



Test Report Serial Number:	45461684 R1.0
Test Report Date:	30 September 2021
Project Number:	1555

EMC Test Report - New Filing

Applicant:



Sendum Wireless Corporation
4500 Beedie St.
Burnaby, BC
V5J 5L2
Canada

FCC ID:

TS5-EG21G

Product Model Number / HVIN

PT300D

IC Registration Number

6234A-EG21G

Product Name / PMN

PT300D

In Accordance With:

FCC 47 CFR Part 15 Subpart B
 Unintentional Radiators

RSS-Gen, ICES-003
 Information Technology Equipment (Including Digital Apparatus) —
 Limits and Methods of Measurement

Approved By:

Ben Hewson, President
 Celltech Labs Inc.
 21-364 Lougheed Rd.
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 Canada



Test Lab Certificate: 2470.01



**Industry
Canada**

IC Registration 3874A



FCC Registration: CA3874

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1.0 DOCUMENT CONTROL

Revision History					
Samples Tested By:		Art Voss, P.Eng.	Date(s) of Evaluation:		13 Sep - 16 Sep, 2021
Report Prepared By:		Art Voss, P.Eng.	Report Reviewed By:		Ben Hewson
Report Revision	Description of Revision		Revised Section	Revised By	Revision Date
0.1	Draft Release		n/a	Art Voss	16 September 2021
1.0	Revised FCC/IC ID, PMN		n/a	Art Voss	30 September 2021

2.0 CLIENT AND DUT INFORMATION

Client Information	
Applicant Name (FCC)	Sendum Wireless Corporation
Applicant Address (FCC)	4500 Beedie St.
	Burnaby, BC, V5J 5L2
	Canada
Applicant Name (ISED)	Sendum Wireless Corporation
Applicant Address (ISED)	4500 Beedie St.
	Burnaby, BC, V5J 5L2
	Canada
DUT (Host) Information	
Device Identifier(s):	FCC ID: TS5-EG21G
	ISED ID: 6234A-EG21G
Device Type:	Asset Tracking Device
Host Device Model(s) / HVIN:	PT300D
Host Marketing Name / HMN:	PT300D
Host Firmware Version ID Number / FVIN:	-
Test Sample Serial No.:	MP4115092809310, GP331AW000892
Antenna Make and Model:	n/a
Antenna Type and Gain:	n/a
DUT Power Source:	3.2 - 4.2VDC Rechargeable Li-Ion
DUT Dimensions (mm)	L x W x D: 145mm x 52mm x 12mm
Deviation(s) from standard/procedure:	None
Modification of DUT:	None

Integrated Module Information	
Module Manufacturer:	Quectel Wireless Solutions Limited
Device Identifier(s):	FCC ID: XMR201906EG21G
	IC ID: 10224A-201906EG21G
Device Type:	LTE M1, GSM, UMTS Module
Module Device Model(s) / HVIN:	EG21-G
Module Product Marketing Name / PMN:	Quectel EG21-G
Module Firmware Version ID Number / FVIN:	V1.0
Equipment Class (FCC):	PCS Licensed Transmitter
Equipment Class (ISED):*	PCS Mobile (1850-1910 MHz)
	Cellular Telephones Employing New Technologies (824-849 MHz)
	Broadband Radio Service (2500-2690 MHz)
	Mobile Broadband Service (MBS) Equipment (698-756/777-787 MHz)
	Advanced Wireless Services Equipment (1710-1780 MHz and 2110-2180 MHz)
	Cellular Mobile GSM (824-849 MHz)
Transmit Frequency Range:	GSM 850, 900, 1800, 1900
Transmit Frequency Range:	WCDMA Bands 1 thru 9, Band 19
Transmit Frequency Range:	LTE Bands 1 thru 5, 7 thru 14, 17 thru 20, 25, 28, 34, 38 thru 41, 66, 71
Test Channels:	n/a
Manuf. Max. Rated Output Power:	1.849W (Max)

* As Listed on the ISED REL

Integrated Module Information	
Module Manufacturer:	u-blox AG
Device Identifier(s):	FCC ID: XPYANNAB1
	IC ID: 8595A-ANNAB1
Device Type:	Bluetooth Module
Module Device Model(s) / HVIN:	ANNA-B112
Module Product Marketing Name / PMN:	ANNA-B112
Module Firmware Version ID Number / FVIN:	V1.0
Equipment Class (FCC):	Digital Transmission System (DTS)
Equipment Class (ISED):*	Bluetooth Device
Transmit Frequency Range:	2402 - 2480MHz
Test Channels:	n/a
Manuf. Max. Rated Output Power:	0.002W

* As Listed on the ISED REL

Integrated Module Information	
Module Manufacturer:	u-blox AG
Device Identifier(s):	FCC ID: XPYNINAW13
	IC ID: 8595A-NINAW13
Device Type:	WiFi Module
Module Device Model(s) / HVIN:	NINA-W131
Module Product Marketing Name / PMN:	NINA-W131
Module Firmware Version ID Number / FVIN:	V1.0
Equipment Class (FCC):	Digital Transmission System (DTS)
Equipment Class (ISED):*	WLAN
Transmit Frequency Range:	2412 - 2462
Test Channels:	n/a
Manuf. Max. Rated Output Power:	0.0363W**

* As Listed on the ISED REL

** This device is used as a receiver only

3.0 SCOPE

Preface:

This Certification Report was prepared on behalf of:

Sendum Wireless Corporation

, (the 'Applicant'), in accordance with the applicable Federal Communications Commission (FCC) CFR 47 and Innovation, Scientific and Economic Development (ISED) Canada rules parts and regulations (the 'Rules'). The scope of this investigation was limited to only the equipment, devices and accessories (the 'Equipment') supplied by the Applicant. The tests and measurements performed on this Equipment were only those set forth in the applicable Rules and/or the Test and Measurement Standards they reference. The Rules applied and the Test and Measurement Standards used during this evaluation appear in the Normative References section of this report. The limits set forth in the technical requirements of the applicable Rules were applied to the measurement results obtained during this evaluation and, unless otherwise noted, these limits were used as the Pass/Fail criteria. The Pass/Fail statements made in this report apply to only the tests and measurements performed on only the Equipment tested during this evaluation. Where applicable and permissible, information including test and measurement data and/or results from previous evaluations of same or similar equipment, devices and/or accessories may be cited in this report.

Device / Equipment Description:

The PT300D is an asset tracking device used to track assets in transit. The PT300D integrates the follow certified transceiver modules and contains no other transmitters.

WiFi Module (used as receiver ONLY)

FCC ID: **XMR201906EG21G**

IC ID: **10224A-201906EG21G**

Quectel Wireless Solutions Limited

Model/HVIN: EG21-G

LTE Module

FCC ID: **XPYANNAB1**

IC ID: **8595A-ANNAB1**

u-blox AG

Model/HVIN: ANNA-B112

Bluetooth Module

FCC ID: **XPYNINAW13**

IC ID: **8595A-NINAW13**

u-blox AG

Model/HVIN: NINA-W131

The WiFi module is used as a receiver only and does not transmit. The LTE and Bluetooth LE modules are capable of simultaneous transmission.

Certification Requirement:

As per 47CFR Part 2 Subpart J and ISED RSP-100, Certification is required to 47 CFR Part 15 Subpart B, ISED RSS-Gen and ISED ICES-003.

Application:

This is an application for a new certification.

Scope:

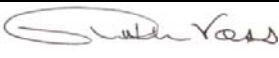
The scope of this investigation is to evaluate this Equipment to the requirements of the standards and procedures identified in this report but only so far as to verify that this Equipment operates within the limits of modular grants. Since simultaneous transmission can occur between the LTE and Bluetooth Modules, intermodulation components will also be investigated. Test result data from the modular approvals may be cited in this report.

4.0 TEST RESULT SUMMARY

TEST SUMMARY						
Section	Description of Test	Procedure Reference	Applicable Rule Part(s) FCC	Applicable Rule Part(s) ISED	Test Date	Result
7.0	Radiated Rx Spurious Emissions	ANSI C63.4-2014	§15.109	ICES-003 (6.2)	15 Sept 2021	Pass
8.0	Conducted Spurious Emissions Intermodulation Products	ANSI C63.4-2014	§15.109	ICES-003 (6.2)	13-15 Sept 2021	Pass
9.0	Powerline Conducted Spurious Emissions	ANSI C63.4-2014	§15.107	ICES-003 (6.1)	15 Sept 2018	Pass

Test Station Day Log					
Date	Ambient Temp (°C)	Relative Humidity (%)	Barometric Pressure (kPa)	Test Station	Tests Performed Section(s)
14 Sept 2021	21.3	16	101.8	EMC	8
15 Sept 2021	20.6	16	101.6	EMC	8
15 Sept 2021	12.0	67	101.6	OATS	7
15 Sept 2021	19.4	19	101.6	LISN	9

- EMC** - EMC Test Bench **SAC** - Semi-Anechoic Chamber
- OATS** - Open Area Test Site **TC** - Temperature Chamber
- LISN** - LISN Test Area **ESD** - ESD Test Bench
- IMM** - Immunity Test Area **RI** - Radiated Immunity Chamber

<p>I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel under my direct supervision. The results of this investigation are based solely on the test sample(s) provided by the client which were not adjusted, modified or altered in any manner whatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance with ISO/IEC 17025.</p>	 <hr/> Art Voss, P.Eng. Technical Manager Celltech Labs Inc. <hr/> 30 September 2021 Date
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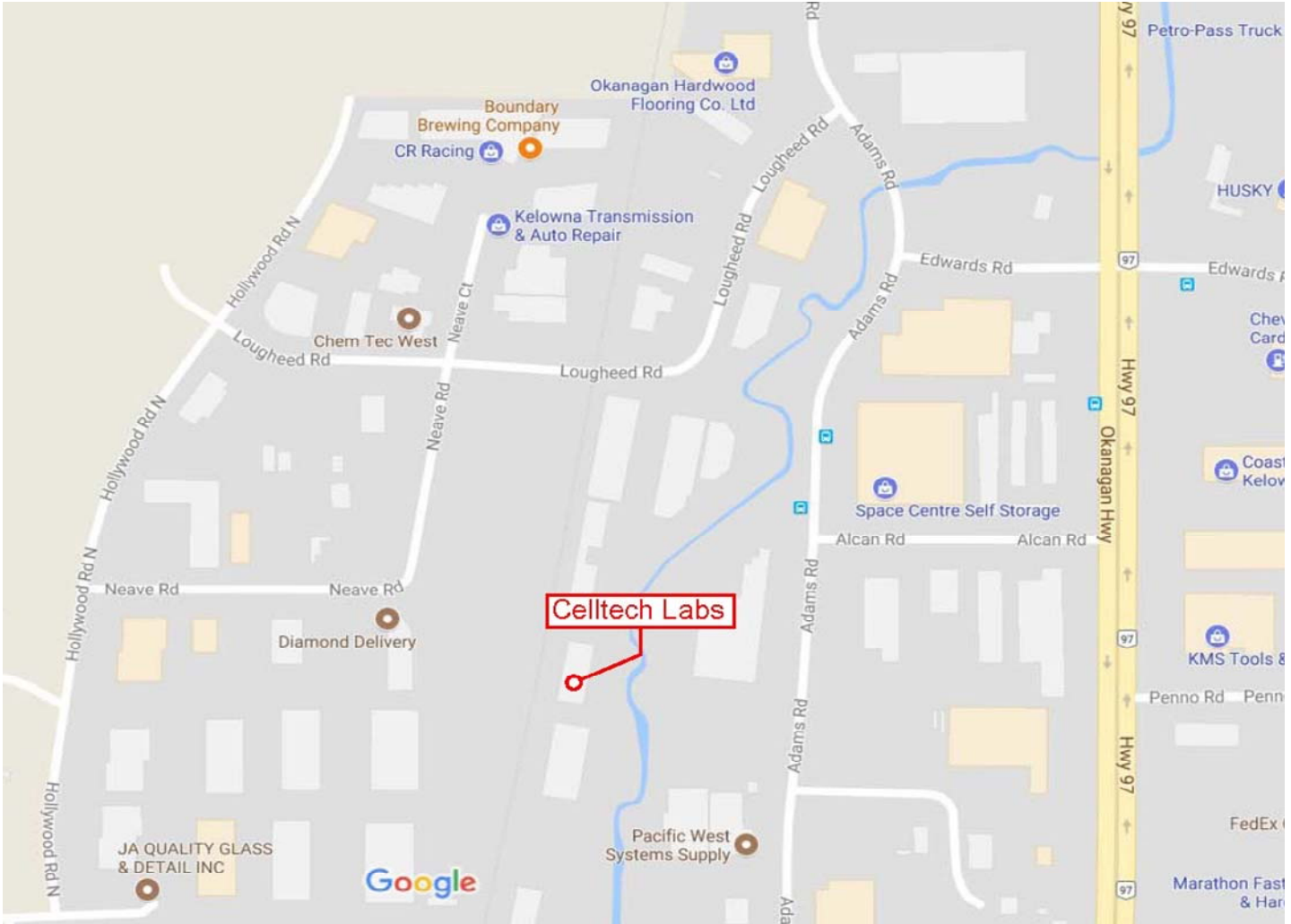
5.0 NORMATIVE REFERENCES

Normative References	
ISO/IEC 17025:2017	General requirements for the competence of testing and calibration laboratories
ANSI C63.4-2014	American National Standard of Procedures for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electric and Electronic Equipment in the Range of 9kHz to 40GHz
CFR	Code of Federal Regulations Title 47: Telecommunication Part 15: Radio Frequency Devices Subpart B: Unintentional Radiators
ISED	Innovation, Science and Economic Development Canada RSS-Gen Issue 5A1: Spectrum Management and Telecommunications Radio Standards Specification March 2019 General Requirements and Information for the Certification of Radiocommunication Equipment
ISED	Innovation, Science and Economic Development Canada Spectrum Management and Telecommunications Radio Standards Specification ICES-003 Issue 6: Information Technology Equipment (Including Digital Apparatus) — Jan 2016 Limits and Methods of Measurement

6.0 FACILITIES AND ACCREDITATIONS

Facility and Accreditation:

The facilities used to evaluate this device outlined in this report are located at 21-364 Lougheed Road, Kelowna, British Columbia, Canada V1X 7R8. The radiated emissions site (OATS) conforms to the requirements set forth in ANSI C63.4 and is filed and listed with the FCC under Test Firm Registration Number CA3874 and Innovation, Science and Economic Development Canada under Test Site File Number ISED 3874A. Celltech is accredited to ISO 17025, through accrediting body A2LA and with certificate 2470.01.



