RR051-15-102324-3-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: 48 with 6 appendixes

Ed.	Date	Modified pages	Written by Name	Visa	Technical Verification and Quality Approval Name	Visa
0	31/07/2015	Creation	S. LOUIS	SL	O. ROY	

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
Person presents during the tests:	Mr MARCHAND
DATES OF TEST:	Between 11-JUNE-2015 to 30-JUL-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

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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 multifrequency wireless transceiver (WIFI 5.8GHz) – 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 5725 MHz to 5875 MHz
Number of channels:	5
Channel spacing:	20MHz
Modulation:	WIFI 5.8GHz
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.

The duty cycle used for each mode (b,g or n) is 85%.
The duty factor is 0.71dB.

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.
558074 D01 DTS v03r02	Guidance for Performing Compliance on Digital Transmission Systems Operating under §15.247
Public Notice DA 00-705	Filing and Measurement Guideline for Frequency Hopping Spread Spectrum Systems.
662911 D01 Multiple Transmitter Output V02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band

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

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
8702	R&S NRVS	Power meter	05/09/2013	05/09/2015	05/11/2015
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
8742	R&S NRV-Z52	Sensor	05/09/2013	05/09/2015	05/11/2015
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	/	/	/

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

6. TESTS AND CONCLUSIONS

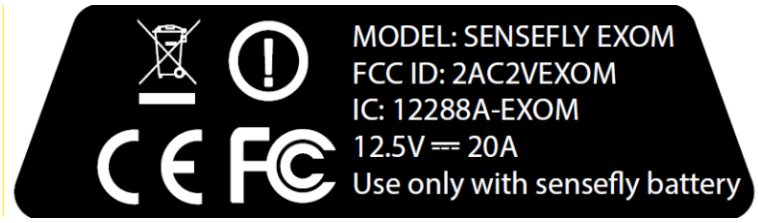
6.1 general (subpart A)

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*
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					
	(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				*Note 5*
	(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 / dedicated antenna. Professionally installed equipment.

Note 2: See FCC part 15.247 (d).

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

Note 4: The minimum 6 dB bandwidth of the equipment is 13.25 MHz (see appendix 4).

Note 5: Conducted measurement is not possible (integral antenna), so we used the radiated method in open field.

RF EXPOSURE:

Maximum measured power = 33.91 mW

In accordance with KDB 447498 D01 General RF Exposure Guidance v05r02

*PSD= EIRP/(4*π*R²)=33.91/(4*π*(20 cm)²)= 6.75×10⁻³ mW/cm² (limit= 1 mW/cm²).*

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 (5th 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

Applicable limits:
for 30 MHz ≤ F ≤ 88 MHz : 40 dBµV/m at 3 meters
for 88 MHz < F ≤ 216 MHz : 43.5 dBµV/m at 3 meters
for 216 MHz < F ≤ 960 MHz : 46 dBµV/m at 3 meters
Above 960 MHz : 54 dBµV/m at 3 meters

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. 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.

Results:

Ambient temperature (°C): 21.6
Relative humidity (%): 54

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

Lower Band Edge: from 5723 MHz to 5725 MHz
Upper Band Edge: from 5875 MHz to 5877 MHz

Sample N° 1: Mode 802.11a

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)
5745	105	PEAK	5724.892	-38.03	66.97	85	18.03
5825	104	PEAK	5875.648	-40.14	63.86	84	20.14

* *Marker-Delta method*

20 dB bandwidth curves are given in appendix 5; band-edge curves are given in appendix 6.

Sample N° 1: Mode 802.11n

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)
5745	102	PEAK	5724.628	-44.18	57.82	82	24.18
5825	103	PEAK	5876.168	-47.68	55.52	83	27.48

* *Marker-Delta method*

20 dB bandwidth curves are given in appendix 5; band-edge curves are given in appendix 6.

Test conclusion:

RESPECTED STANDARD

9. MAXIMUM PEAK OUTPUT POWER

Standard: FCC Part 15

Test procedure: paragraph 15.247 (b)

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
Relative humidity (%): 54

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

Sample N° 1 Low channel (F=5745 MHz) – Mode 802.11.a

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
0.49	0.4	0.89	1000

Sample N° 1 Central channel (F=5785 MHz) – Mode 802.11.a

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
0.5	0.4	0.9	1000

Sample N° 1 High channel (F=5825 MHz) – Mode 802.11.a

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
0.4	0.3	0.7	1000

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=5745 MHz) – Mode 802.11.n

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
15.92	18	33.91	1000

Sample N° 1 Central channel (F=5785 MHz) – Mode 802.11.n

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
16.1	13.9	30	1000

Sample N° 1 High channel (F=5825 MHz) – Mode 802.11.n

Conducted Power (mW):		Total Conducted power (mW)	Limit (mW)
Chain 1	Chain 2		
12.5	11.1	23.5	1000

Test conclusion:

RESPECTED STANDARD

10. 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.

Frequency range: From 9 kHz to 40GHz.

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.

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=5745 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
11491.34*	P	150	39	1000	V	58.2	74	15.8
11491.34*	Av	150	39	1000	V	46.6	54	7.4

Sample N° 1 Central channel (F=5785 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
11566.16*	P	150	33	1000	V	62.5	74	11.5
11566.16*	Av	150	33	1000	V	50.5	54	3.5

Sample N° 1 High channel (F=5825 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
11649.68*	P	150	39	1000	V	58.6	74	15.4
11649.68*	Av	150	39	1000	V	46.1	54	7.9

* restricted bands of operation in 15.205
***the peak level is lower than the average limit (54 dBµV/m).*

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

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 dBµV/m on low channel.
So the applicable limit is 85 dBµV/m.
In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

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=5745 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
11489.6*	P	150	33	1000	V	56.7	74	17.3
11489.6*	Av	150	33	1000	V	46.6	54	7.4

Sample N° 1 Central channel (F=5785 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
11571*	P	150	33	1000	V	57.3	74	16.7
11571*	Av	150	33	1000	V	48.2	54	5.8

Sample N° 1 High channel (F=5825 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
11650.2*	P	150	32	1000	V	55.7	74	18.3
11650.2*	Av	150	32	1000	V	45.1	54	8.9

* restricted bands of operation in 15.205
***the peak level is lower than the average limit (54 dBµV/m).*

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

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 103 dBµV/m on High channel .
So the applicable limit is 83 dBµV/m.
In addition, radiated emissions which fall in the restricted band, as defined in section 15.205 (a), must also comply with the radiated emission limits specified in section 15.209 (a) (see section 15.205 (c)).

Test conclusion:

RESPECTED STANDARD

11. PEAK POWER DENSITY

Standard: FCC Part 15

Test procedure: paragraph 15.247 (e)

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: 3 kHz
Video bandwidth: 10 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.

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=5745 MHz) – Mode 802.11.a

Power Spectral Density (dBm):		Sum of PSD (dBm)	Limit (dBm)
Chain 1	Chain 2		
-28.81	-29.04	-25.9	8

Sample N° 1 Central channel (F=5785 MHz) – Mode 802.11.a

Power Spectral Density (dBm):		Sum of PSD (dBm)	Limit (dBm)
Chain 1	Chain 2		
-29.39	-30.14	-26.7	8

Sample N° 1 High channel (F=5825 MHz) – Mode 802.11.a

Power Spectral Density (dBm):		Sum of PSD (dBm)	Limit (dBm)
Chain 1	Chain 2		
-29.15	-30.94	-26.9	8

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=5745 MHz) – Mode 802.11.n

Power Spectral Density (dBm):		Sum of PSD (dBm)	Limit (dBm)
Chain 1	Chain 2		
-13.21	-13.63	-10.4	8

Sample N° 1 Central channel (F=5785 MHz) – Mode 802.11.n

Power Spectral Density (dBm):		Sum of PSD (dBm)	Limit (dBm)
Chain 1	Chain 2		
-13.3	-13.37	-10.3	8

