

Test Report

Product	DECT Handset with Bluetooth
Name and address of the applicant	Ascom Sweden AB Grimbodalen 2 P.O.Box 8783, 40276 Göteborg, Sweden
Name and address of the manufacturer	Ascom Sweden AB Grimbodalen 2 P.O.Box 8783, 40276 Göteborg, Sweden
Model	See clause 1.1
Rating	3.7V _{dc} (Secondary Battery, Li-Ion)
Trademark	ASCOM
Serial number	See clause 1.1
Additional information	DECT 6.0, BLE, BT Classic
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	430662
Tested in period	2021-04-09 to 2021-05-28
Issue date	2021-08-03
Name and address of the testing laboratory	<div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="text-align: center;">  Instituttveien 6 Kjeller, Norway www.nemko.com </div> <div style="text-align: center;"> CAB Number: FCC: NO0001 ISED: NO0470 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50 </div> <div style="text-align: center;">   </div> </div> <p style="text-align: center; color: red;">An accredited technical test executed under the Norwegian accreditation scheme</p>
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  Prepared by [Frode Sveinsen] </div> <div style="text-align: center;">  Approved by [G.Suhanthakumar] </div> </div>	
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1 INFORMATION

1.1 Test Item

Name	ASCOM
Model/version	DH8-AAAA DH8-ABAA DH8-ACAA DH8-ABAB DH8-ACAB DH8-CEAA DH8-CEAB DH8-DDAA DH8-DEAB
FCC ID	BXZDH8
ISED Canada ID	3724B-DH8
Serial number	Conducted Sample: T26107D4JV Radiated Sample: T26107D2WF
Hardware identity and/or version	PD
Software identity and/or version	1.0.8
Frequency Range	2402–2480 MHz
Number of Channels	79
Operating Modes	Bluetooth Classic
Type of Modulation	GFSK / $\pi/4$ -DPSK / 8-DPSK
Conducted Output Power	1.52 mW
Antenna Connector	None
Number of Antennas	1
Diversity or Smart Antennas	No
Power Supply	Secondary Battery (3.7V Li-Ion, 910mAh)
Desktop Charger	Ascom DC3-AAD with AC Adaptor DSA-6PFG-05

Description of Test Item

The EUT is a DECT Handset with Bluetooth FHSS and Bluetooth Low Energy.

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

All models listed above have identical RF part and the main PCB and physical properties are identical. See model differences letter for description of differences.

All tests were performed on model DH8-ACAA, this model contains all options.

1.2 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	3.7 VDC (Nominal Battery Voltage)

The values are the limit registered during the test period.

All tests were performed with a fully charged battery.

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	Burst TX on single channel, Basic Rate, 2-EDR and 3-EDR
Additional information	The following settings were used for all tests: Power Setting: Maximum Bit Pattern: PSRB9 (Pseudo Random Bit Stream) Frame Type: DH1, 2-DH1, 3-DH1

1.6 Comments

The EUT uses the Bluetooth protocol with Frequency Hopping.

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 3m.

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".

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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	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	2021-06-22	First edition	FS
01	2021-08-03	Updated model numbers	FS

3 TEST RESULTS

3.1 Power Line Conducted Emissions

FCC Part 15.107 (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

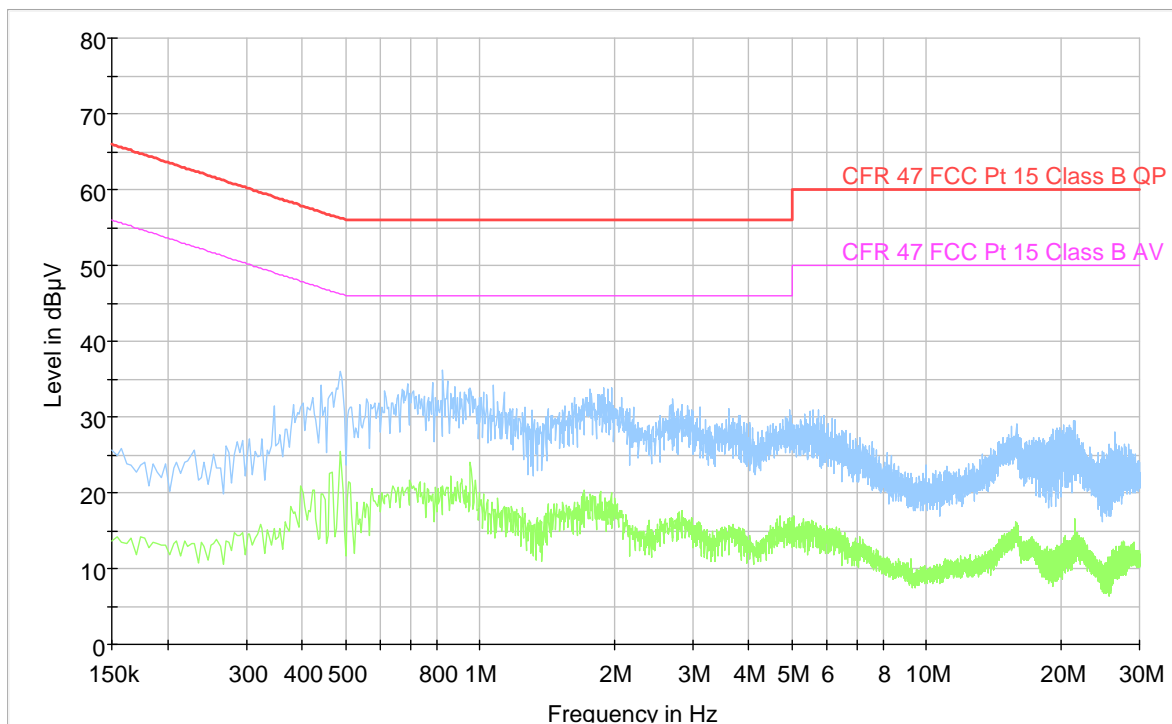
Measurement Data: See attached plots.

Highest measured value (L1 and N):

Handset in Charger, 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
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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:

Modulation	20dB Bandwidth		
	2402 MHz	2440 MHz	2480 MHz
Basic Rate (GFSK)	0.899 MHz	0.899 MHz	0.901 MHz
2-EDR ($\pi/4$ -DPSK)	0.897 MHz	0.899 MHz	0.899 MHz
3-EDR (8-DPSK)	1.06 MHz	1.06 MHz	1.06 MHz

Channel Separation is 1.0 MHz

RF channel has no influence on 20 dB bandwidth.

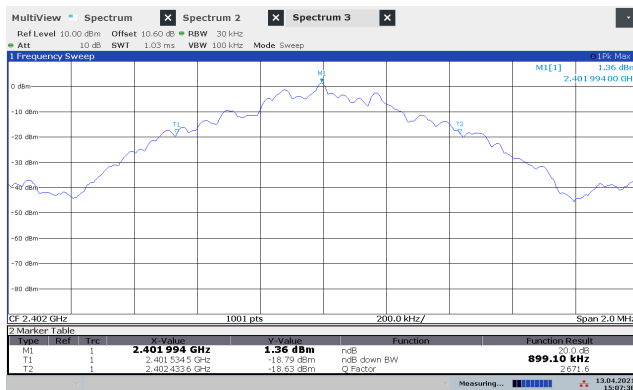
See attached plots.

Requirement:

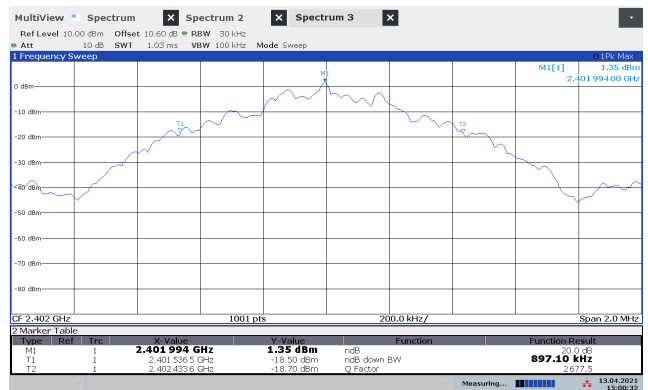
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

or:

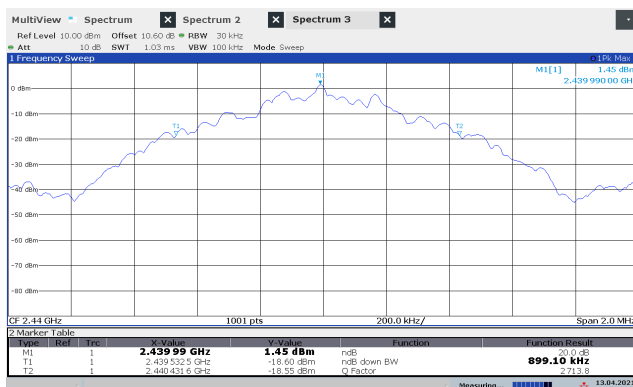
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the system operates with an output power no greater than 125 mW.



