

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-TGE660 / KX-TGE680AC | | |
| Rating | 120V 60Hz (Input: 120V ~60Hz 0.1A; Output: 5.5V 0.5A, 2.75W) | | |
| Trademark | Panasonic | | |
| Serial number | 4332900012 | | |
| 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 | 433290 | | |
| Tested in period | 2020-10-09 to 2020-10-27 and 2021-03-24 to 2021-04-15 | | |
| Issue date | 2021-05-05 | | |
| 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 | 29 |
| 5 | LIST OF TEST EQUIPMENT | 30 |
| 6 | BLOCK DIAGRAM | 31 |
| 6.1 | Power Line Conducted Emission | 31 |
| 6.2 | Test Site Radiated Emission | 31 |

1 INFORMATION

1.1 Test Item

| | |
|----------------------------------|--|
| Name | Panasonic |
| Model name | KX-TGE660 (US Models) KX-TGE680AC (Canadian Models) |
| FCC ID | ACJ96NKX-TGE660A |
| ISED ID | 216A-KXTGE680A |
| Serial number | 4332900012 |
| Hardware identity and/or version | PNLB2728 |
| Software identity and/or version | SW400 |
| 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 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 KX-TGE660 (FCC ID: ACJ96NKX-TGE660), 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).

All 50 Ohm tests were performed on a KX-TGD860.

US and Canadian models are identical.

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 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 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 | 2021-04-22 | First edition | FS |
| 01 | 2021-05-05 | Removed AC adaptor model suffix | 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

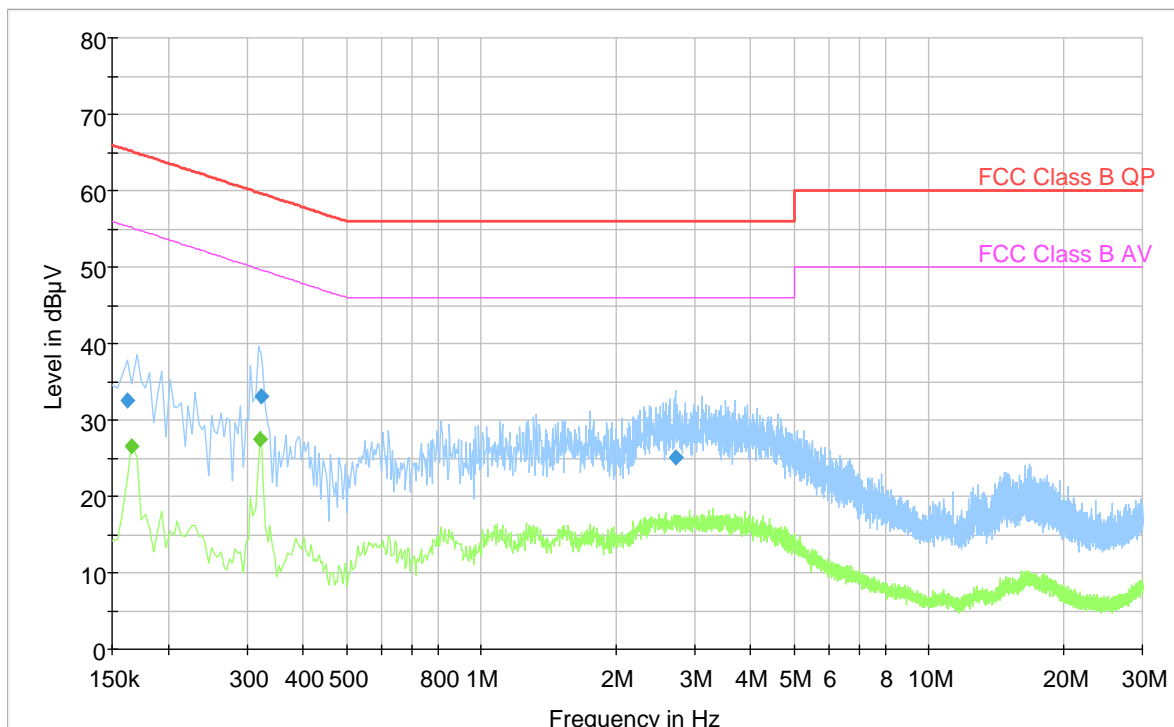
Measurement Data: See attached plots.
 Tested with AC Adaptor PNLV226

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 |
|-----------------|------------------------|----------------------|--------------------|-------------|-----------------|-----------------|------|--------|
| 0.162 | 32.60 | --- | 65.36 | 32.76 | 1000 | 9 | N | OFF |
| 0.166 | --- | 26.63 | 55.16 | 28.53 | 1000 | 9 | N | OFF |
| 0.320 | --- | 27.50 | 49.71 | 22.21 | 1000 | 9 | N | OFF |
| 0.324 | 33.16 | --- | 59.60 | 26.44 | 1000 | 9 | L1 | OFF |
| 2.712 | 25.10 | --- | 56.00 | 30.90 | 1000 | 9 | N | OFF |

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

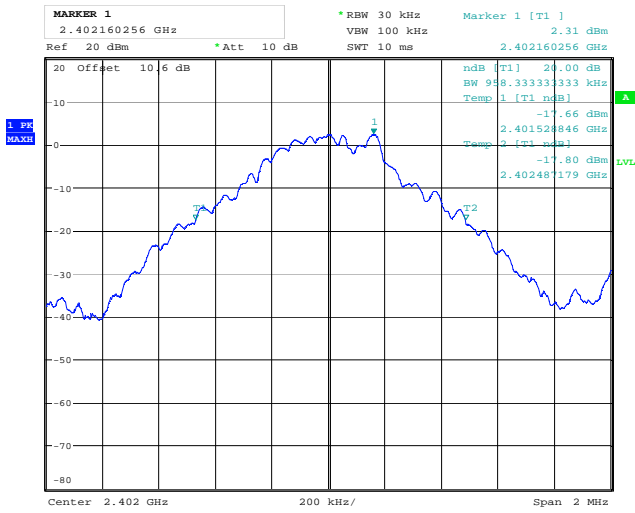
Requirement:

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:

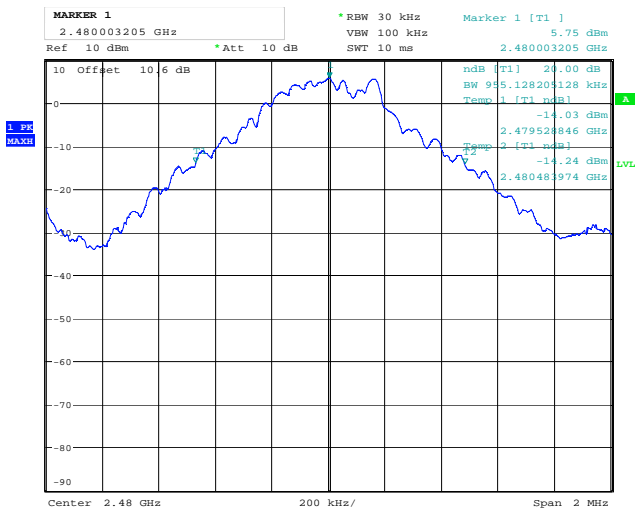
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the system operates with an output power no greater than 125 mW.

No requirements for Digital Transmission Systems.



