix Plate Wiring Rework (wiretabs 322R959 or 322R960) OLS-12 OLS-13 OLS-14 to 16	 GG17D GG67D GG16D	1/28/91 S&IS	1/28/91
9C board assy rework (775R076 or 775R077) OLS-12 OLS-13 OLS-14 to 16	 GG10D, GG15D & GG20D GG69D GG11D, GG15D & GG21D	S&IS C45	2/15/91
SDF-5 board assy rework (775R078 & 775R079) OLS-12 OLS-13 OLS-14 to 16	 GG08D, GG14D & GG18D GG68D GG09D, GG14D & GG19D	[illegible]	2/15/91

Verification

		Mfg/Date	Insp/Date
OSU chassis rework (640R960)		1/21/91	2/14/91
S/N 5007, 5009-5011	GG33D		
S/N 5008	GG67D		
OSU Top Cover Rework (644R046)		017 1/21/91	2/14/91
S/N 5007, 5009-5011	GG32D		
S/N 5008	GG65D		
OSU Mother Plate Rework (522R783)		S&IS 017 1/21/91	1/23/91
S/N 5007, 5009-5011	GG34D		
S/N 5008	GG66D		
OSU Matrix Plate Wiring Rework (wiretab 322R958)		S&IS 017 1/21/91	1/23/91
S/N 5007-5011	GG22D		
OSU-1 board assy rework (775R080)		017 2/14/91	2/14/91
S/N 5007, 5009-5011	GG12D, GG15D & GG23D GG54A, GG55A & GG56A		
S/N 5008	GG63D		
OSU-2 board assy rework (775R081)		S&IS 017 2/14/91	2/14/91
S/N 5007, 5009-5011	GG13D, GG15D & GG24D		
S/N 5008	GG64D		

OLS12

2.3 Assembly Level Retest

2.3.1 Prime Side 9C Retest (775R076/775R077) SN 5014

	Date	Verification
Rework Complete - No open items on ICT	1/14/91	
Room Temperature Retest per paragraph 4.3 of T814A76	1/21/91	
Pre Coat Data Review		1/[illegible]/91
WEC Inspection - OK to Coat	1/26/91	
DPRO Inspection - OK to Coat	1/29/91	
Conformal Coat	2-2-91	
Eight Non-powered Temperature Cycles	2-3-91	
Hi/Low Temperature Test per paragraph 4.7 of T814A76	2-4-91	
Data Review Complete	2/5/91	
WEC Inspection - Assembly Complete	2/7/91	
DPRO Inspection - Assembly Complete		2/8/91

* open item on C/T for coating JEK 2/2/91, OK 2/7/91

OLS12

2.3.2 Redundant Side 9C Retest (775R076/775R077) SN 5013

Rework Complete - No open items on ICT	1-14-91	S&IS 103
Room Temperature Retest per paragraph 4.3 of T814A76	1-21-91	AJA
Pre Coat Data Review		1/22/91
WEC Inspection - OK to Coat		1/26/91
DPRO Inspection - OK to Coat		1/28/91
Conformal Coat		2/2/91
Eight Non-powered Temperature Cycles		2/3/91
Hi/Low Temperature Test per paragraph 4.7 of T814A76		02-05-1991
Data Review Complete		2/6/91
WEC Inspection - Assembly Complete		2/7/91
DPRO Inspection - Assembly Complete		2/8/91

* open item on c/t for coating JEK 2/2/91 OK 2/7/91

2.3.3 Prime Side SDF-5 Retest (775R078/775R079) SN 5012

	Date	Verification
Rework Complete - No open items on ICT	1/24/91	
Room Temperature Retest per paragraph 4.3 of T814A78	1/31/91	
Pre Coat Data Review	1/31/91	McJAMES QC
WEC Inspection - OK to Coat	2/4/91	QC
DPRO Inspection - OK to Coat	2/4/91	
Conformal Coat	2/5/91	
Eight Non-powered Temperature Cycles	2/9/91	
Hi/Low Temperature Test per paragraph 4.7 of T814A78	2/10/91	3224 QA
Data Review Complete	2/11/91	
WEC Inspection - Assembly Complete	2-11-91	
DPRO Inspection - Assembly Complete	2/11/91	

0LS12

2.3.4 Redundant Side SDF-5 Retest (775R078/775R079) SN 5013

Rework Complete - No open items on ICT	1/26/91	
Room Temperature Retest per paragraph 4.3 of T814A78	1/31/91	
Pre Coat Data Review	1/31/91	McJames
WEC Inspection - OK to Coat	2/4/91	
DPRO Inspection - OK to Coat	2/4/91	
Conformal Coat	2/8/91	
Eight Non-powered Temperature Cycles	2/9/91	
Hi/Low Temperature Test per paragraph 4.7 of T814A78	2/10/91	
Data Review Complete		2/11/91
WEC Inspection - Assembly Complete	2-11-91	QC 25
DPRO Inspection - Assembly Complete	2/12/91	

0L512

2.3.5 OSU-1 Retest (775R080) SN 5007

	Date	Verification
Rework Complete - No open items on ICT	2/2/91	
Room Temperature Retest per paragraph 4.3 of T814A80	2/3/91	[illegible]
Pre Coat Data Review	2/4/91	QC
WEC Inspection - OK to Coat	2/6/91	
DPRO Inspection - OK to Coat	2/6/91	
Conformal Coat	2/6/91	SS'S 009
Eight Non-powered Temperature Cycles	2-11-91	[illegible]
Hi/Low Temperature Test per paragraph 4.7 of T814A80	2-11-91	[illegible]
Data Review Complete	2/13/91	QC
WEC Inspection - Assembly Complete	2/13/91	QC 775
DPRO Inspection - Assembly Complete	2/13/91	

2.3.6 OSU-2 Retest (775R081) SN 5007

	Date	Verification
Rework Complete - No open items on ICT	1/18/91	S&IS 026
Room Temperature Retest per paragraph 4.3 of T814A81	1/29/91	0469 AIA
Pre Coat Data Review		1/29/91
WEC Inspection - OK to Coat		1/31/91
DPRO Inspection - OK to Coat		1/31/91
Conformal Coat	1/31/91	S&IS C28
Eight Non-powered Temperature Cycles	02-06-1991	[illegible]
Hi/Low Temperature Test per paragraph 4.7 of T814A81	2/7/91	0469 AIA
Data Review Complete	✓	2/7/91
WEC Inspection - Assembly Complete	2-7-91	
DPRO Inspection - Assembly Complete		2/8/91

0LS12

2.3.7 OSU Assembly Retest (640R960) SN 5007

	Date	Verification
*Rework Complete - No open items on ICT	2/15/91	
Room Temperature Retest per paragraph 4.1 and 4.2 of T814A56	02-15-1991	
Hi/Low Temperature Test per paragraph 4.7 of T814A56	2/16/91	
Data Review Complete	2/18/91	Aw
WEC Inspection - Assembly Complete	2-19-91	
DPRO Inspection - Assembly Complete	2/19/91	

* open item # 80 2/15/91 JEK
No impact on test.

3.0 Subsystem Level Retest Procedure

3.1 Ambient Subsystem Verification

	Date	Verification
Rework Complete - No unexplained Open Items on ICT	3/25/91	
Checkpoint A of PD 045 (attach copy)	3/25/91	
Run the following Test Files (Room Temperature):		
NEWON1SS.ST	3/25/91	0982
QKTESTN.ST	3/25/91	0301 A/A
5X20X1SS.ST ~~RDSTSTSS.ST~~	3/25/91	0301 A/A
NEWON2SS.ST	3/25/91	
QKTESTR.ST	3/25/91	0301 A/A
5X20X2SS.ST ~~RDSTSTSS.ST~~	3/25/91	0301 A/A
5X18X1SS.ST	4/25/91	3146
5X18X2SS.ST	4/25/91	3146 A/A
5X18X3SS.ST	4/25/91	0301 A/A
5X18X4SS.ST	4/25/91	0301 A/A

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.

	Date	Verification
Install the KG-46 data encrypter and KG-28 decrypter. Check out the KG-28 set-up using the ST-19 verification procedure	4/25/91	
Run the following test files:		
NEWON1SS.ST	4/25/91	0982 A/A
5X20X3SS.ST ~~RDSTST.ST~~	4/25/91	A/A

OLS 12 BVS 2600 3/13

OLS PROGRAM DIRECTIVE

-CONTINUATION
SHEET-

DIRECTIVE NO. 045

DATE 12/12/88

CHECKPOINT #A

(Before Subsystem Test, ~~in Block 5 Clean Room~~, per T927000)
PQL 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). SPS, SPU, PSU, OSU, + CABLES		INSP	
E.	Test equipment configuration checked per Program Directive ~~#022 less paragraphs IID and IIE.~~ #033 3/22/91		QE	PQL
F.	Perform Test Equipment Operational Check per ~~PD022~~ PD033 paragraphs IID and IIE.		TD	PQL
G.	Review open ICT items on the SPS, SPU, PSU and OSU, and evaluate closure prior to moving to subsystem test. OPEN T SPEC RNs WILL BE EVALUATED DURING TEST. 3/22/91		QE 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.		TD	PQL
I.	Item annotated on OLS SYSTEM OLS12 ICT that units are ready for subsystem test.		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.

NEWON2SS.ST 4/25/91

5X20X4SS.ST ~~RDSTST.ST~~ 4/25/91 A/A

NEWOND1.ST 4/25/91 869 A/A

5X20X3SS.ST ~~RDSTSTSS.ST~~ 4/25/91 2869 A/A

NEWOND2.ST 4/25/91

5X20X4SS.ST ~~RDSTST.ST~~ 4/25/91

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. Later vibrations due to rework or RN incorporation shall be recorded on the units ICT.

Pre-Vib Data Review 4/26/91 JRH

WEC Inspection - OK to Vibrate 4/26/91

DPRO Inspection - OK to Vibrate 4/26/91

Vibrate SPS - x-axis, random only
5D3 acceptance level per PQL737, nonpowered PQL 243 4/26/91

Vibrate OSU - x-axis, random only
5D3 acceptance level per PQL737, nonpowered PQL 243 4/26/91

WEC Inspection - Post Vib 4/26/91

DPRO Inspection - Post Vib 4/26/91 DPRO WAVE PER R.BA JH

3.3 Thermal Test

Checkpoint B of PD-045
(attach copy) 4/26/91

Install Thermocouples (PQL operation) 4/27/91 PQL 111

OLS 12 4/25/91 [illegible]

O L S P R O G R A M D I R E C T I V E

-CONTINUATION SHEET-   DIRECTIVE NO. 045   DATE 12/12/88

CHECKPOINT #B

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

			RESP
A.	PQL thermal chamber is clean and area contains no miscellaneous parts or extraneous hardware.	321	QE
B.	Assembly and cable connectors (buffered and unbuffered) were checked before cabling up, and no damage was found. (<u>Note</u>: Where buffer connectors are in-place, check the viewable side; do <u>not</u> remove from assembly.) <u>VERIFY COLOR CODE ON BUFFER CONNECTORS PER PD 034, APPENDIX B</u>.	QC	INSP
C.	SPS, SPU, PSU and OSU tranported per 9RA4220.		MFG
D.	Assemblies SPS, SPU and TCP are connected to system cable connectors and each is grounded to the ground bus per 9RD7845.	JRH	TD
E.	Test equipment is in calibration as required in Program Directive ~~#022~~ 023 less paragraphs IID and IIE.		QE
F.	Perform Test Equipment operational check per PD ~~022~~ 023 paragraphs IID and IIE.	JRH	TD

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.

3.3.1 <u>Ambient Verification</u>

Run the following Test Files (Room Temperature):

	Rerun	Date	Verification	Date A
NEWON1.ST	5/2 2889 A|A	4/26/91	2889 A|A	5/7 4/2
QKTESTN.ST	5/2 2889 A|A	4/26/91	2889 A|A	5/7 4/2
5X20X1SS.ST ~~RDSTSTSS.ST~~	5/2 2889 A|A	4/26/91	2889 A|A	5/7 4/2
NEWON2.ST	5/2 2889 A|A	4/26/91	2889 A|A	5/7 4/2
QKTESTR.ST	5/2 2889 A|A	4/26/91	2889 A|A	5/7 4/2
5X20X2SS.ST ~~RDSTSTSS.ST~~	5/2 2889 A|A	4/26/91	2889 A|A	5/7 4/2
5X18X1SS.ST		5/2/91	2889 A|A	5/7
5X18X2SS.ST		5/2/91	U301 A|A	5/7
5X18X3SS.ST		5/3/91	U301 A|A	5/7/9
5X18X4SS.ST		5/3/91	U301 A|A	5/7/9

3.3.2 Thermal Cycle #1

3.3.2.1 Hot Temperature

	Date	Verification	Data Rev.
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.	5/4/91	RMc	
Run 5x18x1SS.ST	5/4/91	RMc	12C-5 5/7/91
NEWON1.ST 5x20x1SS.ST ~~RDSSTSTSS.ST~~	5/4/91	RMc	5/7/91
Enter CON 0 42	5/4/91		
Enter OLS OFF	5/4/91		

3.3.2.2 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.	5/4/91	A/A	
Run 5x18x1SS.ST	5/4/91		5/7/91
NEWON2.ST 5x20x2SS.ST ~~RDSSTSTSS.ST~~	5/4/91	A/A	12C-5 5/7/91 12C-6
Enter CON 0 42	5/4/91	A/A	
Enter OLS OFF	5/4/91	A/A	

3.3.3 Thermal Cycle #2

3.3.3.1 Hot Temperature

	Date	Verification	Date
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.	5/4/91	2087 AIA	
Run 5x18x2SS.ST	5/5/91	1301 AIA	909 5/7
5X20X1SS.ST NEWON1.ST ~~RDSSTSTSS.ST~~	5/5/91	1301 AIA	909 5/7
Enter CON 0 42	5/5/91	1301 AIA	
Enter OLS OFF	5/5/91	1301 AIA	

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.	5/5/91	1301 AIA	
Run 5x18x2SS.ST	5/5/91	3146 AIA	909 5/7
5X20X2SS.ST NEWON2.ST ~~RDSSTSTSS.ST~~	5/5/91	3146 AIA	909 5/7
Enter CON 0 42	5/5/91	3146 AIA	
Enter OLS OFF	5/5/91	3146 AIA	

3.3.4 Thermal Cycle #3

3.3.4.1 Hot Temperature	Date	Verification	*Data Revie*
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.	5/5/91	3146 QA	
Run 5x18x3SS.ST	5/5/91	[illegible]	5/7/91
5X20X1SS.ST NEWON1.ST ~~RDSSTSTSS~~.ST	5/5/91	2889 A/A	5/7/91
Enter CON 0 42	5/5/91	2889 A/A	
Enter OLS OFF	5/5/91	2889 A/A	

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.	5/5/91	2889 A/A
Run 5x18x3SS.ST	5/5/91	[illegible] 5/7/91
5X20X2SS.ST NEWON2.ST ~~RDSSTSTSS.~~ST	5/5/91	2889 A/A 5/7/91
Enter CON 0 42	5/5/91	[illegible]
Enter OLS OFF	5/5/91	2889 A/A

3.3.5 Thermal Cycle #4

3.3.5.1 Hot Temperature	Date	Verification	Data k
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.	5/6/91	U301 A/A	
Run 5x18x4SS.ST NEWON1.ST	5/6/91	U301 A/A	909 5/7
5X20X1SS.ST RDSSTSTSS.ST	5/6/91	U301 A/A	909 5/7
Enter CON 0 42	5/6/91	U301 A/A	
Enter OLS OFF	5/6/91	U301 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.	5/6/91	3146 A/A	
Run 5x18x4SS.ST NEWON2.ST	5/6/91	2889 A/A	909 5/7
5X20X2SS.ST ~~RDSSTSTSS.ST~~	5/6/91	3146 A/A	909 5/7
Enter CON 0 42	5/6/91	2889 A/A	
Enter OLS OFF	5/6/91	2889 A/A	

3.3.6 Thermal Cycle #5

3.3.6.1 Hot Temperature

	Date	Verification	Data Rev
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.	5/6/91	[illegible]	
Run 5x18x1SS.ST	5/7/91	3146 A|A	5/7/91 12C-5
5x20x1SS.ST NEWON1.ST ~~RDSSTSTSS~~.ST	5/7/91	3146 A|A	5/7/91
Enter CON 0 42	5/7/91	3146	
Enter OLS OFF	5/7/91	3146	

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.	5/7/91	2665 A|A	
Run 5x18x1SS.ST	5/8/91	2665 A|A	5/10/91
5x20x2SS.ST NEWON2.ST ~~RDSSTSTSS~~.ST	5/8/91	2665 A	5/10/91
Enter CON 0 42	5/8/91	883 A	
Enter OLS OFF	5/8/91	393	

3.3.7 Thermal Cycle #6

3.3.7.1 Hot Temperature	Date	Verification	*Data*
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.	5/8/91	0301 QA	
Run 5x18x2SS.ST	5/9/91	0301 QA	5/1 12 C:
5X20X1SS.ST NEWON1.ST ~~RDSSTSTSS.ST~~	5/9/91	0301 QA	5/10/
Enter CON 0 42	5/9/91	0301 QA	
Enter OLS OFF	5/9/91	0301 QA	

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.	5/9/91	3146 QA	
Run 5x18x2SS.ST	5/9/91	3146 QA	5/1
5X20X2SS.ST NEWON2.ST ~~RDSSTSTSS.ST~~	5/9/91	3146 QA	5/1
Enter CON 0 42	5/9/91	3146 QA	
Enter OLS OFF	5/9/91	3146 QA	

3.3.8 Thermal Cycle #7

3.3.8.1 Hot Temperature	Date	Verification	Date Rev
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.	5/9/91	[illegible]	
Run 5x18x3SS.ST	5/9/91	[illegible]	5/10/9 12C-5
5x20x1SS.ST NEWON1.ST ~~RDSSTSTSS.~~ST	5/9/91	[illegible]	5/10/91
Enter CON 0 42	5/9/91	2989	
Enter OLS OFF	5/9/91	2989	

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.	5/10/91	3146 A/A	
Run 5x18x3SS.ST	5/10/91	3146 A/A	5/10/91
5x20x2SS.ST ~~RDSSTSTSS~~.ST	5/10/91	3146 A/A	5/10/91 12C-5
Enter CON 0 42	5/10/91	3146 A/A	
Enter OLS OFF	5/10/91	3146 A/A	

3.3.9 Thermal Cycle #8

3.3.9.1 Hot Temperature

Data Re

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. 5/10/91 3146 A|A

Run the following dual prime Test Files:

✓ NEWOND1.ST	5/10/91	3146 A|A	5/13
✓ 5x3x1SS.ST	5/10/91	3146 A|A	5/13
✓ 5x3x5SS.ST	5/10/91	3146 A|A	5/13/
5x5x1SS.ST	5/10/91	3146 A|A	5/13
✓ 5x6x1SS.ST	5/10/91	2888 A|A	5/13
✓ 5x8x1SS.ST	5/10/91	2888	5/13.
5X9X1SS.ST	5/10/91	12C-8	5/1.
✓ 5X10X1SS.ST	5/10/91	[illegible] A|A	5/13.
✓ 5X11X1SS.ST	5/10/91	[illegible]	5/13/9
✓ 5X12X1SS.ST	5/10/91	[illegible]	5/13/
✓ 5X13X1SS.ST	5/10/91	2889 A|A	5/13/7
✓ 5x13x3SS.ST	5/10/91	589	5/13/71
5X14X1SS.ST	5/10/91	A|A	5/13/7.
✓ 5X16X1SS.ST	5/10/91	2883 A|A	5/13/9.
✓ 5X17X1SS.ST	5/10/91	2885	5/13/91
5X19X3SS.ST	N/A for	OLS 12	
✓ 5X2X1SS.ST	5/10/91	417	5/13/91
✓ 5X2X2SS.ST	5/10/91	[illegible]	5/13/91

Run the following dual prime Test Files:

			Data Revw
✓	NEWOND2.ST	5/10/91	5/13/9
✓	5x3x2SS.ST	5/11/91	5/13/91
✓	5x3x6SS.ST	5/11/91	5/13/91
✓	5x5x2SS.ST	5/11/91	5/13/91
✓	5x6x2SS.ST	5/11/91	5/13/91
✓	5x8x2SS.ST	5/11/91	5/13/91
✓	5X9X2SS.ST	5/11/91	5/13/91
✓	5X10X2SS.ST	5/11/91	5/13/91
✓	5X11X2SS.ST	5/11/91	5/13/91
✓	5X12X2SS.ST	5/11/91	5/13/91
✓	5x13x2SS.ST	5/11/91	5/13/91
✓	5x13x4SS.ST	5/11/91	5/13/91
✓	5X14X2SS.ST	5/11/91	5/13/91
✓	5X16X2SS.ST	5/11/91	5/13/91
✓	5X17X2SS.ST	5/11/91	5/13/91
✓	5X19X4SS.ST	N/A for OLS 12	Fails
		5/11/91	
		5/11/91	

			Data Revi
Install the KG-46 data encrypter and KG-28 decrypter. Check out the KG-28 set-up using the ST-19 verification procedure.	SEP	4/13/91	
Run the following test files:			
NEWOND1.ST	5/13/91	3145 BIA	5/14
5X20X3SS.ST ~~RDSSTSTSSE.ST~~	5/13/91	3145 BIA	5/14/9
NEWOND2.ST	5/13/91	3145 BIA	5/14/9
5X20X4SS.ST ~~RDSSTSTSSE.ST~~	5/13/91	3145 BIA	5/14/9,
Enter CON 0 42	5/13/91	3145 BIA	
Enter OLS OFF	5/13/91	3145 BIA	
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.	5/11/91	3145 BIA	
Run the following dual prime Test Files:			
✓ NEWOND1.ST	5/11/91	3145 BIA	5/13
✓ 5x3x1SS.ST	5/11/91	3145 BIA	5/13/9
✓ 5x3x5SS.ST	5/11/91	3145 BIA	5/13/9
✓ 5x5x1SS.ST	5/11/91	3145 BIA	5/13/9
✓ 5x6x1SS.ST	5/11/91	3145 BIA	5/13/91
✓ 5x8x1SS.ST	5/11/91	3145 BIA	5/13/91
✓ 5X9X1SS.ST	5/11/91	3145 BIA	5/13/91
✓ 5X10X1SS.ST	5/11/91	3145 BIA	5/13/91 12C-7
✓ 5X11X1SS.ST	5/11/91	3145 BIA	5/13/91

			Date Revi
✓ 5X12X1SS.ST	5/11/91	3145 A/A	5/13/91
✓ 5x13x1SS.ST	5/11/91	3145 A/A	5/13/91
✓ 5x13x3SS.ST	5/11/91	3145 A/A	5/13/91
✓ 5X14X1SS.ST	5/11/91	3145 A/A	5/13/91
✓ 5X16X1SS.ST	5/11/91	3145 A/A	5/13/91
✓ 5X17X1SS.ST	5/11/91	3145 A/A	5/13/91
~~5X19X3SS.ST~~	NA For OLS #12		
✓ 5X2X1SS.ST	5/11/91	2889 A/A	12C-6
✓ 5X2X2SS.ST	5/11/91	2889 A/A	5/13/91

Run the following dual redundant Test Files:

NEWOND2.ST	5/11/91	2889 A/A	5/13/91
✓ 5x3x2SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5x3x6SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5x5x2SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5x6x2SS.ST	5/11/91	2889 A/A	5/13/91 12C-6
✓ 5x8x2SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5X9X2SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5X10X2SS.ST	5/11/91	[illegible]	5/13/91
✓ 5X11X2SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5X12X2SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5x13x2SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5x13x4SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5X14X2SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5X16X2SS.ST	5/11/91	2889 A/A	5/13/91
✓ 5X17X2SS.ST	5/11/91	2889 A/A	5/13/91

Data Revi

5X16X2SS.ST	see previous page	
5X17X2SS.ST		
~~5X18X4SS.ST~~	NA for OLS #12	
Install the KG-46 data encrypter and KG-28 decrypter. Check out the KG-28 set-up using the ST-19 verification procedure.	5/13/91	314b AIA
Run the following test files:		
NEWOND1.ST	5/13/91	314b AIA 5/14/91
5X20X3SS.ST ~~RDSSTSTSSE.ST~~	5/13/91	314b AIA 5/14/91
NEWOND2.ST	5/13/91	314b AIA 5/14/91
5X20X4SS.ST ~~RDSSTSTSSE.ST~~	5/13/91	DEP
Enter CON 0 42	5/13/91	DEP
Turn OLS and TCP OFF, bring chamber from cold to +50 ± 10° C and allow to soak for 2 hours minimum to prevent moisture from condensing on units	5/17/91	DEP
Return chamber to room temperature and remove thermocouples.	5/17/91	DEP
Subsystem Data Review	5/17/91	DEP
Subsystem Test Complete	5/17/91	DEP
Final WEC Inspection	No NEED to Submit TO INSPECTION.	
Final DPRO Inspection		

BVS 2693

DATE 20 March 1992

ORIGINATOR J. Scilipoti

REV -

F12

OLS #12 BEARING RETROFIT

ACCEPTANCE TEST REPORT
VOLUME III OF III
ALIGNMENT AND SYNCHRONIZATION CURVES

(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. REFPLN Plots.. 1

2. Align/Sync Plotted with Respect to REFPLN.................. 4
   - Alignment - HRD.................................. 5
   - - T.................................. 6
   - - PMT.................................. 7
   - Synchronization - HRD.................................. 8
   - - T.................................. 9
   - - PMT.................................. 10

3. Alignment/Synchronization For All Modes.................... 12
   - Alignment - HRD.................................. 13
   - - T.................................. 18
   - - PMT.................................. 23
   - Synchronization - HRD SDF & SDS.......................... 28
   - - HRD RTDF & RTDS.......................... 36
   - - T SDF & SDS.......................... 42
   - - T RTDF & RTDS.......................... 50
   - - PMT SDS & RTDS.......................... 52

4. Synchronization Using Backup Encoder & Encoder Simulator..... 62

ABBREVIATIONS

AS	Along Scan (Synchronization)
AT	Along Track (Alignment)
SD	Surface Distance
SDF	Stored Data Fine
SDS	Stored Data Smooth
RTD F	Real Time Data - Fine
RTD S	Real Time Data - Smoothed
H	HRD Channel
T	T(Thermal) Channel
P	PMT Channel

1. REFPLN PLOTS

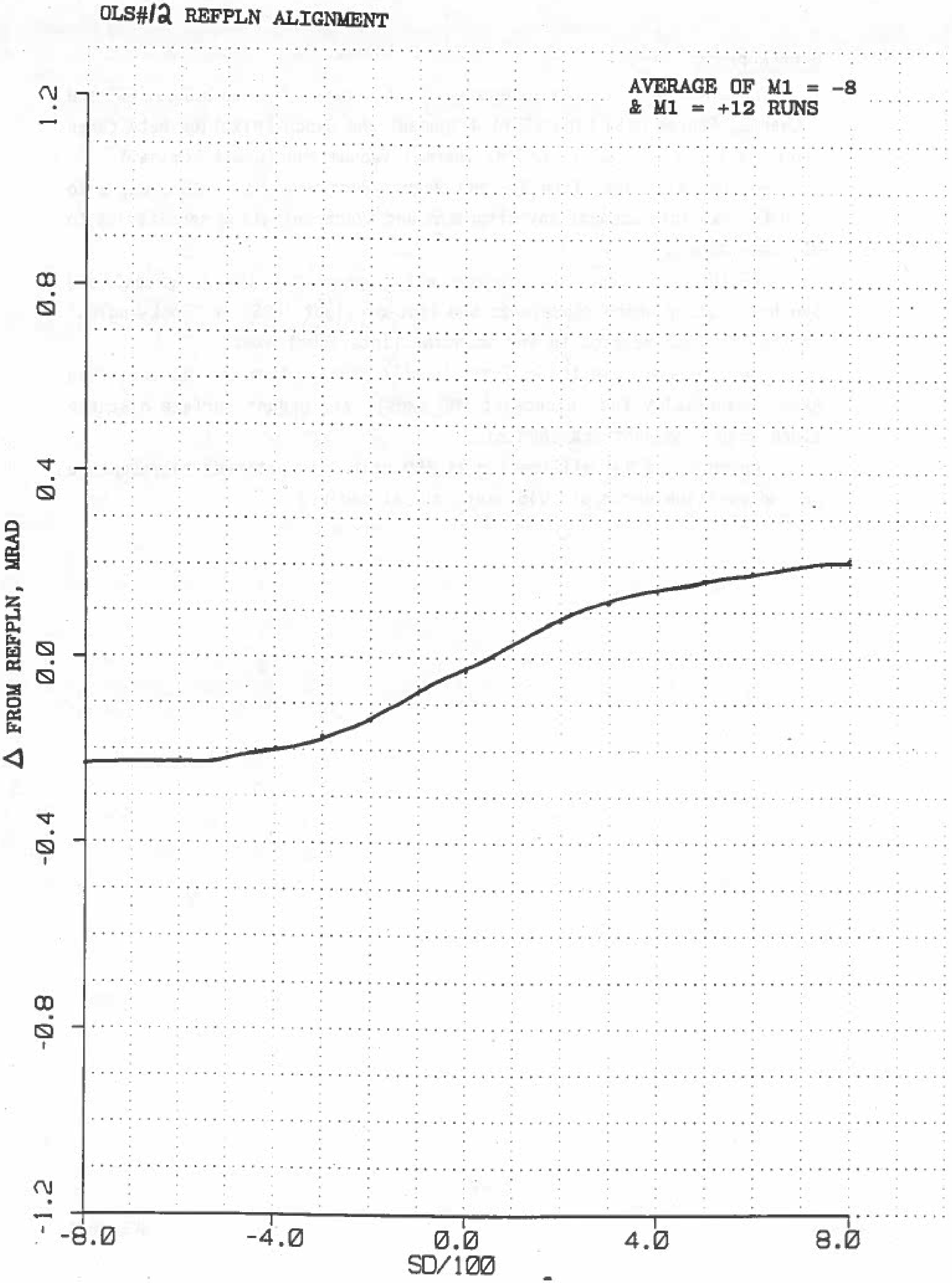
These are the computer-generated least-squares fits to OLS #12 HRD and T Channel Stored Data Fine (SDF) Alignment and Synchronization data taken from the final +5•C SSS/ -8•C M1 Thermal Vacuum run (Orbit Nominal).

For OLS #12, data from Thermal Vacuum Runs with M1 = +12•C was also used to take into account any Alignment and Synchronization sensitivity to M1 temperature.

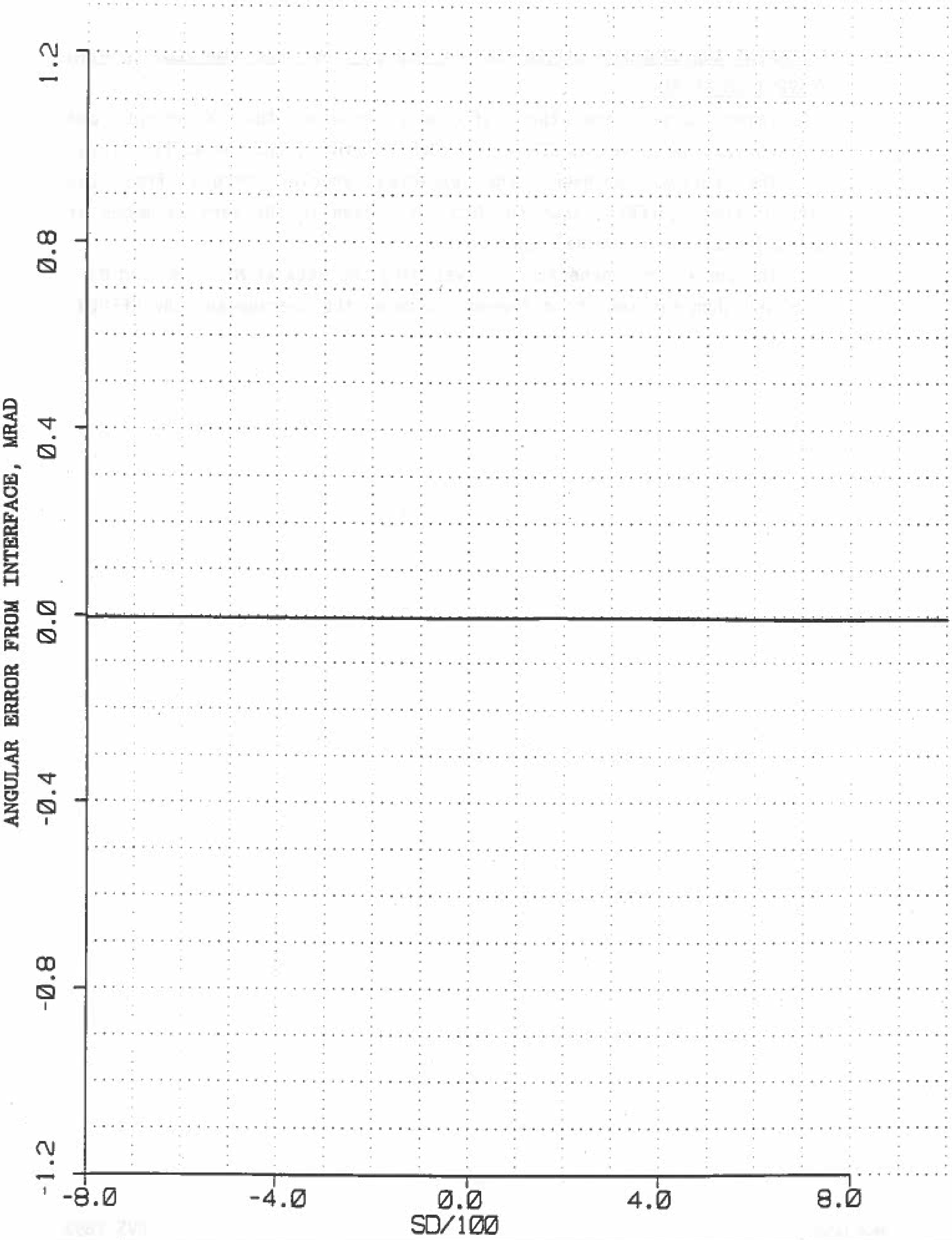
REFPLN is a computer program which generates the Alignment and Synchronization which represents the line-of-sight (LOS) or "look-angles" of the SSS with respect to the mounting (Interface) axes.

The curves are plotted as Error in milliradians from the OLS Interface Axes (essentially the spacecraft PMP axes), vs. ground surface distance along scan from subtrack (Nadir).

(An error of 0.1 milliradian at 450 naut. mi. altitude represents a ground position error of .045 naut. mi. at nadir.)


OLS#12 REFPLN ALIGNMENT
AVERAGE OF M1 = -8
& M1 = +12 RUNS
Δ FROM REFPLN, MRAD
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
-8.0
-4.0
0.0
4.0
8.0
SD/100

OLS#12 REFPLN SYNCHRONIZATION



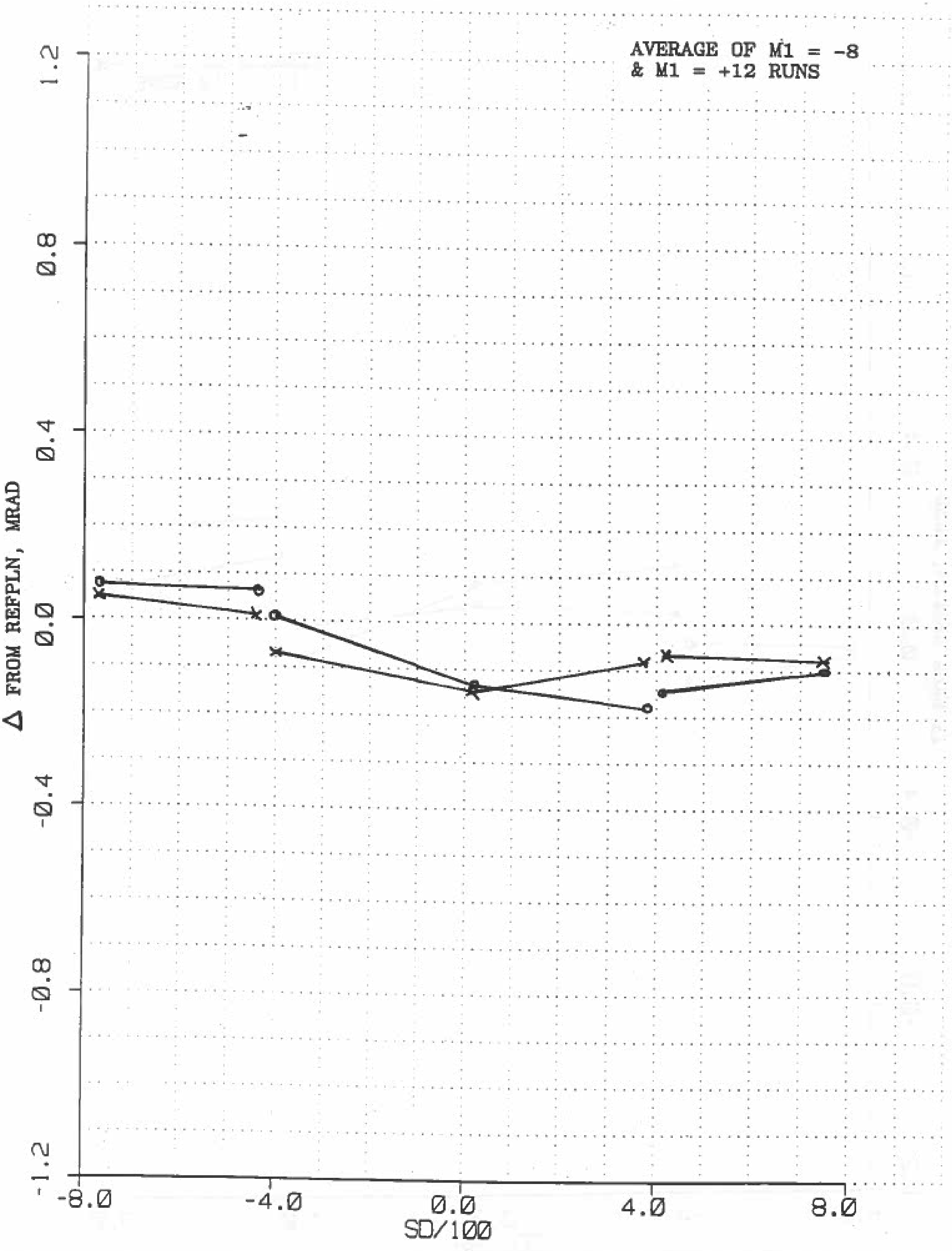
2. ALIGNMENT AND SYNCHRONIZATION FOR ALL MODES AT +5• SSS TEMP PLOTTED WITH RESPECT TO REFPLN

These curves are the difference between the Alignment and Synchronization curves at SSS = +5•C (Orbit Nominal) and the REFPLN Plots.