7.0 RADIATED RX EMISSIONS

Test Procedure

Normative Reference	FCC 47 CFR §15.109, ICES-003(6.2) ANSI C63.4-2014
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Limits

47 CFR §15.109	(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:	
	30-88MHz: 39.1dBuV/m	30-88MHz: 49.6dBuV/m @ 3m
	88-216MHz: 43.5dBuV/m	88-216MHz: 54.0dBuV/m @ 3m
	216-960MHz: 46.4dBuV/m	216-960MHz: 56.9dBuV/m @ 3m
	> 960MHz: 49.5dBuV/m	> 960MHz: 60.0dBuV/m @ 3m
ICES-003(6.2.1)	6.2.1 - Radiated Emissions Limits Below 1 GHz	
	Class A: ITE that meets the conditions for Class A operation defined in Section 2.2 shall comply with the Class A radiated limits set out in Table 4 determined at a distance of 10 metres.	
	30-88MHz: 39.1dBuV/m	30-88MHz: 49.6dBuV/m @ 3m
	88-216MHz: 43.5dBuV/m	88-216MHz: 54.0dBuV/m @ 3m
	216-960MHz: 46.4dBuV/m	216-960MHz: 56.9dBuV/m @ 3m
	> 960MHz: 49.5dBuV/m	> 960MHz: 60.0dBuV/m @ 3m

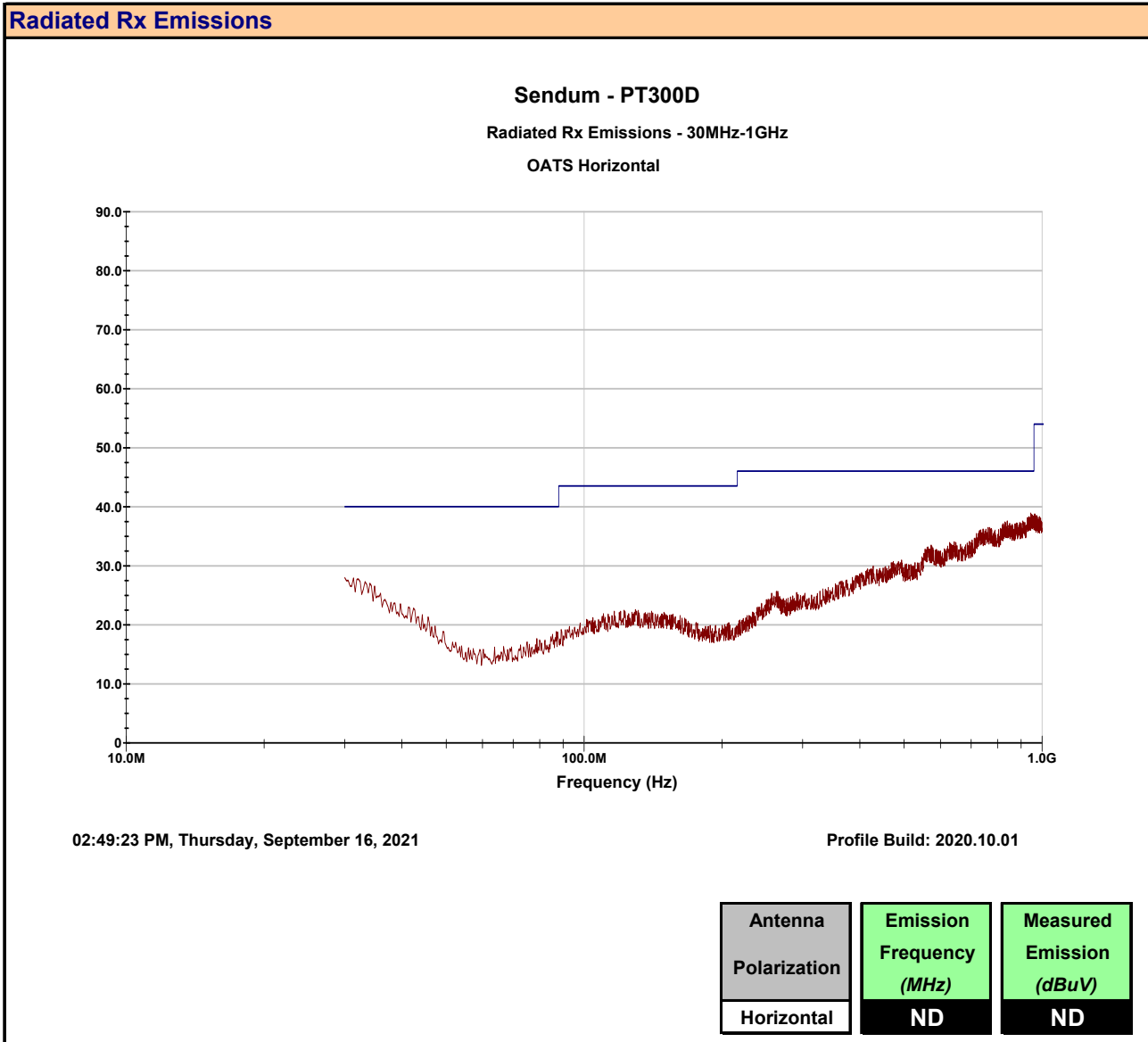
Test Setup

Appendix A **Figure A.1**

Measurement Procedure

The DUT was set up as per ANSI C63.4:2014. Emissions were scanned between 30MHz and 1000MHz. The turntable was rotated 360 degrees and the antenna was elevated to 4m to optimize the measured emissions.

Plot 7.1 – Radiated Emissions, Horizontal



Plot 7.2 – Radiated Emissions, Vertical

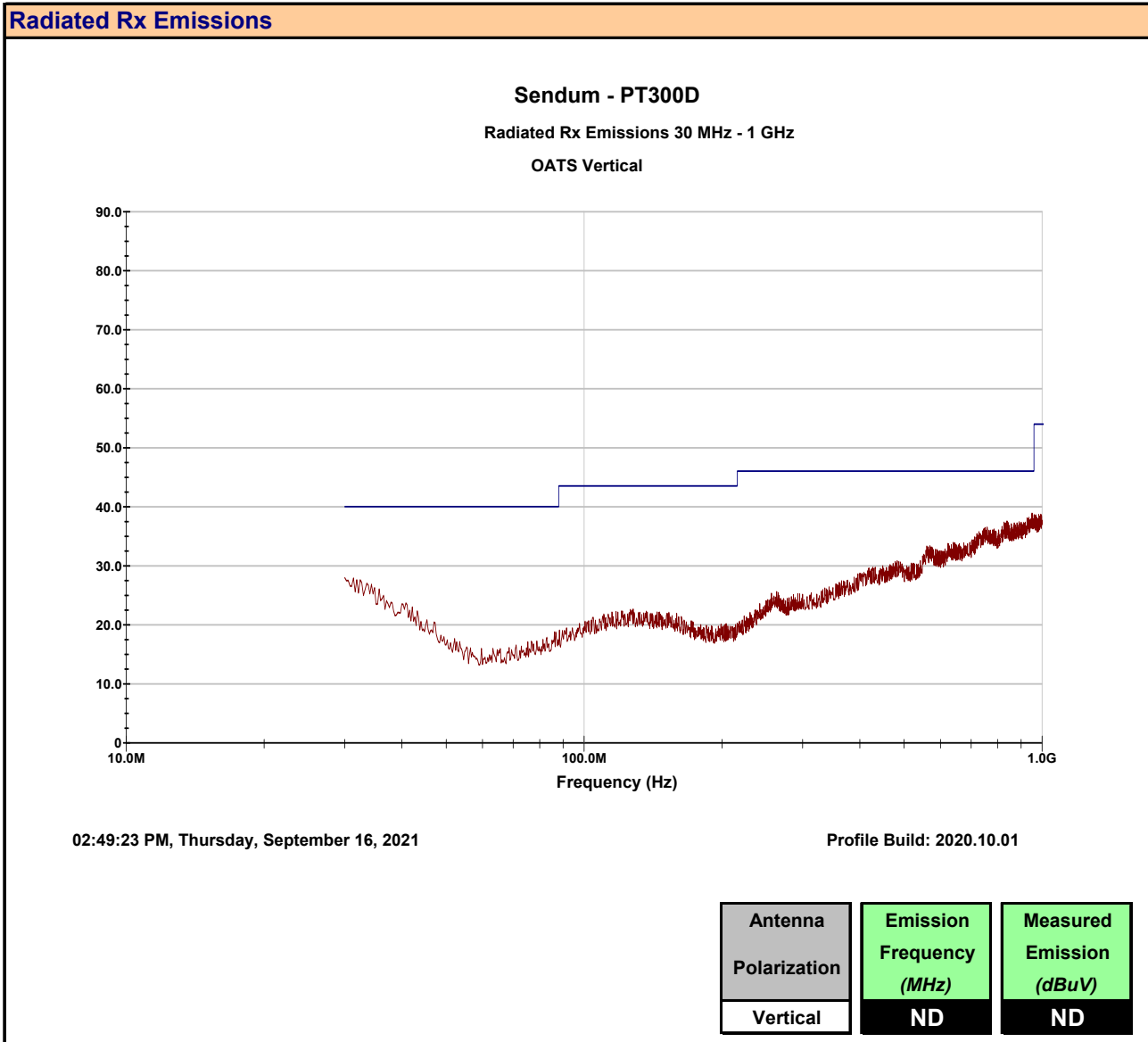


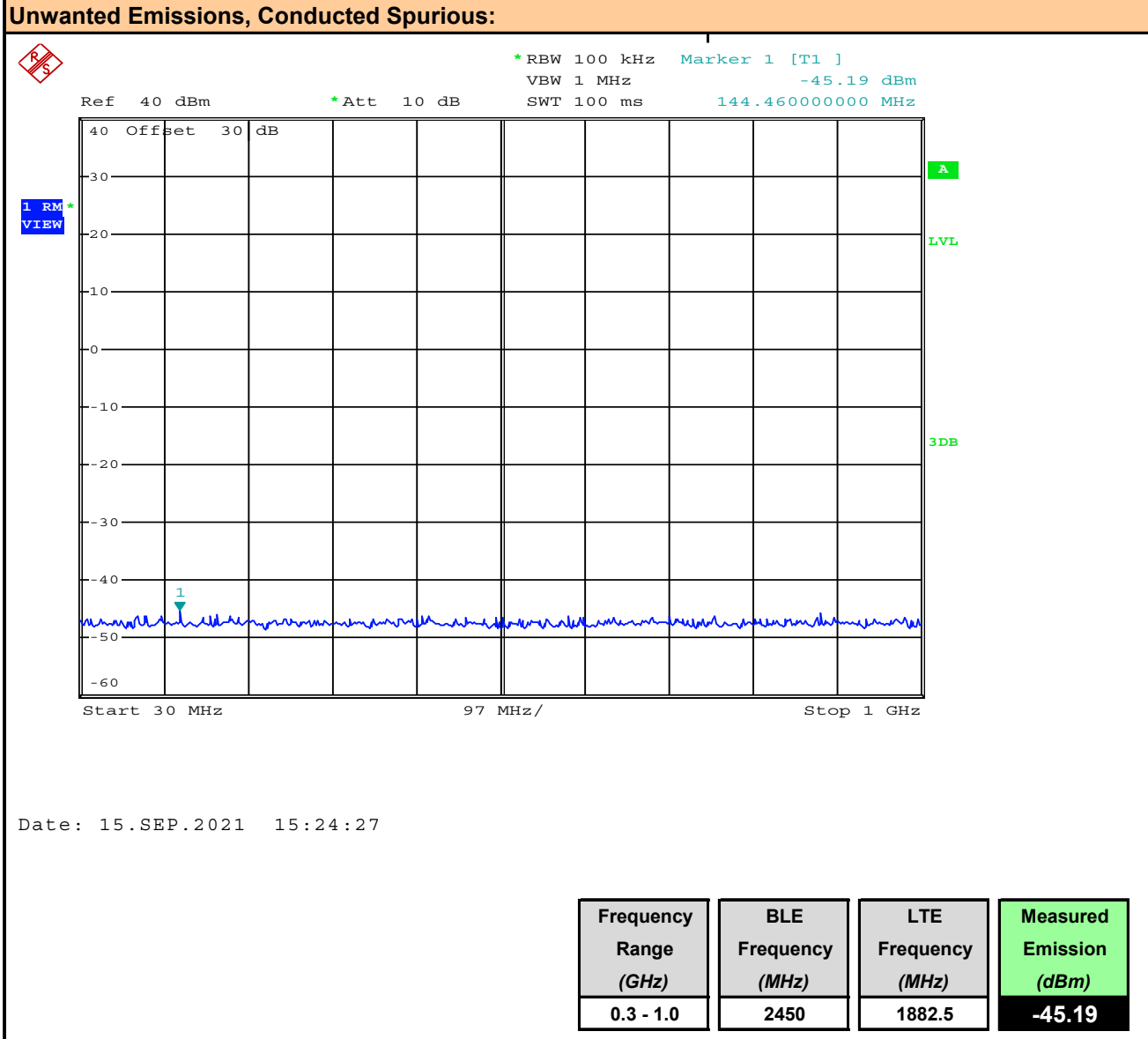
Table 7.1 – Summary of Radiated Rx Emissions Measurements (RMS)

Measurement Results				
Frequency Range	Antenna Polarization	Measured Emission [E_{Meas}] (dBm)	Limit e.r.p./e.r.i.p. [A_L] (dBuV/m)	Margin (dB)
30-1000MHz	Horizontal	ND	60.0	n/a
30-1000MHz	Vertical	ND	60.0	n/a
Results:			Complies	

