Test Report Serial Number:	**45461710 R2.0**
Test Report Date:	**13 April 2022**
Project Number:	**1566**

EMC Test Report - New Filing

Applicant:

SENDUM

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

FCC ID:	IC Registration Number
TS5-OM500B	**6234A-OM500B**
Product Model Number / HVIN	Product Name / PMN
OM500B	**OM500B**

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.
Kelowna, BC, V1X 7R8
Canada

Test Lab Certificate: 2470.01

IC Registration 3874A

FCC Registration: CA3874

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1.0 REVISION HISTORY

Revision History					
Samples Tested By:	Art Voss, P.Eng.		**Date(s) of Evaluation:**	14 Jan - 20 Jan, 2022	
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		n/a	Art Voss	8 March 2022
1.0	Initial Release		n/a	Art Voss	23 March 2022
2.0	Revised RE Rx Data		8.0	Art Voss	13 April 2022

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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-OM500B**
	ISED ID: **6234A-OM500B**
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.:	OTA: 90000157, Conducted: 90000195
Antenna Make and Model:	n/a
Antenna Type and Gain:	n/a
DUT Power Source:	120VAC
DUT Dimensions (mm)	L x W x D: 165mm x 95mm x 50mm
Deviation(s) from standard/procedure:	None
Modification of DUT:	None

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**

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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 OM500B is an offender's monitoring device. The OM500B integrates the follow certified transceiver module and contains no other transmitters.

WiFi Module
FCC ID: **XPYNINAW13**
IC ID: **8595A-NINAW13**
u-blox AG
Model/HVIN: NINA-W131

Certification Requirement:

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

Application:

This is an application for a new SDoC.

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.

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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)	14 Jan 2022	Pass
8.0	Conducted Spurious Emissions Intermodulation Products	ANSI C63.4-2014	§15.109	ICES-003 (6.2)	20 Jan 2022	Pass
9.0	Powerline Conducted Spurious Emissions	ANSI C63.4-2014	§15.107	ICES-003 (6.1)	20 Jan 2022	Pass

Test Station Day Log

Date	Ambient Temp (°C)	Relative Humidity (%)	Barometric Pressure (kPa)	Test Station	Tests Performed Section(s)
14 Jan 2022	2.0	77	101.0	**OATS**	**8.0**
20 Jan 2022	20.6	16	101.6	**EMC**	**7.0**
20 Jan 2022	12.0	67	101.6	**LISN**	**9.0**

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

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.

Technical Manager
Celltech Labs Inc.
8 March 2022
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 Title 47: Part 15: Subpart B:	Code of Federal Regulations Telecommunication Radio Frequency Devices Unintentional Radiators
ISED RSS-Gen Issue 5A1: March 2019	Innovation, Science and Economic Development Canada Spectrum Management and Telecommunications Radio Standards Specification General Requirements and Information for the Certification of Radiocommunication Equipment
ISED ICES-003 Issue 6: Jan 2016	Innovation, Science and Economic Development Canada Spectrum Management and Telecommunications Radio Standards Specification Information Technology Equipment (Including Digital Apparatus) — Limits and Methods of Measurement

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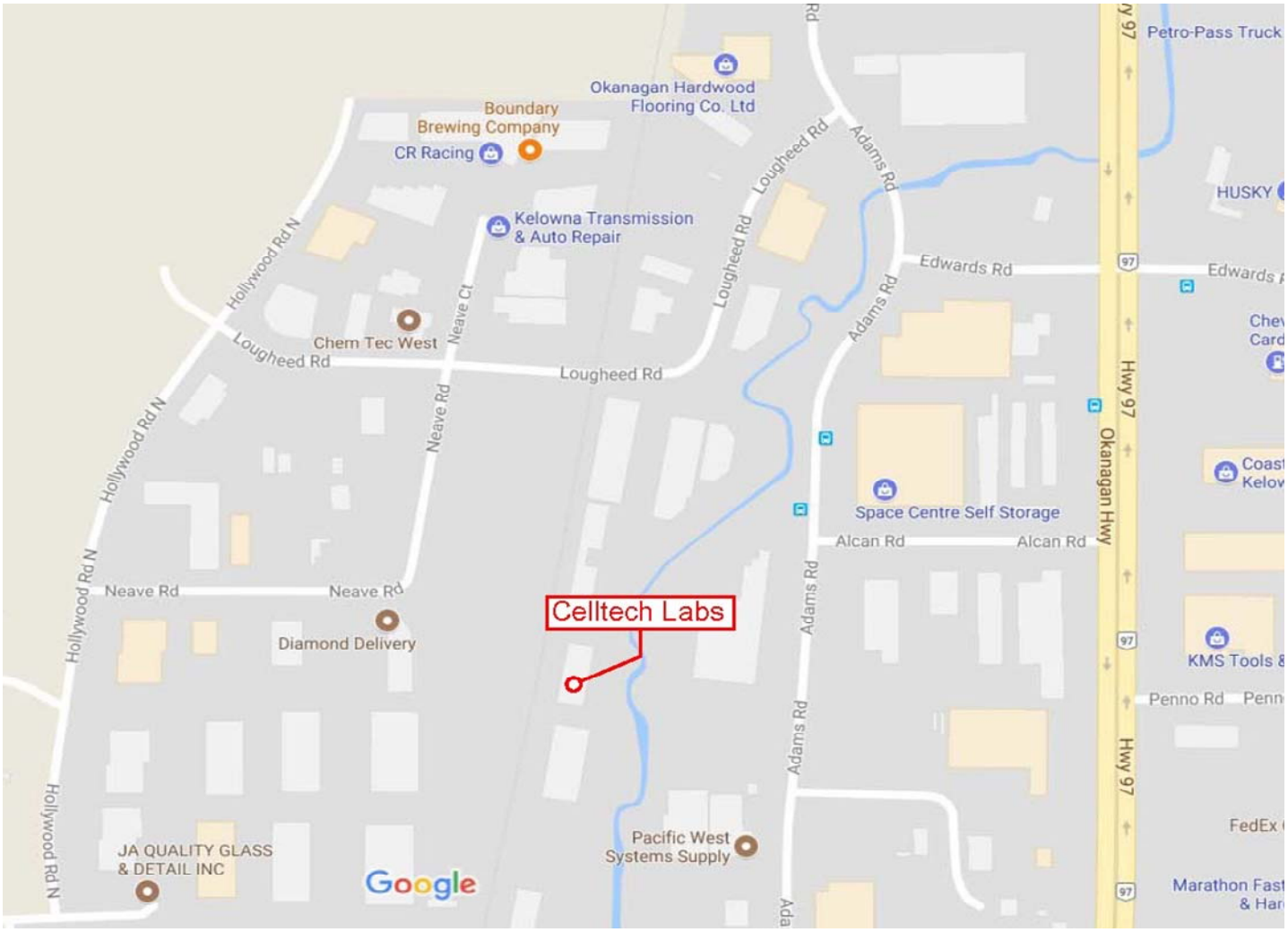
6.0 FACILITIES AND ACCREDITATIONS

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.



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7.0 ANTENNA PORT CONDUCTED EMISSIONS

Test Procedure	
Normative Reference	FCC 47 CFR §2.1051, §15.247(d), RSS-Gen (6.13), RSS-247 (5.5), KDB 558074 (8.5), ANSI C63.10 (11.11.3)

Limits	
47 CFR §15.247(d)	(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.
RSS-247 (5.5)	**5.5 Unwanted emissions** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required. d) For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W. The e.i.r.p. shall not exceed 4 W, except as provided in section 5.4(e). As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power.

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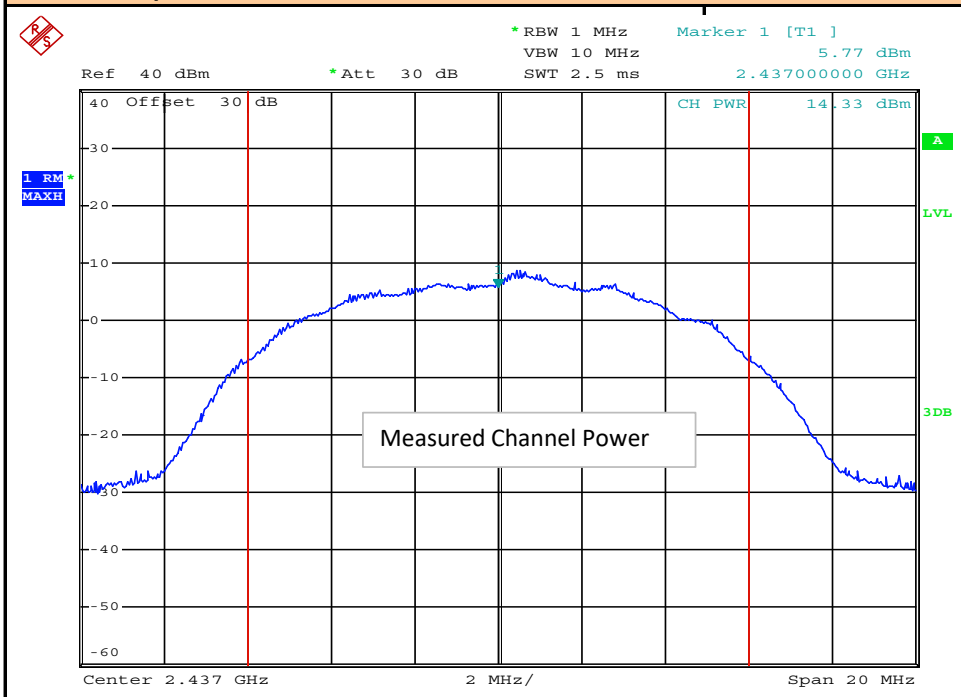
Plot 7.1 – Conducted Emissions, Channel Power

Conducted Spurious Emissions:



Date: 20.JAN.2022 10:54:17

Channel Number	Channel Frequency (MHz)	Emission Frequency (MHz)	Measured Emission (dBm)
6	2437	2437	14.33

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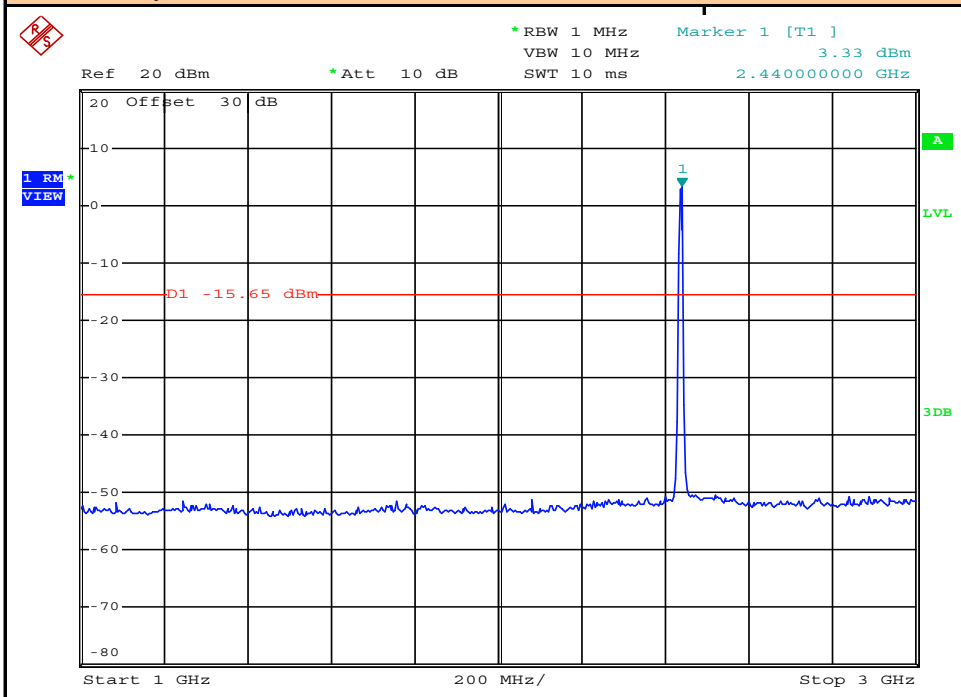
Plot 7.2 – Conducted Emissions, 1 – 3GHz

Conducted Spurious Emissions:



Date: 20.JAN.2022 10:57:35

	Channel Number	Channel Frequency (MHz)	Emission Frequency (MHz)	Measured Emission (dBm)
Marker 1: Fundamental	6	2437	2075	-52.00

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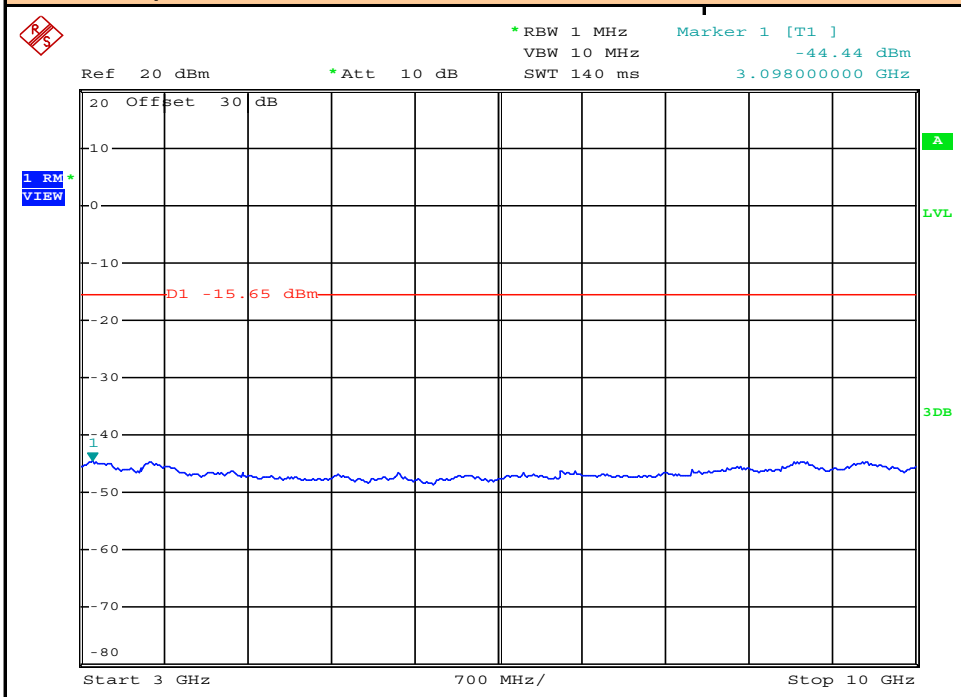
Plot 7.3 – Conducted Emissions, 3 - 10GHz

Conducted Spurious Emissions:



Date: 20.JAN.2022 10:57:58

Channel Number	Channel Frequency (MHz)	Emission Frequency (MHz)	Measured Emission (dBm)
6	2437	3098	-44.44

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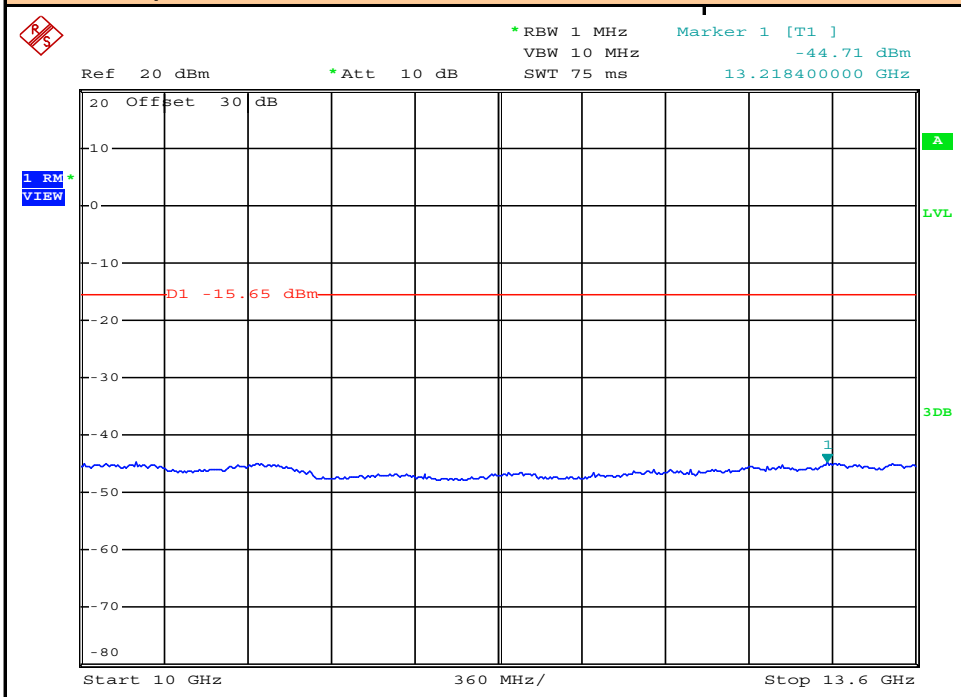
Plot 7.4 – Conducted Emissions, 10 – 13.6GHz

Conducted Spurious Emissions:



Date: 20.JAN.2022 10:58:21

Channel Number	Channel Frequency (MHz)	Emission Frequency (MHz)	Measured Emission (dBm)
6	2437	13218	-44.71

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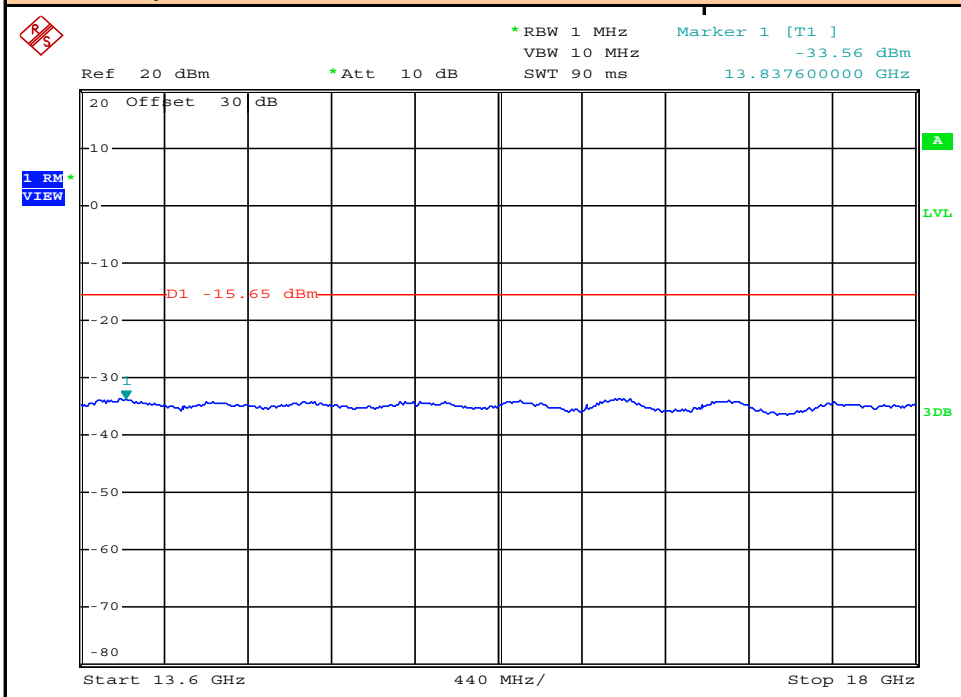
Plot 7.5 – Conducted Emissions, 13.6 - 18GHz

Conducted Spurious Emissions:



Date: 20.JAN.2022 10:58:38

Channel Number	Channel Frequency (MHz)	Emission Frequency (MHz)	Measured Emission (dBm)
6	2437	13838	-35.56

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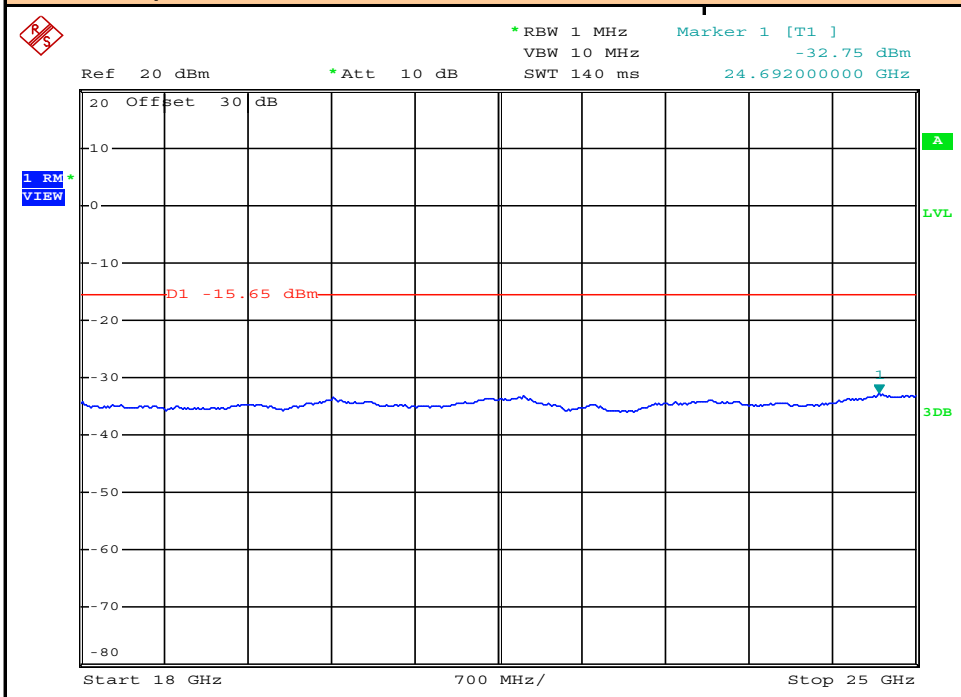
Plot 7.6 – Conducted Emissions, 18 - 25GHz

Conducted Spurious Emissions:



Date: 20.JAN.2022 10:58:55

Channel Number	Channel Frequency (MHz)	Emission Frequency (MHz)	Measured Emission (dBm)
6	2437	24692	-32.75

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Table 7.1 – Summary of Conducted Spurious Emissions Measurements

Conducted Spurious Emissons Measurement Results:							
Channel Number	Frequency (MHz)	Fundamental Power [P_{Fund}] (dBm)	Emission Frequency (MHz)	Measured Emission [P_{Meas}] (dBm)	Attenuation [Att] (dBm)	Limit (dB)	Margin (dB)
6	2437.0	14.33	2437.0	14.33	-	30.0	-
			2075.0	-52.00	66.33		36.3
			3098.0	-44.44	58.77		28.8
			13218.0	-44.71	59.04		29.0
			13838.0	-35.56	49.89		19.9
			24692.0	-32.75	47.08		17.1
							Complies

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8.0 RADIATED RX EMISSIONS

Test Procedure	
Normative Reference	**FCC 47 CFR §15.109, ICES-003(6.2)** **ANSI C64.4-2014**

Limits	
47 CFR §15.109	(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values: 30-88MHz: 40dBuV/m 88-216MHz: 43.5dBuV/m 216-960MHz: 46dBuV/m > 960MHz: 54dBuV/m
ICES-003(6.2.1)	6.2.1 - Radiated Emissions Limits Below 1 GHz Class B: ITE that does not meet the conditions for Class A operation shall comply with the Class B radiated limits set out in Table 5 determined at a distance of 3 metres. 30-88MHz: 40dBuV/m 88-216MHz: 43.5dBuV/m 216-960MHz: 46dBuV/m > 960MHz: 54dBuV/m

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.

