



LCIE

WIFI 2,4GHz Template: Release October 10th, 2016

# TEST REPORT

N°: 149480-706239

Version : 01

## Subject

Radio spectrum matters  
tests according to standards:  
47 CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 4

## Issued to

VELUX America Inc.

1418 Evans Pond Road,  
Greenwood,  
SC 29649, USA

VELUX Canada Inc

2740 Sherwood Heights,  
Drive, Oakville, Ontario  
L6J7V5, CANADA

## Apparatus under test

- Product
- Trade mark
- Manufacturer
- Model under test
- Serial number
- FCC ID
- IC ID
- Industry Canada Number

VELUX ACTIVE Indoor Climate Control

VELUX ACTIVE with NETATMO

VELUX A/S

NXG01S

-

XSG-831591

8642A-831591

6230B(FAR) & 6230B-1(Ecuellen)

## Test date

: July 24, 2017 to October 16, 2017

## Test location

Fontenay Aux Roses

## Composition of document

69 pages

## Document issued on

January 22, 2018

Written by :  
**Armand MAHOUNGOU**  
Tests operator



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

33, Av du Général Leclerc  
92266 Fontenay Aux Roses  
FRANCE

Tél : +33 1 40 95 60 60  
contact@lcie.fr  
www.lcie.fr



## PUBLICATION HISTORY

| Version | Date             | Author           | Modification             |
|---------|------------------|------------------|--------------------------|
| 01      | October 16, 2017 | Armand MAHOUNGOU | Creation of the document |



## SUMMARY

|     |                                                                         |    |
|-----|-------------------------------------------------------------------------|----|
| 1.  | TEST PROGRAM .....                                                      | 4  |
| 2.  | EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER) .....        | 5  |
| 3.  | OCCUPIED BANDWIDTH.....                                                 | 11 |
| 4.  | 6DB EMISSION BANDWIDTH .....                                            | 16 |
| 5.  | DUTY CYCLE .....                                                        | 22 |
| 6.  | MAXIMUM CONDUCTED OUTPUT POWER .....                                    | 26 |
| 7.  | POWER SPECTRAL DENSITY .....                                            | 32 |
| 8.  | UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE | 38 |
| 9.  | UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS.....             | 43 |
| 10. | AC POWER LINE CONDUCTED EMISSIONS.....                                  | 49 |
| 11. | UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS .....                  | 54 |
| 12. | UNCERTAINTIES CHART .....                                               | 69 |

## 1. TEST PROGRAM

### References

- 47 CFR Part 15.247
- RSS 247 Issue 2
- RSS Gen Issue 4
- KDB 558074 D01 DTS Meas Guidance v04
- ANSI C63.10-2013

### Radio requirement:

| Clause (47CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 4)<br>Test Description                    | Test result - Comments                   |                               |                                |                                |
|-------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------|--------------------------------|--------------------------------|
| Occupied Bandwidth <a href="#">Pb</a>                                                                 | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL | <input type="checkbox"/> NA    | <input type="checkbox"/> NP(1) |
| 6dB Bandwidth <a href="#">Pb</a>                                                                      | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL | <input type="checkbox"/> NA()  | <input type="checkbox"/> NP(1) |
| Duty Cycle <a href="#">Pb</a>                                                                         | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL | <input type="checkbox"/> NA    | <input type="checkbox"/> NP(1) |
| Maximum Conducted Output Power <a href="#">Pb</a>                                                     | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL | <input type="checkbox"/> NA    | <input type="checkbox"/> NP(1) |
| Power Spectral Density <a href="#">Pb</a>                                                             | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL | <input type="checkbox"/> NA    | <input type="checkbox"/> NP(1) |
| Conducted Spurious Emission at the Band Edge <a href="#">Pb</a>                                       | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL | <input type="checkbox"/> NA()  | <input type="checkbox"/> NP(1) |
| Unwanted Emissions into Non-Restricted Frequency Bands <a href="#">Pb</a>                             | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL | <input type="checkbox"/> NA()  | <input type="checkbox"/> NP(1) |
| AC Power Line Conducted Emission <a href="#">Pb</a>                                                   | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL | <input type="checkbox"/> NA(2) | <input type="checkbox"/> NP(1) |
| Unwanted Emissions into Restricted Frequency Bands <a href="#">Pb</a>                                 | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL | <input type="checkbox"/> NA    | <input type="checkbox"/> NP(1) |
| Receiver Radiated emissions <a href="#">Pb</a>                                                        | <input checked="" type="checkbox"/> PASS | <input type="checkbox"/> FAIL | <input type="checkbox"/> NA    | <input type="checkbox"/> NP(1) |
| This table is a summary of test report, see conclusion of each clause of this test report for detail. |                                          |                               |                                |                                |

(1): Limited program

(2): EUT not directly or indirectly connected to the AC Power Public Network

PASS: EUT complies with standard's requirement

FAIL: EUT does not comply with standard's requirement

NA: Not Applicable

NP: Test Not Performed

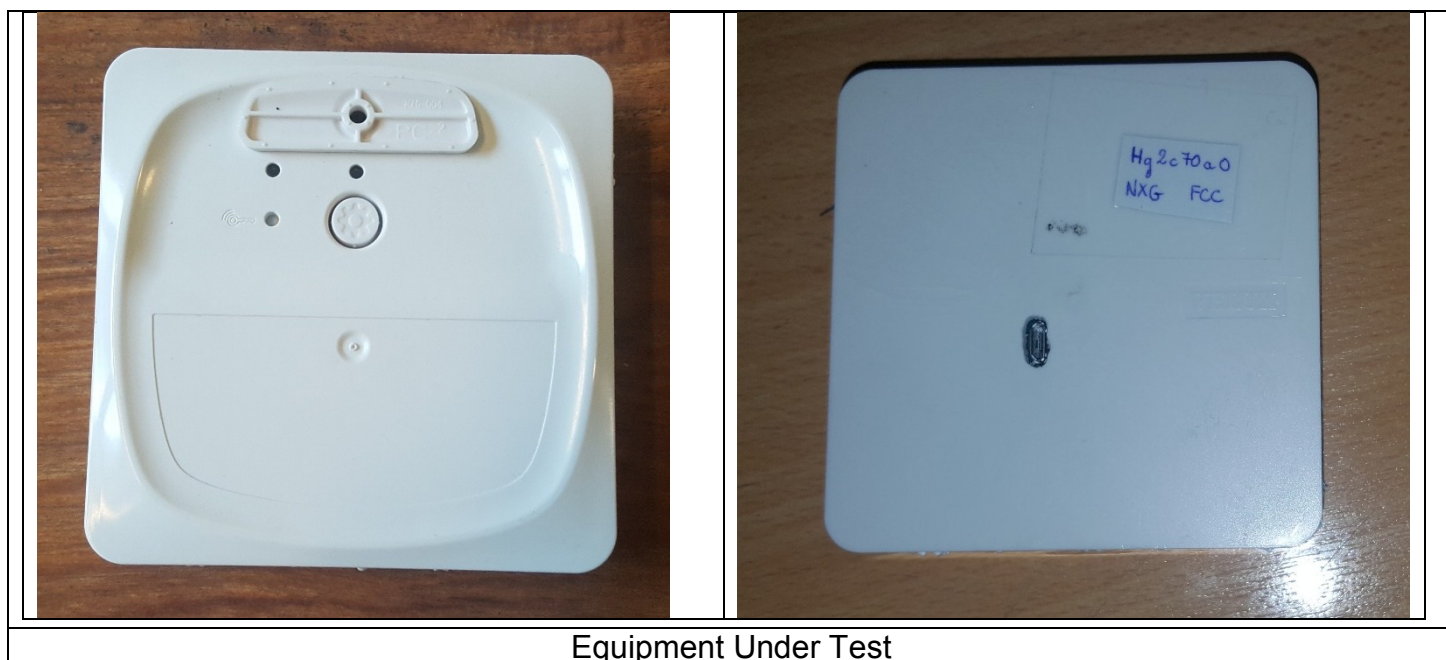
## 2. EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER)

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

#### Equipment under test (EUT):

**VELUX ACTIVE with NETATMO NXG01S**

**Serial Number: -**



#### Inputs/outputs - Cable:

| Access       | Type | Length used (m) | Declared <3m             | Shielded                 | Under test               | Comments |
|--------------|------|-----------------|--------------------------|--------------------------|--------------------------|----------|
| Power supply | -    | -               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | -        |

#### Auxiliary equipment used during test:

| Type                  | Reference | Sn | Comments |
|-----------------------|-----------|----|----------|
| Laptop                | -         | -  | -        |
| Isolation transformer | -         | -  | -        |

**Equipment information:**

|                              |                                                     |                                             |                                                  |                                                        |
|------------------------------|-----------------------------------------------------|---------------------------------------------|--------------------------------------------------|--------------------------------------------------------|
| Type:                        | <b>WIFI</b>                                         |                                             |                                                  |                                                        |
| Frequency band:              | 2400MHz-2483.5MHz                                   |                                             |                                                  |                                                        |
| Standard:                    | <input checked="" type="checkbox"/> 802.11b         | <input checked="" type="checkbox"/> 802.11g | <input checked="" type="checkbox"/> 802.11n HT20 | <input type="checkbox"/> 802.11n HT40                  |
| Spectrum Modulation:         | <input checked="" type="checkbox"/> DSSS            |                                             | <input checked="" type="checkbox"/> OFDM         |                                                        |
| Number of Channel:           | 11                                                  |                                             |                                                  |                                                        |
| Spacing channel:             | 5MHz                                                |                                             |                                                  |                                                        |
| Channel bandwidth:           | <input checked="" type="checkbox"/> 20MHz           |                                             | <input type="checkbox"/> 40MHz                   |                                                        |
| Antenna Type:                | <input checked="" type="checkbox"/> Integral        |                                             | <input type="checkbox"/> External                | <input type="checkbox"/> Dedicated                     |
| Antenna connector:           | <input type="checkbox"/> Yes                        |                                             | <input type="checkbox"/> No                      | <input checked="" type="checkbox"/> Temporary for test |
| Transmit chains:             | <input checked="" type="checkbox"/> 1               | <input type="checkbox"/> 2                  | <input type="checkbox"/> 3                       | <input type="checkbox"/> 4                             |
| Beam forming gain:           | <input type="checkbox"/> Yes: XdB                   |                                             | <input checked="" type="checkbox"/> No           |                                                        |
| Receiver chains:             | <input checked="" type="checkbox"/> 1               | <input type="checkbox"/> 2                  | <input type="checkbox"/> 3                       | <input type="checkbox"/> 4                             |
| Type of equipment:           | <input checked="" type="checkbox"/> Stand-alone     |                                             | <input type="checkbox"/> Plug-in                 | <input type="checkbox"/> Combined                      |
| Ad-Hoc mode:                 | <input type="checkbox"/> Yes                        |                                             | <input checked="" type="checkbox"/> No           |                                                        |
| Duty cycle:                  | <input checked="" type="checkbox"/> Continuous duty |                                             | <input type="checkbox"/> Intermittent duty       | <input type="checkbox"/> 100% duty                     |
| Operating temperature range: | Tmin:                                               | <input type="checkbox"/> -20°C              | <input checked="" type="checkbox"/> 0°C          | <input type="checkbox"/> X°C                           |
|                              | Tnom:                                               | 20°C                                        |                                                  |                                                        |
|                              | Tmax:                                               | <input type="checkbox"/> 35°C               | <input checked="" type="checkbox"/> 55°C         | <input type="checkbox"/> X°C                           |
| Type of power source:        | <input checked="" type="checkbox"/> AC power supply |                                             | <input type="checkbox"/> DC power supply         | <input type="checkbox"/> Battery                       |
| Operating voltage range:     | Vnom:                                               |                                             | <input checked="" type="checkbox"/> 120V/60Hz    | <input type="checkbox"/> X Vdc                         |

**Antenna Characteristic**

| Antenna assembly | Gain (dBi) | Frequency Band (MHz) | Impedance( $\Omega$ ) |
|------------------|------------|----------------------|-----------------------|
| Accumulated      | 5.56       | 2412                 | 50                    |

| CHANNEL PLAN                     |                 |
|----------------------------------|-----------------|
| 802.11b / 802.11g / 802.11n HT20 |                 |
| Channel                          | Frequency (MHz) |
| <b>Cmin: 1</b>                   | <b>2412</b>     |
| 2                                | 2417            |
| 3                                | 2422            |
| 4                                | 2427            |
| 5                                | 2432            |
| <b>Cmid: 6</b>                   | <b>2437</b>     |
| 7                                | 2442            |
| 8                                | 2447            |
| 9                                | 2452            |
| 10                               | 2457            |
| <b>Cmax: 11</b>                  | <b>2462</b>     |

### DATA RATE

#### 802.11b

| Data Rate (Mbps) | Modulation Type | Modulation Worst Case               |
|------------------|-----------------|-------------------------------------|
| 1                | DBPSK           | <input type="checkbox"/>            |
| 2                | DQPSK           | <input type="checkbox"/>            |
| 5.5              | DQPSK           | <input checked="" type="checkbox"/> |
| 11               | CCK             | <input type="checkbox"/>            |

### DATA RATE

#### 802.11g

| Data Rate (Mbps) | Modulation Type | Modulation Worst Case               |
|------------------|-----------------|-------------------------------------|
| 6                | BPSK            | <input checked="" type="checkbox"/> |
| 9                | BPSK            | <input type="checkbox"/>            |
| 12               | QPSK            | <input type="checkbox"/>            |
| 18               | QPSK            | <input type="checkbox"/>            |
| 24               | 16-QAM          | <input type="checkbox"/>            |
| 36               | 16-QAM          | <input type="checkbox"/>            |
| 48               | 64-QAM          | <input type="checkbox"/>            |
| 54               | 64-QAM          | <input type="checkbox"/>            |





L C I E

| DATA RATE            |              |                    |            |        |        |        |                  |              |                          |
|----------------------|--------------|--------------------|------------|--------|--------|--------|------------------|--------------|--------------------------|
| 802.11n HT20         |              |                    |            |        |        |        |                  |              |                          |
| Available<br>for EUT | MCS<br>Index | Spatial<br>streams | Modulation |        |        |        | Data Rate (Mbps) |              | Worst Case<br>Modulation |
|                      |              |                    |            |        |        |        | (GI = 800ns)     | (GI = 400ns) |                          |
| ☑                    | 0            | 1                  | BPSK       |        |        |        | 6.5              | 7.2          | ☑                        |
|                      | 1            | 1                  | QPSK       |        |        |        | 13               | 14.4         | ☐                        |
|                      | 2            | 1                  | QPSK       |        |        |        | 19.5             | 21.7         | ☐                        |
|                      | 3            | 1                  | 16-QAM     |        |        |        | 26               | 28.9         | ☐                        |
|                      | 4            | 1                  | 16-QAM     |        |        |        | 39               | 43.3         | ☐                        |
|                      | 5            | 1                  | 64-QAM     |        |        |        | 52               | 57.8         | ☐                        |
|                      | 6            | 1                  | 64-QAM     |        |        |        | 58.5             | 65           | ☐                        |
|                      | 7            | 1                  | 64-QAM     |        |        |        | 65               | 72.2         | ☐                        |
| ☐                    | 32           | 1                  | BPSK       | -      | -      | -      | -                | -            | ☐                        |
|                      | 8            | 2                  | BPSK       |        |        |        | 13               | 14.4         | ☐                        |
|                      | 9            | 2                  | QPSK       |        |        |        | 26               | 28.9         | ☐                        |
|                      | 10           | 2                  | QPSK       |        |        |        | 39               | 43.3         | ☐                        |
|                      | 11           | 2                  | 16-QAM     |        |        |        | 52               | 57.8         | ☐                        |
|                      | 12           | 2                  | 16-QAM     |        |        |        | 78               | 86.7         | ☐                        |
|                      | 13           | 2                  | 64-QAM     |        |        |        | 104              | 115.6        | ☐                        |
|                      | 14           | 2                  | 64-QAM     |        |        |        | 117              | 130.3        | ☐                        |
|                      | 15           | 2                  | 64-QAM     |        |        |        | 130              | 144.4        | ☐                        |
|                      | 33           | 2                  | 16-QAM     | QPSK   | -      | -      | 39               | 43.3         | ☐                        |
|                      | 34           | 2                  | 64-QAM     | QPSK   | -      | -      | 52               | 57.8         | ☐                        |
|                      | 35           | 2                  | 64-QAM     | 16-QAM | -      | -      | 65               | 72.2         | ☐                        |
|                      | 36           | 2                  | 16-QAM     | QPSK   | -      | -      | 58.5             | 65           | ☐                        |
|                      | 37           | 2                  | 64-QAM     | QPSK   | -      | -      | 78               | 86.7         | ☐                        |
|                      | 38           | 2                  | 64-QAM     | 16-QAM | -      | -      | 97.5             | 108.3        | ☐                        |
| ☐                    | 16           | 3                  | BPSK       |        |        |        | 19.5             | 21.7         | ☐                        |
|                      | 17           | 3                  | QPSK       |        |        |        | 39               | 43.3         | ☐                        |
|                      | 18           | 3                  | QPSK       |        |        |        | 58.5             | 65           | ☐                        |
|                      | 19           | 3                  | 16-QAM     |        |        |        | 78               | 86.7         | ☐                        |
|                      | 20           | 3                  | 16-QAM     |        |        |        | 117              | 130          | ☐                        |
|                      | 21           | 3                  | 64-QAM     |        |        |        | 156              | 173.3        | ☐                        |
|                      | 22           | 3                  | 64-QAM     |        |        |        | 175.5            | 195          | ☐                        |
|                      | 23           | 3                  | 64-QAM     |        |        |        | 195              | 216.7        | ☐                        |
|                      | 39           | 3                  | 16-QAM     | QPSK   | QPSK   | -      | 52               | 57.8         | ☐                        |
|                      | 40           | 3                  | 16-QAM     | 16-QAM | QPSK   | -      | 65               | 72.2         | ☐                        |
|                      | 41           | 3                  | 64-QAM     | QPSK   | QPSK   | -      | 65               | 72.2         | ☐                        |
|                      | 42           | 3                  | 64-QAM     | 16-QAM | QPSK   | -      | 78               | 86.7         | ☐                        |
|                      | 43           | 3                  | 64-QAM     | 16-QAM | 16-QAM | -      | 91               | 101.1        | ☐                        |
|                      | 44           | 3                  | 64-QAM     | 64-QAM | QPSK   | -      | 91               | 101.1        | ☐                        |
|                      | 45           | 3                  | 64-QAM     | 64-QAM | 16-QAM | -      | 104              | 115.6        | ☐                        |
|                      | 46           | 3                  | 16-QAM     | QPSK   | QPSK   | -      | 78               | 86.7         | ☐                        |
|                      | 47           | 3                  | 16-QAM     | 16-QAM | QPSK   | -      | 97.5             | 108.3        | ☐                        |
|                      | 48           | 3                  | 64-QAM     | QPSK   | QPSK   | -      | 97.5             | 108.3        | ☐                        |
|                      | 49           | 3                  | 64-QAM     | 16-QAM | QPSK   | -      | 117              | 130          | ☐                        |
|                      | 50           | 3                  | 64-QAM     | 16-QAM | 16-QAM | -      | 136.5            | 151.7        | ☐                        |
|                      | 51           | 3                  | 64-QAM     | 64-QAM | QPSK   | -      | 136.5            | 151.7        | ☐                        |
| ☐                    | 52           | 3                  | 64-QAM     | 64-QAM | 16-QAM | -      | 156              | 173.3        | ☐                        |
|                      | 24           | 4                  | BPSK       |        |        |        | 26               | 28.9         | ☐                        |
|                      | 25           | 4                  | QPSK       |        |        |        | 52               | 57.8         | ☐                        |
|                      | 26           | 4                  | QPSK       |        |        |        | 78               | 86.7         | ☐                        |
|                      | 27           | 4                  | 16-QAM     |        |        |        | 104              | 115.6        | ☐                        |
|                      | 28           | 4                  | 16-QAM     |        |        |        | 156              | 173.3        | ☐                        |
|                      | 29           | 4                  | 64-QAM     |        |        |        | 208              | 231.1        | ☐                        |
|                      | 30           | 4                  | 64-QAM     |        |        |        | 234              | 260          | ☐                        |
|                      | 31           | 4                  | 64-QAM     |        |        |        | 260              | 288.9        | ☐                        |
|                      | 53           | 4                  | 16-QAM     | QPSK   | QPSK   | QPSK   | 65               | 72.2         | ☐                        |
|                      | 54           | 4                  | 16-QAM     | 16-QAM | QPSK   | QPSK   | 78               | 86.7         | ☐                        |
|                      | 55           | 4                  | 16-QAM     | 16-QAM | 16-QAM | QPSK   | 91               | 101.1        | ☐                        |
|                      | 56           | 4                  | 64-QAM     | QPSK   | QPSK   | QPSK   | 78               | 86.7         | ☐                        |
|                      | 57           | 4                  | 64-QAM     | 16-QAM | QPSK   | QPSK   | 91               | 101.1        | ☐                        |
|                      | 58           | 4                  | 64-QAM     | 16-QAM | 16-QAM | QPSK   | 104              | 115.6        | ☐                        |
|                      | 59           | 4                  | 64-QAM     | 16-QAM | 16-QAM | 16-QAM | 117              | 130          | ☐                        |
|                      | 60           | 4                  | 64-QAM     | QPSK   | QPSK   | QPSK   | 104              | 115.6        | ☐                        |
|                      | 61           | 4                  | 64-QAM     | 16-QAM | 16-QAM | QPSK   | 117              | 130          | ☐                        |
|                      | 62           | 4                  | 64-QAM     | 16-QAM | 16-QAM | 16-QAM | 130              | 144.4        | ☐                        |
|                      | 63           | 4                  | 64-QAM     | 64-QAM | 64-QAM | QPSK   | 130              | 144.4        | ☐                        |
|                      | 64           | 4                  | 64-QAM     | 64-QAM | 64-QAM | 16-QAM | 143              | 158.9        | ☐                        |
|                      | 65           | 4                  | 16-QAM     | QPSK   | QPSK   | QPSK   | 97.5             | 108.3        | ☐                        |
|                      | 66           | 4                  | 16-QAM     | 16-QAM | QPSK   | QPSK   | 117              | 130          | ☐                        |
|                      | 67           | 4                  | 16-QAM     | 16-QAM | 16-QAM | QPSK   | 136.5            | 151.7        | ☐                        |
|                      | 68           | 4                  | 64-QAM     | QPSK   | QPSK   | QPSK   | 117              | 130          | ☐                        |
|                      | 69           | 4                  | 64-QAM     | 16-QAM | QPSK   | QPSK   | 136.5            | 151.7        | ☐                        |
|                      | 70           | 4                  | 64-QAM     | 16-QAM | 16-QAM | QPSK   | 156              | 173.3        | ☐                        |
|                      | 71           | 4                  | 64-QAM     | 16-QAM | 16-QAM | 16-QAM | 175.5            | 195          | ☐                        |
|                      | 72           | 4                  | 64-QAM     | 64-QAM | QPSK   | QPSK   | 156              | 173.3        | ☐                        |
|                      | 73           | 4                  | 64-QAM     | 64-QAM | 16-QAM | QPSK   | 175.5            | 195          | ☐                        |
|                      | 74           | 4                  | 64-QAM     | 64-QAM | 16-QAM | 16-QAM | 195              | 216.7        | ☐                        |
|                      | 75           | 4                  | 64-QAM     | 64-QAM | 64-QAM | QPSK   | 195              | 216.7        | ☐                        |
|                      | 76           | 4                  | 64-QAM     | 64-QAM | 64-QAM | 16-QAM | 214.5            | 238.3        | ☐                        |

## 2.2. RUNNING MODE

The EUT is set in the following modes during tests:

- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception

## 2.3. EQUIPMENT LABELLING



## 2.4. EQUIPMENT MODIFICATION

☒ None ☐ Modification:

### 3. OCCUPIED BANDWIDTH

#### 3.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
Date of test : August 1, 2017  
Ambient temperature : 26 °C  
Relative humidity : 44 %

#### 3.2. TEST SETUP

- The Equipment Under Test is installed:

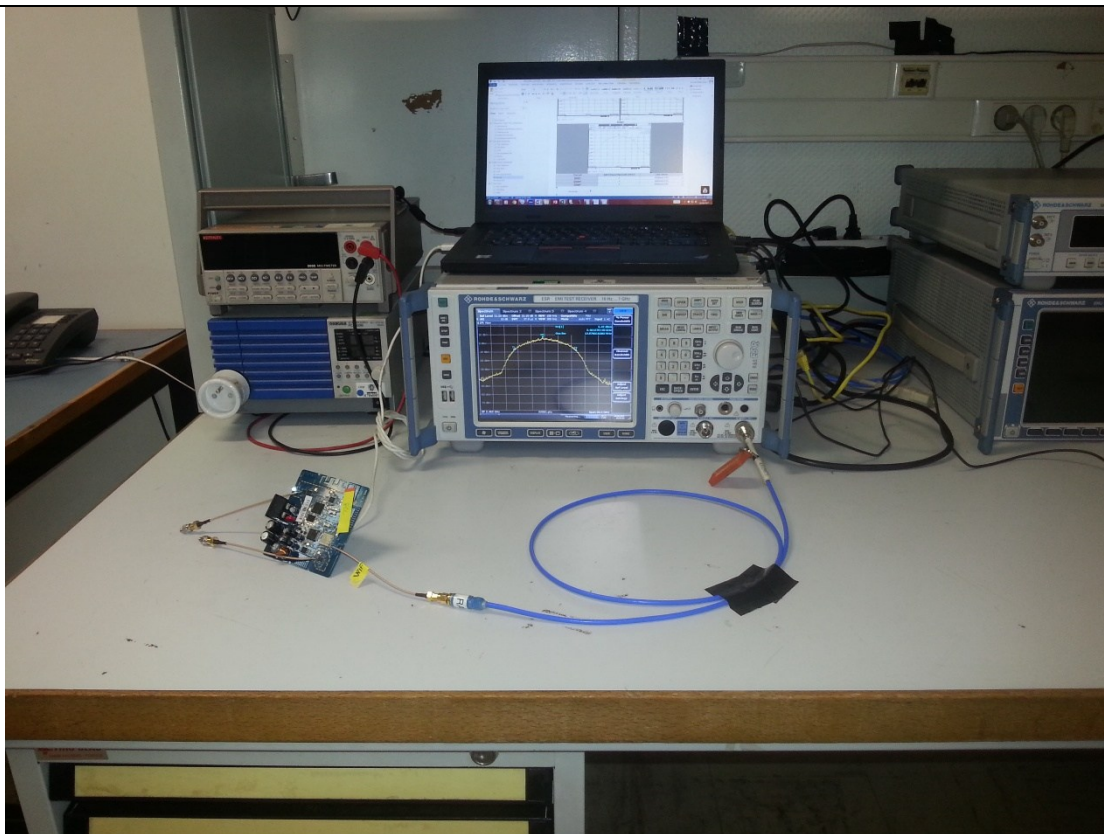
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☐ RSS-Gen Issue 4 § 6.6
- ☒ ANSI C63.10 § 6.9.2



