

Certification Radio test report

According to the standard:

CFR 47 FCC PART 15

RSS GEN – Issue 5

RSS 247 – Issue 2

Equipment under test:

S-lynks gateway

FCC ID: KQ9-0A01A

IC NUMBER: 1317A-0A01A

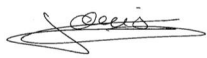
Company:

SERCEL Inc

Distribution: Mr TIJOU

(Company: SERCEL NANTES)

Number of pages: 78 with 1 appendix

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			Name and Function	Visa
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DESIGNATION OF PRODUCT: S-lynks gateway

Serial number (S/N): EDE565C20271E0004
EDE565C20271E0007

Reference / model (P/N): S-lynks gateway

Software version: SLBB_F V4 S38/20

MANUFACTURER: SERCEL Inc

COMPANY CERTIFYING THE PRODUCT:

Company: SERCEL Inc

Address: 17200 Park Row
TEXAS 77084
UNITED STATES

Responsible: Mr WENTZLER

COMPANY SUBMITTING THE PRODUCT:

Company: SERCEL NANTES

Address: 16 RUE DU BEL AIR
BP 30439
44470 CARQUEFOU - FRANCE

Responsible: Mr TIJOU

Person(s) present during the tests: Mr DESSARCE, the first two days (company: SERCEL)
Mr PORCHEL, the first day (company: MODULIC)

DATES OF TEST: From 1-Dec-20 to 7-Dec-20

TESTING LOCATION: EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE

FCC Accredited under US-EU MRA Designation Number: FR0009
Test Firm Registration Number: 873677

ISED Accredited under CANADA-EU MRA Designation Number: FR0001
Industry Canada Registration Number: 4452A

TESTED BY: M. DUMESNIL

VISA:

WRITTEN BY: M. DUMESNIL

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1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **S-lynks gateway**, in accordance with normative reference.

The product integrates the followings radio functions:

- GNSS receiver
- Wi-Fi 2.4GHz radio part not already certified,
- 2G and LTE-M module already certified (FCC ID : N7NWP77B and IC ID : 2417C-WP77B)
- LoRa radio part not already certified,

This report concern only Wi-Fi 2.4GHz function.

2. PRODUCT DESCRIPTION

Category of equipment (ISED): I

Class: A

Utilization: Industrial

Antenna type and gain: The product possesses one external antenna (BKR2400) and two internal antennas.
The product can emit on the external antenna (SISO) or on the internal antennas as follow:

- For mode b and g the product emit on chains one (SISO), however the mode n the product can emit on the chain one (SISO) or chain one and two (MIMO).

Internal PCB antennas : Antenna 1 Gain at 2412MHz => +4.70dBi

Antenna 1 Gain at 2437MHz => +3.75dBi

Antenna 1 Gain at 2462MHz => +3.48dBi

Antenna 2 Gain at 2412MHz => +3.18dBi

Antenna 2 Gain at 2437MHz => +3.17dBi

Antenna 2 Gain at 2462MHz => +2.05dBi

External dipole antenna (BKR2400) with SMA connector: Gain => +2dBi

Operating frequency range: From 2400 MHz to 2483.5 MHz

Number of channels: 11

Channel spacing: 5MHz

Channel bandwidth: 20 MHz

Modulation:	DBPSK OFDM: BPSK OFDM: 64-QAM
Channel tested:	Channel 1: 2412 MHz Channel 6: 2437 MHz Channel 11: 2462 MHz
Mode tested:	802.11 b SISO 802.11 g SISO 802.11 n SISO and MIMO (MIMO with internal antennas only)
Data rate:	For 802.11b: 1Mbit/s For 802.11g: 6Mbit/s For 802.11n: MCS0
Correlated signal:	For mode n the signals are considered as correlated, the mode cyclic delay diversity (CDD) is used. (IEEE 802.11) The product is not using spatial multiplexing or intentional beamforming.
Power source:	Internal battery 7.2Vdc or 12Vdc external power source.
Power level adjusted to	+16 dBm by software
Power level, frequency range and channels characteristics are not user adjustable. The details pictures of the product and the circuit boards are joined with this file.	

3. NORMATIVE REFERENCE

The standards and testing methods related throughout this report are those listed below.

They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

CFR 47 FCC Part 15 (2020)	Radio Frequency Devices
ANSI C63.10	2013 Procedures for Compliance Testing of Unlicensed Wireless Devices.
558074 D01 DTS v05 r02	Guidance for compliance measurements on digital transmission system, frequency hopping spread spectrum system, and hybrid system devices operating under section 15.247 of the FCC rules.
662911 D01 Multiple Transmitter Output V02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
RSP-100	Issue 12, August 2019 Certification of Radio Apparatus
RSS-Gen	Issue 5, April 2018 General Requirements for Compliance of Radio Apparatus
RSS-247	Issue 2, February 2017 Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 part 15:

Subpart C – Intentional Radiators

- Paragraph 203: Antenna requirement
- Paragraph 205: Restricted bands of operation
- Paragraph 207: Conducted limits
- Paragraph 209: Radiated emission limits; general requirements
- Paragraph 212: Modular transmitter
- Paragraph 215: Additional provisions to the general radiated emission limitations
- Paragraph 247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

Radio performance tests procedures given in RSS-Gen:

- Paragraph 2 - General
- Paragraph 3 - Normative publications and related documents
- Paragraph 4 - Labelling requirements
- Paragraph 6 - General administrative and technical requirements
- Paragraph 8 - Licence-exempt Radio Apparatus

Radio performance tests procedures given in RSS-247:

- Paragraph 3 - Certification requirements
- Paragraph 4 - Measurement method
- Paragraph 5 - Standard specifications for frequency hopping systems and digital transmission systems operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last calibration	Calibration interval (years)	Next calibration due
0	BAT-EMC V3.18.0.26	Software	/	/	/
1406	EMCO 6502	Loop antenna	24/04/2020	1	24/04/2021
2507	20dB	Attenuator	21/03/2019	3	20/03/2022
4087	Filtek LP03/1000-7GH	Low Pass Filter	25/02/2020	3	24/02/2023
4088	R&S FSP40	Spectrum Analyzer	04/05/2020	2	04/05/2022
4195	Hewlett Packard E3610A	Power source	(1)	(1)	(1)
6796	R&S FSP7	Spectrum Analyzer	21/08/2019	2	20/08/2021
7124	A.H. Systems SAS-572	Antenna	05/01/2019	3	04/01/2022
7171	R&S HL223	Antenna	19/04/2019	3	18/04/2022
7190	R&S HL223	Antenna	09/03/2019	3	08/03/2022
7240	Emco 3110	Biconical antenna	09/03/2019	3	08/03/2022
7298	Microtronics BRM50702	Reject band filter	25/02/2020	3	24/02/2023
7566	Testo 608-H1	Meteo station	22/09/2020	2	22/09/2022
8528	Schwarzbeck VHA 9103	Biconical antenna	09/03/2019	3	08/03/2022
8704	LUCIX Corp S180265L3201 LNA	Low-noise amplifier	08/09/2020	1	08/09/2021
8707	R&S ESI7	Test receiver	29/06/2020	1	29/06/2021
8732	Emitech	OATS	03/07/2019	3	02/07/2022
8750	La Crosse Technology WS-9232	Meteo station	22/09/2020	2	22/09/2022
8855	EMITECH	Turntable and mat controller	/	/	/
8864	Champ libre Juigné. V3.5	Software	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
8974	STORM MICROWAE k-20cm	cable	14/11/2019	2	13/11/2021
9266	Pasternack DC-18GHz 10dB 2W	Attenuator	28/09/2018	3	27/09/2021
9398	N-1.5m	cable	11/06/2020	2	11/06/2022
10730	Mini-circuit ZFL-1000LN	Low-noise amplifier	14/02/2020	1	13/02/2021
10759	COMTEST Cage 3	Anechoic chamber	/	/	/

Emitech Number	Model	Type	Last calibration	Calibration interval (years)	Next calibration due
10771	EMCO 3117	Antenna	30/11/2019	3	29/11/2022
10789	MATURO	Turntable and mat controller NCD	/	/	/
11592	R&S NRV-Z86	Power Sensor	27/08/2019	2	26/08/2021
12590	LUCIX Corp S005180M3201	Low-noise amplifier	05/08/2020	1	05/08/2021
12912	Huber + Suhner N-5m	cable	11/06/2020	2	11/06/2022
12917	SUCOFLEX K-2m	cable	26/05/2020	2	26/05/2022
14302	SUCOFLEX N-1m	cable	15/12/2018	2	14/12/2020
14303	SUCOFLEX N-2m	cable	15/12/2018	2	14/12/2020
14304	SUCOFLEX N-2.5m	cable	15/12/2018	2	14/12/2020
14475	Oregon Scientific BAR206	Meteo station	24/09/2019	2	23/09/2021
14903	Fluke 177	Multimeter	25/02/2020	2	24/02/2022
15666	R&S FSV40	Spectrum Analyzer	24/09/2020	2	24/09/2022
16109	C&C HPF180400	High pass filter	26/03/2019	3	25/03/2022

(1) The equipment is not verified; instead, the output voltage is checked before each measurement with the calibrated multimeter.

6. TESTS RESULTS SUMMARY

6.1 CFR 47 part 15 requirements

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAP	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT			X		Note 1
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS			X		
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
FCC Part 15.212	MODULAR TRANSMITTERS			X		
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of §15.247 frequency bands	X				Note 3
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz					
	(a) (1) Hopping systems			X		
	(a) (2) Digital modulation techniques	X				Note 4
	(b) Maximum peak output power	X				
	(c) Operation with directional antenna gains > 6 dBi			X		
	(d) Intentional radiator	X				
	(e) Peak power spectral density	X				
	(f) Hybrid system			X		
	(g) Frequency hopping requirements			X		
	(h) Frequency hopping intelligence			X		
	(i) RF exposure compliance	X				

NAP: Not Applicable

NAs: Not Asked

Note 1: Professionally installed equipment.

Note 2: See FCC part 15.247 (d).

Note 3: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

Note 4: The minimum 6 dB bandwidth of the equipment is 9012,5 kHz for 802.11b modulation on channel 1.

6.2 RSS-Gen requirements

Test procedure	Description of test	Criteria respected ?				Comment
		Yes	No	NAp	NAs	
Paragraph 8	Licence-exempt radio apparatus					
§ 8.1	Measurement Bandwidths and Detector Functions	X				
§ 8.2	Pulsed operation	X				
§ 8.3	Prohibition of amplifiers	X				
§ 8.4	User manual notice	X				see certification documents
§ 8.5	Measurement of licence-exempt devices on-site (in-situ)			X		
§ 8.6	Operating frequency range of devices in master/slave networks	X				
§ 8.7	Radio frequency identification (RFID) devices			X		
§ 8.8	AC power line conducted emissions limits			X		
§ 8.9	Transmitter emission limits	X				
§ 8.10	Restricted frequency bands	X				
§ 8.11	Frequency stability			X		

NAp: Not Applicable

NAs: Not Asked

6.3 RSS-247 requirements

Test Procedure RSS-247	Description of test	Criteria respected ?				Comment
		Yes	No	NAp	NAs	
Paragraph 5	Standard specifications for frequency hopping system and digital transmission systems operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz					
5.1	Frequency hopping systems (FHSS)			X		
5.2	Digital transmission systems	X				Note
5.3	Hybrid systems			X		
5.4	Transmitter output power and equivalent isotropically radiated power (e.i.r.p.) requirements	X				
5.5	Unwanted emissions	X				

NAp: Not Applicable

NAs: Not Asked

Note: The minimum 6 dB bandwidth of the equipment is 9012,5 kHz for 802.11b modulation on channel 1.

7. MEASUREMENT UNCERTAINTY

To declare, or not, the compliance with the specifications, it was not explicitly taken into account of uncertainty associated with the result(s)

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for normal distribution corresponds to a coverage probability of approximately 95%.

Parameter	Emitech Uncertainty
RF power, conducted	$\pm 0.75\text{dB}$
Radiated emission valid to 26 GHz	
F < 62.5 MHz:	$\pm 5.14\text{ dB}$
62.5 MHz < F < 1 GHz:	$\pm 5.13\text{ dB}$
1 GHz < F < 26 GHz:	$\pm 5.16\text{ dB}$
AC Power Lines conducted emissions	$\pm 3.38\text{ dB}$
Temperature	$\pm 1\text{ }^{\circ}\text{C}$
Humidity	$\pm 5\%$

8. OCCUPIED BANDWIDTH

Temperature (°C) : 20.9-21.3

Humidity (%HR): 38.2-40

Date : December 3, 2019 and
December 4, 2019

Technician : M. DUMESNILM.
DUMESNIL

Standard: FCC Part 15
RSS-247

Test procedure:

Method of paragraphs 11.8 of ANSI C63.10 (6dB Measurement)

Method of paragraphs 6.9.3 of ANSI C63.10 (99% Measurement)

Test set up:

Conducted test

Setting:

Measure	6dB	99%
Center frequency	The centre frequency of the channel under test	
Detector	Peak	
Span	Large enough to capture all products of the modulation	1.5 to 5 times the OBW
RBW	100kHz	1% to 5% of the OBW
VBW	300kHz	3 x RBW
Trace	Max hold	
Sweep	Auto	

Test operating condition of the equipment:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate (P Software adjusted to +16 dBm).

Power source: 12Vdc by an external power supply

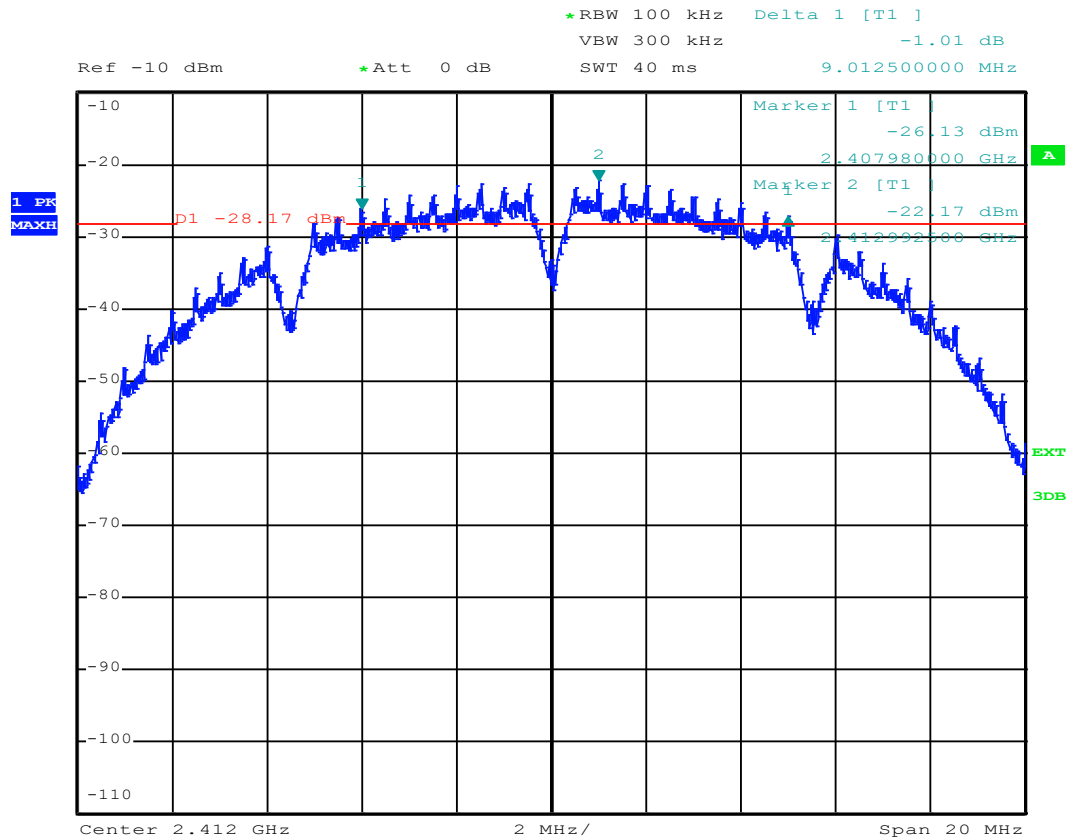
Percentage of voltage variation during the test (%):

± 1

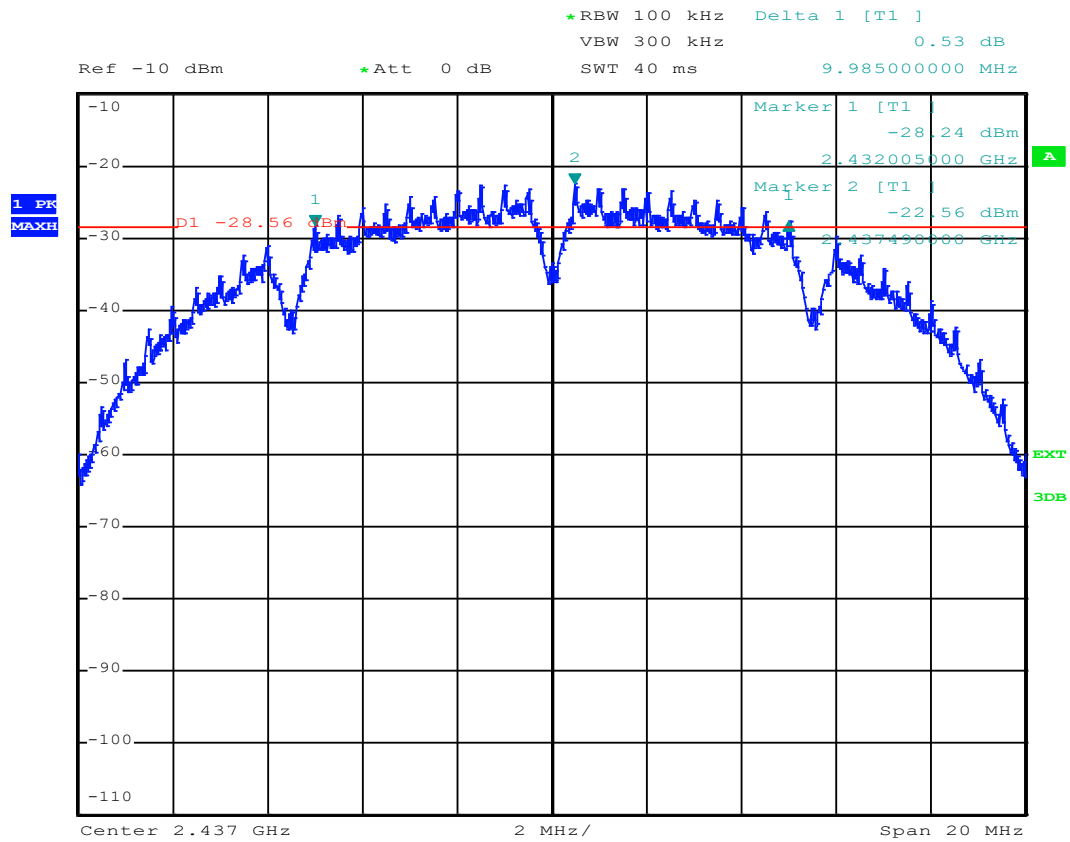
Results:

Sample N° 1

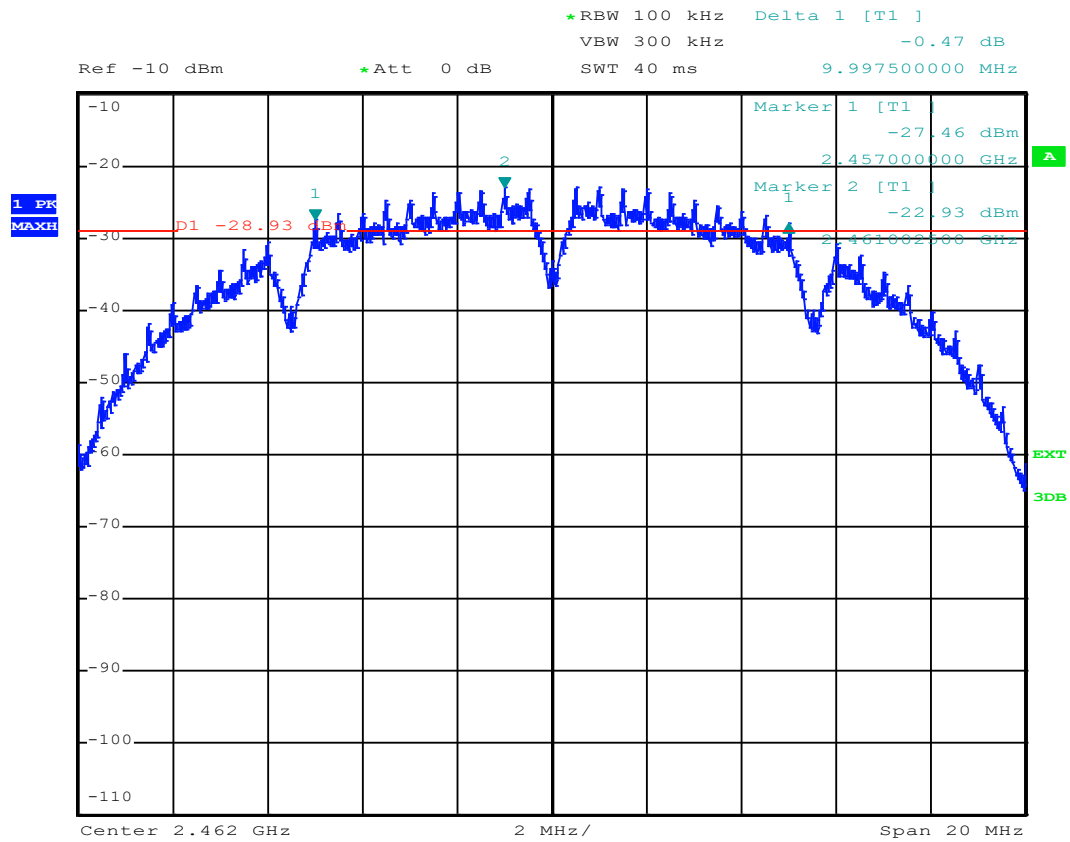
6dB Bandwidth - Low Channel – Mode 802.11.b - SISO



