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TEST REPORT

N°: 17429988-784987-A(FILE#4709287)

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

SCHNEIDER ELECTRIC
28 Rue Henri Tarze
38000 - GRENOBLE
France

Apparatus under test

- ↗ Product
- ↗ Trade mark
- ↗ Manufacturer
- ↗ Model under test
- ↗ Serial number
- ↗ FCC ID
- ↗ IC

Extension Zigbee module
SCHNEIDER ELECTRIC
SCHNEIDER ELECTRIC
Extension Zigbee module
HRB76894 03
2AHP8-JYT46620
21245- JYT46620

Conclusion

See Test Program chapter

Test date

December 26, 2022 to December 28, 2022

Test location

Moirans

FCC Test site

FR0008 - 197516

ISED Test site

FR0008 - 6500A

Sample receipt date

December 16, 2022

Composition of document

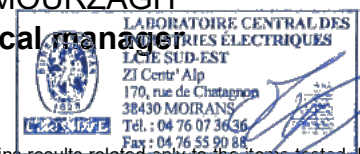
48 pages


Document issued on

August 27, 2024

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	August 27, 2024	Mounir BOUAMARA	Creation of the document
02	August 27, 2024	Akram HAKKARI	Adding FCC ID & IC ID

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

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1. TEST PROGRAM

References

- 47 CFR Part 15.247
- RSS 247 Issue 2
- RSS Gen Issue 5
- KDB 558074 D01 DTS Meas Guidance v05r02 [fb](#)
- ANSI C63.10-2013

Radio requirement:

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)
6dB Bandwidth	<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)
Power Spectral Density	<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. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

SCHNEIDER ELECTRIC Extension Zigbee module
HRB76894 03

Serial

Number:



Equipment Under Test

Power supply:

During all the tests, EUT is supplied by V_{nom} : 3.3VDC

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

Name	Type	Rating	Reference / Sn	Comments
Supply1	<input type="checkbox"/> AC <input checked="" type="checkbox"/> DC <input type="checkbox"/> Battery	3.3 VDC		

Voltage table used (for Power Line Conducted Emissions):

Type	Measurement performed:	
<input type="checkbox"/> AC	<input type="checkbox"/> 120VAC/60Hz	<input type="checkbox"/> 240VAC/50Hz
<input checked="" type="checkbox"/> DC	<input checked="" type="checkbox"/> +3.3VDC	<input type="checkbox"/> -....VDC
<input type="checkbox"/> Battery	<input type="checkbox"/> +3.6VDC	<input type="checkbox"/> -....VDC



<input type="checkbox"/> USB (Laptop auxiliary)	<input type="checkbox"/> 120VAC/60Hz (Laptop auxiliary)	<input type="checkbox"/> 240VAC/50Hz(Laptop auxiliary)
---	---	--

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
1	RJ45	/	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop	/		

Equipment information:

Type:	<input checked="" type="checkbox"/> ZIGBEE		<input type="checkbox"/> RF4CE
Frequency band:	[2400 – 2483.5] MHz		
Number of Channel:	16		
Spacing channel:	5MHz		
Channel bandwidth:	2MHz		
Antenna Type:	<input checked="" type="checkbox"/> Integral	<input type="checkbox"/> External	<input type="checkbox"/> Dedicated
Antenna connector:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Temporary for test
Transmit chains:	1		
	Dual antenna		
	Gain: 1.5dBi (both)		
Beam forming gain:	No		
Receiver chains	1		
Antenna requirements §15.203	The transmitter uses an integral antenna with a ufl connector which is classified as a unique connector		
Type of equipment:	<input type="checkbox"/> Stand-alone	<input checked="" type="checkbox"/> Plug-in	<input type="checkbox"/> Combined
Ad-Hoc mode:	<input type="checkbox"/> Yes		<input checked="" type="checkbox"/> No
Adaptivity mode:	<input type="checkbox"/> Yes (Load Based)	<input type="checkbox"/> Off mode	<input checked="" type="checkbox"/> No
	Clear Channel Assessment Time:		Xµs
Duty cycle:	<input type="checkbox"/> Continuous duty	<input type="checkbox"/> Intermittent duty	<input checked="" type="checkbox"/> 100% duty
Equipment type:	<input checked="" type="checkbox"/> Production model		<input type="checkbox"/> Pre-production model
Operating temperature range:	Tmin:	<input type="checkbox"/> -20°C	<input type="checkbox"/> 0°C
	Tnom:	20°C	
	Tmax:	<input type="checkbox"/> 35°C	<input type="checkbox"/> 55°C
Type of power source:	<input type="checkbox"/> AC power supply	<input checked="" type="checkbox"/> DC power supply	<input type="checkbox"/> Battery
Operating voltage range:	Vnom:	<input type="checkbox"/> 230V/50Hz	<input checked="" type="checkbox"/> 3.3Vdc



CHANNEL PLAN	
Channel	Frequency (MHz)
Cmin: 11	2405
12	2410
13	2415
14	2420
15	2425
16	2430
17	2435
Cmid: 18	2440
19	2445
20	2450
21	2455
22	2460
23	2465
24	2470
25	2475
Cmax: 26	2480

DATA RATE		
Data Rate (Mbps)	Modulation Type	Worst Case Modulation
0.25	O-QPSK	<input checked="" type="checkbox"/>

2.2. RUNNING MODE

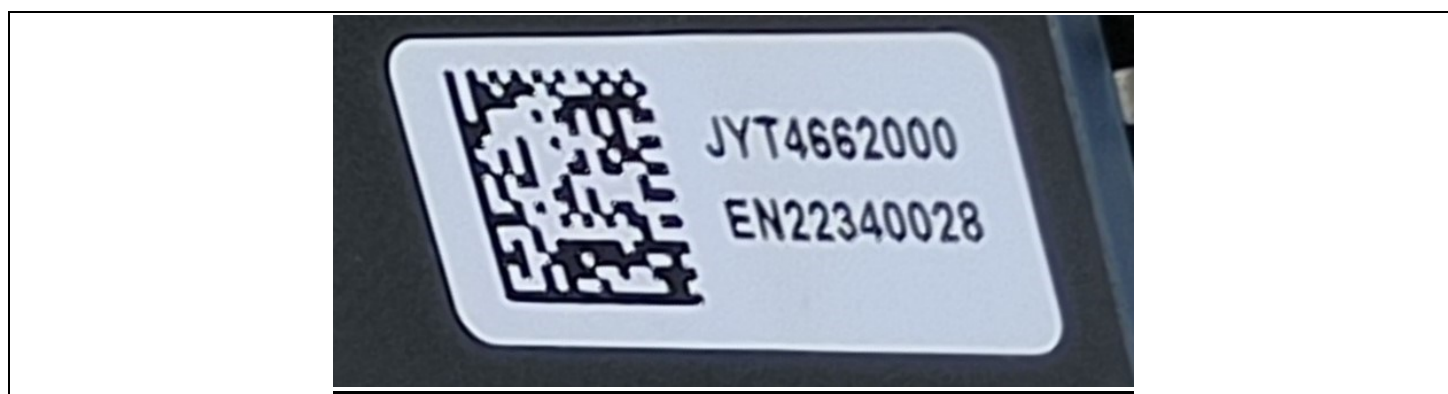
Test mode	Description of test mode
Test mode 1	Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
Test mode 2	Permanent reception
Test	Running mode
Occupied Bandwidth	<input checked="" type="checkbox"/> Test mode 1 (1) <input type="checkbox"/> Alternative test mode()
6dB Bandwidth	<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()
Power Spectral Density	<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 type="checkbox"/> Test mode 1 (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()

(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.

Hardware information		
Software (if applicable):	V. :	Not communicated

2.3. EQUIPMENT LABELLING



2.4. EQUIPMENT MODIFICATION

☒ None ☐ Modification:

2.5. FIELD STRENGTH CALCULATION

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

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

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

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

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

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

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

2.6. TEST DISTANCE EXTRAPOLATION – FCC/ISED

The field strength is extrapolated to the new measurement distance using formula from FCC Part15.31 (f) and §6.5-6.6 RSS-GEN:

Below 30MHz,

$$FS_{\text{limit}} = FS_{\text{max}} - 40 \log \left(\frac{d_{\text{limit}}}{d_{\text{measure}}} \right)$$

Above 30MHz,

$$FS_{\text{limit}} = FS_{\text{max}} - 20 \log \left(\frac{d_{\text{limit}}}{d_{\text{measure}}} \right)$$

Where:

FS_{limit} is the calculation of field strength at the limit distance, expressed in dBμV/m

FS_{max} is the measured field strength, expressed in dBμV/m

d_{measure} is the distance of the measurement point from the EUT

d_{limit} is the reference limit distance

2.7. CALIBRATION DATE

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

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Mounir BOUAMARA
Date of test : December 26, 2022 to December 28, 2022
Ambient temperature : 21 °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:

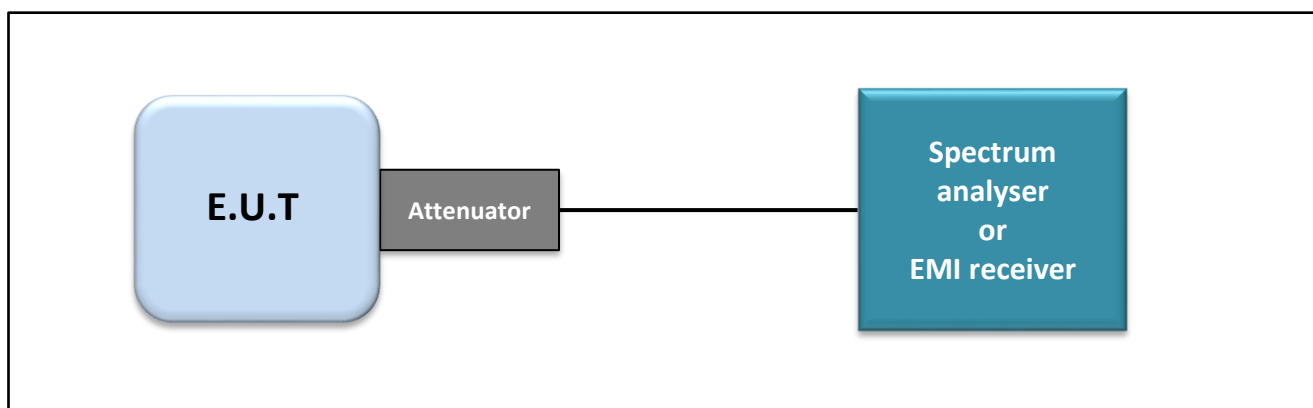
- ☒ Conducted Method
☐ Radiated Method

- Test Procedure:

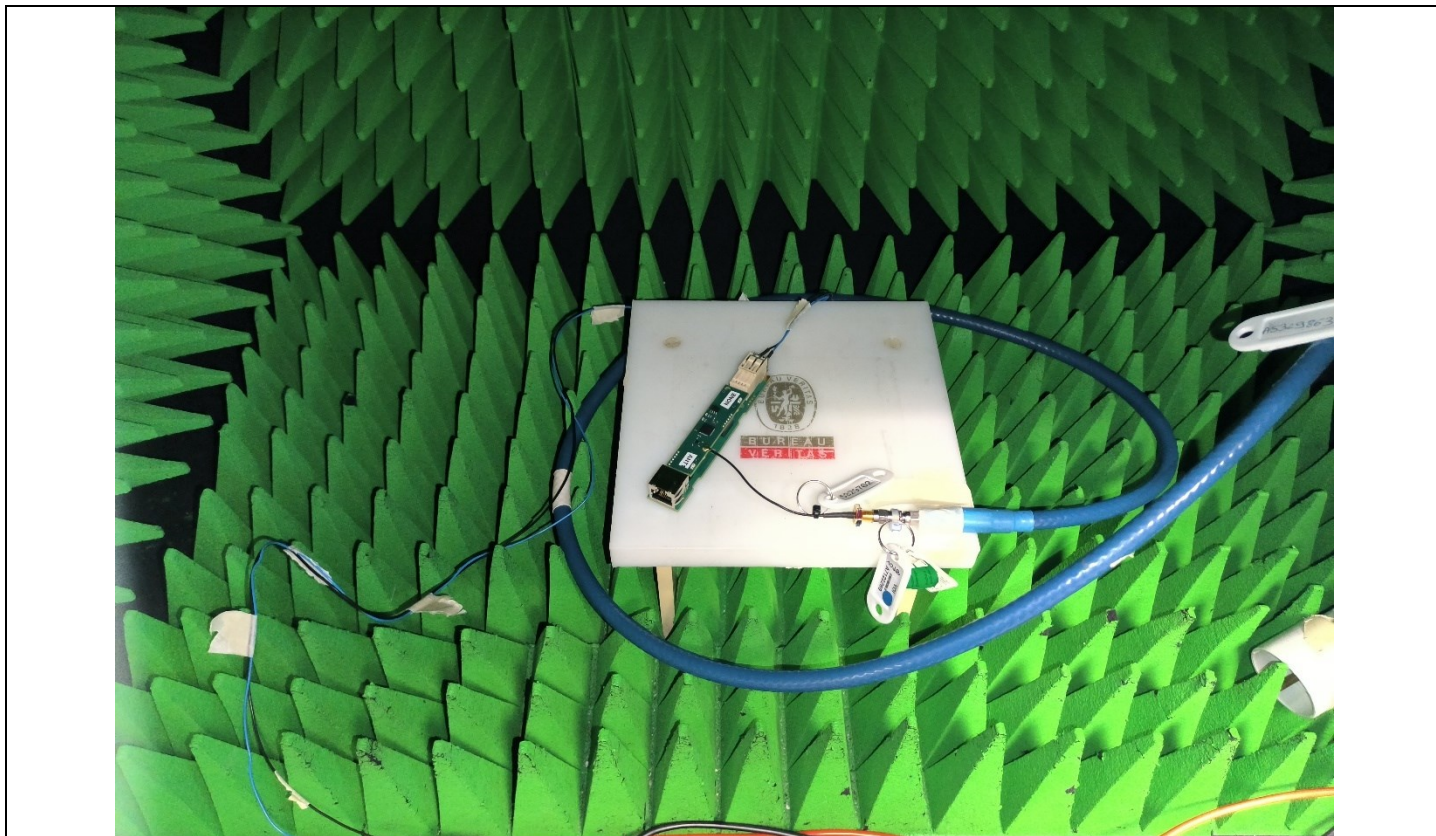
- ☒ RSS-Gen Issue 5 § 6.7
☐ ANSI C63.10 § 6.9.2

Measurement Procedure:

- RBW shall be in the range of 1% to 5% of the anticipated occupied bandwidth
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW
- SPAN = Capture all products of the modulation process
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- OBW 99% function of spectrum analyzer used



Test set up of Occupied Bandwidth



Photograph for Occupied bandwidth

3.3. LIMIT

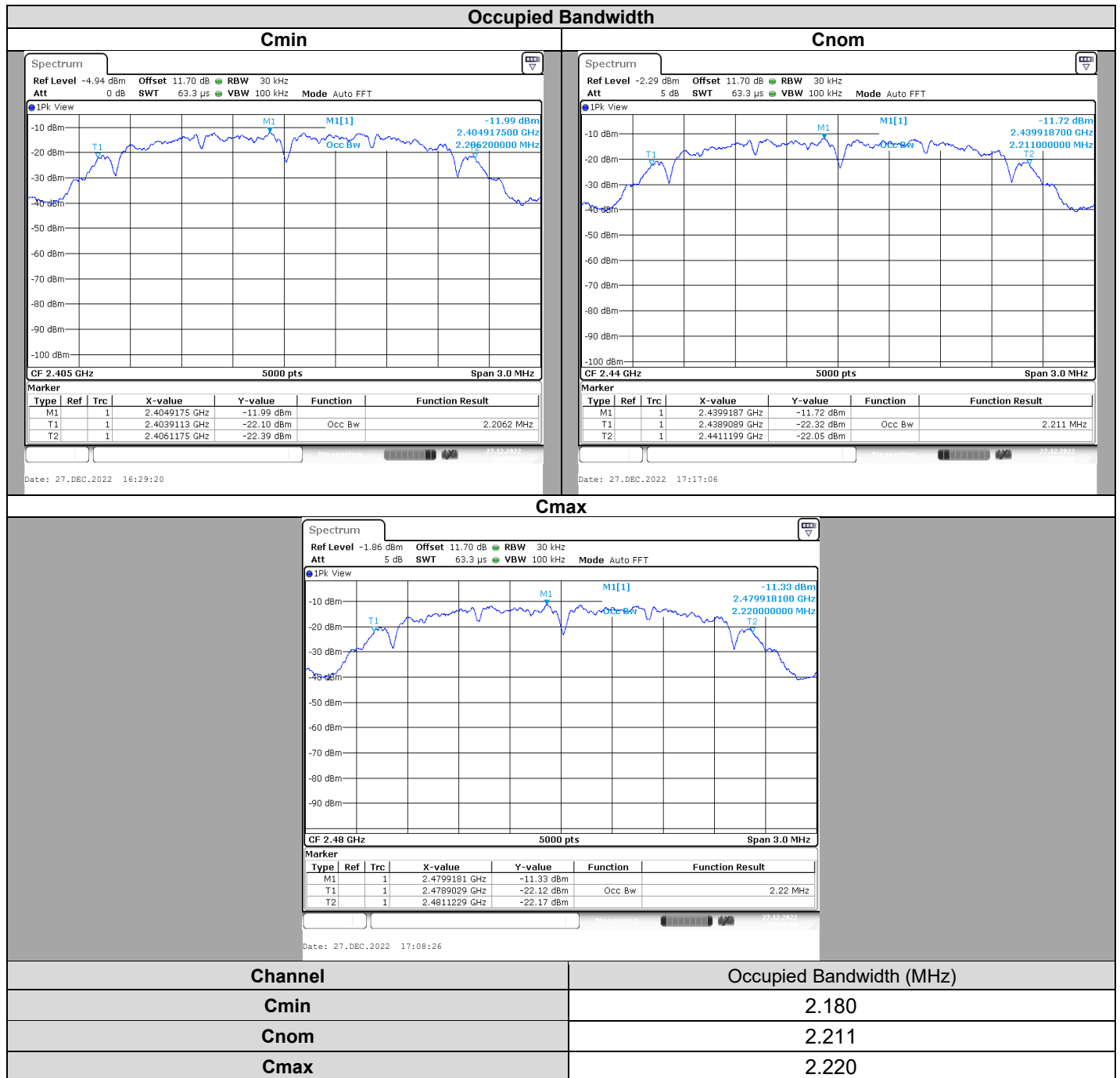
None

3.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	09/20	01/23
Cable SMA UFL	—	—	A5329761	05/22	05/24
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	03/21	03/23
Power supply DC	METRIX	AX503	A7042307		
SMA 1.5m	SUCOFLEX	18GHz	A5329863	05/22	05/23
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	11/21	11/23
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	01/23
SMA 1.5m	SUCOFLEX	18GHz	A5329864	09/22	09/23

