

RR051-15-106740-7-A Ed. 0

Certification test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
LIVESTOCK POCKET READER - LPR

FCC ID: NQY-30007

Company:
ALLFLEX EUROPE SAS

DISTRIBUTION: Mr LANGOUET

(Company: ALLFLEX EUROPE SAS)

Number of pages: 54 with 8 annexes

Ed.	Date	Modified pages	Written by		Technical Verification and Quality Approval	
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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: LIVESTOCK POCKET READER

Serial number (S/N): C12900006

Part No: 30007-2A2

Model: Livestock pocket reader

Software version: —

MANUFACTURER: ALLFLEX EUROPE SAS

COMPANY SUBMITTING THE PRODUCT:

Company: ALLFLEX EUROPE SAS

Address: Route des Eaux
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DATES OF TEST: 05-FEB-2016

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

TESTED BY: S. LOUIS

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1. INTRODUCTION

This report presents the results of radio test carried out on the following equipment: **Livestock Pocket Reader LPR**, in accordance with normative reference.

The device under test integrates a Bluetooth module already certified (FCCID: X3ZBTMOD4). This module was certified as limited modular approval because this module does not possess a shield. That's why all test were realized for certify this function directly with the product. For tests concerning protocol use see original certification.

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	Handheld control terminals
Antenna type and gain:	Integral antenna, gain unknown
Operating frequency range:	From 2402 MHz to 2480 MHz
Frequency tested:	2402 MHz (low channel), 2440 MHz (central channel), 2480 MHz (high channel)
Number of channels:	79
Channel spacing:	1MHz
Frequency generation:	Bluetooth (FHSS)
Power source:	7.2 Vdc Ni-MH batteries

The applicant declares that the equipment can't emit during the recharge of batteries.

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 (2015)	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.
Public Notice DA 00-705	Filing and Measurement Guideline for Frequency Hopping Spread Spectrum Systems.

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

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

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
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	06/08/2015	06/08/2016	06/10/2016
4087	Filtek LP03/1000-7GH	Low Pass Filter	24/02/2014	24/02/2016	24/04/2016
4088	R&S FSP40	Spectrum Analyzer	29/10/2015	29/10/2017	29/12/2017
7299	Microtronics BRM50702	Reject band filter	04/11/2015	04/11/2017	04/01/2018
8508	California instruments 1251RP	Power source	12/10/2015	12/10/2016	12/12/2016
8511	HP 8447D	Low noise preamplifier	07/10/2015	07/10/2016	07/12/2016
8523	R&S FSEM30	Spectrum analyzer	20/05/2014	20/05/2016	20/07/2016
8524	HP 8591EM	Test receiver	10/09/2015	10/09/2017	10/11/2017
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/06/2015	12/06/2018	12/08/2018
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	12/06/2015	12/06/2018	12/08/2018
8593	SIDT Cage 2	Anechoic chamber	/	/	/
8635	R&S EZ-25	High pass Filter	05/08/2014	05/08/2016	05/10/2016
8671	HUGER	Meteo station	04/09/2014	04/09/2016	04/11/2016
8676	ISOTECH IDM106N	Multimeter	21/05/2015	21/05/2017	21/07/2017
8707	R&S ESI7	Test receiver	11/12/2014	11/12/2016	11/02/2017
8719	Thurbly Thandar Instruments 1600	LISN	23/06/2014	23/06/2016	23/08/2016
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	/	/	/
8893	Emitech	Outside room Hors cage	/	/	/
8896	ACQUISYS GPS8	Satellite synchronized frequency standard	/	/	/
10651	Absorber sheath current	Emitech	16/12/2015	16/12/2017	16/02/2018
10739	Lucix S005180M3201	Low-noise amplifier	20/01/2016	20/01/2017	20/03/2017
/	GPIB SHOT	Software	/	/	/

6. TESTS RESULTS SUMMARY

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 not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

6.2 unintentional radiator (subpart B)

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

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	Criteria respected ?				Comment
		Yes	No	NAP	NAs	
FCC Part 15.203	ANTENNA REQUIREMENTS	X				Note 1
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS			X		Note 2
FCC Part 15.209	RADIATED EMISSION LIMITS; GENERAL REQUIREMENTS	X				Note 3
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 4
	(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				Note 5
	(a) (2) Digital modulation techniques			X		
	(b) Maximum peak output power	X				Note 6
	(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: The applicant declares that the equipment does not emit during recharge of batteries.

Note 3: See FCC part 15.247 (d).

Note 4: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.

Note 5: The system hops to channel frequencies from a pseudo randomly ordered list of hopping frequencies. Each frequency is used equally on the average by the transmitter, and separated by a minimum of 20 dB bandwidth of the hopping channel (see appendix 5 and 9).

The frequency hopping system uses 79 channels (see appendix 9).

The maximum timing by channel is 168.48 μ s (see appendix 10).

During 79 channels \times 0.4 s = 31.6 s, any channel is used at maximum 23 times (see appendix 9), then 23 \times 168.48 μ s = 3.875 ms, thus the average time of occupancy on any channel is less than 400 ms within a period of 0.4 seconds multiplied by the number of hopping channels employed, in normal operating mode.

Number of channels	Observation period (0.4s * Nbr of channel) (s)	Maximal Duration of each burst (μ s)	Number of burst repetition during observation period	average time of occupancy on any channel (s)	Limits (s)
79	31.6	168.48	23	0.003875	0.4

Note 6: Conducted measurement is not possible (integral antenna), so we used the radiated method in anechoic room.

RF EXPOSURE:

Note 7: In accordance with KDB 447498 D01 General RF Exposure Guidance v06, Paragraph 4.3.1.

The product must respect the exclusion limit for 1-g hand-held (body-worn) SAR:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] * [\sqrt{f(\text{GHz})}] \leq 3.0$$

$$[(\text{max. power of channel, including tune-up tolerance, mW})] \leq (\text{min. test separation distance, mm} * 3.0) / \sqrt{f(\text{GHz})}$$

$$[(\text{max. power of channel, including tune-up tolerance, mW})] \leq (3.0 * 5\text{mm}) / \sqrt{(2.48)}$$

$$[(\text{max. power of channel, including tune-up tolerance, mW})] \leq \mathbf{9.53 \text{ mW}}$$

The highest conducted output power measured is 1.06 mW at 2480 MHz.

7. CONDUCTED LIMITS

Standard: FCC Part 15

Test procedure: Paragraph 15.107

Limits: Class B

Software used: BAT-EMC V3.6.0.32

Test set up:

The EUT is isolated and placed on a wooden table, 0.8 m over an horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane. The equipment is powered via an AC / DC adapter which is supplied by an external power source (120 V / 60 Hz).

See photos in appendix 2

Frequency range: 150 kHz - 30 MHz

Detection mode: Peak / Quasi-peak / Average

Bandwidth: 10 kHz / 9 kHz

Equipment under test operating condition:

The equipment is blocked in reception mode.

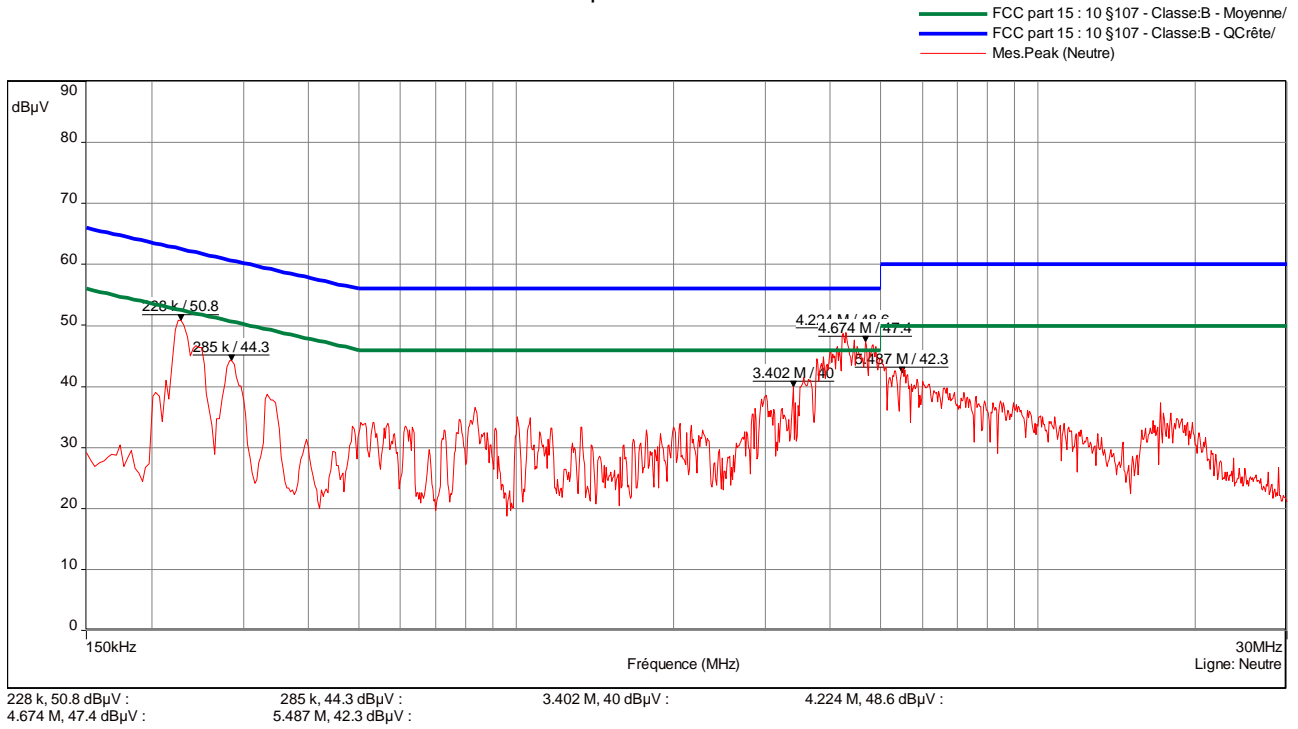
Results:

Ambient temperature (°C):	20.5
Relative humidity (%):	30

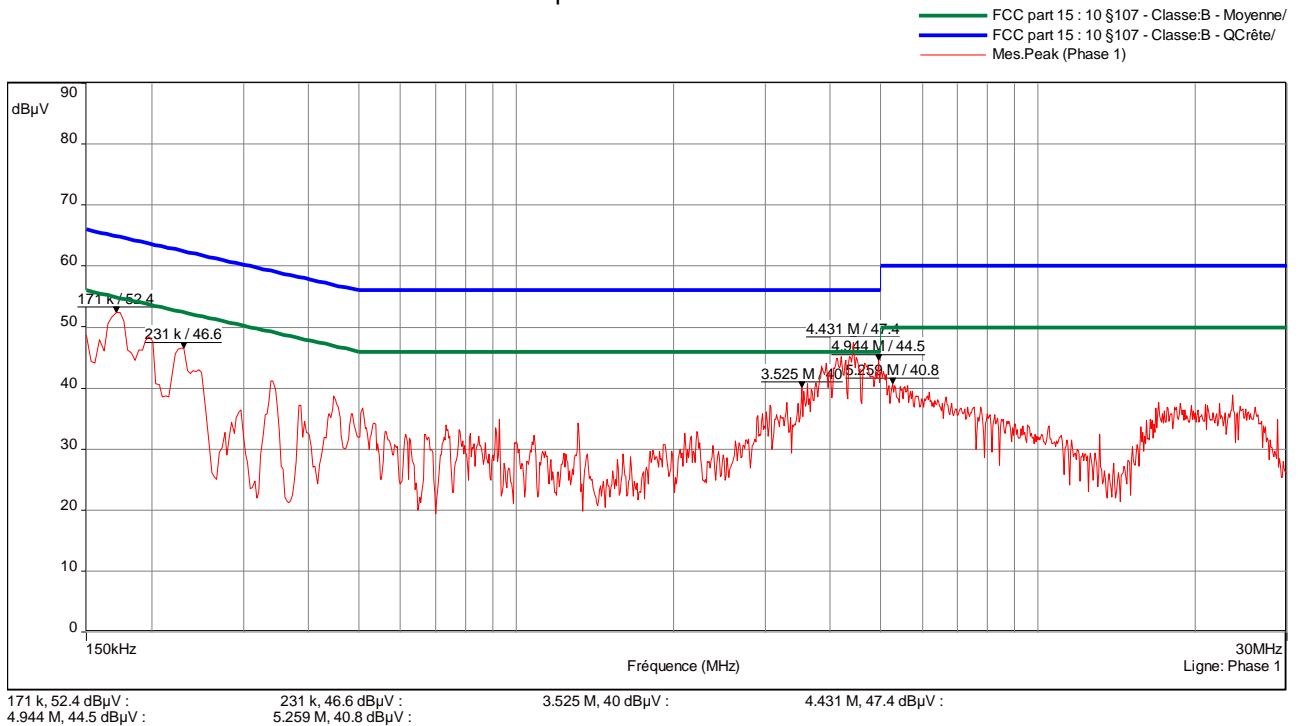
Sample N° 1: Measurement on the mains power supply:

The measurement is first realized with Peak detector.

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



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

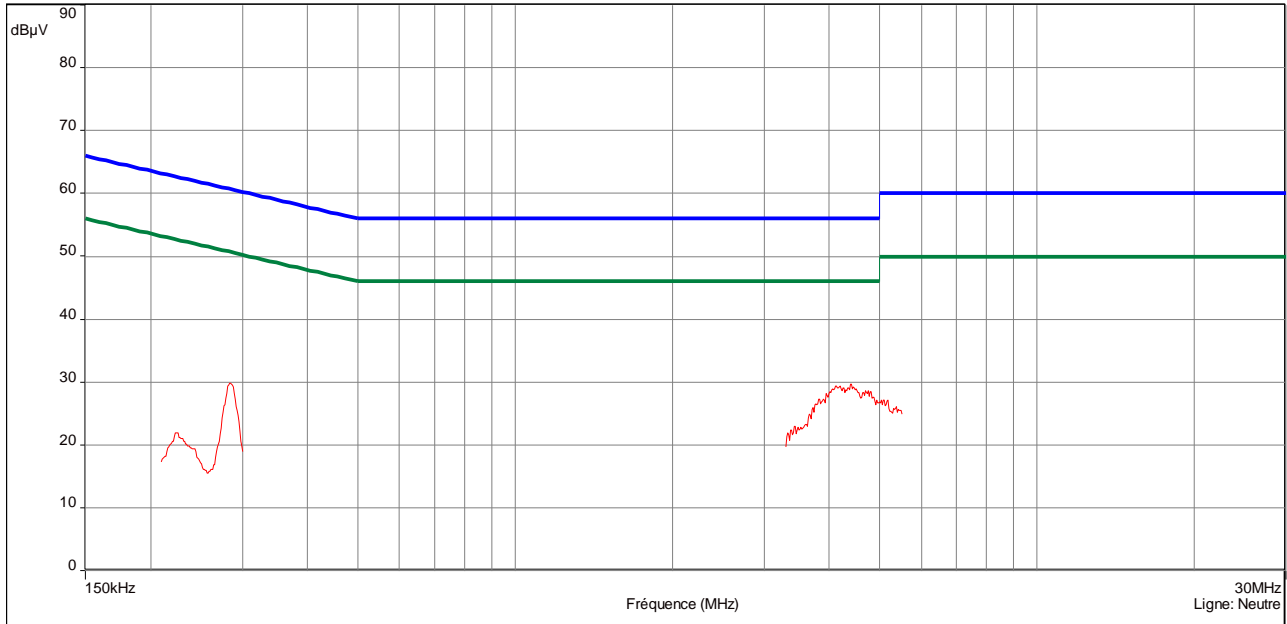


The frequencies which are not 6 dB under the Average limit are then analyzed with Average detector.

