smiths interconnect

Smiths Interconnect Qualification Test Report
Report No: TML_QUAL_111
Revision A

ISO-SPLITTER (1:2)

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Rev	**A**								
Date	09.01.20								
ECN									

1. Contents

2. Table of Figures

3. Scope

This document describes the Test Qualification of product XPD303 Iso-Splitter (1:2). An internal platform qualification for Smiths Interconnect.

4. Order of Precedence

In case of a conflict between the text of this document and the applicable referenced documents, the text of this document shall take precedence.

5. Product Description

Product Part Number	Product description
XPD303	ISO-SPLITTER (1:2)
B108752	OUTLINE DRAWING
C108753	ASSEMBLY DRAWING

Table 1: Product description

6. Standard Atmospheric Test Conditions

All tests and examinations specified by this qualification test procedure will be continued under any combination of conditions within the ranges stated in this paragraph, unless specified otherwise.

Temperature: 23°C +/- 3°C
Relative Humidity: up to 60%
Barometric Pressure: 1 x 10^{-10} BarG – sea level 1023mBar

7. References

Document	Description	Source
TRAK_SPN_132	Specification for Ku Band Iso-splitter	Internal
25/108753/QUAL	Route Card	Internal
WIS-008	Work Instruction - Inspection Hi-Rel components	Internal

Product Part Number	QTY
XPD303	1

Table 2: References

8. Detailed Test Conditions; Key Specifications

Key Specification Parameters	
FREQUENCY	10.7 - 12.8 GHz
RETURN LOSS (50ohms) TYPE 2	18db min
INSERTION LOSS TYPE 2	1.4dB max
COUPLING LOSS TYPE 2	3.0dB max
OUTPUT AMPLITUDE BALANCE	0.5db max
PHASE BALANCE	± 10 DEGREES max
PHASE STABILITY vs TEMPERATURE	<4° phase/15°C
GROUP DELAY VARIATION	5.0 ns
ISOLATION	20db min
ELECTROMAGNETIC COMPATABILITY (EMC)	-80dBi max
POWER HANDLING	1 WATT
OPERATING TEMPERATURE	-25°C to +80°C
STORAGE TEMPERATURE	-40°C to +85°C

Table 3: Key specifications

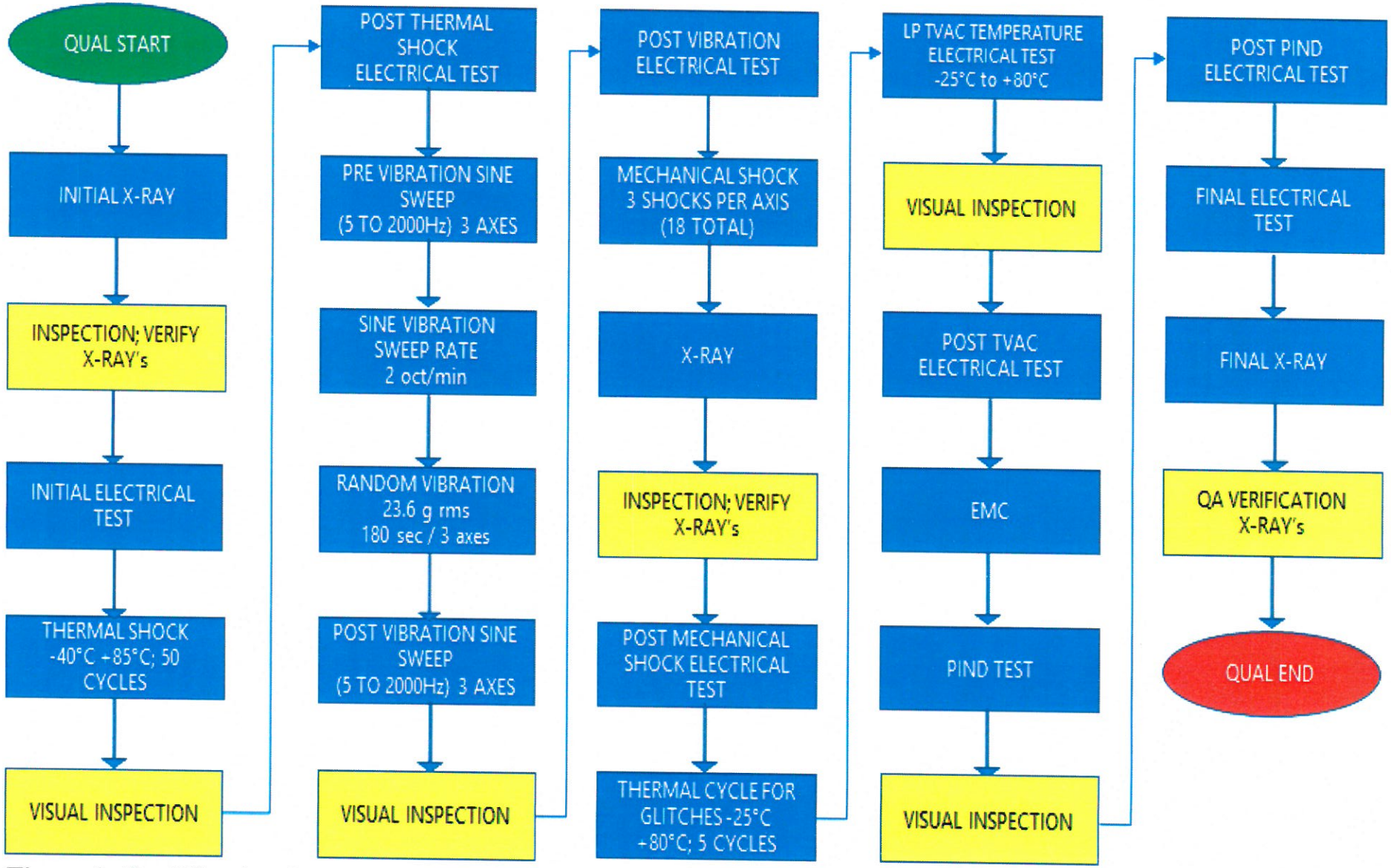


Figure 1: Qualification flow

9. Test Equipment

The Qualification Test Equipment used, including Calibration status.

Test Equipment Description	Type/Manufacturer	Serial No.	Calibration Due date
Vector Network Analyser	R&S ZVA50	1145.1110.50	21/02/2020
Thermal Shock Chamber	DSC	60016519254	16/04/2020
VibPilot Accelerometer	m+p International	B170194	06/08/2020
Vibration Test Equipment	V-TEQ	005-07	13/12/2020
VibPilot Accelerometer	m+p International	A13002	06/08/2020
K Calibration Kit	Anritsu	3652	28/08/2020
X-ray Equipment	X-TEK HARRIER 160Xi	T813	31/01/2020
Thermal Chamber	Thermatron	34429	04/03/2020
Signal Generator	Anritsu MG3692B	64003	19/10/2020

Table 4: Test equipment and calibration details

10. Test Equipment Images

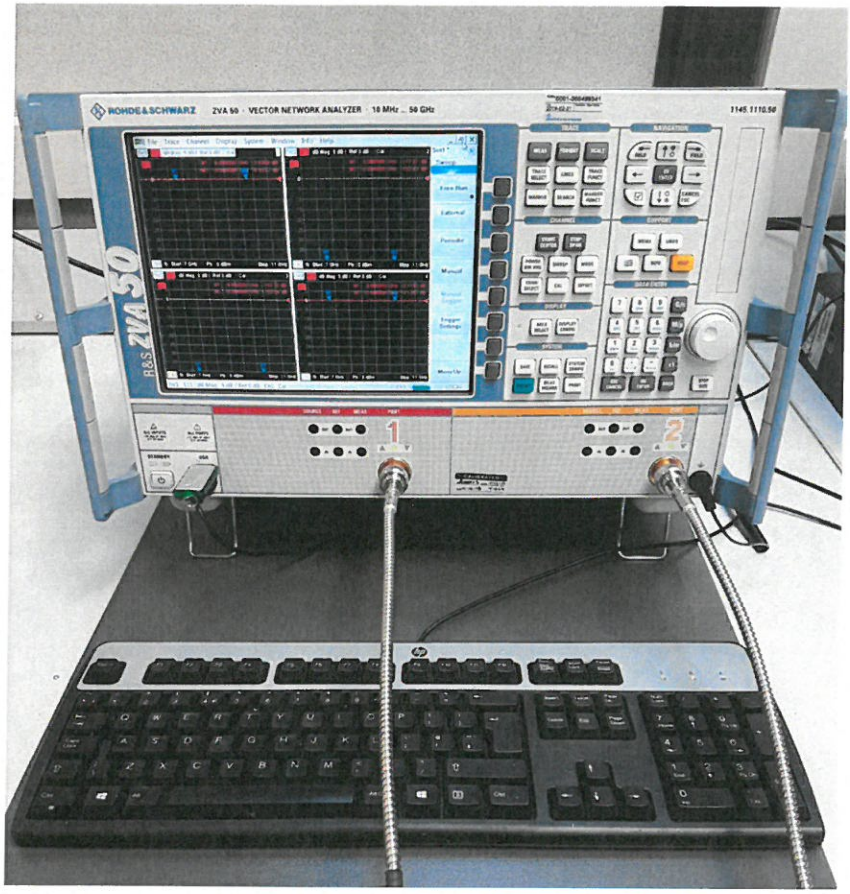


Figure 2: ZVA50 Vector Network Analyser

Figure 3: Anritsu K Calibration Kit

Figure 4: DSC Thermal Shock Chamber

Figure 5: m+p Accelerometer, used for Vibration

Figure 6: V-TEQ Vibration

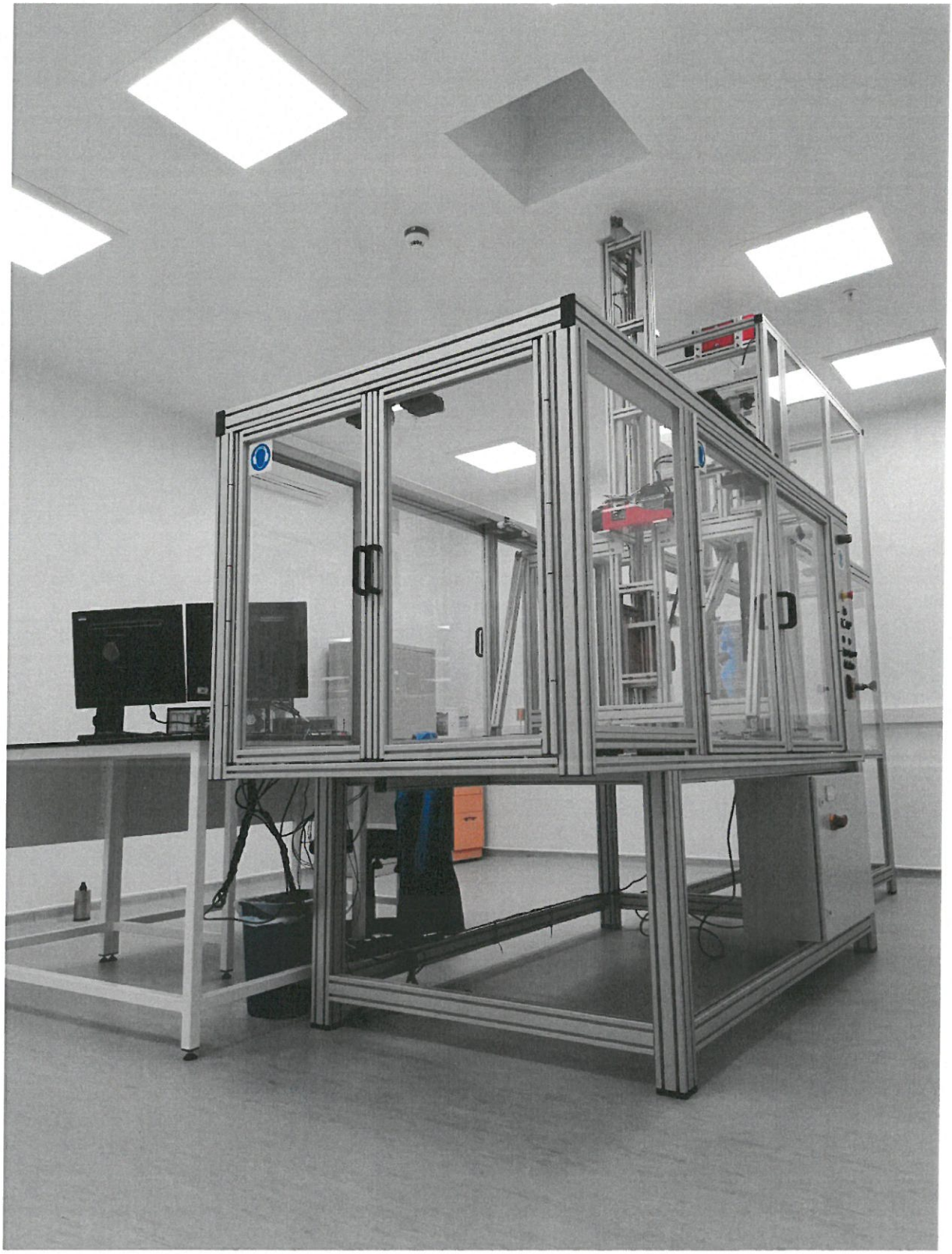


Figure 7: SPTechnologies SRS Shock machine

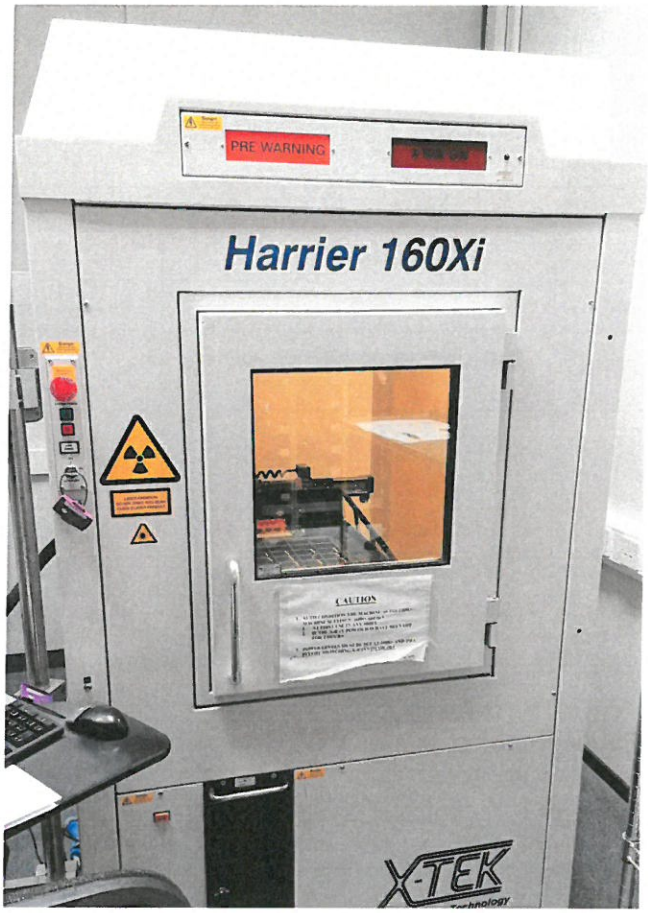


Figure 8: X-TEK HARRIER 160Xi X-ray machine

Figure 9: Thermal Glitch setup

11. Test Results Summary

The Qualification test summary is shown in figure 10. All tests passed successfully.

Test Description/Procedure	Critical Conditions	Result	Pass/Fail/Criteria
Initial X-ray	Visual	**Pass**	Compliant to WIS 008
Initial Electrical Test at 23°C	23°C± 3°C	**Pass**	Compliant to Table 3 params
Thermal Shock: Transfer 5min max	-40°c TO +85°C; 50 cycles, 30 min Dwells at each extreme	**Pass**	Stress profile within bounds
Inspection	Visual	**Pass**	Compliant to WIS 008
Post Thermal Shock Electrical Test at Ambient	23°C± 3°C	**Pass**	Compliant to Table 3 params
Pre Vibration (Sine) Sweep	(5 to 2000Hz) 3 axes	**Pass**	Stress profile within bounds
Sine Vibration Sweep	5-22.6Hz 0.25 ins (0-peak) 22.6-50Hz 13.0g 50-100Hz 10.0g 2 oct/min	**Pass**	Stress profile within bounds
Random Vibration	23.6g rms 180 sec / 3 axes	**Pass**	Stress profile within bounds
Post Vibration (Sine) Sweep	(5 to 2000Hz) 3 axes	**Pass**	Stress profile within bounds
Inspection	Visual	**Pass**	Compliant to WIS 008
Post Vibration Electrical Test at Ambient	23°C± 3°C	**Pass**	Compliant to Table 3 params
Mechanical shock - All axis - 2 Directions	3 shocks per axis (18 total)	**Pass**	Stress profile within bounds
X-ray	Visual	**Pass**	Compliant to WIS 008
Post Mechanical Shock Electrical Test at Ambient	23°C± 3°C	**Pass**	Compliant to Table 3 params
Thermal cycle for glitches	-25°C to +80°C ± 3°C; 5 cycles	**Pass**	Stress profile within bounds
TVAC Temperature Test $1x\ 10^{-6}$	-25°C to +80°C ± 3°C; 60 min dwells	**Pass**	Compliant to Table 3 params
Inspection	Visual	**Pass**	Compliant to WIS 008
Post TVAC Electrical Test at Ambient	23°C± 3°C	**Pass**	Compliant to Table 3 params
EMC	-80dBi min	**Pass**	Compliant to Table 3 params
PIND Test	20g peak 40Hz	**Pass**	No noise detected
Post PIND Electrical Test at Ambient	23°C± 3°C	**Pass**	Compliant to Table 3 params
Final Electrical Test at 23°C	23°C± 3°C	**Pass**	Compliant to Table 3 params
Final X-ray	Visual	**Pass**	Compliant to WIS 008

Figure 10: Qualification Test Result Summary

ISO-SPLITTER (1:2) XPD303	SPECIFICATION	INITIAL ELECTRICAL		POST THERMAL SHOCK		POST VIBRATION		POST MECHANICAL SHOCK		POST TVAC		POST PIND		FINAL ELECTRICAL	
MEASUREMENT	10.7GHz -12.8GHz	10.7GHz	12.8GHz	10.7GHz	12.8GHz	10.7GHz	12.8GHz	10.7GHz	12.8GHz	10.7GHz	12.8GHz	10.7GHz	12.8GHz	10.7GHz	12.8GHz
PORT1 (dB)	18dB (min)	22.9	21.4	22.5	21.2	23.0	21.0	23.2	20.7	22.0	20.9	21.7	21.5	21.9	21.0
PORT2 (dB)	18dB (min)	29.4	26.6	29.2	26.6	29.3	27.2	29.1	27.0	28.3	26.5	28.5	26.6	28.7	2.5
PORT3 (dB)	18dB (min)	25.0	33.8	25.7	32.6	26.2	35.2	25.7	35.4	25.8	34.0	25.9	34.2	25.8	35.1
GROUP DELAY P1-P2 (ns)	5.0 ns	3.6	3.5	3.6	3.5	3.6	3.5	3.6	3.5	3.6	3.5	3.6	3.6	3.6	3.6
GROUP DELAY P1-P3 (ns)	5.0 ns	3.6	3.5	3.6	3.5	3.6	3.5	3.6	3.5	3.5	3.6	3.6	3.6	3.6	3.6
INSERTION PHASE P1-P2 (°)	± 10°C (max)	170.7	170.9	171.0	171.2	170.3	170.4	170.1	170.2	170.2	170.3	171.0	171.2	171.1	171.0
INSERTION PHASE P1-P3 (°)	± 10°C (max)	171.9	171.4	172.2	171.8	171.5	171.0	171.4	170.9	171.5	171.0	172.0	171.5	171.6	171.2
ISOLATION P2-P1 (dB)	20 dB (min)	23.8	21.7	23.9	21.8	24.0	21.8	24.0	21.8	24.0	21.8	23.8	21.8	23.9	23.8
ISOLATION P3-P1 (dB)	20 dB (min)	22.4	21.3	22.5	21.4	22.7	21.5	22.7	21.5	22.6	21.4	22.8	21.3	22.8	21.4
ISOLATION P2-P3 (dB)	20 dB (min)	42.7	38.3	42.7	38.3	43.0	38.2	42.8	38.3	43.1	38.1	43.2	38.1	43.1	38.2
OUTPUT AMPLITUDE BALANCE (dB)	0.5 dB (max)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
INSERTION LOSS P1-P2 (dB)	1.4 dB (max)	0.9	1.1	0.9	1.1	0.9	1.1	0.9	1.1	0.9	1.1	0.9	1.1	0.9	1.1
INSERTION LOSS P1-P3 (dB)	1.4 dB (max)	1.0	1.2	1.0	1.2	1.0	1.2	1.0	1.2	1.0	1.2	1.0	1.2	1.0	1.2

Figure 11: Tabulated Test Data

The above table concludes no significant electrical performance degradation or drift throughout the whole qualification. Correlation between initial and final electrical performance is very stable.