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

3.5. RESULTS



3.6. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **SCHNEIDER ELECTRIC Extension Zigbee module**, SN: **HRB76894 03**, 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. 6dB EMISSION BANDWIDTH

4.1. TEST CONDITIONS

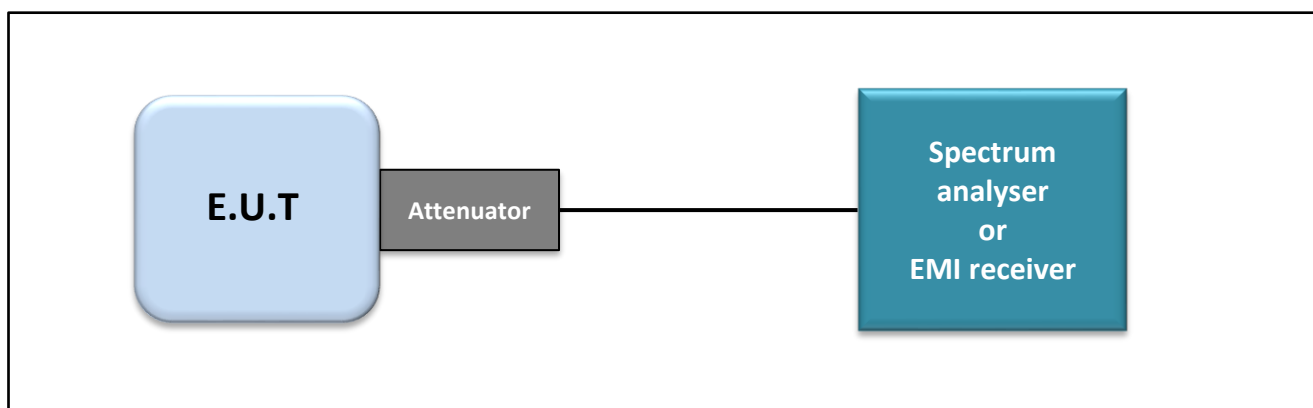
Test performed by : Mounir BOUAMARA
Date of test : December 26, 2022 to December 28, 2022
Ambient temperature : 21 °C
Relative humidity : 32 %

4.2. TEST SETUP

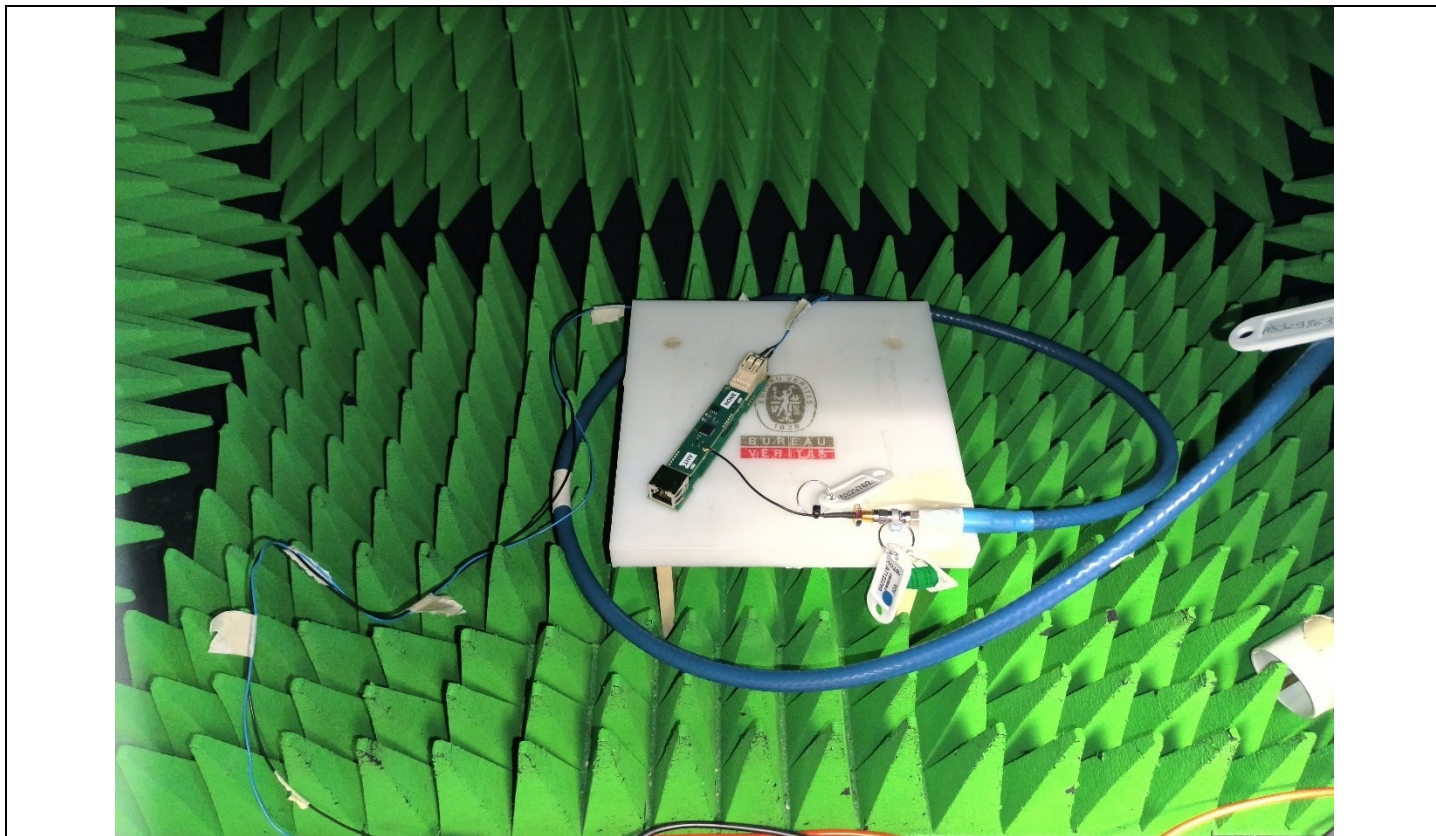
- The Equipment under Test is installed:
 - ☐ On a table
 - ☐ In an anechoic chamber
- Measurement is performed with a spectrum analyzer in:
 - ☐ Conducted Method
 - ☐ Radiated Method
- Test Procedure:
 - ☒ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.2

Measurement Procedure:

1. Set resolution bandwidth (RBW) = 100kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer.



Test set up of 6dB Emission Bandwidth



Photograph for 6dB emission bandwidth

4.3. LIMIT

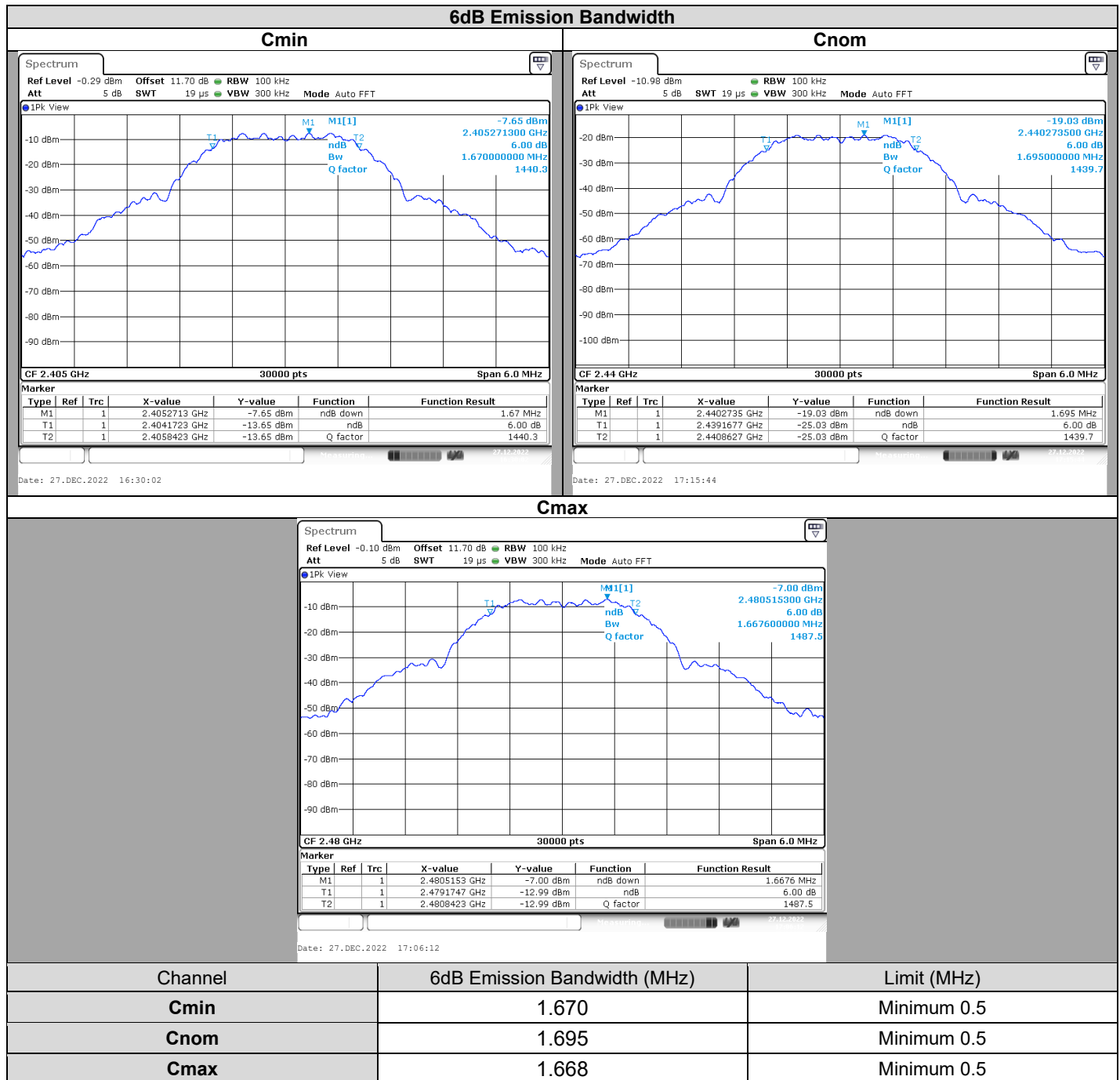
The 6dB bandwidth shall be at least 500kHz

4.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	09/20	01/23
Cable SMA UFL	—	—	A5329761	05/22	05/24
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	03/21	03/23
Power supply DC	METRIX	AX503	A7042307		
SMA 1.5m	SUCOFLEX	18GHz	A5329863	05/22	05/23
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	11/21	11/23
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	01/23
SMA 1.5m	SUCOFLEX	18GHz	A5329864	09/22	09/23

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 **SCHNEIDER ELECTRIC Extension Zigbee module**, SN: **HRB76894 03**, 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. MAXIMUM CONDUCTED OUTPUT POWER

5.1. TEST CONDITIONS

Test performed by : Mounir BOUAMARA
Date of test : December 26, 2022 to December 28, 2022
Ambient temperature : 21 °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:

- ☒ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.3.1.1

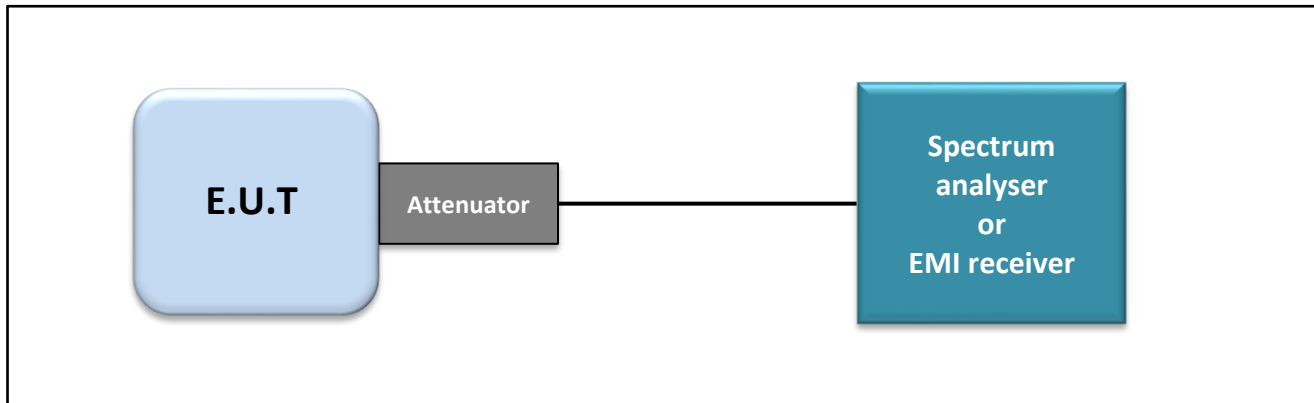
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

- a) Set the RBW \geq DTS bandwidth.
- b) Set VBW $\geq 3 \times$ RBW.
- c) Set span $\geq 3 \times$ RBW
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

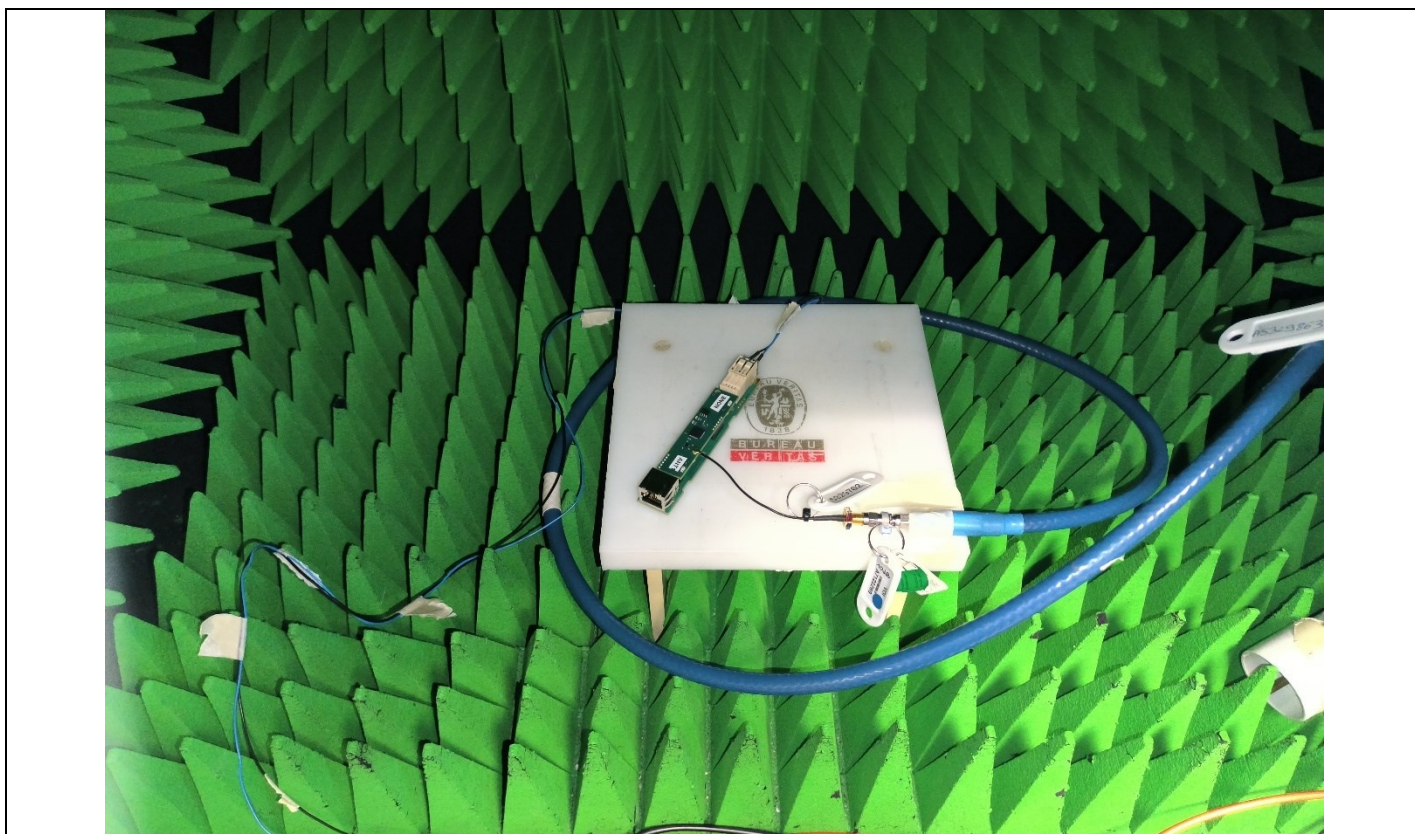
- ☐ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.3.1.2

This procedure may be used when the maximum available RBW of the measurement instrument is less than the DTS bandwidth.