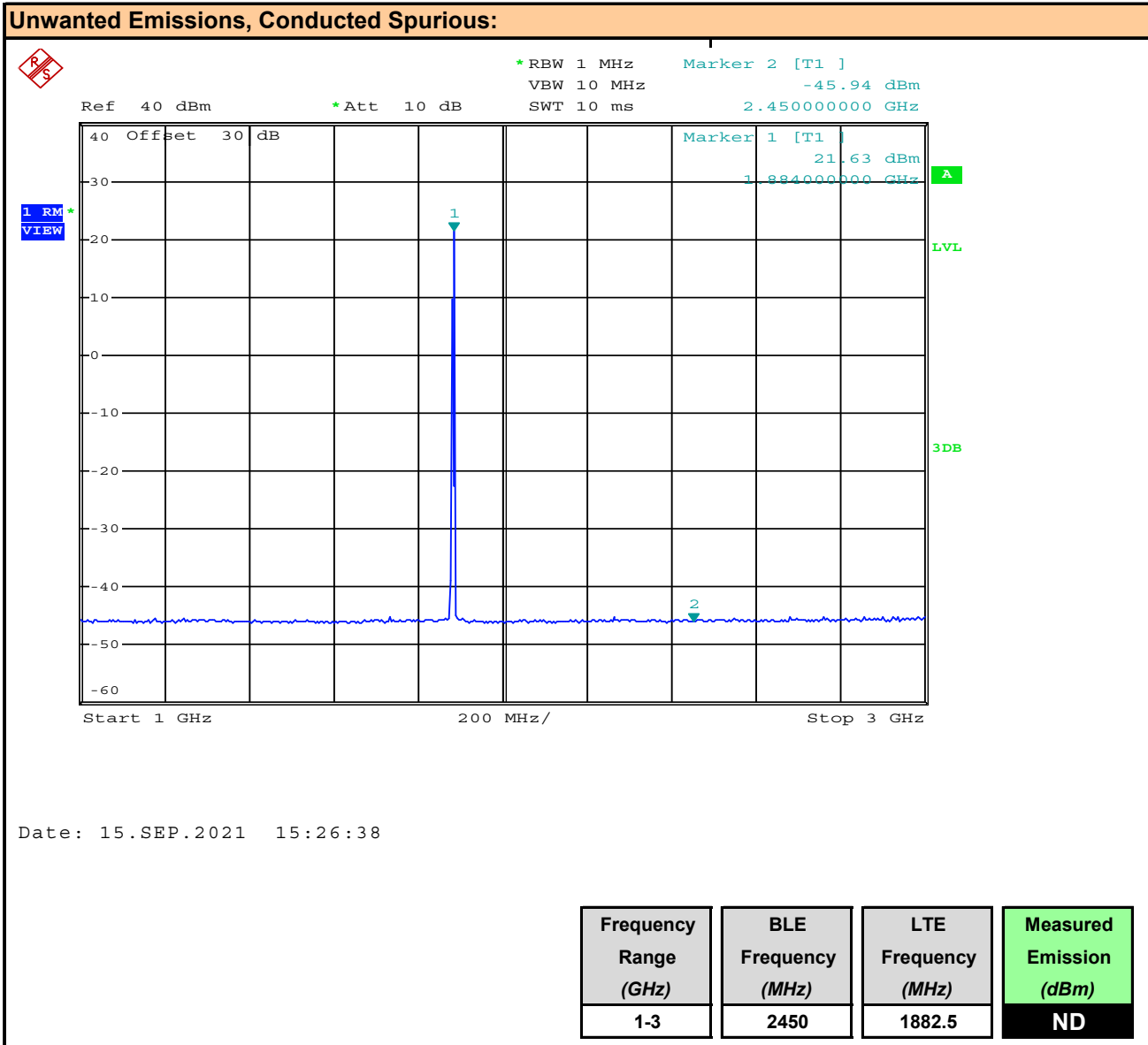
ND: No emissions detected above ambient or within 20dB of the limit

8.0 SIMULTANEOUS TRANSMISSION EVALUATION

Plot 8.1 – Intermodulation Response, BLE + LTE B25, 30 – 1000MHz

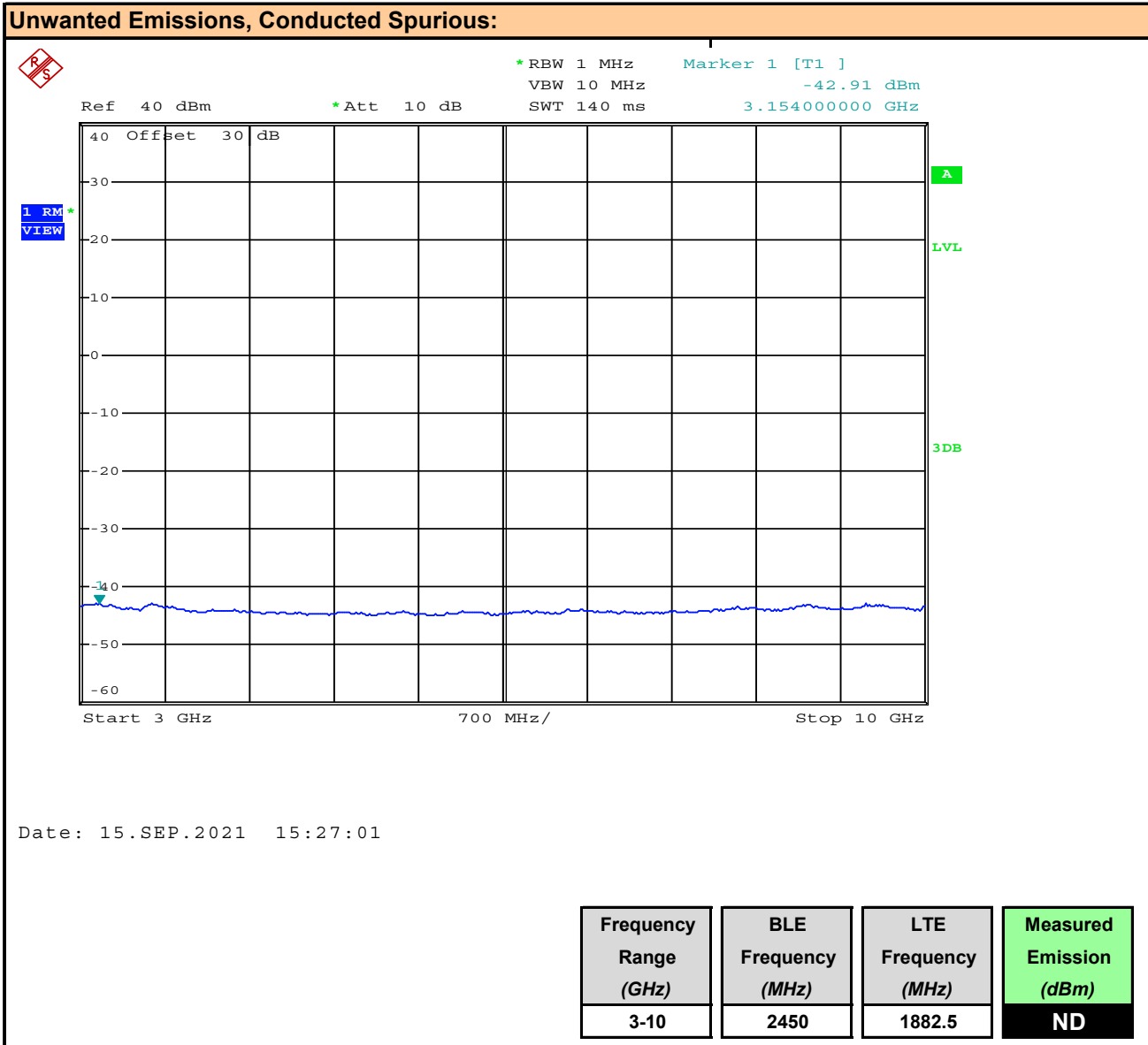


Plot 8.2 – Intermodulation Response, BLE + LTE B25, 1 – 3GHz

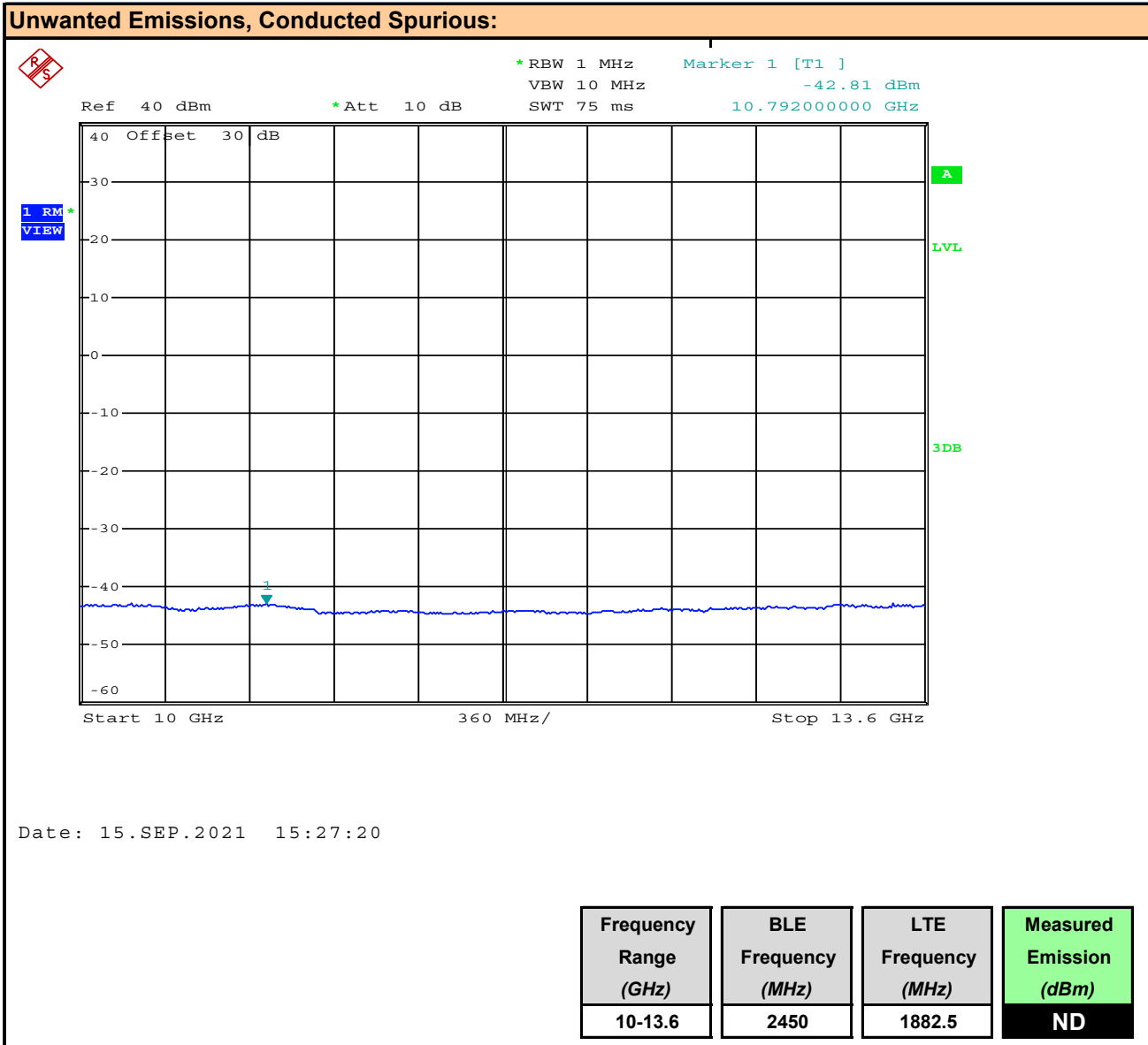


Date: 15.SEP.2021 15:26:38

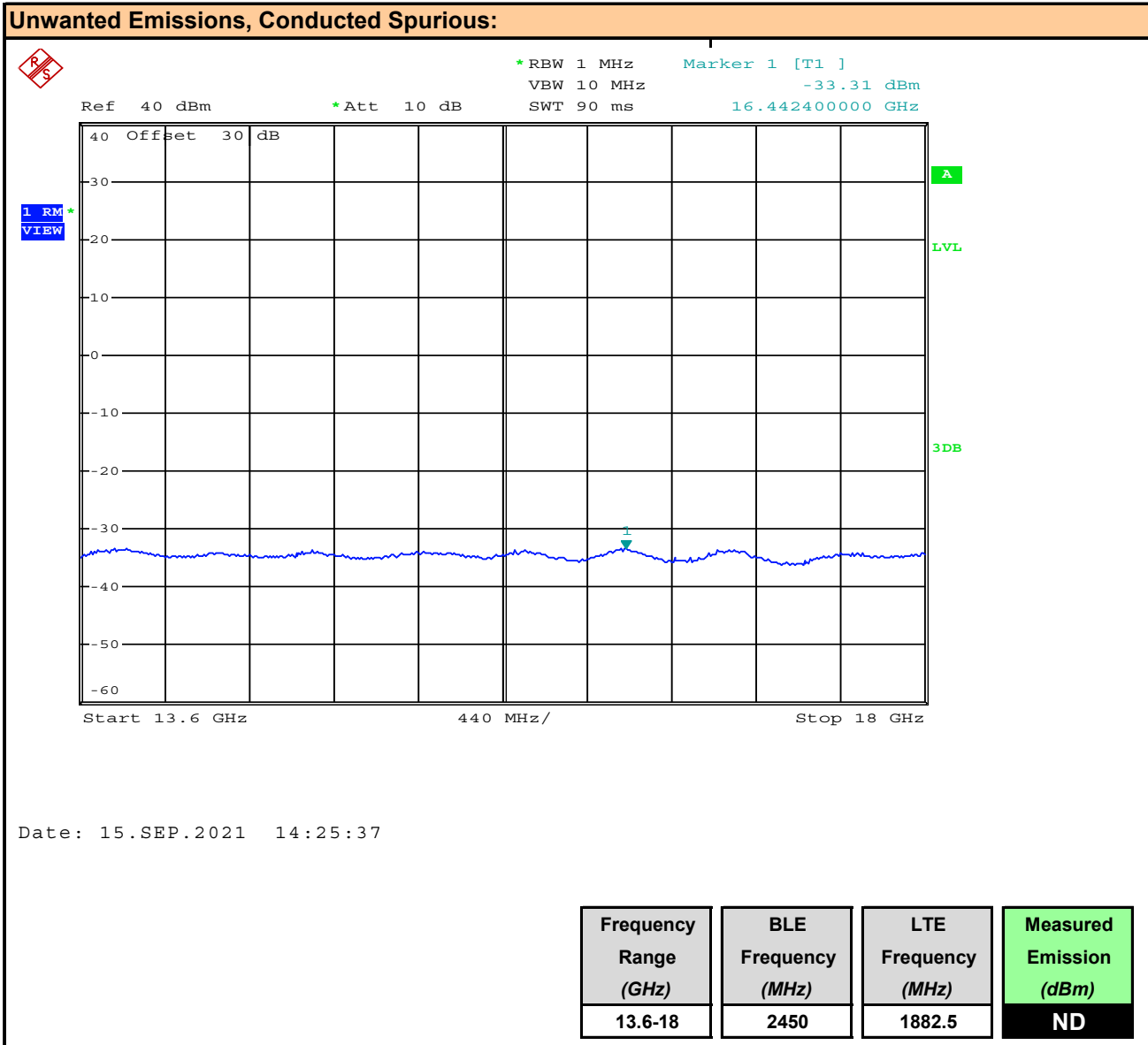
Plot 8.3 – Intermodulation Response, BLE + LTE B25, 3 - 10GHz



