

RR051-15-102324-5-A Ed. 0

## Certification Radio test report

According to the standard:  
CFR 47 FCC PART 15

Equipment under test:  
DRONE EXOM

FCC ID:  
2AC2VEXOM

Company:  
SENSEFLY

DISTRIBUTION: Mr GILLE

(Company: SENSEFLY)

Number of pages: 52 with 7 annexes

Ed.	Date	Modified pages	Written by		Technical Verification and Quality Approval	
			Name	Visa	Name	Visa
0	21/08/2015	Creation	S. LOUIS	SL	M. DUMESNIL	

Duplication of this test report 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.



**DESIGNATION OF PRODUCT:** DRONE EXOM

**Serial number (S/N):** AD04 EX-99-12880

**Reference / model (P/N):** SENSEFLY EXOM

**Software version:** —

**MANUFACTURER:** SENSEFLY

**COMPANY SUBMITTING THE PRODUCT:**

**Company:** SENSEFLY

**Address:** Route de Genève 38  
1033 Cheseaux-Lausanne  
SWITZERLAND

**Responsible:** Mr GILLE

**DATES OF TEST:** Between 11-JUNE-2015 to 21-AUG-2015

**TESTING LOCATION:** EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE  
21 rue de la Fuye  
49610 Juigne sur Loire  
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:** S. LOUIS and T. LEDRESSEUR

## CONTENTS

<i><b>TITLE</b></i>	<i><b>PAGE</b></i>
<b>1. INTRODUCTION</b>	<b>4</b>
<b>2. PRODUCT DESCRIPTION</b>	<b>4</b>
<b>3. NORMATIVE REFERENCE</b>	<b>5</b>
<b>4. TEST METHODOLOGY</b>	<b>5</b>
<b>5. TEST EQUIPMENT CALIBRATION DATES</b>	<b>6</b>
<b>6. TESTS AND CONCLUSIONS</b>	<b>7</b>
<b>7. RADIATED EMISSION LIMITS</b>	<b>11</b>
<b>8. POWER LIMITS</b>	<b>13</b>
<b>9. INTENTIONAL RADIATOR</b>	<b>15</b>
<b>10. PEAK POWER DENSITY</b>	<b>18</b>

APPENDIX 1: Photos of the equipment under test

APPENDIX 2: Test set up

APPENDIX 3: Test equipment list

APPENDIX 4: 6 dB bandwidth

APPENDIX 5: 20 dB bandwidth

APPENDIX 6: 26 dB bandwidth

APPENDIX 7: Band edge

## **1. INTRODUCTION**

This document presents the result of RADIO test carried out on the following equipment: **DRONE EXOM** in accordance with normative reference.

The device under test integrates a multifrequencies wireless transceiver (WIFI 5GHz) – NERATEC DTM60  
The host device of certified modules shall be properly labeled to identify the modules within.

## **2. PRODUCT DESCRIPTION**

Class:	B
Utilization:	Drone
Antenna type and gain:	the product possess 2 identical internal antennas which functioned in MIMO, gain: 2dBi
Operating frequency range:	from 5150 MHz to 5250 MHz
Number of channels:	4
Channel spacing:	20 MHz
Modulation:	WIFI 5GHz
Power source:	Battery LiPo, 11.1Vdc

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 (2014)      Radio Frequency Devices

ANSI C63.4                      2009  
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                    2009  
Testing Unlicensed Wireless Devices.

789033 D02 General UNII      Guidelines for compliances testing of unlicensed national information  
Test Procedures New          infrastructure (U-NII) devices pat 15, subpart E  
Rules v01

662911 D01 Multiple           Emissions Testing of Transmitters with Multiple Outputs in the Same Band  
Transmitter Output V02r01

### **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

Subpart E – Unlicensed national information infrastructure devices

Paragraph 407:   General technical requirements

# 5. TEST EQUIPMENT CALIBRATION DATES

Equipment	Model	Type	Last verification	Next verification	Validity
0000	BAT-EMC	Software	/	/	/
1406	EMCO 6502	Loop antenna	27/01/2015	27/01/2017	27/03/2017
1922	Microwave DB C020180F-4B1	Low-noise amplifier	20/08/2014	20/08/2015	20/10/2015
1939	IMC WR42	Antenna	20/04/2012	20/04/2016	20/06/2016
1940	IMC WR42	Antenna	20/04/2012	20/04/2016	20/06/2016
3036	ALC Microwave ALN02-0102	Low-noise amplifier	14/05/2014	14/05/2015	14/07/2015
4087	Filtek LP03/1000-7GH	Low Pass Filter	24/02/2014	24/02/2016	24/04/2016
4088	R&S FSP40	Spectrum Analyzer	22/08/2013	22/08/2015	22/10/2015
4353	ATM WR28	Antenna	20/04/2012	20/04/2016	20/06/2016
4354	ALC ALS2640-30-10	Low-noise amplifier	21/07/2014	21/07/2015	21/09/2015
6606	Microtronics LPM 15601	Low Pass Filter	05/04/2013	05/04/2015	05/06/2015
6607	Microtronics HPM 15600	High Pass Filter	05/04/2013	05/04/2015	05/06/2015
7299	Microtronics BRM50702	Reject band filter	25/10/2013	25/10/2015	25/12/2015
8511	HP 8447D	Low noise preamplifier	20/08/2014	20/08/2015	20/10/2015
8523	R&S FSEM30	Spectrum analyzer	20/05/2014	20/05/2016	20/07/2016
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/06/2012	12/06/2016	12/08/2016
8528	Schwarzbeck VHA 9103	Biconical antenna	24/09/2013	24/09/2017	24/11/2017
8534	EMCO 3115	Antenna	30/10/2012	30/10/2016	30/12/2016
8535	EMCO 3115	Antenna	29/10/2012	29/10/2016	29/12/2016
8543	Schwarzbeck UHALP 9108A	Log periodic antenna	12/06/2012	12/06/2016	12/08/2016
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8675	AOIP MN5102B	Multimeter	23/02/2015	23/02/2017	23/04/2017
8707	R&S ESI7	Test receiver	11/12/2014	11/12/2016	11/02/2017
8732	Emitech	OATS	23/08/2013	23/08/2016	23/10/2016
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	24/09/2013	24/09/2017	24/11/2017
8864	Champ libre Juigné. V3.4	Software	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
/	GPIB SHOT	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

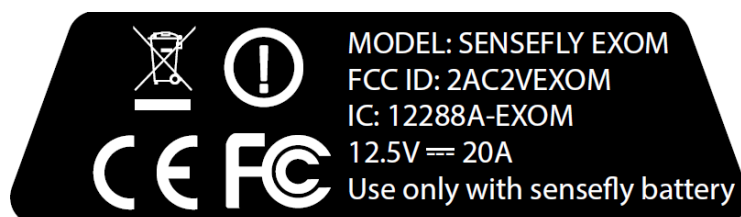
NAP: Not Applicable

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

The user notice, not provided during tests, shall include the following informations:

### §15.21:

*Any changes or modifications to this equipment not expressly approved by SENSEFLY 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		
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

The user notice, not provided during tests, shall include the following informations:

#### § 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

NAp: Not Applicable

NAs: Not Asked

Note 1: Integral antenna.

Note 2: See FCC part 15.407.

#### 6.4 unlicensed national information infrastructure device (subpart E)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.407	GENERAL TECHNICAL REQUIREMENTS					
	a) Power limits	X				Note 1 ,Note 2
	a) (1) in the bands 5150–5250 MHz					
	a) (2) in the bands 5250–5350 MHz and 5470–5725 MHz			X		
	a) (3) in the bands 5725–5825 MHz			X		
	a) (4) maximum conducted output power	X				
	a) 5) peak power spectral density	X				Note 1 ,Note 2
	b) Undesirable emission limits					
	b) (1) outside of the bands 5150–5250 MHz	X				
	b) (2) outside of the bands 5250–5350 MHz			X		
	b) (3) outside of the bands 5470–5725 MHz			X		
	b) (4) outside of the bands 5725–5825 MHz			X		

NAp: Not Applicable

NAs: Not Asked

Note 1: the product is a drone so the limits applicable are a mobile limit

Note 2: The 26 dB bandwidth plots are on appendix 6.

#### RF EXPOSURE:

Maximum measured power 17.6mW

with  $P = (E \times d)^2 / (30 \times G_p)$  with  $d = 3 \text{ m}$  and  $G_p = 2.51$

In accordance with KDB 447498 D01 General RF Exposure Guidance v05r02

$PSD = EIRP / (4 \times \pi \times R^2) = 189.29 / (4 \times \pi \times (20 \text{ cm})^2) = 3.5 \times 10^{-3} \text{ mW/cm}^2$  (limit= 1 mW/cm<sup>2</sup>).

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

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

## **7. 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 30 GHz (5<sup>th</sup> harmonic of the highest frequency used).

**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 discovery mode. The motors were activated.

## Results:

Ambient temperature (°C): 25.6  
Relative humidity (%): 55

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

## Sample N° 1

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi- Peak	Antenna height (cm)	Azimuth (degree)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
182	QP	100	312	V	17.06	43.5	26.44
208	QP	100	179	V	24.52	43.5	18.98
260	QP	100	88	V	26.79	46.4	19.61
286	QP	100	364	V	23.75	46.4	22.65
338	QP	276	349	V	26.33	46.4	20.07
679.22	QP	317	172	V	27.70	46.4	18.70
787.62	QP	385	363	V	22.00	46.4	24.40
900	QP	400	229	V	23.77	46.4	22.63

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.

## Test conclusion:

RESPECTED STANDARD

## 8. POWER LIMITS

**Standard:** FCC Part 15

**Test procedure:** paragraph 15.407 (a)

### Test set up:

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

### Equipment under test operating condition:

The equipment under test is blocked in continuous modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

### Results:

Ambient temperature (°C): 24.9  
Relative humidity (%): 44

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

Sample N° 1 Low channel (F=5180 MHz) – Mode 802.11.a

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
7.71	7.91	14.89	250

Sample N° 1 Central channel (F=5200 MHz) – Mode 802.11.a

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
9.7	7.7	17.4	250

Sample N° 1 High channel (F=5240 MHz) – Mode 802.11.a

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
9.9	7.7	17.6	250

## Results:

Ambient temperature (°C): 24.9  
Relative humidity (%): 44

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

Sample N° 1 Low channel (F=5180 MHz) – Mode 802.11.n

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
7.57	7.0	14.57	250

Sample N° 1 Central channel (F=5200 MHz) – Mode 802.11.n

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
7.5	6.2	13.7	250

Sample N° 1 High channel (F=5240 MHz) – Mode 802.11.n

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
7.9	5.6	13.5	250

## Test conclusion:

RESPECTED STANDARD

## **9. INTENTIONAL RADIATOR**

**Standard:** FCC Part 15

**Test procedure:** paragraph 15.205, paragraph 15.209, paragraph 15.407 (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 9 kHz to 40GHz.

**Detection mode:** Quasi-peak ( $F < 1 \text{ GHz}$ )

Peak / Average ( $F > 1 \text{ GHz}$ )

**Bandwidth:** 200Hz ( $9 \text{ kHz} < F < 150\text{kHz}$ )  
9 kHz ( $150 \text{ kHz} < F < 30\text{MHz}$ )  
120 kHz ( $30 \text{ MHz} < F < 1 \text{ GHz}$ )  
100 kHz / 1 MHz ( $F > 1 \text{ GHz}$ )

**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.

## Results:

Ambient temperature (°C): 24  
Relative humidity (%): 54

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

### Sample N° 1 Low channel (F=5180 MHz) – Mode 802.11.a

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi- Peak Av: Average	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
208	QP	100	179	120	V	24.52	43.5	18.98
260	QP	100	88	120	V	26.79	46.4	19.61
679.22	QP	317	172	120	V	27.70	46.4	18.70

### Sample N° 1 Central channel (F=5200 MHz) - Mode 802.11.a

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi- Peak Av: Average	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
208	QP	100	179	120	V	24.52	43.5	18.98
260	QP	100	88	120	V	26.79	46.4	19.61
679.22	QP	317	172	120	V	27.70	46.4	18.70

### Sample N° 1 High channel (F=5240 MHz) - Mode 802.11.a

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi- Peak Av: Average	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
208	QP	100	179	120	V	24.52	43.5	18.98
260	QP	100	88	120	V	26.79	46.4	19.61
679.22	QP	317	172	120	V	27.70	46.4	18.70

Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.