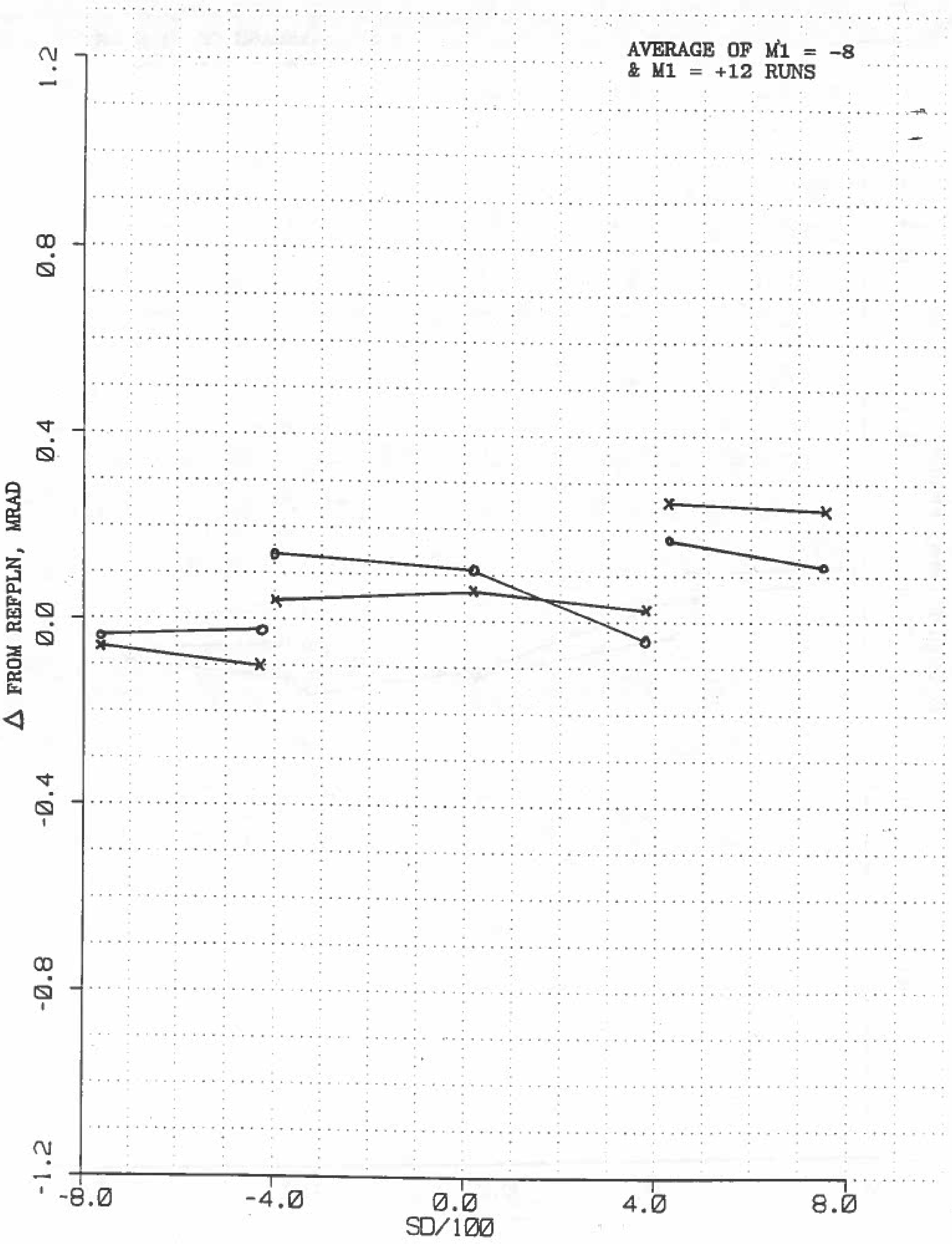
The curves represent the expected angular errors from the line-of-sight (REFPLN) axes for OLS data taken in the various modes of operation at orbit nominal conditions.

The curves were generated by averaging the data at M1 = -8• and M1 = +12• and then finding the difference between the average and the REFPLN.

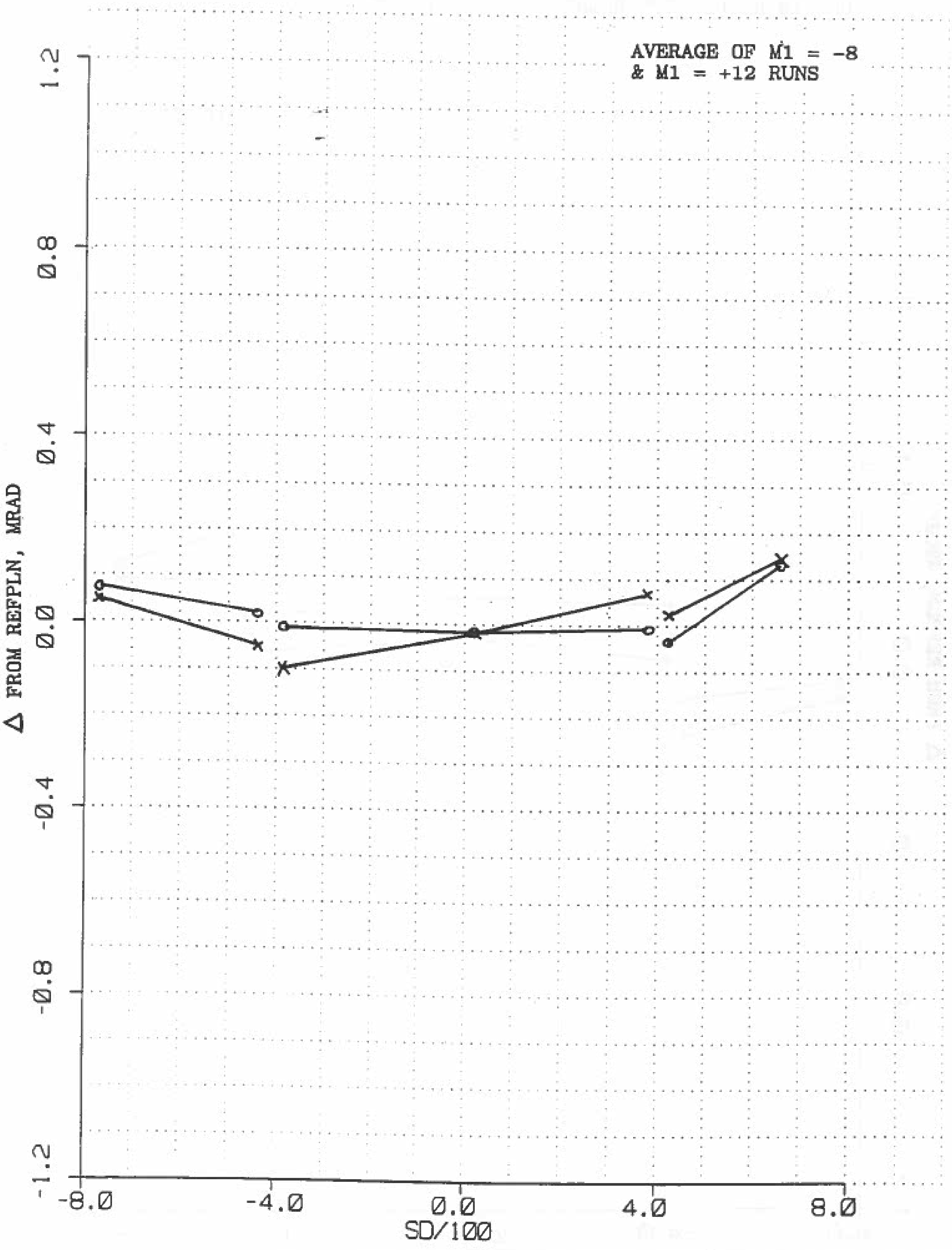
OLS#12 REFPLN ALIGNMENT - HRD SDF



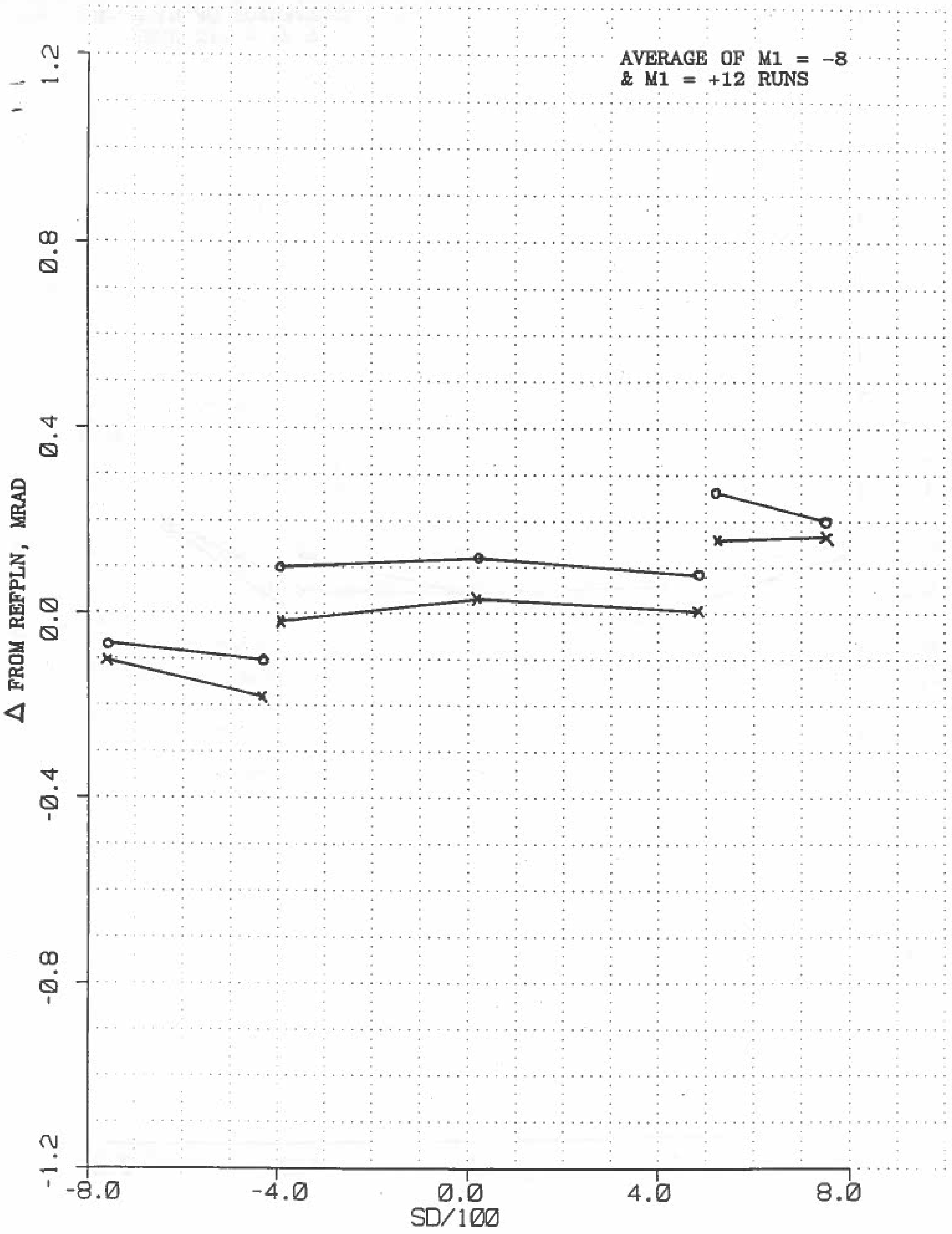
OLS#12 REFPLN ALIGNMENT - T ALIGN



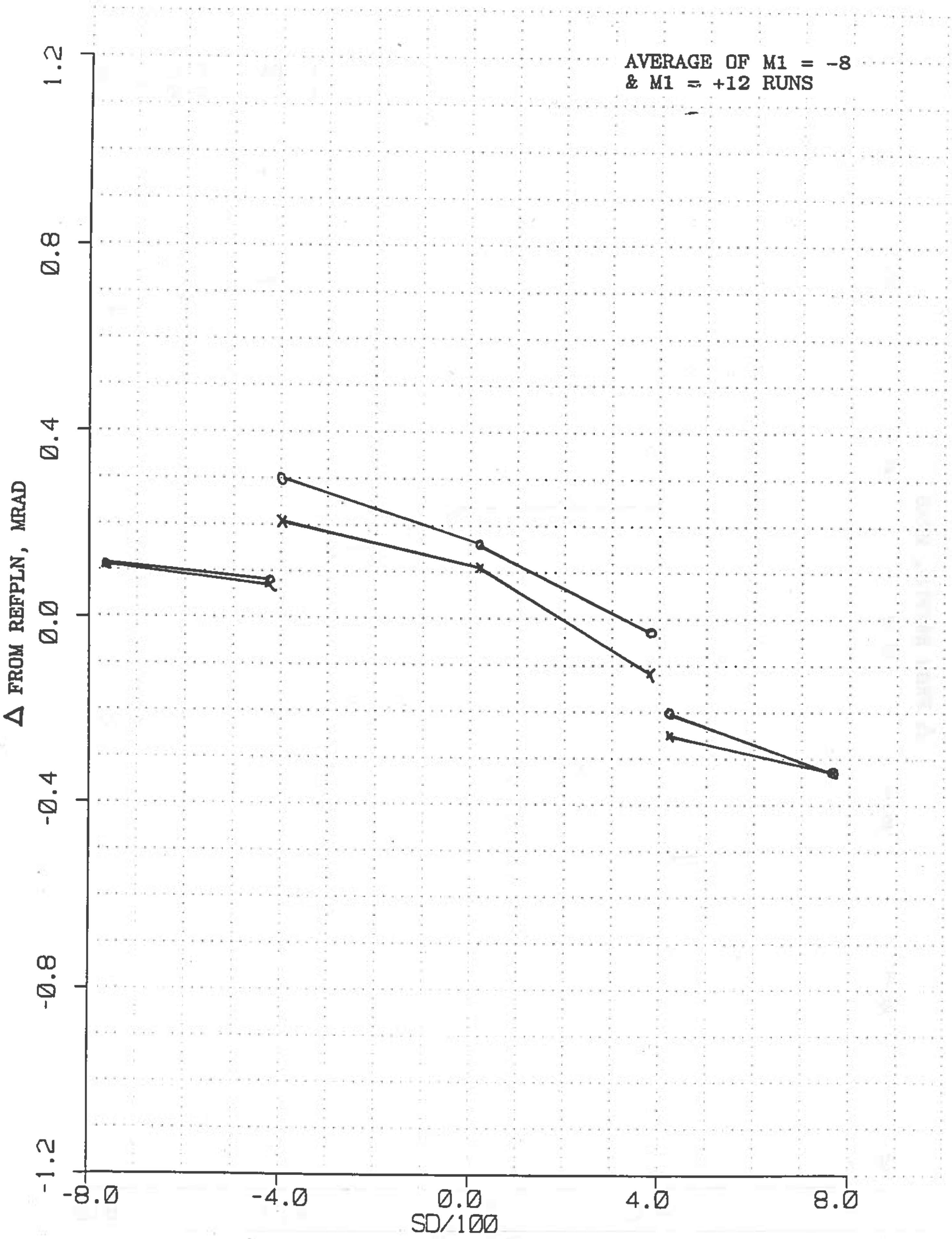
OLS#12 REFPLN ALIGNMENT - PMT RTDS



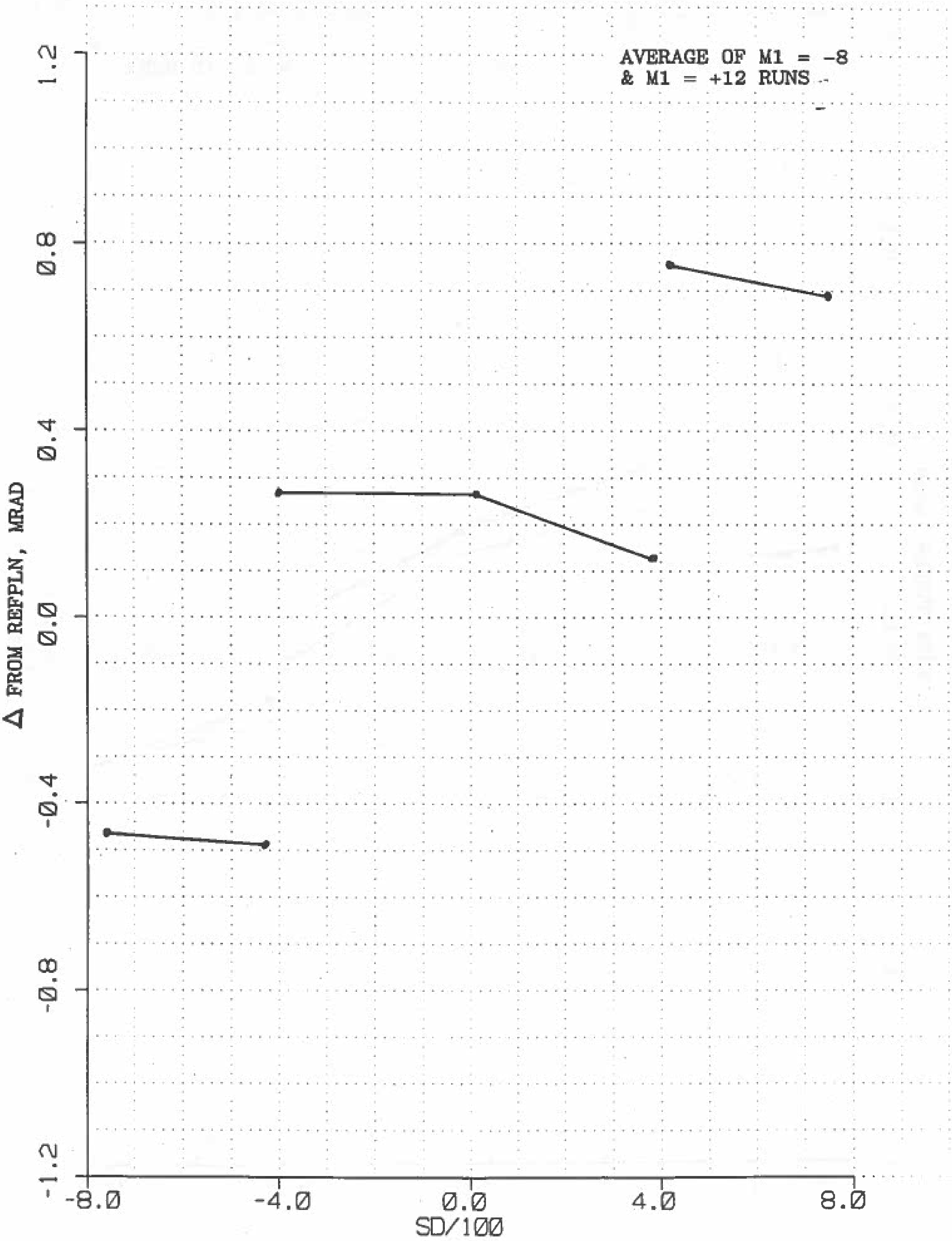
OLS#12 REFPLN SYNCHRONIZATION- HRD SDF



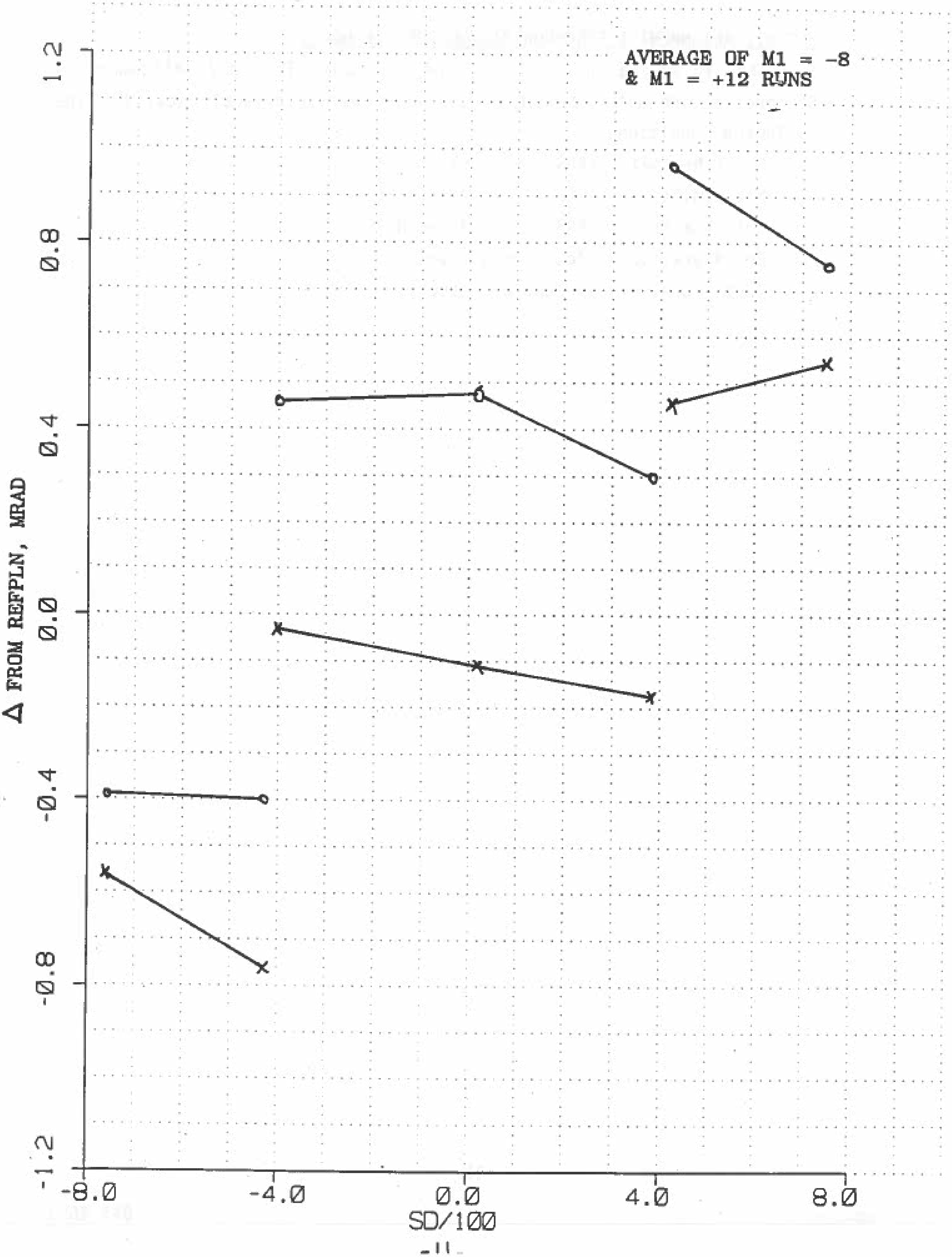
OLS#12 REFPLN SYNCHRONIZATION – T SDF



OLS#12 REFPLN SYNCHRONIZATION – PMT SDS



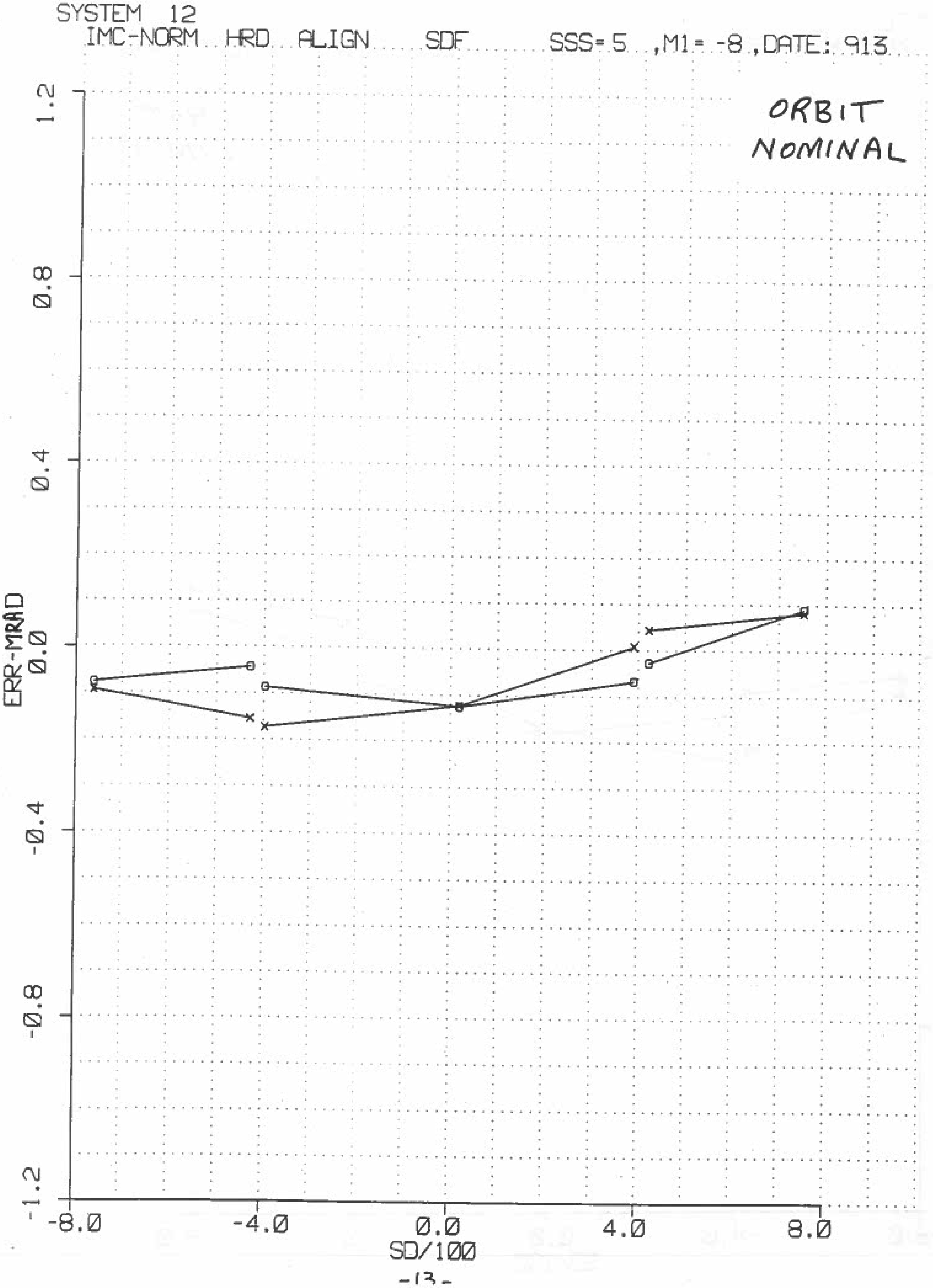
OLS#12 REFPLN SYNCHRONIZATION - PMT RTDS



3. OLS #12 ALIGNMENT & SYNCHRONIZATION FOR ALL MODES

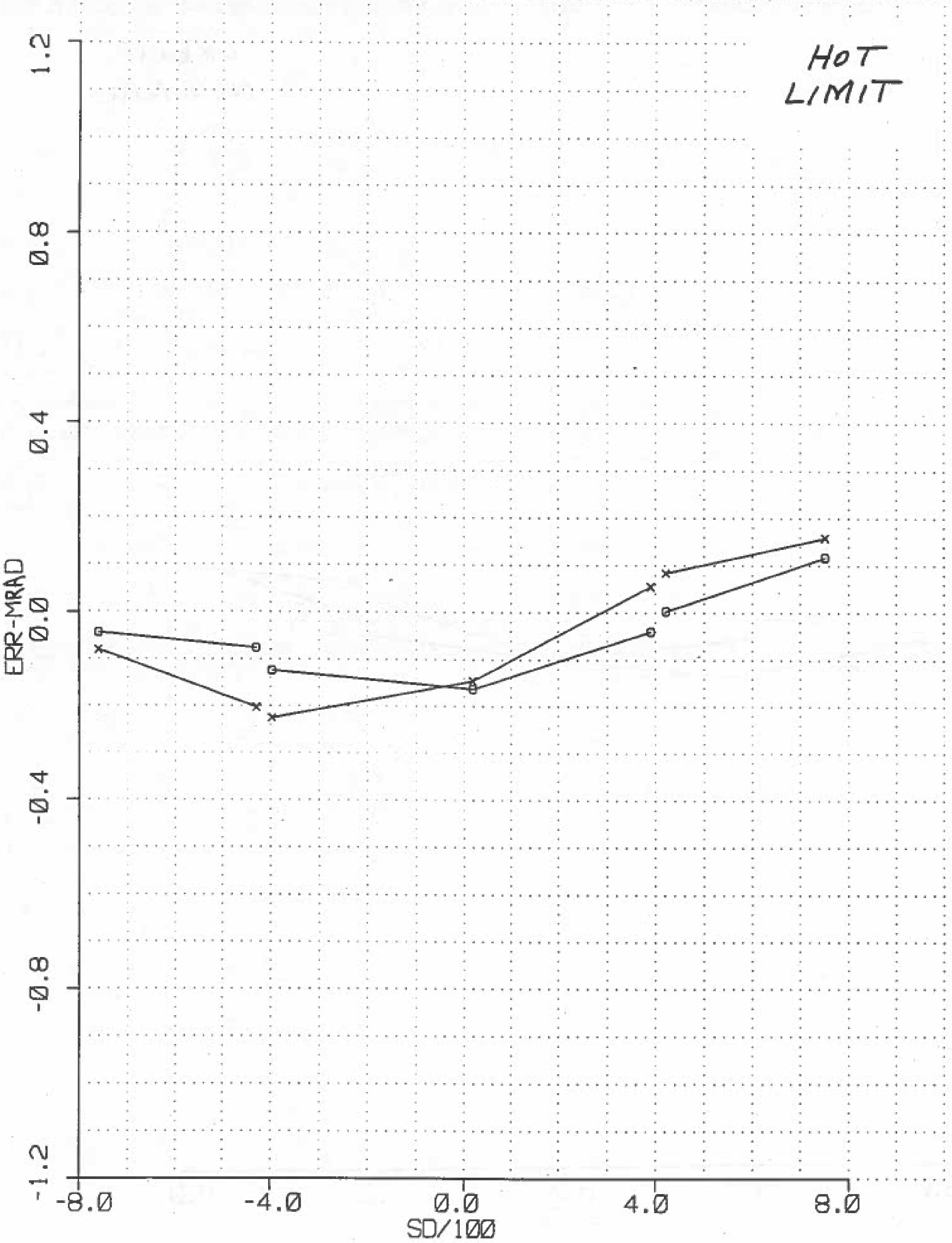
The following graphs are the measured OLS #12 Alignment & Synchronization with respect to the mounting (Interface) axes, for the following conditions.

Orbit Nominal	(SSS = +5°, M1 = -8°)
Hot Limits	(SSS = +7°, M1 = +12°)
Cold Limits	(SSS = +3°, M1 = -8°)
Pre Vibration	(Acceptance Level)
Post Vibration	(Acceptance Level)

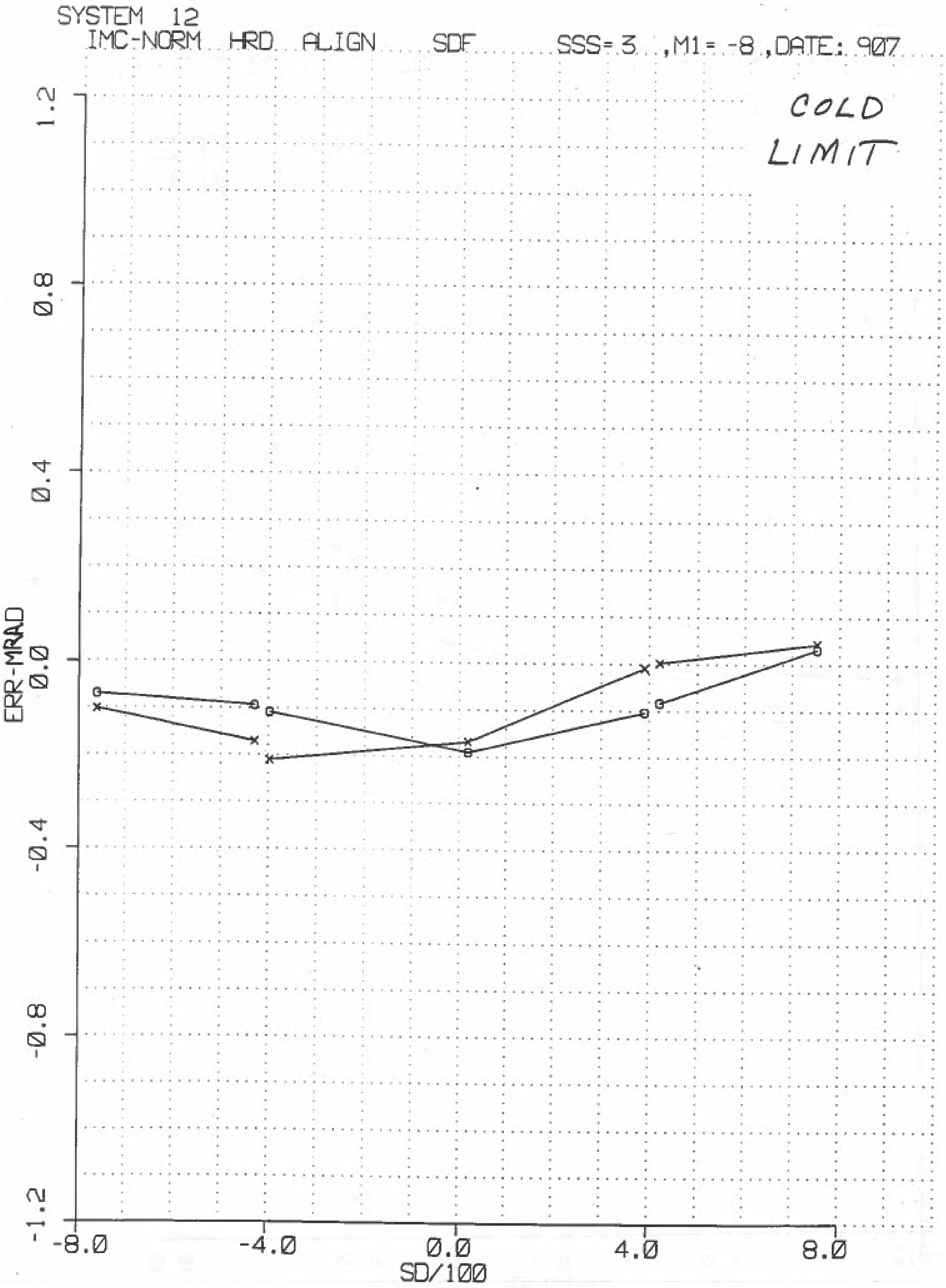


ORBIT
NOMINAL

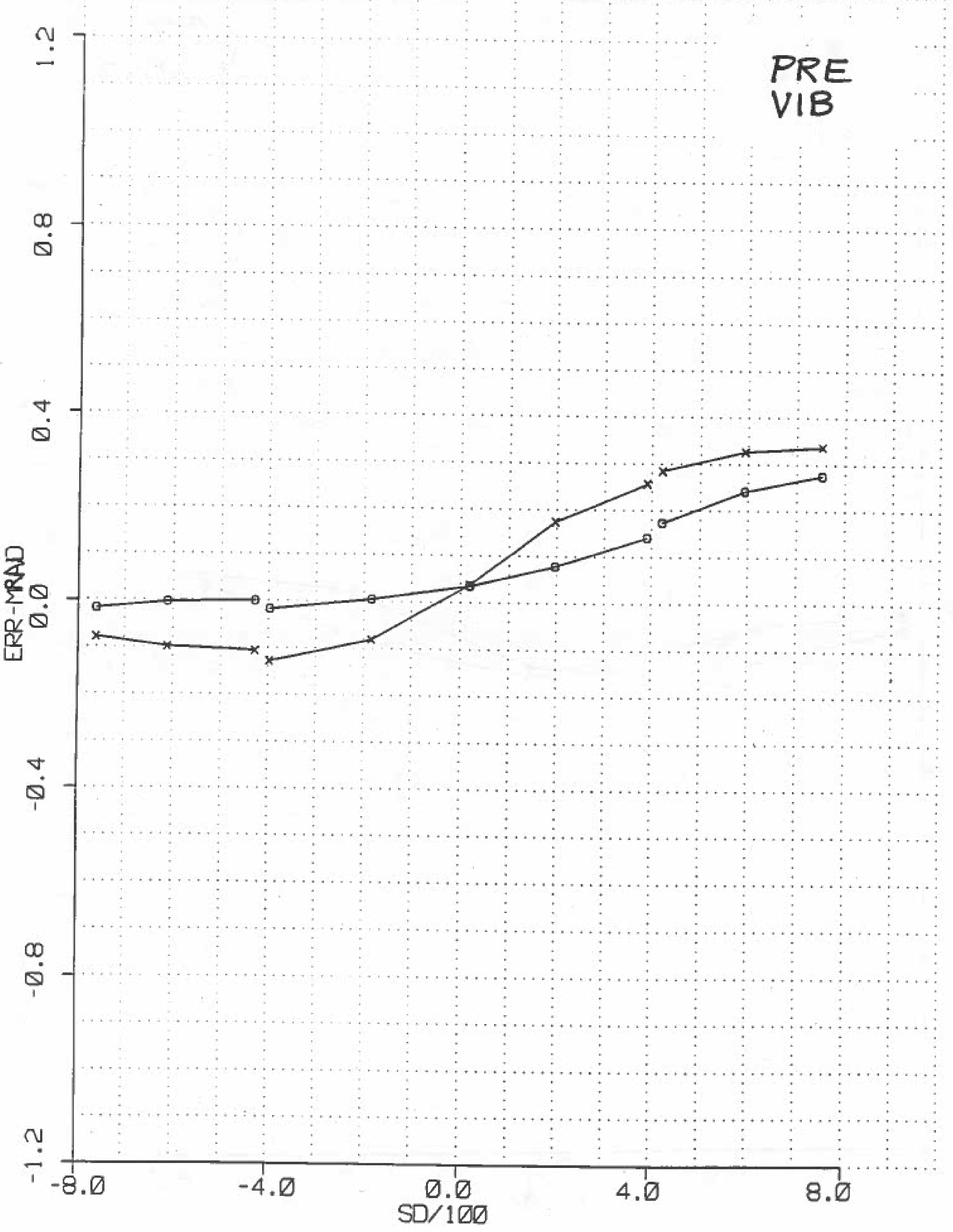
SYSTEM 12
IMC-NORM HRD ALIGN SDF SSS=7 ,M1=12 ,DATE: 903



