

RR051-17-104757-2-A Ed. 0

Certification Radio test report

**According to the standard:
CFR 47 FCC PART 15**

**Equipment under test:
Parrot BLUEGRASS**


FCC ID: 2AG6ICHIMERA

**Company:
PARROT DRONES**

Distribution: Mr EL HANBALI

(Company: PARROT DRONES)

Number of pages: 87 with 5 annexes

Ed.	Date	Modified Page(s)	Technical Verification and Quality Approval	
			Name and Function	Visa
0	20-Nov-17	Creation	M. DUMESNIL, Radio Technical Manager	

Duplication of this document is only permitted for an integral photographic facsimile. It includes the number of pages referenced here above. This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.



Siège Social : Emitech - 3, rue des Coudriers - Z.A. de l'Observatoire - 78180 MONTIGNY LE BX - France
 Siret : 344 545 645 00022 - Tél. : 33 (0)1 30 57 55 55 - Fax : 33 (0)1 30 43 74 48 - E-mail : contact@emitech.fr - URL : www.emitech.fr
 S.A. au capital de 1 560 000 € - R.C.S. VERSAILLES 344 545 645 - APE 7112B

DESIGNATION OF PRODUCT: Parrot BLUEGRASS

Serial number (S/N): DV04

Reference / model (P/N): CHIMERA

Software version: RF software

MANUFACTURER: PARROT DRONES

COMPANY SUBMITTING THE PRODUCT:

Company: PARROT DRONES

Address: 174 QUA DE JEMMAPES
7501 PARIS
FRANCE

Responsible: Mr EL HANBALI

Persons present during the tests: Mr EL HANBALI

DATE(S) OF TEST: From 31-Oct-17 to 8-Nov-17

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

TESTED BY: T. LEDRESSEUR

VISA:



WRITTEN BY: T. LEDRESSEUR

CONTENTS

<i>TITLE</i>	<i>PAGE</i>
1. INTRODUCTION.....	4
2. PRODUCT DESCRIPTION.....	4
3. NORMATIVE REFERENCE.....	5
4. TEST METHODOLOGY.....	5
5. TEST EQUIPMENT CALIBRATION DATES.....	6
6. TESTS RESULTS SUMMARY.....	7
7. MEASUREMENT UNCERTAINTY.....	9
8. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS.....	10
9. MAXIMUM PEAK CONDUCTED OUTPUT POWER.....	12
10. INTENTIONAL RADIATOR.....	16
11. MAXIMUM PEAK CONDUCTED POWER DENSITY.....	30
APPENDIX 1: TEST EQUIPMENT LIST.....	34
APPENDIX 2: 6 DB BANDWIDTH.....	37
APPENDIX 3: 99% BANDWIDTH.....	52
APPENDIX 4: BAND EDGE.....	67
APPENDIX 5: SPECTRAL DENSITY.....	73

1. INTRODUCTION

This report presents the results of radio test carried out on the following radio equipment: **Parrot BLUEGRASS**, in accordance with normative reference.

The product integrates a WLAN radio part.

See test report RR051-17-104757-1-A for test on U-NII bands and RR051-17-104757-3-A for test on non-radio part.

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	Residential
Antenna type and gain:	(3.8 dBi) 2 integral identical antennas
Operating frequency range:	From 2400 MHz to 2483.5MHz
Number of channels:	11
Channel spacing:	5 MHz
Modulation:	DBPSK OFDM: BPSK OFDM: 64-QAM
Power source:	14.8Vdc by internal battery The battery is rechargeable outside the product.
Mode tested:	802.11 b 802.11 g 802.11 n
Data rate:	For 802.11b: 1Mbit/s For 802.11g: 6Mbit/s For 802.11n: MCS0
Channel tested:	Channel 1: 2412 MHz Channel 6: 2437 MHz Channel 11: 2462 MHz

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 (2017)	Radio Frequency Devices
ANSI C63.10	2013 Procedures for Compliance Testing of Unlicensed Wireless Devices.
558074 D01 DTS v04	Guidance for Performing Compliance on Digital Transmission Systems Operating under §15.247
662911 D01 Multiple Transmitter Output V02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
447498 D01 General RF Exposure Guidance v06	RF Exposure procedures and equipment authorization policies for mobile and portable equipment

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 209: Radiated emission limits; general requirements
- 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	/	/	/
4087	Filtek LP03/1000-7GH	Low Pass Filter	05/04/2016	05/04/2018	05/06/2018
4088	R&S FSP40	Spectrum Analyzer	29/10/2015	29/10/2017	29/12/2017
7190	R&S HL223	Antenna	15/03/2016	15/03/2019	15/05/2019
7299	Microtronics BRM50702	Reject band filter	04/11/2015	04/11/2017	04/01/2018
8511	HP 8447D	Low-noise amplifier	28/11/2016	28/11/2017	28/01/2018
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	10/02/2016	10/02/2020	10/04/2020
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/06/2015	12/06/2018	12/08/2018
8549	Midwest Microwave 20dB	Attenuator	09/06/2016	09/06/2018	09/08/2018
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8704	LUCIX Corp S180265L3201 LNA	Low-noise amplifier	02/05/2017	02/05/2018	02/07/2018
8707	R&S ESI7	Test receiver	07/06/2016	07/06/2018	07/08/2018
8732	Emitech	OATS	11/10/2016	11/10/2019	11/12/2019
8750	La Crosse Technology WS-9232	Meteo station	23/09/2016	23/09/2018	23/11/2018
8786	ETS Lindgren 3160-09	Antenna	16/05/2016	16/05/2019	16/07/2019
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
9403	R&S ESU8	Spectrum Analyzer	11/08/2016	11/08/2018	11/10/2018
10739	LUCIX Corp S005180M3201	Low-noise amplifier	29/03/2017	29/03/2018	29/05/2018
11592	R&S NRV-Z86	Power Sensor	02/03/2017	02/03/2018	02/05/2018
14476	Fluke 177	Multimeter	20/03/2017	20/03/2018	20/05/2018
14539	R&S FSL18	Spectrum Analyzer	02/06/2017	02/06/2018	02/08/2018

6. TESTS RESULTS SUMMARY

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 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
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: 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 8064 kHz (see appendix 4).

RF EXPOSURE:

Maximum conducted measured power = 25.57dBm at 2462 MHz

With *Gain* = 3.8dBi

EIRP = 29.37dBm

In accordance with KDB 447498 D01 General RF Exposure Guidance v06:

$PSD = EIRP / (4 * \pi * R^2)$

$$\Rightarrow 864.97 / (4 * \pi * (20 \text{ cm})^2) = 0.172 \text{ mW/cm}^2 \text{ (limit = 1 mW/cm}^2 \text{ above 1500 MHz)}$$

The equipment fulfils the requirements on power density for general population/uncontrolled exposure and therefore fulfils the requirements of 47 CFR §1.1310.

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. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS
--

Temperature (°C) : 22

Humidity (%HR): 40

Date : November 6, 2017

Technician : T. LEDRESSEUR

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 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.

We used for power source the internal fully charged battery

Results:
Sample N° 1 Mode 802.11.b

Fundamental frequency (MHz)	Field Strength Level of fundamental (dBµV/m)	RBW (kHz)	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	104	100	Peak	2399.157	-47.07	56.93	84	27.07
2462	110.1	1000	Peak	2483.91	-53.57	56.53	74	17.47
2462	110.1	1000	Average	2483.72	-65.19	44.91	54	9.09

(1) Marker-Delta method

Sample N° 1 Mode 802.11.g

Fundamental frequency (MHz)	Field Strength Level of fundamental (dB μ V/m)	RBW (kHz)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2412	105	100	Peak	2399.182	-43.82	61.18	85	23.82
2462	113.48	1000	Peak	2484.22	-48.71	64.77	74	9.23
2462	113.48	1000	Average	2484.972	-65.23	48.25	54	5.75

(1) Marker-Delta method

Sample N° 1 Mode 802.11.n

Fundamental frequency (MHz)	Field Strength Level of fundamental (dB μ V/m)	RBW (kHz)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB) (1)	Calculated Max Out-of-Band Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2412	105	100	Peak	2399.68	-45.11	59.89	85	25.11
2462	113.07	1000	Peak	2483.957	-49.92	63.15	74	10.85
2462	113.07	1000	Average	2485.26	-65.79	47.28	54	6.72

(1) Marker-Delta method

band-edge curves are given in appendix 4.

Test conclusion:

RESPECTED STANDARD

9. MAXIMUM PEAK CONDUCTED OUTPUT POWER**Temperature (°C) :** 22**Humidity (%HR):** 40**Date :** November 6, 2017**Technician :** T. LEDRESSEUR**Standard:** FCC Part 15**Test procedure:** paragraph 15.247 (b)**Method:** PKPM1 Peak power meter method of paragraph 9.1.3 of KDB 558074**Test set up:**

The measure is realized in conducted mode with peak power meter

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.

We used for power source the internal fully charged battery

Results:

Sample N° 1 Channel 1 (F = 2412 MHz) – Mode 802.11.b

Conducted Power (dBm):		Conducted Power (mW):		Total Conducted power (W)	Limit (W) (1)
Chain 1	Chain 2	Chain 1	Chain 2		
21.1		128.825		0.129	1

(1) For 2 antennas with 3.8 dBi

Sample N° 1 Channel 6 (F = 2437 MHz) – Mode 802.11.b

Conducted Power (dBm):		Conducted Power (mW):		Total Conducted power (W)	Limit (W) (1)
Chain 1	Chain 2	Chain 1	Chain 2		
21.3		134.896		0.135	1

(1) For 2 antennas with 3.8 dBi

Sample N° 1 Channel 11 (F = 2462 MHz) – Mode 802.11.b

Conducted Power (dBm):		Conducted Power (mW):		Total Conducted power (W)	Limit (W) (1)
Chain 1	Chain 2	Chain 1	Chain 2		
21.5		141.254		0.141	1

(1) For 2 antennas with 3.8 dBi

Sample N° 1 Channel 1 (F = 2412 MHz) – Mode 802.11.g

Conducted Power (dBm):		Conducted Power (mW):		Total Conducted power (W)	Limit (W) (1)
Chain 1	Chain 2	Chain 1	Chain 2		
22.53	21.58	179.06	143.88	0.323	1

(1) For 2 antennas with 3.8 dBi

Sample N° 1 Channel 6 (F = 2437 MHz) – Mode 802.11.g

Conducted Power (dBm):		Conducted Power (mW):		Total Conducted power (W)	Limit (W) (1)
Chain 1	Chain 2	Chain 1	Chain 2		
22.76	21.82	188.8	152.05	0.341	1

(1) For 2 antennas with 3.8 dBi

Sample N° 1 Channel 11 (F = 2462 MHz) – Mode 802.11.g

Conducted Power (dBm):		Conducted Power (mW):		Total Conducted power (W)	Limit (W) (1)
Chain 1	Chain 2	Chain 1	Chain 2		
22.95	22.13	197.24	163.31	0.360	1

(1) For 2 antennas with 3.8 dBi

Sample N° 1 Channel 1 (F = 2412 MHz) – Mode 802.11.n

Conducted Power (dBm):		Conducted Power (mW):		Total Conducted power (W)	Limit (W) (1)
Chain 1	Chain 2	Chain 1	Chain 2		
22.53	21.6	179.06	144.54	0.323	1

(1) For 2 antennas with 3.8 dBi

Sample N° 1 Channel 6 (F = 2437 MHz) – Mode 802.11.n

Conducted Power (dBm):		Conducted Power (mW):		Total Conducted power (W)	Limit (W) (1)
Chain 1	Chain 2	Chain 1	Chain 2		
22.81	22.03	190.99	159.59	0.350	1

(1) For 2 antennas with 3.8 dBi

Sample N° 1 Channel 11 (F = 2462 MHz) – Mode 802.11.n

Conducted Power (dBm):		Conducted Power (mW):		Total Conducted power (W)	Limit (W) (1)
Chain 1	Chain 2	Chain 1	Chain 2		
22.98	22.02	198.61	159.22	0.357	1

(1) For 2 antennas with 3.8 dBi

Test conclusion:

RESPECTED STANDARD

10. INTENTIONAL RADIATOR**Temperature (°C) :** 22/21.5**Humidity (%HR):** 43/40**Date :** November 7, 2017 and
November 8, 2017**Technician :** T. LEDRESSEUR**Standard:** FCC Part 15**Test procedure:** paragraph 15.205, paragraph 15.209, paragraph 15.247 (d)**Method** Emissions in non-restricted frequency bands method of paragraph 11 of KDB 558074

Emissions in restricted frequency bands method of paragraph 12 of KDB 558074

The average measure are realized with the method 12.2.5.2

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, 1.5 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 (25 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 m below 1 GHz
3 m between 1 GHz and 18 GHz
1 m between 18 GHz and 26 GHz**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.

We used for power source the internal fully charged battery

Duty cycle measured for mode b:

Ton=351.6

Toff=93.27

Correction= $10 \log (1/X) = 1 \text{ dB}$

Duty cycle measured for mode g or n:

Ton=53 μs

Toff=98 μs

Correction= $10 \log (1/X) = 4.5 \text{ dB}$

These factors are already included on the results (tables and graphs)

Results:

Sample N° 1 Channel 1 (F = 2412 MHz) – Mode 802.11.b

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2334 (1)	P	1000	56.68	74	17.32
2334 (1)	Av	1000	51	54	3
2492.6 (1)	P	1000	59.22	74	14.78
2492.6 (1)	Av	1000	53.14	54	0.86
4824.4 (1)	P	1000	55.44	74	18.56
4824.4 (1)	Av	1000	51.6	54	2.4
7232.7	P	100	54.47	84.6	30.13

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

(1) Restricted bands of operation in 15.205

Sample N° 1 Channel 6 (F = 2437 MHz) – Mode 802.11.b

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2359 (1)	P	1000	57.33	74	16.67
2359 (1)	Av	1000	50.97	54	3.03
2518.2	P	100	60.16	84.6	24.44
4874 (1)	P	1000	53.03	74	20.97
4874 (1)	Av	1000	50.156	54	3.844
7312.8 (1)	P	1000	53.74	74	20.26
7312.8 (1)	Av	1000	48.9	54	5.1

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

(1) Restricted bands of operation in 15.205

Sample N° 1 Channel 11 (F = 2462MHz) – Mode 802.11.b

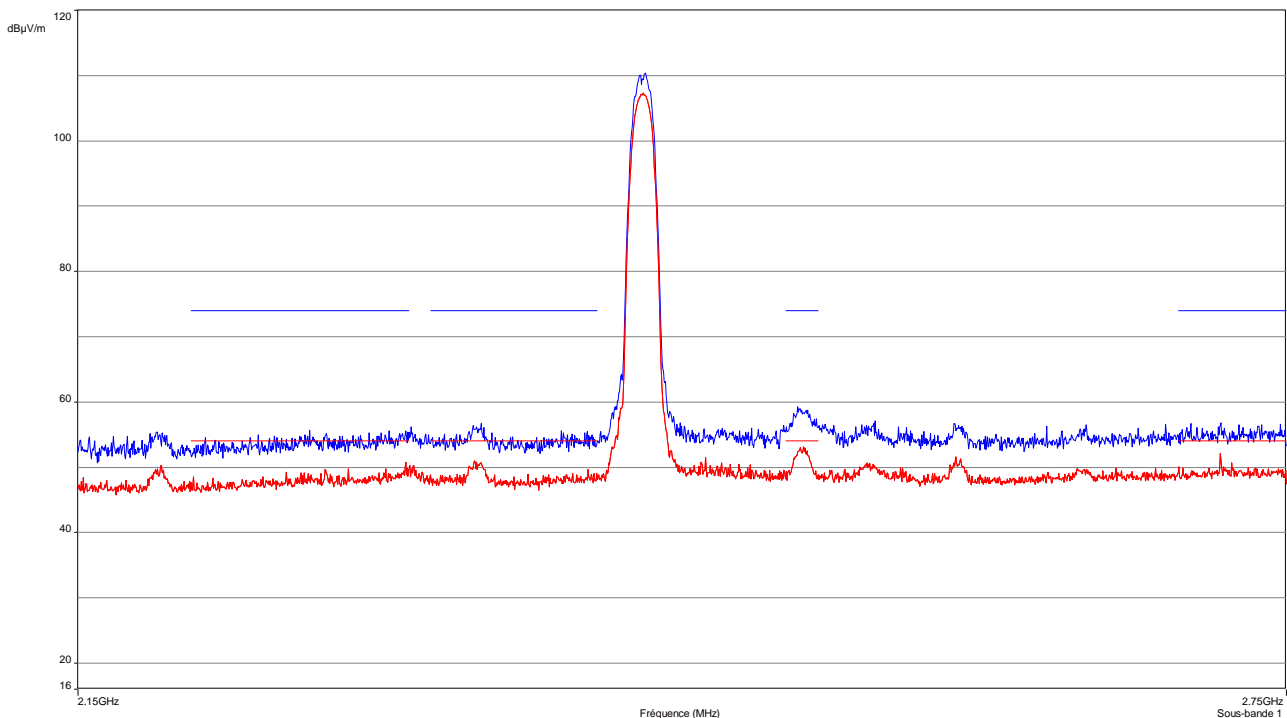
Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2383.4 (1)	P	1000	56.4	74	17.6
2383.4 (1)	Av	1000	50.96	54	3.04
2540.5	P	100	58.88	84.6	25.72
4924.4 (1)	P	1000	54.81	74	19.19
4924.4 (1)	Av	1000	51.44	54	2.56
7385.6 (1)	P	1000	53.69	74	20.31
7385.6 (1)	Av	1000	45.16	54	8.84

P= Peak, QP=Quasi-peak, Av=Average
 (1) Restricted bands of operation in 15.205

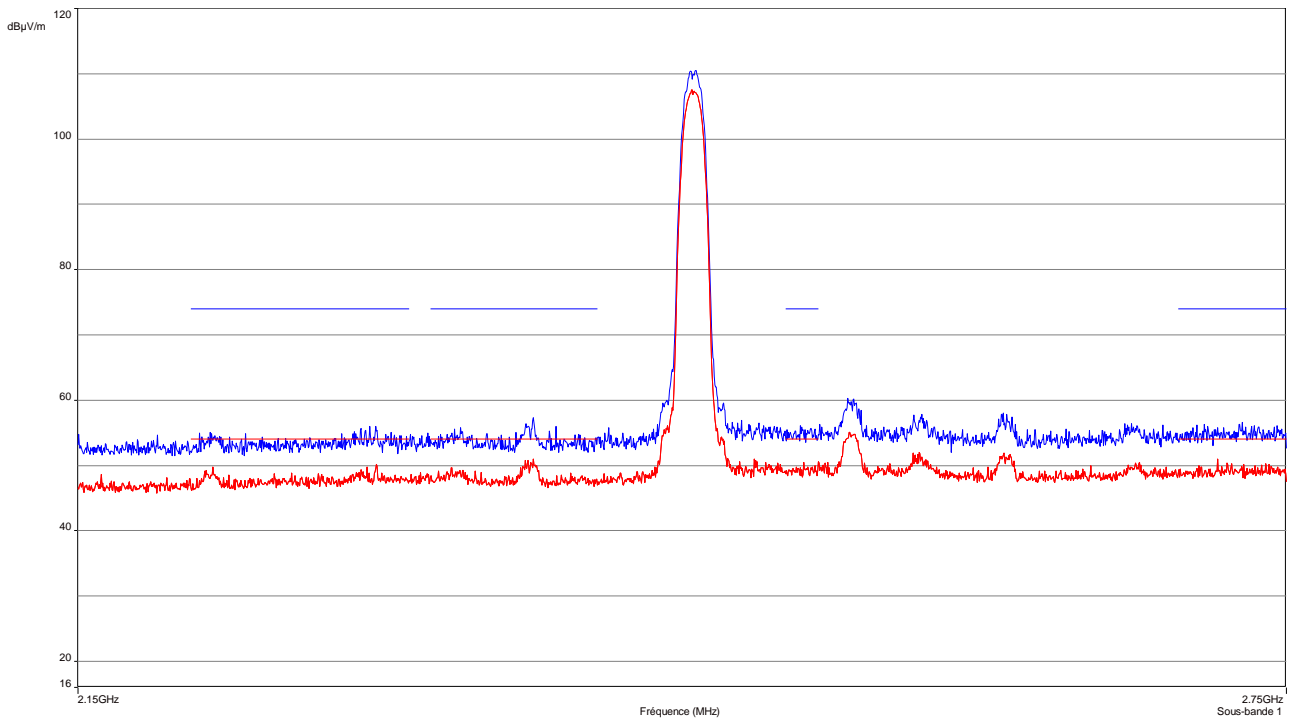
Band edge worst case measurement

The red curves are realized with only a RMS detector, the results obtained with the complete method 12.2.5.2 of the KDB 558074 (D01 DTS Meas Guidance) are reported on the table

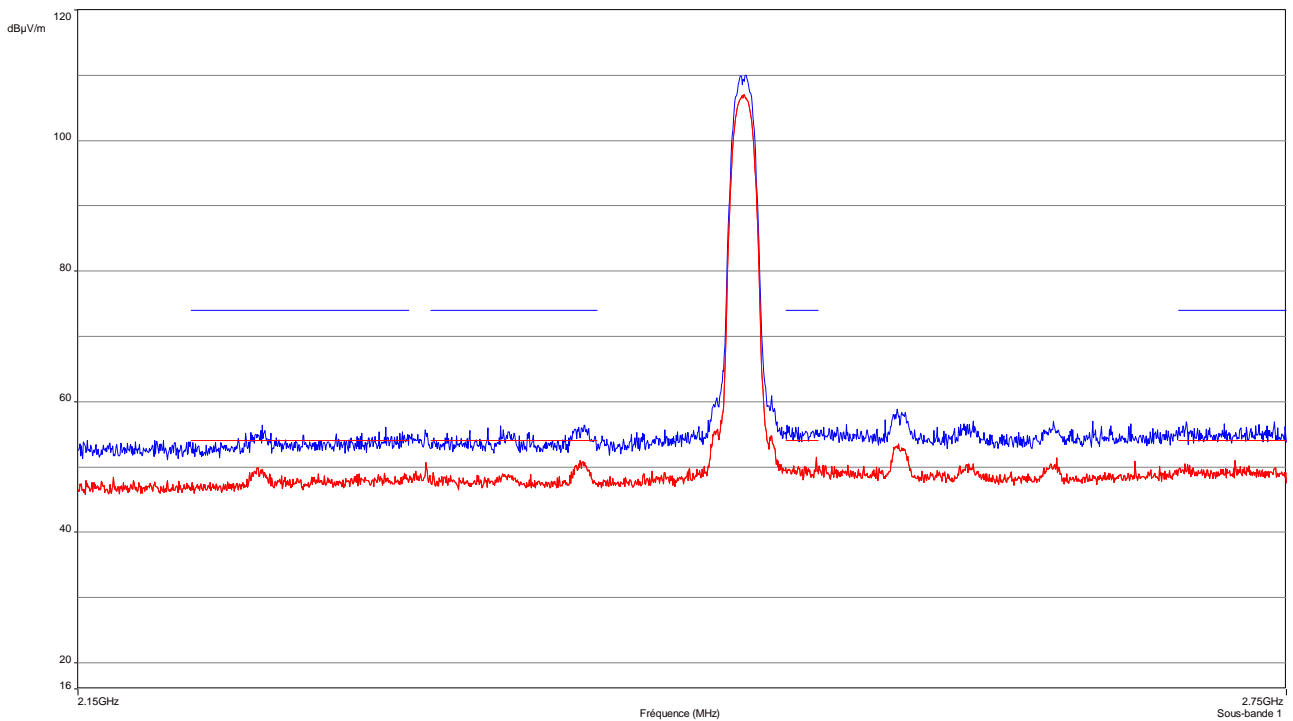
Low channel



Central Channel



High channel



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 104.6 dB μ V/m on channel 6.