12. Initial X-ray Images

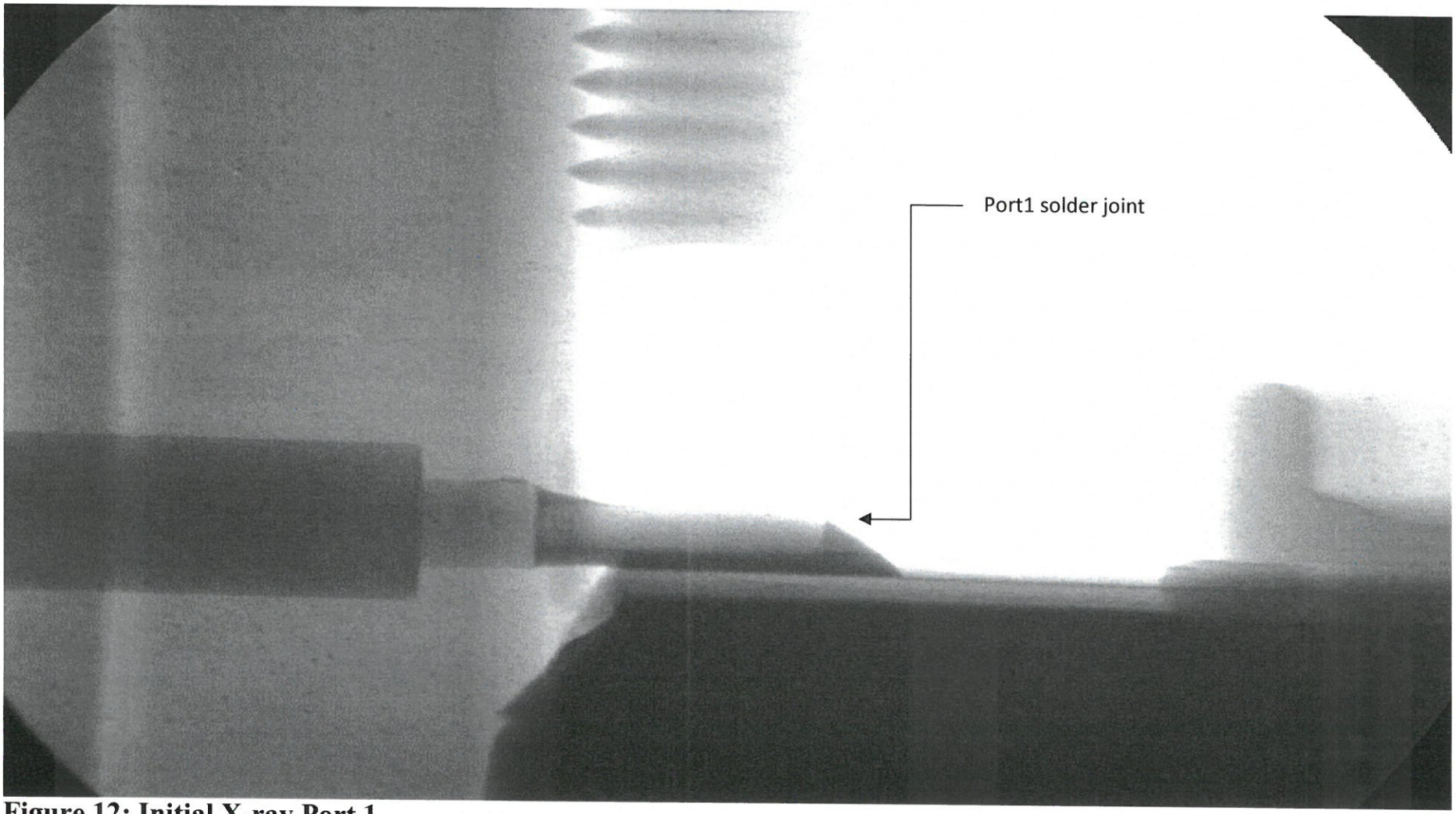


Figure 12: Initial X-ray Port 1

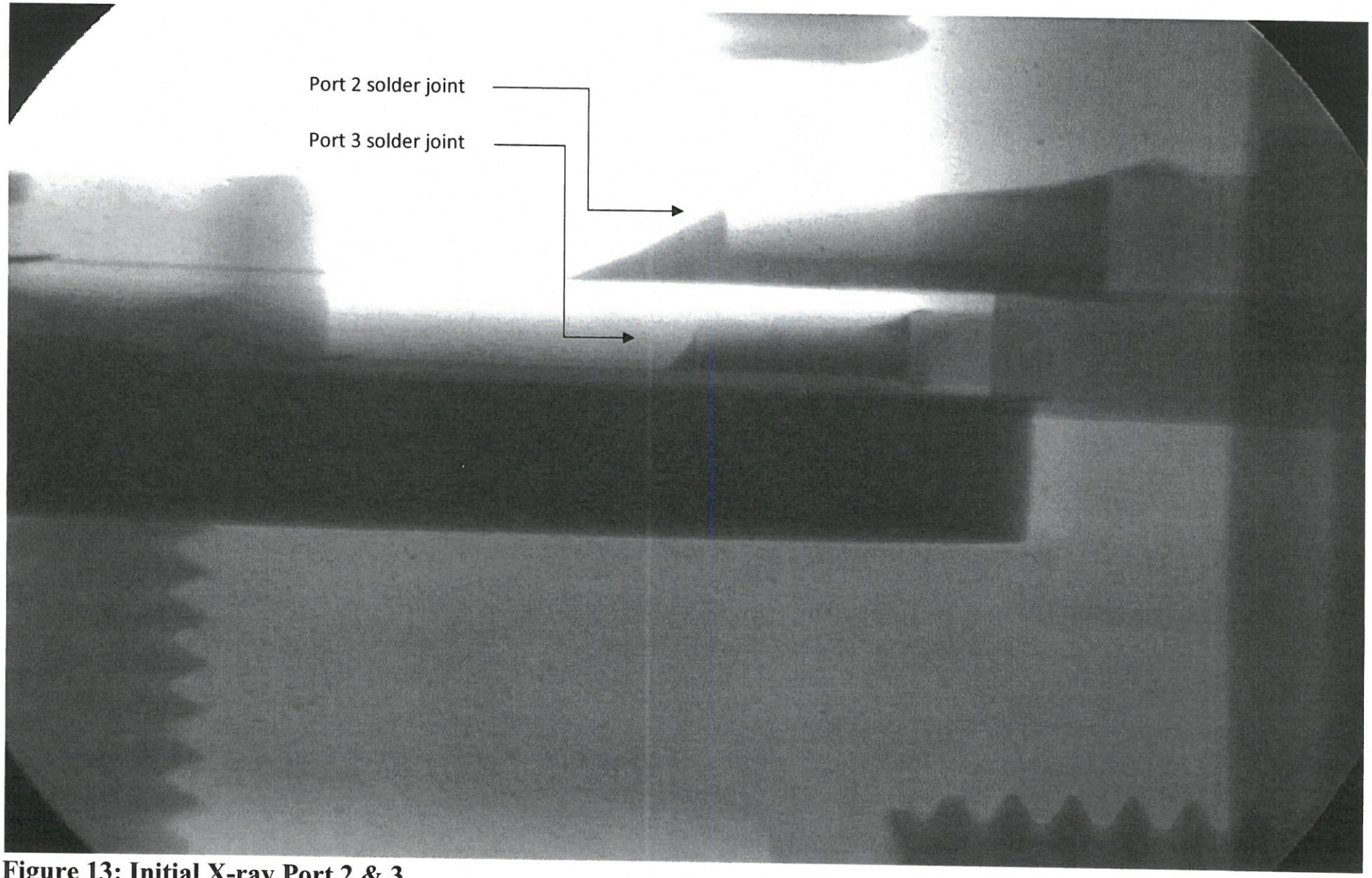


Figure 13: Initial X-ray Port 2 & 3

13. Initial Electrical Test

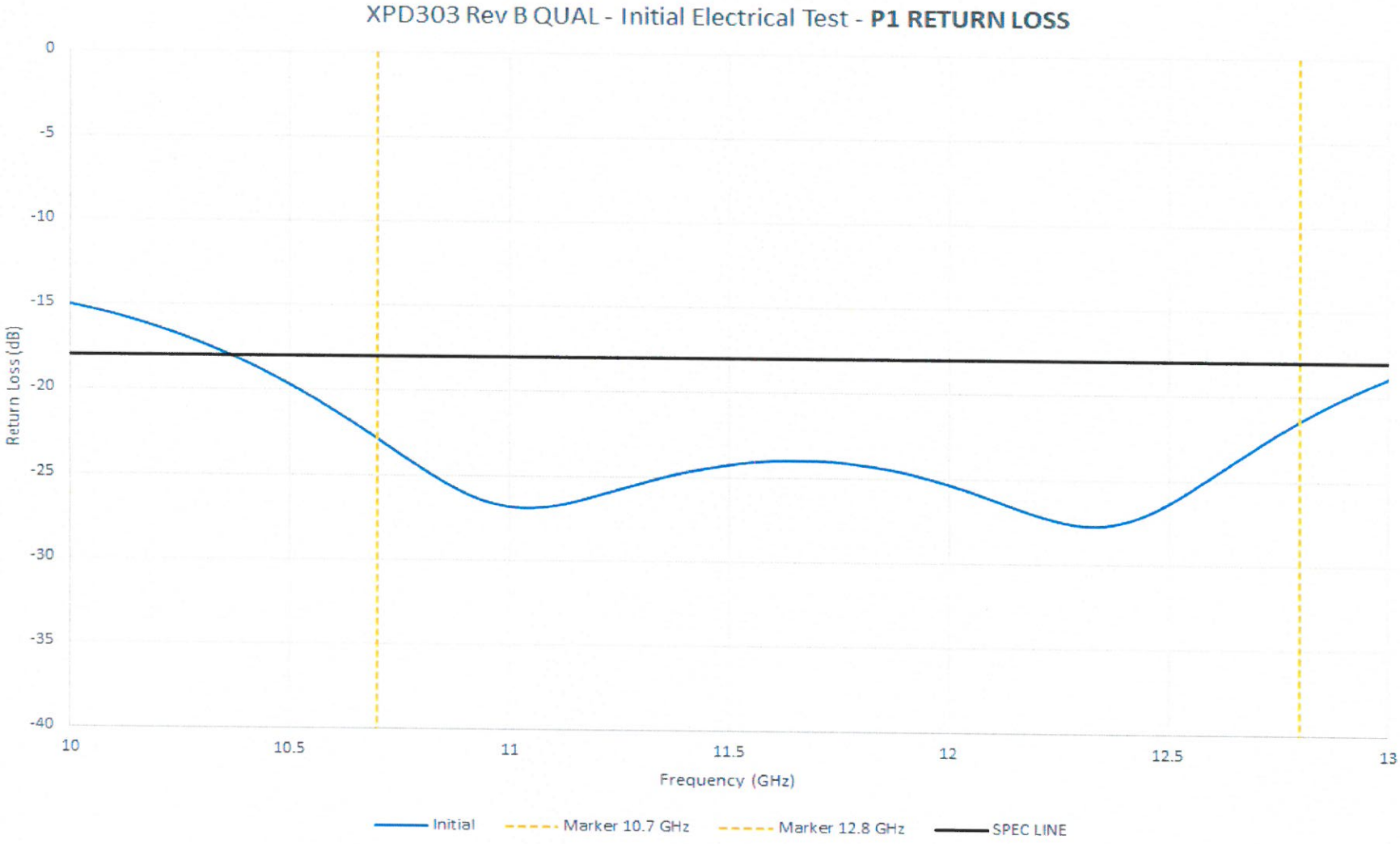


Figure 14: Port 1 Return loss

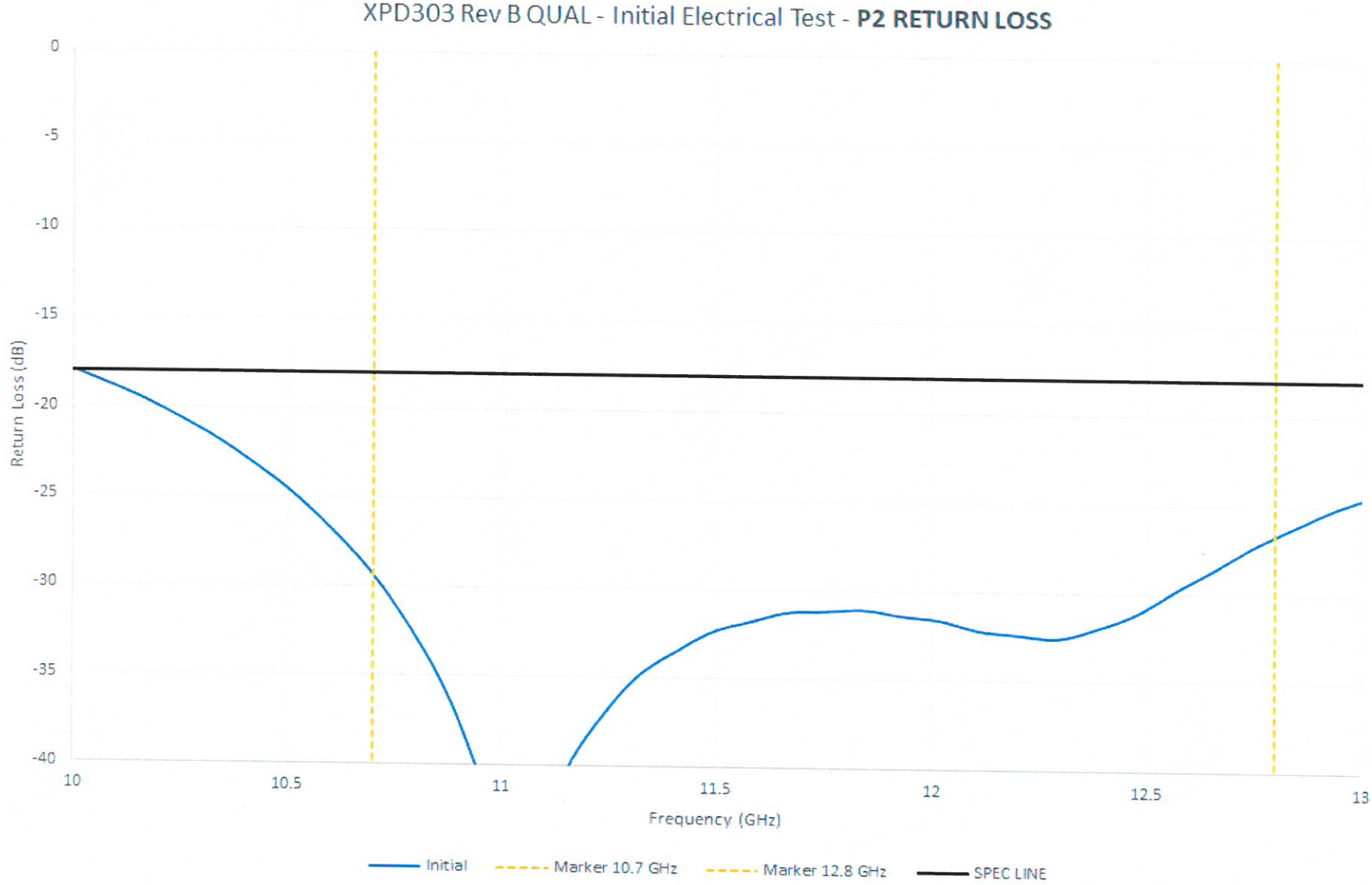


Figure 15: Port 2 Return loss

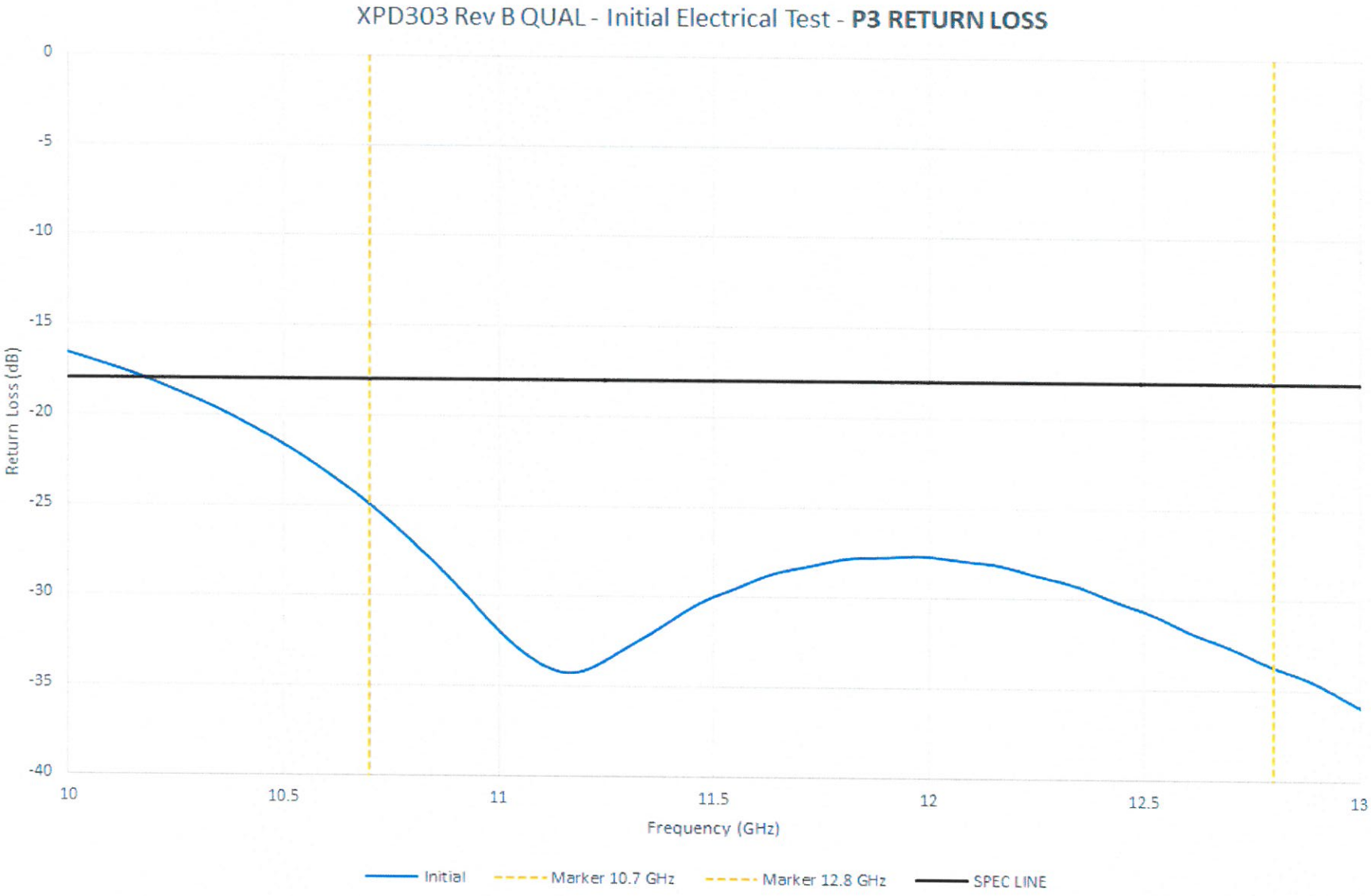


Figure 16: Port 3 Return loss

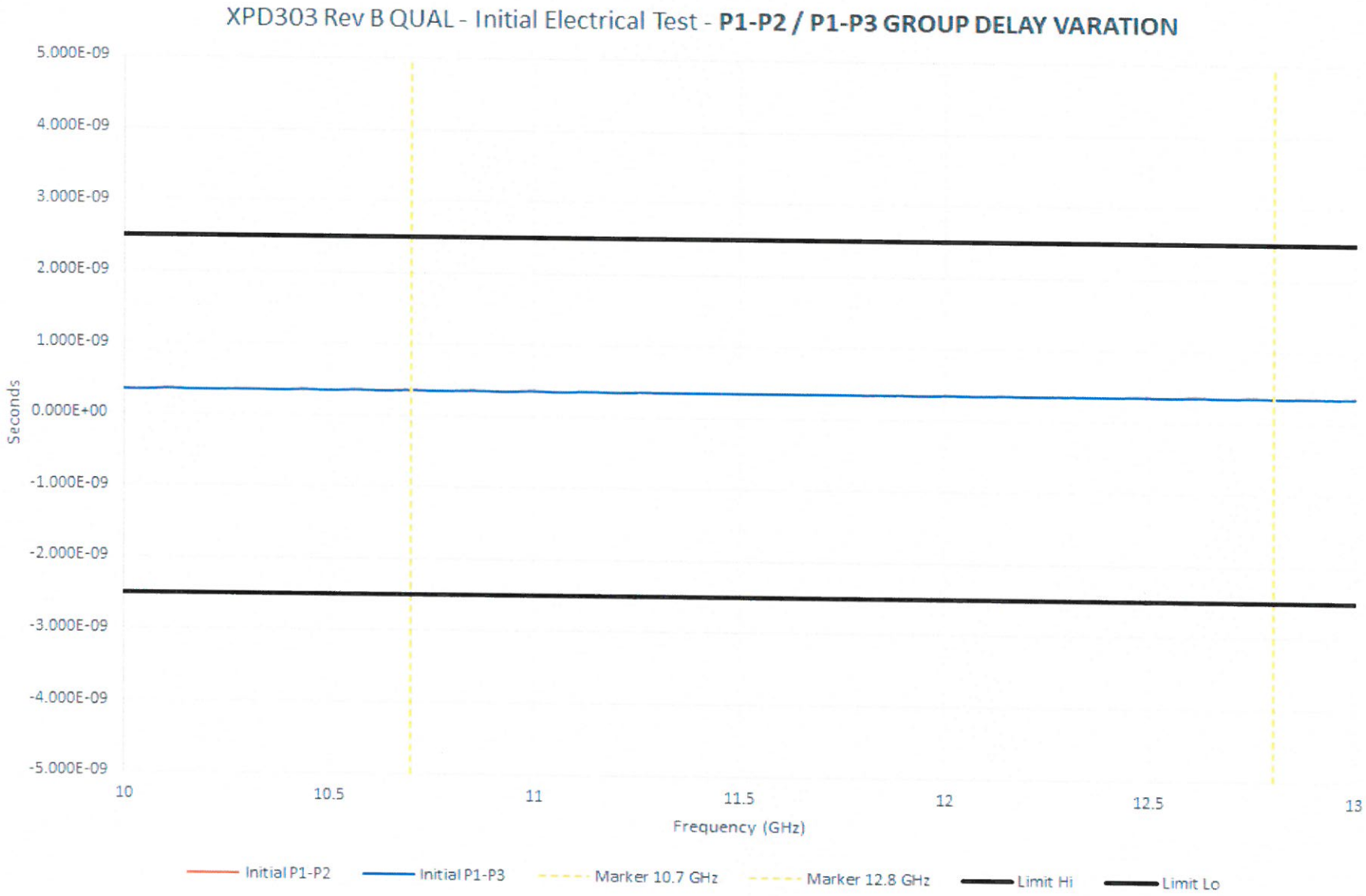


Figure 17: Group delay variation P1-P2 / P1-P3

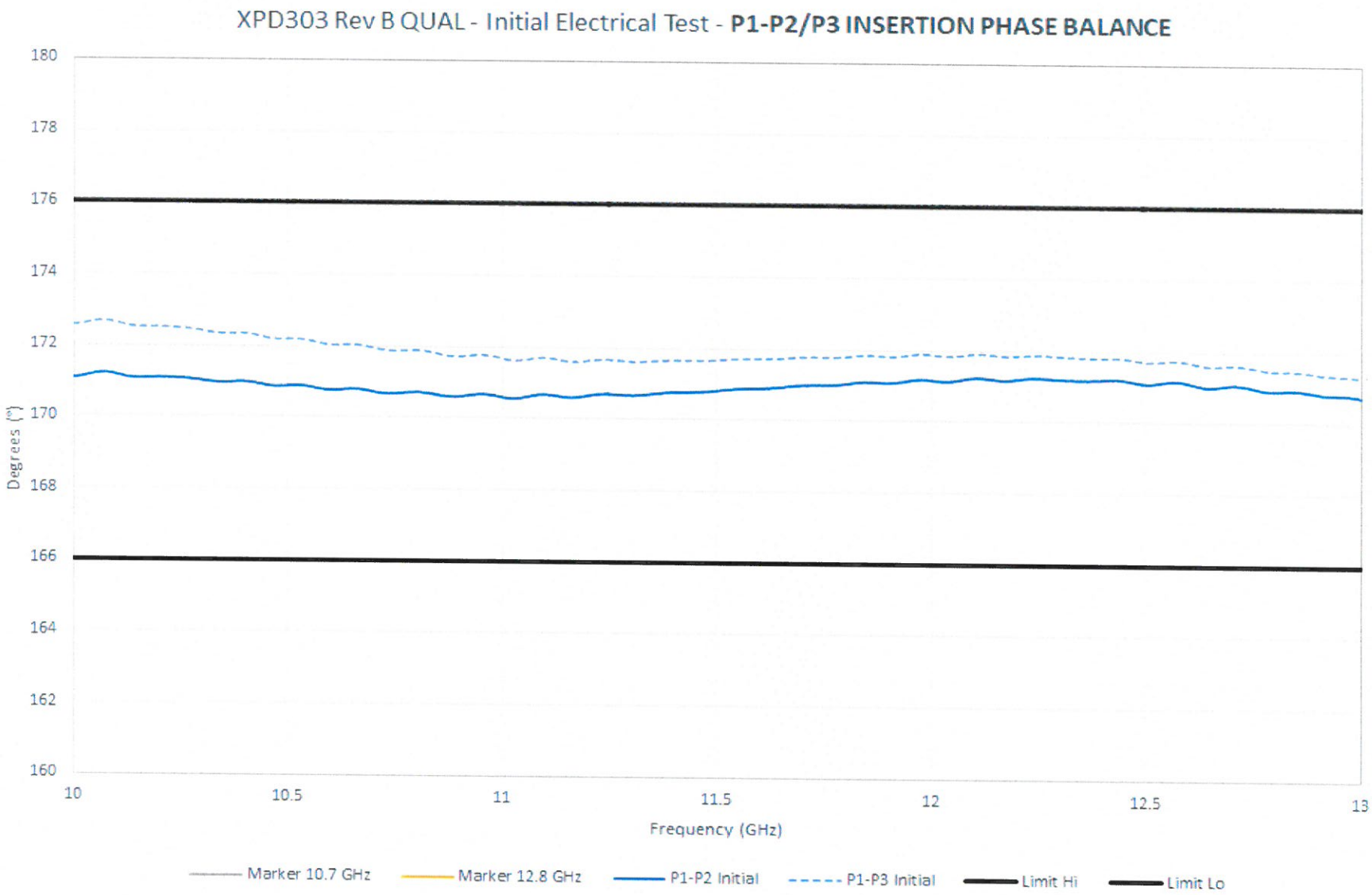


Figure 18: Insertion phase balance P1-P2 / P1-P3

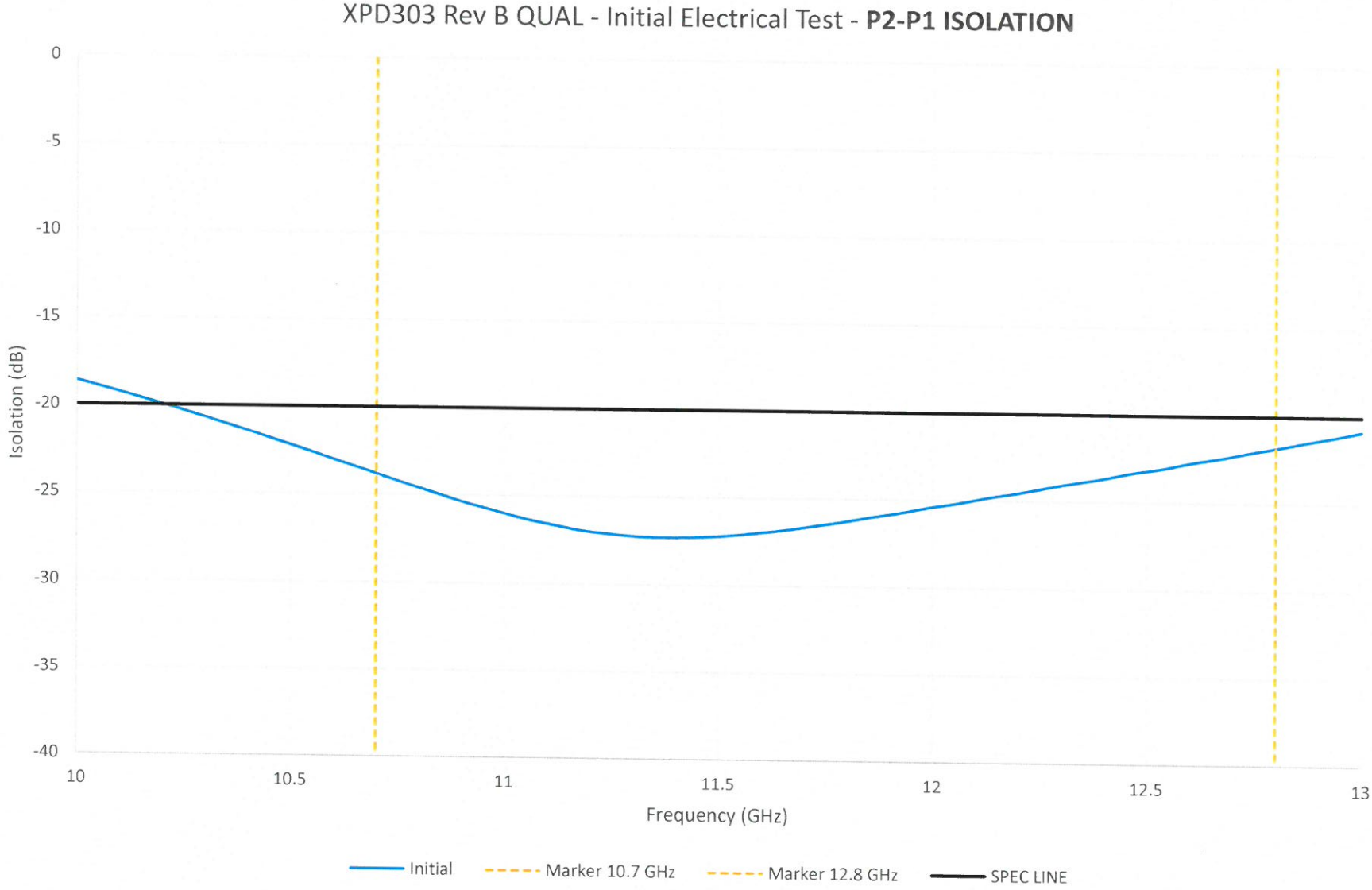


Figure 19: Isolation P2-P1

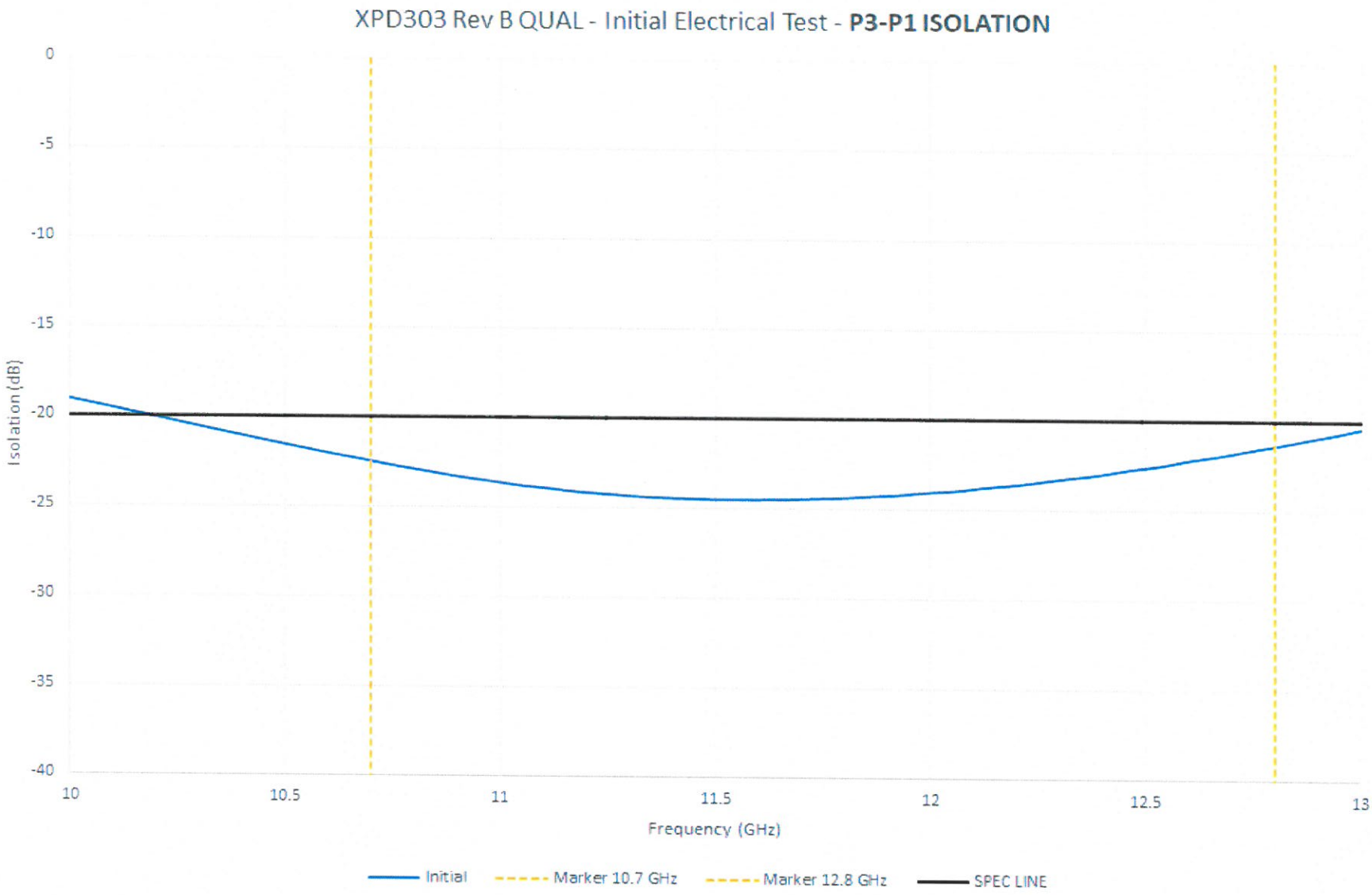


Figure 20: Isolation P3-P1

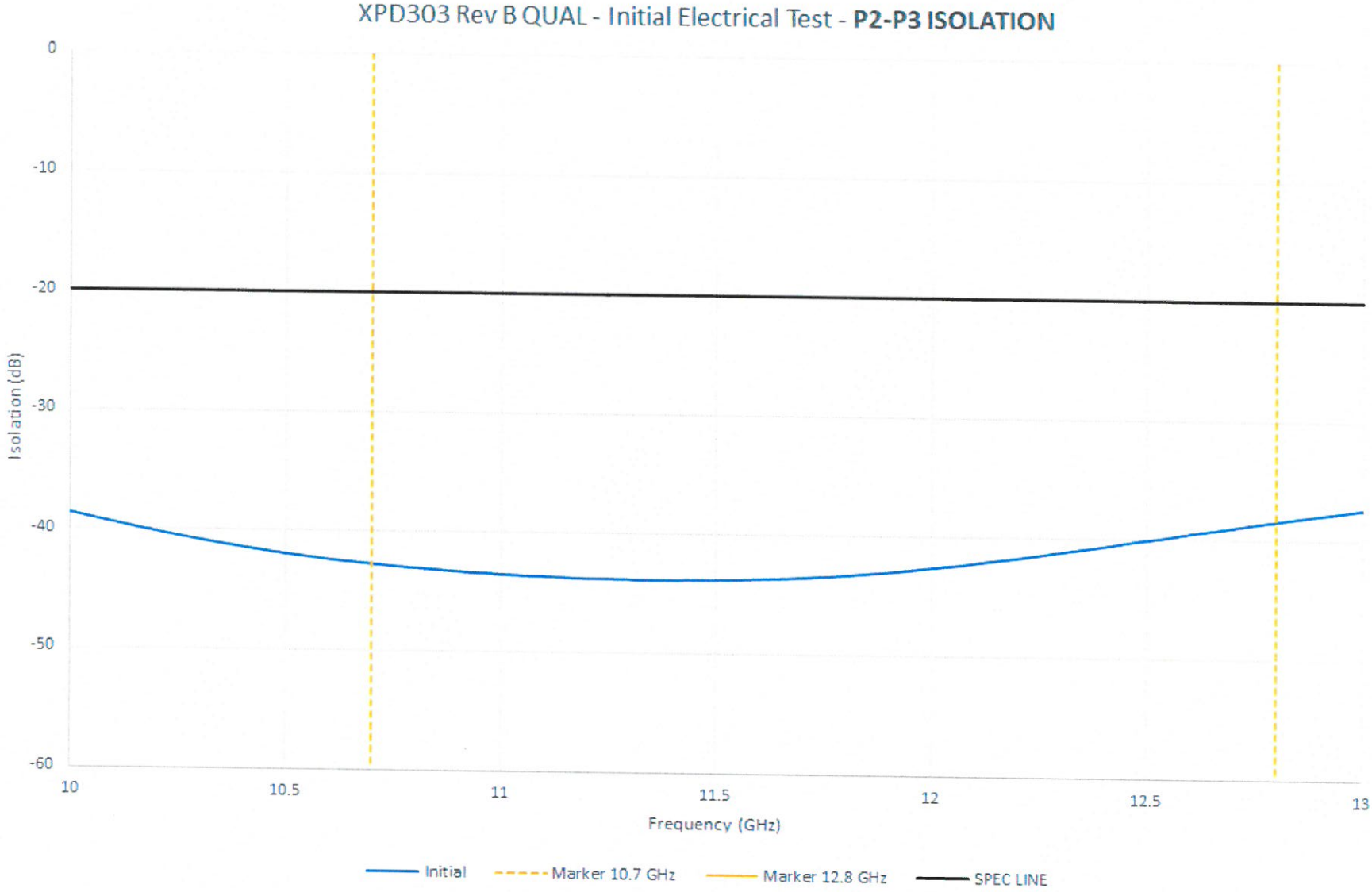


Figure 21: Isolation P2-P3

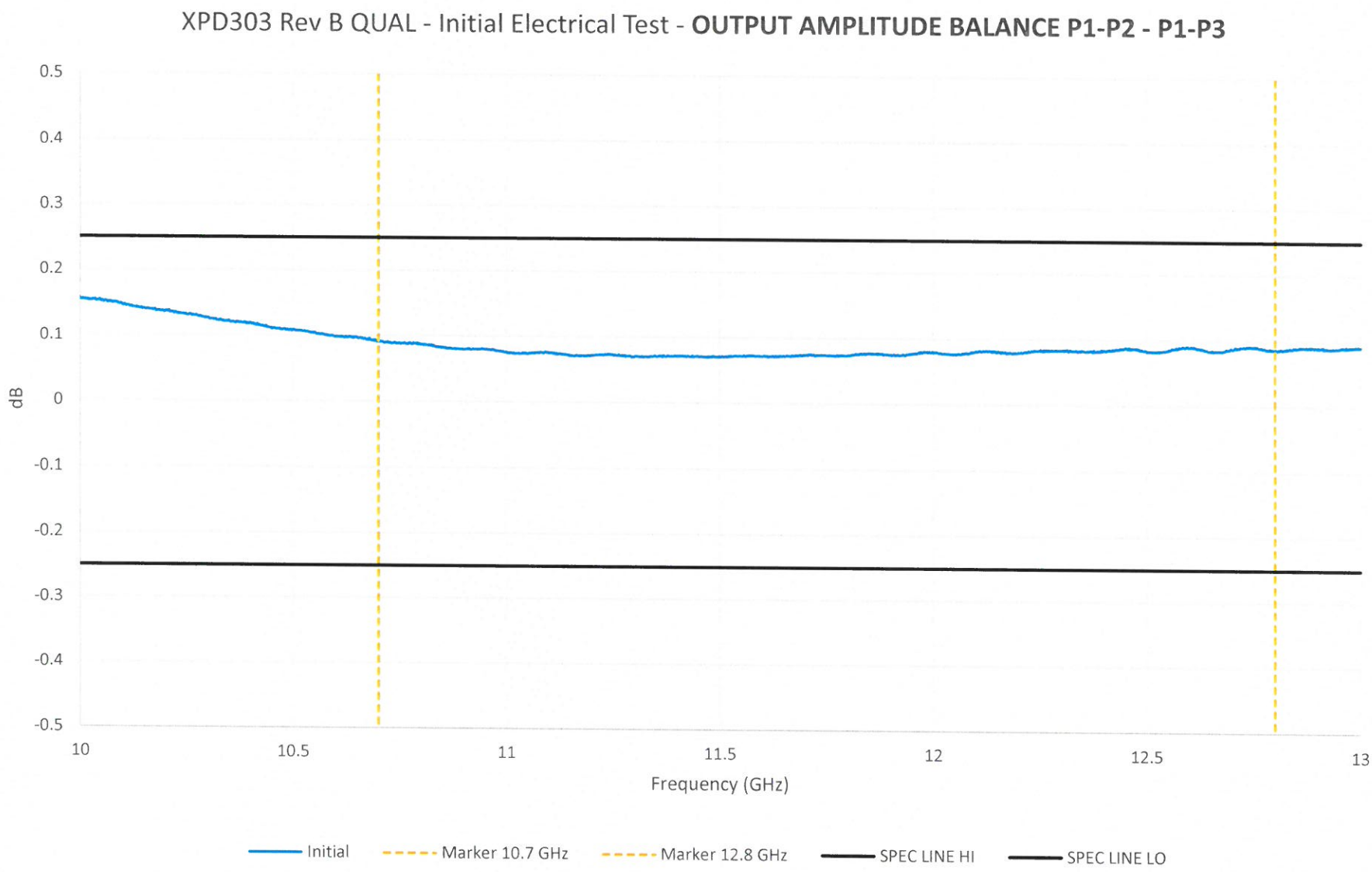


Figure 22: Output Amplitude Balance P1-P2 / P1-P3

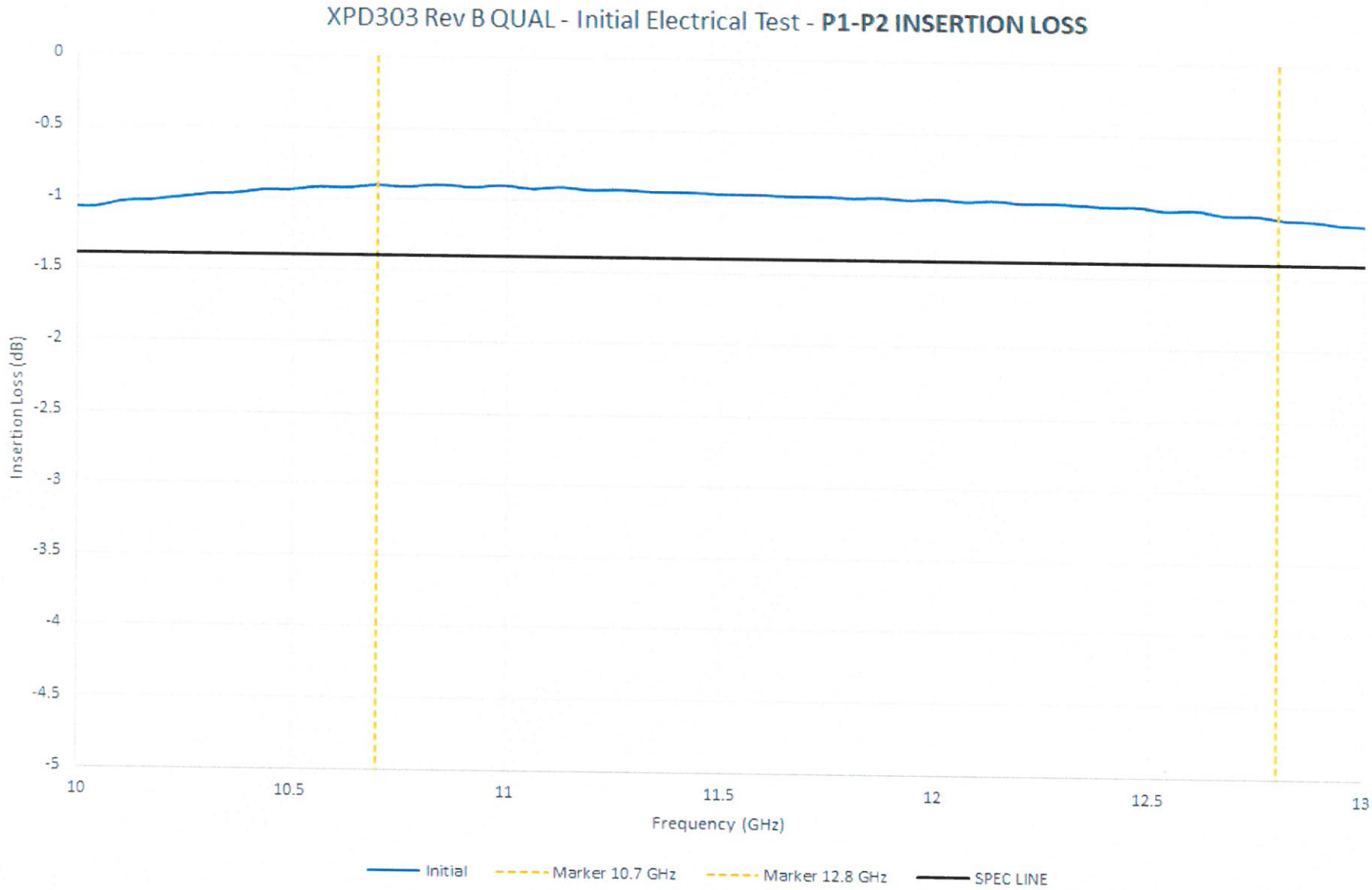


Figure 23: Insertion loss P1-P2

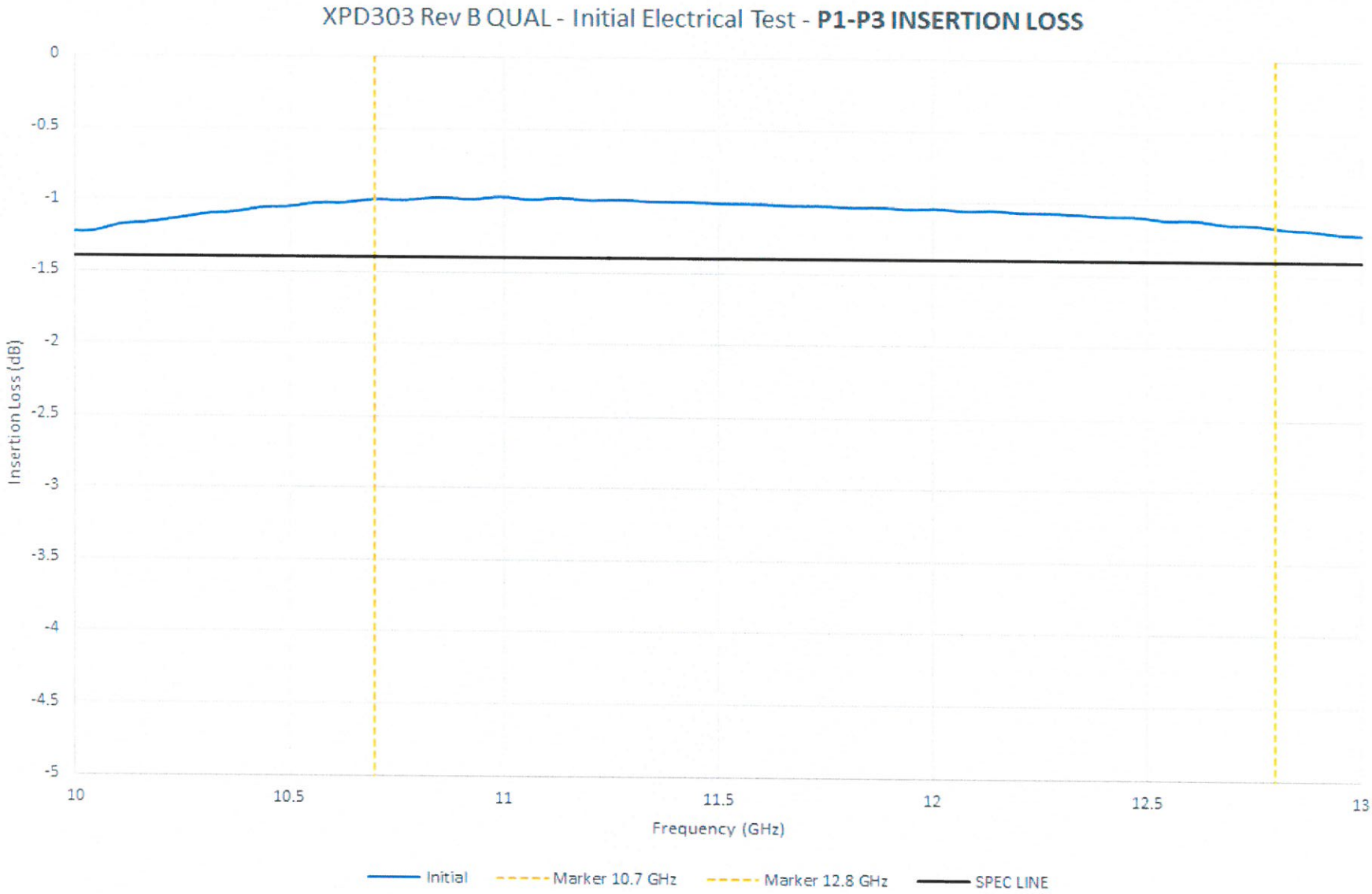


