


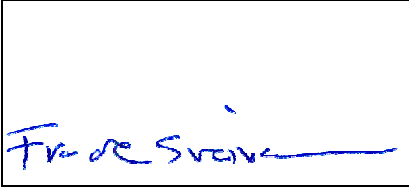
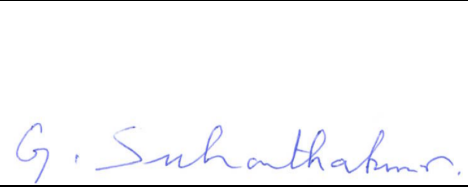


Test Report

Product	Wireless Microphone (ALD)		
Name and address of the applicant	Sonova USA Inc. 520 Weaver Parkway, 60555 Warrenville, Illinois, USA		
Name and address of the manufacturer	Sonova AG Labrisrütistrasse 28 8712 Stäfa, Switzerland		
Model	PartnerMic		
Rating	3.7V _{DC} (Li-Ion Battery)		
Trademark	Phonak		
Serial number	/		
Additional information	Assistive Listening Device (ALD)		
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	365228		
Tested in period	2019-02-13 to 2019-02-18		
Issue date	2019-03-04		
Name and address of the testing laboratory	 Instituttveien 6 Kjeller, Norway	CAB Number: FCC: NO0001 ISED: NO0470	 
An accredited technical test executed under the Norwegian accreditation scheme			
 Prepared by [Frode Sveisen]		 Approved by [G.Suhanthakumar]	
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.			

CONTENTS

1	INFORMATION	3
1.1	Test Item	3
1.2	Normal test condition	4
1.3	Test Engineer	4
1.4	Antenna Requirement	4
1.5	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	Occupied Bandwidth	8
3.3	Minimum 6 dB Bandwidth	11
3.4	Peak Power Output	14
3.5	Power Spectral Density (PSD)	20
3.6	Conducted Emissions at Antenna Connector	23
3.7	Restricted Bands of operation	31
3.8	Spurious Emissions (Radiated)	32
3.9	Radiated Emissions, below 1GHz	34
3.10	Radiated Emissions, above 1GHz	36
4	Measurement Uncertainty.....	46
5	LIST OF TEST EQUIPMENT	47
6	BLOCK DIAGRAM	48
6.1	Power Line Conducted Emission.....	48
6.2	Test Site Radiated Emission.....	48

1 INFORMATION

1.1 Test Item

Name	Wireless Microphone (ALD)
Model name	PartnerMic
FCC ID	KWCTX28V1
Industry Canada Registration Number	2262A-TX28V1
Serial number	/
Trademark	PHONAK
Hardware identity and/or version	02
Software identity and/or version	V1.0
Tested to ISED Radio Standard (RSS)	RSS-247 Issue 2; RSS-Gen Issue 5
Frequency Range	2402–2480 MHz (Hopping Mode, Full Power) 2402, 2450 and 2480 MHz (Control Carriers, Low Power)
Number of Channels	Hopping Mode: Minimum 20 and Maximum 40 Hopping Channels Control Carriers: 3
Operating Modes	Proprietary
Type of Modulation	Digital (Gaussian Frequency Shift Keying)
Conducted Output Power	10.5 mW (Peak, Full Power)
Antenna Connector	None
Number of Antennas	1
Antenna Diversity Supported	No
Power Supply	Internal Battery and External Power Adaptor for Charging Secondary Battery (3.7V Li-Ion) and USB Adaptor (5.0V _{DC})
Interface	microUSB for Charging and SW updates

Description of Test Item

The EUT is a Wireless Microphone (ALD) with Frequency Hopping and Fixed Control Carrier. Several Wireless Microphones may be synchronized, for this the system uses a Control Carrier at 2402, 2450 or 2480 MHz. Control Carriers use Dynamic Frequency Selection.

This device has been tested as a DTS system and fulfils all requirements for a DTS systems. The only difference between hopping carriers and control carriers is duty cycle and output power.

1.2 Normal test condition

Temperature:	20–25 °C
Relative humidity	20–50 %
Air pressure	860–1060 mbar
Normal test voltage	3.7 V _{DC} (Nominal Voltage)

All tests were performed with the EUT powered from a fully charged battery. For radiated emissions tests the EUT was also powered from a USB charger supplied by the manufacturer. Power Line Conducted emissions Tests were performed with the supplied power adaptor.

Values above are the limit registered during the test period.

1.3 Test Engineer

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 with a temporary antenna connector.		

Requirement: FCC 15.203, 15.204

1.5 Comments

The EUT uses frequency hopping with 40 hopping channels from 2402 to 2480 MHz. Additionally, the EUT transmit a control signal on alternatingly on 2402, 2450 and 2480 MHz. The control signal is transmitted with the same modulation and bandwidth but with reduced Output Power.

Radiated measurements were done with the EUT powered by a fully charged battery. Measurements below 1 GHz was performed with the EUT charging from a USB power adaptor.

Antenna Conducted tests were performed with the EUT powered from a regulated power supply. It was also checked that power variations of ±15 % did not have any influence on Output Power.

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 and 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

DTS Equipment Code

Family Listing



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

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

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	Result
Supply Voltage Variations	15.31(e)	6.11 (RSS-GEN)	Complies
Antenna Requirement	15.203	6.8 (RSS-GEN)	Complies
Power Line Conducted Emission	15.107(a) 15.207(a)	7.2 / 8.8 (RSS-GEN)	Complies
Occupied Bandwidth	N/A	6.7 (RSS-GEN)	N/A ¹
Minimum 6 dB Bandwidth	15.247(a)(2)	5.2 (1) (RSS-247)	Complies
Peak Power Output	15.247(b)	5.4 (RSS-247)	Complies
Power Spectral Density	15.247(d)	5.2 (2) (RSS-247)	Complies
Spurious Emissions (Antenna Conducted)	15.247(c)	5.5 (RSS-247)	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)	Complies

¹ No limit defined

3 TEST RESULTS

3.1 Power Line Conducted Emissions

FCC Part 15.107 (a)

ISED ICES-003 Issue 6, Clause 6.1

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

Test Results: Complies

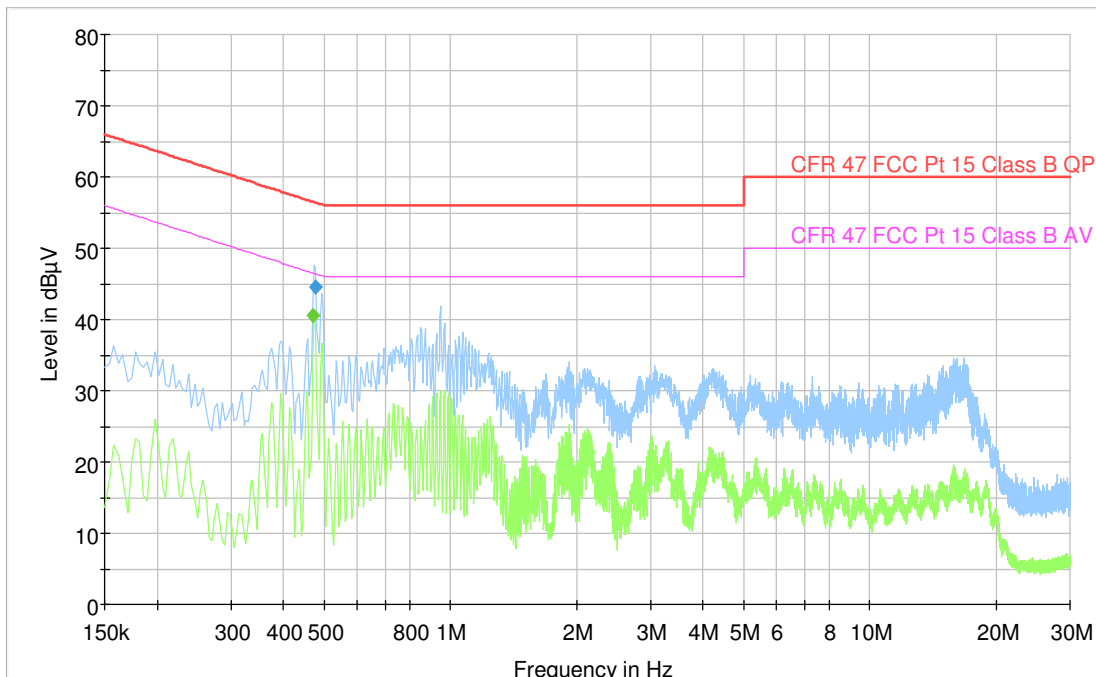
Measurement Data: See attached plots.

Highest measured value (L1 and N):

Frequency (MHz)	QuasiPeak (dB μ V)	Average (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter
0.472	---	40.57	46.48	5.91	1000	9	N	OFF
0.476	44.54	---	56.41	11.87	1000	9	L1	OFF

120V 60Hz

Full Spectrum



3.2 Occupied Bandwidth

RSS-GEN Issue 5, Clause 6.7

Test Results: Complies

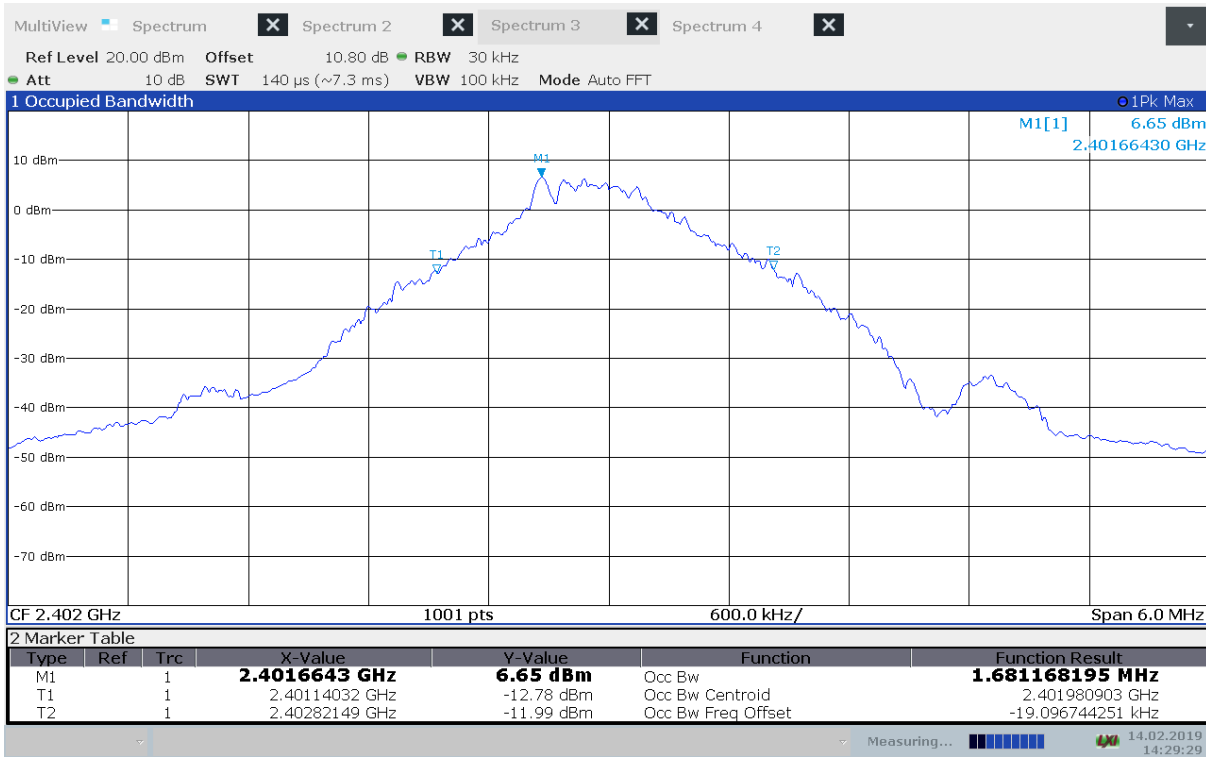
Measurement Data:

Carrier Frequency	Occupied Bandwidth (99% BW)
2402 MHz	1.68 MHz
2440 MHz	1.81 MHz
2480 MHz	2.06 MHz

See attached plots.

Requirements:

No limit specified.



Occupied Bandwidth, 99%, 2402 MHz



Occupied Bandwidth, 99%, 2440 MHz



Occupied Bandwidth, 99%, 2480 MHz

3.3 Minimum 6 dB Bandwidth

FCC Part 15.247 (a)(2)

RSS-247 Issue 2, Clause 5.2 (a)

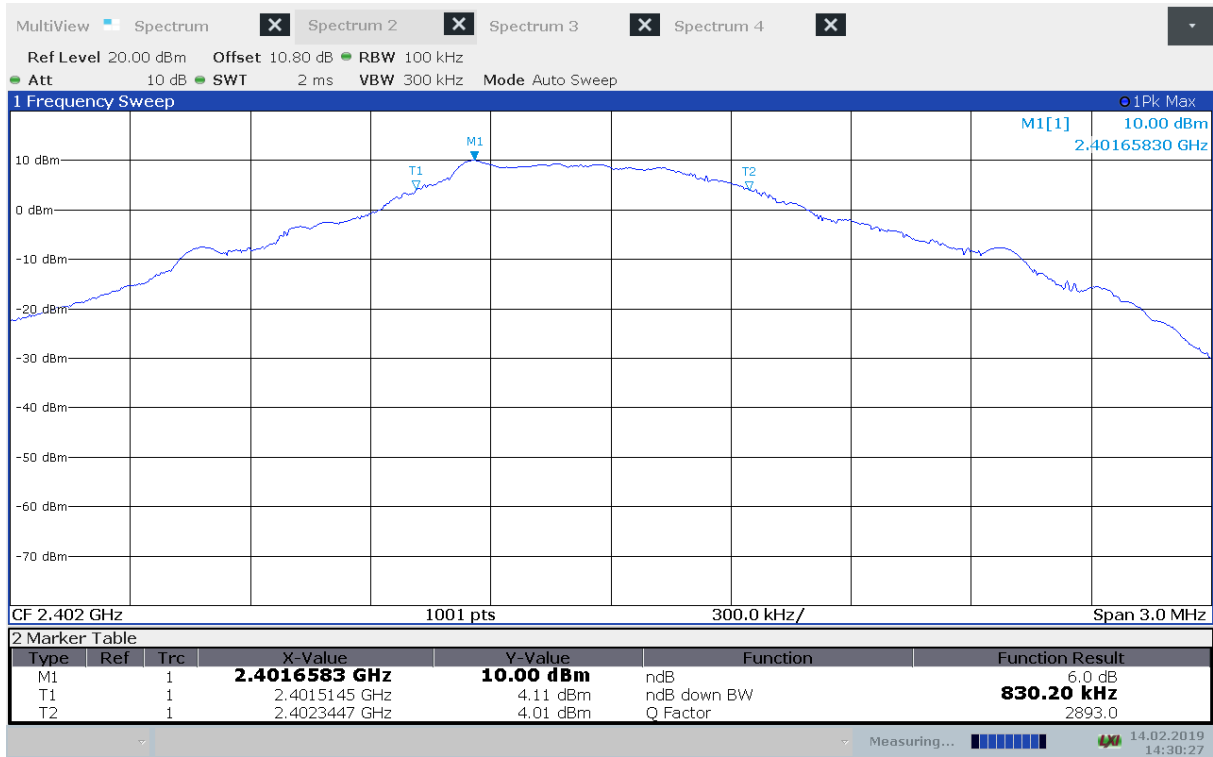
Test Results: Complies

Measurement Data:

Modulation type and bitrate	Measured 6 dB Bandwidth (kHz)
2402 MHz	830
2440 MHz	800
2480 MHz	806

Requirements:

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



DTS Bandwidth, 2402 MHz



DTS Bandwidth, 2440 MHz



DTS Bandwidth, 2480 MHz

3.4 Peak Power Output

FCC 15.247 (b)

RSS-247 Issue 2, Clause 5.4 (d)

Test Results: Complies

Measurement Data:

Maximum Peak Power, Max Power			
	2402 MHz	2440 MHz	2476 MHz
Peak Power, Conducted (dBm)	9.9	10.2	10.2
Peak Power, Conducted (mW)	9.7	10.5	10.5
Peak Power, e.i.r.p. (dBm)	11.4	12.6	11.1
Peak Power, e.i.r.p. (mW)	13.9	18.3	12.9
Calculated Antenna Gain (dBi)	1.6	2.4	0.9

Maximum Peak Power, Low Power			
	2402 MHz	2450 MHz	2480 MHz
Conducted Power (dBm)	6.99	7.57	7.60
Conducted Power (mW)	5.0	5.7	5.8

Peak Power, e.i.r.p. is calculated from Field Strength using the Free Field Formula.

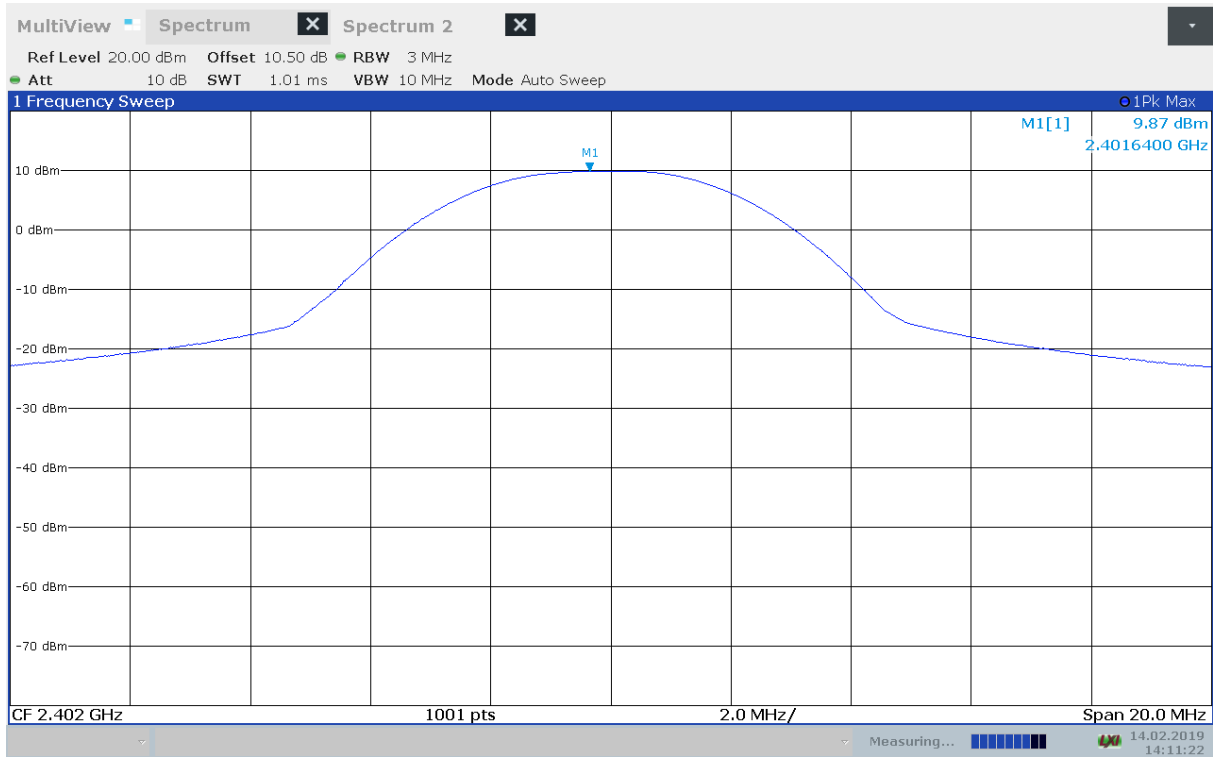
See attached plots.

