

FCC LISTED, REGISTRATION  
NUMBER: 720267

Informe de ensayo nº:  
Test report No:

IC LISTED REGISTRATION NUMBER  
IC 4621A-2

**NIE: 51368RRF.001**

## Test report

USA FCC Part 15.231, 15.209

CANADA RSS-210, RSS-Gen

Radio Frequency Devices. Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.

Licence-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment.  
General Requirements and Information for the Certification of Radio Apparatus.

|                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Identificación del objeto ensayado.....:</b><br>Identification of item tested                | Transmitter                                                                                                                                                                                                                                                                                                                                                                |
| <b>Marca .....</b><br>Trademark                                                                 | JCM TECHNOLOGIES, S.A.                                                                                                                                                                                                                                                                                                                                                     |
| <b>Modelo y/o referencia tipo .....</b><br>Model and /or type reference                         | MUV2 FCC / MUV4 FCC / MUVEVO4HID-CIS                                                                                                                                                                                                                                                                                                                                       |
| <b>Other identification of the product .....</b>                                                | FCC ID: U5Z-MUV<br>IC: 8572A-MUV                                                                                                                                                                                                                                                                                                                                           |
| <b>Final HW version .....</b>                                                                   | 2000538 (S-MUV2 FCC-EL) / 2000539 (S-MUV4 FCC-EL)                                                                                                                                                                                                                                                                                                                          |
| <b>Final SW version .....</b>                                                                   | GONOAPS_RFPIC_03090000                                                                                                                                                                                                                                                                                                                                                     |
| <b>Características .....</b><br>Features                                                        | Not provided data                                                                                                                                                                                                                                                                                                                                                          |
| <b>Fabricante .....</b><br>Manufacturer                                                         | JCM TECHNOLOGIES,S.A.<br>C/ Morgades,46 Bajos, 08500, Vic, Barcelona. SPAIN                                                                                                                                                                                                                                                                                                |
| <b>Método de ensayo solicitado, norma.....:</b><br>Test method requested, standard              | USA FCC Part 15.231 10-1-15 Edition: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.<br>USA FCC Part 15.209 10-1-15 Edition: Radiated emission limits; general requirements.<br>CANADA RSS-210 Issue 9 (August 2016).<br>CANADA RSS-Gen Issue 4 (November 2014).<br>ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices. |
| <b>Resultado.....:</b><br>Summary                                                               | IN COMPLIANCE                                                                                                                                                                                                                                                                                                                                                              |
| <b>Aprobado por (nombre / cargo y firma) .....</b><br>Approved by (name / position & signature) | A. Llamas / RF Lab. Manager                                                                                                                                                                                                                                                                                                                                                |
| <b>Fecha de realización .....</b><br>Date of issue                                              | 2016-12-19                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Formato de informe No. ....:</b><br>Report template No                                       | FDT08_17                                                                                                                                                                                                                                                                                                                                                                   |



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## Competences and guarantees

AT4 wireless is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 720267.

AT4 wireless is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621A-2.

In order to assure the traceability to other national and international laboratories, AT4 wireless has a calibration and maintenance program for its measurement equipment.

AT4 wireless guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at AT4 wireless at the time of performance of the test.

AT4 wireless is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

**IMPORTANT:** No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of AT4 wireless.

## General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of AT4 wireless.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of AT4 wireless and the Accreditation Bodies.

## Uncertainty

Uncertainty (factor  $k=2$ ) was calculated according to the AT4 wireless internal document PODT000.

## Usage of samples

Samples undergoing test have been selected by: **the client**

Sample M/01 is composed of the following elements:

| Control N° | Description | Model    | Serial N°      | Date of reception |
|------------|-------------|----------|----------------|-------------------|
| 51368/029  | Transmitter | MUV2 FCC | 1016003 851612 | 2016-10-27        |

1. Sample M/01 has undergone following test(s) in appendix A:  
Section 15.231 Subclause (c) / RSS-210 A.1.3: 20 dB Emission Bandwidth and Occupied Bandwidth.

Sample M/02 is composed of the following elements:

| Control N° | Description | Model    | Serial N°      | Date of reception |
|------------|-------------|----------|----------------|-------------------|
| 51368/028  | Transmitter | MUV2 FCC | 1016003 851614 | 2016-10-27        |

1. Sample M/02 has undergone following test(s) in appendix A:

Section 15.231 Subclause (b) & 15.209 / RSS-210 A.1.2. & RSS-Gen: Field strength and Emission limitations radiated (Transmitter).

Sample M/03 is composed of the following elements:

| Control N° | Description | Model    | Serial N°      | Date of reception |
|------------|-------------|----------|----------------|-------------------|
| 51368/030  | Transmitter | MUV2 FCC | 1016003 851613 | 2016-10-27        |

1. Sample M/03 has undergone following test(s) in appendix A:

Section 15.231 Subclause (a) (1) / RSS-210 A.1.1.: Transmitter deactivation.

## Test sample description

The test sample consists of an 868MHz radio transmitter with high security rolling code and side-prog system.

## Identification of the client

JCM TECHNOLOGIES,S.A.

