



LCIE

Template: Release October 10th, 2016

TEST REPORT

N°: 149480-706240

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 December 15, 2017

Test location

Fontenay Aux Roses

Composition of document

43 pages

Document issued on

January 26, 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.....	9
4.	6DB EMISSION BANDWIDTH	12
5.	DUTY CYCLE	15
6.	MAXIMUM CONDUCTED OUTPUT POWER	18
7.	POWER SPECTRAL DENSITY	21
8.	UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE	24
9.	UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS.....	27
10.	AC POWER LINE CONDUCTED EMISSIONS.....	31
11.	UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS	36
12.	UNCERTAINTIES CHART	43

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) Test Description	Test result - Comments			
Occupied Bandwidth Pb	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
6dB Bandwidth Pb	☒ PASS	☐ FAIL	☐ NA()	☐ NP(1)
Duty Cycle Pb	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Maximum Conducted Output Power Pb	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Power Spectral Density Pb	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Conducted Spurious Emission at the Band Edge Pb	☒ PASS	☐ FAIL	☐ NA()	☐ NP(1)
Unwanted Emissions into Non-Restricted Frequency Bands Pb	☒ PASS	☐ FAIL	☐ NA()	☐ NP(1)
AC Power Line Conducted Emission Pb	☒ PASS	☐ FAIL	☐ NA(2)	☐ NP(1)
Unwanted Emissions into Restricted Frequency Bands Pb	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Receiver Radiated emissions Pb	☒ PASS	☐ FAIL	☐ NA	☐ 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

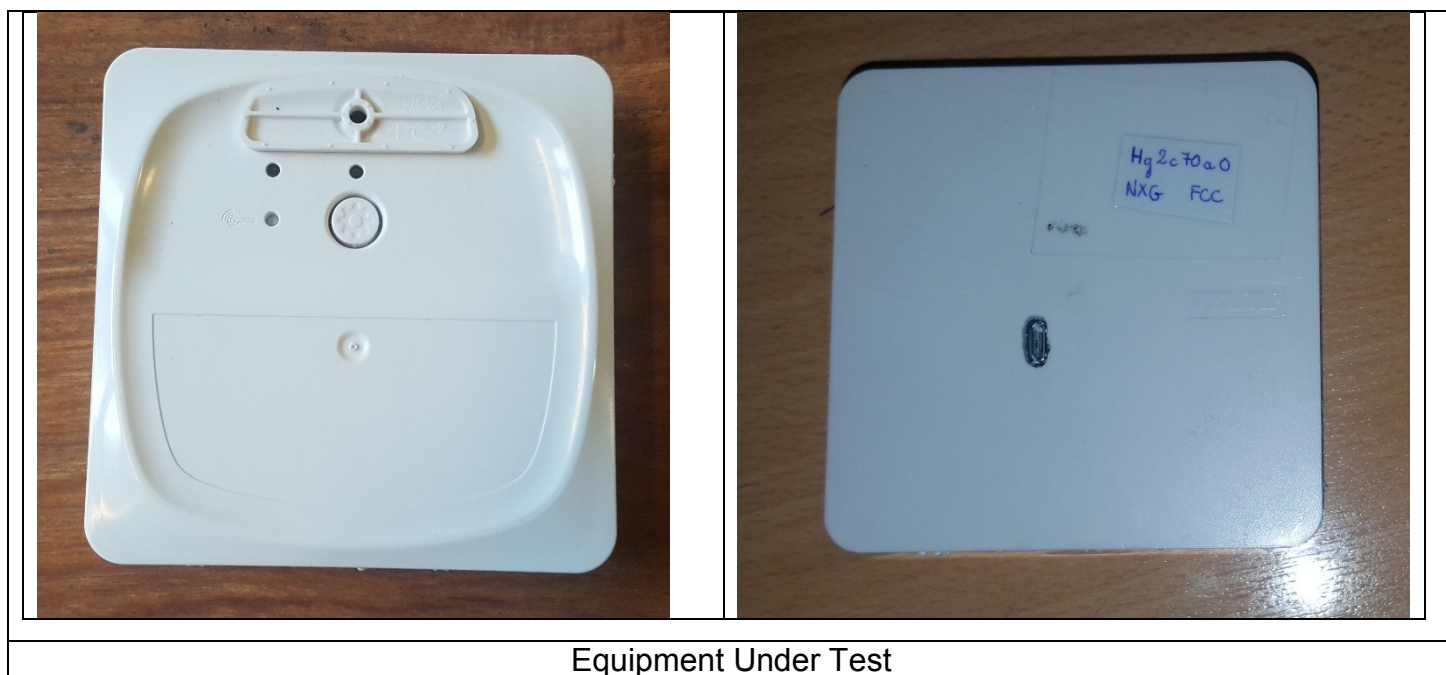
2. EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER)

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

VELUX ACTIVE with NETATMO NXG01S

Serial Number: -



Equipment Under Test

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Power supply	-	-	☐	☐	☐	-

Auxiliary equipment used during test:

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



Equipment information:

Frequency band:	[2400 – 2483.5] MHz		
Number of Channel:	3		
Spacing channel:	25MHz		
Channel bandwidth:	2MHz		
Antenna Type:	☒ Integral	☐ External	☐ Dedicated
Antenna connector:	☒ Yes	☐ No	☐ Temporary for test
Transmit chains:	1		
Receiver chains:	1		
Type of equipment:	☒ Stand-alone	☐ Plug-in	☐ Combined
Ad-Hoc mode:	☐ Yes		☒ No
Duty cycle:	☒ Continuous duty	☐ Intermittent duty	☐ 100% duty
Equipment type:	☒ Production model		☐ Pre-production model
Operating temperature range:	Tmin:	☐ -20°C	☒ 0°C
	Tnom:	20°C	
	Tmax:	☐ 35°C	☒ 55°C
Type of power source:	☒ AC power supply	☐ DC power supply	☐ Battery
Operating voltage range:	Vnom:	☒ 120V/60Hz	☐ X Vdc

Antenna Characteristic

Antenna assembly	Gain (dBi)	Frequency Band (MHz)	Impedance(Ω)
1	5.56	2412	50

CHANNEL PLAN

Channel	Frequency (MHz)
Cmin	2425
Cmid	2450
Cmax	2475

DATA RATE

Data Rate (Mbps)	Modulation Type	Worst Case Modulation
0.25	O-QPSK	☒

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 : December 15, 2017
Ambient temperature : 25 °C
Relative humidity : 42 %

3.2. TEST SETUP

- The Equipment Under Test is installed:

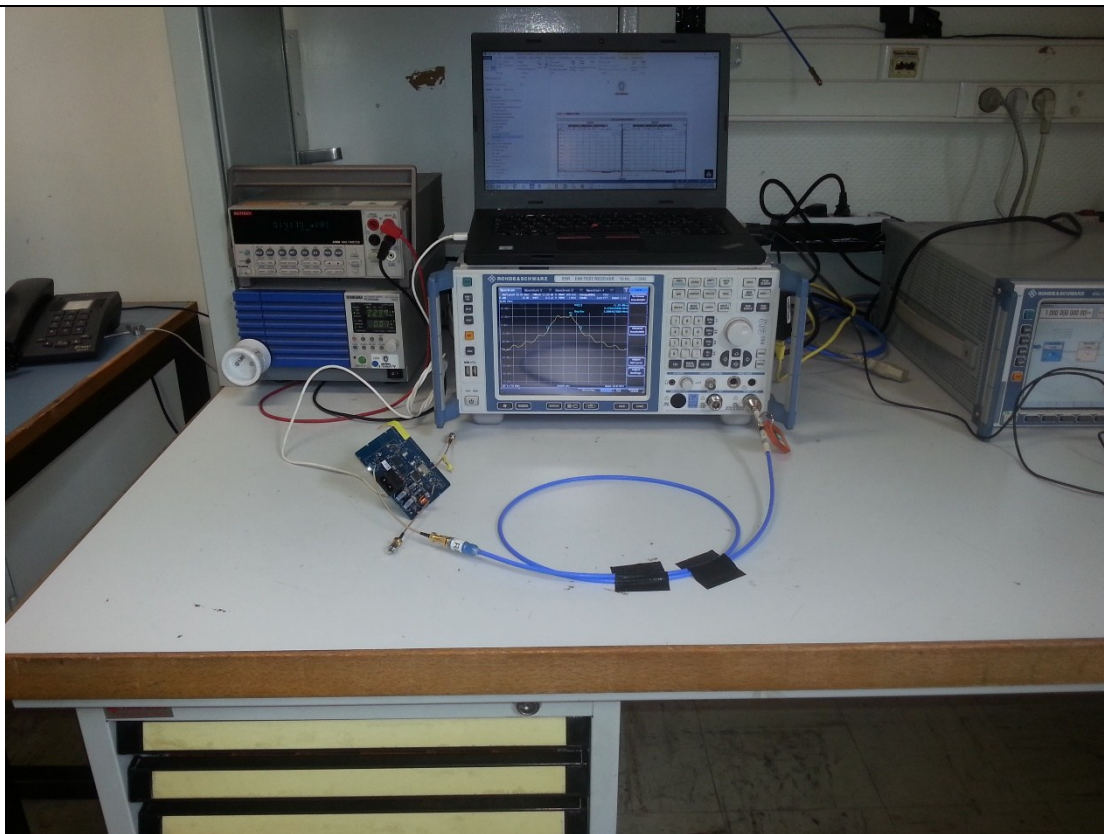
- ☒ On a table
- ☐ In an anechoic chamber

