

Test Report

Product	Bluetooth Transceiver in DECT Base Station		
Name and address of the applicant	Panasonic Corporation of North America Two Riverfront Plaza, 9 th Floor Newark, 07102-5490, NJ, USA		
Name and address of the manufacturer	Panasonic Corporation 1-62, 4-chome, Minoshima, Hakata-ku Fukuoka, 812-8531, Japan		
Model	KX-TGM460		
Rating	120V 60Hz (Input: 120V ~60Hz 0.1A; Output: 5.5V 0.5A, 2.75W)		
Trademark	Panasonic		
Serial number	4408450005		
Additional information	DECT 6.0, Bluetooth 4.2, GFSK only		
Tested according to	Parts of FCC Part 15.247 Frequency Hopping Transmitters / Digital Transmission Systems Parts of 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	440845		
Tested in period	2021-05-25 to 2021-06-15		
Issue date	2021-07-08		
Name and address of the testing laboratory	 Instituttveien 6 Kjeller, Norway www.nemko.com	CAB Number: FCC: NO0001 ISED: NO0470 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50	 
An accredited technical test executed under the Norwegian accreditation scheme			
 Prepared by [Frode Sveinsen]		 Approved by [G.Suhanthakumar]	
<p>This report shall not be reproduced except in full without the written approval of Nemko. Opinions and interpretations expressed within this report are not part of the current accreditation. This report was originally distributed electronically with digital signatures. For more information contact Nemko.</p>			

CONTENTS

1	INFORMATION	3
1.1	Test Item	3
1.2	Normal test conditions	4
1.3	Test Engineer(s)	4
1.4	Antenna Requirement	4
1.5	EUT Operating Modes	4
1.6	Comments	4
2	TEST REPORT SUMMARY	5
2.1	General	5
2.2	Test Summary	6
3	TEST RESULTS	7
3.1	Power Line Conducted Emissions	7
3.2	20dB Bandwidth	8
3.3	Hopping Bandwidth	10
3.4	Occupancy Time	12
3.5	Occupied Bandwidth (99% BW)	14
3.6	Peak Power Output	16
3.7	Conducted Emissions at Antenna Connector	18
3.8	Restricted Bands of operation	22
3.9	Radiated Emissions, Band Edge	23
3.10	Radiated Emission, 30 – 1000 MHz	25
3.11	Radiated Emissions, 1-26 GHz	27
4	Measurement Uncertainty	30
5	LIST OF TEST EQUIPMENT	31
6	BLOCK DIAGRAM	32
6.1	Power Line Conducted Emission	32
6.2	Test Site Radiated Emission	32

1 INFORMATION

1.1 Test Item

Name	Panasonic
Model name	KX-TGM460
FCC ID	ACJ96NKX-TGM460A
ISED ID	N/A
Serial number	4408450005
Hardware identity and/or version	PNLB2574
Software identity and/or version	SW401
Frequency Range	2402–2480 MHz
Number of Channels	79
Operating Modes	Bluetooth Basic Rate
Type of Modulation	GFSK
Conducted Output Power	0.0068 mW (Peak)
Antenna Connector	None
Number of Antennas	1
Diversity or Smart Antennas	No
Power Supply	AC Adaptor PNLV236 (tested with PNLV226) (Input: 120V ~60Hz 0.1A, Output: 5.5V _{DC} 0.5A, 2.75W)
Interfaces	PSTN

Description of Test Item

The EUT is a DECT Base Station with Bluetooth transceiver.

This Bluetooth part has been tested as a Frequency Hopping system and fulfils all requirements for FHSS systems.

Only Basic Rate Bluetooth with GFSK is supported, Enhanced Data Rates are not supported.

This model is identical to the already certified model (FCC ID: ACJ96NKX-TGM460), only the Bluetooth Part is changed. The main PCB and the DECT part are identical.

The BT part is identical to the BT part in the already certified model KX-TGD860 (FCC ID: ACJ96NKX-TGD860).

The models KX-TGM460 and KX-TGM430 are identical, the only difference is amplified volume level and different AC adaptor. KX-TGM460 uses AC adaptor model PNLV236.

All 50 Ohm tests were performed on a KX-TGD860, all other tests were performed on a KX-TGM430 with AC adaptor PNLV236.

This report contains all results for the Bluetooth Part.

1.2 Normal test conditions

Temperature:	20 – 23 °C
Relative humidity:	30 – 50 %
Normal test voltage:	120 V 60 Hz

The values are the limit registered during the test period.

All tests were performed with the EUT connected to a regulated Power Source.

1.3 Test Engineer(s)

Frode Sveinsen

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 and Hopping, Basic Rate
Additional information	<p>The EUT was programmed with batch files from a computer with a USB-Serial dongle.</p> <p>The following settings were used for all tests:</p> <p>Power Setting: Not selectable Modulation: GFSK (Not selectable) Bit Pattern: PSRB (Not selectable) Frame Type: DH1, DH3, DH5</p>

1.6 Comments

The EUT uses the Bluetooth protocol with Frequency Hopping.

The measurements were done with the EUT powered by 120 V AC.

It was checked that power variations between 85% and 115% did not have any influence on the measurements.

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 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

DSS 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".

Nemko Group authorizes the above named entity to reproduce this report provided it is reproduced in its entirety and for use by the entity's employees only. Any reproduction of parts of this report requires approval in writing from Nemko Group.

Any use that a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Nemko Group accepts no responsibility for damages suffered by any third party caused by decisions made or actions based on this report.

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	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
Channel Separation and 20 dB BW	15.247(a)(1)	5.1 (4) (RSS-247)	7.8.2 (FHSS)	Complies
Number of Hopping Frequencies	15.31(m)	5.1 (6) (RSS-247)	7.8.3 (FHSS)	Complies
Pseudorandom Hopping Algorithm	15.247(a)(1)	5.1 (3) (RSS-247)	N/A (FHSS)	Complies
Time of Occupancy (dwell time)	15.247(a)(1)(iii)	5.1 (5) (RSS-247)	7.8.4 (FHSS)	Complies
Occupied Bandwidth	15.247(a)(1)	5.1 (7) (RSS-247)	6.9.2 FHSS)	Complies
Occupied Bandwidth (99% BW)	N/A	6.7 (RSS-GEN)	6.9.3	Complies
Peak Power Output	15.247(b)	5.4 (RSS-247)	11.9.1.1	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	5.5 (RSS-247)	6.7 7.8.6 (FHSS) 7.8.8 (FHSS)	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	Complies

Revision history

Revision	Date	Comment	Sign
00	2021-06-16	First edition	FS

3 TEST RESULTS

3.1 Power Line Conducted Emissions

FCC Part 15.207 (a)

ISED RSS-GEN Issue 5, Clause 7.2/8.8

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

Test Results: Complies

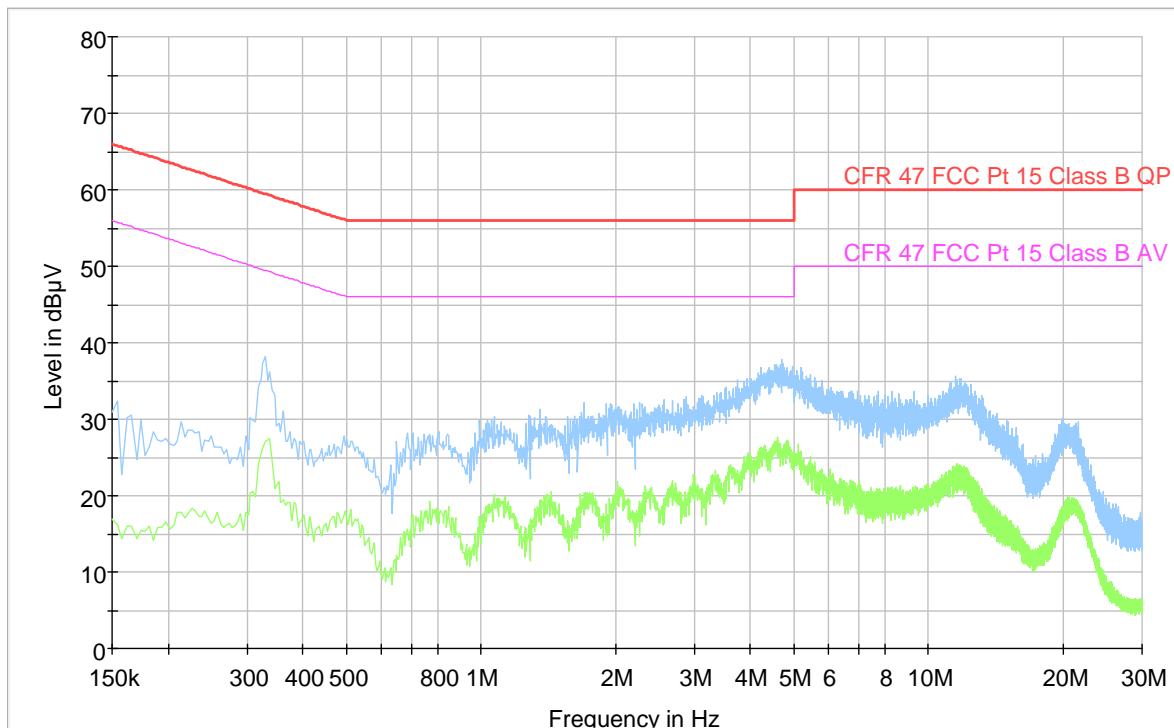
Measurement Data: See attached plots.
 Tested with AC Adaptor PNLV226

