

Test Report

Product	Smart Brick
Name and address of the applicant	LEGO System A/S Aastvej 1 Billund 7190, Denmark
Name and address of the manufacturer	LEGO System A/S Aastvej 1 Billund 7190, Denmark
Model	PEL-1
Rating	3.7V _{DC} (Li-Ion Battery)
Trademark	LEGO
Additional information	BLE, 13.56MHz, 8.25MHz
Tested according to	FCC Part 15.247 Frequency Hopping Transmitters / Digital Transmission Systems Industry Canada RSS-247, Issue 4 Digital Transmission Systems, Frequency Hopping Systems and Licence-Exempt Local Area Network Devices in 902-928 MHz, 2400-2483.5 MHz, 5150-5350 MHz, and 5470-5895 MHz bands
Order number	PRJ0078073
Tested in period	2025-07-02 to 2025-07-04
Issue date	2025-11-11
Name and address of the testing laboratory	 Nemko Scandinavia AS Instituttveien 6 2007 Kjeller, Norway www.nemko.com CAB Number: FCC: NO0001 ISED: NO0470 ISED No: 2040D-1   An accredited technical test executed under the Norwegian accreditation scheme
 Digitally signed by Frode Sveinsen DN: cn=Frode Sveinsen, c=NO, o=Nemko Scandinavia AS, ou=ETM, email=frode.sveinsen@nemko.com Date: 2025.11.11 13:39:27 +01'00'  Digitally signed by Roy Uggerud DN: cn=Roy Uggerud, c=NO, o=Nemko Scandinavia AS, email=Roy.uggerud@nemko.com Reason: I have reviewed this document Date: 2025.11.11 13:57:55 +01'00' Prepared by [Frode Sveinsen] Approved by [Roy Uggerud]	
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Revision history

Revision	Date	Comment	Sign
A	2025-09-12	First edition	FS
B	2025-10-20	Corrected model name	FS
C	2025-11-11	Updated to Issue 4	FS

GENERAL REMARKS

This report applies only to the sample(s) tested. It is the manufacturer's responsibility to ensure the additional production units of this product are manufactured with identical electrical and mechanical components. The manufacturer is solely responsible for any modifications to the product that could result in non-compliance with the relevant regulations.

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Opinions expressed within this report regarding general assessments and qualifications for PASS or FAIL to the standards limits and requirements are not part of the current accreditation. Neither are opinions expressed regarding model variants covered by the testing of this report.

CALIBRATION

All instruments used in the tests given in this test report are calibrated and traceable to national or international standards. Between calibrations all test set-ups are controlled and verified on a regular basis by periodic checks to ensure, with 95% confidence, that the instruments remain within the calibrated levels.

MEASUREMENT UNCERTAINTY

Measurement uncertainties are calculated or considered for all instruments and instrument set-ups used during these tests. Uncertainty figures are found in a separate clause in this report.

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1 INFORMATION

1.1 Test Item

Product	Smart Brick
Manufacturer	LEGO System A/S
Model	PEL-1
Serial number	Radiated: 0017FU, 0017F5 and 0017G2 Conducted: Sample1
FCC ID	NPI106929
ISED ID	3072A-106929
Hardware version	AB1.1-STD
Software version	V2.29.0-27
Frequency Range	2402 – 2480 MHz
Number of Channels	40
Operating Modes	Bluetooth Low Energy ☒ 1Mb ☒ 2Mb
Type of Modulation	GFSK
Conducted Output Power	3.8 mW
Antenna Connector	None (Integral Antenna)
Number of Antennas	1
Diversity or Smart Antennas	No
Power Supply	Secondary Battery (3.7V Li-Ion)

1.2 Description of Tested Device

The EUT is a Smart Brick with Bluetooth Low Energy (BLE) as well as 13.56 MHz and 8.25 MHz transmitters. The Smart Brick is charged by an inductive charger. The charging frequency is 27.12 MHz and there is no communication between Charger and Brick during charging.

1.3 Test Environment

Temperature:	20 - 23 °C
Relative humidity:	40 - 70 %
Normal test voltage:	3.7 V _{DC} (Nominal Battery Voltage)

The values are the limit registered during the test period.

1.4 Test Engineers

Frode Sveinsen

1.5 Antenna Requirement

Does the EUT have detachable antenna(s)?	☐ YES	☒ NO
If detachable, is the antenna connector(s) non-standard?	☐ YES	☐ NO
The tested equipment has only integral antennas. Conducted tests were performed with a temporary antenna connector.		

Requirement: FCC 15.203, 15.204

1.6 EUT Operating Modes

Description of operating modes	All tests were performed with the EUT set to transmit at a single channel with a pseudo-random bit pattern and normal modulation with output power at 6dBm.
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1.7 Comments

All measurements were performed with the EUT powered by a fully charged battery.

Measurements with BLE and NFC or NPM active at the same time were performed with BLE in advertising mode.

2 TEST REPORT SUMMARY

2.1 General

The tests were conducted on a sample of the equipment for demonstrating compliance with one or more of the following standards.

Standard	Description
FCC CFR 47 Part 15.247	Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz
ISED RSS-247, Issue 4	Digital Transmission Systems, Frequency Hopping Systems and Licence-Exempt Local Area Network Devices in 902-928 MHz, 2400-2483.5 MHz, 5150-5350 MHz, and 5470-5895 MHz bands
ISED RSS-GEN, Issue 5	General Requirements for Compliance of Radio Apparatus

The following standards and documents were used for one or more measurements:

Standard	Description
ANSI C63.4-2014	Unintentional Radiators
FCC: ANSI C63.10-2020	Procedures for Compliance Testing of Unlicensed Wireless Devices
ISED Canada: ANSI C63.10-2020 +cor.1-2023 +ANSI C63.10a-2024 +Errata to C63.10a-2024	Procedures for Compliance Testing of Unlicensed Wireless Devices +Corrigendum 1 +Amendment 1 +Errata to Amendment 1
FCC KDB 558074 D01	15.247 Measurement Guidance for DTS and Frequency Hopping Systems

All measurements are traceable to national standards.

A description of the test facility is on file with FCC and ISED Canada.

☒ New Submission	☐ Production Unit
☐ Class II Permissive Change	☒ Pre-production Unit
DTS Equipment Class	☐ Family Listing

2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247 Issue 4, RSS-GEN Issue 5 reference	ANSI C63.10-2020 Reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	5.13	N/A
Antenna Requirement	15.203	6.8 (RSS-GEN)	5.8	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2 / 8.8 (RSS-GEN)	6.2	N/A
Occupied Bandwidth (99% BW)	N/A	6.7 (RSS-GEN)	6.9.3	Complies
DTS Bandwidth	15.247(a)(2)	6.3.1a (RSS-247)	11.8 Option 2	Complies
Peak Power Output	15.247(b)	6.3.2 (RSS-247)	11.9.1.1	Complies
Power Spectral Density	15.247(d)	6.3.1b (RSS-247)	11.10.2 PKPSD (DTS)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	6.6 (RSS-247)	6.7 11.11 (DTS)	Complies
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	6.6 (RSS-247) 7.3 (RSS-GEN) 8.9 (RSS-GEN)	6.3, 6.5, 6.6, 6.10 11.12, 11.13 (DTS)	Complies

3 TEST RESULTS

3.1 Occupied Bandwidth (99% BW)

ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2013 Clause 6.9.2

Test Results: Complies

Measurement Data:

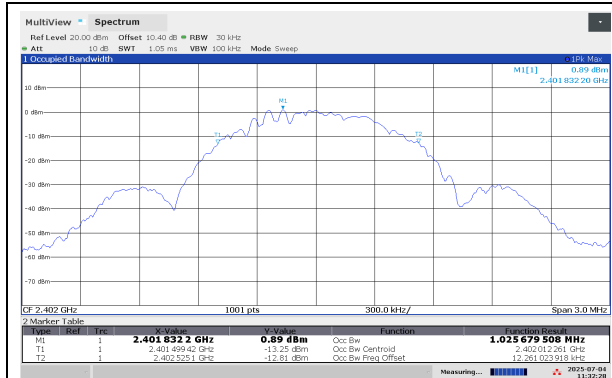
Carrier Frequency	Data Rate	Occupied Bandwidth (99% BW) (MHz)
2402 MHz	1Mb	1.03
2440 MHz		1.03
2480 MHz		1.02
2402 MHz	2Mb	2.05
2440 MHz		2.05
2480 MHz		2.05

Measurements on Brick 000VR6.

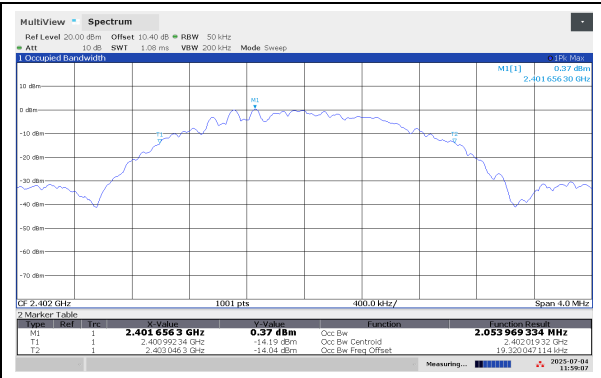
See attached plots

Requirements:

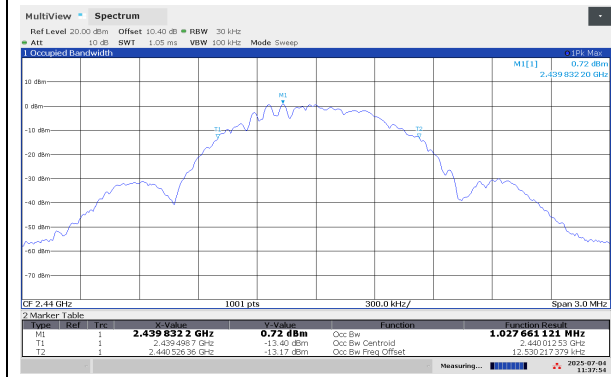
No requirement for 99% BW, reported for information only.



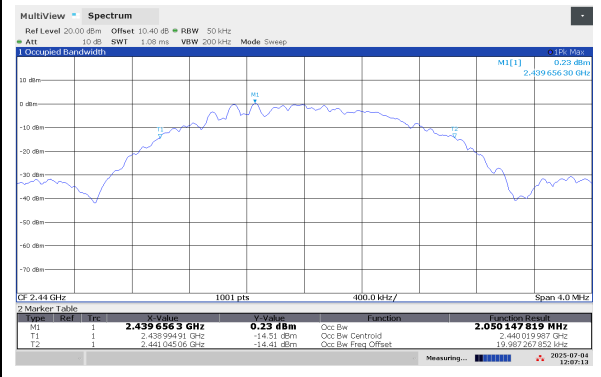
99% Occupied BW, 2402MHz, 1Mb



99% Occupied BW, 2402MHz, 2Mb



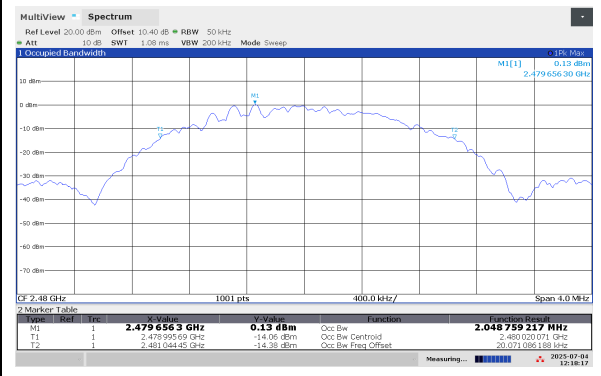
99% Occupied BW, 2440MHz, 1Mb



99% Occupied BW, 2440MHz, 2Mb



99% Occupied BW, 2480MHz, 1Mb



99% Occupied BW, 2480MHz, 2Mb

3.2 DTS Bandwidth (6dB BW)

FCC Part 15.247 (a)(2)

ISED Canada RSS-247 Issue 4, Clause 6.3.1a

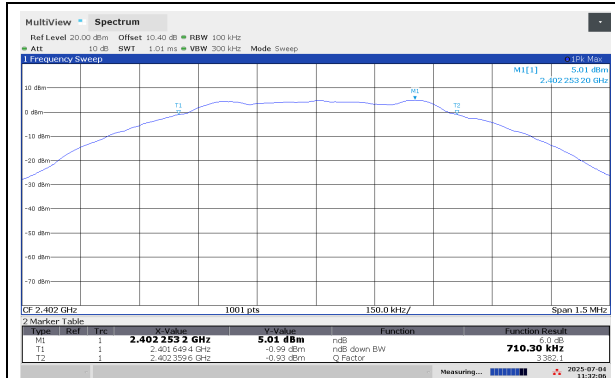
Measurement procedure: ANSI C63.10-2013 Clause 11.8

