RR051-15-105885-3-A Ed. 0

# Certification Radio test report

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

**Equipment under test:**
**VAGINAL THERMOMETER FOR CALVING DETECTION TVi**

**FCC ID: 2AGBG-2X000184**

**Company:**
**MEDRIA TECHNOLOGIES**

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

**Number of pages: 50 with 9 appendixes**

| Ed. | Date | Modified pages | Written by Name | Written by Visa | Technical Verification and Quality Approval Name | Technical Verification and Quality Approval Visa |
|---|---|---|---|---|---|---|
| 0 | 10-DEC-2015 | Creation | S. LOUIS | SL | T. LEDRESSEUR | |

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:*** | **VAGINAL THERMOMETER FOR CALVING DETECTION** |
| ***Serial number (S/N):*** | TVi0801U |
| ***Reference / model (P/N):*** | TVi |
| ***Software version:*** | V1.07 |
| ***MANUFACTURER:*** | MEDRIA TECHNOLOGIES |

***COMPANY SUBMITTING THE PRODUCT:***

| | |
|---|---|
| ***Company:*** | MEDRIA TECHNOLOGIES |
| ***Address:*** | PARC D'ACTIVITE DE LA GAULTIERE<br>35220 CHATEAUBOURG<br>FRANCE |
| ***Responsible:*** | Mr GOUJON |
| ***Person present during the tests:*** | Mr PAVAGEAU |
| ***DATES OF TEST:*** | From 03-DEC-2015 to 08-DEC-2015 |
| ***TESTING LOCATION:*** | EMITECH ANGERS laboratory at JUIGNE SUR LOIRE (49) FRANCE<br>21 rue de la Fuye<br>49610 Juigne sur Loire<br>France<br>FCC Accredited under US-EU MRA Designation Number: FR0009<br>Test Firm Registration Number: 873677 |
| ***TESTED BY:*** | S. LOUIS |

# CONTENTS

*TITLE* *PAGE*

## *1. INTRODUCTION*

This document presents the result of RADIO test carried out on the following equipment: **Vaginal thermometer for calving detection TVi**, in accordance with normative reference.

The device under test integrates a multifrequencies wireless transceiver LoRa.

The LoRa protocol integrated on the product is a hybrid system, that's why it was tested following FCC part 15.247 (f)

## *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 |
| Power adjusted by software: | 8 |
| 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<br>Methods of measurement of Radio-Noise<br>Emissions from low-voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz. |
| ANSI C63.10 | 2009<br>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 |
| 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* |
| | | | | | | |
| 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*<br>*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 8).*

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

*The timing by channel is 123ms (see appendix 7).*

*During 64 channels × 0.4 s = 25.6 s, any channel is used 1 time, then 1 x 123 ms = 123 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 | 123 | 1 | 0.123 | 0.4 |

*Note 6: The maximum 99% bandwidth of the equipment is 124.81 kHz (see appendix 4).*

***RF EXPOSURE:***

*Note 7 :*

*Maximum measured power = 90.4 dBµV/m = 3.65 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)=3.65/(4*π*(20 cm)²)= 0.000726 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 ($5^{th}$ 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): | 21.5 |
| Relative humidity (%): | 45 |

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): 21.7
Relative humidity (%): 44

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 | 89.4 | P | 901.96 | 47.68 | 41.83 | 69.4 | 27.57 |
| 914.8 | 90.4 | P | 928.10 | 44.91 | 45.49 | 70.4 | 24.91 |

* *Marker-Delta method*

99% bandwidth curves are given in appendix 4; band-edge curves are given in appendix 7.

**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): 21.7
Relative humidity (%): 46

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** | 89.5 | 0.00297 | 1 |

Polarization of test antenna: Vertical (height: 400 cm)
Position of equipment: See appendix 2 (azimuth: 0 degree)

Sample N° 1 Central Channel 908.7MHz

| | Electro-magnetic field (dBµV/m): | Conducted power * (W) | Limit (W) |
|---|---|---|---|
| **Nominal supply voltage: 3.6V** | 88.5 | 0.00236 | 1 |

Polarization of test antenna: Vertical (height: 400 cm)
Position of equipment: See appendix 2 (azimuth: 38 degrees)

Sample N° 1 High Channel 914.9MHz

| | Electro-magnetic field (dBµV/m): | Conducted power * (W) | Limit (W) |
|---|---|---|---|
| **Nominal supply voltage: 3.6V** | 90.4 | 0.00365 | 1 |

Polarization of test antenna: Vertical (height: 215 cm)
Position of equipment: See appendix 2 (azimuth: 204 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 ($10^{th}$ 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): 19.6
Relative humidity (%): 48

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 | 259 | 100 | H | 52.5 | 80.8 | 28.3 |
| 2707* | P | 150 | 346 | 1000 | V | 46.9 | 74 | 27.1 |
| 3609* | P | 150 | 0 | 1000 | V | 53.6** | 74 | 20.4 |
| 3609* | Av | 150 | 0 | 1000 | V | 51.2 | 74 | 22.8 |
| 4511.5* | P | 150 | 0 | 1000 | V | 48.4** | 74 | 25.6 |
| 5414* | P | 150 | 258 | 1000 | H | 47.9** | 74 | 26.1 |
| 6316 | P | 150 | 0 | 100 | V | 45.8 | 80.8 | 35.0 |
| 7218 | P | 150 | 342 | 100 | V | 46.7 | 80.8 | 34.1 |
| 8120.8* | P | 150 | 317 | 1000 | V | 52.8** | 74 | 21.2 |
| 9022.4* | P | 150 | 0 | 1000 | V | 53.9** | 74 | 20.1 |
| 9022.4* | Av | 150 | 0 | 1000 | V | 43 | 54 | 11.0 |

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 | 273 | 100 | H | 52.9 | 80.8 | 27.9 |
| 2726* | P | 150 | 0 | 1000 | V | 46.8** | 74 | 27.2 |
| 3634.5* | P | 150 | 320 | 1000 | V | 54.7 | 74 | 19.3 |
| 3634.5* | Av | 150 | 320 | 1000 | V | 52.4 | 54 | 1.6 |
| 4544* | P | 150 | 0 | 1000 | V | 47.7** | 74 | 26.3 |
| 6360.8 | P | 150 | 0 | 100 | H | 45.3 | 80.8 | 35.5 |
| 7269.6* | P | 150 | 0 | 1000 | H | 52.6** | 74 | 21.4 |
| 8178* | P | 150 | 0 | 1000 | H | 54.2 | 74 | 19.8 |
| 8178* | Av | 150 | 0 | 1000 | H | 47.9 | 54 | 6.1 |
| 9087.2* | P | 150 | 0 | 1000 | H | 54.4 | 74 | 19.6 |
| 9087.2* | Av | 150 | 0 | 1000 | H | 46.5 | 54 | 7.5 |

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 | 252 | 100 | H | 52.1 | 80.8 | 28.7 |
| 2745* | P | 150 | 0 | 1000 | V | 47.3** | 74 | 26.7 |
| 3660* | P | 150 | 0 | 1000 | V | 53.4** | 74 | 20.6 |
| 4575* | P | 150 | 0 | 1000 | V | 47.2** | 74 | 26.8 |
| 6404.4 | P | 150 | 0 | 100 | H | 44.6 | 80.8 | 36.2 |
| 7318.2* | P | 150 | 0 | 1000 | V | 50.8** | 74 | 23.2 |
| 8234.4* | P | 150 | 0 | 1000 | H | 54.5 | 74 | 19.5 |
| 8234.4* | Av | 150 | 0 | 1000 | H | 48.3 | 54 | 5.7 |
| 9148.8* | P | 150 | 0 | 1000 | H | 56.3 | 74 | 17.7 |
| 9148.8* | Av | 150 | 0 | 1000 | H | 51.5 | 54 | 2.5 |

* *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 100.8 dBµV/m on high channel.
So the applicable limit is 80.8 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): 21.7
Relative humidity (%): 46

Power source: Lithium battery 3.6Vdc fully charged

Sample N° 1 Low Channel

| | **Peak power density at frequency: 902.3 MHz** |
|---|---|
| **Normal test conditions** | +4.23 dBm |
| **Limits** | +8 dBm |

Sample N° 1 Central Channel

| | **Peak power density at frequency: 908.7 MHz** |
|---|---|
| **Normal test conditions** | +3.13 dBm |
| **Limits** | +8 dBm |

Sample N° 1 High Channel

| | **Peak power density at frequency: 914.9 MHz** |
|---|---|
| **Normal test conditions** | +4.73 dBm |
| **Limits** | +8 dBm |

