RR051-15-105259-3-A Ed. 0

Certification Radio test report

According to the standard:
CFR 47 FCC PART 15

Equipment under test:
SENSOR FOR HEAT DETECTION AXi

FCC ID: 2AGBG-2X000175

Company:
MEDRIA TECHNOLOGIES

DISTRIBUTION: Mr GOUJON **(Company: MEDRIA TECHNOLOGIES)**

Number of pages: 51 with 9 appendixes

Ed.	Date	Modified pages	Written by Name	Visa	Technical Verification and Quality Approval Name	Visa
0	19-NOV-2015	Creation	S. LOUIS	SL	T. LEDRESSEUR	

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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:	**SENSOR FOR HEAT DETECTION**
Serial number (S/N):	Axi00289
Reference / model (P/N):	AXi
Software version:	V1.07
MANUFACTURER:	MEDRIA TECHNOLOGIES

COMPANY SUBMITTING THE PRODUCT:

Company:	MEDRIA TECHNOLOGIES
Address:	PARC D'ACTIVITE DE LA GAULTIERE 35220 CHATEAUBOURG FRANCE
Responsible:	Mr GOUJON
Person present during the tests:	Mr PAVAGEAU
DATES OF TEST:	From 20-OCT-2015 to 16-NOV-2015
TESTING LOCATION:	EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE 21 rue de la Fuye 49610 Juigne sur Loire France FCC Accredited under US-EU MRA Designation Number: FR0009 Test Firm Registration Number: 873677
TESTED BY:	S. LOUIS / M.DUMESNIL

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1. INTRODUCTION

This document presents the result of RADIO test carried out on the following equipment: **Sensor for heat detection AXi**, in accordance with normative reference.

The device under test integrates a multifrequencies wireless transceiver LoRa.
The products use only the data rate SF7.

2. PRODUCT DESCRIPTION

Class:	B
Utilization:	The product is destined to be used on a professional environment, but it was tested for respect the class B limit. Tele transmission
Antenna type and gain:	Integral antenna; 0dBi
Operating frequency range:	from 902.3MHz to 914.9MHz
Number of channels:	64
Channel spacing:	200 KHz
Modulation:	LoRa
Power source:	3.6Vdc

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.
558074 D01 DTS v03r03	Guidance for Performing Compliance on Digital Transmission Systems Operating under §15.247

4. TEST METHODOLOGY

Radio performance tests procedures given in CFR 47 part 15:

Subpart A –General
- Paragraph 19: labelling requirements
- Paragraph 21: information to user

Subpart B –Unintentional Radiators
- Paragraph 105: information to the user
- Paragraph 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
1922	Microwave DB C020180F-4B1	Low-noise amplifier	08/11/2015	08/11/2016	08/01/2017
4088	R&S FSP40	Spectrum Analyzer	29/10/2015	29/10/2017	29/12/2017
6609	HPM11630	High pass filter	24/02/2014	24/02/2016	24/04/2016
8511	HP 8447D	Low noise preamplifier	08/10/2015	08/10/2016	08/12/2016
8526	Schwarzbeck VHBB 9124	Biconical antenna	12/06/2012	12/06/2016	12/08/2016
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
8556	HP11708A	Attenuator 30dB	24/02/2014	24/02/2016	24/04/2016
8593	SIDT Cage 2	Anechoic chamber	/	/	/
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
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	/	/	/
/	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 MEDRIA TECHNOLOGIES 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 Note 1 Note2*
FCC Part 15.107	CONDUCTED LIMITS			X		
FCC Part 15.109	RADIATED EMISSION LIMITS	X				
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 A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of §15.247 frequency bands	X				*Note 3*
	(c) 20 dB bandwidth and band-edge compliance	X				
FCC Part 15.247	OPERATION WITHIN THE BANDS 902-928 MHZ, 2400-2483.5 MHz and 5725-5850 MHz					
	(a) (1) Hopping systems			X		
	(a) (2) Digital modulation techniques			X		
	(b) Maximum peak output power	X				*Note 4*
	(c) Operation with directional antenna gains > 6 dBi			X		
	(d) Intentional radiator	X				
	(e) Peak power spectral density	X				
	(f) Hybrid system	X				*Note 5* *Note 6*
	(g) Frequency hopping requirements			X		
	(h) Frequency hopping intelligence			X		
	(i) RF exposure compliance	X				*Note 7*

NAp: Not Applicable NAs: Not Asked

Note 1: Integral antenna.

Note 2: See FCC part 15.247 (d).

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

Note 4: Conducted measurement is not possible (integral antenna), so we used the radiated method in open field.

Note 5: The frequency hopping system uses 64 channels (see appendix 6).

Each frequency is used equally on the average by the transmitter.

The timing by channel is 72.14ms (see appendix 7).

During 64 channels × 0.4 s = 25.6 s, any channel is used 1 time, then 1 x 72.14 ms = 72.14 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 (ms)	Number of burst repetition during observation period	average time of occupancy on any channel (s)	Limits (s)
64	25.6	72.14	1	0.072	0.4

Note 6: The maximum 99% bandwidth of the equipment is 125.5 kHz (see appendix 4).

RF EXPOSURE:

Note 7 :

Maximum measured power = 88.85 dBµV/m = 0.00256 mW
With P = (Exd)² / (30xGp) with d = 3m and Gp = 1

In accordance with KDB 447498 D01 General RF Exposure Guidance v05r02
*PSD = EIRP/(4*π*R²)=2.56/(4*π*(20 cm)²)= 0.00051 mW/cm² (limit= 0.6 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 results

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 5GHz (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 on low, middle then high channel in reception mode.

Results:

Ambient temperature (°C):	22
Relative humidity (%):	57

Power source: Lithium battery 3.6Vdc fully charged

Not any spurious has been detected.

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): 21.9
Relative humidity (%): 46

Power source: Lithium battery 3.6Vdc fully charged

Lower Band Edge: from 900MHz to 902MHz
Upper Band Edge: from 928MHz to 930MHz

Sample N° 1:

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)
902.3	86.37	P	901.99	28.93	57.44	66.37	8.93
914.8	88.85	P	928.46	49.34	39.51	68.85	29.34

* *Marker-Delta method*

99% bandwidth curves are given in appendix 4; band-edge curves are given in appendix 5.

Test conclusion:

RESPECTED STANDARD

9. 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.

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.

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.

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

See photos in appendix 2.

Distance of antenna: 10 meters

Antenna height: 1 to 4 meters

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): 22
Relative humidity (%): 48

Power source: Lithium battery 3.6Vdc fully charged

Sample N° 1 Low Channel 902.3MHz

	Electro-magnetic field (dBµV/m):	Conducted power * (W)	Limit (W)
Nominal supply voltage: 3.6V	86.37	0.00145	1

Polarization of test antenna: Horizontal (height: 100 cm)
Position of equipment: See appendix 2 (azimuth: 218 degrees)

Sample N° 1 Central Channel 908.7MHz

	Electro-magnetic field (dBµV/m):	Conducted power * (W)	Limit (W)
Nominal supply voltage: 3.6V	87.8	0.00201	1

Polarization of test antenna: Horizontal (height: 100 cm)
Position of equipment: See appendix 2 (azimuth: 215 degrees)

Sample N° 1 High Channel 914.9MHz

	Electro-magnetic field (dBµV/m):	Conducted power * (W)	Limit (W)
Nominal supply voltage: 3.6V	88.85	0.00256	1

Polarization of test antenna: Horizontal (height: 100 cm)
Position of equipment: See appendix 2 (azimuth: 200 degrees)

** $P = (E \times d)^2 / (30 \times Gp)$ with $d = 10$ m and $Gp = 1$*

Antenna gain: 0 dBi

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

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): 21.1
Relative humidity (%): 58

Power source: Lithium battery 3.6Vdc fully charged

Sample N° 1 Low Channel

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)
1805	P	150	51	100	V	60.8	79.3	18.5
2707.5*	P	150	9	1000	V	56.4	74	17.6
2705.5*	Av	150	9	1000	V	51.8	54	2.2
3609.5*	P	150	20	1000	V	50.4**	74	23.6
4511.5*	P	150	0	1000	V	49.0**	74	25
5413.5*	P	150	325	1000	V	48.7**	74	25.3
9023.2*	P	150	0	1000	H	57.0	74	17
9023.2*	Av	150	0	1000	H	52.4	54	1.6

Sample N° 1 Central Channel

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)
1817.5	P	150	48	100	V	59.9	79.3	19.4
2726*	P	150	0	1000	V	53.6**	74	20.4
3634.5*	P	150	350	1000	V	49.6**	74	24.4
4543.5*	P	150	5	1000	V	48.6**	74	25.4
5452*	P	150	0	1000	V	49.4**	74	24.6
9087.2*	P	150	335	1000	H	55.9	74	18.1
9087.2*	Av	150	335	1000	H	50.1	54	3.9

Sample N° 1 High Channel

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)
1830	P	150	43	100	V	57.5	79.4	21.7
2745*	P	150	0	1000	V	52.9**	74	21.1
3659.5*	P	150	0	1000	V	47.6**	74	26.4
4575*	P	150	0	1000	V	48.7**	74	25.3
5489*	P	150	0	1000	V	45.7**	74	28.3
9148.4*	P	150	0	1000	H	58	74	16.0
9148.4*	Av	150	0	1000	H	53.2	54	0.8

* *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 99.3 dBµV/m on high channel.
So the applicable limit is 79.3 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:

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 system is tested in an open area test site (OATS). The EUT is placed on a rotating table, 0.8m from a ground plane. Zero degree azimuths correspond to the front of the device under test.

The measurement of the electro-magnetic field is realized; with a resolution bandwidth adjusted at 3 kHz and video bandwidth at 10 kHz

The measuring distance between the equipment and the test antenna is 10 m. The test antenna has been oriented in two polarizations (Vertical and Horizontal) and raised and lowered from 1m to 4m above the ground level. Only the highest level of each measurement is reported.

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): 22
Relative humidity (%): 48

Power source: Lithium battery 3.6Vdc fully charged

Sample N° 1 Low Channel

	Peak power density at frequency: 902.3 MHz
Normal test conditions	-1.67dBm
Limits	+8 dBm

Sample N° 1 Central Channel

	Peak power density at frequency: 908.7 MHz
Normal test conditions	-1.77dBm
Limits	+8 dBm

Sample N° 1 High Channel

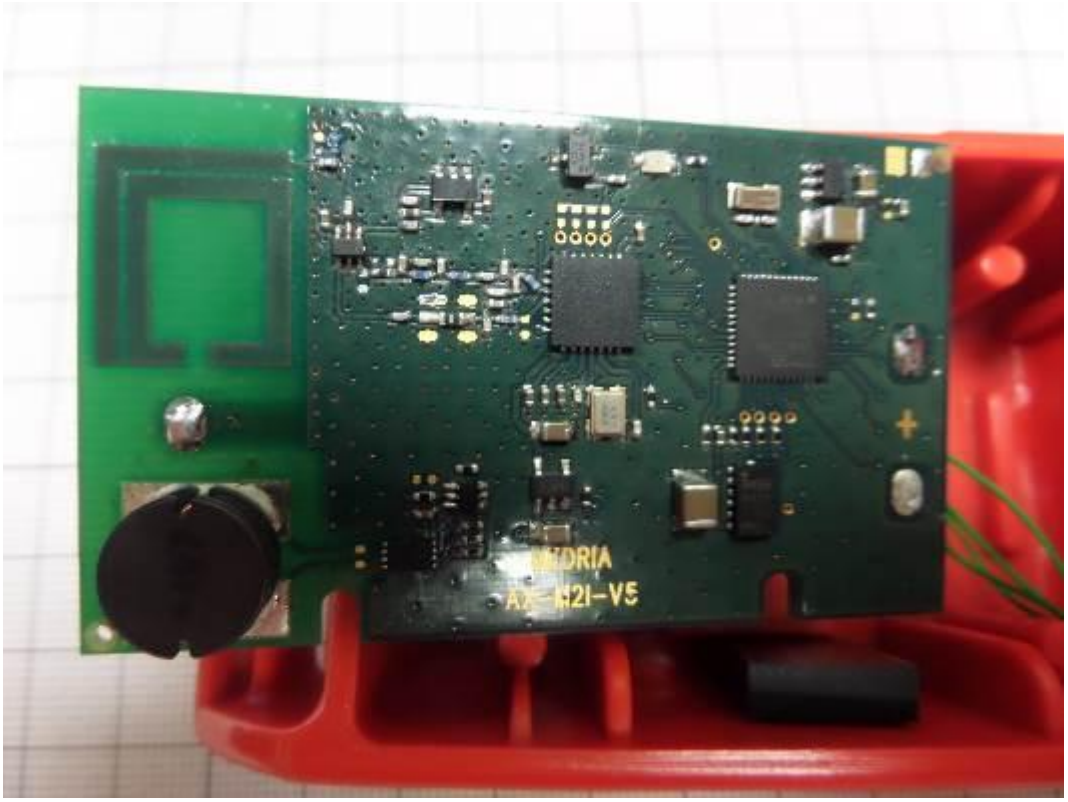
	Peak power density at frequency: 914.9 MHz
Normal test conditions	+1.33dBm
Limits	+8 dBm