Requirements:

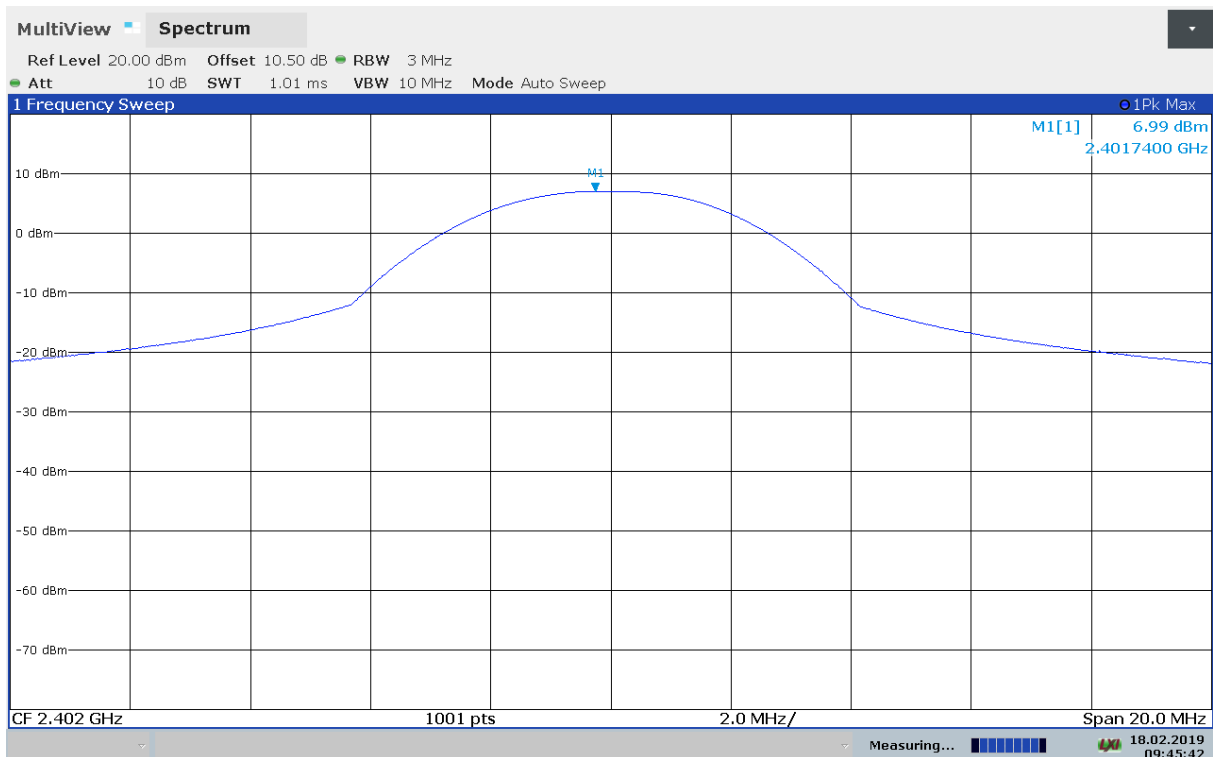
The maximum peak output power shall not exceed the following limits:

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

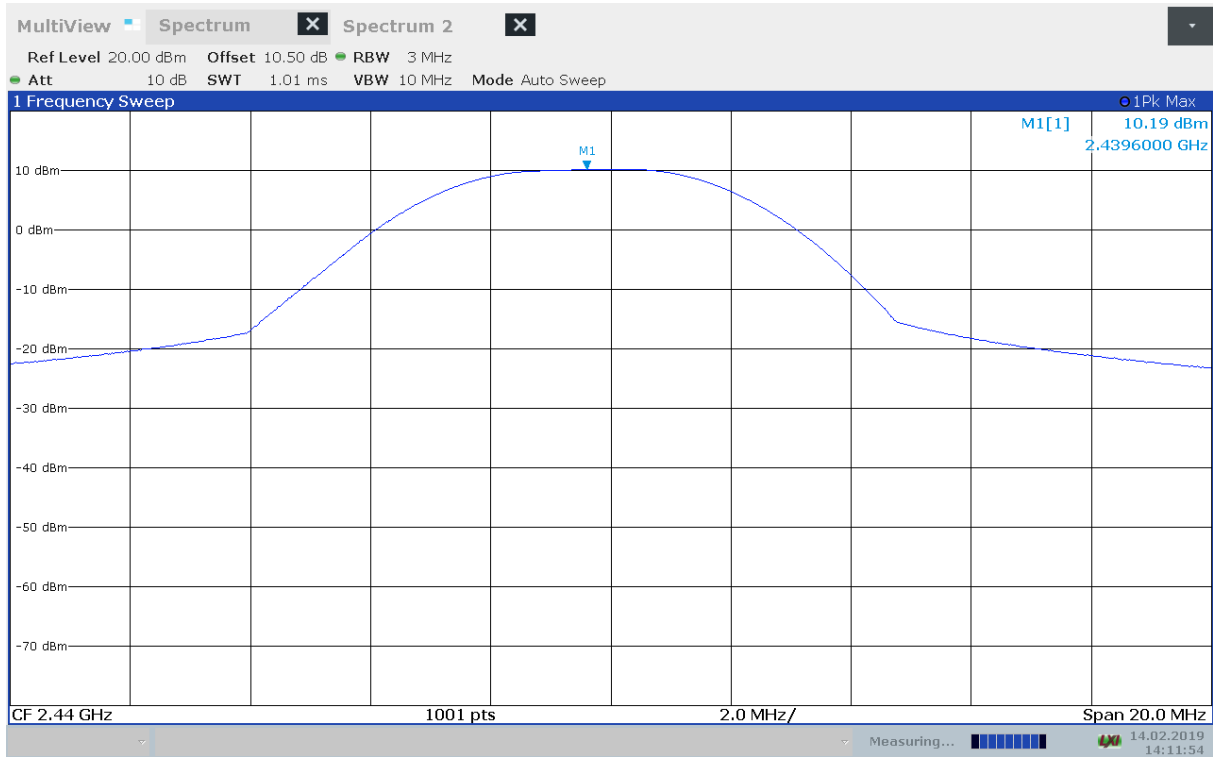
If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced below the stated value above by the amount in dB that the directional gain of the antenna exceeds 6 dBi.