So the applicable limit is 84.6 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 Channel 1 (F = 2412 MHz) – Mode 802.11.g

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2389.8 (1)	P	1000	61.12	74	12.88
2389.8 (1)	Av	1000	52.84	54	1.16
2495.6 (1)	P	1000	58.09	74	15.91
2495.6 (1)	Av	1000	51.74	54	2.26
4824.4 (1)	P	1000	54.8	74	19.2
4824.4 (1)	Av	1000	48.18	54	5.82
7232.7	P	100	51.85	85.4	33.55

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

(1) Restricted bands of operation in 15.205

Sample N° 1 Channel 6 (F = 2437 MHz) – Mode 802.11.g

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2285 (1)	P	1000	56.77	74	17.23
2285 (1)	Av	1000	52.7	54	1.3
2515	P	100	60.52	85.4	24.88
4874 (1)	P	1000	55.69	74	18.31
4874 (1)	Av	1000	47.28	54	6.72
7312.8 (1)	P	1000	50.8	74	23.2
7312.8 (1)	Av	1000	43.7	54	10.3

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

(1) Restricted bands of operation in 15.205

Sample N° 1 Channel 11 (F = 2462 MHz) – Mode 802.11.g

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2383.4 (1)	P	1000	55.5	74	18.5
2383.4 (1)	Av	1000	49.58	54	4.42
2540.5	P	100	52.94	85.4	32.46
4924.4 (1)	P	1000	55.07	74	18.93
4924.4 (1)	Av	1000	47.14	54	6.86
7385.6 (1)	P	1000	53.08	74	20.92
7385.6 (1)	Av	1000	44.15	54	9.85

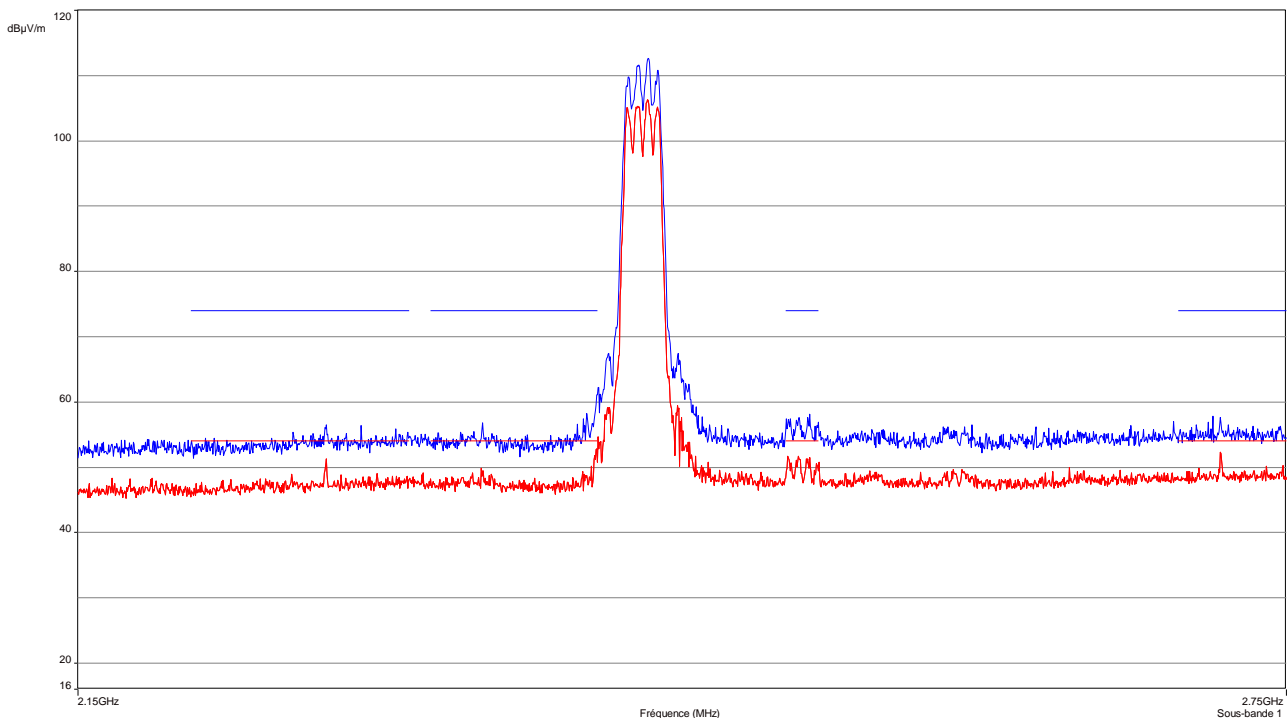
P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205

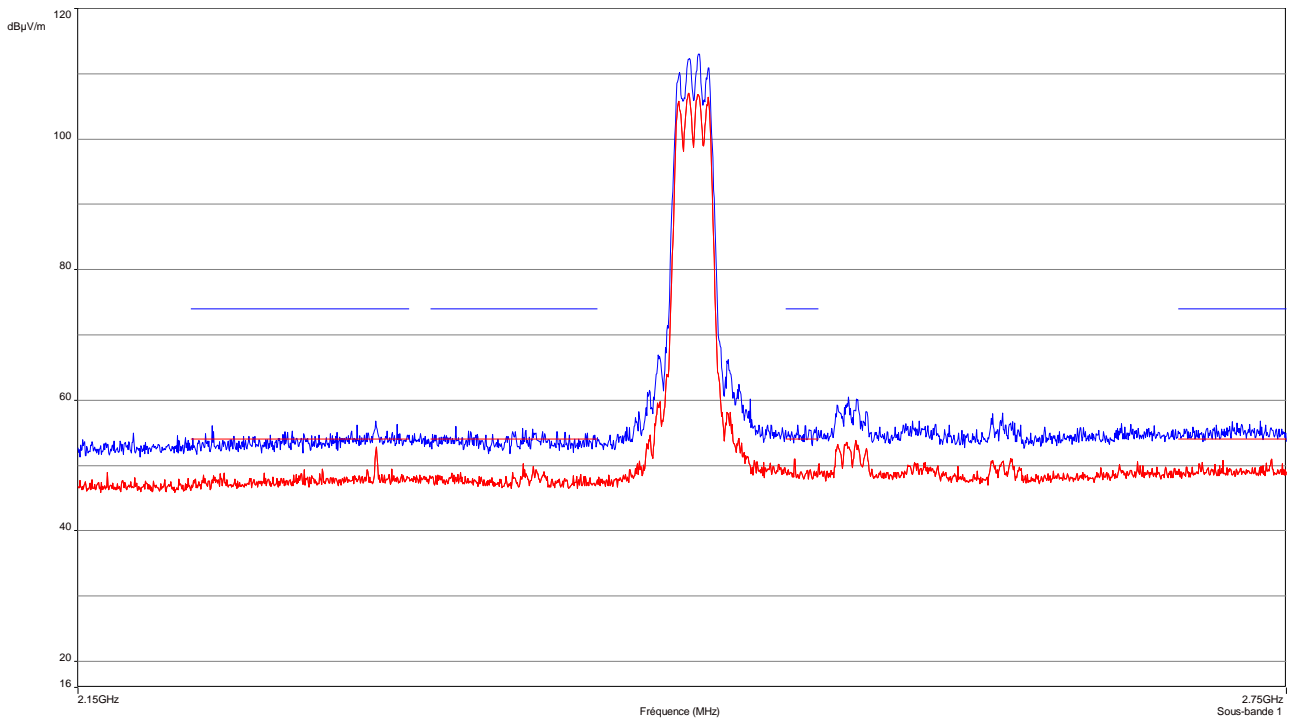
Band edge worst case measurement

The red curves are realized with only a RMS detector, the results obtained with the complete method 12.2.5.2 of the KDB 558074 (D01 DTS Meas Guidance) are reported on the table

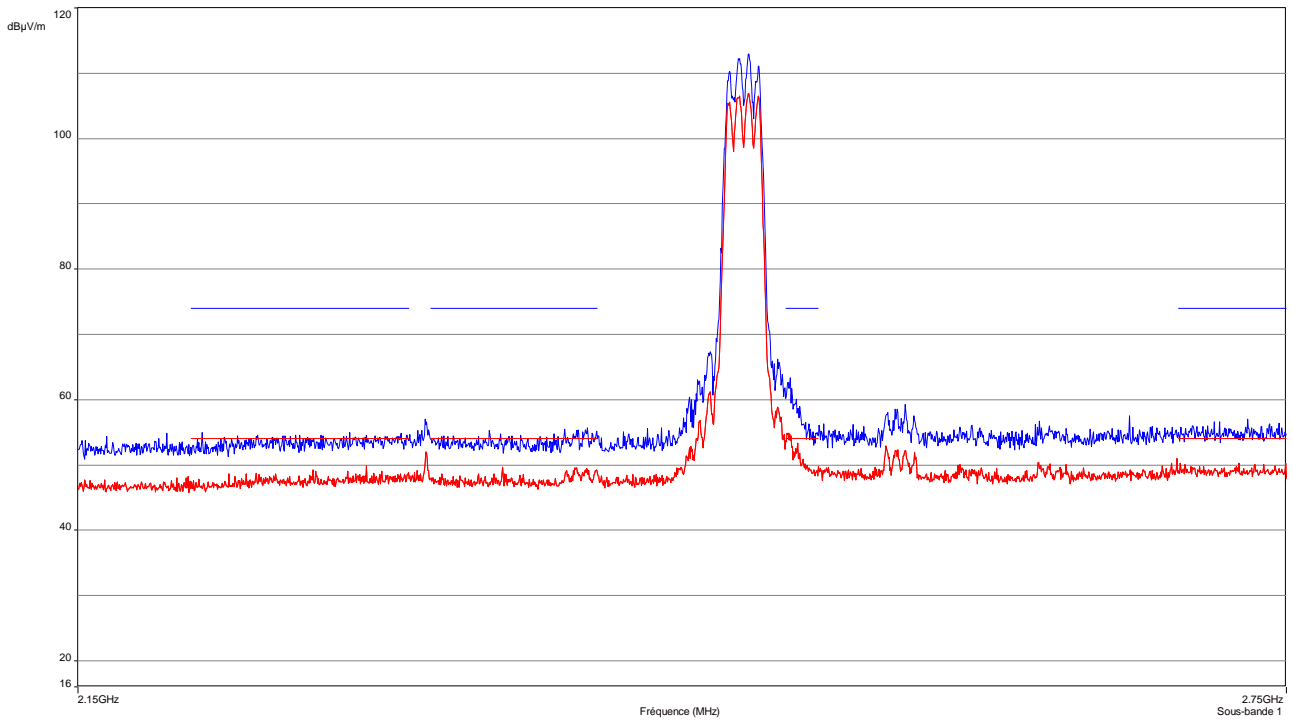
Low channel



Central Channel



High channel



For band 2483.5 MHz to 2485.5 MHz see §8

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 105.4 dB μ V/m on channel 6.

So the applicable limit is 85.4 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 Channel 1 (F = 2412 MHz) – Mode 802.11.n

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2389.7 (1)	P	1000	59.73	74	14.27
2389.7 (1)	Av	1000	52.4	54	1.6
2490 (1)	P	1000	57.33	74	16.67
2490 (1)	Av	1000	51.84	54	2.16
4824.4 (1)	P	1000	55.03	74	18.97
4824.4 (1)	Av	1000	47.73	54	6.27
7232.7	P	100	50.67	85.3	34.63

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

(1) Restricted bands of operation in 15.205

Sample N° 1 Channel 6 (F = 2437 MHz) – Mode 802.11.n

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2284.3 (1)	P	1000	56.84	74	17.16
2284.3 (1)	Av	1000	52.26	54	1.74
2521	P	100	59.5	85.3	25.8
4874 (1)	P	1000	54.66	74	19.34
4874 (1)	Av	1000	48.73	54	5.27
7312.8 (1)	P	1000	51.81	74	22.19
7312.8 (1)	Av	1000	44.58	54	9.42

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

(1) Restricted bands of operation in 15.205

Sample N° 1 Channel 11 (F = 2462 MHz) – Mode 802.11.n

Frequencies (MHz)	Detector P QP Av	RBW (kHz)	Field strength Measured at 3m (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
2383.4 (1)	P	1000	56.28	74	17.72
2383.4 (1)	Av	1000	49.45	54	4.55
2540.5	P	100	59	85.3	26.3
4924.4 (1)	P	1000	54.44	74	19.56
4924.4 (1)	Av	1000	43.2	54	10.8
7385.6 (1)	P	1000	53.1	74	20.9
7385.6 (1)	Av	1000	42.76	54	11.24

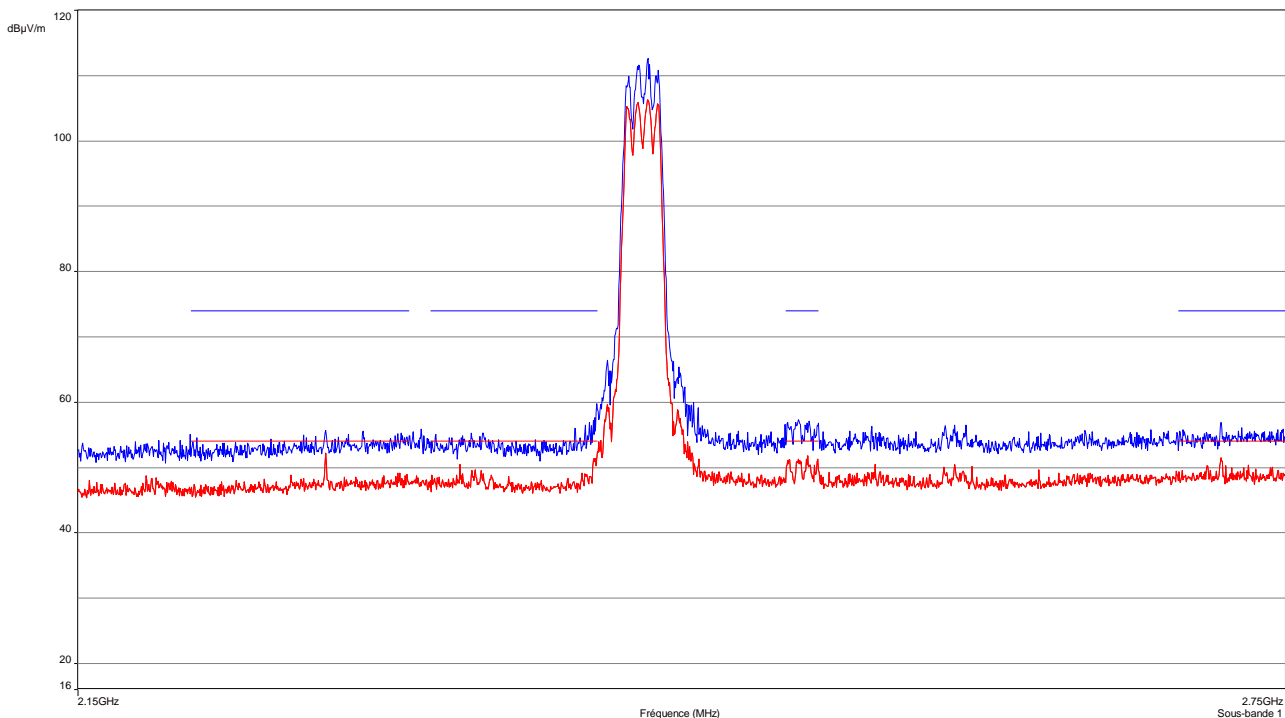
P= Peak, QP=Quasi-peak, Av=Average

(1) Restricted bands of operation in 15.205

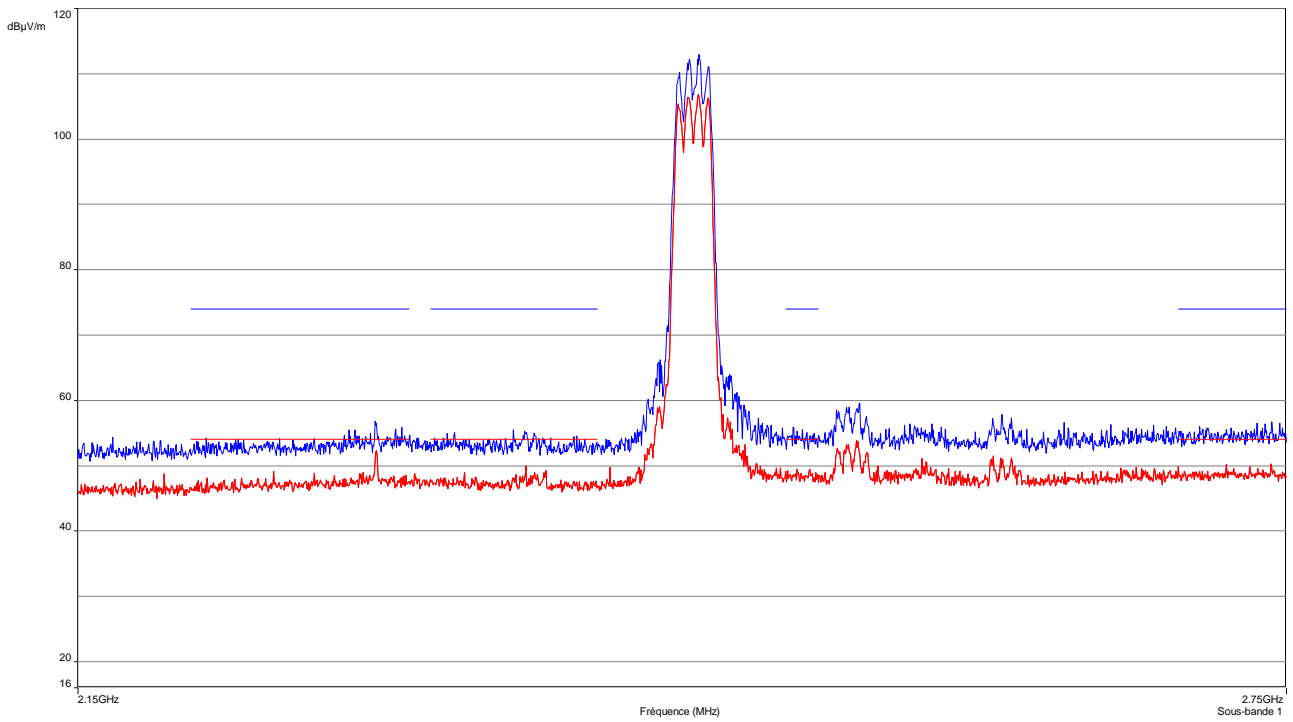
Band edge worst case measurement

The red curves are realized with only a RMS detector, the results obtained with the complete method 12.2.5.2 of the KDB 558074 (D01 DTS Meas Guidance) are reported on the table

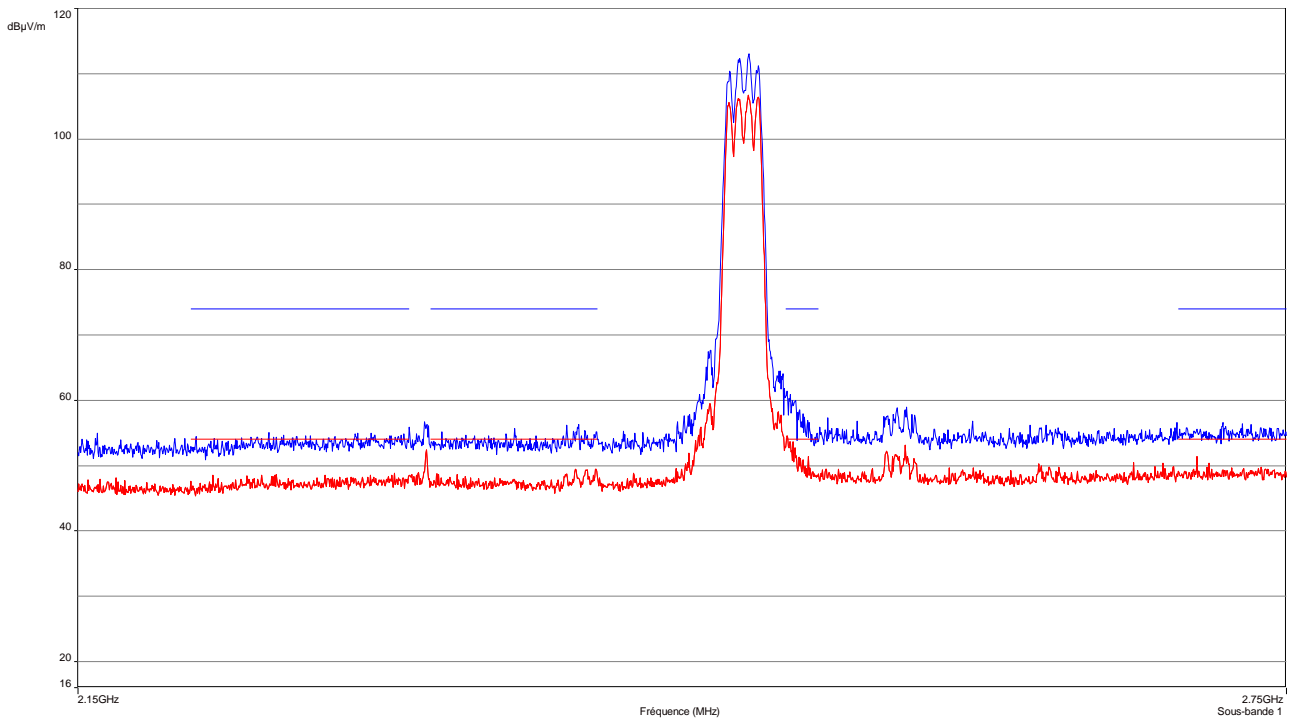
Low channel



Central Channel



High channel



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 105.3 dB μ V/m on channel 11.

So the applicable limit is 85.3 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)).

Test conclusion:

RESPECTED STANDARD

11. MAXIMUM PEAK CONDUCTED POWER DENSITY

Temperature (°C) : 22

Humidity (%HR): 40

Date : November 6, 2017

Technician : T. LEDRESSEUR

Standard: FCC Part 15**Test procedure:** paragraph 15.247 (e)**Method:** PKPSD (Peak PSD) method of paragraph 10.2 of KDB 558074**Test set up:**

The measure is realized in conducted mode with an analyser.

Span: 30 MHz

RBW: 3 kHz

VBW : 10 khz

Detector = peak.

Sweep time = auto couple.

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 in 802.11b, 802.11g and 802.11n modes.

We used for power source the internal fully charged battery

- According with KDB 662911 the antenna gain is calculated as follow:

Total gain = antenna gain (dBi) + array gain

With Array Gain = $10 \log(\text{NANT}/\text{NSS})$ dB = 3

NANT=2

NSS=1

Total gain = 3.8 +3 = 6.8 dBi

The limit is so reduced by 0.8 dBm in order to taken in account the amount in dB that the directional gain of the antenna exceeds 6 dBi

Results:

Sample N° 1 Channel 1 (F = 2412 MHz) – Mode 802.11.b

Power Spectral Density (dBm):		Sum of PSD (dBm/3kHz)	Limit (dBm/3kHz)
Chain 1	Chain 2		
-6.76		-6.76	7.2

Sample N° 1 Channel 6 (F = 2437 MHz) – Mode 802.11.b

Power Spectral Density (dBm/3kHz):		Sum of PSD (dBm/3kHz)	Limit (dBm/3kHz)
Chain 1	Chain 2		
-6.57		-6.57	7.2

Sample N° 1 Channel 11 (F = 2462 MHz) – Mode 802.11.b

Power Spectral Density (dBm/3kHz):		Sum of PSD (dBm/3kHz)	Limit (dBm/3kHz)
Chain 1	Chain 2		
-6.34		-6.34	7.2

Sample N° 1 Channel 1 (F = 2412 MHz) – Mode 802.11.g

Power Spectral Density (dBm/3kHz):		Sum of PSD (dBm/3kHz)	Limit (dBm/3kHz)
Chain 1	Chain 2		
-12.79	-14.07	-10.37	7.2

Sample N° 1 Channel 6 (F = 2437 MHz) – Mode 802.11.g

Power Spectral Density (dBm/3kHz):		Sum of PSD (dBm/3kHz)	Limit (dBm/3kHz)
Chain 1	Chain 2		
-12.62	-13.78	-10.15	7.2

Sample N° 1 Channel 11 (F = 2462 MHz) – Mode 802.11.g

Power Spectral Density (dBm/3kHz):		Sum of PSD (dBm/3kHz)	Limit (dBm/3kHz)
Chain 1	Chain 2		
-12.39	-13.27	-9.8	7.2

Sample N° 1 Channel 1 (F = 2412 MHz) – Mode 802.11.n

Power Spectral Density (dBm/3kHz):		Sum of PSD (dBm/3kHz)	Limit (dBm/3kHz)
Chain 1	Chain 2		
-12.59	-13.69	-10.09	7.2

Sample N° 1 Channel 6 (F = 2437 MHz) – Mode 802.11.n

Power Spectral Density (dBm/3kHz):		Sum of PSD (dBm/3kHz)	Limit (dBm/3kHz)
Chain 1	Chain 2		
-12.75	-13.74	-10.21	7.2

Sample N° 1 Channel 11 (F = 2462 MHz) – Mode 802.11.n

Power Spectral Density (dBm/3kHz):		Sum of PSD (dBm/3kHz)	Limit (dBm/3kHz)
Chain 1	Chain 2		
-12.72	-13.6	-10.13	7.2

Test conclusion:

RESPECTED STANDARD

□□□ End of report, 5 annexes to be forwarded □□□

APPENDIX 1: Test equipment list

Additional provisions to the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Antenna 3115	EMCO	8535
Multimeter 177	Fluke	14476
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

Maximum peak conducted output power

TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Spectrum Analyzer FSL 18	Rohde & Schwarz	14539
Spectrum Analyzer ESU 8	Rohde & Schwarz	9403
Wideband sensor Z86	Rohde & Schwarz	11592
Multimeter 177	Fluke	14476
Meteo station WS-9232	La Crosse Technology	8750

Intentional radiator

TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	EMITECH	8593
Open test site	EMITECH	8732
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Test receiver ES17	Rohde & Schwarz	8707
Biconical antenna VHBB 9124	Schwarzbeck	8526
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Log periodic antenna HL223	Rohde & Schwarz	7190
Antenna 3115	EMCO	8535
Antenna M3160-09	ETS-Lindgren	8786
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier S005180M3201	LUCIX Corp.	10739
Low-noise amplifier S180265L3201 LNA	LUCIX Corp.	8704
Low pass filter LP03/1000-7GH	Filtek	4087
Band reject Filter BRM50702	Microtronics	7299
Multimeter 177	Fluke	14476
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

Maximum Peak conducted power density

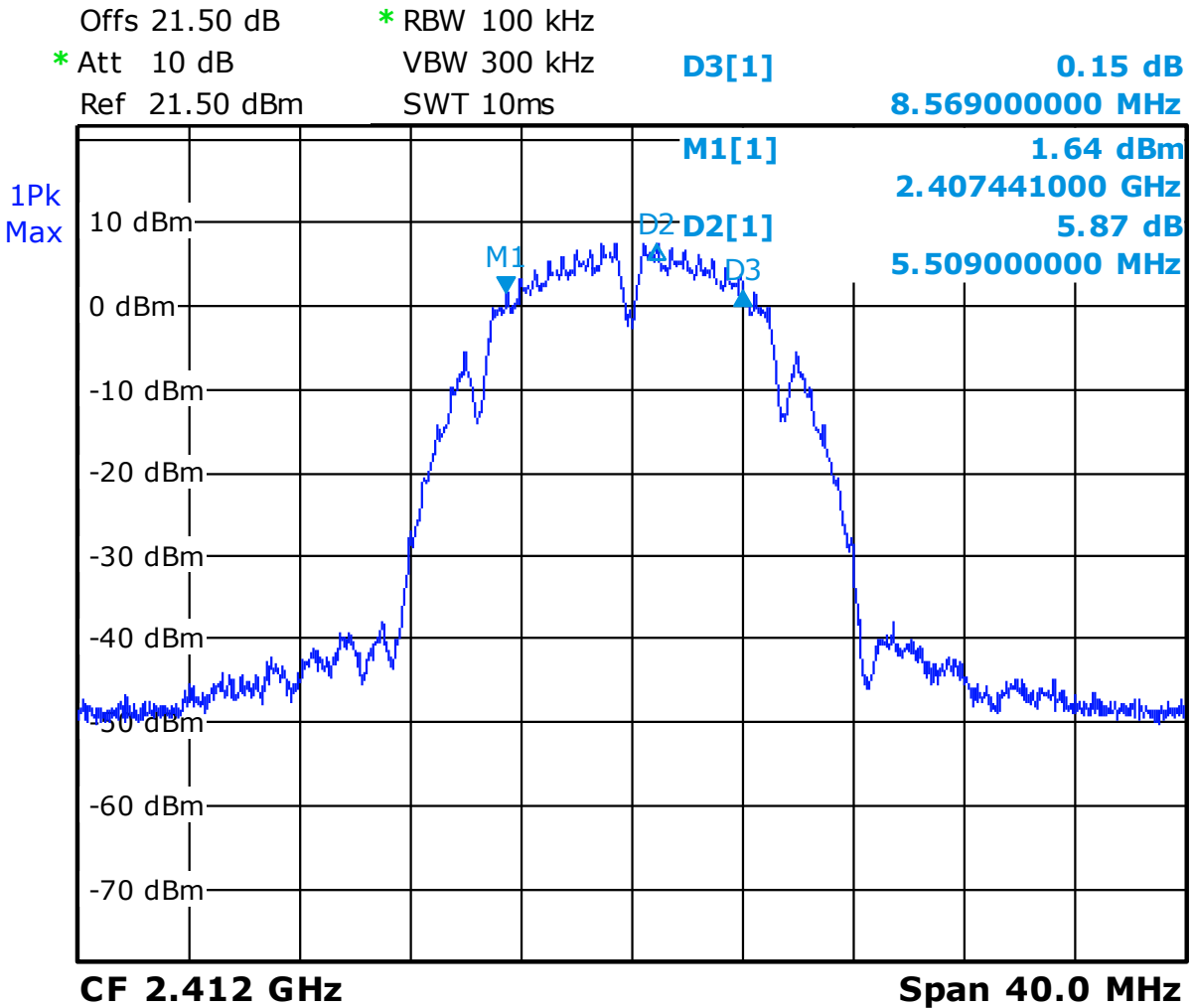
TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Spectrum Analyzer FSL 18	Rohde & Schwarz	14539
Spectrum Analyzer ESU 8	Rohde & Schwarz	9403
Attenuator 20 dB DC-18GHz 20dB	Midwest Microwave	8549
Multimeter 177	Fluke	14476
Meteo station WS-9232	La Crosse Technology	8750