**Test conclusion:**

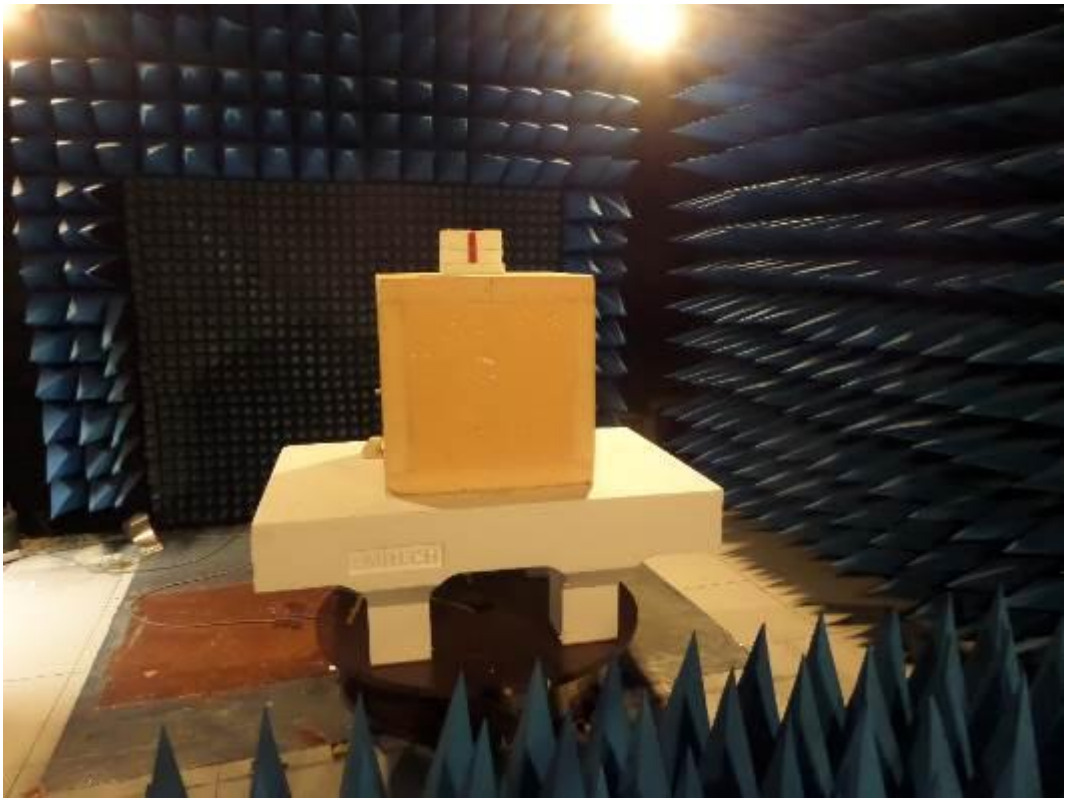
RESPECTED STANDARD

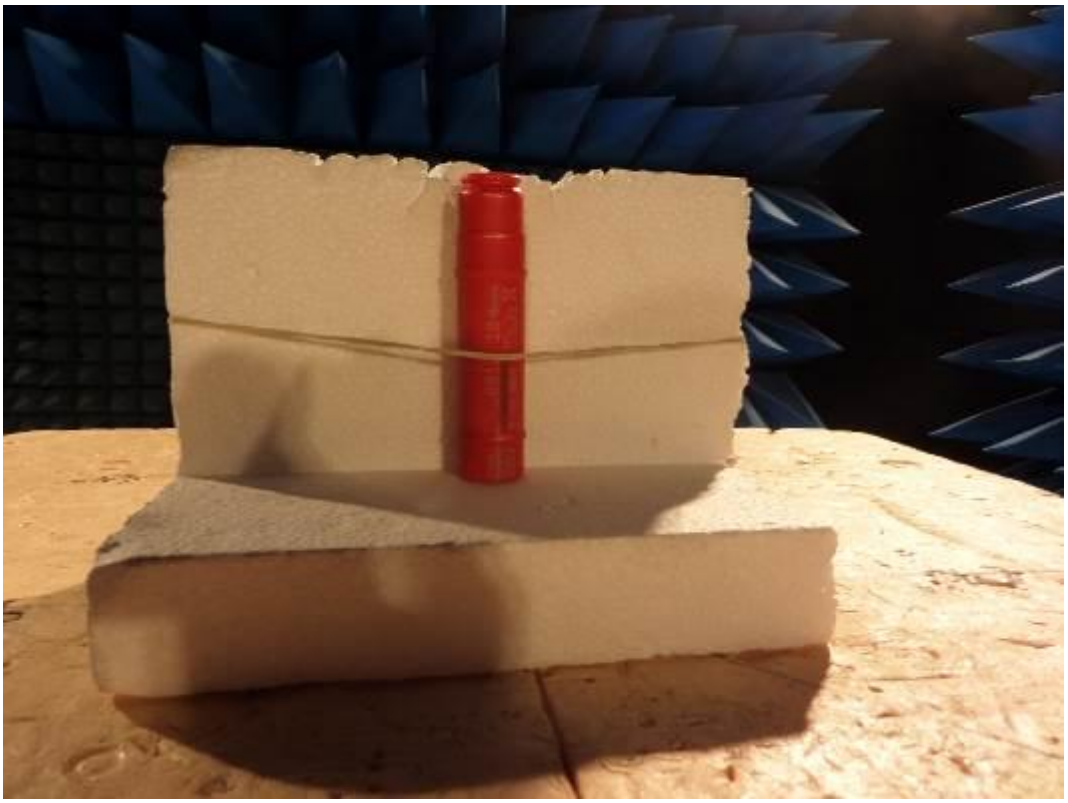
***□□□ End of report, 9 appendixes to be forwarded □□□***

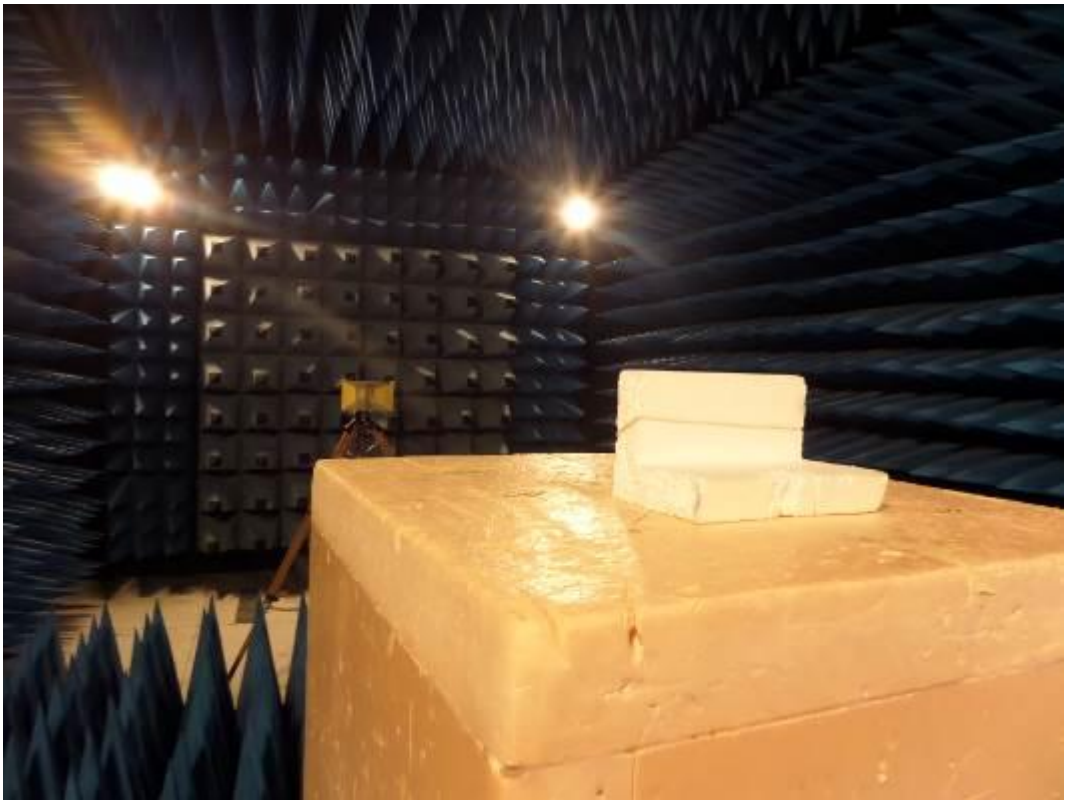
# APPENDIX 1: Photos of the equipment under test

# 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 |
| Spectrum Analyzer FSP40 | Rohde & Schwarz | 4088 |
| Multimeter IDM106N | ISOTECH | 8676 |
| Meteo station WS-9232 | La Crosse Technology | 8750 |
| 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 |
| Multimeter IDM106N | ISOTECH | 8676 |
| Meteo station WS-9232 | La Crosse Technology | 8749 |
| Software | Champ libre Juigné. V3.4 | 8864 |
| Software | BAT-EMC V3.6.0.32 | 0000 |

**Intentional radiator**

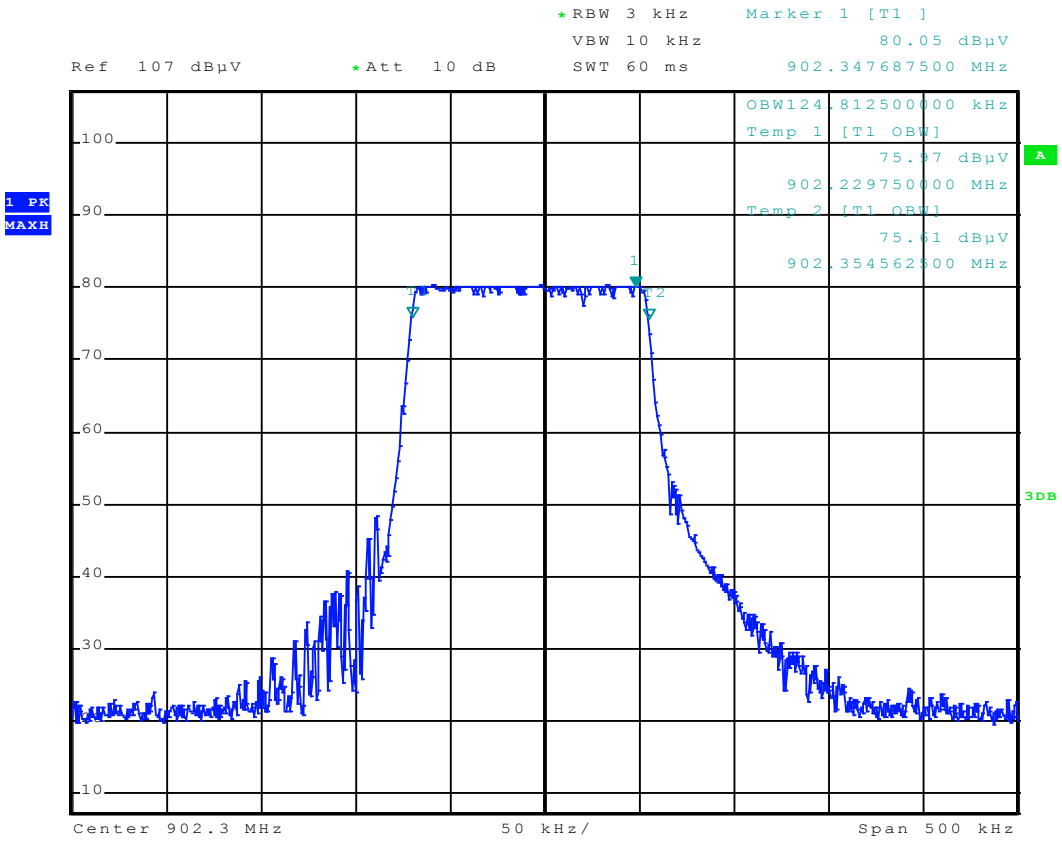
| TYPE | MANUFACTURER | EMITECH NUMBER |
|---|---|---|
| Anechoic Chamber | EMITECH | 8593 |
| Satellite synchronized frequency standard GPS8 | ACQUISYS | 8896 |
| Spectrum Analyzer FSP40 | Rohde & Schwarz | 4088 |
| Loop antenna 6502 | EMCO | 1406 |
| Biconical antenna VHBB 9124 | Schwarzbeck | 8526 |
| 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 | Champ libre Juigné. V3.4 | 8864 |
| Software | BAT-EMC V3.6.0.32 | 0000 |