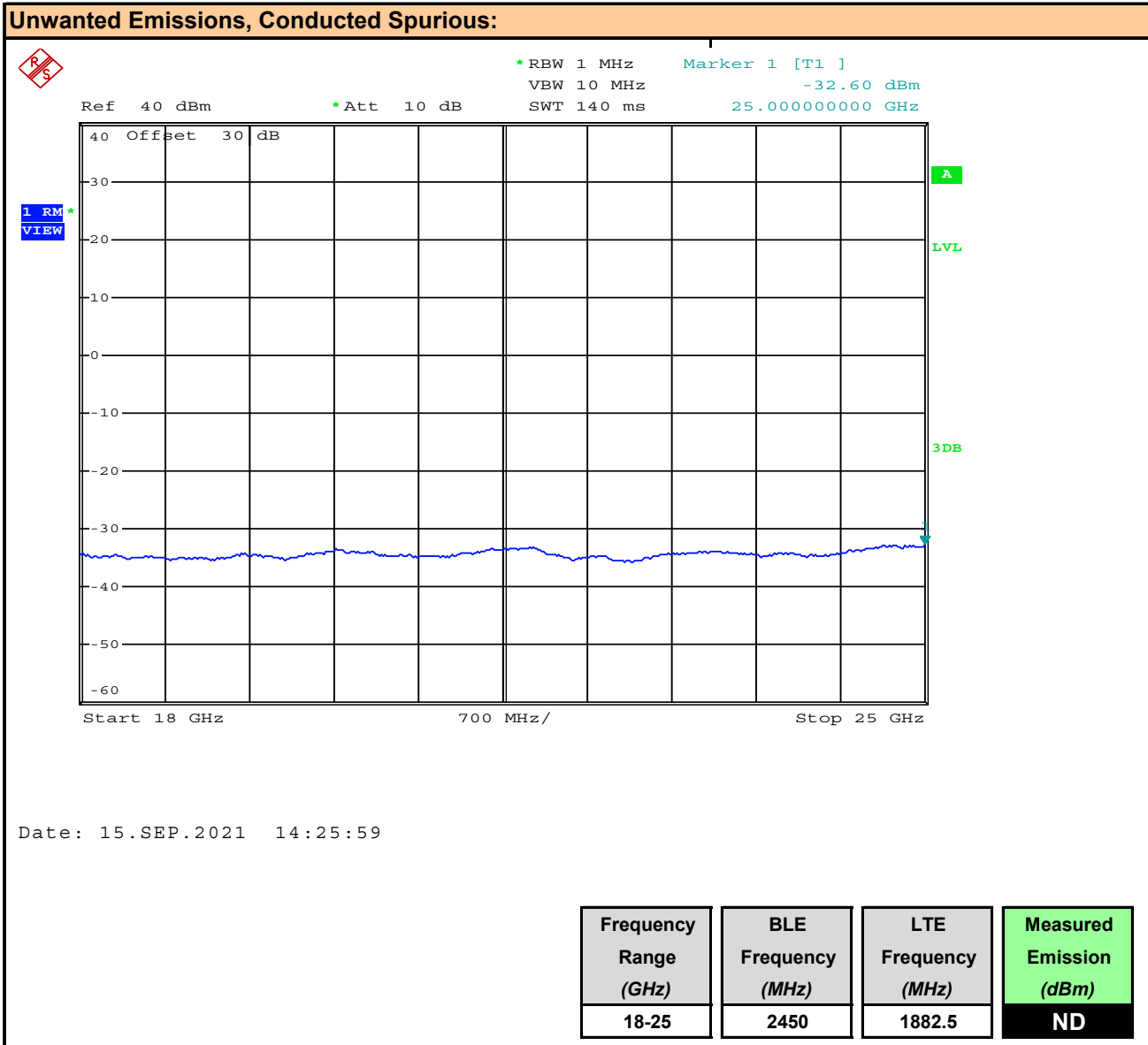
Plot 8.4 – Intermodulation Response, BLE + LTE B25, 10 – 13.6GHz



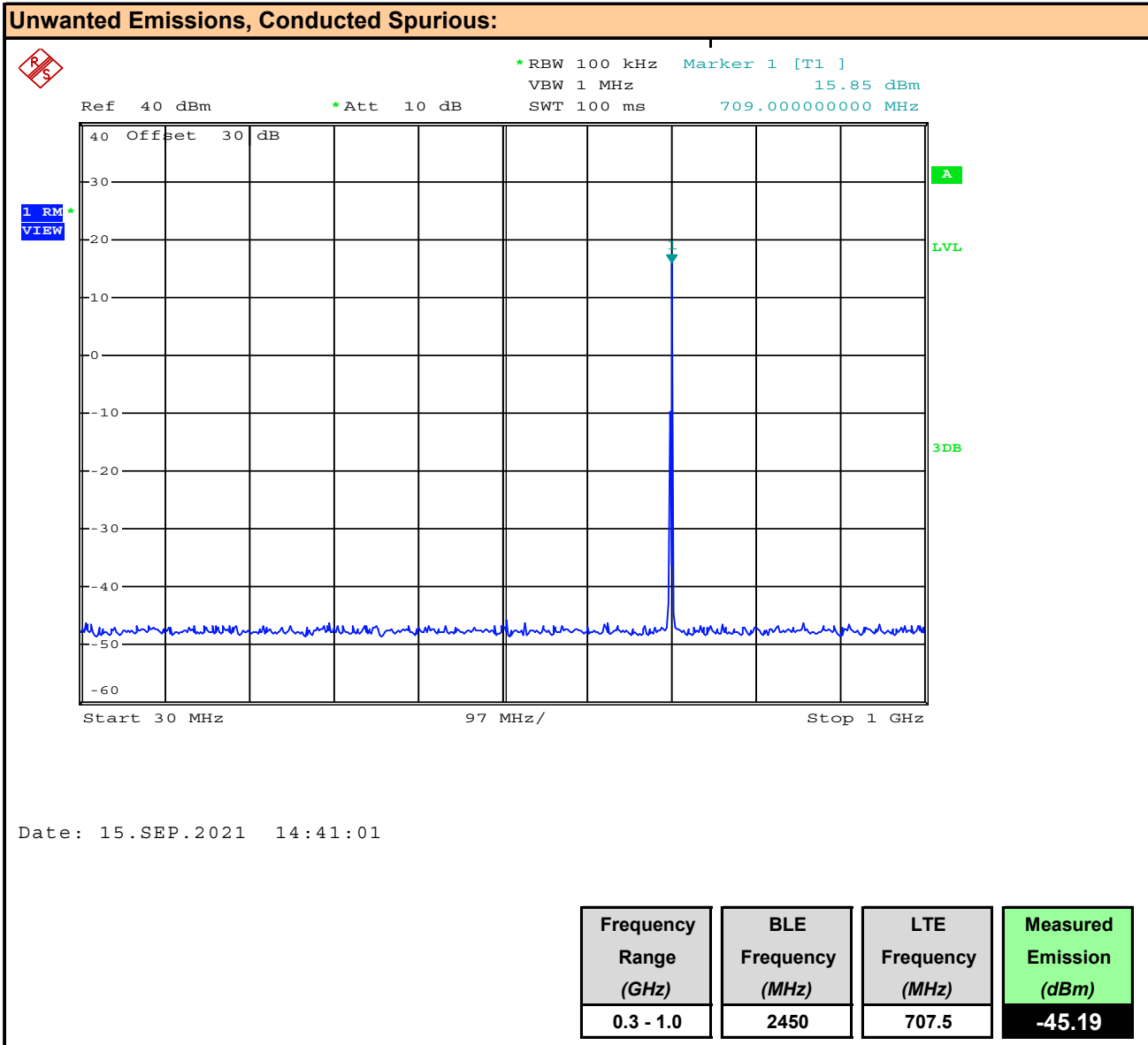
Plot 8.5 – Intermodulation Response, BLE + LTE B25, 13.6 - 18GHz



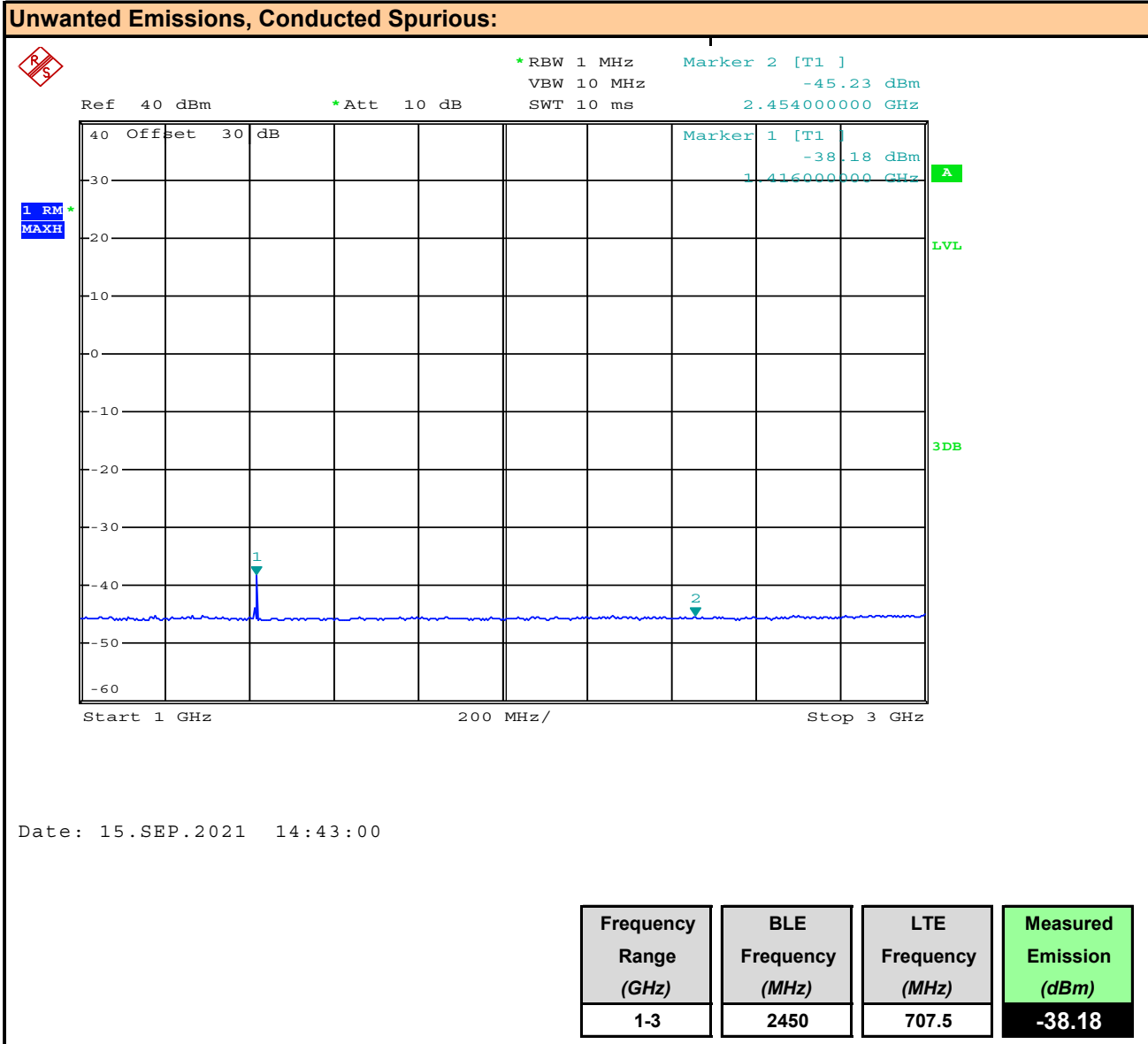
Plot 8.6 – Intermodulation Response, BLE + LTE B25, 18 - 25GHz