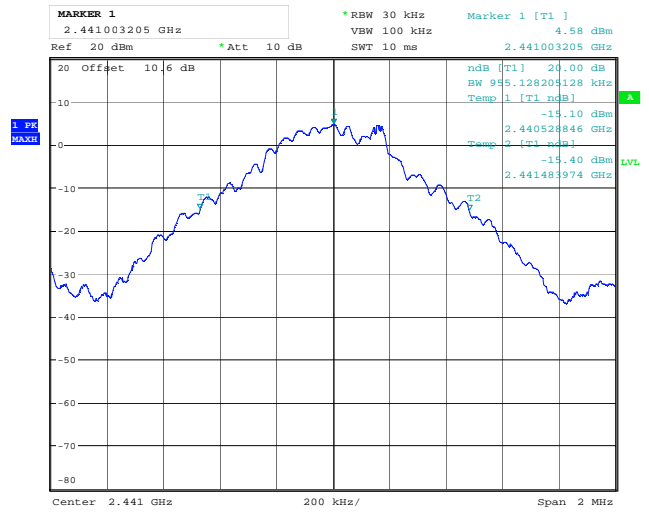
Date: 27.OCT.2020 13:11:27

20dB Bandwidth 2402 MHz, Basic Rate



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

20dB Bandwidth 2480 MHz, Basic Rate



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

20dB Bandwidth 2441 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

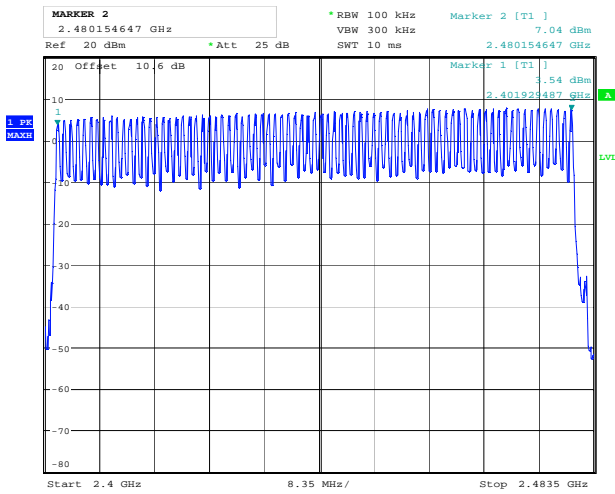
Measurement Data:

| | |
|------------------------------|---------------------------|
| 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.

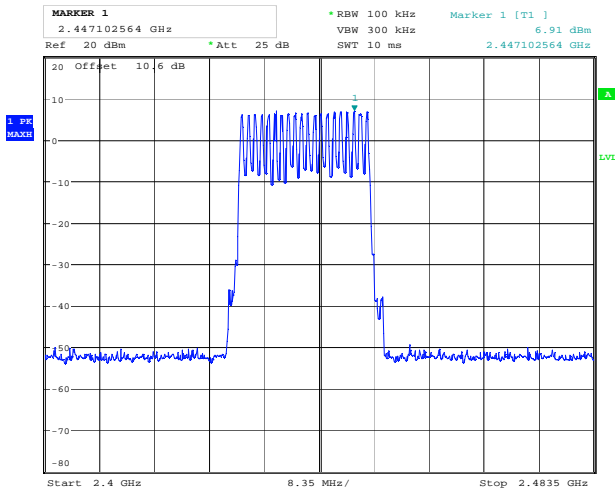
Requirements:

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.



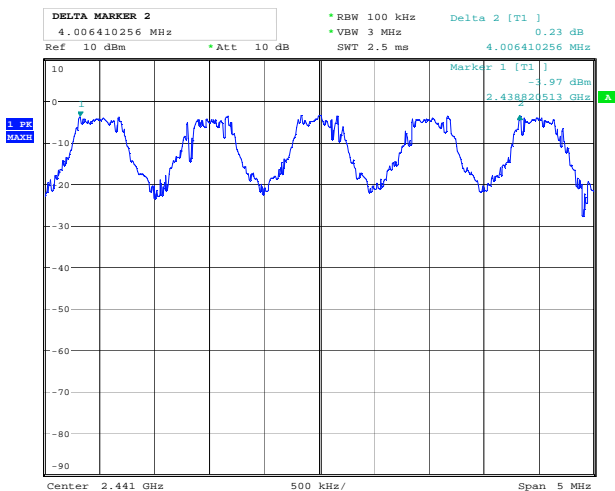
Date: 21.OCT.2020 10:09:44

RF Channels in Use, Basic Rate, 79 Channels



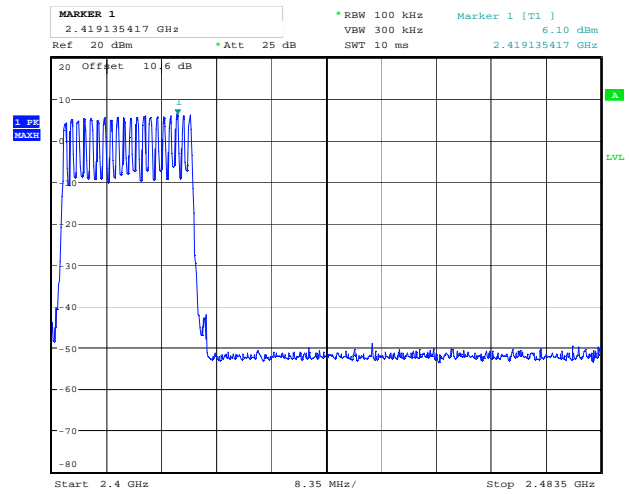
Date: 21.OCT.2020 10:20:57

RF Channels in Use, Basic Rate, 20 Channels



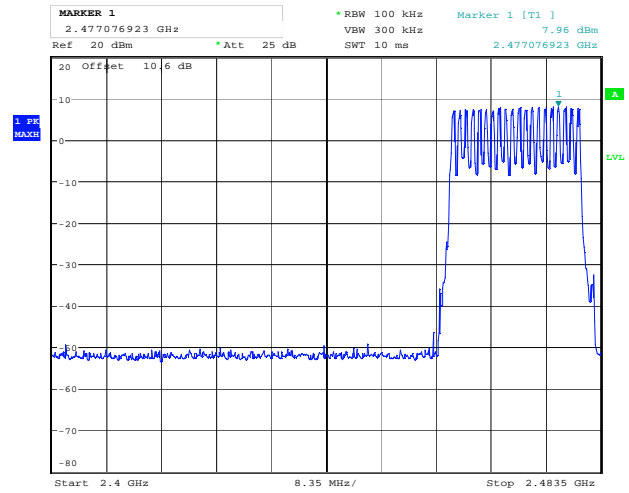
Date: 27.OCT.2020 12:55:58

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

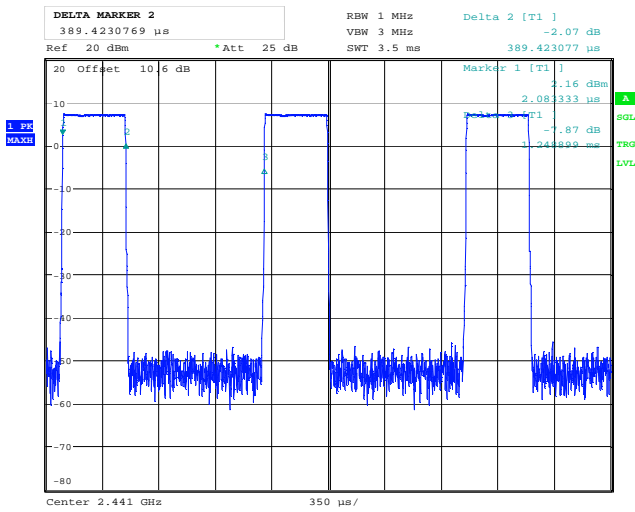
Number of RF channels is minimum 20 and maximum 78.