Figure 24: Insertion loss P1-P3

14. Qualification Test Profiles - Thermal Shock Test

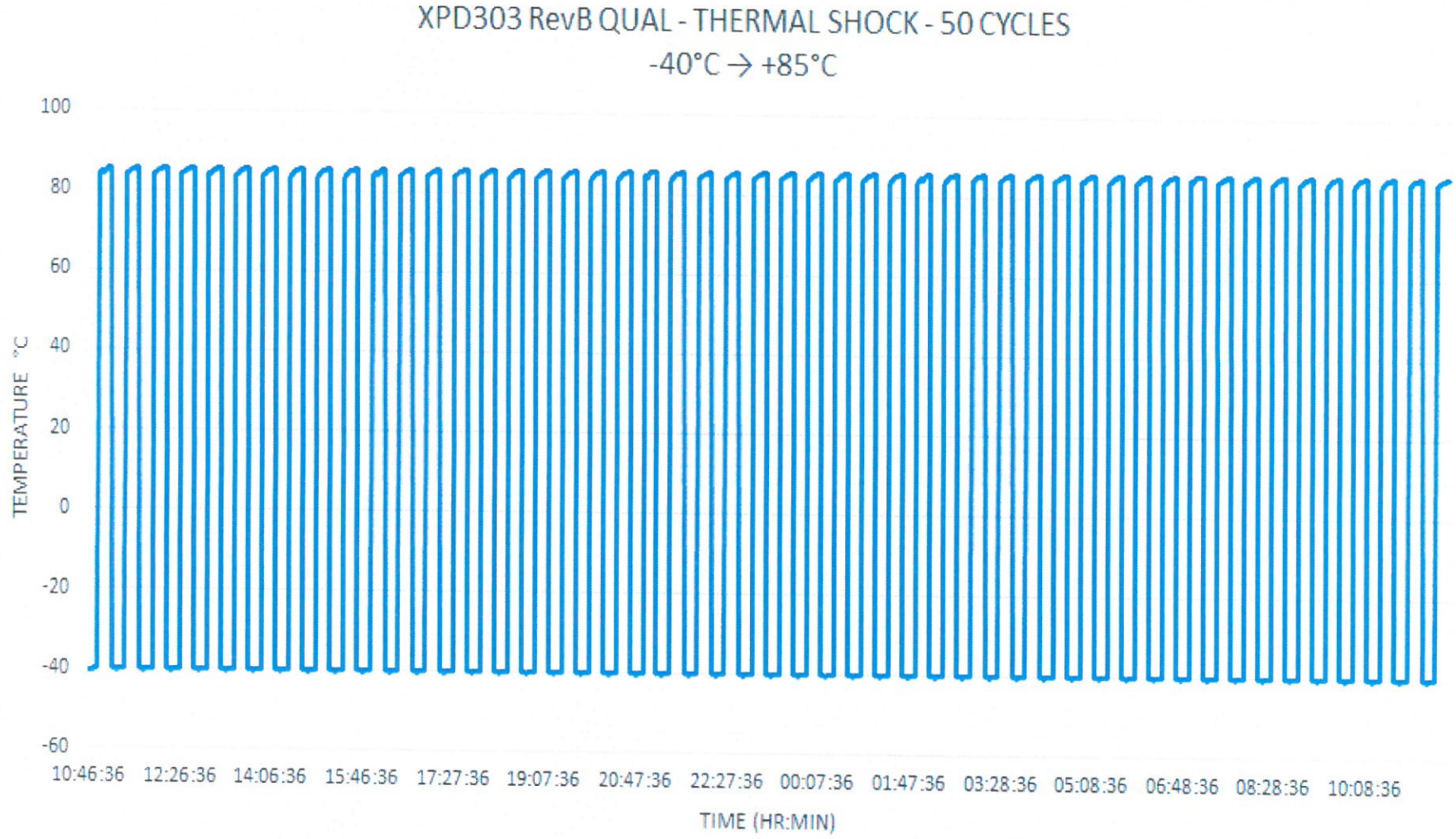
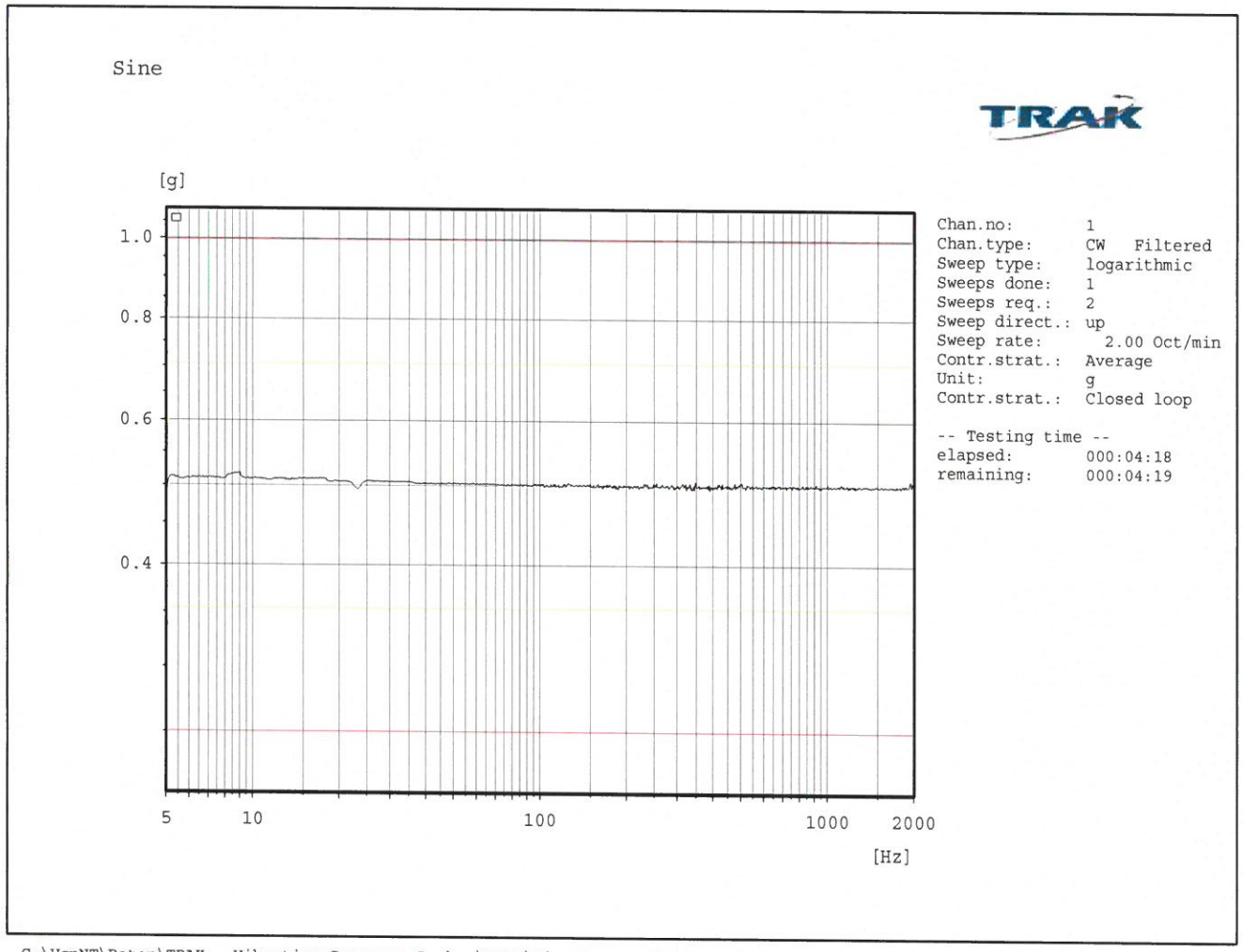


Figure 25: Thermal shock – 50 cycles

15. Qualification Test Profiles – Pre Sine Vibration



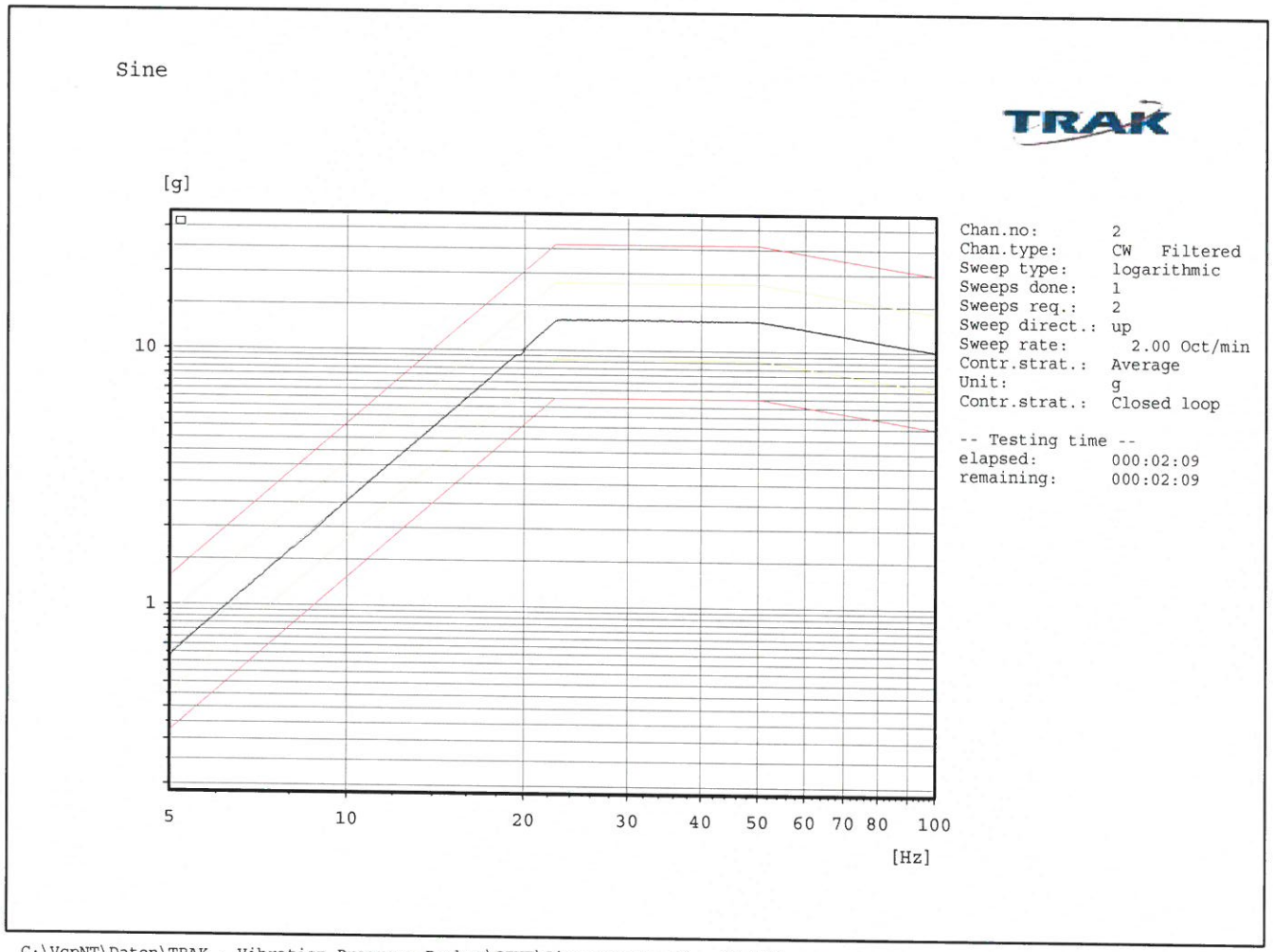
Job Number: COTS+
Model Number : XPD303
Op No : 90

X Axis	Y Axis	Z Axis
XXX		

Pre Vibration Low level Sine (3- Axis)	
Frequency	Level
5 to 2000 Hz	Low level Sine covering full range
Duration	Covering full range, 3 mutually perpindicular axes

Figure 26: Pre Sine Vibration (Typical)

16. Qualification Test Profiles – Sine Vibration



Sine Vibration (3- Axis)	
Frequency	Level
5 -22.6 Hz	6.4mm (0.25 in.) (0-peak)
22.6 -50 Hz	13.0 g
50 - 100 Hz	10.0 g
Duration	Sweep rate 2 octave/min, 3 mutually perpindicular axes

Figure 27: Sine Vibration (Typical)

17. Qualification Test Profiles – Random Vibration

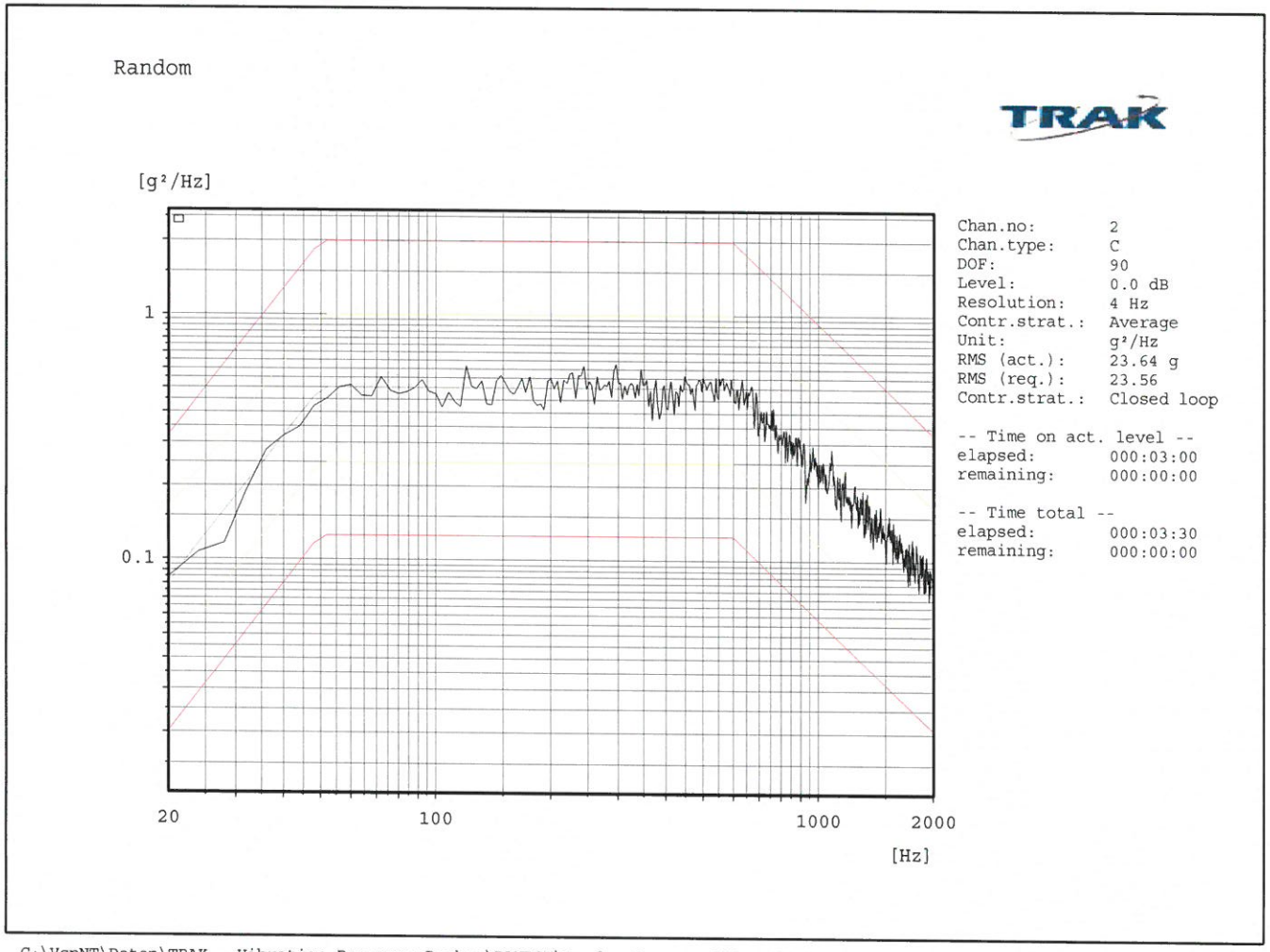


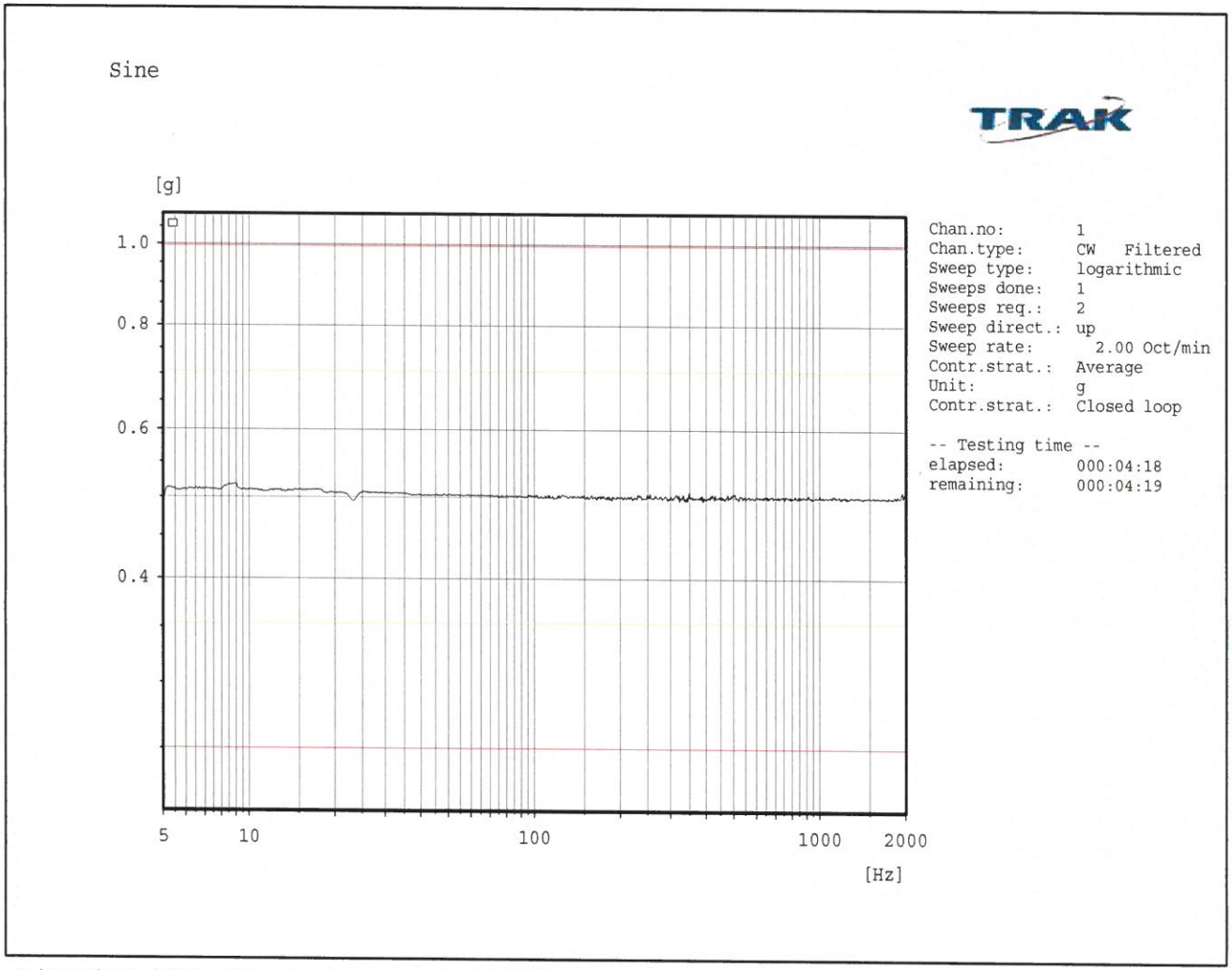
Figure 28: Random Vibration (Typical)