Photograph for Occupied bandwidth



### 3.1. LIMIT

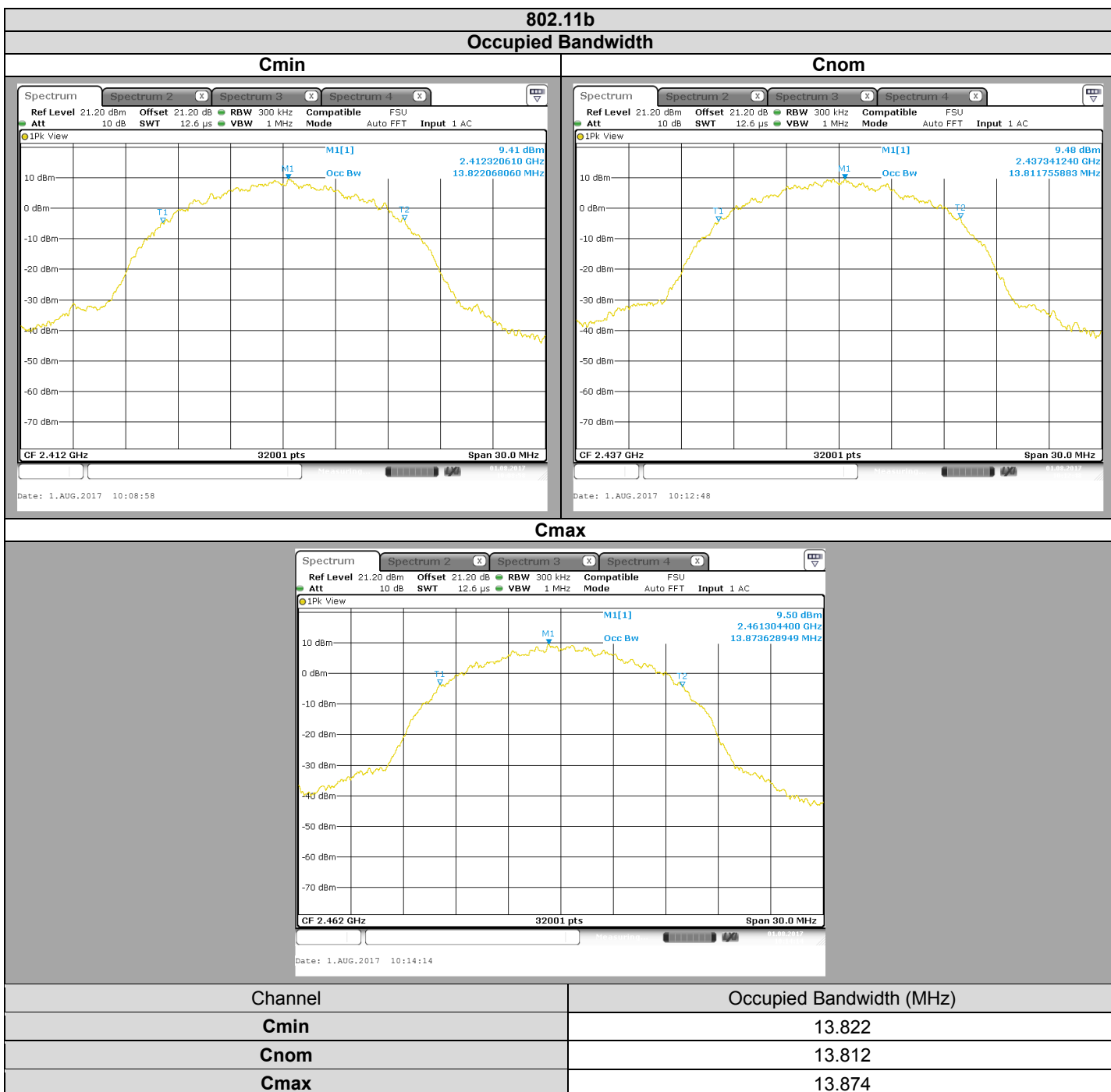
None

### 3.2. TEST EQUIPMENT LIST

| DESCRIPTION                 | MANUFACTURER    | MODEL        | N° LCIE  | Cal_Date | Cal_Due |
|-----------------------------|-----------------|--------------|----------|----------|---------|
| EMI receiver                | ROHDE & SCHWARZ | ESR 7        | A2642023 | 2016/09  | 2018/09 |
| RF cable & 20 dB attenuator | Téledyne        | 920-0202-048 | A5329675 | 2016/09  | 2017/09 |
| Load 50 ohms                | TELEGARTNER     |              | A7150103 | 2016/12  | 2017/12 |
| Load 50 ohms                | TELEGARTNER     |              | A7150104 | 2016/12  | 2017/12 |

Note: In our quality system, the test equipment calibration due is more & less 2 months

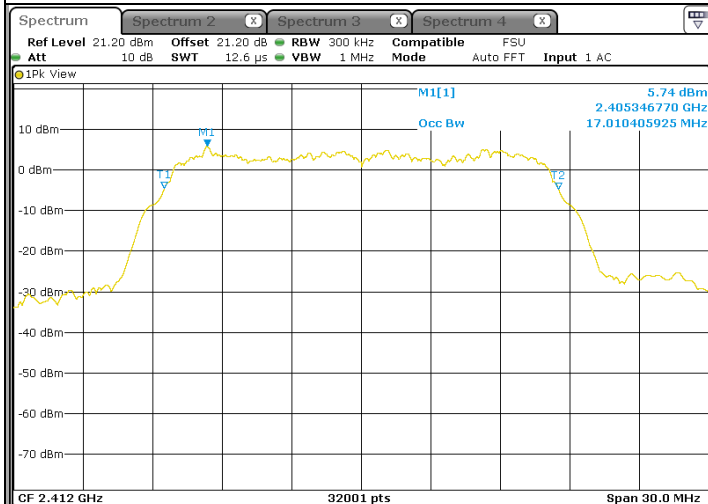
### 3.3. RESULTS



### 802.11g

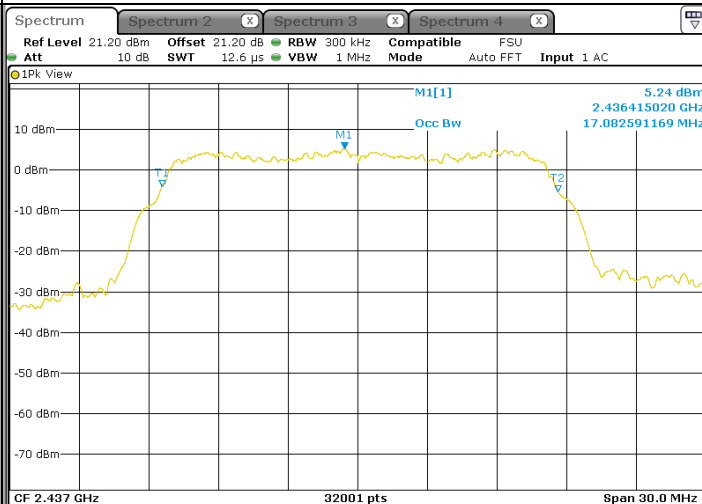
#### Occupied Bandwidth

##### Cmin



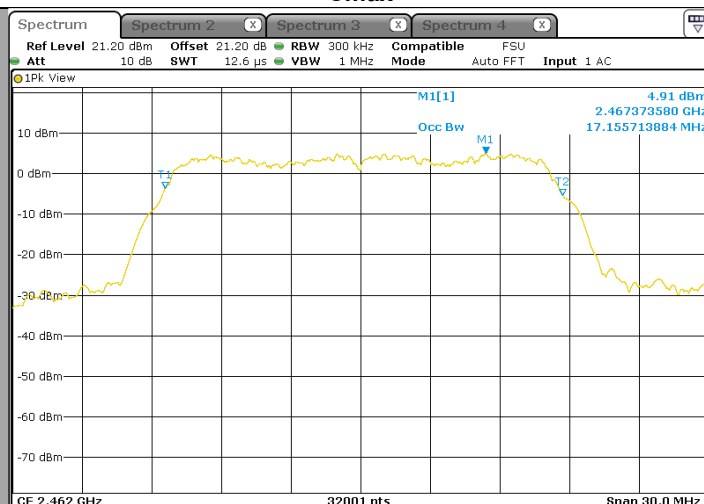
Date: 1.AUG.2017 10:26:48

##### Cnom



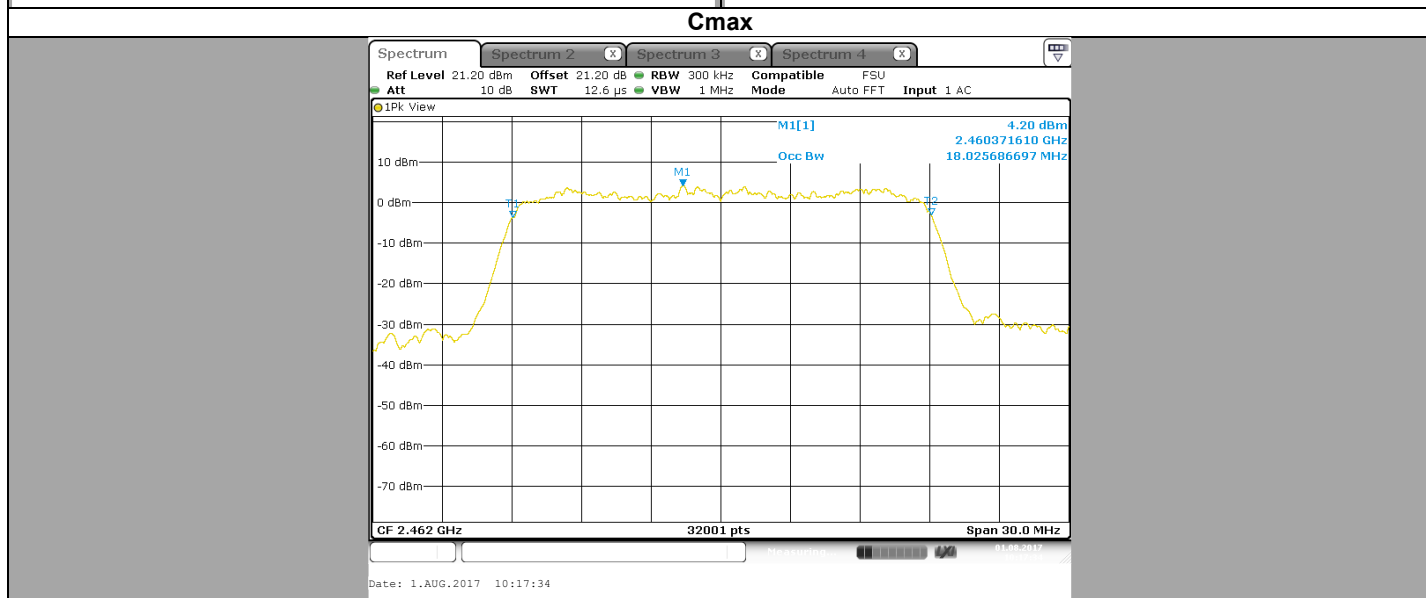
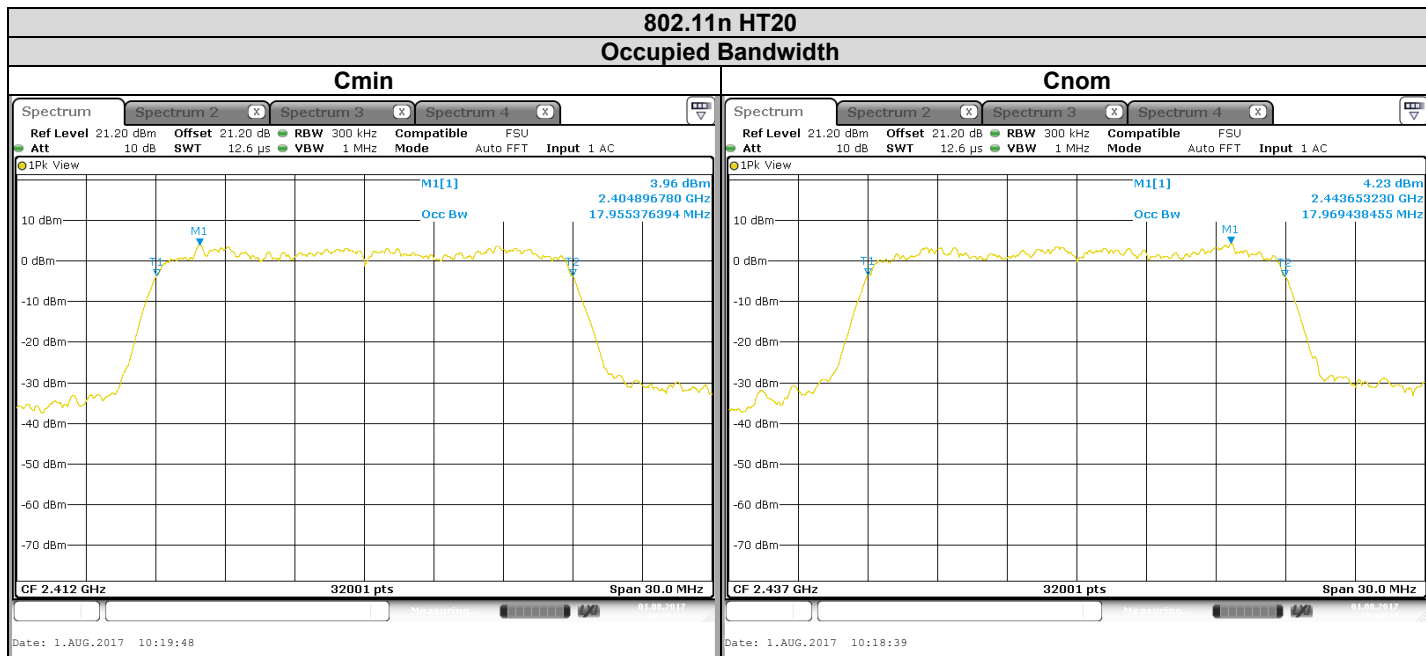
Date: 1.AUG.2017 10:27:32

##### Cmax



Date: 1.AUG.2017 10:28:18

| Channel     | Occupied Bandwidth (MHz) |
|-------------|--------------------------|
| <b>Cmin</b> | 17.010                   |
| <b>Cnom</b> | 17.082                   |
| <b>Cmax</b> | 17.156                   |



| Channel     | Occupied Bandwidth (MHz) |
|-------------|--------------------------|
| <b>Cmin</b> | 17.953                   |
| <b>Cnom</b> | 17.969                   |
| <b>Cmax</b> | 18.026                   |

### 3.1. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **VELUX ACTIVE** with **NETATMO** NXG01S, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS-GEN ISSUE 4** limits.



## 4. 6dB EMISSION BANDWIDTH

### 4.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
Date of test : August 1, 2017  
Ambient temperature : 26 °C  
Relative humidity : 44 %

### 4.2. TEST SETUP

- The Equipment Under Test is installed:

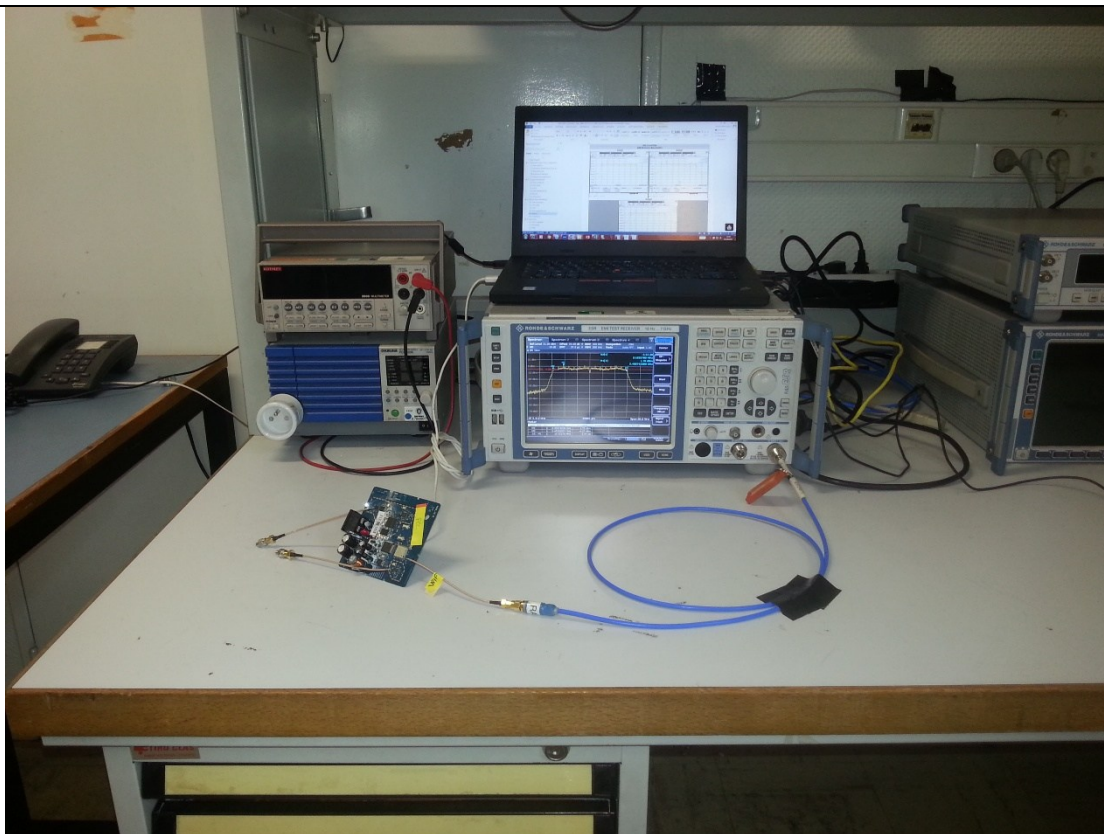
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☐ KDB 558074 D01 DTS Meas Guidance v04 § 8.1
- ☒ KDB 558074 D01 DTS Meas Guidance v04 § 8.2



Photograph for 6dB emission bandwidth





#### 4.3. LIMIT

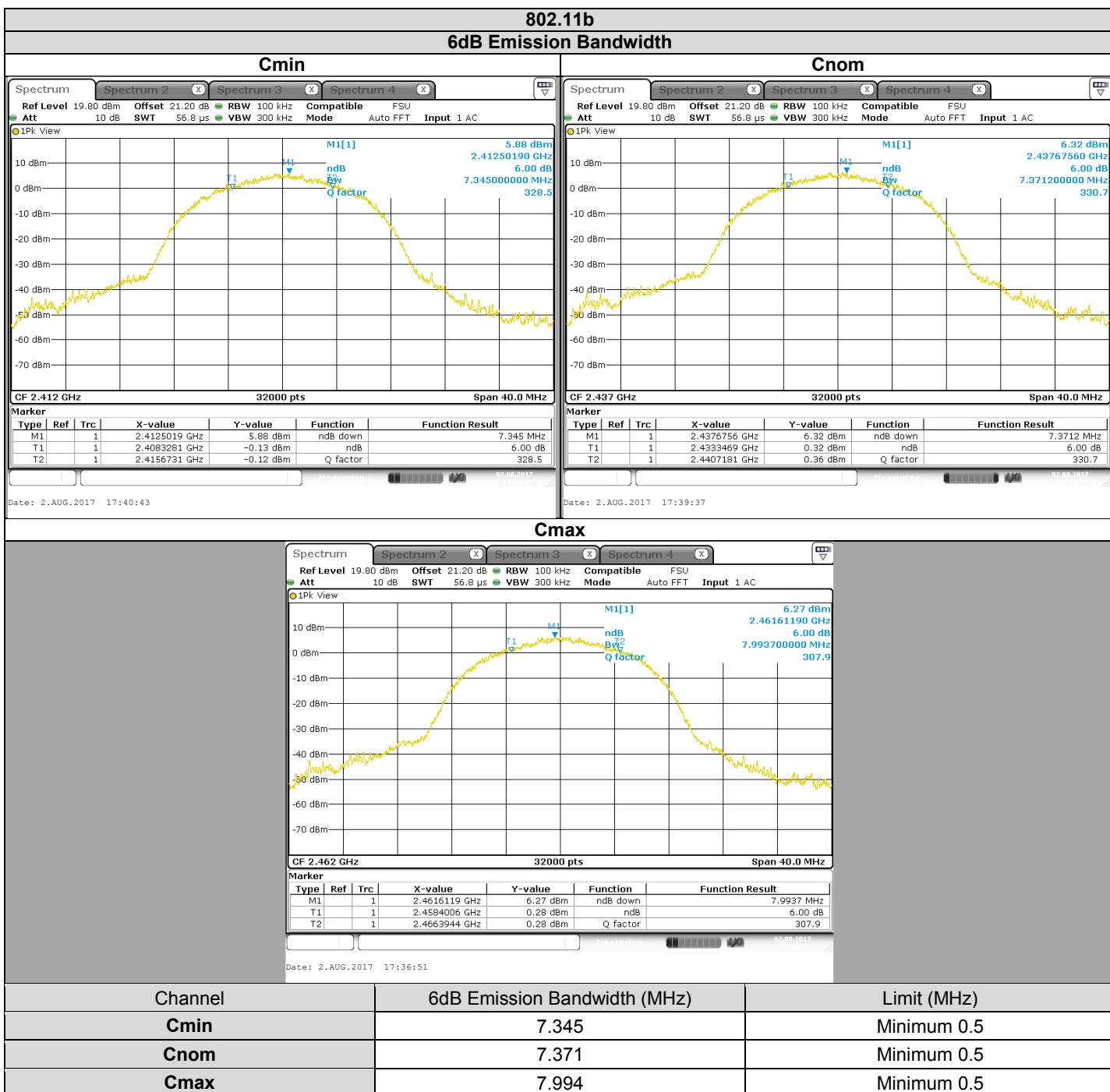
The 6dB bandwidth shall be at least 500kHz

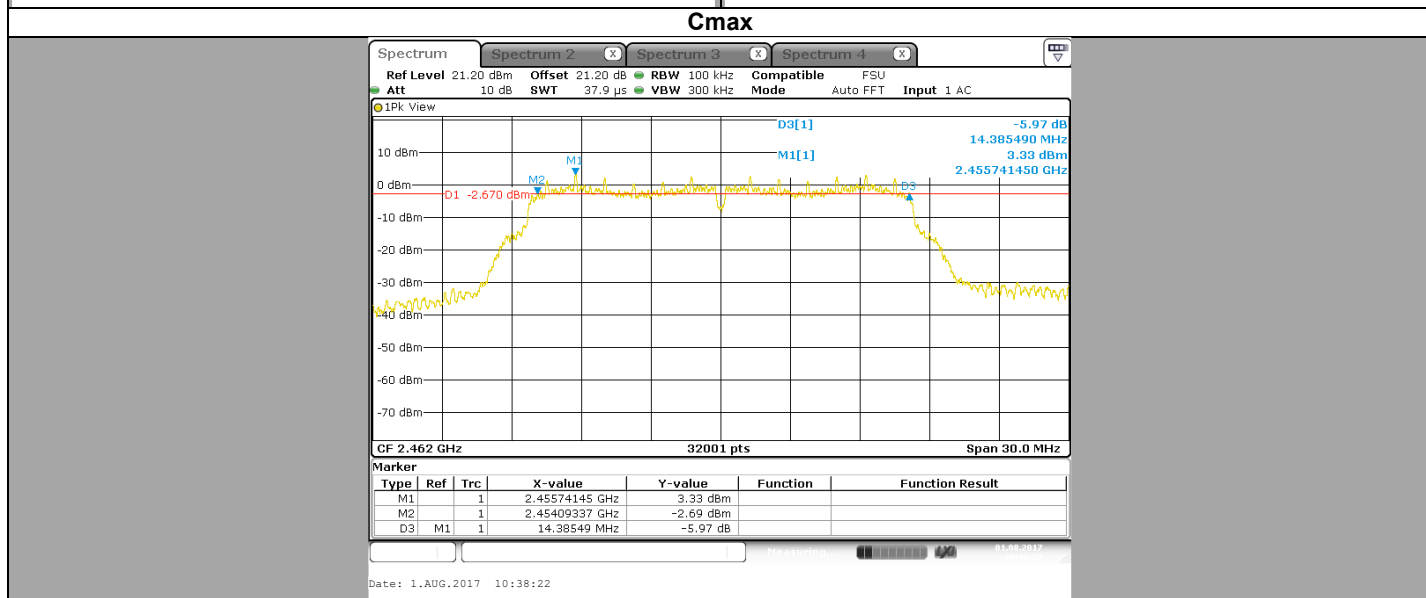
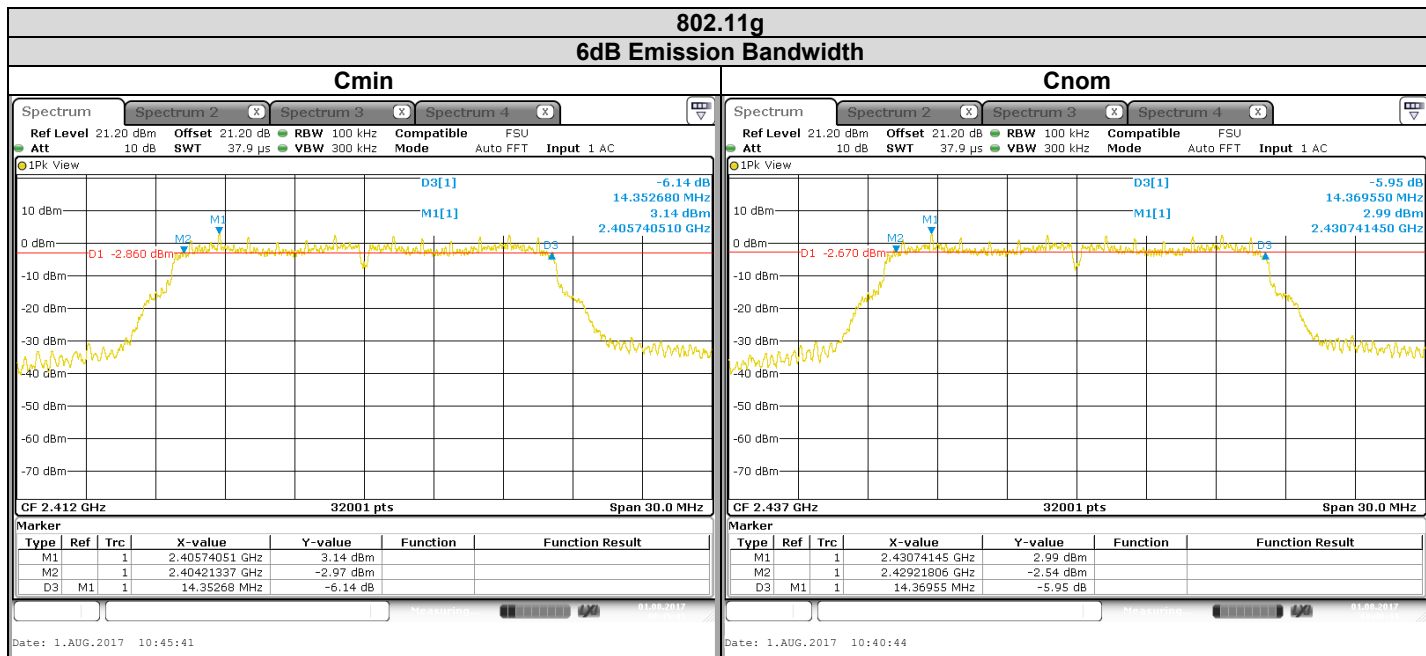
#### 4.4. TEST EQUIPMENT LIST

| DESCRIPTION                 | MANUFACTURER    | MODEL        | N° LCIE  | Cal_Date | Cal_Due |
|-----------------------------|-----------------|--------------|----------|----------|---------|
| EMI receiver                | ROHDE & SCHWARZ | ESR 7        | A2642023 | 2016/09  | 2018/09 |
| RF cable & 20 dB attenuator | Télédyne        | 920-0202-048 | A5329675 | 2016/09  | 2017/09 |
| Load 50 ohms                | TELEGARTNER     |              | A7150103 | 2016/12  | 2017/12 |
| Load 50 ohms                | TELEGARTNER     |              | A7150104 | 2016/12  | 2017/12 |

