



LCIE

# TEST REPORT

N°: 162778-740452-A (FILE#1028609)

Version : 02

|                                |                                                                                                                                                                          |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Subject</b>                 | <b>Electromagnetic compatibility tests according to the standards:</b><br><b>FCC CFR 47 Part 15, Subpart C</b><br><b>ANSI C63.10 (2013)</b><br><b>RSS-210 Issue 10.0</b> |
| <b>Issued to</b>               | <b>ASTEEL FLASH FRANCE</b><br><br>43 chemin du Vieux Chêne<br>38240 - MEYLAN<br>FRANCE                                                                                   |
| <b>Apparatus under test</b>    |                                                                                                                                                                          |
| ↳ Product                      | <b>Avalanche beacon</b>                                                                                                                                                  |
| ↳ Trade mark                   | <b>ARVA</b>                                                                                                                                                              |
| ↳ Manufacturer                 | <b>ARVA</b>                                                                                                                                                              |
| ↳ Model under test             | <b>NEO PRO</b>                                                                                                                                                           |
| ↳ Serial number                | <b>E48839-1024</b>                                                                                                                                                       |
| ↳ FCCID                        | <b>O9BARVANEOPRO</b>                                                                                                                                                     |
| ↳ IC                           | <b>22008-ARVaneo</b>                                                                                                                                                     |
| <b>Conclusion</b>              | See Test Program chapter §1                                                                                                                                              |
| <b>Test date</b>               | December 4, 2019                                                                                                                                                         |
| <b>Test location</b>           | FONTENAY AUX ROSES                                                                                                                                                       |
| <b>IC Test site</b>            | 6230B-1                                                                                                                                                                  |
| <b>Composition of document</b> | 31 pages                                                                                                                                                                 |
| <b>Document issued on</b>      | April 14, 2020                                                                                                                                                           |

**Written by :**  
Gaetan DESCHAMPS  
**Tests operator**

**Approved by :**  
Anthony MERLIN  
**Technical manager**

This document shall not be reproduced, except in full, without the written approval of the LCIE. This document contains results related only to the items tested. It does not imply the conformity of the whole production to the items tested. Unless otherwise specified, the decision of conformity takes into account the uncertainty of measurement. This document doesn't anticipate any certification decision.

**LCIE**

Laboratoire Central des Industries Electriques  
Une société de Bureau Veritas

ZI Centr'alp  
170 rue de Chatagnon  
38430 Moirans FRANCE

Tél : +33 4 76 07 36 36  
contact@lcie.fr  
www.lcie.fr



## PUBLICATION HISTORY

| Version | Date              | Author           | Modification                                  |
|---------|-------------------|------------------|-----------------------------------------------|
| 01      | December 16, 2019 | Gaetan DESCHAMPS | Creation of the document                      |
| 02      | April 14, 2020    | Gaetan DESCHAMPS | Modification of model to FCC/IC Certification |



|                |
|----------------|
| <b>SUMMARY</b> |
|----------------|

|                                                |    |
|------------------------------------------------|----|
| 1. TEST PROGRAM.....                           | 4  |
| 2. SYSTEM TEST CONFIGURATION .....             | 5  |
| 3. RADIATED EMISSION DATA (15.209).....        | 7  |
| 4. OCCUPIED BANDWIDTH .....                    | 18 |
| 5. FUNDAMENTAL FREQUENCY TOLERANCE (RSS) ..... | 20 |
| 6. RECEIVER SPURIOUS EMISSION.....             | 22 |
| 8. UNCERTAINTIES CHART.....                    | 31 |



## 1. TEST PROGRAM

**Standard:**

- FCC Part 15, Subpart C
- ANSI C63.10 (2013)
- RSS-210 Issue 10
- RSS-Gen Issue 5

| EMISSION TEST                                                                                                                                                 | LIMITS                                                                                                                                                      |                                |                             | RESULTS<br>(Comments)                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| <b>Limits for conducted disturbance at mains ports</b><br>150kHz-30MHz<br>CFR 47 §15.207                                                                      | <b>Frequency</b>                                                                                                                                            | <b>Quasi-peak value (dBμV)</b> | <b>Average value (dBμV)</b> | <input type="checkbox"/> PASS<br><input type="checkbox"/> FAIL<br><input checked="" type="checkbox"/> NA<br><input type="checkbox"/> NP |
|                                                                                                                                                               | 150-500kHz                                                                                                                                                  | 66 to 56                       | 56 to 46                    |                                                                                                                                         |
|                                                                                                                                                               | 0.5-5MHz                                                                                                                                                    | 56                             | 46                          |                                                                                                                                         |
|                                                                                                                                                               | 5-30MHz                                                                                                                                                     | 60                             | 50                          |                                                                                                                                         |
| <b>Radiated emissions</b><br>9kHz-30MHz<br>CFR 47 §15.209 (a)<br>CFR 47 §15.225<br>RSS-Gen §4.9                                                               | <b>Measure at 300m</b><br>9kHz-490kHz : 67.6dBμV/m /F(kHz)<br><b>Measure at 30m</b><br>490kHz-1.705MHz : 87.6dBμV/m /F(kHz)<br>1.705MHz-30MHz : 29.5 dBμV/m |                                |                             | <input checked="" type="checkbox"/> PASS<br><input type="checkbox"/> FAIL<br><input type="checkbox"/> NA<br><input type="checkbox"/> NP |
| <b>Radiated emissions</b><br>30MHz-25GHz*<br>CFR 47 §15.209 (a)<br>CFR 47 §15.225<br>RSS-Gen §4.9<br><i>Highest frequency :<br/>(Declaration of provider)</i> | <b>Measure at 3m</b><br>30MHz-88MHz : 40 dBμV/m<br>88MHz-216MHz : 43.5 dBμV/m<br>216MHz-960MHz : 46.0 dBμV/m<br>Above 960MHz : 54.0 dBμV/m                  |                                |                             | <input checked="" type="checkbox"/> PASS<br><input type="checkbox"/> FAIL<br><input type="checkbox"/> NA<br><input type="checkbox"/> NP |
| <b>Occupied bandwidth</b><br>RSS-Gen Issue 5 §6.7                                                                                                             | No limit                                                                                                                                                    |                                |                             | <input checked="" type="checkbox"/> PASS<br><input type="checkbox"/> FAIL<br><input type="checkbox"/> NA<br><input type="checkbox"/> NP |
| <b>Receiver Spurious Emission**</b><br>RSS-Gen Issue 5 §7.3                                                                                                   | <b>See RSS-Gen §7.3</b><br>30MHz-88MHz : 40 dBμV/m<br>88MHz-216MHz : 43.5 dBμV/m<br>216MHz-960MHz : 46.0 dBμV/m<br>Above 960MHz : 54.0 dBμV/m               |                                |                             | <input checked="" type="checkbox"/> PASS<br><input type="checkbox"/> FAIL<br><input type="checkbox"/> NA<br><input type="checkbox"/> NP |

\*§15.33: The highest internal source of a testing device is defined like more the highest frequency generated or used in the testing device or on which the testing device works or agrees.

- If the highest frequency of the internal sources of the testing device is lower than 108 MHz, measurement must be only performed until 1GHz.

- If the highest frequency of the internal sources of the testing device ranges between 108 MHz and 500 MHz, measurement must be only performed until 2GHz.

- If the highest frequency of the internal sources of the testing device ranges between 500 MHz and 1 GHz, measurement must be only performed until 5GHz.

If the highest frequency of the internal sources of the testing device is above 1 GHz, measurement must be only performed until 5 times the highest frequency or 40 GHz, while taking smallest of both.

\*\*Testing covered the receive mode, and receiver spurious emissions are considered to be the same as transmitter.

## 2. SYSTEM TEST CONFIGURATION

### 2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

#### Equipment under test (EUT):

NEO PRO

Serial Number: E48839-1024



#### Power supply:

During all the tests, EUT is supplied by  $V_{nom}$ : 3\*1,5VDC

For measurement with different voltage, it will be presented in test method.

| Name    | Type                                                                                                | Rating | Reference / Sn | Comments |
|---------|-----------------------------------------------------------------------------------------------------|--------|----------------|----------|
| Supply1 | <input type="checkbox"/> AC <input type="checkbox"/> DC <input checked="" type="checkbox"/> Battery | 3*1,5  | -              | -        |

#### Auxiliary equipment used during test:

| Type          | Reference | Sn | Comments |
|---------------|-----------|----|----------|
| Laptop        | L460      | -  | -        |
| AC source 1kW | KEYSIGHT  | -  | -        |



## Equipment information:

| EQUIPMENT INFORMATION        |                                                                            |                                                                          |                                                                   |                                                                 |
|------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------|
| RF module:                   | Nc*                                                                        |                                                                          |                                                                   |                                                                 |
| Frequency Carrier:           | [457 kHz]                                                                  |                                                                          |                                                                   |                                                                 |
| Frequency band:              | [456.9-457.1kHz]                                                           |                                                                          |                                                                   |                                                                 |
| RF mode:                     | <input checked="" type="checkbox"/> Transmitter                            | <input type="checkbox"/> Transceiver                                     | <input checked="" type="checkbox"/> Receiver                      | <input type="checkbox"/> Standby                                |
| Antenna type:                | <input type="checkbox"/> External:                                         |                                                                          | <input checked="" type="checkbox"/> Internal: Coil                |                                                                 |
| Antenna gain:                | 0 dBi                                                                      |                                                                          |                                                                   |                                                                 |
| Equipment location           | <input checked="" type="checkbox"/> Mobile station                         |                                                                          | <input type="checkbox"/> Fixed station                            |                                                                 |
| Extreme temperature range:   | <input checked="" type="checkbox"/> Category I (General)<br>-20°C to +55°C |                                                                          | <input type="checkbox"/> Category II (Portable)<br>-10°C to +55°C | <input type="checkbox"/> Category III (Indoor)<br>+5°C to +35°C |
| Extreme test source voltage: | <input checked="" type="checkbox"/> ±10%:                                  | <input type="checkbox"/> Other: From XXVDC to XXVDC ( ask from provider) |                                                                   |                                                                 |
| Rmq:                         |                                                                            |                                                                          |                                                                   |                                                                 |

Nc\*: Not Communicated

## 2.2. EUT CONFIGURATION

A special configuration of the EUT permits:

- Permanent emission of the carrier frequency with modulation
- Permanent RX mode

Inboard Firmware / Software version of EUT: V. Not communicated

## 2.3. EQUIPMENT MODIFICATIONS

☒ None ☐ Modification:

## 2.4. FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow:

$$FS = RA + AF + CF - AG$$

Where  
 FS = Field Strength  
 RA = Receiver Amplitude  
 AF = Antenna Factor  
 CF = Cable Factor  
 AG = Amplifier Gain

Assume a receiver reading of 52.5dBμV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 are added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBμV/m.

$$FS = 52.5 + 7.4 + 1.1 - 29 = 32 \text{ dB}\mu\text{V/m}$$

The 32 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32\text{dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}.$$

## 2.5. CALIBRATION DATE

The calibration intervals are extended at 12+2 months. This extended interval is based on the fact that there is sufficient calibration data to statistically establish a trend or based on experience of use of the test equipment to assure good measurement results for a longer period

### 3. RADIATED EMISSION DATA (15.209)

#### 3.1. ENVIRONMENTAL CONDITIONS

Test performed by : Mounir Bouamara  
 Date of test : December 12, 2019  
 Relative humidity (%) : 40  
 Ambient temperature (°C) : 24

#### 3.2. TEST SETUP

The installation of EUT is identical for pre-characterization measures in a 3 meters semi- anechoic chamber and for measures on the 10 meters Open site.