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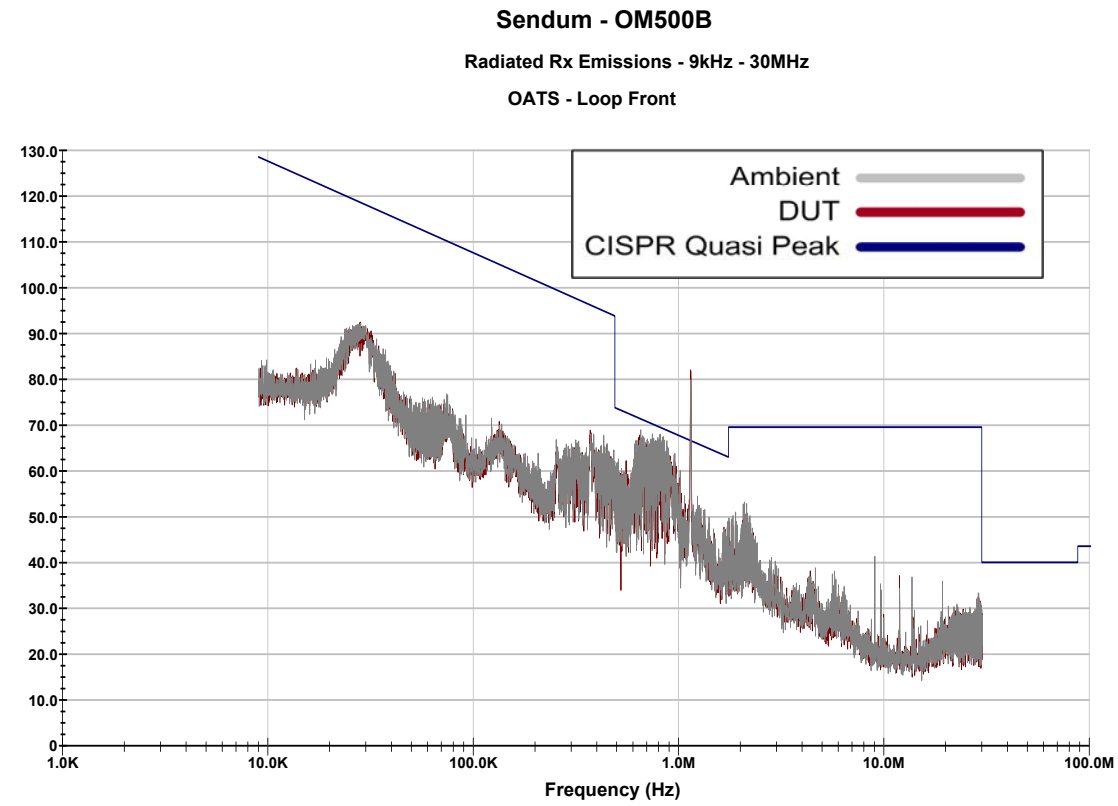
Plot 8.1 – Radiated Rx Emissions, 9kHz – 30MHz, Front

Radiated Rx Emissions:



Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Front	-	-

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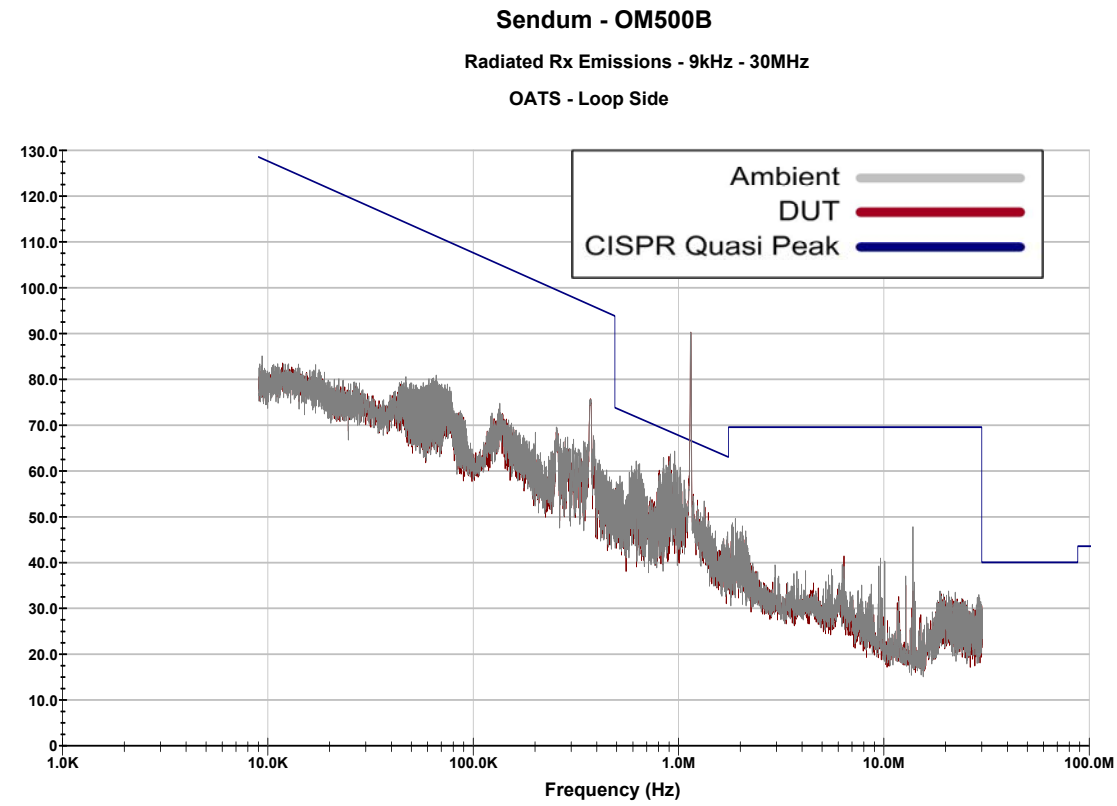
Plot 8.2 – Radiated Rx Emissions, 9kHz – 30MHz, Side

Radiated Rx Emissions:



12:01:30 PM, Wednesday, April 20, 2022

Profile Build: 2020.10.19

Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Side	-	-

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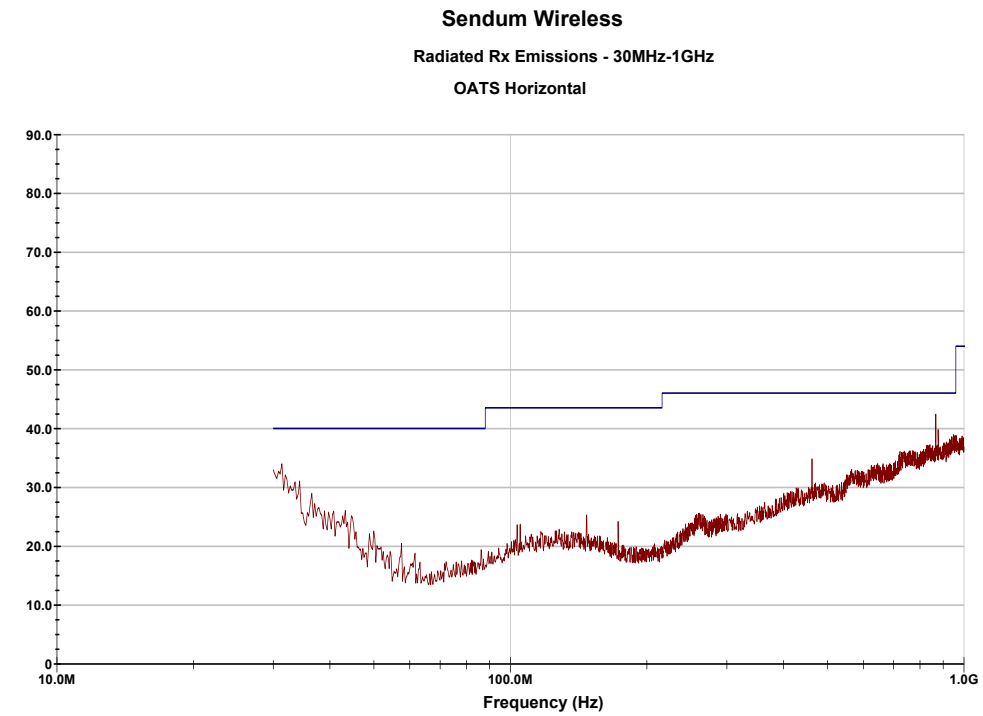
Plot 8.3 – Radiated Rx Emissions, 30 – 1000MHz, Horizontal

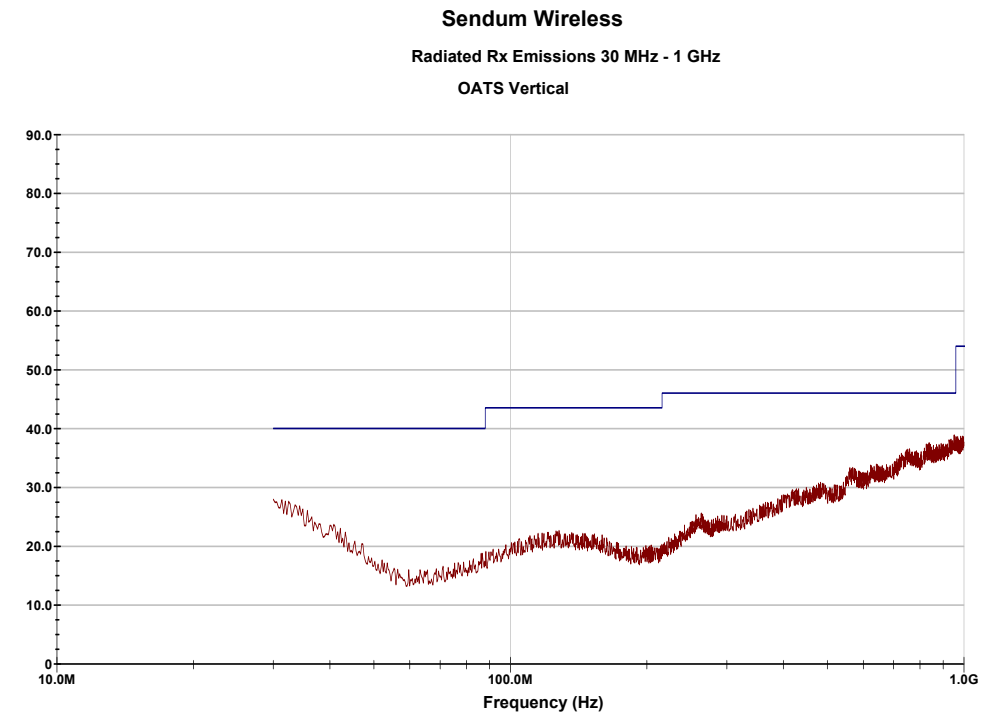
Radiated Rx Emissions:



Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Horizontal	-	-

Plot 8.4 – Radiated Rx Emissions, 30 – 1000MHz, Vertical

Radiated Rx Emissions:



Antenna Polarization	Emission Frequency *(MHz)*	Measured Emission *(dBm)*
Vertical	-	-

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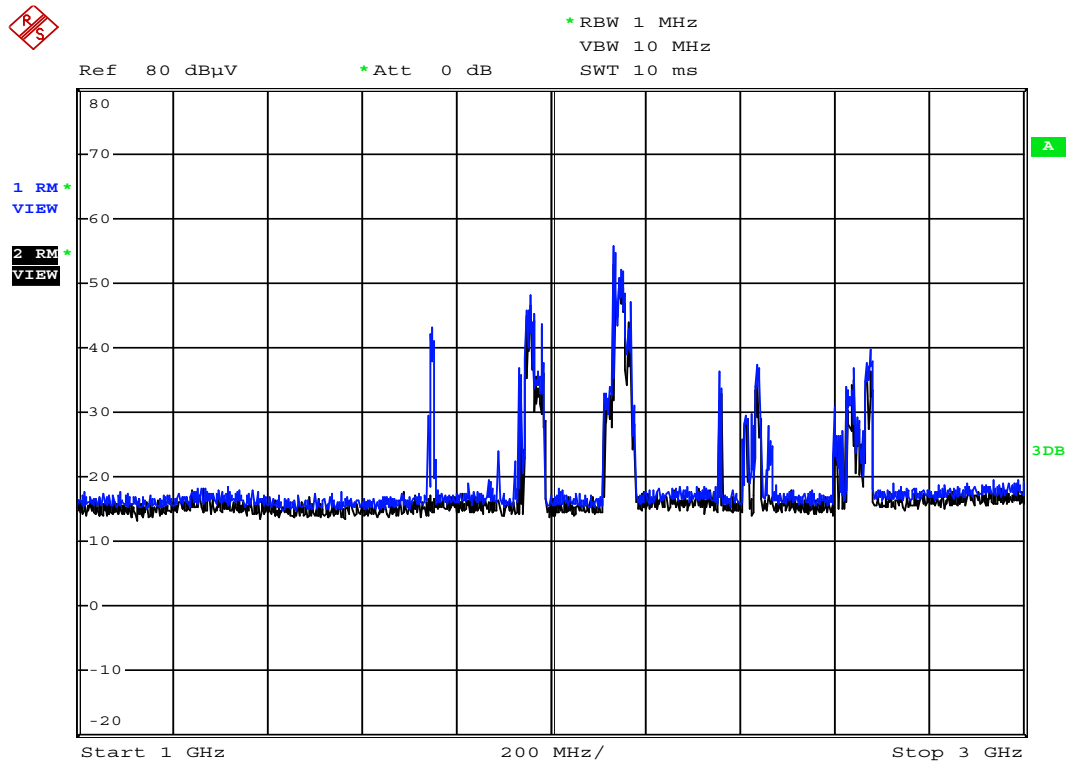
Plot 8.5 – Radiated Rx Emissions, 1 – 3GHz, Horizontal

