

Test Report

Product	Wireless Gateway
Name and address of the applicant	Assa Abloy Global Solutions Norway AS Postboks 340, Anolitseien 1-3 1402 Ski, Norway
Name and address of the manufacturer	Assa Abloy Global Solutions Norway AS Postboks 340, Anolitseien 1-3 1402 Ski, Norway
Model	Zigbee Gateway 4030
Rating	12.0V DC or PoE (48V DC)
Trademark	Vingcard Assa Abloy
Additional information	Zigbee
Tested according to	FCC Part 15.247 Frequency Hopping Transmitters / Digital Transmission Systems ISED 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 5470-5875 MHz bands
Order number	PRJ0054981
Tested in period	2024-11-20 to 2024-11-22 and 2025-03-18
Issue date	2025-10-14
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
 Prepared by [Frode Sveinsen]  Approved by [Roy Uggerud]	
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Revision history

Revision	Date	Comment	Sign
A	2025-06-13	First edition	FS
B	2025-10-14	Corrected ANSI C63.10 reference	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	Wireless Gateway
Manufacturer	Assa Abloy Global Solutions Norway AS
Model	Zigbee Gateway 4030
Serial number	2411 HAN 00031
FCC ID	Y7V-GW4030C1
ISED ID	9514A-GW4030C1
Hardware version	GW4030C1
Software version	Ver. 1.0
Frequency Range	2405 – 2480 MHz
Number of Channels	15
Operating Modes	Zigbee
Type of Modulation	QPSK
Conducted Output Power	7.6 mW
Antenna Connector	None
Number of Antennas	1
Diversity or Smart Antennas	No
Power Supply	External AC Adaptor or Power over Ethernet

Description of Test Item

The EUT is a Zigbee wireless gateway.

1.2 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	12.0V _{DC} , or PoE (48V _{DC})

The values are the limit registered during the test period.

1.3 Test Engineers

Frode Sveinsen

Thomas Dangle (Power-Line Conducted Emissions)

1.4 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

1.5 EUT Operating Modes

Description of operating modes	Radiated Emissions and Power Line Conducted Emissions were performed with the EUT set to transmit on a fixed channel with the selected output power.
Power Level	All tests were performed with Power Level: -12dBm

1.6 Comments

All ports were populated during spurious emission measurements.

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 5470-5875 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
ANSI C63.10-2020 (FCC)	Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.10-2020 (ISED Canada) +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	Complies
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	Complies
Occupied Bandwidth (99% BW)	N/A	6.7 (RSS-GEN)	6.9.3	Complies
DTS Bandwidth	15.247(a)(2)	6.3 (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)	6.3.1 (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) 15.209(a)	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 Power Line Conducted Emissions

FCC Part 15.207

ISED RSS-GEN Issue 5, Clause 7.2 / 8.8

Measurement procedure: ANSI C63.4-2014 using 50 µH/50 ohms LISN

Test Results: Complies

Measurement Data: See attached plots

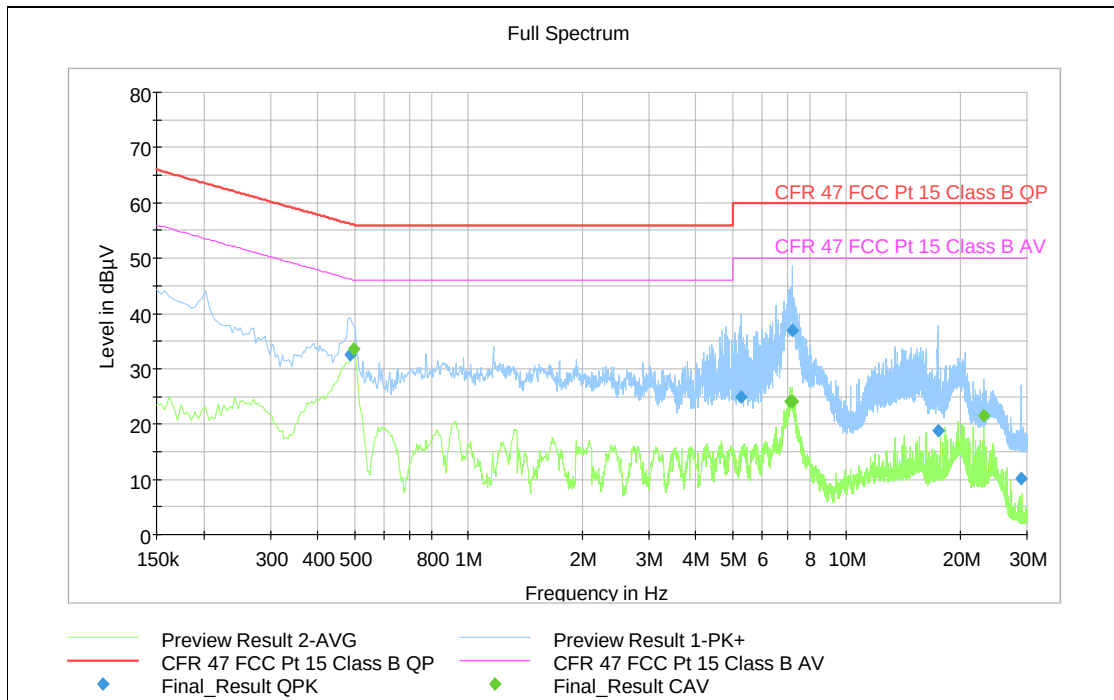
Highest measured value (L1 and N):

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.486000	32.45	---	56.24	23.78	15000.0	9.000	N	OFF	9.6
0.498000	---	33.66	46.03	12.37	15000.0	9.000	L1	OFF	9.6
5.254000	24.91	---	60.00	35.09	15000.0	9.000	L1	OFF	9.8
7.102000	---	24.13	50.00	25.87	15000.0	9.000	L1	OFF	9.8
7.182000	37.01	---	60.00	22.99	15000.0	9.000	L1	OFF	9.8
7.182000	---	24.05	50.00	25.95	15000.0	9.000	L1	OFF	9.8
17.430000	18.79	---	60.00	41.21	15000.0	9.000	L1	OFF	9.9
23.130000	---	21.58	50.00	28.42	15000.0	9.000	L1	OFF	10.0
28.942000	10.04	---	60.00	49.96	15000.0	9.000	N	OFF	9.8

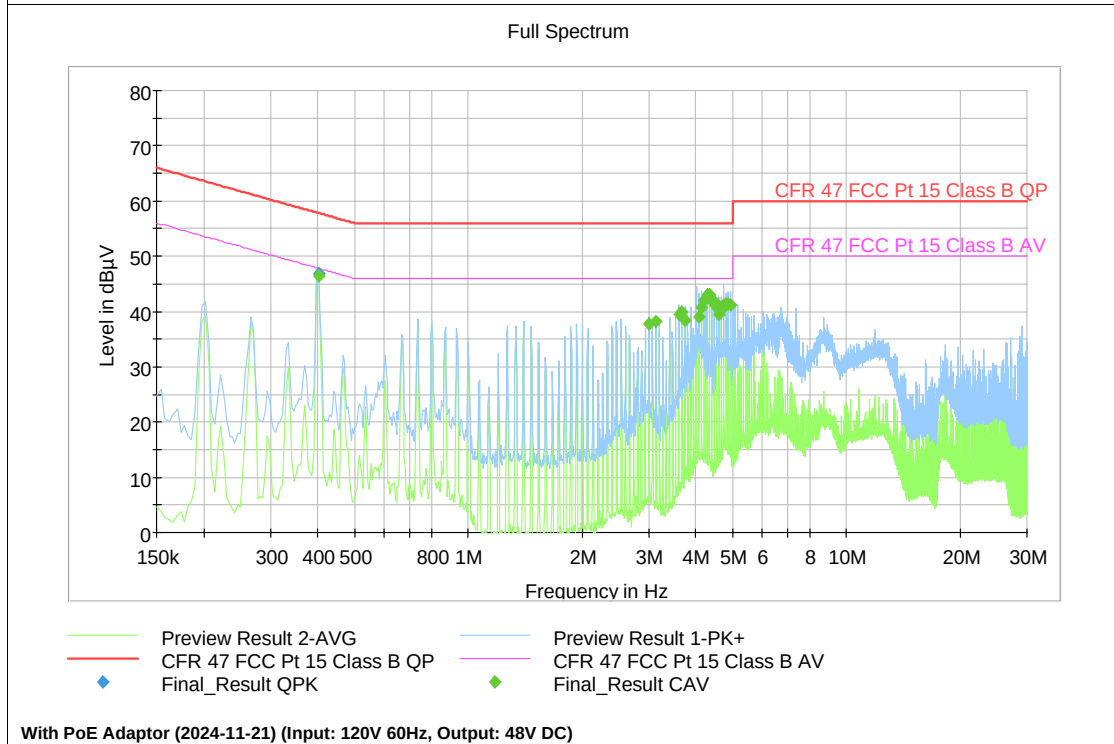
Original Power Supply and new choke (2025-03-18), 120V 60 Hz