Highest measured value (L1 and N):

120V 60Hz:

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter
---	---	---	---	---	---	---		

Full Spectrum



3.2 20dB Bandwidth

FCC Part 15.247(a)(1)

ISED RSS-247 Issue 2, Clause 5.1 (b)

Measurement procedure: ANSI C63.10-2013 Clause 7.8.2

Test Results: Complies

Measurement Data:

Carrier Frequency and Modulation	20dB Bandwidth
2402 MHz, GFSK	958 kHz
2441 MHz, GFSK	955 kHz
2480 MHz, GFSK	955 kHz

RF channel has no influence on 20 dB bandwidth.

See attached plots.

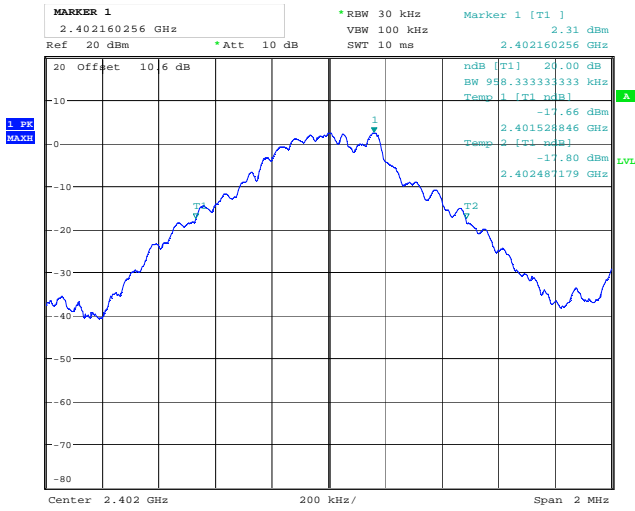
Requirement:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

or:

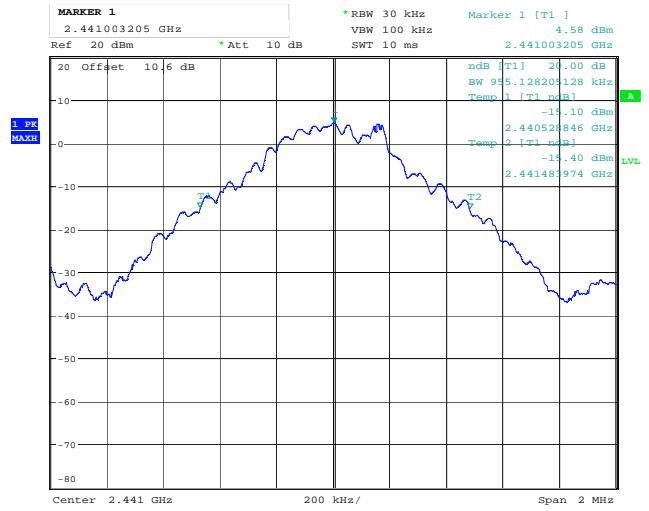
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the system operates with an output power no greater than 125 mW.

No requirements for Digital Transmission Systems.



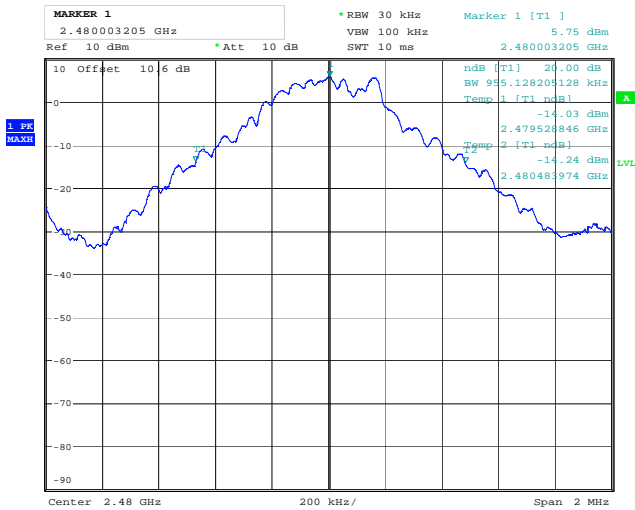
Date: 27.OCT.2020 13:11:27

20dB Bandwidth 2402 MHz, Basic Rate



Date: 27.OCT.2020 13:10:24

20dB Bandwidth 2441 MHz, Basic Rate



Date: 27.OCT.2020 13:20:41

20dB Bandwidth 2480 MHz, Basic Rate

3.3 Hopping Bandwidth

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

ISED Canada RSS-247 Issue 2, Clause 5.1

Measurement procedure: ANSI C63.10-2013 Clause 6.9.2 / 7.8.3

Test Results: Complies

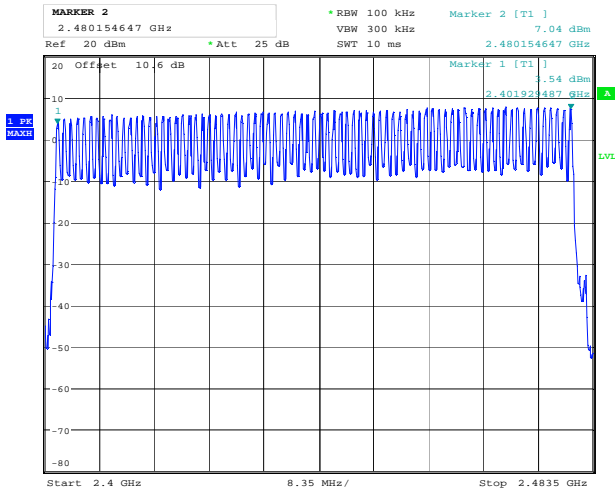
Measurement Data:

Number of RF Channels in use	Minimum 20 and Maximum 79
Channel Centre Frequencies	2402 to 2480 MHz
Channel Separation	1 MHz

See attached plots.

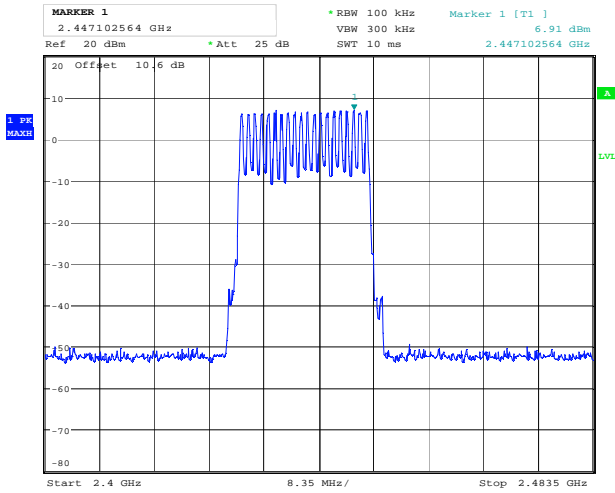
Requirements:

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.