C/ Morgades, 46 Bajos, 08500, Vic, Barcelona SPAIN

## Testing period

The performed test started on 2015-11-24 and finished on 2015-11-25.

The tests have been performed at AT4 wireless.

## Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

|                                      |                              |
|--------------------------------------|------------------------------|
| <b>Temperature</b>                   | Min. = 15 °C<br>Max. = 35 °C |
| <b>Relative humidity</b>             | Min. = 20 %<br>Max. = 75 %   |
| <b>Shielding effectiveness</b>       | > 100 dB                     |
| <b>Electric insulation</b>           | > 10 kΩ                      |
| <b>Reference resistance to earth</b> | < 1 Ω                        |

In the semianechoic chamber, the following limits were not exceeded during the test.

|                                      |                                                                                             |
|--------------------------------------|---------------------------------------------------------------------------------------------|
| <b>Temperature</b>                   | Min. = 15 °C<br>Max. = 35 °C                                                                |
| <b>Relative humidity</b>             | Min. = 20 %<br>Max. = 75 %                                                                  |
| <b>Air pressure</b>                  | Min. = 860 mbar<br>Max. = 1060 mbar                                                         |
| <b>Shielding effectiveness</b>       | > 100 dB                                                                                    |
| <b>Electric insulation</b>           | > 10 kΩ                                                                                     |
| <b>Reference resistance to earth</b> | < 1 Ω                                                                                       |
| <b>Normal site attenuation (NSA)</b> | < ±4 dB at 10 m distance between item under test and receiver antenna, (30 MHz to 1000 MHz) |
| <b>Field homogeneity</b>             | More than 75% of illuminated surface is between 0 and 6 dB (26 MHz to 1000 MHz).            |

In the chamber for conducted measurements, the following limits were not exceeded during the test:

|                                      |                                     |
|--------------------------------------|-------------------------------------|
| <b>Temperature</b>                   | Min. = 15 °C<br>Max. = 35 °C        |
| <b>Relative humidity</b>             | Min. = 20 %<br>Max. = 35 %          |
| <b>Air pressure</b>                  | Min. = 860 mbar<br>Max. = 1060 mbar |
| <b>Shielding effectiveness</b>       | > 100 dB                            |
| <b>Electric insulation</b>           | > 10 kΩ                             |
| <b>Reference resistance to earth</b> | < 1 Ω                               |

## Remarks and comments

1: Used instrumentation:

### Conducted Measurements

|    |                                  | Last Cal. date | Cal. due date |
|----|----------------------------------|----------------|---------------|
| 1. | Spectrum analyser Agilent E4440A | 2015/10        | 2017/10       |
| 2. | DC power supply R&S NGPE 40/40   | 2014/11        | 2017/11       |

### Radiated Measurements

|    |                                                                  | Last Cal. date | Cal. due date |
|----|------------------------------------------------------------------|----------------|---------------|
| 1. | Semianechoic Absorber Lined Chamber ETS FACT3 200STP             | N.A.           | N.A.          |
| 2. | BiconicalLog antenna ETS LINDGREN 3142E                          | 2014/03        | 2017/03       |
| 3. | Multi Device Controller EMCO 2090                                | N.A.           | N.A.          |
| 4. | Double-ridge Guide Horn antenna 1-18 GHz SCHWARZBECK BBHA 9120 D | 2013/11        | 2016/11       |
| 5. | Broadband Horn antenna 18-40 GHz SCHWARZBECK BBHA 9170           | 2014/03        | 2017/03       |
| 6. | EMI Test Receiver R&S ESU 40                                     | 2016/03        | 2018/03       |
| 7. | Spectrum analyser Rohde & Schwarz FSW50                          | 2015/12        | 2017/12       |
| 8. | RF pre-amplifier 10 MHz-6 GHz SCHWARZBECK BBV9743                | 2016/04        | 2017/04       |
| 9. | RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-1M           | 2016/02        | 2018/02       |

2: Testing has been carried out on model MUV2 FCC which, according to manufacturer's declaration, presents no RF and EMC functional differences with respect to models MUV4 FCC and MUVEVO4HID-CIS. See declaration below.



Date: 13/12/2016  
Contact person: David Clos Bonet

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Statement from the applicant – Declaration:

**Model name:**

MUV2 FCC / MUV4 FCC / MUVEVO4HID-CIS

Models that are used in for applied standard test:

To whom it may concern,

This statement letter is to declare following products

MUV2 FCC / MUV4 FCC / MUVEVO4HID-CIS

These Model names and part numbers should be listed in test reports

These products have same RF block, but below features are different between models:

The three models are the same, except that the MUV2 FCC have two push buttons, the MUV4 FCC have four push buttons and the MUVEVO4HID-CIS have four push buttons + one passive TAG (HID to 125Khz)

Remarks:

(1) About following applied standard, there is no influence.

- Standard: 47 CFR Part 15B (10-1-15 Edition) + ICES-003 Issue 6 (2016)
- Standard: 47 CFR Part 15 Subpart C (15.231) (10-1-15 Edition) + ICES-003 Issue 6 (2016)
- USA FCC Part 15.231 10-1-15 Edition: Periodic operation in the band 40.66-40.70 MHz and above 70 MHz.
- USA FCC Part 15.209 10-1-15 Edition: Radiated emission limits; general requirements.
- CANADA RSS-210 Issue 9 (August 2016).
- CANADA RSS-Gen Issue 4 (November 2014).