Sample N° 1 High channel (F=5825 MHz) – Mode 802.11.n

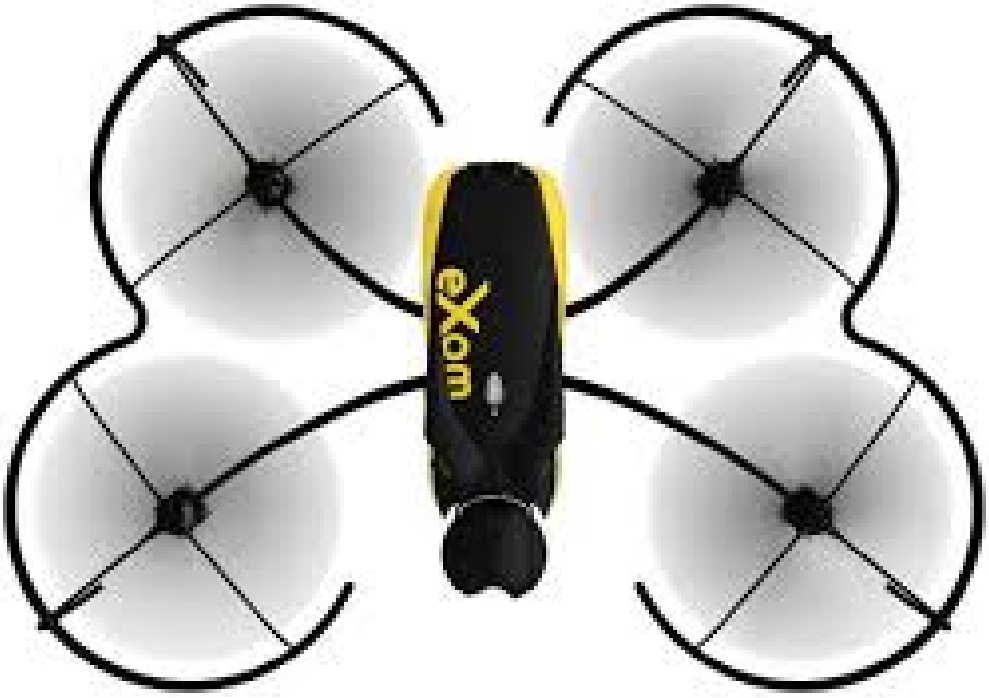
Power Spectral Density (dBm):		Sum of PSD (dBm)	Limit (dBm)
Chain 1	Chain 2		
-15.93	-16.88	-13.4	8

Test conclusion:

RESPECTED STANDARD

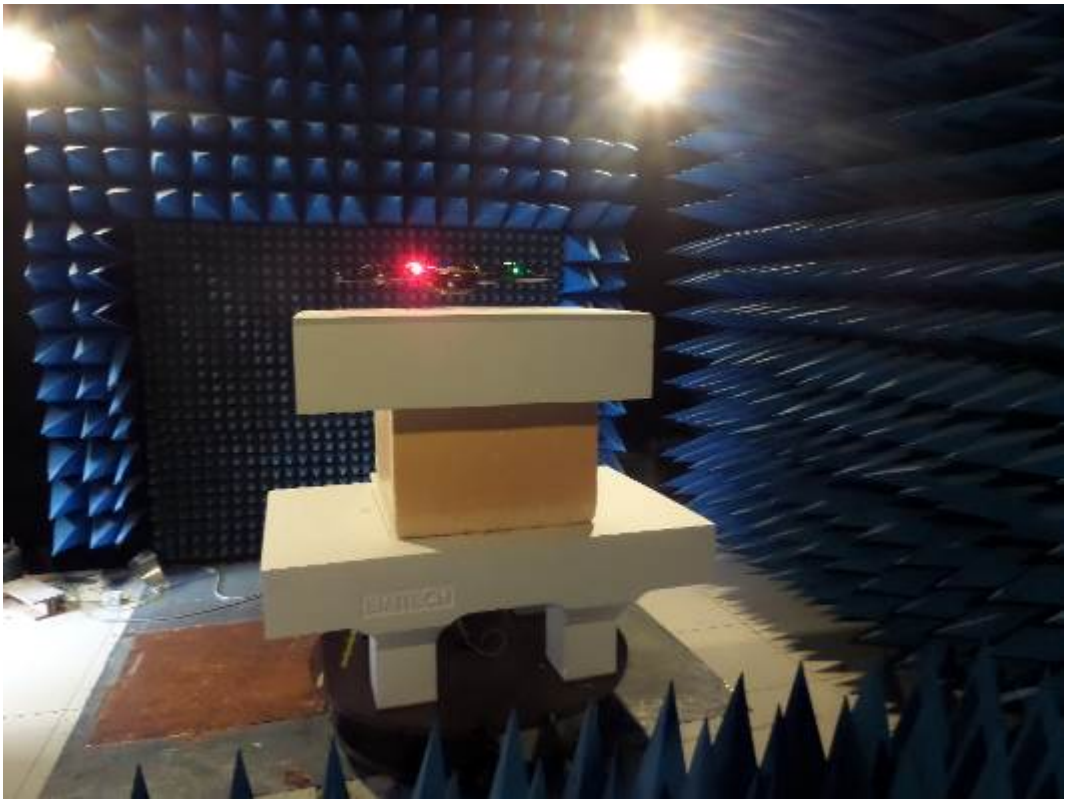
End of report, 6 appendixes to be forwarded

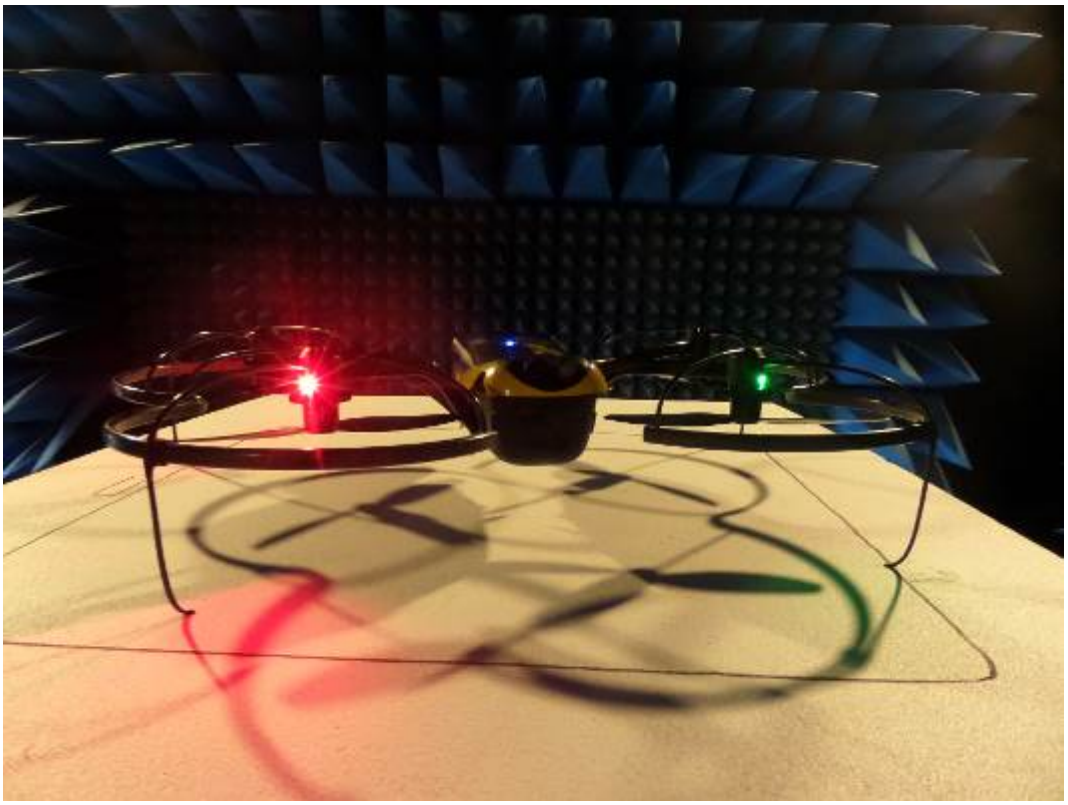
APPENDIX 1: Photos of the equipment under test



eXom

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

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
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBShot V2.4	-

Maximum peak output power

TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Power meter NRVS (2.9)	Rohde & Schwarz	8742
Power sensor NRV-Z52	Rohde & Schwarz	8702
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