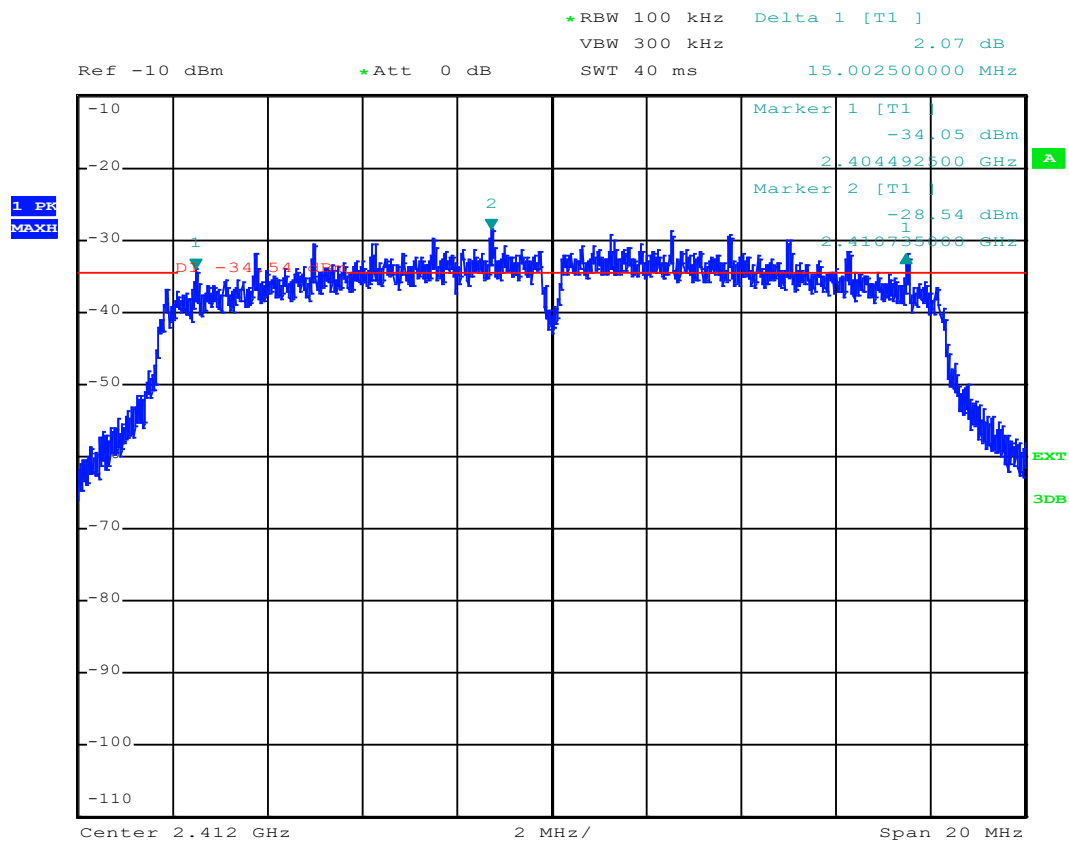
6dB Bandwidth - Central Channel – Mode 802.11.b - SISO



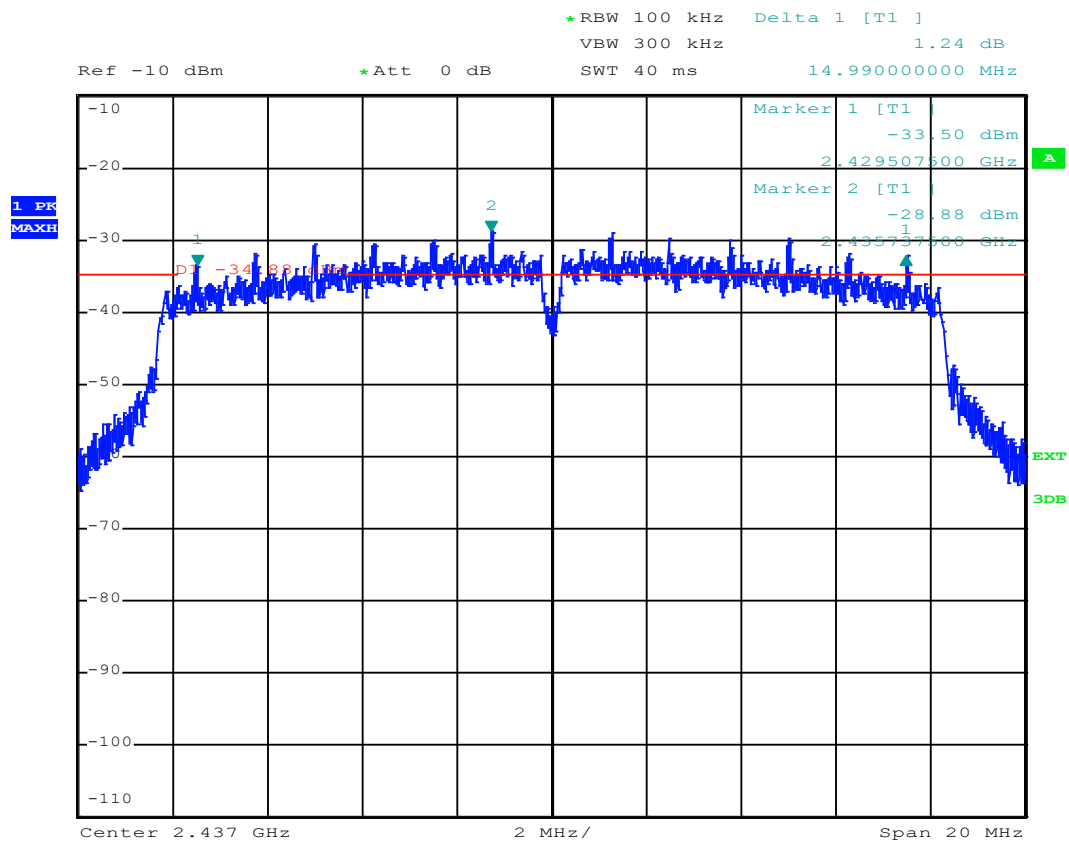
6dB Bandwidth - High Channel – Mode 802.11.b - SISO



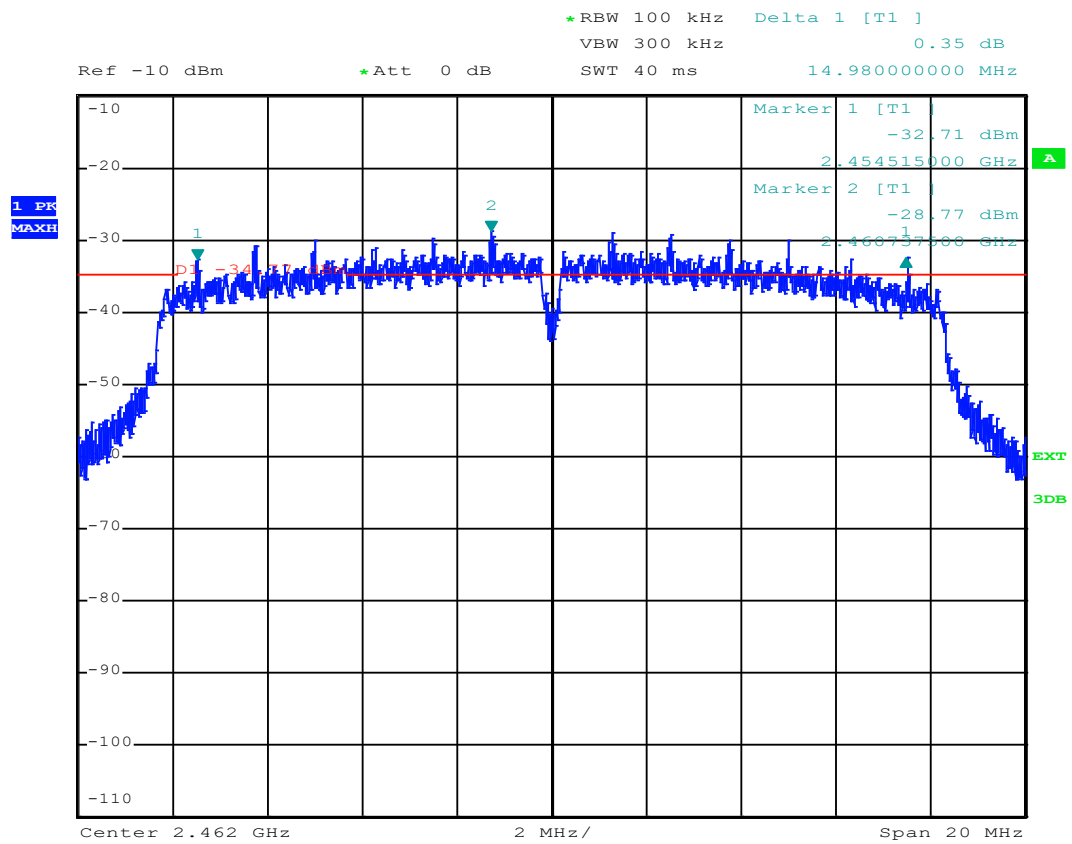
6dB Bandwidth - Low Channel – Mode 802.11.g - SISO



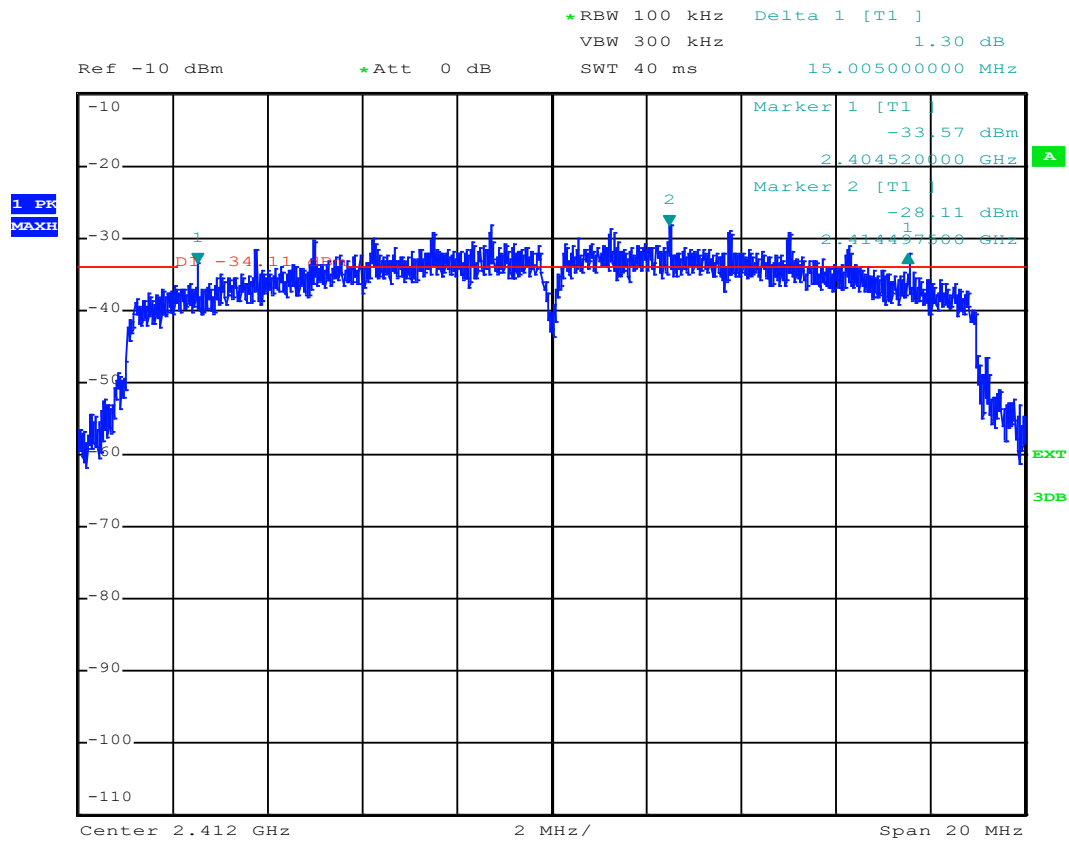
6dB Bandwidth - Central Channel – Mode 802.11.g - SISO



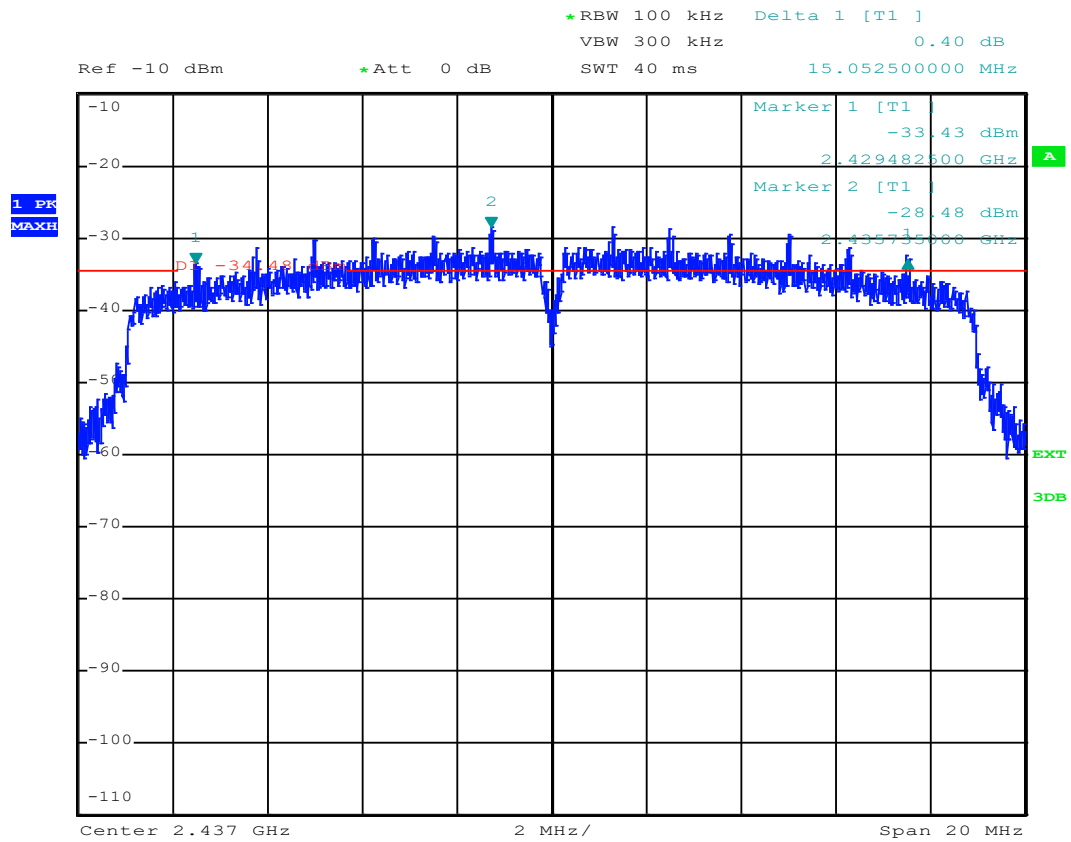
6dB Bandwidth - High Channel – Mode 802.11.g - SISO



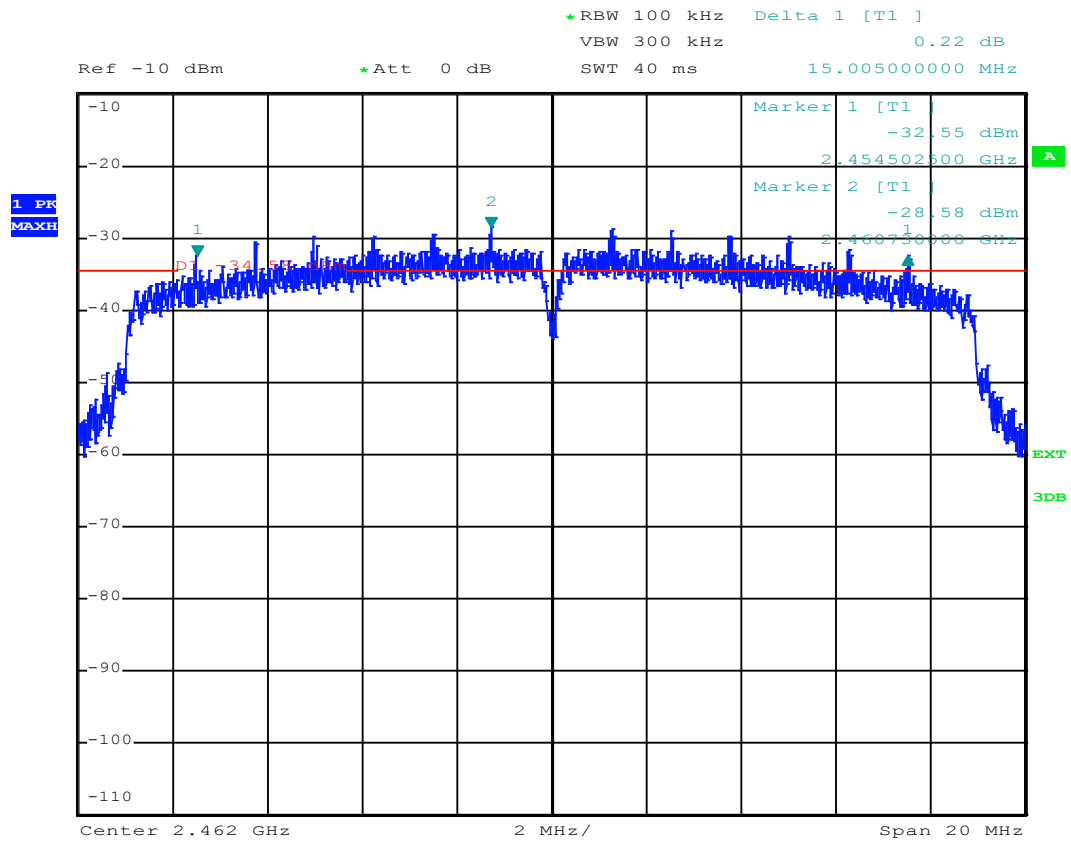
6dB Bandwidth - Low Channel – Mode 802.11.n - SISO



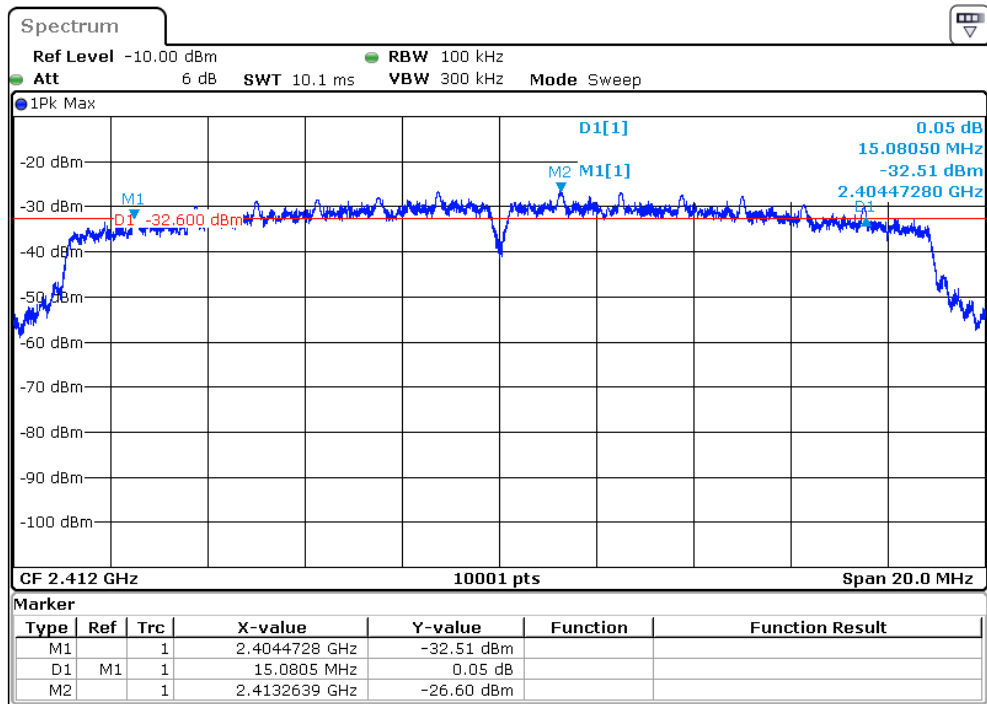
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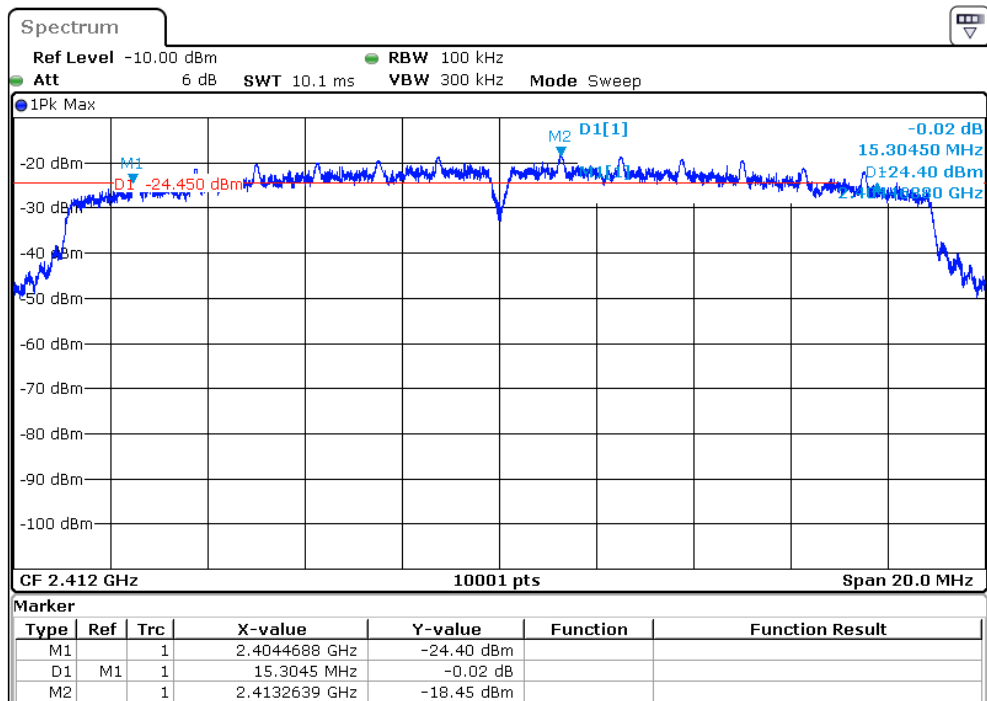
6dB Bandwidth - High Channel – Mode 802.11.n - SISO