- a) Set the RBW = 1 MHz.
- b) Set the VBW $\geq 3 \times$ RBW
- c) Set the span $\geq 1.5 \times$ DTS bandwidth.
- d) Detector = peak.
- e) Sweep time = auto couple.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges



Test set up of Maximum Conducted Output Power



Photograph for Maximum Conducted Output Power

5.3. LIMIT

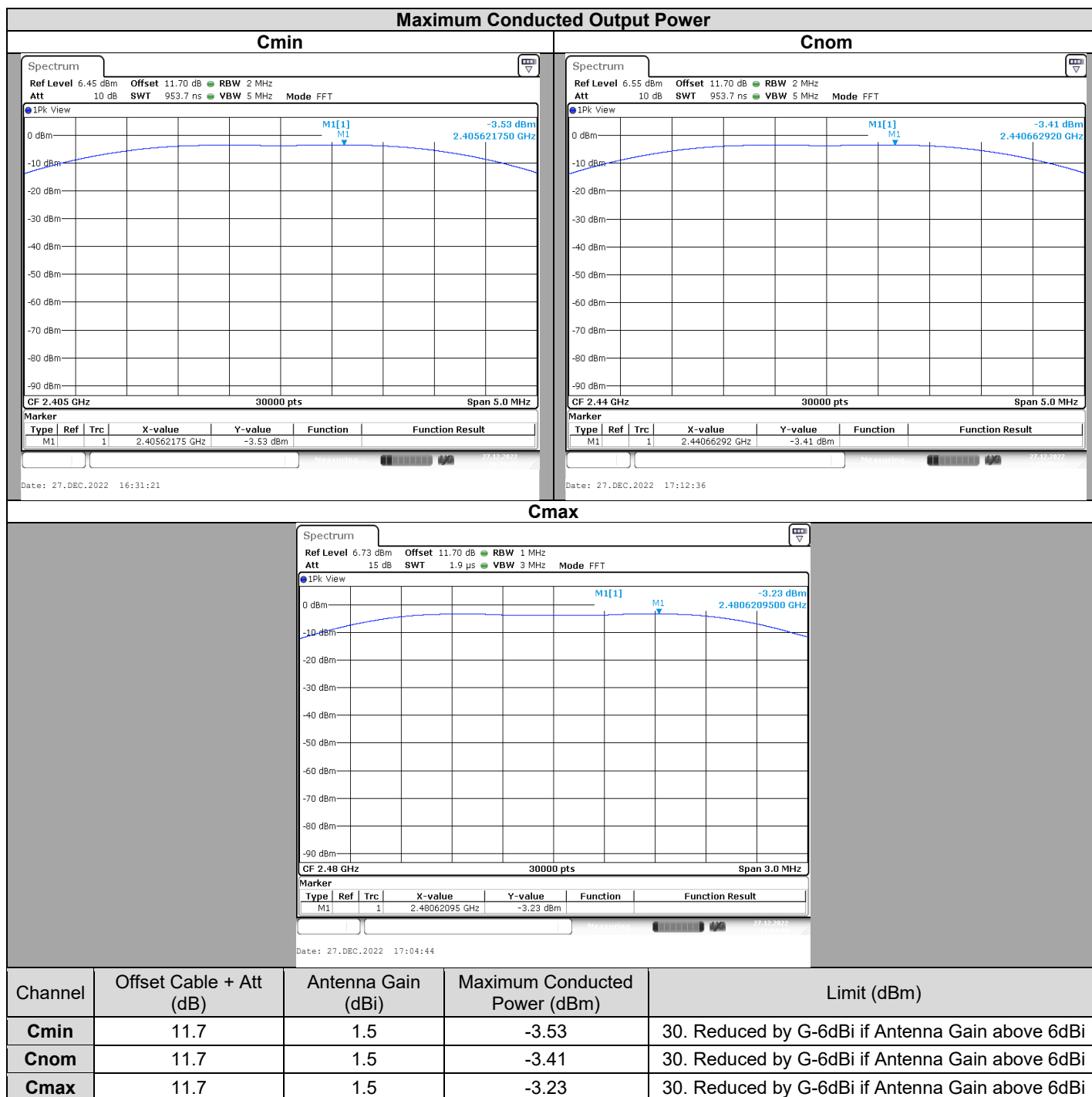
Maximum Conducted Output power:
 2400MHz-2483.5MHz: Shall not exceed 30dBm
 Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

5.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	09/20	01/23
Cable SMA UFL	—	—	A5329761	05/22	05/24
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	03/21	03/23
Power supply DC	METRIX	AX503	A7042307		
SMA 1.5m	SUCOFLEX	18GHz	A5329863	05/22	05/23
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	11/21	11/23
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	01/23
SMA 1.5m	SUCOFLEX	18GHz	A5329864	09/22	09/23

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

5.5. RESULTS



5.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **SCHNEIDER ELECTRIC Extension Zigbee module**, SN: **HRB76894 03**, 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. POWER SPECTRAL DENSITY

6.1. TEST CONDITIONS

Test performed by : Mounir BOUAMARA
Date of test : December 26, 2022 to December 28, 2022
Ambient temperature : 21 °C
Relative humidity : 32 %

6.2. TEST SETUP

- The Equipment Under Test is installed:

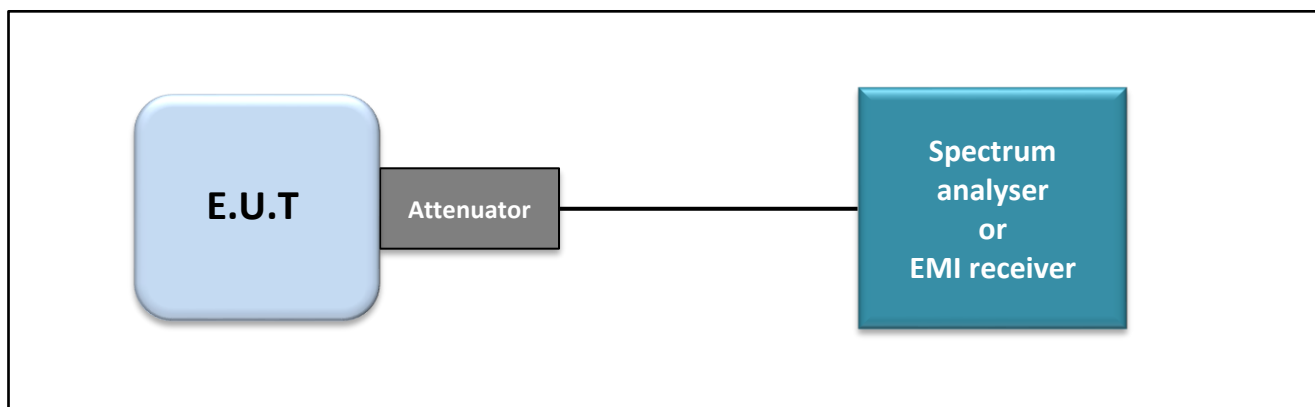
- ☐ On a table
☒ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

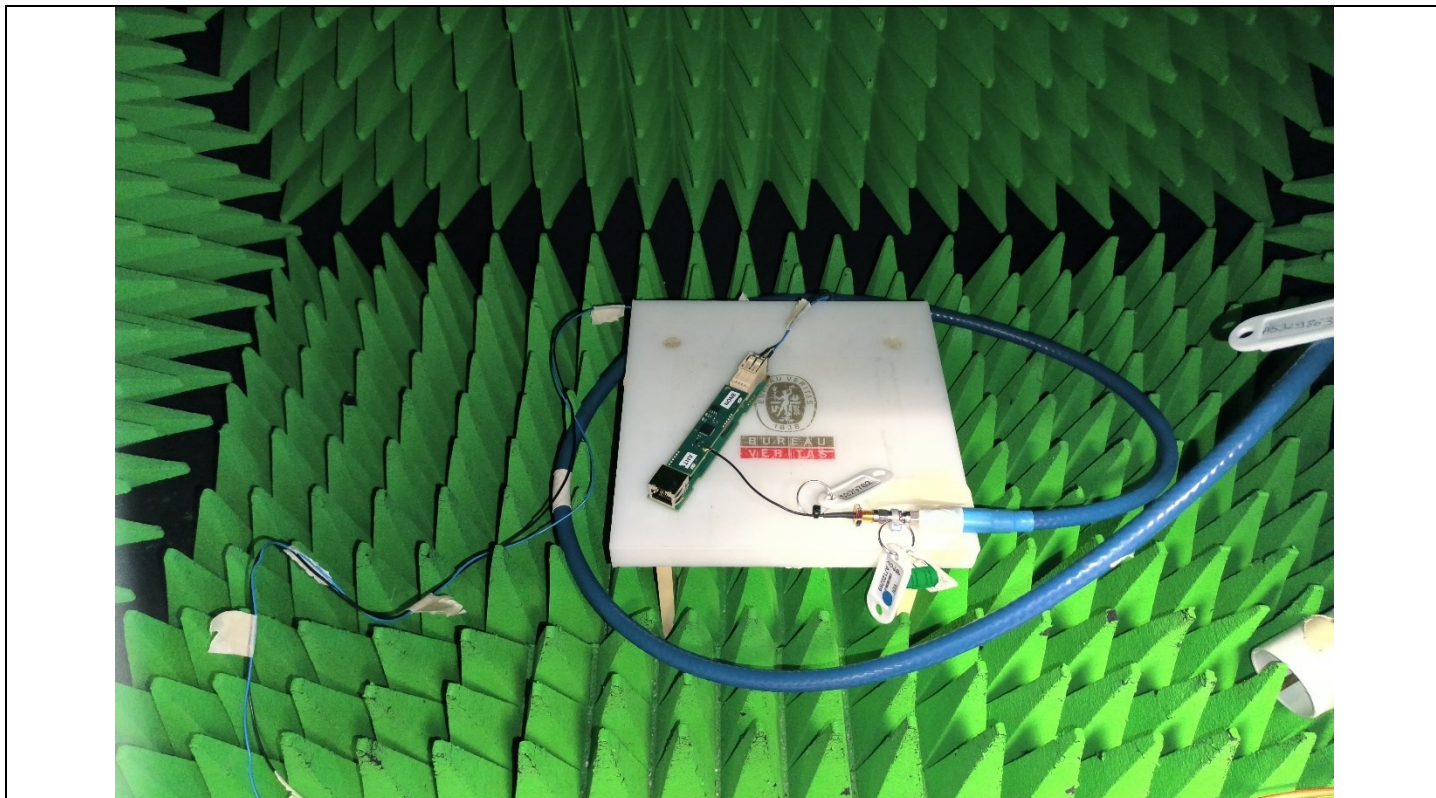
- ☒ Conducted Method
☐ Radiated Method

- Test Procedure:

- ☒ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.4 (Method PKPSD)
- Set analyzer center frequency to DTS channel center frequency.
 - Set the span to 1.5 times the DTS bandwidth.
 - Set the RBW to: 3 kHz.
 - Set the VBW $\geq 3 \times$ RBW.
 - Detector = peak.
 - Sweep time = auto couple.
 - Trace mode = max hold.
 - Allow trace to fully stabilize.
 - Use the peak marker function to determine the maximum amplitude level within the RBW.
 - If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test set up of Power Spectral Density



Photograph for Power Spectral Density

6.3. LIMIT

Power Spectral Density:

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

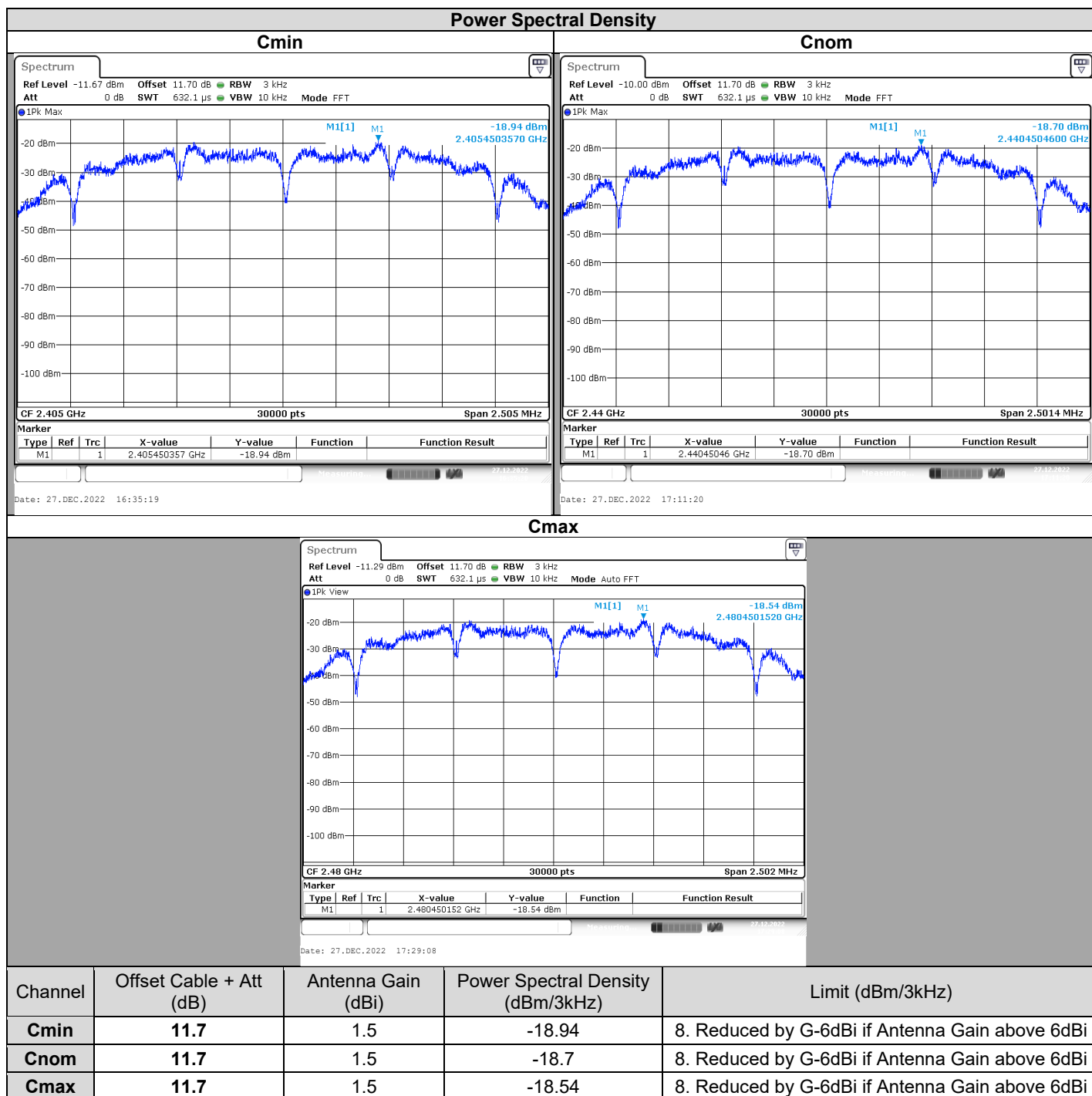
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

6.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	09/20	01/23
Cable SMA UFL	—	—	A5329761	05/22	05/24
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	03/21	03/23
Power supply DC	METRIX	AX503	A7042307		
SMA 1.5m	SUCOFLEX	18GHz	A5329863	05/22	05/23
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	11/21	11/23
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	01/23
SMA 1.5m	SUCOFLEX	18GHz	A5329864	09/22	09/23

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

6.5. RESULTS



6.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **SCHNEIDER ELECTRIC Extension Zigbee module**, SN: **HRB76894 03**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

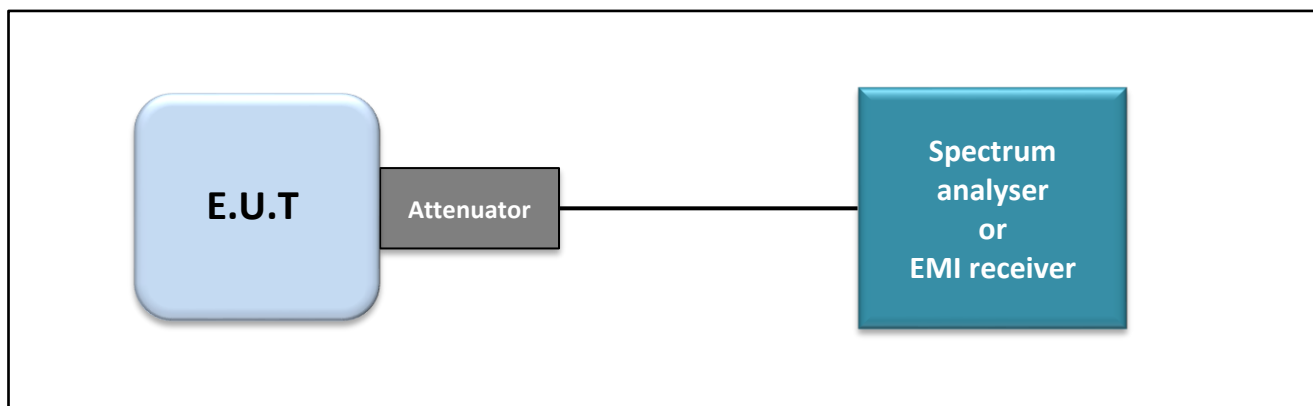
7. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE

7.1. TEST CONDITIONS

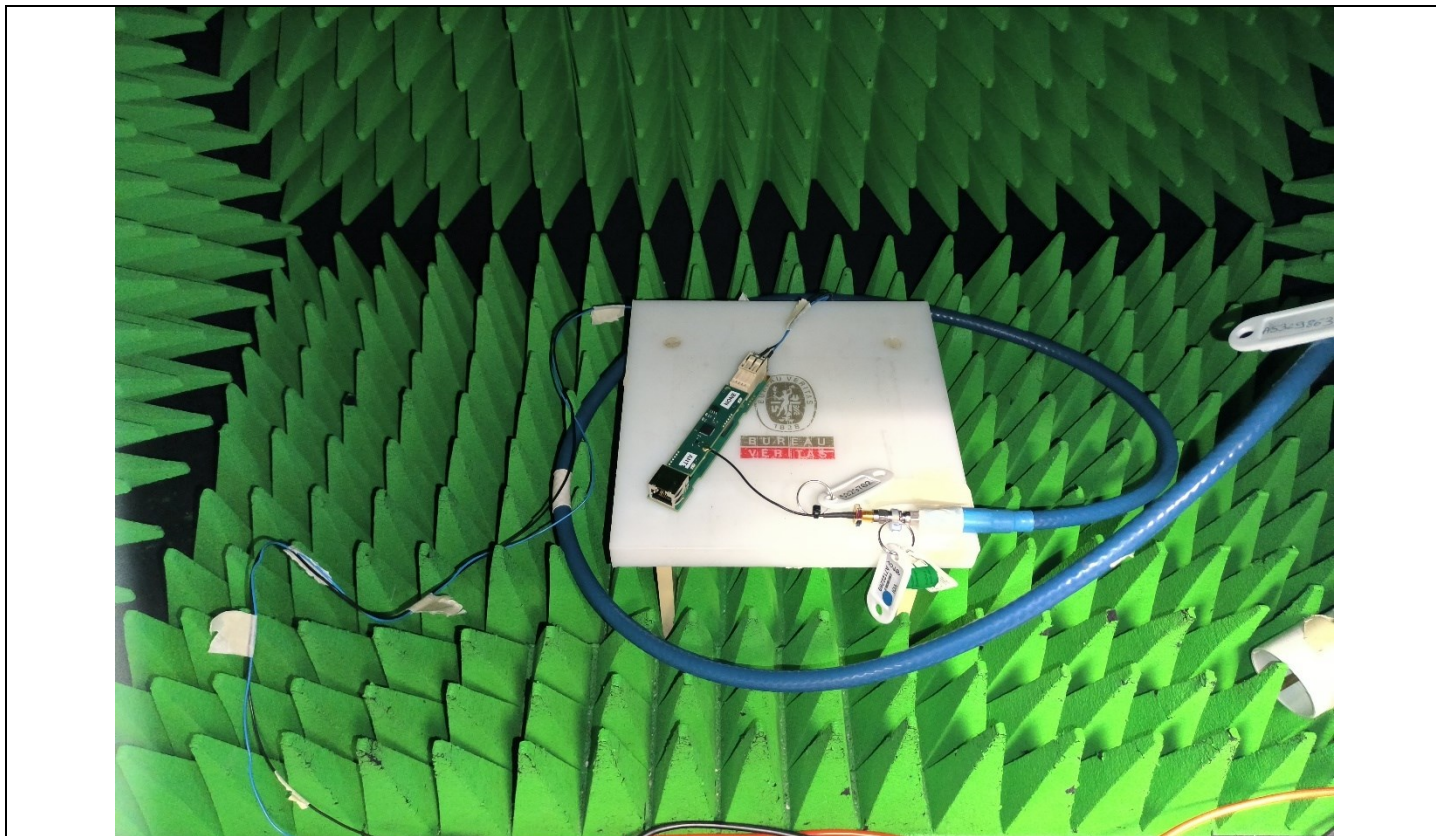
Test performed by : Mounir BOUAMARA
Date of test : December 26, 2022 to December 28, 2022
Ambient temperature : 21 °C
Relative humidity : 32 %

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:
 - ☒ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.5



Test set up of Unwanted Emissions into Non-Restricted Frequency Bands at the Band Edge



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

7.3. LIMIT

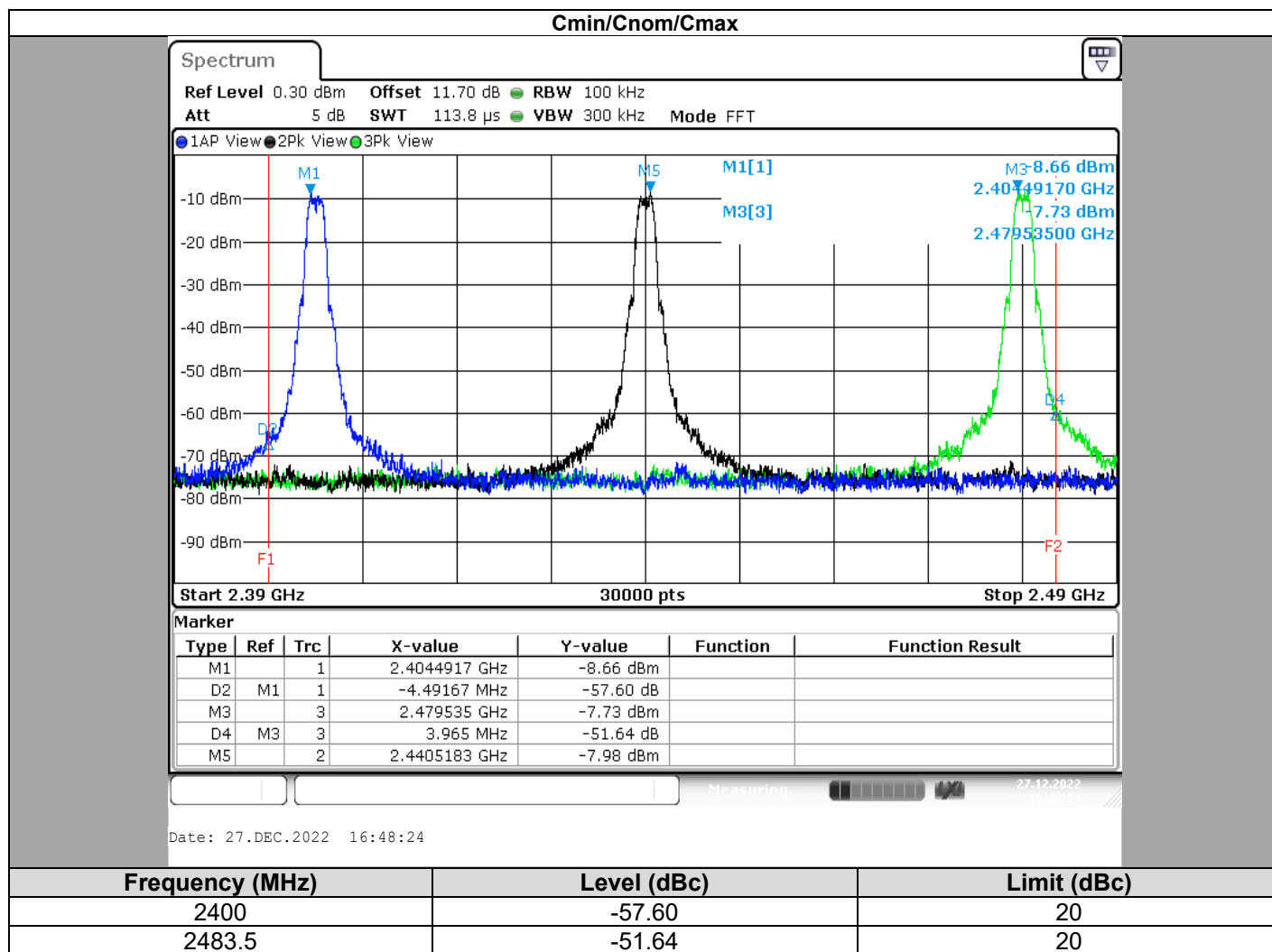
All Spurious Emissions must be at least 20dB below the Fundamental Radiator Level at the Band Edge “2400MHz & 2483,5MHz”

7.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	09/20	01/23
Cable SMA UFL	—	—	A5329761	05/22	05/24
Full Anechoic Room	SIEPEL	—	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	03/21	03/23
Power supply DC	METRIX	AX503	A7042307		
SMA 1.5m	SUCOFLEX	18GHz	A5329863	05/22	05/23
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	11/21	11/23
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	01/23
SMA 1.5m	SUCOFLEX	18GHz	A5329864	09/22	09/23

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

7.5. RESULTS



7.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **SCHNEIDER ELECTRIC Extension Zigbee module**, SN: **HRB76894 03**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

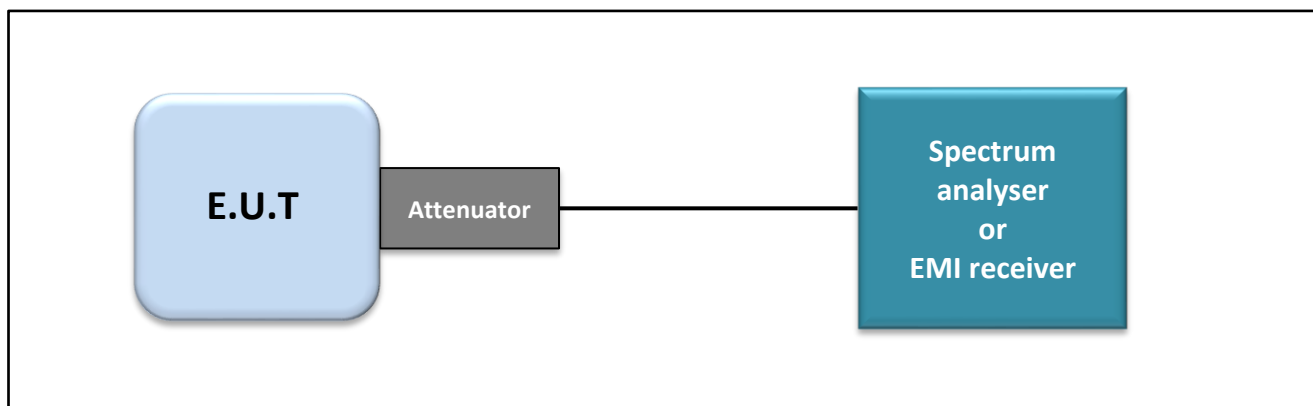
8. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

8.1. TEST CONDITIONS

Test performed by : Mounir BOUAMARA
Date of test : December 26, 2022 to December 28, 2022
Ambient temperature : 21 °C
Relative humidity : 32 %

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 v05r02 § 8.5



Test set up of Unwanted Emissions into Non-Restricted Frequency Bands



Photograph for Unwanted Emission into non-restricted frequency bands

8.3. **LIMIT**

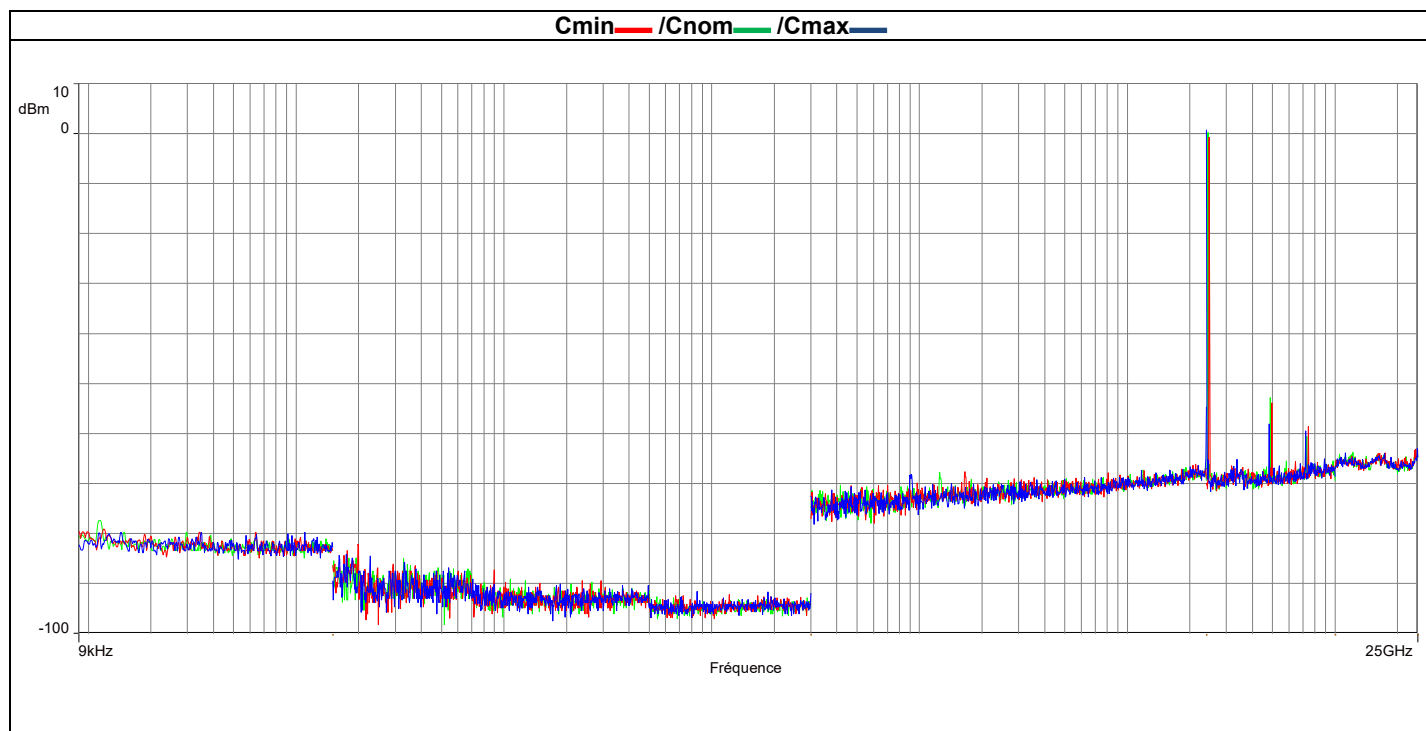
All Spurious Emissions must be at least 20 below the Fundamental Radiator Level

8.4. **TEST EQUIPMENT LIST**

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Emission Cable (SMA 1m)	TELEDYNE	26GHz	A5329874	08/22	08/23
Multimeter - CEM	FLUKE	189	A1240171	09/21	09/23
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	09/21	09/23
Attenuator 10dB	AEROFLEX	—	A7122269	09/20	01/23
Power supply DC	METRIX	AX503	A7042307		
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	01/23

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

8.5. RESULTS



Frequency (MHz)	Level (dBm)	Level (dBc)	Limit (dBc)
2405.00	0.7		
4808.9467	-58.081	58.781	20
72168.8	-59.545	60.245	20
2440.00	0.22		
4878.8667	-52.881	53.101	20
7318.4667	-60.579	60.799	20
2480.00	-0.7		
4958.92	-53.855	53.155	20
7441.84	-58.583	57.883	20

8.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **SCHNEIDER ELECTRIC Extension Zigbee module**, SN: **HRB76894 03**, 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 IN RESTRICTED FREQUENCY BANDS

9.1. TEST CONDITIONS

Test performed by : Mounir BOUAMARA
 Date of test : December 26, 2022 to December 28, 2022
 Ambient temperature : 21 °C
 Relative humidity : 32 %

9.2. TEST SETUP

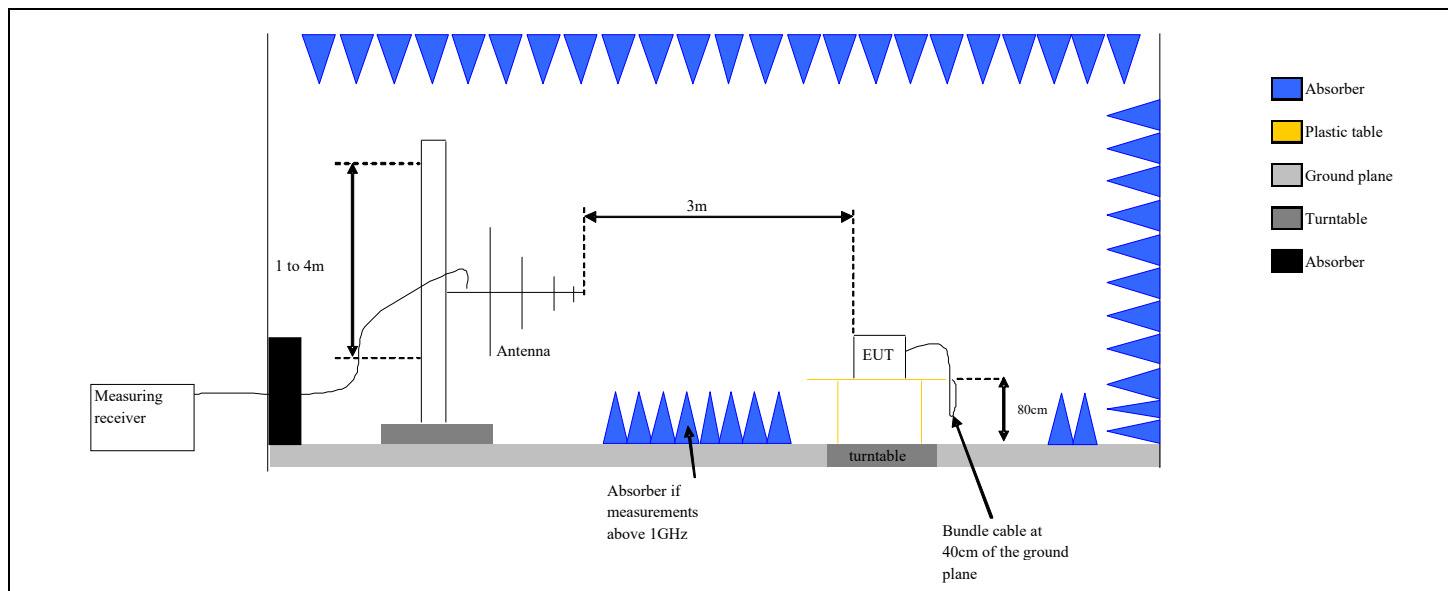
The product has been tested according to ANSI C63.10 (2013) and FCC part15 subpart C.
 Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration. Antenna height was 1m. The EUT is placed **in a semi-anechoic chamber**. Distance between measuring antenna and the EUT is **3m**.