Radiated Rx Emissions:



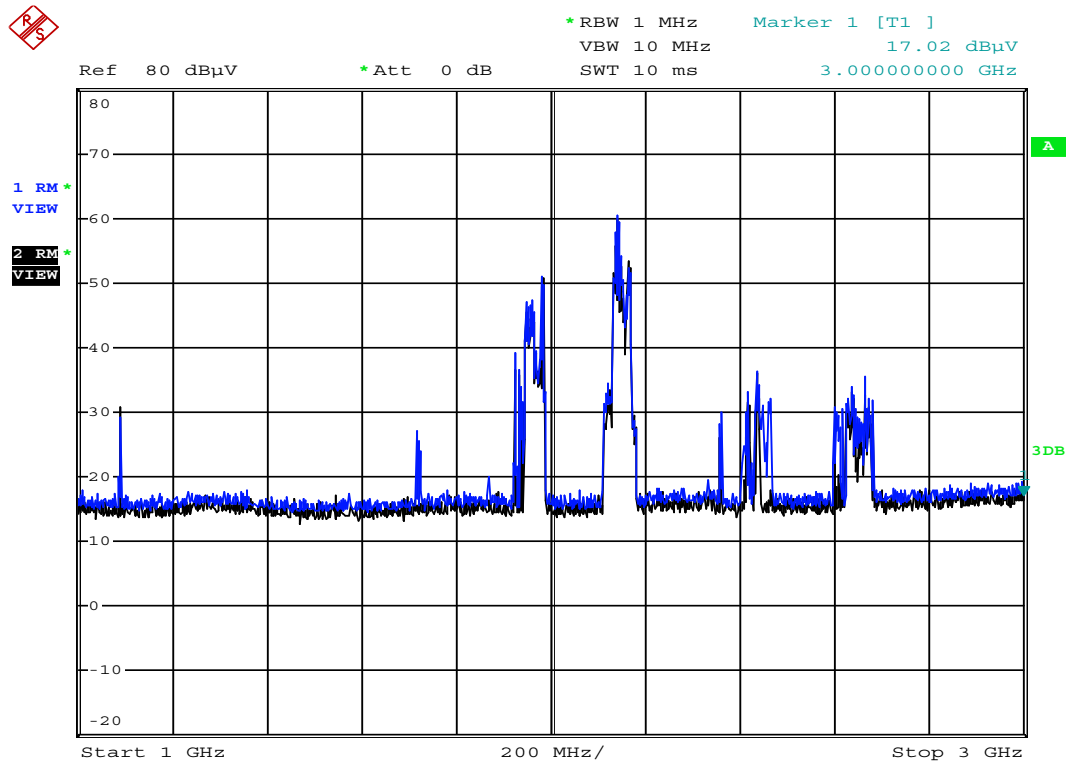
Date: 25.MAR.2022 12:50:35

Trace 1: Ambient, Trace 2: DUT

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Horizontal	ND	ND

Plot 8.6 – Radiated Rx Emissions, 1 – 3GHz, Vertical

Radiated Rx Emissions:



Date: 25.MAR.2022 13:02:27

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Vertical	ND	ND

Trace 1: Ambient, Trace 2: DUT

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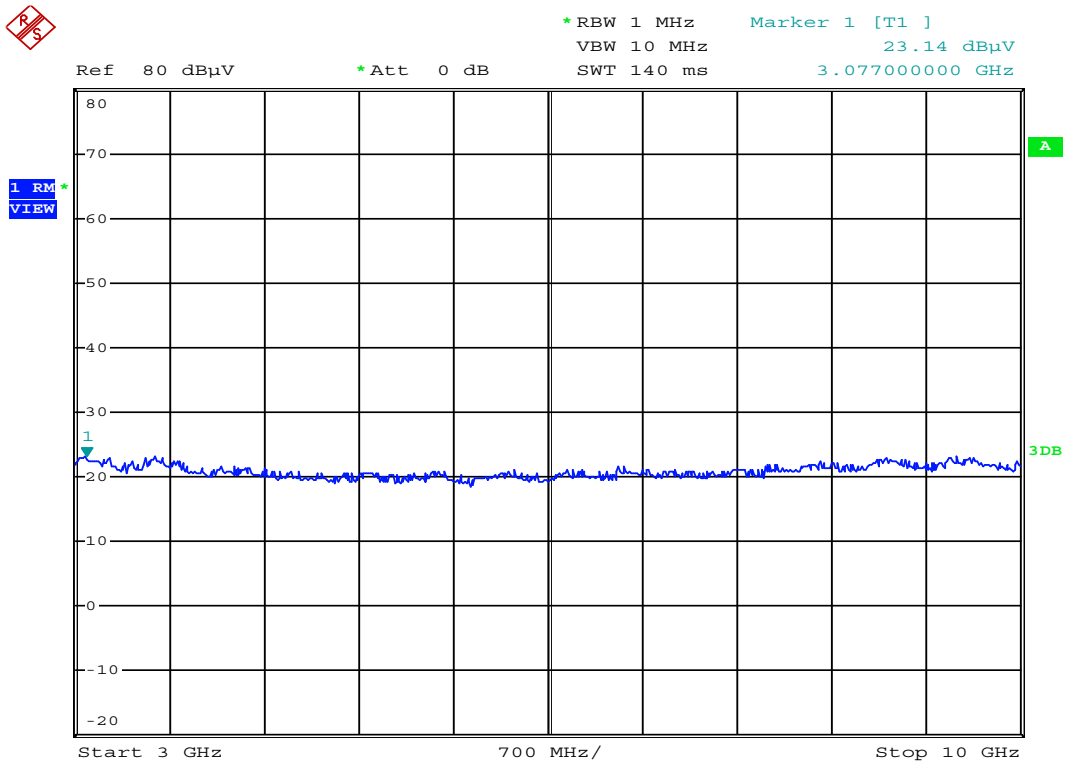
Plot 8.7 – Radiated Rx Emissions, 3 - 10GHz, Horizontal

Radiated Rx Emissions:



Date: 25.MAR.2022 12:51:03

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Horizontal	ND	ND

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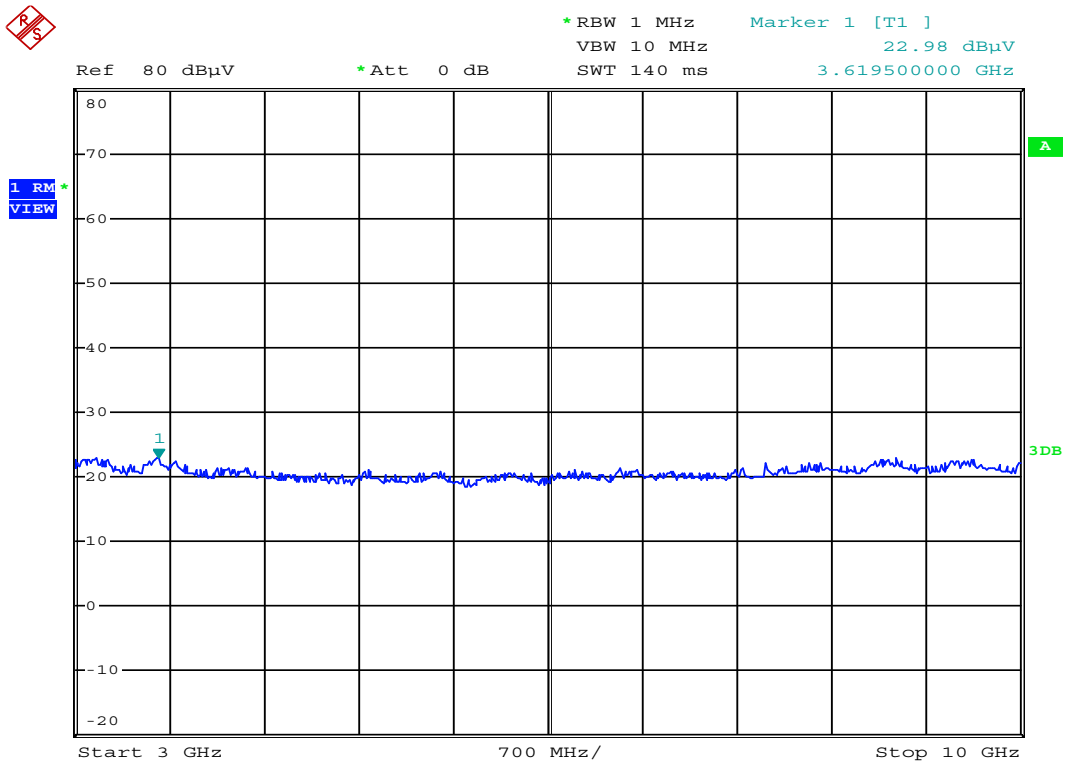
Plot 8.8 – Radiated Rx Emissions, 3 - 10GHz, Vertical

Radiated Rx Emissions:



Date: 25.MAR.2022 13:03:16

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Vertical	ND	ND

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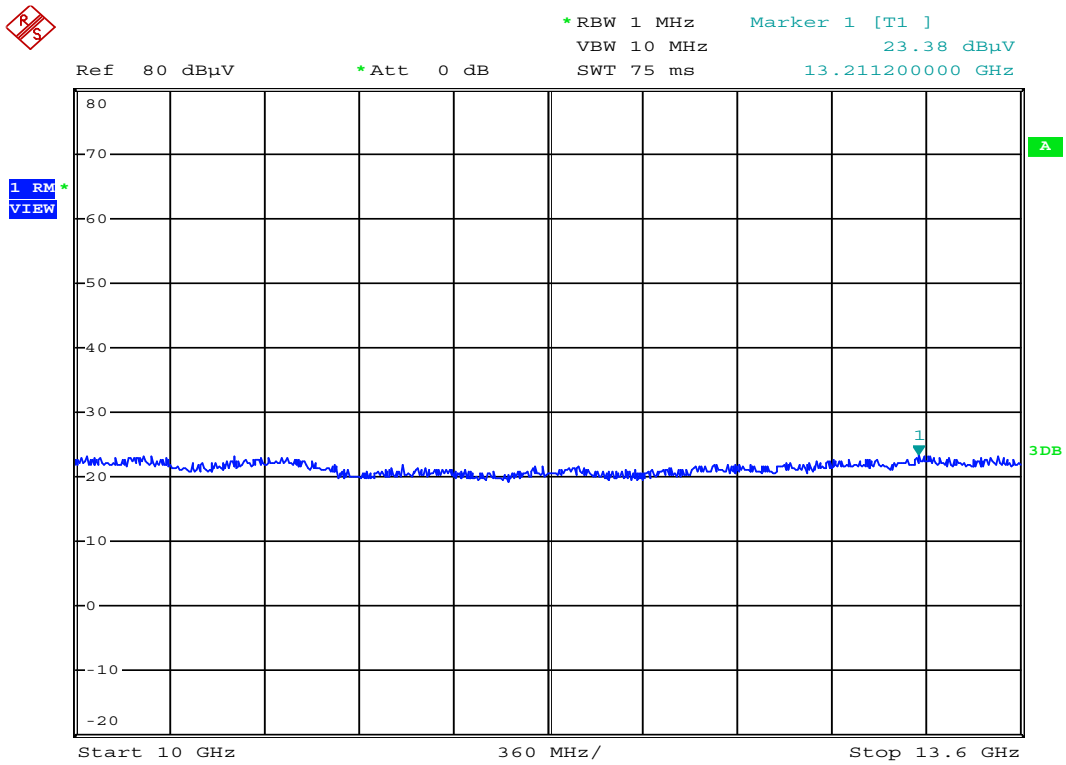
Plot 8.9 – Radiated Rx Emissions, 10 – 13.6GHz, Horizontal

