

Test Report

Product	Bluetooth Transceiver in Desktop Phone with 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-TGF880, KX-TGF890C
Rating	Mains (120V, 60Hz)
Trademark	Panasonic
Serial number	/
Additional information	DECT 6.0, Bluetooth
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	379643
Tested in period	2019.08.20 to 2019.08.27 and 2019.09.10
Issue date	2019.09.11
Name and address of the testing laboratory	 CAB Number: FCC: NO0001 ISED: NO0470 TEL: +47 22 96 03 30 FAX: +47 22 96 05 50   Instituttveien 6 Kjeller, Norway An accredited technical test executed under the Norwegian accreditation scheme
 Prepared by [Frode Sveinsen]  Approved by [G.Suhanthakumar]	
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1 INFORMATION

1.1 Test Item

Name	Panasonic
FCC ID	ACJ96NKX-TGF880
ISED ID	216A-KXTGF890
Model/version	KX-TGF880 (USA Model) KX-TGF890C (Canada Model)
Serial number	/
Hardware identity and/or version	PNLB2838
Software identity and/or version	SW202
Frequency Range	2402 – 2480 MHz
Number of Channels	79
Operating Modes	Classic Bluetooth
Type of Modulation	Digital (GFSK)
User Frequency Adjustment	None
Rated Output Power	6.14 mW (Conducted)
Type of Power Supply	AC Adaptor PNLV226
Antenna Connector	None
Number of Antennas	1
Diversity or Smart Antennas	No

Description of Test Item

The EUT is a Desktop Phone with DECT Base Station.

The EUT also has a Bluetooth transceiver for connection to a cellular phone or a Bluetooth headset. If the Base station is connected to a cellular phone it is possible to make outgoing calls through the cellular phone from the Desktop Phone or from connected DECT handsets.

The models KX-TGF880 and KX-TGF890C are identical.

1.2 Normal test condition

Temperature:	20 - 24 °C
Relative humidity:	20 - 50 %
Normal test voltage:	120 V AC

The values are the limit registered during the test period.

1.3 Test Engineer(s)

Frode Sveinsen

1.4 Description of modification for Modification Filing

Not applicable.

1.5 Family List Rational

Not Applicable.

1.6 Antenna Requirement

Is the antenna detachable?

☐ Yes ☒ No

If detachable, is the antenna connector non-standard?

☐ Yes ☐ No

Type of antenna connector: N/A

Ref. FCC §15.203

1.7 Worst-Case Configuration and Mode

Radiated Emissions and Power Line Conducted Emissions were performed with the EUT set to transmit at the channel with the highest output power as worst-case scenario.

1.8 Comments

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 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 ISSED.

☒ 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

Version	Date	Comment	Sign
1.0	2019.09.02	First edition	FS
2.0	2019.09.10	Removed references to KX-TGF770	FS

TEST RESULTS

2.3 Power Line Conducted Emissions

FCC Part 15.107 (a)

ISED RSS-GEN Issue 5, Clause 7.2/8.8

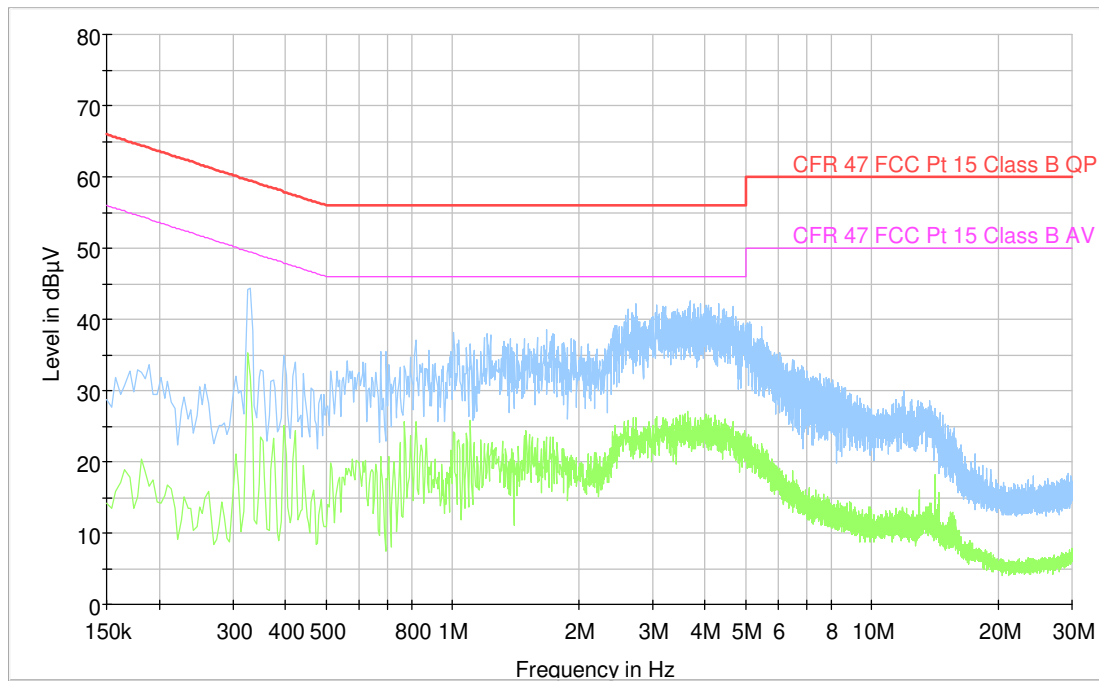
Measurement procedure: ANSI C63.4-2014 using 50 μ H/50 ohms LISN.

Test Results: Complies

Measurement Data: See attached plots.

120V 60Hz

Full Spectrum



2.4 Channel Separation and 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:

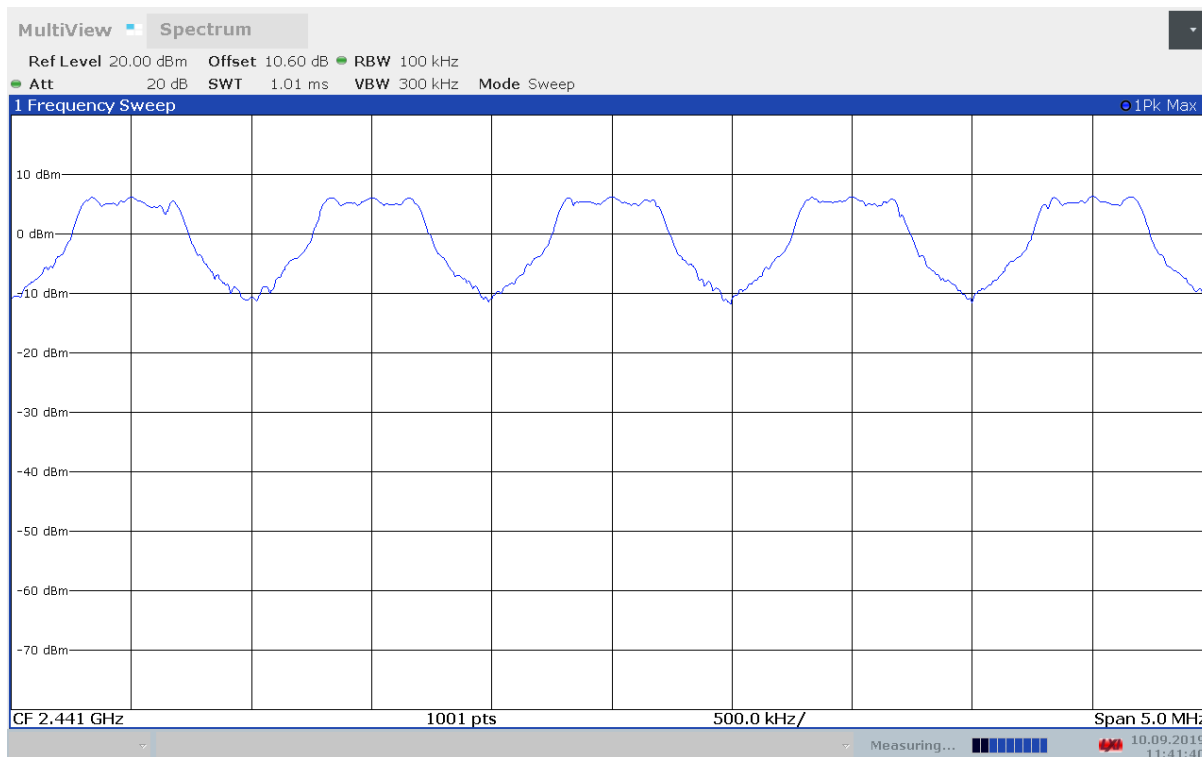
Channel Separation:	1.0 MHz
Nominal value for Channel Separation	1.0 MHz

Carrier Frequency	20 dB Bandwidth
2402 MHz	887 kHz
2441 MHz	891 kHz
2480 MHz	894 kHz

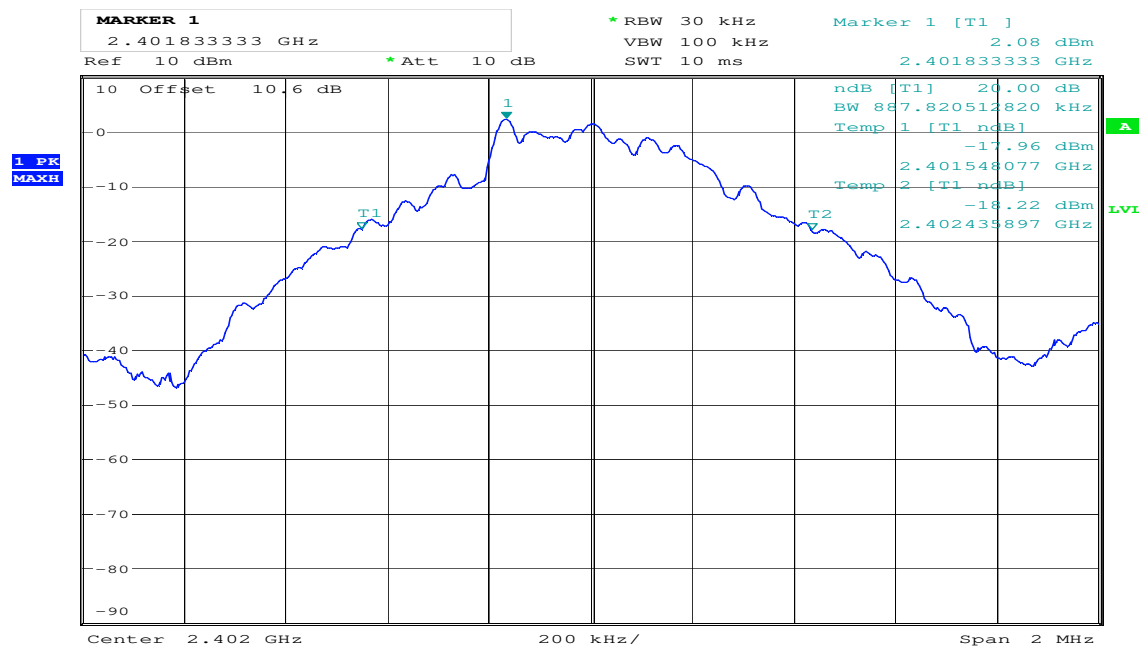
See attached plots

Requirement:

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.

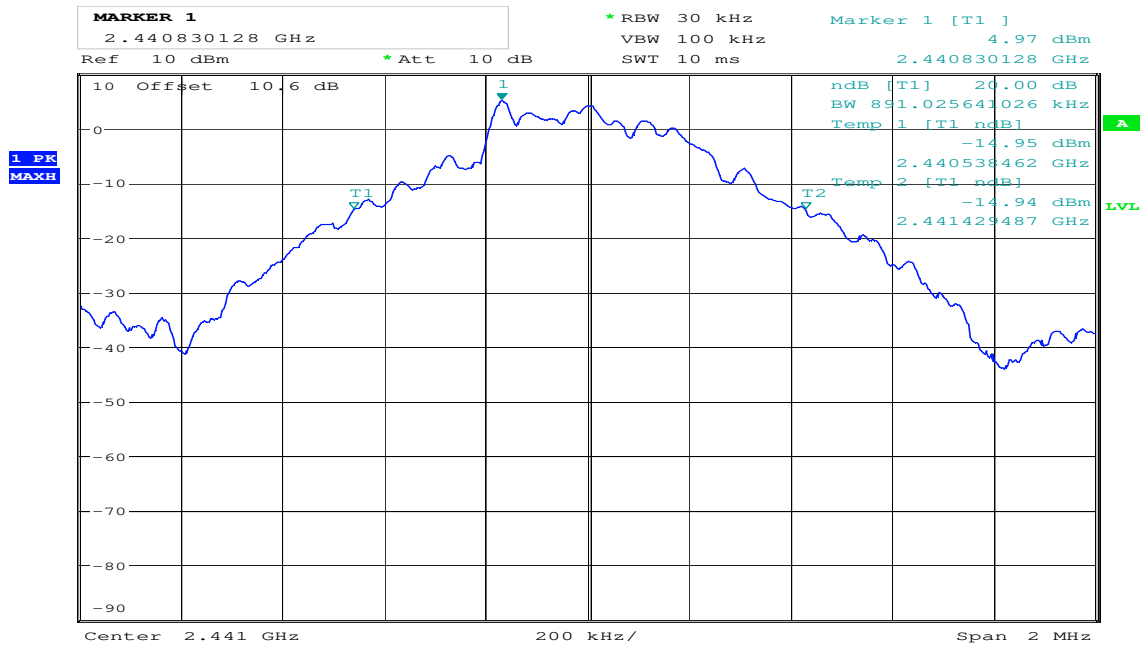


Channel Separation



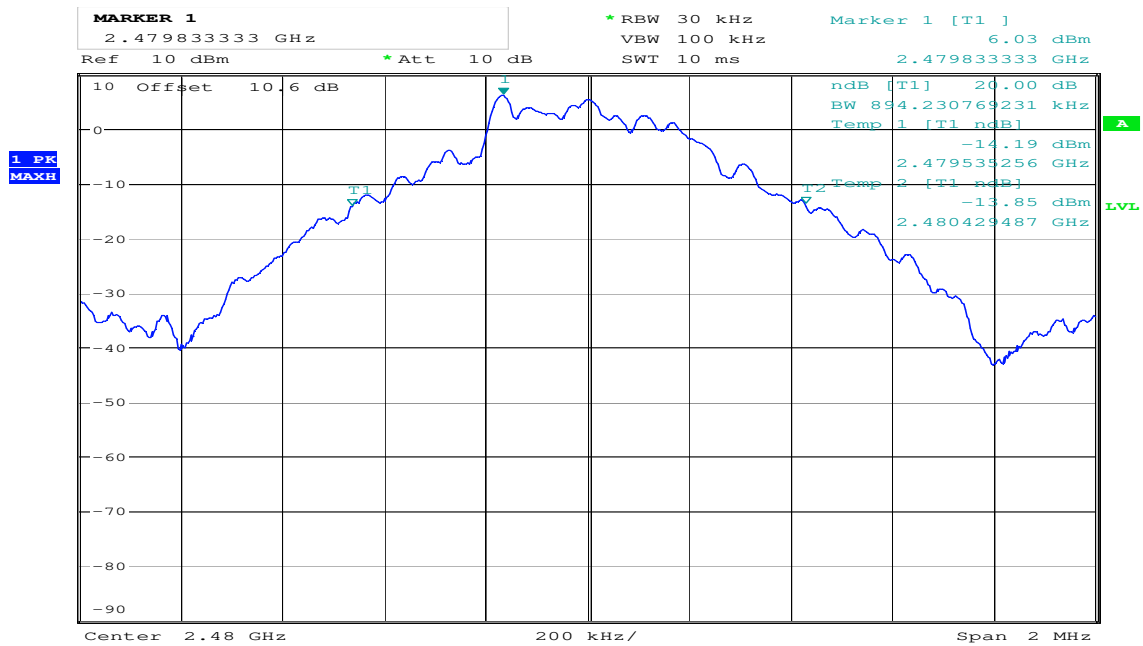
Date: 27.AUG.2019 13:44:06

20dB Bandwidth, 2402 MHz



Date: 27.AUG.2019 13:45:00

20dB Bandwidth, 2441 MHz



Date: 27.AUG.2019 13:45:55

20dB Bandwidth, 2480 MHz

2.5 Pseudorandom Hopping Algorithm

FCC Part 15.247 (a)(1)