Job Number: COTS+
Model Number : XPD303
Op No : 110

X Axis	Y Axis	Z Axis
XXX		

Random Vibration (3- Axis)	
Frequency	Level
20 -50 Hz	+6.0 dB/Octave
50 -600 Hz	0.5 g2/Hz
600 - 2000Hz	-4.5dB/Octave
Overall	23.6 gRMS
Duration	180 seconds in each perpendicular axes

18. Qualification Test Profiles – Post Sine Vibration



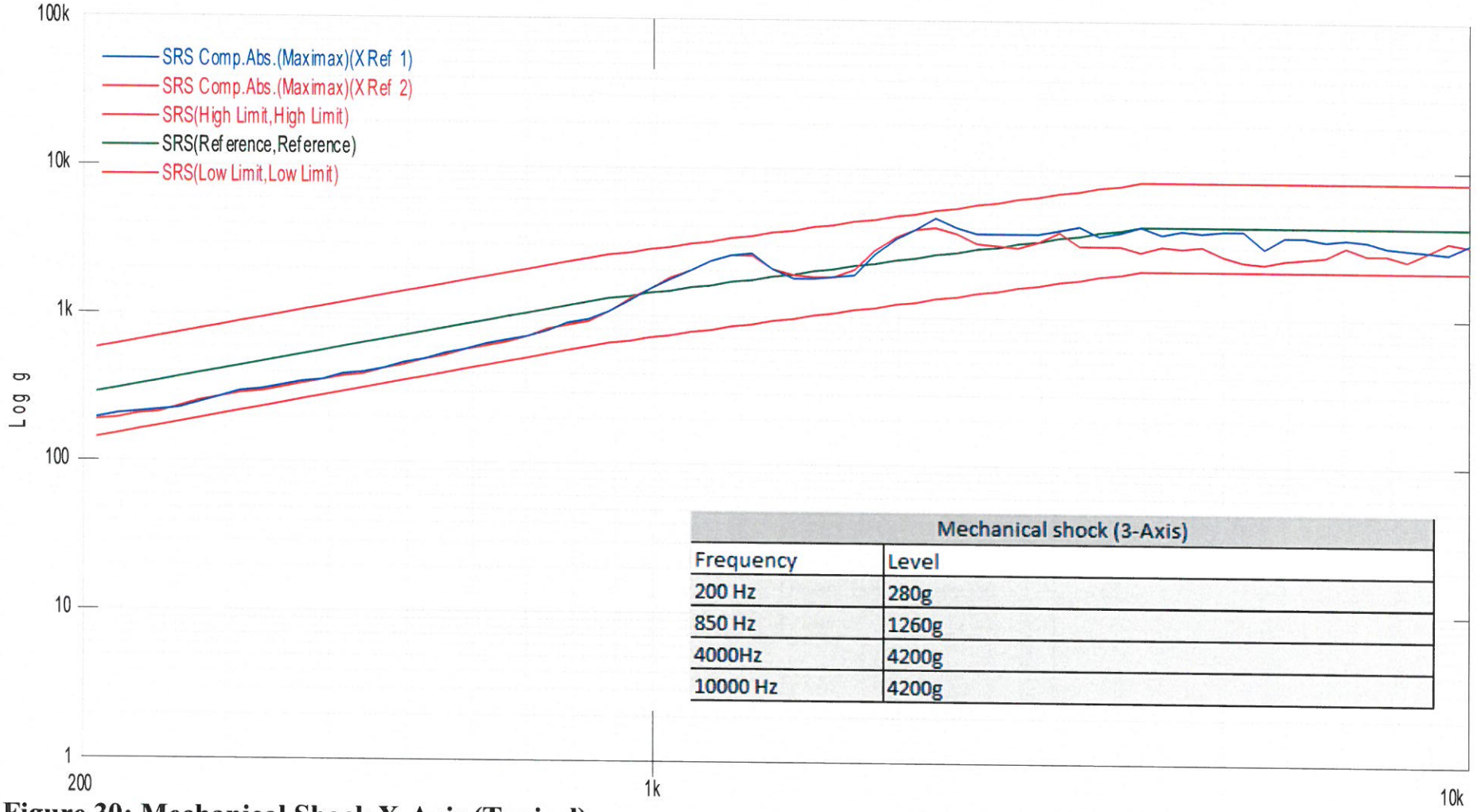
C:\VcpNT\Daten\TRAK - Vibration Programs Backup\SINE\Sine Program 30_1347.rsn

Figure 29: Post Sine Vibration (Typical)

Job Number:	COTS+	
Model Number :	XPD303	
Op No :	120	
X Axis	**Y Axis**	**Z Axis**
XXX		

Post Vibration Low level Sine (3- Axis)	
Frequency	Level
5 to 2000 Hz	Low level Sine covering full range
Duration	Covering full range, 3 mutually perpindicular axes

19. Qualification Test Profiles – Mechanical Shock



Mechanical shock (3-Axis)	
Frequency	Level
200 Hz	280g
850 Hz	1260g
4000Hz	4200g
10000 Hz	4200g

Figure 30: Mechanical Shock X-Axis (Typical)

20. Qualification Test Profiles – X-Ray

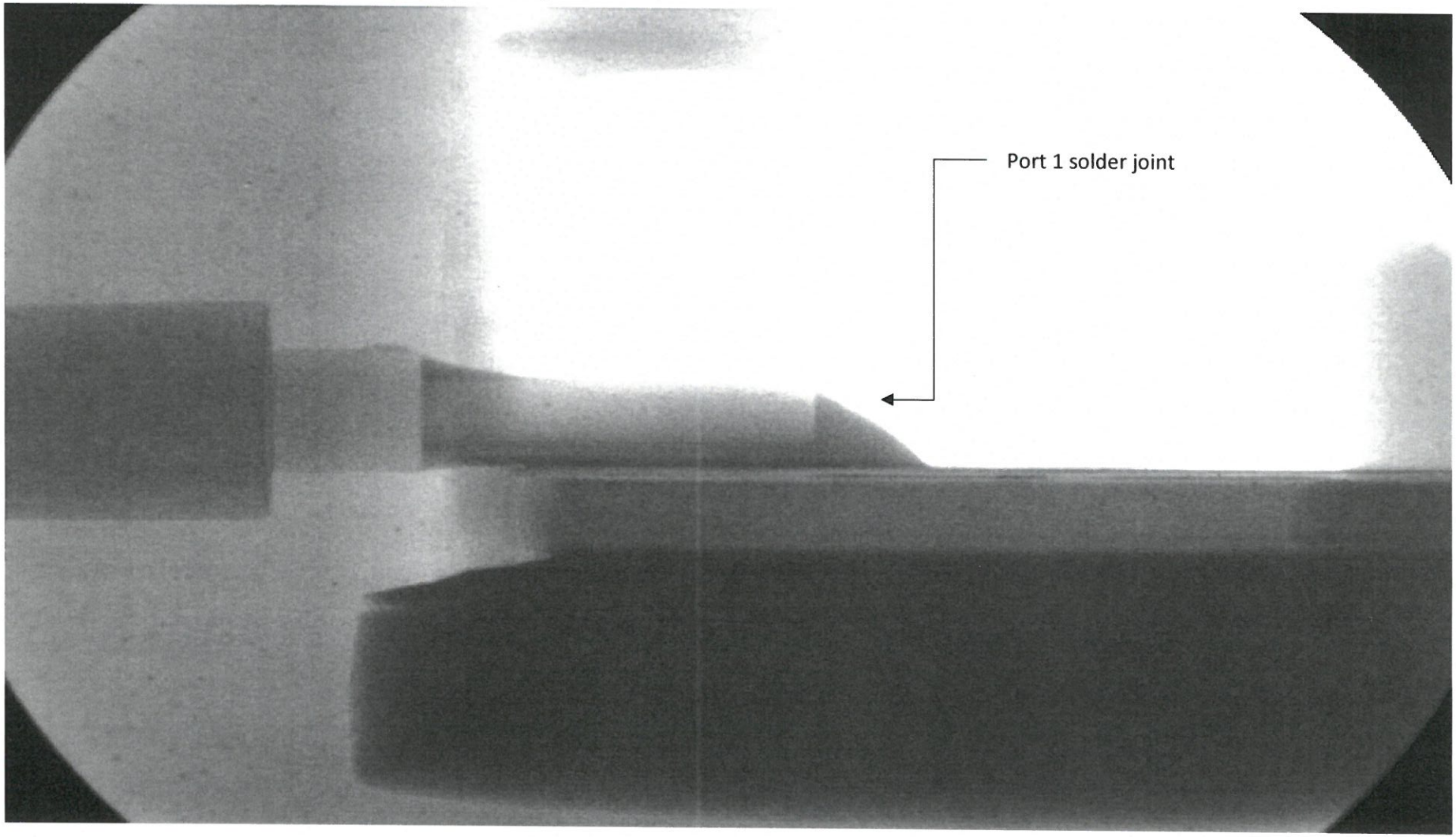


Figure 31: X-ray Port 1

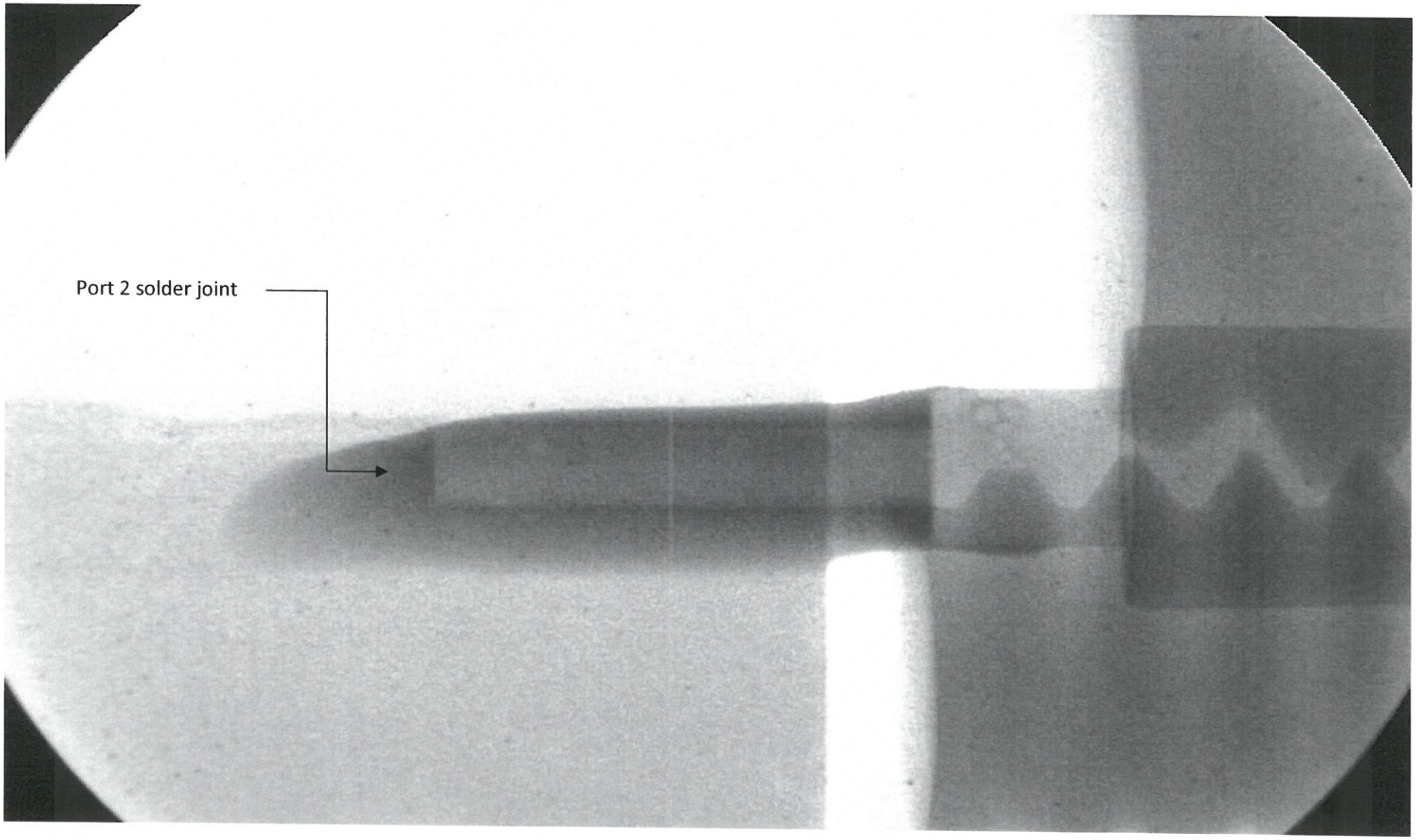


Figure 32: X-ray Port 2

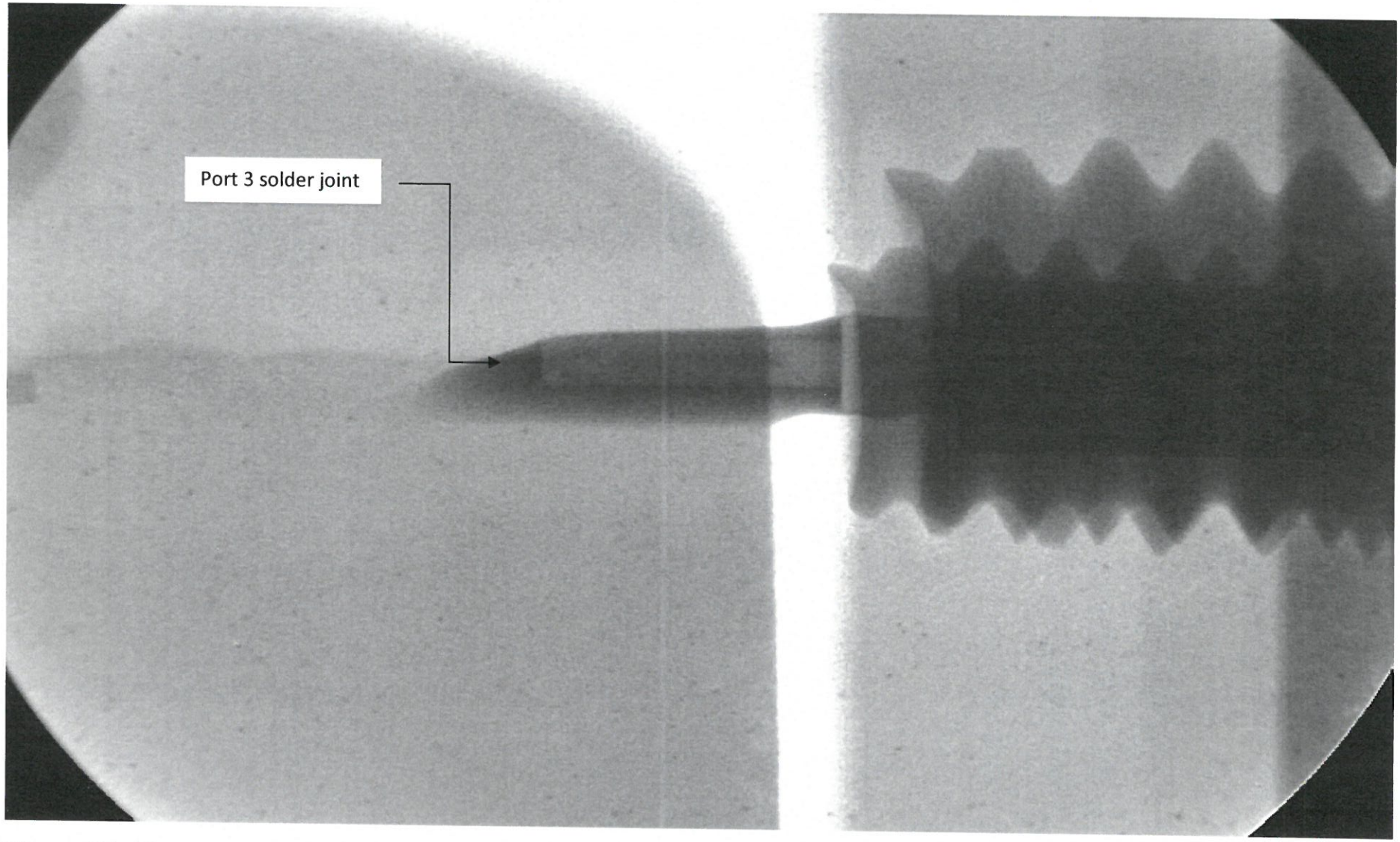


Figure 33: X-ray Port 3

21. Qualification Test Profiles – Thermal Glitch Cycles _ (-25°C +80°C)

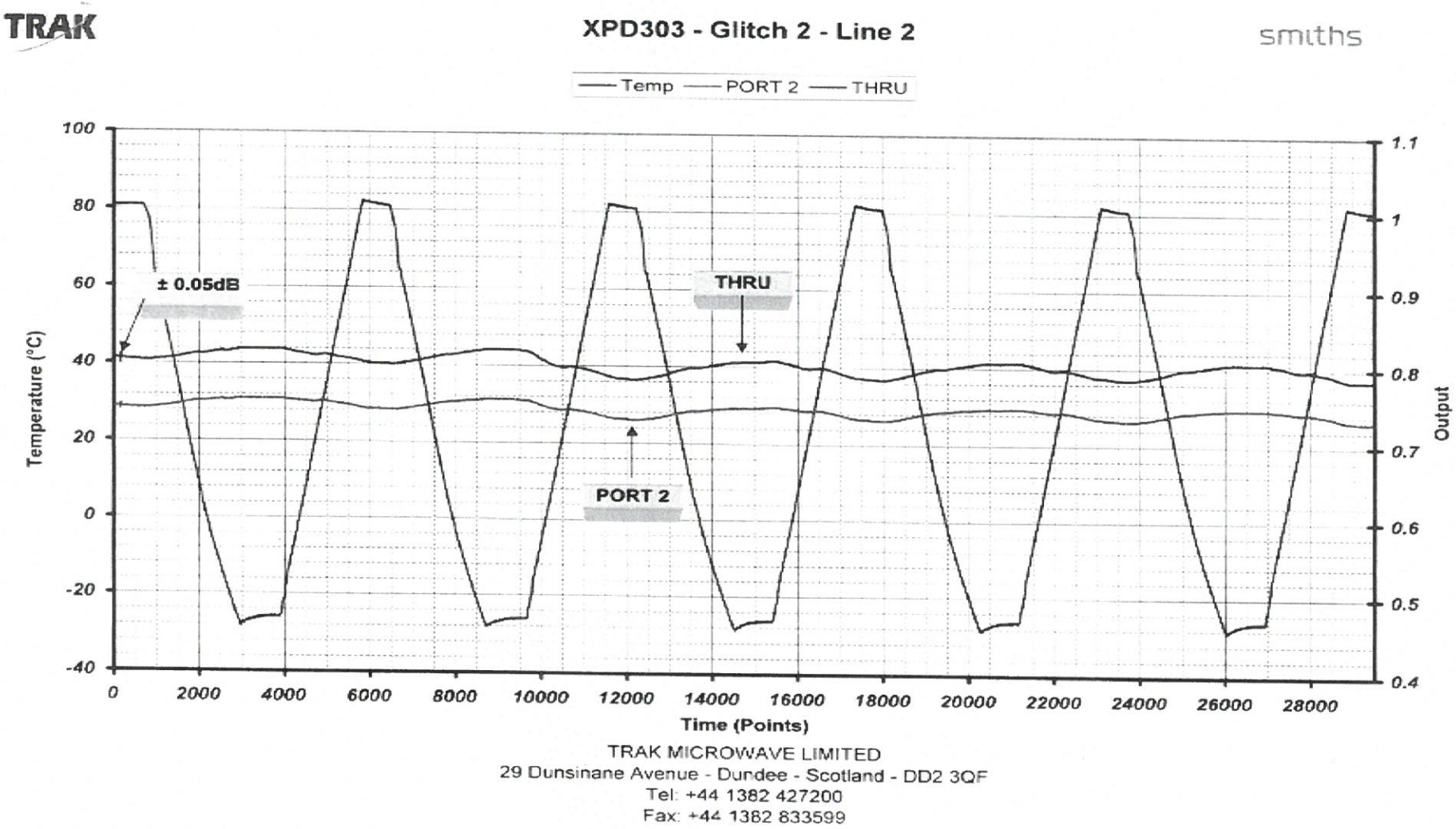


Figure 34: Thermal Cycle for Glitches - 5 cycle glitch (Typical)