Intentional radiator

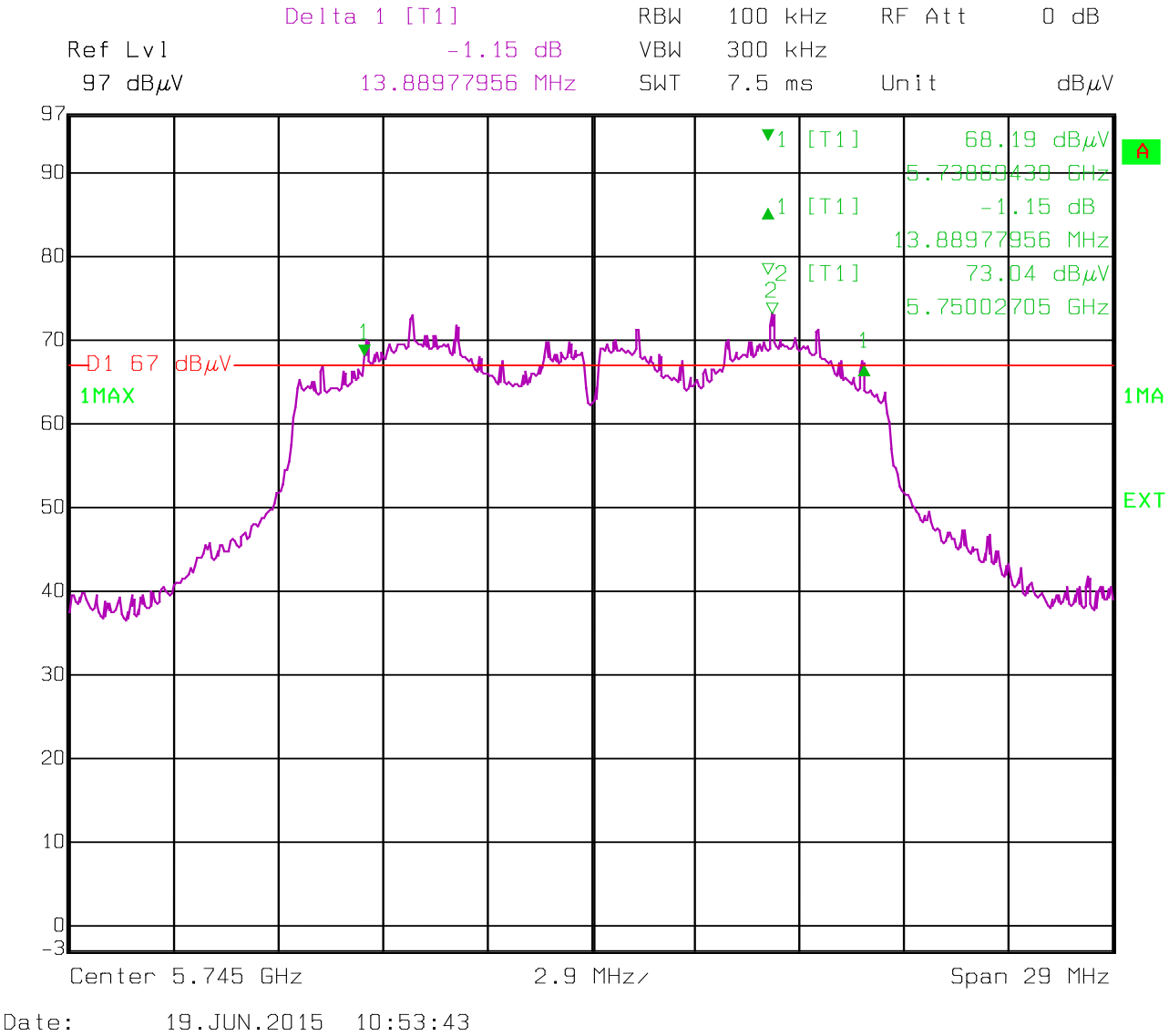
TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna VHBB 9124	Schwarzbeck	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

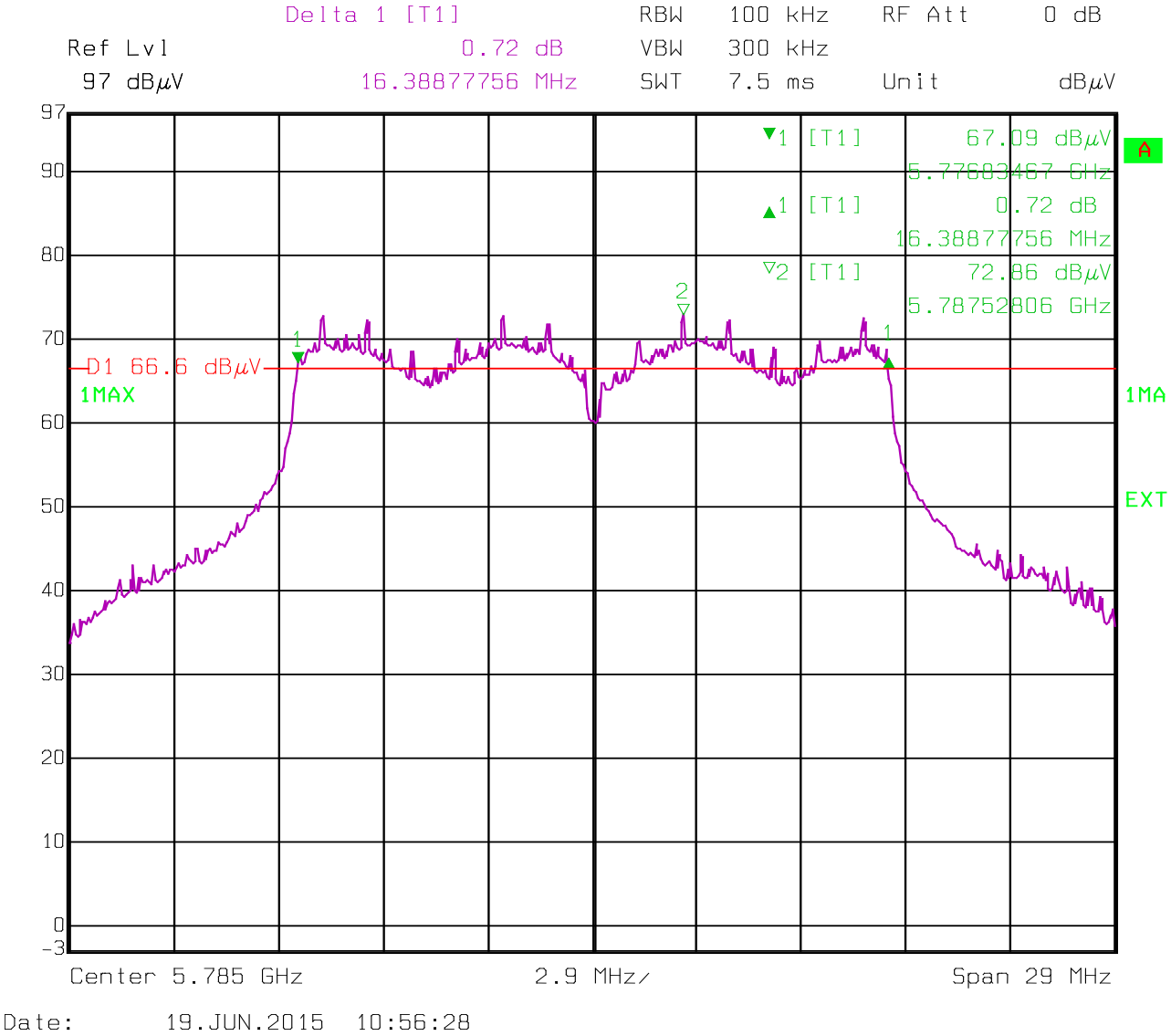
TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Multimeter MN5102B	AOIP	8675
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

