



LCIE

902MHz-928MHz Template: Release February 06th, 2020

TEST REPORT

N°: 166555-749603-B(FILE#1033512)

Version : 02

Subject

Radio spectrum matters
tests according to standards:
47 CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5

Issued to

CSM

62 Boulevard Diderot
75012 - PARIS
FRANCE

Apparatus under test

↳ Product
↳ Trade mark
↳ Manufacturer

↳ Model range

↳ Model under test
↳ Serial number
↳ FCC ID
↳ IC

Human Presence detector – WX sensor

CSM

ASTEEL FLASH

WX SENSOR-NC-SR-YPA-DP-1B / WX SENSOR-NC-SR-YPA-DP-2B / WX SENSOR-NC-SR-YPA-CP-1B / WX SENSOR-NC-SR-YPA-CP-2B / WX SENSOR-YC-SR-YPA-CC-2B

WX SENSOR-YC-SR-YPA-CC-2B

SCC13 & SCC1

2ASLE-NCSR

26875-NCSR

Conclusion

See Test Program chapter

Test date

March 17, 2020 to May 18, 2020

Test location

Moirans

Test Site

6500A

Sample receipt date

May 12, 2020

Composition of document

46 pages

Document issued on

June 10, 2021

Written by :

Gaetan DESCHAMPS

Test operator

Approved by :

Anthony MERLINE

Technical manager



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PUBLICATION HISTORY

Version	Date	Author	Modification
01	August 10, 2020	Gaetan DESCHAMPS	Creation of the document
02	June 10, 2021	Gaetan DESCHAMPS	Adding FCC/IC informations

Each new edition of this test report replaces and cancels the previous edition. The control of the old editions of report is under responsibility of client.



SUMMARY

1. TEST PROGRAM	4
2. EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER)	5
3. HOPPING : OCCUPIED BANDWIDTH	9
4. HOPPING : 20DB EMISSION BANDWIDTH	13
5. HOPPING : NUMBER OF HOPPING FREQUENCY	17
6. HOPPING : CARRIER FREQUENCY SEPARATION	20
7. HOPPING : TIME OF OCCUPANCY	23
8. HOPPING : DUTY CYCLE	25
9. HOPPING : MAXIMUM CONDUCTED OUTPUT POWER	26
10. HOPPING : UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE	29
11. HOPPING : UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS	32
12. HOPPING : UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS	35
13. UNCERTAINTIES CHART	46



L C I E

1. TEST PROGRAM

References

- 47 CFR Part 15.247
- RSS 247 Issue 2
- RSS Gen Issue 5
- KDB 558074 D01 DTS Meas Guidance v05r02
- ANSI C63.10-2013

Radio requirement Hopping mode:

Clause (47CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
20dB Bandwidth	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Number of Hopping Frequency	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Carrier Frequency Separation	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Time of Occupancy	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Duty Cycle	<input type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input checked="" type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Maximum Conducted Output Power	<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	<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	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA()	<input type="checkbox"/> NP(1)
AC Power Line Conducted Emission	<input type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input checked="" type="checkbox"/> NA(2)	<input type="checkbox"/> NP(1)
Unwanted Emissions into Restricted Frequency Bands	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Receiver Radiated emissions	<input type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input checked="" 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. INFORMATION

Tests are performed on the most complete product **CSM WX SENSOR-YC-SR-YPA-CC-2B**, SN: **SCC13 & SCC1** See Table below for difference between products.

Reference	Electronic reference	Mechanical reference	Battery
WX SENSOR-NC-SR-YPA-DP-1B	WX SENSOR-Sigfox with PA	Desk	1
WX SENSOR-NC-SR-YPA-DP-2B	WX SENSOR-Sigfox with PA	Desk	2
WX SENSOR-NC-SR-YPA-CP-1B	WX SENSOR-Sigfox with PA	Ceiling	1
WX SENSOR-NC-SR-YPA-CP-2B	WX SENSOR-Sigfox with PA	Ceiling	2
WX SENSOR-YC-SR-YPA-CC-2B	WX SENSOR-Sigfox with PA + Comptage	Ceiling Comptage	2

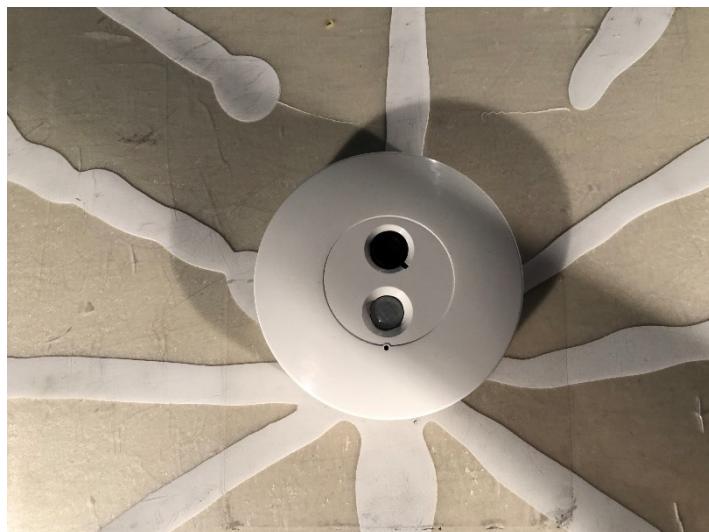


2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

CSM WX SENSOR-YC-SR-YPA-CC-2B

Serial Number: SCC13 & SCC1



Equipment Under Test

Power supply:

During all the tests, EUT is supplied by V_{nom} : 3VDC

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

Name	Type	Rating	Mark / Sn	Comments
Battery	<input type="checkbox"/> AC <input type="checkbox"/> DC <input checked="" type="checkbox"/> Battery	3VDC	SZENBAR / CR 17505	Lithium

Inputs/outputs – Cable/:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
		None				

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
raspiCEM03	pi / oiaadmin	-	-



L C I E

Equipment information:

Type:	Sigfox		
Frequency band:	[902 – 928] MHz		
Number of Channel:	54		
Antenna Type:	<input checked="" type="checkbox"/> Integral	<input type="checkbox"/> External	<input type="checkbox"/> Dedicated
Antenna connector:	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No	<input checked="" type="checkbox"/> Temporary for test
Transmit chains:	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	
Receiver chains	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	
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
Equipment type:	<input checked="" type="checkbox"/> Production model	<input type="checkbox"/> Pre-production model	
Type of power source:	<input type="checkbox"/> AC power supply	<input type="checkbox"/> DC power supply	<input checked="" type="checkbox"/> Battery
Operating voltage range:	Vnom:	<input type="checkbox"/> 120V/60Hz <input type="checkbox"/> 240V/50Hz	<input checked="" type="checkbox"/> 3 Vdc <input type="checkbox"/> X Vdc

Antenna Characteristic

Antenna assembly	Gain (dBi)	Frequency Band (MHz)	Impedance(Ω)
1	0	[902 – 928] MHz	50

CHANNEL PLAN**Micro Channels number**

Macro Channels	Channel1	Channel2	Channel3	Channel4	Channel5	Channel6
N°1	902.1375	902.1625	902.1875	902.2125	902.2375	902.2625
N°2	902.4375	902.4625	902.4875	902.5125	902.5375	902.5625
N°3	902.7375	902.7625	902.7875	902.8125	902.8375	902.8625
N°4	903.0375	903.0625	903.0875	903.1125	903.1375	903.1625
N°5	903.3375	903.3625	903.3875	903.4125	903.4375	903.4625
N°6	903.6375	903.6625	903.6875	903.7175	903.7375	903.7625
N°7	903.9375	903.9625	903.9875	904.0125	904.0375	904.0625
N°8	904.2375	904.2625	904.2875	904.3125	904.3375	904.3625
N°9	904.5375	904.5625	904.5875	904.6125	904.6375	904.6625

Modulation Type**Worst Case Modulation**

600bps	<input checked="" type="checkbox"/>
100bps	<input type="checkbox"/>

Hardware information

Software (if applicable):raspiCEM_csm_certification	V. :	1.0.28
The order power is set at 22dBm.		



2.3. RUNNING MODE

Test mode	Description of test mode
Test mode 1	Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
Test mode 2	Permanent emission with modulation & hopping in the data rate that produced the highest power
Test mode 3	Permanent reception

Test	Running mode	
Occupied Bandwidth	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
20dB Bandwidth	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Number of Hopping Frequency	<input checked="" type="checkbox"/> Test mode 2 (1)	<input type="checkbox"/> Alternative test mode()
Carrier Frequency Separation	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Time of Occupancy	<input checked="" type="checkbox"/> Test mode 2 (1)	<input type="checkbox"/> Alternative test mode()
Duty Cycle	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Maximum Conducted Output Power	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Conducted Spurious Emission at the Band Edge	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Unwanted Emissions into Non-Restricted Frequency Bands	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
AC Power Line Conducted Emission	<input checked="" type="checkbox"/> Test mode 2 (1)	<input type="checkbox"/> Alternative test mode()
Unwanted Emissions into Restricted Frequency Bands	<input checked="" type="checkbox"/> Test mode 1 (1)	<input type="checkbox"/> Alternative test mode()
Receiver Radiated emissions	<input checked="" type="checkbox"/> Test mode 3 (1)	<input type="checkbox"/> Alternative test mode()

(1) Following commands with the specific test software "X" are used to set the product:
 a. – See document "X"(provided by customer) for the command used during test.

2.4. EQUIPMENT LABELLING

None

2.5. EQUIPMENT MODIFICATION

None Modification:



3. HOPPING : OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Gaetan DESCHAMPS
Date of test : July 21, 2020
Ambient temperature : 23 °C
Relative humidity : 32 %

3.2. TEST SETUP

- The Equipment Under Test is installed:

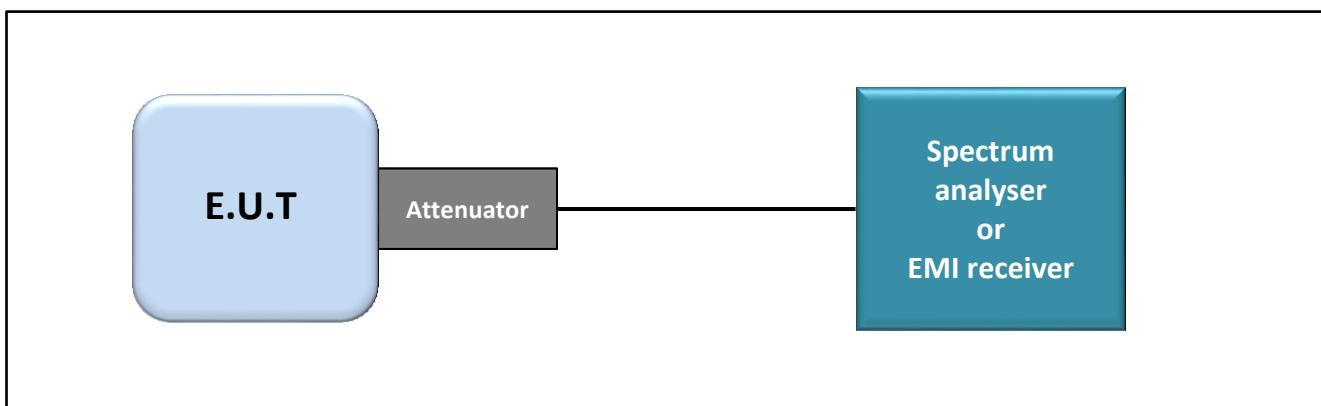
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

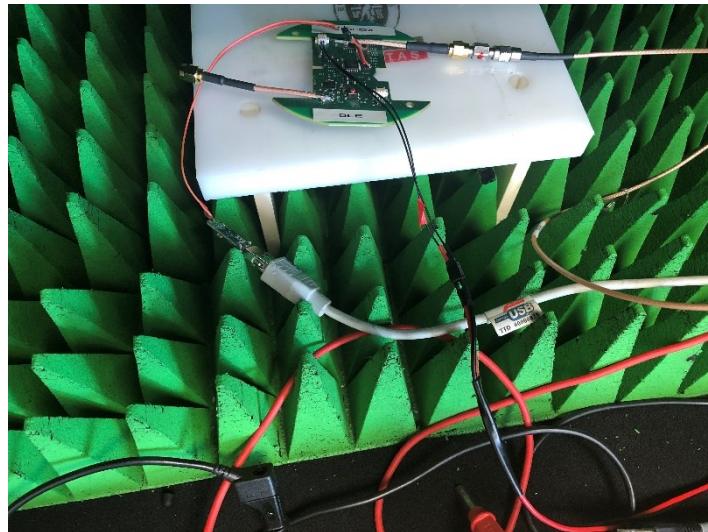
- Conducted Method
- Radiated Method

- Test Procedure:

- RSS-Gen Issue 5 § 6.7
- ANSI C63.10 § 6.9.2



Test set up



Photograph for Occupied bandwidth

3.3. LIMIT

None

3.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
CABLE SMA 1m	RADIALL	18GHz	A5329862	11/18	05/20
DC POWER SUPPLY 20V	HEWLETT PACKARD	6632A	A7042061		
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/21	05/23
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	06/20
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	05/20