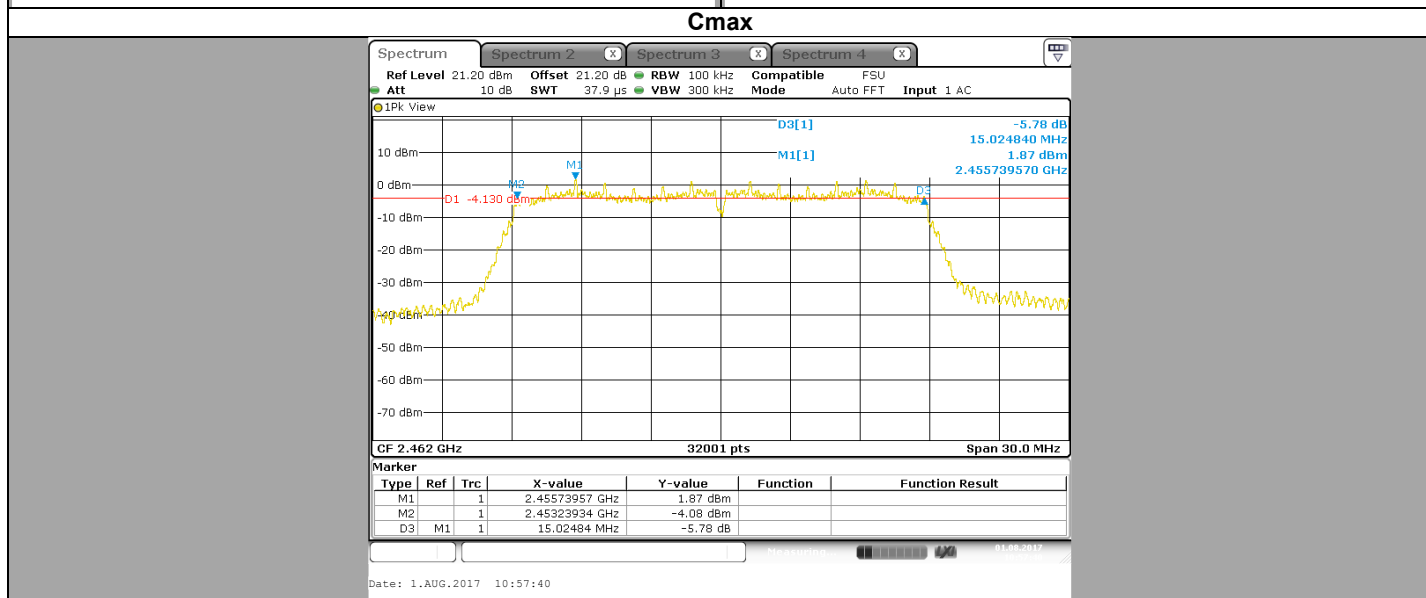
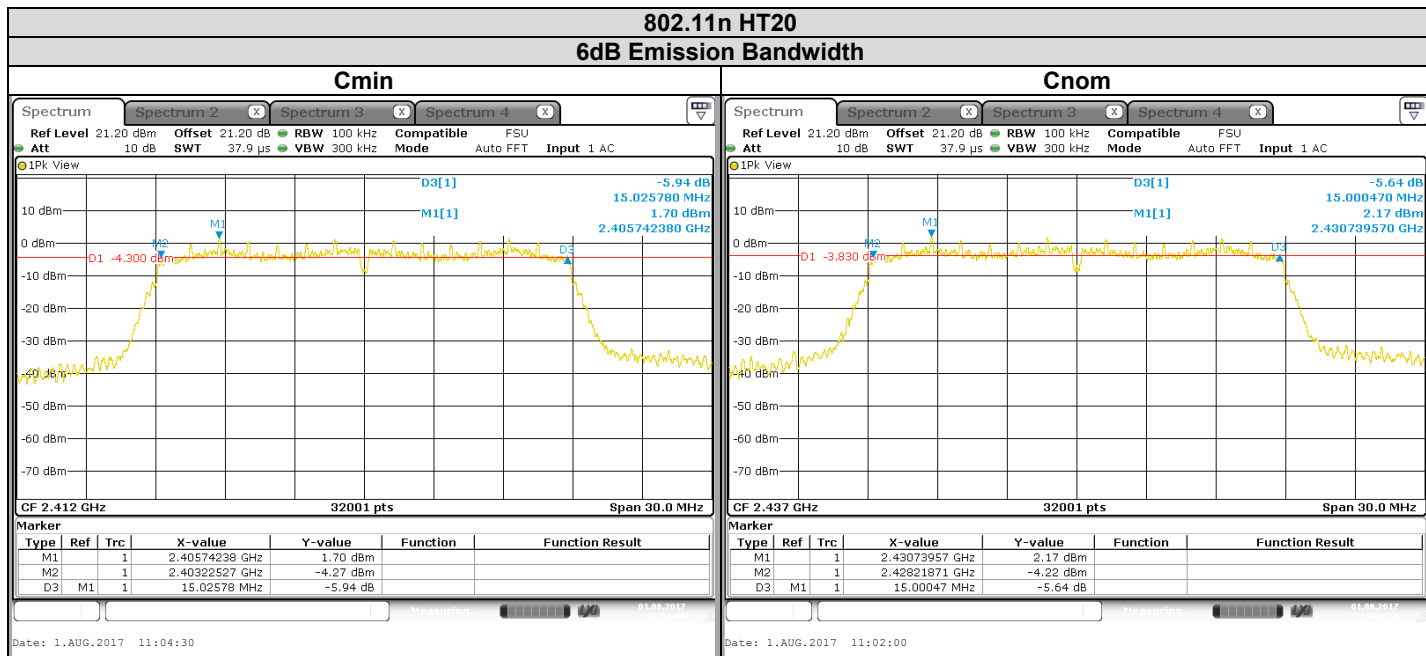
Note: In our quality system, the test equipment calibration due is more & less 2 months

## 4.5. RESULTS





| Channel     | 6dB Emission Bandwidth (MHz) | Limit (MHz) |
|-------------|------------------------------|-------------|
| <b>Cmin</b> | 14.352                       | Minimum 0.5 |
| <b>Cnom</b> | 14.369                       | Minimum 0.5 |
| <b>Cmax</b> | 14.385                       | Minimum 0.5 |



| Channel     | 6dB Emission Bandwidth (MHz) | Limit (MHz) |
|-------------|------------------------------|-------------|
| <b>Cmin</b> | 15.026                       | Minimum 0.5 |
| <b>Cnom</b> | 15.000                       | Minimum 0.5 |
| <b>Cmax</b> | 15.025                       | Minimum 0.5 |



#### 4.6. CONCLUSION

6dB Emission Bandwidth measurement performed on the sample of the product **VELUX ACTIVE** with **NETATMO** NXG01S, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

## 5. DUTY CYCLE

### 5.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
Date of test : August 1, 2017  
Ambient temperature : 26 °C  
Relative humidity : 44 %

### 5.2. TEST SETUP

- The Equipment Under Test is installed:

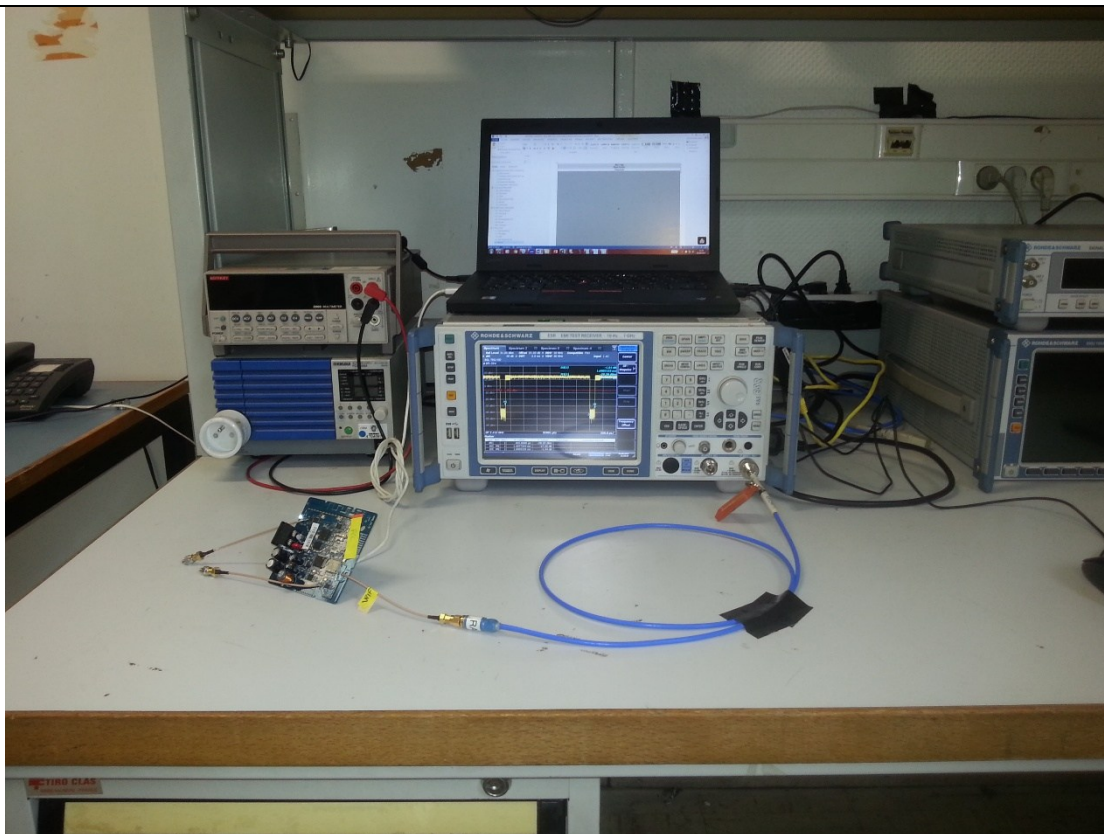
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☒ KDB 558074 D01 DTS Meas Guidance v04 § 6.0 b)



Photograph for Duty Cycle

### 5.3. LIMIT

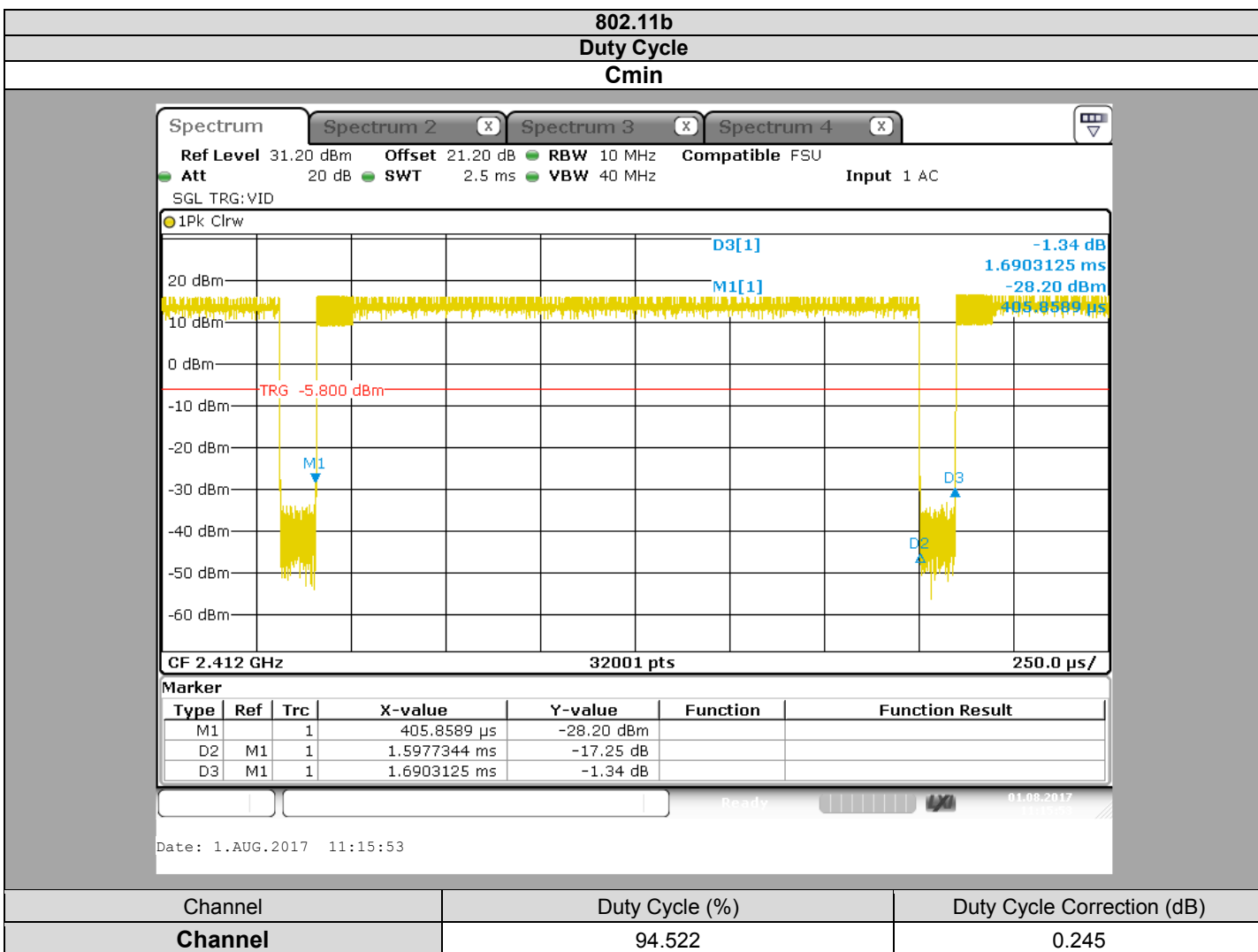
None

### 5.4. TEST EQUIPMENT LIST

| DESCRIPTION                 | MANUFACTURER    | MODEL        | N° LCIE  | Cal_Date | Cal_Due |
|-----------------------------|-----------------|--------------|----------|----------|---------|
| EMI receiver                | ROHDE & SCHWARZ | ESR 7        | A2642023 | 2016/09  | 2018/09 |
| RF cable & 20 dB attenuator | Télédyn         | 920-0202-048 | A5329675 | 2016/09  | 2017/09 |
| Load 50 ohms                | TELEGARTNER     |              | A7150103 | 2016/12  | 2017/12 |
| Load 50 ohms                | TELEGARTNER     |              | A7150104 | 2016/12  | 2017/12 |

Note: In our quality system, the test equipment calibration due is more & less 2 months

### 5.5. RESULTS

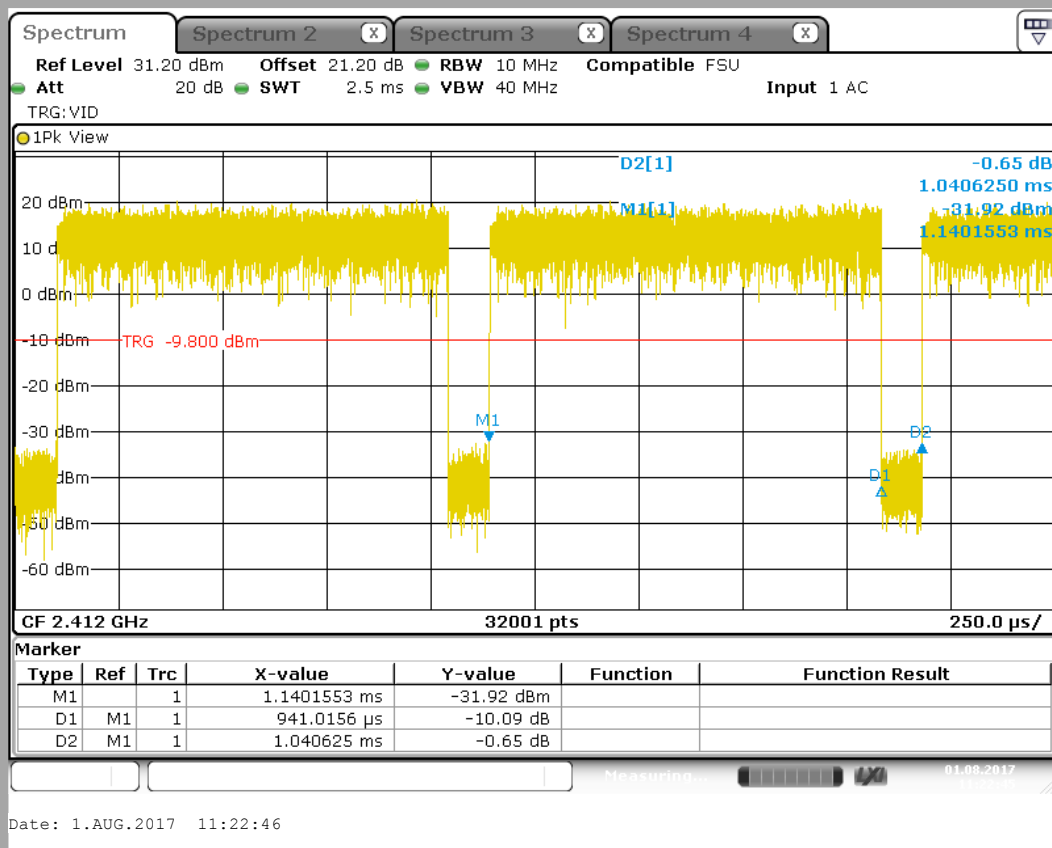




802.11g

Duty Cycle

Cmin



Channel

Duty Cycle (%)

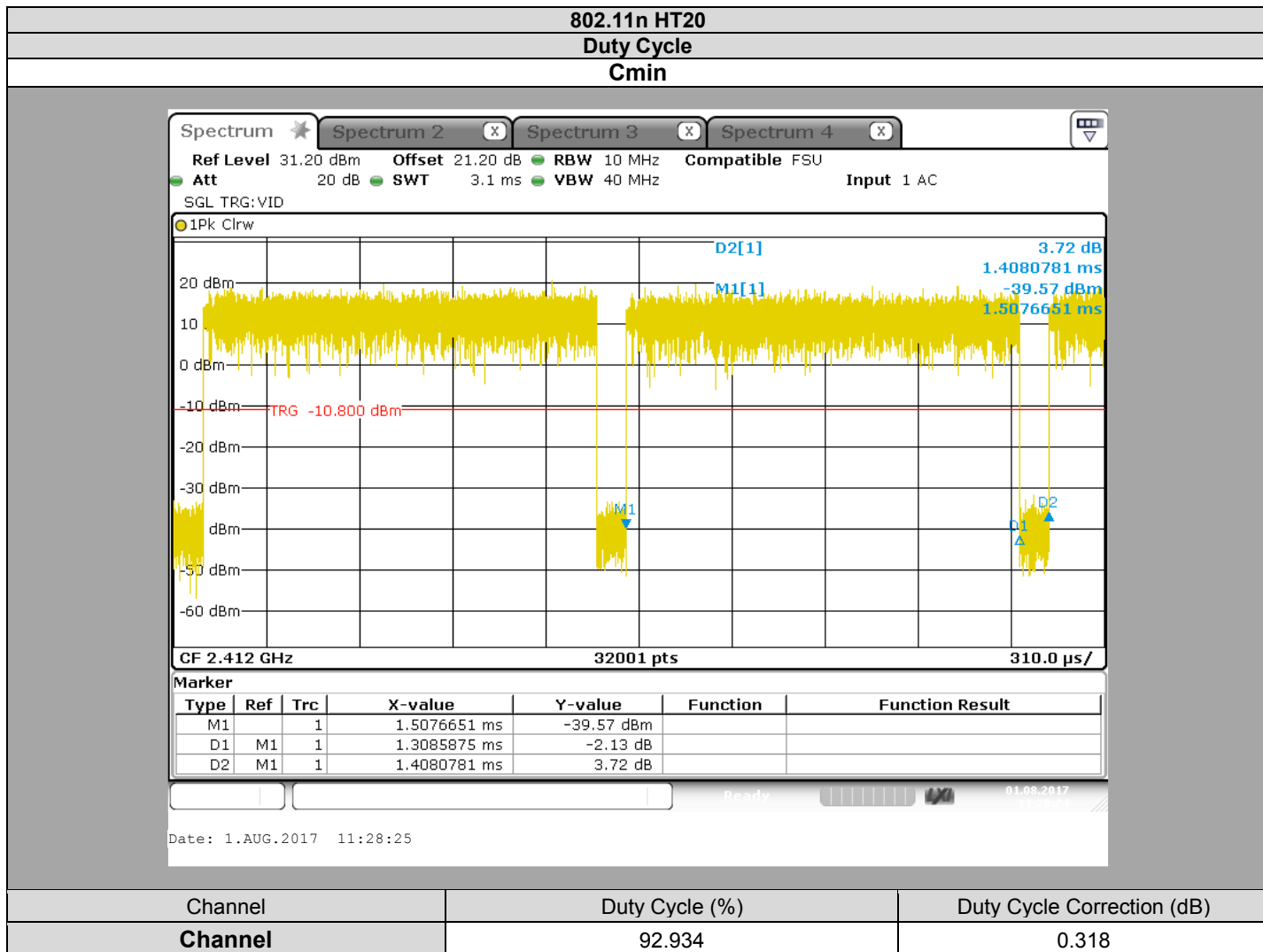
Duty Cycle Correction (dB)

Channel

90.428

0.437





## 5.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **VELUX ACTIVE** with **NETATMO** NXG01S, SN: - , in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

## 6. MAXIMUM CONDUCTED OUTPUT POWER

### 6.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
Date of test : August 1, 2017  
Ambient temperature : 26 °C  
Relative humidity : 44 %

### 6.2. TEST SETUP

- The Equipment Under Test is installed:

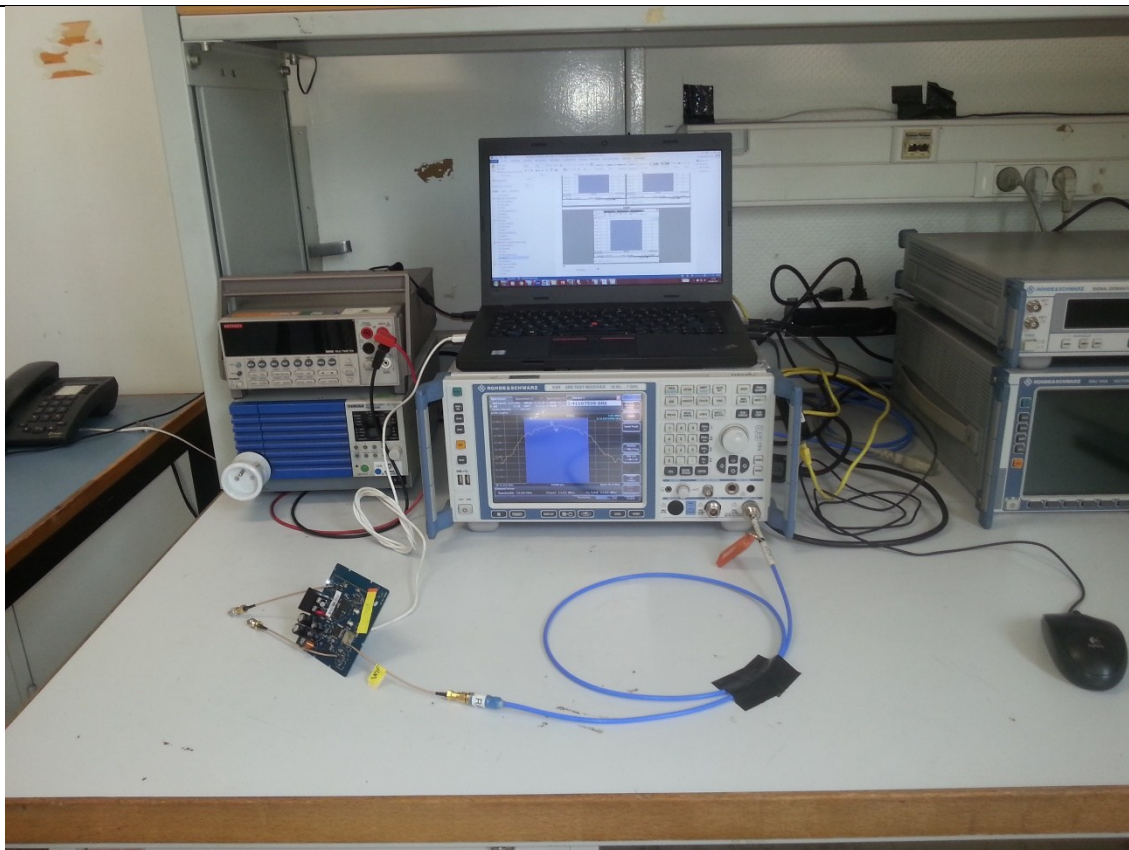
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☒ KDB 558074 D01 DTS Meas Guidance v04 § 9.2.2.2 (Method AVGSA-1)
- ☐ KDB 558074 D01 DTS Meas Guidance v04 § 9.2.2.4 (Method AVGSA-2)



Photograph for Maximum Conducted Output Power



### 6.3. LIMIT

Maximum Conducted Output power:

2400MHz-2483.5MHz: Shall not exceed 30dBm

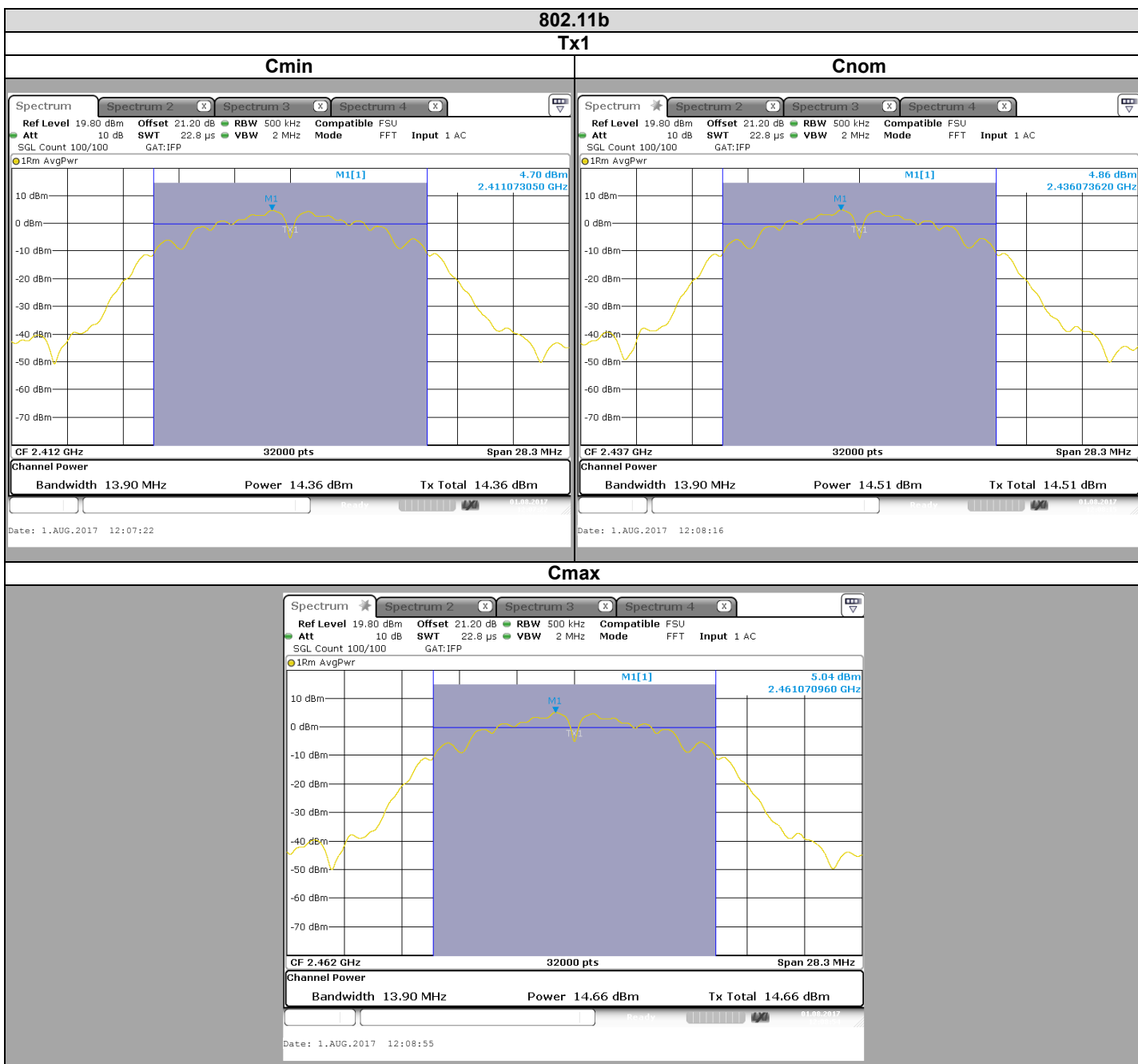
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