APPENDIX 4: 6 dB bandwidth

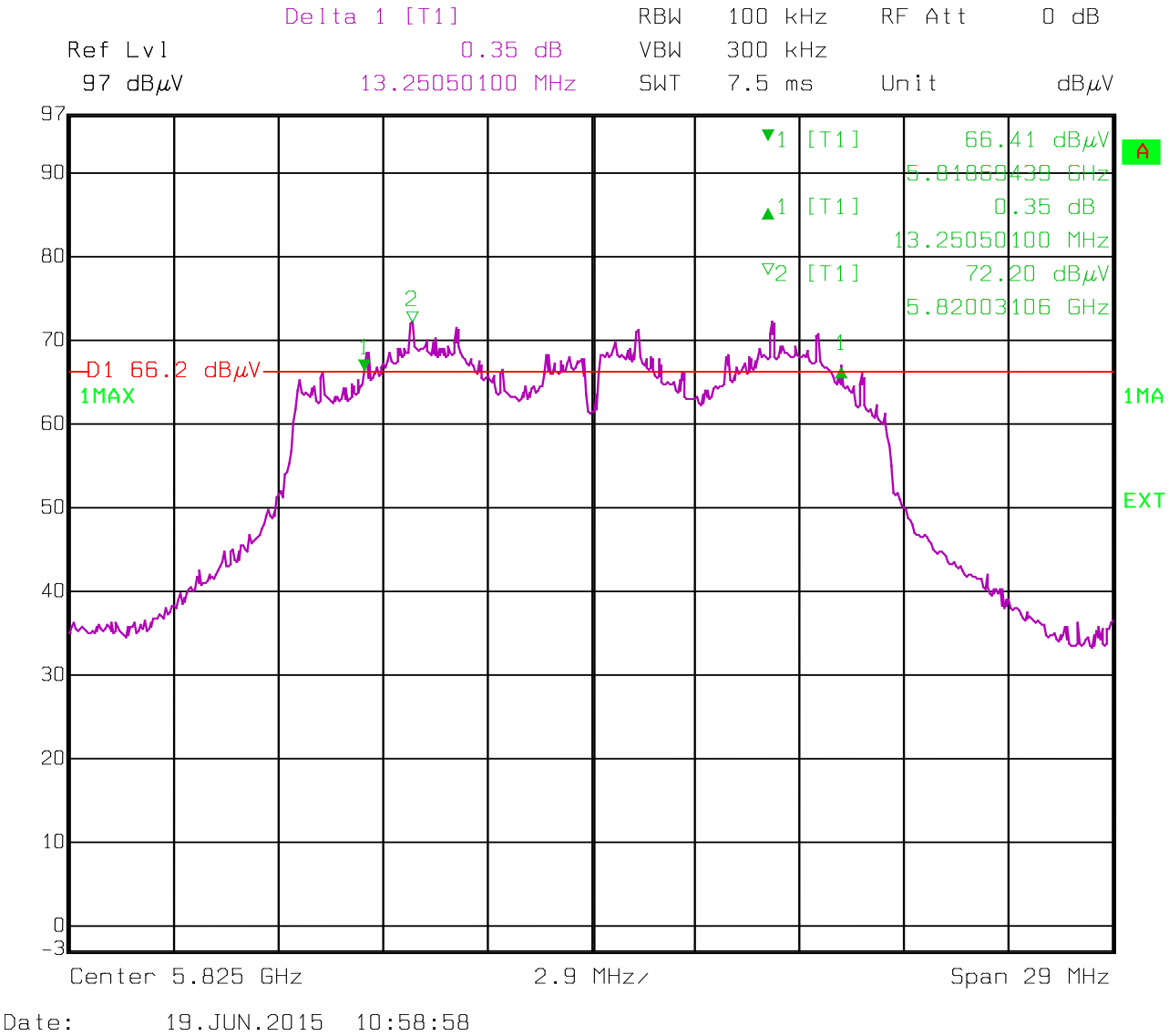
Low channel – Mode 802.11.a



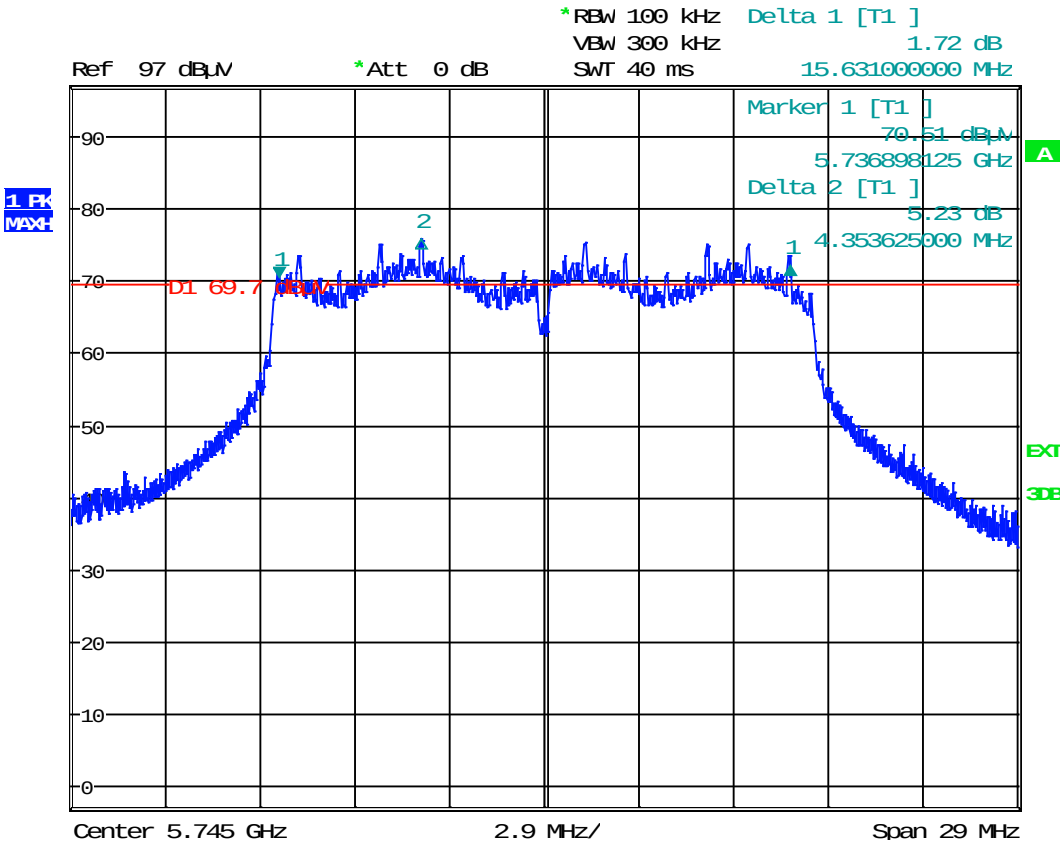
Central channel – Mode 802.11.a



High channel – Mode 802.11.a

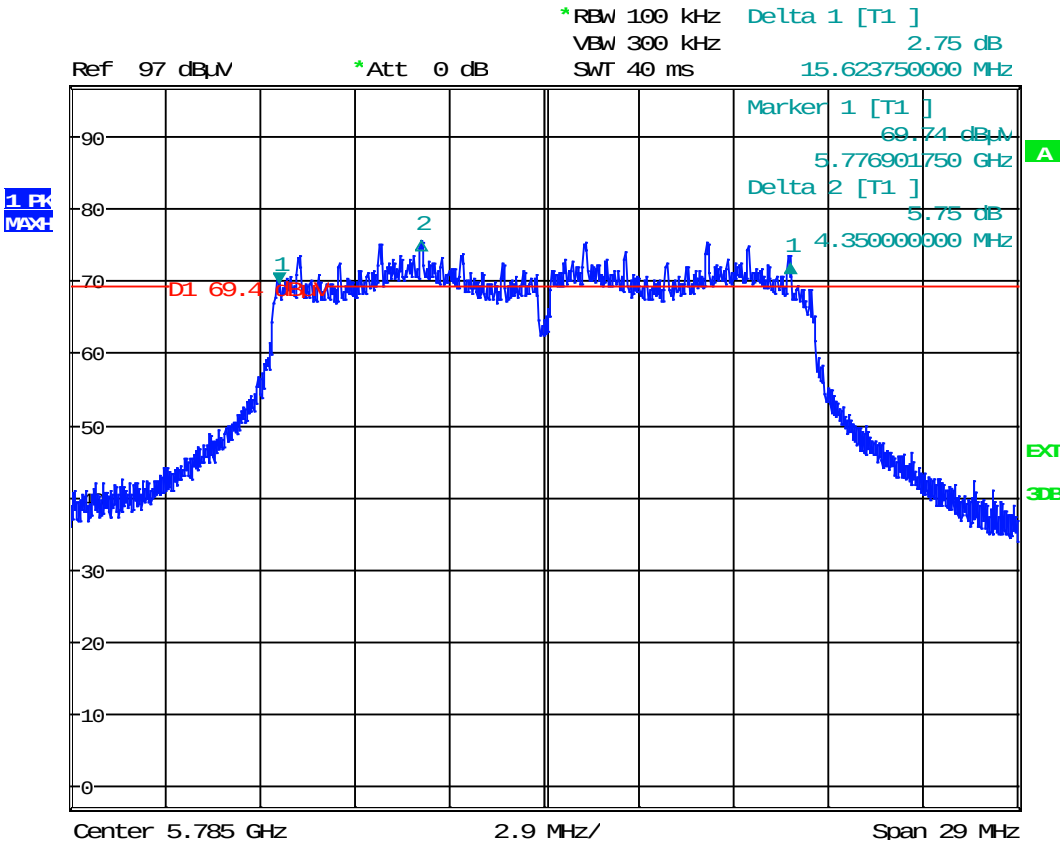


Low channel – Mode 802.11.n