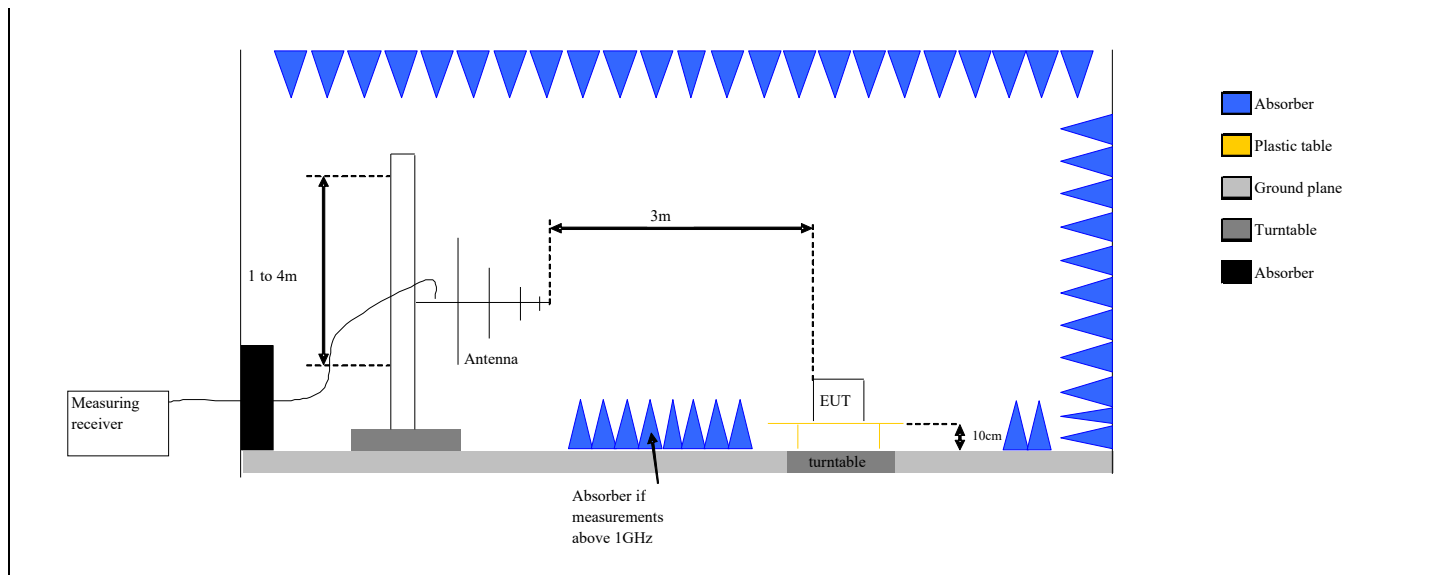
Test is performed in horizontal (H) and vertical (V) polarization with **bilog** between 30MHz & 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration. The EUT is placed 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

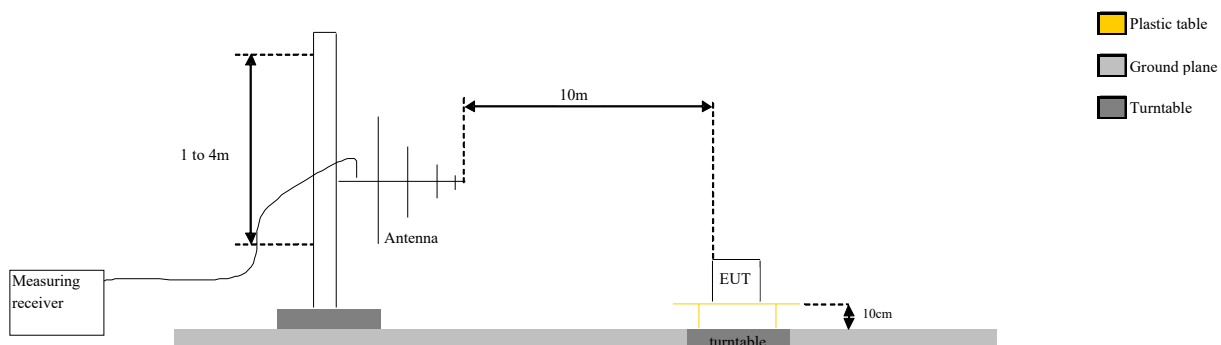
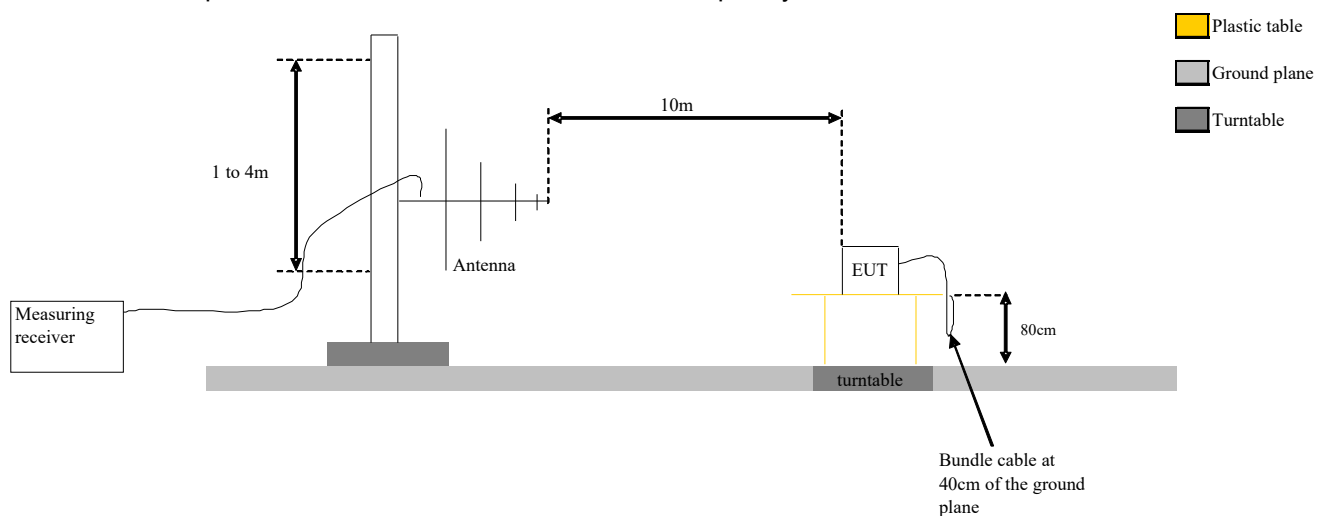
☒ Fixed and centered on the EUT (EUT smaller than the beamwidth of the measurement antenna, ANSI C63.10 §6.6.5)

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





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

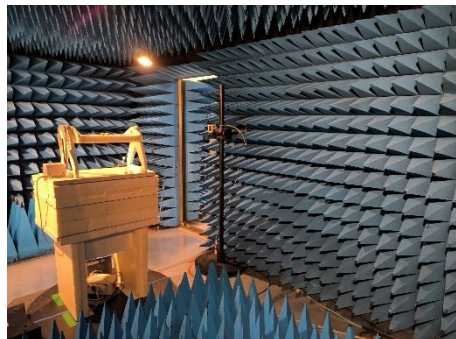
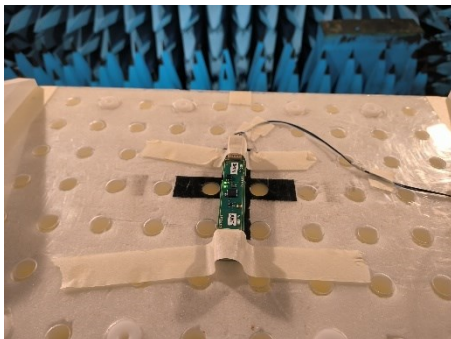
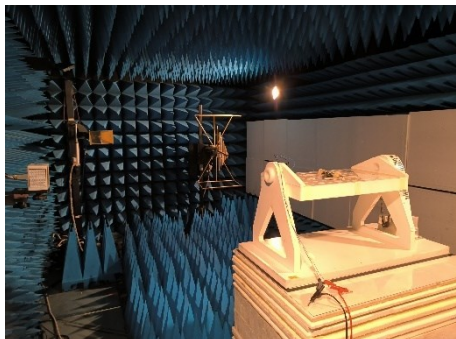


Photo Setup: anechoic chamber (XY axis)

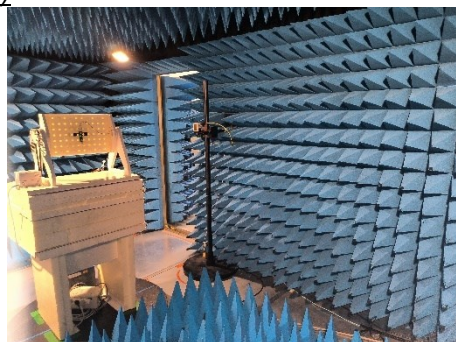
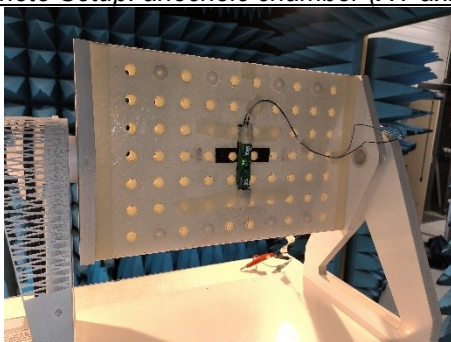


Photo Setup: anechoic chamber (Z axis)



Photo Setup : OATS (XY axis)

Photograph for Unwanted Emission in restricted frequency bands

9.3. 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
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	35.5B μ V/m	QPeak
960MHz to 1000MHz	43.5dB μ V/m	QPeak
Above 1000MHz	63.5dB μ V/m	Peak
	43.5dB μ V/m	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	46B μ V/m	QPeak
960MHz to 1000MHz	54dB μ V/m	QPeak
Above 1000MHz	74dB μ V/m	Peak
	54dB μ V/m	Average

9.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due
Amplifier 9kHz - 40GHz	LCIE SUD EST	—	A7102082	05/22	05/24
Antenna Bi-log	AH System	SAS-521-7	C2040180	02/21	02/23
BAT EMC	NEXIO	v3.21.0.32	L1000115		
Cable 0.75m	-	18GHz	A5329900	08/22	08/24
Cable 1m	HUBER & SUHNER	18GHz	A5329706	08/21	08/23
Cable SMA 40GHz 40cm	WITHWAVE	W101-SM1-0.4M	A5329979	04/21	04/23
Comb EMR HF	YORK	CGE01	A3169114		
CONTROLLER	INNCO	CO3000	D3044034		
Filter Matrice	LCIE SUD EST	Combined filters	A7484078	09/20	01/23
Multimeter - CEM	FLUKE	189	A1240171	09/21	09/23
Rehausse Table C3	LCIE	—	F2000511		
Semi-Anechoic chamber #3 (BF)	SIEPEL	—	D3044017_BF	04/22	04/25
Semi-Anechoic chamber #3 (VSWR)	SIEPEL	—	D3044017_VSWR	04/22	04/25
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	09/21	09/23
Table C3	LCIE	—	F2000461		
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	01/23
TILT	INNCO	TILT	D3044033		
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371		
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444		
Antenna horn 18GHz	EMCO	3115	C2042029	03/22	03/25
CABLE	TELEDYNE	R82-0404-8M	A5330008	02/22	02/24
Cable 1m	HUBER & SUHNER	18GHz	A5329705	08/21	08/23
Emission Cable (SMA 1m)	TELEDYNE	26GHz	A5329874	08/22	08/23
Emission Cable (SMA 3.3m)	TELEDYNE	26GHz	A5329875	08/22	08/23
Rehausse Table C3	LCIE	—	F2000507		
Antenna horn 40GHz	SCHWARZBECK	BBHA 9170	C2042028	06/22	06/25
Cable 1m 40GHz	INTELLICONNECT	C-KPKP-1503-1M	A5329987	04/21	08/22
SMA 1.5m	SUCOFLEX	18GHz	A5329864	09/22	09/23
Antenna Mat (OATS)	ETS Lingren	2071-2	F2000392		
Biconic Antenna	EATON	94455-1	C2040234	03/21	03/23
Cable (OATS)	—	1GHz	A5329623	09/22	09/23
Emission Cable	MICRO-COAX	1GHz	A5329656	08/22	08/23
Emission Cable	RADIALEX		A5329061	08/22	08/23
OATS	—	—	F2000409	07/22	07/23
Rehausse Table C1/OATS	LCIE	—	F2000512		
Turntable / Mast controller (OATS)	ETS Lingren	Model 2066	F2000372		

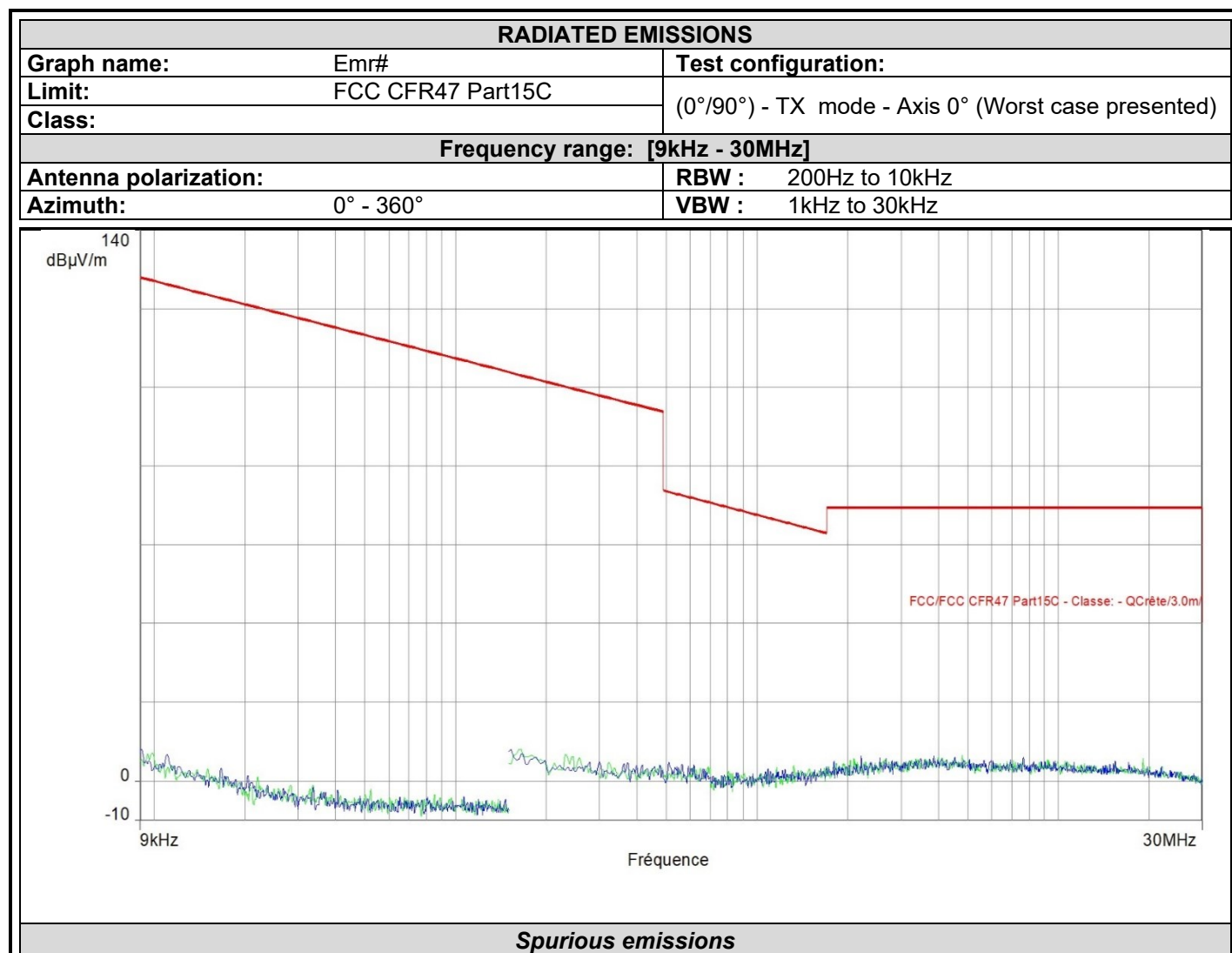
Note: In our quality system, the test equipment calibration due is more & less 2 months

