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telefication

FCC and IC Test Report for Parts 15.247, 15.207, 15.209 (DTS) 15.107 and 15.109 and RSS-247, RSS Gen

Product name	LM1
Applicant	RATIONAL AG
FCC ID	2AUI6-LM1
IC ID	25504-LM1

Test report No. : 180300268 001 v1.00

Laboratory information

Accreditation

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:2005. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

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The Industry Canada registration number for the 3 meter test chamber of Telefication is: 4173A-1.

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Documentation

The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 10 years at Telefication Netherlands.

Testing Location

Test Site	Telefication BV
Test Site location	Edisonstraat 12a 6902 PK Zevenaar The Netherlands Tel. +31889983600 Fax. +31316583189
Test Site FCC	NL0001

Revision History

Version	Date	Remarks	By
v0.50	10-07-2019	First draft	RvB
v1.00	28-11-2019	Initial release	RvB

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Summary of Test results

FCC	ISED	Description	Section in report	Verdict
15.203	--	Antenna requirements	1.4	Pass
15.247 (a)	RSS-247 5.2(a)	6dB Bandwidth	3.1	Pass
--	RSS-Gen 6.7	99% Bandwidth	3.2	Pass
15.247 (b)	RSS-247 5.1 (b)	RF output power	3.3	Pass
15.247 (e)	RSS-247 5.2 (b)	Power spectral density	3.4	Pass
15.247 (d)	RSS-247 5.5	Band edge	3.5	Pass
15.209 (a)	RSS-247 5.4	Radiated Spurious emissions	3.6	Pass
15.205 (a)	RSS Gen 8.10	Spurious emissions in the restricted bands	3.6	Pass
15.207(c)/ 15.247(d)	RSS-GEN 8.8	Conducted spurious emission on AC mains	3.7	Pass

1 General Description

1.1 Applicant

Client name:	RATIONAL AG
Address	Siegfried-Meister-Straße 1, Landsberg am Lech, Bavaria, Germany
Zip code:	86899
E-mail:	r.hegmann@rational-online.com
Contact name:	Mr. R. Hegmann

1.2 Manufacturer

Client name:	RATIONAL AG
Address	Celsiusstraße 6, Landsberg am Lech, Bavaria, Germany
Zip code:	86899
E-mail:	p.buhl@rational-online.com
Contact name:	Mr. P. Bühl

1.3 Tested Equipment Under Test (EUT)

Product name:	LM1
Brand name:	RATIONAL
Product type:	Oven controller with Wifi
FCC ID:	2AUI6-LM1
IC ID	25504-LM1
Software version:	--
Hardware version:	--
Date of receipt	01-03-2019
Tests started:	06-03-2019
Testing ended:	11-07-2019

1.4 Product specifications of Equipment under test

TX Frequency range (MHz)	2400 – 2483.5
RX frequency range (MHz)	2400 – 2483.5
Maximum output power to antenna (dBm)	18.58
Antenna type	PIFA antenna
Antenna gain (dBi)	-1
Type of modulation	Acc. to IEEE 802.11b/g/n
Emission designator	802.11b: 9M4G1D 802.11g: 16M5G1D 802.11n: 17M8G1D

1.5 Modification of the Equipment Under Test (EUT)

None.

1.6 Observations and remarks

The EUT is an oven controller with a WIFI module inside.

1.7 Environmental conditions

Test date	06-03-2019	03-05-2019	11-07-2019
Ambient temperature	21.5°C	22.1°C	23.8°C
Humidity	33.2	34.7%	47.5%

1.8 Measurement Standards

- ANSI C63.10:2013
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05

1.9 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247, §15.209, §15.207 and §15.109
- RSS-247 Issue 2, RSS-Gen Issue 5

1.10 Conclusions

The sample of the product showed **NO NON-COMPLIANCES** to the specifications stated in paragraph 1.9 of this report.

The results of the test as stated in this report, are exclusively applicable to the product items as identified in this report. Telefication accepts no responsibility for any properties of product items in this test report, which are not supported by the tests as specified in paragraph 1.9 *"Applicable standards".*

All tests are performed by:

Name : ing. R. van Barneveld

Review of test methods and report by:

Name : P. van Wanrooij, BASc

The above conclusions have been verified by the following signatory:

Date :

Name : ing. K.A. Roes

Function : Coordinator Radio Laboratory

Signature :

2 Test configuration of the Equipment Under Test

2.1 Test mode

The applicant provided test mode software called “Labtool” for the EUT, in which it was possible to configure the EUT into different test channels. The for all the tests performed in this test report the power setting “15 “ is used.

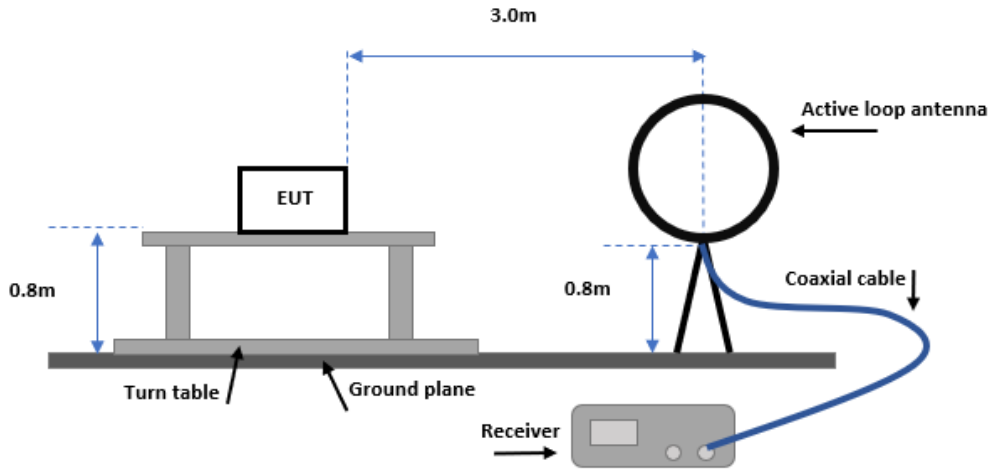
The applicant also provided both a radiated sample and a conducted sample for radio testing.

2.2 Tested channels and Data rates

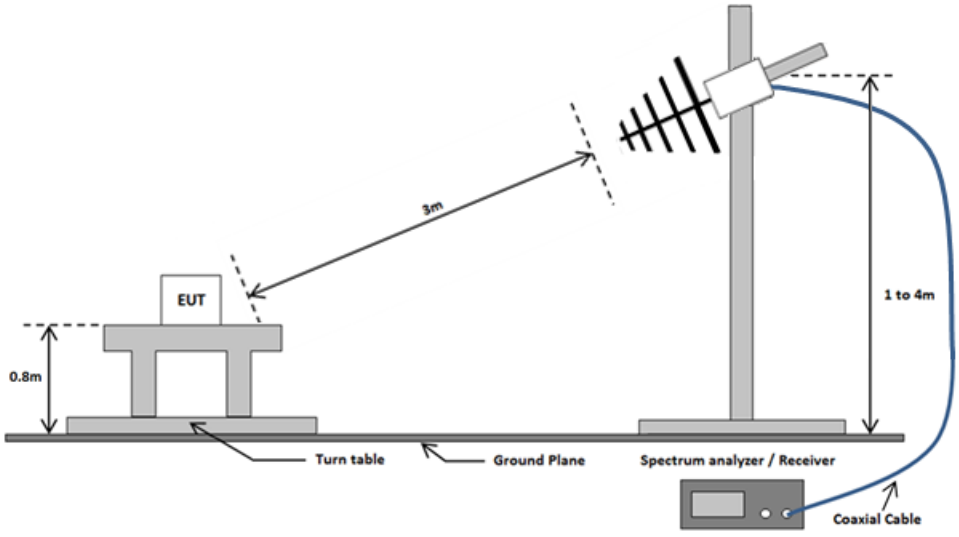
Technology	Channels	Data rate	Frequency (MHz)
IEEE 802.11b/g/n	1 (Low)	11/54 Mbps and MCS 7	2412
	6(Mid)	11/54 Mbps and MCS 7	2437
	11 (High)	11/54 Mbps and MCS 7	2462

2.3 Test setups

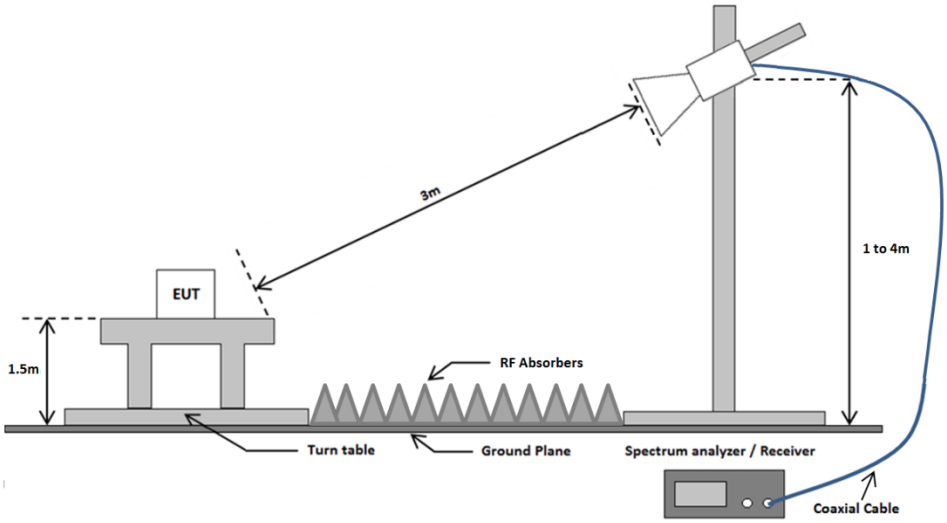
Radiated emissions test setup 9 kHz – 30 MHz



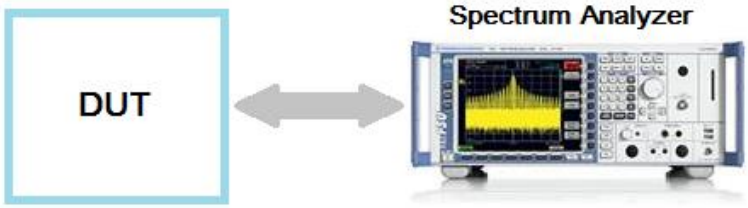
Radiated emissions test setup 30 MHz - 1 GHz



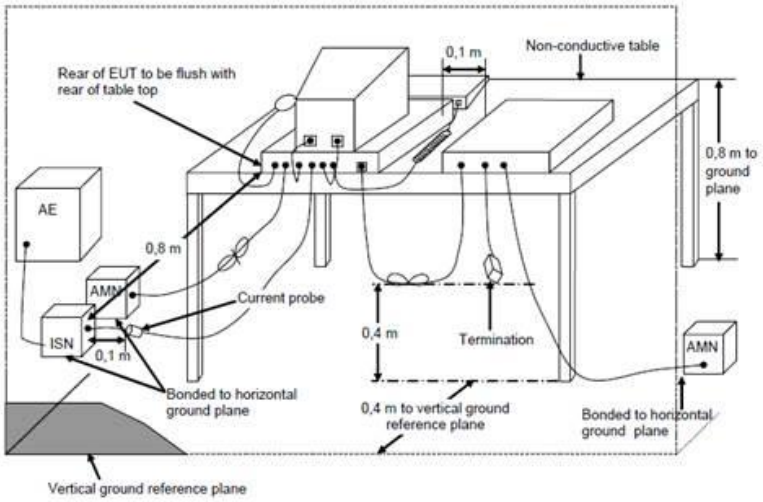
Radiated emissions test setup above 1 GHz



Conducted test setup



Conducted Emissions on the AC mains test setup



2.4 Equipment used in the test configuration

Description	Manufacturer	Model	ID	Used at Par.
Spectrum Analyzer	Rohde & Schwarz	FSV40	TE01269	3.1 – 3.5
Spectrum Analyzer	Rohde & Schwarz	FSP40	TE11125	3.6
Spectrum Analyzer	Rohde & Schwarz	ESR7	TE01220	3.6-3.7
Biconilog Antenna	Chase	CBL6112A	TE00967	3.6
Horn Antenna	EMCO The Electro – Mechanics Co	3115	TE00531	3.6
Horn Antenna	Flann Microwave	20240-25	TE00818	3.6
SAC Chamber	Comtest Engineering BV	-	TE00861	3.6
Band reject filter	5N45-2441/T83-0/0	WHK3.0/18G-10EF	TE00932	3.6
Pre-amplifier	Miteq	Js4-18004000-30-8P-A1	TE11131	3.6
Pre-amplifier	Miteq	AFS42-041001800-29-OP-42	TE00092	3.6
Software	DARE Instruments	Radimation 2018.3.8	--	3.6
Software	DARE Instruments	Radimation 2016.2.8	--	3.7
Artificial Mains Network (AMN)	Rohde & Schwarz	ESH3-Z5	TE00208	3.7
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	TE00756	3.7
Active loop antenna	Rohde & Schwarz	HFH2-z2	TE00747	3.6

2.5 Sample calculation

Field Strength Measurement **example**:

Frequency (GHz)	Polarization	Height(m)	Peak (dBµV/m)
7,236	Horizontal	2	52.5

The following relation applies:

E (dBµV/m) = U(dBµV) + AF (dB/m) – G (dB) + CL (dB)

Where:

E = Electric field strength
U = Measuring receiver voltage
AF = Antenna factor
G = Gain of the pre-amplifier
CL = Cable loss

(52.5 = 48.12 + 36.1 - 37.42 + 5.7)

3 Test results

3.1 6dB bandwidth Measurement

3.1.1 Limit

The minimum 6 dB Bandwidth shall be at least 500 kHz.

3.1.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.1.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.1.4 Test procedure

Tests according to ANSI C63.10
IRN 017 - Occupied bandwidth (Hz) Method 4 – DTS Bandwidth.

3.1.5 Test Results of the 6 dB bandwidth Measurement

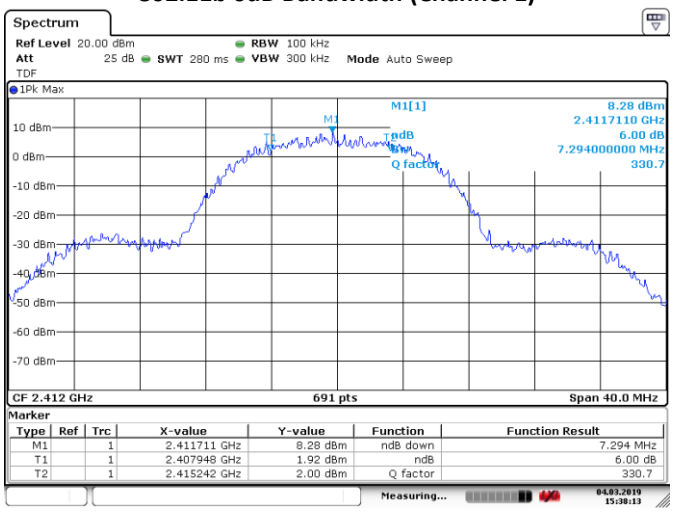
Technology Std.	Channel	Frequency (MHz)	Data rate	6dB bandwidth (MHz)
802.11b	1	2412	11 Mbps	7.79
	6	2437	11 Mbps	9.44
	11	2462	11 Mbps	9.38
Uncertainty	± 39 kHz			

Technology Std.	Channel	Frequency (MHz)	Data rate	6dB bandwidth (MHz)
802.11g	1	2412	54 Mbps	13.87
	6	2437	54 Mbps	16.50
	11	2462	54 Mbps	16.50
Uncertainty	± 39 kHz			

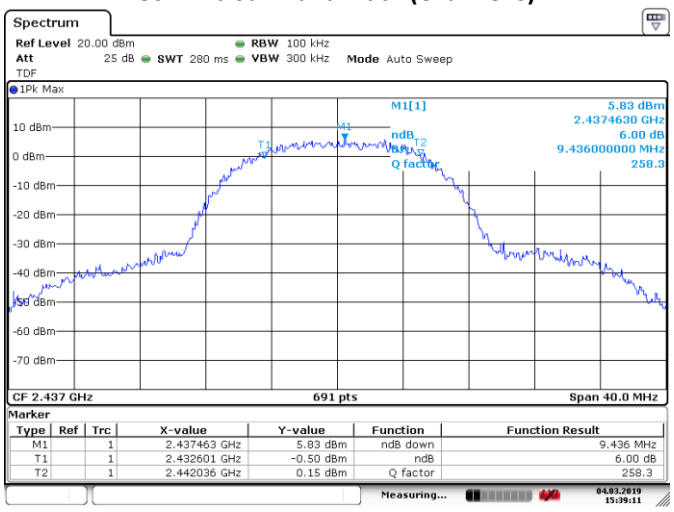
Technology Std.	Channel	Frequency (MHz)	Data rate	6dB bandwidth (MHz)
802.11n	1	2412	MCS7	17.79
	6	2437	MCS7	17.79
	11	2462	MCS7	17.76
Uncertainty	± 39 kHz			

3.1.6 Plots of the 6 dB bandwidth Measurement

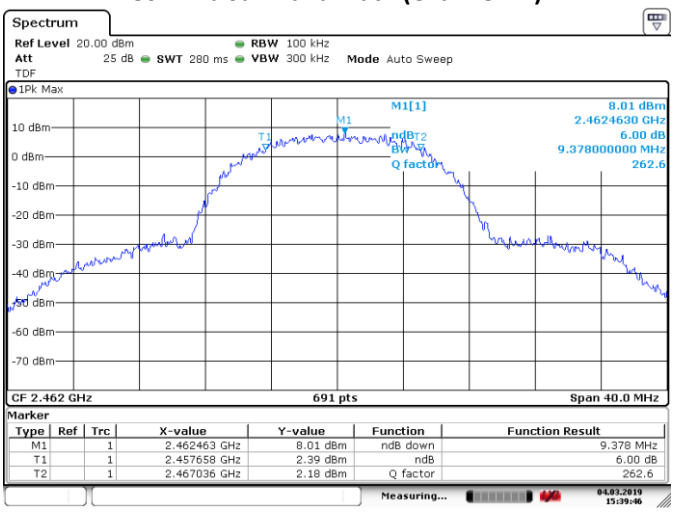
802.11b 6dB Bandwidth (Channel 1)



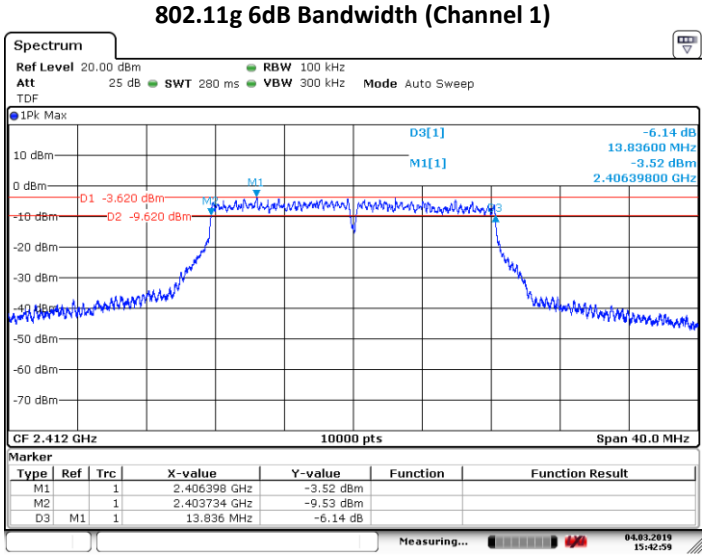
802.11b 6dB Bandwidth (Channel 6)



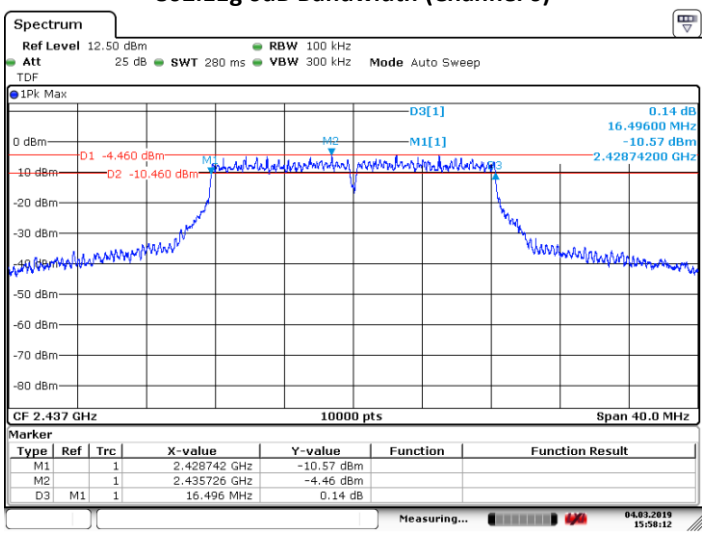
802.11b 6dB Bandwidth (Channel 11)



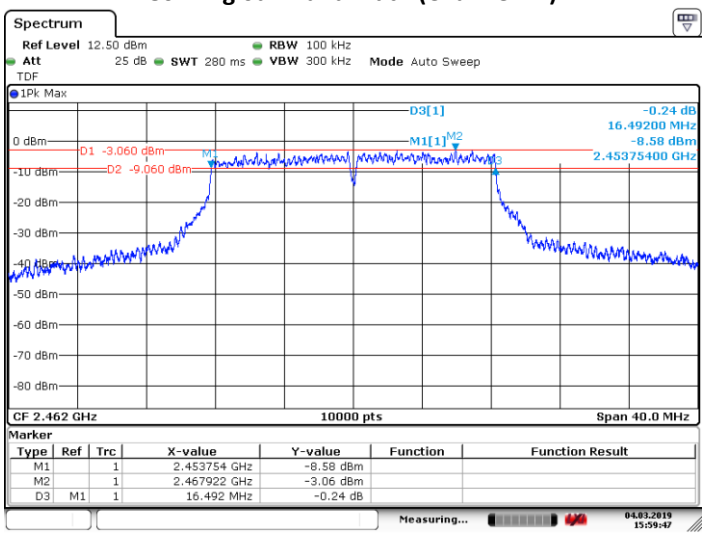
802.11g 6dB Bandwidth (Channel 1)



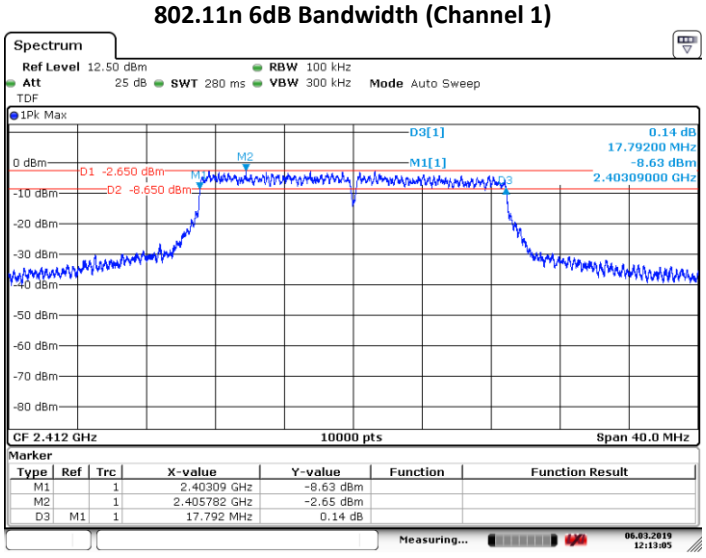
802.11g 6dB Bandwidth (Channel 6)



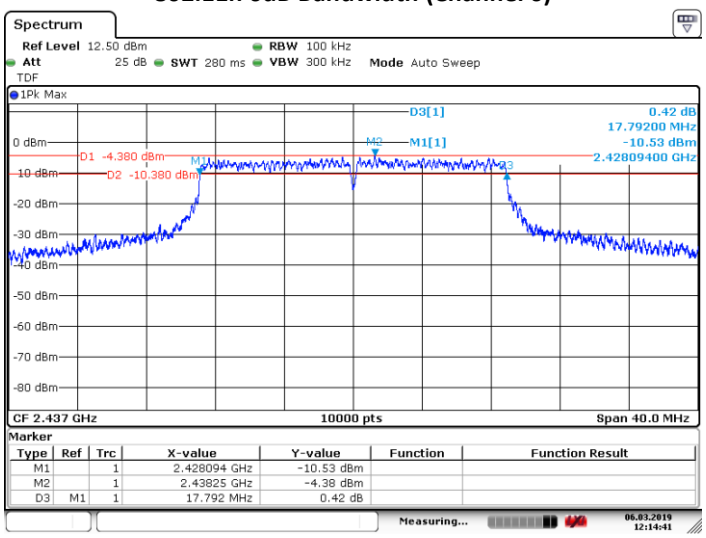
802.11g 6dB Bandwidth (Channel 11)



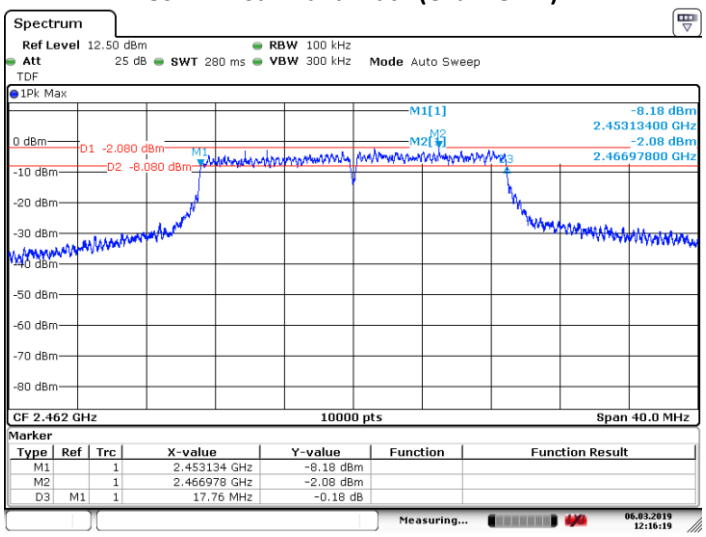
802.11n 6dB Bandwidth (Channel 1)



802.11n 6dB Bandwidth (Channel 6)



802.11n 6dB Bandwidth (Channel 11)



3.2 99% Occupied Bandwidth

3.2.1 Limit

According to RSS-Gen 6.7

3.2.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.2.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.2.4 Test procedure

IRN 017 - Occupied bandwidth (Hz) Method 1 – XX % power bandwidth.