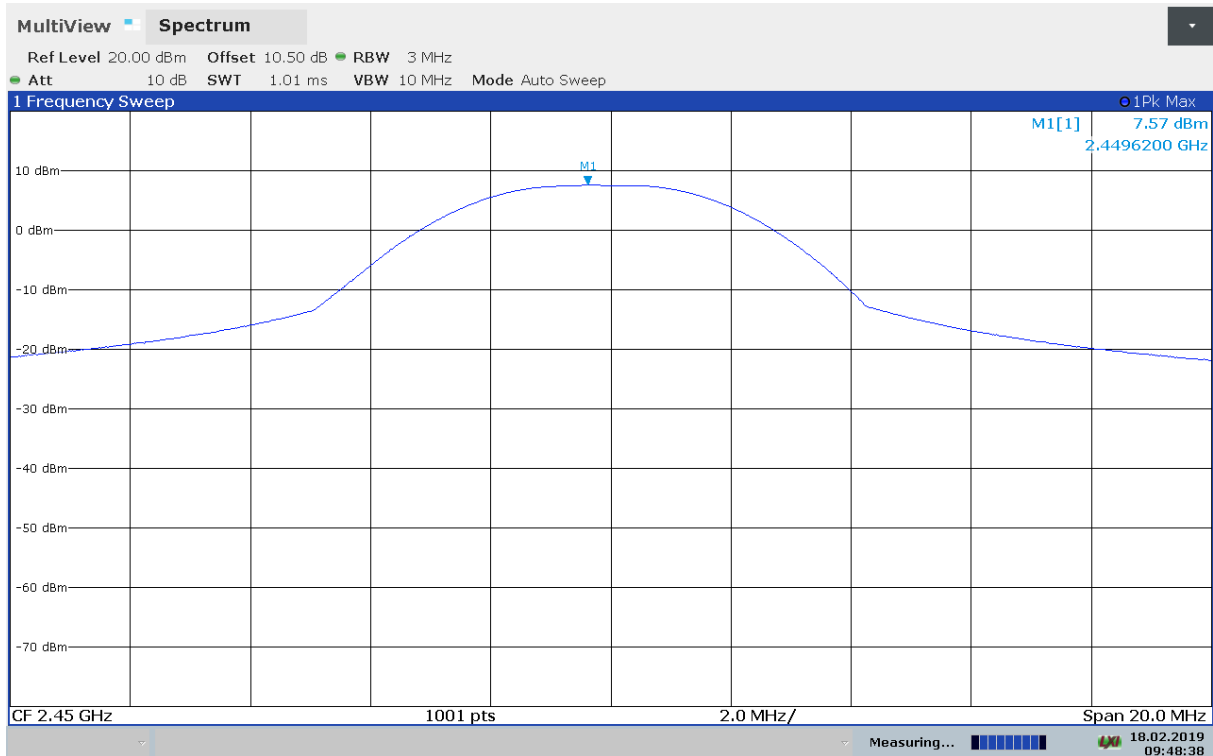
Conducted Power, 2402 MHz, Max Power



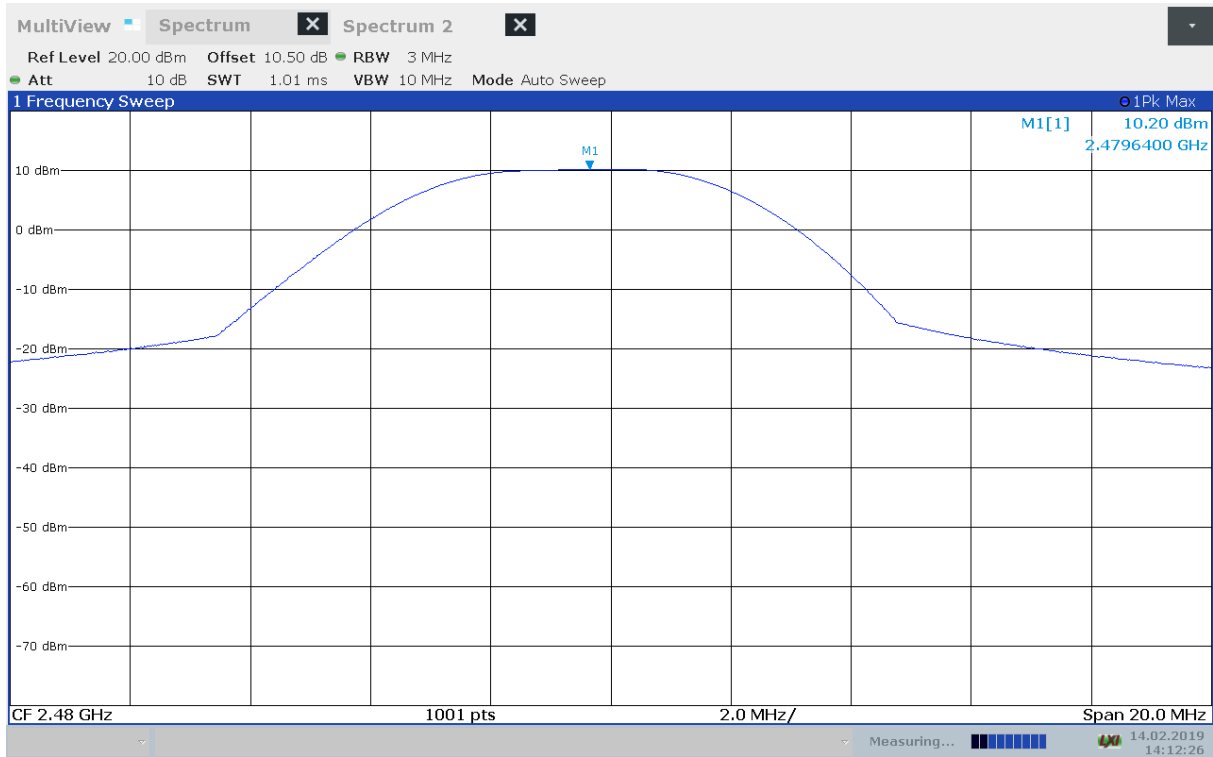
Conducted Power, 2402 MHz, Low Power



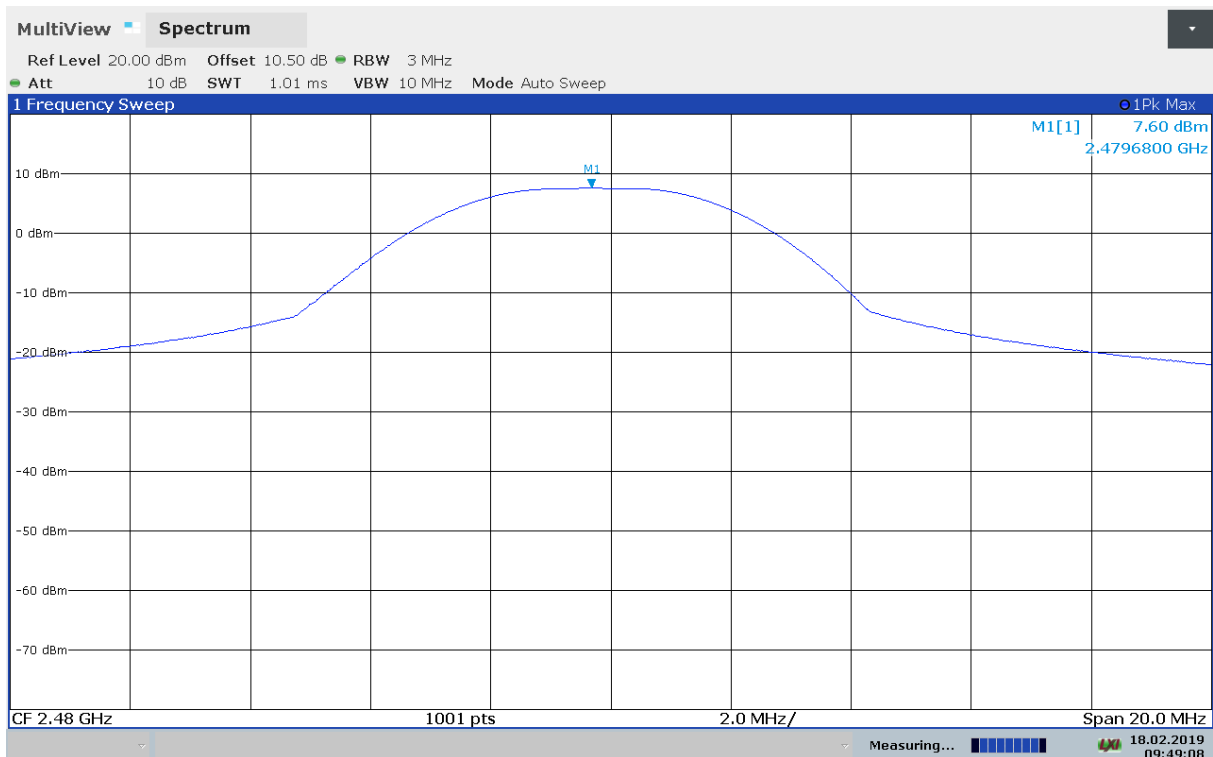
Conducted Power, 2440 MHz, Max Power



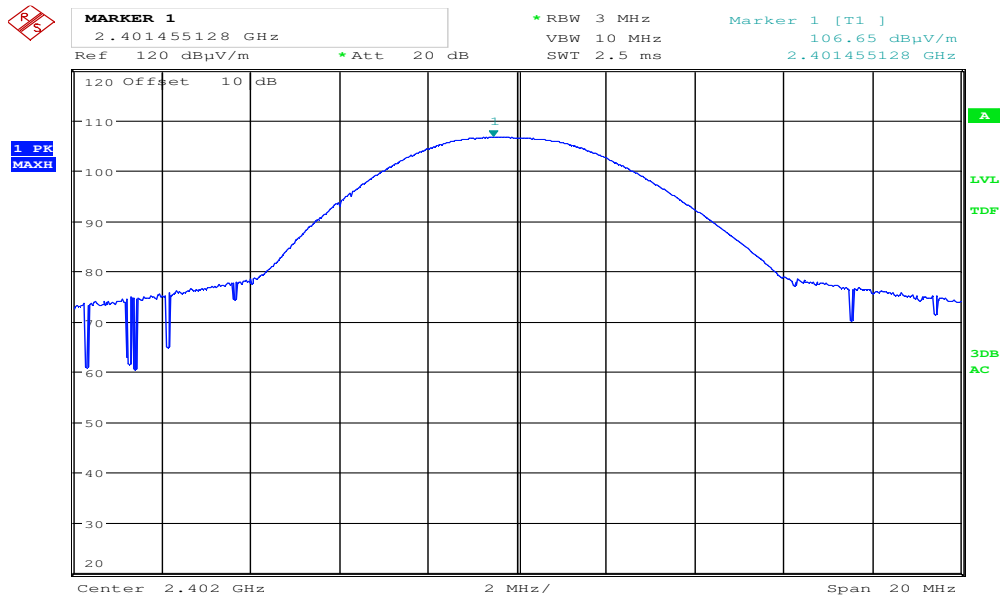
Conducted Power, 2450 MHz, Low Power



Conducted Power, 2480 MHz, Max Power

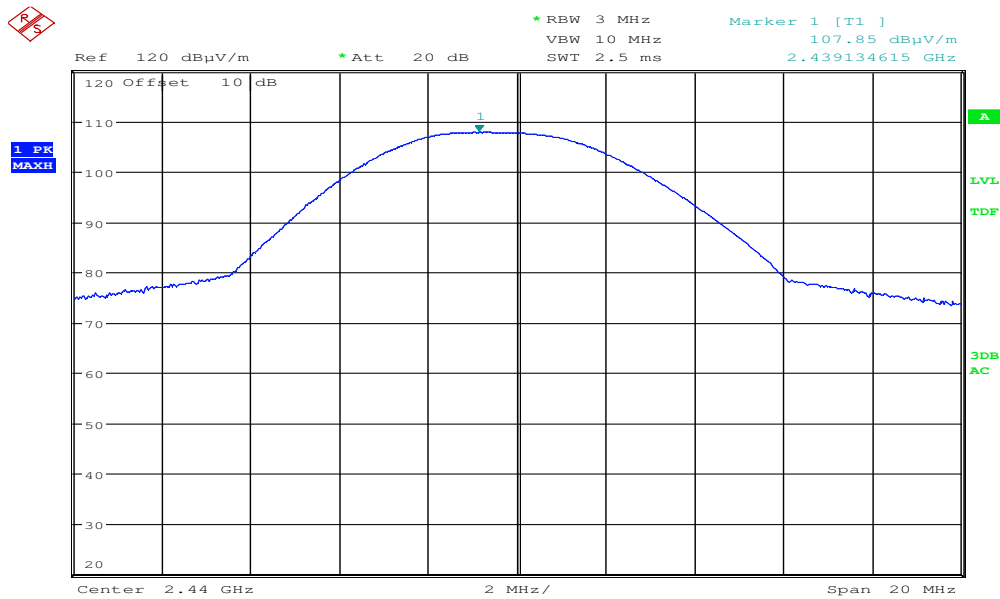


Conducted Power, 2480 MHz, Low Power



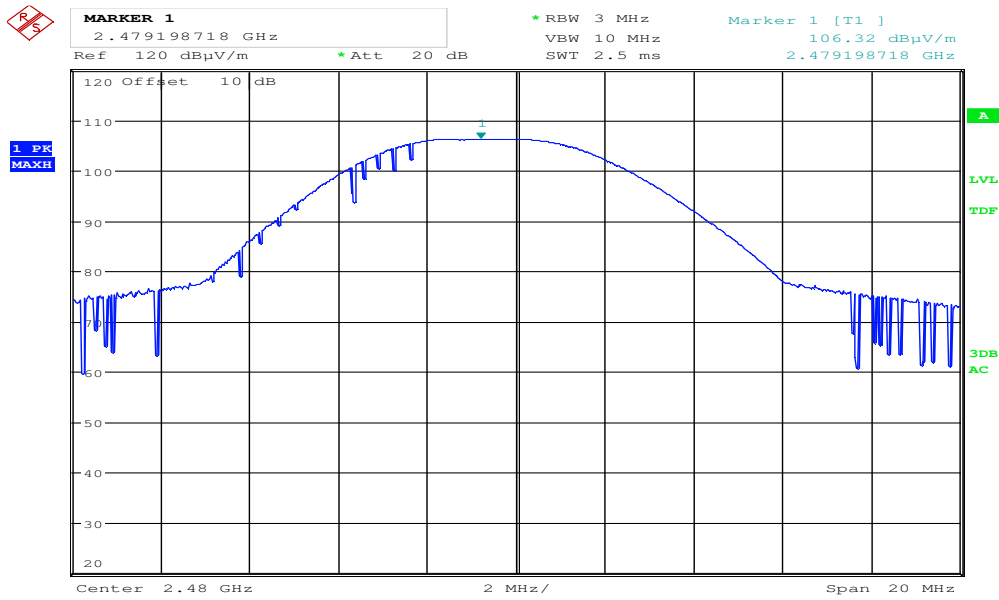
Date: 13.FEB.2019 13:13:14

Maximum Field Strength, 2402 MHz, Max Power



Date: 13.FEB.2019 13:12:03

Maximum Field Strength, 2440 MHz, Max Power



Date: 13.FEB.2019 13:12:31

Maximum Field Strength, 2480 MHz, Max Power

3.5 Power Spectral Density (PSD)

Para. No.: 15.247 (d)

Test Results: Passed

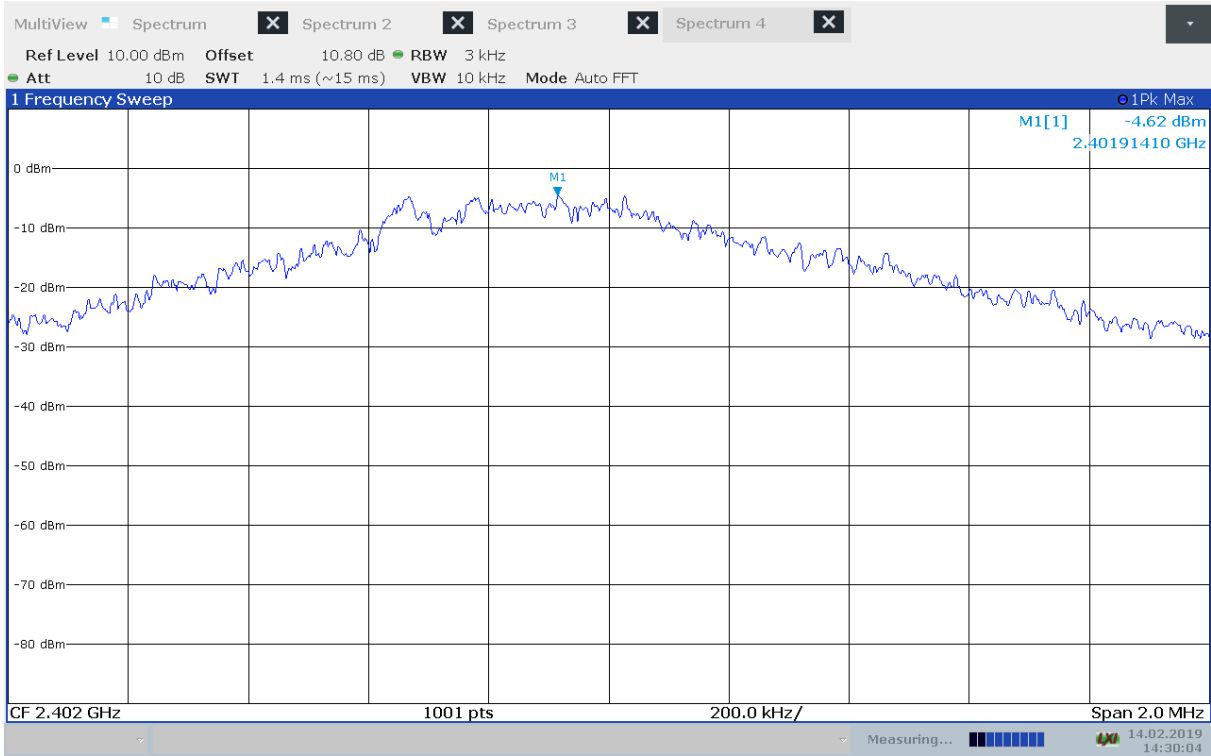
Measured and Calculated Data:

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

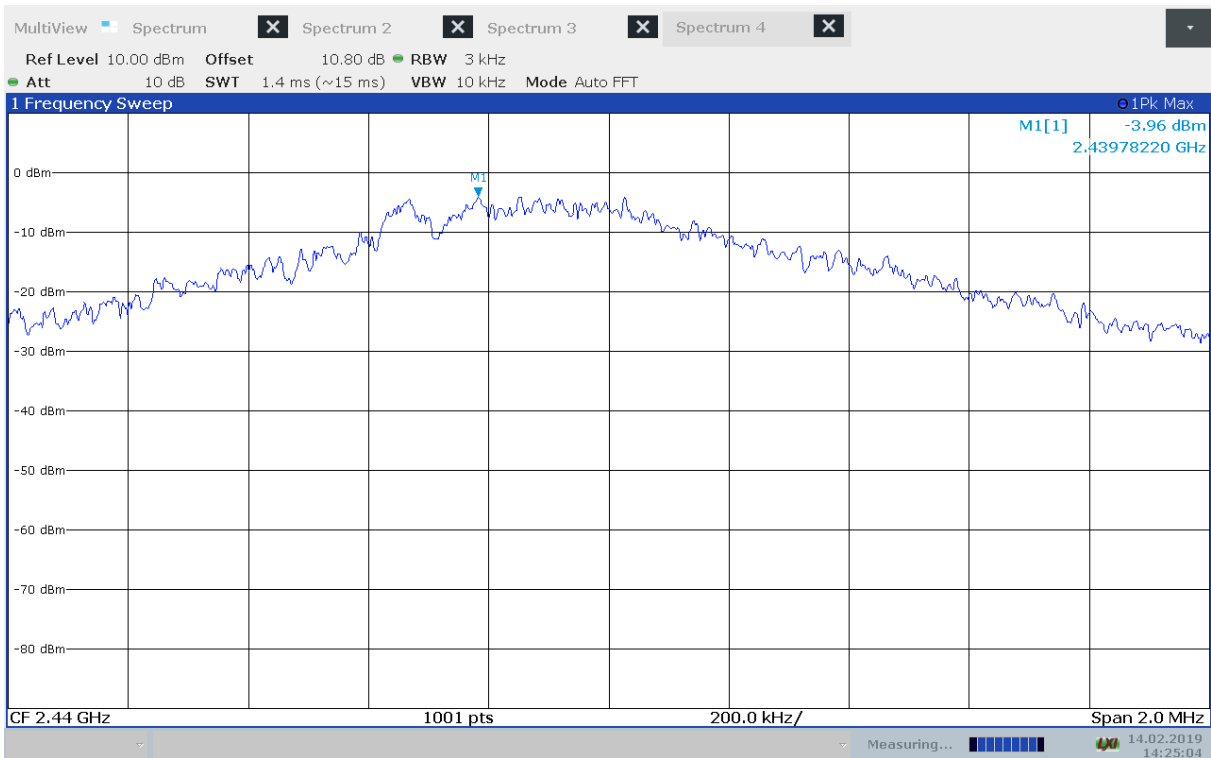
Carrier Frequency (MHz)	Power Spectral Density (dBm/3 kHz)
2402	-4.6
2440	-4.0
2480	-3.9

Requirements:

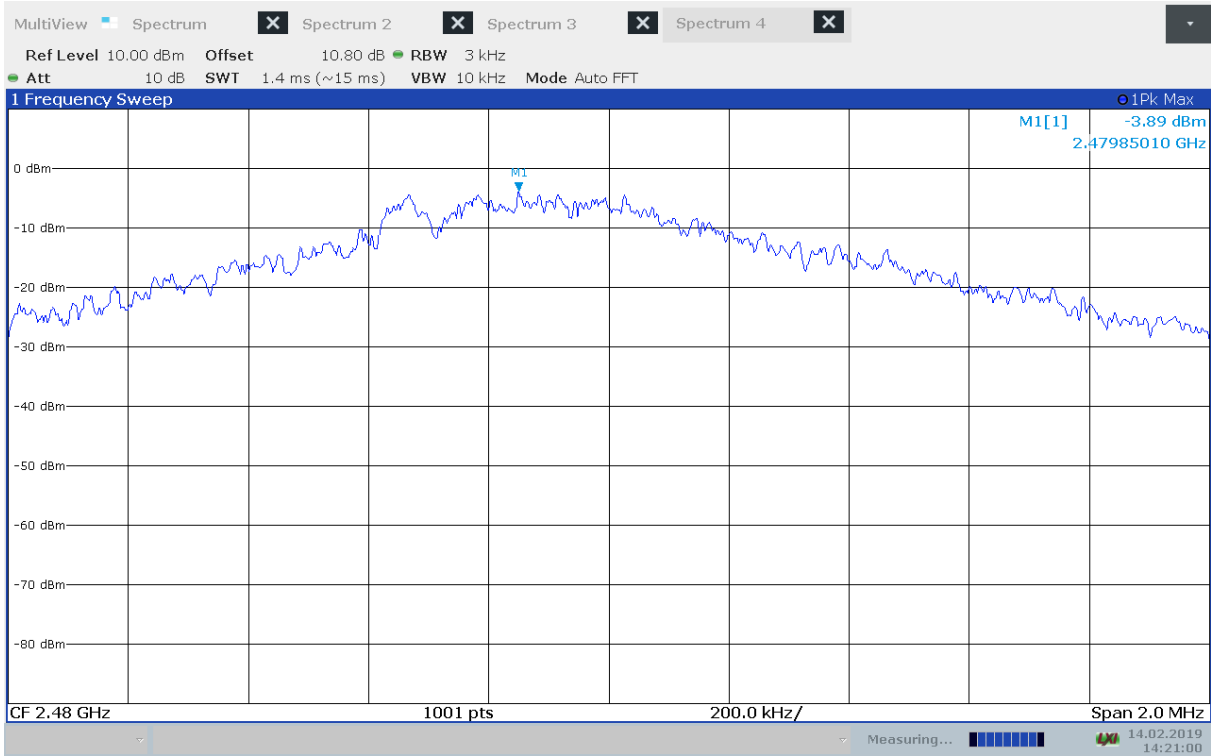
The Power Spectral Density of a Digital Transmission System shall be no greater than +8 dBm in any 3 kHz band.



Power Spectral Density, 2402 MHz, Max Power



Power Spectral Density, 2440 MHz, Max Power



Power Spectral Density, 2480 MHz, Max Power

3.6 Conducted Emissions at Antenna Connector

Para. No.: 15.247 (d)

Carrier Frequency	Highest Value (dBc)	Margin (dB)	Verdict
2402 MHz	38.6	18.6	Pass
2440 MHz	69.0	49.0	Pass
2480 MHz	53.9	33.9	Pass
Hopping active	41.8	21.8	Pass

Measured with Peak Detector

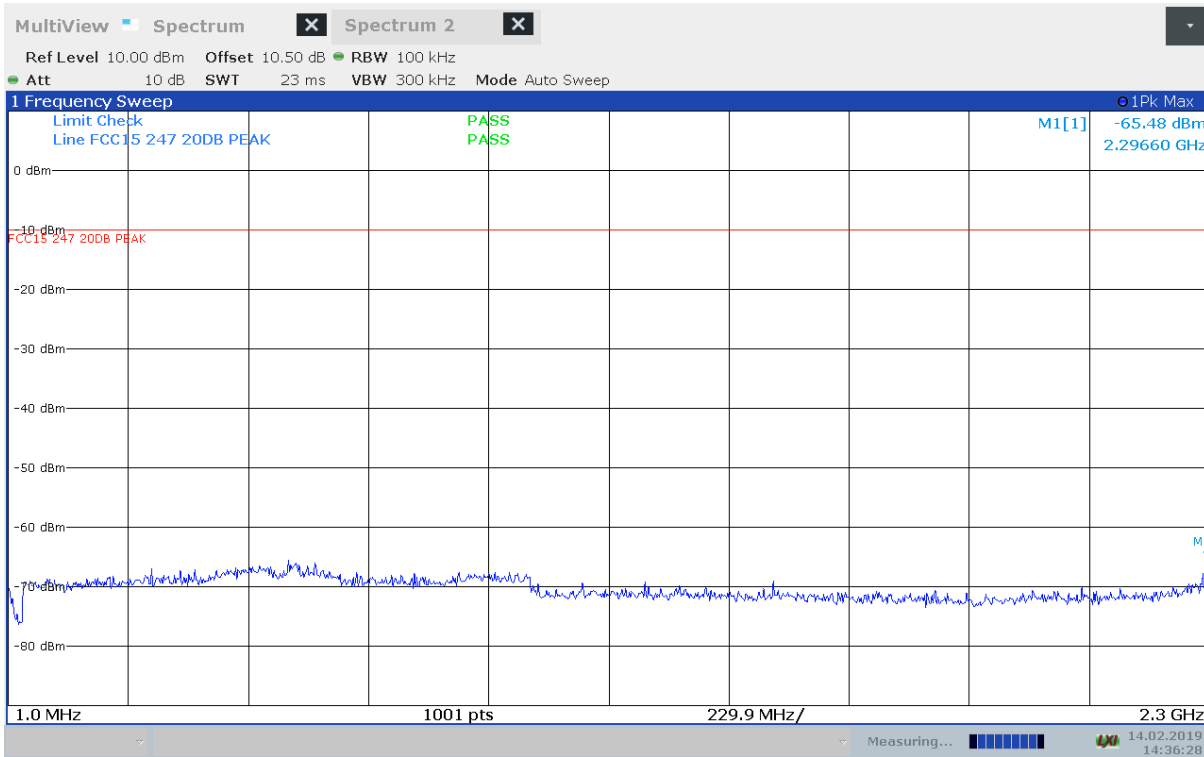
RF conducted power to 25 GHz: see attached plots.