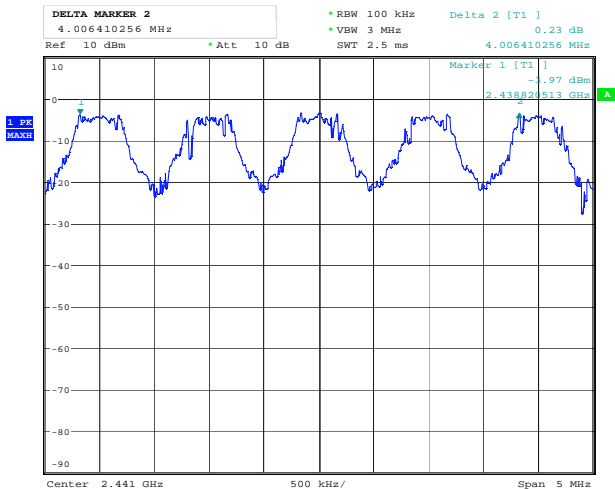
Date: 21.OCT.2020 10:09:44

RF Channels in Use, Basic Rate, 79 Channels



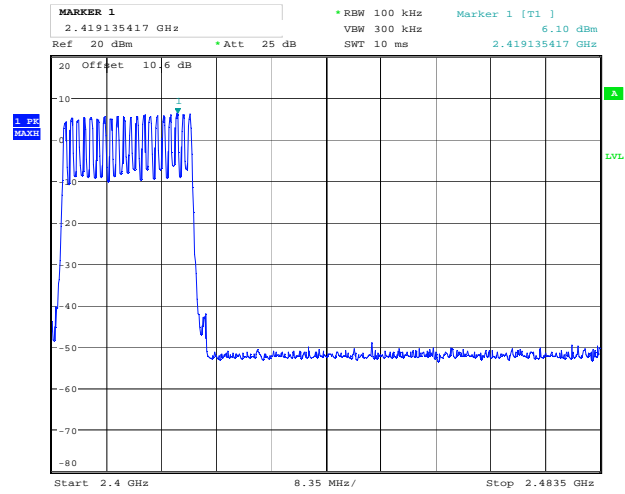
Date: 21.OCT.2020 10:20:57

RF Channels in Use, Basic Rate, 20 Channels



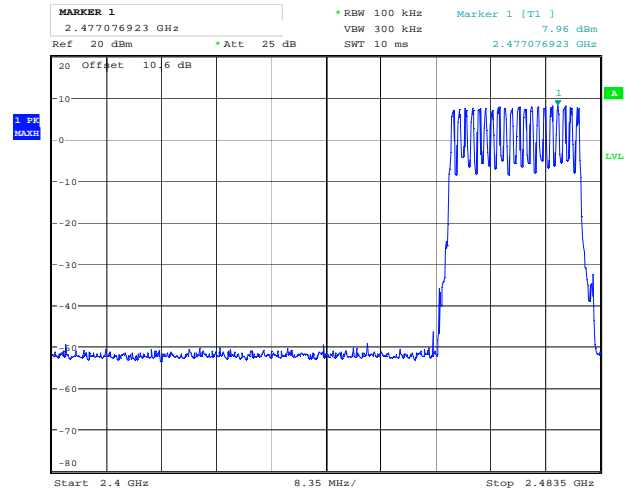
Date: 27.OCT.2020 12:55:58

Channel Separation



Date: 21.OCT.2020 10:21:42

RF Channels in Use, Basic Rate, 20 Channels



Date: 21.OCT.2020 10:20:19

RF Channels in Use, Basic Rate, 20 Channels

3.4 Occupancy Time

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

ISED Canada RSS-247 Issue 2, Clause 5.1 (c)

Measurement procedure: ANSI C63.10-2013 Clause 7.8.4

Test Results: Complies

Measurement Data:

Frame Type and Data Rate	Burst Length (ms)	Frame Length (ms)	Time of Occupancy (ms)	Verdict
DH1	0.390	1.25	124.8	Complies
DH3	1.65	2.50	264.0	Complies
DH5	2.90	3.75	309.3	Complies

Burst length is the same for all data rates.

Time between RF burst on same channel = Frame Length * Number of Channels

Time of occupancy = (Burst Length * Number of Channels * 400 ms) / Time Between Burst on Same Channel
 = (Burst Length * 400 ms) / Frame Length

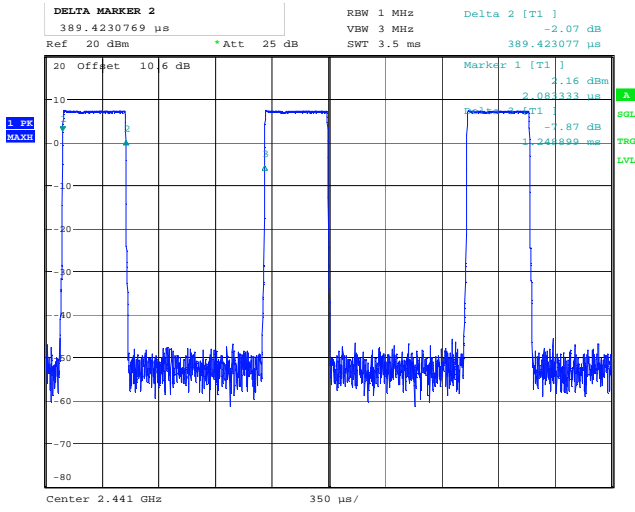
Number of RF channels is minimum 20 and maximum 78.

See attached plots.

Requirements:

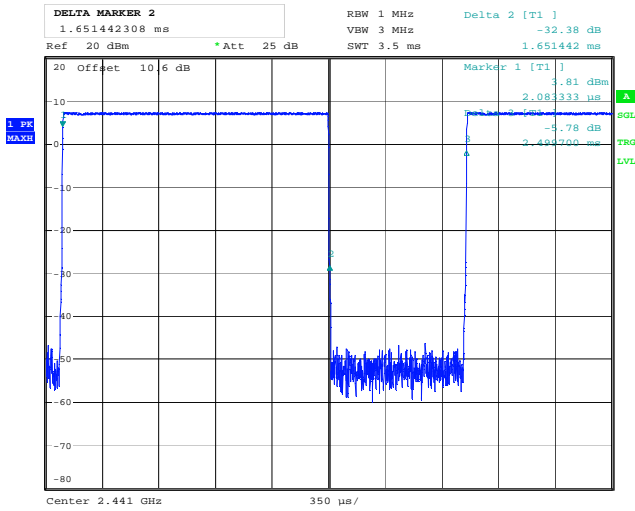
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

No requirements for Digital Transmission Systems.



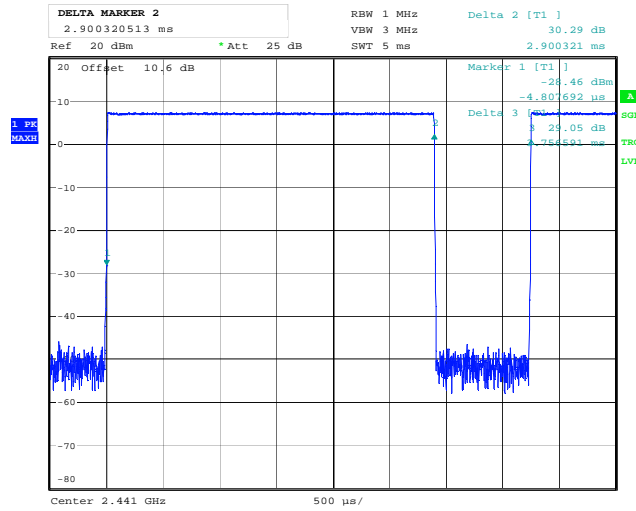
Date: 21.OCT.2020 10:00:21

RF Burst, DH1



Date: 21.OCT.2020 10:01:17

RF Burst, DH3



Date: 21.OCT.2020 10:03:08

RF Burst DH5

3.5 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 and Data Rate	Occupied Bandwidth (99% BW)
2402 MHz GFSK	869 kHz
2441 MHz GFSK	878 kHz
2480 MHz GFSK	894 kHz

Occupied Bandwidth is the same for all channels.

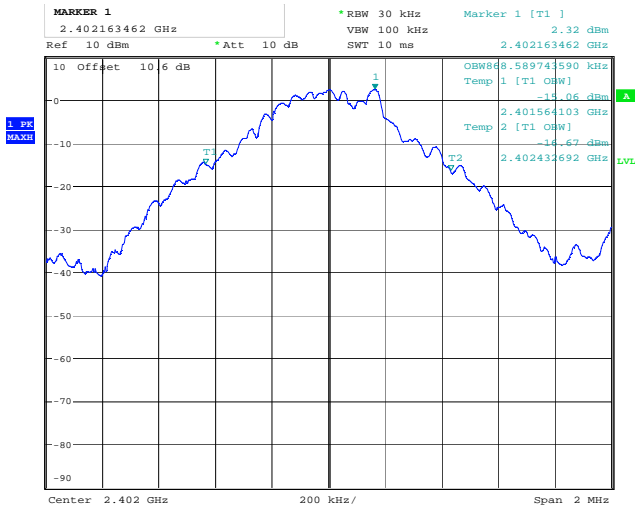
See attached plots.