Jordi Beringues Algué

## Testing verdicts

|                             |     |
|-----------------------------|-----|
| <b>Not applicable</b> ..... | N/A |
| <b>Pass</b> .....           | P   |
| <b>Fail</b> .....           | F   |
| <b>Not measured</b> .....   | N/M |

| FCC PART 15 PARAGRAPH / RSS-210                                     |                                                                   | VERDICT |   |   |    |
|---------------------------------------------------------------------|-------------------------------------------------------------------|---------|---|---|----|
|                                                                     |                                                                   | NA      | P | F | NM |
| Section 15.231 Subclause (a) (1) / RSS-210 A.1.1.                   | Transmitter deactivation                                          |         | P |   |    |
| Section 15.231 Subclause (c) / RSS-210 A.1.3...                     | Bandwidth                                                         |         | P |   |    |
| Section 15.231 Subclause (b) / 15.209 / RSS-210 A.1.2.<br>/ RSS-Gen | Field strength and Emission limitations<br>radiated (Transmitter) |         | P |   |    |

## Appendix A – Test result

## INDEX

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## TEST CONDITIONS

Power supply (V):

$$V_{\text{nominal}} = 3.0 \text{ Vdc}$$

Type of power supply = CR2032 battery.

Type of antenna = Integral antenna

## TEST FREQUENCIES:

The equipment transmits at the nominal frequency of 868.32 MHz.

## CONDUCTED MEASUREMENTS

The equipment under test was set up in a shielded room and it is directly connected to the spectrum analyzer.



## RADIATED MEASUREMENTS

The equipment under test was scanned for spurious emissions in the frequency range 30 to 10000 MHz.

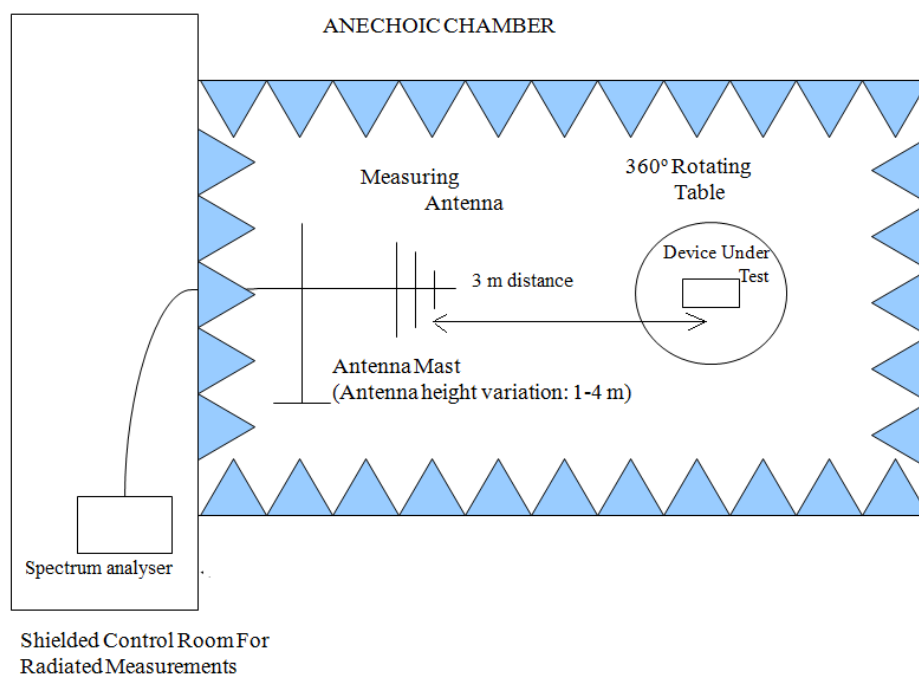
All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-10 GHz (1 GHz-18 GHz Double ridge horn antenna).

For radiated emissions in the range 1 GHz-10 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance. The sample is prepared so that transmits continuously when the batteries are connected