22. Qualification Test Profiles – TVAC Temperature Test _ (-25°C +80°C)

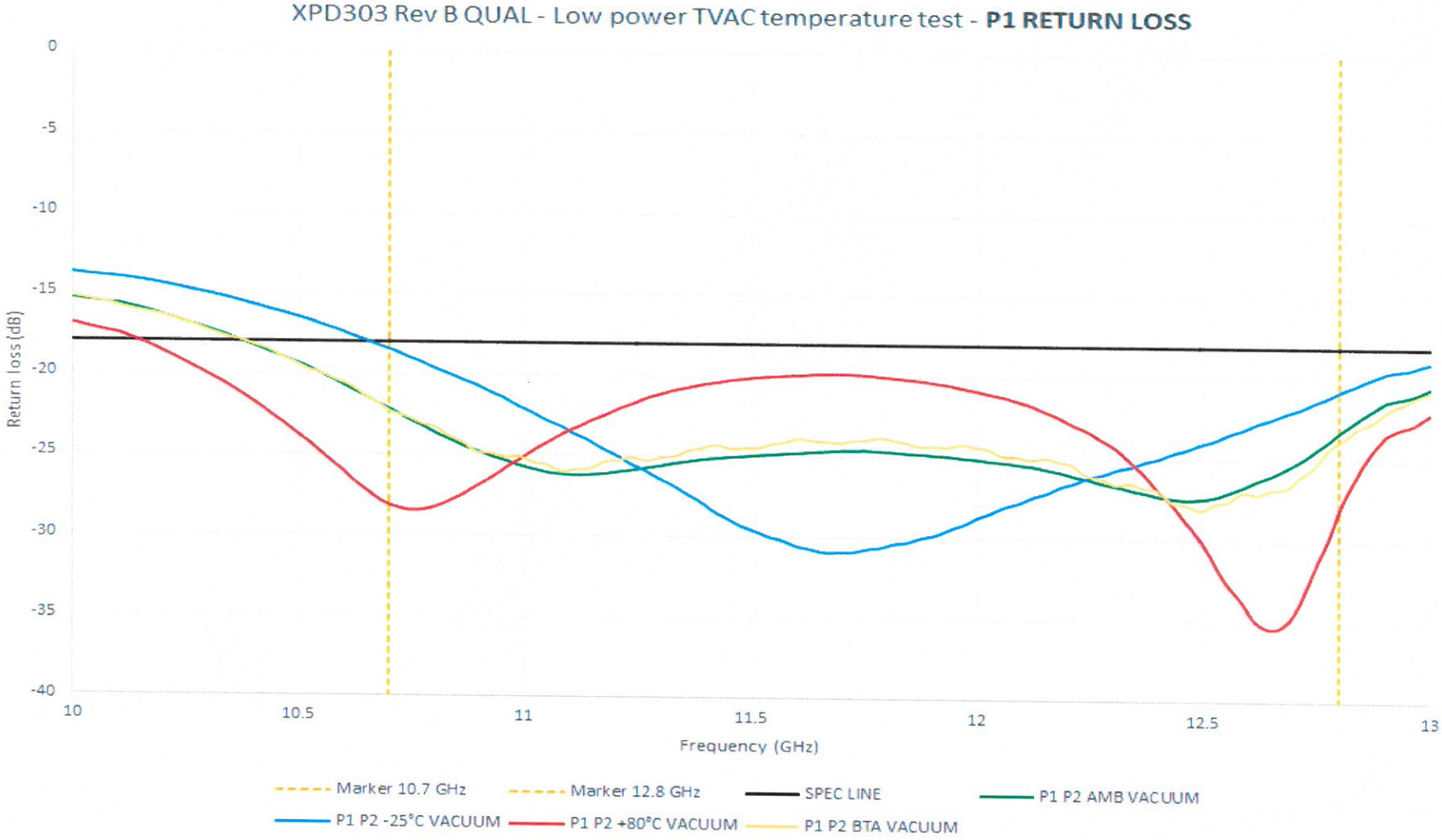


Figure 35: Return Loss Port 1

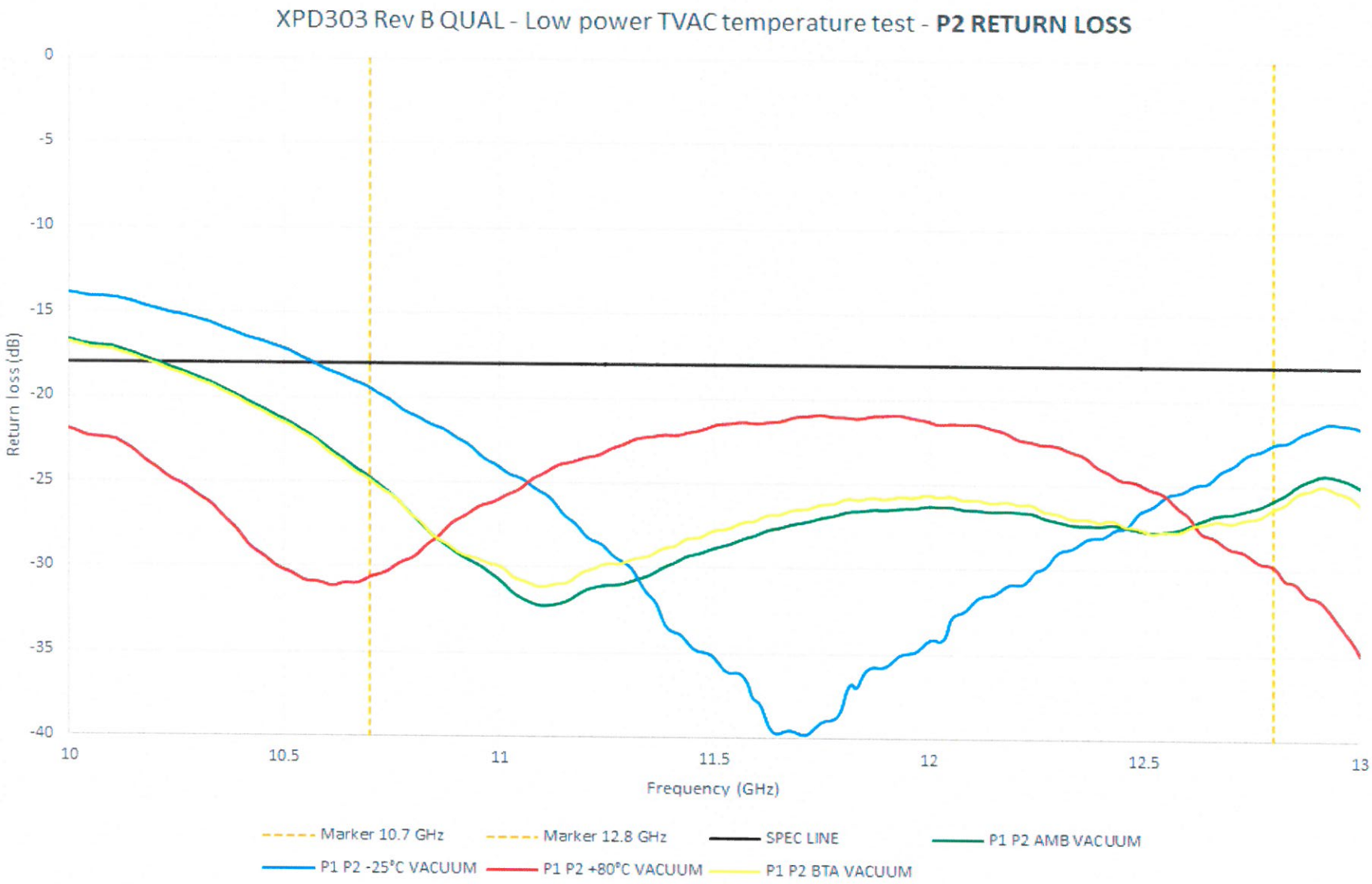


Figure 36: Return Loss Port 2

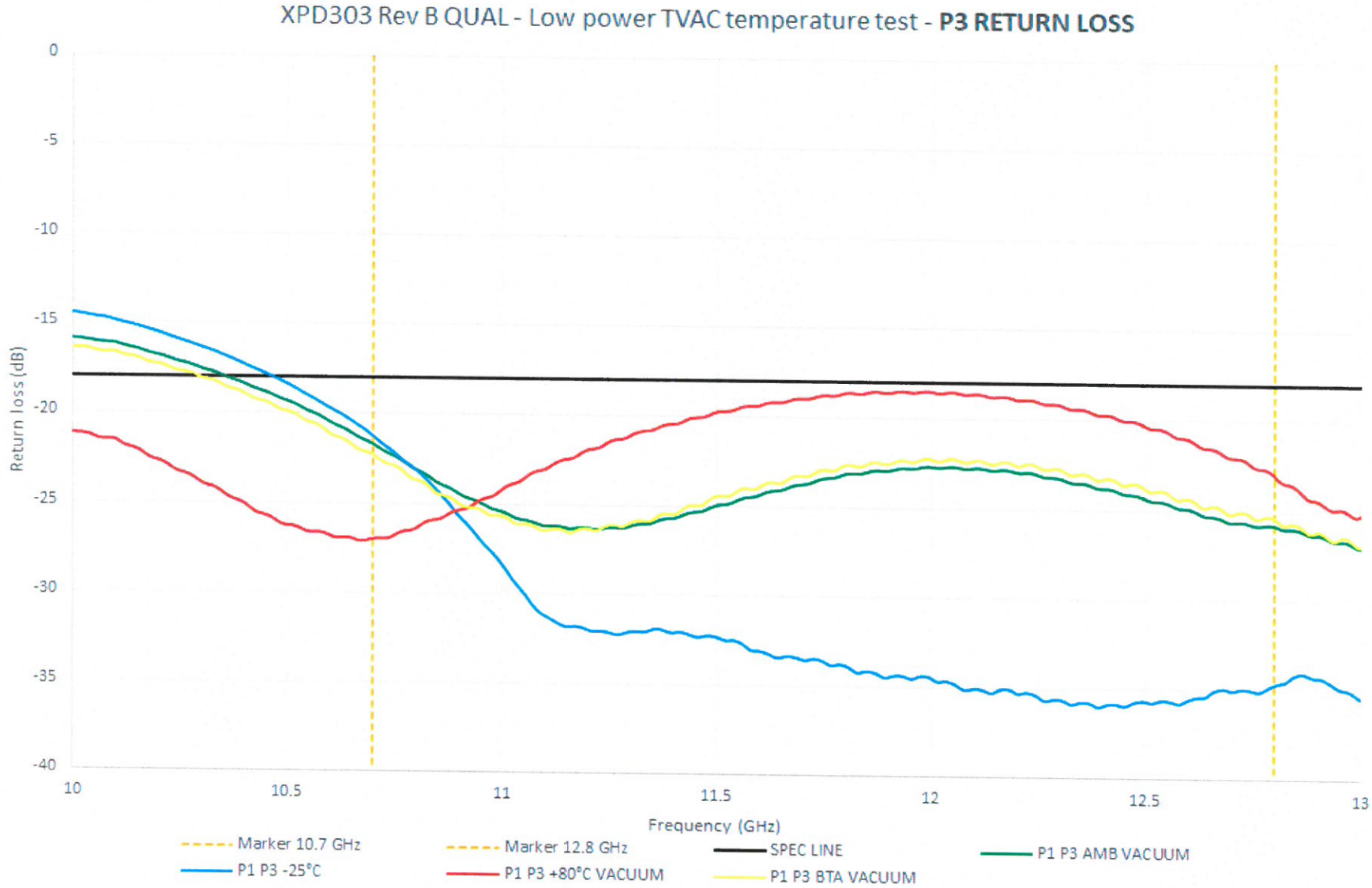


Figure 37: Return Loss Port 3

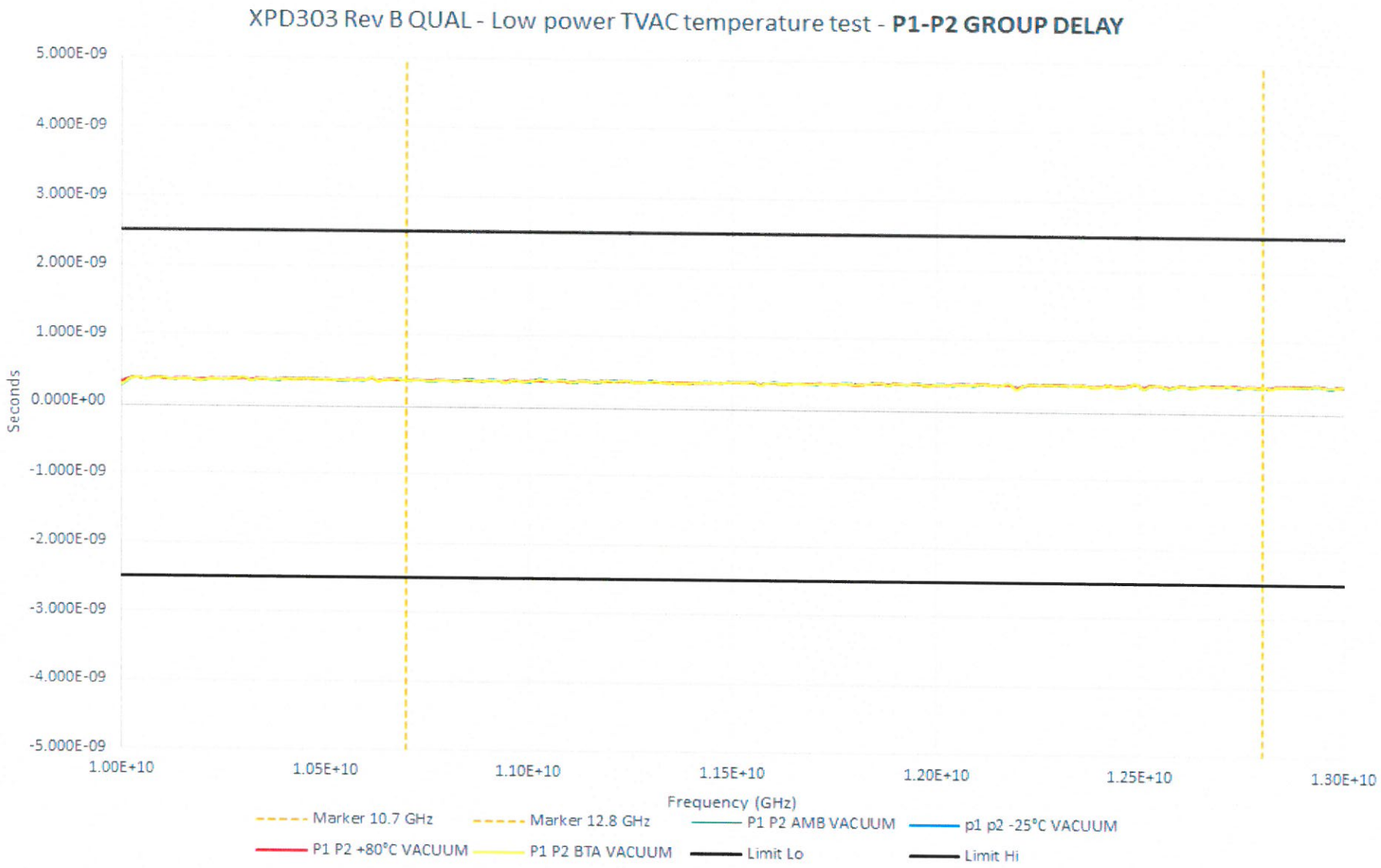


Figure 38: Group Delay P1-P2 (Typical)

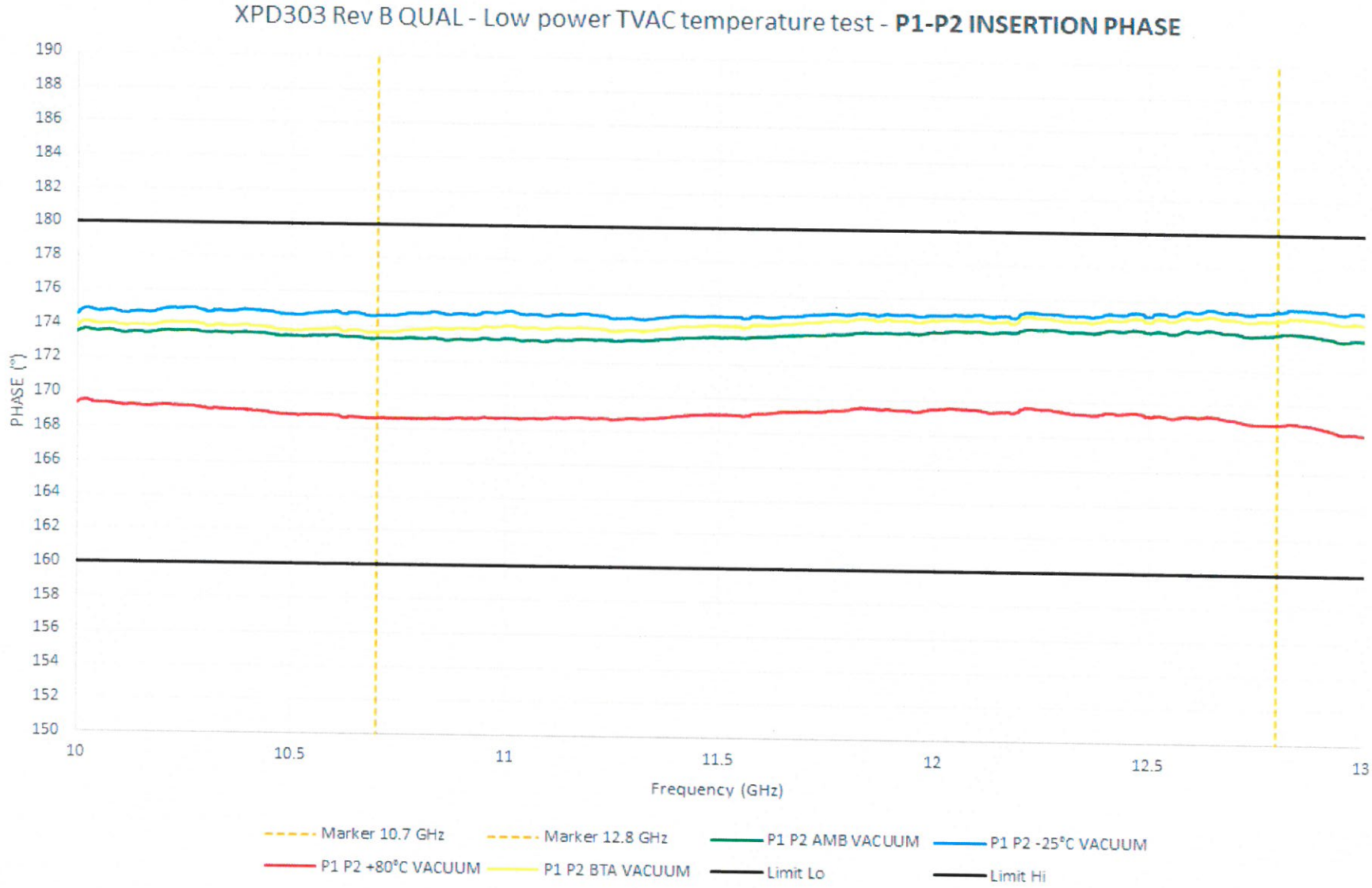


Figure 39: Insertion Phase P1-P2 (Typical)

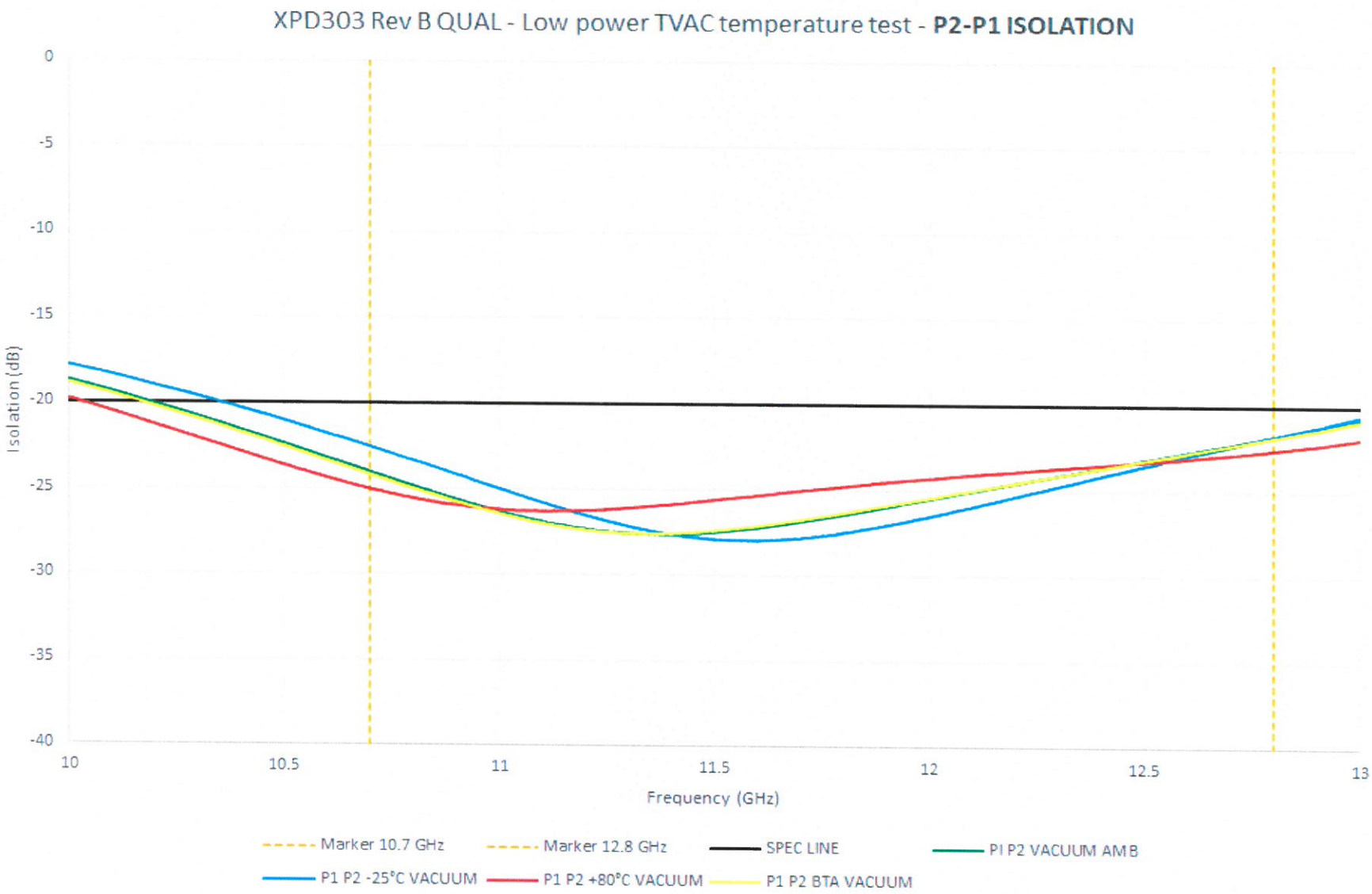


Figure 40: Isolation P2-P1 (Typical)

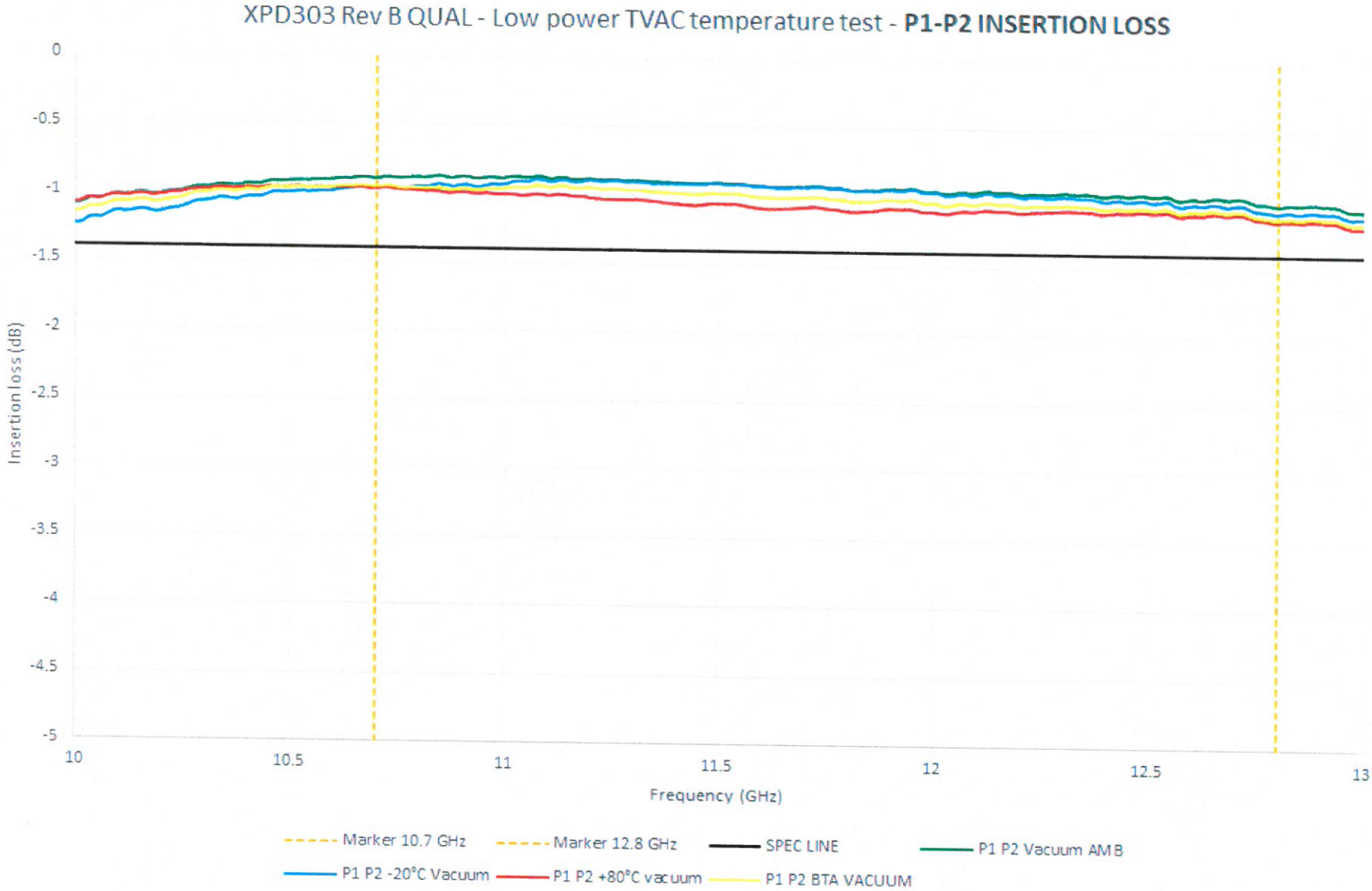


Figure 41: Insertion Loss P1-P2 (Typical)

23. Qualification Test Profiles - EMC

TRAK
TRAK Microwave Limited
A Smiths Group Company

EMC Test Spreadsheet.

NOTE: Enter values into the yellow boxes only!! (working from the top, left to right)

Waveguide Size — WG 16 / WR 90

a =	2.286	cm	
b =	1.016	cm	
Distance from the transition to the device. D =	0.15	m	
Test frequency (GHz) f =	11.75	GHz	

Model No	S/N	Port 1, 2 or 3	Centre freq	Gain of the transition	Sythesiser output power measured on spectrum analyser	Cable loss	Power to the transition	E-field	Power read on spectrum analyser	Power at device output	SE	SE Spec	Margin	PASS/ FAIL
			MHz		dBm	dB	dBm	V/m	dBm	dBm	dBi	dBi	dB	
XPD303	EXXX	1	11.750	4.5	10.4	-1.8	12.2	10.0	-105.1	-103.3	85	80	5	PASS
XPD303	EXXX	2	11.750	4.5	10.4	-1.8	12.2	10.0	-106.5	-104.7	86	80	6	PASS
XPD303	EXXX	3	11.750	4.5	10.4	-1.8	12.2	10.0	-105.5	-103.7	85	80	5	PASS

Tested By [signature] Date 5/9/2019 QA _____ Date _____

C Smith
2/09/03

TRAK MICROWAVE LIMITED Dunsinane Avenue Dundee DD2 3QF Tel +44 (0)1382 427200. Fax +44 (0)1382 833696

Figure 42: EMC test result

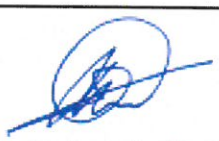
24. Qualification Test Profiles – PIND Test

ALTER TECHNOLOGY	GBR	REF: 2019901931-001	REV:
		DOC. DATE: 2019/11/07	
TEST RESULTS		PAGE: 1 of 5	

LAB TESTS SEQUENCE

PARTS TRACEABILITY DATA

COMPONENT DESCRIPTION:	HYBRID
PART TYPE:	XPD303
COMPONENT NUMBER:	XPD303
CUSTOMER PURCHASE ORDER:	ATP@20191002
GENERIC SPECIFICATION:	–
DETAIL SPECIFICATION:	MFR DATA SHEET
MANUFACTURER:	–
DATE CODE:	–
QUANTITY:	2
SERIAL NUMBER:	N/A
MARKING:	PIND#SINT#S/N-XXX#SOUTHWEST (*) A part has only the following marking: SOUTHWEST. This is on the connectors assembled to the device.

REPORT PREPARED BY	Tomás Pérez Cabrera	
REPORT SUPERVISED BY	Dimas Morilla Mairén	

- This documentation is property of ALTER TECHNOLOGY TÜV NORD, S.A.U. (ATN) and the Customer for whom it was issued.
- Results included herein are referred just to the product specified on this cover sheet.
- This documentation must not be partially reproduced nor divulgated without ATN approval. Individual reports included herein are only valid if they are accompanied by the rest of the testing documentation.