ISED Canada RSS-247 Issue 2, Clause 5.1

Test Results: **Complies**

Measurement Data: /

Requirements:

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

2.6 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 – Basic Rate	0.395	1.25	126	Complies
DH3 – Basic Rate	1.65	2.50	264	Complies
DH5 – Basic Rate	2.90	3.75	310	Complies

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

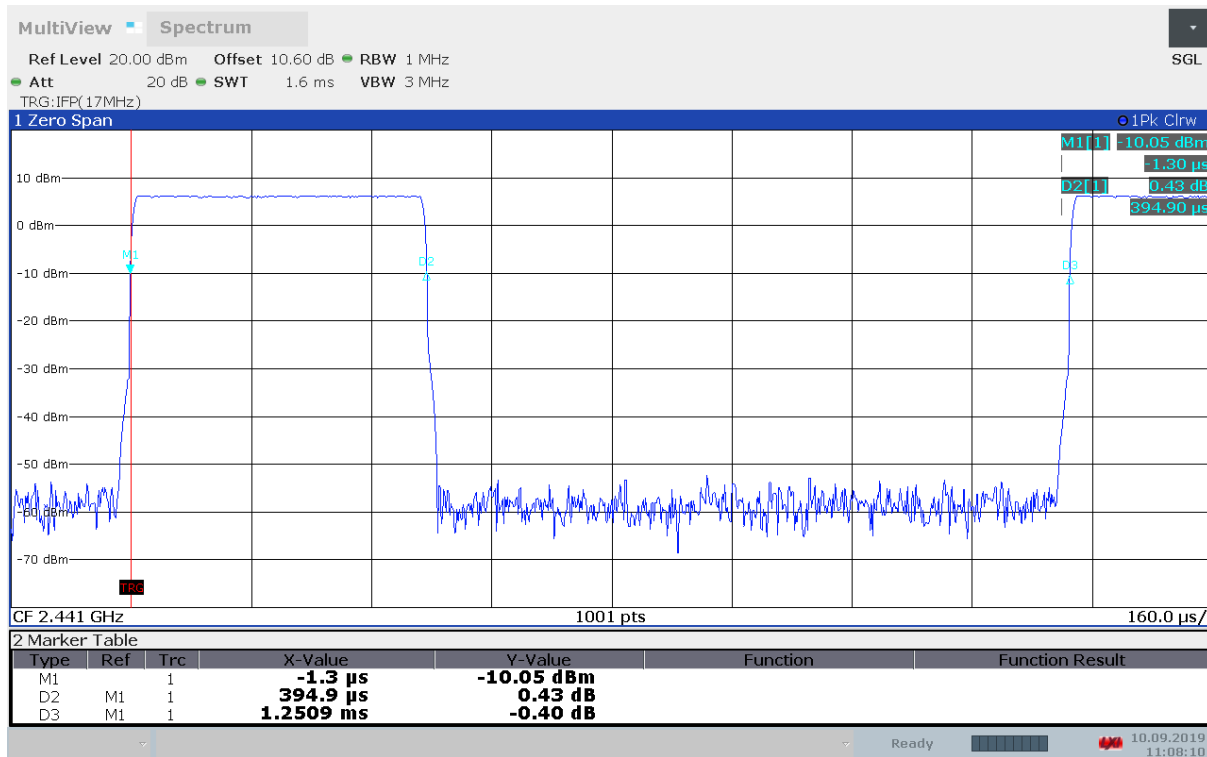
Time of occupancy = (Burst Length * Number of Channels * 400 ms) / Time Between Burst on Same Channel
= (Burst Length * 400 ms) / Frame Length

Number of RF channels is minimum 20 and maximum 78

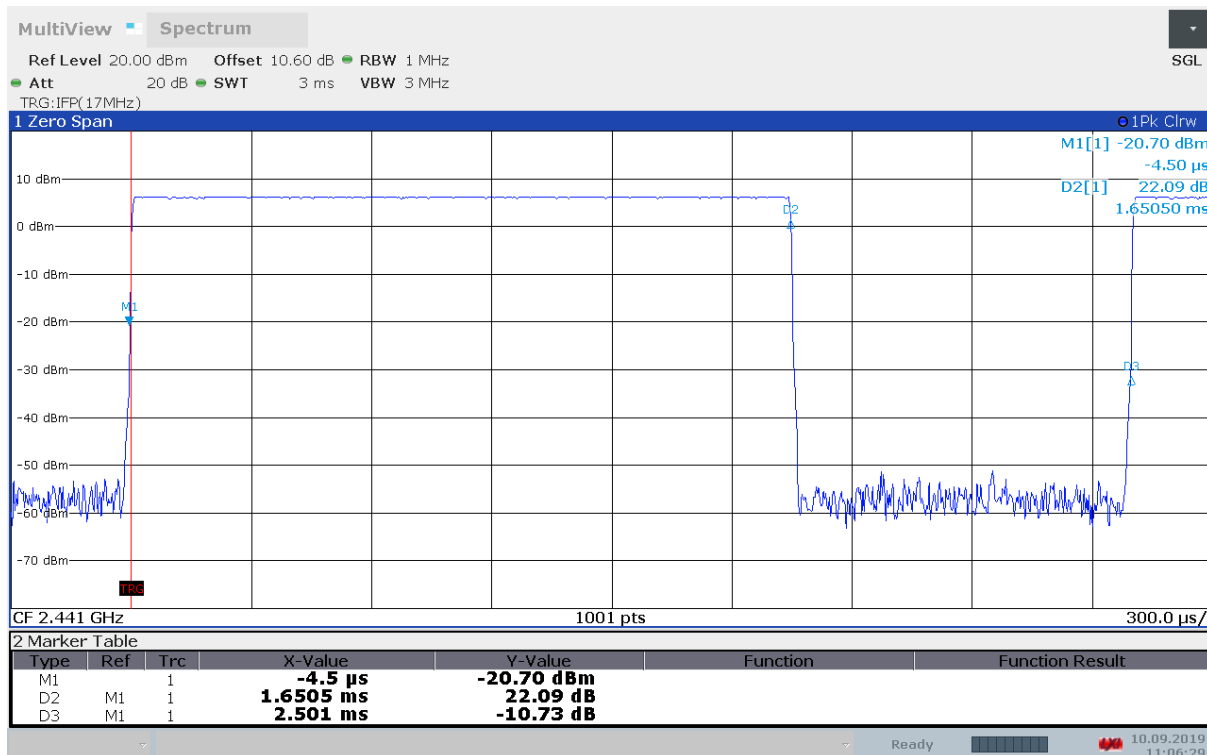
See attached plots

Requirements:

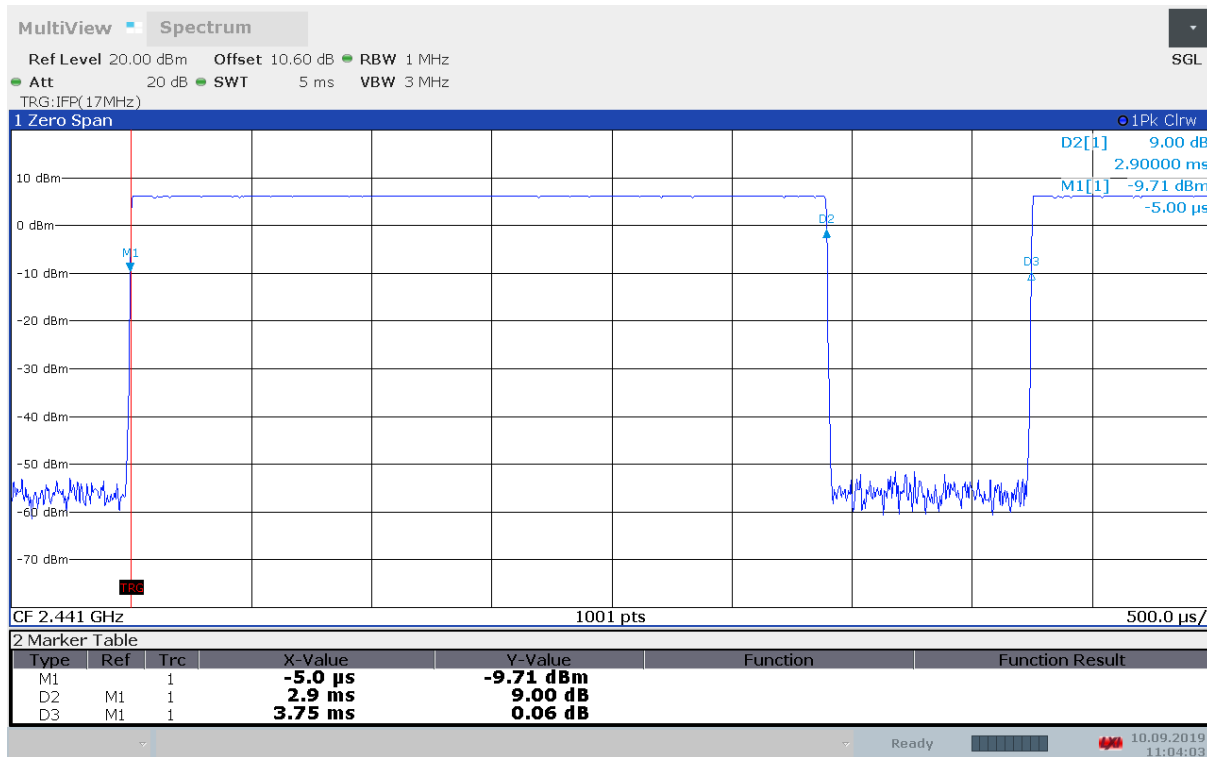
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.



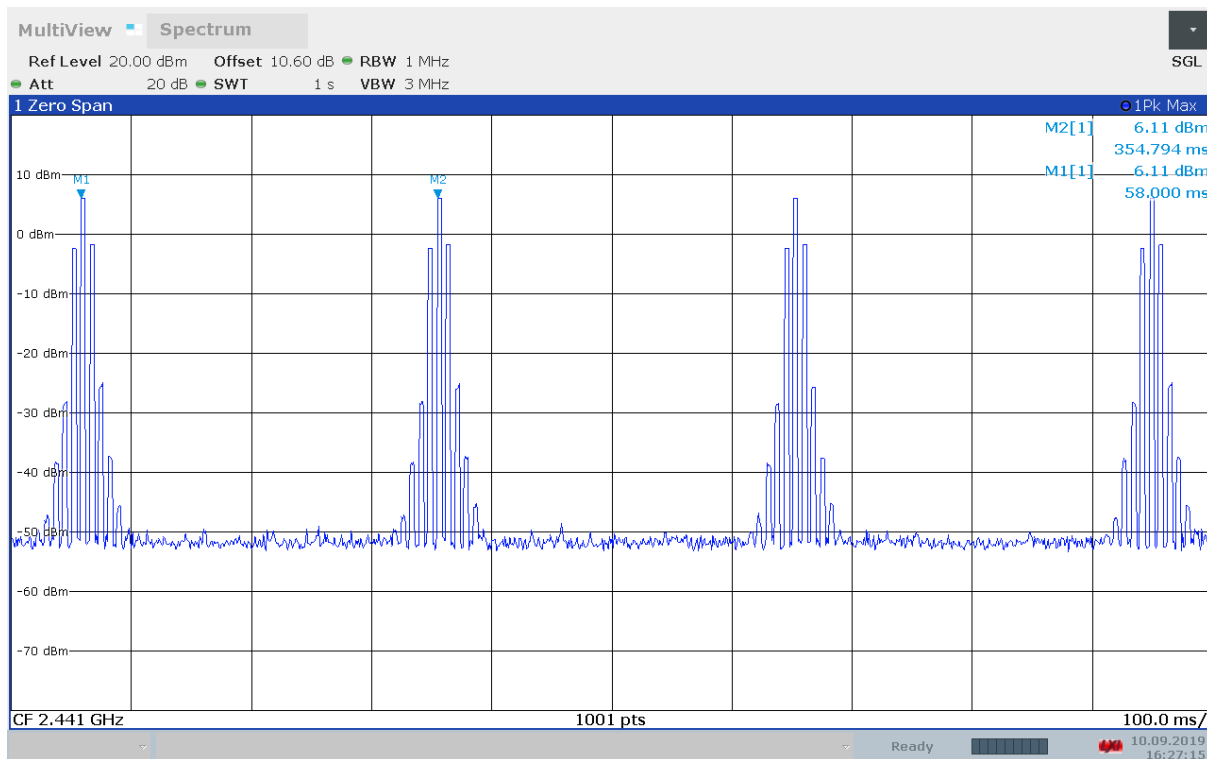
Burst Length, DH1



Burst Length, DH3



Burst Length, DH5



Occupancy Time

2.7 Occupied Bandwidth (99% BW) and Hopping Bandwidth

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:

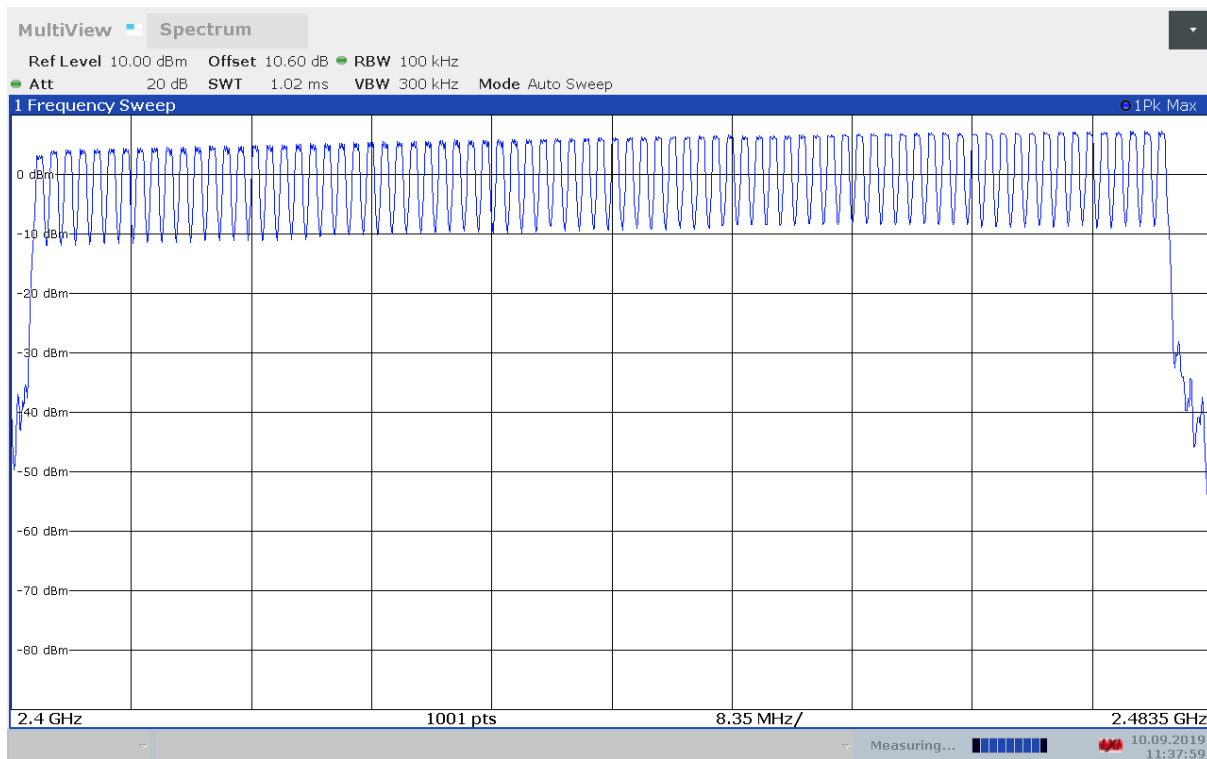
Number of RF Channels in use:	79
Channel Centre Frequencies:	Every full MHz from 2402 to 2480 MHz
99% BW Measured on Centre Channel (2441 MHz)	846 kHz

See attached plots.