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.402000	---	46.54	47.81	1.27	15000.0	9.000	N	OFF	9.6
0.402000	46.79	---	57.81	11.03	15000.0	9.000	N	OFF	9.6
3.006000	---	37.81	46.00	8.19	15000.0	9.000	N	OFF	9.5
3.138000	---	38.27	46.00	7.73	15000.0	9.000	N	OFF	9.5
3.606000	---	39.49	46.00	6.51	15000.0	9.000	N	OFF	9.5
3.674000	---	39.92	46.00	6.08	15000.0	9.000	N	OFF	9.5
3.738000	---	38.50	46.00	7.50	15000.0	9.000	N	OFF	9.5
4.074000	---	39.10	46.00	6.90	15000.0	9.000	N	OFF	9.5
4.142000	---	40.82	46.00	5.18	15000.0	9.000	N	OFF	9.5
4.206000	---	41.96	46.00	4.04	15000.0	9.000	N	OFF	9.5
4.274000	---	43.15	46.00	2.85	15000.0	9.000	N	OFF	9.5
4.342000	---	43.02	46.00	2.98	15000.0	9.000	N	OFF	9.5
4.406000	---	41.74	46.00	4.26	15000.0	9.000	N	OFF	9.5
4.474000	---	41.73	46.00	4.27	15000.0	9.000	N	OFF	9.5
4.542000	---	40.74	46.00	5.26	15000.0	9.000	N	OFF	9.5
4.610000	---	39.52	46.00	6.48	15000.0	9.000	N	OFF	9.5
4.674000	---	40.31	46.00	5.69	15000.0	9.000	N	OFF	9.5
4.742000	---	41.19	46.00	4.81	15000.0	9.000	N	OFF	9.5
4.810000	---	41.29	46.00	4.71	15000.0	9.000	N	OFF	9.5
4.874000	---	41.40	46.00	4.60	15000.0	9.000	N	OFF	9.5
4.942000	---	41.25	46.00	4.75	15000.0	9.000	N	OFF	9.5

With PoE Adaptor (2024-11-21) (Input: 120V 60Hz, Output: 48V DC)



Original Power Supply and new choke (2025-03-18), 120V 60 Hz



3.2 Occupied Bandwidth (99% BW)

ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2020 Clause 6.9.2

Test Results: Complies

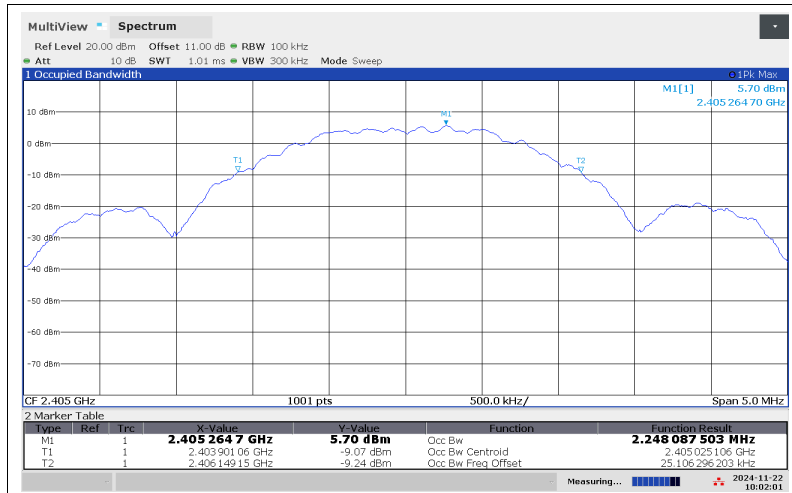
Measurement Data:

Carrier Frequency	Occupied Bandwidth (99% BW)
2405 MHz	2.25 MHz
2440 MHz	2.26 MHz
2480 MHz	2.26 MHz

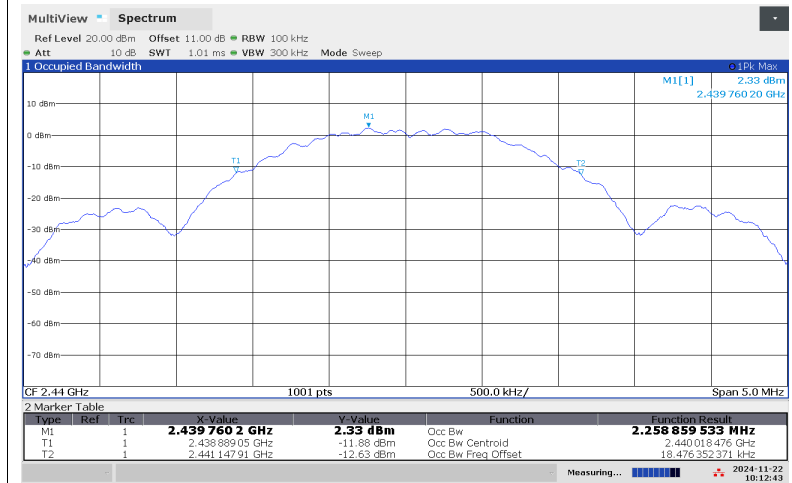
See attached plots

Requirements:

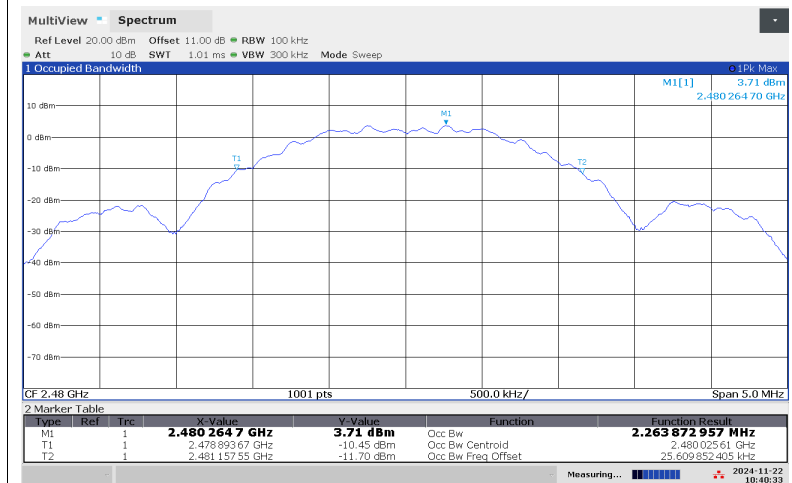
No requirement for 99% BW, reported for information only.



99% Occupied BW, 2405 MHz



99% Occupied BW, 2440 MHz



99% Occupied BW, 2440 MHz

3.3 DTS Bandwidth (6dB BW)

FCC Part 15.247 (a)(2)

ISED Canada RSS-247 Issue 4, Clause 6.3

Measurement procedure: ANSI C63.10-2020 Clause 11.8

Test Results: Complies

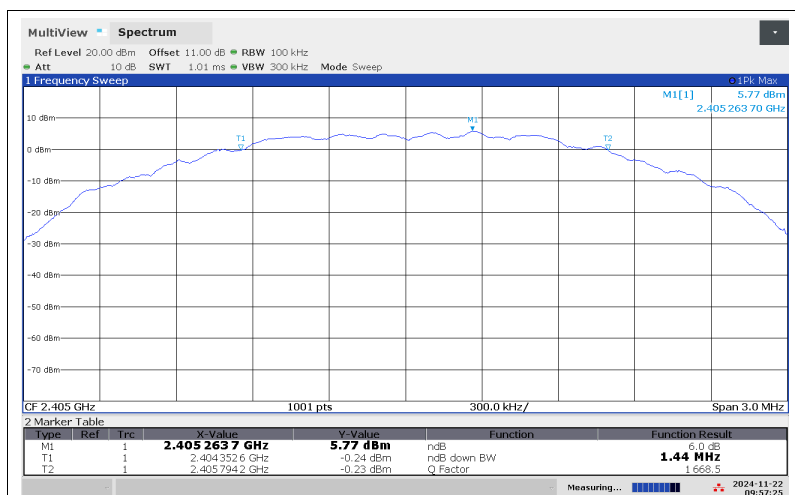
Measurement Data:

Carrier Frequency	DTS Bandwidth (6dB BW)
2405 MHz	1.44 MHz
2440 MHz	1.44 MHz
2480 MHz	1.47 MHz