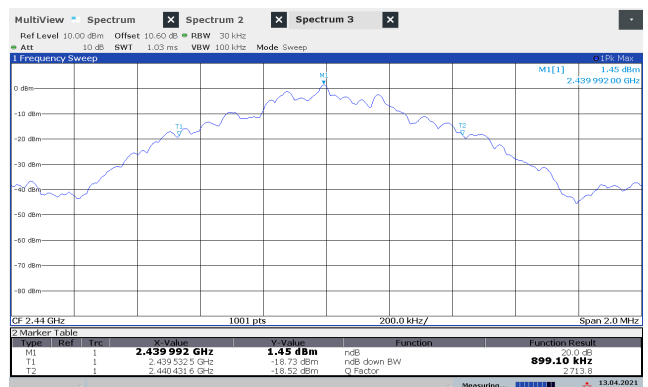
20dB Bandwidth 2402 MHz, GFSK



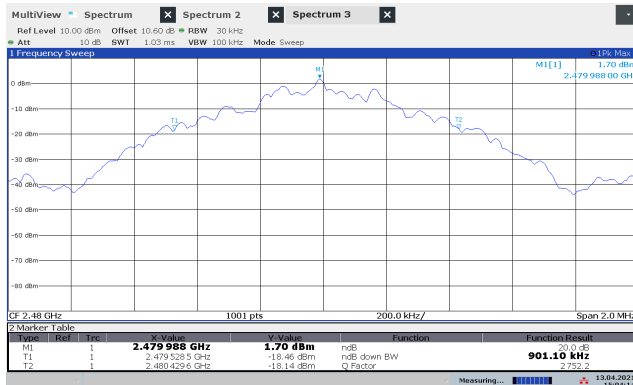
20dB Bandwidth 2402 MHz, $\pi/4$ -DPSK



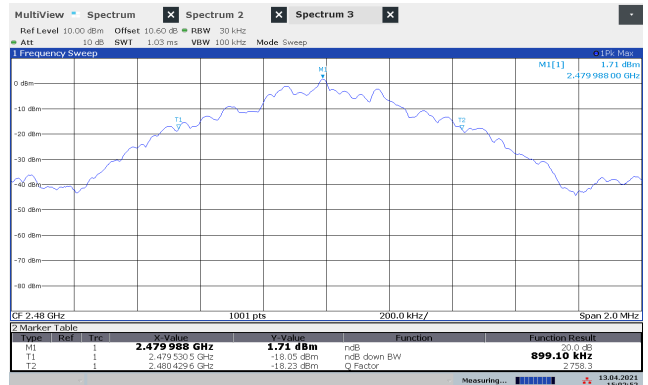
20dB Bandwidth 2440 MHz, GFSK



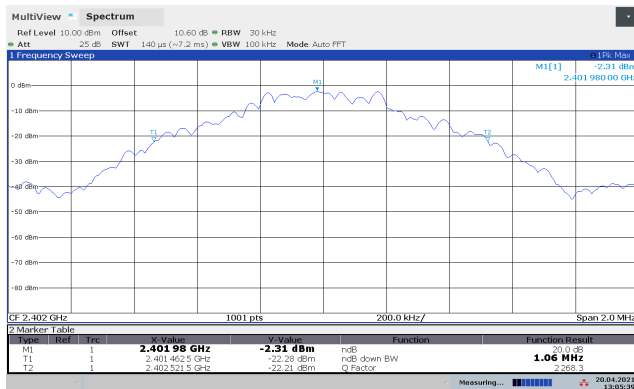
20dB Bandwidth 2440 MHz, $\pi/4$ -DPSK



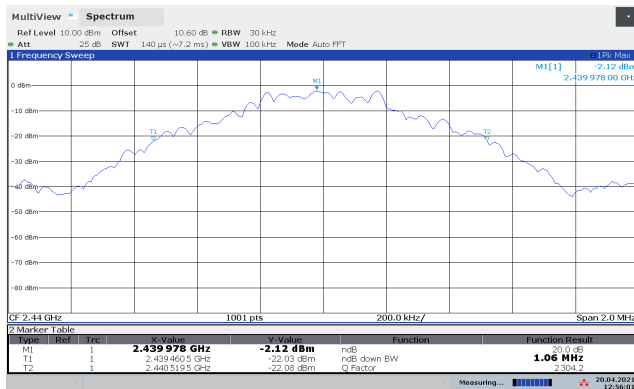
20dB Bandwidth 2480 MHz, GFSK



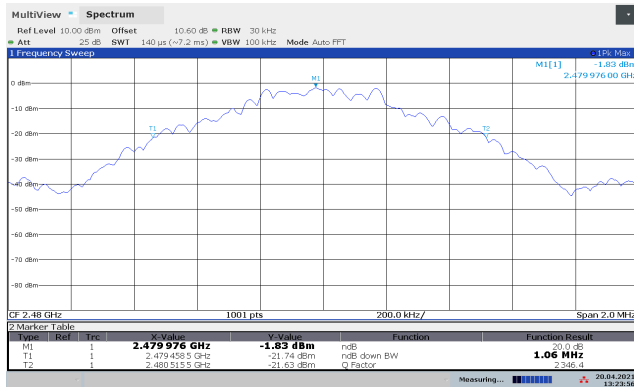
20dB Bandwidth 2480 MHz, $\pi/4$ -DPSK



20dB Bandwidth 2402 MHz, 8-DPSK



20dB Bandwidth 2440 MHz, 8-DPSK



20dB Bandwidth 2480 MHz, 8-DPSK

3.3 Pseudorandom Hopping Algorithm

FCC Part 15.247 (a)(1)

ISED Canada RSS-247 Issue 2, Clause 5.1

Test Results: Complies

Measurement Data: The EUT uses the Bluetooth Protocol.

Requirements:

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

3.4 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**

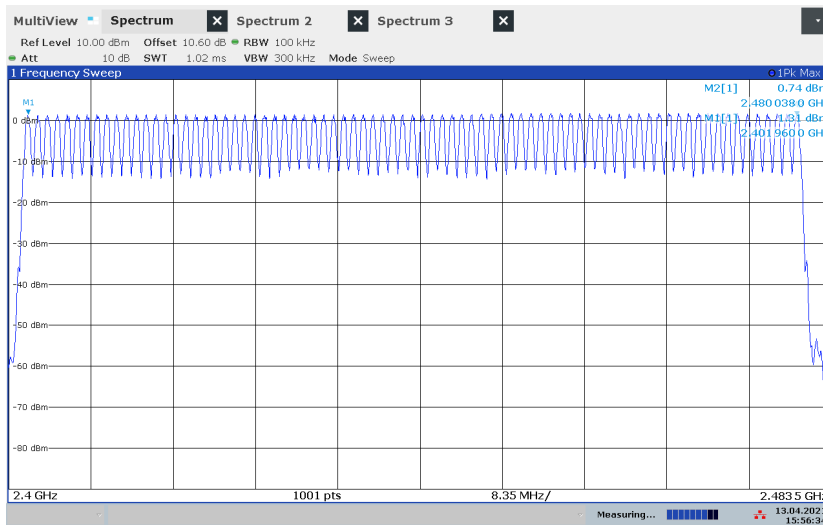
Measurement Data:

Number of RF Channels in use	20 to 79
Channel Centre Frequencies	2402 to 2480 MHz
Channel Separation	1.0 MHz

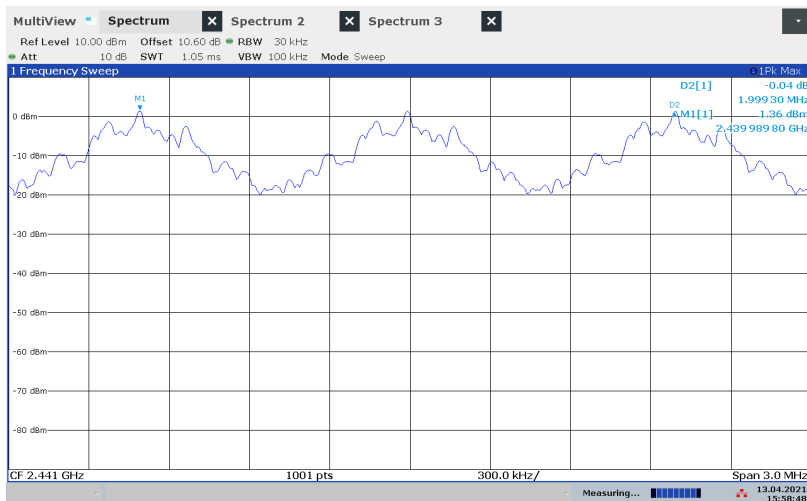
See attached plots.

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.



RF Channels in Use, Basic Rate



Channel Separation

3.5 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	0.44	1.25	141	Complies
DH3	1.70	2.50	272	Complies
DH5	2.95	3.75	315	Complies

Burst length is the same for all data rates.

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

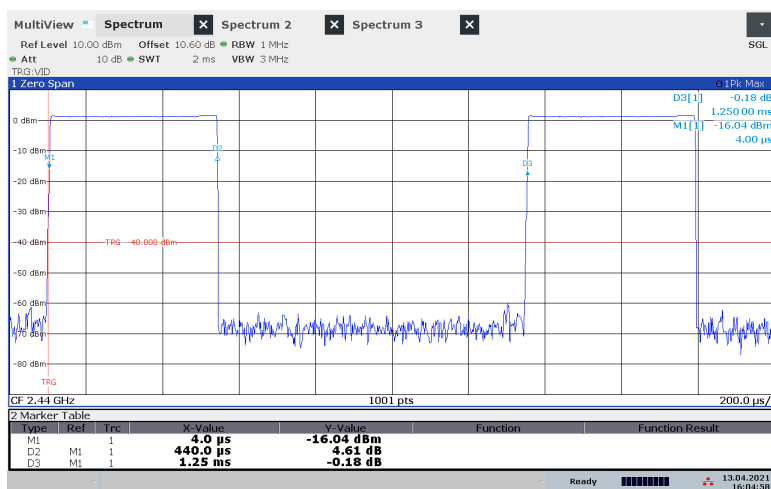
Time of occupancy = (Burst Length * Number of Channels * 400 ms) / Time Between Burst on Same Channel
= (Burst Length * 400 ms) / Frame Length

Number of RF channels is minimum 20 and maximum 78.

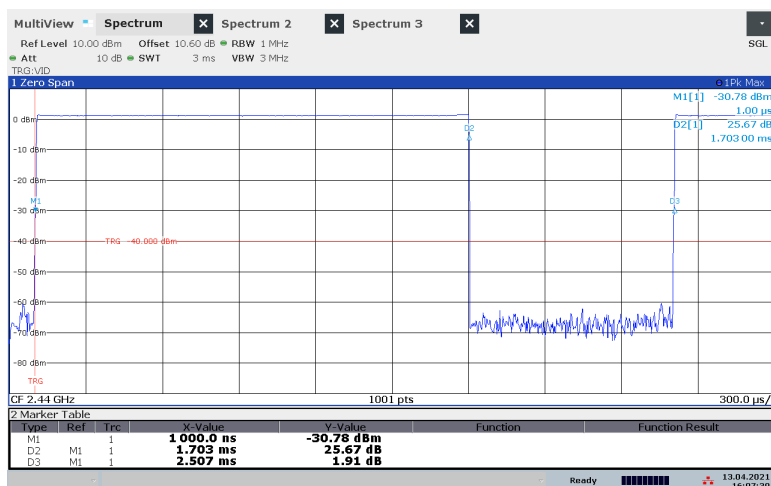
See attached plots.