Curve N° 3: average measurement on the Neutral, for the frequency range:

- 210kHz to 300kHz and 3.3MHz to 5.5MHz

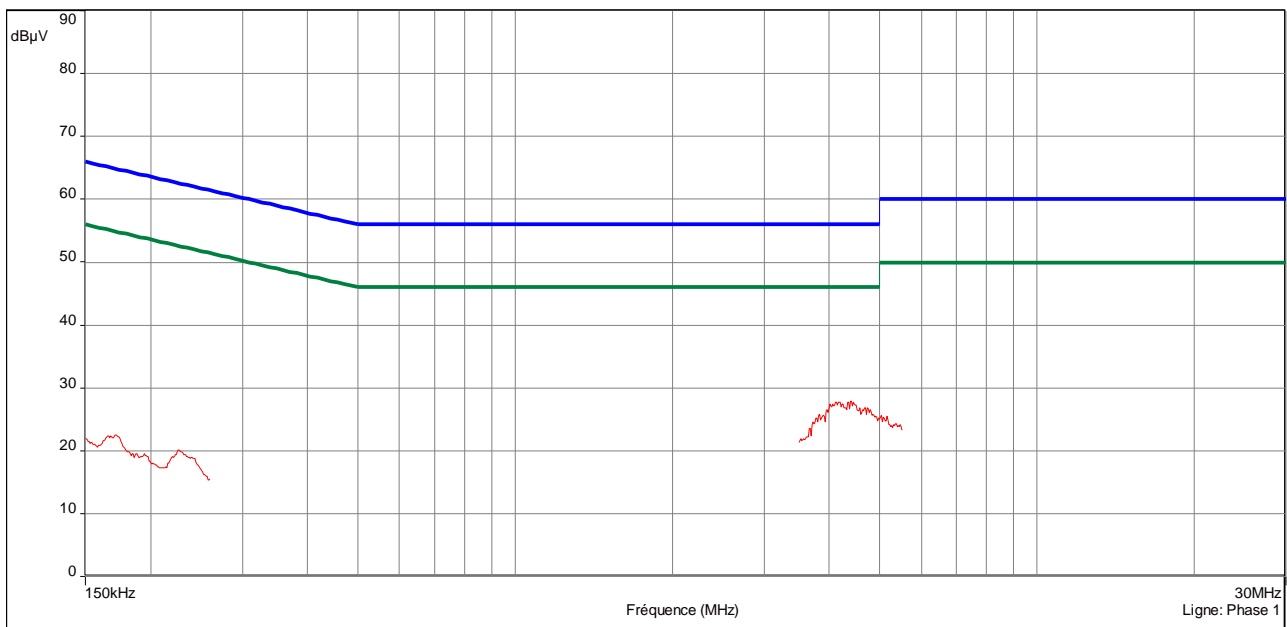
— FCC part 15 : 10 §107 - Classe:B - Moyenne/
 — FCC part 15 : 10 §107 - Classe:B - QCrête/
 — Mes.Peak (Neutre)



Curve N° 4: average measurement on the Line, for the frequency range:

- 150kHz to 260kHz and 3.3MHz to 5.5MHz

— FCC part 15 : 10 §107 - Classe:B - Moyenne/
 — FCC part 15 : 10 §107 - Classe:B - QCrête/
 — Mes.Peak (Phase 1)



Test conclusion:

RESPECTED STANDARD

8. 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 30MHz to 12.5 GHz

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

Bandwidth: 120 kHz ($F < 1$ GHz)

Distance of antenna: 10 meters (in open area test site) / 3 meters (in anechoic room)

Antenna height: 1 to 4 meters (in open area test site) / 1.5 meter (in anechoic room)

Antenna polarization: vertical and horizontal (only the highest level is recorded)

Equipment under test operating condition:

The equipment is blocked in reception mode.

Results:

Ambient temperature (°C): 22.4
 Relative humidity (%): 32

Power source: The equipment is powered via an AC / DC adapter which is supplied by an external power source (120 V / 60 Hz).

Sample N° 1

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	Polarization H: Horizontal V: Vertical	Field strength measured at 10 m (dBμV/m)	Field strength correlated at 3m (dBμV/m)	Limits at 3m (dBμV/m)	Margin (dB)
111.8	QP	134	172	V	25.3	35.5	43.5	8
170.5	QP	110	329	V	31.7	42.1	43.5	1.4
174.6	QP	—	—	V	27.1	37.5	43.5	6
258.9	QP	400	0	H	29.5	39.9	46	6.1

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

Test conclusion:

RESPECTED STANDARD

9. ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS

Standard: FCC Part 15

Test procedure: Paragraph 15.215

Test set up:

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

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 hopping transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.
The measure is then repeated with the hopping function deactivated.

Results:

Ambient temperature (°C):	21.2
Relative humidity (%):	48

Power source: 7.2 Vdc Ni-MH batteries fully charged

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

Sample N° 1 with hopping mode off

Fundamental frequency (MHz)	Field Strength Level of fundamental (dB μ V/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2402	91.6	PEAK	2399.95	-46.3	45.3	74.7	29.4
2480	95.5	PEAK	2483.79	-43.7	51.8	74	22.2
2480	94.7	AVERAGE	2483.62	-61.2	33.5	54	20.5

* Marker-Delta method

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

Sample N° 1 with hopping mode on

Fundamental frequency (MHz)	Field Strength Level of fundamental (dB μ V/m)	Detector (Peak or Average)	Frequency of maximum Band-edges Emission (MHz)	Delta Marker (dB)*	Calculated Max Out-of-Band Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
2402	91.6	PEAK	2399.95	-45.0	46.6	74.7	28.1
2480	95.5	PEAK	2483.54	>(-37.1)	<58.4	74	>15.6
2480	94.7	AVERAGE	2483.62	-53.7	41.0	54	13.0

* Marker-Delta method

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

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

Test conclusion:

RESPECTED STANDARD

10. MAXIMUM PEAK OUTPUT POWER

Standard: FCC Part 15

Test procedure: paragraph 15.247 (b)

Test set up:

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

The measurement is realized with the product on the most critical orientation.

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.

The measurement of the electro-magnetic field is realized, with a resolution bandwidth adjusted at 1MHz and video bandwidth at 3MHz.

Distance of antenna: 3 meters (in anechoic room)

Antenna height: 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 hopping modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 21.1
 Relative humidity (%): 49

Power source: 7.2 Vdc Ni-MH batteries fully charged

Sample N° 1 Low Channel (F=2402MHz)

	Electro-magnetic field (dBµV/m):	Conducted power * (mW)	Limit (mW)
Nominal supply voltage: 7.2V	91.6	0.43	1000

Polarization of test antenna: Horizontal (height: 150 cm)
 Position of equipment: see photos in annex 2 (azimuth: 146 degrees)

Sample N° 1 Central Channel (F=2440MHz)

	Electro-magnetic field (dBµV/m):	Conducted power * (mW)	Limit (mW)
Nominal supply voltage: 7.2V	94.1	0.77	1000

Polarization of test antenna: Vertical (height: 150 cm)
 Position of equipment: see photos in annex 2 (azimuth: 143 degrees)

Sample N° 1 High Channel (F=2480MHz)

	Electro-magnetic field (dBµV/m):	Conducted power * (mW)	Limit (mW)
Nominal supply voltage: 7.2V	95.5	1.06	1000

Polarization of test antenna: Vertical (height: 150 cm)
 Position of equipment: see photos in annex 2 (azimuth: 132 degrees)

* $P = (E \times d)^2 / (30 \times G_p)$ with $d = 3 \text{ m}$ and $G_p = 1$

Test conclusion:

RESPECTED STANDARD

11.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.

The 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 25GHz (10th harmonic of the highest fundamental frequency).

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

Peak / VBW = 10Hz (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 hopping modulated transmission mode, at the highest output power level at which the transmitter is intended to operate.

Results:

Ambient temperature (°C): 22.3
 Relative humidity (%): 47

Power source: 7.2 Vdc Ni-MH batteries fully charged

Sample N° 1 Low Channel (F=2402MHz)

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 (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
7206	P	150	171	100	H	65.4	74.7	9.3

Sample N° 1 Central Channel (F=2440MHz)

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 (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
7320*	P	150	171	1000	H	65.2	74	8.8
7320*	VBW =10Hz	150	171	1000	H	34.6	54	19.4

Sample N° 1 High Channel (F=2480MHz)

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 (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)
7440*	P	150	171	1000	H	62.8	74	11.2
7440*	VBW =10Hz	150	171	1000	H	35.3	54	18.7

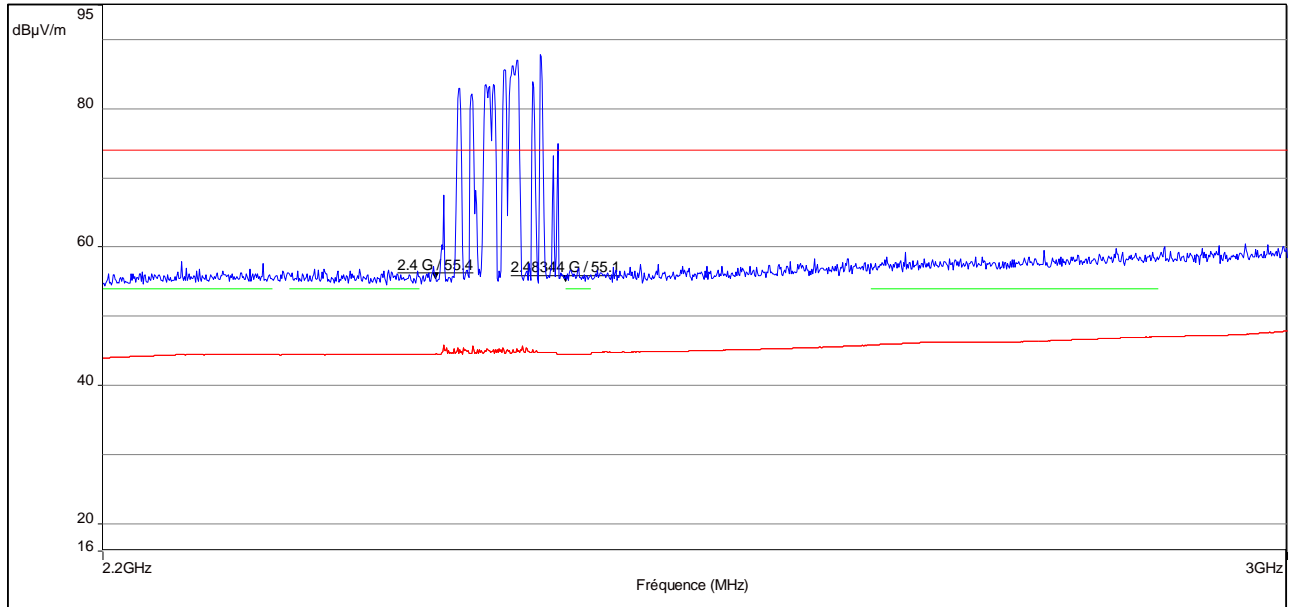
* restricted bands of operation in 15.205

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

Band edge worst case results

Hopping mode – Vertical Polarization

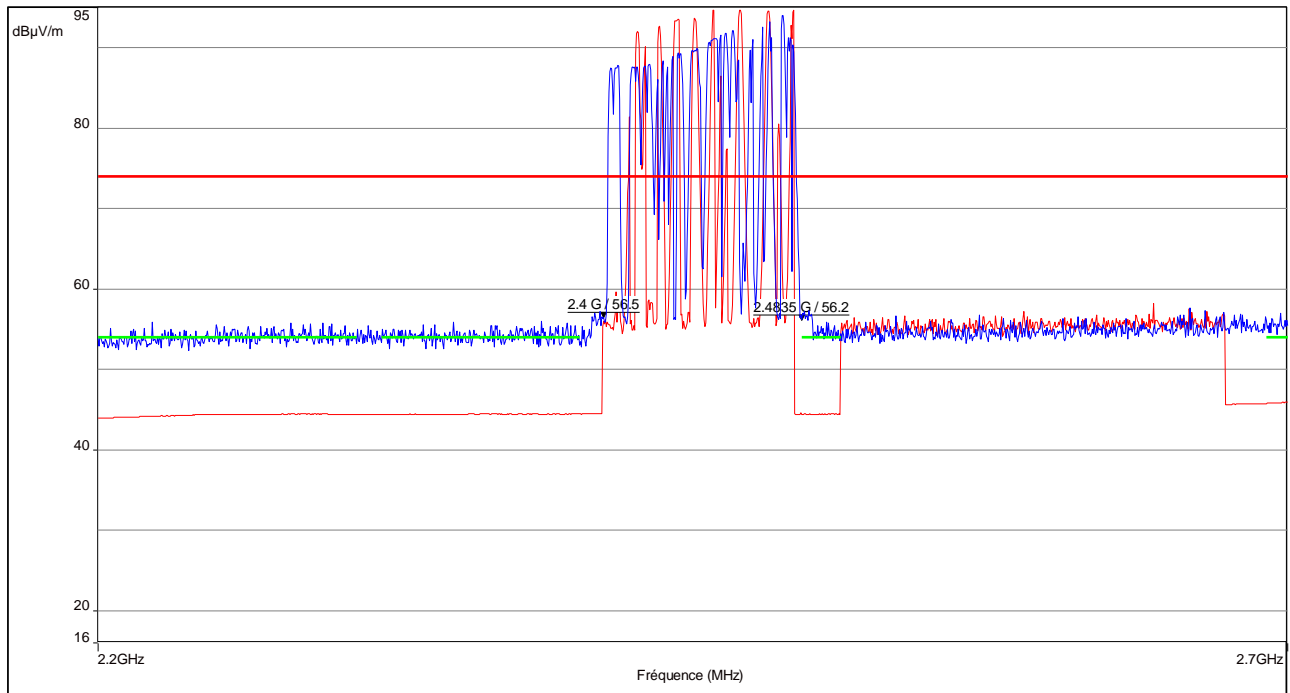
- 15.209 avec bande restrictive - Classe:Av - Crête/3.0m/
- 15.209 avec bande restrictive - Classe:Pk - Crête/3.0m/
- Mes.Peak (Verticale)
- Mes.Avg (Verticale)



2.4 G, 55.4 dBµV/m : 2.48344 G, 55.1 dBµV/m :

Hopping mode – Horizontal Polarization

- 15.209 avec bande restrictive - Classe:Av - Crête/3.0m/
- 15.209 avec bande restrictive - Classe:Pk - Crête/3.0m/
- Mes.Peak (Verticale)
- Mes.av (Verticale)



2.4 G, 56.5 dBµV/m : 2.4835 G, 56.2 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 94.7dB μ V/m on high channel.

So the applicable limit is 74.7dB 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)).