Radiated Rx Emissions:



Date: 25.MAR.2022 12:51:31

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Horizontal	ND	ND

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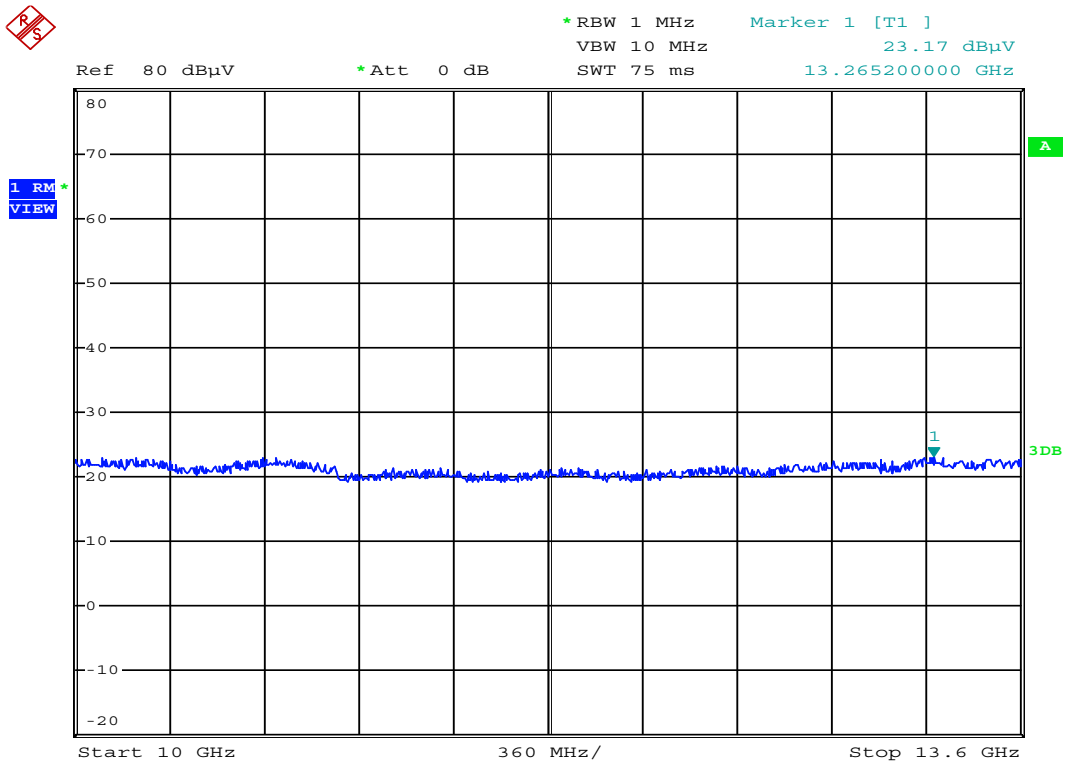
Plot 8.10 – Radiated Rx Emissions, 10 – 13.6GHz, Vertical

Radiated Rx Emissions:



Date: 25.MAR.2022 13:03:36

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Vertical	ND	ND

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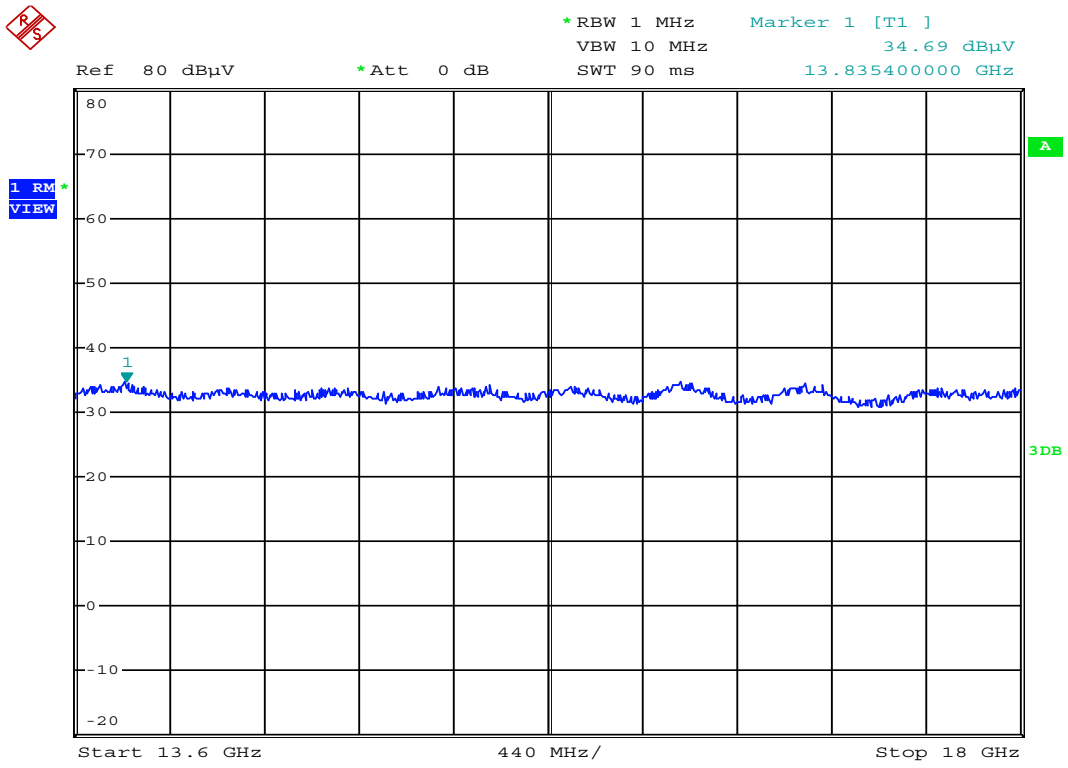
Plot 8.11 – Radiated Rx Emissions, 13.6 - 18GHz, Horizontal

Radiated Rx Emissions:



Date: 25.MAR.2022 12:51:54

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Horizontal	ND	ND

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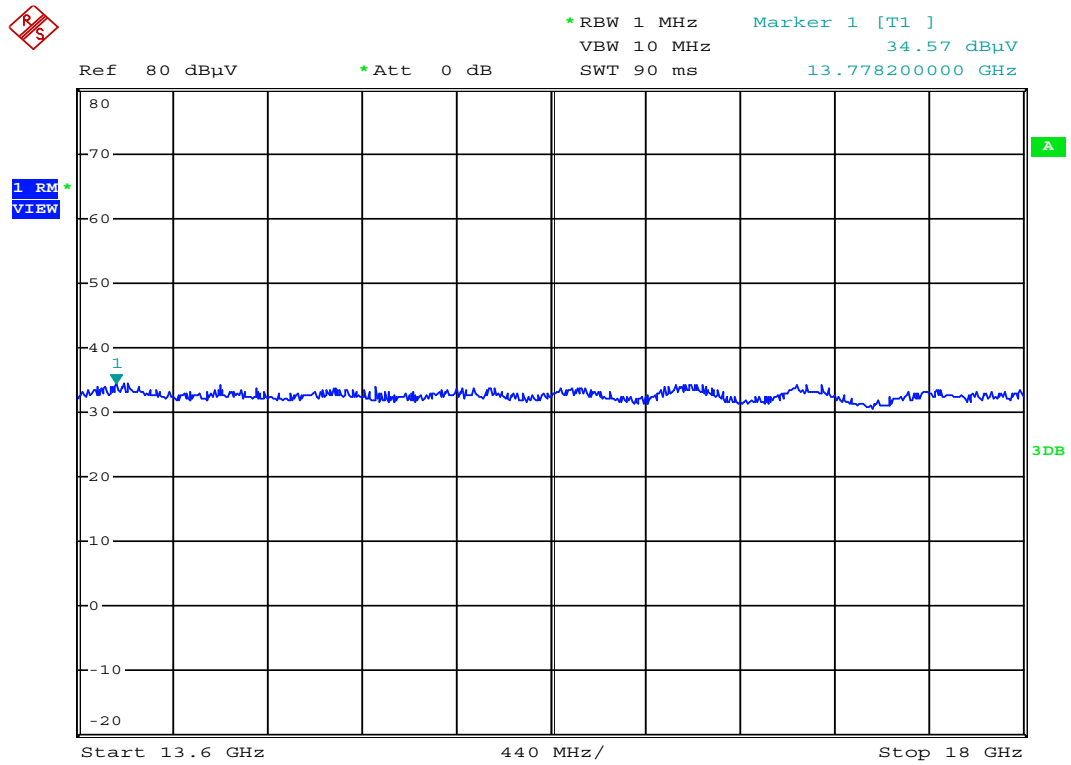
Plot 8.12 – Radiated Rx Emissions, 13.6 - 18GHz, Vertical

Radiated Rx Emissions:



Date: 25.MAR.2022 13:04:07

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Vertical	ND	ND

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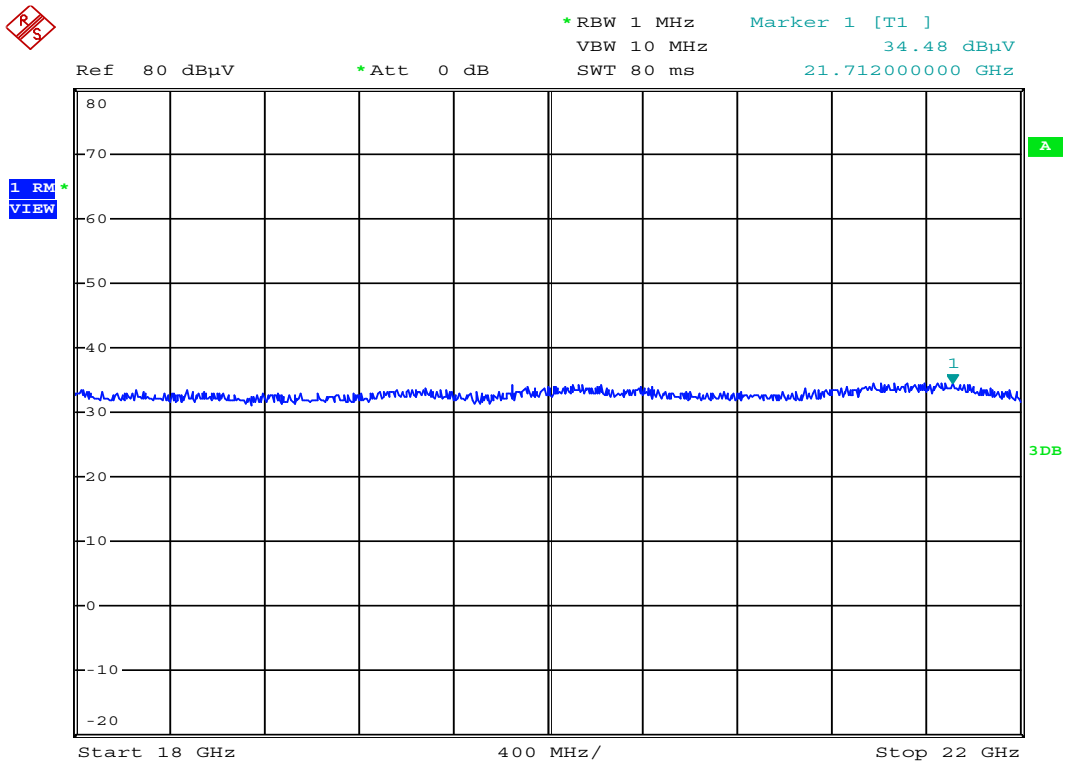
Plot 8.13 – Radiated Rx Emissions, 18 - 22GHz, Horizontal

Radiated Rx Emissions:



Date: 25.MAR.2022 13:19:42

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Horizontal	ND	ND

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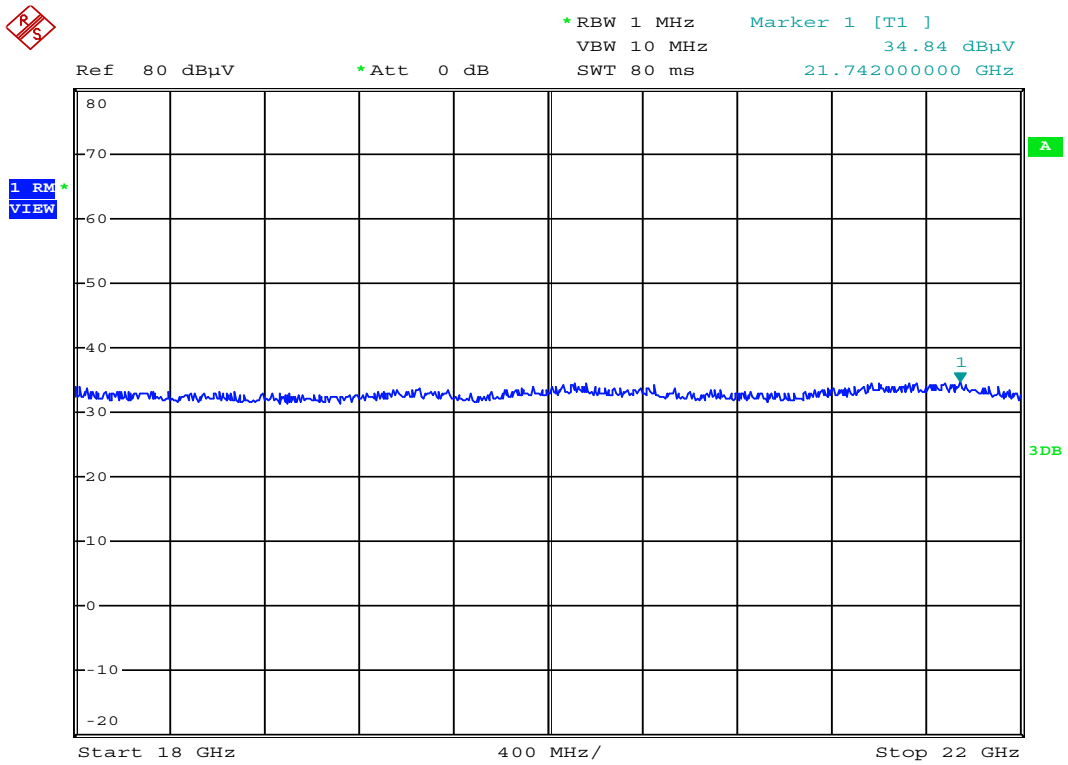
Plot 8.14 – Radiated Rx Emissions, 18 - 22GHz, Vertical

Radiated Rx Emissions:



Date: 25.MAR.2022 13:13:55

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Vertical	ND	ND

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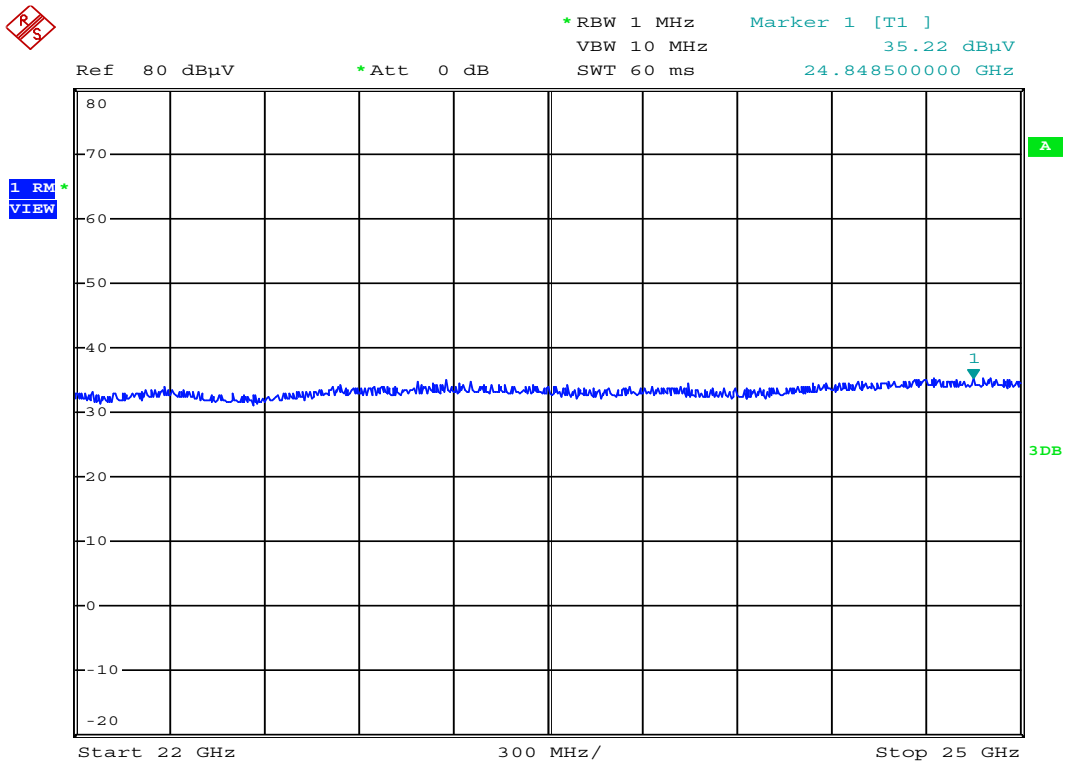
Plot 8.15 – Radiated Rx Emissions, 12 - 25GHz, Horizontal

Radiated Rx Emissions:



Date: 25.MAR.2022 13:20:01

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Horizontal	ND	ND

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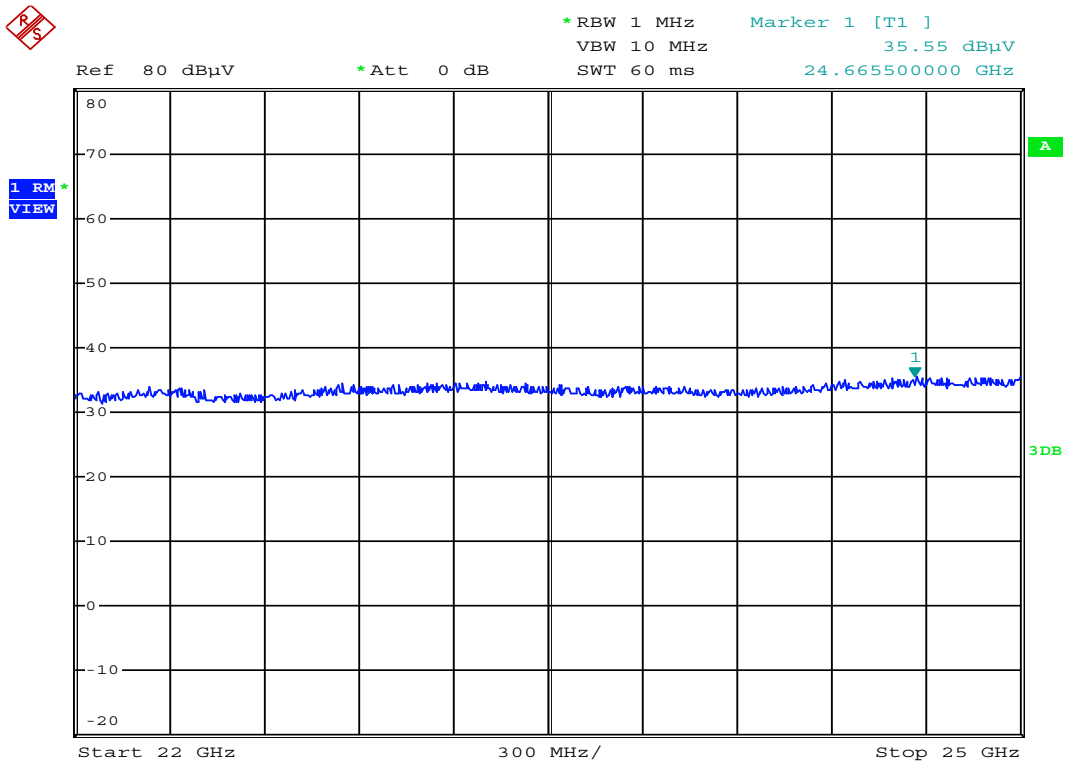
Plot 8.16 – Radiated Rx Emissions, 12 - 25GHz, Vertical

Radiated Rx Emissions:



Date: 25.MAR.2022 13:14:53

Antenna Polarization	Emission Frequency (MHz)	Measured Emission (dBm)
Vertical	ND	ND

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Table 8.1 – Summary of Radiated Rx Emissions

Summary of Radiated Rx Emissions										
Measured Frequency Range (MHz)	Channel Frequency (MHz)	Antenna Polarization	Emission Frequency	Measured Emission [E_{Meas}] (dBuV)	Antenna ACF [ACF] (dB)	Cable Loss [L_C] (dB)	Amplifier Gain [G_A] (dB)	Corrected Emission [E_{Corr}] (dBuV/m)	Limit (dBuV)	Margin (dB)
9kHz - 30MHz	2437	Front	ND MHz	ND (1)			0.00 (3)	(2)		**n/a**
9kHz - 30MHz	2437	Side	ND MHz	ND (1)			0.00 (3)	(2)		**n/a**
30-1000MHz	2437	Horizontal	31.35 MHz	12.7	23.00	0.67	0.00 (3)	36.3 (2)	40.0	**3.7**
30-1000MHz	2437	Horizontal	462.40 MHz	11.3	22.50	1.91	0.00 (3)	35.7 (2)	46.0	**10.3**
30-1000MHz	2437	Horizontal	867.00 MHz	10.4	29.40	2.78	0.00 (3)	42.5 (2)	46.0	**3.5**
30-1000MHz	2437	Vertical	ND MHz	ND (1)			0.00 (3)	(2)	46.0	**n/a**
1-25GHz	2437	Horizontal	ND MHz	ND (1)			0.00 (3)	(2)	46.0	**n/a**
1-25GHz	2437	Vertical	ND MHz	ND (1)			0.00 (3)	(2)	46.0	**n/a**
								Results:	**Complies**	

(1) No Emissions Detected (ND) above ambient or within 20dB of the limit
(2) Antenna ACF, Cable Loss and Amplifier Gain corrected in Spectrum Analyzer Transducer Factor
(3) External Amplier not used

$E_{Corr} = E_{Meas} + ACF^E + L_C - G_A$

Where ACF^E is the Electric Antenna Correction Factor
* Without Manufacturer's Accessories, ** With Manufacturer's Accessories

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9.0 LINE CONDUCTED EMISSIONS

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

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 µH/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**

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.