Bandwidth and band edge

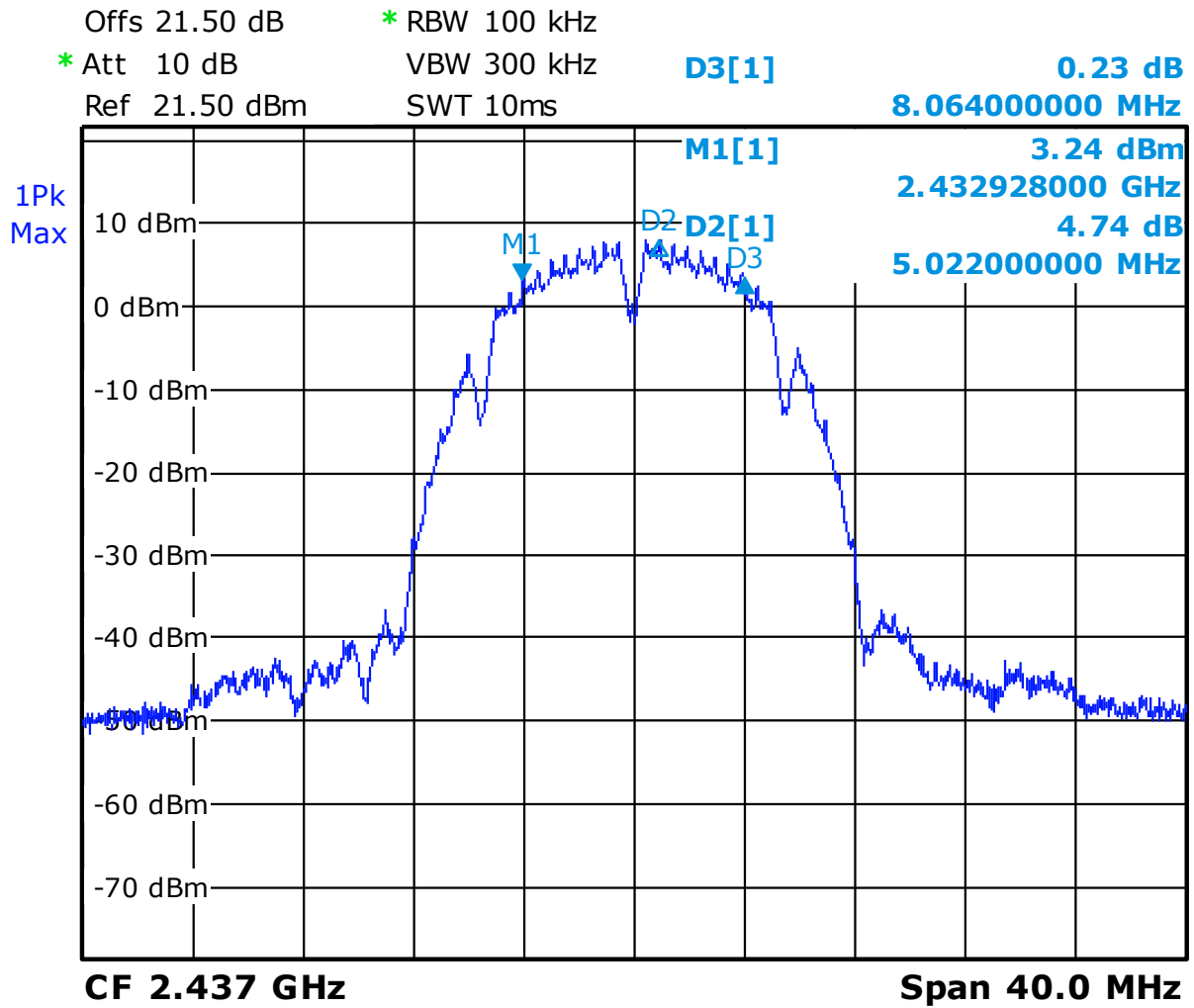
TYPE	MANUFACTURER	EMITECH NUMBER
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Spectrum Analyzer FSL 18	Rohde & Schwarz	14539
Spectrum Analyzer ESU 8	Rohde & Schwarz	9403
Attenuator 20 dB DC-18GHz 20dB	Midwest Microwave	8549
Multimeter 177	Fluke	14476
Meteo station WS-9232	La Crosse Technology	8750

