

RR051-16-102193-2-A Ed. 0

Certification Radio test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
Parrot SKYCONTROLLER 2

FCC ID: 2AG6ISKC2

Company:
PARROT DRONES SAS

DISTRIBUTION: Mrs. ABOU EL ANOUAR

(Company: PARROT DRONES SAS)

Number of pages: 77 with 6 annexes

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DESIGNATION OF PRODUCT: Parrot SKYCONTROLLER 2

Serial number (S/N): Sample 1 = PI040409D16D000074 with PV1 EMC rework
Only radiated tests
Sample 2 = PI040409D16D000044
Only conducted tests

Reference / model (P/N): SKYCONTROLLER 2

Software version: Sample 1: 6.37.114.64 (r516176 WLTEST)
Sample 2: 6.37.114.64 (r516176 WLTEST)

MANUFACTURER: PARROT DRONES SAS

COMPANY SUBMITTING THE PRODUCT:

Company: PARROT DRONES SAS

Address: 174 QUAI DE JEMMAPES
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FRANCE

Responsible: Mrs. ABOU EL ANOUAR

DATES OF TEST: From 01-June-2016 to 15-June-2016

TESTING LOCATION: EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE
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France
FCC 2.948 Listed Site Registration Number: 90469
FCC Accredited under US-EU MRA Designation Number: FR0009
Test Firm Registration Number: 873677

TESTED BY: M. DUMESNIL

CONTENTS

TITLE	PAGE
1. INTRODUCTION	4
2. PRODUCT DESCRIPTION	4
3. NORMATIVE REFERENCE	5
4. TEST METHODOLOGY	5
5. TEST EQUIPMENT CALIBRATION DATES	6
6. TESTS AND CONCLUSIONS	7
7. MEASUREMENT UNCERTAINTY	10
8. MEASUREMENT OF THE CONDUCTED DISTURBANCES	11
9. RADIATED EMISSION LIMITS	15
10. MEASUREMENT OF THE CONDUCTED DISTURBANCES	17
11. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS	21
12. MAXIMUM PEAK OUTPUT POWER	24
13. INTENTIONAL RADIATOR	27
14. PEAK POWER DENSITY	46
APPENDIX 1: Photos of the equipment under test	49
APPENDIX 2: Test set up	50
APPENDIX 3: Test equipment list	51
APPENDIX 4: 6 dB bandwidth	54
APPENDIX 5: 99% bandwidth	63
APPENDIX 6: Band edge	72

1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: **Parrot SKYCONTROLLER 2**, in accordance with normative reference.

2. PRODUCT DESCRIPTION

Class:	B (residential)
Utilization:	Remote control for drone
Antenna type and gain:	Quad antennas (two antennas by connector on wifi module / 5,5 dBi declared) - b : 1Tx/2Rx - g : 2Tx/2Rx (alternate emissions) - n : MiMo 2
Operating frequency range:	From 2412 to 2462 MHz
Frequency tested:	2412 MHz / 2442 MHz / 2462 MHz
Number of channels:	11
Channel spacing:	5 MHz
Modulation:	802.11 b: DSSS 802.11 g and 802.11 n: OFDM
Rates:	802.11 b: 1 Mbps 802.11 g: 6 Mbps 802.11 n: 6.5 Mbps
Set of power:	Country code: US = max power Country code: US/44 = reduction of power on channel 11 only.
Power source:	Internal lithium battery 7.4Vdc or 120Vac/60Hz by AC adapter

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 (2016)	Radio Frequency Devices
ANSI C63.4	2014 Methods of measurement of Radio-Noise Emissions from low-voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10	2013 Testing Unlicensed Wireless Devices.
558074 D01 DTS v03r05	Guidance for Performing Compliance on Digital Transmission Systems Operating under §15.247

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 part 15:

Subpart A –General

- Paragraph 19: labelling requirements
- Paragraph 21: information to user

Subpart B –Unintentional Radiators

- Paragraph 105: information to the user
- Paragraph 107: Conducted limits
- Paragraph 109: Radiated emission limits
- Paragraph 111: Antenna power conduction limits for receivers

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

5. TEST EQUIPMENT CALIBRATION DATES

Emitech Number	Model	Type	Last verification	Next verification	Validity
0000	BAT-EMC V3.6.0.32	Software	/	/	/
1406	EMCO 6502	Loop antenna	27/01/2015	27/01/2017	27/03/2017
3036	ALC Microwave ALN02-0102	Low-noise amplifier	06/08/2015	06/08/2016	06/10/2016
4088	R&S FSP40	Spectrum Analyzer	29/10/2015	29/10/2017	29/12/2017
7299	Microtronics BRM50702	Reject band filter	04/11/2015	04/11/2017	04/01/2018
8508	California instruments 1251RP	Power source	12/10/2015	12/10/2016	12/12/2016
8511	HP 8447D	Low-noise amplifier	07/10/2015	07/10/2016	07/12/2016
8523	R&S FSEM30	Spectrum analyzer	20/05/2014	20/05/2016	20/07/2016
8524	HP 8591EM	Test receiver	27/04/2016	27/04/2018	27/06/2018
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/06/2015	12/06/2018	12/08/2018
8528	Schwarzbeck VHA 9103	Biconical antenna	15/03/2016	15/03/2019	15/05/2019
8535	EMCO 3115	Antenna	29/10/2012	29/10/2016	29/12/2016
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/06/2015	12/06/2018	12/08/2018
8548	Midwest Microwave 10dB	Attenuator	27/04/2016	27/04/2018	27/06/2018
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8641	SECRE ETP232	High-pass filter	13/04/2015	13/04/2017	13/06/2017
8671	HUGER	Meteo station	04/09/2014	04/09/2016	04/11/2016
8675	AOIP MN5102B	Multimeter	23/02/2015	23/02/2017	23/04/2017
8676	ISOTECH IDM106N	Multimeter	21/05/2015	21/05/2017	21/07/2017
8705	HP 10855A	Low-noise amplifier	12/04/2016	12/04/2017	12/06/2017
8719	Thurbly Thandar Instruments 1600	LISN	06/04/2016	06/04/2018	06/06/2018
8732	Emitech	OATS	18/02/2015	18/02/2018	18/04/2018
8749	La Crosse Technology WS-9232	Meteo station	03/09/2014	03/09/2016	03/11/2016
8750	La Crosse Technology WS-9232	Meteo station	03/09/2014	03/09/2016	03/11/2016
8783	EMCO 3147	Log periodic antenna	15/03/2016	15/03/2019	15/05/2019
8786	ETS Lindgren 3160-09	Antenna	16/05/2016	16/05/2019	16/07/2019
8862	MES_EMISSION V2.5	Software	/	/	/
8893	Emitech	Outside room Hors cage	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
10318	Fluke 177	Multimeter	24/08/2015	24/08/2017	24/10/2017
10651	Absorber sheath current	Emitech	21/04/2016	21/04/2018	21/06/2018
10739	LUCIX Corp S005180M3201	Low-noise amplifier	20/01/2016	20/01/2017	20/03/2017
11592	R&S NRV-Z86	Power Sensor	12/02/2016	12/02/2017	12/04/2017
/	GPIBShot V2.4	Software	/	/	/
/	R&S Power Viewer Plus V5.9	Software	/	/	/

6. TESTS AND CONCLUSIONS

6.1 general (subpart A)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.19	LABELLING REQUIREMENTS	X				See certification documents
FCC Part 15.21	INFORMATION TO USER	X				See certification documents

NAp: Not Applicable

NAs: Not Asked

LABEL SHALL CONTAIN

The label shall be located in a conspicuous location on the device

The label shall not be a stick-on, paper label. The label on these products shall be permanently affixed to the product and shall be readily visible to the purchaser at the time of purchase

§15.19: (can be placed in the user manual if the product is too small)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

USER NOTICE SHALL CONTAIN

§15.21:

Any changes or modifications to this equipment not expressly approved by PARROT DRONES SAS may cause, harmful interference and void the FCC authorization to operate this equipment

6.2 unintentional radiator (subpart B)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.105	INFORMATION TO THE USER	X				See certification documents
FCC Part 15.107	CONDUCTED LIMITS	X				Class B
FCC Part 15.109	RADIATED EMISSION LIMITS	X				Class B
FCC Part 15.111	ANTENNA POWER CONDUCTED LIMITS FOR RECEIVER			X		

NAp: Not Applicable

NAs: Not Asked

USER NOTICE SHALL CONTAIN

§ 15.105:

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference's by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

6.3 intentional radiator (subpart C)

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				Note 5

NAp: Not Applicable

NAs: Not Asked

Note 1: Integral antenna.

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 8165 kHz (see appendix 4).

Note 5: See SAR Report.

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. MEASUREMENT OF THE CONDUCTED DISTURBANCES

Standard: FCC Part 15

Test procedure: Paragraph 15.107

Limits: Class B

Software used: BAT-EMC V3.6.0.32

Test set up:

The EUT is isolated and placed on a wooden table, 0.8 m over a horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane. The equipment is powered with the AC power operating voltage of 120 V / 60 Hz.

See photos in appendix 2

Frequency range: 150 kHz - 30 MHz

Detection mode: Peak / Quasi-peak / Average

Bandwidth: 10 kHz / 9 kHz

Equipment under test operating condition:

The equipment is blocked in reception mode.

Results:

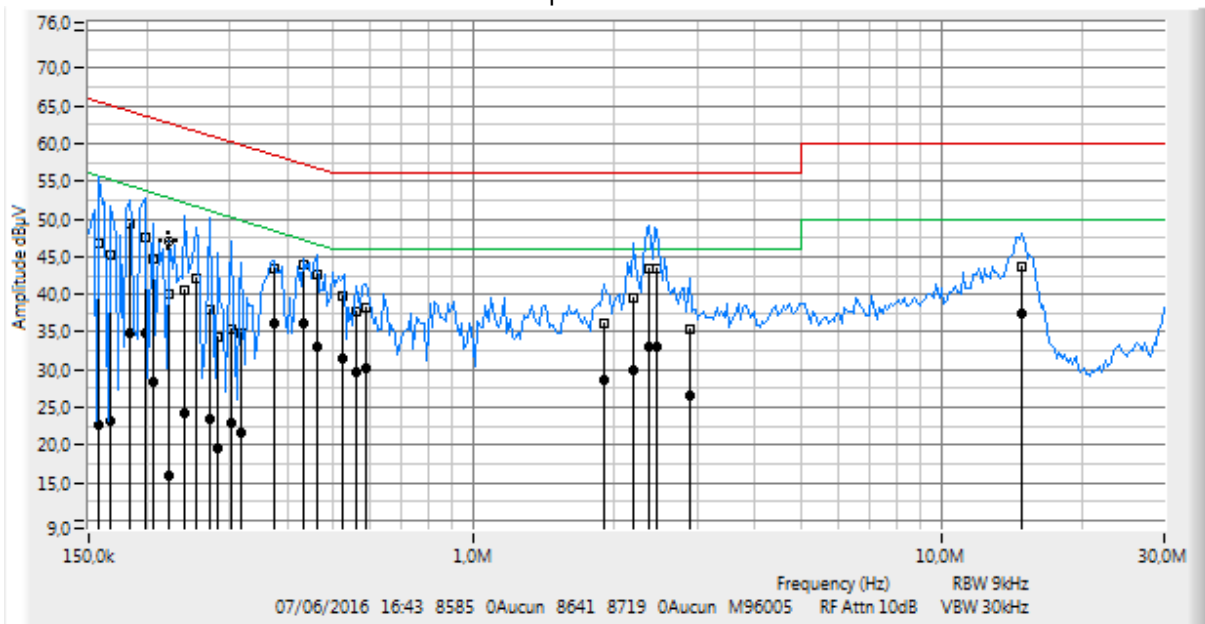
Ambient temperature (°C): 24
 Relative humidity (%): 52

Sample N° 1:

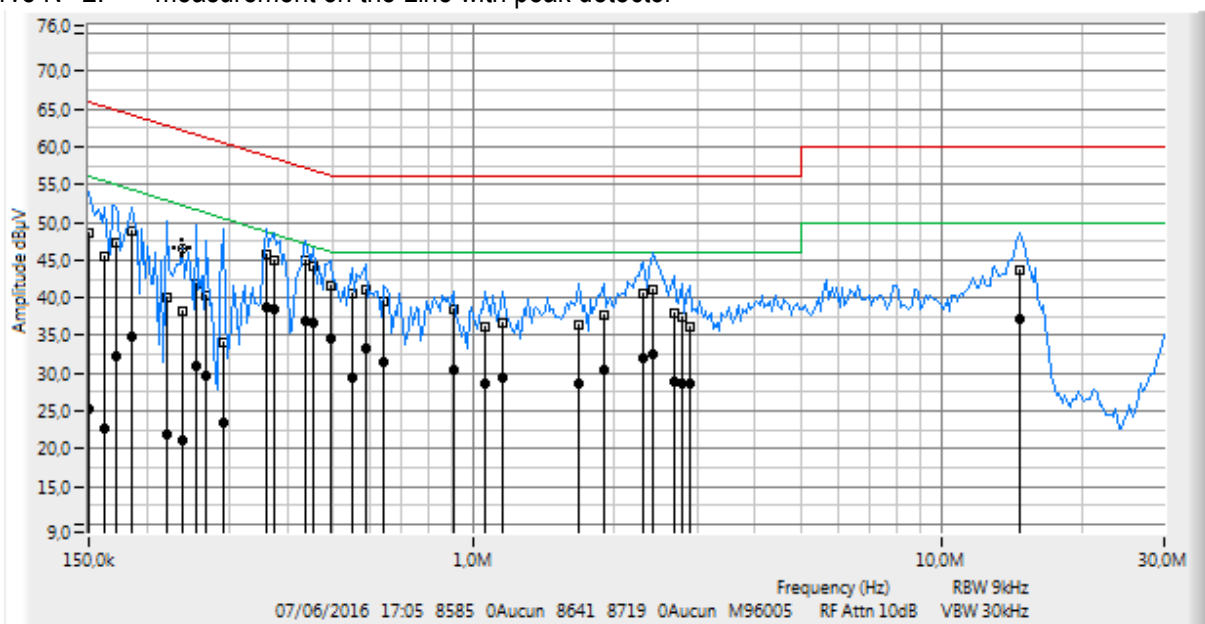
Measurement on the mains power supply:

The measurement is first realized with Peak detector.

Curve N° 1: measurement on the Neutral with peak detector



Curve N° 2: measurement on the Line with peak detector



The frequencies which are not 6 dB under the Quasi-peak limit are then analyzed with Quasi-peak detector.

The frequencies which are not 6 dB under the Average limit are then analyzed with Average detector.