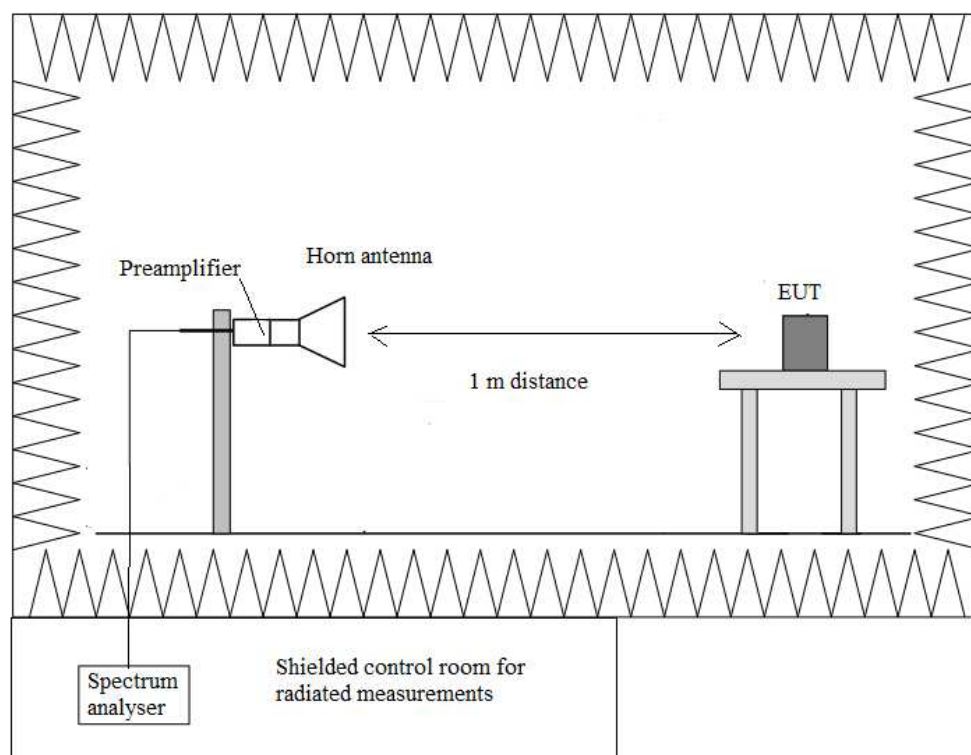
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

## Radiated measurements setup $f < 1$ GHz



## Radiated measurements setup $f > 1$ GHz



## Section 15.231 Subclause (a) (1) / RSS-210 A.1.1. Transmitter deactivation.

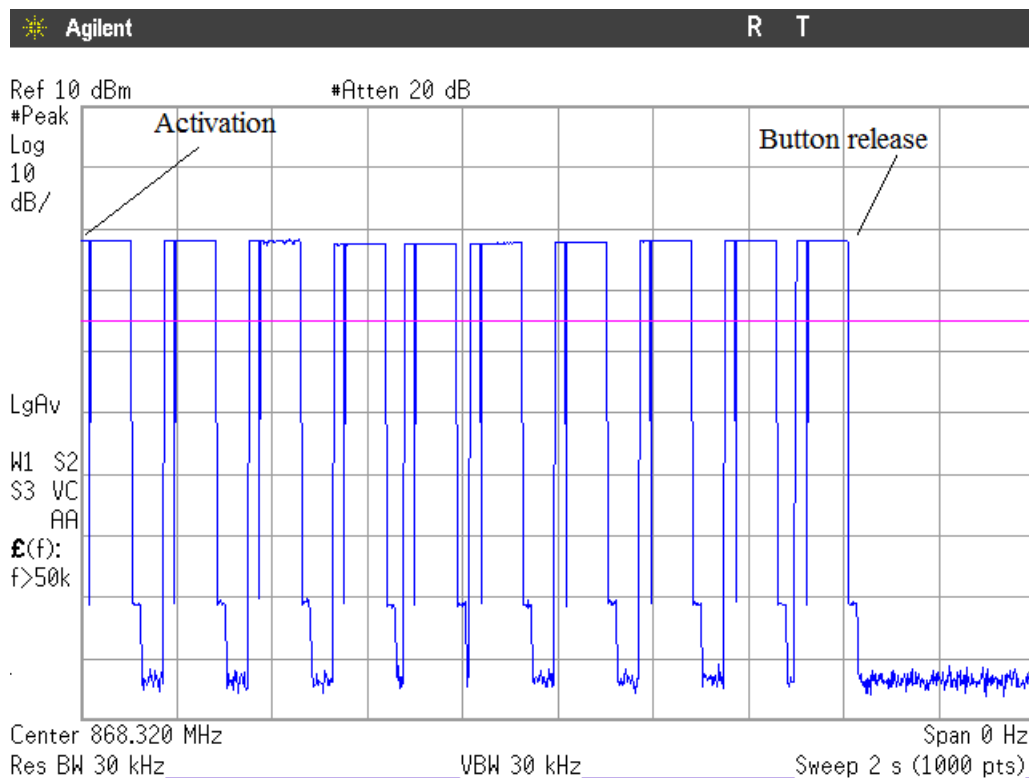
### SPECIFICATION

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### RESULTS

The equipment can only operate in manual mode.

The transmission is activated by pressing a button and ceases after releasing it in less than 5 seconds (see next plot).