- 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

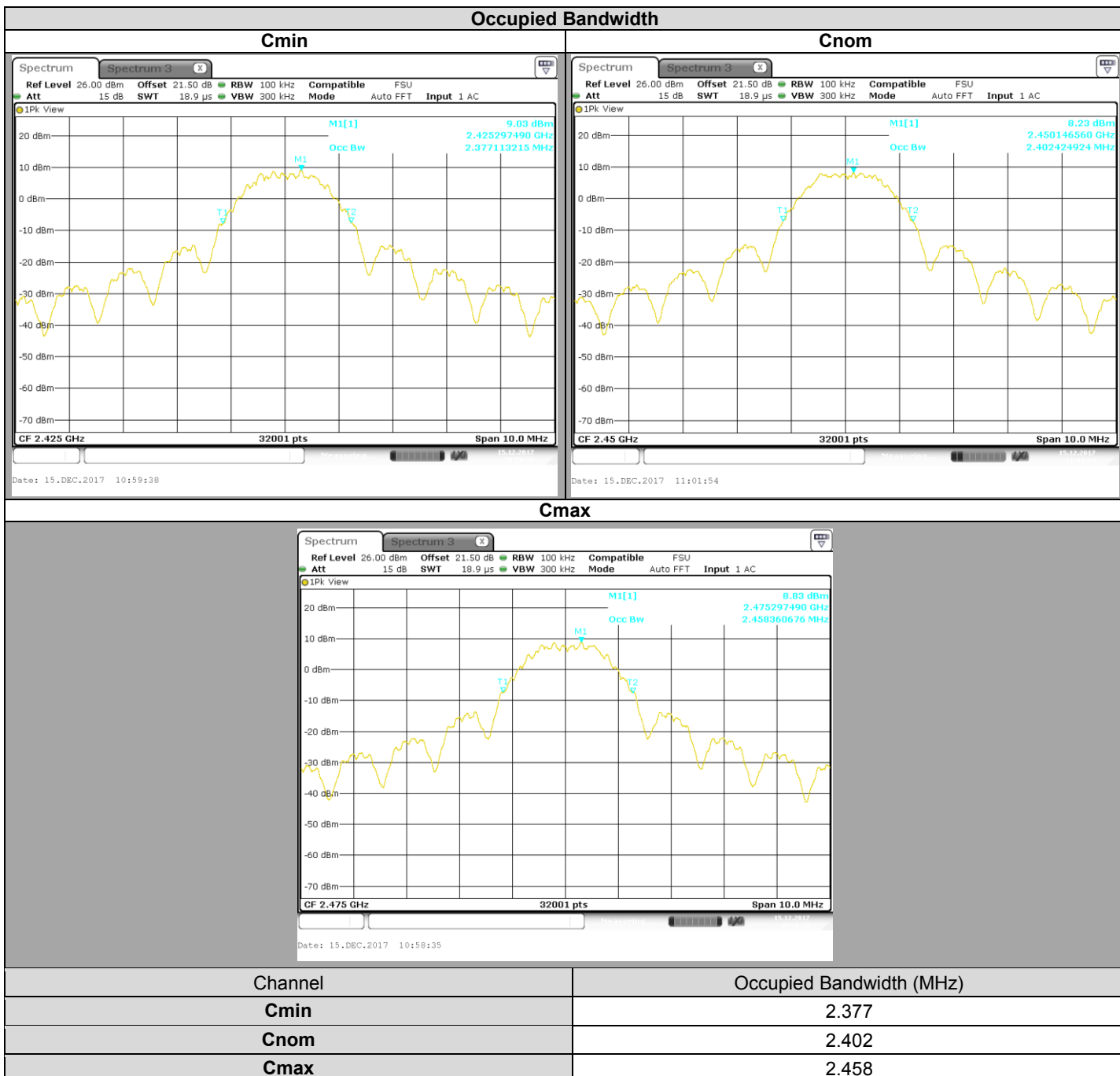
None

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	Télédyné	920-0202-048	A5329675	2017/09	2018/09
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



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 2, 2017
Ambient temperature : 25 °C
Relative humidity : 42 %

4.2. TEST SETUP

- The Equipment Under Test is installed:

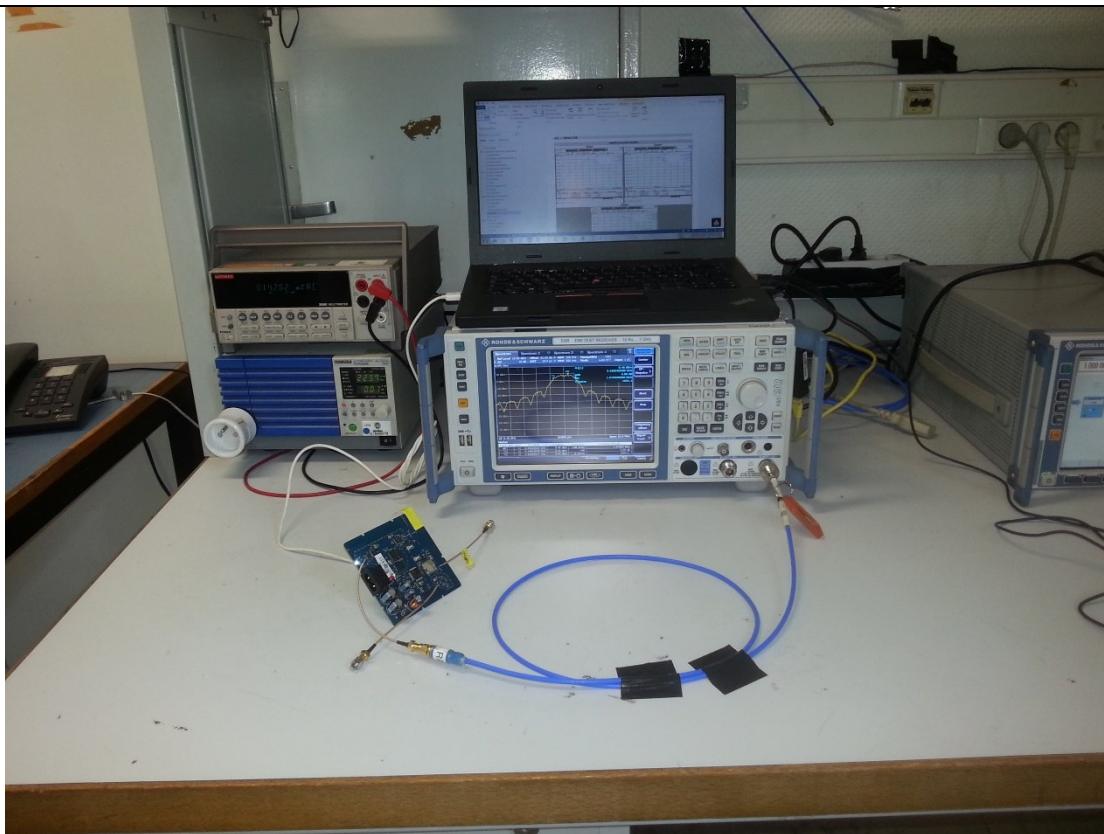
- ☒ On a table
- ☐ In an anechoic chamber

- 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	Télédyné	920-0202-048	A5329675	2017/09	2018/09
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



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.

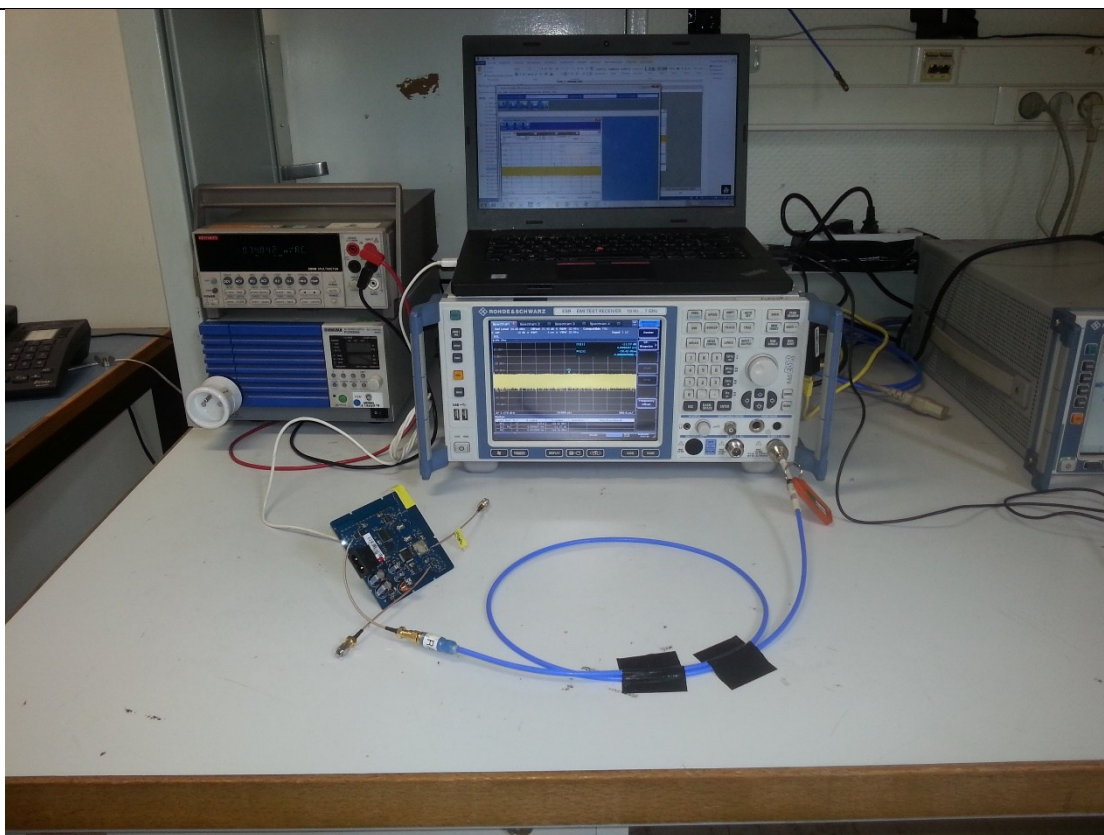
5. DUTY CYCLE

5.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : August 2, 2017
Ambient temperature : 25 °C
Relative humidity : 42 %

