

Test Report

Product	Wireless Communication Device
Name and address of the applicant	Sonitor Technologies AS Drammensveien 288, N-0283 Oslo, Norway
Name and address of the manufacturer	Sonitor Technologies AS Drammensveien 288, N-0283 Oslo, Norway
Model	HHM-A001
Rating	6.0 VDC, (4x1.5 VDC secondary Batteries)
Trademark	Sonitor Technologies AS
Serial number	See page 3
Additional information	2.4 GHz Zigbee based on IEEE 802.15.4
Tested according to	FCC Part 15.247 Frequency Hopping Transmitters / Digital Transmission Systems Industry Canada RSS-247, Issue 2 Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices
Order number	457218
Tested in period	2022-02-07 - 2022-02-15
Issue date	2022-03-01
Name and address of the testing laboratory	<div> Nemko Scandinavia AS Instituttveien 6 2007 Kjeller Norway </div> <div> CAB Number: FCC: NO0001 ISED: NO0470 </div> <div>   </div> <p>An accredited technical test executed under the Norwegian accreditation scheme</p>
<div>   </div> <div> Prepared by [G.Suhanthakumar] Approved by [Frode Sveisen] </div>	
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1 INFORMATION

1.1 Test Item

Name	SenseClean™ Hand Hygiene Module
Model/version	HHM-A001
FCC ID	2AD7T21122013101
ISED ID	20330-21122013101
Serial number	Radiated: 0004066 Conducted: 0004033
Hardware identity and/or version	V1.5
Software identity and/or version	nemkotest2022
Frequency Range	2405–2480 MHz
Number of Channels	16
Operating Modes	Transceiver
Type of Modulation	Offset-QPSK
Conducted Output Power	2.48 mW (Peak)
Antenna Connector	None
Number of Antennas	1
Diversity or Smart Antennas	No
Power Supply	N/A
Desktop Charger	None

Description of Test Item

The EUT is an IEEE 802.15.4 based Zigbee radio and 125 kHz LF radio. The EUT does not transmit simultaneously. This report only covers for Zigbee part.

This device will be installed in dispenser.

1.2 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	6.0 VDC

The values are the limit registered during the test period.

1.3 Test Engineer(s)

G.Suwanthakumar

1.4 Antenna Requirement

Does the EUT have detachable antenna(s)?	<input type="checkbox"/> YES	<input checked="" type="checkbox"/> NO
If detachable, is the antenna connector(s) non-standard?	<input type="checkbox"/> YES	<input type="checkbox"/> 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	Continuous TX
Additional information	The following settings were used for all tests: Power Setting: 4 dBm Data Rate: 250 kbps

1.6 Comments

The EUT uses the Zigbee protocol based on IEEE 802.15.4.

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

All ports were populated during spurious emission measurements.

2 TEST REPORT SUMMARY

2.1 General

All measurements are traceable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.247 and Industry Canada RSS-247 Issue 2 and RSS-GEN Issue 5.

Tests were performed in accordance with ANSI C63.4-2014 and ANSI C63.10-2013.

Radiated tests were made in a semi-anechoic chamber at measuring distances of 1m, 3m and 10m.

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

☒ New Submission

☒ Production Unit

☐ Class II Permissive Change

☐ Pre-production Unit

DTS Equipment Code

☐ Family Listing



THIS TEST REPORT APPLIES ONLY TO THE ITEM(S) AND CONFIGURATIONS TESTED.

Deviations from, additions to, or exclusions from the test specifications are described in "Summary of Test Data".

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2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247 Issue 2, RSS-GEN Issue 5 reference	ANSI C63.10-2013 Reference	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	5.13	N/A ¹
Antenna Requirement	15.203	6.8 (RSS-GEN)	5.8	Complies ²
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2 / 8.8 (RSS-GEN)	6.2	N/A ¹
Occupied Bandwidth (99% BW)	N/A	6.7 (RSS-GEN)	6.9.3	-
DTS Bandwidth	15.247(a)(2)	5.2 (1) (RSS-247)	11.8 Option 2	Complies
Peak Power Output	15.247(b)	5.4 (RSS-247)	11.9.1.1	Complies
Power Spectral Density	15.247(d)	5.2 (2) (RSS-247)	11.10.2 PKPSD (DTS)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	5.5 (RSS-247)	6.7 11.11 (DTS)	Complies
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	5.5 (RSS-247) 7.3 (RSS-GEN) 8.9 (RSS-GEN)	6.3, 6.5, 6.6, 6.10 11.12, 11.13 (DTS)	Complies

¹ The tested equipment only operates with battery

² Integral antenna.

- for information only

Revision history

Revision	Date	Comment	Sign
00	2022-03-01	First edition	gns

3 TEST RESULTS

3.1 Occupied Bandwidth (99% BW)

FCC Part 15.247 (a)(1)(iii)

ISED Canada RSS-247 Issue 2, Clause 5.1

ISED Canada RSS-GEN Issue 5, Clause 6.7

Measurement procedure: ANSI C63.10-2013 Clause 6.9.3 / 7.8.3

Test Results: Complies

Measurement Data:

Carrier Frequency	Occupied Bandwidth (99% BW)
2405 MHz	2.35 MHz
2440 MHz	2.39 MHz
2480 MHz	2.45 MHz

Occupied Bandwidth is the same for all channels

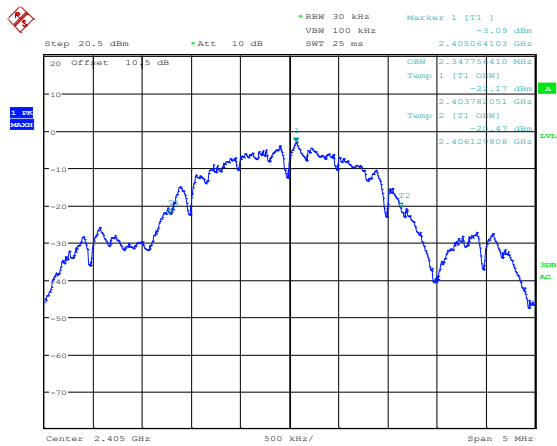
See attached plots.

Requirements:

Frequency hopping systems in the 2400 - 2483.5 MHz band shall use at least 15 non-overlapping channels. No requirements for bandwidth for this frequency band.