Verdict: Pass

## Section 15.231 Subclause (c) / RSS-210 A.1.3. Bandwidth

### SPECIFICATION

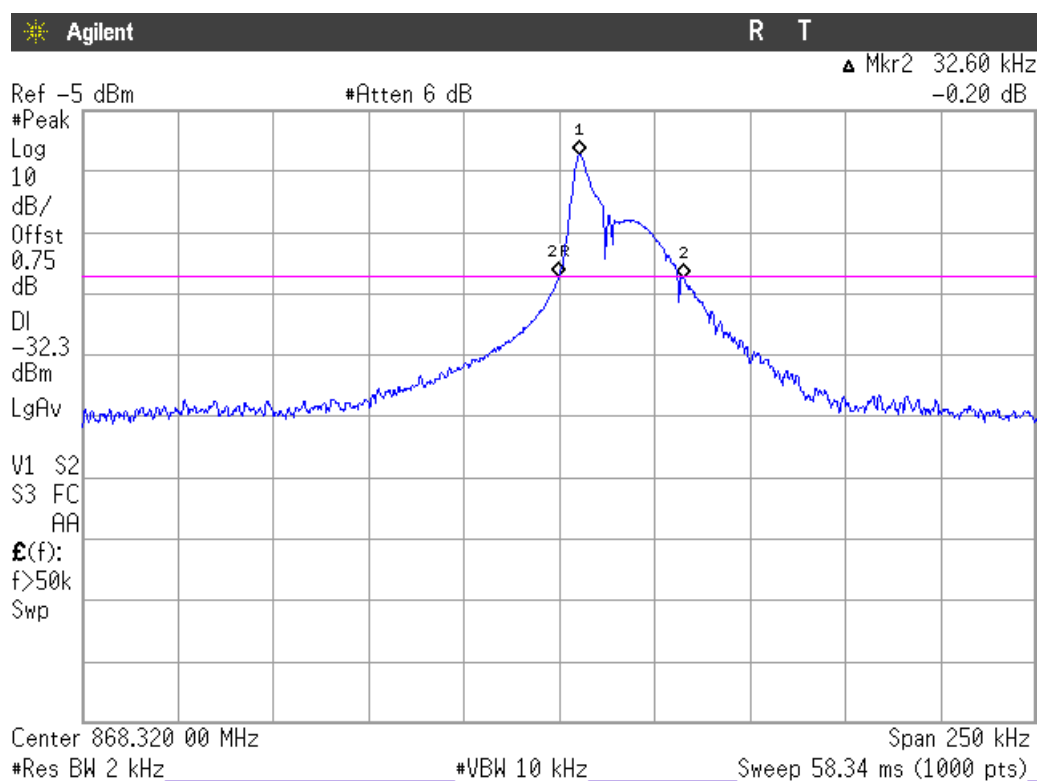
**FCC 15.231:** The bandwidth of the emission shall be no wider than 0.25 % of the centre frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

### RESULTS (see next plots)

Nominal centre frequency = 868.32 MHz

Limit of spectrum bandwidth = 0.25 % of 868.32 MHz = 2170.80 kHz

|                                |        |
|--------------------------------|--------|
| Measured 20 dB Bandwidth (kHz) | 32.60  |
| Measurement uncertainty (kHz)  | <±0.85 |



Verdict: PASS

## Occupied Bandwidth

### SPECIFICATION

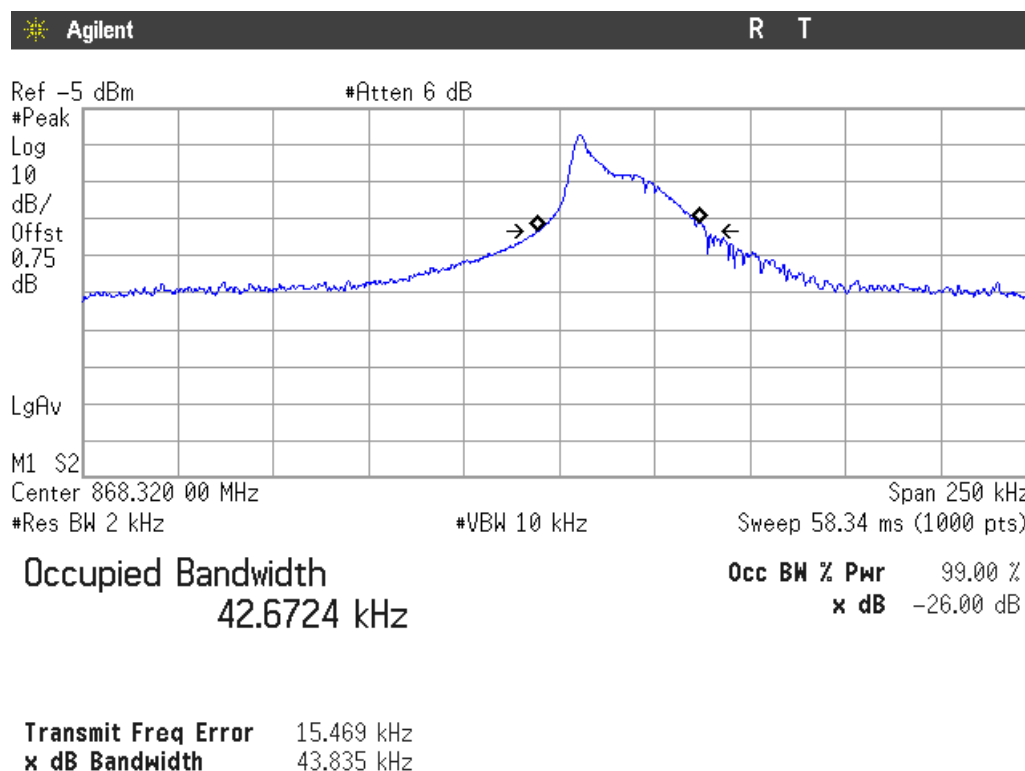
RSS-210. A.1.3.: the 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70 MHz and 900 MHz.