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

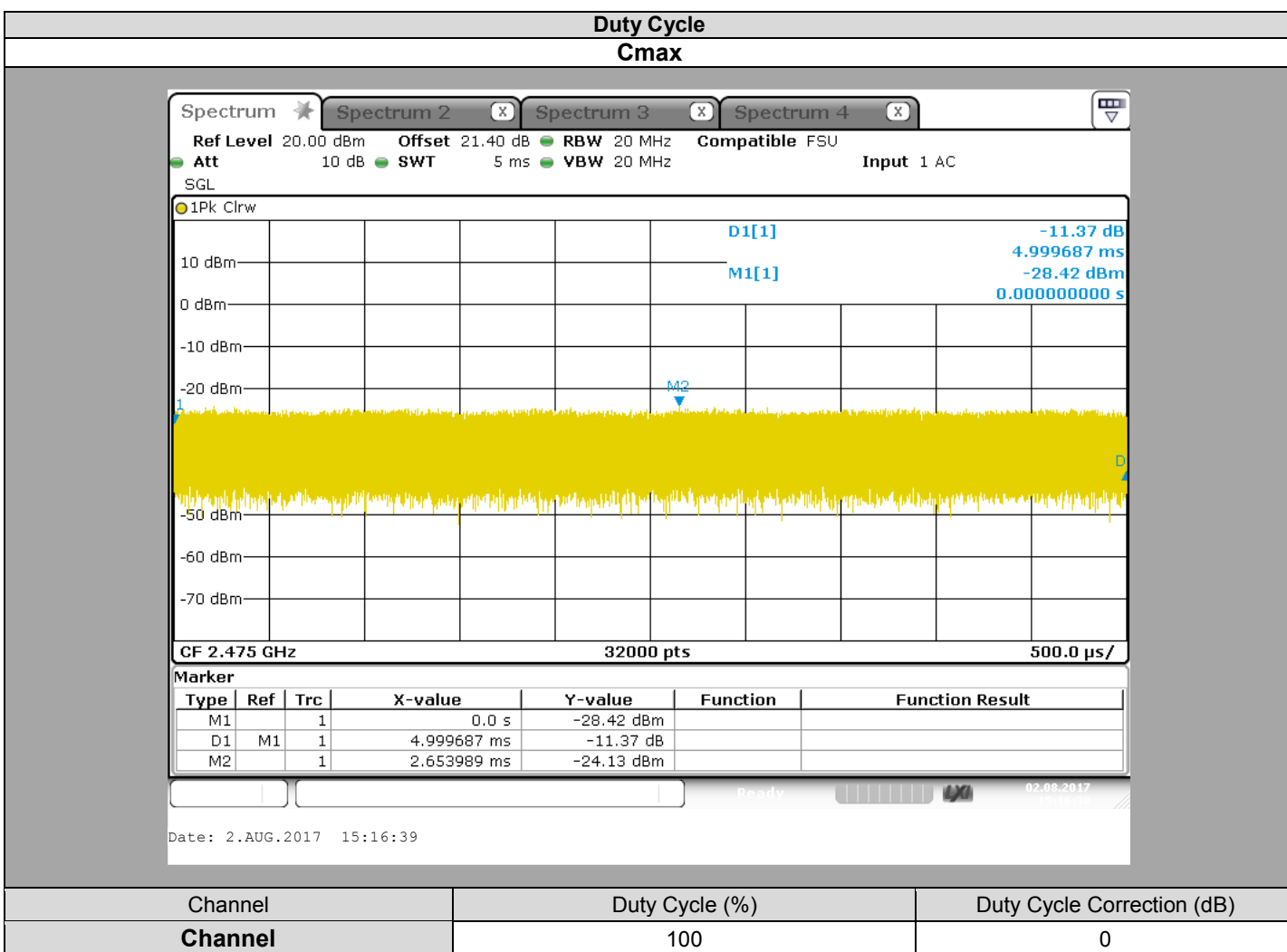
None

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	2017/09	2018/09
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





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 2, 2017
Ambient temperature : 25 °C
Relative humidity : 42 %

6.2. TEST SETUP

- The Equipment Under Test is installed:

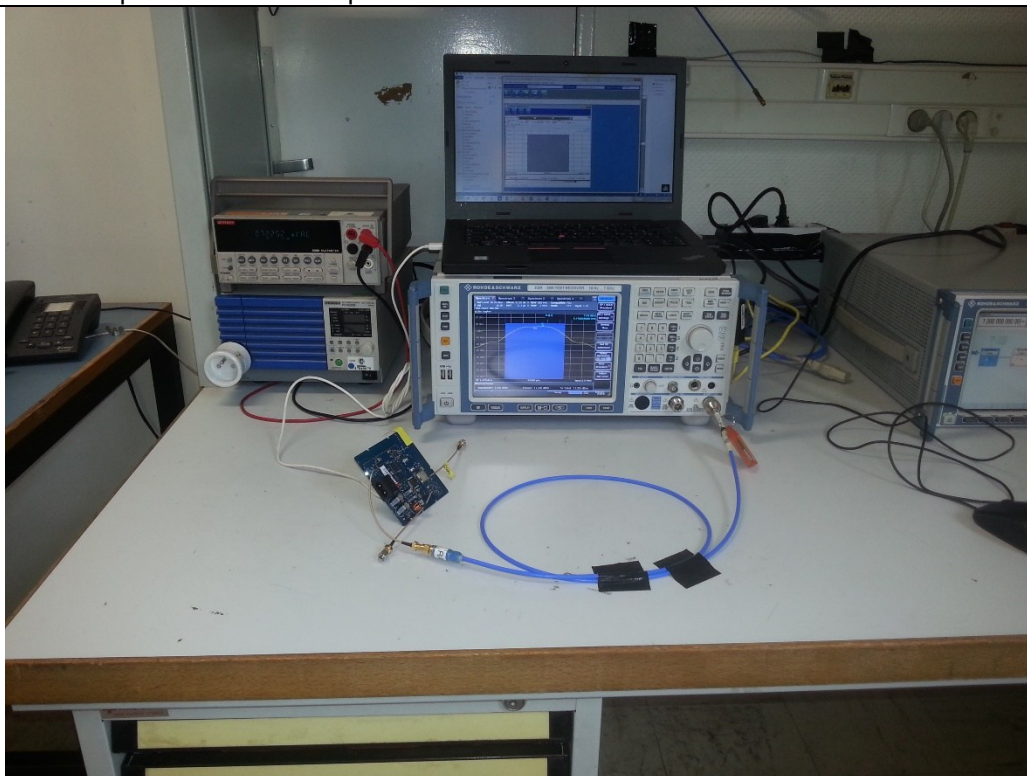
- ☒ On a table
- ☐ In an anechoic chamber

- 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)
- ☐ KDB 662911 D01 Multiple Transmitter Output v02r01



Photograph for Maximum Conducted Output Power



6.3. LIMIT

Maximum Conducted Output power:

2400MHz-2483.5MHz: Shall not exceed 30dBm

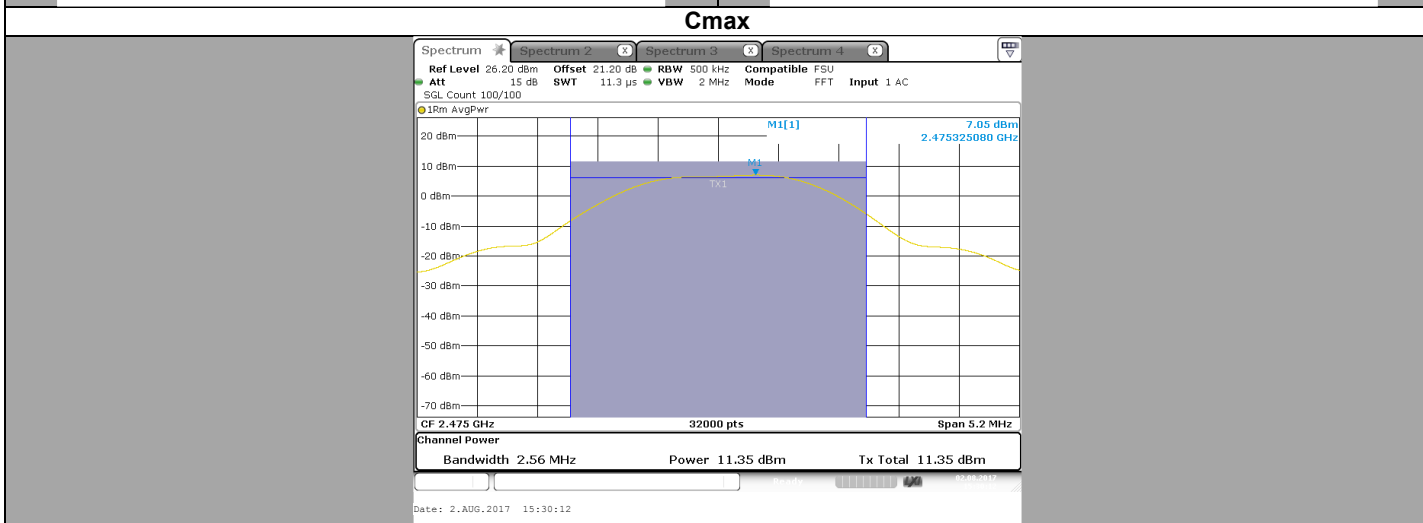
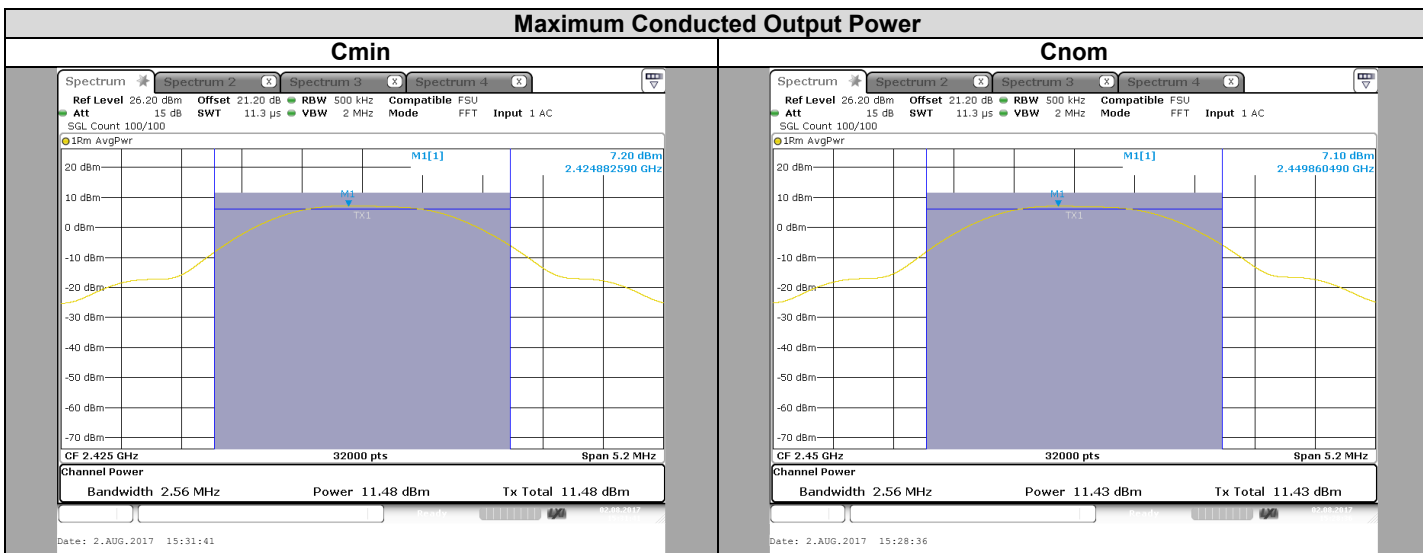
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