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.

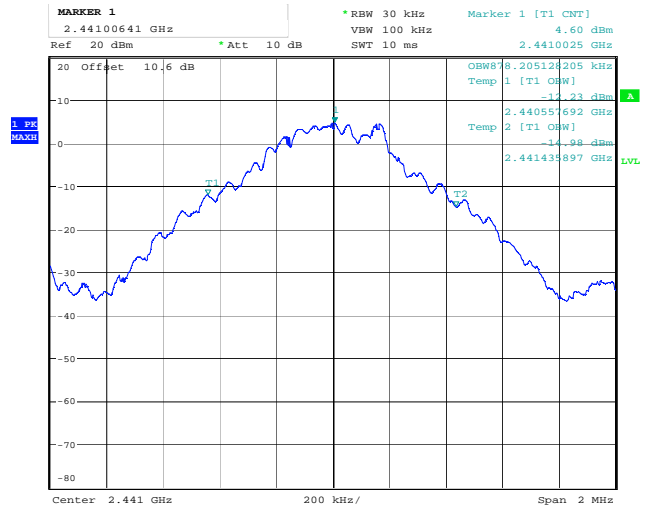
No requirements for Digital Transmission Systems.

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



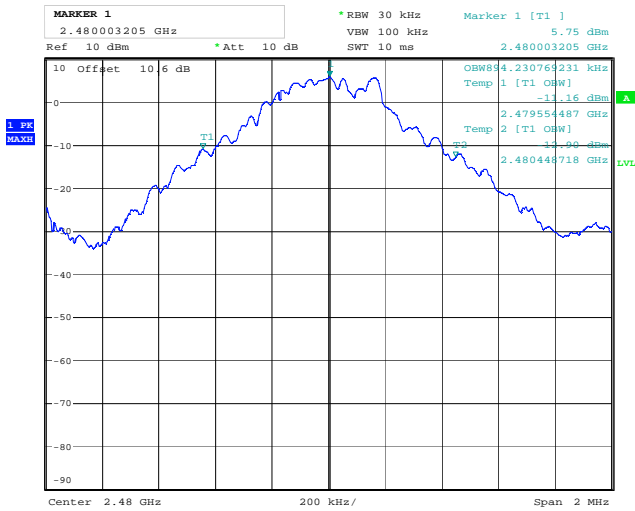
Date: 27.OCT.2020 13:12:30

99% Occupied BW, 2402 MHz, GFSK



Date: 27.OCT.2020 13:09:19

99% Occupied BW, 2441 MHz, GFSK



Date: 27.OCT.2020 13:13:16

99% Occupied BW, 2480 MHz, GFSK

3.6 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)
2402	GFSK	5.1	3.2
2441	GFSK	7.3	5.4
2480	GFSK	8.3	6.8

Antenna Gain reported by the manufacturer: 0 dBi.

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.

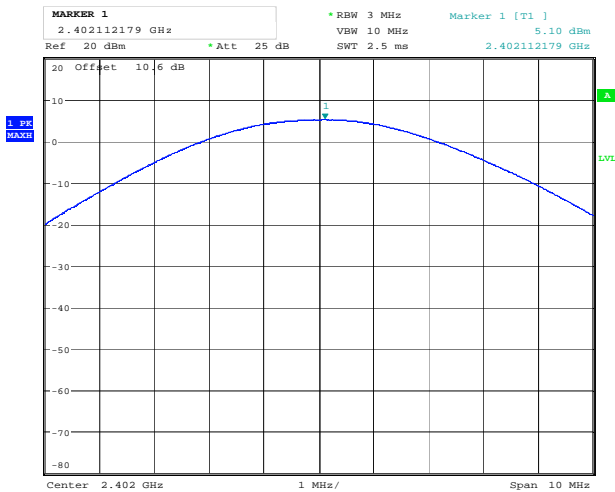
Requirements:

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

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

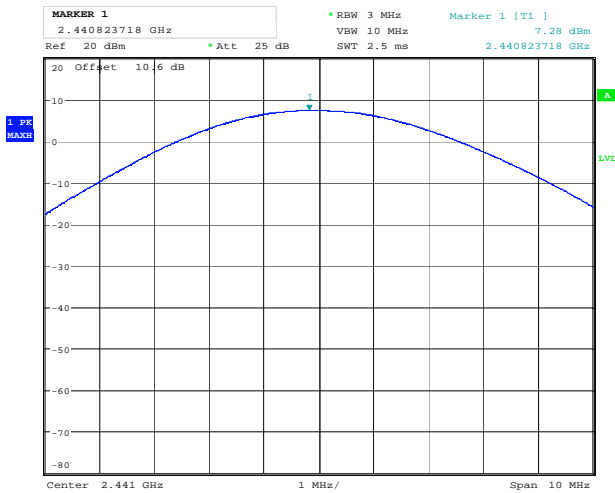
For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts.

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.



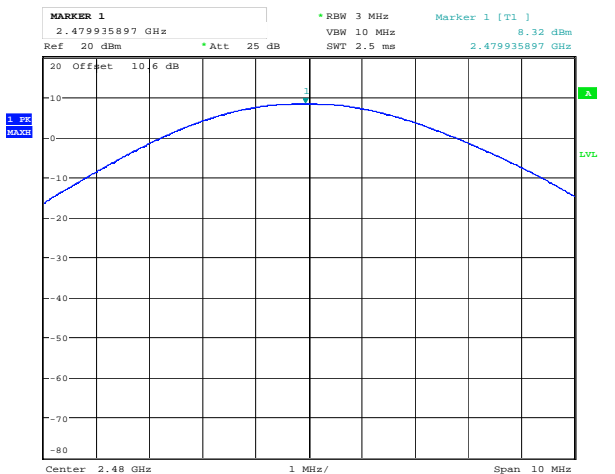
Date: 21.OCT.2020 09:54:48

Peak Power, 2402 MHz, GFSK



Date: 21.OCT.2020 09:55:26

Peak Power, 2441 MHz, GFSK



Date: 21.OCT.2020 09:56:07

Peak Power, 2480 MHz, GFSK

3.7 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
2402 MHz	> 50	> 30	Pass
2441 MHz	> 50	> 30	Pass
2480 MHz	> 50	> 30	Pass

Measured with Peak Detector

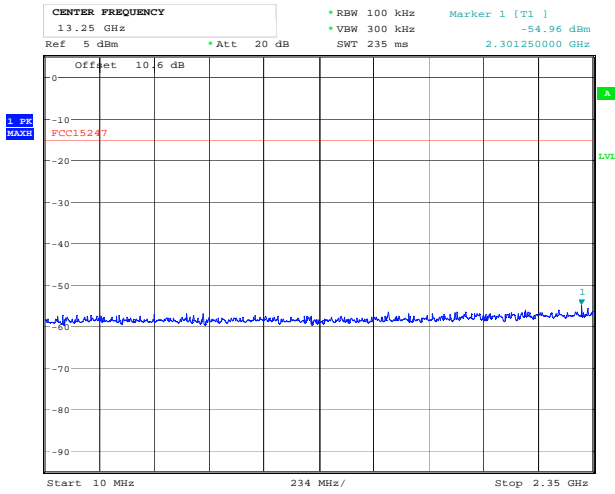
RF conducted power to 25 GHz: see attached plots.

Limit

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

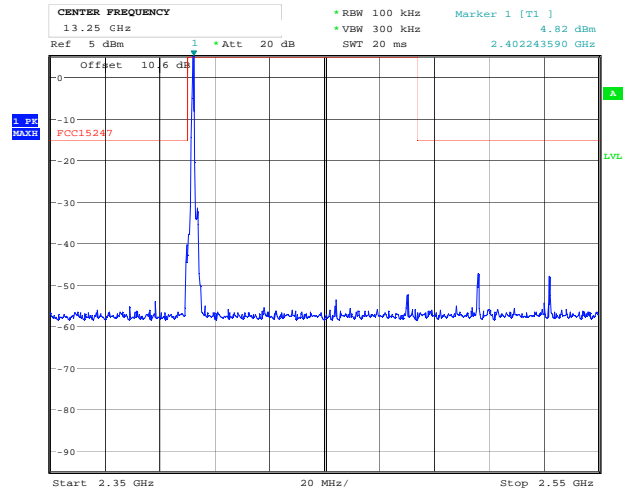
Detector type shall be the same as used for measuring Output Power.