Limit

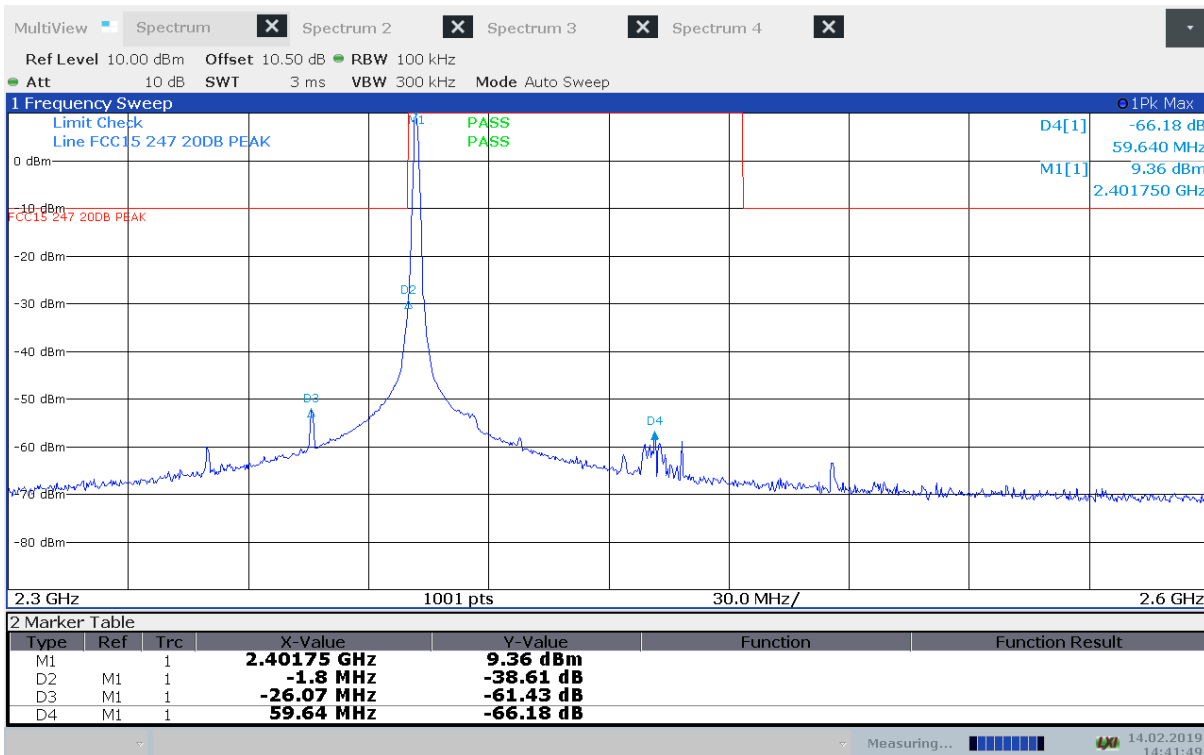
Peak measurement	RMS averaging
20 dBc or more in 100 kHz bandwidth	30 dBc or more in 100 kHz bandwidth

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

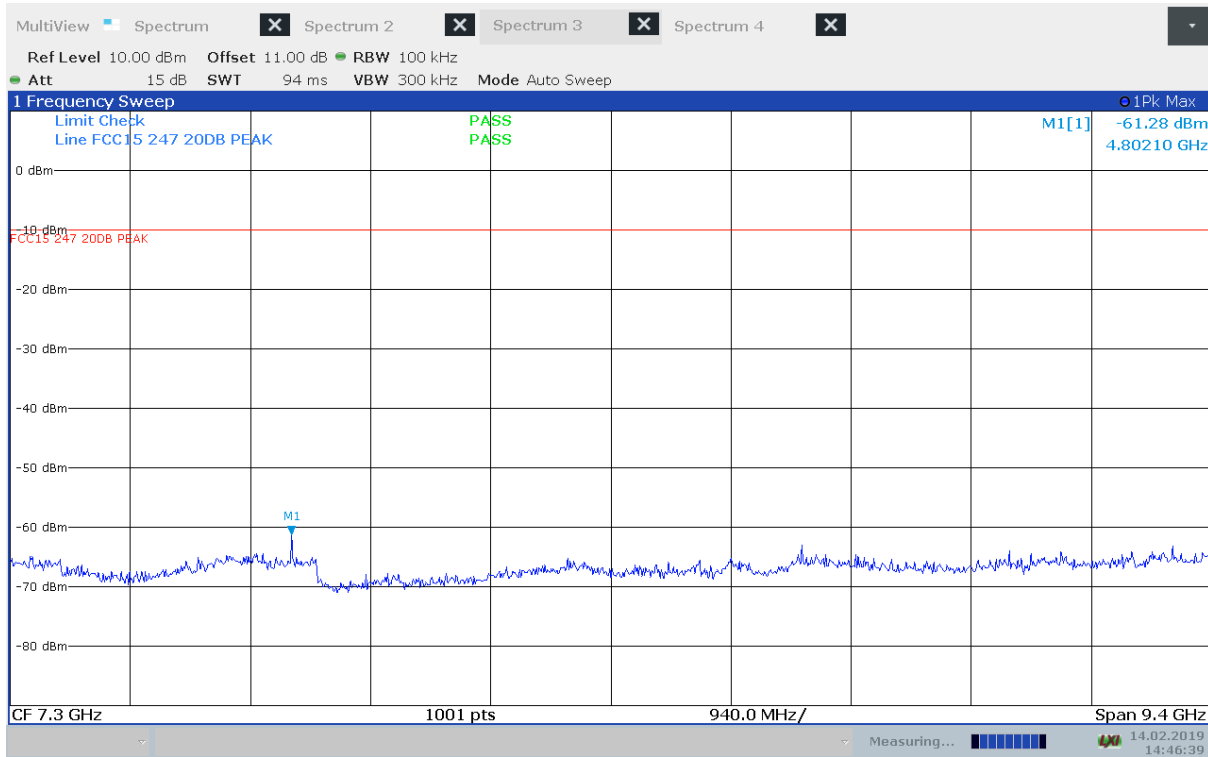
Attenuation below the general limits specified in part 15.209(a) is not required.



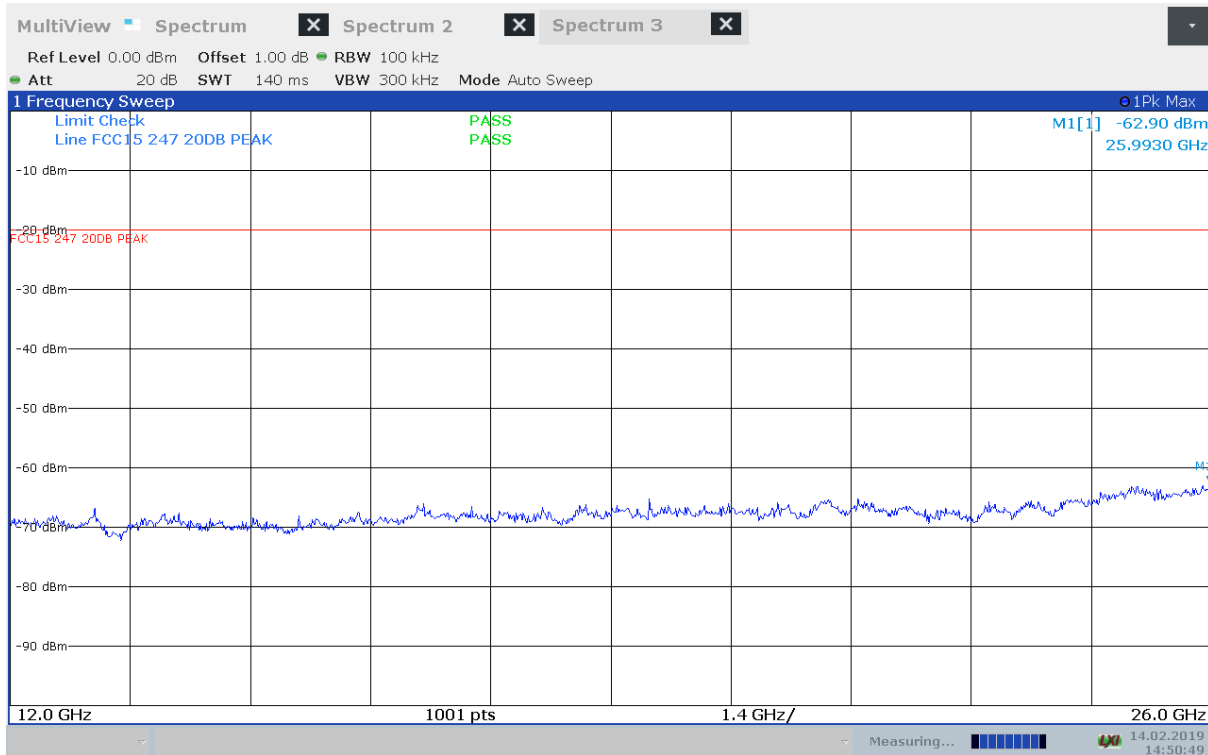
Conducted Emissions, 1–2300 MHz, 2402MHz



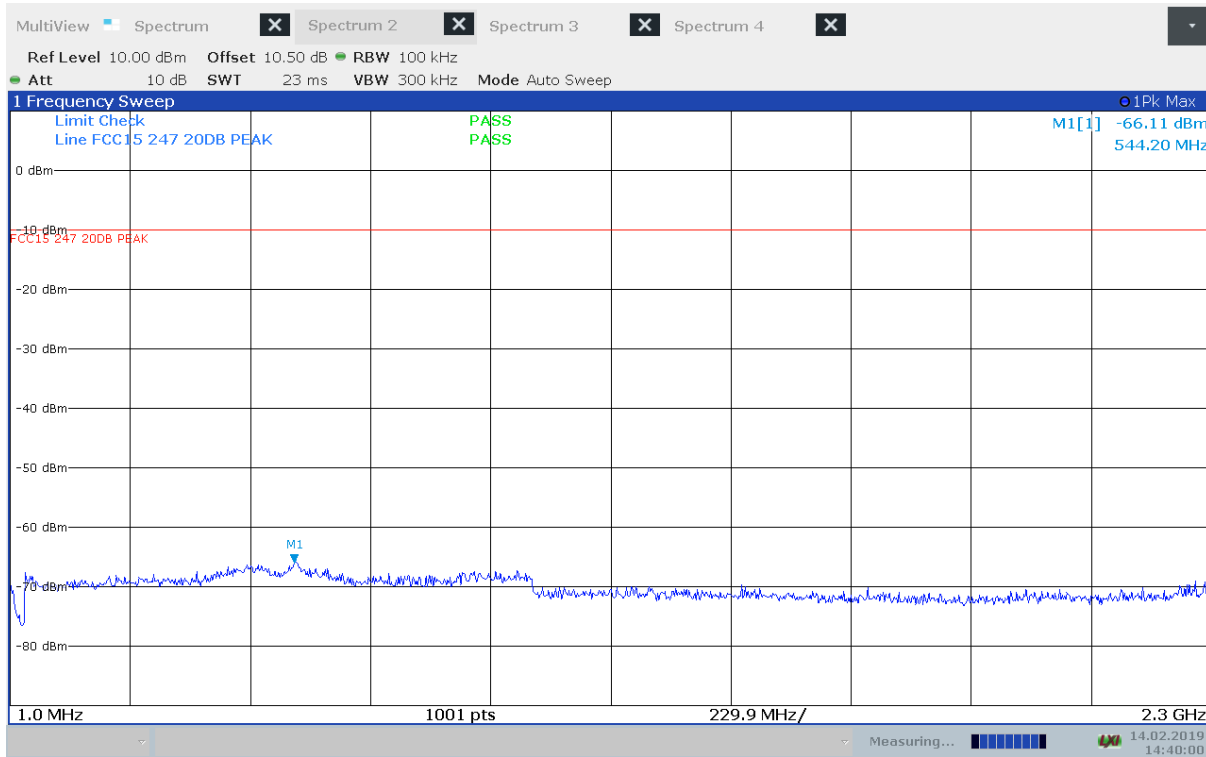
Conducted Emissions, 2300–2600 MHz, 2402MHz



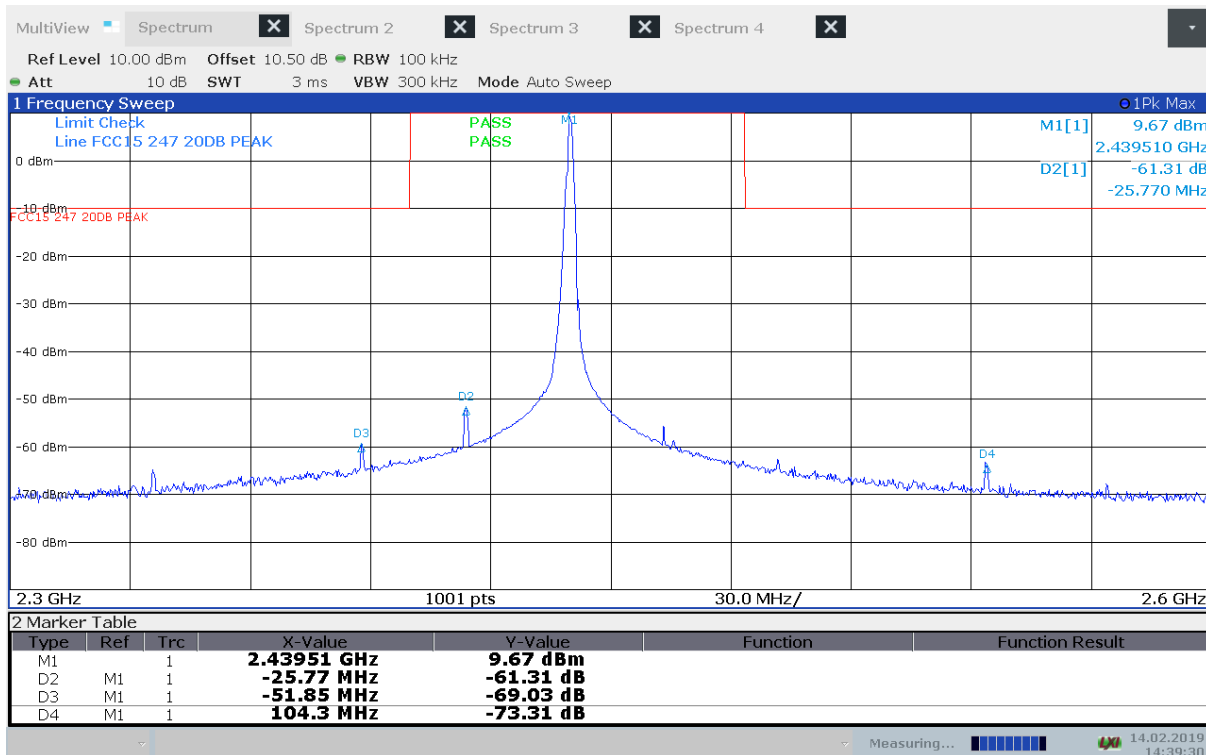
Conducted Emissions, 2600–12000 MHz, 2402MHz



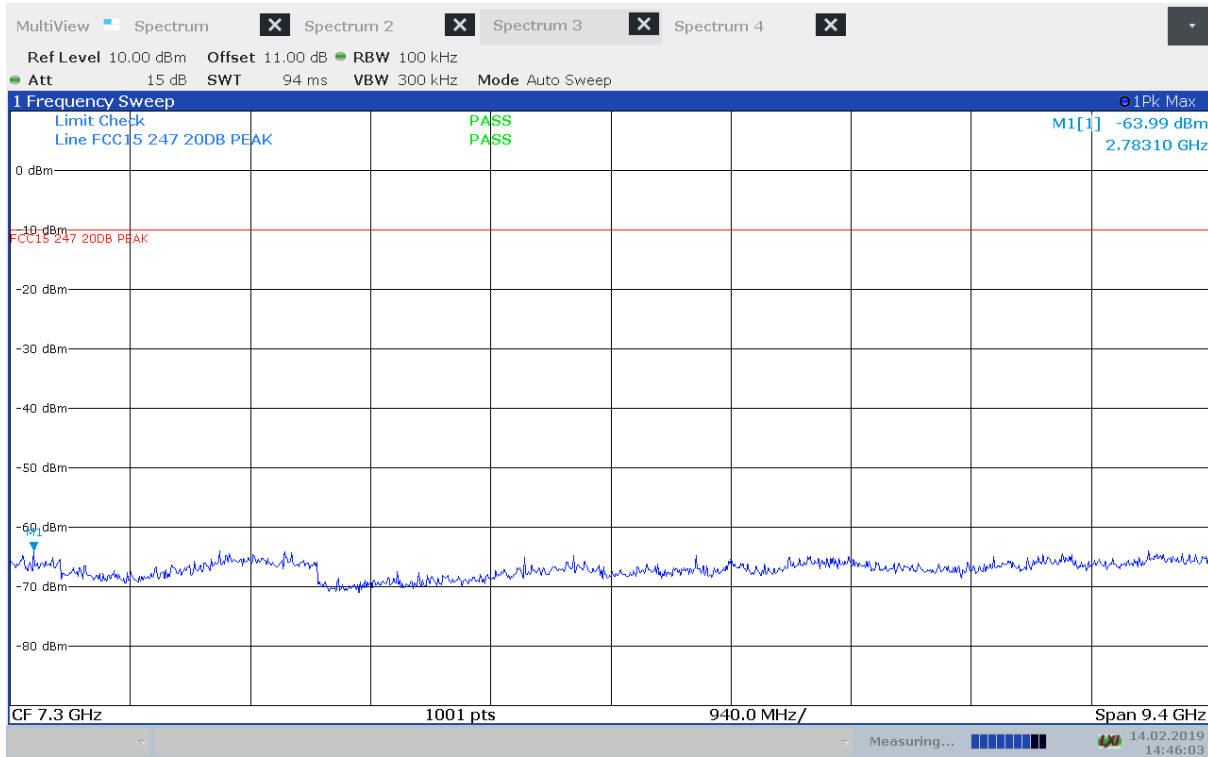
Conducted Emissions, 12000–26000 MHz, 2402MHz