Test Results: Complies

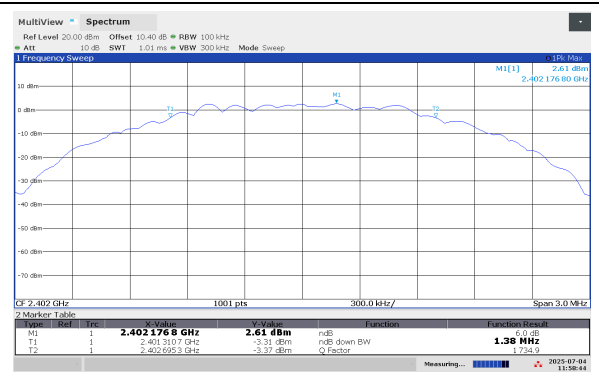
Measurement Data:

Data Rate	Measured DTS Bandwidth		
	2402 MHz	2440 MHz	2480 MHz
1Mb	710 kHz	710 kHz	712 kHz
2Mb	1.38 MHz	1.37 MHz	1.37 MHz

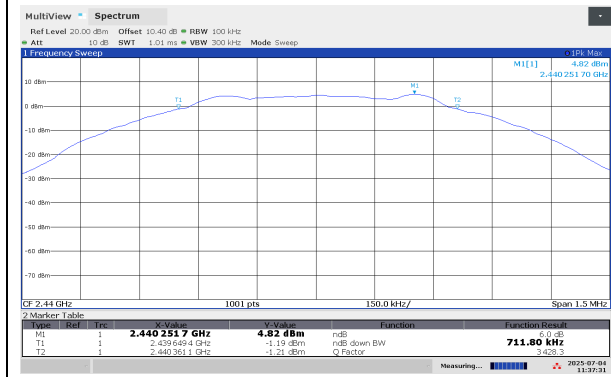
Frequency Band	Requirement for systems using Digital Modulation
902-928 MHz	The minimum 6 dB bandwidth shall be at least 500 kHz.
2400-2483.5 MHz	
5725-5850 MHz	



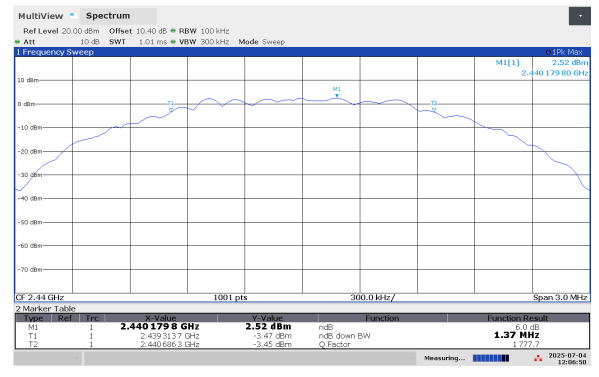
DTS BW, 2402 MHz, 1M



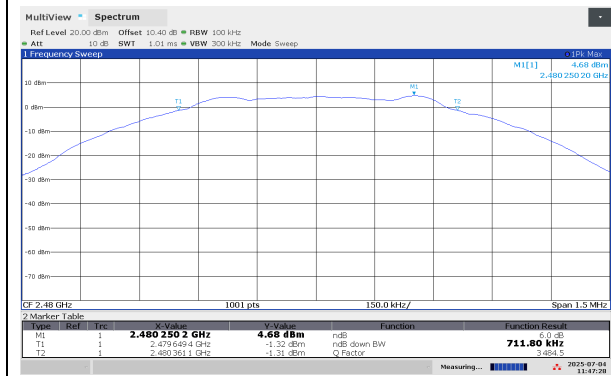
DTS BW, 2402 MHz, 2M



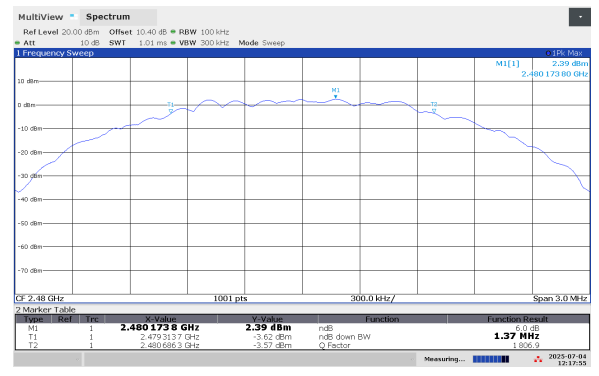
DTS BW, 2440 MHz, 1M



DTS BW, 2440 MHz, 2M



DTS BW, 2480 MHz, 1M



DTS BW, 2480 MHz, 2M

3.3 Peak Power Output

FCC Part 15.247 (b)

ISED Canada RSS-247 Issue 4, Clause 6.3.2

Measurement procedure: ANSI C63.10-2013 Clause 11.9.1.2

Test Results: Complies

Measurement Data:

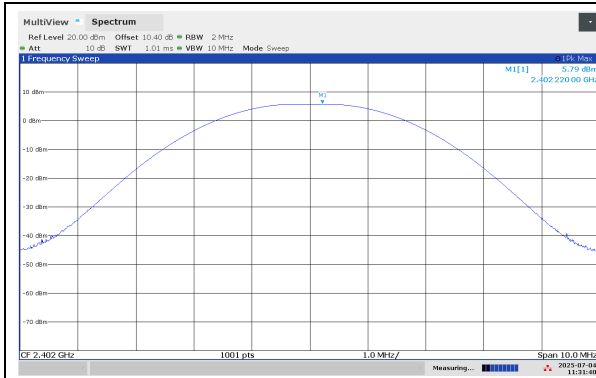
Data Rate	Carrier Frequency	Peak Conducted Power, dBm	Measured Field Strength, dBμV/m @3m	Calculated EIRP, dBm	Antenna Gain, dBi
1Mb	2402 MHz	5.79	87.4	-7.8	-13.6
	2440 MHz	5.60	88.0	-7.3	-12.8
	2480 MHz	5.46	86.0	-9.2	-14.6
2Mb	2402 MHz	5.79	86.3	-8.9	-14.7
	2440 MHz	5.60	88.1	-7.1	-12.7
	2480 MHz	5.45	86.3	-8.9	-14.3

Output Power reported is Maximum Peak Power.

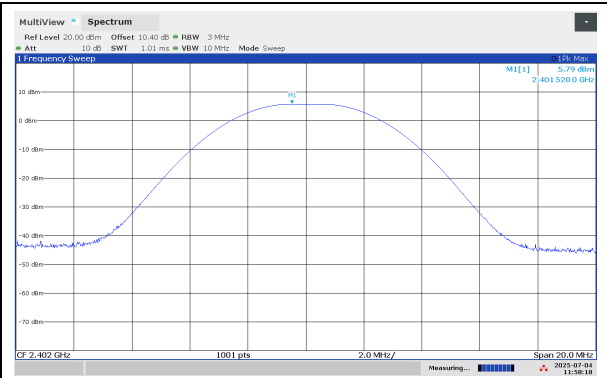
Radiated Power was calculated from measured Field Strength using the method described in ANSI C63.10-2013/2020 Annex G.

See attached plots.

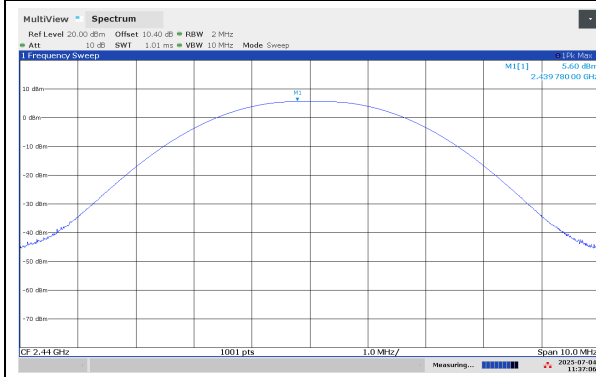
Requirements for Digital Modulation systems
For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the 1 Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the <i>maximum conducted output power</i> is the highest total transmit power occurring in any mode.
Maximum allowed Antenna Gain
If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