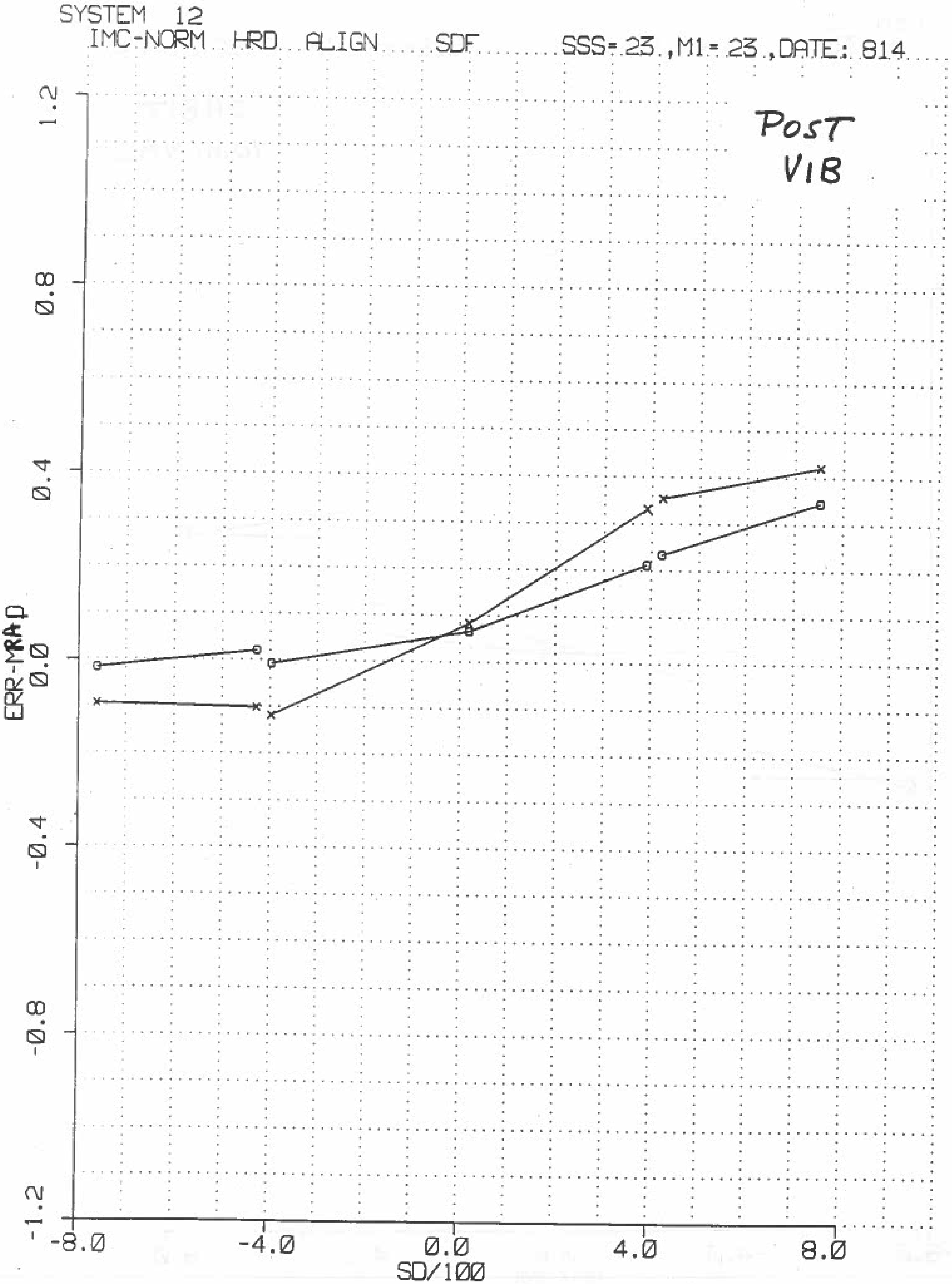
HoT
LIMIT


SYSTEM 12
IMC-NORM HRD ALIGN SDF SSS= 3 ,M1= -8 ,DATE: 907
COLD LIMIT
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

SYSTEM 12
IMC-NORM HRD ALIGN SDF SSS= 22 ,M1= 23 ,DATE: 812

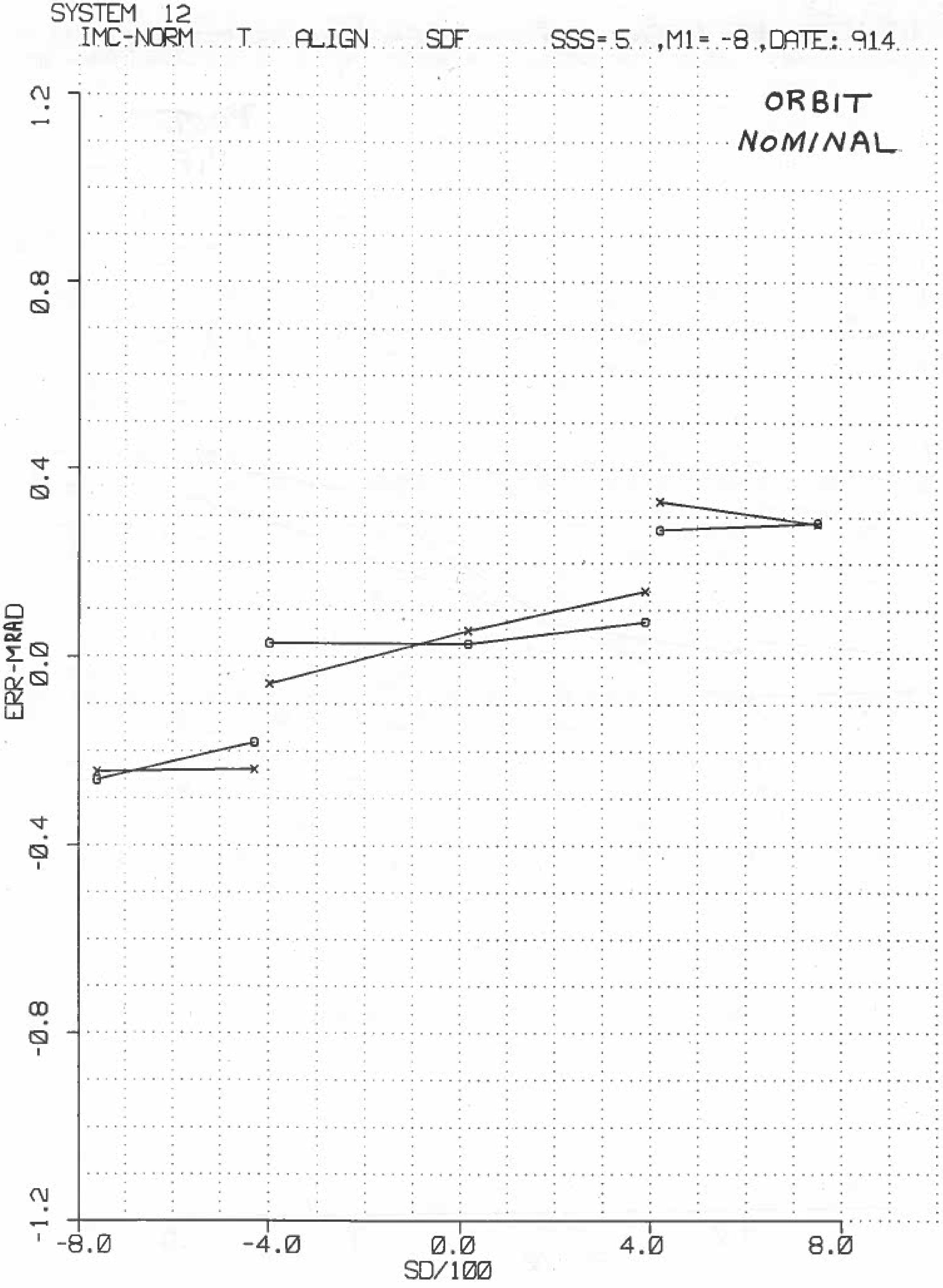


PRE
VIB



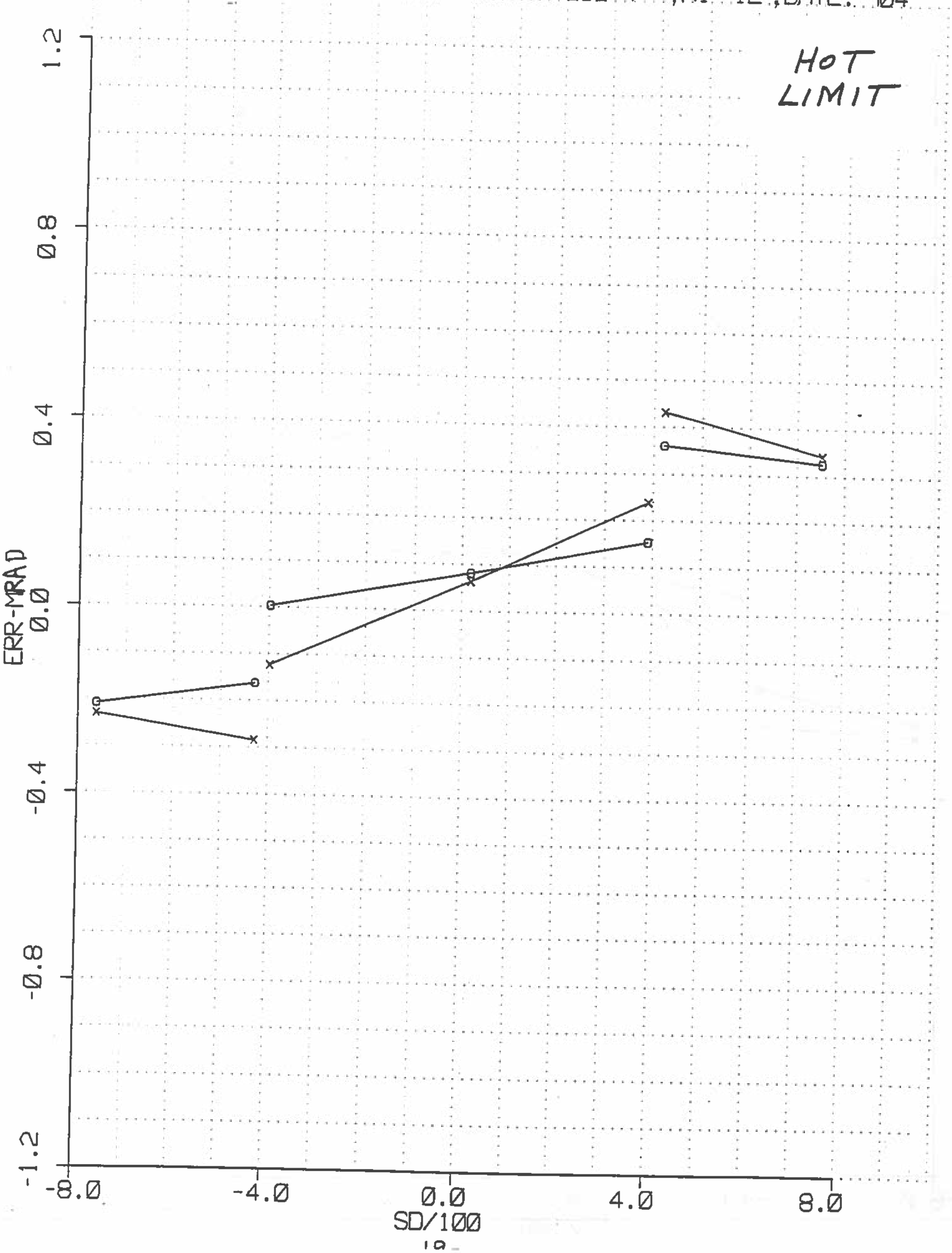
SYSTEM 12
IMC-NORM HRD ALIGN SDF SSS=23,M1=23,DATE:814

POST
VIB

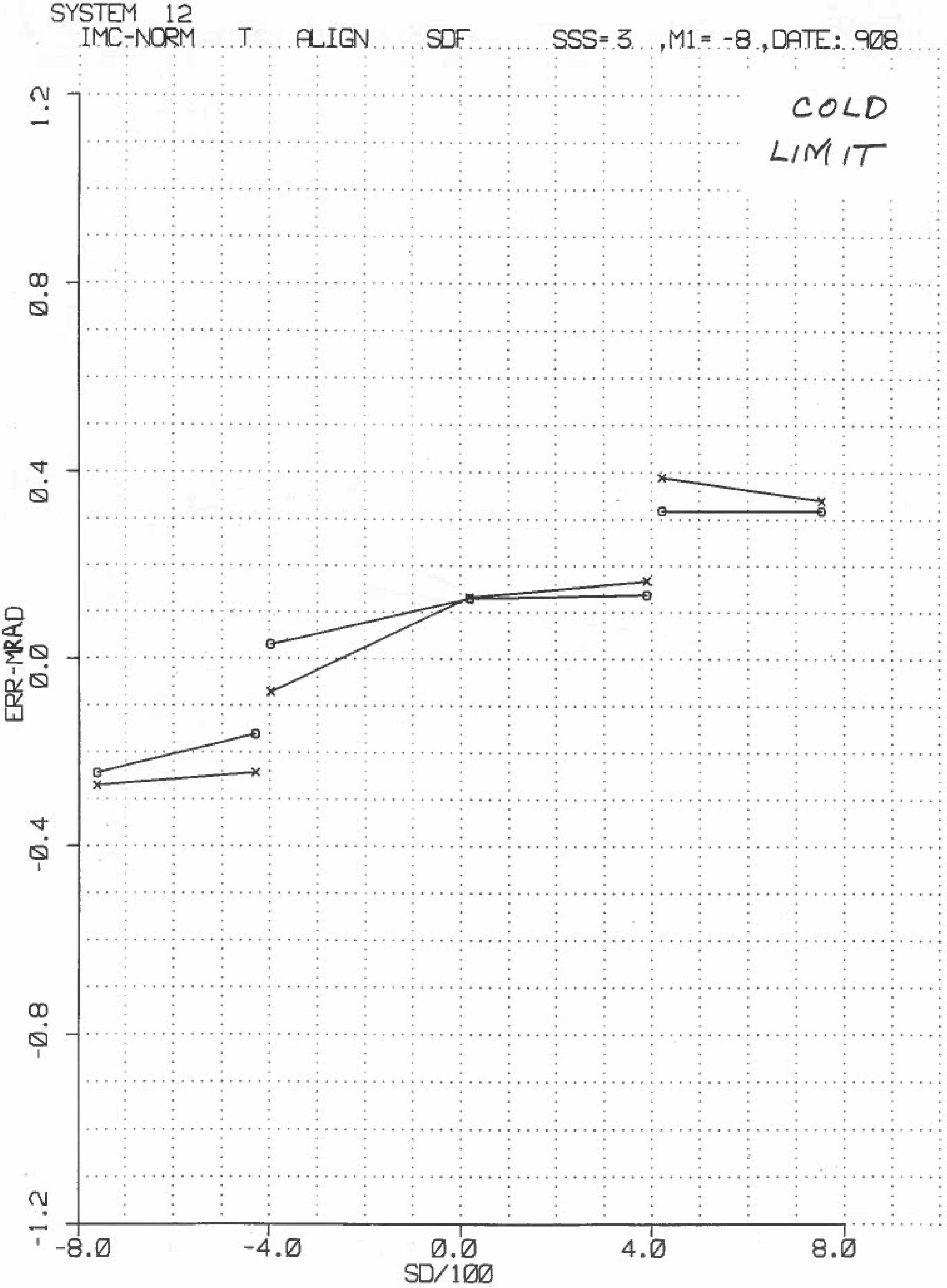


ORBIT
NOMINAL

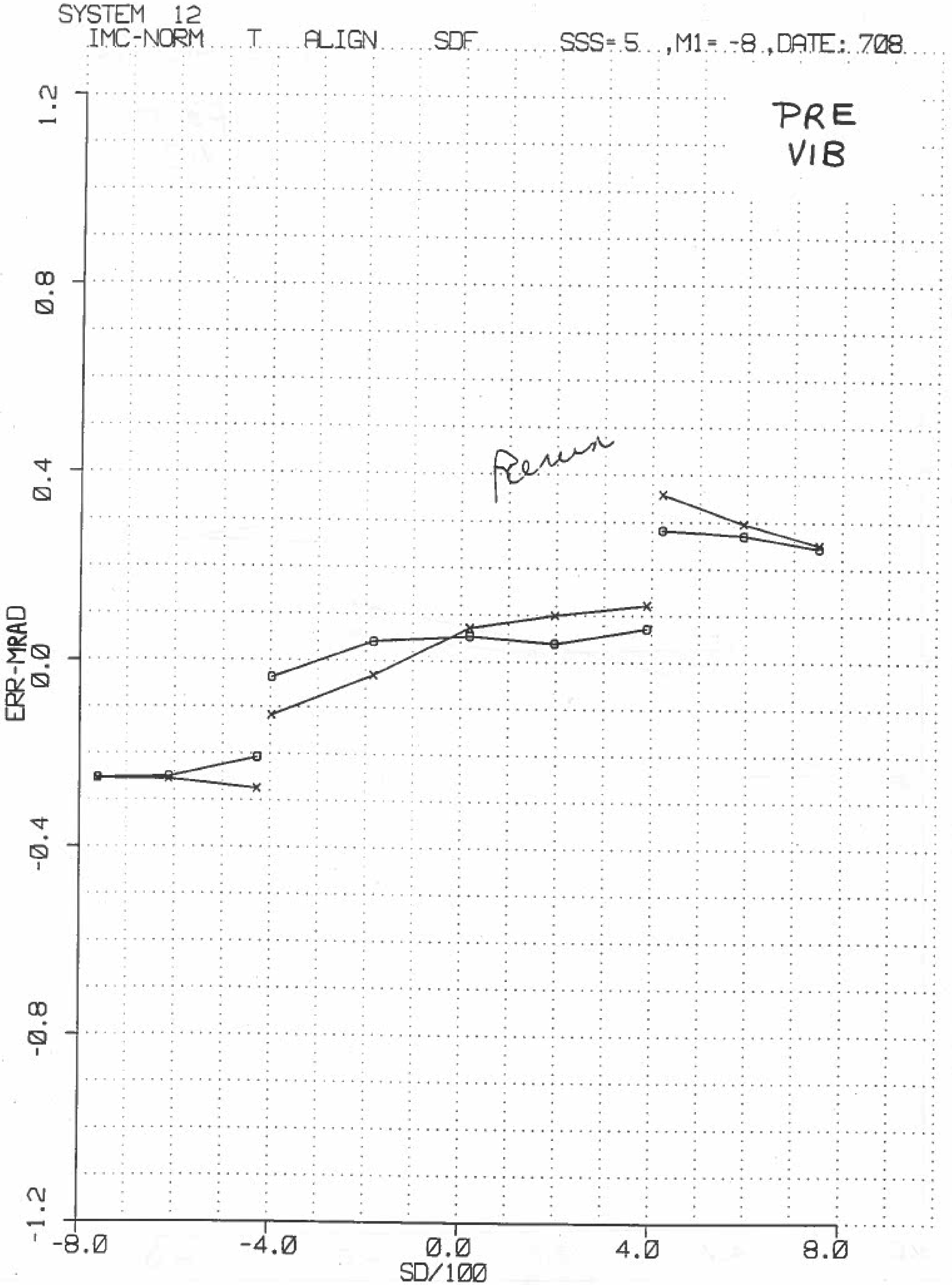
SYSTEM 12
IMC-NORM T ALIGN SDF SSS= 7 ,M1= 12 ,DATE: 904



HOT
LIMIT


SYSTEM 12
IMC-NORM T ALIGN SDF SSS=3 ,M1= -8 ,DATE: 908
ERR-MRAD
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
-8.0
-4.0
0.0
4.0
8.0
SD/100

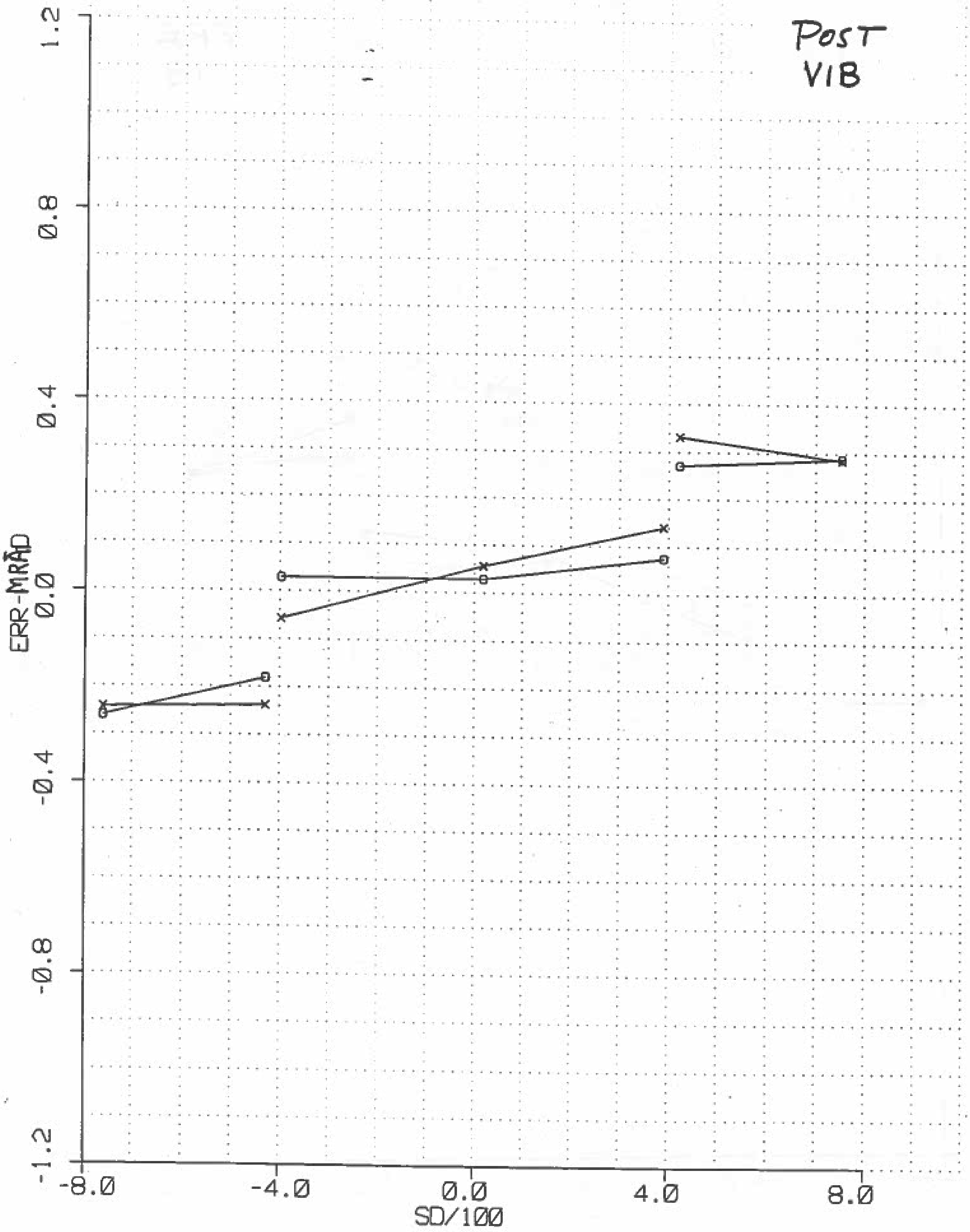
COLD LIMIT



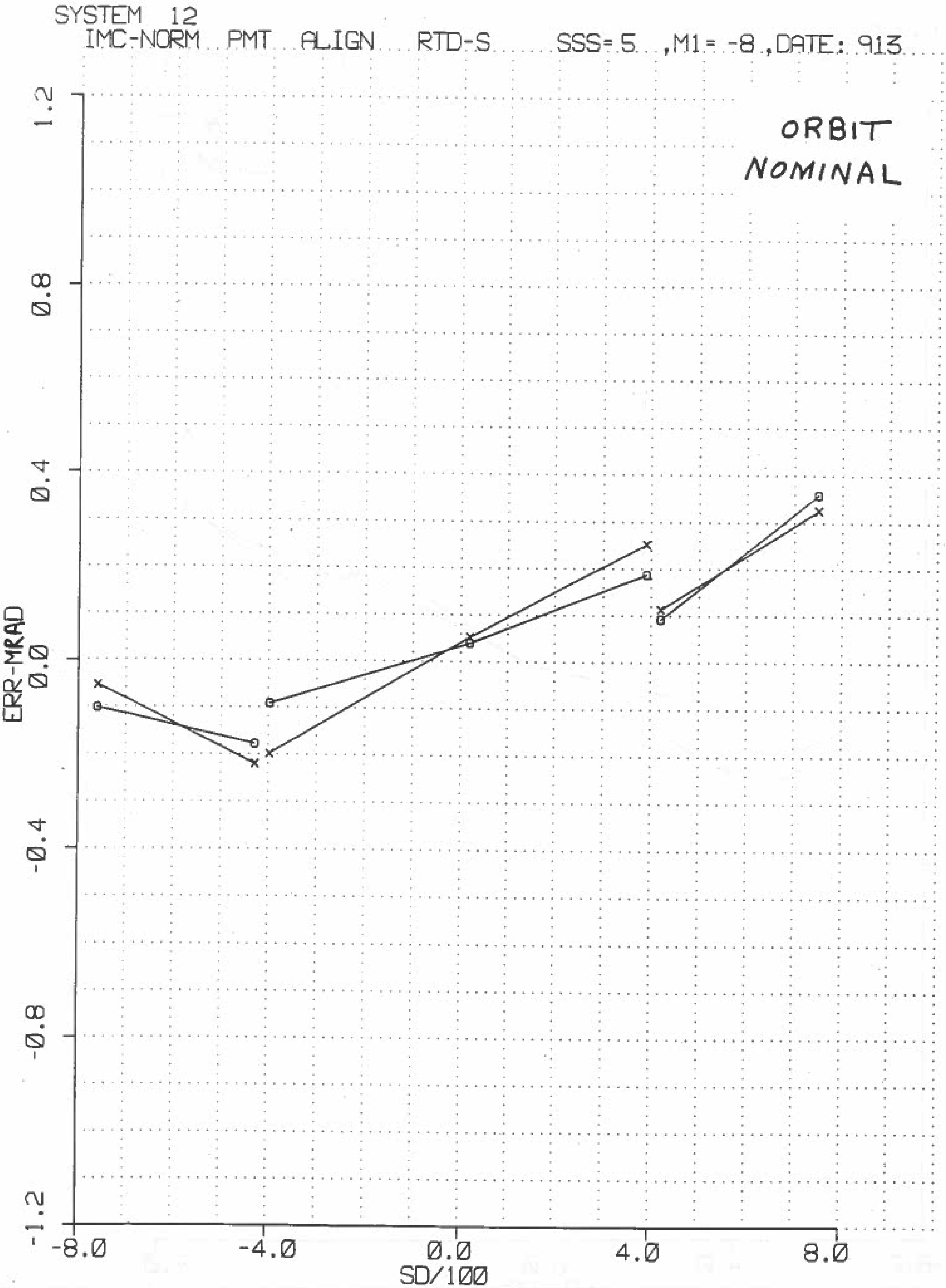
PRE VIB

Rerun

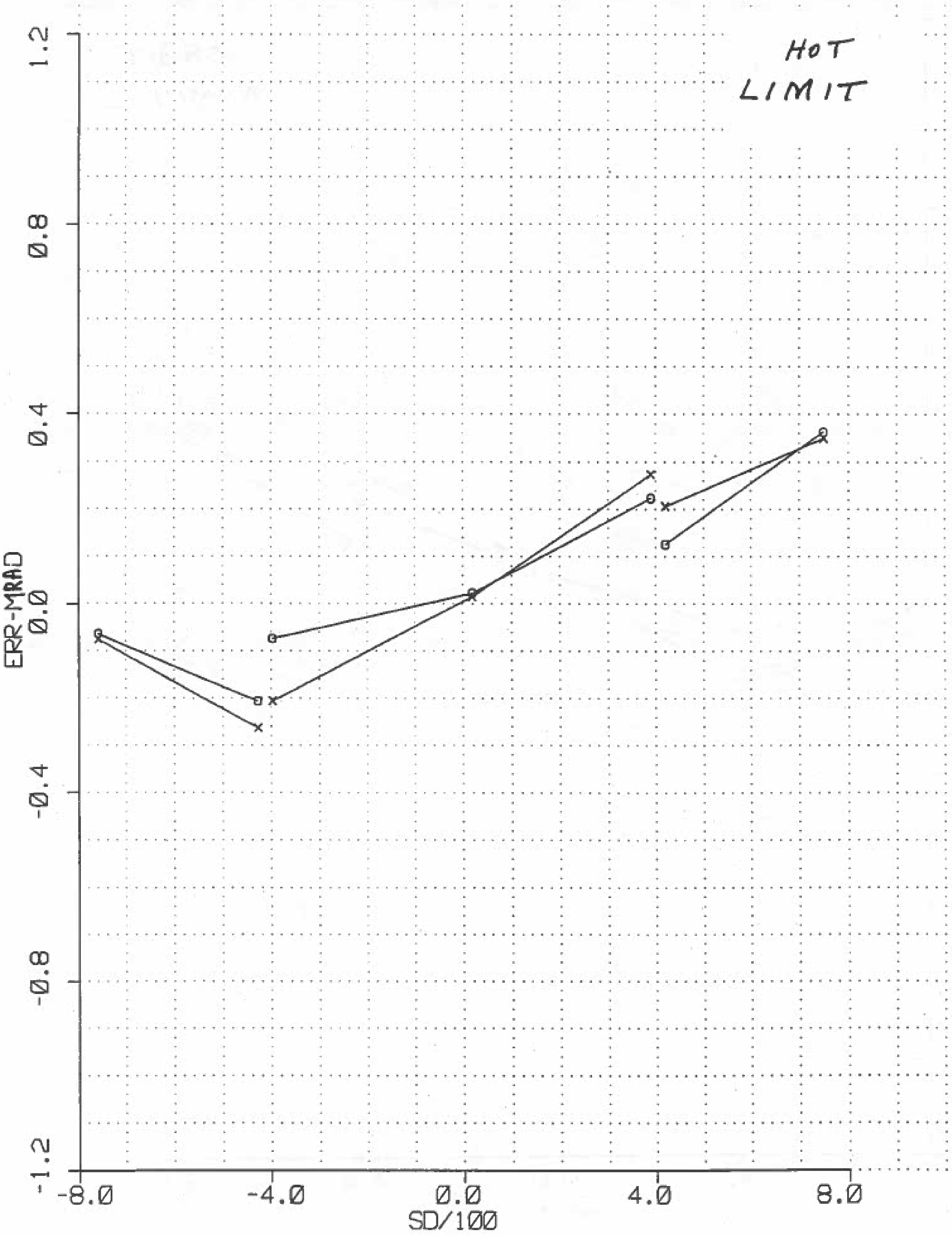
SYSTEM 12
IMC-NORM T ALIGN SDF SSS= 5 ,M1= -8 ,DATE: 914



POST
VIB

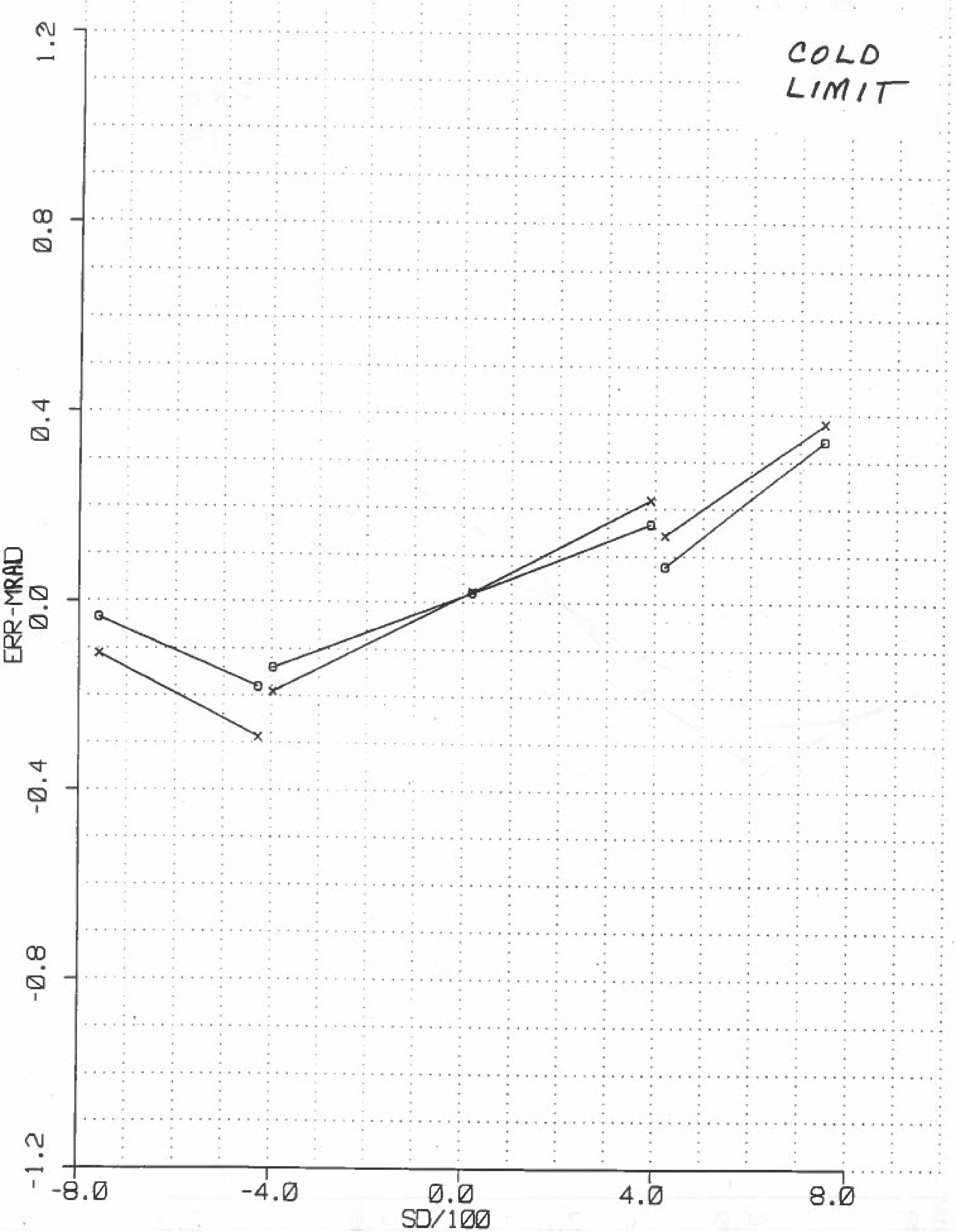

SYSTEM 12
IMC-NORM PMT ALIGN RTD-S SSS=5 ,M1= -8 ,DATE: 913
ORBIT
NOMINAL
ERR-MRAD
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
-8.0
-4.0
0.0
4.0
8.0
SD/100