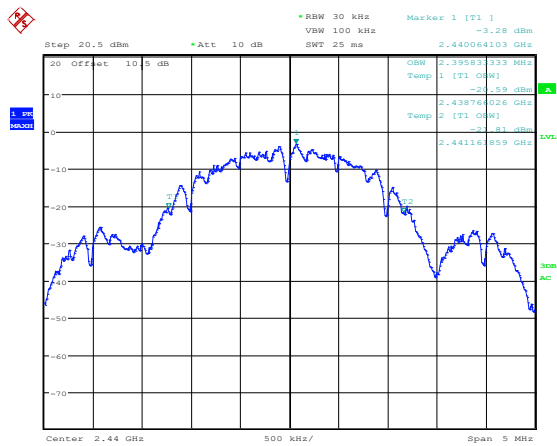
No requirements for Digital Transmission Systems.

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



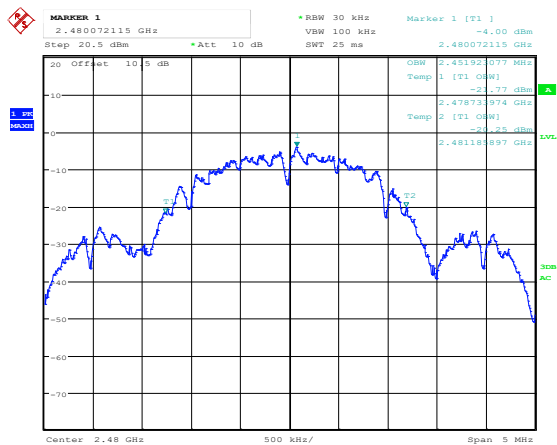
Date: 7.FEB.2022 16:43:21

99 % Occupied BW, Ch2405 MHz



Date: 7.FEB.2022 16:49:36

99 % Occupied BW, Ch2440 MHz



Date: 7.FEB.2022 16:55:19

99 % Occupied BW, ch2480 MHz

3.2 DTS Bandwidth

FCC Part 15.247 (a)(2)

ISED Canada RSS-247 Issue 2, Clause 5.2 (a)

Measurement procedure: ANSI C63.10-2013 Clause 11.8

Test Results: Complies

Measurement Data:

Operating Mode	DTS Bandwidth (6 dB BW)		
	2405 MHz	2440 MHz	2480 MHz
Zigbee	1.62 MHz	1.63 MHz	1.67 MHz

Requirements:

For Digital Transmission Systems in the 2400-2483.5 MHz band the minimum 6 dB bandwidth shall be at least 500 KHz.

No requirements for Frequency Hopping Systems.



Step 20.5 dBm Att 10 dB SWT 5 ma 1.634619385 MHz

20 Off/ac 10.5 dB Markers 1 [T1] -0.17 dB
-4.55 dBm
2.439154667 GHz

Center 2.44 GHz 1 MHz/ Span 10 MHz

Date: 7.FEB.2022 16:49:06

The screenshot shows a Keysight E67 Series Spectrum Analyzer interface. The main display is a grid with a blue trace representing the signal spectrum. The trace shows a noisy signal centered around 2.48 GHz, with a peak level of approximately -10 dBm. The signal has a bandwidth of about 10 MHz, as indicated by the span. The center frequency is 2.48 GHz, and the resolution bandwidth is 100 kHz. The video bandwidth is 300 kHz, and the sweep time is 5 ms. The display also shows the input power level as 20.5 dBm and the attenuation as 10 dB. The marker shows the peak level as -1.33 dBm at 2.479156641 GHz. The reference level is -70 dBm. The display is in dBm mode, and the scale is linear. The grid lines are spaced at 10 MHz intervals horizontally and 10 dB intervals vertically. The signal is centered at 2.48 GHz, and the span is 10 MHz. The resolution bandwidth is 100 kHz, and the video bandwidth is 300 kHz. The sweep time is 5 ms, and the input power level is 20.5 dBm. The attenuation is 10 dB. The marker shows the peak level as -1.33 dBm at 2.479156641 GHz. The reference level is -70 dBm. The display is in dBm mode, and the scale is linear. The grid lines are spaced at 10 MHz intervals horizontally and 10 dB intervals vertically.

Top status bar:

- Step 20.5 dBm
- Att 10 dB
- SWT 5 ms
- 1.666666667 MHz
- Delta 1 [T1]
- 0.26 dB
- VBW 300 kHz

Top right corner:

- Marker 1 [T1]
- 1.33 dBm
- 2.479156641 GHz

Left side controls:

- 100 kHz RBW
- 300 kHz VBW

Bottom status bar:

- Center 2.48 GHz
- 1 MHz/
- Span 10 MHz

Date: 7.FEB.2022 16:54:50

Page 10 (28)

3.3 Peak Power Output

FCC Part 15.247 (b)

ISED Canada RSS-247 Issue 2, Clause 5.4

Measurement procedure: ANSI C63.10-2013 Clause 11.9.1.2

Test Results: Complies

Measurement Data:

Carrier Frequency (MHz)	Modulation Type	Conducted Power (dBm)	Conducted Power (mW)	Field Strength (dBμV/m)	EIRP (mW)	Antenna gain (dBi)
2405	O-QPSK	3.95	2.48	99.88	2.92	0.7
2440	O-QPSK	3.77	2.38	100.38	3.27	1.4
2480	O-QPSK	3.60	2.29	100.70	3.52	1.9

Output Power reported is Maximum Peak Power.

Radiated Power was calculated from measured Field Strength using the method described in FCC KDB 412172 D01.

Antenna Gain is less than 6 dBi.

See attached plots.

Requirements:

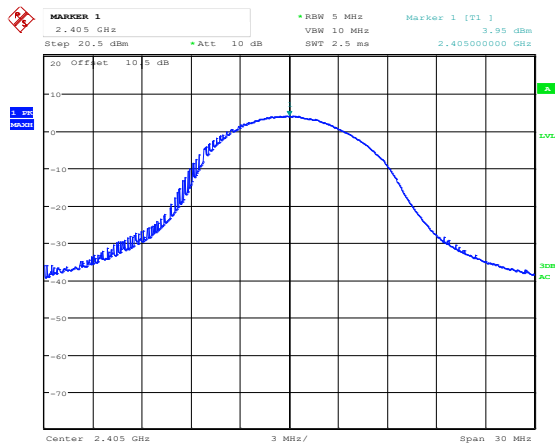
The maximum peak output power shall not exceed the following limits:

For frequency hopping systems employing at least 75 hopping channels: 1 Watt

For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts

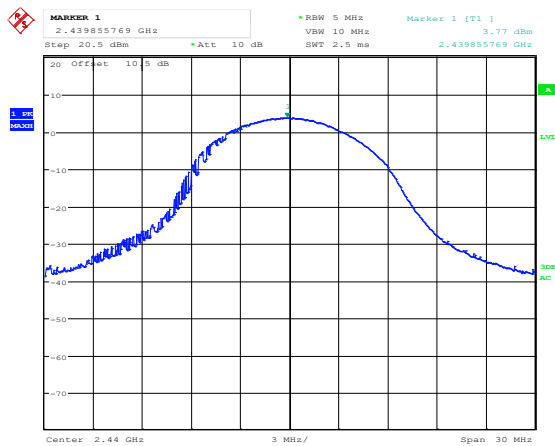
For Digital Transmission Systems in the 2400 - 2483.5 MHz band: 1 Watt

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.