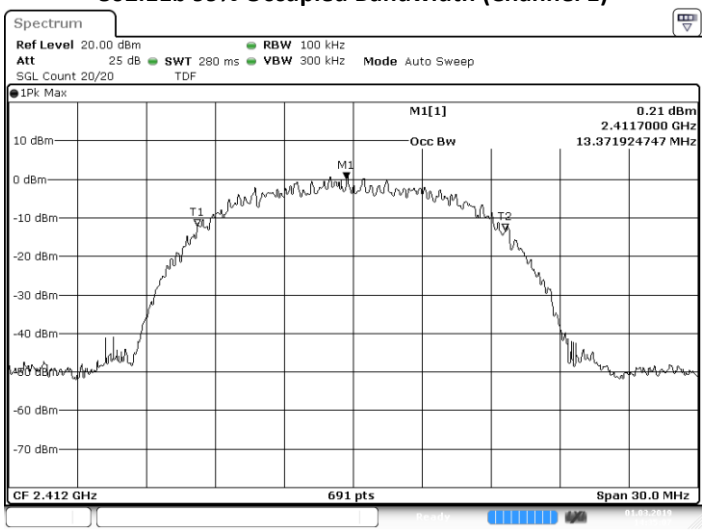
1. Set the centre frequency to the nominal EUT channel centre frequency
2. Set span = 1.5 times to 0.5 times the Occupied Bandwidth
3. Set VBW ≥ 3x RBW
4. Video averaging is not permitted. Where practical, detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.

3.2.5 Test results of the 99% occupied bandwidth measurement

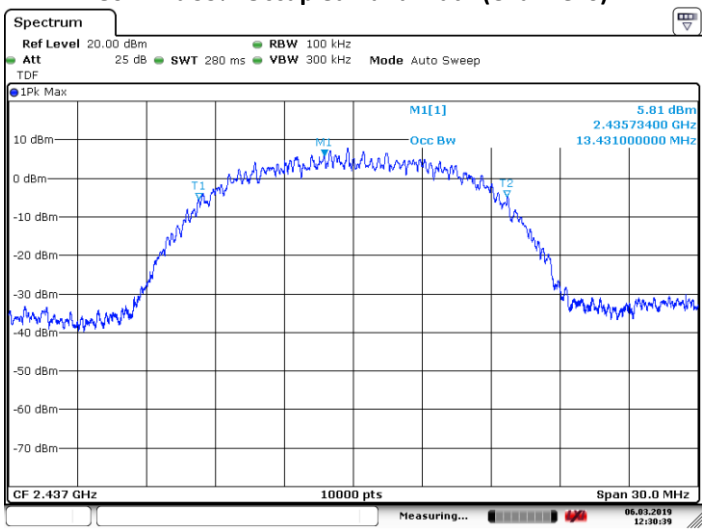
Technology Std.	Channel	Frequency (MHz)	Data rate	99% bandwidth (MHz)
IEEE 802.11b	1(Low)	2412	11 Mbps	13.371
	6(Mid)	2437	11 Mbps	13.431
	11 (High)	2462	11 Mbps	13.328
IEEE 802.11g	1(Low)	2412	54 Mbps	16.454
	6(Mid)	2437	54 Mbps	16.452
	11 (High)	2462	54 Mbps	16.454
IEEE 802.11n	1(Low)	2412	MCS7	17.670
	6(Mid)	2437	MCS7	17.800
	11 (High)	2462	MCS7	17.713
Uncertainty	±39 kHz			

3.2.6 Plots of the 99% Occupied Bandwidth Measurement

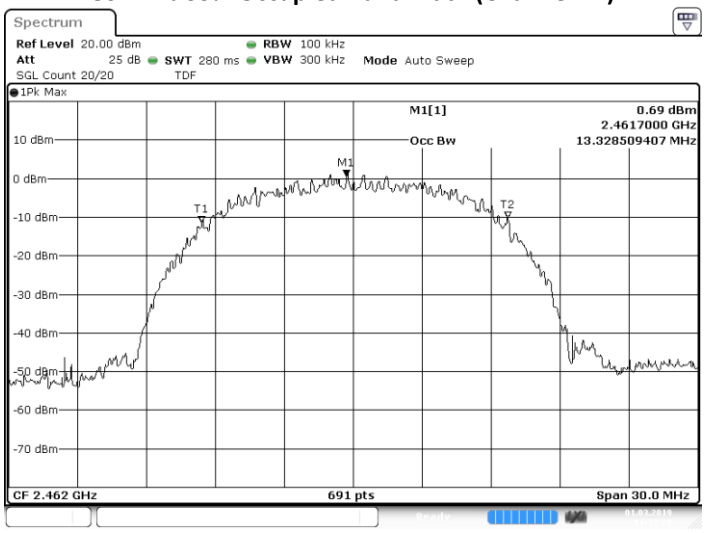
802.11b 99% Occupied Bandwidth (Channel 1)



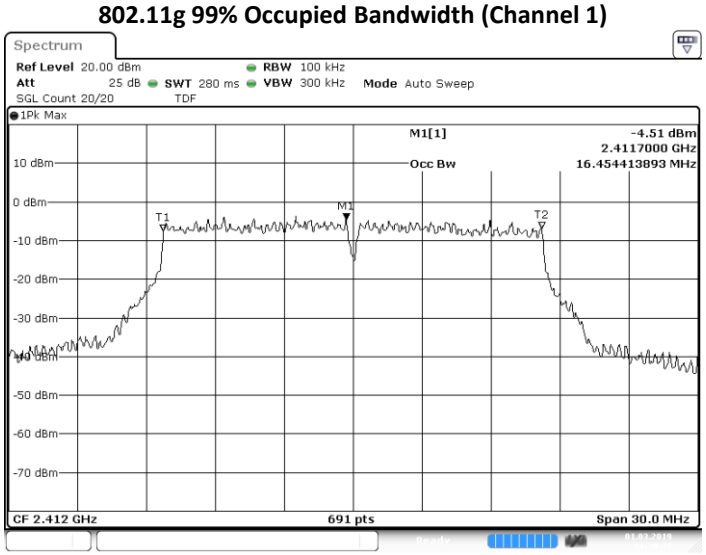
802.11b 99% Occupied Bandwidth (Channel 6)



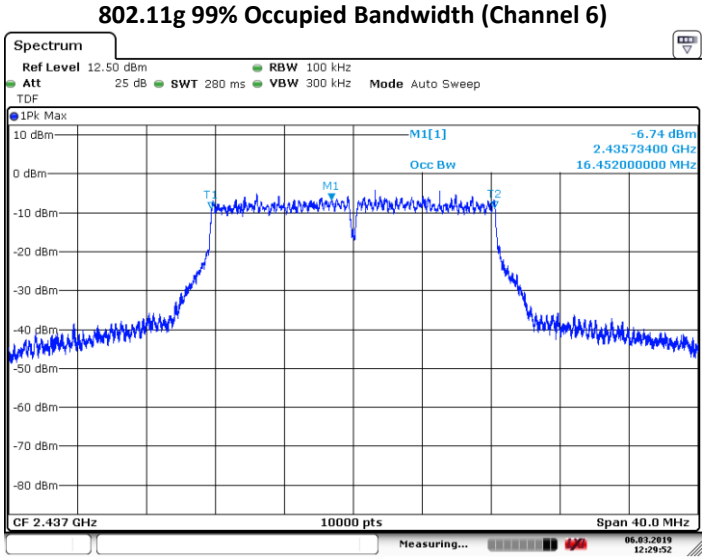
802.11b 99% Occupied Bandwidth (Channel 11)



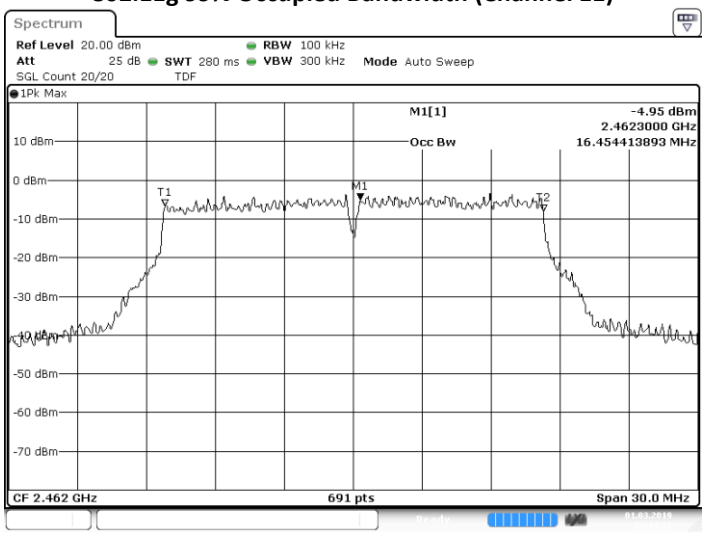
802.11g 99% Occupied Bandwidth (Channel 1)



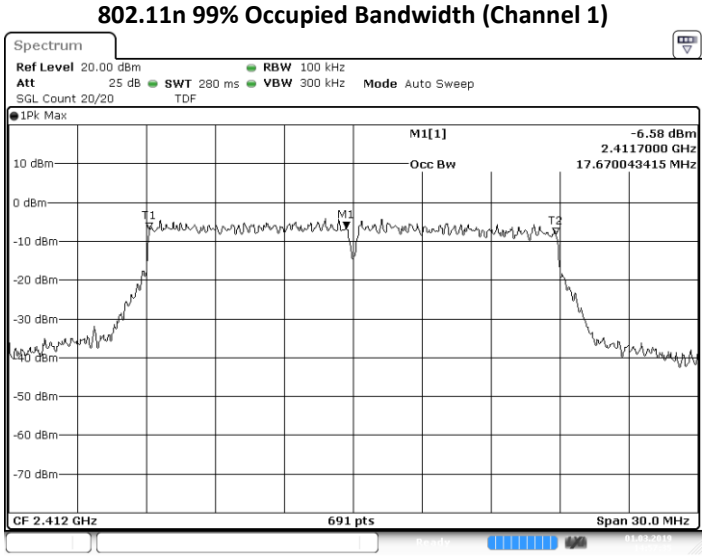
802.11g 99% Occupied Bandwidth (Channel 6)



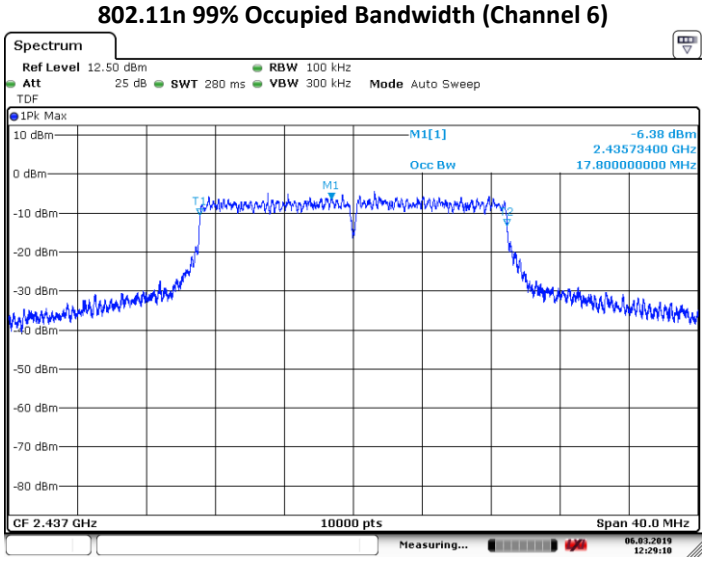
802.11g 99% Occupied Bandwidth (Channel 11)



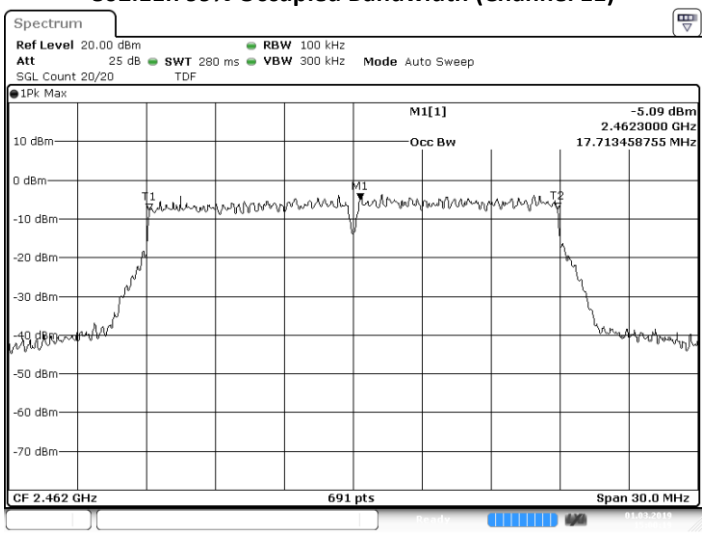
802.11n 99% Occupied Bandwidth (Channel 1)



802.11n 99% Occupied Bandwidth (Channel 6)



802.11n 99% Occupied Bandwidth (Channel 11)



3.3 Output Power Measurement

3.3.1 Limit

For systems using digital modulation in the 2400-2483.5 MHz, the limit for the peak output power is 30 dBm. If transmitting antenna of directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point to point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

3.3.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.3.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.3.4 Test procedure

The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.

IRN 014 - RF power (W) - Method 1 – AVGSA (DTS) according to ANSI C63.10.

3.3.5 Test results of Output Power Measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	Peak output power (dBm)
802.11b	1	2412	11 Mbps	11.46
	6	2437	11 Mbps	10.60
	11	2462	11 Mbps	12.00
Uncertainty	±0.71 dB			

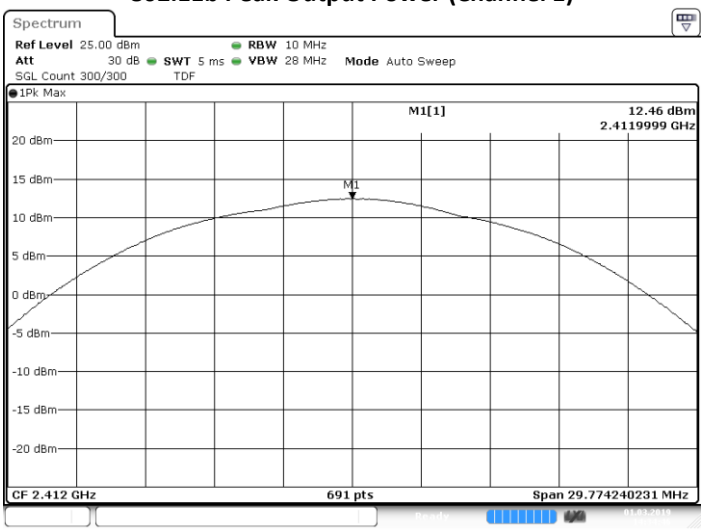
Technology Std.	Channel	Frequency (MHz)	Data rate	Peak output power (dBm)
802.11g	1	2412	54 Mbps	16.59
	6	2437	54 Mbps	16.02
	11	2462	54 Mbps	17.58
Uncertainty	±0.71 dB			

Technology Std.	Channel	Frequency (MHz)	Data rate	Peak output power (dBm)
802.11n	1	2412	MCS7	16.03
	6	2437	MCS7	15.22
	11	2462	MCS7	16.59
Uncertainty	±0.71 dB			

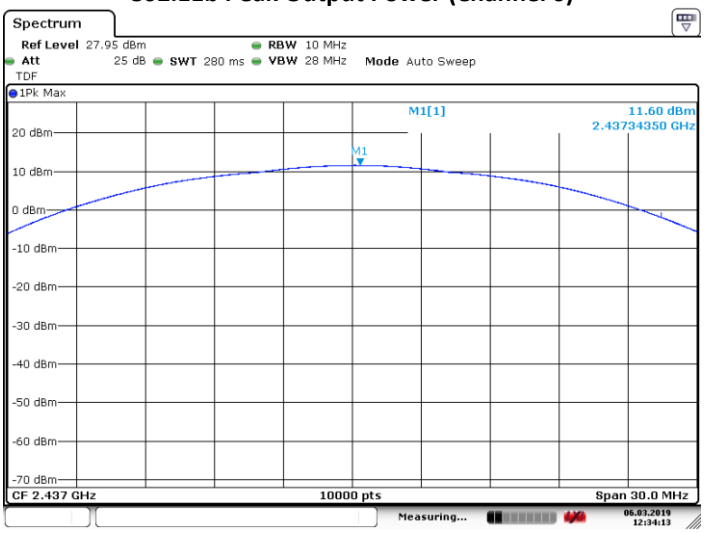
Note: conducted output power (dBm) + antenna gain (dBi) = peak output power (dBm)

3.3.6 Plots of the output power measurement

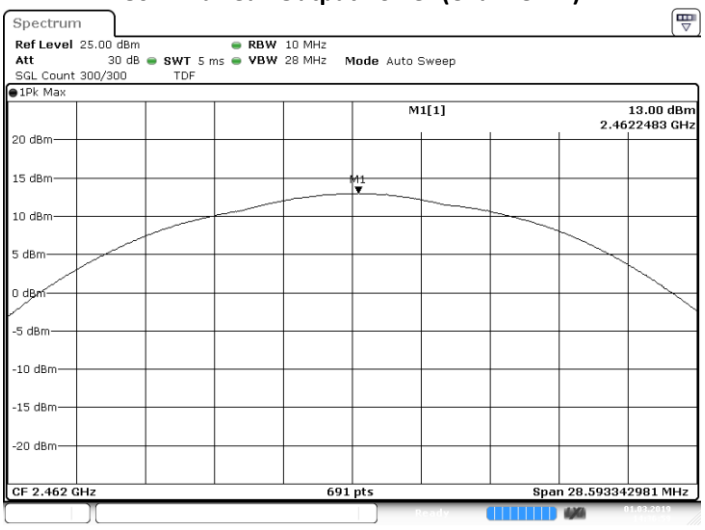
802.11b Peak Output Power (Channel 1)



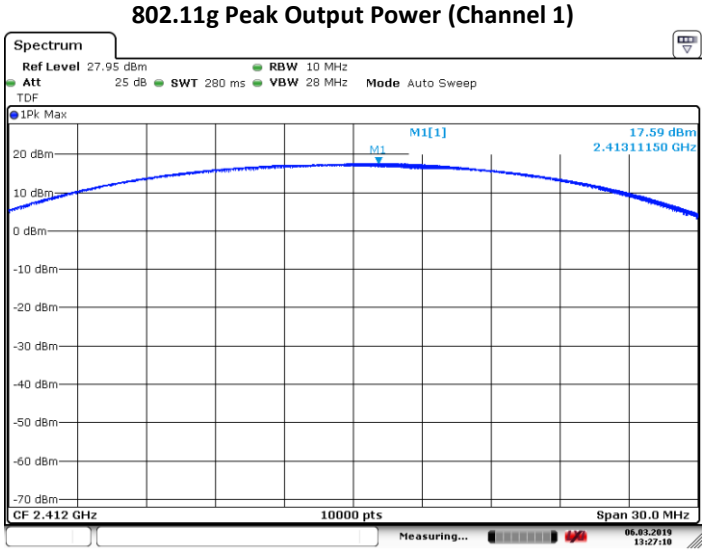
802.11b Peak Output Power (Channel 6)



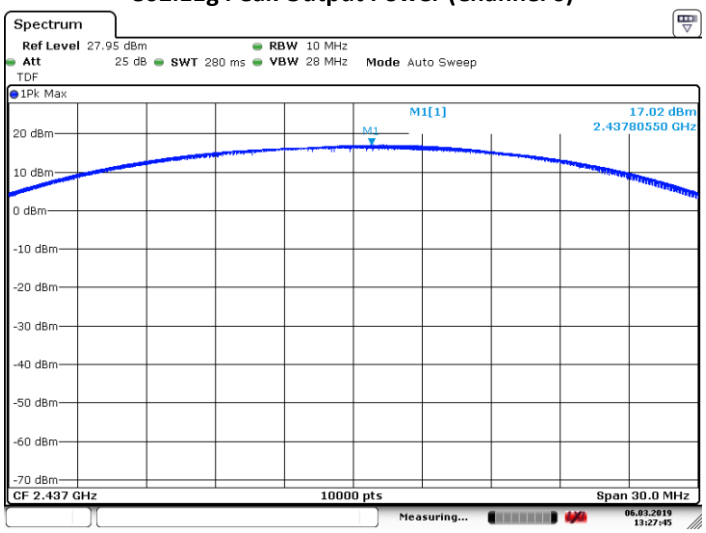
802.11b Peak Output Power (Channel 11)