Average and Quasi-Peak measurement on the Neutral, for the frequency range:

Fréquence (MHz)	Measure QP (dB μ V)	Limite QP (dB μ V)	Marge QP (dB μ V)	Measure AVG (dB μ V)	Limite AVG (dB μ V)	Marge AVG (dB μ V)
0,158	46,66	65,57	18,91	22,72	55,57	32,85
0,167	45,22	65,11	19,89	23,35	55,11	31,76
0,183	49,26	64,35	15,09	34,87	54,35	19,48
0,198	47,65	63,69	16,04	34,87	53,69	18,82
0,206	44,77	63,37	18,60	28,30	53,37	25,07
0,223	40,06	62,71	22,65	16,07	52,71	36,64
0,241	40,62	62,06	21,44	24,15	52,06	27,91
0,254	42,09	61,63	19,54	25,62	51,63	26,01
0,272	38,10	61,06	22,96	23,57	51,06	27,49
0,283	34,26	60,73	26,47	19,58	50,73	31,15
0,302	35,30	60,19	24,89	23,01	50,19	27,18
0,319	34,83	59,73	24,90	21,69	49,73	28,04
0,373	43,29	58,43	15,14	36,19	48,43	12,24
0,432	43,81	57,21	13,40	36,15	47,21	11,06
0,461	42,60	56,67	14,07	32,94	46,67	13,73
0,526	39,82	56,00	16,18	31,57	46,00	14,43
0,562	37,72	56,00	18,28	29,79	46,00	16,21
0,585	38,33	56,00	17,67	30,10	46,00	15,90
1,896	36,05	56,00	19,95	28,56	46,00	17,44
2,193	39,46	56,00	16,54	29,93	46,00	16,07
2,373	43,53	56,00	12,47	33,02	46,00	12,98
2,469	43,34	56,00	12,66	33,15	46,00	12,85
2,894	35,28	56,00	20,72	26,59	46,00	19,41
14,893	43,77	60,00	16,23	37,44	50,00	12,56

Average and Quasi-Peak measurement on the Line, for the frequency range:

Fréquence (MHz)	Measure QP (dB μ V)	Limite QP (dB μ V)	Marge QP (dB μ V)	Measure AVG (dB μ V)	Limite AVG (dB μ V)	Marge AVG (dB μ V)
0,150	48,61	66,00	17,39	25,32	56,00	30,68
0,162	45,43	65,36	19,93	22,59	55,36	32,77
0,171	47,36	64,91	17,55	32,24	54,91	22,67
0,185	48,96	64,26	15,30	34,93	54,26	19,33
0,220	39,97	62,82	22,85	21,96	52,82	30,86
0,238	38,17	62,17	24,00	21,27	52,17	30,90
0,254	41,78	61,63	19,85	31,09	51,63	20,54
0,268	40,26	61,18	20,92	29,71	51,18	21,47
0,290	34,20	60,52	26,32	23,42	50,52	27,10
0,359	45,76	58,75	12,99	38,81	48,75	9,94
0,373	45,07	58,43	13,36	38,39	48,43	10,04
0,437	45,04	57,12	12,08	37,00	47,12	10,12
0,455	44,14	56,78	12,64	36,58	46,78	10,20
0,493	41,49	56,12	14,63	34,55	46,12	11,57
0,548	40,68	56,00	15,32	29,48	46,00	16,52
0,585	41,17	56,00	14,83	33,33	46,00	12,67
0,642	39,49	56,00	16,51	31,48	46,00	14,52
0,905	38,44	56,00	17,56	30,47	46,00	15,53
1,060	36,21	56,00	19,79	28,72	46,00	17,28
1,148	36,64	56,00	19,36	29,31	46,00	16,69
1,683	36,36	56,00	19,64	28,68	46,00	17,32
1,896	37,66	56,00	18,34	30,43	46,00	15,57
2,312	40,47	56,00	15,53	31,90	46,00	14,10
2,405	41,01	56,00	14,99	32,45	46,00	13,55
2,673	38,05	56,00	17,95	29,03	46,00	16,97
2,781	37,45	56,00	18,55	28,56	46,00	17,44
2,894	36,07	56,00	19,93	28,64	46,00	17,36
14,698	43,70	60,00	16,30	37,14	50,00	12,86

Test conclusion:

RESPECTED STANDARD

9. RADIATED EMISSION LIMITS

Standard: FCC Part 15

Test procedure: paragraph 109

Limit class: Class B

Test set up:

First an exploratory radiated measurement was performed. During this phase the product is oriented in three orthogonal planes.

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.

When the system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.5m from a ground plane.

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

See photos in appendix 2.

Frequency range: From 30 MHz to 5th harmonic of the highest frequency used (2462MHz) = 12.31 GHz.

Detection mode: Quasi-peak (F < 1 GHz) Average (F > 1 GHz)

Bandwidth: 120 kHz (F < 1 GHz) 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 is blocked in reception mode.

Results:

Ambient temperature (°C): 22.5
 Relative humidity (%): 60

Sample N° 1

Power source: 120Vac/60Hz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
35.3	P	100	0	100	V	29.5	39.96	40	0.04
41.4	P	100	0	100	V	22.2	32.66	40	7.34
55.2	P	100	89	100	V	23.9	34.36	40	10.46
120.61	QP	100	161	120	V	29.8	40.26	43.5	3.24
192	P	400	0	100	V	30.4	40.86	43.5	2.64
200	P	400	38	100	V	23.1	33.56	43.5	9.94
360	P	400	0	100	V	29.1	39.56	46	6.44
420	P	284	78	100	H	25.9	36.36	46	9.64
660	P	100	195	100	H	29.7	40.16	46	5.84
2547.79	P	150	221	1000	H	41.53*	/	74	32.47
3822.10	P	150	164	1000	V	42.48*	/	74	31.52

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

*The peak level is lower than the average limit (54 dB μ V/m).

Power source: we used for power source the internal battery of the equipment fully charged.

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
195.7	P	400	0	100	V	31.5	41.96	43.5	1.54
360	P	249	96	100	H	32.3	42.76	46	3.24
660	P	100	197	100	H	29.2	39.66	46	6.34
2547.79	P	150	221	1000	H	41.53*	/	74	32.47
3822.10	P	150	164	1000	V	42.48*	/	74	31.52

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

*The peak level is lower than the average limit (54 dB μ V/m).

Test conclusion:

RESPECTED STANDARD

10. MEASUREMENT OF THE CONDUCTED DISTURBANCES

Standard: FCC Part 15

Test procedure: Paragraph 15.207

Software used: BAT-EMC V3.6.0.32

Test set up:

The EUT is isolated and placed on a wooden table, 0.8 m over a horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane. The equipment is powered with the AC power operating voltage of 120 V / 60 Hz.

See photos in appendix 2

Frequency range: 150 kHz - 30 MHz

Detection mode: Peak / Quasi-peak / Average

Bandwidth: 10 kHz / 9 kHz

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 (802.11n modulation on high channel with country code US)

Results:

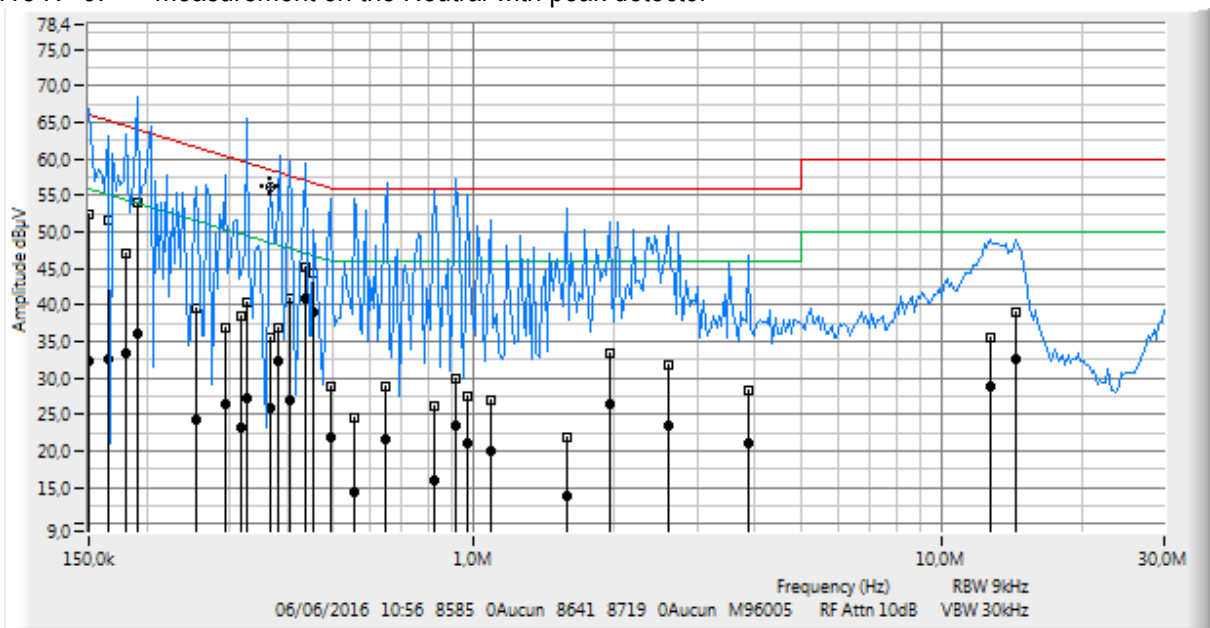
Ambient temperature (°C): 24
 Relative humidity (%): 52

Sample N° 1: 802.11 n, channel 11 with country code US

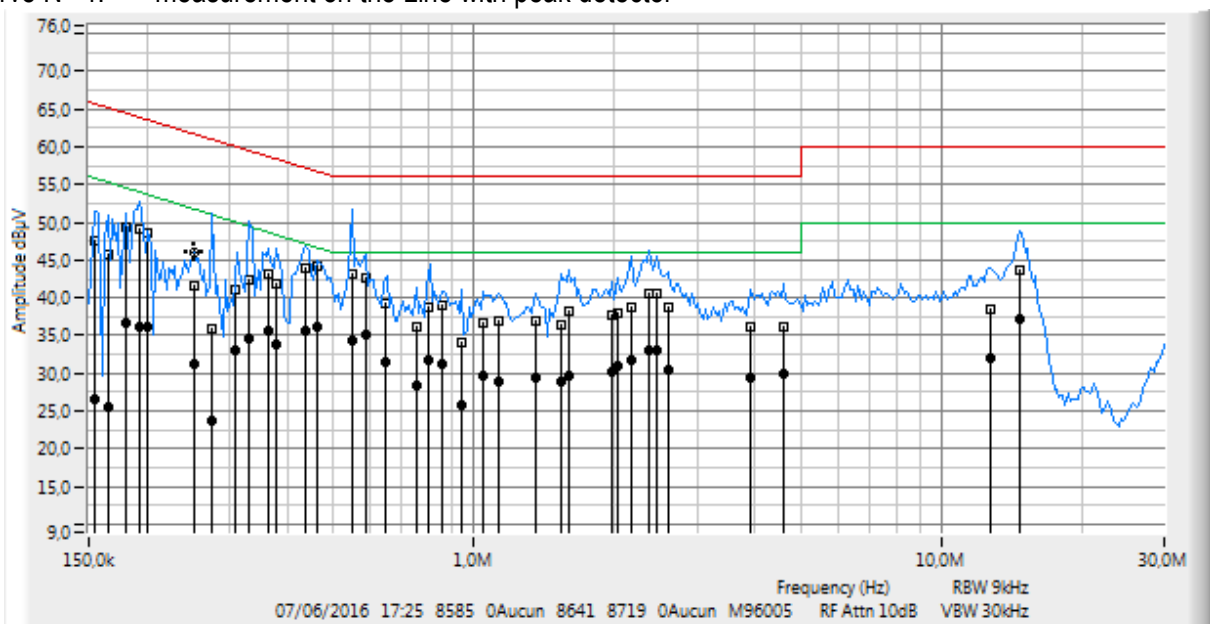
Measurement on the mains power supply:

The measurement is first realized with Peak detector.

Curve N° 3: measurement on the Neutral with peak detector



Curve N° 4: measurement on the Line with peak detector



The frequencies which are not 6 dB under the Quasi-peak limit are then analyzed with Quasi-peak detector.

The frequencies which are not 6 dB under the Average limit are then analyzed with Average detector.

Average and Quasi-Peak measurement on the Neutral, for the frequency range:

Fréquence (MHz)	Measure QP (dB μ V)	Limite QP (dB μ V)	Marge QP (dB μ V)	Measure AVG (dB μ V)	Limite AVG (dB μ V)	Marge AVG (dB μ V)
0,150	52,45	66,00	13,55	32,42	56,00	23,58
0,165	51,55	65,21	13,66	32,55	55,21	22,66
0,180	47,16	64,49	17,33	33,48	54,49	21,01
0,190	54,04	64,04	10,00	36,07	54,04	17,97
0,254	39,50	61,63	22,13	24,22	51,63	27,41
0,294	36,83	60,41	23,58	26,45	50,41	23,96
0,319	38,58	59,73	21,15	23,15	49,73	26,58
0,327	40,44	59,53	19,09	27,23	49,53	22,30
0,368	35,55	58,55	23,00	25,84	48,55	22,71
0,383	36,86	58,21	21,35	32,20	48,21	16,01
0,404	40,80	57,77	16,97	27,01	47,77	20,76
0,437	45,16	57,12	11,96	40,98	47,12	6,14
0,455	44,44	56,78	12,34	39,02	46,78	7,76
0,493	28,96	56,12	27,16	21,96	46,12	24,16
0,555	24,65	56,00	31,35	14,34	46,00	31,66
0,650	28,76	56,00	27,24	21,67	46,00	24,33
0,825	26,19	56,00	29,81	15,96	46,00	30,04
0,917	29,84	56,00	26,16	23,55	46,00	22,45
0,966	27,55	56,00	28,45	20,94	46,00	25,06
1,088	27,00	56,00	29,00	19,87	46,00	26,13
1,576	21,91	56,00	34,09	13,73	46,00	32,27
1,947	33,35	56,00	22,65	26,40	46,00	19,60
2,603	31,86	56,00	24,14	23,56	46,00	22,44
3,870	28,38	56,00	27,62	20,95	46,00	25,05
12,710	35,63	60,00	24,37	28,93	50,00	21,07
14,505	38,98	60,00	21,02	32,50	50,00	17,50

Average and Quasi-Peak measurement on the Line, for the frequency range:

Fréquence (MHz)	Measure QP (dB μ V)	Limite QP (dB μ V)	Marge QP (dB μ V)	Measure AVG (dB μ V)	Limite AVG (dB μ V)	Marge AVG (dB μ V)
0,154	47,52	65,78	18,26	26,65	55,78	29,13
0,165	45,73	65,21	19,48	25,52	55,21	29,69
0,180	49,30	64,49	15,19	36,69	54,49	17,80
0,193	48,97	63,91	14,94	36,14	53,91	17,77
0,201	48,46	63,57	15,11	36,09	53,57	17,48
0,251	41,61	61,72	20,11	31,37	51,72	20,35
0,275	35,81	60,97	25,16	23,69	50,97	27,28
0,310	41,06	59,97	18,91	33,01	49,97	16,96
0,331	42,44	59,43	16,99	34,60	49,43	14,83
0,364	43,04	58,64	15,60	35,59	48,64	13,05
0,378	41,73	58,32	16,59	33,96	48,32	14,36
0,437	43,95	57,12	13,17	35,77	47,12	11,35
0,461	44,16	56,67	12,51	36,26	46,67	10,41
0,548	43,08	56,00	12,92	34,45	46,00	11,55
0,585	42,54	56,00	13,46	35,14	46,00	10,86
0,650	39,22	56,00	16,78	31,62	46,00	14,38
0,752	36,11	56,00	19,89	28,42	46,00	17,58
0,803	38,76	56,00	17,24	31,74	46,00	14,26
0,858	39,01	56,00	16,99	31,27	46,00	14,73
0,941	34,21	56,00	21,79	25,87	46,00	20,13
1,046	36,79	56,00	19,21	29,65	46,00	16,35
1,133	36,88	56,00	19,12	28,83	46,00	17,17
1,363	36,99	56,00	19,01	29,51	46,00	16,49
1,535	36,51	56,00	19,49	28,83	46,00	17,17
1,597	38,18	56,00	17,82	29,57	46,00	16,43
1,973	37,79	56,00	18,21	30,23	46,00	15,77
2,025	38,08	56,00	17,92	31,05	46,00	14,95
2,164	38,78	56,00	17,22	31,75	46,00	14,25
2,373	40,66	56,00	15,34	33,17	46,00	12,83
2,469	40,49	56,00	15,51	32,93	46,00	13,07
2,603	38,66	56,00	17,34	30,35	46,00	15,65
3,921	36,17	56,00	19,83	29,40	46,00	16,60
4,595	36,12	56,00	19,88	29,91	46,00	16,09
12,710	38,38	60,00	21,62	31,93	50,00	18,07
14,698	43,63	60,00	16,37	37,19	50,00	12,81

Test conclusion:

RESPECTED STANDARD

11. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS

Standard: FCC Part 15

Test procedure: Paragraph 15.215

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 transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate in 802.11b, 802.11g and 802.11n modes.