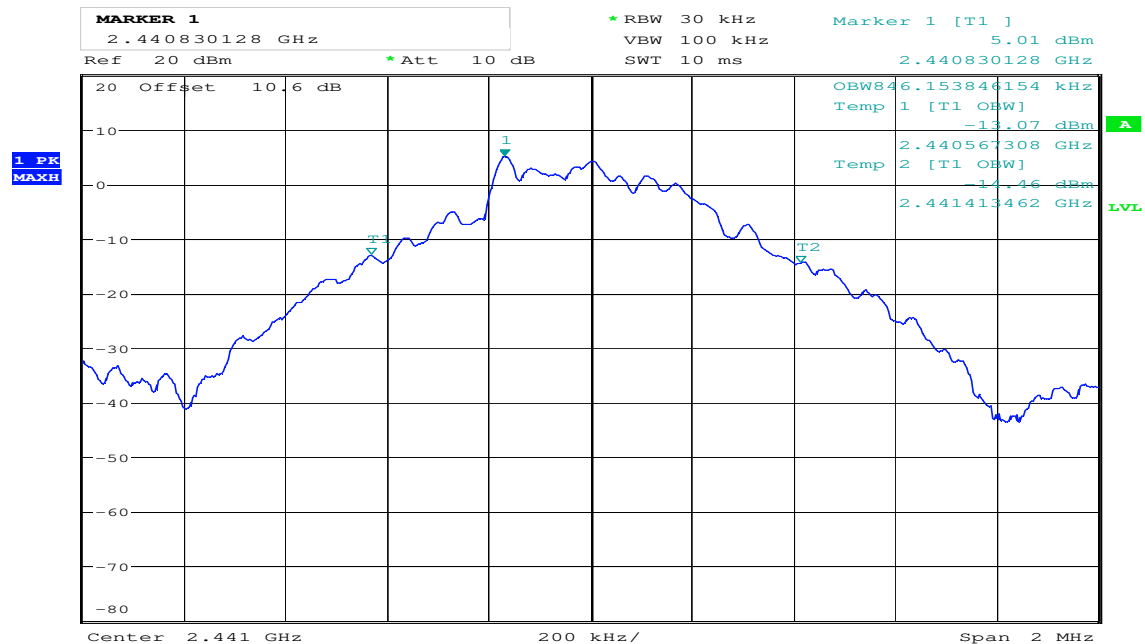
Requirements:

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.



RF Channels in Use



Date: 27.AUG.2019 13:37:39

99% Bandwidth

2.8 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:

	2402 MHz	2441 MHz	2480 MHz
Conducted Power (dBm)	4.06	6.81	7.88
Conducted Power (mW)	2.55	4.80	6.14
Field Strength (dBμV/m)	91.55	94.08	99.86
EIRP, Calculated (mW)	0.43	0.77	2.90
Antenna gain (dBi)	-7.0	-8.0	-3.2

Antenna gain = $10 \cdot \log(\text{EIRP} / \text{Conducted power})$ dBi

EIRP is calculated from measured field strength by the formulas in KDB 412172 D01 Determining ERP and EIRP v01.

See attached plots.

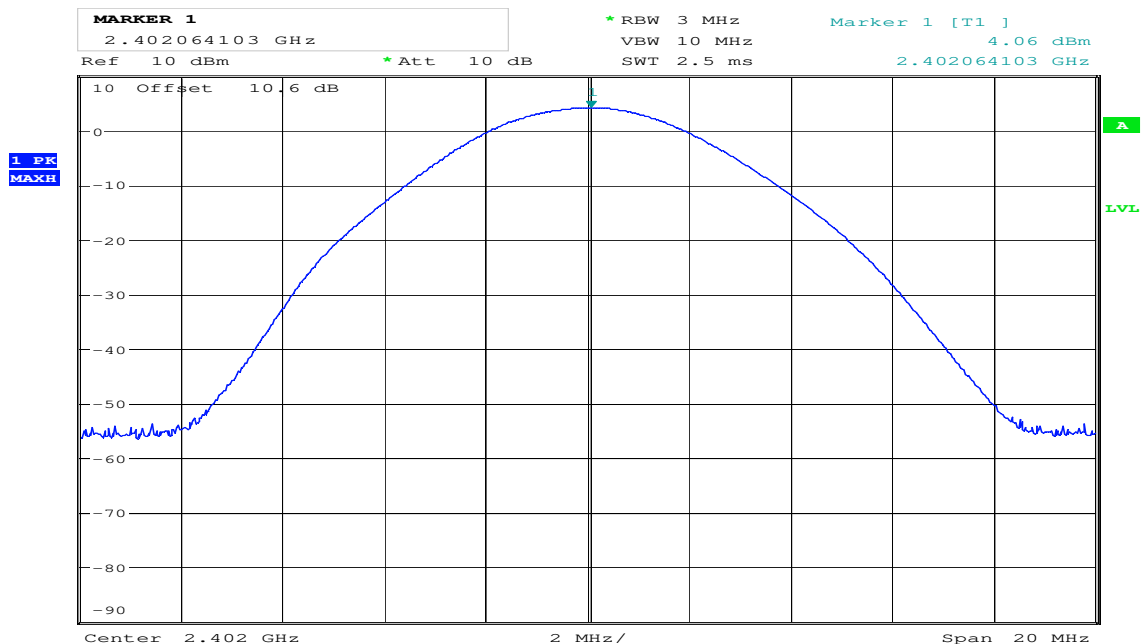
Requirements:

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

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

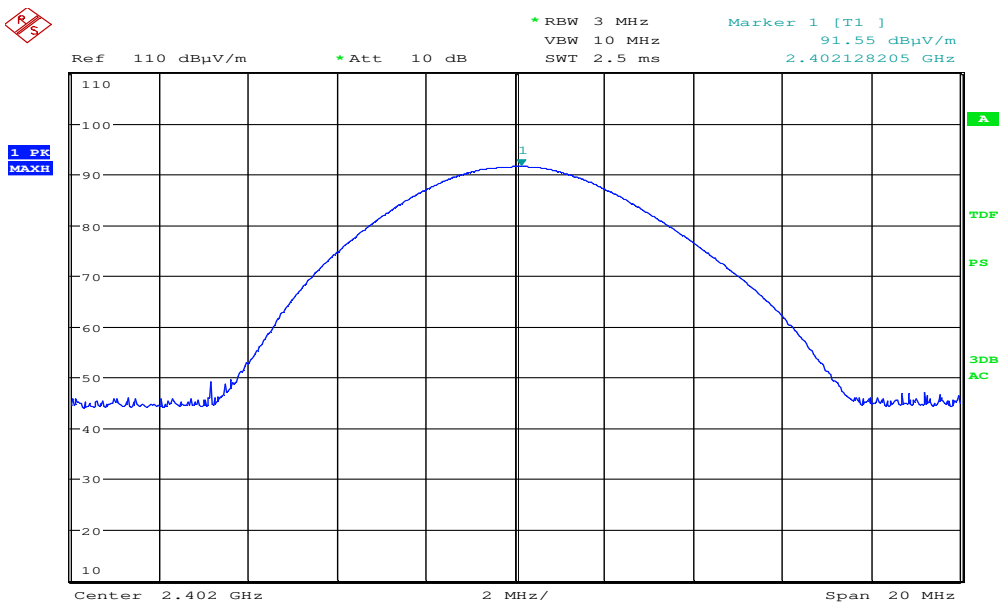
For all other frequency hopping systems in the 2400 - 2483.5 MHz band: 0.125 Watts

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.



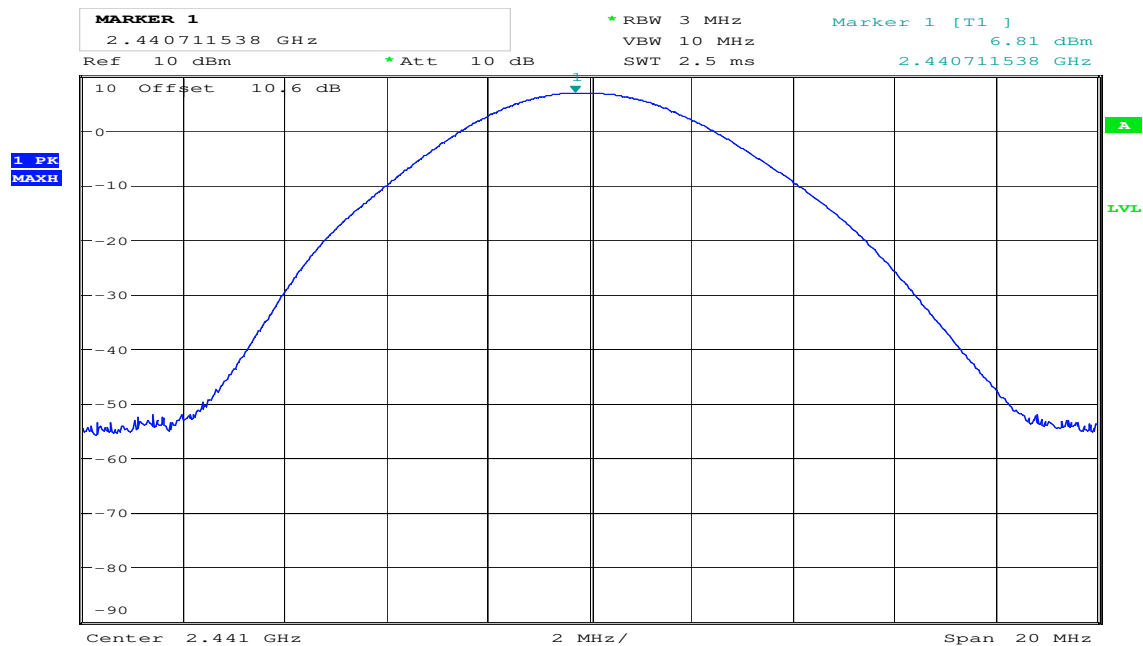
Date: 27.AUG.2019 13:31:48

Conducted Output Power, 2402 MHz



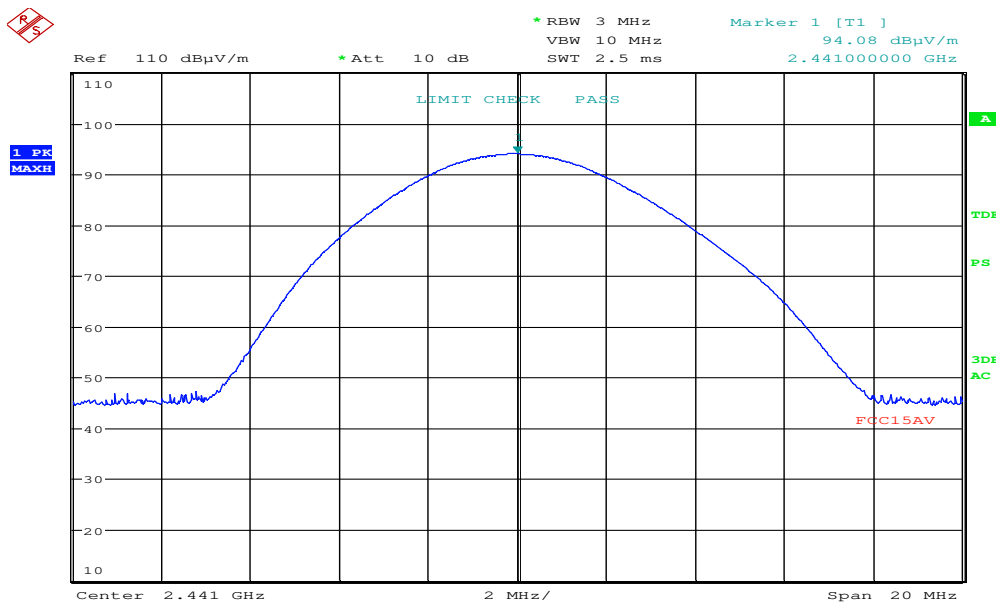
Date: 20.AUG.2019 16:18:27

Field Strength, 2402 MHz (Max: VP)



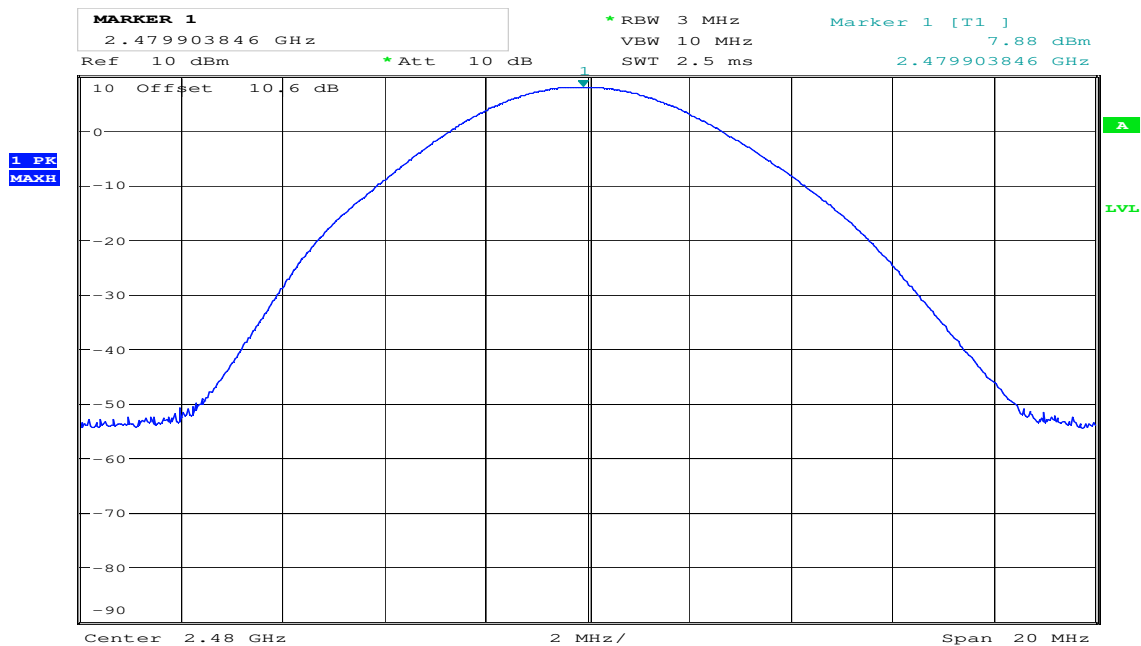
Date: 27.AUG.2019 13:32:31

Conducted Output Power, 2441 MHz



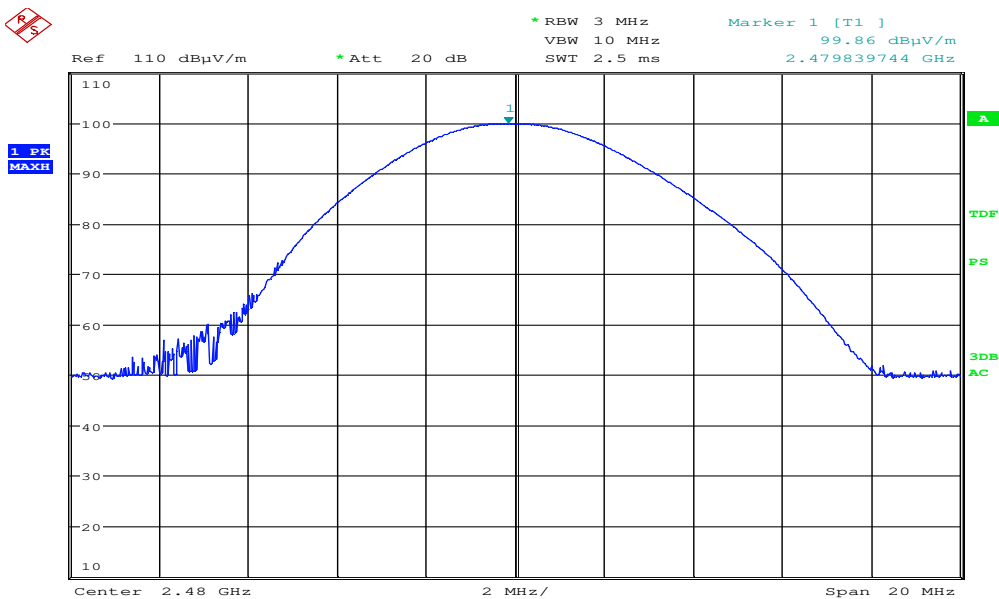
Date: 20.AUG.2019 17:09:20

Field Strength, 2441 MHz (Max: VP)