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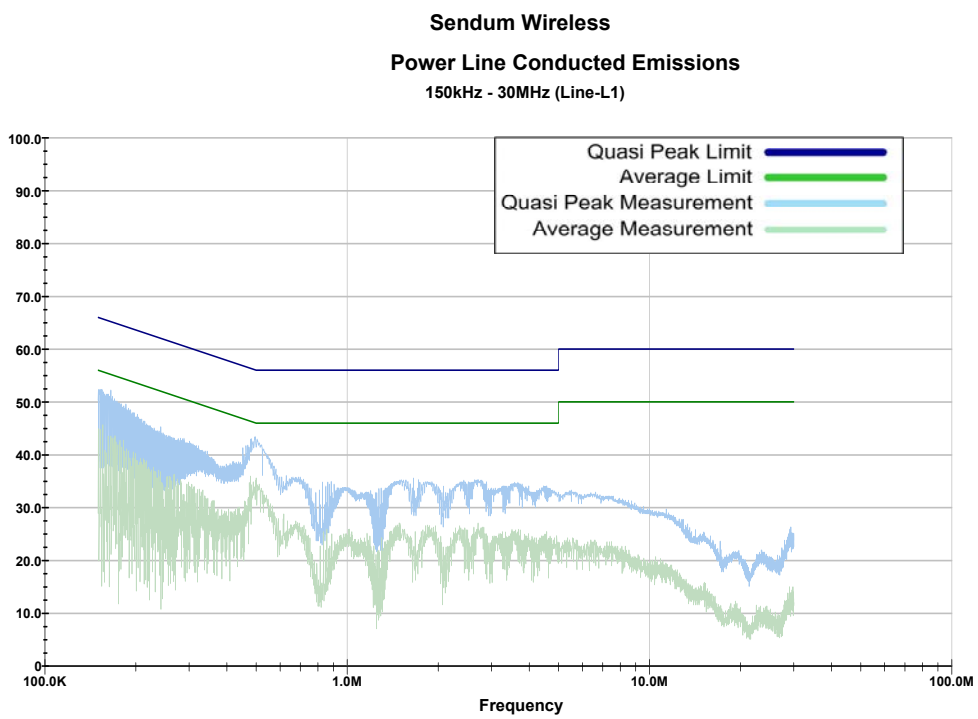
Plot 9.1 – Line Conducted Emissions, L1

Power Line Conducted Emissions



Channel Frequeny *(MHz)*	LISN Port	Emission Frequency *(MHz)*	Measured Emission *(dBuV)*
2437	L1	-	-

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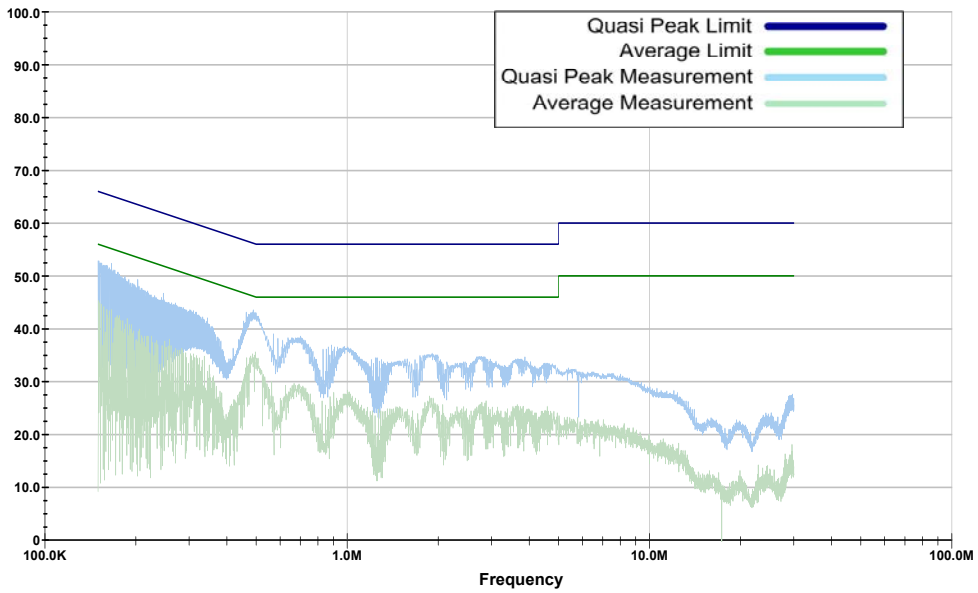
Plot 9.2 – Line Conducted Emissions, L2

Power Line Conducted Emissions



Channel Frequeny *(MHz)*	LISN Port	Emission Frequency *(MHz)*	Measured Emission *(dBuV)*
2437	L2	-	-

Table 9.1 – Summary of Power Line Conducted Emissions, L1

Summary of Power Line Conducted Tx Emissions												
Measured Frequency Range (MHz)	Channel Frequency (MHz)	LISN Port	Emission Frequency [f_{Emm}]		Measured Emission [E_{Meas}] (dBuV)	Detector*	Insertion Loss [L_{LISN}] (dB)	Cable Loss [L_C] (dB)	Amplifier Gain [G_A] (dB)		Corrected Emission [E_{Corr}] (dBuV)	Limit (dBuV)	Margin (dB)
150kHz - 30MHz	2437.0	L1	165.24	kHz	51.57	Peak	0.40	0.25	0.00	(3)	52.22 (2)	65.6	**13.4**
			465.88	kHz	42.85		0.30	0.26			43.41 (2)	56.6	**13.2**
			152.27	kHz	44.14	Average	0.40	0.26			44.80 (2)	56.3	**11.5**
			478.44	kHz	35.35		0.30	0.26			35.91 (2)	46.4	**10.5**
											Results:	**Complies**	

* In accordance with FCC §15.35 and ANSI C63.4, a Peak detector may be used to demonstrate compliance to Quasi-Peak limits provided the Resolution Bandwidth (RBW) is equal to or greater than Quasi-Peak bandwidth. The Detector RBW employed was ≥ 9kHz.
(2) LISN Insertion Loss, Cable Loss and Amplifier Gain corrected in Spectrum Analyzer Transducer Factor
(3) External Amplier not used
$E_{Corr} = E_{Meas} + L_{LISN} + L_C - G_A$
Class B QP Limit = 56 - 20Log (f_{Emm}/500) for f_{Emm} = 150kHz to 500kHz
Class B Avg Limit = 46 - 20Log (f_{Emm}/500) for f_{Emm} = 150kHz to 500kHz
Class A QP Limit = 79dBuV for f_{Emm} = 150kHz to 500kHz
Class A Avg Limit = 66dBuV for f_{Emm} = 150kHz to 500kHz
Margin = Limit - E_{corr}

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Table 9.2 – Summary of Power Line Conducted Emissions, L2

Summary of Power Line Conducted Tx Emissions												
Measured Frequency Range (MHz)	Channel Frequency (MHz)	LISN Port	Emission Frequency [f_{Emm}]	Measured Emission [E_{Meas}] (dBuV)	Detector*	Insertion Loss [L_{LISN}] (dB)	Cable Loss [L_C] (dB)	Amplifier Gain [G_A] (dB)	Corrected Emission [E_{Corr}] (dBuV)	Limit (dBuV)	Margin (dB)
150kHz - 30MHz	2437.0	L2	150.97 kHz	52.16	Peak	0.40	0.25	0.00 (3)	52.81 (2)	66.4	**13.6**
			489.73 kHz	42.95		0.30	0.26		43.51 (2)	56.2	**12.7**
			153.89 kHz	43.94	Average	0.40	0.26		44.60 (2)	56.2	**11.6**
			496.60 kHz	35.04		0.30	0.27		35.61 (2)	46.1	**10.5**
									Results:	**Complies**	

* In accordance with FCC §15.35 and ANSI C63.4, a Peak detector may be used to demonstrate compliance to Quasi-Peak limits provided the Resolution Bandwidth (RBW) is equal to or greater than Quasi-Peak bandwidth. The Detector RBW employed was ≥ 9kHz.
(2) LISN Insertion Loss, Cable Loss and Amplifier Gain corrected in Spectrum Analyzer Transducer Factor
(3) External Amplier not used
$E_{Corr} = E_{Meas} + L_{LISN} + L_C - G_A$
Class B QP Limit = 56 - 20Log (f_{Emm}/500) for f_{Emm} = 150kHz to 500kHz
Class B Avg Limit = 46 - 20Log (f_{Emm}/500) for f_{Emm} = 150kHz to 500kHz
Class A QP Limit = 79dBuV for f_{Emm} = 150kHz to 500kHz
Class A Avg Limit = 66dBuV for f_{Emm} = 150kHz to 500kHz
Margin = Limit - E_{corr}

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APPENDIX A – TEST SETUP DRAWINGS AND EQUIPMENT

Table A.1 – Setup – Antenna Port Conducted Emissions Equipment

Figure A.1 – Setup – Antenna Port Conducted Emissions

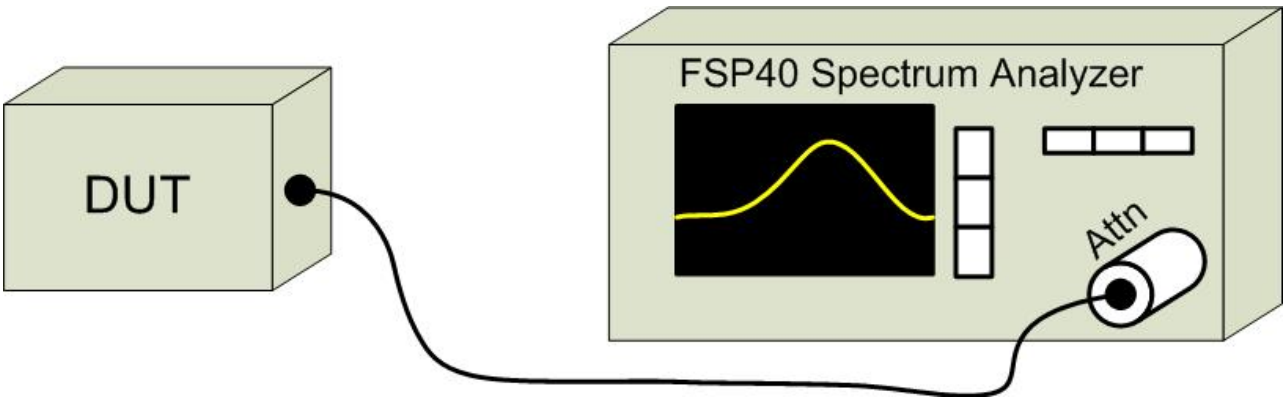

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Table A.2 – Setup - Radiated Emissions Equipment

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

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Figure A.2 – Test Setup Radiated Emissions Measurements 30 – 1000MHz

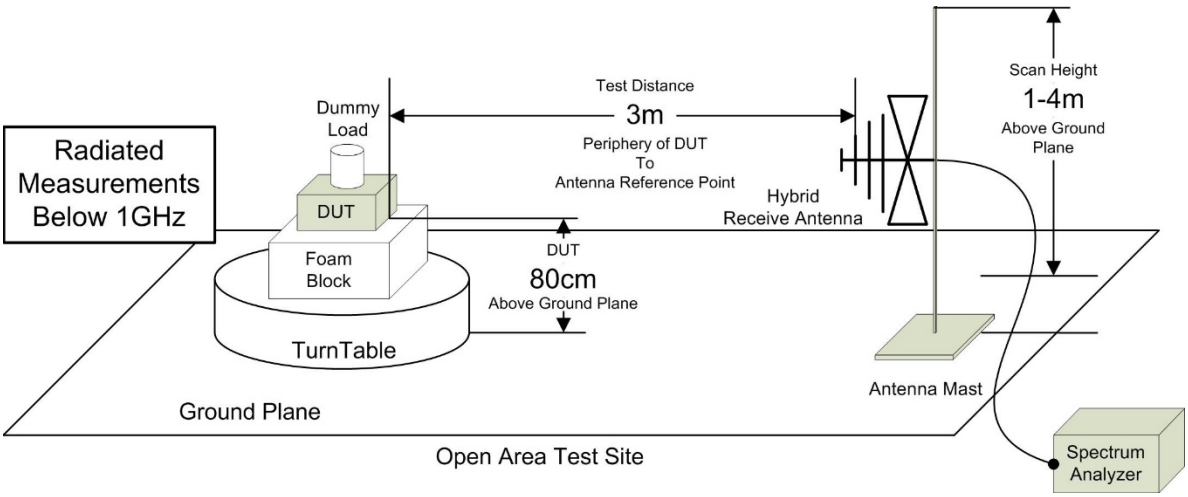

Figure A.3 – Test Setup Radiated Emissions Measurements 30 – 1000MHz w/ Signal Substitution