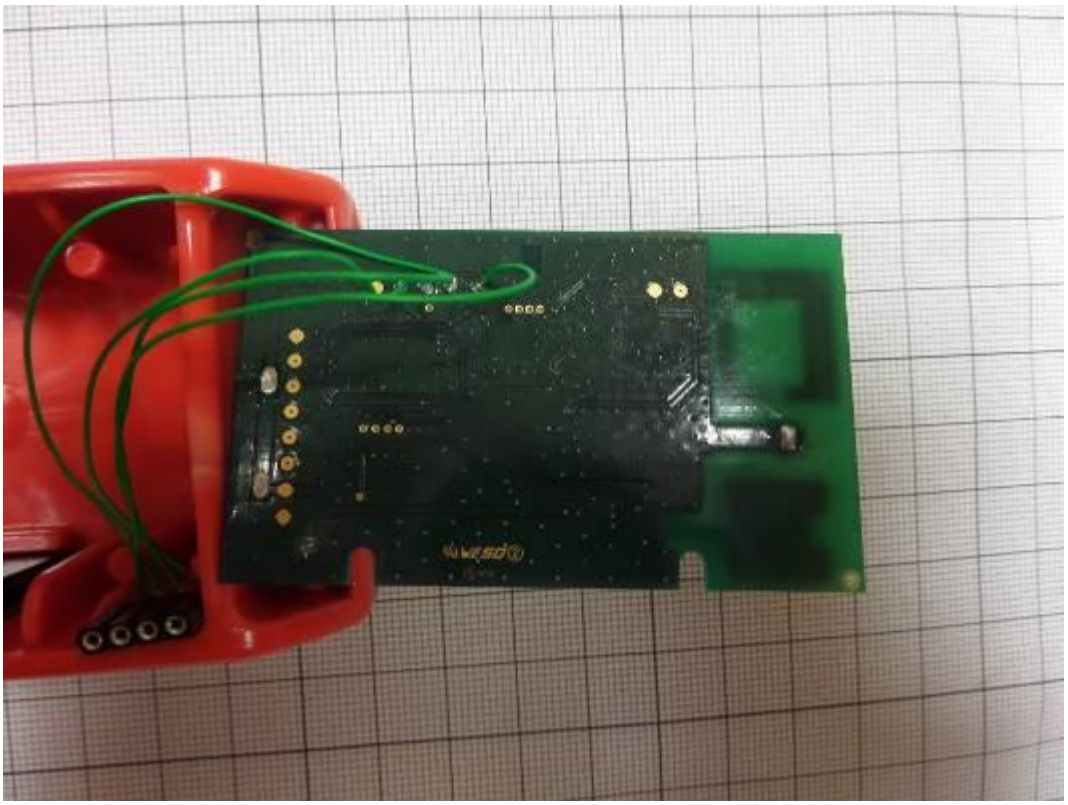
Test conclusion:

RESPECTED STANDARD

□□□ End of report, 9 appendixes to be forwarded □□□

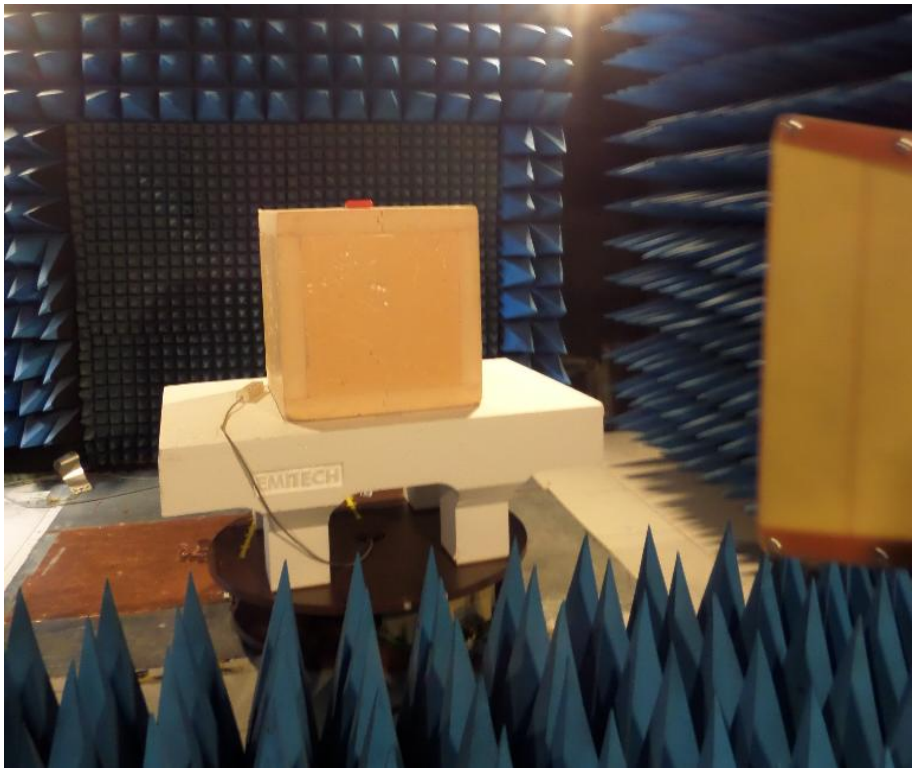
APPENDIX 1: Photos of the equipment under test

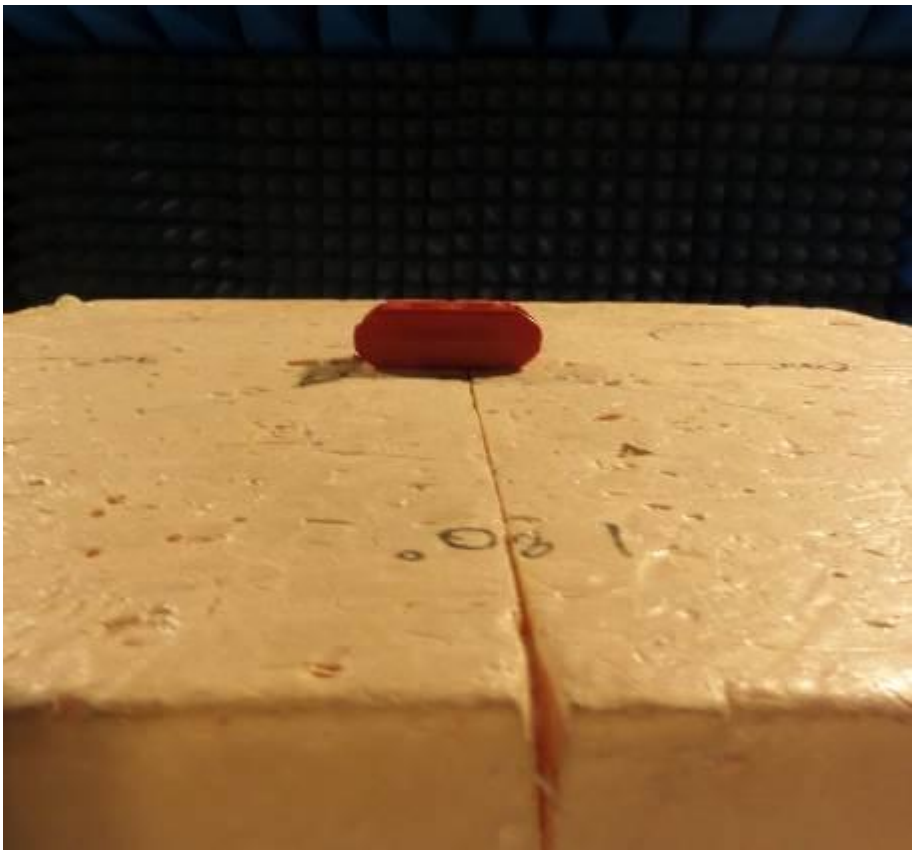

DRIA
A2 H2I-V5

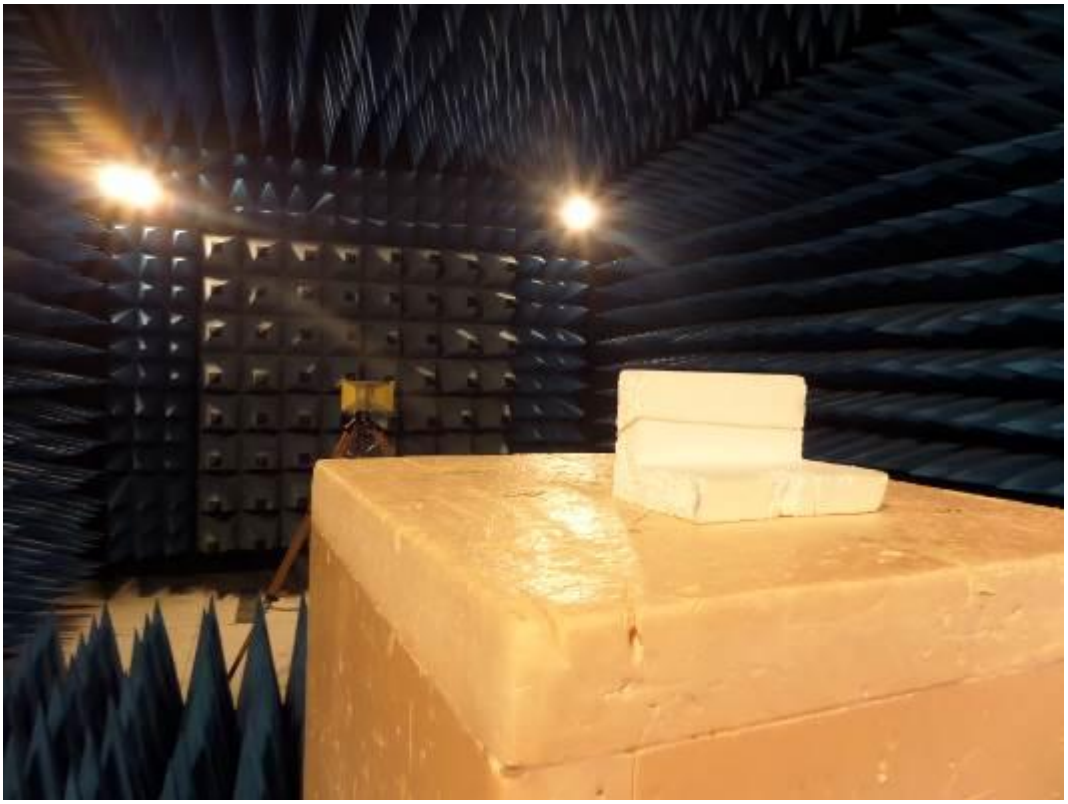


APPENDIX 2: Test set up

EUT in anechoic chamber







OATS

APPENDIX 3: Test equipment list

Radiated emission limits

TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Biconical antenna VHBB 9124	Schwarzbeck	8526
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Antenna 3115	EMCO	8535
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier C020180F-4B1	Microwave DB	1922
High pass filter HPM11630	Hewlett Packard	6609
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

Additional provisions to the general radiated emission limitations

TYPE	MANUFACTURER	EMITECH NUMBER
Outside room Hors cage	Emitech	8893
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8749
Software	GPIBShot V2.4	-

Maximum peak output power

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Log periodic antenna 3147	EMCO	8783
Attenuator 30dB	Hewlett Packard	8556
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8749
Software	Champ libre Juigné. V3.4	8864

Intentional radiator

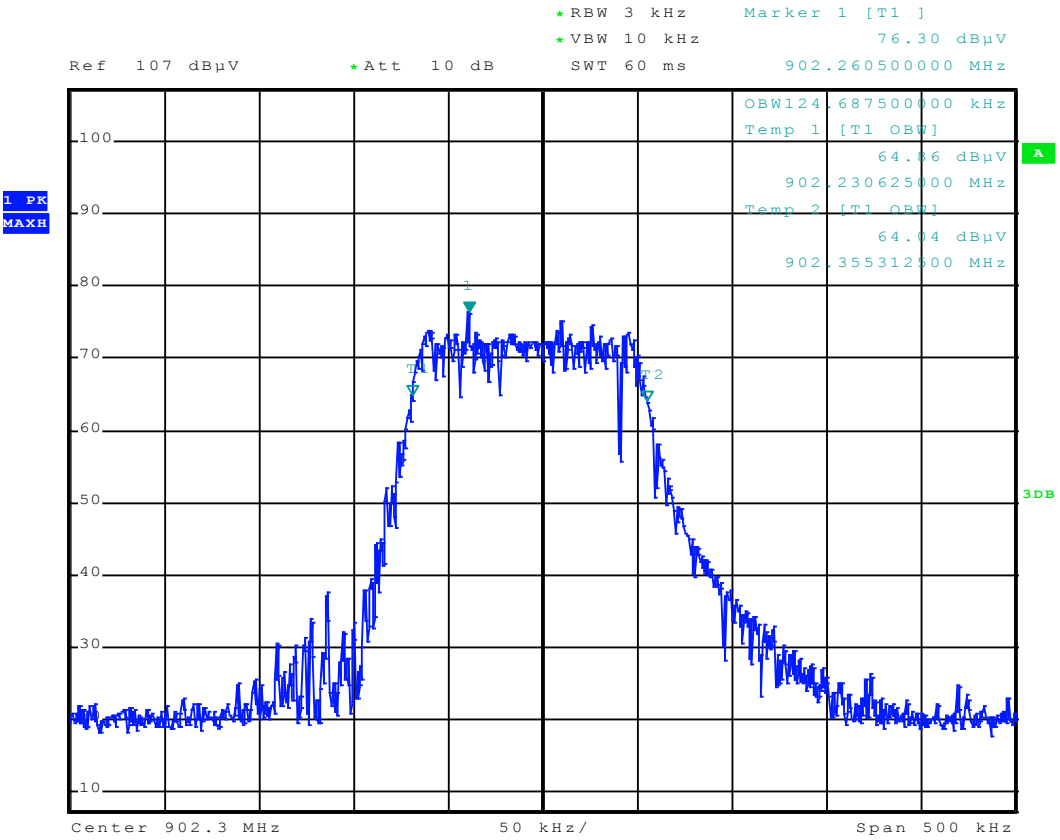
TYPE	MANUFACTURER	EMITECH NUMBER
Anechoic Chamber	EMITECH	8593
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Spectrum Analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna VHBB 9124	Schwarzbeck	8526
Log periodic antenna UHALP 9108A	Schwarzbeck	8543
Antenna 3115	EMCO	8535
Low-noise amplifier 8447D	Hewlett Packard	8511
Low-noise amplifier C020180F-4B1	Microwave DB	1922
High pass filter HPM11630	Hewlett Packard	6609
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8750
Software	BAT-EMC V3.6.0.32	0000

Peak power density

TYPE	MANUFACTURER	EMITECH NUMBER
Open test site	EMITECH	8732
Satellite synchronized frequency standard GPS8	ACQUISYS	8896
Test receiver ESI7	Rohde & Schwarz	8707
Log periodic antenna 3147	EMCO	8783
Multimeter IDM106N	ISOTECH	8676
Meteo station WS-9232	La Crosse Technology	8749
Software	BAT-EMC V3.6.0.32	0000