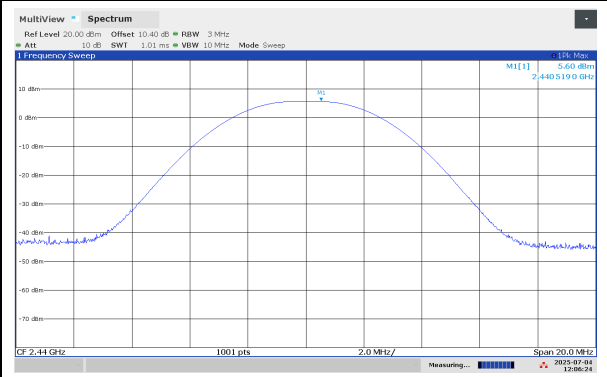
Peak Power, 2402 MHz, 1Mb



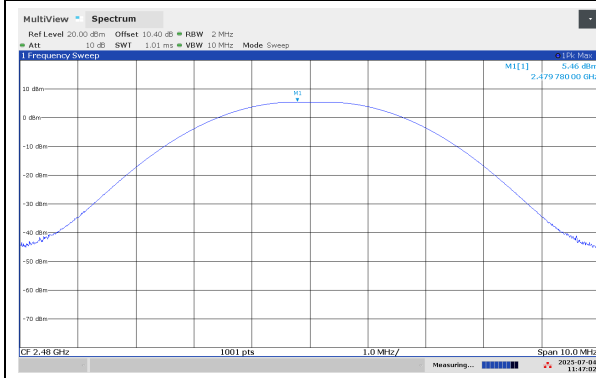
Peak Power, 2402 MHz, 2Mb



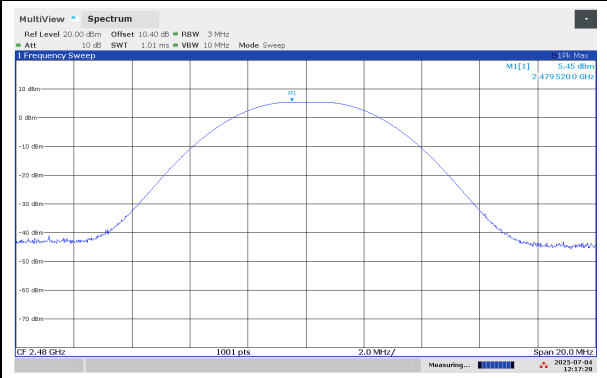
Peak Power, 2440 MHz, 1Mb



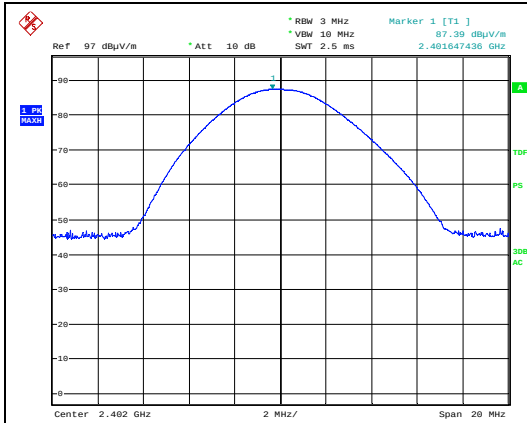
Peak Power, 2440 MHz, 2Mb



Peak Power, 2480 MHz, 1Mb

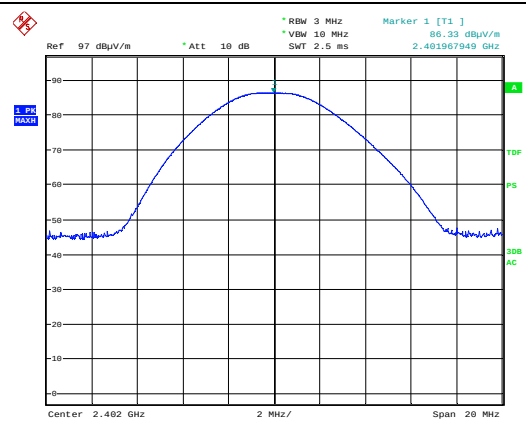


Peak Power, 2480 MHz, 2Mb



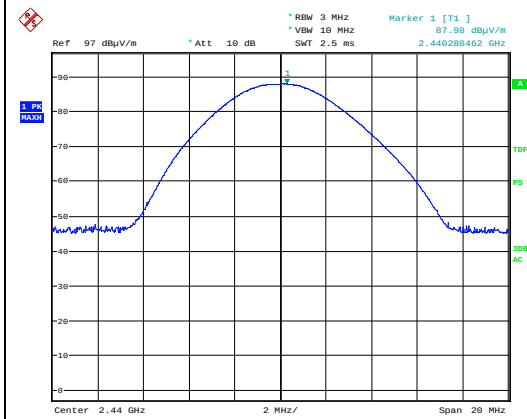
Date: 2.JUL.2025 11:00:37

Field Strength, 2402 MHz, 1Mb



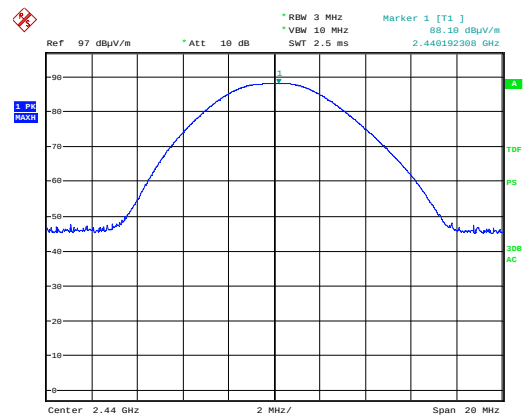
Date: 2.JUL.2025 11:14:42

Field Strength, 2402 MHz, 2Mb



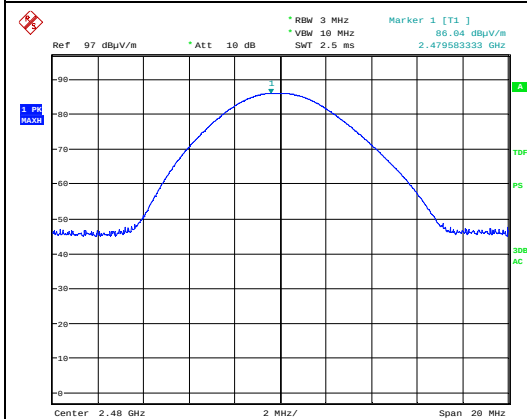
Date: 2.JUL.2025 11:20:46

Field Strength, 2440 MHz, 1Mb



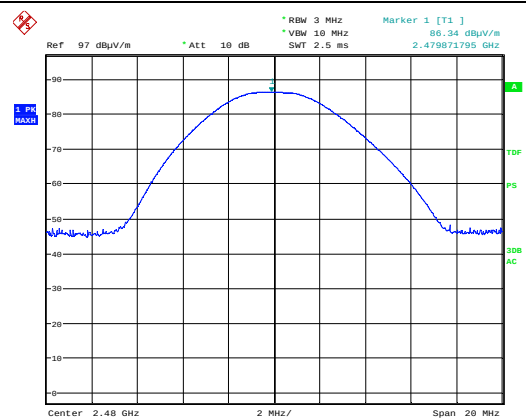
Date: 2.JUL.2025 11:25:20

Field Strength, 2440 MHz, 2Mb



Date: 2.JUL.2025 10:48:45

Field Strength, 2480 MHz, 1Mb



Date: 2.JUL.2025 10:57:35

Field Strength, 2480 MHz, 2Mb

3.4 Conducted Emissions at Antenna Connector

FCC Part 15.247 (d)

ISED Canada RSS-247 Issue 4, Clause 6.6

Measurement procedure: ANSI C63.10-2013 Clause 11.11

Test Results: Complies

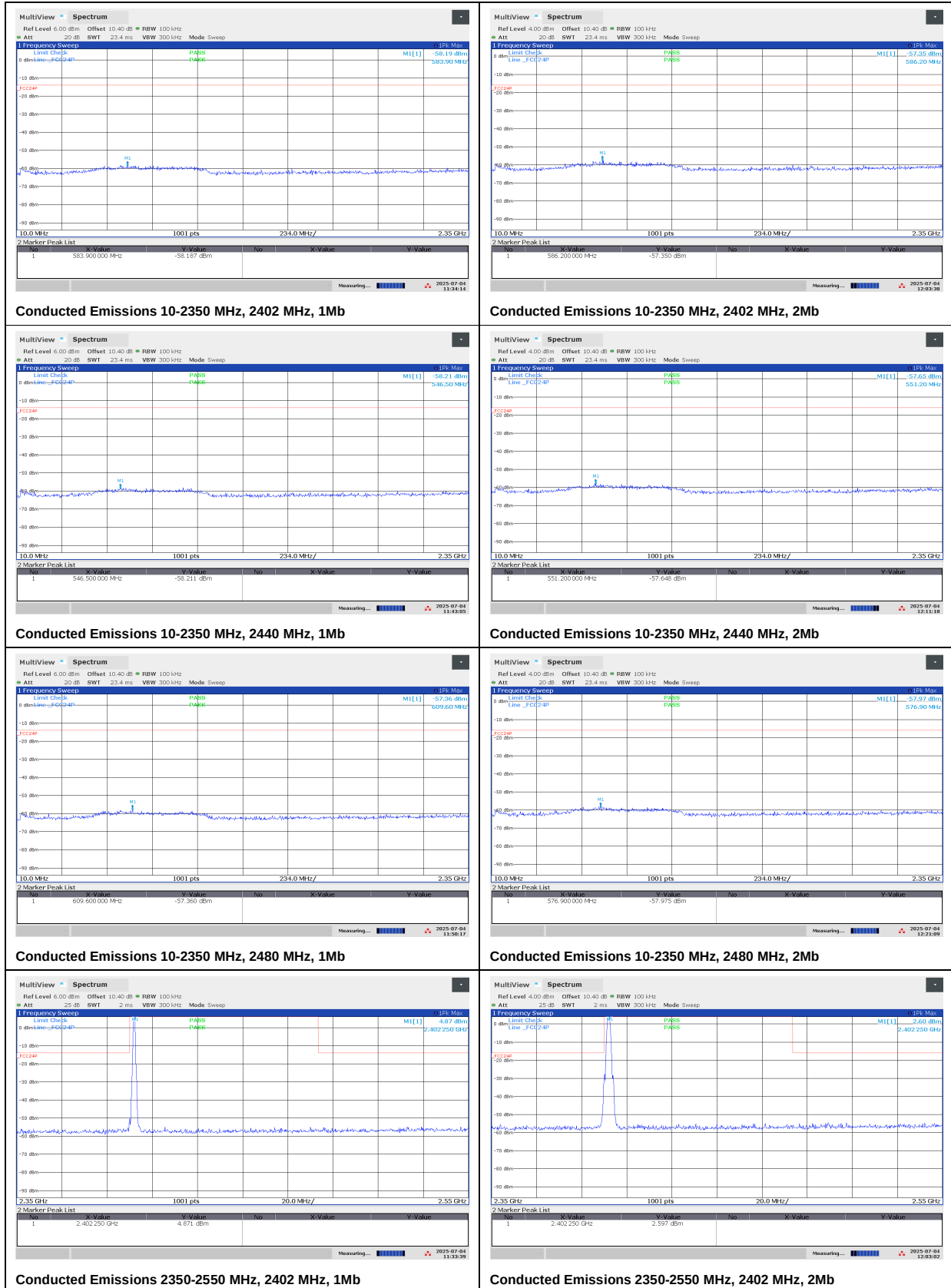
Measurement Data:

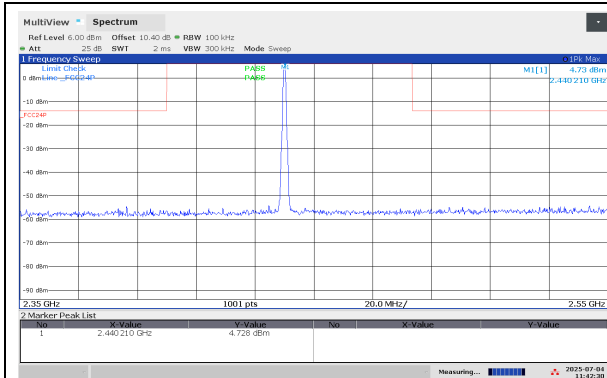
Data Rate	Carrier Frequency	Highest Value (dBc)	Margin (dB)	Verdict
1Mb	2402 MHz	>40	>20	Pass
	2440 MHz	>40	>20	Pass
	2480 MHz	>40	>20	Pass
2Mb	2402 MHz	>40	>20	Pass
	2440 MHz	>40	>20	Pass
	2480 MHz	>40	>20	Pass

Measured with Peak Detector

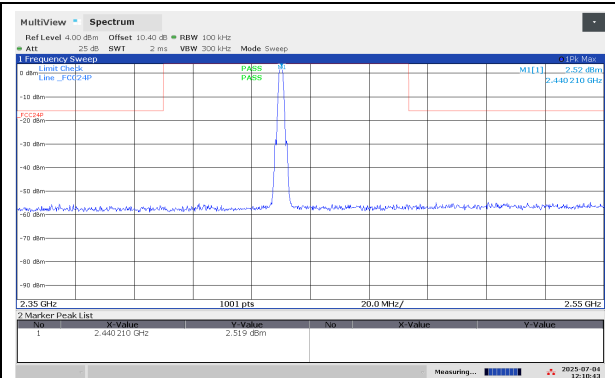
RF conducted power to 25 GHz: see attached plots.

Requirements for all systems	
Peak measurement	RMS averaging (alternative measurement)
20 dB or more below carrier measured in 100 kHz bandwidth	30 dB or more below carrier measured in 100 kHz bandwidth
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.	

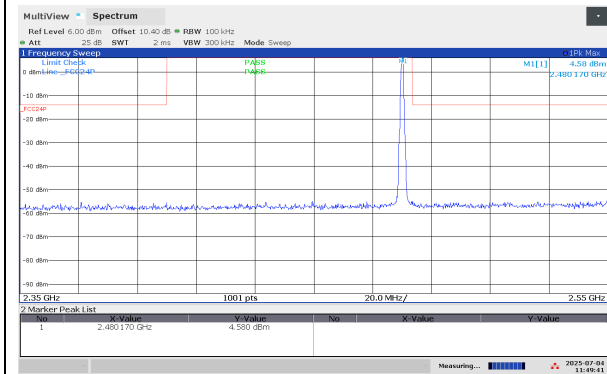




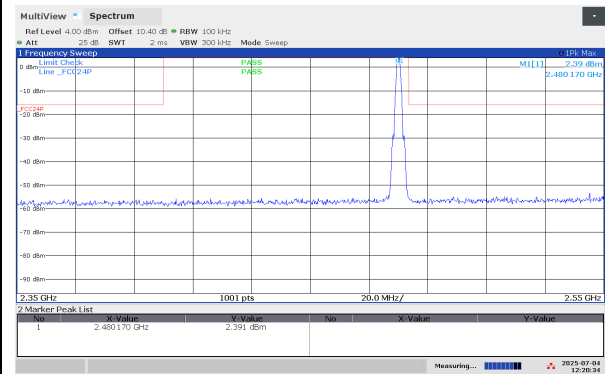
Conducted Emissions 2350-2550 MHz, 2402 MHz, 1Mb



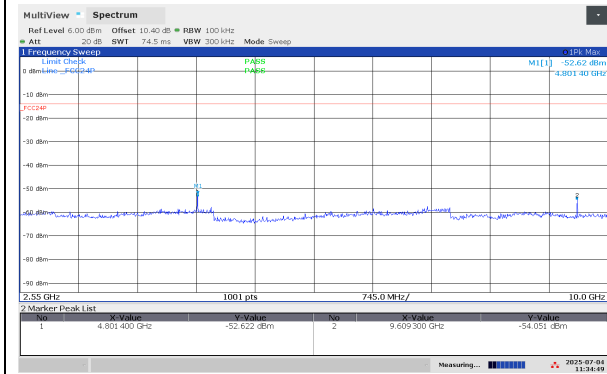
Conducted Emissions 2350-2550 MHz, 2402 MHz, 2Mb