## Results:

Ambient temperature (°C): 24  
Relative humidity (%): 54

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

Sample N° 1 Low channel (F=5180 MHz) – Mode 802.11.n

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
208	QP	100	179	120	V	24.52	43.5	18.98
260	QP	100	88	120	V	26.79	46.4	19.61
679.22	QP	317	172	120	V	27.70	46.4	18.70
6906.44	P	150	—	100	V	50.8	82	17.4

Sample N° 1 Central channel (F=5200 MHz) - Mode 802.11.n

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
208	QP	100	179	120	V	24.52	43.5	18.98
260	QP	100	88	120	V	26.79	46.4	19.61
679.22	QP	317	172	120	V	27.70	46.4	18.70
6933.12	P	150	—	100	V	49	68.2	19.2

Sample N° 1 High channel (F=5240 MHz) - Mode 802.11.n

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak Av: Average	Antenna height (cm)	Azimuth (degree)	Resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
208	QP	100	179	120	V	24.52	43.5	18.98
260	QP	100	88	120	V	26.79	46.4	19.61
679.22	QP	317	172	120	V	27.70	46.4	18.70
6993.44	P	150	—	100	V	45.8	68.2	22.4

## Test conclusion:

RESPECTED STANDARD

## 10. PEAK POWER DENSITY

**Standard:** FCC Part 15

**Test procedure:** paragraph 15.407 (a)

### Test set up:

We used the same method of the peak output power measurement, but the equipment under test power level is recorded with the spectrum analyzer.

Resolution bandwidth: 1 MHz

Video bandwidth: 1 MHz

### 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.

### Results:

Ambient temperature (°C): 24.9

Relative humidity (%): 44

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

Sample N° 1 Low channel (F=5180 MHz) – Mode 802.11.a

Power Spectral Density (dBm/MHz):		Sum of PSD (dBm/MHz)	Limit (dBm/MHz)
Chain 1	Chain 2		
7.45	5.21	9.5	11

Sample N° 1 Central channel (F=5200 MHz) – Mode 802.11.a

Power Spectral Density (dBm/MHz):		Sum of PSD (dBm/MHz)	Limit (dBm/MHz)
Chain 1	Chain 2		
6.21	6.65	9.4	11

Sample N° 1 High channel (F=5240 MHz) – Mode 802.11.a

Power Spectral Density (dBm/MHz):		Sum of PSD (dBm/MHz)	Limit (dBm/MHz)
Chain 1	Chain 2		
5.9	6.79	9.4	11

### Results:

Ambient temperature (°C): 24.9

Relative humidity (%): 44

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

Sample N° 1 Low channel (F=5180 MHz) – Mode 802.11.n

Power Spectral Density (dBm/MHz):		Sum of PSD (dBm/MHz)	Limit (dBm/MHz)
Chain 1	Chain 2		
5.84	6.93	9.4	11

Sample N° 1 Central channel (F=5200 MHz) – Mode 802.11.n

Power Spectral Density (dBm/MHz):		Sum of PSD (dBm/MHz)	Limit (dBm/MHz)
Chain 1	Chain 2		
5.62	4.93	8.3	11

Sample N° 1 High channel (F=5240 MHz) – Mode 802.11.n

Power Spectral Density (dBm/MHz):		Sum of PSD (dBm/MHz)	Limit (dBm/MHz)
Chain 1	Chain 2		
5.63	4.66	8.2	11

### Test conclusion:

RESPECTED STANDARD

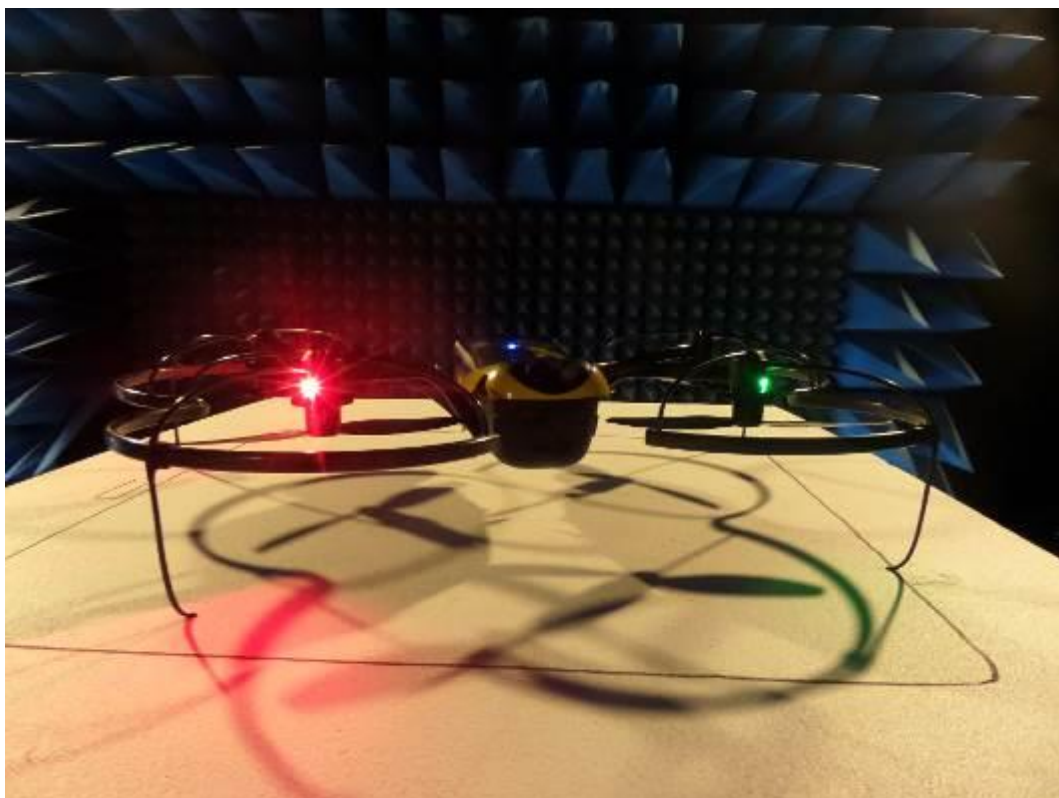
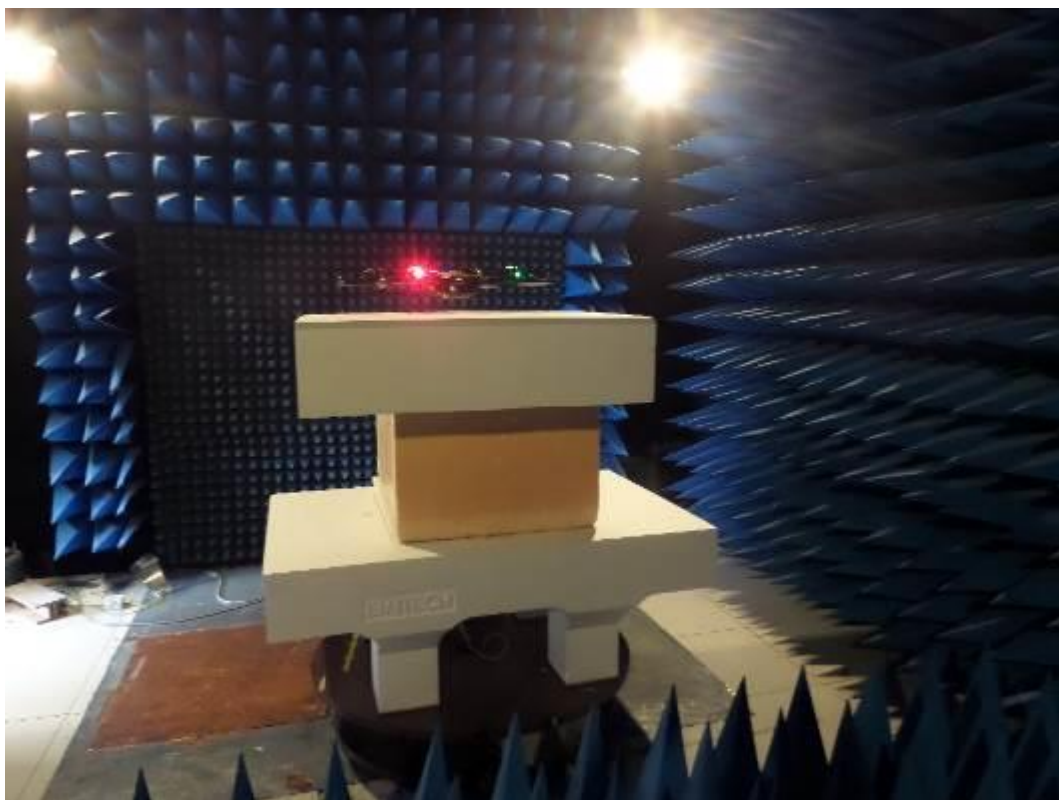
□□□ End of report, 7 annexes to be forwarded □□□

## APPENDIX 1: Photos of the equipment under test





## APPENDIX 2: Test set up







## APPENDIX 3: Test equipment list

### Radiated emission limits

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
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
Antenna WR42	IMC	1939
Antenna WR42	IMC	1940
Antenna ATM WR28	Elhyte	4353
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier C020180F-4B1	Microwave DB	1922
Low-noise amplifier ALN02-0102	ALC Microwave	3036
Low-noise amplifier ALC ALS2640-30-10	Elhyte	4354
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8749
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000
Software	Champ libre Juigné. V3.4	8864

### Power limits

TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Band pass filter BP2442-84-7CS	BL Microwave	5625
Antenna 3115	EMCO	8535
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000



### Intentional radiator

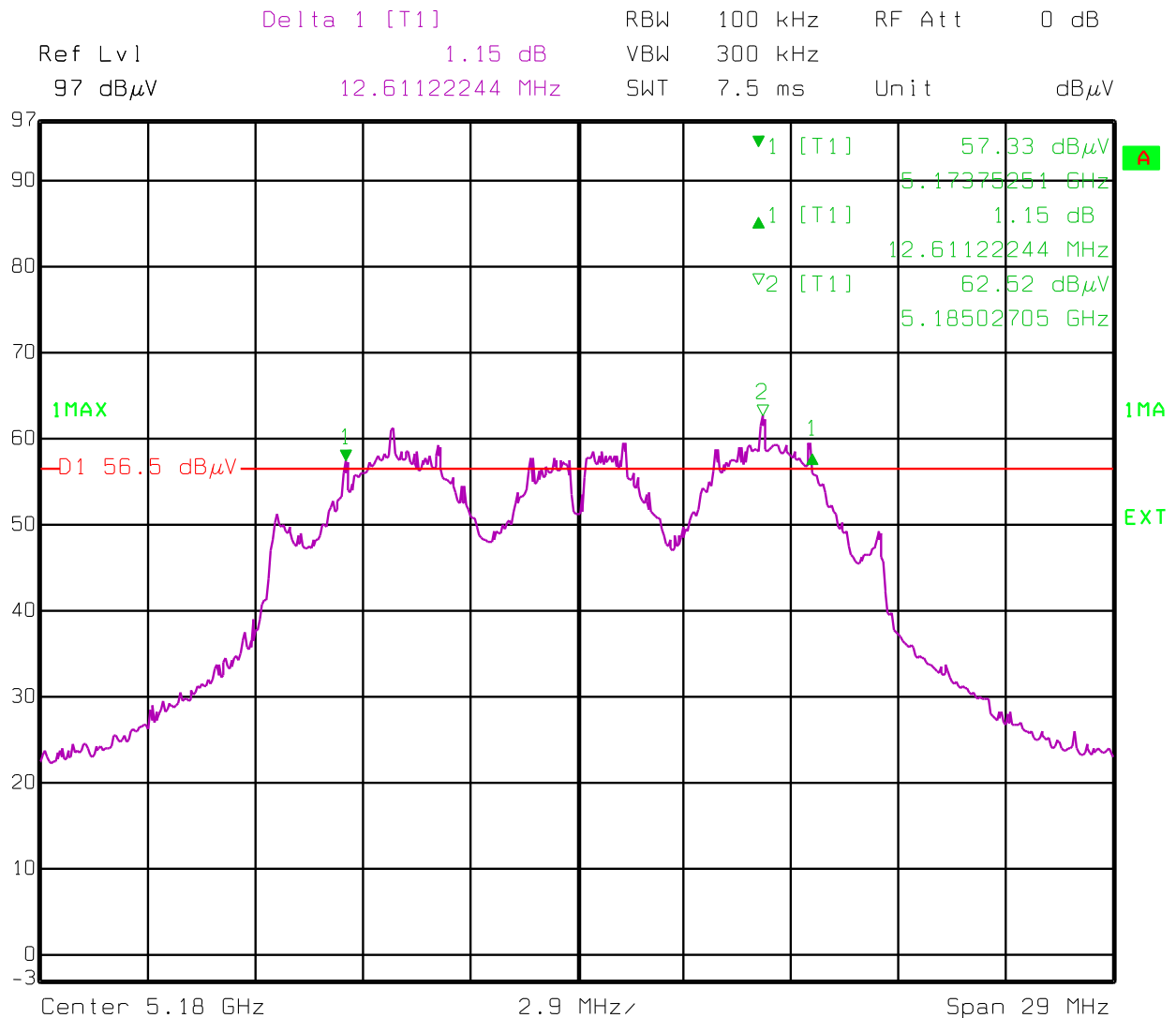
TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna VHBB 9124	Schwarzbeck	8526
Biconical antenna VHA 9103	Schwarzbeck	8528
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Log periodic antenna 3147	EMCO	8783
Bi-log antenna CBL6112A	Chase	8530
Antenna 3115	EMCO	8535
Antenna WR42	IMC	1939
Antenna WR42	IMC	1940
Antenna ATM WR28	Elhyte	4353
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier C020180F-4B1	Microwave DB	1922
Low-noise amplifier ALN02-0102	ALC Microwave	3036
Low-noise amplifier ALC ALS2640-30-10	Elhyte	4354
Low pass filter LP03/1000-7GH	Filtek	4087
Low Pass Filter LPM15601	Microtronics	6606
High Pass Filter LPM15600	Microtronics	6607
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8749
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000
Software	Champ libre Juigné. V3.4	8864