Date: 27.AUG.2019 13:33:24

Conducted Output Power, 2480 MHz



Date: 20.AUG.2019 15:39:33

Field Strength, 2480 MHz (Max: VP)

2.9 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

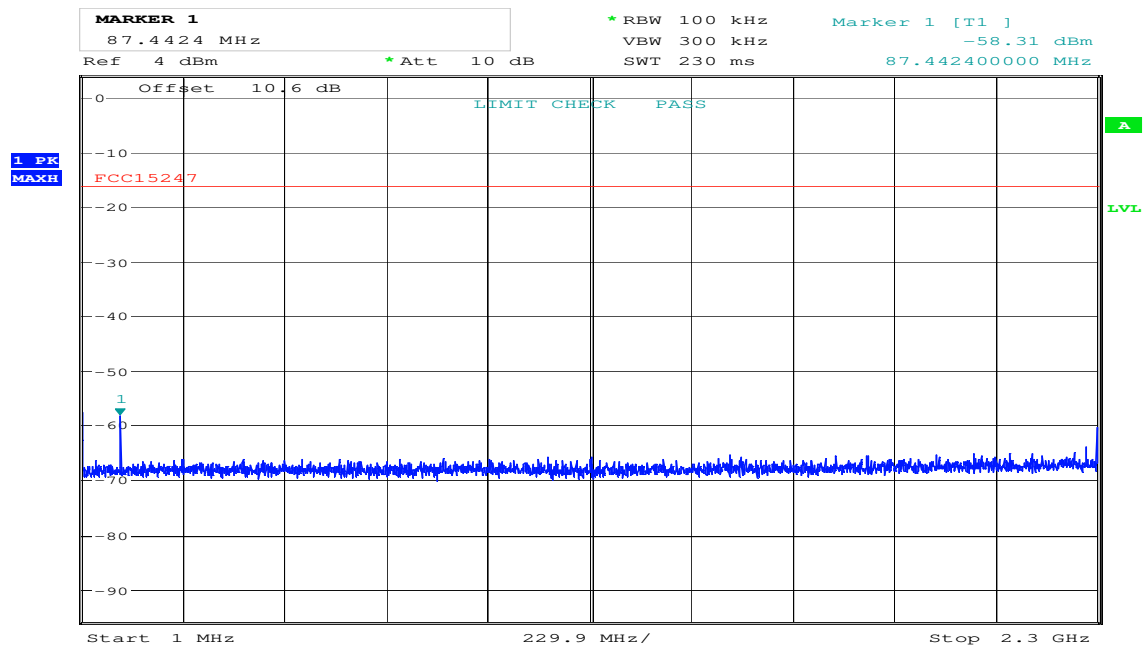
RF conducted power to 26 GHz: see attached plots.

Limit

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

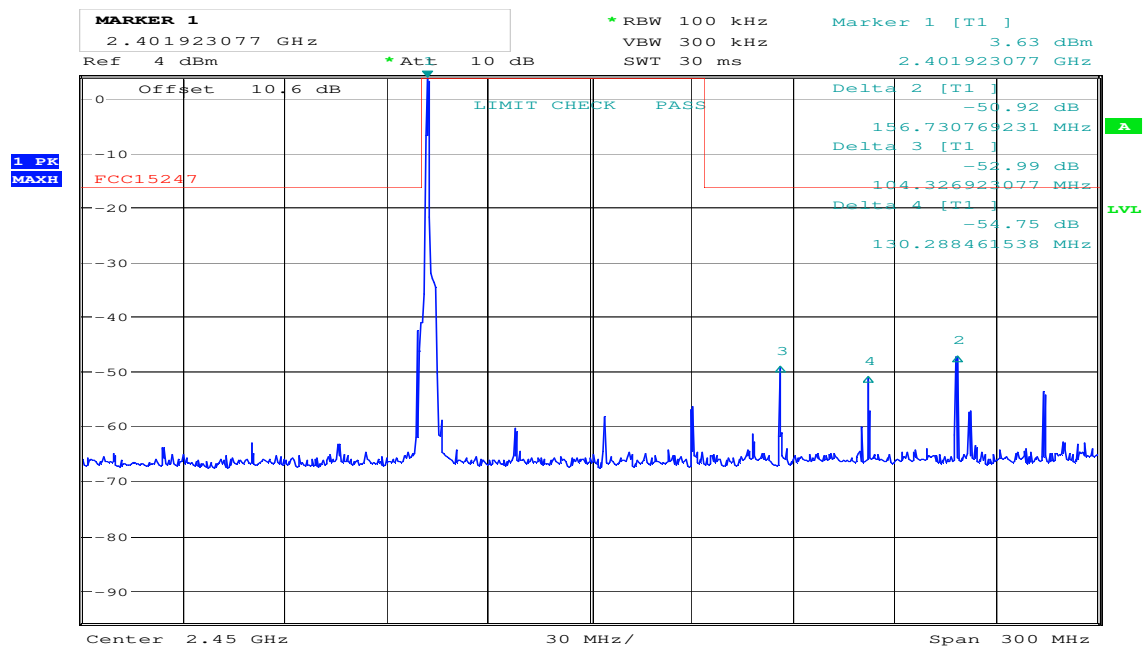
Detector type shall be the same as used for measuring Output Power.