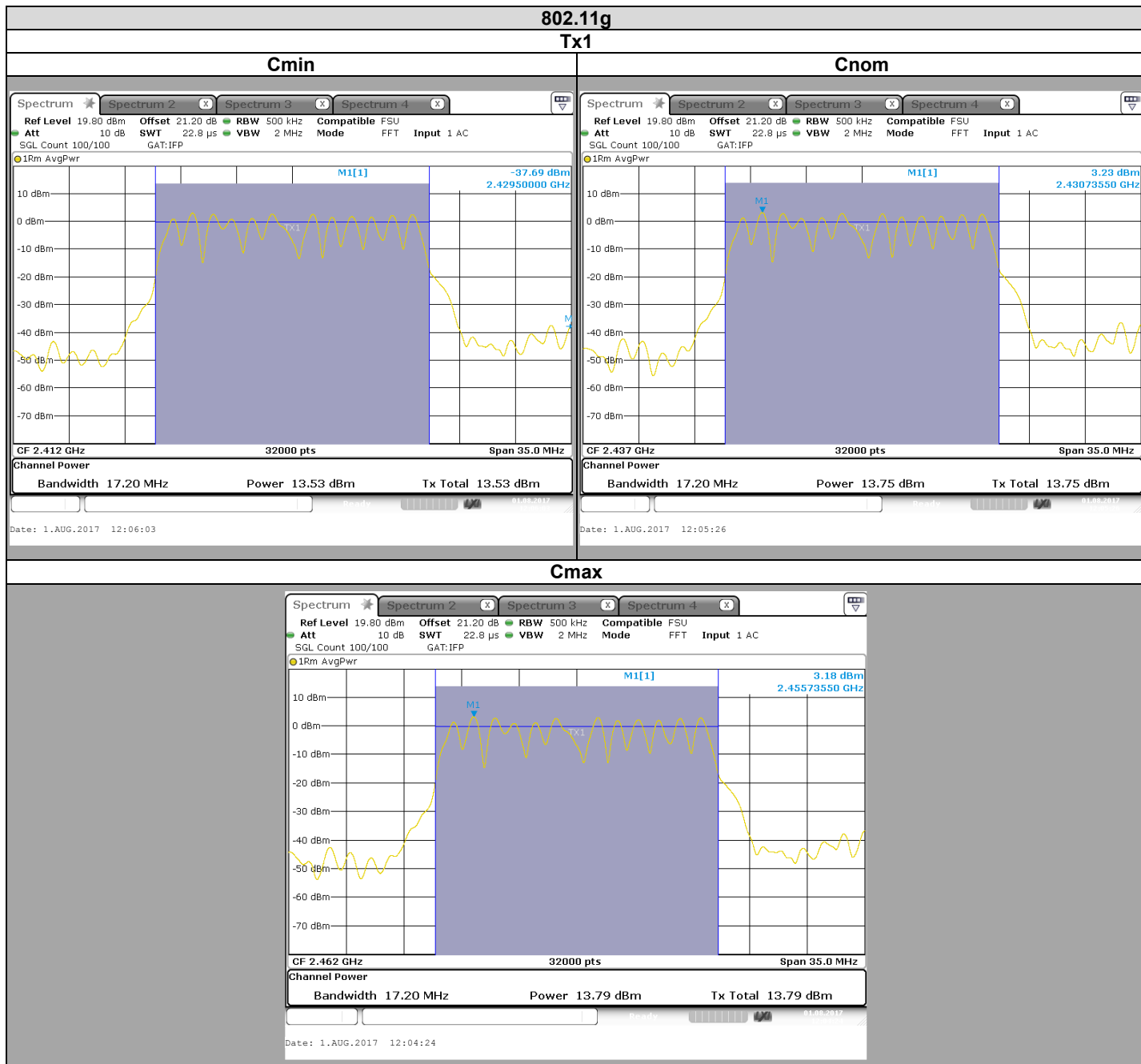
### 6.4. TEST EQUIPMENT LIST

| DESCRIPTION                 | MANUFACTURER    | MODEL        | N° LCIE  | Cal_Date | Cal_Due |
|-----------------------------|-----------------|--------------|----------|----------|---------|
| EMI receiver                | ROHDE & SCHWARZ | ESR 7        | A2642023 | 2016/09  | 2018/09 |
| RF cable & 20 dB attenuator | Télédynne       | 920-0202-048 | A5329675 | 2016/09  | 2017/09 |
| Load 50 ohms                | TELEGARTNER     |              | A7150103 | 2016/12  | 2017/12 |
| Load 50 ohms                | TELEGARTNER     |              | A7150104 | 2016/12  | 2017/12 |

Note: In our quality system, the test equipment calibration due is more & less 2 months

## 6.5. RESULTS

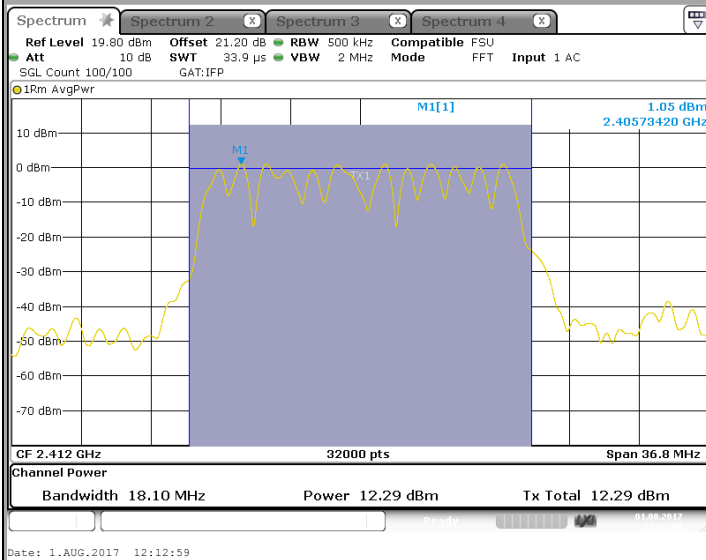




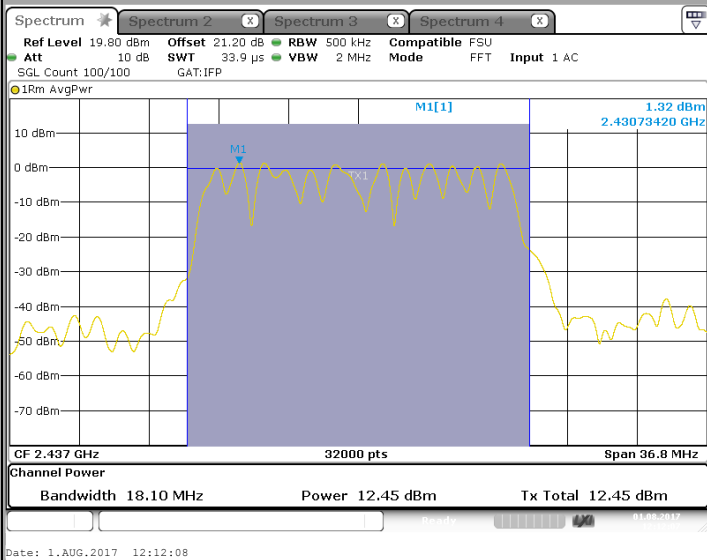
## 802.11n HT20

### Tx1

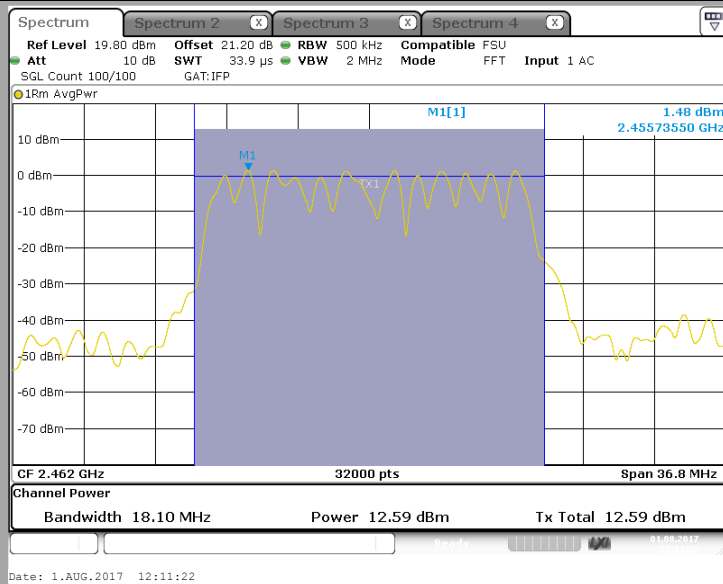
#### Cmin



#### Cnom



### Cmax





Spectrum Analyzer Offset:  
Cable Loss=1.20dB + Attenuator= 20dB

| 802.11b |           |                            |                               |             |
|---------|-----------|----------------------------|-------------------------------|-------------|
| Channel | Tx1 (dBm) | Overall Antenna Gain (dBi) | Maximum Conducted Power (dBm) | Limit (dBm) |
| Cmin    | 14.36     | 5.56                       | 14.36                         | 30          |
| Cnom    | 14.51     | 5.56                       | 14.51                         | 30          |
| Cmax    | 14.66     | 5.56                       | 14.66                         | 30          |

| 802.11g |           |                            |                               |             |
|---------|-----------|----------------------------|-------------------------------|-------------|
| Channel | Tx1 (dBm) | Overall Antenna Gain (dBi) | Maximum Conducted Power (dBm) | Limit (dBm) |
| Cmin    | 13.53     | 5.56                       | 13.53                         | 30          |
| Cnom    | 13.75     | 5.56                       | 13.75                         | 30          |
| Cmax    | 13.79     | 5.56                       | 13.79                         | 30          |

| 802.11n HT20 |           |                            |                               |             |
|--------------|-----------|----------------------------|-------------------------------|-------------|
| Channel      | Tx1 (dBm) | Overall Antenna Gain (dBi) | Maximum Conducted Power (dBm) | Limit (dBm) |
| Cmin         | 12.29     | 5.56                       | 12.29                         | 30          |
| Cnom         | 12.45     | 5.56                       | 12.45                         | 30          |
| Cmax         | 12.59     | 5.56                       | 12.29                         | 30          |

## 6.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **VELUX ACTIVE** with **NETATMO** NXG01S, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

## 7. POWER SPECTRAL DENSITY

### 7.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
Date of test : August 1, 2017  
Ambient temperature : 26 °C  
Relative humidity : 44 %

### 7.2. TEST SETUP

- The Equipment Under Test is installed:

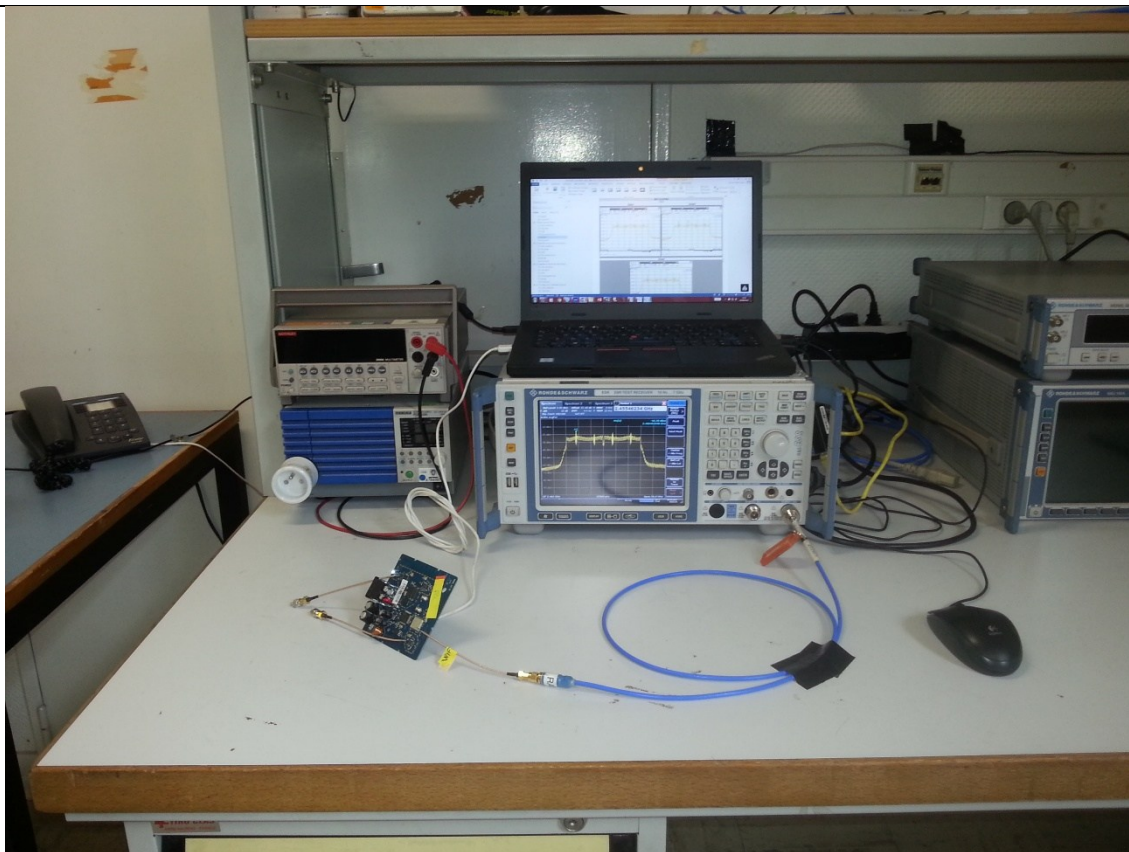
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☐ KDB 558074 D01 DTS Meas Guidance v04 § 10.2 (Method PKPSD)
- ☒ KDB 558074 D01 DTS Meas Guidance v04 § 10.3 (Method AVGPSD-1)



Photograph for Power Spectral Density





### 7.3. LIMIT

Power Spectral Density:

2400MHz-2483.5MHz: Shall not exceed 8dBm/3kHz

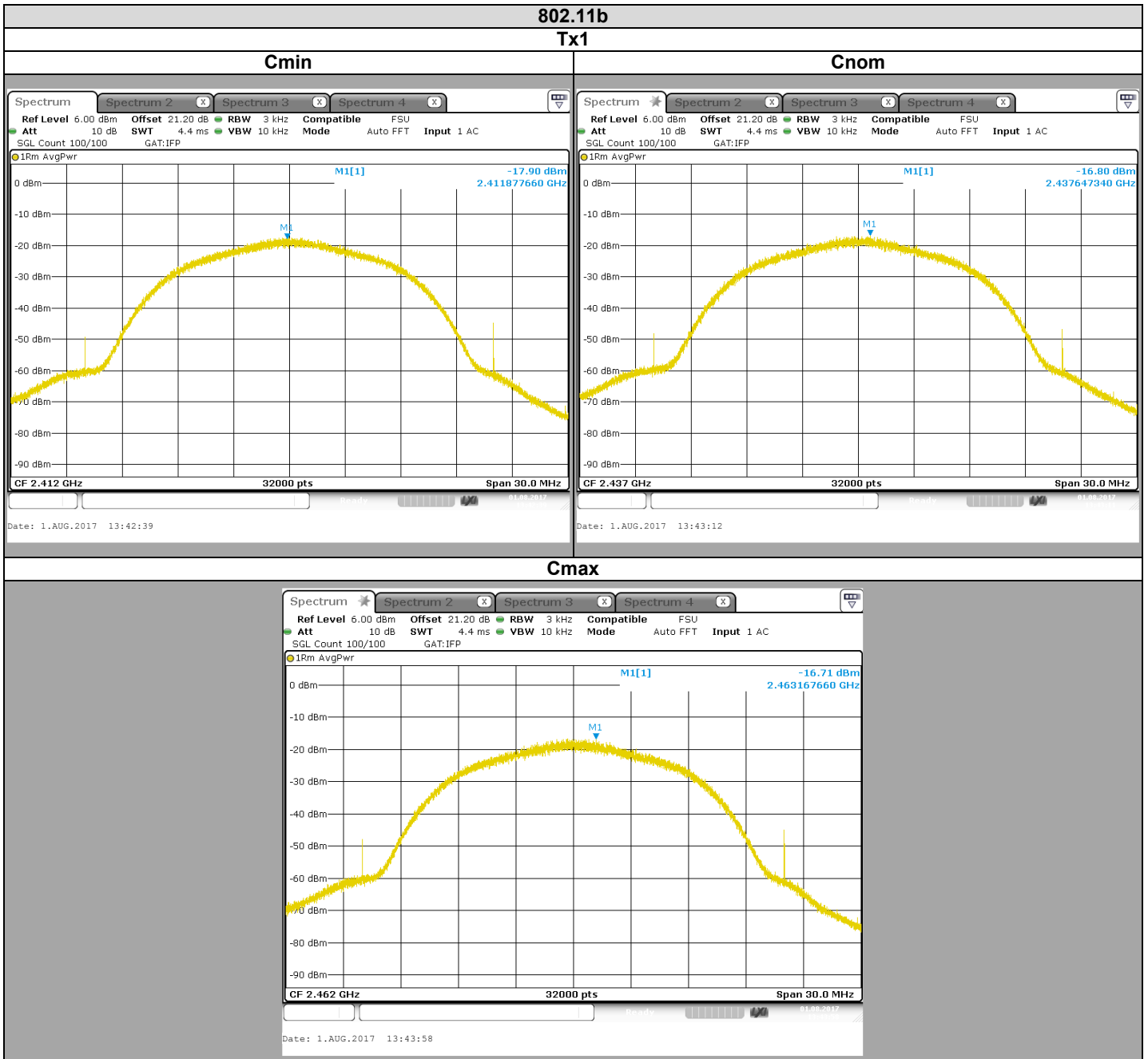
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

### 7.4. TEST EQUIPMENT LIST

| DESCRIPTION                 | MANUFACTURER    | MODEL        | N° LCIE  | Cal_Date | Cal_Due |
|-----------------------------|-----------------|--------------|----------|----------|---------|
| EMI receiver                | ROHDE & SCHWARZ | ESR 7        | A2642023 | 2016/09  | 2018/09 |
| RF cable & 20 dB attenuator | Télédyné        | 920-0202-048 | A5329675 | 2016/09  | 2017/09 |
| Load 50 ohms                | TELEGARTNER     |              | A7150103 | 2016/12  | 2017/12 |
| Load 50 ohms                | TELEGARTNER     |              | A7150104 | 2016/12  | 2017/12 |

Note: In our quality system, the test equipment calibration due is more & less 2 months

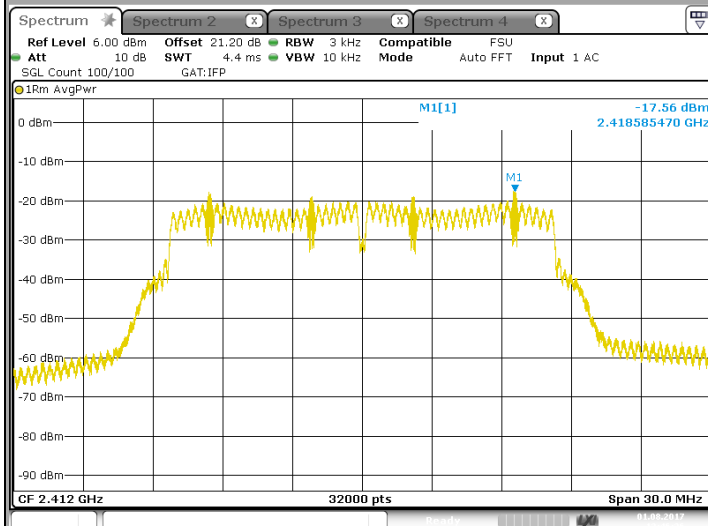
## 7.5. RESULTS



**802.11g**

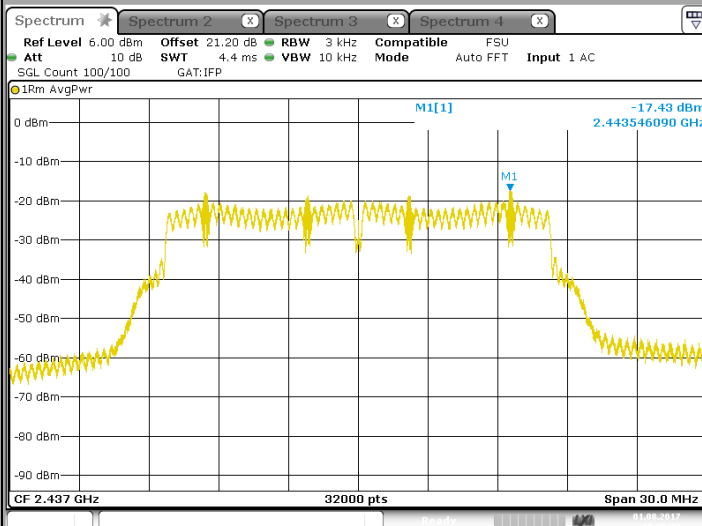
**Tx1**

**Cmin**



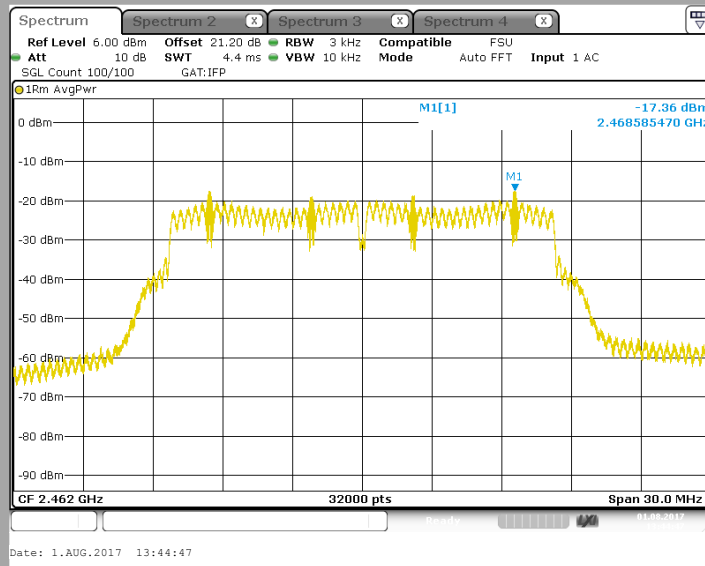
Date: 1.AUG.2017 13:46:27

**Cnom**



Date: 1.AUG.2017 13:45:33

**Cmax**

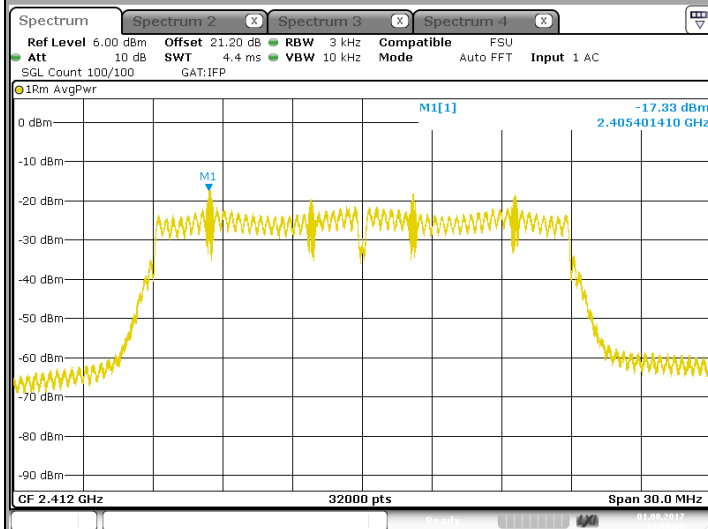


Date: 1.AUG.2017 13:44:47

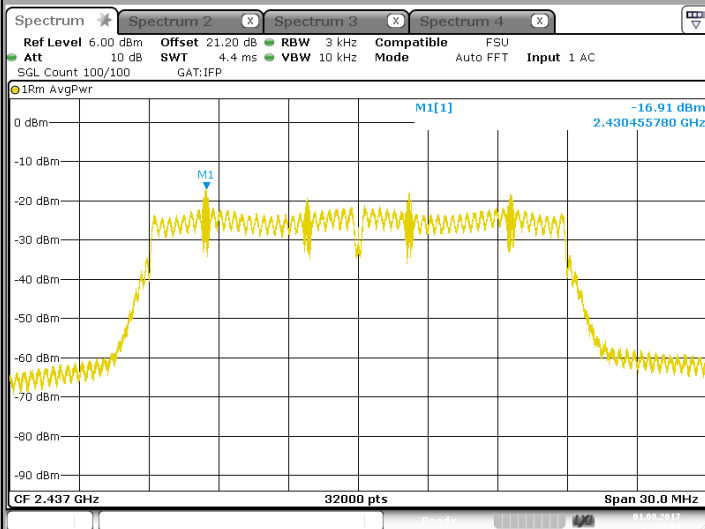
## 802.11n HT20

### Tx1

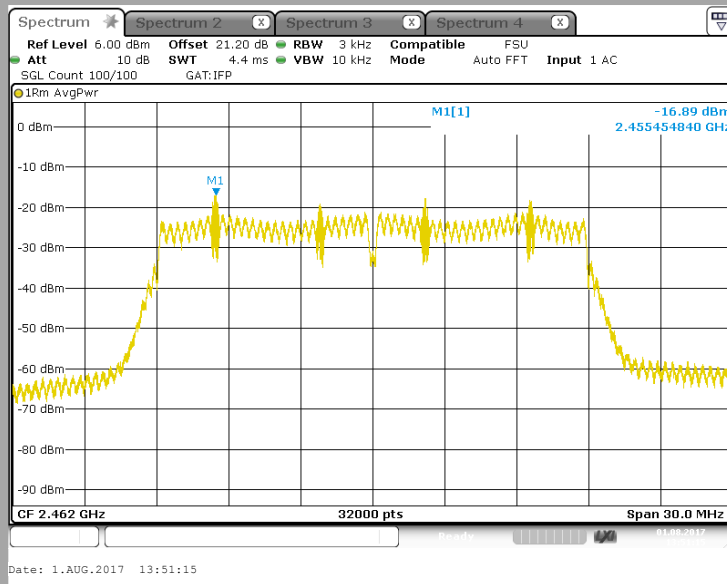
#### Cmin



#### Cnom



#### Cmax



Spectrum Analyzer Offset:  
Cable Loss=1.2dB + Attenuator= 20dB

| 802.11b |                   |                               |                                 |                     |
|---------|-------------------|-------------------------------|---------------------------------|---------------------|
| Channel | Tx1<br>(dBm/3kHz) | Overall Antenna<br>Gain (dBi) | Power Spectral<br>Density (dBm) | Limit<br>(dBm/3kHz) |
| Cmin    | -17.90            | 5.56                          | -17.90                          | 8                   |
| Cnom    | -16.80            | 5.56                          | -16.80                          | 8                   |
| Cmax    | -16.71            | 5.56                          | -16.71                          | 8                   |

| 802.11g |                   |                               |                                 |                     |
|---------|-------------------|-------------------------------|---------------------------------|---------------------|
| Channel | Tx1<br>(dBm/3kHz) | Overall Antenna<br>Gain (dBi) | Power Spectral<br>Density (dBm) | Limit<br>(dBm/3kHz) |
| Cmin    | -17.56            | 5.56                          | -17.56                          | 8                   |
| Cnom    | -17.43            | 5.56                          | -17.43                          | 8                   |
| Cmax    | -17.36            | 5.56                          | -17.36                          | 8                   |

| 802.11nHT20 |                   |                               |                                 |                     |
|-------------|-------------------|-------------------------------|---------------------------------|---------------------|
| Channel     | Tx1<br>(dBm/3kHz) | Overall Antenna<br>Gain (dBi) | Power Spectral<br>Density (dBm) | Limit<br>(dBm/3kHz) |
| Cmin        | -17.33            | 5.56                          | -17.33                          | 8                   |
| Cnom        | -16.91            | 5.56                          | -16.91                          | 8                   |
| Cmax        | -16.89            | 5.56                          | -16.89                          | 8                   |