Figure 43: PIND test report (ALTER) – Full test report available

25. Qualification Test Data

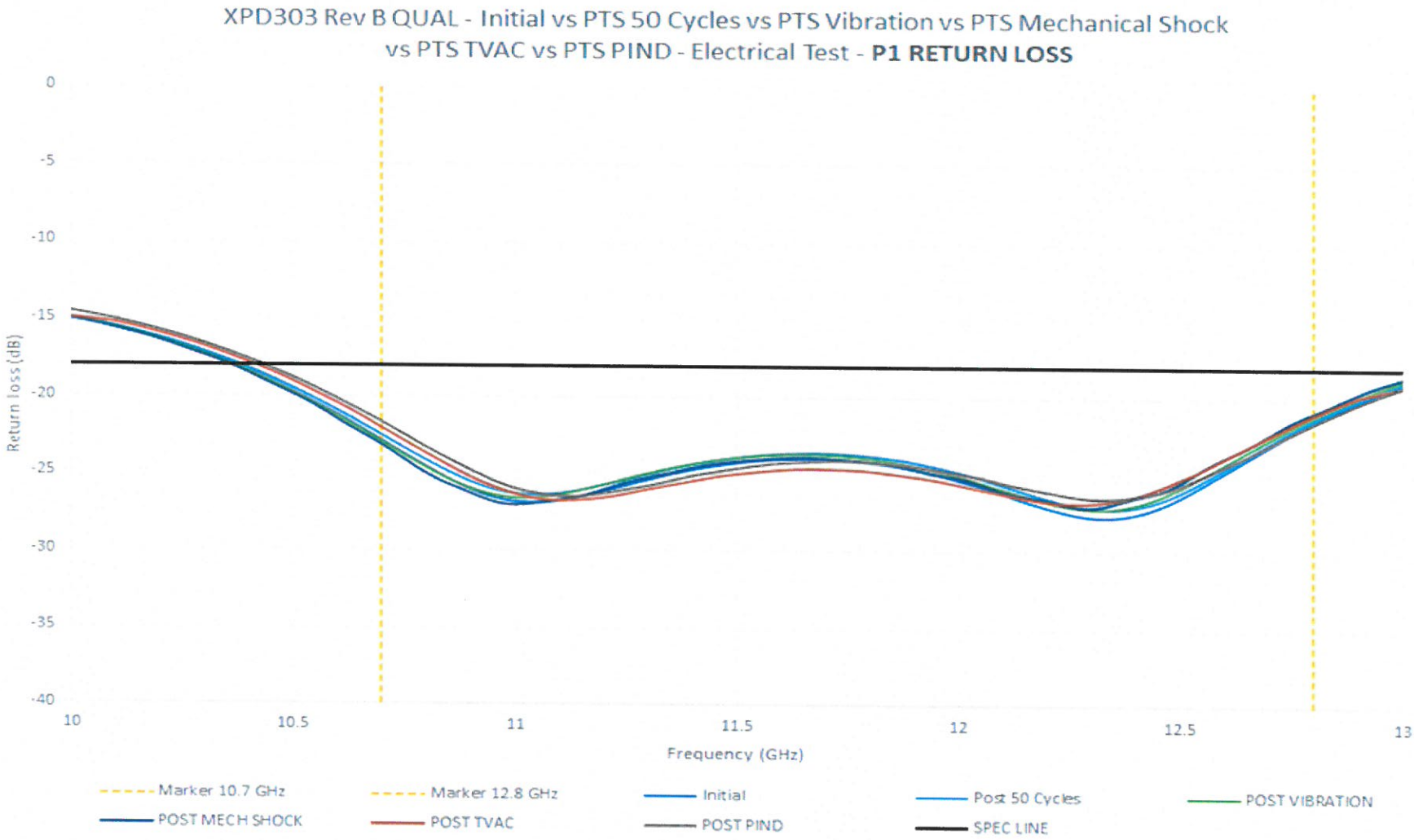


Figure 44: Qualification Test Data – Return loss Port 1

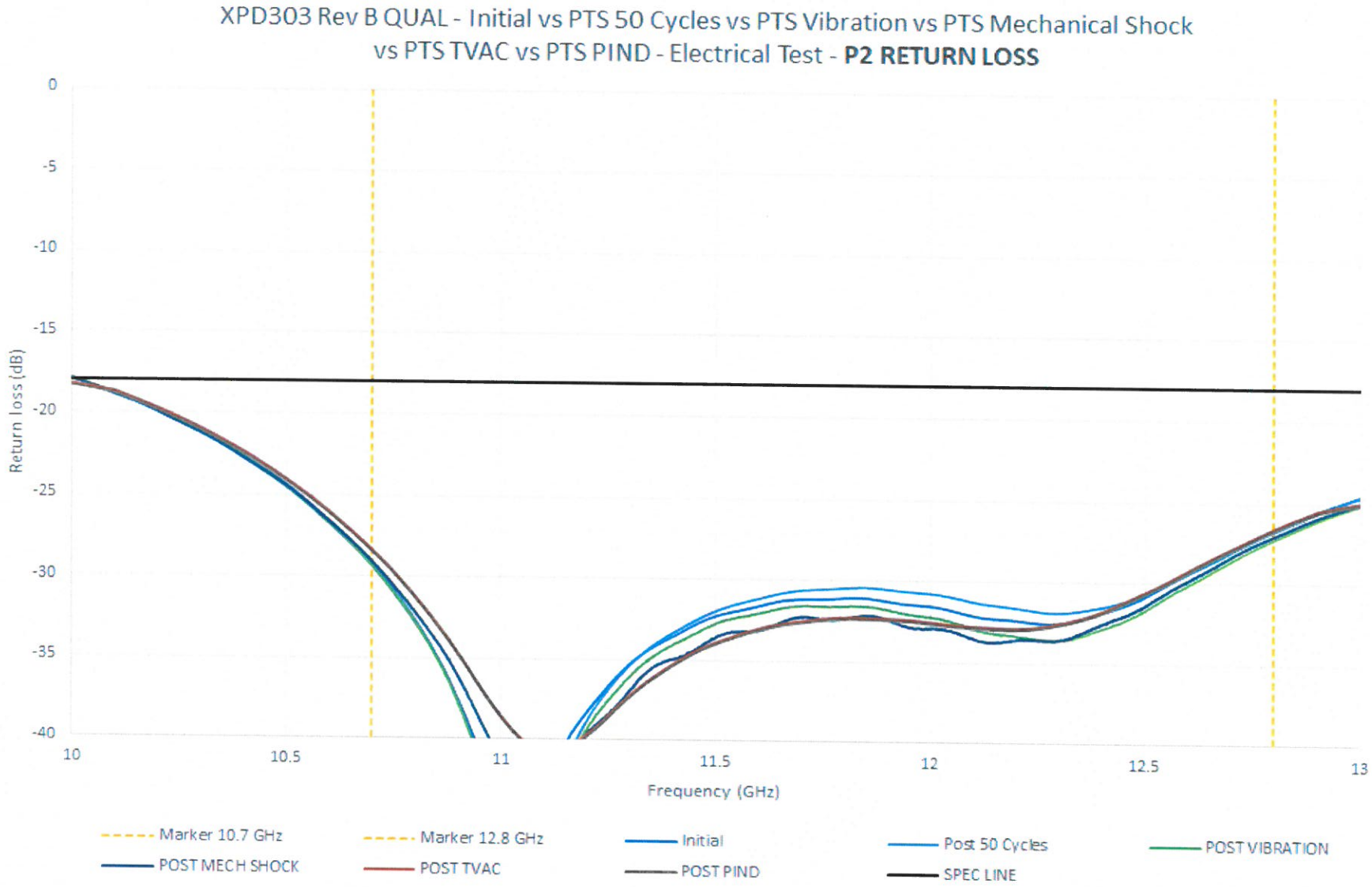


Figure 45: Qualification Test Data – Return loss Port 2

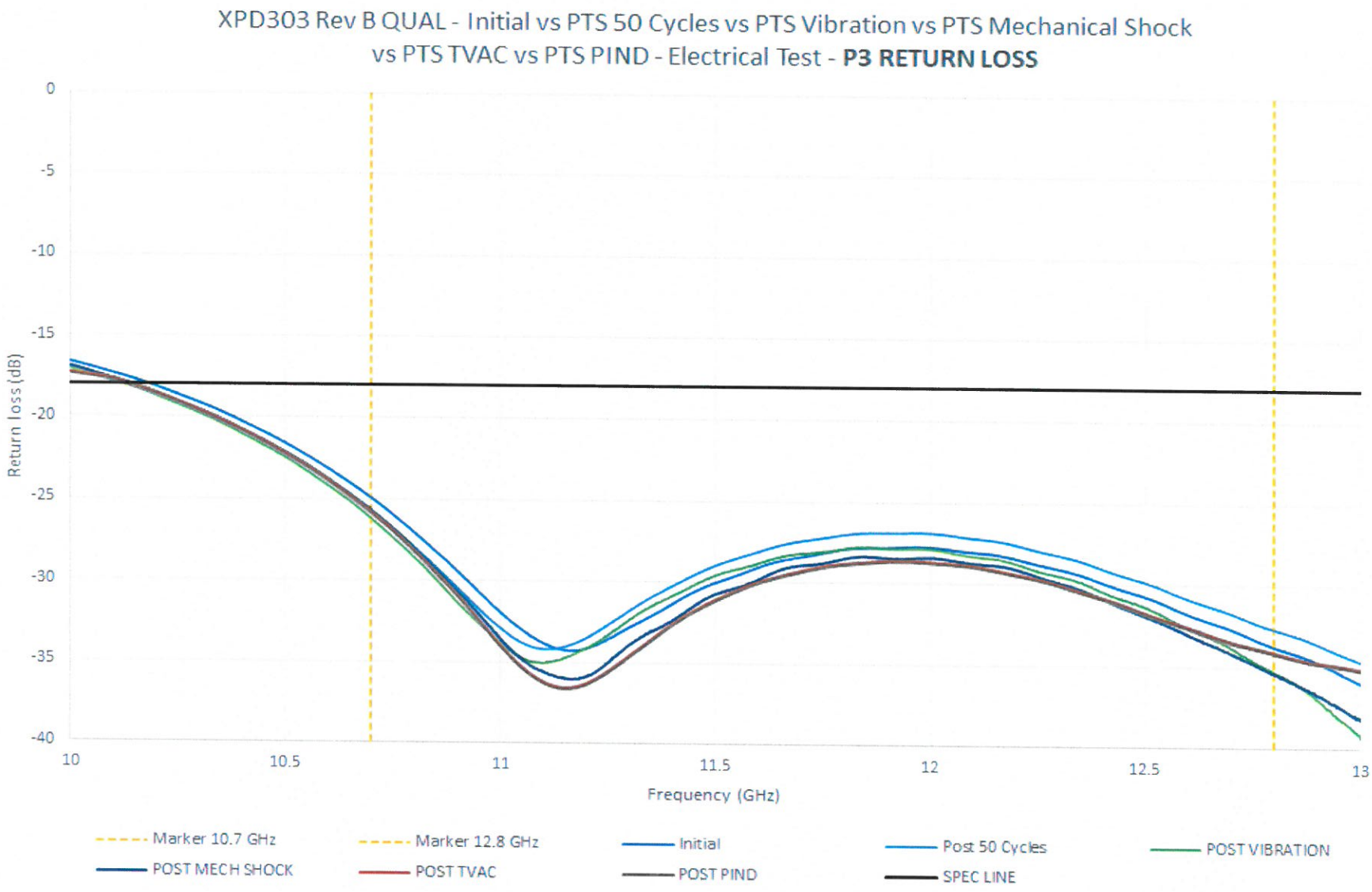


Figure 46: Qualification Test Data – Return loss Port 3

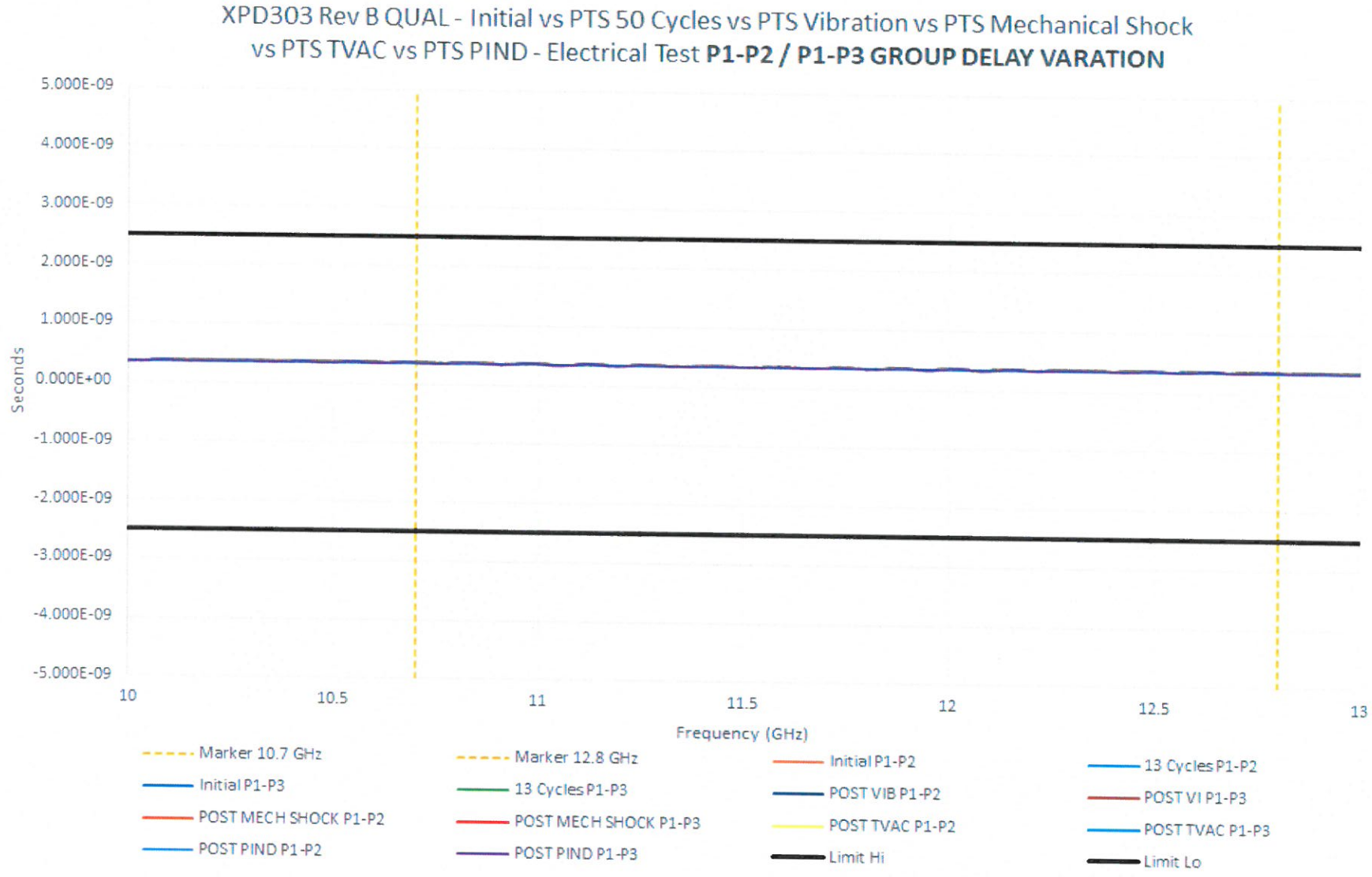


Figure 47: Qualification Test Data – Group delay variation P1-P2 / P1-P3

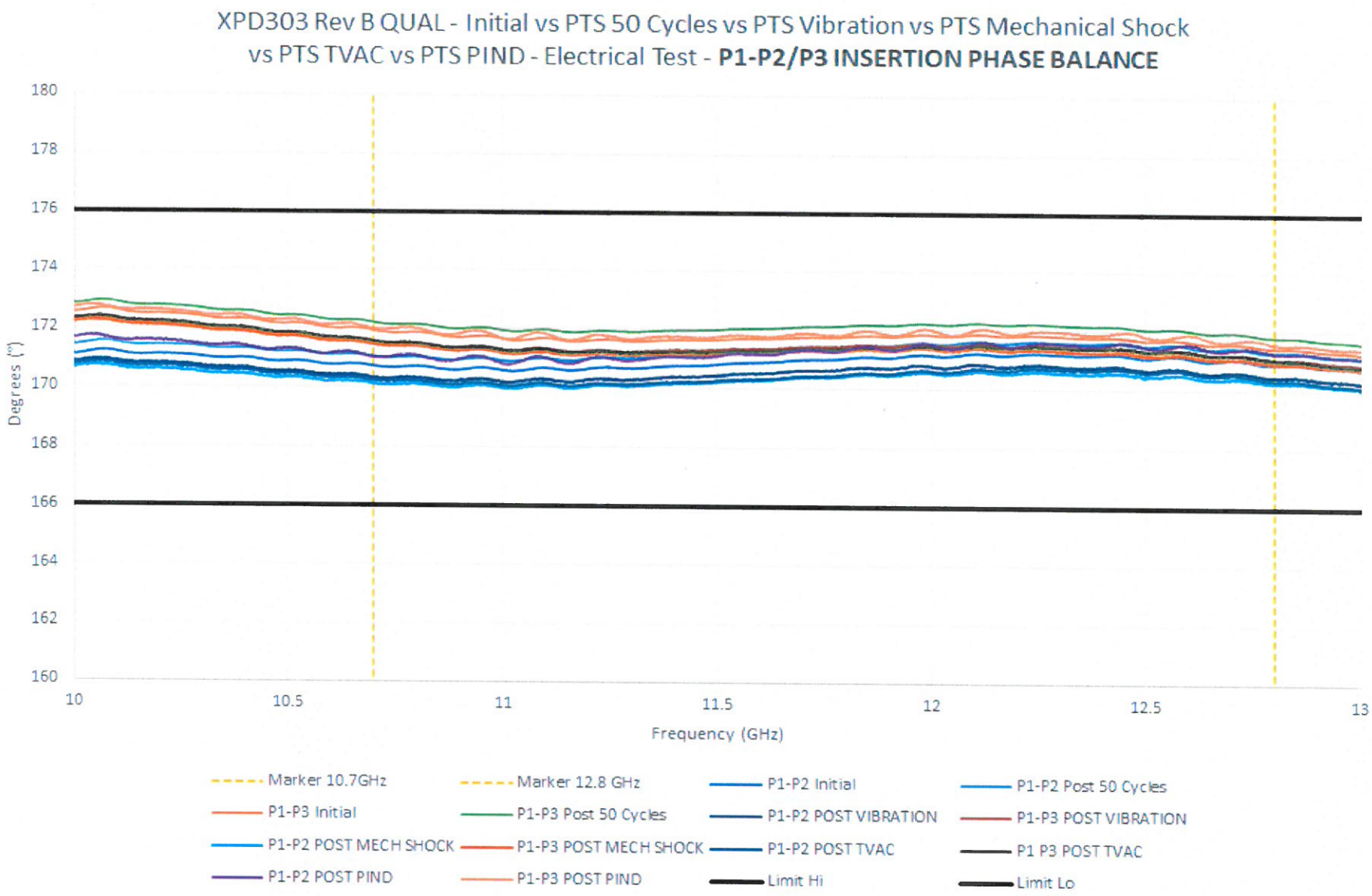


Figure 48: Qualification Test Data – Insertion phase balance P1-P2/P3

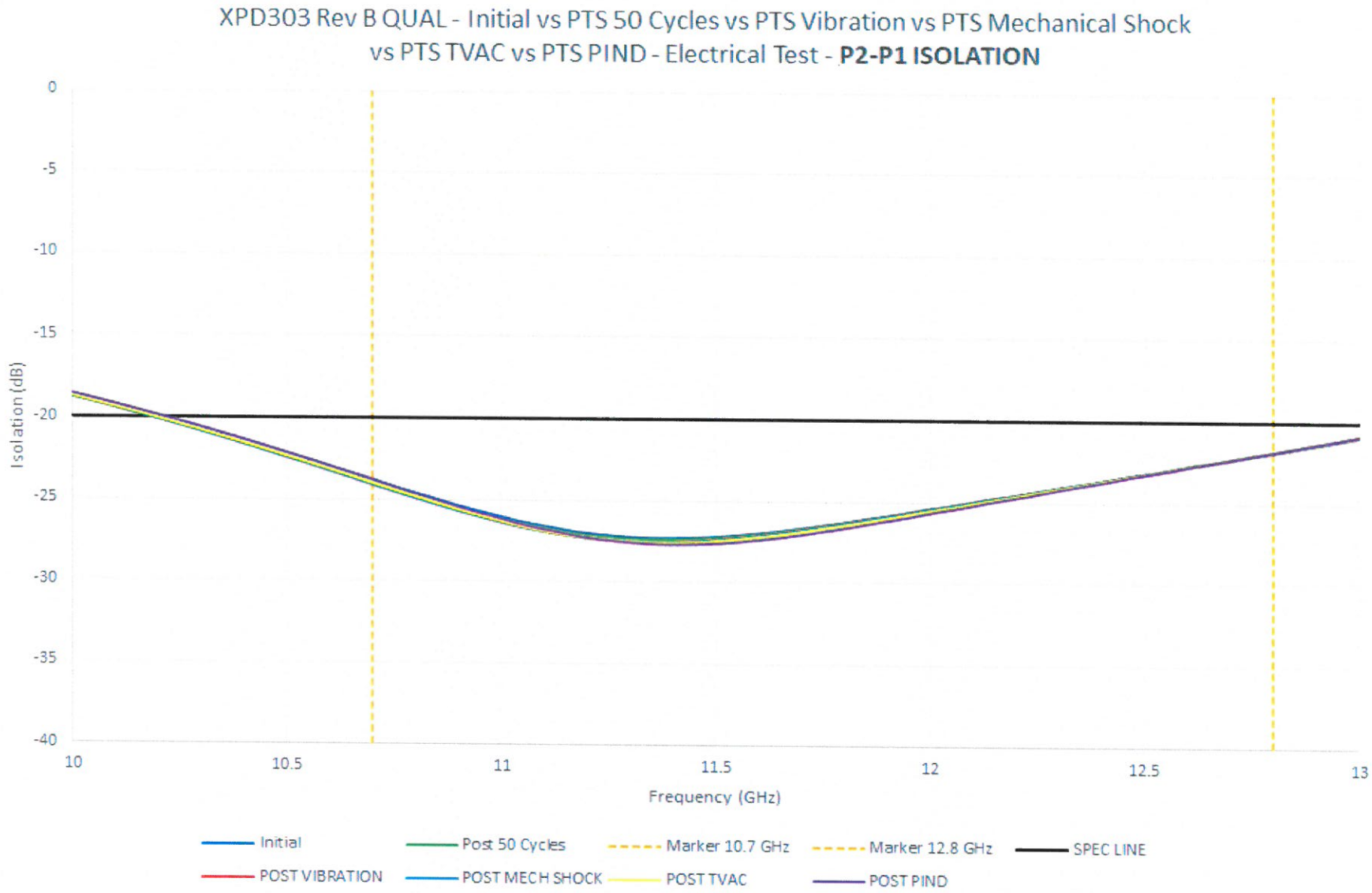


Figure 49: Qualification Test Data – Isolation P2-P1

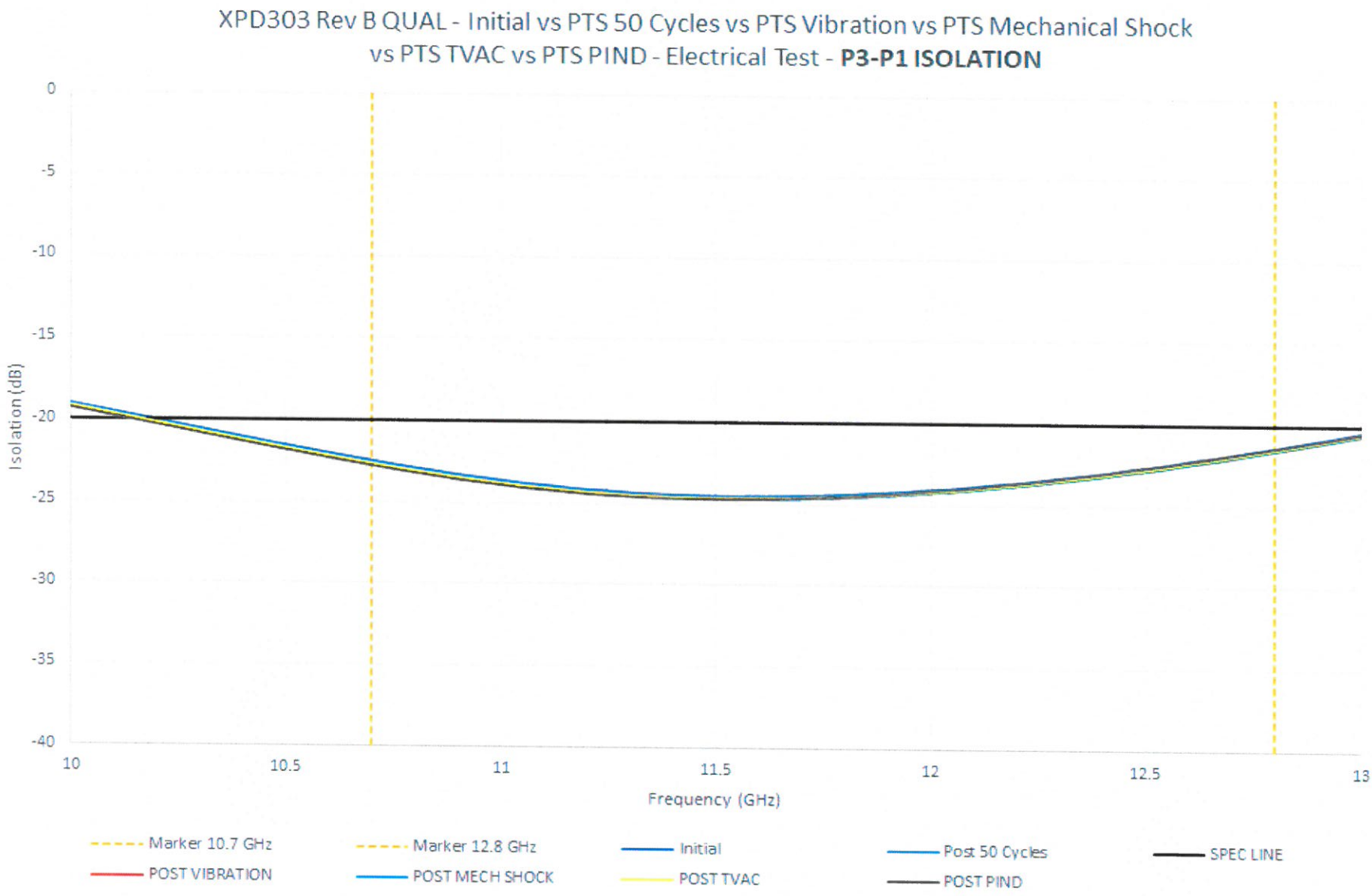


Figure 50: Qualification Test Data – Isolation P3-P1

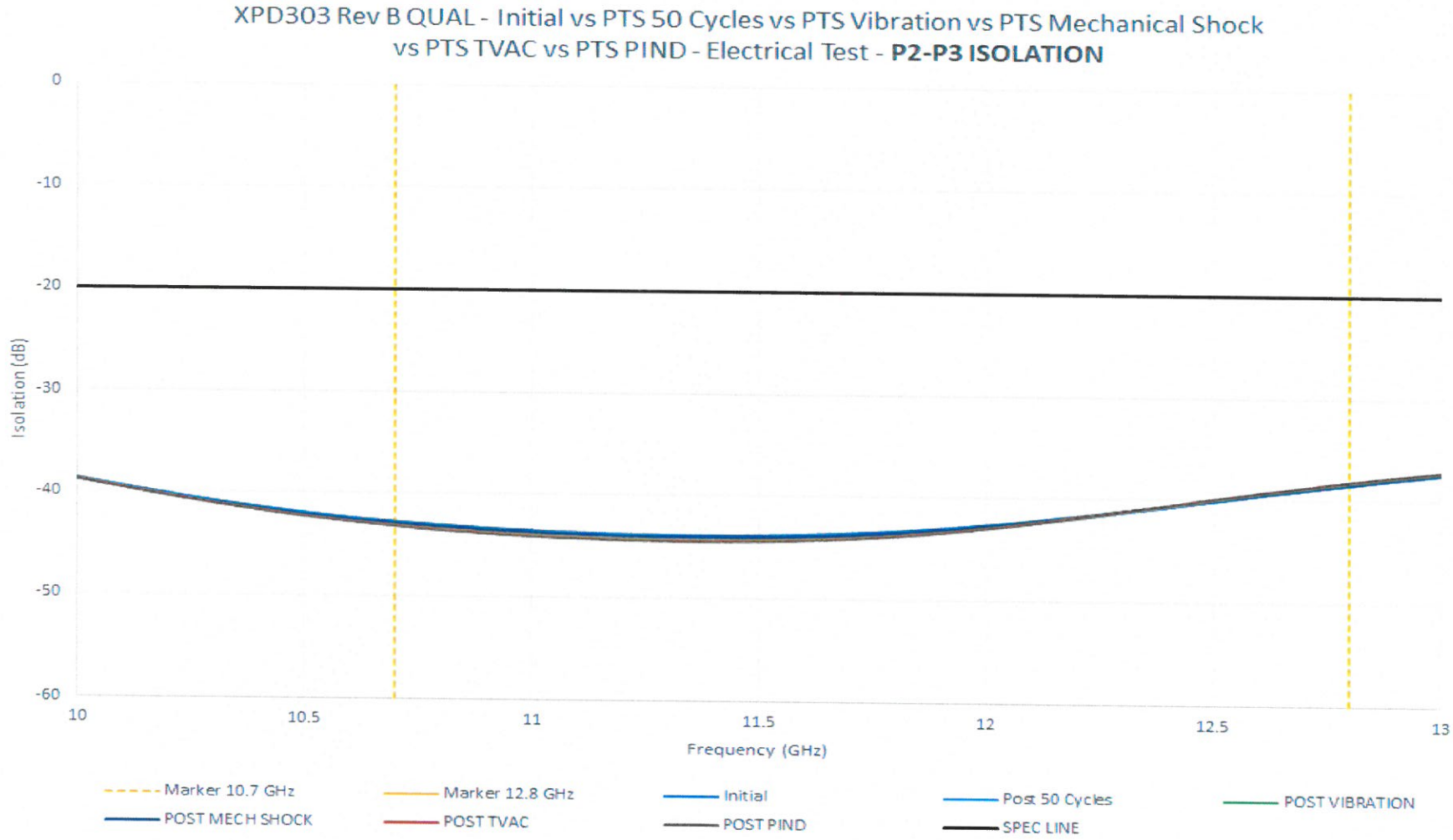


Figure 51: Qualification Test Data – Isolation P2-P3

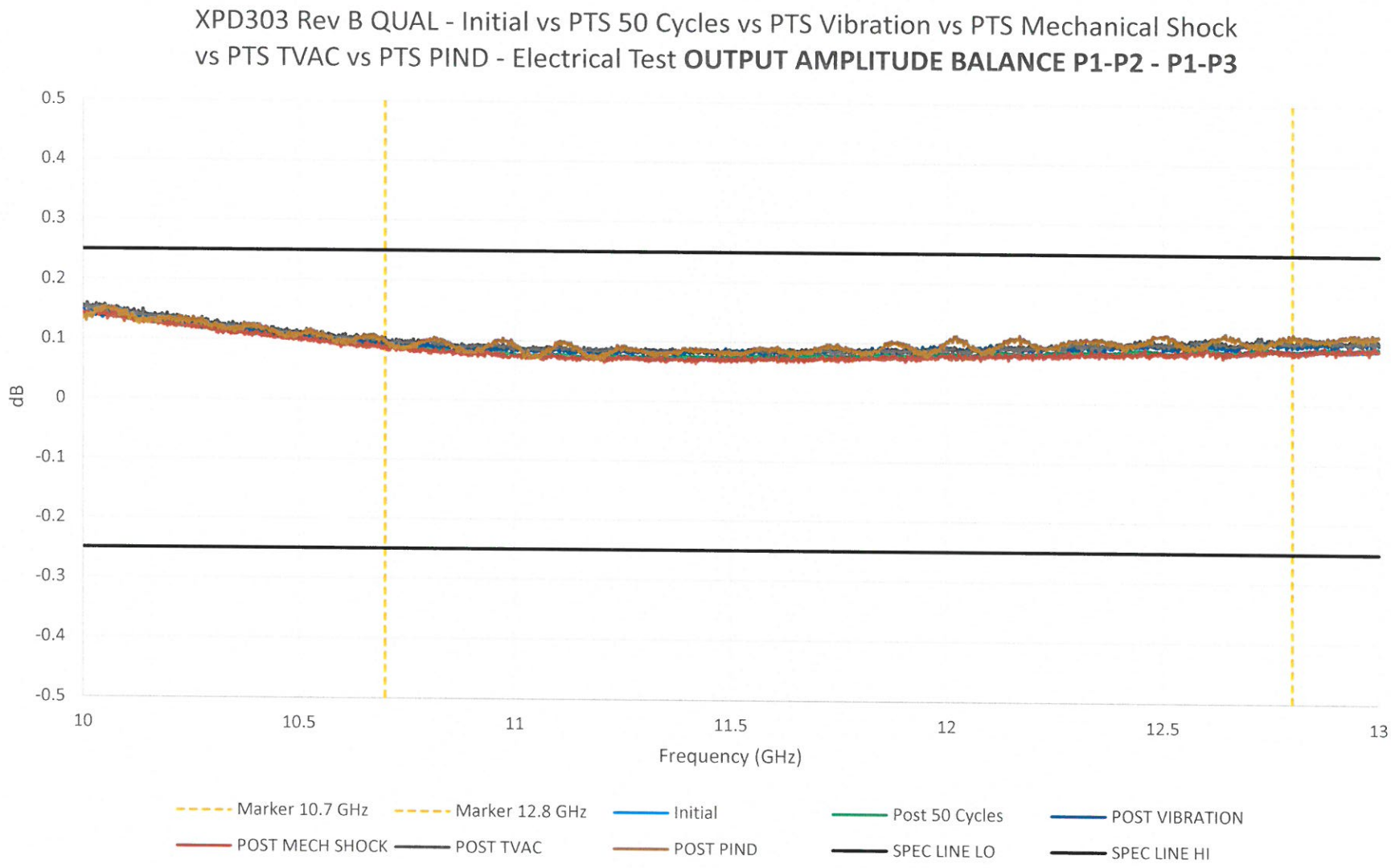


Figure 52: Qualification Test Data – Output Amplitude Balance P1-P2 / P1-P3

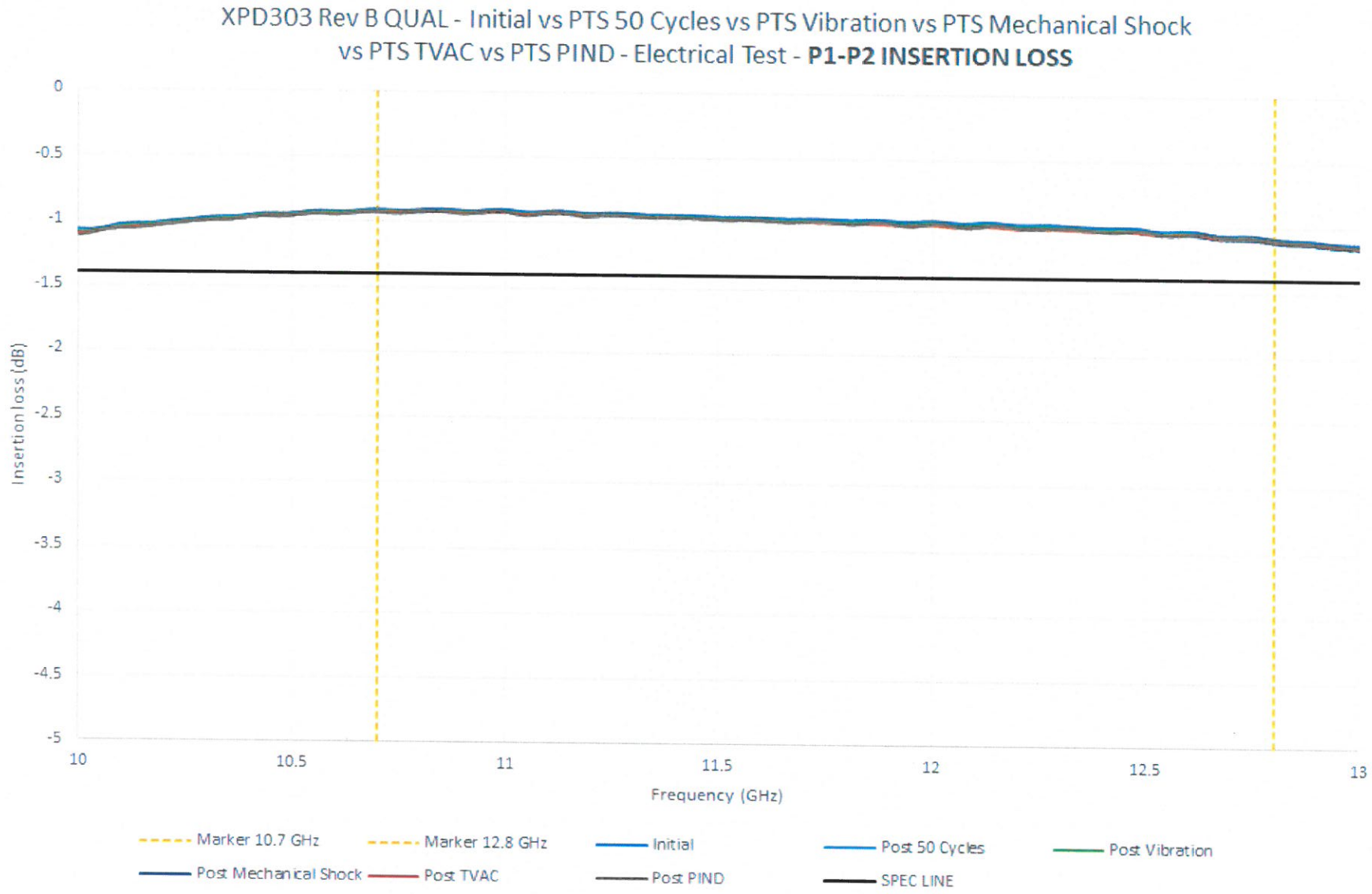


