# SRD Test Report
# on

# SR250

# (433.92 MHz & 868.35MHz)

# as per

# ETSI EN 300 220-1 V3.1.1 (2017-02)
# ETSI EN 300 220-2 V3.2.1 (2018-04)

Add value.
Inspire trust.

Prepared for:
Paradox Security Systems
6 Milton Street,
Freeport, Bahamas

| RESPONSIBLE FOR | NAME | DATE | SIGNATURE |
|---|---|---|---|
| **Test Engineer** | Abdoulaye Ndiaye | 24-03-2020 | |
| **Test Engineer** | Jose Martinez-Ortega | 24-03-2020 | |
| **Authorised Signatory** | Scott Drysdale | 24-03-2020 | |

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.


**EXECUTIVE SUMMARY**
A sample of this product was tested and found to be in compliance with ETSI EN 300 220-1 V3.1.1 (2017-02) & ETSI EN 300 220-2 V3.2.0 (2018-04)


A2LA Cert. No. 2955.20

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# 1 Report Summary

## 1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

| Issue | Description of Change | Date of Issue |
|---|---|---|
| 1 | First Issue | 24th March 2020 |

**Table 1 – Modification Records**

## 1.2 Acronyms & Definitions

The following definitions and acronyms are applicable in this report.

**Acronyms:**

| | |
|---|---|
| **AM** | Amplitude Modulated |
| **DCT** | Duty Cycle Template |
| **EUT** | Equipment Under Test |
| **$F_{high\_OFB}$** | The upper edge of the Operational Frequency Band |
| **$F_{low\_OFB}$** | The lower edge of the Operational Frequency Ba |
| **NA** | No Applicable |
| **NCR** | No Calibration Required |
| **NP** | Number of Pulses |
| **OCW** | Operational Channel Width |
| **OOB** | Tx Out OF Band Spurious Emission |
| **OOK** | On/Of Keying modulation |
| **RBW** | Reading Bandwidth of RTSA |
| **RTSA** | Real Time Spectrum Analyzer |
| **SE** | Support Equipment |
| **SRD** | Short Range Devices |
| **SWT** | Sweep Time of RTSA |
| **$T_{obs}$** | Observation period |
| **TR** | Technical Report |
| **VBW** | Video Bandwidth of RTSA |
| **WS** | Wanted Signal, in dBm |

## 1.3 Introduction

The following test report describes tests in compliance with electromagnetic compatibility directive 2014/53/EU. Following the former directive, the information contained in this report is intended to show verification of the SR250 – 433.92MHz and SR250 – 868.35MHz to the requirements of ETSI EN 300 220-1 V3.1.1 (2017-02) and ETSI EN 300 220-2 V3.2.1 (2018-04).

| | |
|---|---|
| Number of Samples Tested | 2 |
| Test Specification/Issue/Date | ETSI EN 300 220-1 V3.1.1 (2017-02)<br>ETSI EN 300 220-2 V3.2.1 (2018-04) |
| Test Plan/Issue/Date | N/A |
| Order Number<br>Date: | 7169007312<br>20120-01-26 |
| Date of Receipt of EUT | 2020-02-06 |
| Start of Test | 2020-02-06 |
| Finish of Test | 2020-03-18 |
| Name of Engineer(s) | Jose Martinez-Ortega<br>Abdoulaye Nadine |

### 1.3.1 Brief Summary

A brief summary of the tests carried out in the EUT in accordance with ETSI EN 300 220-1 V3.1.1 (2017-02) and ETSI EN 300 220-2 (2018-04) are summarized in Table 2 and Table 3 below.

| Section | Clause | Test Name/ Base Standard | Results |
|---|---|---|---|
| - | 5.1 | Operating frequency | Pass <Note 1> |
| 2.1 | 5.2 | Effective radiated power | Pass |
| - | 5.3 | Maximum E.R.P. spectral density | N/A <Note 2> |
| 2.2 | 5.4 | Duty Cycle | Pass |
| 2.3 | 5.5 | Duty Cycle Template | Pass |
| 2.4 | 5.6 | Occupied Bandwidth | Pass |
| - | 5.7 | Frequency Error | N/A <Note 2> |
| 2.5 | 5.8 | Tx Out Of Band Emissions | Pass |
| 2.6 | 5.9 | Tx - Unwanted emissions in the spurious domain | Pass |
| | | Rx - Unwanted emissions in the spurious domain | Pass |
| - | 5.10 | Transient power | N/A <Note 2> |
| - | 5.11 | Adjacent Channel Power (if OCW <25 kHz) | N/A <Note 3> |
| 2.7 | 5.12 | TX behaviour under Low Voltage Conditions | Pass |
| - | 5.13 | Adaptive Power Control | N/A <Note 4> |
| - | 5.14 | Rx Sensitivity Level | N/A <Note 4> |
| - | 5.15 | Adjacent Channel Selectivity | N/A Note 4 |
| - | 5.16 | Receiver Saturation at Adjacent Channel | N/A <Note 4> |
| - | 5.17 | Spurious Response Rejection | N/A <Note 4> |
| 2.8 | 5.18 | Blocking | Pass |
| - | 5.19 | Behaviour at High Wanted Signal | N/A <Note 4> |
| - | 5.20 | Void | N/A <Note 4> |
| - | 5.21 | Polite Spectrum Access | N/A <Note 4> |
| - | 5.22 | Bi-Directional Operational Verification | N/A <Note 4> |

Note 1. Self Declaration of the Manufacturer (See Appendix A)
Note 2. Applicable for equipment wideband modulation
Note 3. No applicable as OCW is 200kHz
Note 4. No applicable for the EUT classification

**Table 2 – Test Summary Table – SR250– 433.92MHz**

| Section | Clause | Test Name/ Base Standard | Results |
|---|---|---|---|
| - | 5.1 | Operating frequency | Pass <Note 1> |
| 2.1 | 5.2 | Effective radiated power | Pass |
| - | 5.3 | Maximum E.R.P. spectral density | N/A <Note 2> |
| 2.2 | 5.4 | Duty Cycle | Pass |
| 2.3 | 5.5 | Duty Cycle Template | Pass |
| 2.4 | 5.6 | Occupied Bandwidth | Pass |
| - | 5.7 | Frequency Error | N/A <Note 2> |
| 2.5 | 5.8 | Tx Out Of Band Emissions | Pass |
| 2.6 | 5.9 | Tx - Unwanted emissions in the spurious domain | Pass |
| | | Rx - Unwanted emissions in the spurious domain | Pass |
| - | 5.10 | Transient power | N/A <Note 2> |
| - | 5.11 | Adjacent Channel Power (if OCW <25 kHz) | N/A <Note 3> |
| 2.7 | 5.12 | TX behaviour under Low Voltage Conditions | Pass |
| - | 5.13 | Adaptive Power Control | N/A Note 4 |
| - | 5.14 | Rx Sensitivity Level | N/A <Note 4> |
| - | 5.15 | Adjacent Channel Selectivity | N/A <Note 4> |
| - | 5.16 | Receiver Saturation at Adjacent Channel | N/A <Note 4> |
| - | 5.17 | Spurious Response Rejection | N/A <Note 4> |
| 2.8 | 5.18 | Blocking | Pass |
| - | 5.19 | Behaviour at High Wanted Signal | N/A <Note 4> |
| - | 5.20 | Void | N/A Note 4 |
| - | 5.21 | Polite Spectrum Access | N/A <Note 4> |
| - | 5.22 | Bi-Directional Operational Verification | N/A <Note 4> |

Note 1. Self Declaration of the Manufacturer (See Appendix A)
Note 2. Only applicable for equipment wideband modulation
Note 3. The OCW is higher than 25kHz
Note 4. No applicable for the EUT classification

**Table 3 – Test Summary Table – SR250 – 868.35MHz**

## 1.4 Declaration of Build Status

This report addresses the EMC verification testing and test results of the SR250 (433.92MHz and 868.35MHz) Models herein referred to as EUT (Equipment Under Test). The EUT was tested for immunity compliance against the following standards ETSI EN 300 220-2 V3.2.1 (2018-04) and ETSI EN 300 220-1 V3.2.1 (2017-02).

For a more detailed list of the standards and the revision used, see the "Applicable Standards, Specifications and Methods" section of this report.

This report does not imply product endorsement by any government, accreditation agency, or TÜV SÜD Canada Inc.

Opinions or interpretations expressed in this report, if any, are outside the scope of TÜV SÜD Canada Inc accreditations. Any opinions expressed do not necessarily reflect the opinions of TÜV SÜD Canada Inc, unless otherwise stated.

## 1.5 EUT Information

### 1.5.1 SR250– 433.92MHz

| | |
|---|---|
| **MODEL NAME:** | SR250 – 433.92MHz |
| **MANUFACTURER:** | Paradox Security Systems |
| **TYPE:** | Alarm System |
| **Band number from EC Decision 2017/1483/EU [2]** | 44a, 45a |
| **TUV NUMBER:** | 475971 |
| **PART NUMBER:** | N/A |
| **PCB MARKING** | 2M00000443 |
| **SERUAL NUMBER** | 187244 |
| **Hardware Version** | 331-6301-991 |
| **Software Version** | 1.00 |
| **Operating Channel (MHz)** | 433.92 |
| **NUMBER OF OPERATING FREQUENCIES** | 1 |
| **Type of Equipment Designation** | 2 |
| **MODULATION TYPE** | OOK |
| **Bit Rate** | 1.67kbps |
| **OCW (kHz)** | 200 |
| **VOLTAGE RATING:** | 4.5Vdc |
| **EUT SIZE:** | Width = 17.7 cm<br>Height = 24.5cm<br>Depth = 4.8 cm |


**Photo 1: EUT – SR250– 433.92MHz**

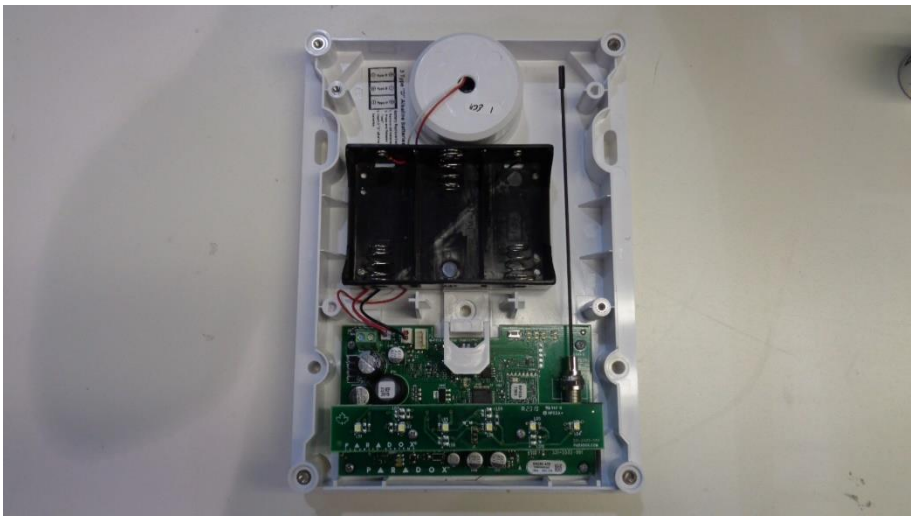


**Photo 2: EUT – SR250– 433.92MHz – PCB**


**Photo 3: EUT – SR250– 433.92MHz – SN – 2M00000443**

### 1.5.2 SR250– 868.35MHz

| | |
|---|---|
| **MODEL NAME:** | SR250 – 868.35MHz |
| **MANUFACTURER:** | Paradox Security Systems |
| **TYPE:** | Alarm System |
| **Band number from EC Decision 2017/1483/EU [2]** | 48 |
| **TUV NUMBER:** | 475970 |
| **PART NUMBER:** | N/A |
| **PCB MARKING** | 3D00000431 |
| **SERIAL NUMBER:** | 204243 |
| **Hardware Version** | 331-6301-991 |
| **Software Version** | 1.00 |
| **FREQUENCY (MHz)** | 433.35 |
| **NUMBER OF OPERATING FREQUENCIES** | 1 |
| **MODULATION TYPE** | OOK |
| **Bit Rate** | 1.67kbps |
| **OCW (kHz)** | 200 |
| **VOLTAGE RATING:** | 4.5Vdc. |
| **EUT SIZE:** | Width = 17.7 cm<br>Height = 24.5cm<br>Depth = 4.8 cm |


**Photo 4: EUT – SR250– 868.35MHz**

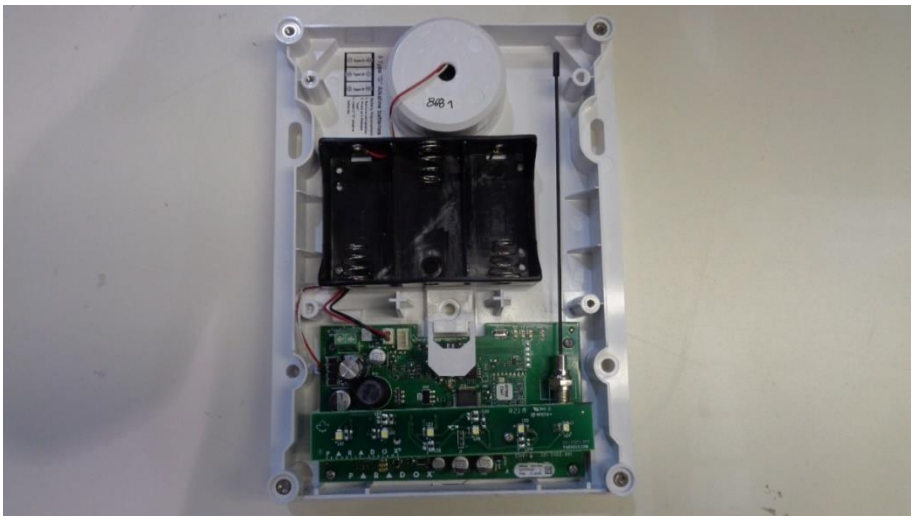


**Photo 5: EUT – SR250– 868.35MHz – PCB**


**Photo 6: EUT – SR250– 868.35MHz – SN – 3D00000431**

### 1.5.1 Antenna Details

| | |
|---|---|
| **MODEL** | 125-0433-410 |
| **MANUFACTURER** | Paradox Security Systems |
| **ANTENNA TYPE** | 0.060” diameter |
| **ANTENNA GAIN (dBi)** | 0 |

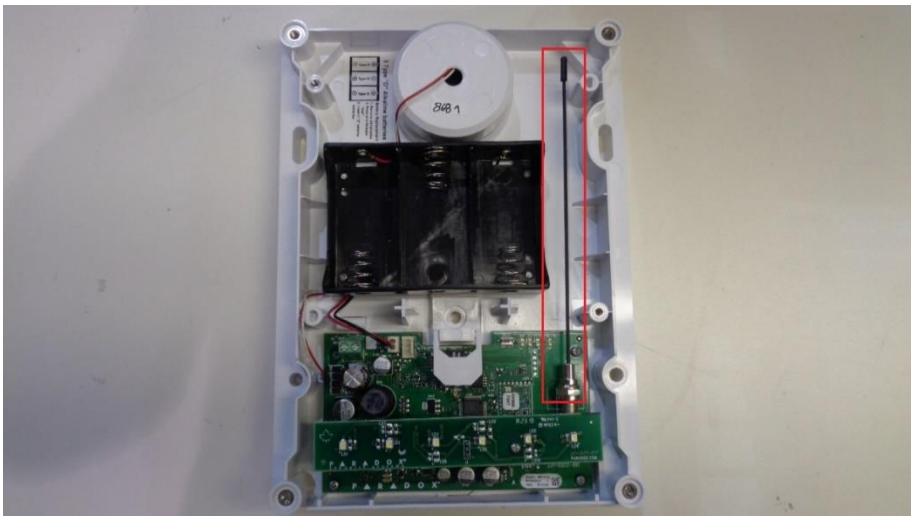


**Photo 7: EUT – SR250– Antenna – Inside the Red Rectangle**

### 1.5.2 Support Equipment

#### 1.5.2.1 DCTXP2

The DCTXP2 was used in the receiving blocking test. Refer to the setup depicted in section 2.10.

| | |
|---|---|
| **PRODUCT NAME:** | DCTXP2 |
| **MANUFACTURER:** | Paradox Security Systems |
| **Model** | DCTXP2 |
| **TYPE:** | Magnetic door contact (specially modified to testing purposes) |
| **TUV NUMBER:** | NA |
| **PART NUMBER:** | DCTXP2-G3H |
| **SERIAL NUMBER:** | 246120 |
| **VOLTAGE RATING:** | 2*AAA(1.5Vdc) |
| **EUT SIZE:** | Width = 11.4cm<br>Height = 3.2cm<br>Depth = 2.6cm |

**Photo 8: Support Equipment – DCTXP2**

## 1.6 Test Methodology

All measurements contained in this report were conducted with ETSI EN 300 220-1 V3.1.1 (2017-02), Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 25 MHz to 1 GHz frequency range with power levels ranging up to 500mW; Part 1: Technical characteristics and test methods.

For conducted– and radiated– emissions, the equipment under test (EUT) was configured to measure its highest possible emission level. This level was based on the maximized cable configuration from exploratory testing per ANSI C63.4-2014. The test modes were adapted according to the Operating Instructions provided by the manufacturer/client.

## 1.7 Modes of Operation

During the EUT was exercised by powering to the rate voltage and connecting according to section Test Detail Section. Table 4 depicts the testing mode of operation dedicated for testing.

| Mode No. | Name | Tests Mode(s) | Description |
|---|---|---|---|
| 1 | Constant Carrier | MOD1 | Constant un-modulated signal |
| 2 | Pulsed Carrier | MOD2 | Intermittent un-modulated signal |
| 3 | Constant Preamble | MOD3 | Constant modulated signal |
| 4 | Tx Range | MOD4 | Transmission mode for testing |
| 5 | Rx Range | MOD5 | Receive mode for testing |

**Table 4 – EUT Configuration Description**

## 1.8 Performance Criteria

The normal operation of the EUT shall be maintained and without interruption. Parameters measured during testing shall be maintained within specifications corresponding to each subsection of ETSI EN 300 220-2 V3.2.1 (2018-04) (2017-02) and ETSI EN 300 220-2 V3.2.1 (2018-04).

## 1.9 Engineering Comments

### 1.9.1 Modifications incorporated in the EUT

No modification was performed on the EUT during testing:

## 1.10 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

### 1.11 Measurement Uncertainty

For the test methods, according to ETS EN 300220-1 & 2 standards, the measurement uncertainty figures shall be calculated in accordance with ETR 100028-1[4] an shall correspond to an expansion factor (coverage factor) K =1.96 or k=22 (which provide confidence levels of 95% and 95.45% in case where the distributions characterizing the actual measurement uncertainties are normal (gaussian). Uncertainty values are depicted in Table 5.

| Test | Uncertainty |
|---|---|
| Occupied Channel Bandwidth | ±5% |
| RF Output Power | ±1.5dB |
| All emission <Conducted> | ±6dB |
| All emission <Radiated> | ±6dB |
| Temperature | ±1°C |
| Humidity | ±5% |
| DC and low frequency voltages | ±3% |
| Time | ±5% |
| Duty Cycle | ±5% |

**Table 5 – Maximum Measurement Uncertainty**

### 1.12 Test Location

TÜV SÜD Product Service conducted the following tests at Laval Test Laboratory.

| No. | Test Name | Test Specialist |
|---|---|---|
| 1 | Effective radiated power | Jose Martinez-Ortega<br>Abdoulaye Ndiaye |
| 2 | Duty Cycle | Jose Martinez-Ortega<br>Abdoulaye Ndiaye |
| 3 | Duty Cycle Template | Jose Martinez-Ortega<br>Abdoulaye Ndiaye |
| 4 | Occupied Bandwidth | Jose Martinez-Ortega<br>Abdoulaye Ndiaye |
| 5 | Tx Out Of Band Emissions | Jose Martinez-Ortega<br>Abdoulaye Ndiaye |
| 6 | Tx unwanted emissions in the spurious domain | Jose Martinez-Ortega<br>Abdoulaye Ndiaye |
| 7 | Rx unwanted emissions in the spurious domain | Jose Martinez-Ortega<br>Abdoulaye Ndiaye |
| 8 | TX behaviour under Low Voltage Conditions | Jose Martinez-Ortega<br>Abdoulaye Ndiaye |
| 9 | Receiver Blocking | Jose Martinez-Ortega<br>Abdoulaye Ndiaye |

**Table 6 Tests location**

**Office Address:**

2972, Joseph-A-Bombardier
Laval, Quebec, H7P 6E3
Canada
Tel: 450-687-4976

# 2 RADIO TESTING

## 2.1 Effective Radiated Power (ERP)

### 2.1.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | Clause 5.2.2 of ETSI EN 300 220-1 V3.1.1 (2017-02)<br>Clause 5.2.2.1 of ETSI EN 300 220-2 V3.2.1 (2018-04) |

**SPECIFICATIONS**

| | |
|---|---|
| **RBW (kHz)** | 200 |
| **VBW (kHz)** | 500 |
| **SPAN(MHz)** | 1 |
| **Frequency** | 433.92MHz<br>868.35MHz |
| **Installation** | Tabletop Equipment |
| **Limits** | See Table 7 |

**EUTs**

| | |
|---|---|
| **Identification** | SR250– 433.92MHz<br>SR250– 868.35MHz |
| **Test Mode** | Mode #3 in Table 4. |
| **Voltage Input** | 4.5Vdc |

**ENVIROMENTAL & TEST INFO**

| | |
|---|---|
| **Test Date (YYYY-MM-DD)** | 2020-02-17 |
| **Temperature °C (For Info Only)** | 22.1 |
| **Humidity %(For Info Only)** | 16 |
| **Atmospheric Pressure kPa (For Info Only)** | 101.6 |
| **Engineer** | Jose Martinez Ortega |
| **Client Witness** | No witness |

### 2.1.2 Limits

The effective radiate power shall not be greater than the value allowed Annex B in EN 300 220-2 for the chosen operation frequency band(s). The harmonized frequency bands and the specification for non-specific short-range devices are depicted in Table 7.

| SDR Classification <Note 1> | Frequency Band (MHz) | Maximum Effective Radiate Power (mW) |
|---|---|---|
| H | 433.050 to 434.790 | 10 |
| M | 868.000 to 868.600 | 25 |
| Note 1. See page 22 in Annex B in EN 300 220-2 V3.2.1 (2018-04) | | |

**Table 7 – ERP – Limits**

### 2.1.3 Test Setup

The conducted measurement procedure is referred in Clause 5.2.2.1 of ETSI EN 300 220-1 V3.1.1. The measurement was performed in mode No. 3 (see Table 4). The test setup picture is illustrated in Photo 9.