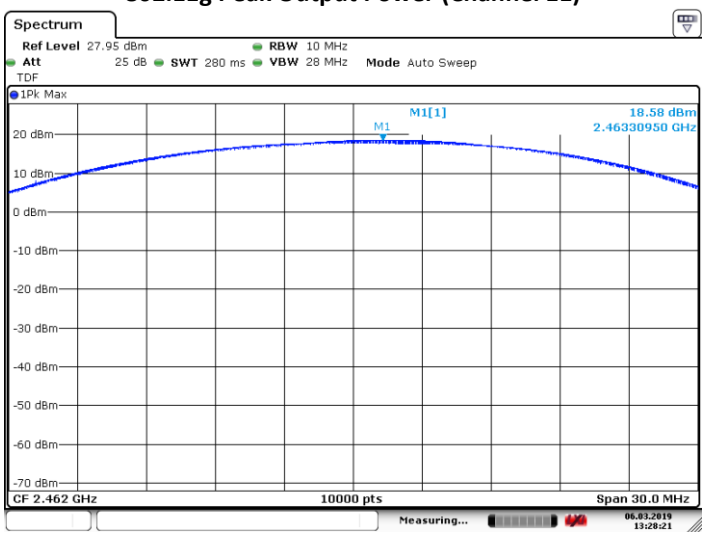
802.11g Peak Output Power (Channel 1)



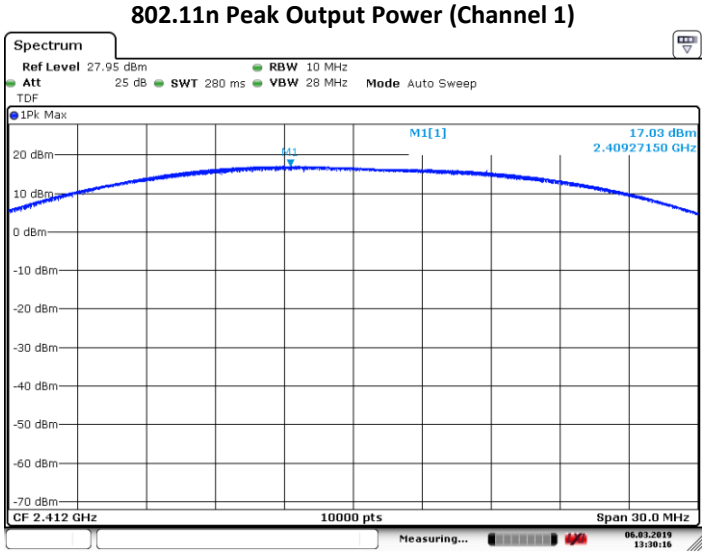
802.11g Peak Output Power (Channel 6)



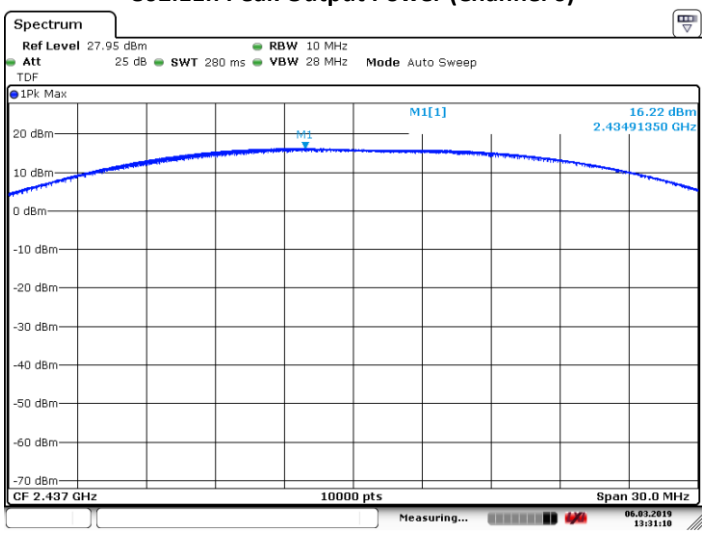
802.11g Peak Output Power (Channel 11)



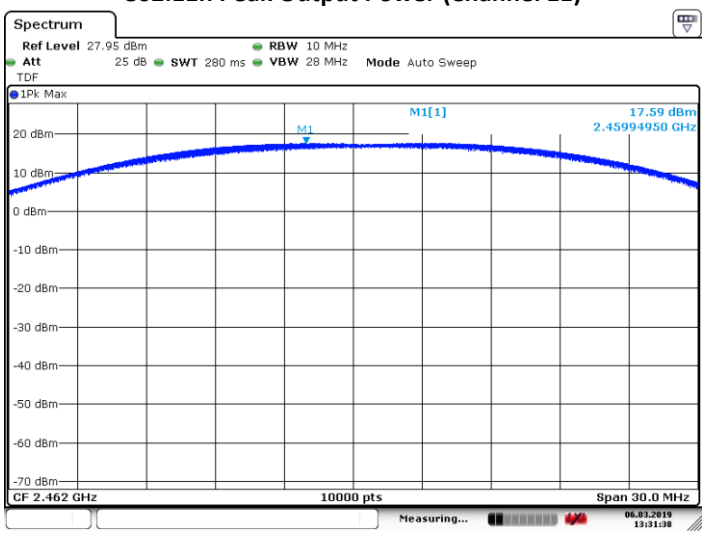
802.11n Peak Output Power (Channel 1)



802.11n Peak Output Power (Channel 6)



802.11n Peak Output Power (Channel 11)



3.4 Power Spectral Density

3.4.1 Limit

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

3.4.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.4.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.4.4 Test procedure

The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05.
IRN 030 - Spectral power density (W per n.Hz) - Method 5 – Peak method PKPSD (PSD in 3 kHz band)

3.4.5 Test results of Power Spectral Density Measurement

3.4.6 Spectral Density Measurement

Technology Std.	Channel	Frequency (MHz)	Data rate	PSD/3 kHz (dBm)
IEEE 802.11b	1(Low)	2412	11 Mbps	-14.18
	6(Mid)	2437	11 Mbps	-7.89
	11 (High)	2462	11 Mbps	-13.70
Uncertainty	±2 dB			

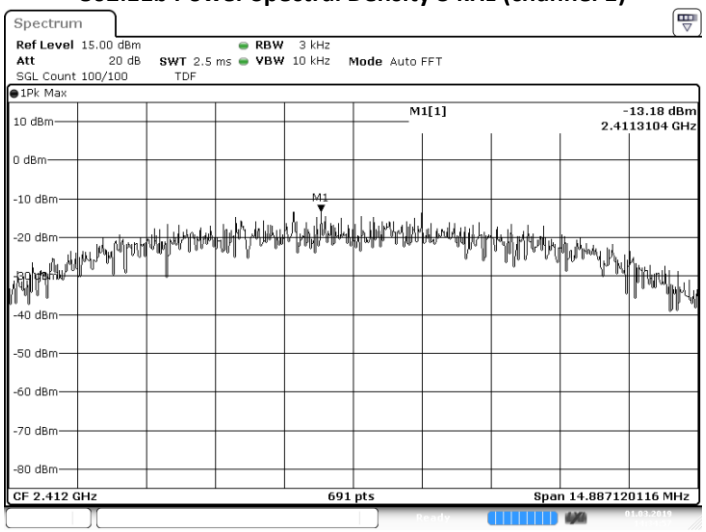
Technology Std.	Channels	Frequency (MHz)	Data rate	PSD/3 kHz (dBm)
IEEE 802.11g	1(Low)	2412	54 Mbps	-19.02
	6(Mid)	2437	54 Mbps	-20.02
	11 (High)	2462	54 Mbps	-18.44
Uncertainty	±2 dB			

Technology Std.	Channels	Frequency (MHz)	Data rate	PSD/3 kHz (dBm)
IEEE 802.11n	1(Low)	2412	MCS7	-19.12
	6(Mid)	2437	MCS7	-20.69
	11 (High)	2462	MCS7	-20.77
Uncertainty	±2 dB			

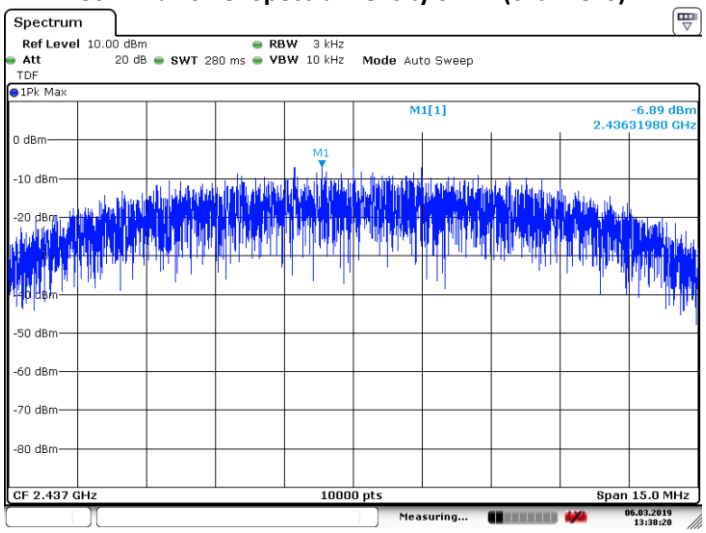
Note: conducted output power (dBm) + antenna gain (dBi) = peak output power (dBm)

3.4.7 Plots of the Power Spectral Density Measurements

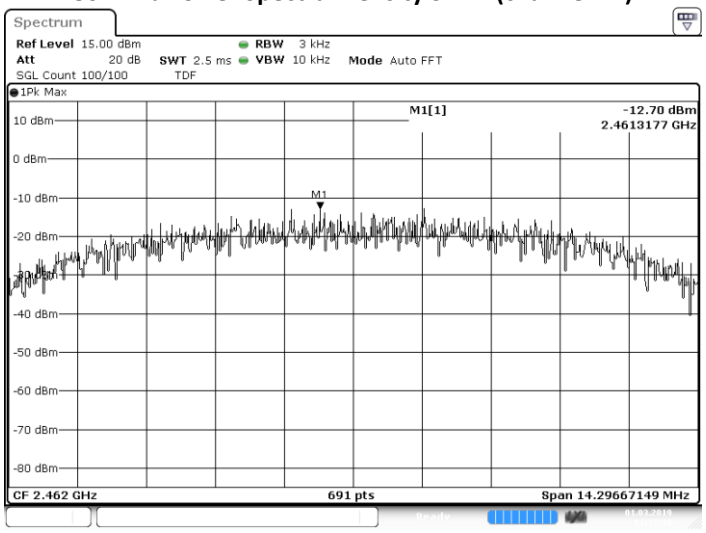
802.11b Power Spectral Density 3 kHz (channel 1)



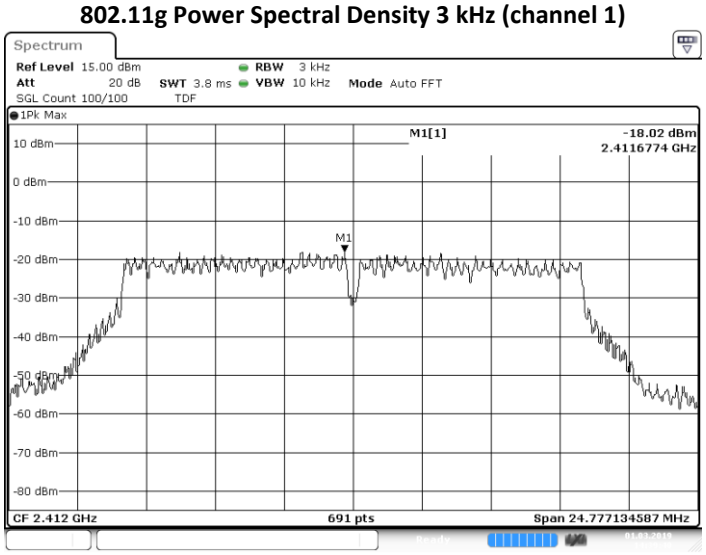
802.11b Power Spectral Density 3 kHz (channel 6)



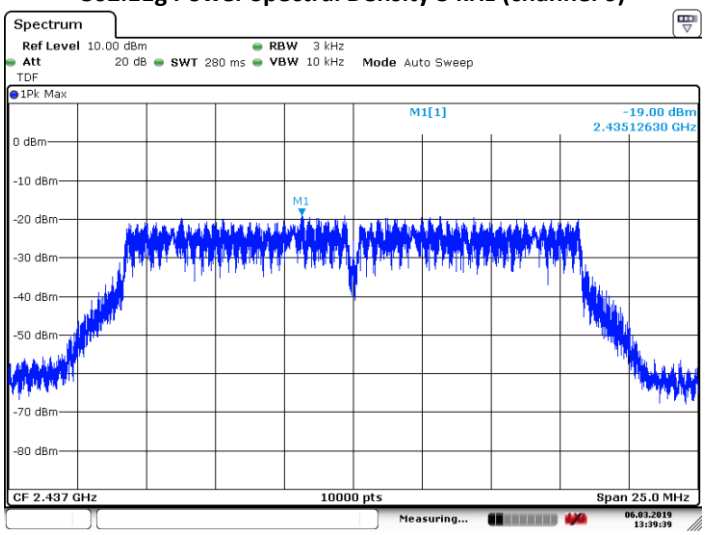
802.11b Power Spectral Density 3 kHz (channel 11)



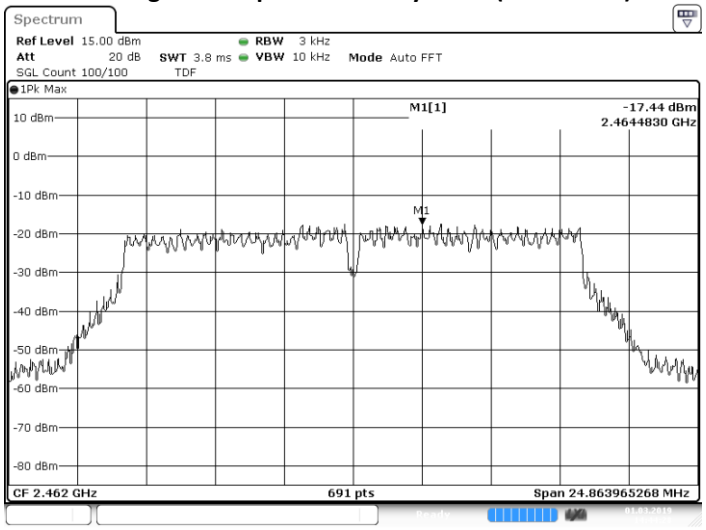
802.11g Power Spectral Density 3 kHz (channel 1)



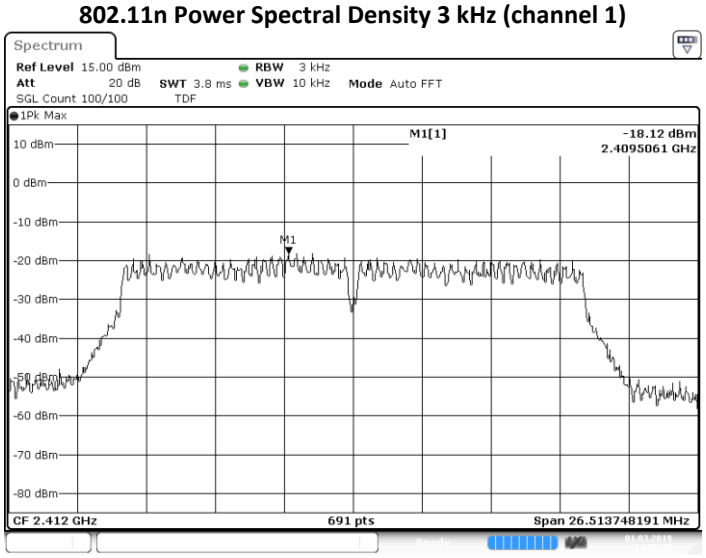
802.11g Power Spectral Density 3 kHz (channel 6)



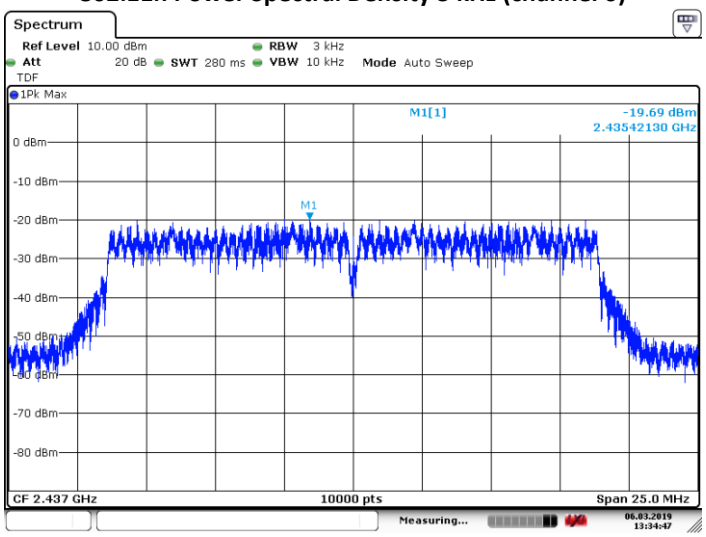
802.11g Power Spectral Density 3 kHz (channel 11)



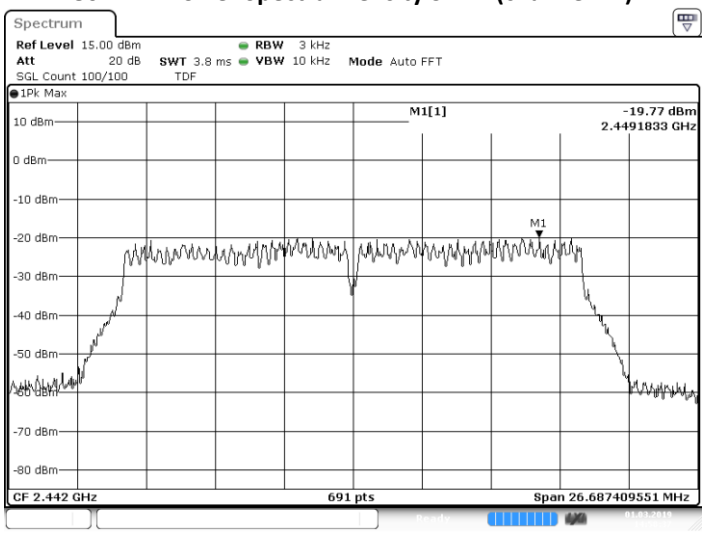
802.11n Power Spectral Density 3 kHz (channel 1)



802.11n Power Spectral Density 3 kHz (channel 6)



802.11n Power Spectral Density 3 kHz (channel 11)



3.5 Band edge Measurement

3.5.1 Limit

Band edge:
At the edge of the authorized band the RF power shall be at least 20 dB down.

3.5.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.5.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.5.4 Test procedure

According to KDB Publication 558074 V05
IRN 026 - Radiated electrical disturbance (V per m) Method 6 – Radiated electrical disturbance at the Authorized band edge.

3.5.5 Test results the Band edge Measurements

Band edge

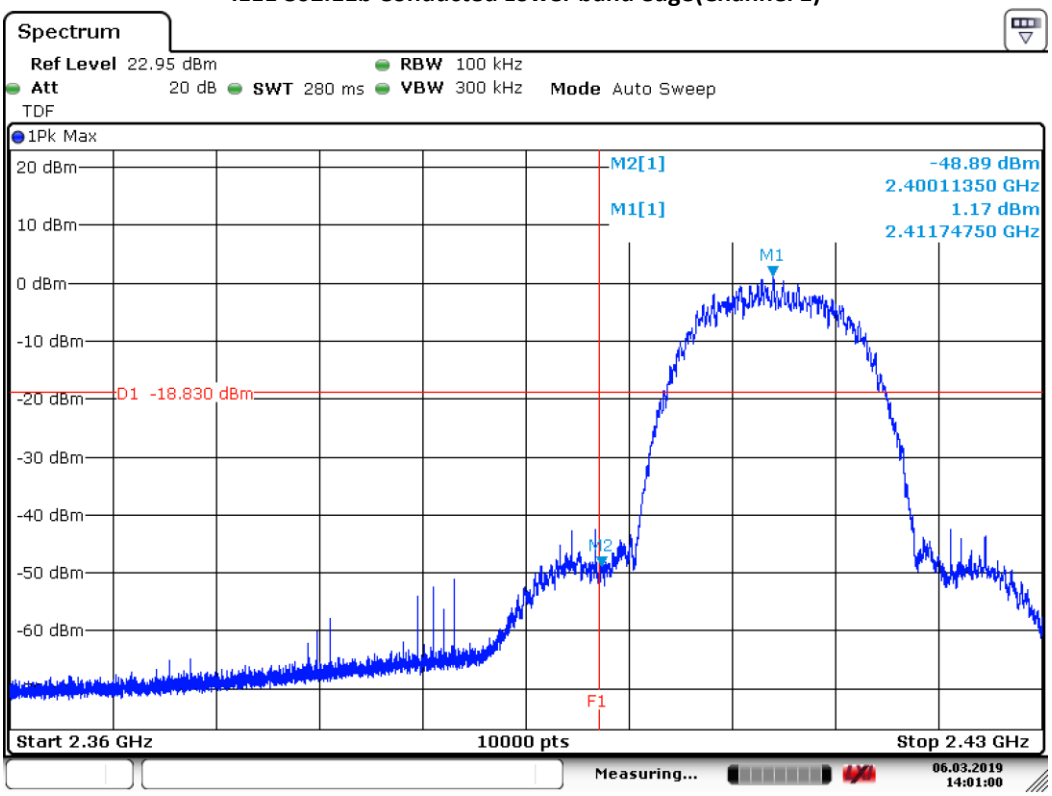
Technology Std.	Channels	Frequency (MHz)	Data rate	Band edge (dBm)	Limit (dBm)
IEEE 802.11b	1(Low)	2412	11 Mbps	-48.89	-18.83
	11(high)	2462	11 Mbps	-62.66	-18.44
Uncertainty	±2 dB				

Technology Std.	Channels	Frequency (MHz)	Data rate	Band edge (dBm)	Limit (dBm)
IEEE 802.11g	1(Low)	2412	54 Mbps	-41.19	-23.95
	11(high)	2462	54 Mbps	-48.17	-23.29
Uncertainty	±2 dB				

