Report No. 349542-7

Test Report

Product	Module with WLAN and Bluetooth
Name and address of the applicant	Cisco Systems, Inc. 170 West Tasman Drive San Jose, CA 95134, USA
Name and address of the manufacturer	Cisco Systems, Inc. 170 West Tasman Drive San Jose, CA 95134, USA
Model	P3310
Rating	Mains (100-240V 50/60 Hz)
Trademark	Cisco
Serial number	/
Additional information	Bluetooth, WLAN 2x2 802.11a/b/g/n/ac
Tested according to	**FCC Part 15.247** Frequency Hopping Transmitters / Digital Transmission Systems **Industry Canada RSS-247, Issue 2** Low Power Licence-Exempt Radiocommunications Devices
Order number	349542
Tested in period	2018.05.24 and 2018.06.04
Issue date	2018.07.10
Name and address of the testing laboratory	Nemko Instituttveien 6 Kjeller, Norway SITE NUMBER: FCC: NO0001 IC: 2040D-1 ilac-MRA NORWEGIAN ACCREDITATION TEST 033 **An accredited technical test executed under the Norwegian accreditation scheme**

Prepared by [Frode Sveinsen]	Approved by [Jan G. Eriksen]

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ENTERPRISE NUMBER NO974404532

CONTENTS

1 INFORMATION

1.1 Test Item

Name	CISCO
Model/version	P3310
FCC ID	LDKNVTX221737
Industry Canada ID	2461N-NVTX21737
Serial number	/
Hardware identity and/or version	/
Software identity and/or version	/
Frequency Range	2402 – 2480 MHz
Number of Channels	Bluetooth Low energy: 40 Bluetooth: 79
Operating Modes	Bluetooth and Bluetooth Low Energy
Type of Modulation	GFSK, π/4-DQPSK, 8DPSK
Output Power	Basic GFSK: 7.33 mW Enhanced 8PSK: 6.71 mW BLE: 3.36 mW
Antenna Connector	Patch Antennas connected to radio module by U-FL connector
Number of antennas	1
Antenna Diversity Supported	No
Power Supply	Mains powered (integral power supply)

Description of Test Item

The EUT is a certified radio module with WiFi and Bluetooth transceivers, this test report contains data for new antennas.

1.2 Normal test conditions

Temperature:	20 – 25 °C
Relative humidity:	20 - 50 %
Normal test voltage:	120V 60Hz

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 Rationale

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: U-FL connector

Ref. FCC §15.203

1.7 Comments

This report covers only limited radiated tests to show compliance with the new antenna in this EUT. All other radio tests for DSS are covered by UL reports no. 11526345-E1V2.

Radio tests for BLE are covered by UL report no. 11526345-E2V2. Output Power when operating in BLE mode is lower than in normal BT mode, therefore spurious emissions are only measured in BT mode.

All tests were performed with the antennas placed on the non-conducting support table with the radio module P3310 mounted in a TTC6-13 Digital Video Codec.

2 TEST REPORT SUMMARY

2.1 General

All measurements are tracable to national standards.

The tests were conducted for demonstrating compliance with FCC CFR 47 Part 15, paragraph 15.247 and ISED RSS-247 Issue 2.

Tests were performed in accordance with ANSI C63.4-2014 and and ANSI C63.10-2013.

Radiated tests were made in a semi-anechoic chamber at measuring distances of 1 m and 3 m.

A description of the test facility is on file with the FCC and Industry Canada.

☐ New Submission ☒ Production Unit

☒ Class II Permissive Change ☐ Pre-production Unit

DSS Equipment Code* ☐ Family Listing

*Equipment Code for BLE mode is DTS

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”.

2.2 Test Summary

Name of test	FCC Part 15 reference	RSS-247 Issue 1, RSS-GEN Issue 5 reference	Result
Supply Voltage Variations	15.31(e)	N/A	N/A[1]
Number of Operating Frequencies	15.31(m)	5.1 (6) (RSS-247)	N/A[1]
Antenna Requirement	15.203	6.8 (RSS-GEN)	N/A
Power Line Conducted Emission	15.107(a) 15.207(a)	8.8 (RSS-GEN)	N/A
Channel Separation	15.247(a)(1)	5.1 (4) (RSS-247)	N/A[1]
Pseudorandom Hopping Algorithm	15.247(a)(1)	5.1 (3) (RSS-247)	N/A[1]
Time of Occupancy	15.247(a)(1)(iii)	5.1 (5) (RSS-247)	N/A[1]
Occupied Bandwidth	N/A	6.7 (RSS-GEN)	N/A[1]
20dB Bandwidth	15.247(a)(1)	5.1 (RSS-247)	N/A[1]
Peak Power Output	15.247(b)	5.4 (RSS-247)	N/A[1]
Spurious Emissions (Antenna Conducted)	15.247(c)	5.5 (RSS-247)	N/A[1]
Spurious Emissions (Radiated)	15.247(c) 15.109(a) 15.209(a)	5.5 (RSS-247) 6.13 (RSS-GEN) 8.9 (RSS-GEN)	Complies

[1] Not Applicable for Class II Permissive Change application

3 TEST RESULTS

3.1 Band Edge Emissions (Radiated)

FCC 15.205, 15.209

ISED RSS-GEN Issue 5, Clause 8.9

Test Results: Complies

Measurement Data:

Modulation	Detector	Measured field strength (dBµV/m @3m)		Limit	Margin	
		2390 MHz	2483.5 MHz	(dBµV/m)	(dB)	
GFSK	Peak	41.8	45.7	74	32.2	28.3
	Average	21.8	25.7	54	32.2	28.3
8PSK	Peak	41.6	46.0	74	32.4	28.0
	Average	21.6	26.0	54	32.4	28.0

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

Values for QPSK and 8PSK were the same

The modulation scheme did not affect the result at Lower Band Edge.

See attached plots.

Duty Cycle Correction Factor Calculation:

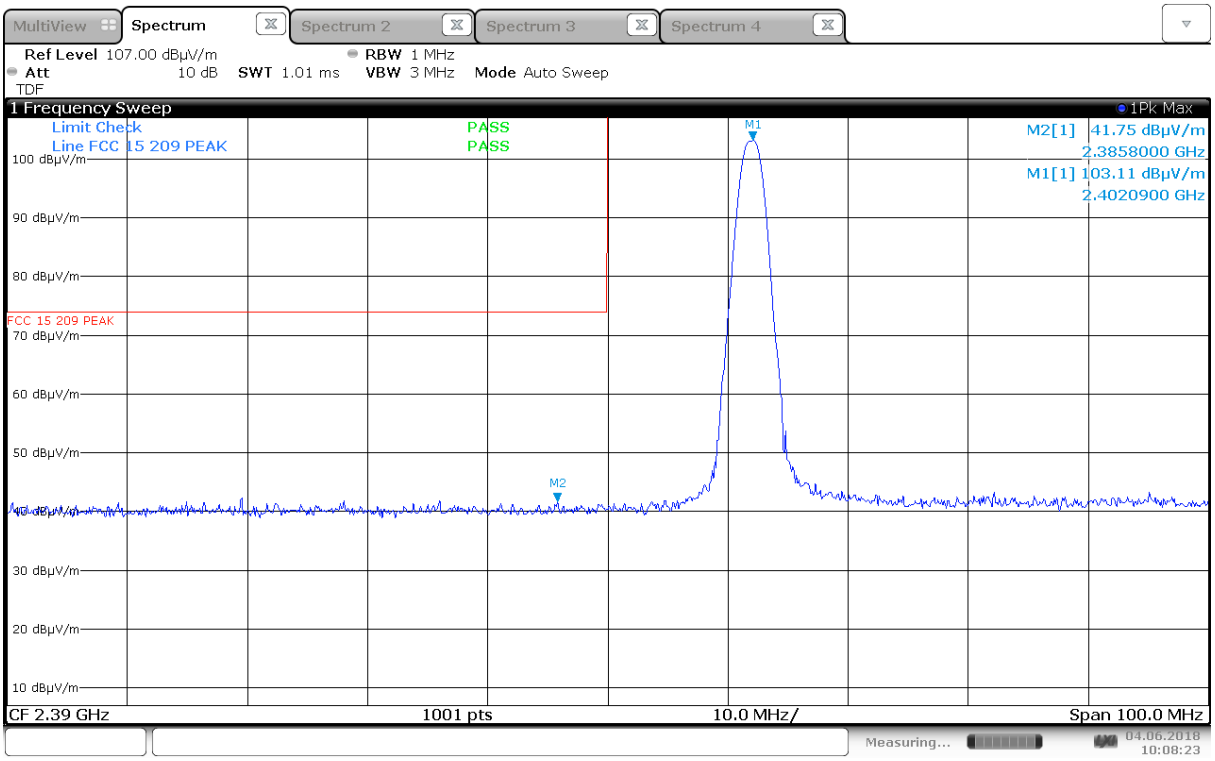
Calculated from values in UL report no. 11526345-E1V2.