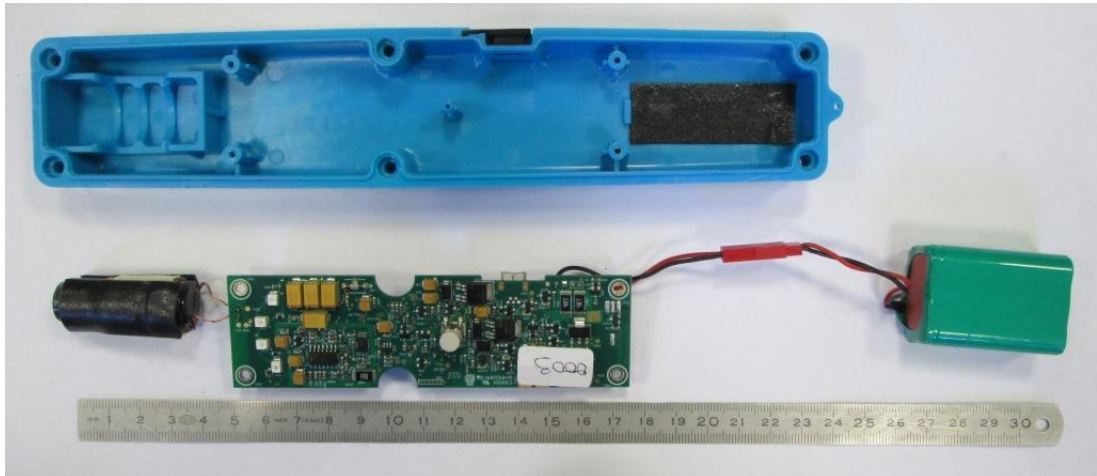
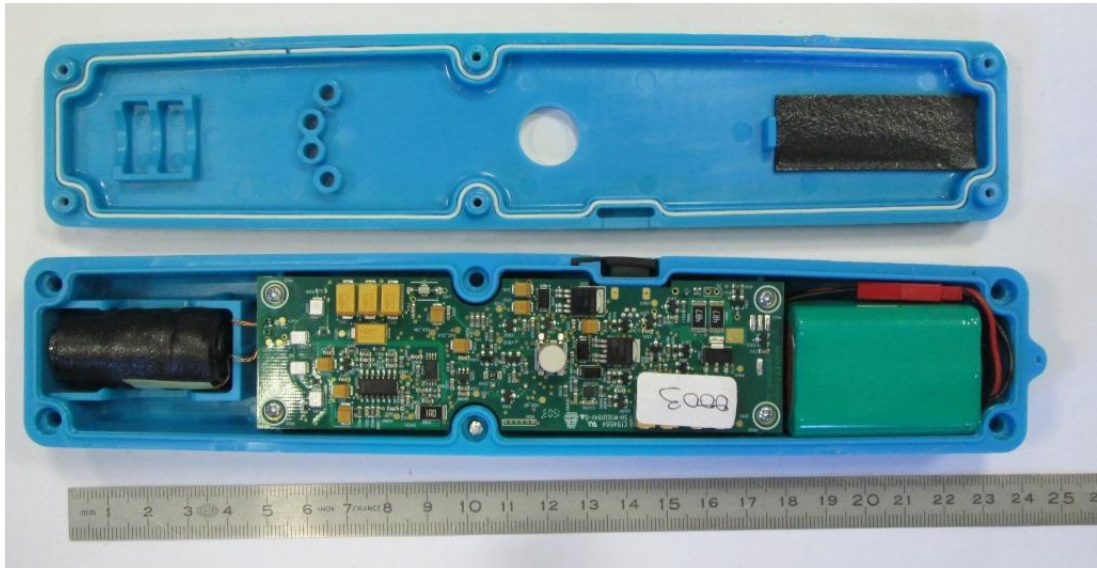
Test conclusion:

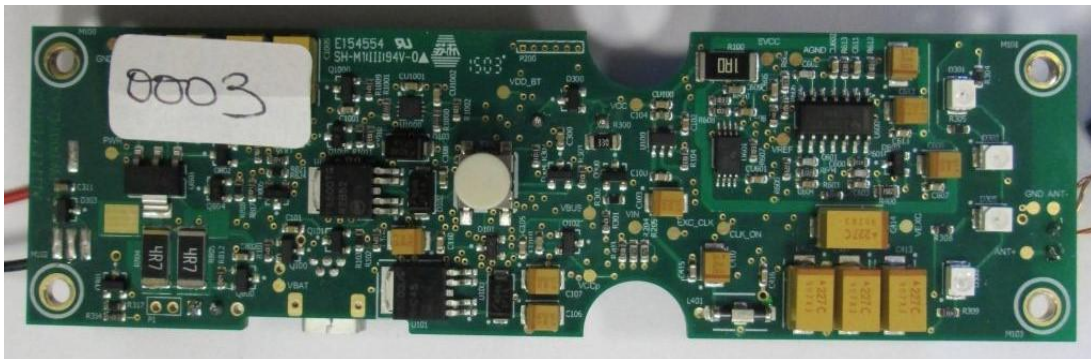
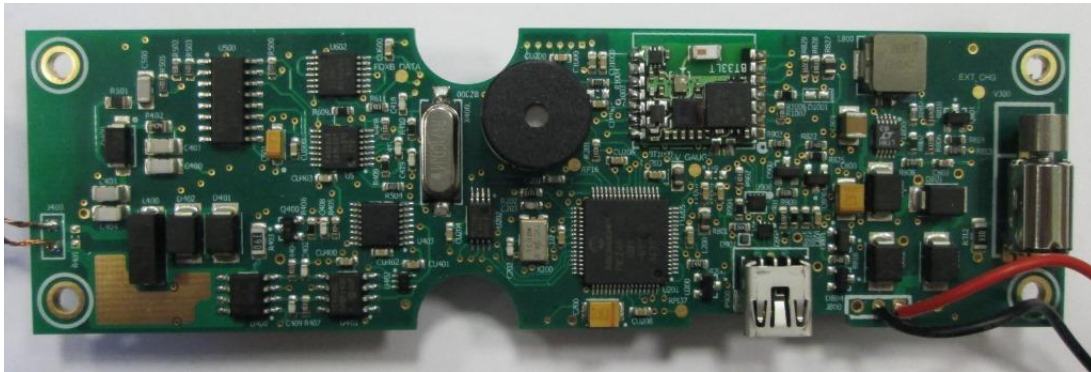
RESPECTED STANDARD

□□□ End of report, 10 appendixes to be forwarded □□□

APPENDIX 1: Photos of the equipment under test

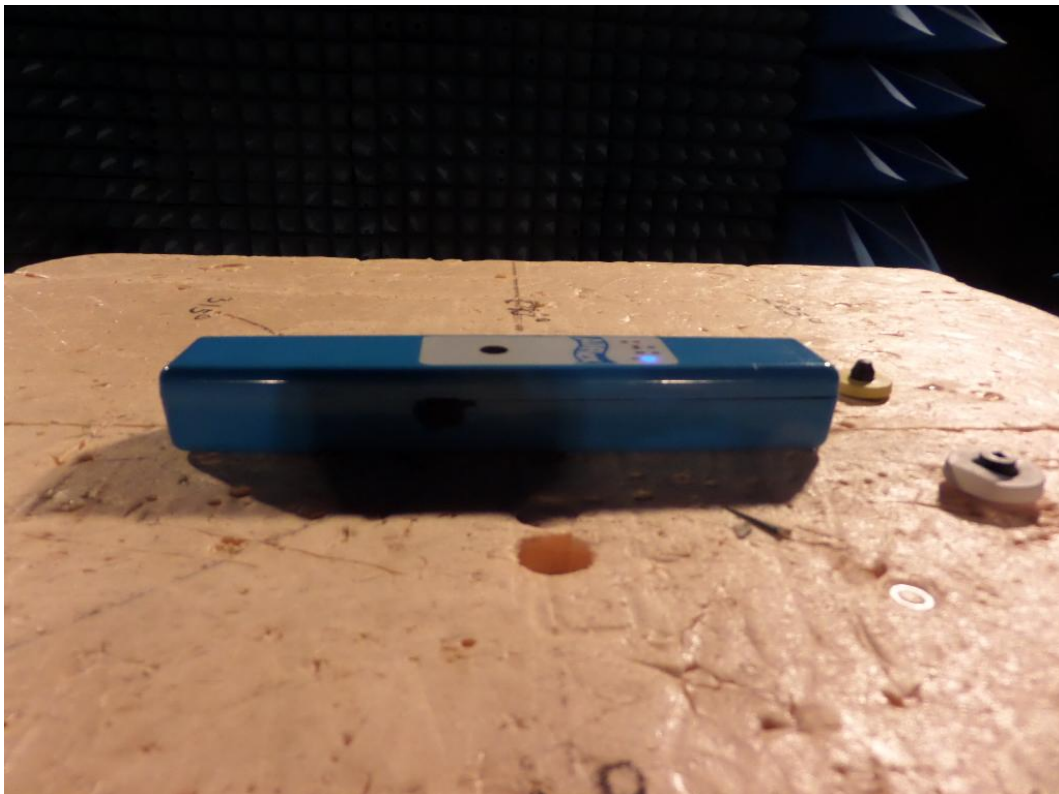
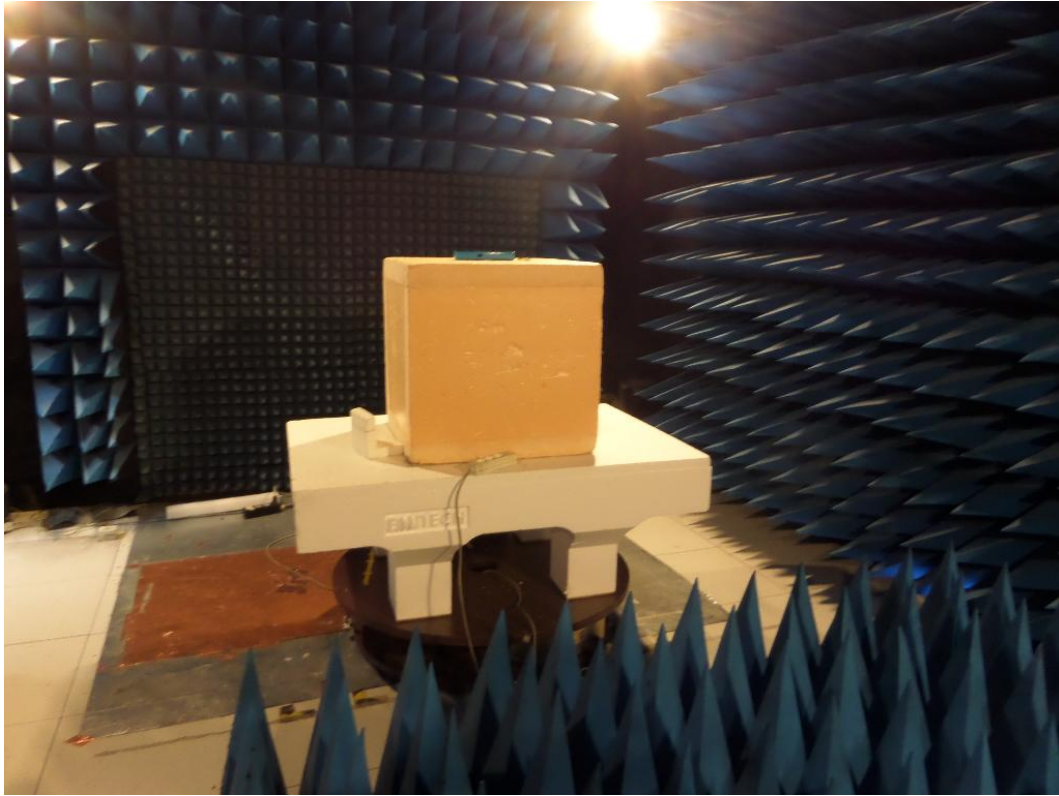




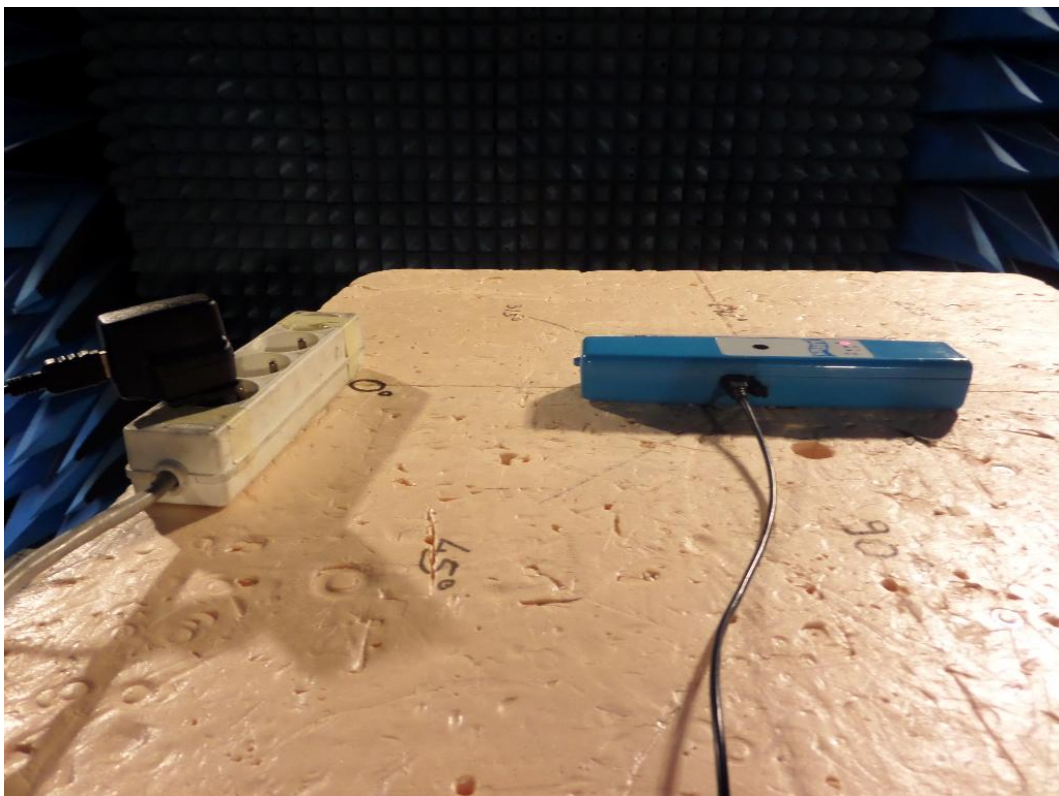
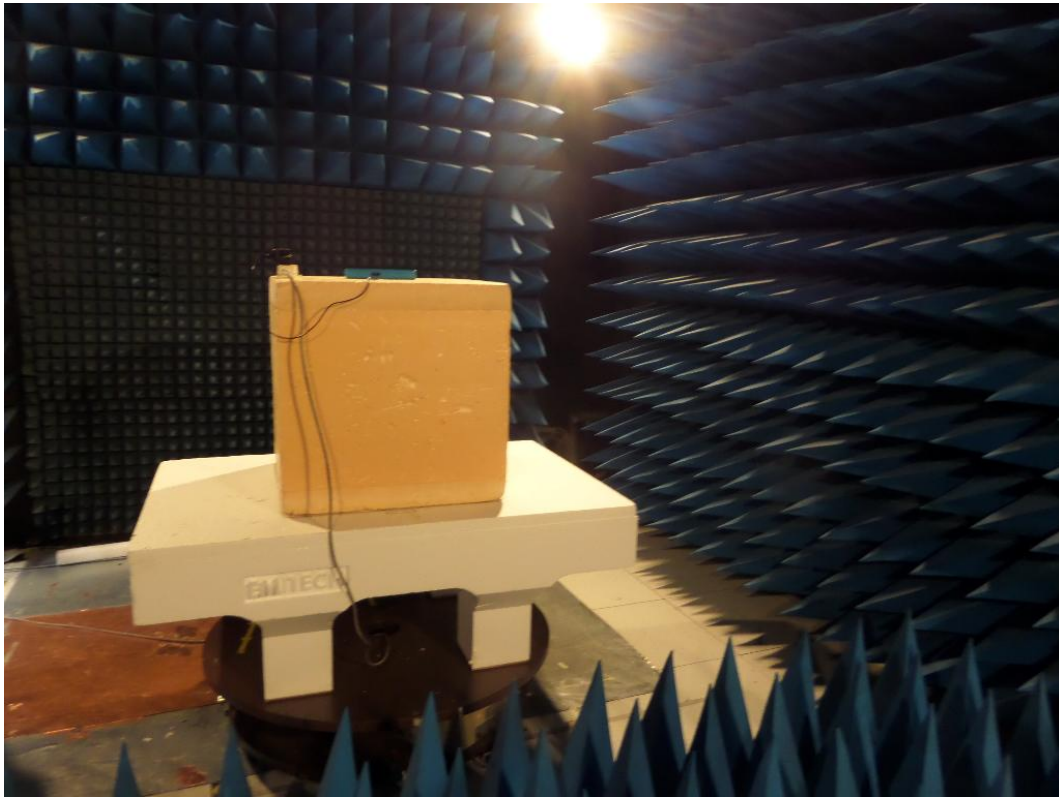


APPENDIX 2: Test set up

Anechoic room - TX mode



Anechoic room – RX mode



Open Area Test Site – RX mode



Conducted tests – RX mode



APPENDIX 3: Test equipment list

Conducted limits

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	8893
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver HP 8591EM	Hewlett Packard	8524
LISN 1600	Thurbly Thandar Instruments	8719
High-pass filter EZ25	R&S	8635
Absorber sheath current	Emitech	10651
Power source 1251RP	California instruments	8508
Multimeter IDM106N	ISOTECH	8676
Meteo station	HUGER	8671
Software	BAT-EMC V3.6.0.32	0000

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
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier S005180M3201	LUCIX CORP.	10739
Power source 1251RP	California instruments	8508
Multimeter IDM106N	ISOTECH	8676
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
Outside room Hors cage	Emitech	8893
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Spectrum Analyzer FSEM30	Rohde & Schwarz	8523
Antenna 3115	EMCO	8535
Multimeter MN5102B	AOIP	8676
Meteo station WS-9232	La Crosse Technology	8750
Software	GPIBSHOT V2.4	-