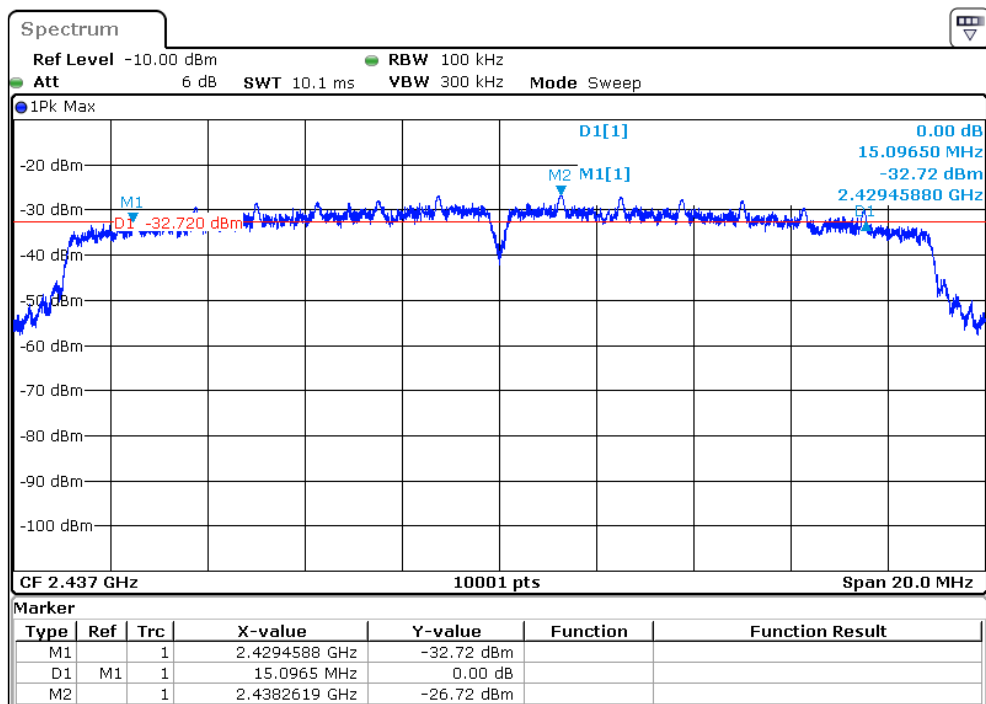
6dB Bandwidth – Low Channel – RF1 – Mode 802.11.n - MIMO



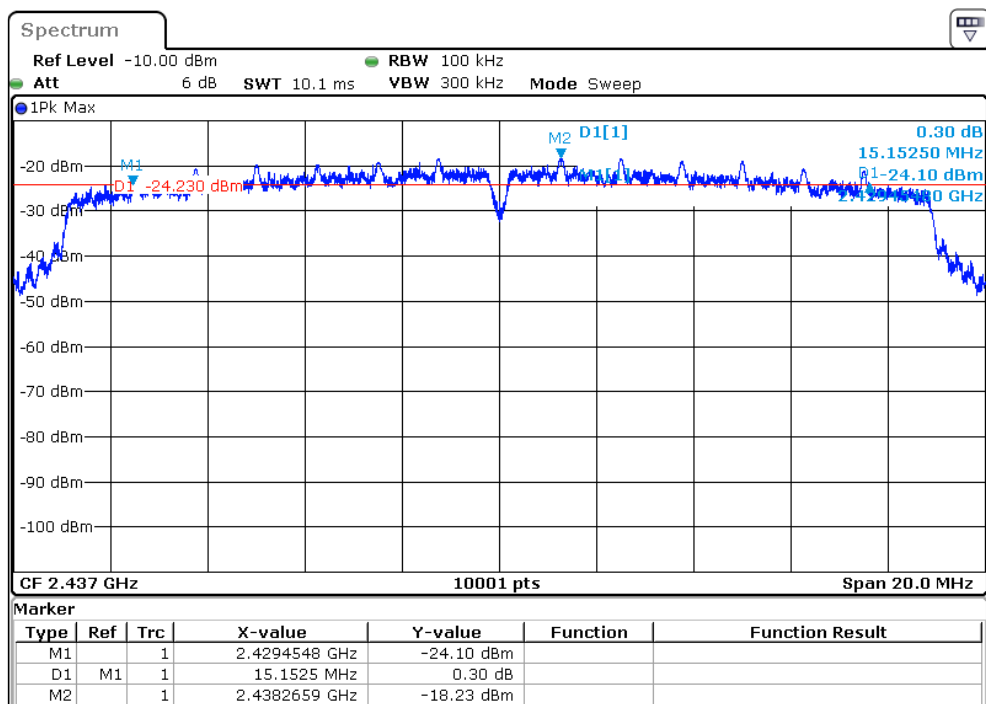
6dB Bandwidth – Low Channel – RF2 – Mode 802.11.n - MIMO



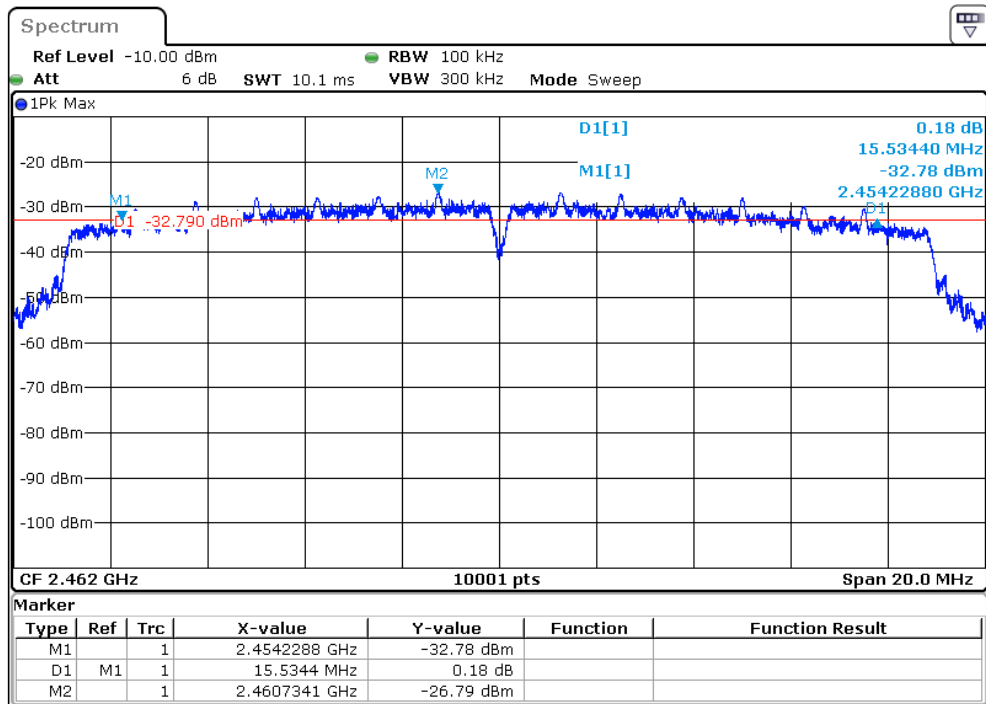
6dB Bandwidth – Central Channel – RF1 – Mode 802.11.n - MIMO



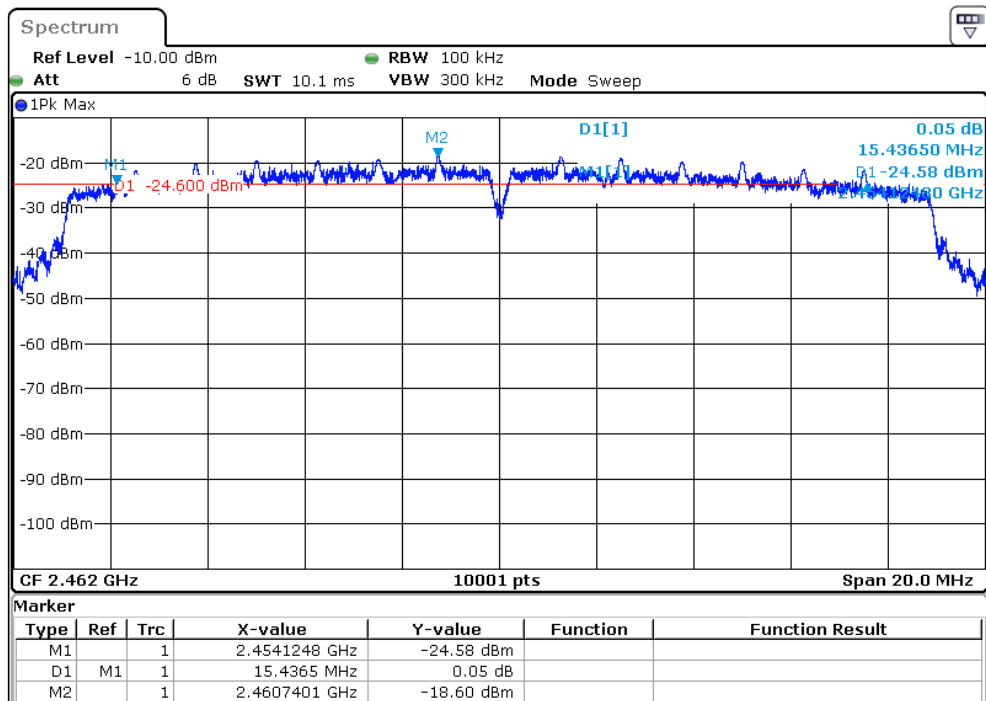
6dB Bandwidth – Central Channel – RF2 – Mode 802.11.n - MIMO



6dB Bandwidth – High Channel – RF1 – Mode 802.11.n - MIMO



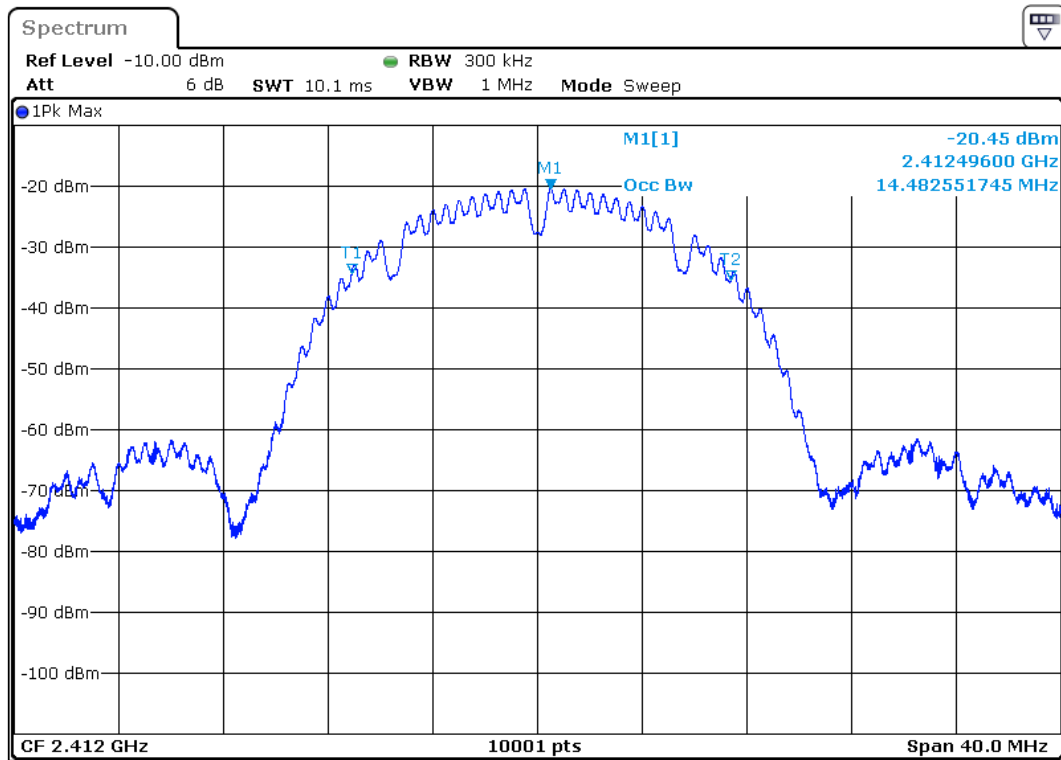
6dB Bandwidth – High Channel – RF2 – Mode 802.11.n - MIMO



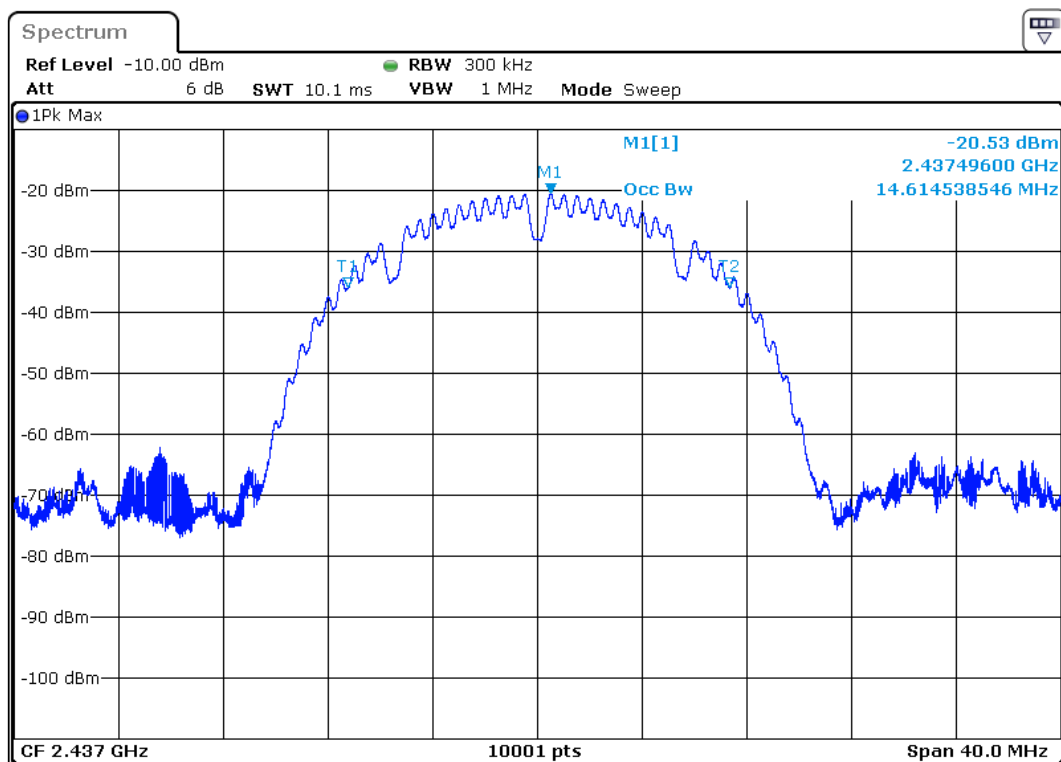
Limit:

Shall be at least 500 kHz

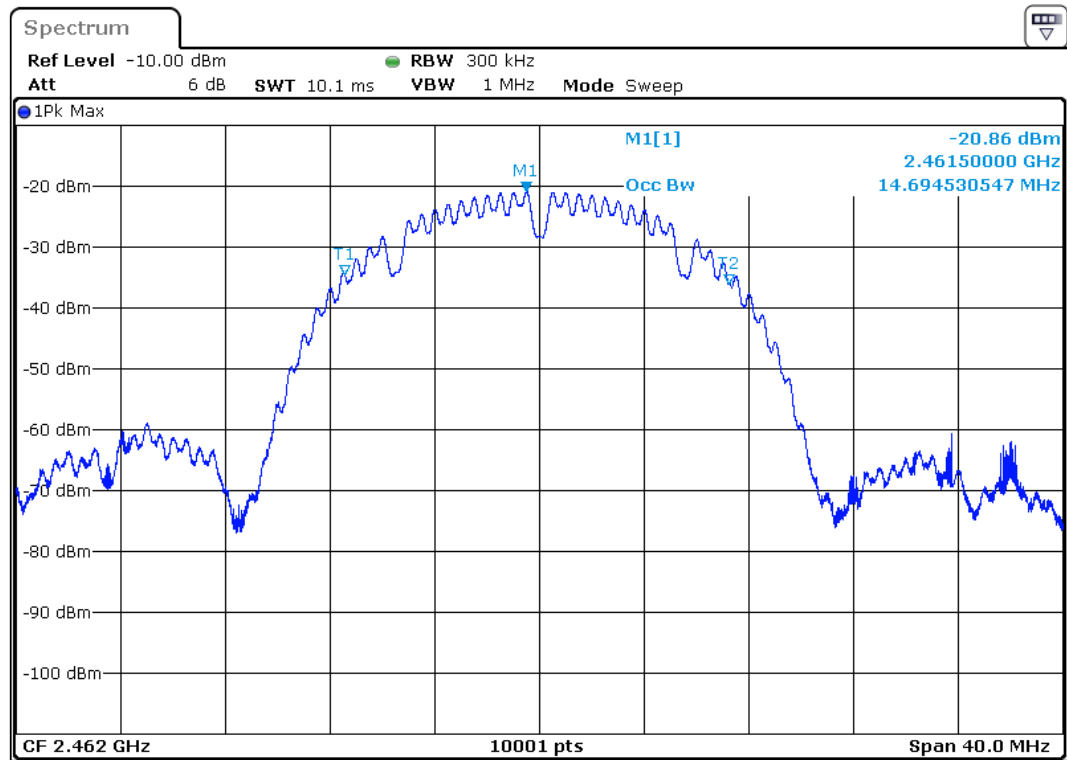
99% Bandwidth - Low Channel – Mode 802.11.b - SISO



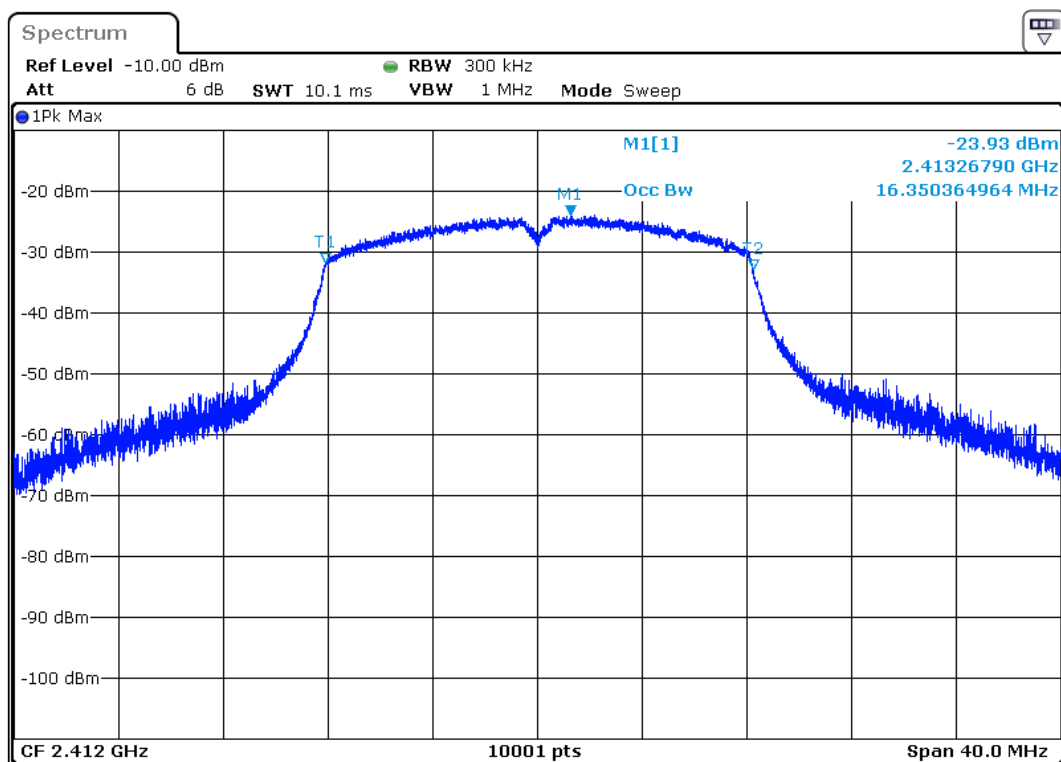
99% Bandwidth - Central Channel – Mode 802.11.b - SISO