Mode	On Time (ms)	Period (ms)	Duty Cycle (linear)	Number of Hopping Channels	Calculated Duty Cycle Correction Factor (dB)	Duty Cycle Correction Factor (dB)
GFSK	2.870	3.757	0.764	79	40.2	20
8PSK	1.062	3.745	0.284	79	49.1	20

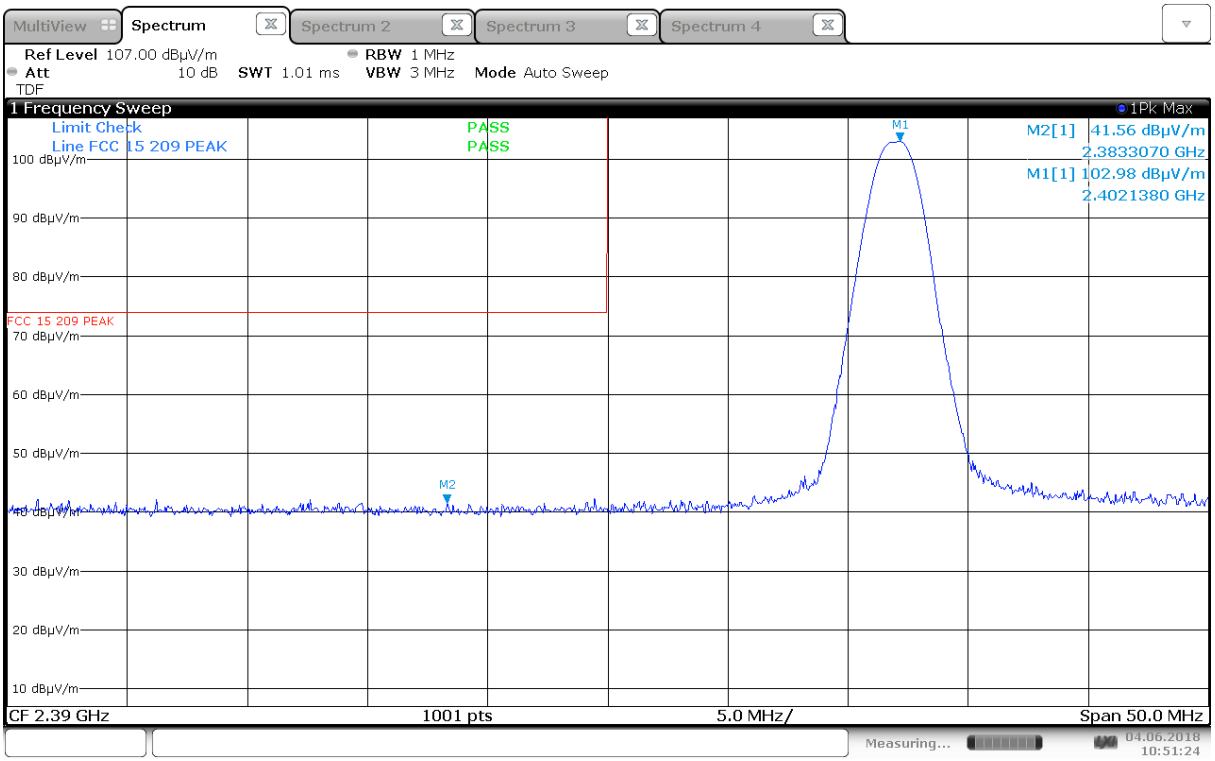
Duty Cycle Correction factor = -20 x log(Duty Cycle/Number of Hopping Channels)

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

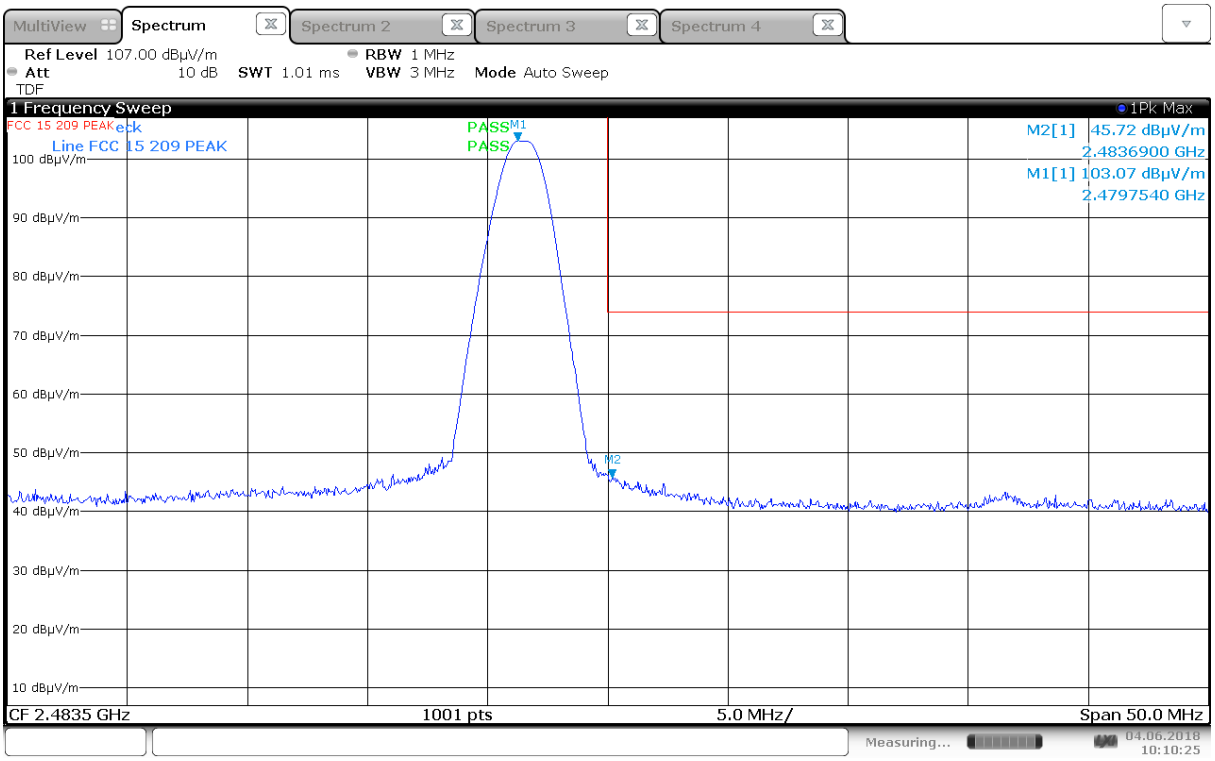
Correction Factors above are used with field strength values and are valid when EUT is operating in hopping mode with 79 hopping channels.



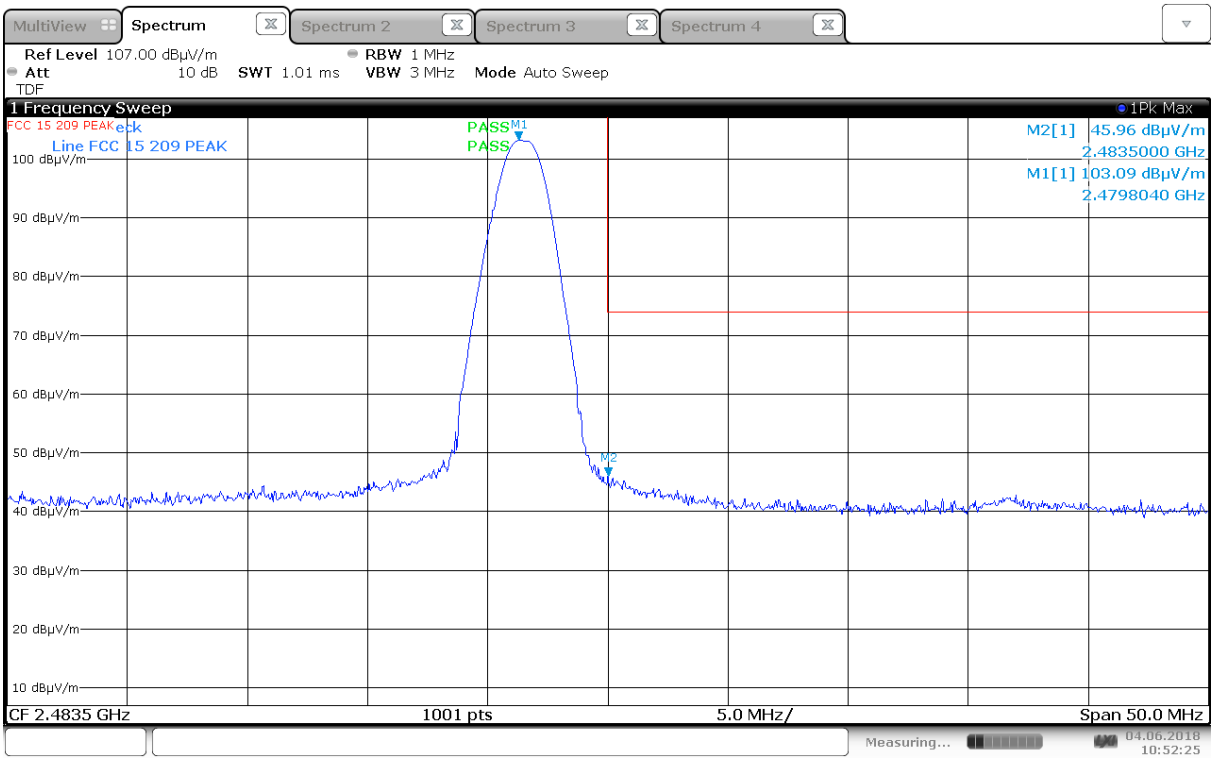
Lower Band Edge, 2402MHz, GFSK, Peak, (Max: HP)