APPENDIX 2: 6 dB bandwidth

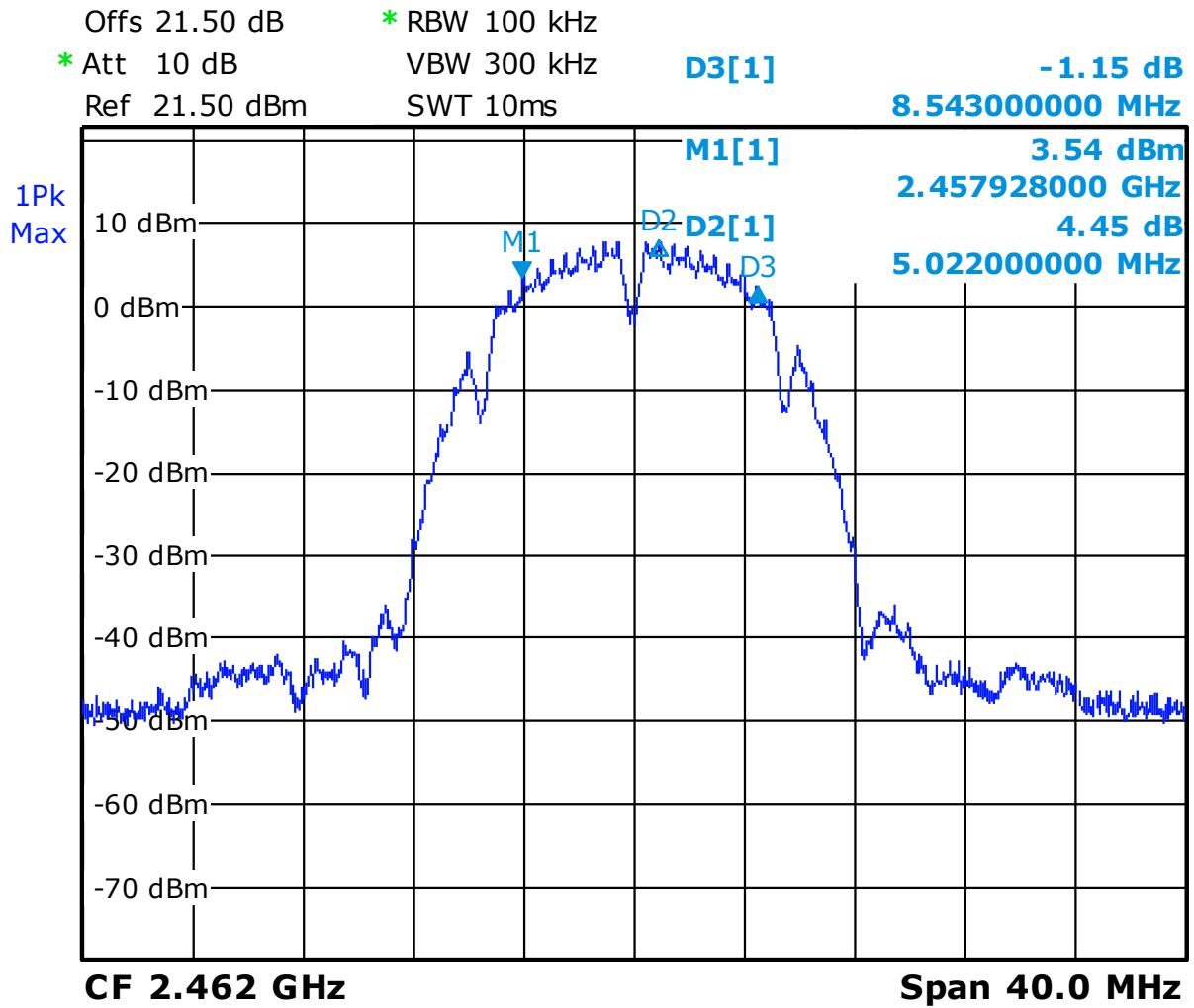
Low Channel – Mode 802.11.b – RF 1



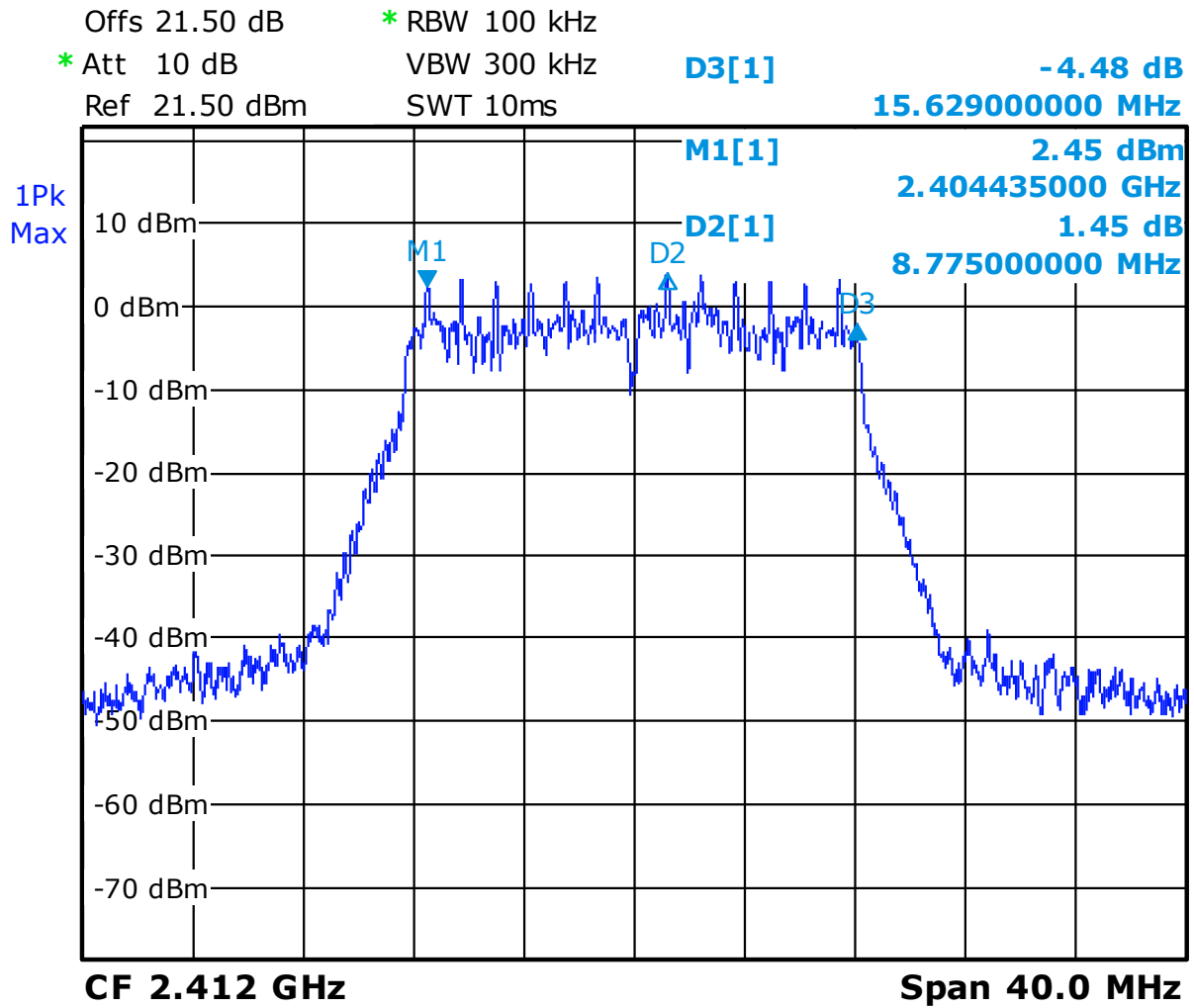
Central Channel – Mode 802.11.b – RF 1



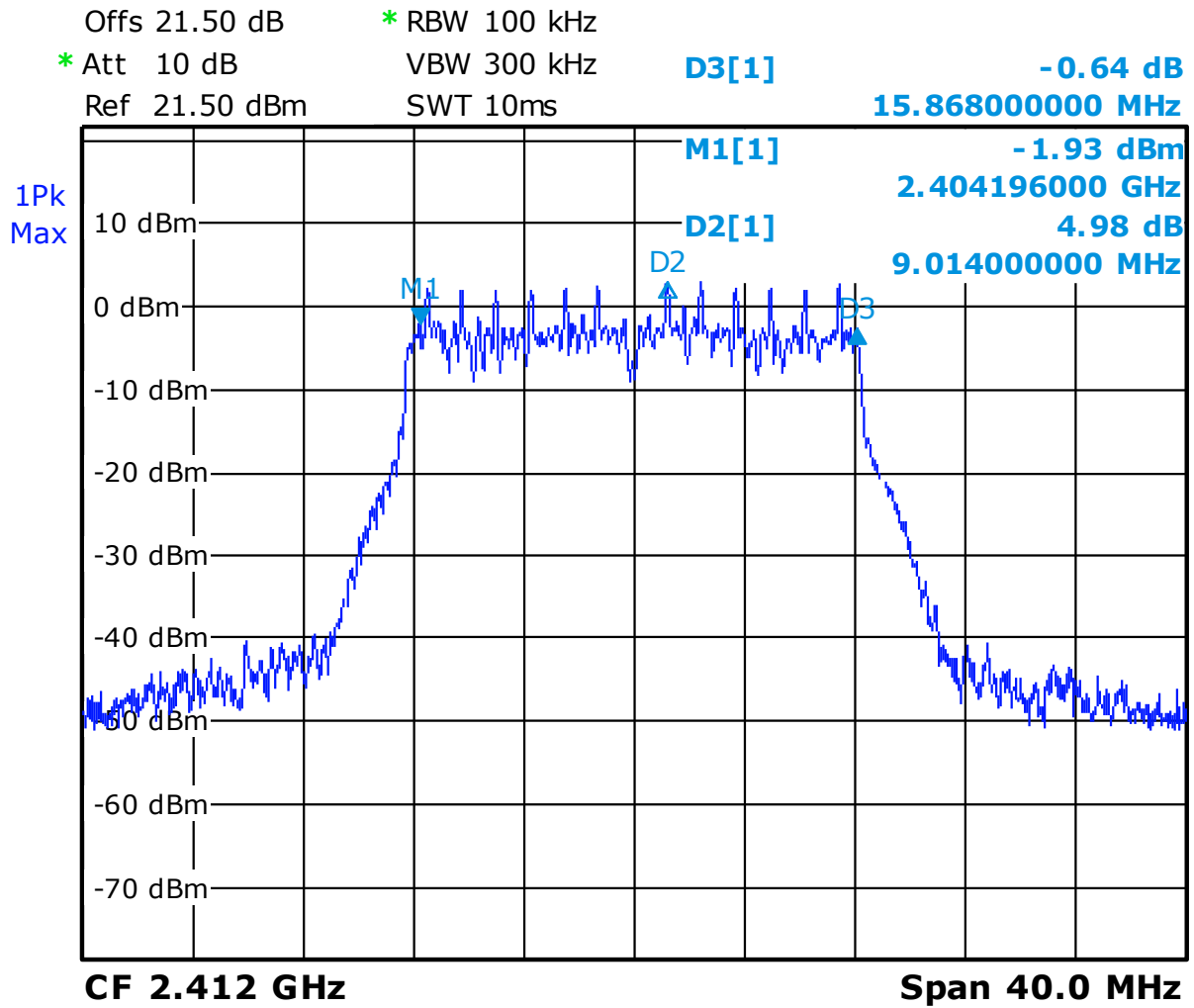
High Channel – Mode 802.11.b – RF 1



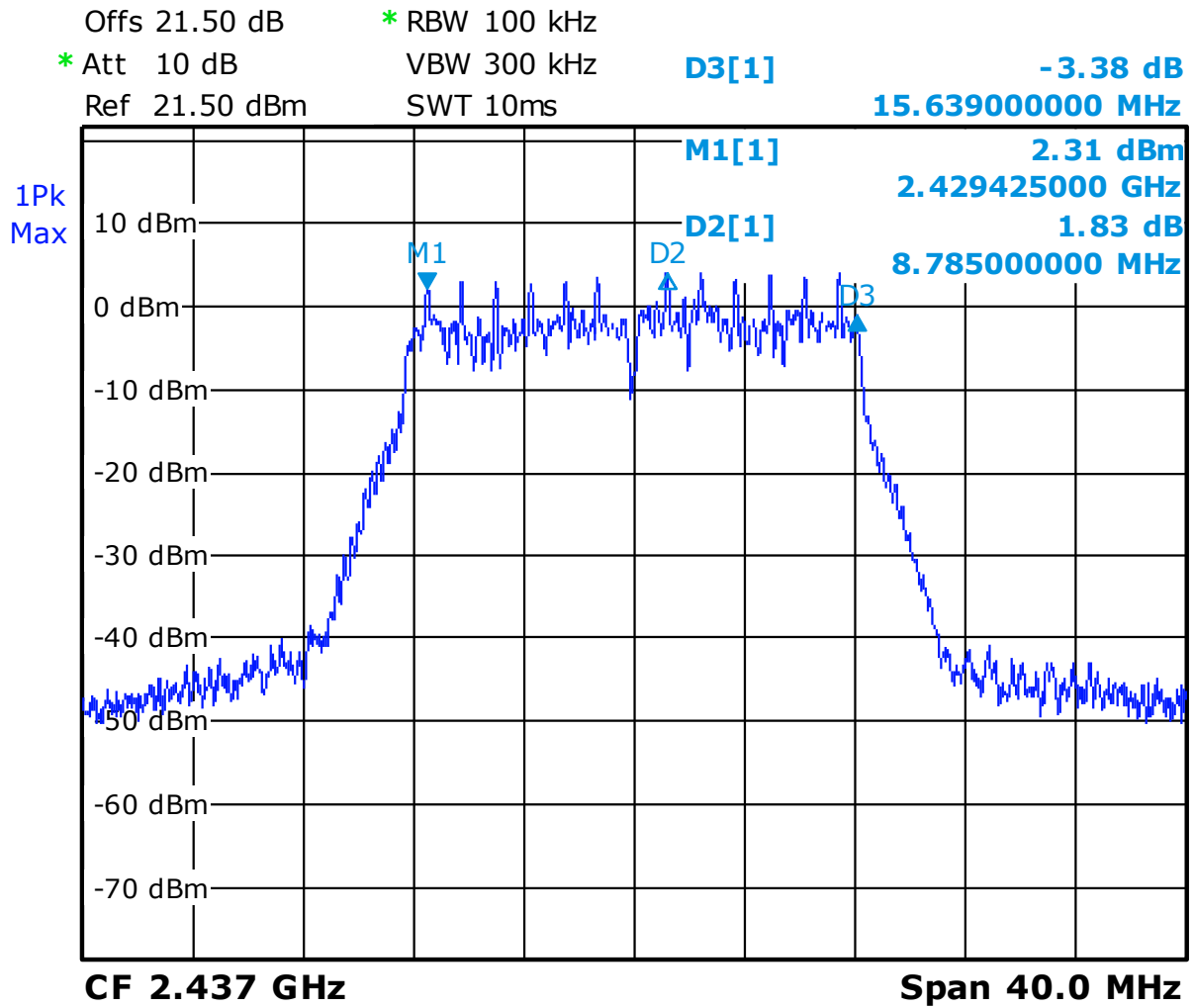
Low Channel – Mode 802.11.g – RF 1



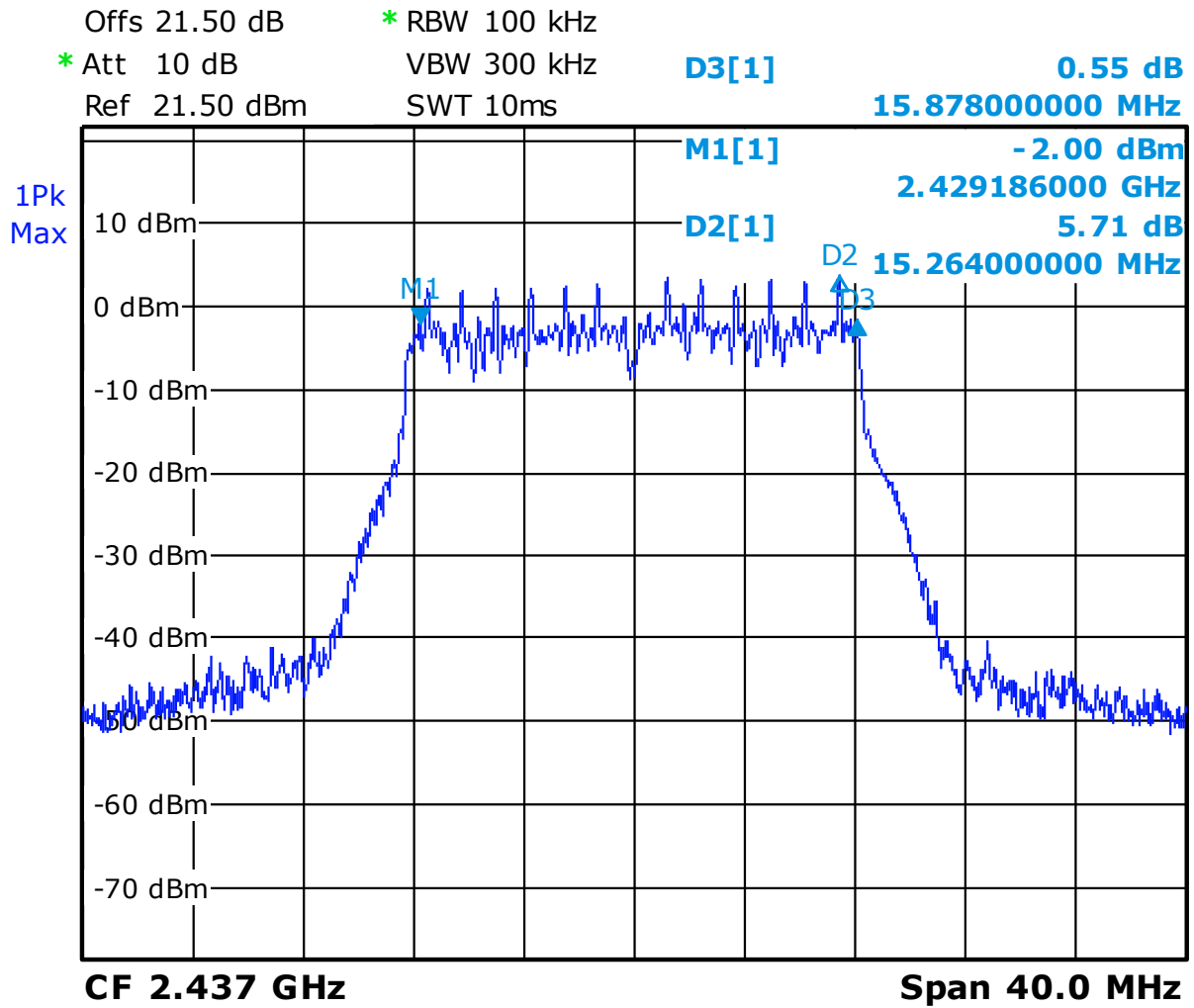
Low Channel – Mode 802.11.g – RF 2



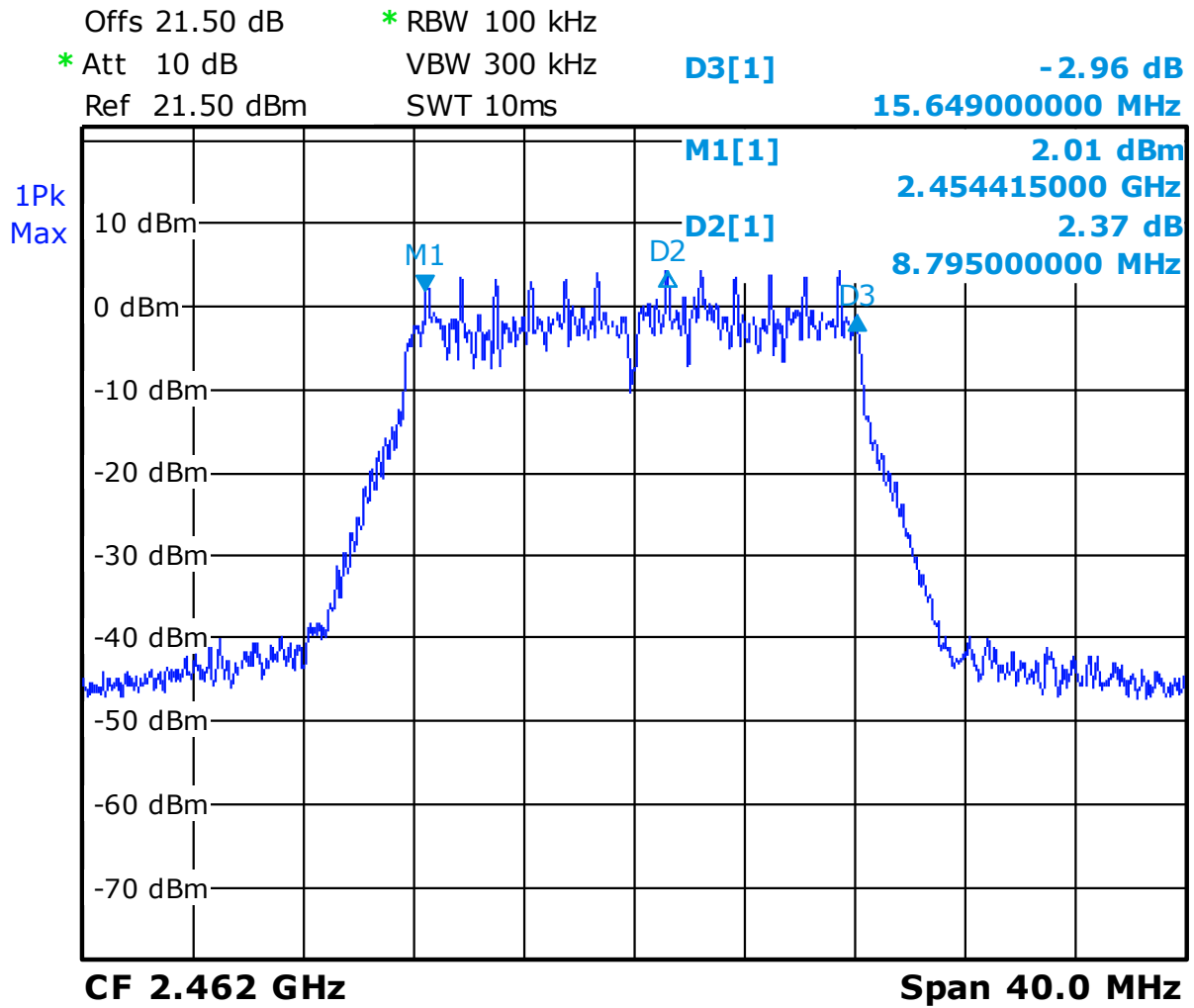
Central Channel – Mode 802.11.g – RF 1



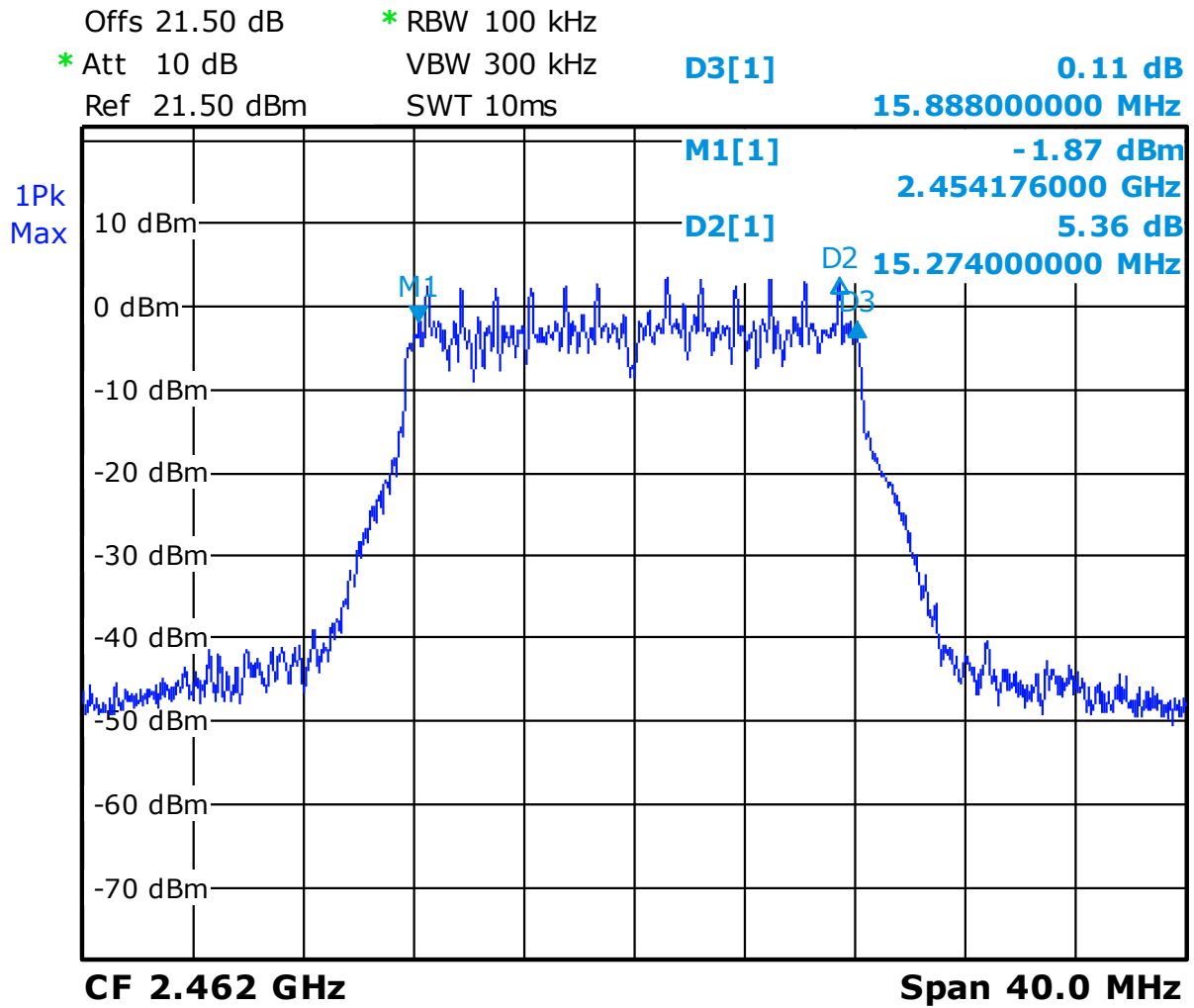
Central Channel – Mode 802.11.g – RF 2



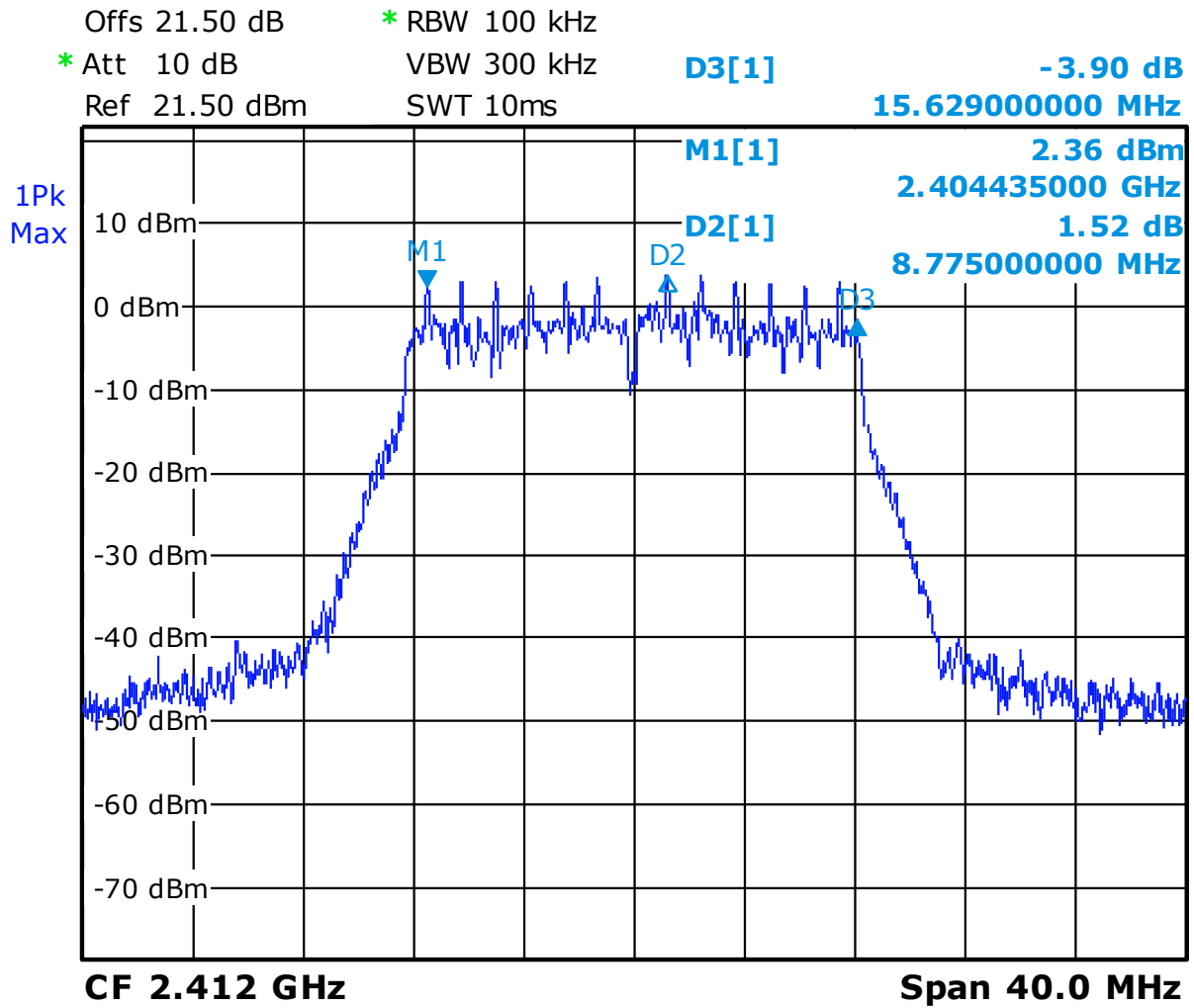
High Channel – Mode 802.11.g – RF 1



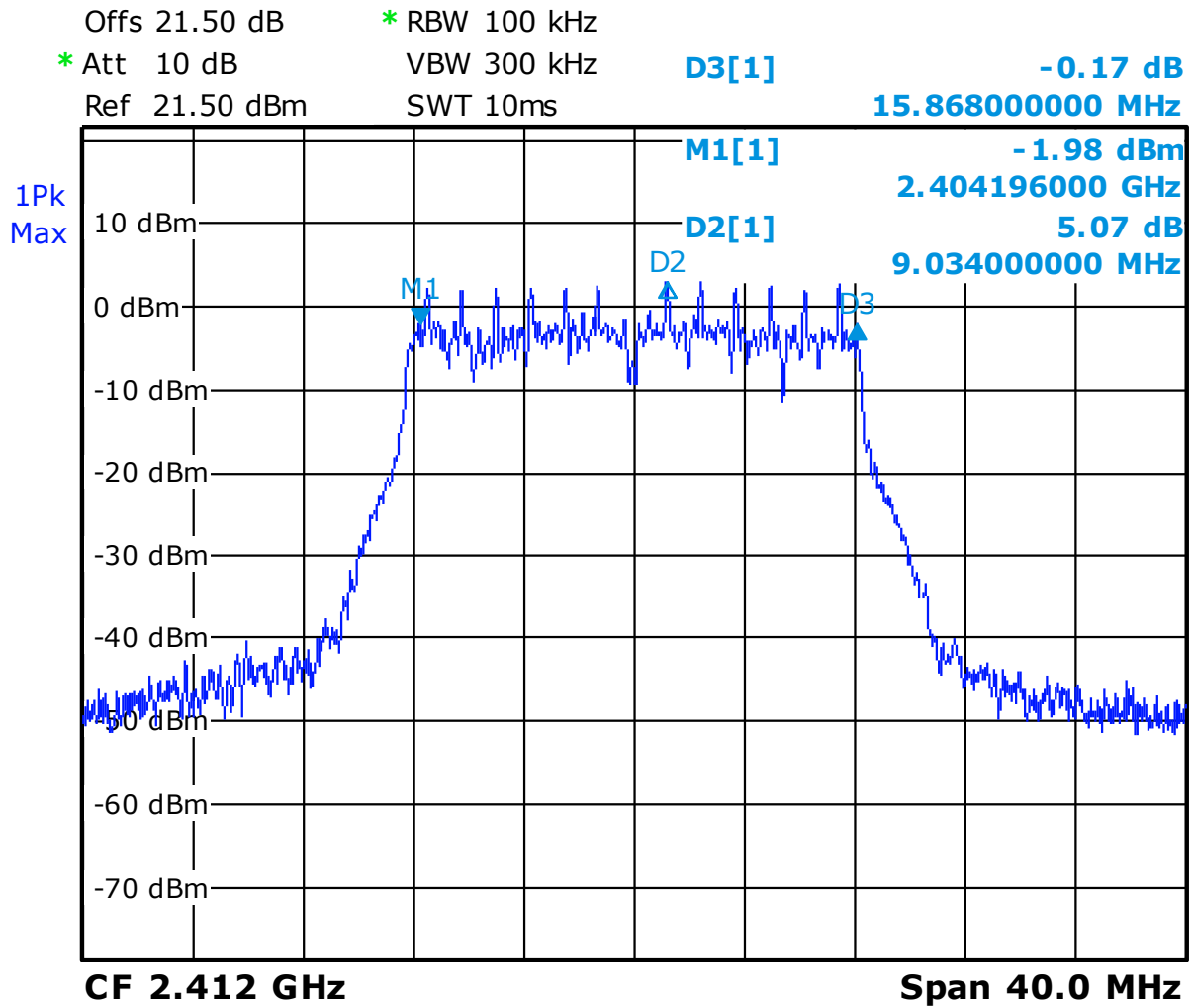
High Channel – Mode 802.11.g – RF 2



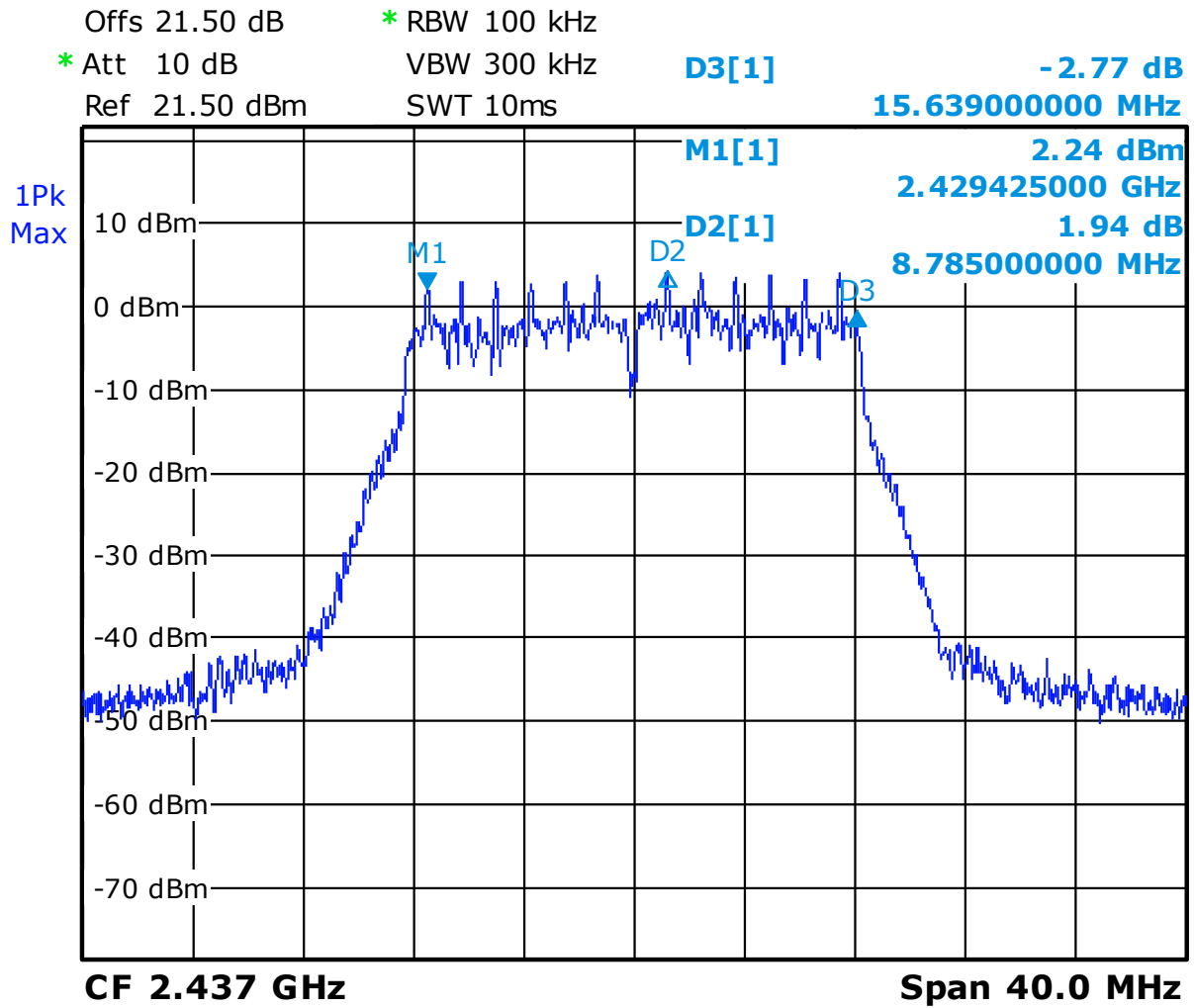
Low Channel – Mode 802.11.n – RF1



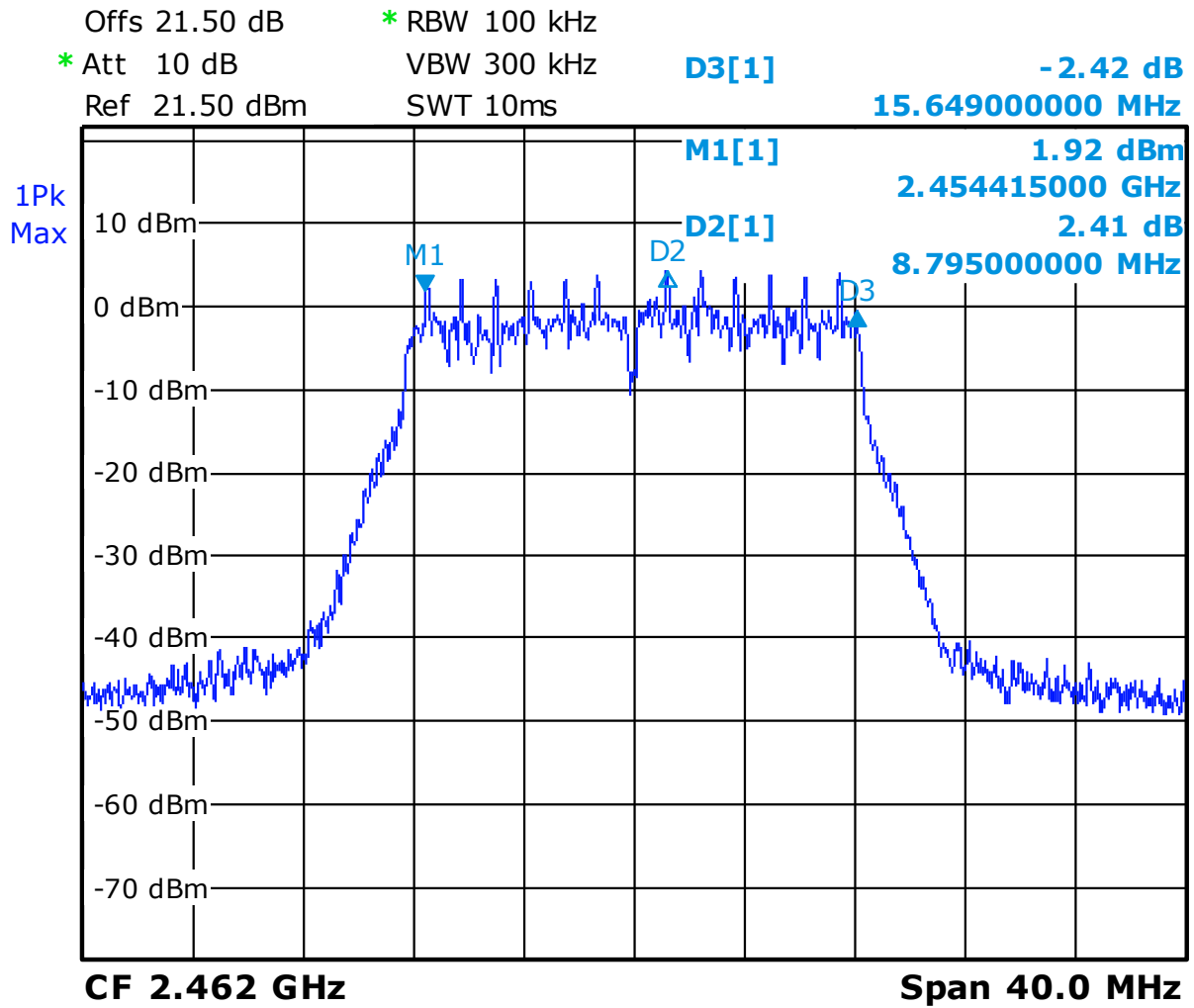
Low Channel – Mode 802.11.n – RF2