## 7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **VELUX ACTIVE** with **NETATMO** NXG01S, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

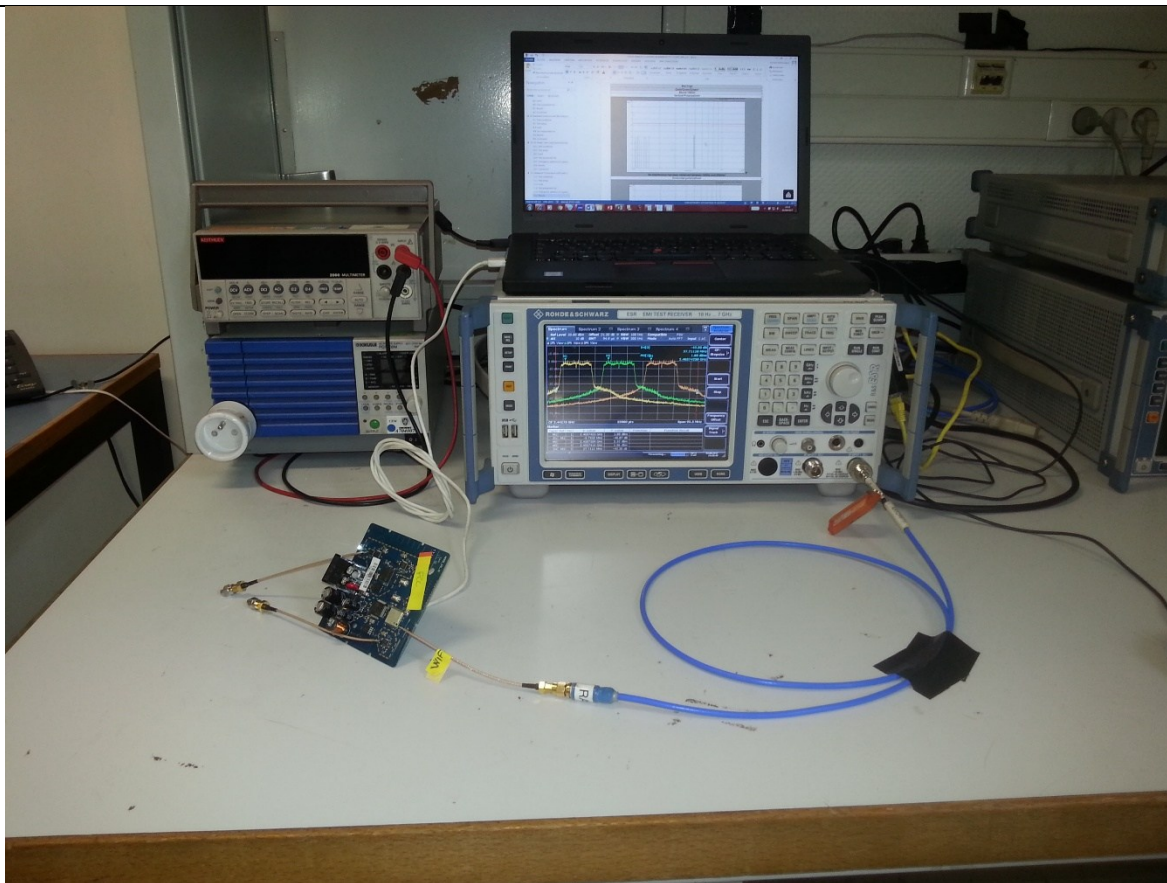
## 8. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE

### 8.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
Date of test : August 1, 2017  
Ambient temperature : 26 °C  
Relative humidity : 44 %

### 8.2. TEST SETUP

- The Equipment Under Test is installed:
  - ☒ On a table
  - ☐ In an anechoic chamber
- Measurement is performed with a spectrum analyzer in:
  - ☒ Conducted Method
  - ☐ Radiated Method
- Test Procedure:
  - ☒ KDB 558074 D01 DTS Meas Guidance v04 § 11



Photograph for Unwanted Emission into non-restricted frequency bands at the band edge



### 8.3. LIMIT

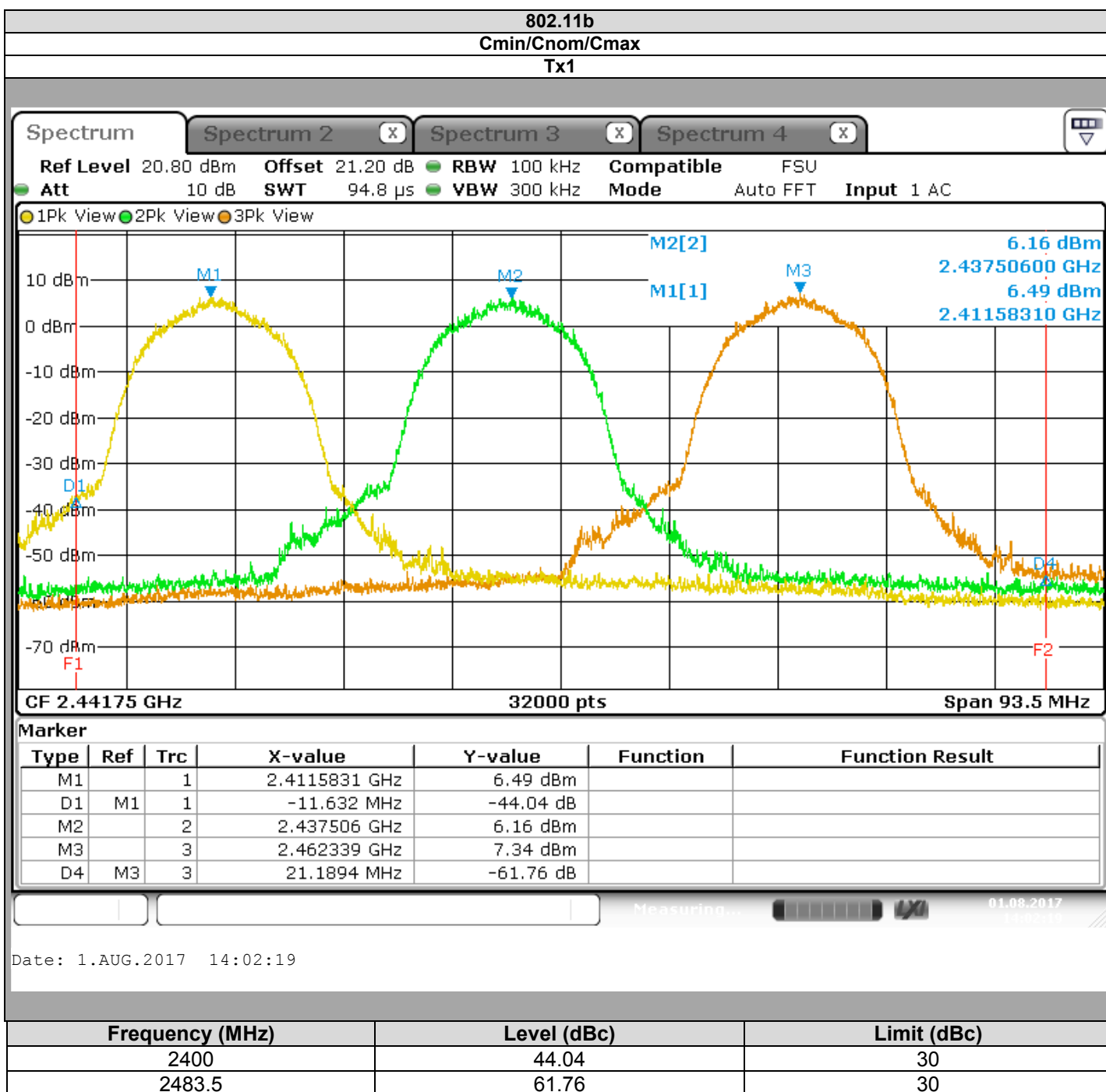
All Spurious Emissions must be at least 30dB (Average Conducted Power) below the Fundamental Radiator Level at the Band Edge "2400MHz & 2483,5MHz"

### 8.4. TEST EQUIPMENT LIST

| DESCRIPTION                 | MANUFACTURER    | MODEL        | N° LCIE  | Cal_Date | Cal_Due |
|-----------------------------|-----------------|--------------|----------|----------|---------|
| EMI receiver                | ROHDE & SCHWARZ | ESR 7        | A2642023 | 2016/09  | 2018/09 |
| RF cable & 20 dB attenuator | Télédynne       | 920-0202-048 | A5329675 | 2016/09  | 2017/09 |
| Load 50 ohms                | TELEGARTNER     |              | A7150103 | 2016/12  | 2017/12 |
| Load 50 ohms                | TELEGARTNER     |              | A7150104 | 2016/12  | 2017/12 |

Note: In our quality system, the test equipment calibration due is more & less 2 months

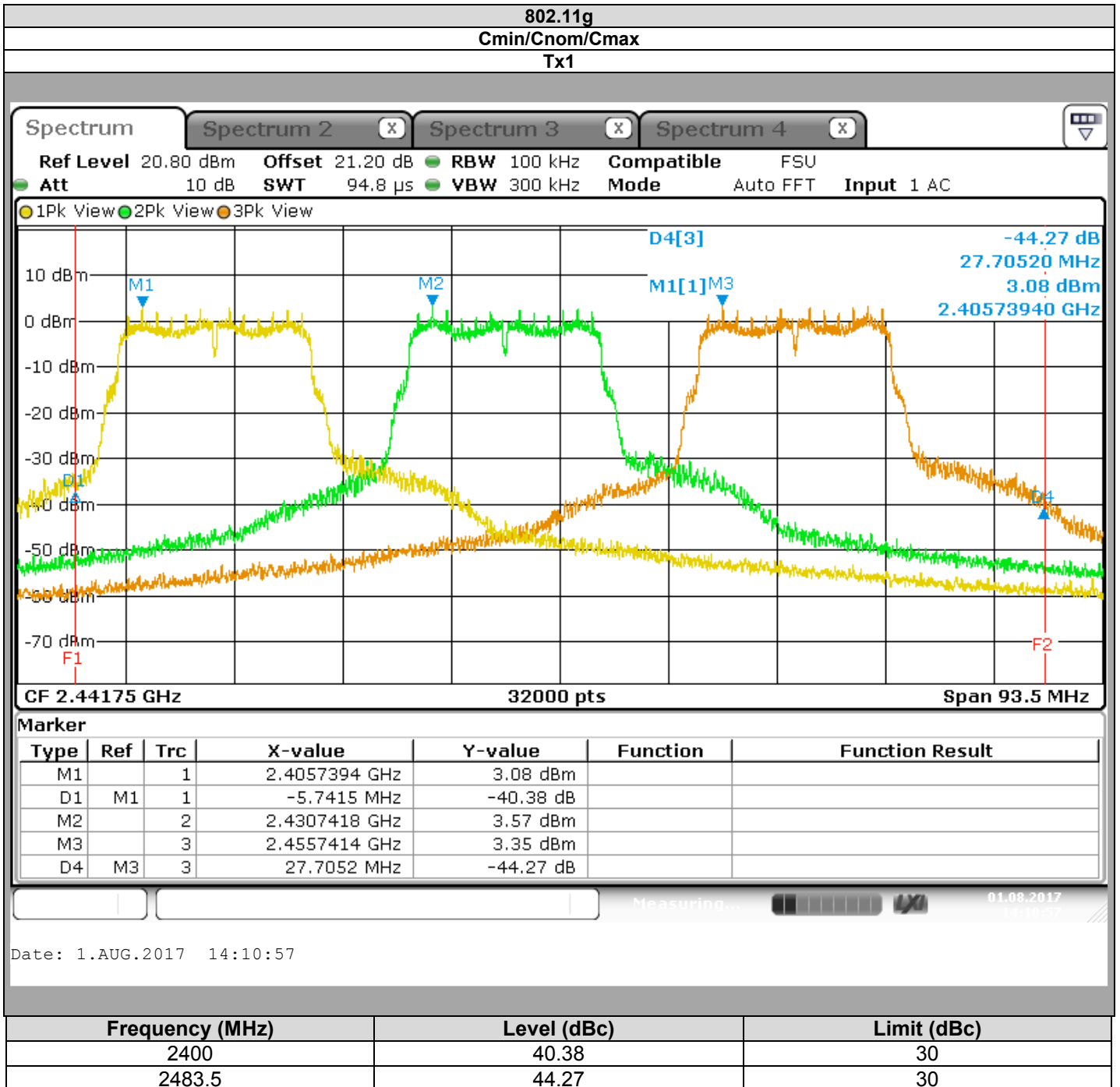
## 8.5. RESULTS





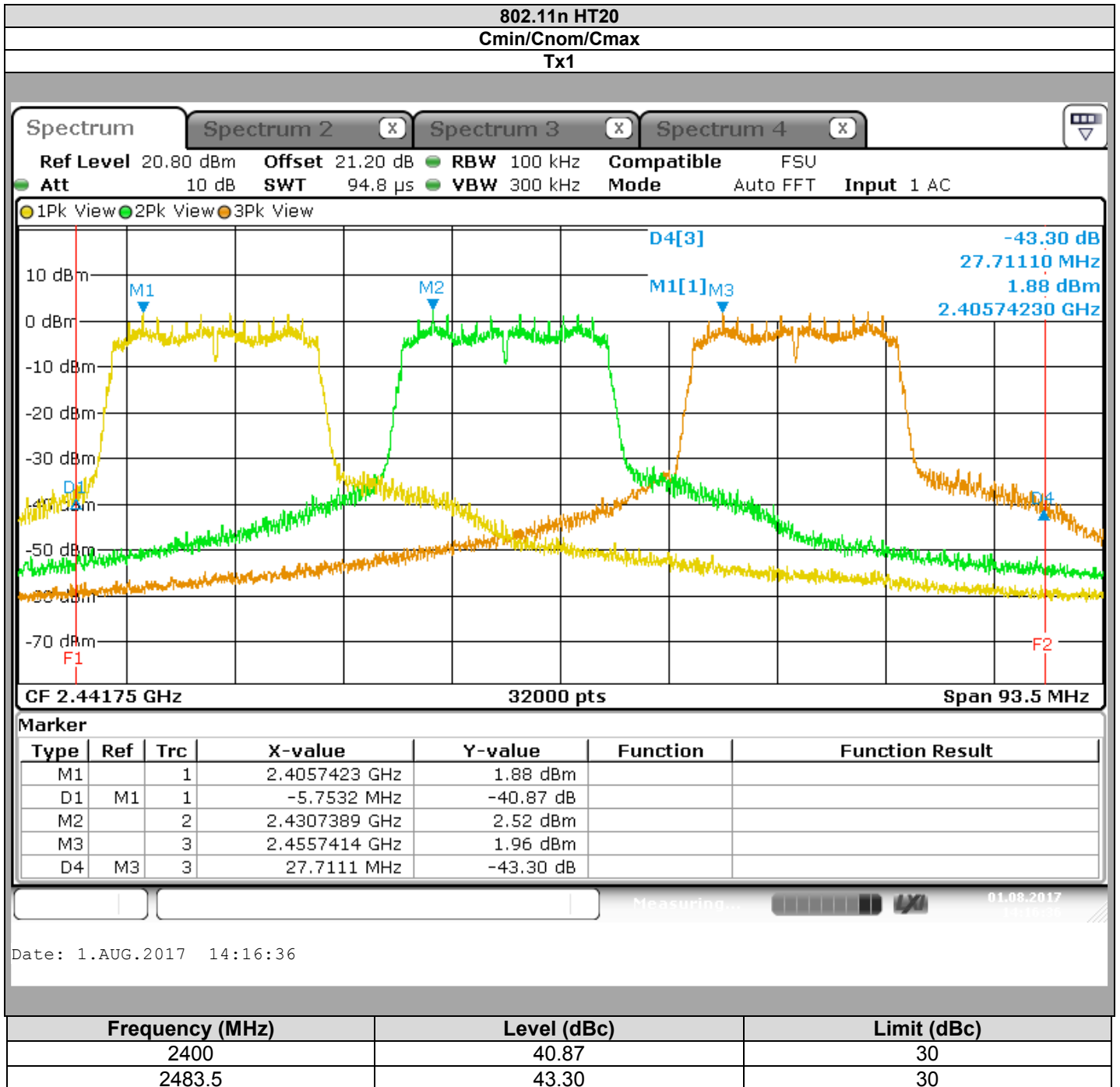


L C I E





L C I E



## 8.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **VELUX ACTIVE** with **NETATMO** NXG01S, SN: -, in configuration and description presented in this test report, show levels compliant to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

## 9. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

### 9.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
Date of test : August 2, 2017  
Ambient temperature : 25 °C  
Relative humidity : 45 %

### 9.2. TEST SETUP

- The Equipment Under Test is installed:

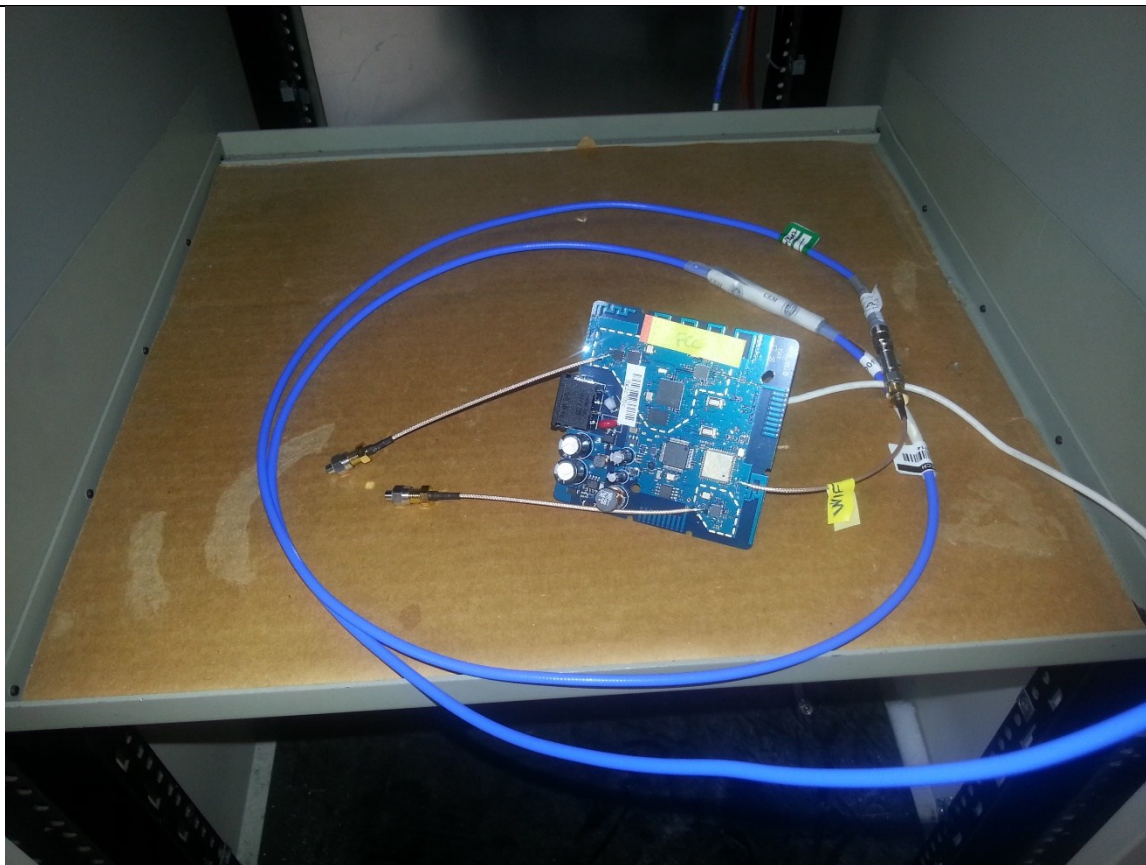
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

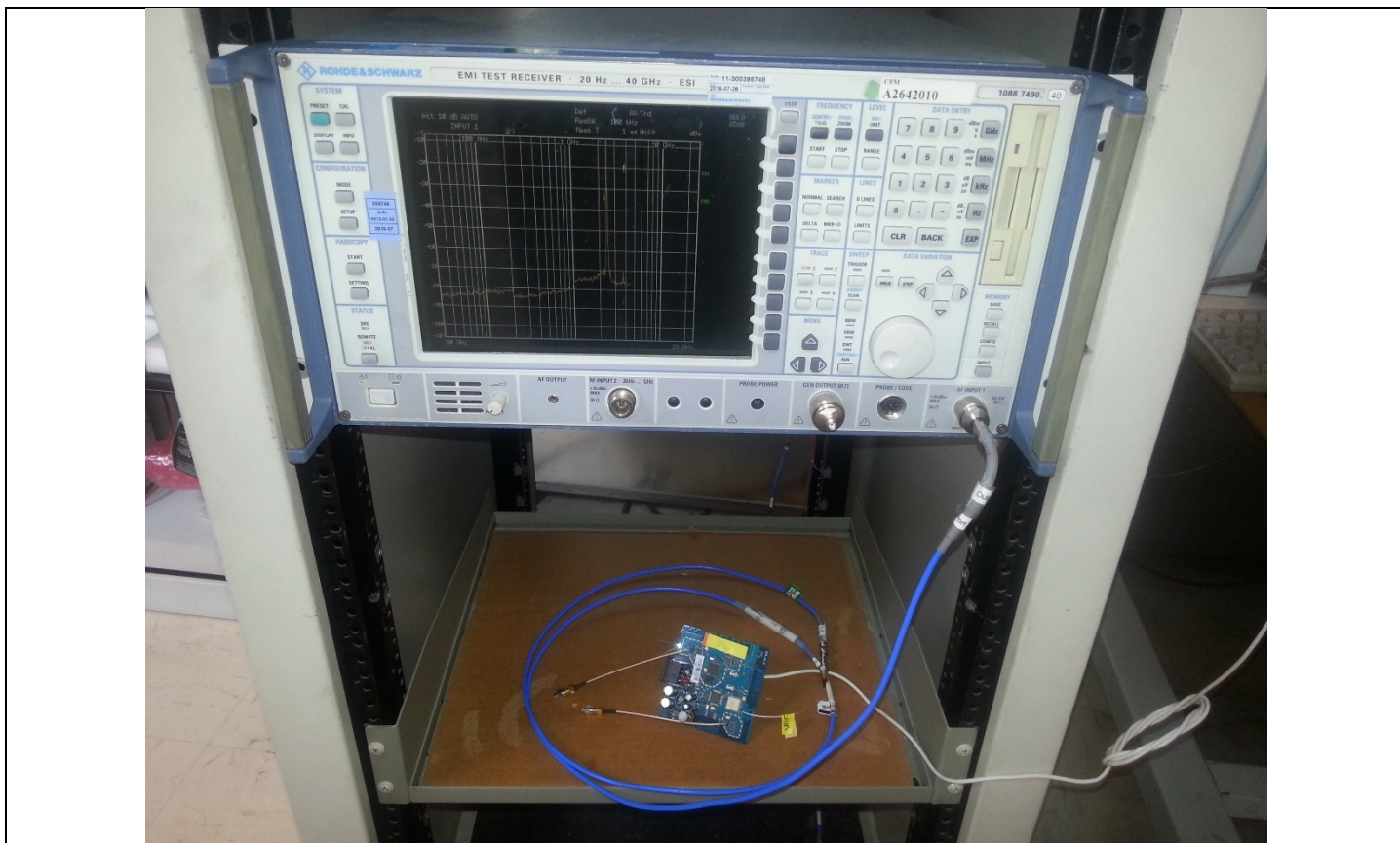
- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☒ KDB 558074 D01 DTS Meas Guidance v04 § 11



Photograph for Unwanted Emission into non-restricted frequency bands



Photograph for Unwanted Emission into non-restricted frequency bands

### 9.3. LIMIT

All Spurious Emissions must be at least 30dB (Average Conducted Power) below the Fundamental Radiator Level

### 9.4. TEST EQUIPMENT LIST

| DESCRIPTION             | MANUFACTURER    | MODEL                       | N° LCIE  | Cal_Date | Cal_Due |
|-------------------------|-----------------|-----------------------------|----------|----------|---------|
| EMI receiver            | ROHDE & SCHWARZ | ESI40 1088 740K40           | A2642010 | 2017/07  | 2018/07 |
| Cable                   | Télédyné        | 084-0555-2MTR               | A5329758 | 2016/10  | 2017/10 |
| Attenuator 3dB          | WEINSCHTEL      | WA54-3-12                   | A7122223 | 2016/10  | 2017/10 |
| High pass filter 2,4GHz | Wainwright      | WHKX12-2494-2900-18000-80ST | A7484068 | 2017/03  | 2018/03 |
| Load 50 ohms            | TELEGARTNER     |                             | A7150103 | 2016/12  | 2017/12 |
| Load 50 ohms            | TELEGARTNER     |                             | A7150104 | 2016/12  | 2017/12 |

Note: In our quality system, the test equipment calibration due is more & less 2 months