**Peak Power Density**

TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Band pass filter BP2442-84-7CS	BL Microwave	5625
Antenna 3115	EMCO	8535
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

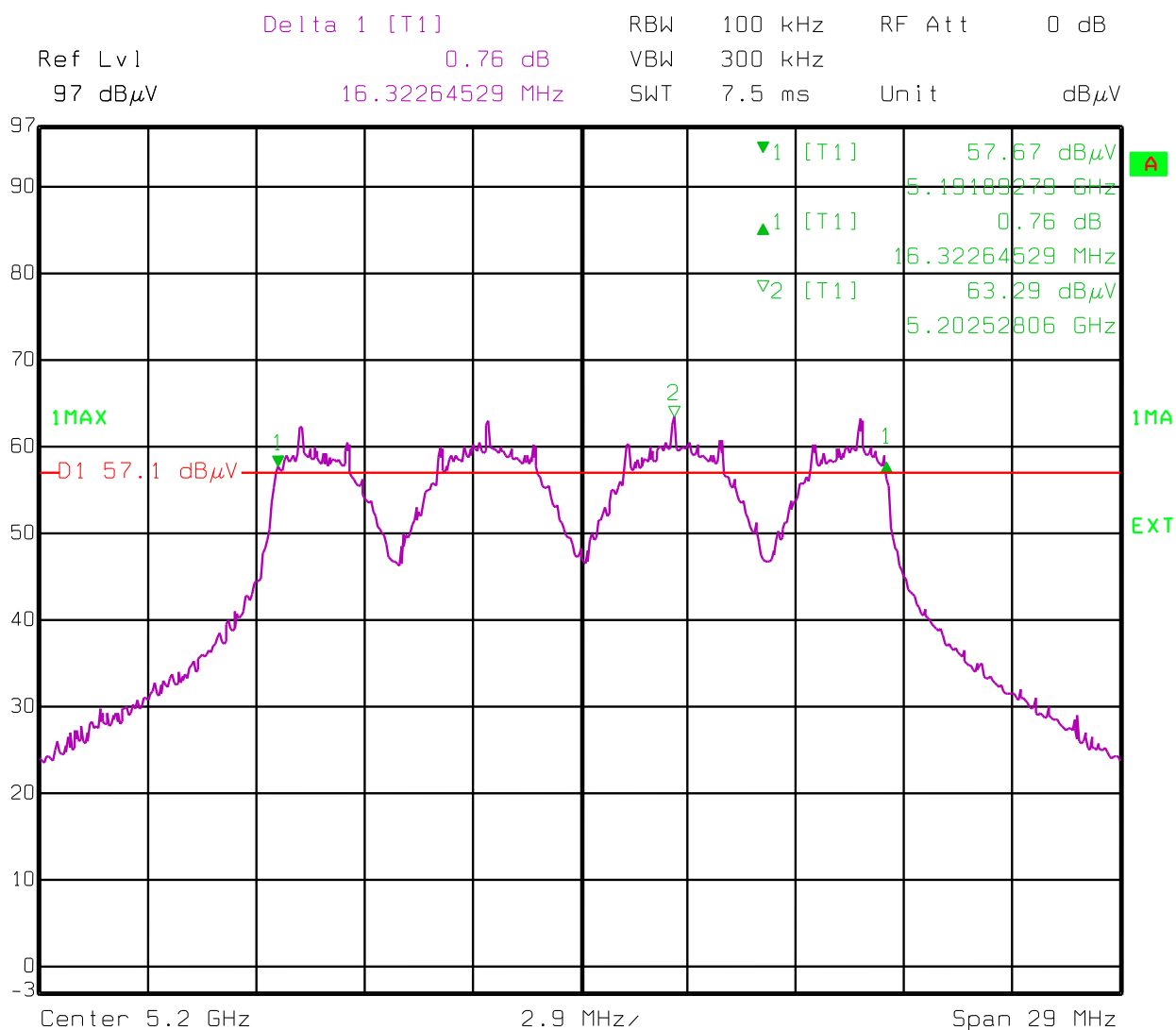
## APPENDIX 4: 6 dB bandwidth

Low channel – Mode 802.11.a



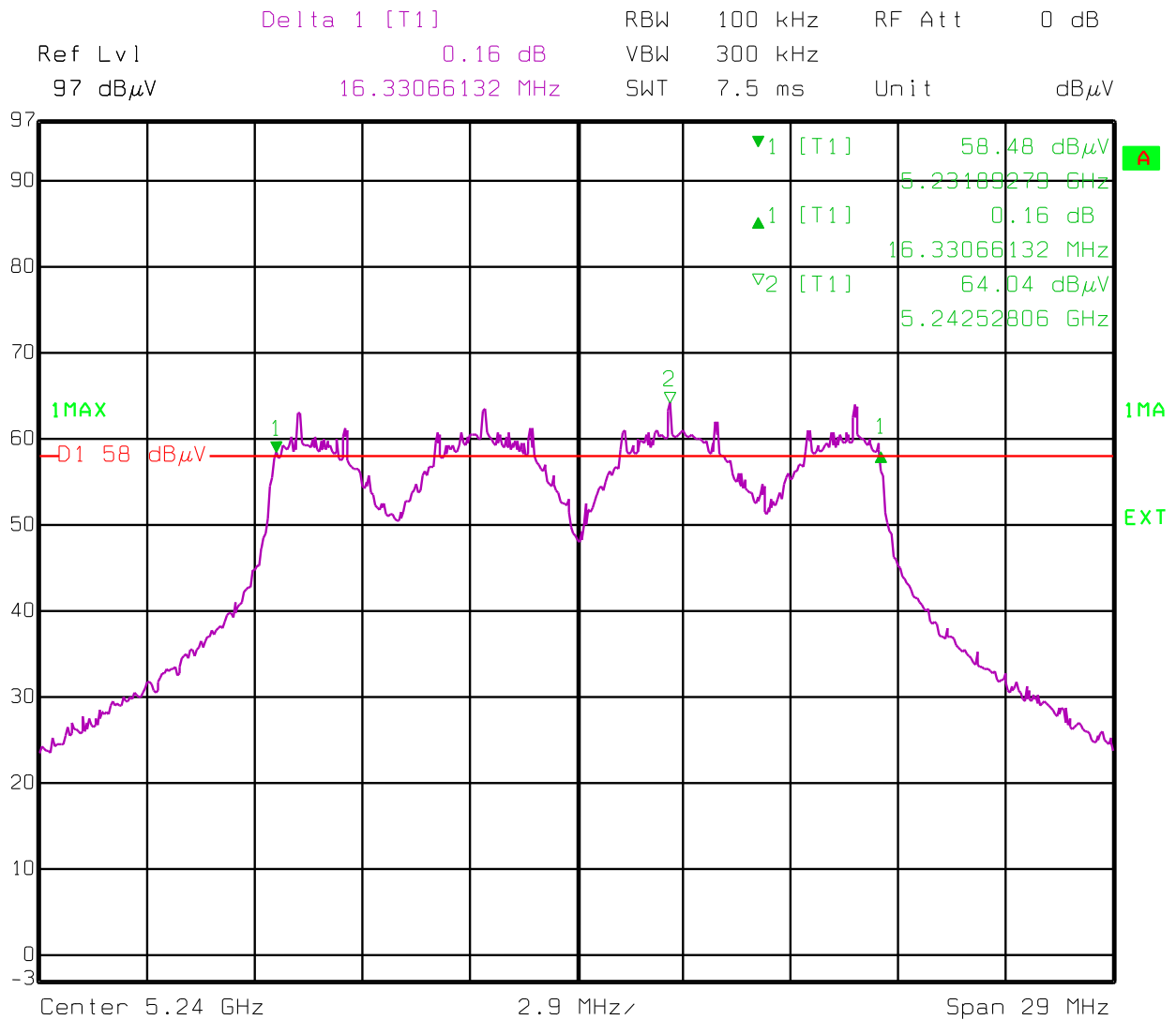
Date: 19.JUN.2015 11:19:57

## Central channel – Mode 802.11.a



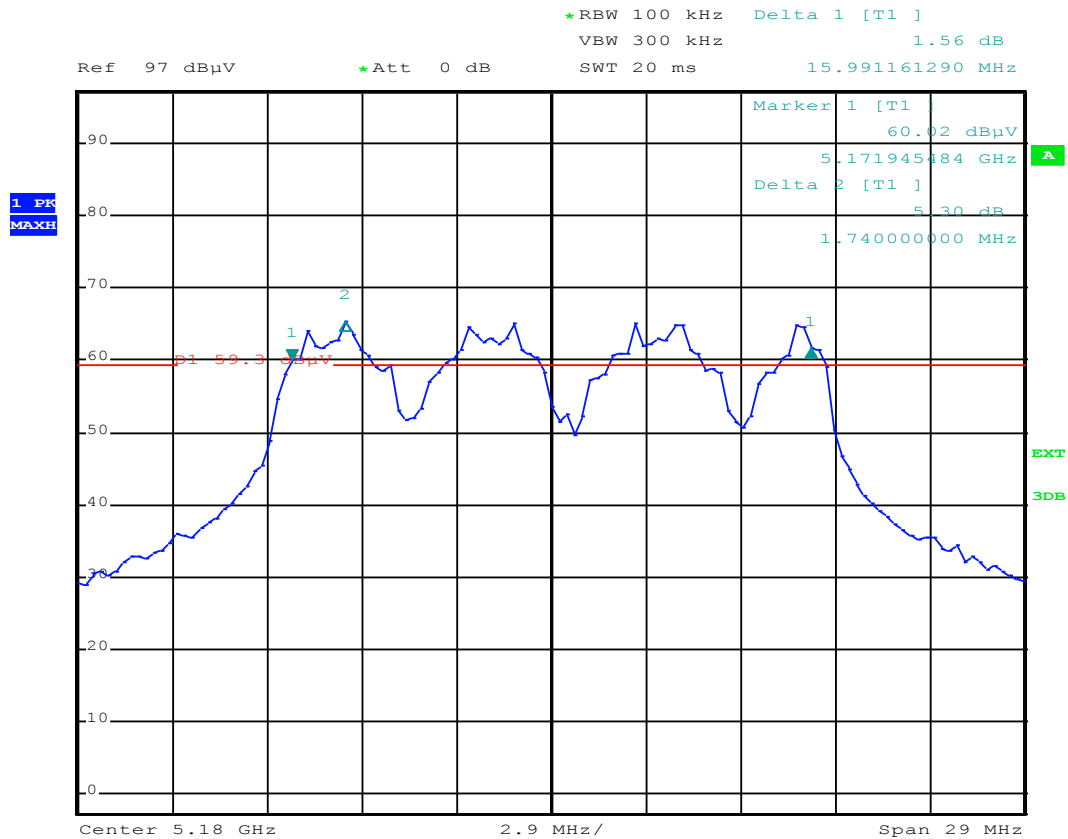
Date: 19.JUN.2015 11:22:49

## High channel – Mode 802.11.a



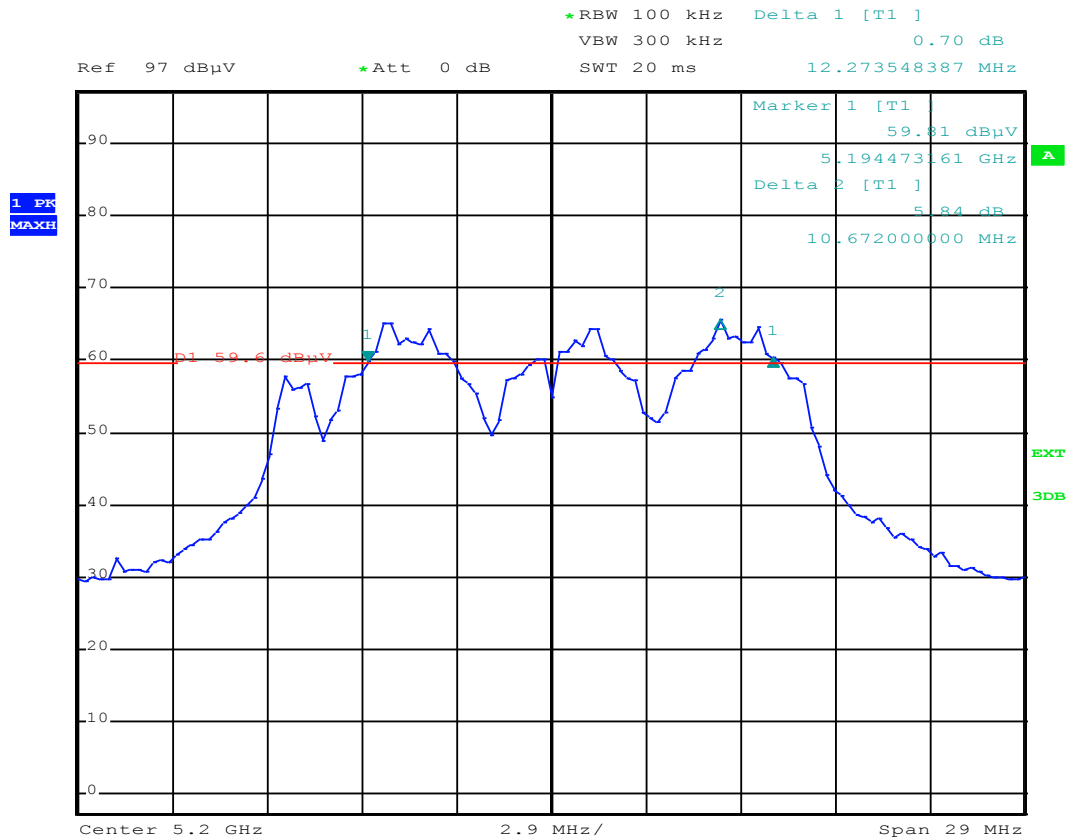
Date: 19.JUN.2015 11:34:47