SYSTEM 12
IMC-NORM PMT ALIGN RTD-S SSS=7 ,M1=12 ,DATE: 903



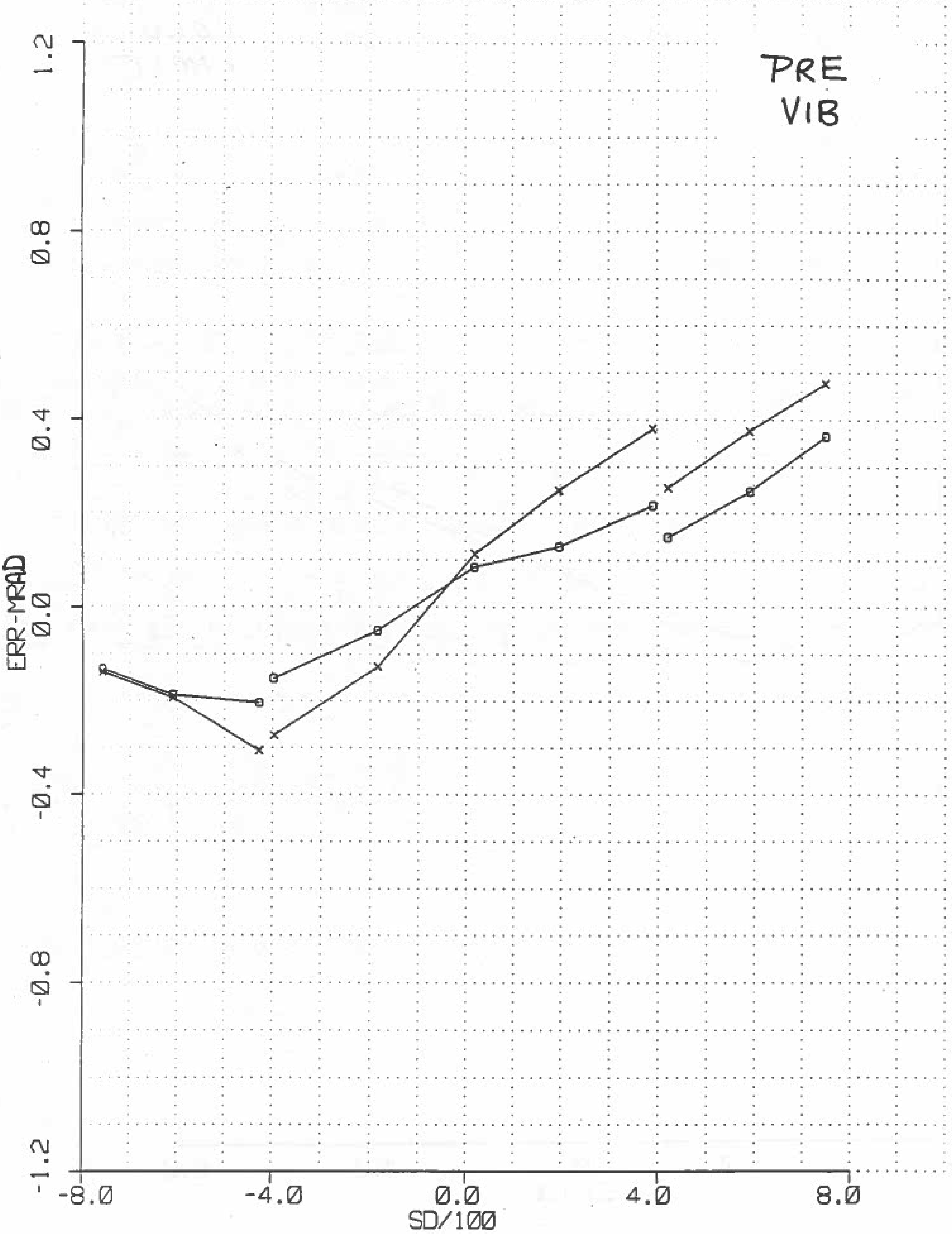
HOT
LIMIT

SYSTEM 12
IMC-NORM PMT ALIGN RTD-S SSS=3 ,M1=-8 ,DATE: 907

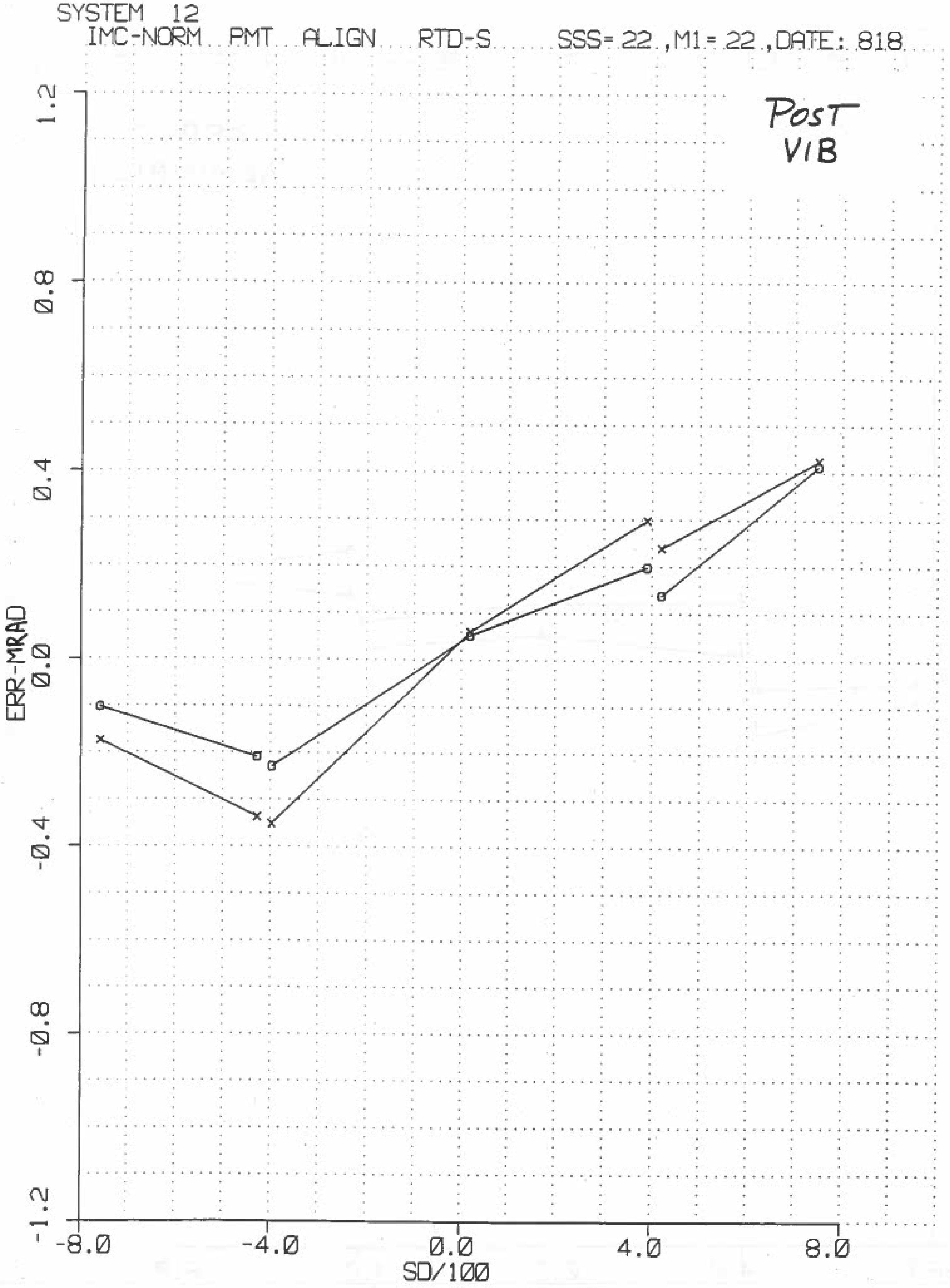


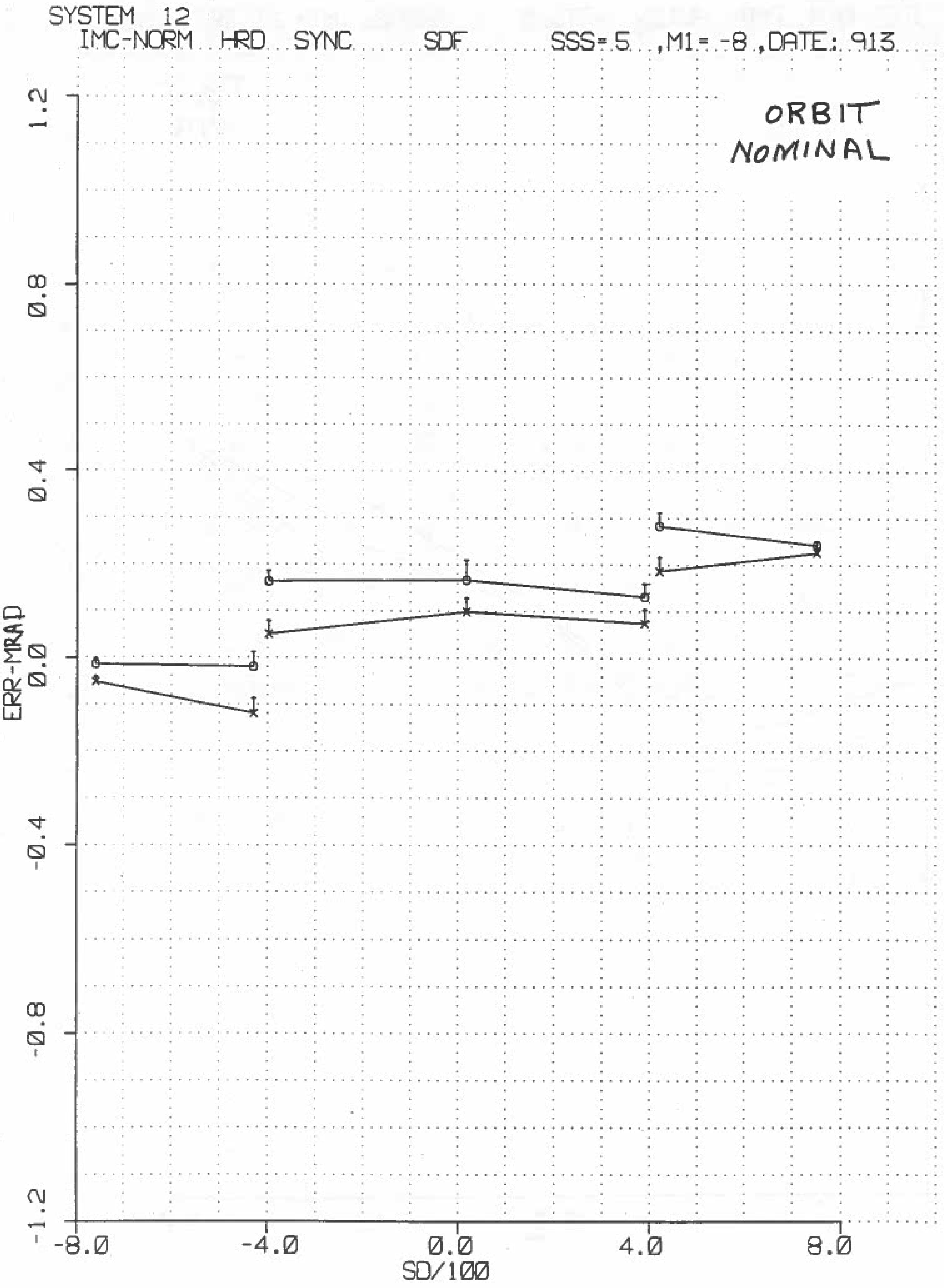
COLD LIMIT

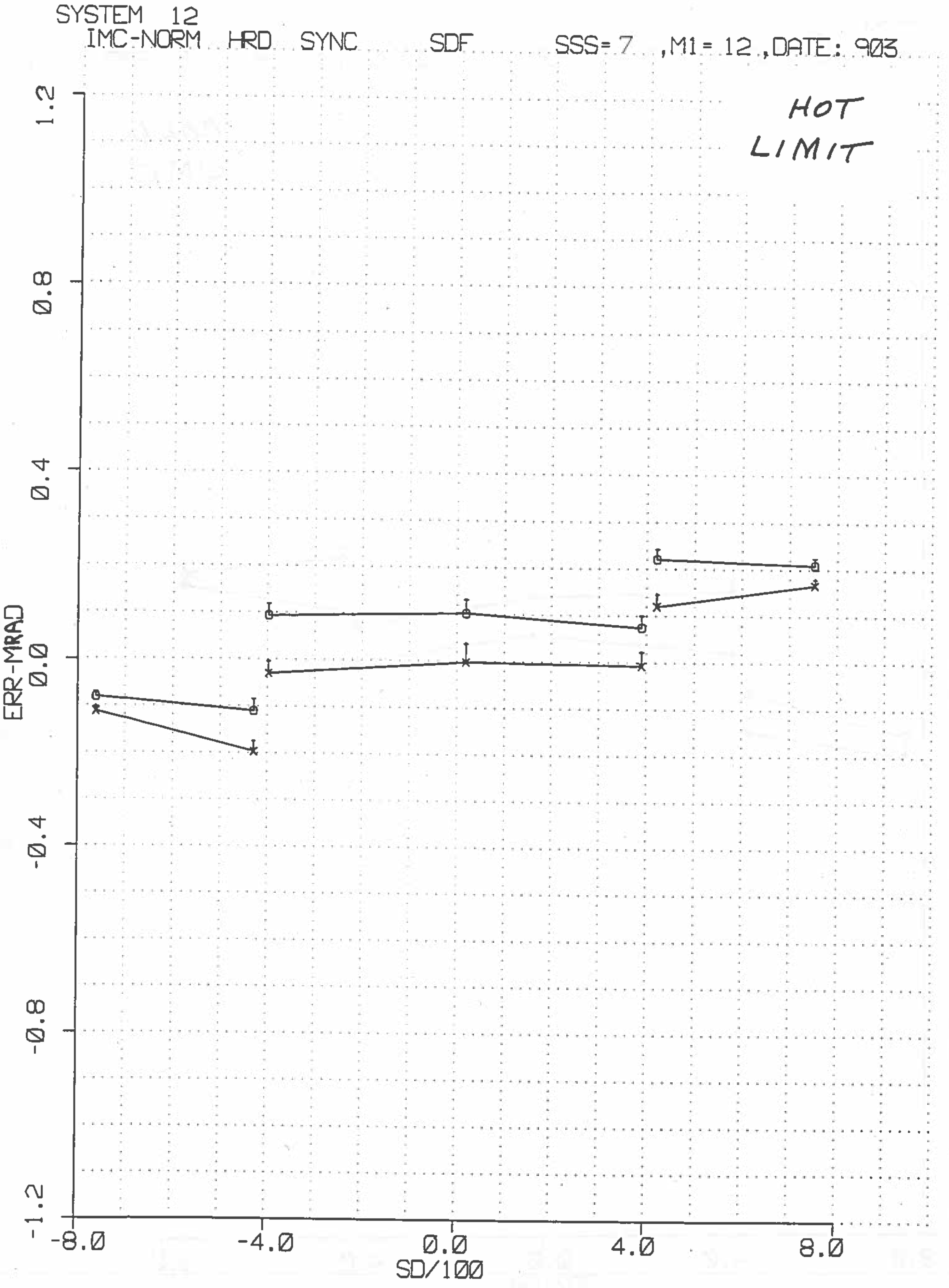
SYSTEM 12
IMC-NORM PMT ALIGN RTD-S SSS= 23 ,M1= 24 ,DATE: 812



PRE
VIB

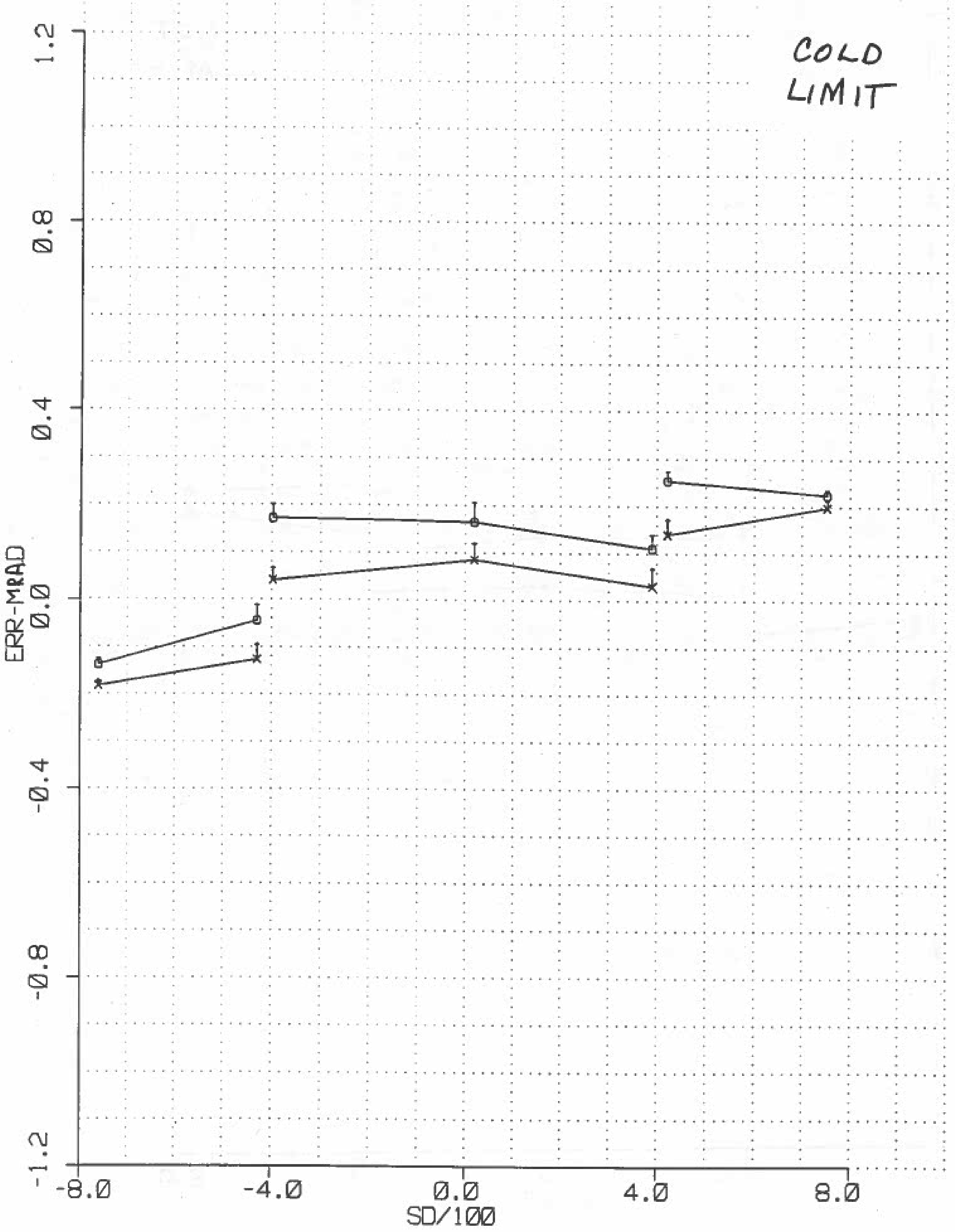

SYSTEM 12
IMC-NORM PMT ALIGN RTD-S SSS= 22 ,M1= 22 ,DATE: 818
POST
VIB
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100


SYSTEM 12
IMC-NORM HRD SYNC SDF SSS=5 ,M1= -8 ,DATE: 913
ORBIT
NOMINAL
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

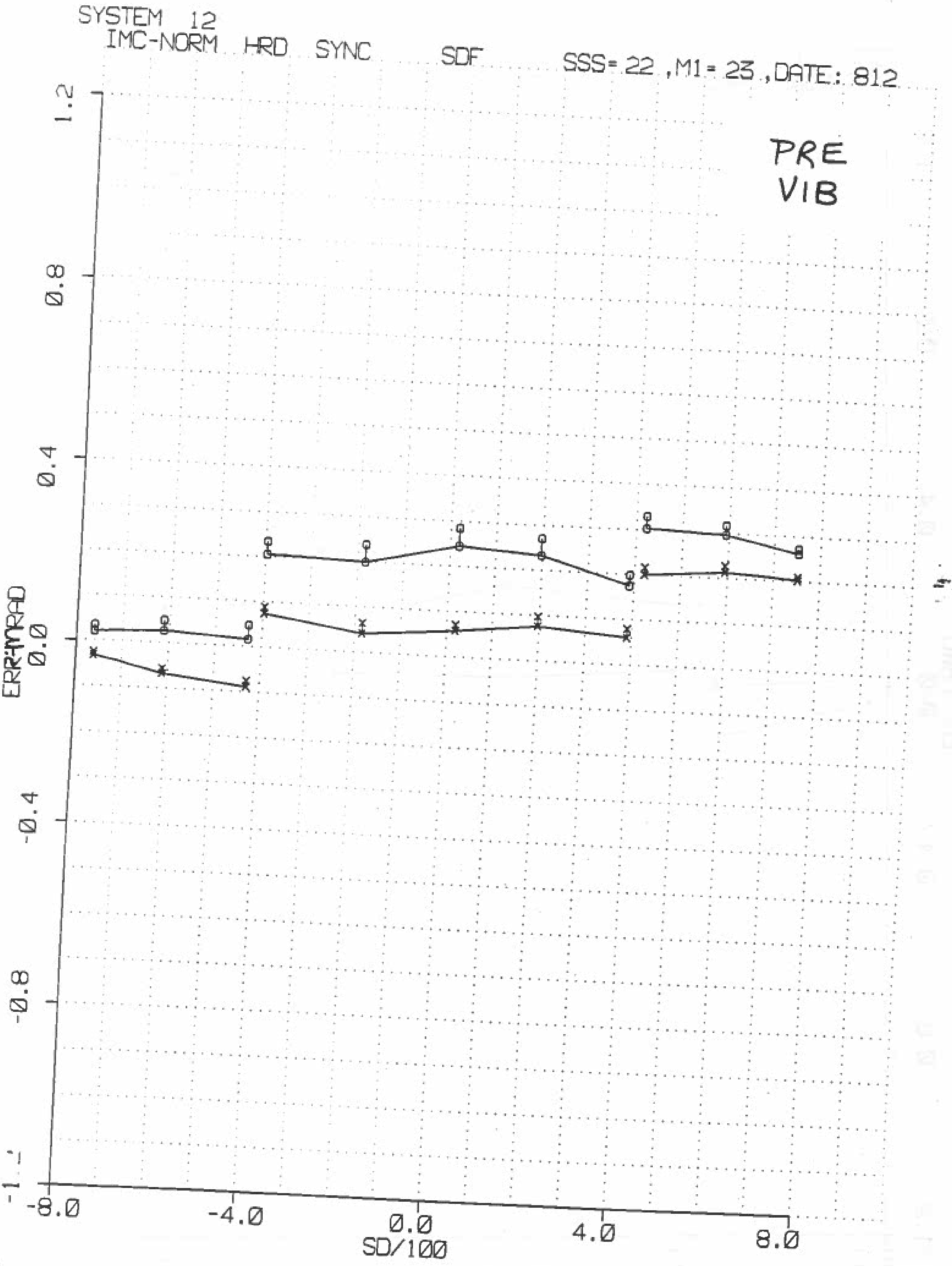

SYSTEM 12
IMC-NORM HRD SYNC SDF SSS= 7 ,M1= 12 ,DATE: 903
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

HOT
LIMIT

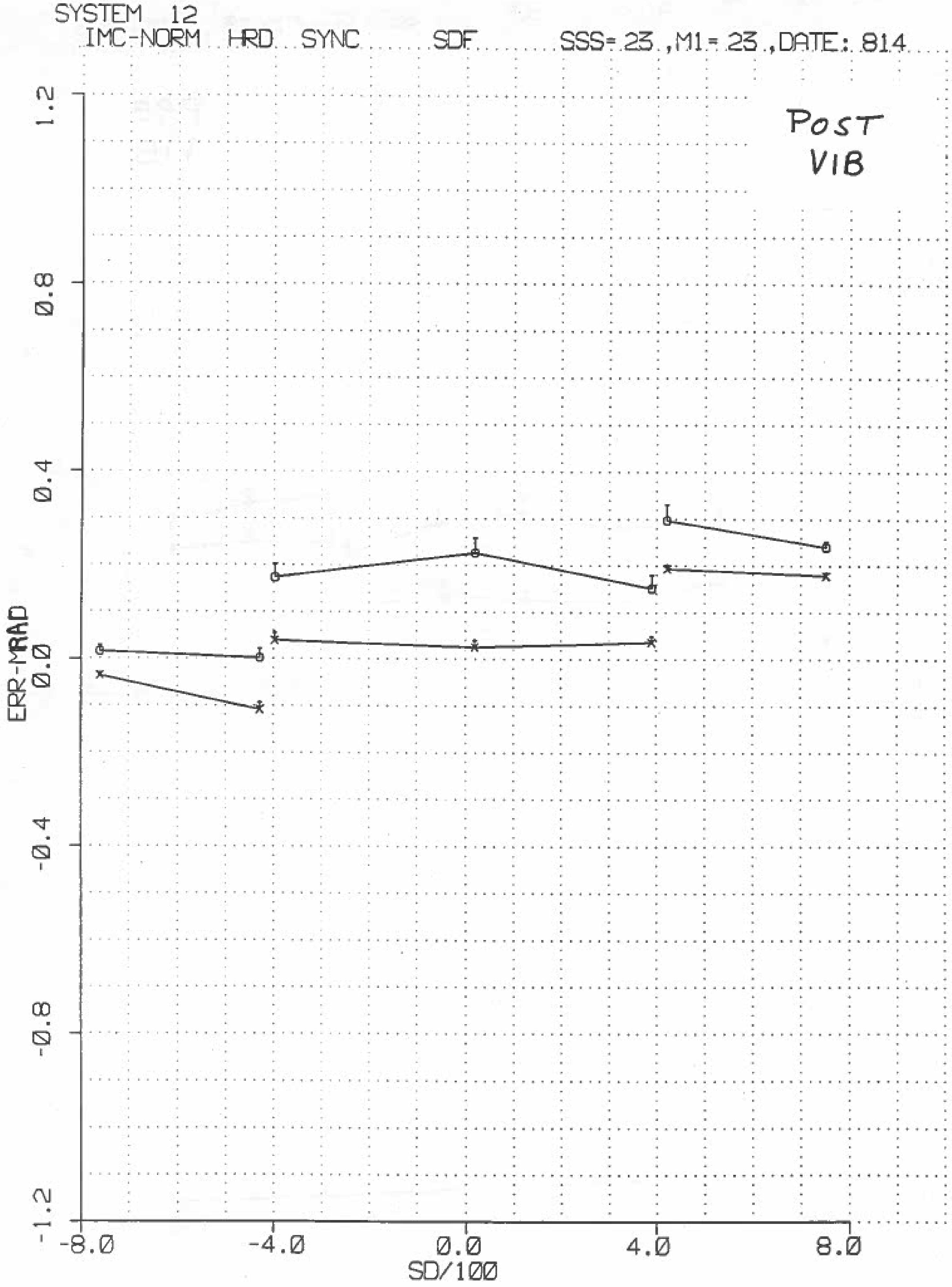
SYSTEM 12
IMC-NORM HRD SYNC SDF SSS= 3 ,M1= -8 ,DATE: 907

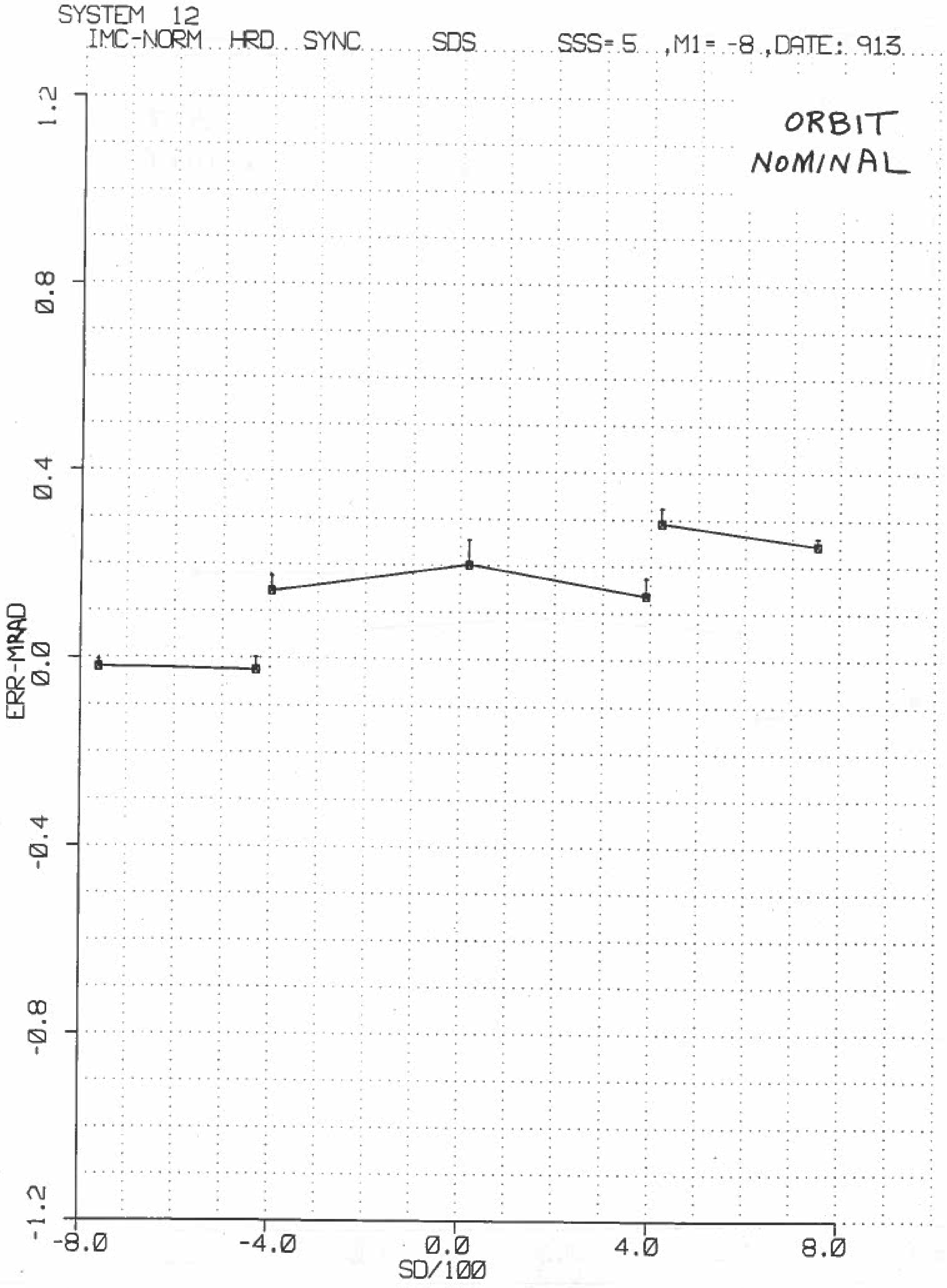


COLD LIMIT


SYSTEM 12
IMC-NORM HRD SYNC SDF
SSS= 22 ,M1= 23 ,DATE: 812
ERR:MRAD
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
-8.0
-4.0
0.0
4.0
8.0
SD/100

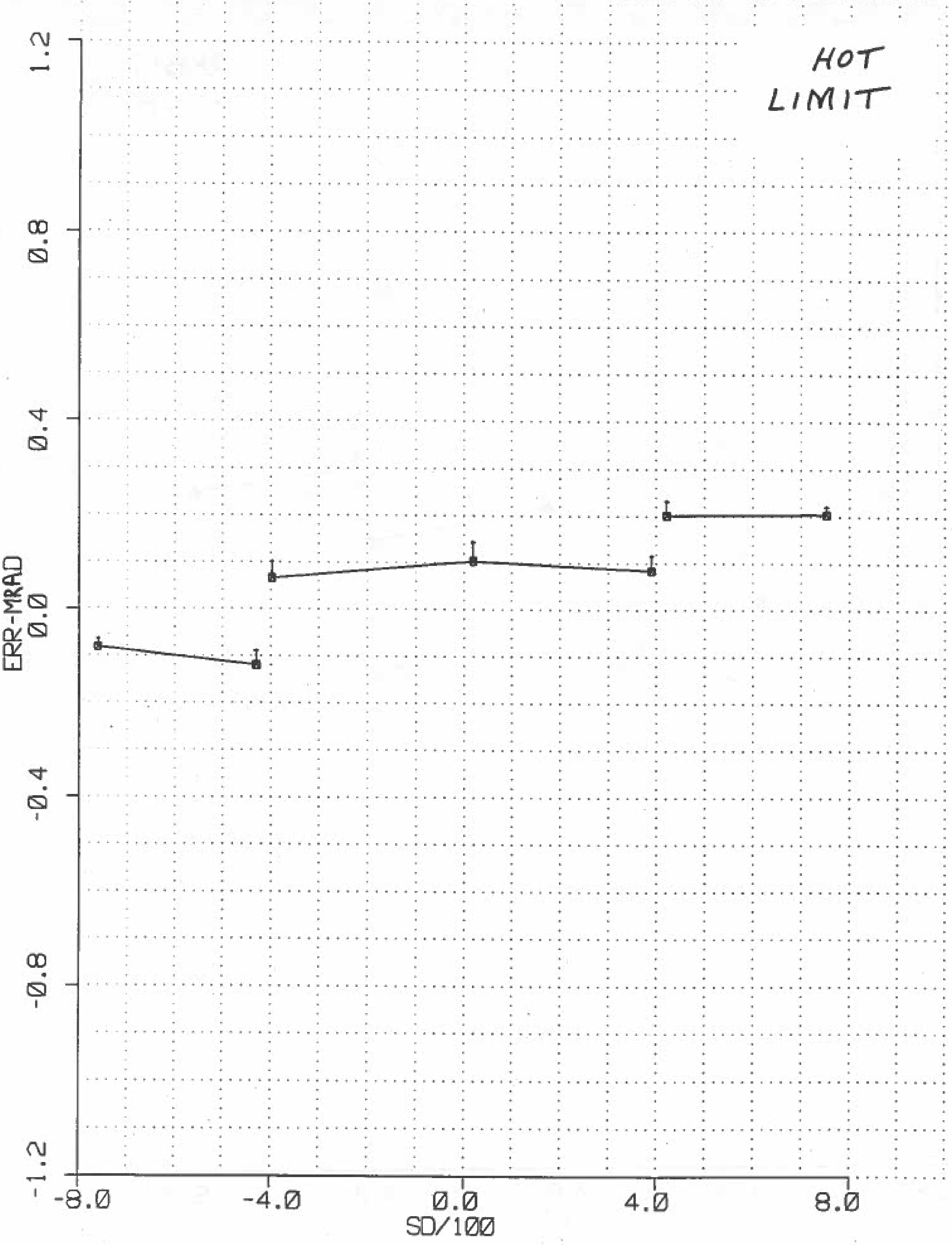
PRE
VIB


SYSTEM 12
IMC-NORM HRD SYNC SDF SSS= 23 ,M1= 23 ,DATE: 814
POST VIB
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100


SYSTEM 12
IMC-NORM HRD SYNC SDS SSS=5 ,M1= -8 ,DATE: 913
ORBIT
NOMINAL
ERR-MRAD
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
-8.0
-4.0
0.0
4.0
8.0
SD/100