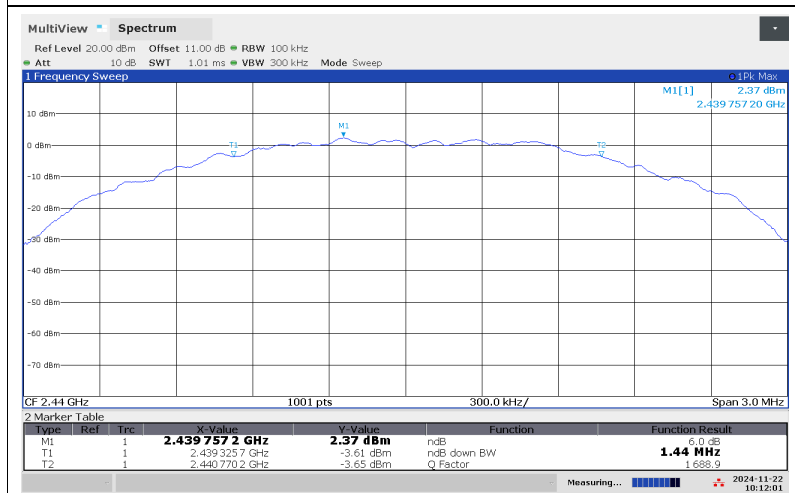
Power supply variation within 85 % to 115% of nominal value has no influence on measured value.

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	

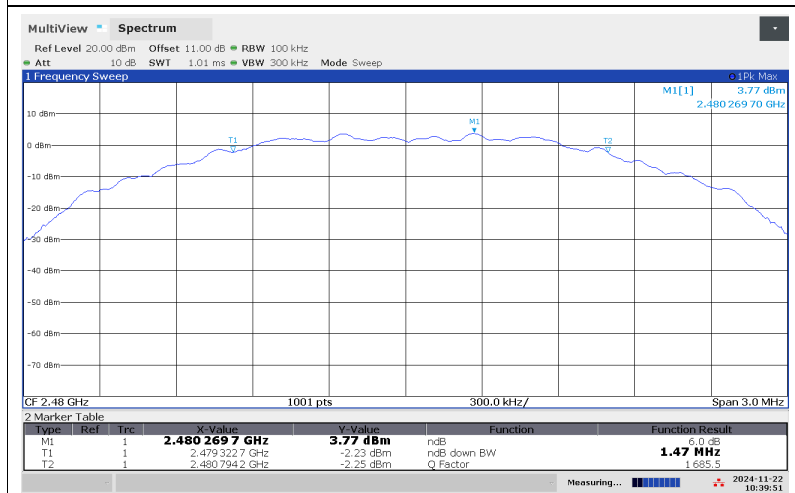
No requirements for Frequency Hopping Systems.



DTS BW, 2402 MHz



DTS BW, 2440 MHz



DTS BW, 2480 MHz

3.4 Peak Power Output

FCC Part 15.247 (b)

ISED Canada RSS-247 Issue 4, Clause 6.3.2

Measurement procedure: ANSI C63.10-2020 Clause 11.9.1.2

Test Results: Complies

Measurement Data:

Carrier Frequency	Measured Peak Conducted Power (dBm)	Measured Field Strength @3m (dBμV/m)	Calculated EIRP (dBm)	Calculated Antenna Gain (dBi)
2405 MHz	8.83 dBm	106.0	10.77	1.9
2440 MHz	5.17 dBm	104.4	9.17	4.0
2480 MHz	6.64 dBm	107.1	11.87	5.2

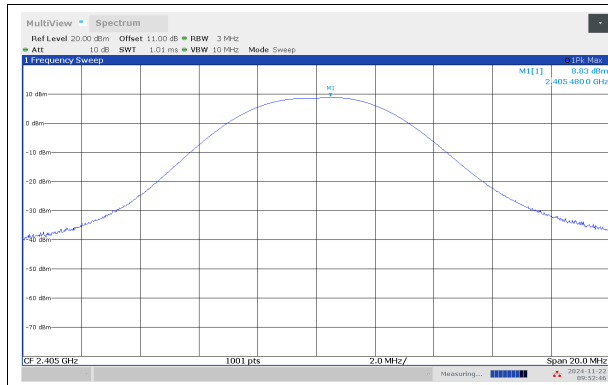
Output Power reported is Maximum Peak Power.

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

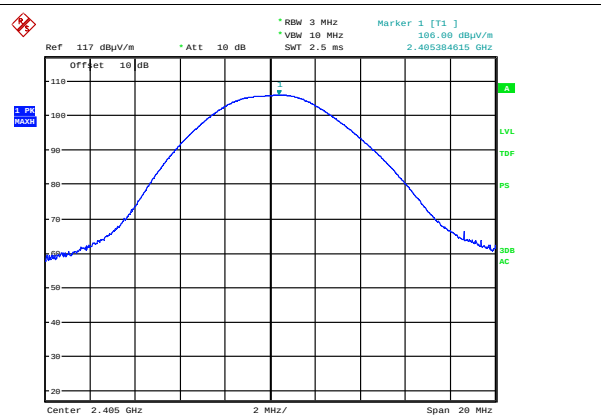
Antenna Gain is less than 6 dBi.

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.

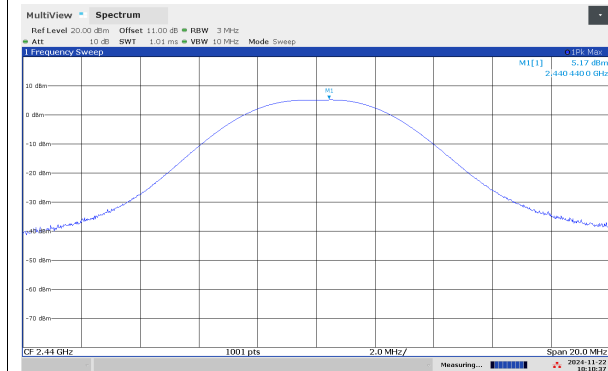


Peak Power, 2402 MHz, 1Mb

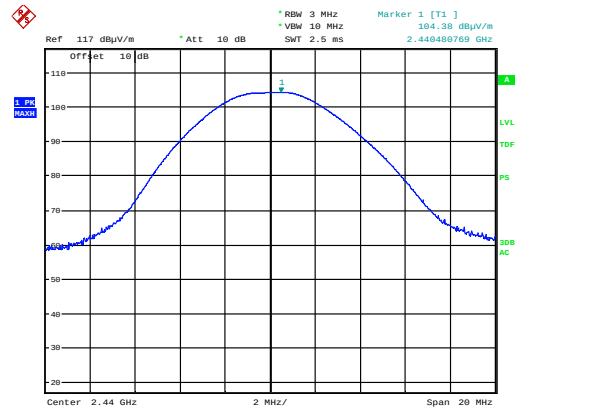


Date: 21.NOV.2024 12:25:08

Peak EIRP, 2402 MHz, 1Mb

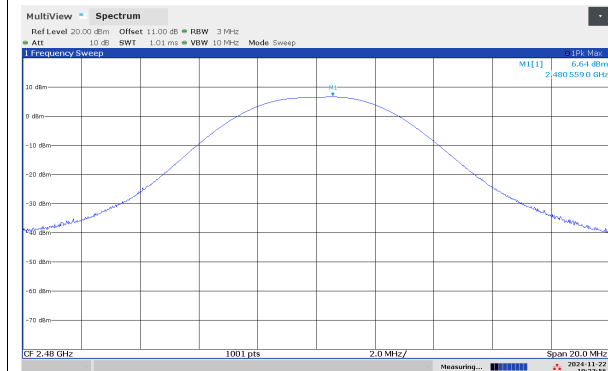


Peak Power, 2440 MHz, 1Mb

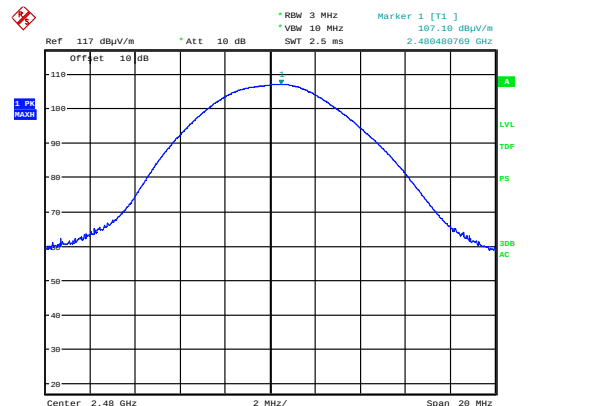


Date: 21.NOV.2024 13:09:03

Peak EIRP, 2440 MHz, 1Mb



Peak Power, 2480 MHz, 1Mb



Date: 21.NOV.2024 12:57:16

Peak EIRP, 2480 MHz, 1Mb

3.5 Conducted Emissions at Antenna Connector

FCC Part 15.247 (d)