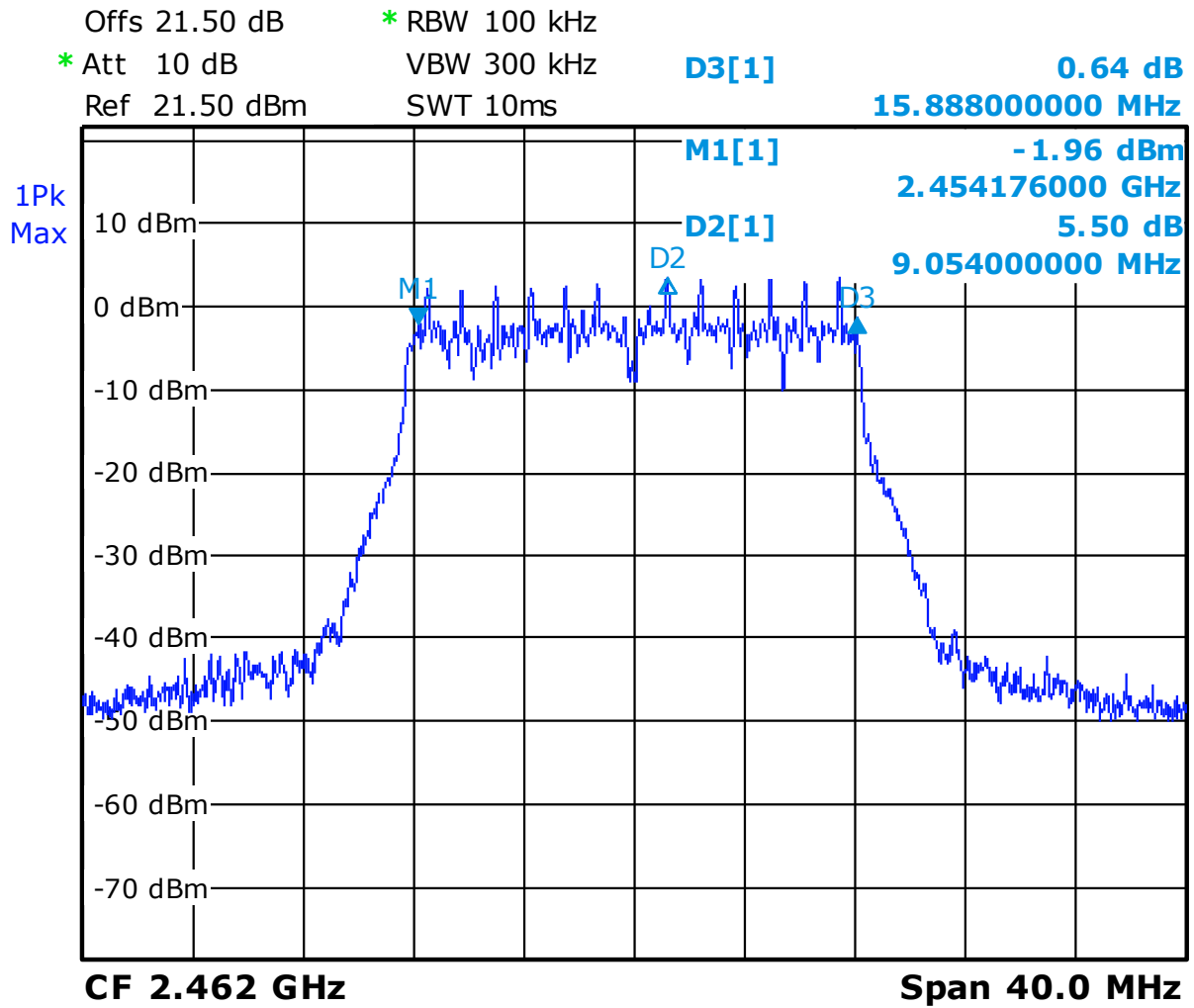
Central Channel – Mode 802.11.n – RF1



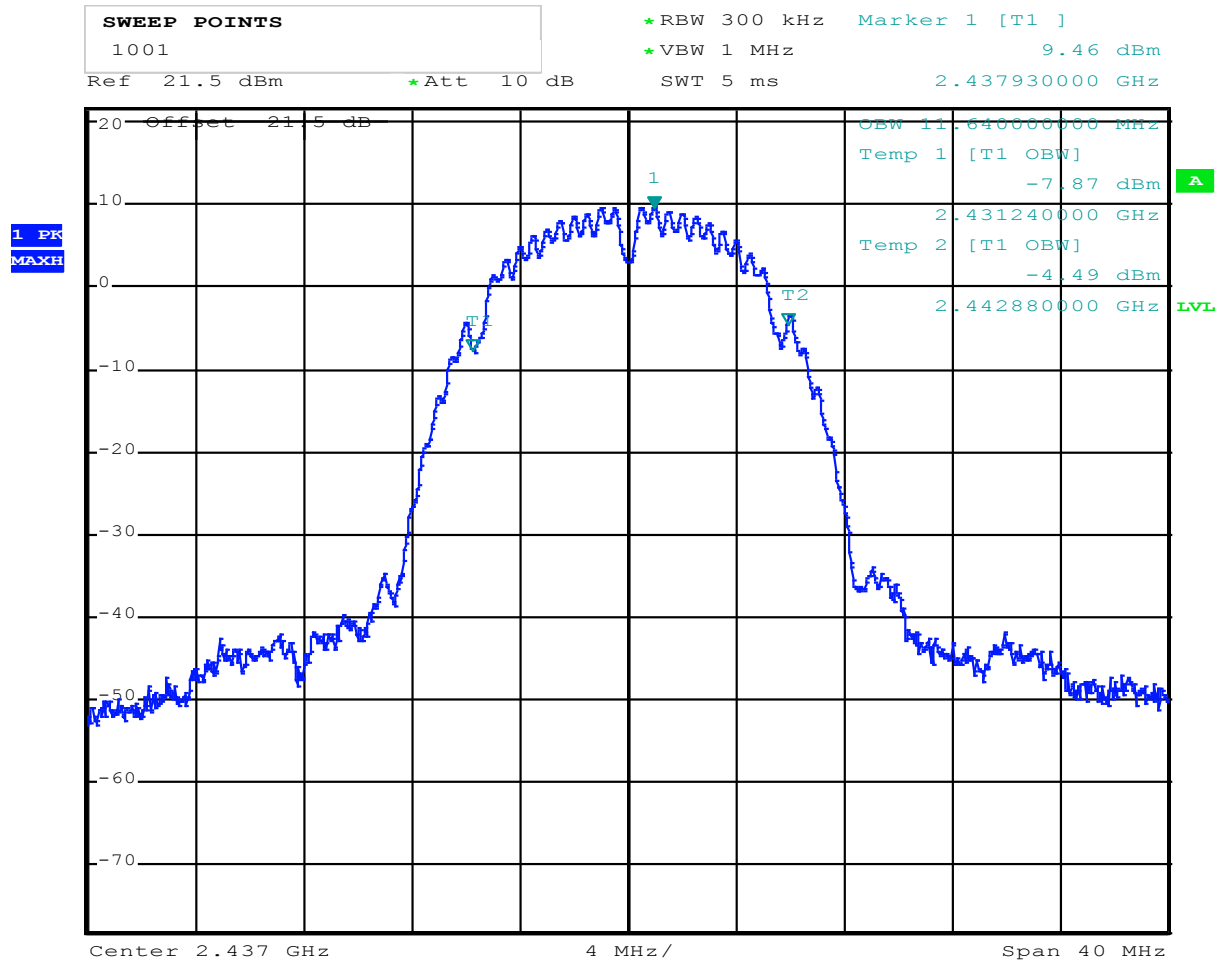
High Channel – Mode 802.11.n – RF1



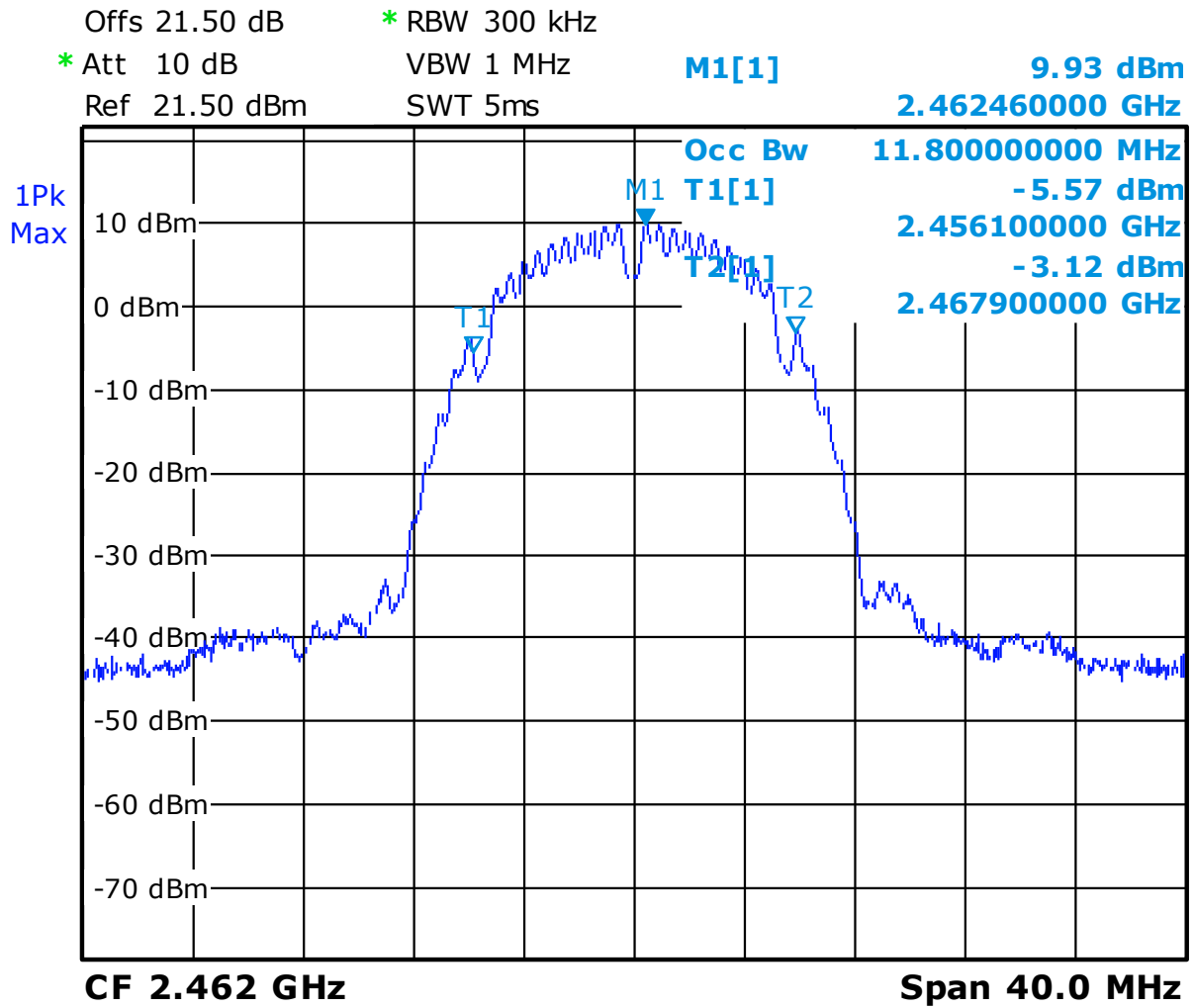
High Channel – Mode 802.11.n – RF2



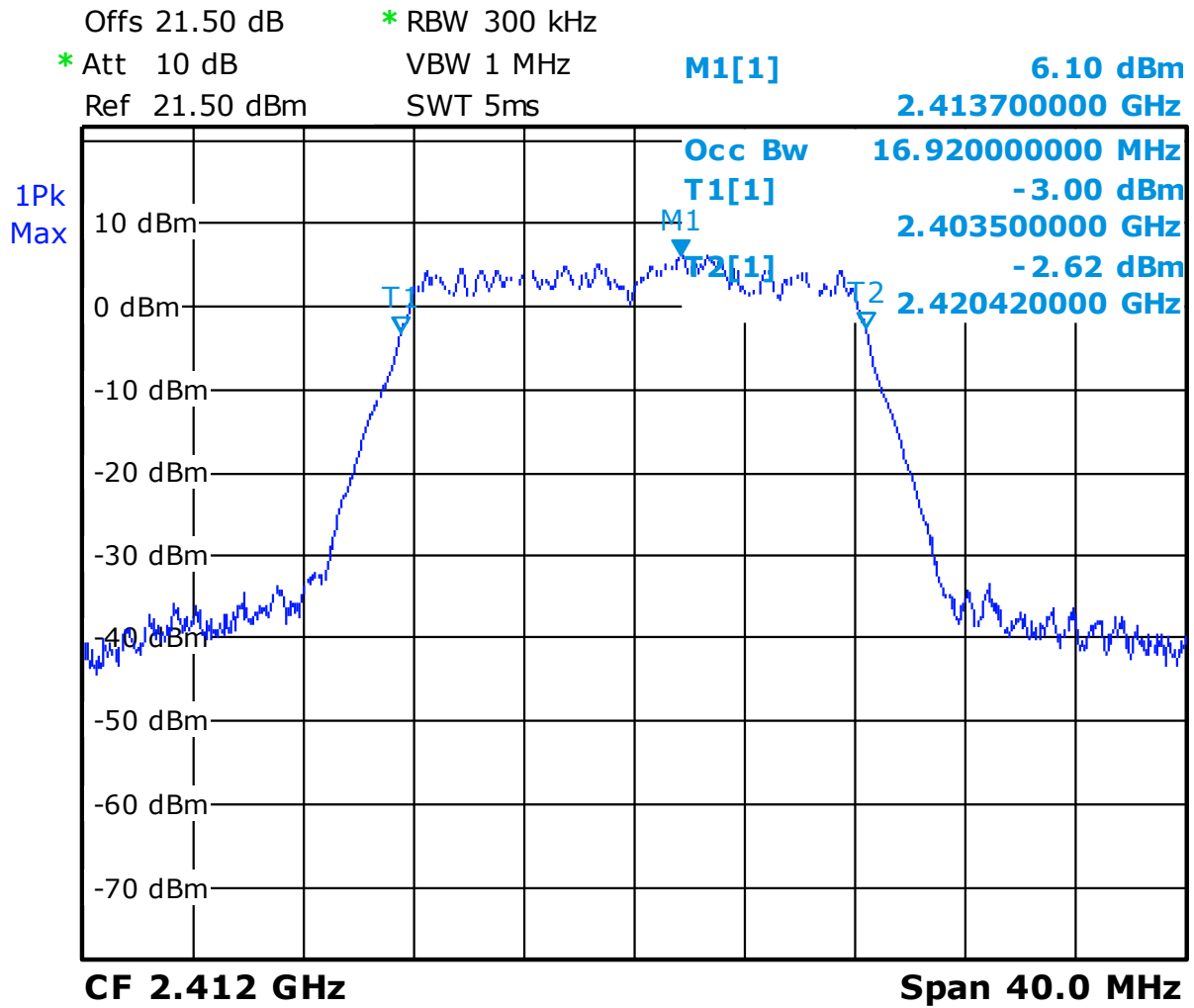
Central Channel – Mode 802.11.b – RF 1



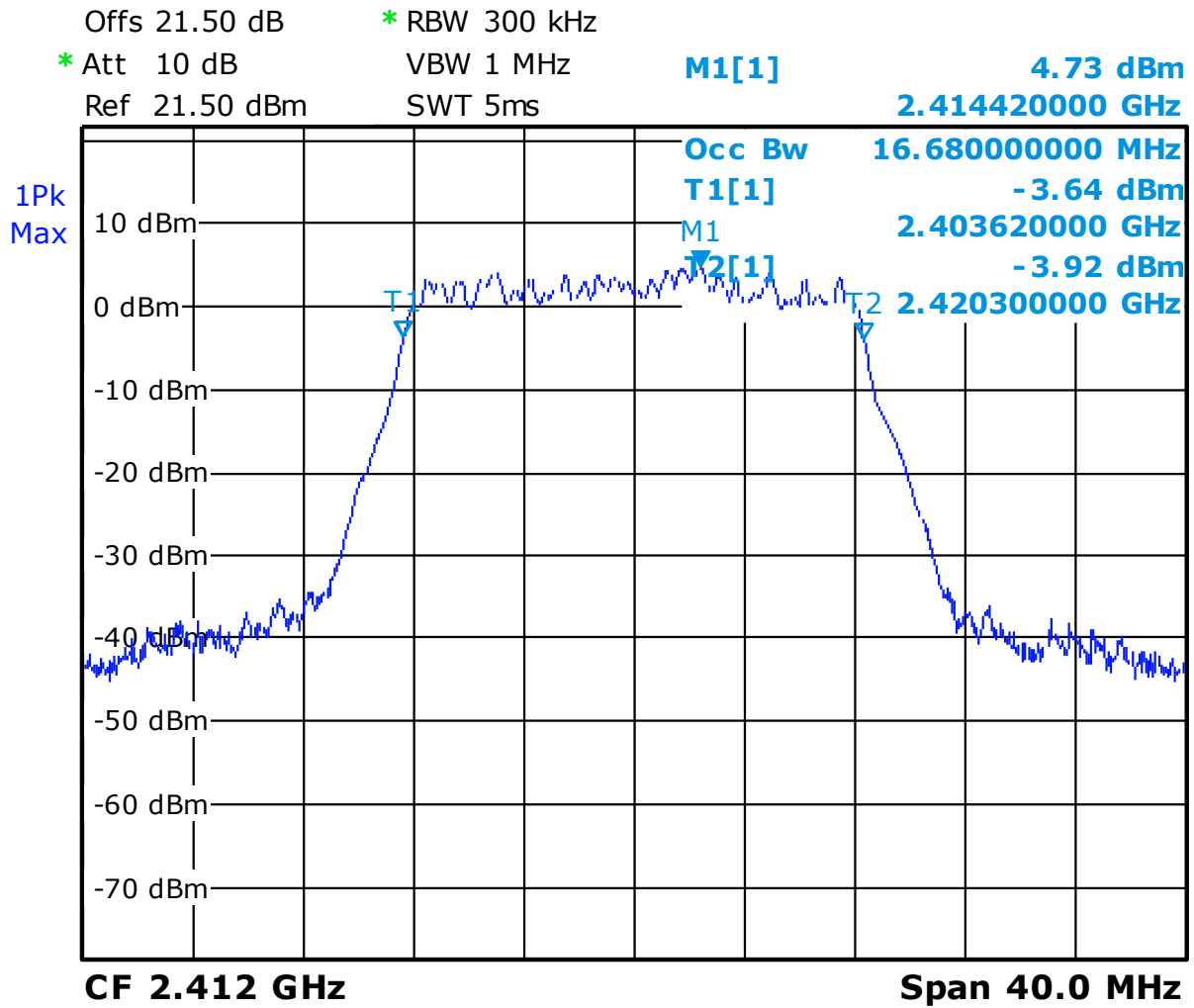
High Channel – Mode 802.11.b – RF 1



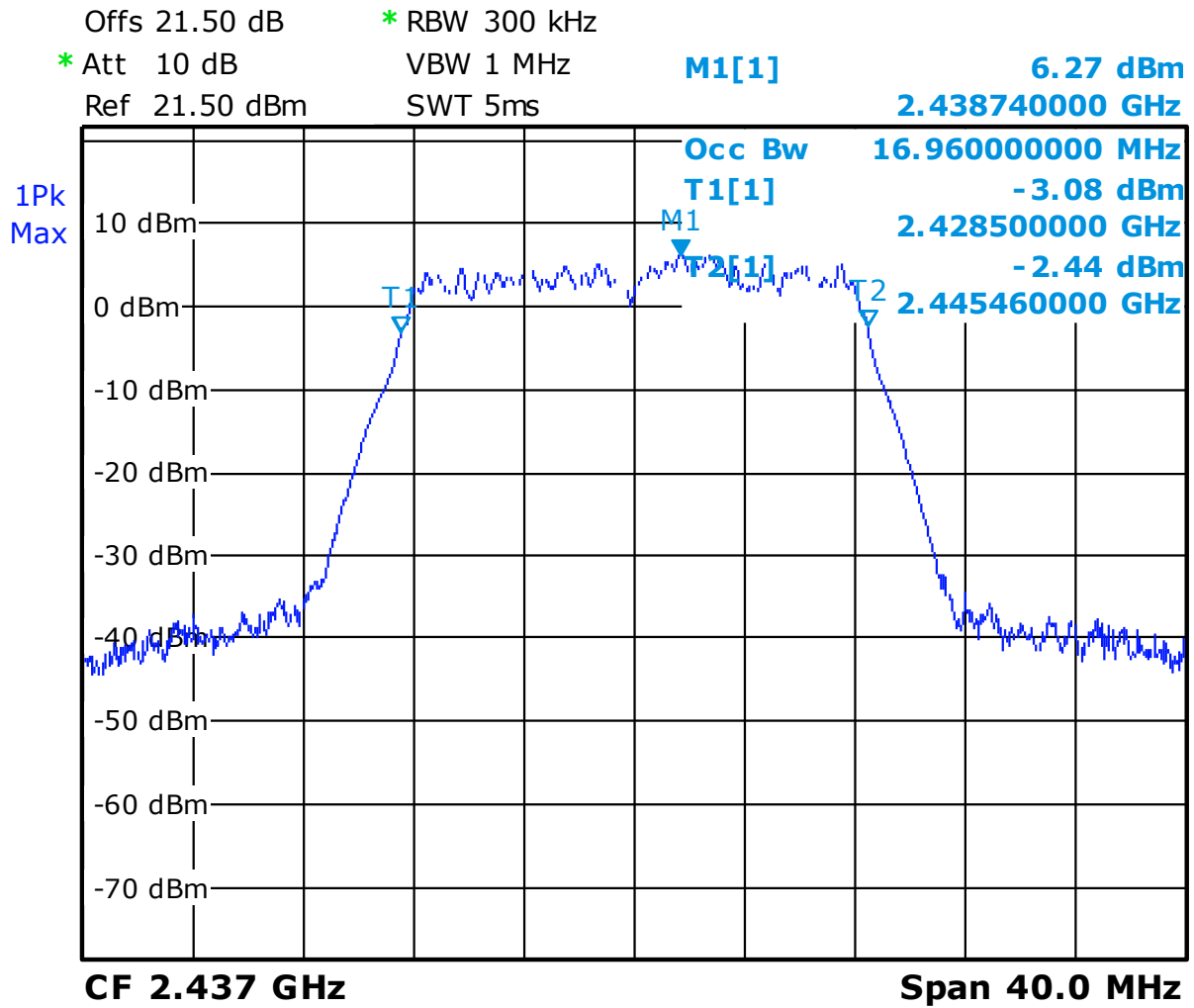
Low Channel – Mode 802.11.g – RF 1



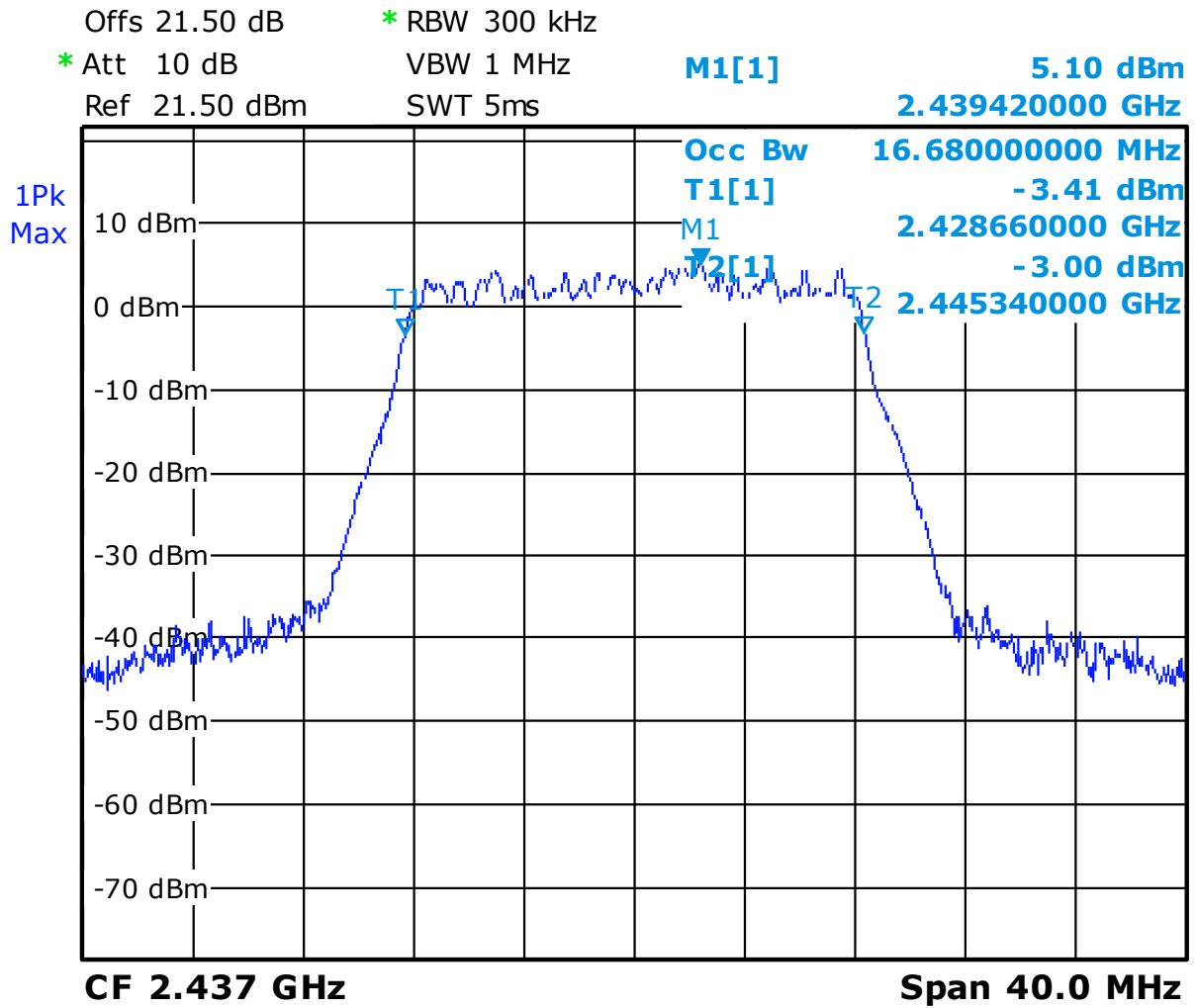
Low Channel – Mode 802.11.g – RF 2



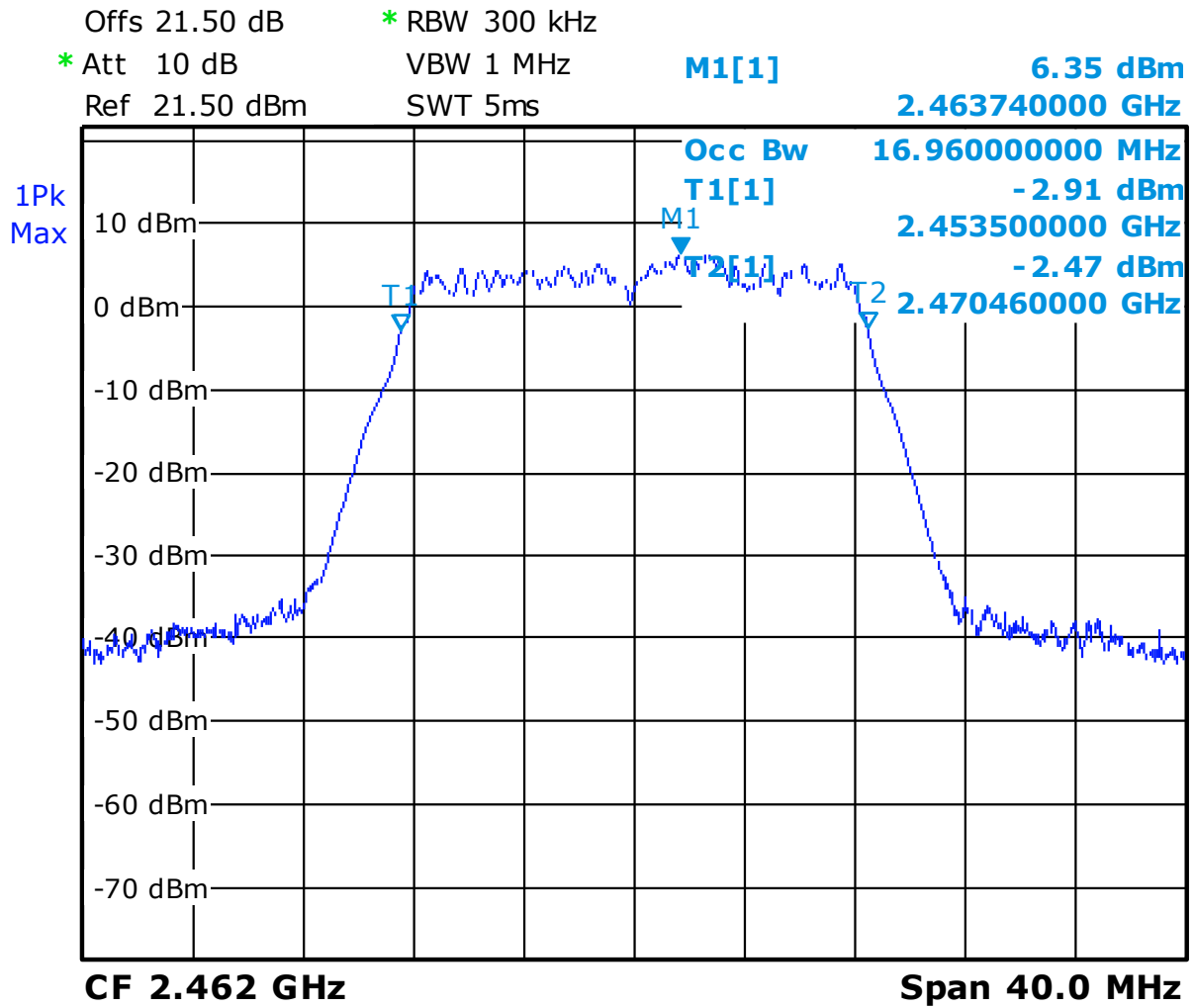
Central Channel – Mode 802.11.g – RF 1



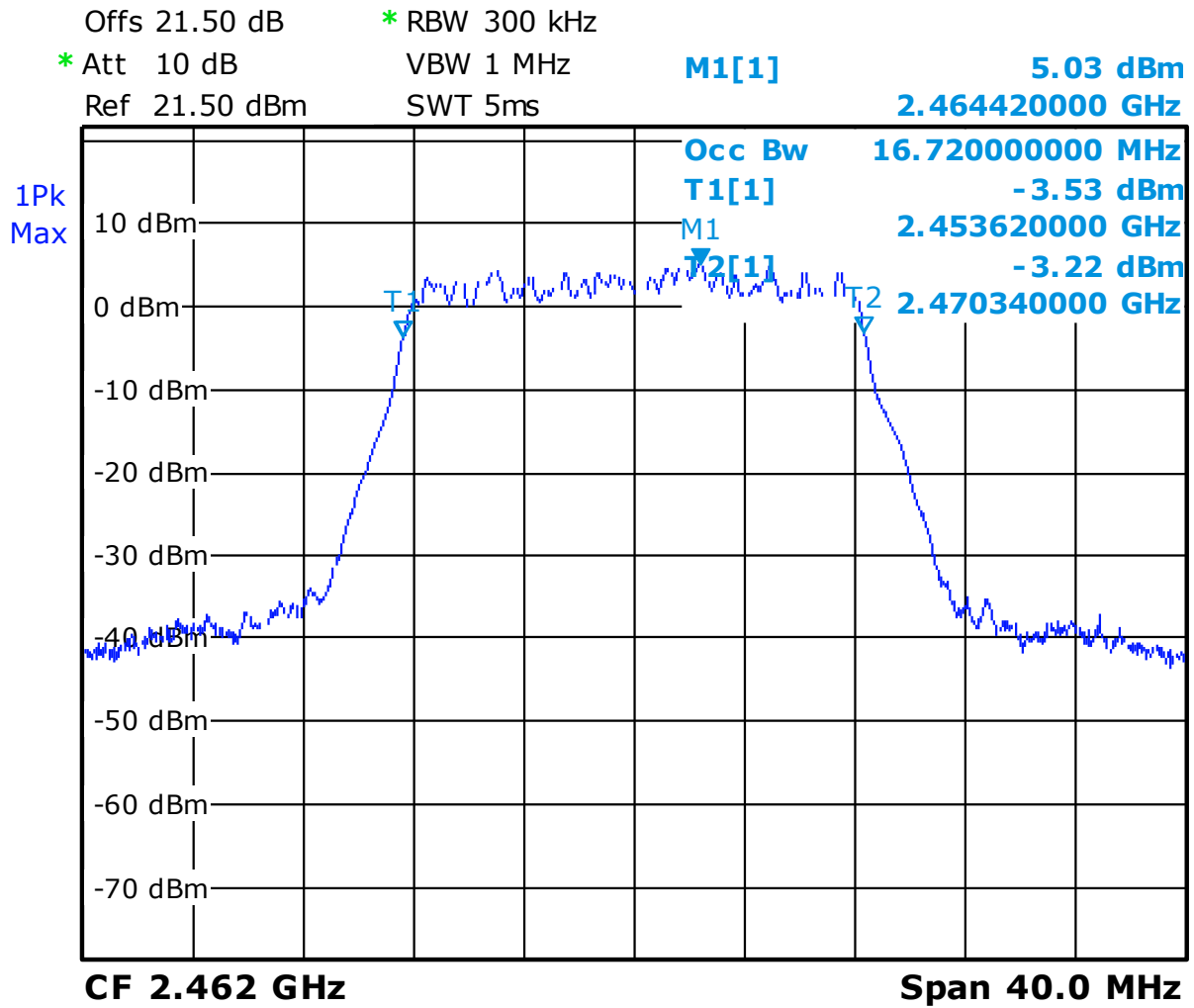
Central Channel – Mode 802.11.g – RF 2



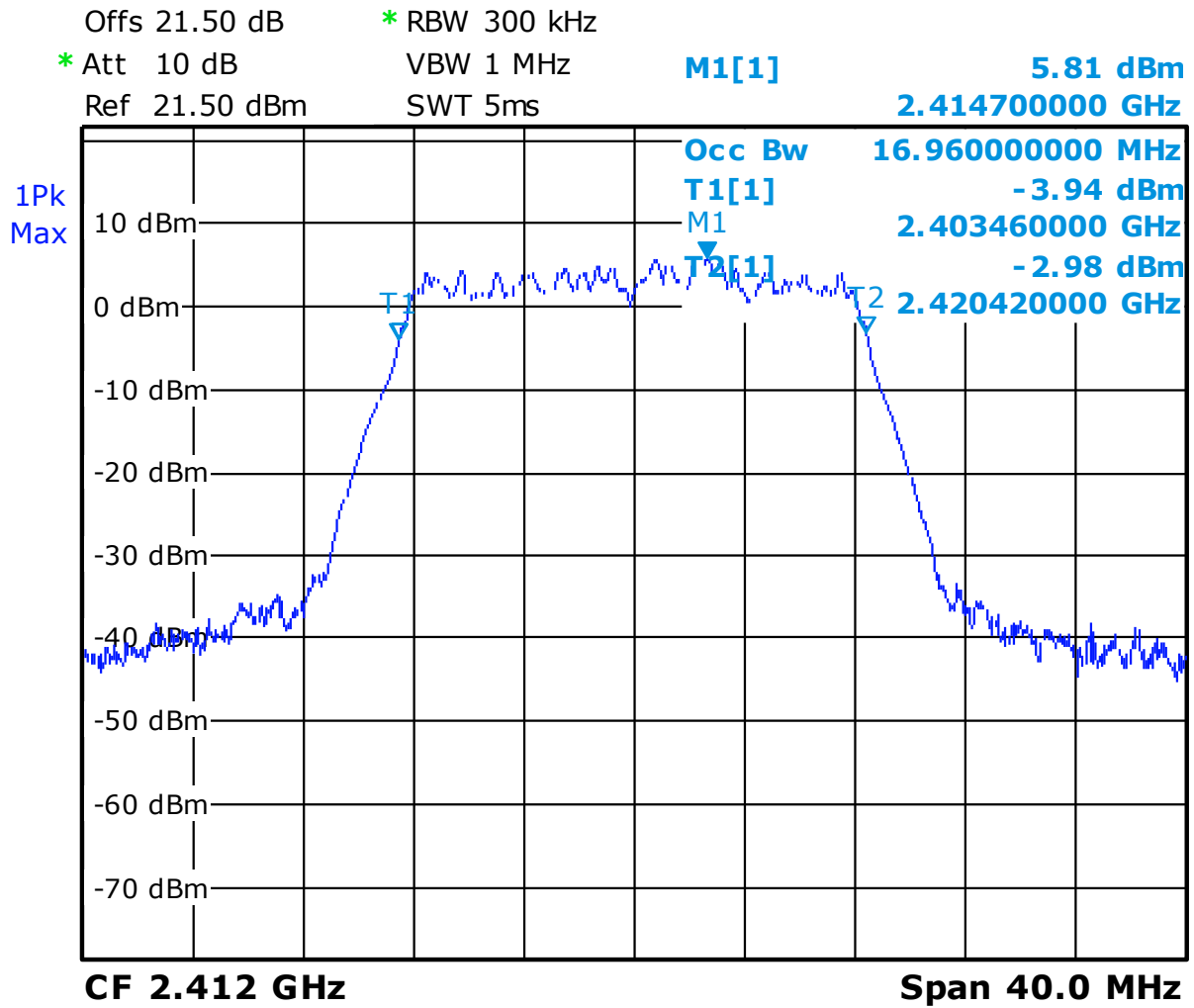
High Channel – Mode 802.11.g – RF 1



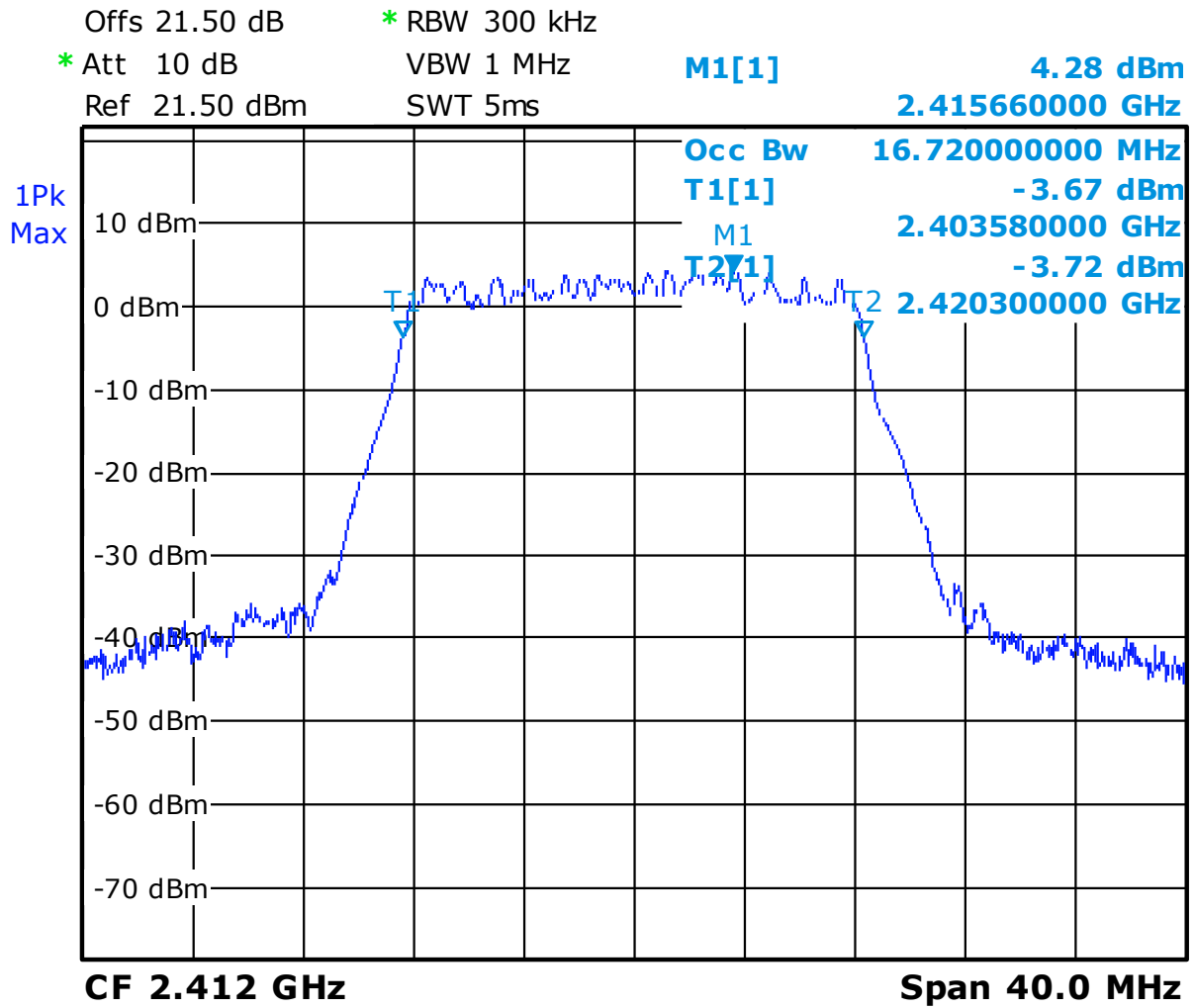
High Channel – Mode 802.11.g – RF 2