Figure 53: Qualification Test Data – Insertion loss P1-P2

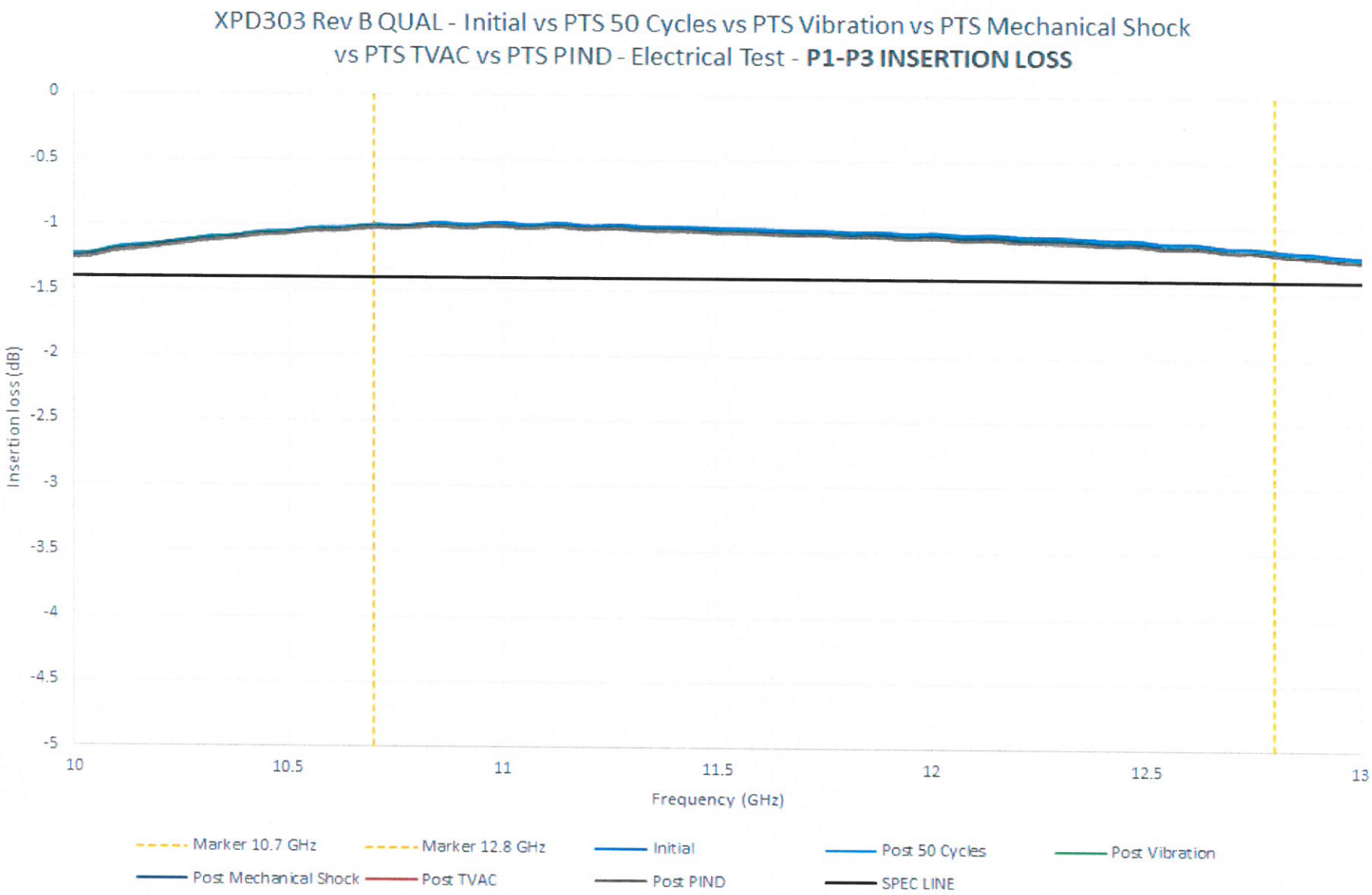


Figure 54: Qualification Test Data – Insertion loss P1-P3

26. Final Electrical Test

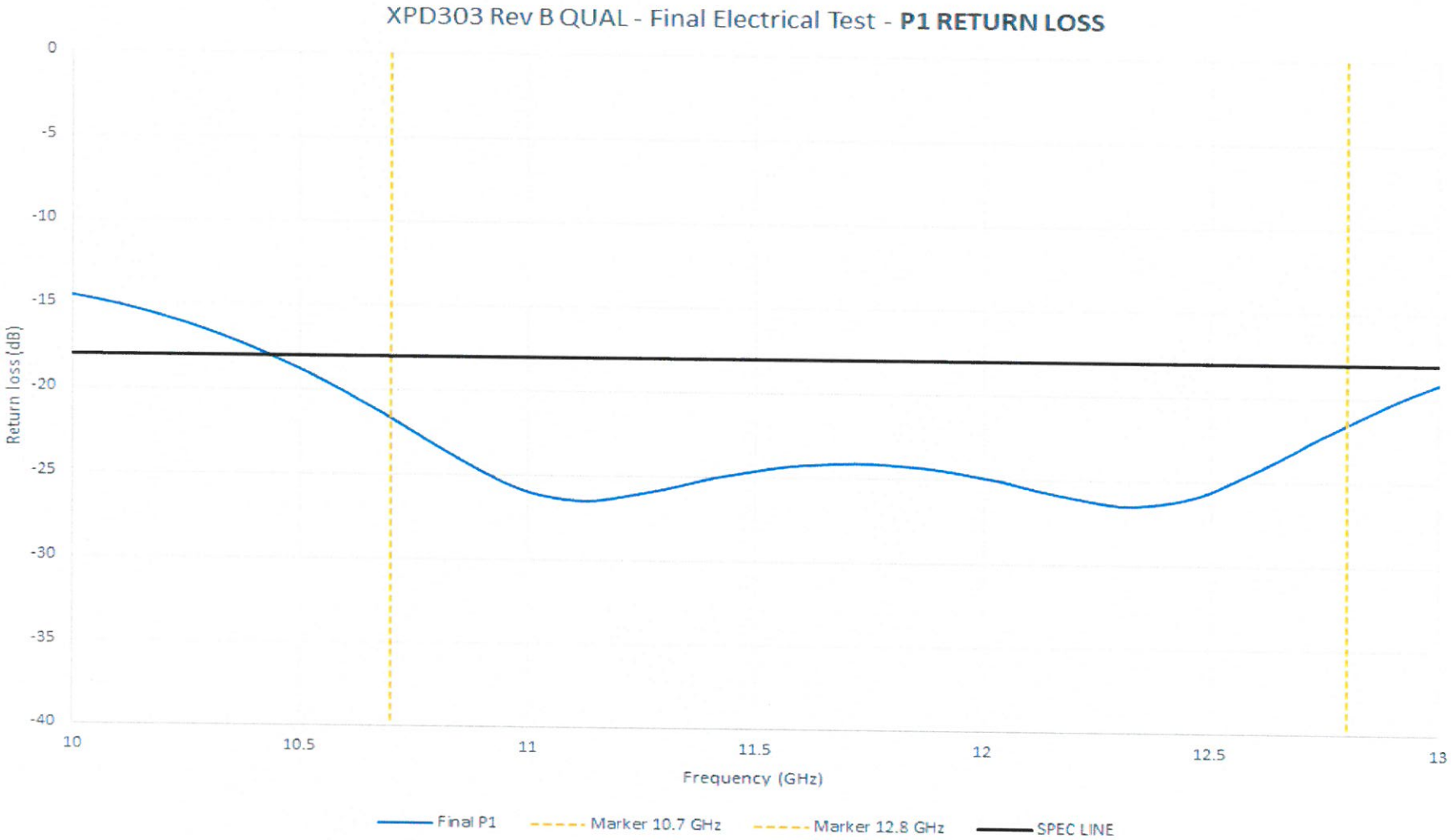


Figure 55: Final Electrical Test – Return loss Port 1

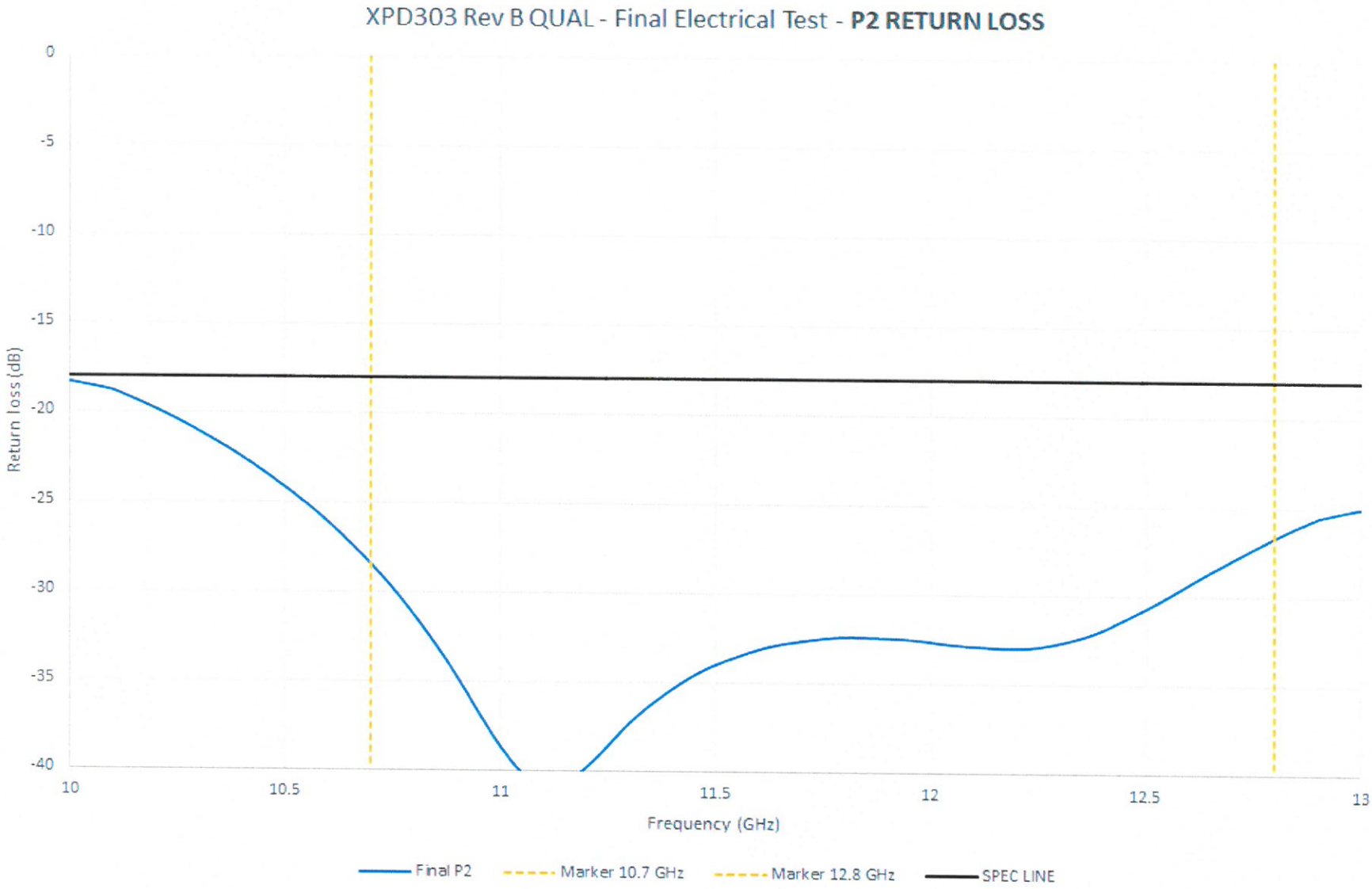


Figure 56: Final Electrical Test – Return loss Port 2

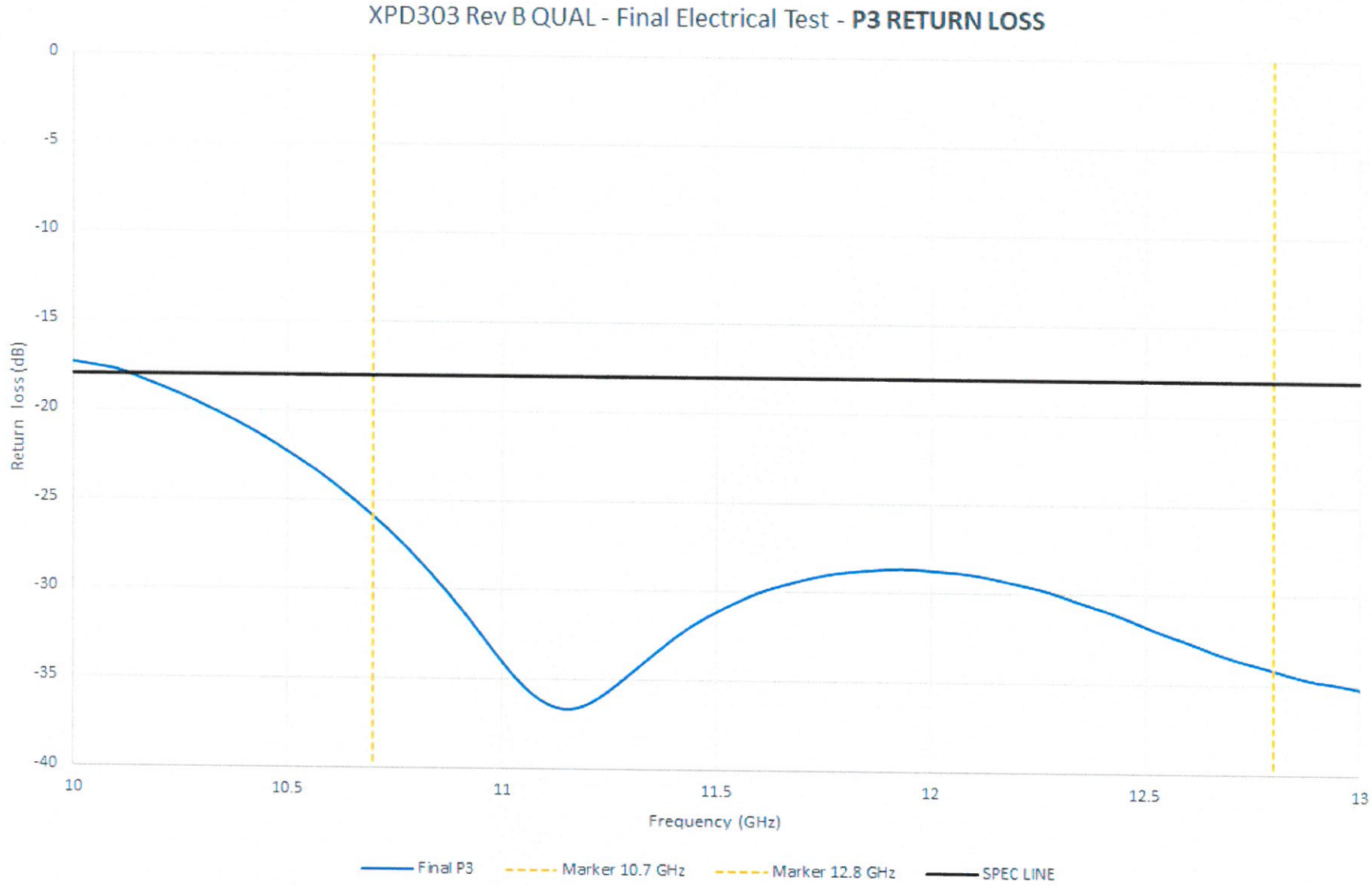


Figure 57: Final Electrical Test – Return loss Port 3

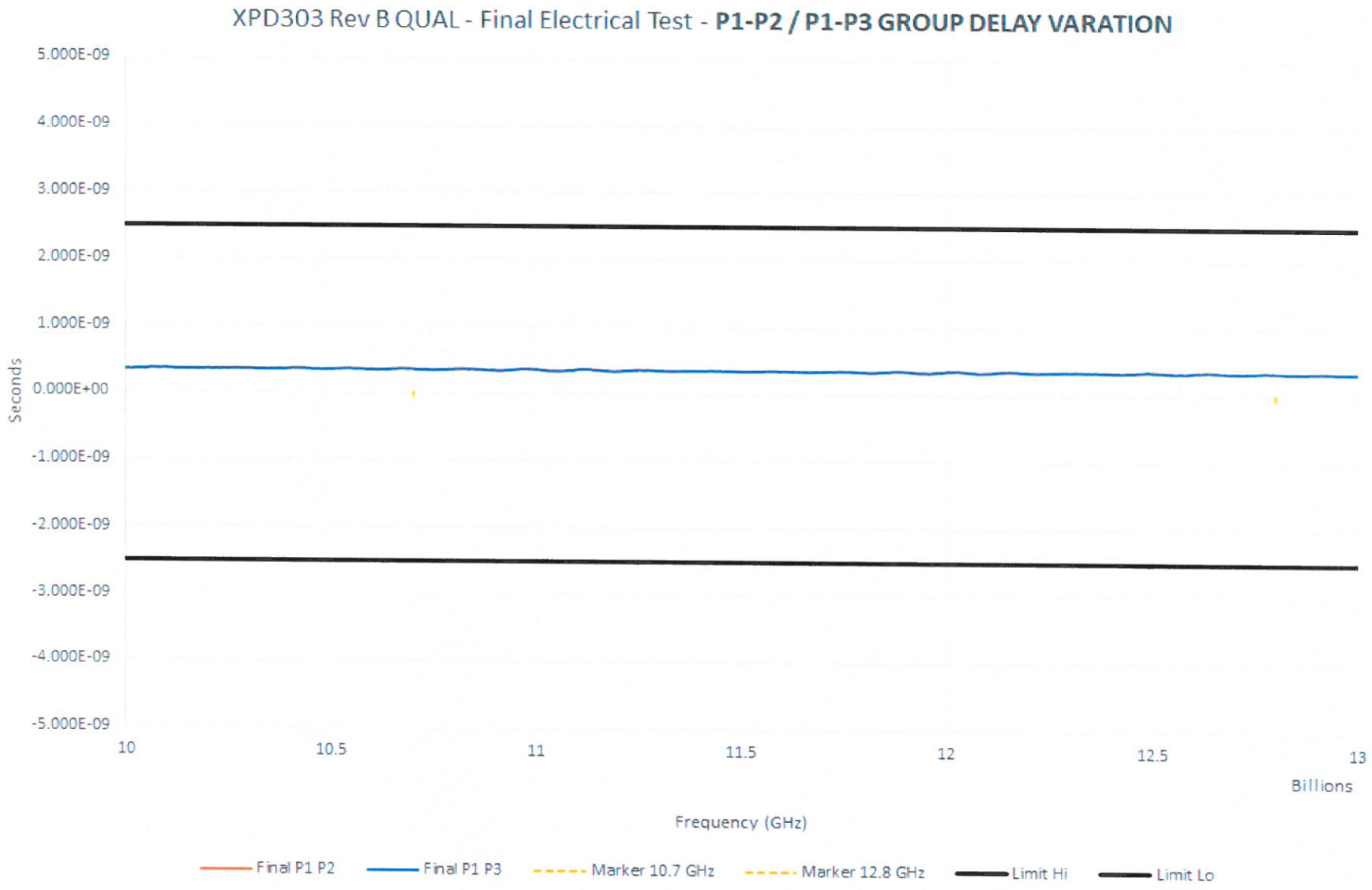


Figure 58: Final Electrical Test – Group delay variation P1-P2 / P1-P3

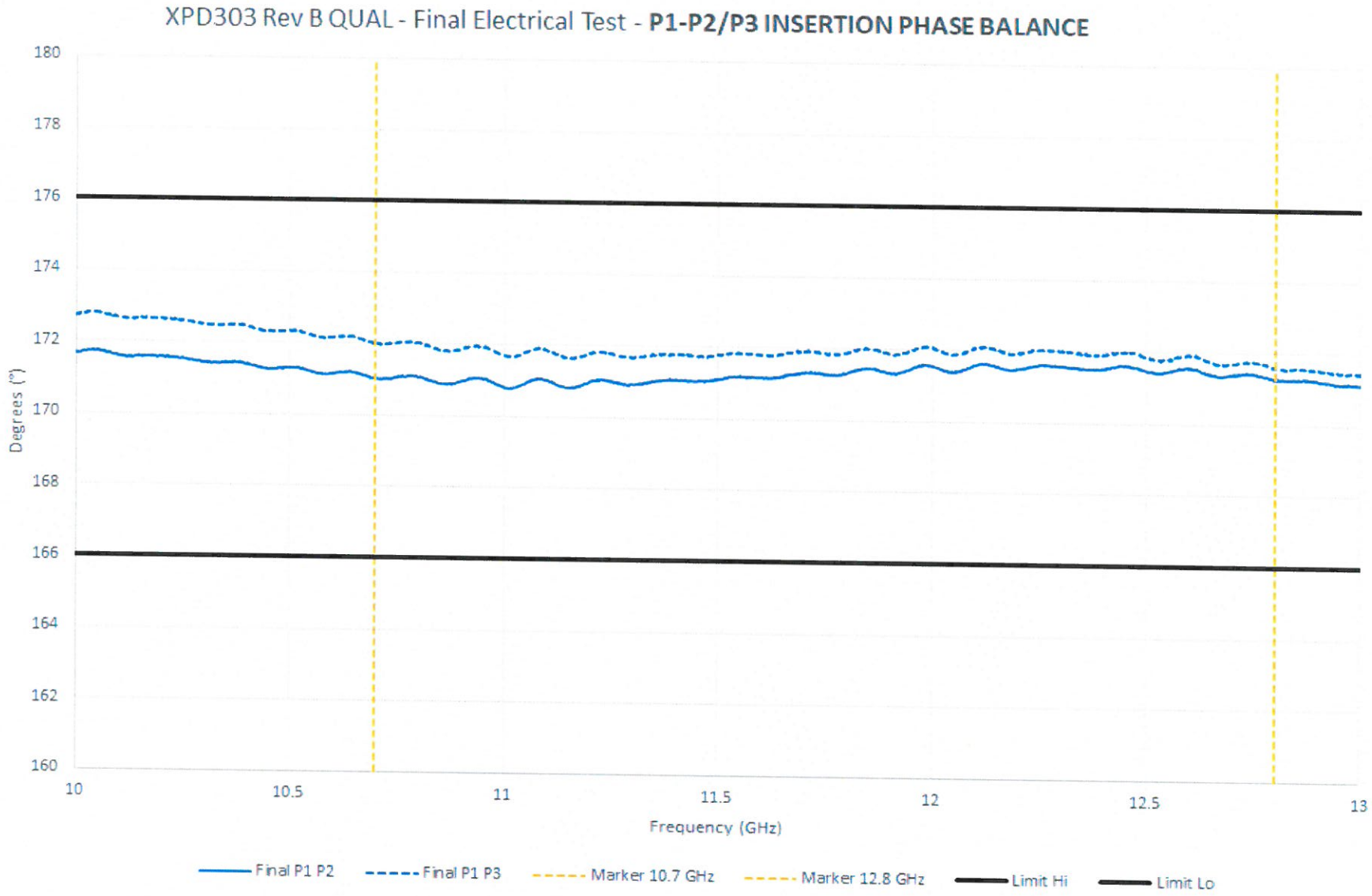


Figure 59: Final Electrical Test – Insertion phase balance P1-P2/P3

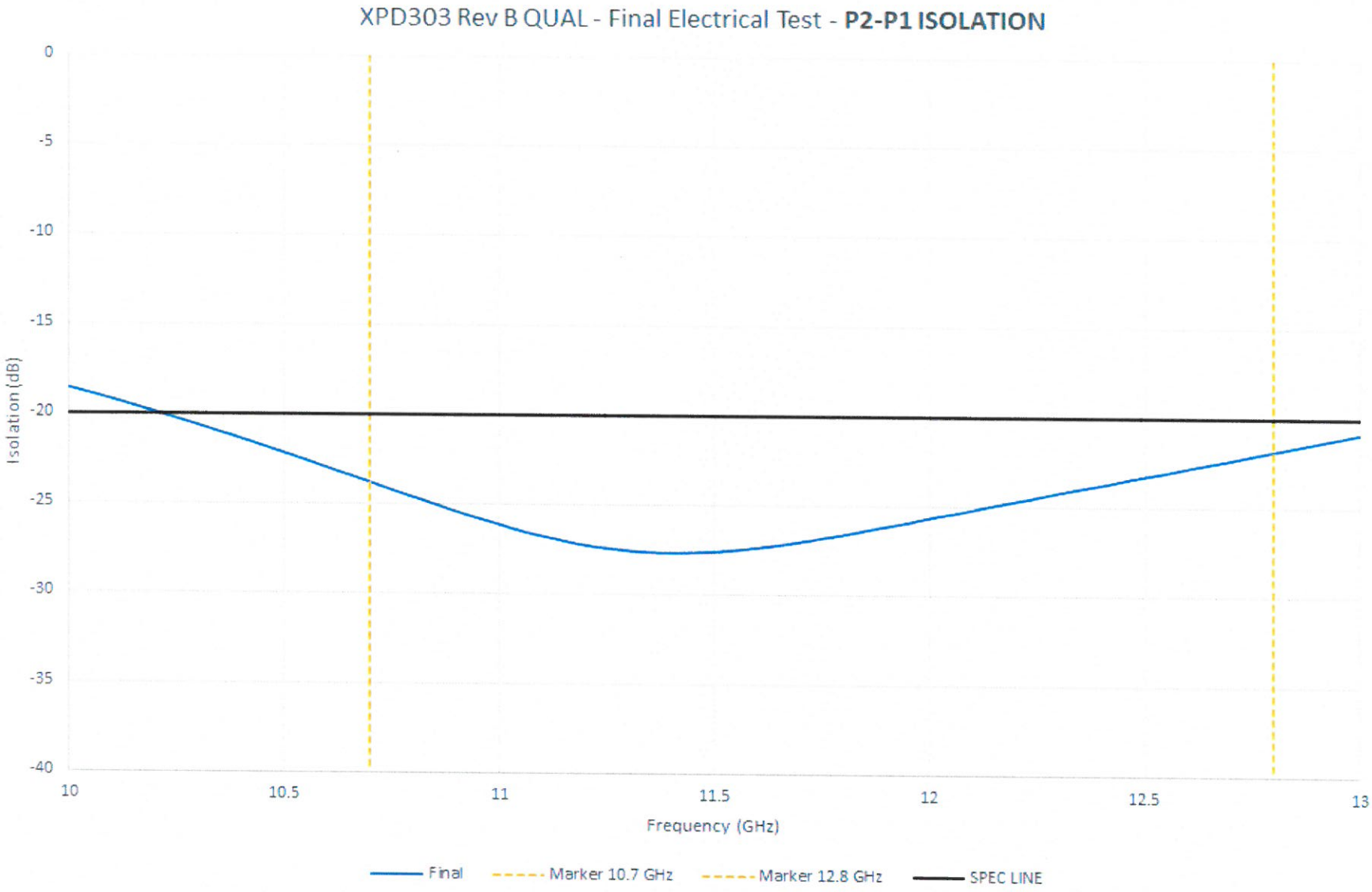


Figure 60: Final Electrical Test – Isolation P2-P1

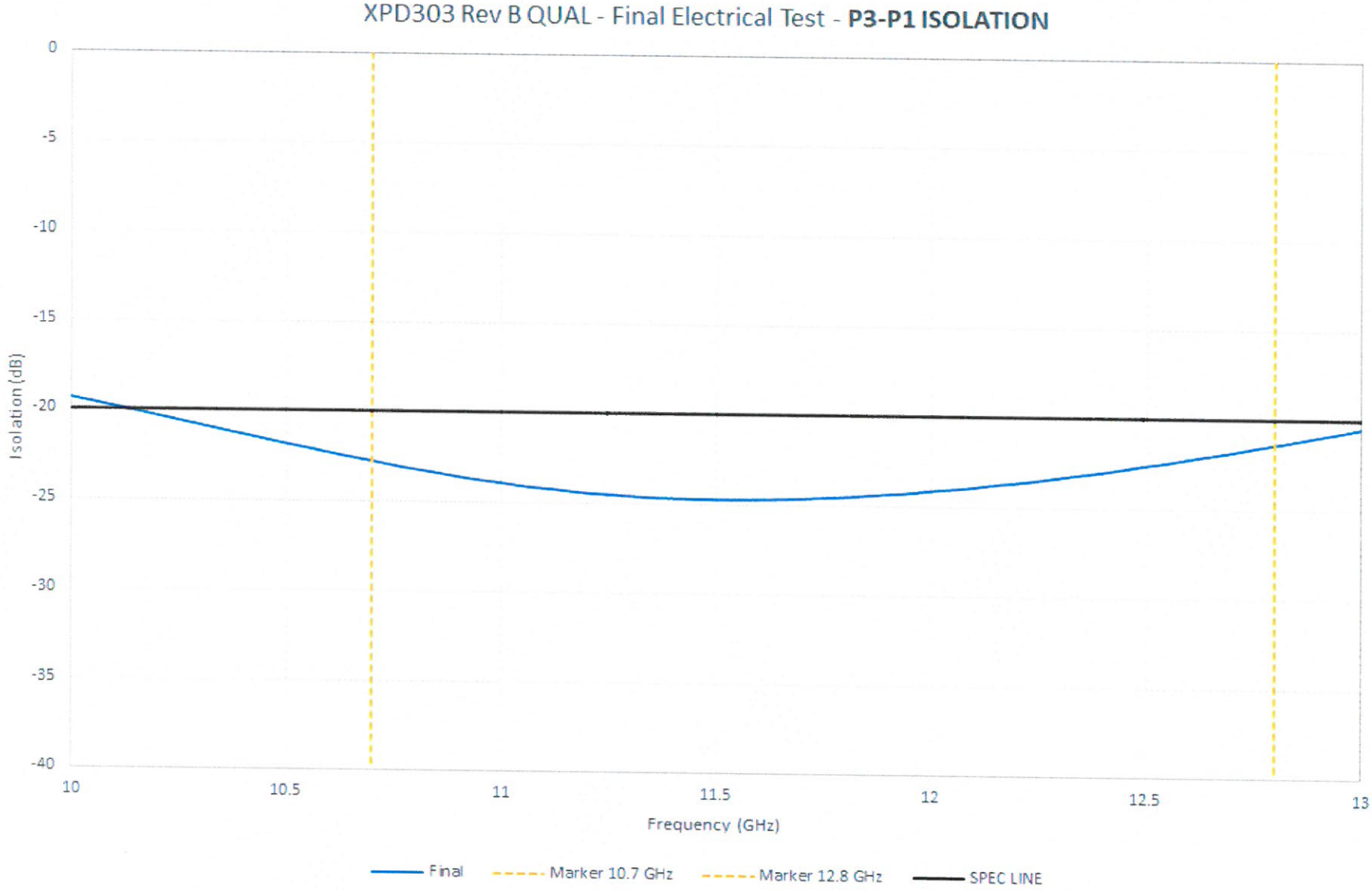


Figure 61: Final Electrical Test – Isolation P3-P1

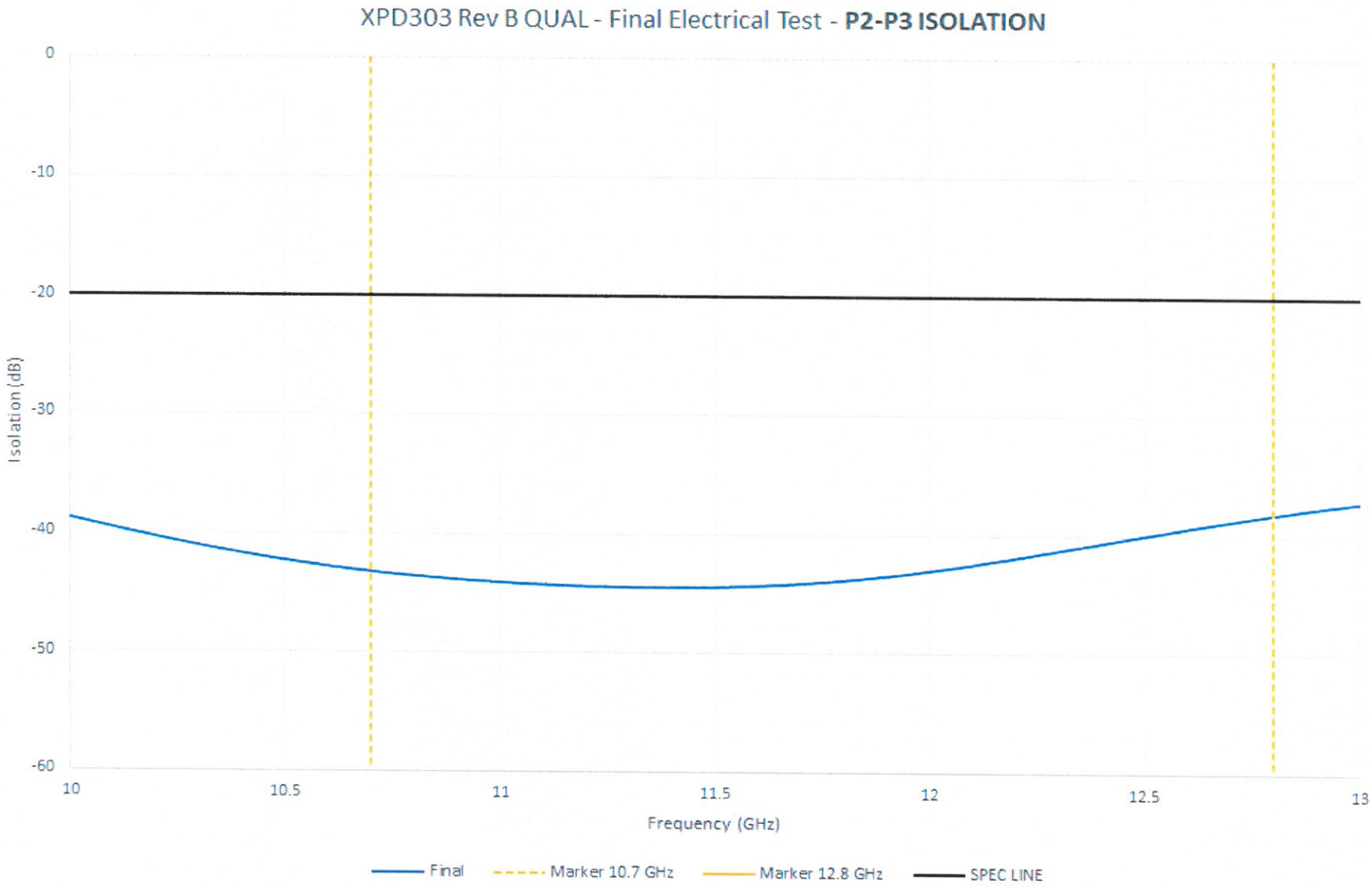


Figure 62: Final Electrical Test – Isolation P2-P3

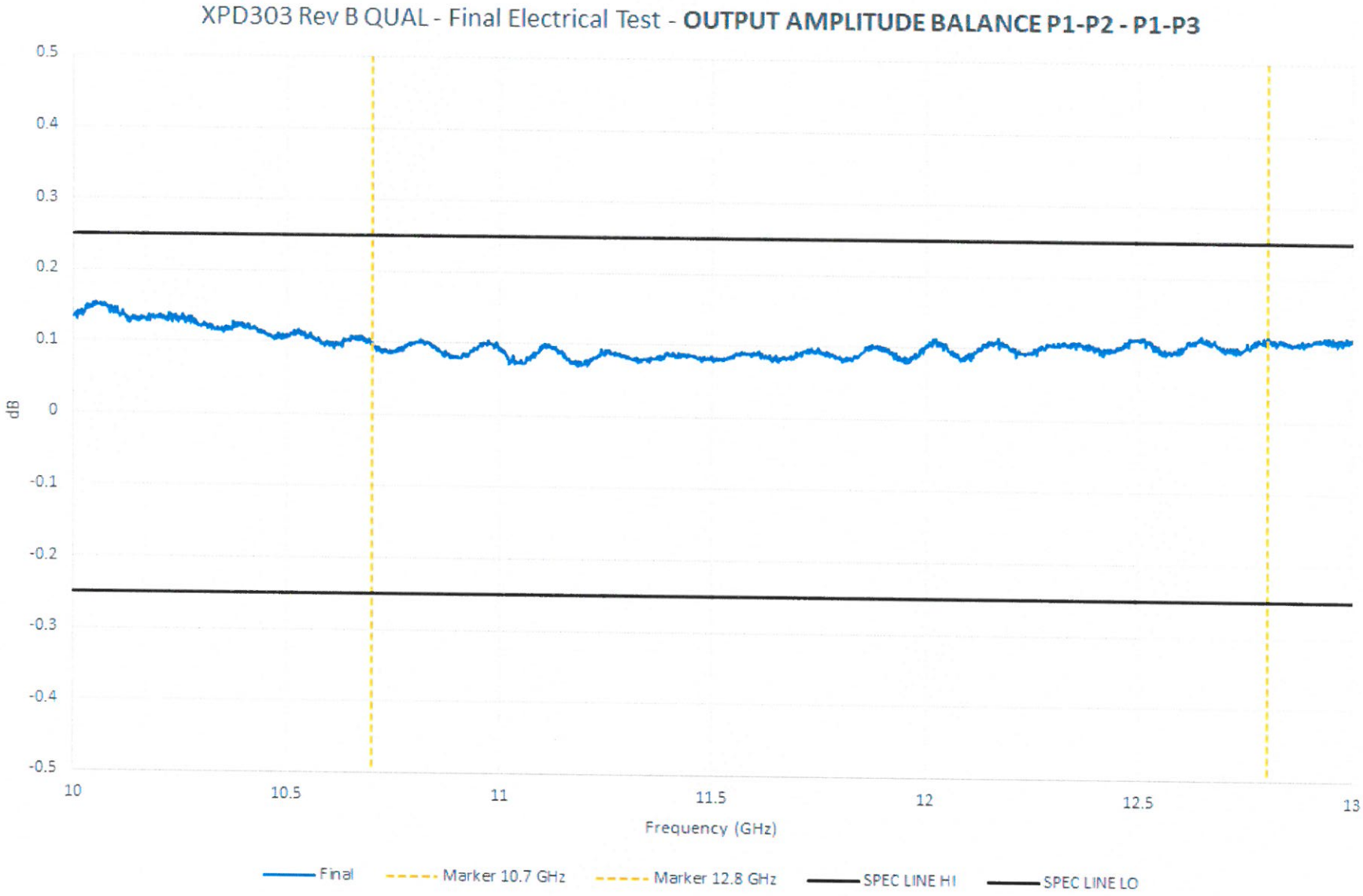