**Photo 9: Setup – ERP – SR250 – 433/868**

### 2.1.4 Test Results

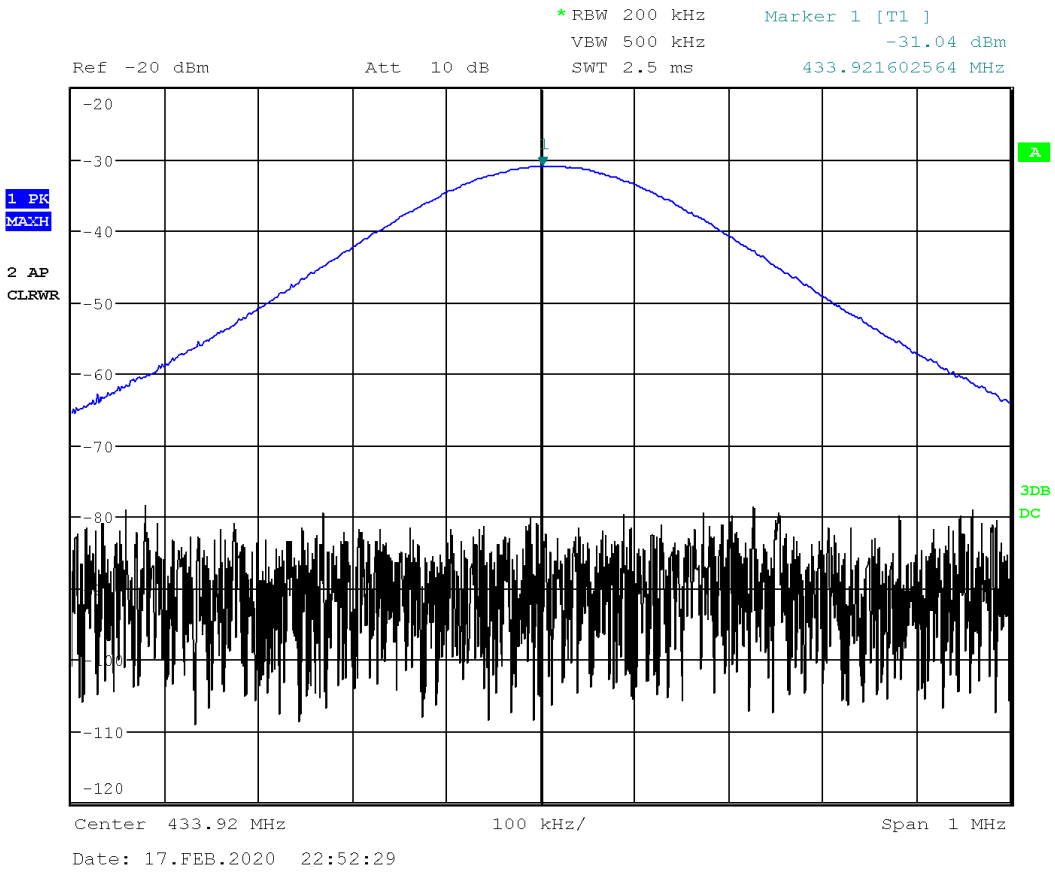
Test result are summarized in Table 8 below.

| SRD Classification <Note 1> | SR250 Model | External Attenuation (dB) | SA - Reading (dB) | ERP dBm(mW) | Limit (mW) | Result |
|---|---|---|---|---|---|---|
| H | 433.92MHz | 40 | -31.04 | 8.96 (7.87) | 10 | Pass |
| M | 868.35MHz | 40 | -29.5 | 10.5 (11.22) | 25 | Pass |
| Note 1. According to Annex B in ETSI EN 300 220-1 V3.1.1 (2018-04) | | | | | | |

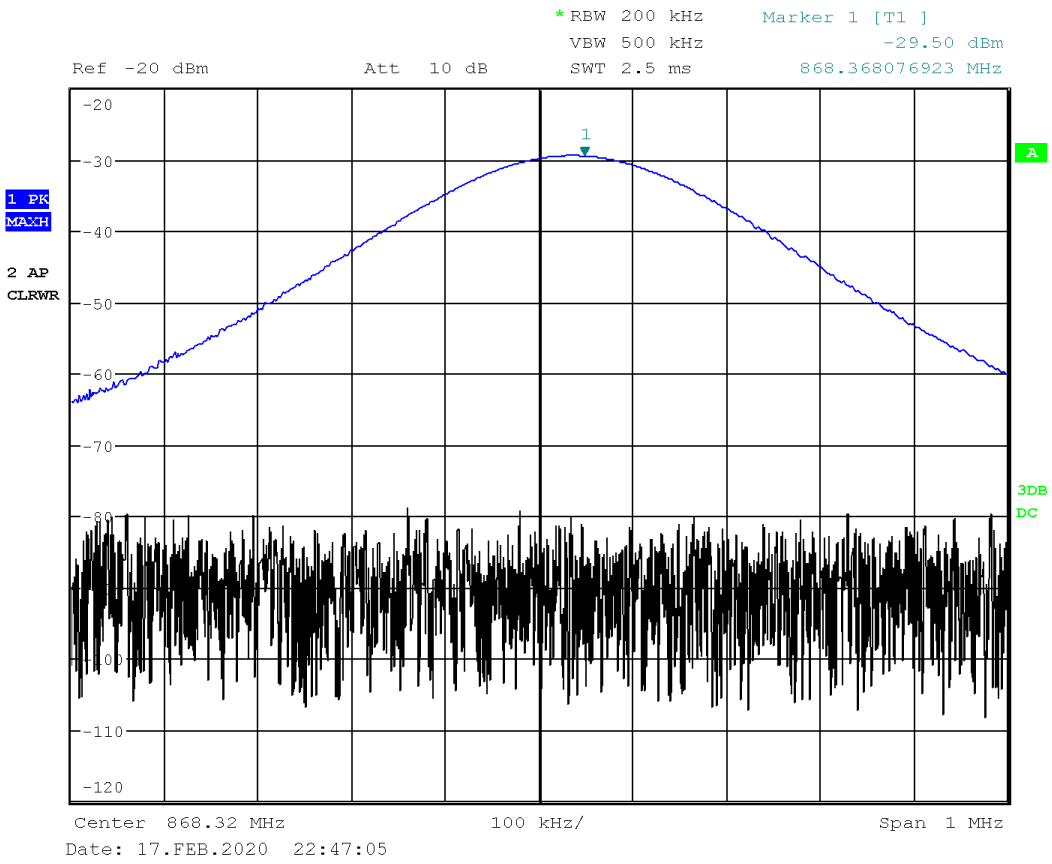
**Table 8 – ERP – Test Results – SR250**

### 2.1.5 Test Data

Test data recorded, with the environmental conditions given in section 2.1.1, for SR250–433.92MHz and SR250–868.35MHz are given in Graph 1 and Graph 2, respectively.




**Graph 1 : ERP – SR250 – 433.92MHz**




**Graph 2 : ERP – SR250 – 868.35MHz**

### 2.1.6 Test Method

Tests were conducted according to the method of the reference standard mentioned in section 2.1.1.

### 2.1.7 Test Location and Test Equipment Used

Test location was TUV Laval office. Instrumentation used is depicted in Table

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due (YYY-MM-DD) |
|---|---|---|---|---|---|
| Cable 160 in SMA to N | FLORIDA RF LABS | Lab-Flex 335 | 4138 | NA | NCR |
| Variable Attenuator Rotary Attenuator | ETLS System | VAT02BXP-4242 | N/A | NA | NCR |
| Spectrum Analyzer | Rohde & Schwarz | ESU-40 | 4092 | 12 | 2020-06-06 |
| Attenuator 10 dB | Narda | 4779-10 | 4096 | NCR | NCR |

**Table 9 Inside the Designed Band Test Equipment**

## 2.2 Duty Cycle

### 2.2.1 Test Details

**REFERENCE STANDARD** Clause 4.3.3. of ETSI EN 300 220-1 V3.1.1 (2017-02)
Clause 5.5 of ETSI EN 300 220-2 V3.2.1 (2018-04)

**SPECIFICATIONS**

| | |
|---|---|
| **Operating Frequency** | 433.92MHz<br>868.35MHz |
| **Observation Time (h)** | 1 |
| **SPAN (Hz)** | 0 |
| **Detector** | Max Peak |
| **Trace** | Max Hold |
| **Sweep(s)** | 3600 |
| **$T_{obs}$(h)** | 1 |

**EUT**

| | |
|---|---|
| **Identification** | SR250 – 433.92MHz<br>SR250 – 868.35MHz |
| **Voltage Input** | Battery Powered<br>+4.5Vdc |
| **Test Mode** | Mode #2 in Table 4. |

**ENVIROMENTAL & TEST INFO**

| | |
|---|---|
| **Test Date (YYYY-MM-DD)** | 2020-02-18 |
| **Temperature °C (For Info Only)** | 23 |
| **Humidity %(For Info Only)** | 30 |
| **Atmospheric Pressure kPa (For Info Only)** | 101.5 |
| **Engineer** | Jose Martinez Ortega |
| **Client Witness** | No witness |

### 2.2.2 Limits

The duty cycle shall not be greater than the value allowed Annex B in EN 300 220-2 V3.2.1 (2018-04) for the chosen operation frequency band(s). The harmonized frequency bands for SR250 are depicted in Table 10.

| SRD Classification <Note 1> | Frequency Band (MHz) | Duty Cycle (%) |
|---|---|---|
| H | 433.050 – 434.790 | 10 |
| M | 863 – 870 | 1 |
| Note 1. According to Annex B of EN 300 220-2 V3.2.1 (2018-04) | | |

**Table 10 – Duty Cycle – Limits**

### 2.2.3 Test Setup Diagram

During testing the EUT was installed according to Figure 1.

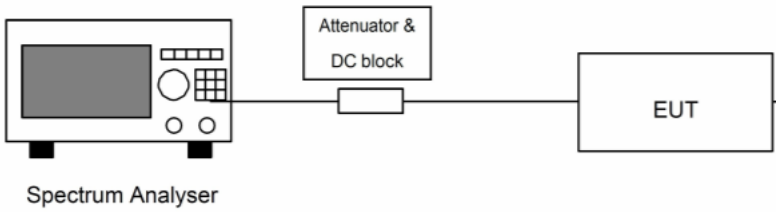



**Figure 1: EUT – Setup Diagram – Conducted Measurements**

### 2.2.4 Test Results

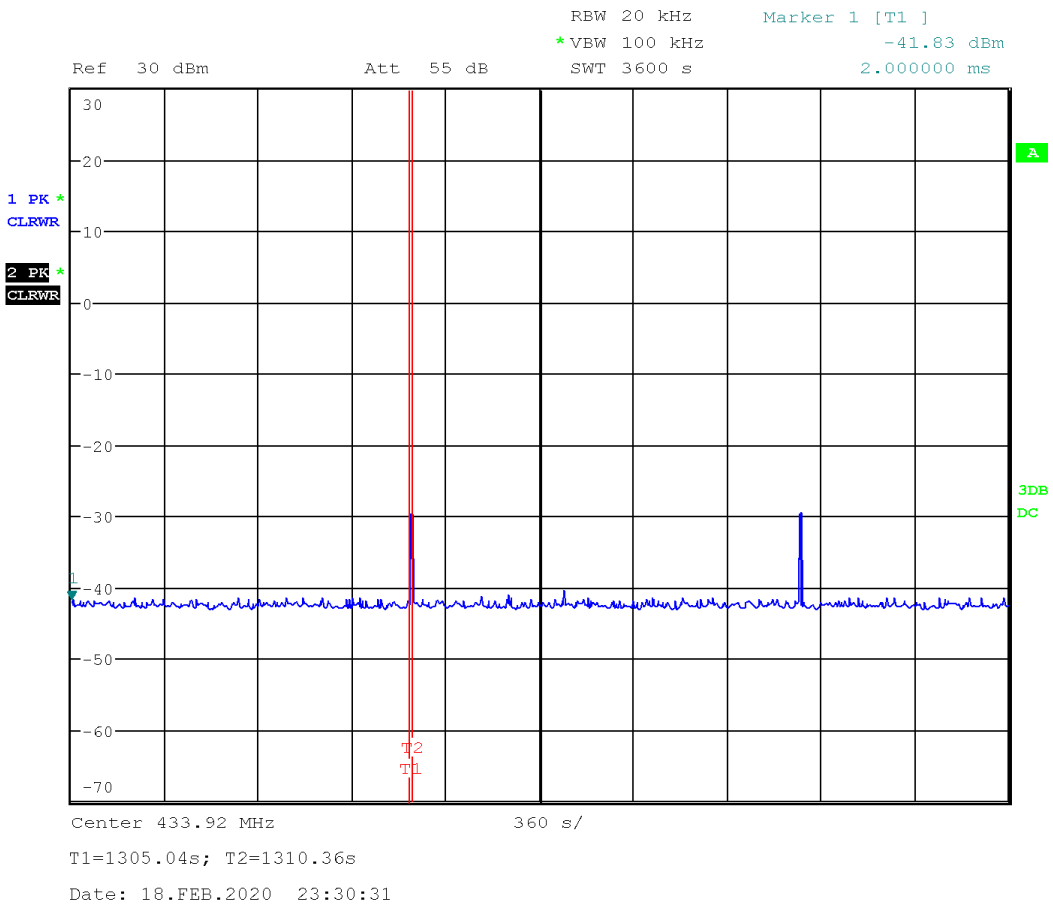
Values of Table 11 are in accordance with Graph 3 and 4. The duty cycle measured for SR250 models are depicted in Table 11 below.

| Frequency (MHz) | $T_{obs}$ (s) | $T_1$ (s) | $T_2$ (s) | $T_{on}$ <$T_2$-$T_1$> (s) | NP | Duty Cycle <NPx$T_{on}$/$T_{obs}$ > (%) | Limit <Note 1> (%) | Result |
|---|---|---|---|---|---|---|---|---|
| 433.92 | 3600 | 1305.04 | 1310.36 | 5.32 | 2 | 0.3 | 10 | Pass |
| 868.35 | | 1327.66 | 1332.92 | 5.26 | 2 | 0.3 | 1 | Pass |
| NP. Number of Pulses<br>$T_{obs}$. The observation period =1h.<br>Note 1. According to Annex B in EN 300 220-2 V3.2.1 (2018-04) | | | | | | | | |

**Table 11: $T_1$ & $T_2$ Measurements – Duty Cycle – SR250**

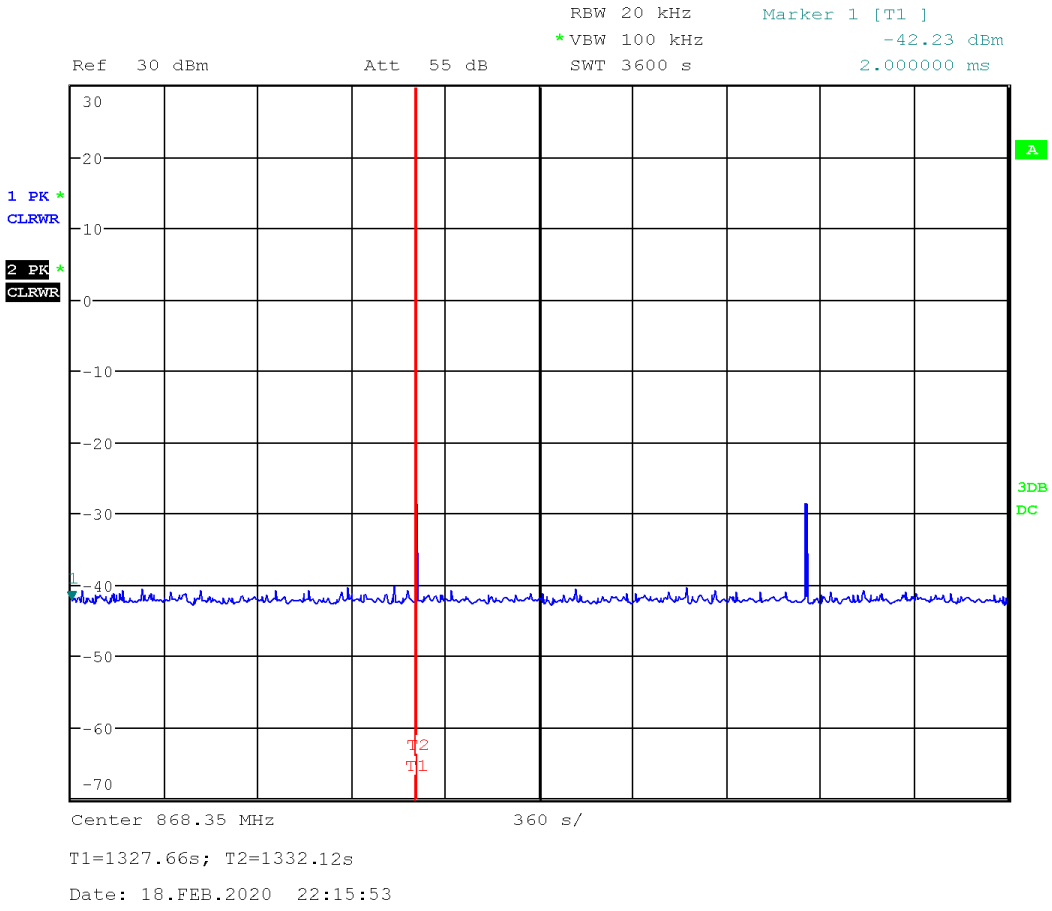
### 2.2.5 Test Data

#### 2.2.5.1 Model – 433.92MHz




**Graph 3 : $T_1$ & $T_2$ of Duty Cycle – SR250 – 433.92MHz**

### 2.2.5.1 Model 868.35MHz




**Graph 4 : $T_1$ & $T_2$ of Duty Cycle – SR250 – 868.35MHz**

### 2.2.6 Test Method

Tests were conducted according to the method of the reference standards mentioned in Section 2.2.1.

### 2.2.7 Test Location and Test Equipment Used

This test was carried out in Laval test location.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due (YYY-MM-DD) |
|---|---|---|---|---|---|
| Cable 160 in SMA to N | FLORIDA RF LABS | Lab-Flex 335 | 4138 | NA | NCR |
| Variable Attenuator Rotary Attenuator | ETLS System | VAT02BXP-4242 | N/A | NA | NCR |
| Spectrum Analyzer | Rohde & Schwarz | ESU-40 | 4092 | 12 | 2020-06-06 |
| Attenuator 10 dB | Narda | 4779-10 | 4096 | NCR | NCR |

**Table 12 Throughput – Test Equipment**

## 2.3 Duty Cycle Template (DCT)

### 2.3.1 Test Details

**REFERENCE STANDARD** Clause 5.5 of ETSI EN 300 220-1 V3.2.1 (2017-04)

**SPECIFICATIONS**

| | |
|---|---|
| **Operating Frequency** | 433.92MHz<br>868.35MHz |
| **RBW(kHz)** | 3 |
| **VBW(kHz)** | 10 |
| **Span (Hz)** | 0 |
| **Trace** | Clear White |
| **$T_{obs}$(s)** | 1 |

**EUT**

| | |
|---|---|
| **Identification** | SR250 – 433.92MHz<br>SR250 – 868.35MHz |
| **Voltage Input** | Battery Powered<br>+4.5Vdc |
| **Test Mode** | Mode #2 in Table 4. |

**ENVIROMENTAL & TEST INFO**

| | |
|---|---|
| **Test Date (YYYY-MM-DD)** | 2020-03-18 |
| **Temperature °C (For Info Only)** | 23 |
| **Humidity %(For Info Only)** | 30 |
| **Atmospheric Pressure kPa (For Info Only)** | 101.5 |
| **Engineer** | Jose Martinez Ortega |
| **Client Witness** | No witness |

### 2.3.2 Test Setup Diagram

During testing the EUT was installed according to Figure 2.

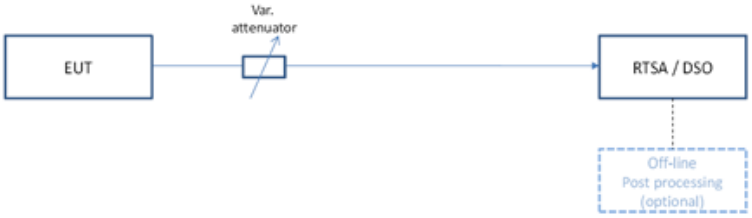



**Figure 2: EUT – Setup Diagram – DCT Conducted Measurements**

### 2.3.3 Test Results

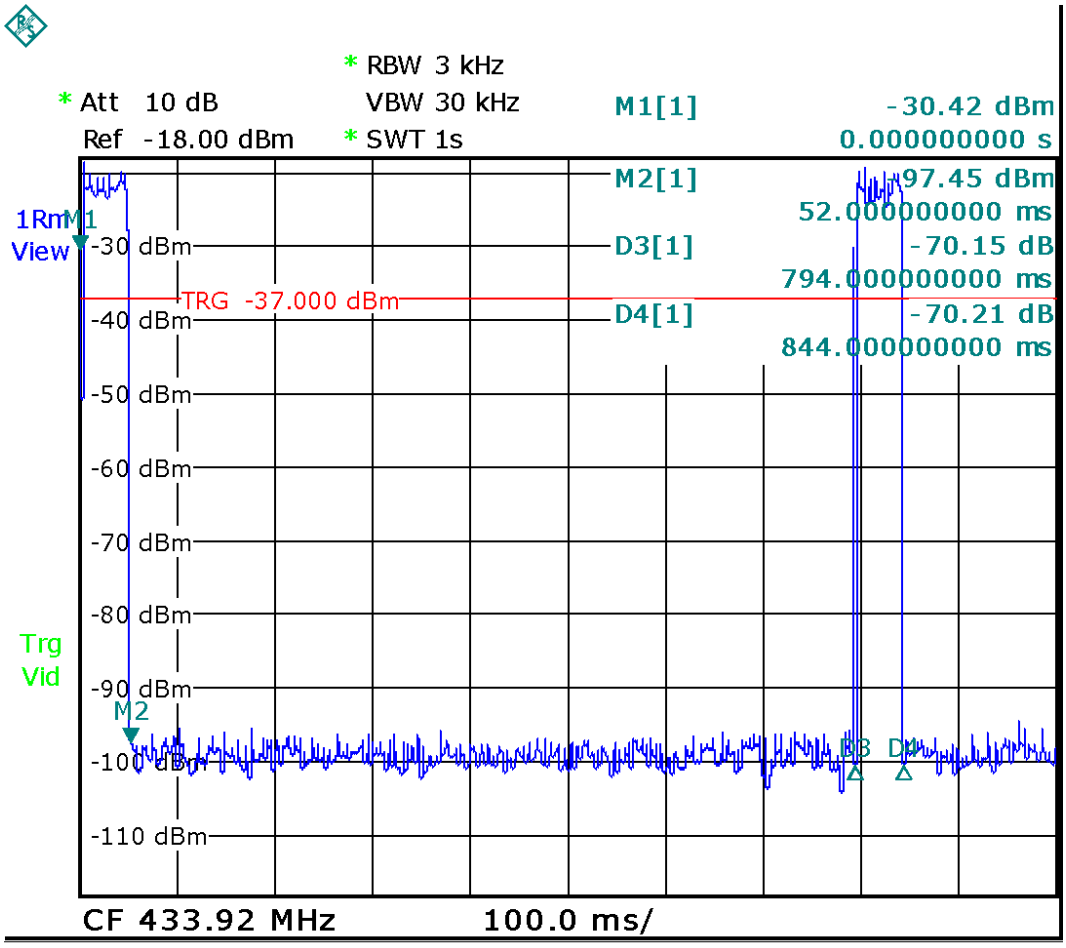
The accumulative DCT template was measured for SR250 models as depicted in Graphs 5 – 8 depicted in Table 13 below.

| Frequency (MHz) | $(T_{on})_1$ $M_2$-$M_1$ (ms) | $(T_1)_1$ $D_3$-$M_2$ (ms) | $(T_{on})_2$ $D_4$-$D_3$ (ms) | $(T_1)_2$ $D_3$-$M_2$ (ms) | $(T_{on})_{Acc}$ $(T_{on})_1+(T_{on})_2$ (ms) | $(T)_{Acc}$ $(T_1)_1+(T_1)_2$ (ms) | DCT $(T_{on})_{Acc}/(T)_{Acc}$ <Note 1> | Limit | Result |
|---|---|---|---|---|---|---|---|---|---|
| 433.92 | 52 <Note 1> | 742 <Note 1> | 42 <Note 2> | 192 <Note 2> | 94 | 934 | 10.06% | <Note 5> | Pass |
| 868.35 | 52 <Note 3> | 740 <Note 3> | 56 <Note 4> | 348 <Note 4> | 108 | 1088 | 9.92% | | Pass |
| Note 1. See Graph 5<br>Note 2. See Graph 6<br>Note 3. See Graph 7<br>Note 4. See Graph 8<br>Note 5. No requirement for these two-frequency bands according to any of the Annex of ETSI EN 300 220-2 (2018-04). | | | | | | | | | |