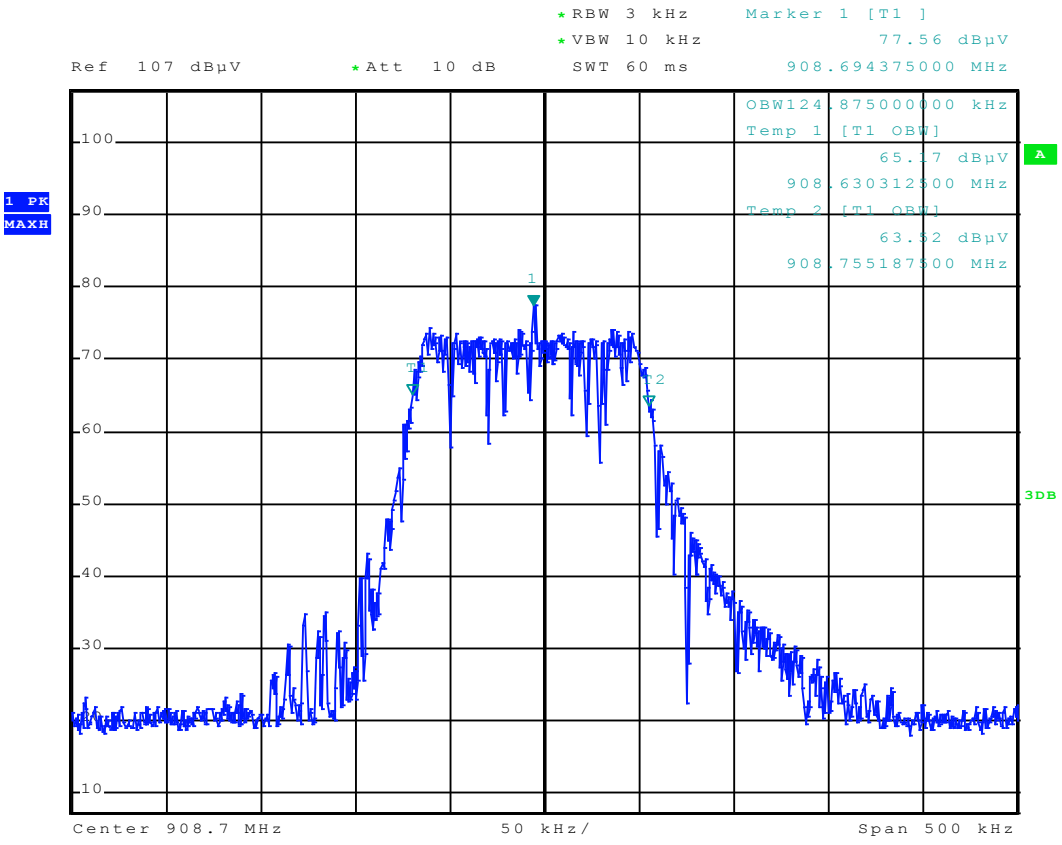
APPENDIX 4: 99% bandwidth

Low channel



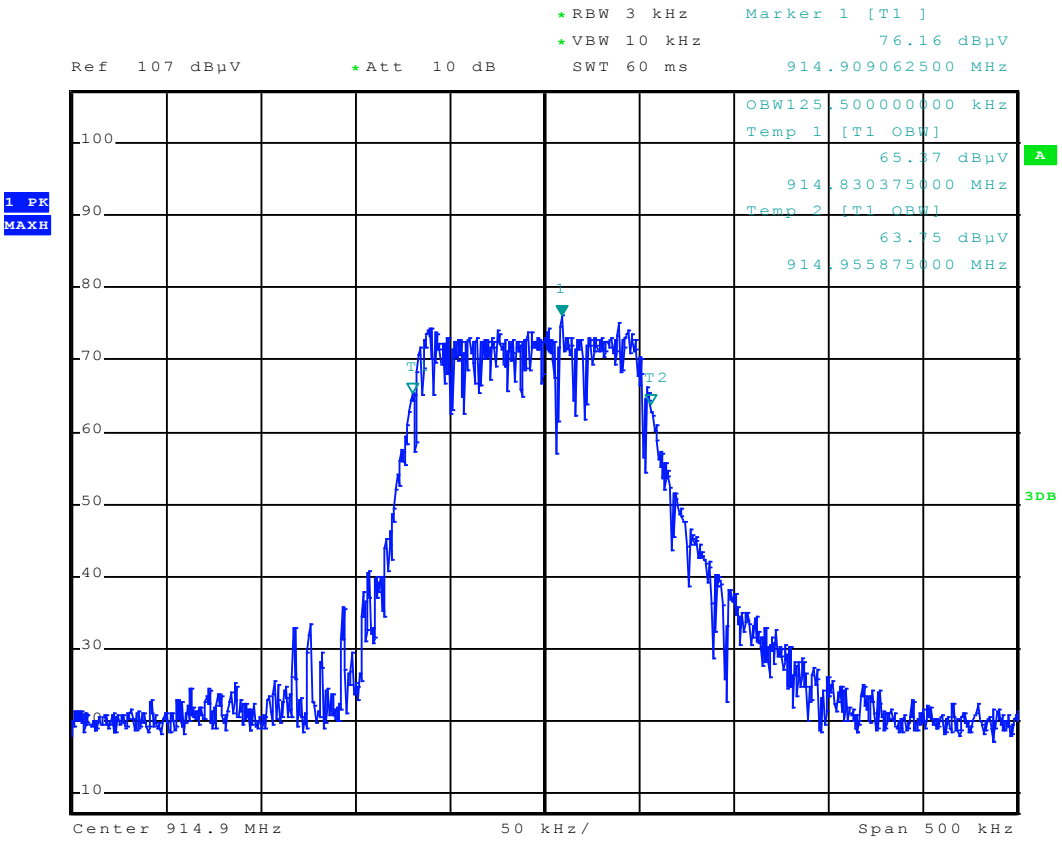
Date: 7.DEC.2015 15:58:26

Central Channel



Date: 7.DEC.2015 16:00:13

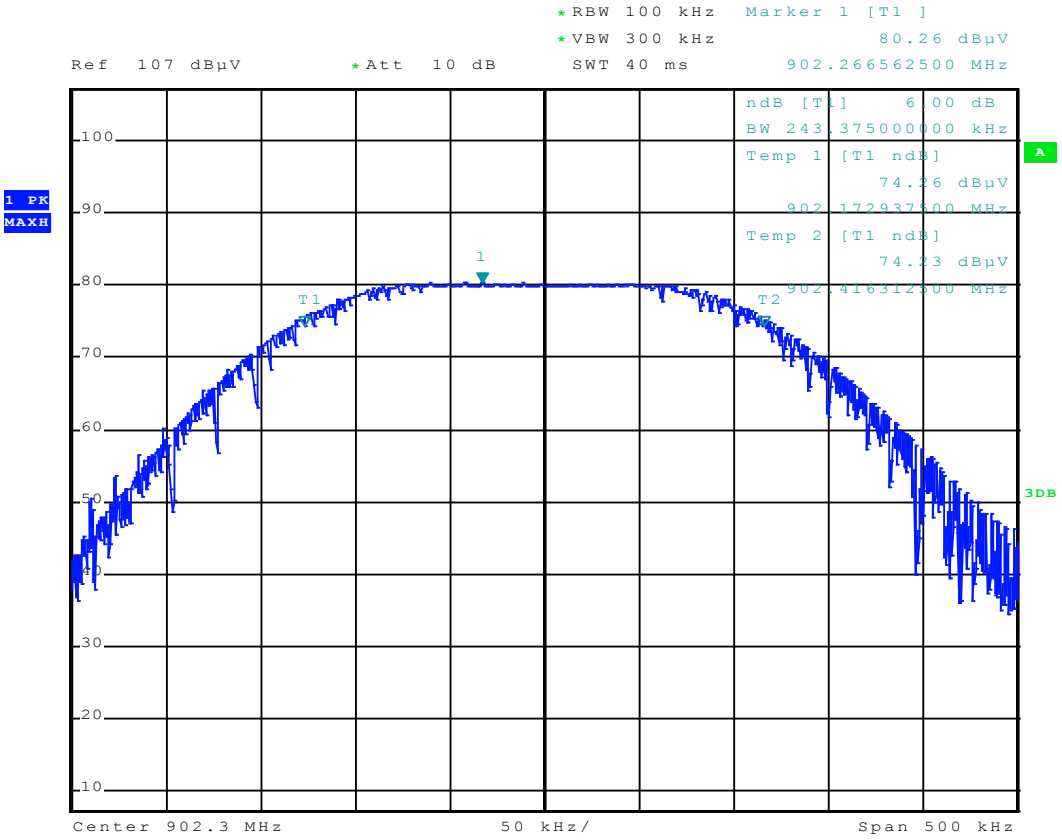
High Channel



Date: 7.DEC.2015 16:01:29

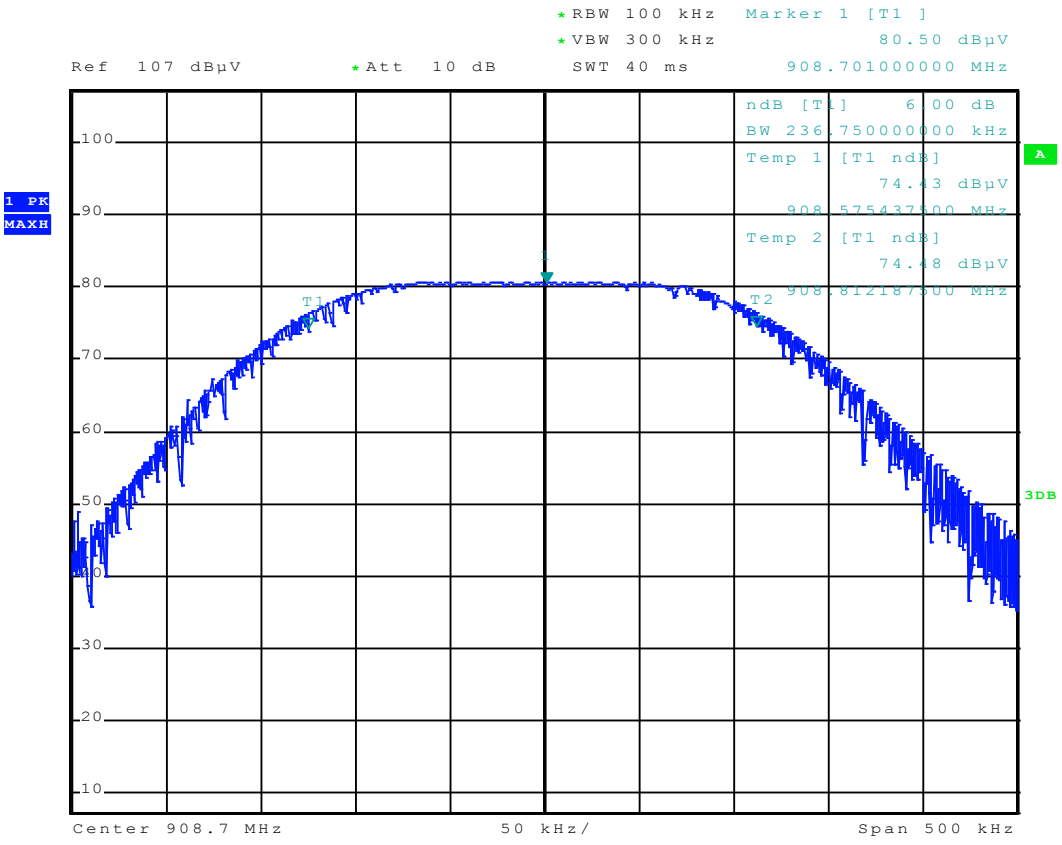
APPENDIX 5: 6dB bandwidth

Low channel



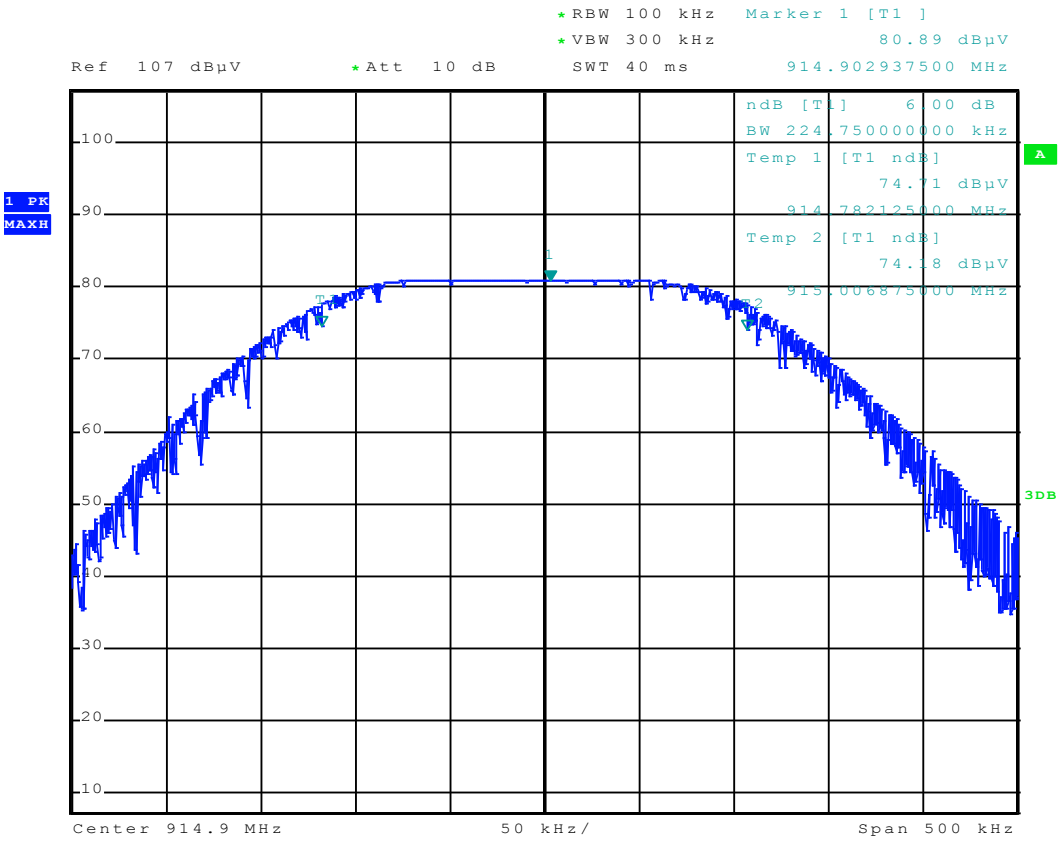
Date: 7.DEC.2015 16:06:46