See attached plots.

Requirements:

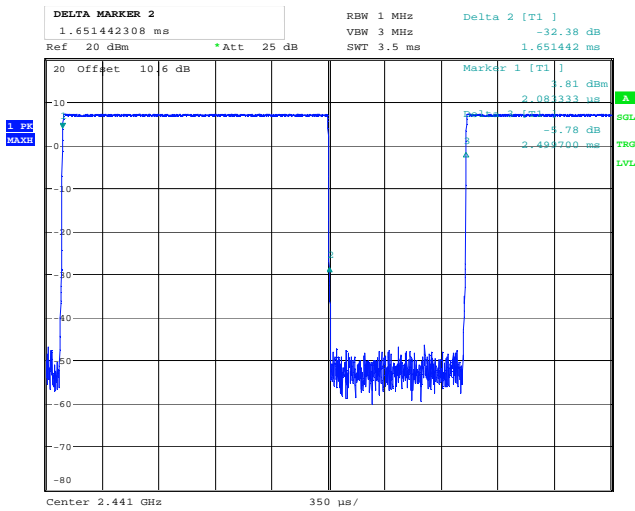
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

No requirements for Digital Transmission Systems.



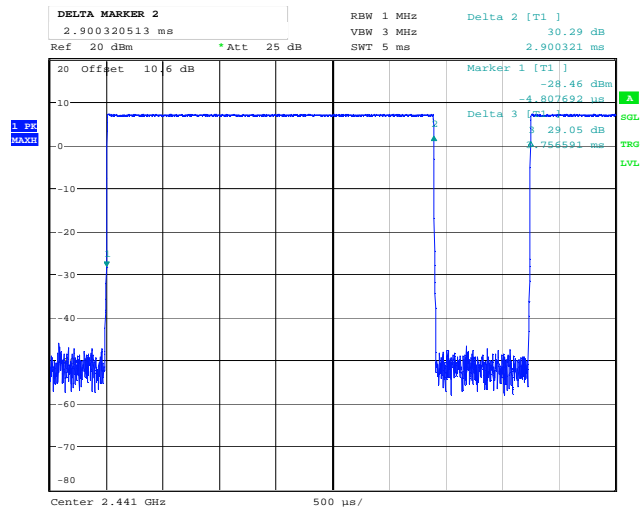
Date: 21.OCT.2020 10:00:21

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

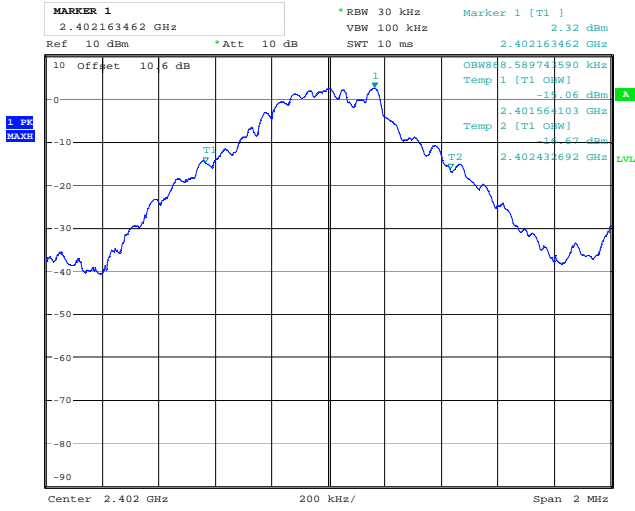
See attached plots.

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.

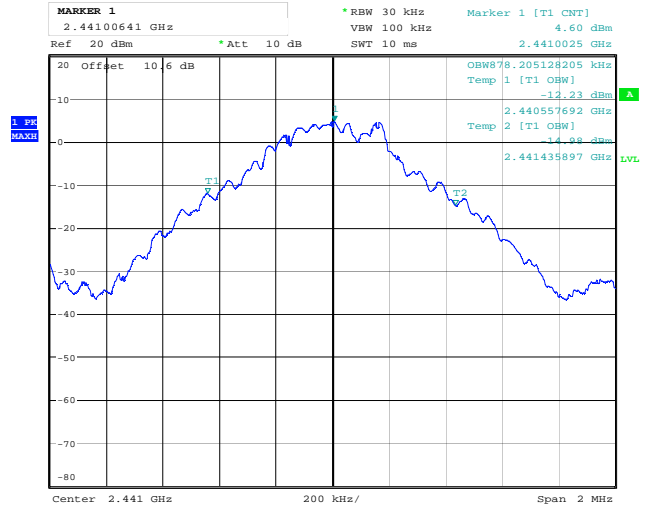
No requirements for Digital Transmission Systems.

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



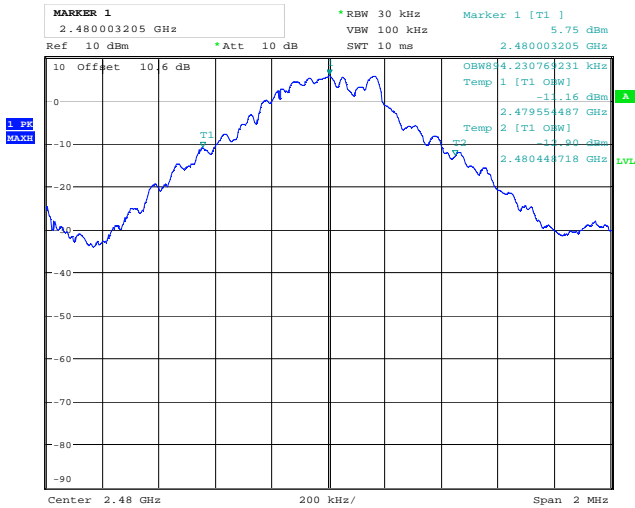
Date: 27.OCT.2020 13:12:30

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.