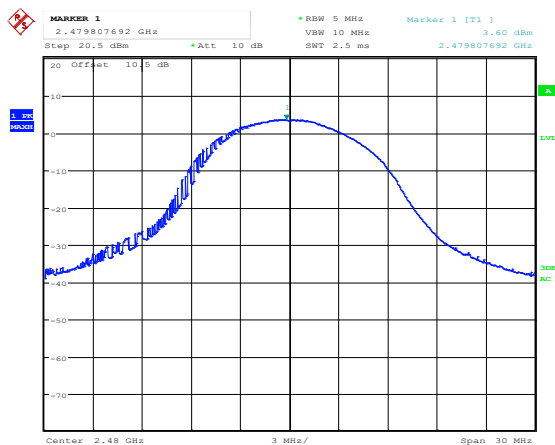
Date: 7.FEB.2022 16:41:15

Peak Power, 2405 MHz, O-QPSK



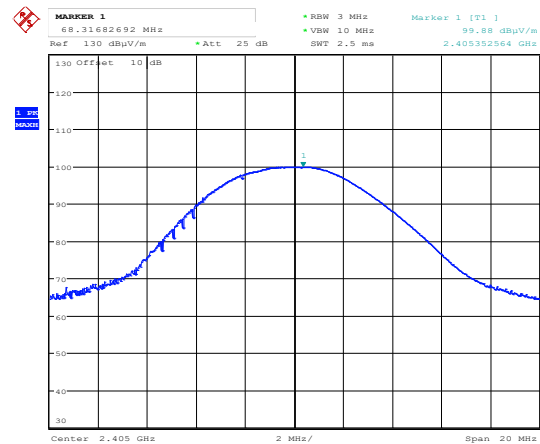
Date: 7.FEB.2022 16:48:15

Peak Power, 2440 MHz, O-QPSK



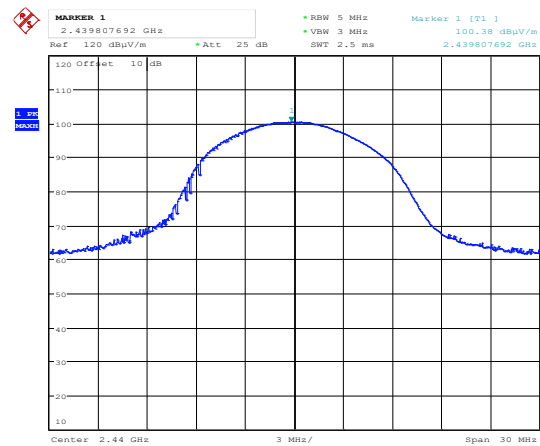
Date: 7.FEB.2022 16:54:09

Peak Power, 2480 MHz, O-QPSK



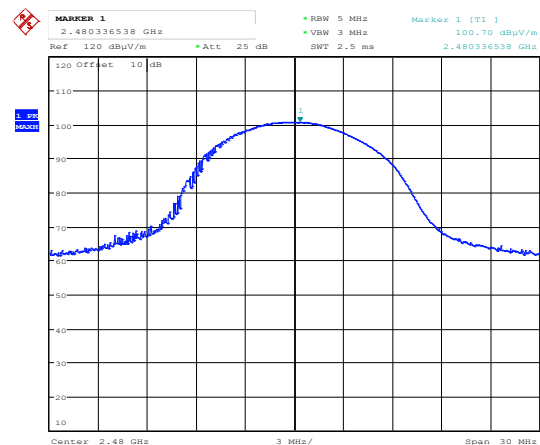
Date: 7.FEB.2022 09:49:05

Maximum Field Strength, 2405 MHz, O-QPSK



Date: 7.FEB.2022 10:28:52

Maximum Field Strength, 2440 MHz, O-QPSK



Date: 7.FEB.2022 10:34:34

Maximum Field Strength, 2480 MHz, O-QPSK

3.4 Conducted Emissions at Antenna Connector

FCC Part 15.247 (d)

ISED Canada RSS-247 Issue 2, Clause 5.5

Measurement procedure: ANSI C63.10-2013 Clause 11.11

Test Results: Complies

Measurement Data:

Carrier Frequency	Highest Value (dBc)	Margin (dB)	Verdict
2405 MHz	37.63	> 20	Pass
2440 MHz	38.11	> 20	Pass
2480 MHz	36.67	> 20	Pass

Measured with Peak Detector

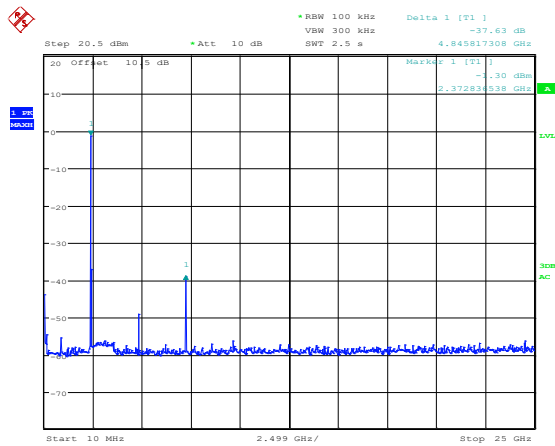
RF conducted power to 25 GHz: see attached plots.

Limit

Peak measurement	RMS averaging
20 dBc or more in 100 kHz bandwidth	30 dBc or more in 100 kHz bandwidth

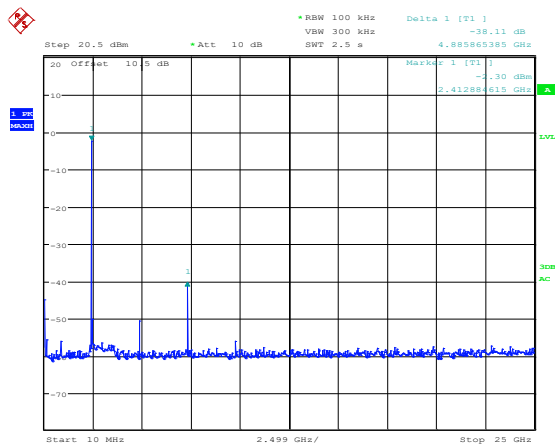
Detector type shall be the same as used for measuring Output Power.