ISED Canada RSS-247 Issue 4, Clause 6.6

Measurement procedure: ANSI C63.10-2020 Clause 11.11

Test Results: Complies

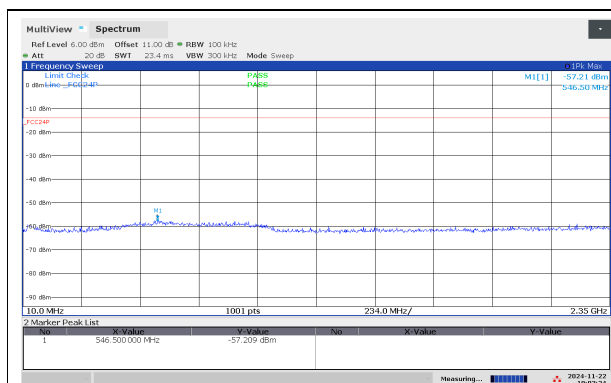
Measurement Data:

Carrier Frequency	Highest Value (dBc)	Margin (dB)	Verdict
2405 MHz	> 50	> 30	Pass
2440 MHz	> 50	> 30	Pass
2480 MHz	> 50	> 30	Pass

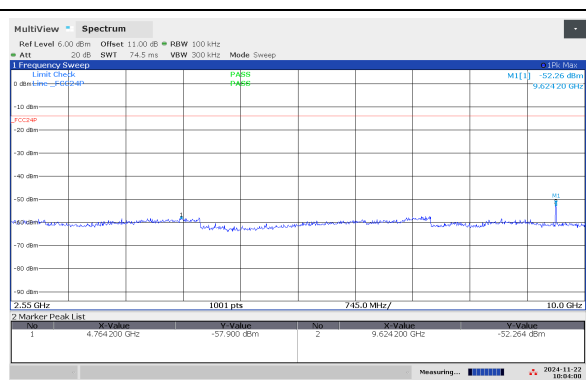
Measured with Peak Detector

RF conducted power to 25 GHz: see attached plots.

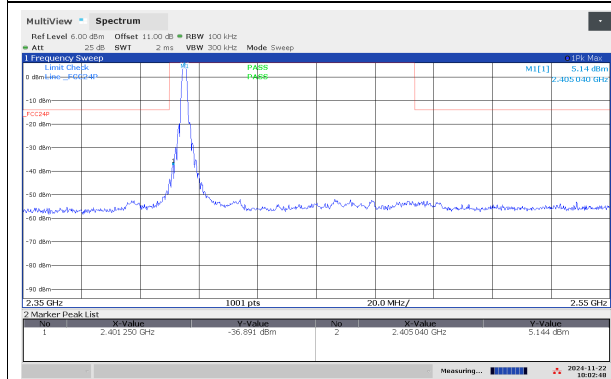
Requirements for all systems	
Peak measurement	RMS averaging (alternative measurement)
20 dB or more below carrier measured in 100 kHz bandwidth	30 dB or more below carrier measured in 100 kHz bandwidth
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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.	



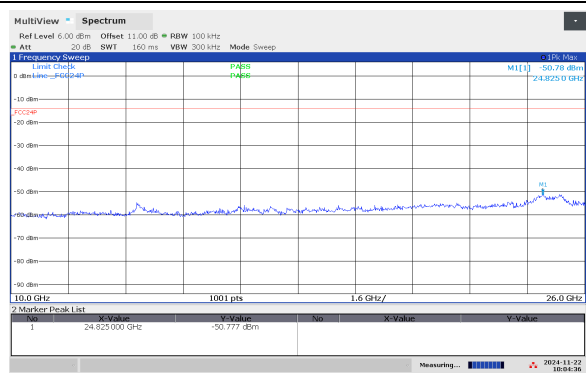
Conducted Emissions 10-2350 MHz, 2405 MHz



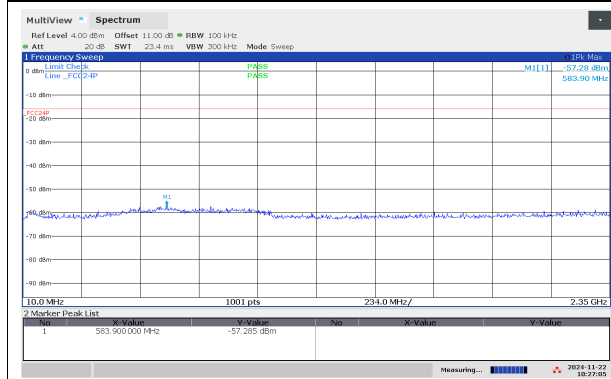
Conducted Emissions 2.55-10 GHz, 2405 MHz



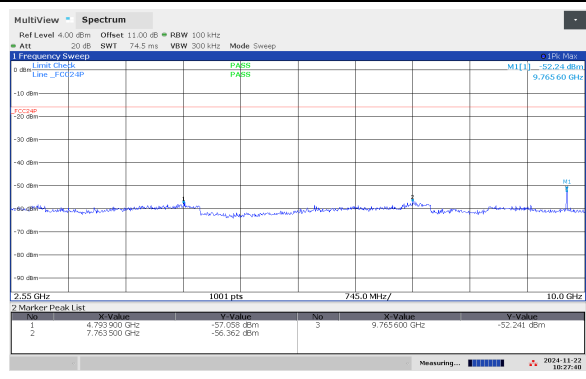
Conducted Emissions 2350-2550 MHz, 2405 MHz



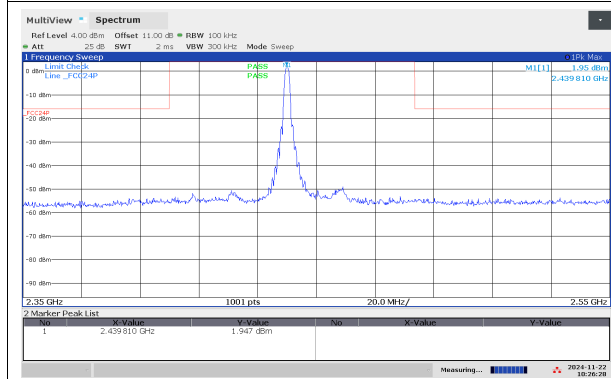
Conducted Emissions 10-26 GHz, 2405 MHz



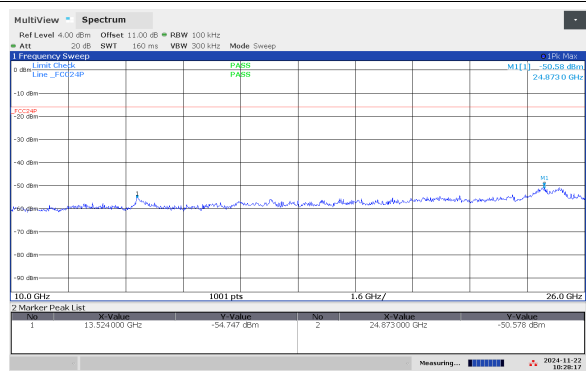
Conducted Emissions 10-2350 MHz, 2440 MHz



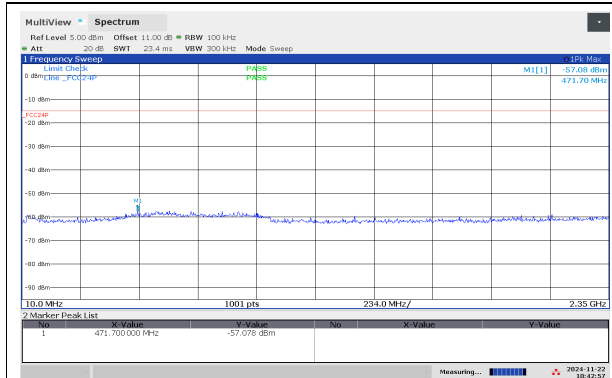
Conducted Emissions 2.55-10 GHz, 2440 MHz



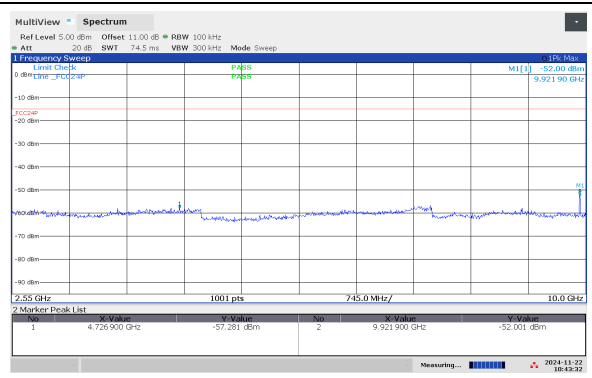
Conducted Emissions 2350-2550 MHz, 2440 MHz