Central channel



Date: 7.DEC.2015 16:05:13

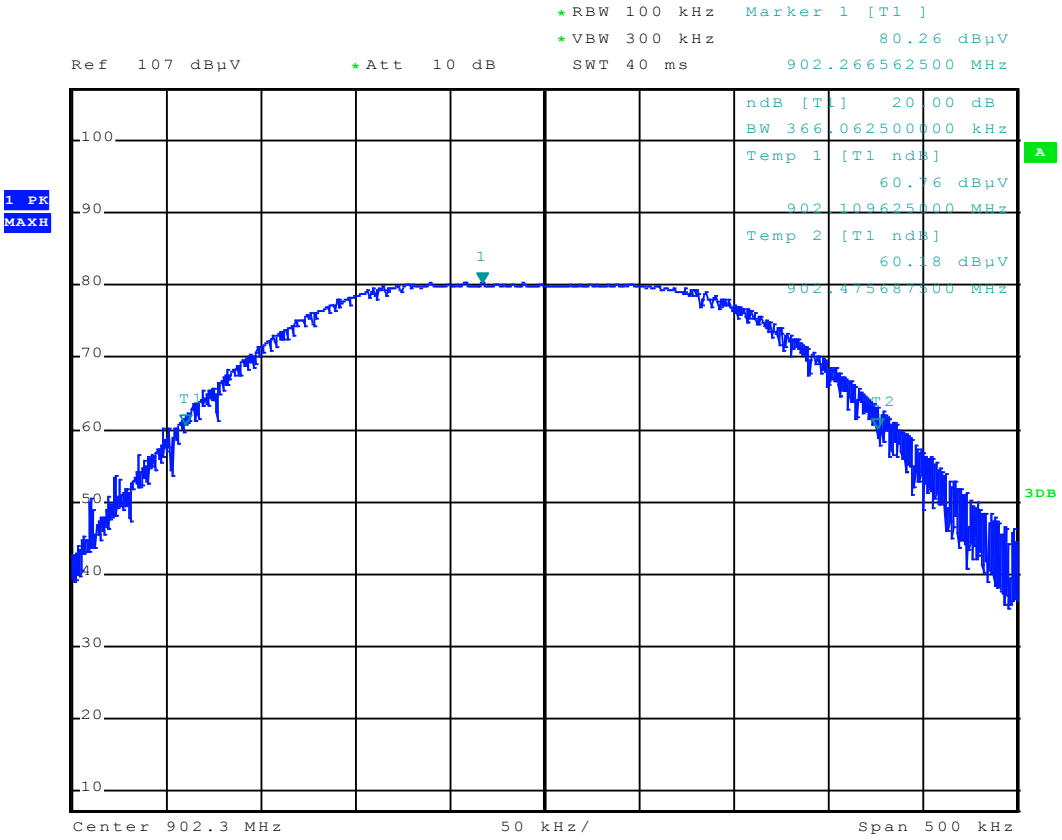
High channel



Date: 7.DEC.2015 16:03:00

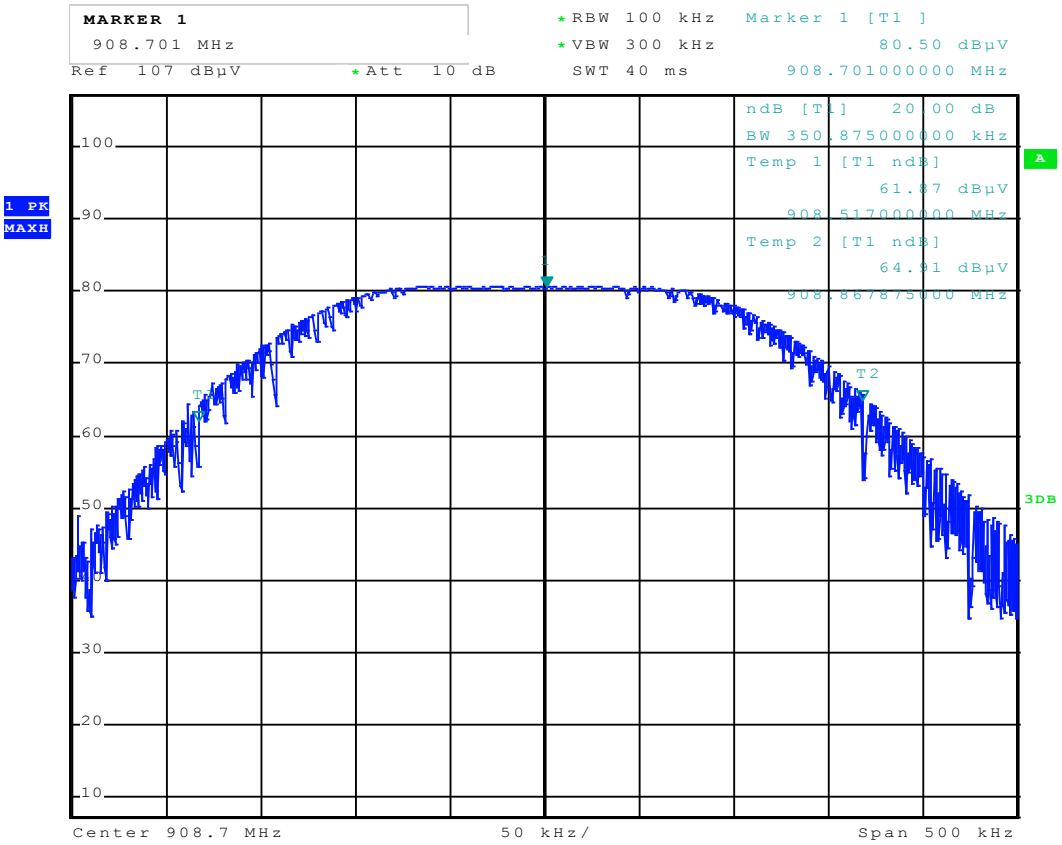
APPENDIX 6: 20dB bandwidth

Low channel



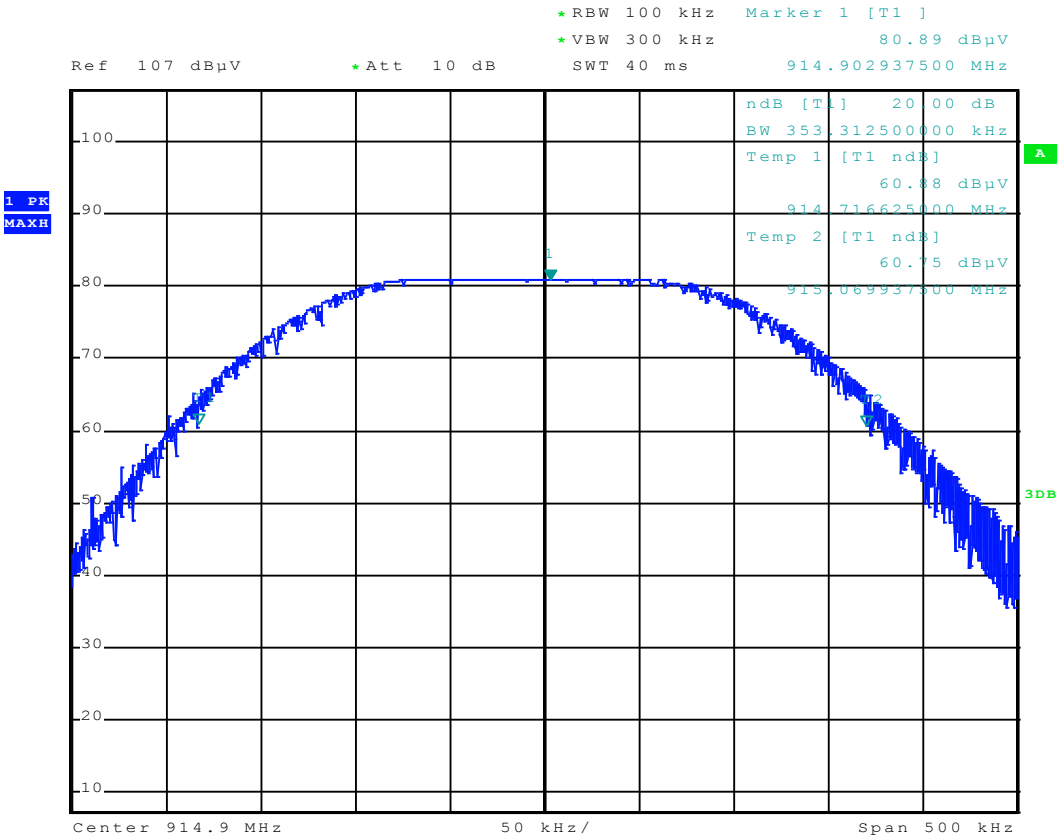
Date: 7.DEC.2015 16:07:26

Central channel



Date: 7.DEC.2015 16:04:52

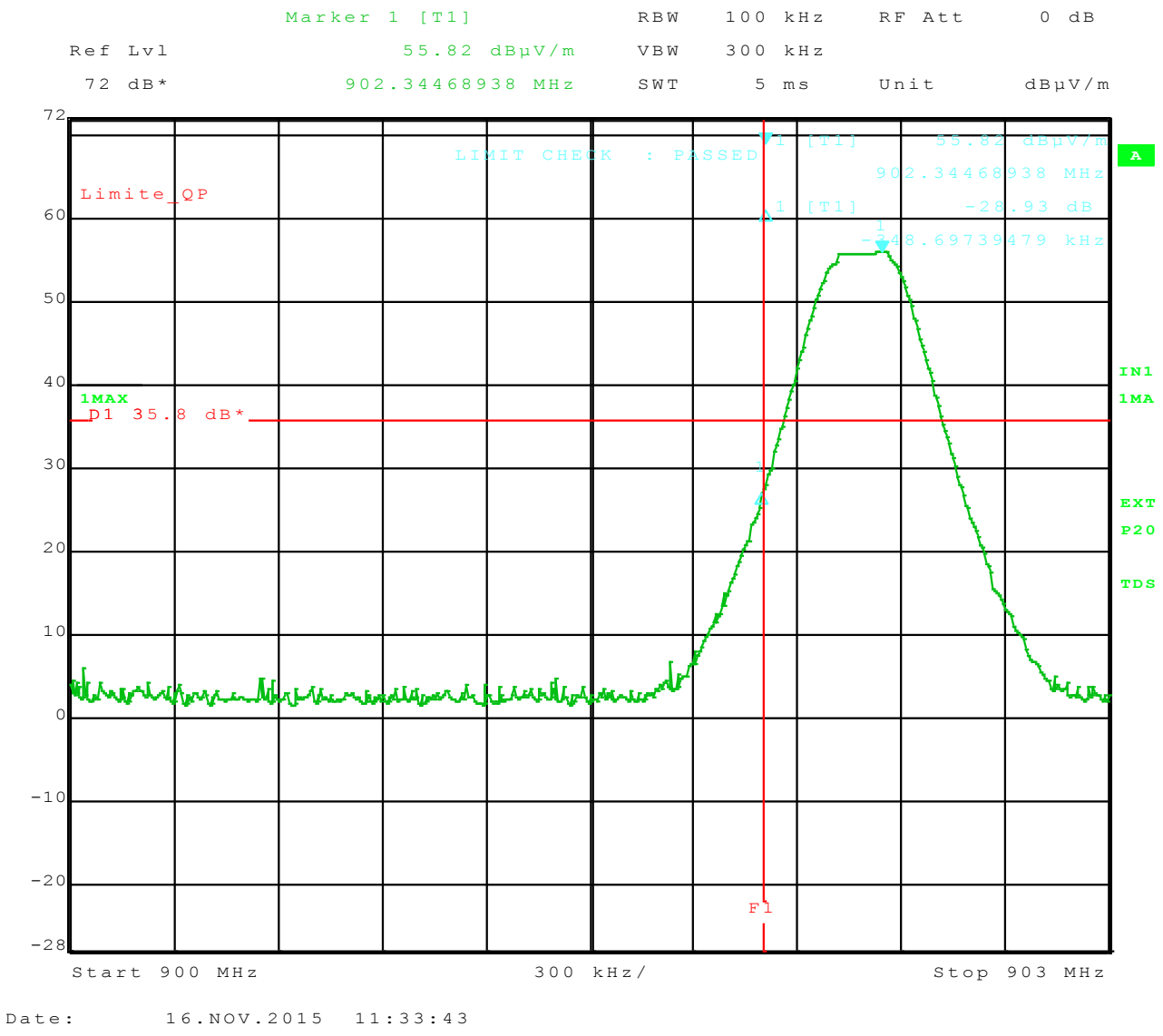
High channel



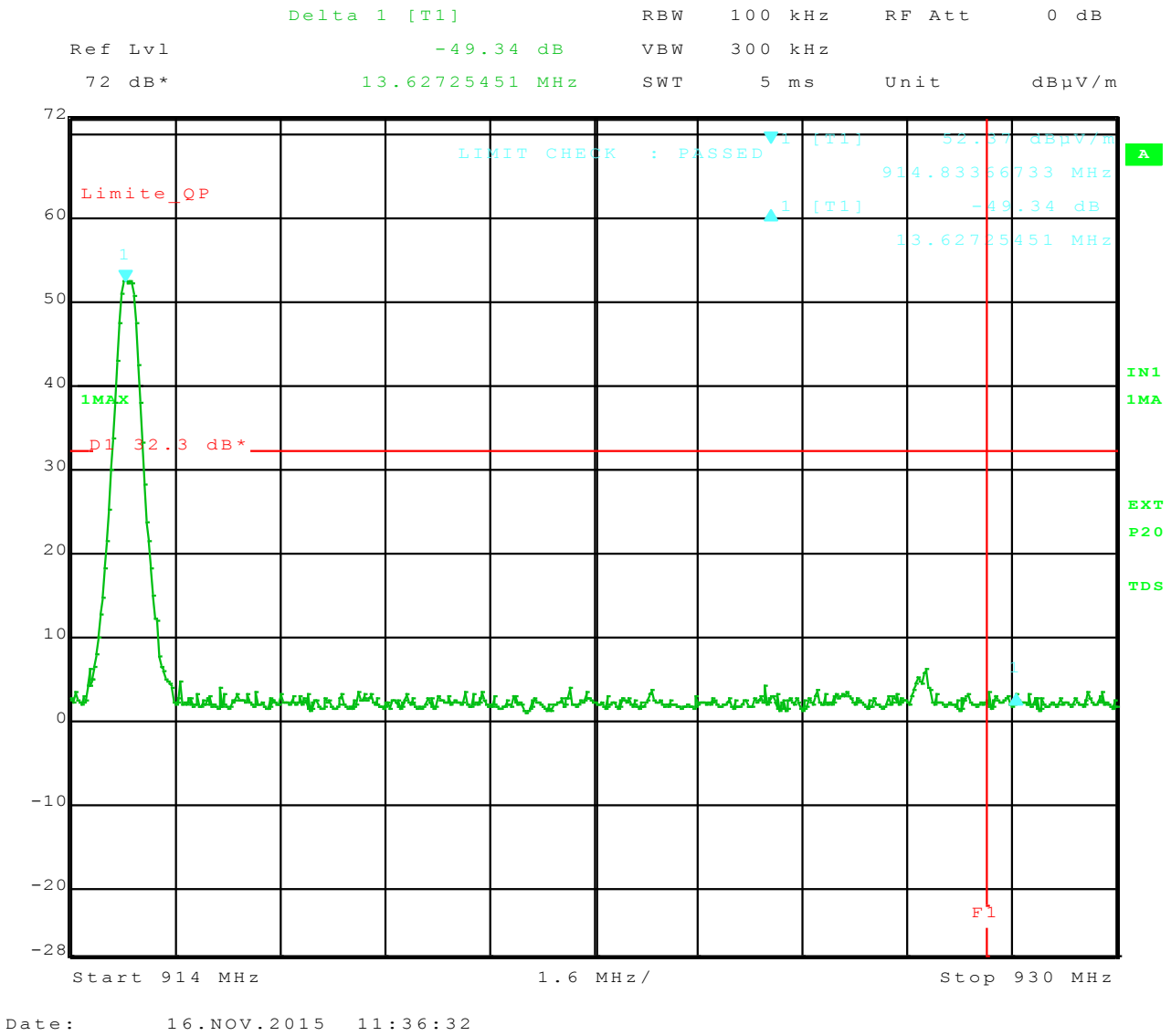