Attenuation below the general limits specified in part 15.209(a) is not required.



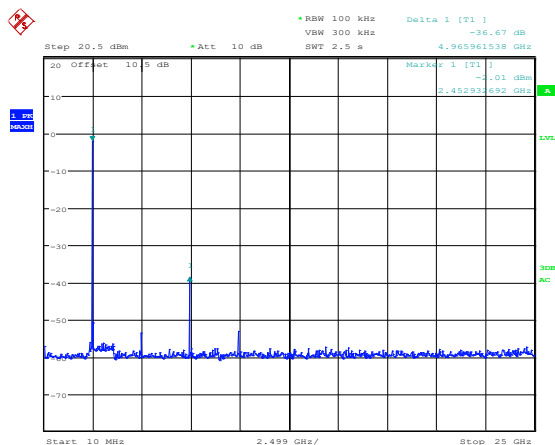
Date: 7.FEB.2022 16:46:04

Conducted Emissions 10MHz-25GHz, 2405 MHz, O-QPSK



Date: 7.FEB.2022 16:50:38

Conducted Emissions 10MHz-25GHz, 2440 MHz, O-QPSK



Date: 7.FEB.2022 16:56:16

Conducted Emissions 10MHz-25GHz, 2480 MHz, O-QPSK

3.5 Restricted Bands of operation

Restricted Bands of operation for FCC and ISED are defined in FCC Part 15.205 and ISED 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 Canada (MHz)	FCC (GHz)	ISED Canada (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 ISED, all other frequencies are common.

3.6 Radiated Emissions, Band Edge

FCC Part 15.209 (a)

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

Measurement procedure: ANSI C63.10-2013 Clause 11.12

Test Results: Complies

Measurement Data:

Carrier Frequency and Data Rate	Band Edge Frequency	Measured Field Strength (dBμV/m)		Limit (dBμV/m)		Margin (dB)	
		Peak Detector	Average Detector	Peak Det	Average Det	Peak Det	Average Det
2405 MHz, O-QPSK	2390 MHz	60.69	40.69	74	54	13.31	13.31
2480 MHz, O-QPSK	2483.5 MHz	73.56	53.56			0.44	0.44

Average Detector values are measured with Peak Detector and corrected for Duty Cycle.

See attached plots.

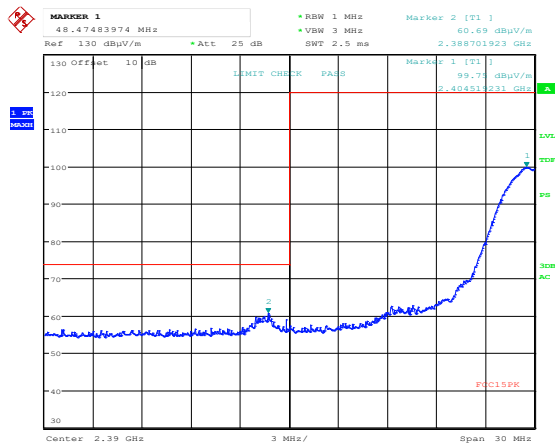
Duty Cycle Correction Factor Calculation:

Manufacturer data:

Duty Cycle = 0.02 % (One message lasting 1 ms each 5s)

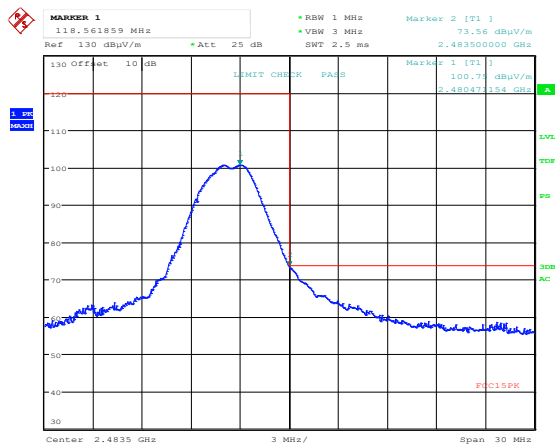
Duty Cycle Correction factor = $-20 \times \log(0.0002) = > 20 \text{ dB}$

Maximum Duty Cycle Correction Factor according to Para 15.35 (b): 20 dB



Date: 7.FEB.2022 09:50:22

Lower Band Edge 2405 MHz, O-QPSK, Peak



Date: 7.FEB.2022 10:39:06

Upper Band Edge 2480 MHz, O-QPSK, Peak

3.8 Radiated Emission, 30 – 1000 MHz.

FCC Part 15.209 (a)

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 (found frequencies were measured with Quasi-Peak Detector)