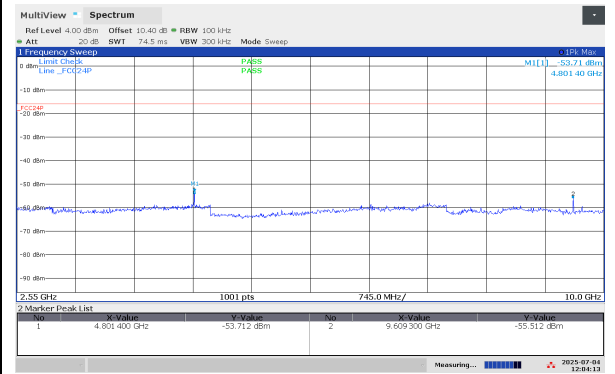
Conducted Emissions 2350-2550 MHz, 2480 MHz, 1Mb



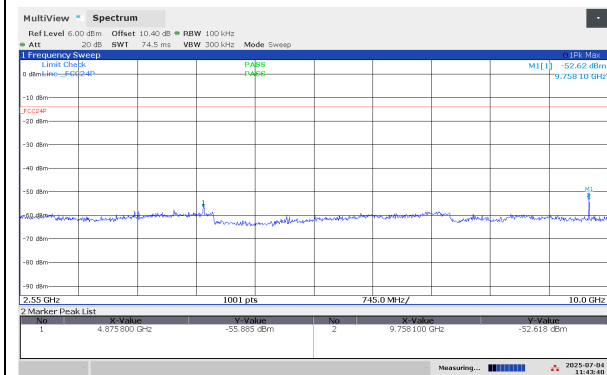
Conducted Emissions 2350-2550 MHz, 2480 MHz, 2Mb



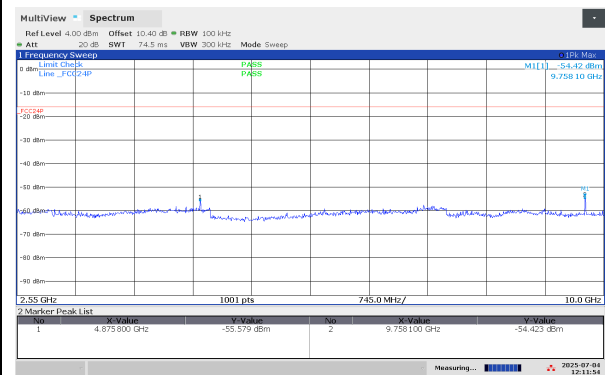
Conducted Emissions 2.55-10 MHz, 2402 MHz, 1Mb



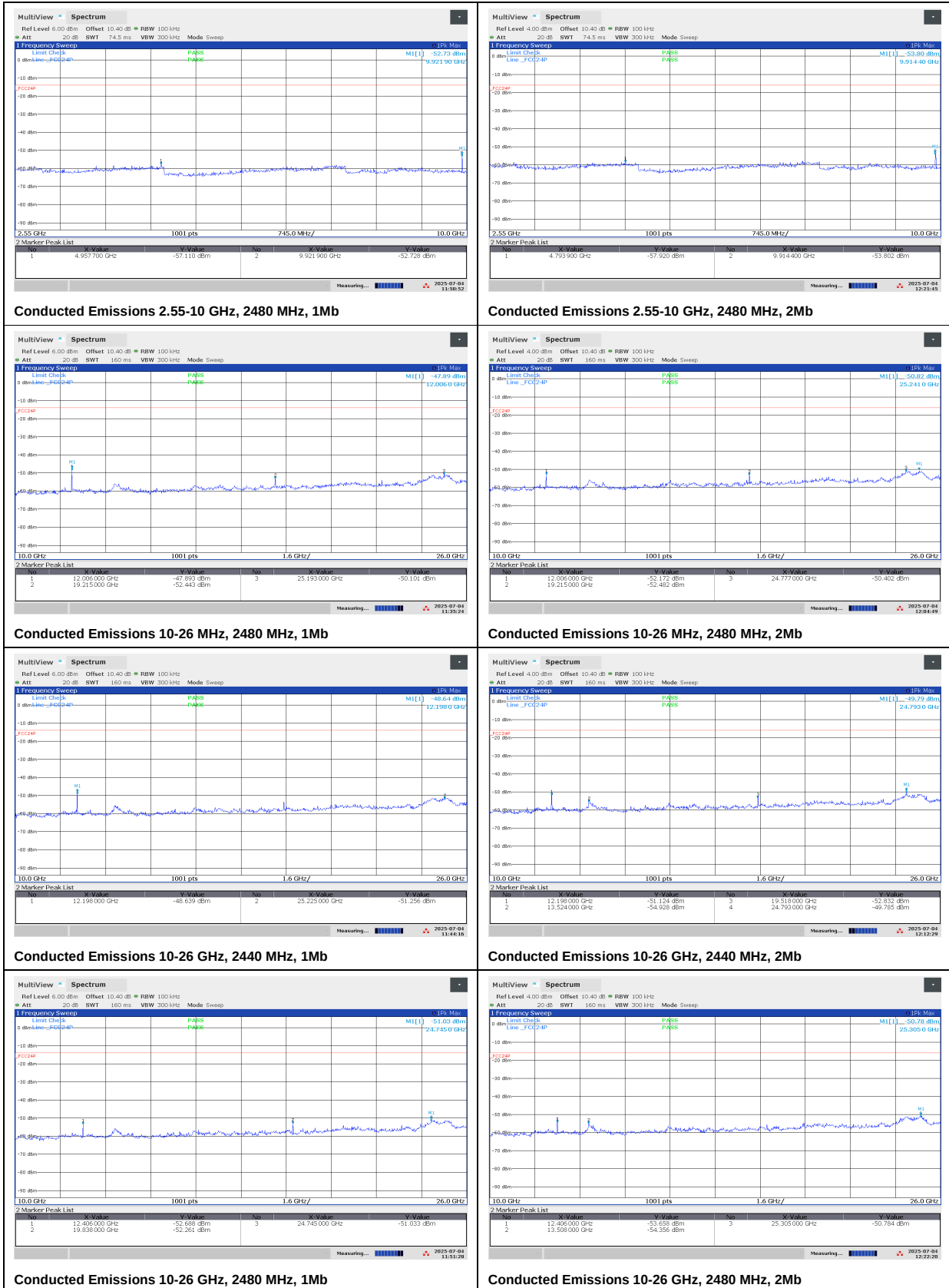
Conducted Emissions 2.55-10 MHz, 2402 MHz, 2Mb



Conducted Emissions 2.55-10 GHz, 2440 MHz, 1Mb



Conducted Emissions 2.55-10 GHz, 2440 MHz, 2Mb



3.5 Restricted Bands of operation

Restricted Bands of operation for FCC and ISSED are defined in FCC Part 15.205 and ISSED RSS-GEN, Issue 5 clause 8.10.

Generally, no fundamentals are allowed in the restricted bands and all emissions must comply with the limits in FCC 15.209 or RSS-GEN, Issue 5, clause 8.9.

FCC (MHz)	ISED (MHz)	FCC (GHz)	ISED (GHz)
0.090-0.110		0.96-1.24 1.3-1.427	0.96-1.427
0.495-0.505		1.435-1.6265	
2.1735-2.1905		1.6455-1.6465	
	3.020-3.026	1.660-1.710	
4.125-4.128		1.7188-1.7222	
4.17725-4.17775		2.2-2.3	
4.20725-4.20775		2.31-2.39	
	5.677-5.683	2.4835-2.5	
6.215-6.218		2.69-2.9	2.655-2.9
6.26775-6.26825		3.26-3.267	
6.31175-6.31225		3.332-3.339	
8.291-8.294		3.3458-3.358	
8.362-8.366		3.6-4.4	3.5-4.4
8.37625-8.38675		4.5-5.15	
8.41425-8.41475		5.35-5.46	
12.29-12.293		7.25-7.75	
12.51975-12.52025		8.025-8.5	
12.57675-12.57725		9.0-9.2	
13.36-13.41		9.3-9.5	
16.42-16.423		10.6-12.7	
16.69475-16.69525		13.25-13.4	
16.80425-16.80475		14.47-14.5	
25.5-25.67		15.35-16.2	
37.5-38.25		17.7-21.4	
73-74.6		22.01-23.12	
74.8-75.2		23.6-24.0	
108-121.94 123-138	108-138	31.2-31.8	
149.9-150.05		36.43-36.5	
156.52475-156.52525		Above 38.6	
156.7-156.9			
162.0125-167.17			
167.72-173.2			
240-285			
322-335.4			
399.9-410			
608-614			

Frequencies in **Bold** text are specific for FCC or ISSED, all other frequencies are common.

3.6 Radiated Emissions, Band Edge

FCC Part 15.209 (a)

ISED Canada RSS-247 Issue 4, Clause 6.6

ISED Canada RSS-GEN Issue 5, Clause 7.3 / 8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

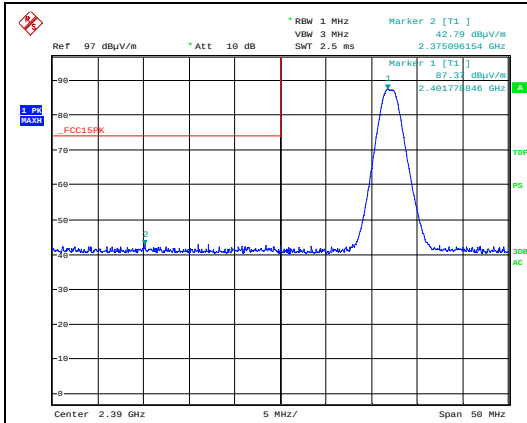
Test Results: Complies

Measurement Data:

Modulation and Bitrate	Detector	Measured field strength (dB μ V/m)		Limit (dB)	Margin (dB)	
		2390 MHz	2483.5 MHz			
GFSK 1Mb	Peak	42.8	46.4	74	31.2	27.6
GFSK 2Mb	Peak	42.9	49.9	74	31.1	24.1

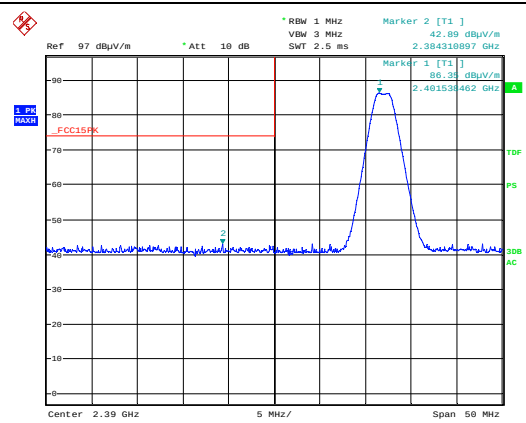
Peak values are below Average Limit.

See attached plots.



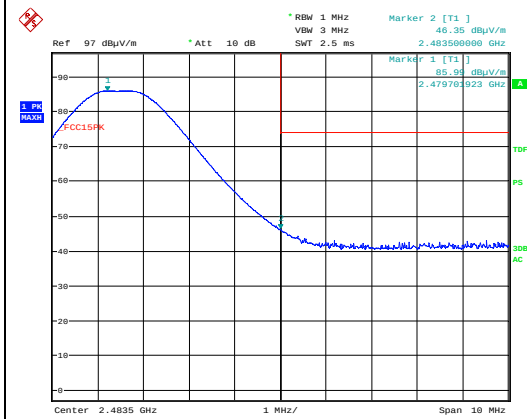
Date: 2.JUL.2025 11:09:21

Lower Band Edge, 2402 MHz, 1Mb, Peak



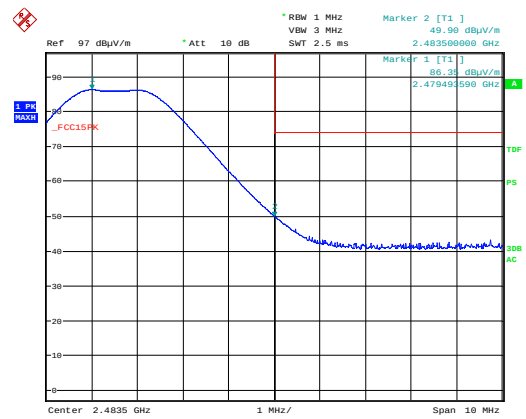
Date: 2.JUL.2025 11:15:26

Lower Band Edge, 2402 MHz, 2Mb, Peak



Date: 2.JUL.2025 10:52:03

Upper Band Edge, 2480 MHz, 1Mb, Peak



Date: 2.JUL.2025 10:58:19

Upper Band Edge, 2480 MHz, 2Mb, Peak

3.7 Radiated Emissions, 30 – 1000 MHz

FCC Part 15.209 (a)