9.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

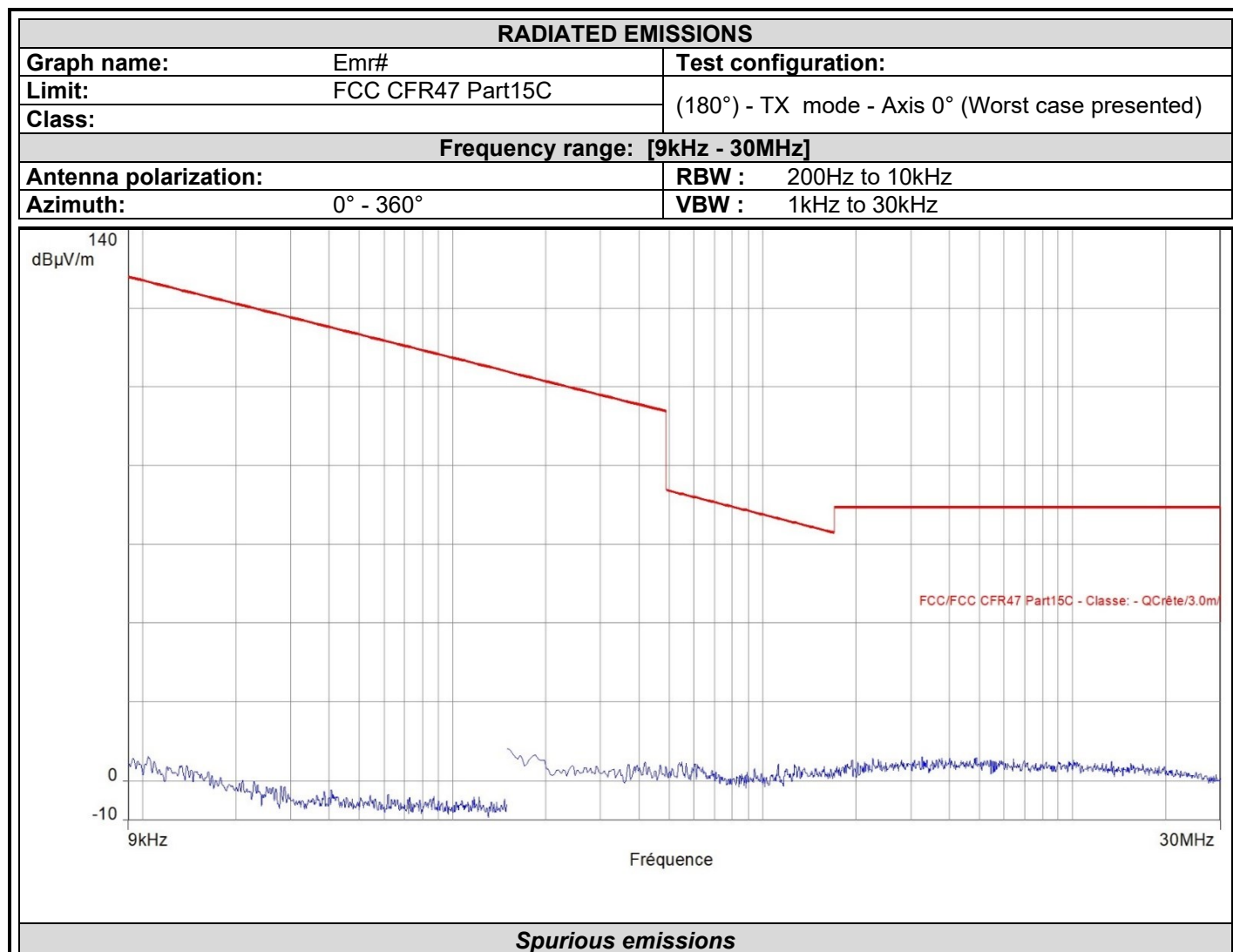
☒ None
 ☐ Divergence:

9.6. RESULTS

Results in the frequency band [0.009-30] MHz: Worst case presented BETWEEN ANTENNA 1&2

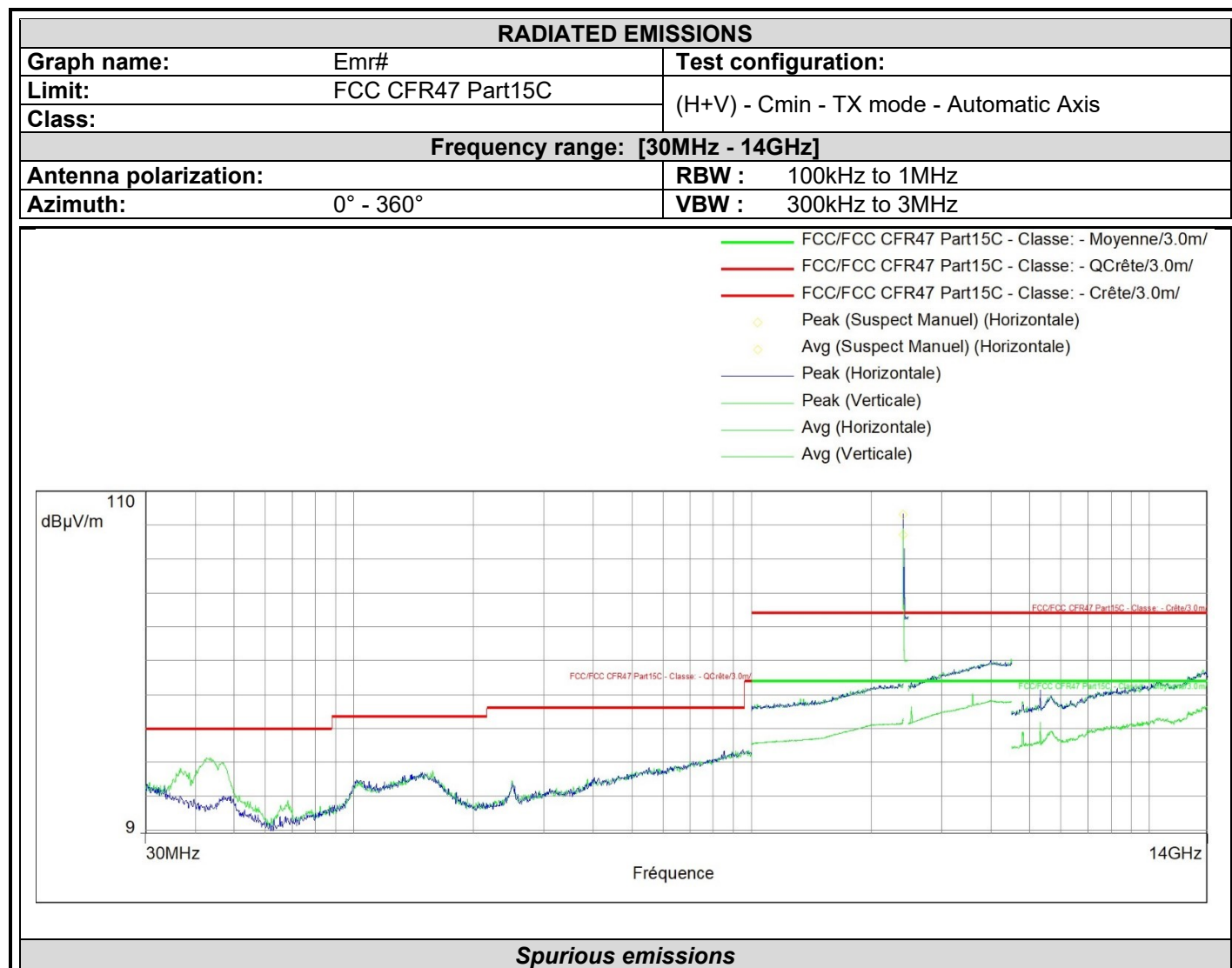


No significative frequency observed



No significative frequency observed

Results in the frequency band [30MHz - 25GHz]: Worst case presented
ANTENNA 1

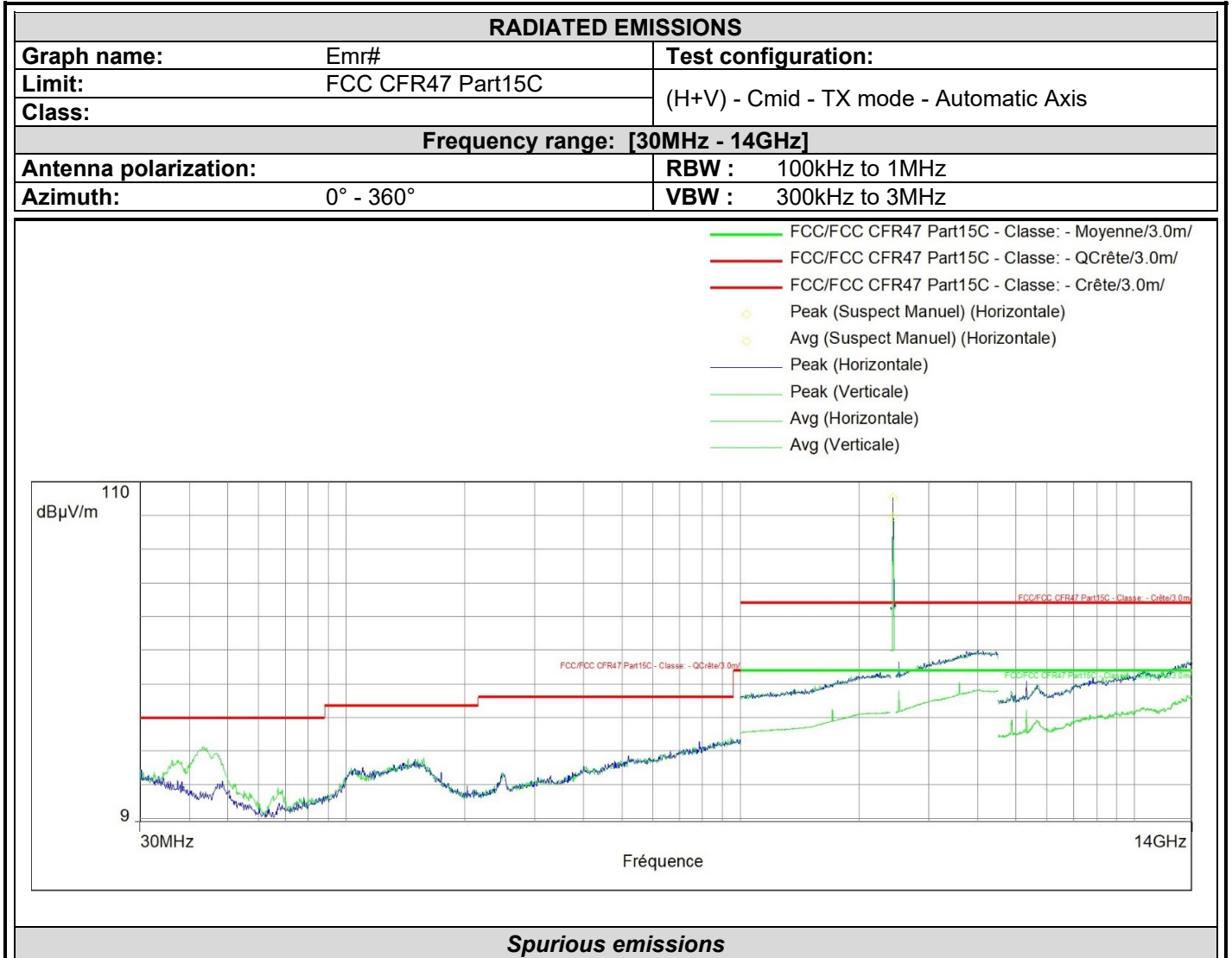


Spurious emissions

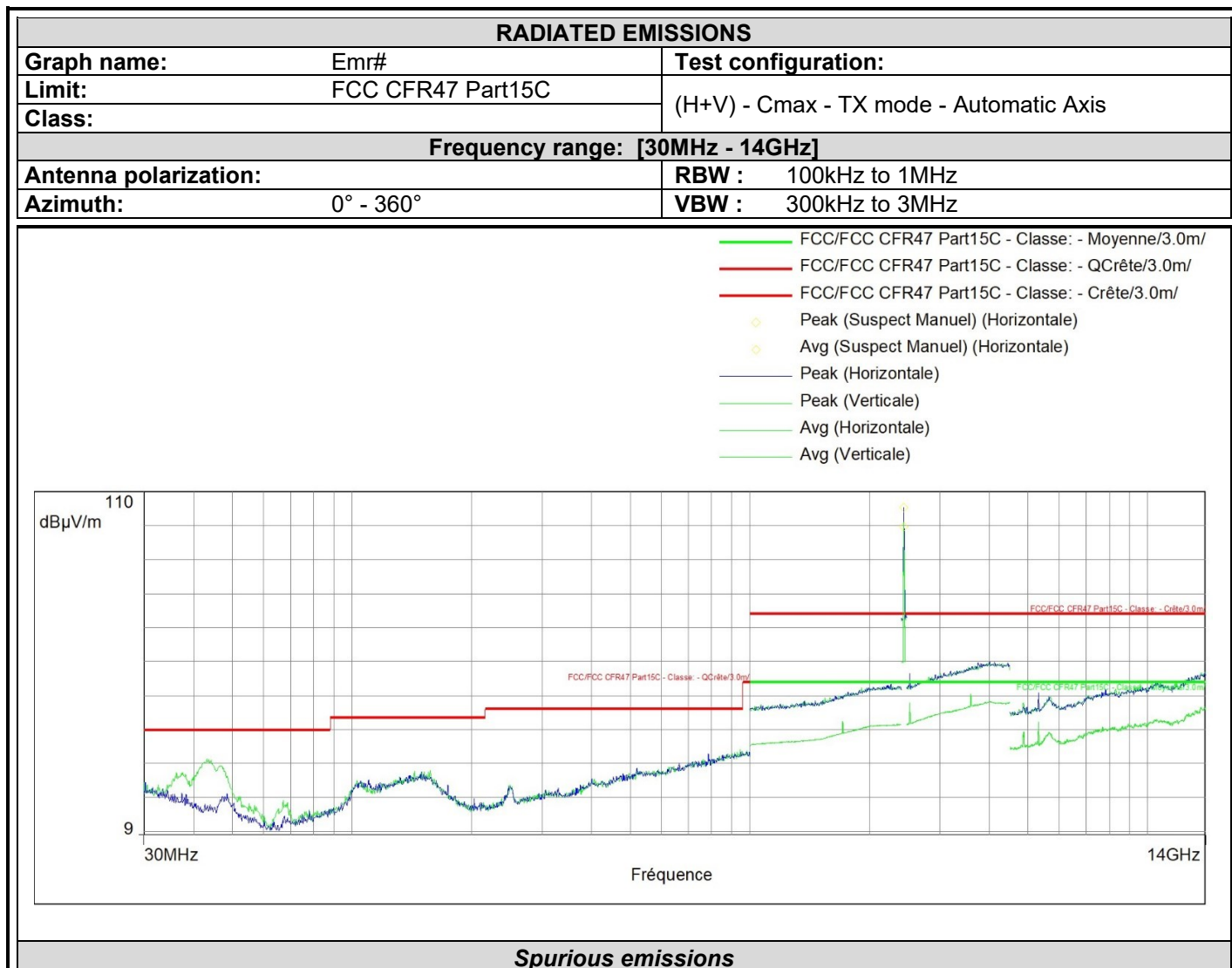
Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Lim.Q-Peak (dBμV/m)	Polarization	Correction (dB)
2404.384	103.2	74.0	97.2	54.0		Horizontal	35.4



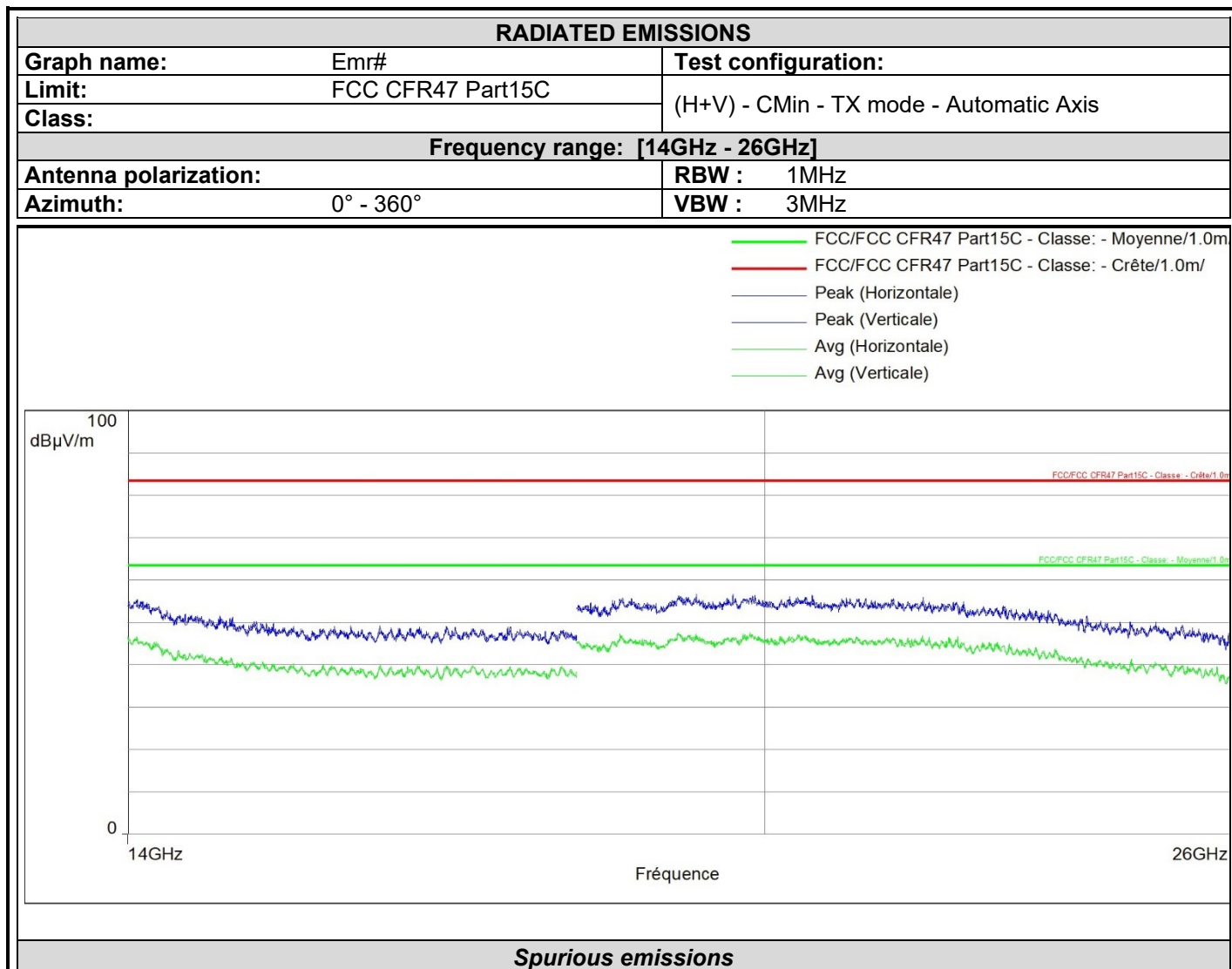
L C I E



Frequency (MHz)	Peak (dBµV/m)	Lim.Peak (dBµV/m)	Avg (dBµV/m)	Lim.Avg (dBµV/m)	Lim.Q-Peak (dBµV/m)	Polarization	Correction (dB)
2440.539	105.3	74.0	99.7	54.0		Horizontal	35.4