The EUT and auxiliaries are set:

- ☒ 80cm above the ground on the non-conducting table (Table-top equipment) - Below 1GHz
- ☐ 150cm above the ground on the non-conducting table (Table-top equipment) - Above 1GHz
- ☐ 10cm above the ground on isolating support (Floor standing equipment)

The EUT is powered by  $V_{nom}$ .



*Test setup on OATS*



*Test setup in anechoic chamber*



### 3.3. TEST METHOD

The product has been tested according to ANSI C63.10, FCC Part 15 Subpart C.

Pre-characterisation measurement: (9kHz – 1GHz)

A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber for frequency from 30MHz to 1GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test for maximized the emission measurement. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration.

Characterization on 10 meters open site from 9kHz to 1GHz:

Radiated Emissions were measured on an open area test site. A description of the facility is on file with the FCC. The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC Part 15 Subpart C limits. Measurement bandwidth was 9kHz below 30MHz and 120kHz from 30 MHz to 1GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test for maximized the emission measurement. The height antenna is varied from 1m to 4m. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown.

Frequency list has been created with anechoic chamber pre-scan results.

### 3.4. TEST EQUIPMENT LIST

| TEST EQUIPMENT USED                 |                 |              |               |          |         |
|-------------------------------------|-----------------|--------------|---------------|----------|---------|
| Description                         | Manufacturer    | Model        | Identifier    | Cal_Date | Cal_Due |
| Amplifier 100kHz - 18GHz            | LCIE SUD EST    | —            | A7085027      | 07/19    | 07/20   |
| Antenna Bi-log                      | AH System       | SAS-521-7    | C2040180      | 10/18    | 10/20   |
| Antenna mast (Cage#1)               | MATURO Gmbh     | AM 4.0       | F2000407      |          |         |
| BAT EMC                             | NEXIO           | v3.9.0.10    | L1000115      |          |         |
| Cable 0.75m                         | SUCOFLEX        | 18GHz        | A5329920      | 09/19    | 09/20   |
| Emission Cable                      | MICRO-COAX      | 18GHz        | A5329656      | 07/19    | 07/20   |
| Emission Cable                      | SUCOFLEX        | 18GHz        | A5329899      | 07/19    | 07/20   |
| HF Radiated emission comb generator | LCIE SUD EST    | —            | A3169088      |          |         |
| Radiated emission comb generator    | BARDET          | —            | A3169050      |          |         |
| Semi-Anechoic chamber #1 (BF)       | SIEPEL          | —            | D3044016_BF   | 07/19    | 07/22   |
| Semi-Anechoic chamber #1 (VSWR)     | SIEPEL          | —            | D3044016_VSWR | 07/19    | 07/22   |
| Spectrum analyzer                   | ROHDE & SCHWARZ | FSV 30       | A4060051      | 03/18    | 03/20   |
| Table C1/OATS                       | MATURO Gmbh     | —            | F2000437      |          |         |
| Thermo-hygrometer (C1)              | OREGON          | WMR 80       | B4206013      | 06/18    | 06/20   |
| Thermo-hygrometer (PM1/2/3)         | KIMO            | HQ 210       | B4206022      | 08/18    | 08/20   |
| Turntable chamber (Cage#1)          | MATURO Gmbh     | TT 2.0 SI    | F2000406      |          |         |
| Turntable controller (Cage#1)       | MATURO Gmbh     | Control Unit | F2000408      |          |         |

### 3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None

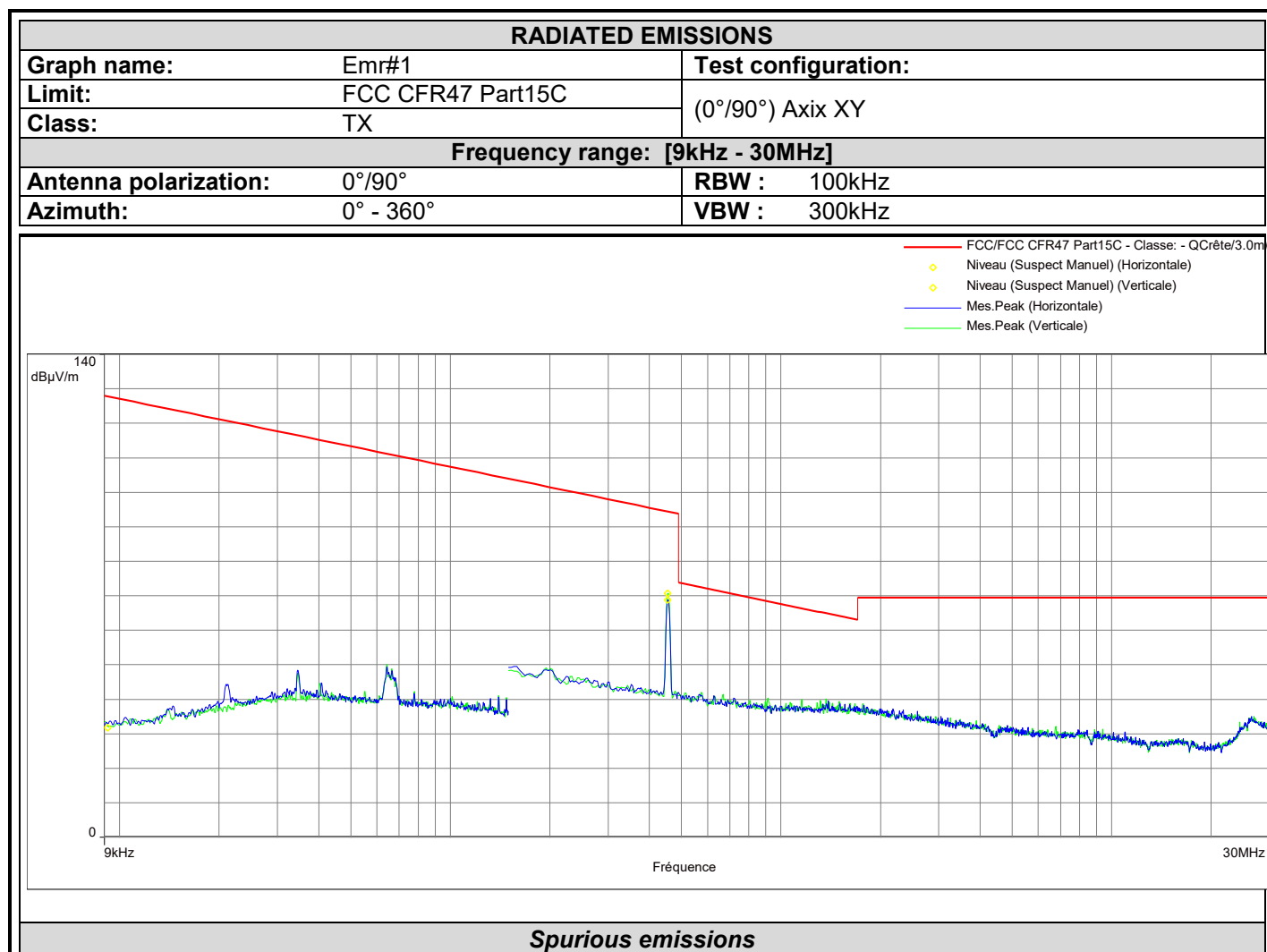
☐ Divergence:

### 3.6. TEST RESULTS

#### 3.6.1. Pre-characterization at 3 meters [9kHz-30MHz]

See graph for 9kHz-30MHz band:

| Graph identifier | Polarization | EUT position | Mode | Comments    |
|------------------|--------------|--------------|------|-------------|
| Emr# 1           | 0°,90        | Axis XY      | TX   | See annex 1 |
| Emr# 2           | 180°         | Axis XY      | TX   | See annex 1 |
| Emr# 3           | 0°,90        | Axis Z       | TX   | See annex 1 |
| Emr# 4           | 180°         | Axis Z       | TX   | See annex 1 |

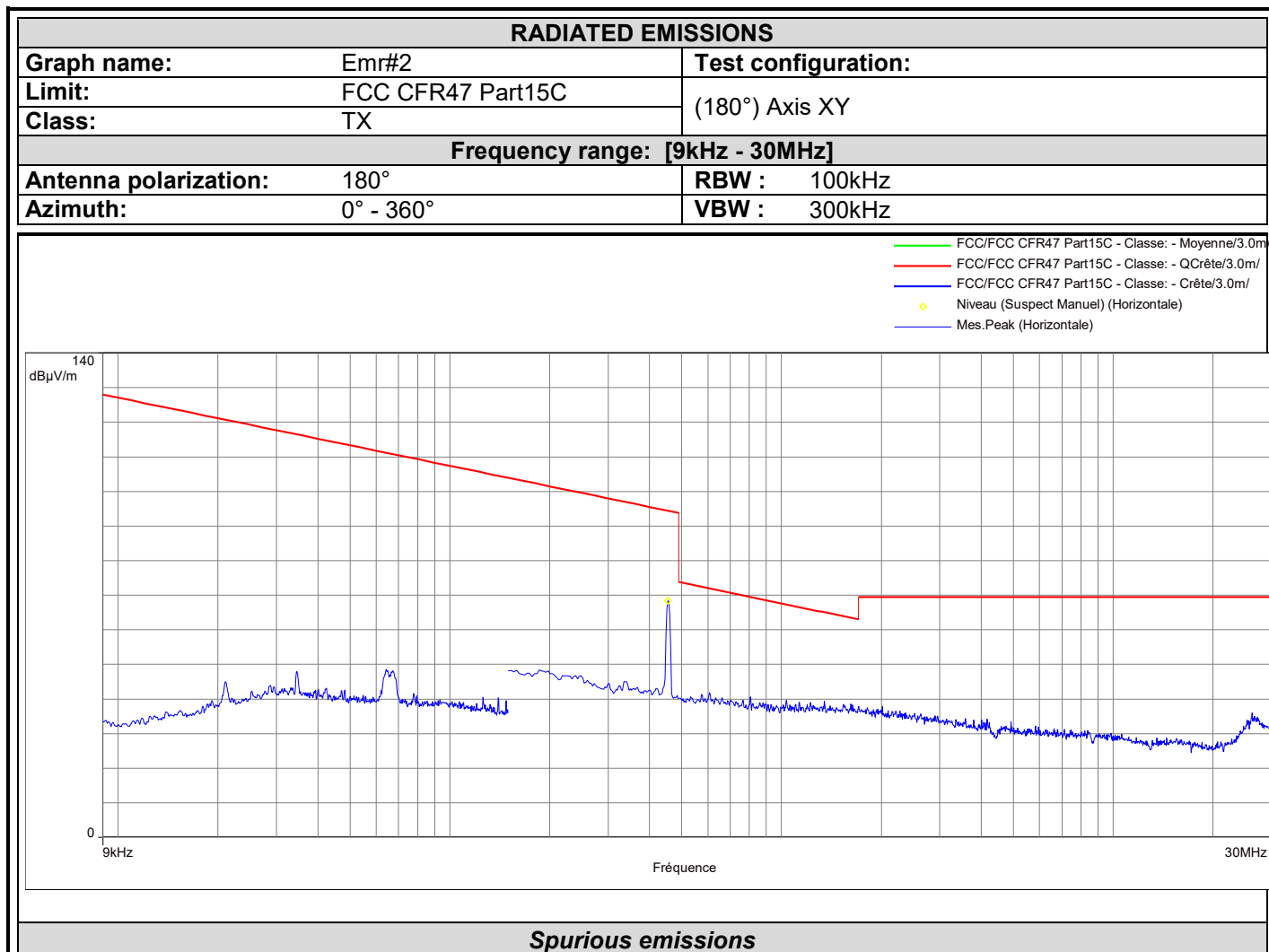


| Frequency (MHz) | Peak Level (dBµV/m) | Hauteur (m) | Polarization |
|-----------------|---------------------|-------------|--------------|
| 0.454*          | 68.8                | 1.6         | 0°           |
| 0.009           | 31.8                | 1.6         | 90°          |
| 0.454*          | 70.8                | 1.6         | 90°          |