**Table 13: Test Results – DCT – SR250**

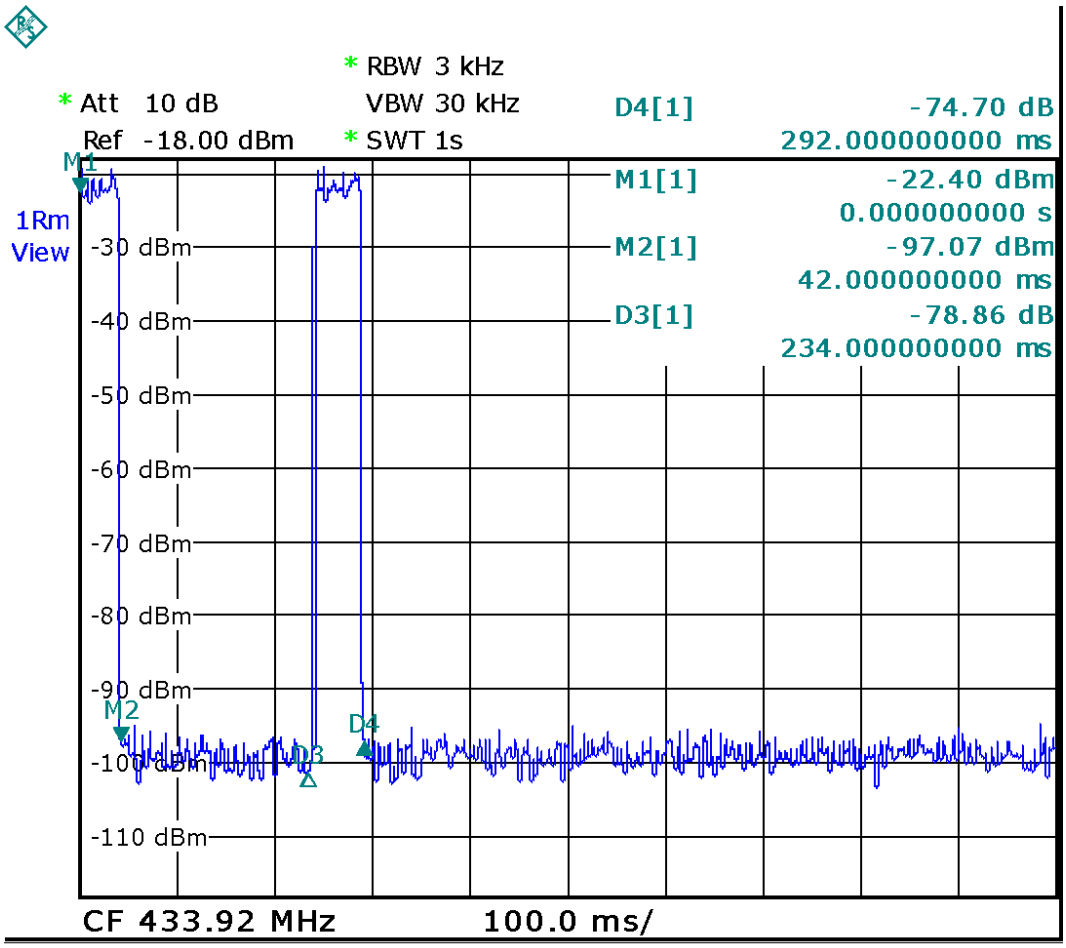
### 2.3.4 Test Data

#### 2.3.4.1 433.92MHz




Date: 18.MAR.2020 17:49:02

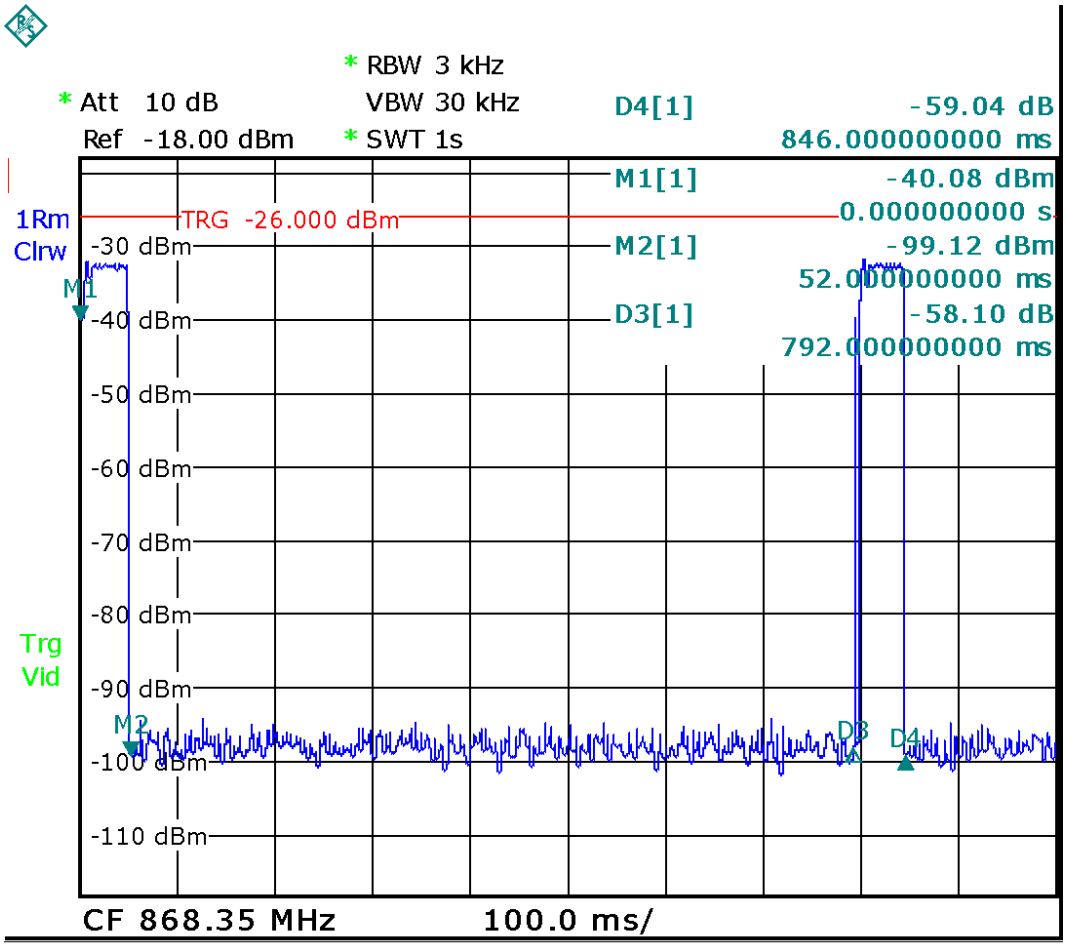
**Graph 5 : DCT – $T_1$ – SR250 – 433.92MHz**




Date: 18.MAR.2020 17:50:59

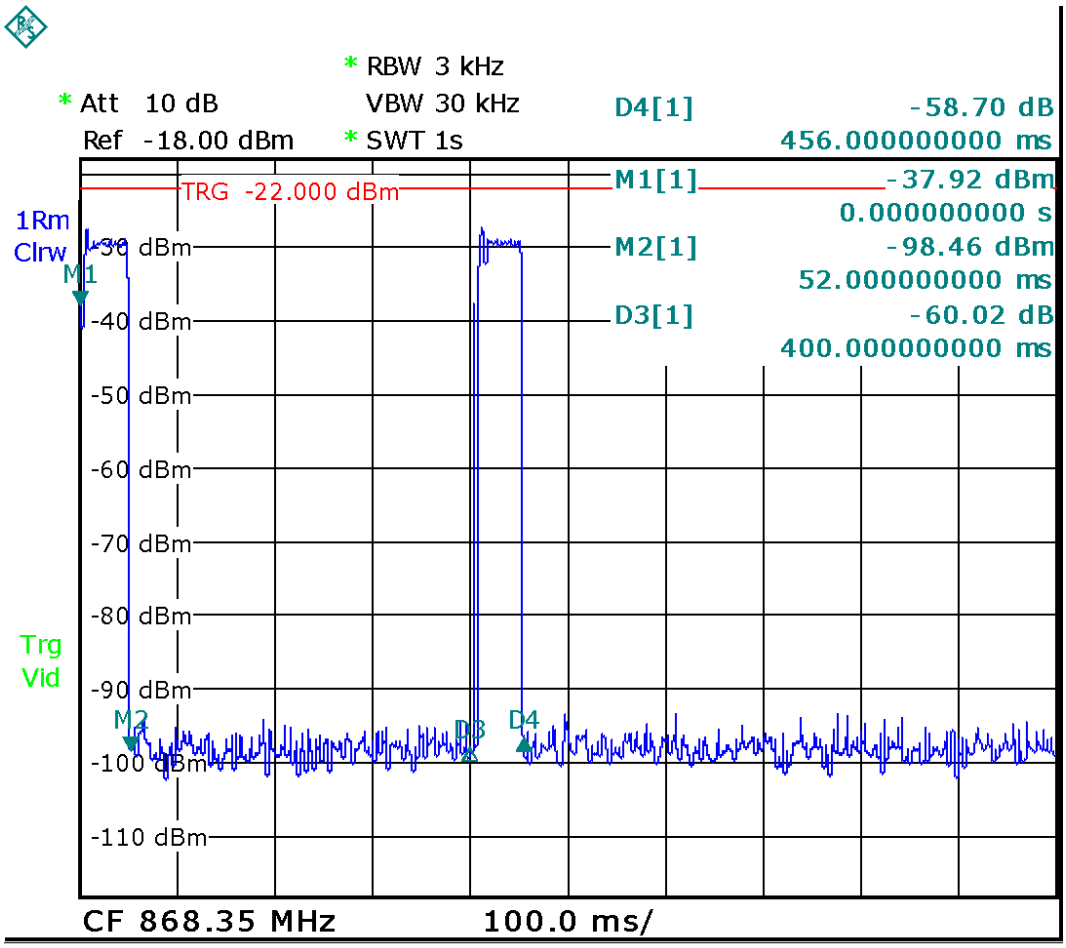
**Graph 6 : DCT – $(T_1)_2$ – SR250 – 433.92MHz**

#### 2.3.4.1 868.35MHz




Date: 18.MAR.2020 17:43:27

**Graph 7 : DCT – $T_1$ – SR250 – 868.35MHz**




Date: 18.MAR.2020 17:44:51

**Graph 8 : $(T_{on})_2$ – SR250 – 868.35MHz**

### 2.3.5 Test Method

Tests were conducted according to the method of the reference standards in section 2.3.1.

### 2.3.6 Test Location and Test Equipment Used

This test was carried out in Laval test location.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due (YYY-MM-DD) |
|---|---|---|---|---|---|
| Log Periodic Antenna | Electro-Metrics | LPA-25 | 4087 | 12 | 2020/11/29 |
| Signal Generator | ROHDE & SCHWARZ | SMB100A | 4135 | 12 | 2020/08/23 |
| Cable 160 in SMA to N | FLORIDA RF LABS | Lab-Flex 335 | 4138 | NA | NCR |
| Variable Attenuator Rotary Attenuator | ETLS System | VAT02BXP-4242 | N/A | NA | NCR |

**Table 14 Throughput – Test Equipment**

## 2.4 Occupied Bandwidth

### 2.4.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | Clause 5.6 of ETSI EN 300 220-1 V3.1.1 (2017-02)<br>Clause 4.3.4 of ETSI EN 300 200-2 V3.2.0 (2018-04) |

**SPECIFICATIONS**

| | |
|---|---|
| **Frequency** | 433.92MHz<br>868.35MHz |
| **RBW** | (1.5% OCW) = 0.15x200=30kHz |
| **VBW** | 3xRBW~100kHz |
| **Spam** | 2xOCW = 400kHz |
| **Detector** | RMS |
| **Trace** | Max hold |
| **RTSA – Function** | Channel Bandwidth |

**EUTs**

| | |
|---|---|
| **Identification** | SR250– 433.92MHz<br>SR250– 868.35MHz |
| **Voltage Input** | Battery Power<br>4.5Vdc |
| **Test Mode** | Mode #3 in Table 4. |

**ENVIROMENTAL & TEST INFO**

| | |
|---|---|
| **Test Date (YYYY-MM-DD)** | 2020-03-18 |
| **Temperature °C (For Info Only)** | 23 |
| **Humidity %(For Info Only)** | 11.4 |
| **Atmospheric Pressure kPa (For Info Only)** | 103.4 |
| **Engineer** | Jose Martinez Ortega |
| **Client Witness** | No witness |

### 2.4.2 Limits

The OBW shall be in accordance value allowed in Annex B in EN 300 220-1 for the chosen operation frequency band(s). The harmonized frequency bands and the specification for non specific SDR are depicted in Table 15.

| SRD Classification <Note 1> | Frequency Band (MHz) | Limit (MHz) | OBW (%) |
|---|---|---|---|
| H | 433.050 – 434.790 | 1.74 | 99 |
| M | 868.00 – 868.600 | 0.6 | |
| Note 1. According to Appendix B in ETSI EN 300 220-1 V3.1.1 (2018-04) | | | |

**Table 15 – OBW – Limits**

### 2.4.3 Test Procedure

The conducted measurement procedure in clause 5.6.3.4 of ETSI EN 300 220-1 V3.1.1. was used. The measurement was performed during continuously transmitting and mode no. 3 as depicted in Table 4.

### 2.4.4 Test Procedure

The test setup was identical as depicted in Section 2.1.3

### 2.4.5 Test Results

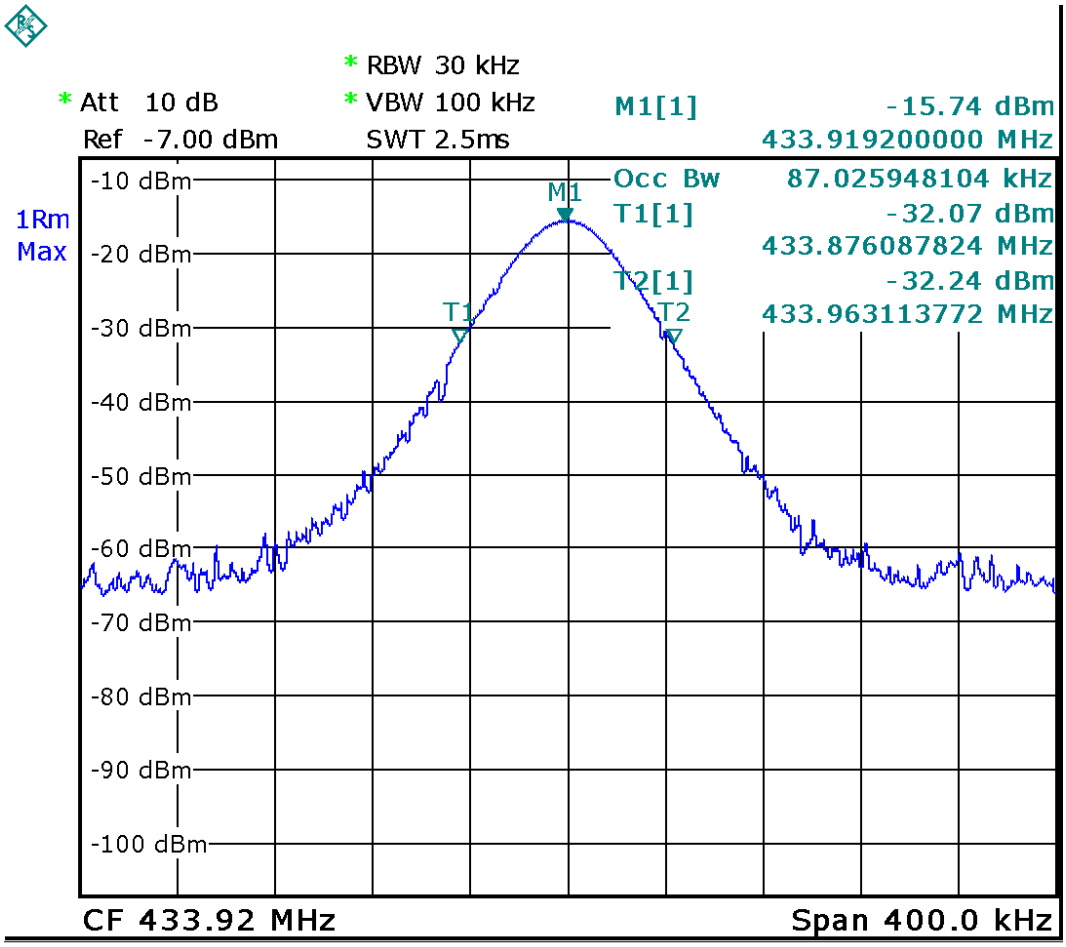
Test results are summarized in Table 16 below.

| SRD Classification Reference | Operating Frequency (MHz) | OBW (kHz) | Limit (MHz) | Result |
|---|---|---|---|---|
| H Appendix B <Note 1> | 433.92 | 87.03 | 1.74 | Pass |
| M Appendix B <Note 1> | 868.35 | 88.62 | 0.6 | Pass |
| Note 1. See page 22 of ETSI EN 300 220-1 V3.1.1 (2018-04) | | | | |

**Table 16 – OBW – Results – SR250**

### 2.4.6 Test Data

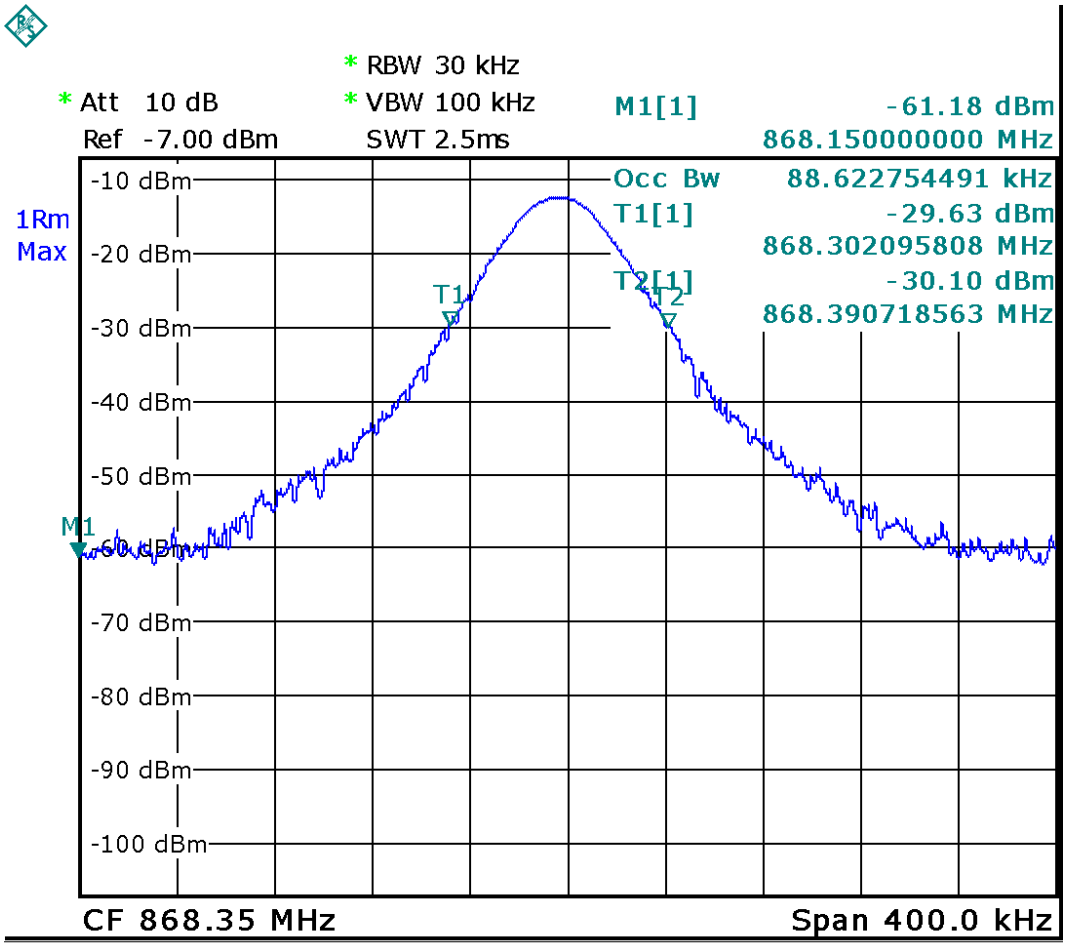
#### 2.4.6.1 Model – 433.92MHz




Date: 19.MAR.2020 09:28:47

**Graph 9 : OBW – SR250 – 433.92MHz**

### 2.4.6.2 Model 868.35MHz




Date: 19.MAR.2020 09:32:41

**Graph 10 : OBW – SR250 – 868.35MHz**

### 2.4.7 Test Method

Tests were conducted according to the method of the reference standards mentioned in Section 2.2.1.

### 2.4.8 Test Location and Test Equipment Used

This test was carried out in Laval test location.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due (YYY-MM-DD) |
|---|---|---|---|---|---|
| Cable 160 in SMA to N | FLORIDA RF LABS | Lab-Flex 335 | 4138 | NA | NCR |
| Variable Attenuator Rotary Attenuator | ETLS System | VAT02BXP-4242 | N/A | NA | NCR |
| Spectrum Analyzer | Rohde & Schwarz | ESU-40 | 4092 | 12 | 2020-06-06 |
| Spectrum Analyzer | Rohde & Schwarz | FSL6 | 4095 | 24 | 2020-09-02 |

**Table 17 Throughput – Test Equipment**

## 2.5 Tx OOB Emissions

### 2.5.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | Clause 5.8 of ETSI EN 300 220-1 V3.1.1 (2017-02)<br>Clause 4.3.5 of ETSI EN 300 220 V3.2.1 (2018-04) |

**SPECIFICATIONS**

| | |
|---|---|
| **Operating Frequencies (MHz)** | 433.92<br>868.35 |
| **Limits** | See Figure 3 & Figure 4. |
| **RBW** | See Table 18 |
| **Span** | See Figure 3 & Figure 4. |
| **Detector** | RMS |

**EUTs**

| | |
|---|---|
| **Identification** | SR250– 433.92MHz<br>SR250– 868.35MHz |
| **Voltage Input** | 4.5Vdc |

**ENVIROMENTAL & TEST INFO**

| | |
|---|---|
| **Test Date (YYYY-MM-DD)** | 2020-03-19 |
| **Temperature °C (For Info Only)** | 22.4 |
| **Humidity %(For Info Only)** | 17 |
| **Atmospheric Pressure kPa (For Info Only)** | 101 |
| **Engineer** | Jose Martinez Ortega |
| **Client Witness** | No witness |

### 2.5.2 Limits

Limits of OOB domains are defined, one for Operating Channel (see Figure 3) and one for Operational Frequency band (see Figure 4).