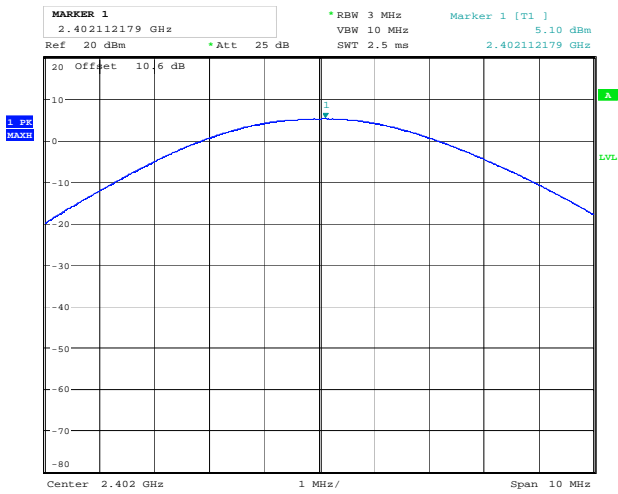
Requirements:

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

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

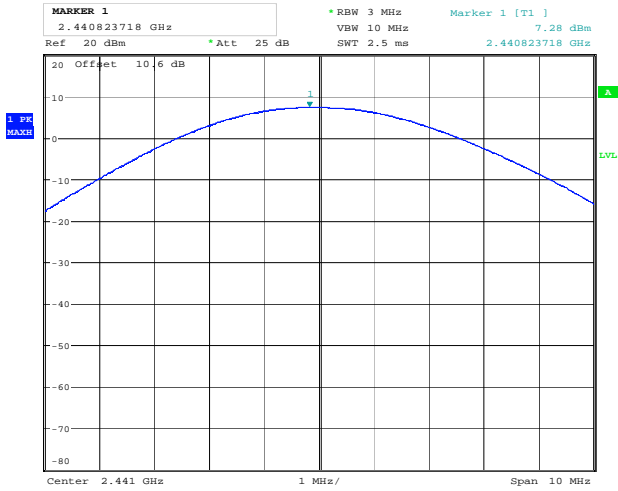
For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts.

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.



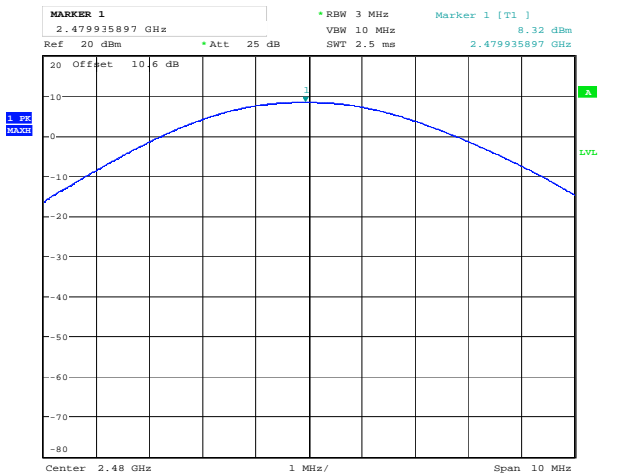
Date: 21.OCT.2020 09:54:48

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

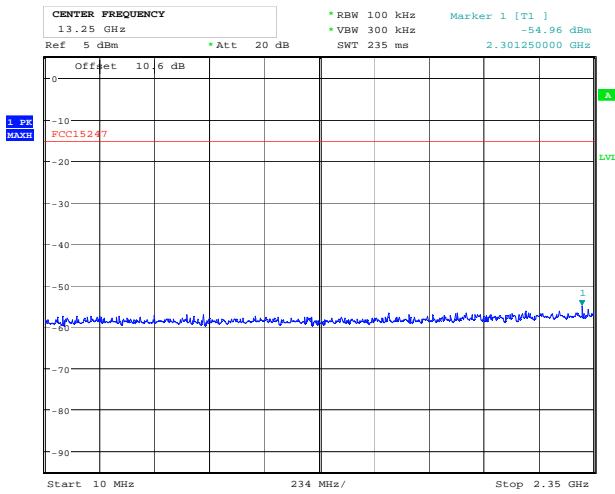
RF conducted power to 25 GHz: see attached plots.

Limit

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

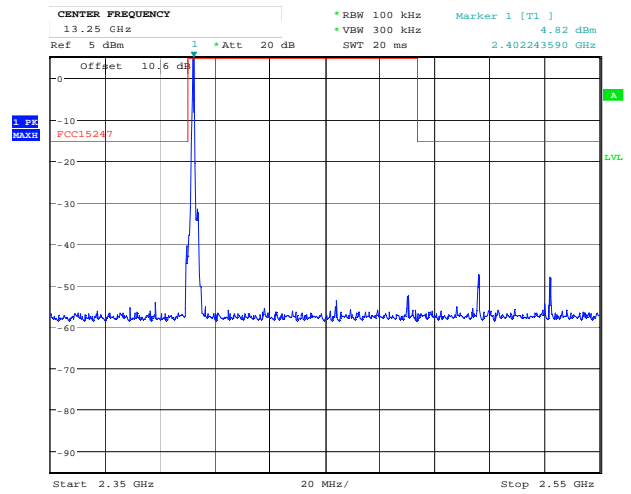
Detector type shall be the same as used for measuring Output Power.