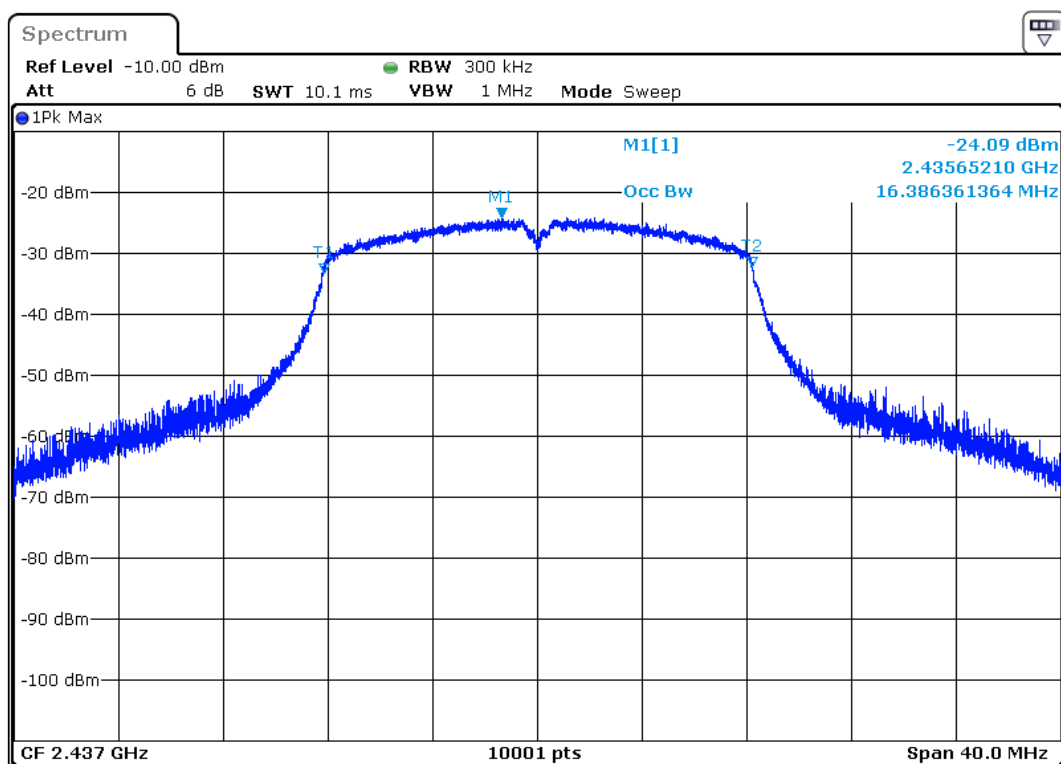
99% Bandwidth - High Channel – Mode 802.11.b - SISO



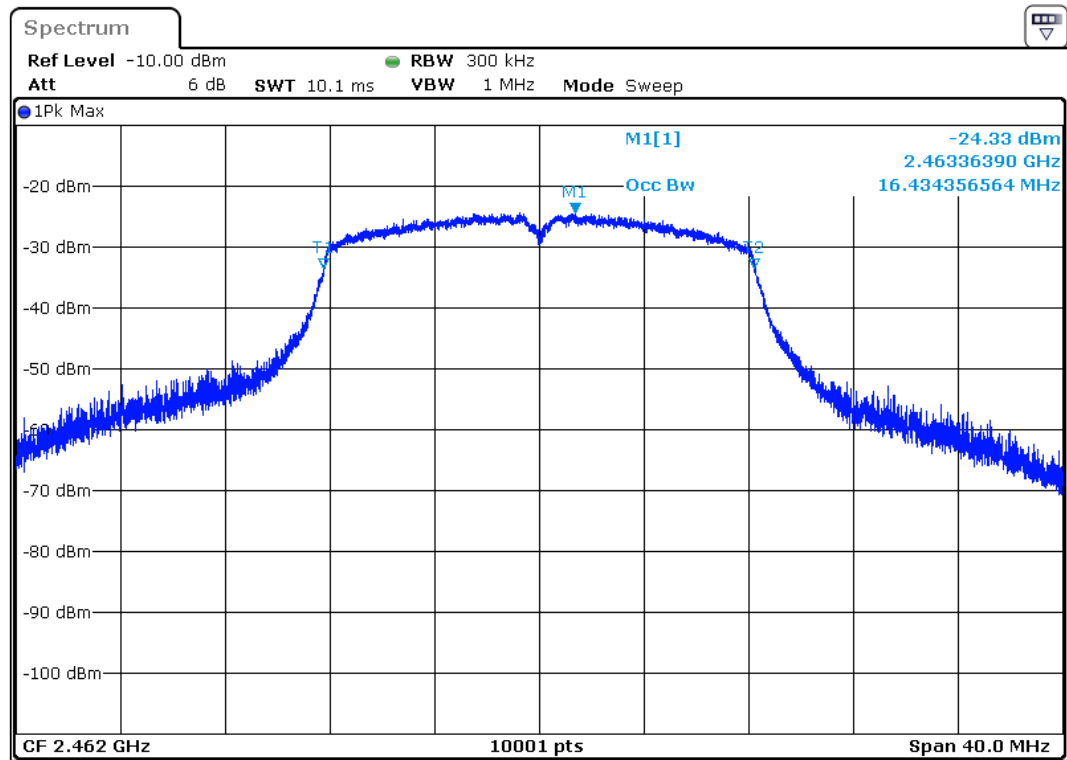
99% Bandwidth - Low Channel – Mode 802.11.g - SISO



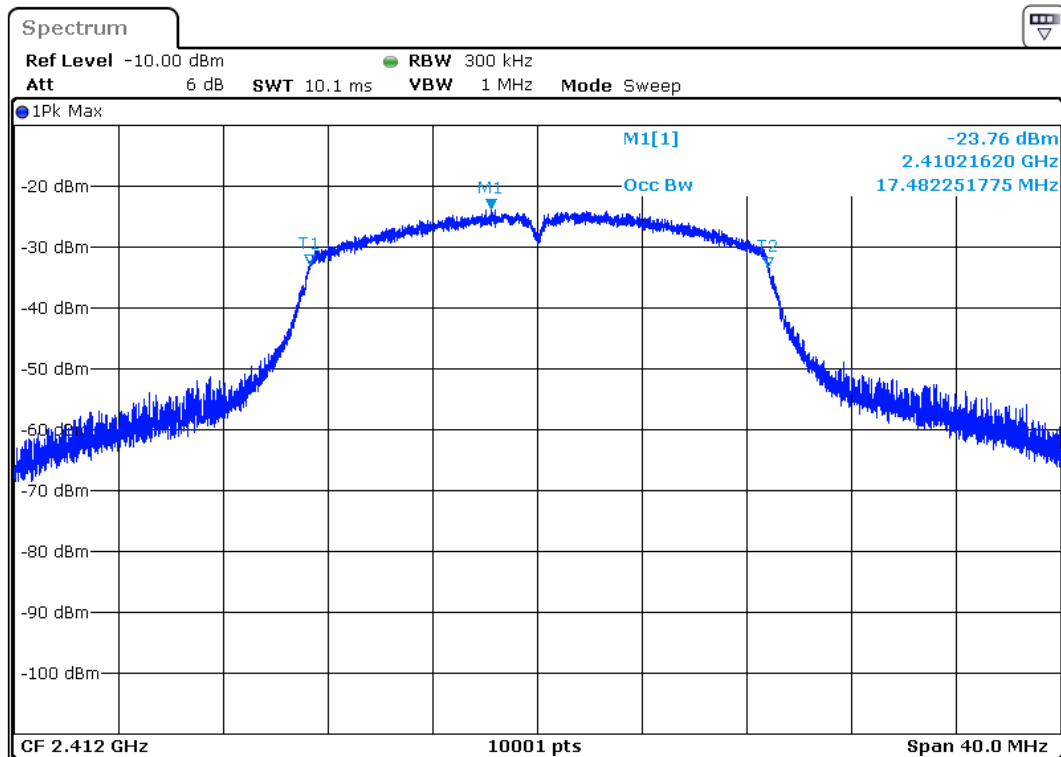
99% Bandwidth - Central Channel – Mode 802.11.g - SISO



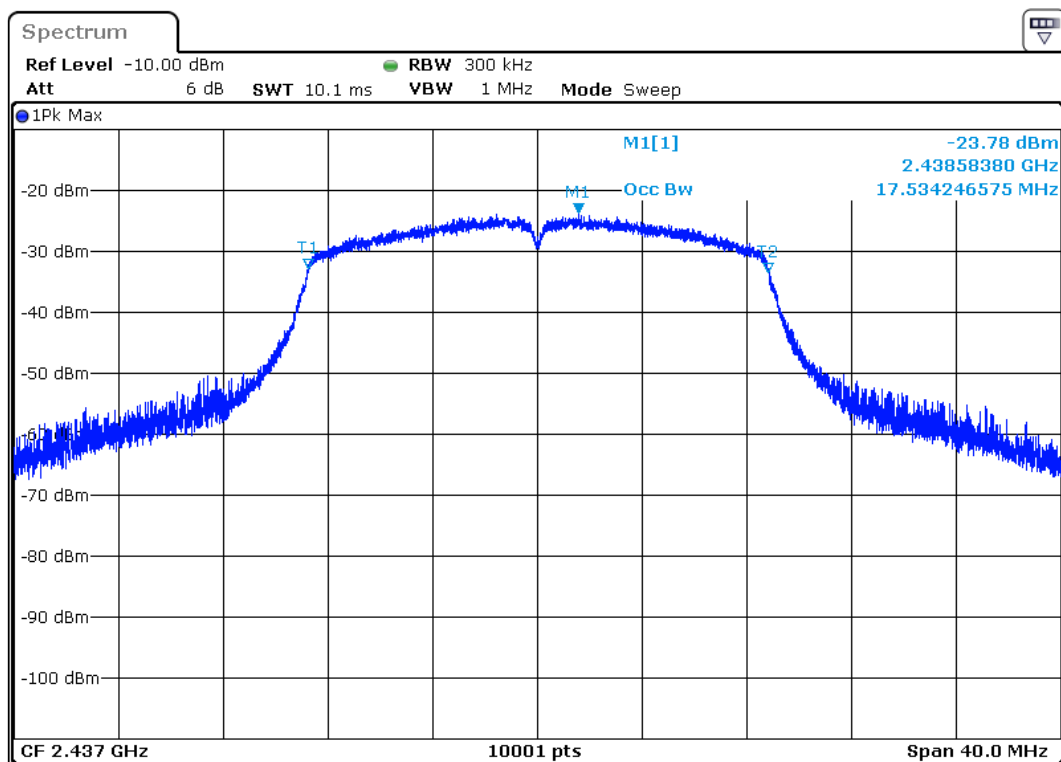
99% Bandwidth - High Channel – Mode 802.11.g - SISO



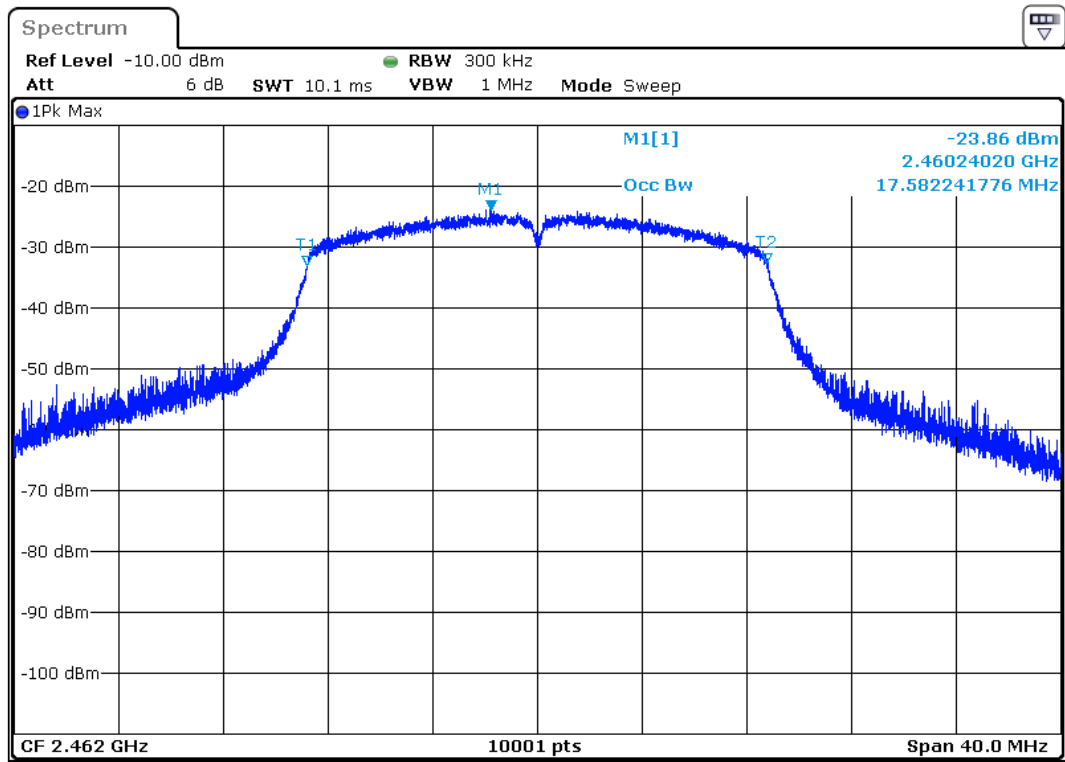
99% Bandwidth - Low Channel – Mode 802.11.n - SISO



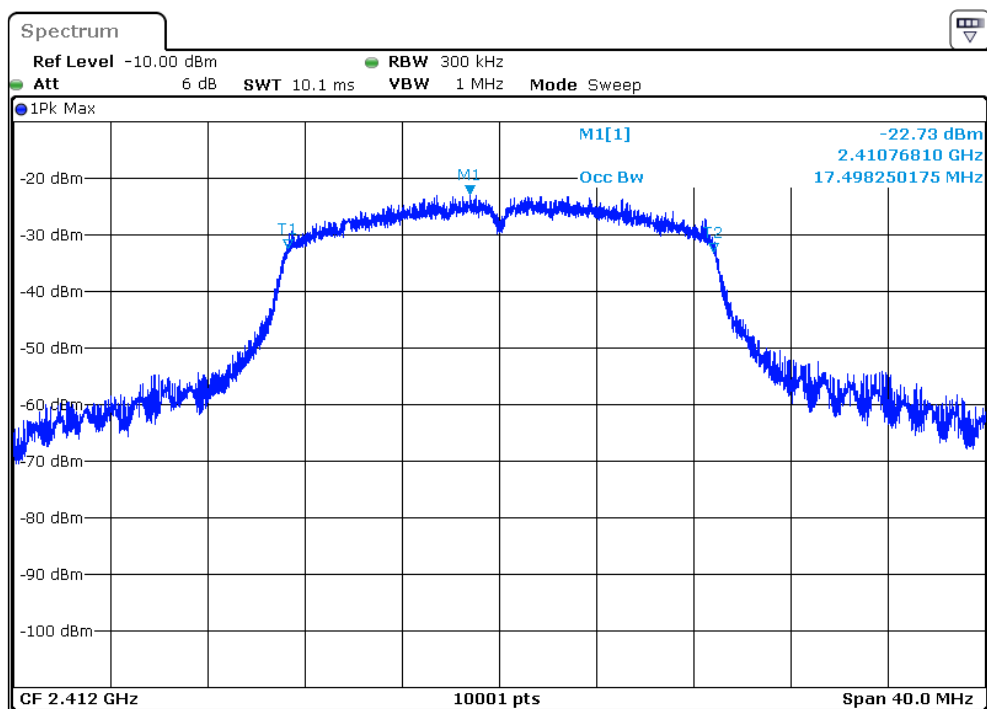
99% Bandwidth - Central Channel – Mode 802.11.n - SISO



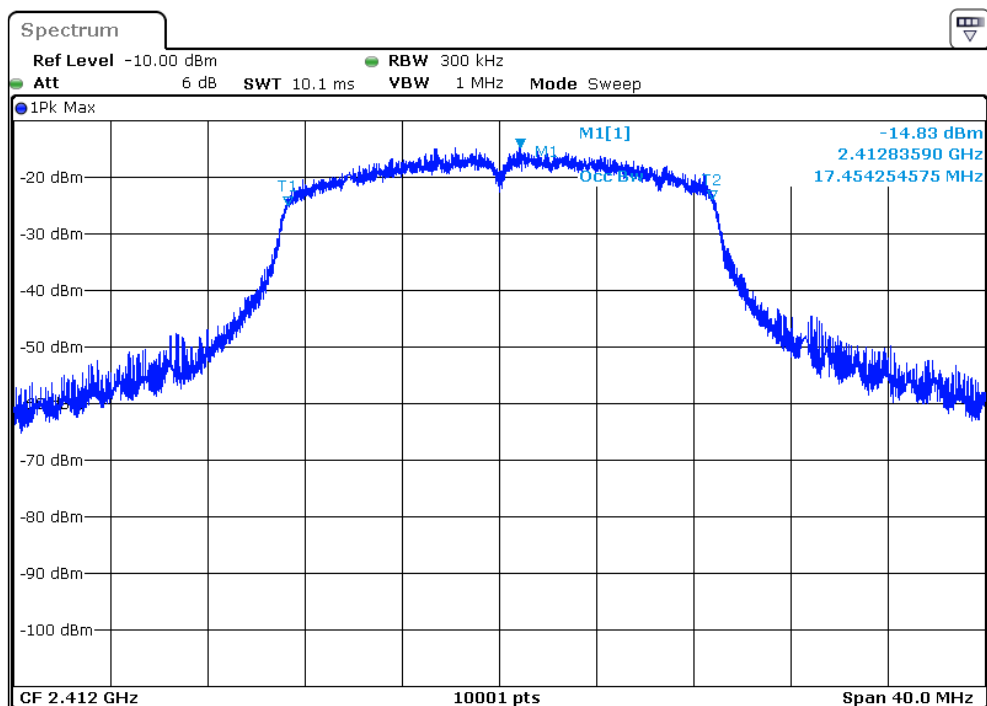
99%B Bandwidth - High Channel – Mode 802.11.n - SISO



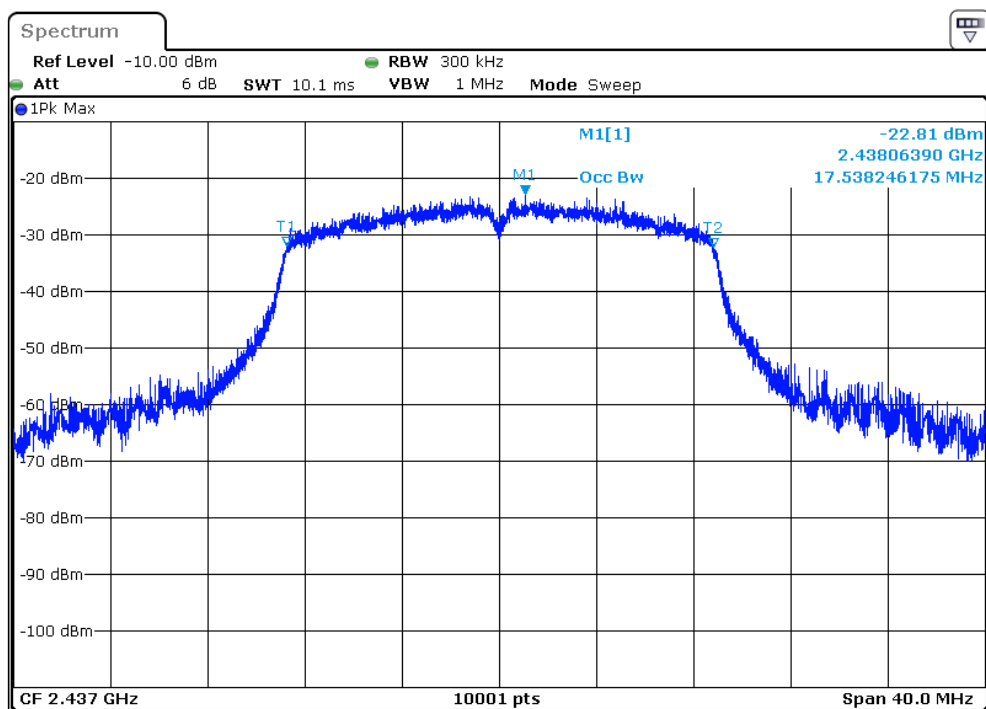
99% Bandwidth – Low Channel – RF1 – Mode 802.11.n - MIMO



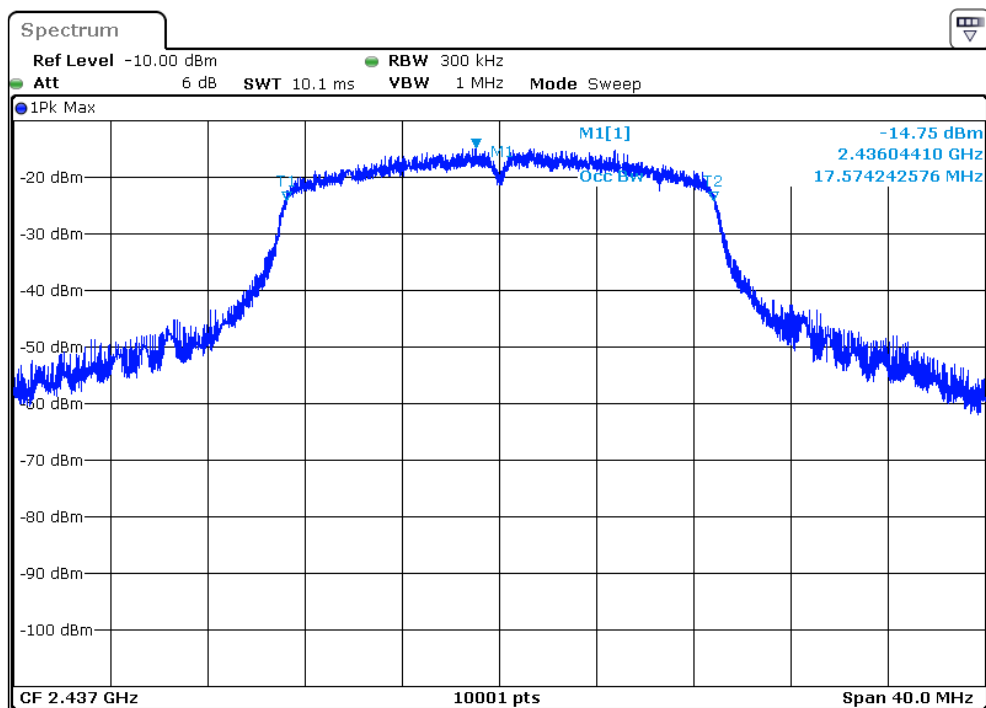
99% Bandwidth – Low Channel – RF2 – Mode 802.11.n - MIMO