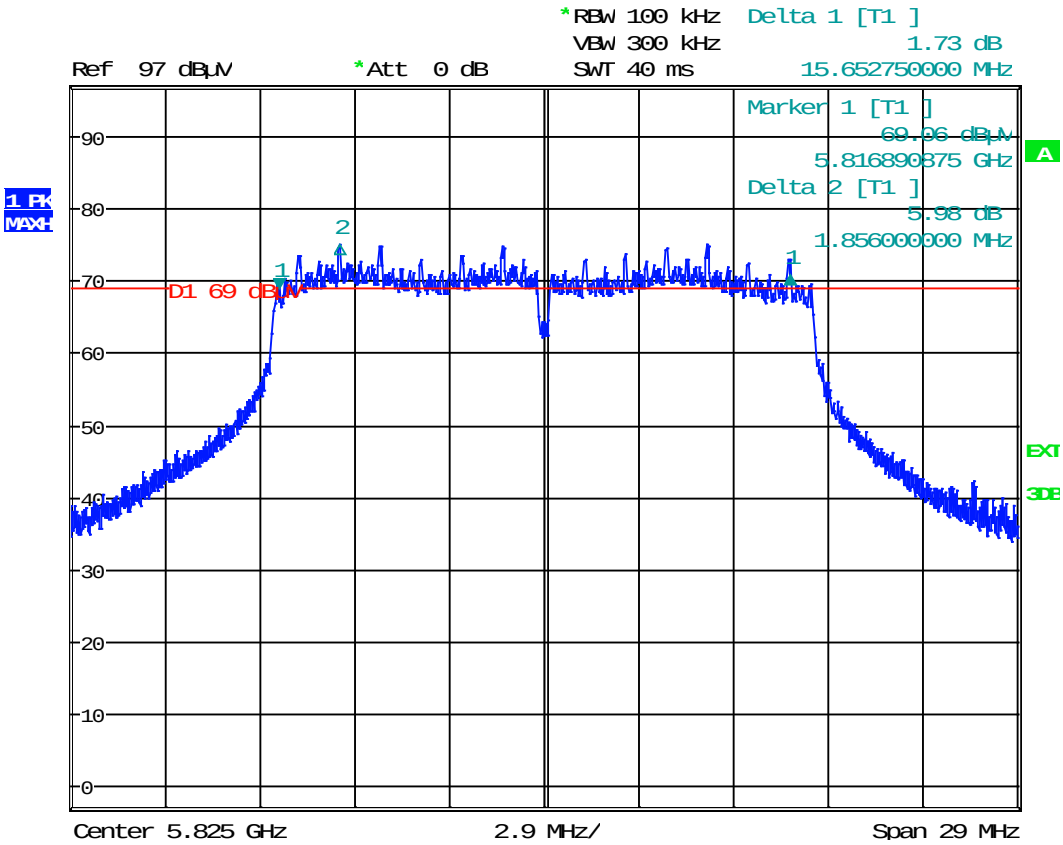
Date: 26.JUN.2015 12:40:05

Central channel – Mode 802.11.n



Date: 26.JUN.2015 12:54:28

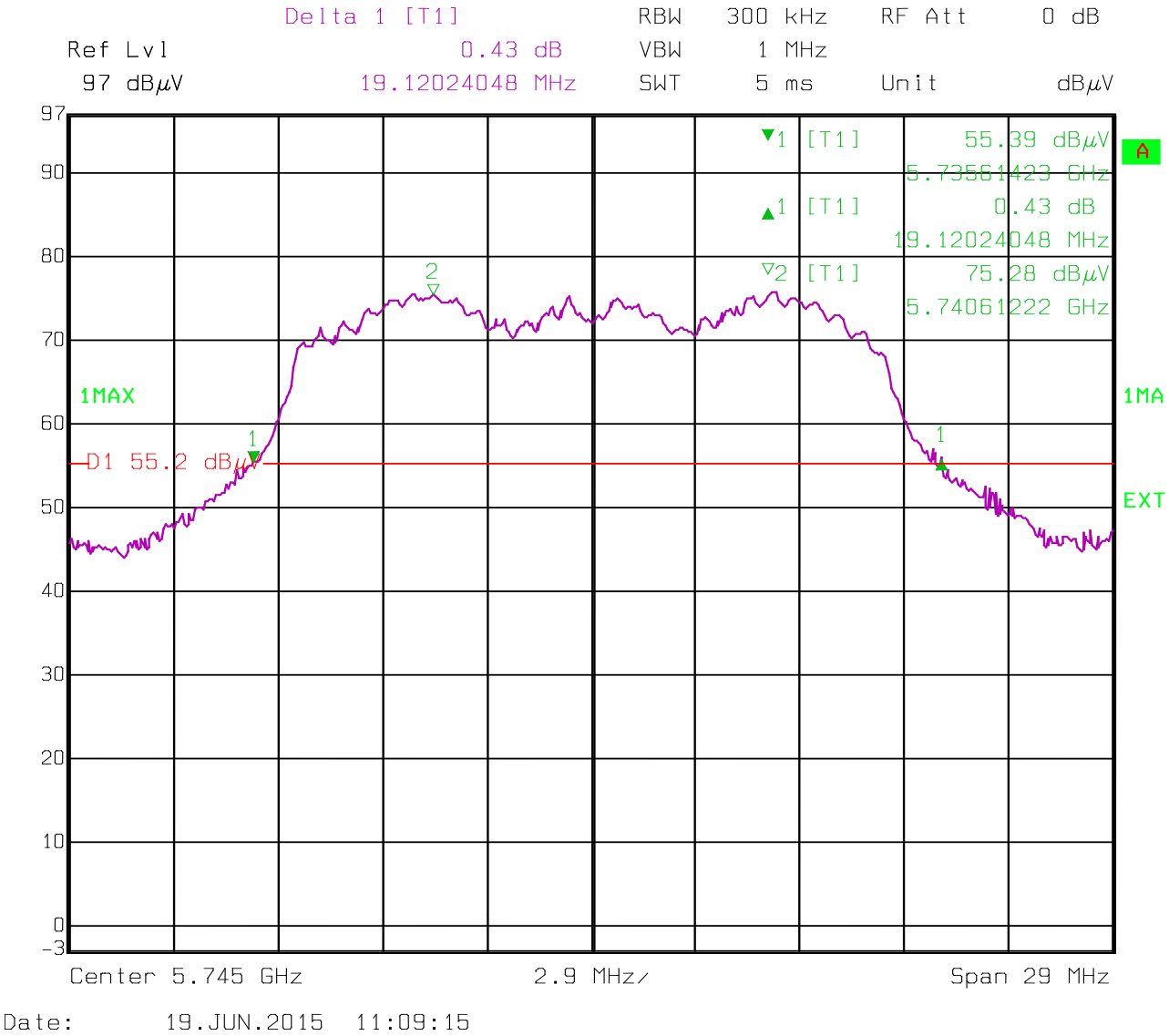
High channel – Mode 802.11.n



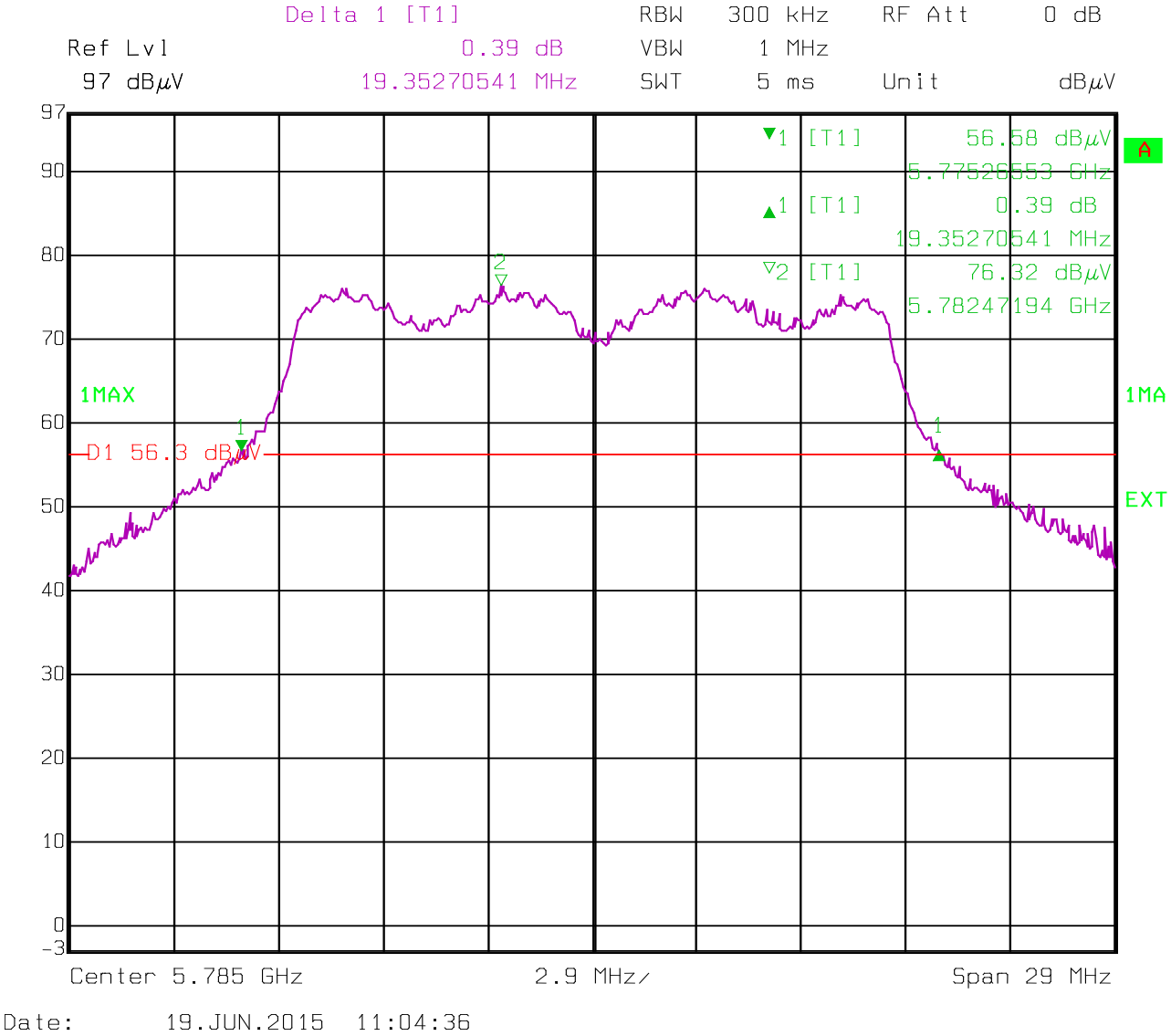
Date: 26.JUN.2015 12:47:45

APPENDIX 5: 20 dB bandwidth