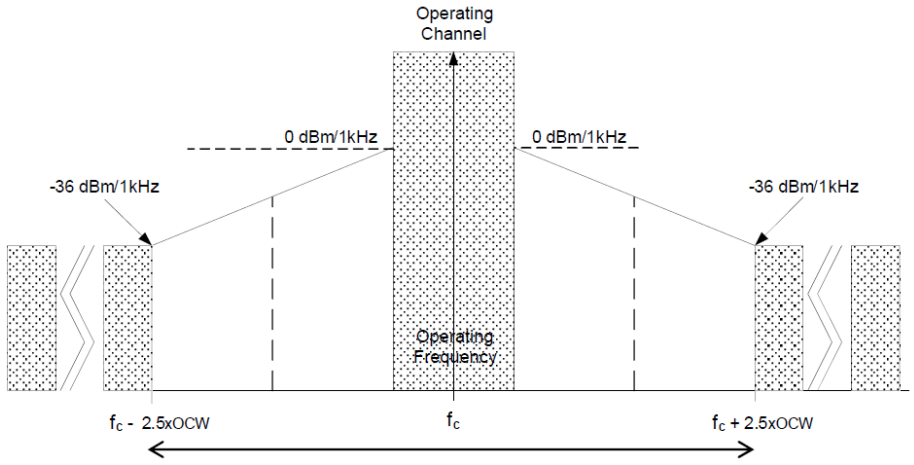



**Figure 3: EUT – OOB Limits – Operating Channel with respect to RBW**

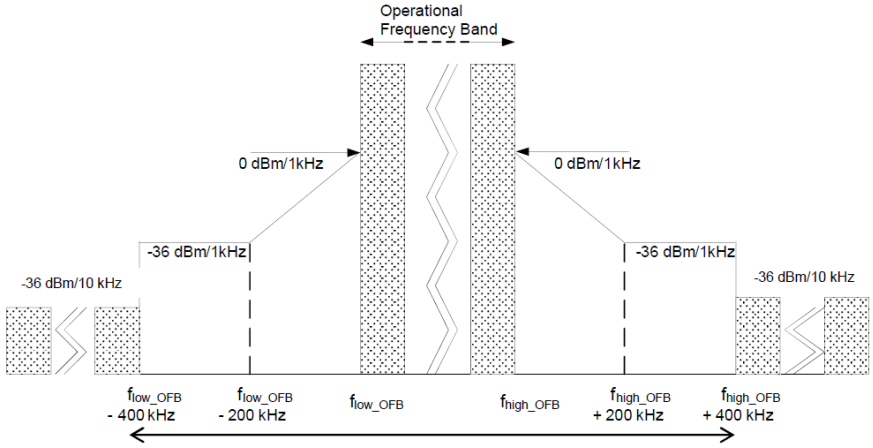



**Figure 4: EUT – OOB Limits – Operating Frequency Band with respect to RBW**

### 2.5.3 Test Results

#### 2.5.3.1 Model – 433.92MHz

| Domain | Frequency Range | $RBW_{REF}$ | Max power limit | Result |
|---|---|---|---|---|
| OOB limits applicable to Operational Frequency Band (See Figure 4) | $f \le f_{low\_OFB}$ - 400 kHz<br>f ≤ 433.88MHz – 0.4MHz = 433.48MHz | 10 kHz | -36 dBm | Pass |
| | $F_{low\_OFB}$ - 400 kHz ≤ f ≤$f_{flow\_OFB}$ - 200 kHz<br>433.476MHz ≤ f ≤ 433.68MHz | 1 kHz | -36 dBm | Pass |
| | $f_{low}$ - 200 kHz ≤ f < $f_{low\_OFB}$<br>433.68MHz ≤ f < 433.88MHz | 1 kHz | See Figure 4 | Pass |
| | f = $f_{low\_OFB}$ = 433.88MHz | 1 kHz | 0 dBm | Pass |
| | f = $f_{high\_OFB}$= 433.96MHz | 1 kHz | 0 dBm | Pass |
| | $F_{high\_OFB}$ < f ≤ $f_{fhigh\_OFB}$ + 200 kHz<br>433.96MHz < f ≤ 434.16 MHz | 1 kHz | See Figure 4 | Pass |
| | $F_{high\_OFB}$ + 200 kHz ≤ f ≤ $f_{fhigh\_OFB}$ + 400 kHz<br>434.16 MHz ≤ f ≤ 434.36 MHz | 1 kHz | -36 dBm | Pass |
| | $F_{high\_OFB}$ + 400 kHz ≤ f<br>434.36 MHz ≤ f | 10 kHz | -36 dBm | Pass |
| OOB limits applicable to Operating Channel (See Figure 3) | f = $f_c$ - 2.5 x OCW<br>433.42 MHz | 1 kHz | -36 dBm | Pass |
| | $f_c$ - 2,5 x OCW ≤ f ≤ $f_c$ - 0,5 x OCW<br>434.42 MHz ≤ f ≤ 433.82MHz | 1 kHz | See Figure 3 | Pass |
| | f = $f_c$ - 0,5 x OCW<br>f = 433.82MHz | 1 kHz | 0 dBm | Pass |
| | f = $f_c$ + 0,5 x OCW<br>f = 434.02MHz | 1 kHz | 0 dBm | Pass |
| | $f_c$ + 0,5 x OCW ≤ f ≤ $f_c$ + 2,5 x OCW<br>434.02MHz ≤ f ≤ 434.42MHz | 1 kHz | See Figure 3 | Pass |
| | f = $f_c$ + 2,5 x OCW<br>434.42MHz | 1 kHz | -36 dBm | Pass |

f is the measurement frequency.
$f_c$ is the Operating Frequency = 433.92MHz
$F_{low\_OFB}$ is the lower edge of the Operational Frequency Band. See Graph 9 T1= 433.88MHz
$F_{high\_OFB}$ is the upper edge of the Operational Frequency Band. See to Graph 9; T2 = 433.96MHz

**Table 18 – OBB – Results – 433.92MHz**

#### 2.5.3.1 Model – 868.35MHz

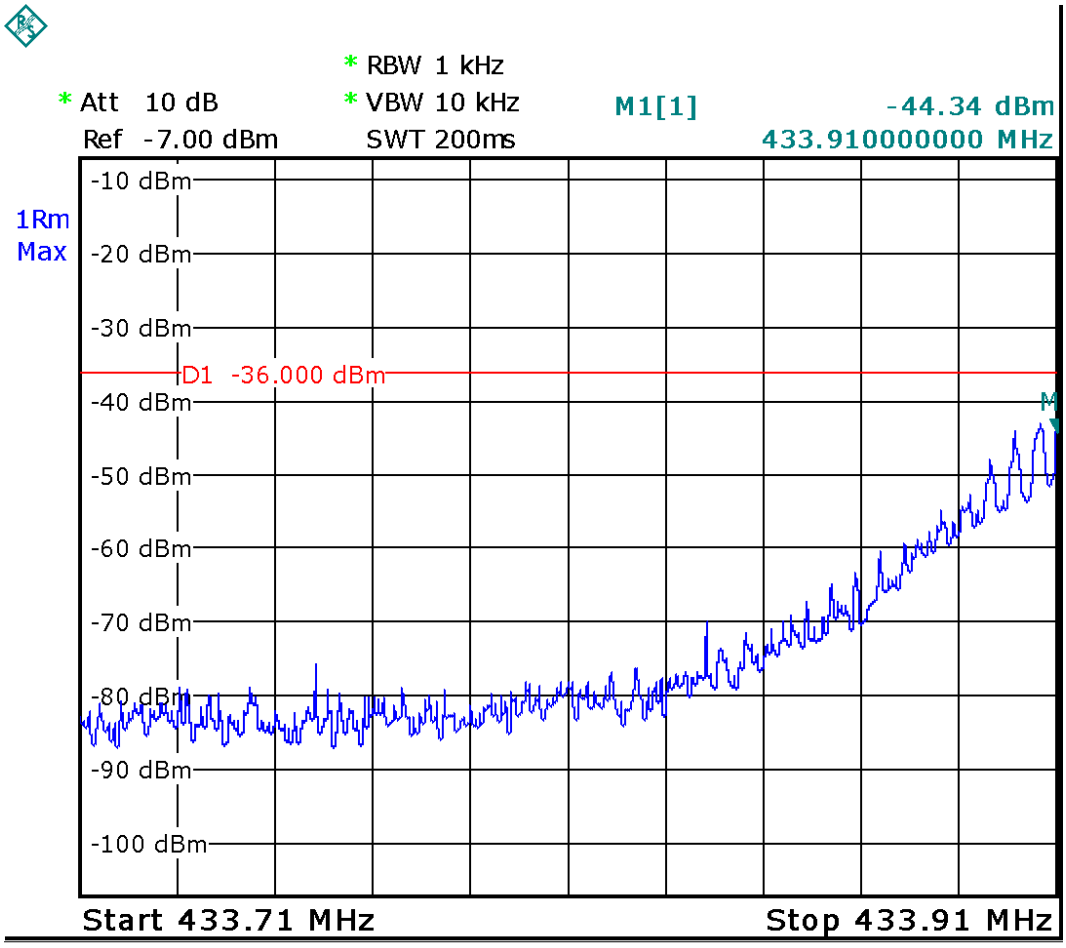
| Domain | Frequency Range | $RBW_{REF}$ | Max power limit | Result |
|---|---|---|---|---|
| OOB limits applicable to Operational Frequency Band (See Figure 4) | $f \leq f_{low\_OFB}$ - 400 kHz = 867.9MHz | 10 kHz | -36 dBm | Pass |
| | $F_{low\_OFB}$ - 400 kHz ≤ f ≤$f_{flow\_OFB}$ - 200 kHz<br>867.9MHz ≤ f ≤ 868.1MHz | 1 kHz | -36 dBm | Pass |
| | $f_{low}$ - 200 kHz ≤ f < $f_{low\_OFB}$<br>868.10MHz ≤ f < 868.30MHz | 1 kHz | See Figure 6 | Pass |
| | f = $f_{low\_OFB}$ =868.30MHz | 1 kHz | 0 dBm | Pass |
| | f = $f_{high\_OFB}$ = 868.39MHz | 1 kHz | 0 dBm | Pass |
| | $F_{high\_OFB}$ < f ≤ $f_{fhigh\_OFB}$ + 200 kHz<br>868.39MHz < f ≤ 868.59MHz | 1 kHz | See Figure 6 | Pass |
| | $F_{high\_OFB}$ + 200 kHz ≤ f ≤ $f_{fhigh\_OFB}$ + 400 kHz<br>868.59MHz ≤ f ≤ 868.79MHz | 1 kHz | -36 dBm | Pass |
| | $F_{high\_OFB}$ + 400 kHz ≤ f<br>868.79MHz ≤ f | 10 kHz | -36 dBm | Pass |
| OOB limits applicable to Operating Channel (See Figure 3) | f = $f_c$ - 2.5 x OCW<br>868.59MHz – 0.5MHz = 868.09MHz | 1 kHz | -36 dBm | Pass |
| | $f_c$ - 2,5 x OCW ≤ f ≤ $f_c$ - 0,5 x OCW<br>868.09MHz ≤ f ≤ 868.25MHz | 1 kHz | See Figure 5 | Pass |
| | f = $f_c$ - 0,5 x OCW<br>868.35MHz-0.1MHz= 868.25MHz | 1 kHz | 0 dBm | Pass |
| | f = $f_c$ + 0,5 x OCW<br>868.35MHz + 0.1MHz = 868.45MHz | 1 kHz | 0 dBm | Pass |
| | $f_c$ + 0,5 x OCW ≤ f ≤ $f_c$ + 2,5 x OCW<br>868.25MHz ≤ f ≤ 868.85MHz | 1 kHz | See Figure 5 | Pass |
| | f = $f_c$ + 2,5 x OCW<br>868.35MHz+0.5MHz = 868.85MHz | 1 kHz | -36 dBm | Pass |

f is the measurement frequency.
$f_c$ is the Operating Frequency = 868.35MHz
$F_{low\_OFB}$ is the lower edge of the Operational Frequency Band. See Graph 10; T1 = 868.30MHz
$F_{high\_OFB}$ is the upper edge of the Operational Frequency Band. See Graph 10; T2 = 868.39MHz

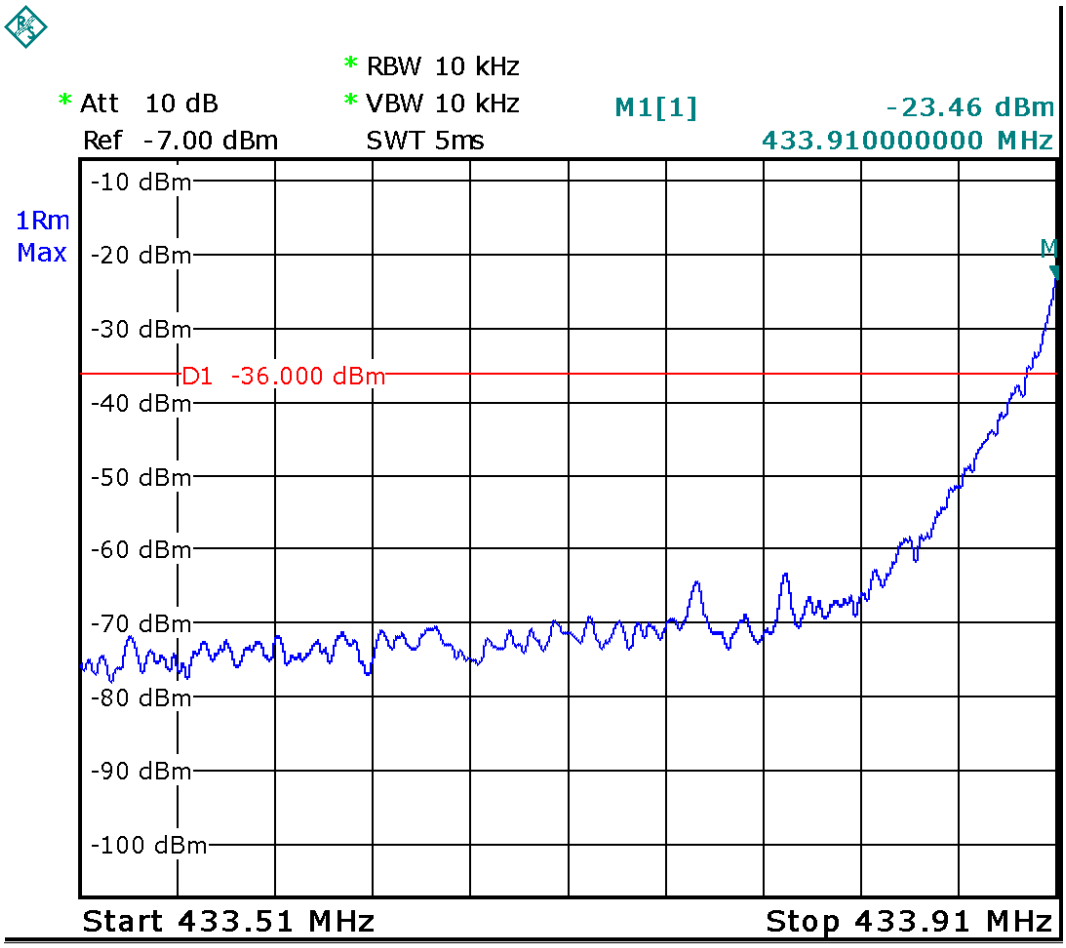
**Table 19 – OBB – Results – 868.35MHz**

### 2.5.4 Test Data

#### 2.5.4.1 Model – 433.92MHz

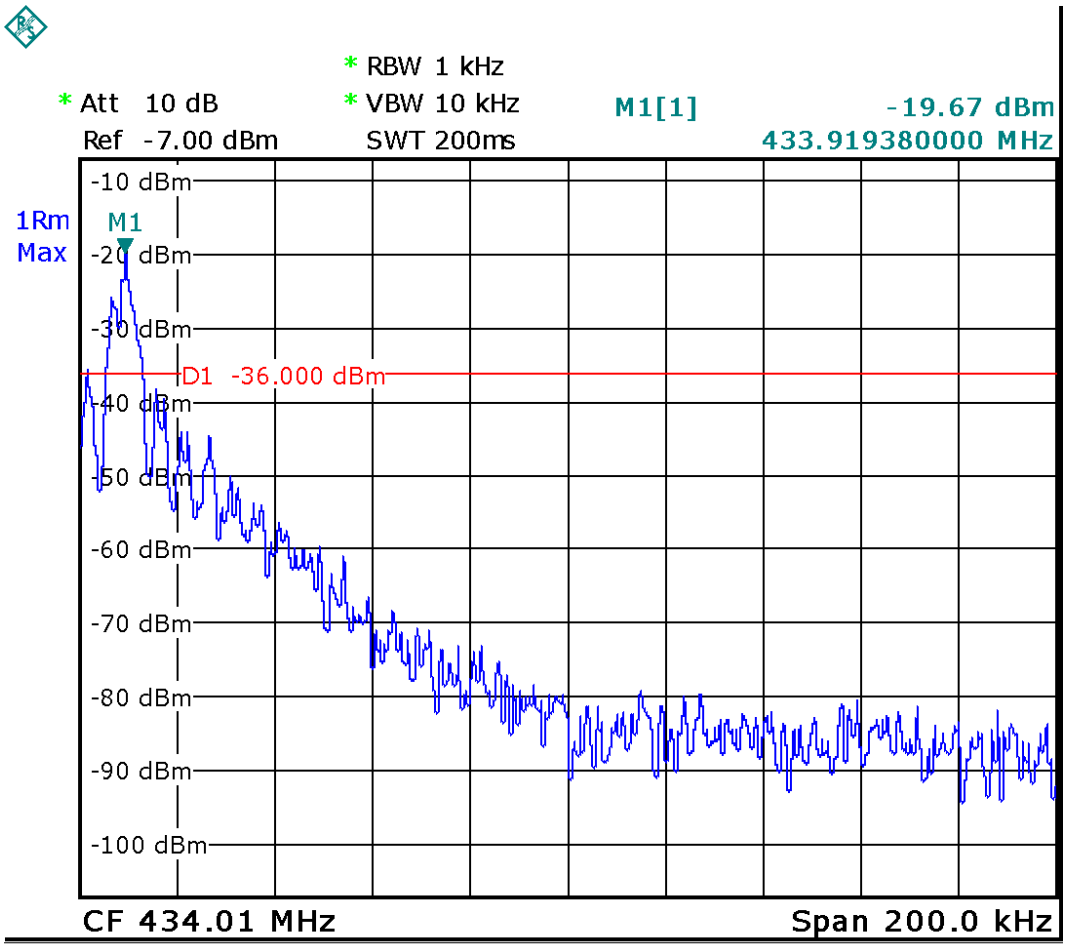



**Graph 11 : OOB – Lower Band – RBW =1kHz – SR250 – 433.92MHz**



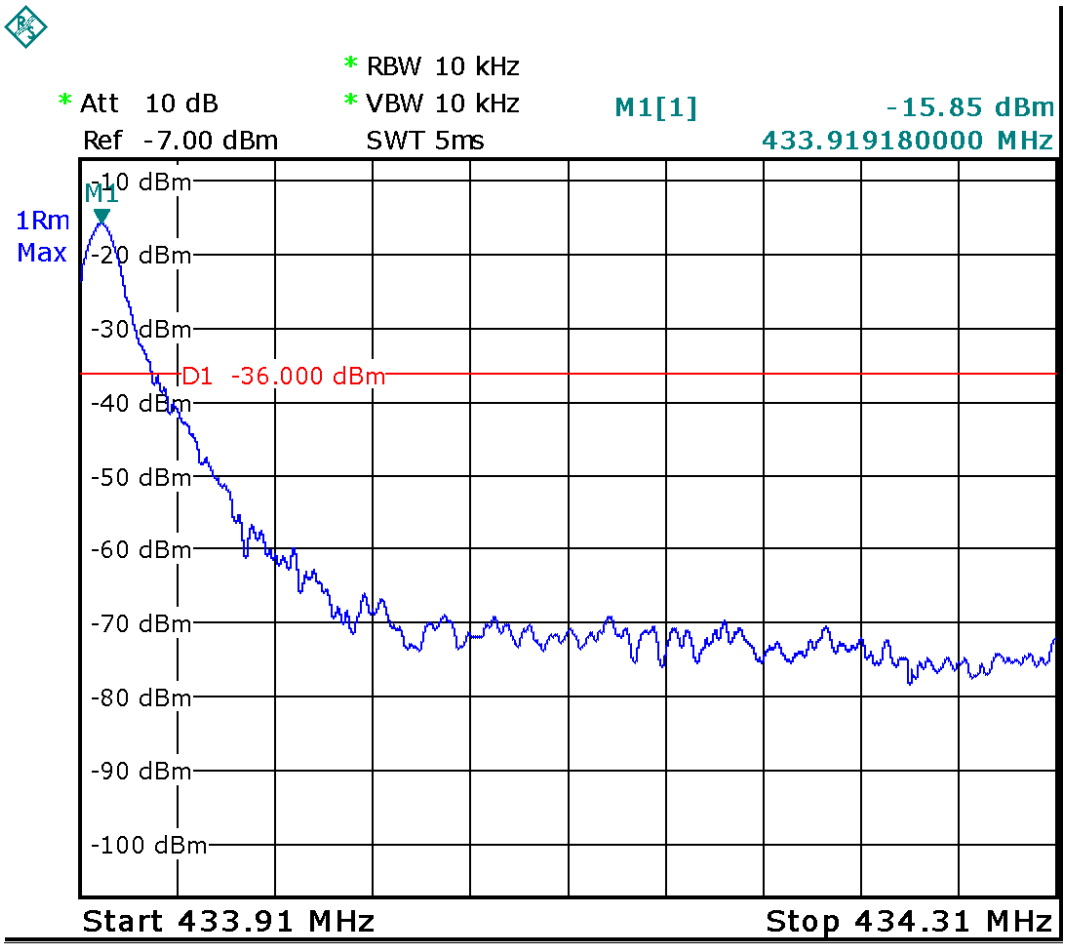

Date: 19.MAR.2020 12:33:17

**Graph 12 : OOB – Lower Band – RBW =10kHz – SR250 – 433.92MHz**




Date: 19.MAR.2020 12:51:12

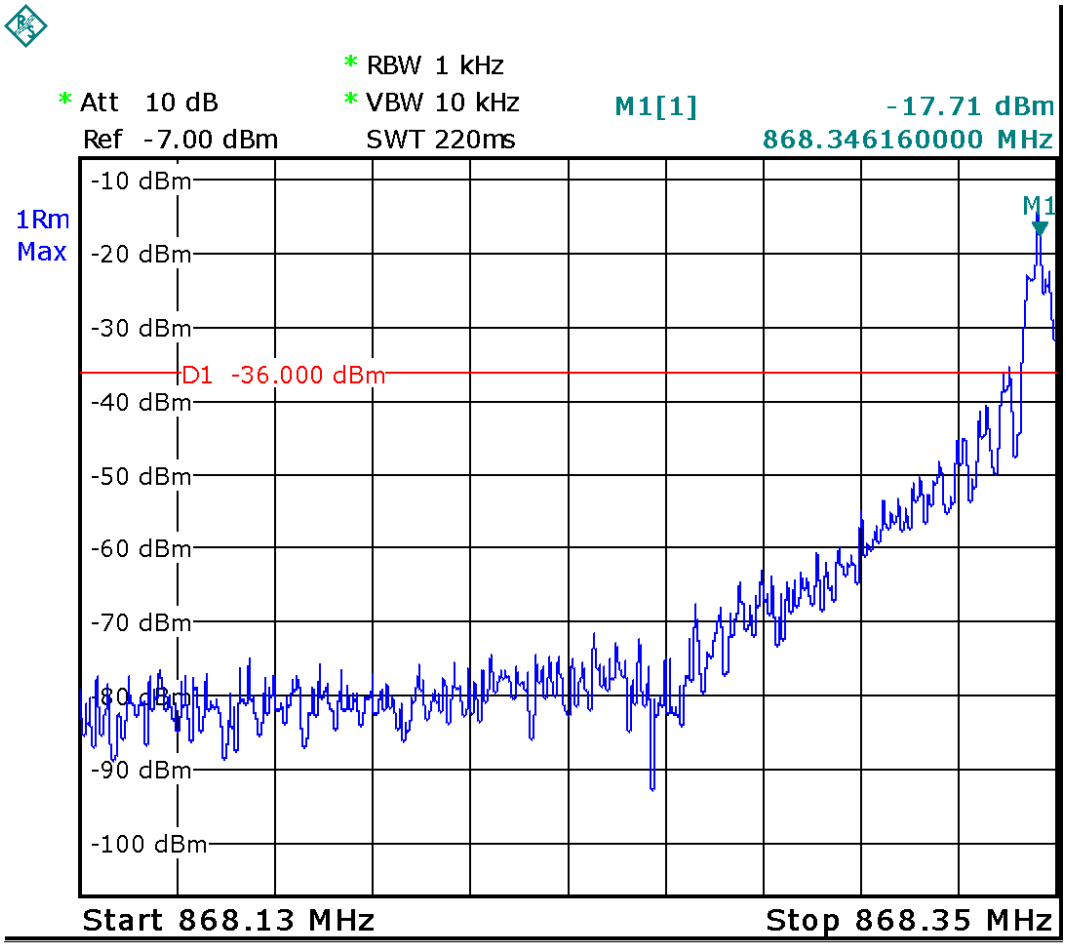
**Graph 13 : OOB – High Band – RBW =1kHz – SR250 – 433.92MHz**