Results:

Ambient temperature (°C): 23.6
 Relative humidity (%): 51

Power source: 120Vac / 60Hz

Lower Band Edge: band from 2398 MHz to 2400 MHz
 Upper Band Edge: band from 2483.5 MHz to 2485.5 MHz

Sample N° 1: 802.11 b, channel 1 with country code US and channel 11 with country code US/44

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	110.27	Peak	2399.204	-47.26	63.01	90.27	27.26
2462	108.88	Peak	2483.76	-53.53	55.35	74	18.65
2462	108.88	Average	2483.93	-59.09	49.79	54	4.21

* *Marker-Delta method*

Sample N° 1: 802.11 g, channel 1 with country code US and channel 11 with country code US/44

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2412	107.35	Peak	2399.829	-28.78	78.57	87.35	8.78
2462	113.62	Peak	2485.12	-40.98	72.64	74	1.36
2462	113.62	Average	2484.44	-61.56	52.06	54	1.94

* *Marker-Delta method*

Sample N° 1: 802.11 n, channel 1 with country code US and channel 11 with country code US/44

Fundamental frequency (MHz)	Field Strength Level of fundamental (dB μ V/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2412	107.04	Peak	2398.509	-28.64	78.40	87.04	8.64
2462	113.31	Peak	2484.10	-43.42	69.89	74	4.11
2462	113.31	Average	2483.59	-59.49	53.82	54	0.18

* *Marker-Delta method*

99% bandwidth curves are given in appendix 5; band-edge curves are given in appendix 6.

Test conclusion:

RESPECTED STANDARD

12. MAXIMUM PEAK OUTPUT POWER

Standard: FCC Part 15

Test procedure: paragraph 15.247 (b)

Test set up:

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

PKPM1 Peak power meter method of paragraph 9.1.2 of KDB 558074 is applied.

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 in 802.11b, 802.11g and 802.11n modes.

Results:

Ambient temperature (°C): 22.5
 Relative humidity (%): 53

Power source: we used for power source the internal battery of the equipment fully charged

Sample N° 2: 802.11 b, channel 1 and 7 with country code US and channel 11 with country code US/44

Frequency (MHz)	Transmit chain	Maximum conducted output power		Limit (W)
		(dBm)	(W)	
2412	1	/	/	1
2412	2	18.86	0.07691	1
2442	1	/	/	1
2442	2	18.90	0.07762	1
2472	1	/	/	1
2472	2	18.74	0.07482	1

Declared antenna gain: 5.5 dBi

Transmit chain 1: on connector J102

Transmit chain 2: on connector J103

Sample N° 2: 802.11 g, channel 1 and 7 with country code US and channel 11 with country code US/44

Frequency (MHz)	Transmit chain	Maximum conducted output power		Limit (W)
		(dBm)	(W)	
2412	1	24.31	0.26977	1
2412	2	25.43	0.34914	1
2442	1	24.30	0.26915	1
2442	2	25.60	0.36308	1
2472	1	22.47	0.17660	1
2472	2	24.09	0.25645	1

Declared antenna gain: 5.5 dBi

Transmit chain 1: on connector J102

Transmit chain 2: on connector J103

Sample N° 2: 802.11 n, channel 1 and 7 with country code US and channel 11 with country code US/44

Frequency (MHz)	Transmit chain	Conducted power (dBm)	Maximum conducted output power		Limit (W)
			(dBm)	(W)	
2412	1	24.29	27.9	0.6177	1
2412	2	25.43			
2442	1	24.25	28.0	0.6258	1
2442	2	25.56			
2472	1	22.24	26.1	0.4118	1
2472	2	23.88			

Declared antenna gain: 5.5 dBi

Transmit chain 1: on connector J102

Transmit chain 2: on connector J103

Test conclusion:

RESPECTED STANDARD

13. INTENTIONAL RADIATOR

Standard: FCC Part 15

Test procedure: paragraph 15.205, paragraph 15.209, paragraph 15.247 (d)

Test set up:

First an exploratory radiated measurement was performed. During this phase the product is oriented in three orthogonal planes.

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.

When the system is tested in anechoic chamber, the EUT is placed on a rotating table, 1.5m from a ground plane.

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

See photos in appendix 2.

Emissions in non-restricted frequency bands method of paragraph 11 of KDB 558074 and Emissions in restricted frequency bands method of paragraph 12 of KDB 558074 are apply.

Frequency range: From 9 kHz to 10th harmonic of the highest fundamental frequency (2462 MHz)
= 24.62 GHz.

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 in 802.11b, 802.11g and 802.11n modes.

Results:

Ambient temperature (°C): 23.2
 Relative humidity (%): 50

Sample N° 1: 802.11 b, channel 1 with country code US

Power source: 120Vac/60Hz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
35.3	P	100	0	100	V	29.5	39.96	90.27	50.31
41.4	P	100	0	100	V	22.2	32.66	90.27	57.61
55.2	P	100	89	100	V	23.9	34.36	90.27	55.91
120.61*	QP	100	161	120	V	29.8	40.26	43.5	3.24
192	P	400	0	100	V	30.4	40.86	90.27	49.41
200	P	400	38	100	V	23.1	33.56	90.27	56.71
360	P	400	0	100	V	29.1	39.56	90.27	50.71
420	P	284	78	100	H	25.9	36.36	90.27	53.91
660	P	100	195	100	H	29.7	40.16	90.27	50.11
4824*	P	150	/	1000	H	49.5**	/	74	24.50

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

* restricted bands of operation in 15.205

** the peak level is lower than the average limit (54 dB μ V/m at 3 m)

Power source: we used for power source the internal battery of the equipment fully charged.

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
195.7	P	400	0	100	V	31.5	41.96	90.27	48.31
360	P	249	96	100	H	32.3	42.76	90.27	47.51
660	P	100	197	100	H	29.2	39.66	90.27	50.61
4824*	P	150	/	1000	H	49.8**	/	74	24.20

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

* restricted bands of operation in 15.205

** the peak level is lower than the average limit (54 dB μ V/m at 3 m)

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 power level recorded in a 100 kHz bandwidth is 110.27 dB μ V/m.

So the applicable limit is 90.27 dB μ V/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)).

Sample N° 1: 802.11 b, channel 7 with country code US

Power source: 120Vac/60Hz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
35.3	P	100	0	100	V	29.5	39.96	89.64	49.68
41.4	P	100	0	100	V	22.2	32.66	89.64	56.98
55.2	P	100	89	100	V	23.9	34.36	89.64	55.28
120.61*	QP	100	161	120	V	29.8	40.26	43.5	3.24
192	P	400	0	100	V	30.4	40.86	89.64	48.78
200	P	400	38	100	V	23.1	33.56	89.64	56.08
360	P	400	0	100	V	29.1	39.56	89.64	50.08
420	P	284	78	100	H	25.9	36.36	89.64	53.28
660	P	100	195	100	H	29.7	40.16	89.64	49.48
4884*	P	150	61	1000	H	55.7	/	74	18.30
4884*	Av	150	61	1000	H	52.7	/	54	1.30

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

* restricted bands of operation in 15.205

Power source: we used for power source the internal battery of the equipment fully charged.

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
195.7	P	400	0	100	V	31.5	41.96	89.64	47.68
360	P	249	96	100	H	32.3	42.76	89.64	46.88
660	P	100	197	100	H	29.2	39.66	89.64	49.98
4884*	P	150	59	1000	H	55.5	/	74	18.50
4884*	Av	150	59	1000	H	52.6	/	54	1.40

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

* restricted bands of operation in 15.205

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 power level recorded in a 100 kHz bandwidth is 109.64 dB μ V/m.

So the applicable limit is 89.64 dB μ V/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)).

Sample N° 1: 802.11 b, channel 11 with country code US

Power source: 120Vac/60Hz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
35.3	P	100	0	100	V	29.5	39.96	90.23	50.27
41.4	P	100	0	100	V	22.2	32.66	90.23	57.57
55.2	P	100	89	100	V	23.9	34.36	90.23	55.87
120.61*	QP	100	161	120	V	29.8	40.26	43.5	3.24
192	P	400	0	100	V	30.4	40.86	90.23	49.37
200	P	400	38	100	V	23.1	33.56	90.23	56.67
360	P	400	0	100	V	29.1	39.56	90.23	50.67
420	P	284	78	100	H	25.9	36.36	90.23	53.87
660	P	100	195	100	H	29.7	40.16	90.23	50.07
4924*	P	150	62	1000	H	56.3	/	74	17.70
4924*	Av	150	62	1000	H	53.6	/	54	0.40

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

* restricted bands of operation in 15.205

Power source: we used for power source the internal battery of the equipment fully charged.

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
195.7	P	400	0	100	V	31.5	41.96	90.23	48.27
360	P	249	96	100	H	32.3	42.76	90.23	47.47
660	P	100	197	100	H	29.2	39.66	90.23	50.57
4924*	P	150	28	1000	H	56.1	/	74	17.90
4924*	Av	150	28	1000	H	53.4	/	54	0.60

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

* restricted bands of operation in 15.205

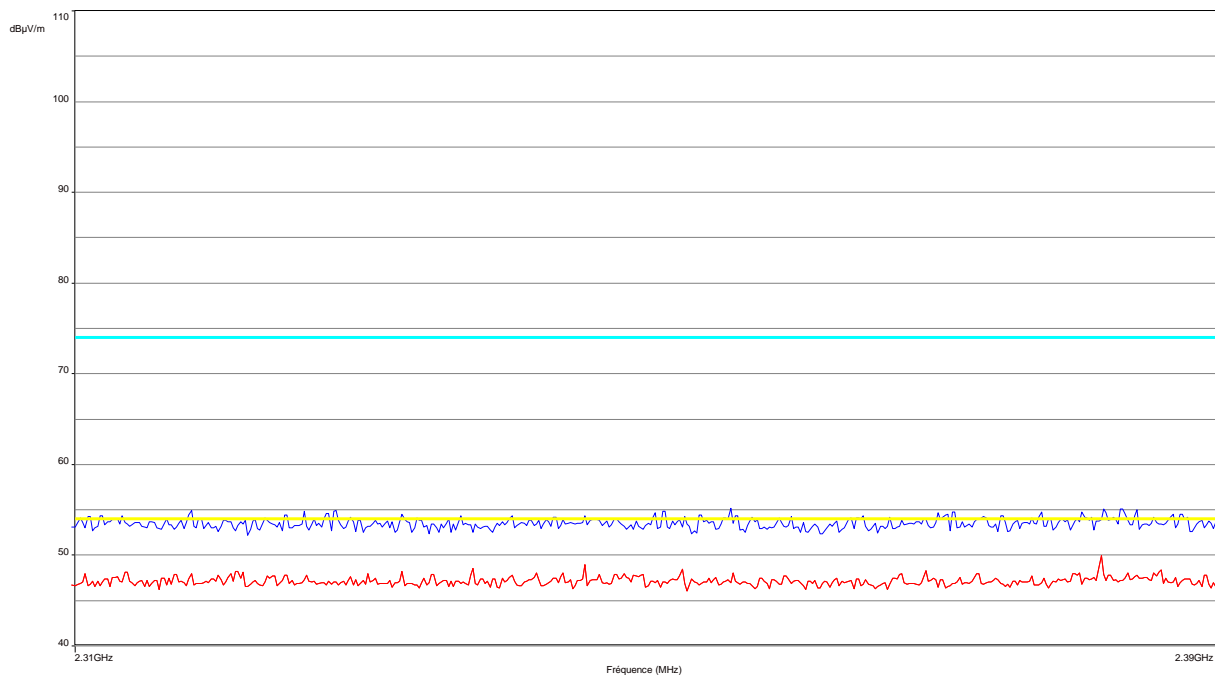
Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band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

The power level recorded in a 100 kHz bandwidth is 110.23 dB μ V/m.

So the applicable limit is 90.23 dB μ V/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)).

Band edge worst case measurement (band 2.31GHz to 2.39GHz)



Blue curve : Peak measure
 Red curve: Average measure

Sample N° 1: 802.11 g, channel 1 with country code US

Power source: 120Vac/60Hz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
35.3	P	100	0	100	V	29.5	39.96	87.35	47.39
41.4	P	100	0	100	V	22.2	32.66	87.35	54.69
55.2	P	100	89	100	V	23.9	34.36	87.35	52.99
120.61*	QP	100	161	120	V	29.8	40.26	43.5	3.24
192	P	400	0	100	V	30.4	40.86	87.35	46.49
200	P	400	38	100	V	23.1	33.56	87.35	53.79
360	P	400	0	100	V	29.1	39.56	87.35	47.79
420	P	284	78	100	H	25.9	36.36	87.35	50.99
660	P	100	195	100	H	29.7	40.16	87.35	47.19
4824*	P	150	300	1000	H	60.8	/	74	13.20
4824*	Av	150	300	1000	H	44.7	/	54	9.30
7236	P	150	0	100	V	47	/	87.35	40.35

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

* restricted bands of operation in 15.205

Power source: we used for power source the internal battery of the equipment fully charged.

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
195.7	P	400	0	100	V	31.5	41.96	87.35	45.39
360	P	249	96	100	H	32.3	42.76	87.35	44.59
660	P	100	197	100	H	29.2	39.66	87.35	47.69
4824*	P	150	297	1000	H	60.5	/	74	13.50
4824*	Av	150	297	1000	H	44.4	/	54	9.60
7236	P	150	0	100	V	46.5	/	87.35	40.85

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

* restricted bands of operation in 15.205

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 power level recorded in a 100 kHz bandwidth is 107.35 dB μ V/m.

So the applicable limit is 87.35 dB μ V/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)).

Sample N° 1: 802.11 g, channel 7 with country code US

Power source: 120Vac/60Hz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
35.3	P	100	0	100	V	29.5	39.96	87.41	47.45
41.4	P	100	0	100	V	22.2	32.66	87.41	54.75
55.2	P	100	89	100	V	23.9	34.36	87.41	53.05
120.61*	QP	100	161	120	V	29.8	40.26	43.5	3.24
192	P	400	0	100	V	30.4	40.86	87.41	46.55
200	P	400	38	100	V	23.1	33.56	87.41	53.85
360	P	400	0	100	V	29.1	39.56	87.41	47.85
420	P	284	78	100	H	25.9	36.36	87.41	51.05
660	P	100	195	100	H	29.7	40.16	87.41	47.25
4884*	P	150	300	1000	H	63.7	/	74	10.30
4884*	Av	150	300	1000	H	48.4	/	54	5.60
7326*	P	150	0	1000	V	56.7	/	74	17.30
7326*	Av	150	0	1000	V	45	/	54	9.00

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

* restricted bands of operation in 15.205

Power source: we used for power source the internal battery of the equipment fully charged.