## 9.5. RESULTS

### 802.11b Cmin/Cnom/Cmax Tx1

Description Sous-bande 1

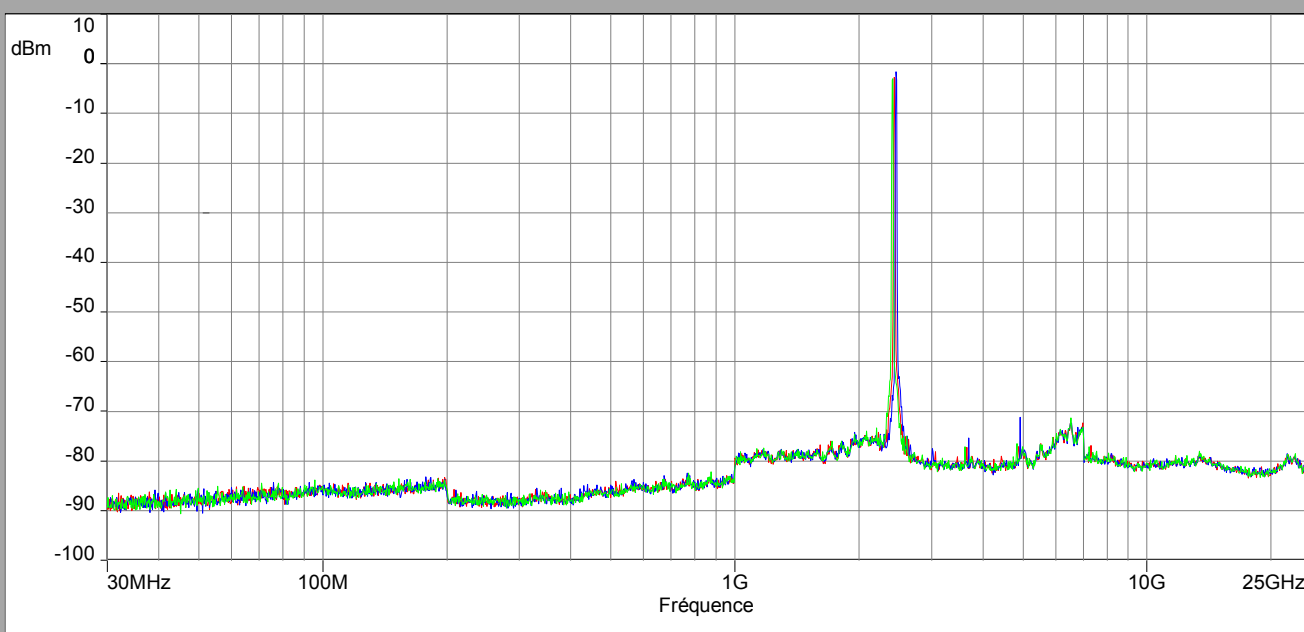
Fréquences: 30 MHz - 25 GHz (Mode: Lin, Pas: 100 kHz)

Réglages: RBW: 100 kHz, VBW: 300 kHz, Durée balayage : 1 ms/Pts, Atténuation : 42965184, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Preset : C

Mes.Peak Channel Low

Mes.Peak Channel High

Mes.Peak Channel Middle



## 802.11g

**Cmin/Cnom/Cmax**

**Tx1**

Description Sous-bande 1

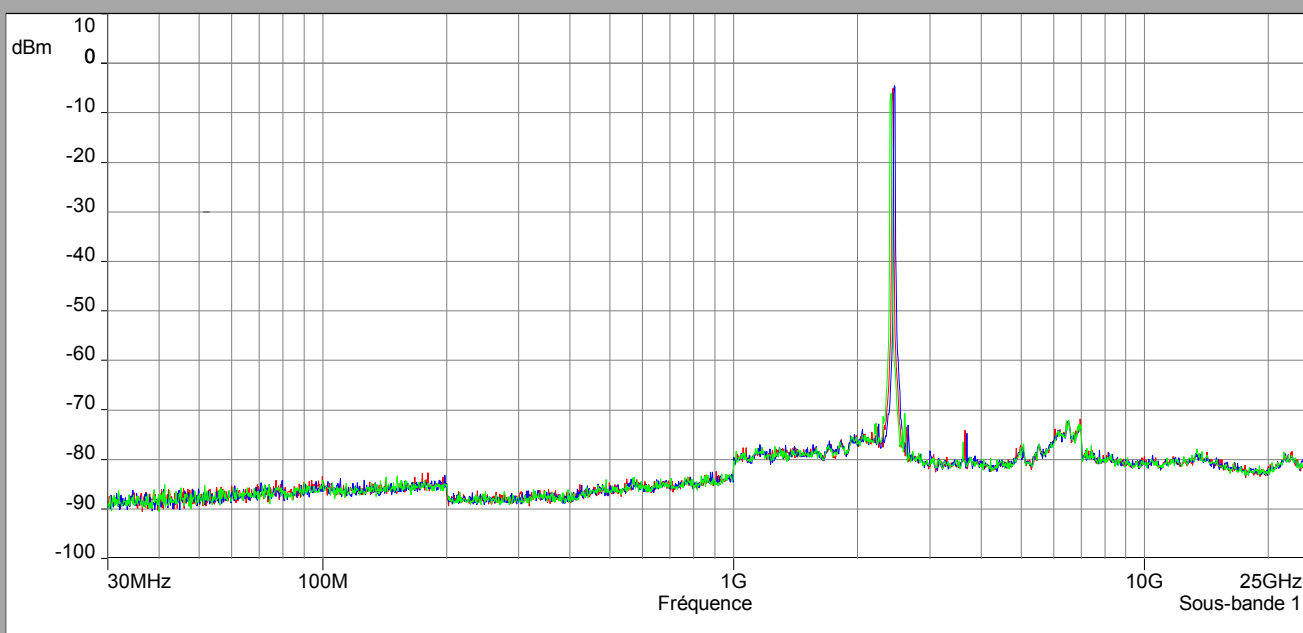
Fréquences: 30 MHz - 25 GHz (Mode: Lin, Pas: 100 kHz)

Réglages: RBW: 100 kHz, VBW: 300 kHz, Durée balayage : 1 ms/Pts, Atténuation : 45700936, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Presélection : C

Mes.Peak Channel Low

Mes.Peak Channel High

Mes.Peak Channel Middle



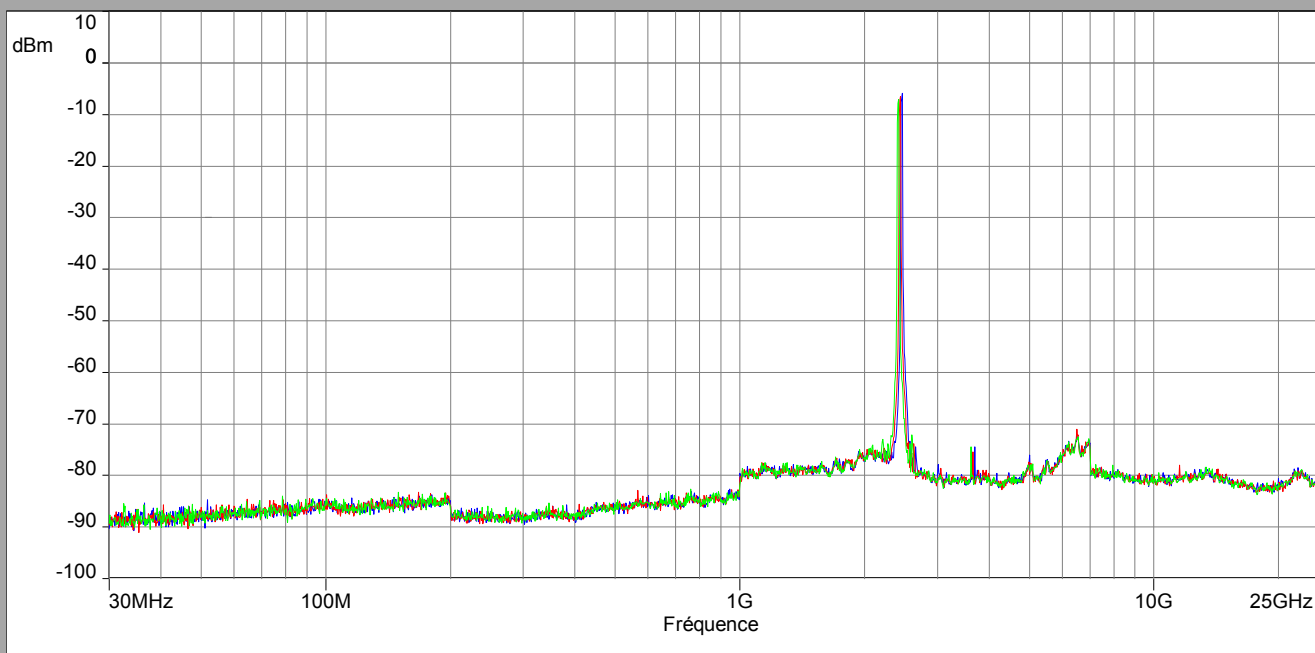
**802.11n HT20**  
**Cmin/Cnom/Cmax**  
**Tx1**

Description Sous-bande 1

Fréquences: 30 MHz - 25 GHz (Mode: Lin, Pas: 100 kHz)

Réglages: RBW: 100 kHz, VBW: 300 kHz, Durée balayage : 1 ms/Pts, Atténuation : 217824048, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Praselecteur: Off

Mes.Peak Channel Low  
 Mes.Peak Channel Middle  
 Mes.Peak Channel High





| 802.11b         |             |             |             |
|-----------------|-------------|-------------|-------------|
| Frequency (MHz) | Level (dBm) | Level (dBc) | Limit (dBc) |
| 2412            | -2.96       |             |             |
| 4829.5          | -76.44      | 73.48       | 30          |
| 2437            | -2.71       |             |             |
| 4869.2          | -77.07      | 74.11       | 30          |
| 2462            | -1.67       |             |             |
| 4924            | -71.18      | 69.51       | 30          |

| 802.11g         |             |             |             |
|-----------------|-------------|-------------|-------------|
| Frequency (MHz) | Level (dBm) | Level (dBc) | Limit (dBc) |
| 2412            | -6.02       |             |             |
| 4826            | -76.47      | 70.45       | 30          |
| 2437            | -5.03       |             |             |
| 4876            | -74.09      | 69.06       | 30          |
| 2462            | -4.58       |             |             |
| 4925            | -74.71      | 70.13       | 30          |

| 802.11n HT20    |             |             |             |
|-----------------|-------------|-------------|-------------|
| Frequency (MHz) | Level (dBm) | Level (dBc) | Limit (dBc) |
| 2412            | -7.13       |             |             |
| 4826            | -74.45      | 67.33       | 30          |
| 2437            | -6.51       |             |             |
| 4876            | -75.46      | 68.95       | 30          |
| 2462            | -5.88       |             |             |
| 4925            | -74.47      | 68.59       | 30          |

## 9.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **VELUX ACTIVE** with **NETATMO** NXG01S, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.



## 10. AC POWER LINE CONDUCTED EMISSIONS

### 10.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
Date of test : July 25, 2017  
Ambient temperature : 27 °C  
Relative humidity : 48 %

### 10.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013) method. The EUT is placed on the ground reference plane, at 80cm from the LISN. The distance between the EUT and the vertical ground plane is 40cm. Auxiliaries are powered by another LISN. The cable has been shorted to 1meter length. The EUT is powered through the LISN. Measurement is made with a receiver in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement for any strong signal. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary. The LISN (measure) is  $50\Omega / 50\mu\text{H}$ . Interconnecting cables and equipment's were moved to position that maximized emission.



Photograph for AC Power Line Conducted Emissions (Front view)



Photograph for AC Power Line Conducted Emissions (Rear view)

### 10.3. LIMIT

#### Quasi-Peak

0,15kHz to 0,5MHz: 66dB $\mu$ V to 56dB $\mu$ V\*

0,5MHz to 5MHz: 56dB $\mu$ V

5MHz to 30MHz: 60dB $\mu$ V

#### Average

0,15kHz to 0,5MHz: 56dB $\mu$ V to 46dB $\mu$ V\*

0,5MHz to 5MHz: 46dB $\mu$ V

5MHz to 30MHz: 50dB $\mu$ V

\*Decreases with the logarithm of the frequency



#### 10.4. TEST EQUIPMENT LIST

| DESCRIPTION           | MANUFACTURER    | MODEL   | N° LCIE  | Cal_Date | Cal_Due |
|-----------------------|-----------------|---------|----------|----------|---------|
| Semi anechoic chamber | SIEPEL          | -       | D3044008 | 2017/06  | 2018/06 |
| V LISN                | ROHDE & SCHWARZ | ESH3-Z5 | C2322003 | 2016/08  | 2017/08 |
| pulse limiter         | ROHDE & SCHWARZ | ESH3-Z2 | A2649004 | 2017/03  | 2018/03 |
| Cable                 | -               |         | A5329531 | 2017/02  | 2018/02 |

Note: In our quality system, the test equipment calibration due is more & less 2 months

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

☒ None      ☐ Divergence:

## 10.6. RESULTS

### 802.11b

#### Cmin

#### Phase

Description Sous-bande 1

Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)

Réglages: RBW: 9 kHz, VBW: Auto, Durée balayage: 50 ms/Pts, Atténuation: 160667760, Nombre de Balayages: 1, Preamp: Off, Mes. Peak: Off, Preselcteur: On

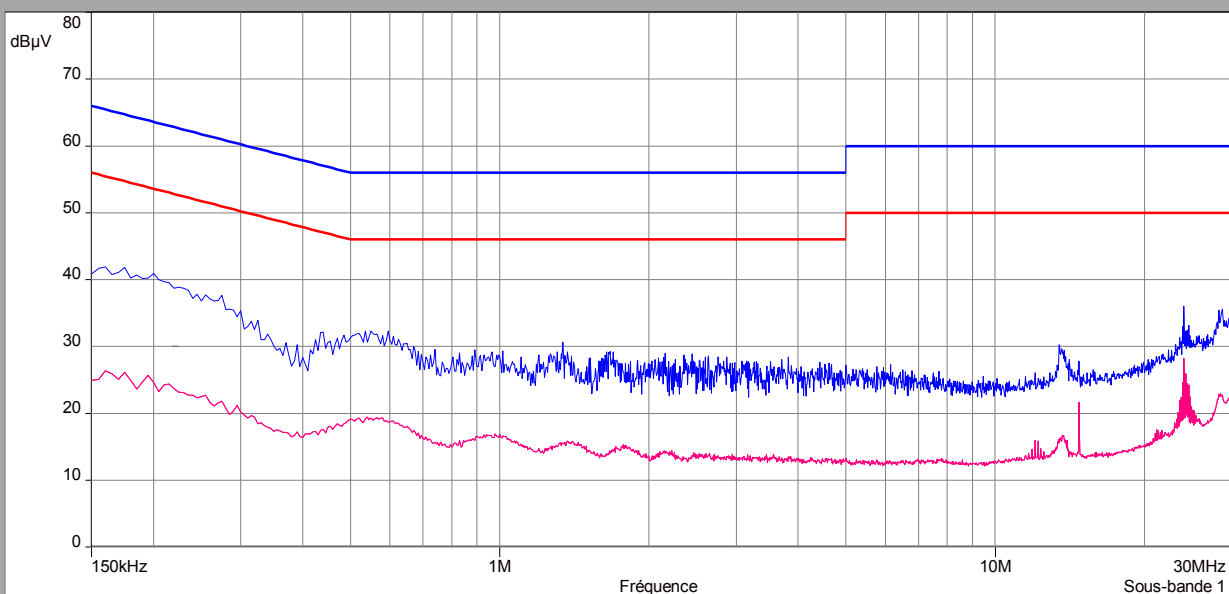
Ligne: Phase 1

FCC/FCC 15.107 - Classe: B - Moyenne/

FCC/FCC 15.107 - Classe: B - QCrête/

Mes. Peak (Phase 1)

Mes. Avg (Phase 1)



#### Line

Description Sous-bande 2

Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)

Réglages: RBW: 9 kHz, VBW: Auto, Durée balayage: 50 ms/Pts, Atténuation: 160642672, Nombre de Balayages: 1, Preamp: Off, Mes. Peak: Off, Preselcteur: On

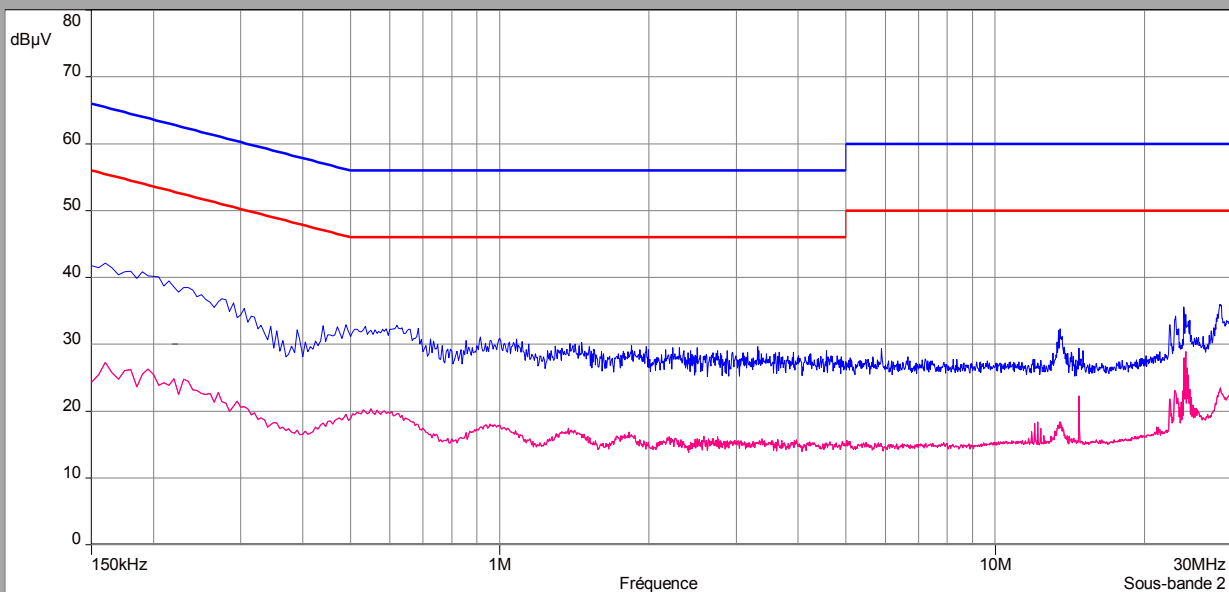
Ligne: Neutre

FCC/FCC 15.107 - Classe: B - Moyenne/

FCC/FCC 15.107 - Classe: B - QCrête/

Mes. Peak (Neutre)

Mes. Avg (Neutre)





| Phase Line      |                   |                         |                         |                      |                      |                      |                         |
|-----------------|-------------------|-------------------------|-------------------------|----------------------|----------------------|----------------------|-------------------------|
| Frequency (MHz) | Peak Level (dBμV) | Quasi-Peak Level (dBμV) | Quasi-Peak Limit (dBμV) | Peak Margin (dBμV/m) | Average Level (dBμV) | Average Limit (dBμV) | Average Margin (dBμV/m) |
| 14.74           | 32.31             | -                       | 60                      | 27.69                | 22.25                | 50                   | 27.75                   |
| 24.00           | 35.59             | -                       | 60                      | 24.41                | 28.89                | 50                   | 21.11                   |
| 28.46           | 35.94             | -                       | 60                      | 24.06                | 23.48                | 50                   | 26.52                   |

| Neutral Line    |                   |                         |                         |                      |                      |                      |                         |
|-----------------|-------------------|-------------------------|-------------------------|----------------------|----------------------|----------------------|-------------------------|
| Frequency (MHz) | Peak Level (dBμV) | Quasi-Peak Level (dBμV) | Quasi-Peak Limit (dBμV) | Peak Margin (dBμV/m) | Average Level (dBμV) | Average Limit (dBμV) | Average Margin (dBμV/m) |
| 14.74           | 30.24             | -                       | 60                      | 29.76                | 21.61                | 50                   | 28.39                   |
| 24.00           | 36.06             | -                       | 60                      | 23.94                | 28.18                | 50                   | 21.82                   |
| 28.46           | 35.56             | -                       | 60                      | 24.44                | 22.91                | 50                   | 27.09                   |

## 10.7. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **VELUX ACTIVE** with **NETATMO** NXG01S, SN: -, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.247 & RSS 247 ISSUE 2 limits.



## 11. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

### 11.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
Date of test : July 24, 2017 to July 25, 2017  
Ambient temperature : 25 °C & 26 °C  
Relative humidity : 46 % & 48 %

### 11.2. TEST SETUP

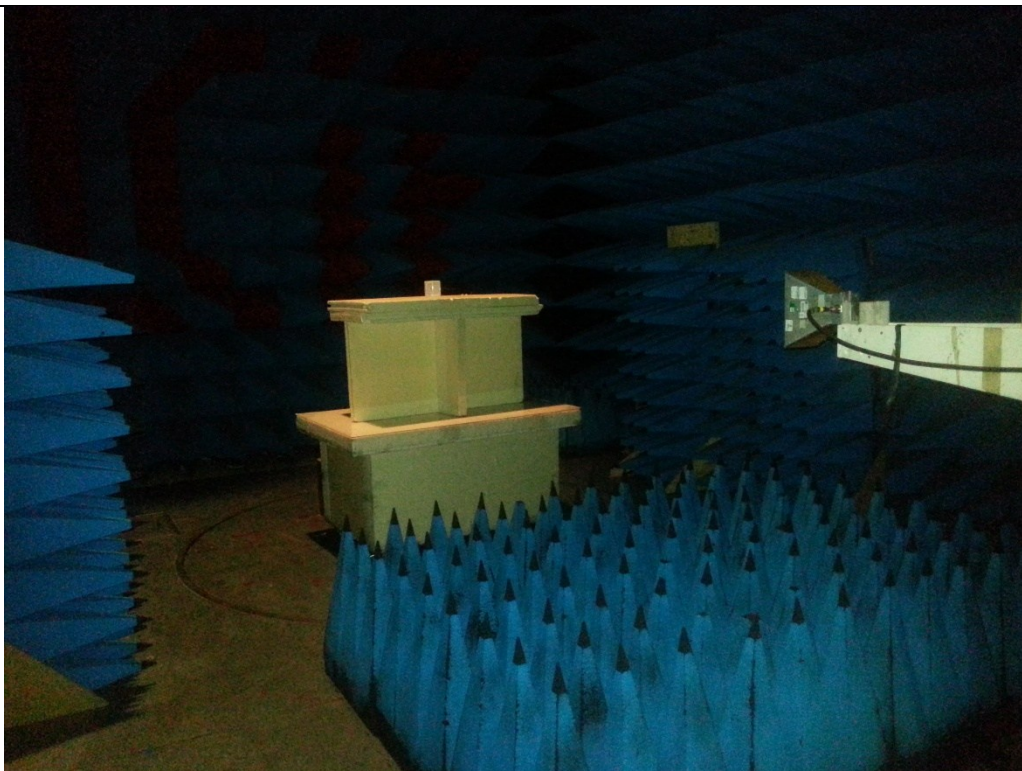
The product has been tested according to ANSI C63.10 (2013). The EUT is placed **ina semi-anechoic chamber**. Distance between measuring antenna and the EUT is **3m**. Test is performed in horizontal (H) and vertical (V) polarization with **bilog** antenna below 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height search was performed from 1 to 4m. The EUT is place at 1.5m high above 1GHz and at 0.8m high under 1GHz.



Photograph for Unwanted Emissions



Photograph for Unwanted Emissions



Photograph for Unwanted Emissions

### 11.3. LIMIT

#### Limit at 3m:

30MHz to 88MHz: 40dB $\mu$ V/m QPeak  
 88MHz to 216MHz: 43,5dB $\mu$ V/m QPeak  
 216MHz to 960MHz: 46dB $\mu$ V/m QPeak  
 960MHz to 1000MHz: 54dB $\mu$ V/m QPeak  
 Above 1000MHz: 74dB $\mu$ V/m Peak  
 54dB $\mu$ V/m Average

#### Limit at 10m:

30MHz to 88MHz: 29.5dB $\mu$ V/m QPeak  
 88MHz to 216MHz: 33dB $\mu$ V/m QPeak  
 216MHz to 960MHz: 35.5dB $\mu$ V/m QPeak  
 960MHz to 1000MHz: 43.5dB $\mu$ V/m QPeak  
 Above 1000MHz: 63.5dB $\mu$ V/m Peak  
 43.5dB $\mu$ V/m Average

### 11.4. TEST EQUIPMENT LIST

| DESCRIPTION             | MANUFACTURER          | MODEL                       | N° LCIE  | Cal_Date | Cal_Due |
|-------------------------|-----------------------|-----------------------------|----------|----------|---------|
| Semi anechoic chamber   | SIEPEL                | -                           | D3044008 | 2017/06  | 2018/06 |
| EMI receiver            | ROHDE & SCHWARZ       | ESU26                       | A2642018 | 2016/10  | 2017/10 |
| Bilog antenna           | SCHWARZBECK           | VULB 9160                   | C2040150 | 2017/03  | 2018/03 |
| High pass filter 2,4GHz | Wainwright            | WHKX12-2494-2900-18000-80ST | A7484068 | 2017/03  | 2018/03 |
| RF cable                | RADIALL; CDI          | 30990-7M                    | A5329711 | 2017/03  | 2018/03 |
| Cable                   | CABLES & CONNECTIQUES | 3.5MD/CSU528AA/3.5MC/4000   | A5329431 | 2017/03  | 2018/03 |
| Horn antenna            | A-INFOMW              | LB-10180-NF                 | C2042018 | 2017/03  | 2018/03 |
| Cable                   | CABLES & CONNECTIQUES | 3.5MD/CSU528AA/3.5MD/1500   | A5329364 | 2016/11  | 2017/11 |
| Preamplifier            | BONN Elektronik       | BLNA 3018-8F305             | A7080053 | 2017/04  | 2018/04 |

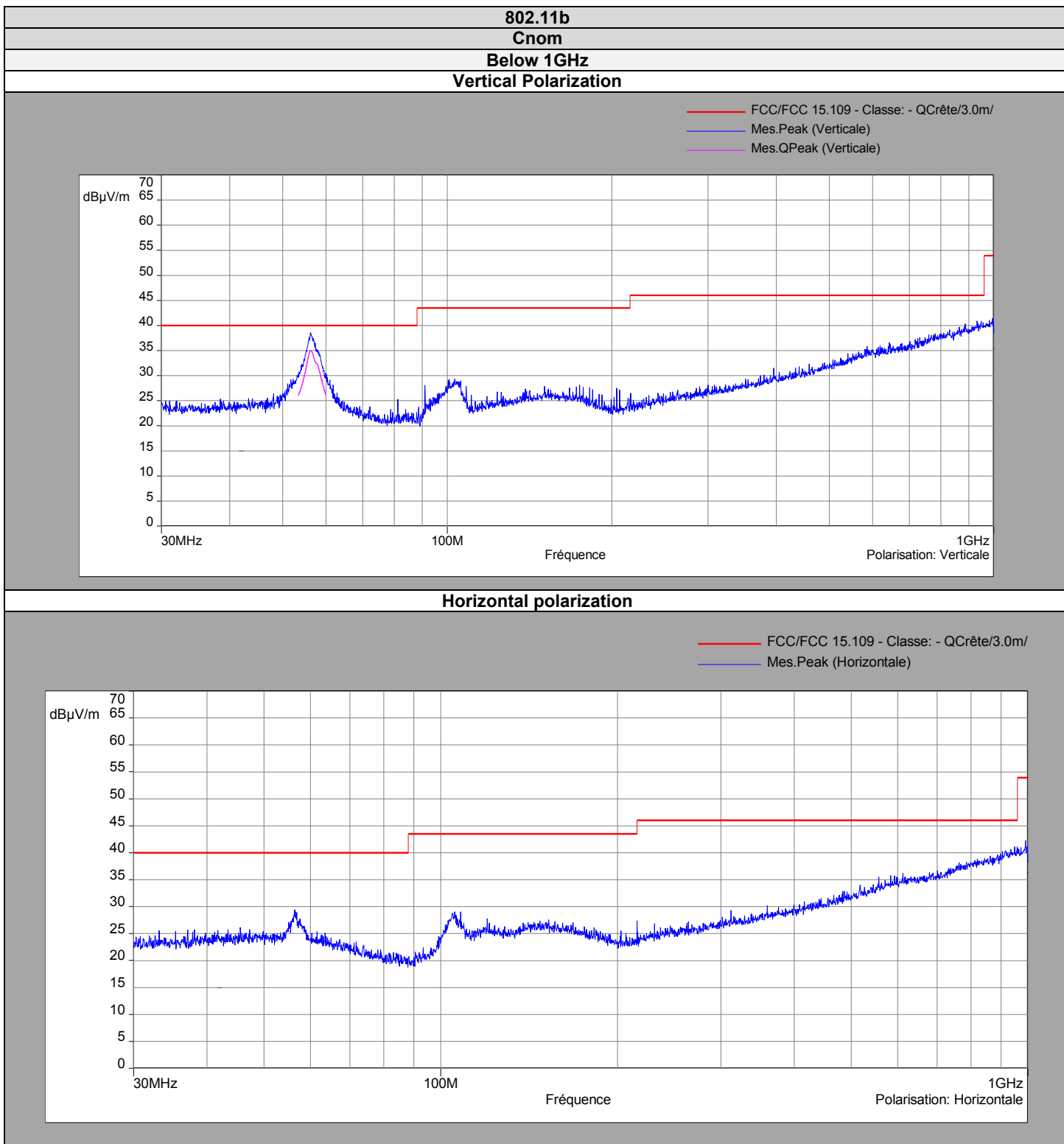
Note: In our quality system, the test equipment calibration due is more & less 2 months