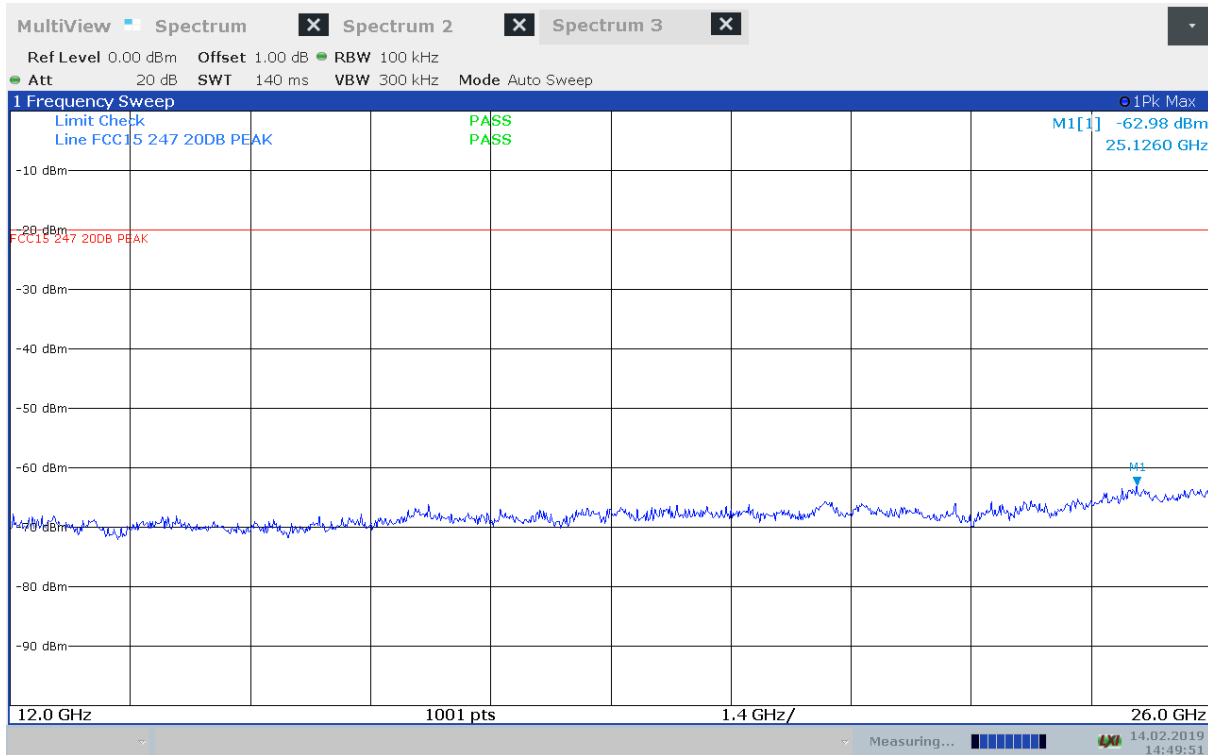
Conducted Emissions, 1–2300 MHz, 2440MHz



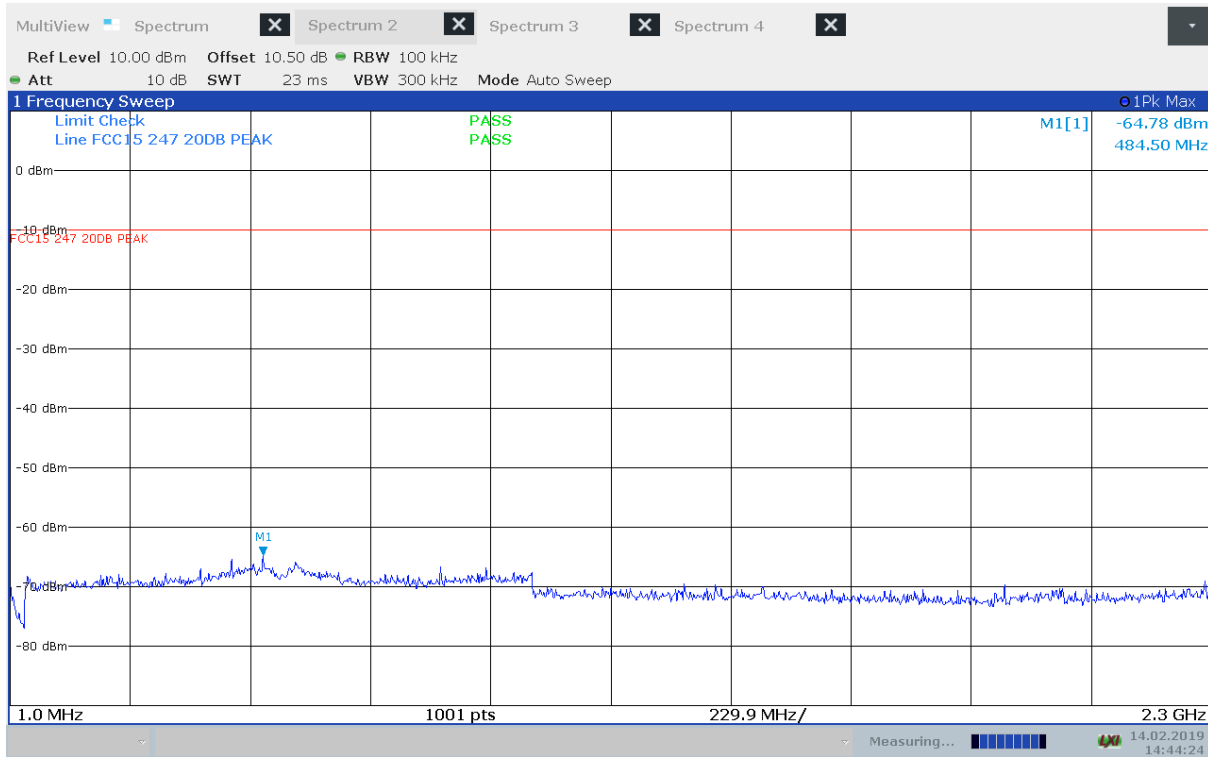
Conducted Emissions, 2300–2600 MHz, 2440MHz



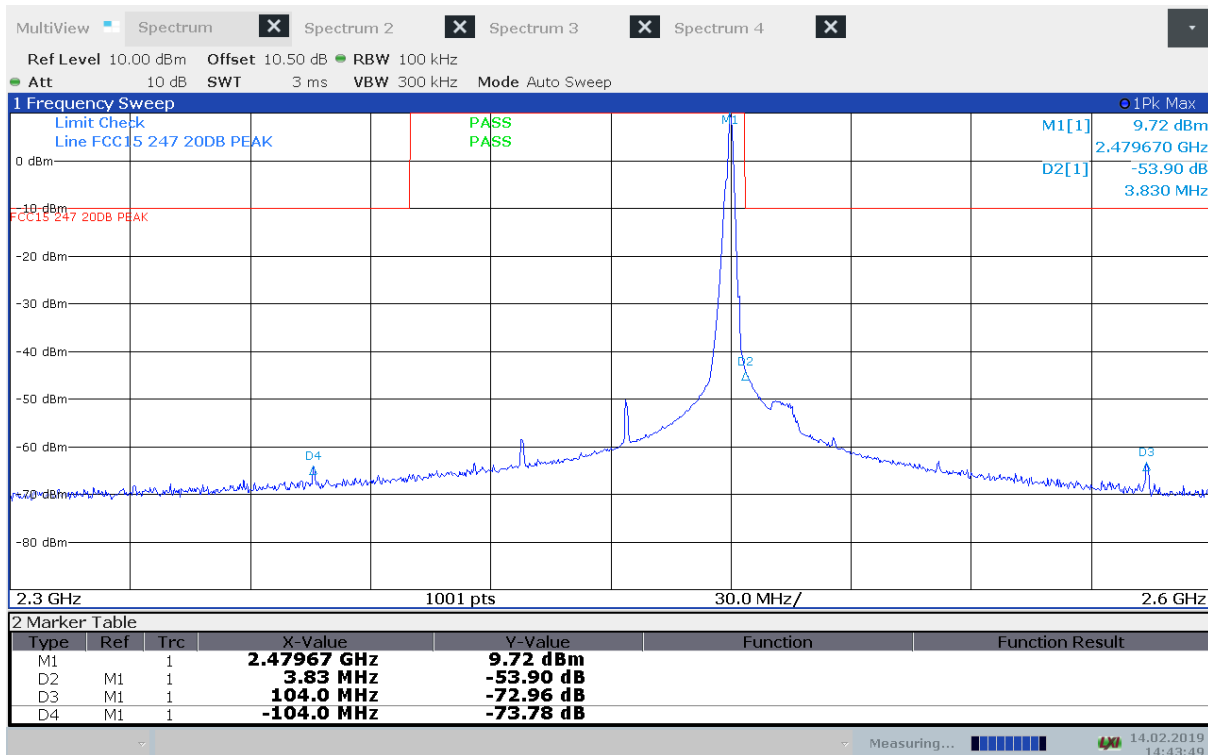
Conducted Emissions, 2600–12000 MHz, 2440MHz



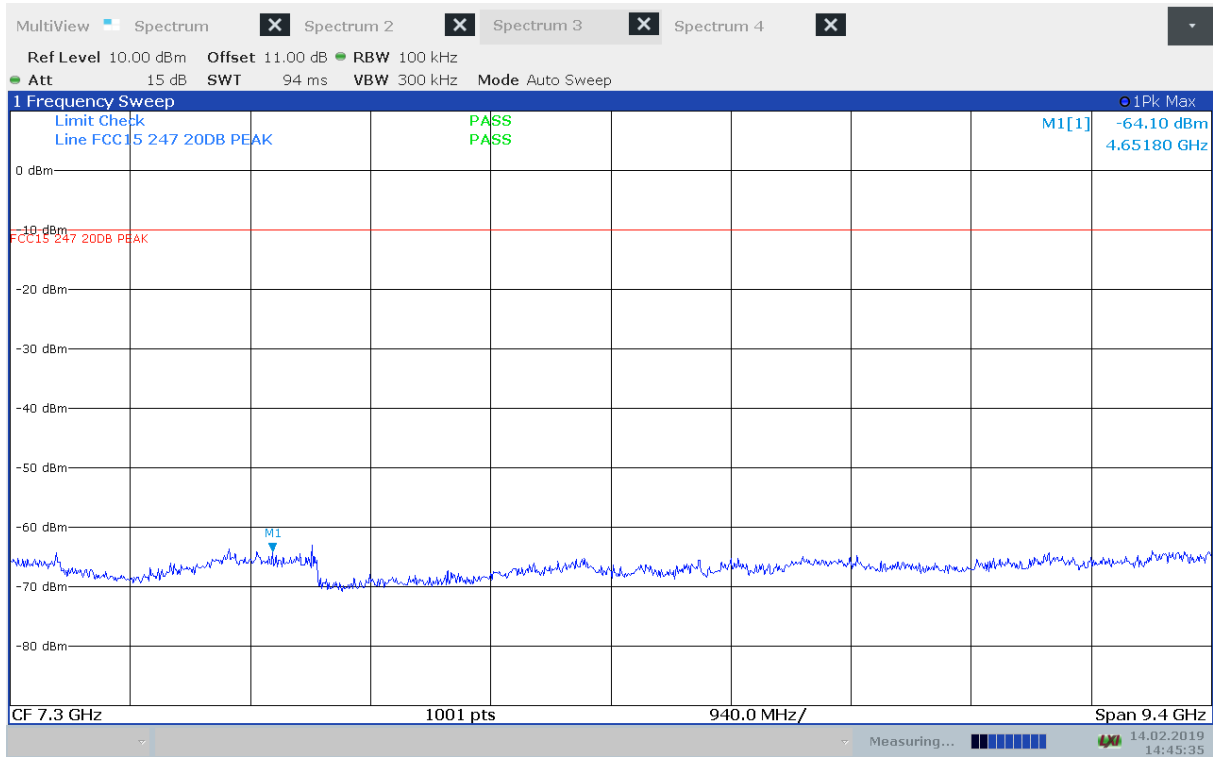
Conducted Emissions, 12000–26000 MHz, 2440MHz



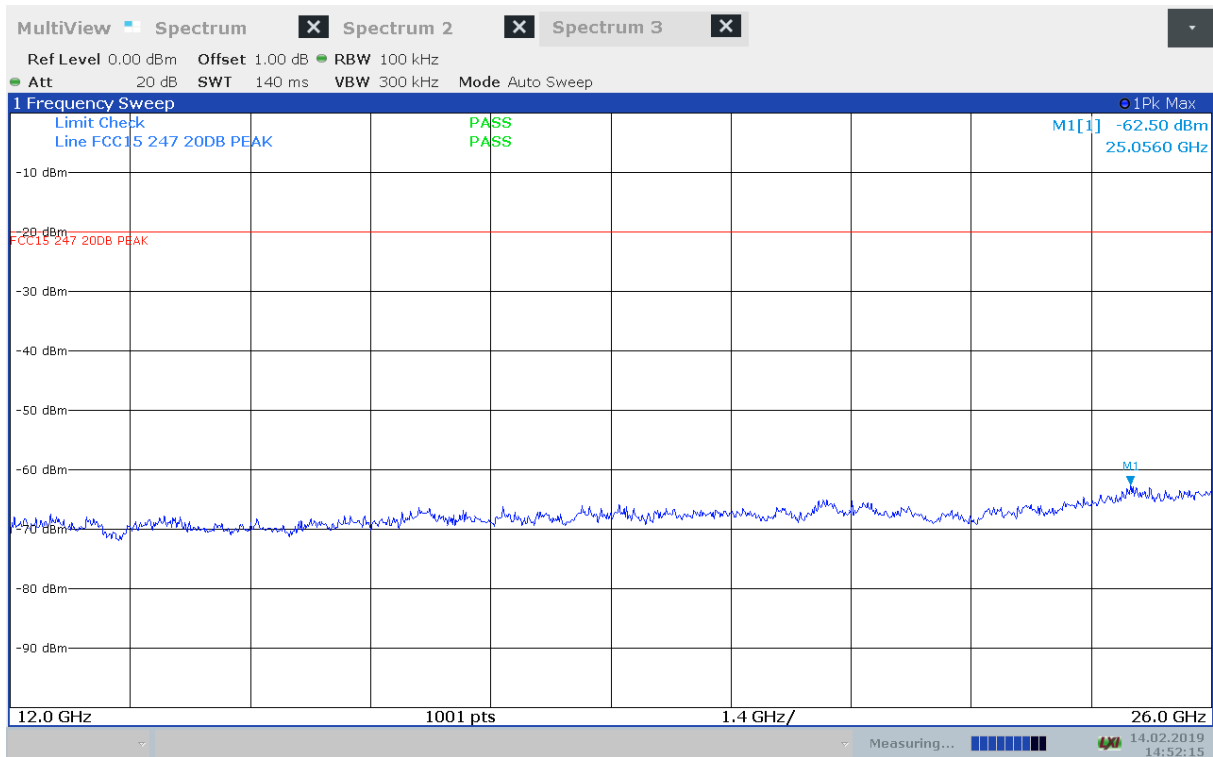
Conducted Emissions, 1–2300 MHz, 2480MHz



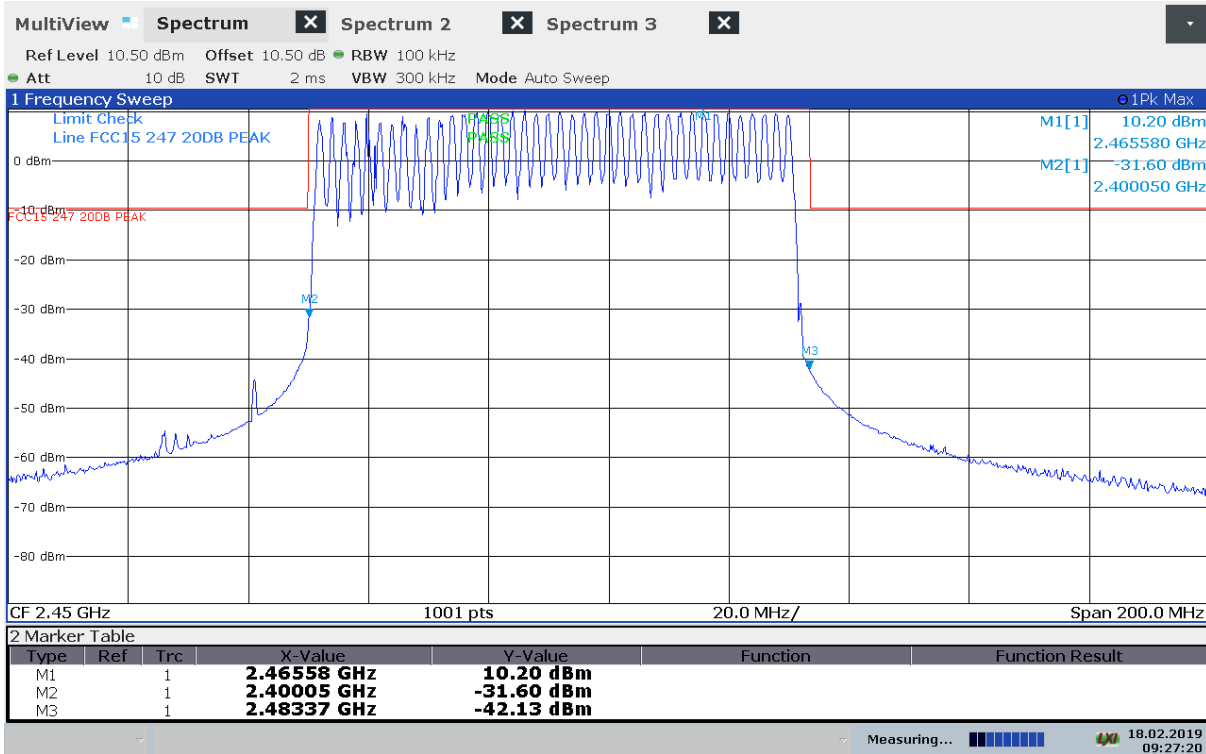
Conducted Emissions, 2300–2600 MHz, 2480MHz



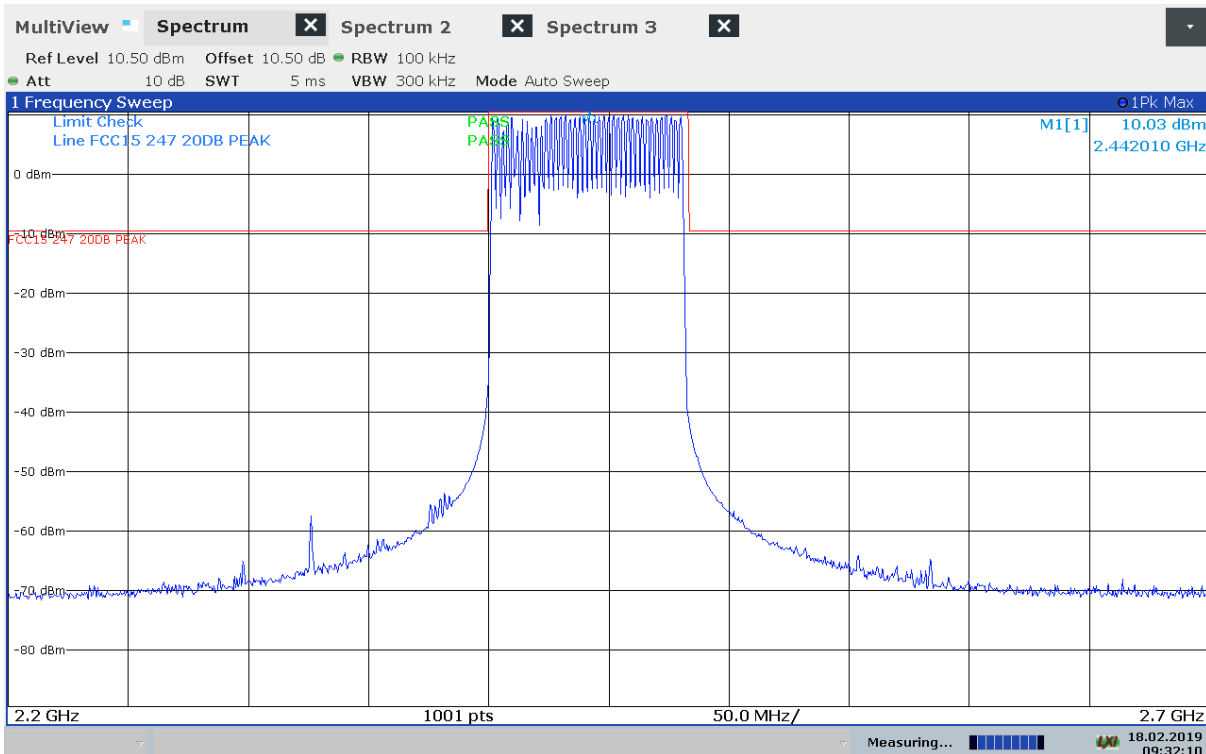
Conducted Emissions, 2600–12000 MHz, 2480MHz



Conducted Emissions, 12000–26000 MHz, 2480MHz



Conducted Emissions, 2350–2550 MHz, Hopping



Conducted Emissions, 2200–2700 MHz, Hopping

3.7 Restricted Bands of operation

Restricted Bands of operation for FCC and ISED are defined in FCC Part 15.205 and ISED RSS-GEN, Issue 4 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 (MHz)	FCC (GHz)	ISED (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.