## Low channel – Mode 802.11.n



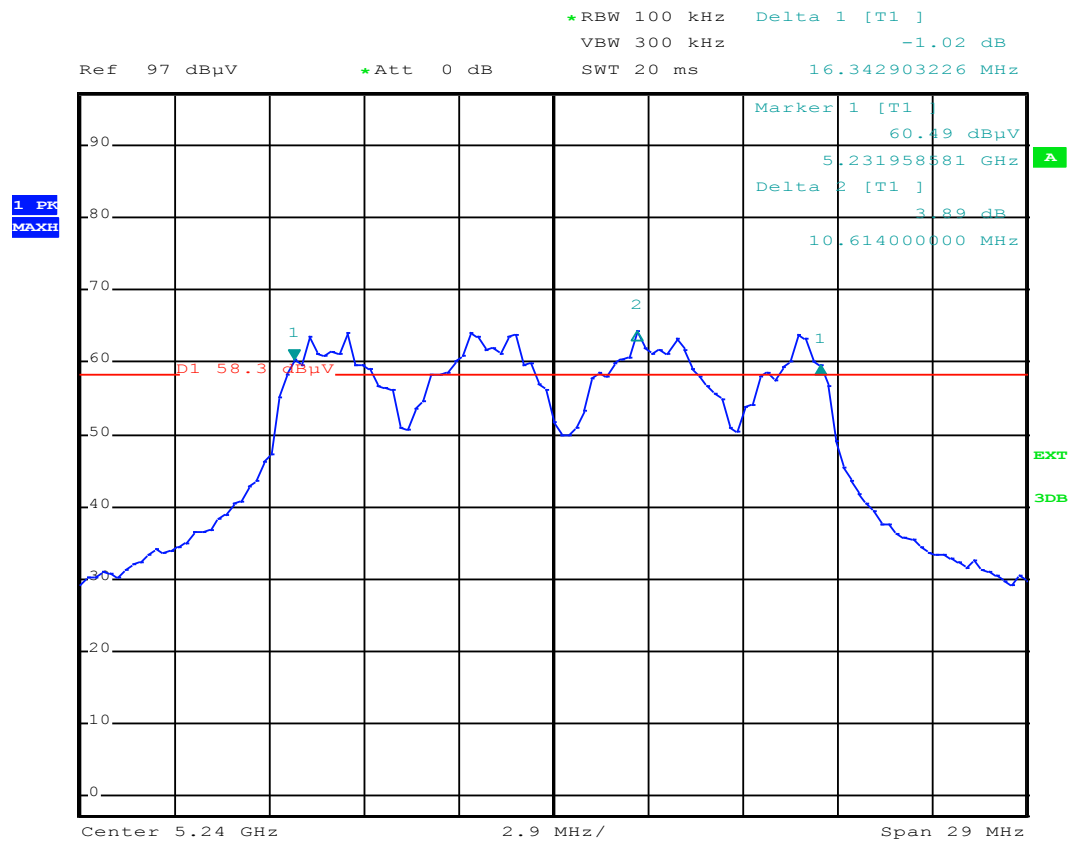
Date: 26.JUN.2015 16:03:30

## Central channel – Mode 802.11.n



Date: 26.JUN.2015 16:06:25

## High channel – Mode 802.11.n

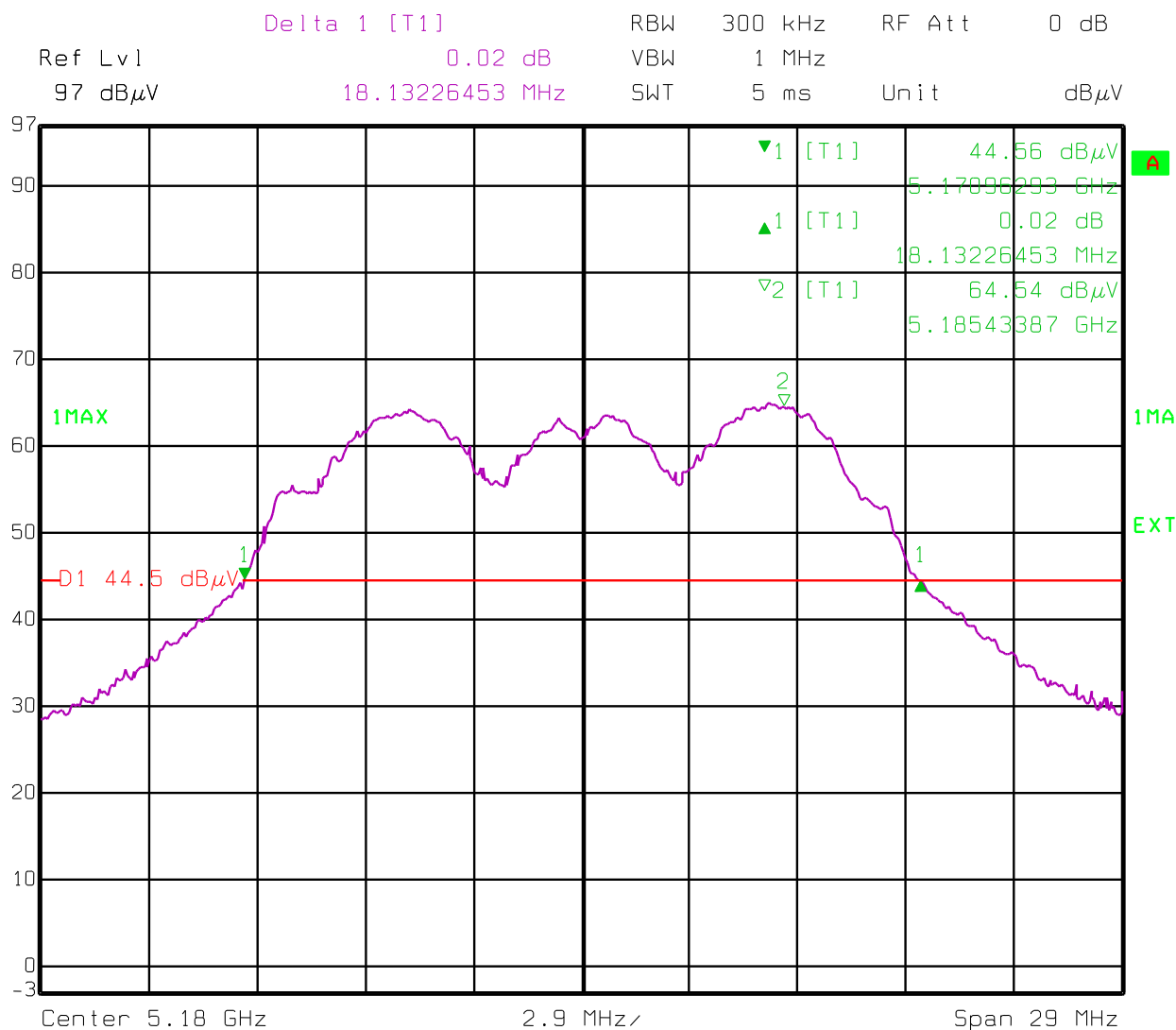


Date: 26.JUN.2015 16:08:33



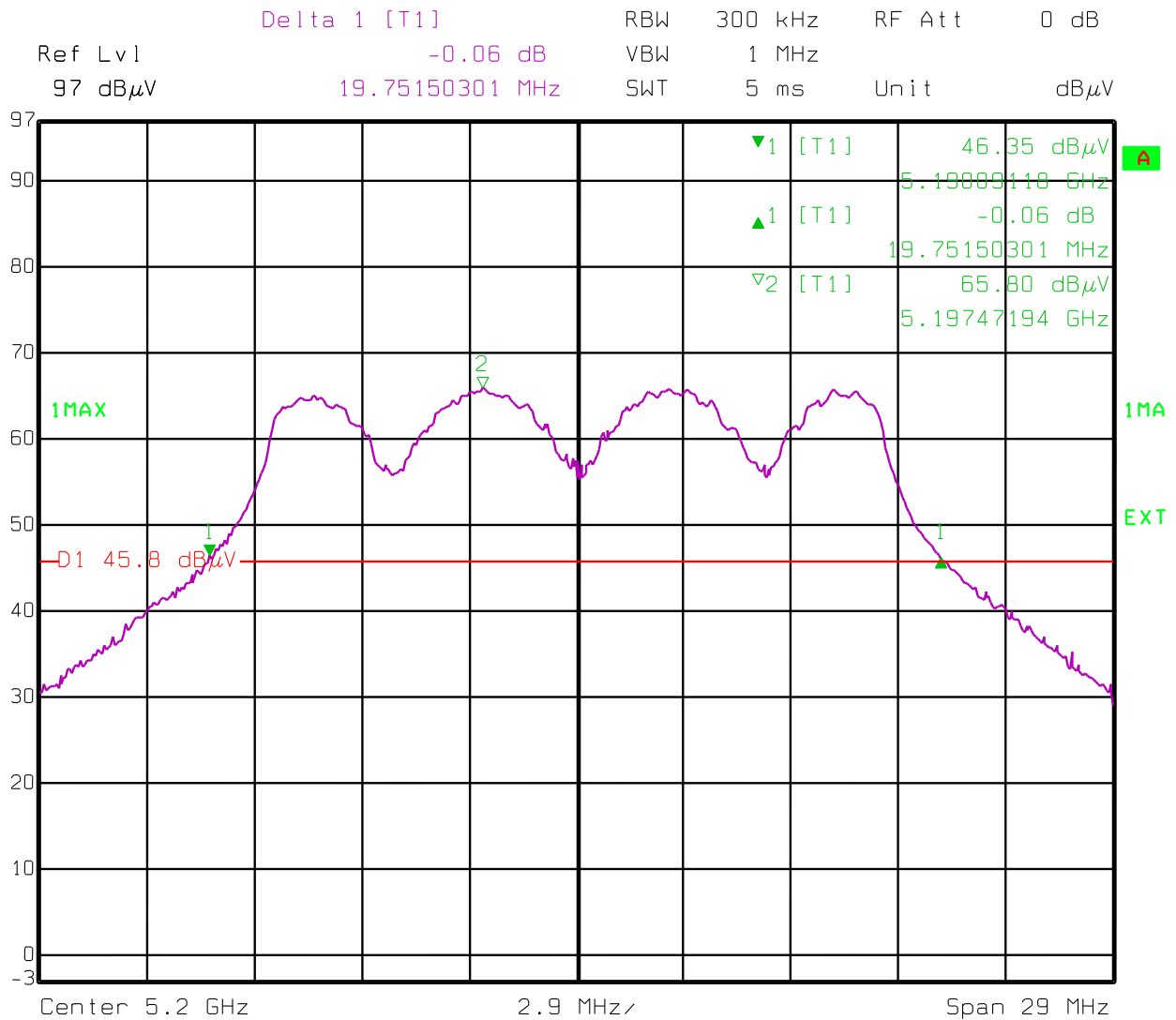
## APPENDIX 5: 20 dB bandwidth

Low channel – Mode 802.11.a



Date: 19.JUN.2015 11:15:47

## Central channel – Mode 802.11.a



Date: 19.JUN.2015 11:25:57

Delta 1 [T1] RBW 300 kHz RF Att 0 dB  
 Ref Lvl 97 dBμV VBW 1 MHz Unit dBμV  
 19.64328657 MHz SWT 5 ms