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
195.7	P	400	0	100	V	31.5	41.96	87.41	45.45
360	P	249	96	100	H	32.3	42.76	87.41	44.65
660	P	100	197	100	H	29.2	39.66	87.41	47.75
4884*	P	150	302	1000	H	63.6	/	74	10.40
4884*	Av	150	302	1000	H	48.2	/	54	5.80
7326*	P	150	0	1000	V	57.2	/	74	16.80
7326*	Av	150	0	1000	V	45	/	54	9.00

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

* restricted bands of operation in 15.205

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 power level recorded in a 100 kHz bandwidth is 107.41 dB μ V/m.

So the applicable limit is 87.41 dB μ V/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)).

Sample N° 1: 802.11 g, channel 11 with country code US

Power source: 120Vac/60Hz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
35.3	P	100	0	100	V	29.5	39.96	87.30	47.34
41.4	P	100	0	100	V	22.2	32.66	87.30	54.64
55.2	P	100	89	100	V	23.9	34.36	87.30	52.94
120.61*	QP	100	161	120	V	29.8	40.26	43.5	3.24
192	P	400	0	100	V	30.4	40.86	87.30	46.44
200	P	400	38	100	V	23.1	33.56	87.30	53.74
360	P	400	0	100	V	29.1	39.56	87.30	47.74
420	P	284	78	100	H	25.9	36.36	87.30	50.94
660	P	100	195	100	H	29.7	40.16	87.30	47.14
4924*	P	150	301	1000	H	64.5	/	74	9.50
4924*	Av	150	301	1000	H	49.3	/	54	4.70
7386*	P	150	0	1000	V	56.9	/	74	17.10
7386*	Av	150	0	1000	V	44.4	/	54	9.60

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

* restricted bands of operation in 15.205

Power source: we used for power source the internal battery of the equipment fully charged.

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
195.7	P	400	0	100	V	31.5	41.96	87.30	45.34
360	P	249	96	100	H	32.3	42.76	87.30	44.54
660	P	100	197	100	H	29.2	39.66	87.30	47.64
4924*	P	150	298	1000	H	64.6	/	74	9.40
4924*	Av	150	298	1000	H	49.6	/	54	4.40
7386*	P	150	/	1000	V	53.7**	/	74	20.30

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

* restricted bands of operation in 15.205

** the peak level is lower than the average limit (54 dB μ V/m at 3 m)

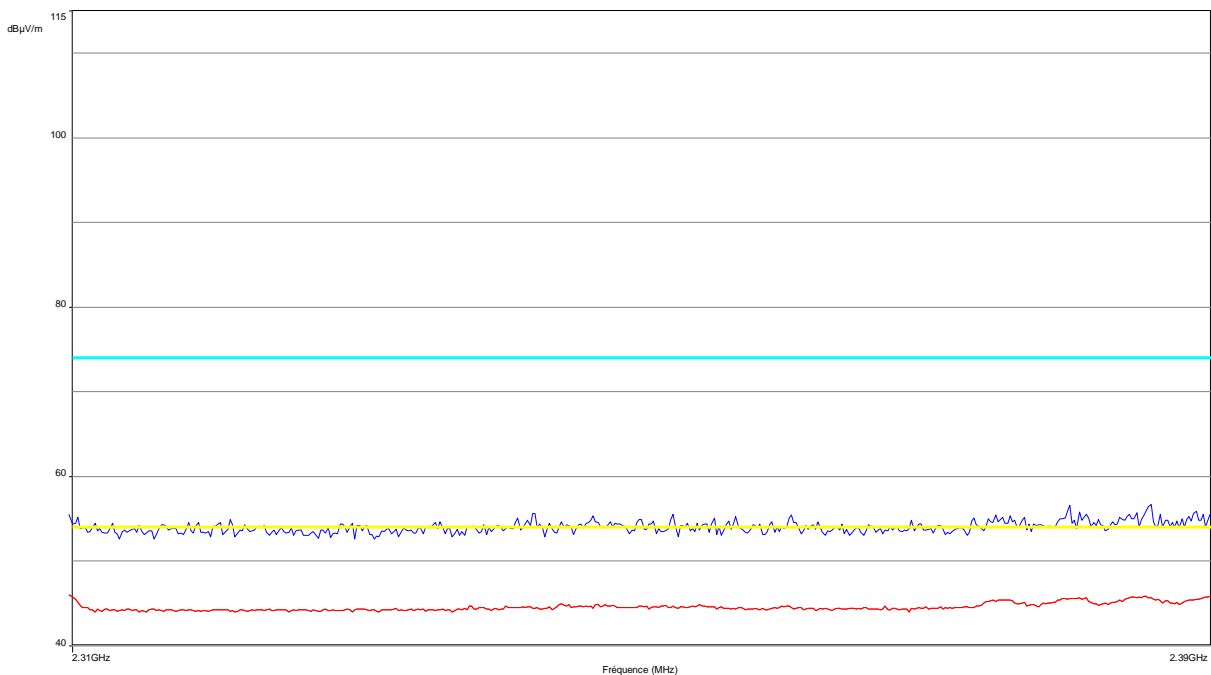
Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band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

The power level recorded in a 100 kHz bandwidth is 107.30 dB μ V/m.

So the applicable limit is 87.30 dB μ V/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)).

Band edge worst case measurement (band 2.31GHz to 2.39GHz)



Blue curve : Peak measure
 Red curve: Average measure

Sample N° 1: 802.11 n, channel 1 with country code US

Power source: 120Vac/60Hz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
35.3	P	100	0	100	V	29.5	39.96	87.04	47.08
41.4	P	100	0	100	V	22.2	32.66	87.04	54.38
55.2	P	100	89	100	V	23.9	34.36	87.04	52.68
120.61*	QP	100	161	120	V	29.8	40.26	43.5	3.24
192	P	400	0	100	V	30.4	40.86	87.04	46.18
200	P	400	38	100	V	23.1	33.56	87.04	53.48
360	P	400	0	100	V	29.1	39.56	87.04	47.48
420	P	284	78	100	H	25.9	36.36	87.04	50.68
660	P	100	195	100	H	29.7	40.16	87.04	46.88
4824*	P	150	60	1000	H	61.1	/	74	12.90
4824*	Av	150	60	1000	H	44	/	54	10.00
7236	P	150	0	100	V	46.9	/	87.04	40.14

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

* restricted bands of operation in 15.205

Power source: we used for power source the internal battery of the equipment fully charged.

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
195.7	P	400	0	100	V	31.5	41.96	87.04	45.08
360	P	249	96	100	H	32.3	42.76	87.04	44.28
660	P	100	197	100	H	29.2	39.66	87.04	47.38
4824*	P	150	62	1000	H	60.2	/	74	13.80
4824*	Av	150	62	1000	H	44.4	/	54	9.60
7236	P	150	0	100	V	47.4	/	87.04	39.64

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

* restricted bands of operation in 15.205

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 power level recorded in a 100 kHz bandwidth is 107.04 dB μ V/m.

So the applicable limit is 87.04 dB μ V/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)).

Sample N° 1: 802.11 n, channel 7 with country code US

Power source: 120Vac/60Hz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
35.3	P	100	0	100	V	29.5	39.96	87.23	47.27
41.4	P	100	0	100	V	22.2	32.66	87.23	54.57
55.2	P	100	89	100	V	23.9	34.36	87.23	52.87
120.61*	QP	100	161	120	V	29.8	40.26	43.5	3.24
192	P	400	0	100	V	30.4	40.86	87.23	46.37
200	P	400	38	100	V	23.1	33.56	87.23	53.67
360	P	400	0	100	V	29.1	39.56	87.23	47.67
420	P	284	78	100	H	25.9	36.36	87.23	50.87
660	P	100	195	100	H	29.7	40.16	87.23	47.07
4884*	P	150	66	1000	H	63.1	/	74	10.90
4884*	Av	150	66	1000	H	47.6	/	54	6.40
7326*	P	150	0	1000	V	55.6	/	74	18.40
7326*	Av	150	0	1000	V	43.1	/	54	10.90

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

* restricted bands of operation in 15.205

Power source: we used for power source the internal battery of the equipment fully charged.

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
195.7	P	400	0	100	V	31.5	41.96	87.23	45.27
360	P	249	96	100	H	32.3	42.76	87.23	44.47
660	P	100	197	100	H	29.2	39.66	87.23	47.57
4884*	P	150	66	1000	H	63	/	74	11
4884*	Av	150	66	1000	H	47.4	/	54	6.60
7326*	P	150	0	1000	V	56.40	/	74	17.60
7326*	Av	150	0	1000	V	43.5	/	54	10.50

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

* restricted bands of operation in 15.205

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 power level recorded in a 100 kHz bandwidth is 107.23 dB μ V/m.

So the applicable limit is 87.23 dB μ V/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)).

Sample N° 1: 802.11 n, channel 11 with country code US

Power source: 120Vac/60Hz

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
35.3	P	100	0	100	V	29.5	39.96	87.09	47.13
41.4	P	100	0	100	V	22.2	32.66	87.09	54.43
55.2	P	100	89	100	V	23.9	34.36	87.09	52.73
120.61*	QP	100	161	120	V	29.8	40.26	43.5	3.24
192	P	400	0	100	V	30.4	40.86	87.09	46.23
200	P	400	38	100	V	23.1	33.56	87.09	53.53
360	P	400	0	100	V	29.1	39.56	87.09	47.53
420	P	284	78	100	H	25.9	36.36	87.09	50.73
660	P	100	195	100	H	29.7	40.16	87.09	46.93
4924*	P	150	297	1000	H	64.3	/	74	9.70
4924*	Av	150	297	1000	H	48.6	/	54	5.40
7386*	P	150	/	1000	V	53.6**	/	74	20.40

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

* restricted bands of operation in 15.205

** the peak level is lower than the average limit (54 dB μ V/m at 3 m)

Power source: we used for power source the internal battery of the equipment fully charged.

Frequencies (MHz)	Detector P QP Av	Antenna height (cm)	Azimuth (degree)	RBW (kHz)	Polarization H: Horizontal V: Vertical	Field strength Measured at 3/10 m (dB μ V/m)	Field strength Computed at 3 m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
195.7	P	400	0	100	V	31.5	41.96	87.09	45.13
360	P	249	96	100	H	32.3	42.76	87.09	44.33
660	P	100	197	100	H	29.2	39.66	87.09	47.43
4924*	P	150	63	1000	H	63.8	/	74	10.20
4924*	Av	150	63	1000	H	48.6	/	54	5.40
7386*	P	150	/	1000	V	51.8**	/	74	22.20

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

* restricted bands of operation in 15.205

** the peak level is lower than the average limit (54 dB μ V/m at 3 m)

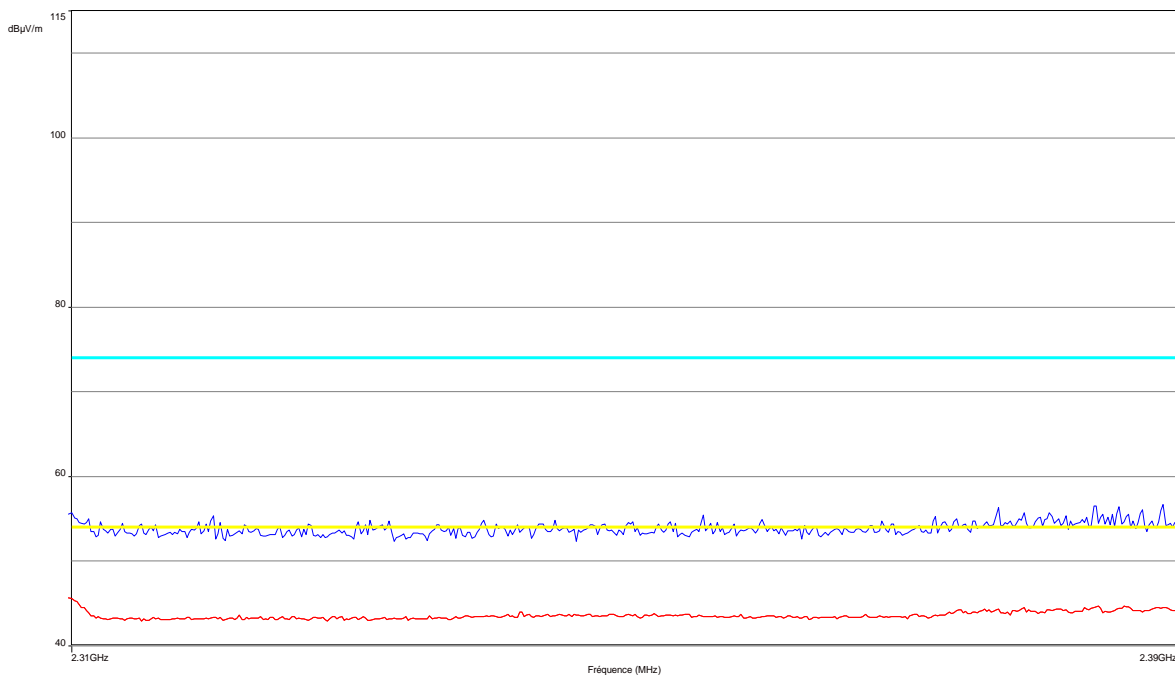
Applicable limits: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band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

The power level recorded in a 100 kHz bandwidth is 107.09 dB μ V/m.

So the applicable limit is 87.09 dB μ V/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)).

Band edge worst case measurement (band 2.31GHz to 2.39GHz)



Blue curve : Peak measure
 Red curve: Average measure

Test conclusion:

RESPECTED STANDARD

14. PEAK POWER DENSITY

Standard: FCC Part 15

Test procedure: paragraph 15.247 (e)

Test set up:

The measure is realized in conducted mode with a calibrated spectrum analyzer.

PKPSD (Peak PSD) method of paragraph 10.2 of KDB 558074 is applied.

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 in 802.11b, 802.11g and 802.11n modes.