### RESULTS (see next plots).

Nominal centre frequency = 868.32 MHz

Limit of spectrum bandwidth = 0.25 % of 868.32 MHz = 2170.80 kHz

|                               |        |
|-------------------------------|--------|
| 99% bandwidth (kHz)           | 42.672 |
| -26 dBc bandwidth (kHz)       | 43.835 |
| Measurement uncertainty (kHz) | <±0.42 |



**Section 15.231 Subclause (b) /15.209 / RSS-210 A.1.2. / RSS-Gen. Field strength and Emission limitations radiated (Transmitter)**

**SPECIFICATION**

The field strength of emissions from intentional radiators shall not exceed the following:

| Fundamental frequency (MHz) | Field strength of fundamental ( $\mu\text{V/m}$ ) | Field strength of spurious emissions ( $\mu\text{V/m}$ ) |
|-----------------------------|---------------------------------------------------|----------------------------------------------------------|
| 40.66 – 40.70               | 2,250                                             | 225                                                      |
| 70 – 130                    | 1,250                                             | 125                                                      |
| 130 - 174                   | 1,250 to 3,750 **                                 | 125 to 375 **                                            |
| 174 - 260                   | 3,750                                             | 375                                                      |
| 260 - 470                   | 3,750 to 12,500 **                                | 375 to 1,250 **                                          |
| Above 470                   | 12,500                                            | 1,250                                                    |

\*\* : Linear Interpolations. The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level.

Spurious emissions shall be attenuated to the limits shown in the above table or to the general limits shown in Section 15.209/RSS-Gen, whichever limit permits a higher field strength.

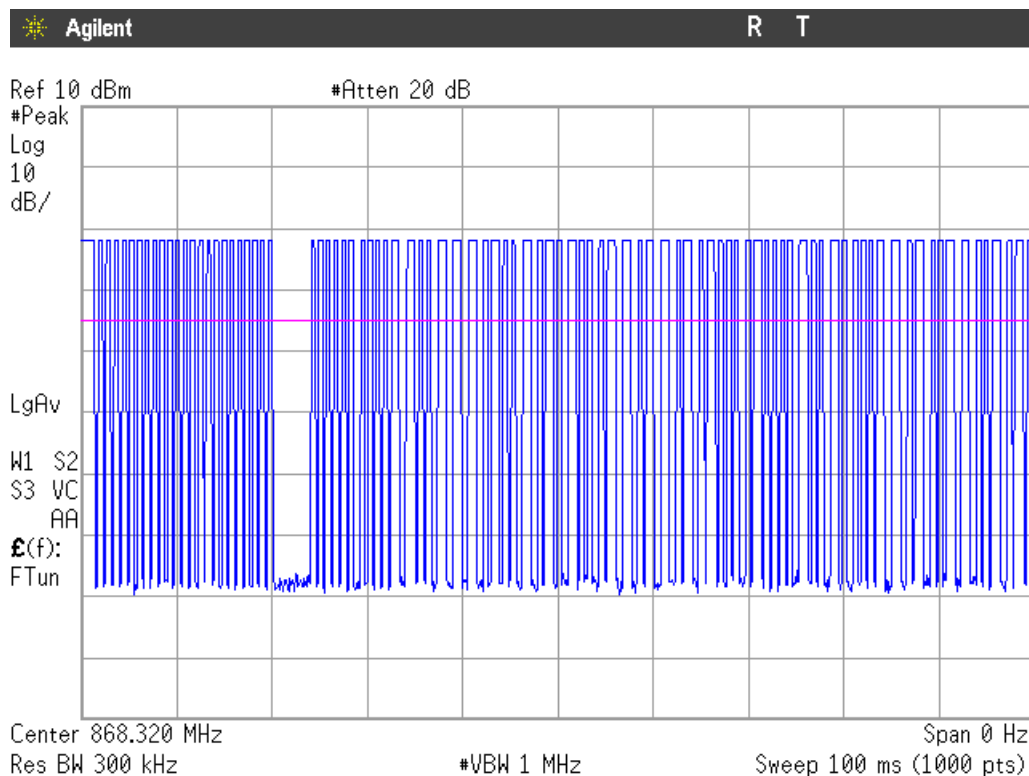
For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