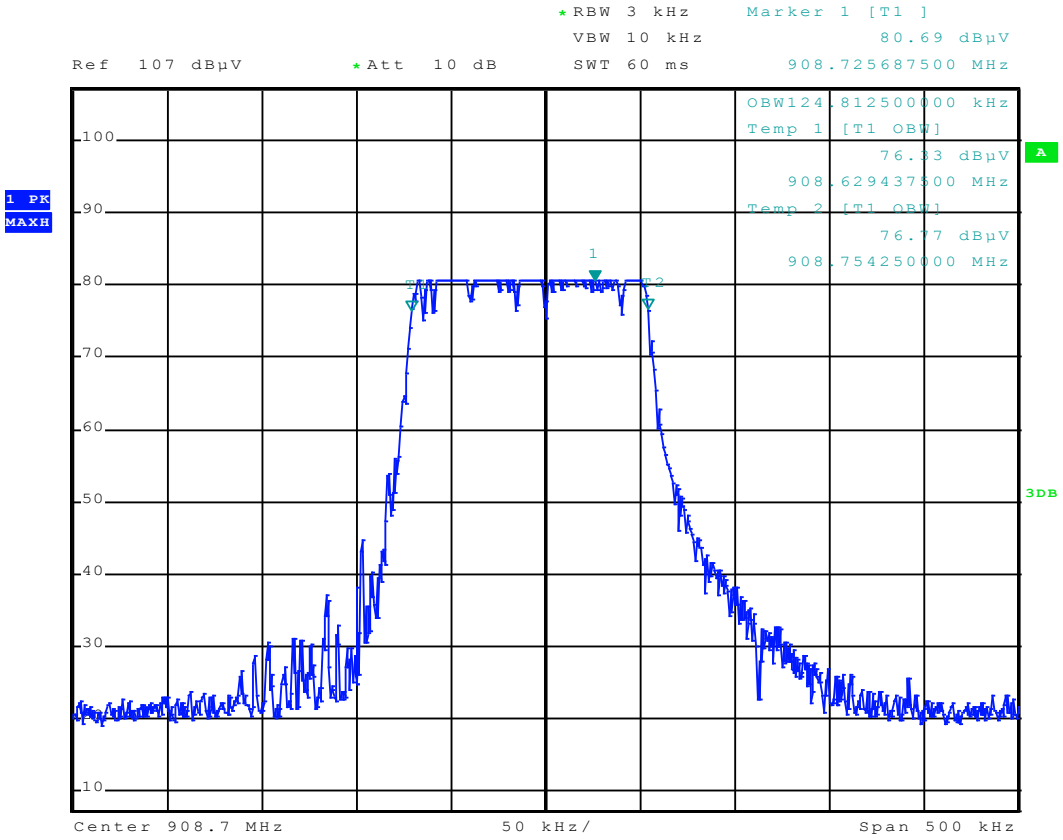
# APPENDIX 4: 99% bandwidth

Low channel



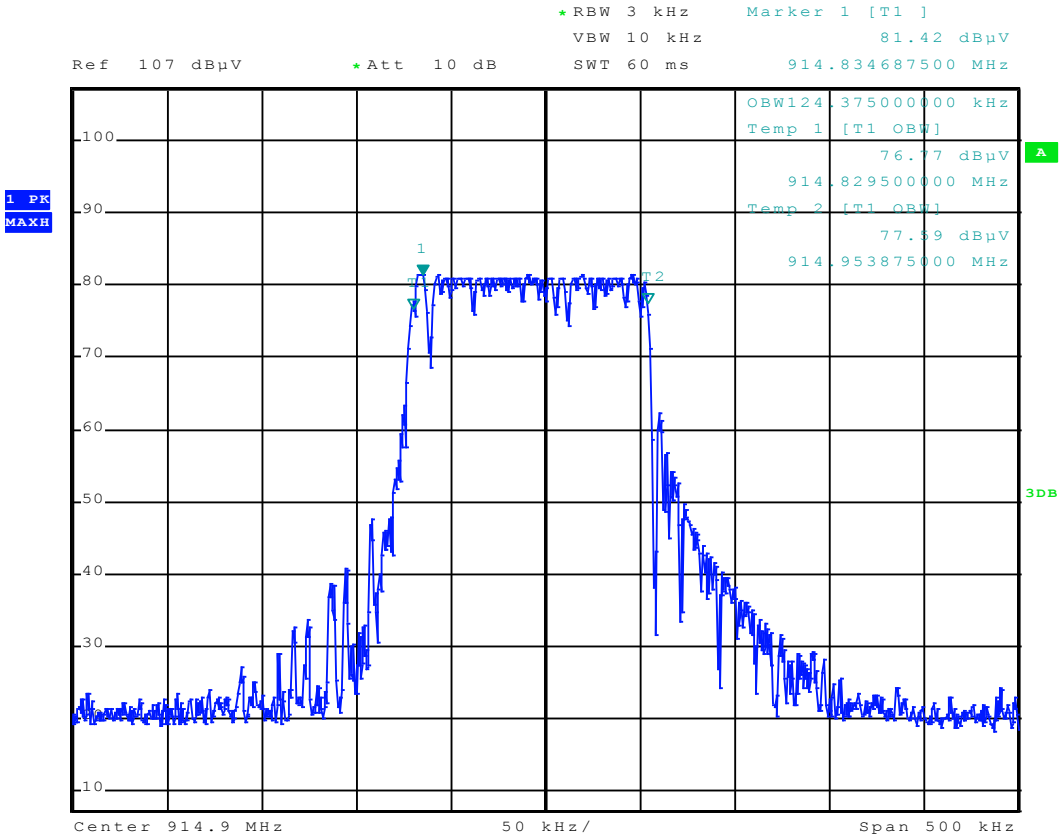

Date: 7.DEC.2015 15:43:34

Central Channel




Date: 7.DEC.2015 15:46:35

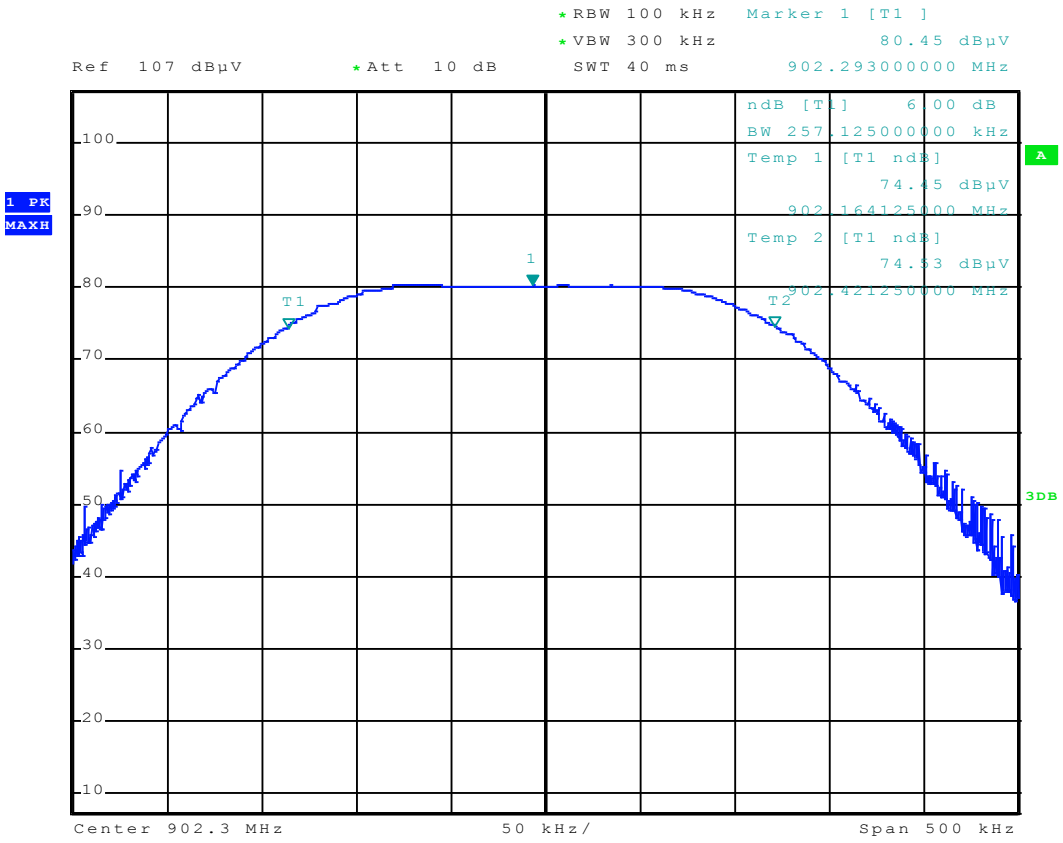
High Channel




Date: 7.DEC.2015 15:49:23

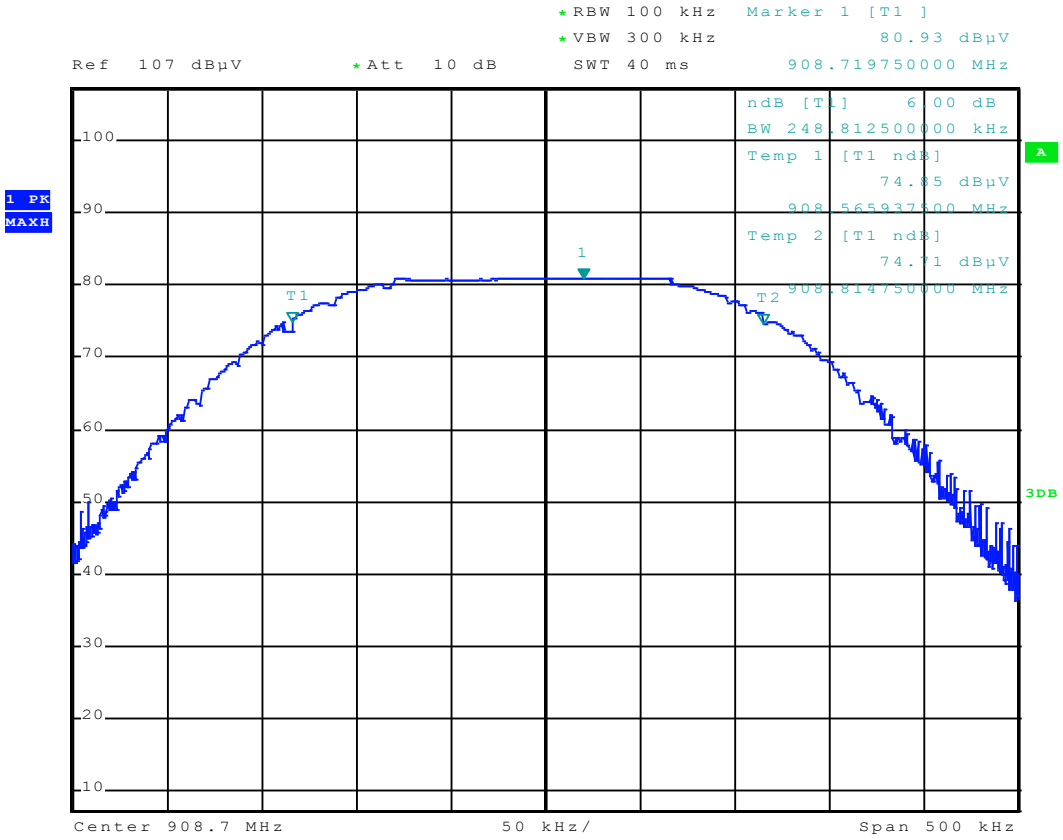
# APPENDIX 5: 6dB bandwidth

Low channel



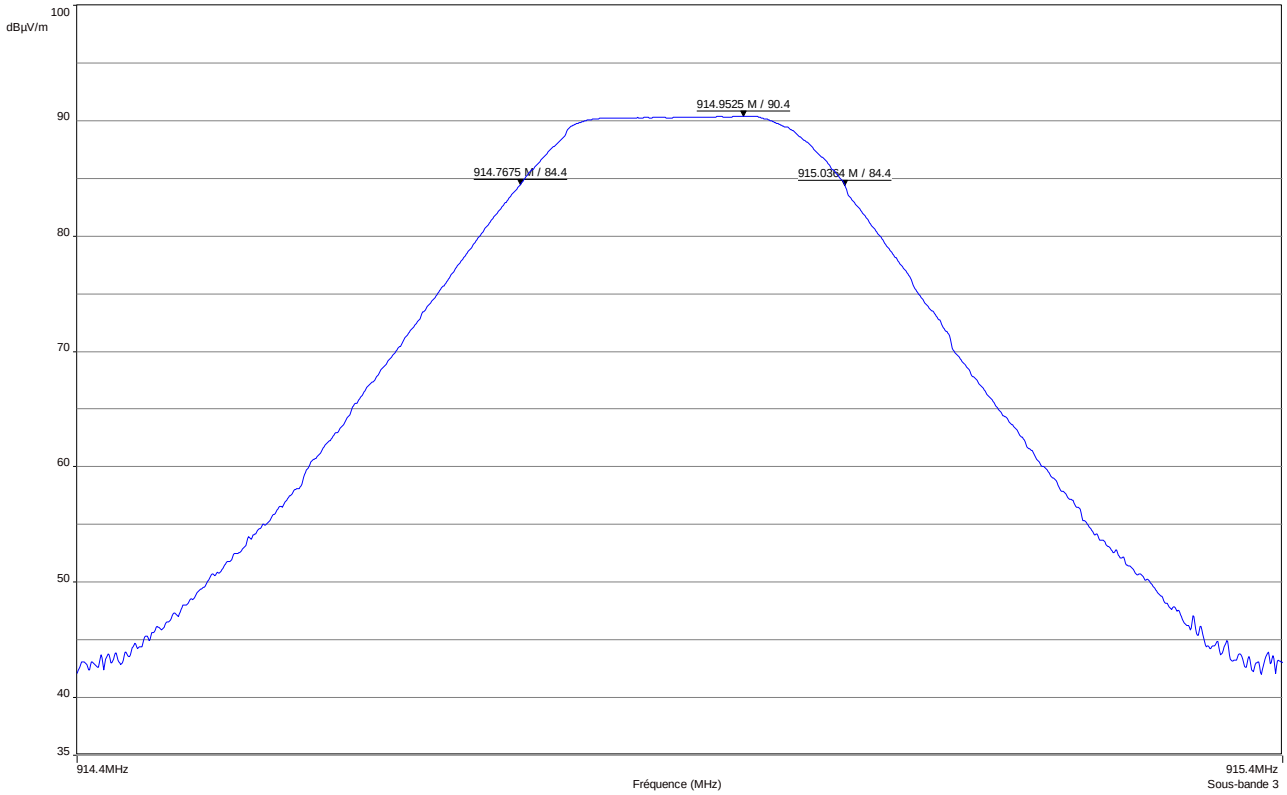

Date: 7.DEC.2015 15:53:38

Central channel