\*Carrier frequency



L C I E

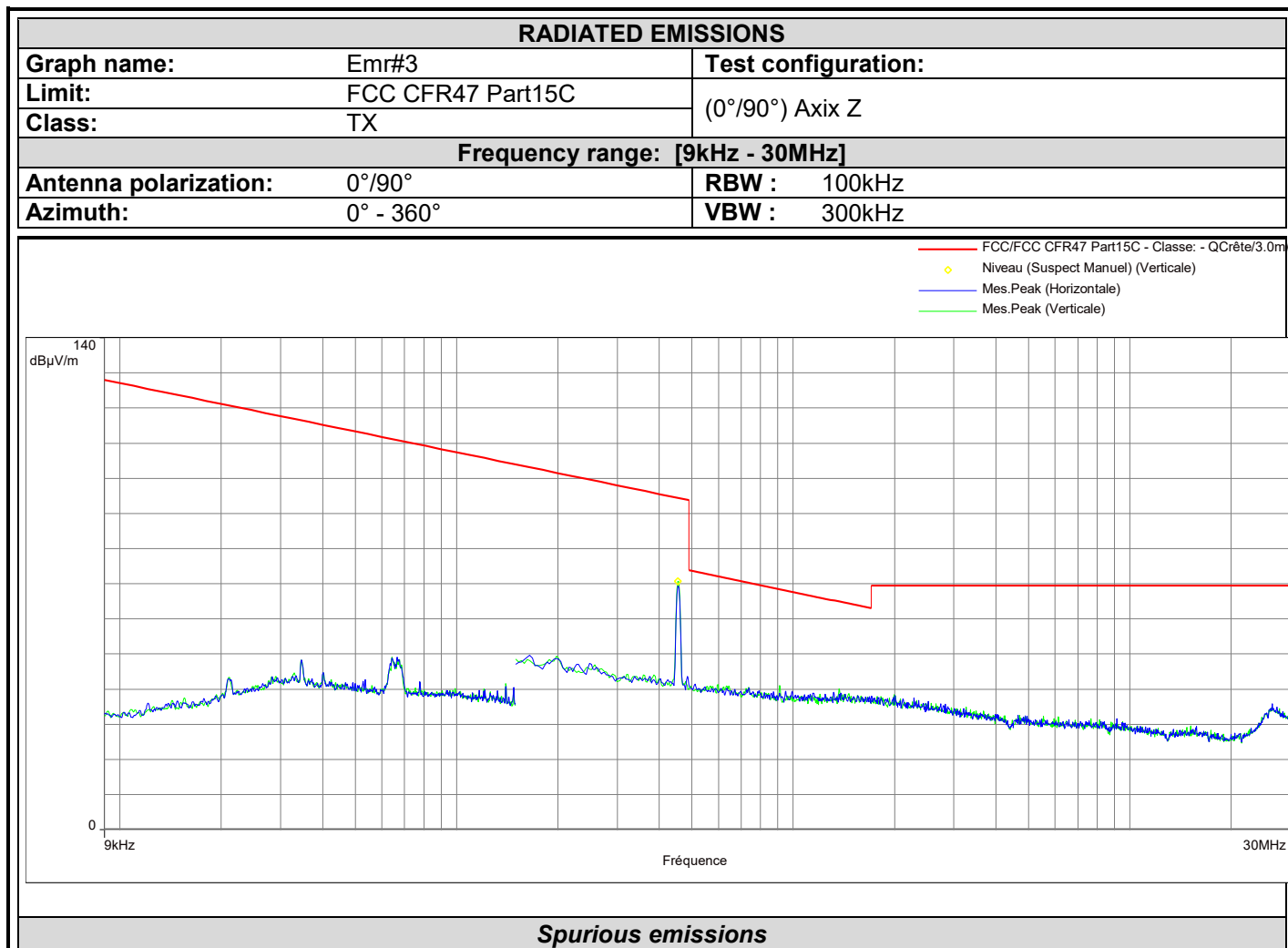


| Frequency (MHz) | Peak Level (dBμV/m) | Hauteur (m) | Polarization |
|-----------------|---------------------|-------------|--------------|
| 0.454*          | 68.4                | 1.6         | 180°         |

\*Carrier frequency



L C I E

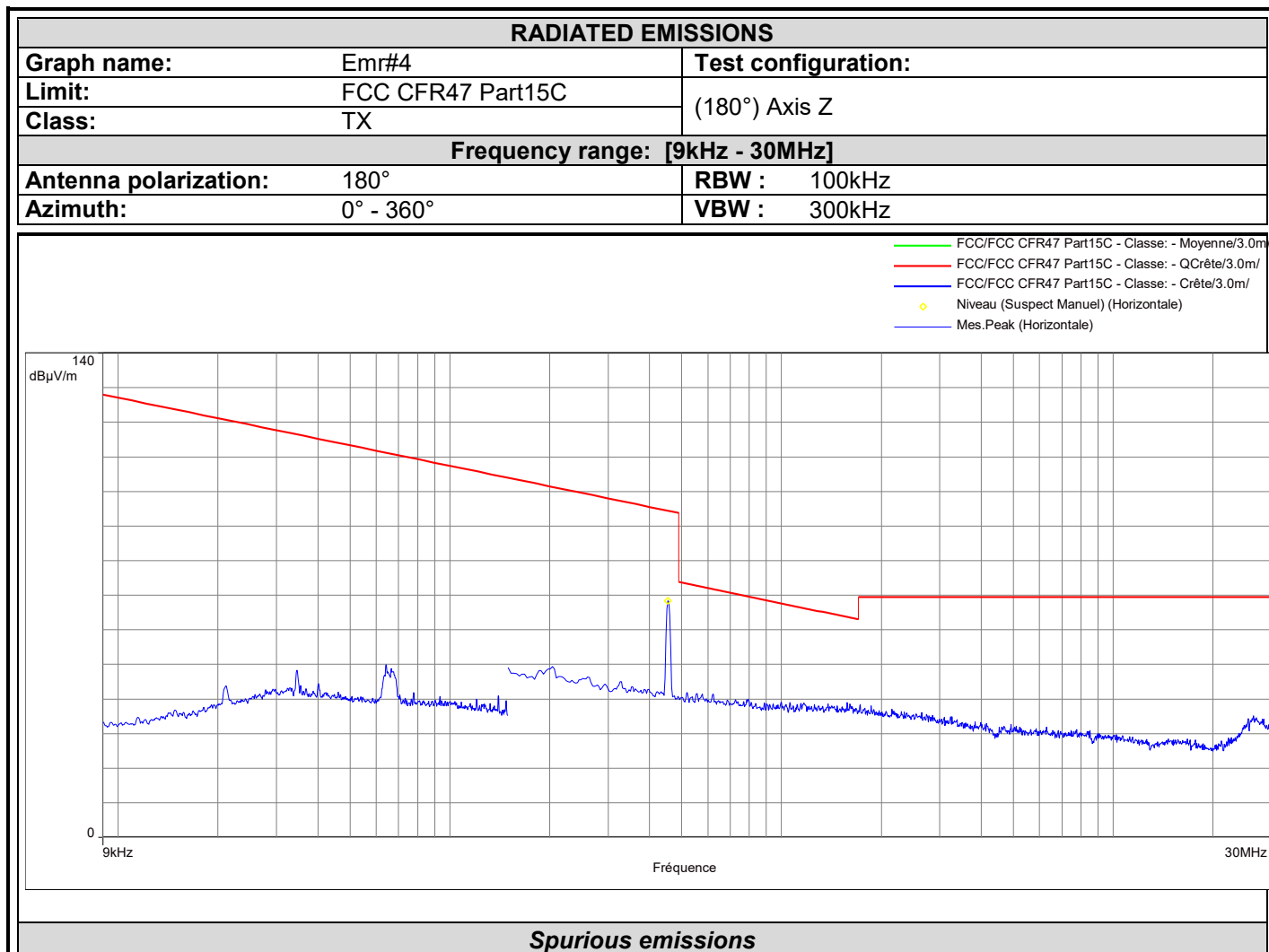


| Frequency (MHz) | Peak Level (dBµV/m) | Hauteur (m) | Polarization |
|-----------------|---------------------|-------------|--------------|
| 0.454*          | 70.8                | 1.6         | 90°          |

\*Carrier frequency



L C I E



| Frequency (MHz) | Peak Level (dBµV/m) | Hauteur (m) | Polarization |
|-----------------|---------------------|-------------|--------------|
| 0.454*          | 68.4                | 1.6         | 180°         |

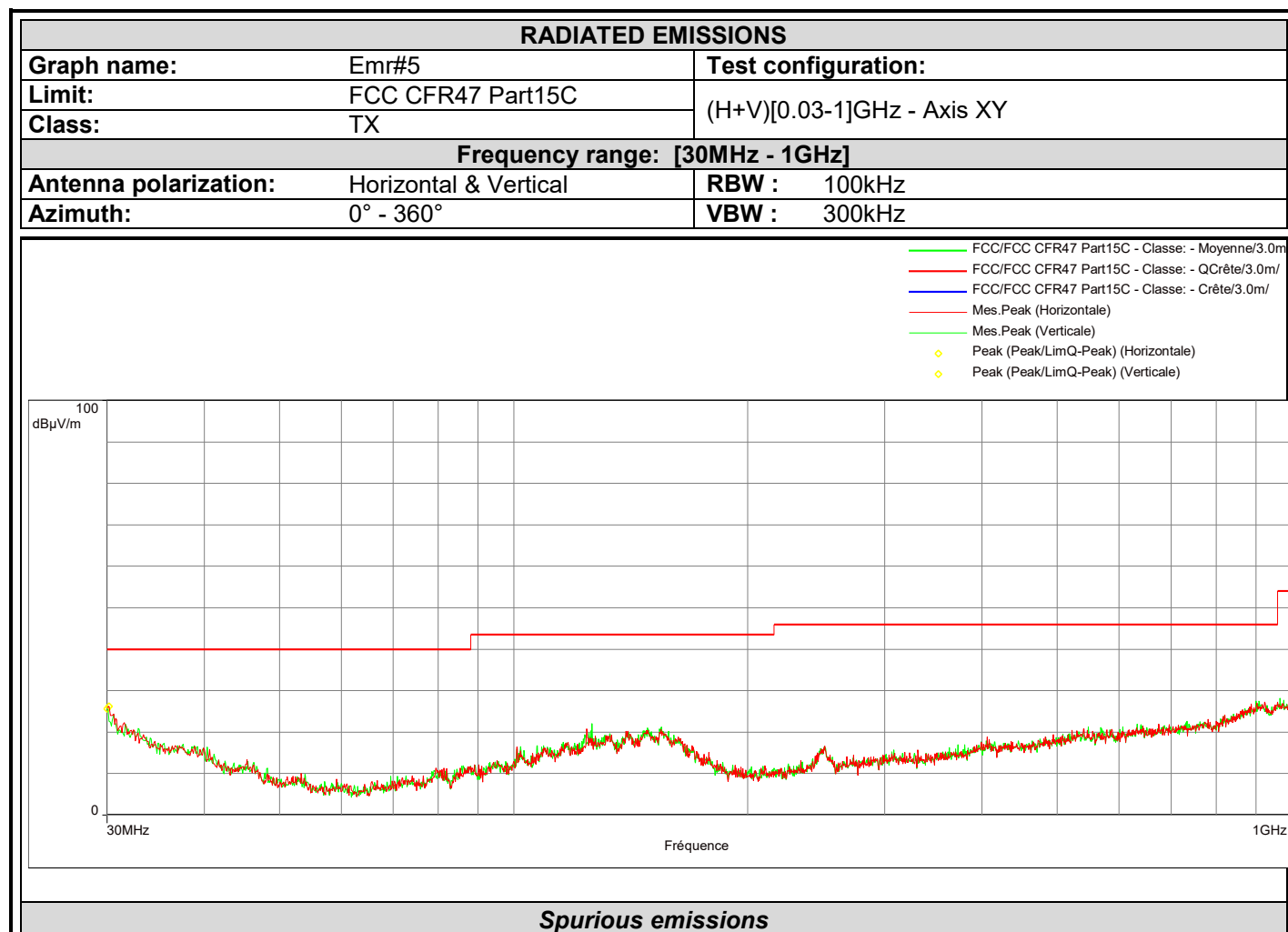
\*Carrier frequency



### 3.6.2. Pre-characterization at 3 meters [30MHz-1GHz]

See graphs for 30MHz-1GHz:

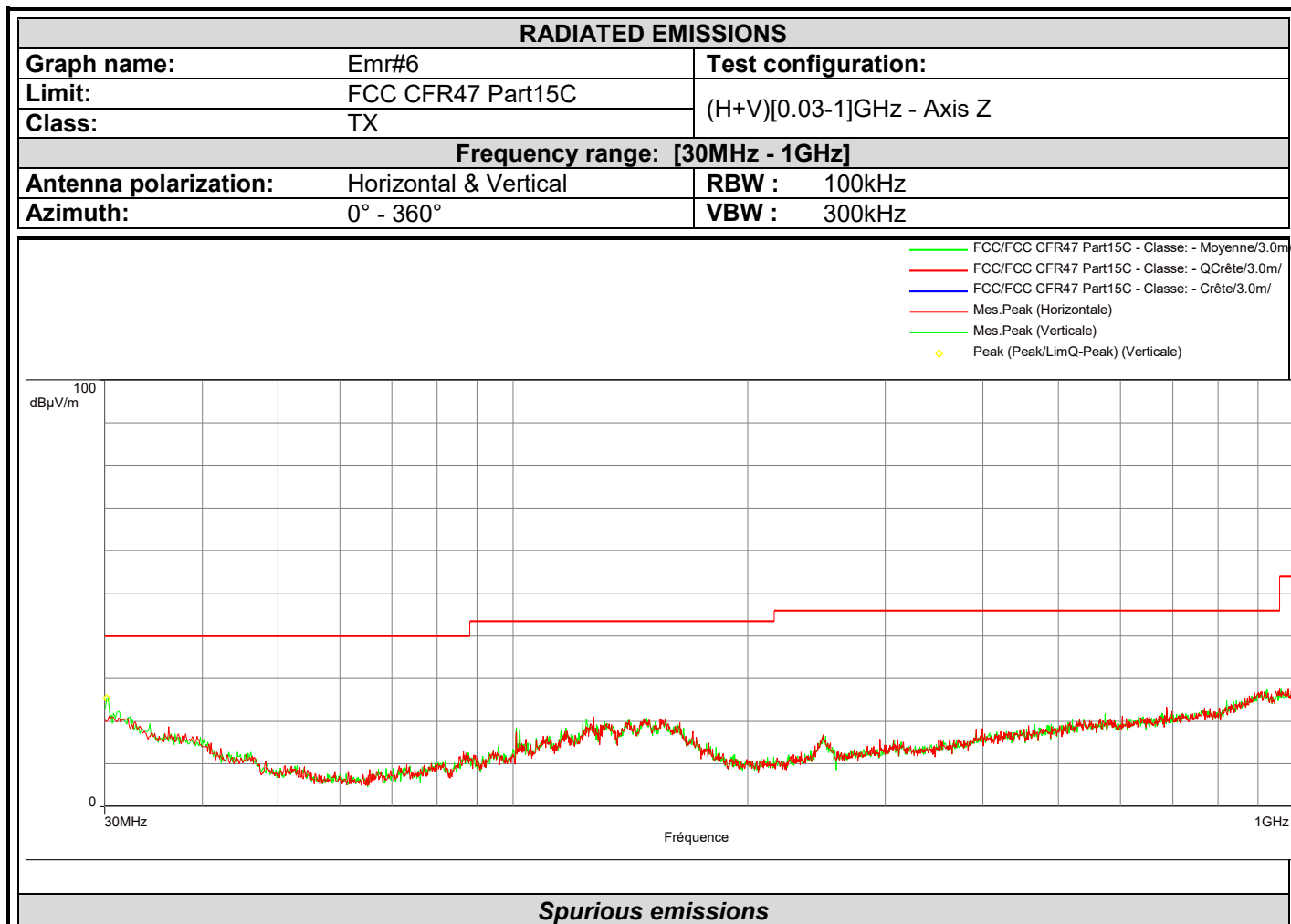
| Graph identifier | Polarization | EUT position | Mode | Comments    |
|------------------|--------------|--------------|------|-------------|
| Emr# 5           | H & V        | Axis XY      | TX   | See annex 1 |
| Emr# 6           | H & V        | Axis Z       | TX   | See annex 1 |
| Emr# 7           | H & V        | Axis XY      | RX   | See annex 1 |
| Emr# 8           | H & V        | Axis Z       | RX   | See annex 1 |



| Frequency (MHz) | Peak (dBμV/m) | LimQP (dBμV/m) | Peak-LimQP (dB) | Hauteur (m) | Polarization | Correction (dB) |
|-----------------|---------------|----------------|-----------------|-------------|--------------|-----------------|
| 30.194          | 26.2          | 40.0           | -13.8           | 1.6         | Horizontal   | -6.9            |
| 30.000          | 25.6          | 40.0           | -14.4           | 1.6         | Vertical     | -6.8            |



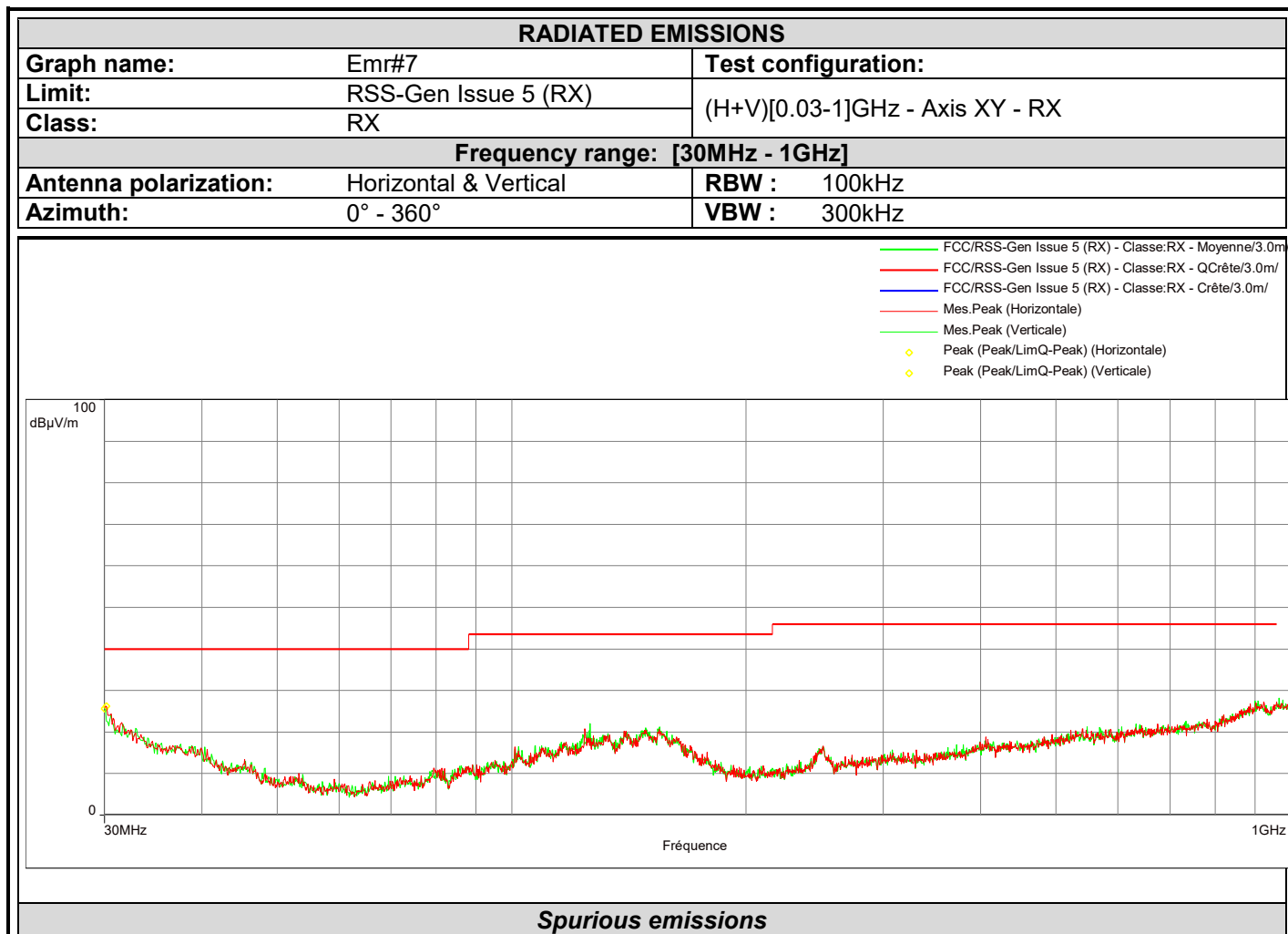
L C I E



| Frequency (MHz) | Peak (dBμV/m) | LimQP (dBμV/m) | Peak-LimQP (dB) | Hauteur (m) | Polarization | Correction (dB) |
|-----------------|---------------|----------------|-----------------|-------------|--------------|-----------------|
| 30.194          | 25.4          | 40.0           | -14.6           | 1.6         | Vertical     | -6.9            |