Measuring distance 3 m

Measured in Zigbee test mode

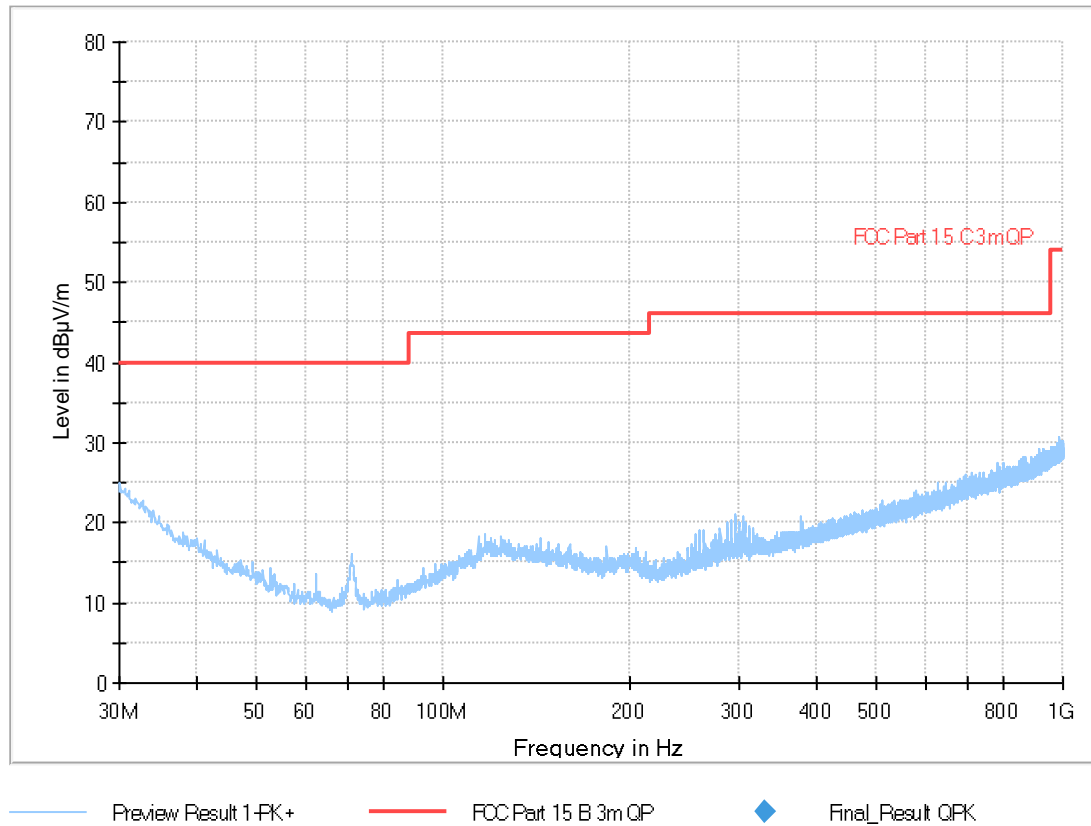
Measured Frequency (MHz)	Carrier Frequency (MHz)	Modulation	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30 – 88	2440	O-QPSK	/	40.0	/
88 – 216	2440	O-QPSK	/	43.5	/
216 – 960	2440	O-QPSK	/	46.0	/
960 – 1000	2440	O-QPSK	/	54.0	/

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	

Full Spectrum



Radiated Emissions 30 - 1000 MHz, GFSK, VP/HP

3.9 Radiated Emissions, 1-25 GHz

FCC Part 15.209 (a)

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)

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

Peak Detector, RBW=1 MHz

Carrier freq. (MHz)	Measured Frequency (GHz)	Modulation	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2405	7.215	O-QPSK	56.56	74	17.44
2440	7.320	O-QPSK	57.44	74	16.56
2480	7.440	O-QPSK	57.07	74	16.93

Average Detector, RBW=1 MHz

Carrier freq. (MHz)	Measured Frequency (GHz)	Modulation	Measured Emission (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2405	7.215	O-QPSK	36.56	54	17.44
2440	7.320	O-QPSK	37.44	54	16.56
2480	7.440	O-QPSK	37.07	54	16.93

Maximum radiated spurious emissions are obtained in Horizontal polarization.

Duty Cycle Correction Factor Calculation:

Manufacturer data:

Duty Cycle = 0.02 % (One message lasting 1 ms each 5s)

Duty Cycle Correction factor = $-20 \times \log(0.0002) = > 20$ dB

Average Detector values are calculated from Peak values by Duty Cycle Correction Factor

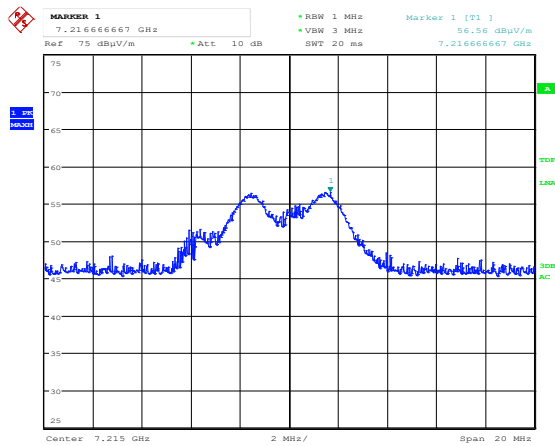
A Band Reject Filter was used for measurements from 1 GHz to 18 GHz