Note: In our quality system, the test equipment calibration due is more & less 4 months



L C I E

3.5. RESULTS

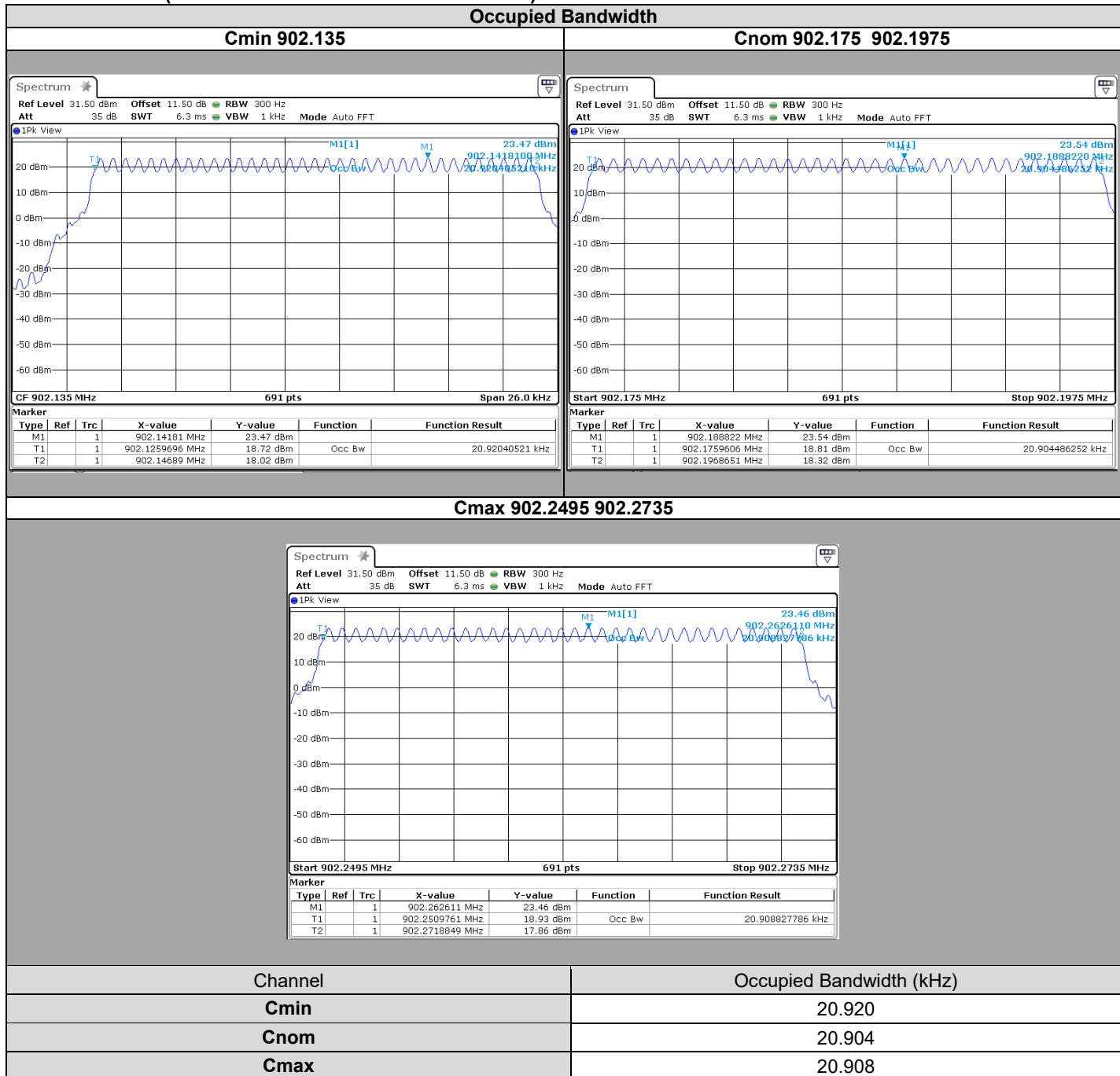
Macro channels:

Occupied Bandwidth	
Cmin	Cnom
<p>Spectrum</p> <p>Ref Level 31.50 dBm Offset 11.50 dB RBW 3 kHz Att 35 dB SWT 631.6 μs VBW 10 kHz Mode Auto FFT</p> <p>1Pk Max</p> <p>CF 902.1875 MHz 691 pts Span 500.0 kHz</p>	<p>Spectrum</p> <p>Ref Level 31.50 dBm Offset 11.50 dB RBW 3 kHz Att 35 dB SWT 631.6 μs VBW 10 kHz Mode Auto FFT</p> <p>1Pk View</p> <p>CF 903.420790 MHz 691 pts Span 500.0 kHz</p>
Cmax	
<p>Spectrum</p> <p>Ref Level 31.50 dBm Offset 11.50 dB RBW 3 kHz Att 35 dB SWT 631.6 μs VBW 10 kHz Mode Auto FFT</p> <p>1Pk View</p> <p>CF 904.615720 MHz 691 pts Span 500.0 kHz</p>	
Channel	Occupied Bandwidth (kHz)
Cmin	147.612
Cnom	148.335
Cmax	147.612



L C I E

Micro channels (realized on Cmin of Macro-channels):



3.6. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **CSM WX SENSOR-YC-SR-YPA-CC-2B**, SN: **SCC13**, in configuration and description presented in this test report, show levels compliant to the **47 CFR PART 15.247 & RSS-GEN ISSUE 5** limits.



4. HOPPING : 20dB EMISSION BANDWIDTH

4.1. TEST CONDITIONS

Test performed by : Gaetan DESCHAMPS
Date of test : July 21, 2020
Ambient temperature : 23 °C
Relative humidity : 32 %

4.2. TEST SETUP

- The Equipment Under Test is installed:

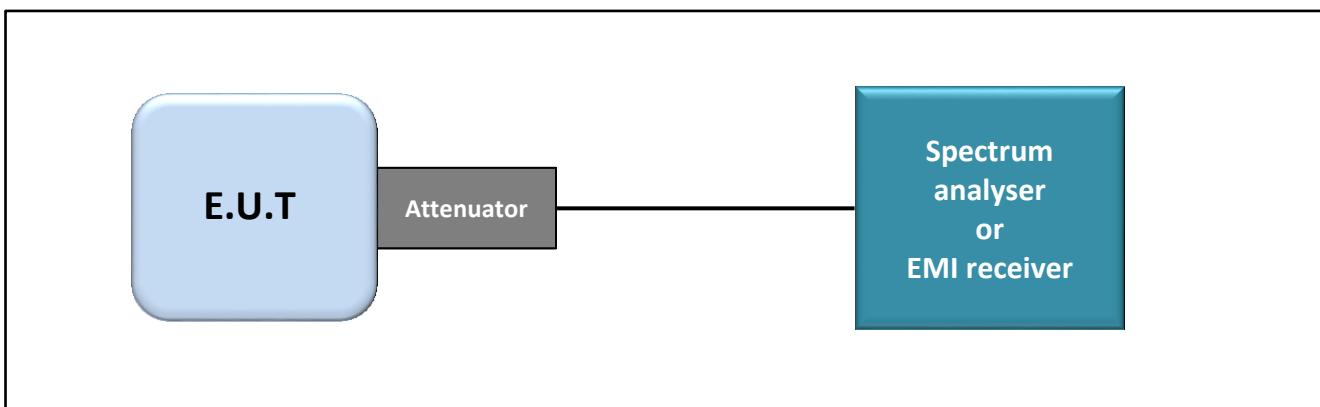
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

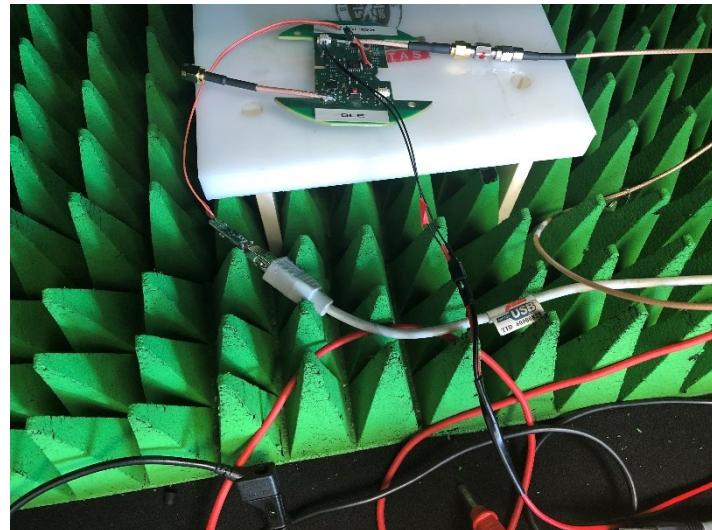
- ANSI C63.10 § 6.9.2



Test set up



L C I E



Photograph for 20dB emission bandwidth

4.3. LIMIT

There is no limit for Hopping system

4.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
CABLE SMA 1m	RADIALL	18GHz	A5329862	11/18	05/20
DC POWER SUPPLY 20V	HEWLETT PACKARD	6632A	A7042061		
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/21	05/23
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	06/20
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	05/20

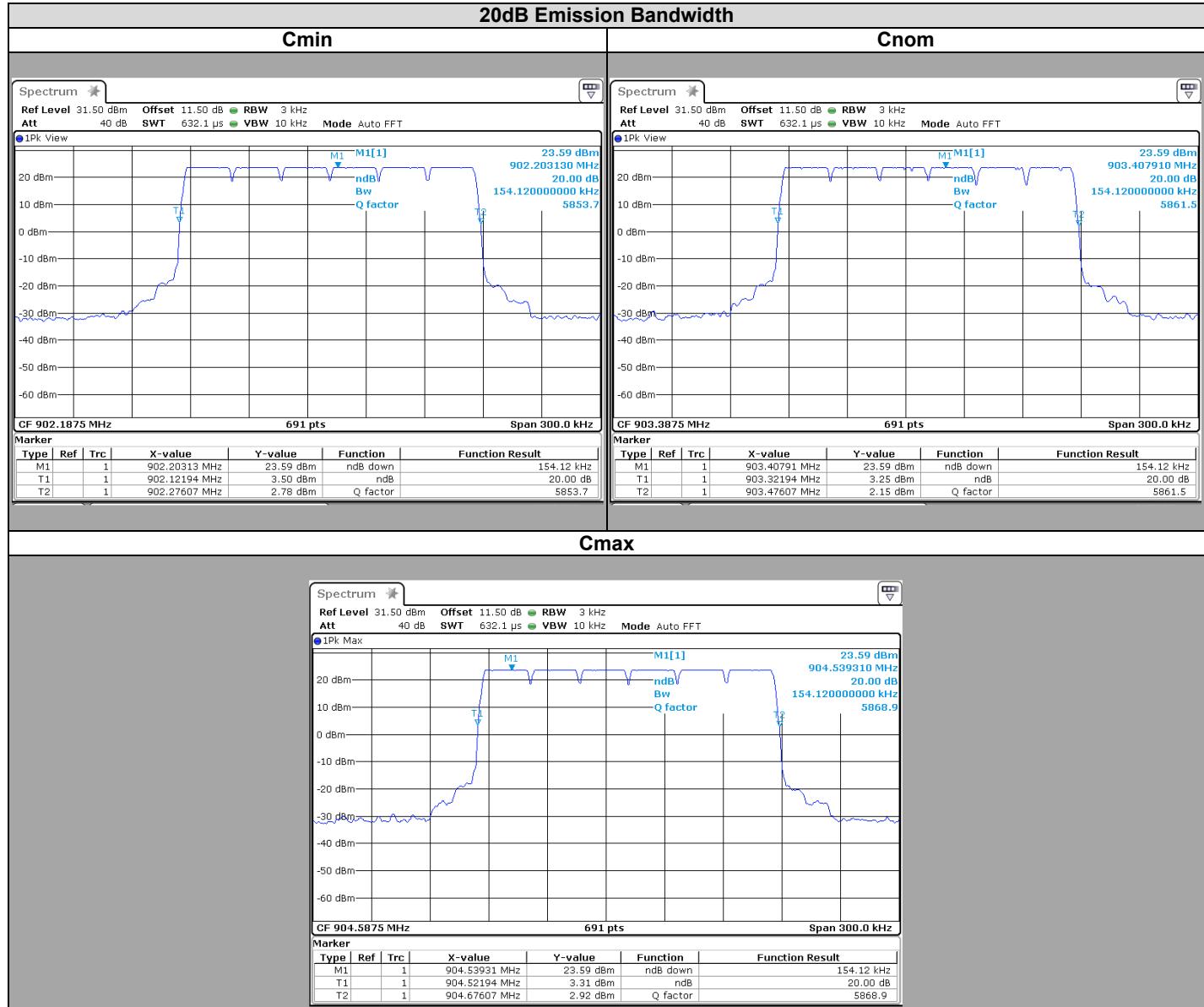
Note: In our quality system, the test equipment calibration due is more & less 4 months