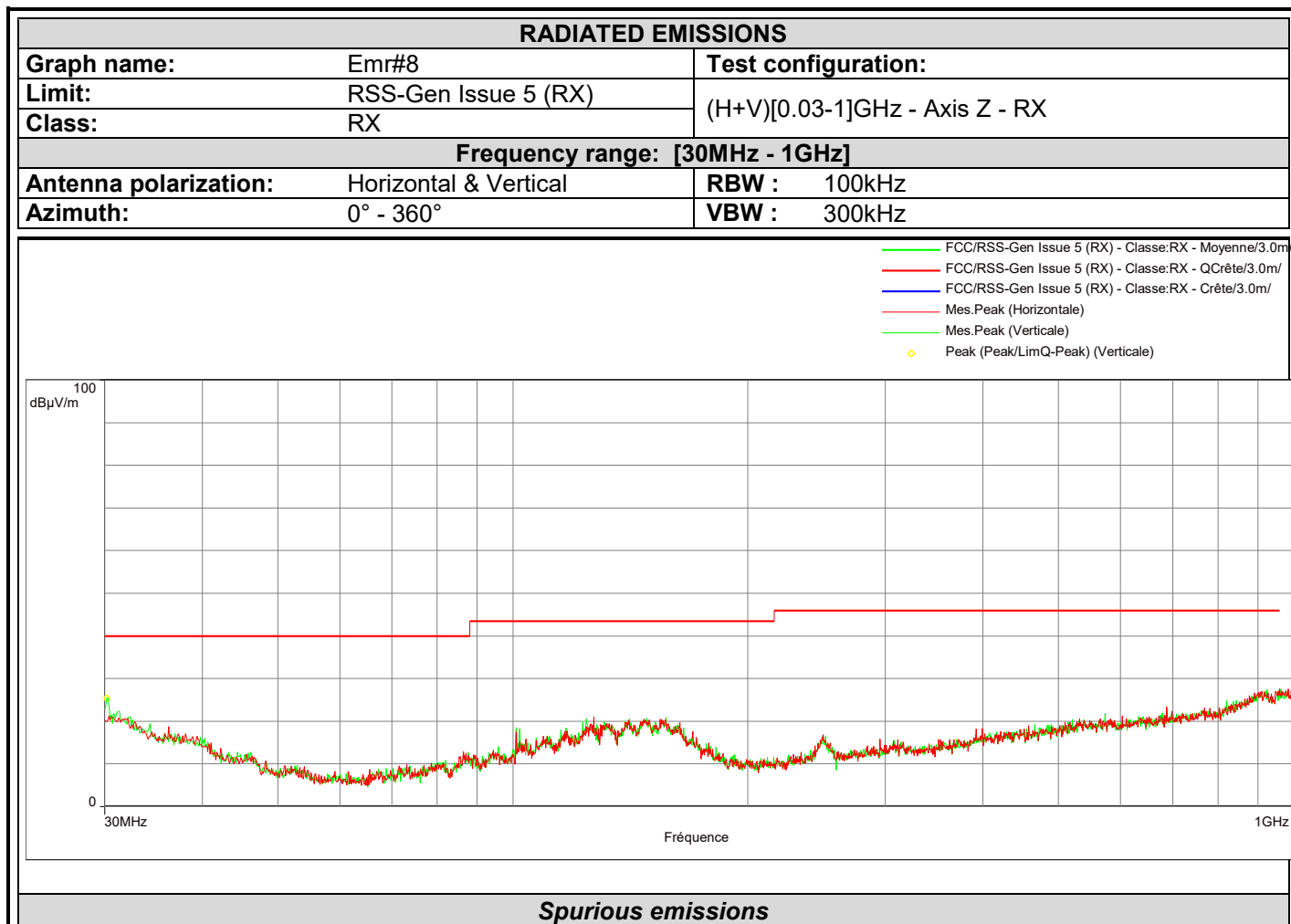
L C I E



| Frequency (MHz) | Peak (dBµV/m) | LimQP (dBµV/m) | Peak-LimQP (dB) | Hauteur (m) | Polarization | Correction (dB) |
|-----------------|---------------|----------------|-----------------|-------------|--------------|-----------------|
| 30.194          | 26.2          | 40.0           | -13.8           | 1.6         | Horizontal   | -6.9            |
| 30.000          | 25.6          | 40.0           | -14.4           | 1.6         | Vertical     | -6.8            |



L C I E



| Frequency (MHz) | Peak (dBµV/m) | LimQP (dBµV/m) | Peak-LimQP (dB) | Hauteur (m) | Polarization | Correction (dB) |
|-----------------|---------------|----------------|-----------------|-------------|--------------|-----------------|
| 30.194          | 25.4          | 40.0           | -14.6           | 1.6         | Vertical     | -6.9            |



### 3.6.3. Characterization on 10 meters open site below 30 MHz

#### Worst case final data result:

Frequency list has been created with semi-anechoic chamber pre-scan results.  
Measurements are performed using a QUASI-PEAK detection.

| No | Frequency (MHz) | QPeak Limit (dBμV/m) @ 10m | Qpeak (dBμV/m) | Margin (Mes-Lim) (dB) | Angle Table (deg) | Pol Ant. | Ht Ant. (cm) | Correc. Factor (dB) | Comments |
|----|-----------------|----------------------------|----------------|-----------------------|-------------------|----------|--------------|---------------------|----------|
| 1  | 0.457           | 73.5                       | 8.0            | -65.5                 | -                 | V        | -            | -                   | -        |

\*: Measure have been done at 10m distance and corrected according to requirements of 15.209.e  
(M@300m = M@10m-59.1dB)

### 3.6.4. Characterization on 10 meters open site from 30MHz to 1GHz

#### Worst case final data result:

Frequency list has been created with semi-anechoic chamber pre-scan results.  
Measurements are performed using a QUASI-PEAK detection.

| Test Frequency (MHz)                                        | Meter Reading dB(μV) | Detector (Pk/QP/Av) | Polarity (V/H) | Azimuth (Degrees) | Antenna Height (cm) | Transducer Factor (dB) | Level (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
|-------------------------------------------------------------|----------------------|---------------------|----------------|-------------------|---------------------|------------------------|----------------|----------------|-------------|
| No frequency observed, margin >20dB in pre-characterization |                      |                     |                |                   |                     |                        |                |                |             |

### 3.7. CONCLUSION

The sample of the equipment NEO PRO, Sn: E48839-1024, tested in the configuration presented in this test report satisfies to requirements of class B limits of the standard FCC Part 15 Subpart C, for radiated emissions.



## 4. OCCUPIED BANDWIDTH

### 4.1. ENVIRONMENTAL CONDITIONS

Test performed by : Mounir Bouamara  
Date of test : December 12, 2019  
Relative humidity (%) : 40  
Ambient temperature (°C) : 24

### 4.1. SETUP

☐ **Conducted measurement:**

The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

☒ **Radiated measurement:**

The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

**Measurement Procedure:**

1. RBW used in the range of 1% to 5% of the anticipated emission bandwidth
2. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
3. Detector = Peak.
4. Trace mode = Max Hold.
5. Sweep = Auto couple.
6. Allow the trace to stabilize.
7. OBW 99% function of spectrum analyzer used

### 4.2. TEST EQUIPMENT LIST

| TEST EQUIPMENT USED           |                 |         |            |          |         |
|-------------------------------|-----------------|---------|------------|----------|---------|
| Description                   | Manufacturer    | Model   | Identifier | Cal_Date | Cal_Due |
| Antenna Loop (near field)     | ELECTRO-METRICS | EM-6993 | C2040215   | 06/19    | 06/21   |
| Climatic chamber              | BIA CLIMATIC    | CL 6-25 | D1022117   | 02/19    | 02/20   |
| Multimeter - CEM              | FLUKE           | 87      | A1240251   | 11/18    | 11/20   |
| SMA 1.5m                      | SUCOFLEX        | 18GHz   | A5329864   | 11/18    | 11/19   |
| Spectrum Analyzer 9kHz - 6GHz | ROHDE & SCHWARZ | FSL6    | A2642020   | 06/18    | 06/20   |
| Thermocouple K (radio)        | FLUKE           | Type K  | B4045005   | 09/19    | 09/20   |
| Thermocouple K (radio)        | FLUKE           | Type K  | B4045004   | 09/19    | 09/20   |
| Thermometer (radio)           | FLUKE           | 52 II   | B4043150   | 09/19    | 09/20   |

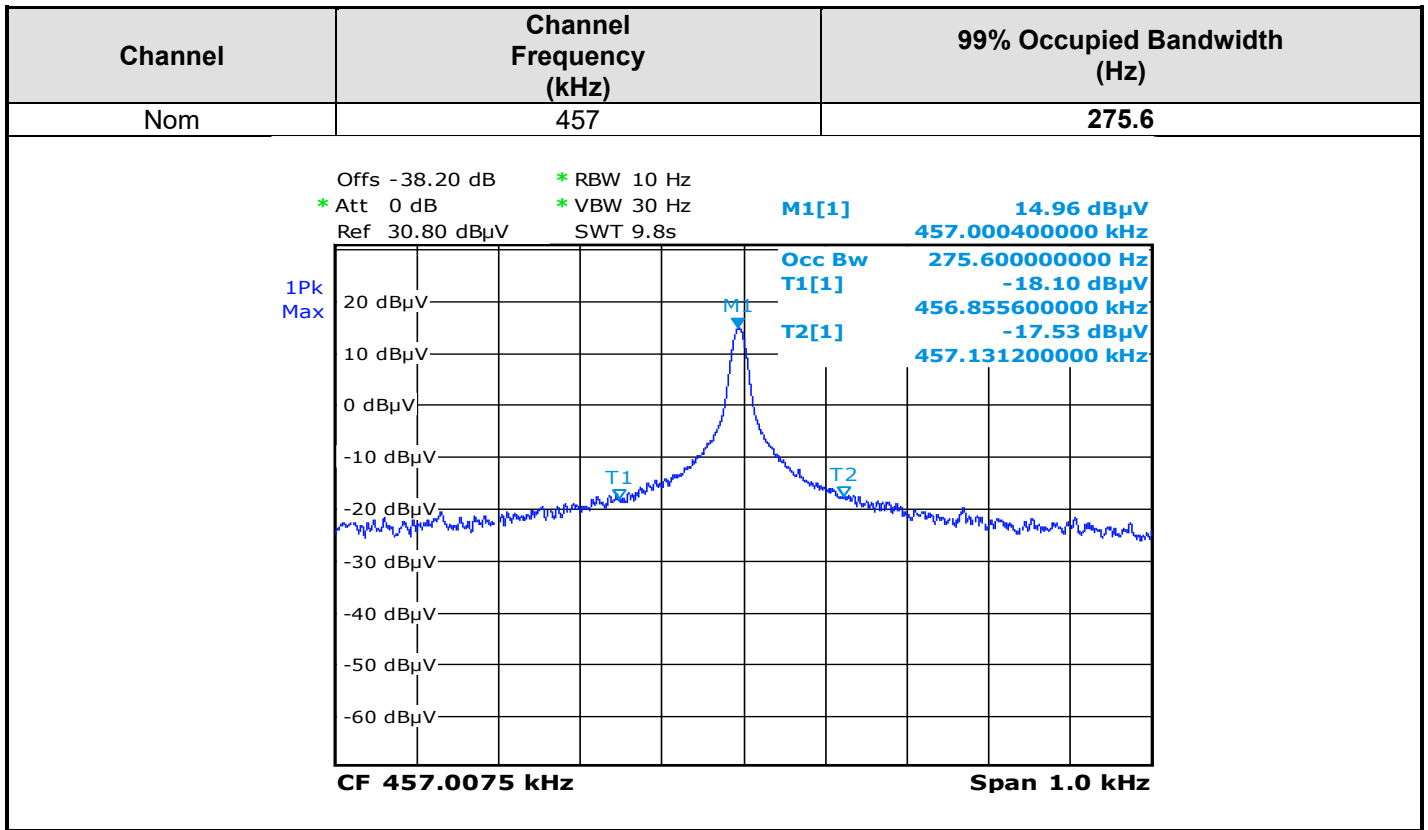
### 4.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:



L C I E

#### 4.4. TEST SEQUENCE AND RESULTS



## 5. FUNDAMENTAL FREQUENCY TOLERANCE (RSS)

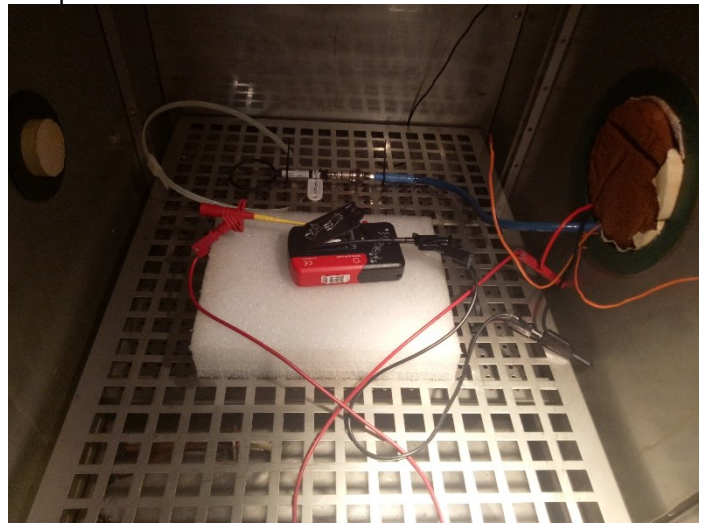
### 5.1. ENVIRONMENTAL CONDITIONS

Test performed by : Mounir Bouamara  
Date of test : December 12, 2019  
Relative humidity (%) : 40  
Ambient temperature (°C) : 24

### 5.2. TEST SETUP

Frequency of carrier: 457kHz

The equipment (RF box) is set in a climatic chamber. Measure is performed on one channel of RF module.