Date: 7.DEC.2015 15:54:49

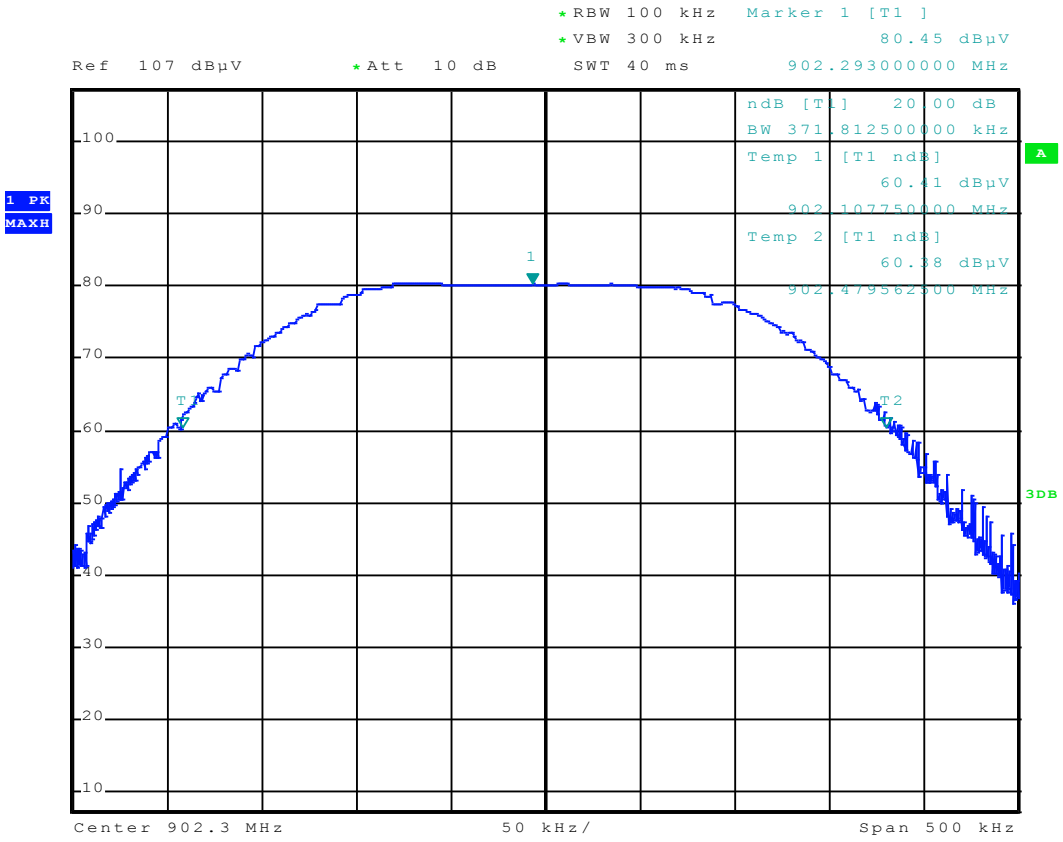
High channel




OBW = 268.9 kHz

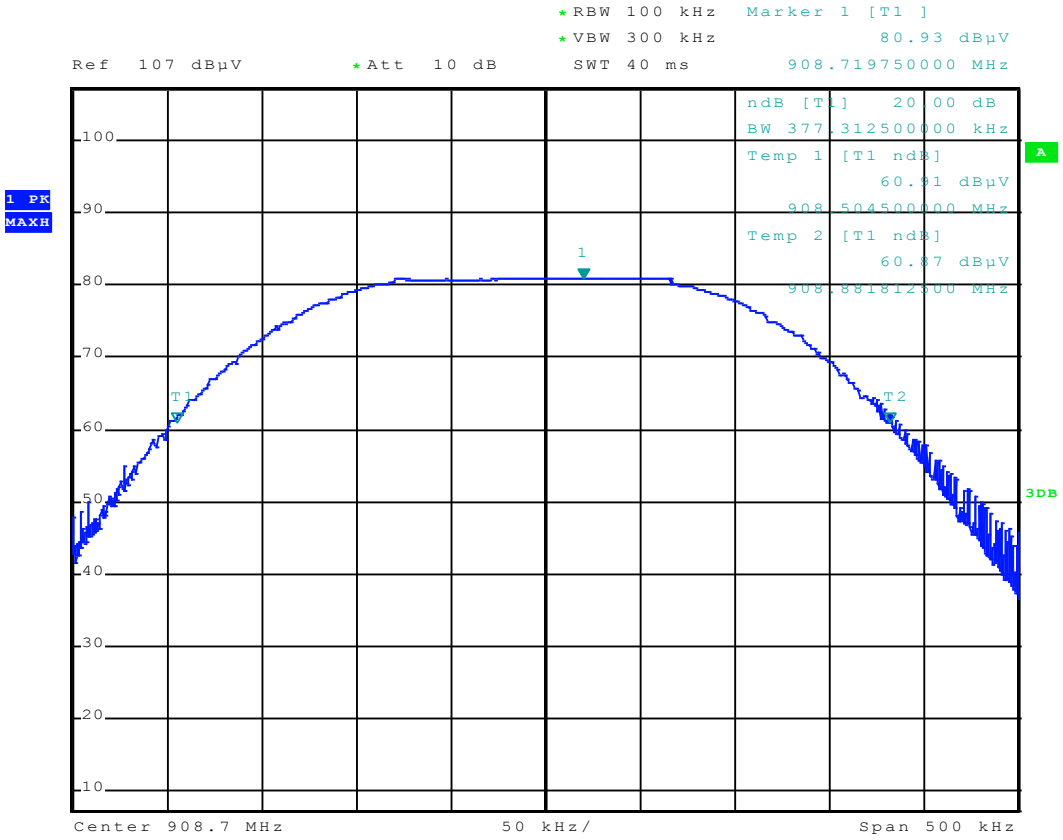
# APPENDIX 6: 20dB bandwidth

Low channel



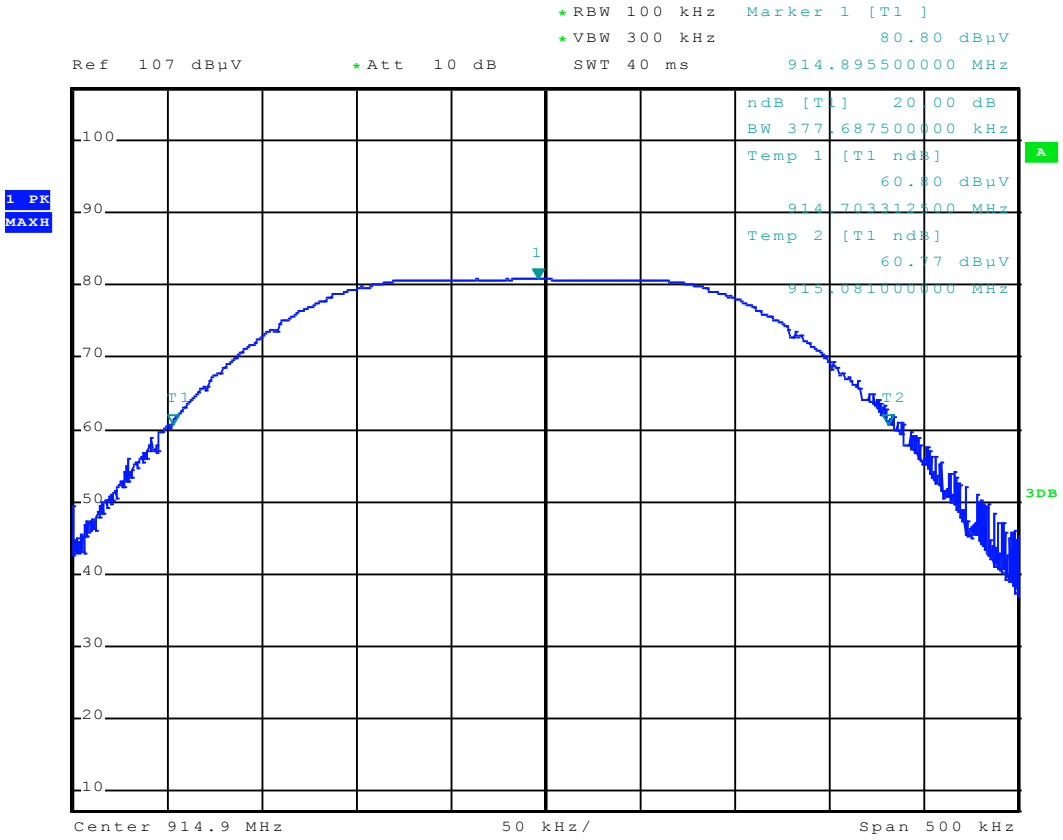

Date: 7.DEC.2015 15:53:11

Central channel




Date: 7.DEC.2015 15:55:22

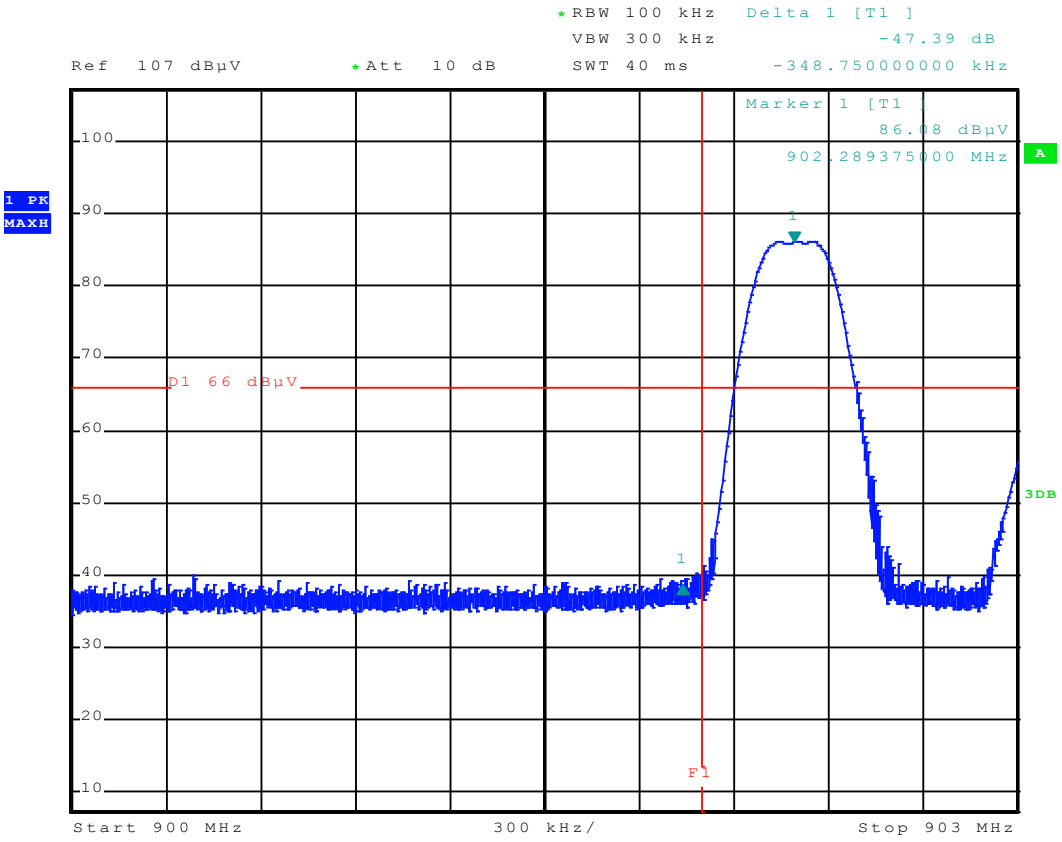
High channel




Date: 7.DEC.2015 15:51:17

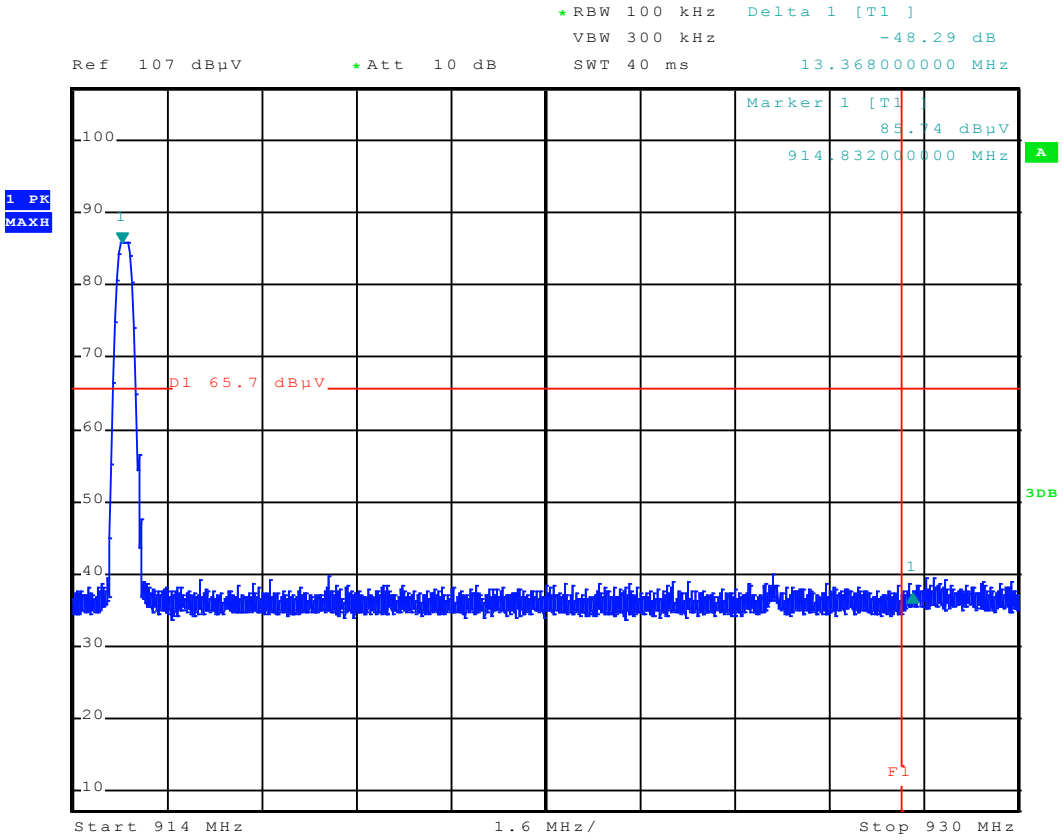