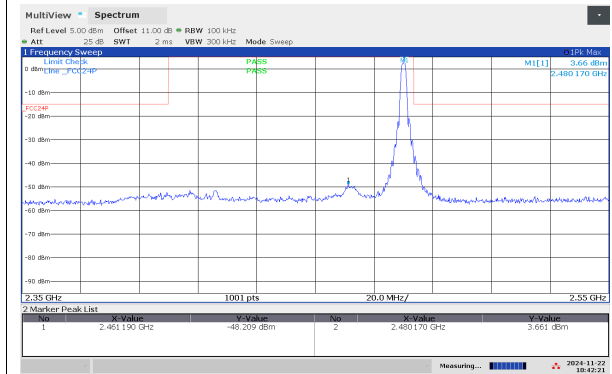
Conducted Emissions 10-26 GHz, 2440 MHz



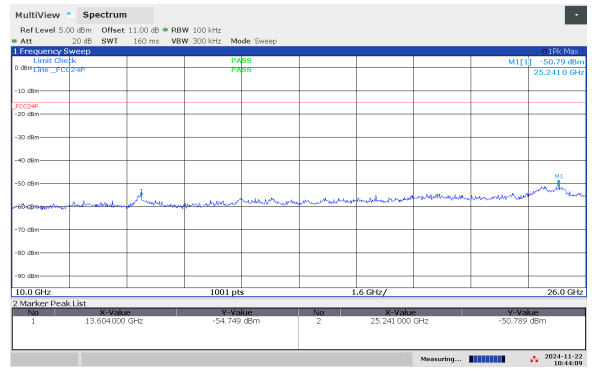
Conducted Emissions 10-2350 MHz, 2480 MHz



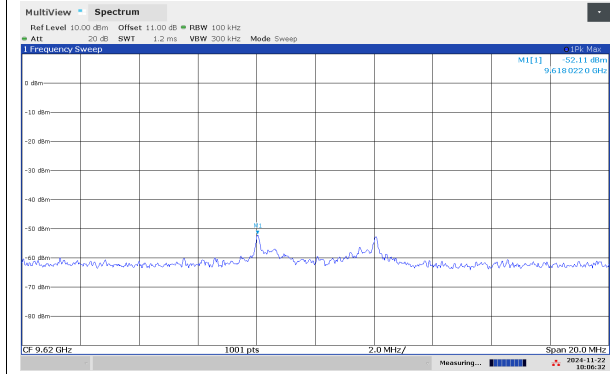
Conducted Emissions 2.55-10 GHz, 2480 MHz



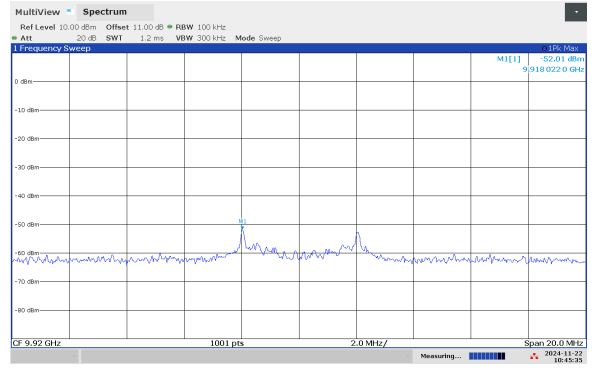
Conducted Emissions 2350-2550 MHz, 2480 MHz



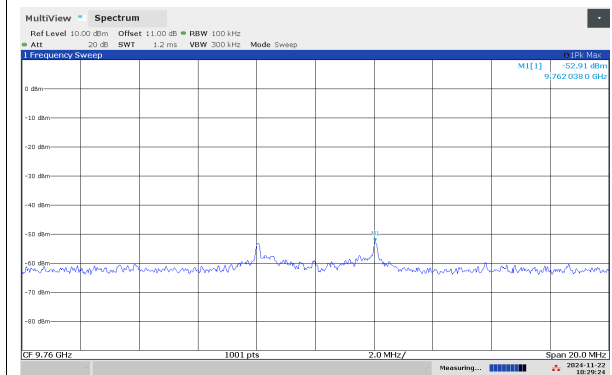
Conducted Emissions 10-26 GHz, 2480 MHz



Conducted Emissions 9620 MHz, 2405 MHz



Conducted Emissions 9920 MHz, 2480 MHz



Conducted Emissions 9760 MHz, 2440 MHz

3.6 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.

3.7 Radiated Emissions, Band Edge

FCC Part 15.209 (a)

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

Measurement procedure: ANSI C63.10-2020 Clause 11.12

Test Results: Complies

Measurement Data:

	Measured field strength (dBμV/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dB	dB	
Peak Detector	55.0	72.4	74	19.0	1.6
Average Detector	35.0	52.8	54	19.0	1.6

Average values were calculated from Peak values using duty-cycle correction factor.

See attached plots.

Duty Cycle Calculation:

Pollperiod: 20s

CSMA/CA frame transmission: 2.368 ms (default random back-off exponent of 3)

Data Frame transmission: 4.256 ms (full frame)

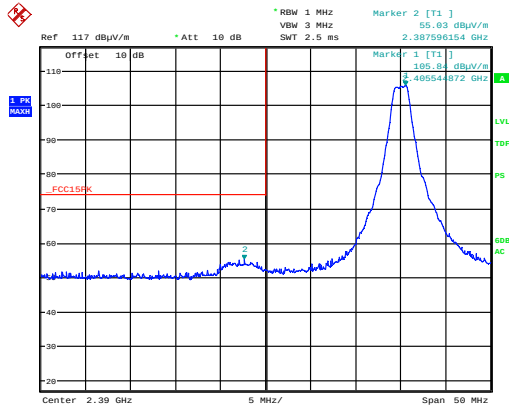
Maximum transmission is one CSMA/CA and one Data Frame per poll period.

Duty Cycle Calculation: $(2.368 + 4.256) / 100 = 6.624\%$

Duty Cycle Correction Factor Calculation: $-20 \cdot \log_{10}(0.06624)$ dB = 23.4 dB

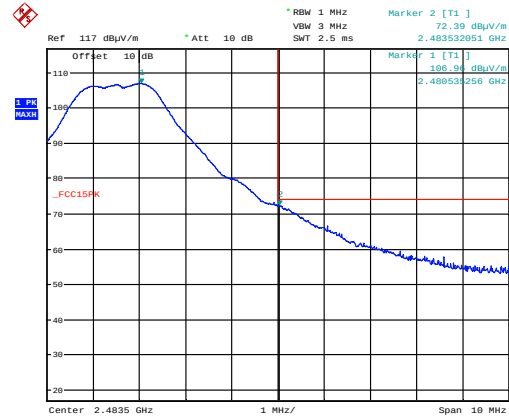
Duty Cycle Correction Factor is 20 dB

Above values are supplied by the applicant.



Date: 21.NOV.2024 12:27:46

Lower Band Edge, 2405 MHz, Peak



Date: 21.NOV.2024 12:58:21

Upper Band Edge, 2480 MHz, Peak

3.8 Radiated Emissions, 30 – 1000 MHz

FCC Part 15.209 (a)

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

Measurement procedure: ANSI C63.10-2020 Clause 11.12

Test Results: Complies

Measurement Data:

Detector: Quasi-Peak

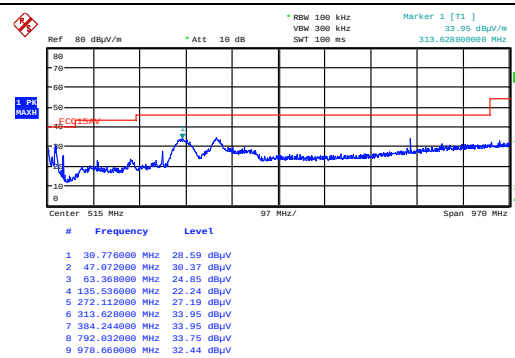
Measuring distance 3m

Measured Frequency (MHz)	Carrier Frequency (MHz)	Modulation	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30 – 88	2440	GFSK	< 30	40.0	>10
88 – 216	2440	GFSK	< 30	43.5	>13.5
216 – 960	2440	GFSK	< 36	46.0	>10
960 – 1000	2440	GFSK	< 40	54.0	>16
86.75	2440	GFSK	29.7	40	10.3