Maximum peak output power

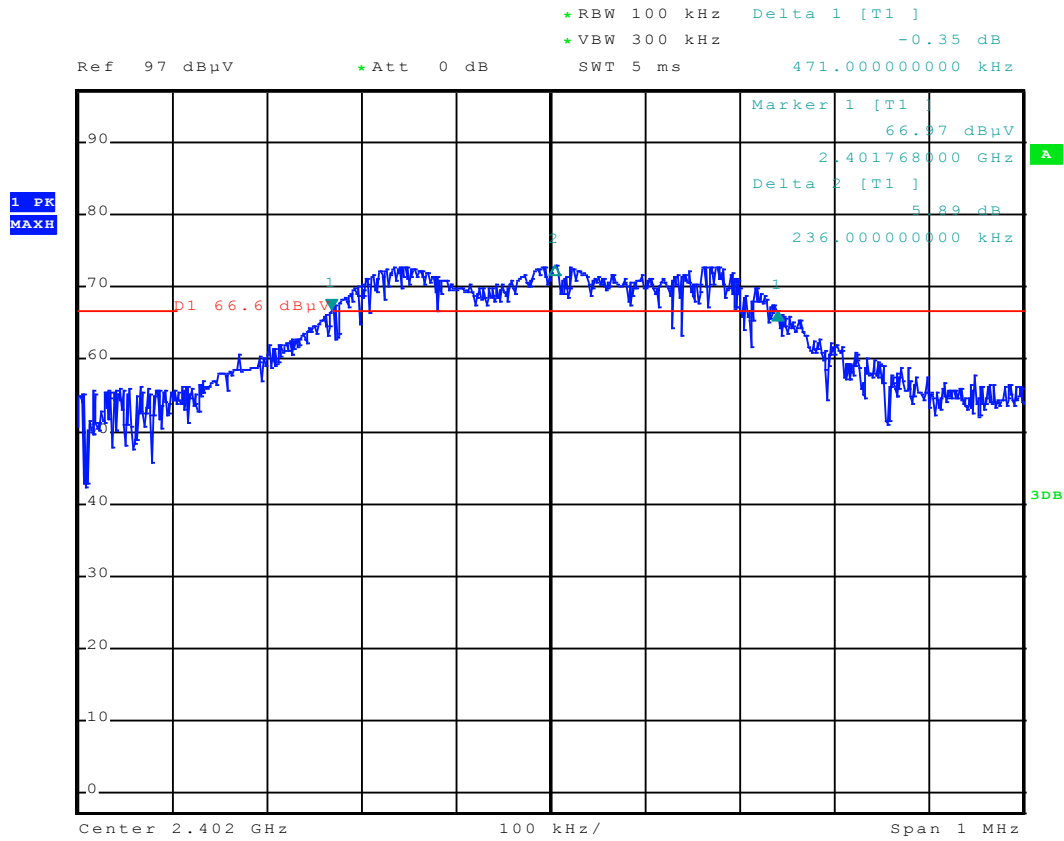
TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Antenna 3115	EMCO	8535
Multimeter MN5102B	AOIP	8676
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

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
Antenna 3115	EMCO	8535
Antenna WR42	IMC	1939
Antenna WR42	IMC	1940
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier S005180M3201	LUCIX CORP.	10739
Low-noise amplifier ALN02-0102	ALC Microwave	3036
Low pass filter LP03/1000-7GH	Filtek	4087
Reject band filter BRM50702	Microtronics	7299
Multimeter MN5102B	AOIP	8676
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

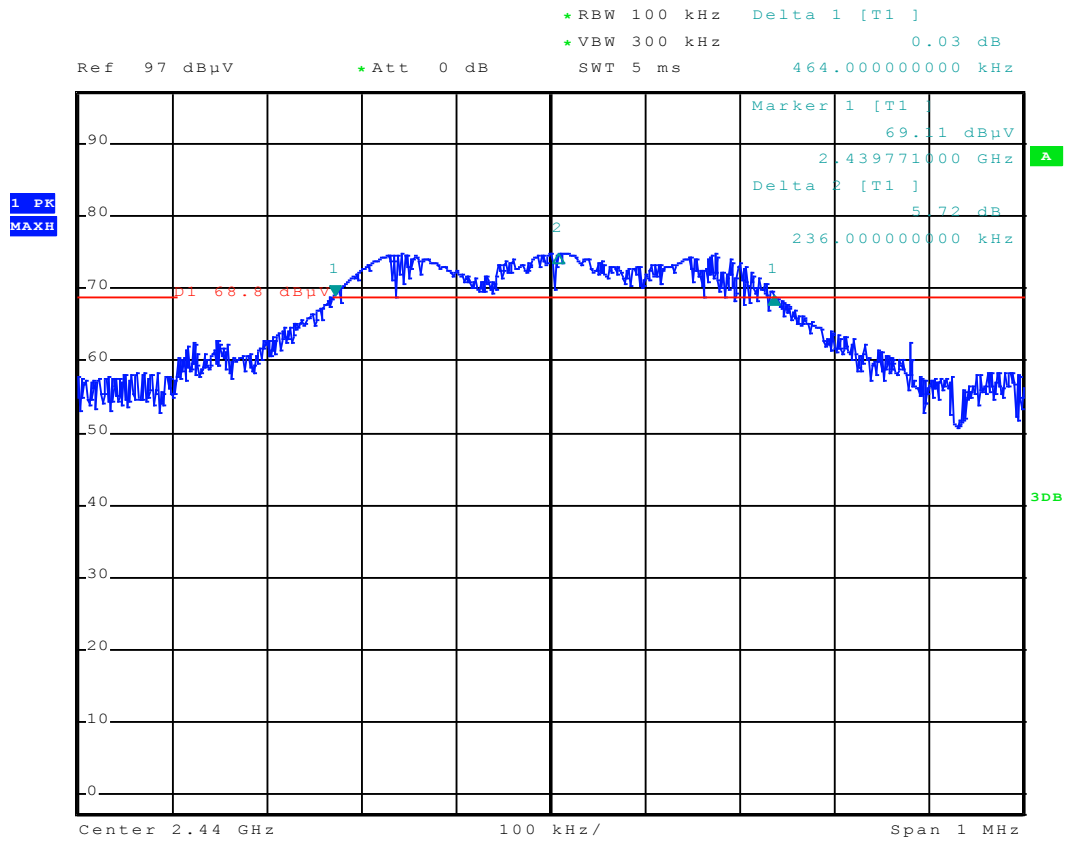
APPENDIX 4: 6dB BANDWIDTH

Low channel



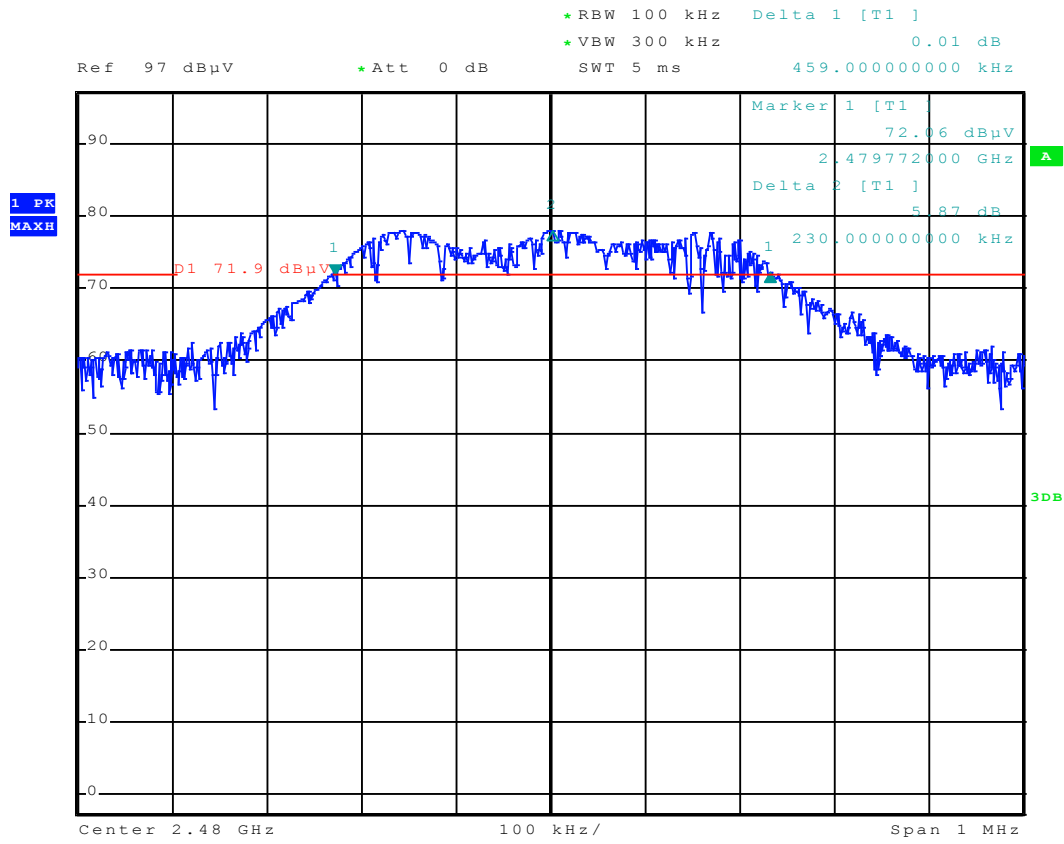
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Central channel



Date: 15.FEB.2016 09:21:12

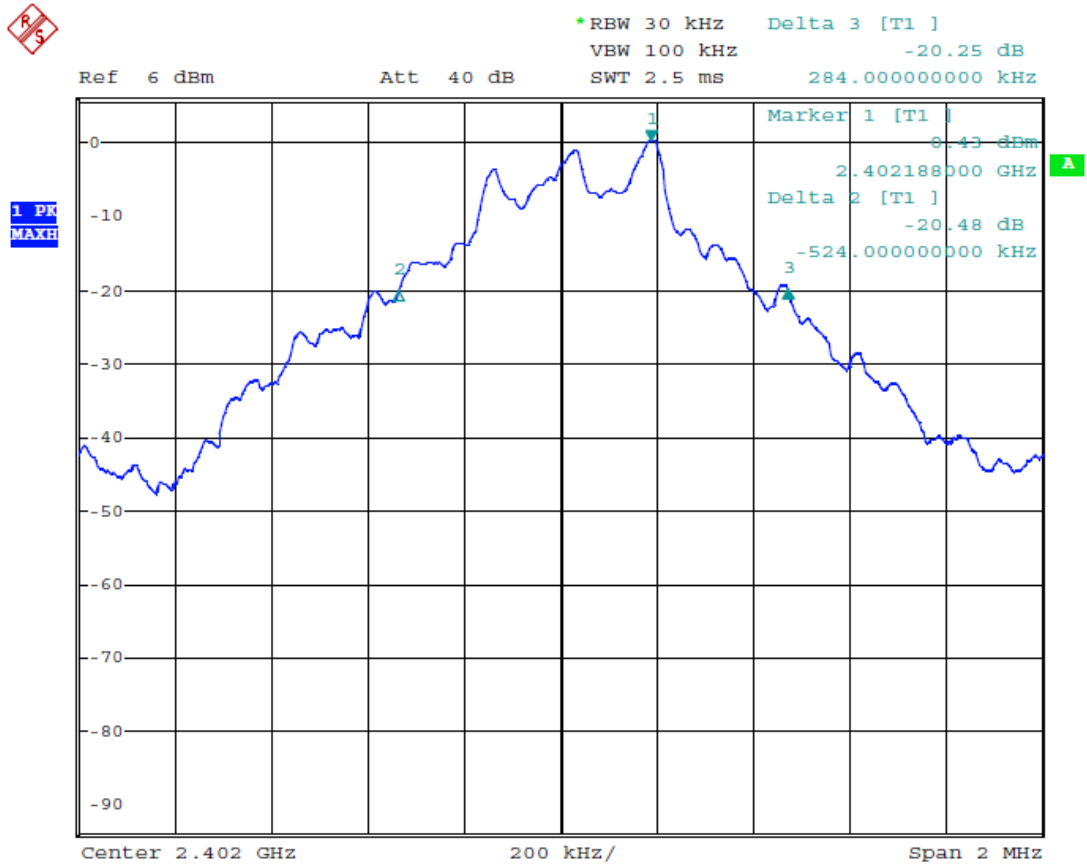
High channel



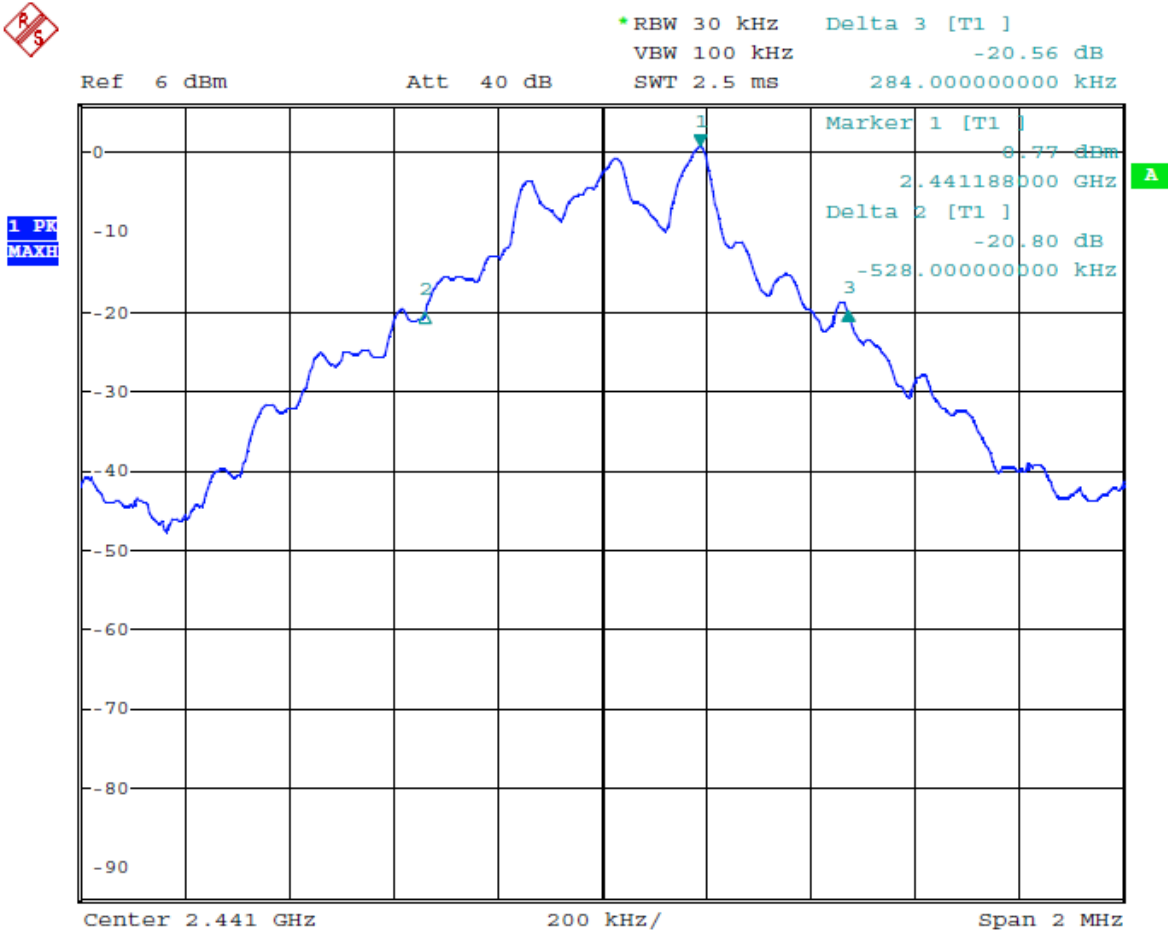
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APPENDIX 5: 20dB BANDWIDTH