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



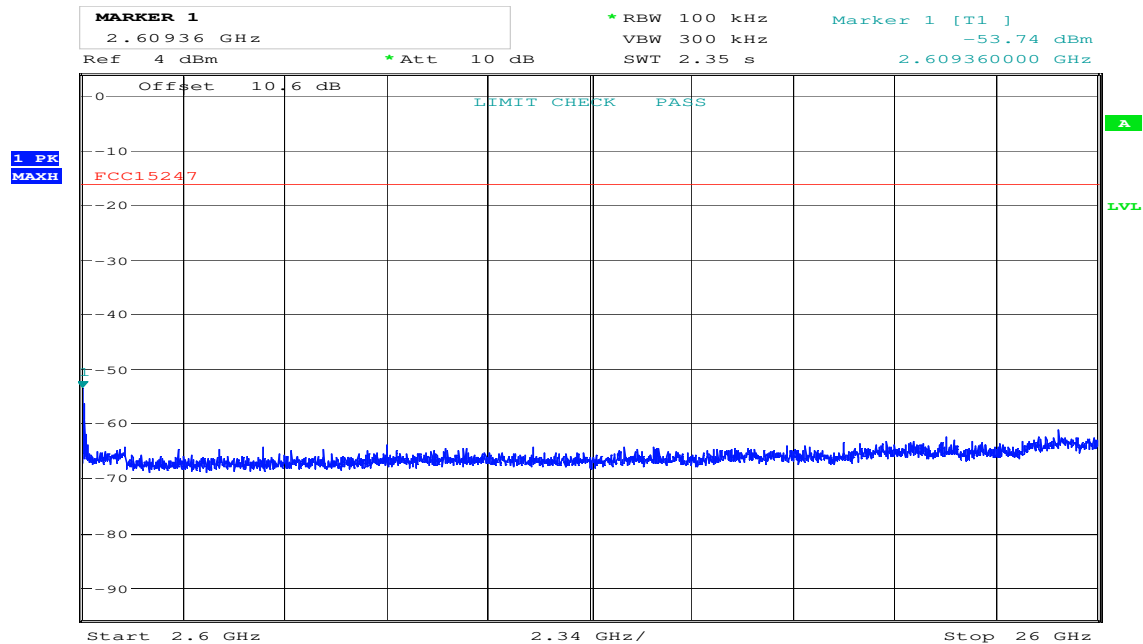
Date: 27.AUG.2019 14:01:42

Conducted Emissions, 1 – 2300 MHz, Carrier 2402 MHz



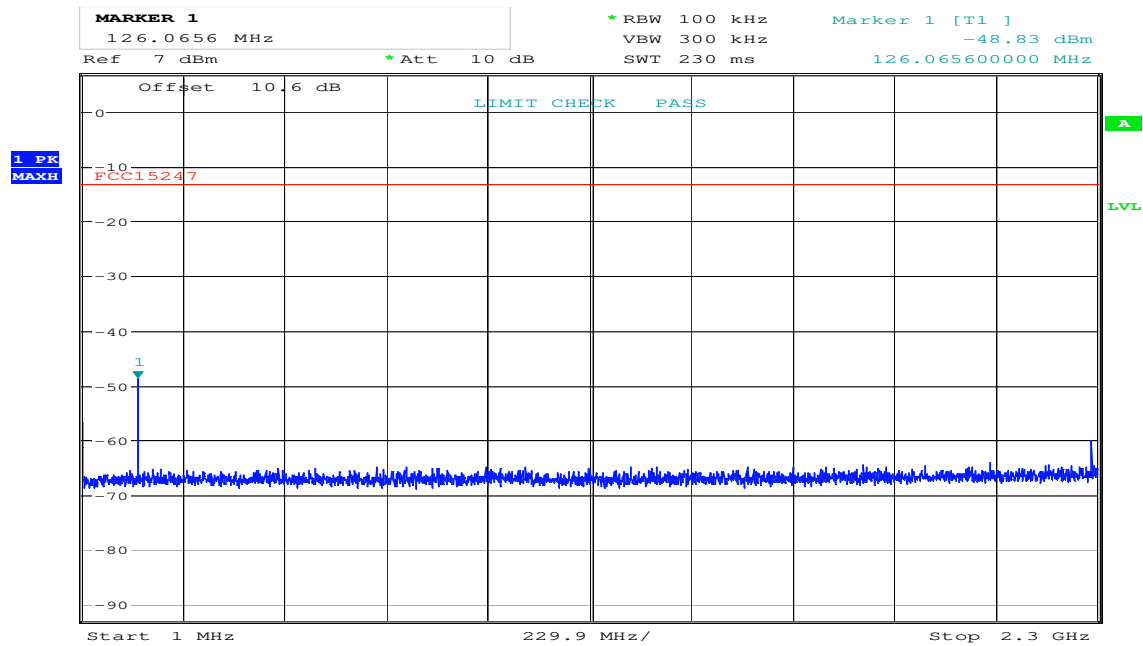
Date: 27.AUG.2019 13:51:41

Conducted Emissions, 200 – 2600 MHz, Carrier 2402 MHz



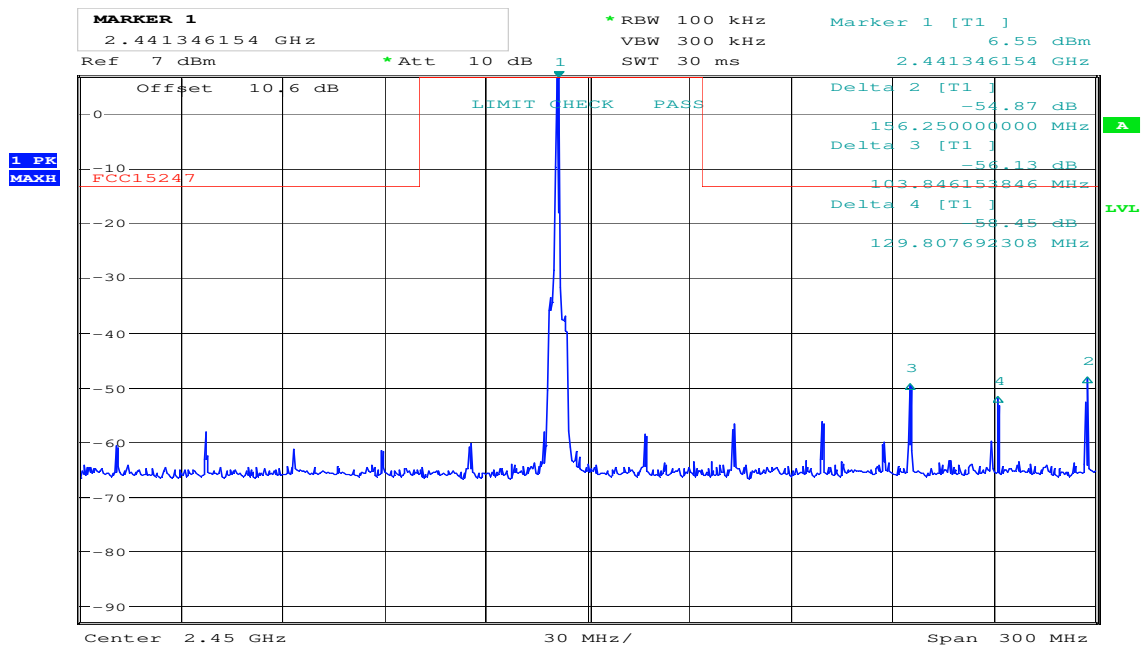
Date: 27.AUG.2019 13:56:03

Conducted Emissions, 2600 – 26000 MHz, Carrier 2402 MHz



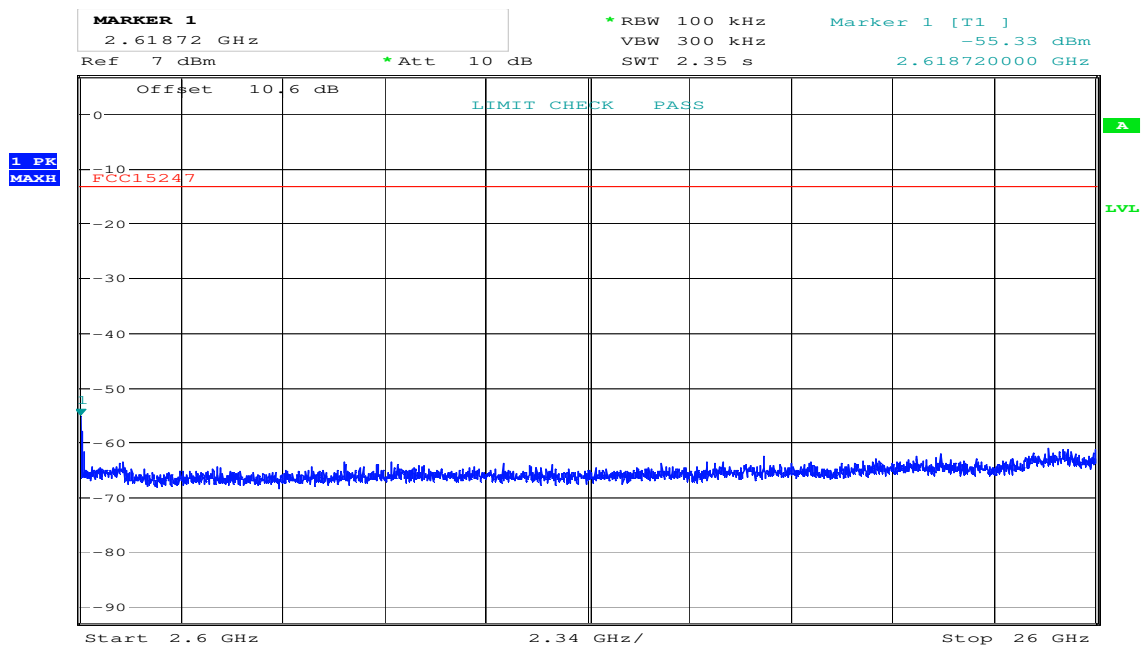
Date: 27.AUG.2019 14:00:32

Conducted Emissions, 1 – 2300 MHz, Carrier 2441 MHz



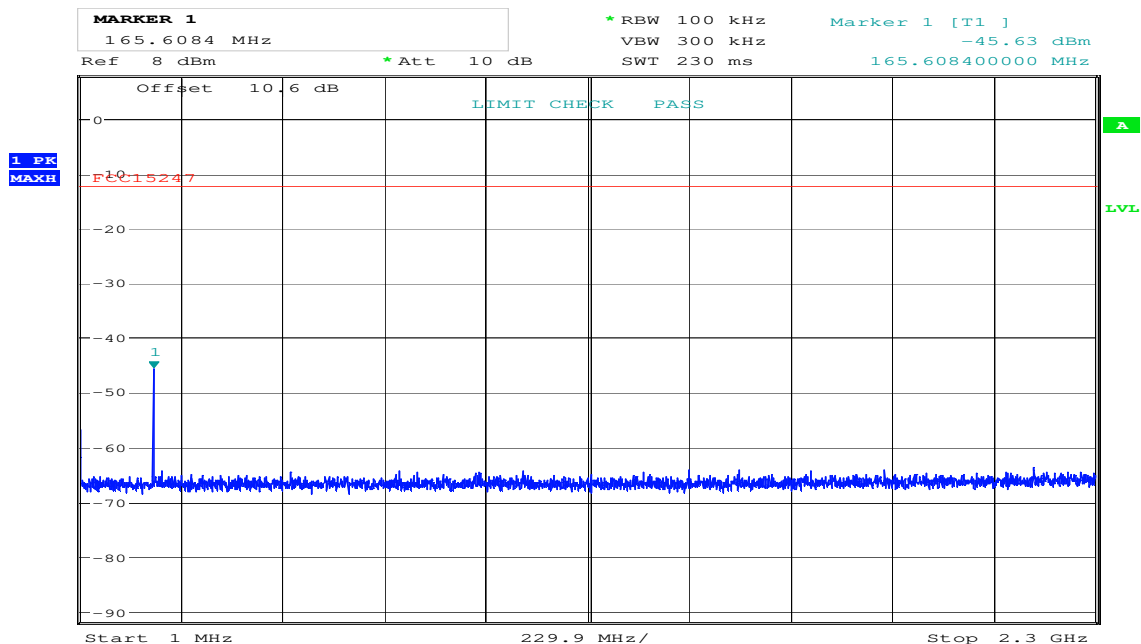
Date: 27.AUG.2019 13:50:31

Conducted Emissions, 2300 – 2600 MHz, Carrier 2441 MHz



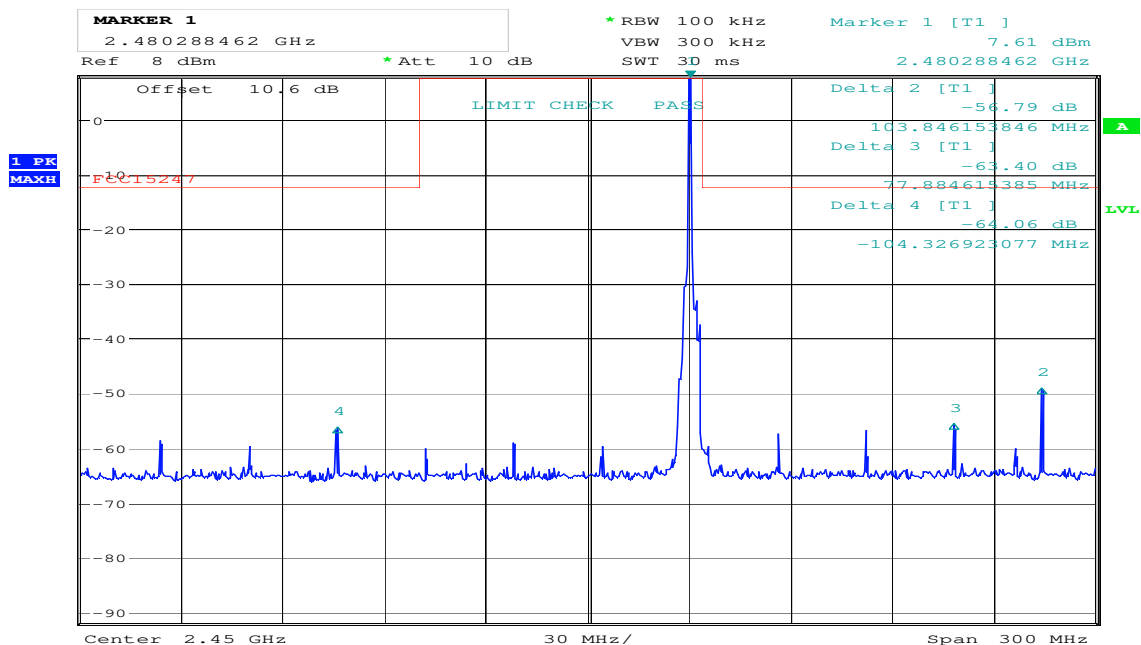
Date: 27.AUG.2019 13:57:22

Conducted Emissions, 2600 – 26000 MHz, Carrier 2441 MHz



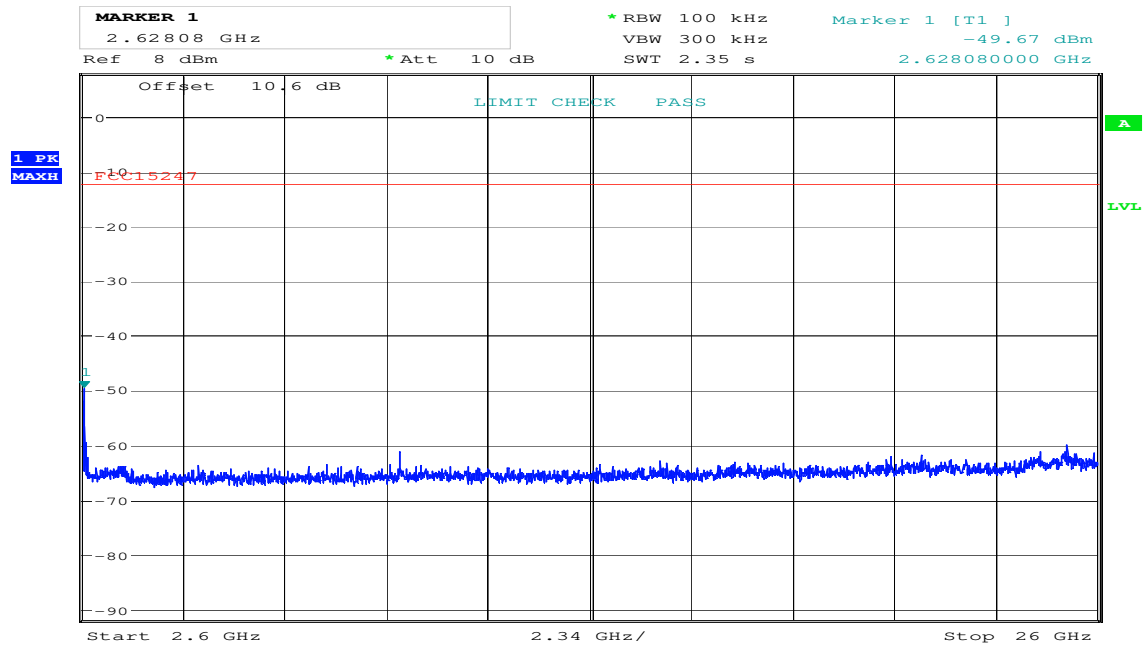
Date: 27.AUG.2019 13:59:37

Conducted Emissions, 1 – 2300 MHz, Carrier 2480 MHz



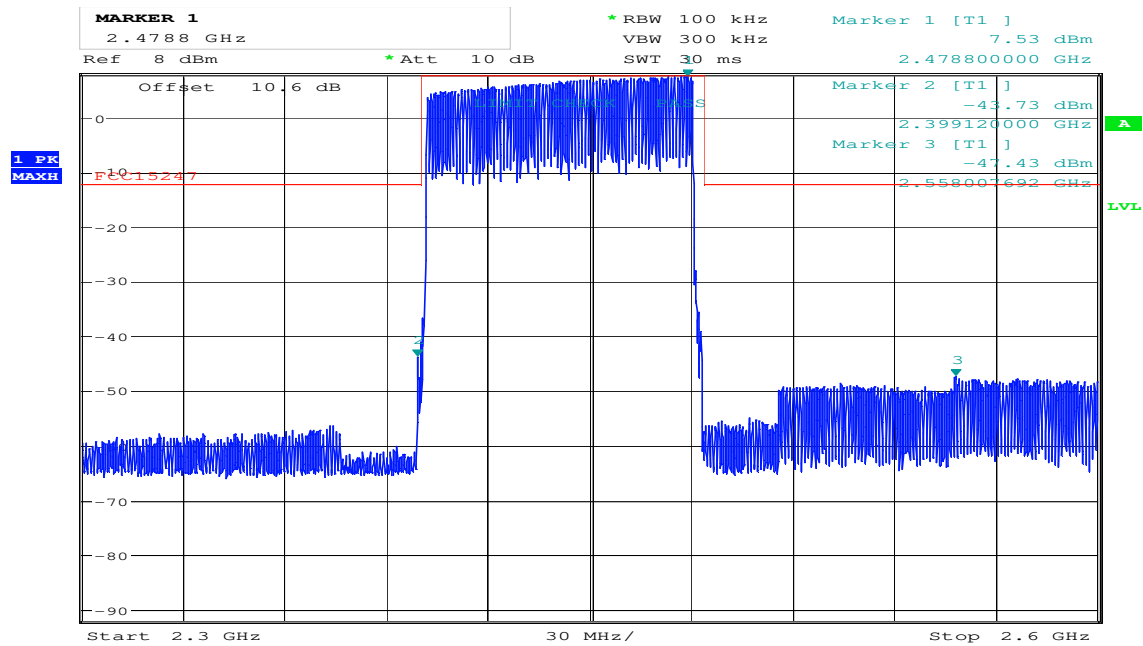
Date: 27.AUG.2019 13:49:16

Conducted Emissions, 2300 – 2600 MHz, Carrier 2480 MHz



Date: 27.AUG.2019 13:58:35

Conducted Emissions, 2600 – 26000 MHz, Carrier 2480 MHz



Date: 27.AUG.2019 14:12:13

Conducted Emissions, 2300 – 2600 MHz, Hopping

2.10 Restricted Bands of operation

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

2.11 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:

	Measured field strength (dB μ V/m)		Limit	Margin	
	2390 MHz	2483.5 MHz	dB μ V/m	dB	
Peak Detector	43.1	54.9	74	30.9	19.1
Average Detector	23.1	34.9	54	30.9	19.1

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 / (frame length * Minimum Number of Channels)

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

2.12 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

Detector: Quasi-Peak

Measuring distance 3m

Tested in normal mode

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
54.900900	22.41	40.00	17.59	1000.0	120.000	149.0	V	196.0
82.931100	24.76	40.00	15.24	1000.0	120.000	117.0	V	190.0
290.303600	33.44	46.00	12.56	1000.0	120.000	102.0	H	119.0

See attached plots

Requirements/Limit

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

2.13 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

Measuring distance: 3m (1 – 18 GHz)
1m (18 – 26 GHz)

Peak Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Limit	Margin
GHz	L,M,H	dB	dBμV/m	dBμV/m	dB
1 – 18	L,M,H	0	None detected	74	>20
18 - 26	L,M,H	-9.5	None detected	74	>20

Average Detector:

Frequency	RF channel	Dist. corr. factor	Field strength, Peak Detector, 3m	Duty cycle corr. factor	Limit	Margin
GHz	L,M,H	dB	dBμV/m	dB	dBμV/m	dB
1 – 18	L,M,H	0	None detected	20	54	>20
18 - 26	L,M,H	-9.5	None detected	20	54	>20

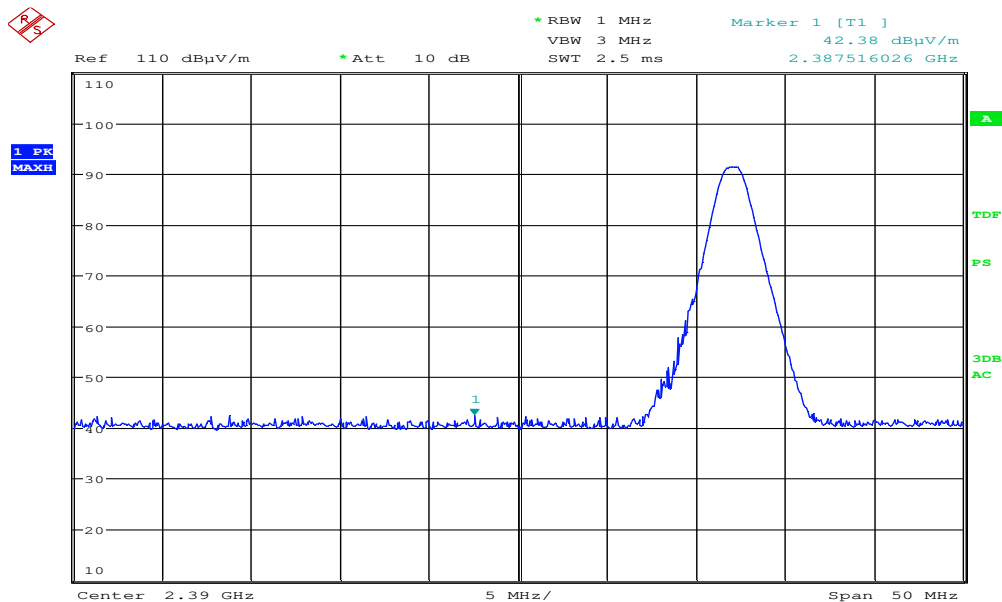
Average Detector values are calculated from Peak values by Duty Cycle Correction Factor.

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

See plots.

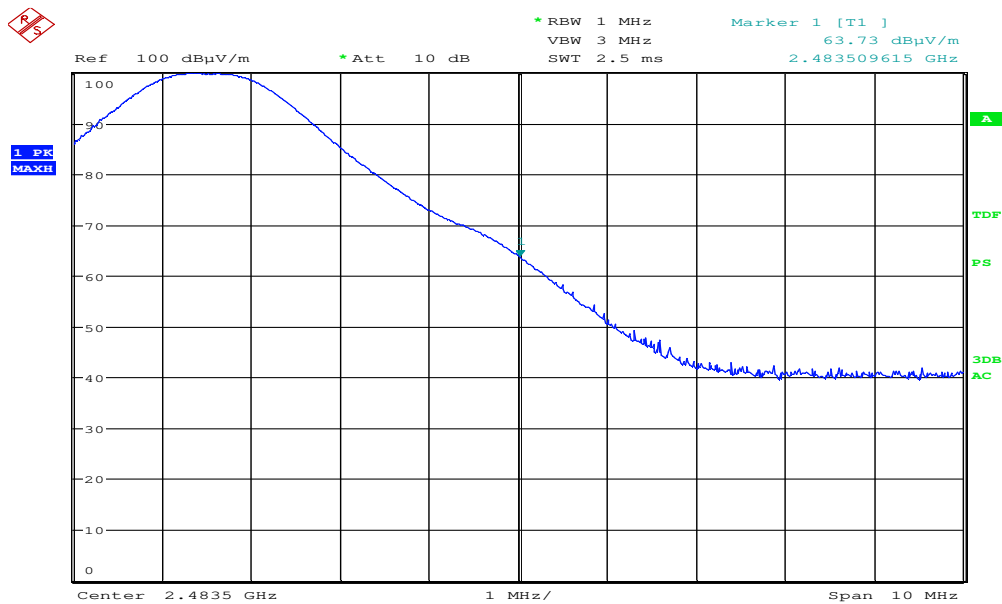
Requirements/Limit

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: 20.AUG.2019 16:19:24

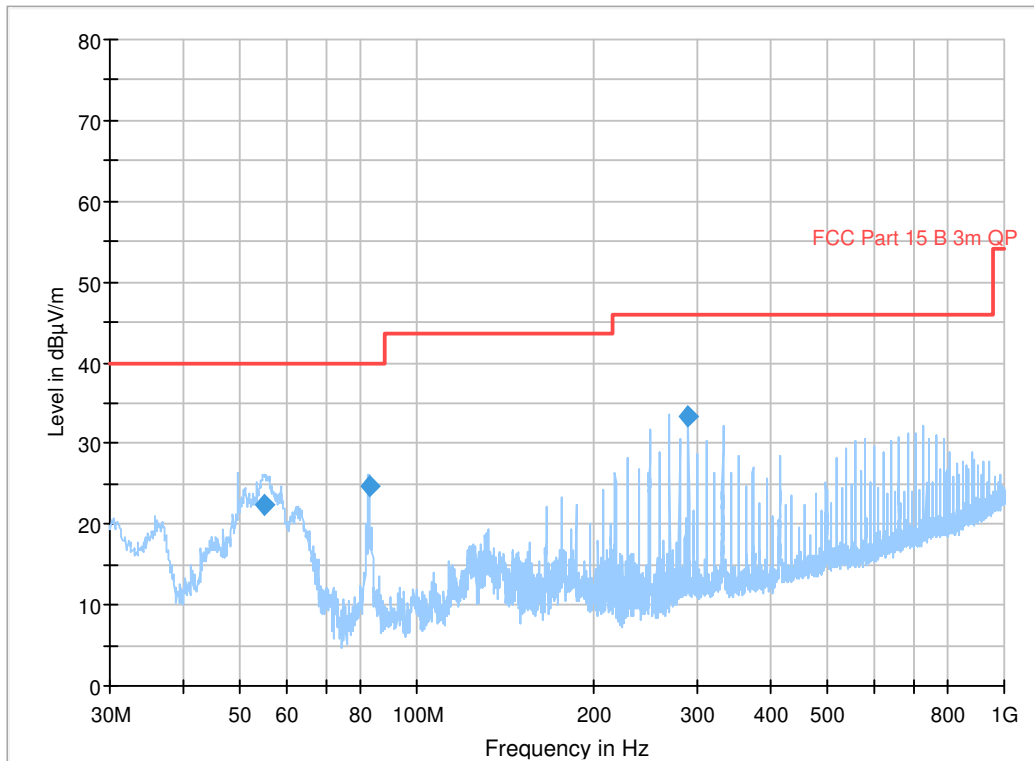
Lower Band Edge, Peak, 2402MHz (Max: VP)