3.8 Spurious Emissions (Radiated)

FCC Part 15.209

Test Results: **Complies**

Measurement Data:

	Measured field strength (dBµV/m)		Limit (dBµV/m)	Margin (dB)	
	2390 MHz	2483.5 MHz			
Peak Detector	63.2	72.5	74	10.8	1.5
Average Detector	43.2	52.5	54	10.8	1.5

Band Edge is measured with the EUT transmitting with Max Power on 2402 and 2480 MHz

In normal mode the EUT is always hopping with minimum 20 hopping channels when transmitting at Max Power.

Low Power is only used for Control Beacons, Control Beacons are transmitted on 2402, 2450 or 2480 MHz.

All Radiated Emissions tests were performed with the EUT transmitting on a fixed channel with Max Power.

Average values are calculated from Peak Values using the appropriate Duty Cycle correction factor.

See attached plots.

Duty Cycle Correction Factors

When transmitting at Max Power (2402 MHz to 2476 MHz):

$$\begin{aligned} \text{Correction Factor} &= -20 \times \log(\text{Sum of Bursts} / (\text{Frame Length} \times (\text{Min \# Hopping Channels} / \text{Bursts per frame}))) \\ &= -20 \times \log((0.140 + 3 \times 0.164) / (4.000 \times (20 / 4))) \text{ dB} = -20 \times \log(0.632 / 20) = 30.0 \text{ dB} \end{aligned}$$

Maximum Allowed Correction Factor = 20 dB

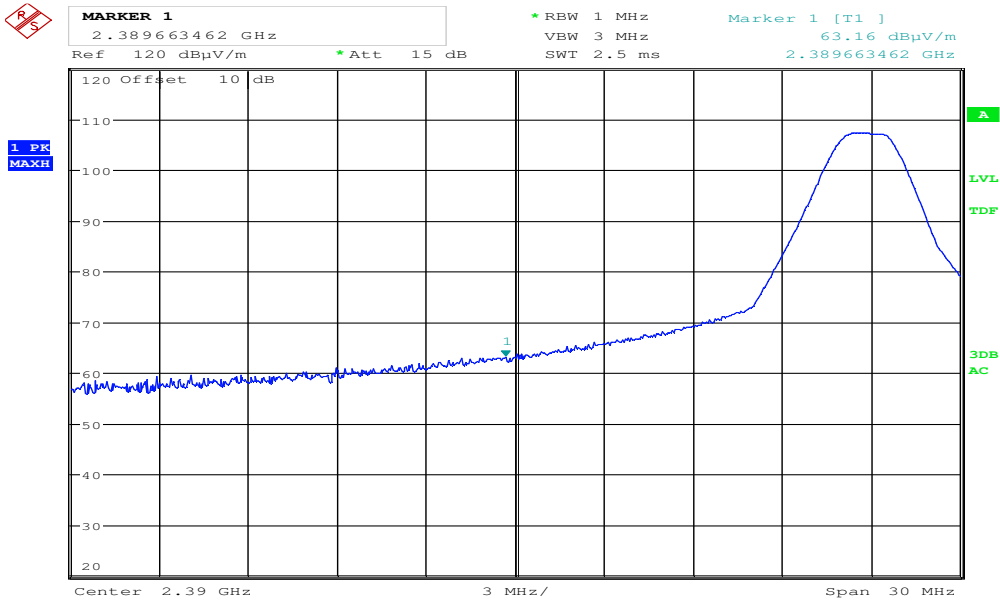
EUT Transmits one BEACON packet (140µs) and 3 AUDIO packets (164µs) per frame, for each packets the frequency is chosen randomly and equally. BEACON and AUDIO packets are transmitted at full power.

When transmitting at Low Power (2402, 2450 and 2480 MHz):

$$\begin{aligned} \text{Correction Factor} &= -20 \times \log(\text{Beacon Length} / \text{Frame Length}) \\ &= -20 \times \log(0.096 / 4.000) \text{ dB} = 32.4 \text{ dB} \end{aligned}$$

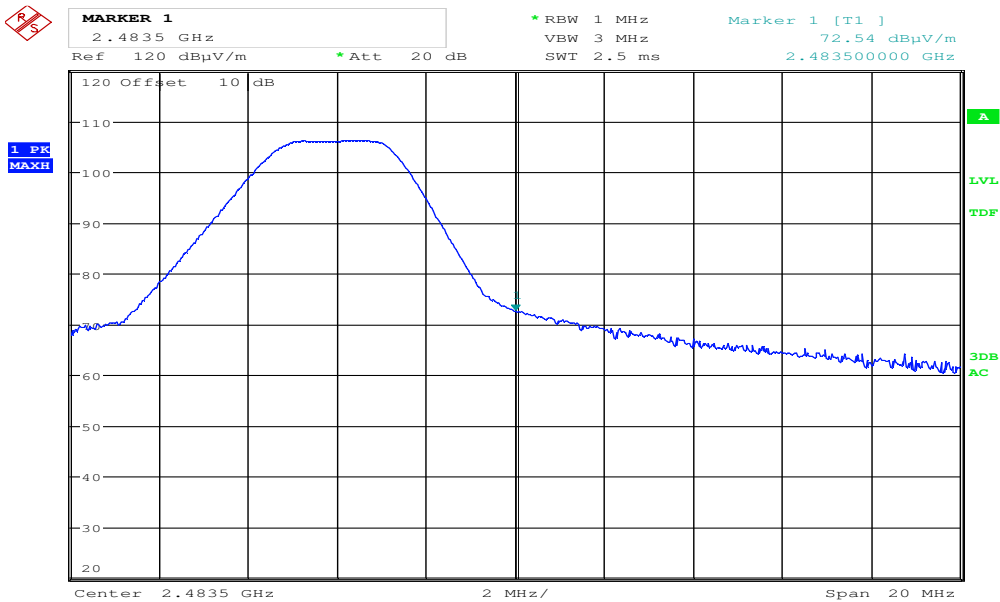
Maximum Allowed Correction Factor = 20 dB

EUT transmits one FHS (96µs) on each Control Channel (2402, 2450 and 2480 MHz) for every Frame. FHS packets are transmitted at low power



Date: 13.FEB.2019 12:35:27

Band Edge, Lower, Peak, 2402 MHz, Max Power



Date: 13.FEB.2019 13:16:54

Band Edge, Upper, Peak, 2480 MHz, Max Power

3.9 Radiated Emissions, below 1GHz

FCC 15.205, 15.209

ISED RSS-GEN, Issue 5, Clause 8.9

Test Results: Complies

Radiated emission 30–1000 MHz

Measuring distance 3 m.

Tested in test mode with EUT transmitting on 3 hopping channels.

All measurements were performed with the EUT transmitting at Max Power.

Measured values:

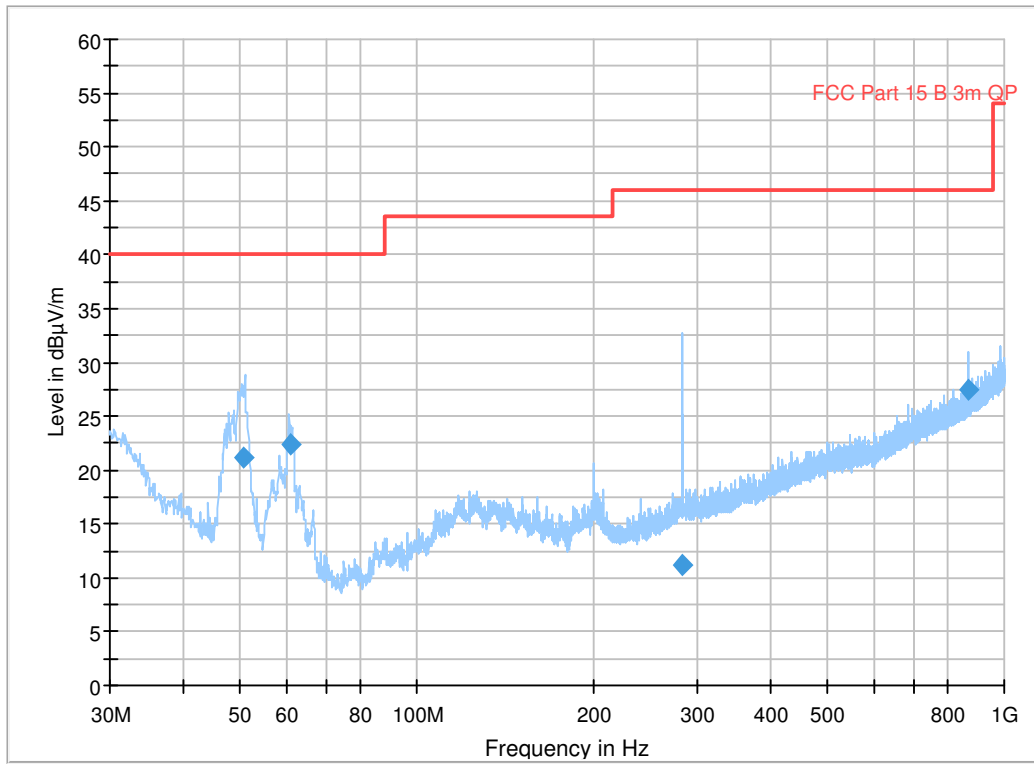
Frequency (MHz)	QuasiPeak (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
50.838750	21.10	40.00	18.90	1000.0	120.000	105.0	V	328.0
60.896750	22.34	40.00	17.66	1000.0	120.000	103.0	V	254.0
282.866500	11.25	46.00	34.75	1000.0	120.000	107.0	H	206.0
869.534300	27.43	46.00	18.57	1000.0	120.000	380.0	V	36.0

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	
	Radiated emission limit @3 meters	
Frequency (MHz)	Quasi Peak (μ V/m)	Quasi Peak (dB μ V/m)
30–88	100	40.0
88–216	150	43.5
216–960	200	46.0
Above 960	500	54.0

Full Spectrum



3.10 Radiated Emissions, above 1GHz

FCC 15.205, 15.209

ISED RSS-GEN, Issue 5, Clause 8.9

Test Results: Complies

Measurement Data:

Radiated Emissions, 1–26 GHz

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

Measured values:

Frequency (MHz)	Channel	Polarization	Peak (dBµV/m)	Average (dBµV/m)	Peak Margin (dB)	Av Margin (dB)
all	Mid	V/H	< 55	< 44	>19	>10

All measurements were performed with the EUT transmitting at Max Power.

All Peak values are more than 12 dB below the limit.

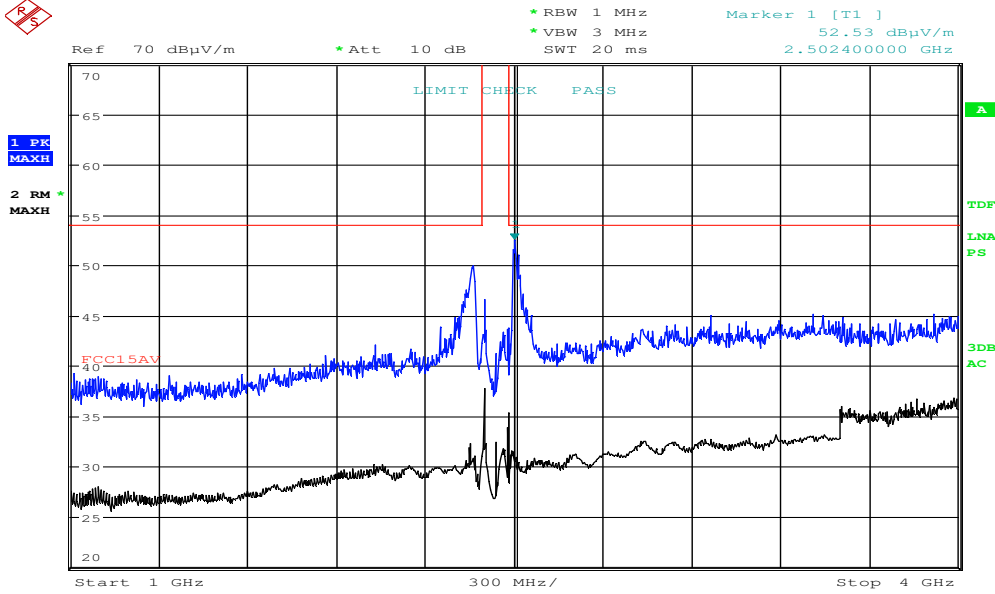
Average Values are calculated from Peak Values by Duty Cycle Correction Factor.

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

See plots.

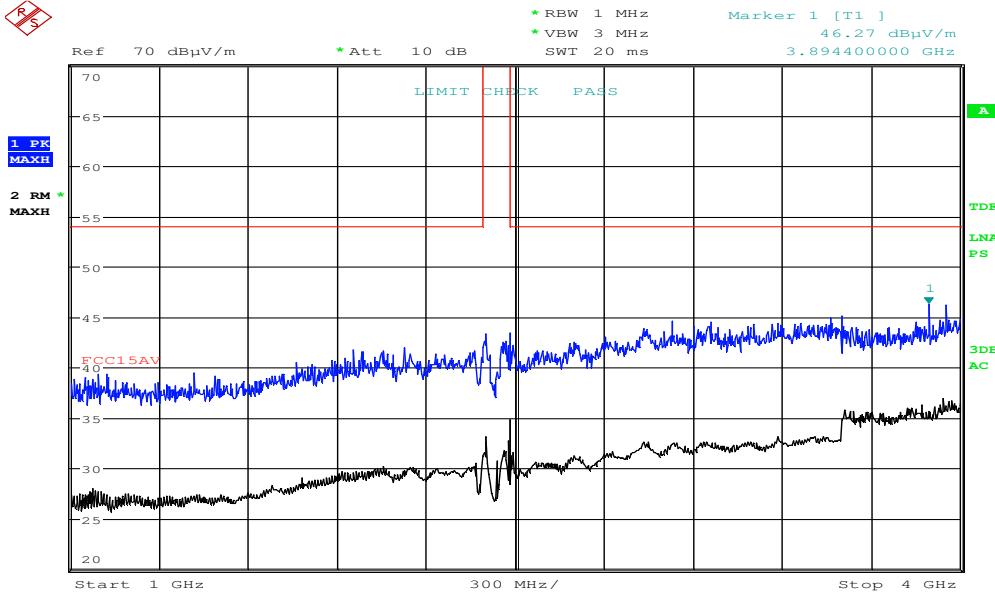
Requirements/Limit

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 (MHz)	AV (dBµV/m)	Peak (dBµV/m)
Above 1 GHz	54.0	74.0