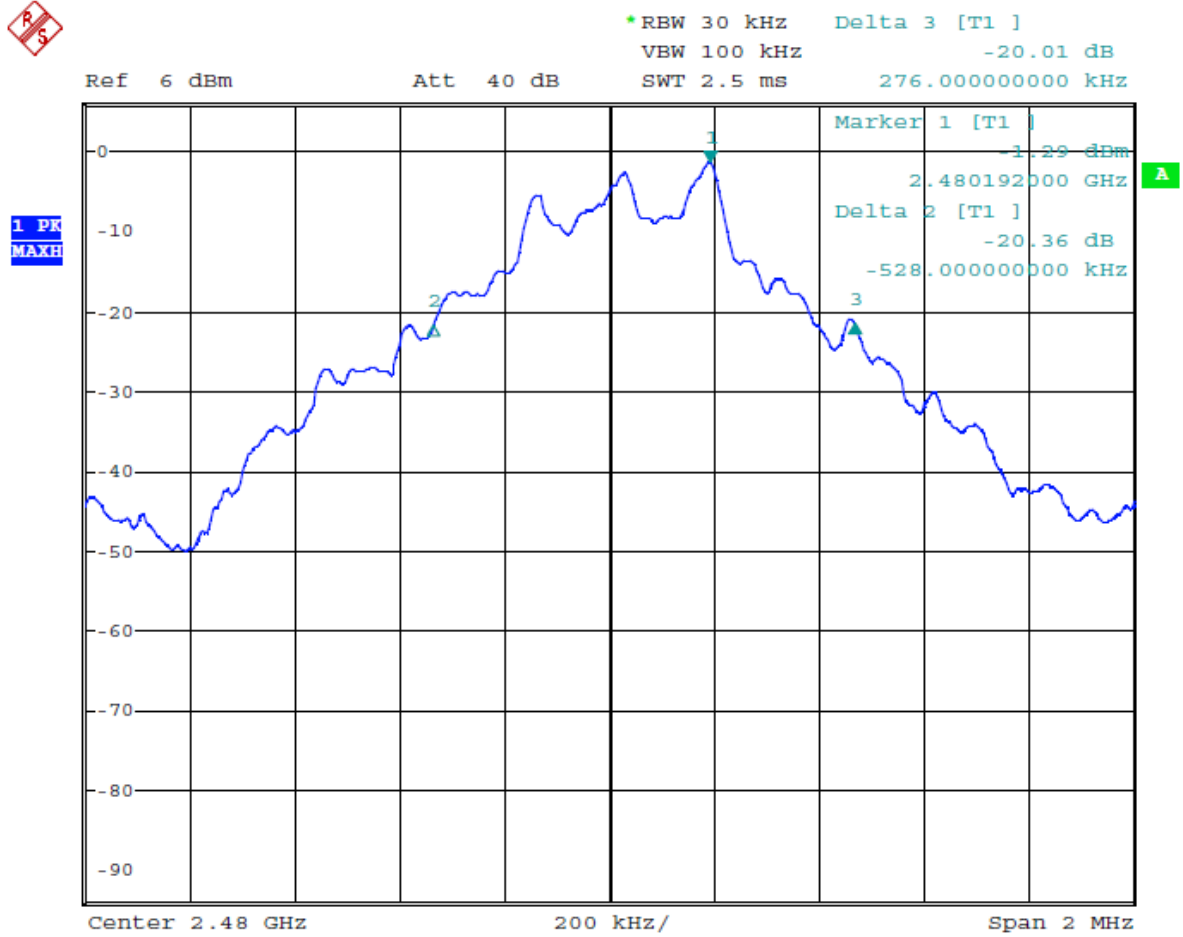
Low channel



Central channel

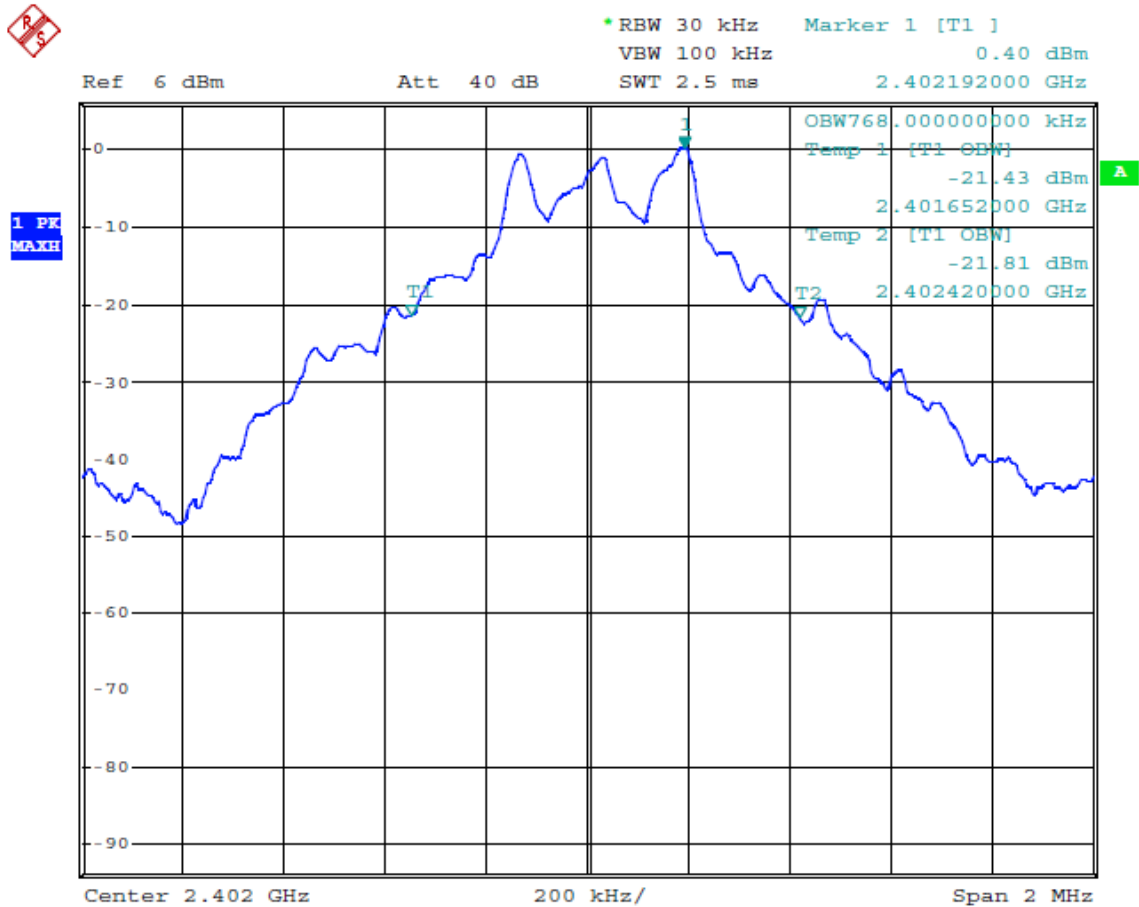


High channel

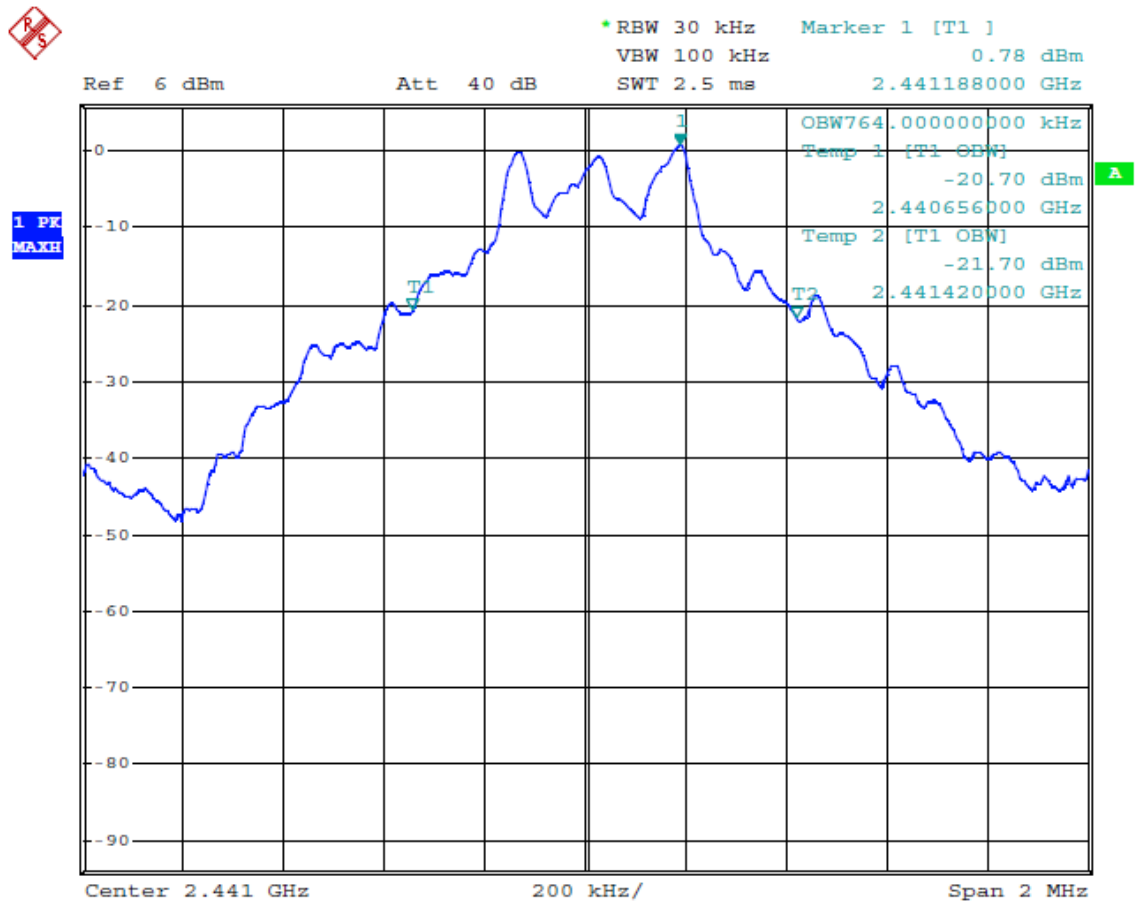


APPENDIX 6: 99% BANDWIDTH

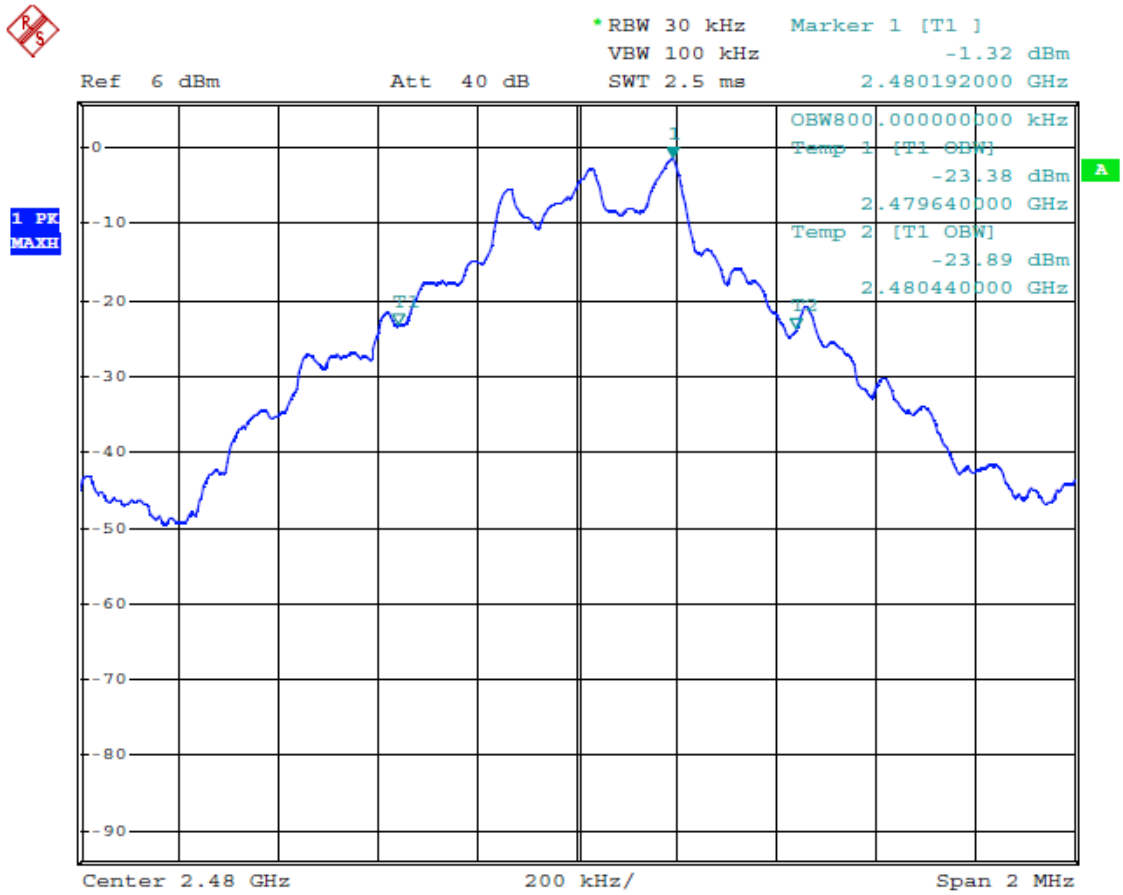
Low channel



Central channel

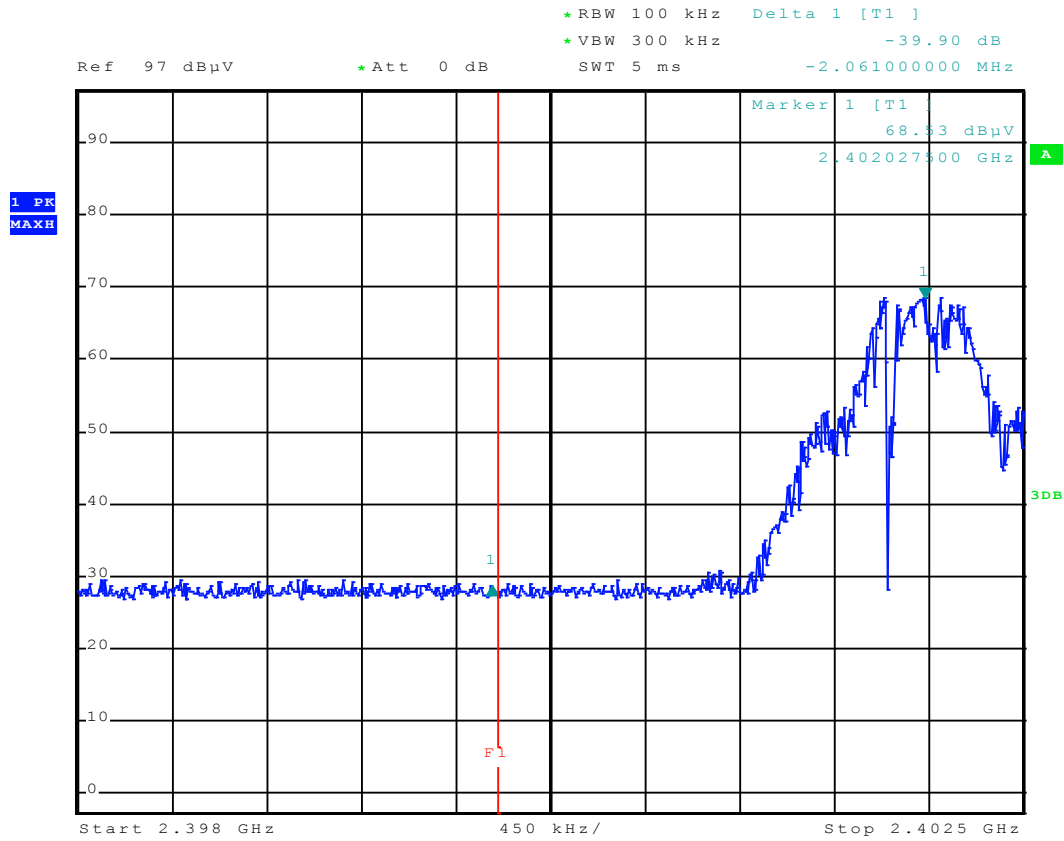


High channel



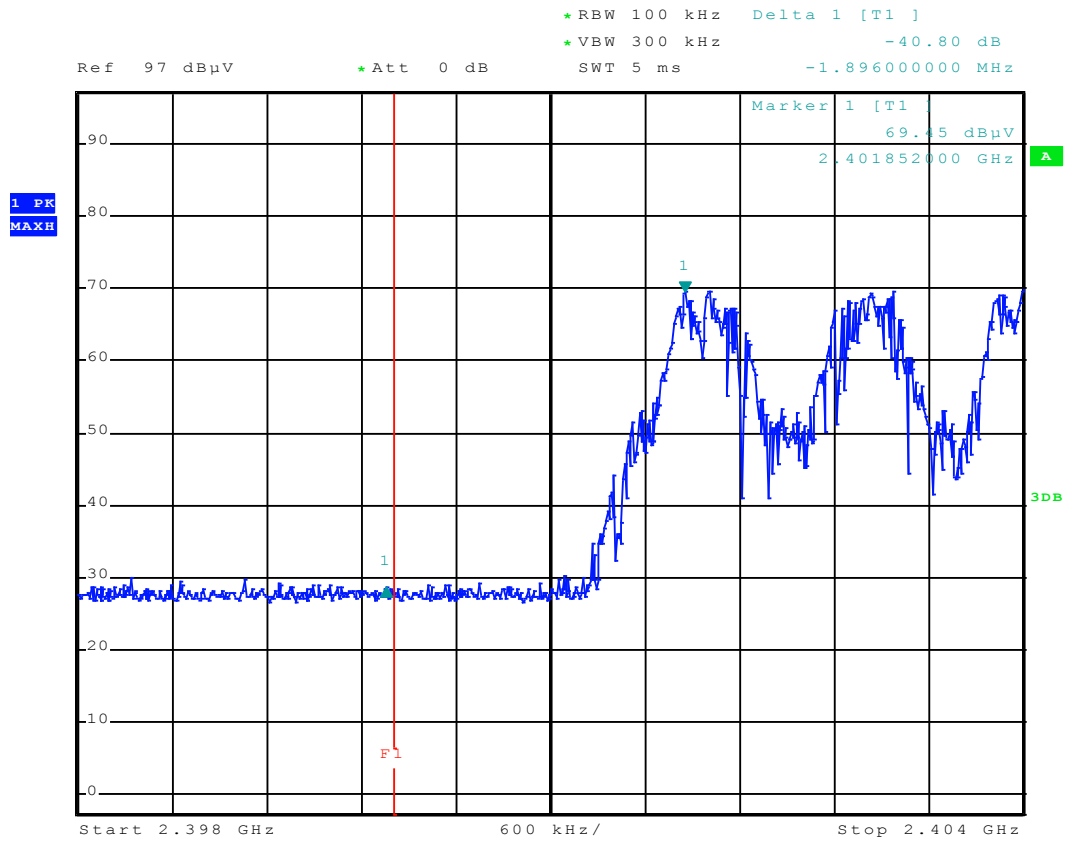
APPENDIX 7: BAND EDGE