See attached plots

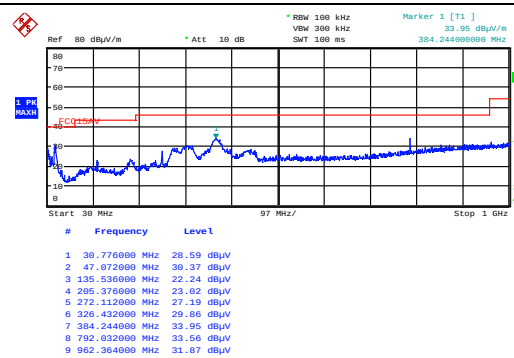
Requirements/Limit

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		



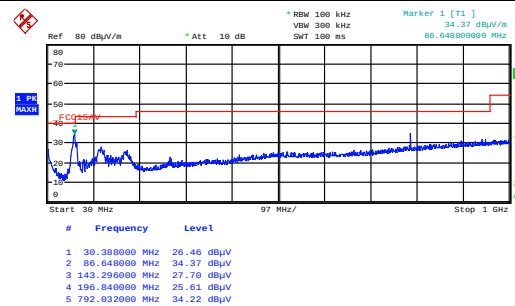
Date: 21.NOV.2024 17:23:01

Radiated Emissions 30 - 1000 MHz, PoE, HP



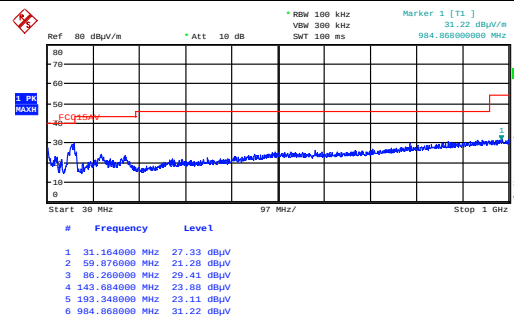
Date: 21.NOV.2024 17:21:04

VP



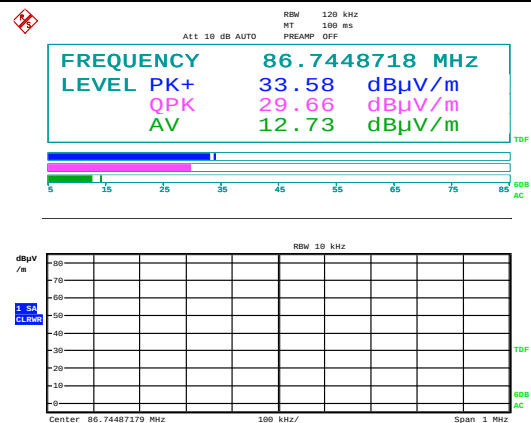
Date: 21.NOV.2024 15:53:06

Radiated Emissions 30 - 1000 MHz, AC Adaptor, HP



Date: 21.NOV.2024 15:51:10

VP



Date: 21.NOV.2024 15:42:56

Radiated Emissions 30 - 1000 MHz, AC Adaptor, HP

3.9 Radiated Emissions, 1 – 26 GHz

FCC Part 15.209 (a)

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

Measurement procedure: ANSI C63.10-2020 Clause 11.12

Test Results: Complies

Measurement Data:

Measuring distance: 3m (1 – 18 GHz)

A pre-scan was performed above 18 GHz and no spurious emissions were detected.

RBW / WBW = 1MHz / 3MHz

Measured Frequency (GHz)	Carrier Frequency (MHz)	Measured Emissions (dBμV/m)		Limit (dBμV/m)		Margin (dB)	
		Peak	Average	Pk	Av	Pk	Av
9620	2405	53.8	44.0	74	54	20.2	10.0
9760	2440	56.3	48.8	74	54	17.7	5.2
9920	2480	55.2	47.3	74	54	18.8	6.7
Any	Any	< 56	< 46	74	54	>18	>8

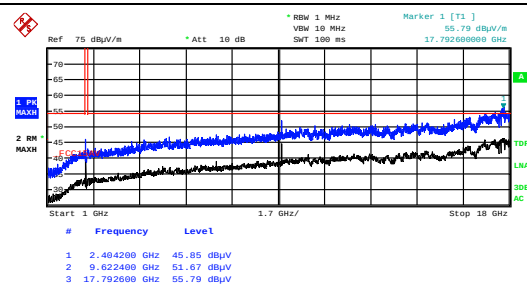
A Band Reject Filter was used for measurements from 1 GHz to 18 GHz

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

See plots.