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

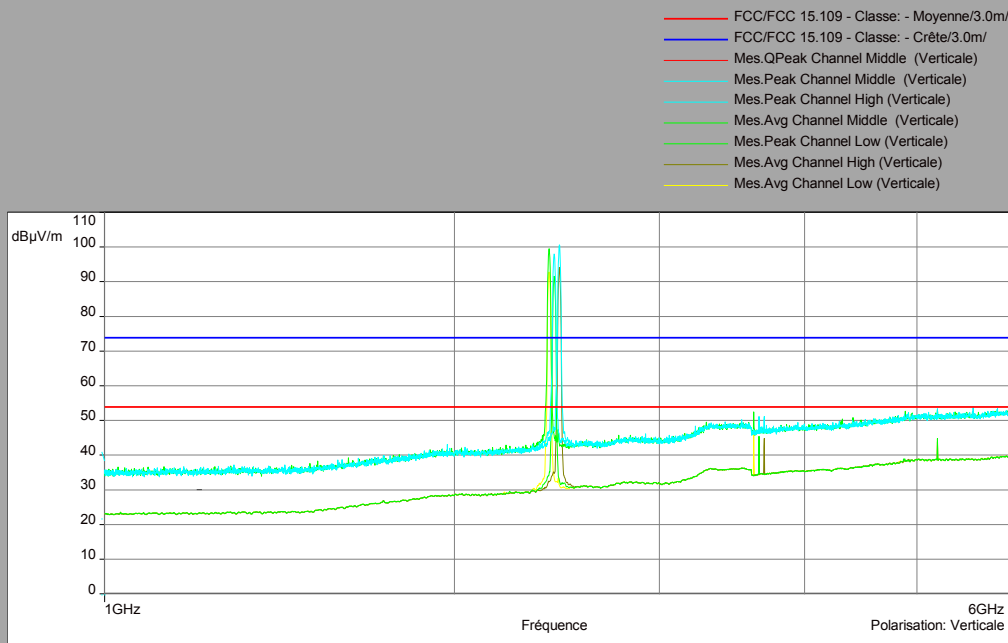
☒ None
 ☐ Divergence:



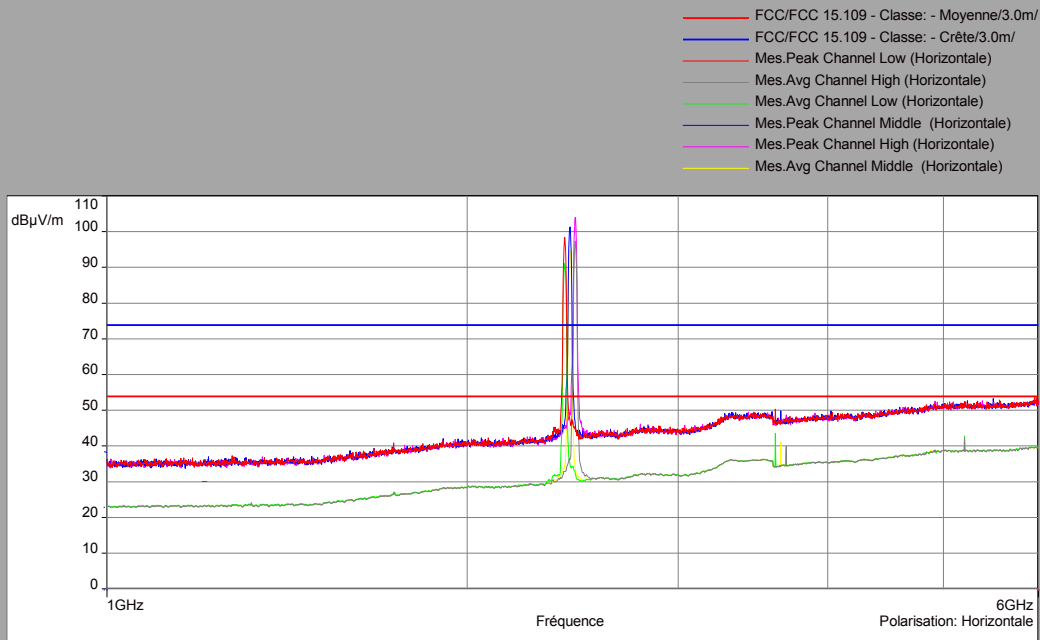
## 11.6. RESULTS



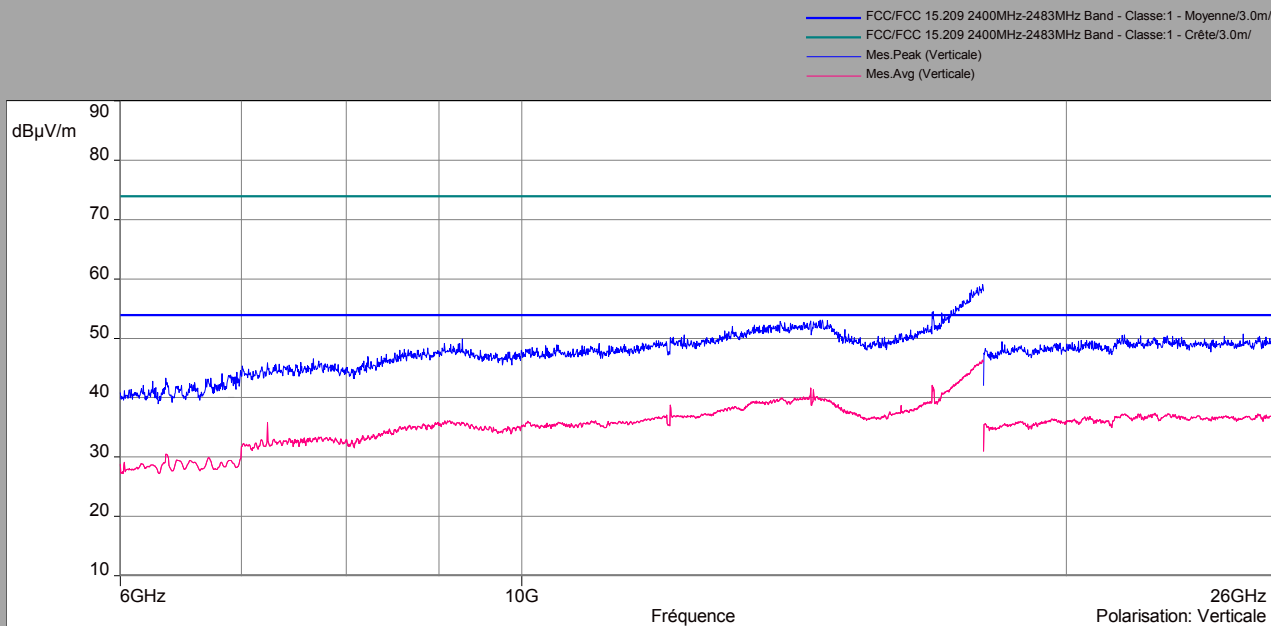
**802.11b**  
**Cmin/Cnom/Cmax**  
**Above 1GHz**  
**Vertical Polarization**



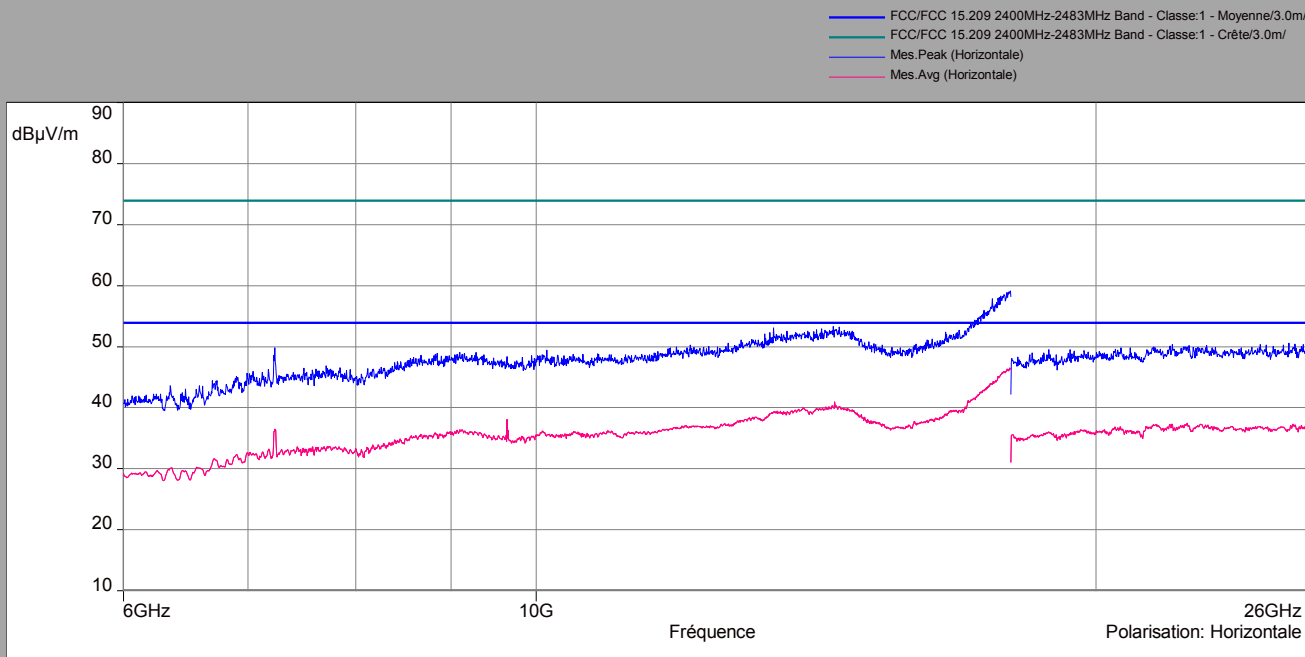
**Horizontal polarization**



**802.11b**  
**Cmin/Cnom/Cmax**  
**Above 1GHz**  
**Vertical Polarization**

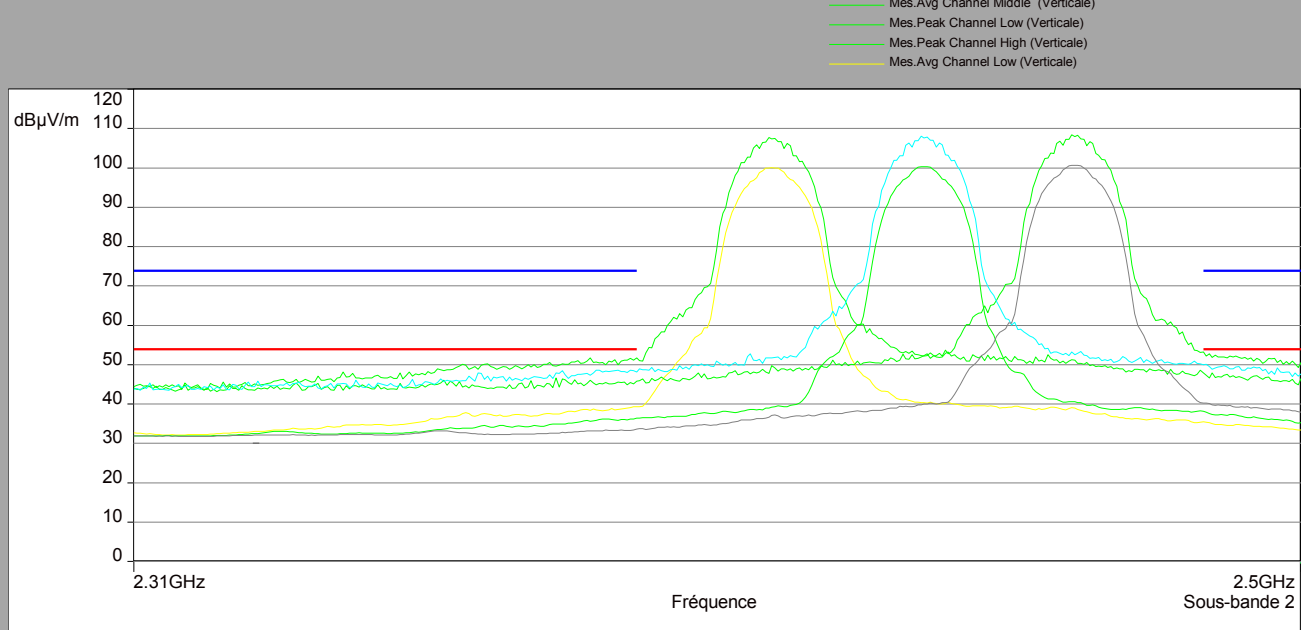


**Horizontal polarization**



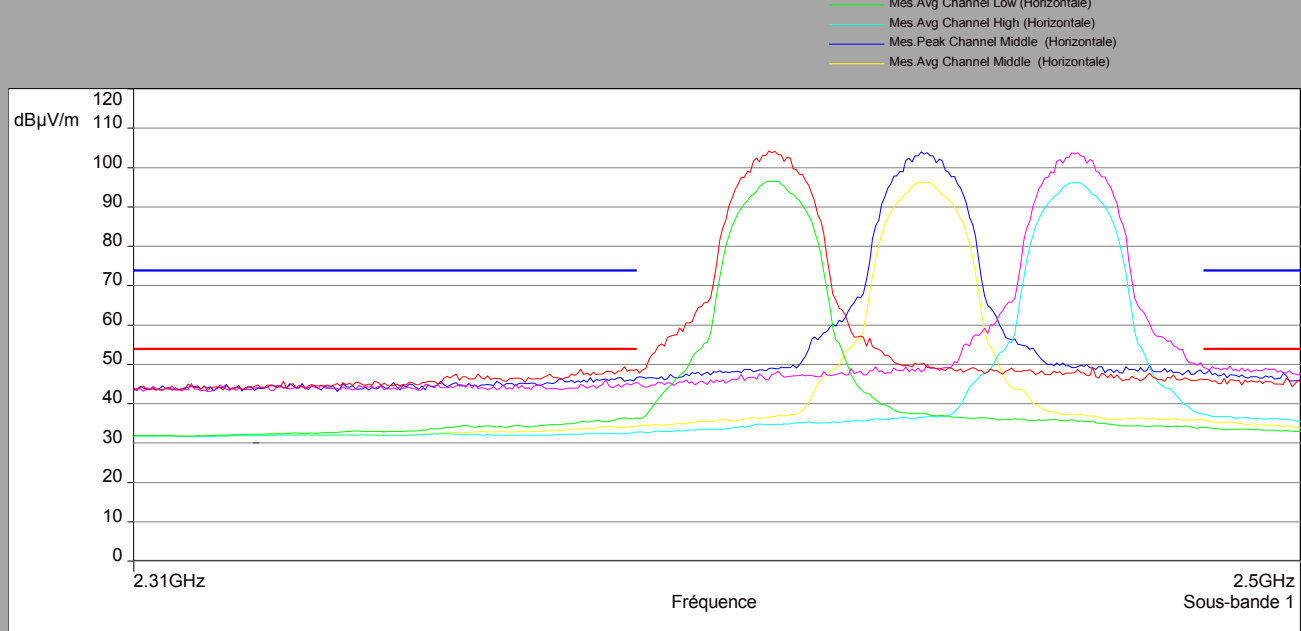
**802.11b**  
**Cmin/Cnom/Cmax**  
**Zoom 2310MHz-2500MHz**  
**Vertical Polarization**

Description Sous-bande 2  
 Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 500 kHz )  
 Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 182191856, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Préselecteur : Off  
 Polarisation: Verticale  
 Distance: 3 m

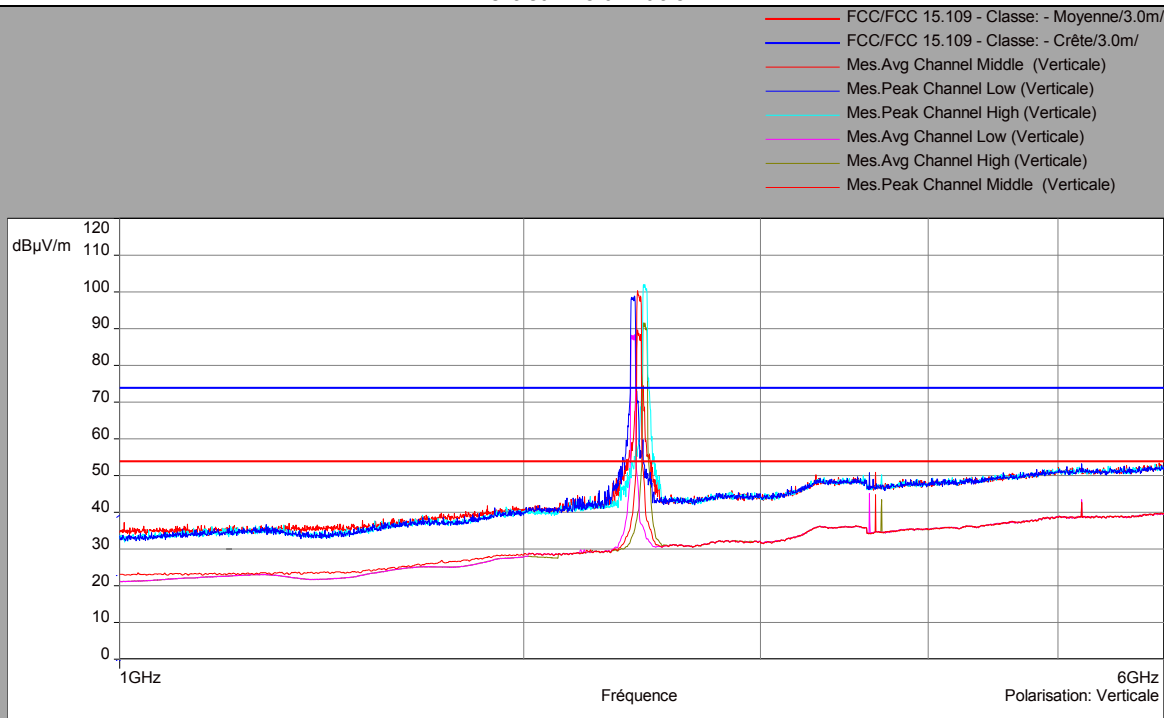


**Horizontal polarization**

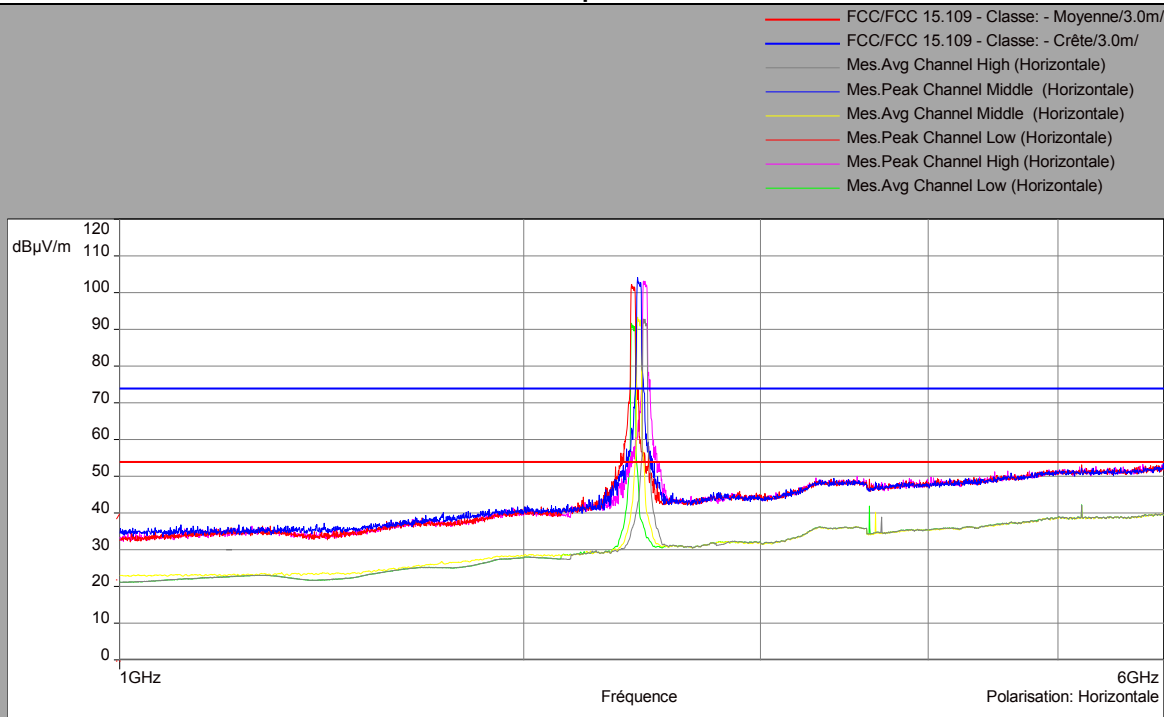
Description Sous-bande 1  
 Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 500 kHz )  
 Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 182191920, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Préselecteur : Off  
 Polarisation: Horizontale  
 Distance: 3 m

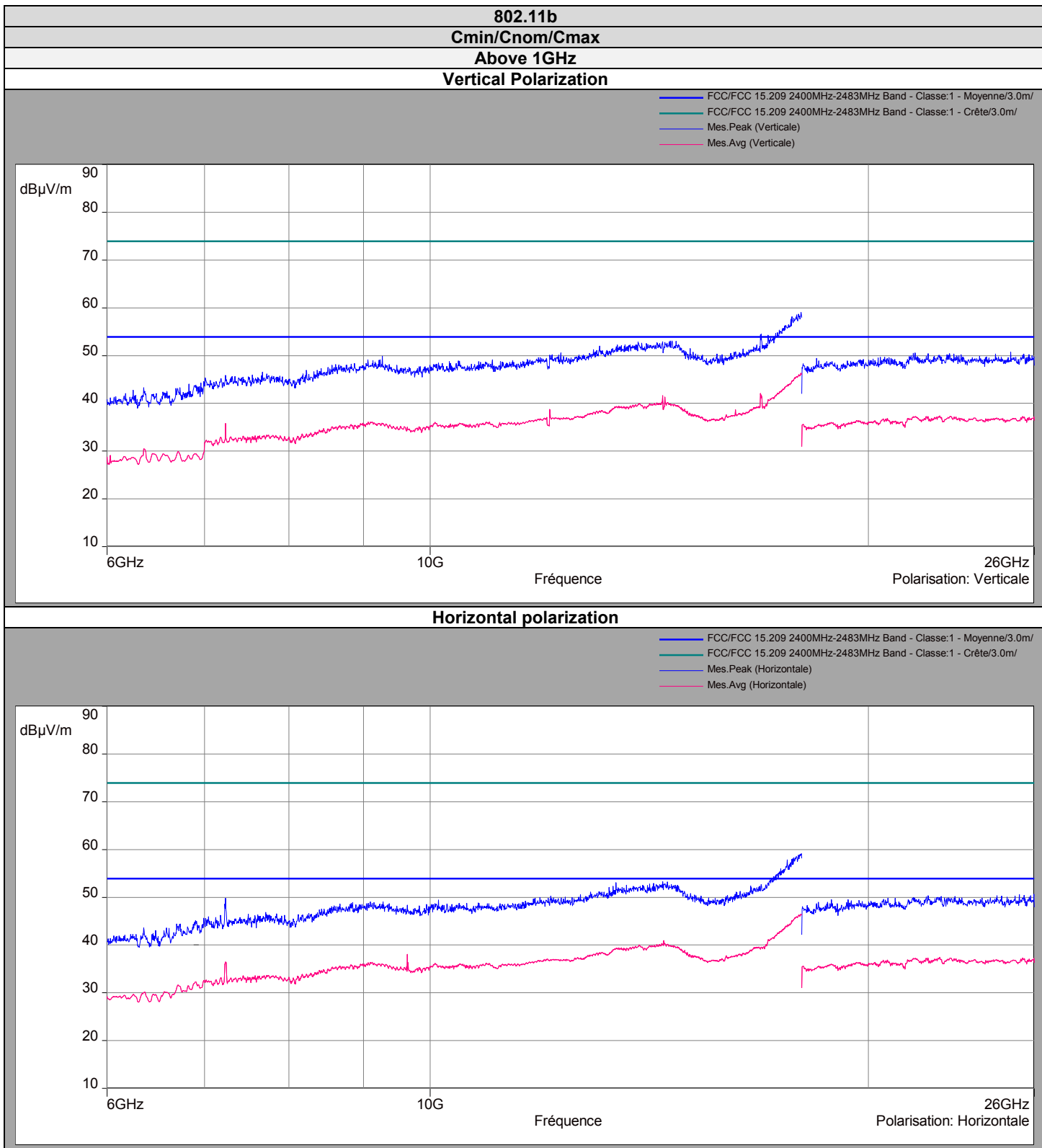


|                              |
|------------------------------|
| <b>802.11g</b>               |
| <b>Cmin/Cnom/Cmax</b>        |
| <b>Above 1GHz</b>            |
| <b>Vertical Polarization</b> |



|                                |
|--------------------------------|
| <b>Horizontal polarization</b> |
|--------------------------------|





**802.11g**  
**Cmin/Cnom/Cmax**  
**Zoom 2310MHz-2500MHz**  
**Vertical Polarization**

Description Sous-bande 2

Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 500 kHz)

Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage: 50 ms/Pts, Atténuation: 43941424, Nombre de Balayages: 1, Preamp: On: 20 dB, LN Preamp: Off, Presélection: Off

Polarisation: Verticale

Distance: 3 m

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/

Mes.Avg Channel High (Verticale)

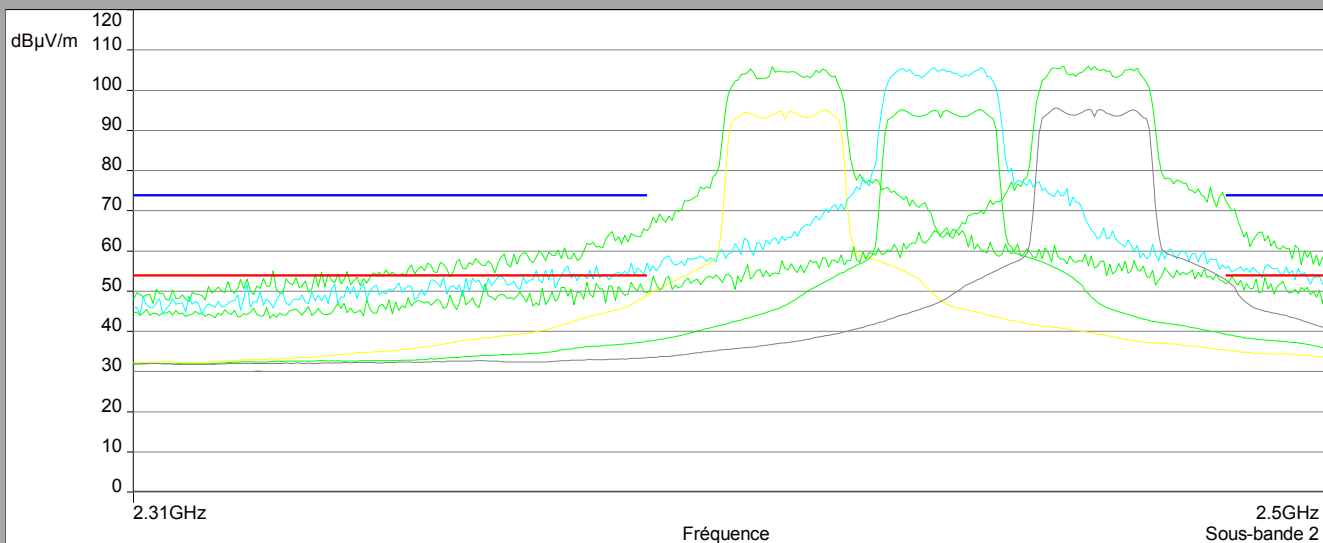
Mes.Peak Channel Middle (Verticale)