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

See plots

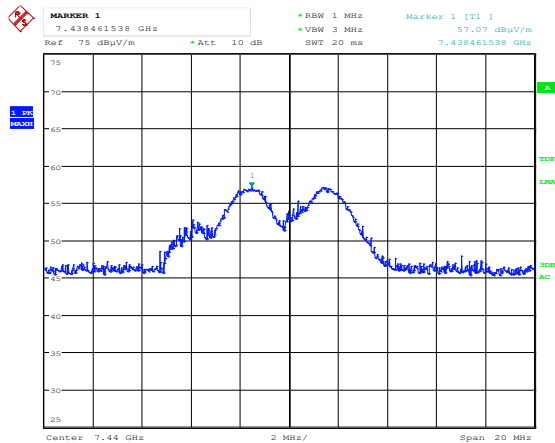
Requirements/Limit

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



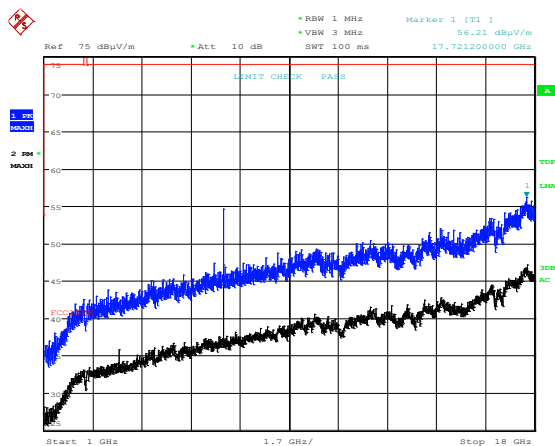
Date: 7.FEB.2022 10:09:51

3rd harmonic, ch2405 MHz, HP, PK



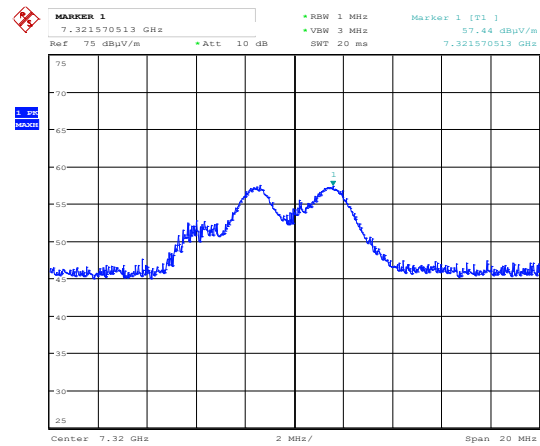
Date: 7.FEB.2022 10:52:00

3rd harmonic, ch2480 MHz, HP, PK



Date: 7.FEB.2022 10:04:16

Radiated Emissions 1 - 18 GHz, 2405 MHz, GFSK, HP



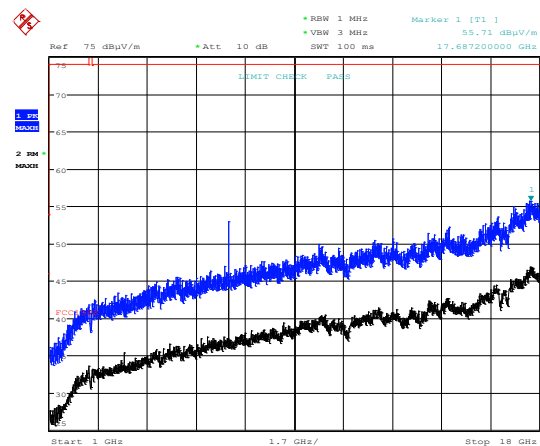
Date: 7.FEB.2022 10:13:41

3rd harmonic, ch2440 MHz, HP, PK



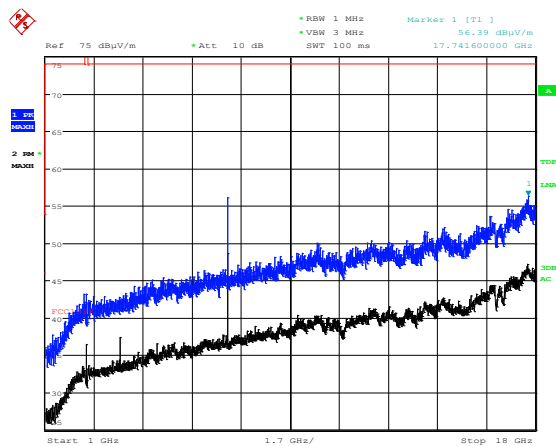
Date: 7.FEB.2022 10:52:00

3rd harmonic, ch2480 MHz, HP, PK



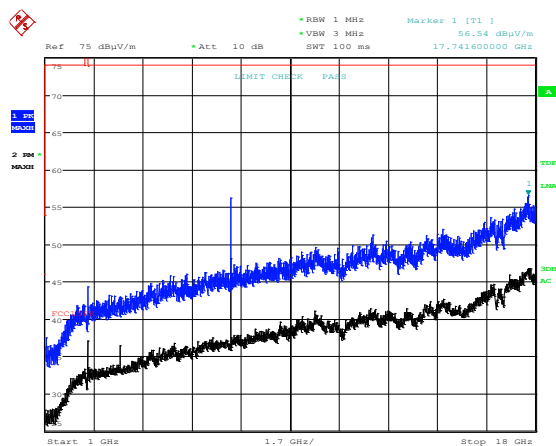
Date: 7.FEB.2022 10:06:29

Radiated Emissions 1 - 18 GHz, 2405 MHz, GFSK, VP



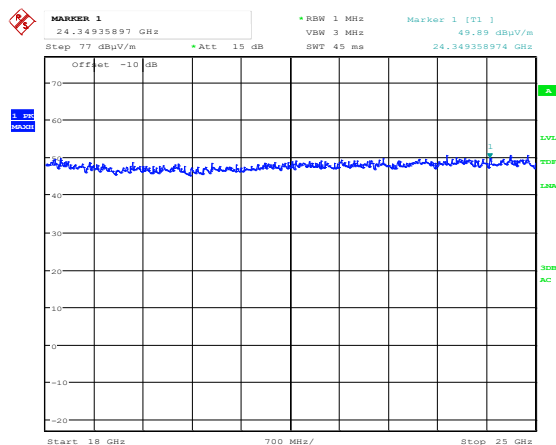
Date: 7.FEB.2022 10:20:40

Radiated Emissions 1 - 18 GHz, 2440 MHz, GFSK, HP



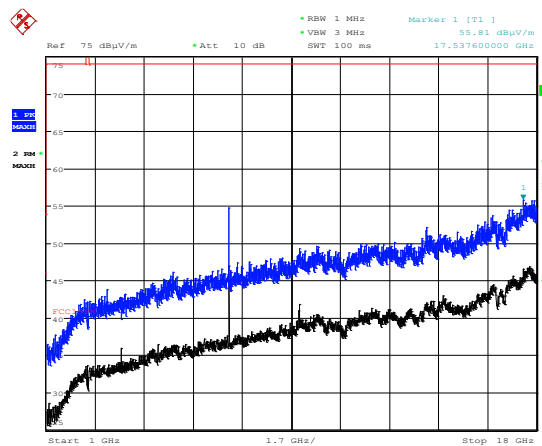
Date: 7.FEB.2022 10:47:48

Radiated Emissions 1 - 18 GHz, 2480 MHz, GFSK, HP



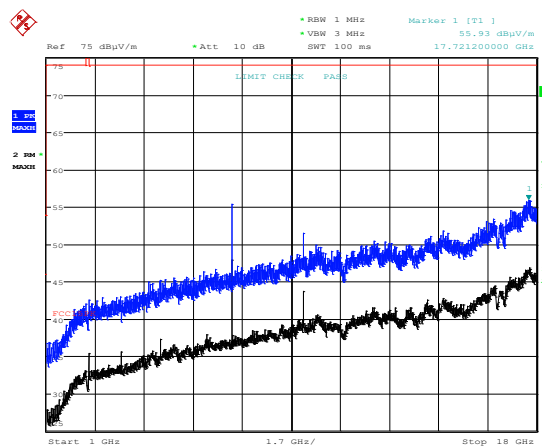
Date: 7.FEB.2022 17:31:31

Radiated Emissions 18 - 25 GHz, 2405 MHz, O-QPSK, HP, pk @1m



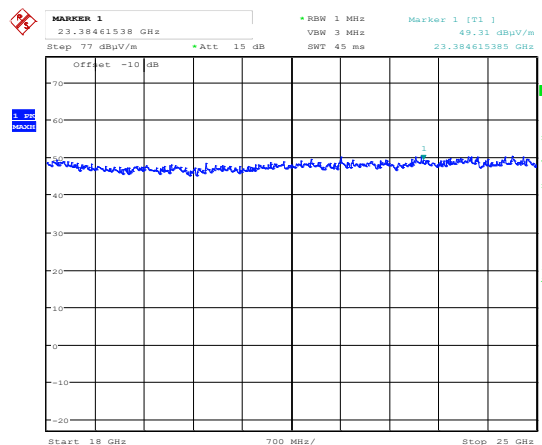
Date: 7.FEB.2022 10:22:54

Radiated Emissions 1 - 18 GHz, 2440 MHz, GFSK, VP



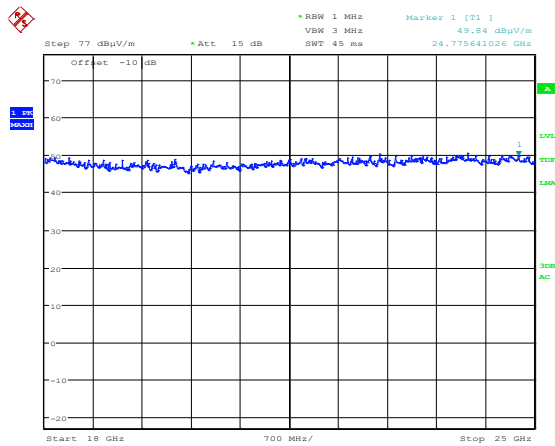