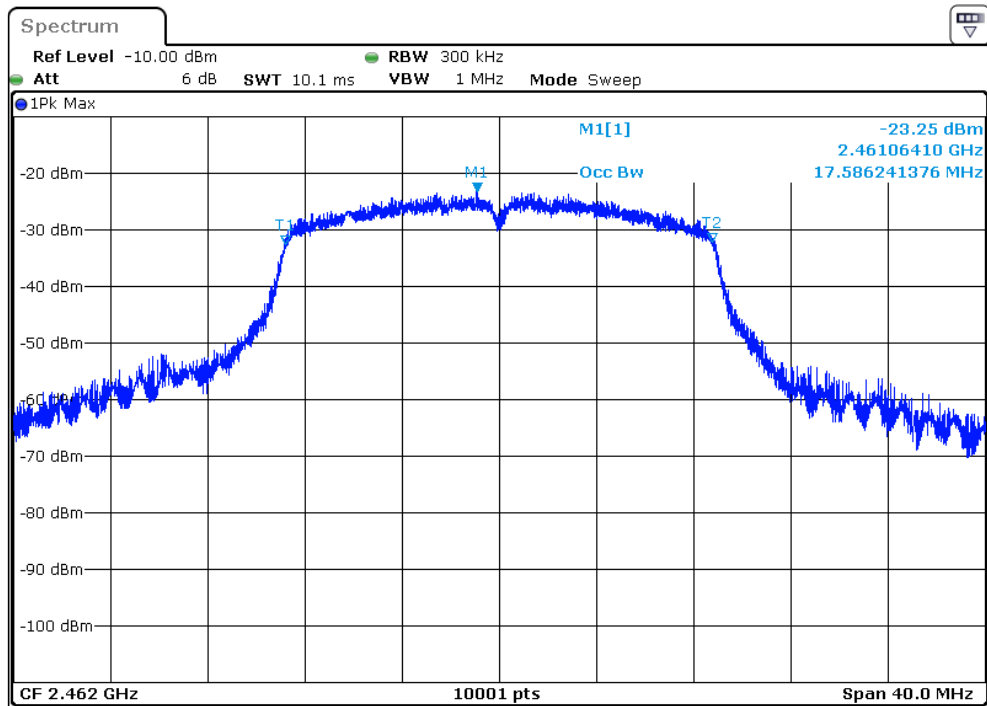
99% Bandwidth – Central Channel – RF1 – Mode 802.11.n - MIMO



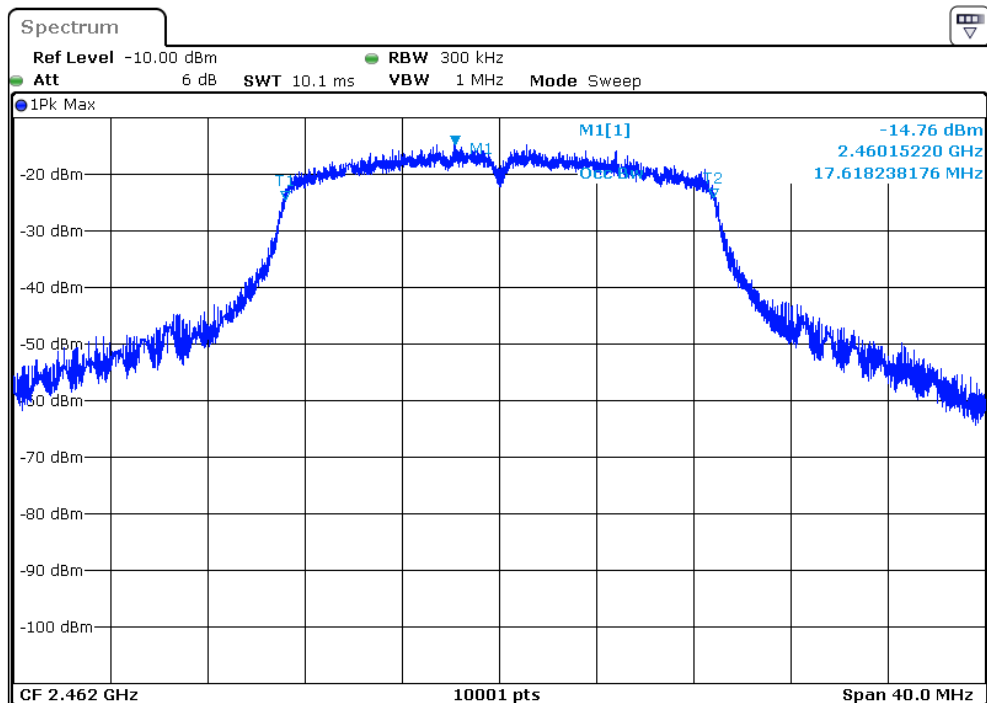
99% Bandwidth – Central Channel – RF2 – Mode 802.11.n - MIMO



99% Bandwidth – High Channel – RF1 – Mode 802.11.n - MIMO



99% Bandwidth – High Channel – RF2 – Mode 802.11.n - MIMO



Measure realized for reporting only

Test conclusion:

RESPECTED STANDARD

9. BAND EDGE**Temperature (°C) :** 20.9**Humidity (%HR):** 38.2**Date :** December 4, 2020**Technician :** M. DUMESNIL**Standard:** FCC Part 15
RSS-247**Test procedure:**

Method of paragraph 11.13 of ANSI C63.10

Test set up:

Test realized in near field. All field strength measurements are correlated with the radiated maximum peak output power

Test operating condition of the equipment:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate (P Software adjusted to +16 dBm).

Power source: 12 Vdc by an external power supply

Percentage of voltage variation during the test (%):

 ± 1

Results:

Lower Band Edge: From 2398 MHz to 2400 MHz

Upper Band Edge: From 2483.5 MHz to 2485.5 MHz

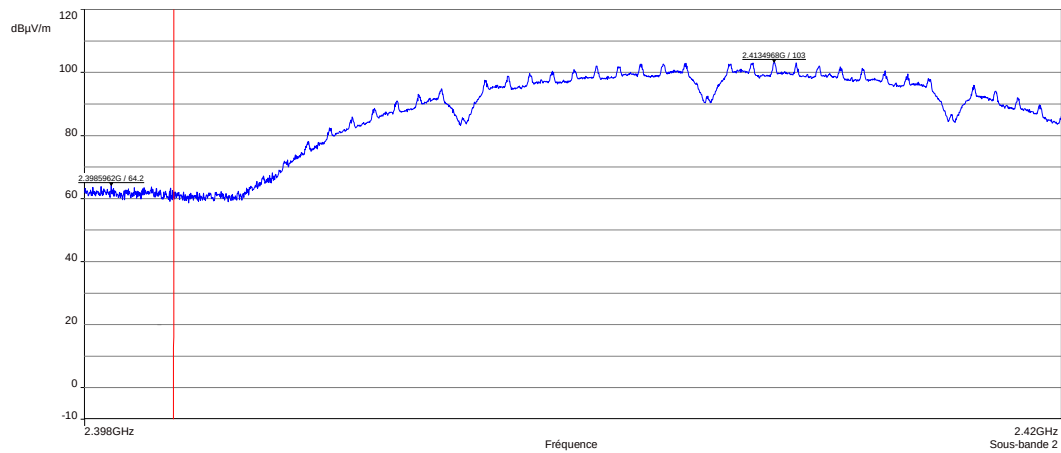
Internal antenna

Sample N° 1 **WiFi mode 802.11.b - SISO**

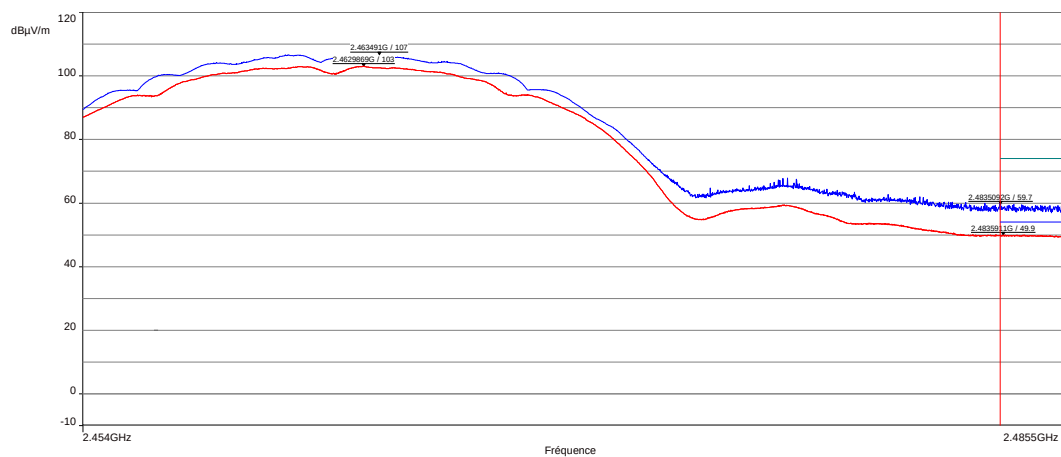
Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	103	Peak	2398.5962	-38.8	64.2	83	18.8
2462	107	Peak	2483.5092	-47.3	59.7	74	14.3
2462	103	Average	2483.5911	-53.1	49.9	54	4.1

(1) Marker-Delta method

Low channel



High channel

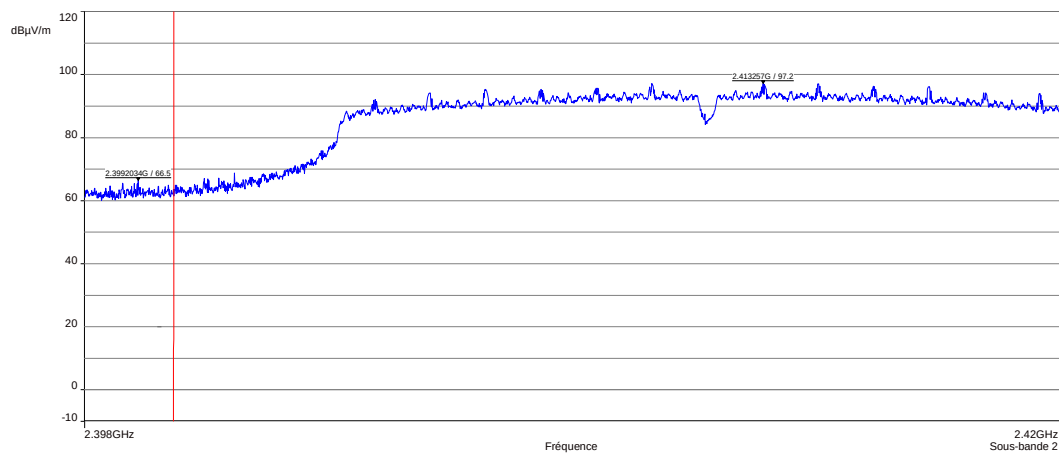


Sample N° 1 WiFi mode 802.11.g - SISO

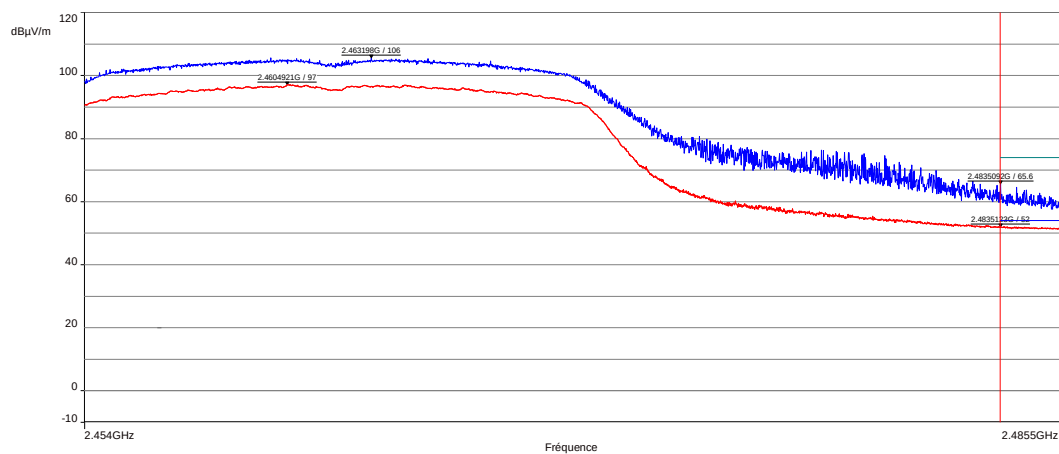
Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	97.2	Peak	2399.2034	-30.7	66.5	77.2	10.7
2462	106	Peak	2483.5092	-40.4	65.6	74	8.4
2462	97	Average	2483.5123	-45	52	54	2

(1) Marker-Delta method

Low channel



High channel

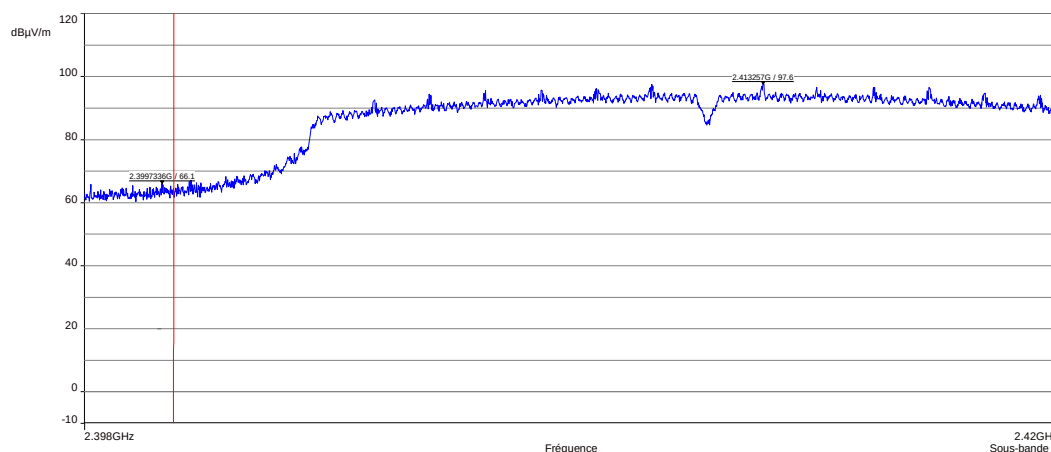


Sample N° 1 WiFi mode 802.11.n - SISO

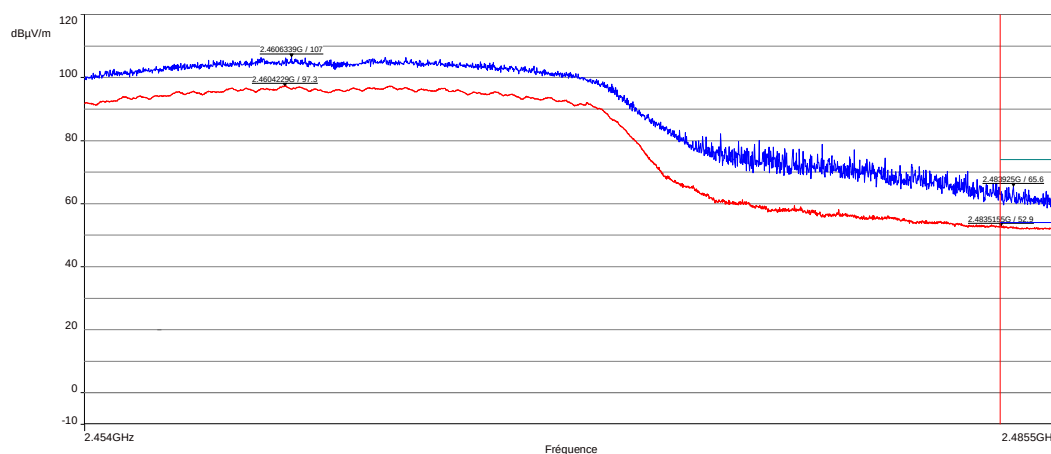
Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	97.6	Peak	2399.7336	-31.5	66.1	77.6	11.5
2462	103	Peak	2483.925	-37.4	65.6	74	8.4
2462	97.3	Average	2483.5155	-44.4	52.9	54	1.1

(1) Marker-Delta method

Low channel



High channel

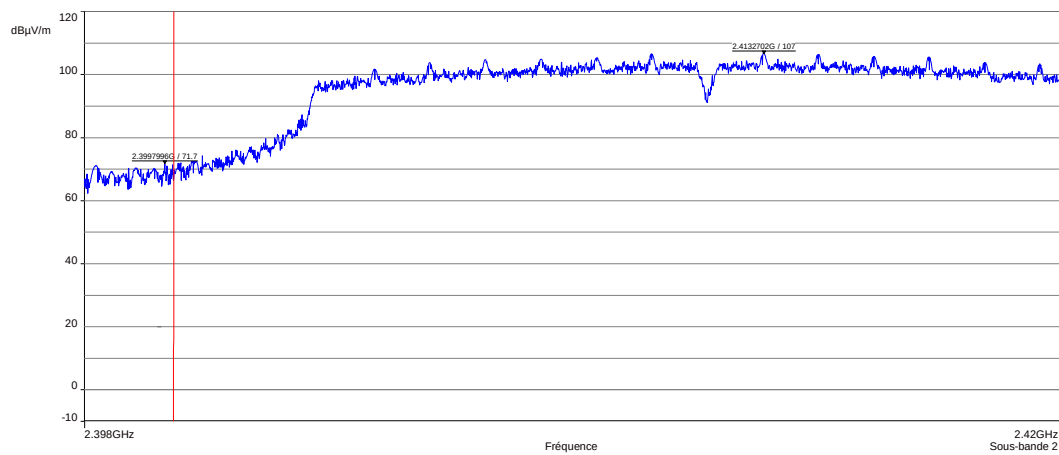


Sample N° 1 WiFi mode 802.11.n - MIMO

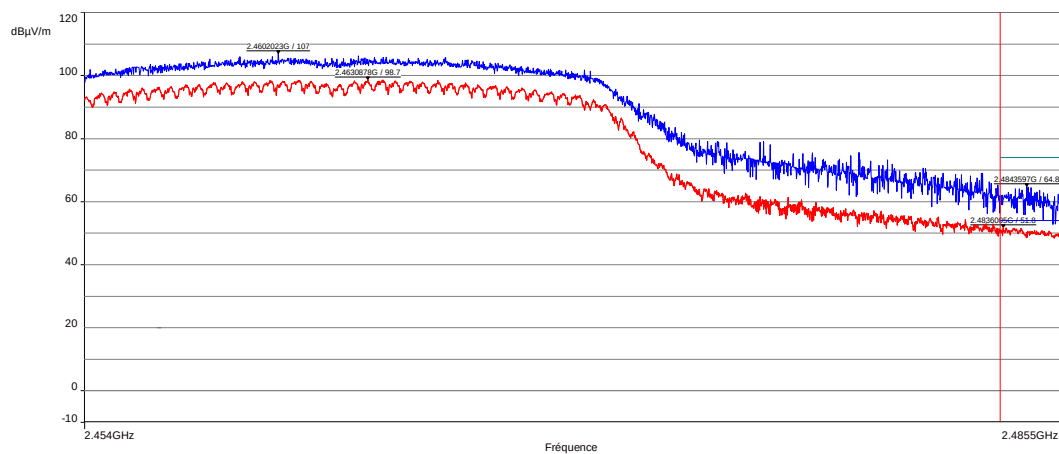
Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	107	Peak	2399.7996	-35.3	71.7	87	15.3
2462	107	Peak	2484.3597	-42.2	64.8	74	9.2
2462	98.7	Average	2483.6005	-46.9	51.8	54	2.2

(1) Marker-Delta method

Low channel



High channel



External antenna

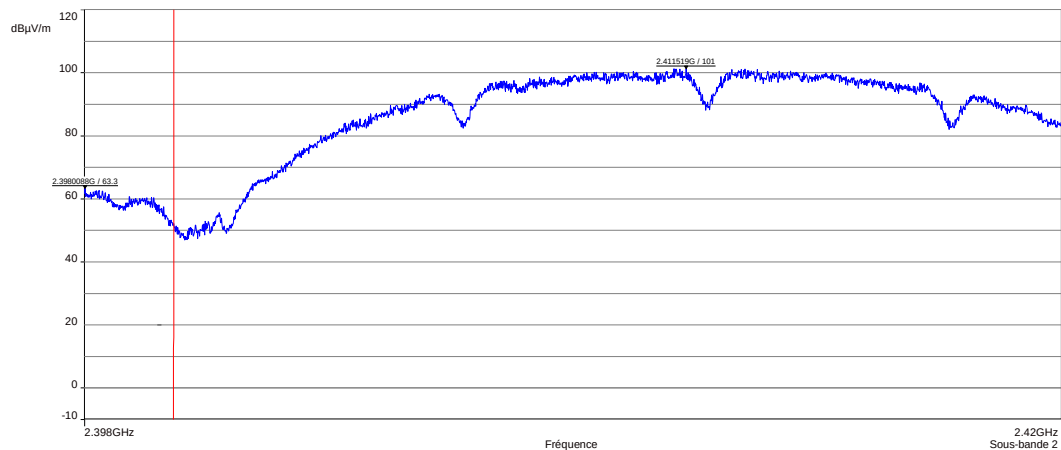
Sample N° 1 WiFi mode 802.11.b - SISO

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	101	Peak	2398.0088	-37.7	63.3	81	17.7
2462	106	Peak	2483.673	-52.3	53.7 (2)	74	20.3
2462	101	Average	2483.525	-54.9	46.1	54	7.9

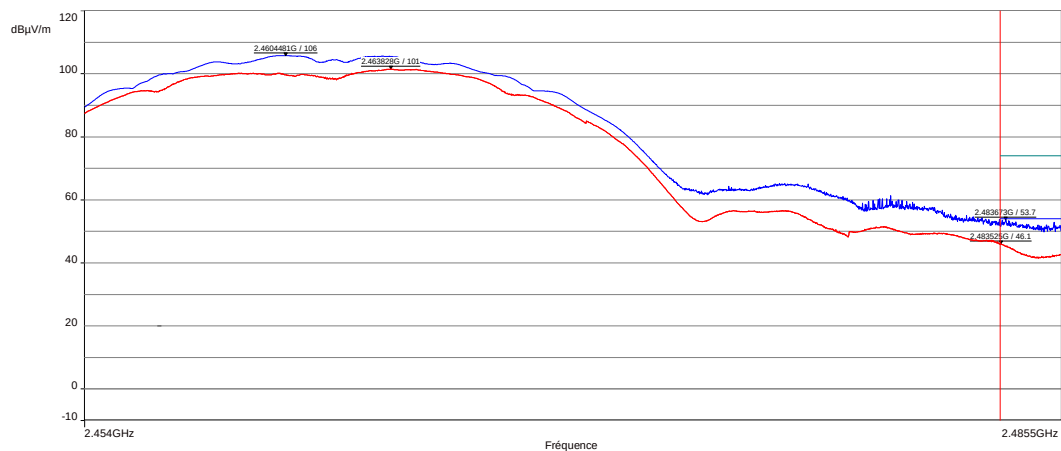
(1) Marker-Delta method

(2) The peak level is lower than the average limit (54 dBμV/m)