**RESULTS:**

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

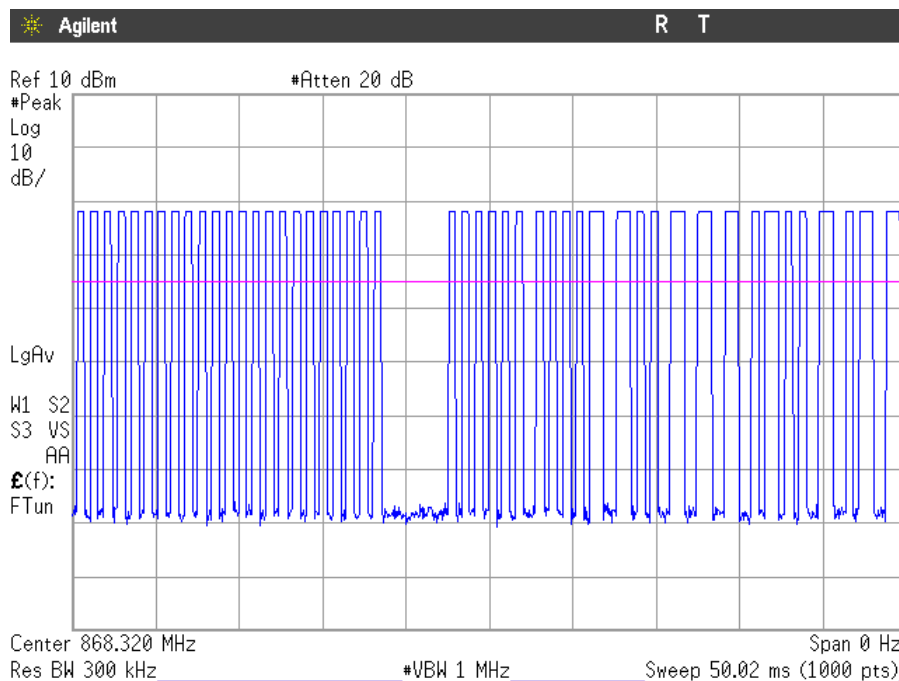
The transmission is pulsed so the average values of transmitter fundamental and spurious emissions are calculated from the measured peak values using the duty cycle correction factor  $\delta$  as indicated in standard ANSI C63.10-2013.

## Computation of duty-cycle correction factor

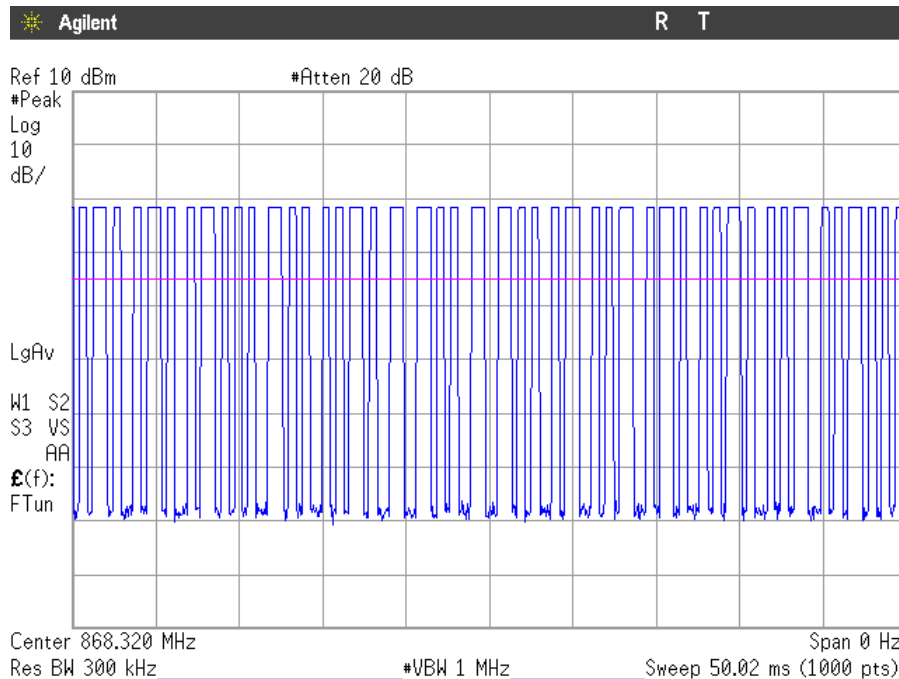


Number of pulses within 100 ms: 95

### Sub-part1:



## Sub-part2:



Duty-cycle correction factor calculation.

### Sub-part 1

| Sub-pulse | Duration (ms) | Number of pulses             | Sub-pulse "On Time" (ms) |
|-----------|---------------|------------------------------|--------------------------|
| 1         | 0.3505        | 19                           | 6.6595                   |
| 2         | 0.4005        | 21                           | 8.4105                   |
| 3         | 0.8011        | 4                            | 3.2044                   |
| 4         | 0.7510        | 4                            | 3.0040                   |
|           |               | TOTAL ON TIME<br>Sub-part 1: | 21.2784                  |

### Sub-part 2

| Sub-pulse | Duration (ms) | Number of pulses             | Sub-pulse "On Time" (ms) |
|-----------|---------------|------------------------------|--------------------------|
| 1         | 0.3505        | 11                           | 3.8555                   |
| 2         | 0.4005        | 21                           | 8.4105                   |
| 3         | 0.8011        | 7                            | 5.6077                   |
| 4         | 0.7510        | 8                            | 6.0080                   |
|           |               | TOTAL ON TIME<br>Sub-part 2: | 23.8817                  |

| Sub-part       | Sub-pulse "On Time" (ms) |
|----------------|--------------------------|
| 1              | 21.2784                  |
| 2              | 23.8817                  |
| TOTAL ON TIME: | 45.1601                  |

Duty cycle correction factor  $\delta = 45.1601 / 100 = 0.4516$

$\delta = 20 \log (0.4516) = -6.90 \text{ dB}$

**Frequency range 30 MHz-1000 MHz (see next plots)**

| Frequency (MHz)          | Polarization | Detector | Emission Level (µV/m) | Limits (µV/m)<br>15.231 (b) / 15.209 |
|--------------------------|--------------|----------|-----------------------|--------------------------------------|
| 868.322<br>(Fundamental) | V            | Peak     | 26,091.55             | 125,000 (101.84 dBµV/m) / ---        |