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



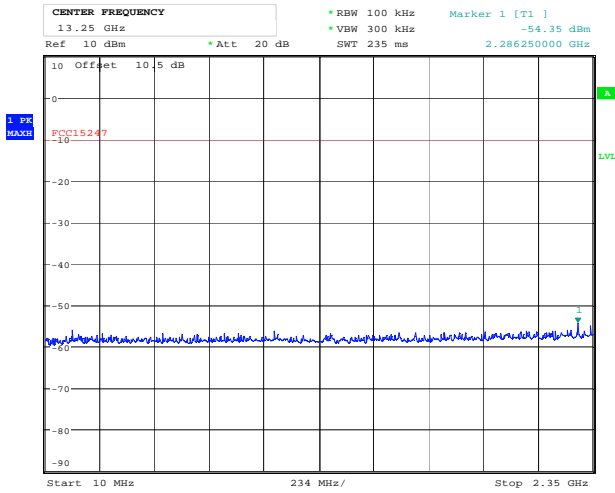
Date: 27.OCT.2020 14:23:36

Conducted Emissions 10-2350 MHz, 2402 MHz, GFSK



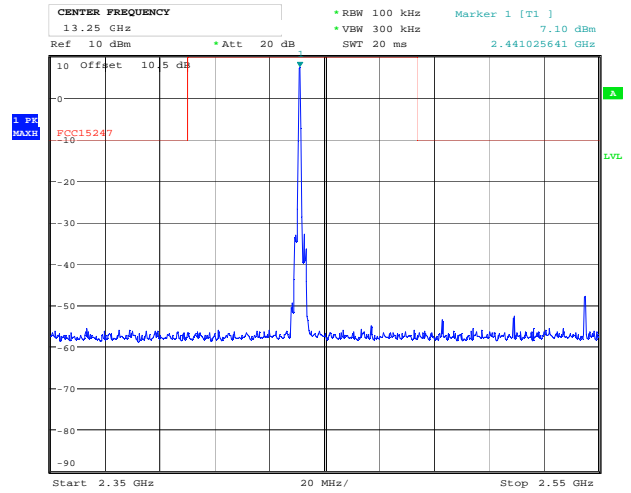
Date: 27.OCT.2020 14:22:28

Conducted Emissions 2350-2550 MHz, 2402 MHz, GFSK



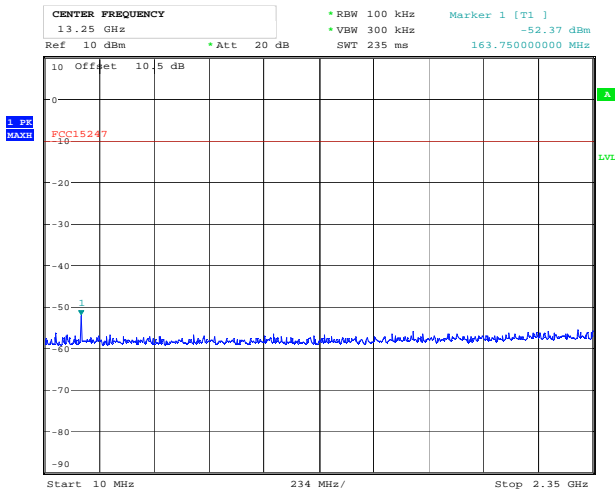
Date: 15.OCT.2020 16:25:56

Conducted Emissions 10-2350 MHz, 2441 MHz, GFSK



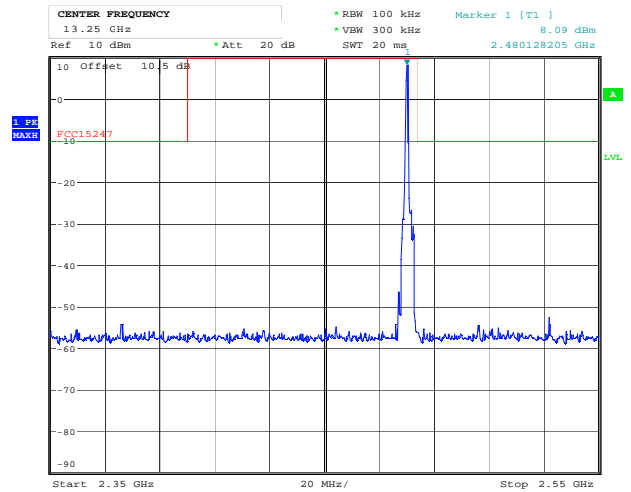
Date: 15.OCT.2020 16:24:59

Conducted Emissions 2350-2550 MHz, 2441 MHz, GFSK



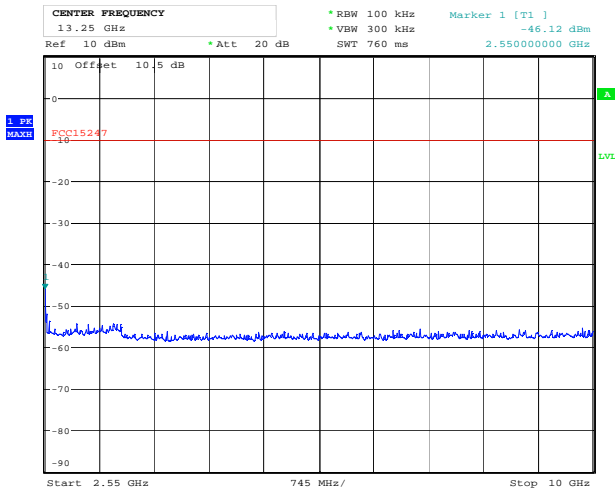
Date: 15.OCT.2020 16:35:32

Conducted Emissions 10-2350 MHz, 2480 MHz, GFSK



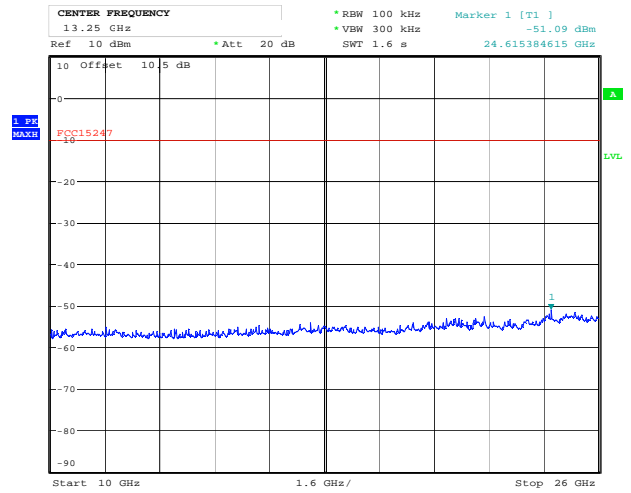
Date: 15.OCT.2020 16:34:35

Conducted Emissions 2350-2550 MHz, 2480 MHz, GFSK



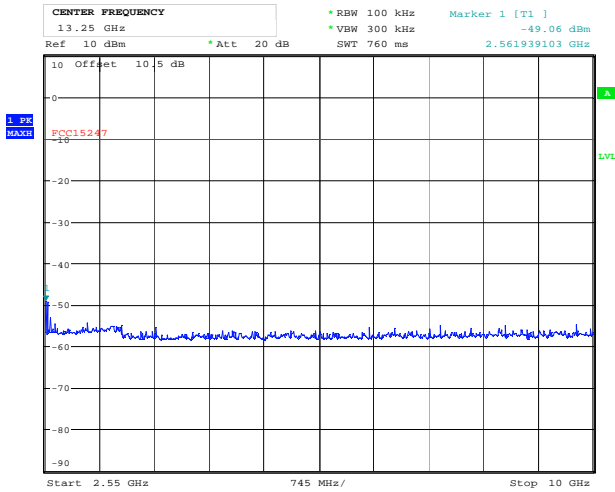
Date: 15.OCT.2020 16:32:00

Conducted Emissions 2550-10000 MHz, 2402 MHz, GFSK



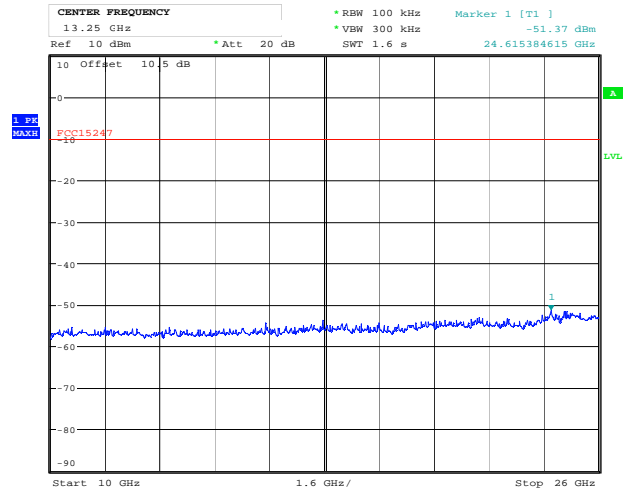
Date: 15.OCT.2020 16:32:57

Conducted Emissions 10000-26000 MHz, 2402 MHz, GFSK



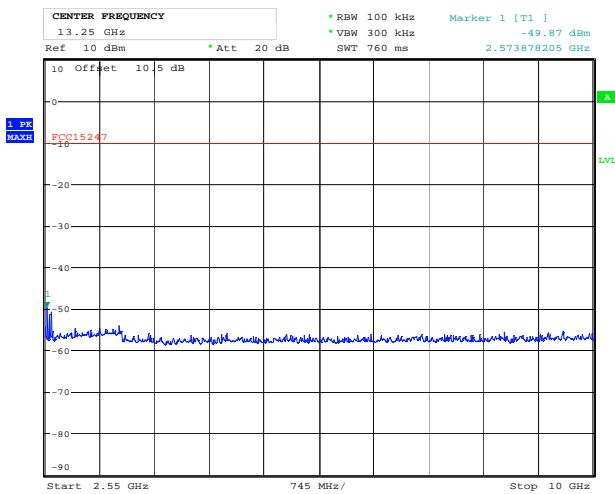
Date: 15.OCT.2020 16:27:13

Conducted Emissions 2550-10000 MHz, 2441 MHz, GFSK



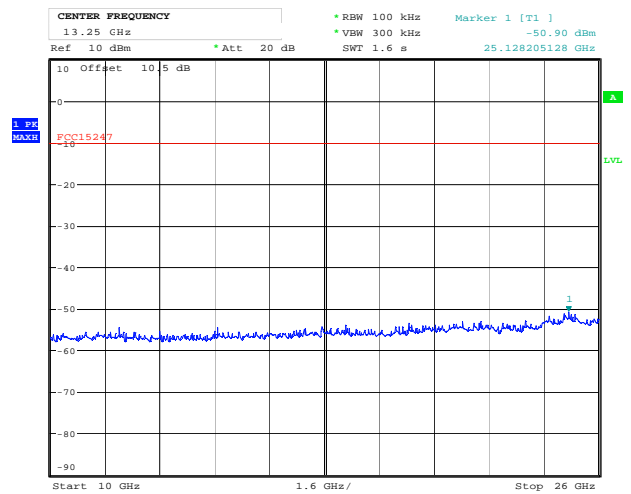
Date: 15.OCT.2020 16:28:10

Conducted Emissions 10000-26000 MHz, 2441 MHz, GFSK



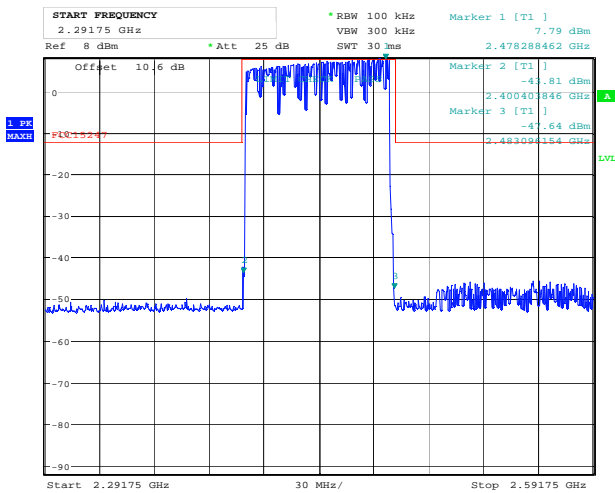
Date: 15.OCT.2020 16:36:48

Conducted Emissions 2550-10000 MHz, 2480 MHz, GFSK