ISED Canada RSS-247 Issue 4, Clause 6.6

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Detector: Peak

Measuring distance: 3m

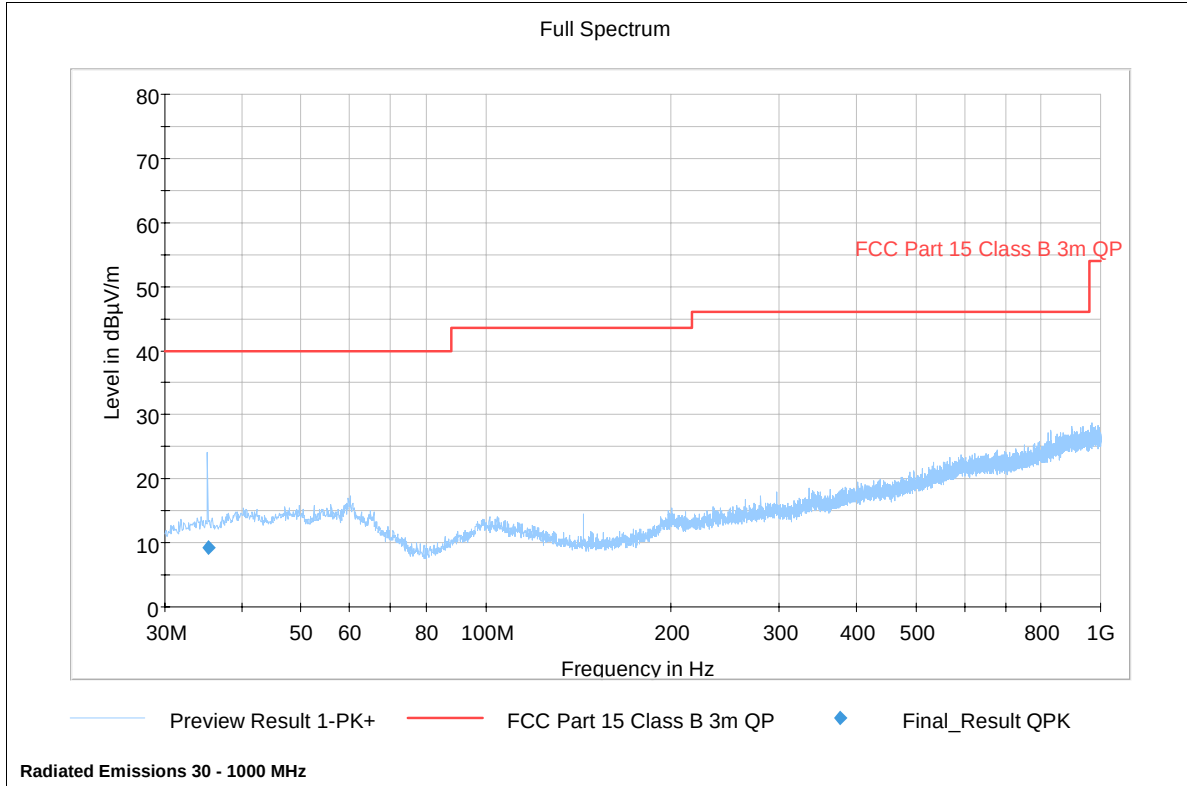
RBW / WBW = 100kHz / 300kHz

Measured Frequency (MHz)	Carrier Frequency (MHz)	Measured Emissions (dBμV/m)	Limit (dBμV/m)	Margin (dB)
33 – 88	2440	< 20	40.0	> 20
88 – 216	2440	< 23.5	43.5	> 20
216 – 960	2440	< 30	46.0	> 16
960 – 1000	2440	< 30	54.0	> 25

See attached plots.

Requirements/Limit

FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10	
Frequency	Radiated emission limit @3 meters	
30 – 88 MHz	100 μV/m	40.0 dBμV/m
88 – 216 MHz	150 μV/m	43.5 dBμV/m
216 – 960 MHz	200 μV/m	46.0 dBμV/m
960 – 1000 MHz	500 μV/m	54.0 dBμV/m
	Limits above are with Quasi Peak Detector	



3.8 Radiated Emissions, 1 – 26 GHz

FCC Part 15.209 (a)

ISED Canada RSS-247 Issue 4, Clause 6.6

ISED Canada RSS-GEN Issue 5, Clause 7.3/8.9

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Measuring distance: 3m (1 – 18 GHz)
1m (18 – 26 GHz)

RBW / WBW = 1MHz / 3MHz

Measured Frequency (GHz)	Carrier Frequency (MHz)	Data Rate	Measured Emissions (dBµV/m)		Limit (dBµV/m)		Margin (dB)	
			Peak	Average	Pk	Av	Pk	Av
4804	2402	1Mb	53.2	47.8	74	54	20.8	6.2
4880	2440	1Mb	53.7	47.9	74	54	20.3	6.1
4960	2480	1Mb	52.9	46.3	74	54	21.1	7.7
7206	2402	1Mb	53.4	44.3	74	54	20.6	9.7
7320	2440	1Mb	54.3	46.3	74	54	19.7	7.7
7320	2440	2Mb	53.7	45.0	74	54	20.3	9.0
7440	2480	1Mb	55.2	47.8	74	54	18.8	6.2
Any	Any	Any	< 56	< 46	74	54	>18	>8

A Band Reject Filter was used for measurements from 1 GHz to 18 GHz

Antenna factor, amplifier gain and cable loss are included in spectrum analyzer "Transducer factor".

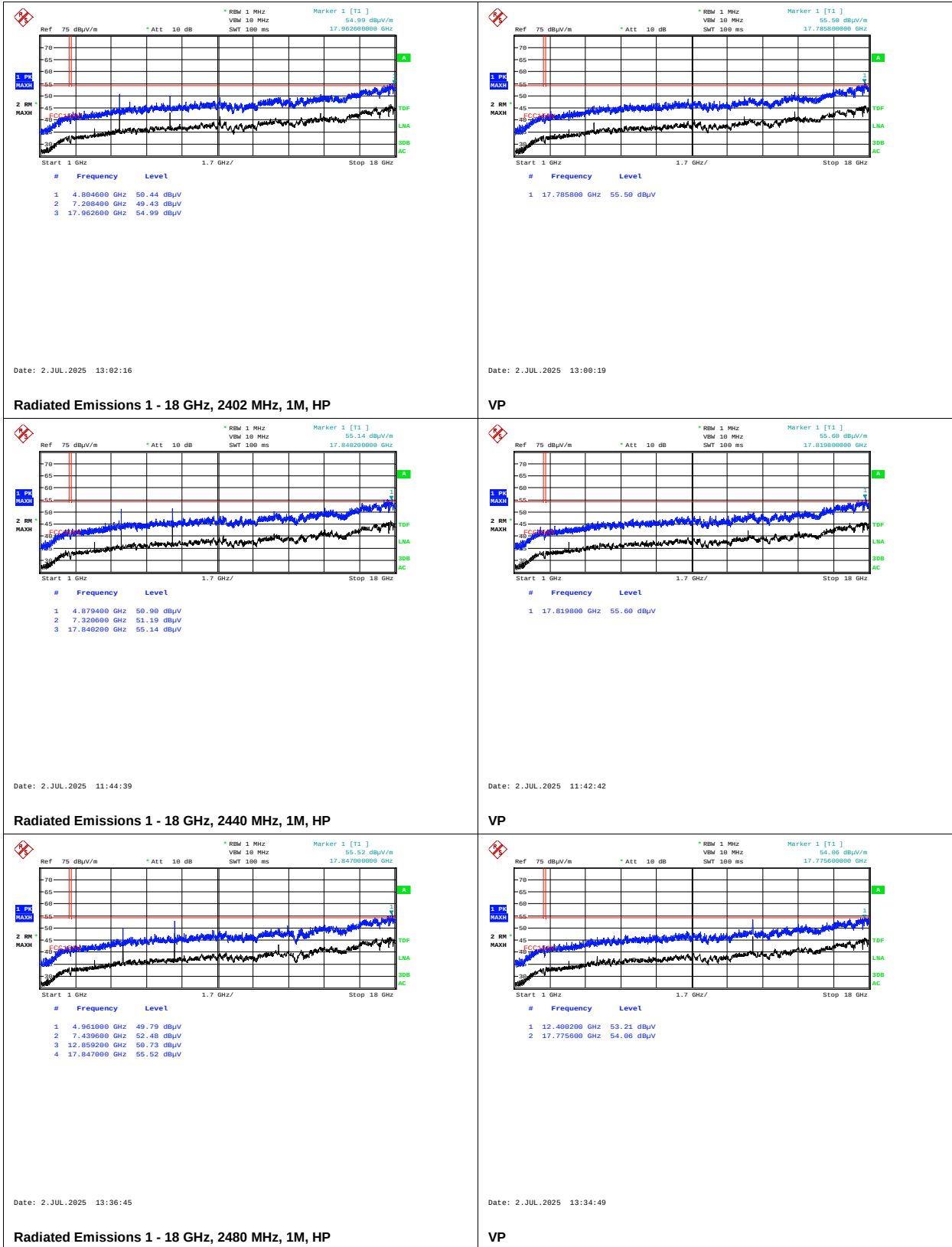
This measurement was performed with the EUT transmitting continuously.

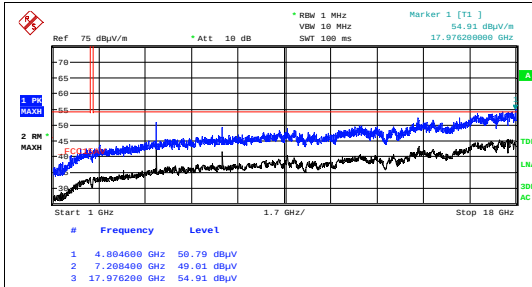
Measurements with BLE and NFC or NPM active at the same time were performed with BLE in advertising mode.

See plots.

Requirements/Limit

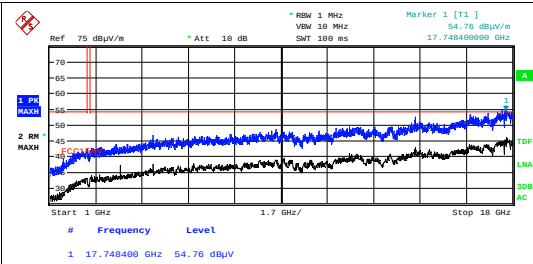
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	Average Detector	Peak Detector
1 – 26 GHz	54.0 dBµV/m	74.0 dBµV/m