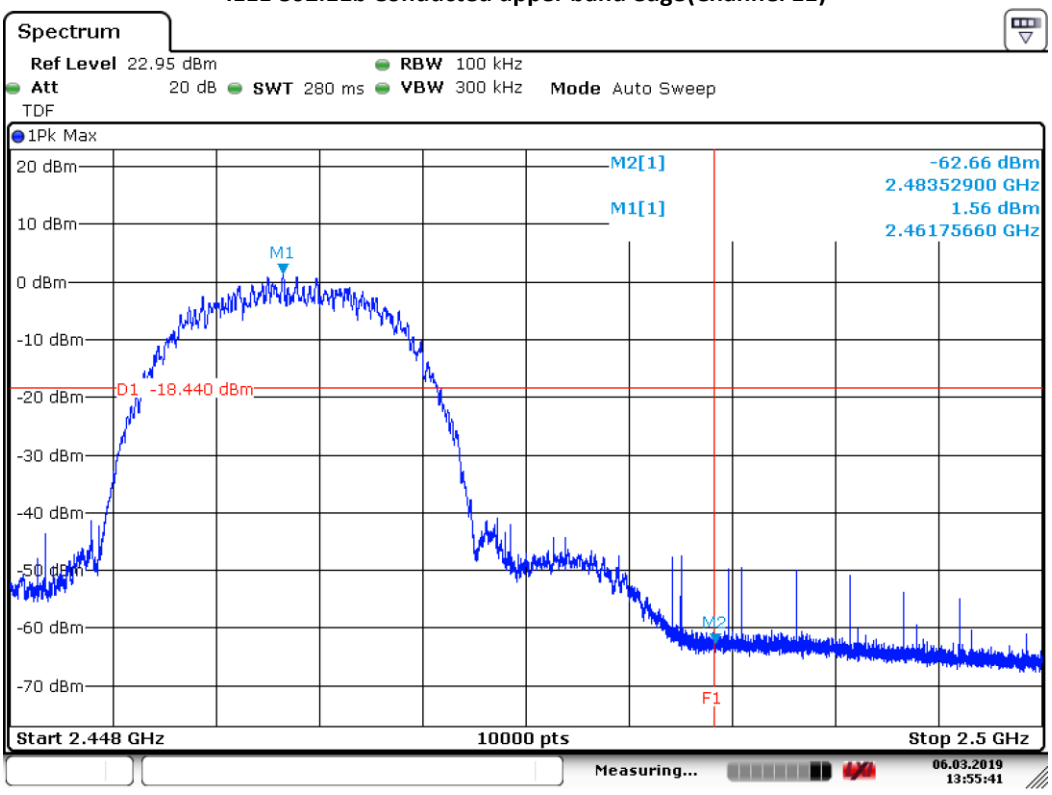
Technology Std.	Channels	Frequency (MHz)	Data rate	Band edge (dBm)	Limit (dBm)
IEEE 802.11n	1(Low)	2412	MCS7	-36.30	-24.65
	11(high)	2462	MCS7	-41.47	-23.51
Uncertainty	±2 dB				

3.5.6 Plots of the Conducted Spurious an Band edge Measurements

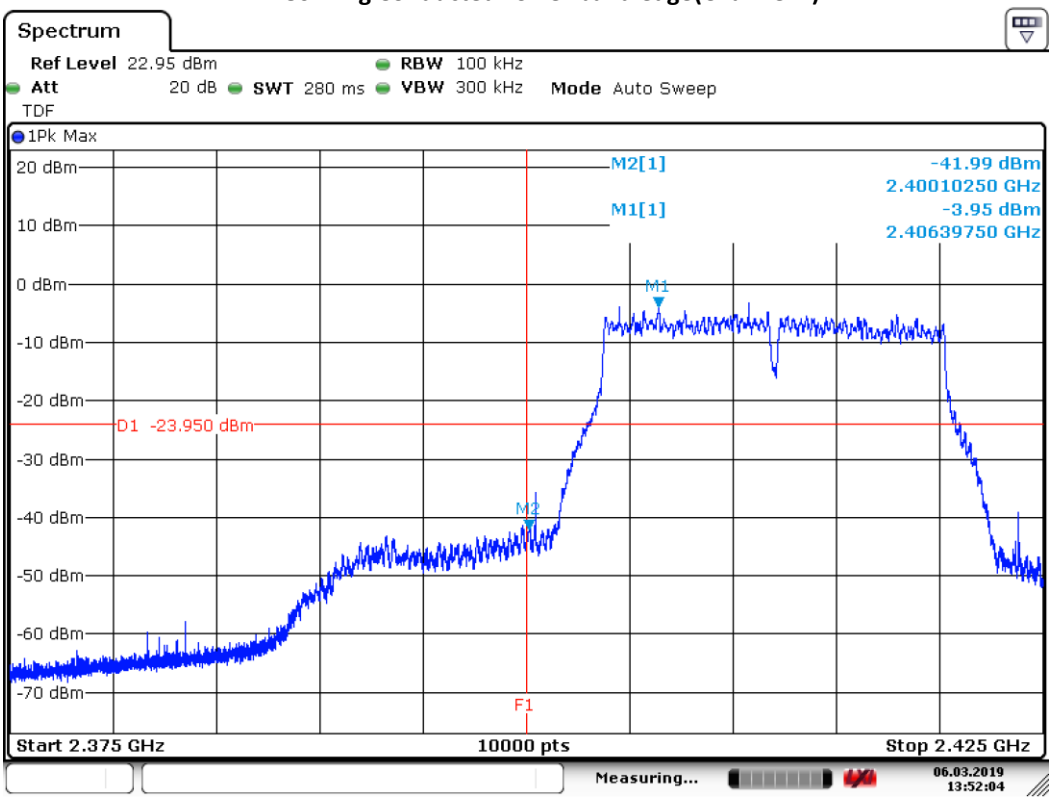
IEEE 802.11b Conducted Lower band edge(Channel 1)



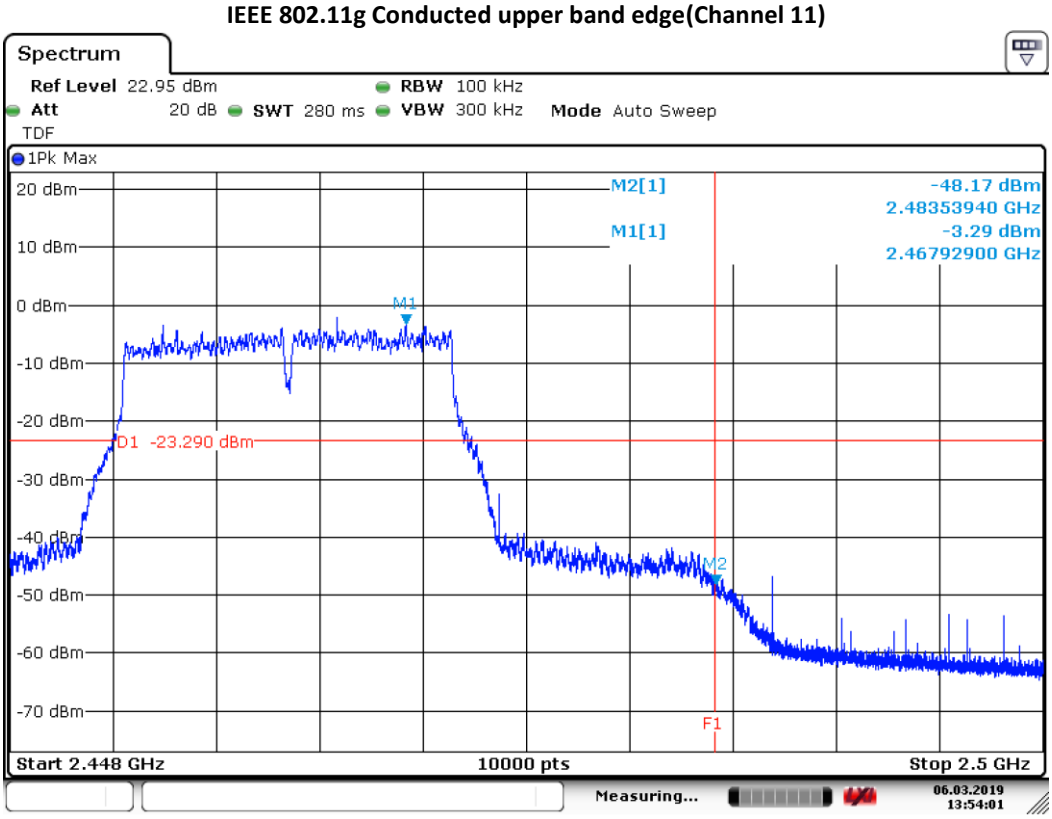
IEEE 802.11b Conducted upper band edge(Channel 11)



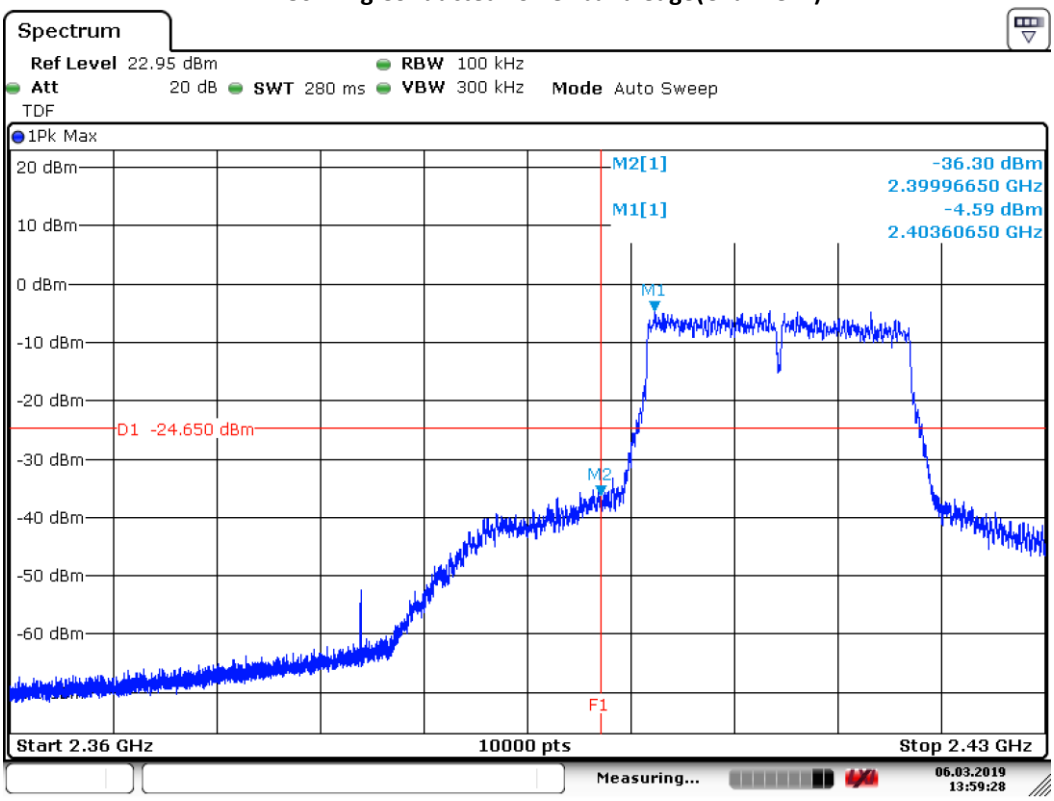
IEEE 802.11g Conducted Lower band edge(Channel 1)



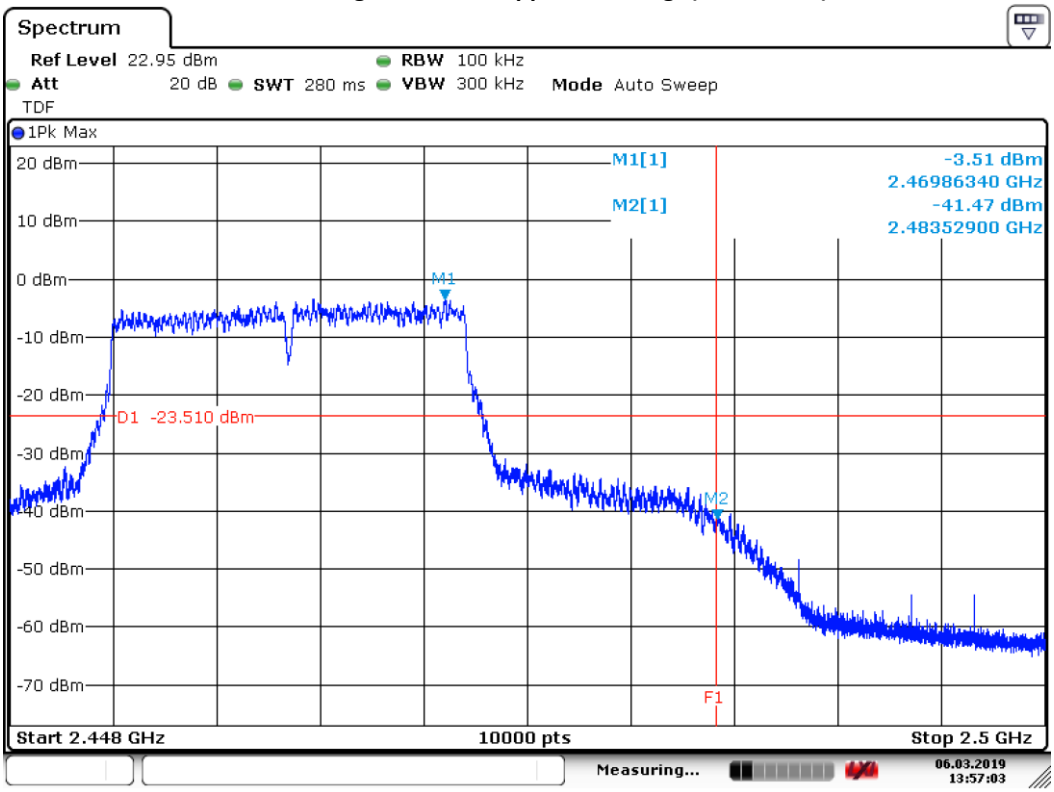
IEEE 802.11g Conducted upper band edge(Channel 11)



IEEE 802.11g Conducted Lower band edge(Channel 1)



IEEE 802.11g Conducted Upper band edge(Channel 11)



3.6 Radiated Spurious Emissions Measurement

3.6.1 Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

15.209

Frequency (MHz)	Field strength (µV/m)	Measurement distance(m)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 - 30	30	30
30 -88	100	3
88 - 216	150	3
216-960	200	3
Above 960	500	3

3.6.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.6.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.6.4 Test procedure

The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz.
Radiated emission limits in these three bands are based on measurements employing an average detector.

Other details are according to KDB Publication 558074 V05

IRN 026 - Radiated electrical disturbance (V per m) Method 1 – 30 MHz – 1 GHz in SAR.
IRN 026 - Radiated electrical disturbance (V per m) Method 2 – 1 - 18 GHz in SAR.
IRN 026 - Radiated electrical disturbance (V per m) Method 3 – 18 - 26.5 GHz in SAR.
IRN 027 - Radiated magnetic disturbance Method 1 – Loop antenna

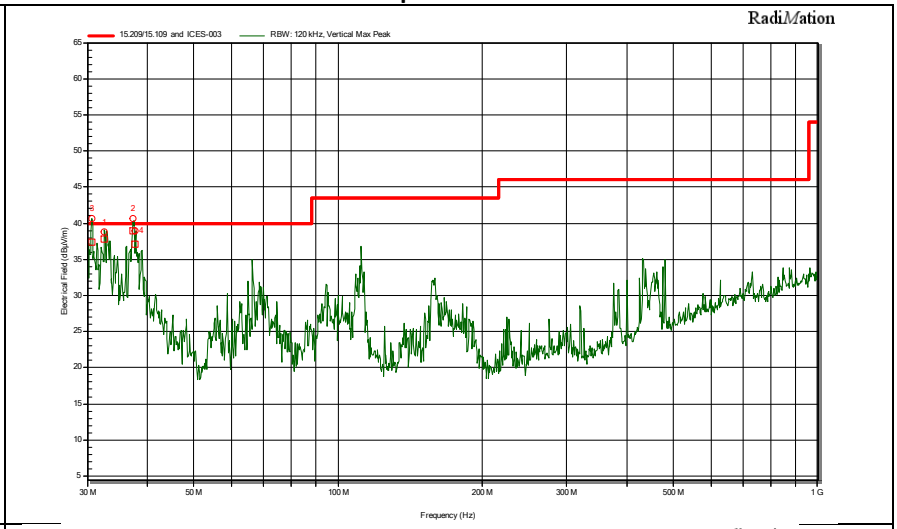
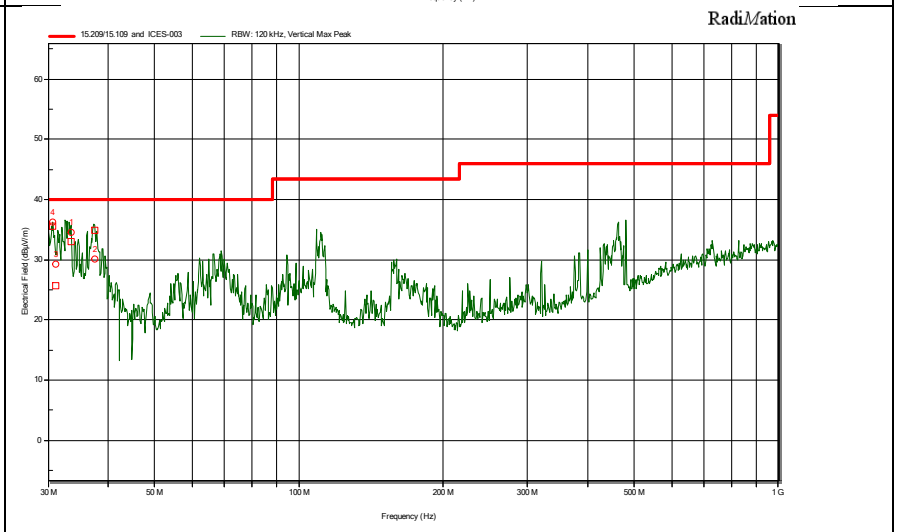
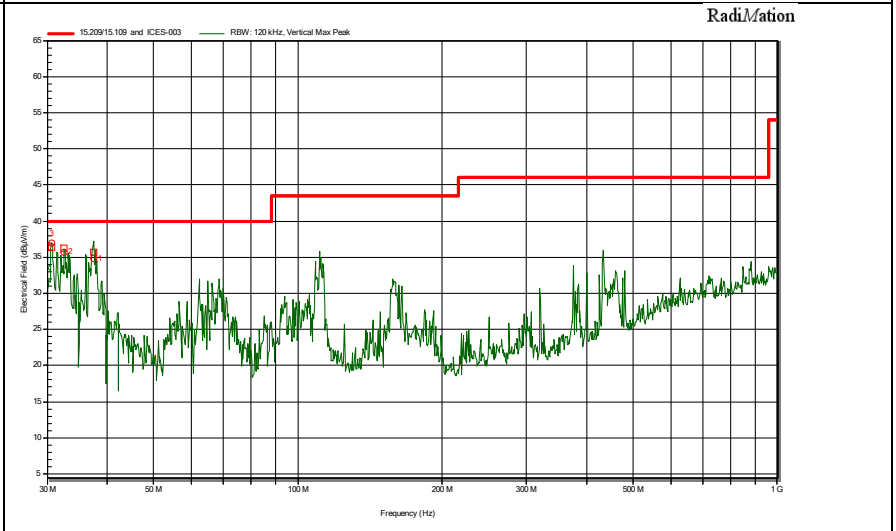
3.6.5 Notes

- In the frequency range of 1 – 26 GHz the green trace is measured using a peak detector and the red trace is measured using an average detector. The top limit line represent the peak limit and the bottom limit represents the average limit
- in the frequency range of 9 kHz to 30 MHz all emissions are 20 dB below the limit and are therefore not reported.

3.6.6 Plots of the Radiated Spurious Emissions

802.11b
30 MHz to 1 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

Measured peaks vertical low channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
30,617 MHz	40,6 dBµV/m	37,4 dBµV/m	40 dBµV/m	85 degrees	1 m	Vertical
32,596 MHz	38,8 dBµV/m	37,8 dBµV/m	40 dBµV/m	56 degrees	1 m	Vertical
37,366 MHz	40,6 dBµV/m	39 dBµV/m	40 dBµV/m	186 degrees	1 m	Vertical
37,803 MHz	39 dBµV/m	37,1 dBµV/m	40 dBµV/m	186 degrees	1 m	Vertical

Measured peaks vertical mid channel

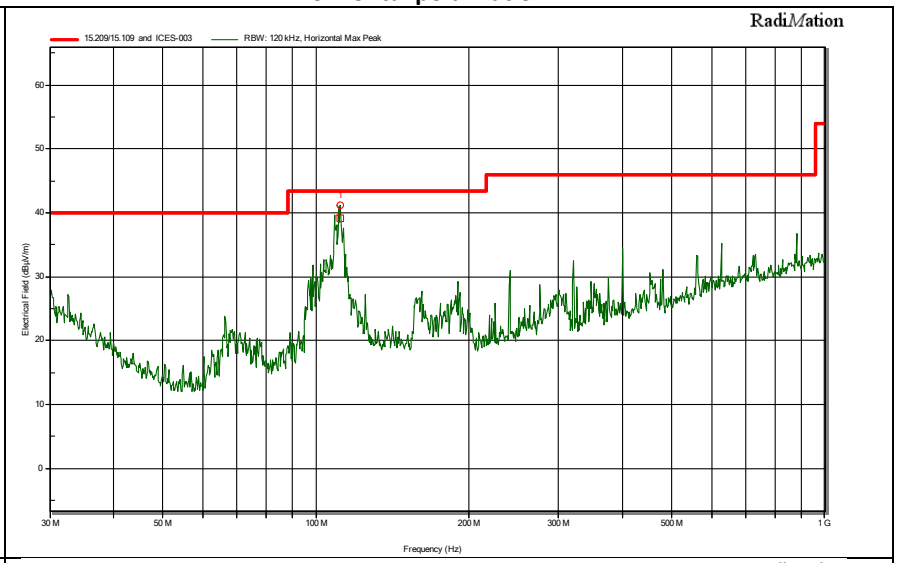
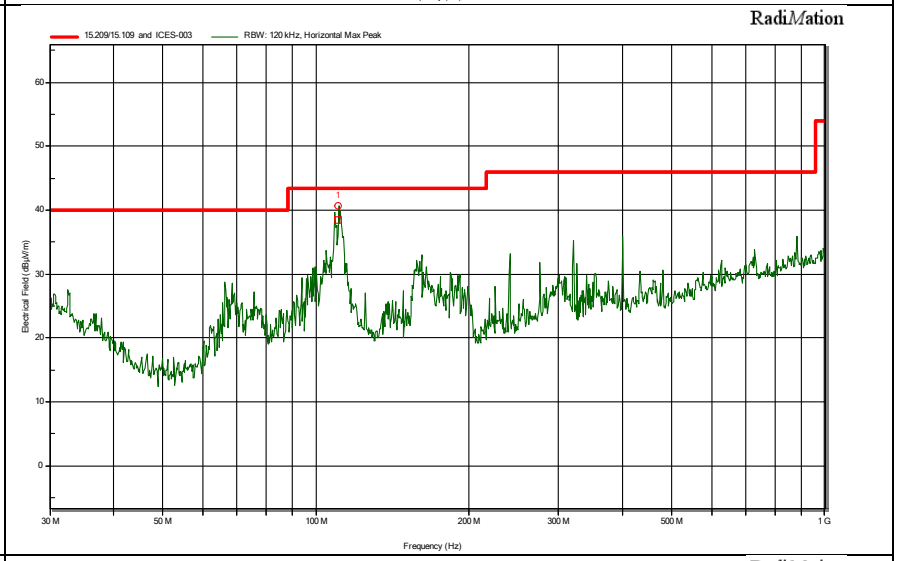
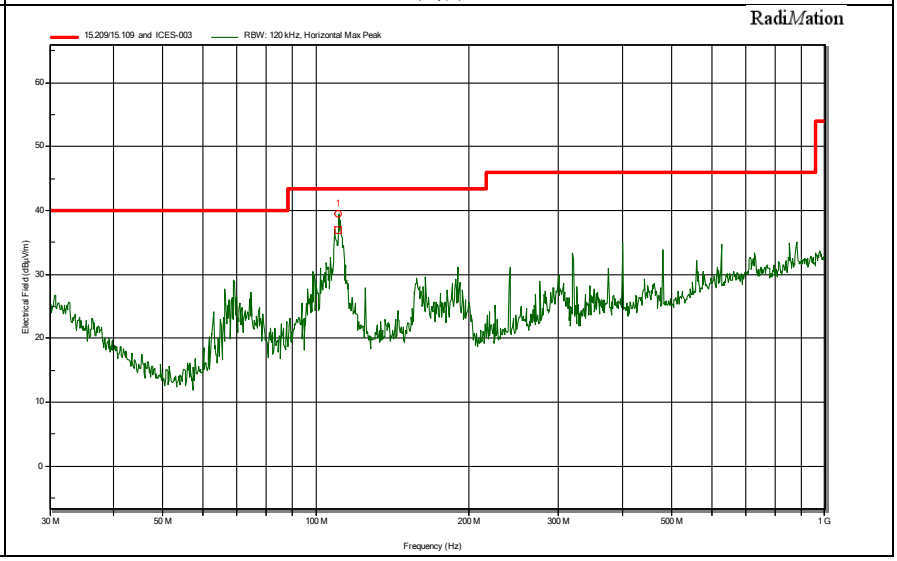
Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
30,613 MHz	36,3 dBµV/m	35,5 dBµV/m	40 dBµV/m	3 degrees	1,5 m	Vertical
31,06 MHz	29,3 dBµV/m	25,7 dBµV/m	40 dBµV/m	360 degrees	2 m	Vertical
33,448 MHz	34,6 dBµV/m	33 dBµV/m	40 dBµV/m	227 degrees	1,5 m	Vertical
37,532 MHz	30,1 dBµV/m	34,9 dBµV/m	40 dBµV/m	357 degrees	1,5 m	Vertical