# APPENDIX 7: Band edge

Low channel – with hopping off mode



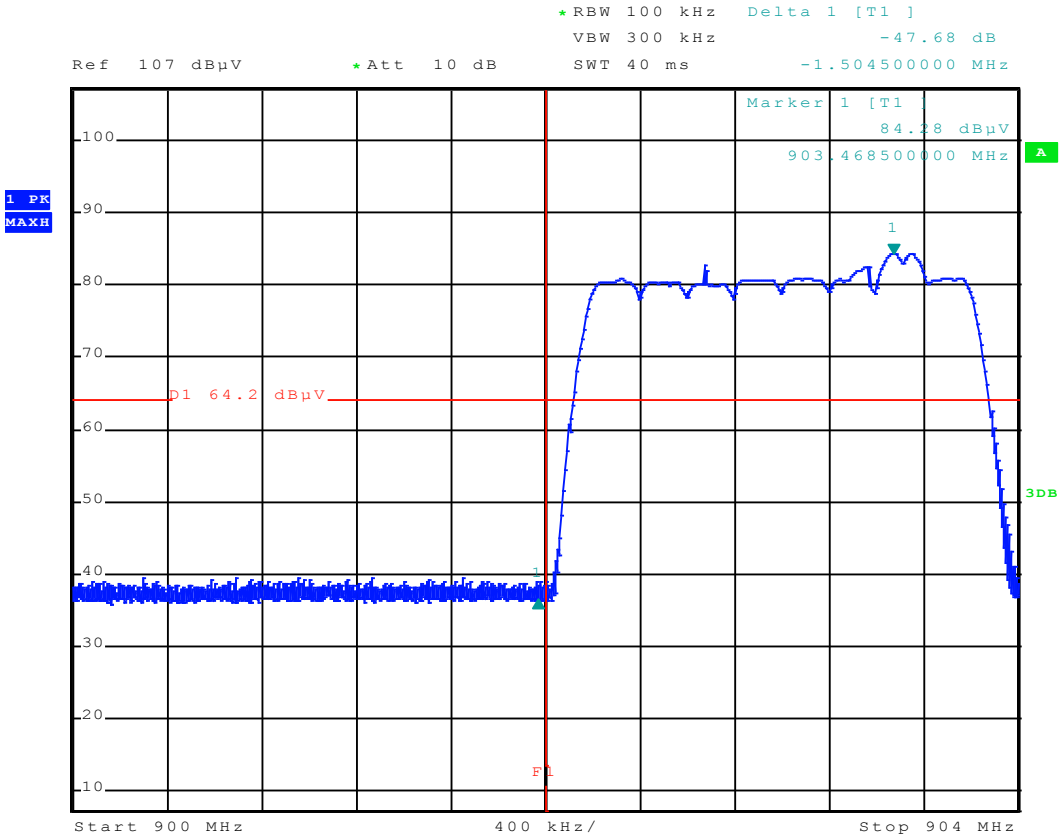

Date: 7.DEC.2015 14:14:56

High channel with hopping off mode



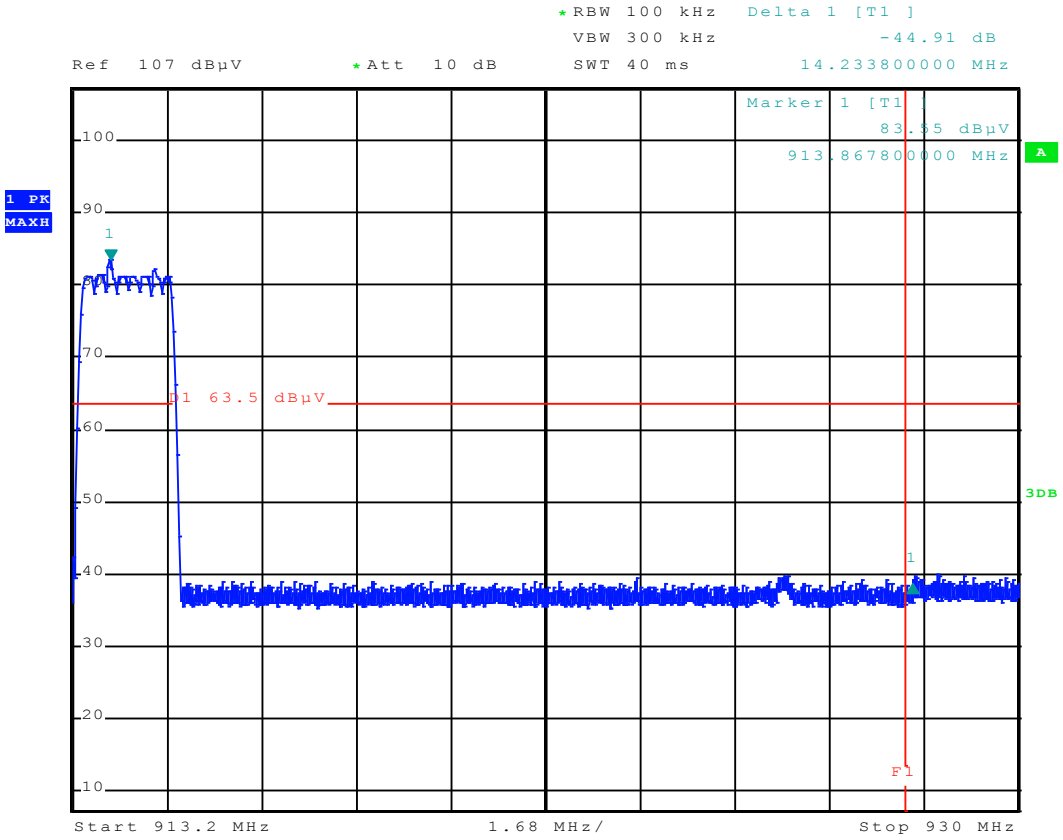

Date: 7.DEC.2015 14:17:49

Low channel with hopping on mode




Date: 7.DEC.2015 15:01:39

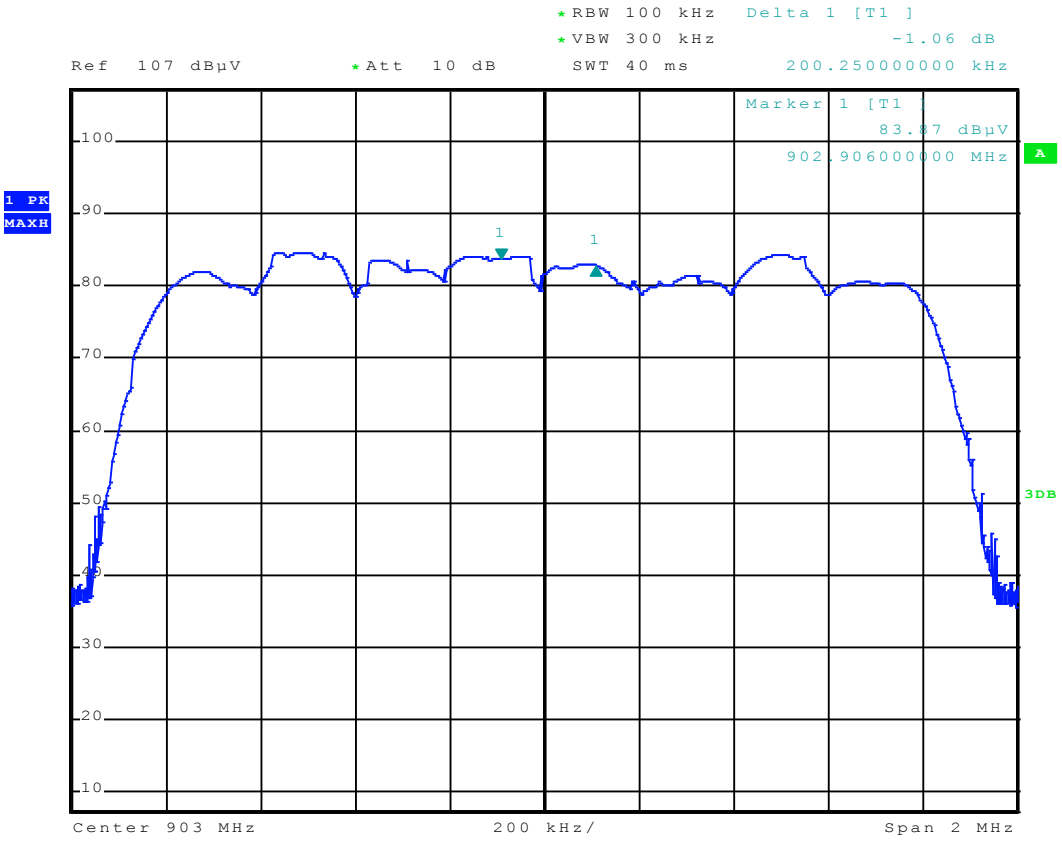
High channel with hopping on mode




Date: 7.DEC.2015 14:28:03

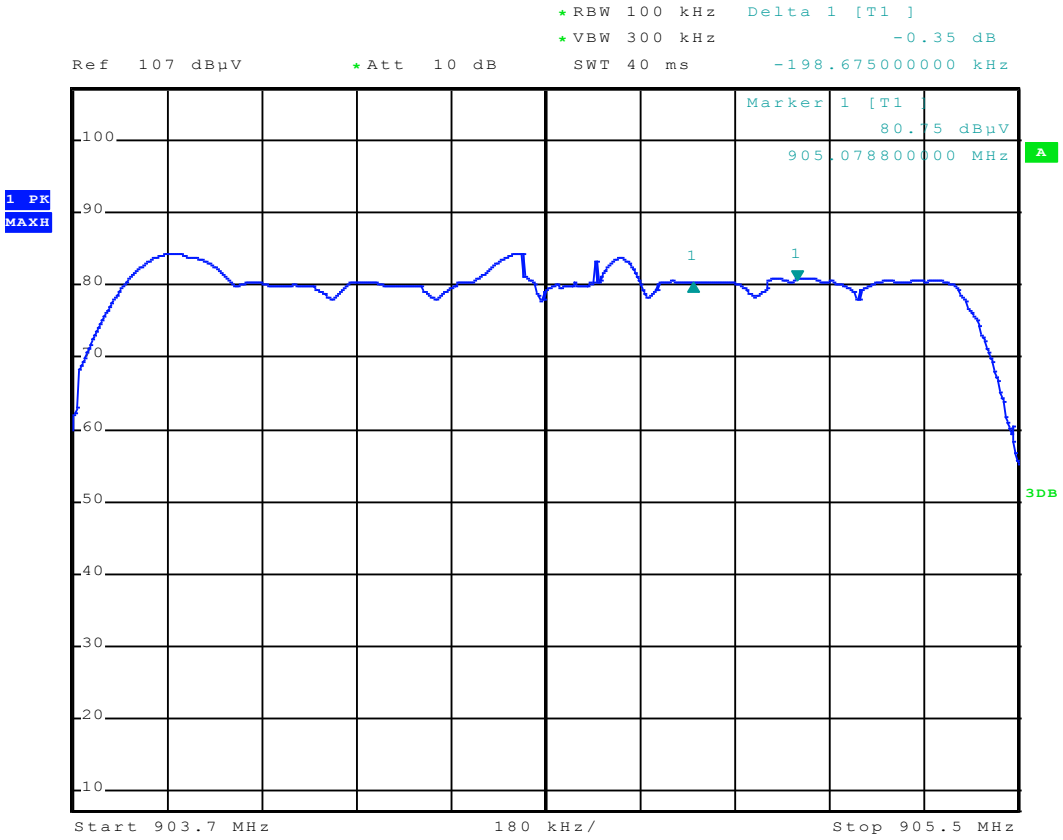