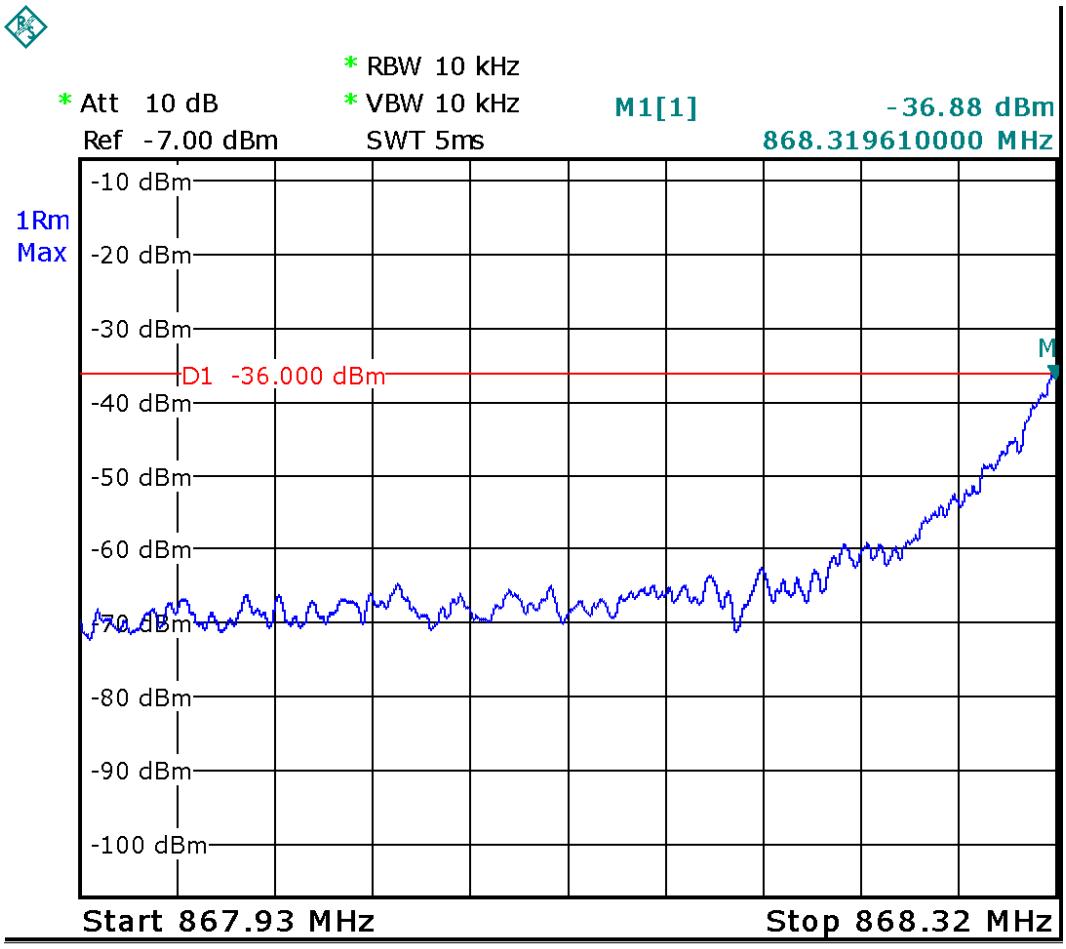

Date: 19.MAR.2020 12:34:35

**Graph 14 : OOB – High Band – RBW =10KHz – SR250 – 433.92MHz**

### 2.5.4.2 Model – 868.35MHz

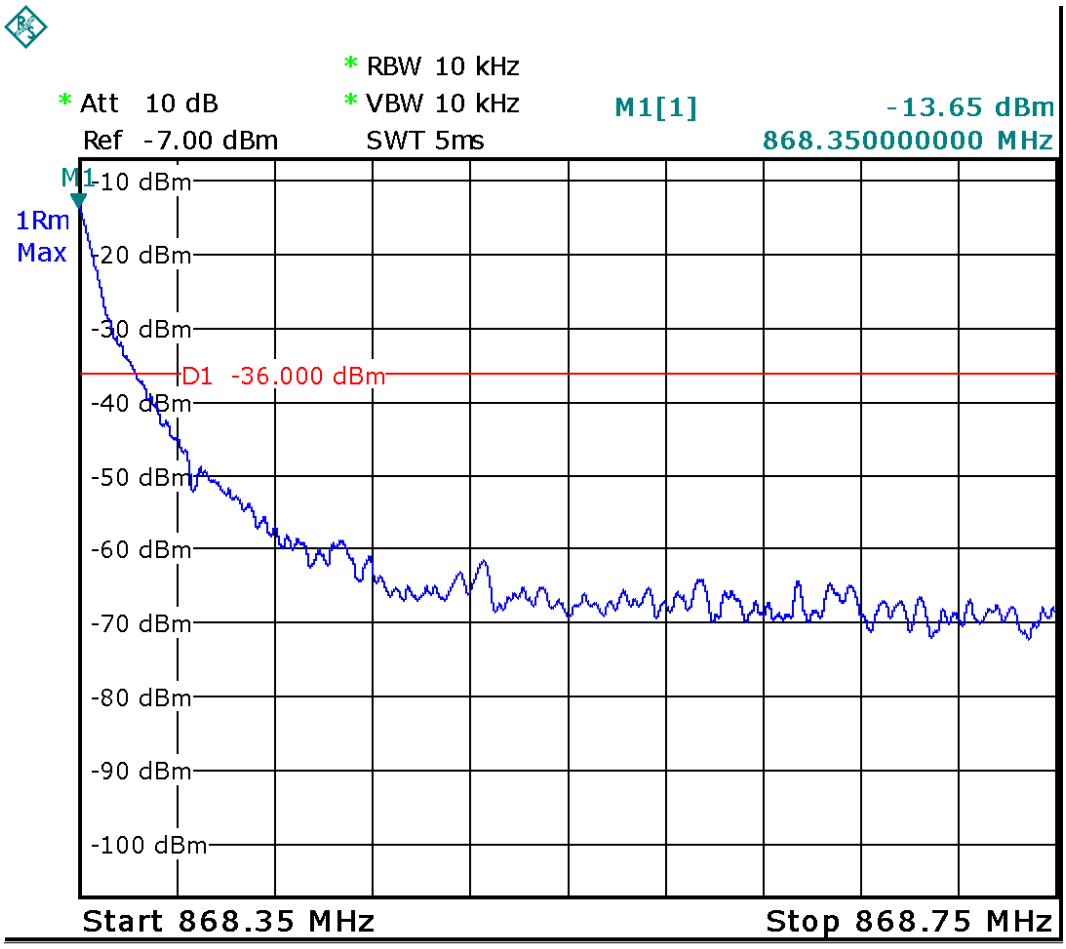



**Graph 15 : OOB – Lower Band – RBW=1kHz – SR250 – 868.35MHz**



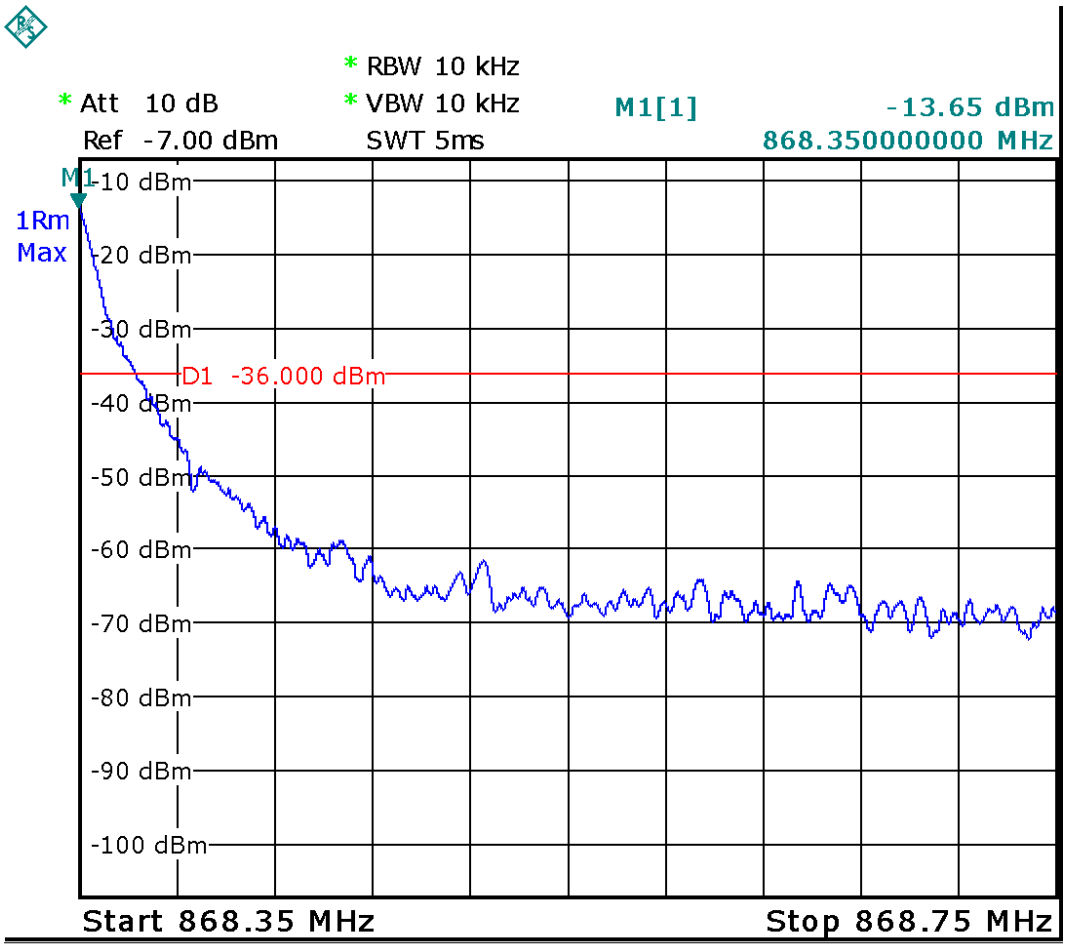

Date: 19.MAR.2020 10:29:38

**Graph 16 : OOB – Lower Band – RBW=10kHz – SR250 – 868.35MHz**




Date: 19.MAR.2020 10:33:13

**Graph 17 : OOB – High Band – RBW=1kHz – SR250 – 868.35MHz**




Date: 19.MAR.2020 10:33:13

**Graph 18 : OOB – High Band – RBW=10kHz – SR250 – 868.35MHz**

### 2.5.1 Setup Diagram

The test setup was identical as depicted in Section 2.1.3

### 2.5.2 Test Method

Tests were conducted according to the method of the reference standards referred in Section 2.5.1.

### 2.5.3 Test Location and Test Equipment Used

This test was carried out in Laval test location.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due (YYY-MM-DD) |
|---|---|---|---|---|---|
| Spectrum Analyzer | Rohde & Schwarz | FSL6 | 4095 | 24 | 2020-09-02 |
| Cable 160 in SMA to N | FLORIDA RF LABS | Lab-Flex 335 | 4138 | NA | NCR |
| Variable Attenuator Rotary Attenuator | ETLS System | VAT02BXP-4242 | N/A | NA | NCR |

**Table 20 Interference Outside the Assigned Band – Test Equipment**

## 2.6 Tx– & Rx– unwanted Spurious Emissions

### 2.6.1 Test Details

**SPECIFICATION REFERENCE** Clause 5.9.1.2 of ETSI EN 300 220-1 V3.2.1 (2017-02)

**SPECIFICATIONS**

**Frequency** 433.92MHz
868.35MHz

**Limits** See Table 21

**EUTs**

**Identification** SR250– 433.92MHz
SR250– 868.35MHz

**Voltage Input** 4.5Vdc

**Test Mode** Mode #5 in Table 4.

**ENVIROMENTAL & TEST INFO**

| | | |
|---|---|---|
| **Test Date (YYYY-MM-DD)** | 2020-02-20 | 2020-03-16 |
| **Temperature °C (For Info Only)** | 23 | 21 |
| **Humidity %(For Info Only)** | 15 | 11 |
| **Atmospheric Pressure kPa (For Info Only)** | 100.1 | 102.1 |
| **Engineer** | Jose Martinez-Ortega | |
| **Client Witness** | No witness | |

### 2.6.1 Limits

The power of any unwanted emission in the spurious domain shall not exceed the values given in Table 19.

**Table 19: Spurious domain emission limits**

| Frequency / State | 47 MHz to 74 MHz<br>87,5 MHz to 118 MHz<br>174 MHz to 230 MHz<br>470 MHz to 790 MHz | Other frequencies below 1 000 MHz | Frequencies above 1 000 MHz |
|---|---|---|---|
| TX mode | -54 dBm | -36 dBm | -30 dBm |
| RX and all other modes | -57 dBm | -57 dBm | -47 dBm |

**Table 21 Tx/Rx Spurious – Emission Limits**

### 2.6.2 Test Results

#### 2.6.2.1 Tx Spurious Emissions

| Frequency (MHz) | Detector | Polarization | Limit(s) (dBm) | Results |
|---|---|---|---|---|
| 25 – 30 | RMS | N/A | -36 | Pass |
| 30 – 1000 | RMS | Horizontal | Tx mode in Table 20 | Pass |
| | | Vertical | | Pass |
| 1 000 – 6000 | RMS | Horizontal | -30 | Pass |
| | | Vertical | | Pass |

**Table 22 Tx Spurious – Results – SR433.92MHz**

| Frequency (MHz) | Detector | Polarization | Limit(s) (dBm) | Results |
|---|---|---|---|---|
| 25 – 30 | RMS | N/A | -36 | Pass |
| 30 – 1000 | RMS | Horizontal | Tx mode in Table 20 | Pass |
| | | Vertical | | Pass |
| 1 000 – 6000 | RMS | Horizontal | -30 | Pass |
| | | Vertical | | Pass |

**Table 23 Tx Spurious – Results – SR868.35MHz**

### 2.6.1 Rx Spurious Emissions

| Frequency (MHz) | Detector | Limit(s) (dBm) | Results |
|---|---|---|---|
| 25 – 1000 | RMS | -57 | Pass |
| 1000 – 4000 | RMS | -47 | Pass |

**Table 24 Rx Spurious – Results – SR433.92MHz**

| Frequency (MHz) | Detector | Limit(s) (dBm) | Results |
|---|---|---|---|
| 25 – 1000 | RMS | -57 | Pass |
| 1000 – 4000 | RMS | -47 | Pass |

**Table 25 Rx Spurious – Results – SR868.35MHz**

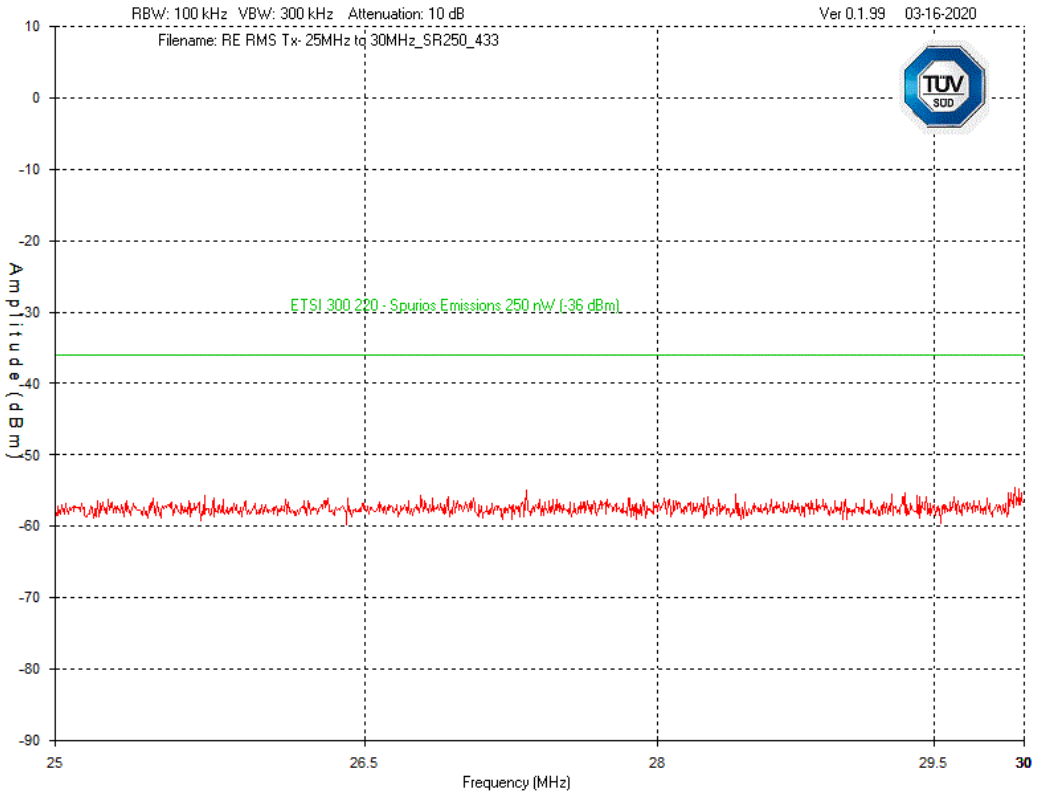
### 2.6.2 Test Data

#### 2.6.2.1 Tx Spurious Emissions

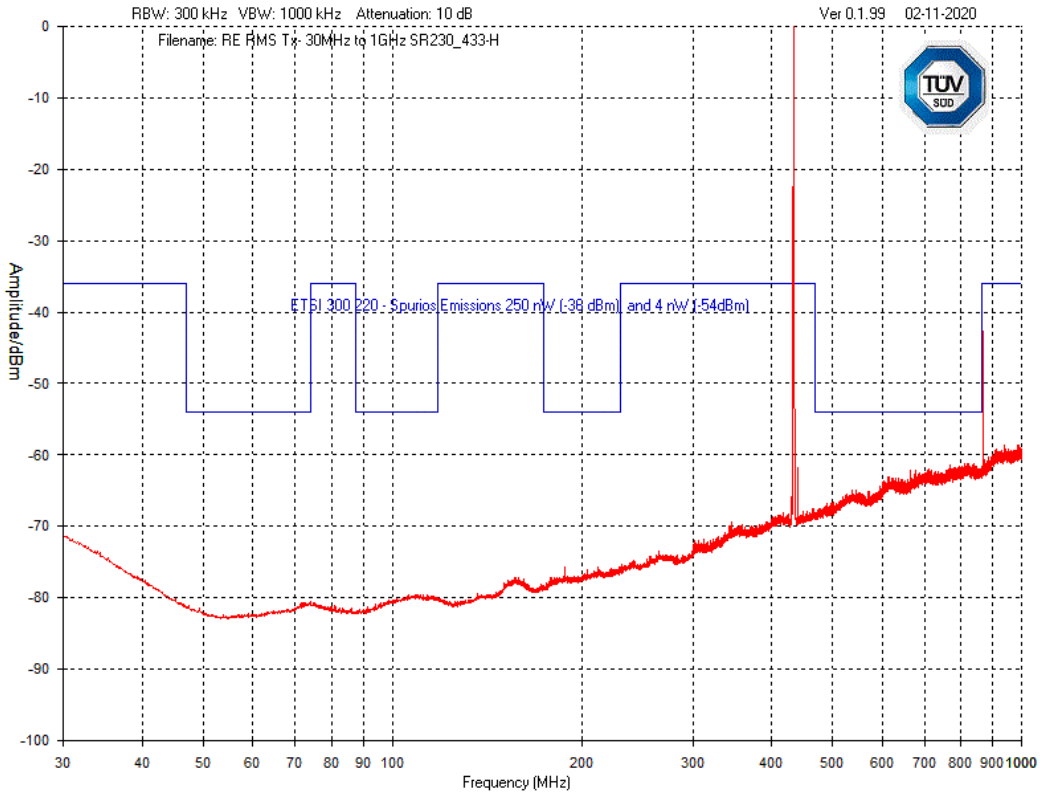
The graphs shown below are maximized peak measurement graphs measured with a resolution bandwidth greater than or equal to the final required detector over a full 0-360°. This peaking process is done as a worst-case measurement and enables the detection of frequencies of concern for final measurement. For final measurements with the appropriate detector, where applicable, please refer to the tables under Final Measurements.