Measured vertical high channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
30,645 MHz	36,9 dBµV/m	36,4 dBµV/m	40 dBµV/m	11 degrees	1 m	Vertical
32,602 MHz	35,7 dBµV/m	36,3 dBµV/m	40 dBµV/m	11 degrees	1 m	Vertical
37,534 MHz	34,9 dBµV/m	35,7 dBµV/m	40 dBµV/m	360 degrees	1 m	Vertical

802.11b
30 MHz to 1 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

Measured peaks horizontal low channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
111,566 MHz	41,1 dBµV/m	39,1 dBµV/m	43,5 dBµV/m	187 degrees	2,5 m	Horizontal

Measured peaks horizontal mid channel

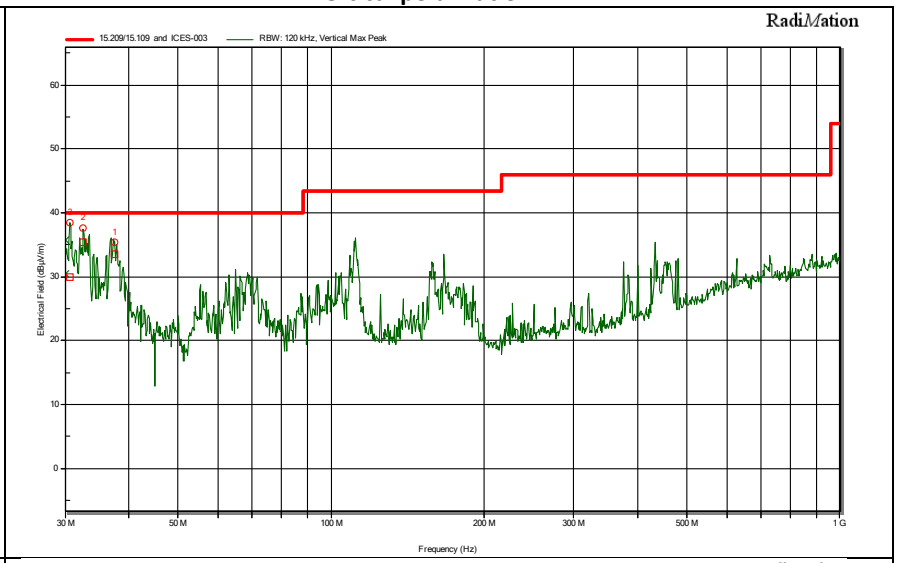
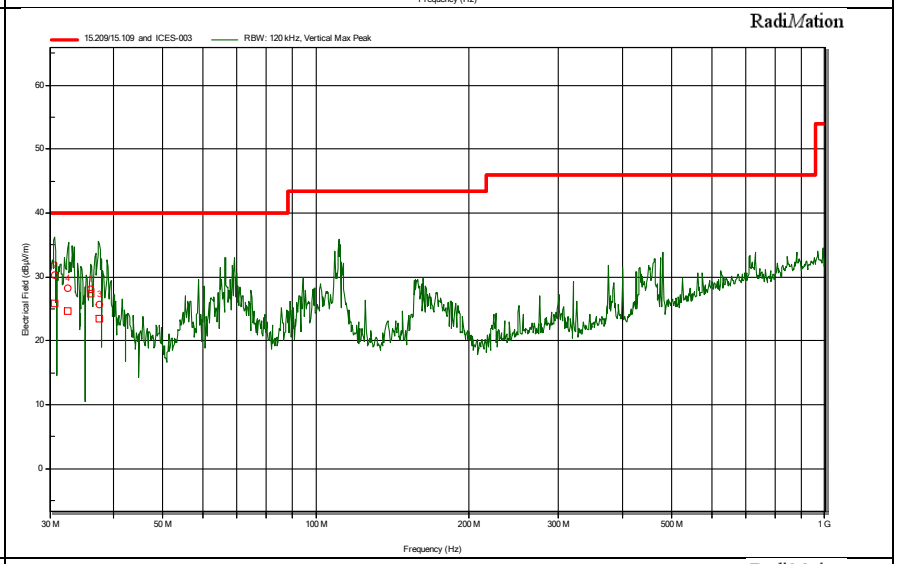
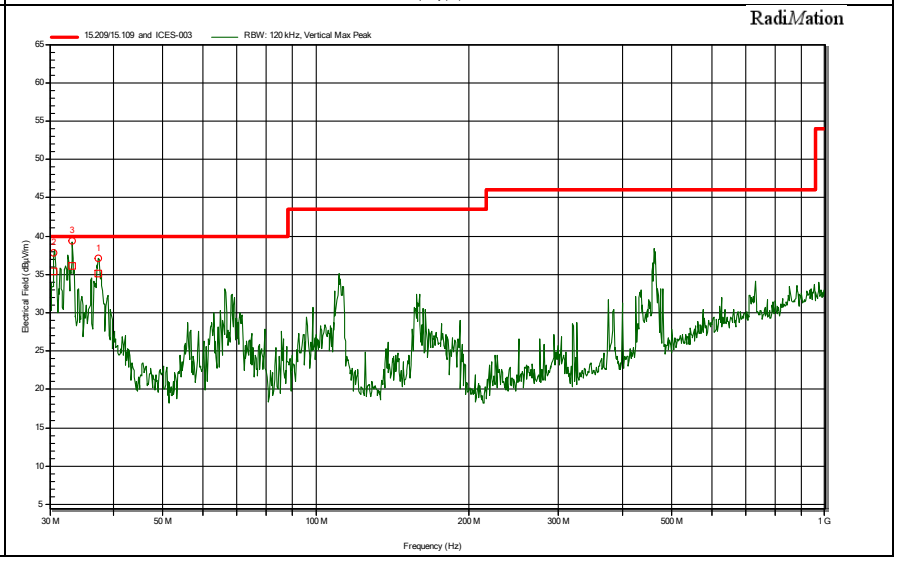
Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
110,766 MHz	40,7 dBµV/m	38,5 dBµV/m	43,5 dBµV/m	186 degrees	2,5 m	Horizontal

Measured peaks horizontal high channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
110,798 MHz	39,5 dBµV/m	37 dBµV/m	43,5 dBµV/m	156 degrees	2,5 m	Horizontal

802.11g
30 MHz to 1 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

Measured peaks Vertical low channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
30,627 MHz	38,5 dBµV/m	30 dBµV/m	40 dBµV/m	105 degrees	1 m	Vertical
32,58 MHz	37,5 dBµV/m	35,3 dBµV/m	40 dBµV/m	105 degrees	1 m	Vertical
37,535 MHz	35,4 dBµV/m	33,5 dBµV/m	40 dBµV/m	359 degrees	1,5 m	Vertical

Measured peaks Vertical mid channel

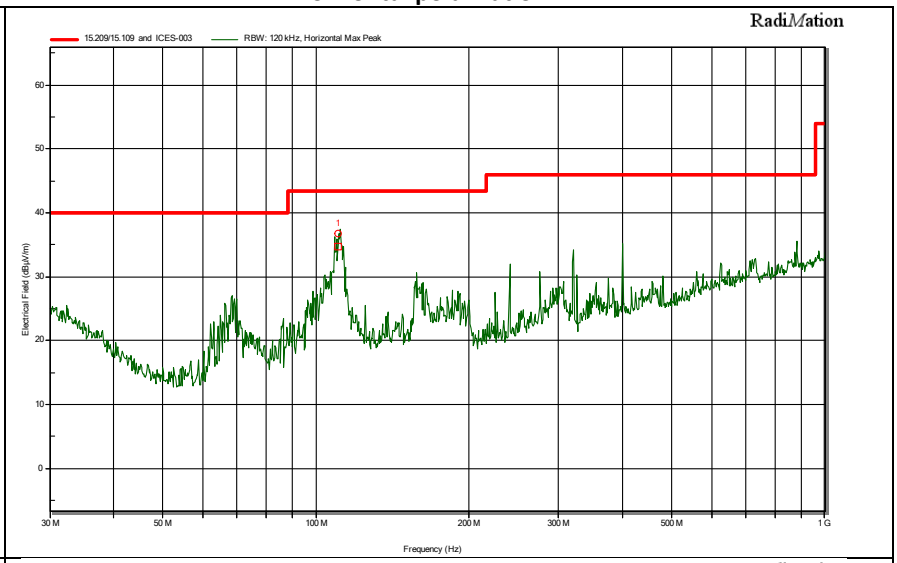
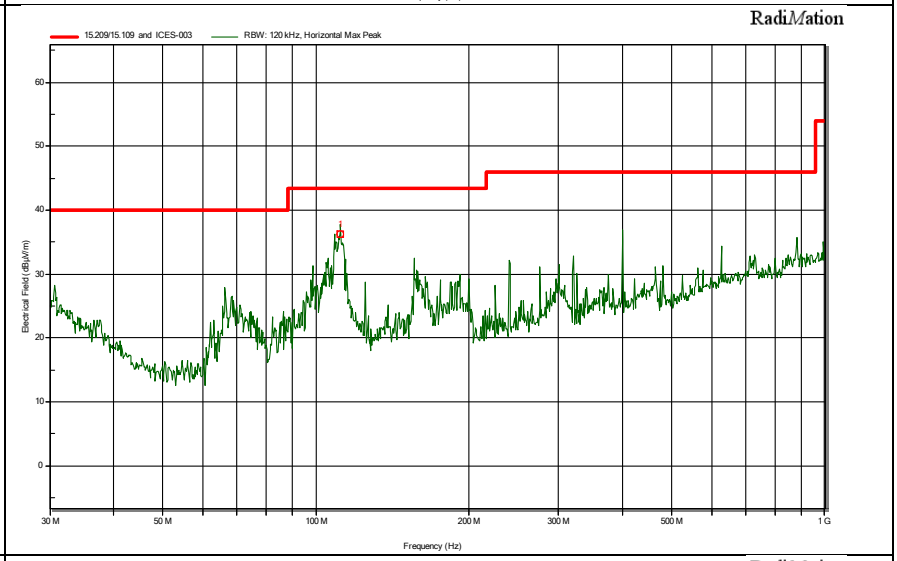
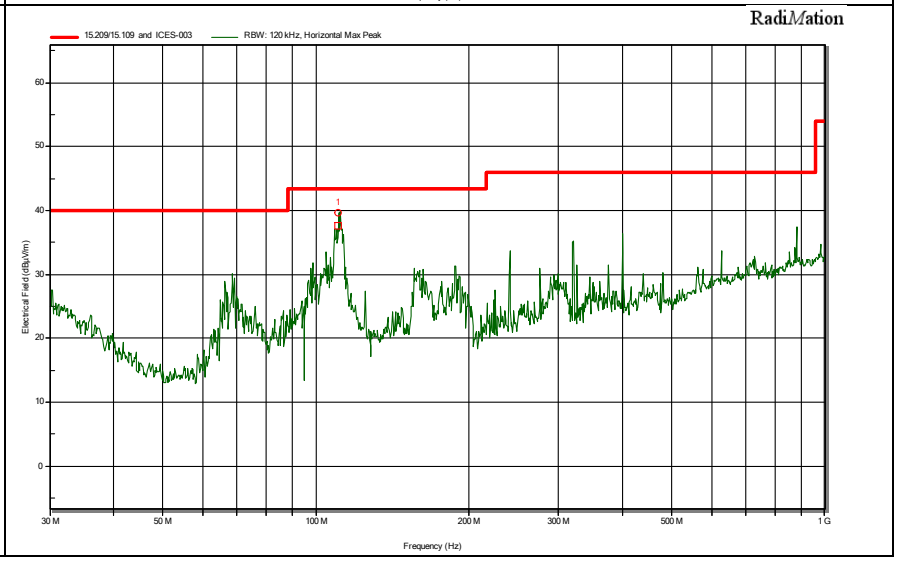
Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
30,653 MHz	30,3 dBµV/m	25,9 dBµV/m	40 dBµV/m	203 degrees	1,5 m	Vertical
32,591 MHz	28,2 dBµV/m	24,6 dBµV/m	40 dBµV/m	96 degrees	1,5 m	Vertical
36,144 MHz	28,1 dBµV/m	27,5 dBµV/m	40 dBµV/m	360 degrees	1 m	Vertical
37,516 MHz	25,6 dBµV/m	23,5 dBµV/m	40 dBµV/m	283 degrees	1,5 m	Vertical

Measured peaks Vertical high channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
30,597 MHz	37,8 dBµV/m	35,4 dBµV/m	40 dBµV/m	16 degrees	1,5 m	Vertical
33,182 MHz	39,3 dBµV/m	36,1 dBµV/m	40 dBµV/m	2 degrees	1 m	Vertical
37,37 MHz	37,1 dBµV/m	35,1 dBµV/m	40 dBµV/m	34 degrees	1,5 m	Vertical

802.11g
30 MHz to 1 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

Measured peaks horizontal low channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
110,778 MHz	36,7 dBµV/m	34,8 dBµV/m	43,5 dBµV/m	236 degrees	2,5 m	Horizontal

Measured peaks horizontal mid channel

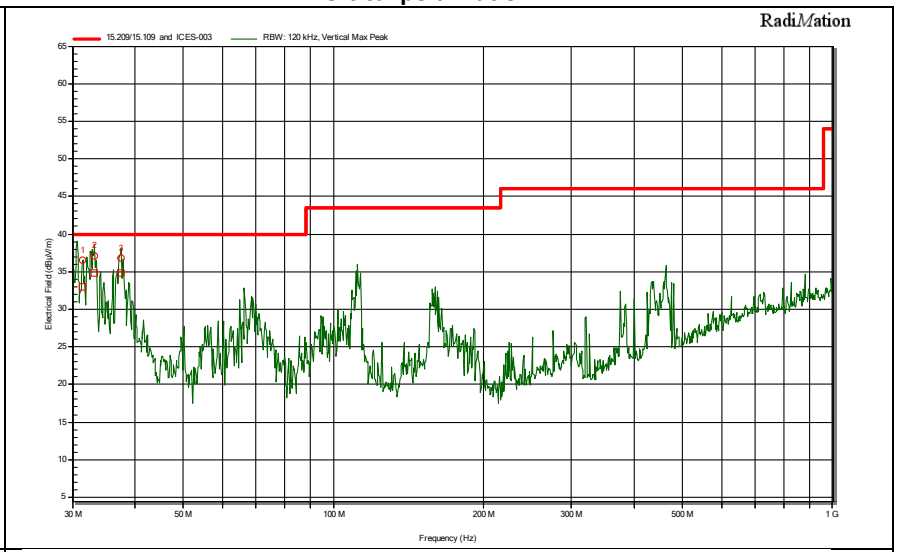
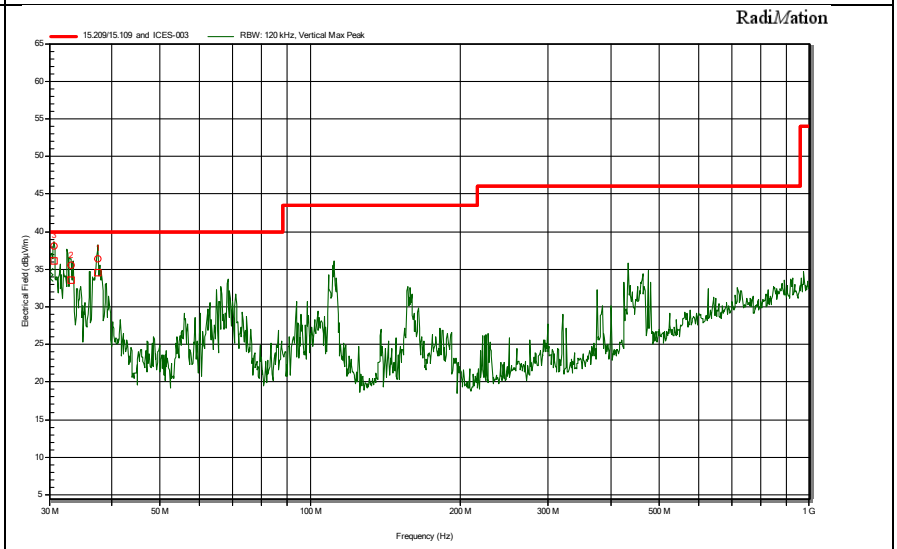
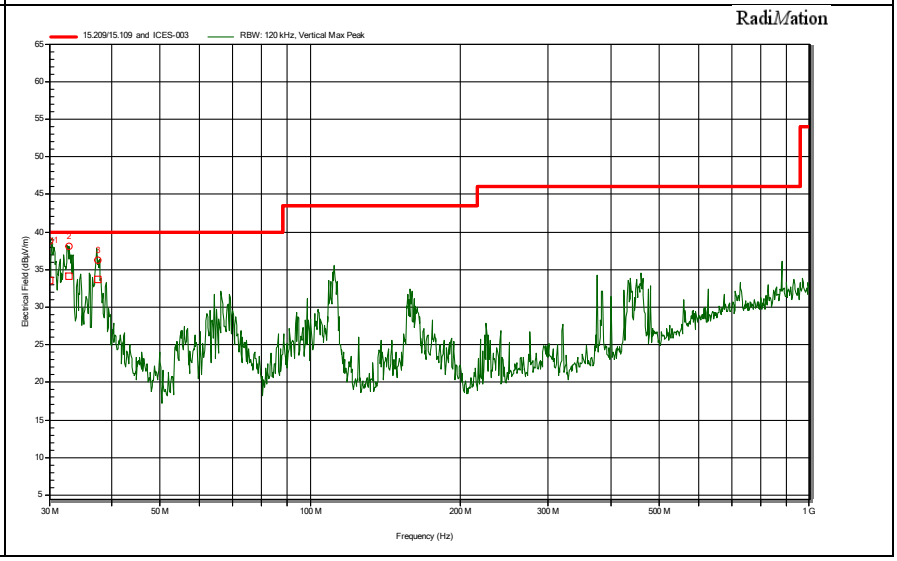
Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
111,637 MHz	36,3 dBµV/m	36,2 dBµV/m	43,5 dBµV/m	12 degrees	2,5 m	Horizontal

Measured peaks horizontal high channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
110,797 MHz	39,7 dBµV/m	37,6 dBµV/m	43,5 dBµV/m	359 degrees	2,5 m	Horizontal

802.11n
30 MHz to 1 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

Measured peaks vertical low channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
31,419 MHz	36,5 dBµV/m	33 dBµV/m	40 dBµV/m	101 degrees	1 m	Vertical
33,184 MHz	37,1 dBµV/m	34,8 dBµV/m	40 dBµV/m	319 degrees	1 m	Vertical
37,531 MHz	36,8 dBµV/m	34,8 dBµV/m	40 dBµV/m	66 degrees	1,5 m	Vertical

Measured peaks vertical mid channel

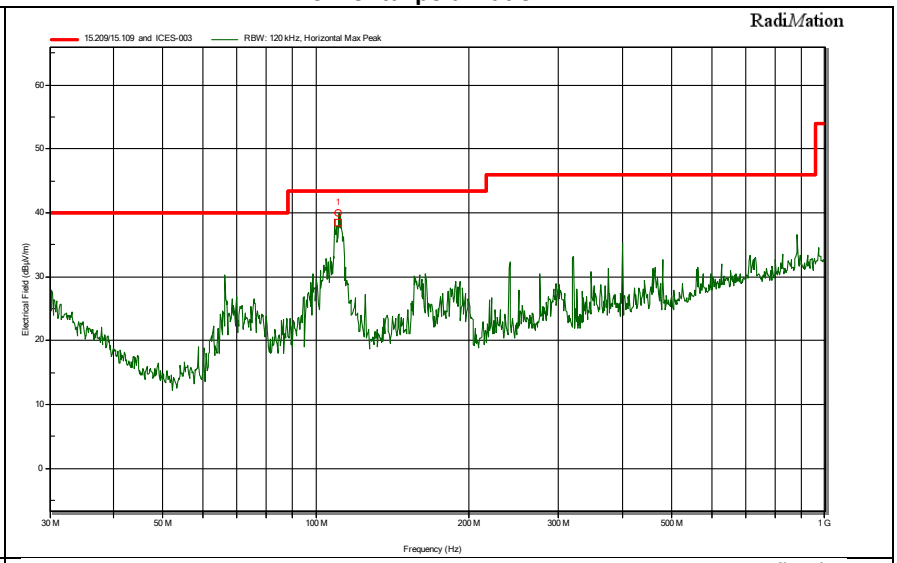
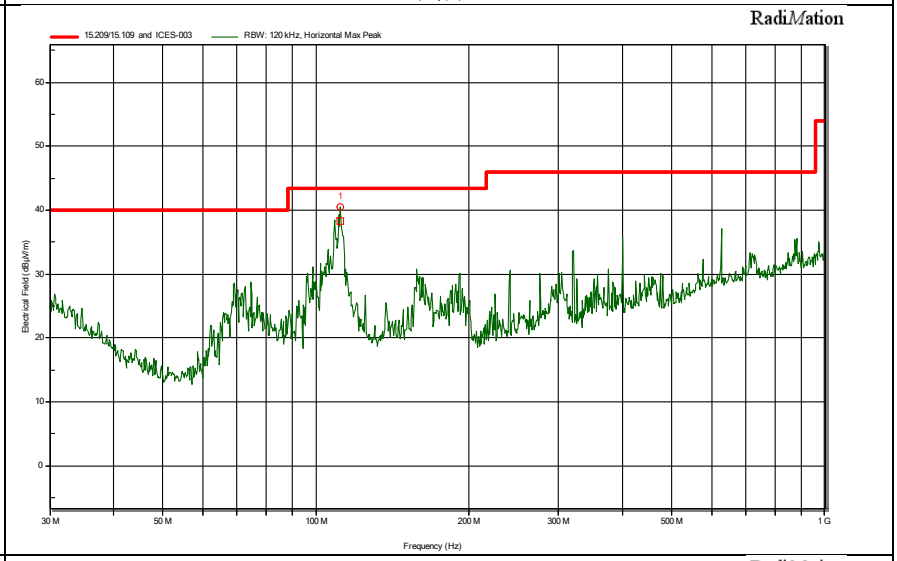
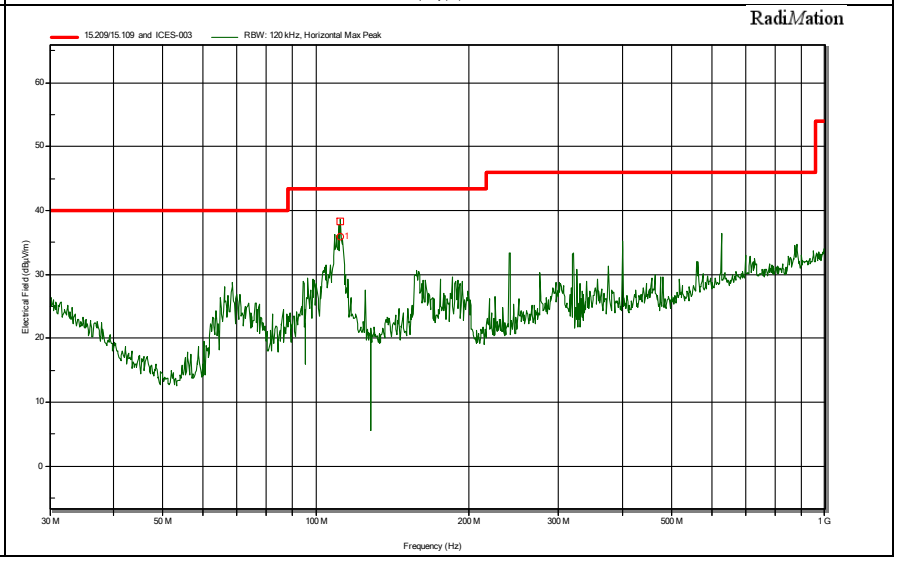
Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
30,61 MHz	38,1 dBµV/m	36,2 dBµV/m	40 dBµV/m	162 degrees	1 m	Vertical
33,174 MHz	35,5 dBµV/m	33,6 dBµV/m	40 dBµV/m	246 degrees	1 m	Vertical
37,527 MHz	36,4 dBµV/m	34,6 dBµV/m	40 dBµV/m	201 degrees	1,5 m	Vertical