# APPENDIX 8:Number of hopping channels

First group of 8 channels centred at 903 MHz



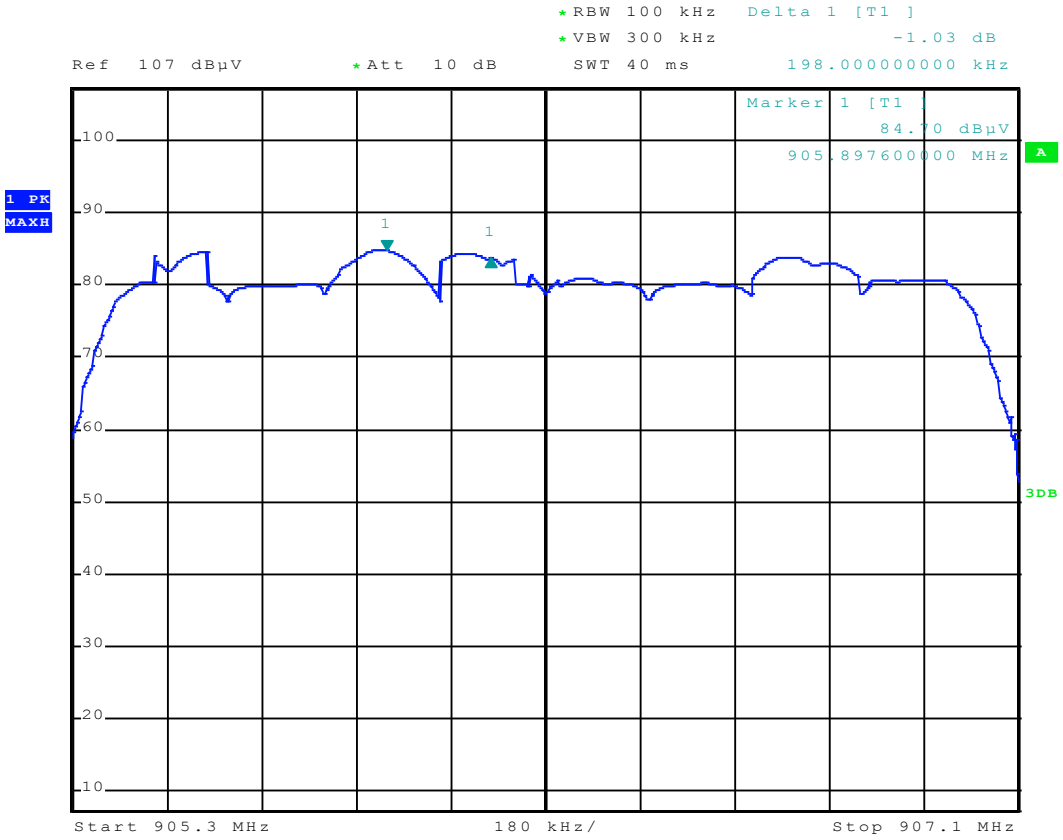

Date: 7.DEC.2015 16:25:57

Second group of 8 channels centred at 904.6 MHz



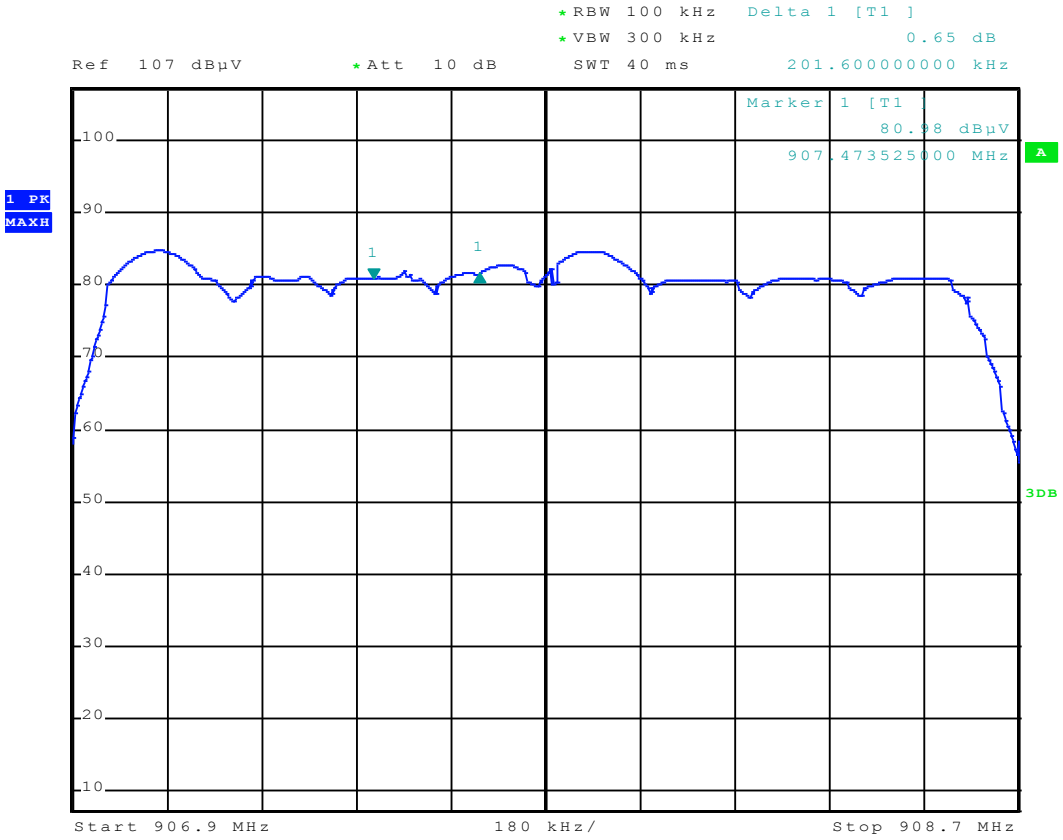

Date: 7.DEC.2015 16:32:42

Third group of 8 channels centred at 906.2 MHz



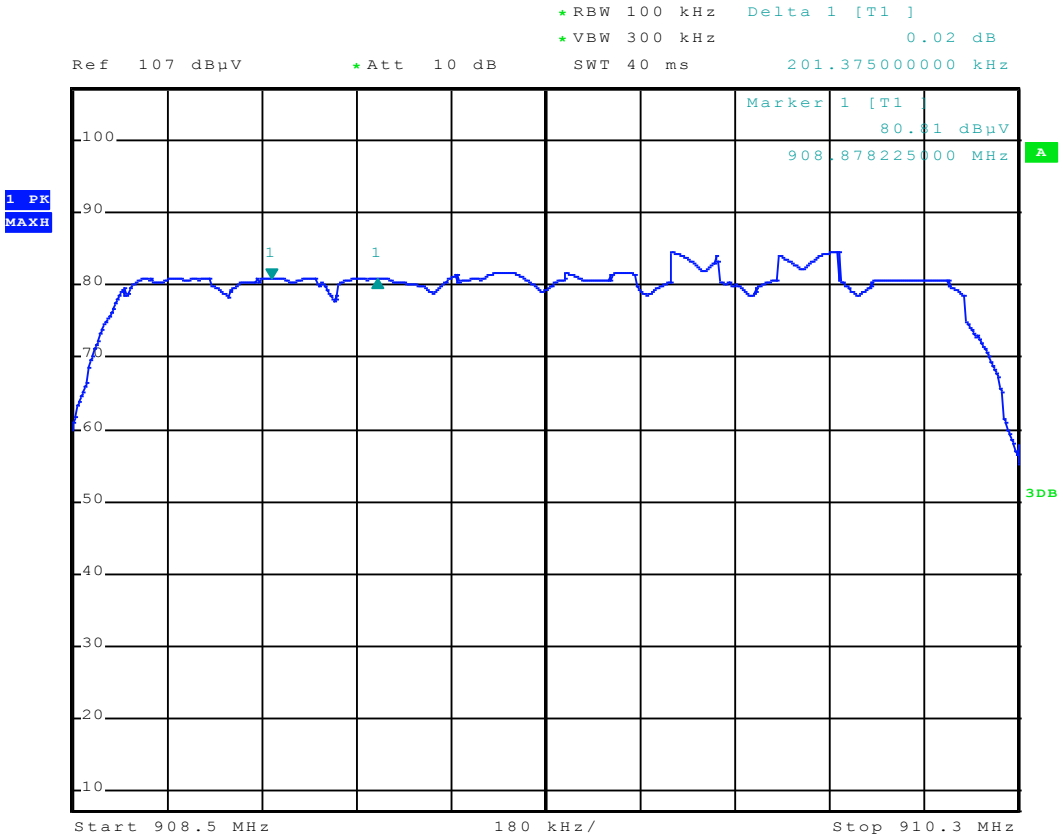

Date: 7.DEC.2015 16:38:35

Fourth group of 8 channels centred at 907.8 MHz



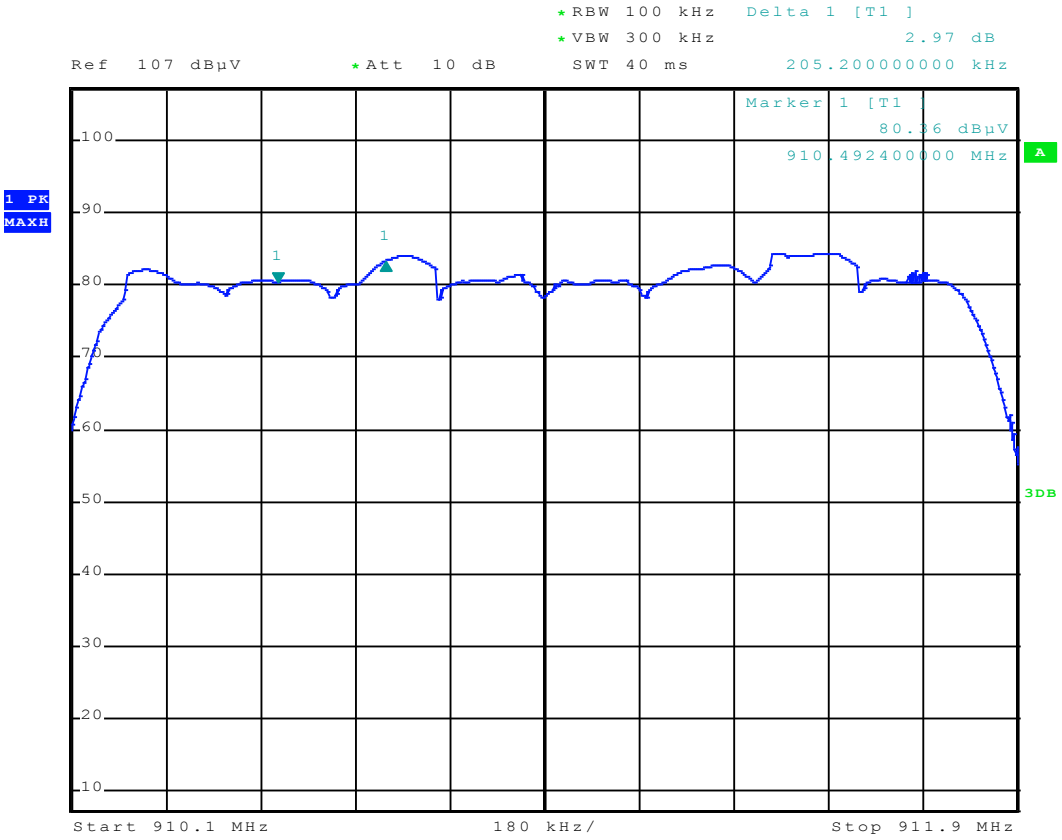