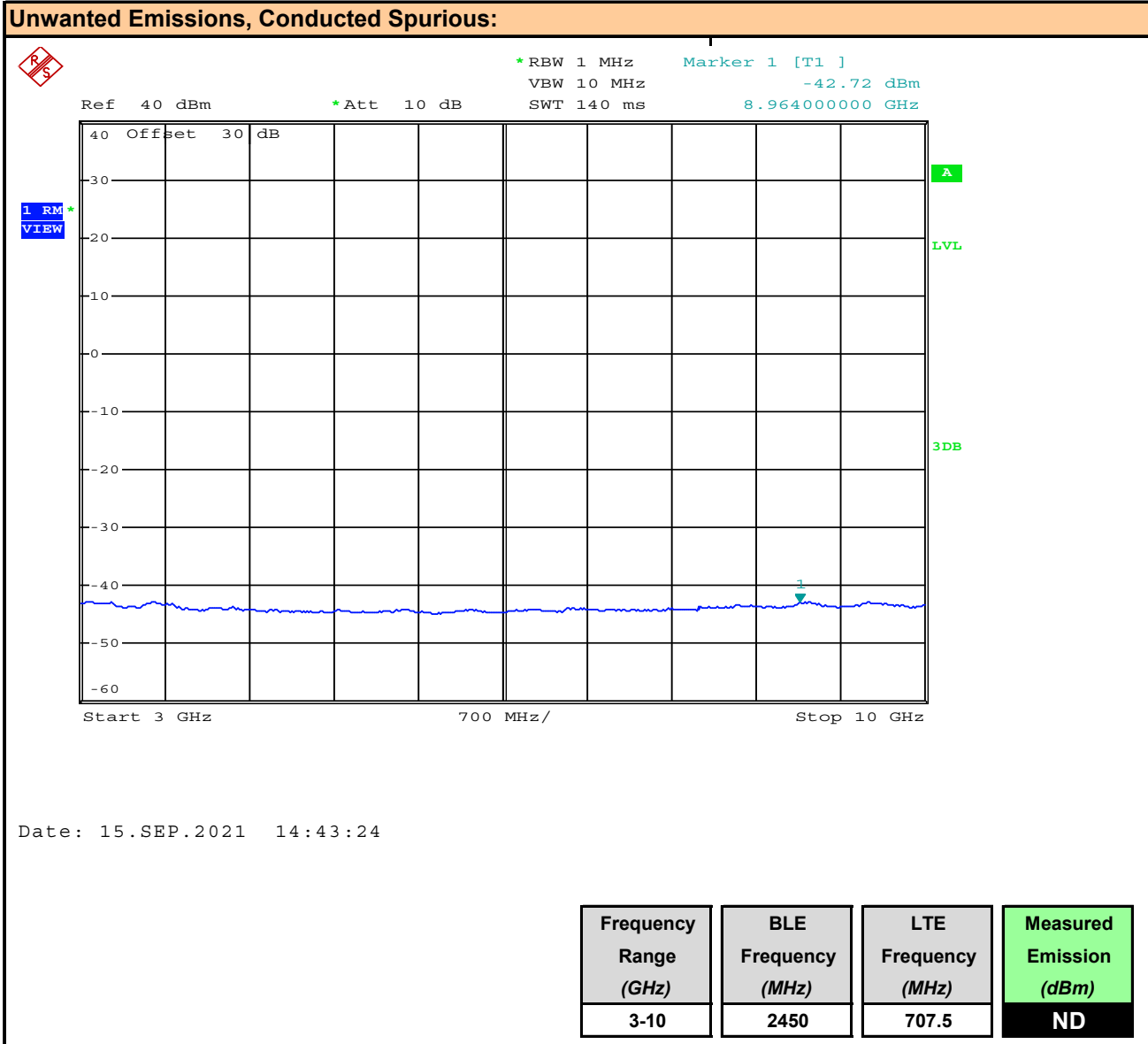
Plot 8.7 – Intermodulation Response, BLE + LTE B12, 30 – 1000MHz



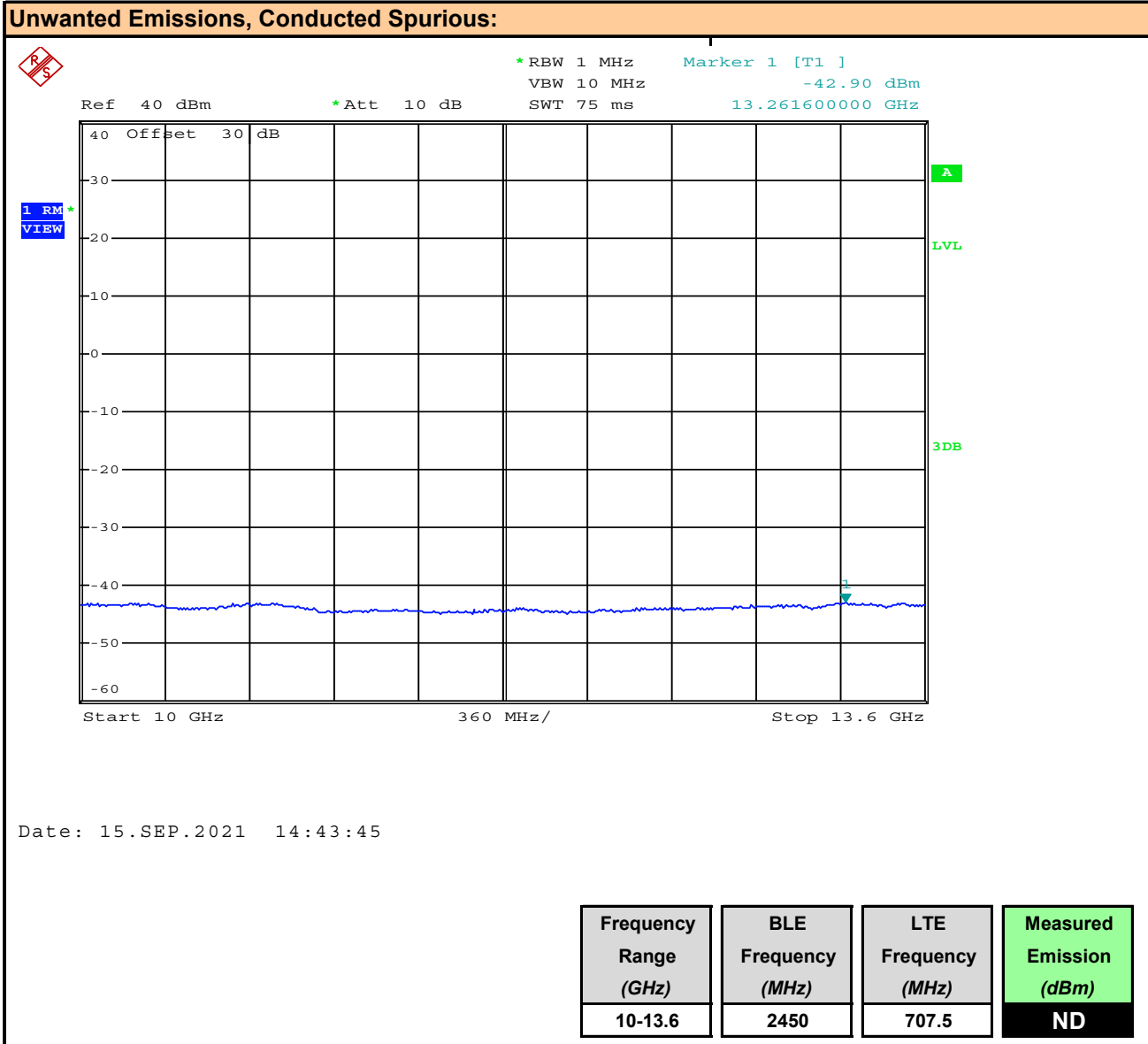
Plot 8.8 – Intermodulation Response, BLE + LTE B12, 1 – 3GHz



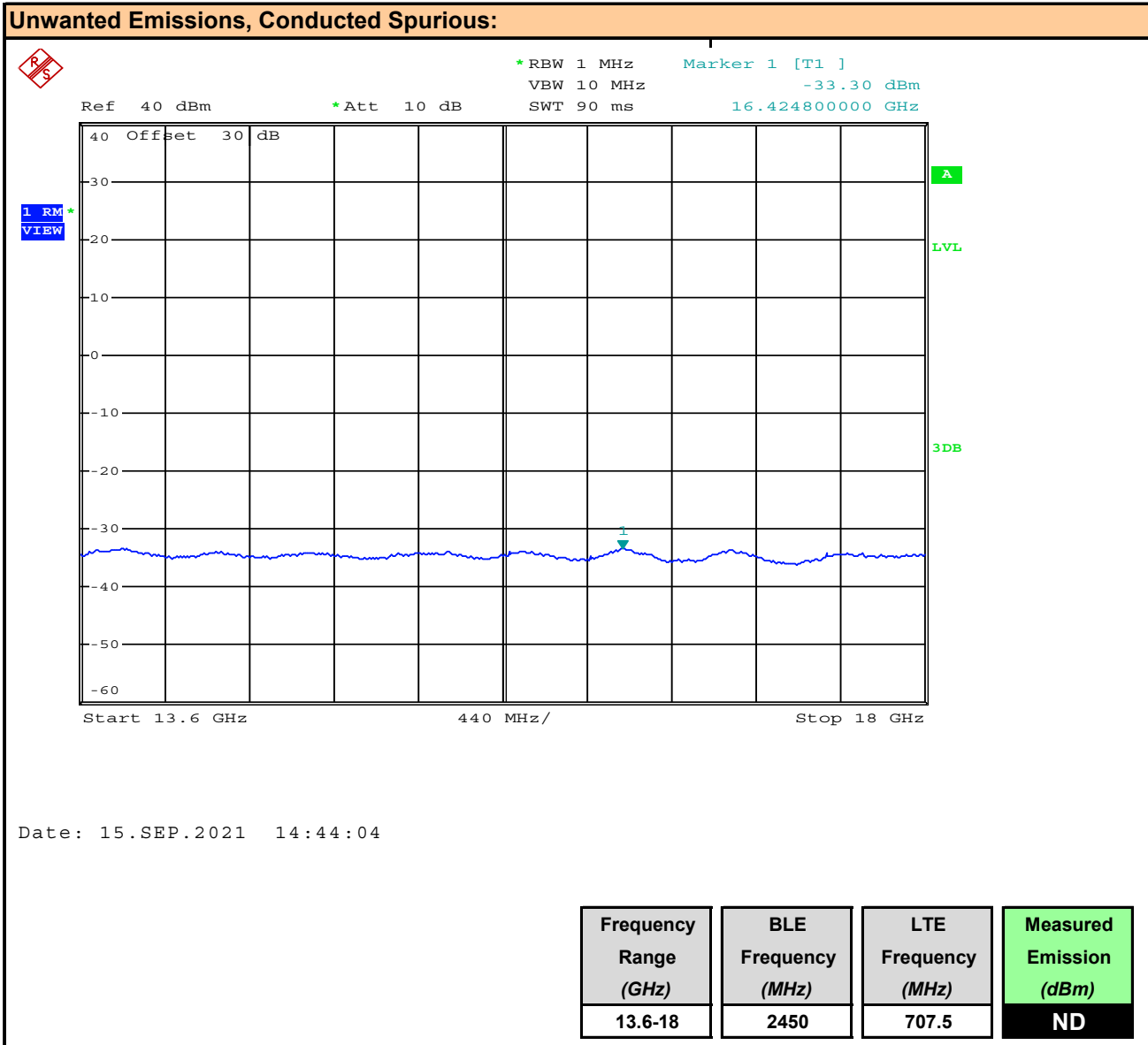
Plot 8.9 – Intermodulation Response, BLE + LTE B12, 3 - 10GHz



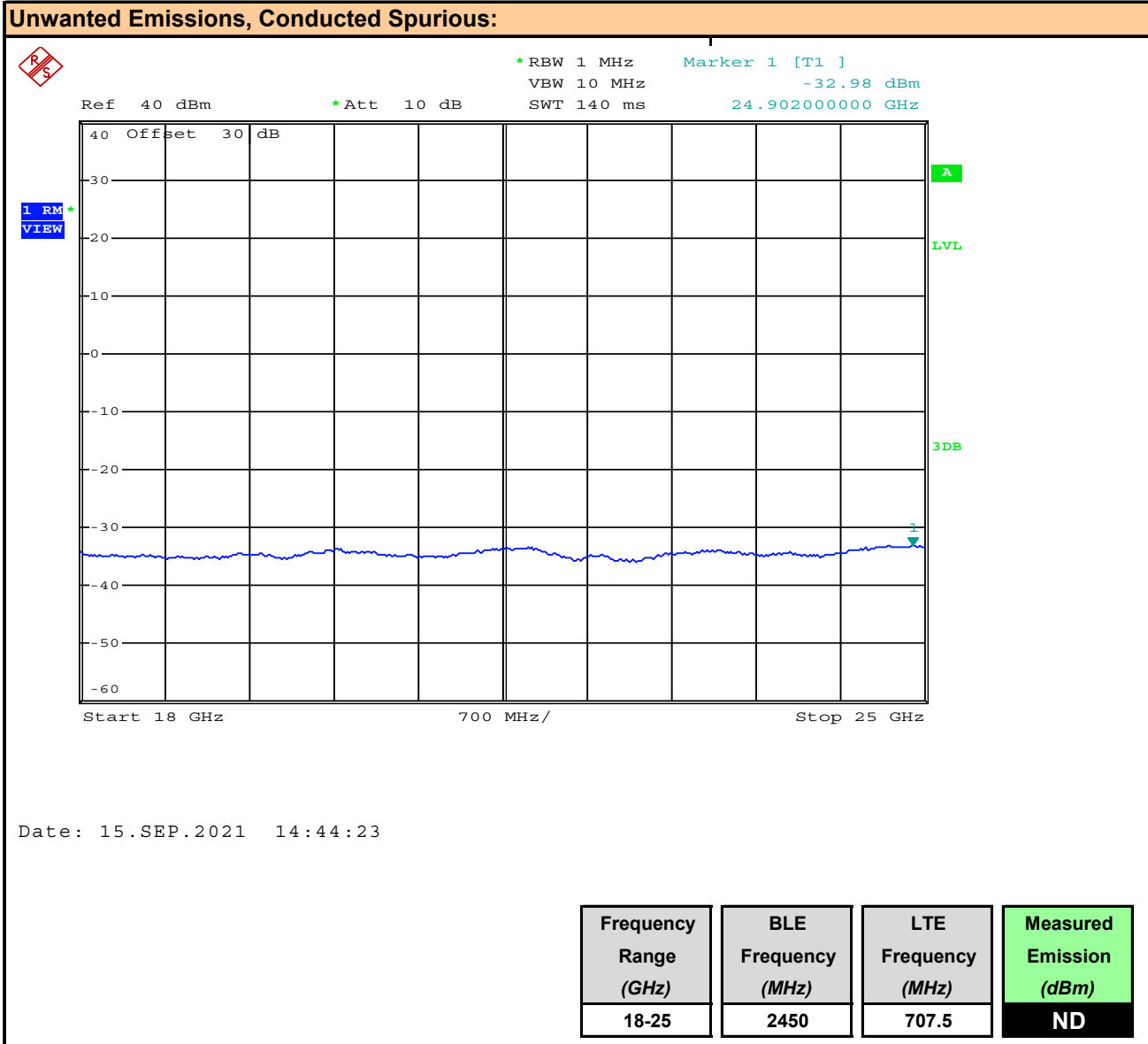
Plot 8.10 – Intermodulation Response, BLE + LTE B12, 10 – 13.6GHz