Lower Band Edge, 2402MHz, 8PSK, Peak, (Max: HP)



Upper Band Edge, 2480MHz, GFSK, Peak, (Max: HP)



Upper Band Edge, 2480MHz, 8PSK, Peak, (Max: HP)

3.2 Radiated Emissions, 30 – 1000 MHz

FCC 15.205, 15.209

ISED RSS-GEN Issue 5, Clause 8.9

Test Results: Complies

Measurement Data:

Detector: Quasi-Peak

Measuring distance 3m

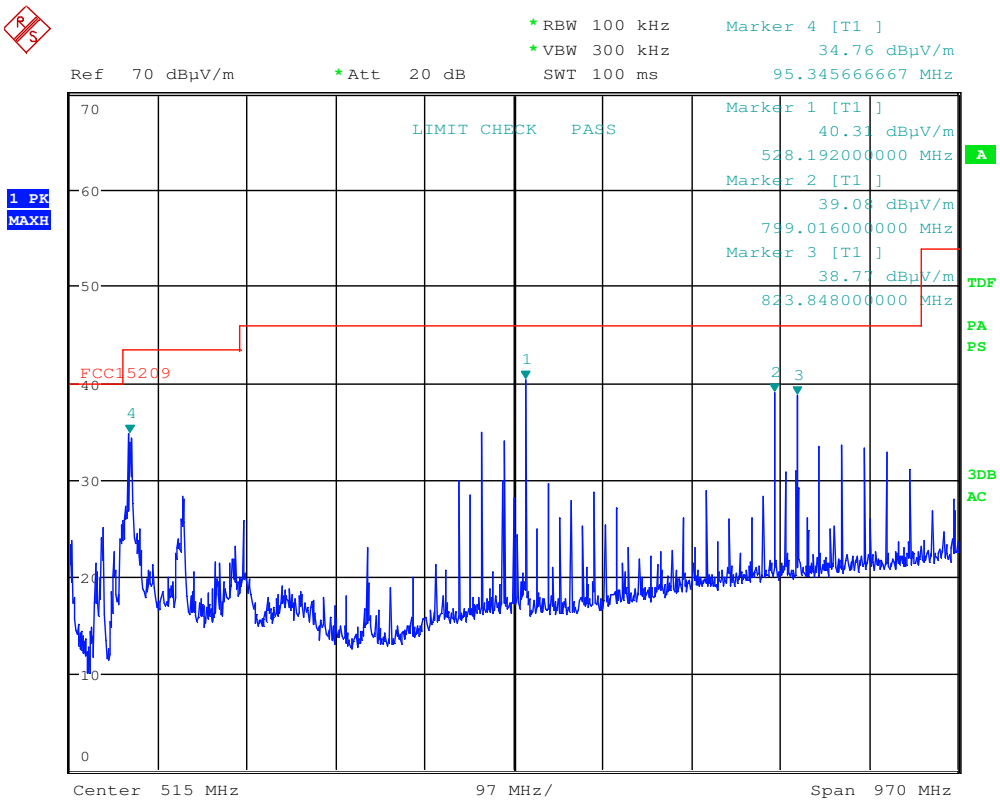
Tested with all all connections active

Radiated Emissions					
Carrier Modulation	**Carrier Freq MHz**	**Measured Freq MHz**	**Measured value QP dBµV/m @3m**	**Limit (dBµV/m)**	**Verdict**
Any	**Any**	**32.500**	**28.0**	**40.0**	**Complies**
Any	**Any**	**454.660**	**40.4**	**46.0**	**Complies**
Any	**Any**	**479.233**	**40.8**	**46.0**	**Complies**

See attached plot

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 (µV/m)**	**Quasi Peak (dBµV/m)**
30 – 88	**100**	**40.0**
88 – 216	**150**	**43.5**
216 – 960	**200**	**46.0**
Above 960	**500**	**54.0**



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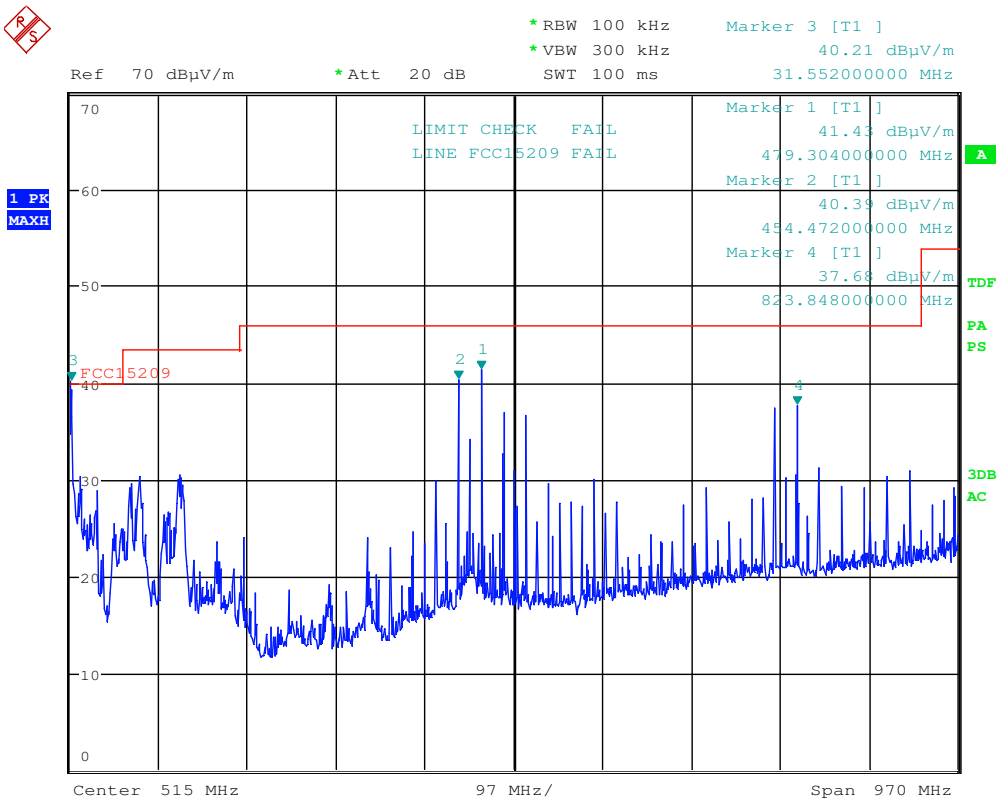
Radiated Emissions, 30 -1000MHz, HP, Peak Detector



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Radiated Emissions, 30 -1000MHz, VP, Peak Detector

3.3 Radiated Emissions, 1-25 GHz

FCC 15.205, 15.209

ISED RSS-GEN Issue 5, Clause 8.9

Test Results: Complies

Measurement Data:

Radiated Emissions, 1-25 GHz

Measuring distance: 3m (1 – 18 GHz)
A Pre-scan was performed from 18 – 26 GHz

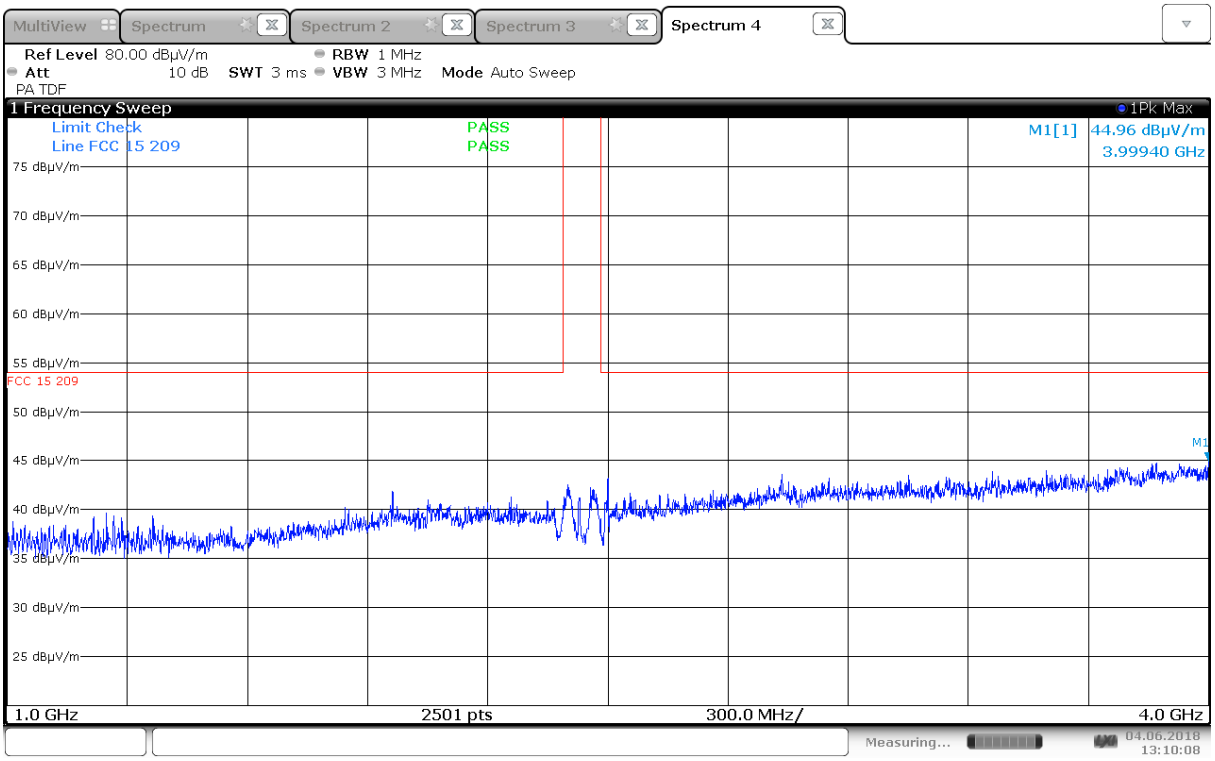
Radiated Emissions in Restricted Bands						
Carrier Modulation	**Carrier Freq MHz**	**Measured Freq MHz**	**Measured value Peak dBµV/m @3m**	**Calculated value AV dBµV/m @3m**	**Limit (dBµV/m)**	**Verdict**
GFSK	**Any**	**Any**	**< 54**	**< 44**	**74/54**	**Complies**

Antenna factor, amplifier gain and cable loss are included in Spectrum Analyzer “Transducer factor”.

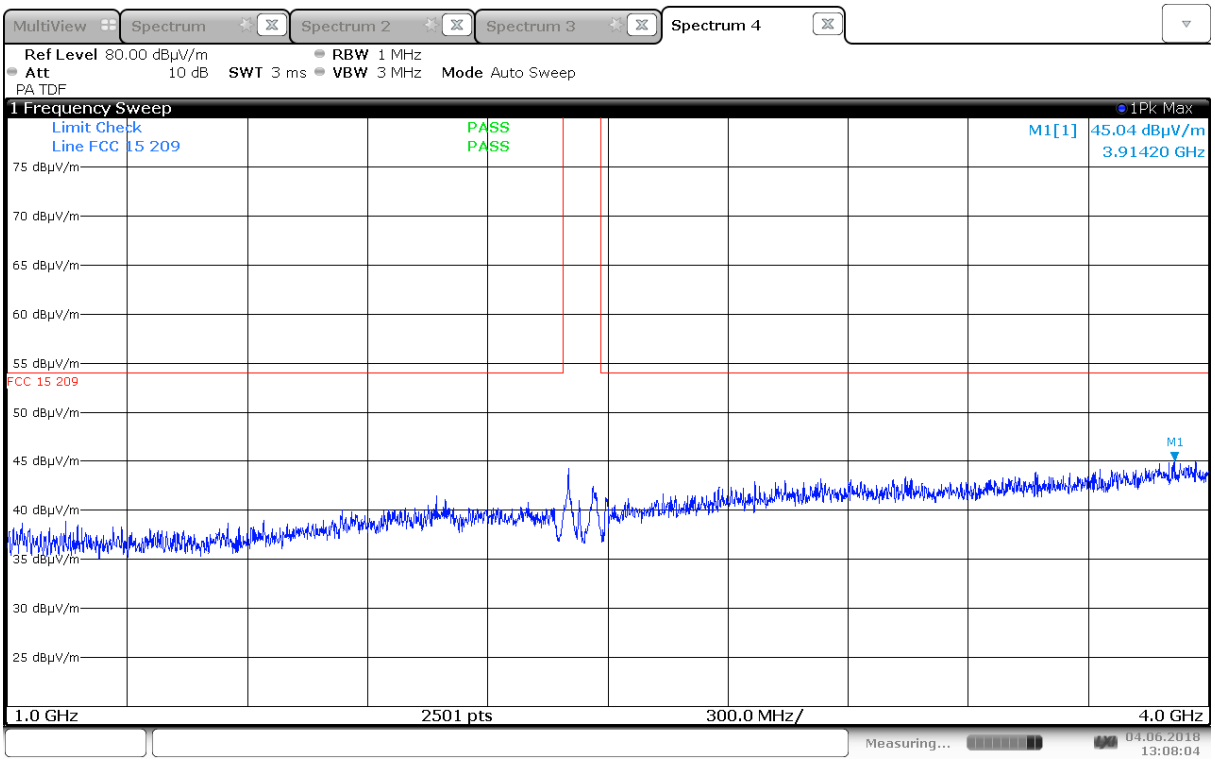
See attached plots.

Limits

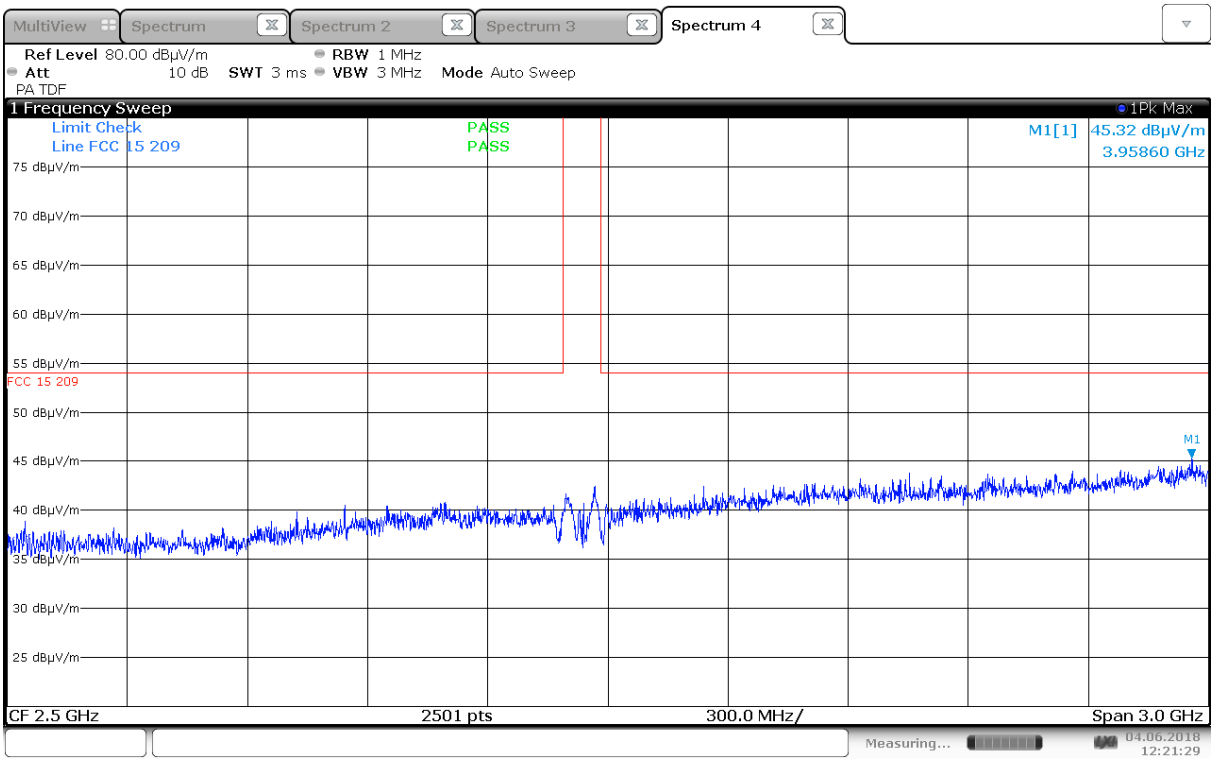
FCC	**Part 15.209 @ frequencies defined in §15.205**	
ISED	**RSS-GEN Issue 5, Clause 8.9 @ frequencies defined in clause 8.10**	
	Radiated emission limit @3 meters	
Frequency (MHz)	**AV (dBµV/m)**	**Peak (dBµV/m)**
Above 1 GHz	**54.0**	**74.0**