Low channel with hopping mode off



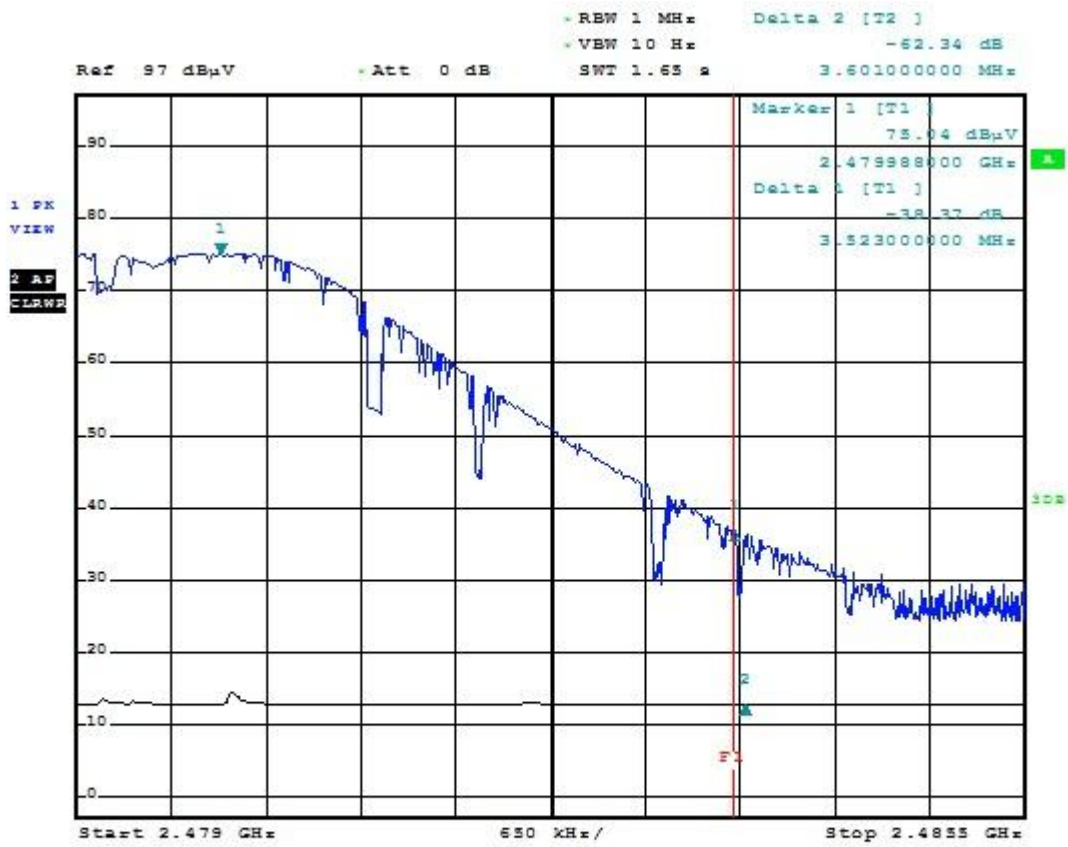
Date: 15.FEB.2016 12:02:45

Low channel with hopping mode on



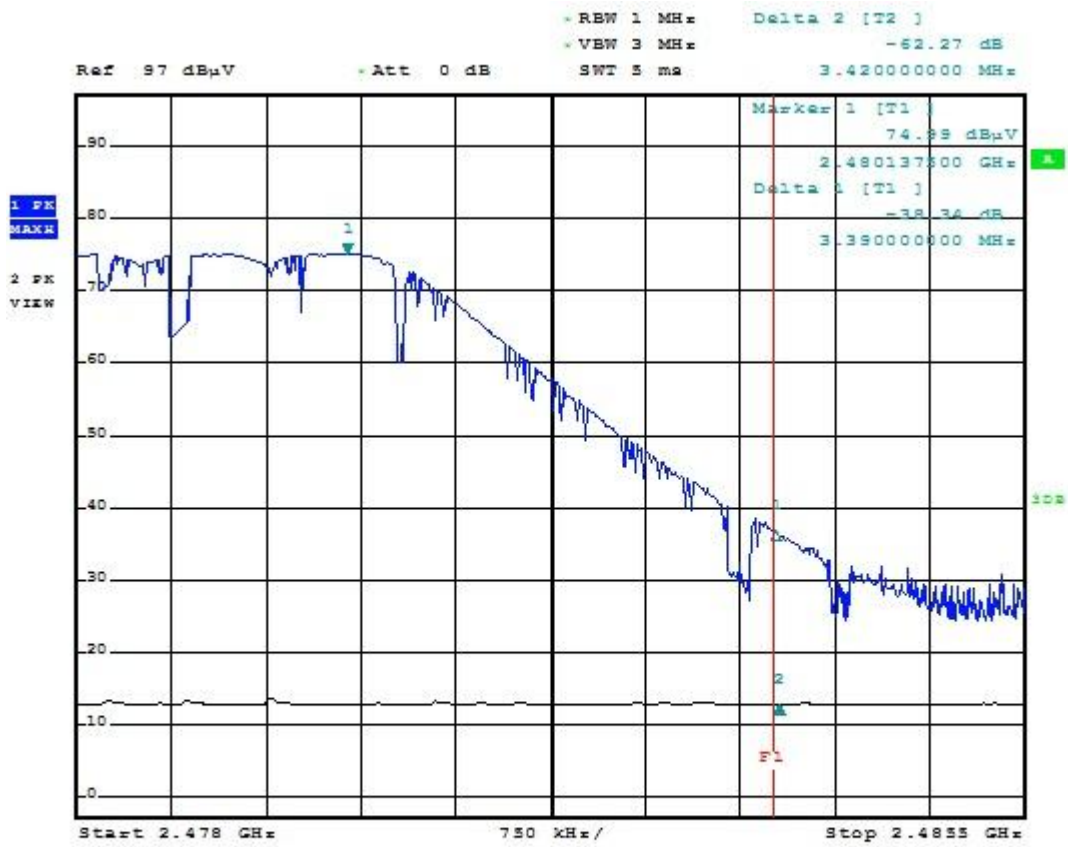
Date: 15.FEB.2016 12:17:47

High channel with hopping mode off



Date: 15.FEB.2016 12:26:26

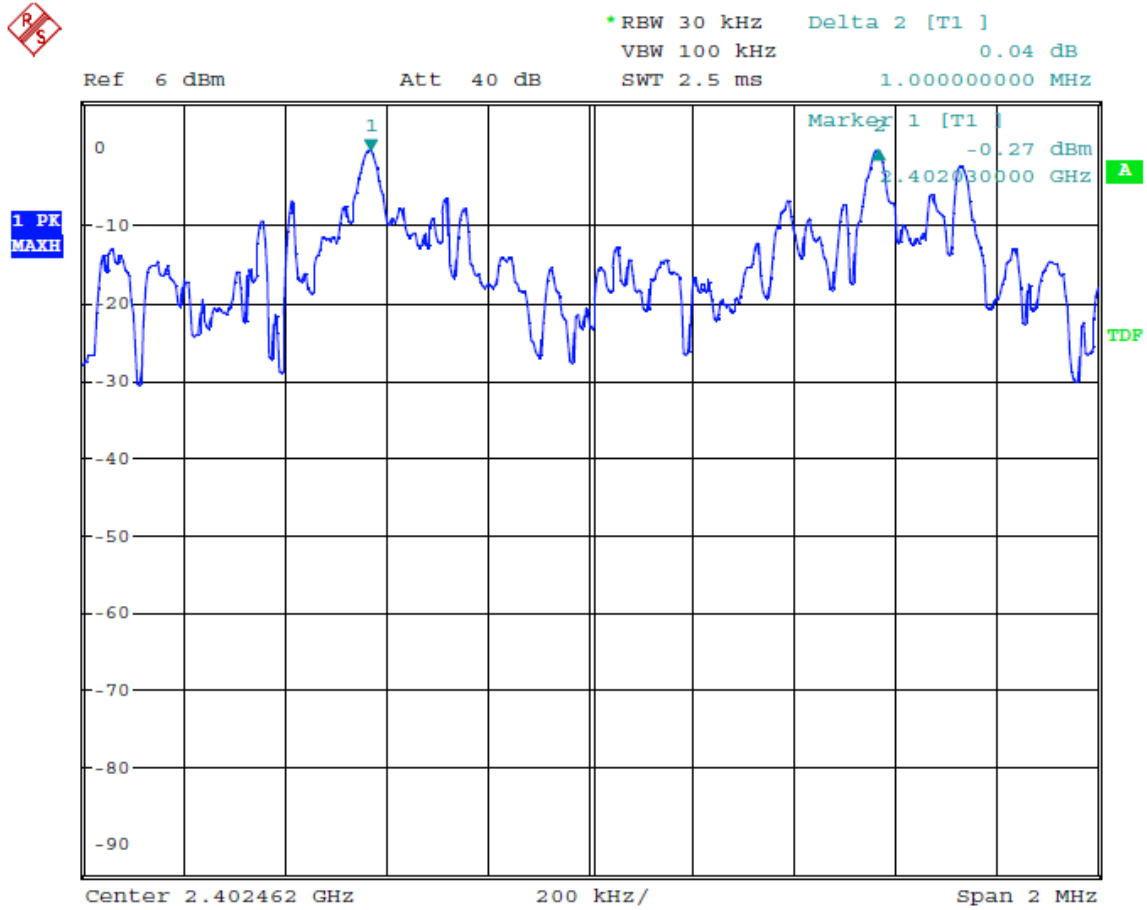
High channel with hopping mode on



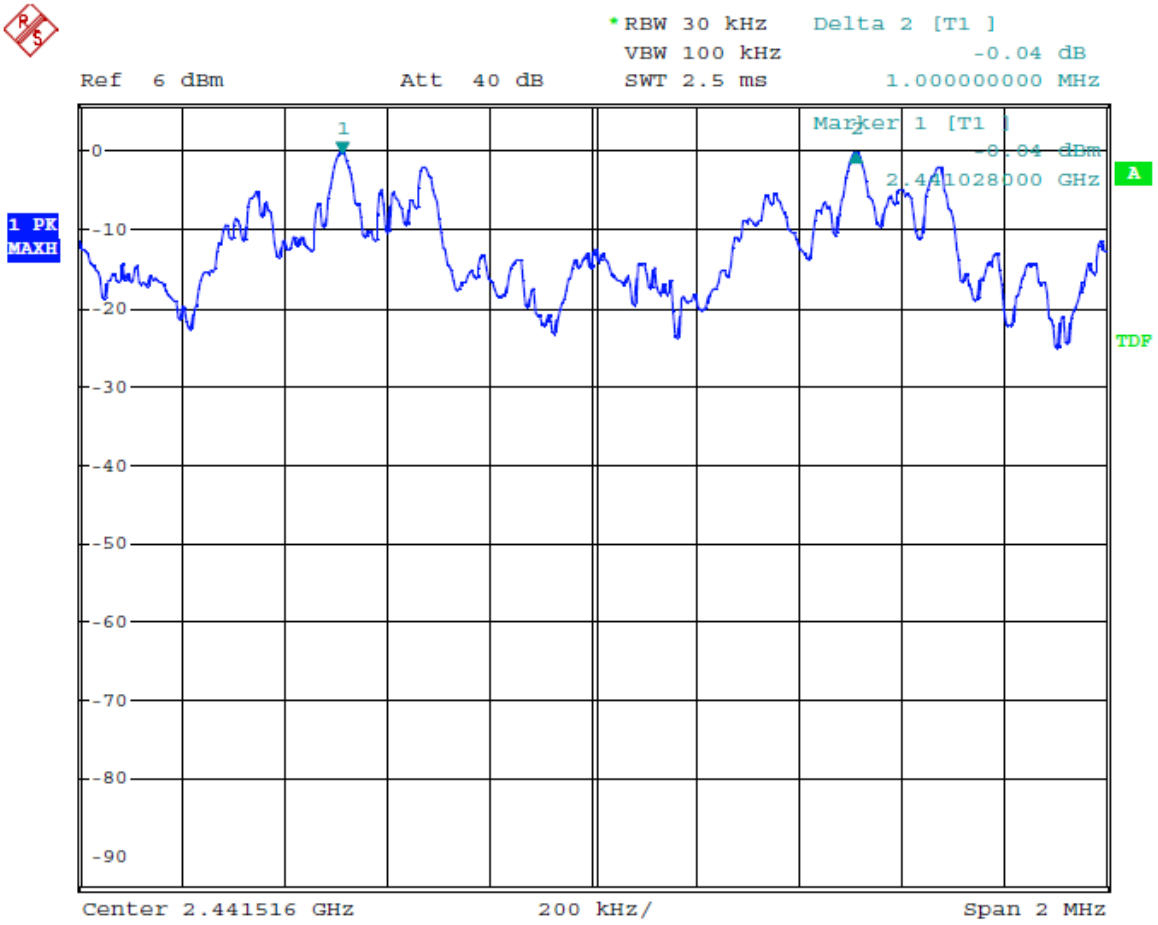
Date: 15.FEB.2016 12:33:47