Requirements:

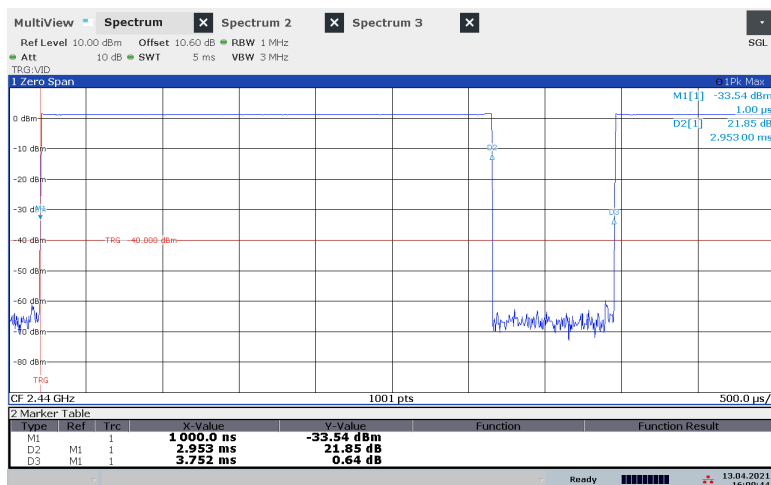
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.



RF Burst, DH1



RF Burst, DH3



RF Burst DH5

3.6 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)
2440 MHz Basic Rate	0.928 MHz
2440 MHz 2-EDR	0.936 MHz
2440 MHz 3-EDR	0.958 MHz

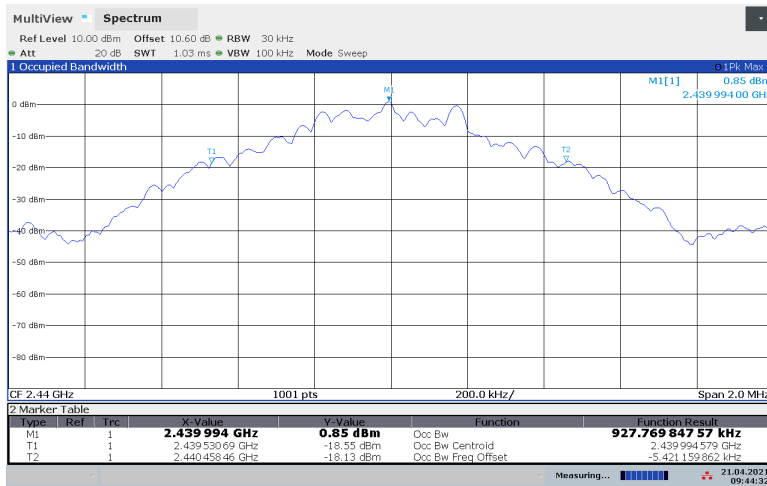
Occupied Bandwidth is the same for all channels

See attached plots.

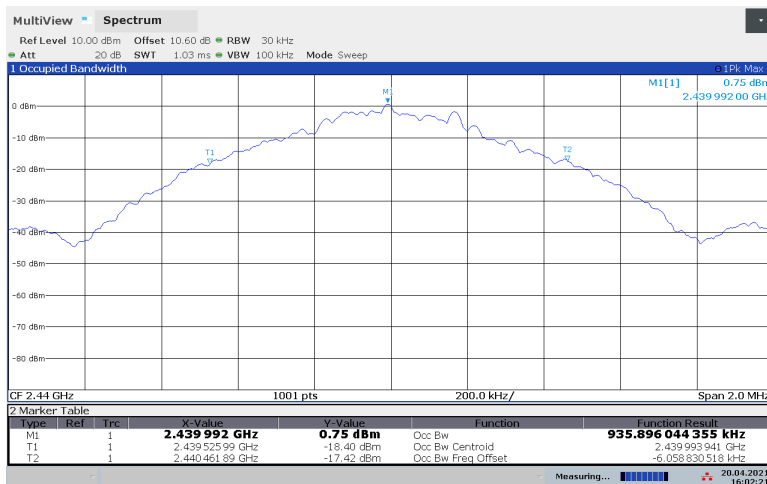
Requirements:

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.

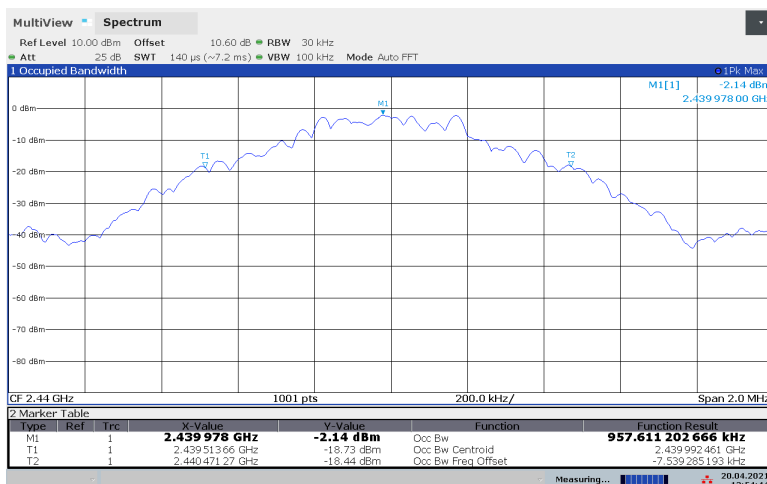
No requirement for 99% BW, reported for information only.



99% Occupied BW, GFSK



99% Occupied BW, $\pi/4$ -DPSK



99% Occupied BW, 8-DPSK

3.7 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	1.5	1.41
	$\pi/4$ -DPSK	1.5	1.41
	8-DPSK	0.8	1.21
2440	GFSK	1.6	1.44
	$\pi/4$ -DPSK	1.6	1.44
	8-DPSK	1.0	1.25
2480	GFSK	1.8	1.52
	$\pi/4$ -DPSK	1.8	1.52
	8-DPSK	1.2	1.33

Manufacturer specified antenna gain is Less than 3 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:

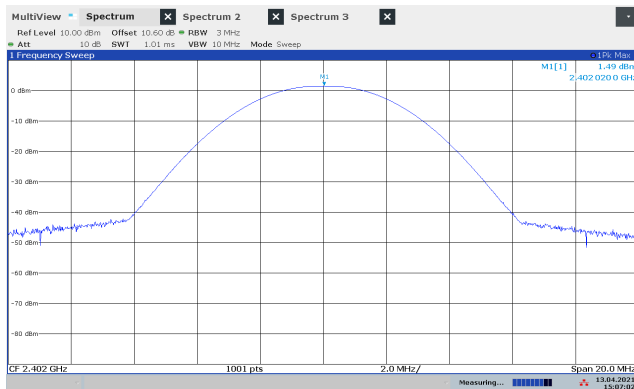
The maximum peak output power shall not exceed the following limits:

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

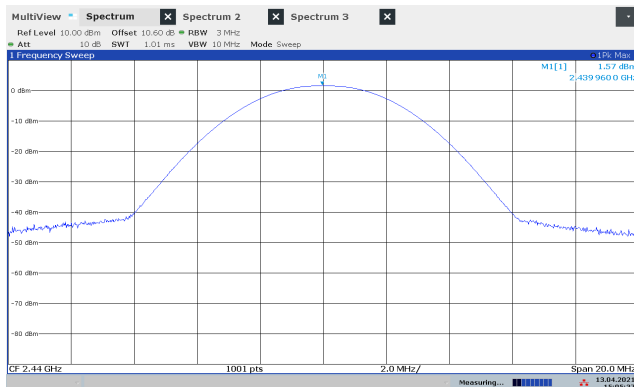
For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts

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

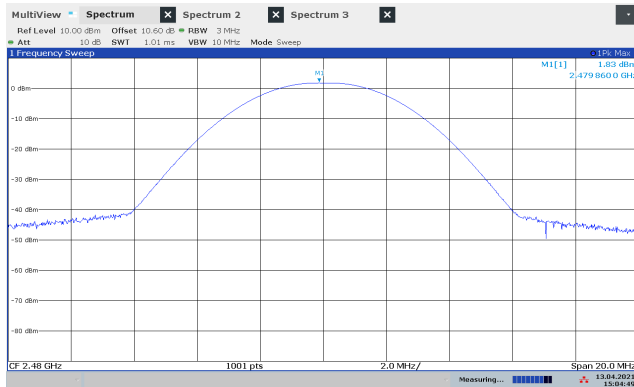
If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