Results:

Ambient temperature (°C): 27.5
 Relative humidity (%): 46

Power source: we used for power source the internal battery of the equipment fully charged

Sample N° 2: 802.11 b, channel 1, 7 and 11 with country code US

Frequency (MHz)	Transmit chain	Maximum conducted output power density (dBm)	Limit (dBm)
2412	1	/	8
2412	2	-8.24	8
2442	1	/	8
2442	2	-8.31	8
2472	1	/	8
2472	2	-8.74	8

Declared antenna gain: 5.5 dBi

Transmit chain 1: on connector J102

Transmit chain 2: on connector J103

Sample N° 2: 802.11 g, channel 1, 7 and 11 with country code US

Frequency (MHz)	Transmit chain	Maximum conducted output power density (dBm)	Limit (dBm)
2412	1	-7.18	8
2412	2	-6.58	8
2442	1	-7.98	8
2442	2	-7.89	8
2472	1	-7.78	8
2472	2	-8.18	8

Declared antenna gain: 5.5 dBi

Transmit chain 1: on connector J102

Transmit chain 2: on connector J103

Sample N° 2: 802.11 n, channel 1, 7 and 11 with country code US

Frequency (MHz)	Transmit chain	Conducted power density (dBm)	Maximum conducted output power density (dBm)	Limit (dBm)
2412	1	-8.14	-4.5	8
2412	2	-7.01		
2442	1	-8.48	-5.1	8
2442	2	-7.80		
2472	1	-8.72	-4.2	8
2472	2	-6.03		

Declared antenna gain: 5.5 dBi

Transmit chain 1: on connector J102

Transmit chain 2: on connector J103

Test conclusion:

RESPECTED STANDARD

□□□ End of report, 6 appendixes to be forwarded □□□

APPENDIX 1: PHOTOS OF THE EQUIPMENT UNDER TEST

CONFIDENTIAL

APPENDIX 2: TEST SET UP

CONFIDENTIAL

APPENDIX 3: TEST EQUIPMENT LIST

Measurement of the conducted disturbances

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	8893
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver HP 8591EM	Hewlett Packard	8524
LISN 1600	Thurbly Thandar Instruments	8719
High-pass filter ETP232	SECRE	8641
Absorber sheath current	Emitech	10651
Power source 1251RP	California instruments	8508
Multimeter 177	Fluke	10318
Meteo station	HUGER	8671
Software MES_EMISSION	V2.5	8862

Radiated emission limits

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSEM30	Rohde & Schwarz	8523
Test receiver HP 8591EM	Hewlett Packard	8524
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Biconical antenna VHBB 9124	Schwarzbeck	8526
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Log periodic antenna 3147	EMCO	8783
Antenna 3115	EMCO	8535
Low-noise amplifier 10855A	Hewlett Packard	8705
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier S005180M3201	LUCIX Corp.	10739
Power source 1251RP	California instruments	8508
Multimeter MN5102B	AOIP	8675
Multimeter 177	Fluke	10318
Meteo station WS-9232	La Crosse Technology	8749
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

Additional provisions to the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Antenna 3115	EMCO	8535
Power source 1251RP	California instruments	8508
Multimeter MN5102B	AOIP	8675
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-

Maximum peak output power

TYPE	MANUFACTURER	EMITECH NUMBER
Power sensor NRV-Z86	Rohde & Schwarz	11592
Attenuator 10dB	Midwest Microwave	8548
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750
Software	R&S Power Viewer Plus V5.9	-

Intentional radiator

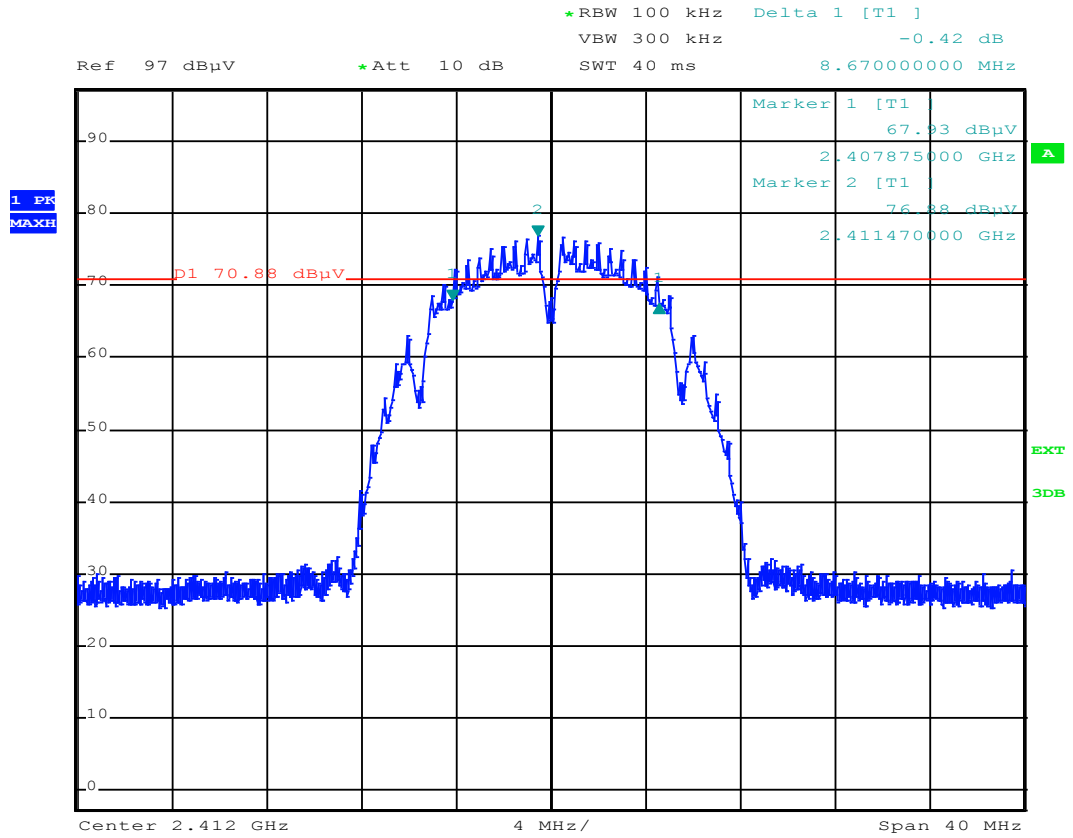
TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSEM30	Rohde & Schwarz	8523
Test receiver HP 8591EM	Hewlett Packard	8524
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna VHBB 9124	Schwarzbeck	8526
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Log periodic antenna 3147	EMCO	8783
Antenna 3115	EMCO	8535
Antenna 3160-09	ETS Lindgren	8786
Low-noise amplifier 10855A	Hewlett Packard	8705
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier S005180M3201	LUCIX Corp.	10739
Low-noise amplifier ALN02-0102	ALC Microwave	3036
Reject band filter BRM50702	Microtronics	7299
Power source 1251RP	California instruments	8508
Multimeter MN5102B	AOIP	8675
Multimeter 177	Fluke	10318
Meteo station WS-9232	La Crosse Technology	8749
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

Peak power density

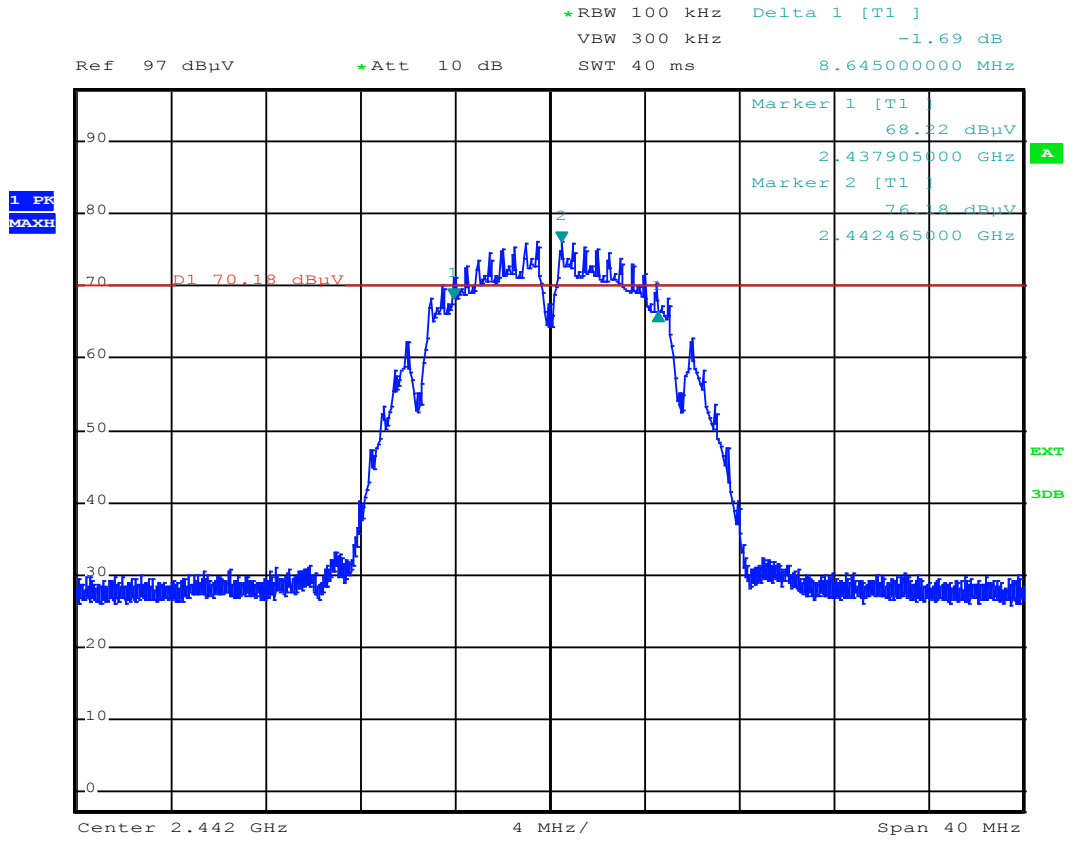
TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Attenuator 10dB	Midwest Microwave	8548
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBSHOT V2.4	-