Date: 7.DEC.2015 16:03:29

APPENDIX 7: Band edge

Low channel – with hopping off mode

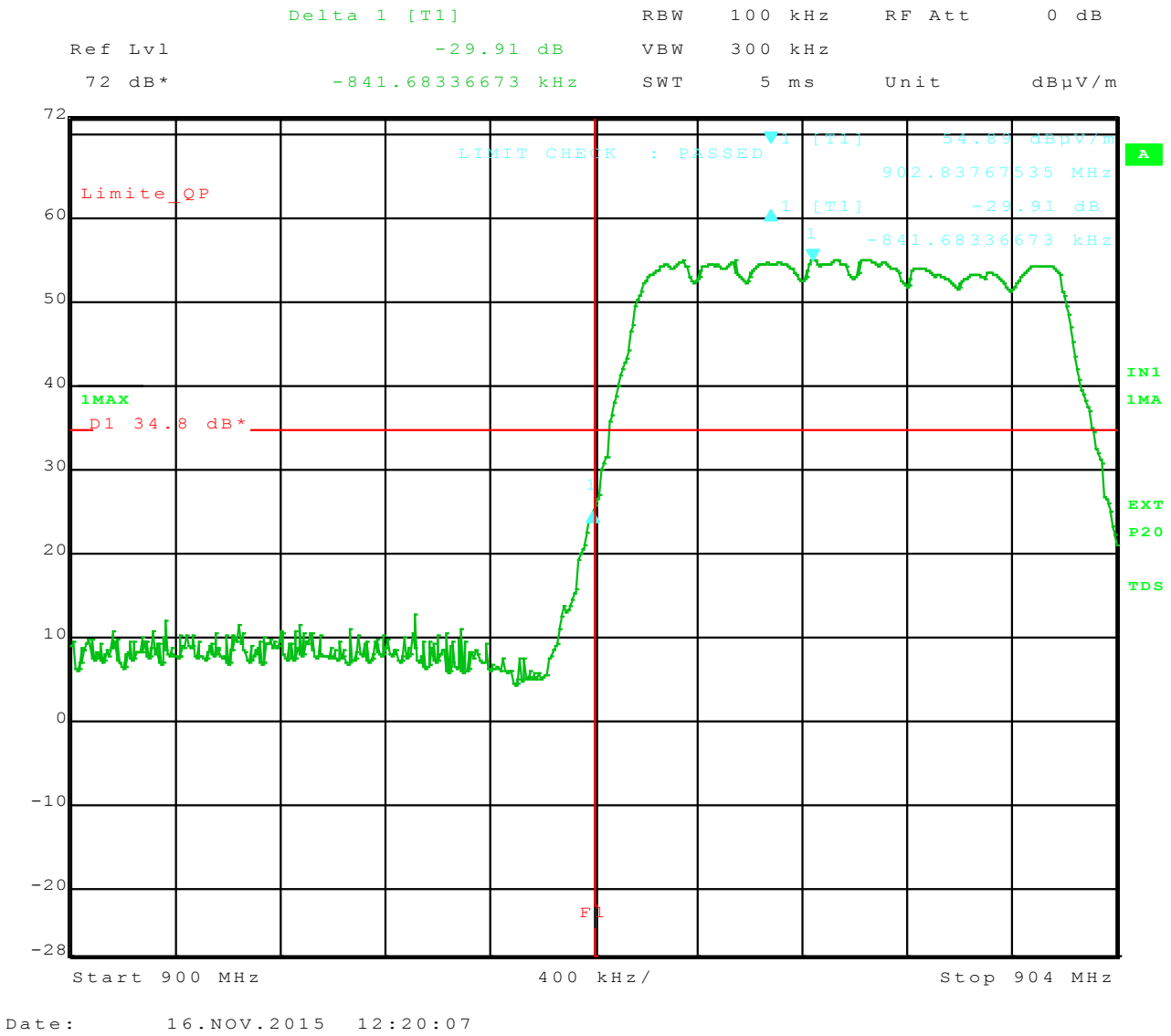


High channel with hopping off mode



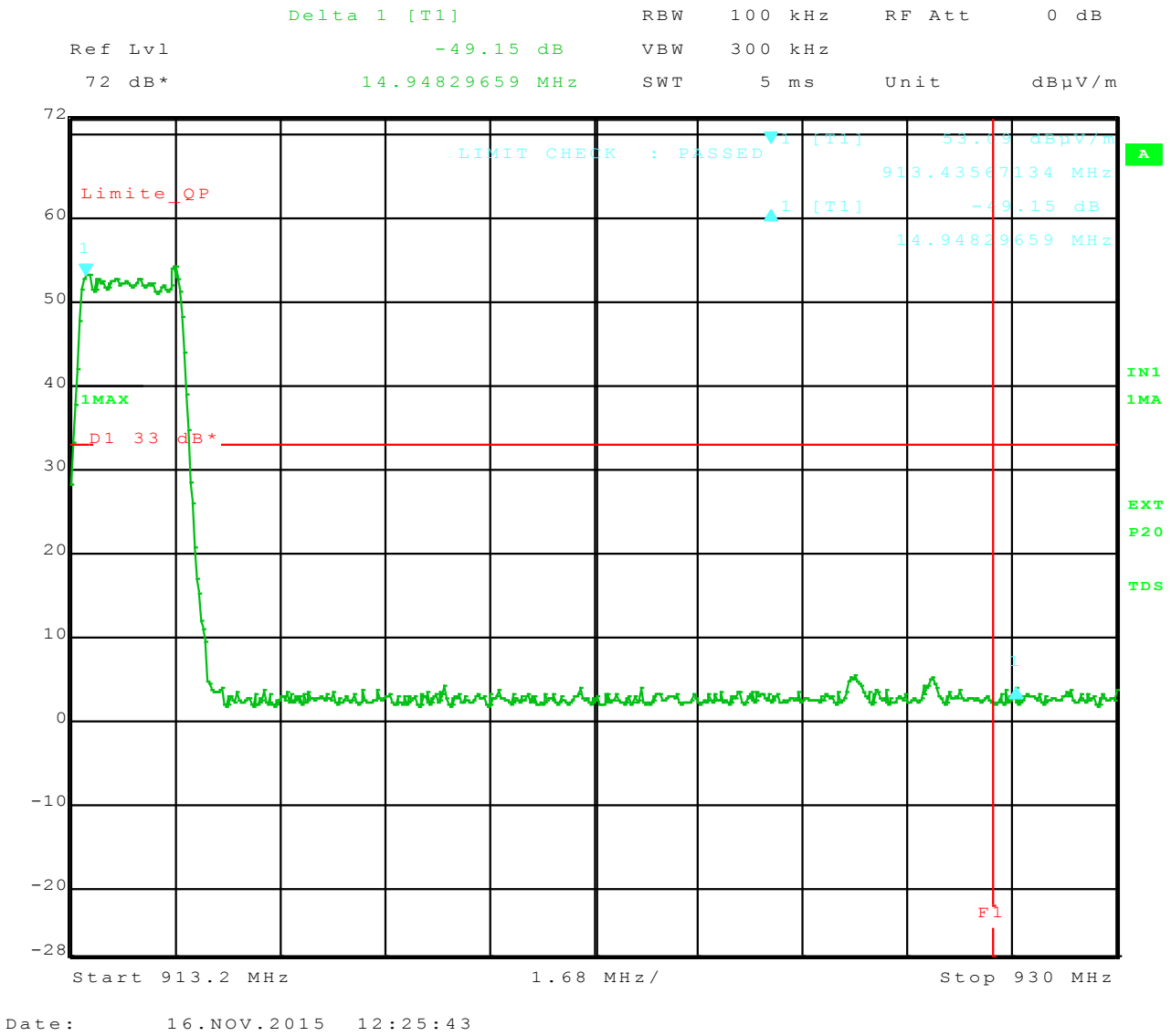
Date: 16.NOV.2015 11:36:32

Low channel with hopping on mode



Date: 16.NOV.2015 12:20:07

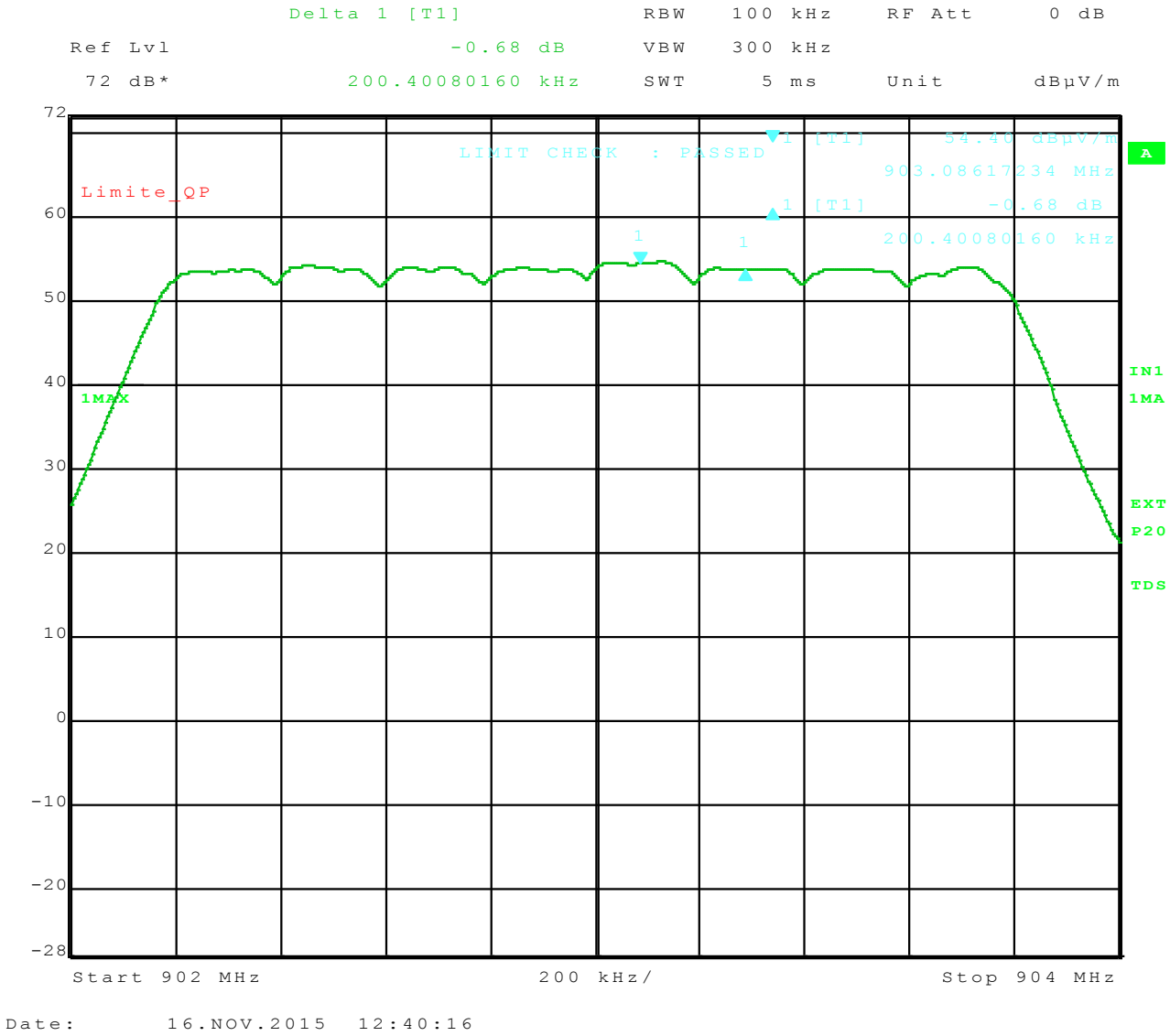
High channel with hopping on mode



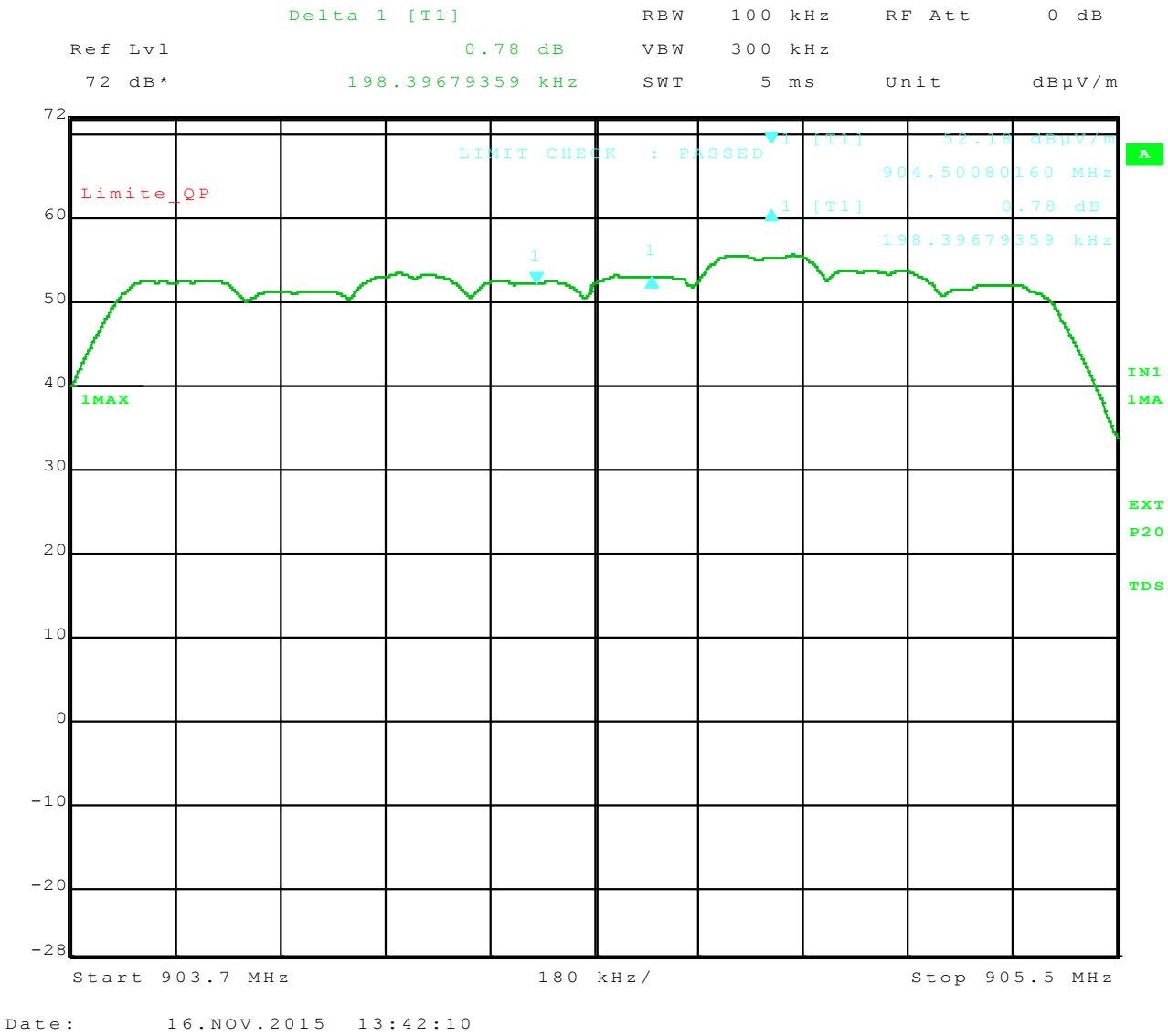
Date: 16.NOV.2015 12:25:43