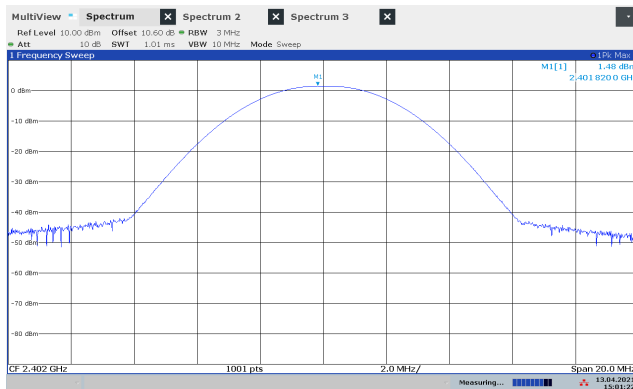
Peak Power, 2402 MHz, GFSK



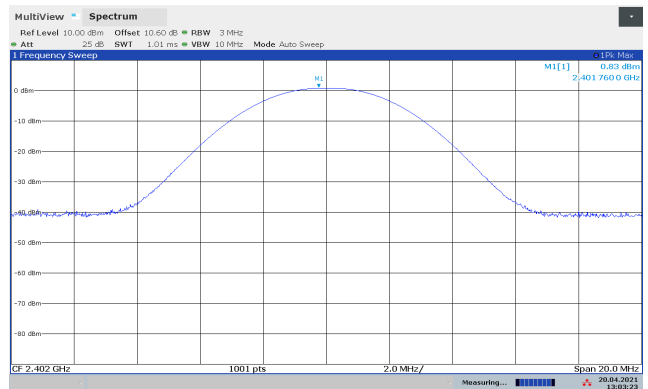
Peak Power, 2440 MHz, GFSK



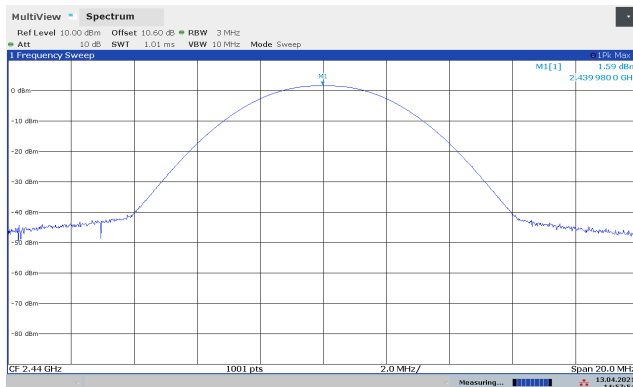
Peak Power, 2480 MHz, GFSK



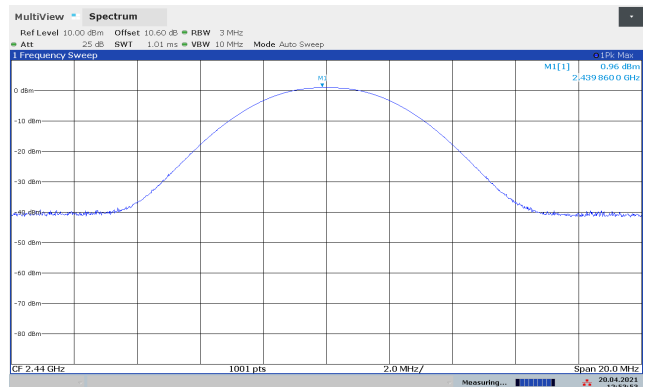
Peak Power, 2402 MHz, $\pi/4$ -DPSK



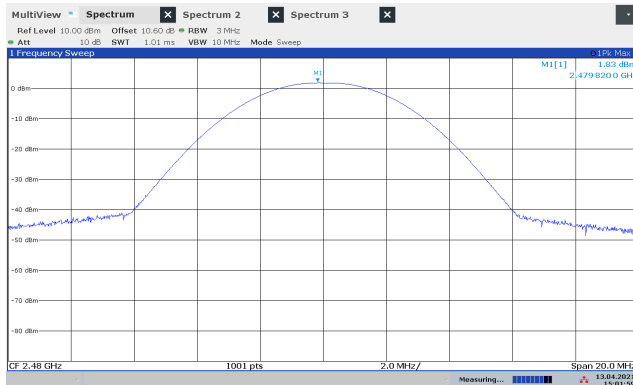
Peak Power, 2402 MHz, 8-DPSK



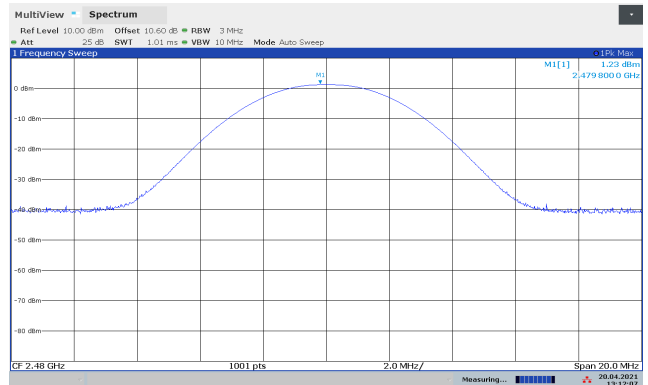
Peak Power, 2440 MHz, $\pi/4$ -DPSK



Peak Power, 2440 MHz, 8-DPSK



Peak Power, 2480 MHz, $\pi/4$ -DPSK



Peak Power, 2480 MHz, 8-DPSK

3.8 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	> 40	> 20	Pass
2440 MHz	> 40	> 20	Pass
2480 MHz	> 40	> 20	Pass

Measured with Peak Detector

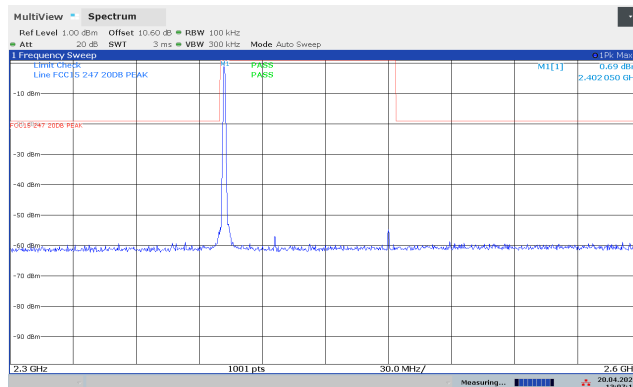
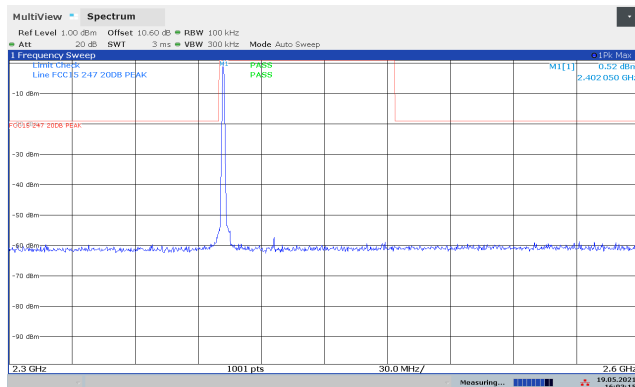
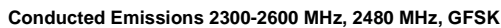
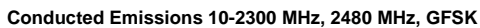
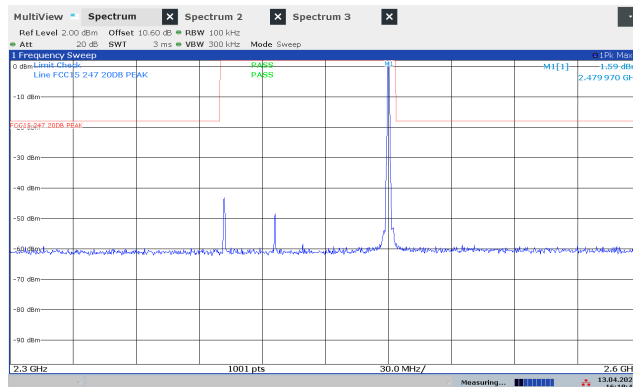
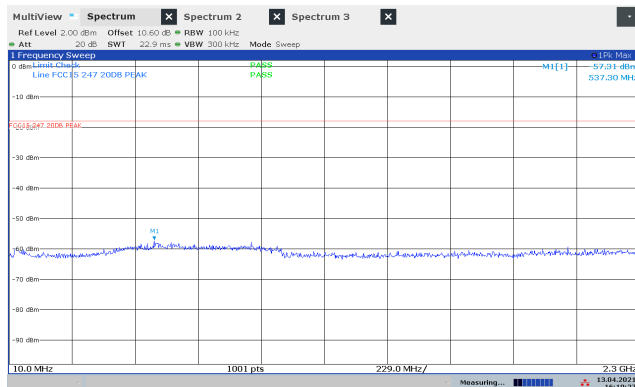
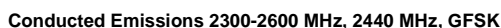
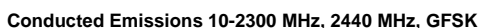
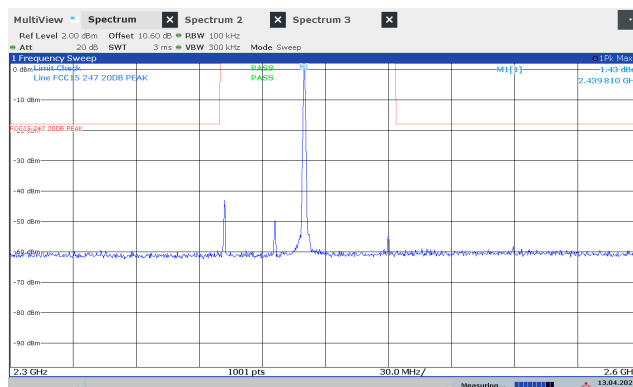
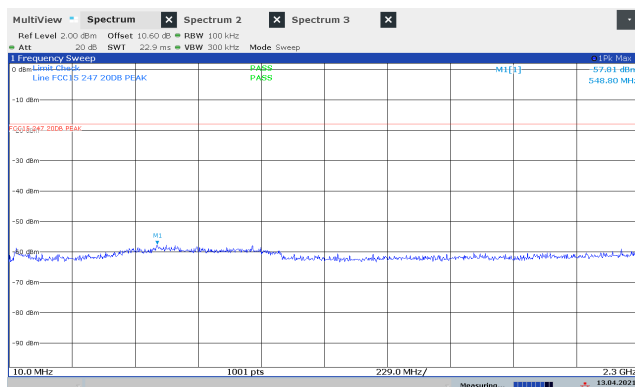
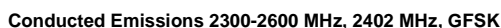
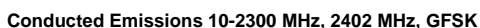
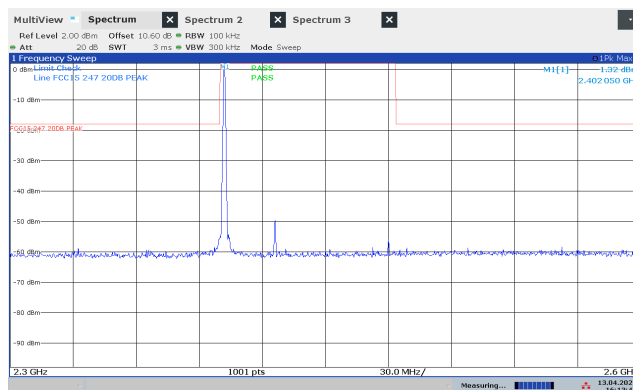
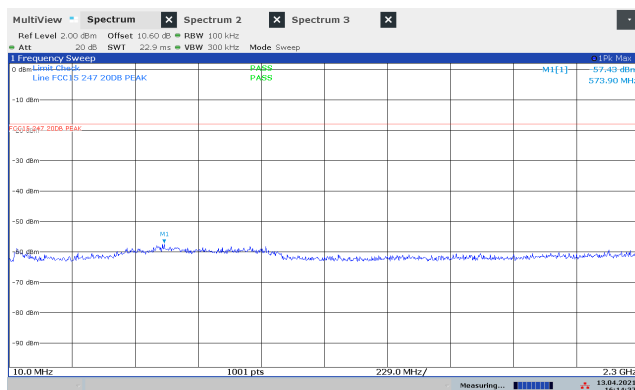
RF conducted power to 25 GHz: see attached plots.