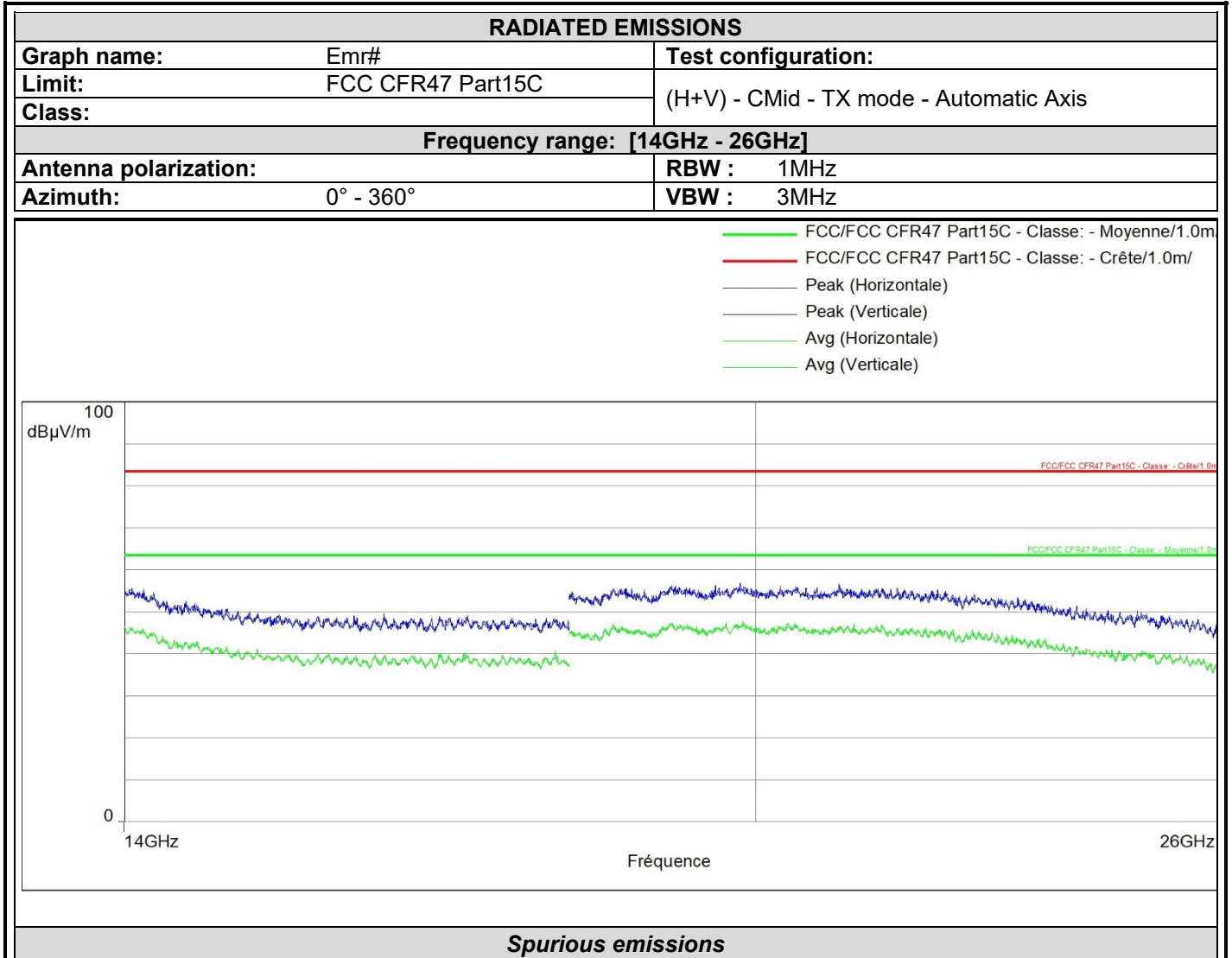
Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Lim.Q-Peak (dBμV/m)	Polarization	Correction (dB)
2479.539	104.7	74.0	97.7	54.0		Horizontal	35.5



No significative frequency observed

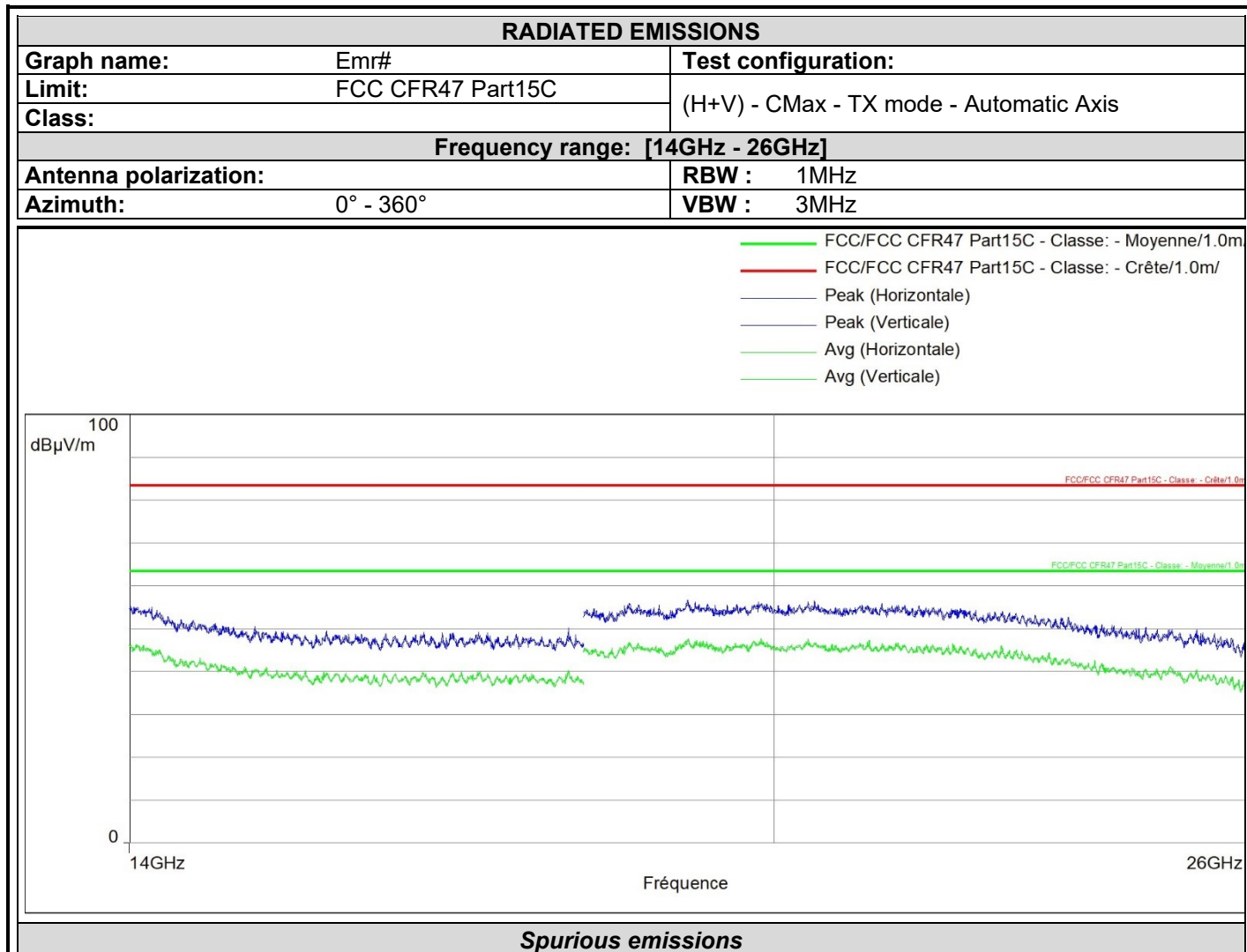


L C I E



Spurious emissions

No significative frequency observed



No significative frequency observed

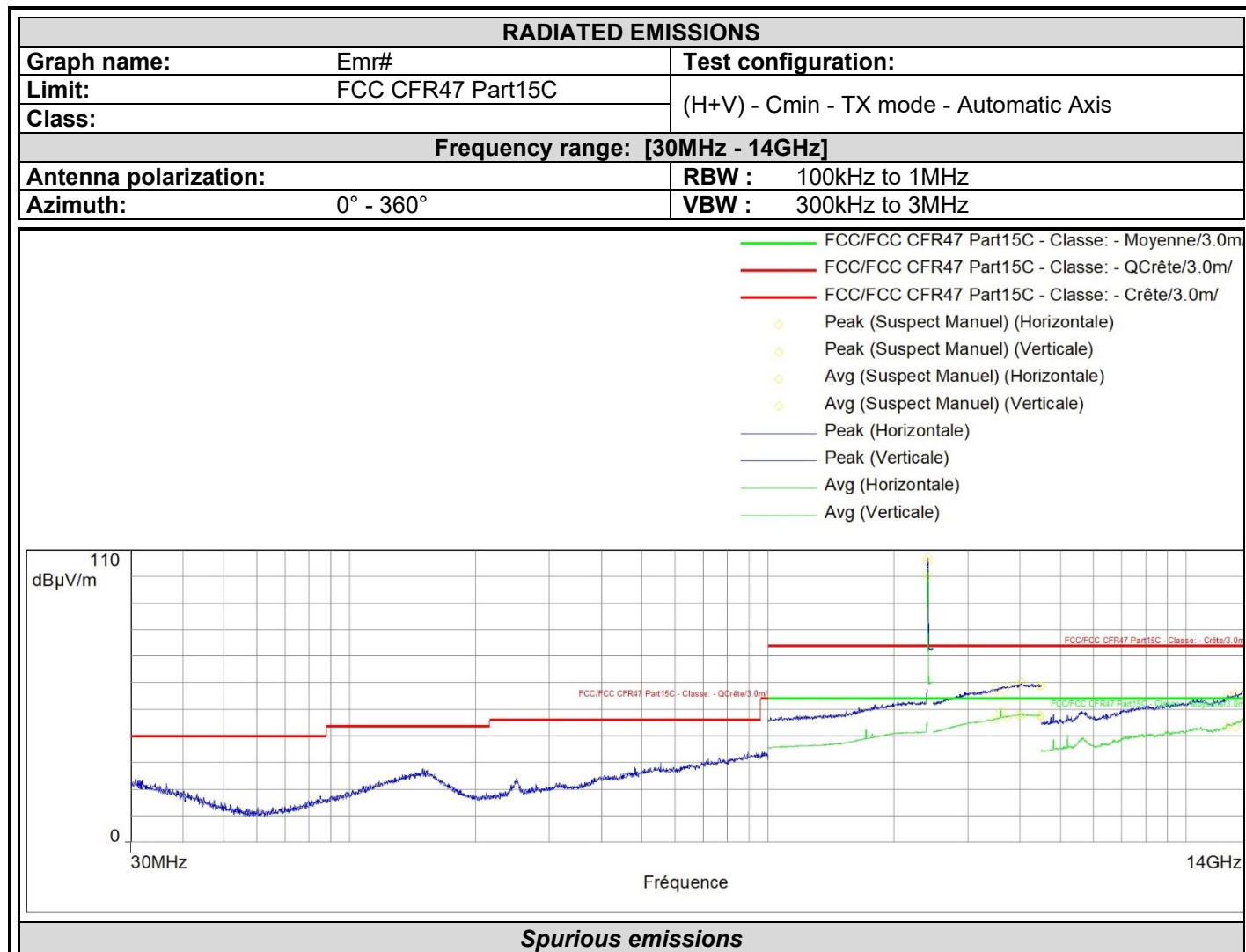
QUALIFICATION (30MHz - 25GHz): 3 meters measurement in full anechoic chamber. The frequency list is created from the results obtained during the pre-characterization in anechoic chamber.

Measurements are performed using a PEAK and AVERAGE detection.

Test Frequency (MHz)	Meter Reading dB(μV)	Detector (Pk/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Transducer Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
No significant frequency observed										

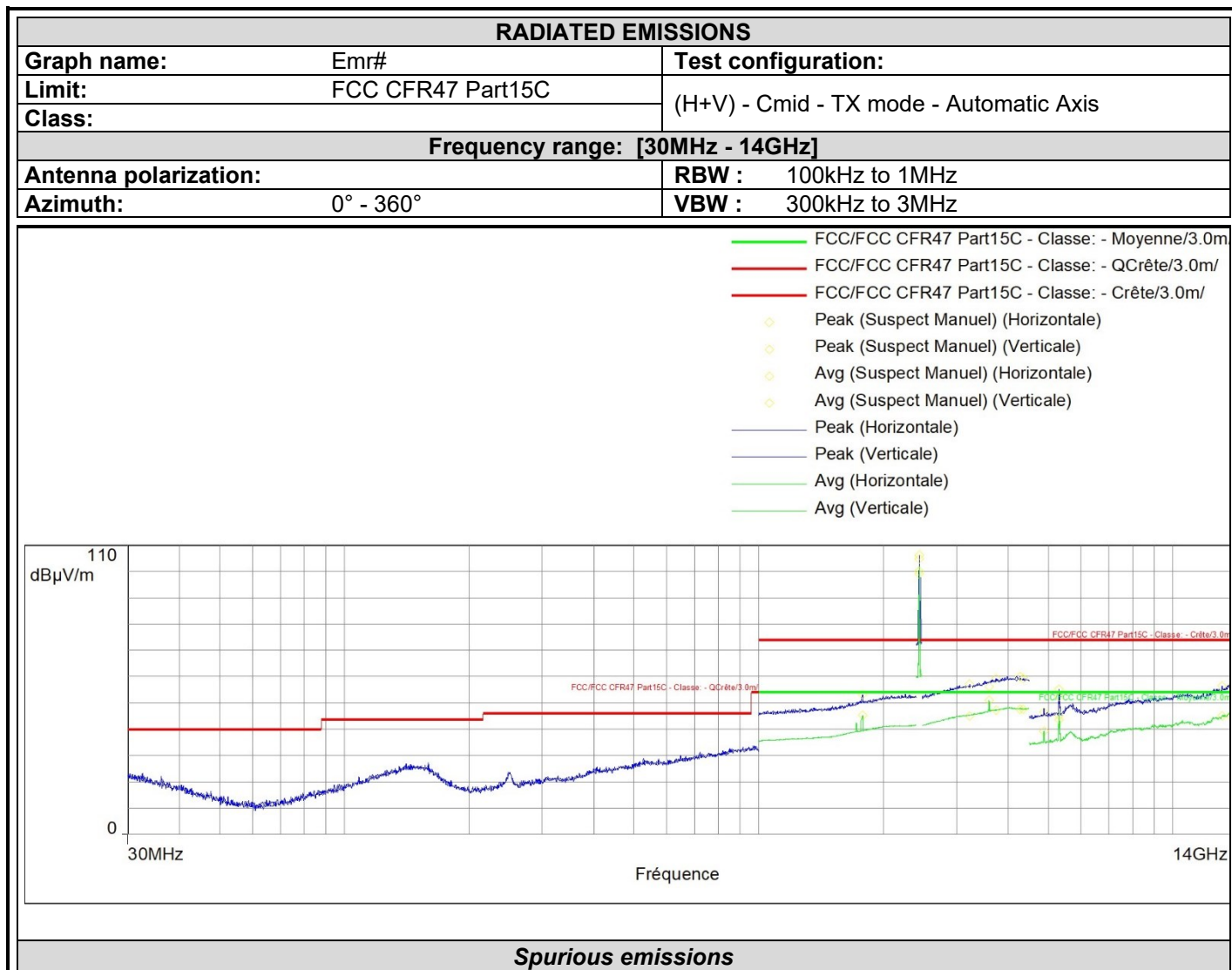
*Note: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)
 (M@3m = M@10m+10.5dB)*