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	Télédyné	920-0202-048	A5329675	2017/09	2018/09
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



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	21.2	5.56	11.48	30.
Cnom	21.2	5.56	11.43	30.
Cmax	21.2	5.56	11.35	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 2, 2017
Ambient temperature : 25 °C
Relative humidity : 42 %

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 AVGPS-1)
- ☐ KDB 662911 D01 Multiple Transmitter Output v02r01



Photograph for Power Spectral Density



7.3. LIMIT

Power Spectral Density:

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

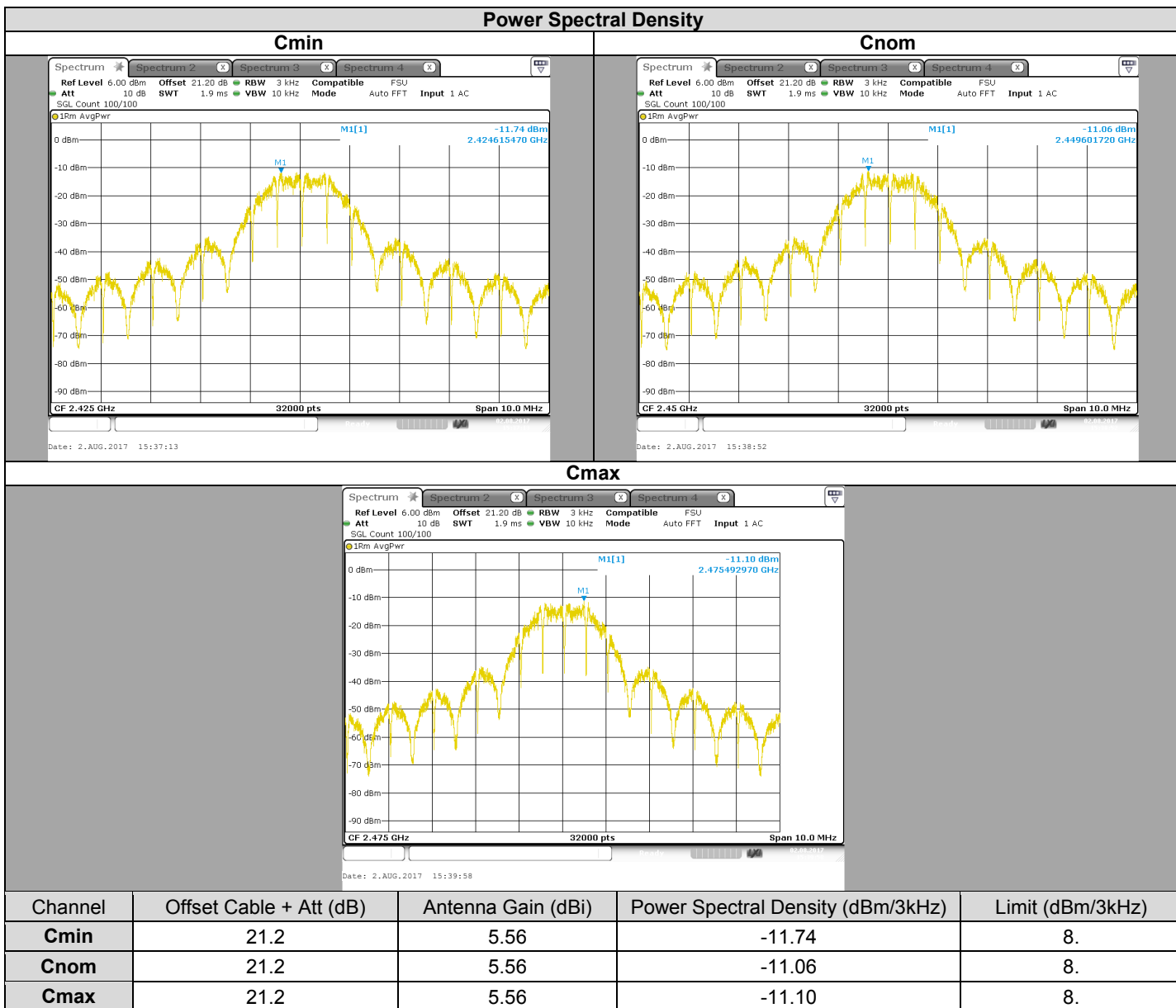
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

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	Télédynne	920-0202-048	A5329675	2017/09	2018/09
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



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 2, 2017
Ambient temperature : 25 °C
Relative humidity : 42 %

8.2. TEST SETUP

- The Equipment Under Test is installed:

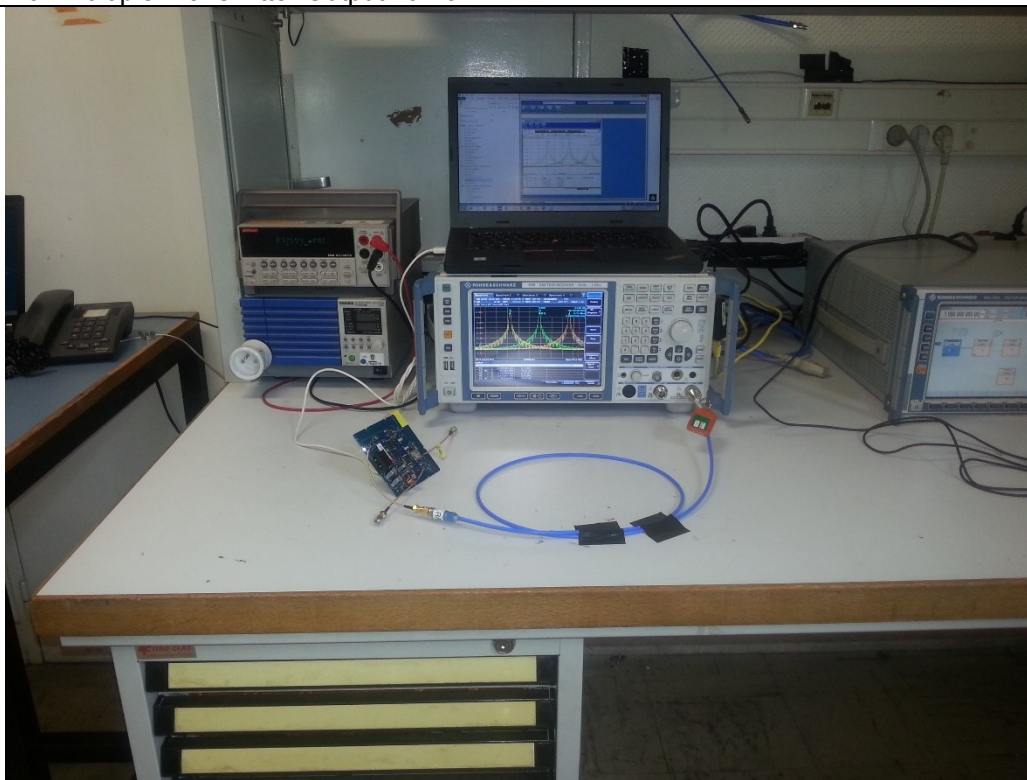
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☒ KDB 558074 D01 DTS Meas Guidance v04 § 11
- ☐ KDB 662911 D01 Multiple Transmitter Output v02r01