APPENDIX 8:Number of hopping channels

First group of 8 channels centred at 903 MHz

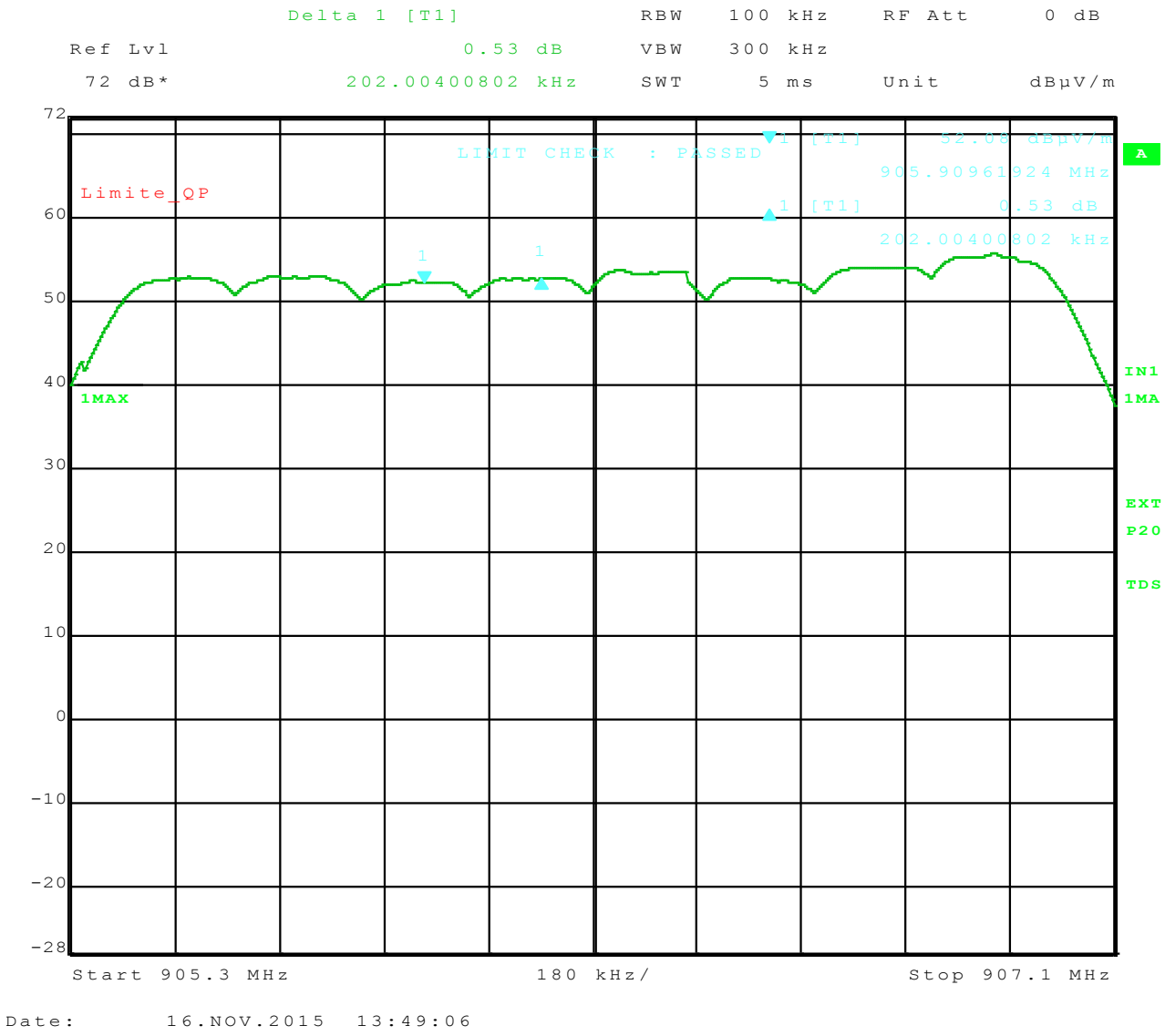


Second group of 8 channels centred at 904.6 MHz



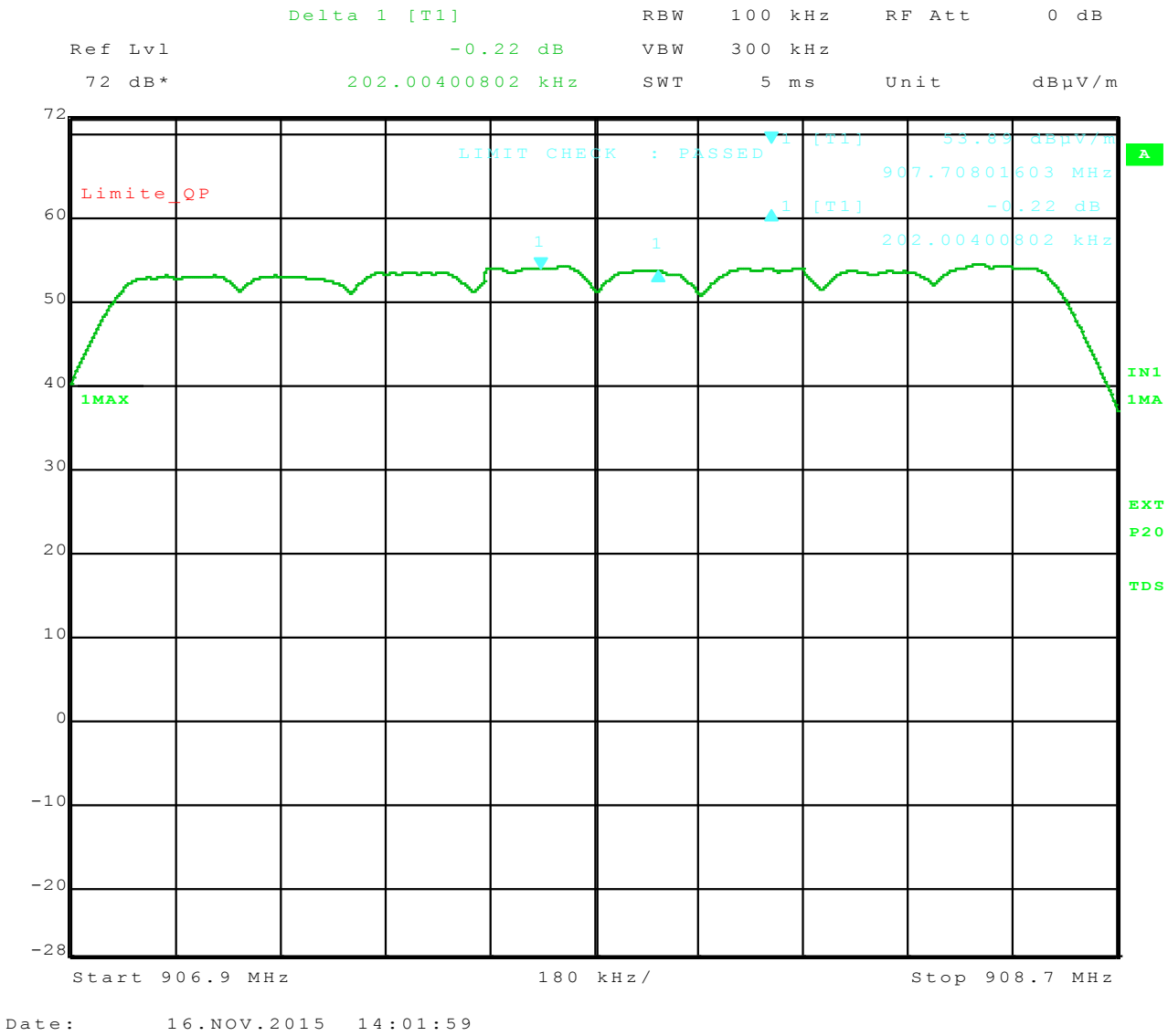
Date: 16.NOV.2015 13:42:10

Third group of 8 channels centred at 906.2 MHz



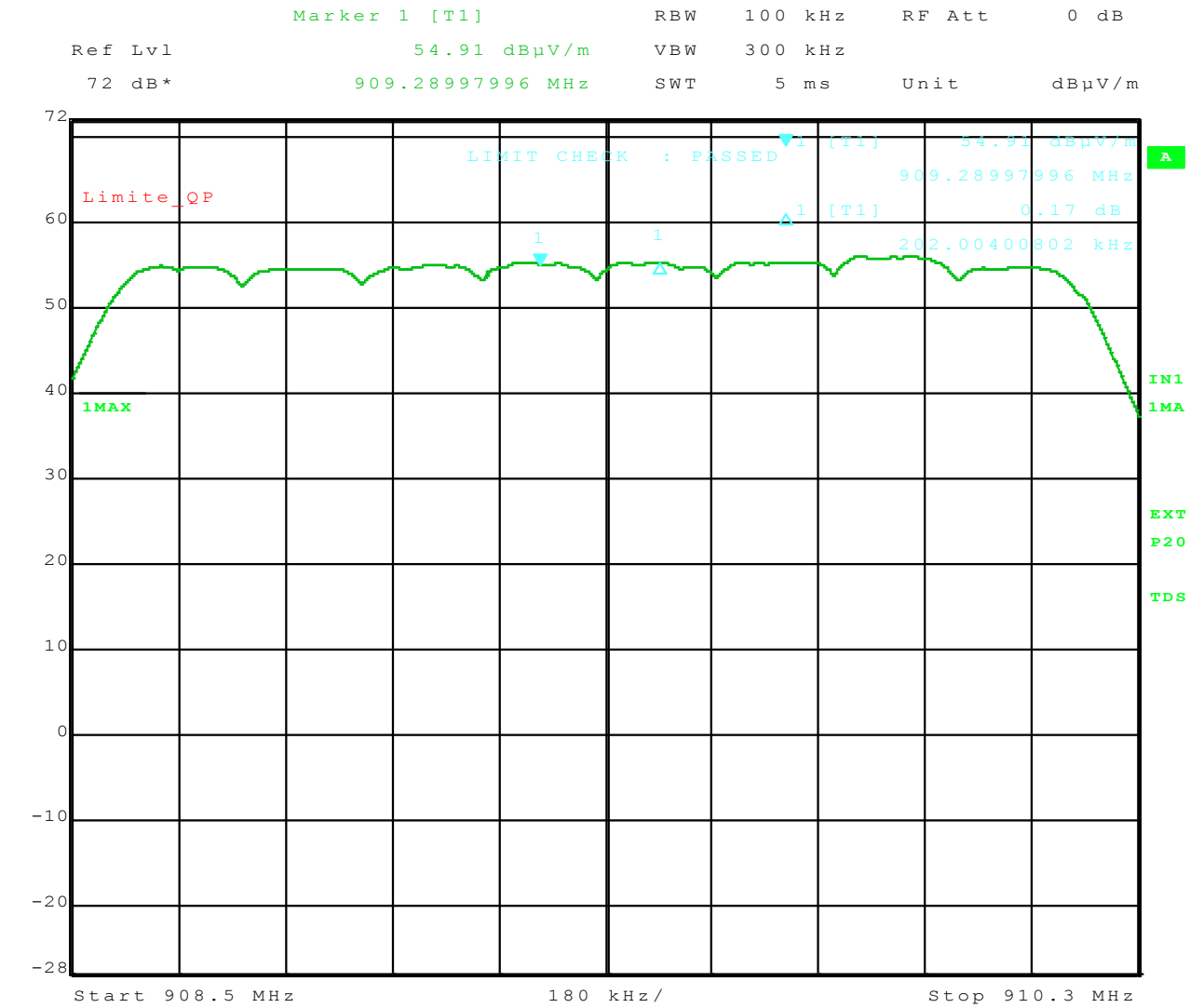
Date: 16.NOV.2015 13:49:06

Fourth group of 8 channels centred at 907.8 MHz