Date: 7.FEB.2022 10:50:02

Radiated Emissions 1 - 18 GHz, 2480 MHz, GFSK, VP



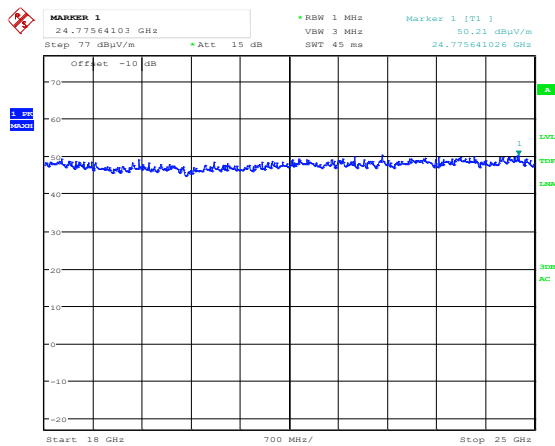
Date: 7.FEB.2022 17:31:08

Radiated Emissions 18 - 25 GHz, 2405 MHz, O-QPSK, VP, pk @1m



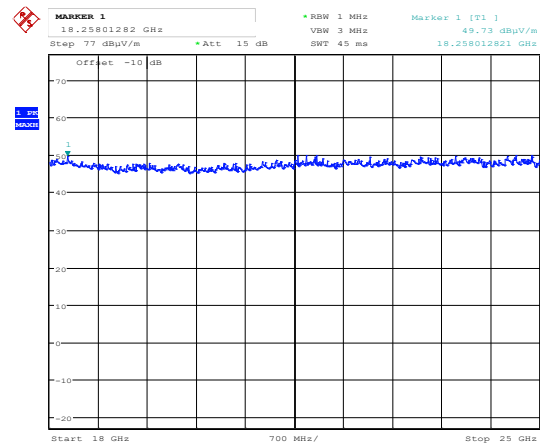
Date: 7.FEB.2022 17:34:30

Radiated Emissions 18 - 25 GHz, 2440 MHz, O-QPSK, HP, pk @1m



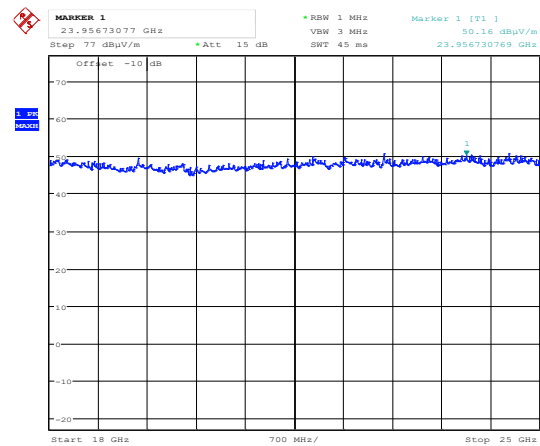
Date: 7.FEB.2022 17:33:51

Radiated Emissions 18 - 25 GHz, 2480 MHz, O-QPSK, HP, pk @1m



Date: 7.FEB.2022 17:34:47

Radiated Emissions 18 - 25 GHz, 2440 MHz, O-QPSK, VP, pk @1m



Date: 7.FEB.2022 17:33:30

Radiated Emissions 18 - 25 GHz, 2480 MHz, O-QPSK, VP, pk @1m

3.10 Power Spectral Density (PSD)

FCC part 15.247(d)

ISED Canada RSS-247 Issue 2, Clause 5.2 (2)

Measurement procedure: ANSI C63.10-2013 Clause 11.10

Test Results: Complies

Measurement Data:

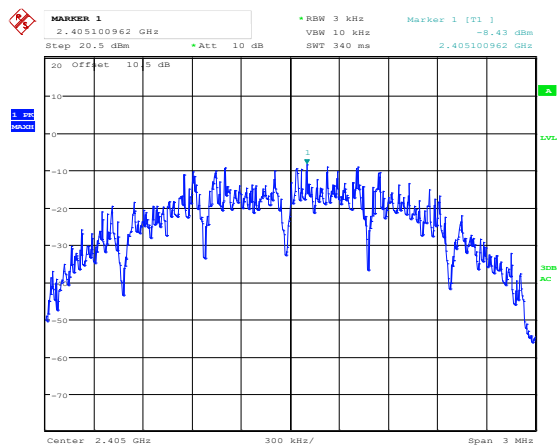
The measurement procedure PKPSD described in ANSI C63.10-2013 was used.

Modulation Type	Measured Power Spectral Density (dBm/3kHz)		
	2405 MHz	2440 MHz	2480 MHz
O-QPSK	-8.43	-8.27	-8.98

Requirements:

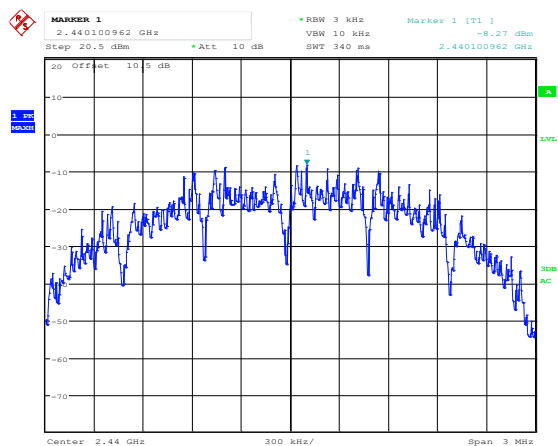
The Power Spectral Density of a Digital Transmission System shall be no greater than +8 dBm in any 3 kHz band

No requirements for Frequency Hopping Systems.