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



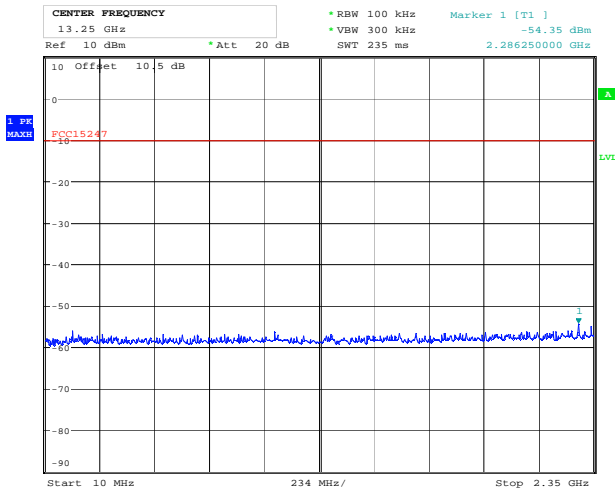
Date: 27.OCT.2020 14:23:36

Conducted Emissions 10-2350 MHz, 2402 MHz, GFSK



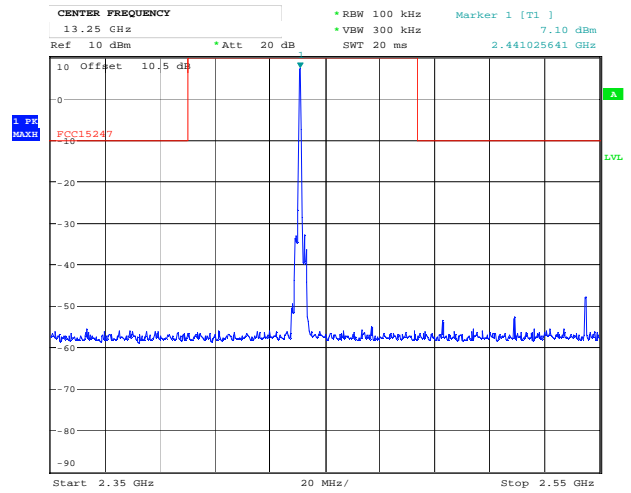
Date: 27.OCT.2020 14:22:28

Conducted Emissions 2350-2550 MHz, 2402 MHz, GFSK



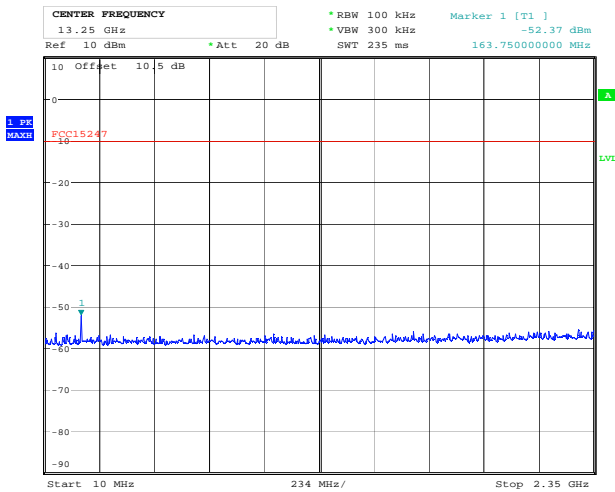
Date: 15.OCT.2020 16:25:56

Conducted Emissions 10-2350 MHz, 2441 MHz, GFSK



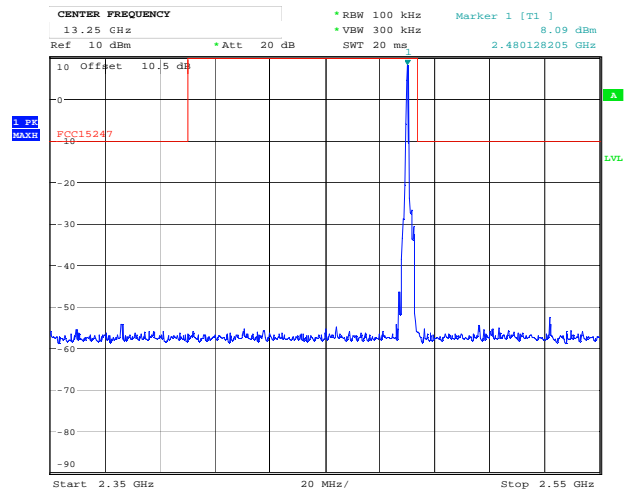
Date: 15.OCT.2020 16:24:59

Conducted Emissions 2350-2550 MHz, 2441 MHz, GFSK



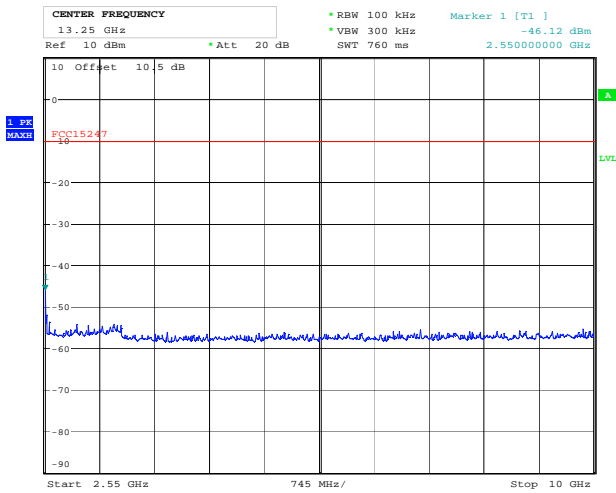
Date: 15.OCT.2020 16:35:32

Conducted Emissions 10-2350 MHz, 2480 MHz, GFSK



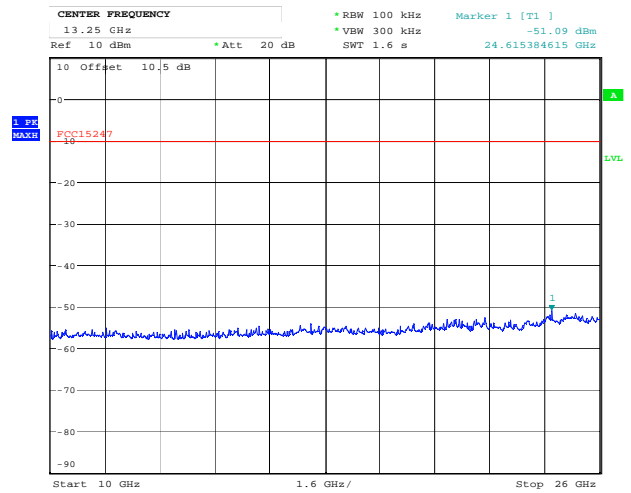
Date: 15.OCT.2020 16:34:35

Conducted Emissions 2350-2550 MHz, 2480 MHz, GFSK



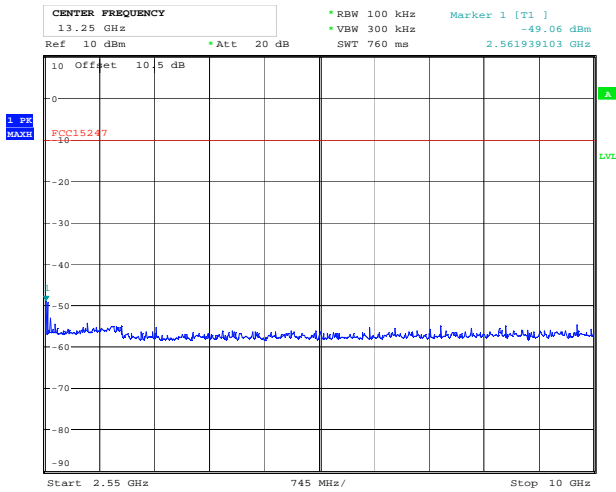
Date: 15.OCT.2020 16:32:00

Conducted Emissions 2550-10000 MHz, 2402 MHz, GFSK



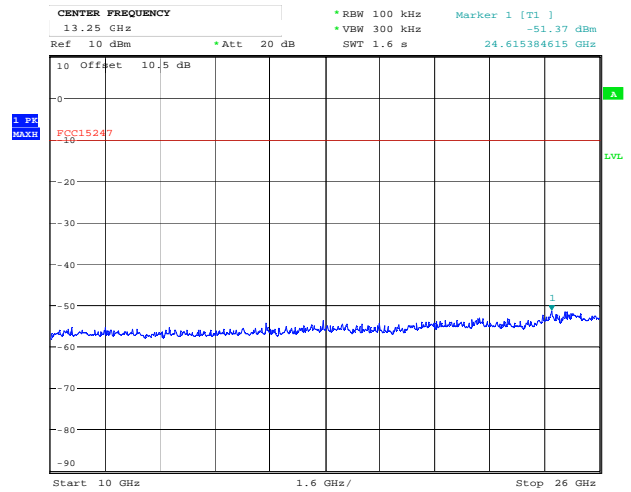
Date: 15.OCT.2020 16:32:57

Conducted Emissions 10000-26000 MHz, 2402 MHz, GFSK



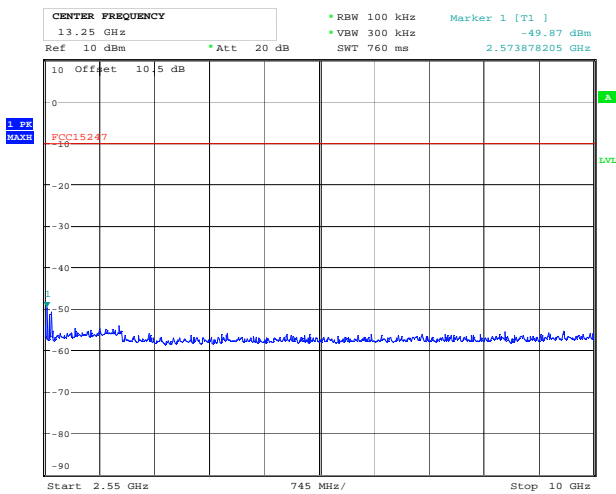