APPENDIX 8: CHANNEL SPACING

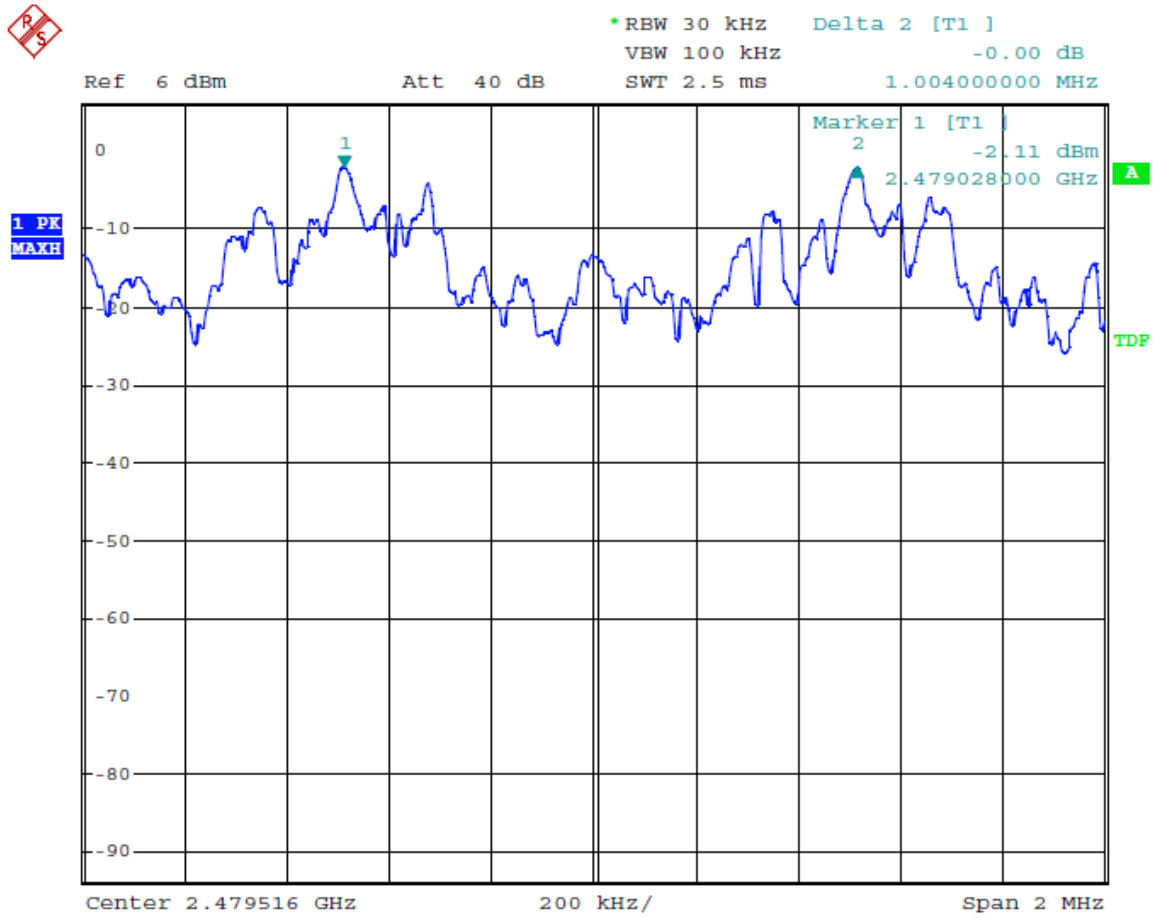
Low channel



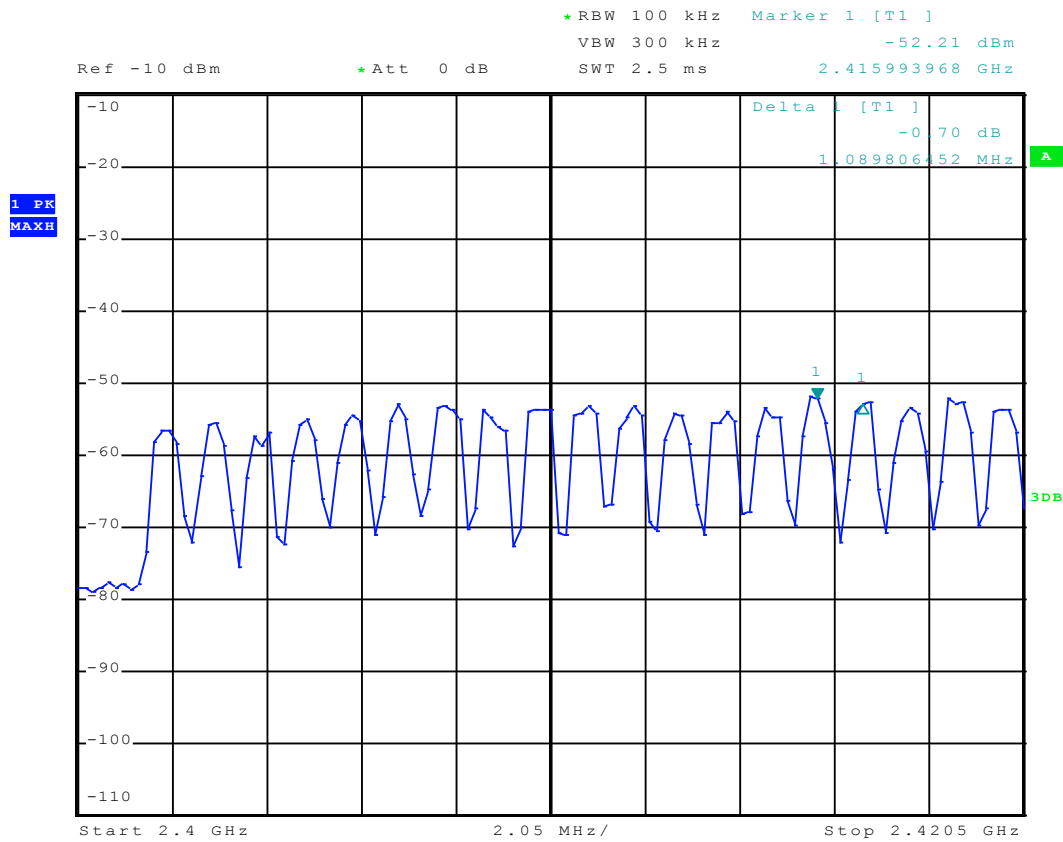
Central channel



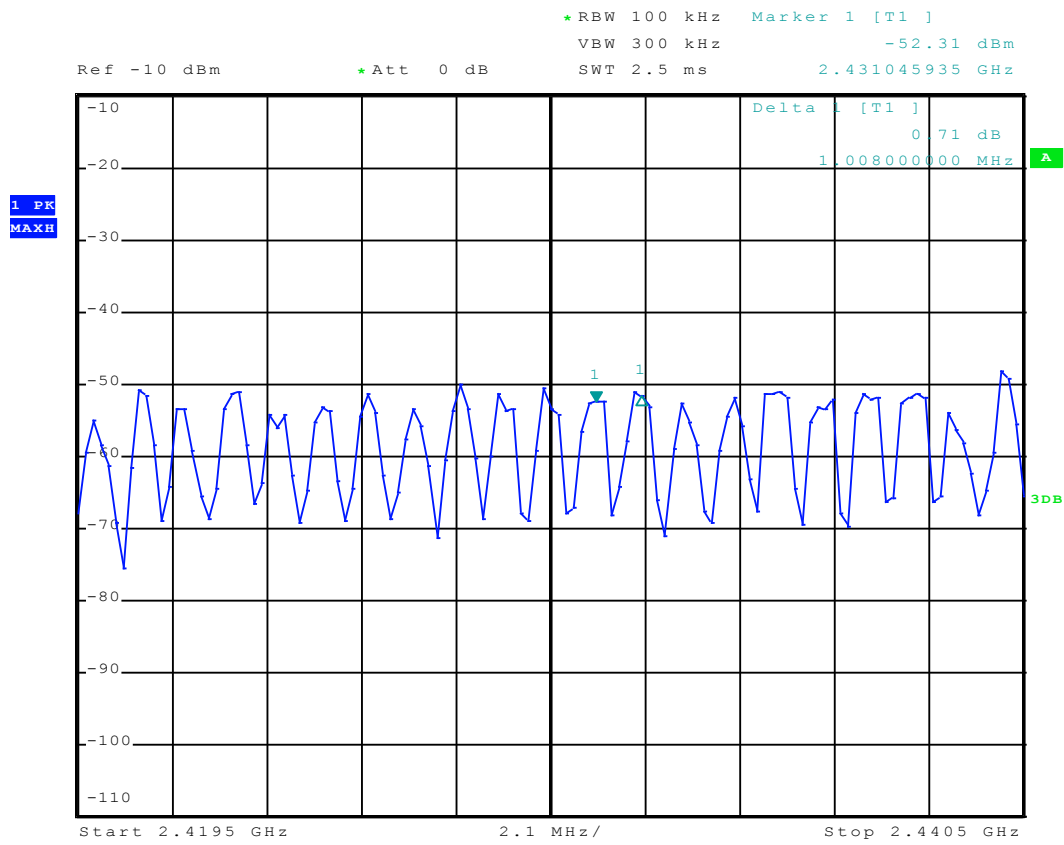
High channel



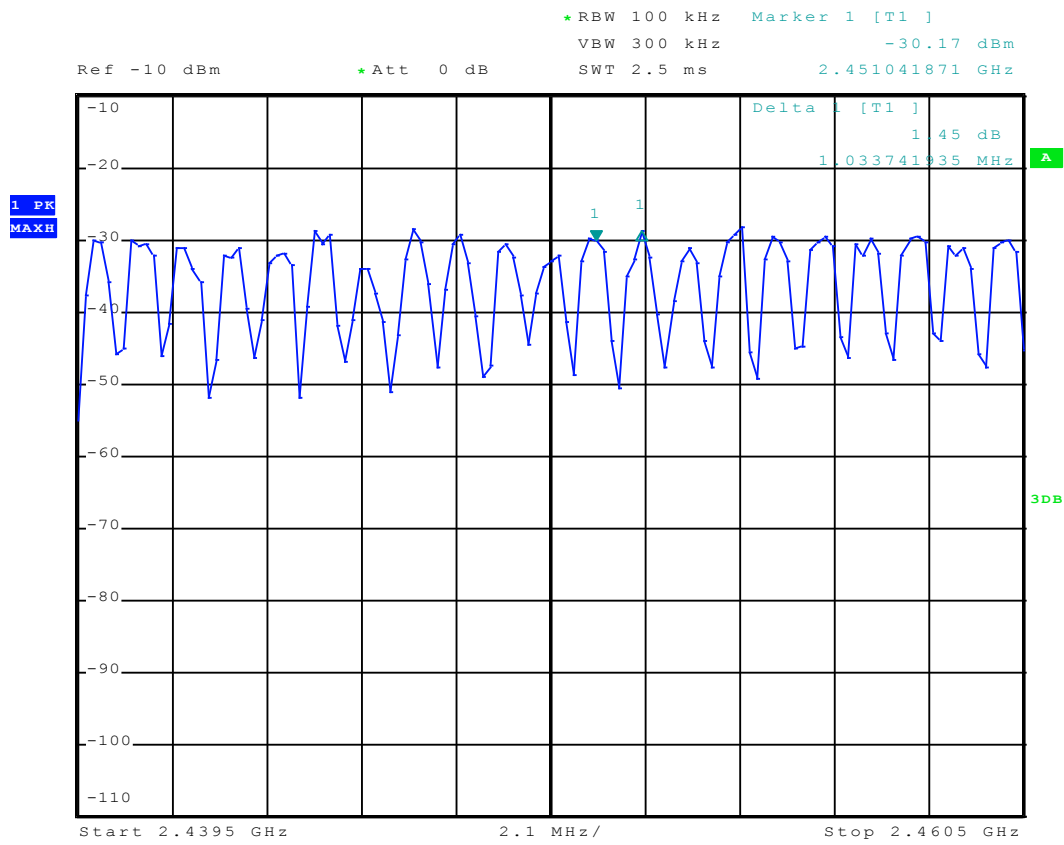
APPENDIX 9 :NUMBER OF HOPPING CHANNEL



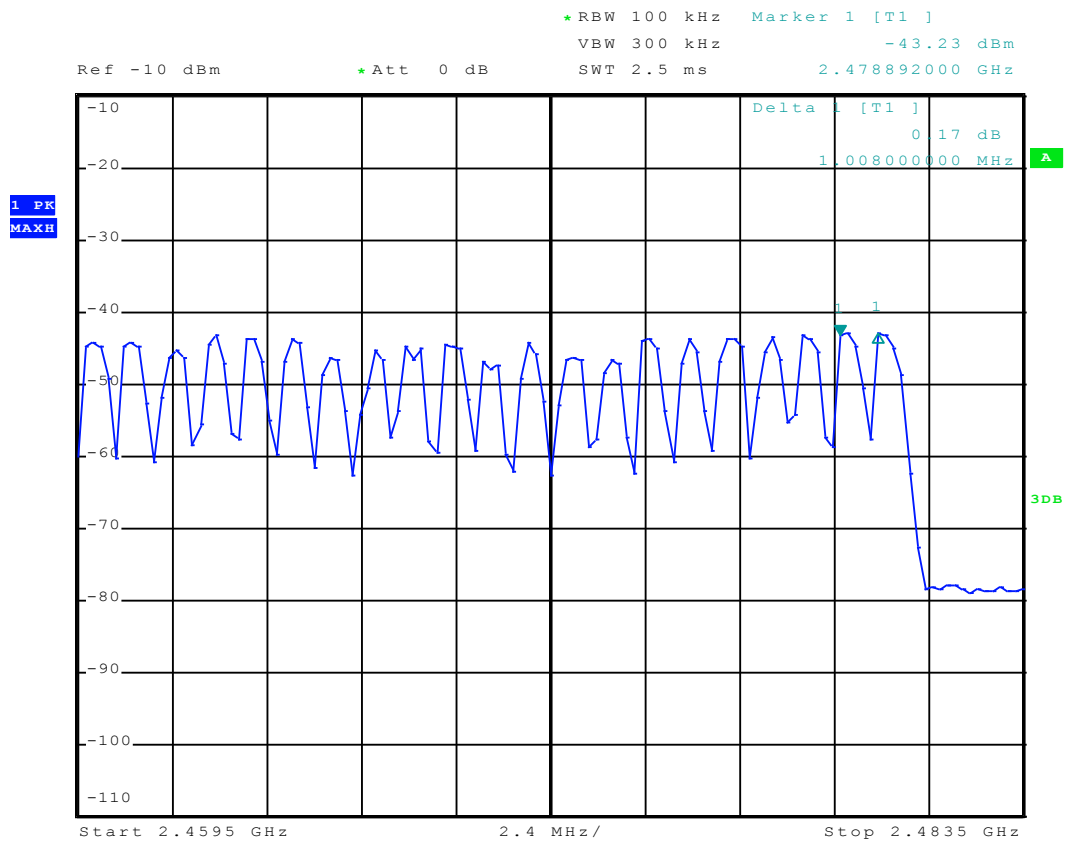
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Date: 19.FEB.2016 08:29:05