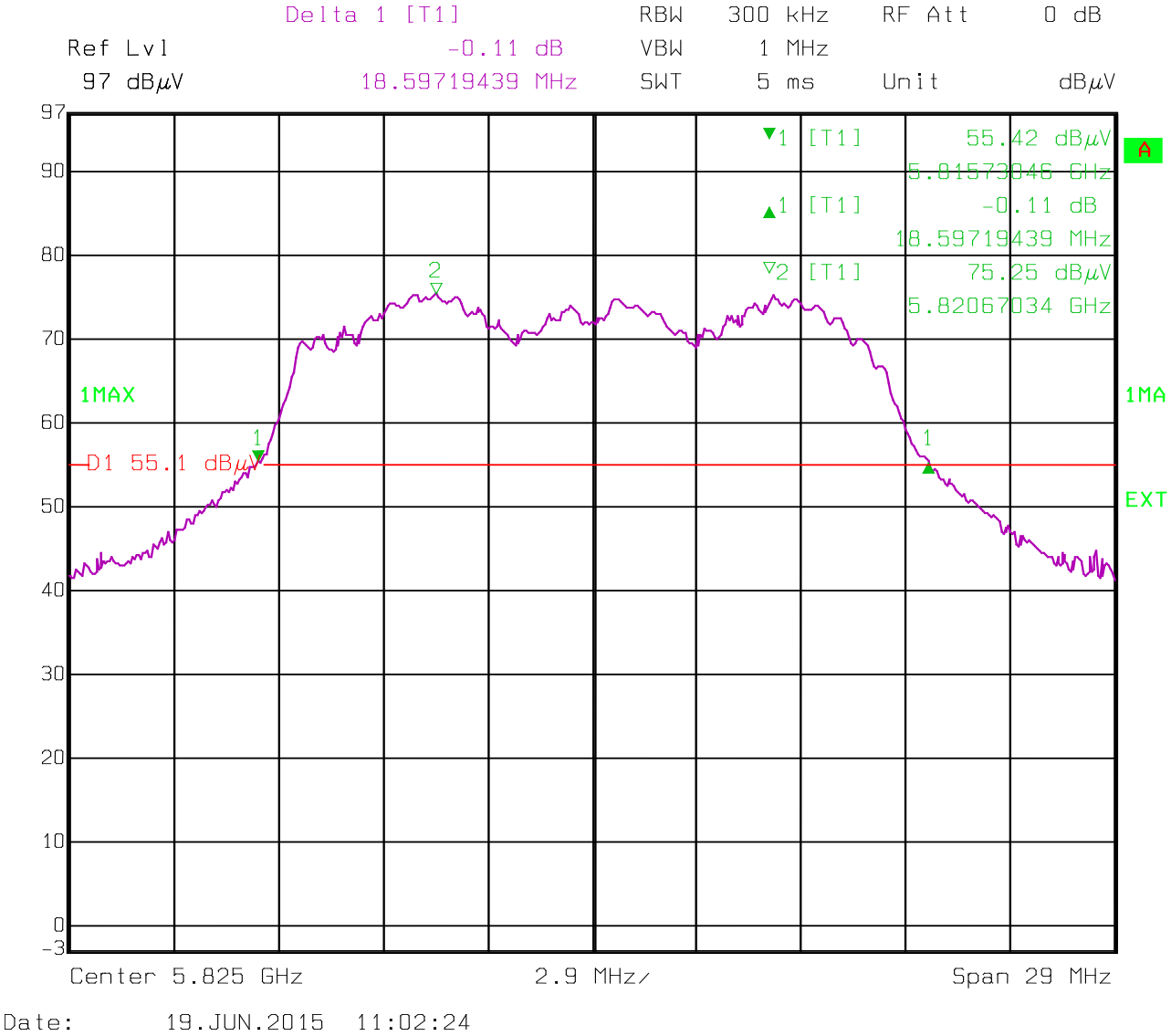
Low channel – Mode 802.11.a



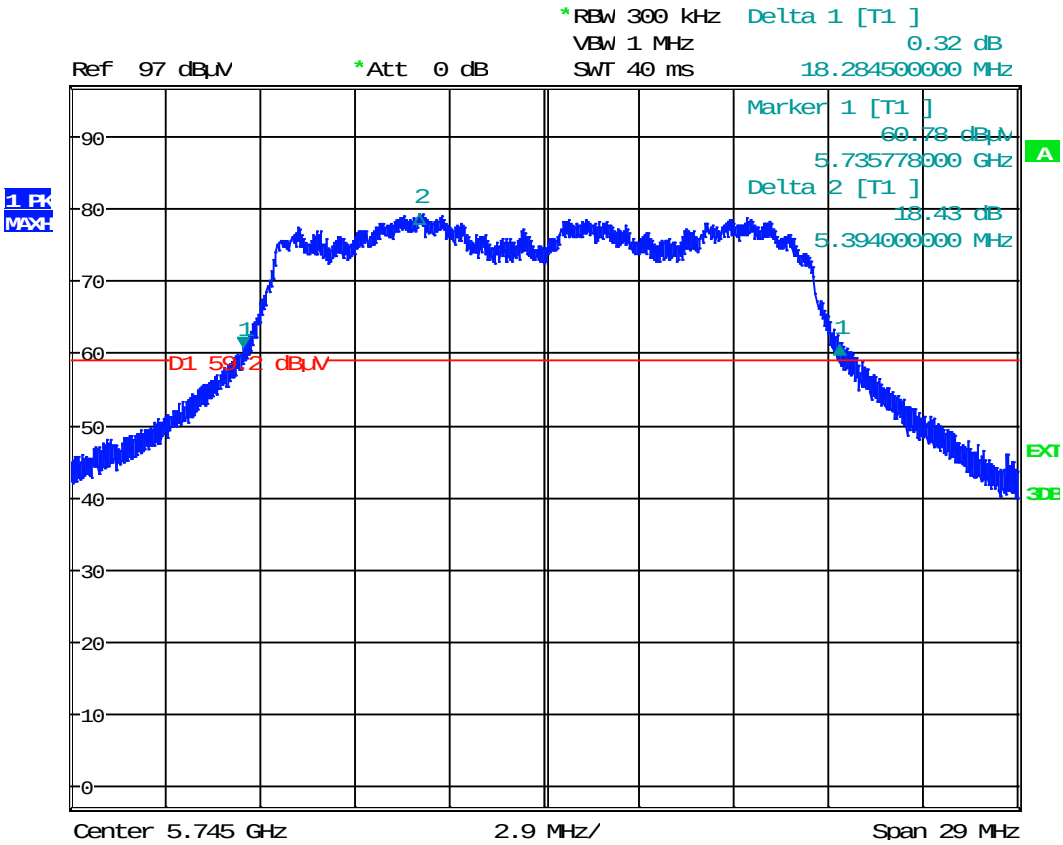
Central channel – Mode 802.11.a



High channel – Mode 802.11.a

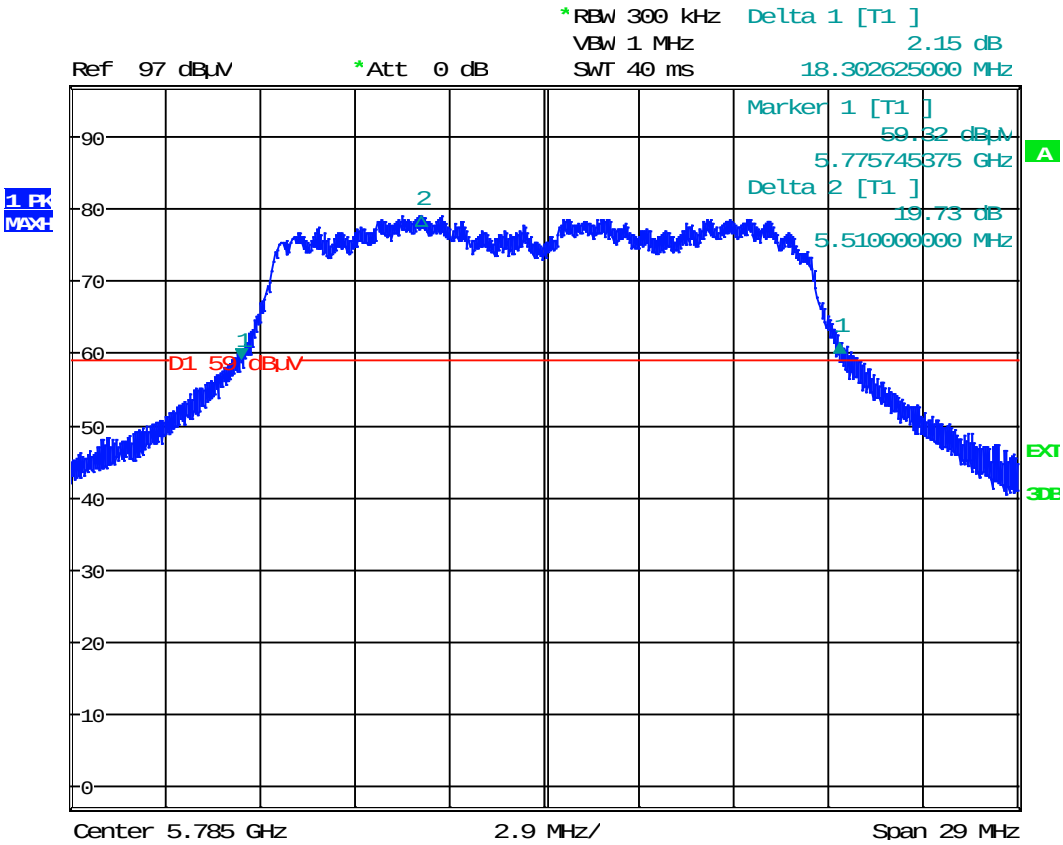


Low channel – Mode 802.11.n



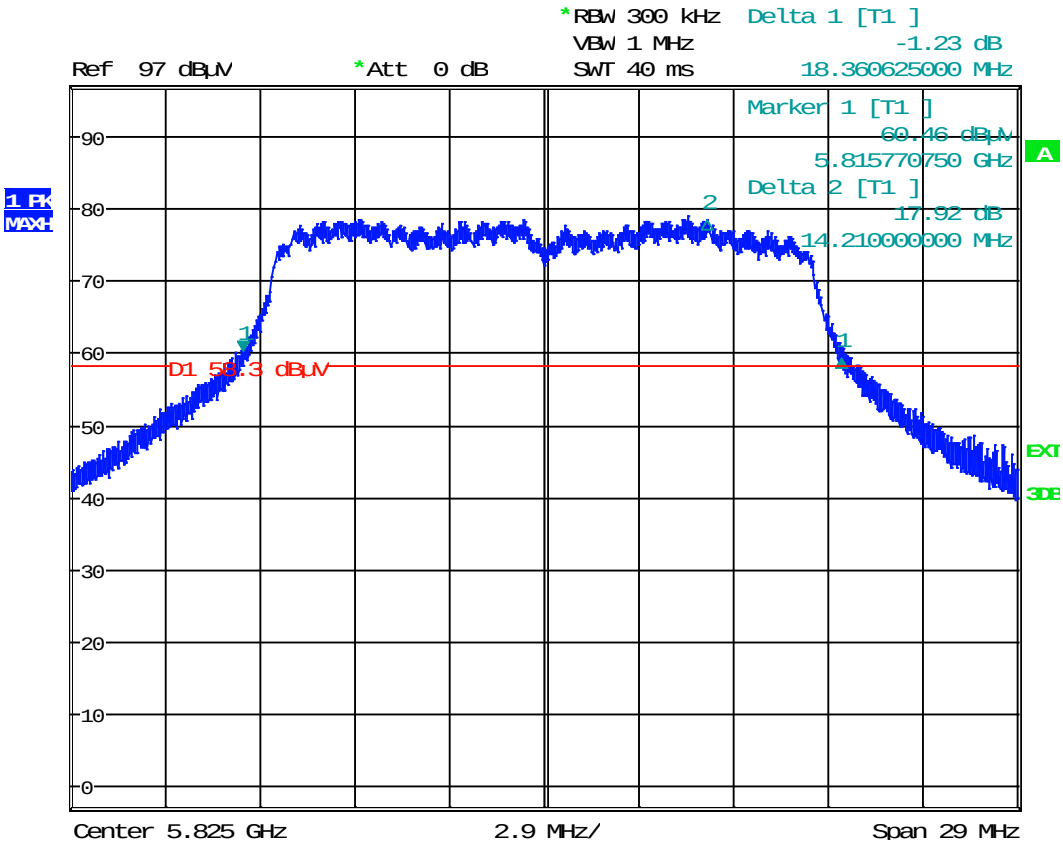