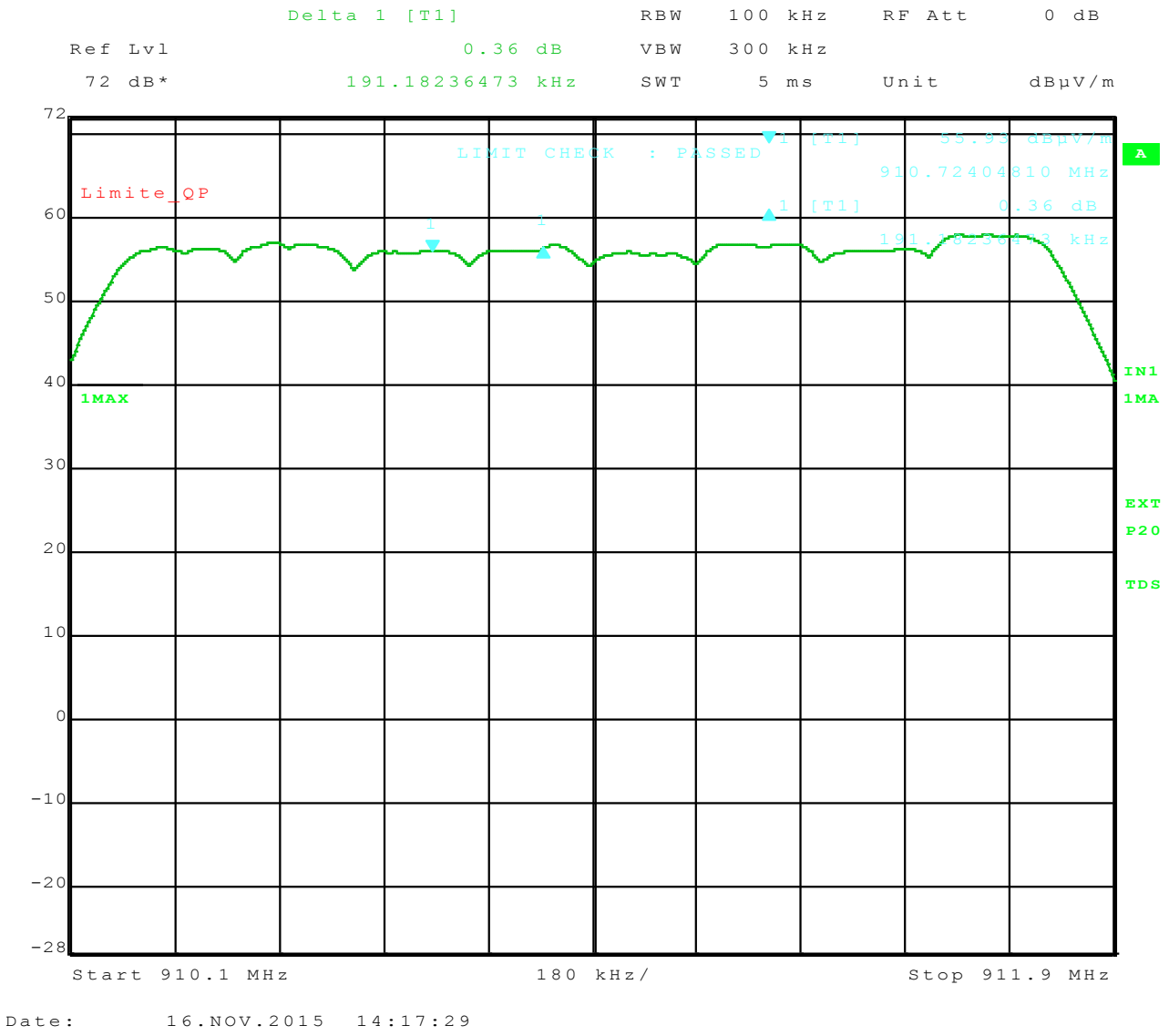
Date: 16.NOV.2015 14:01:59

Fifth group of 8 channels centred at 909.4 MHz



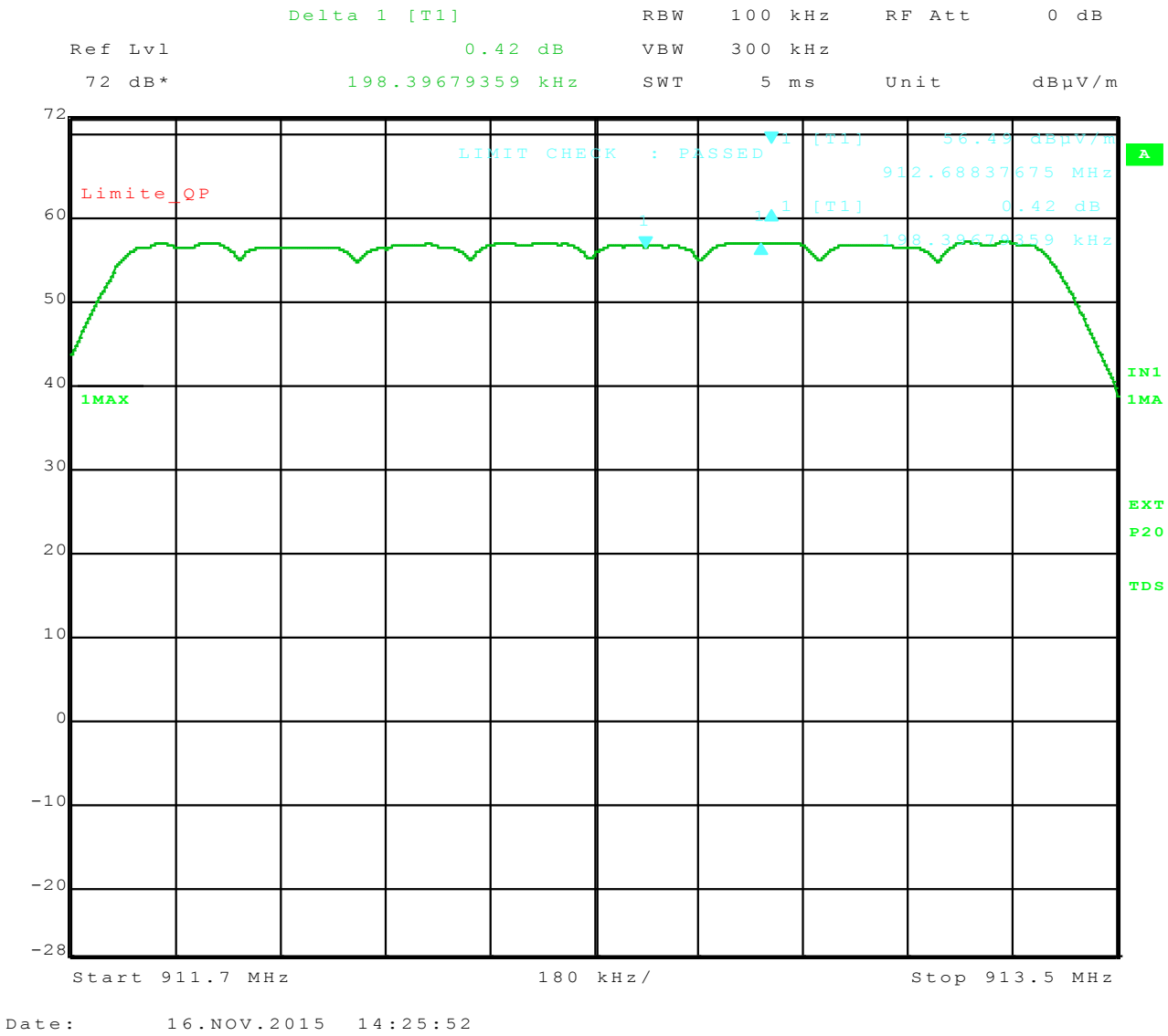
Date: 16.NOV.2015 12:49:44

Sixth group of 8 channels centred at 911 MHz



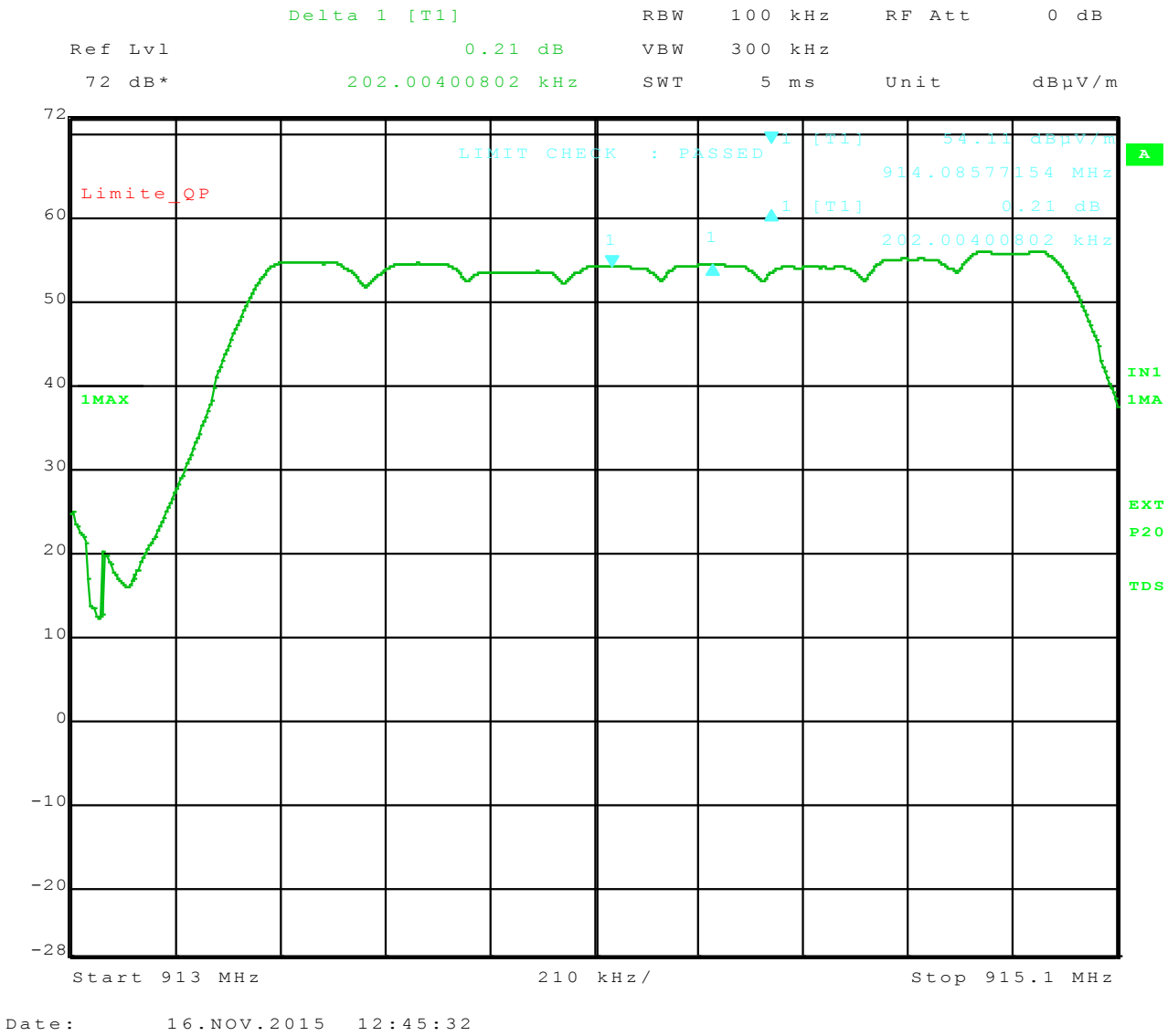
Date: 16.NOV.2015 14:17:29

Seventh group of 8 channels centred at 912.6 MHz



Date: 16.NOV.2015 14:25:52

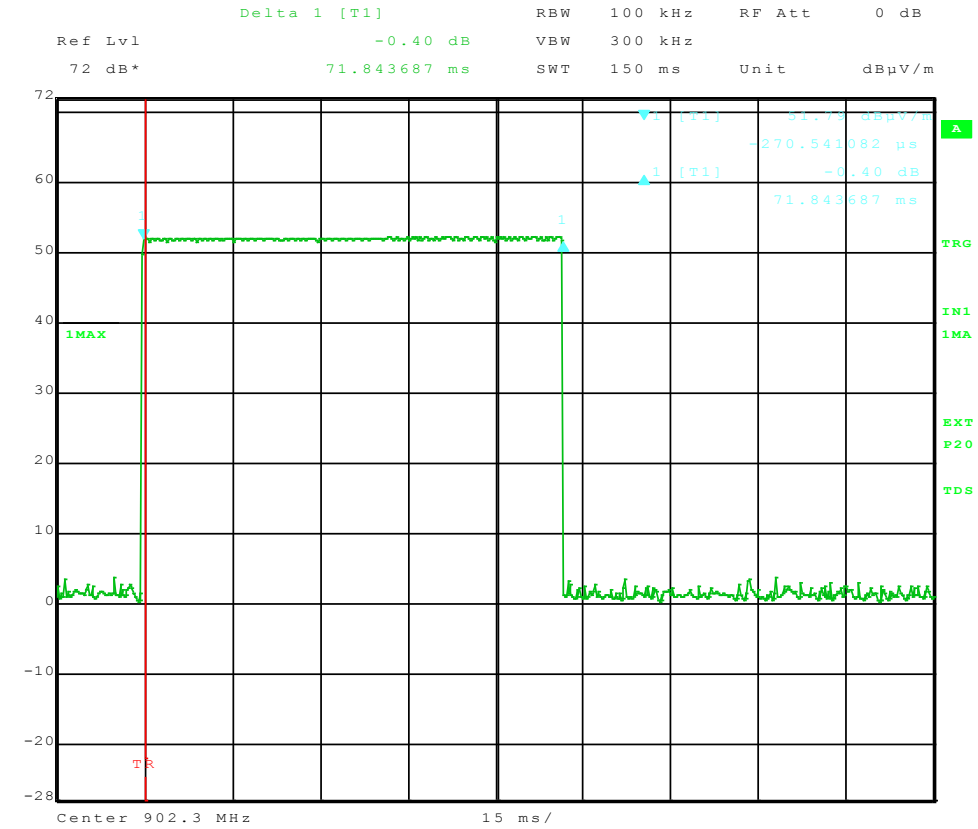