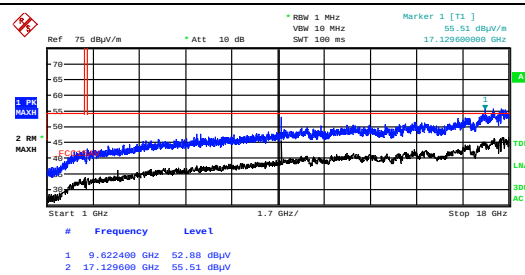
Requirements/Limit

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



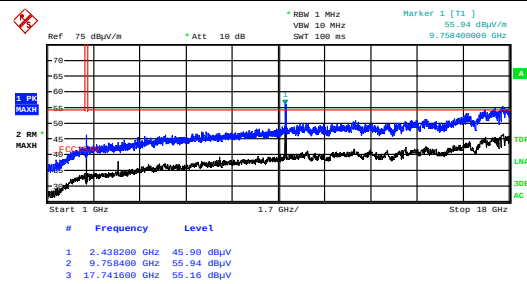
Date: 21.NOV.2024 14:26:31

Radiated Emissions 1 - 18 GHz, 2405 MHz, HP



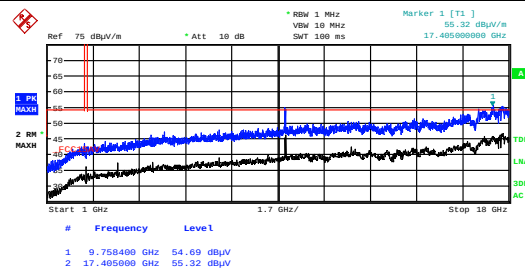
Date: 21.NOV.2024 14:24:33

Radiated Emissions 1 - 18 GHz, 2405 MHz, VP



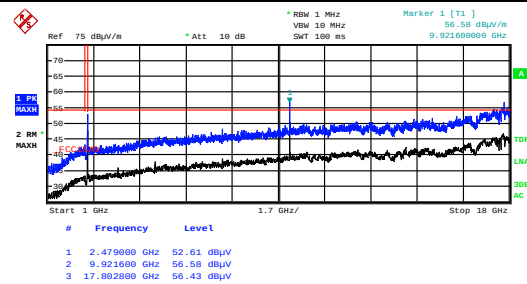
Date: 21.NOV.2024 13:24:06

Radiated Emissions 1 - 18 GHz, 2440 MHz, HP



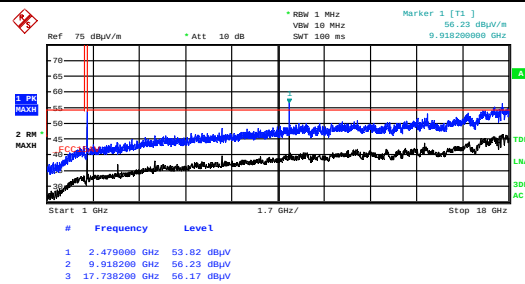
Date: 21.NOV.2024 13:22:09

Radiated Emissions 1 - 18 GHz, 2440 MHz, VP



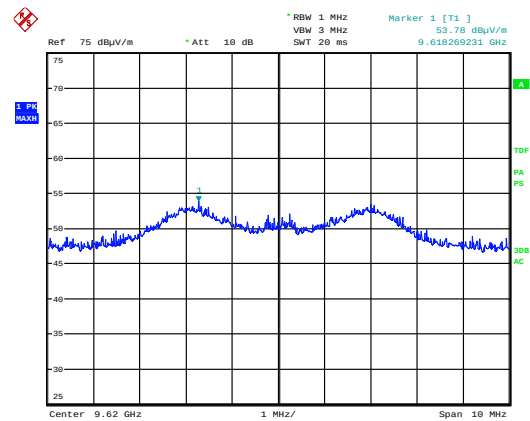
Date: 21.NOV.2024 14:44:25

Radiated Emissions 1 - 18 GHz, 2480 MHz, HP



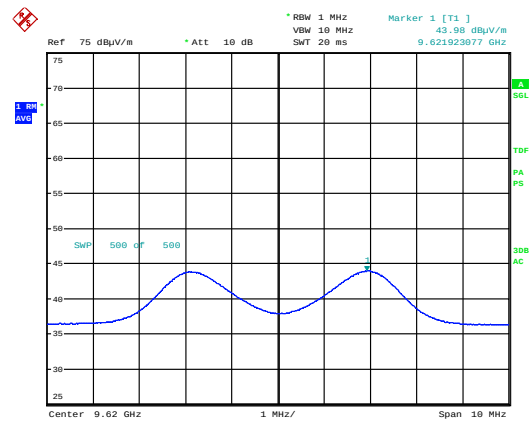
Date: 21.NOV.2024 14:42:27

Radiated Emissions 1 - 18 GHz, 2480 MHz, VP



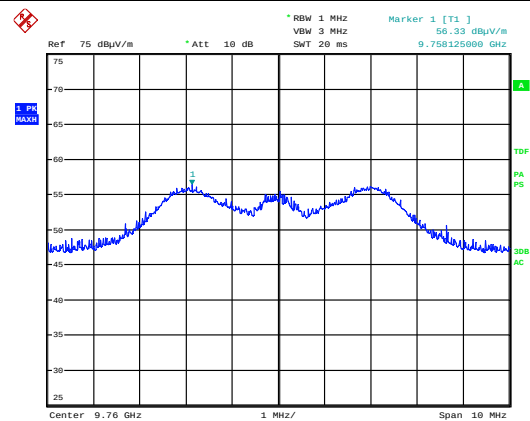
Date: 21.NOV.2024 14:28:30

Radiated Emissions, 9620 MHz, 2405 MHz (Max: YZ, VP), Peak



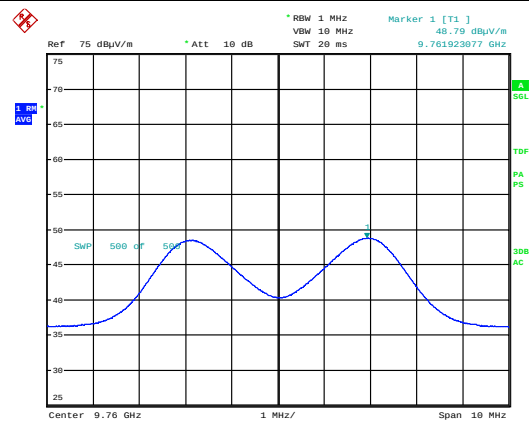
Date: 21.NOV.2024 14:21:04

Av



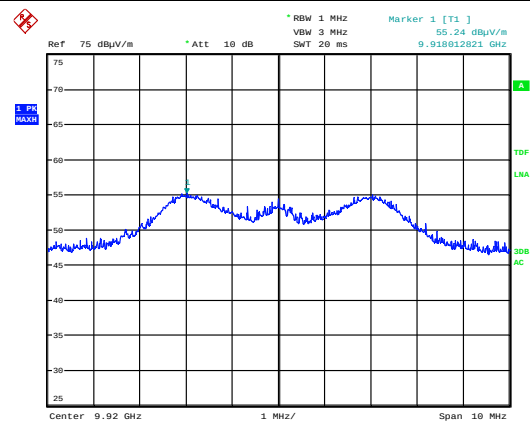
Date: 21.NOV.2024 14:01:19

Radiated Emissions, 9760 MHz, 2440 MHz (Max: YZ, VP), Peak



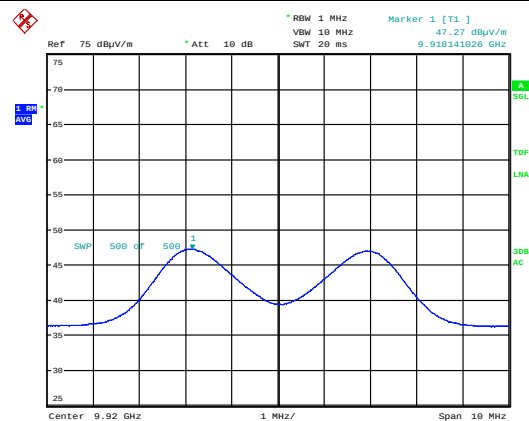
Date: 21.NOV.2024 14:01:47

Av



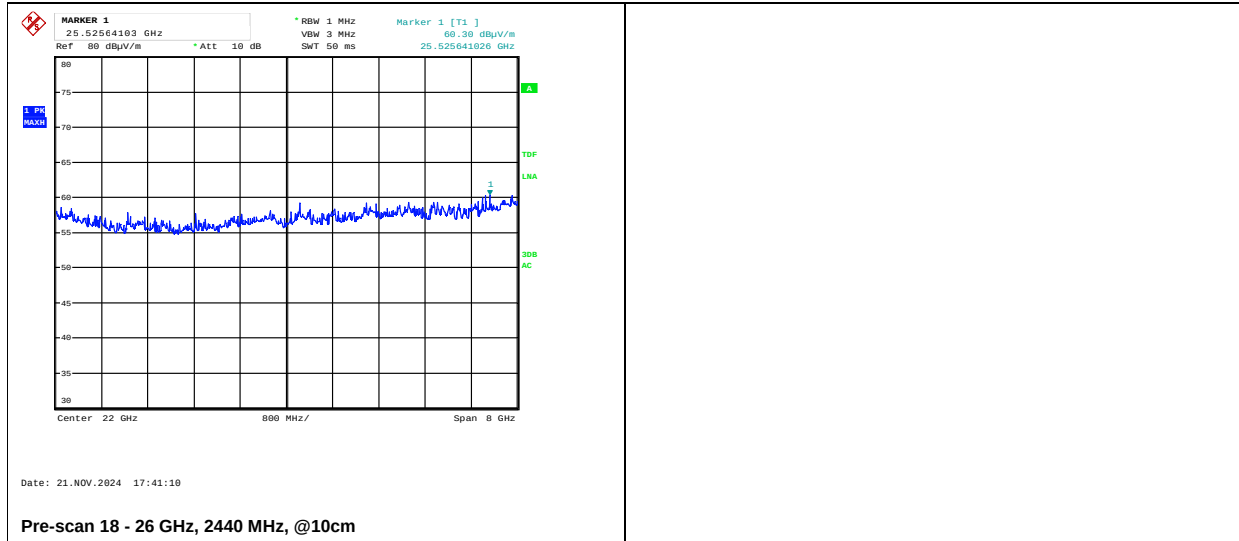
Date: 21.NOV.2024 15:02:26

Radiated Emissions, 9920 MHz, 2480 MHz (Max: YZ, VP), Peak



Date: 21.NOV.2024 15:02:53

Av



3.10 Power Spectral Density (PSD)

FCC part 15.247(d)

ISED Canada RSS-247 Issue 4, Clause 6.3.1

Measurement procedure: ANSI C63.10-2020 Clause 11.10

Test Results: Complies

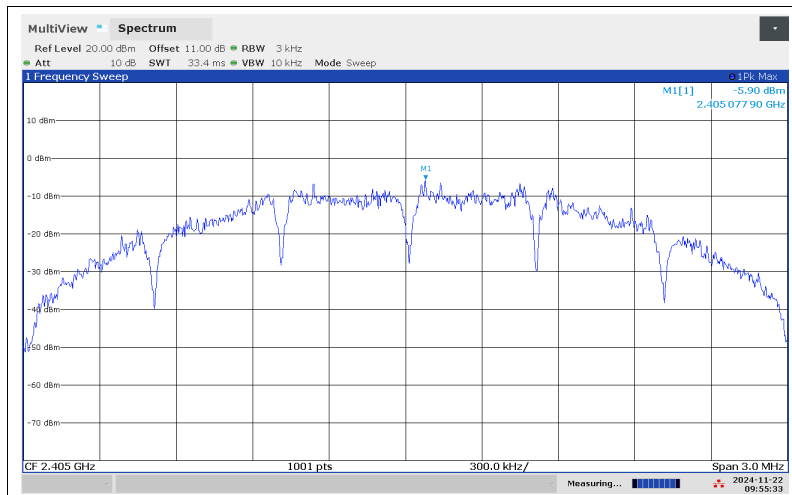
Measurement Data:

The measurement procedure PKPSD described in ANSI C63.10-2020 was used.