Test setup

### 5.3. TEST METHOD

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency when the temperature is varied from  $-30^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$  at the nominal power voltage and the primary power voltage is varied from battery's operating end-point voltage to nominal voltage at  $20^{\circ}\text{C}$ .



#### 5.4. TEST EQUIPMENT LIST

| TEST EQUIPMENT USED           |                 |         |            |          |         |
|-------------------------------|-----------------|---------|------------|----------|---------|
| Description                   | Manufacturer    | Model   | Identifier | Cal_Date | Cal_Due |
| AC source 1kW                 | KEYSIGHT        | AC6802A | A7042305   |          |         |
| Antenna Loop (near field)     | ELECTRO-METRICS | EM-6993 | C2040215   | 06/19    | 06/21   |
| Climatic chamber              | BIA CLIMATIC    | CL 6-25 | D1022117   | 02/19    | 02/20   |
| SMA 1.5m                      | SUCOFLEX        | 18GHz   | A5329864   | 11/18    | 11/19   |
| Spectrum Analyzer 9kHz - 6GHz | ROHDE & SCHWARZ | FSL6    | A2642020   | 06/18    | 06/20   |
| Thermocouple K (radio)        | FLUKE           | Type K  | B4045005   | 09/19    | 09/20   |
| Thermocouple K (radio)        | FLUKE           | Type K  | B4045004   | 09/19    | 09/20   |
| Thermometer (radio)           | FLUKE           | 52 II   | B4043150   | 09/19    | 09/20   |

#### 5.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

#### 5.6. TEST RESULTS

| Temperature \ Voltage | -30°C      | 20°C            | +55°C      |
|-----------------------|------------|-----------------|------------|
| Mains voltage: 4,5V   |            |                 |            |
| Frequency Drift (MHz) | - 0,000003 | <b>0,457019</b> | - 0,000003 |
| Carrier level (dBc)   | + 0,02     | <b>8,330000</b> | + 0,65     |
| Mains voltage: 4,05V  |            |                 |            |
| Frequency Drift (MHz) | - 0,000003 | - 0,000003      | - 0,000003 |
| Carrier level (dBc)   | - 0,15     | - 0,08          | + 0,81     |
| Mains voltage: 4,95   |            |                 |            |
| Frequency Drift (MHz) | -0,000003  | -0,000018       | -0,000003  |
| Carrier level (dBc)   | - 0,17     | + 0,12          | + 0,68     |

Frequency drift measured is **18Hz** when the temperature is varied from -30°C to +55°C and voltage is varied.

#### 5.7. CONCLUSION

The sample of the equipment NEO PRO, Sn: E48839-1024, tested in the configuration presented in this test report satisfies to requirements of the standard FCC Part 15 Subpart C, for fundamental frequency tolerance.

## 6. RECEIVER SPURIOUS EMISSION

Test performed by : Mounir Bouamara  
 Date of test : December 12, 2019  
 Relative humidity (%) : 40  
 Ambient temperature (°C) : 24

### 6.1. TEST SETUP

The installation of EUT is identical for pre-characterization measures in a 3 meters semi- anechoic chamber and for measures on the 10 meters Open site.

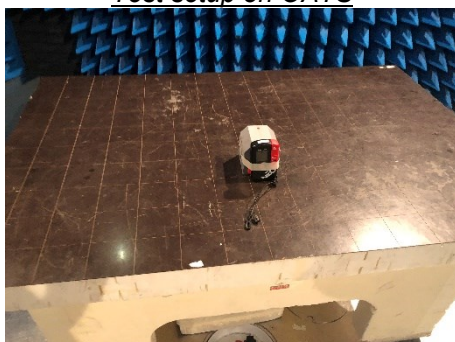
The EUT and auxiliaries are set:

- ☒ 80cm above the ground on the non-conducting table (Table-top equipment) - Below 1GHz
- ☐ 150cm above the ground on the non-conducting table (Table-top equipment) - Above 1GHz
- ☐ 10cm above the ground on isolating support (Floor standing equipment)

The EUT is powered by  $V_{nom}$ .



*Test setup on OATS*



*Test setup in anechoic chamber*



## 6.2. TEST METHOD

The product has been tested according to RSS GEN.

### Pre-characterisation measurement: (9kHz – 1GHz)

A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber for frequency from 30MHz to 1GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test for maximized the emission measurement. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration.

### Characterization on 10 meters open site from 9kHz to 1GHz:

Radiated Emissions were measured on an open area test site. A description of the facility is on file with the RSS GEN. The product has been tested at a distance of **10 meters** from the antenna and compared to the RSS GEN limits. Measurement bandwidth was 9kHz below 30MHz and 120kHz from 30 MHz to 1GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test for maximized the emission measurement. The height antenna is varied from 1m to 4m. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown.

Frequency list has been created with anechoic chamber pre-scan results.



### 6.3. TEST EQUIPMENT LIST

| TEST EQUIPMENT USED                 |                 |              |               |          |         |
|-------------------------------------|-----------------|--------------|---------------|----------|---------|
| Description                         | Manufacturer    | Model        | Identifier    | Cal_Date | Cal_Due |
| Amplifier 100kHz - 18GHz            | LCIE SUD EST    | _            | A7085027      | 07/19    | 07/20   |
| Antenna Bi-log                      | AH System       | SAS-521-7    | C2040180      | 10/18    | 10/20   |
| Antenna mast (Cage#1)               | MATURO Gmbh     | AM 4.0       | F2000407      |          |         |
| BAT EMC                             | NEXIO           | v3.9.0.10    | L1000115      |          |         |
| Cable 0.75m                         | SUCOFLEX        | 18GHz        | A5329920      | 09/19    | 09/20   |
| Emission Cable                      | MICRO-COAX      | 18GHz        | A5329656      | 07/19    | 07/20   |
| Emission Cable                      | SUCOFLEX        | 18GHz        | A5329899      | 07/19    | 07/20   |
| HF Radiated emission comb generator | LCIE SUD EST    | _            | A3169088      |          |         |
| Radiated emission comb generator    | BARDET          | _            | A3169050      |          |         |
| Semi-Anechoic chamber #1 (BF)       | SIEPEL          | _            | D3044016_BF   | 07/19    | 07/22   |
| Semi-Anechoic chamber #1 (VSWR)     | SIEPEL          | _            | D3044016_VSWR | 07/19    | 07/22   |
| Spectrum analyzer                   | ROHDE & SCHWARZ | FSV 30       | A4060051      | 03/18    | 03/20   |
| Table C1/OATS                       | MATURO Gmbh     | _            | F2000437      |          |         |
| Thermo-hygrometer (C1)              | OREGON          | WMR 80       | B4206013      | 06/18    | 06/20   |
| Thermo-hygrometer (PM1/2/3)         | KIMO            | HQ 210       | B4206022      | 08/18    | 08/20   |
| Turntable chamber (Cage#1)          | MATURO Gmbh     | TT 2.0 SI    | F2000406      |          |         |
| Turntable controller (Cage#1)       | MATURO Gmbh     | Control Unit | F2000408      |          |         |