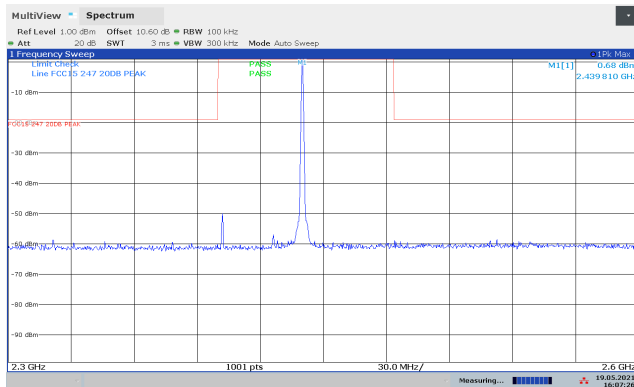
Limit

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

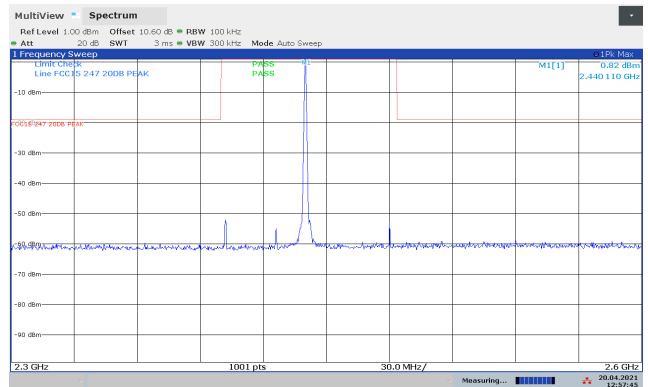
Detector type shall be the same as used for measuring Output Power.

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

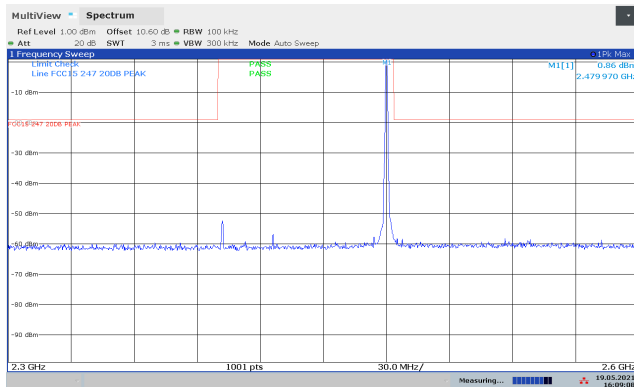




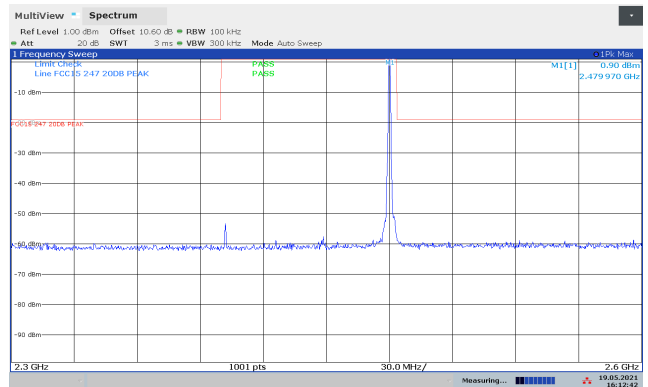
Conducted Emissions 2300-2600 MHz, 2440 MHz, $\pi/4$ -DPSK



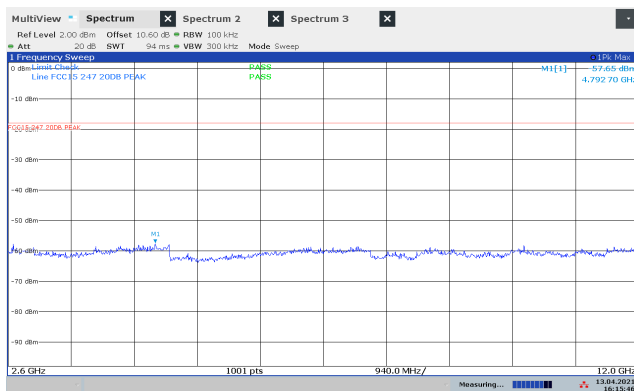
Conducted Emissions 2300-2600 MHz, 2440 MHz, 8-DPSK



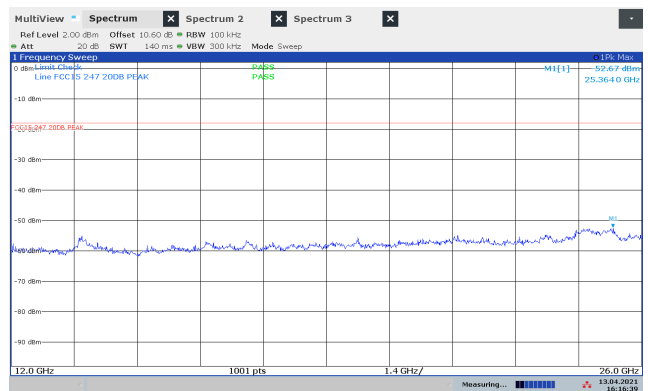
Conducted Emissions 2300-2600 MHz, 2480 MHz, $\pi/4$ -DPSK



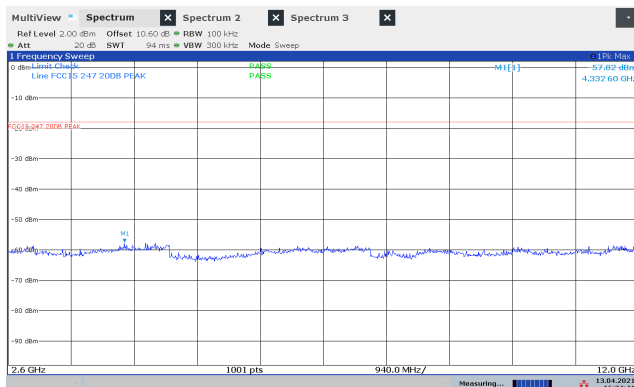
Conducted Emissions 2300-2600 MHz, 2480 MHz, 8-DPSK



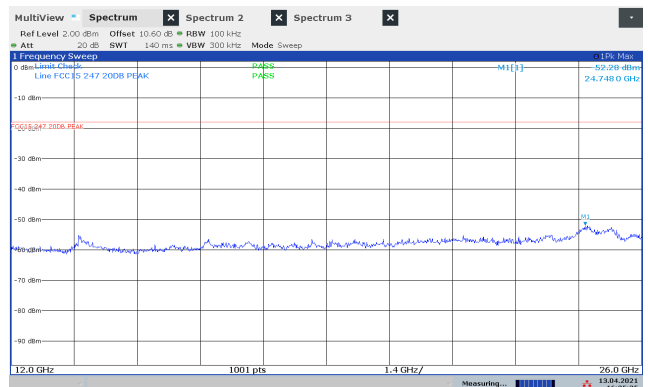
Conducted Emissions 2600-12000 MHz, 2402 MHz, GFSK



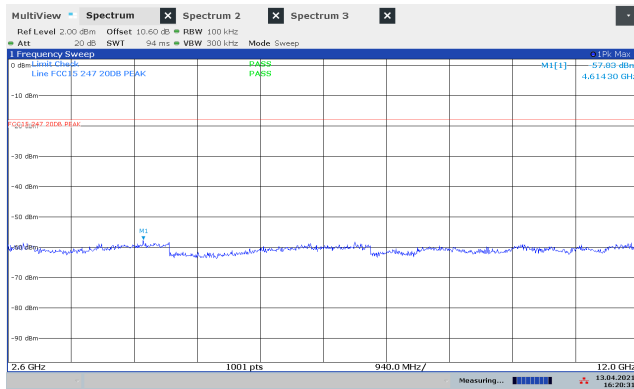
Conducted Emissions 12000-26000 MHz, 2402 MHz, GFSK



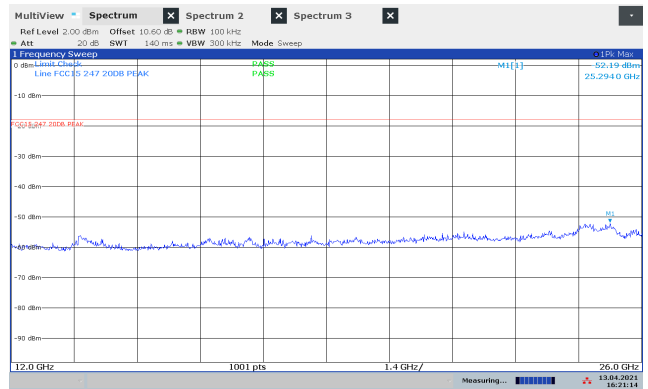
Conducted Emissions 2600-12000 MHz, 2440 MHz, GFSK



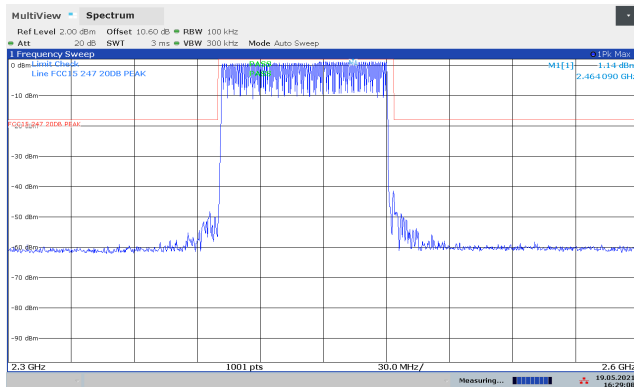
Conducted Emissions 12000-26000 MHz, 2440 MHz, GFSK