Low channel



High channel

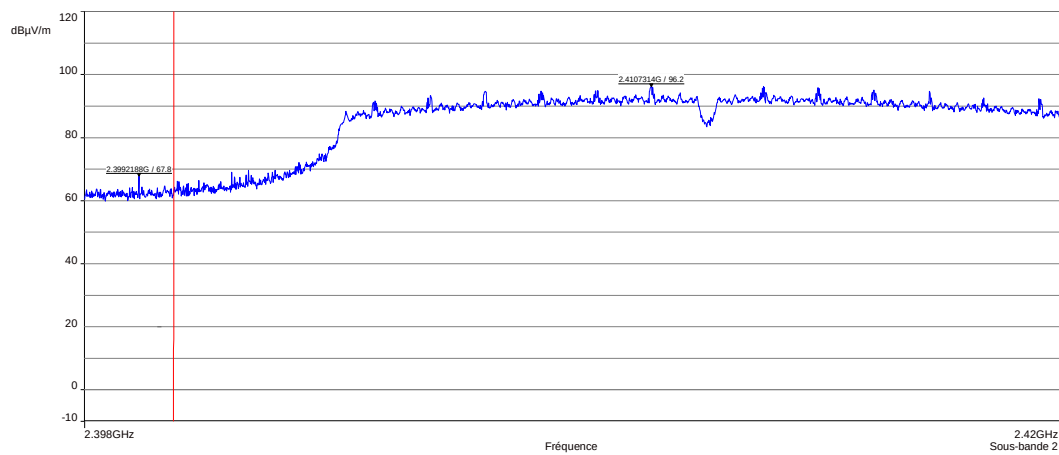


Sample N° 1 WiFi mode 802.11.g - SISO

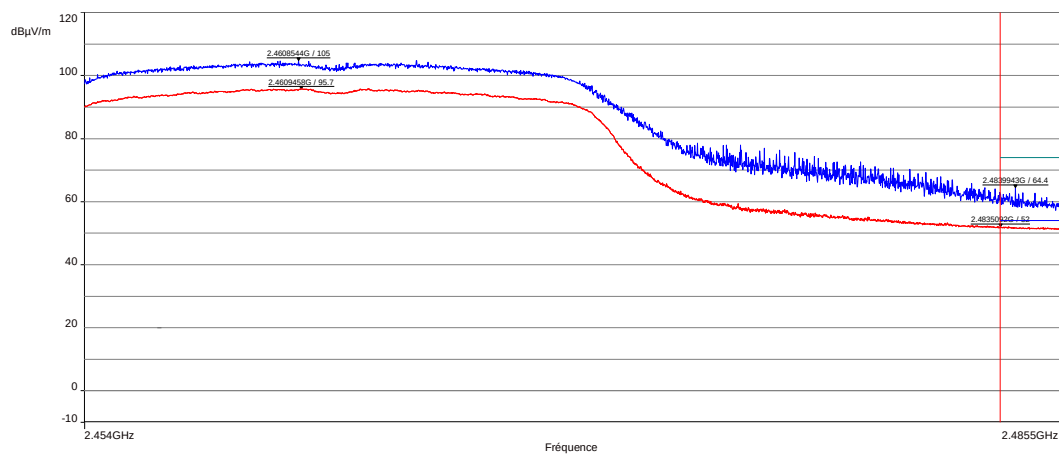
Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	96.2	Peak	2399.2188	-28.4	67.8	76.2	8.4
2462	105	Peak	2483.9943	-40.6	64.4	74	9.6
2462	95.7	Average	2483.5092	-43.7	52	54	2

(1) Marker-Delta method

Low channel



High channel

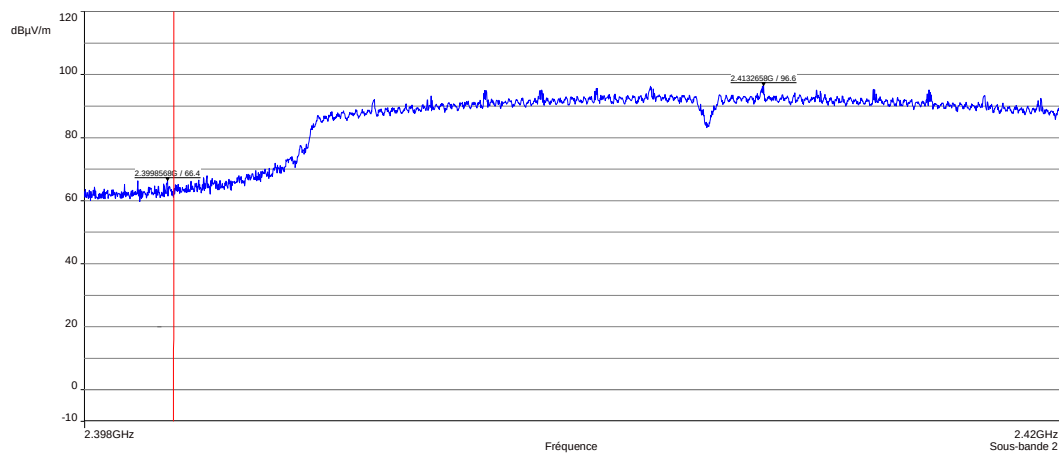


Sample N° 1 WiFi mode 802.11.n - SISO

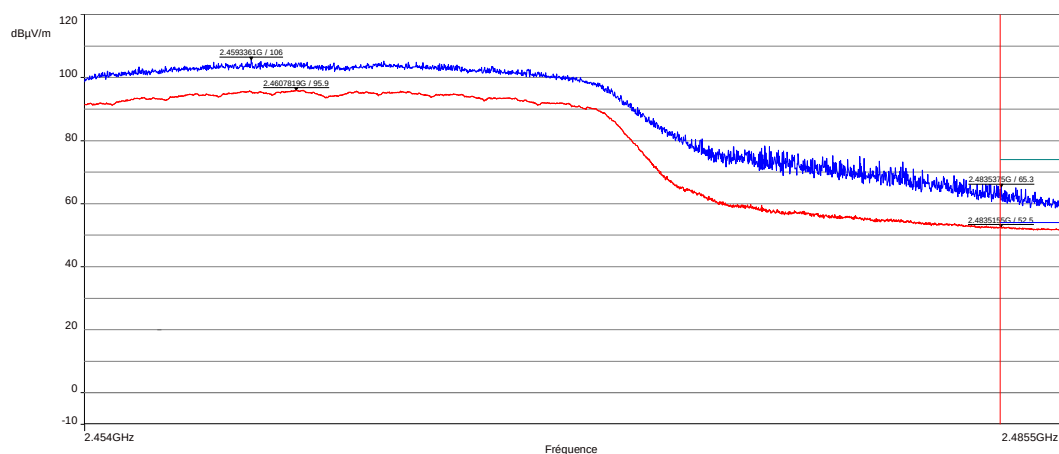
Fundamental frequency (MHz)	Field Strength Level of fundamental (dBμV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2412	96.6	Peak	2399.8568	-30.2	66.4	76.6	10.2
2462	106	Peak	2483.5375	-40.7	65.3	74	8.7
2462	95.9	Average	2483.5155	-43.4	52.5	54	1.5

(1) Marker-Delta method

Low channel



High channel



Test conclusion:

RESPECTED STANDARD

10. PEAK CONDUCTED OUTPUT POWER

Temperature (°C) : 20.8

Humidity (%HR): 38

Date : December 4, 2020

Technician : M. DUMESNIL

Standard: FCC Part 15
RSS-247

Test procedure:

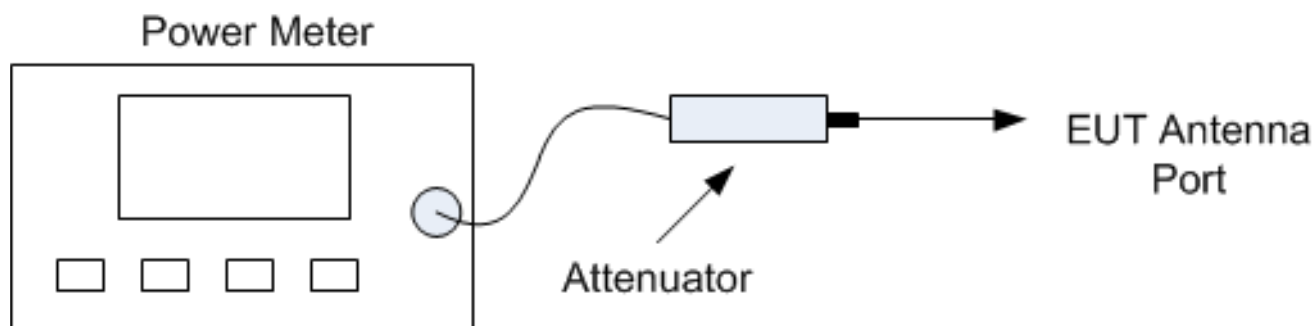
For FCC Part 15: paragraph 15.247 (b)

For RSS-247: paragraph 5.4

PKPM1 Peak power meter method of paragraph 11.9.1.3 of ANSI C63.10

Test set up:

Conducted test



The measure is realized in conducted mode with a calibrated peak power reading power meter.

The power sensor was used on each output port of the EUT. A power meter was used to read the response of the power sensor. Record the power level. Then the results were summed in linear power unit.

Equipment under test operating condition:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate (P Software adjusted to +16 dBm).

Power source: 12 Vdc by an external power supply

Percentage of voltage variation during the test (%):

± 1

Results:

Sample N° 1 Low Channel – Mode 802.11.b - SISO

	Maximum Peak conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	15.38	0.035	1

Declared maximum antenna gain: +4.70dBi

Sample N° 1 Central Channel – Mode 802.11.b - SISO

	Maximum Peak conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	14.70	0.030	1

Declared maximum antenna gain: +3.75dBi

Sample N° 1 High Channel – Mode 802.11.b - SISO

	Maximum Peak conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	14.88	0.031	1

Declared maximum antenna gain: +3.48dBi

Sample N° 1 Low Channel – Mode 802.11.g - SISO

	Maximum Peak conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	17.19	0.052	1

Declared maximum antenna gain: +4.70dBi

Sample N° 1 Central Channel – Mode 802.11.g - SISO

	Maximum Peak conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	16.78	0.048	1

Declared maximum antenna gain: +3.75dBi

Sample N° 1 High Channel – Mode 802.11.g - SISO

	Maximum Peak conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	17.01	0.050	1

Declared maximum antenna gain: +3.48dBi

Sample N° 1 Low Channel – Mode 802.11.n - SISO

	Maximum Peak conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	17.17	0.052	1

Declared maximum antenna gain: +4.70dBi

Sample N° 1 Central Channel – Mode 802.11.n - SISO

	Maximum Peak conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	16.72	0.047	1

Declared maximum antenna gain: +3.75dBi

Sample N° 1 High Channel – Mode 802.11.n - SISO

	Maximum Peak conducted output power		Limit (W)
	(dBm)	(W)	
Nominal supply voltage:	16.91	0.049	1

Declared maximum antenna gain: +3.48dBi

Sample N° 1 Low Channel – Mode 802.11.n - MIMO

Frequency (MHz)	Transmit chain	Maximum Peak conducted output power		Maximum Total Peak conducted output power (W)	Limit (W)
		(dBm)	(W)		
2412	1	17.37	0.055	0.182	1
2412	2	21.04	0.127		

Declared maximum antenna gain: Transmit chain 1 at 2412MHz => +4.70dBi
Transmit chain 2 at 2412MHz => +3.18dBi

Sample N° 1 Central Channel – Mode 802.11.n - MIMO

Frequency (MHz)	Transmit chain	Maximum Peak conducted output power		Maximum Total Peak conducted output power (W)	Limit (W)
		(dBm)	(W)		
2437	1	17.06	0.051	0.168	1
2437	2	20.69	0.117		

Declared maximum antenna gain: Transmit chain 1 at 2437MHz => +3.75dBi
Transmit chain 2 at 2437MHz => +3.17dBi

Sample N° 1 High Channel – Mode 802.11.n - MIMO

Frequency (MHz)	Transmit chain	Maximum Peak conducted output power		Maximum Total Peak conducted output power (W)	Limit (W)
		(dBm)	(W)		
2462	1	17.26	0.053	0.166	1
2462	2	20.54	0.113		

Declared maximum antenna gain: Transmit chain 1 at 2462MHz => +3.48dBi
Transmit chain 2 at 2462MHz => +2.05dBi

Test conclusion:

RESPECTED STANDARD

11. RADIATED SPURIOUS EMISSIONS**Temperature (°C) :** 20.6-22.4**Humidity (%HR):** 36.7-40.3**Date :** December 1, 2, 3 and 7, 2020**Technician :** M. DUMESNIL**Standard:** FCC Part 15
RSS-247**Test procedure:**

For FCC Part 15: paragraph 15.205, paragraph 15.209, paragraph 15.247 (d)

For RSS-247: paragraph 5.5

Emissions in non-restricted frequency bands method of paragraph 11.11 of ANSI C63.10

Emissions in restricted frequency bands method of paragraph 11.12 of ANSI C63.10

Test set up:

First an exploratory radiated measurement was performed. During this phase the product is oriented in these two normal positions. Then the final measurement is realized with the product on the most critical orientation.

The measure is realized on open area test site under 1 GHz and in anechoic chamber above 1 GHz.

When the system is tested in an open area test site (OATS), the EUT is placed on a rotating table, 0.8m from a ground plane and when the system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.5 m from a ground plane.

Zero degree azimuths correspond to the front of the device under test.

Frequency range: From 9 kHz to 10th harmonic of the highest fundamental frequency (2462 MHz).**Detection mode:** Quasi-peak (F < 1 GHz)

Peak / Average (F > 1 GHz)

Bandwidth: 200Hz (9 kHz < F < 150kHz)
9 kHz (150 kHz < F < 30MHz)
120 kHz (30 MHz < F < 1 GHz)
100 kHz / 1 MHz (F > 1 GHz)**Distance of antenna:** 10 meters (in open area test site) / 3 meters (in anechoic room)**Antenna height:** 1 to 4 meters (in open area test site) / 1.5 meter (in anechoic room)**Antenna polarization:** vertical and horizontal (only the highest level is recorded)**Equipment under test operating condition:**

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate (P Software adjusted to +16 dBm).

Power source: 12 Vdc by an external power supply

Percentage of voltage variation during the test (%):

± 1

Results:

Internal antenna

Sample N° 1 Low Channel – Mode 802.11.b - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6
4824 (1)	P	1000	H	47.5 (2)	/	74	26.5

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

(2) The peak level is lower than the average limit (54 dBμV/m)

Sample N° 1 Central Channel – Mode 802.11.b - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6
4874 (1)	P	1000	H	49.1 (2)	/	74	24.9

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

(2) The peak level is lower than the average limit (54 dBμV/m)

Sample N° 1 High Channel – Mode 802.11.b - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6
4924 (1)	P	1000	H	49.7 (2)	/	74	24.3

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

(2) The peak level is lower than the average limit (54 dBμV/m)

Sample N° 1 Low Channel – Mode 802.11.g - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Sample N° 1 Central Channel – Mode 802.11.g - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6
4874 (1)	P	1000	H	47.1 (2)	/	74	26.9

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

(2) The peak level is lower than the average limit (54 dBμV/m)

Sample N° 1 High Channel – Mode 802.11.g - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6
4924 (1)	P	1000	H	44.3 (2)	/	74	29.7

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

(2) The peak level is lower than the average limit (54 dBμV/m)

Sample N° 1 Low Channel – Mode 802.11.n - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Sample N° 1 Central Channel – Mode 802.11.n - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6
4874 (1)	P	1000	H	45.1 (2)	/	74	28.9

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

(2) The peak level is lower than the average limit (54 dBμV/m)

Sample N° 1 High Channel – Mode 802.11.n - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Sample N° 1 Low Channel – Mode 802.11.n - MIMO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Sample N° 1 Central Channel – Mode 802.11.n - MIMO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Sample N° 1 High Channel – Mode 802.11.n - MIMO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	87	56.6
153.862	P	100	V	20.85	31.3	87	55.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	87	61.2
576	P	100	V	17.55	28	87	59
640	P	100	V	14.35	24.8	87	62.2
704	P	100	V	20.95	31.4	87	55.6
735.96	P	100	V	19.95	30.4	87	56.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The highest level recorded in a 100 kHz bandwidth is 107 dBμV/m on channel Low.

So the applicable limit is 87 dBμV/m.

In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

In addition, radiated emissions which fall in the restricted band, as defined in Table 6 of RSS-Gen, must also comply with the radiated emission limits specified in Table 4 and Table 5 of RSS-Gen.

External antenna

Sample N° 1 Low Channel – Mode 802.11.b - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	81	50.6
153.862	P	100	V	20.85	31.3	81	49.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	81	55.2
576	P	100	V	17.55	28	81	53
640	P	100	V	14.35	24.8	81	56.2
704	P	100	V	20.95	31.4	81	49.6
735.96	P	100	V	19.95	30.4	81	50.6
4824 (1)	P	1000	V	46.2 (2)	/	74	27.8

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

(2) The peak level is lower than the average limit (54 dBμV/m)

Sample N° 1 Central Channel – Mode 802.11.b - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	81	50.6
153.862	P	100	V	20.85	31.3	81	49.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	81	55.2
576	P	100	V	17.55	28	81	53
640	P	100	V	14.35	24.8	81	56.2
704	P	100	V	20.95	31.4	81	49.6
735.96	P	100	V	19.95	30.4	81	50.6
4874 (1)	P	1000	V	44.5 (2)	/	74	29.5

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

(2) The peak level is lower than the average limit (54 dBμV/m)

Sample N° 1 High Channel – Mode 802.11.b - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	81	50.6
153.862	P	100	V	20.85	31.3	81	49.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	81	55.2
576	P	100	V	17.55	28	81	53
640	P	100	V	14.35	24.8	81	56.2
704	P	100	V	20.95	31.4	81	49.6
735.96	P	100	V	19.95	30.4	81	50.6
4924 (1)	P	1000	V	47.2 (2)	/	74	26.8

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

(2) The peak level is lower than the average limit (54 dBμV/m)

Sample N° 1 Low Channel – Mode 802.11.g - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	81	50.6
153.862	P	100	V	20.85	31.3	81	49.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	81	55.2
576	P	100	V	17.55	28	81	53
640	P	100	V	14.35	24.8	81	56.2
704	P	100	V	20.95	31.4	81	49.6
735.96	P	100	V	19.95	30.4	81	50.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Sample N° 1 Central Channel – Mode 802.11.g - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	81	50.6
153.862	P	100	V	20.85	31.3	81	49.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	81	55.2
576	P	100	V	17.55	28	81	53
640	P	100	V	14.35	24.8	81	56.2
704	P	100	V	20.95	31.4	81	49.6
735.96	P	100	V	19.95	30.4	81	50.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Sample N° 1 High Channel – Mode 802.11.g - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	81	50.6
153.862	P	100	V	20.85	31.3	81	49.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	81	55.2
576	P	100	V	17.55	28	81	53
640	P	100	V	14.35	24.8	81	56.2
704	P	100	V	20.95	31.4	81	49.6
735.96	P	100	V	19.95	30.4	81	50.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Sample N° 1 Low Channel – Mode 802.11.n - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	81	50.6
153.862	P	100	V	20.85	31.3	81	49.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	81	55.2
576	P	100	V	17.55	28	81	53
640	P	100	V	14.35	24.8	81	56.2
704	P	100	V	20.95	31.4	81	49.6
735.96	P	100	V	19.95	30.4	81	50.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Sample N° 1 Central Channel – Mode 802.11.n - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	81	50.6
153.862	P	100	V	20.85	31.3	81	49.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	81	55.2
576	P	100	V	17.55	28	81	53
640	P	100	V	14.35	24.8	81	56.2
704	P	100	V	20.95	31.4	81	49.6
735.96	P	100	V	19.95	30.4	81	50.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Sample N° 1 High Channel – Mode 802.11.n - SISO

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3 /10 m (dBμV/m)	Field strength Computed at 3 m (dBμV/m)	Limits at 3 m (dBμV/m)	Margin (dB)
125.149 (1)	P	100	V	19.45	29.9	43.5	13.6
144.41	P	100	V	19.95	30.4	81	50.6
153.862	P	100	V	20.85	31.3	81	49.7
164.50 (1)	P	100	V	18.15	28.6	43.5	14.9
193.166	P	100	H	15.35	25.8	81	55.2
576	P	100	V	17.55	28	81	53
640	P	100	V	14.35	24.8	81	56.2
704	P	100	V	20.95	31.4	81	49.6
735.96	P	100	V	19.95	30.4	81	50.6

P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205 or in Table 6 of RSS-Gen

Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

The highest level recorded in a 100 kHz bandwidth is 101 dBμV/m on channel Low.

So the applicable limit is 81 dBμV/m.

In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

In addition, radiated emissions which fall in the restricted band, as defined in Table 6 of RSS-Gen, must also comply with the radiated emission limits specified in Table 4 and Table 5 of RSS-Gen.