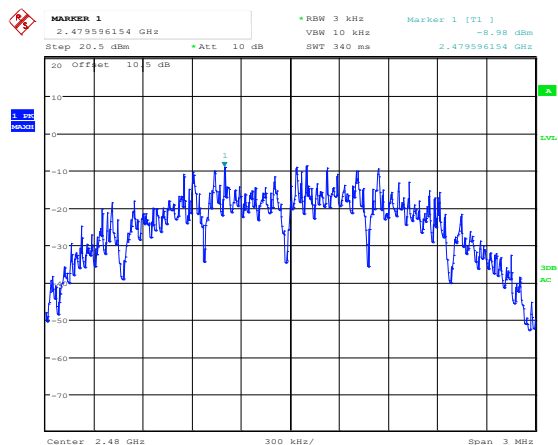
Date: 7.FEB.2022 16:44:09

PSD, 2405 MHz, O-QPSK



Date: 7.FEB.2022 16:50:04

PSD, 2440 MHz, O-QPSK



Date: 7.FEB.2022 16:55:47

PSD, 2480 MHz, O-QPSK

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 Test Laboratory.

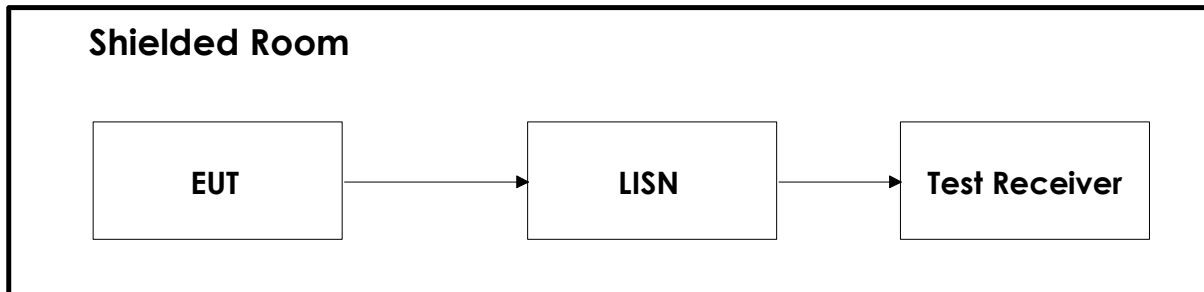
No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2022-01	2023-01
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2022-01	2023-01
3	6810.17B	Attenuator	Suhner	LR 1669	COU	
4	NO324415	Band Reject Filter	Microwave Circuits	LR 1760	COU	
5	JB3	Biconical-LOG Hybrid	Sunol Sceiences	N-4525	2020-02	2024-02
6	317	Preamplifier	Sonoma Inst.	LR 1687	2021-07	2022-07
7	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2021-12	2022-12
10	638	Antenna Horn	Narda	LR 1480	N/A	
11	HFH2-Z2	Loop Antenna	Rohde & Schwarz	LR 1660	2022-01	2024-01
12	Model 87V	Multimeter	Fluke	LR 1599	2021-01	2023-01
16	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	

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

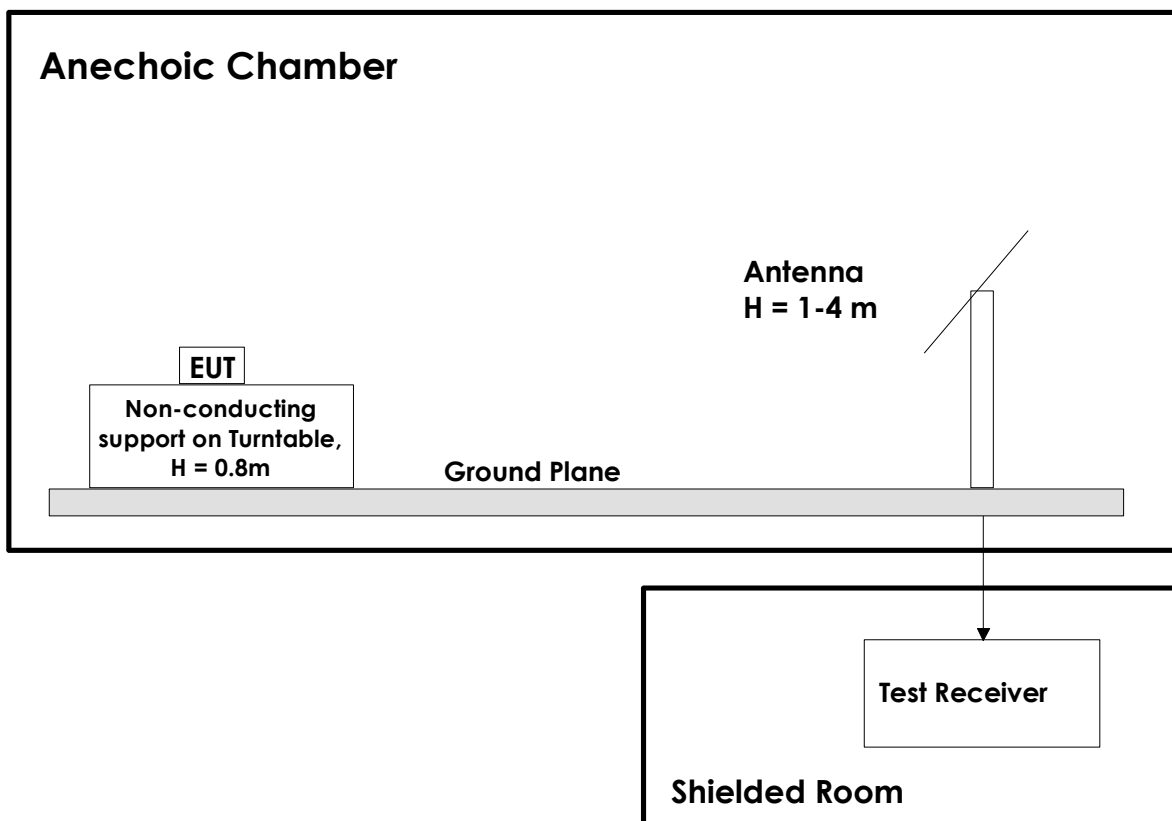
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.30.10	EMC test software
2	Nemko AS	RSPlot	1.0.8.0	Screen capture from R&S Spectrum Analyzers

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 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.