### 6.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

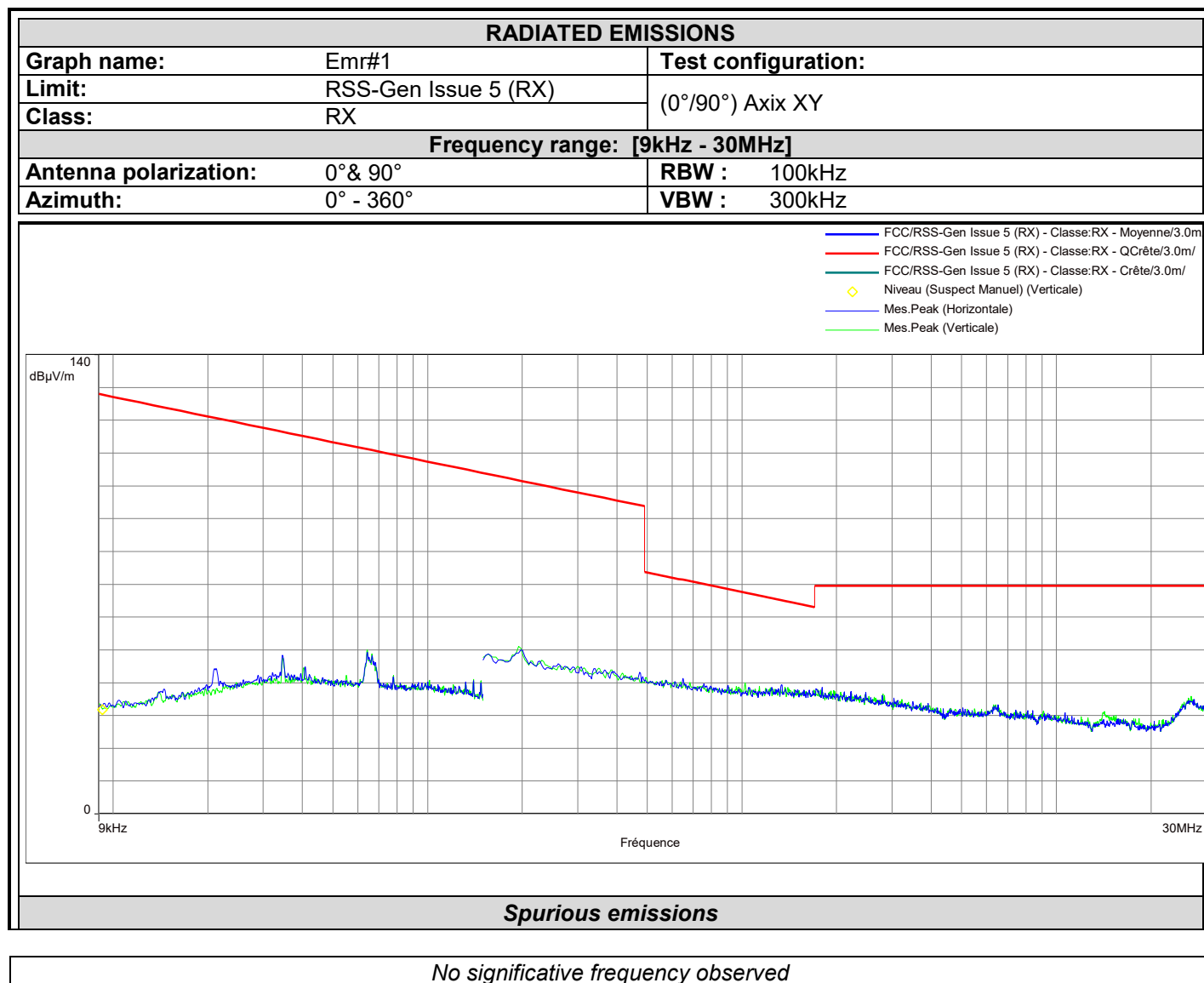


## 6.5. TEST RESULTS

### 6.5.1. Pre-characterization at 3 meters [9kHz-30MHz]

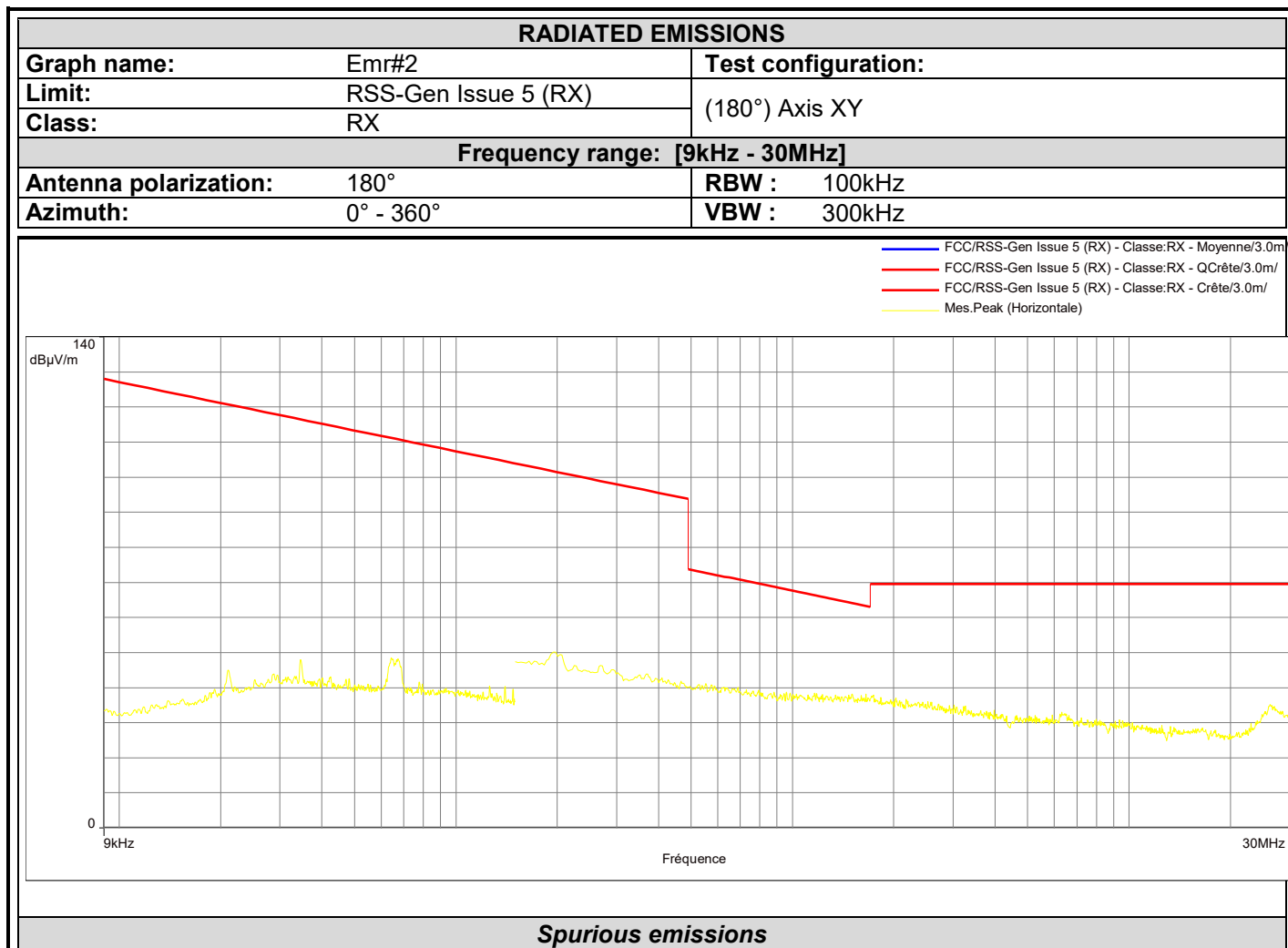
See graph for 9kHz-30MHz band:

| Graph identifier | Polarization | EUT position | Mode | Comments    |
|------------------|--------------|--------------|------|-------------|
| Emr# 1           | 0°,90        | Axis XY      | RX   | See annex 1 |
| Emr# 2           | 180°         | Axis XY      | RX   | See annex 1 |
| Emr# 3           | 0°,90        | Axis Z       | RX   | See annex 1 |
| Emr# 4           | 180°         | Axis Z       | RX   | See annex 1 |





L C I E



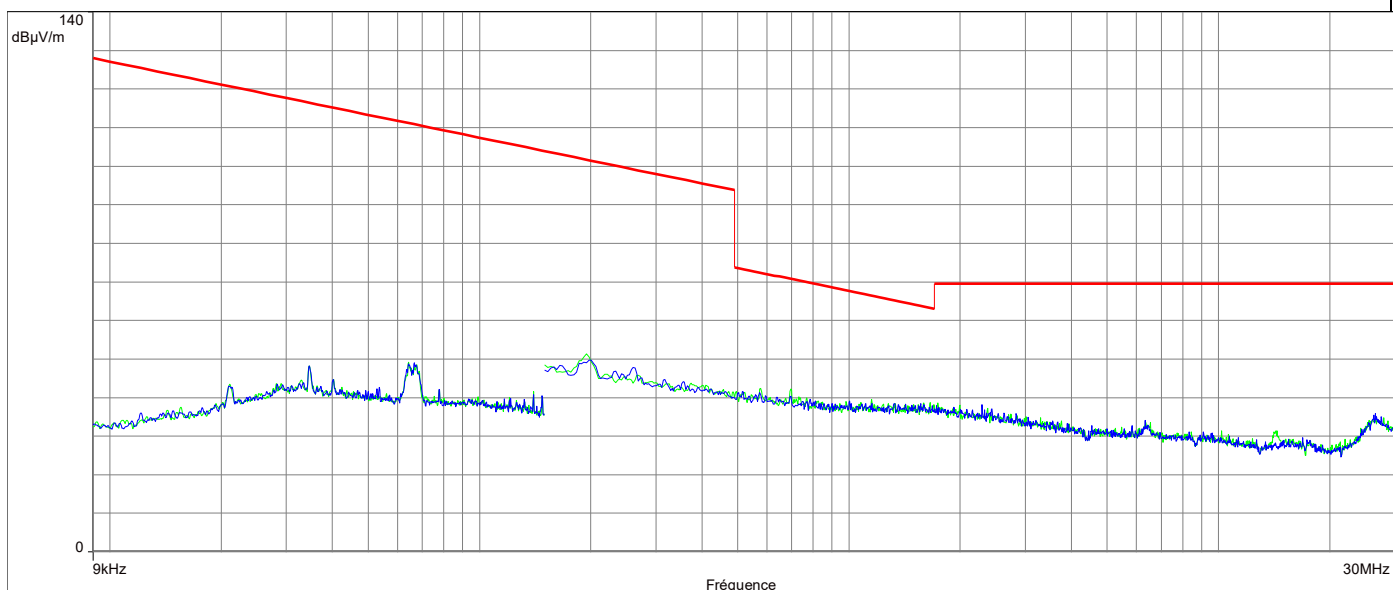
No significative frequency observed



L C I E

| RADIATED EMISSIONS              |                      |                     |
|---------------------------------|----------------------|---------------------|
| Graph name:                     | Emr#3                | Test configuration: |
| Limit:                          | RSS-Gen Issue 5 (RX) | (0°/90°) Axix Z     |
| Class:                          | RX                   |                     |
| Frequency range: [9kHz - 30MHz] |                      |                     |
| Antenna polarization:           | 0°& 90°              | RBW : 100kHz        |
| Azimuth:                        | 0° - 360°            | VBW : 300kHz        |

FCC/RSS-Gen Issue 5 (RX) - Classe:RX - Moyenne/3.0m/  
FCC/RSS-Gen Issue 5 (RX) - Classe:RX - QCrête/3.0m/  
FCC/RSS-Gen Issue 5 (RX) - Classe:RX - Crête/3.0m/  
Mes.Peak (Horizontale)  
Mes.Peak (Verticale)