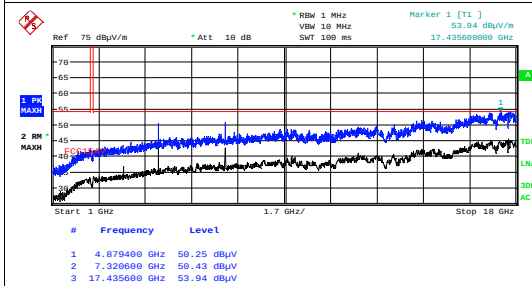
Date: 2.JUL.2025 14:23:08

Radiated Emissions 1 - 18 GHz, 2402 MHz, 2M, HP



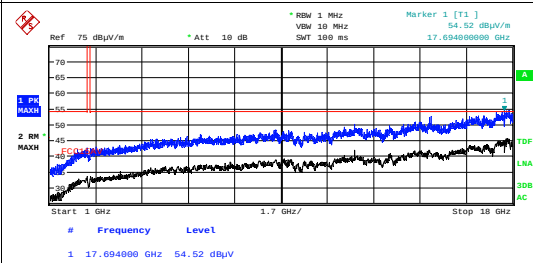
Date: 2.JUL.2025 14:21:11

VP



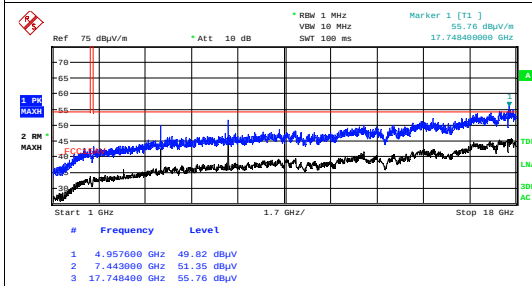
Date: 2.JUL.2025 14:13:11

Radiated Emissions 1 - 18 GHz, 2440 MHz, 2M, HP



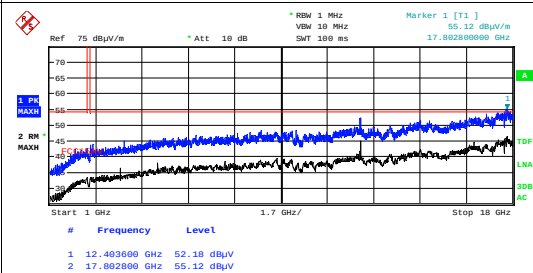
Date: 2.JUL.2025 14:11:14

VP



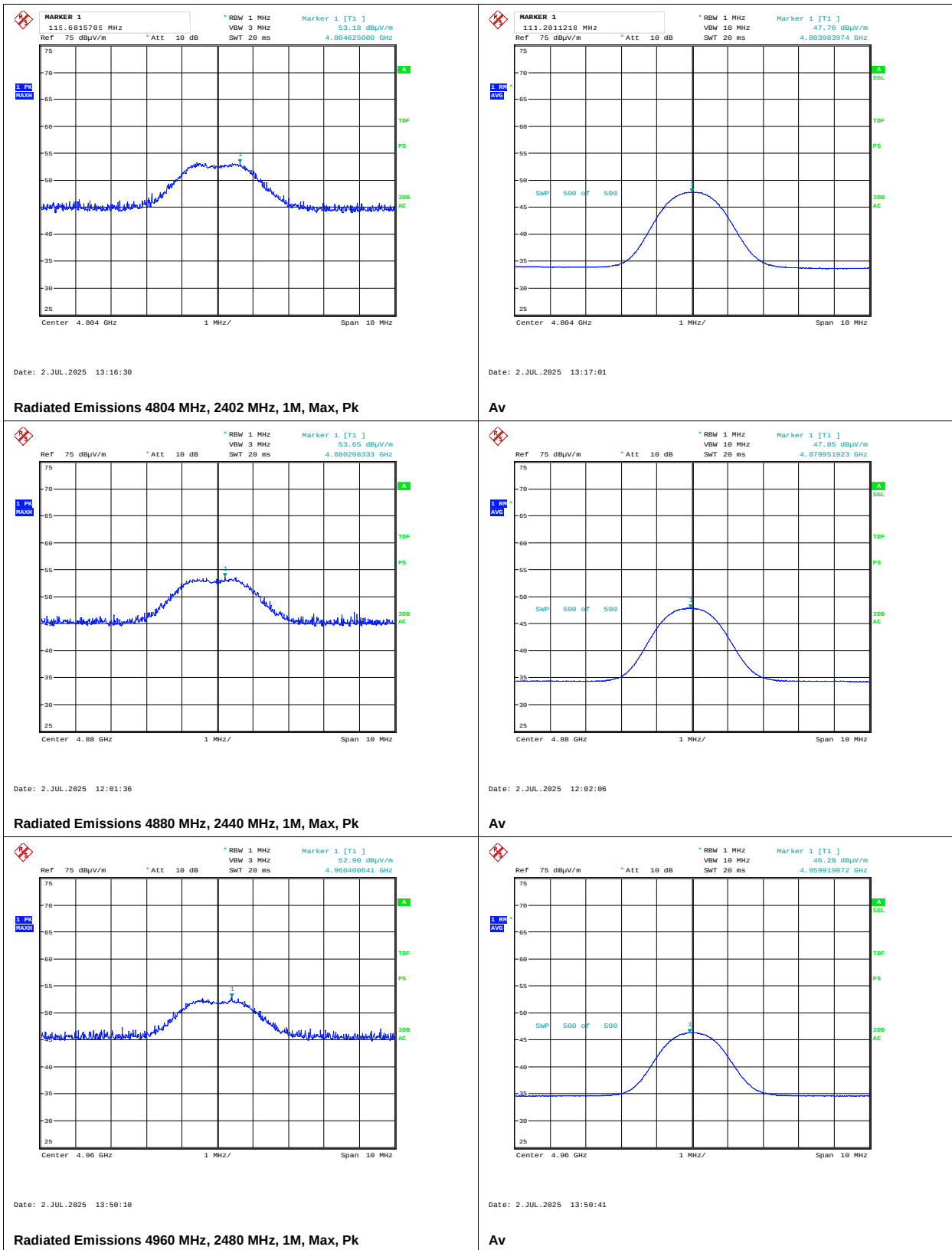
Date: 2.JUL.2025 14:34:03

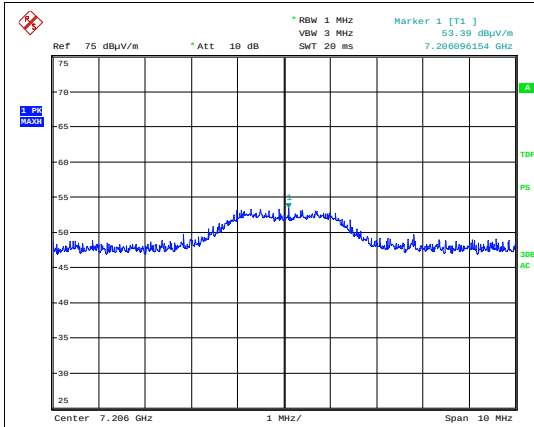
Radiated Emissions 1 - 18 GHz, 2480 MHz, 2M, HP



Date: 2.JUL.2025 14:32:06

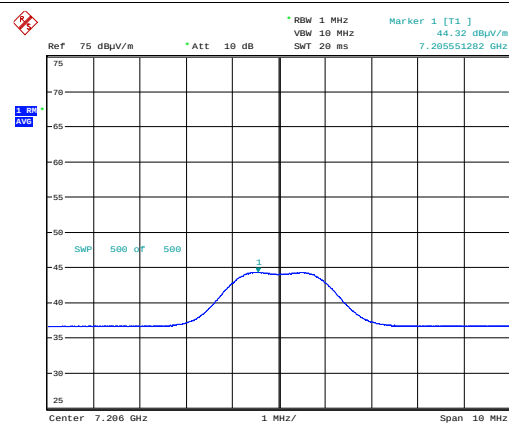
VP





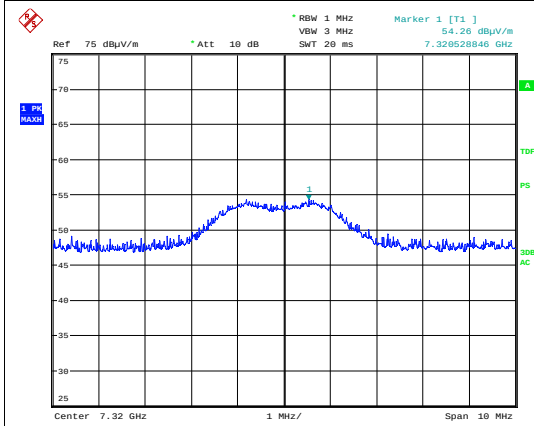
Date: 2.JUL.2025 13:29:59

Radiated Emissions 7206 MHz, 2402 MHz, 1M, Max, Pk



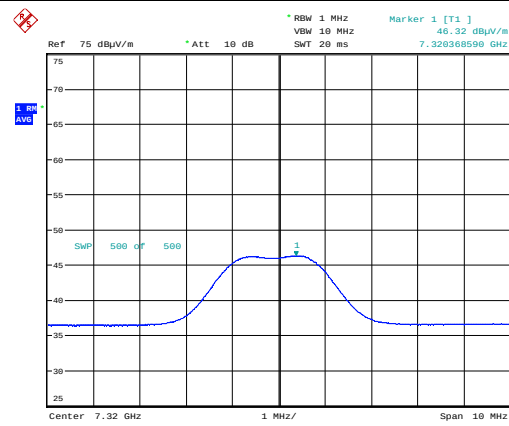
Date: 2.JUL.2025 13:30:26

Av



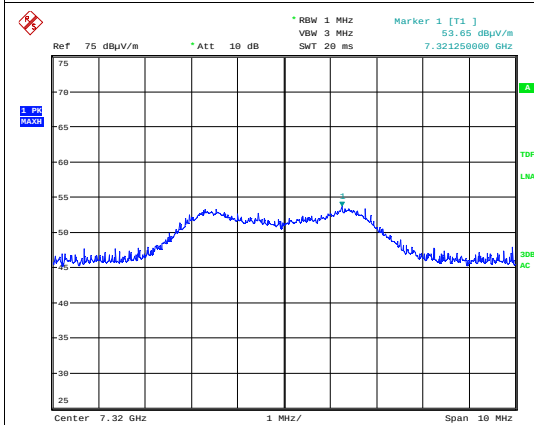
Date: 2.JUL.2025 12:54:19

Radiated Emissions 7320 MHz, 2440 MHz, 1M, Max, Pk



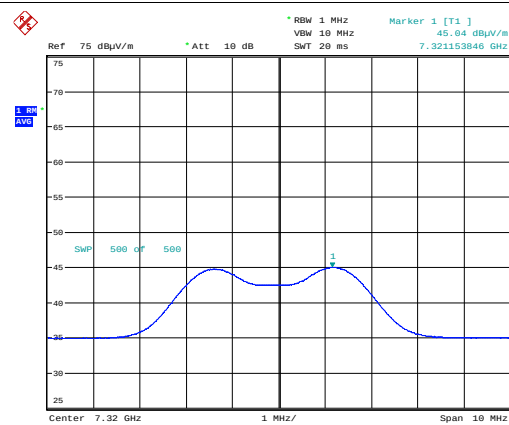
Date: 2.JUL.2025 12:54:46

Av



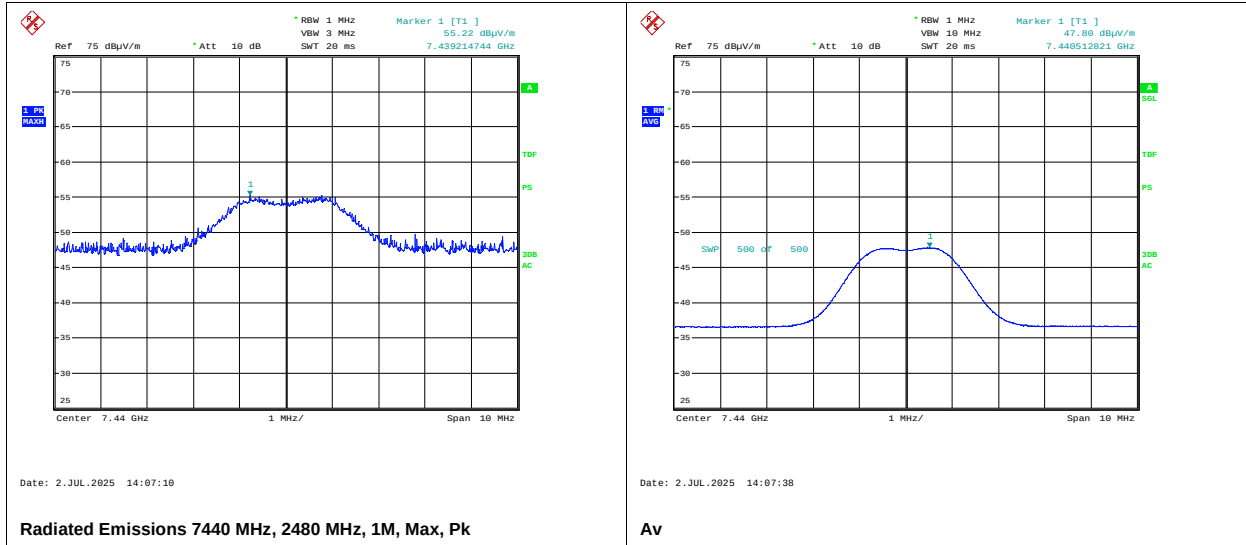
Date: 2.JUL.2025 14:46:57

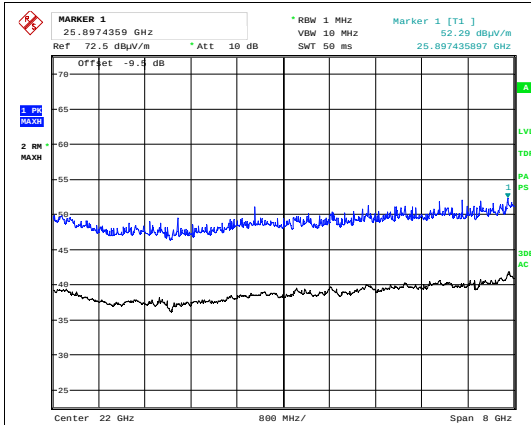
Radiated Emissions 7320 MHz, 2440 MHz, 2M, Max, Pk