Date: 15.OCT.2020 16:37:45

Conducted Emissions 10000-26000 MHz, 2480 MHz, GFSK



Date: 21.OCT.2020 10:13:00

Conducted Emissions 2292-2592 MHz, Hopping, GFSK

3.8 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.

3.9 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
2402 MHz GFSK	2390 MHz	53.3	/	74	54	20.7	/
2480 MHz GFSK	2483.5 MHz	61.2	41.2			12.8	12.8

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

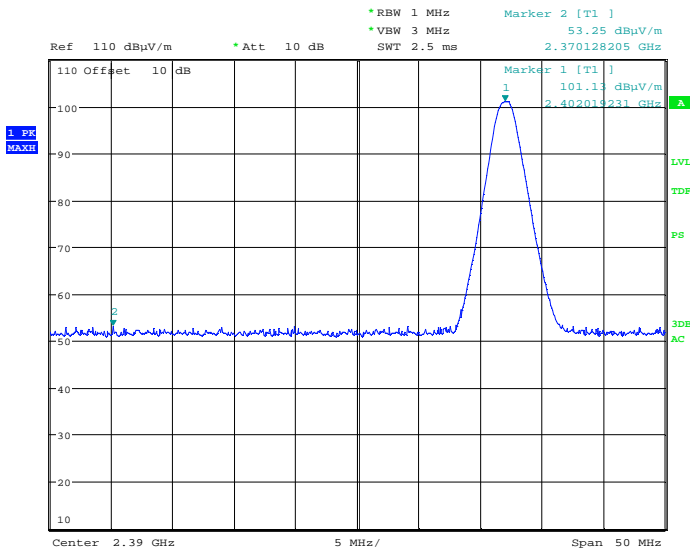
See attached plots.

Duty Cycle Correction Factor Calculation:

Duty Cycle = slot length * number of hopping channels / frame length

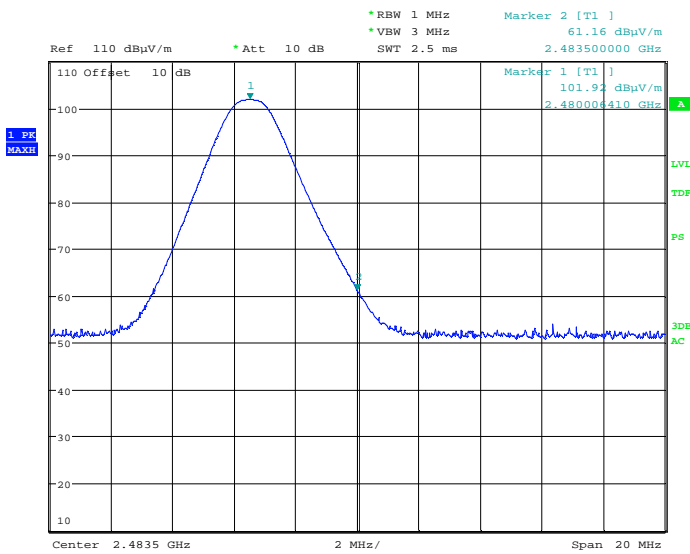
Duty Cycle Correction factor = -20 x log(Duty Cycle) = 27.5 dB

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



Date: 25.MAY.2021 15:29:23

Lower Band Edge 2402 MHz, GFSK, Peak



Date: 25.MAY.2021 15:07:11

Upper Band Edge 2480 MHz, GFSK, Peak

3.10 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:

Measuring distance 3m

The EUT were rotated 360 degrees and the antenna height varied between 1m and 4m.

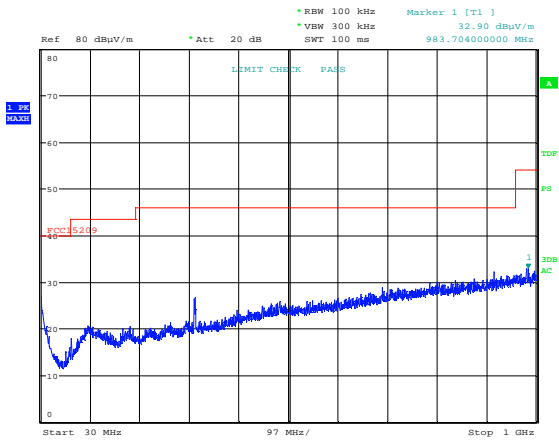
Tested with BT and DECT Active

Measured Frequency (MHz)	Carrier Frequency (MHz)	Detector	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30 – 88	Hopping	Peak	< 30	40.0	> 10
88 – 216	Hopping	Peak	< 30	43.5	> 13.5
216 – 960	Hopping	Peak	< 30	46.0	> 46
960 – 1000	Hopping	Peak	< 30	54.0	> 24

See attached plots.