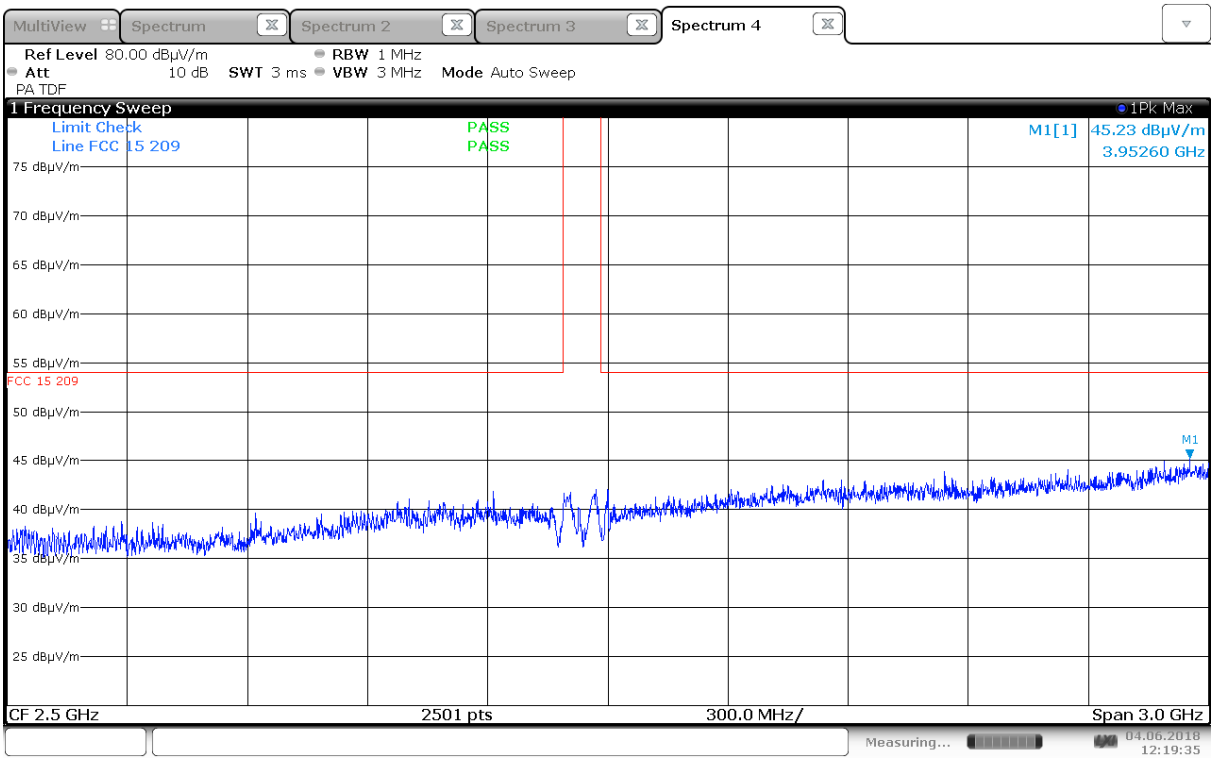
Radiated Emissions, 1000 -4000 MHz, 2402 MHz, GFSK, HP



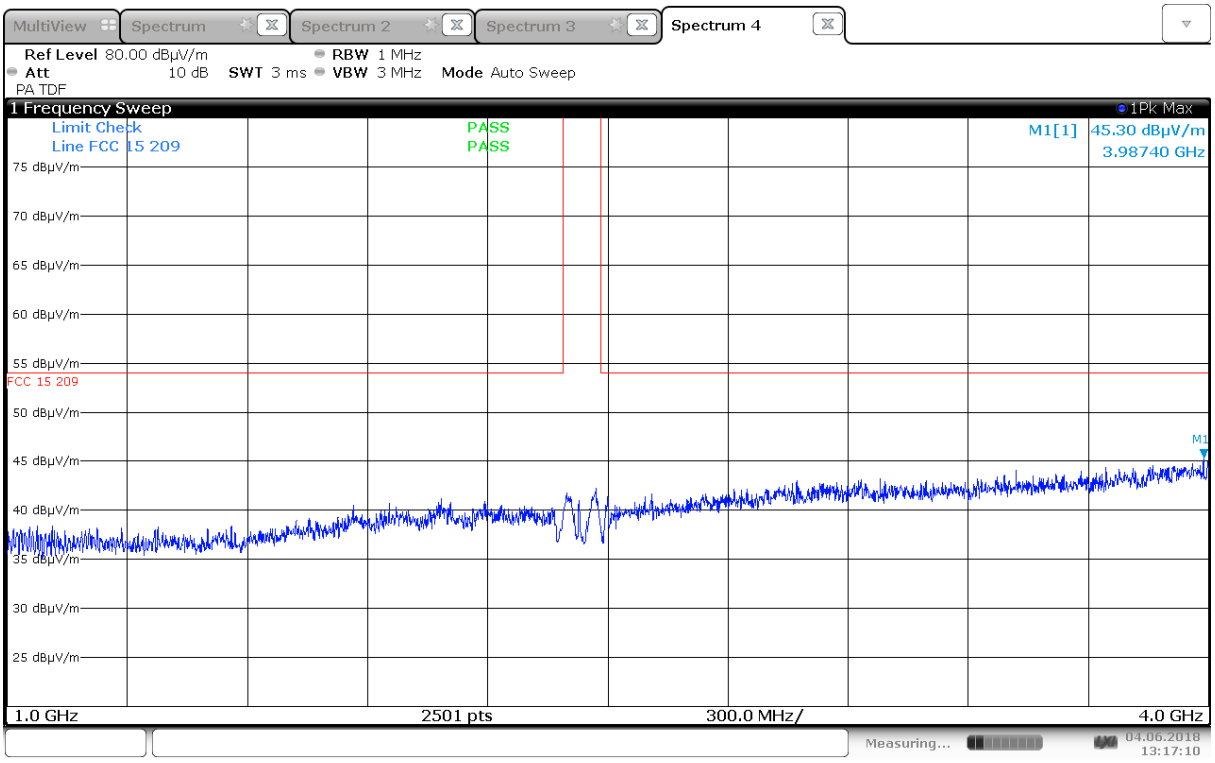
Radiated Emissions, 1000 -4000 MHz, 2402 MHz, GFSK, VP



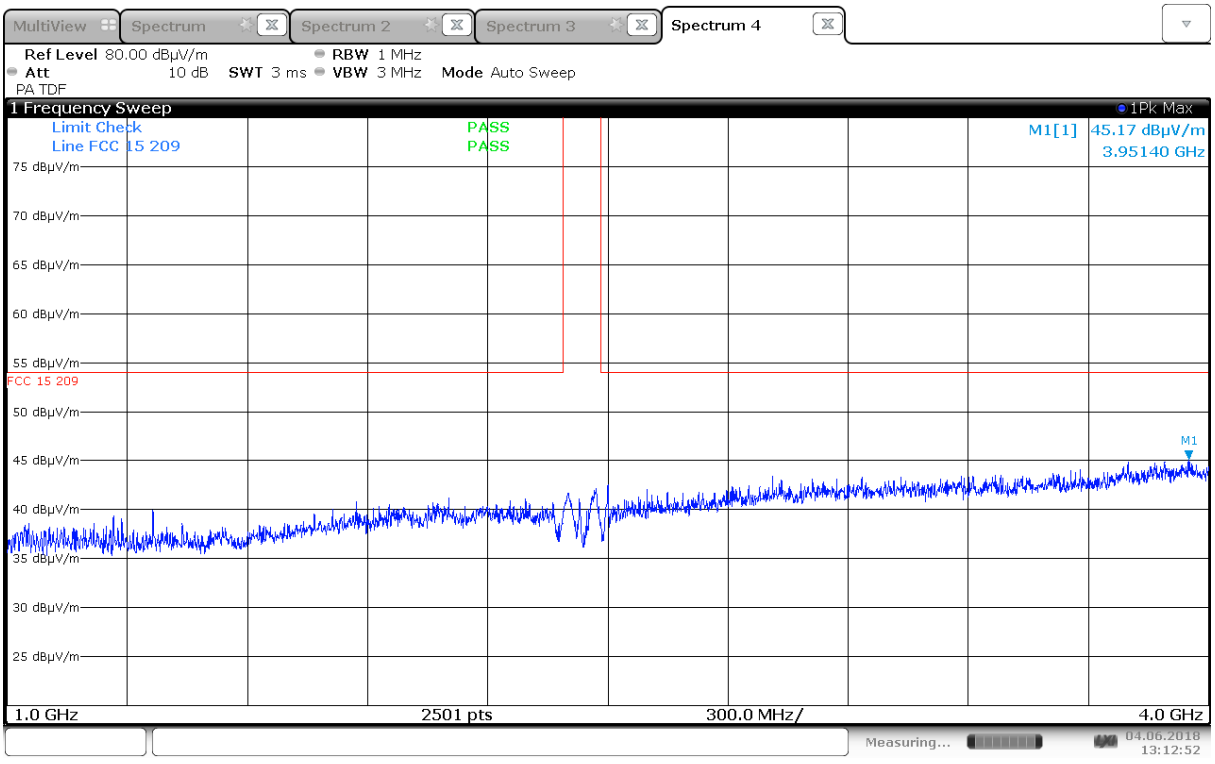
Radiated Emissions, 1000 -4000 MHz, 2440 MHz, GFSK, HP