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



8.3. LIMIT

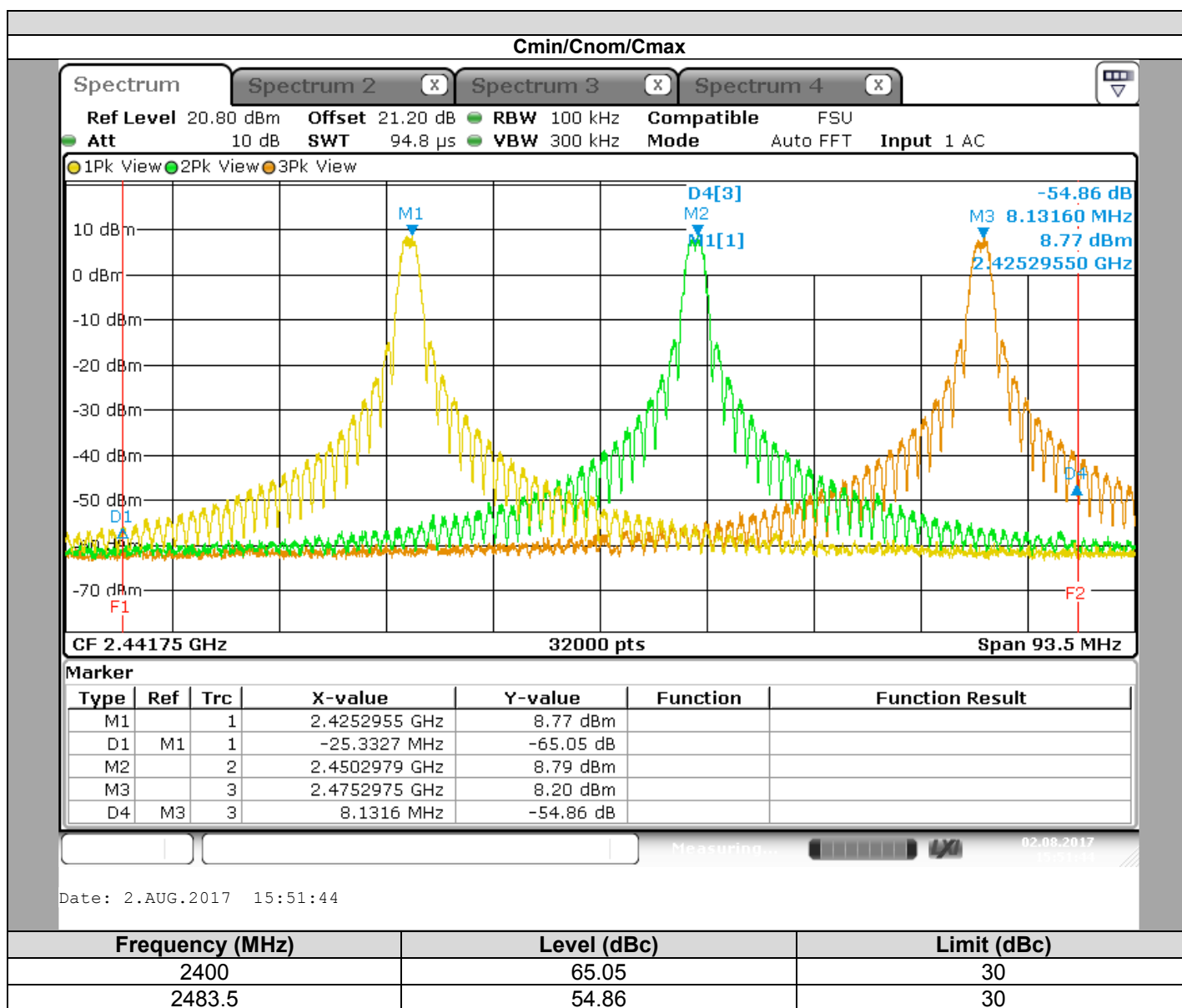
All Spurious Emissions must be at least 30dB (Average Conducted Power) below the Fundamental Radiator Level at the Band Edge "2400MHz & 2483,5MHz"

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	Télédyné	920-0202-048	A5329675	2017/09	2018/09
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



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 : 42 %

9.2. TEST SETUP

- The Equipment Under Test is installed:

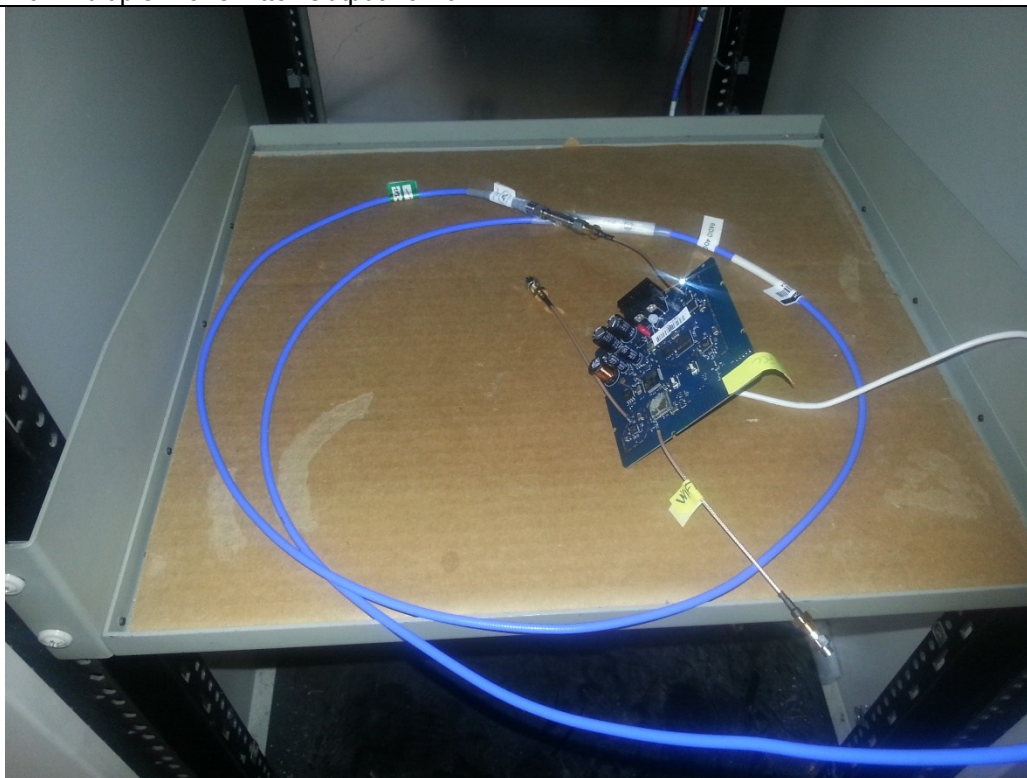
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

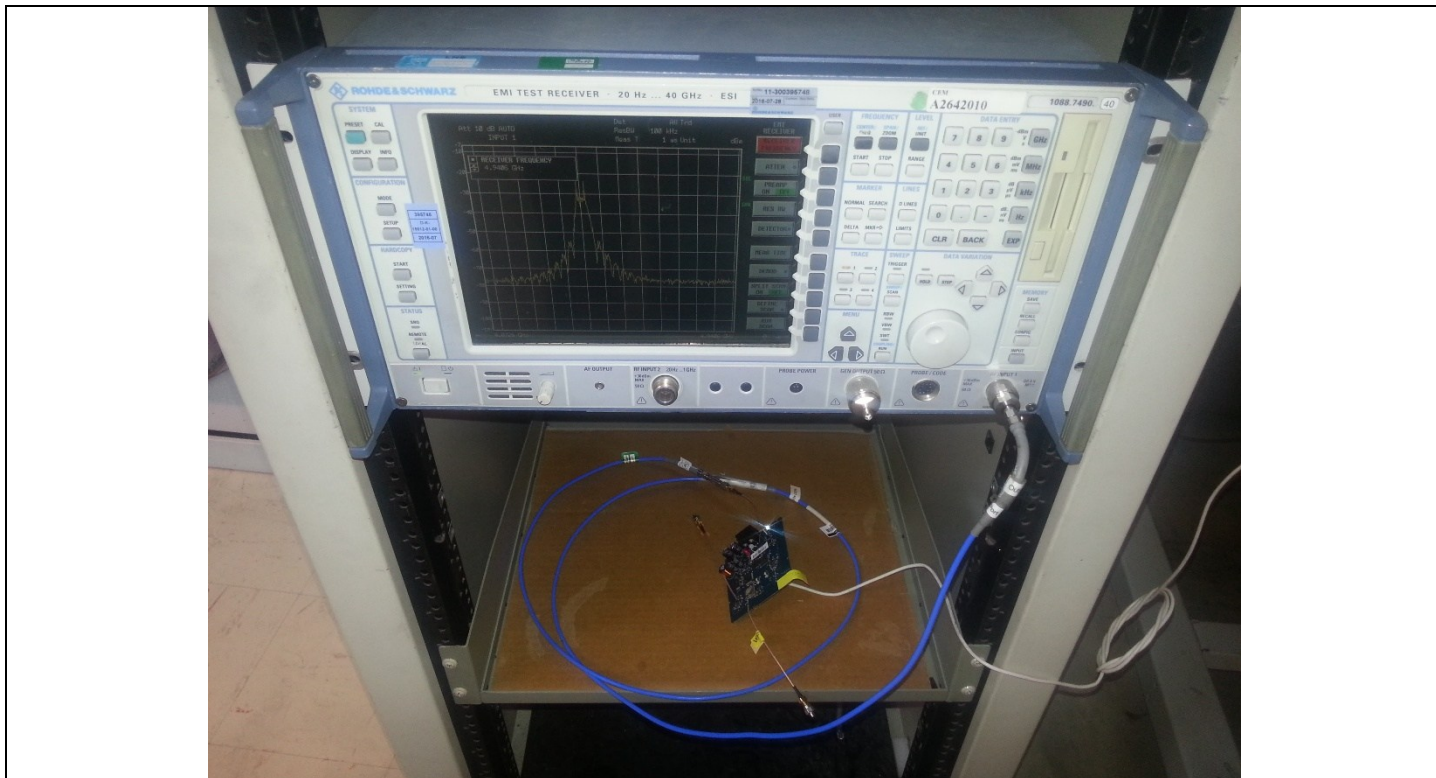
- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☒ KDB 558074 D01 DTS Meas Guidance v04 § 11
- ☐ KDB 662911 D01 Multiple Transmitter Output v02r01