L C I E

4.5. RESULTS

Macro channels:



Channel	6dB Emission Bandwidth (Hz)	Limit (Hz)
Cmin	154.120	None
Cnom	154.120	None
Cmax	154.120	None



L C I E

Micro channels (realized on Cmin of Macro-channels):



4.6. CONCLUSION

6dB Emission Bandwidth measurement performed on the sample of the product **CSM WX SENSOR-YC-SR-YPA-CC-2B**, SN: **SCC13**, 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. HOPPING : NUMBER OF HOPPING FREQUENCY

5.1. TEST CONDITIONS

Test performed by : Gaetan DESCHAMPS
Date of test : July 22, 2020
Ambient temperature : 23 °C
Relative humidity : 32 %

5.2. TEST SETUP

- The Equipment Under Test is installed:

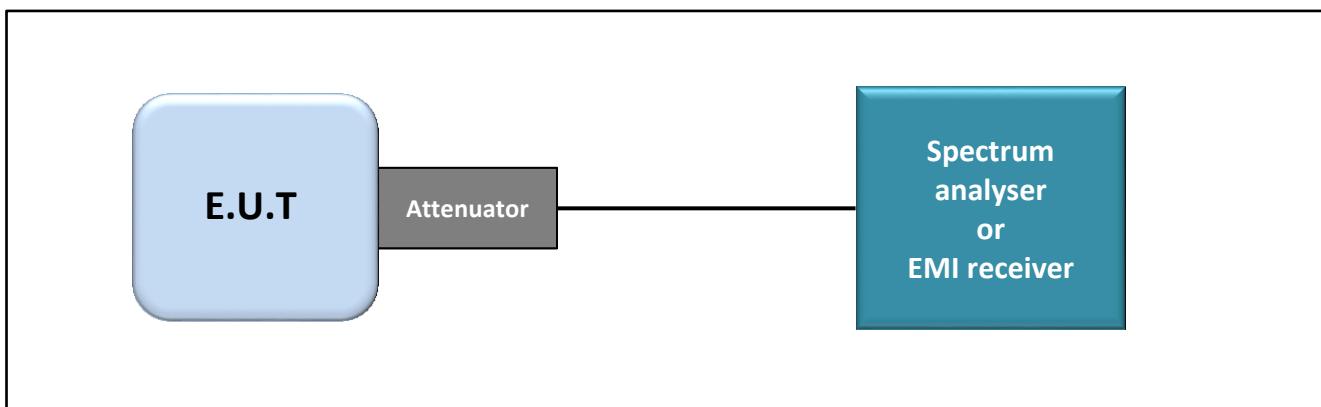
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

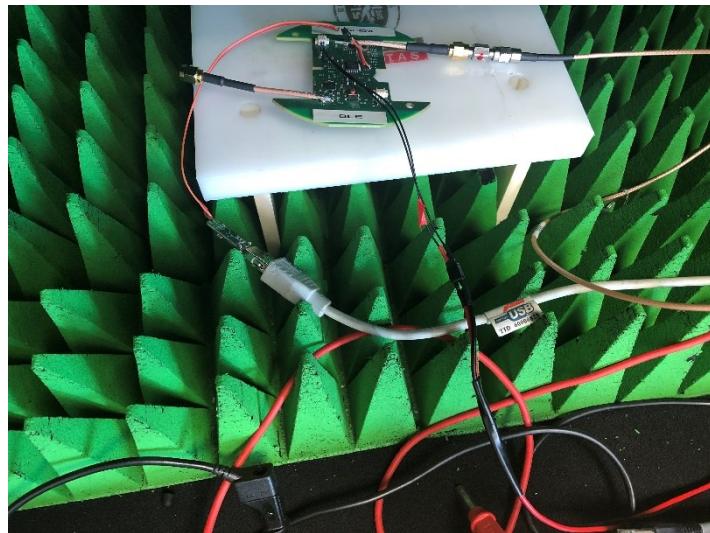
- ANSI C63.10 § 7.8.3



Test set up



L C I E



Photograph for Number of Frequency Hopping

5.1. LIMIT

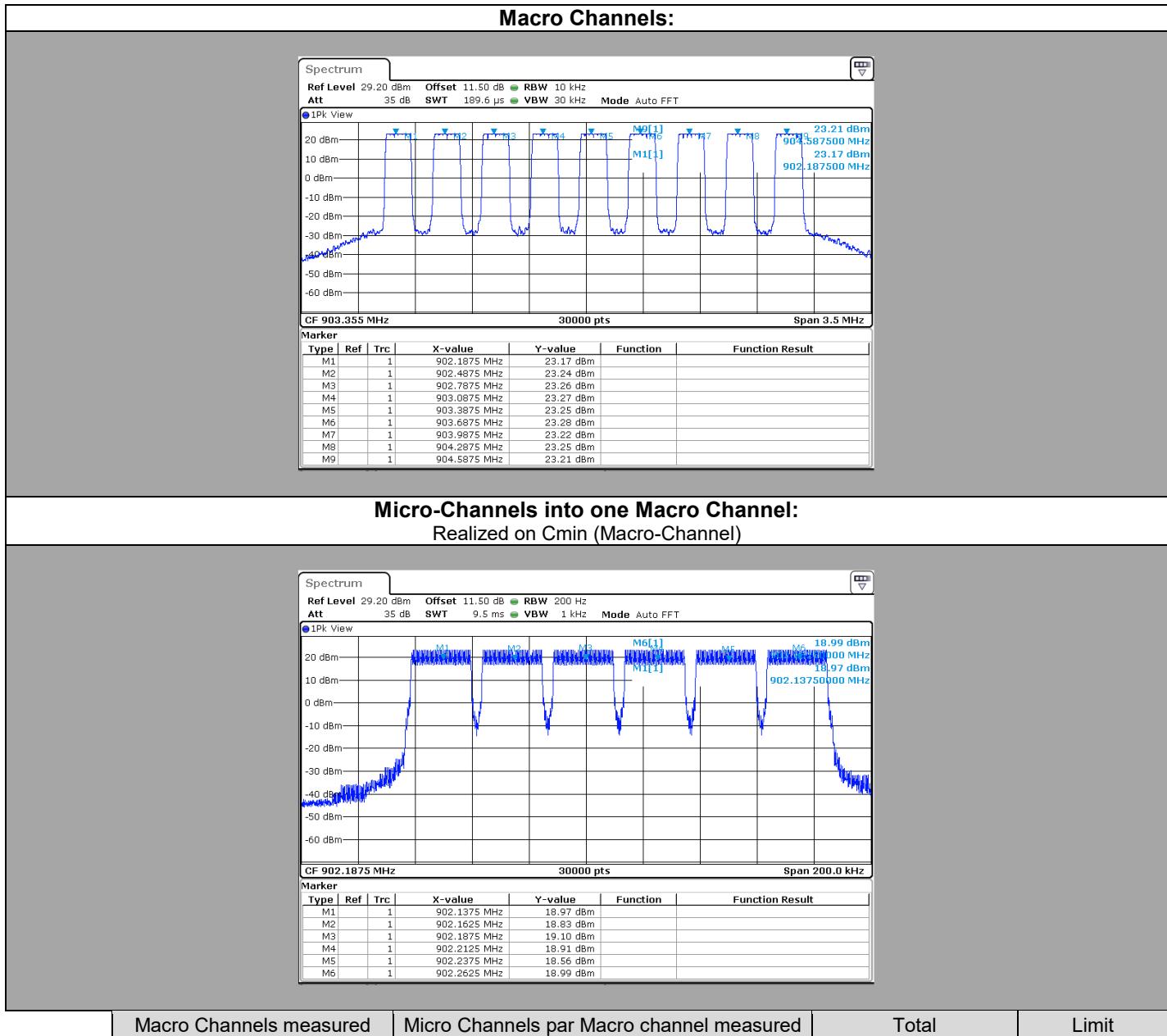
Number of Hopping Frequencies shall be at least 50 channels if 20dB bandwidth is less than 250kHz

5.2. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
CABLE SMA 1m	RADIALL	18GHz	A5329862	11/18	05/20
DC POWER SUPPLY 20V	HEWLETT PACKARD	6632A	A7042061		
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/21	05/23
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	06/20
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	05/20

Note: In our quality system, the test equipment calibration due is more & less 4 months

5.3. RESULTS



5.4. CONCLUSION

Number of Frequency Hopping measurement performed on the sample of the product **CSM WX SENSOR-YC-SR-YPA-CC-2B**, SN: **SCC13**, in configuration and description presented in this test report, show levels compliant to the **47 CFR PART 15.247 & RSS-GEN ISSUE 4** limits.



6. HOPPING : CARRIER FREQUENCY SEPARATION

6.1. TEST CONDITIONS

Test performed by : Gaetan DESCHAMPS
Date of test : July 22, 2020
Ambient temperature : 23 °C
Relative humidity : 32 %

6.2. TEST SETUP

- The Equipment Under Test is installed:

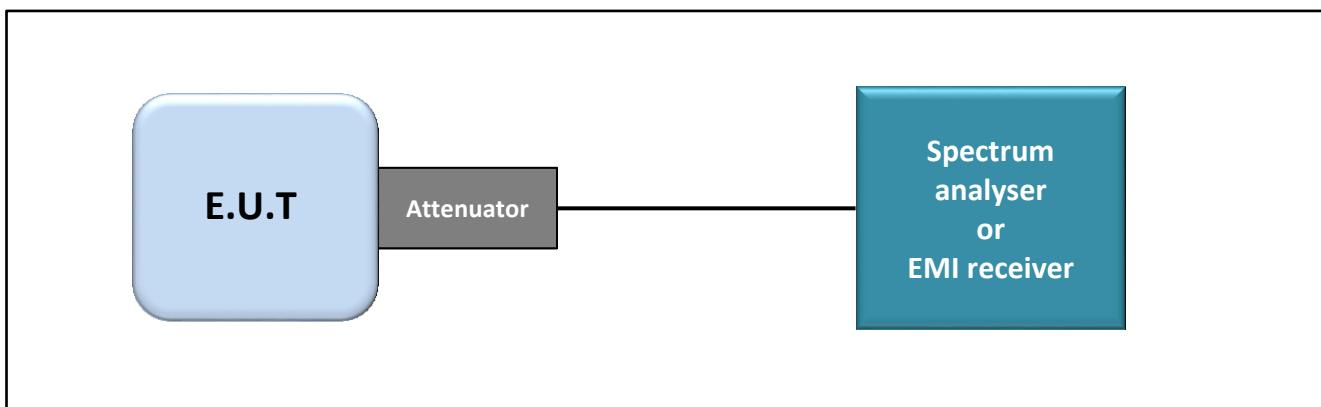
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

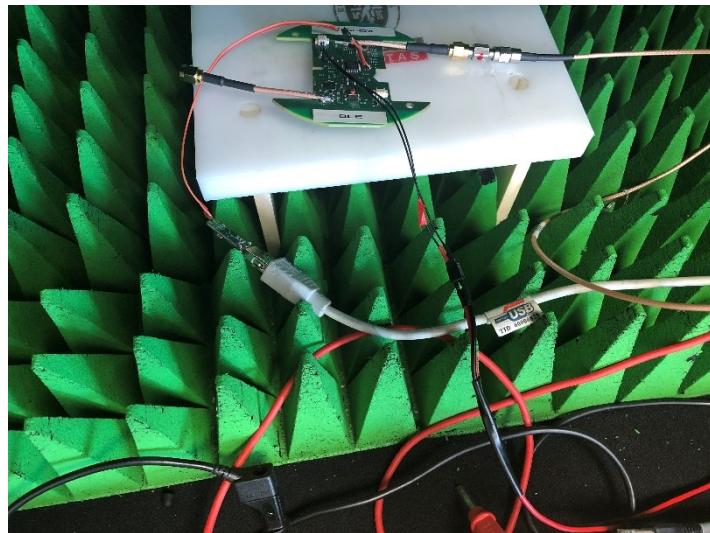
- ANSI C63.10 § 7.8.2



Test set up



L C I E



Photograph for Carrier Frequency Separation

6.3. LIMIT

Carrier Frequency Separation shall be at 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