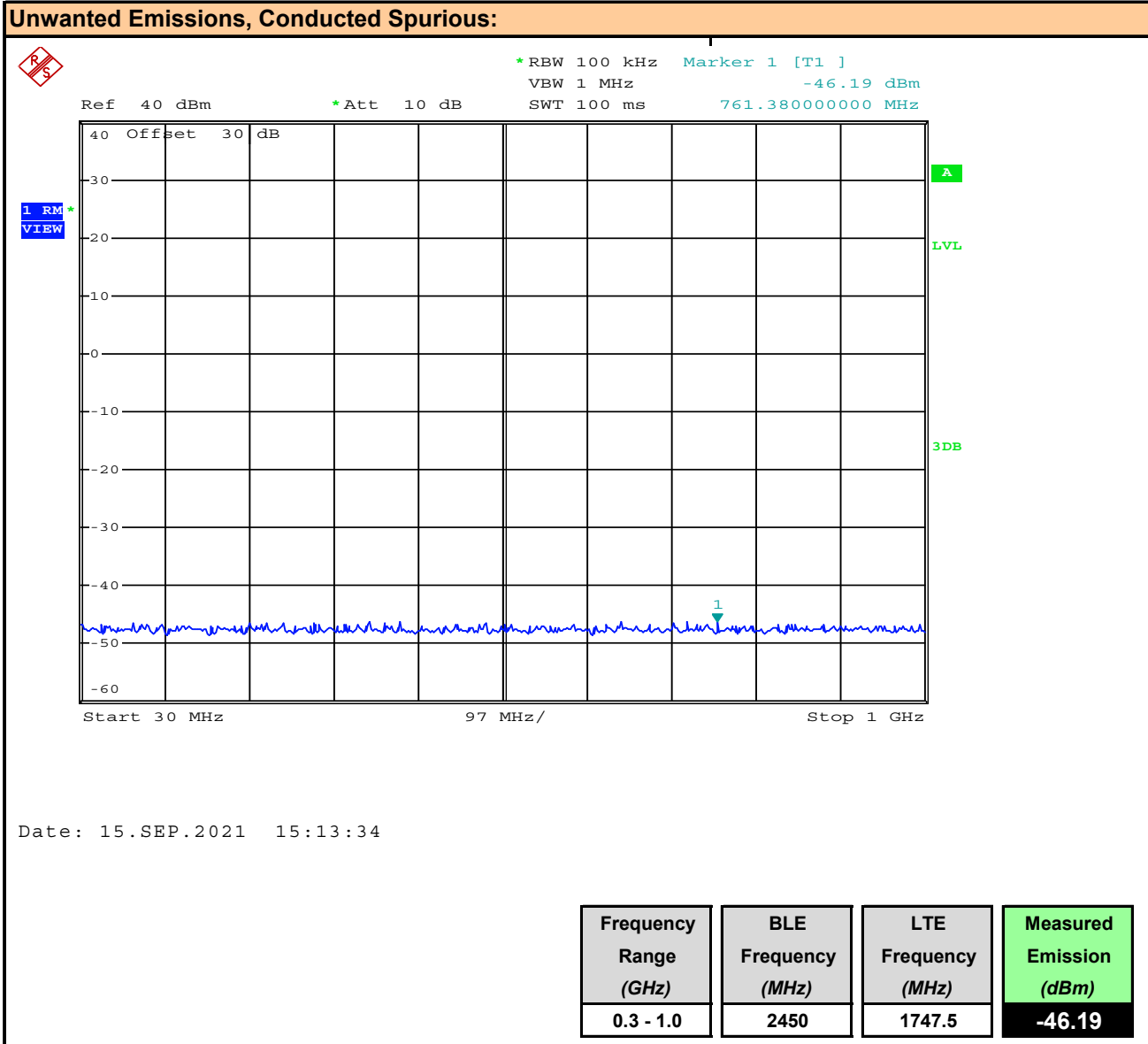
Plot 8.11 – Intermodulation Response, BLE + LTE B12, 13.6 - 18GHz



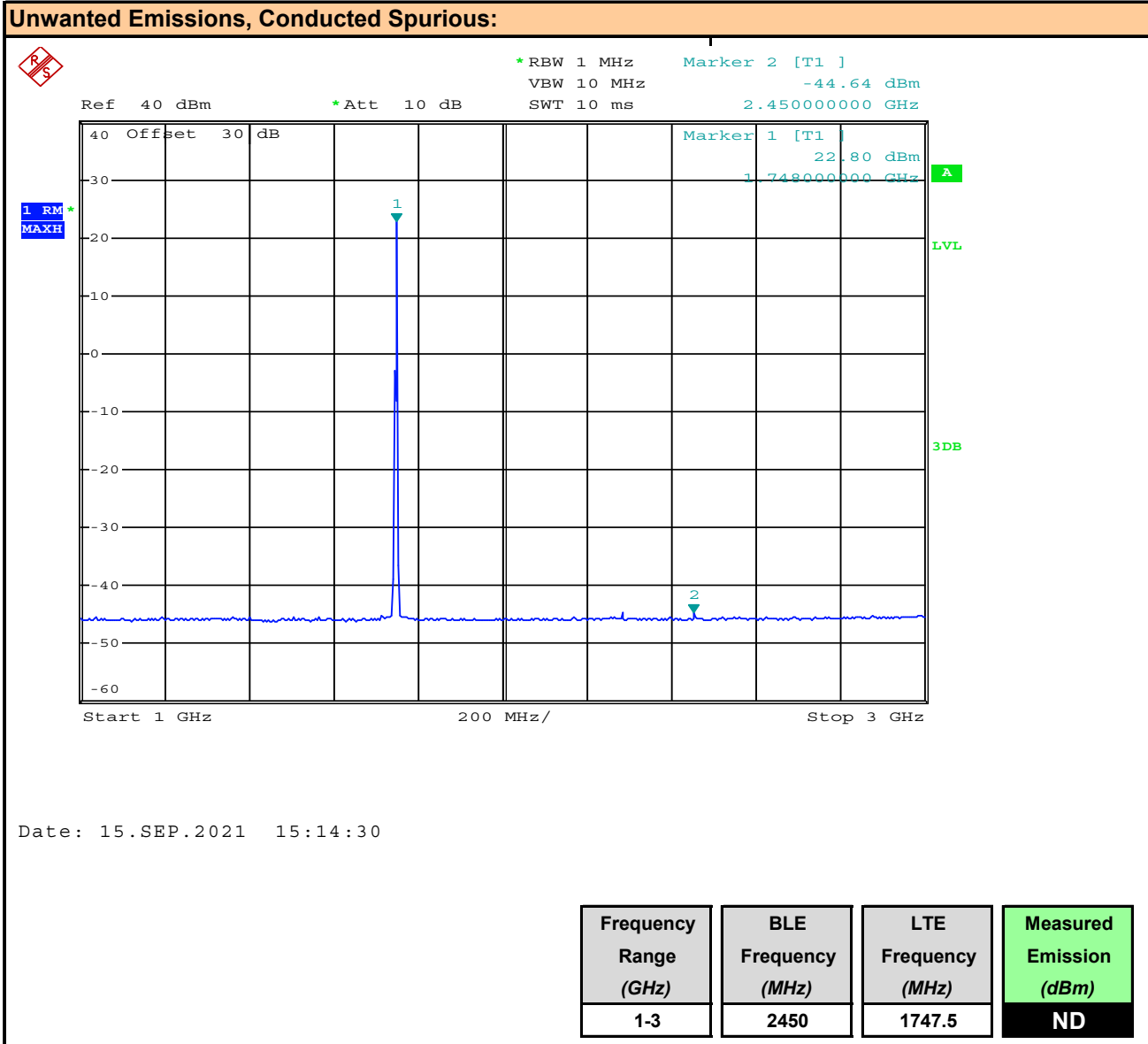
Plot 8.12 – Intermodulation Response, BLE + LTE B12, 18 - 25GHz



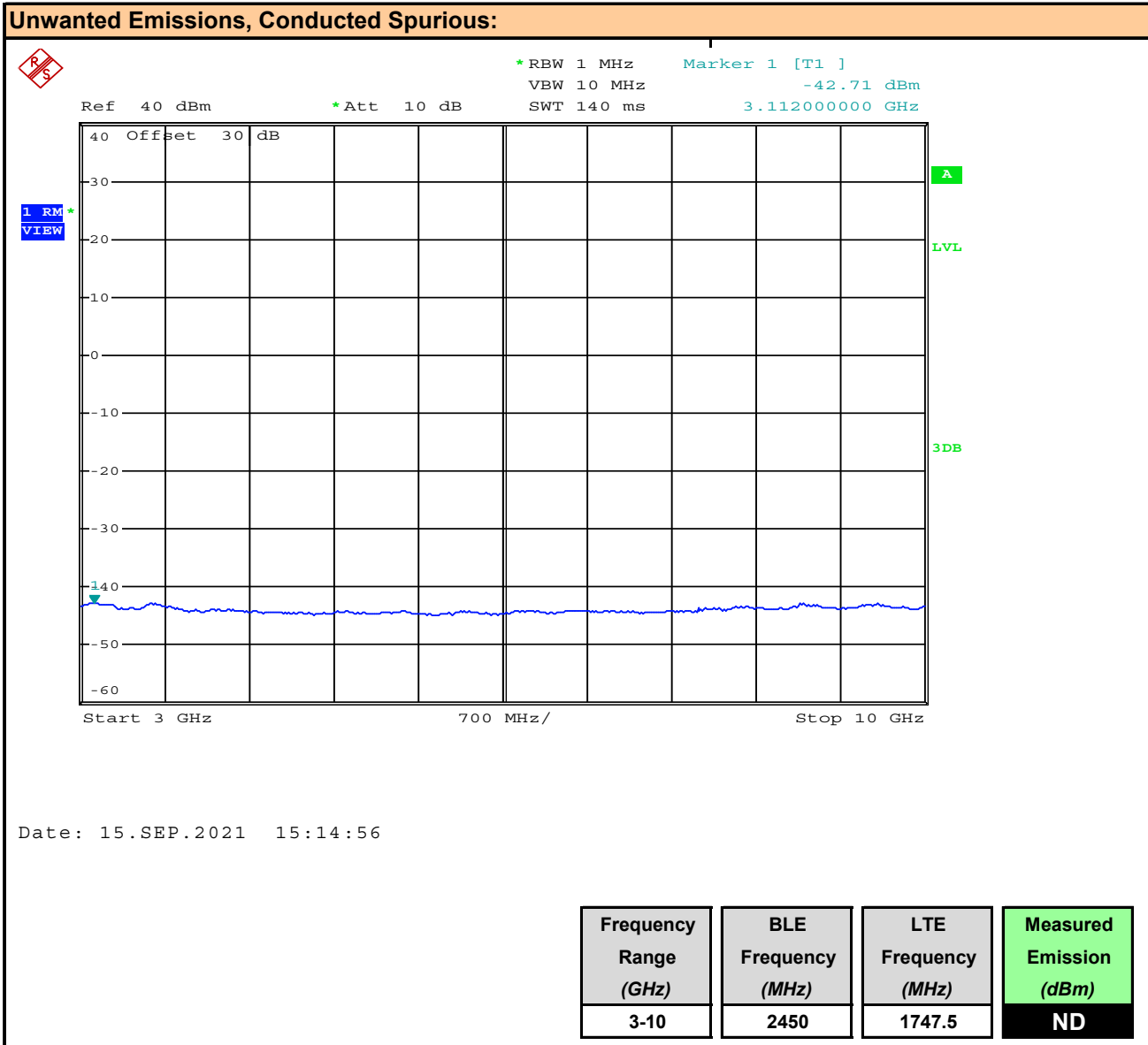
Plot 8.13 – Intermodulation Response, BLE + LTE B3, 30 – 1000MHz