Date: 2.JUL.2025 14:47:24

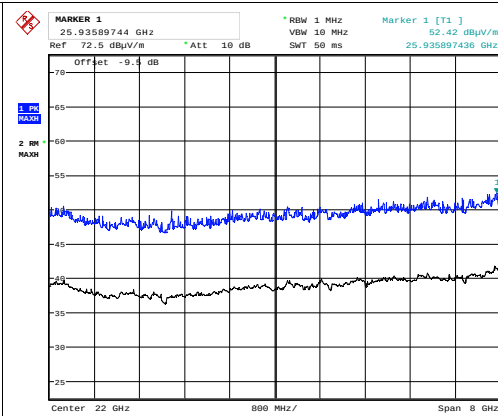
Av





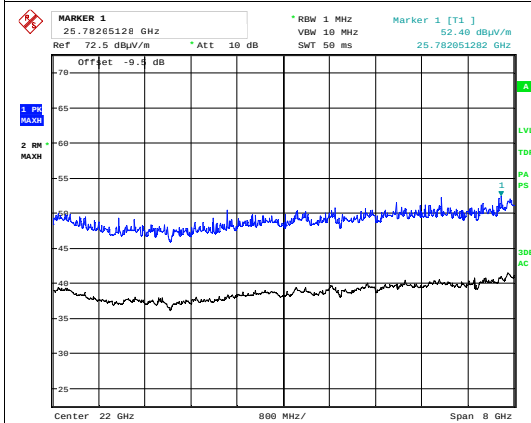
Date: 4.JUL.2025 10:27:28

Radiated Emissions 18-26 GHz, 2402 MHz, 1M, HP, @1m



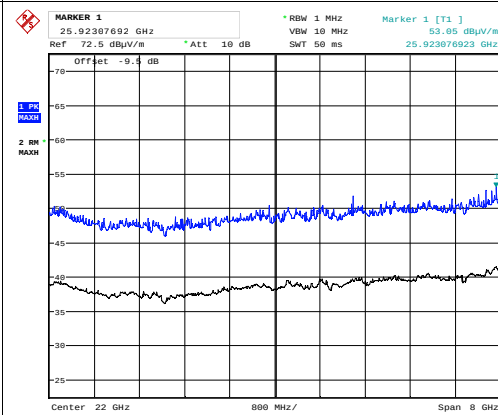
Date: 4.JUL.2025 10:24:43

VP



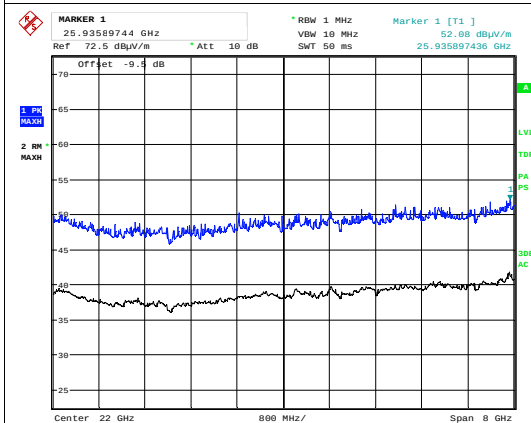
Date: 4.JUL.2025 10:30:34

Radiated Emissions 18-26 GHz, 2440 MHz, 1M, HP, @1m



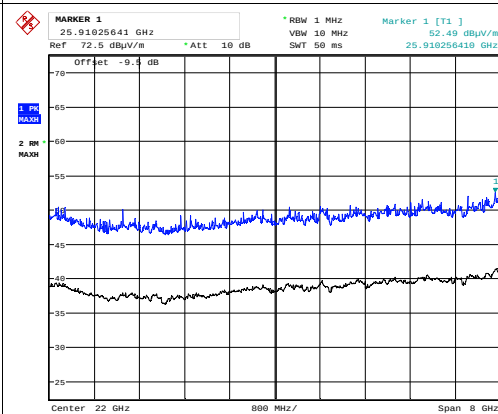
Date: 4.JUL.2025 10:33:11

VP



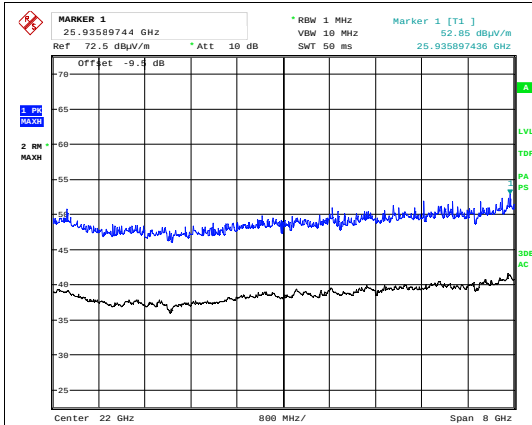
Date: 4.JUL.2025 10:37:56

Radiated Emissions 18-26 GHz, 2480 MHz, 1M, HP, @1m



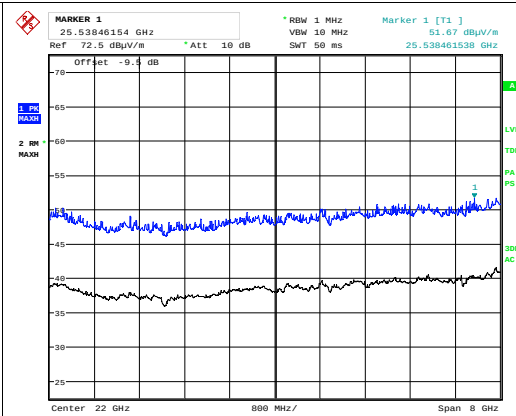
Date: 4.JUL.2025 10:35:44

VP



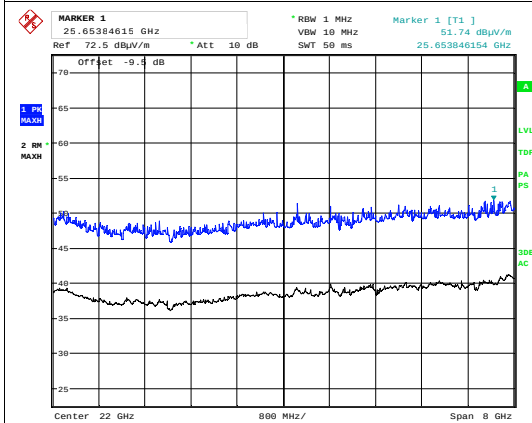
Date: 4.JUL.2025 10:40:38

Radiated Emissions 18-26 GHz, 2402 MHz, 2M, HP, @1m



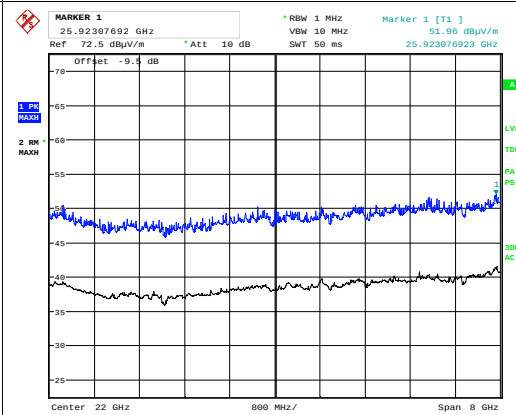
Date: 4.JUL.2025 10:42:41

VP



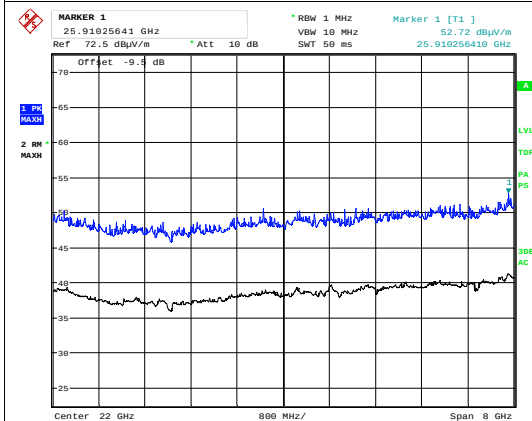
Date: 4.JUL.2025 10:47:47

Radiated Emissions 18-26 GHz, 2440 MHz, 2M, HP, @1m



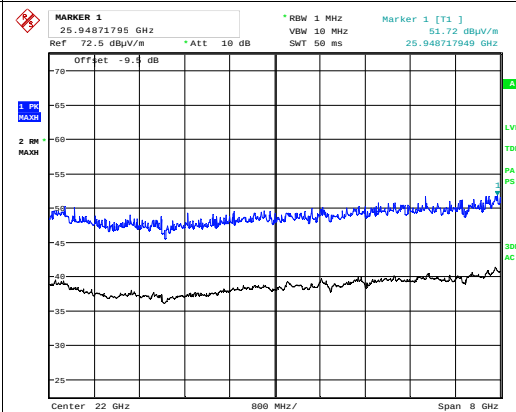
Date: 4.JUL.2025 10:45:42

VP



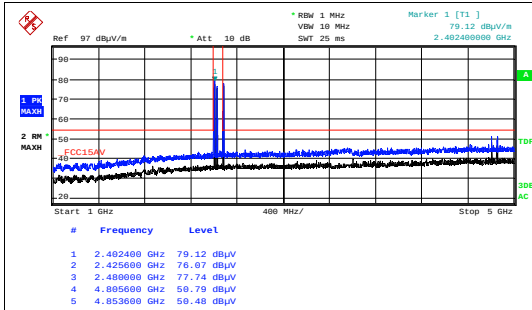
Date: 4.JUL.2025 10:50:46

Radiated Emissions 18-26 GHz, 2480 MHz, 2M, HP, @1m



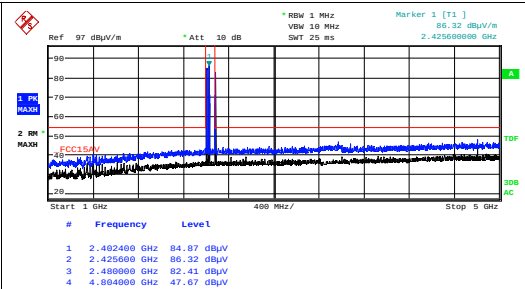
Date: 4.JUL.2025 10:53:11

VP



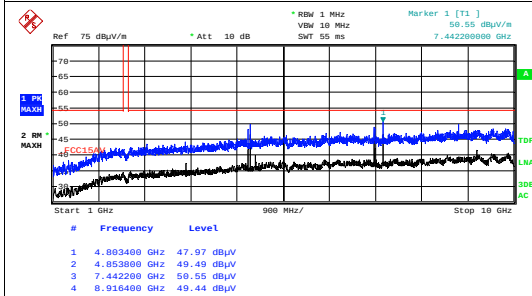
Date: 2.JUL.2025 15:22:13

Radiated Emissions 1000 - 5000 MHz, BLE + NFC3, HP



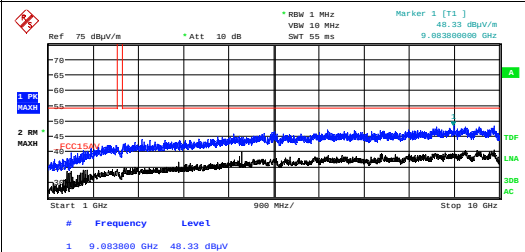
Date: 2.JUL.2025 15:20:17

VP



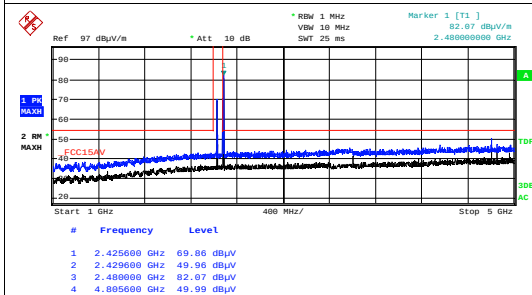
Date: 2.JUL.2025 14:56:32

Radiated Emissions 1000 - 10000 MHz, BLE + NFC3, HP



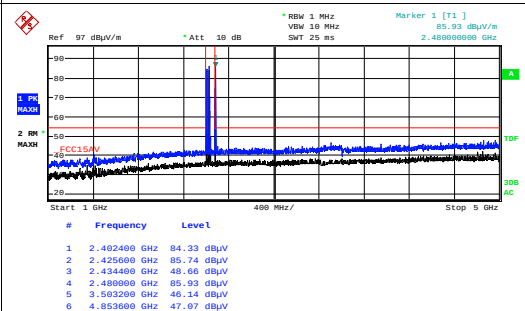
Date: 2.JUL.2025 14:54:35

VP



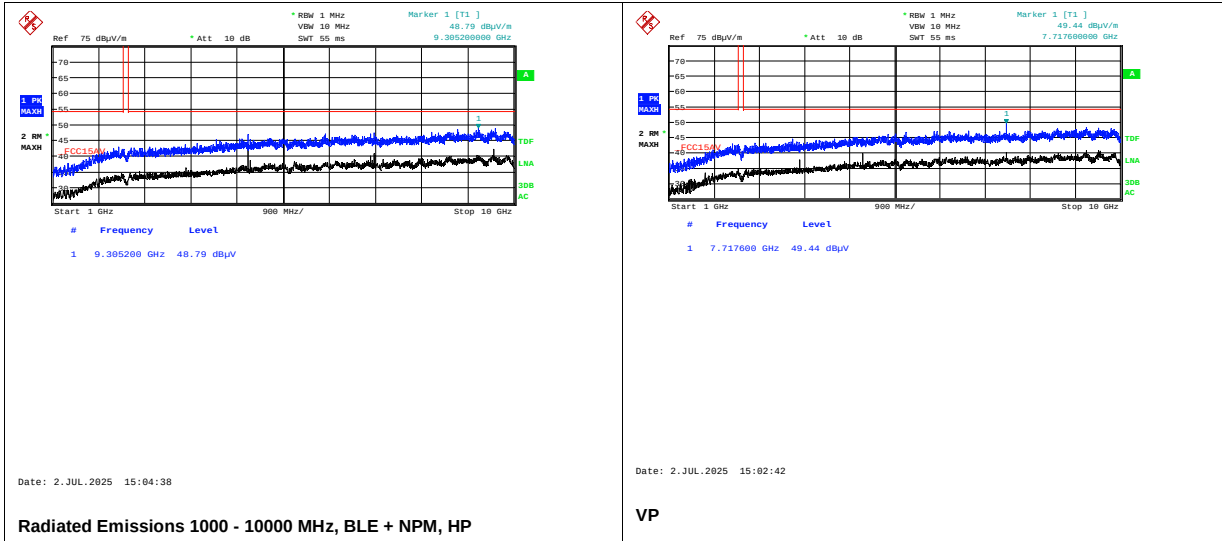
Date: 2.JUL.2025 15:14:31

Radiated Emissions 1000 - 5000 MHz, BLE + NPM, HP



Date: 2.JUL.2025 15:12:34

VP



3.9 Power Spectral Density (PSD)

FCC part 15.247(d)

ISED Canada RSS-247 Issue 4, Clause 6.3.1b

Measurement procedure: ANSI C63.10-2013 Clause 11.10

Test Results: Complies

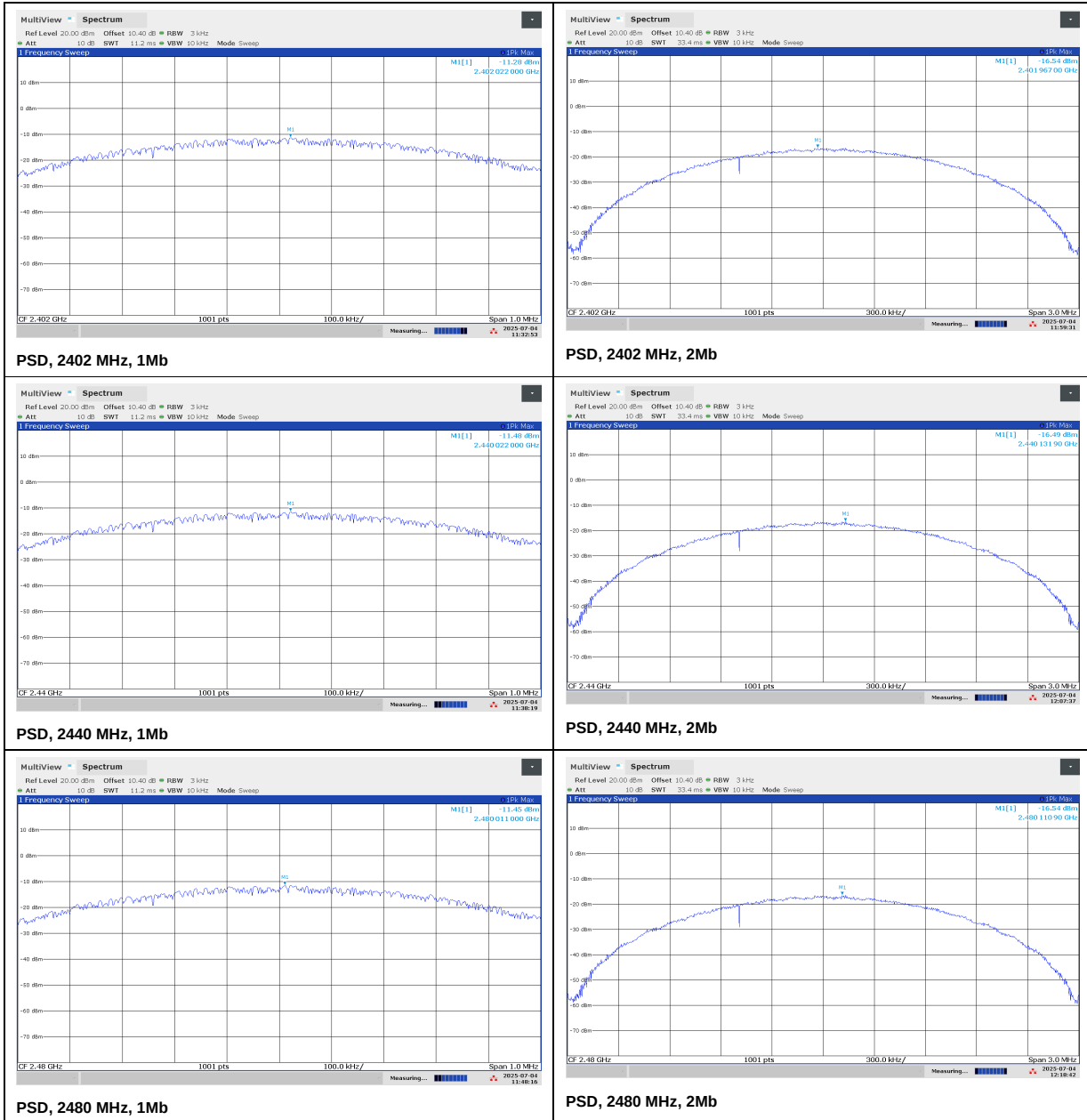
Measurement Data:

The measurement procedure PKPSD described in ANSI C63.10-2013 was used.