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

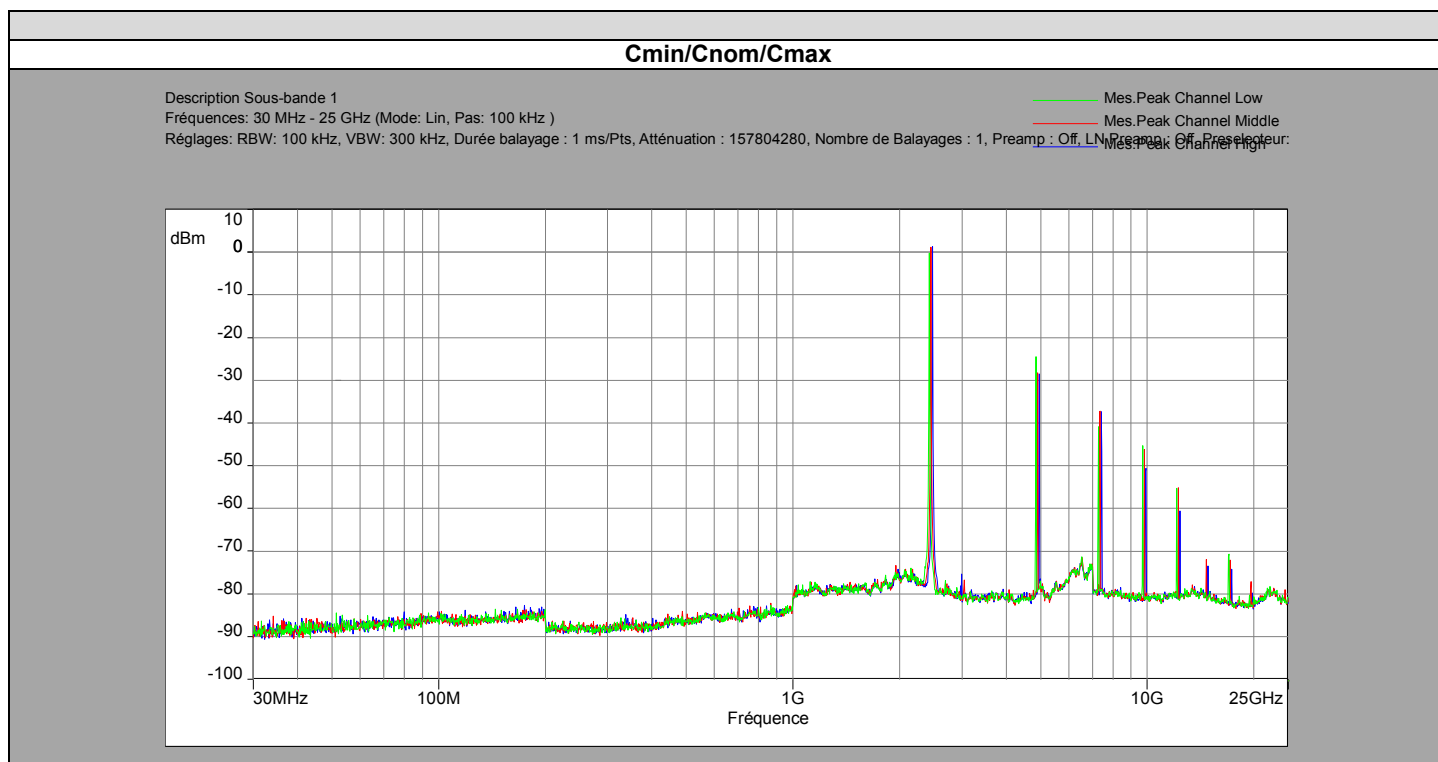
9.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2016/07	2018/07
Rejector filter 2,4GHz	-	2.45GHz	A7484048	2017/09	2018/09
Cable	Télédynne	084-0555-2MTR	A5329758	2016/10	2017/10
Attenuator 3dB	WEINSCHEL	WA54-3-12	A7122223	2016/10	2017/10
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



Frequency (MHz)	Level (dBm)	Level (dBc)	Limit (dBc)
2425	-0.22		
4849.1	-24.51	24.29	30
7276.4	-40.89	40.67	30
9698.2	-45.26	45.04	30
12127.6	-55.36	55.14	30
16978.7	-70.66	70.44	30
2450	1.14		
4901.1	-28.22	27.08	30
7351.5	-37.19	36.05	30
9798.2	-46.23	45.09	30
12247.2	-55.11	53.97	30
14703.3	-71.90	70.76	30
17146.7	-71.06	69.92	30
19604.3	-77.13	75.99	30
2475	1.23		
4951.1	-28.49	27.26	30
7423.8	-37.39	36.16	30
9902.2	-50.65	49.42	30
12377.5	-60.65	59.42	30
14853.3	-73.44	72.21	30
17328.7	-74.23	73.00	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 μ V to 56dB μ V*

0,5MHz to 5MHz: 56dB μ V

5MHz to 30MHz: 60dB μ V

Average

0,15kHz to 0,5MHz: 56dB μ V to 46dB μ V*

0,5MHz to 5MHz: 46dB μ V

5MHz to 30MHz: 50dB μ 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

Cmin

Phase

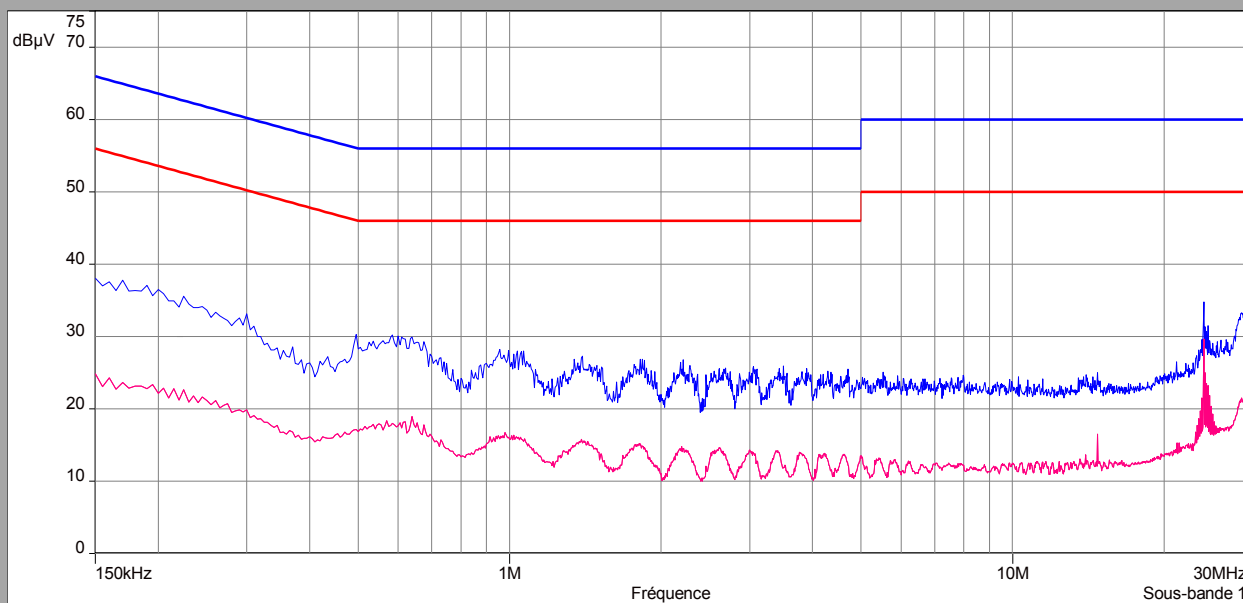
Description Sous-bande 1

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

Réglages: RBW: 9 kHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 163053944, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Presetector : On

Ligne:Phase 1

FCC/FCC 15.107 - Classe:B - Moyenne/
 FCC/FCC 15.107 - Classe:B - QCrête/
 Mes.Pk (Phase 1)
 Mes.Avg (Phase 1)



Line

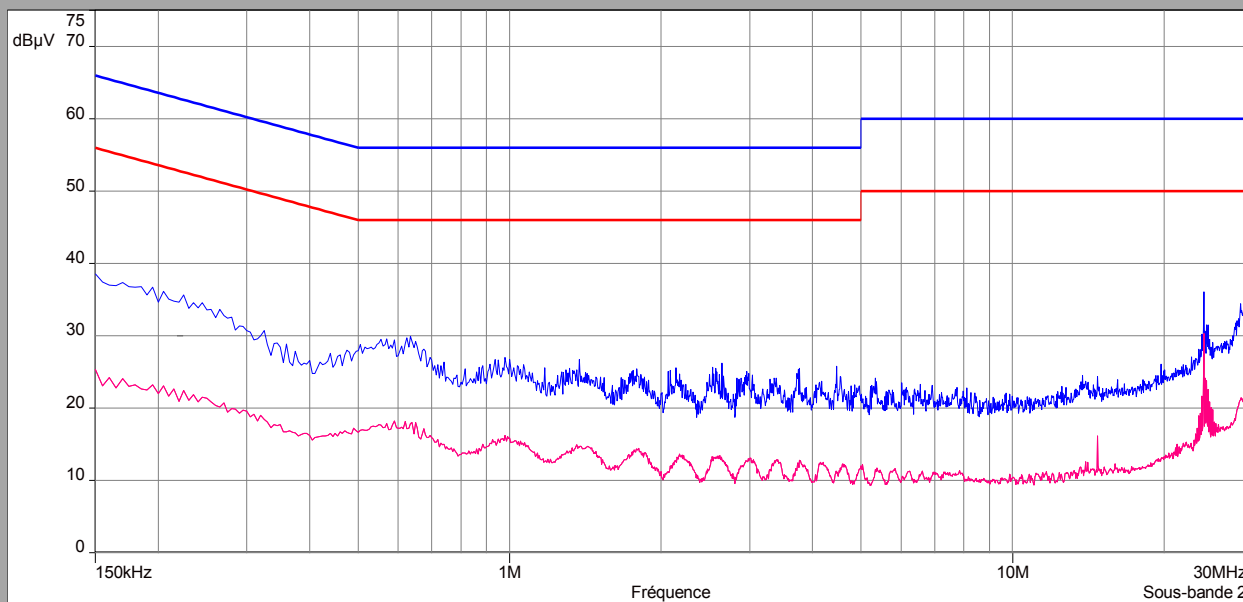
Description Sous-bande 2

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

Réglages: RBW: 9 kHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 163054104, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Presetector : On