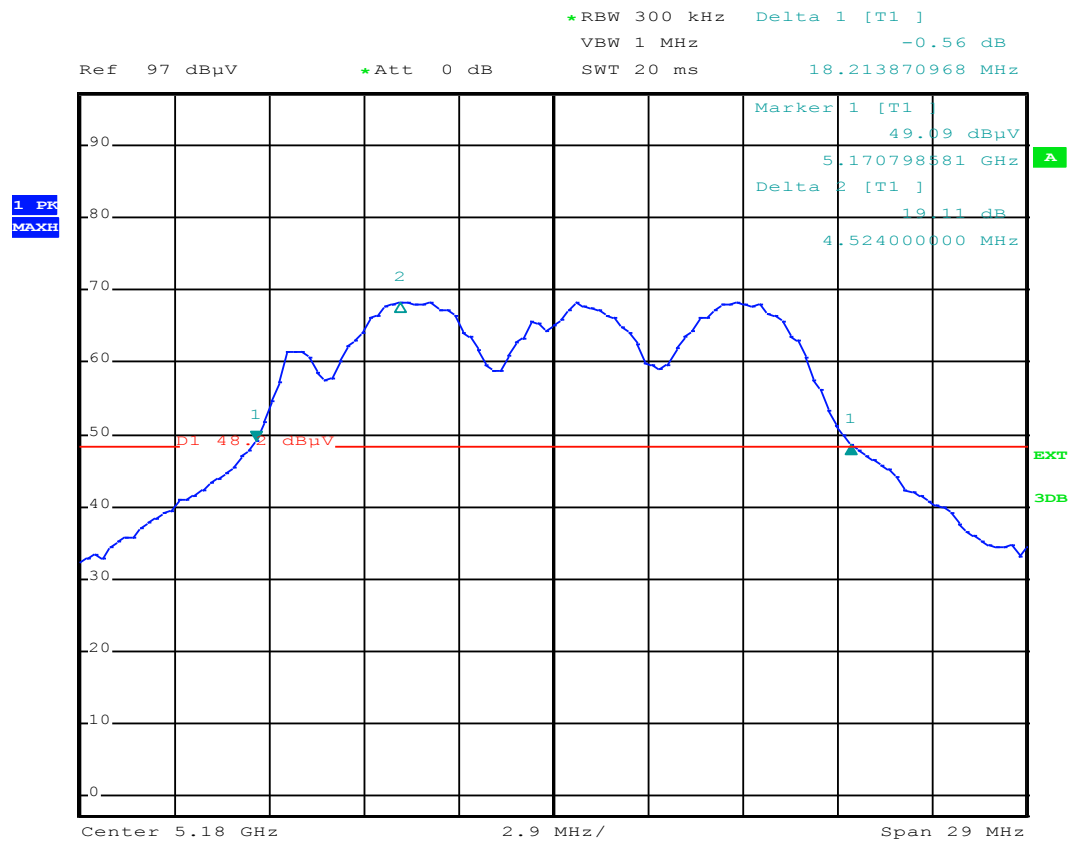
Marker	Frequency [GHz]	Amplitude [dBμV]
1	5.23828741	46.89
2	5.24252806	66.67