Measured peaks vertical high channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
30 MHz	38,8 dBµV/m	33,5 dBµV/m	40 dBµV/m	330 degrees	1,5 m	Vertical
32,872 MHz	38,1 dBµV/m	34,2 dBµV/m	40 dBµV/m	19 degrees	1 m	Vertical
37,534 MHz	36,3 dBµV/m	33,8 dBµV/m	40 dBµV/m	120 degrees	1,5 m	Vertical

802.11n
30 MHz to 1 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

Measured peaks horizontal low channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
110,785 MHz	40 dBµV/m	38,5 dBµV/m	43,5 dBµV/m	184 degrees	2,5 m	Horizontal

Measured peaks horizontal mid channel

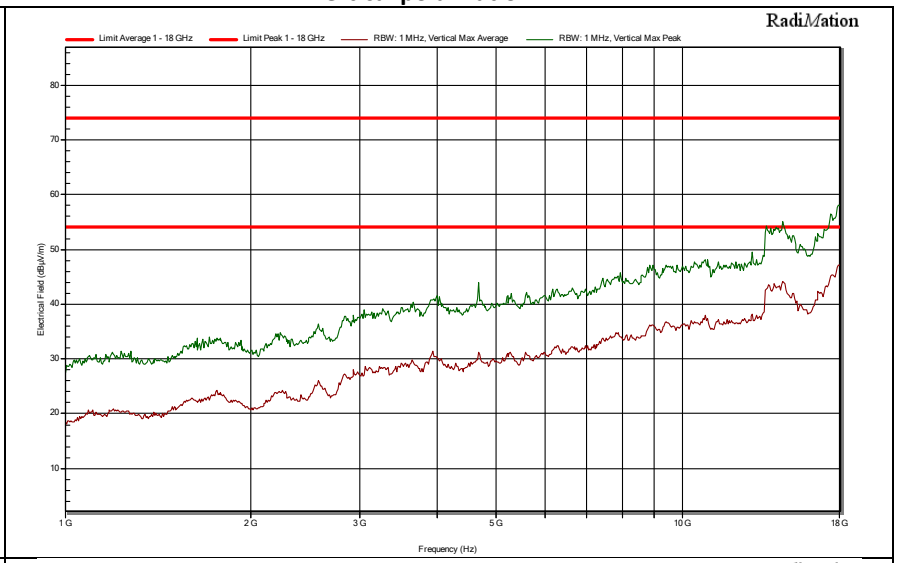
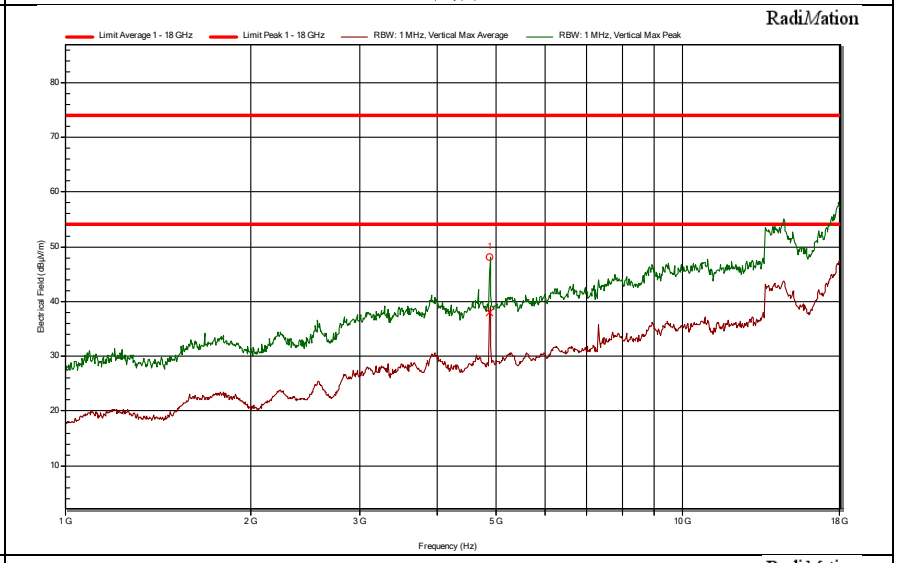
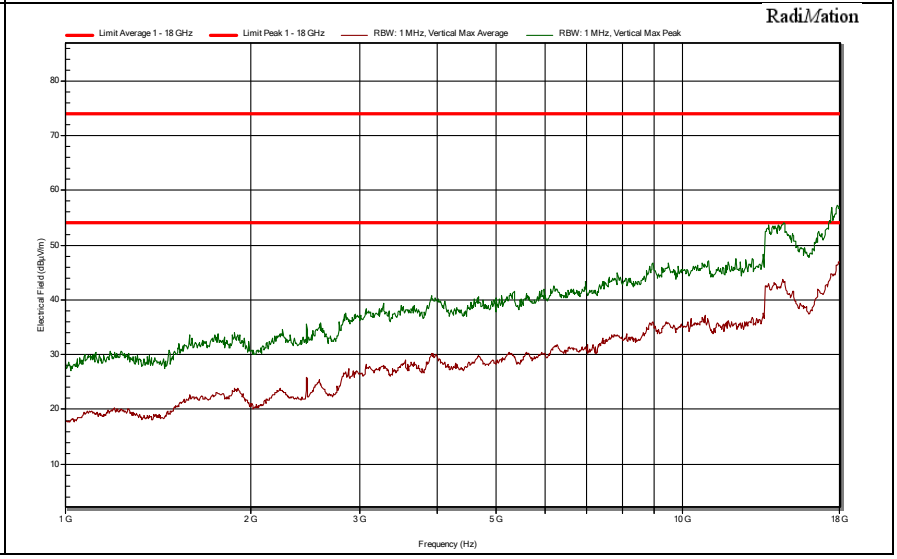
Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
111,571 MHz	40,5 dBµV/m	38,4 dBµV/m	43,5 dBµV/m	179 degrees	2,5 m	Horizontal

Measured peaks horizontal high channel

Frequency	Peak	Quasi-Peak	Quasi-Peak Limit	Angle	Height	Polarization
111,604 MHz	36 dBµV/m	38,4 dBµV/m	43,5 dBµV/m	357 degrees	2,5 m	Horizontal

802.11b
1 GHz to 18 GHz

Vertical polarization

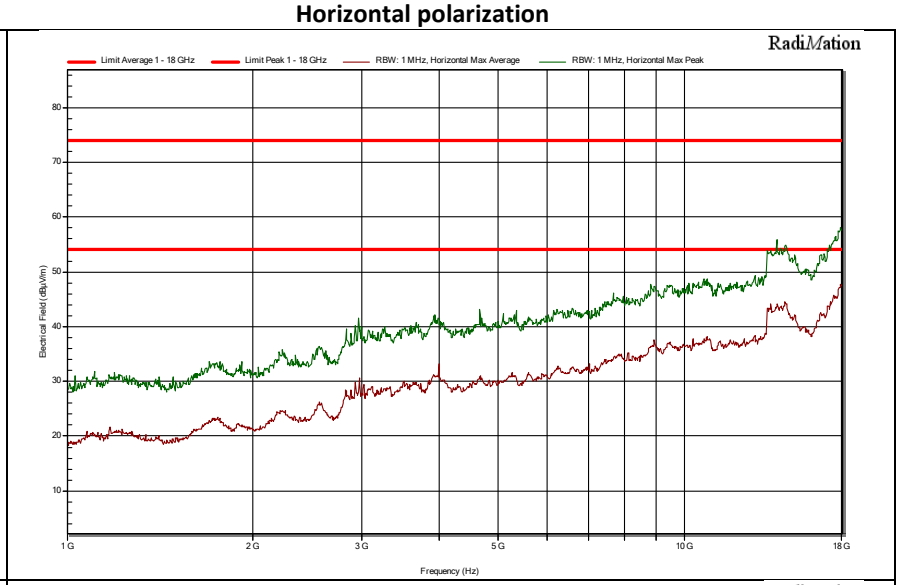
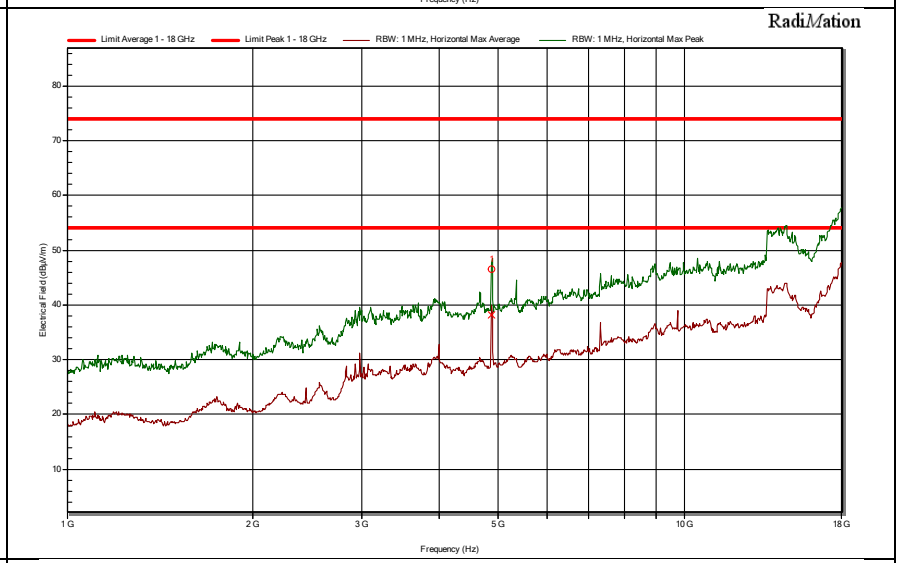
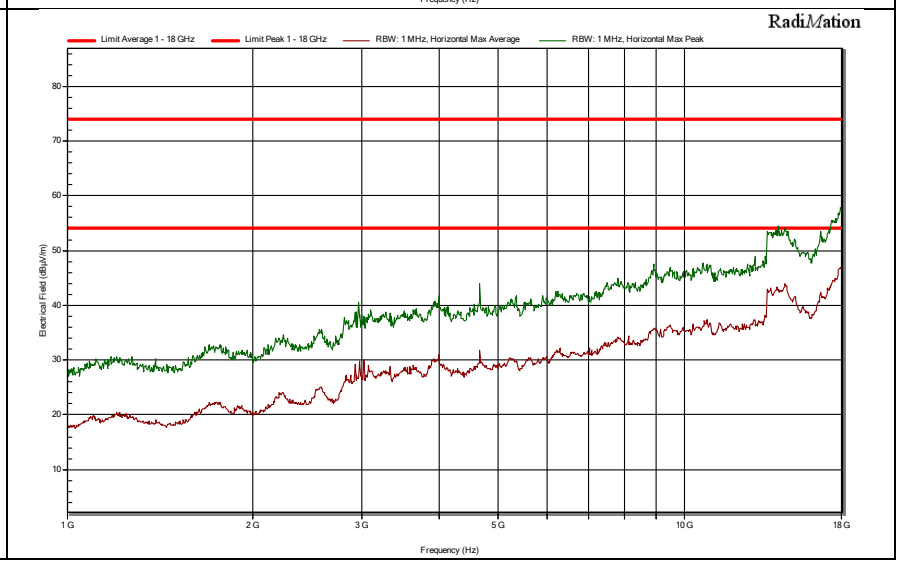
Low ch	
Mid ch	
High ch	

Measured peaks vertical mid channel

Frequency	Peak	Peak Limit	Average	Average Limit	Angle	Height	Polarization
4,874 GHz	48,2 dBµV/m	74 dBµV/m	38 dBµV/m	54 dBµV/m	0 degrees	1 m	Vertical

1 GHz to 18 GHz

Horizontal polarization

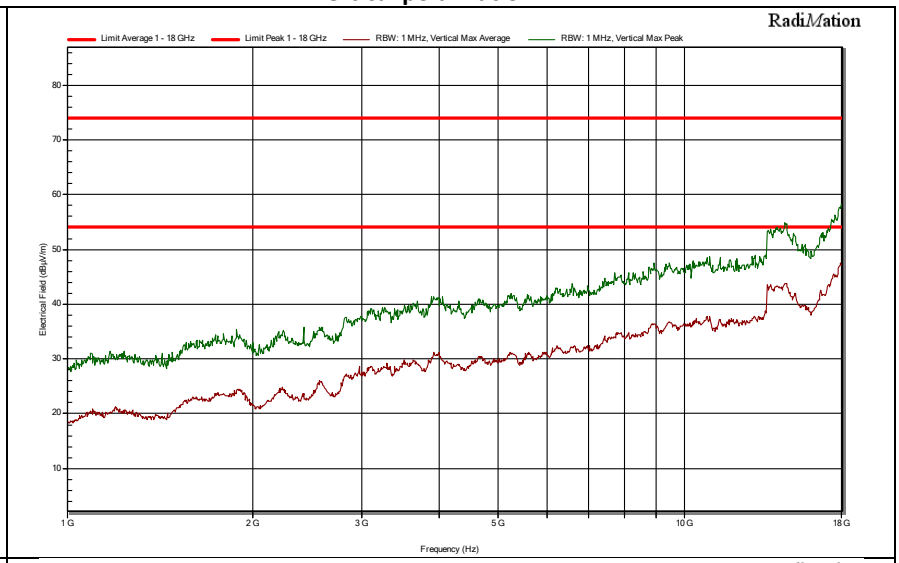
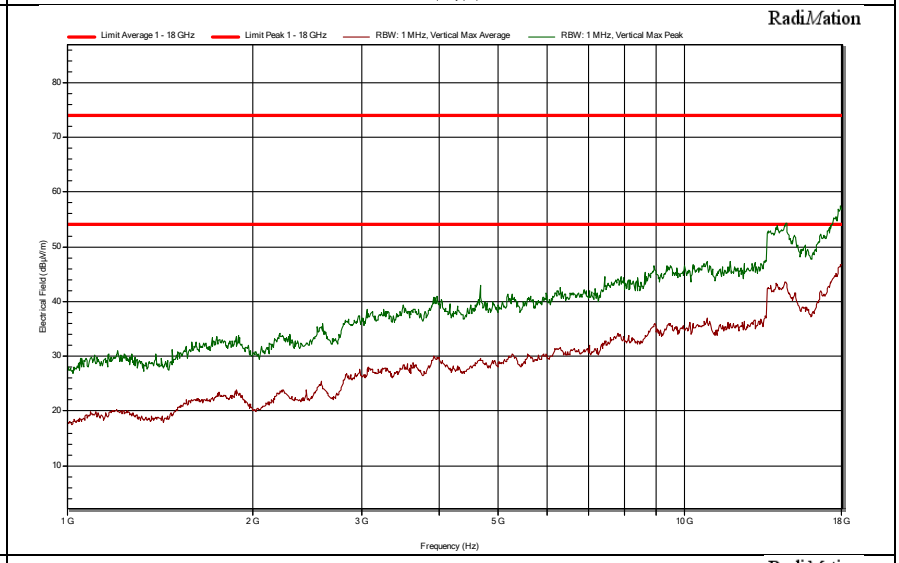
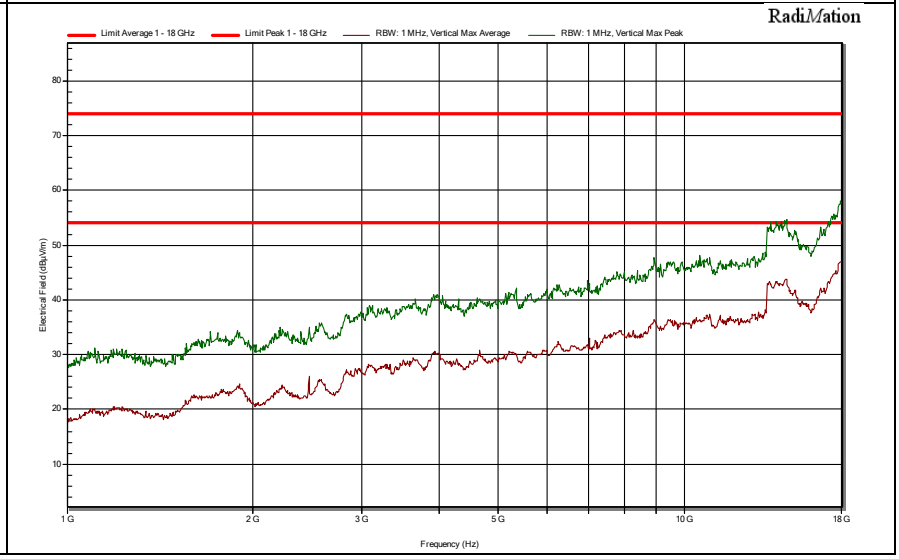
Low ch	
Mid ch	
High ch	

Measured peaks horizontal mid channel

Frequency	Peak	Peak Limit	Average	Average Limit	Angle	Height	Polarization
4,872 GHz	46,6 dBµV/m	74 dBµV/m	38,3 dBµV/m	54 dBµV/m	18 degrees	1 m	Horizontal

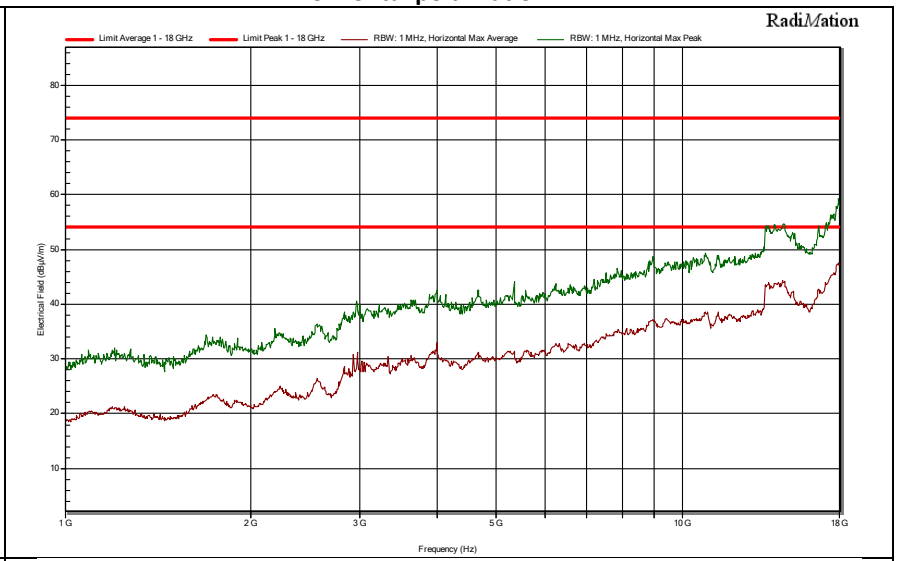
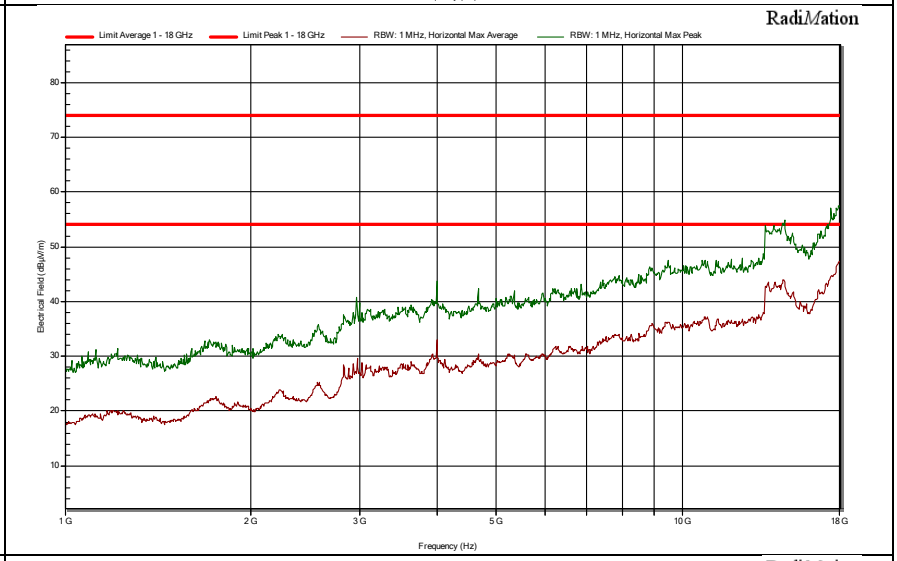
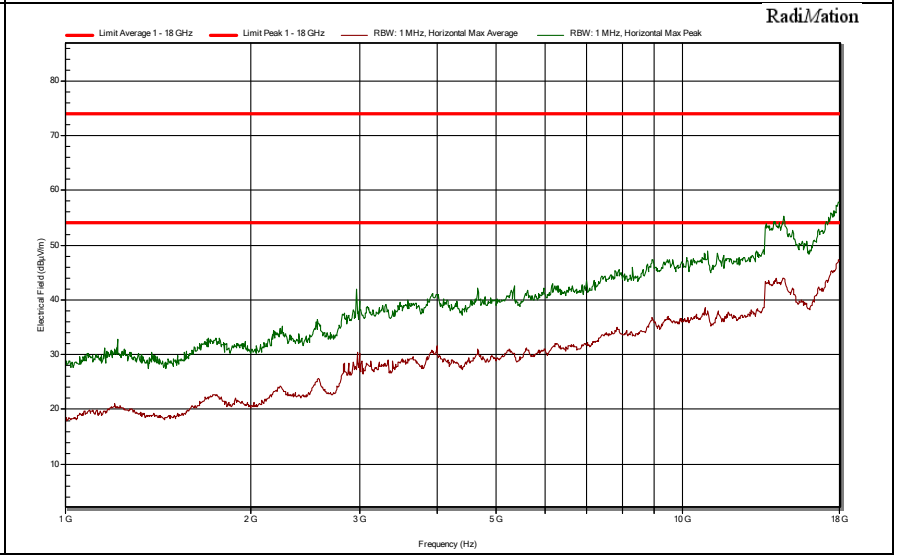
802.11g
1 GHz to 18 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