Worst-case scenarios of measurements are given in Appendix B

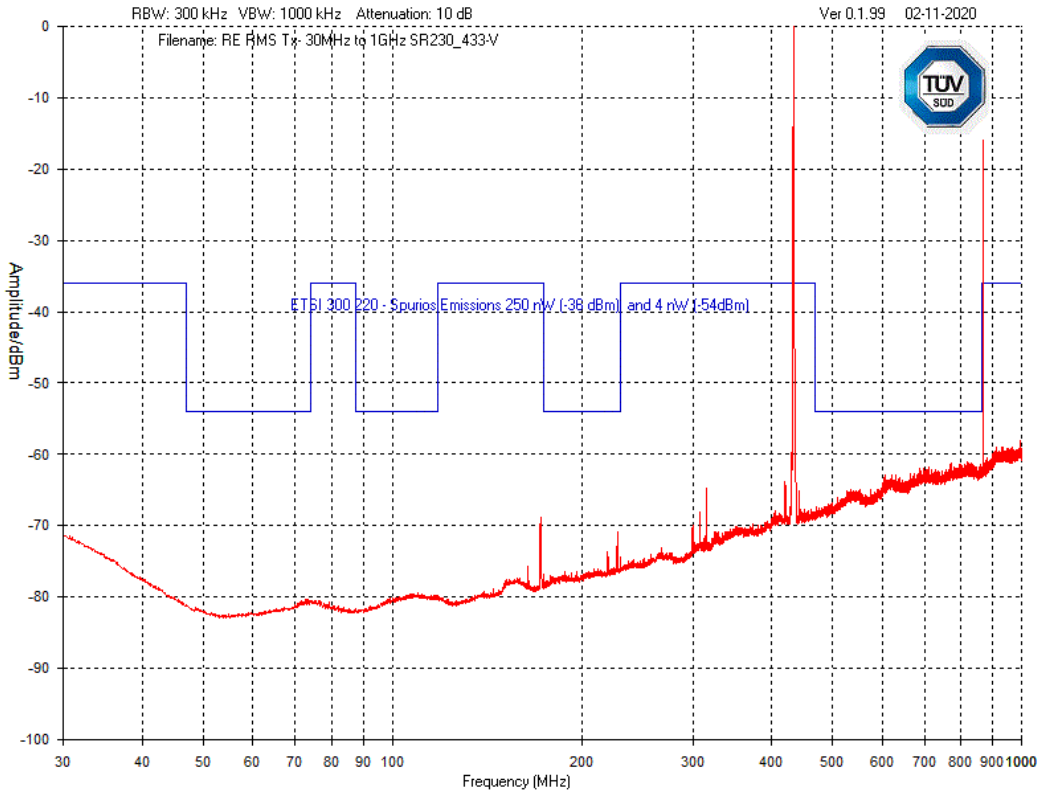
**I. SR250-433.92MHz – Model**



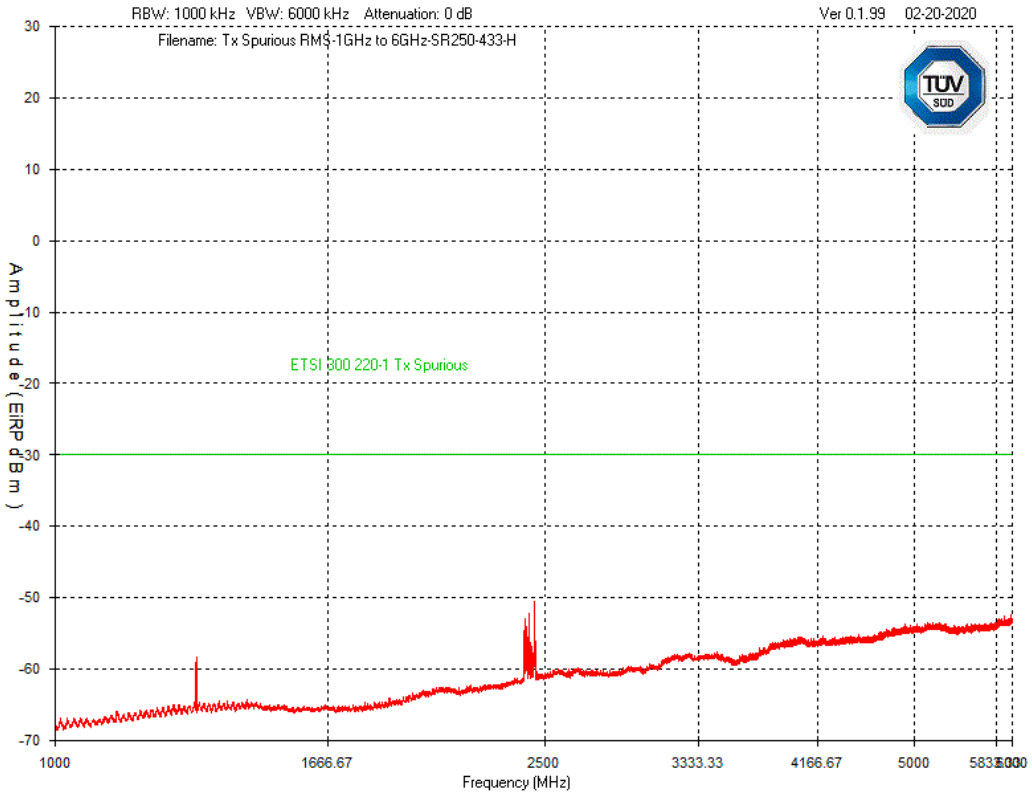

**Graph 19 : Tx Spurious Emissions – 25MHz to 30MHz**



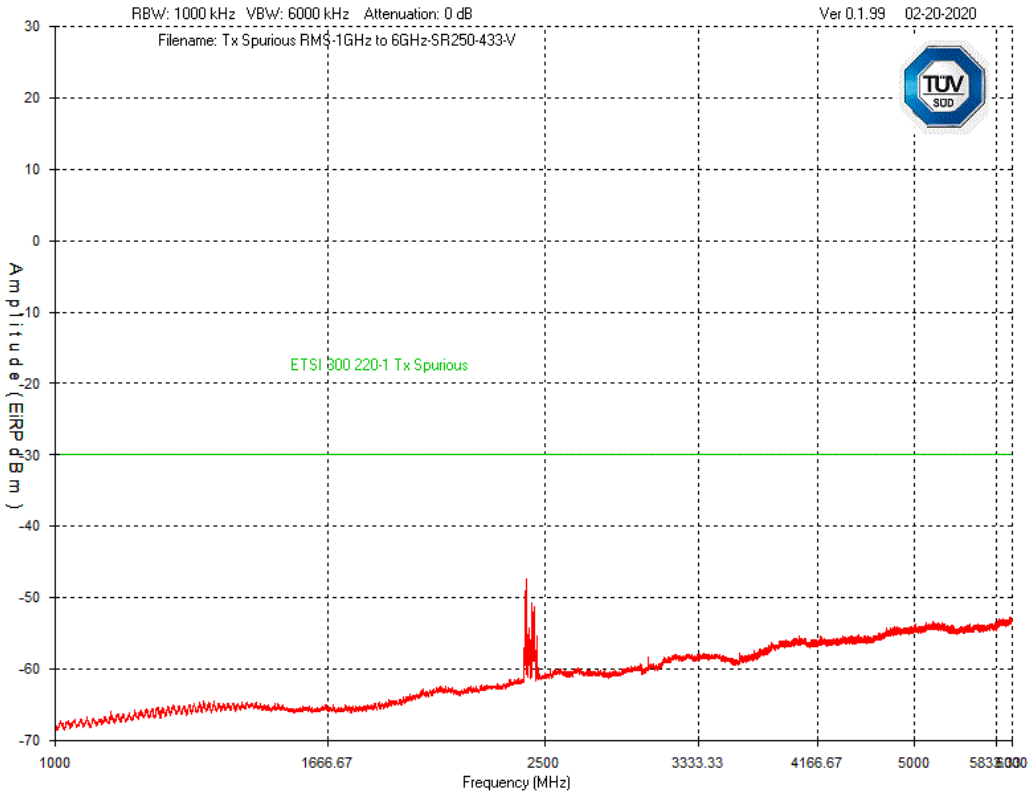

**Graph 20 : Tx Spurious Emissions – 30MHz to 1GHz – Horizontal Polarization**




**Graph 21 : Tx Spurious Emissions – 30MHz to 1GHz – Vertical Polarization**

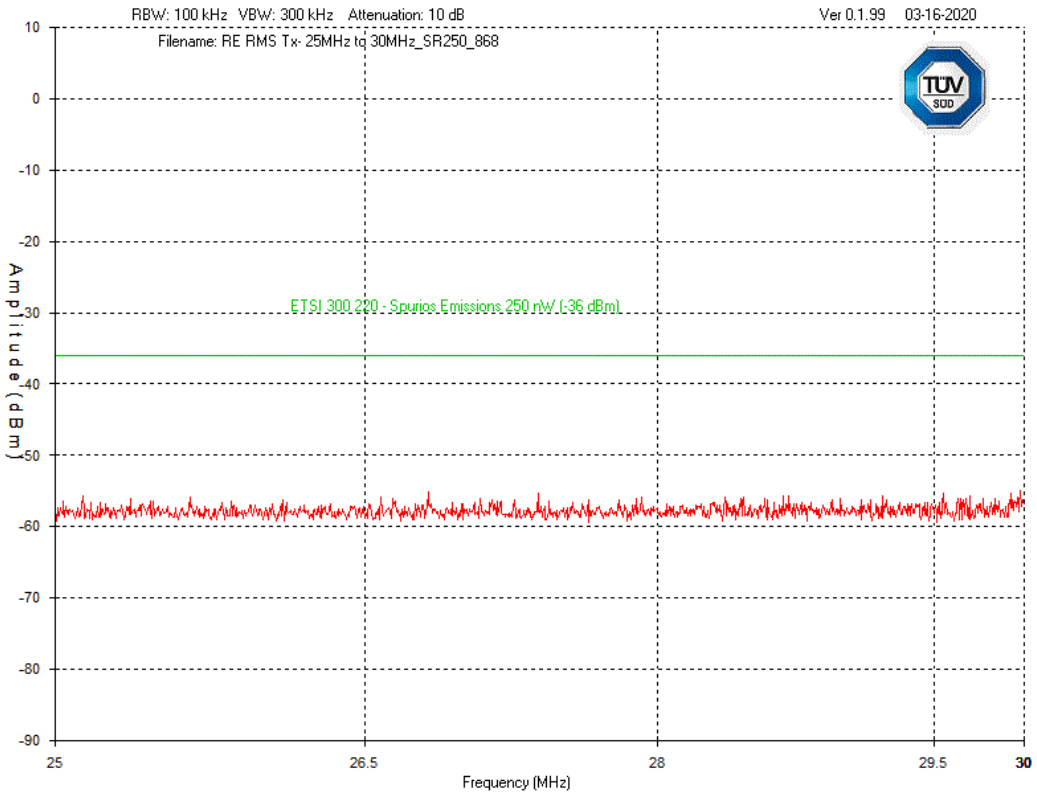



**Graph 22 : Tx Spurious Emissions – 1GHz to 4GHz – Horizontal Polarization**

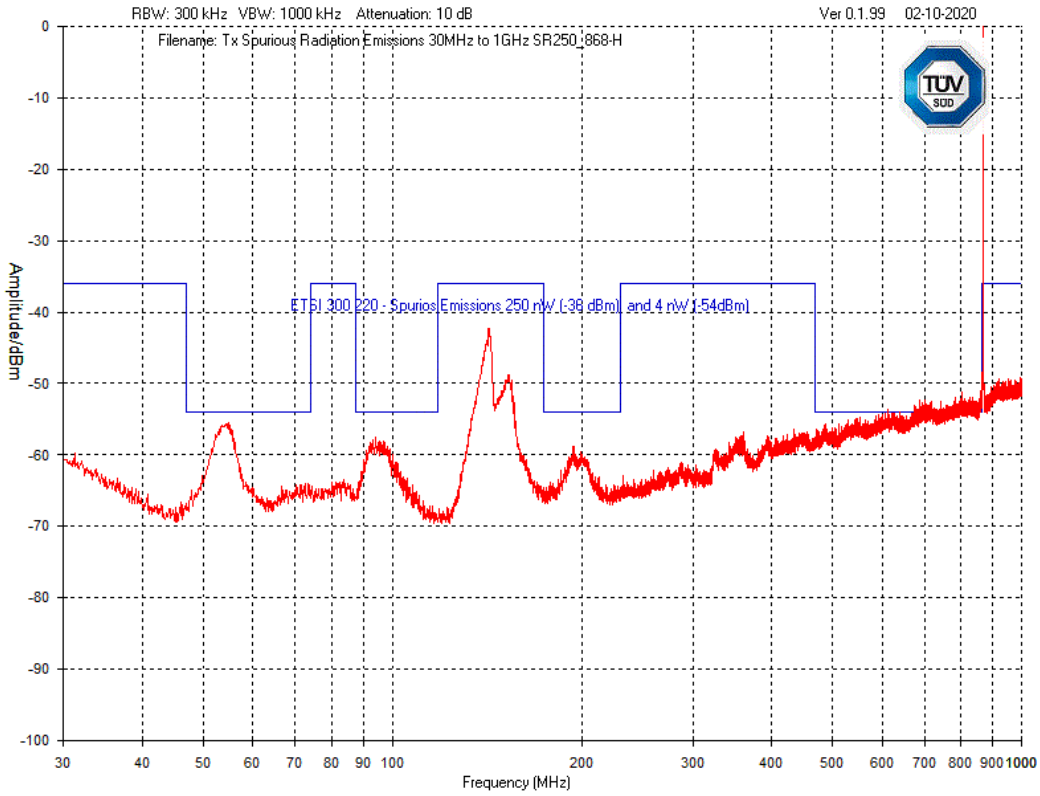



**Graph 23 : Tx Spurious Emissions – 1GHz to 4GHz – Vertical Polarization**

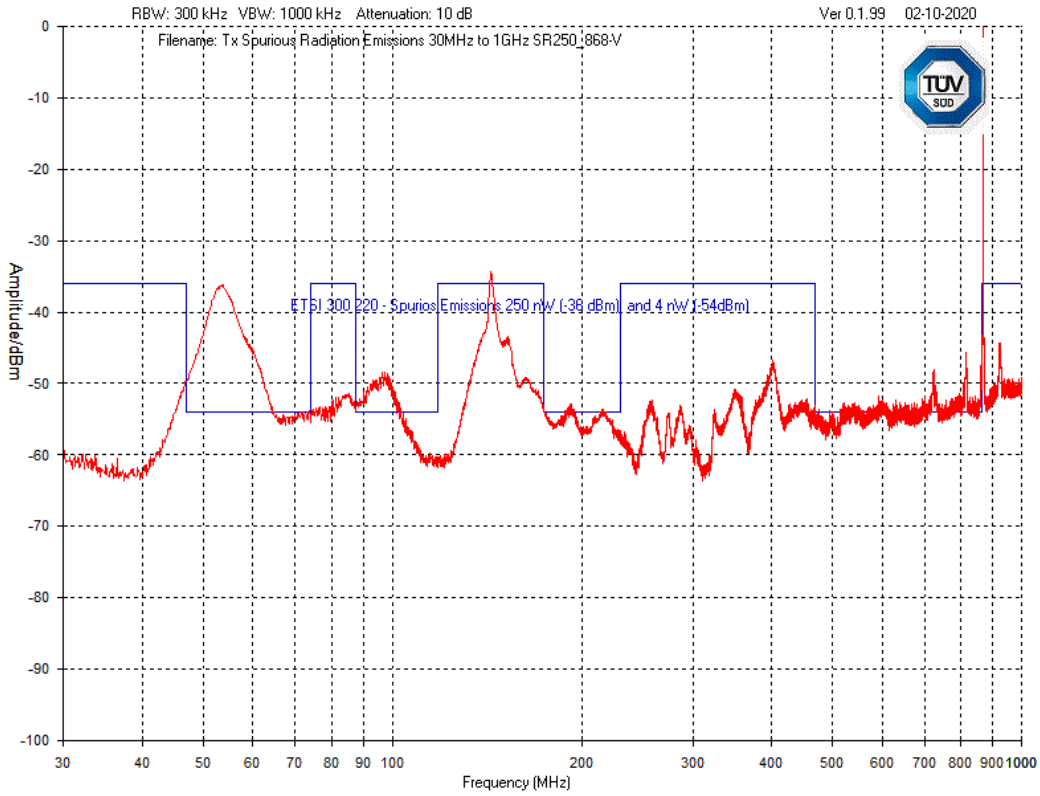
## II. SR250-868.35MHz – Model



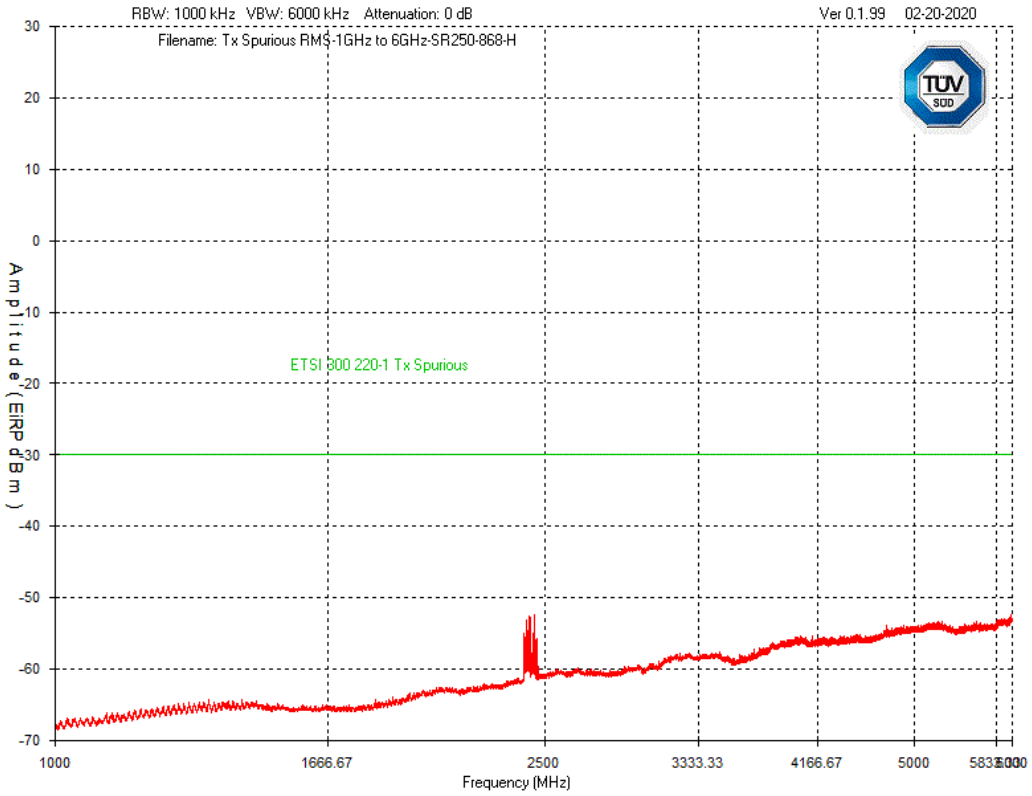

**Graph 24 Tx Spurious Emissions – 25MHz to 30MHz**



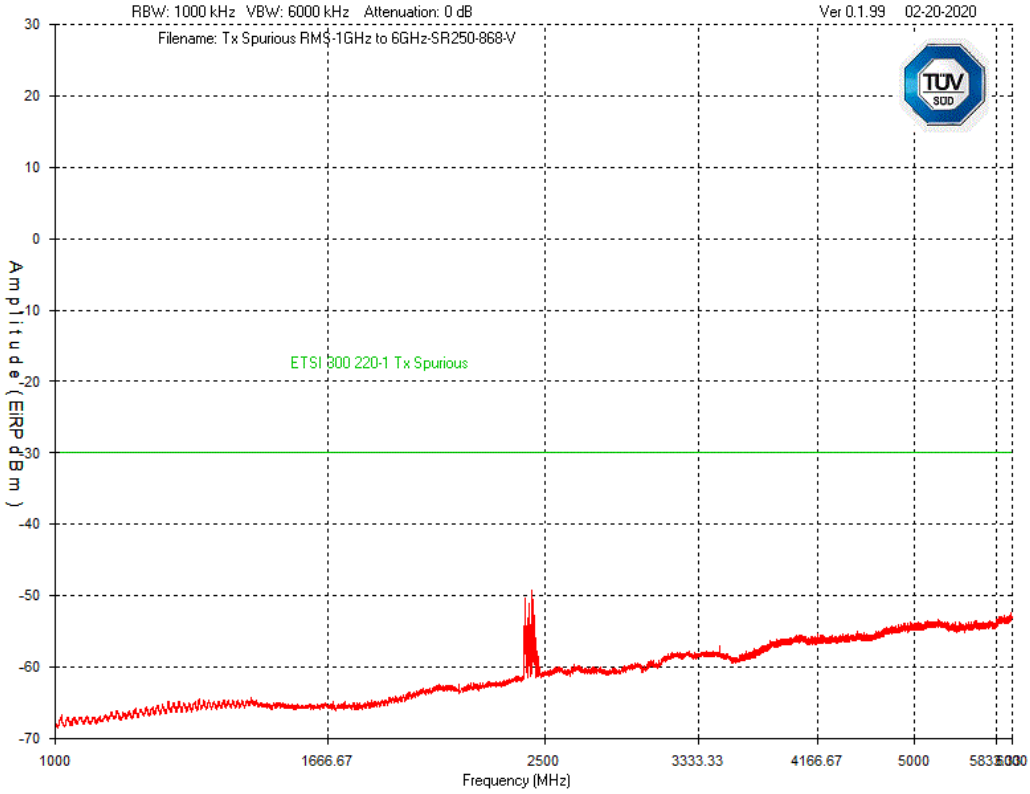

**Graph 25 : Tx Spurious Emissions – 30MHz to 1GHz – Horizontal Polarization**




**Graph 26 : Tx Spurious Emissions – 30MHz to 1GHz – Vertical Polarization**



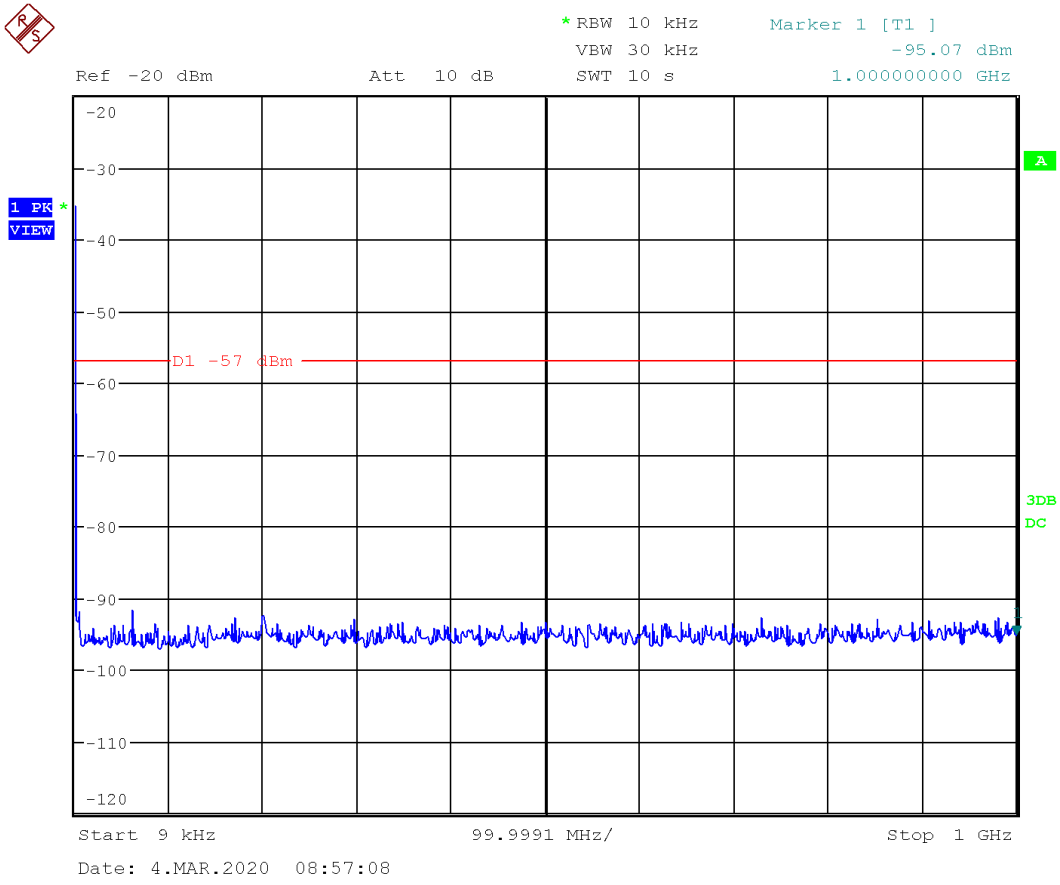

**Graph 27 : Tx Spurious Emissions – 1GHz to 6GHz – Horizontal Polarization**



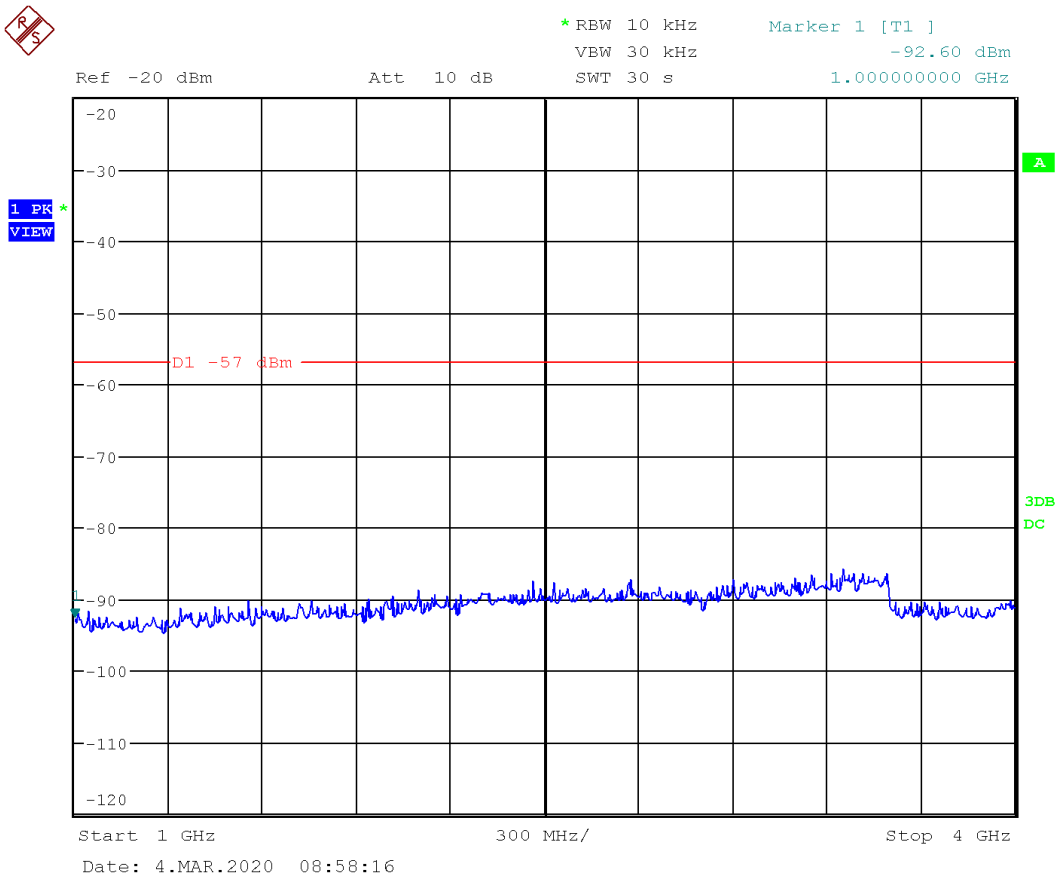

**Graph 28 : Tx Spurious Emissions – 1GHz to 6GHz – Vertical Polarization**

### 2.6.2.2 Rx Spurious Emissions

#### I. SR250-433.92MHz – Model

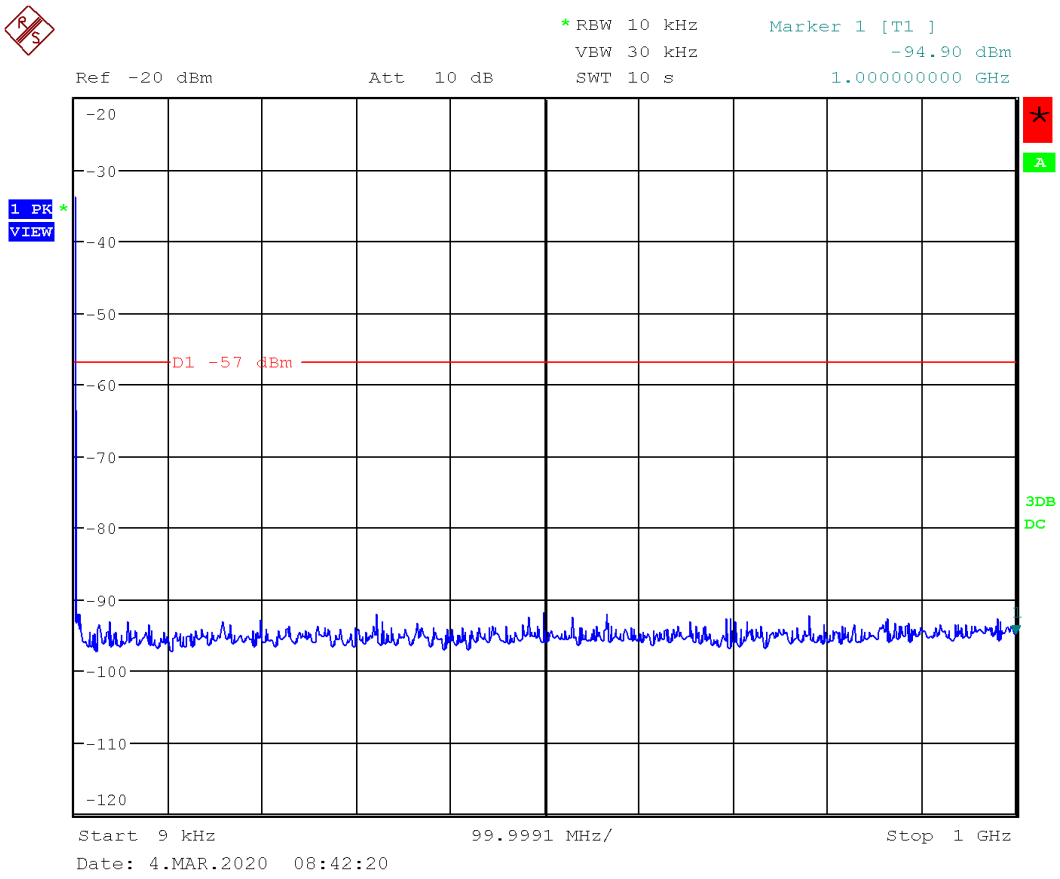



**Graph 29 : Rx Spurious Emissions – 9kHz to 1GHz**

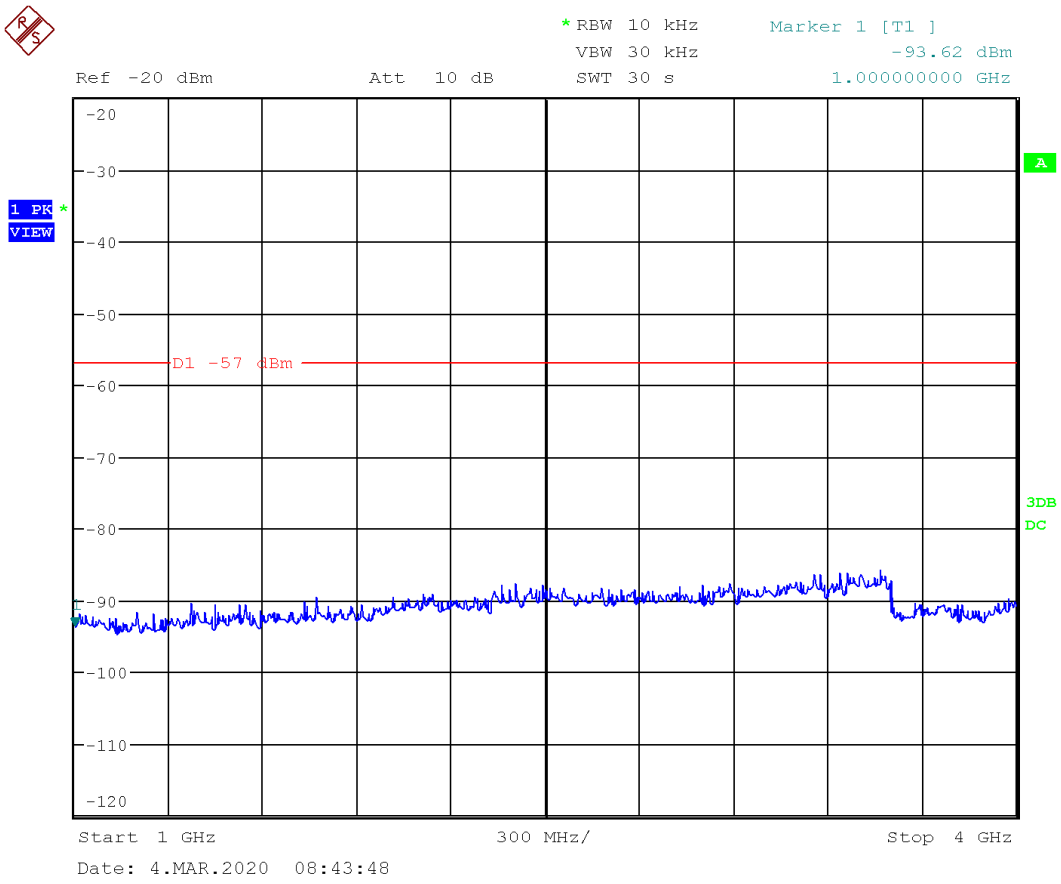



**Graph 30 : Rx Spurious Emissions – 1GHz to 4GHz**

## I. SR250-868.35MHz – Model




**Graph 31 : Rx Spurious Emissions – 9kHz to 1GHz**




**Graph 32 : Rx Spurious Emissions – 1GHz to 4GHz**

### 2.6.3 Test Setup

For Tx spurious emissions the SR250 was installed inside the Anechoic chamber and both Horizontal and Vertical polarization were tested. Photo 10 depict the setup for the range of 25Mhz to 30MHz; while Photo 11 and 12 depict the horizontal– and vertical– polarization of the radiated emission scans, respectively.