Calculation for average level

| Spurious frequency (MHz) | Emission Level (dBµV/m) Peak | Duty-cycle correction factor $\delta$ (dB) | Corrected Emission Level (dBµV/m) Average | Limits (µV/m)<br>15.231 (b) / 15.209 |
|--------------------------|------------------------------|--------------------------------------------|-------------------------------------------|--------------------------------------|
| 868.322<br>(Fundamental) | 88.33                        | -6.90                                      | 81.43                                     | 12,500 (81.94 dBµV/m) / ---          |

Measurement uncertainty (dB):  $\pm 3.88$  dB.

**Frequency range 1 GHz-10 GHz (see next plots)**

Highest spurious levels.

| Frequency (GHz) | Polarization | Detector | Emission Level (dBµV/m) | Limits (µV/m)<br>15.231 (b) / 15.209      |
|-----------------|--------------|----------|-------------------------|-------------------------------------------|
| 1.73665         | H            | Peak     | 52.73                   | 12,500 (81.94 dBµV/m) / 5,000 (74 dBµV/m) |
| 2.60485         | V            | Peak     | 53.06                   | 12,500 (81.94 dBµV/m) / 5,000 (74 dBµV/m) |
| 3.47305         | V            | Peak     | 55.69                   | 12,500 (81.94 dBµV/m) / 5,000 (74 dBµV/m) |
| 4.34155         | H            | Peak     | 65.69                   | 12,500 (81.94 dBµV/m) / 5,000 (74 dBµV/m) |
| 5.21005         | V            | Peak     | 49.41                   | 12,500 (81.94 dBµV/m) / 5,000 (74 dBµV/m) |

### Calculation for average level

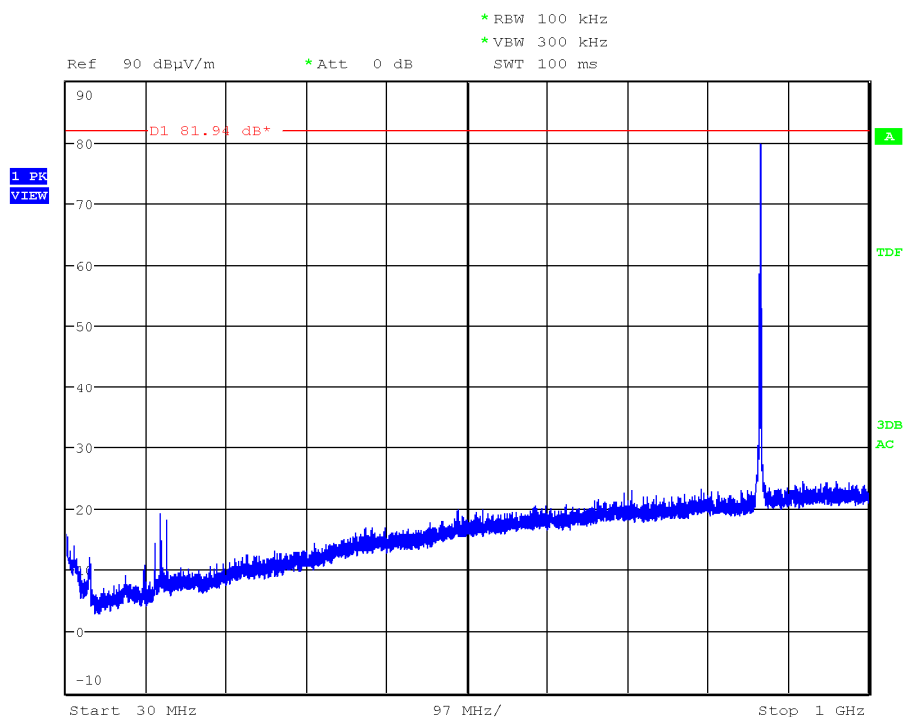
| Spurious frequency<br>(GHz) | Emission Level<br>(dB $\mu$ V/m) Peak | Duty-cycle<br>correction factor $\delta$<br>(dB) | Corrected Emission<br>Level<br>(dB $\mu$ V/m) Average | Limits ( $\mu$ V/m)<br>15.231 (b) / 15.209            |
|-----------------------------|---------------------------------------|--------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|
| 3.47305                     | 55.69                                 | -6.90                                            | 48.79                                                 | 1,250 (61.94 dB $\mu$ V/m) /<br>500 (54 dB $\mu$ V/m) |
| 4.34155                     | 65.69                                 | -6.90                                            | 58.79                                                 | 1,250 (61.94 dB $\mu$ V/m) /<br>500 (54 dB $\mu$ V/m) |

All other peak values are below the average limits.

Measurement uncertainty (dB):  $\pm 4.87$  dB.

Verdict: PASS.

## FREQUENCY RANGE 30 MHz-1000 MHz



Note: The peak shown in the plot is the carrier frequency.

## FREQUENCY RANGE 1 GHz to 10 GHz