Date: 7.DEC.2015 16:45:43

Fifth group of 8 channels centred at 909.4 MHz



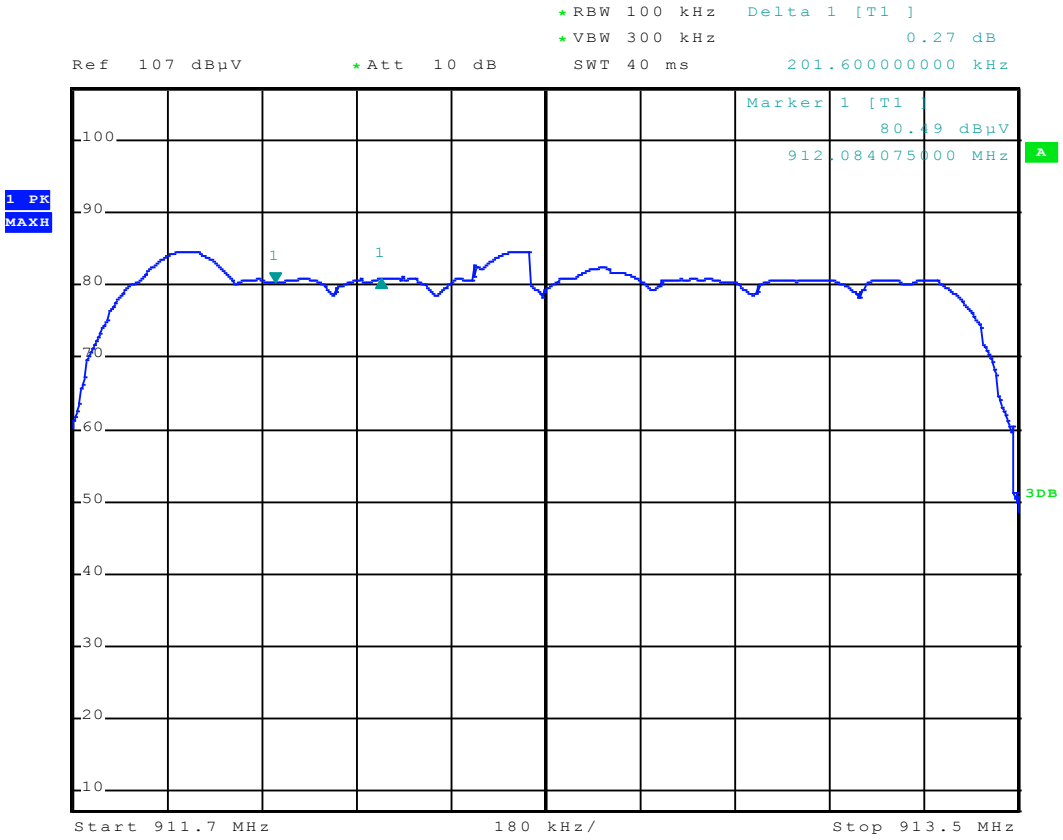

Date: 7.DEC.2015 16:50:46

Sixth group of 8 channels centred at 911 MHz



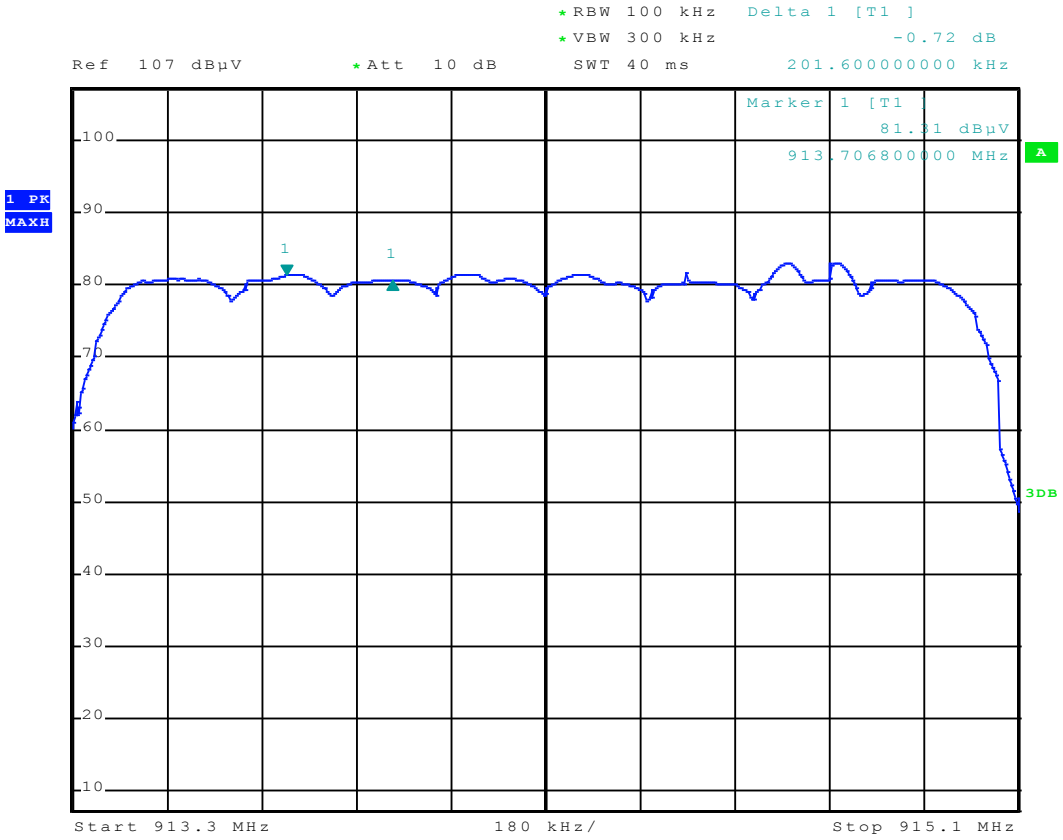

Date: 7.DEC.2015 16:57:28

Seventh group of 8 channels centred at 912.6 MHz




Date: 7.DEC.2015 17:02:00

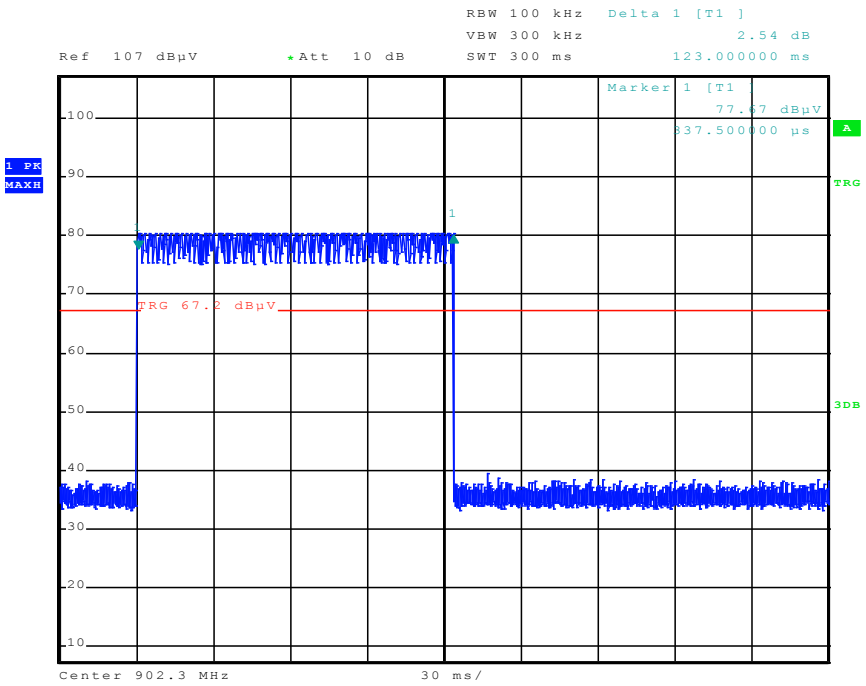
Eighth group of 8 channels centred at 914.2 MHz