Date: 26.JUN.2015 12:42:27

Central channel – Mode 802.11.n



Date: 26.JUN.2015 12:56:11

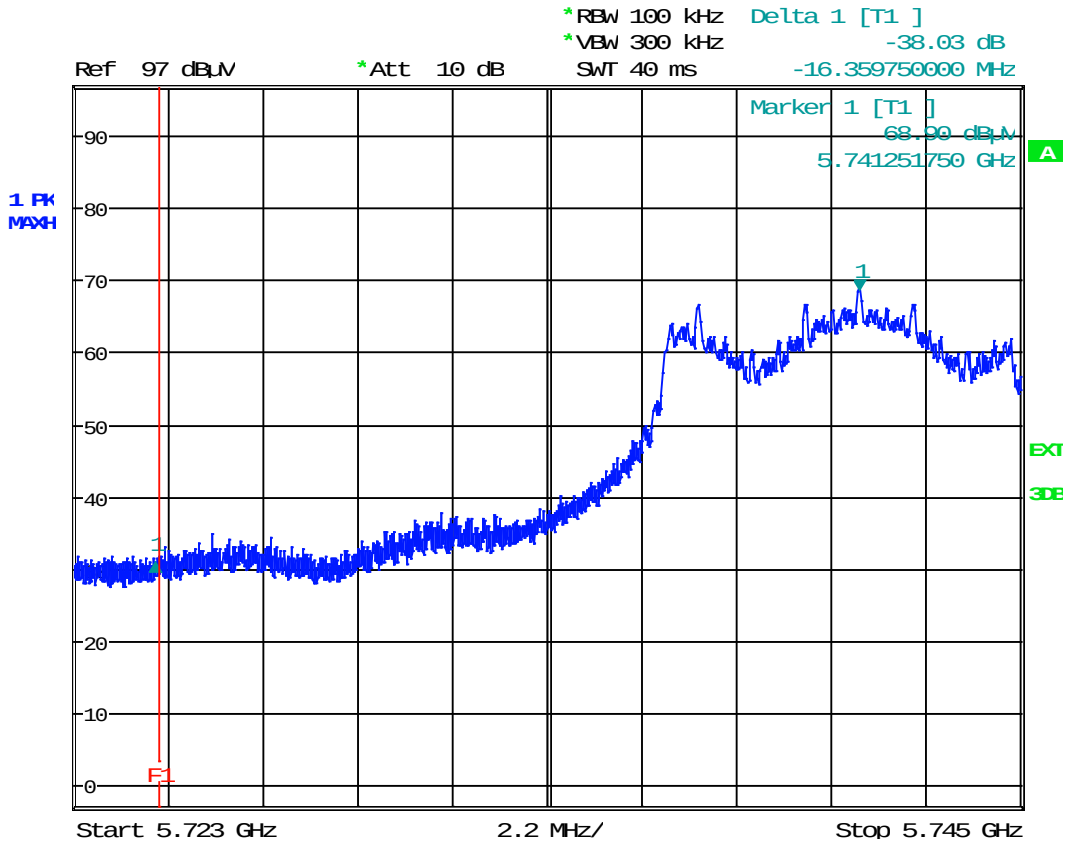
High channel – Mode 802.11.n



Date: 26.JUN.2015 12:49:03

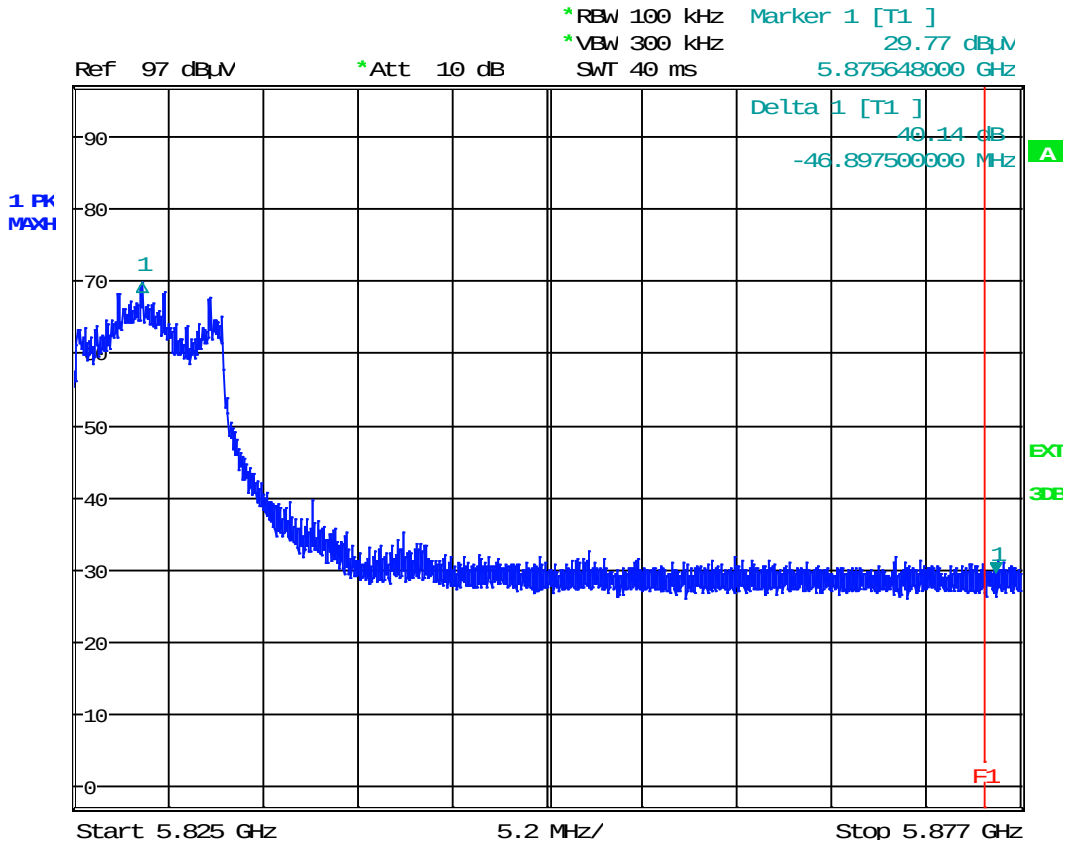
APPENDIX 6: Band edge

Low Channel - Mode 802.11.a