Figure 63: Final Electrical Test – Output amplitude balance P1-P2 / P1-P3

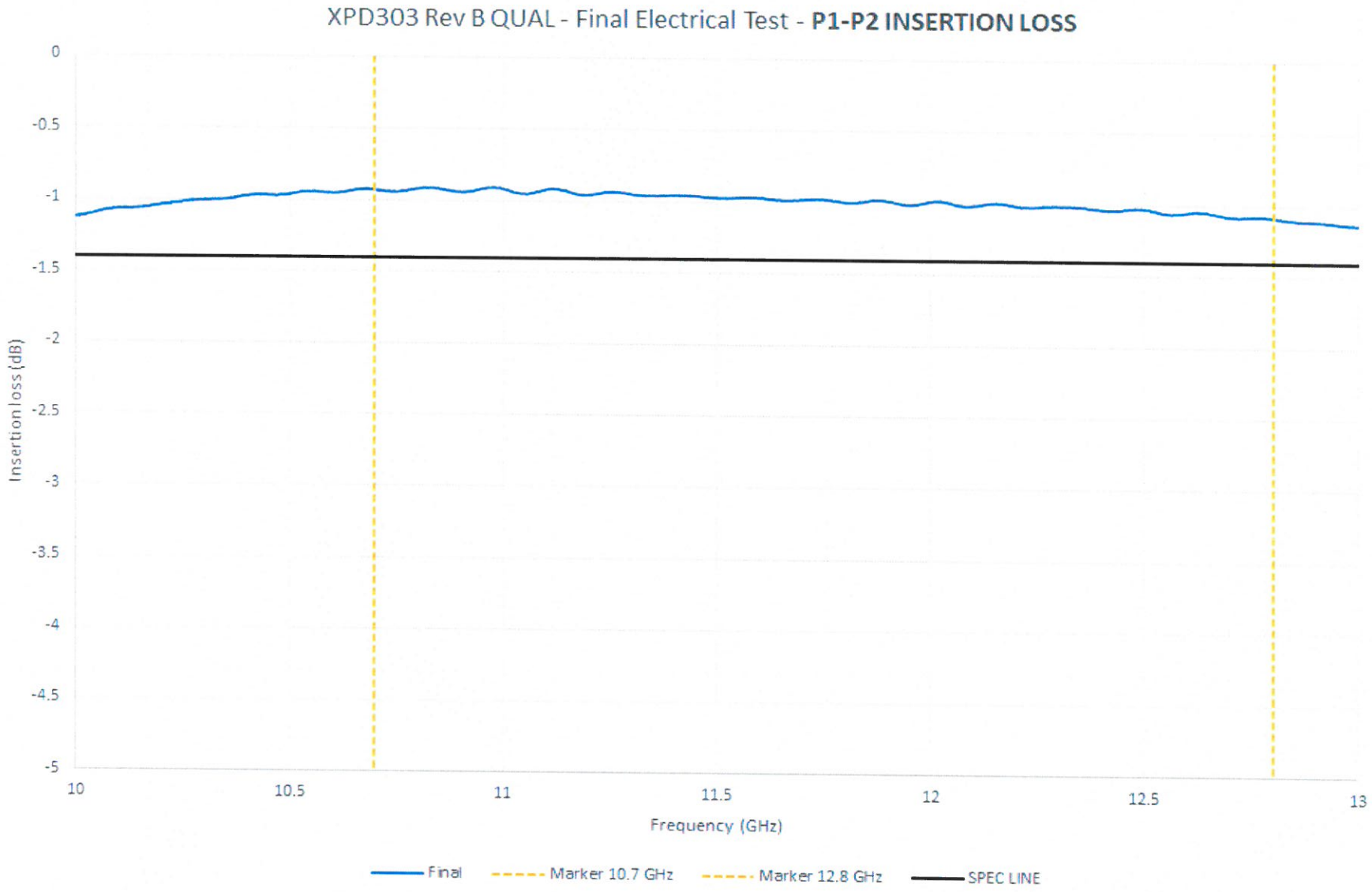


Figure 64: Final Electrical Test – Insertion loss P1-P2

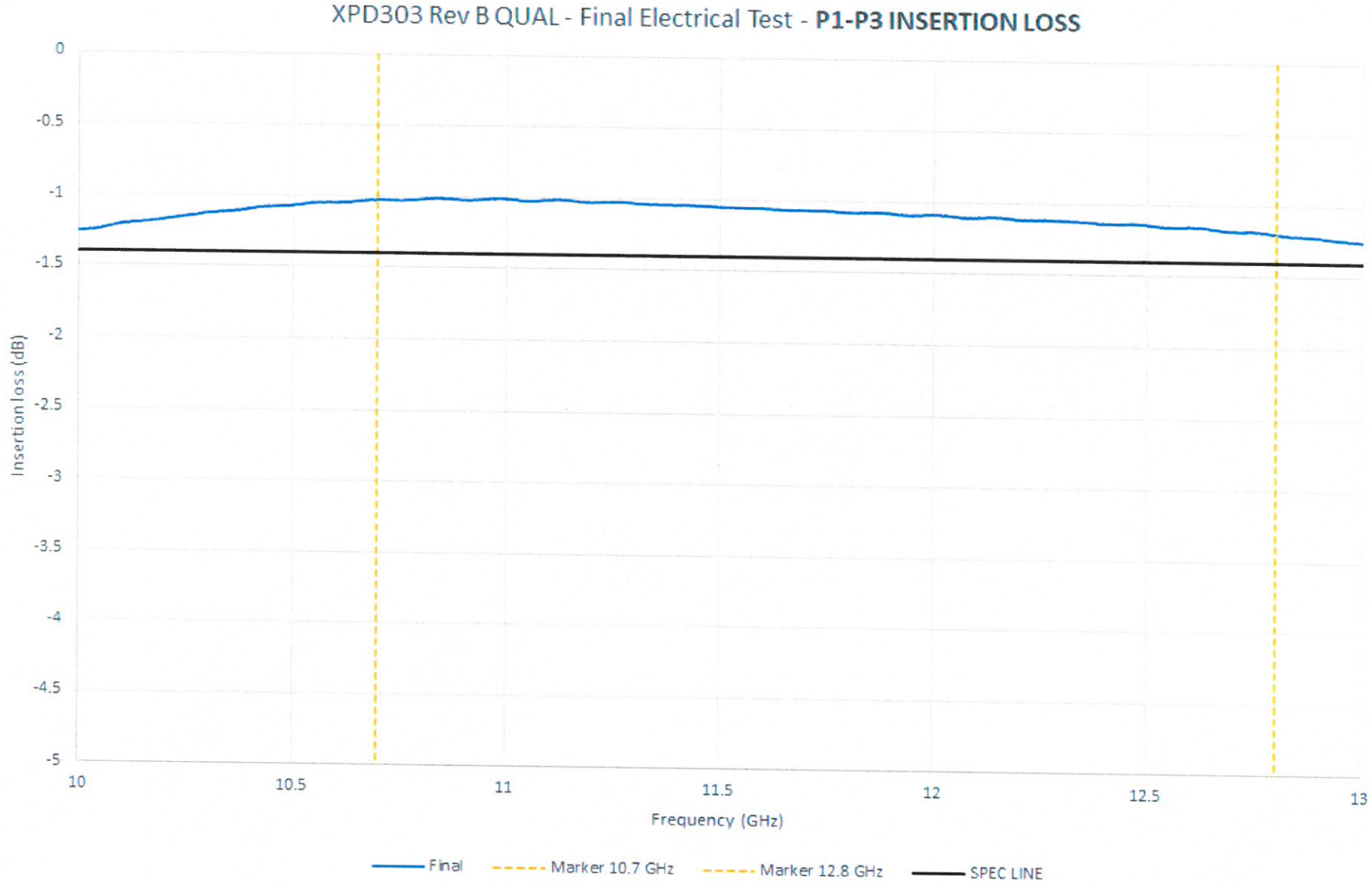


Figure 65: Final Electrical Test – Insertion loss P1-P3

27. Final X-ray

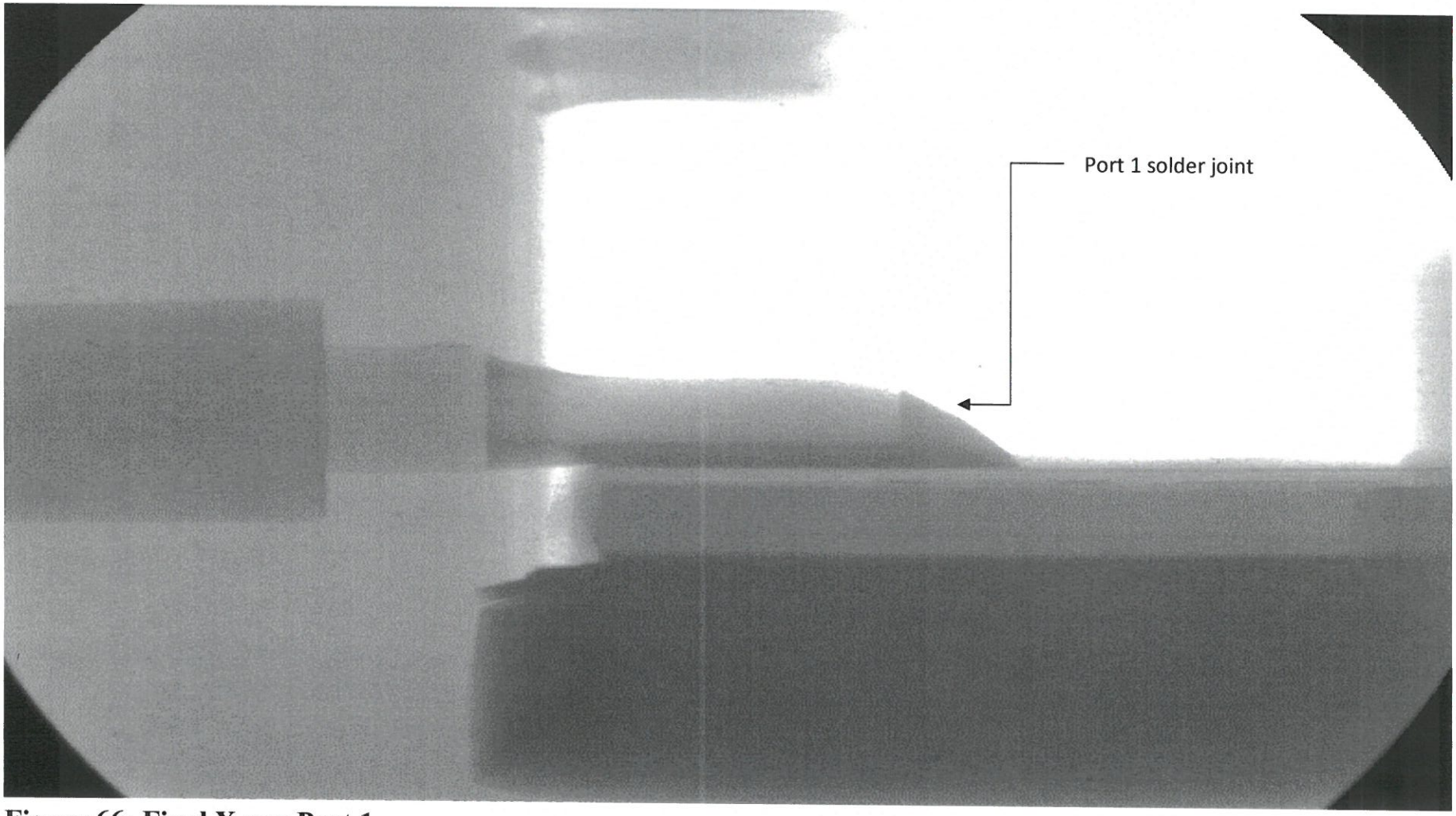


Figure 66: Final X-ray Port 1

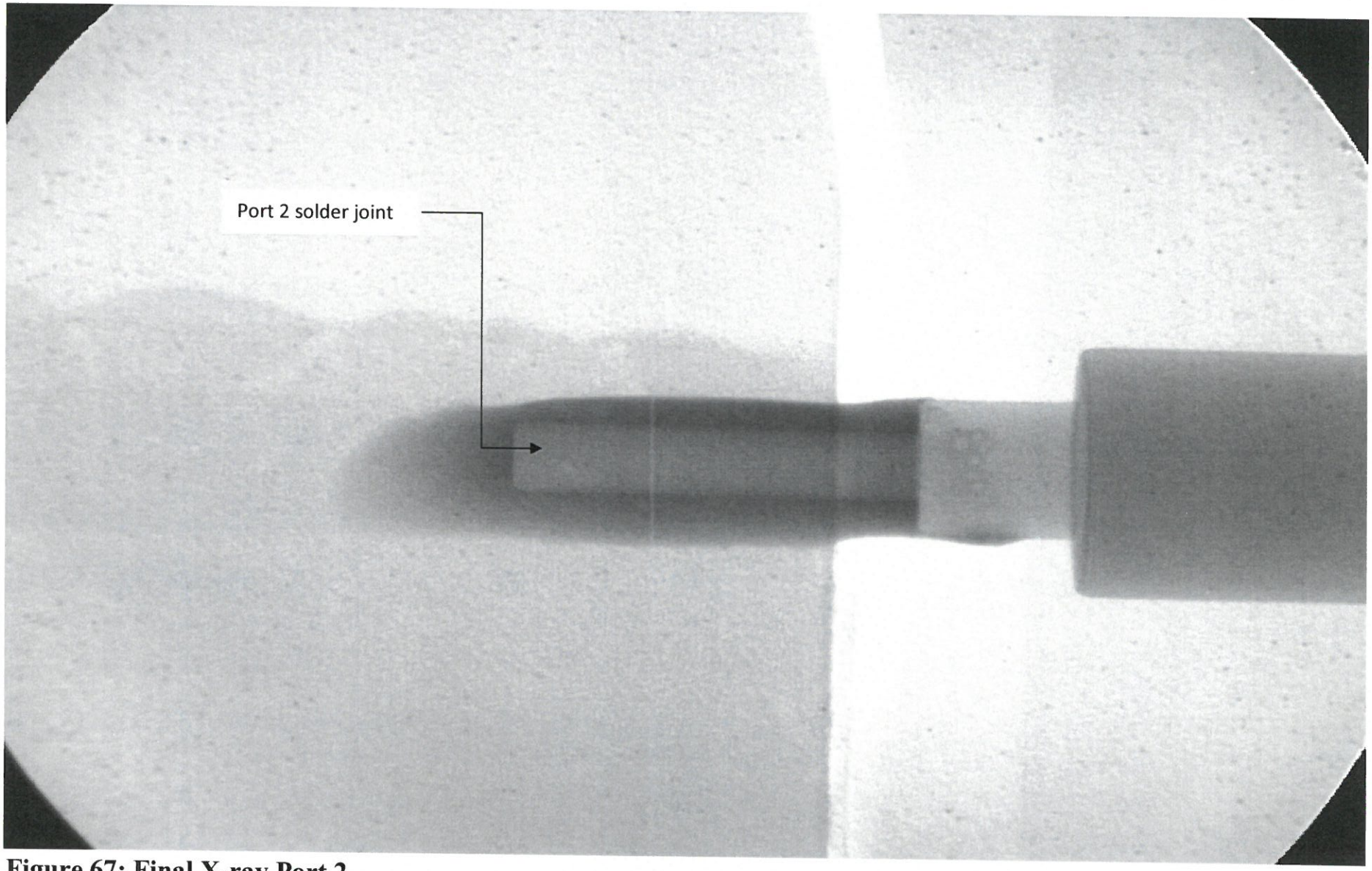


Figure 67: Final X-ray Port 2

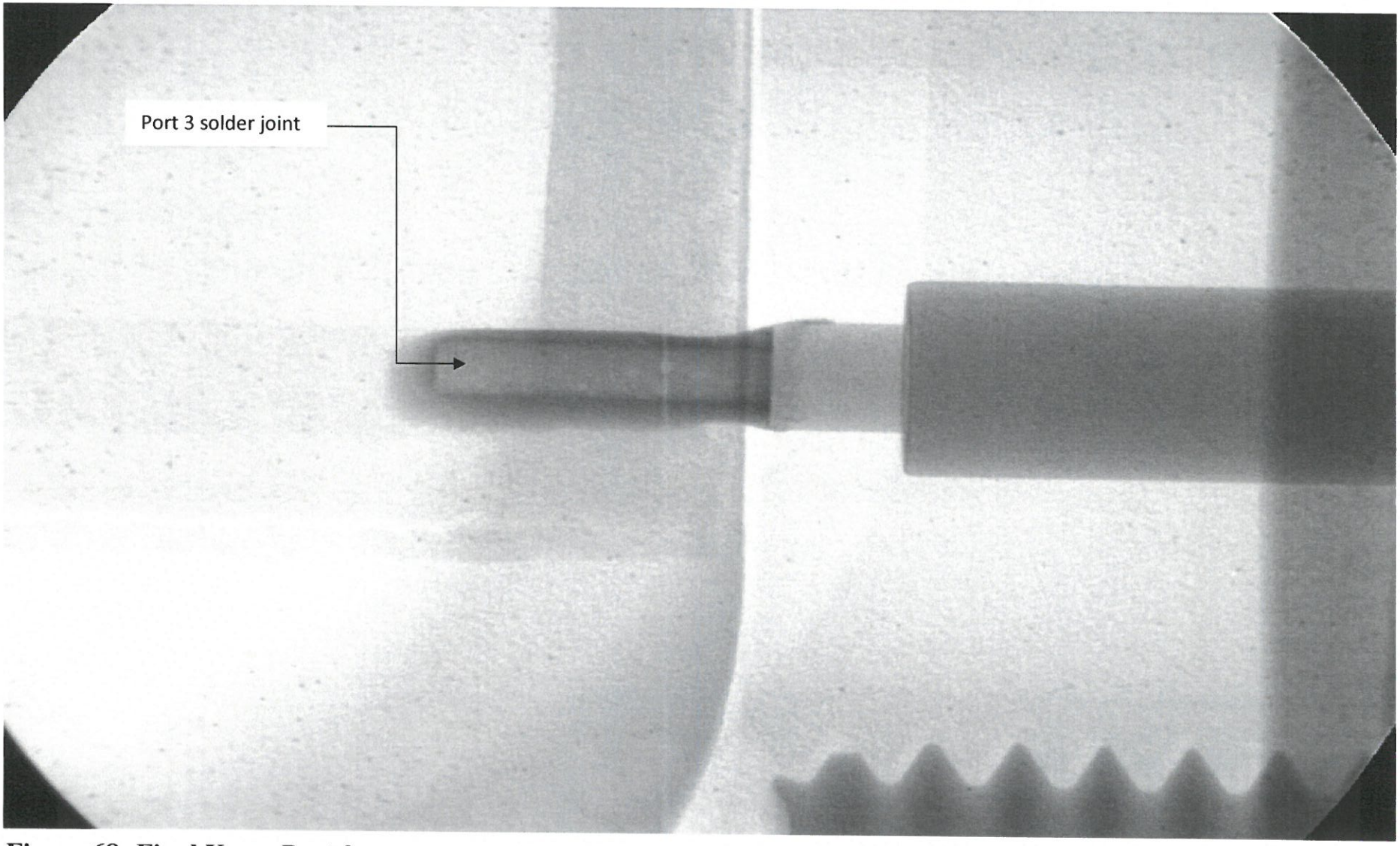


Figure 68: Final X-ray Port 3

28. Conclusion

All qualification testing of XPD303 Iso-splitter (1:2) for Smiths Interconnect was completed successfully with the results summarised throughout this report. There were no concerning electrical parameter drifts observed between initial ambient and final ambient testing and data remained compliant throughout. All testing and inspections were carried out by Smiths Interconnect, Dundee, UK apart from PIND testing, this was completed by ALTER TECHNOLOGY, Seville, Spain. A full PIND test report was supplied and is available on request.