Modulation Type and Bitrate	Measured Power Spectral Density (dBm/3kHz)		
	2402 MHz	2440 MHz	2480 MHz
GFSK 1Mb	-11.3	-11.5	-11.4
GFSK 2Mb	-16.5	-16.5	-16.5

Requirement for systems using Digital Modulation

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.



4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		Uncertainty
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	< 3.6 GHz	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	< 1 GHz	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	Frequency	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the testhouse.

No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2025-02	2026-02
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2025-01	2025-01
3	6810.17B	Attenuator	Suhner	LR 1628	COU	
4	NO324415	Band Reject Filter (2.4 GHz)	Microwave Circuits	LR 1760	COU	
5	VULB 9163	BiLog Antenna	Schwarzbeck	LR 1616	2023-09	2026-09
6	310	Preamplifier	Sonoma Inst.	LR 1686	2024-09	2025-09
7	3115	Horn Antenna	EMCO	LR 1226	2022-12	2027-12
8	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2024-09	2025-09
9	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2024-09	2025-09
10	WLK5-1100-1485-7000-40SS	Low Pass Filter (1 GHz)	Wainwright Inst.	LR 1761	COU	
11	638	Antenna Horn	Narda	LR 1480	N/A	
12	ST18/SMA/N/36	RF Cable	Suhner	LR 1628	COU	

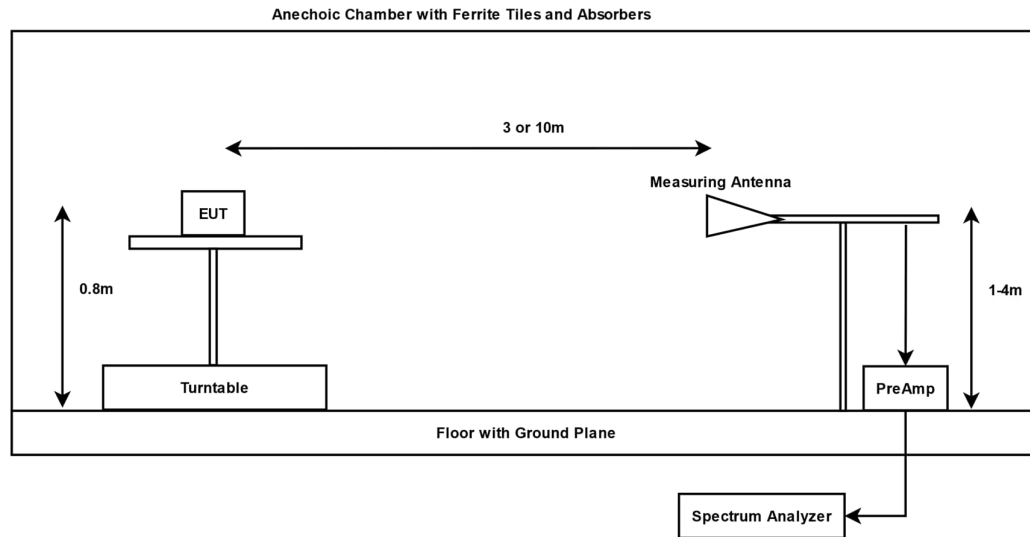
COU=Calibrate on Use

The software listed below has been used for one or more tests.

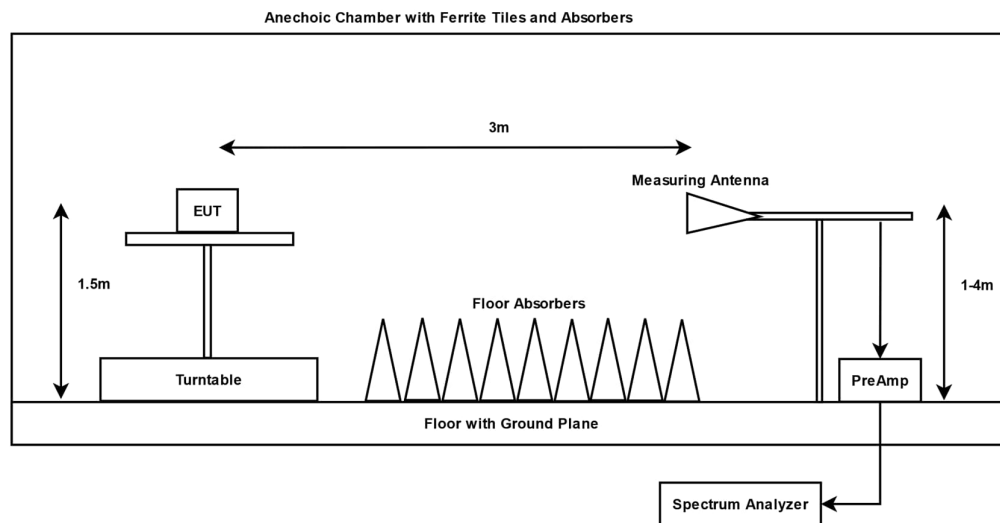
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.60.20	EMC test software
2	Nemko	RSPlot	1.0.8.0	Screenshots from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 Test Site Radiated Emission



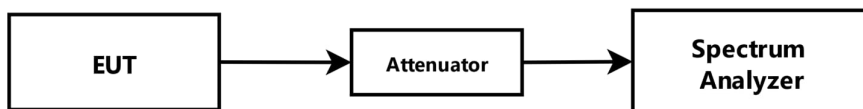
10m kammer, 30-1000 MHz



10m kammer, over 1 GHz

This test setup is used for all radiated emissions tests. Emissions above 1 GHz are measured with a Spectrum Analyzer and Horn Antenna. For measurements above 18 GHz the test receiver is moved inside the anechoic chamber and located next to the antenna to minimize the cable loss.

6.2 Conducted Tests



This test set-up is used for all Conducted tests.