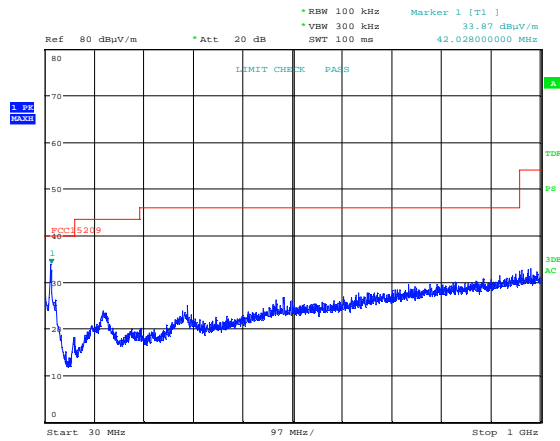
Requirements/Limit

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 QuasiPeak Detector	



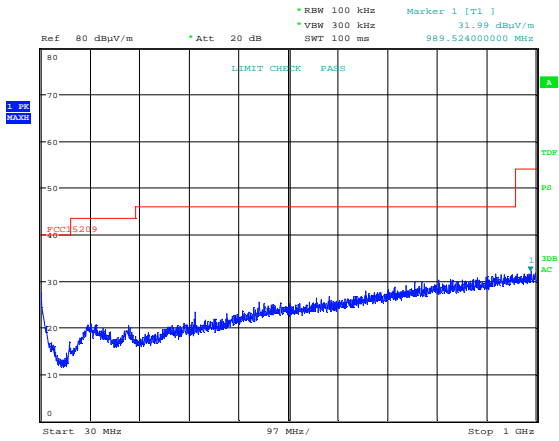
Date: 9.JUN.2021 14:38:25

Radiated Emissions 30 - 1000 MHz, Standby, HP



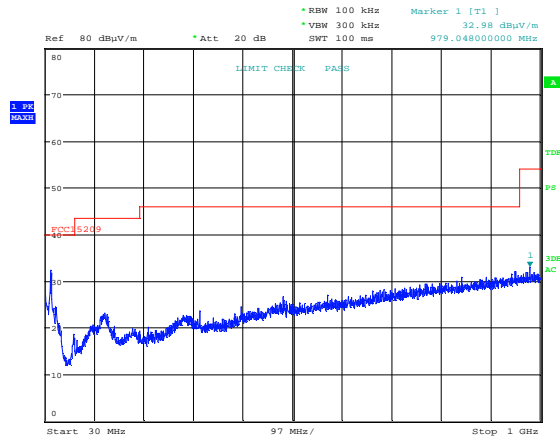
Date: 9.JUN.2021 14:36:36

Radiated Emissions 30 - 1000 MHz, Standby, VP



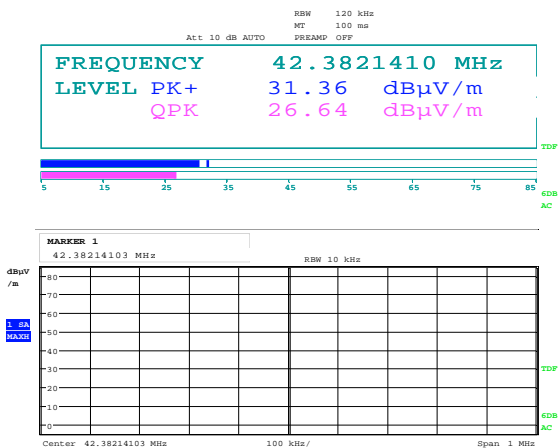
Date: 9.JUN.2021 15:08:27

Radiated Emissions 30 - 1000 MHz, Active Call, HP



Date: 9.JUN.2021 15:06:12

Radiated Emissions 30 - 1000 MHz, Active Call, VP



Date: 9.JUN.2021 15:01:42

Radiated Emissions 42.4 MHz, VP

3.11 Radiated Emissions, 1-26 GHz

FCC Part 15.209 (a)

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

Measurement procedure: ANSI C63.10-2013 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.

No spurious emissions were detected.

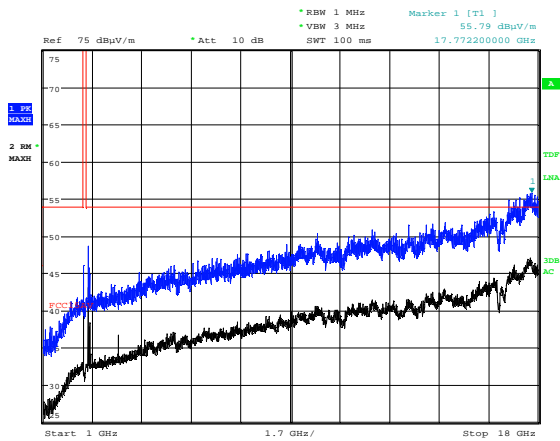
A 2.4GHz Band Reject Filter was used for measurements from 1 GHz to 18 GHz.

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

See plots.