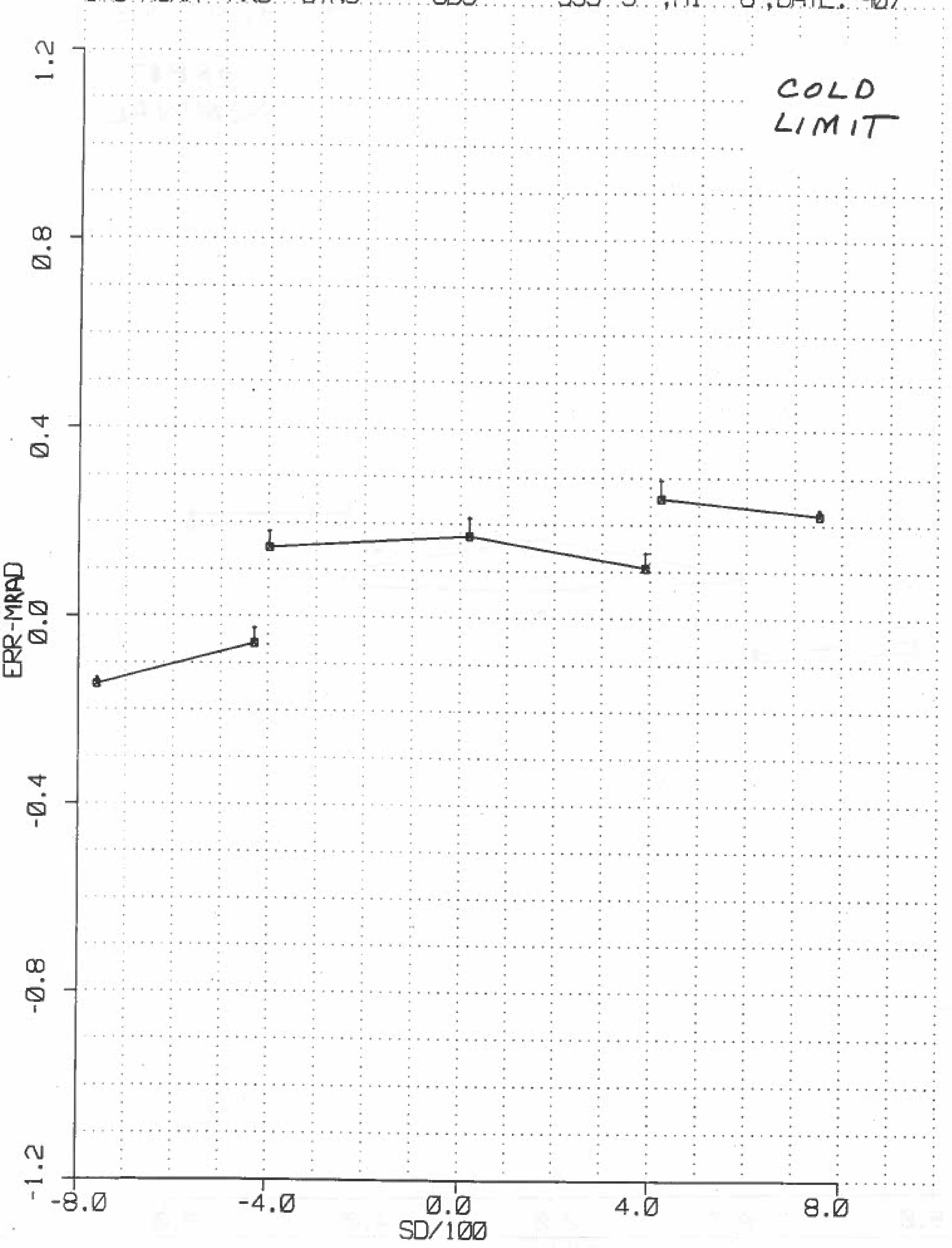
SYSTEM 12

IMC-NORM HRD SYNC SDS SSS= 7 ,M1= 12 ,DATE: 903

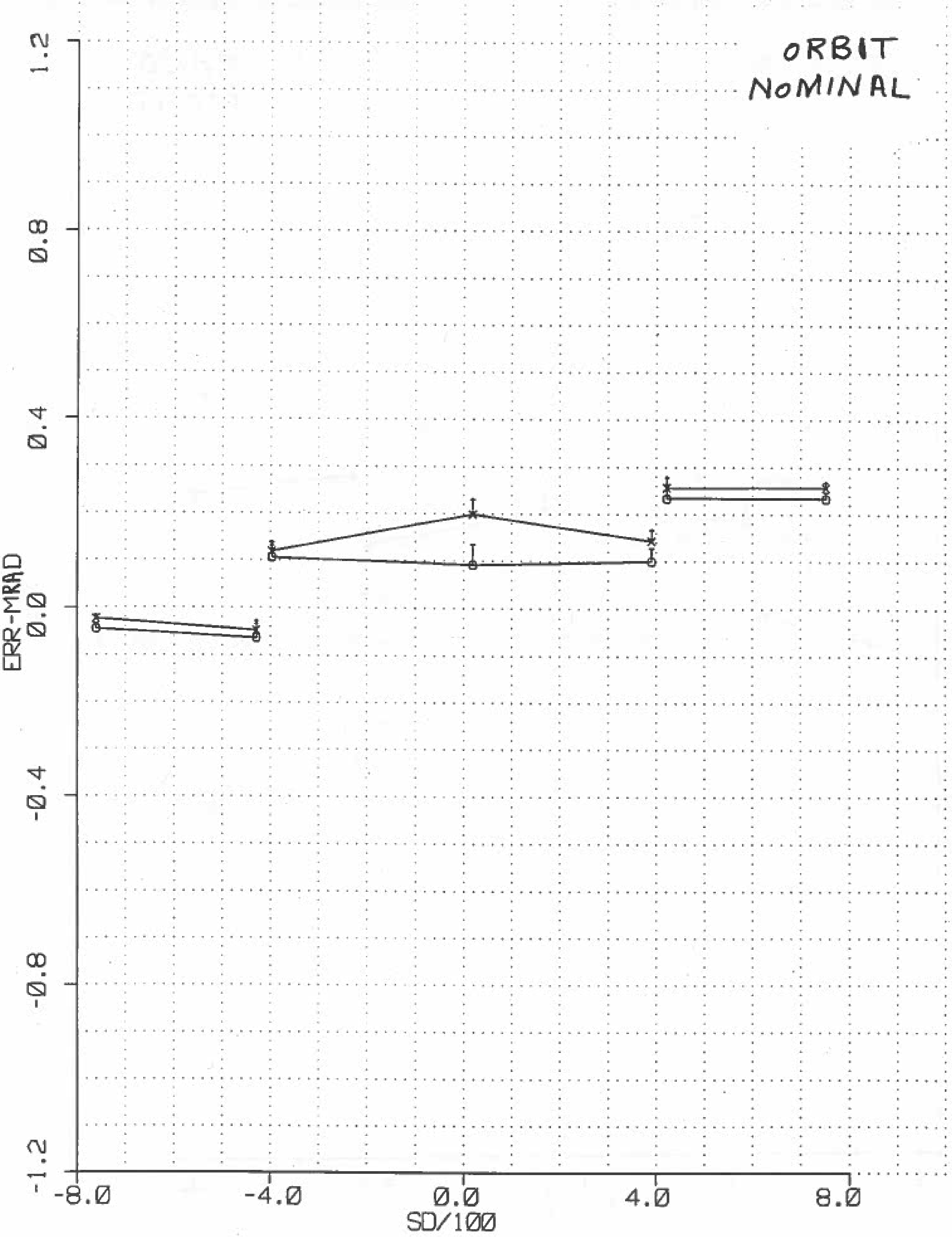


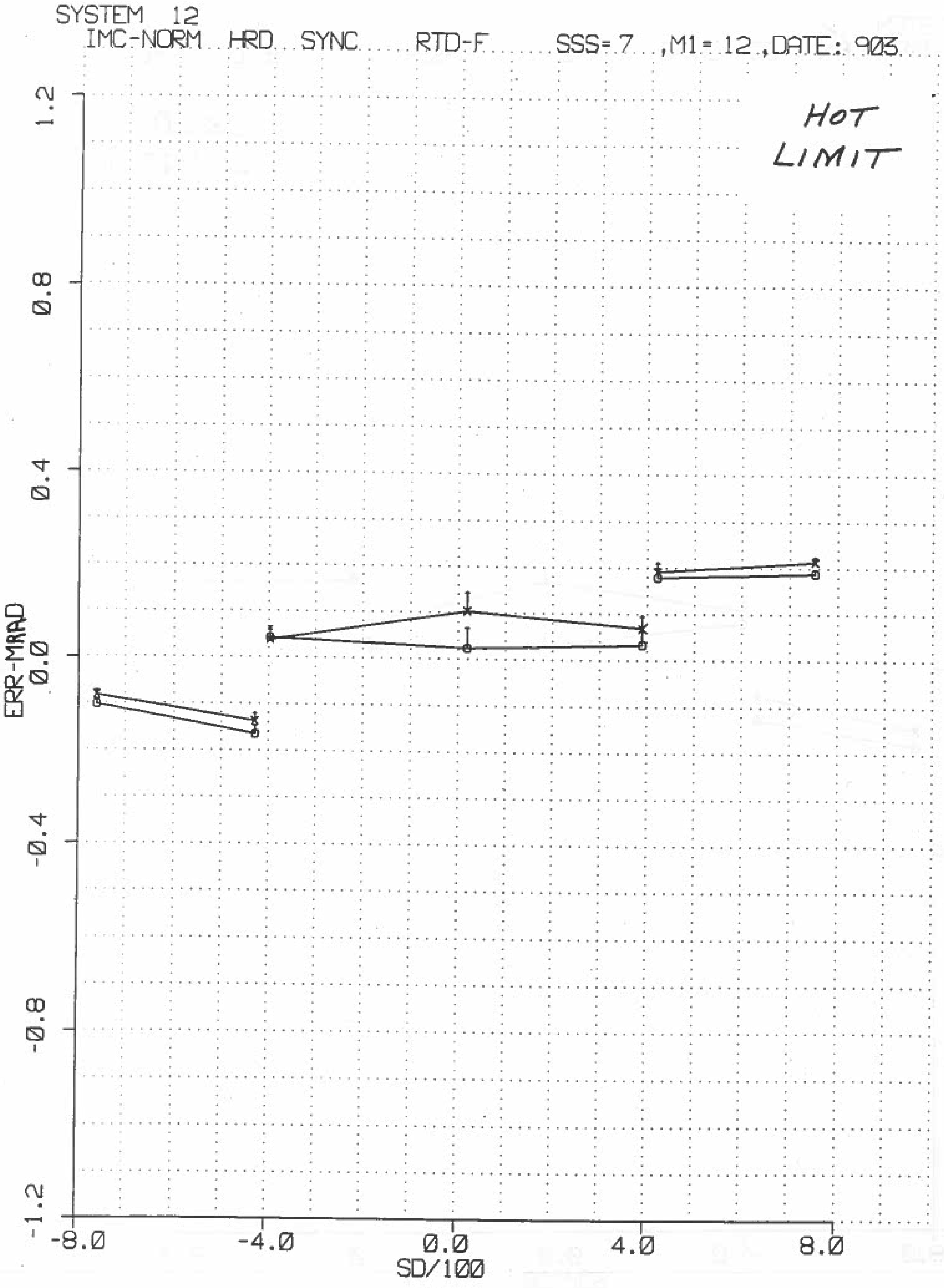
HOT LIMIT

SYSTEM 12
IMC-NORM HRD SYNC SDS SSS=3 ,M1=-8 ,DATE: 907

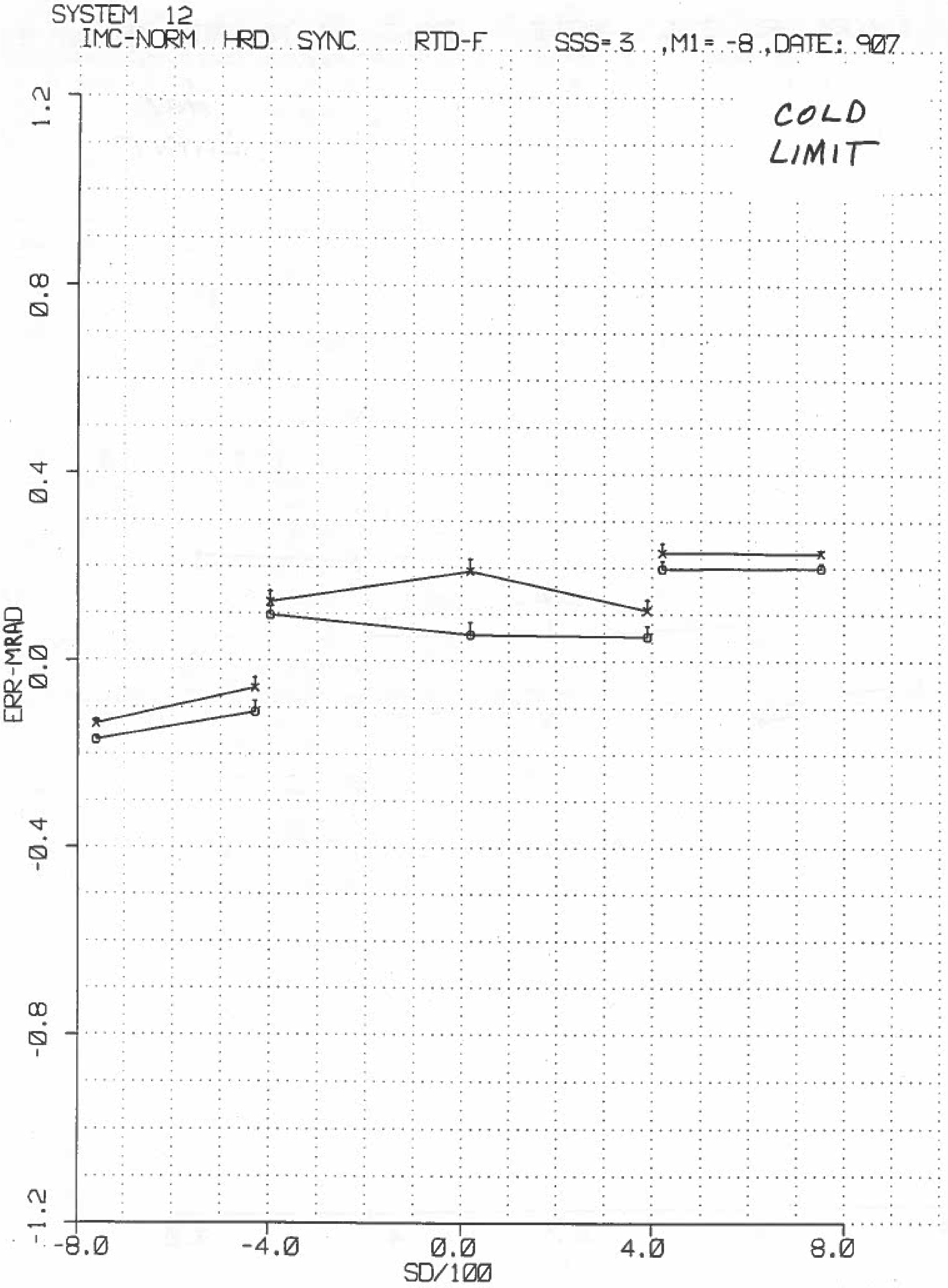


SYSTEM 12
IMC-NORM HRD SYNC RTD-F SSS= 5 ,M1= -8 ,DATE: 913

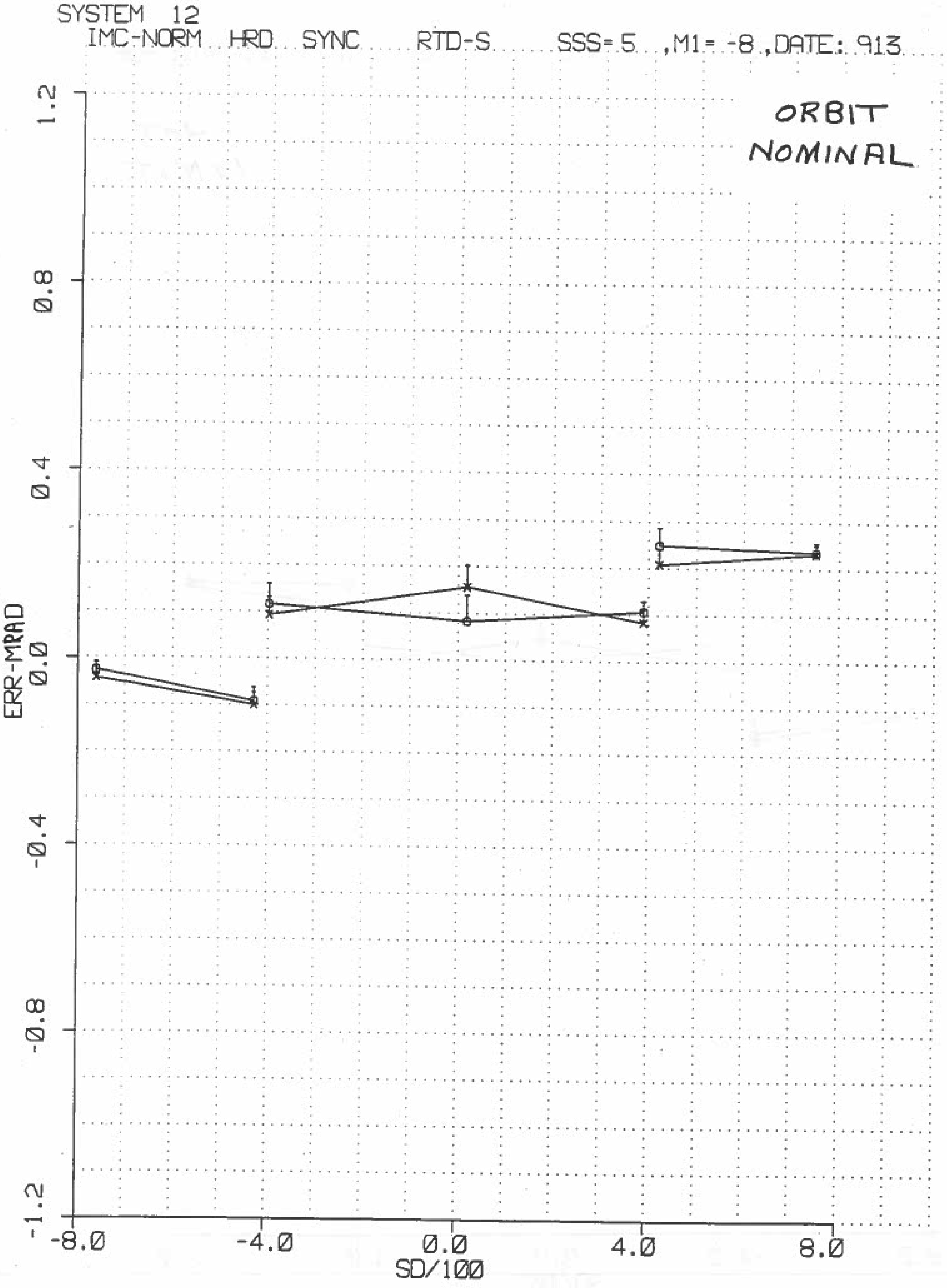


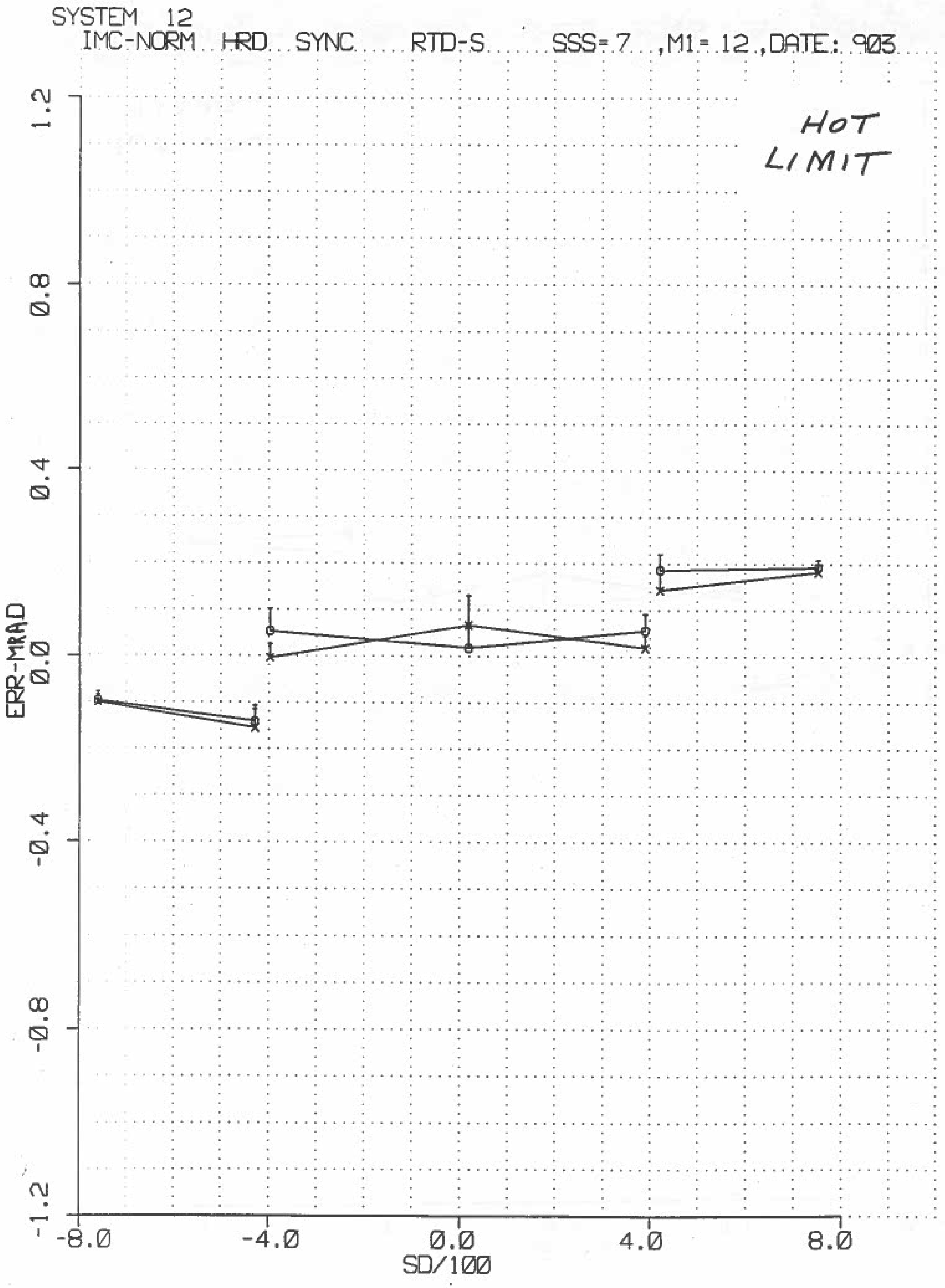

SYSTEM 12
IMC-NORM HRD SYNC RTD-F SSS=7 ,M1=12 ,DATE: 903
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

HOT LIMIT

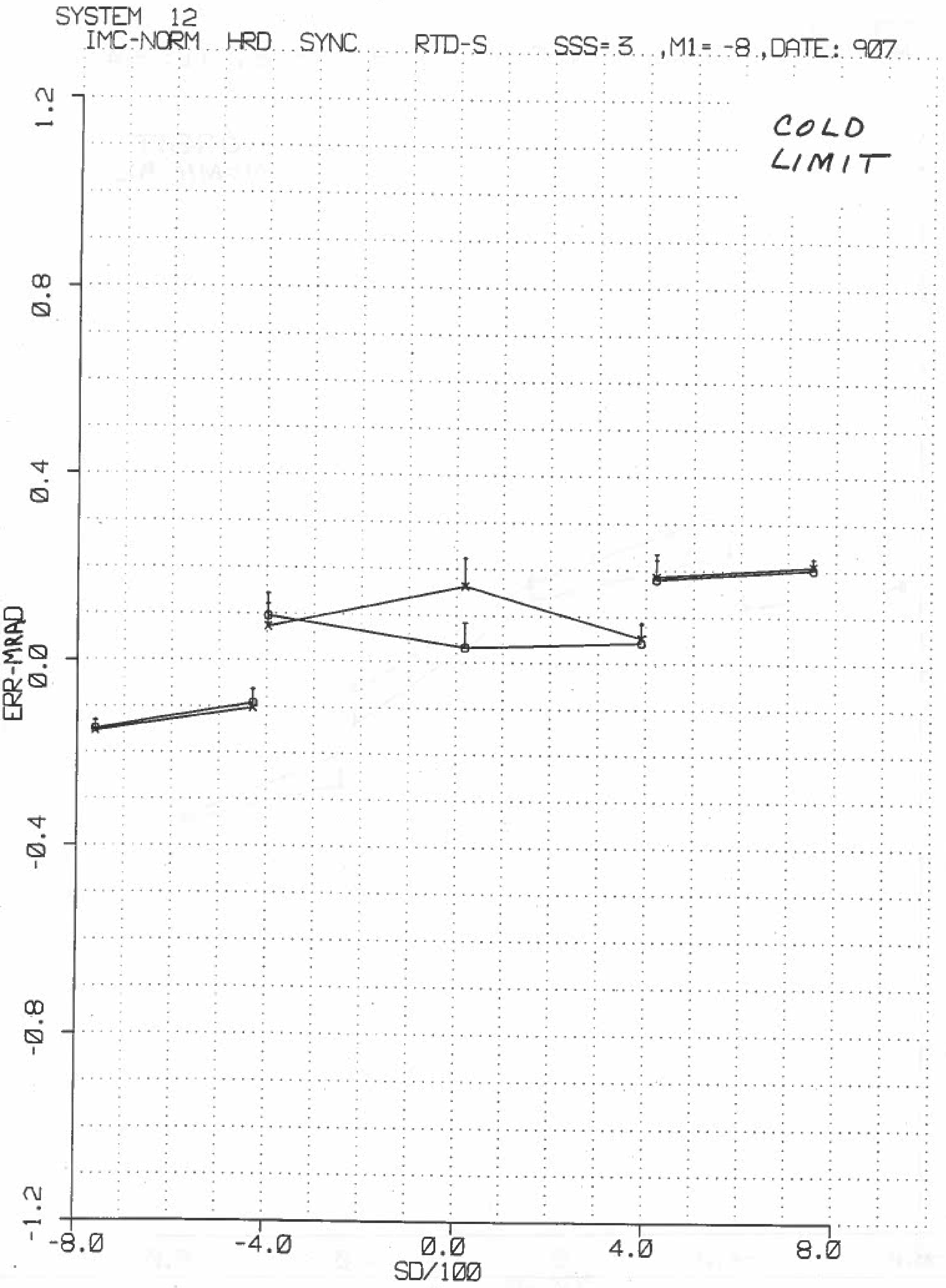

SYSTEM 12
IMC-NORM HRD SYNC RTD-F SSS=3 ,M1= -8 ,DATE: 907
ERR-MRAD
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
-8.0
-4.0
0.0
4.0
8.0
SD/100

COLD
LIMIT


SYSTEM 12
IMC-NORM HRD SYNC RTD-S SSS= 5 ,M1= -8 ,DATE: 913
ORBIT
NOMINAL
ERR-MRAD
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
-8.0
-4.0
0.0
4.0
8.0
SD/100

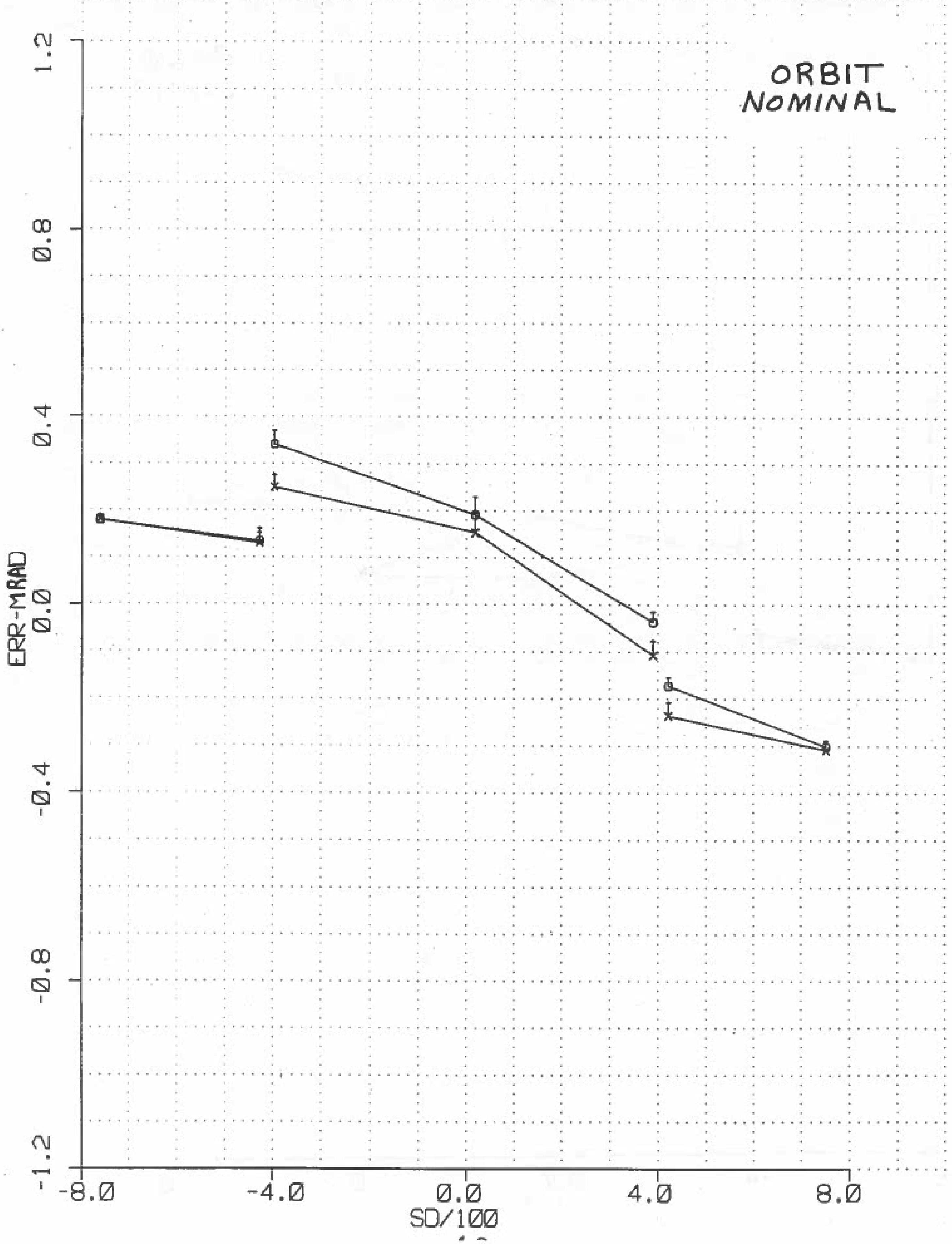

SYSTEM 12
IMC-NORM HRD SYNC RTD-S SSS= 7 ,M1= 12 ,DATE: 903
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

HOT LIMIT

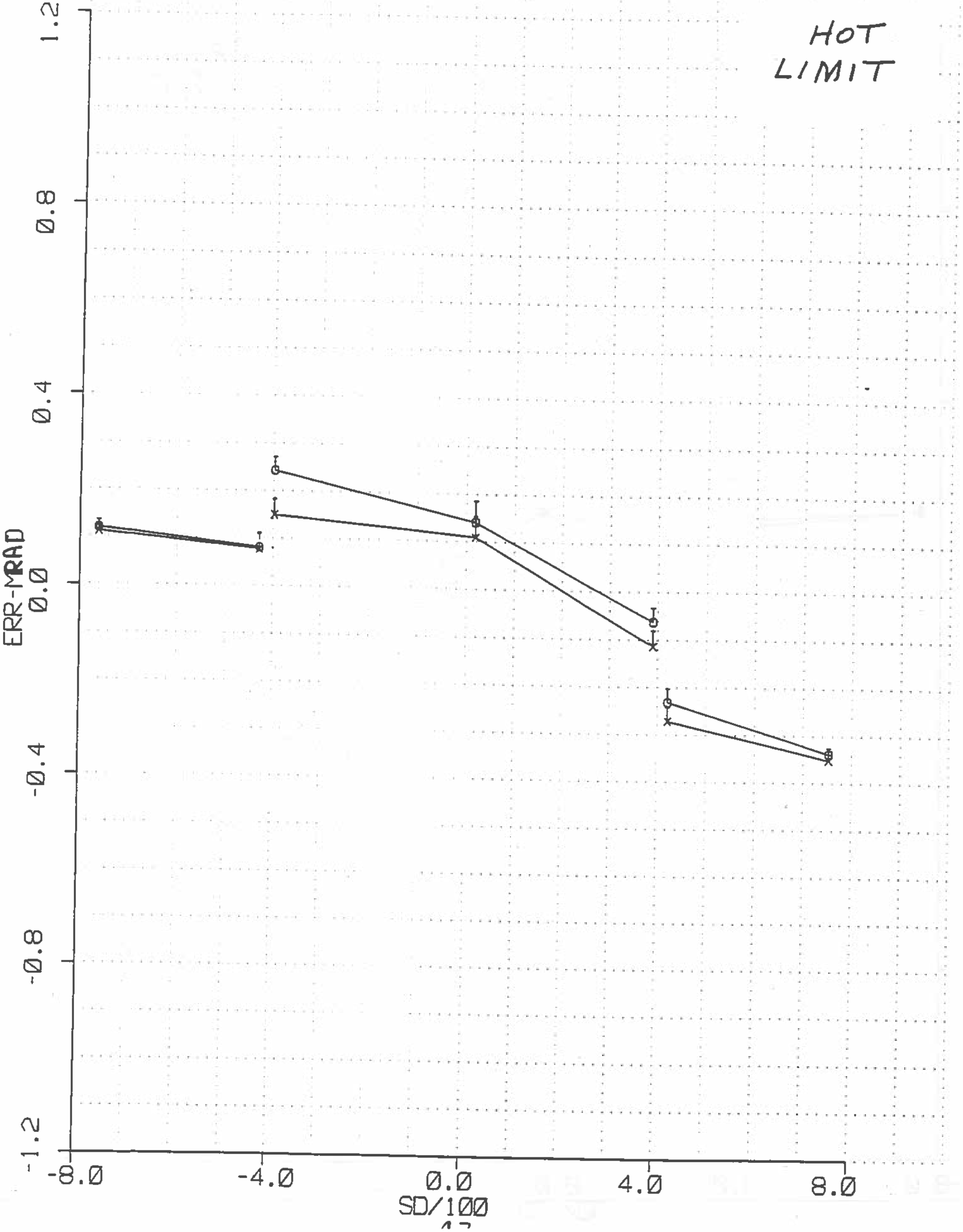

SYSTEM 12
IMC-NORM HRD SYNC RTD-S SSS=3 ,M1= -8 ,DATE: 907
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

COLD
LIMIT

SYSTEM 12
IMC-NORM T SYNC SDF SSS= 5 ,M1= -8 ,DATE: 914

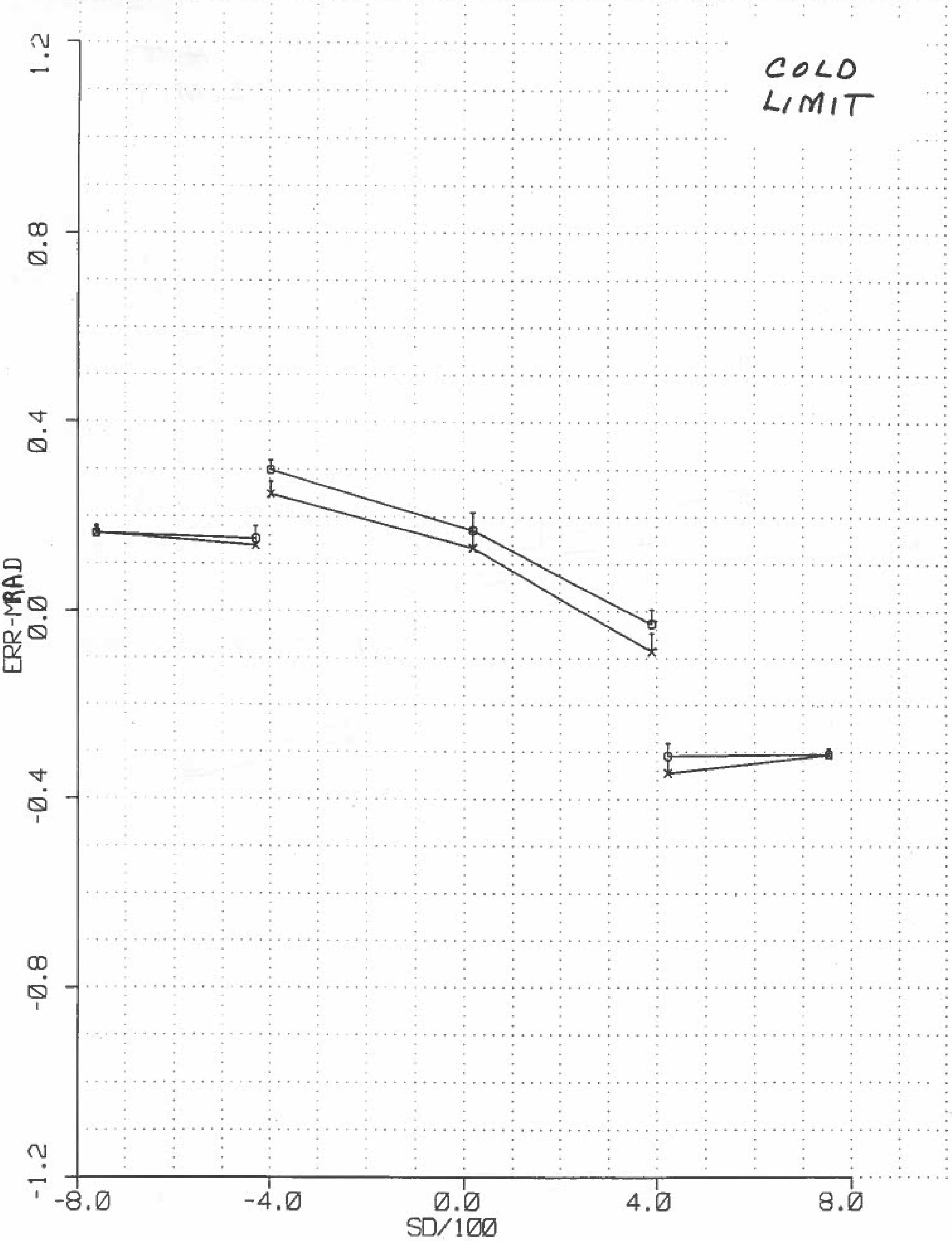


SYSTEM 12
IMC-NORM T SYNC SDF SSS= 7 ,M1= 12 ,DATE: 904

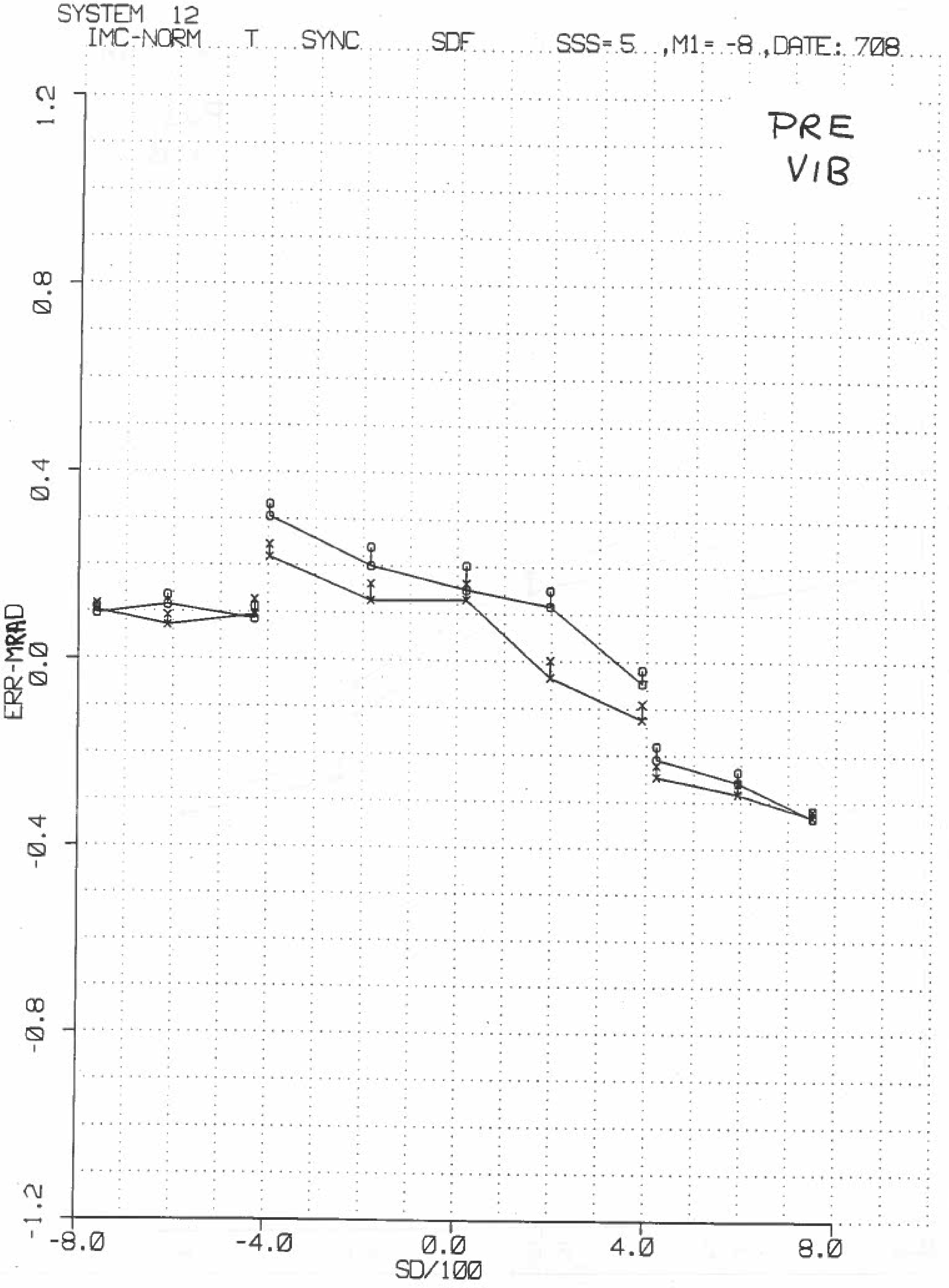


HOT
LIMIT

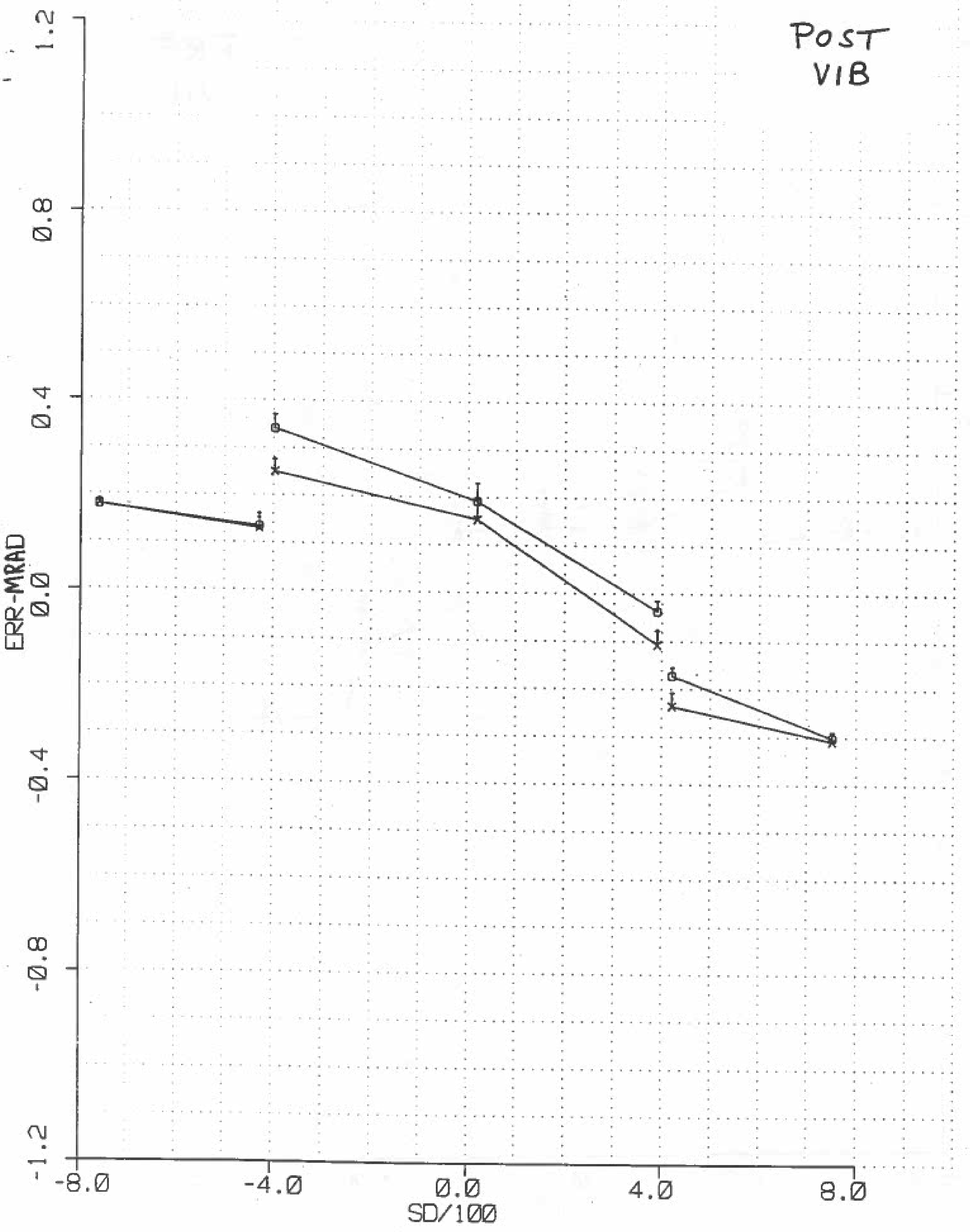
SYSTEM 12
IMC-NORM T SYNC SDF SSS= 3 ,M1= -8 ,DATE: 908