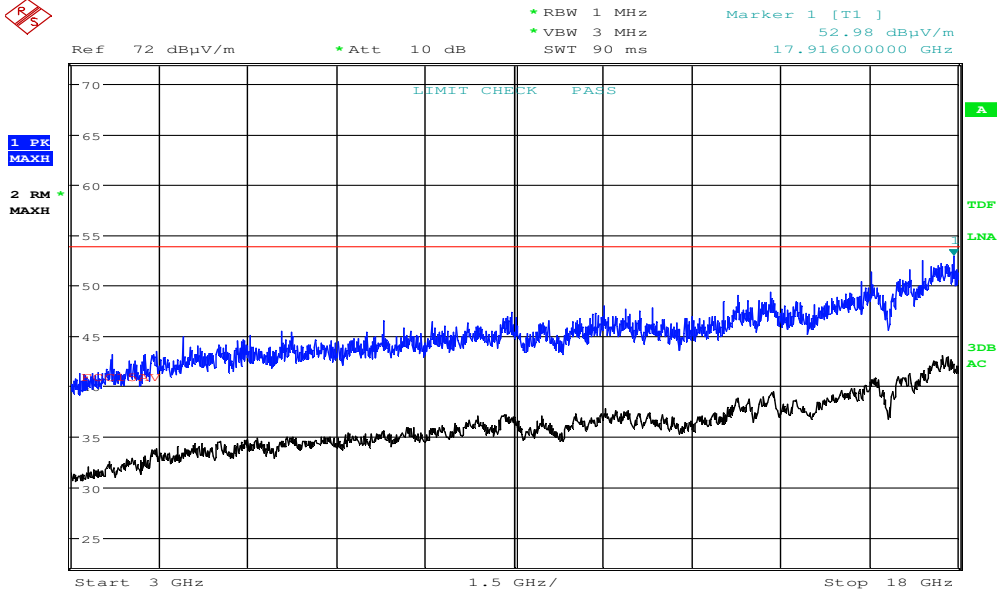
Date: 13.FEB.2019 14:31:01

Radiated Emissions, 1000 – 4000 MHz, EUT V, VP



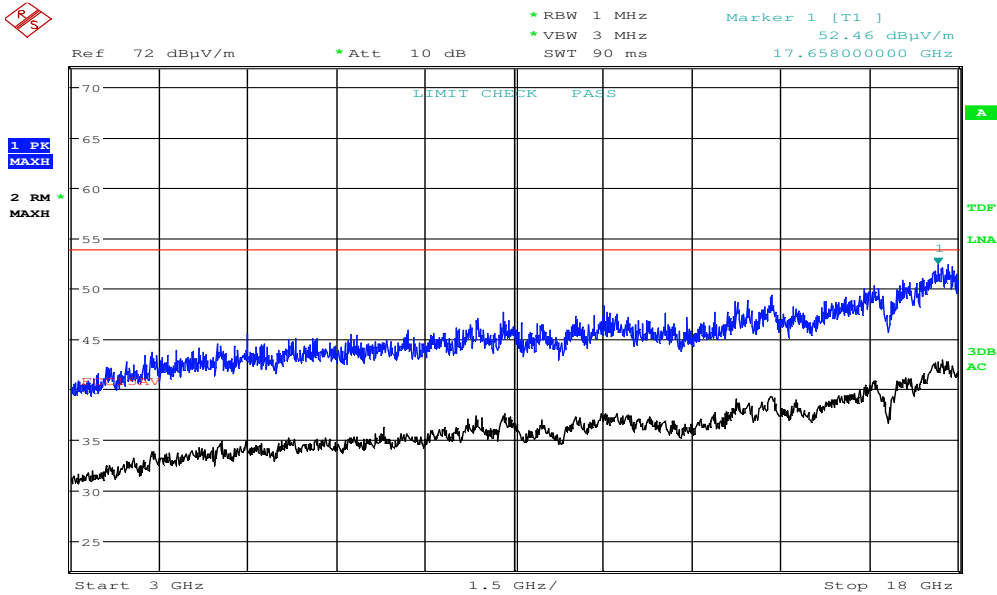
Date: 13.FEB.2019 14:32:57

Radiated Emissions, 1000 – 4000 MHz, EUT V, HP



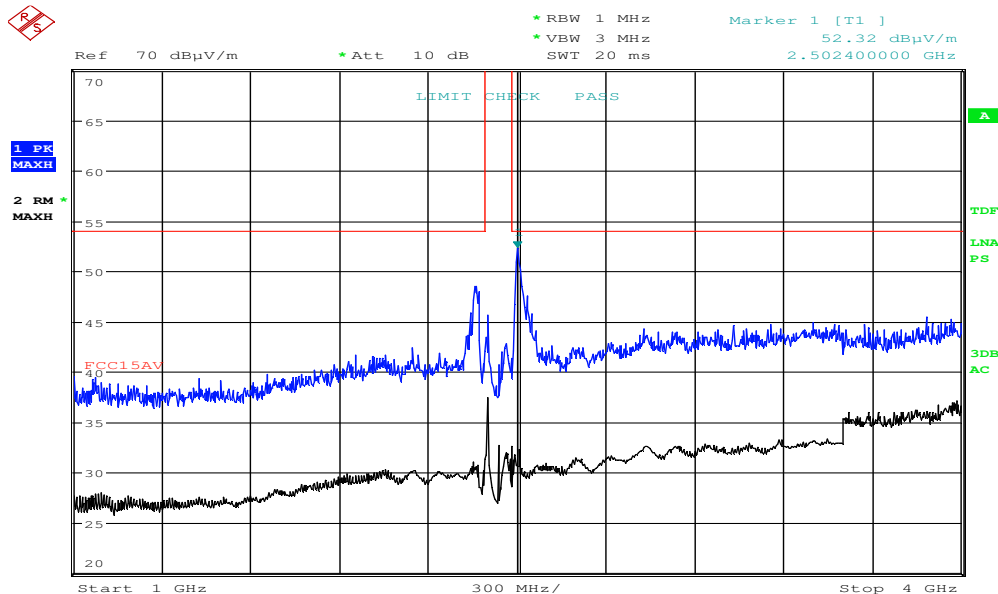
Date: 13.FEB.2019 13:45:13

Radiated Emissions, 3000 – 18000 MHz, EUT V, VP



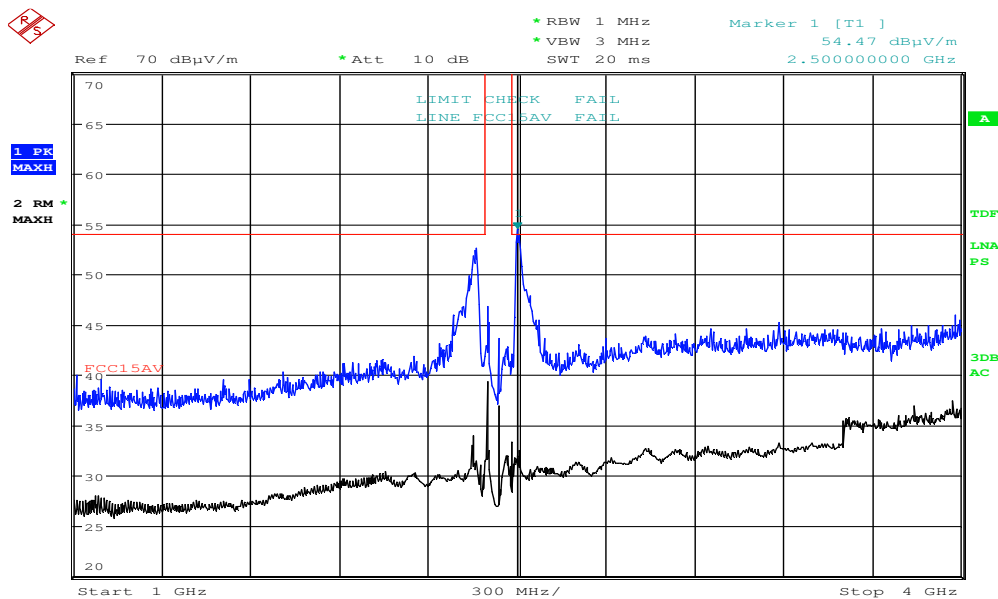
Date: 13.FEB.2019 13:56:17

Radiated Emissions, 3000 – 18000 MHz, EUT V, HP



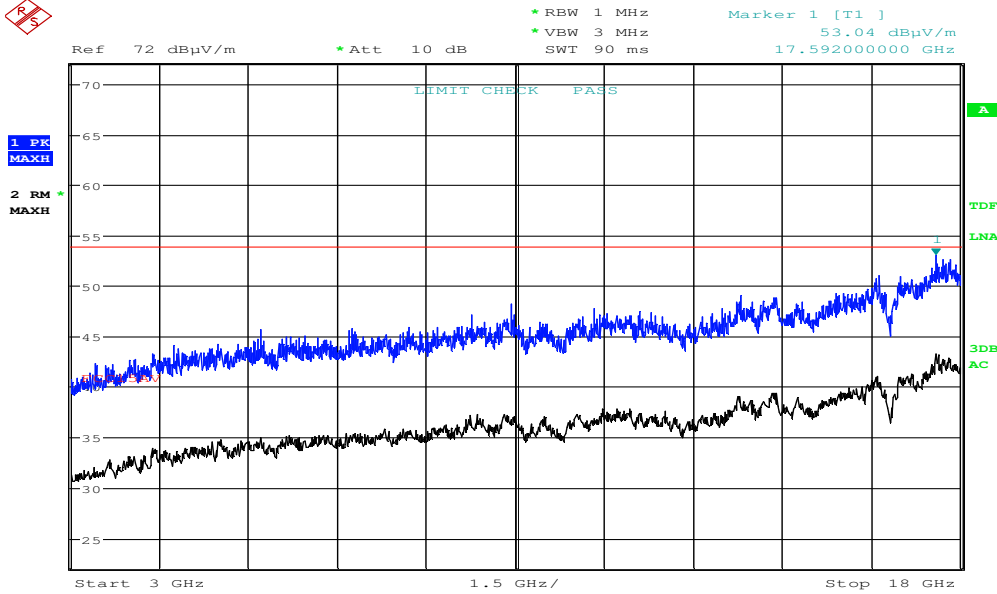
Date: 13.FEB.2019 14:14:46

Radiated Emissions, 1000 – 4000 MHz, EUT H1, VP



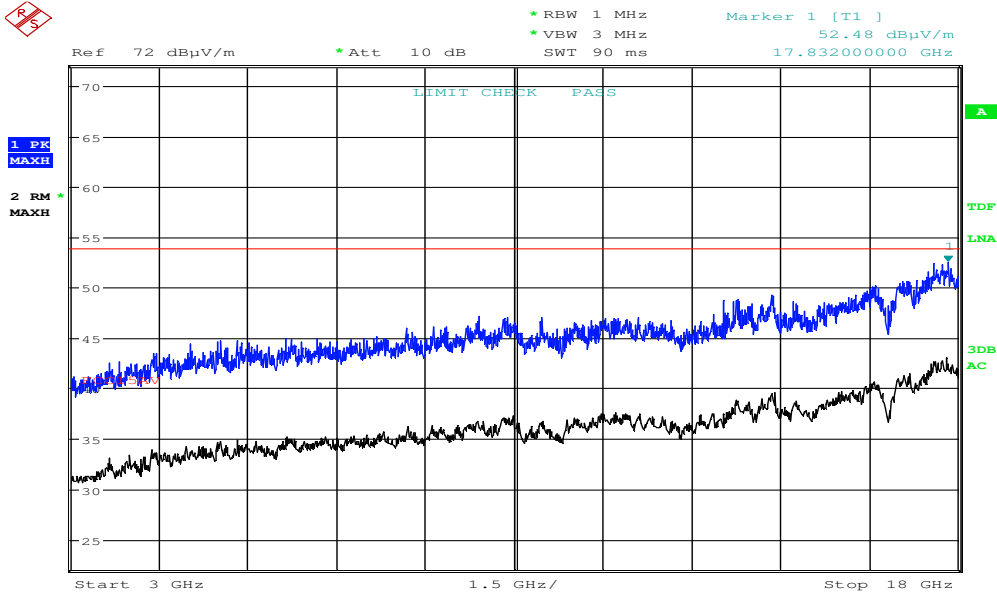
Date: 13.FEB.2019 14:18:23

Radiated Emissions, 1000 – 4000 MHz, EUT H1, HP



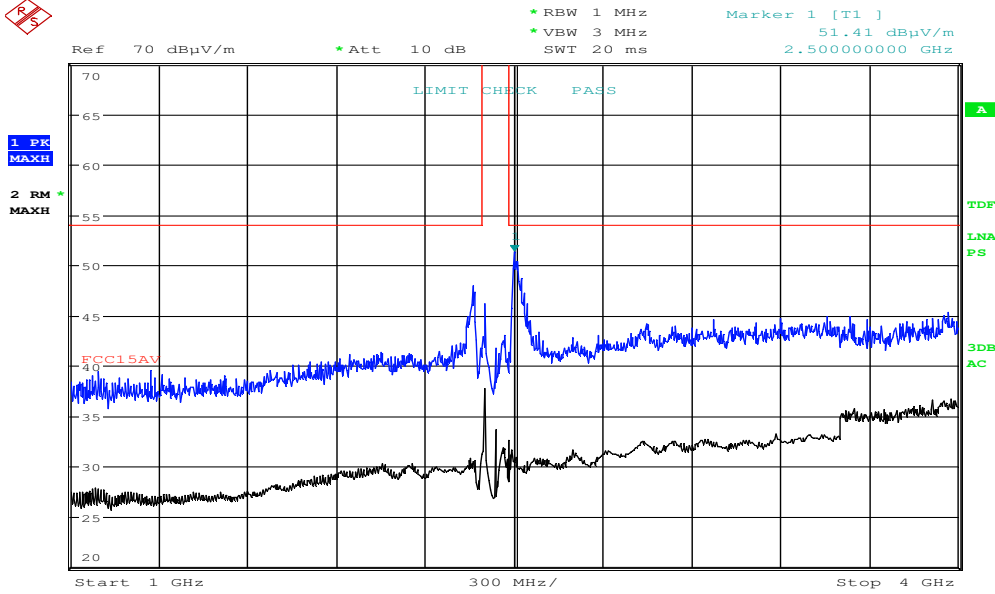
Date: 13.FEB.2019 13:39:30

Radiated Emissions, 3000 – 18000 MHz, EUT H1, VP



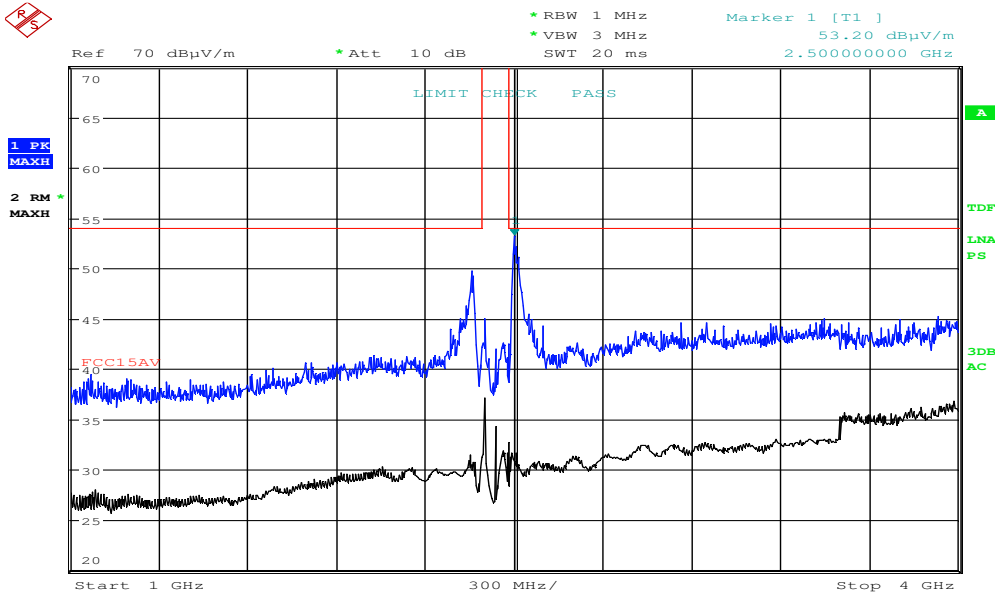
Date: 13.FEB.2019 13:41:24

Radiated Emissions, 3000 – 18000 MHz, EUT H1, HP



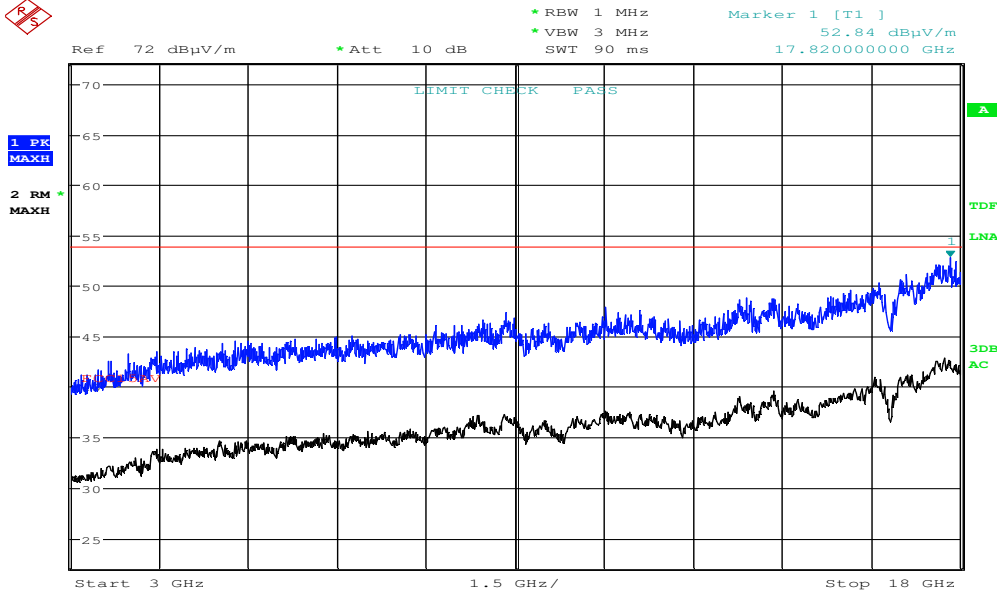
Date: 13.FEB.2019 14:25:19

Radiated Emissions, 1000 – 4000 MHz, EUT H2, VP



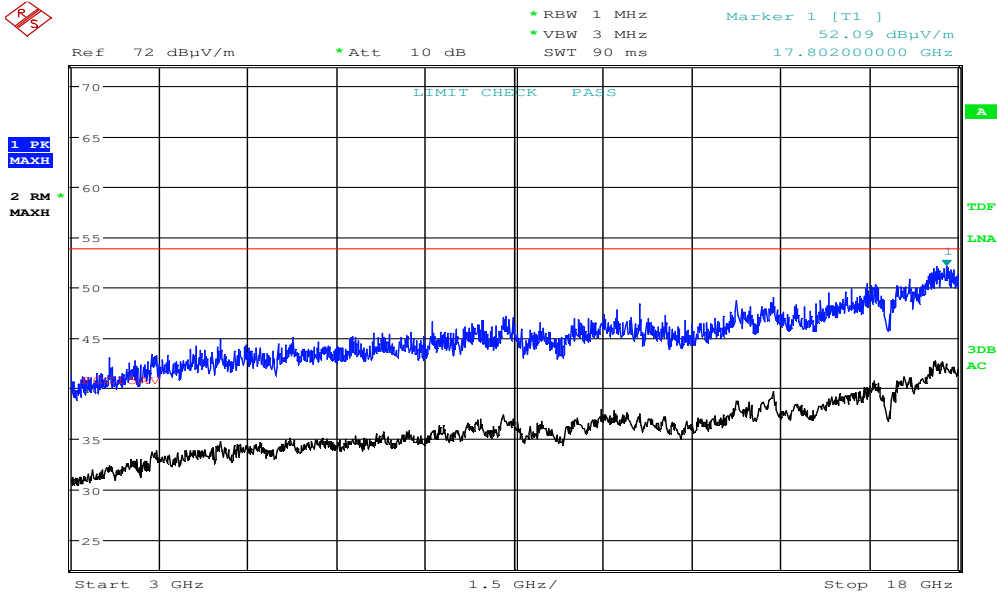
Date: 13.FEB.2019 14:27:14

Radiated Emissions, 1000 – 4000 MHz, EUT H2, HP



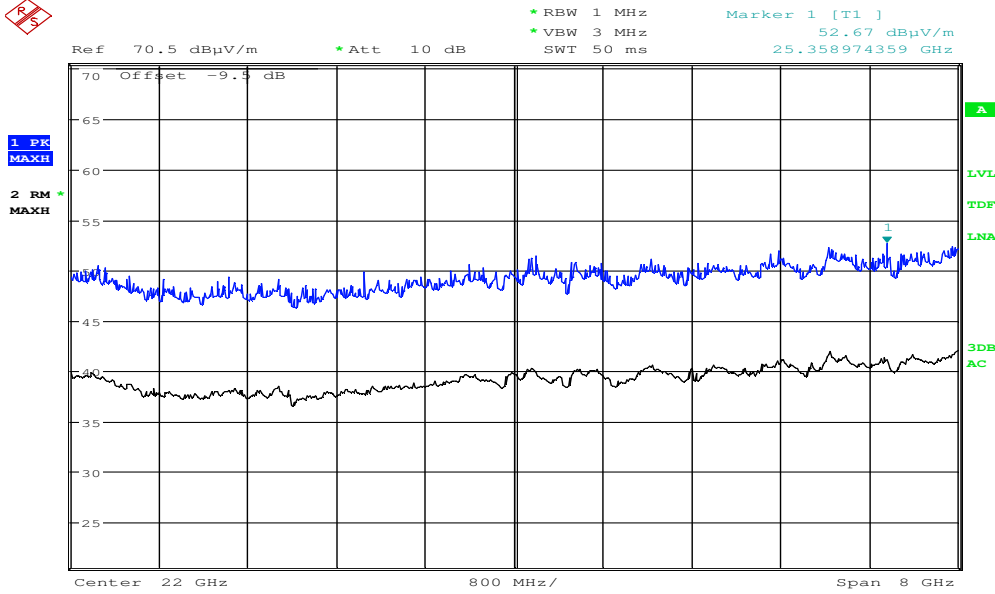
Date: 13.FEB.2019 13:21:26

Radiated Emissions, 3000 – 18000 MHz, EUT H2, VP



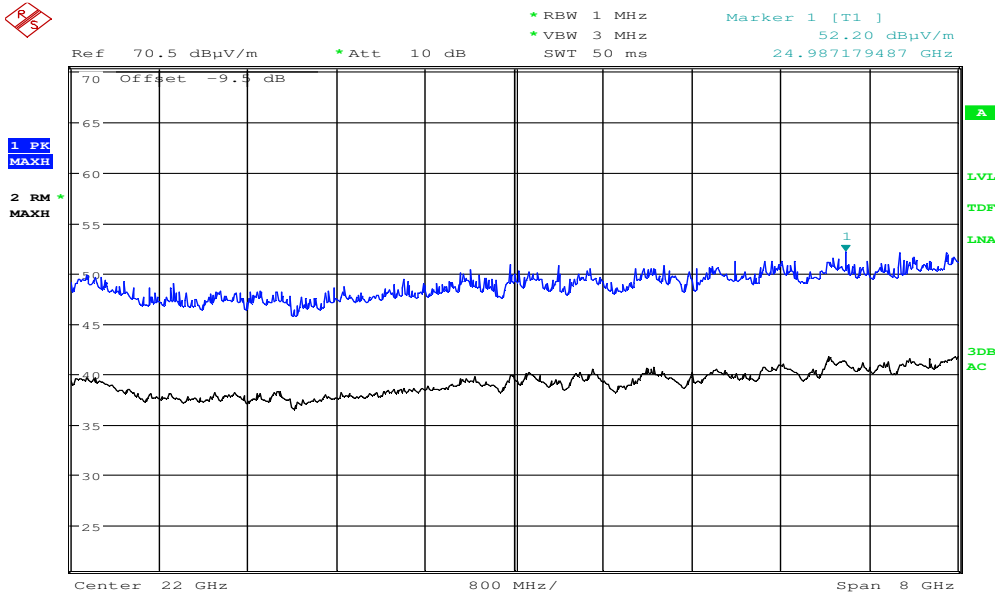
Date: 13.FEB.2019 13:23:20

Radiated Emissions, 3000 – 18000 MHz, EUT H2, HP



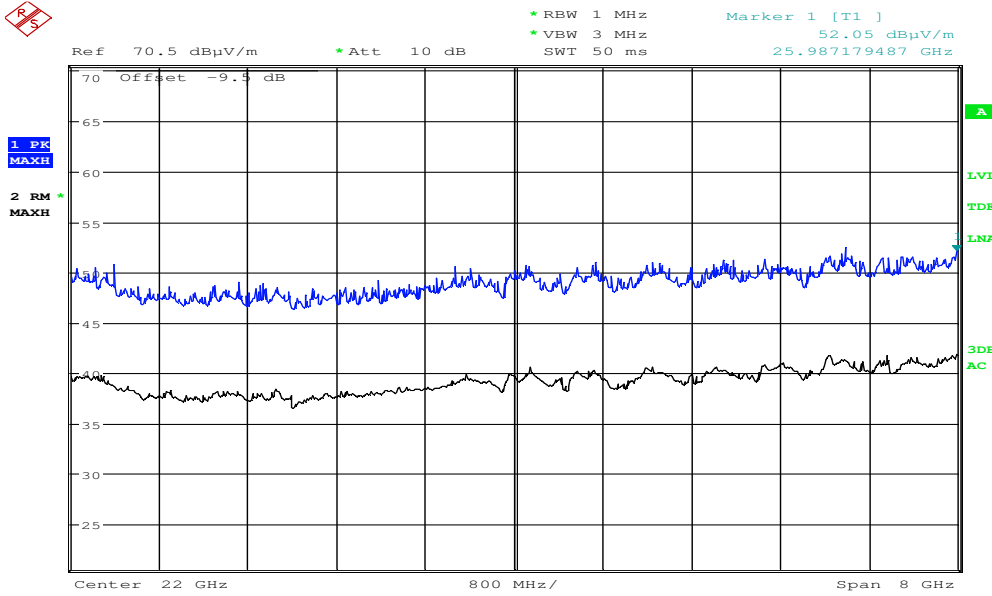
Date: 13.FEB.2019 15:37:40

Radiated Emissions, 18 – 26 GHz, EUT V, VP, @1m



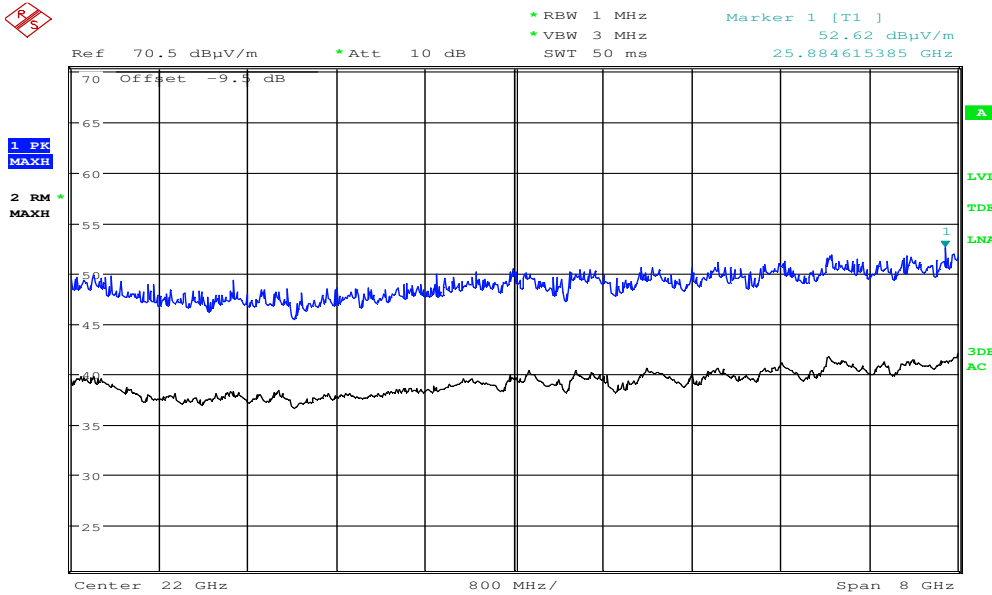
Date: 13.FEB.2019 15:40:01

Radiated Emissions, 18 – 26 MHz, EUT V, HP, @1m



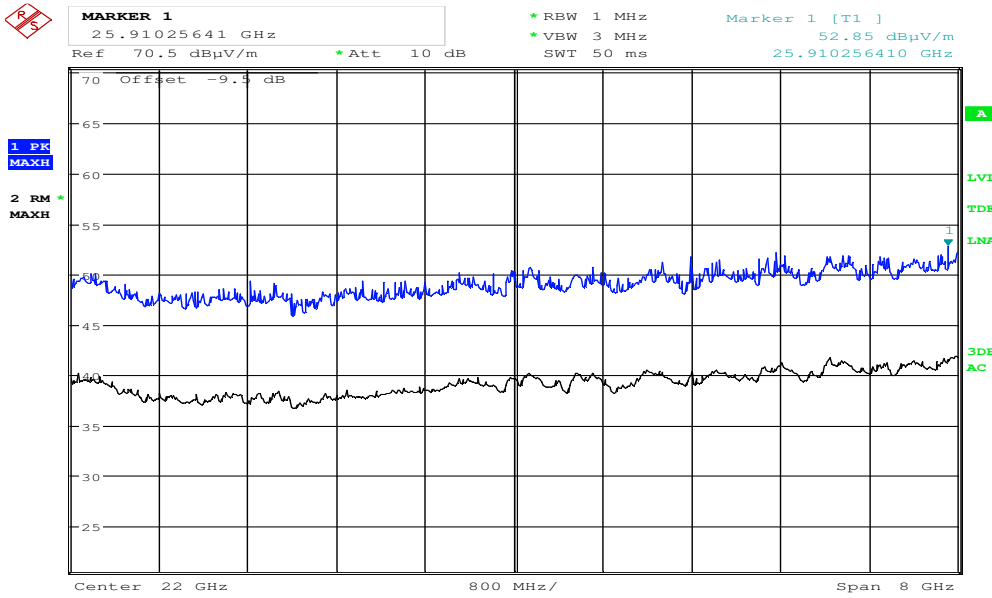
Date: 13.FEB.2019 15:42:38

Radiated Emissions, 18 – 26 GHz, EUT H1, VP, @1m