Test conclusion:

RESPECTED STANDARD

12. PEAK CONDUCTED POWER SPECTRAL DENSITY

Temperature (°C) : 20.8

Humidity (%HR): 38

Date : December 4, 2020

Technician : M. DUMESNIL

Standard: FCC Part 15
RSS-247

Test procedure:

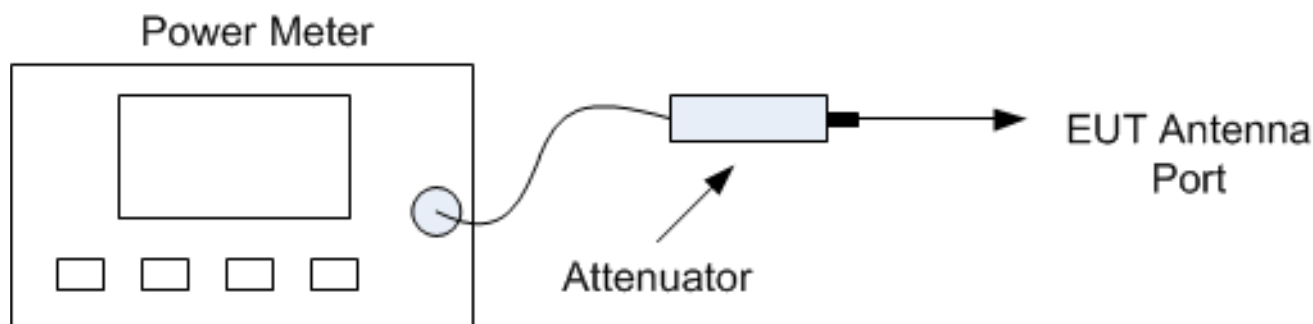
For FCC Part 15: paragraph 15.247 (e), paragraph 15.247 (f)

For RSS-247: paragraph 5.2

PKPSD (Peak PSD) method of paragraph 11.10.2 of ANSI C63.10

Test set up:

Conducted test



The measure is realized in conducted mode with an analyser.

Span: 15, 23 or 25 MHz
Resolution bandwidth: 3 kHz
Video bandwidth: 10 kHz
Detector: RMS
Number of points: 10001
Sweep time: Auto
Trace mode: Max hold

Then the peak marker function is used.

The measure is repeated on each output port of the EUT. Then the results were summed in linear power unit.

Equipment under test operating condition:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate (P Software adjusted to +16 dBm).

Power source: 12 Vdc by an external power supply

Percentage of voltage variation during the test (%):

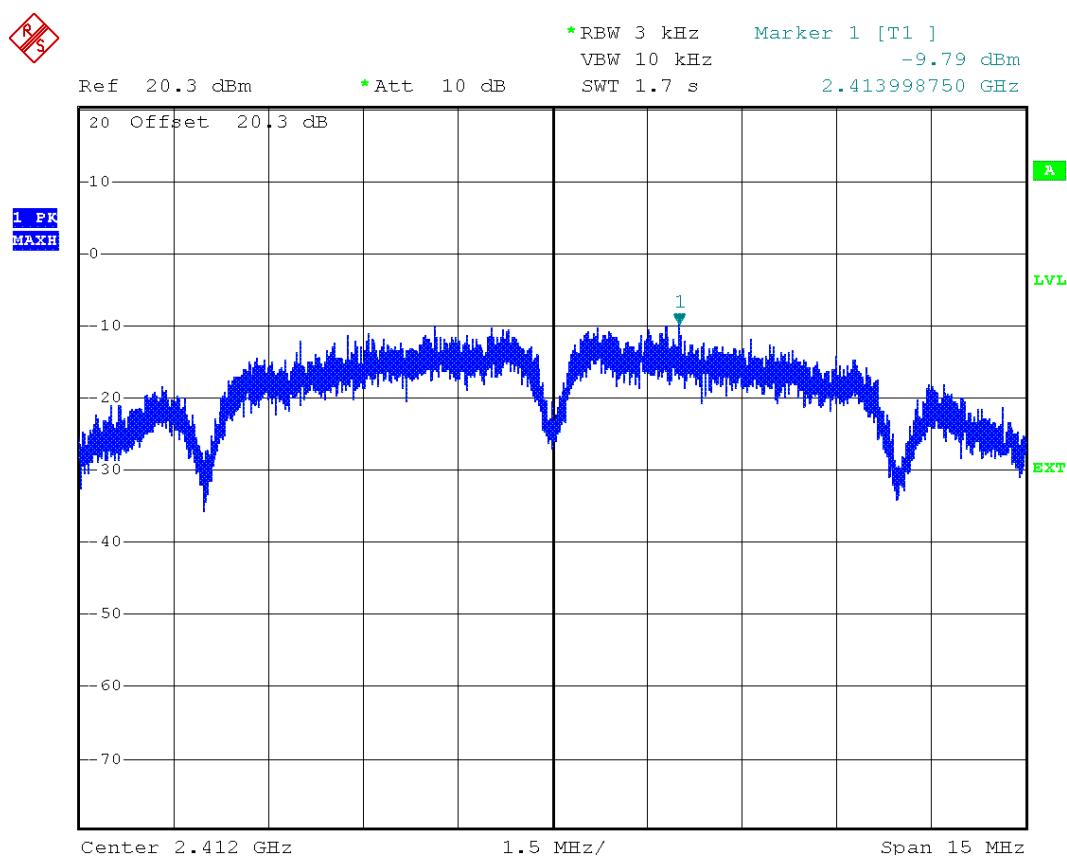
± 1

Results:

Sample N° 1 Low Channel – Mode 802.11.b - SISO

	Maximum Peak conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:	-9.79	8

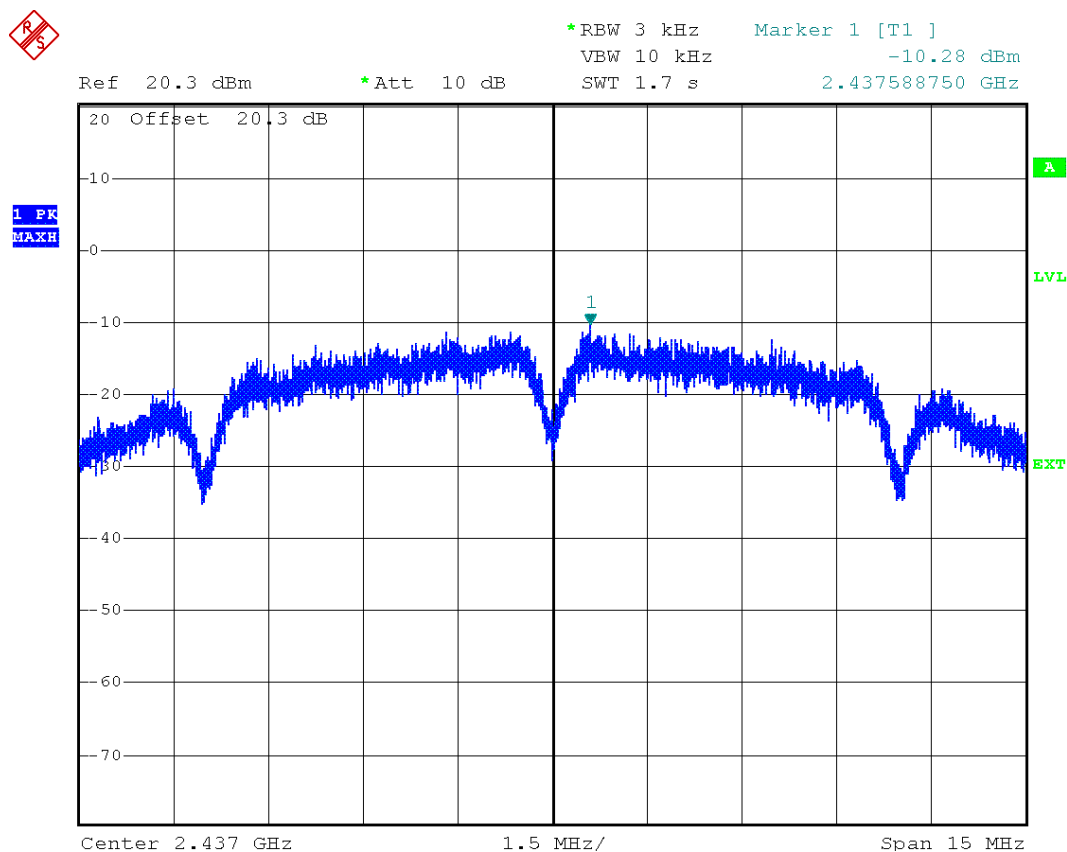
Declared maximum antenna gain: +4.70dBi



Sample N° 1 Central Channel – Mode 802.11.b - SISO

	Maximum Peak conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:	-10.28	8

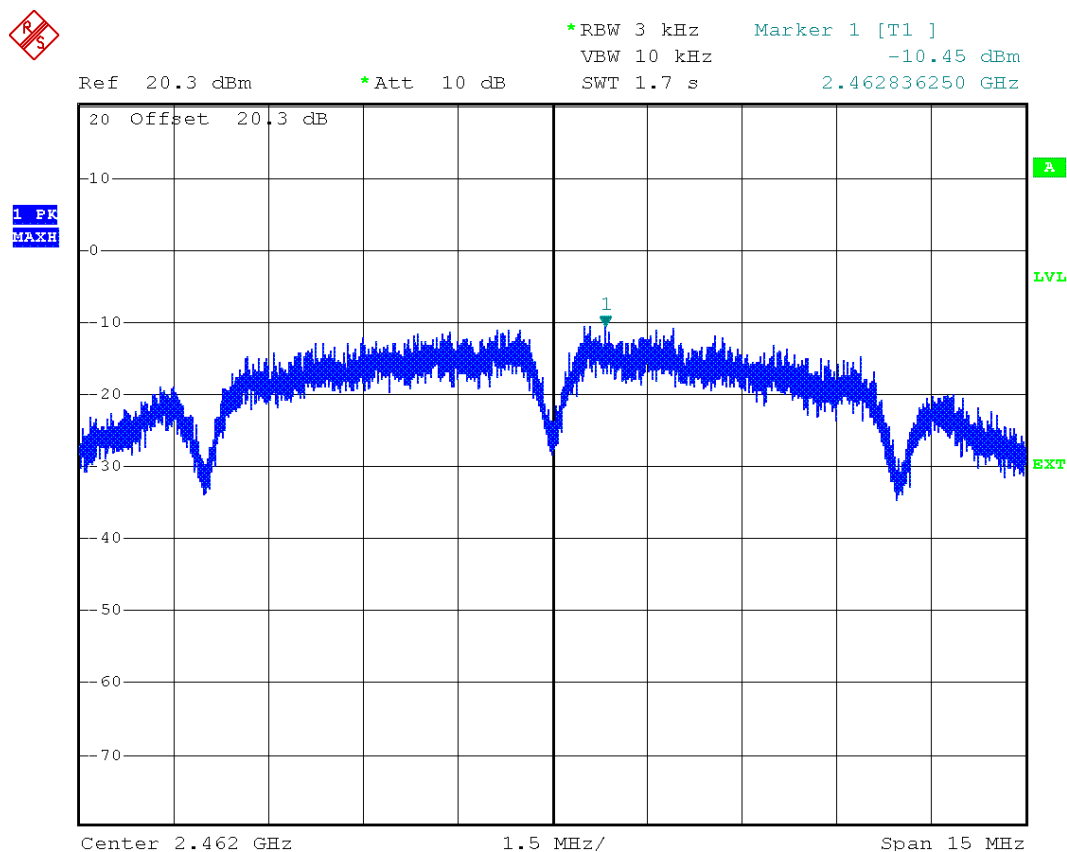
Declared maximum antenna gain: +3.75dBi



Sample N° 1 High Channel – Mode 802.11.b - SISO

	Maximum Peak conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:	-10.45	8

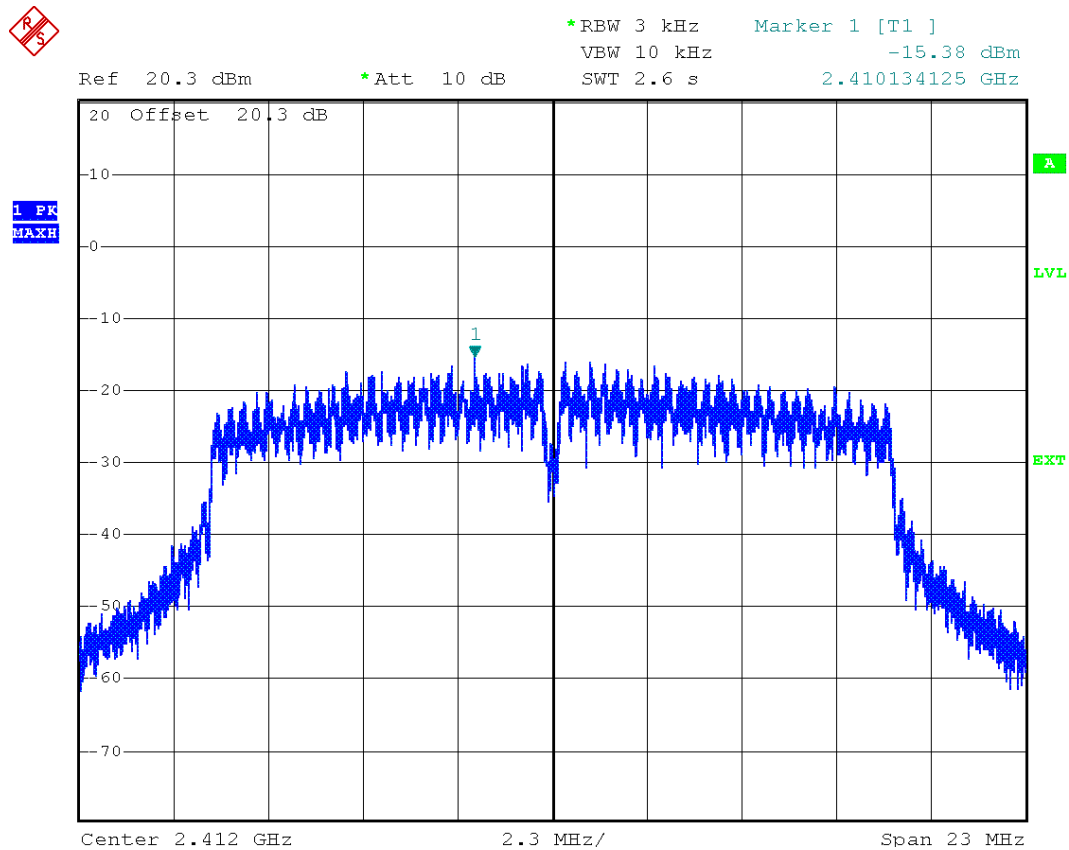
Declared maximum antenna gain: +3.48dBi



Sample N° 1 Low Channel – Mode 802.11.g - SISO

	Maximum Peak conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:	-15.38	8

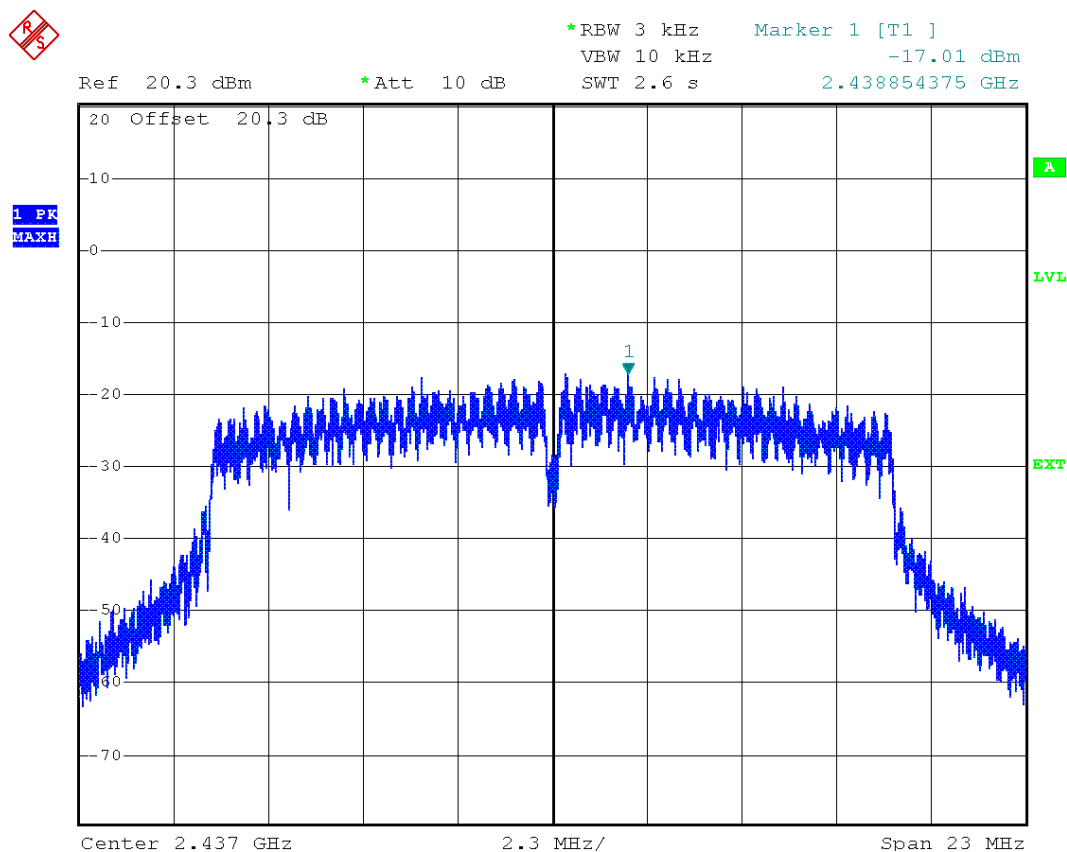
Declared maximum antenna gain: +4.70dBi



Sample N° 1 Central Channel – Mode 802.11.g - SISO

	Maximum Peak conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:	-17.01	8

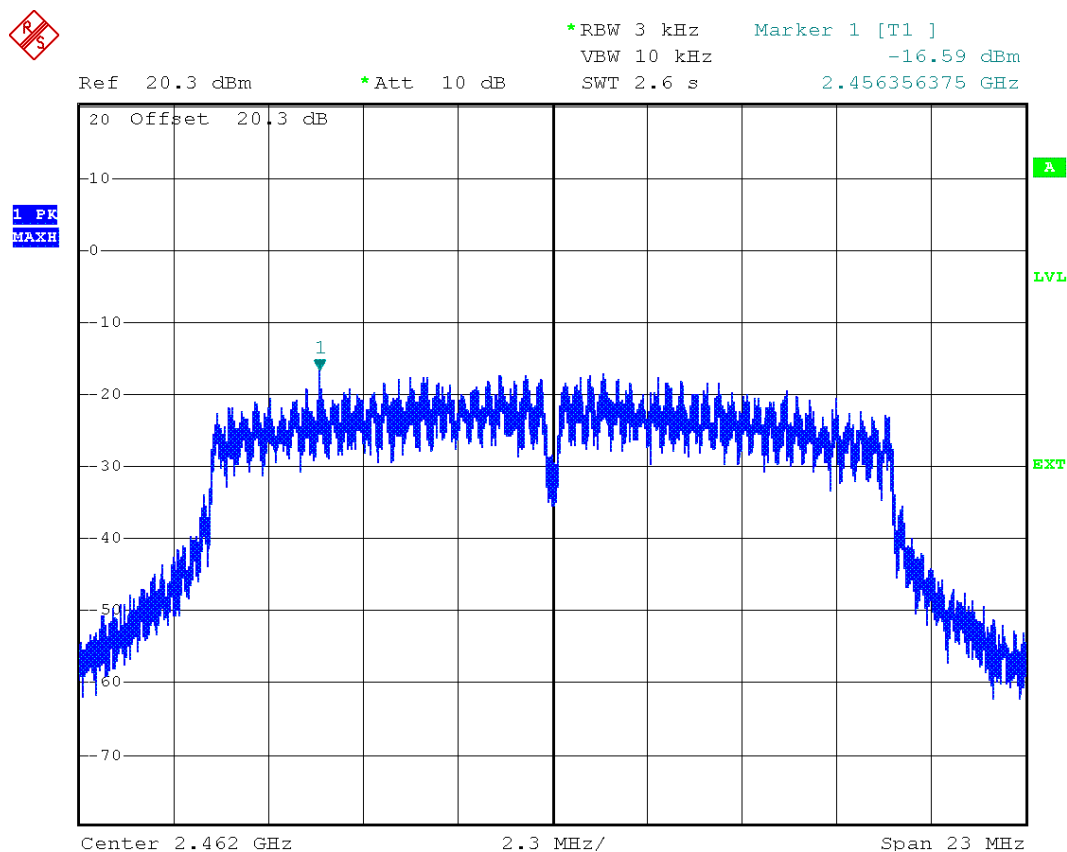
Declared maximum antenna gain: +3.75dBi



Sample N° 1 High Channel – Mode 802.11.g - SISO

	Maximum Peak conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:	-16.59	8

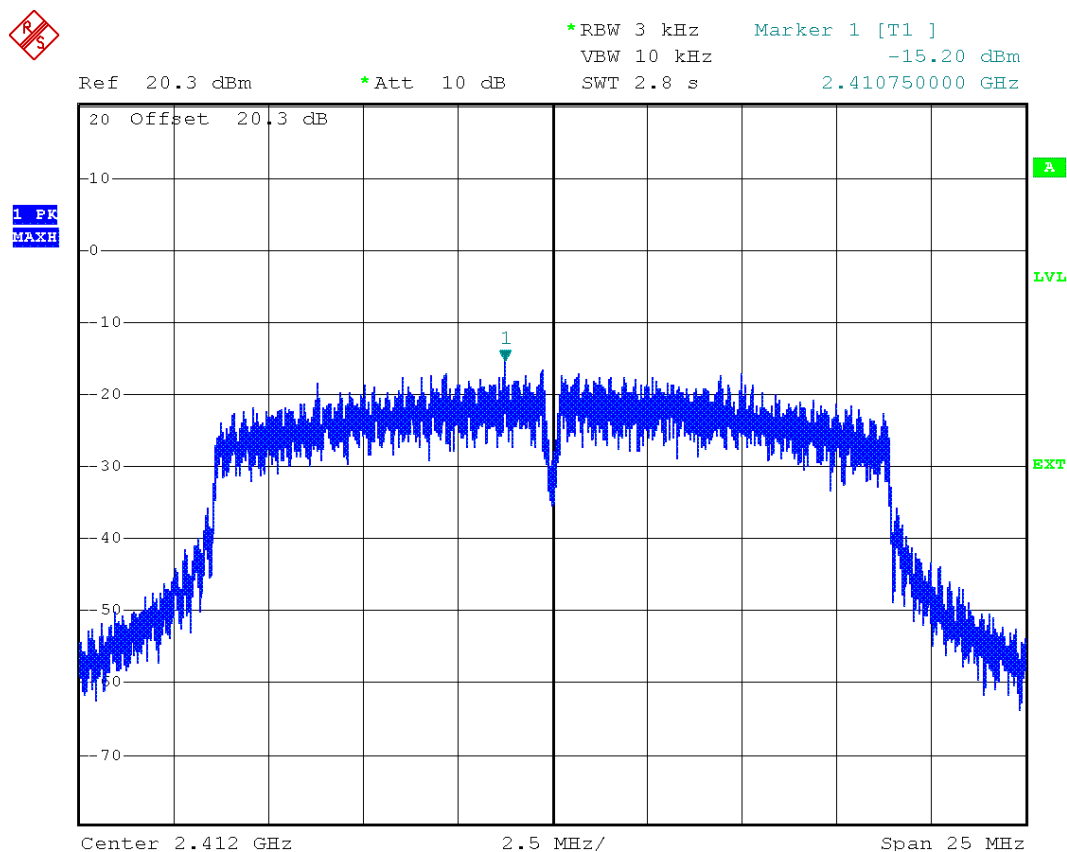
Declared maximum antenna gain: +3.48dBi



Sample N° 1 Low Channel – Mode 802.11.n - SISO

	Maximum Peak conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:	-15.20	8

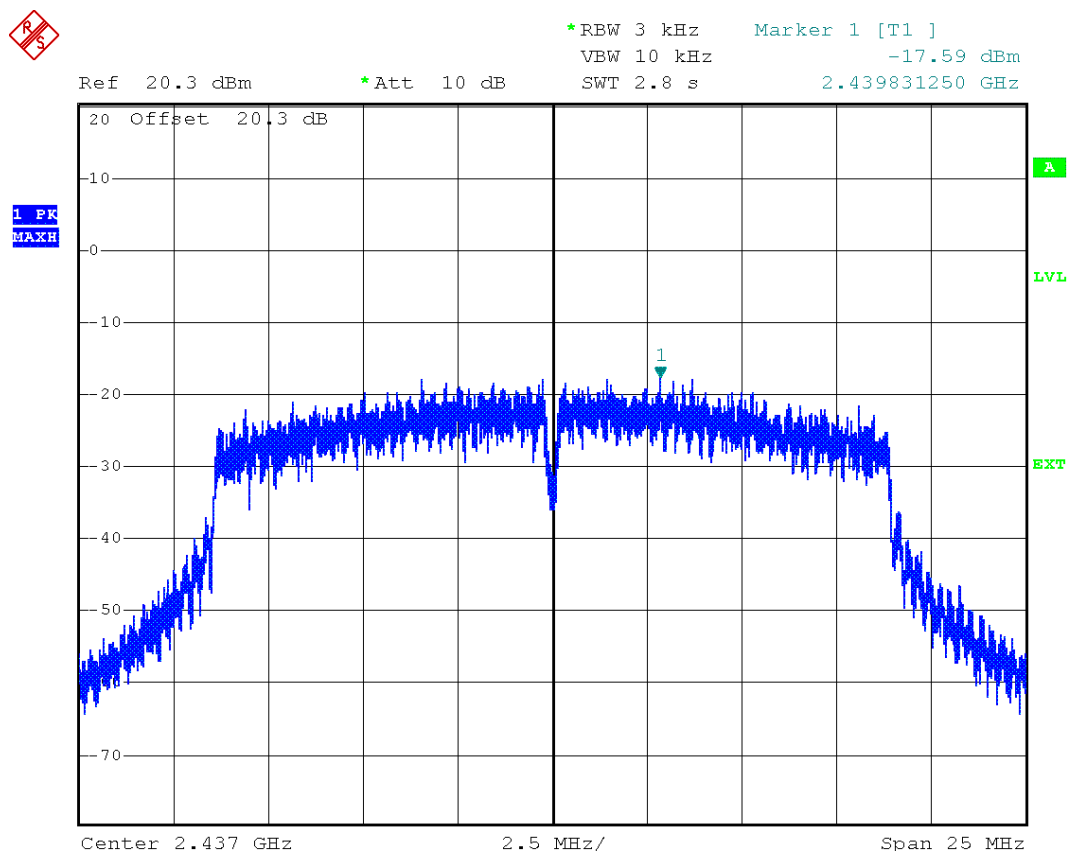
Declared maximum antenna gain: +4.70dBi



Sample N° 1 Central Channel – Mode 802.11.n - SISO

	Maximum Peak conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:	-17.59	8

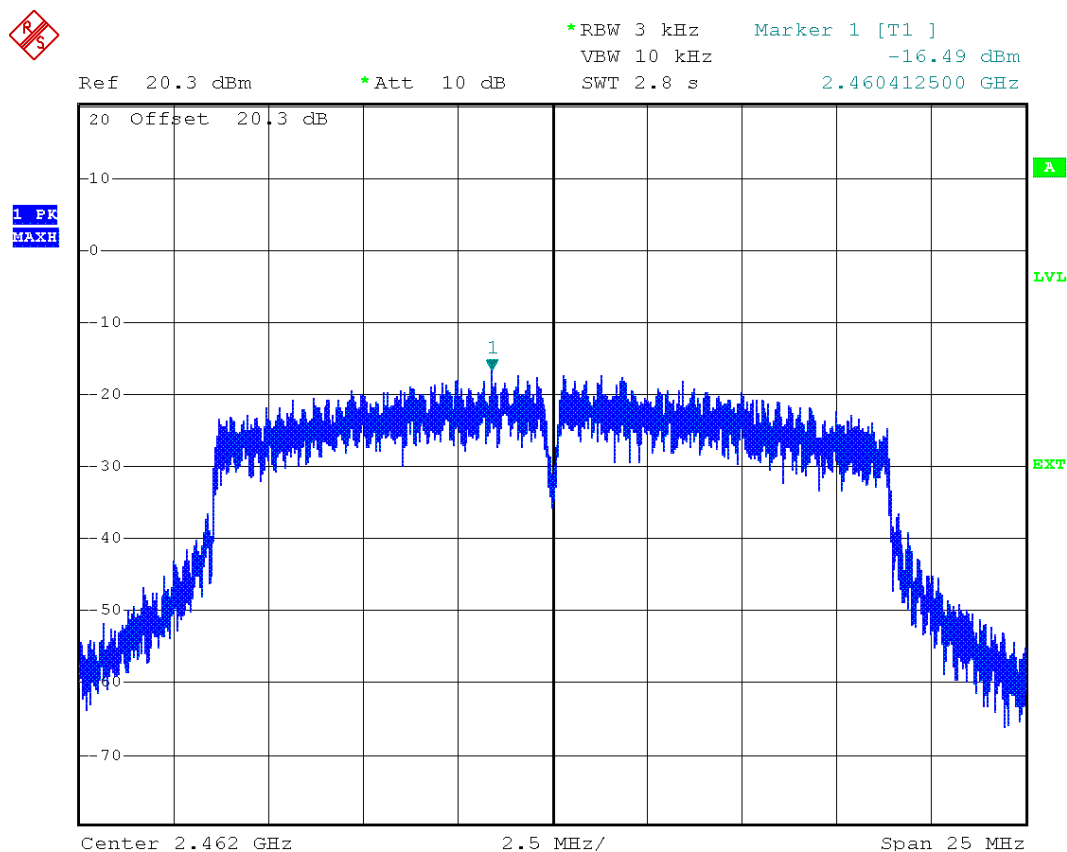
Declared maximum antenna gain: +3.75dBi



Sample N° 1 High Channel – Mode 802.11.n - SISO

	Maximum Peak conducted power density (dBm / 3 kHz)	Limit (dBm / 3 kHz)
Nominal supply voltage:	-16.49	8

Declared maximum antenna gain: +3.48dBi

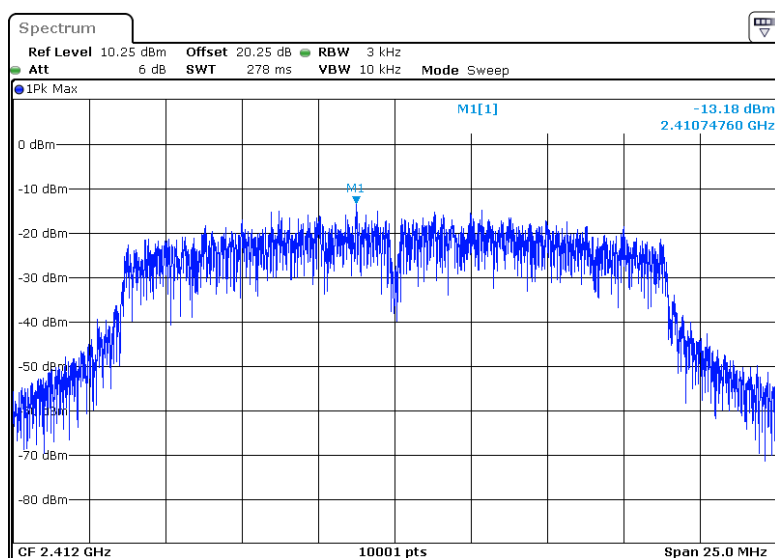
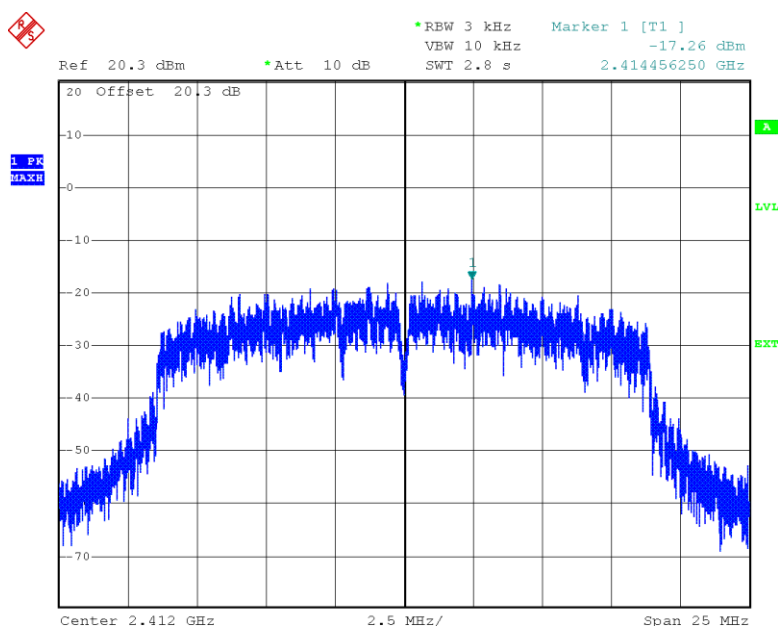


Sample N° 1 Low Channel – Mode 802.11.n - MIMO

Frequency (MHz)	Transmit chain	Maximum Peak conducted power density:	Maximum Total Peak conducted power density	Limit
		(dBm / 3 kHz)	(dBm / 3 kHz)	(dBm / 3 kHz)
2412	1	-17.26	-11.75	8
2412	2	-13.18		

Declared maximum antenna gain: Transmit chain 1 at 2412MHz => +4.70dBi

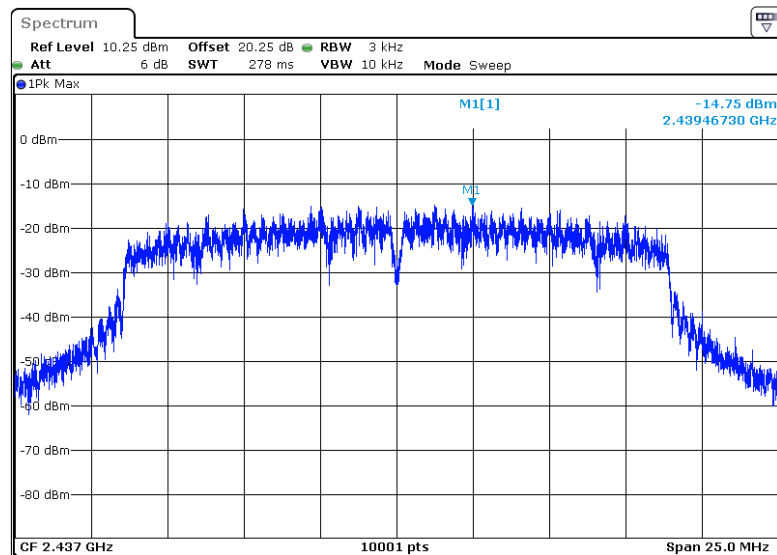
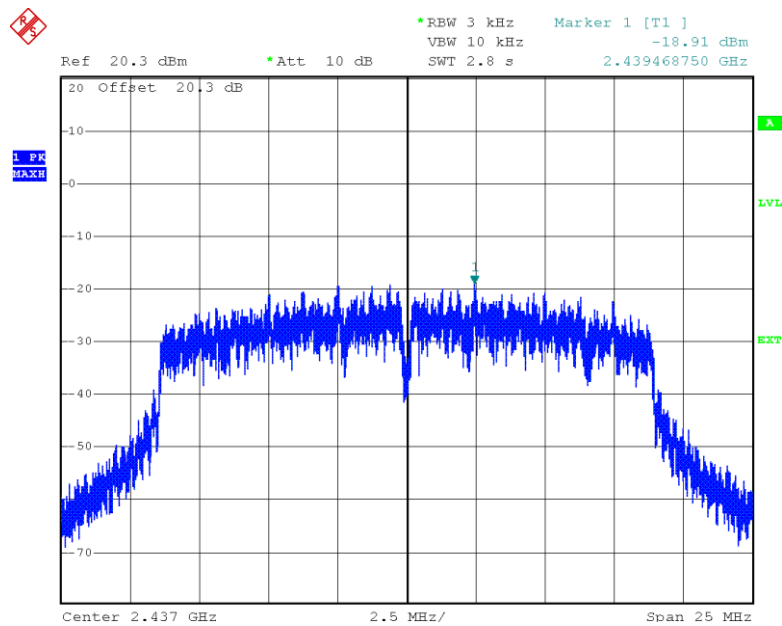
Transmit chain 2 at 2412MHz => +3.18dBi



Sample N° 1 Central Channel – Mode 802.11.n - MIMO

Frequency (MHz)	Transmit chain	Maximum Peak conducted power density:	Maximum Total Peak conducted power density	Limit
		(dBm / 3 kHz)	(dBm / 3 kHz)	(dBm / 3 kHz)
2437	1	-18.91	-13.34	8
2437	2	-14.75		

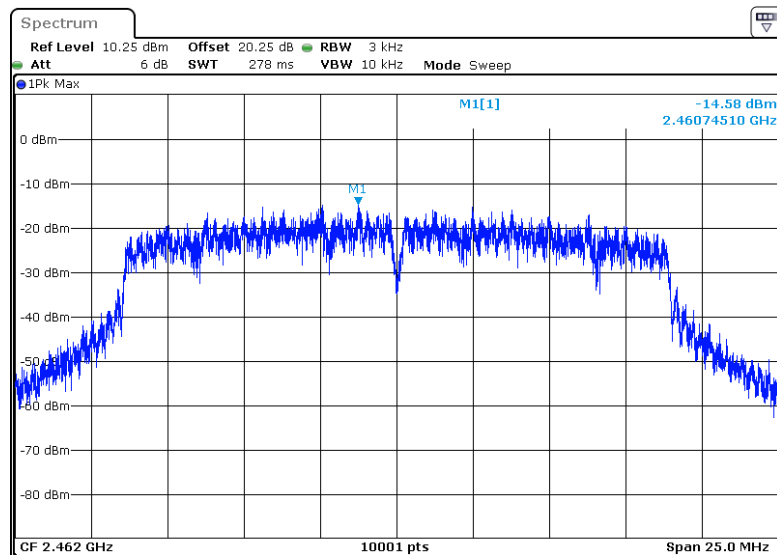
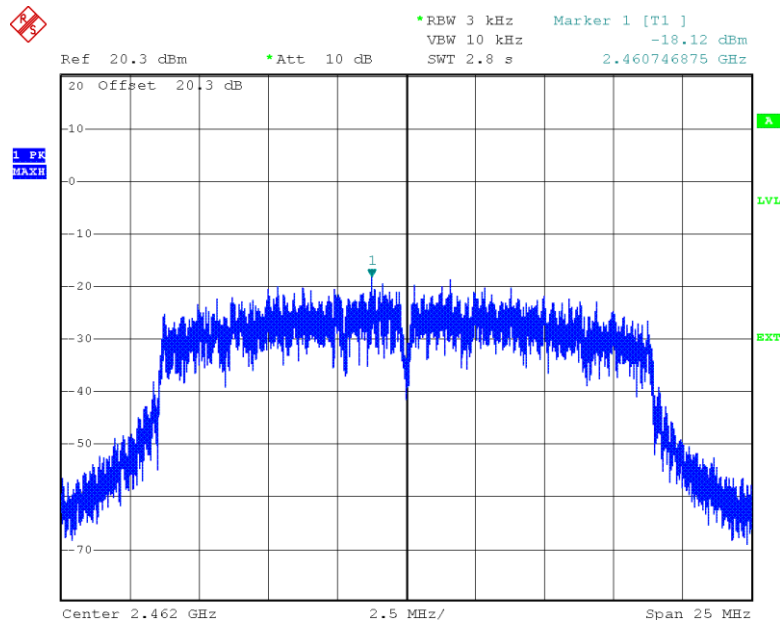
Declared maximum antenna gain: Transmit chain 1 at 2437MHz => +3.75dBi
Transmit chain 2 at 2437MHz => +3.17dBi



Sample N° 1 High Channel – Mode 802.11.n - MIMO

Frequency (MHz)	Transmit chain	Maximum Peak conducted power density:	Maximum Total Peak conducted power density	Limit
		(dBm / 3 kHz)	(dBm / 3 kHz)	(dBm / 3 kHz)
2462	1	-18.12	-12.99	8
2462	2	-14.58		

Declared maximum antenna gain: Transmit chain 1 at 2462MHz => +3.48dBi
Transmit chain 2 at 2462MHz => +2.05dBi



Test conclusion:

RESPECTED STANDARD

□□□ End of report, 1 appendix to be forwarded □□□

APPENDIX 1: Test equipment list

Occupied bandwidth

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
N-1M Cable	SUCOFLEX	14302
Attenuator 8491A-20dB	Hewlett Packard	2507
Power source E3610A	Hewlett Packard	4195
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
50 Ohms Load	-	-
Software	GPIBSHOT V2.4	-
Software	RS Commander	-

Band edge

TYPE	MANUFACTURER	EMITECH NUMBER
Full anechoic chamber	EMITECH	10759
Turntable and mat controller NCD	MATURO	10789
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Antenna 3117	ETS-Lindgren	10771
N-2M Cable	SUCOFLEX	14303
N-2.5M Cable	SUCOFLEX	14304
N-5M Cable	Huber + Suhner	12912
Power source E3610A	Hewlett Packard	4195
Multimeter 177	Fluke	14903
Meteo station 608-H1	Testo	7566
Software	BAT-EMC V3.18.0.26	0000

Peak conducted output power

TYPE	MANUFACTURER	EMITECH NUMBER
N-1M Cable	SUCOFLEX	14302
Attenuator 8491A-20dB	Hewlett Packard	2507
Power sensor NRV-Z86	Rohde & Schwarz	11592
Power source E3610A	Hewlett Packard	4195
Multimeter 177	Fluke	14903
Meteo station WS-9232	La Crosse Technology	8750
50 Ohms Load	-	-
Software	R&S Power Viewer Plus V5.9	-

Radiated spurious emissions

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Turntable and mat controller	EMITECH	8855
Full anechoic chamber	EMITECH	10759
Turntable and mat controller NCD	MATURO	10789
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna VHA 9103	Schwarzbeck	8528
Biconical antenna 3110	Emco	7240
Log periodic antenna HL223	Rohde & Schwarz	7171
Log periodic antenna HL223	Rohde & Schwarz	7190
Antenna 3117	ETS-Lindgren	10771
Antenna SAS-572	A.H Systems	7124
Low-noise amplifier ZFL-1000LN	Mini-circuit	10730
Low-noise amplifier S005180M3201	LUCIX Corp.	12590
Low-noise amplifier S180265L3201	LUCIX Corp.	8704
N-1.5M Cable	SUCOFLEX	9398
N-2M Cable	SUCOFLEX	14303
N-2.5M Cable	SUCOFLEX	14304
N-5M Cable	Huber + Suhner	12912
Cable k-20cm	STORM MICROWAE	8974
Cable k-2M	SUCOFLEX	12917
Attenuator PE7004-10	Pasternack	9266
Low pass filter LP03/1000-7GH	Filtek	4087
Reject band filter BRM50702	Microtronics	7298
High pass filter HPF180400	C&C	16109
Power source E3610A	Hewlett Packard	4195
Multimeter 177	Fluke	14903
Meteo station BAR 206	Oregon Scientific	14475
Meteo station 608-H1	Testo	7566
50 Ohms Load	-	-
Software	BAT-EMC V3.18.0.26	0000
Software	Champ libre Juigné. V3.5	8864

Peak conducted power spectral density

TYPE	MANUFACTURER	EMITECH NUMBER
N-1M Cable	SUCOFLEX	14302
Attenuator 8491A-20dB	Hewlett Packard	2507
Spectrum Analyzer FSP7	Rohde & Schwarz	6796
Spectrum Analyzer FSV40	Rohde & Schwarz	15666
Power source E3610A	Hewlett Packard	4195
Multimeter 177	Fluke	14903
Meteo station WS-9232	La Crosse Technology	8750
50 Ohms Load	-	-
Software	R&S Power Viewer Plus V5.9	-
Software	GPIBShot V2.4	-