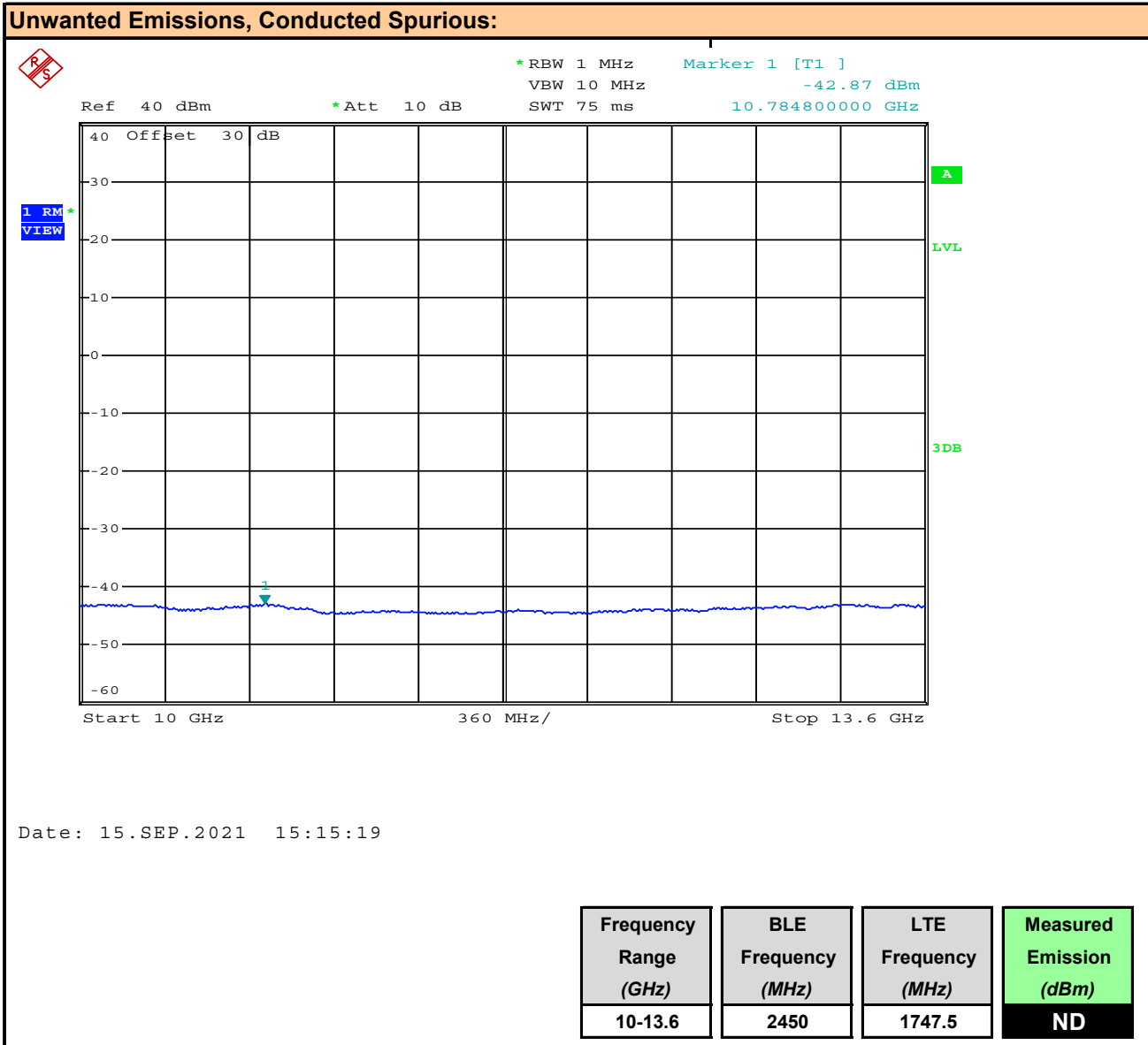
Plot 8.14 – Intermodulation Response, BLE + LTE B3, 1 – 3GHz



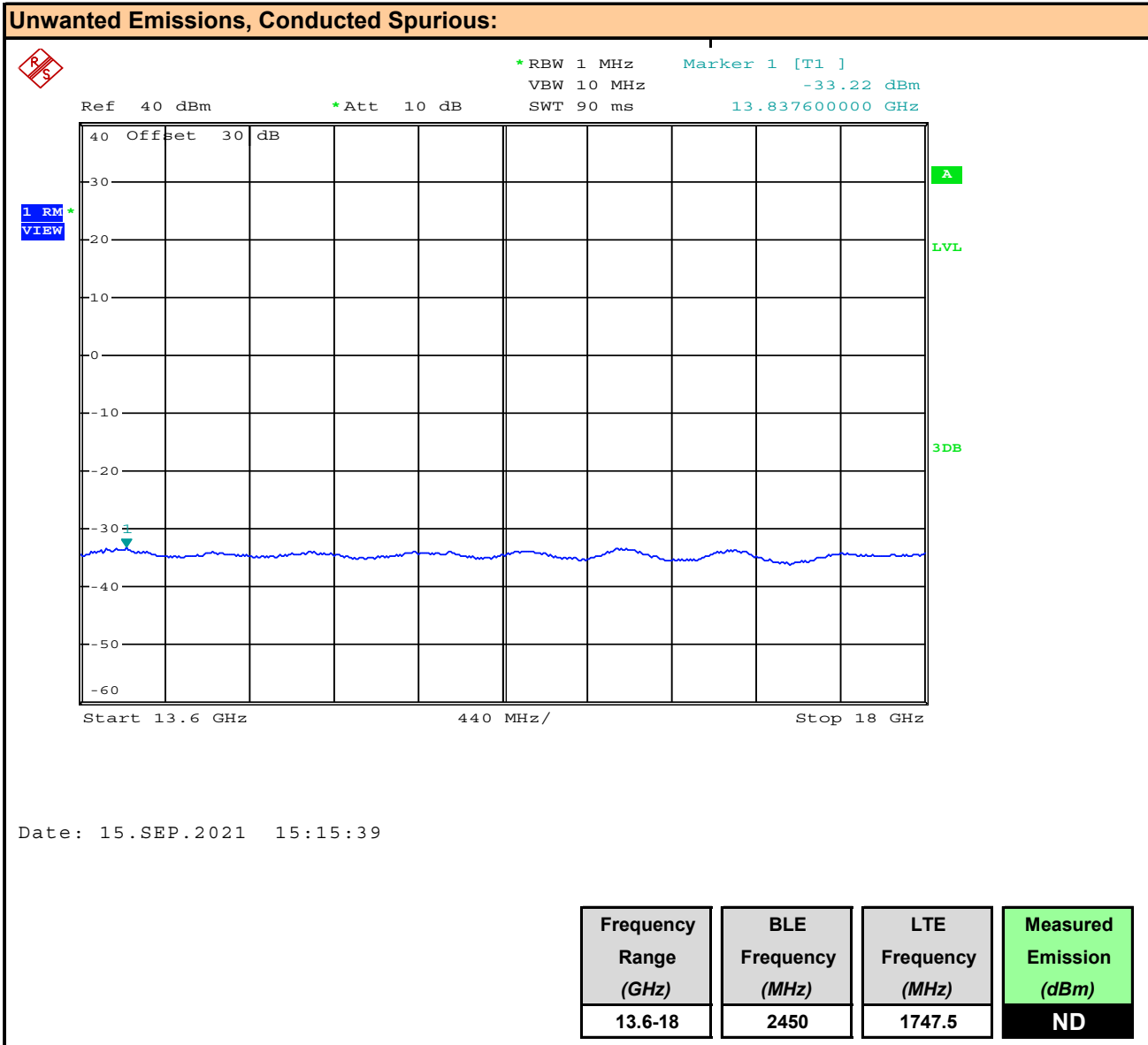
Plot 8.15 – Intermodulation Response, BLE + LTE B3, 3 - 10GHz



Plot 8.16 – Intermodulation Response, BLE + LTE B3, 10 – 13.6GHz



Plot 8.17 – Intermodulation Response, BLE + LTE B3, 13.6 - 18GHz



Plot 8.18 – Intermodulation Response, BLE + LTE B3, 18 - 25GHz

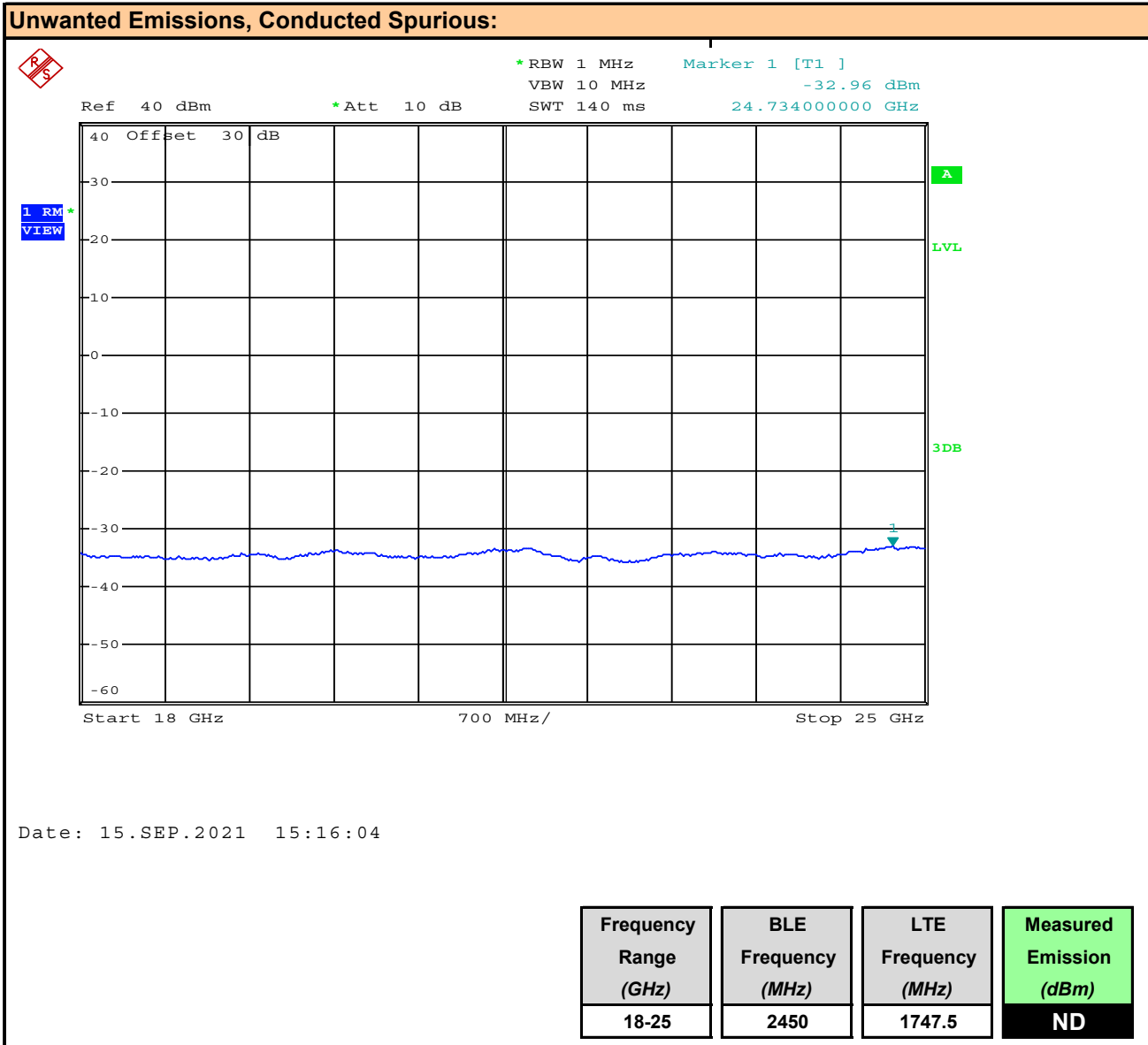


Table 8.1 – Summary of Simultaneous Transmission Evaluation

Unwanted Emission, Conducted Spurious Results:				
BLE Channel Frequency (MHz)	LTE Channel Frequency (MHz)	Frequency Range (GHz)	Measured Emission [P_{MEAS}] (dBm)	Attenuation [Att] (dB)
2450	1882.5	0.3 - 1.0	-45.19	>60
		1 - 3	ND	n/a
		3 - 10	ND	n/a
		10 - 13.6	ND	n/a
		13.6 - 18	ND	n/a
		18-25	ND	n/a
	707.5	0.3 - 1.0	ND	n/a
		1 - 3	-38.18	>50
		3 - 10	ND	n/a
		10 - 13.6	ND	n/a
		13.6 - 18	ND	n/a
		18-25	ND	n/a
	1747.5	0.3 - 1.0	-45.19	>60
		1 - 3	ND	n/a
		3 - 10	ND	n/a
		10 - 13.6	ND	n/a
		13.6 - 18	ND	n/a
		18-25	ND	n/a
Result:				Complies

ND: None Detected

9.0 POWE LINE CONDUCTED EMISSIONS

Test Procedure

Normative Reference	FCC 47 CFR §15.107, ICES-003(6.1) ANSI C63.4-2014
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Limits

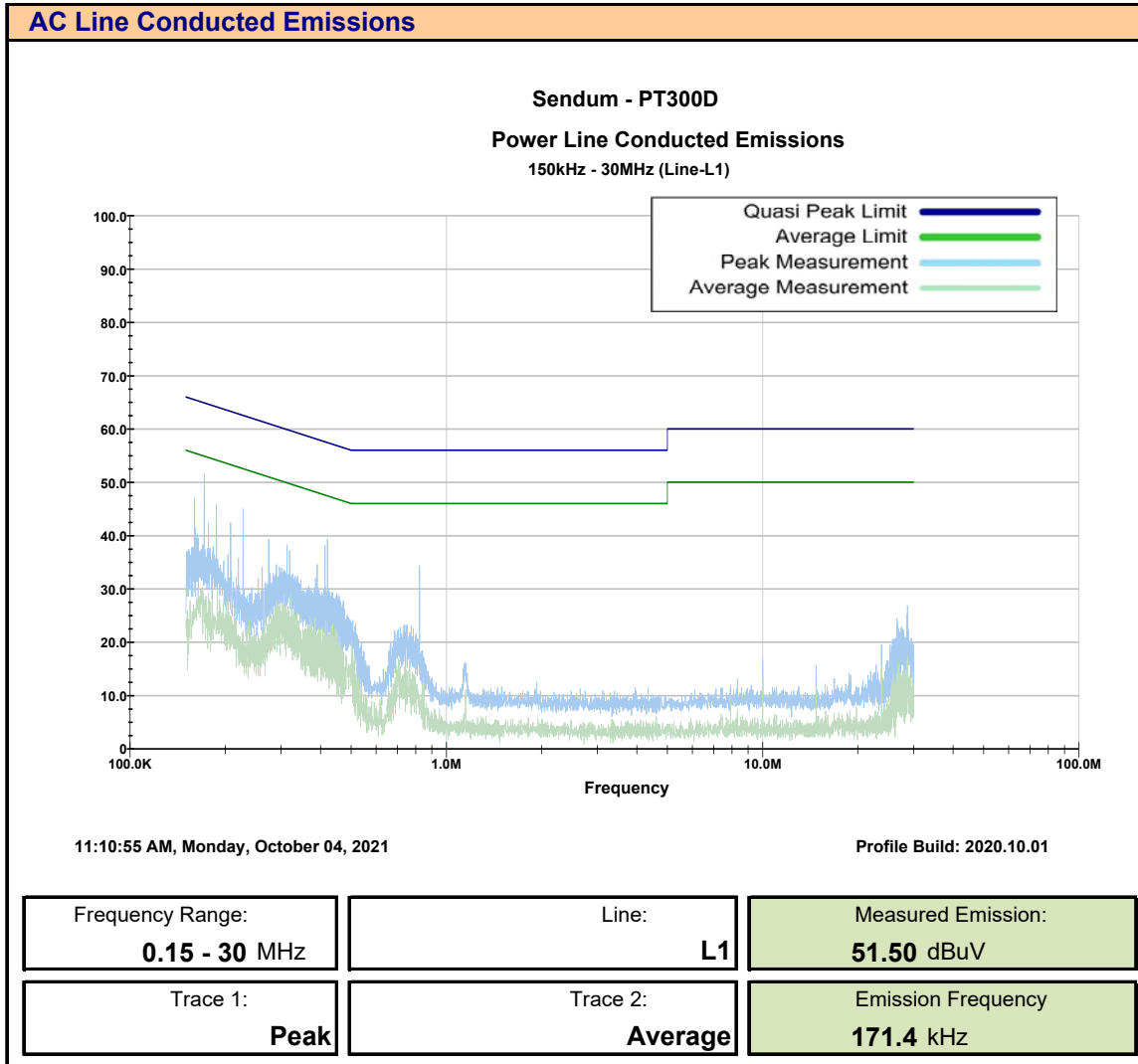
47 CFR §15.107	(b) For a Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms LISN. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges. 0.15 - 0.5 MHz: 79 dBuV Quasi Peak, 66 dBuV Average 0.5 - 30.0 MHz: 73 dBuV Quasi Peak, 60 dBuV Average
ICES-003(6.1)	6.1 - AC Power Line Conducted Emissions Limits Class A: ITE that meets the conditions for Class A operation defined in Section 2.2 shall comply with the Class A conducted limits set out below in Table 1. 0.15 - 0.5 MHz: 79 dBuV Quasi Peak, 66 dBuV Average 0.5 - 30.0 MHz: 73 dBuV Quasi Peak, 60 dBuV Average