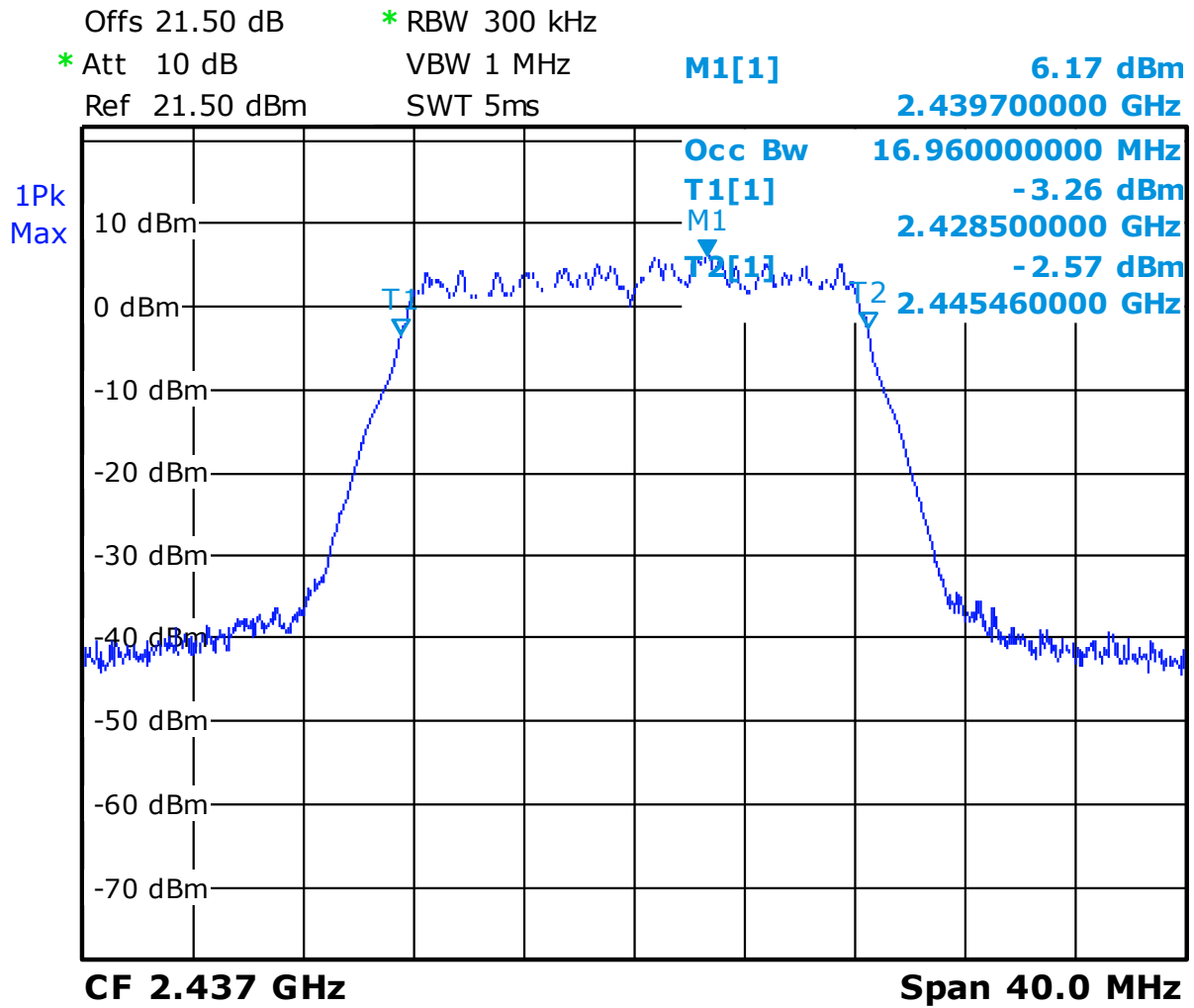
Low Channel – Mode 802.11.n – RF1



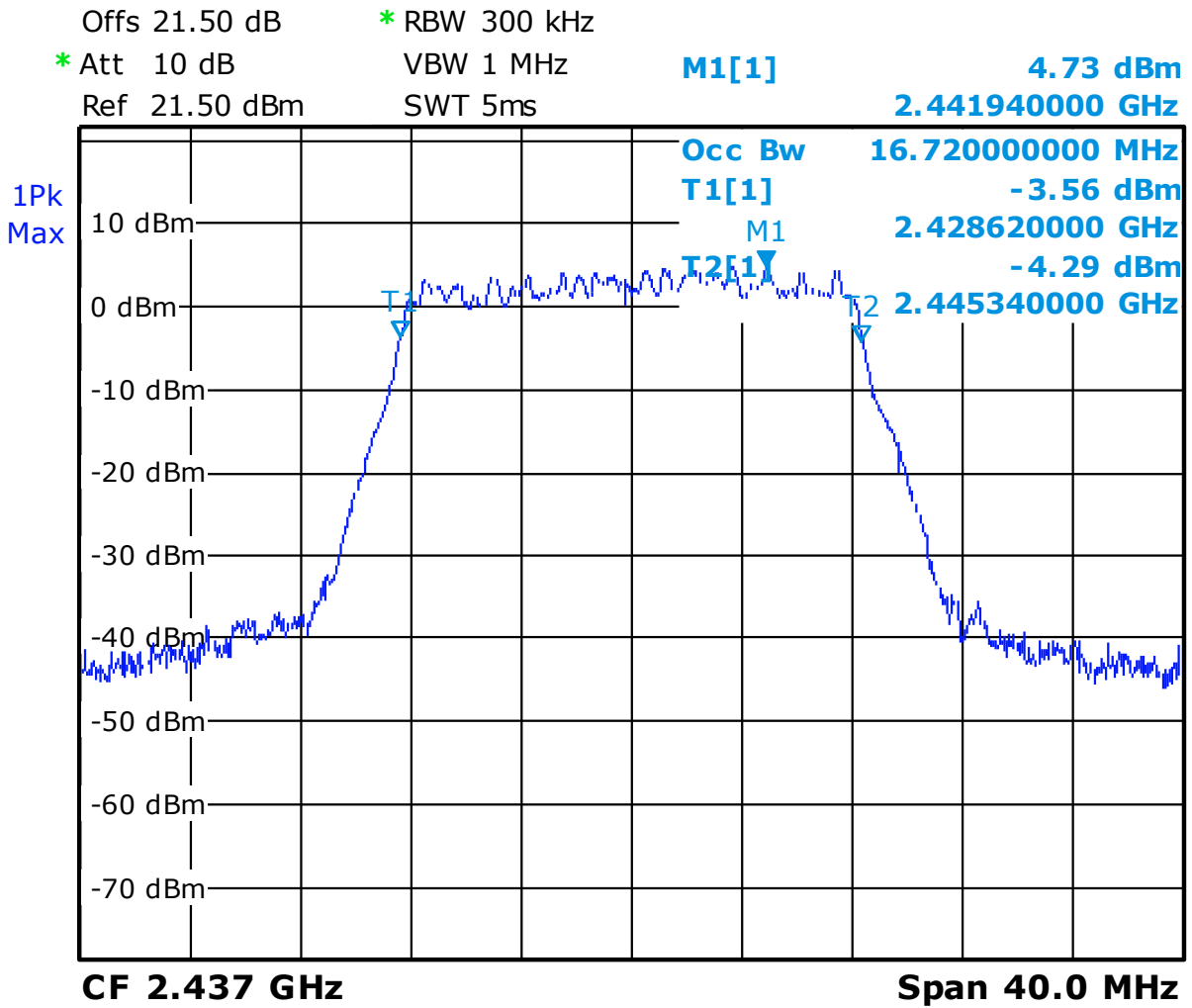
Low Channel – Mode 802.11.n – RF2



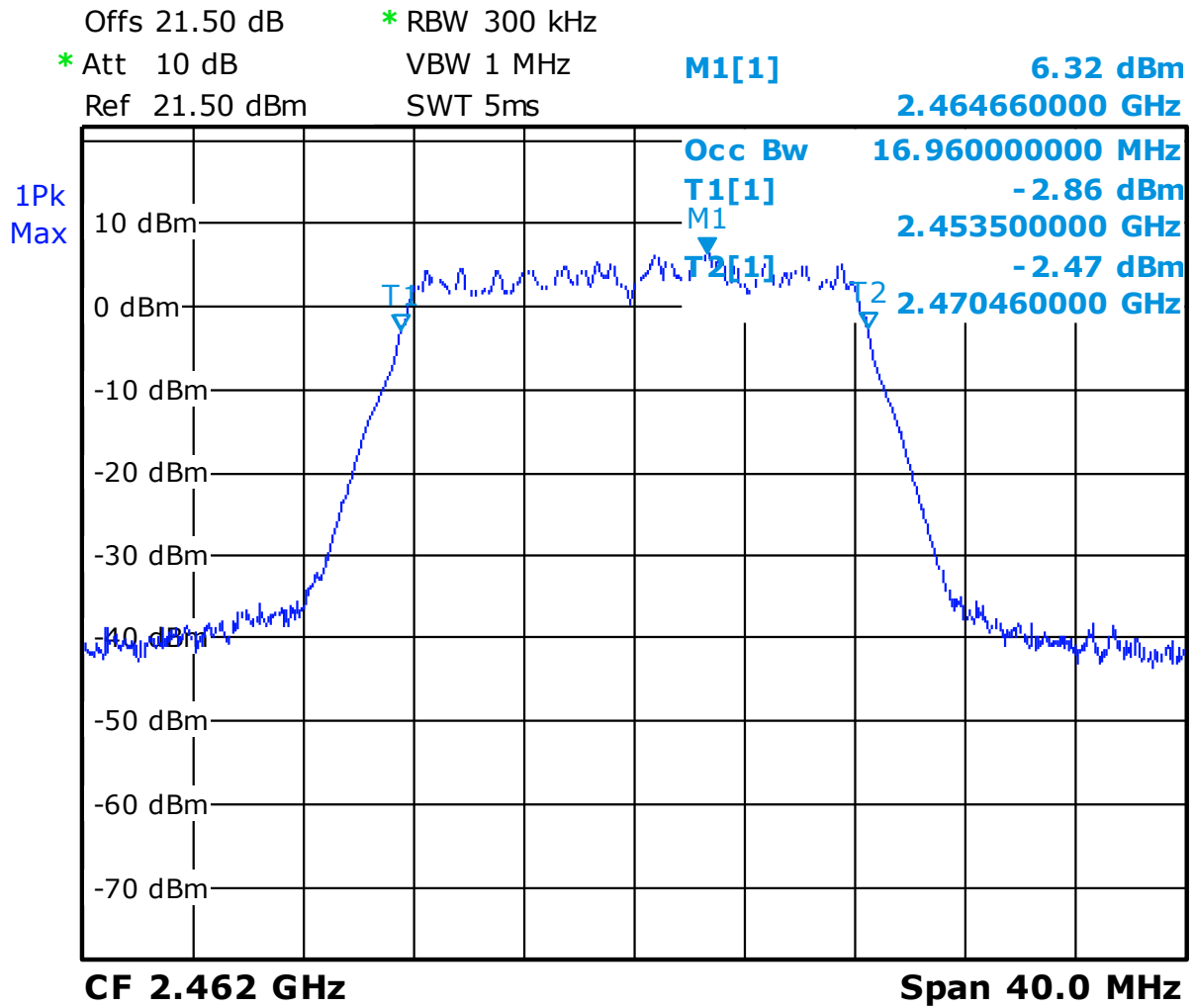
Central Channel – Mode 802.11.n – RF1



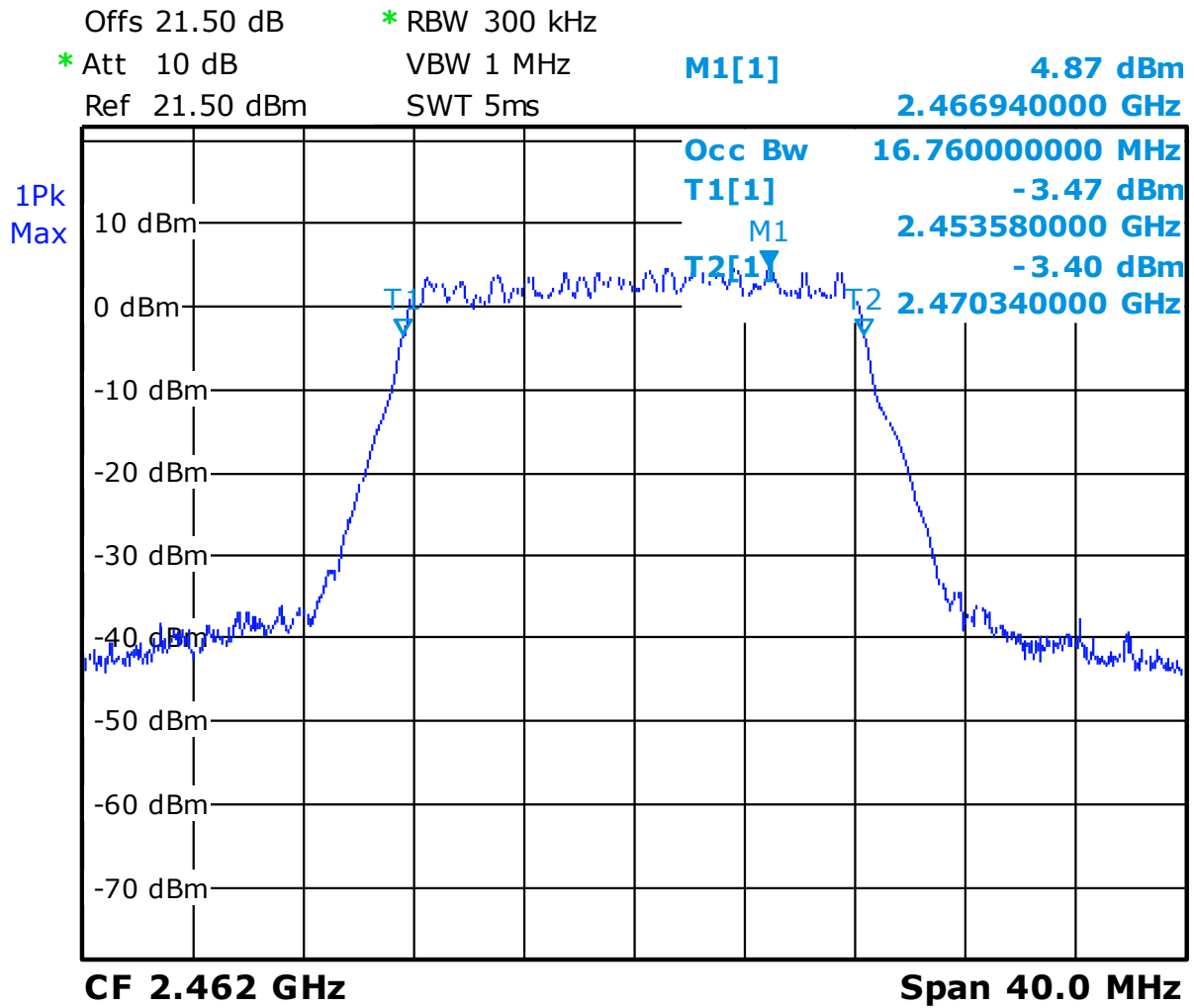
Central Channel – Mode 802.11.n – RF2



High Channel – Mode 802.11.n – RF1

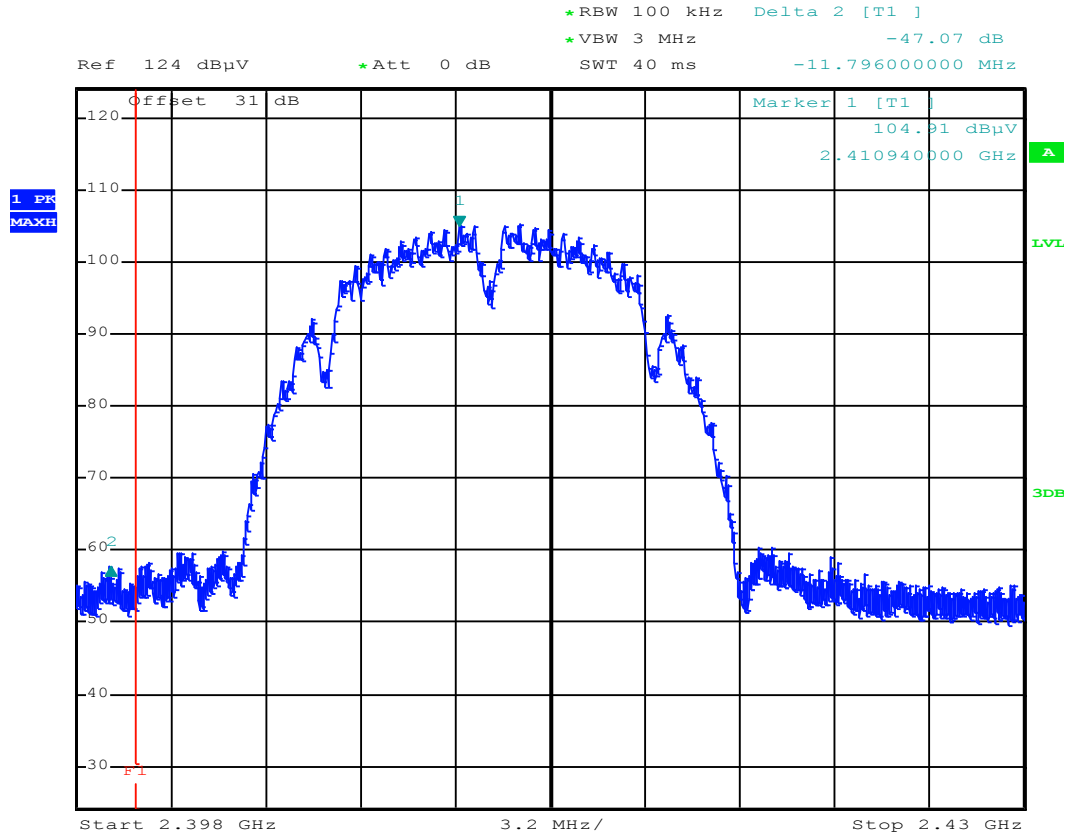


High Channel – Mode 802.11.n – RF2

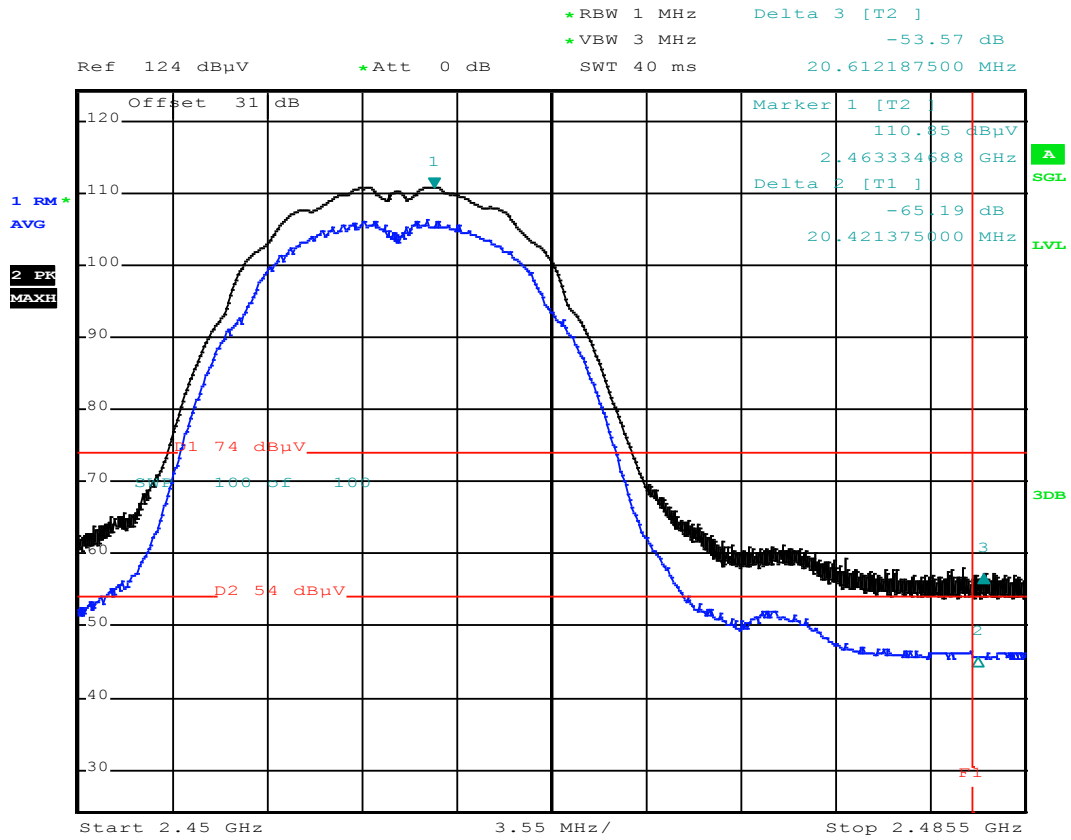


APPENDIX 4: Band edge

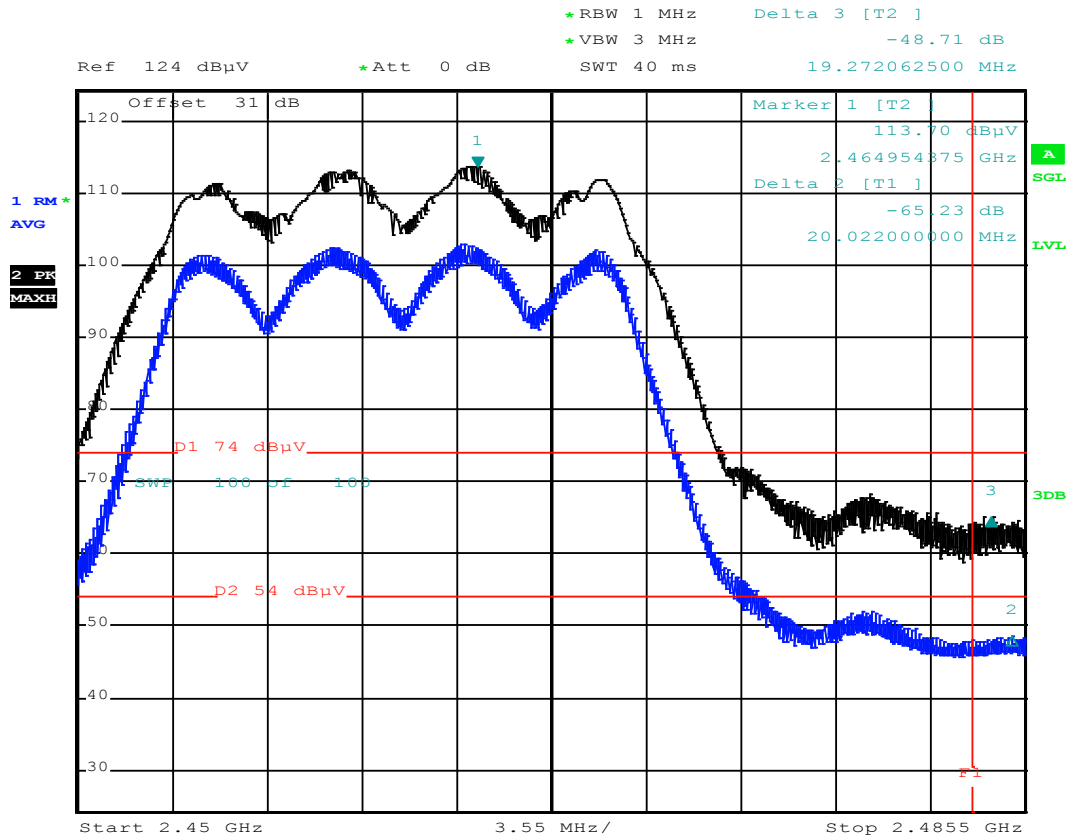
Low Channel – Mode 802.11.b



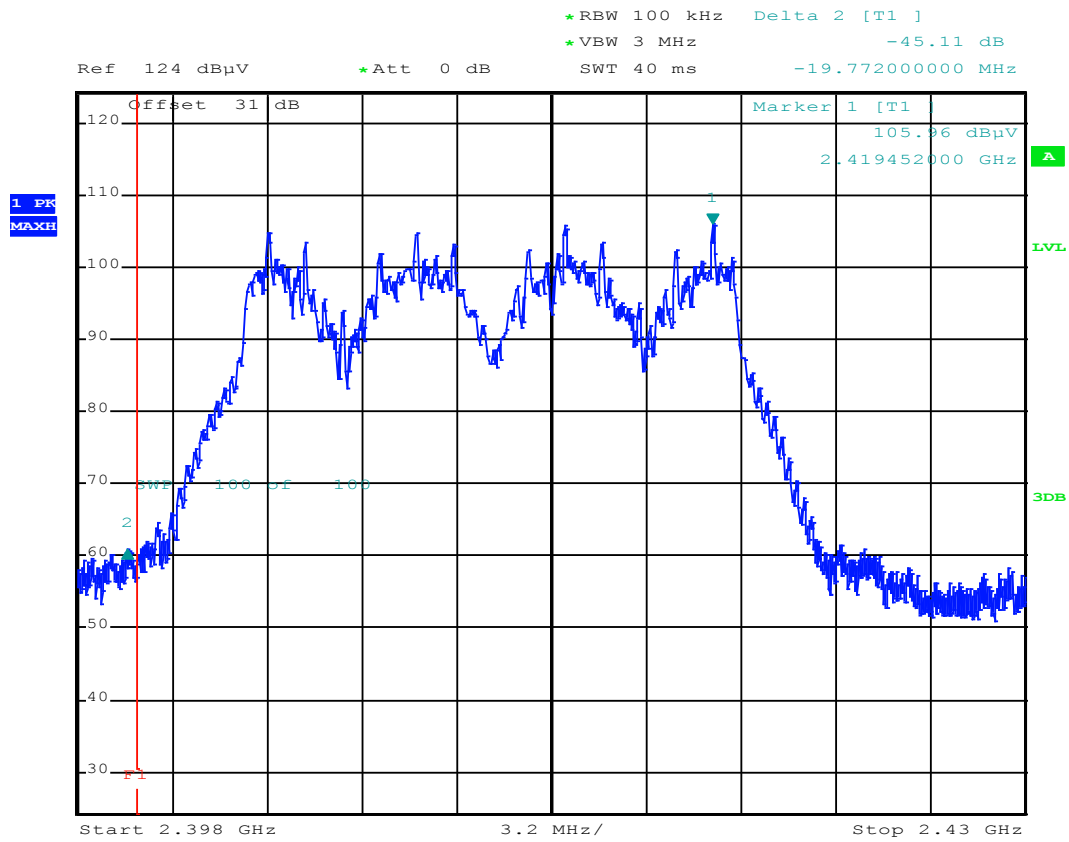
High Channel – Mode 802.11.b



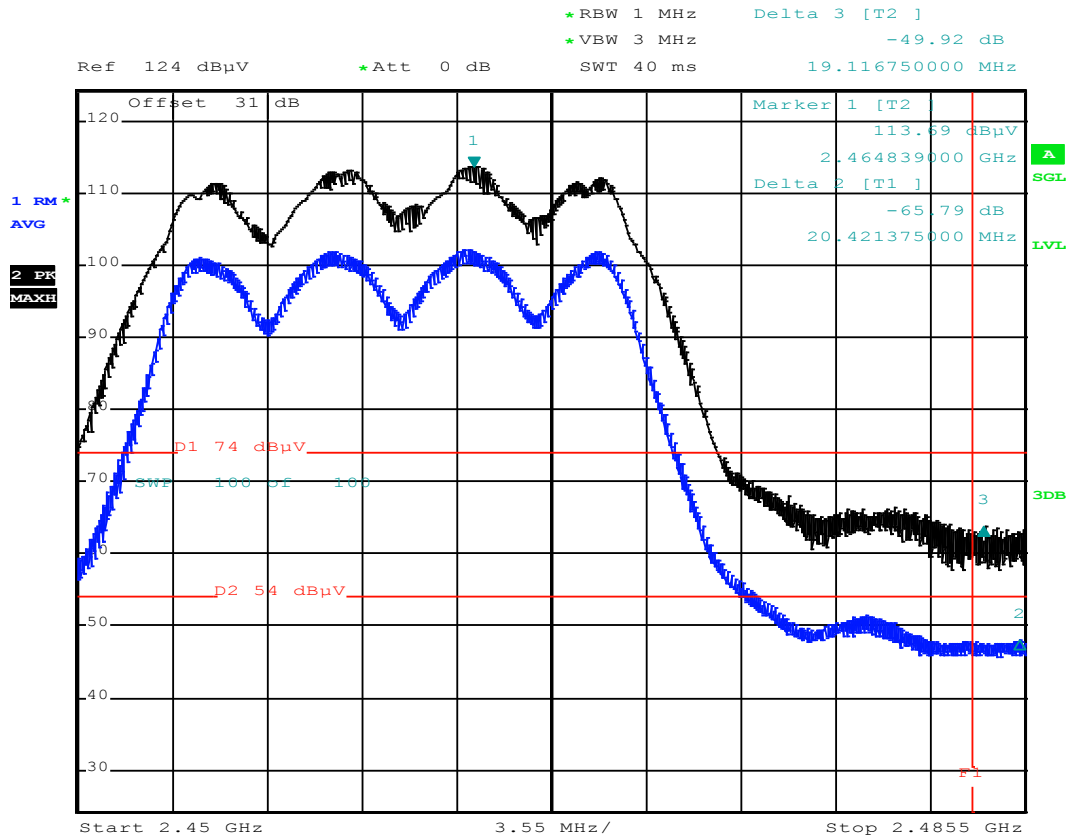
High Channel – Mode 802.11.g



Low Channel – Mode 802.11.n

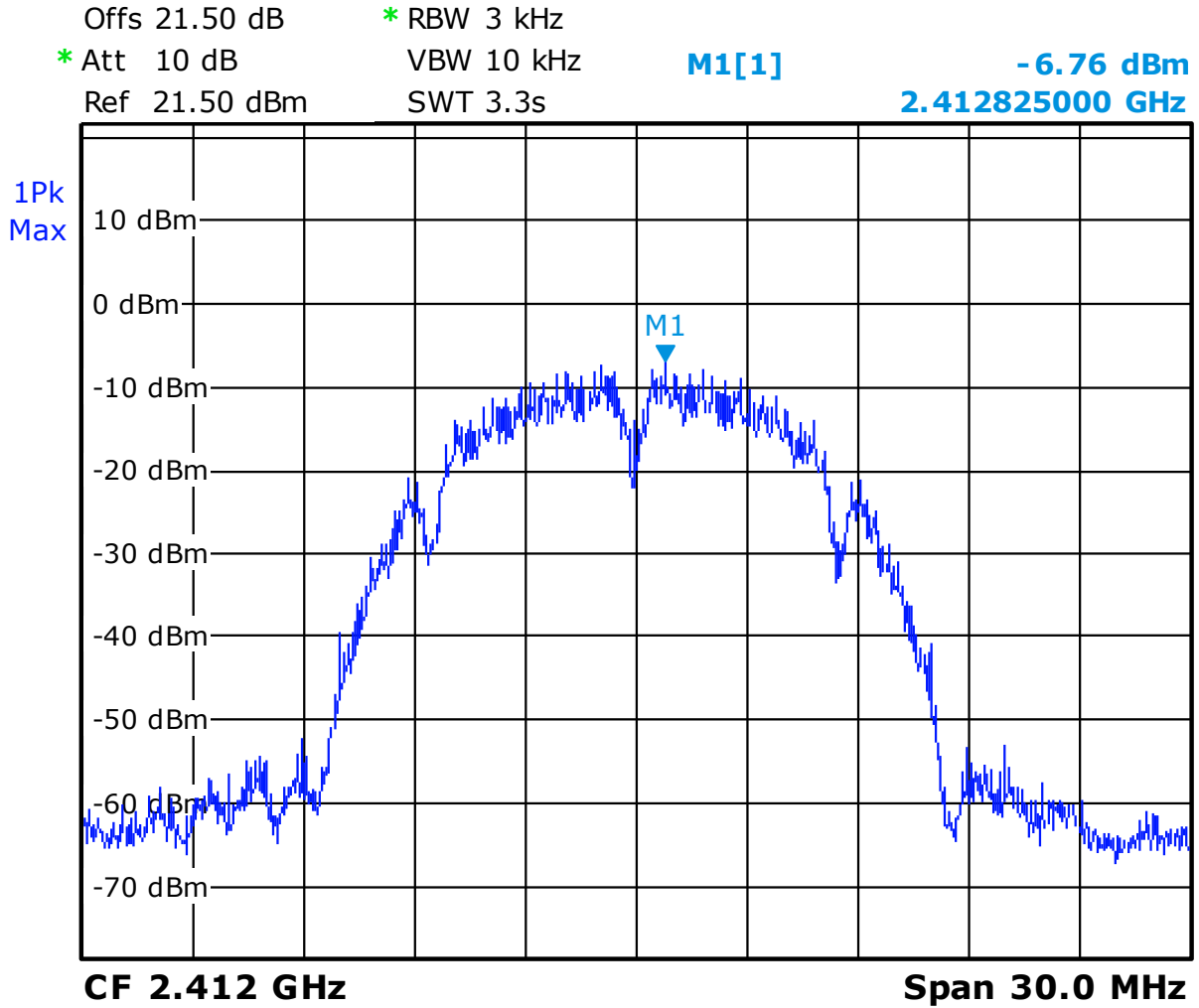


High Channel – Mode 802.11.n



APPENDIX 5: Spectral density

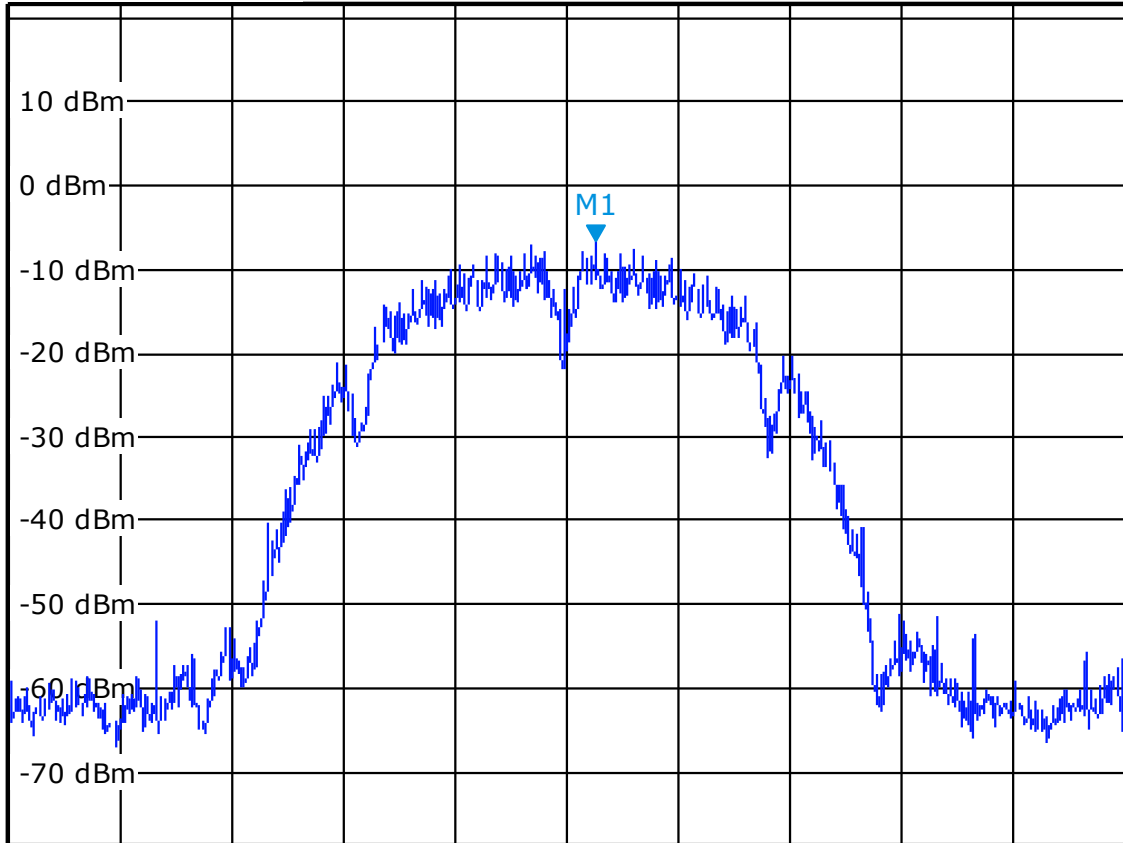