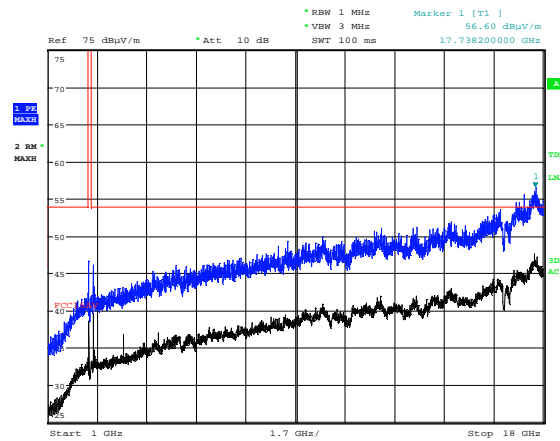
Requirements/Limit

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



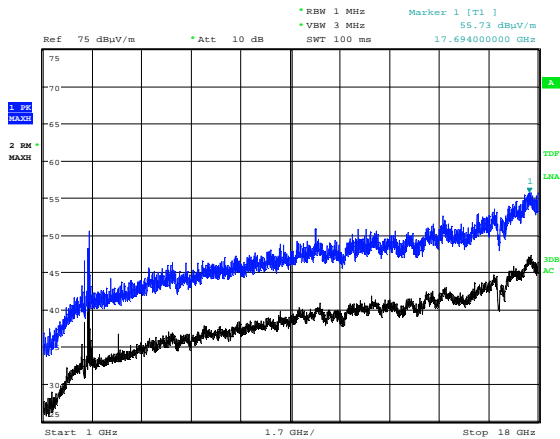
Date: 25.MAY.2021 15:37:11

Radiated Emissions 1 - 18 GHz, 2402 MHz, GFSK, HP



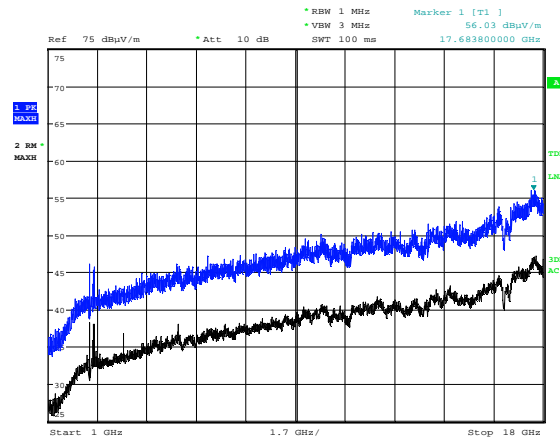
Date: 25.MAY.2021 15:35:10

Radiated Emissions 1 - 18 GHz, 2402 MHz, GFSK, VP



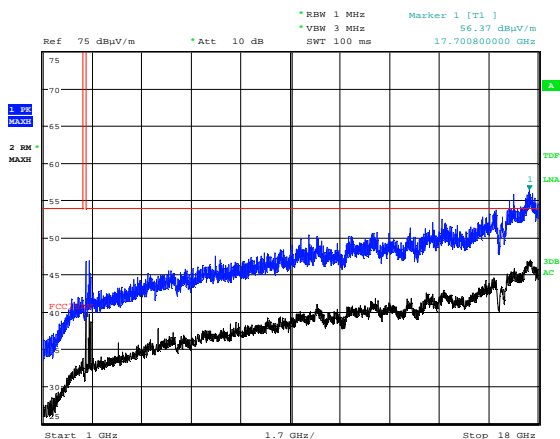
Date: 25.MAY.2021 15:49:45

Radiated Emissions 1 - 18 GHz, 2441 MHz, GFSK, HP



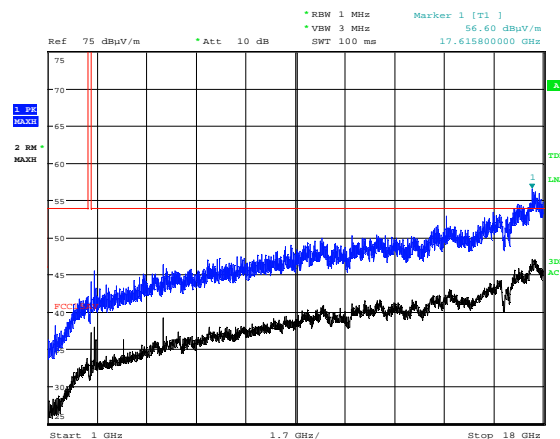
Date: 25.MAY.2021 15:47:28

Radiated Emissions 1 - 18 GHz, 2441 MHz, GFSK, VP



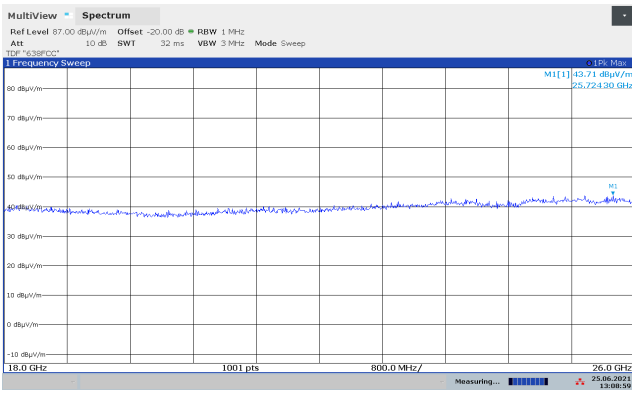
Date: 25.MAY.2021 14:48:15

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



Date: 25.MAY.2021 14:46:14

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



Pre-scan 18 - 26 GHz, 2441 MHz, GFSK, @approx. 10cm

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	FSU26	Spectrum Analyzer	Rohde & Schwarz	LR 1504	2020-01	2022-01
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2020-01 2021-02	2020-01 2022-02
3	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2020-10	2021-10
4	6810.17B	Attenuator	Suhner	LR 1669	2020-08	2021-08
5	NO324415	Band Reject Filter	Microwave Circuits	LR 1760	2020-08	2021-08
6	JB3	BiLog Antenna	Sunol	N-4525	2020-03	2023-03
7	317	Preamplifier	Sonoma Inst.	LR 1687	2020-08	2021-08
8	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2020-08	2021-08
9	Model 638	Horn Antenna	Narda	LR 1480	N/A	
10	HP 8449A	Preamplifier	Hewlett Packard	N 4256	2020-08	2021-08
11	6812B	AC Power Source	Agilent	LR 1515	2020-04	2022-04
12	ESCI3	Measuring Receiver	Rohde & Schwarz	N-4259	2019.10	2021-10
13	ENV216	Two Line V-Network	Rohde & Schwarz	LR 1665	2019-11	2021-11
14	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	

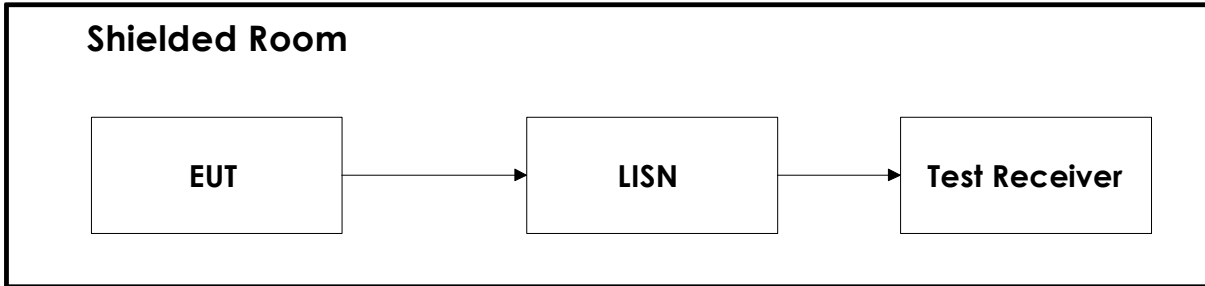
COU = Calibrate on Use

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

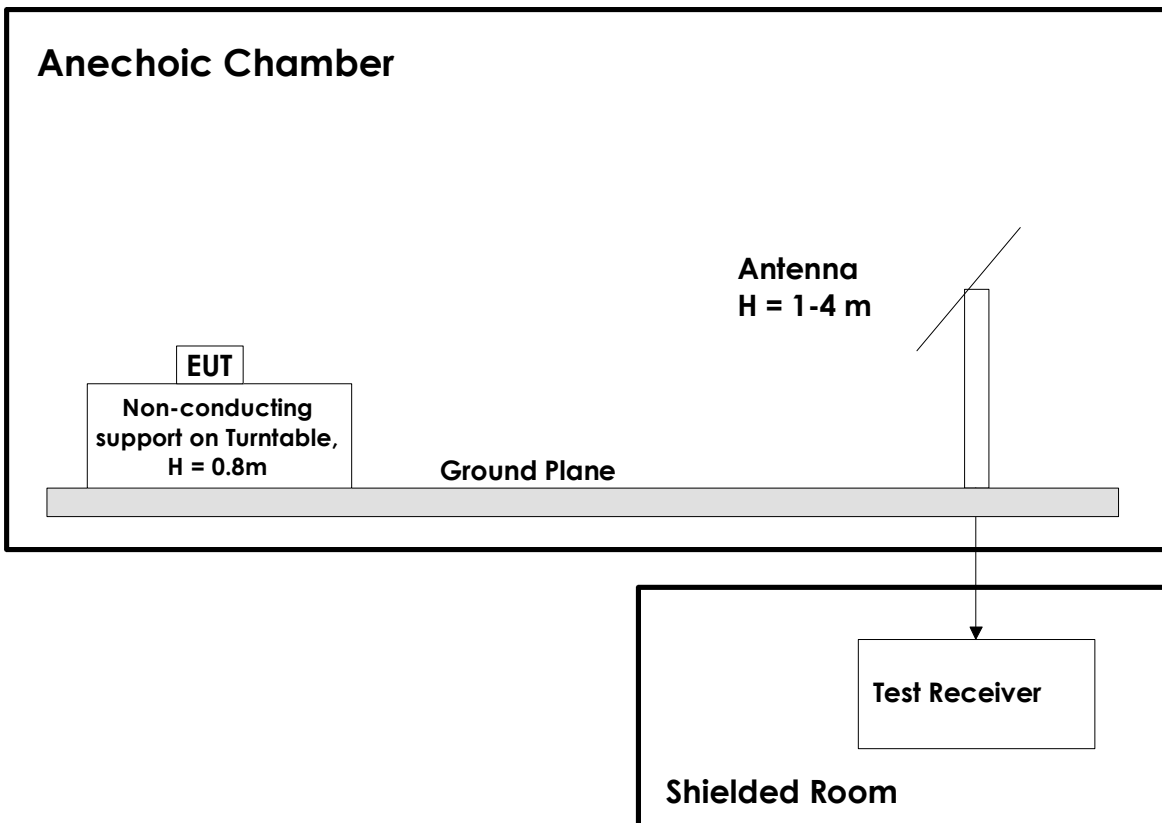
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.10	Power Line Conducted test software
2	Nemko AS	RSPlot	1.0.8.0	Screenshots from R&S Spectrum Analyzers

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. Measuring distance is 3m. 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, measurements above 18GHz are performed at 1m.

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. A filter is used for all spurious frequencies from 30 MHz to 18 GHz.