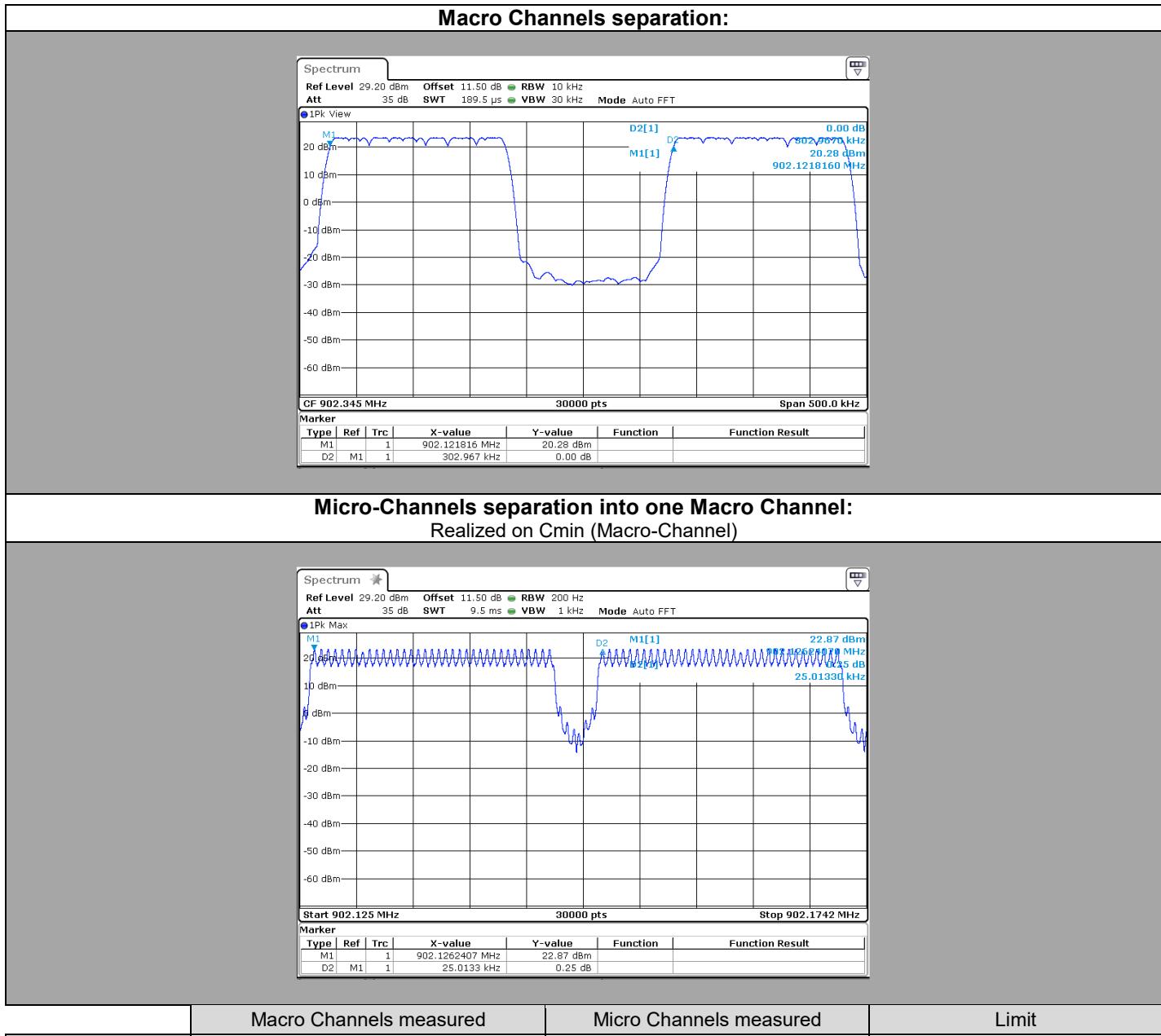
6.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
CABLE SMA 1m	RADIALL	18GHz	A5329862	11/18	05/20
DC POWER SUPPLY 20V	HEWLETT PACKARD	6632A	A7042061		
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/21	05/23
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	06/20
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	05/20

Note: In our quality system, the test equipment calibration due is more & less 4 months



6.5. RESULTS



6.6. CONCLUSION

Carrier Frequency Separation measurement performed on the sample of the product **CSM WX SENSOR-YC-SR-YPA-CC-2B**, SN: **SCC13**, in configuration and description presented in this test report, show levels compliant to the **47 CFR PART 15.247 & RSS-GEN ISSUE 4** limits.



7. HOPPING : TIME OF OCCUPANCY

7.1. TEST CONDITIONS

Test performed by : Gaetan DESCHAMPS
Date of test : July 22, 2020
Ambient temperature : 23 °C
Relative humidity : 32 %

7.2. TEST SETUP

- The Equipment Under Test is installed:

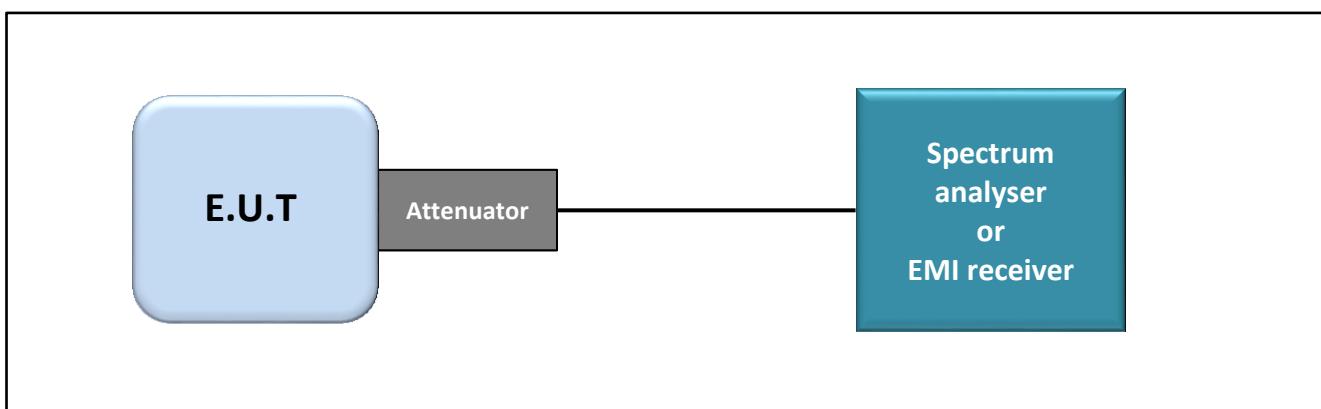
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

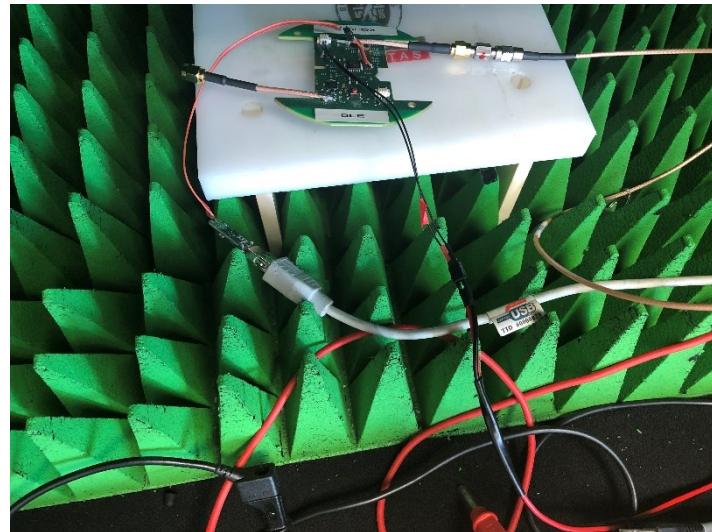
- Conducted Method
- Radiated Method

- Test Procedure:

- ANSI C63.10 § 7.8.4



Test set up



Photograph for Time of Occupancy

7.3. LIMIT

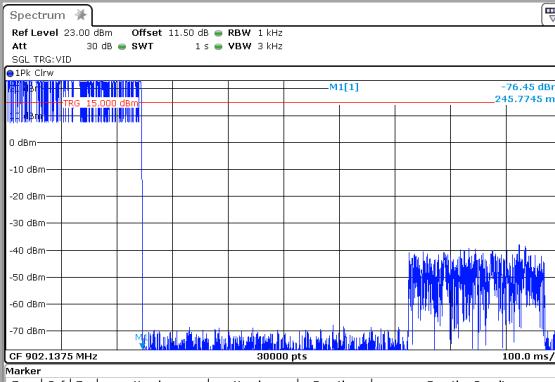
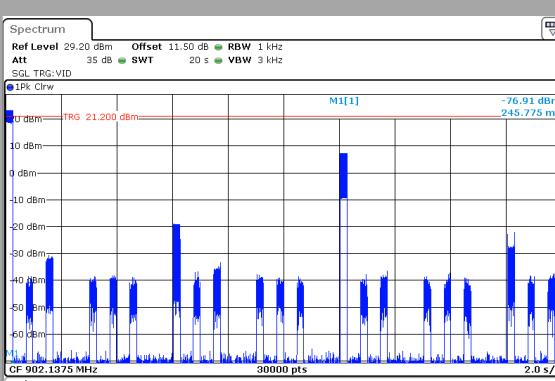
The Time of Occupancy shall not exceed 0.4s within a 20 seconds period if 20dB bandwidth is less than 250kHz

7.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
CABLE SMA 1m	RADIALL	18GHz	A5329862	11/18	05/20
DC POWER SUPPLY 20V	HEWLETT PACKARD	6632A	A7042061		
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/21	05/23
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	06/20
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	05/20

Note: In our quality system, the test equipment calibration due is more & less 4 months

7.5. RESULTS

Burst Length Cmin (Micro-channel)				
				
Time of Occupancy Cmin (Micro-channel)				
				
Channel	Burst Length (ms)	Number of Hopping during Time of Occupancy	Time of Occupancy (ms)	Limit of Time of Occupancy (ms)
Cmin	245.7745	1	245.7745	20 000

7.6. CONCLUSION

Time of Occupancy measurement performed on the sample of the product **CSM WX SENSOR-YC-SR-YPA-CC-2B**, SN: **SCC13**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS-GEN ISSUE 4** limits.



8. HOPPING : MAXIMUM CONDUCTED OUTPUT POWER

8.1. TEST CONDITIONS

Test performed by : Gaetan DESCHAMPS
Date of test : August 5, 2020
Ambient temperature : 22 °C
Relative humidity : 36 %

8.2. TEST SETUP

- The Equipment Under Test is installed:

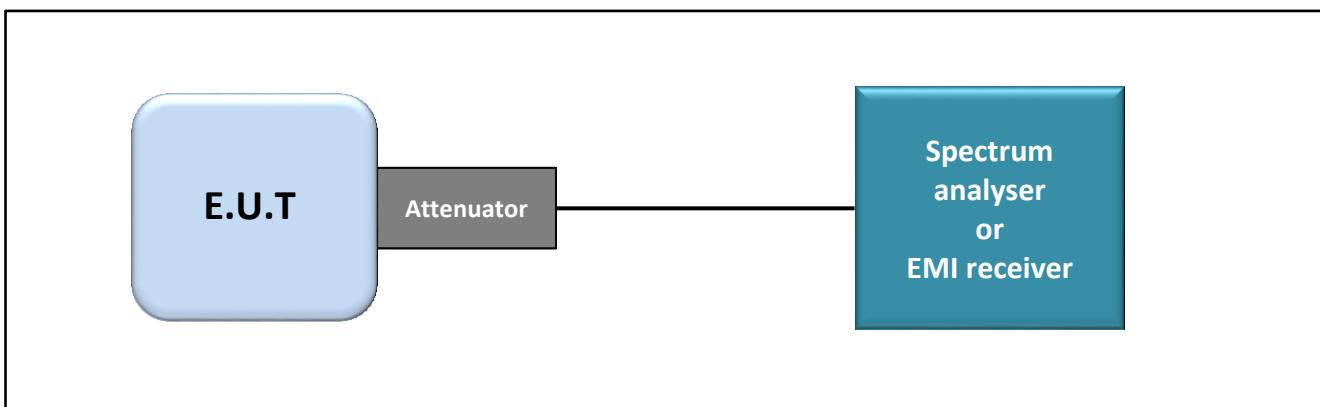
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

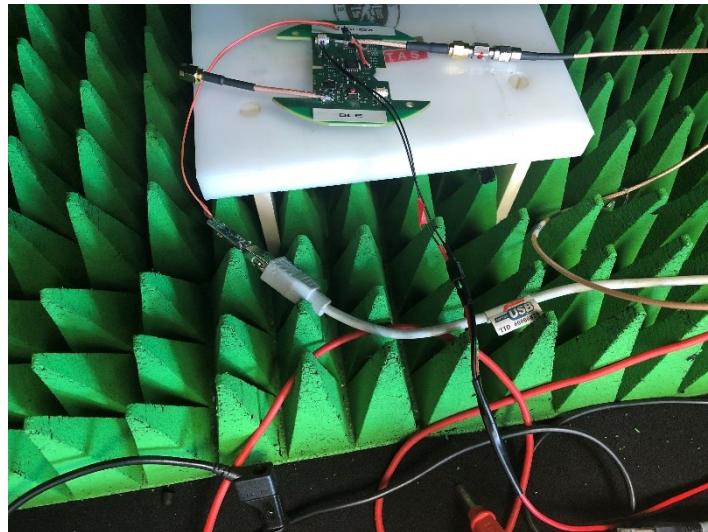
- Conducted Method
- Radiated Method

- Test Procedure:

- ANSI C63.10 § 7.8.5



Test set up



Photograph for Maximum Conducted Output Power

8.3. LIMIT

Maximum Conducted Output power:

Shall not exceed 30dBm if number of hopping channels is above 50
 Limits are reduced by G-6dBi if Antenna Gain above 6dBi

8.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
CABLE SMA 1m	RADIALL	18GHz	A5329862	11/18	05/20
DC POWER SUPPLY 20V	HEWLETT PACKARD	6632A	A7042061		
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/21	05/23
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	06/20
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	05/20

Note: In our quality system, the test equipment calibration due is more & less 4 months



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8.5. RESULTS



8.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **CSM WX SENSOR-YC-SR-YPA-CC-2B**, SN: **SCC13**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.