Ligne:Neutre

FCC/FCC 15.107 - Classe:B - Moyenne/
 FCC/FCC 15.107 - Classe:B - QCrête/
 Mes.Pk (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	25.01	-	60	34.99	16.51	50	33.49
24.00	34.81	-	60	25.19	29.66	50	20.34
28.57	33.30	-	60	26.70	21.52	50	28.48

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)
14.77	24.34	-	60	35.66	16.15	50	33.85
24.00	36.08	-	60	23.92	30.47	50	19.53
28.38	34.43	-	60	25.57	21.45	50	28.55

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

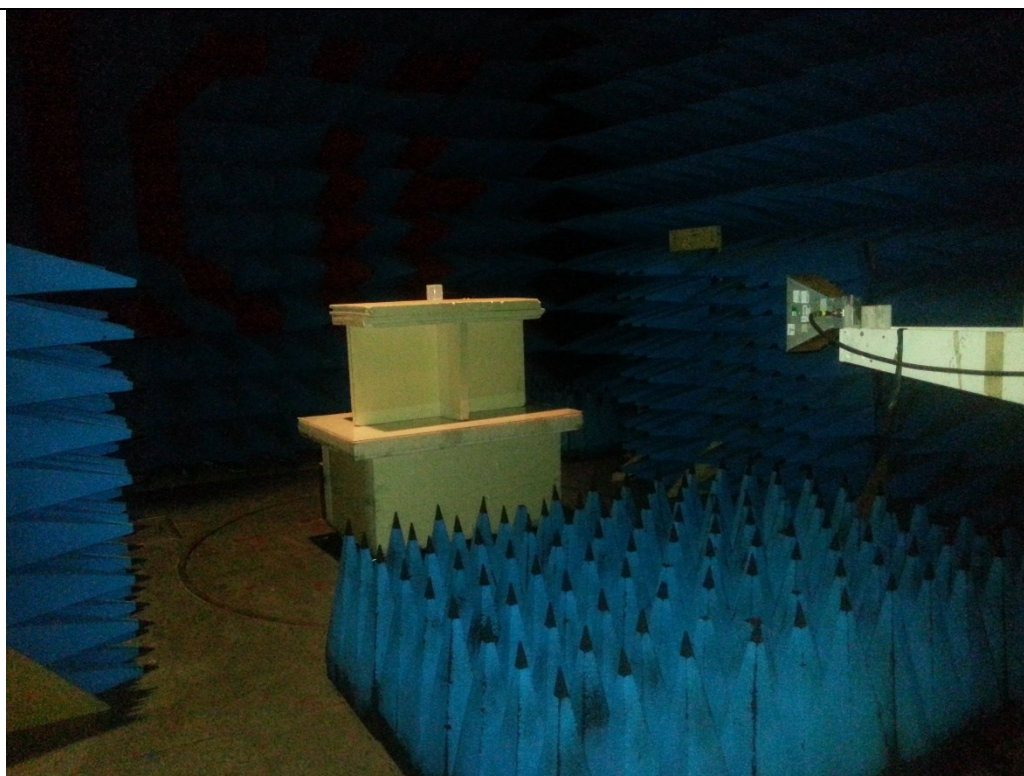
The product has been tested according to ANSI C63.10 (2013). The EUT is placed **ina semi-anechoic chamber**. Distance between measuring antenna and the EUT is **3m**. Test is performed in horizontal (H) and vertical (V) polarization with **bilog** antenna below 1GHz and with a horn antenna above 1GHz. 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 Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands

11.3. 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
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

11.4. LIMIT

Limit at 3m:

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

Limit at 10m:

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

11.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

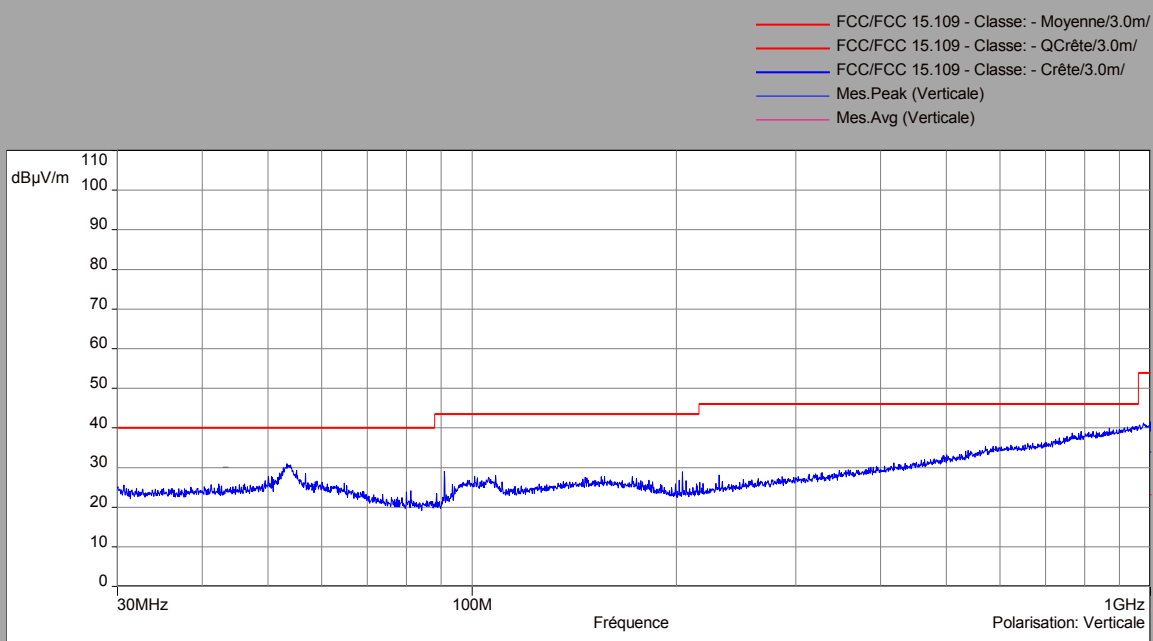
☒ None
 ☐ Divergence:

11.6. RESULTS

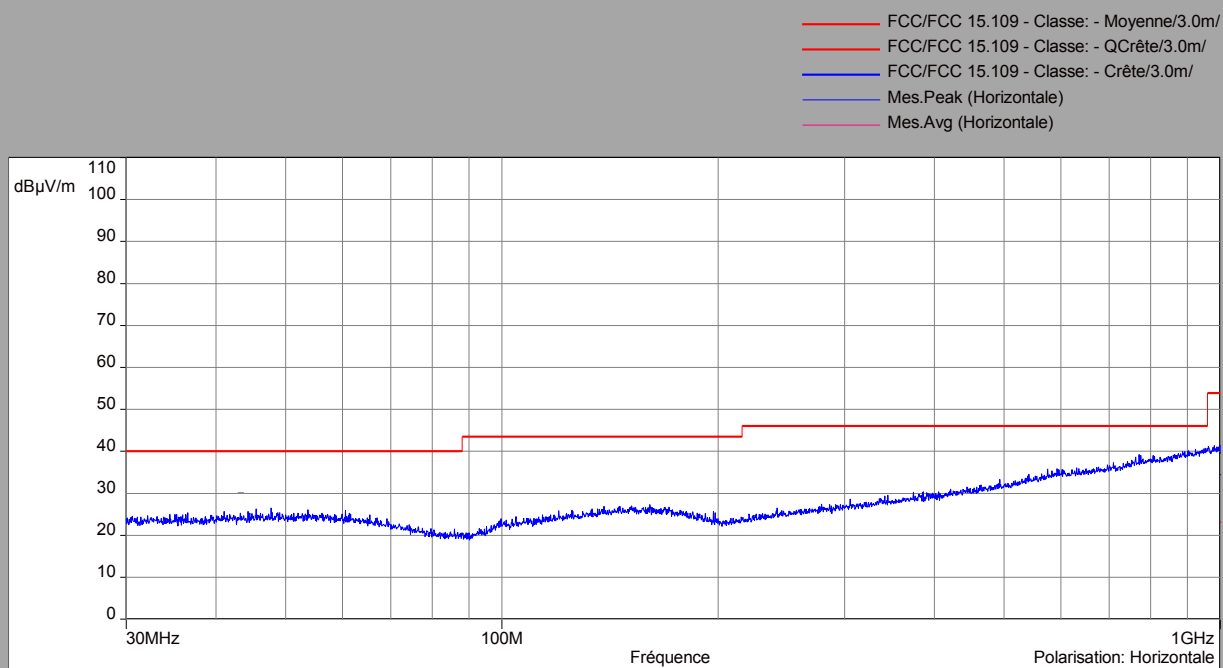
Below 1GHz

Channel

Vertical Polarization



Horizontal polarization

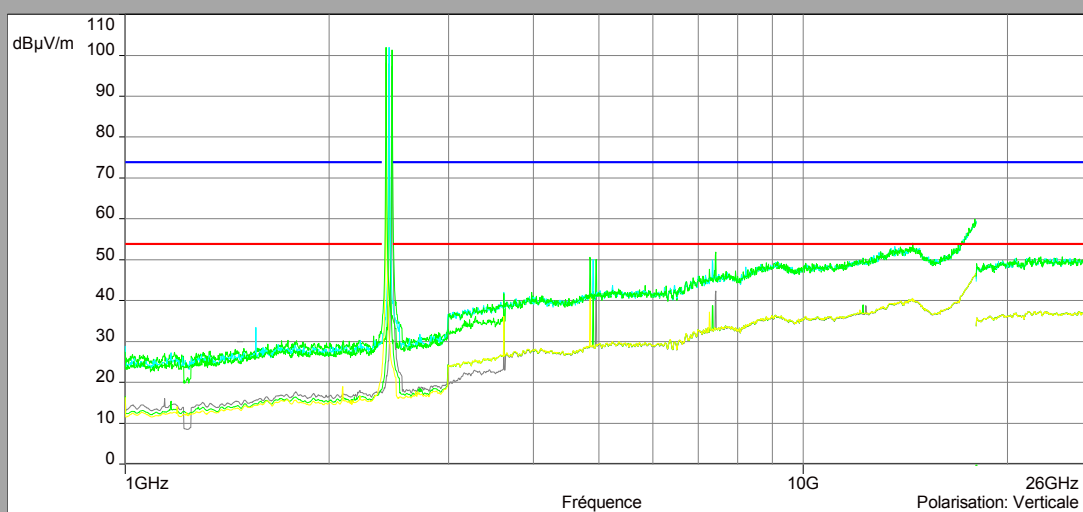


Above 1GHz

Cmin/Cnom/Cmax

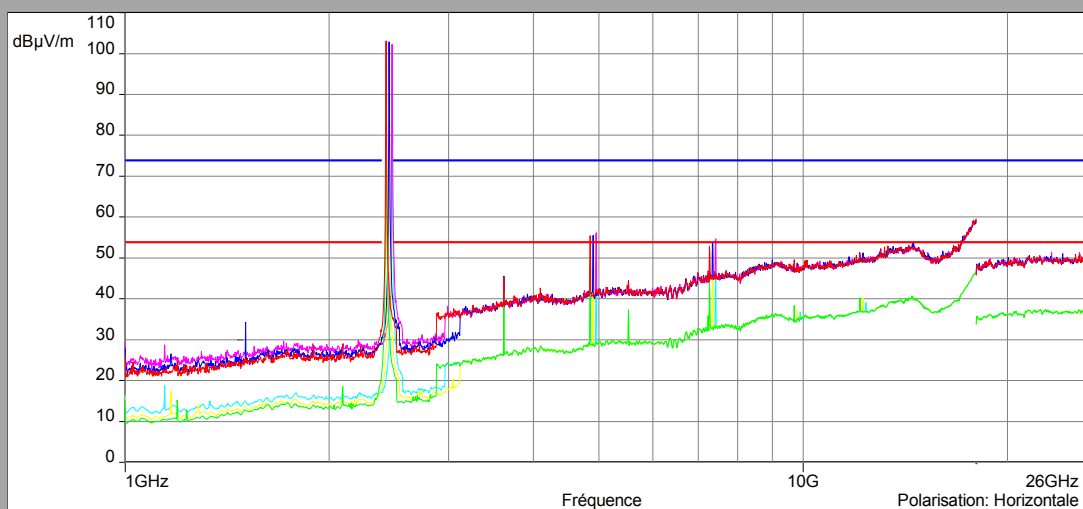
Vertical Polarization

- 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 (Verticale)
- Mes.Avg Channel Low (Verticale)
- Mes.Peak Channel Middle (Verticale)
- Mes.Avg Channel Middle (Verticale)
- Mes.Peak Channel High (Verticale)
- Mes.Avg Channel High (Verticale)



Horizontal polarization

- 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.Avg Channel Low (Horizontale)
- Mes.Peak Channel Middle (Horizontale)
- Mes.Avg Channel Middle (Horizontale)
- Mes.Peak Channel High (Horizontale)
- Mes.Avg Channel High (Horizontale)



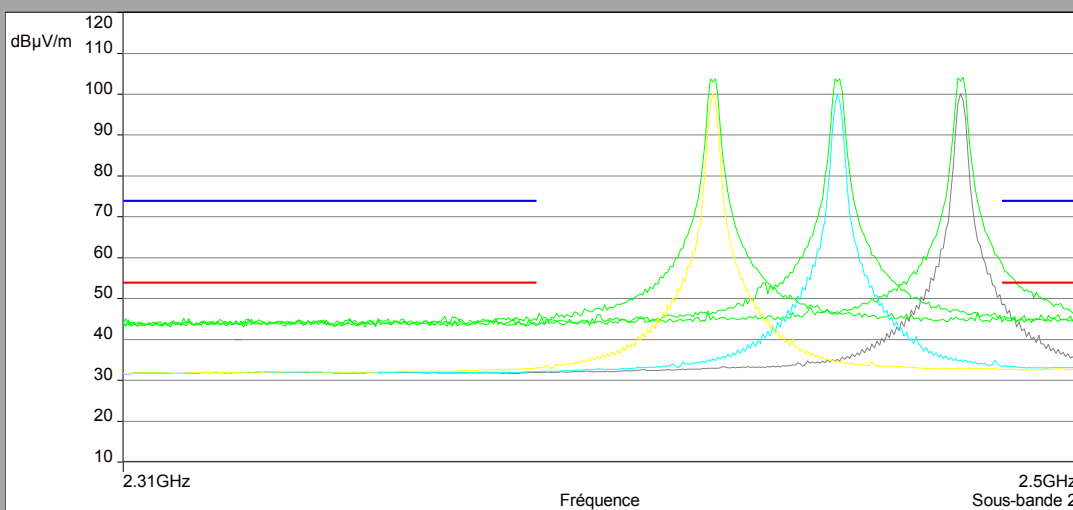
Above 1GHz Zoom 2310MHz-2500MHz

Cmin/Cnom/Cmax

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: 1500/4816 Non balayages : 1, Preamp : On: 20 dB, LN I
 Polarisation: Verticale
 Distance: 3 m

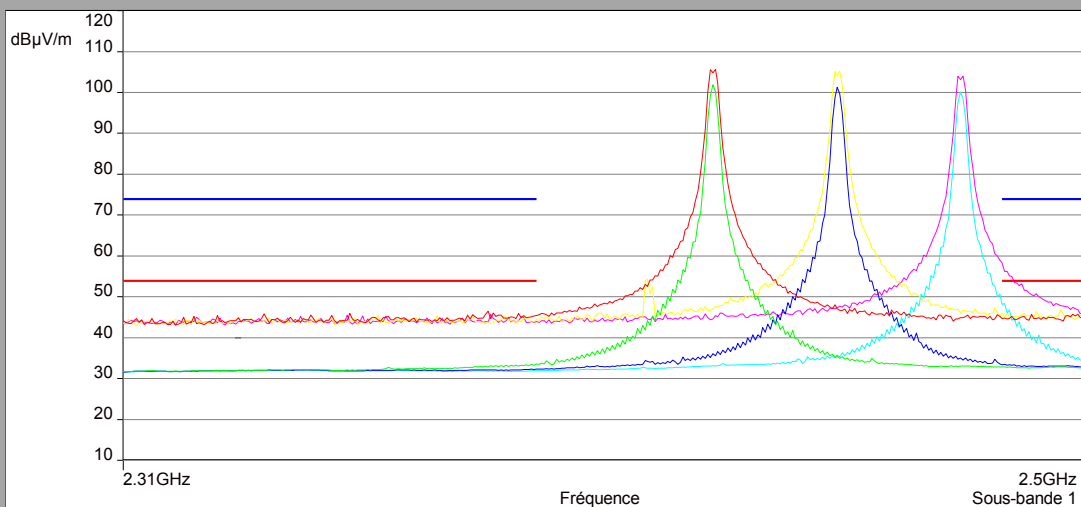
— FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
 — FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
 — Mes.Peak Channel Low (Verticale)
 — Mes.Avg Channel Low (Verticale)
 — Mes.Avg Channel Middle (Verticale)
 — Mes.Peak Channel Middle (Verticale)
 — Mes.Peak Channel High (Verticale)
 — Mes.Avg Channel High (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: 1500/4816 Non balayages : 1, Preamp : On: 20 dB, LN I
 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.Avg Channel Low (Horizontale)
 — Mes.Avg Channel Middle (Horizontale)
 — Mes.Peak Channel Middle (Horizontale)
 — Mes.Peak Channel High (Horizontale)
 — Mes.Avg Channel High (Horizontale)



Below 1GHz					
Polarization	Frequency (MHz)	Peak Level (dBμV/m)	QPeak Level (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)
Vertical	53.35	30.99	-	40	9.01
Vertical	91.05	29.04	-	43.5	14.46
Vertical	204.26	28.97	-	43.5	14.53
Horizontal	771.4	39.25	-	46.0	6.75

Above 1GHz								
Cmin/Cnom/Cmax								
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	2390	0	41.49	54	12,51	59.82	74	14,18
Vertical	2483.5	0	41.46	54	12,54	60.93	74	13,07
Vertical	3618	0	46.24	54	7,76	51.34	74	22,66
Vertical	3652	0	45.07	54	8,93	50.80	74	23,2
Vertical	3693	0	44.67	54	9,33	50.92	74	23,08
Vertical	4810	0	41.89	54	12,11	52.13	74	21,87
Vertical	4880	0	41.99	54	12,01	52.41	74	21,59
Vertical	4960	0	42.17	54	11,83	52.63	74	21,37
Vertical	7215	0	40.86	54	13,14	48.11	74	25,89
Vertical	7320	0	40.95	54	13,05	49.85	74	24,15
Vertical	7440	0	42.09	54	11,91	50.33	74	23,67

11.7. CONCLUSION

Unwanted Emission in 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.

12. UNCERTAINTIES CHART

47 CFR Part 15.209 & 15.207 Kind of test	Wide uncertainty laboratory (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