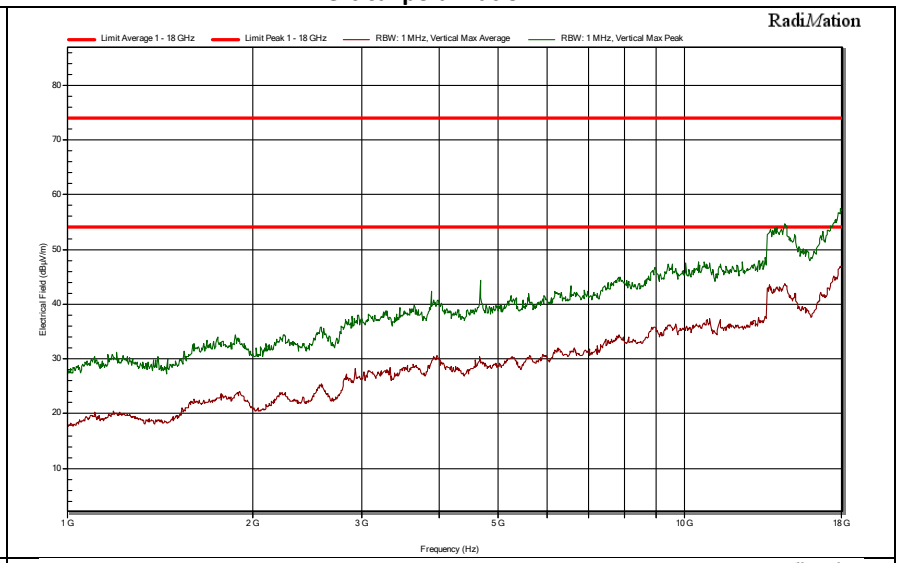
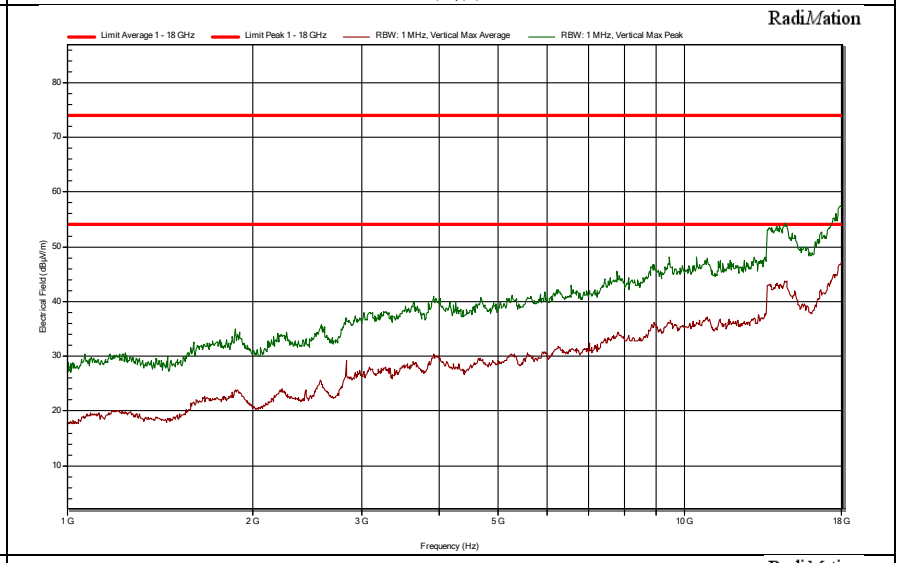
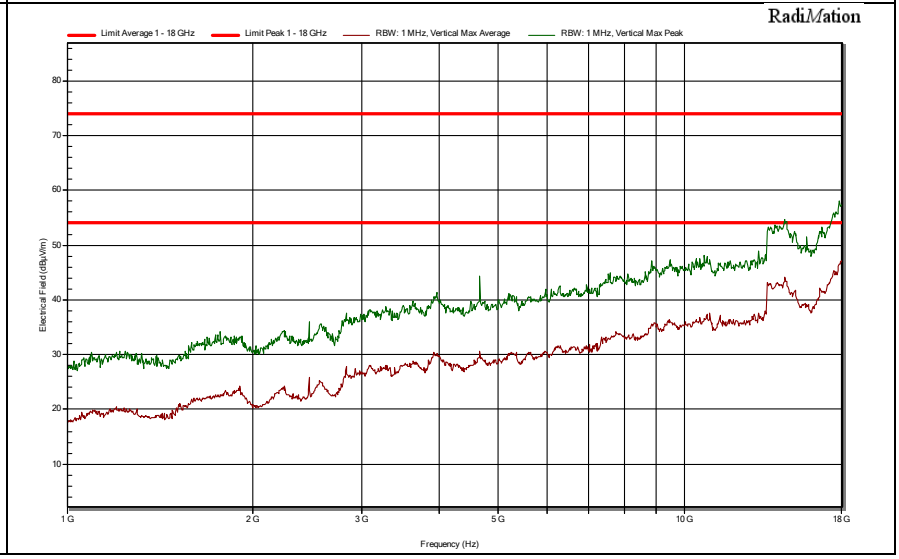
802.11g
1 GHz to 18 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

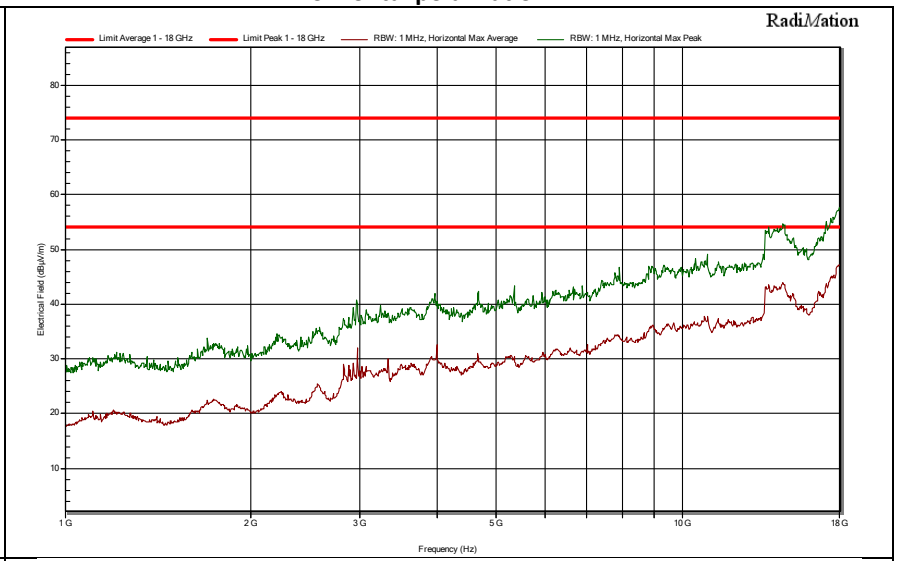
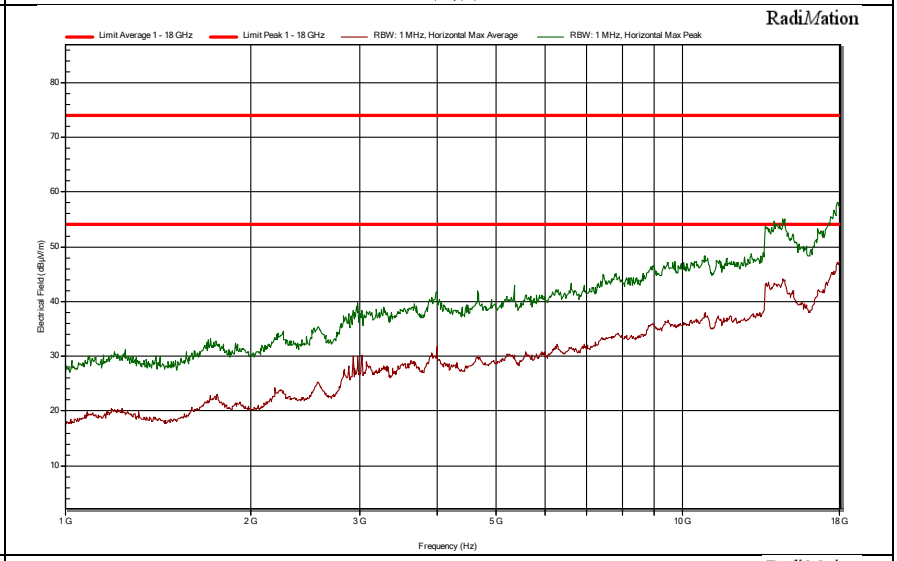
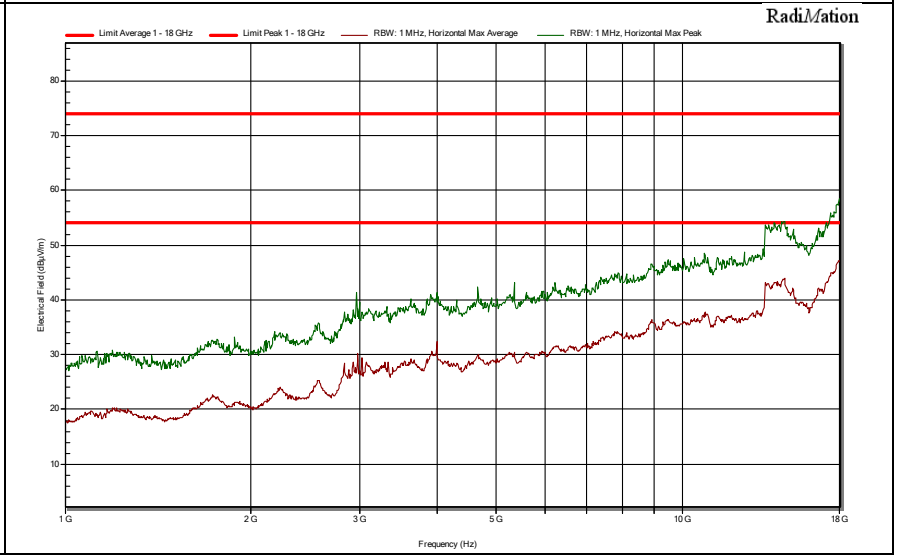
802.11n
1 GHz to 18 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

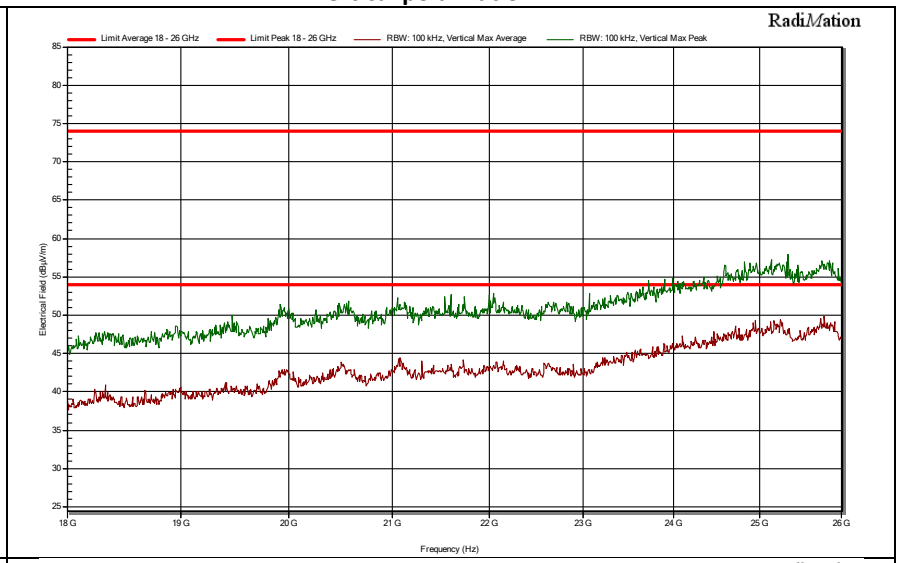
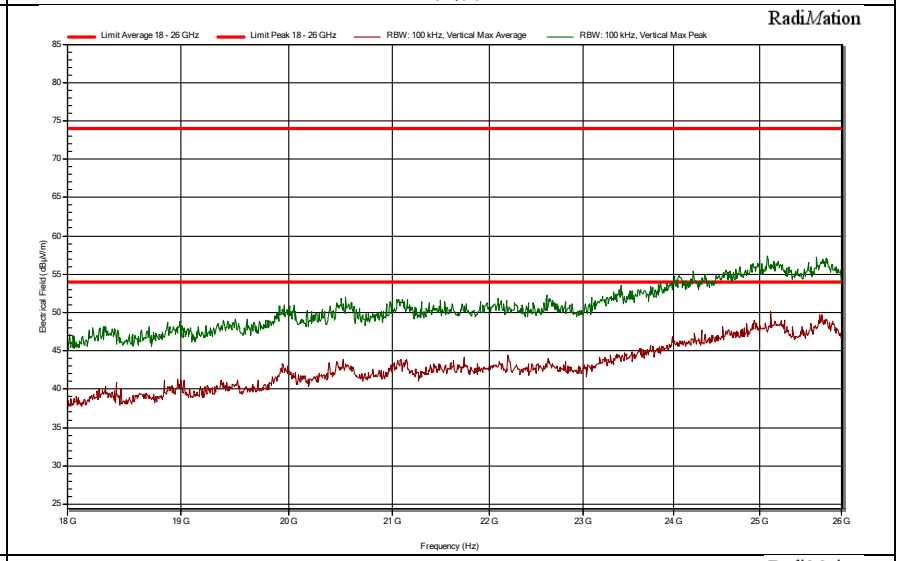
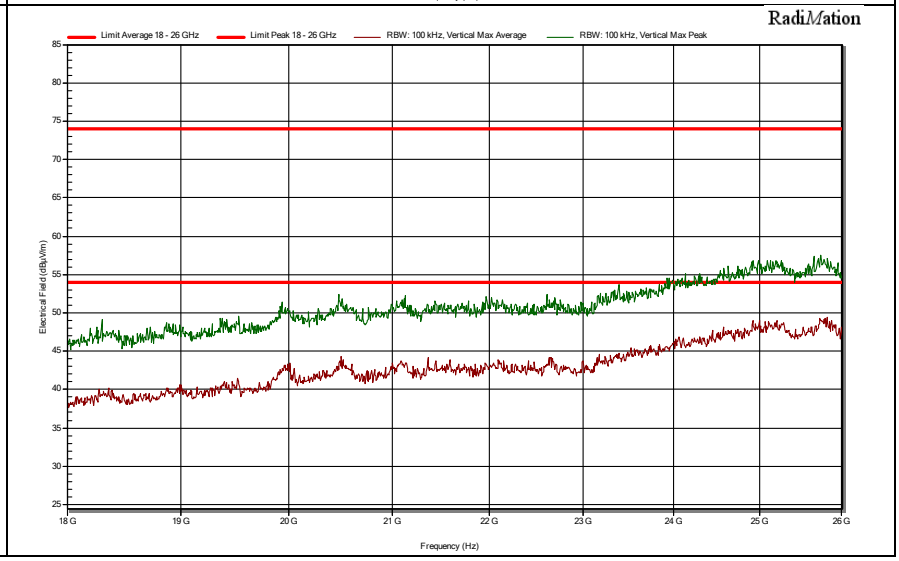
802.11n
1 GHz to 18 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

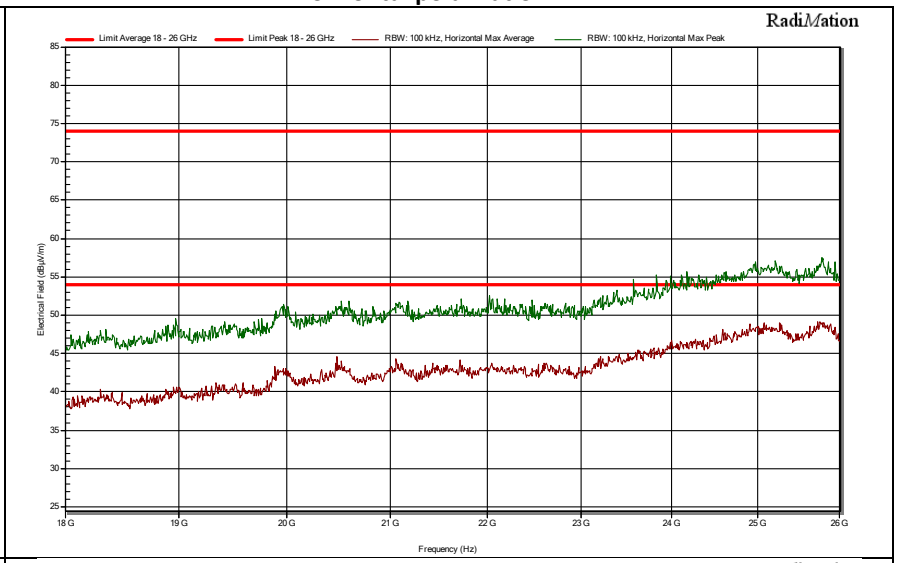
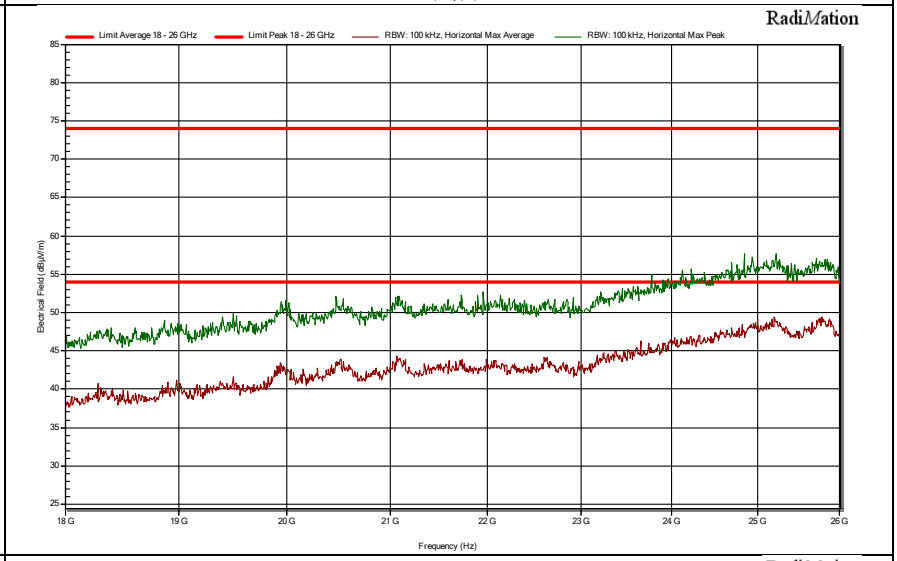
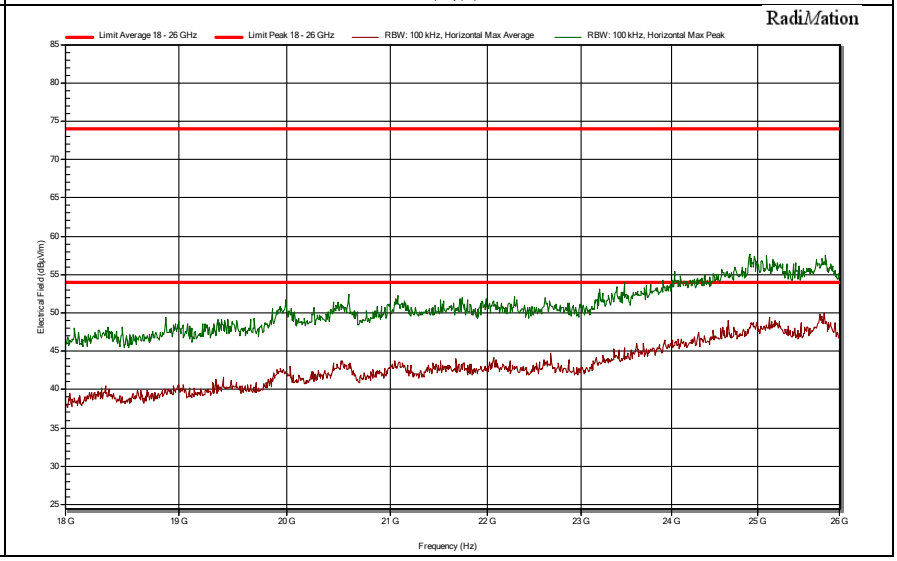
802.11b
18 GHz to 26 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