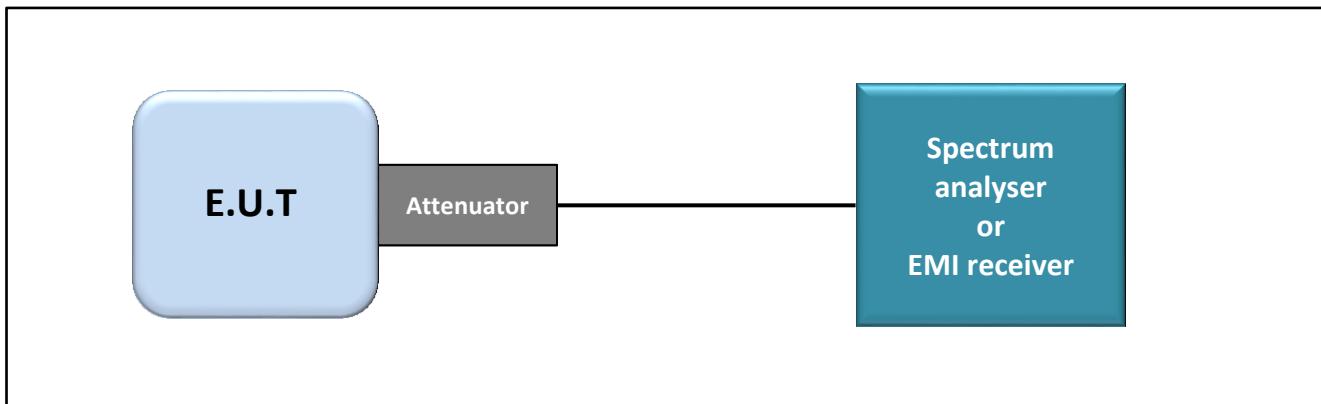
9. HOPPING : UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE

9.1. TEST CONDITIONS

Test performed by : Gaetan DESCHAMPS
Date of test : July 22, 2020
Ambient temperature : 23 °C
Relative humidity : 32 %

9.2. TEST SETUP

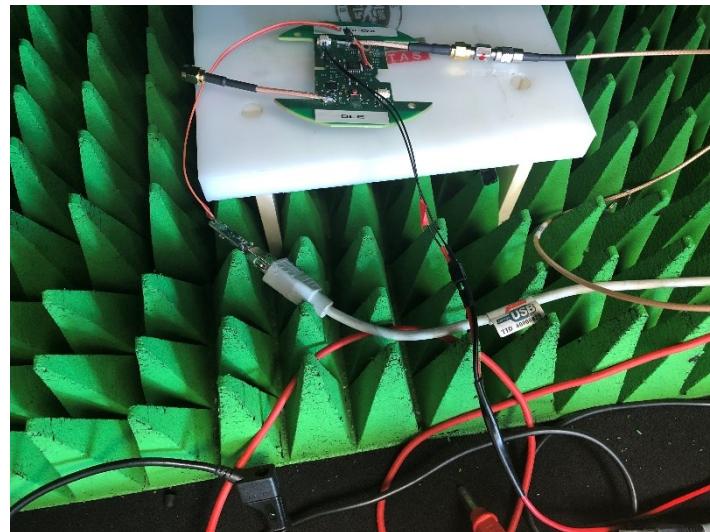
- The Equipment Under Test is installed:
 - On a table
 - In an anechoic chamber
- Measurement is performed with a spectrum analyzer in:
 - Conducted Method
 - Radiated Method
- Test Procedure:
 - ANSI C63.10 § 7.8.6



Test set up



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

9.3. LIMIT

All Spurious Emissions must be at least 20dB below the Fundamental Radiator Level at the Band Edge Edge "902MHz & 928MHz"

9.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
CABLE SMA 1m	RADIALL	18GHz	A5329862	11/18	05/20
DC POWER SUPPLY 20V	HEWLETT PACKARD	6632A	A7042061		
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/21	05/23
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	06/20
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	05/20

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

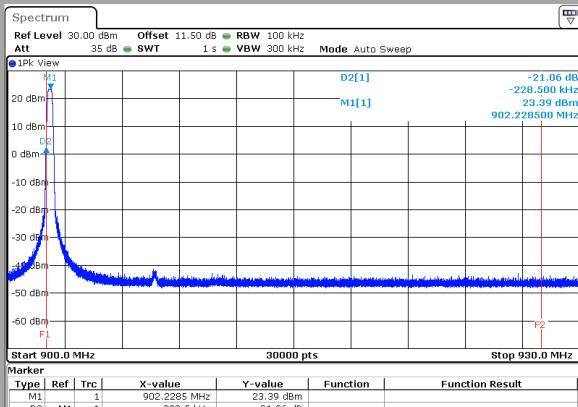


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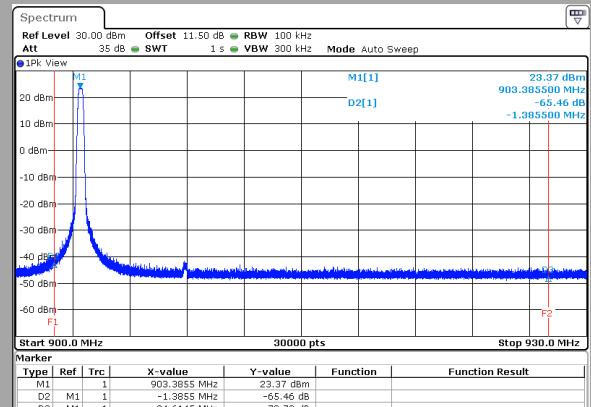
9.5. RESULTS

Single Frequency

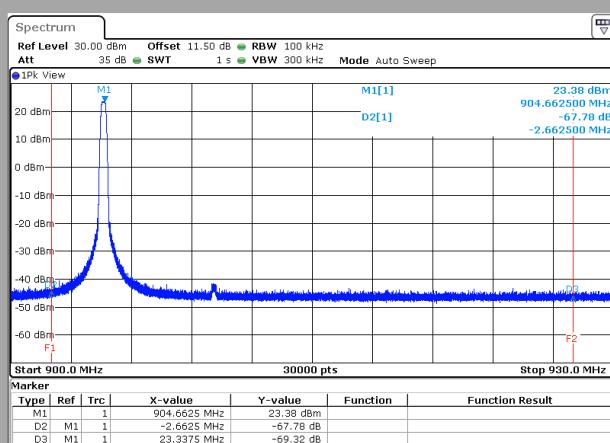
Cmin



Cnom



Cmax



Frequency (MHz)

Level (dBc)

Limit (dBc)

902

21.36 (worst case)

20

928

69.32 (worst case)

20

9.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **CSM WX SENSOR-YC-SR-YPA-CC-2B**, SN: **SCC13**, 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. HOPPING : UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

10.1. TEST CONDITIONS

Test performed by : Gaetan DESCHAMPS
Date of test : July 22, 2020
Ambient temperature : 23 °C
Relative humidity : 32 %

10.2. TEST SETUP

- The Equipment Under Test is installed:

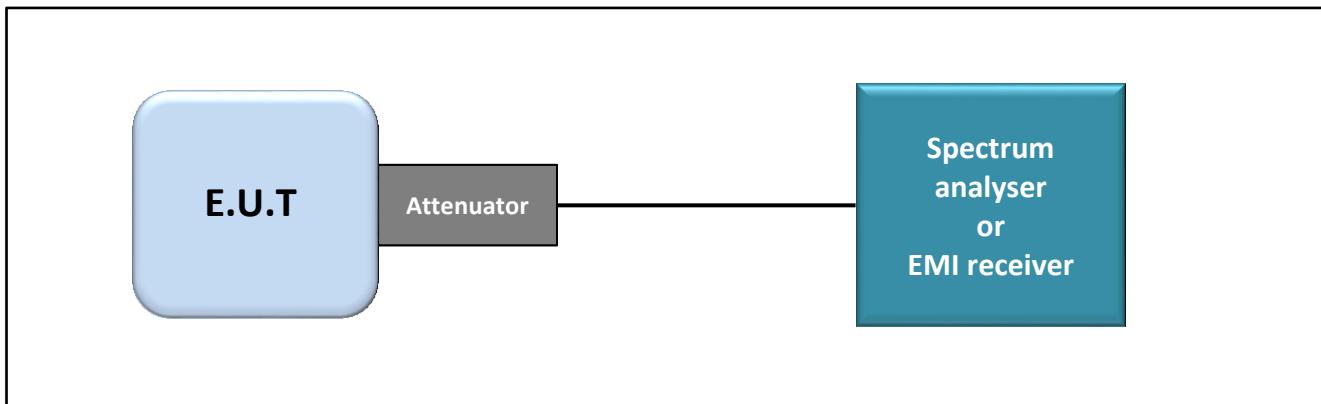
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

- ANSI C63.10 § 7.8.8



Test set up



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Photograph for Unwanted Emission into non-restricted frequency bands

10.3. LIMIT

All Spurious Emissions must be at least 20dB below the Fundamental Radiator Level

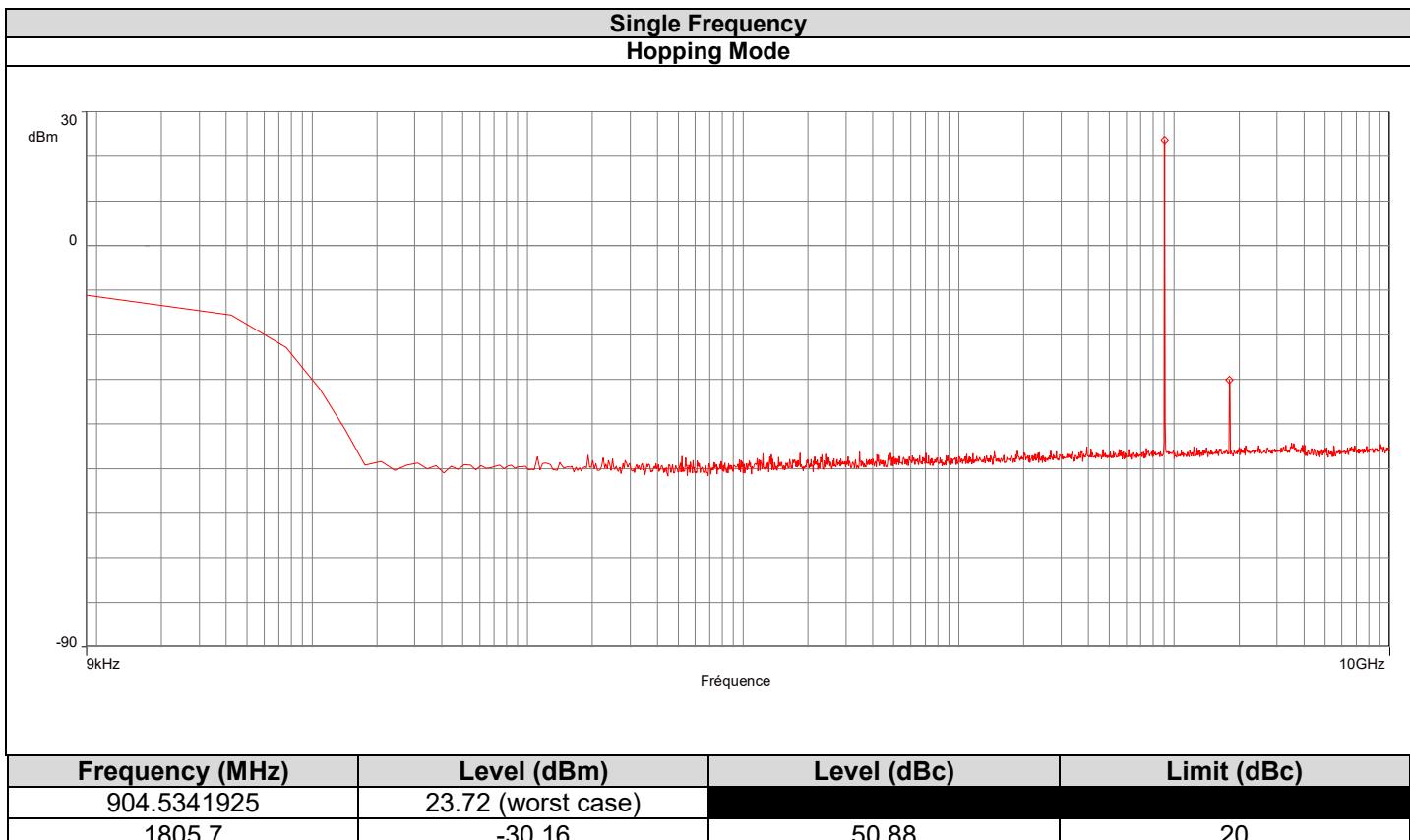
10.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	06/20
Cable Measure	—	36G	A5329604	02/19	08/20
POWER SUPPLY DC 20V	SODILEC	SDRI 205	A7040058		
BAT EMC	NEXIO	v3.19.1.23	L1000115		
Comb EMR HF	YORK	CGE01	A3169114		
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	09/19	09/21

Note: In our quality system, the test equipment calibration due is more & less 4 months



10.5. RESULTS



10.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **CSM WX SENSOR-YC-SR-YPA-CC-2B**, SN: **SCC1**, 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. HOPPING : UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

11.1. TEST CONDITIONS

Test performed by : Gaetan DESCHAMPS
 Date of test : July 22, 2020
 Ambient temperature : 23 °C
 Relative humidity : 32 %

11.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013) and FCC part 15 subpart C.