COLD
LIMIT

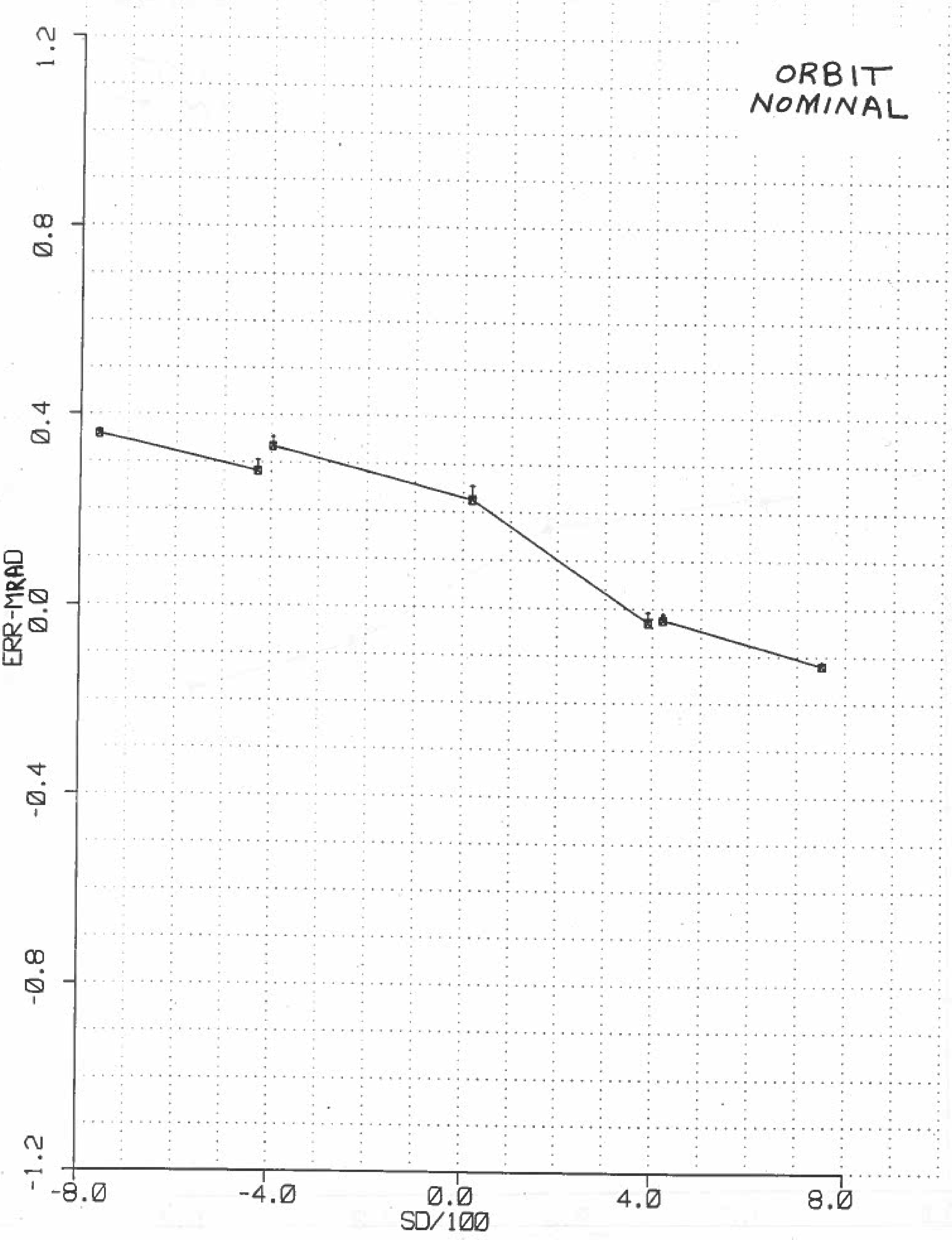

SYSTEM 12
IMC-NORM T SYNC SDF SSS=5 ,M1= -8 ,DATE: 708
PRE
VIB
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

SYSTEM 12
IMC-NORM T SYNC SDF SSS= 5 ,M1= -8 ,DATE: 914

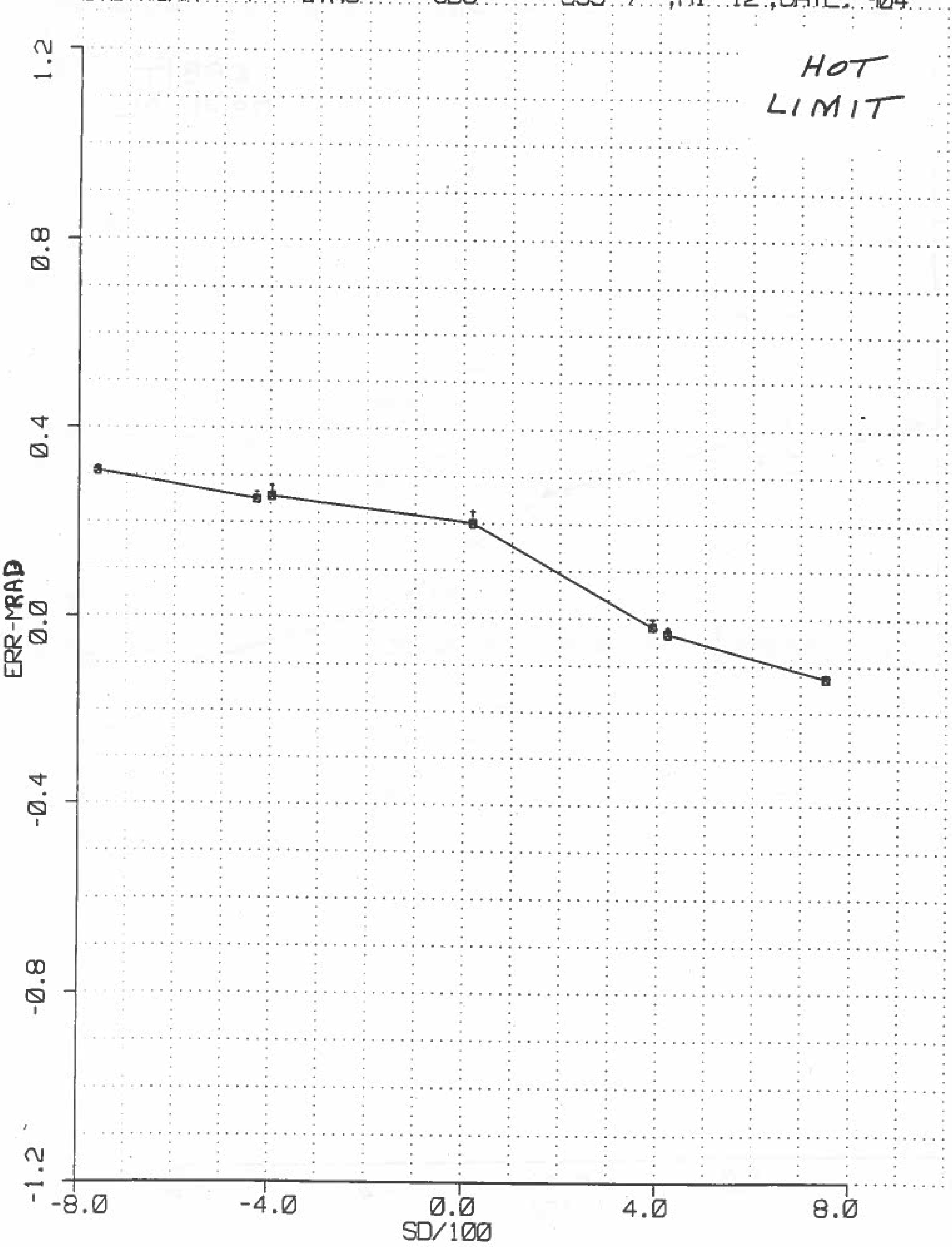


POST
VIB

SYSTEM 12
IMC-NORM T SYNC SDS SSS= 5 ,M1= -8 ,DATE: 914

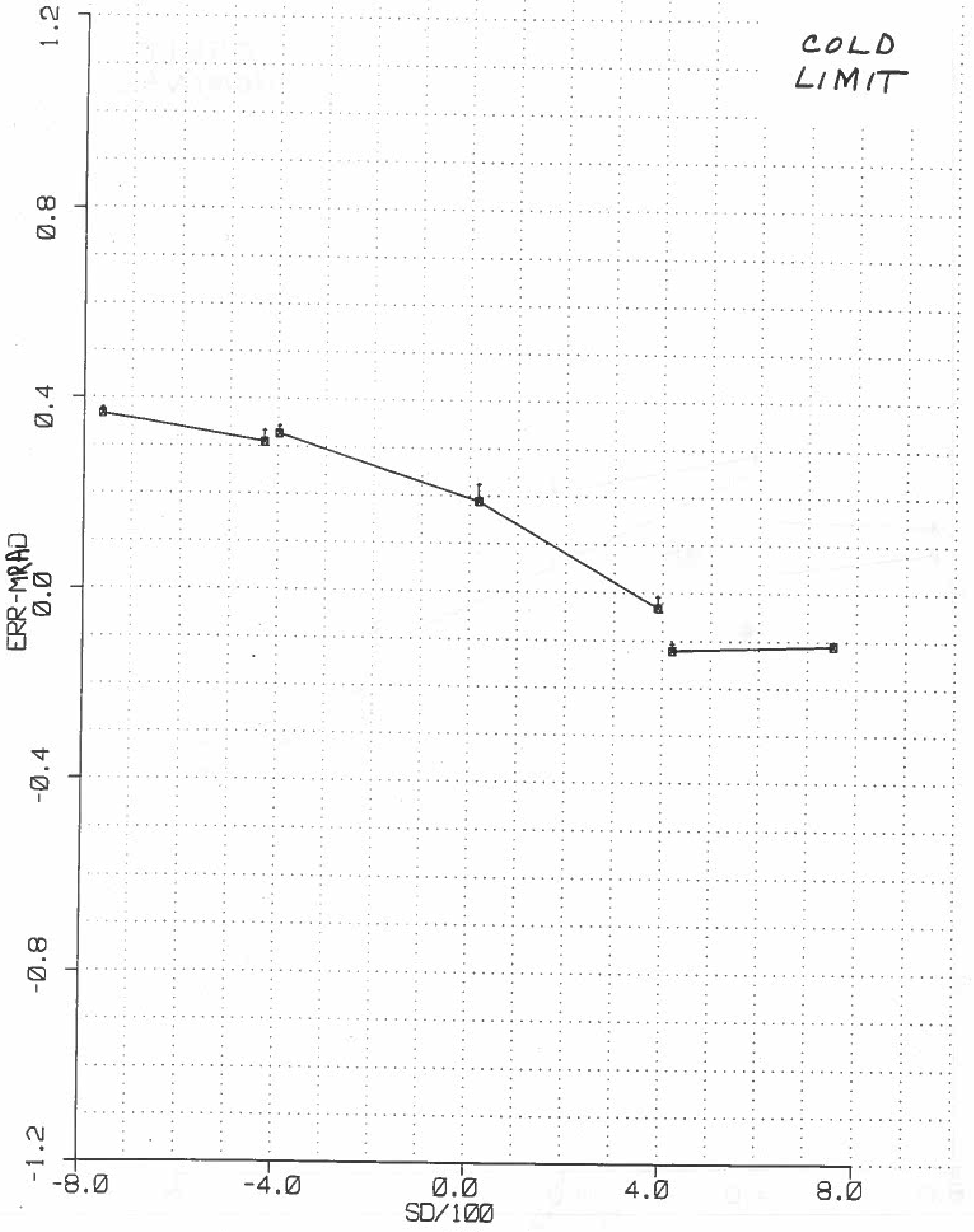


SYSTEM 12
IMC-NORM T SYNC SDS SSS= 7 ,M1= 12 ,DATE: 904



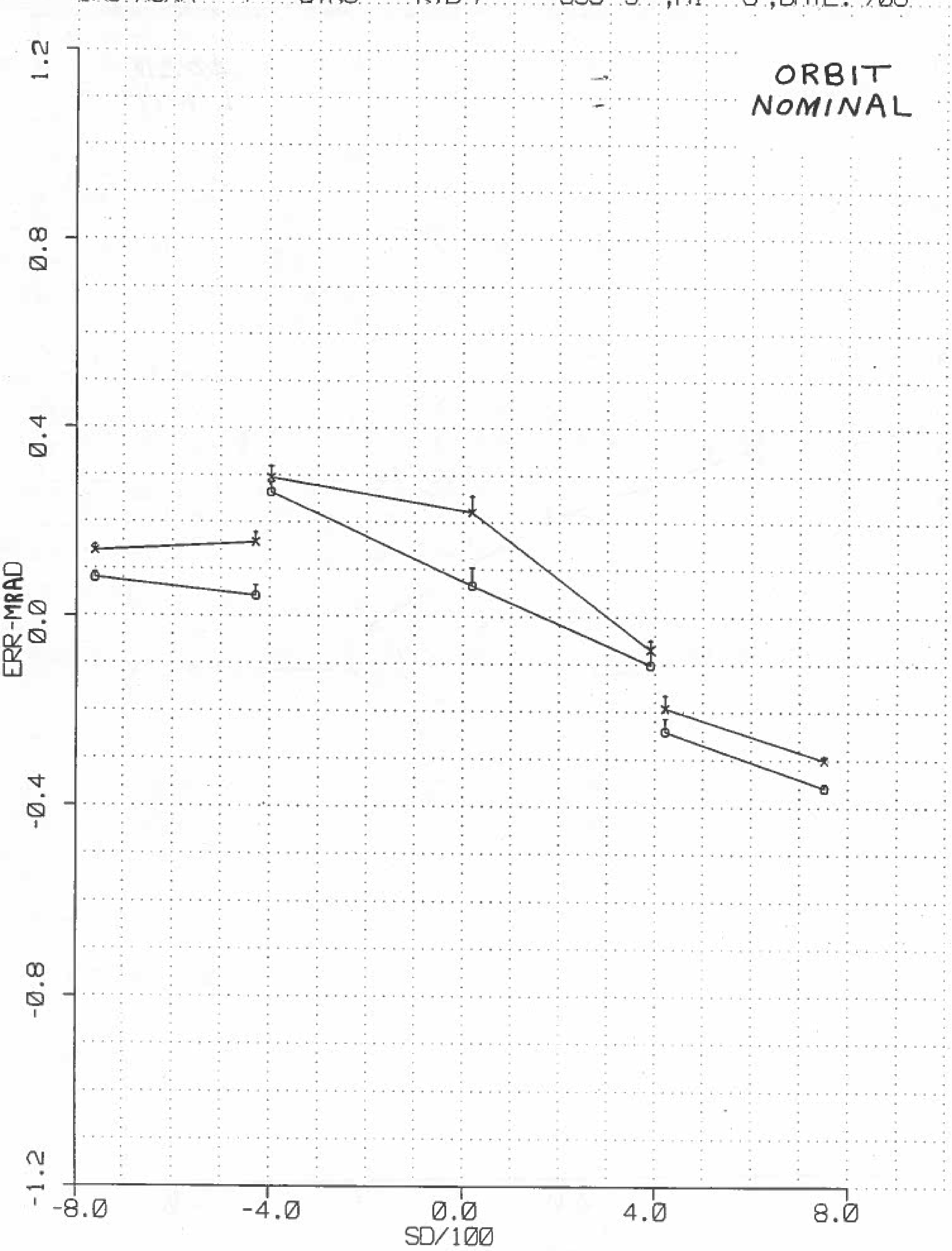
HOT LIMIT

SYSTEM 12
IMC-NORM T SYNC SDS SSS= 3 ,M1= -8 ,DATE: 908

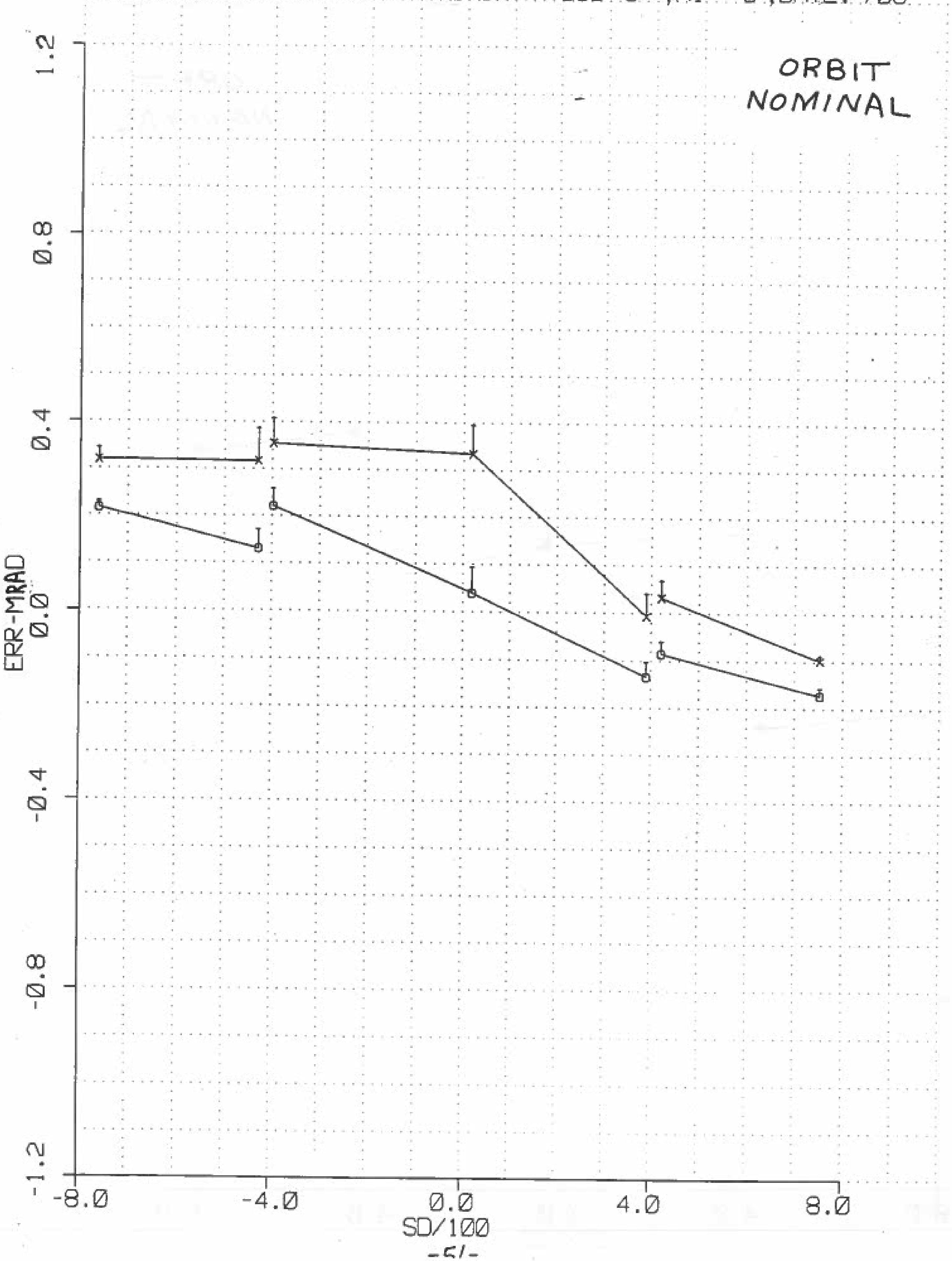


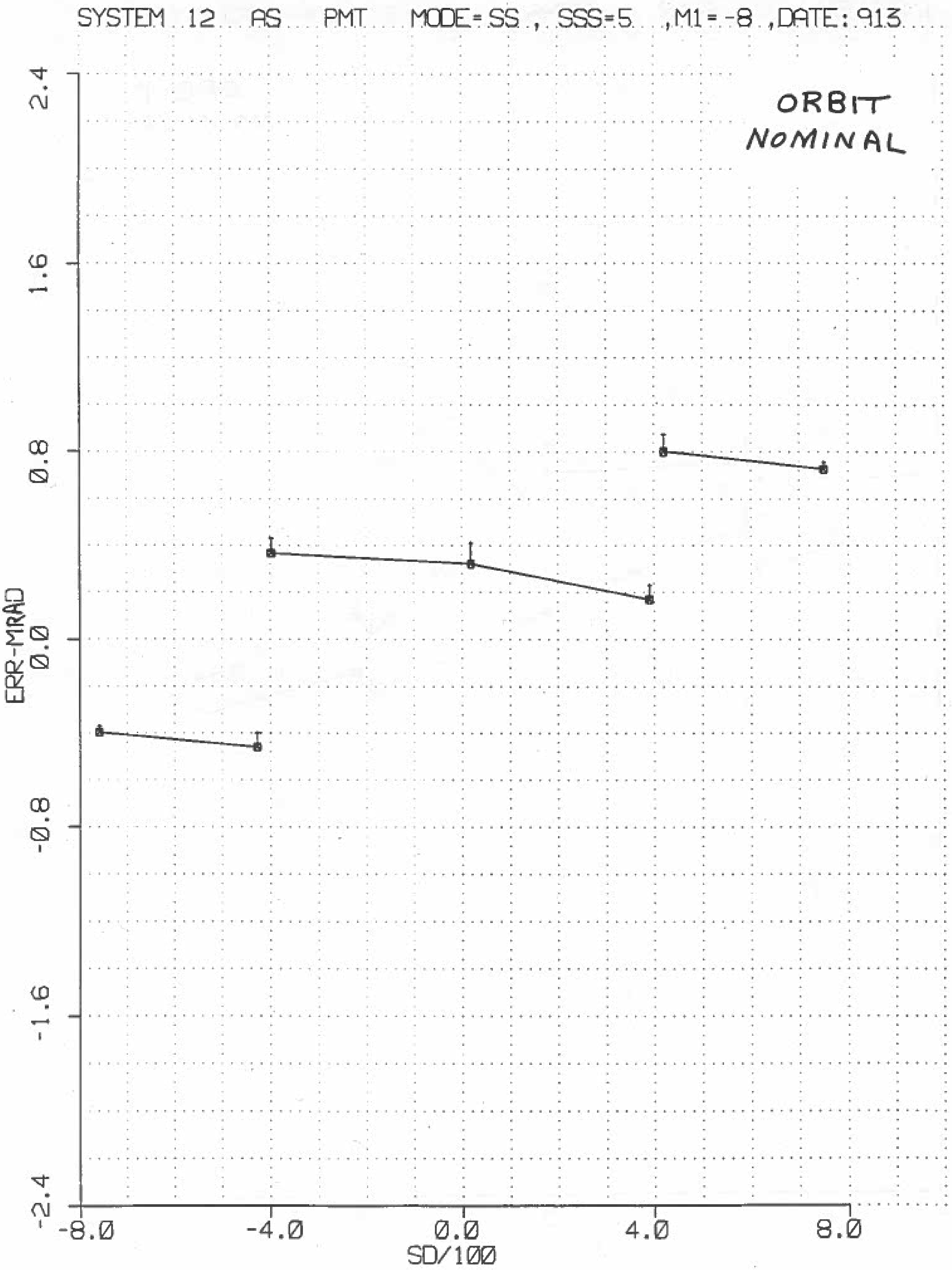
COLD
LIMIT

SYSTEM 12
IMC-NORM T SYNC RTD-F SSS= 5 ,M1= -8 ,DATE: 708

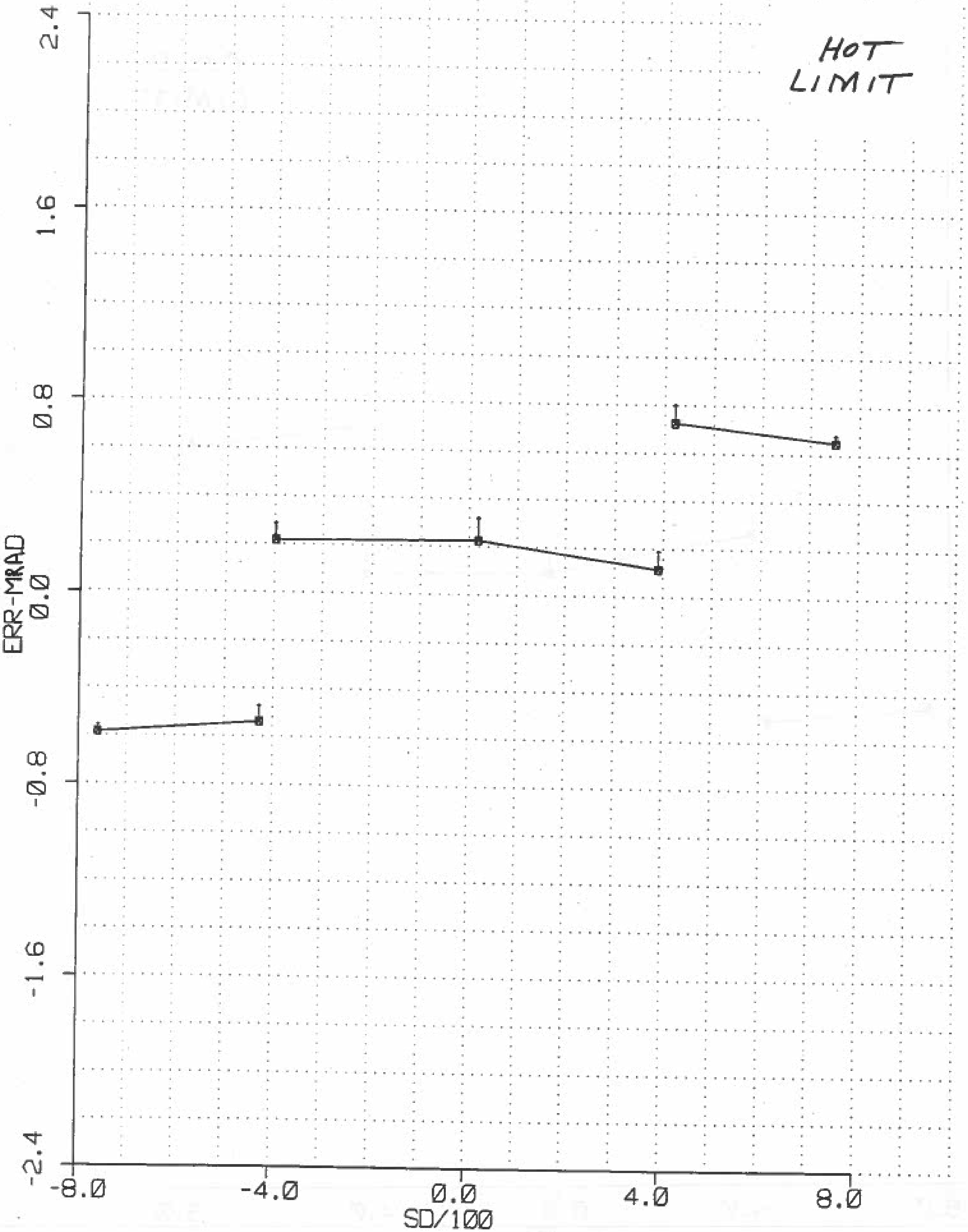


SYSTEM 12
IMC-NORM T SYNC RTD-S SSS= 5 ,M1= -8 ,DATE: 708

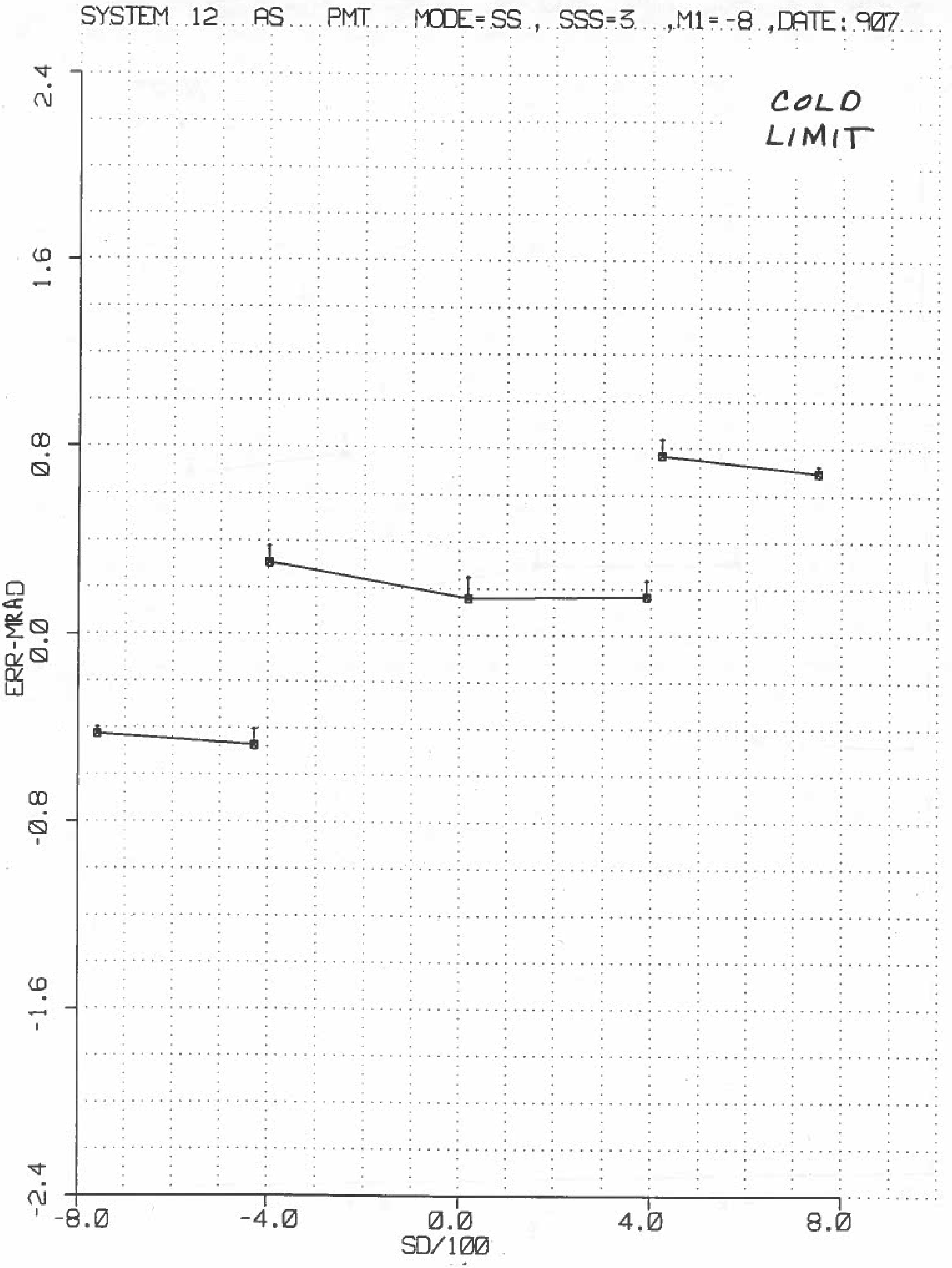



SYSTEM 12 AS PMT MODE=SS , SSS=5 ,M1=-8 ,DATE:913
ORBIT
NOMINAL
2.4
1.6
0.8
0.0
-0.8
-1.6
-2.4
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

SYSTEM 12 AS PMT MODE=SS , SSS=7 ,M1=12 ,DATE:903



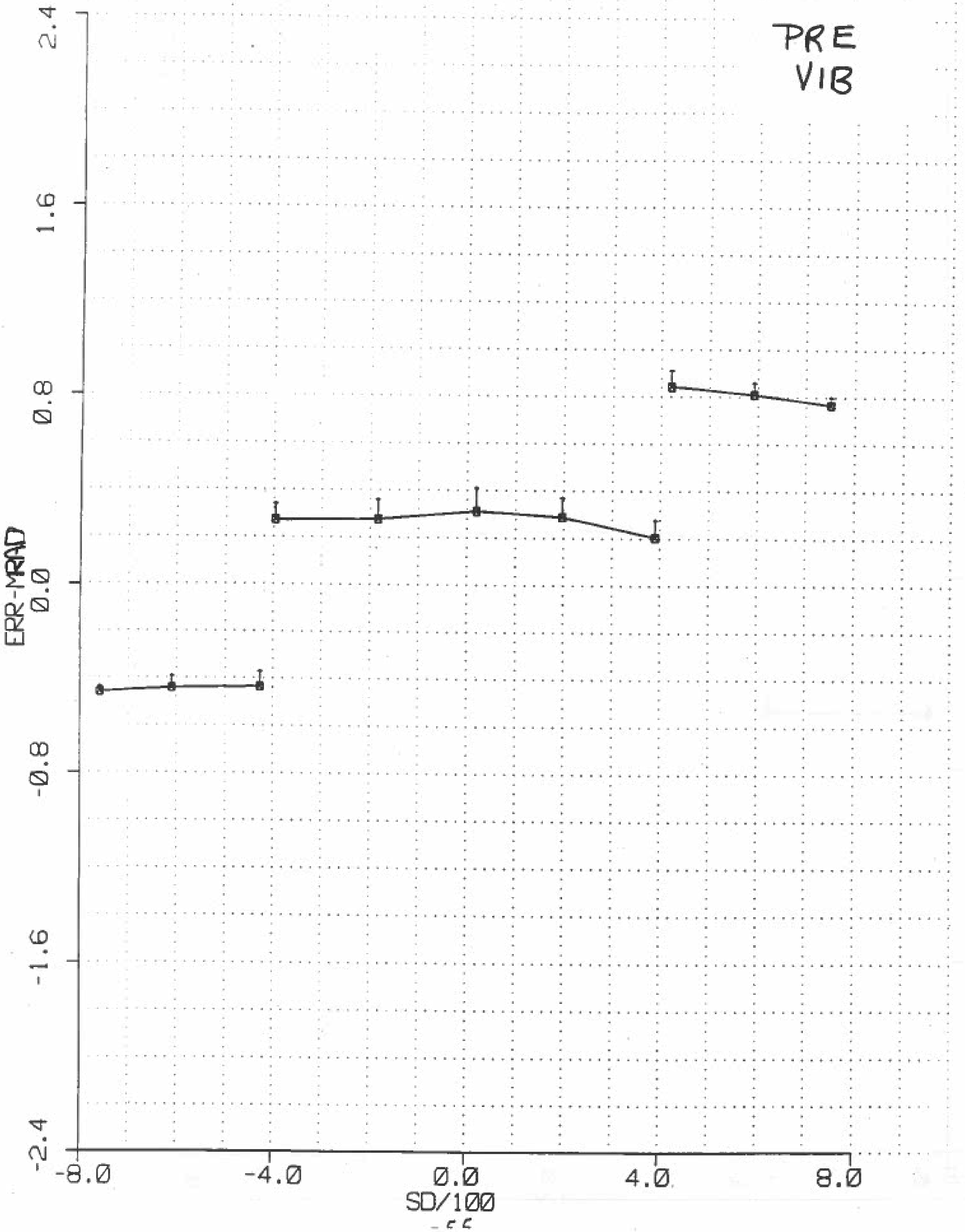
HOT LIMIT



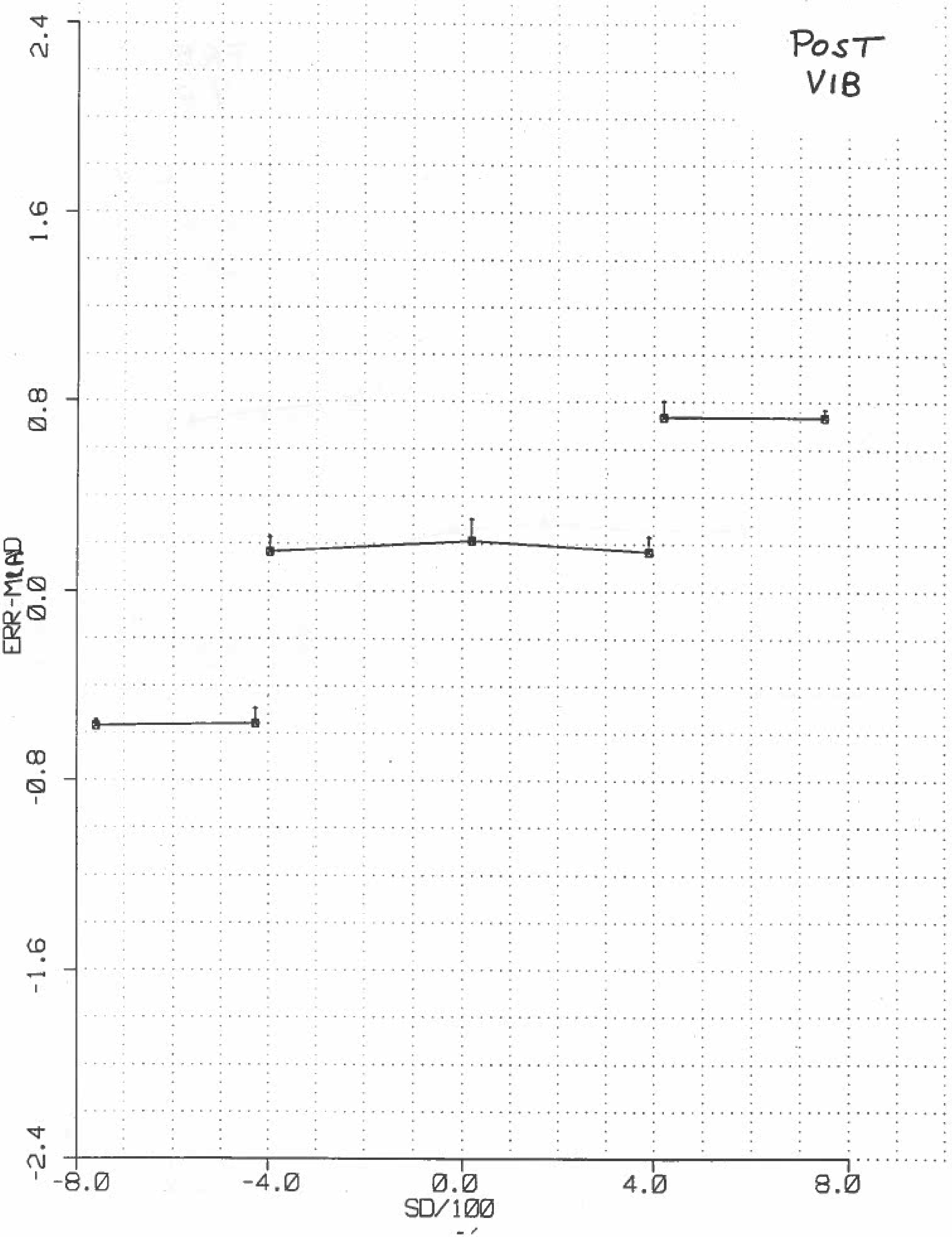
SYSTEM 12 AS PMT MODE=SS , SSS=3 ,M1=-8 ,DATE:907

COLD LIMIT

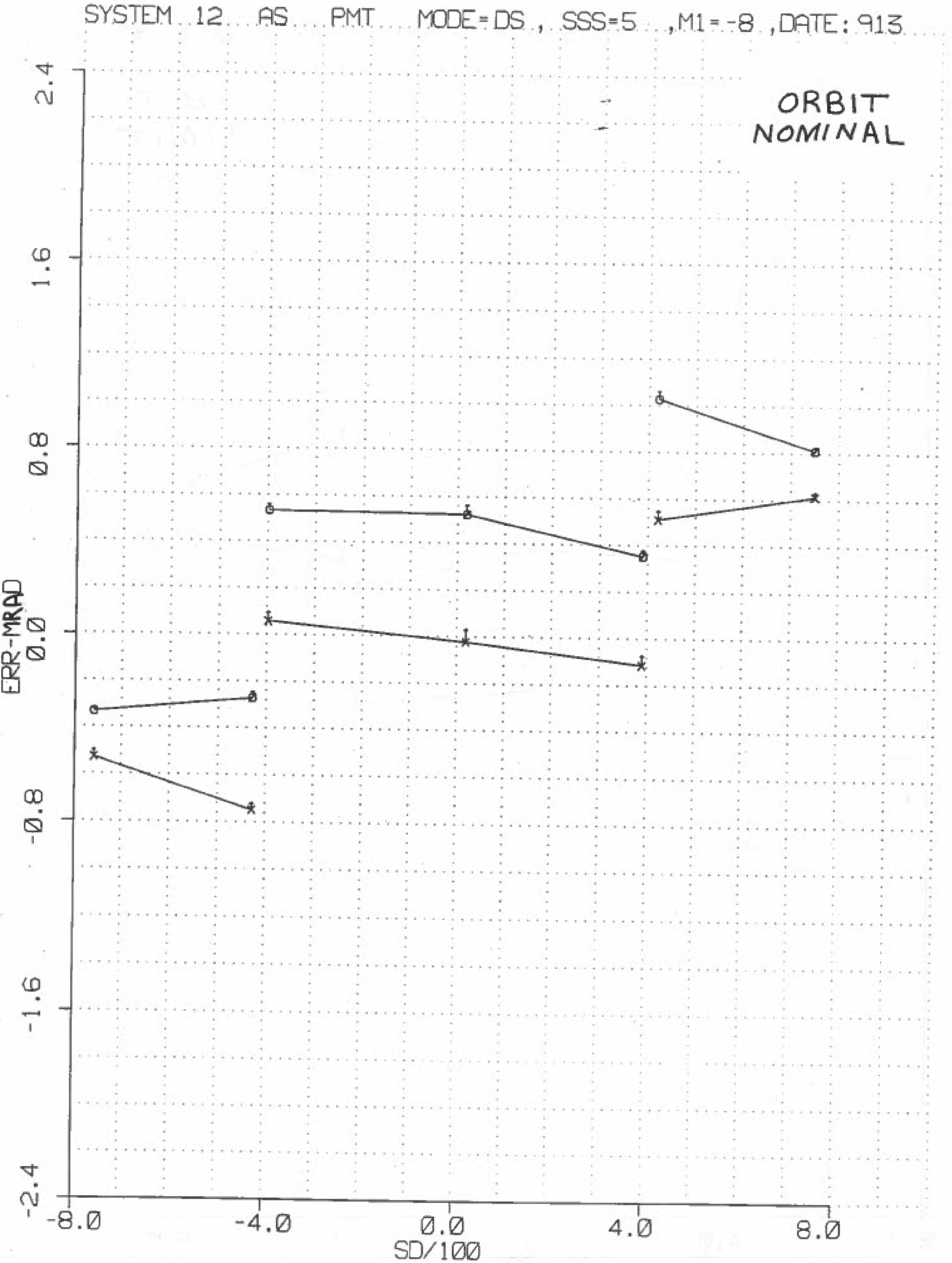
SYSTEM 12 AS PMT MODE=SS, SSS=23 ,M1=24 ,DATE:812