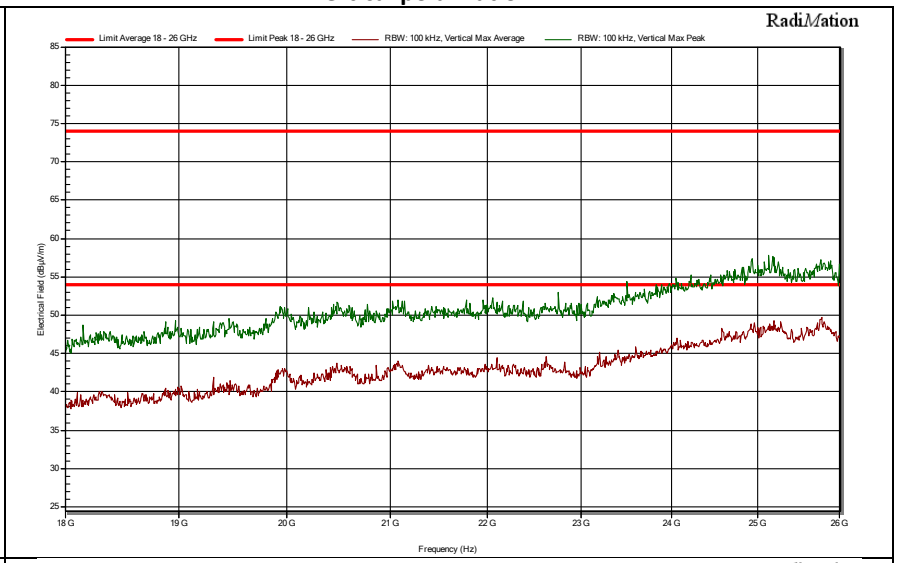
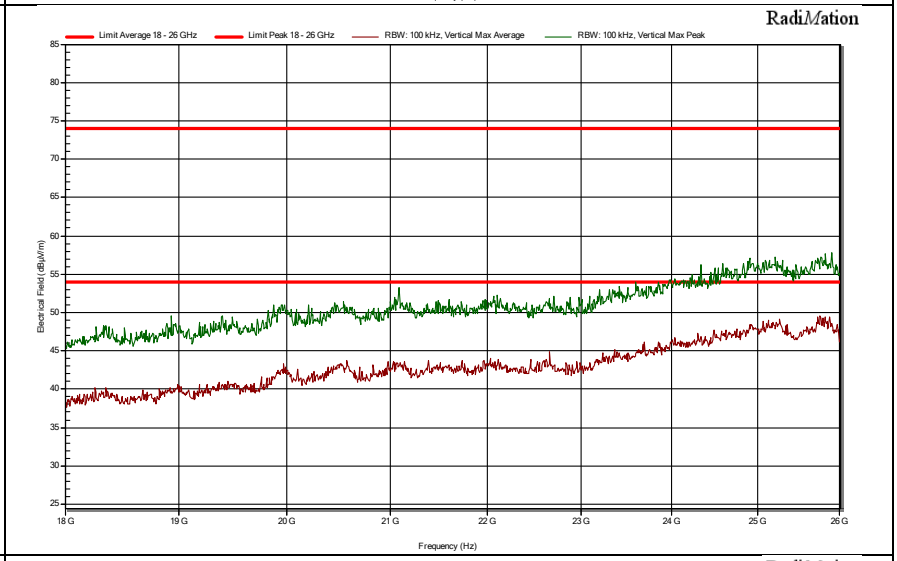
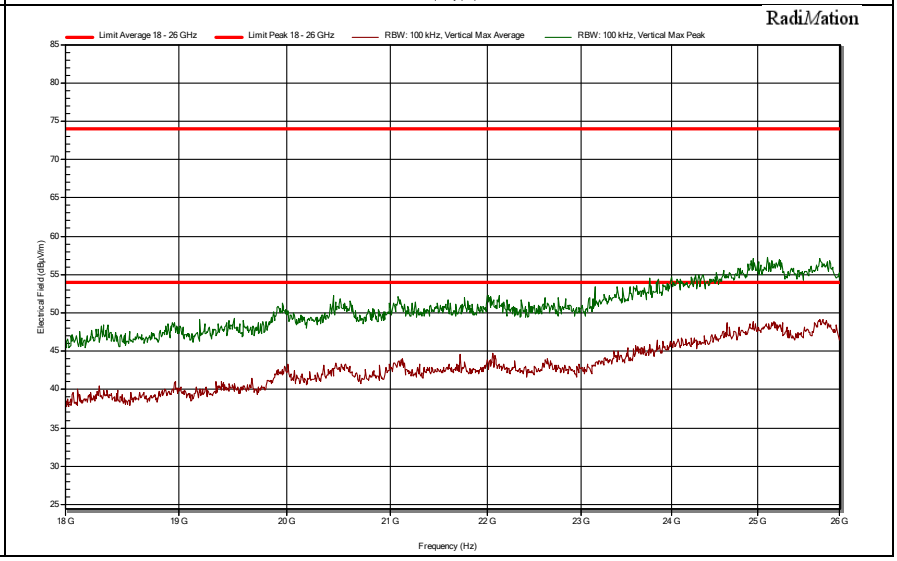
802.11b
18 GHz to 26 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

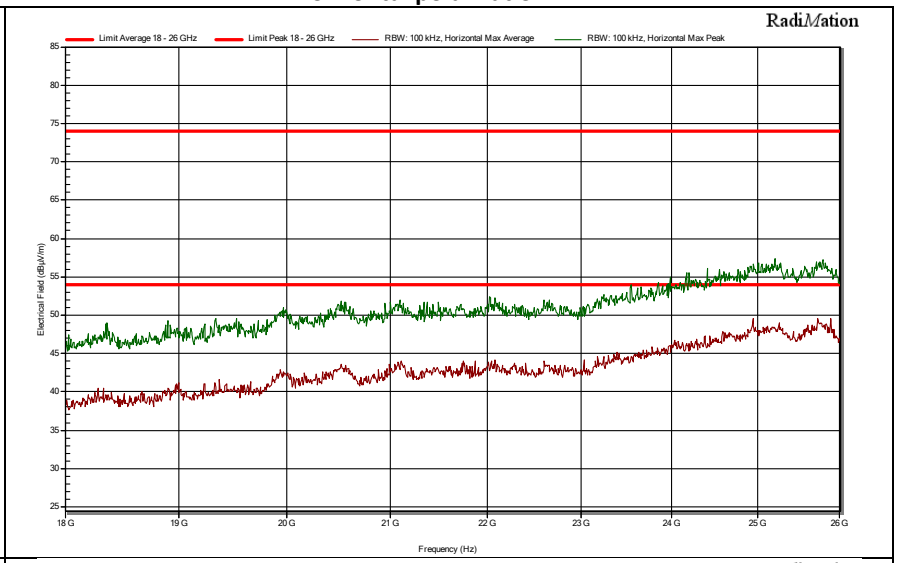
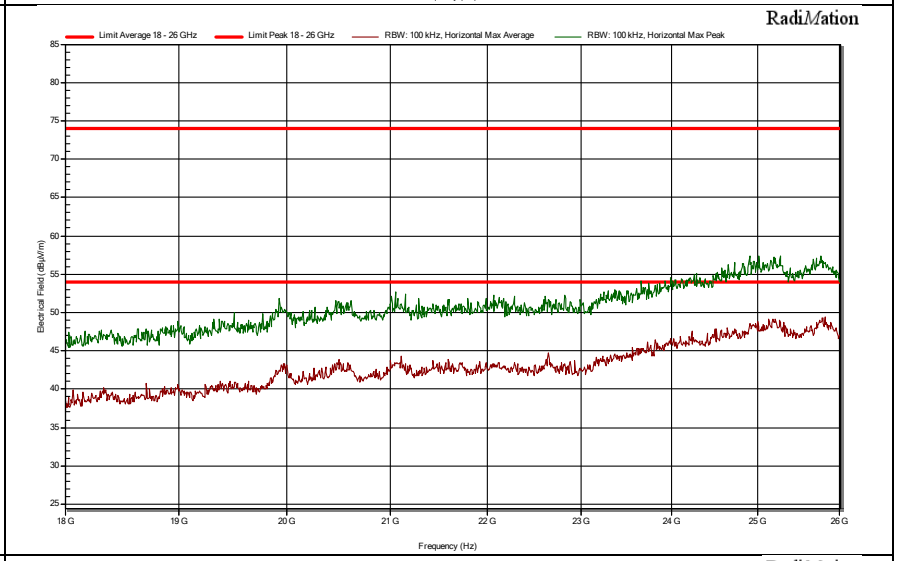
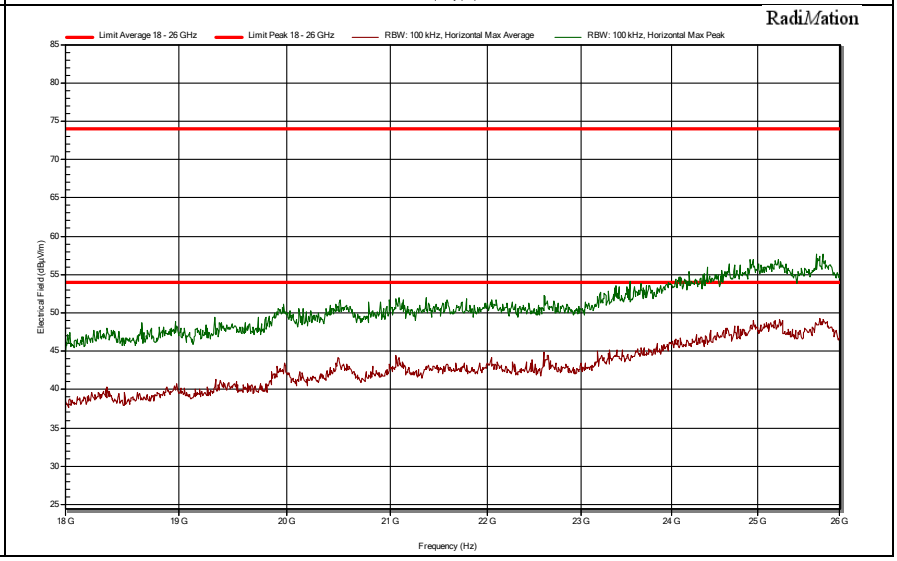
802.11g
18 GHz to 26 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

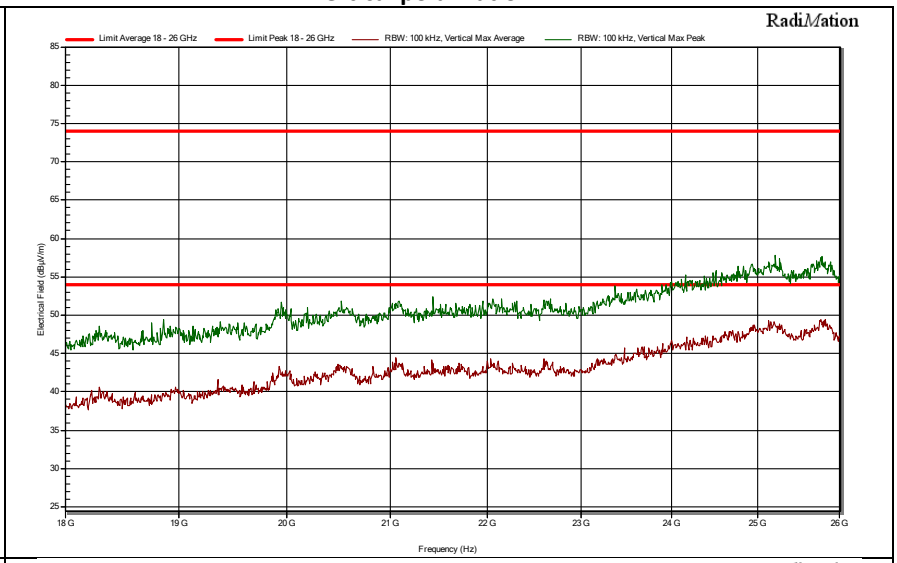
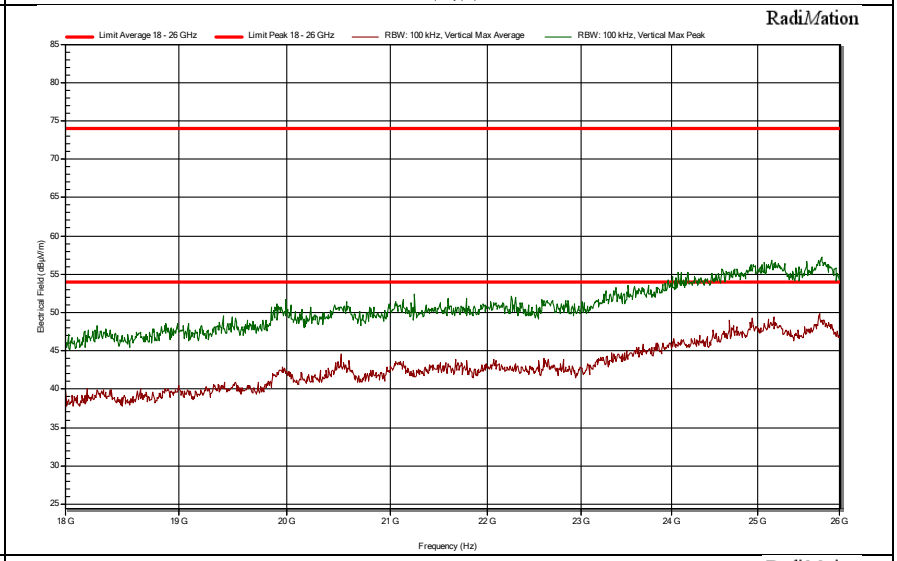
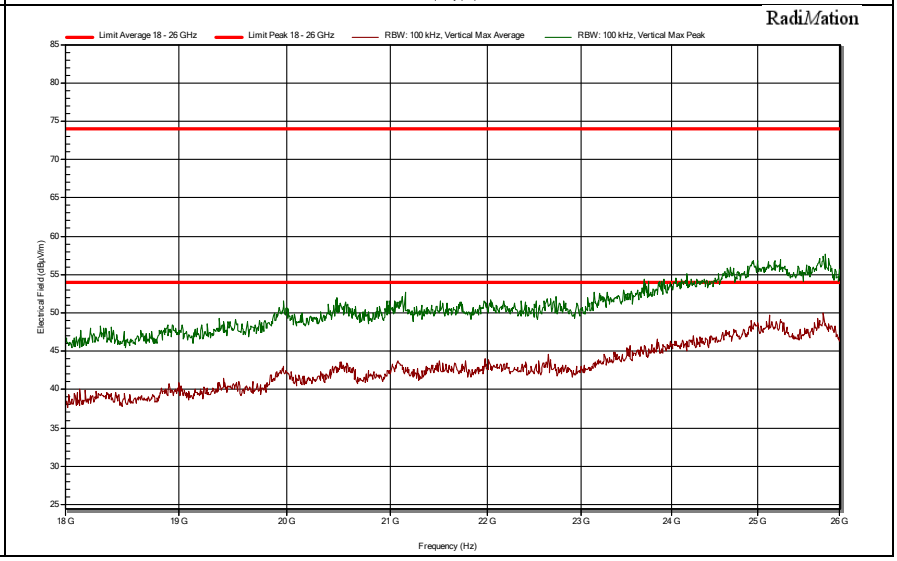
802.11g
18 GHz to 26 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

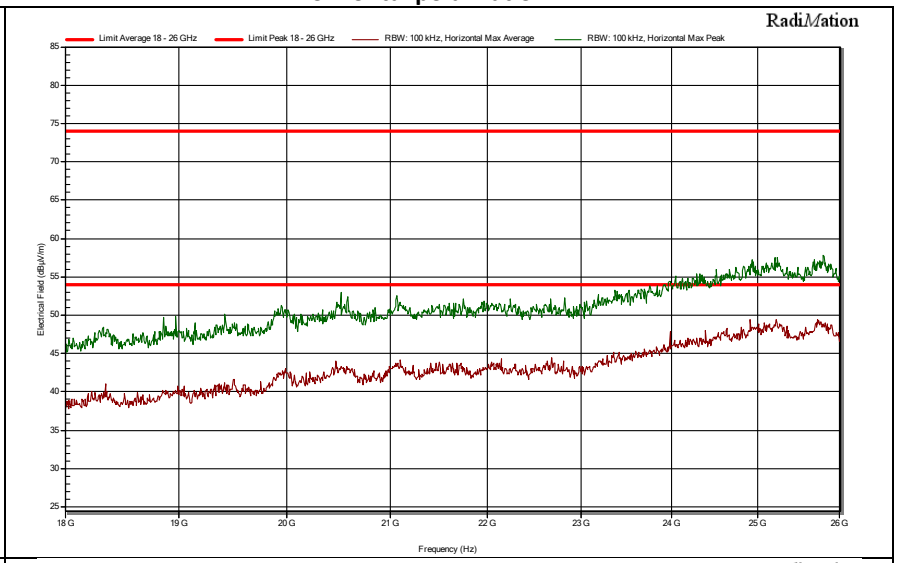
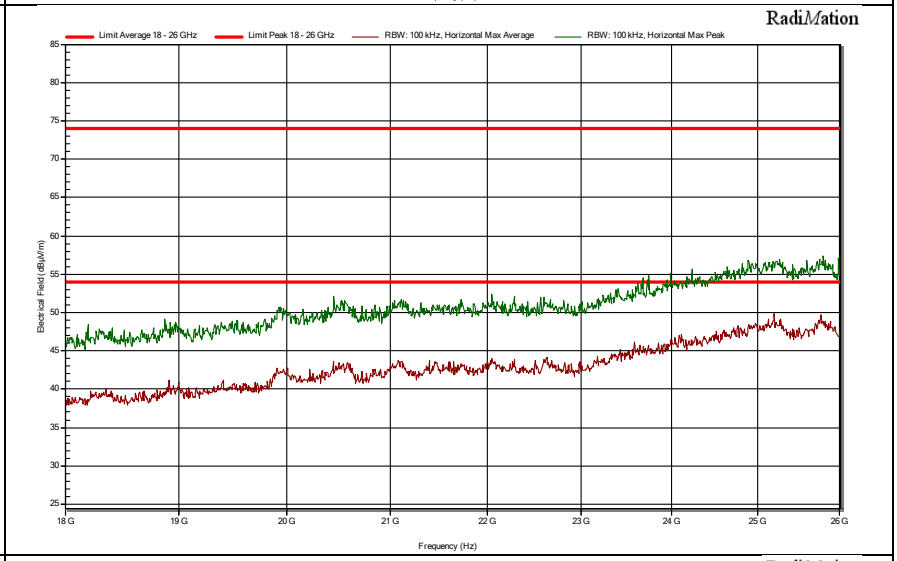
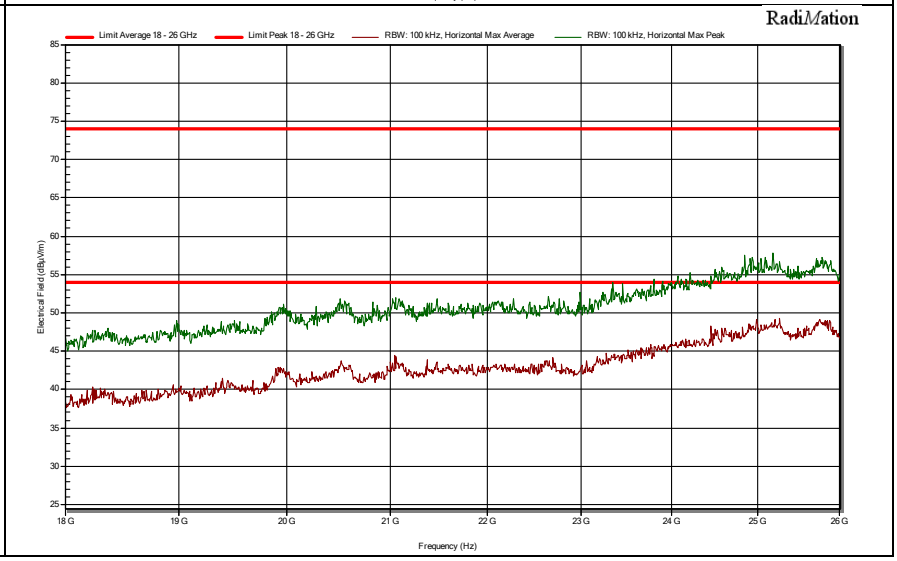
802.11n
18 GHz to 26 GHz

Vertical polarization

Low ch	
Mid ch	
High ch	

802.11n
18 GHz to 26 GHz

Horizontal polarization

Low ch	
Mid ch	
High ch	

3.6.7 Measurement Uncertainty

Measurement uncertainty Radiated emissions below 1 GHz

Horizontal polarization	
9 kHz – 30 MHz	+1.5 dB/-1.6dB
30 – 200 MHz	4.5 dB
200 – 1000 MHz	3.6 dB
Vertical polarization	
9 kHz – 30 MHz	+1.5 dB/-1.6dB
30 – 200 MHz	5.4 dB
200 – 1000 MHz	4.6 dB

Measurement uncertainty Radiated emissions above 1 GHz

1000- 18000 MHZ	5.7 dB
18000 – 26000 MHZ	4.9 dB

3.7 AC conducted mains measurement

3.7.1 Limit

According to 15.207 (c).

An intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

3.7.2 Measurement instruments

The measurement instruments are listed in chapter 2.4 of this report.

3.7.3 Test setup

The test setup is as shown in chapter 2.3 of this report.

3.7.4 Test procedure

According to ANSI C63.4: 2014, section 13.3.
IRN 029 - Conducted disturbance (V) Method 1 – AC mains conducted disturbance.

3.7.5 Test results and plots of the AC conducted mains measurement

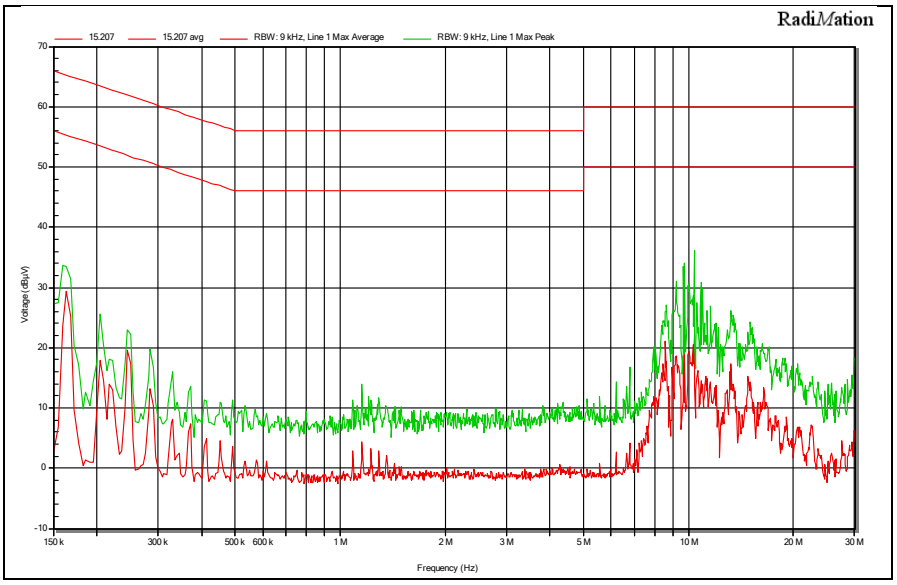
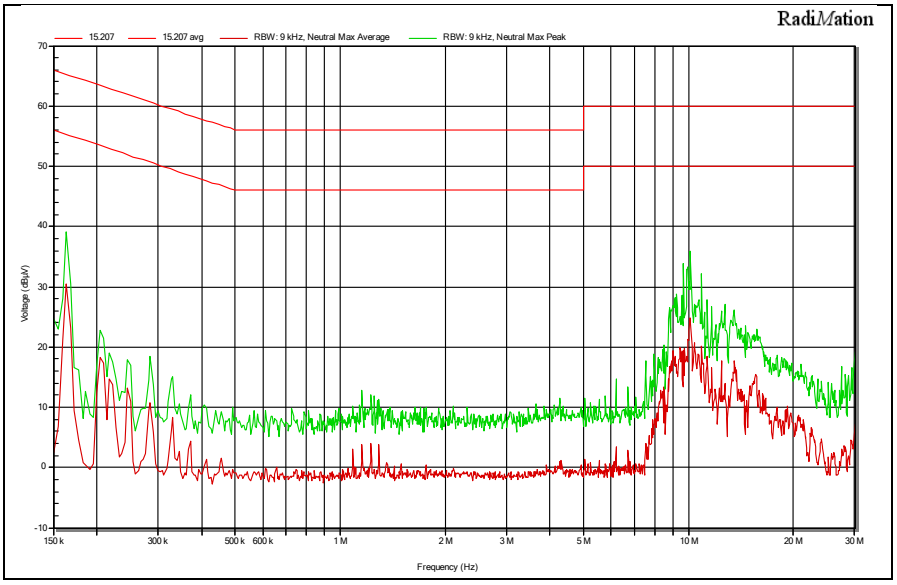
The test results can be found on the next page.

3.7.6 Measurement uncertainty

+/- 3.6 dB.

3.7.7 Plots of the AC conducted spurious measurement

Phase



Neutral