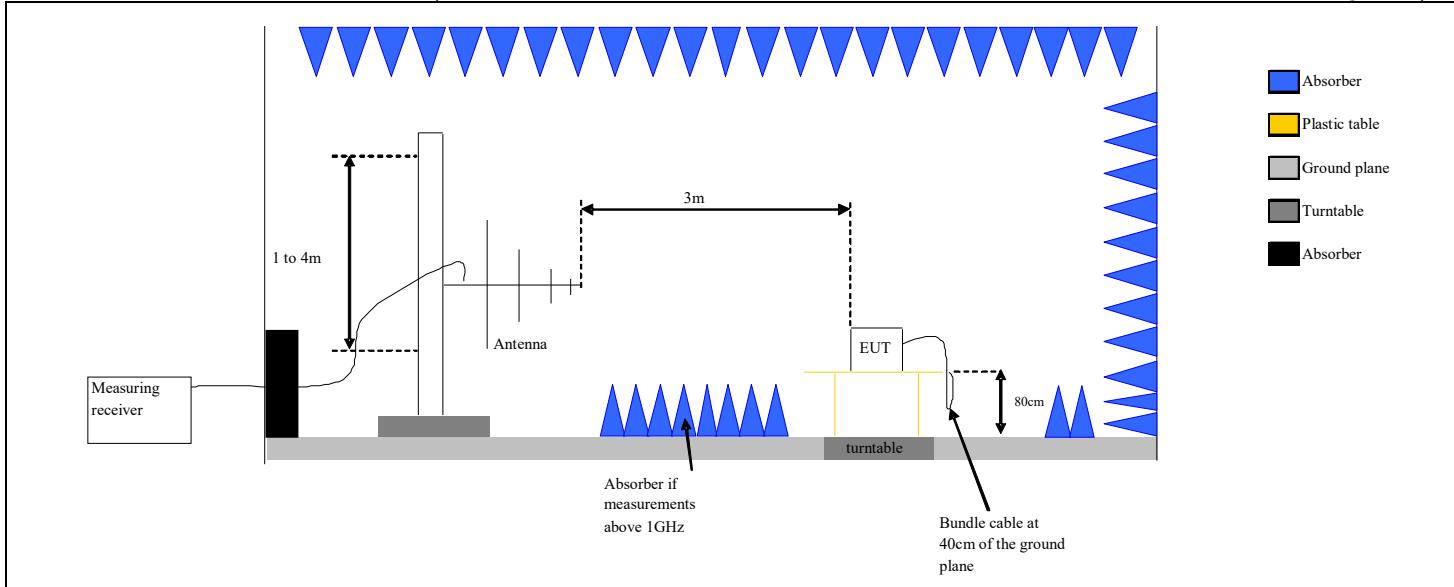
Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration. Antenna height was 1m. The EUT is placed **on an open area test site**. Distance between measuring antenna and the EUT is **10m**.

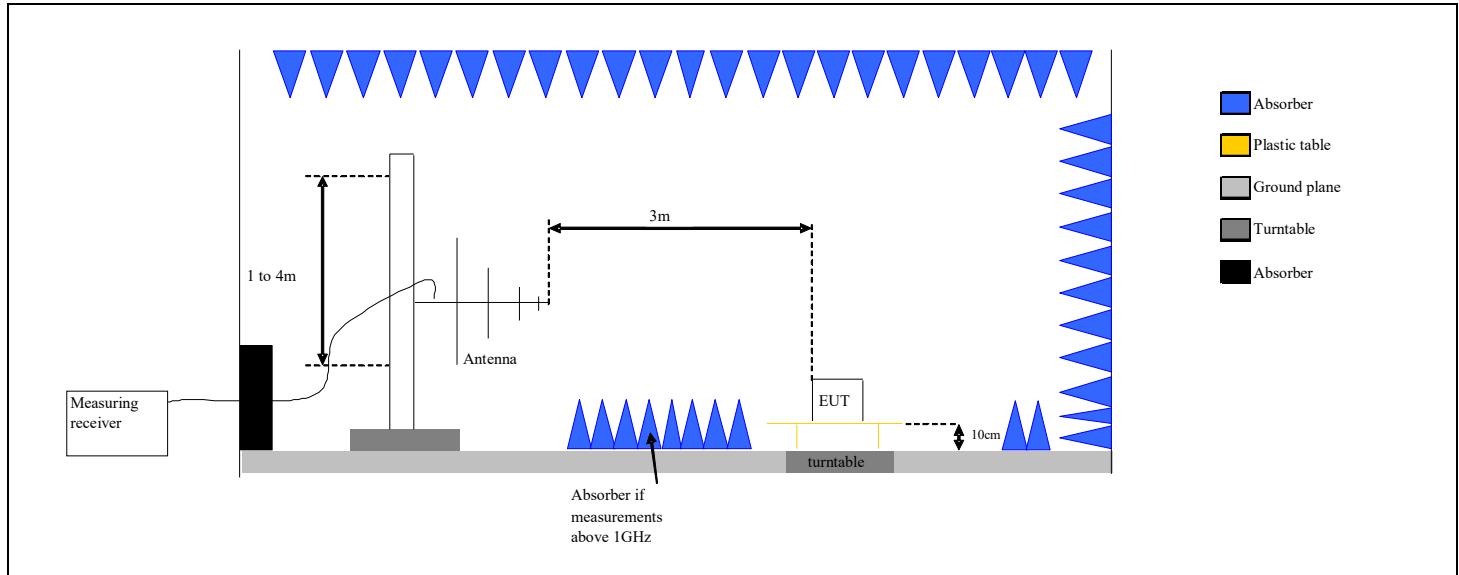
Test is performed in horizontal (H) and vertical (V) polarization with **biconic** and **bilog** between 30MHz & 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration. The EUT is place at 1.5m high above 1GHz and at 0.8m high under 1GHz. The EUT is placed **in a full anechoic chamber** above 1GHz and **on an open area test site** from 30MHz to 1GHz. Distance between measuring antenna and the EUT is **10m**.

The height antenna is varied from 1m to 4m from 30MHz to 1GHz and above 1GHz is :

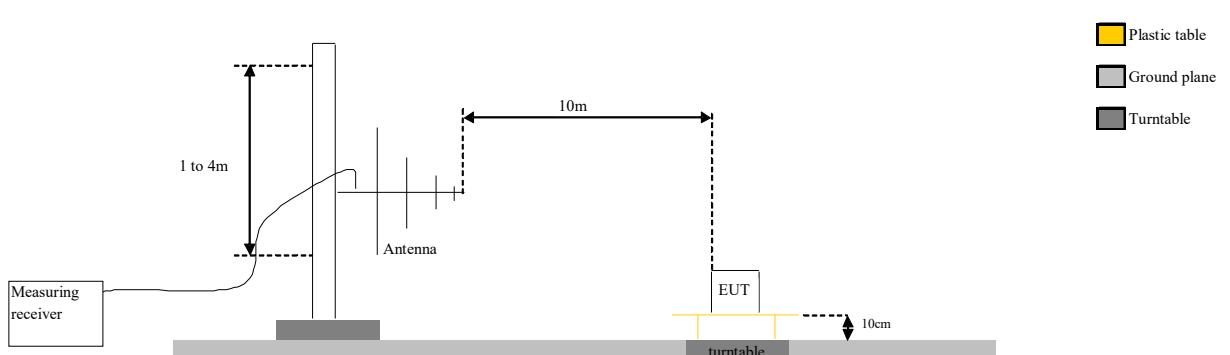
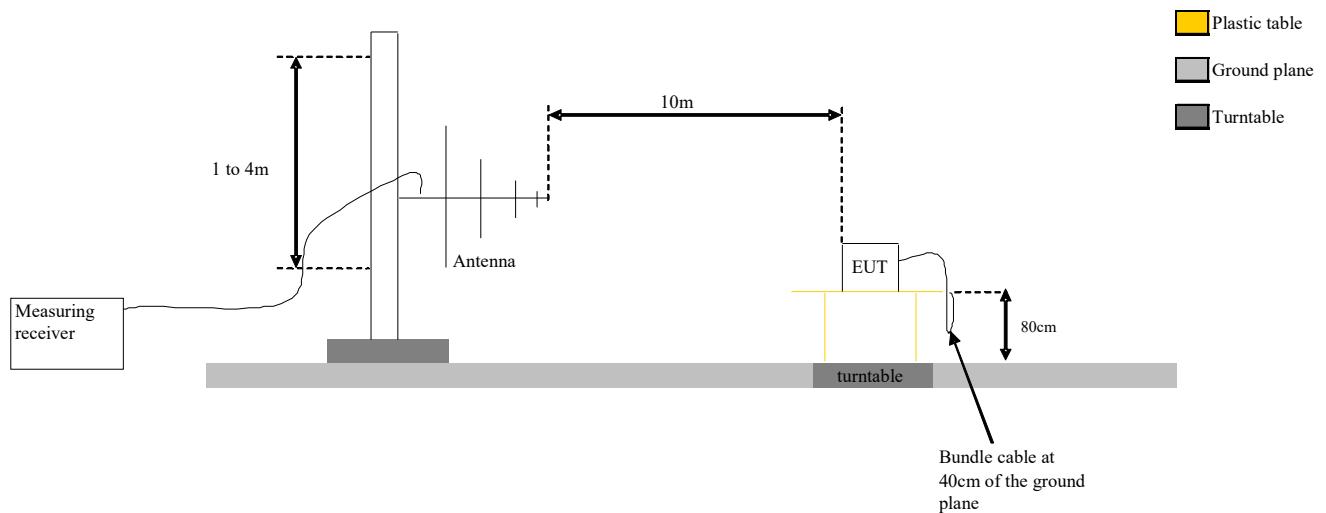
On mast, varied from 1m to 4m

Fixed and centered on the EUT (EUT smaller than the bandwidth of the measurement antenna, ANSI C63.10 §6.6.5)





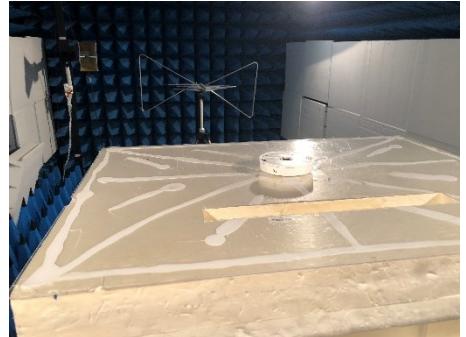
Test set up of Unwanted Emissions in Restricted Frequency Bands in semi anechoic chamber



Test Set up for radiated measurement in open area test site



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Test setup in Axis XY (one position declared)



Photograph for Unwanted Emission in restricted frequency bands

11.3. LIMIT

Measure at 300m

Frequency range	Level	Detector
9kHz-490kHz	67.6dB μ V/m /F(kHz)	QPeak

Measure at 30m

Frequency range	Level	Detector
490kHz-1.705MHz	87.6dB μ V/m /F(kHz)	QPeak
1.705MHz-30MHz	29.5dB μ V/m	QPeak



LCIE

Measure at 10m

Frequency range	Level	Detector
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	63.5dB μ V/m 43.5dB μ V/m	Peak Average

Measure at 3m

Frequency range	Level	Detector
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 54dB μ V/m	Peak Average