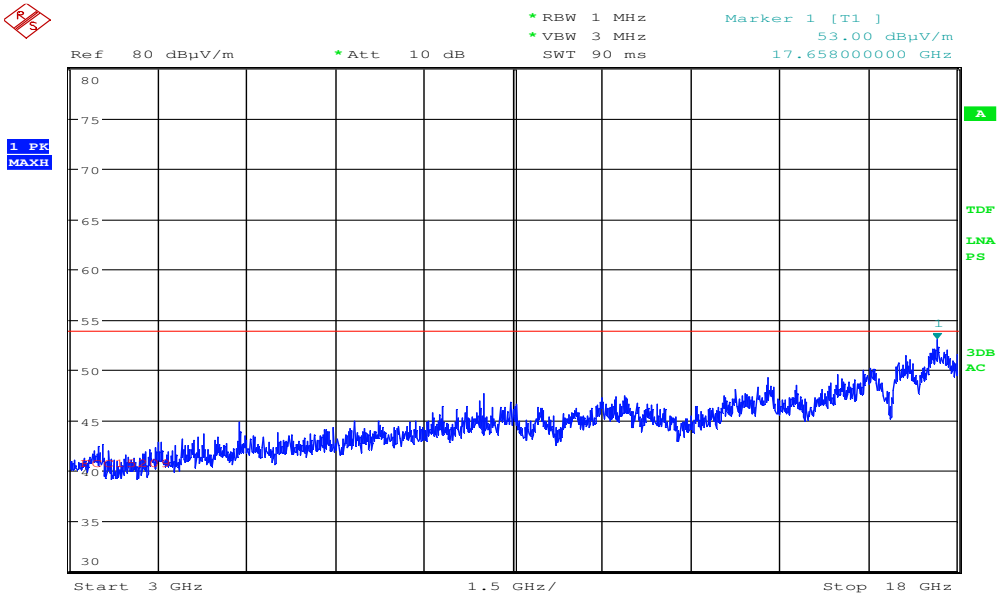
Radiated Emissions, 1000 -4000 MHz, 2440 MHz, GFSK, VP



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



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



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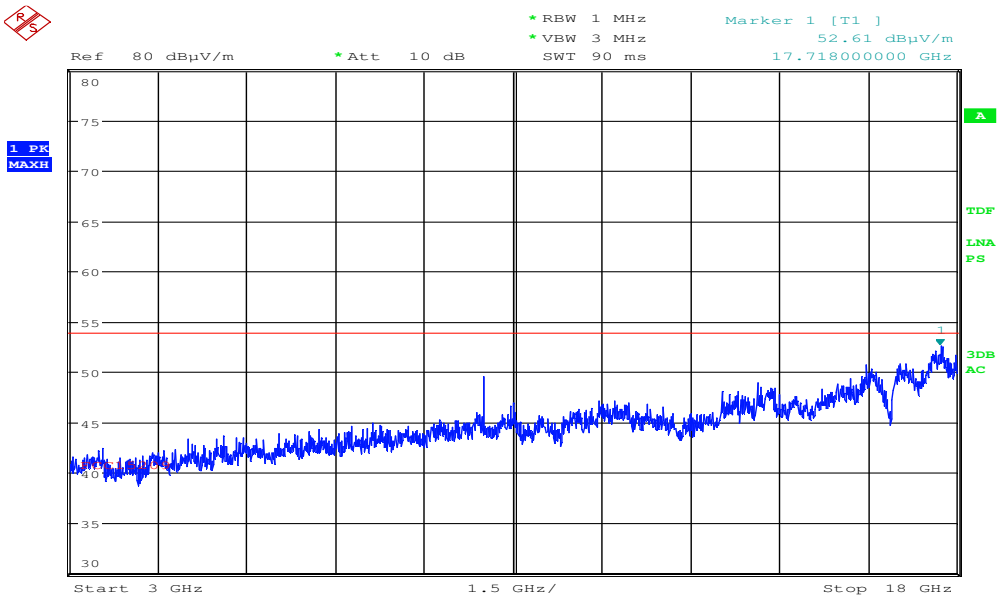
Radiated Emissions, 3000 -18000 MHz, 2402 MHz, GFSK, HP



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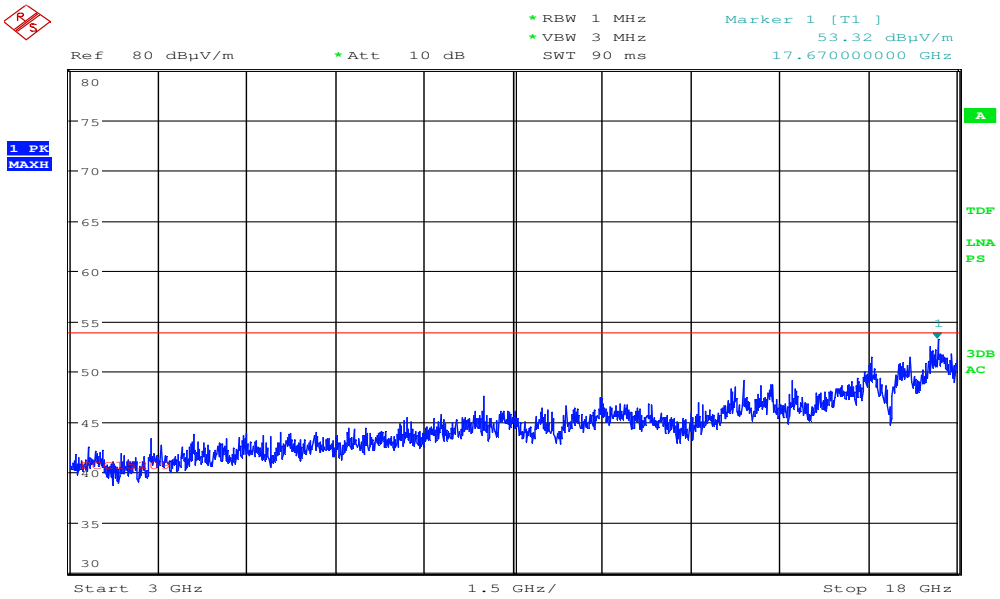
Radiated Emissions, 3000 -18000 MHz, 2402 MHz, GFSK, VP



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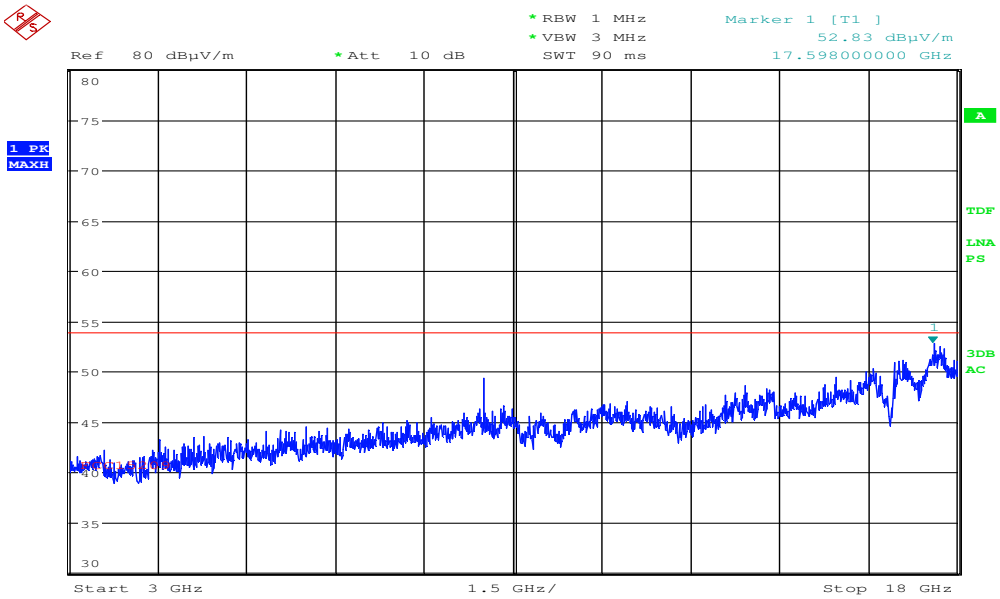
Radiated Emissions, 3000 -18000 MHz, 2440 MHz, GFSK, HP