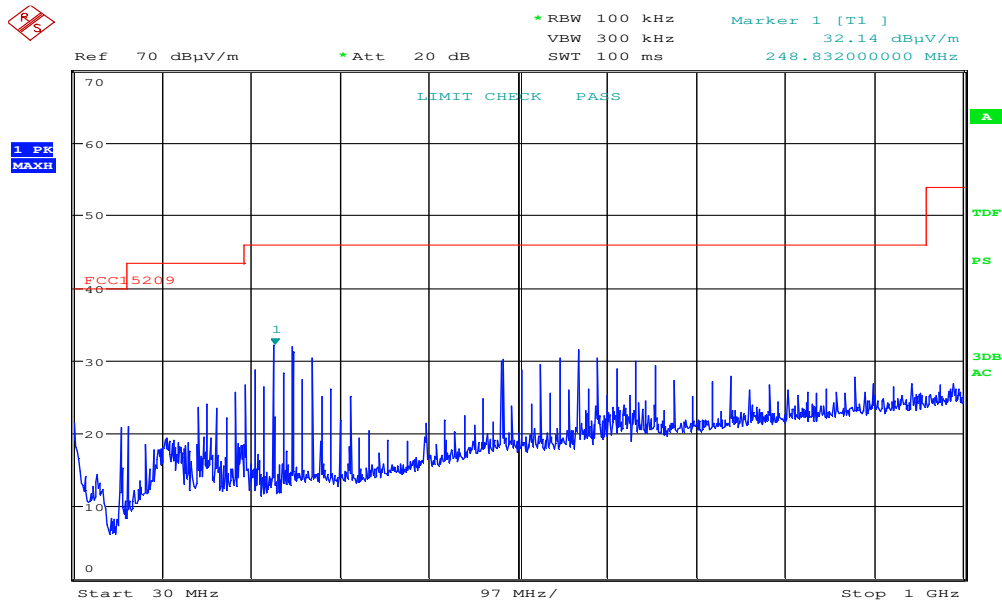
Date: 20.AUG.2019 15:40:56

Upper Band Edge, Peak, 2480MHz (Max: VP)