Low Channel – Mode 802.11.b – RF 1



Central Channel – Mode 802.11.b – RF 1

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-6.57 dBm**
Ref 21.50 dBm SWT 3.3s **2.437825000 GHz**

1Pk
Max



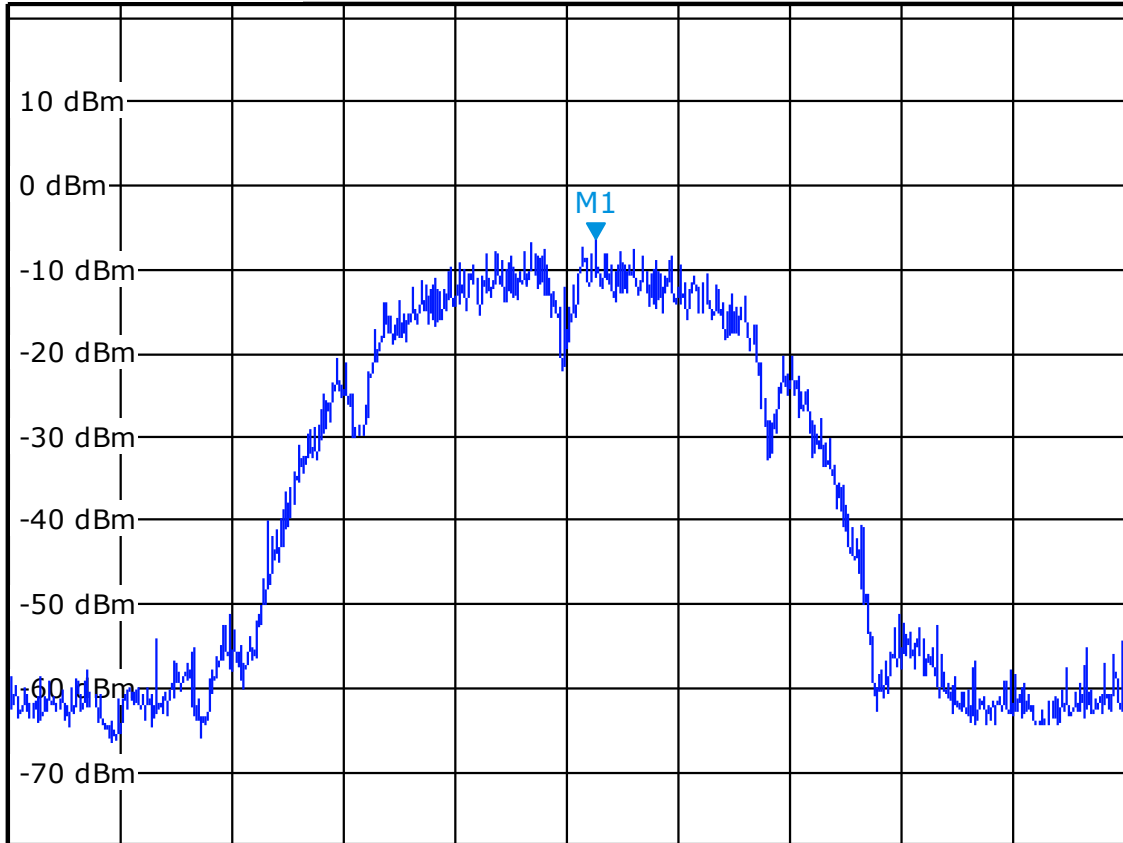
CF 2.437 GHz

Span 30.0 MHz

High Channel – Mode 802.11.b – RF 1

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **- 6.34 dBm**
Ref 21.50 dBm SWT 3.3s **2.462825000 GHz**

1Pk
Max

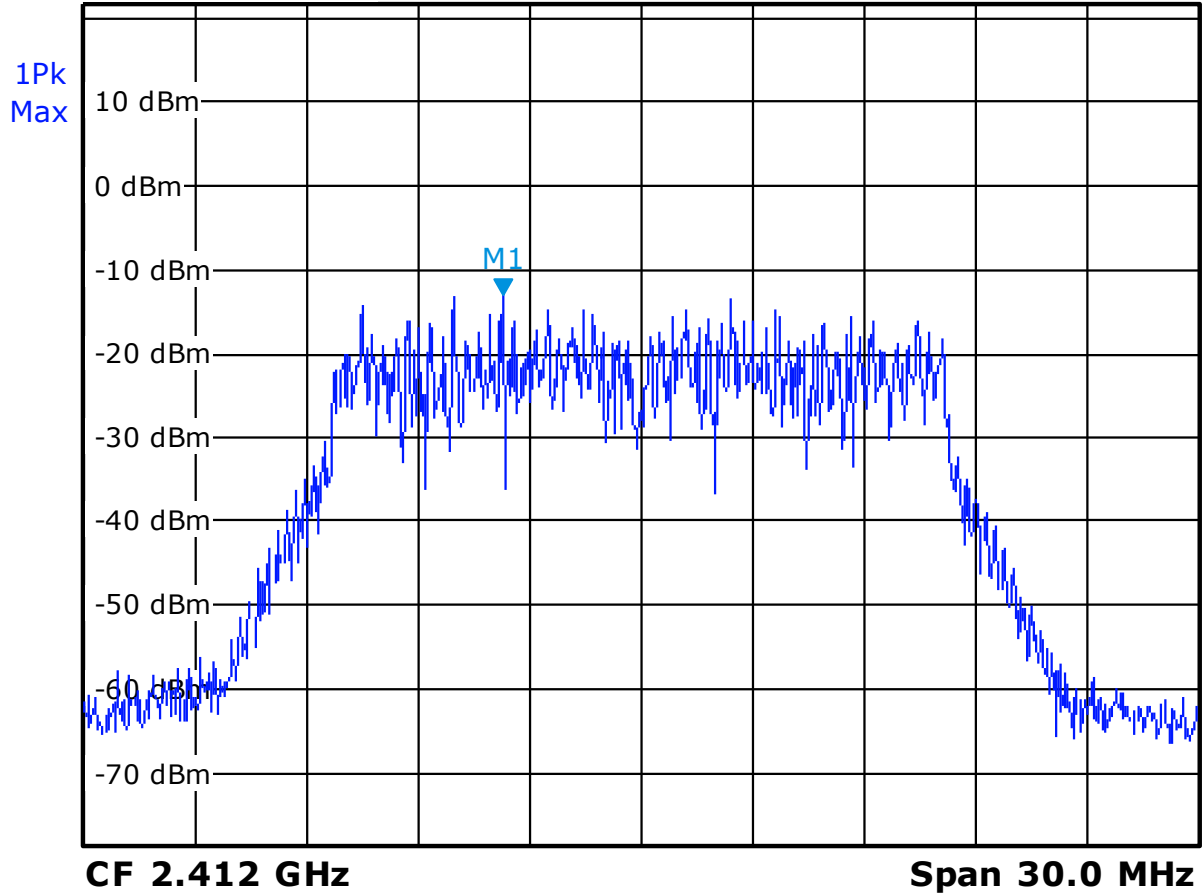


CF 2.462 GHz

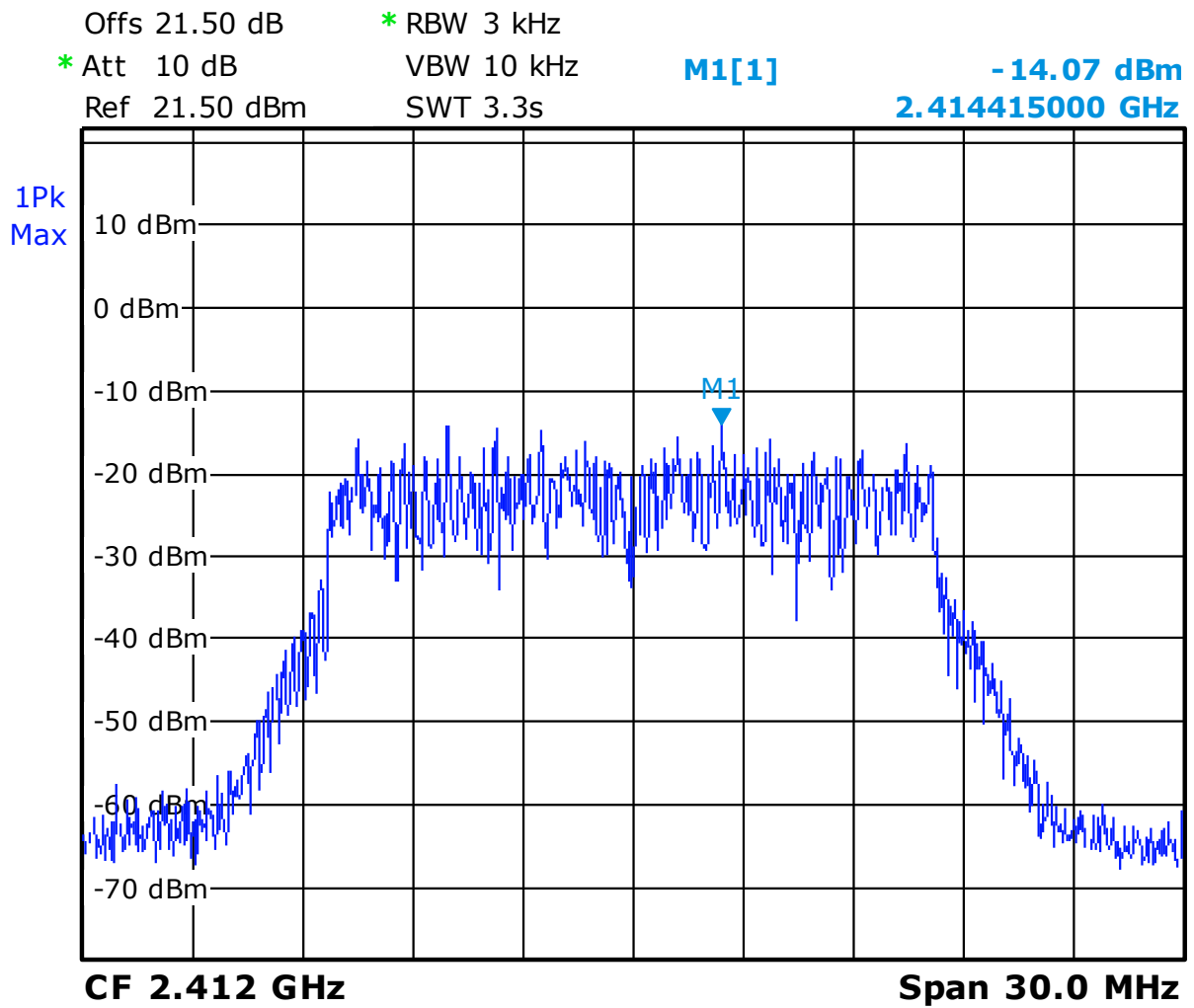
Span 30.0 MHz

Low Channel – Mode 802.11.g – RF 1

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-12.79 dBm**
Ref 21.50 dBm SWT 3.3s **2.408235000 GHz**

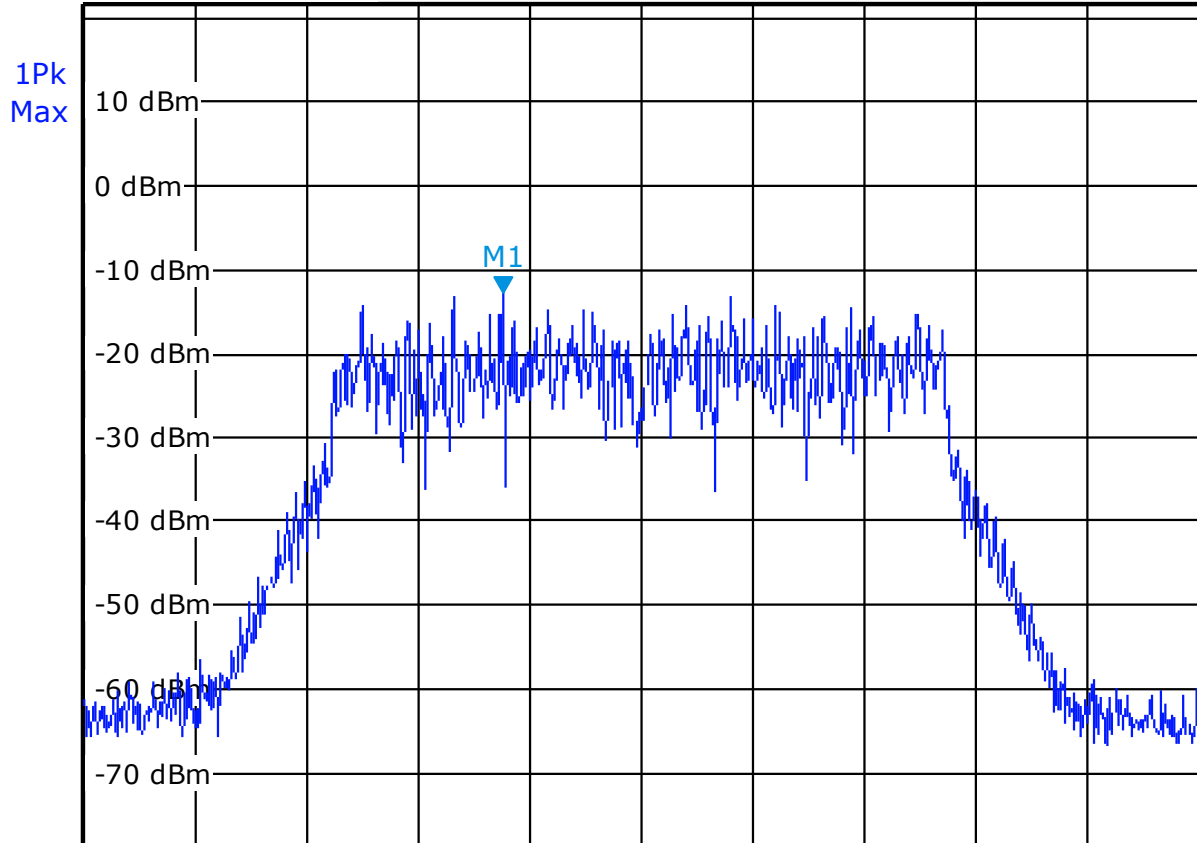


Low Channel – Mode 802.11.g – RF 2



Central Channel – Mode 802.11.g – RF 1

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-12.62 dBm**
Ref 21.50 dBm SWT 3.3s **2.433235000 GHz**