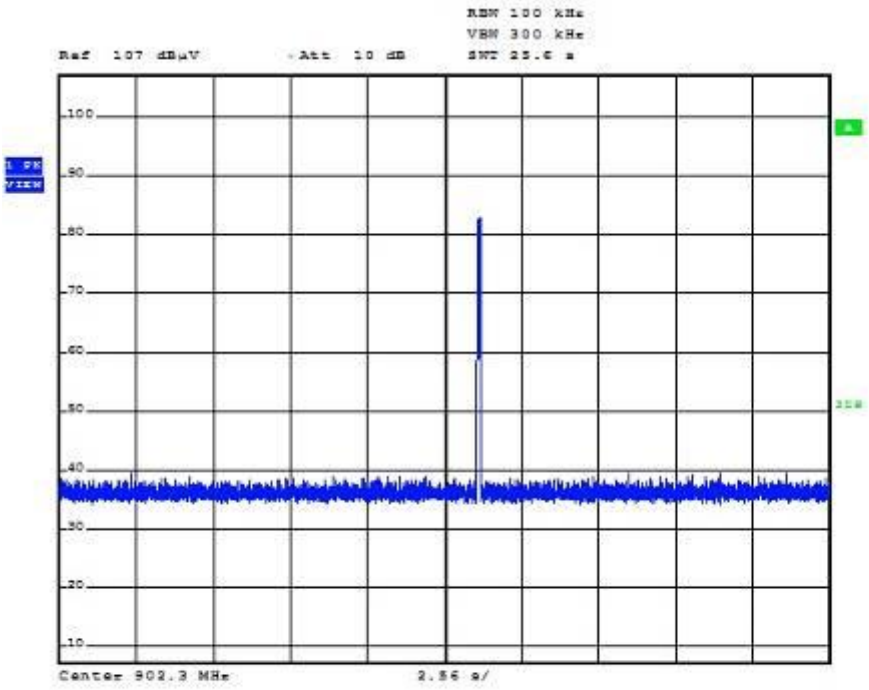

Date: 7.DEC.2015 17:06:38

# APPENDIX 9: Time of occupancy on any frequency

Low channel

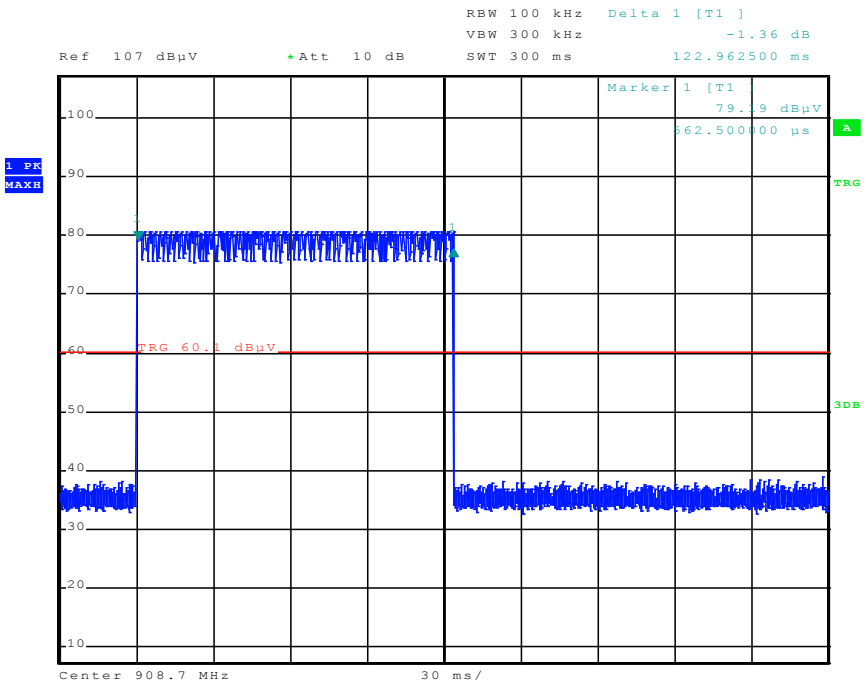



Date: 7.DEC.2015 15:10:37

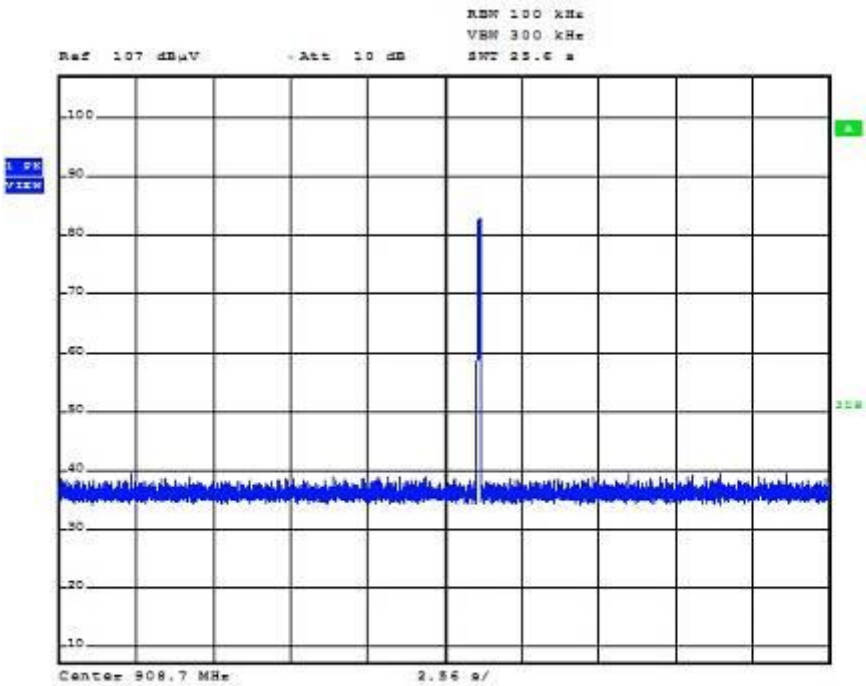



Date: 7.DEC.2015 15:32:23

Central Channel

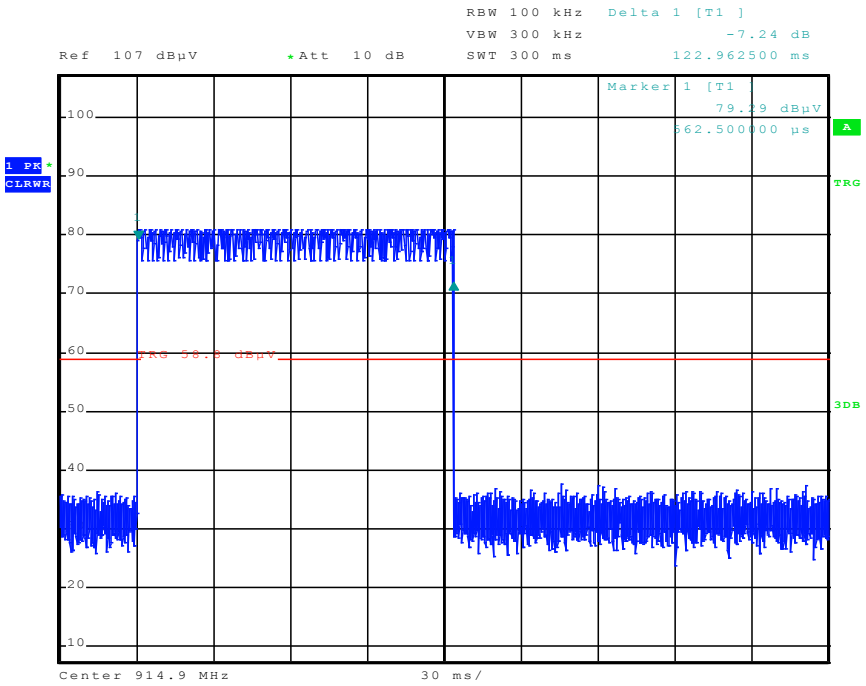



Date: 7.DEC.2015 15:12:38

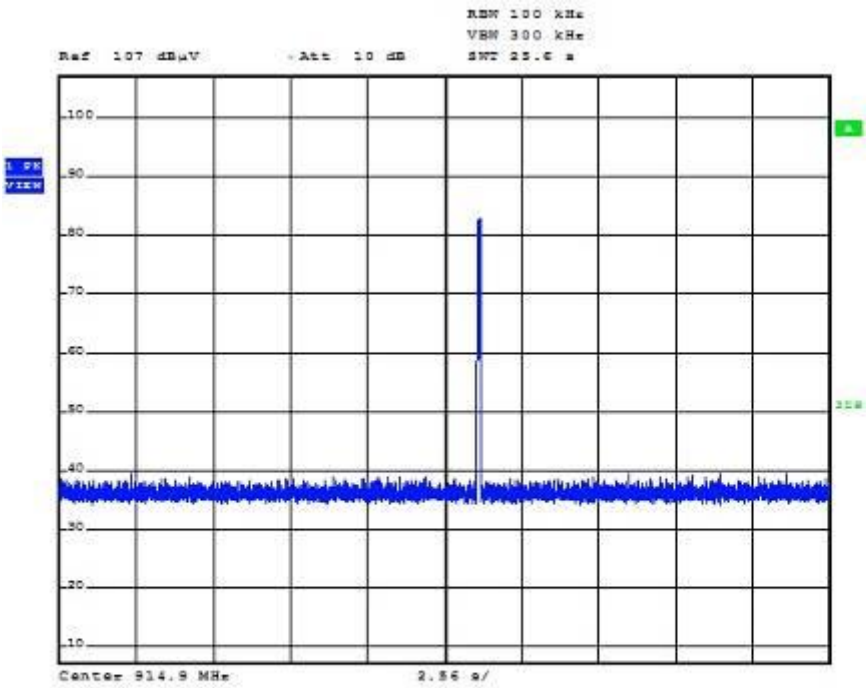



Date: 7.DEC.2015 15:32:02

High Channel




Date: 7.DEC.2015 15:13:59




Date: 7.DEC.2015 15:33:34