Full Spectrum

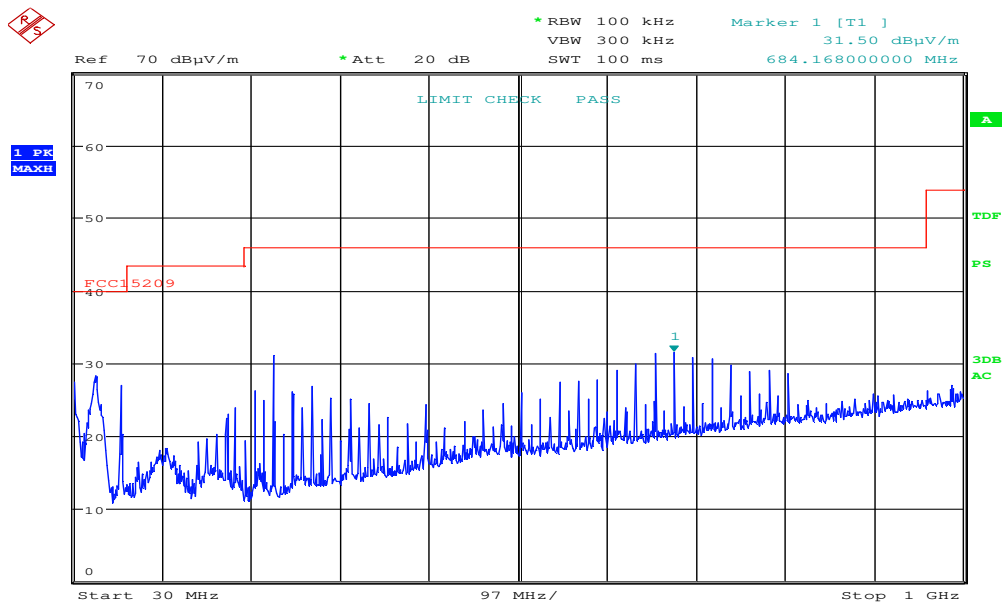


Radiated Emissions, 30 – 1000 MHz



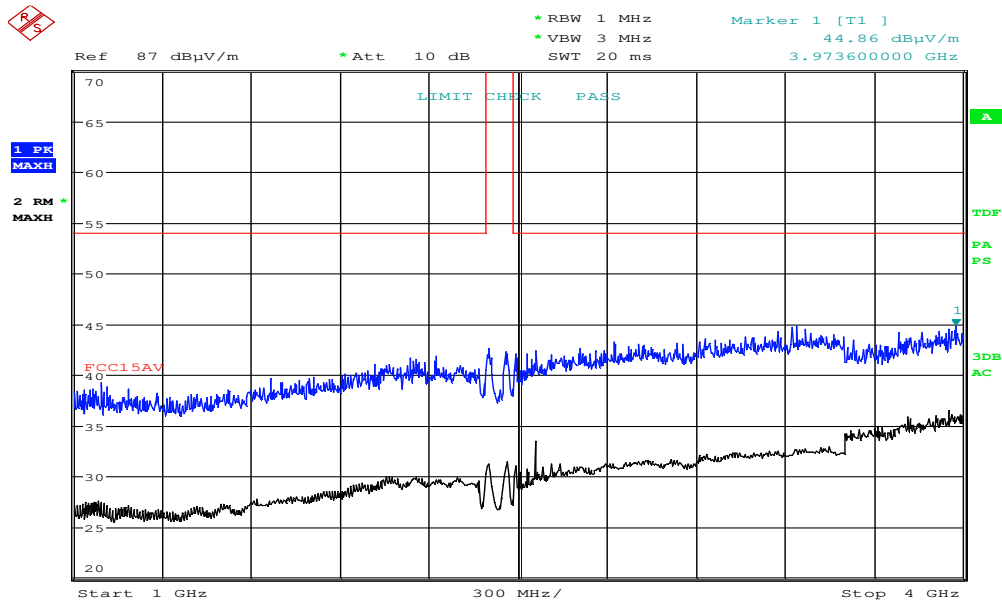
Date: 23.AUG.2019 10:01:25

Radiated Emissions, 30 – 1000 MHz, HP



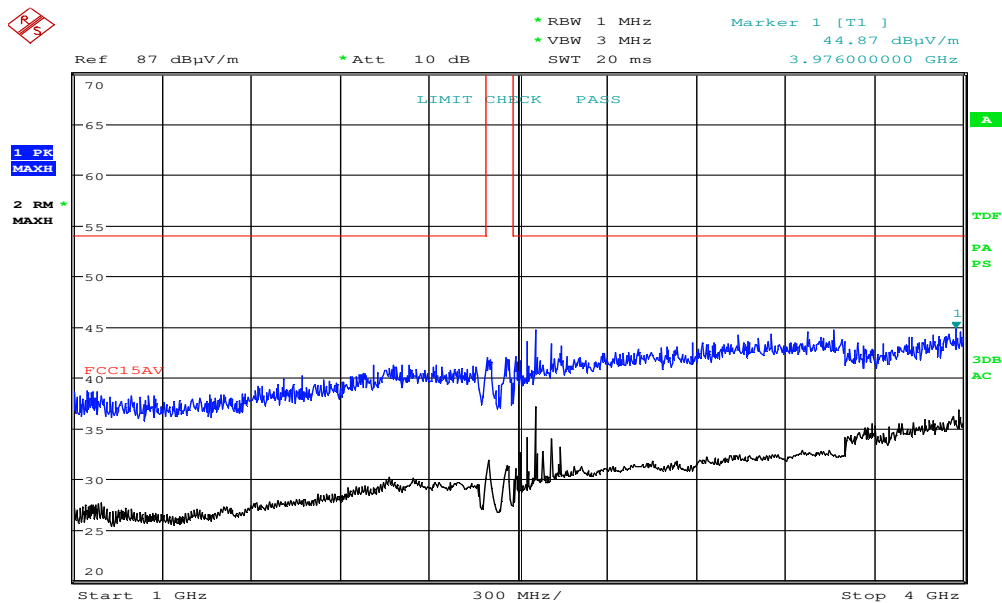
Date: 23.AUG.2019 09:58:46

Radiated Emissions, 30 – 1000 MHz, VP



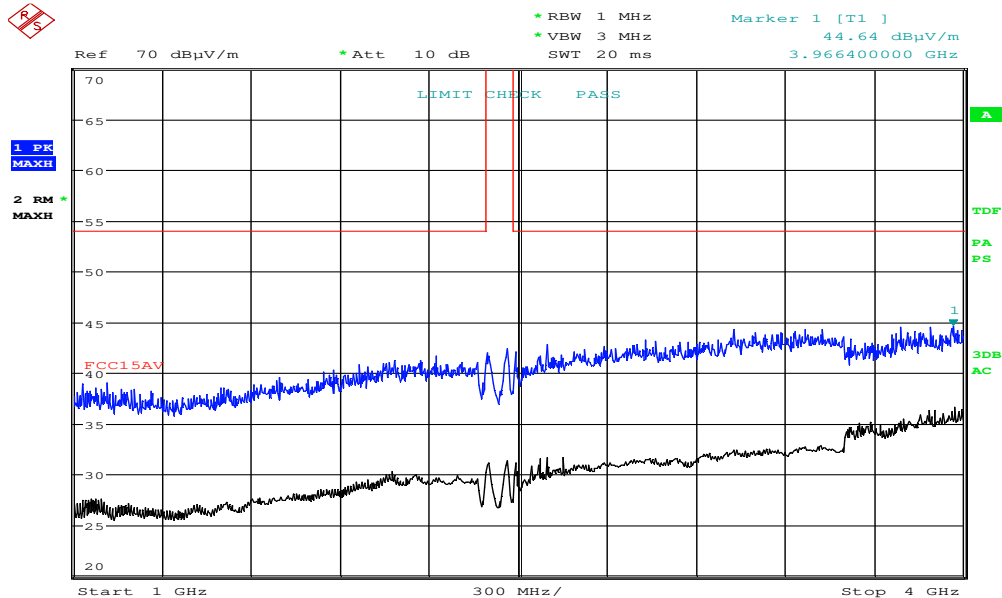
Date: 20.AUG.2019 16:37:39

Radiated Emissions, 1000 -4000 MHz, 2402MHz, HP



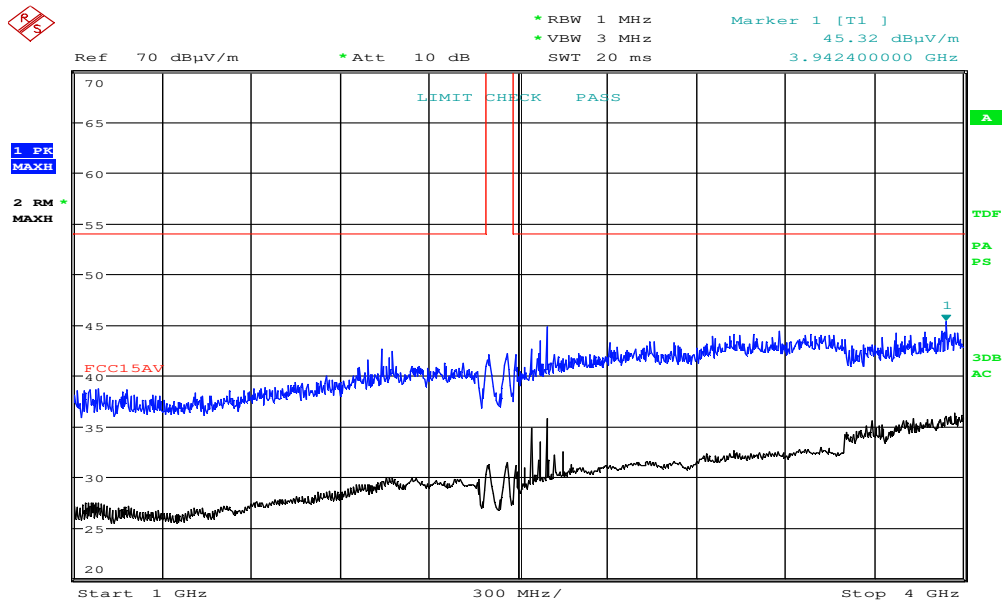
Date: 20.AUG.2019 16:35:43

Radiated Emissions, 1000 -4000 MHz, 2402MHz, VP



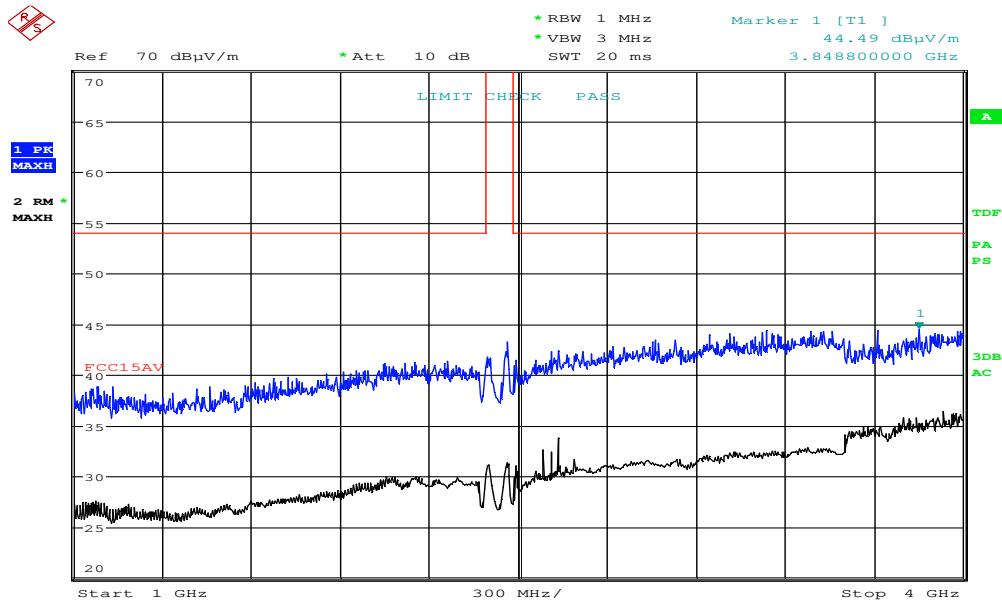
Date: 20.AUG.2019 16:45:12

Radiated Emissions, 1000 -4000 MHz, 2441MHz, HP



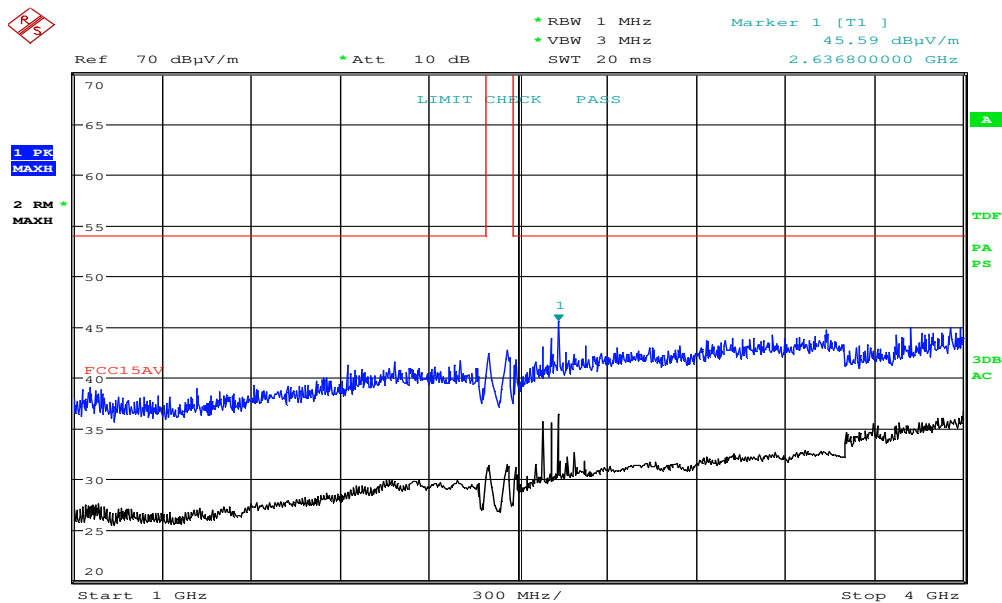
Date: 20.AUG.2019 16:43:17

Radiated Emissions, 1000 -4000 MHz, 2441MHz, VP



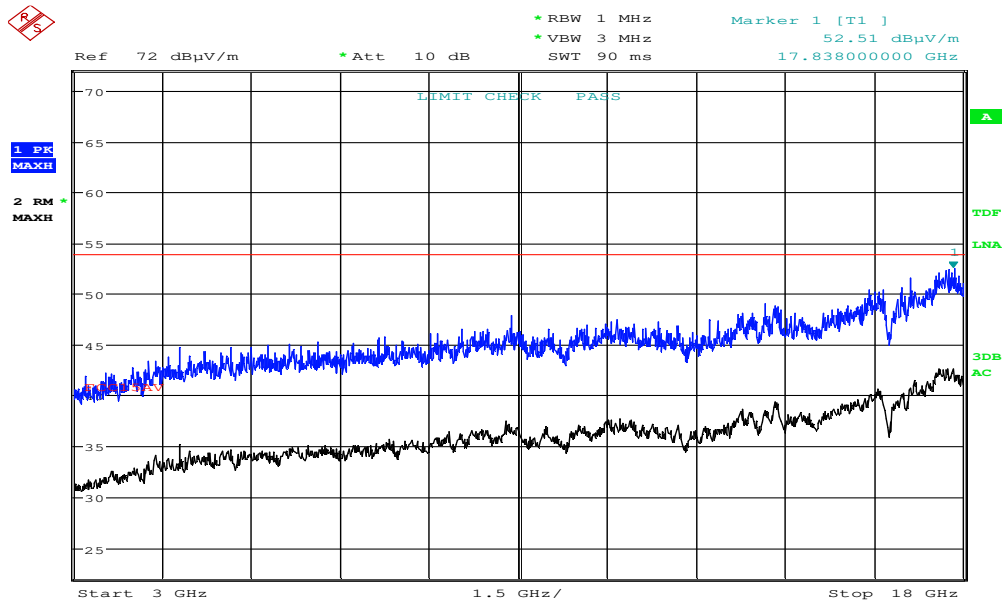
Date: 20.AUG.2019 17:23:58

Radiated Emissions, 1000 -4000 MHz, 2480MHz, HP



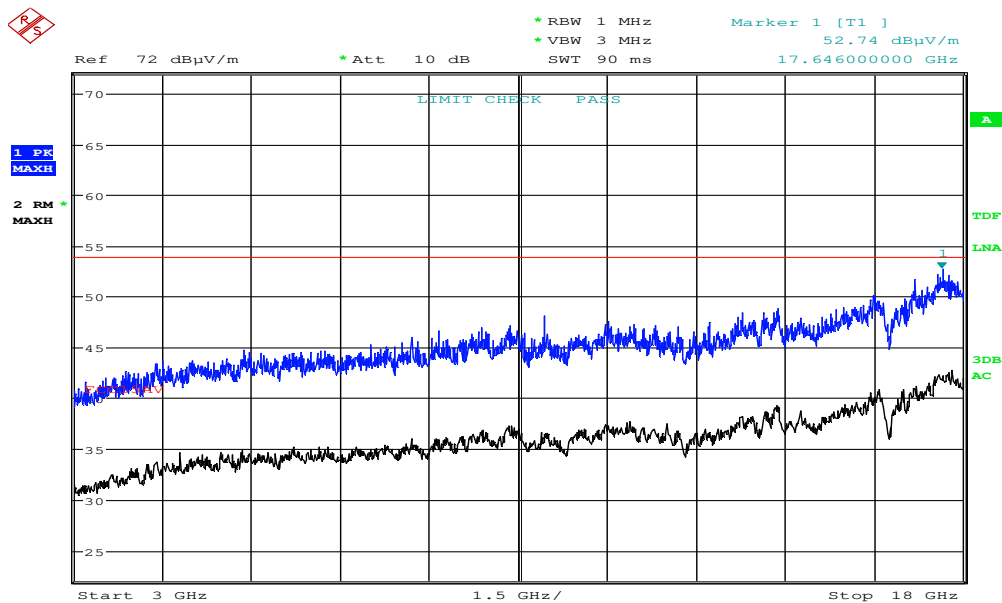
Date: 20.AUG.2019 17:22:02

Radiated Emissions, 1000 -4000 MHz, 2480MHz, VP



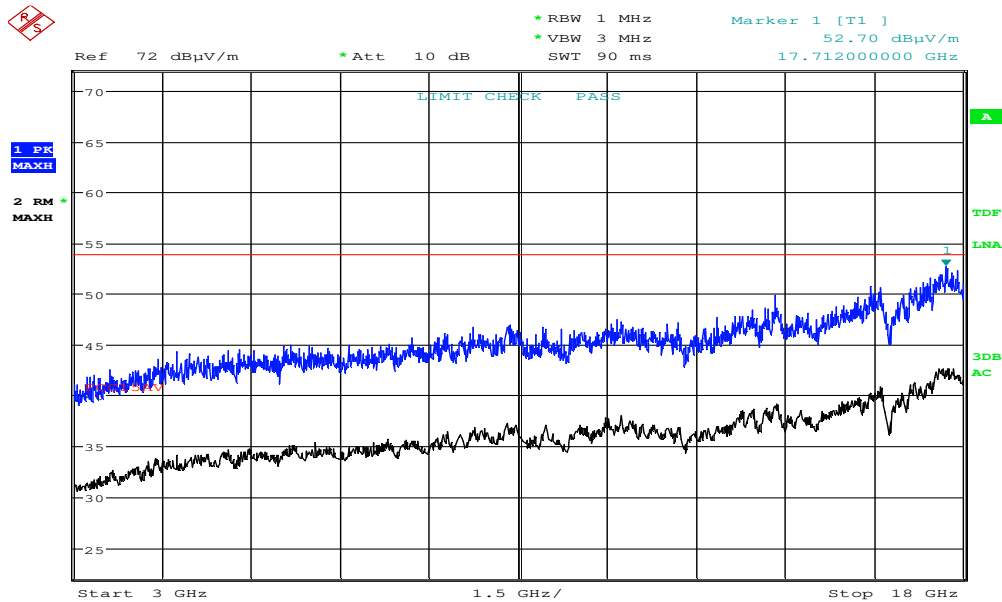
Date: 20.AUG.2019 17:54:35

Radiated Emissions, 3000 -18000 MHz, 2402MHz, HP



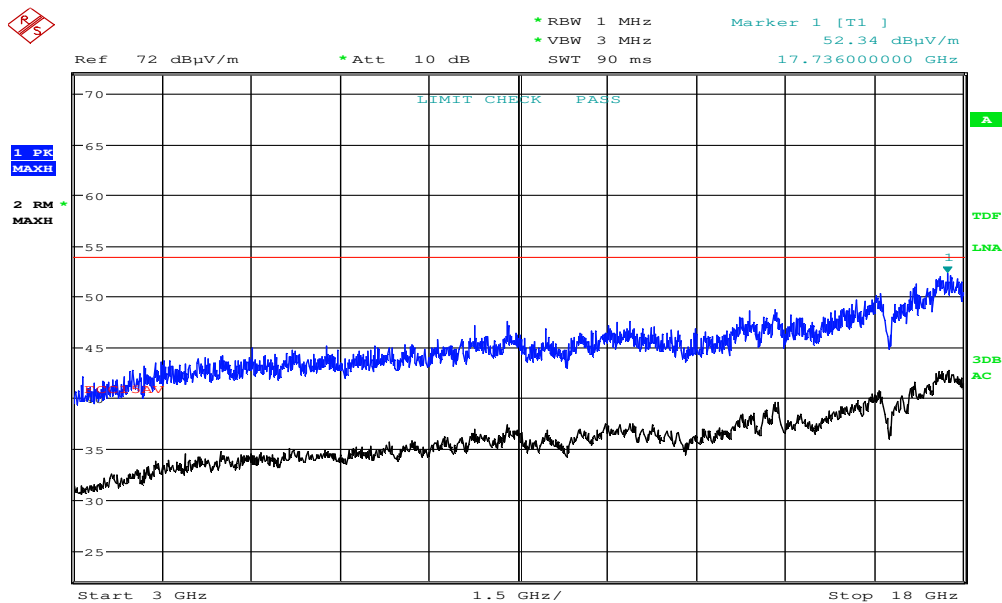
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Radiated Emissions, 3000 -18000 MHz, 2402MHz, VP



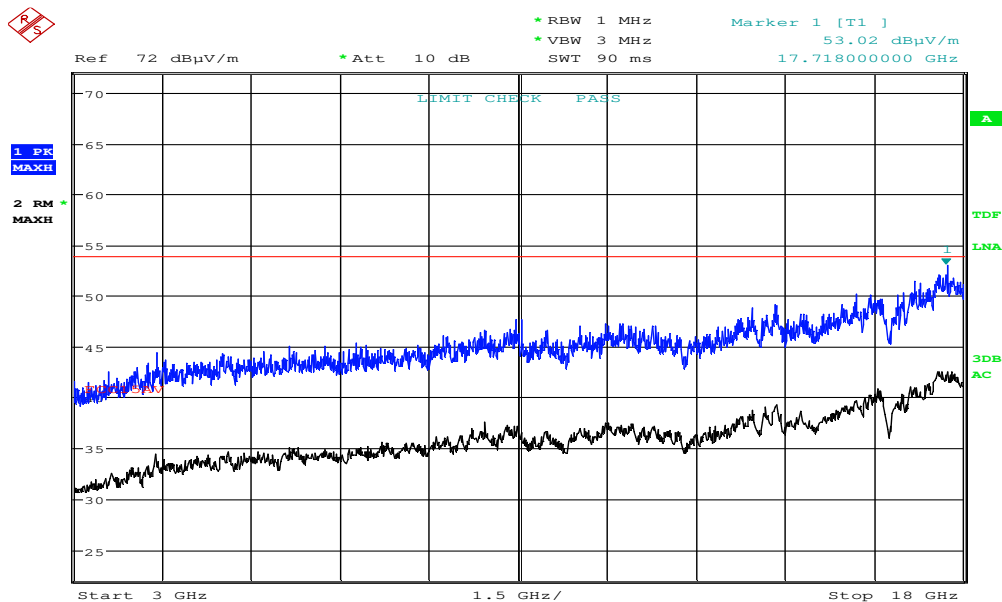
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Radiated Emissions, 3000 -18000 MHz, 2441MHz, HP