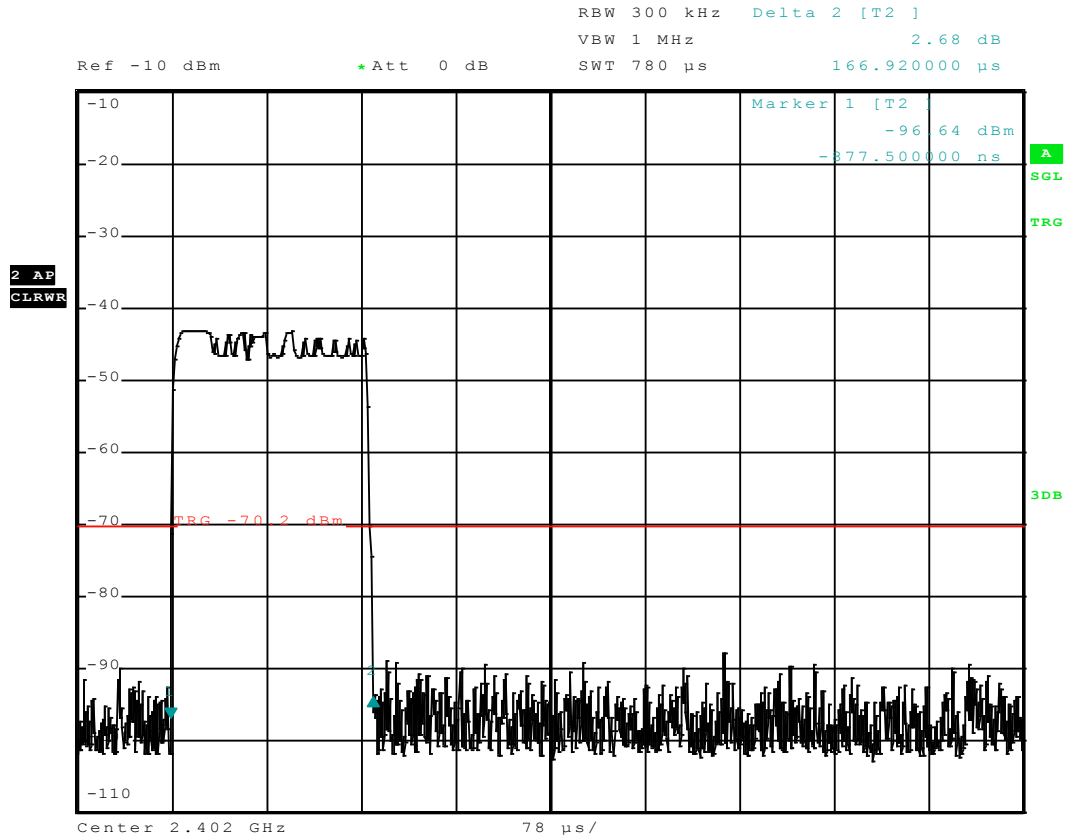
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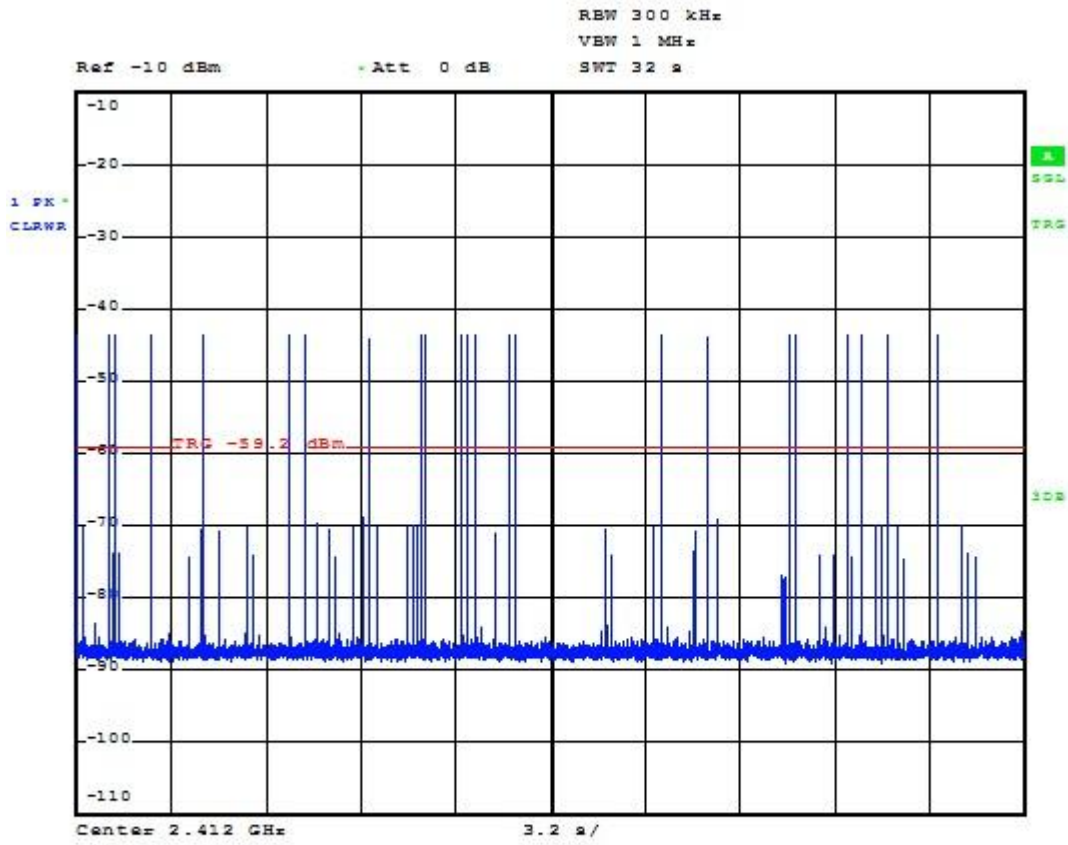
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APPENDIX 10: TIME OF OCCUPANCY ON ANY FREQUENCY

Low Channel

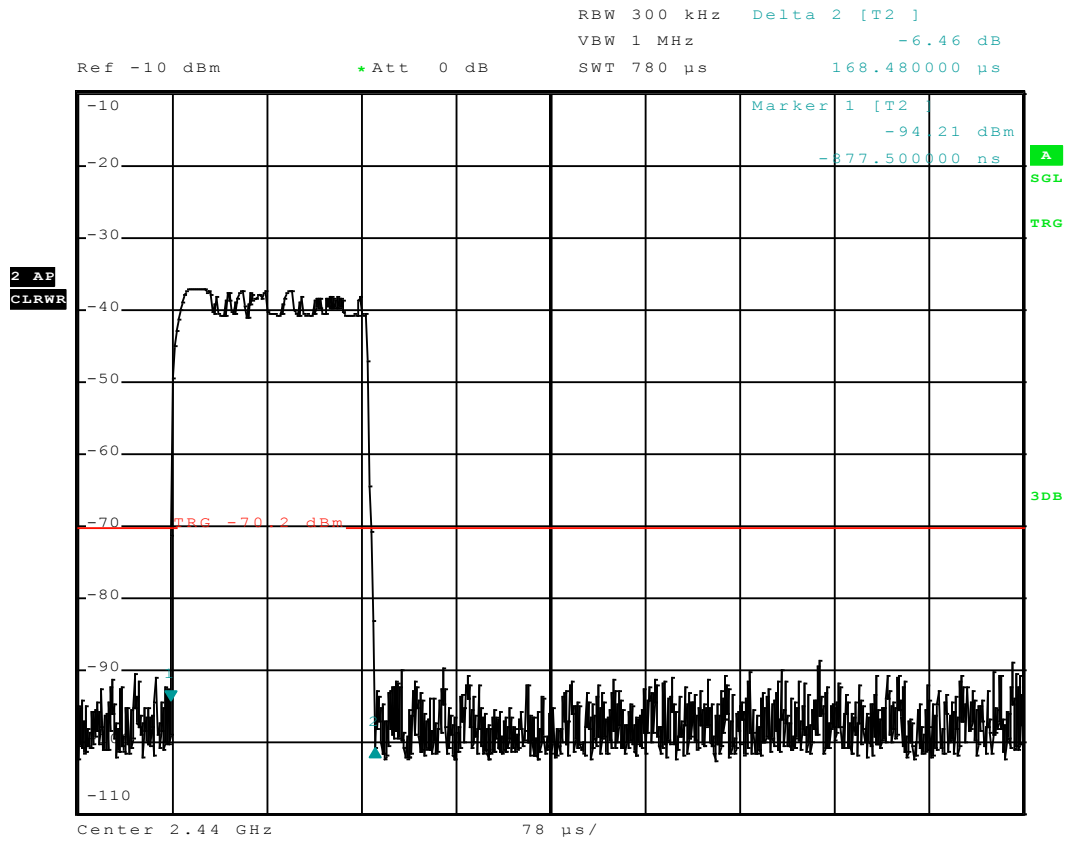


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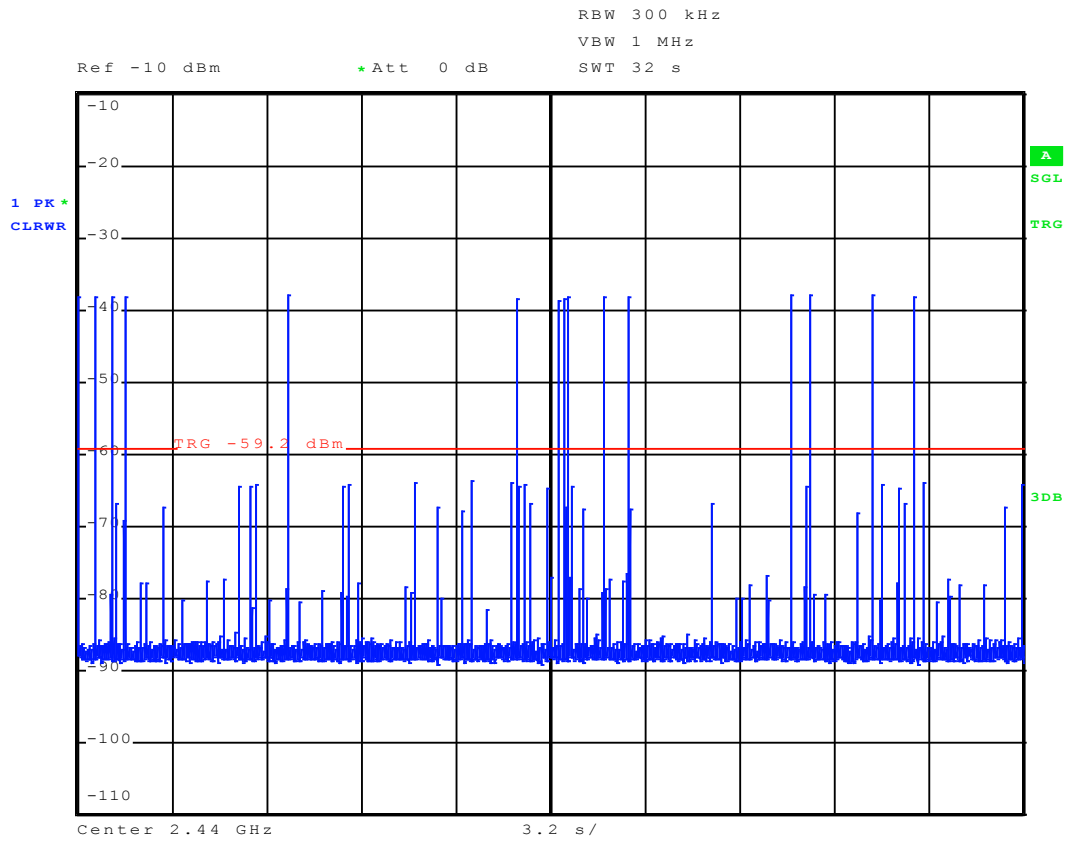


Date: 19.FEB.2016 16:19:14

Central Channel

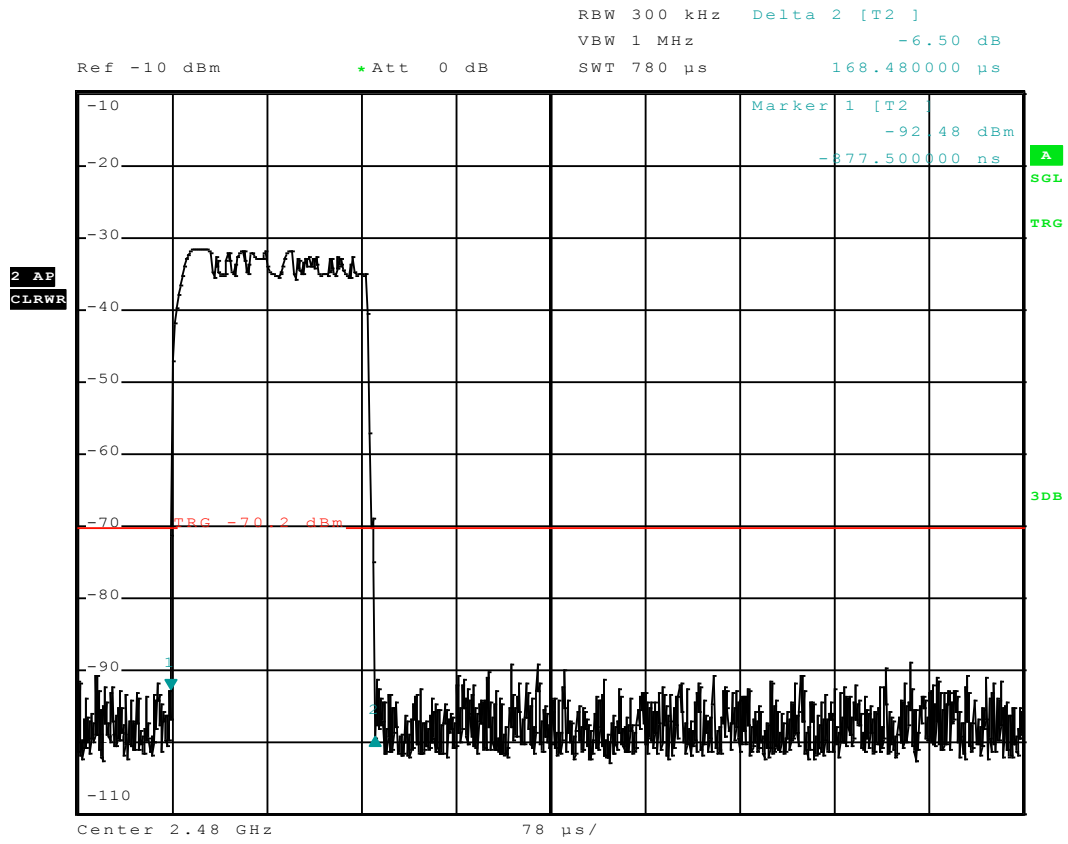


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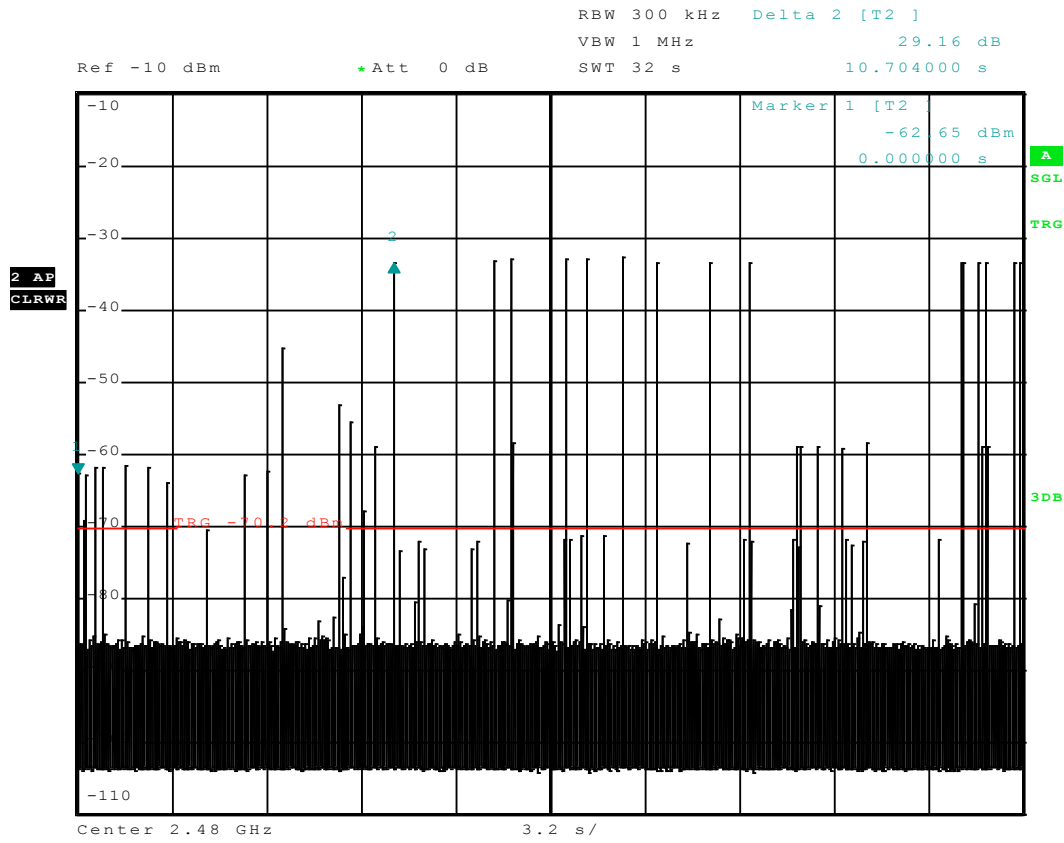


Date: 19.FEB.2016 16:22:31

High Channel



Date: 19.FEB.2016 16:04:41



Date: 19.FEB.2016 16:16:53