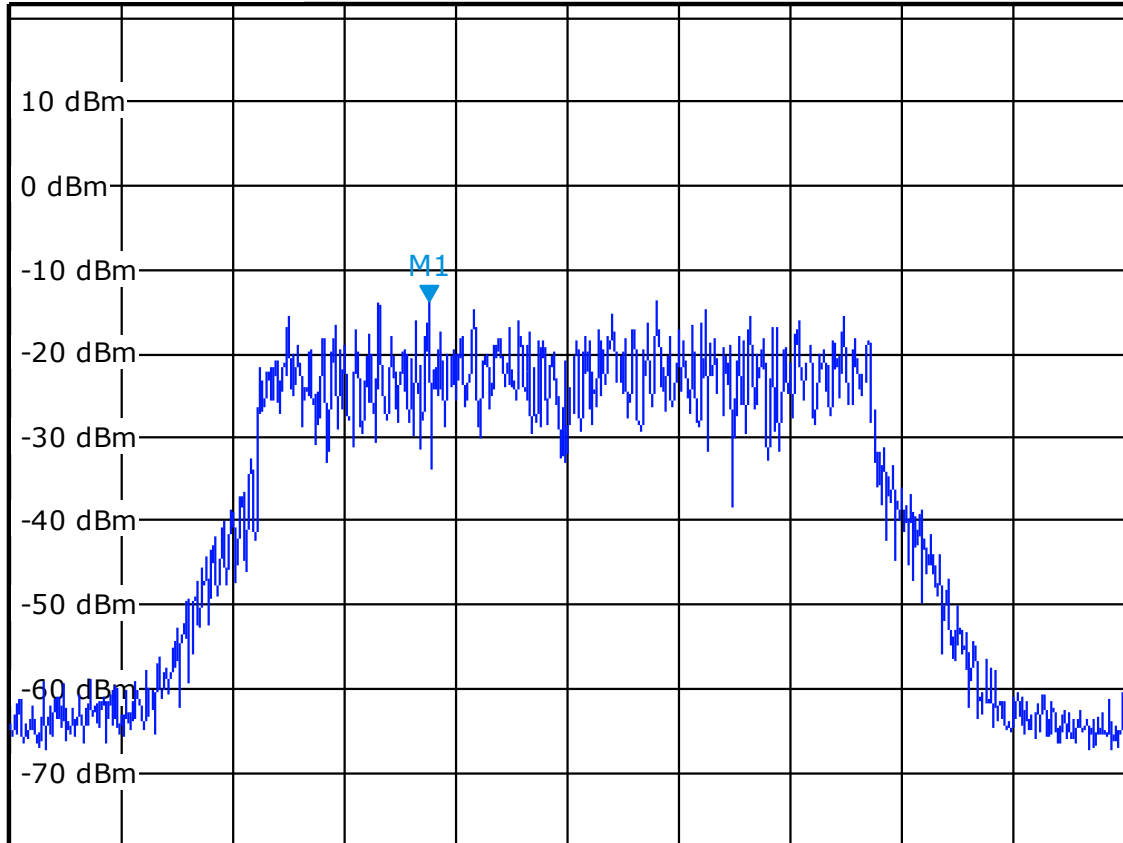
CF 2.437 GHz

Span 30.0 MHz

Central Channel – Mode 802.11.g – RF 2

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-13.78 dBm**
Ref 21.50 dBm SWT 3.3s **2.433235000 GHz**

1Pk
Max



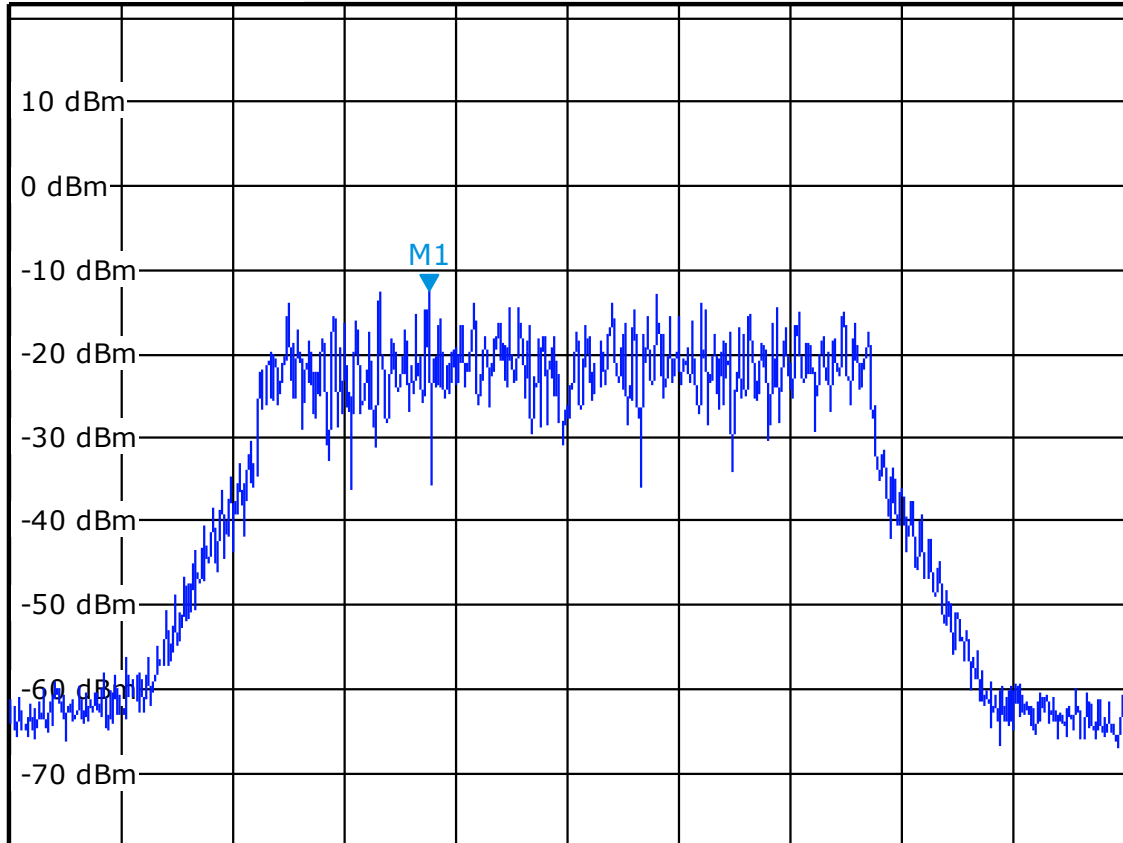
CF 2.437 GHz

Span 30.0 MHz

High Channel – Mode 802.11.g – RF 1

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-12.39 dBm**
Ref 21.50 dBm SWT 3.3s **2.458235000 GHz**

1Pk
Max



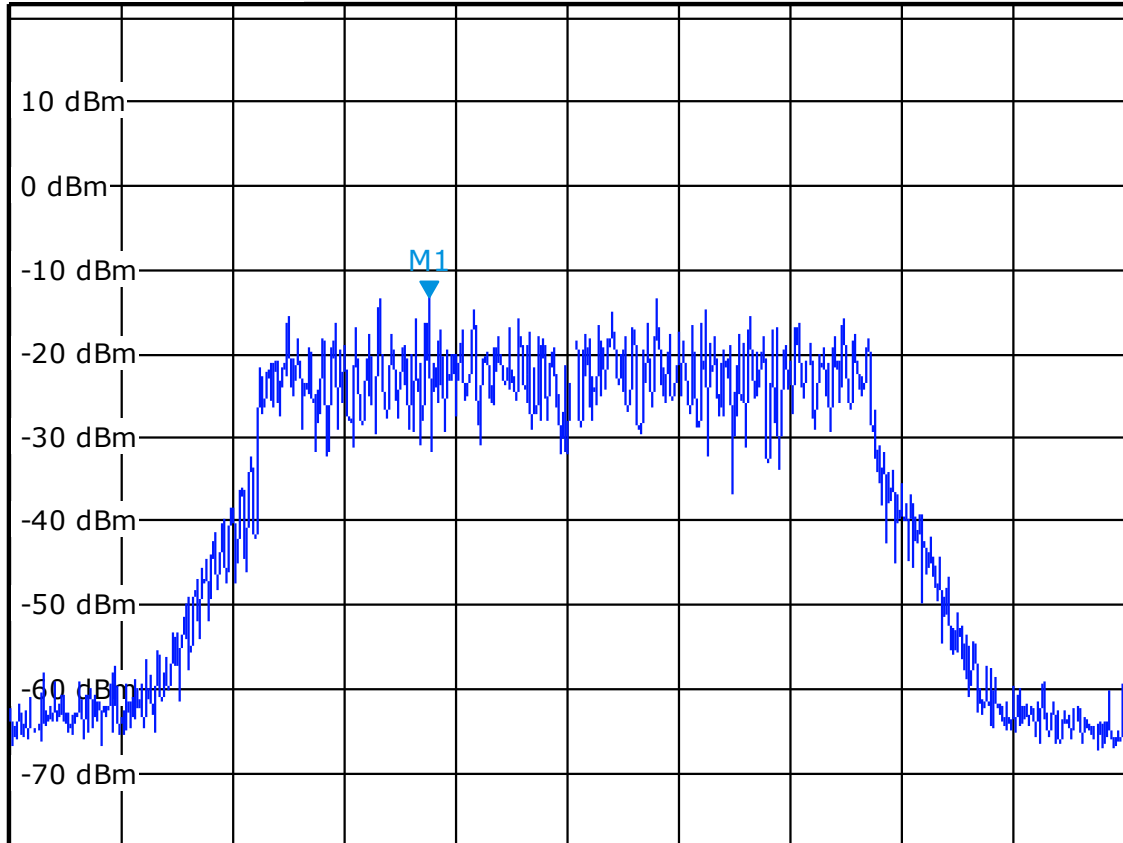
CF 2.462 GHz

Span 30.0 MHz

High Channel – Mode 802.11.g – RF 2

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-13.19 dBm**
Ref 21.50 dBm SWT 3.3s **2.458235000 GHz**

1Pk
Max



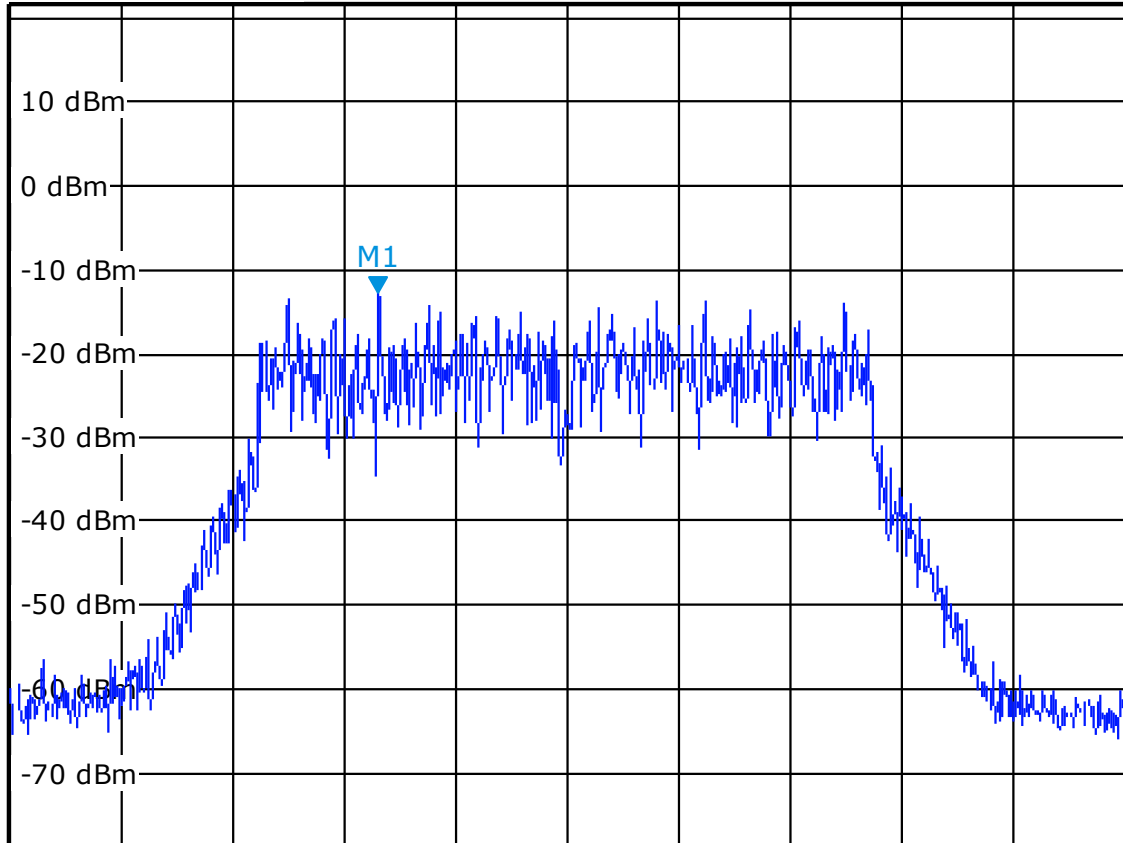
CF 2.462 GHz

Span 30.0 MHz

Low Channel – Mode 802.11.n – RF1

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-12.59 dBm**
Ref 21.50 dBm SWT 3.3s **2.406915000 GHz**

1Pk
Max



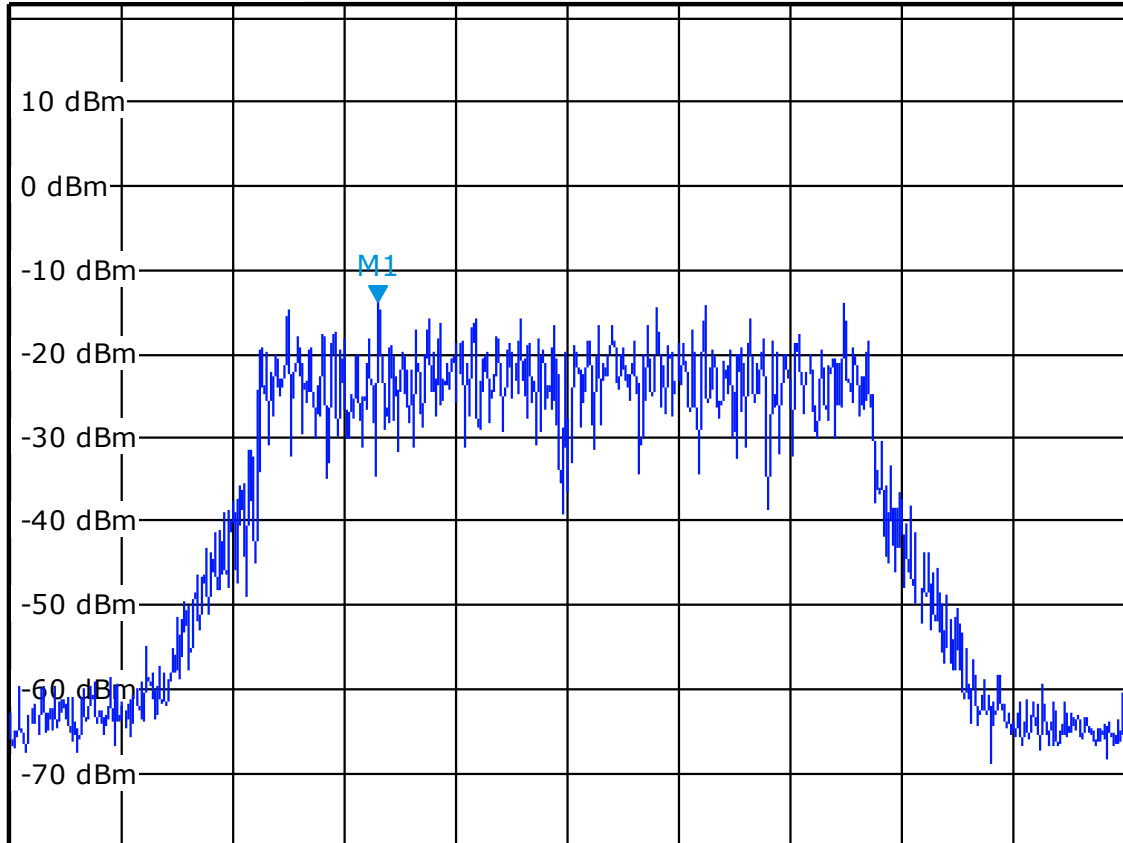
CF 2.412 GHz

Span 30.0 MHz

Low Channel – Mode 802.11.n – RF2

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-13.69 dBm**
Ref 21.50 dBm SWT 3.3s **2.406915000 GHz**

1Pk
Max



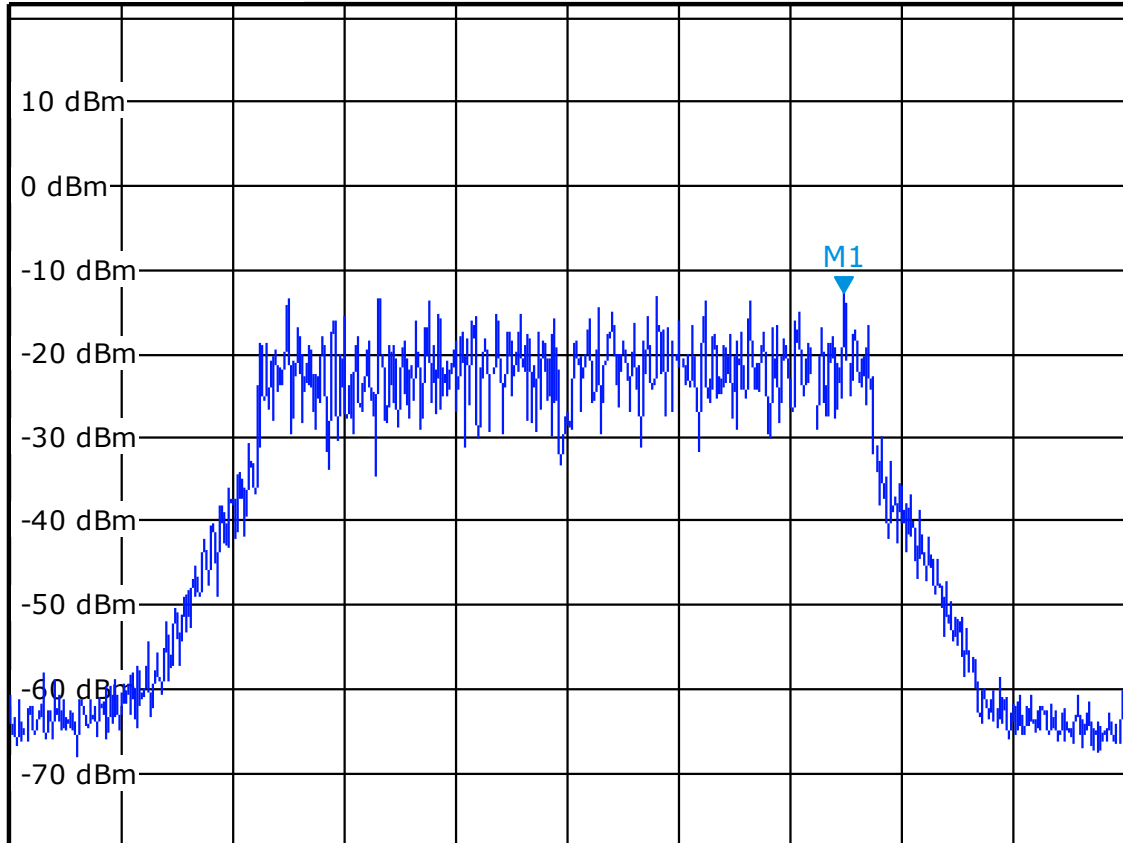
CF 2.412 GHz

Span 30.0 MHz

Central Channel – Mode 802.11.n – RF1

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-12.75 dBm**
Ref 21.50 dBm SWT 3.3s **2.444425000 GHz**

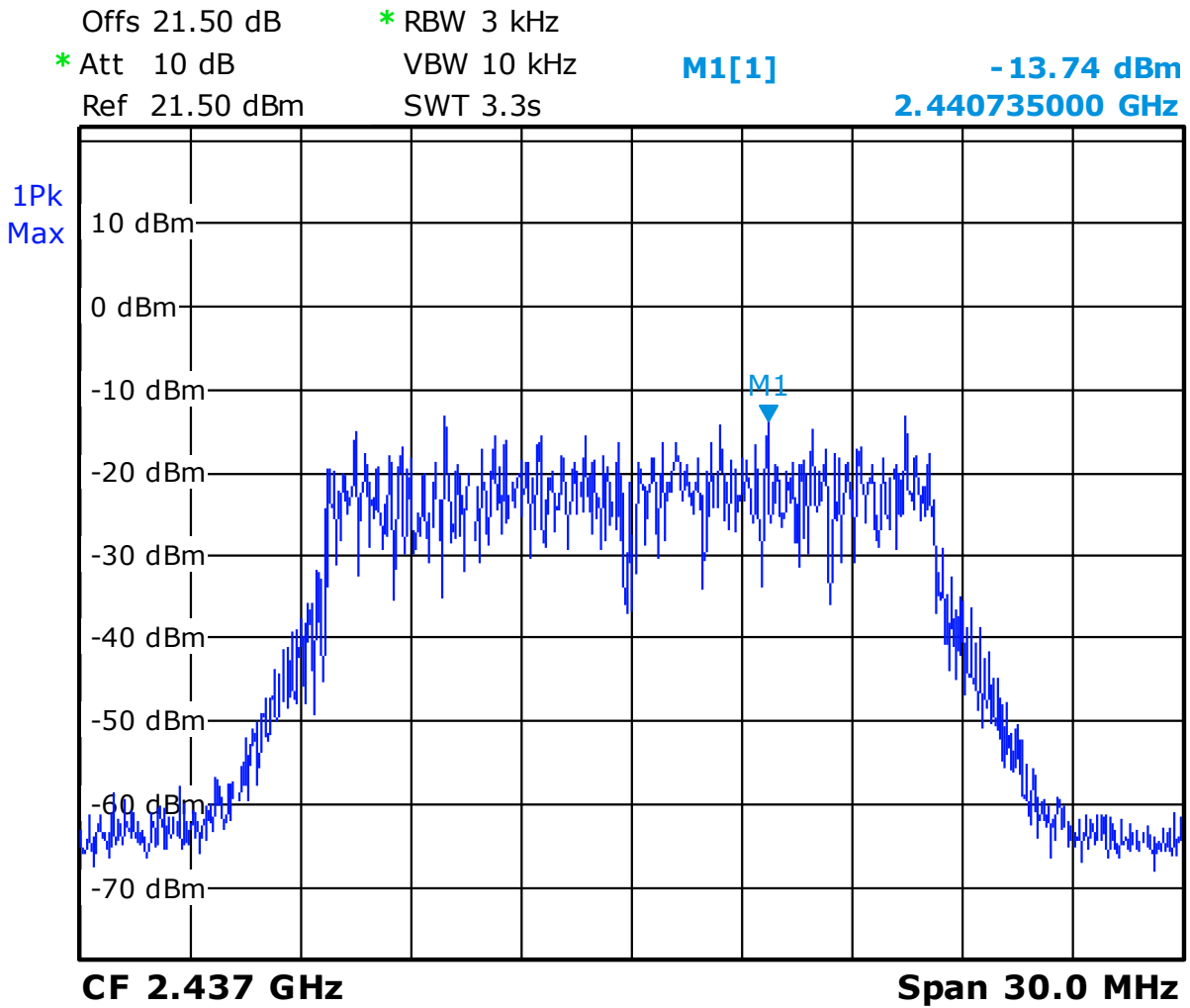
1Pk
Max



CF 2.437 GHz

Span 30.0 MHz

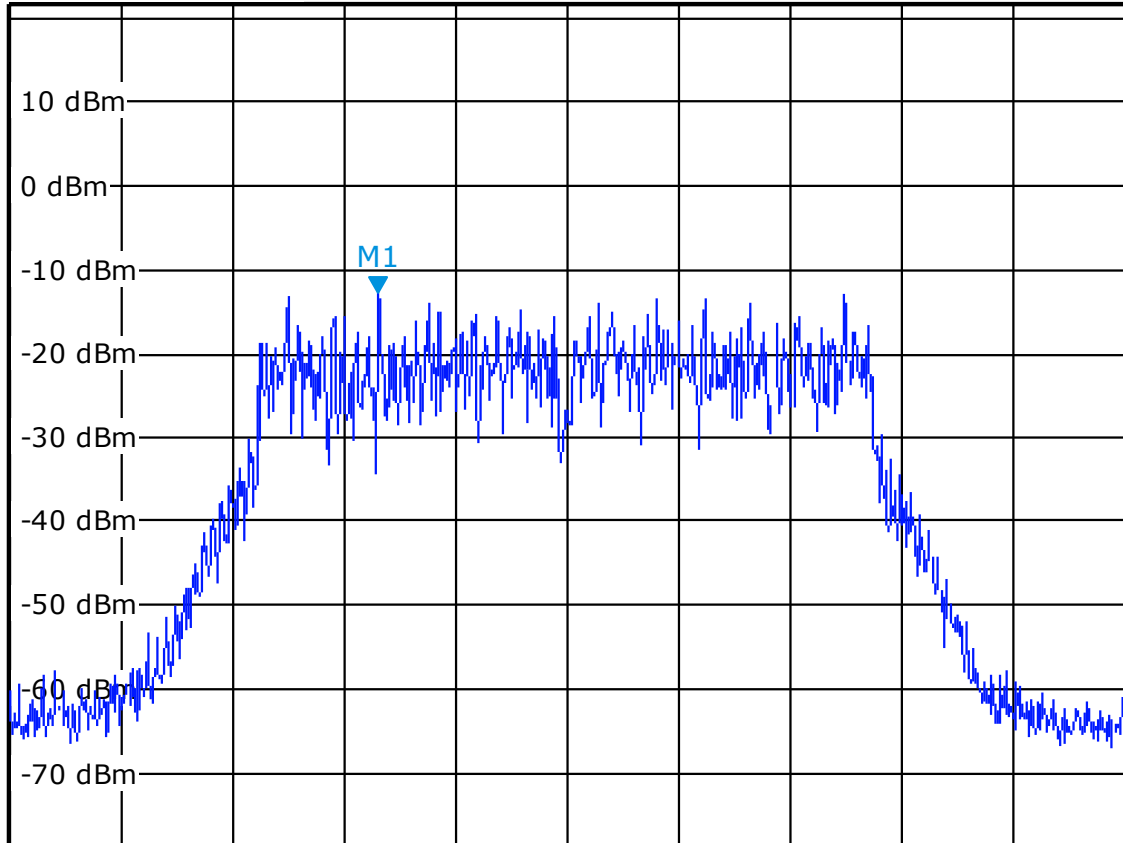
Central Channel – Mode 802.11.n – RF2



High Channel – Mode 802.11.n – RF1

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-12.72 dBm**
Ref 21.50 dBm SWT 3.3s **2.456915000 GHz**

1Pk
Max



CF 2.462 GHz

Span 30.0 MHz

High Channel – Mode 802.11.n – RF2

Offs 21.50 dB * RBW 3 kHz
* Att 10 dB VBW 10 kHz **M1[1]** **-13.60 dBm**
Ref 21.50 dBm SWT 3.3s **2.469425000 GHz**