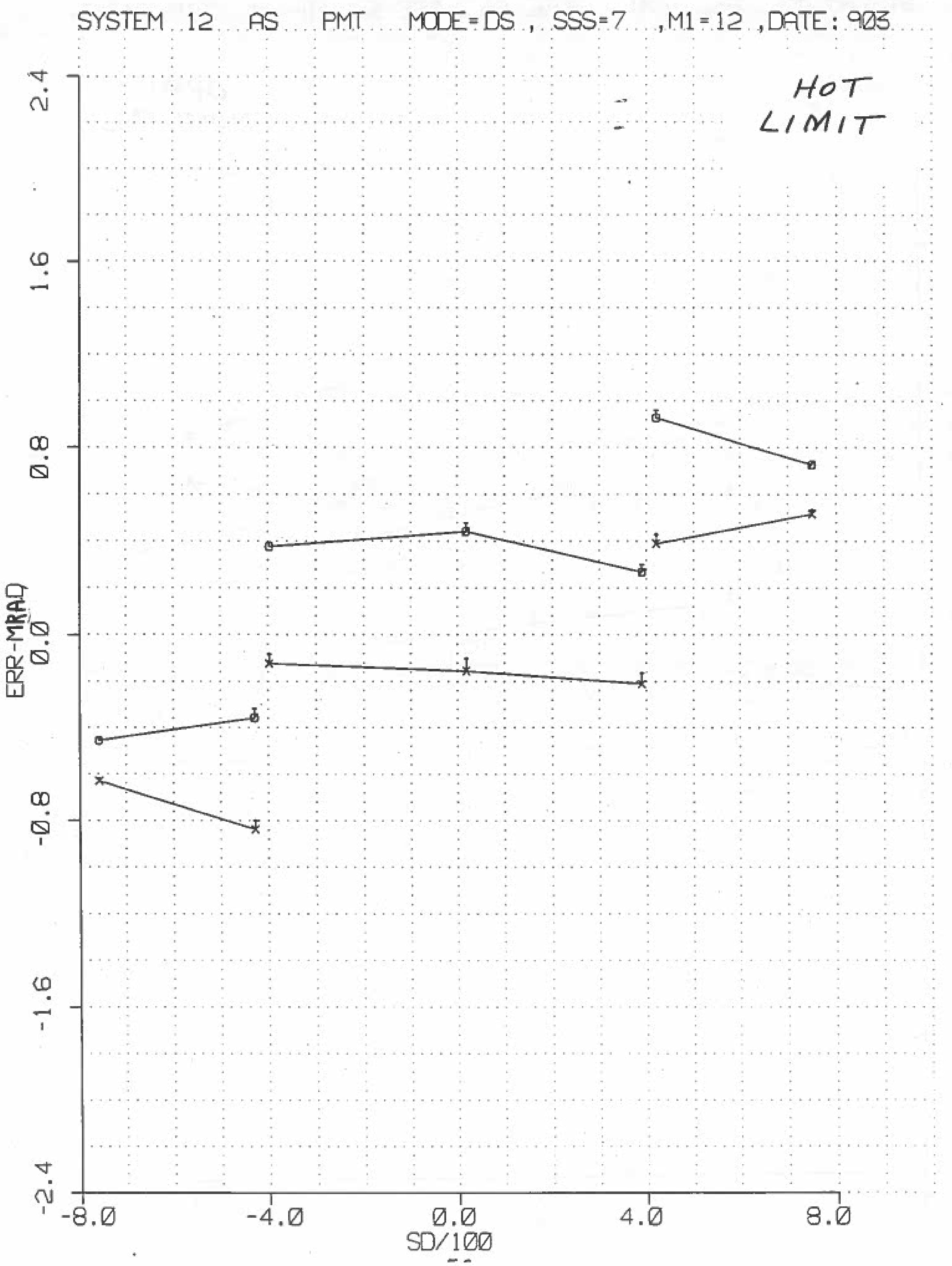


SYSTEM 12 AS PMT MODE=SS , SSS=22 ,M1=22 ,DATE: 818

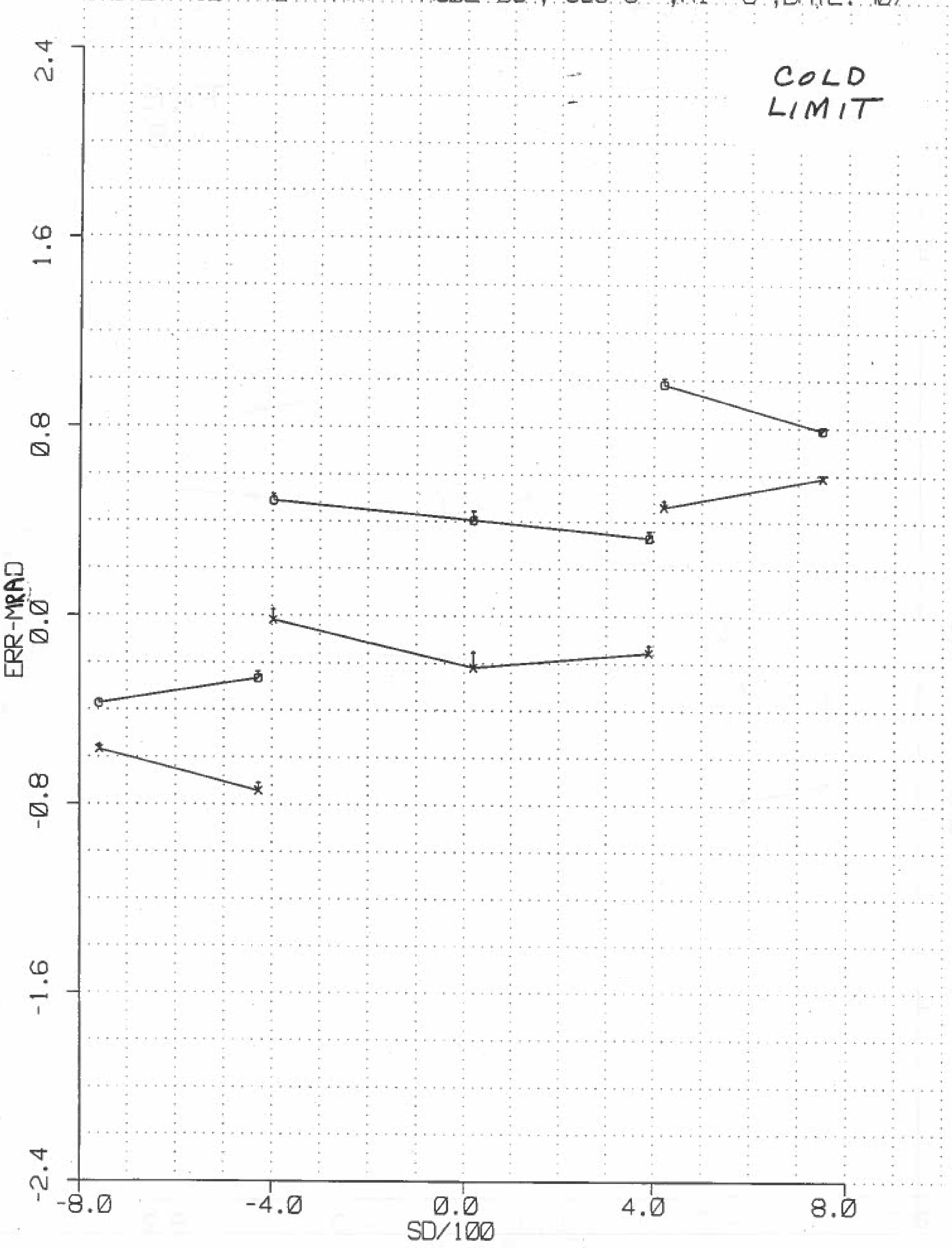


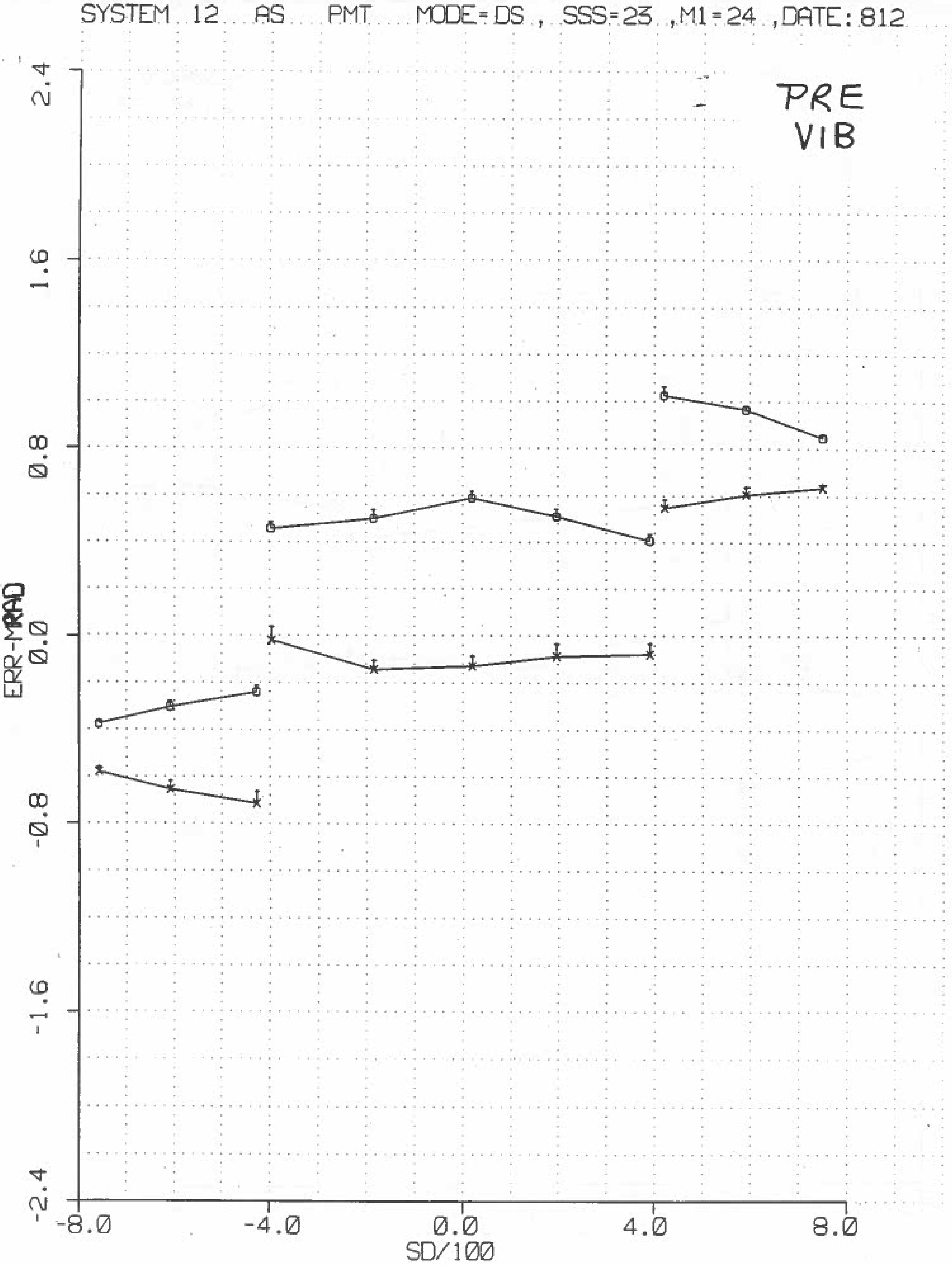
POST
VIB

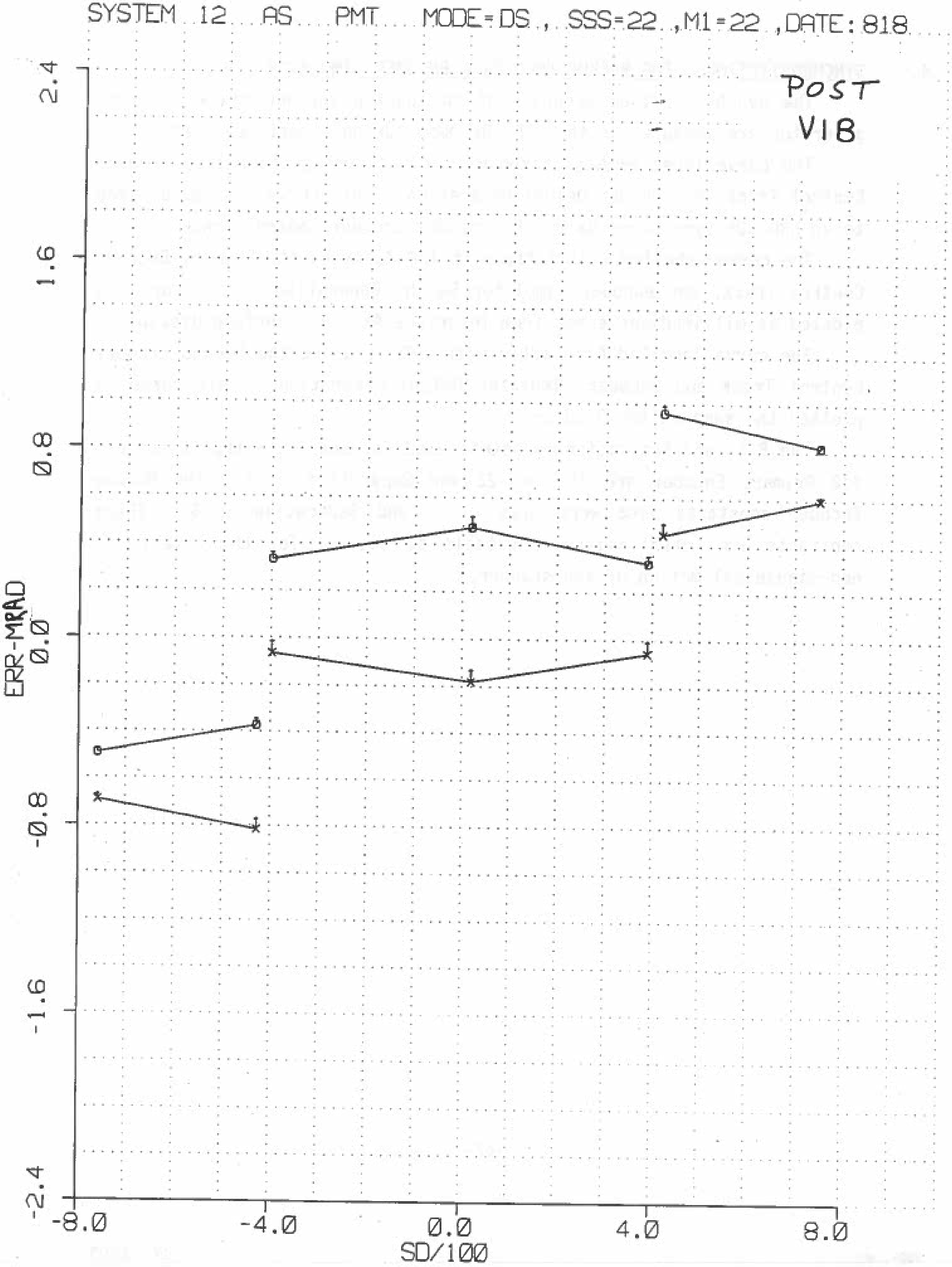

SYSTEM 12 AS PMT MODE=DS , SSS=5 ,M1=-8 ,DATE:913
ORBIT
NOMINAL
ERR-MRAD
2.4
1.6
0.8
0.0
-0.8
-1.6
-2.4
-8.0
-4.0
0.0
4.0
8.0
SD/100


SYSTEM 12 AS PMT MODE=DS , SSS=7 ,M1=12 ,DATE:903
HOT
LIMIT
2.4
1.6
0.8
0.0
-0.8
-1.6
-2.4
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

SYSTEM 12 AS PMT MODE=DS , SSS=3 ,M1=-8 ,DATE:907


COLD LIMIT


SYSTEM 12 AS PMT MODE=DS , SSS=23 ,M1=24 ,DATE:812
PRE VIB
2.4
1.6
0.8
0.0
-0.8
-1.6
-2.4
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100


SYSTEM 12 AS PMT MODE=DS , SSS=22 ,M1=22 ,DATE:818
ERR-MRAD
2.4
1.6
0.8
0.0
-0.8
-1.6
-2.4
-8.0
-4.0
0.0
4.0
8.0
SD/100

POST VIB

4. SYNCHRONIZATION USING BACKUP ENCODER & ENCODER SIMULATOR

The synchronization accuracy of the backup encoder track & delphi generator are measured in the HRD SDF mode during acceptance test.

The curve labelled A is taken with I/O X, using the Backup Encoder Control Track and Encoder Delphi Generation. This curve can be compared to an HRD SDF sync curve using the Primary Encoder Control Track.

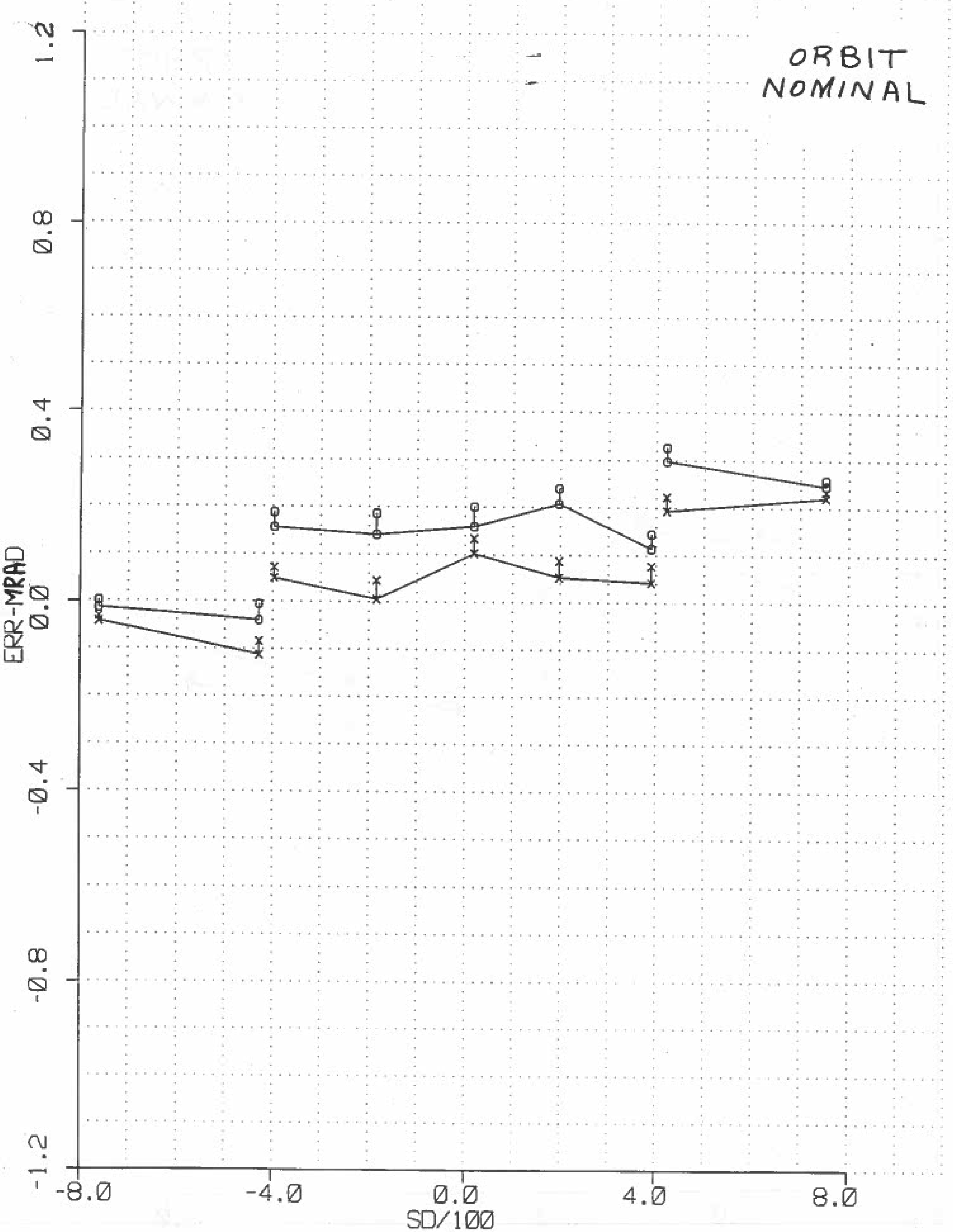
The curve labelled B is taken with I/O X, using the Primary Encoder Control Track, and encoder Simulator Delphi Generation. This curve is plotted as milliradians error from Interface Axis vs. Surface distance.

The curve labelled C is taken with I/O Y, using the Backup Encoder Control Track and Encoder Simulator Delphi Generation. This curve is plotted the same as the B curve.

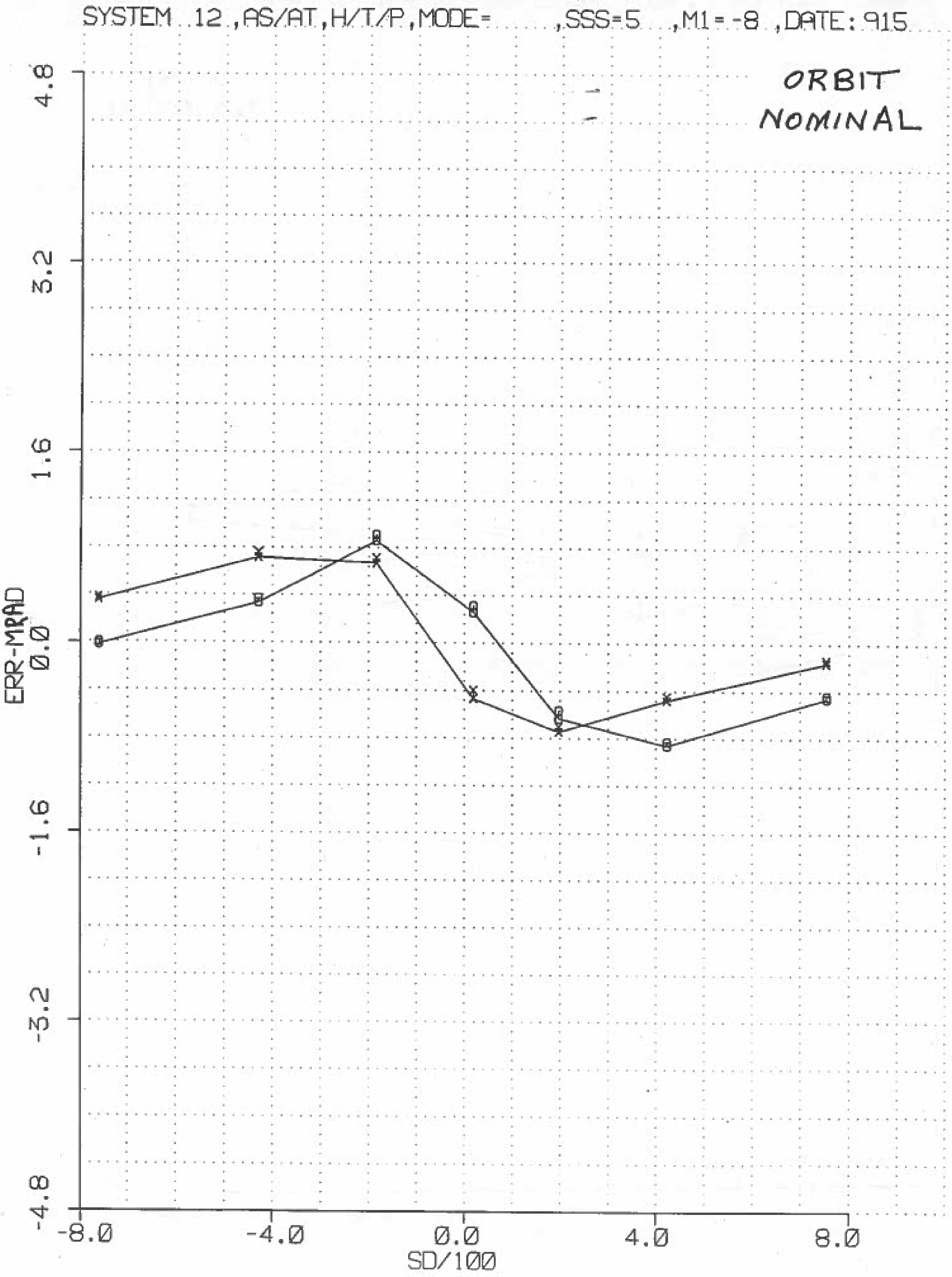
The Bias and Separation constants used for bearing retrofit for OLS #12 Primary Encoder are Bias = -22 and Separation = -7. The Backup Encoder constants used were Bias = -23 and Separation = -6. These constants are operationally adjustable to account for the effects of non-sinusoidal motion of the scanner.

A

SYSTEM 12 ,AS/AT,H/T/P,MODE=SDF ,SSS=5 ,M1=-8 ,DATE: 915

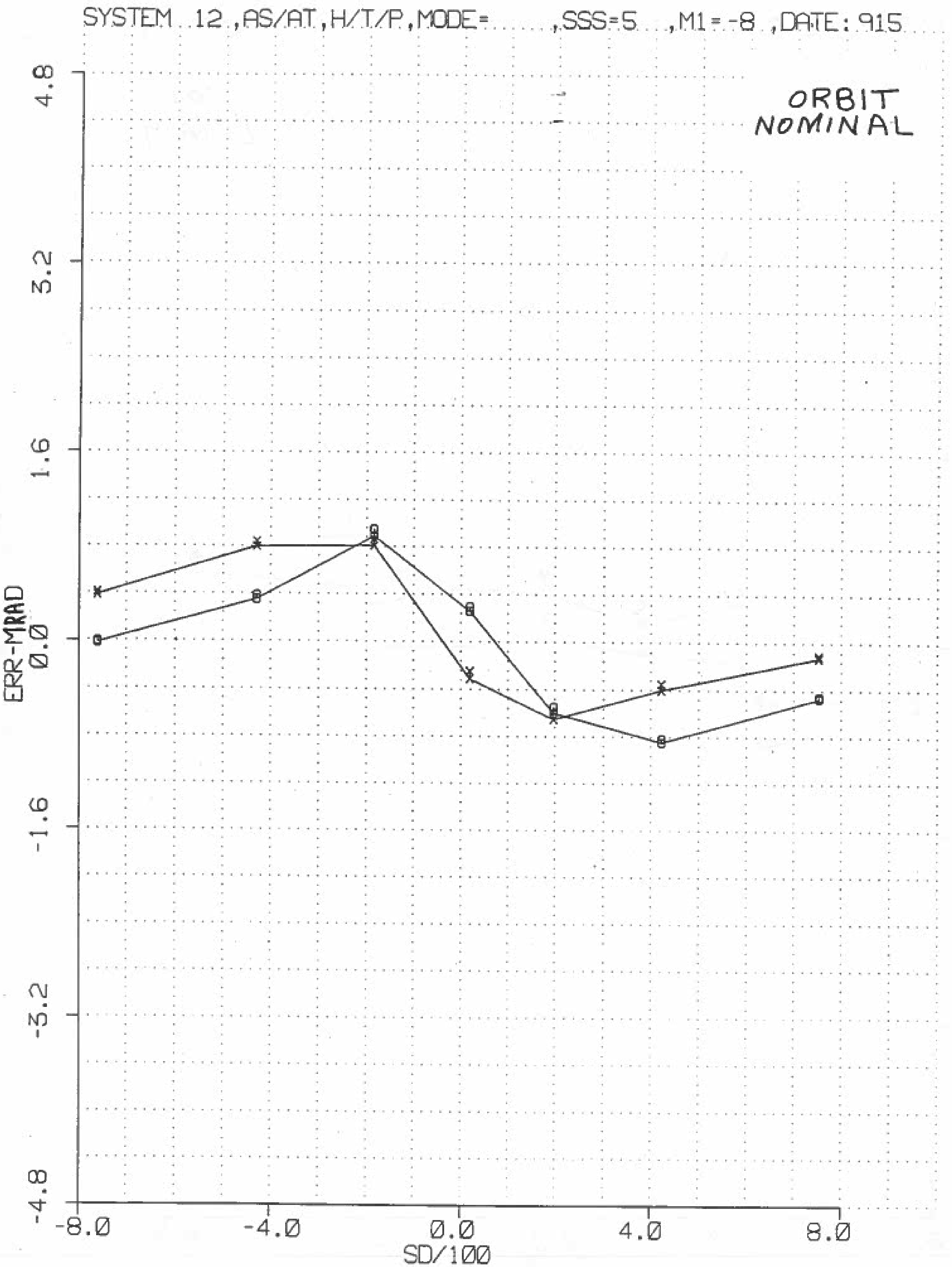

ORBIT NOMINAL

B



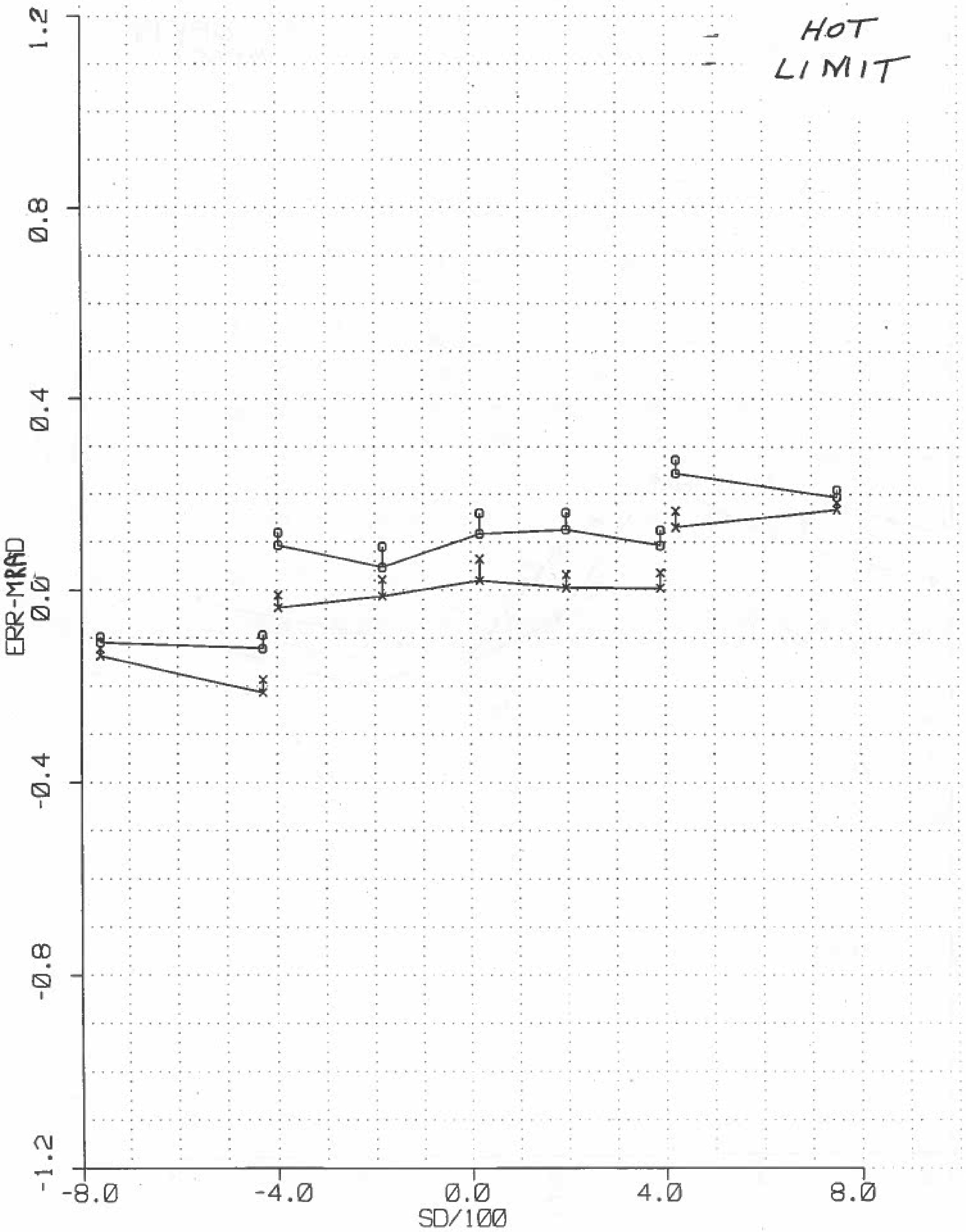
ORBIT
NOMINAL

C

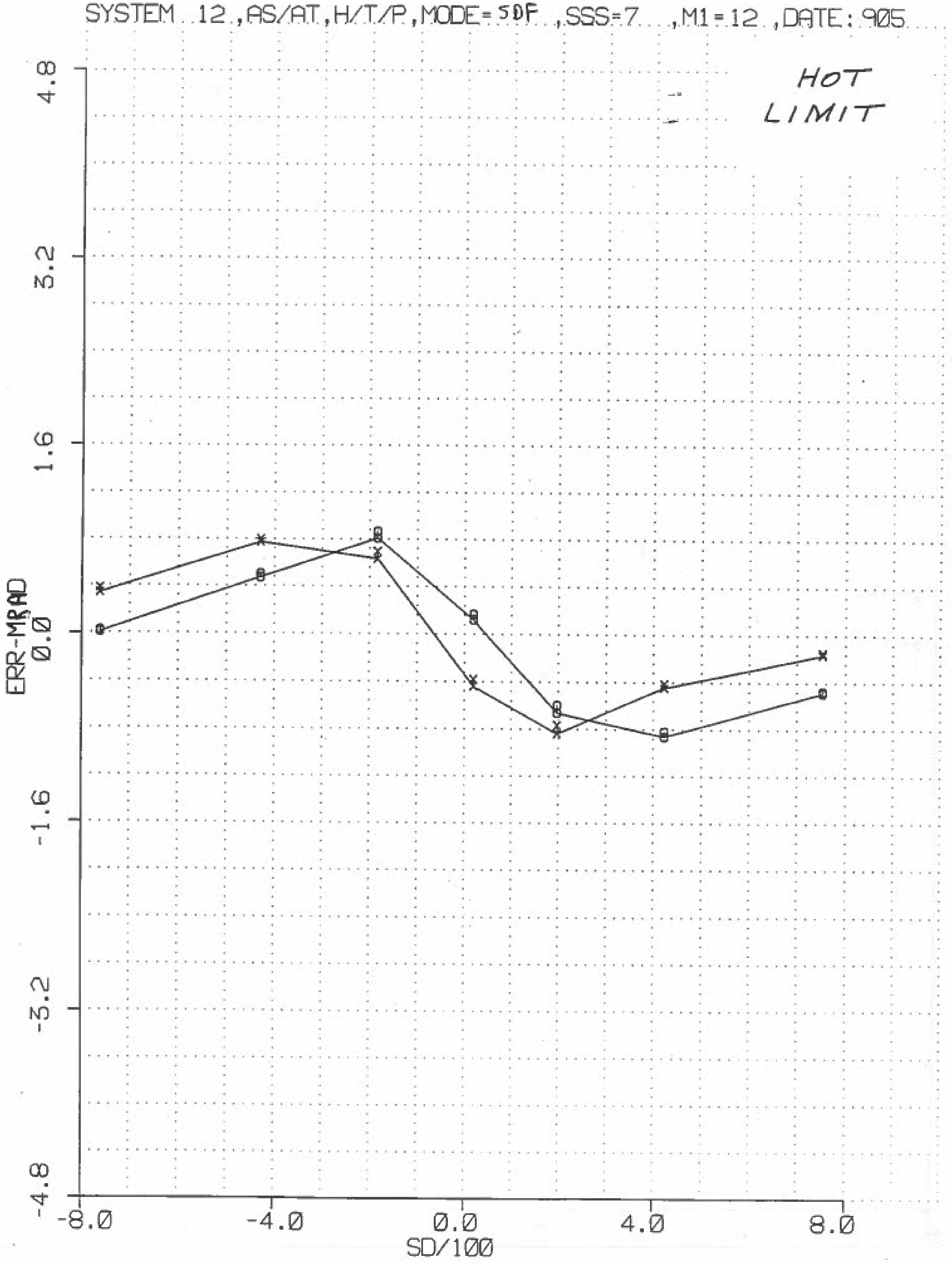

SYSTEM 12 ,AS/AT,H/T/P,MODE= ,SSS=5 ,M1=-8 ,DATE:915
ORBIT
NOMINAL
ERR-MRAD
4.8
3.2
1.6
0.0
-1.6
-3.2
-4.8
-8.0
-4.0
0.0
4.0
8.0
SD/100