11.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Amplifier 9kHz - 40GHz	LCIE SUD EST	—	A7102082	06/20	06/21
Antenna Bi-Log	CHASE	UPA6192	C2040221	01/18	01/20
Antenna horn 18GHz	EMCO	3115	C2042029	09/17	09/20
BAT EMC	NEXIO	v3.19.1.23	L1000115		
Comb EMR HF	YORK	CGE01	A3169114		
Emission Cable (SMA 1m)	TELEDYNE	26GHz	A5329874	01/19	07/20
Emission Cable (SMA 3.3m)	TELEDYNE	26GHz	A5329875	01/19	07/20
Emission Cable (SMA 30cm)	TELEDYNE	26GHz	A5329873	01/19	07/20
Emission Cable <1GHz (Ampl <-> Cage)	-	18GHz	A5329562	08/19	08/20
Emission Cable <1GHz (Ampl <-> Cage)	-	18GHz	A5329907	08/19	08/20
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20
Rehausse Table C3	LCIE	—	F2000507		
Rehausse Table C3	LCIE	—	F2000511		
Semi-Anechoic chamber #3 (BF)	SIEPEL	—	D3044017_BF	12/19	12/22
Semi-Anechoic chamber #3 (VSWR)	SIEPEL	—	D3044017_VSWR	12/19	12/22
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	09/19	09/21
Table C3	LCIE	—	F2000461		
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	10/18	10/20
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371		



Turtable controller (Cage#3)	ETS Lingren	Model 2090	F2000444		
High Pass (1-15GHz)	WAINRIGHT	WHKX 1.03/15G-10SS	A7484035	08/19	08/20

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:



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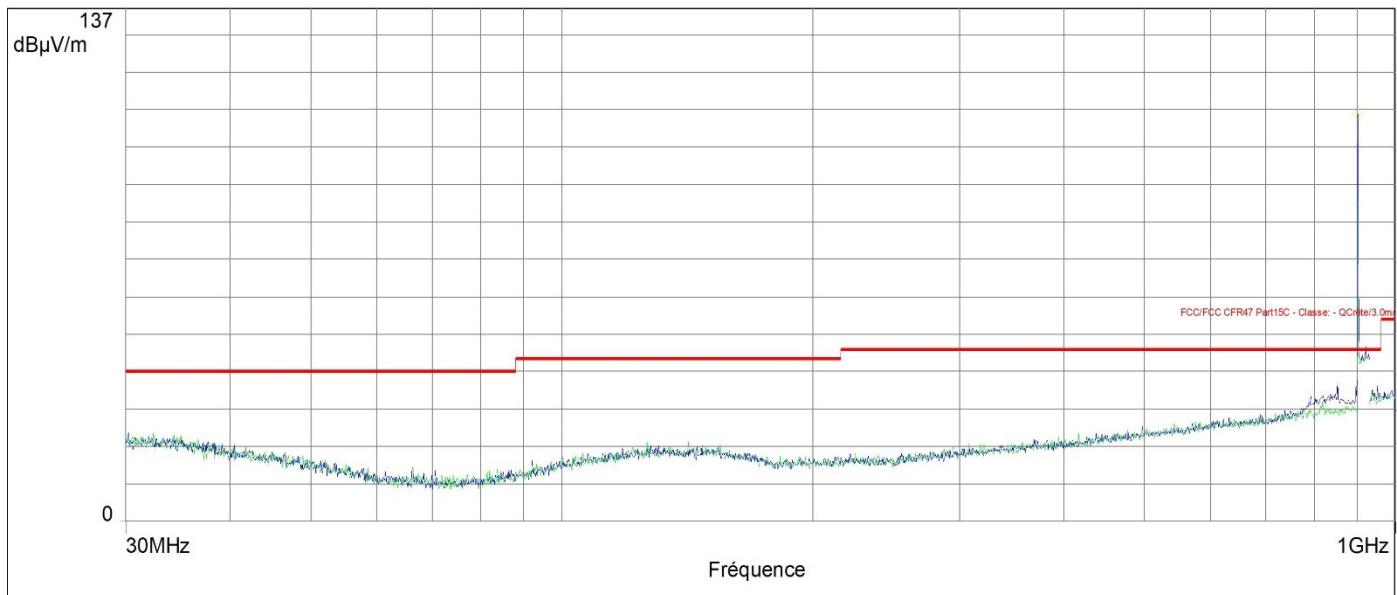
11.6. RESULTS

Results in the frequency band [0.009-30] MHz:

No significant frequency observed due to RF module (See test results in §10.5).

RADIATED EMISSIONS			
Graph name:	Emr#1		
Limit:	FCC CFR47 Part15C		
Class:	(H+V) - CMin - TX mode - Axis XY		
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	RBW :	100kHz
Azimuth:	0° - 360°	VBW :	300kHz

— FCC/FCC CFR47 Part15C - Classe: - Moyenne/3.0m/
— FCC/FCC CFR47 Part15C - Classe: - QCrête/3.0m/
— FCC/FCC CFR47 Part15C - Classe: - Crête/3.0m/
○ Niveau (Suspect Manuel) (Horizontale)
— Mes.RMS (Horizontale)
— Mes.RMS (Verticale)



Spurious emissions

Frequency (MHz)	Peak Level (dB μ V/m)	Polarization	Correction (dB)
902.18	108.8	Horizontal	27.6

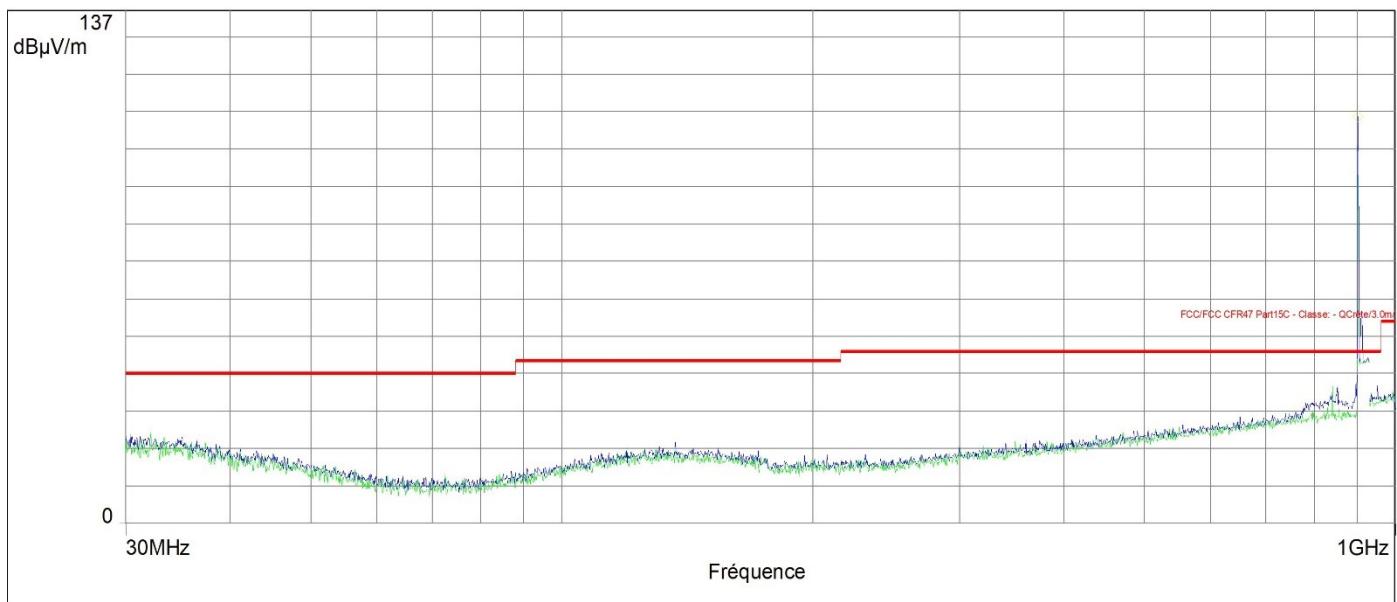


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RADIATED EMISSIONS

Graph name:	Emr#2	Test configuration:	
Limit:	FCC CFR47 Part15C	(H+V) - CMid - TX mode - Axis XY	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	RBW :	100kHz
Azimuth:	0° - 360°	VBW :	300kHz

— FCC/FCC CFR47 Part15C - Classe: - Moyenne/3.0m/
— FCC/FCC CFR47 Part15C - Classe: - QCôte/3.0m/
— FCC/FCC CFR47 Part15C - Classe: - Crête/3.0m/
○ Niveau (Suspect Manuel) (Horizontale)
— Mes.RMS (Horizontale)
— Mes.RMS (Verticale)



Spurious emissions

Frequency (MHz)	Peak Level (dB μ V/m)	Polarization	Correction (dB)
903.38	108.8	Horizontal	27.6

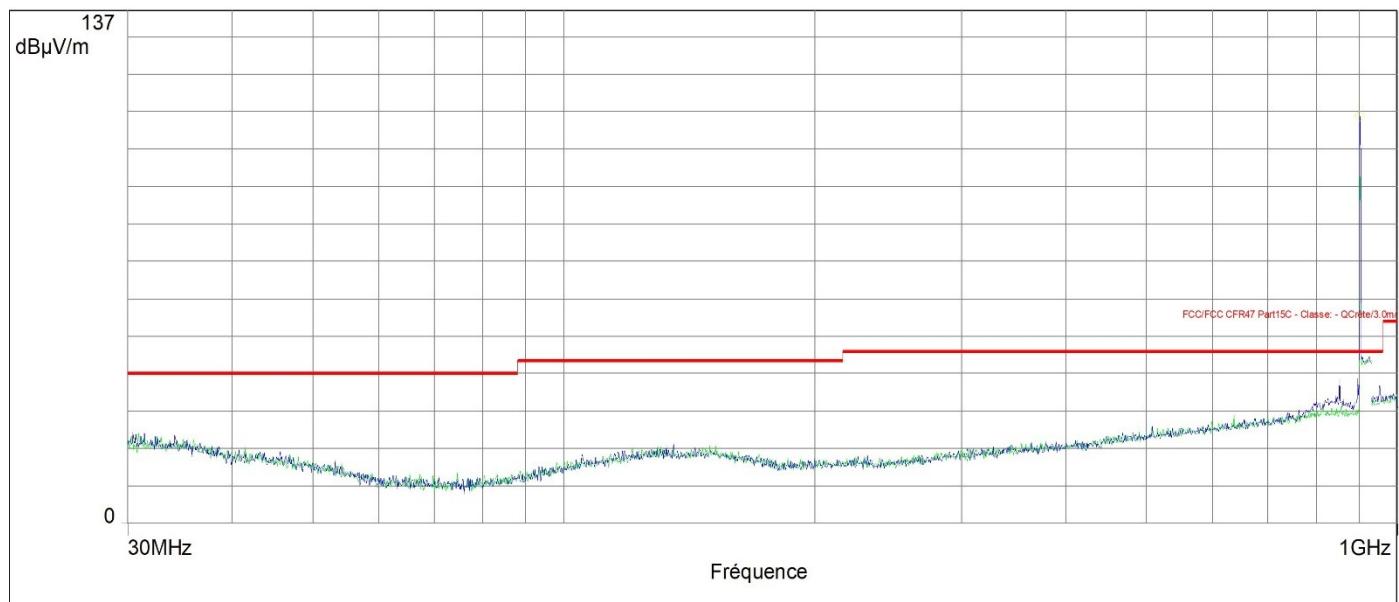


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RADIATED EMISSIONS

Graph name:	Emr#3	Test configuration:	
Limit:	FCC CFR47 Part15C	(H+V) - CMax - TX mode - Axis XY	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:	Horizontal & Vertical	RBW :	100kHz
Azimuth:	0° - 360°	VBW :	300kHz

— FCC/FCC CFR47 Part15C - Classe: - Moyenne/3.0m/
— FCC/FCC CFR47 Part15C - Classe: - QCrête/3.0m/
— FCC/FCC CFR47 Part15C - Classe: - Crête/3.0m/
○ Niveau (Suspect Manuel) (Horizontale)
— Mes.RMS (Horizontale)
— Mes.RMS (Verticale)