1MAX 46.6 dBμV 1MA EXT

Center 5.24 GHz 2.9 MHz Span 29 MHz

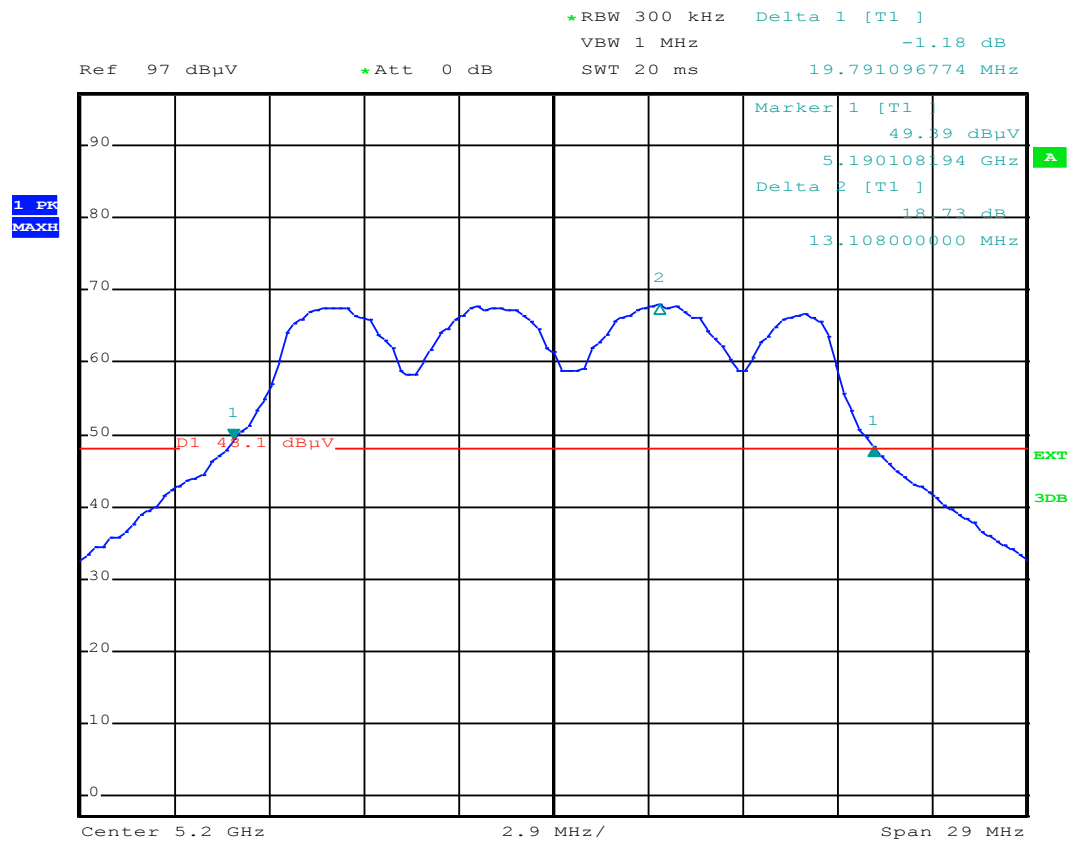
Date: 19.JUN.2015 11:31:59

## Low channel - Mode 802.11.n



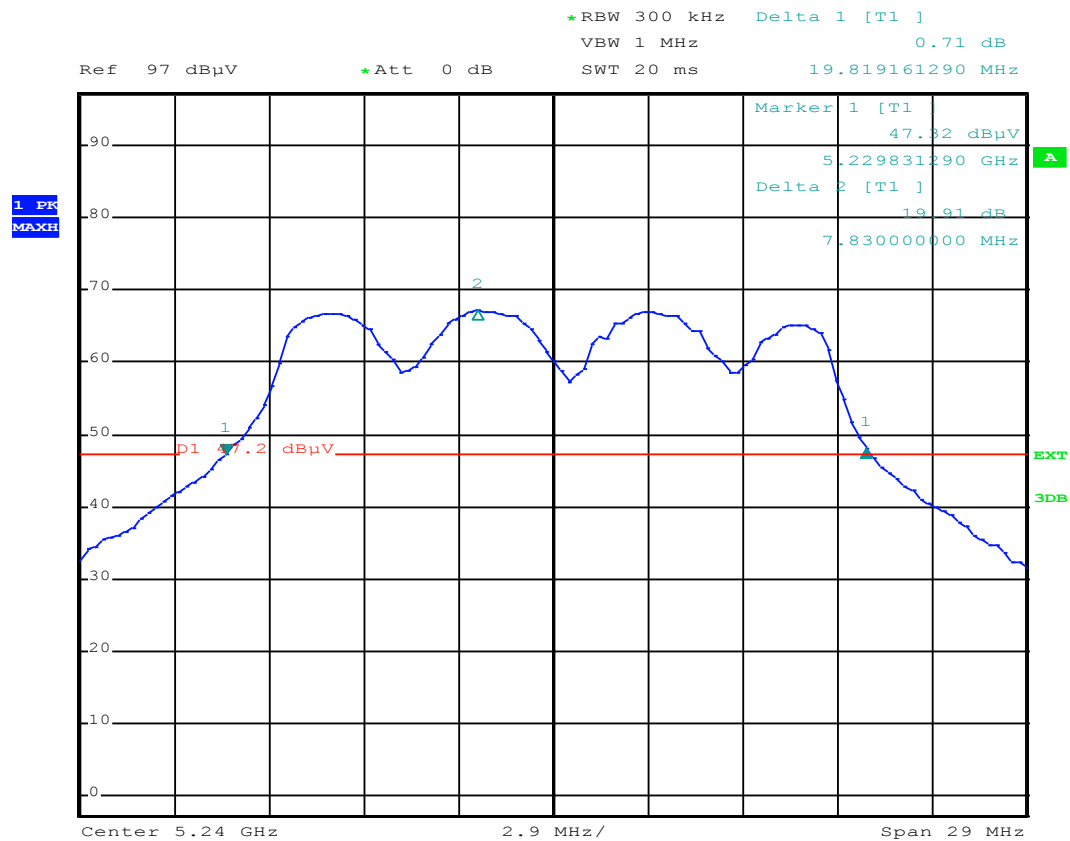
Date: 26.JUN.2015 16:14:05

## Central channel - Mode 802.11.n



Date: 26.JUN.2015 16:16:14

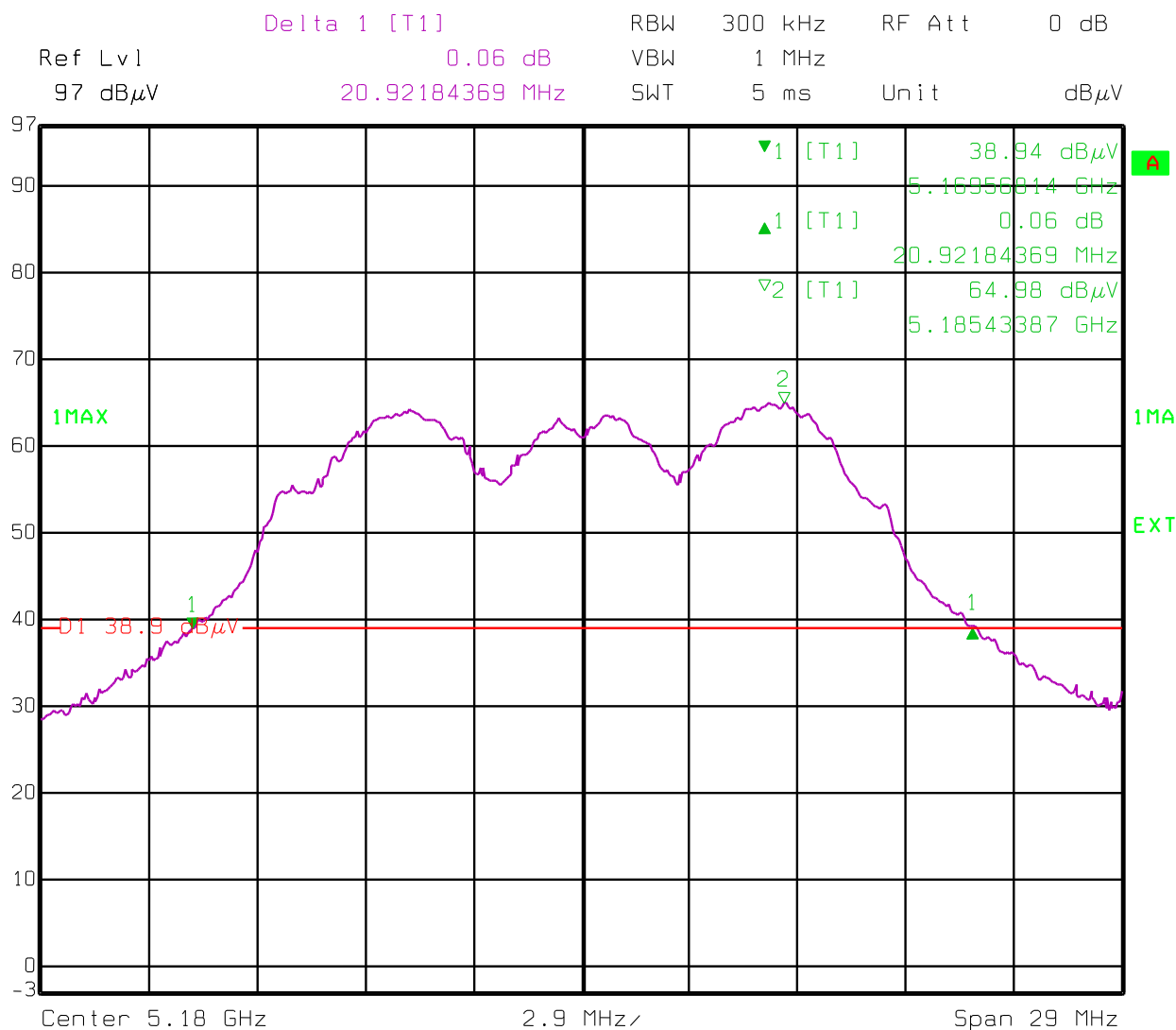
## High channel - Mode 802.11.n



Date: 26.JUN.2015 16:09:51

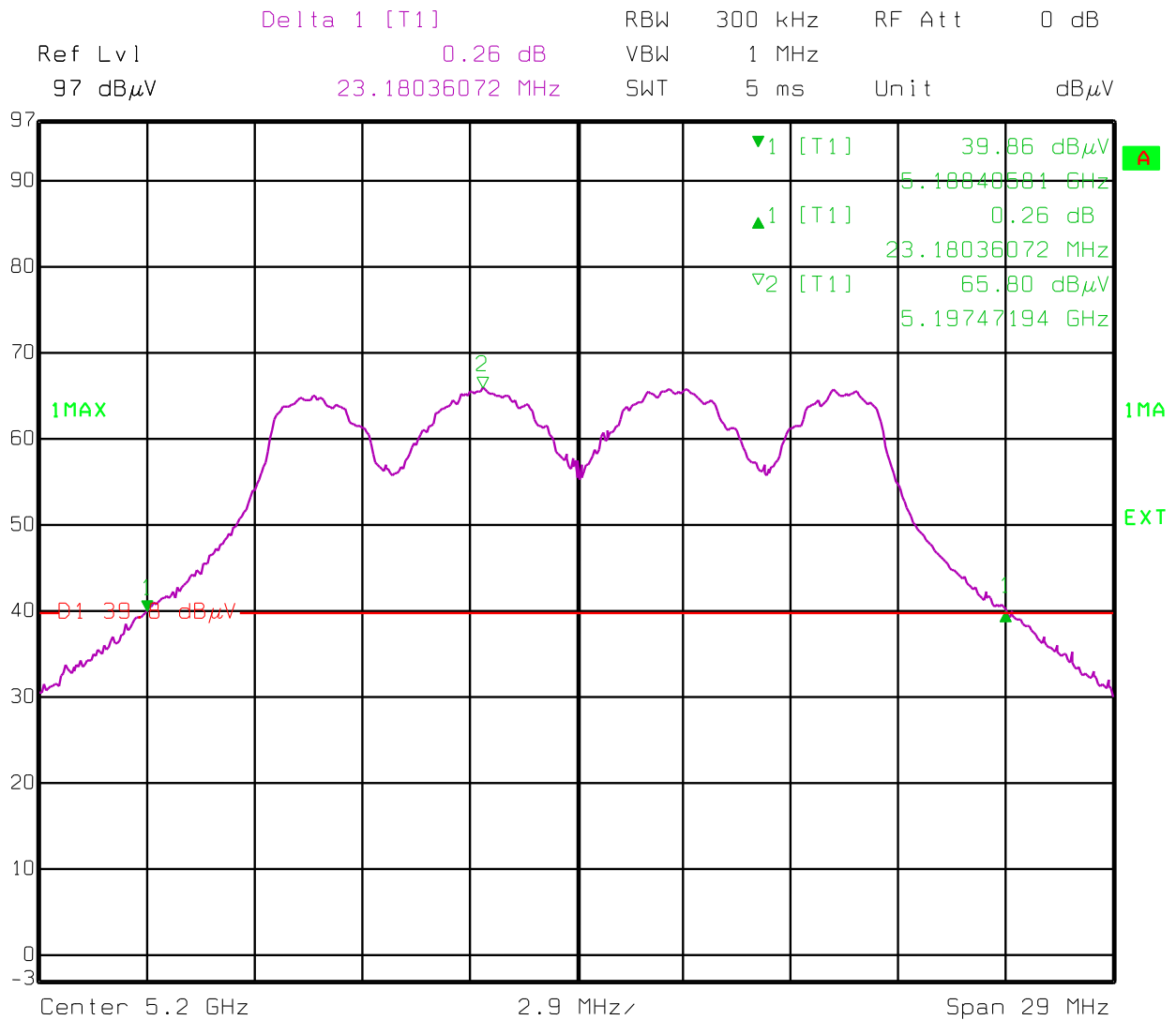
## APPENDIX 6: 26 dB bandwidth

Low channel – Mode 802.11.a



Date: 19.JUN.2015 11:17:49

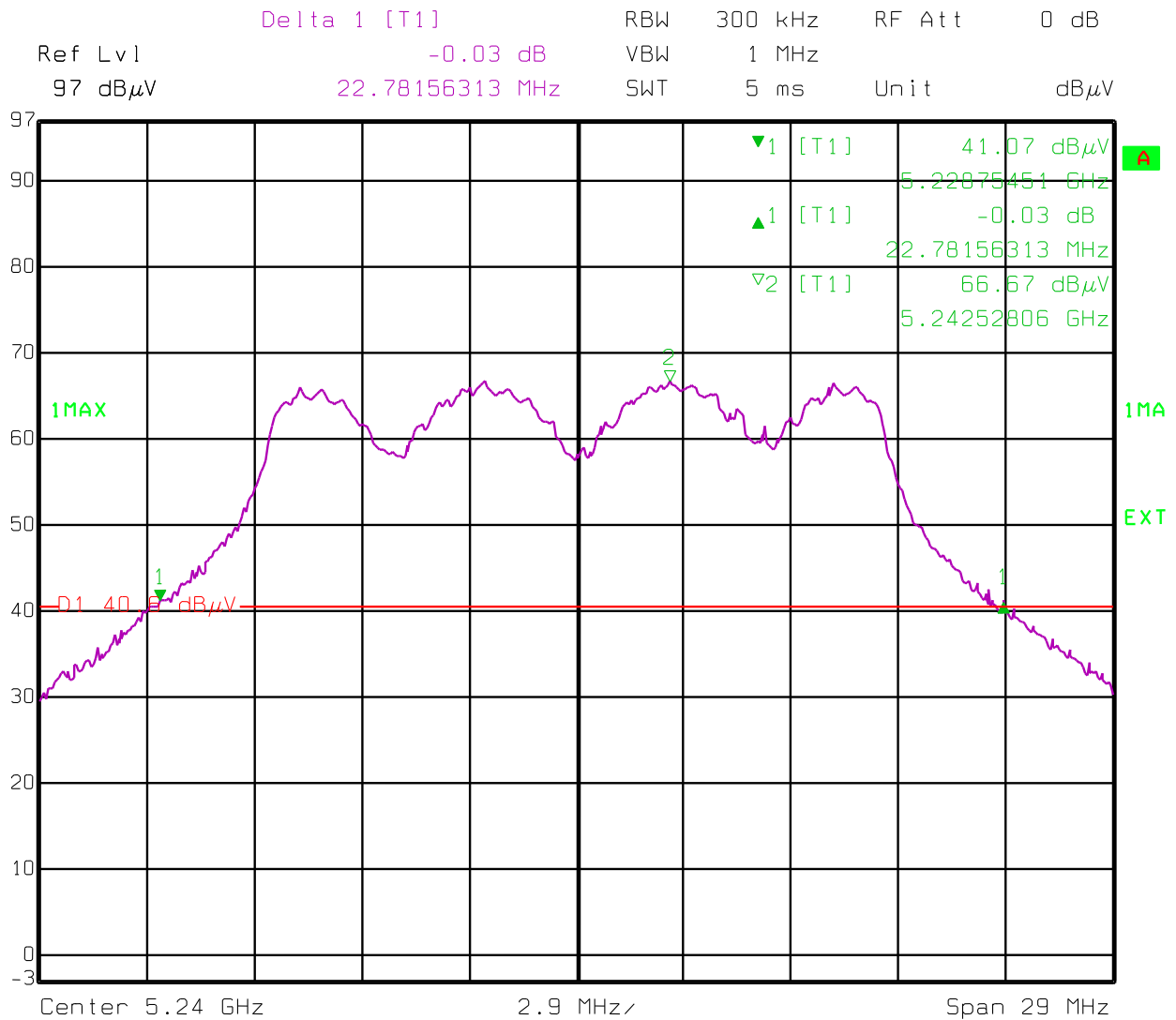
## Central channel – Mode 802.11.a



Date: 19.JUN.2015 11:27:15

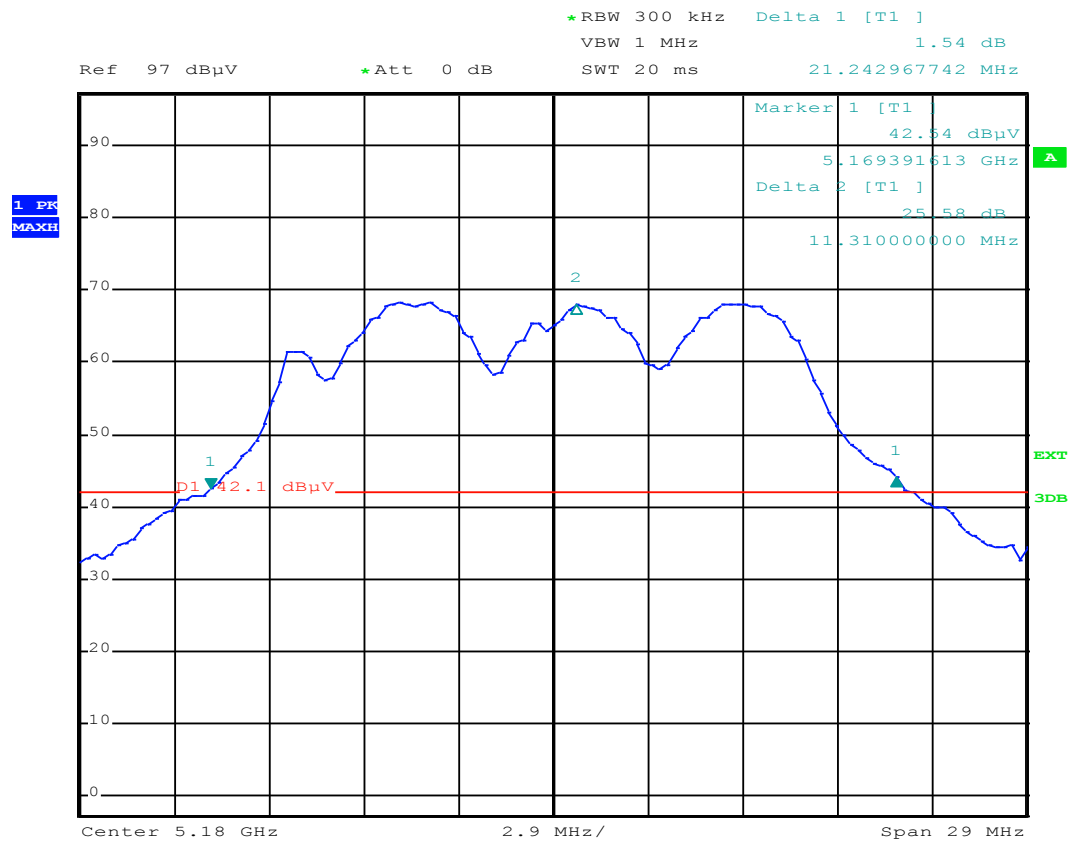


## High channel – Mode 802.11.a



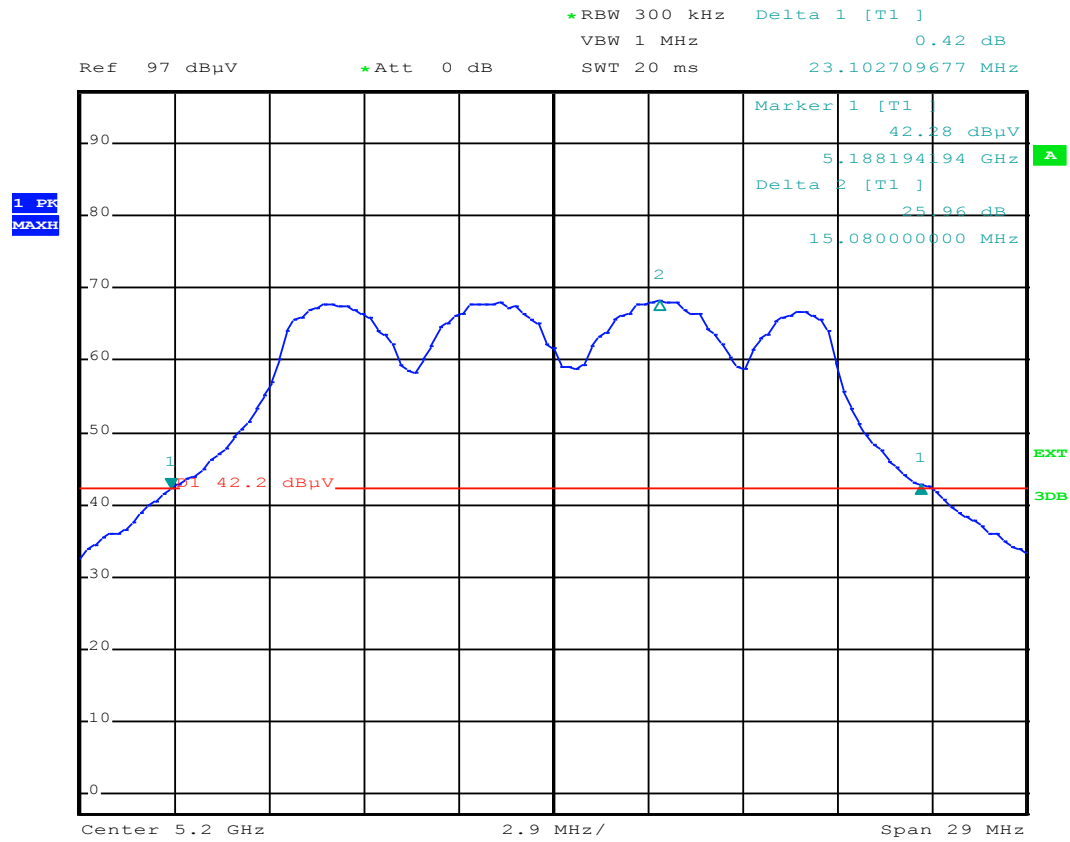
Date: 19.JUN.2015 11:30:12

## Low channel – Mode 802.11.n



Date: 26.JUN.2015 16:13:07

## Central channel – Mode 802.11.n



Date: 26.JUN.2015 16:17:31

\*RBW 300 kHz Delta 1 [T1 ]  
 VBW 1 MHz 0.93 dB  
 Ref 97 dBμV \*Att 0 dB SWT 20 ms 22.895032258 MHz