**Photo 10: Setup – Tx Unwanted Emissions – SR250 – 25MHz to 30MHz**

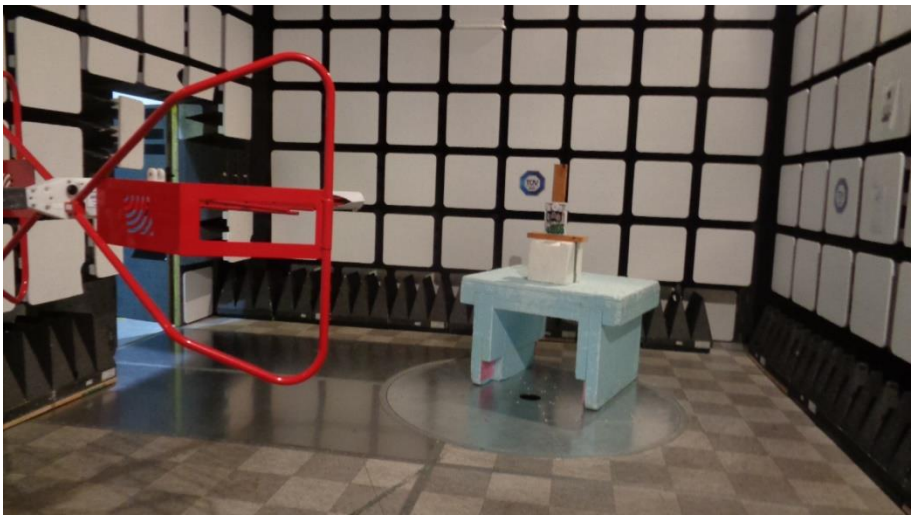


**Photo 11: Setup – Tx Unwanted Emissions – SR250 – 30MHz to 1GHz – Horizontal Polarization**

**Photo 12: Setup – Tx Unwanted Emissions – SR250 – 30MHz to 1GHz – Vertical Polarization**

### 2.6.4 Test Method

Th radiated method as per Clause ETSI EN 300 220-1 V3.1.1 for the Tx mode was used. Likewise, the conducted method as per clause 5.9.3.3.1 of the referred standard was used to test the Rx spurious.

### 2.6.5 Test Location and Test Equipment Used

This test was carried out in Laval test location.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due (YYY-MM-DD) |
|---|---|---|---|---|---|
| Variable Attenuator Rotary Attenuator | ETLS System | VAT02BXP-4242 | N/A | NA | NCR |
| BiLog Antenna | Keytek | 3142-E | 4001 | 12 | 2020/11/29 |
| Cable 160 in SMA to N | FLORIDA RF LABS | Lab-Flex 335 | 4138 | NA | NCR |
| RF Cable 10m | LexTec/Instacables | LMR-400-10M-50OHM-MN-MN | 4025 | NA | NCR |

**Table 26 Unwanted Emissions in the Spurious – Test Equipment**

## 2.7 Tx behaviour under Low Voltage Conditions

### 2.7.1 Test Details

**REFERENCE STANDARD** Clause 5.12 on ETSI EN 300 220-1 V3.1.1 (2017-02)
Clause 5.12 on ETSI EN 300 220-2 V3.2.1 (2018-04)

**SPECIFICATIONS**

| | |
|---|---|
| **RBW (kHz)** | 200 |
| **VBW (kHz)** | 500 |
| **SPAN(MHz)** | 1 |
| **Frequency** | 433.92MHz<br>868.35MHz |
| **Installation** | Tabletop equipment |

**EUTs**

| | |
|---|---|
| **Identification** | SR250– 433.92MHz<br>SR250– 868.35MHz |
| **Test Mode** | Mode #1 in Table 4. |

**ENVIROMENTAL & TEST INFO**

| | |
|---|---|
| **Test Date (YYYY-MM-DD)** | 2020-02-26 |
| **Temperature °C (For Info Only)** | 23.6 |
| **Humidity %(For Info Only)** | 22.1 |
| **Atmospheric Pressure kPa (For Info Only)** | 100 |
| **Engineer** | Jose Martinez Ortega |
| **Client Witness** | Emmanuel Stathopoulos (Paradox Security Systems) |

### 2.7.2 Setup Diagram

During testing the EUT was installed according to section 2.3.1.

### 2.7.3 Test Results

The EUT was installed inside the Anechoic chamber according to Figure 4. Results of the test are depicted in Tables 27 & 28 below.

| Frequency (MHz) | Vdc (V) | Attenuation (dB) | ERP (dBm) | Output ERP (dBm) |
|---|---|---|---|---|
| 433.92 | 4.5 | 40 | -31.08 | 8.92 |
| | 4.0 | | -31.11 | 8.89 |
| | 3.0 | | -31.49 | -31.49 |
| | 2.0 | | -35 | 5.0 |
| | 1.8 | | 0 | 0 |

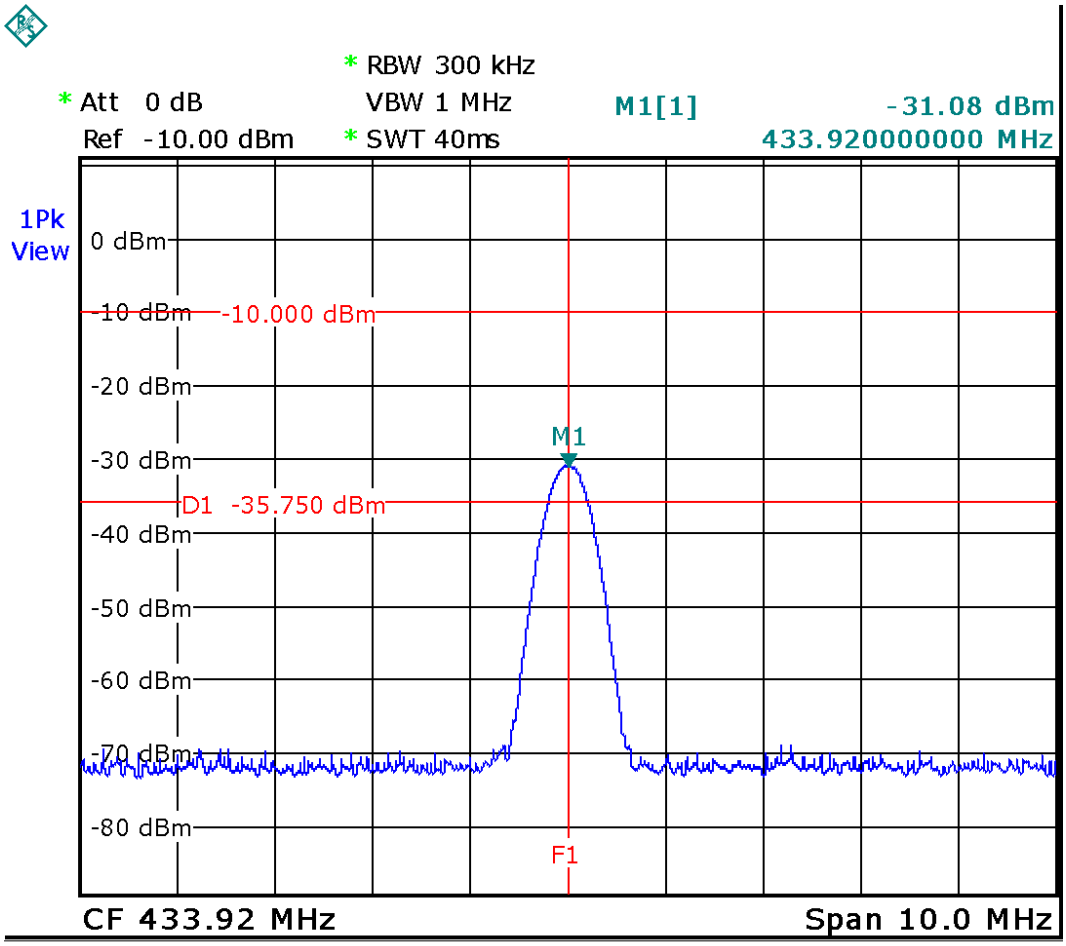
**Table 27: Test Results – SR250 – 433.92MHz – Tx Low Voltage**

| Frequency (MHz) | Vdc (V) | Attenuation (dB) | ERP (dBm) | Output ERP (dBm) |
|---|---|---|---|---|
| 433.92 | 4.5 | 40 | -30.02 | 9.98 |
| | 4.0 | | -30.00 | 10.0 |
| | 3.0 | | -30.46 | 9.54 |
| | 2.0 | | -33.62 | 6.38 |
| | 1.8 | | 0 | 0 |

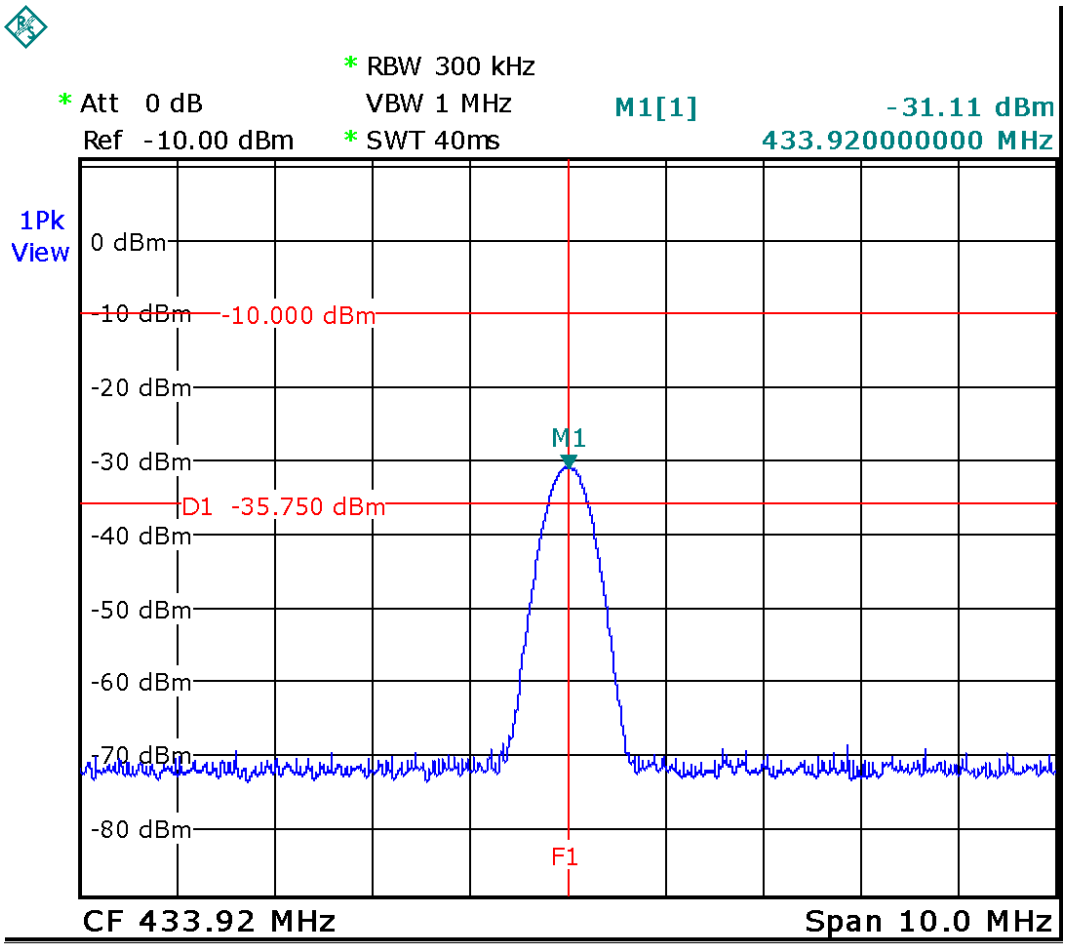
**Table 28: Test Results Tx Low Voltage – SR250 – 868.35MHz**