Date: 15.OCT.2020 16:27:13

Conducted Emissions 2550-10000 MHz, 2441 MHz, GFSK



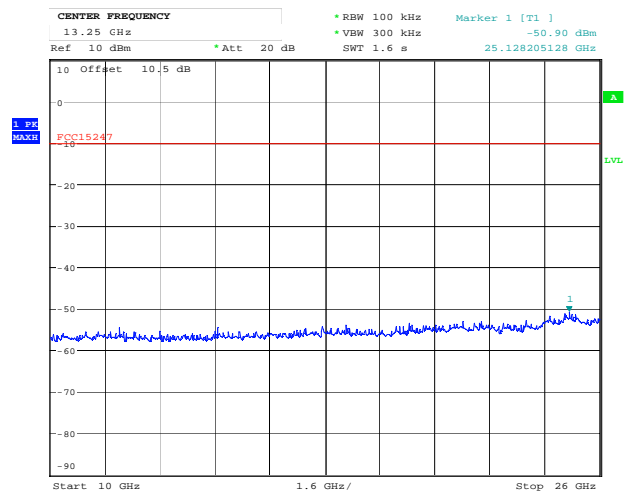
Date: 15.OCT.2020 16:28:10

Conducted Emissions 10000-26000 MHz, 2441 MHz, GFSK



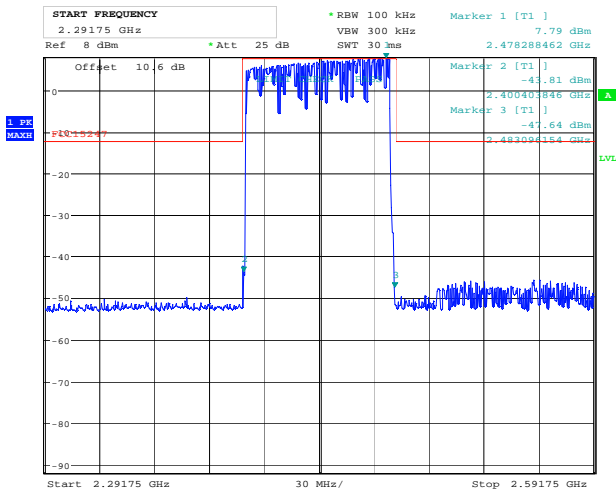
Date: 15.OCT.2020 16:36:48

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 | 53.6 | 33.6 | 74 | 54 | 20.4 | 20.4 |
| 2480 MHz GFSK | 2483.5 MHz | 54.4 | 34.4 | | | 19.6 | 19.6 |

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

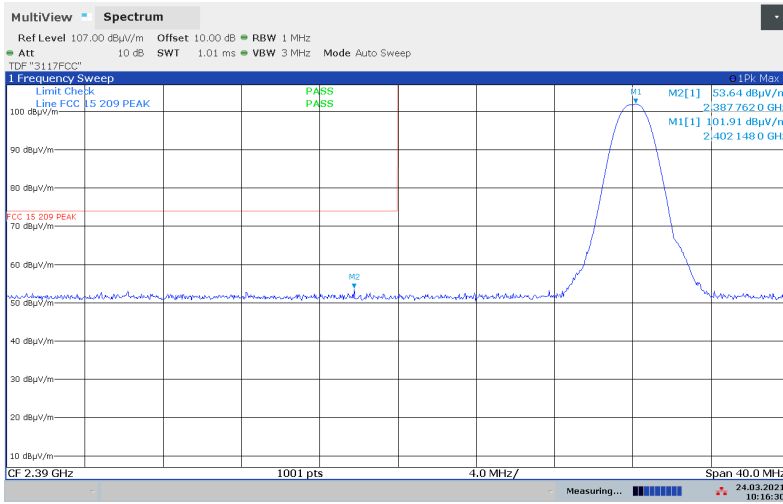
See attached plots.

Duty Cycle Correction Factor Calculation:

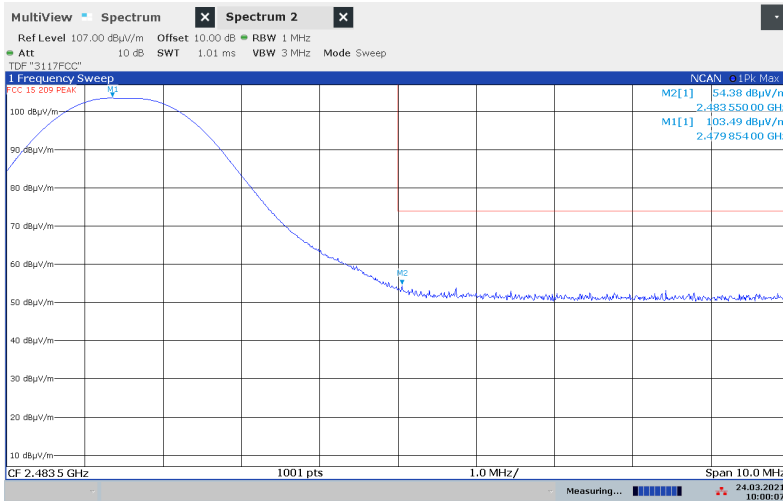
Duty Cycle = slot length * number of hopping channels / frame length

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



Lower Band Edge 2402 MHz, GFSK, Peak



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.

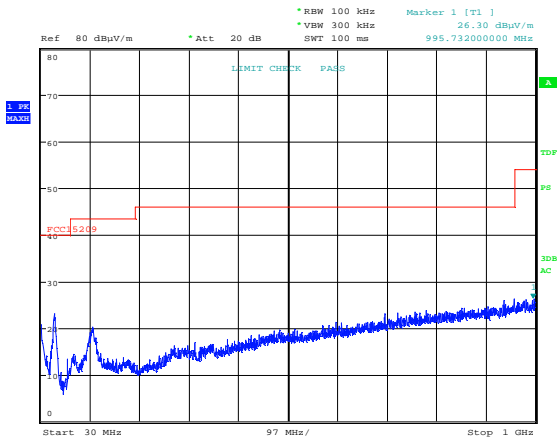
Tested with BT and DECT Active

| Measured Frequency (MHz) | Carrier Frequency (MHz) | Detector | Measured Emission (dB μ V/m) | Limit (dB μ V/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.