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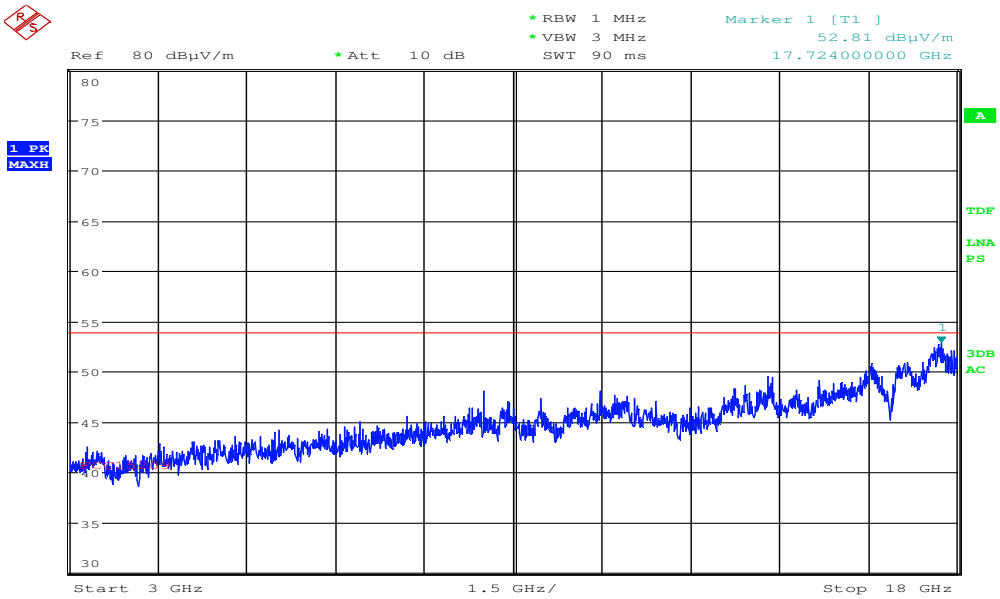
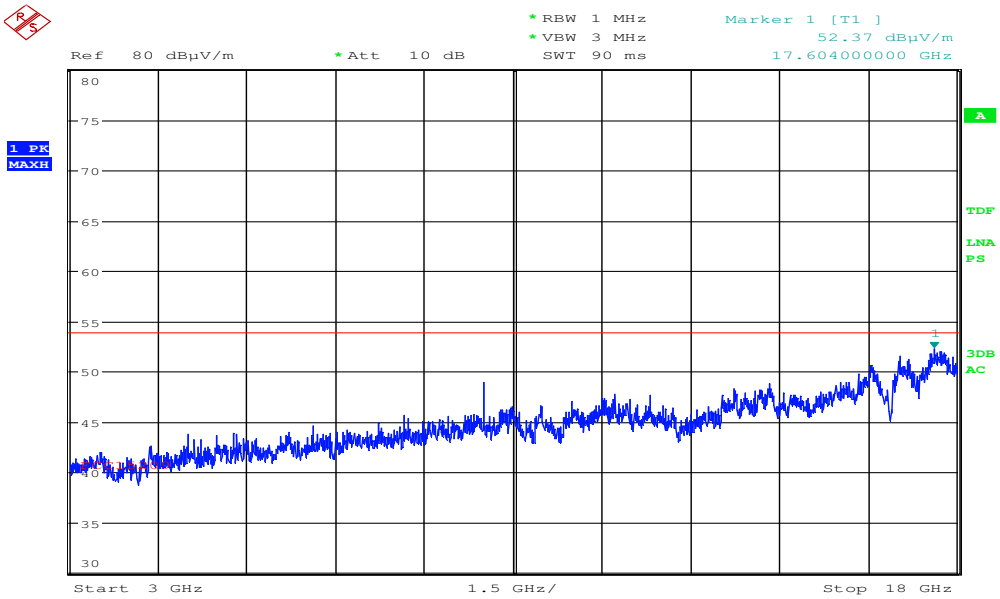
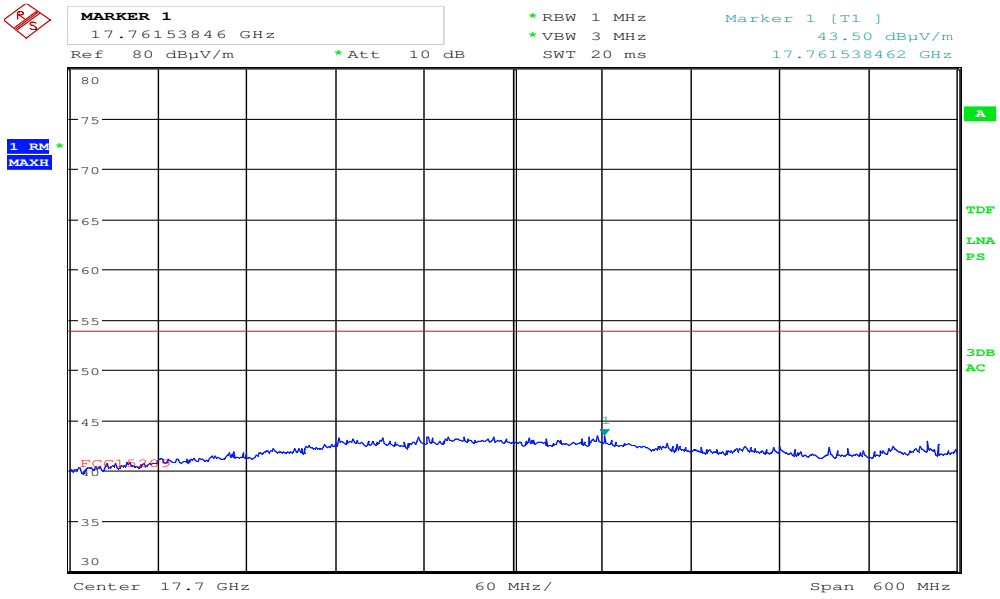
Radiated Emissions, 3000 -18000 MHz, 2440 MHz, GFSK, VP



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



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



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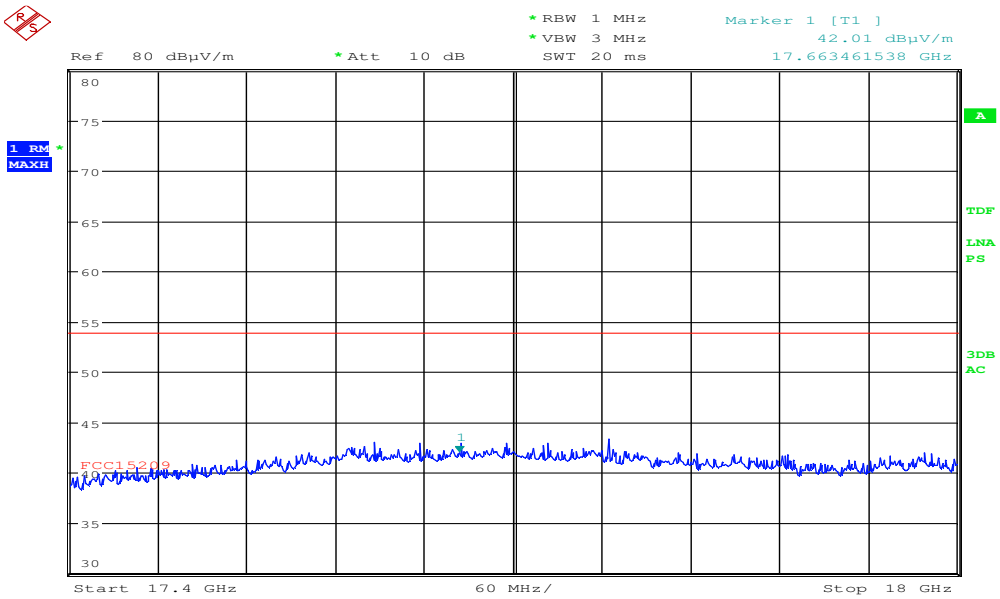
Radiated Emissions, 17400 -18000MHz, 2440MHz, GFSK, HP, AV