APPENDIX 4: 6 DB BANDWIDTH

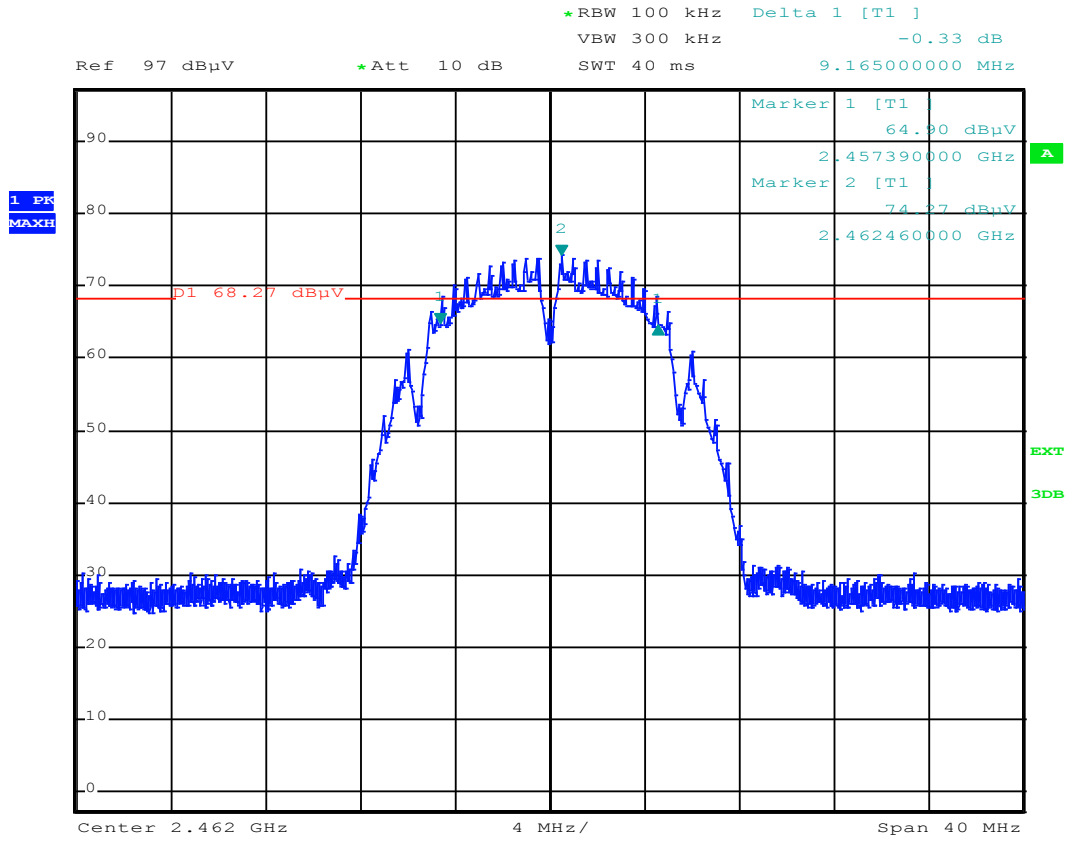
802.11 b, channel 1



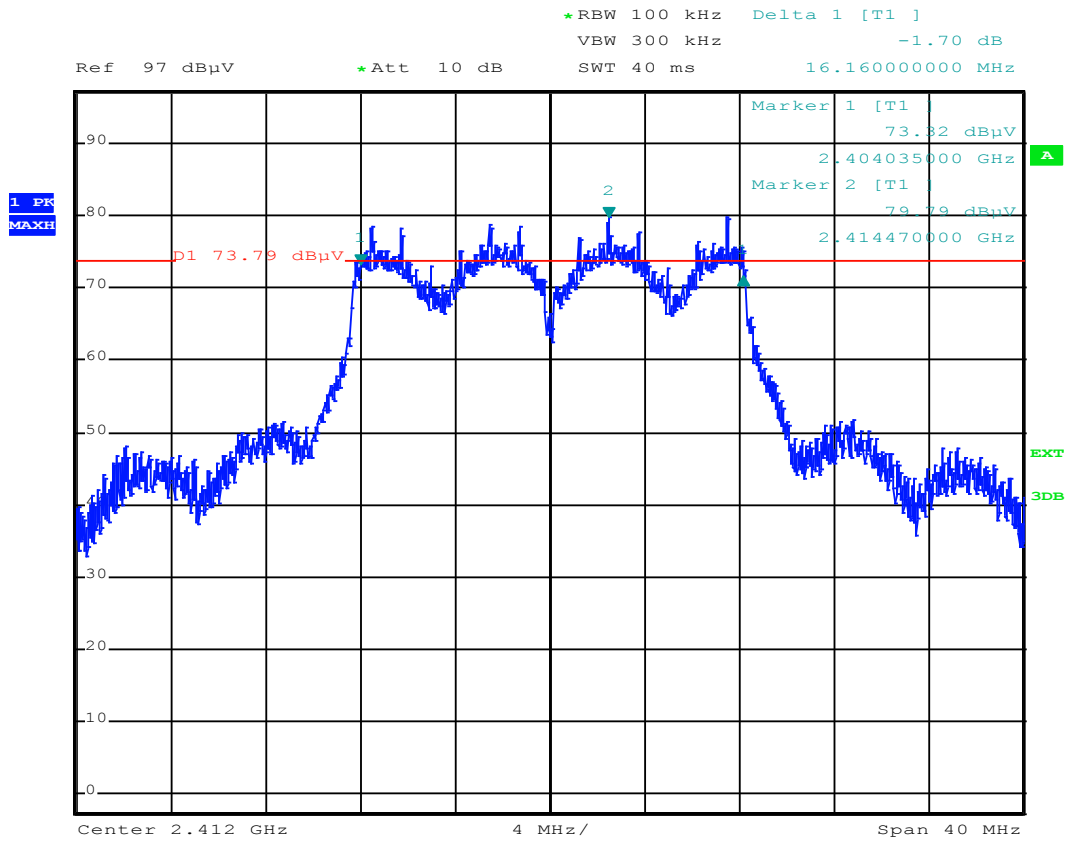
802.11 b, channel 7



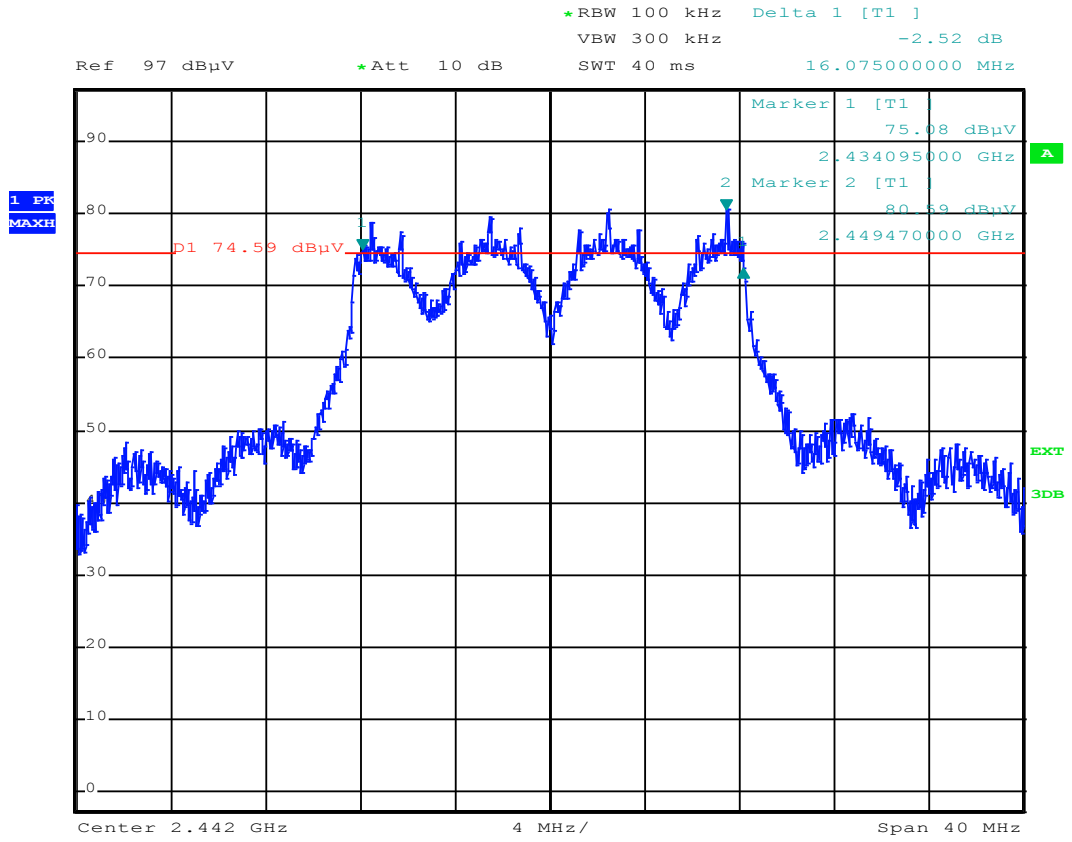
802.11 b, channel 11



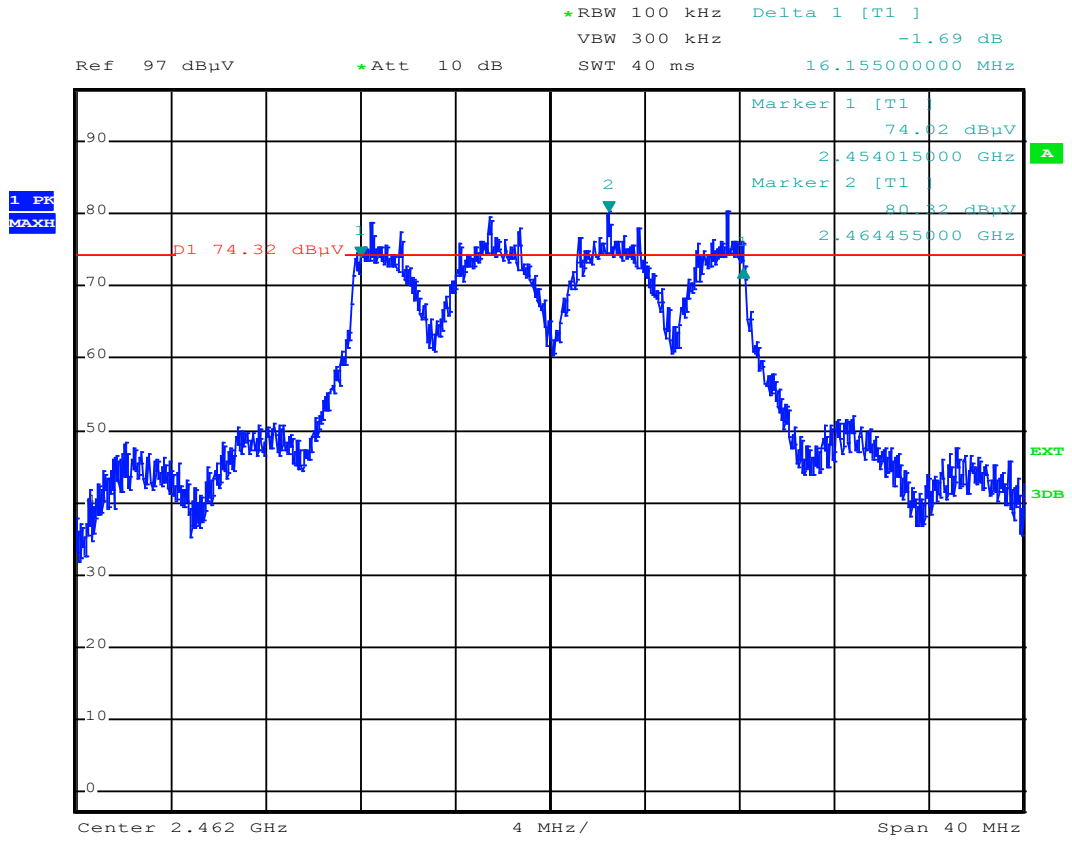
802.11 g, channel 1



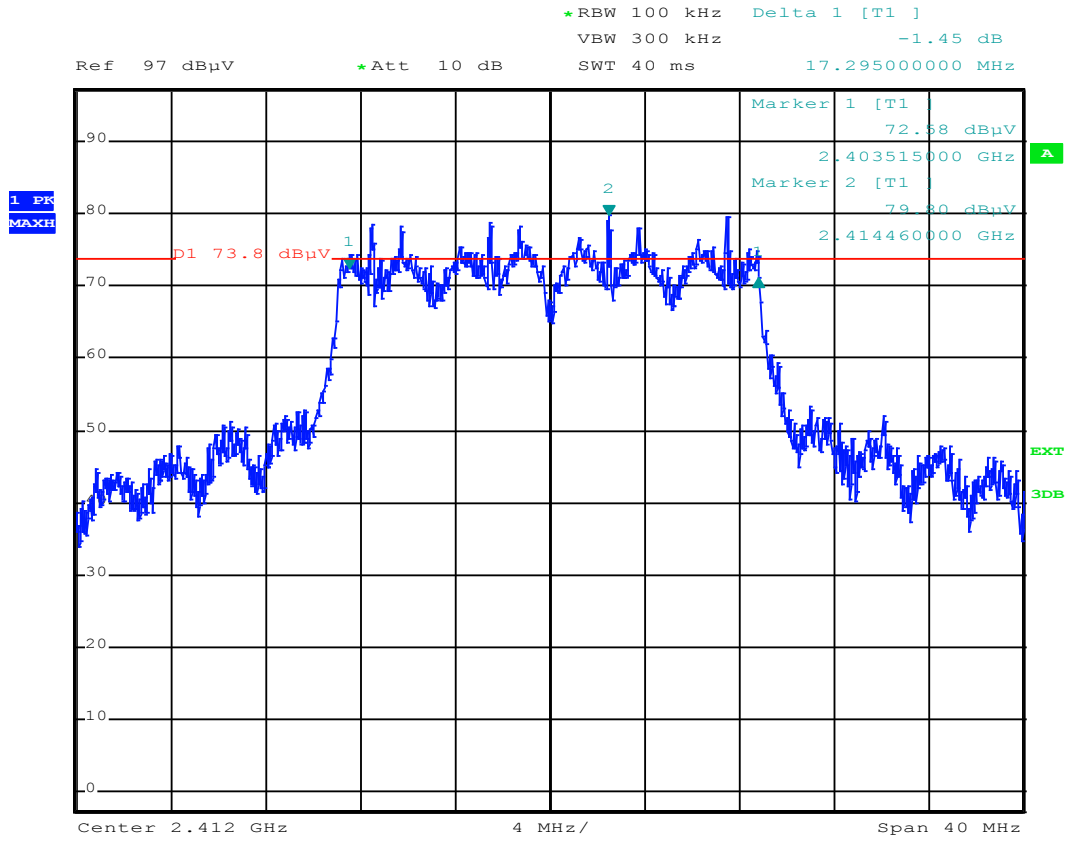
802.11 g, channel 7



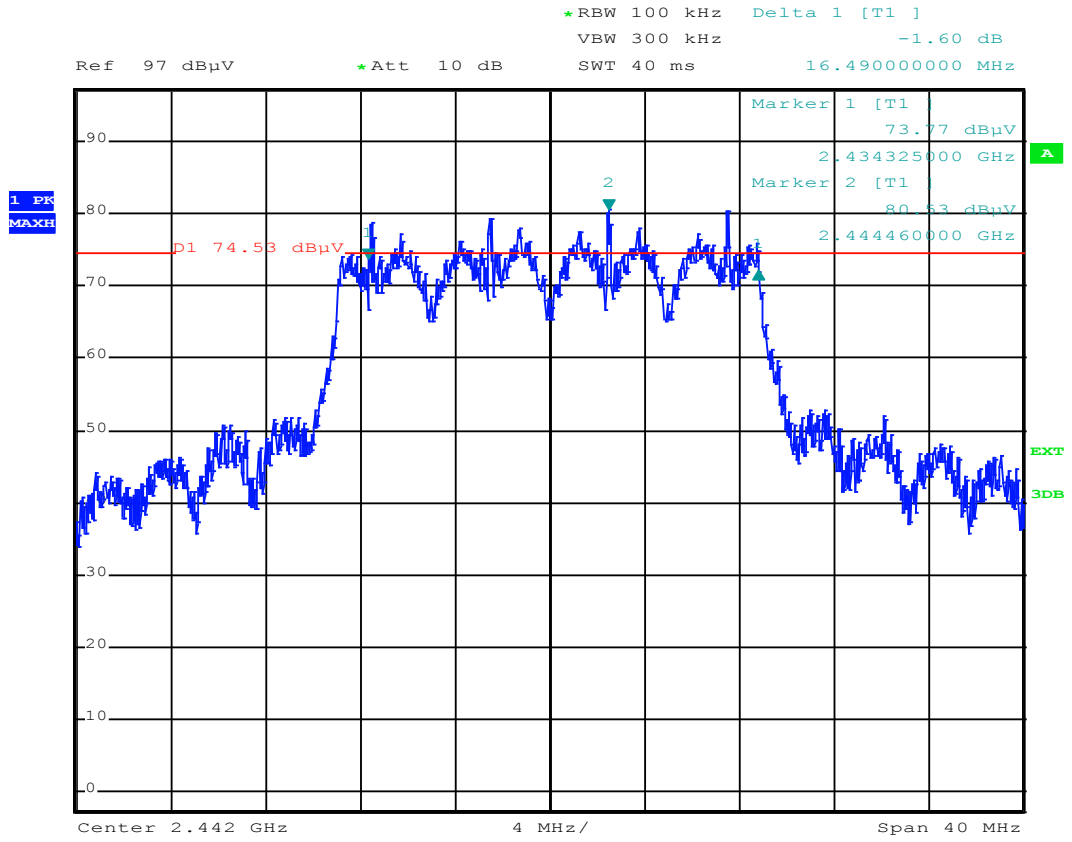
802.11 g, channel 11



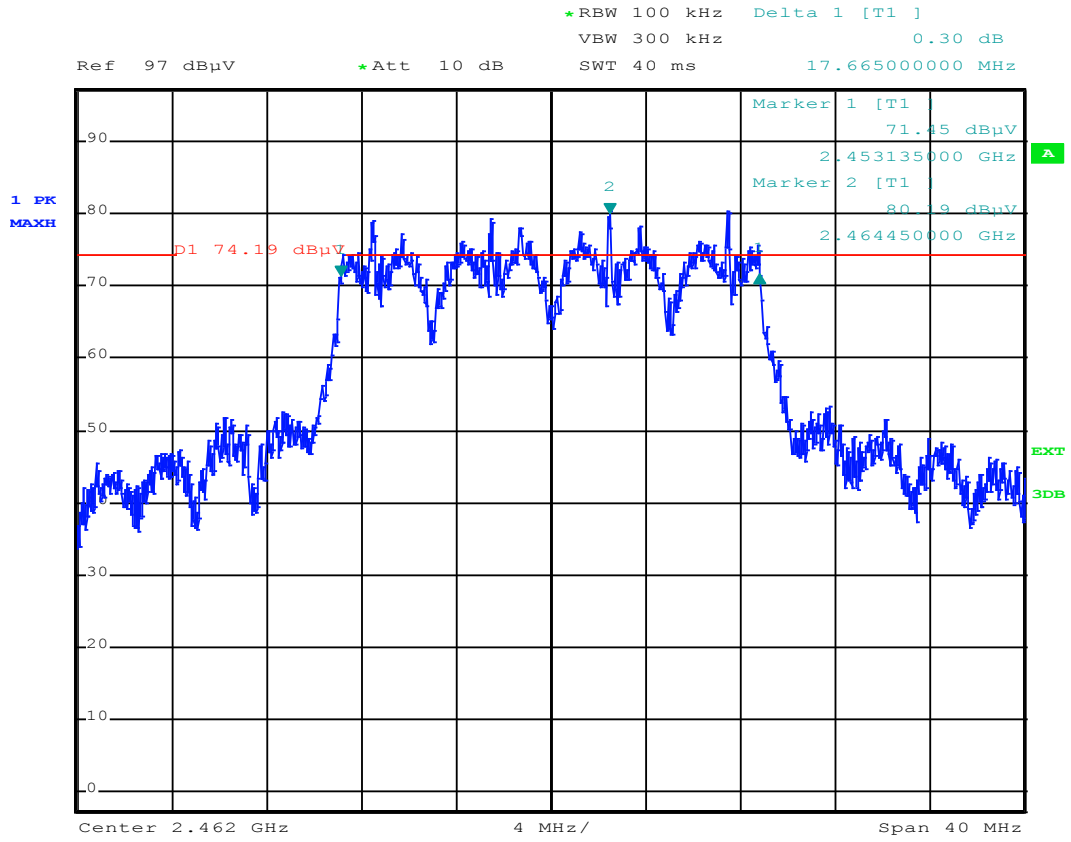
802.11 n, channel 1