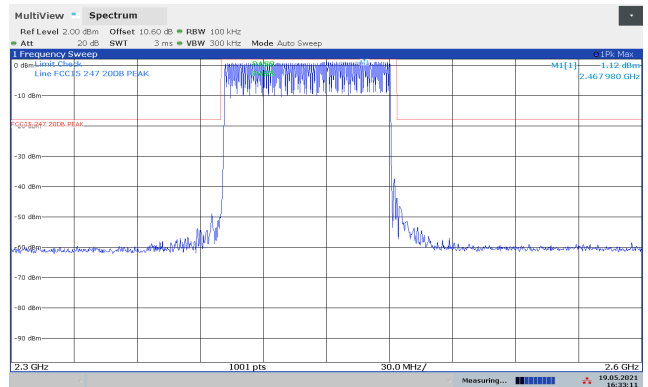
Conducted Emissions 2600-12000 MHz, 2480 MHz, GFSK



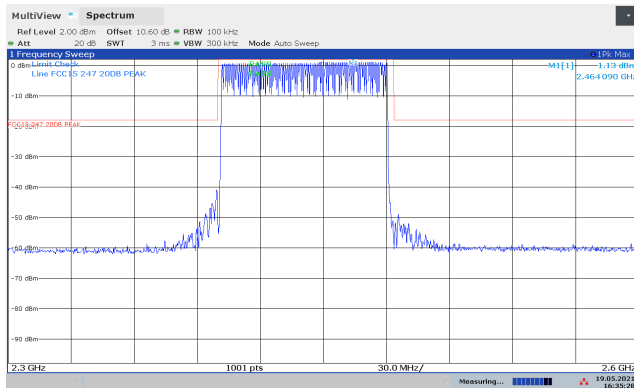
Conducted Emissions 12000-26000 MHz, 2480 MHz, GFSK



Conducted Emissions 2300-2600 MHz, Hopping, GFSK



Conducted Emissions 2300-2600 MHz, Hopping, $\pi/4$ -DPSK



Conducted Emissions 2300-2600 MHz, Hopping, 8-DPSK

3.9 Restricted Bands of operation

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

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

FCC (MHz)	ISSED Canada (MHz)	FCC (GHz)	ISSED 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 ISSED, all other frequencies are common.

3.10 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	52.8	32.8	74	54	21.2	21.2
2480 MHz GFSK	2483.5 MHz	51.3	31.3			22.7	22.7
2402 MHz 2-EDR	2390 MHz	52.5	32.5			21.5	21.5
2480 MHz 2-EDR	2483.5 MHz	66.5	46.5			7.5	7.5
2402 MHz 3-EDR	2390 MHz	65.8	45.8			8.2	8.2
2480 MHz 3-EDR	2483.5 MHz	66.1	46.1			7.9	7.9

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

See attached plots.

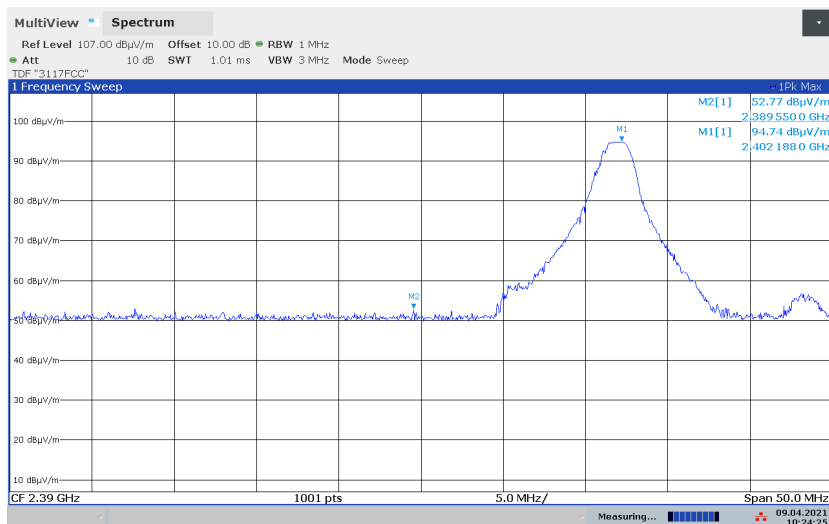
Duty Cycle Correction Factor Calculation:

Frame length = slot length * minimum number of channels in hop sequence (maximum 100ms)

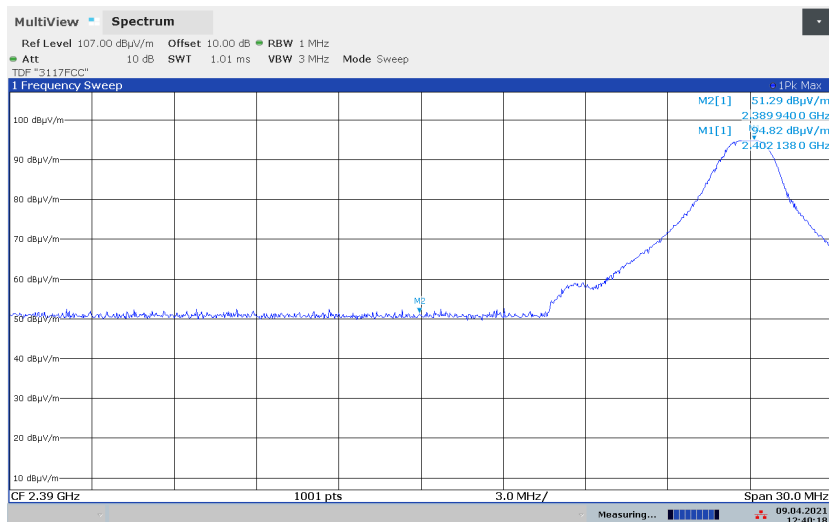
Maximum Duty Cycle = burst length / (frame length * 20) = 2.95 / (3.75 * 20) = 0.0393

Duty Cycle Correction factor = -20 x log(Duty Cycle) = 28.1 dB

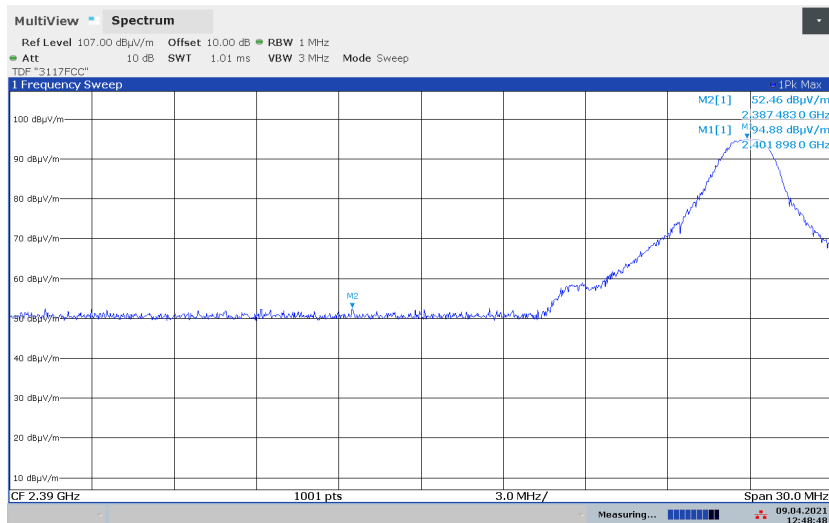
Maximum Duty Cycle Correction Factor according to Para 15.35 (b): 20 dB



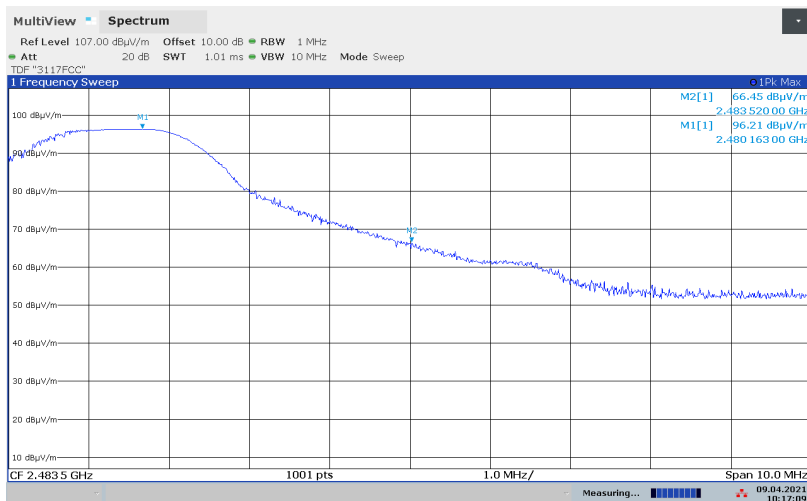
Lower Band Edge 2402 MHz, GFSK, Peak



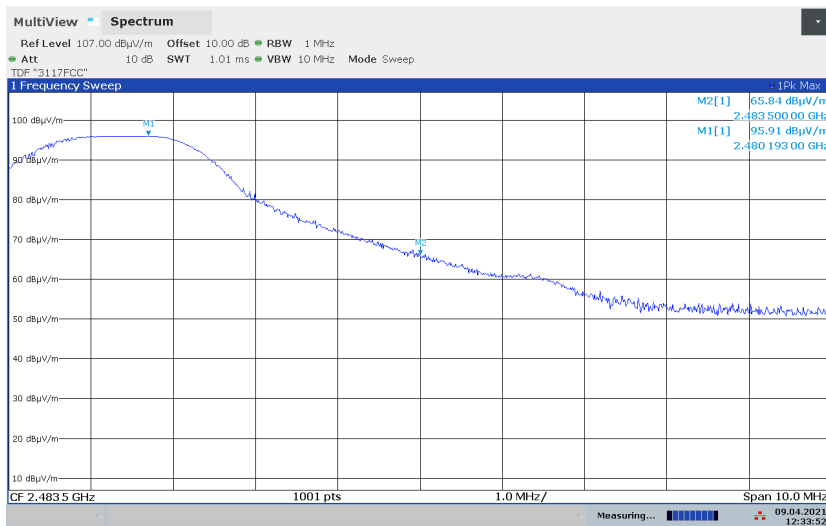
Lower Band Edge 2402 MHz, π/4-DPSK, Peak