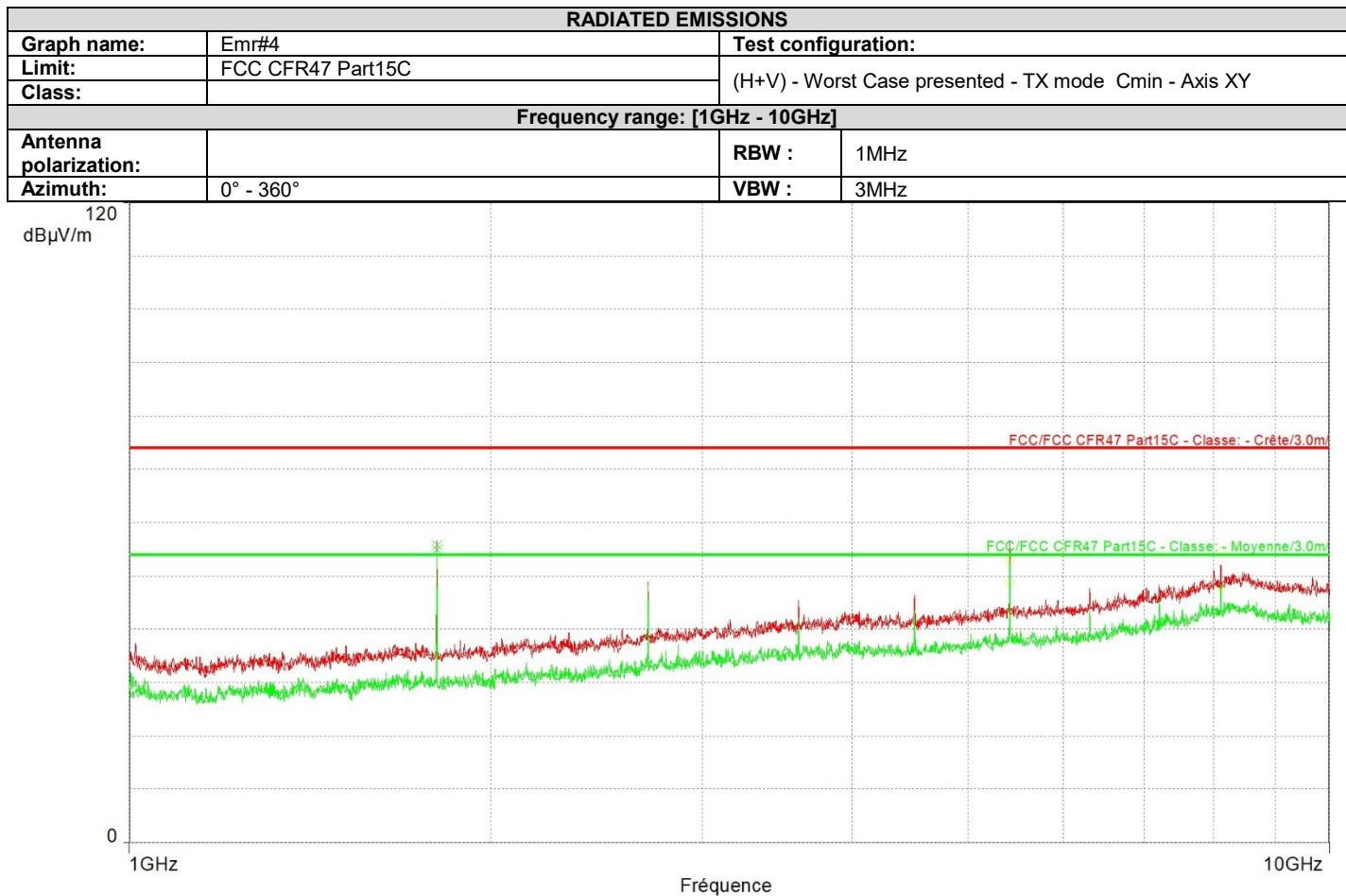
Spurious emissions

Frequency (MHz)	Peak Level (dB μ V/m)	Polarization	Correction (dB)
904.58	108.8	Horizontal	27.6



L C I E

Results in the frequency band [1-10] GHz:



Spurious emissions

Frequency (MHz)	Mes.Avg (dB μ V/m)	Limite (dB μ V/m)	Mes.-Lim. (dB)	Correction (dB)
5412.620	48.9	54.0	-5.1	-24.0
8118.809	47.6	54.0	-6.4	-18.0

Frequency (MHz)	Mes.Peak (dB μ V/m)	Limite (dB μ V/m)	Mes.-Lim. (dB)	Correction (dB)
5412.620	52.8	74.0	-21.2	-24.0
8118.809	54.7	74.0	-19.3	-18.0

Frequency (MHz)	Mes.Avg (dB μ V/m)	Limite (dB μ V/m)	Mes.-Lim. (dB)	Correction (dB)
1804.158	53.0	54.0	-1.0	-33.0

Frequency (MHz)	Mes.Peak (dB μ V/m)	Limite (dB μ V/m)	Mes.-Lim. (dB)	Correction (dB)
1804.158	55.8	74.0	-18.2	-33.0

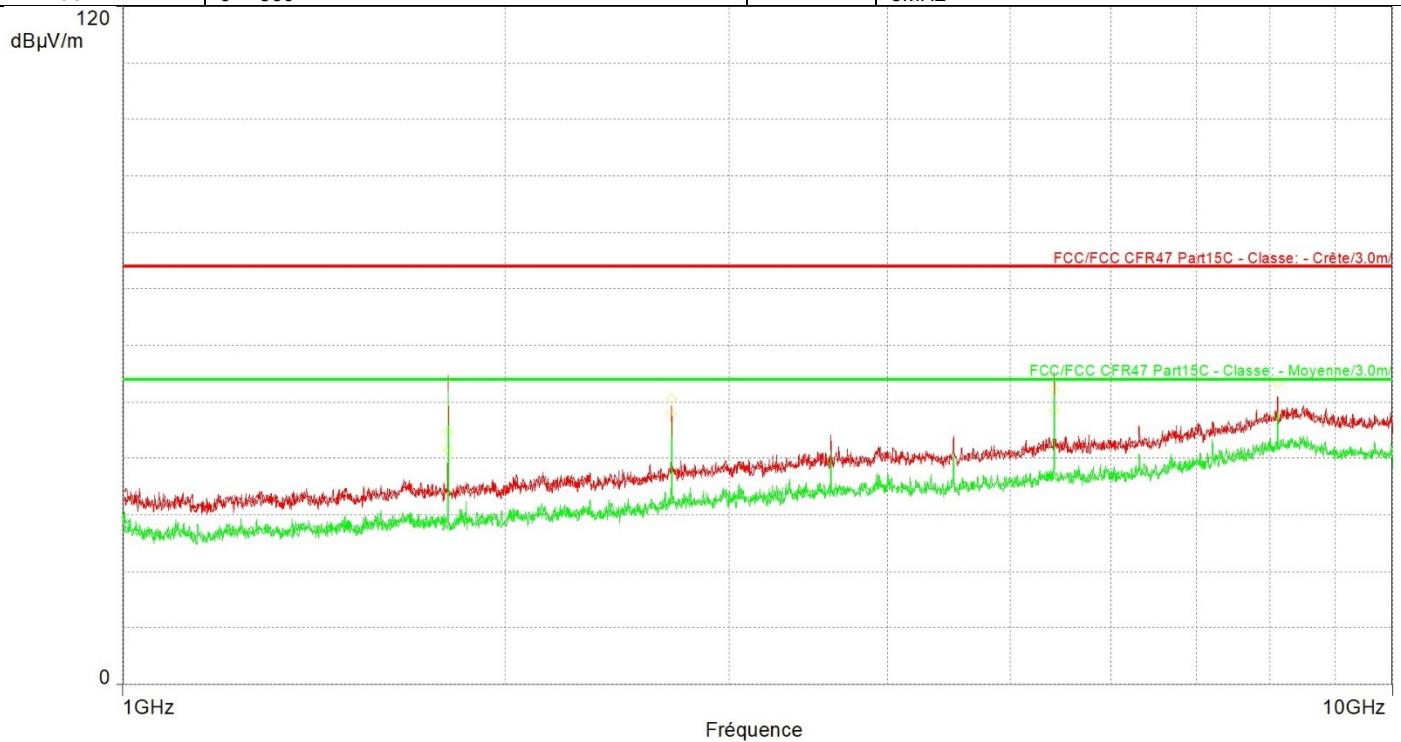
TEST REPORT



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RADIATED EMISSIONS

Graph name:	Emr#5	Test configuration:	
Limit:	FCC CFR47 Part15C	(H+V) - Worst Case presented - TX mode Cmid - Axis XY	
Class:			
Frequency range: [1GHz - 10GHz]			
Antenna polarization:		RBW :	1MHz
Azimuth:	0° - 360°	VBW :	3MHz



Spurious emissions

Frequency (MHz)	Mes.Avg (dBµV/m)	Limite (dBµV/m)	Mes.-Lim. (dB)	Correction (dB)
1804.306	41.4	54.0	-12.6	-33.0
2706.624	48.0	54.0	-6.0	-30.0
5413.076	48.5	54.0	-5.5	-24.0
8119.833	47.5	54.0	-6.5	-18.0

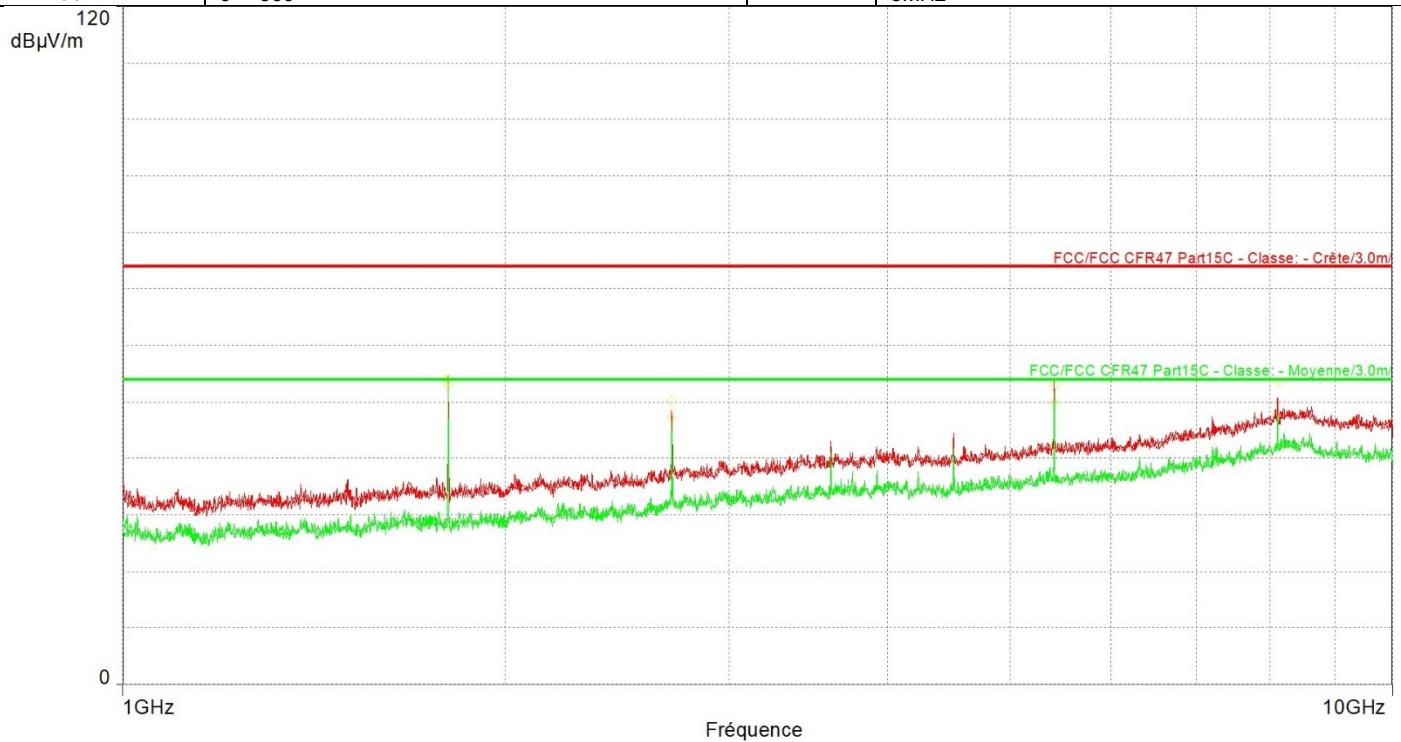
Frequency (MHz)	Mes.Peak (dBµV/m)	Limite (dBµV/m)	Mes.-Lim. (dB)	Correction (dB)
1804.306	44.8	74.0	-29.2	-33.0
2706.624	50.6	74.0	-23.4	-30.0
5413.076	52.2	74.0	-21.8	-24.0
8119.833	53.3	74.0	-20.7	-18.0



L C I E

RADIATED EMISSIONS

Graph name:	Emr#6	Test configuration:	
Limit:	FCC CFR47 Part15C	(H+V) - Worst Case presented - TX mode Cmac - Axis XY	
Class:			
Frequency range: [1GHz - 10GHz]			
Antenna polarization:		RBW :	1MHz
Azimuth:	0° - 360°	VBW :	3MHz



Spurious emissions

Frequency (MHz)	Mes.Avg (dB μ V/m)	Limite (dB μ V/m)	Mes.-Lim. (dB)	Correction (dB)
1804.592	53.0	54.0	-1.0	-33.0
2706.873	47.2	54.0	-6.8	-30.0
5413.803	49.8	54.0	-4.2	-24.0
8120.753	47.8	54.0	-6.2	-18.0

Frequency (MHz)	Mes.Peak (dB μ V/m)	Limite (dB μ V/m)	Mes.-Lim. (dB)	Correction (dB)
1804.592	54.1	74.0	-19.9	-33.0
2706.873	50.2	74.0	-23.8	-30.0
5413.803	52.8	74.0	-21.2	-24.0
8120.753	53.5	74.0	-20.5	-18.0

11.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **CSM WX SENSOR-YC-SR-YPA-CC-2B**, SN: **SCC13**, 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 (Euelles)	4,88	6.3
Measurement of radiated electric field from 1 to 18GHz on the Euelles site	5,16	/
Measurement of radiated electric field from 30 to 1000MHz in vertical position on the OATS (Euelles)	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 (Euelles)	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