Marker 1 [T1 ]  
 41.52 dBμV  
 Delta 2 [T1 ]  
 5.228207290 GHz  
 25.72 dB  
 9.454000000 MHz

1 PK  
 MAXH

1 41.2 dBμV

2

1

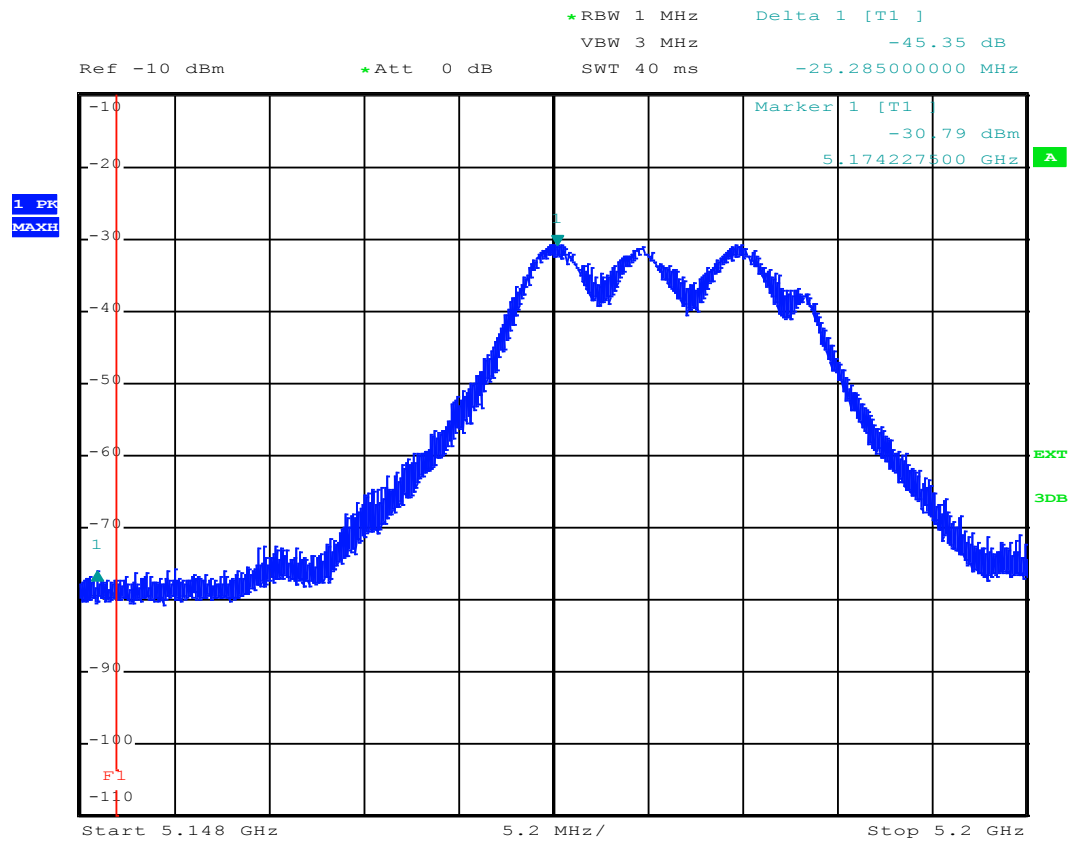
EXT  
 3DB

Center 5.24 GHz Span 29 MHz

Date: 26.JUN.2015 16:11:14

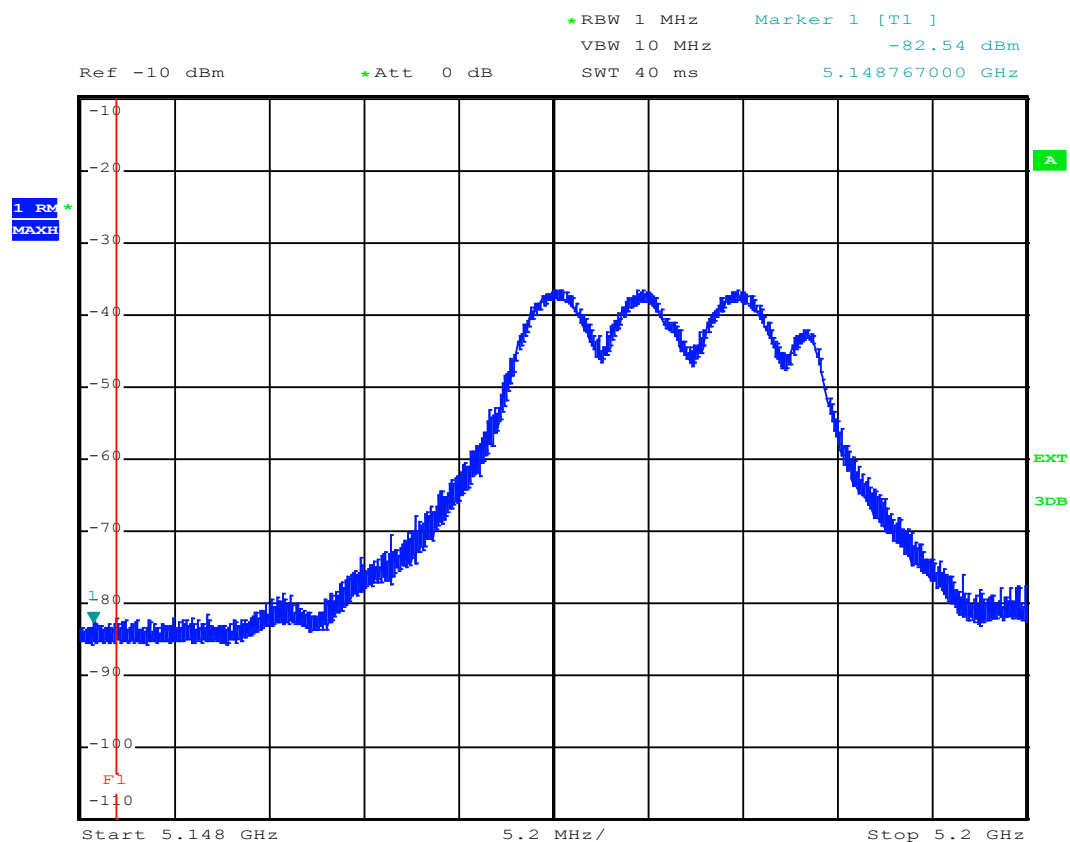
## APPENDIX 7: Band edge

Low Channel – Mode 802.11.a - Peak



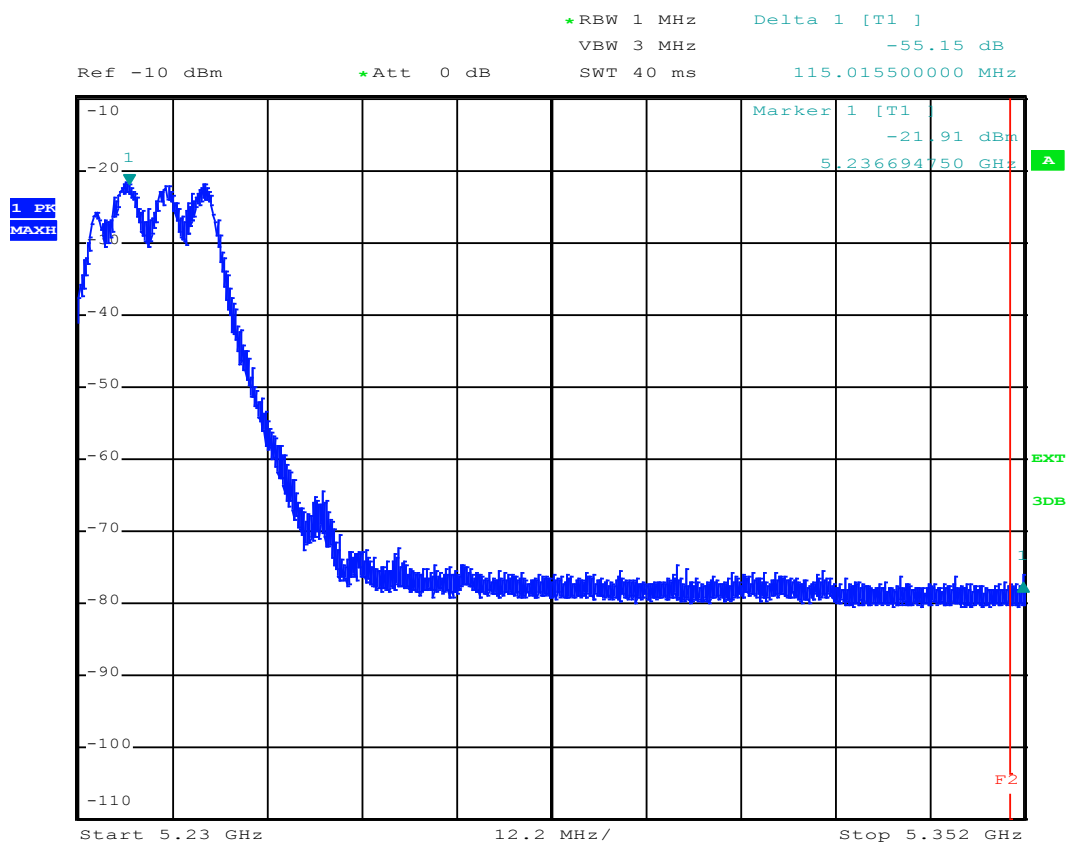
Date: 21.AUG.2015 15:27:15

# Low Channel – Mode 802.11.a – Average



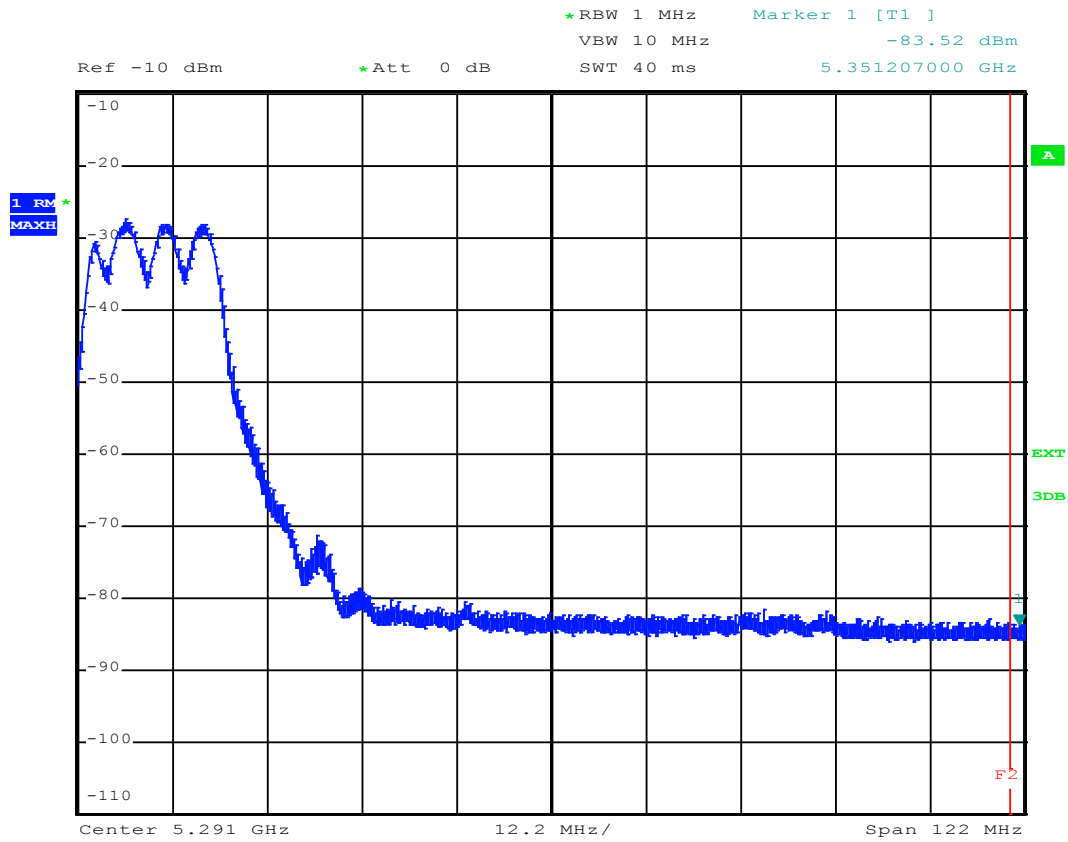
Date: 21.AUG.2015 15:28:15