Eighth group of 8 channels centred at 914.2 MHz

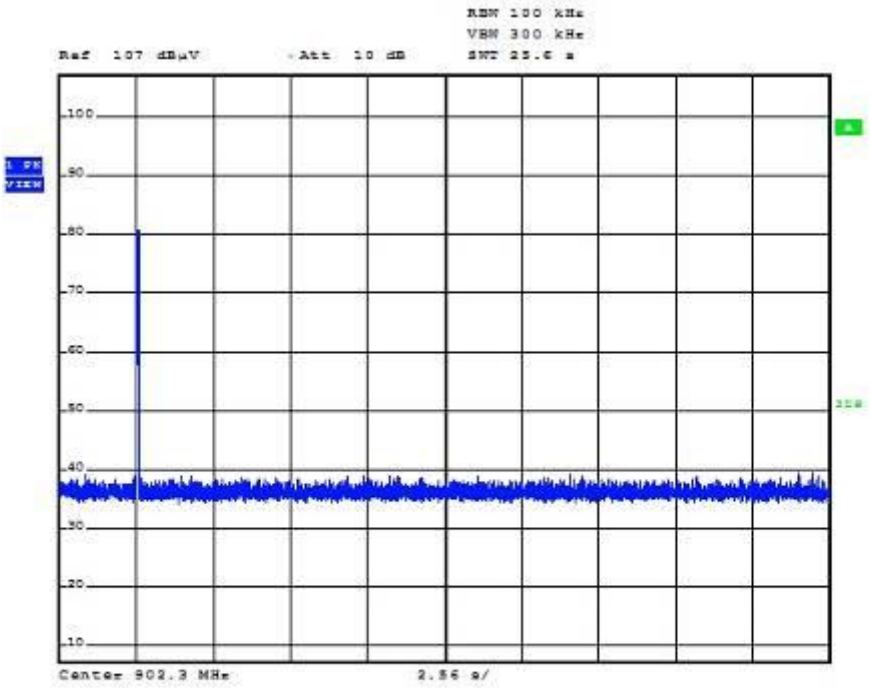


Date: 16.NOV.2015 12:45:32

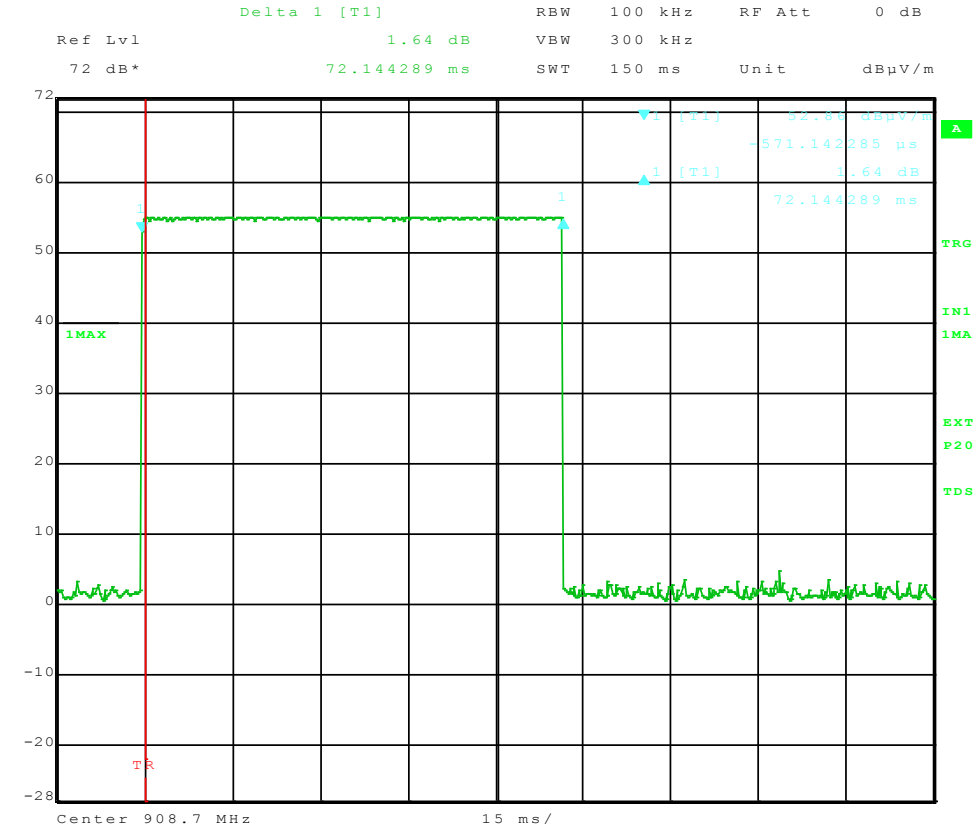
APPENDIX 9: Time of occupancy on any frequency

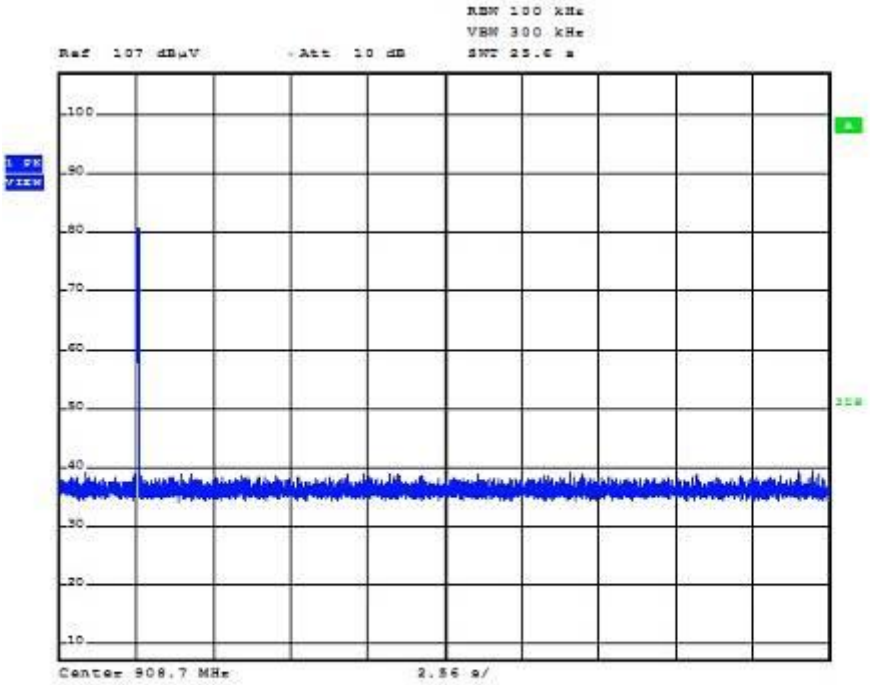
Low channel



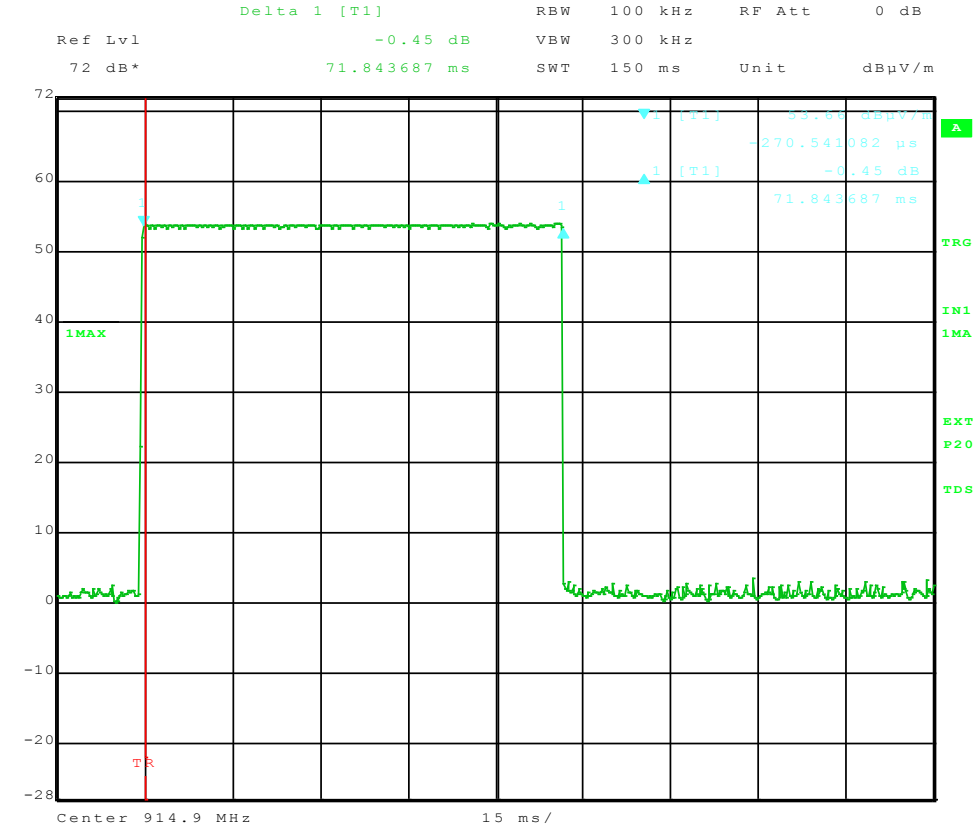


Central Channel

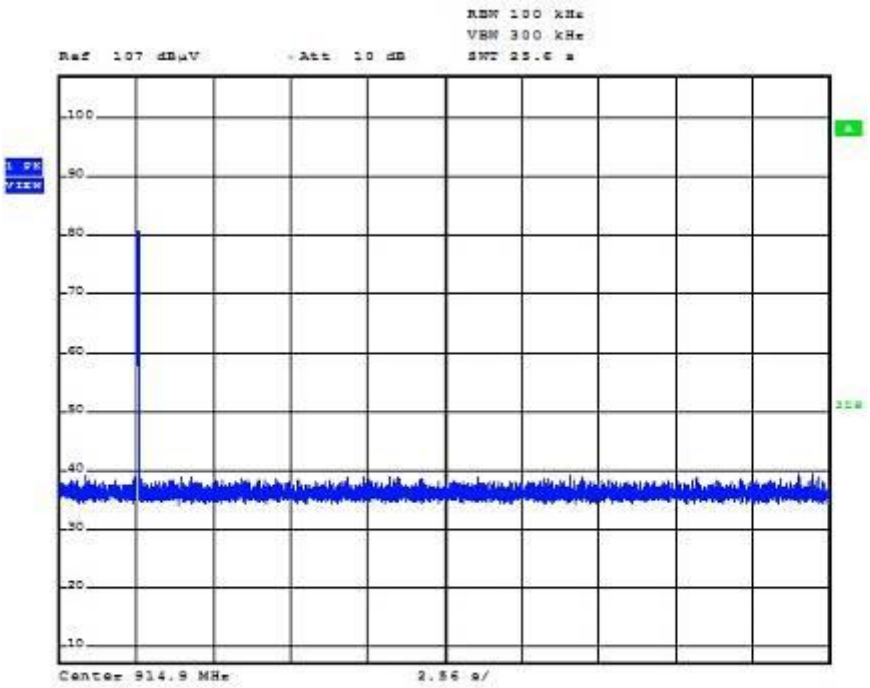




High Channel



Date: 16.NOV.2015 13:21:11



Date: 7.DEC.2015 15:36:07