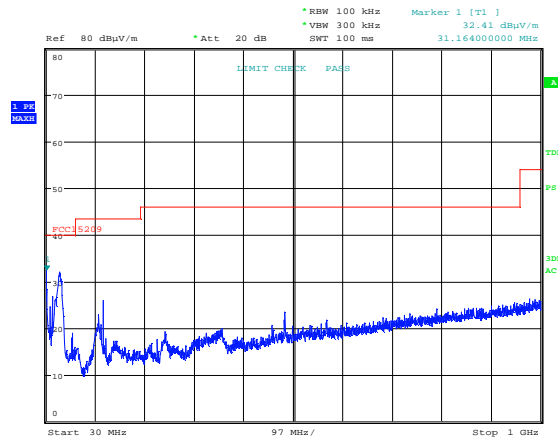
Requirements/Limit

| | | |
|----------------|--|-------------------|
| 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 μ V/m | 40.0 dB μ V/m |
| 88 – 216 MHz | 150 μ V/m | 43.5 dB μ V/m |
| 216 – 960 MHz | 200 μ V/m | 46.0 dB μ V/m |
| 960 – 1000 MHz | 500 μ V/m | 54.0 dB μ V/m |
| | Limits above are with QuasiPeak Detector | |



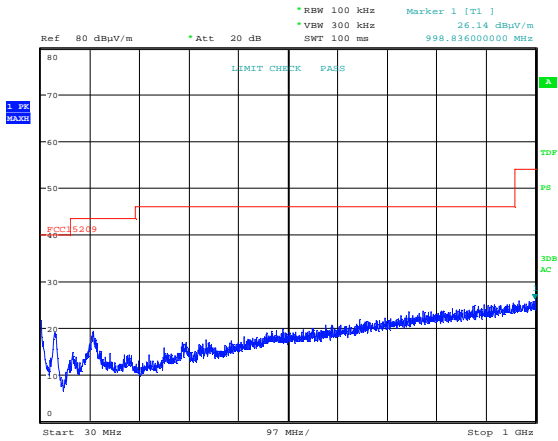
Date: 26.MAR.2021 15:30:36

Radiated Emissions 30 - 1000 MHz, Standby, HP



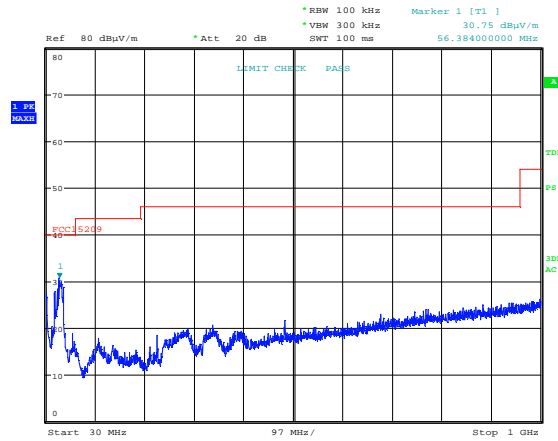
Date: 26.MAR.2021 15:28:22

Radiated Emissions 30 - 1000 MHz, Standby, VP



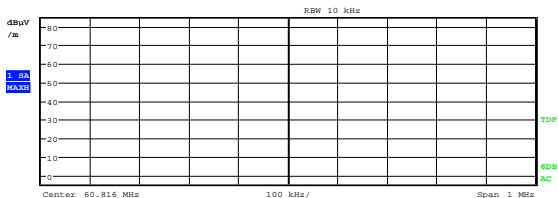
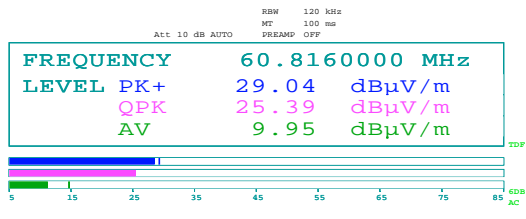
Date: 26.MAR.2021 15:41:05

Radiated Emissions 30 - 1000 MHz, Active Call, HP



Date: 26.MAR.2021 15:35:04

Radiated Emissions 30 - 1000 MHz, Active Call, VP



Date: 26.MAR.2021 15:59:42

Radiated Emissions 60.8 MHz, Active Call, 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.

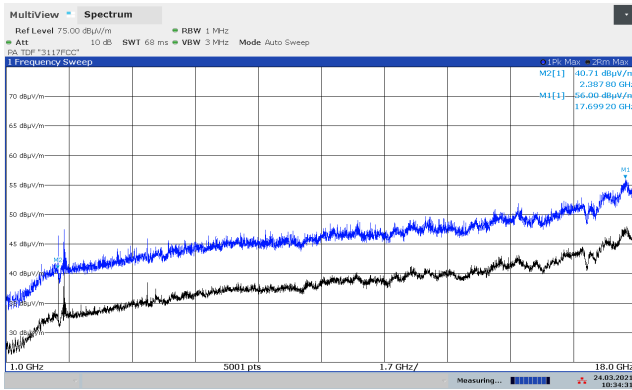
A 2.4GHz Band Reject Filter was used for measurements from 1 GHz to 18 GHz.

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

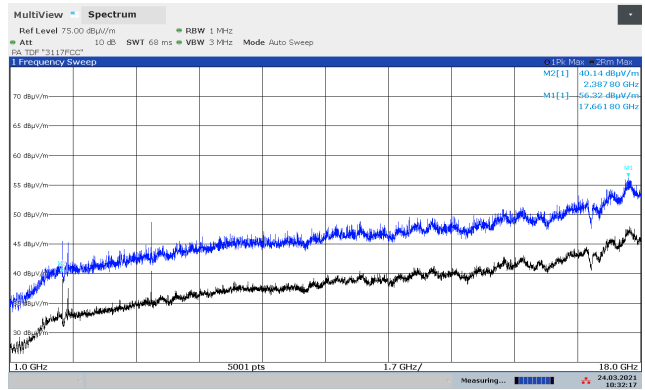
See plots.

Requirements/Limit

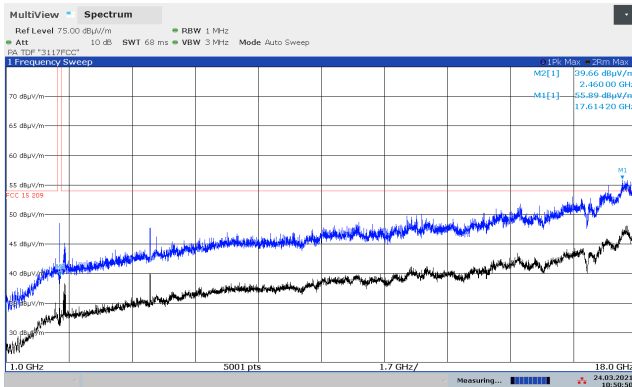
| FCC | Part 15.209 @ frequencies defined in §15.205 | |
|------------|--|---------------|
| ISED | RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10 | |
| | Radiated emission limit @3 meters | |
| Frequency | Average Detector | Peak Detector |
| 1 – 26 GHz | 54.0 dBµV/m | 74.0 dBµV/m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



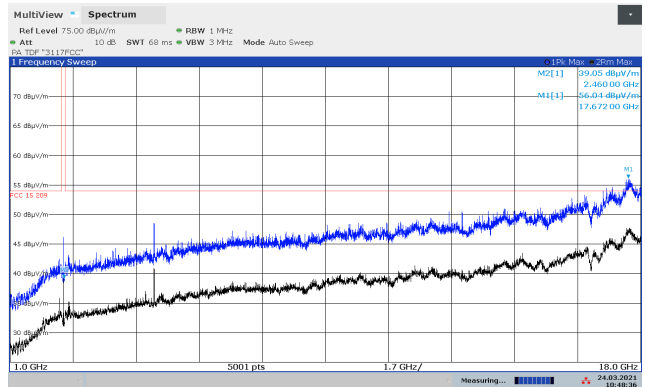
Radiated Emissions 1 - 18 GHz, 2402 MHz, GFSK, HP