802.11 n, channel 7

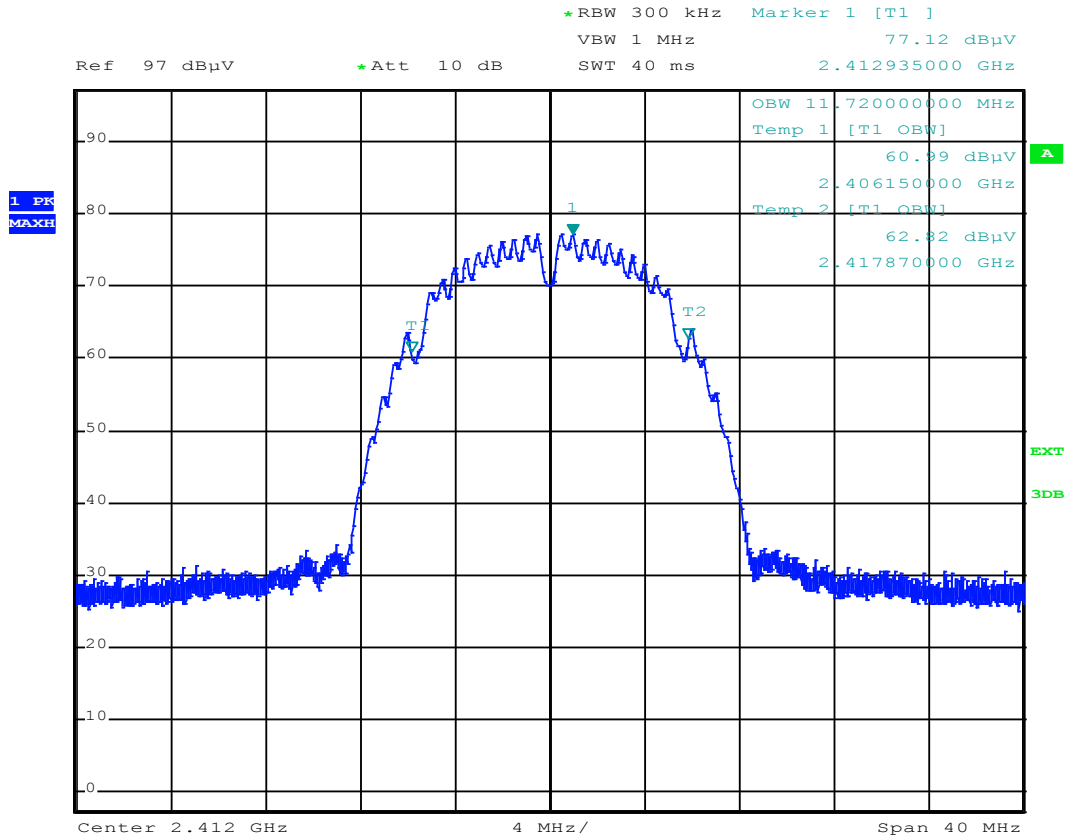


802.11 n, channel 11

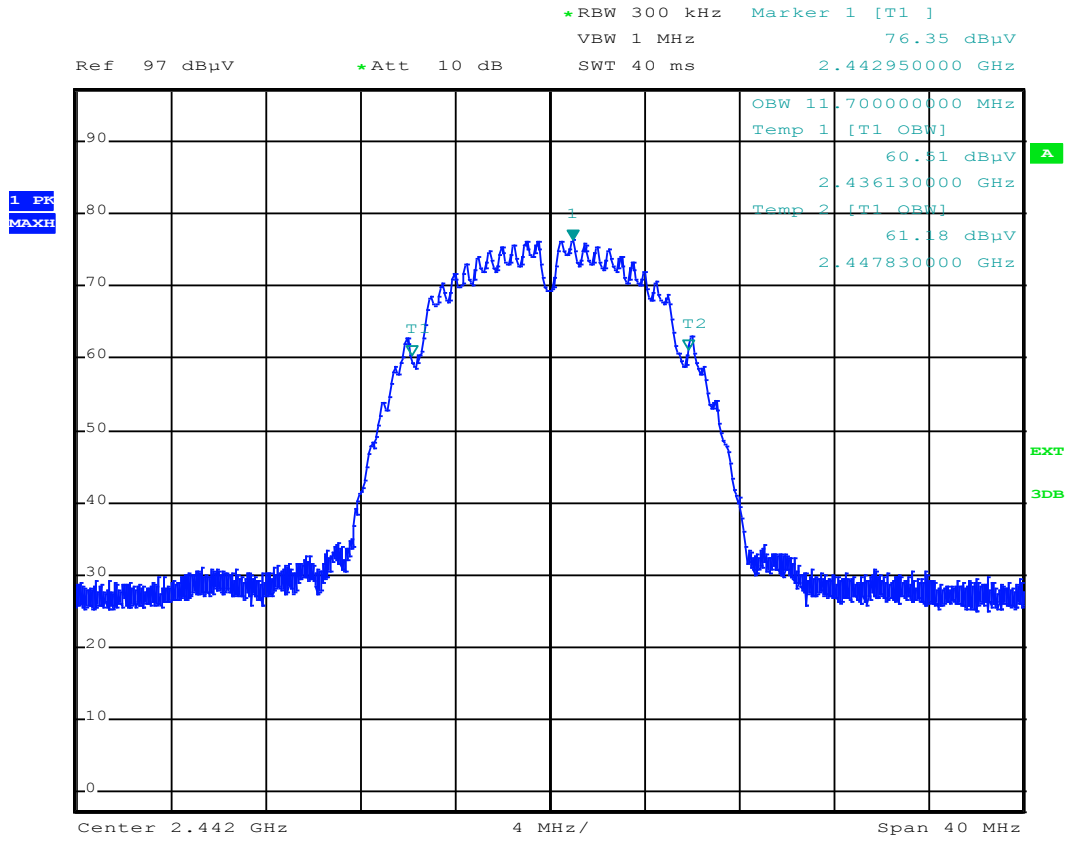


APPENDIX 5: 99% BANDWIDTH

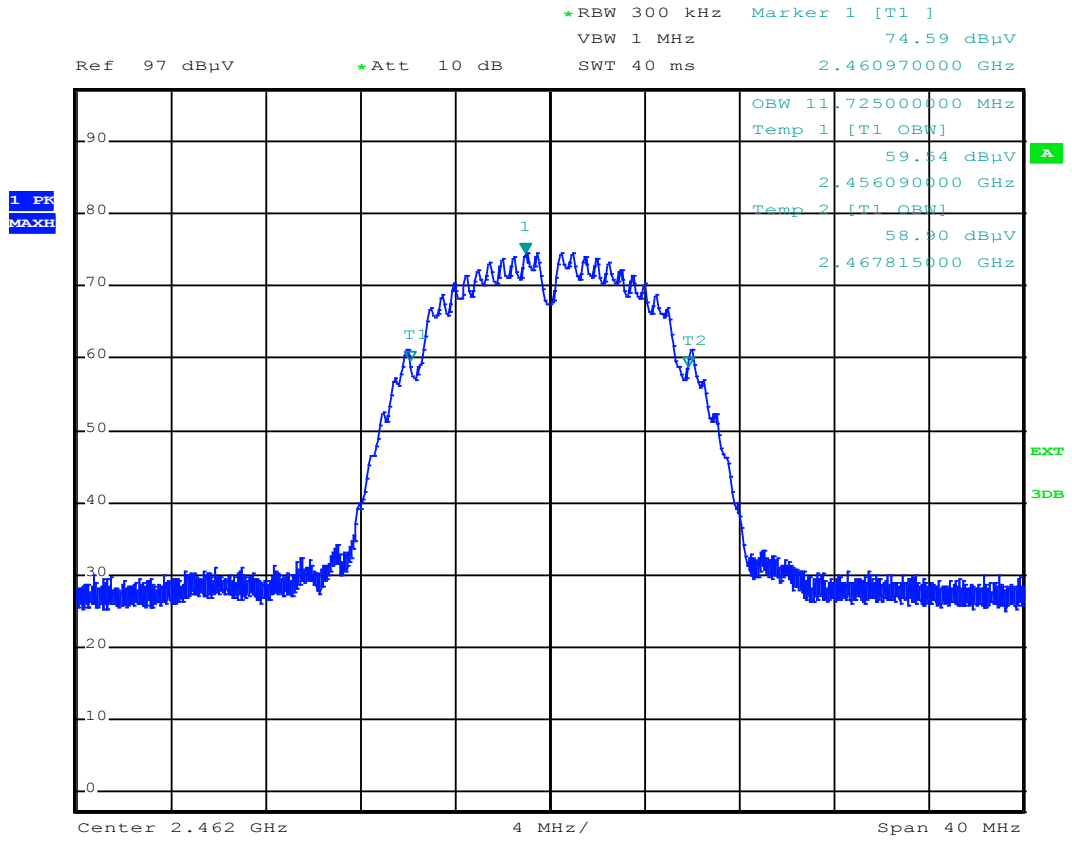
802.11 b, channel 1



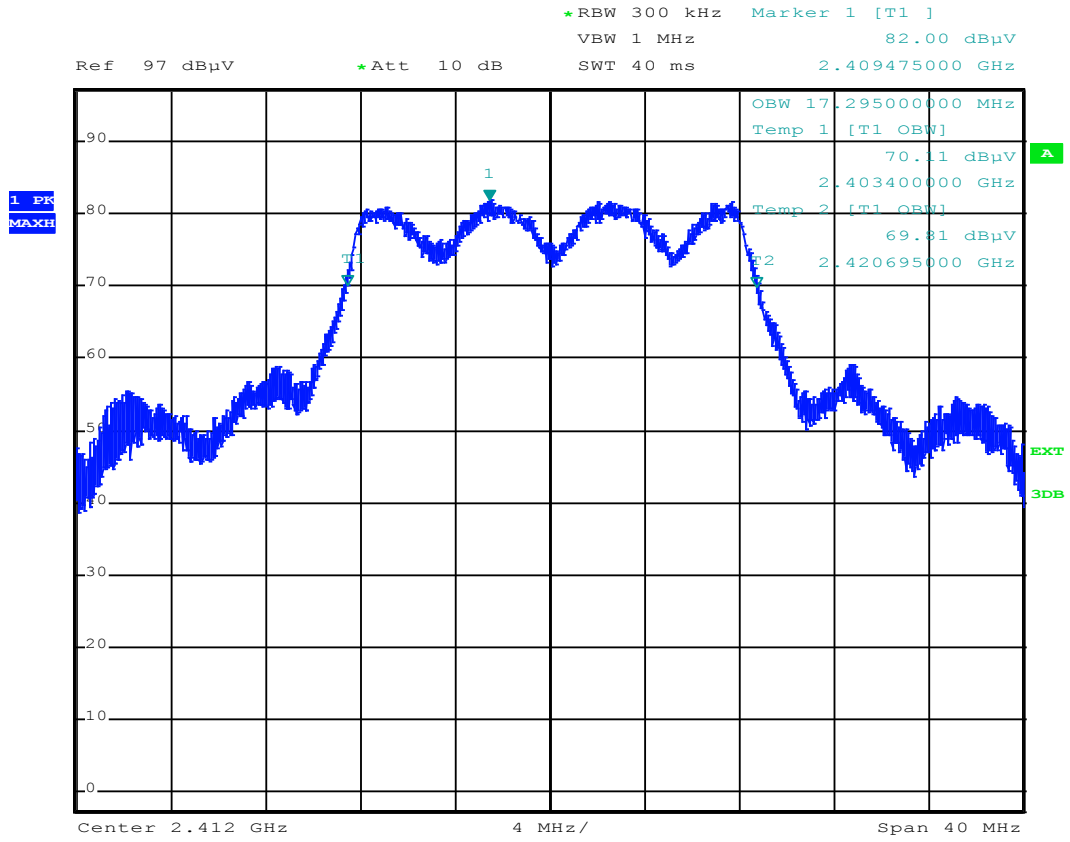
802.11 b, channel 7



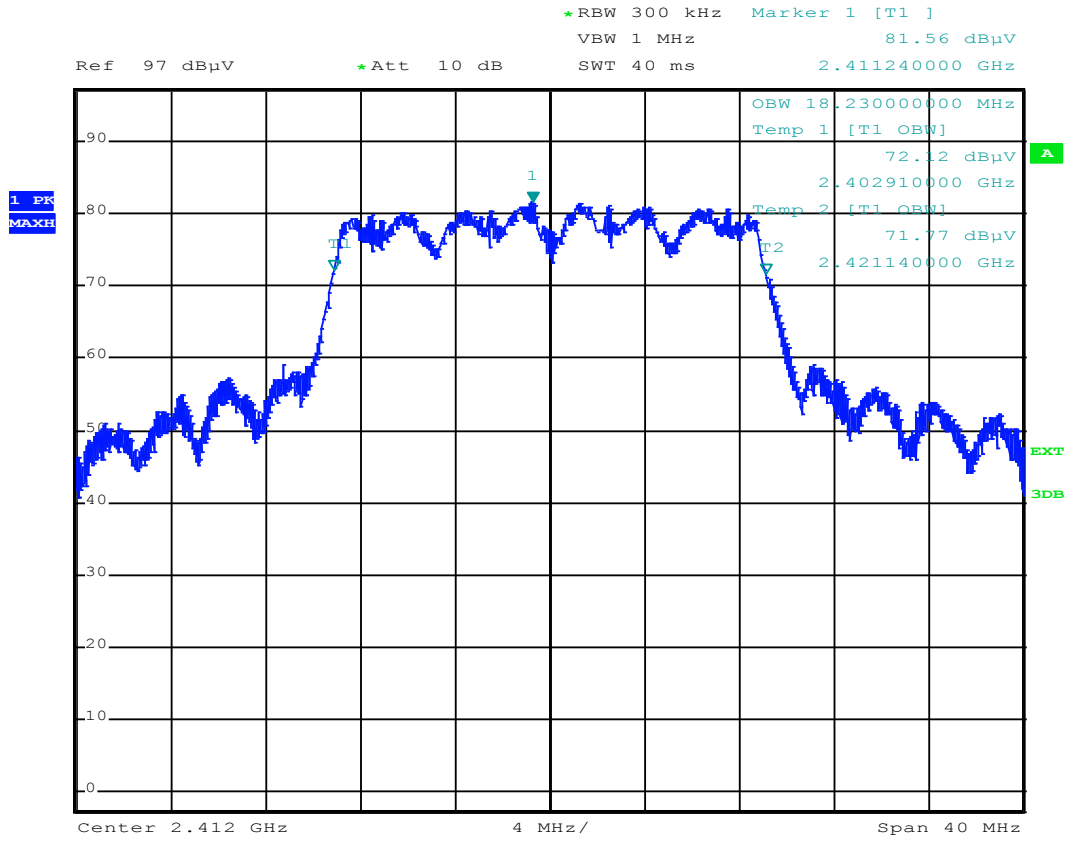
802.11 b, channel 11



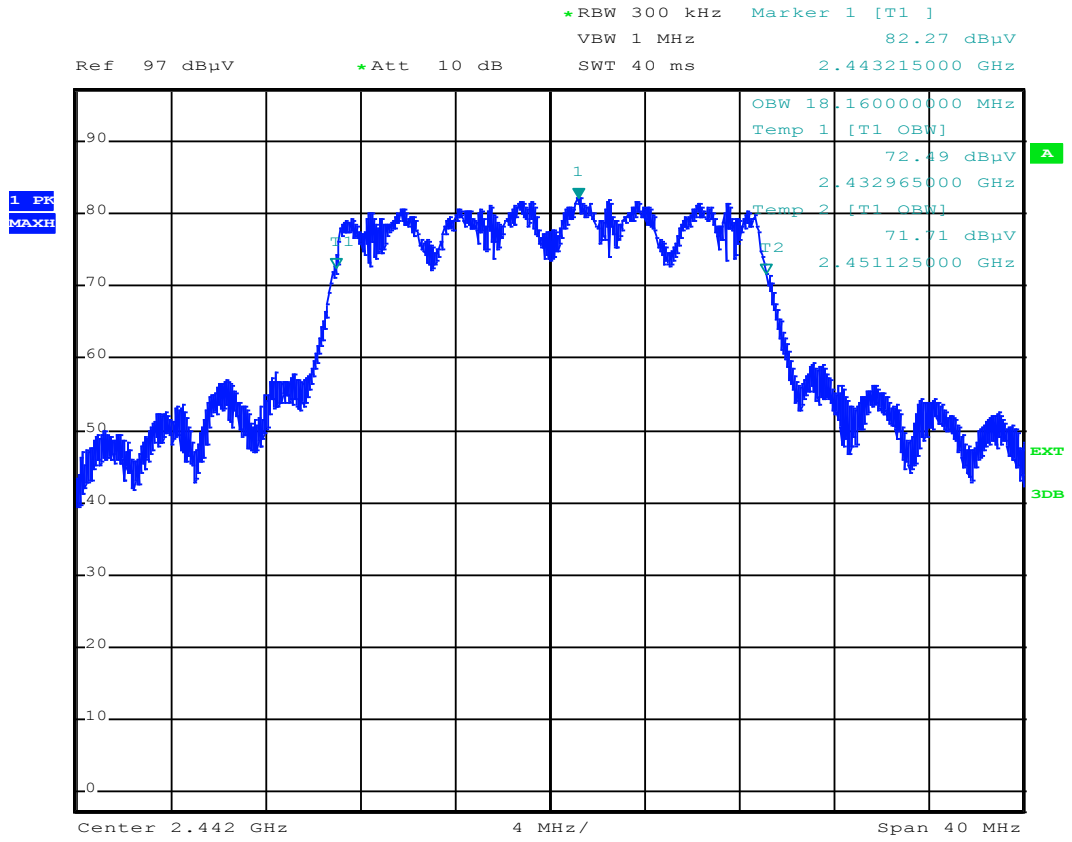
802.11 g, channel 1



802.11 n, channel 1

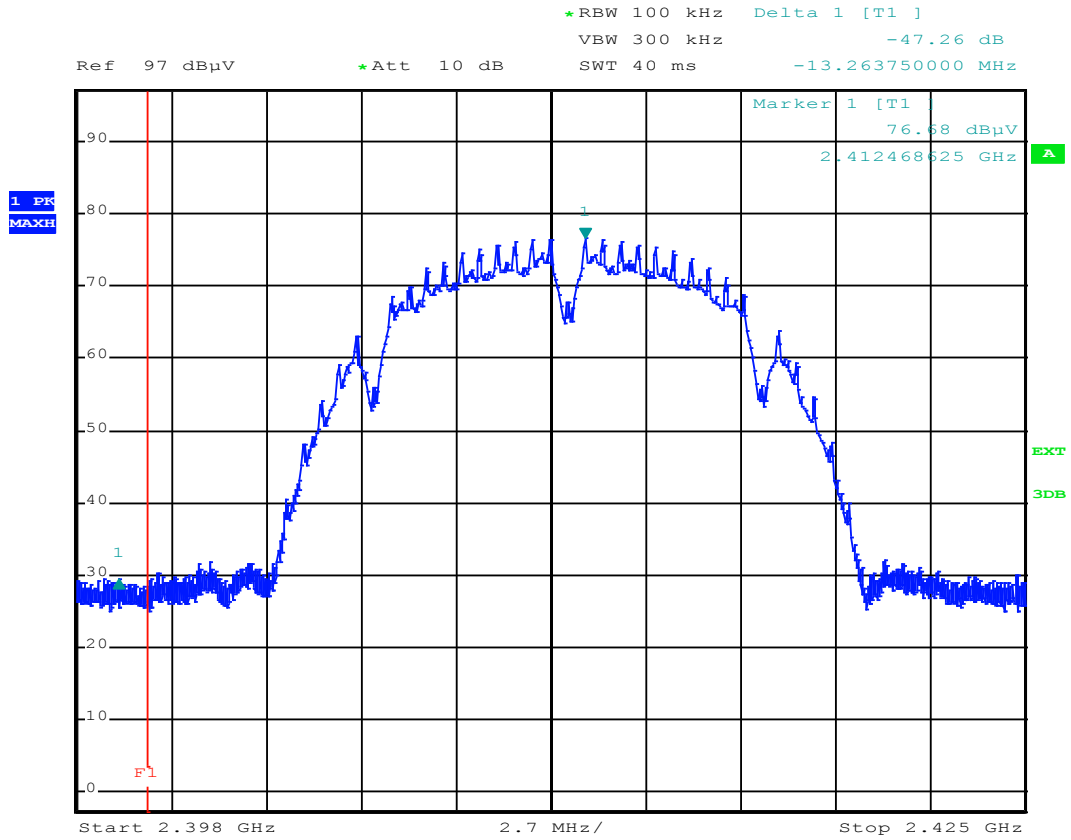