### 2.7.1 Test Data

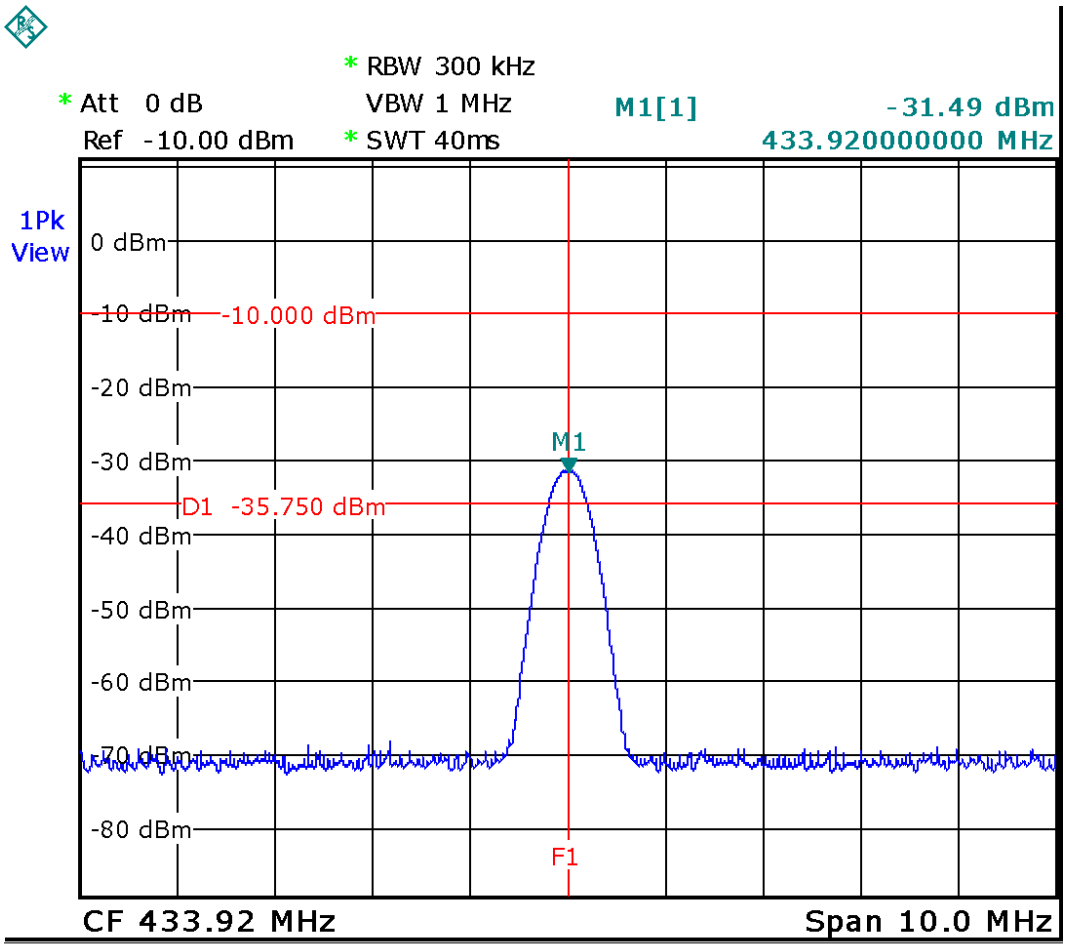
#### 2.7.1.1 Model – 433.92MHz



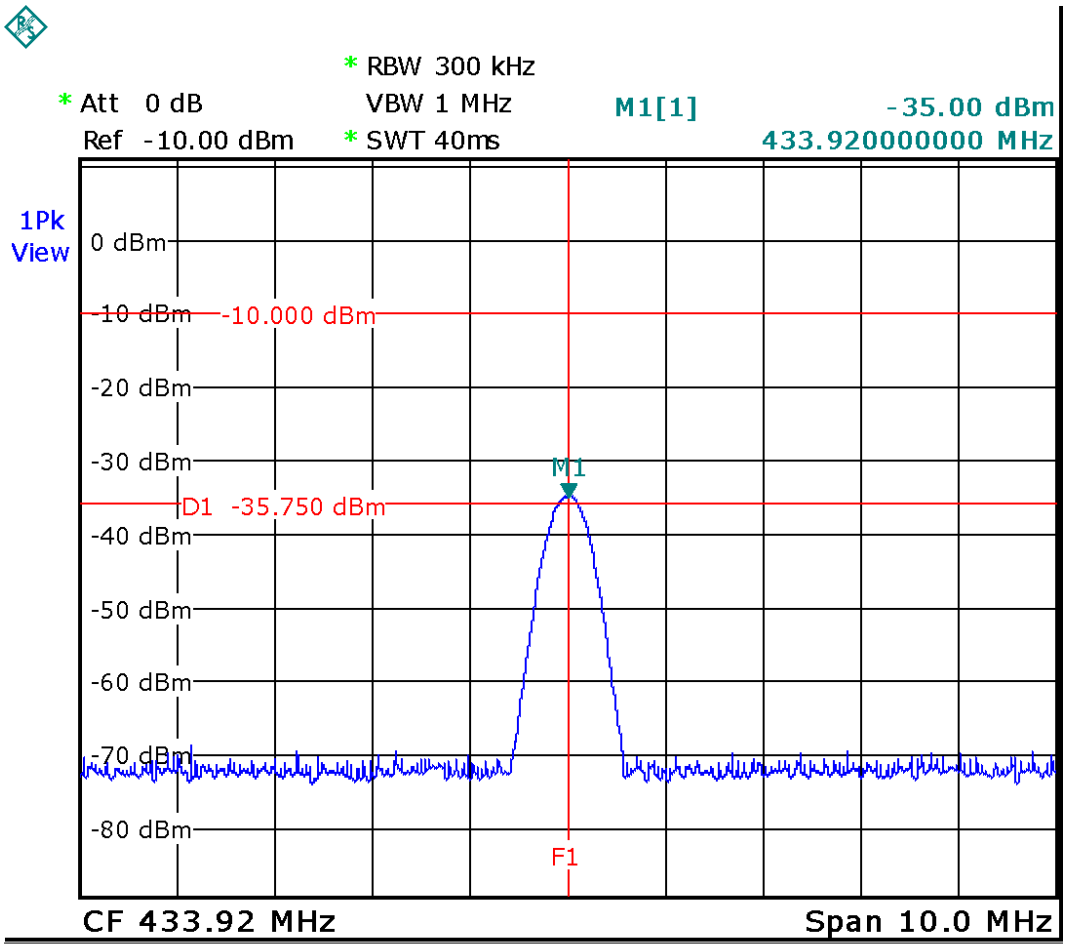

**Graph 33 : SR250 Results – Tx Low Voltage – 4.5Vdc**




**Graph 34 : SR250 Results – Tx Low Voltage – 4.0Vdc**

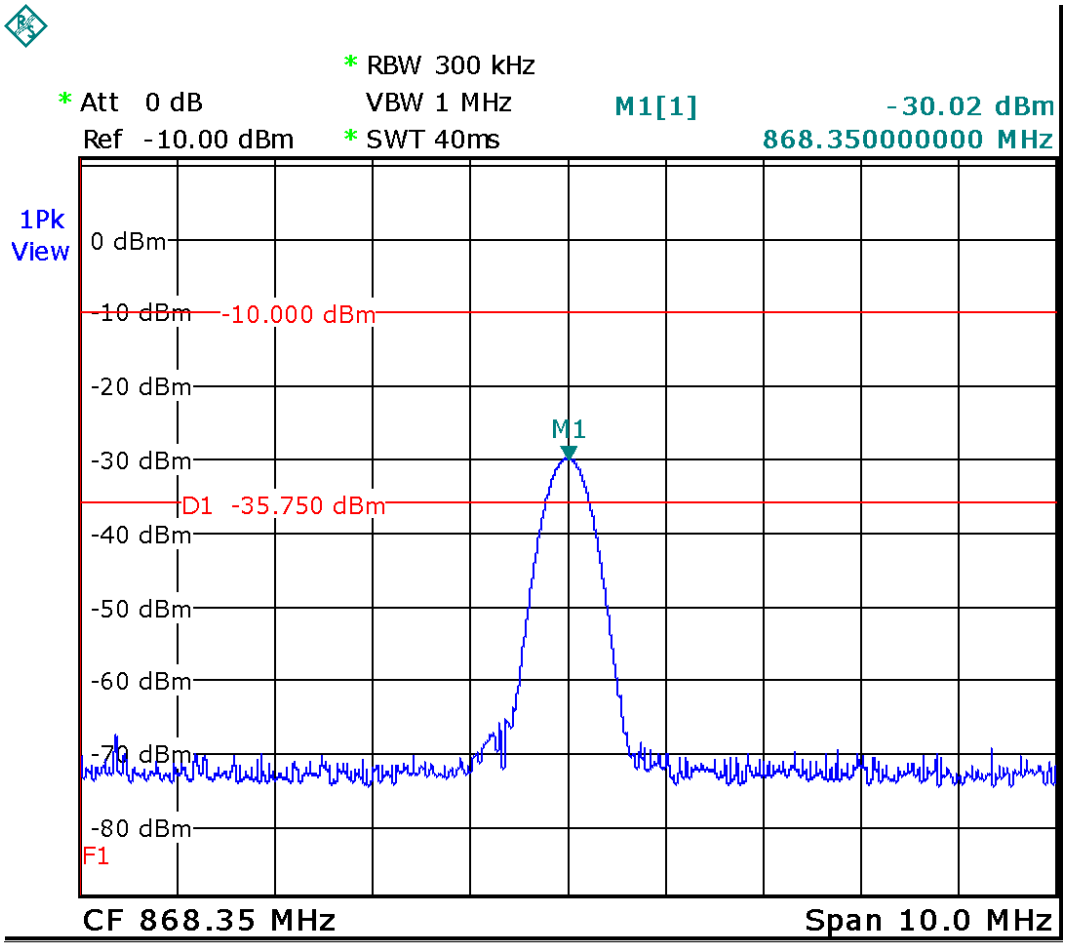



**Graph 35 : SR250 Results – Tx Low Voltage – 3.0Vdc**



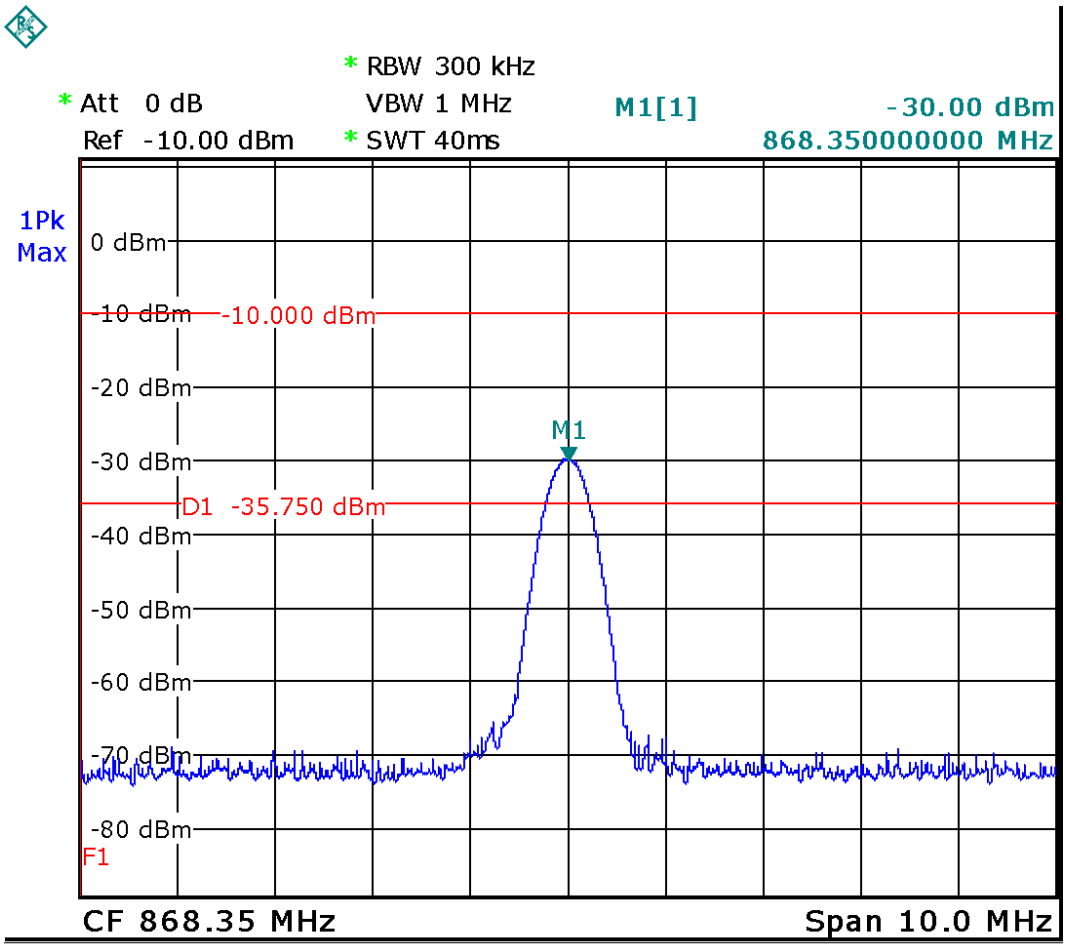

**Graph 36 : SR250 Results – Tx Low Voltage – 2.0Vdc**

#### 2.7.1.1 Model – 868.35MHz



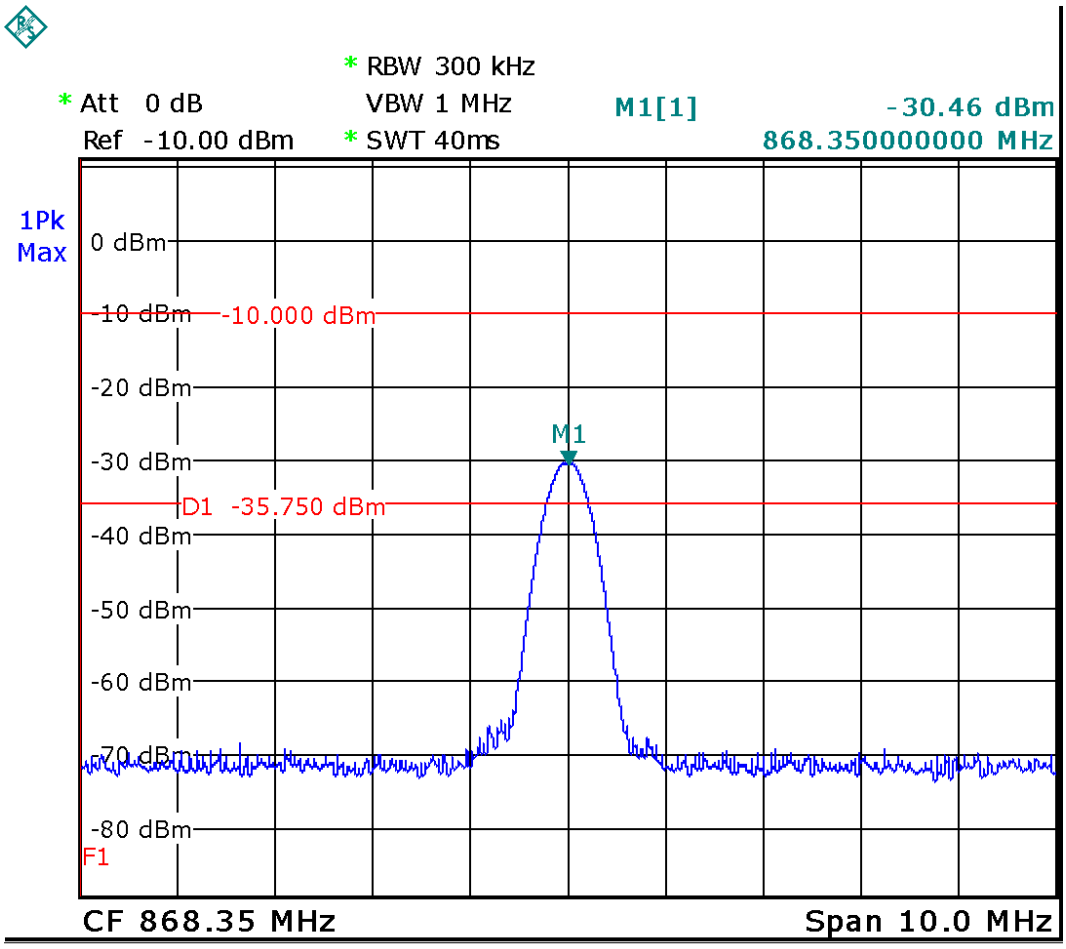

Date: 26.JAN.2020 15:41:54

**Graph 37 : SR250 Results – Tx Low Voltage – 4.5Vdc**



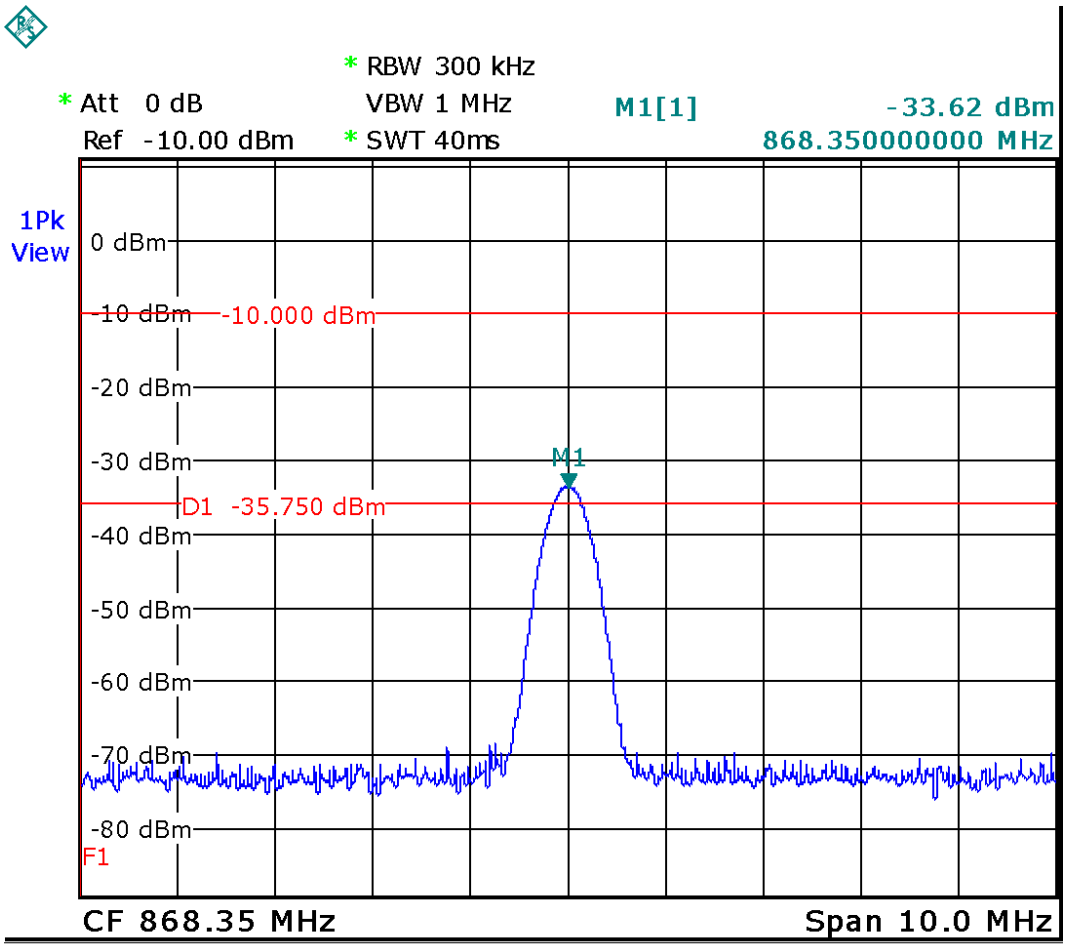

Date: 26.JAN.2020 15:41:13

**Graph 38 : SR250 Results – Tx Low Voltage – 4.0Vdc**




Date: 26.JAN.2020 15:40:23

**Graph 39 : SR250 Results – Tx Low Voltage – 3.0Vdc**




Date: 26.JAN.2020 15:51:23

**Graph 40 : SR250 Results – Tx Low Voltage – 2.0Vdc**

### 2.7.2 Test Setup

During testing the EUT was installed according to section 2.3.1.

### 2.7.3 Test Method

Tests were conducted according to the method of the reference standards.

### 2.7.4 Test Location and Test Equipment Used

This test was carried out in Laval test location.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due (YYY-MM-DD) |
|---|---|---|---|---|---|
| Cable 160 in SMA to N | FLORIDA RF LABS | Lab-Flex 335 | 4138 | NA | NCR |
| Variable Attenuator Rotary Attenuator | ETLS System | VAT02BXP-4242 | N/A | NA | NCR |
| Spectrum Analyzer | Rohde & Schwarz | FSL6 | 4095 | 24 | 2020-09-02 |

**Table 29 Inside the Designed Band Test Equipment**

## 2.8 Receiver Blocking

### 2.8.1 Test Details

| | |
|---|---|
| **REFERENCE STANDARD** | Clause 5.18.3 of ETSI 300 200- v.3.1.1 (2017-02)<br>Clause 4.4.2 of ETSI 300 200- v.3.2.1 (2018-04) |
| **SPECIFICATIONS** | See Table 30 |

| | |
|---|---|
| **Operating Frequency** | 433.92MHz<br>868.35MHz |
| **Installation** | Tabletop equipment |
| **Test Mode** | Mode #5 in Table 4. |

**EUT**

| | |
|---|---|
| **Identification** | SR250 – 433.92MHz<br>SR250 – 868.35MHz |
| **Voltage Input** | Battery Powered:<br>4.5Vdc |

**ENVIROMENTAL & TEST INFO**

| | |
|---|---|
| **Test Date (YYYY-MM-DD)** | 2020-02-12 |
| **Temperature °C (For Info Only)** | 23 |
| **Humidity %(For Info Only)** | 20 |
| **Atmospheric Pressure kPa (For Info Only)** | 102.3 |
| **Engineer** | Jose Martinez Ortega |
| **Client Witness** | Emmanuel Stathopoulos (Paradox Security Systems) |

### 2.8.2 Purpose

Blocking is a measure of the capability of the receiver to receive a wanted modulated signal without exceeding a given degradation due to the presence of an unwanted input signal at any frequencies other than those of the spurious responses or the adjacent channels or bands.

### 2.8.3 Setup Diagram

A conducted method was used for receiver blocking and the EUT was installed according Figure 5. Note the signal trigger (RTX3 in Figure below) shall be within a shielded box to avoid unwanted RF interference on the SR250.

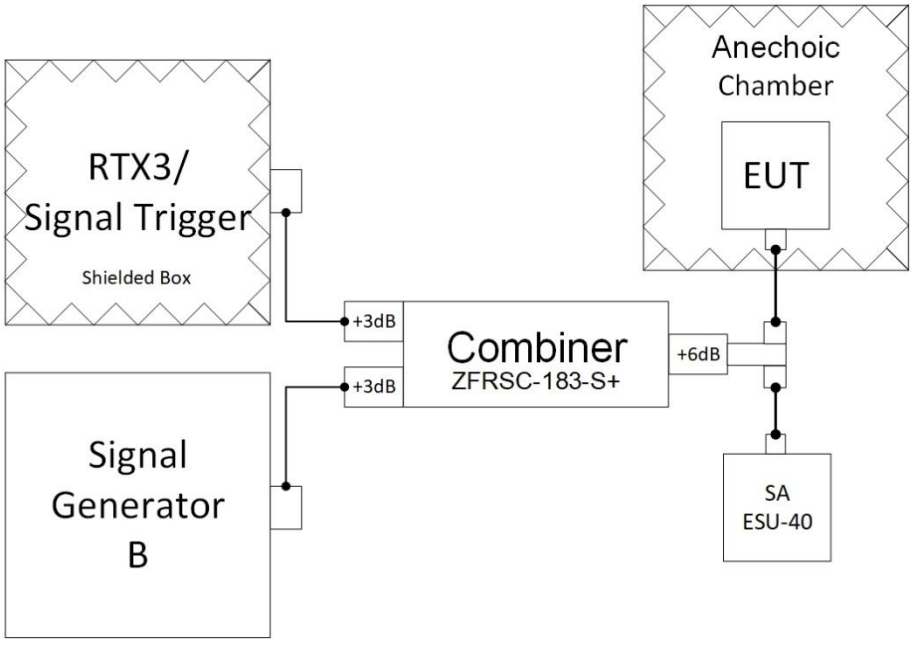



**Figure 5: EUT – Setup Diagram – Receiver Blocking – Conducted Method**

### 2.8.4 Limits

The blocking level shall be better or equal to category 2. Table 30 depicts the limits applied to Rx Category 2.

| Requirement | Limits dBm |
|---|---|
| Blocking at ±2 MHz from OC edge $f_{high}$ and $f_{low}$ | ≥ -69 |
| Blocking at ±10 MHz from OC edge $f_{high}$ and $f_{low}$ | ≥ -44 |
| Blocking at ±5 % of Centre Frequency or 15MHz, whichever is the greater | |

**Table 30 Limits for Receiver Blocking – Rx Category 2**

The minimum power level which give the EUT the wanted performance are given in Table 31.

| OF (MHz) | Combiner Attenuation (dBm) | Attenuation at the antenna input (dBm) | Level at Spectrum Analyzer (dBm) |
|---|---|---|---|
| 433.92 | 3 | -70 | -63 |
| 868.35 | 3 | -60 | -65 |
| OF: Operating Frequency. | | | |

**Table 31 Minimum Power Level – SR250**

### 2.8.5 Test Results

Summary of test results are depicted in Table 32 and Table 33 below.

| Requirement | Blocking Frequency (MHz) | Attenuation (dBm) | Combiner + Cable Losses (dBm) | Signal Generator B (dBm) | Power Level in the SA (dBm) | Limits ≥ (dBm) | Results |
|---|---|---|---|---|---|---|---|
| OF +2MHz | 435.92 | 20 | 6.4 | 17 | -12.76 | -69 | Pass |
| OF -2MHz | 431.92 | | 6.4 | 9 | -17.73 | | Pass |
| OF +10MHz | 443.92 | | 6.4 | 25 | -2.20 | -44 | Pass |
| OF -10MHz | 423.92 | | 6.4 | 25 | 0.68 | | Pass |
| OF + 5% | 455.62 | | 6.4 | 25 | -0.39 | | Pass |
| OF -5% | 412.22 | | 6.4 | 25 | -5.8 | | Pass |
| OF: Operating frequency<br>SA. Spectrum Analyzer | | | | | | | |

**Table 32 SR250 – Blocking at OF = 433.92 MHz**

| Requirement | Blocking Frequency (MHz) | Attenuation (dB) | Cable Losses (dB) | Signal Generator B (dBm) | Power Level in SA (dBm) | Limits ≥ (dBm) | Results |
|---|---|---|---|---|---|---|---|
| OF +2MHz | 870.35 | 20 | 0.4 | -3 | -32.74 | -69 | Pass |
| OF -2MHz | 866.35 | | 0.4 | -2 | -32.15 | | Pass |
| OF +10MHz | 878.35 | | 0.4 | 24 | -6.56 | -44 | Pass |
| OF -10MHz | 858.35 | | 0.4 | 6 | -25.38 | | Pass |
| OF + 5% | 911.77 | | 0.4 | 25 | -1.65 | | Pass |
| OF -5% | 824.93 | | 0.4 | 25 | -4.02 | | Pass |
| OF: Operating frequency=868.35MHz<br>SA. Spectrum Analyzer | | | | | | | |

**Table 33 SR250 – Blocking at OF = 868.35 MHz**

### 2.8.6 Test Setup

To avoid wireless communication between the transmitter module and the receiver and the latter was placed inside the Anechoic Chamber. Photo 13 (inside the chamber) and in Photo 14 (outside the chamber).

**Photo 13 – Test Setup – Receiver Blocking – Inside the Chamber**

**Photo 14 – Test Setup – Receiver Blocking – Outside the Chamber**

### 2.8.7 Test Method

Tests were conducted according to the method of the reference standards.

### 2.8.8 Test Location and Test Equipment Used

This test was carried out in Laval test location.

| Instrument | Manufacturer | Type No | TE No | Calibration Period (months) | Calibration Due (YYY-MM-DD) |
|---|---|---|---|---|---|
| Power Splitter/Combiner | Mini-Circuits | ZFRSC-183-S+ | 4131 | NCR | NCR |
| RF Shielded Box | Will'Tek | M 248 348 | N/A | NCR | NCR |
| Spectrum Analyzer | Rohde & Schwarz | ESU-40 | 4092 | 12 | 2020-06-06 |
| Signal Generator | ROHDE & SCHWARZ | SMB100A | 4135 | 12 | 2020/08/23 |
| Cable 160 in SMA to N | FLORIDA RF LABS | Lab-Flex 335 | 4138 | NA | NCR |
| RF Cable 10m | LexTec/Instacables | LMR-400-10M-50OHM-MN-MN | 4025 | NA | NCR |

**Table 34 Detection of Failure – Test Equipment**

APPENDIX A: SR230/SR50 PARADOX DECLARATION

# Information to declare according to ETSI EN 300 220-2

**a) The name of the manufacturer or his trademark**

**Paradox Security Systems**

**b) The type equipment designation**

**Stand-alone wireless siren**

**c) The application(s) of the equipment**

**For use in an alarm system**

**d) The operating channel OC or channels**
(nominal centre frequency, $F_{low}$ and $F_{high}$ of each OC)

**Single frequency: 433.92MHz & 868.34MHz**

**e) The operational frequency band(s)**

**433.050 to 434.790 MHz**

**868.0 to 868.6 MHz**

**f) The operating channel(s) width(s)**

**200kHz**

The operating channel is less than or equal to 25 kHz?
**NO ☒ YES ☐**

**g) Maximum radio-frequency power transmitted in the frequency band(s) in which the radio equipment operates. Where multiple powers are possible, also state rated power for each level or range of levels**

**Multiple powers are not possible**

**h) Upper and lower temperatures of the operational profile**

**-25°C to +55°C**

**i) Upper and lower extreme test voltages**

**4.5vDC**

## Information to declare according to ETSI EN 300 220-2

**h)** **Antenna maximum gain if EUT has a permanent RF connector**

**i)** **What is the spectrum access mechanism of the equipment?**
**j)** **Duty cycle**
**k)** **Polite spectrum** access
**N/A**
**l)** **In case of polite spectrum access:**
The CCA time implemented by the equipment is..... ms.
The minimal unit of deferral period is: .....
The deadtime $T_{DS}$ is .....ms.
**m)** **Is the equipment battery powered?**
☒Yes ☐No
**n)** **Is the equipment frequency agile?**
Yes ☐ No ☒
**o)** **Is the equipment declared as FHSS?**
Yes☐ No ☒
**p)** **In case of FHSS equipment:**
The declared hop channel bandwidth is .... kHz.
The number of non-overlapping channels or hopping positions separated by the declared hop channel bandwidth is.....
The dwell time per channel is ..... ms.
The return time to a hop channel is ..... ms.
**q)** Is CCA implemented in the equipment? Yes☐ No☐

APPENDIX B: Worst-Case Scenario of Tx Spurious Emission

| Frequency (MHz) | Detector | Raw Reading dB(µV) | Antenna - Bilog3142E_V Factor (dB) | Atten 10dB Factor (dB) | Cable 27 - 10m LMR400 Factor (dB) | Cable 28 - 7m LMR400 Factor (dB) | dBuV_Per meter to dBm EiRP 3 meter Factor | Preamp-LNA1450 Factor | Level dB(µV) | ETSI 300 220 - Spurios Emissions 250 nW (-36 dBm) and 4 nW (-54dBm) Limit | ETSI 300 220 - Spurios Emissions 250 nW (-36 dBm) and 4 nW (-54dBm) Margin |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 433.924 | RMS | 122 | 21.5 | 10 | 0.9 | 0.7 | -95.2 | -33.3 | 26.6 | -36 | -62.6 <Note 1> |
| 867.948 | RMS | 30.5 | 26.7 | 10 | 1.3 | 0.9 | -95.2 | -32.5 | -58.3 | -36 | 22.3 |
| 420.136 | RMS | 14.5 | 21.7 | 10 | 0.9 | 0.7 | -95.2 | -33.3 | -80.7 | -36 | 44.7 |
| 315.66 | RMS | 14.6 | 18.2 | 10 | 0.8 | 0.6 | -95.2 | -33.3 | -84.3 | -36 | 48.3 |
| 171.859 | RMS | 17 | 13.4 | 10 | 0.6 | 0.4 | -95.2 | -33.4 | -87.2 | -36 | 51.2 |
| Note 1. The operating Frequency is excluded from the Spurious limits. | | | | | | | | | | | |

Table B.1 RMS Value of Tx- Spurious – SR250-433.92MHz – Vertical Polarization

| Frequency (MHz) | Detector | Raw Reading dB(µV) | Antenna - Bilog3142E_H Factor (dB) | Atten 10dB Factor (dB) | Cable 27 - 10m LMR400 Factor (dB) | Cable 28 - 7m LMR400 Factor (dB) | dBuV_Permeter to dBm EiRP 3 meter Factor | Preamp-LNA1450 Factor | Level dB(µV) | ETSI 300 220 - Spurios Emissions 250 nW (-36 dBm) and 4 nW (-54dBm) Limit | ETSI 300 220 - Spurios Emissions 250 nW (-36 dBm) and 4 nW (-54dBm) Margin |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 868.531 | RMS | 59.4 | 26.7 | 10 | 1.3 | 0.9 | -95.2 | -32.5 | -29.4 | -36 | -6.6 <Note1> |
| 53.7888 | RMS | 50.8 | 10.8 | 10 | 0.4 | 0.3 | -95.2 | -33.3 | -56.2 | -54 | 2.2 |
| 815.418 | RMS | 21.9 | 27.1 | 10 | 1.3 | 0.9 | -95.2 | -32.8 | -66.8 | -54 | 12.8 |
| 724.633 | RMS | 23.2 | 26.1 | 10 | 1.2 | 0.8 | -95.2 | -33 | -66.9 | -54 | 12.9 |
| 97.3854 | RMS | 41.5 | 12.3 | 10 | 0.5 | 0.3 | -95.2 | -33.5 | -64.1 | -54 | 10.1 |
| Note 1. The operating Frequency is excluded from the Spurious limits. | | | | | | | | | | | |

Table B.1 RMS Value of Tx- Spurious – SR250-868.35MHz – Vertical Polarization