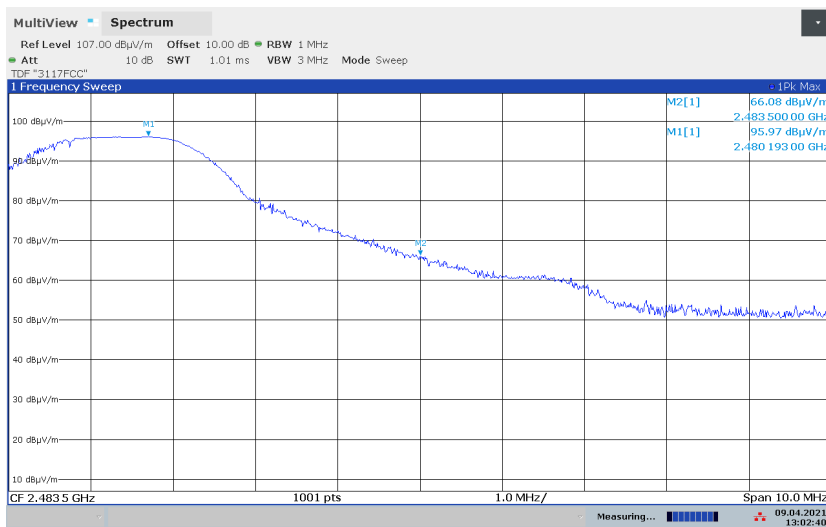
Lower Band Edge 2402 MHz, 8-DPSK, Peak



Upper Band Edge 2480 MHz, GFSK, Peak



Upper Band Edge 2480 MHz, $\pi/4$ -DPSK, Peak



Upper Band Edge 2480 MHz, 8-DPSK, Peak

3.11 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

Tested in test mode with hopping active

Measured Frequency (MHz)	Carrier Frequency (MHz)	Modulation	Measured Emission (dBµV/m)	Limit (dBµV/m)	Margin (dB)
30 – 88	Hopping	GFSK	< 20	40.0	> 20
88 – 216	Hopping	GFSK	< 20	43.5	> 23.5
216 – 960	Hopping	GFSK	< 20	46.0	> 26
960 – 1000	Hopping	GFSK	< 20	54.0	> 34

See attached plots.

Requirements/Limit

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



Date: 12.APR.2021 09:46:04

Radiated Emissions 30 - 1000 MHz, GFSK, VP

3.12 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.

RBW=1 MHz

Carrier freq. (MHz)	Measured Frequency (GHz)	Modulation	Measured Emission (dB μ V/m)		Limit (dB μ V/m)		Margin (dB)	
			Pk	Av	Pk	Av	Pk	Av
2440	4880	GFSK	51.1	/	74	54	22.9	/
2440	4880	$\pi/4$ -DPSK	50.8	/	74	54	23.2	/
2440	4880	8-DPSK	51.7	/	74	54	22.3	/

Average Detector values are not reported when Peak Detector values are below the Average Limit.

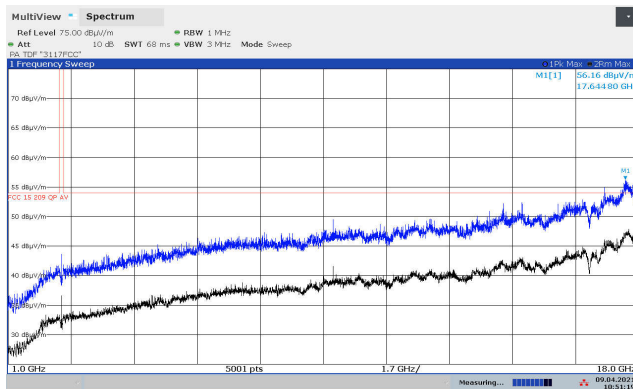
A Band Reject Filter was used for measurements from 1 GHz to 18 GHz.

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

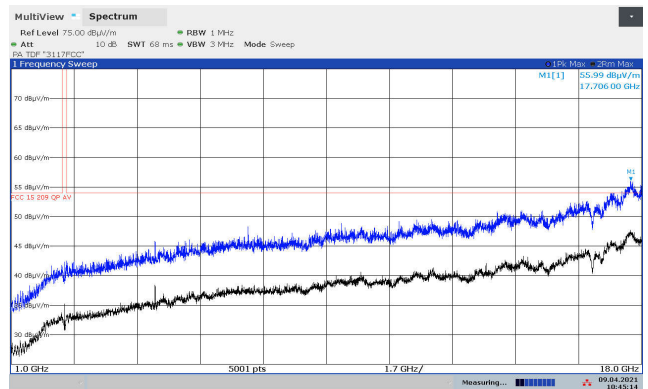
See plots.

Requirements/Limit

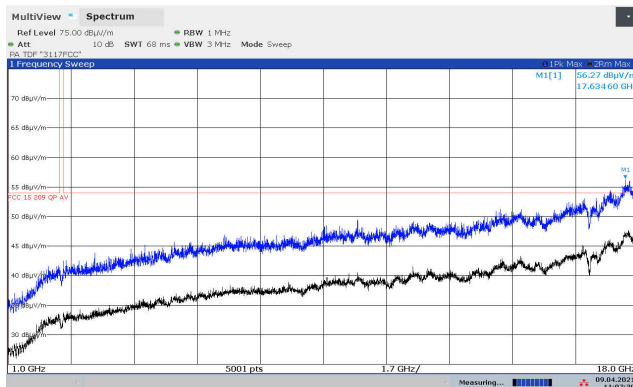
FCC	Part 15.209 @ frequencies defined in §15.205	
ISED	RSS-GEN Issue 5, clause 8.9 @ frequencies defined in clause 8.10	
	Radiated emission limit @3 meters	
Frequency	Average Detector	Peak Detector
1 – 26 GHz	54.0 dB μ V/m	74.0 dB μ V/m



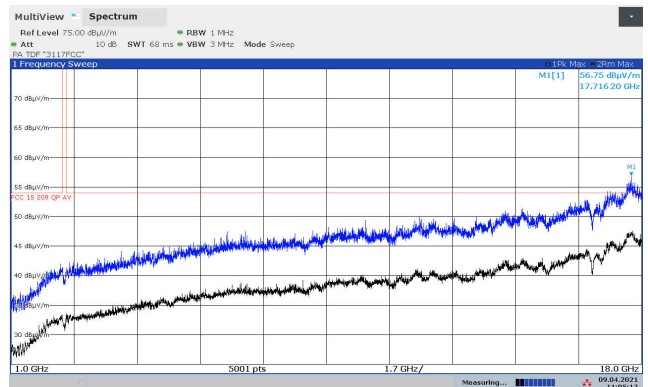
Radiated Emissions 1 - 18 GHz, 2440 MHz, GFSK, HP



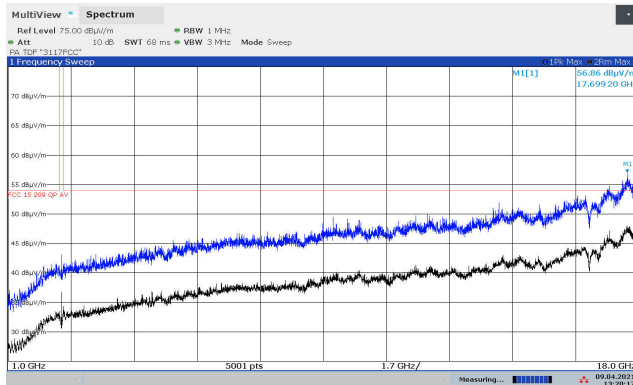
Radiated Emissions 1 - 18 GHz, 2440 MHz, GFSK, VP



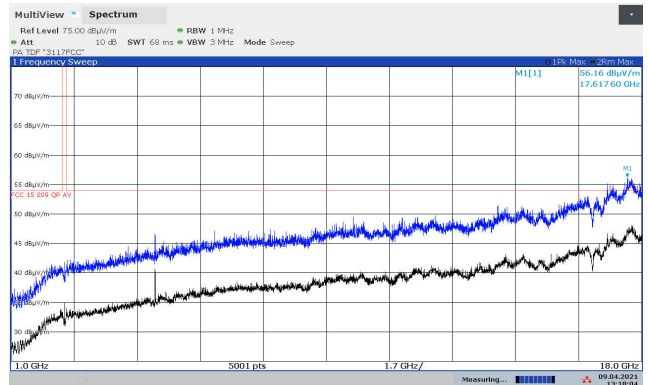
Radiated Emissions 1 - 18 GHz, 2440 MHz, $\pi/4$ -DPSK, HP



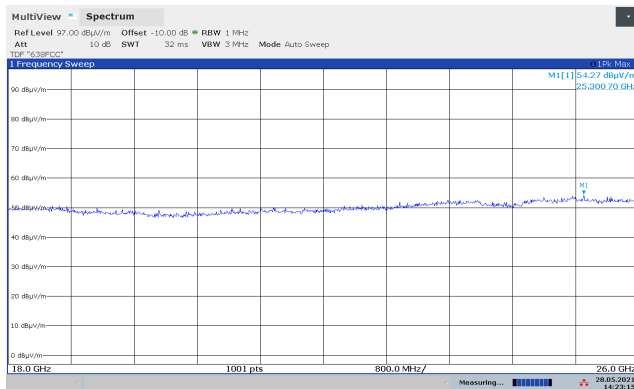
Radiated Emissions 1 - 18 GHz, 2440 MHz, $\pi/4$ -DPSK, VP