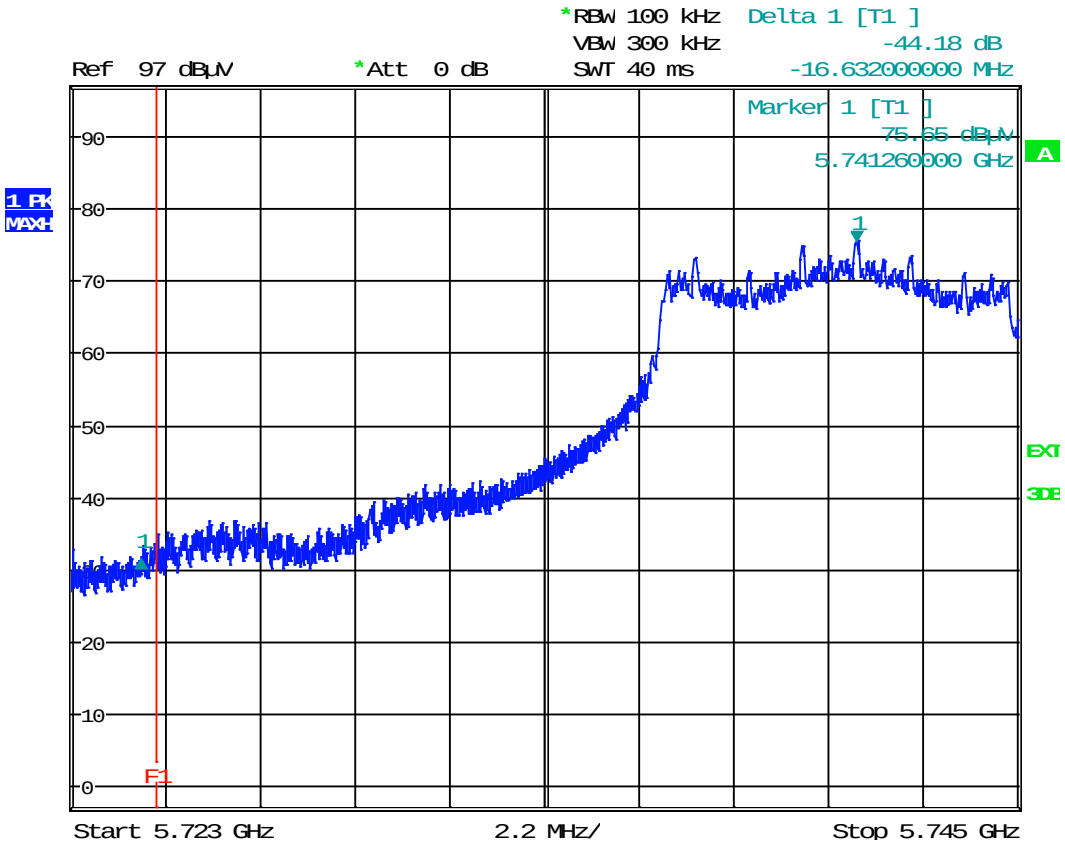
Date: 19.JUN.2015 17:35:31

High Channel - Mode 802.11.a



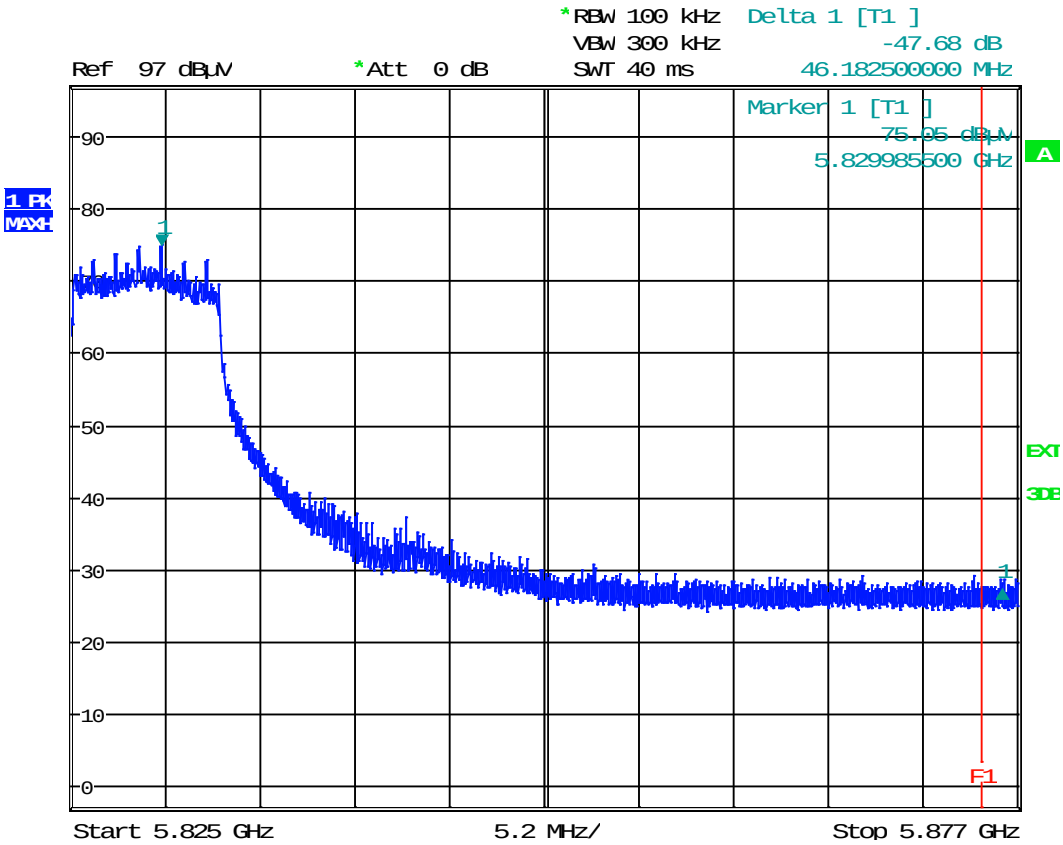
Date: 19.JUN.2015 17:38:45

Low Channel - Mode 802.11.n



Date: 26.JUN.2015 12:37:34

High Channel - Mode 802.11.n



Date: 26.JUN.2015 12:45:20