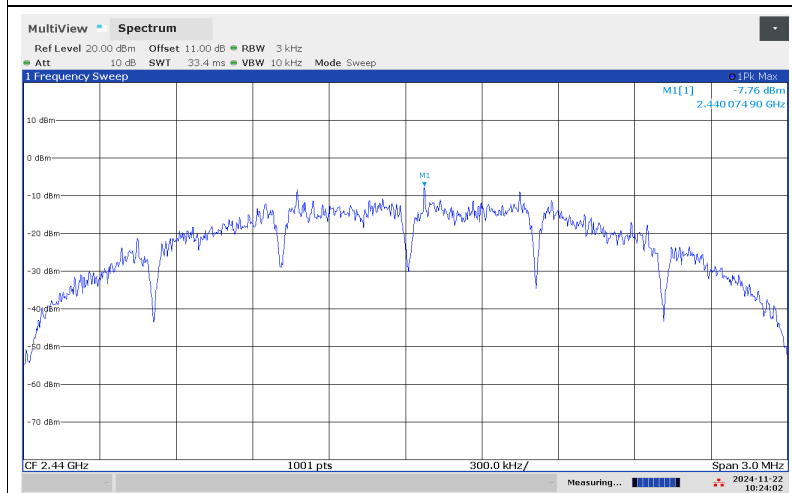
Modulation Type	Measured Power Spectral Density (dBm/3kHz)		
	2402 MHz	2440 MHz	2480 MHz
OPSK	-5.9	-7.8	-7.0

Requirement for systems using Digital Modulation

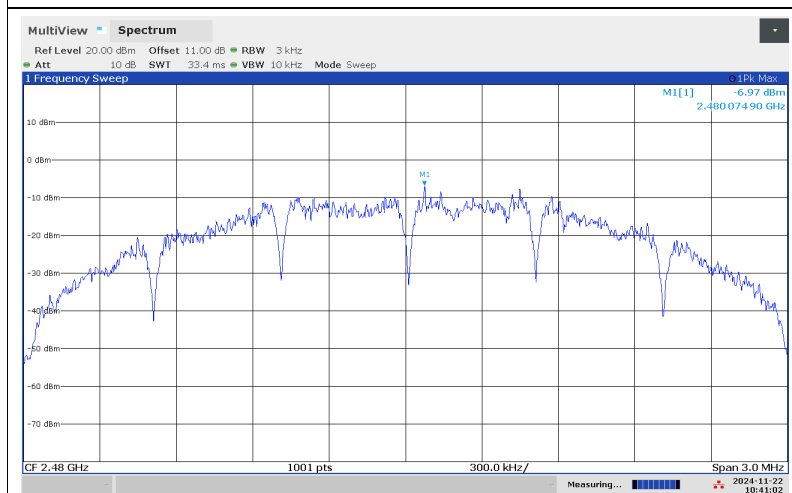
The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.



PSD, 2405 MHz, 1Mb



PSD, 2440 MHz, 1Mb



PSD, 2480 MHz, 1Mb

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.

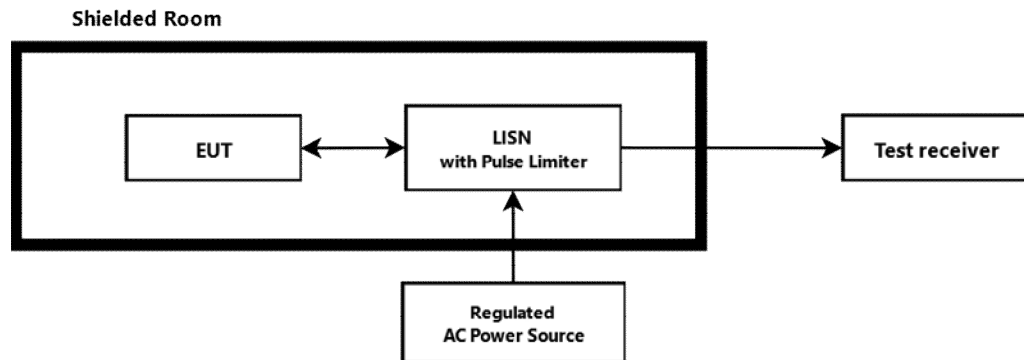
No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2025-01	2026-01
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2025-01	2026-01
3	6810.17B	Attenuator	Suhner	LR 1669	COU	
4	NO324415	Band Reject Filter	Microwave Circuits	LR 1760	COU	
5	JB3	BiLog Antenna	Sunol	N-4525	2023-04	2025-04
6	310	Preamplifier	Sonoma Inst.	LR 1686	2024-09	2025-09
7	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2024-09	2025-09
8	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2024-09	2025-09
9	WLK5-1100-1485-7000-40SS	Low Pass Filter	Wainwright Inst.	LR 1761	COU	
10	638	Antenna Horn	Narda	LR 1480	N/A	
11	Model 87V	Multimeter	Fluke	LR 1599	2024-11	2026.11
12	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	

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

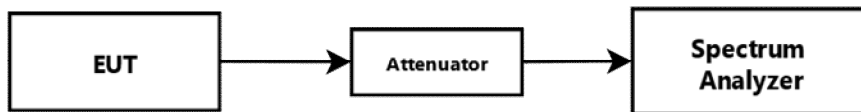
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.40	EMC test software
2	Nemko Scandinavia AS	RSPlot	1.0.8.0	Screenshots from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission

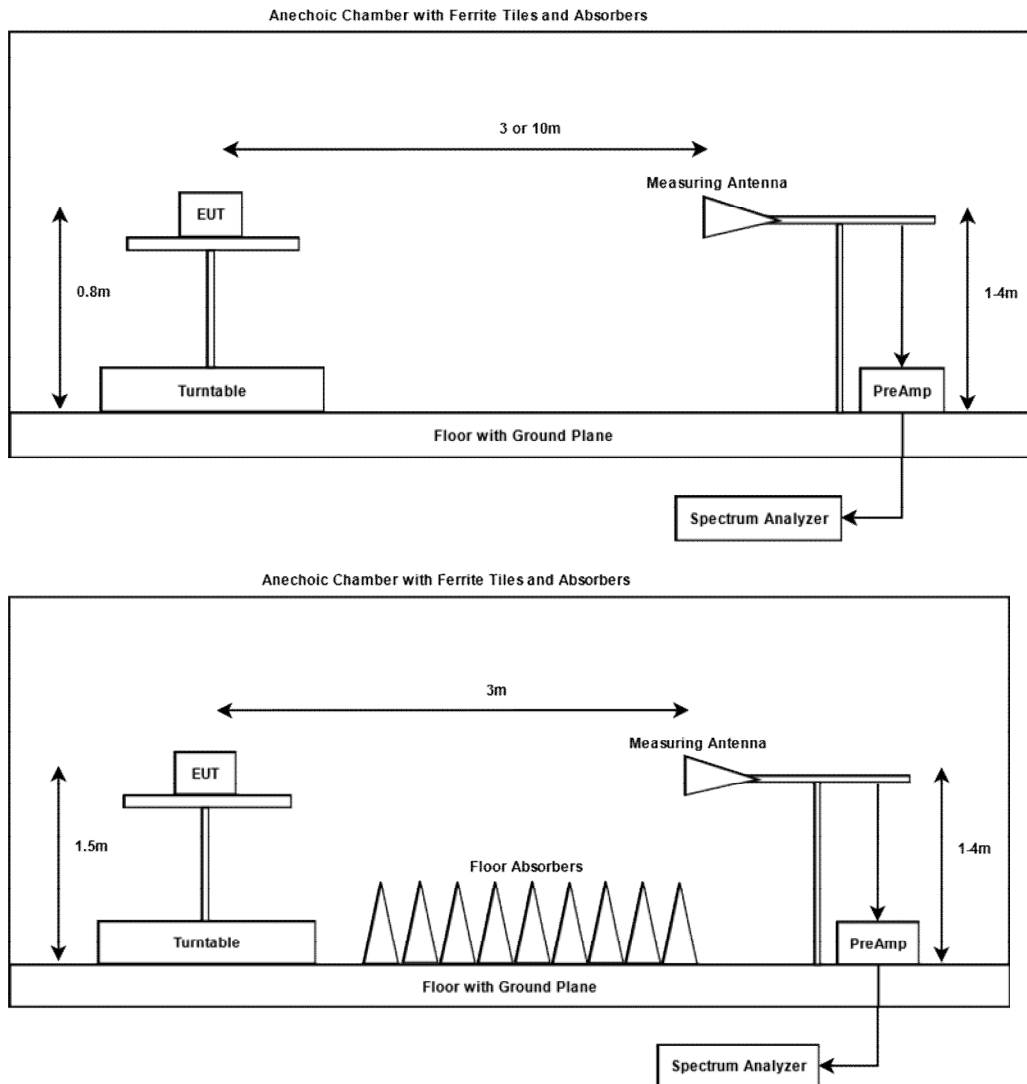


6.2 Conducted Tests



This test set-up is used for all Conducted tests.
For Frequency Stability test the EUT was placed in a climatic chamber.

6.3 Test Site Radiated Emission



This test setup is used for all radiated emissions tests. For frequencies below 30 MHz the measuring distance is 10m, for all other frequencies it is 3m or 1m. 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. All measurements at 1GHz and above were performed with turntable height 1.5m and with the ground plane covered by absorbers. A pre-amplifier is used for all measurements above 30 MHz, and High-Pass or Band-Pass filter is used for all harmonics.