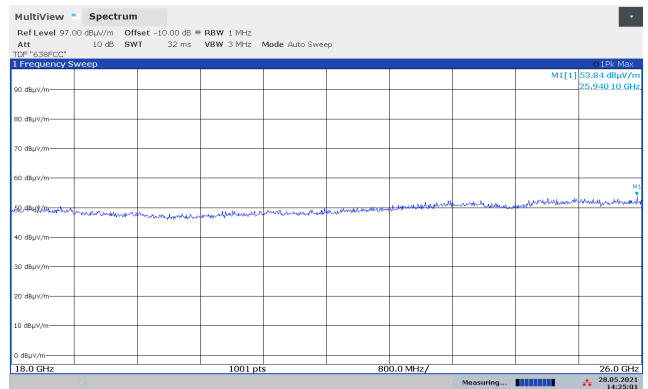
Radiated Emissions 1 - 18 GHz, 2440 MHz, 8-DPSK, HP



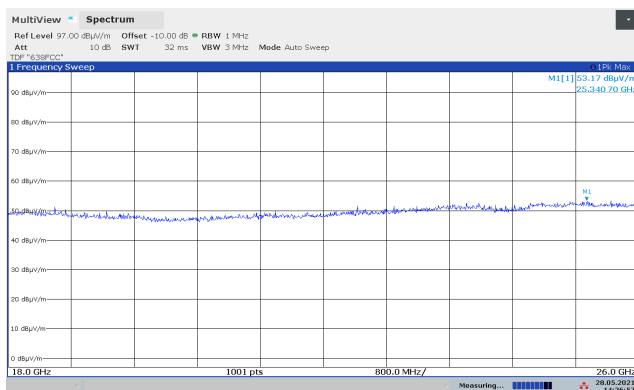
Radiated Emissions 1 - 18 GHz, 2440 MHz, 8-DPSK, VP



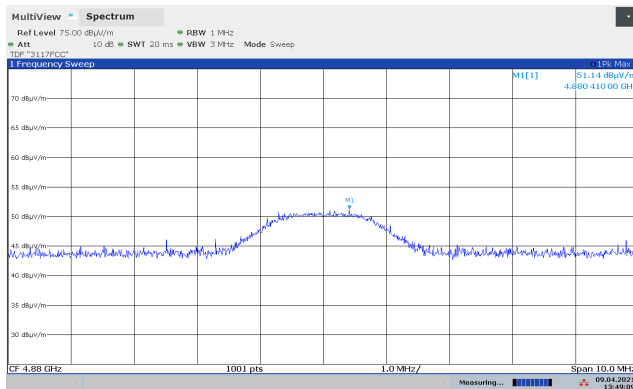
Radiated Emissions 18 - 26 GHz, 2402 MHz, GFSK



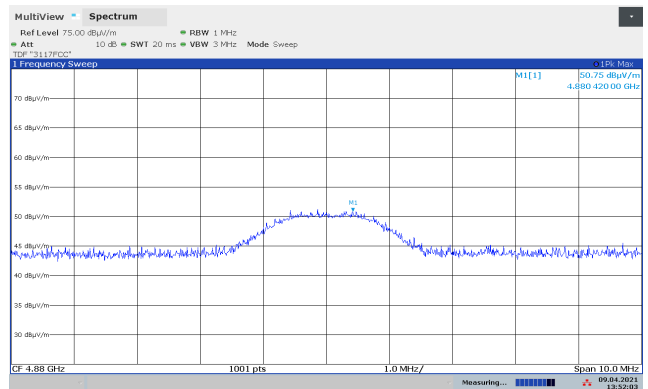
Radiated Emissions 18 - 26 GHz, 2440 MHz, GFSK



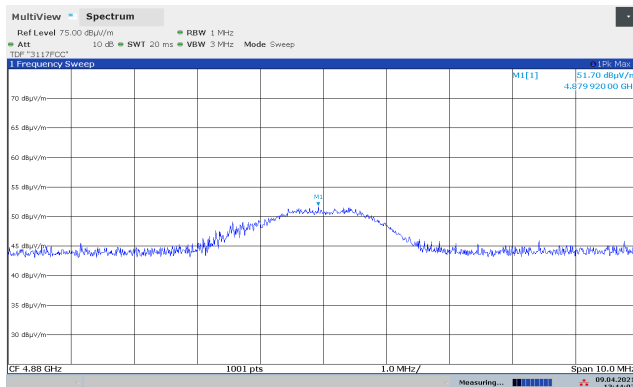
Radiated Emissions 18 - 26 GHz, 2480 MHz, GFSK



Radiated Emissions 4880 MHz, 2440 MHz, GFSK, HP



Radiated Emissions 4880 MHz, 2440 MHz, $\pi/4$ -DPSK, HP



Radiated Emissions 4880 MHz, 2440 MHz, 8-DPSK, HP

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.

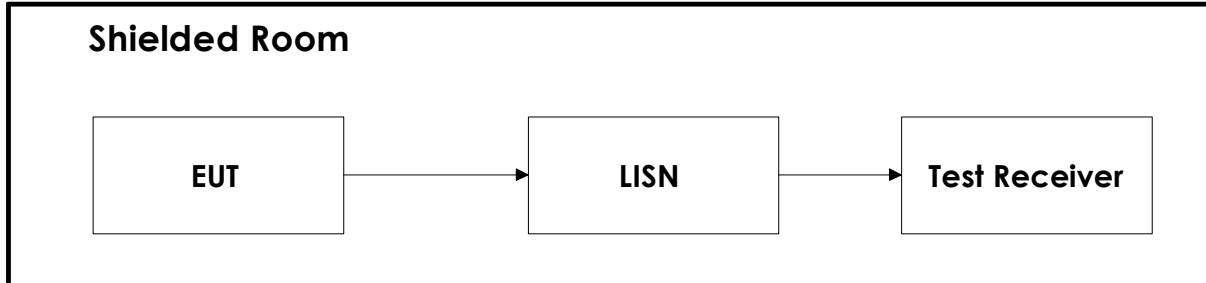
No.	Model number	Description	Manufacturer	Ref. no.	Cal. date	Cal. Due
1	FSW43	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2020-10	2021-10
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2021-02	2022-02
3	6810.17B	Attenuator	Suhner	LR 1669	2020-08	2021-08
4	NO324415	Band Reject Filter	Microwave Circuits	LR 1760	2020-08	2021-08
5	JB3	BiLog Antenna	Sunol	N 4525	2020-03	2023-03
6	317	Preamplifier	Sonoma Inst.	LR 1687	2020-08	2021-08
7	3117-PA	Horn Antenna +PreAmp	EMCO	LR 1717	2020-08	2021-08
8	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2020-08	2021-08
9	638	Antenna Horn	Narda	LR 1480	N/A	
10	Model 87V	Multimeter	Fluke	LR 1599	2021.01	2023.01
11	ENV21	Two Line V-Network	Rohde & Schwarz	LR 1665	2019-11	2021-11
12	6812B	AC Power Source	Agilent	LR 1515	2020-04	2022-04
13	ESCI3	Measuring Receiver	Rohde & Schwarz	N-4259	2019.10	2021.10
14	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	2020-08	2021-08

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

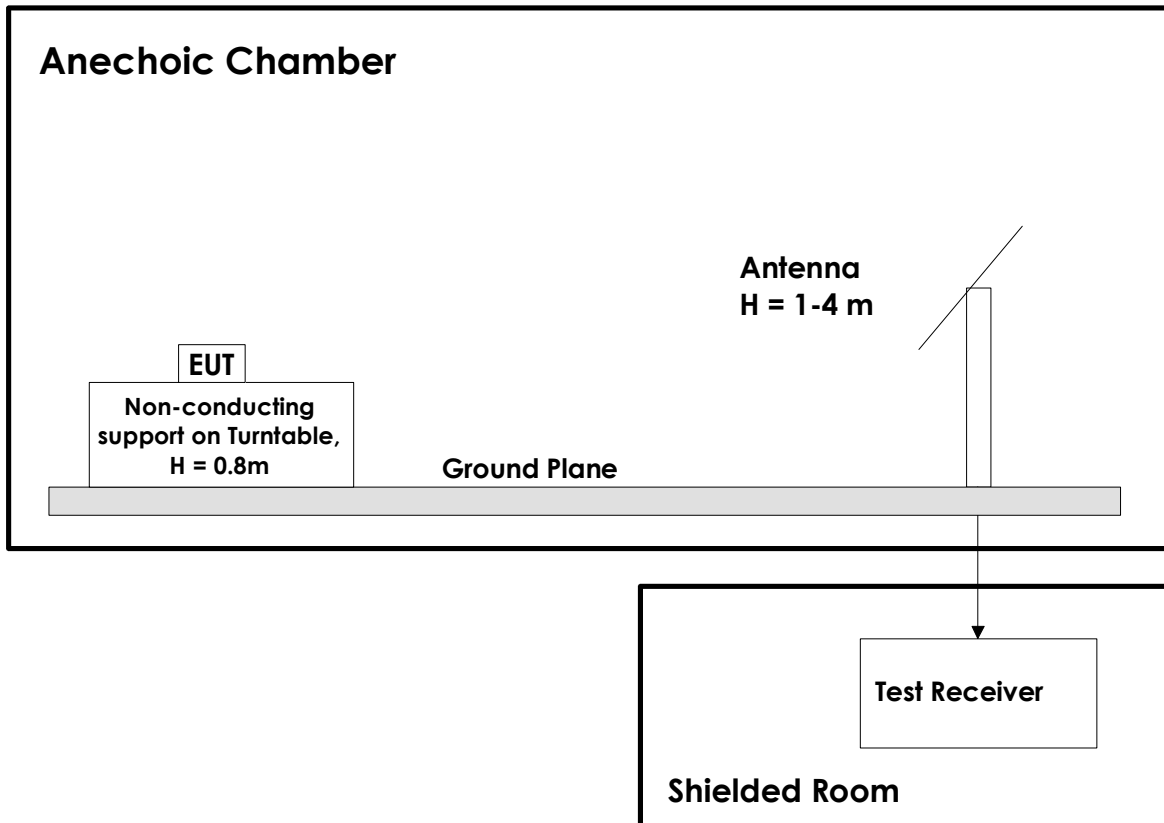
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.50.10	Power Line Conducted test software
2	Rohde & Schwarz	EMC32	10.50.10	Radiated Emission test software
3	Nemko AS	RSPlot	1.0.8.0	Screenshots from R&S Spectrum Analyzers

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. 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.