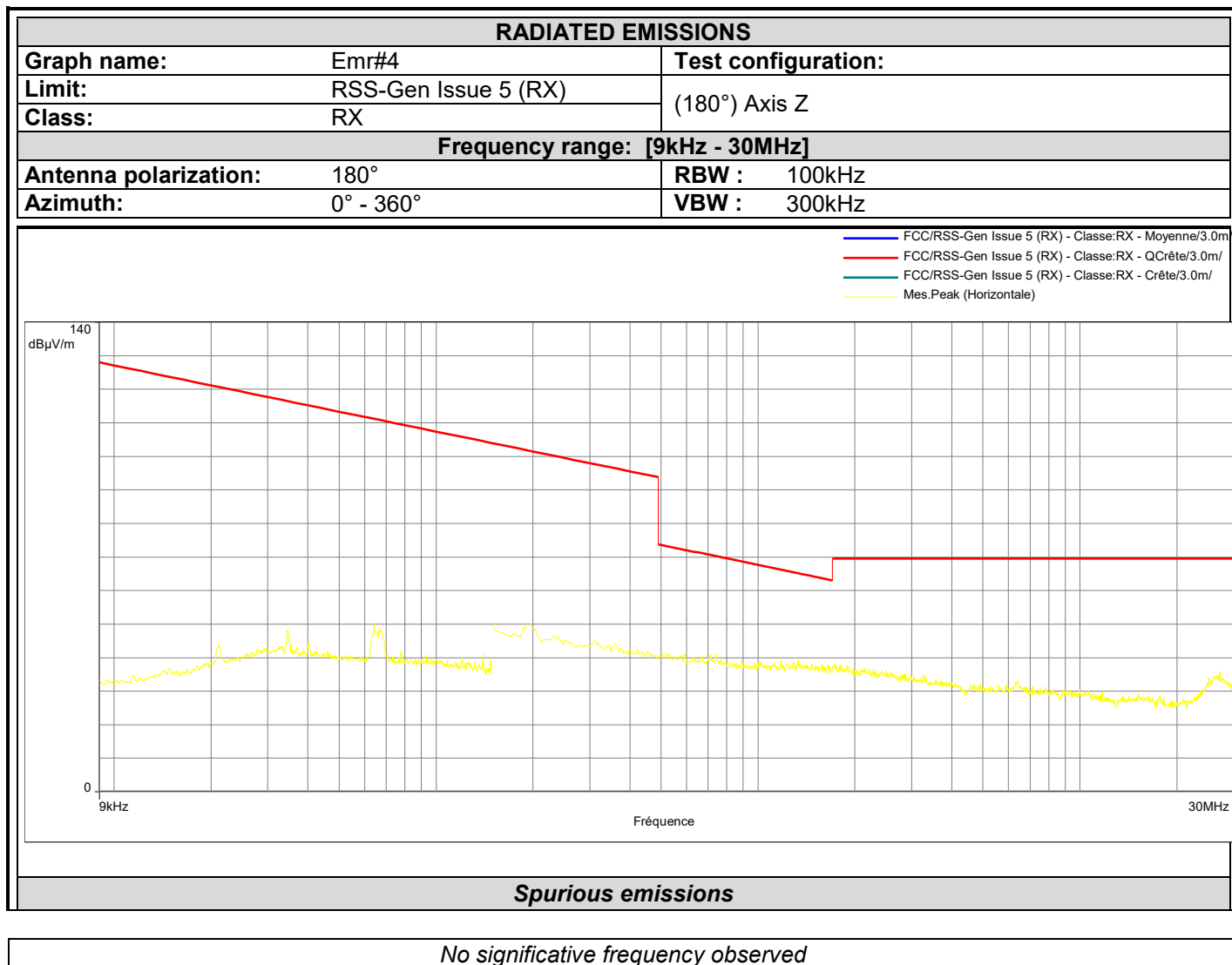


### Spurious emissions

No significative frequency observed



L C I E

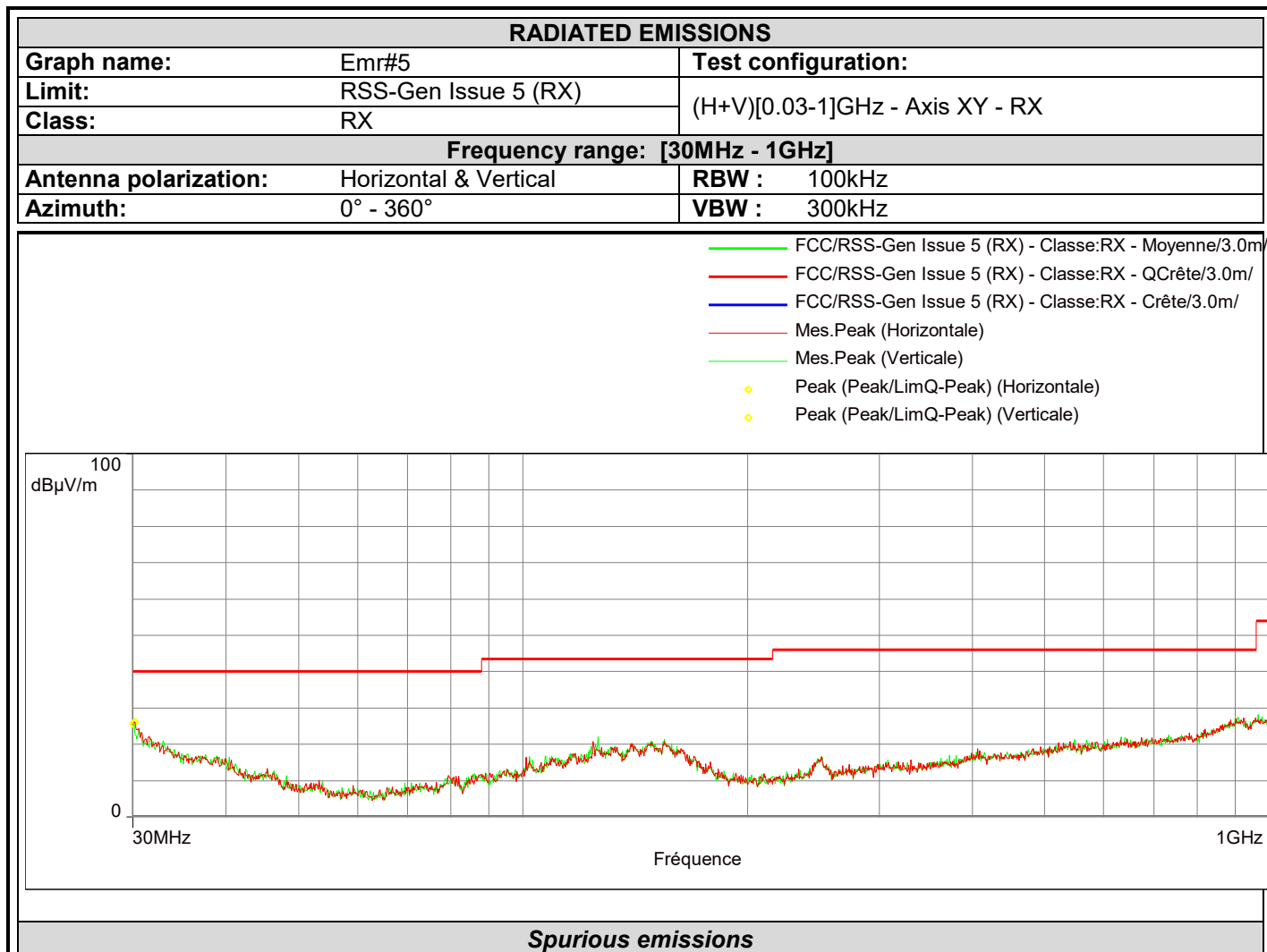




### 6.5.1. Pre-characterization at 3 meters [30MHz-1GHz]

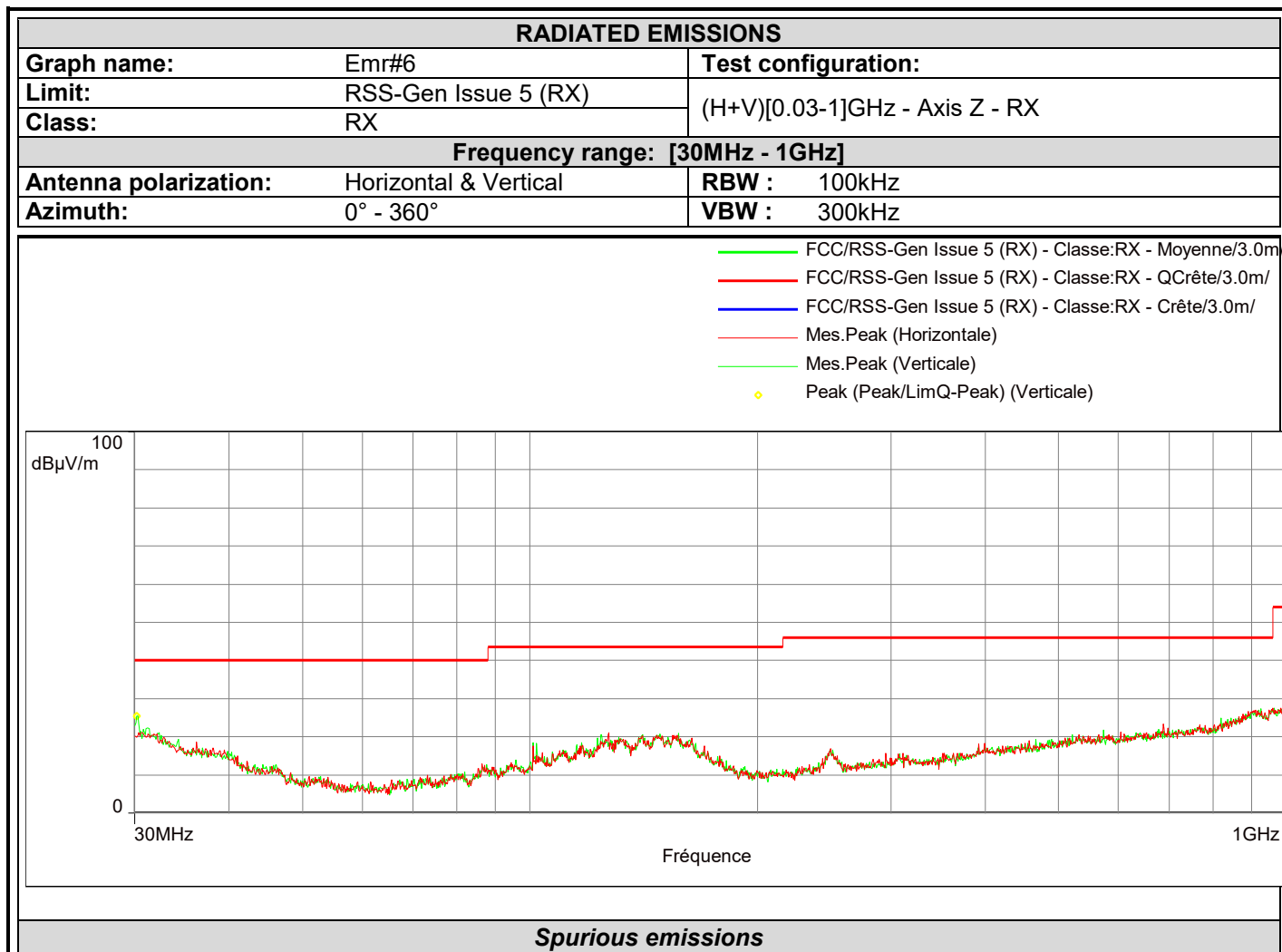
See graphs for 30MHz-1GHz:

| Graph identifier | Polarization | EUT position | Mode | Comments    |
|------------------|--------------|--------------|------|-------------|
| Emr# 5           | H & V        | Axis XY      | RX   | See annex 1 |
| Emr# 6           | H & V        | Axis Z       | RX   | See annex 1 |





L C I E



| Frequency (MHz) | Peak (dBµV/m) | LimQP (dBµV/m) | Peak-LimQP (dB) | Hauteur (m) | Polarization | Correction (dB) |
|-----------------|---------------|----------------|-----------------|-------------|--------------|-----------------|
| 30.194          | 25.4          | 40.0           | -14.6           | 1.6         | Vertical     | -6.9            |

## 6.6. CONCLUSION

The sample of the equipment NEO PRO, Sn: E48839-1024, tested in the configuration presented in this test report satisfies to requirements of the standard RSS GEN, for Receiver Spurious Emission.

## 8. UNCERTAINTIES CHART

| Type de mesure / Kind of measurement                                                                                                                                       | Incertitude élargie<br>laboratoire /<br>Wide uncertainty<br>laboratory<br>(k=2) ± x | Incertitude<br>limite du CISPR<br>/ CISPR<br>uncertainty limit<br>± y |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Mesure des perturbations conduites en tension sur le réseau d'énergie<br><i>Measurement of conducted disturbances in voltage on the power port</i>                         | 3.57 dB                                                                             | 3.6 dB                                                                |
| Mesure des perturbations conduites en tension sur le réseau de télécommunication<br><i>Measurement of conducted disturbances in voltage on the telecommunication port.</i> | 3.28 dB                                                                             | A l'étude /<br>Under consid.                                          |
| Mesure des perturbations discontinues conduites en tension<br><i>Measurement of discontinuous conducted disturbances in voltage</i>                                        | 3.47 dB                                                                             | 3.6 dB                                                                |
| Mesure des perturbations conduites en courant<br><i>Measurement of conducted disturbances in current</i>                                                                   | 2.90 dB                                                                             | A l'étude /<br>Under consid.                                          |
| Mesure du champ électrique rayonné sur le site en espace libre de Moirans<br><i>Measurement of radiated electric field on the Moirans open area test site</i>              | 5.07 dB                                                                             | 5.2 dB                                                                |

Les valeurs d'incertitudes calculées du laboratoire étant inférieures aux valeurs d'incertitudes limites établies par la norme, la conformité de l'échantillon est établie directement par les niveaux limites applicables. / The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the standard. The conformity of the sample is directly established by the applicable limits values.