8 A

SYSTEM 12 ,AS/AT,H/T/P,MODE=5DF ,SSS=7 ,M1=12 ,DATE:905

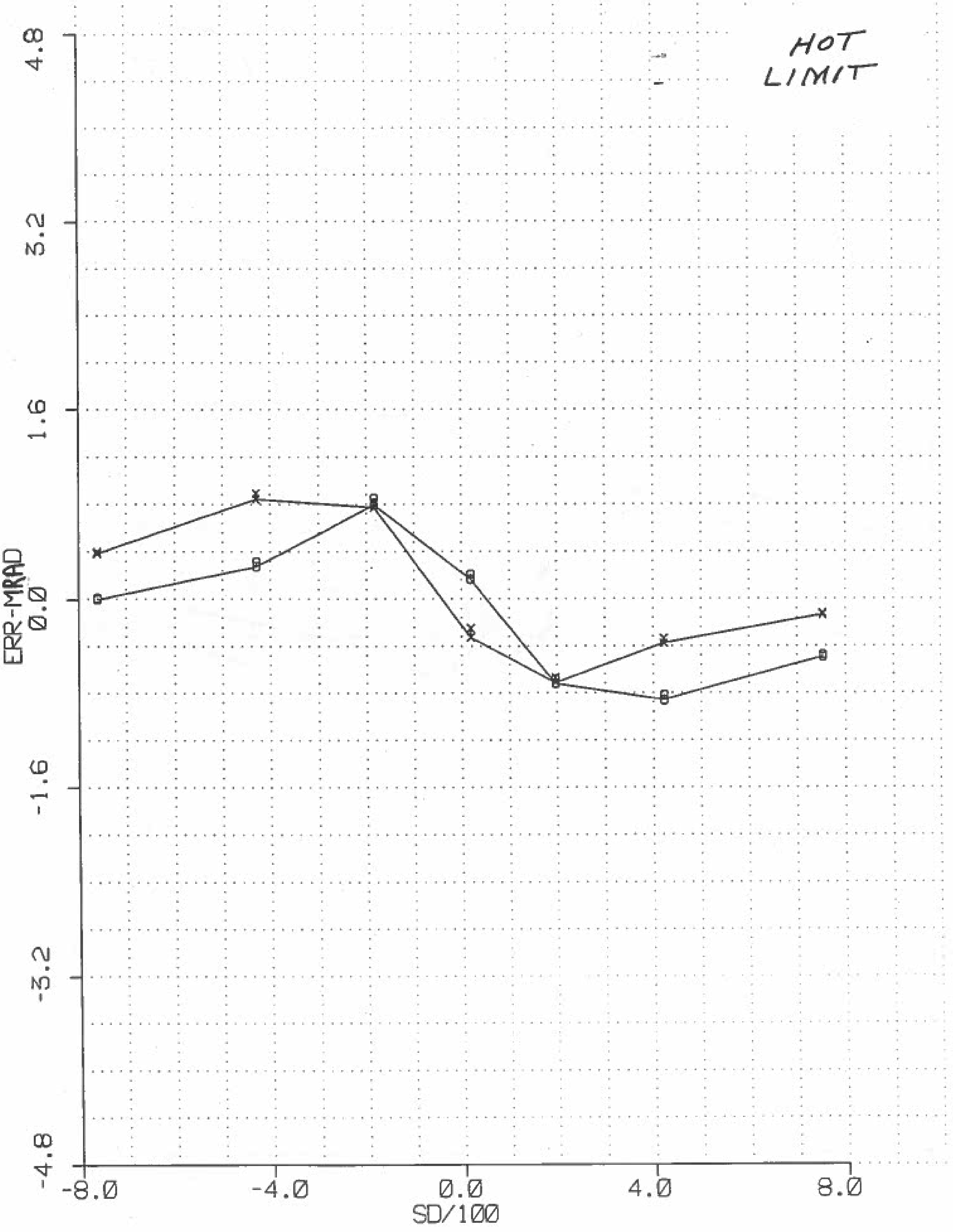


#13


SYSTEM 12 ,AS/AT,H/T/P,MODE= 5DF ,SSS=7 ,M1=12 ,DATE: 905
HOT
LIMIT
ERR-MRAD
4.8
3.2
1.6
0.0
-1.6
-3.2
-4.8
-8.0
-4.0
0.0
4.0
8.0
SD/100

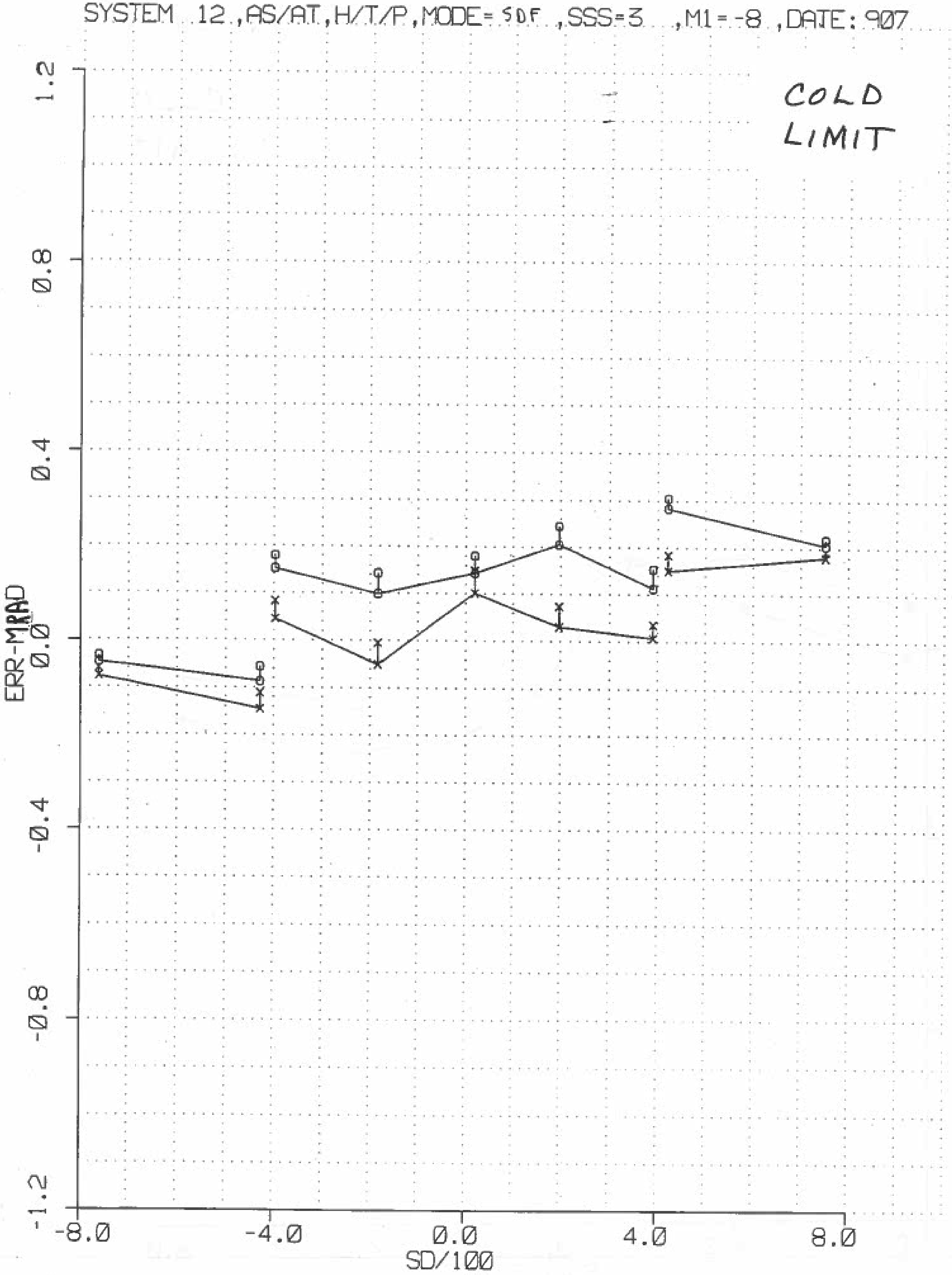
c

SYSTEM 12 ,AS/AT,H/T/P,MODE=SDF ,SSS=7 ,M1=12 ,DATE: 905

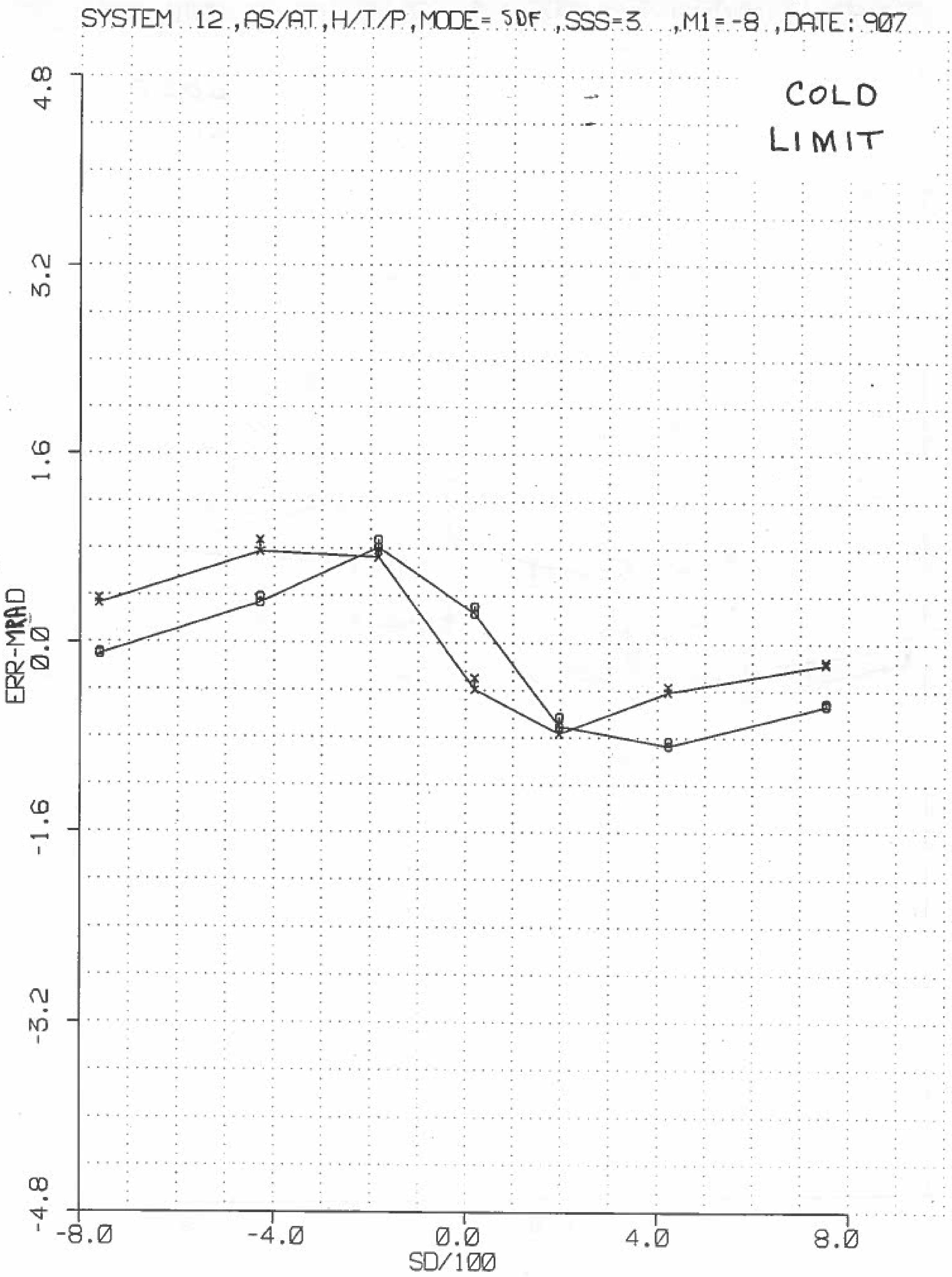


HOT
LIMIT

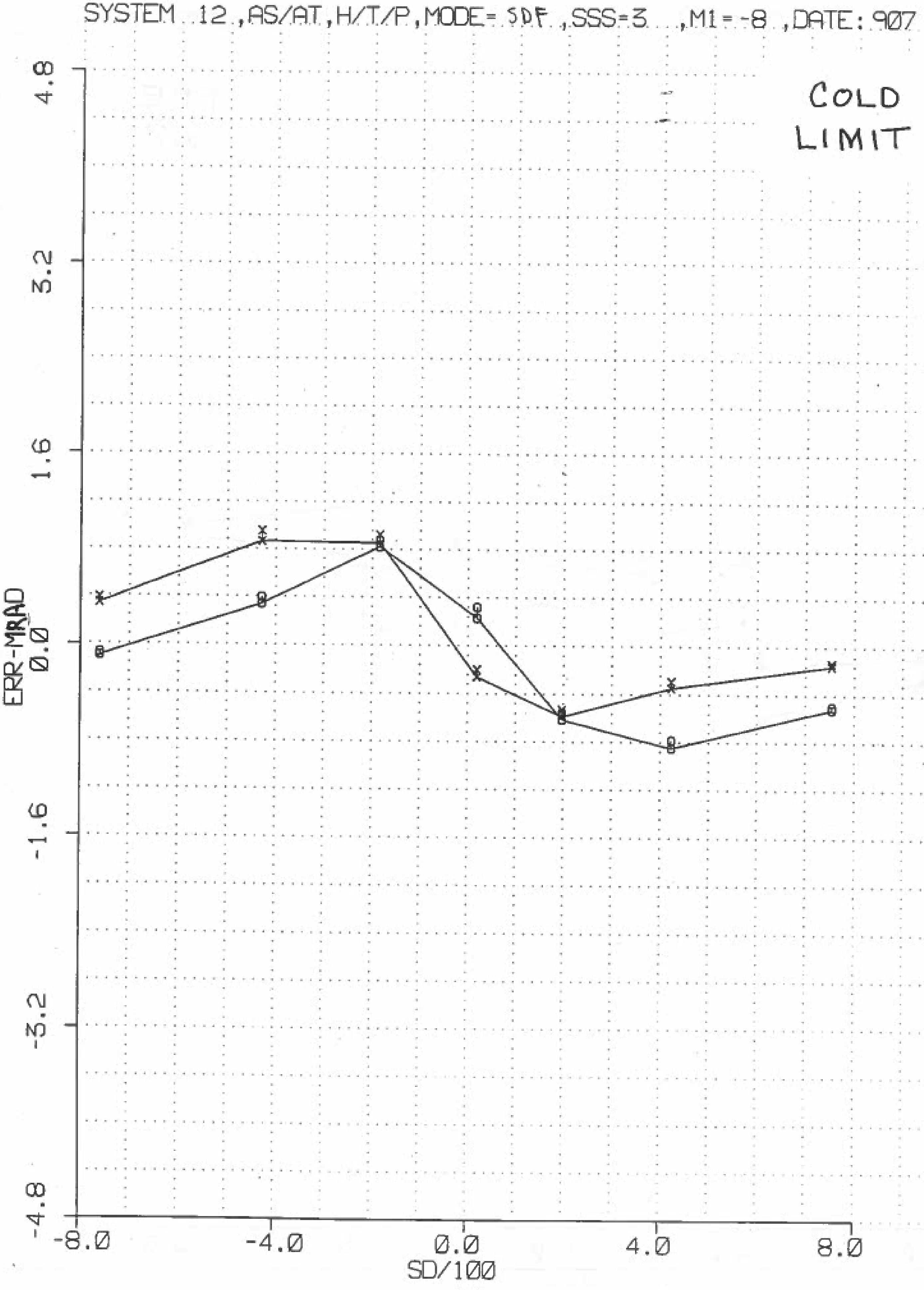
A


SYSTEM 12 ,AS/AT,H/T/P,MODE= SDF ,SSS=3 ,M1=-8 ,DATE: 907
COLD
LIMIT
ERR-MRAD
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
-8.0
-4.0
0.0
4.0
8.0
SD/100

B


SYSTEM 12 ,AS/AT,H/T/P,MODE= SDF ,SSS=3 ,M1=-8 ,DATE: 907
COLD
LIMIT
ERR-MRAD
4.8
3.2
1.6
0.0
-1.6
-3.2
-4.8
-8.0
-4.0
0.0
4.0
8.0
SD/100

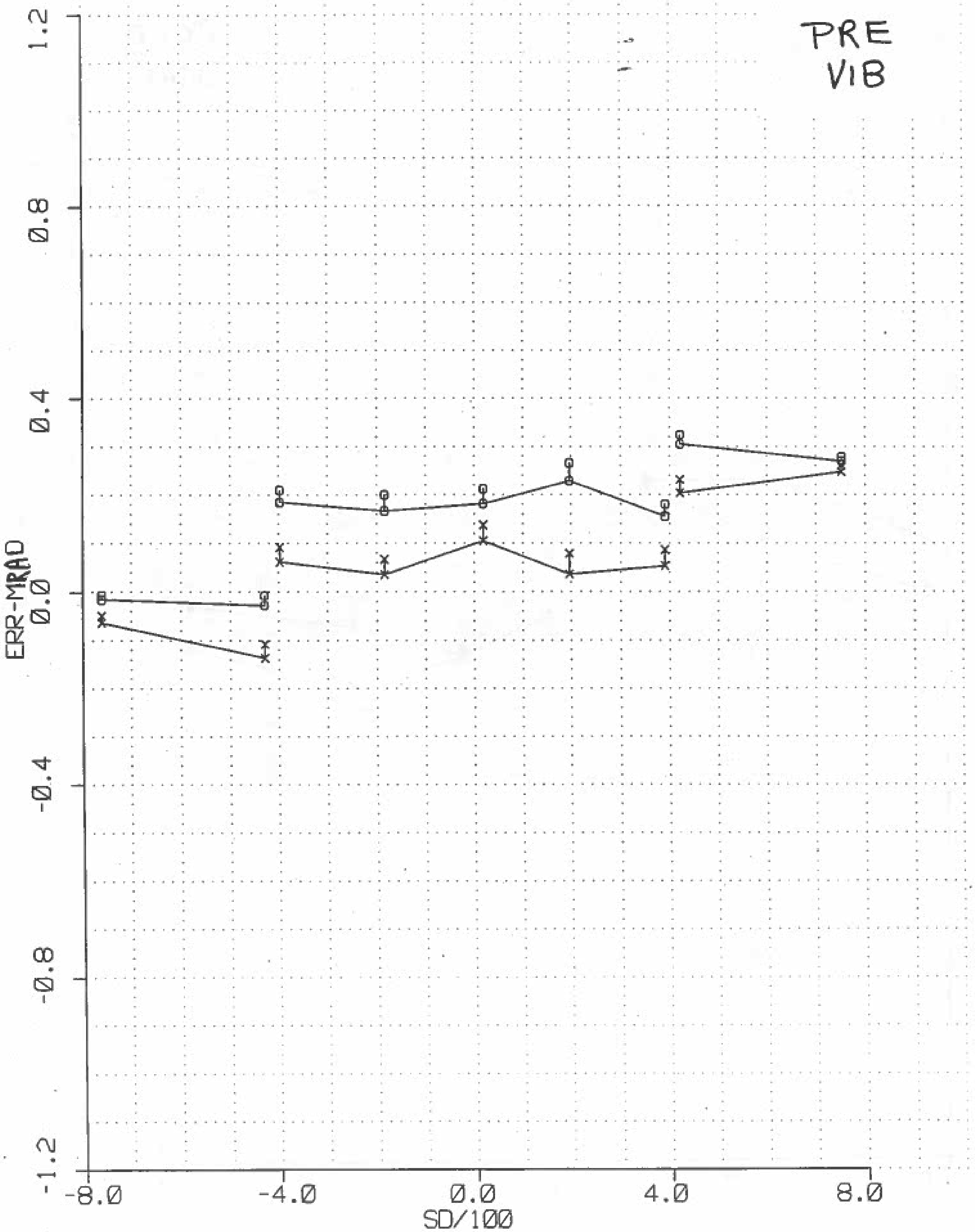
C


SYSTEM 12 ,AS/AT,H/T/P,MODE= SDF ,SSS=3 ,M1= -8 ,DATE: 907
4.8
3.2
1.6
0.0
-1.6
-3.2
-4.8
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

COLD LIMIT

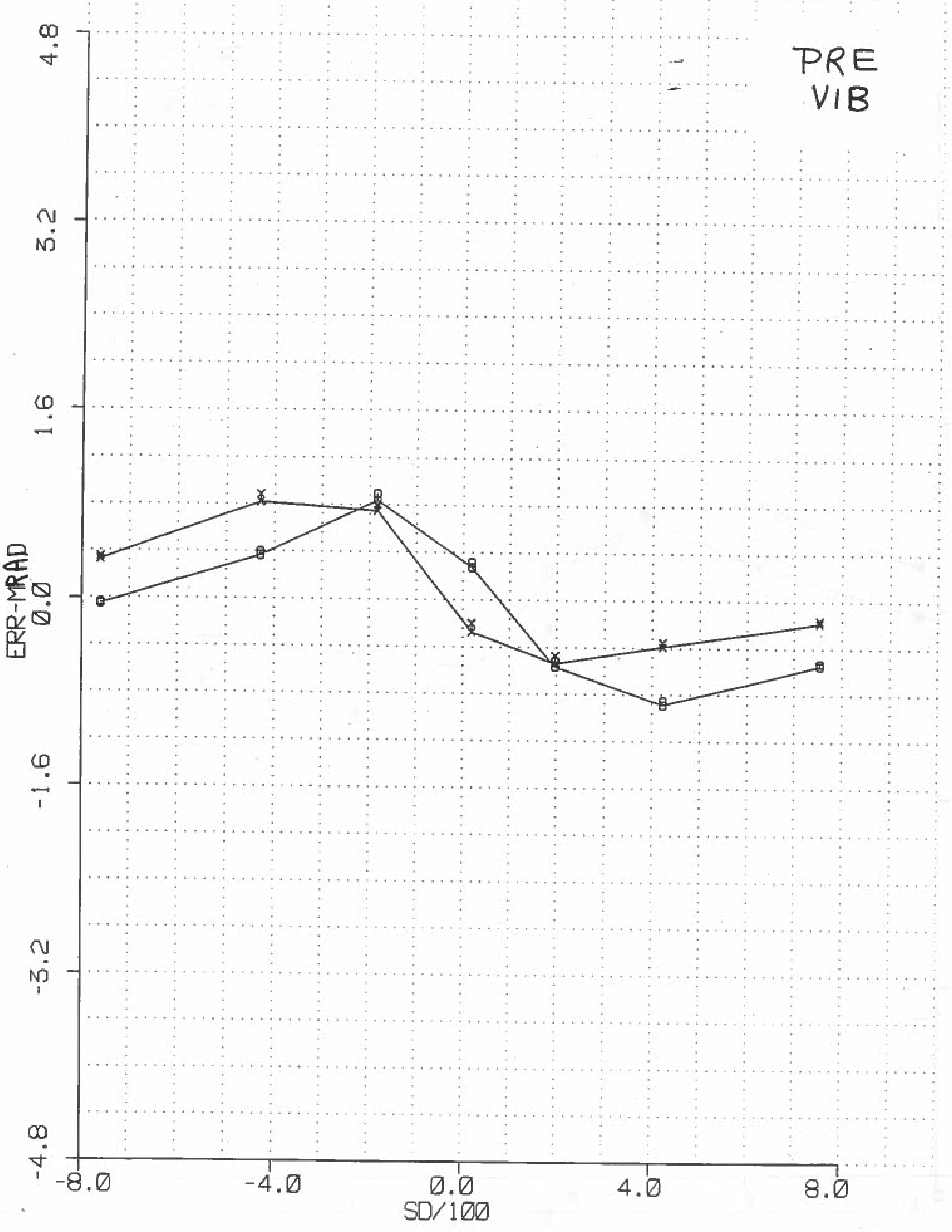
A

SYSTEM 12 ,AS/AT,H/T/P,MODE= SDF ,SSS=5 ,M1=-8 ,DATE:708



B

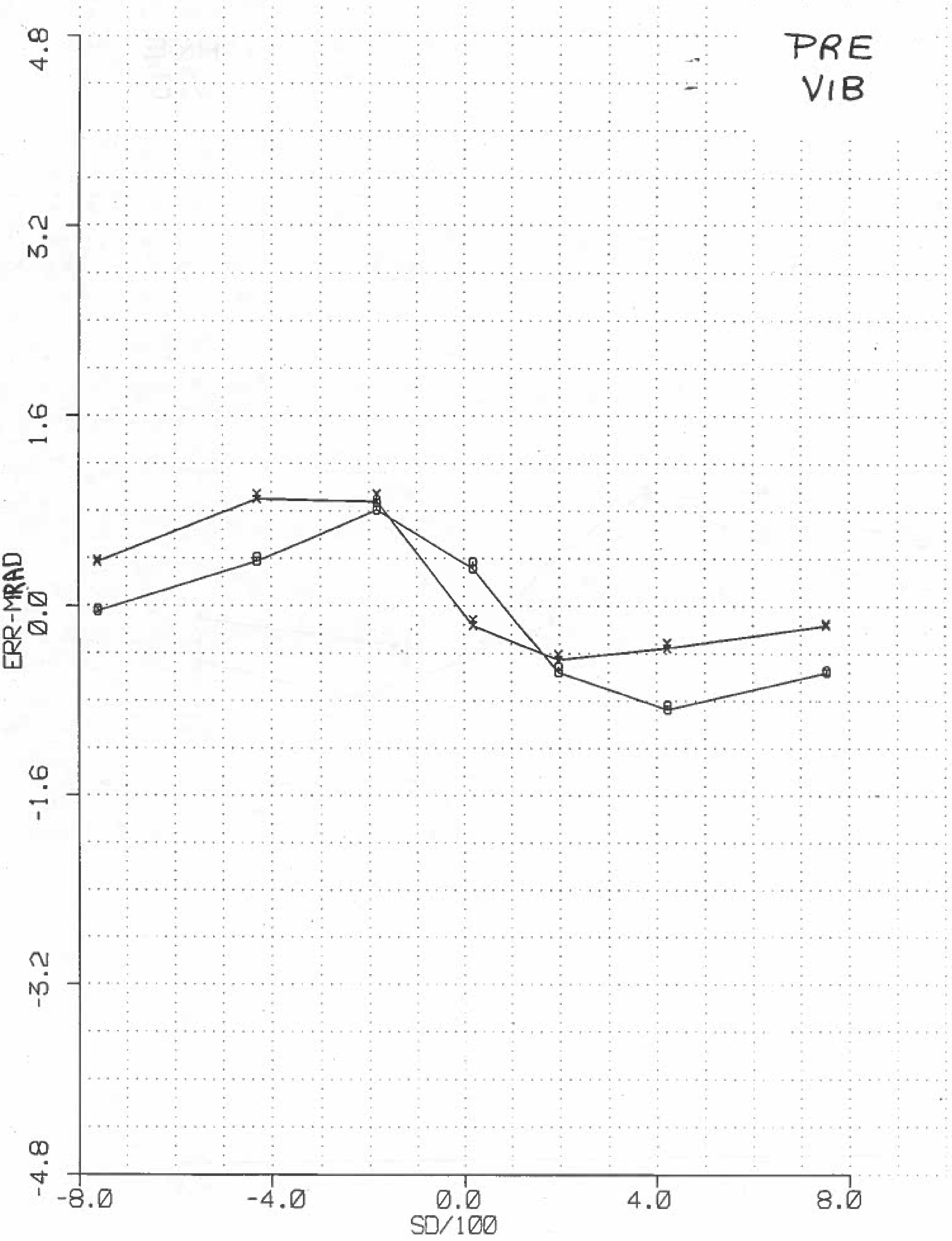
SYSTEM 12, AS/AT, Ⓗ/T/P, MODE= SDF, SSS=5, M1= -8, DATE: 708



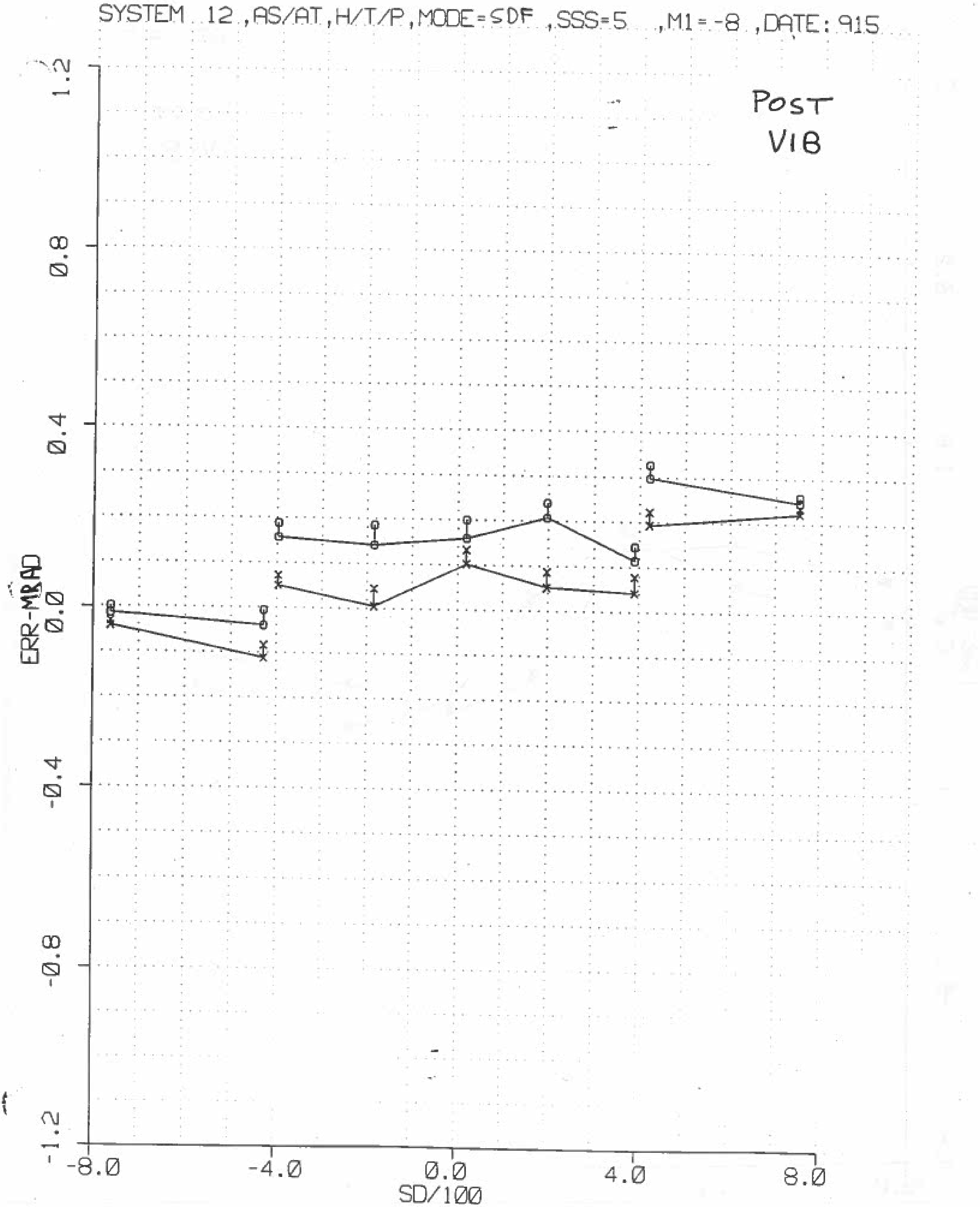
PRE
VIB

c

SYSTEM 12 ,AS/AT,Ⓗ/T/P,MODE= SDF ,SSS=5 ,M1=-8 ,DATE:708



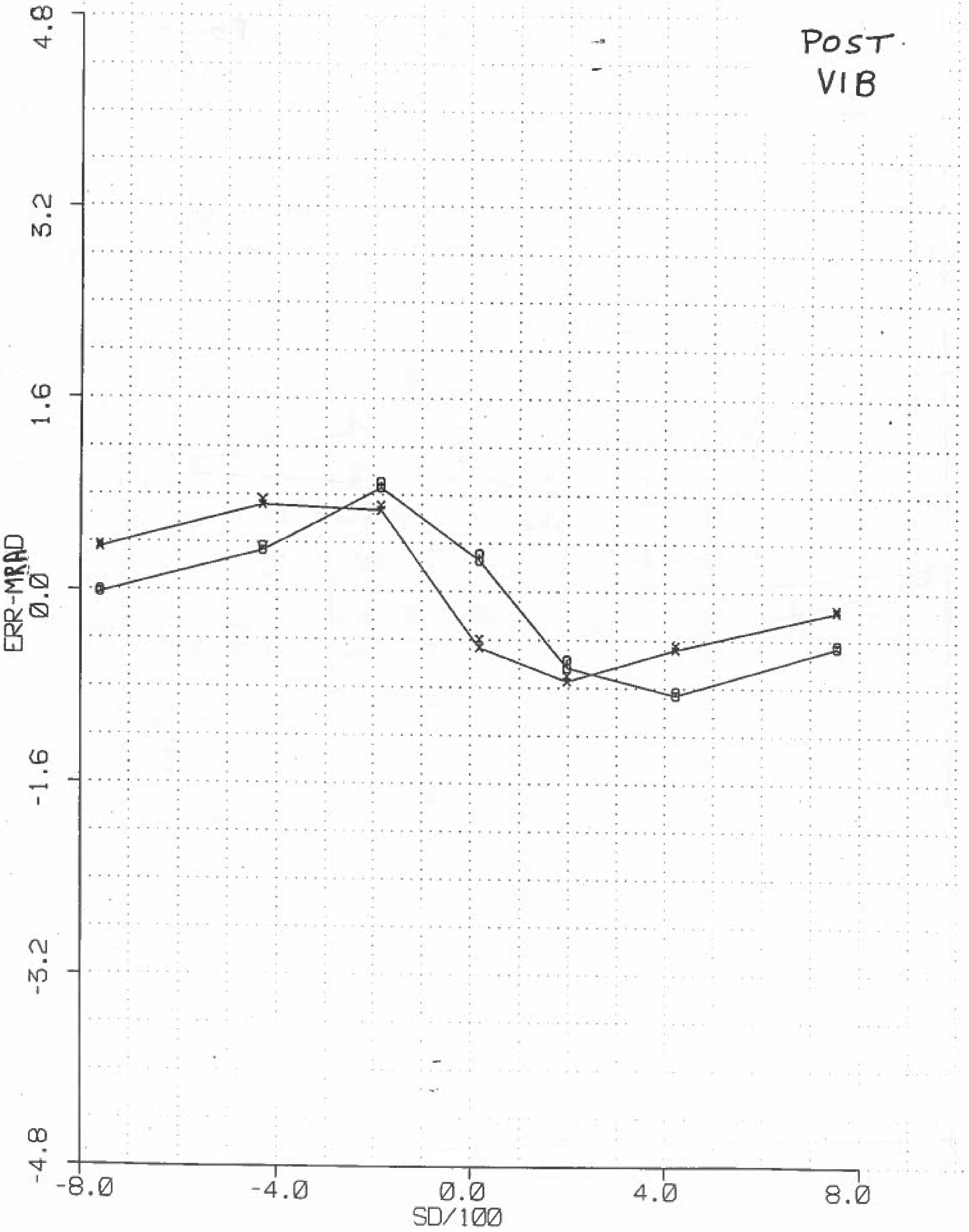
A


SYSTEM 12 ,AS/AT,H/T/P,MODE=SDF ,SSS=5 ,M1=-8 ,DATE:915
1.2
0.8
0.4
0.0
-0.4
-0.8
-1.2
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100

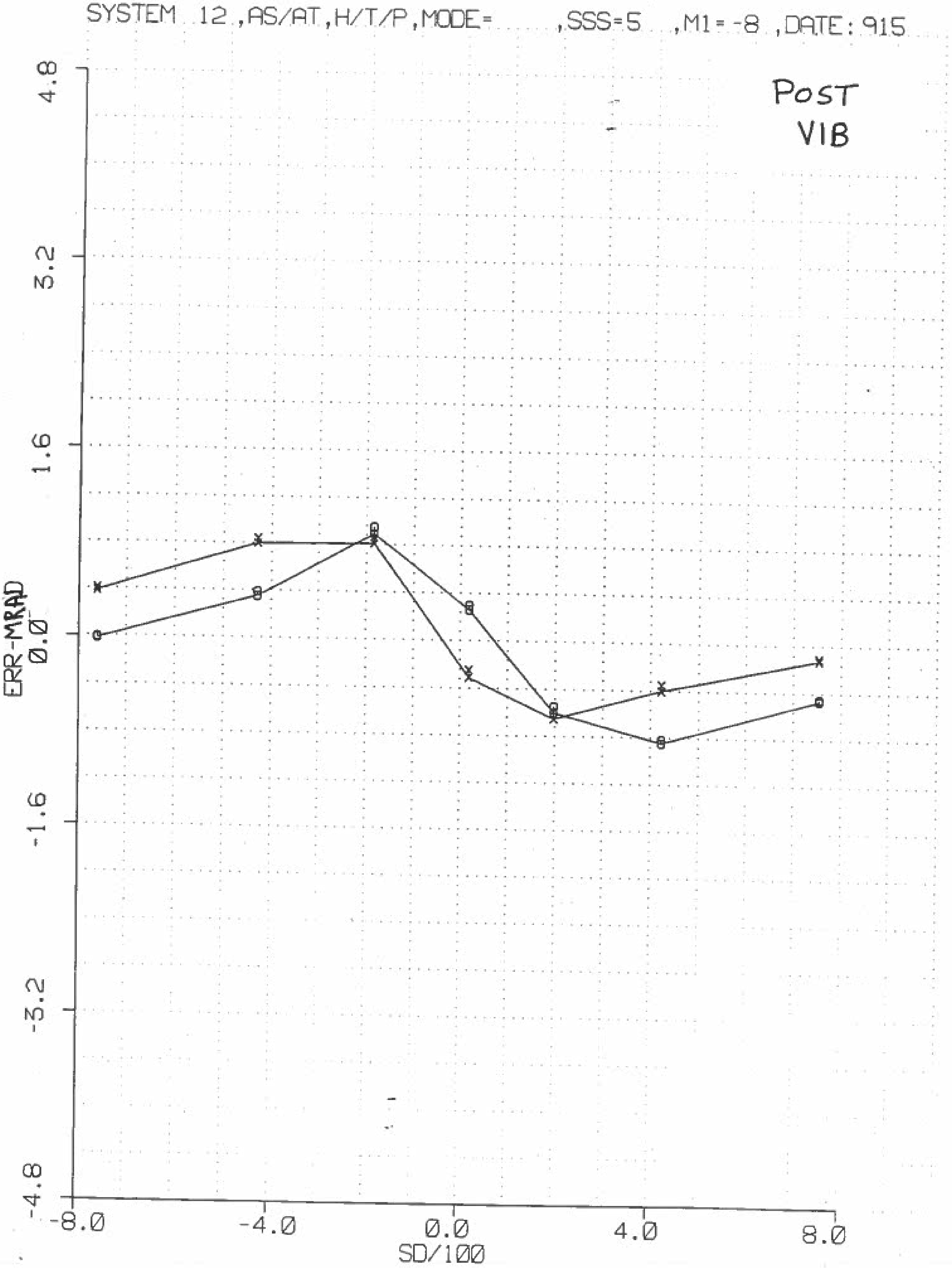
POST
VIB

B

SYSTEM 12 ,AS/AT,H/T/P,MODE= ,SSS=5 ,M1=-8 ,DATE:915



C


SYSTEM 12 ,AS/AT,H/T/P,MODE= ,SSS=5 ,M1=-8 ,DATE:915
POST
VIB
4.8
3.2
1.6
0.0
-1.6
-3.2
-4.8
ERR-MRAD
-8.0
-4.0
0.0
4.0
8.0
SD/100