802.11 n, channel 7

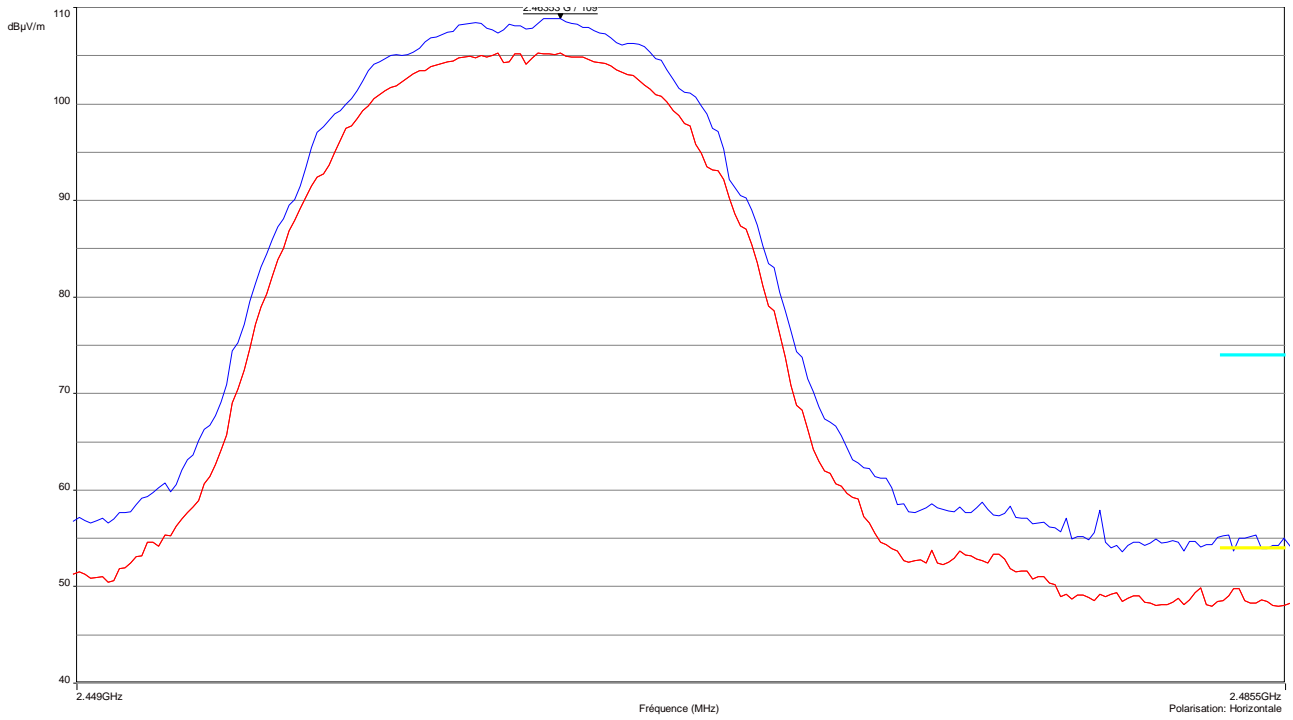


APPENDIX 6: BAND EDGE

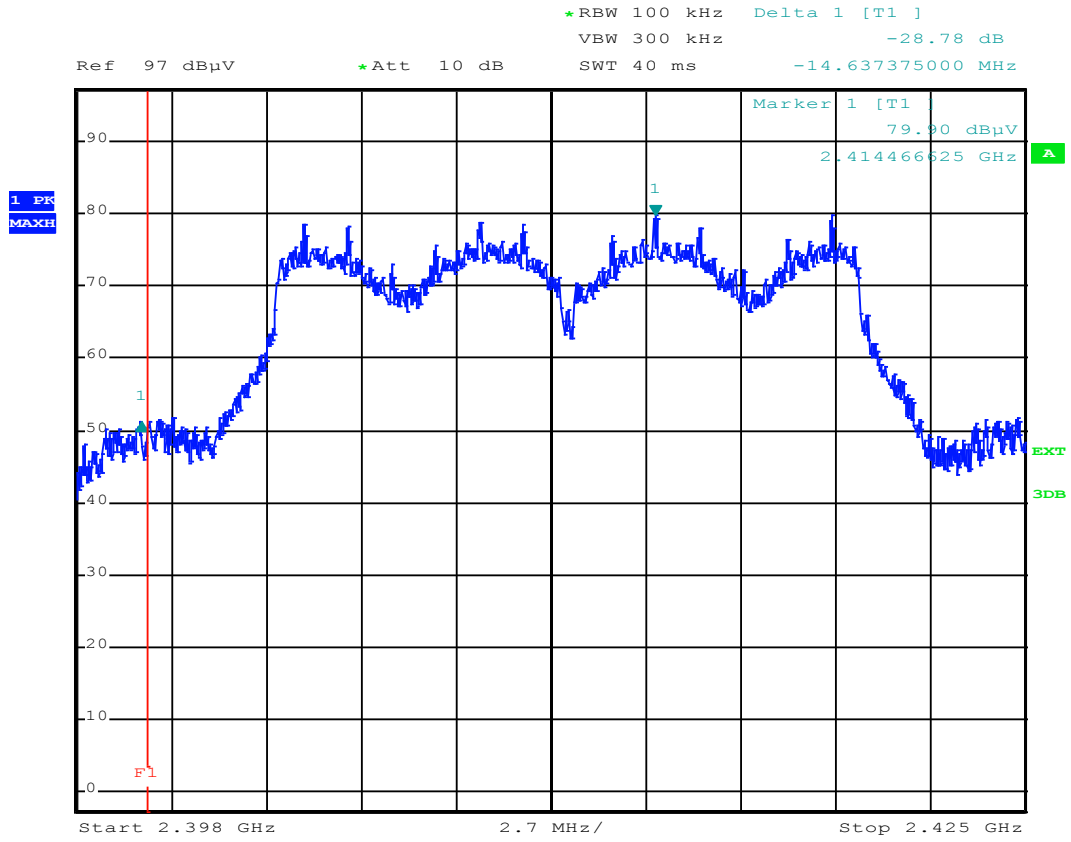
802.11 b, channel 1 with country code US



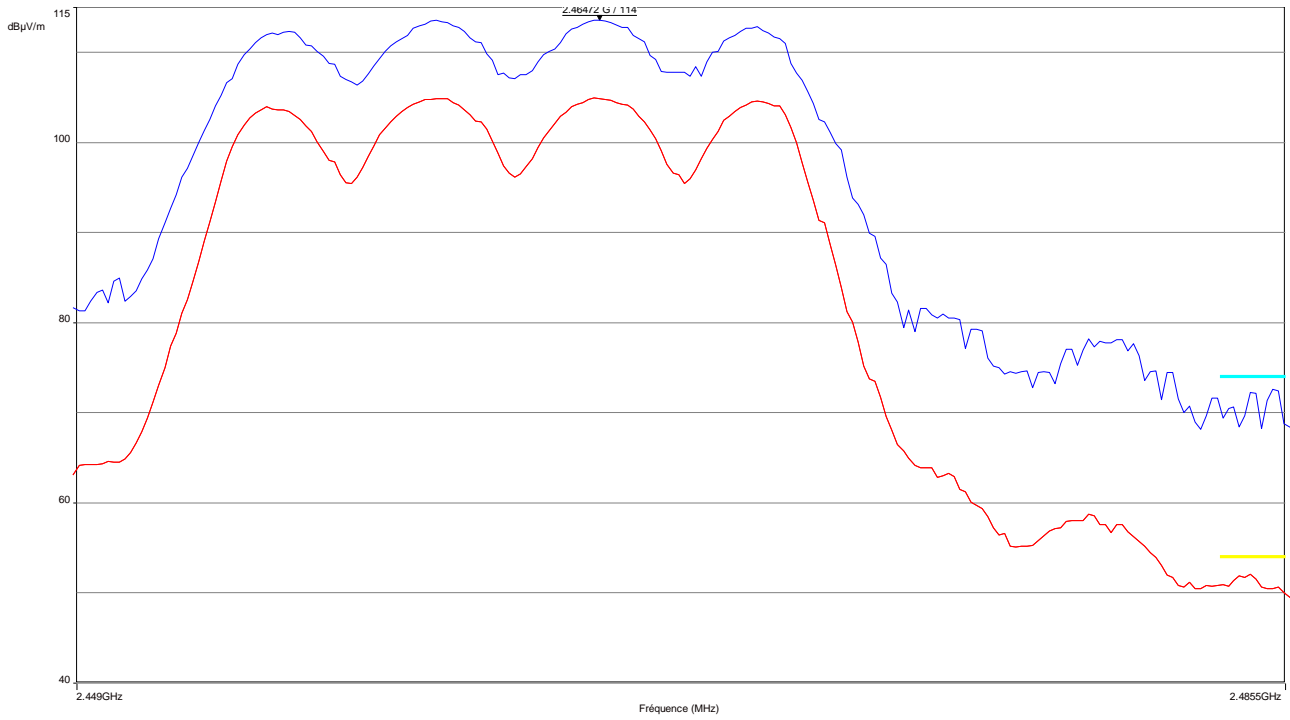
802.11 b, channel 11 with country code US/44



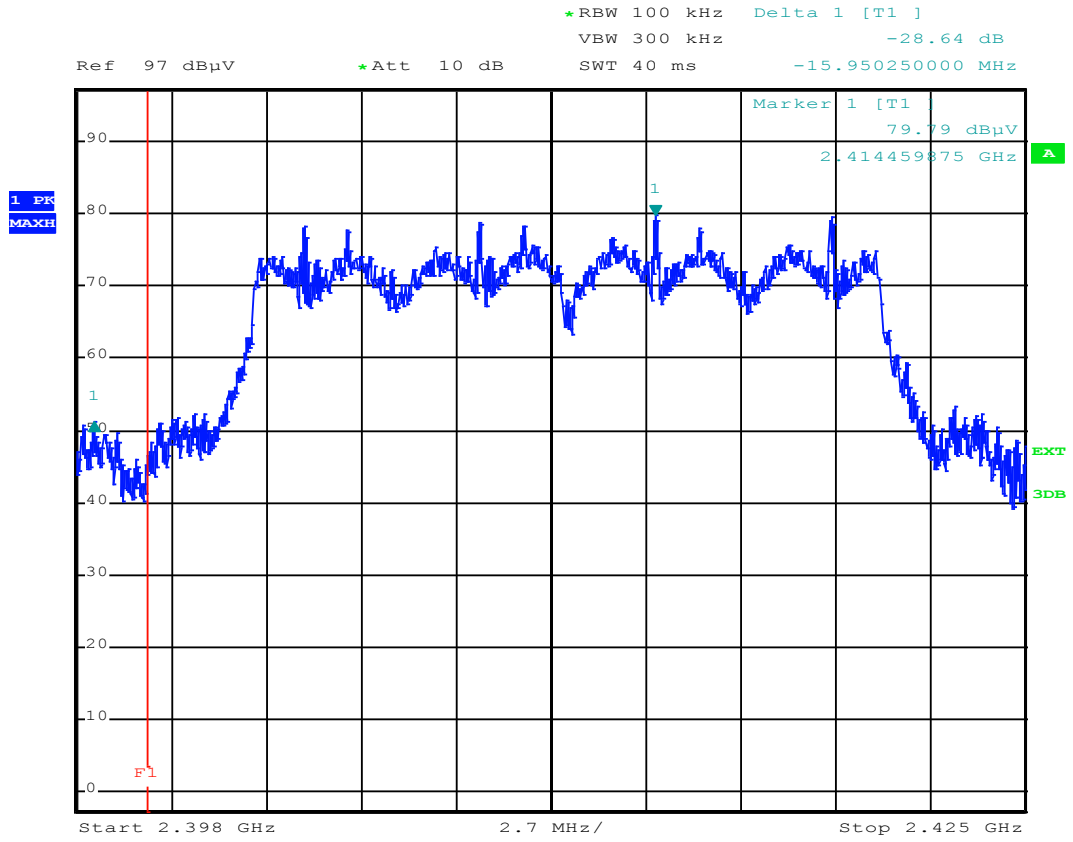
802.11 g, channel 1 with country code US



802.11 g, channel 11 with country code US/44



802.11 n, channel 1 with country code US



802.11 n, channel 11 with country code US/44