Test Setup	Appendix A	Figure A.1
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Measurement Procedure

The device was connected to the LISN as shown in Appendix A. The input power supply was connected to a 208VAC, 1PH power source. The AC Line Conducted emissions were measured from 150kHz to 30MHz on both Lines L1 and L2 while the DUT was set to maximum output power.

Plot 9.1 – Line Conducted Emissions, L1



Plot 9.2 – Line Conducted Emissions, L2

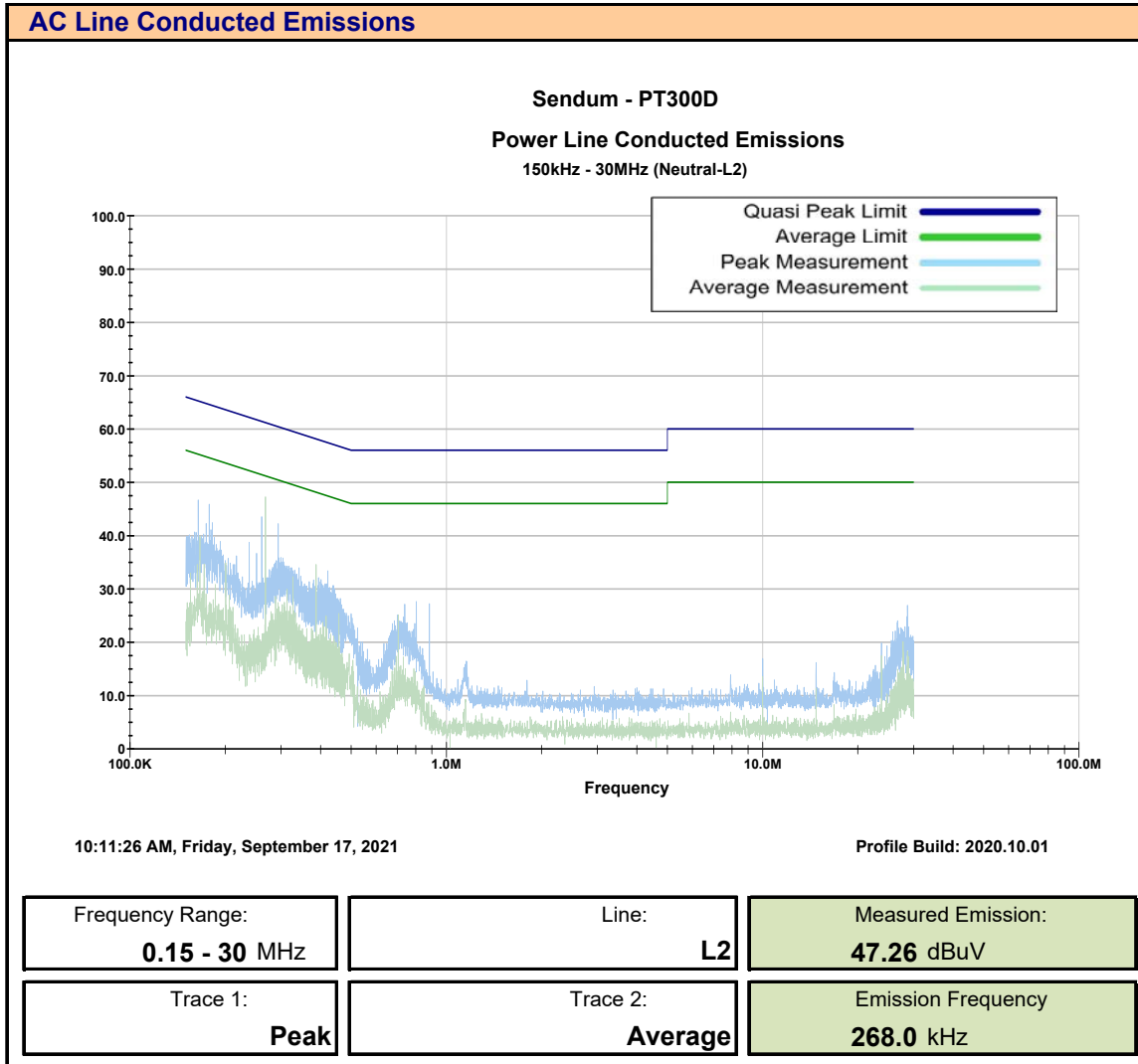


Table 9.1 – Summary of Power Line Conducted Emissions

§15.107, ICES-003 (6.1)							
Emission Frequency (MHz)	LISN Port	Measured Emission [E_{Meas}] (dBuV)	Cable Loss [L_c] (dB)	Insertion Loss [L_{LISN}] (dB)	Corrected Emission* [E_{Corr}] (W)	Limit [Limit] (dBuV)	Margin [Margin] (dB)
171.4 kHz	L1	50.07	0.50	0.50	51.07	79.0	27.9
268.0 kHz	L2	46.16	0.50	0.60	47.26	79.0	31.7
Results:						Complies	

* Measurement Compensated for Cable Loss and LISN Insertion Loss is SA Transducer Factor

$$E_{Corr} = E_{Meas} + L_C + L_{LISN}$$

$$\text{Margin} = \text{Limit} - E_{Corr}$$

No other Emissions within 20dB of the Limit were detected.

Peak measurement performed with SA RBW > 10kHz

APPENDIX A – TEST SETUP DRAWINGS AND EQUIPMENT

Table A.1 – Setup - Radiated Emissions Equipment

Equipment List			
Asset Number	Manufacturer	Model Number	Description
00051	HP	8566B	Spectrum Analyzer
00049	HP	85650A	Quasi-peak Adapter
00047	HP	85685A	RF Preselector
00072	EMCO	2075	Mini-mast
00073	EMCO	2080	Turn Table
00071	EMCO	2090	Multi-Device Controller
00265	Miteq	JS32-00104000-58-5P	Microwave L/N Amplifier
00241	R&S	FSU40	Spectrum Analyzer
00050	Chase	CBL-6111A	Bilog Antenna
00275	Coaxis	LMR400	25m Cable
00276	Coaxis	LMR400	4m Cable
00278	TILE	34G3	TILE Test Software
00034	ETS	3115	Double Ridged Guide Horn

CNR: Calibration Not Required

COU: Calibrate On Use

Figure A.1 – Test Setup Radiated Emissions Measurements 30 – 100MHz

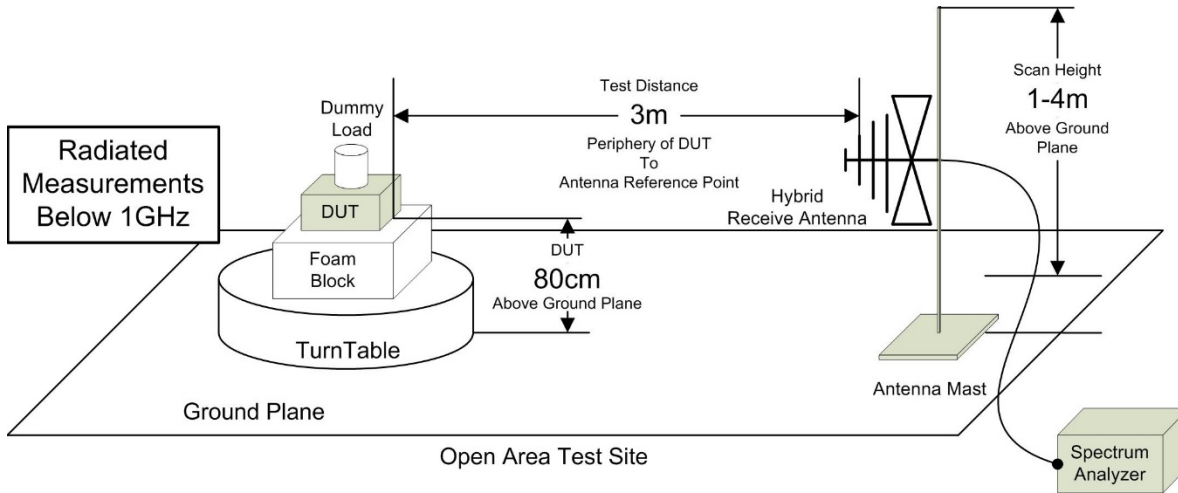


Figure A.2 – Test Setup Radiated Emissions Measurements 30 – 100MHz w/ Signal Substitution

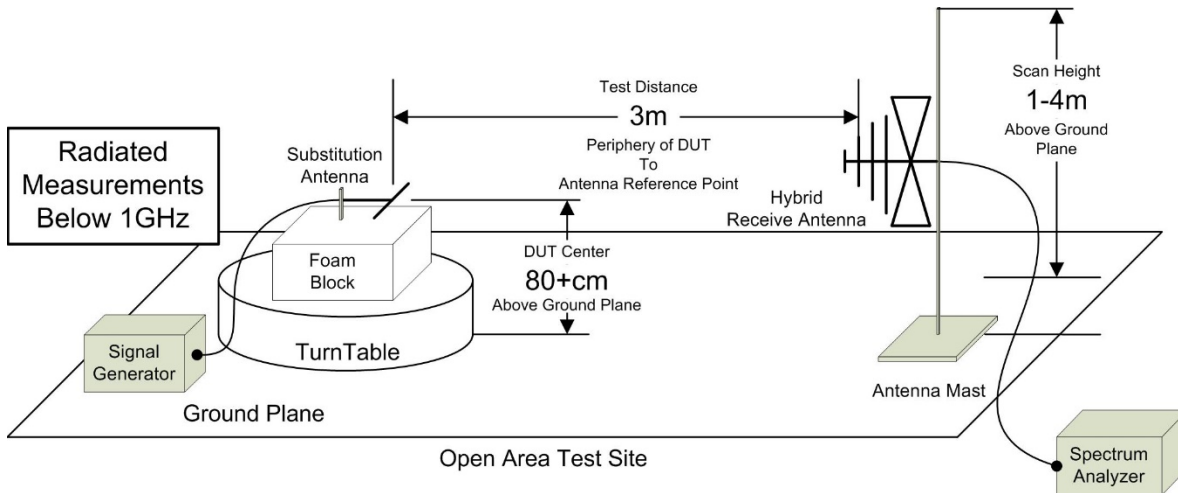
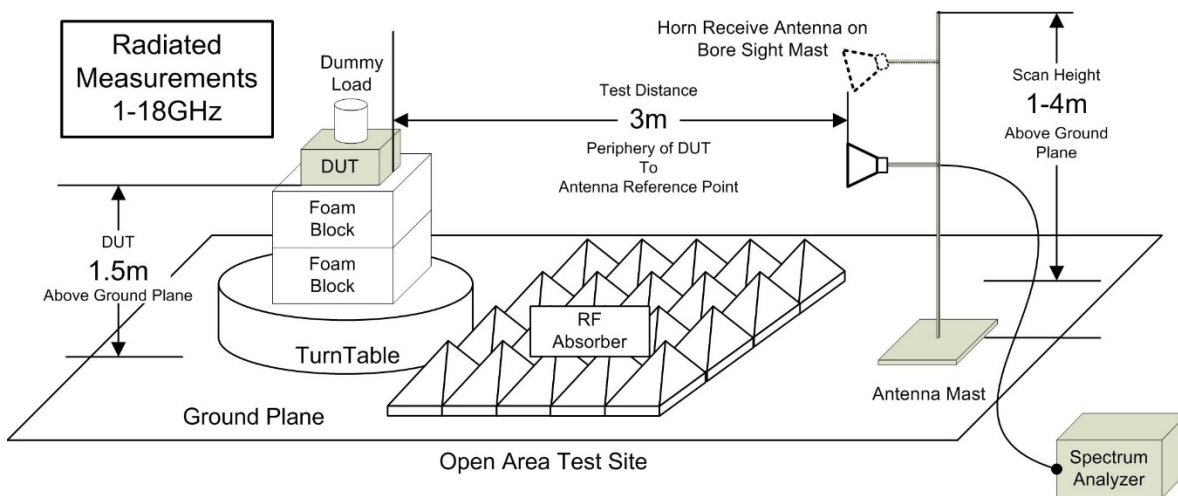


Figure A.3 – Test Setup Radiated Emissions Measurements 1 – 18GHz



APPENDIX B – EQUIPMENT LIST AND CALIBRATION

APPENDIX C – MEASUREMENT INSTRUMENT UNCERTAINTY

END OF REPORT