# High Channel – Mode 802.11.a – Peak



Date: 21.AUG.2015 15:36:11

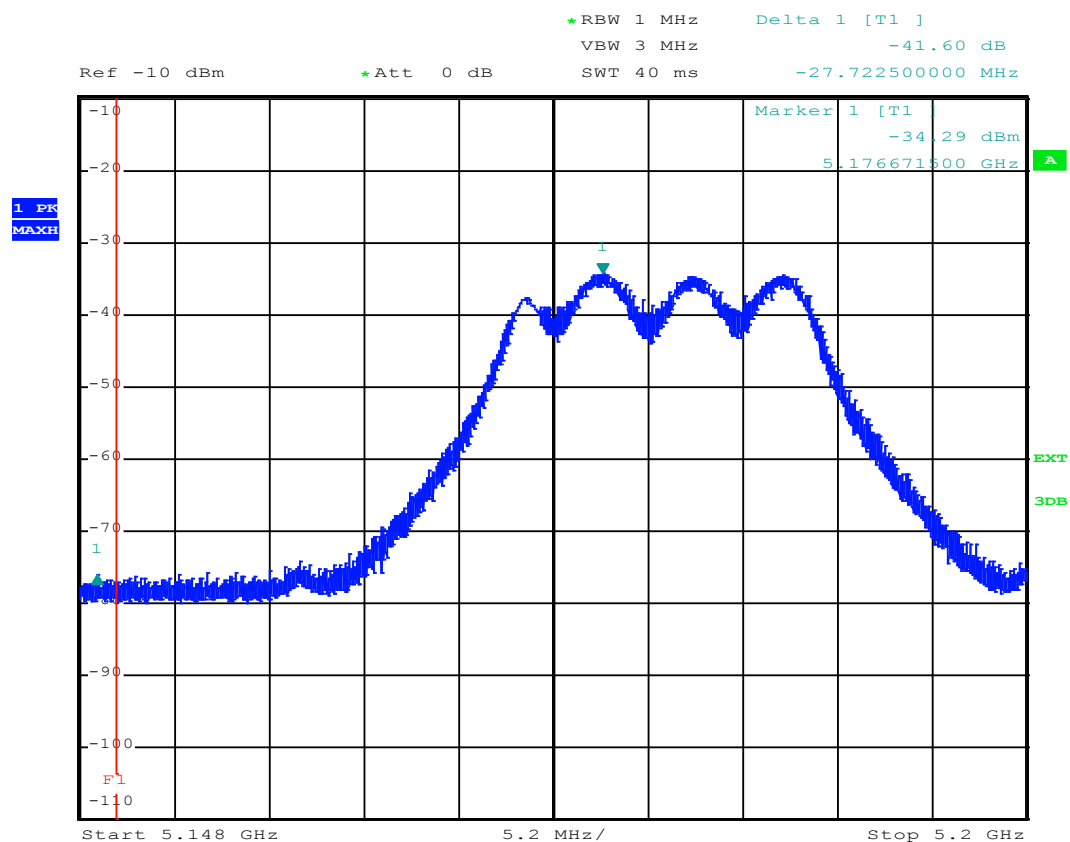
## High Channel – Mode 802.11.a - Average



Date: 21.AUG.2015 15:36:55

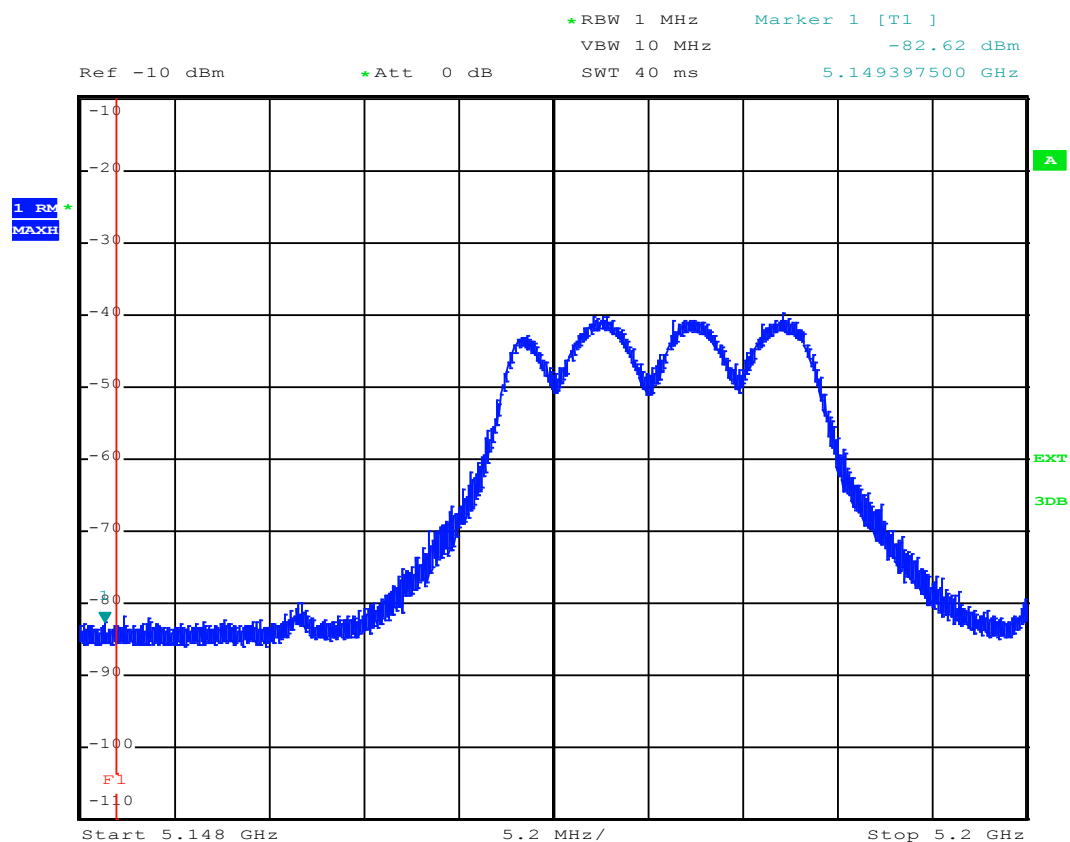


## Low Channel – Mode 802.11.n – Peak



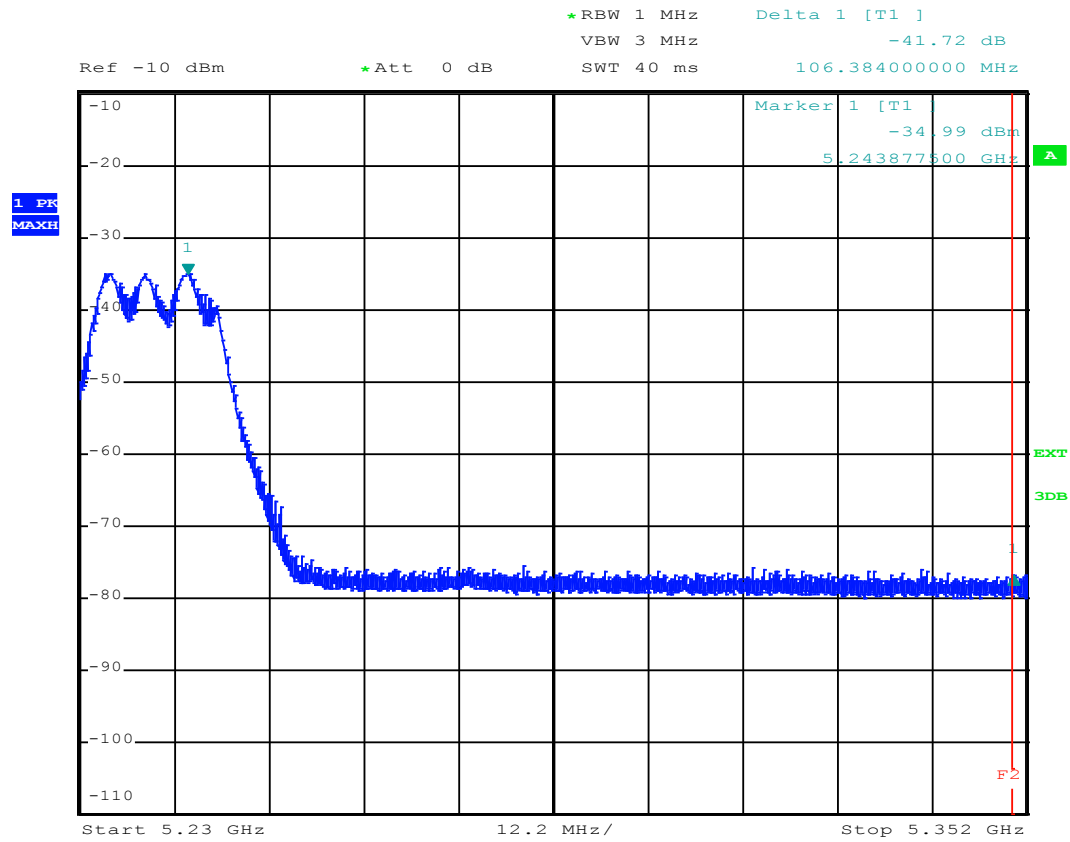
Date: 21.AUG.2015 15:31:36

# Low Channel – Mode 802.11.n - Average



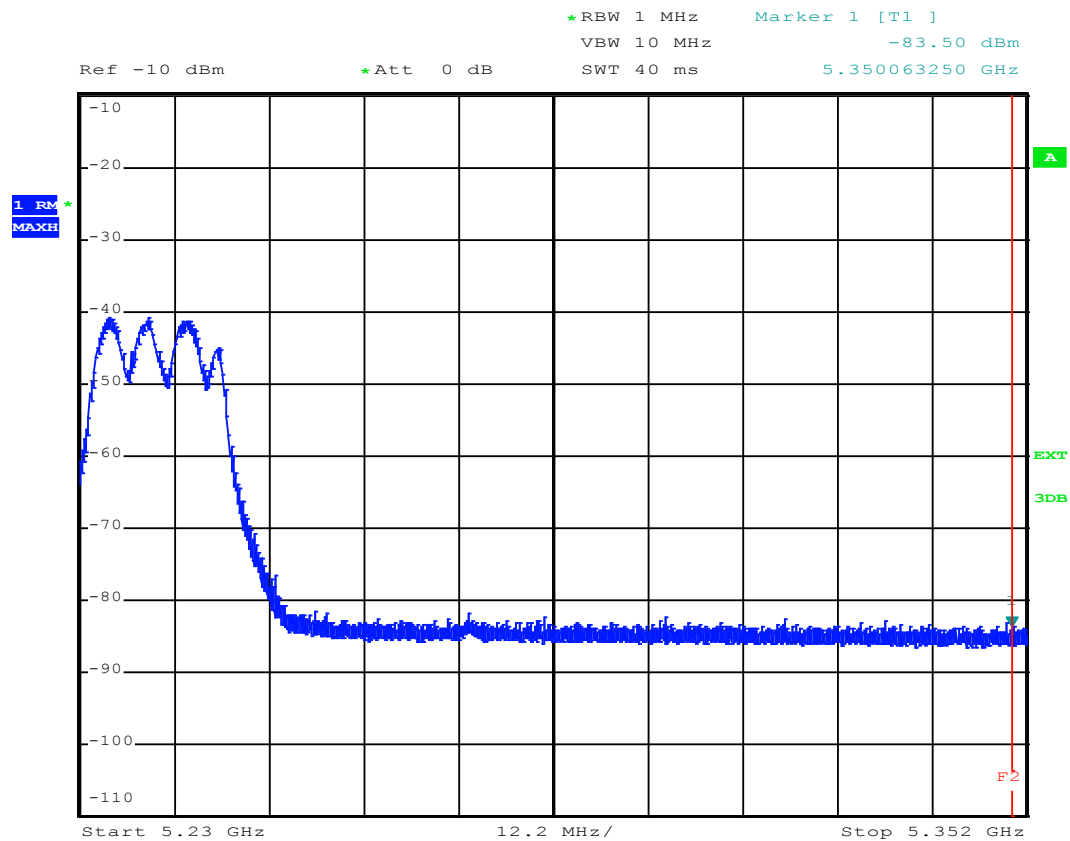
Date: 21.AUG.2015 15:32:07

## High Channel – Mode 802.11.n - Peak



Date: 21.AUG.2015 15:40:06

## High Channel – Mode 802.11.n - Average



Date: 21.AUG.2015 15:40:46