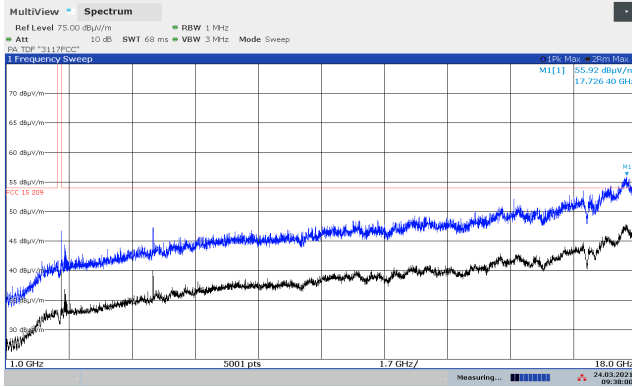
Radiated Emissions 1 - 18 GHz, 2402 MHz, GFSK, VP



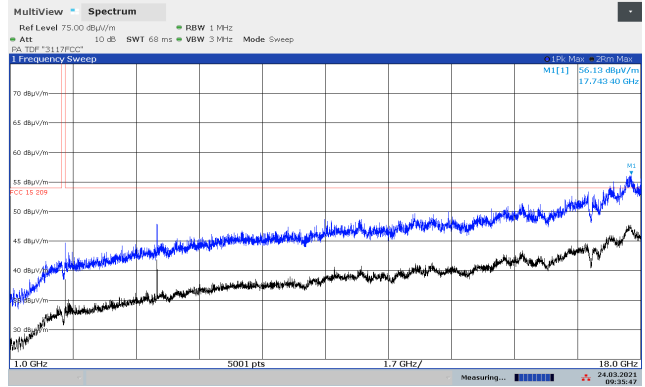
Radiated Emissions 1 - 18 GHz, 2441 MHz, GFSK, HP



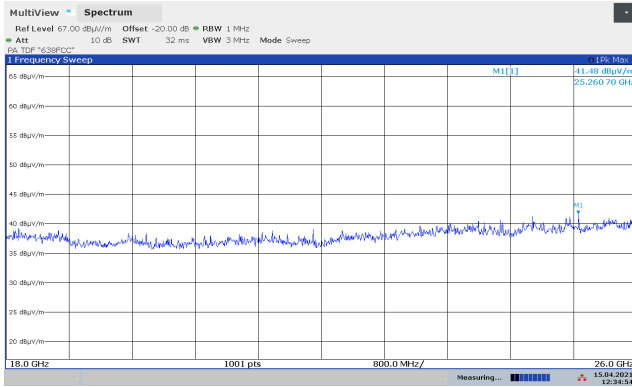
Radiated Emissions 1 - 18 GHz, 2441 MHz, GFSK, VP



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



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 | |

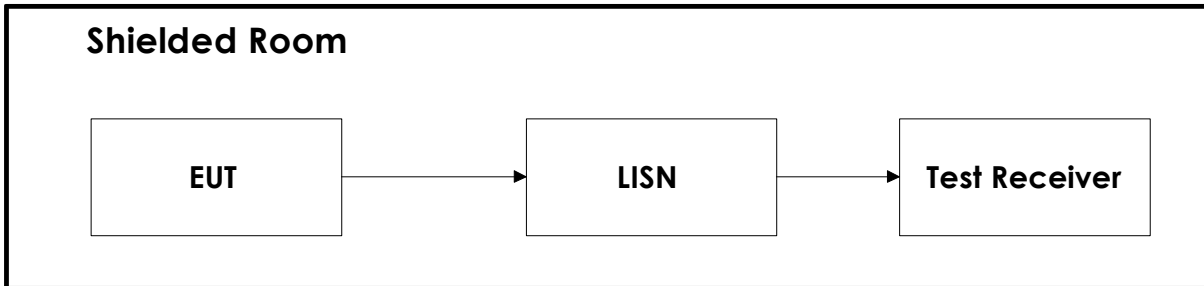
COU = Calibrate on Use

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

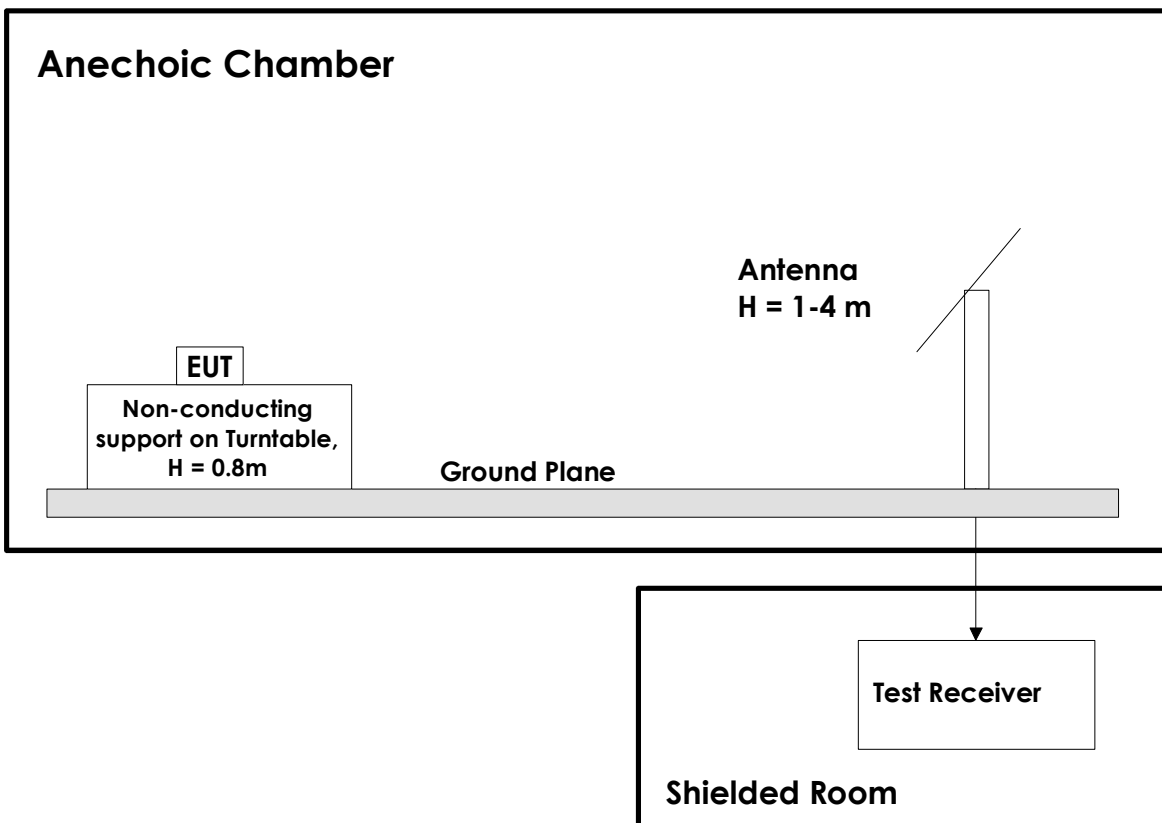
| No. | Manufacturer | Name | Version | Comment |
|-----|-----------------|--------|----------|---|
| 1 | Rohde & Schwarz | EMC32 | 10.50.10 | Power Line Conducted test software |
| 2 | Nemko AS | RSPlot | 1.0.8.0 | Screenshots from R&S Spectrum Analyzers |
| | | | | |

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.