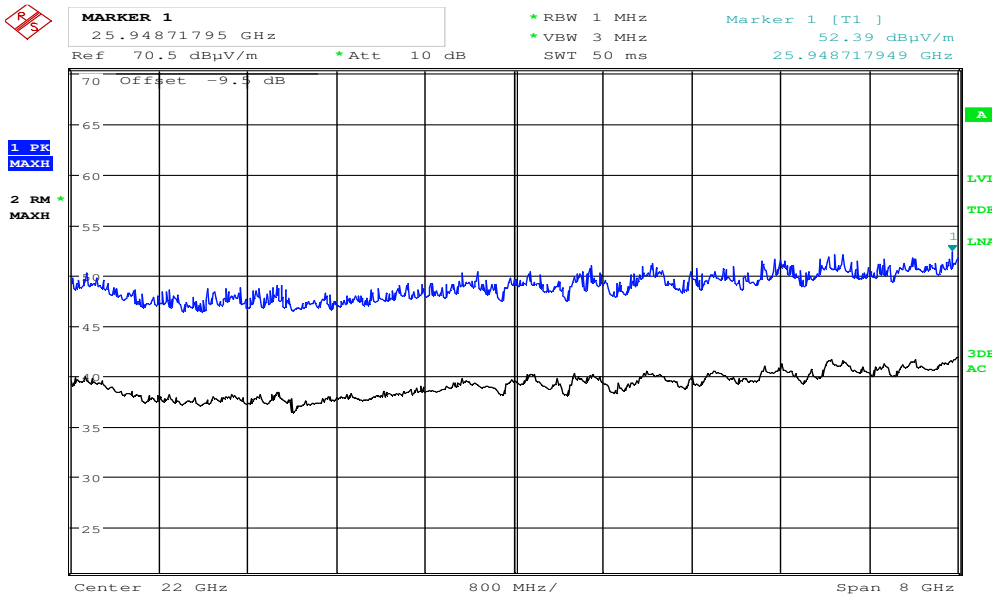
Date: 13.FEB.2019 15:41:27

Radiated Emissions, 18 – 26 MHz, EUT H1, HP, @1m



Date: 13.FEB.2019 15:44:38

Radiated Emissions, 18 – 26 GHz, EUT H2, VP, @1m



Date: 13.FEB.2019 15:45:51

Radiated Emissions, 18 – 26 MHz, EUT H2, HP, @1m

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	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	2016-05	2019-05
6	317	Preamplifier	Sonoma Inst.	LR 1687	2018-07	2019-07
7	3115	Horn Antenna	EMCO	LR 1330	2016-10	2019-10
8	3117-PA	Horn Antenna with Preamp	EMCO	LR 1717	2017-12	2019-12
9	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2018-07	2019-07
10	638	Horn Antenna	Narda	LR 1480	2010-06	2020-06
11	WRCG2400/2483.5	Band Reject Filter	Wainwright Inst.	LR 1530	COU	
12	Model 87 V	Multimeter	Fluke	LR 1597	2018.02	2019.02
13	6812B	AC Power Source	Agilent	LR 1515	COU	
14	ENV216	Two Line V-Network	Rohde & Schwarz	LR 1665	2017.11	2019.11
15	ESC13	Measuring Receiver	Rohde & Schwarz	N-4259	2017.10	2019.10
16	ST18/SMA/N/36	RF Cable	Suhner	LR 1627	COU	
17	SF102/1000MM	RF Cable	Suhner	SN 50113/2	COU	
18	SF102/2000MM	RF Cable	Suhner	SN 500100/2	COU	

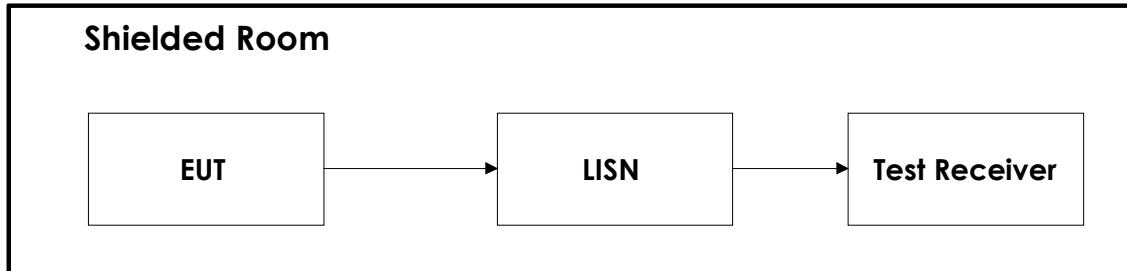
COU - Calibrate ON Use; N/A – Not Applicable

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

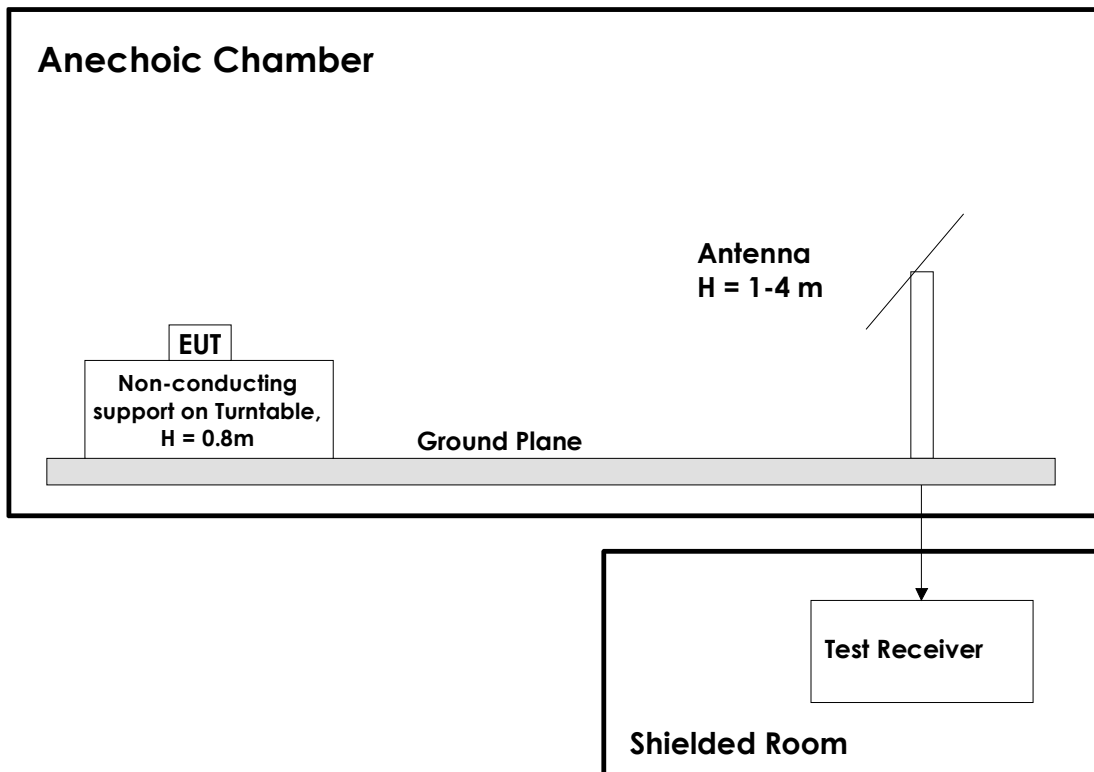
No.	Manufacturer	Name	Version	Comment
1	Rohde & Schwarz	EMC32	10.20.10	Power Line Conducted test software
2	Rohde & Schwarz	EMC32	10.20.10	Radiated Emission test software
3	Rohde & Schwarz	GPBShot	2.7	Screenshots from R&S Spectrum Analyzers

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. The measuring distance 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, and High-Pass filter is used for all harmonics.

Revision history

Version	Date	Comment	Sign
1.0	2019-02-26	First edition	FS