Mes.Avg Channel Middle (Verticale)

Mes.Peak Channel Low (Verticale)

Mes.Peak Channel High (Verticale)

Mes.Avg Channel Low (Verticale)



**Horizontal polarization**

Description Sous-bande 1

Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 500 kHz)

Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage: 50 ms/Pts, Atténuation: 43941456, Nombre de Balayages: 1, Preamp: On: 20 dB, LN Preamp: Off, Presélection: Off

Polarisation: Horizontale

Distance: 3 m

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/

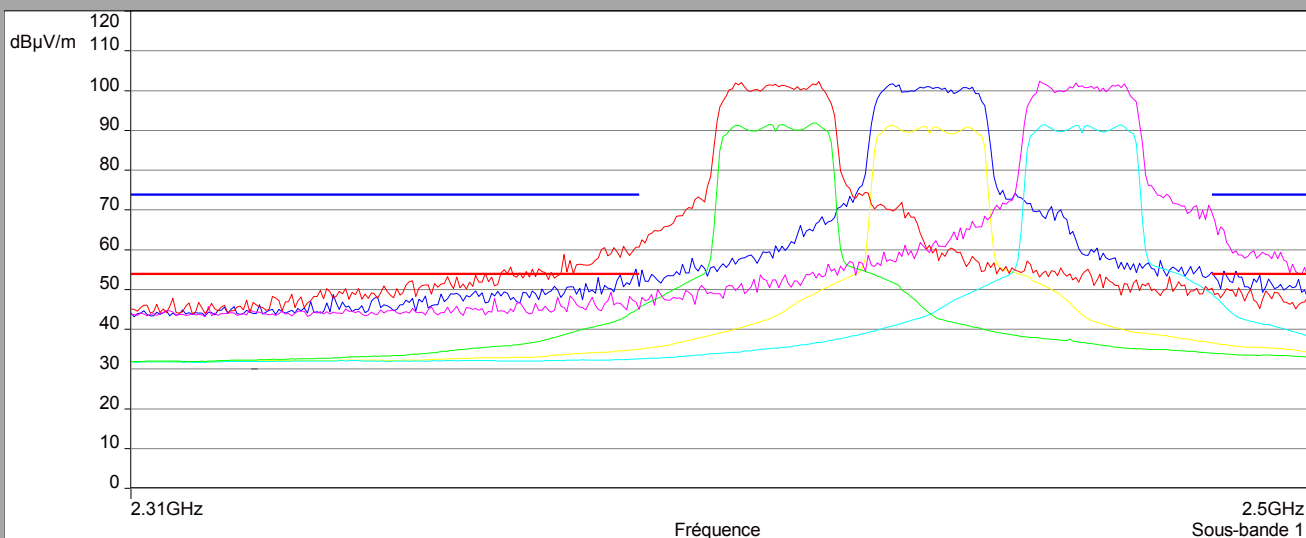
Mes.Peak Channel High (Horizontale)

Mes.Avg Channel Low (Horizontale)

Mes.Avg Channel High (Horizontale)

Mes.Peak Channel Middle (Horizontale)

Mes.Avg Channel Middle (Horizontale)

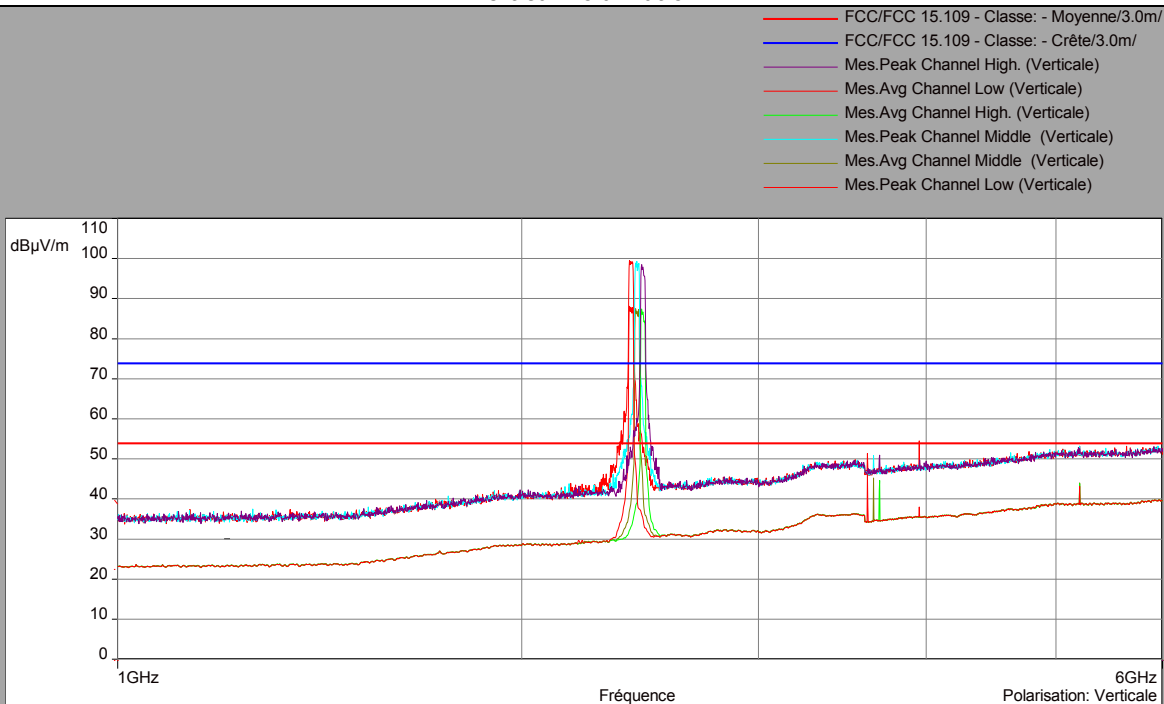


**802.11n HT20**

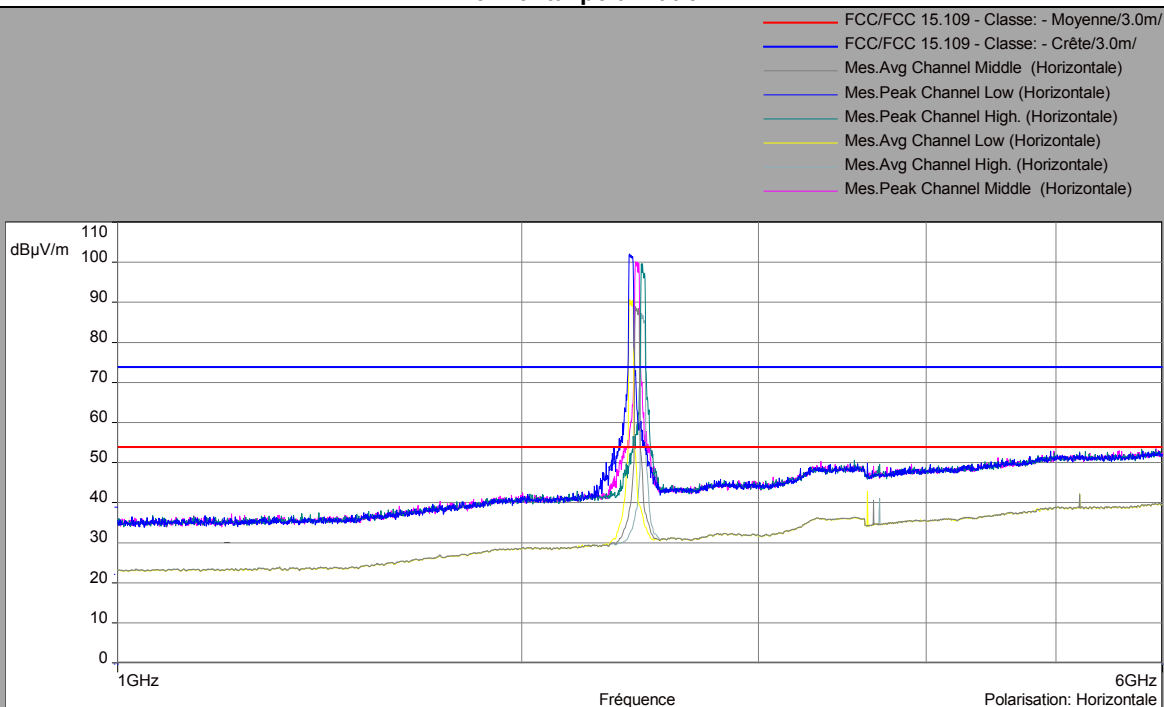
**Cmin/Cnom/Cmax**

**Above 1GHz**

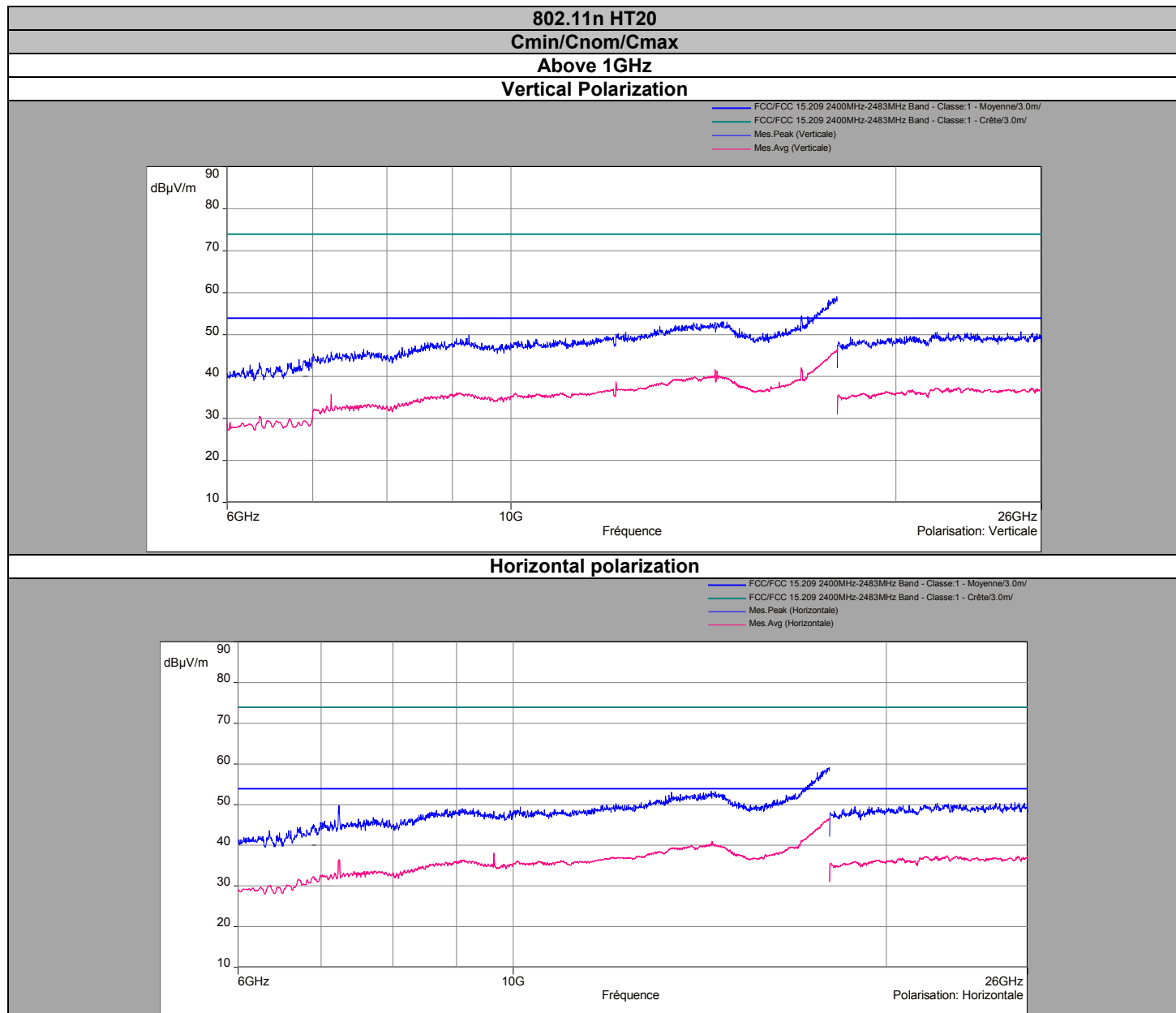
**Vertical Polarization**



**Horizontal polarization**



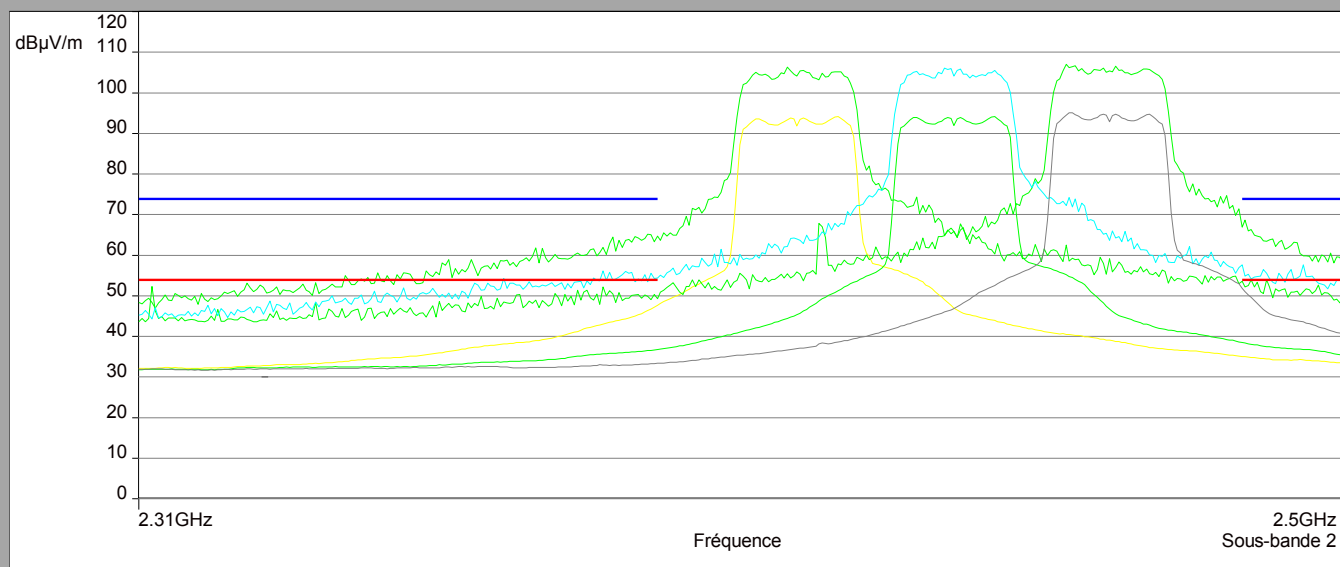




**802.11n HT20**  
**Cmin/Cnom/Cmax**  
**Zoom 2310MHz-2500MHz**  
**Vertical Polarization**

Description Sous-bande 2  
 Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 500 kHz)  
 Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 178114400, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Preselector : Off  
 Polarisation: Verticale  
 Distance: 3 m

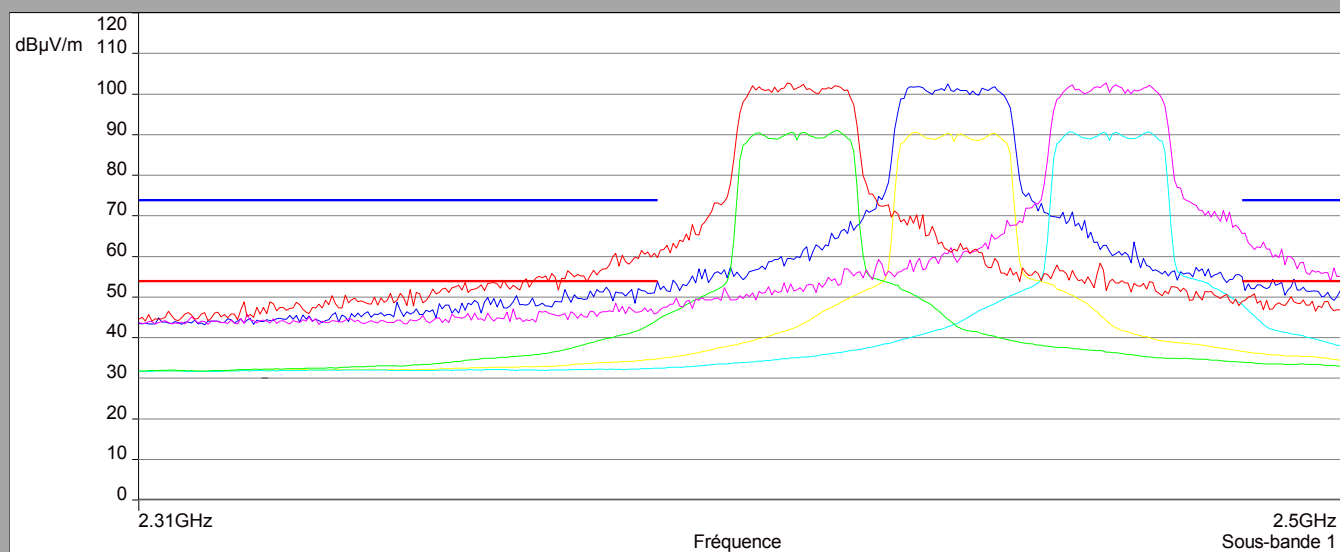
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/  
 FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/  
 Mes.Avg Channel High (Verticale)  
 Mes.Peak Channel Middle (Verticale)  
 Mes.Avg Channel Middle (Verticale)  
 Mes.Peak Channel Low (Verticale)  
 Mes.Peak Channel High (Verticale)  
 Mes.Avg Channel Low (Verticale)



**Horizontal polarization**

Description Sous-bande 1  
 Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 500 kHz)  
 Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 178114848, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Preselector : Off  
 Polarisation: Horizontale  
 Distance: 3 m

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/  
 FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/  
 Mes.Peak Channel Low (Horizontale)  
 Mes.Peak Channel High (Horizontale)  
 Mes.Avg Channel Low (Horizontale)  
 Mes.Avg Channel High (Horizontale)  
 Mes.Peak Channel Middle (Horizontale)  
 Mes.Avg Channel Middle (Horizontale)



| 802.11b      |                 |                     |                      |                |                 |
|--------------|-----------------|---------------------|----------------------|----------------|-----------------|
| Cnom         |                 |                     |                      |                |                 |
| Below 1GHz   |                 |                     |                      |                |                 |
| Polarization | Frequency (MHz) | Peak Level (dBμV/m) | QPeak Level (dBμV/m) | Limit (dBμV/m) | Margin (dBμV/m) |
| Horizontal   | 56.4            | 29.41               | -                    | 40             | 10.59           |
| Vertical     | 56.2            | 38.55               | 35.02                | 40             | 4.98            |
| Horizontal   | 108             | 29.07               | -                    | 43.5           | 14.43           |

| 802.11b        |                 |                            |                        |                        |                         |                     |                     |                      |
|----------------|-----------------|----------------------------|------------------------|------------------------|-------------------------|---------------------|---------------------|----------------------|
| Cmin/Cnom/Cmax |                 |                            |                        |                        |                         |                     |                     |                      |
| Above 1GHz     |                 |                            |                        |                        |                         |                     |                     |                      |
| Polarization   | Frequency (MHz) | Duty cycle correction (dB) | Average Level (dBμV/m) | Average Limit (dBμV/m) | Average Margin (dBμV/m) | Peak Level (dBμV/m) | Peak Limit (dBμV/m) | Peak Margin (dBμV/m) |
| Horizontal     | 1972            | 0,245                      | 28,99                  | 54                     | 25,00                   | 43.08               | 74                  | 30,92                |
| Vertical       | 2390            | 0,245                      | 39,60                  | 54                     | 14,39                   | 51.71               | 74                  | 22,29                |
| Vertical       | 2483.5          | 0,245                      | 40,50                  | 54                     | 13,49                   | 53.23               | 74                  | 20,77                |
| Horizontal     | 3618            | 0,245                      | 47,20                  | 54                     | 6,79                    | 52.42               | 74                  | 21,58                |
| Vertical       | 3655            | 0,245                      | 45,63                  | 54                     | 8,36                    | 51.11               | 74                  | 22,89                |
| Vertical       | 3695            | 0,245                      | 45,07                  | 54                     | 8,92                    | 51.18               | 74                  | 22,82                |
| Vertical       | 5206            | 0,245                      | 45,06                  | 54                     | 8,93                    | 53.40               | 74                  | 20,6                 |

| 802.11g        |                 |                            |                        |                        |                         |                     |                     |                      |
|----------------|-----------------|----------------------------|------------------------|------------------------|-------------------------|---------------------|---------------------|----------------------|
| Cmin/Cnom/Cmax |                 |                            |                        |                        |                         |                     |                     |                      |
| Above 1GHz     |                 |                            |                        |                        |                         |                     |                     |                      |
| Polarization   | Frequency (MHz) | Duty cycle correction (dB) | Average Level (dBμV/m) | Average Limit (dBμV/m) | Average Margin (dBμV/m) | Peak Level (dBμV/m) | Peak Limit (dBμV/m) | Peak Margin (dBμV/m) |
| Vertical       | 2153.5          | 0,437                      | 30,27                  | 54                     | 23,73                   | 43.86               | 74                  | 30,14                |
| Vertical       | 2275.5          | 0,437                      | 30,14                  | 54                     | 23,86                   | 45.89               | 74                  | 28,11                |
| Horizontal     | 2313            | 0,437                      | 30,95                  | 54                     | 23,05                   | 47.24               | 74                  | 26,76                |
| Vertical       | 2390            | 0,437                      | 40,49                  | 54                     | 13,51                   | 68.31               | 74                  | 5,69                 |
| Vertical       | 2483.5          | 0,437                      | 52,65                  | 54                     | 1,35                    | 72.48               | 74                  | 1,52                 |
| Vertical       | 3618            | 0,437                      | 45,60                  | 54                     | 8,40                    | 50.84               | 74                  | 23,16                |
| Vertical       | 3655            | 0,437                      | 45,17                  | 54                     | 8,83                    | 50.91               | 74                  | 23,09                |
| Horizontal     | 3693            | 0,437                      | 43,92                  | 54                     | 10,08                   | 50.28               | 74                  | 23,72                |
| Vertical       | 5206            | 0,437                      | 44,25                  | 54                     | 9,75                    | 53.24               | 74                  | 20,76                |

| 802.11n HT20   |                 |                            |                        |                        |                         |                     |                     |                      |
|----------------|-----------------|----------------------------|------------------------|------------------------|-------------------------|---------------------|---------------------|----------------------|
| Cmin/Cnom/Cmax |                 |                            |                        |                        |                         |                     |                     |                      |
| Above 1GHz     |                 |                            |                        |                        |                         |                     |                     |                      |
| Polarization   | Frequency (MHz) | Duty cycle correction (dB) | Average Level (dBμV/m) | Average Limit (dBμV/m) | Average Margin (dBμV/m) | Peak Level (dBμV/m) | Peak Limit (dBμV/m) | Peak Margin (dBμV/m) |
| Vertical       | 2174            | 0,318                      | 30,10                  | 54                     | 23,90                   | 43.90               | 74                  | 30,1                 |
| Vertical       | 2300            | 0,318                      | 29,92                  | 54                     | 24,08                   | 46.16               | 74                  | 27,84                |
| Vertical       | 2390            | 0,318                      | 48,07                  | 54                     | 5,93                    | 64.69               | 74                  | 9,31                 |
| Vertical       | 2483.5          | 0,318                      | 52,25                  | 54                     | 1,75                    | 66.95               | 74                  | 7,05                 |
| Vertical       | 3618            | 0,318                      | 46,68                  | 54                     | 7,32                    | 51.34               | 74                  | 22,66                |
| Vertical       | 3655            | 0,318                      | 45,64                  | 54                     | 8,36                    | 50.80               | 74                  | 23,2                 |
| Vertical       | 3693            | 0,318                      | 45,11                  | 54                     | 8,89                    | 50.92               | 74                  | 23,08                |
| Vertical       | 3954.5          | 0,318                      | 38,48                  | 54                     | 15,52                   | 54.74               | 74                  | 19,26                |
| Vertical       | 5206            | 0,318                      | 44,45                  | 54                     | 9,55                    | 53.20               | 74                  | 20,8                 |

## 11.7. CONCLUSION

Unwanted emissions measurement performed on the sample of the product **VELUX ACTIVE** with **NETATMO** NXG01S, SN: -, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.247 & RSS 247 ISSUE 2 limits.

## 12. UNCERTAINTIES CHART

| 47 CFR Part 15.209 & 15.207<br>Kind of test                                                             | Wide uncertainty<br>laboratory<br>(k=2) $\pm x(\text{dB}) / (\text{Hz}) / \text{ms}$ | Uncertainty limit |
|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------|
| Measurement of conducted disturbances in voltage on the AC power port (9 kHz – 150 kHz)                 | 2,67                                                                                 | 3.8               |
| Measurement of conducted disturbances in voltage on the AC power port (150 kHz – 30 MHz)                | 2,67                                                                                 | 3.4               |
| Measurement of conducted disturbances in voltage on the telecommunication port. (AAN)                   | 3,67                                                                                 | 5.0               |
| Measurement of conducted disturbances in current (current clamp)                                        | 2,73                                                                                 | 2.9               |
| Measurement of disturbance power                                                                        | 2,67                                                                                 | 4.5               |
| Measurement of radiated magnetic field from 10kHz to 30MHz in SAC V01                                   | 4,48                                                                                 | /                 |
| Measurement of radiated magnetic field from 10kHz to 30MHz in SAC C01                                   | 4,48                                                                                 | /                 |
| Measurement of radiated electric field from 30 to 1000MHz in horizontal position on the OATS (Ecuelles) | 4,88                                                                                 | 6.3               |
| Measurement of radiated electric field from 1 to 18GHz on the Ecuelles site                             | 5.16                                                                                 | /                 |
| Measurement of radiated electric field from 30 to 1000MHz in vertical position on the OATS (Ecuelles)   | 4,99                                                                                 | 6.3               |
| Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC C01             | 5,08                                                                                 | 6.3               |
| Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC C01               | 5,16                                                                                 | 6.3               |
| Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC V01             | 5,08                                                                                 | 6.3               |
| Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC V01               | 5,15                                                                                 | 6.3               |
| Measurement of radiated electric field from 1 to 6 GHz C01                                              | 5,1                                                                                  | 5.2               |
| Measurement of radiated electric field from 1 to 6 GHz V01                                              | 4,85                                                                                 | 5.2               |
| Measurement of radiated magnetic field from 10kHz to 30MHz on the OATS (Ecuelles)                       | 4,48                                                                                 | /                 |

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report