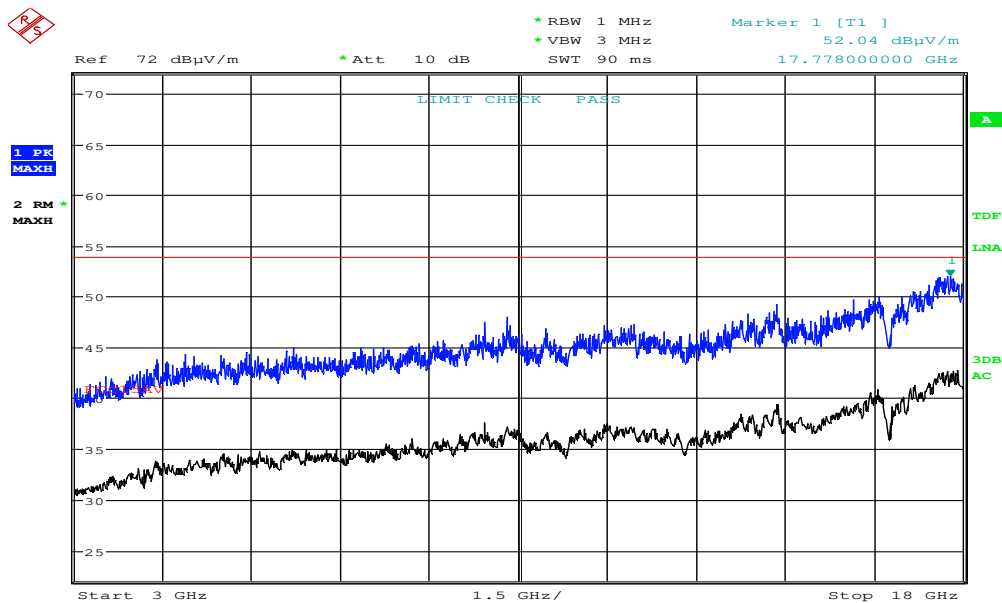
Date: 20.AUG.2019 18:04:10

Radiated Emissions, 3000 -18000 MHz, 2441MHz, VP



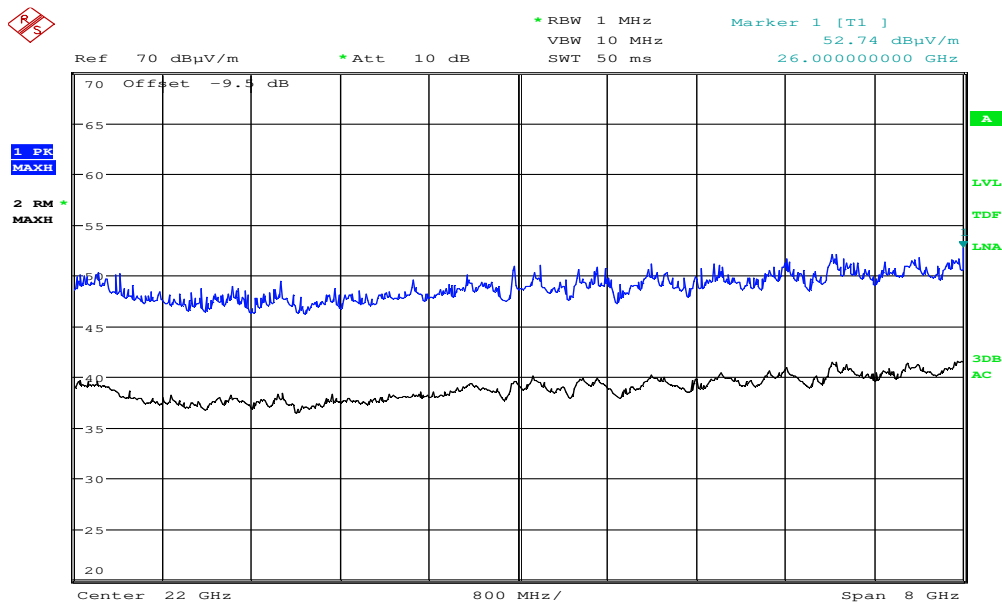
Date: 20.AUG.2019 17:46:42

Radiated Emissions, 3000 -18000 MHz, 2480MHz, HP



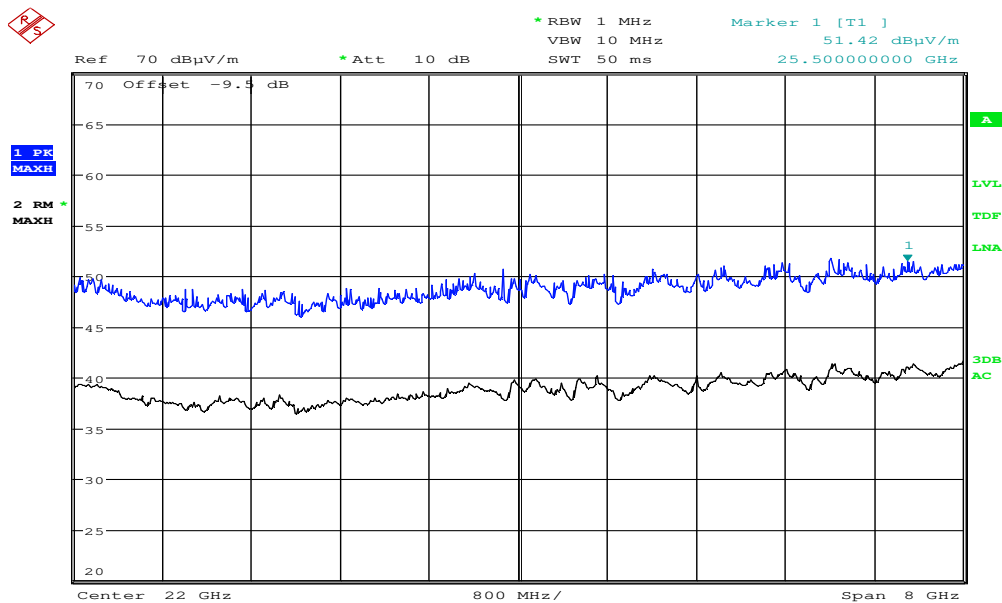
Date: 20.AUG.2019 17:44:46

Radiated Emissions, 3000 -18000 MHz, 2480MHz, VP



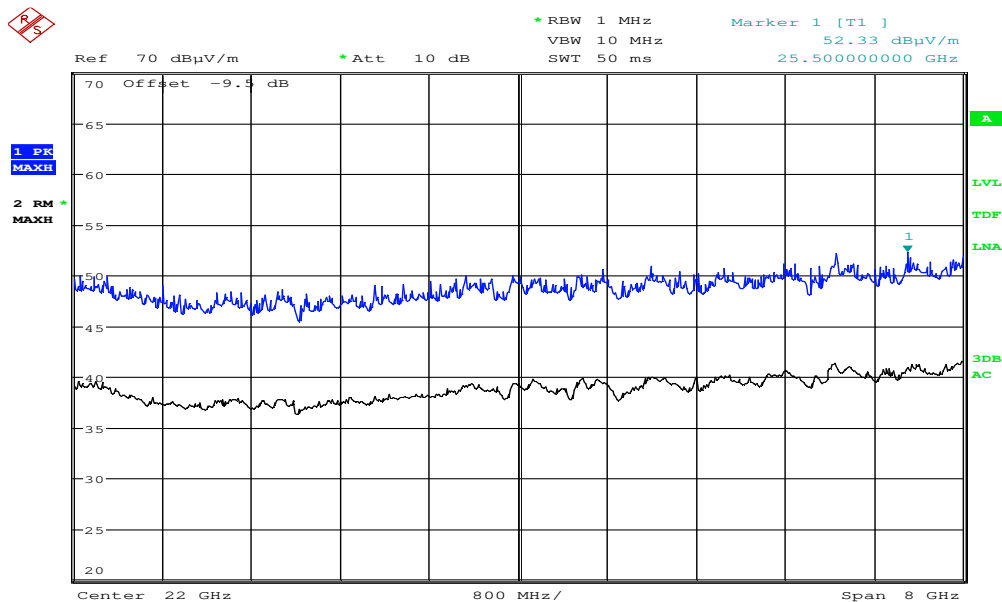
Date: 23.AUG.2019 14:06:24

Radiated Emissions, 18 - 26 GHz, 2402MHz, HP, @1m



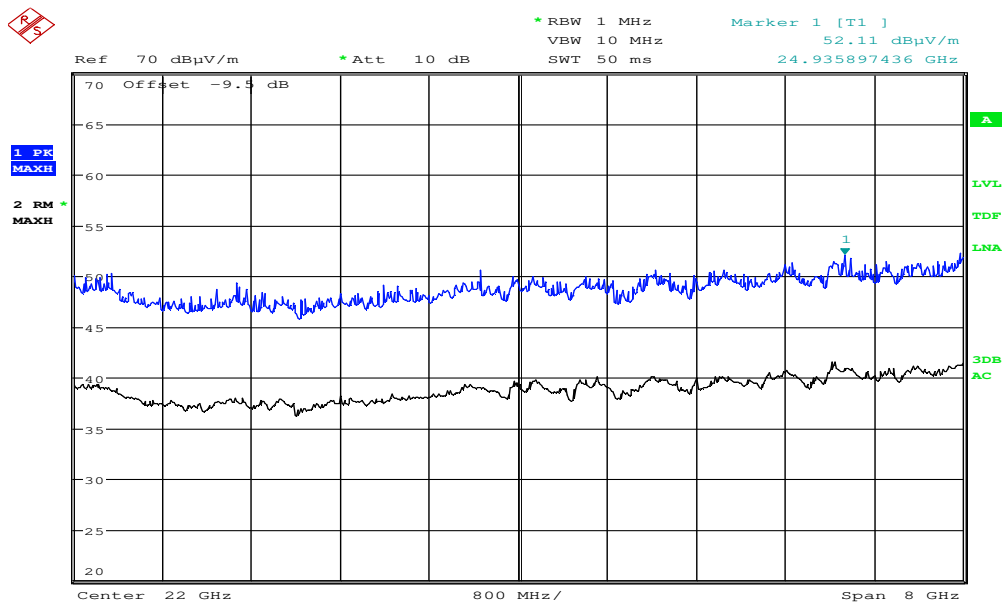
Date: 23.AUG.2019 14:04:56

Radiated Emissions, 18 - 26 GHz, 2402MHz, VP, @1m



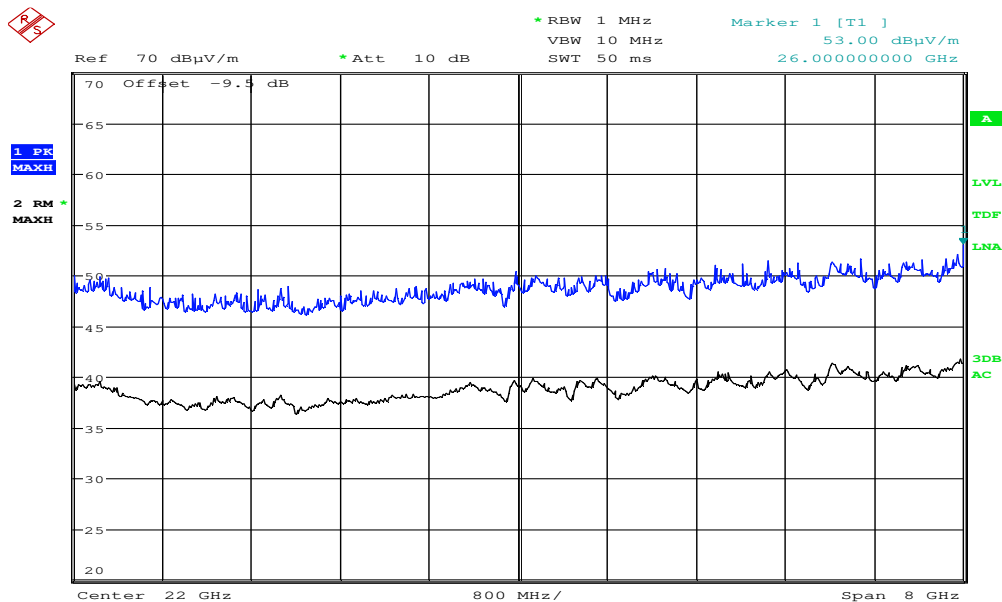
Date: 23.AUG.2019 13:59:31

Radiated Emissions, 18 - 26 GHz, 2441MHz, HP, @1m



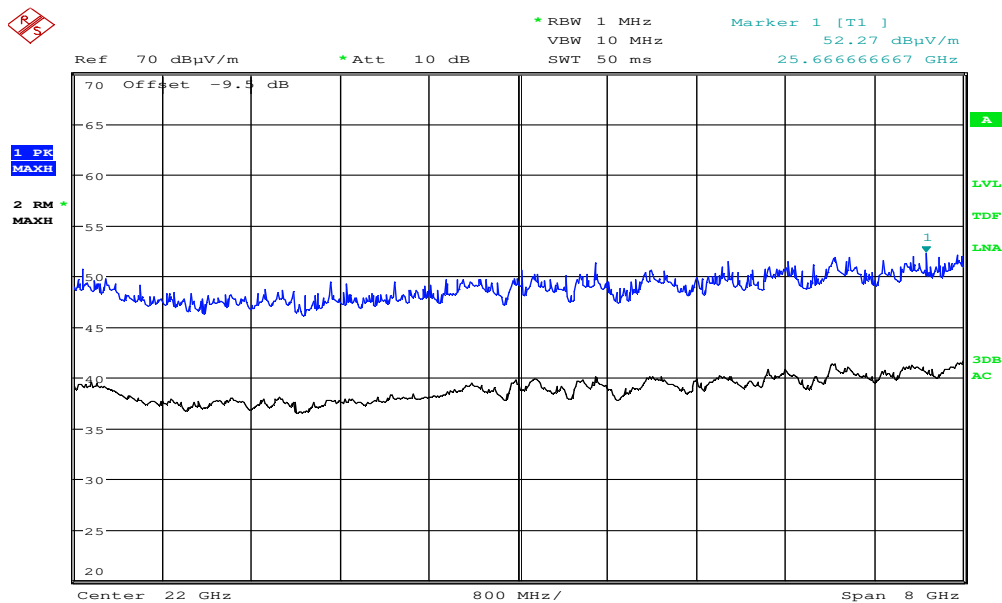
Date: 23.AUG.2019 13:58:31

Radiated Emissions, 18 - 26 GHz, 2441MHz, VP, @1m



Date: 23.AUG.2019 14:10:52

Radiated Emissions, 18 - 26 GHz, 2480MHz, HP, @1m



Date: 23.AUG.2019 14:09:44

Radiated Emissions, 18 - 26 GHz, 2480MHz, VP, @1m

3 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

4 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	2019.01	2020.01
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2019.01	2020.01
3	6810.17B	Attenuator	Suhner	LR 1669	COU	
4	6HC3000/18000	Highpass Filter	Trilithic	LR 1614	COU	
5	JB3	BiLog Antenna	Sunol Sciences	N-4525	2017.11	2020.11
6	317	Pre-amplifier	Sonoma Inst.	LR 1687	2019.07	2020.07
7	3115	Horn Antenna	EMCO	LR 1330	2016.10	2021.10
8	3117-PA	Horn Antenna with PreAmp	EMCO	LR 1717	2017.12	2019.12
9	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2019.07	2020.07
10	638	Antenna Horn	Narda	LR 098	N/A	
11	Model 87V	Multimeter	Fluke	LR 1599	2019.03	2021.03
12	6812B	AC Power Source	Hewlett Packard	LR 1515	COU	
13	ESC13	Measuring Receiver	Rohde & Schwarz	N-4259	2017.09	2019.09
14	ENV216	Two Line V-Network	Rohde & Schwarz	LR 1665	2017.11	2019.11
15	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	

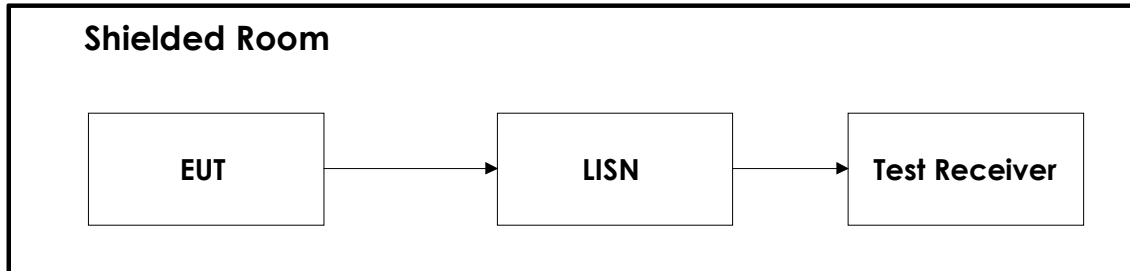
COU = Cal on use

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

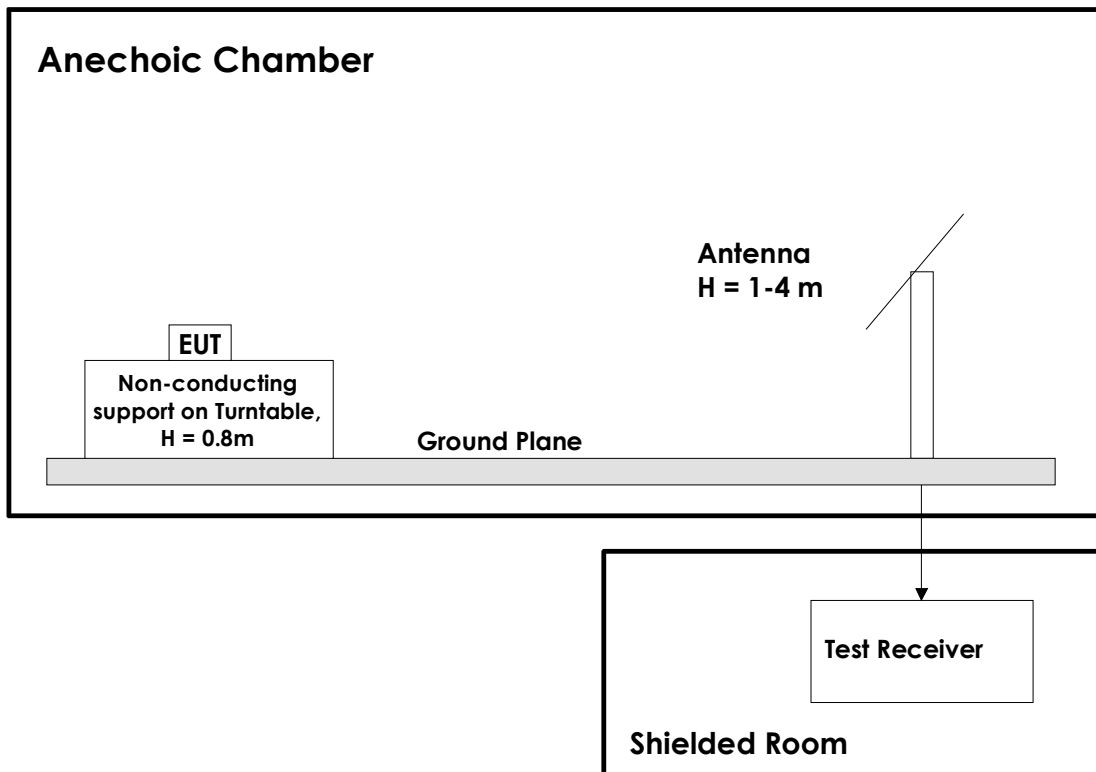
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.40.10	Power Line Conducted test software
2	Rohde & Schwarz	EMC32	10.40.10	Radiated Emission test software
3	Rohde & Schwarz	GPIBShot	2.7	Screenshots from R&S Spectrum Analyzers
4	Agilent	Intuitlink Data Capture	2.1.0	Screenshots from HP 53310A

5 BLOCK DIAGRAM

5.1 Power Line Conducted Emission



5.2 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.