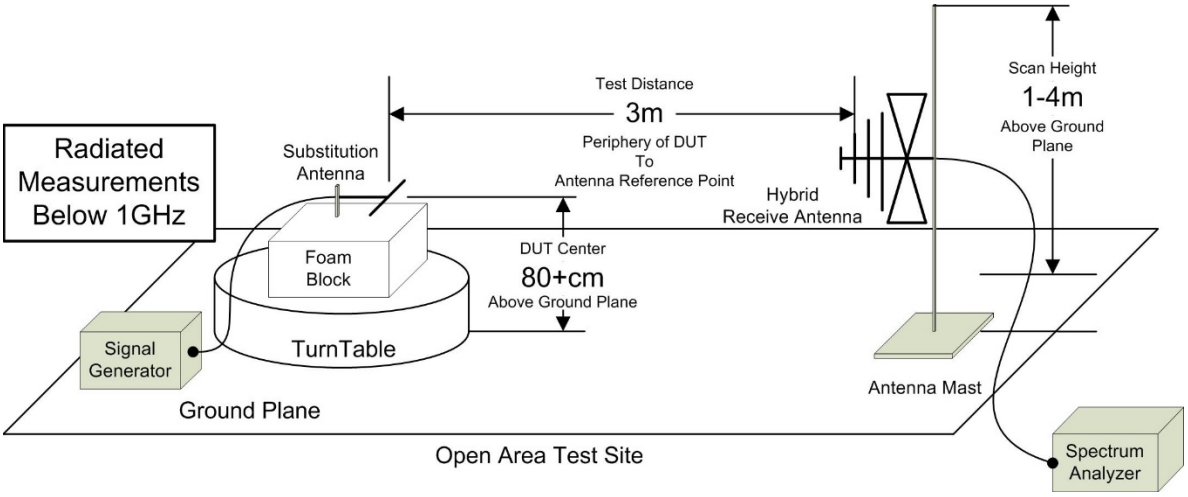

Figure A.4 – Test Setup Radiated Emissions Measurements 1 – 18GHz

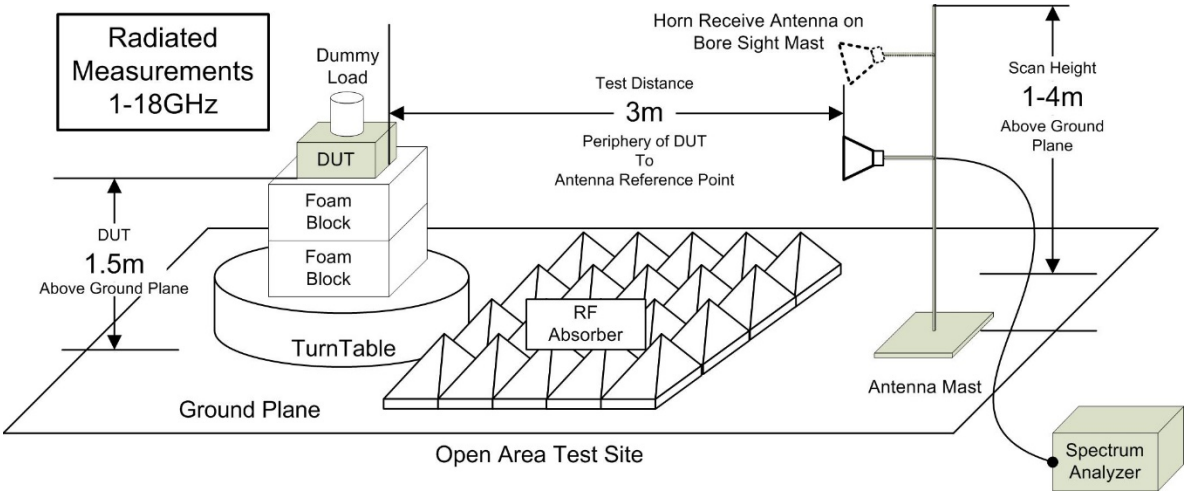

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Table A.3 – Setup – Line Conducted Emissions Equipment

Figure A.5 – Setup – Line Conducted Emissions

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APPENDIX B – EQUIPMENT LIST AND CALIBRATION

Equipment List							
Asset Number	Manufacturer	Model Number	Serial Number	Description	Last Calibrated	Calibration Interval	Calibration Due
00050	Chase	CBL-6111A	1607	Bilog Antenna	3 Jan 2019	Triennial	3 Jan 2022
00034	ETS	3115	6267	Double Ridged Guide Horn	26 Nov 2018	Triennial	26 Nov 2021
00035	ETS	3115	6276	Double Ridged Guide Horn	22 Mar 2019	Triennial	21 Mar 2022
00085	EMCO	6502	9203-2724	Loop Antenna	11 Jun 2019	Triennial	11 Jun 2022
00161	Waveline Inc.	889		Standard Gain Horn 18-26GHz	NCR	n/a	NCR
00162	Waveline Inc.	889		Standard Gain Horn 18-26GHz	NCR	n/a	NCR
00163	Waveline Inc.	1099		Standard Gain Horn 26-40GHz	NCR	n/a	NCR
00164	Waveline Inc.	1099		Standard Gain Horn 26-40GHz	NCR	n/a	NCR
00165	Waveline Inc.	801-KF		Waveguide Adapter 18-26GHz	NCR	n/a	NCR
00166	Waveline Inc.	801-KF		Waveguide Adapter 18-26GHz	NCR	n/a	NCR
00167	Waveline Inc.	1001-KF		Waveguide Adapter 26-40GHz	NCR	n/a	NCR
00168	Waveline Inc.	1001-KF		Waveguide Adapter 26-40GHz	NCR	n/a	NCR
00341	HP	11970k	3003A02959	Harmonic Mixer 18-26.5GHz	COU	n/a	COU
00342	Dorado	GH-42		Standard Gain Horn 18-26GHz	NCR	n/a	NCR
00343	HP	11970A	3003A04090	Harmonic Mixer 26.5-40GHz	COU	n/a	COU
00344	Dorado	GH-28		Standard Gain Horn 26.5-40GHz	NCR	n/a	NCR
00345	HP	11970U	2332A00174	Harmonic Mixer 40-60GHz	COU	n/a	COU
00346	Dorado	GH-19		Standard Gain Horn 40-60GHz	NCR	n/a	NCR
00347	HP	11970V	2521A01347	Harmonic Mixer 50-75GHz	COU	n/a	COU
00348	Dorado	GH-15	99005	Standard Gain Horn 50-75GHz	NCR	n/a	NCR
00349	HP	11970W	2521A01604	Harmonic Mixer 75-110GHz	COU	n/a	COU
00350	Dorado	GH-10	99001	Standard Gain Horn 75-110GHz	NCR	n/a	NCR
00351	CMT	RA42-K-F-4B-C	961418-002	Waveguide Adapter 18-26GHz	NCR	n/a	NCR
00352	CMT	RA28-K-F-4B-C	960452-004	Waveguide Adapter 26-40GHz	NCR	n/a	NCR
00333	HP	85685A	3010A01095	RF Preselector	23 Jun 2020	Triennial	30 Jun 2023
00049	HP	85650A	2043A00162	Quasi-peak Adapter	23 Jun 2020	Triennial	23 Jun 2023
00051	HP	8566B	2747A05510	Spectrum Analyzer	23 Jun 2020	Triennial	23 Jun 2023
00223	HP	8901A	3749A07154	Modulation Analyzer	10 Dec 2020	Triennial	10 Dec 2023
00224	HP	8903B	3729A18691	Audio Analyzer	11 Dec 2020	Triennial	11 Dec 2023
00241	R&S	FSU40	100500	Spectrum Analyzer	10 Aug 2021	Triennial	10 Aug 2024
00005	HP	8648D	3847A00611	Signal Generator	23 Jun 2020	Triennial	23 Jun 2023
00006	R&S	SMR20	100104	Signal Generator	11 Aug 2020	Triennial	11 Aug 2023
00243	Rigol	DS1102E	DS1ET150502164	Oscilloscope	10 Nov 2020	Triennial	10 Nov 2023
00254	LeCroy	WM8600A	532	Oscilloscope	NCR	n/a	NCR
00110	Gigatronics	8652A	1875801	Power Meter	26 Mar 2019	Triennial	26 Mar 2022
00237	Gigatronics	80334A	1837001	Power Sensor	26 Mar 2019	Triennial	26 Mar 2022
00232	ETS Lindgren	HI-6005	91440	Isotropic E-Field Probe	27 Jan 2021	Triennial	27 Jan 2024
00003	HP	53181A	3736A05175	Frequency Counter	23 Jun 2020	Triennial	23 Jun 2023
00257	Com-Power	LI-215A	191934	LISN	27 Dec 2021	Triennial	27 Dec 2024
00250	Circuit Test	DMR-1800	TE182	Digital Multi-Meter - DVM	23 Jun 2020	Triennial	23 Jun 2023
00041	AR	10W1000C	27887	Power Amplifier	NCR	n/a	NCR
00106	AR	5SIG4	26235	Power Amplifier	NCR	n/a	NCR
00280	AR	25A250AM6	22702	Power Amplifier	NCR	n/a	NCR
00265	Miteq	JS32-00104000-58-5P	1939850	Microwave L/N Amplifier	COU	n/a	COU
00071	EMCO	2090	9912-1484	Multi-Device Controller	n/a	n/a	n/a
00072	EMCO	2075	0001-2277	Mini-mast	n/a	n/a	n/a
00073	EMCO	2080	0002-1002	Turn Table	n/a	n/a	n/a
00081	ESPEC	ECT-2	0510154-B	Environmental Chamber	NCR	n/a	CNR
00234	VWR	61161-378	140320430	Temp/Humidity Meter	New	Triennial	New
00201	HP	E3611A	KR83015294	DC Power Supply	COU	n/a	COU
00236	Nokia	-	236	ESD Table	NCR	n/a	NCR
00255	Expert ESD	A4001	A4001-155	ESD Target	COU	n/a	COU
00064	NARDA	3020A	n/a	Bi-Directional Coupler	COU	n/a	COU
00263	Koaxis	KP10-1.00M-TD	263	1m Armoured Cable	COU	n/a	COU
00263B	Koaxis	KP10-1.00M-TD	263B	1m Armoured Cable	COU	n/a	COU
00264	Koaxis	KP10-7.00M-TD	264	7m Armoured Cable	COU	n/a	COU
00275	TMS	LMR400	n/a	25m Cable	COU	n/a	COU
00276	TMS	LMR400	n/a	4m Cable	COU	n/a	COU
00277	TMS	LMR400	n/a	4m Cable	COU	n/a	COU
00278	TILE	34G3	n/a	TILE Test Software	NCR	n/a	NCR
Rented Equipment							

NCR: No Calibration Required
COU: Calibrate On Use

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APPENDIX C – MEASUREMENT INSTRUMENT UNCERTAINTY

CISPR 16-4 Measurement Uncertainty (U_{LAB})	
This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence interval using a coverage factor of k=2	
Radiated Emissions 30MHz - 200MHz	
U_{LAB} = 5.14dB U_{CISPR} = 6.3dB	
Radiated Emissions 200MHz - 1000MHz	
U_{LAB} = 5.90dB U_{CISPR} = 6.3dB	
Radiated Emissions 1GHz - 6GHz	
U_{LAB} = 4.80dB U_{CISPR} = 5.2dB	
Radiated Emissions 6GHz - 18GHz	
U_{LAB} = 5.1dB U_{CISPR} = 5.5dB	
Power Line Conducted Emissions 9kHz to 150kHz	
U_{LAB} = 2.96dB U_{CISPR} = 3.8dB	
Power Line Conducted Emissions 150kHz to 30MHz	
U_{LAB} = 3.12dB U_{CISPR} = 3.4dB	
If the calculated uncertainty **U_{lab}** is **less** than **U_{CISPR}** then:	
1	Compliance is deemed to occur if **NO** measured disturbance exceeds the disturbance limit
2	Non-Compliance is deemed to occur if **ANY** measured disturbance **EXCEEDS** the disturbance limit
If the calculated uncertainty **U_{lab}** is **greater** than **U_{CISPR}** then:	
3	Compliance is deemed to occur if **NO** measured disturbance, increased by (**U_{lab} - U_{CISPR}**), exceeds the disturbance limit
4	Non-Compliance is deemed to occur if **ANY** measured disturbance, increased by (**U_{lab} - U_{CISPR}**), **EXCEEDS** the disturbance limit

Other Measurement Uncertainties (U_{LAB})
RF Conducted Emissions 9kHz - 40GHz
U_{LAB} = 1.0dB U_{CISPR} = n/a
Frequency/Bandwidth 9kHz - 40GHz
U_{LAB} = 0.1ppm U_{CISPR} = n/a
Temperature
U_{LAB} = 1^{O}C U_{CISPR} = n/a

END OF REPORT

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