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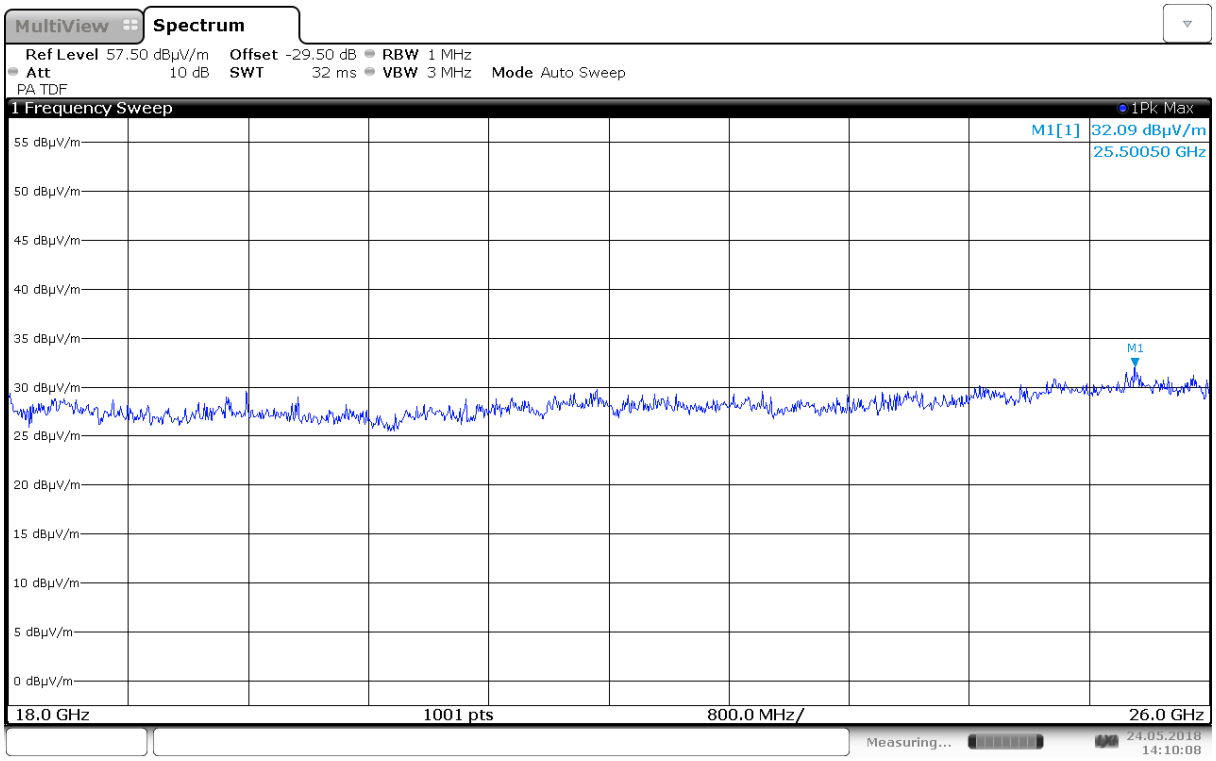
Radiated Emissions, 17400 -18000MHz, 2440MHz, GFSK, VP, AV



Pre-scan, 18000 -26000MHz, 2440MHz, GFSK, @10cm

4 Measurement Uncertainty

Measurement Uncertainty Values		
Test Item		**Uncertainty**
Output Power		±0.5 dB
Power Spectral Density		±0.5 dB
Out of Band Emissions, Conducted	**< 3.6 GHz**	±0.6 dB
	> 3.6 GHz	±0.9 dB
Spurious Emissions, Radiated	**< 1 GHz**	±2.5 dB
	> 1 GHz	±2.2 dB
Emission Bandwidth		±4 %
Power Line Conducted Emissions		+2.9 / -4.1 dB
Spectrum Mask Measurements	**Frequency**	±5 %
	Amplitude	±1.0 dB
Frequency Error		±0.6 ppm
Temperature Uncertainty		±1 °C

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2

5 LIST OF TEST EQUIPMENT

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries are identified (numbered) by the Test Laboratory.

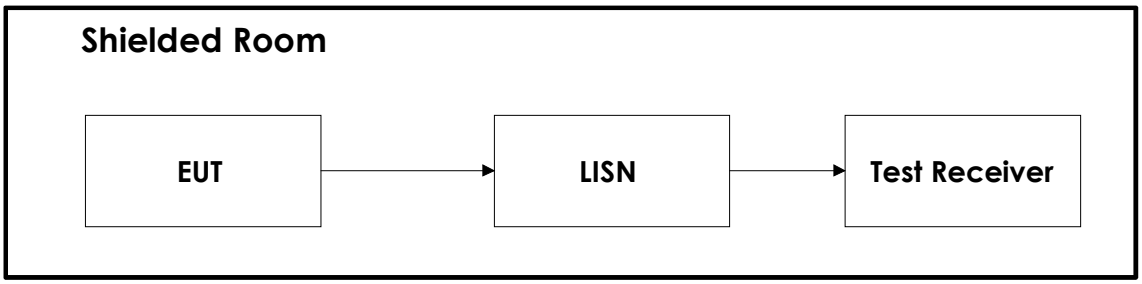
No.	Model	Description	Manufacturer	Asset no.	Cal. date	Cal. Due
1	FSW40	Spectrum Analyzer	Rohde & Schwarz	LR 1690	2018.01	2019.01
2	ESU40	Measuring Receiver	Rohde & Schwarz	LR 1639	2018.03	2019.03
3	6HC3000/18000	Highpass Filter	Trilithic	LR 1614	COU	
4	310	Preamplifier	Sonoma Instrument	LR 1686	2017.08	2018.08
5	317	Preamplifier	Sonoma Instrument	LR 1687	2017.08	2018.08
6	8449A	Pre-amplifier	Hewlett Packard	LR 1322	2017.08	2018.08
7	6812B	AC Power Source	Agilent	LR 1515	COU	
8	3115	Horn Antenna	EMCO	LR 1330	2016.10	2021.10
9	3117-PA	Horn Antenna with Preamp	EMCO	LR 1717	2017.12	2018.12
10	JB3	BiLog Antenna	Sunol	N-4525	2017.11	2020.11
11	638	Antenna Horn	Narda	LR 1480	2010.06	2020.06
12	Model 87 V	Multimeter	Fluke	N-4669	2016.10	2018.10

COU = Calibrate on use

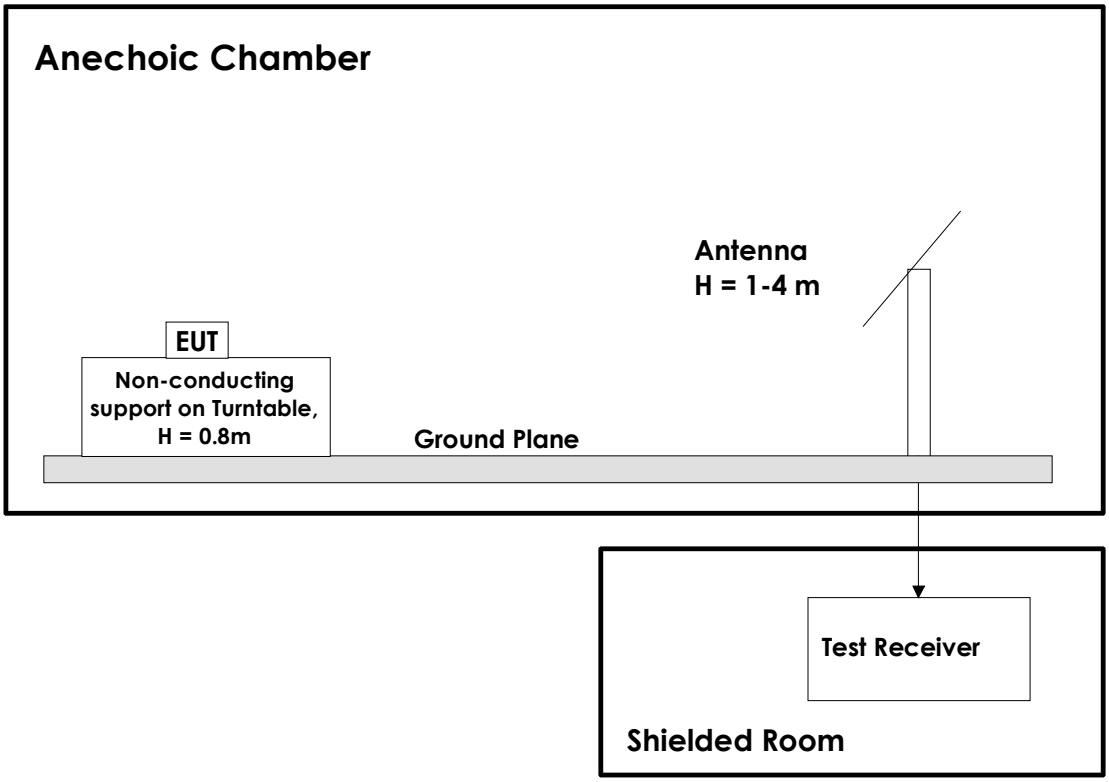
Test Software List			
Description	**Manufacturer**	**Model**	**Version**
EMC Software for Conducted tests	Rohde & Schwarz	EMC32	10.20.01
EMC Software for Radiated tests	Rohde & Schwarz	EMC32	10.20.01

6 BLOCK DIAGRAM

6.1 Power Line Conducted Emission



6.2 Test Site Radiated Emission



All tests below 1 GHz were performed at 3m with ground plane. The EUT was placed on the stand at 0.8m height.

Tests above 1 GHz were performed with the space between the EUT and the antenna covered by absorbers. The EUT was placed on a 1.5m high stand. Tests from 1 GHz to 18 GHz were performed @3m distance. Tests above 18 GHz were performed @1m distance.

The antenna was raised from 1 to 4m and the turntable rotated from 0 to 360 degrees to maximize any emissions found.

Revision history

Version	Date	Comment	Sign
1.0	2018.07.10	First edition	FS