ANTENNA 2



Spurious emissions

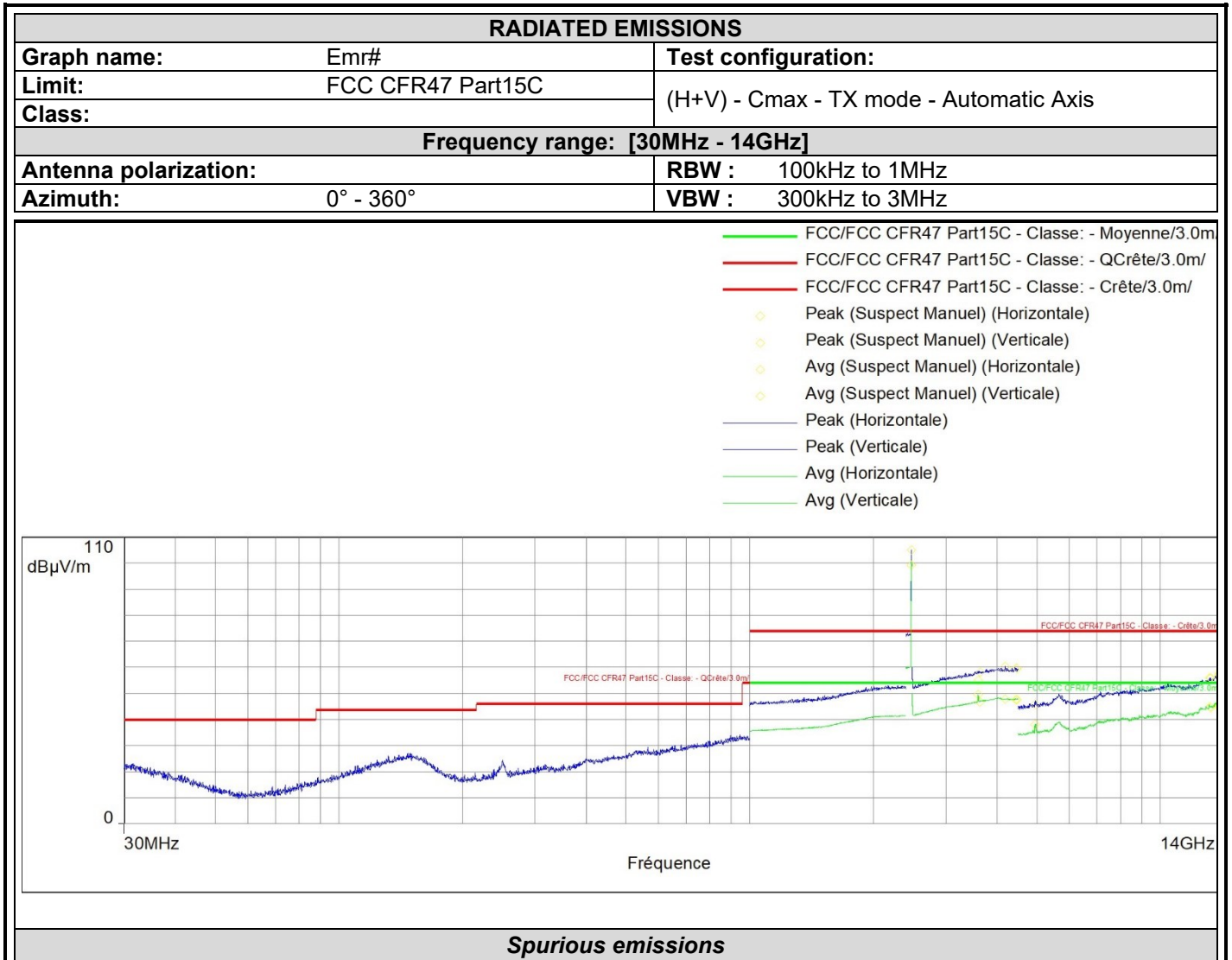
Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Polarization	Correction (dB)
2404.509	105.5	74.0	99.8	54.0	Horizontal	35.4
3599.834	55.0	74.0	49.4	54.0	Horizontal	39.9
3731.310	58.5	74.0	46.8	54.0	Horizontal	40.2
4039.431	60.3	74.0	47.9	54.0	Horizontal	41.1
4468.139	58.7	74.0	47.5	54.0	Horizontal	40.9
12580.542	55.5	74.0	43.6	54.0	Horizontal	-9.4
13904.208	56.9	74.0	46.5	54.0	Horizontal	-5.3
13092.750	56.2	74.0	43.4	54.0	Vertical	-7.8
13907.375	56.7	74.0	46.0	54.0	Vertical	-5.3
3499.816	57.6	74.0	46.2	54.0	Vertical	39.6
3973.694	59.3	74.0	47.8	54.0	Vertical	41.1
4497.177	58.9	74.0	47.6	54.0	Vertical	40.9
2404.467	107.3	74.0	101.4	54.0	Vertical	35.4



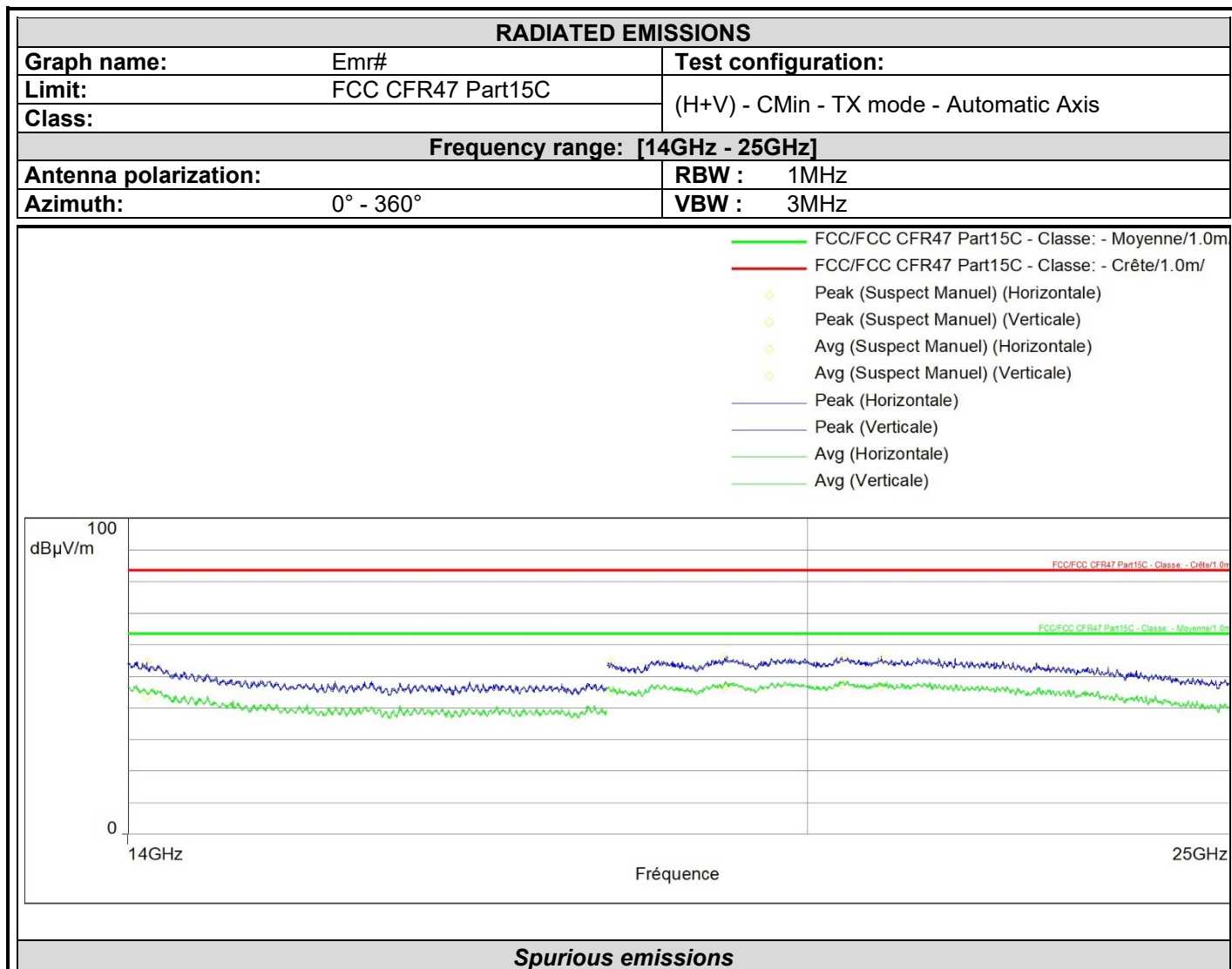
Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Polarization	Correction (dB)
1780.850	53.2	74.0	45.2	54.0	Horizontal	33.7
2439.454	104.9	74.0	99.1	54.0	Horizontal	35.4
3599.834	56.3	74.0	51.0	54.0	Horizontal	39.9
4269.716	60.0	74.0	47.5	54.0	Horizontal	41.0
5313.833	55.2	74.0	45.4	54.0	Horizontal	-18.1
4880.792	46.4	74.0	39.4	54.0	Vertical	-19.1
5313.042	52.5	74.0	43.6	54.0	Vertical	-18.1
13158.458	56.4	74.0	45.0	54.0	Vertical	-8.0
13807.625	56.2	74.0	44.8	54.0	Vertical	-5.6
3230.008	57.2	74.0	45.1	54.0	Vertical	38.9
3745.426	59.4	74.0	47.2	54.0	Vertical	40.3
4352.796	59.3	74.0	47.6	54.0	Vertical	40.9
2439.412	106.2	74.0	100.2	54.0	Vertical	35.4



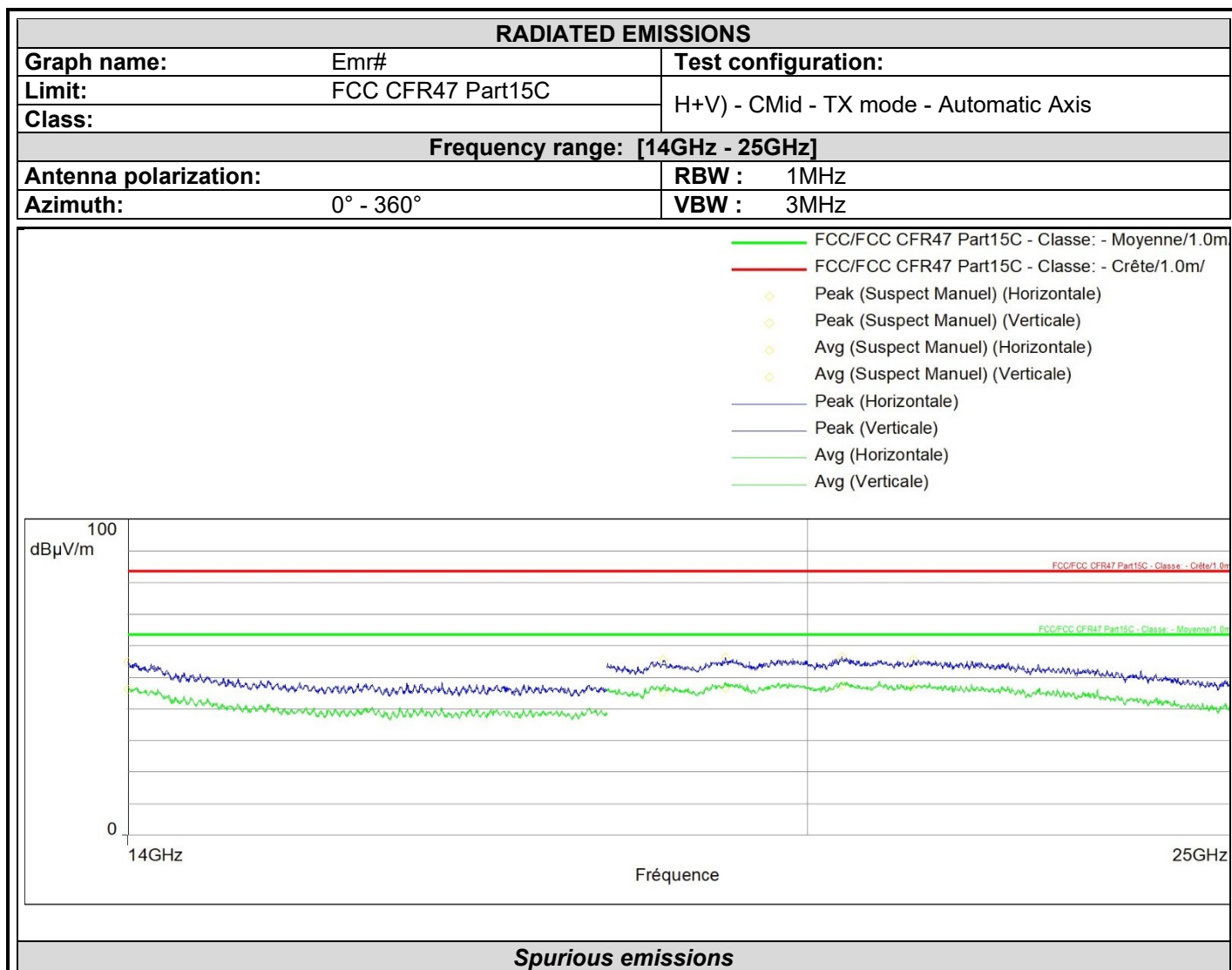
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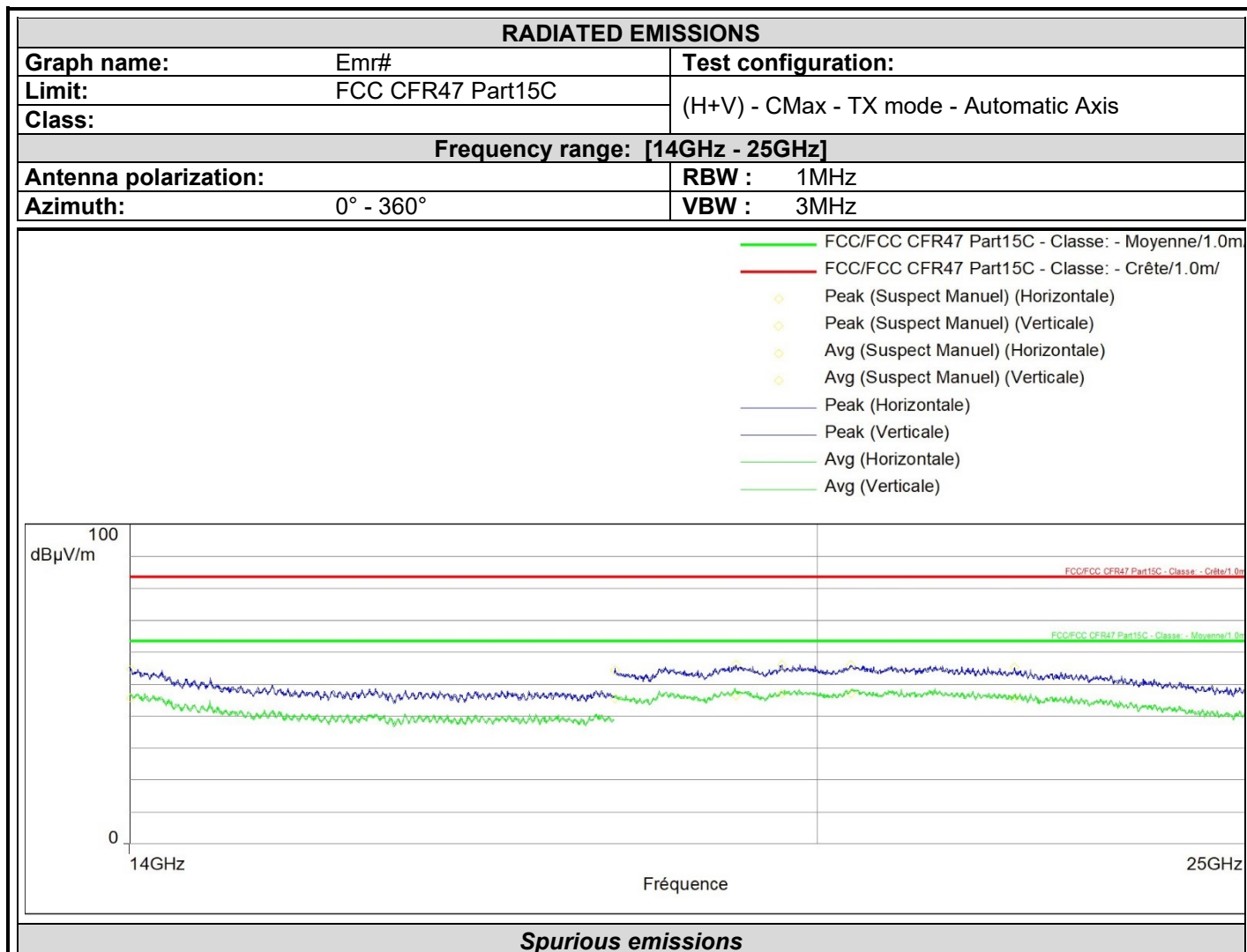
Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Polarization	Correction (dB)
2479.534	104.9	74.0	99.4	54.0	Horizontal	35.4
3599.834	55.1	74.0	49.6	54.0	Horizontal	39.9
3635.728	58.1	74.0	46.6	54.0	Horizontal	40.0
4454.427	59.8	74.0	47.7	54.0	Horizontal	40.8
13174.292	56.0	74.0	44.8	54.0	Horizontal	-8.0
13925.583	57.6	74.0	45.2	54.0	Horizontal	-5.2
4958.375	45.8	74.0	38.2	54.0	Vertical	-18.8
13239.208	56.1	74.0	44.5	54.0	Vertical	-8.3
13920.042	57.3	74.0	45.5	54.0	Vertical	-5.2
4183.813	60.2	74.0	47.9	54.0	Vertical	41.0
4480.642	59.5	74.0	47.6	54.0	Vertical	40.9
2479.492	105.1	74.0	99.2	54.0	Vertical	35.4



Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Polarization	Correction (dB)
14138.000	54.6	83.5	43.6	63.5	Horizontal	1.3
19142.750	55.8	83.5	46.4	63.5	Vertical	2.5
20783.667	55.5	83.5	46.8	63.5	Vertical	1.6
18035.000	54.2	83.5	45.2	63.5	Horizontal	0.6
20355.500	56.0	83.5	47.4	63.5	Horizontal	2.5



Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Polarization	Correction (dB)
14000.333	54.9	83.5	46.1	63.5	Horizontal	2.4
18535.500	55.5	83.5	45.4	63.5	Vertical	2.1
21137.750	55.5	83.5	46.9	63.5	Vertical	1.6
19150.333	56.2	83.5	46.5	63.5	Horizontal	2.5
20359.583	56.4	83.5	47.4	63.5	Horizontal	2.5



Frequency (MHz)	Peak (dBμV/m)	Lim.Peak (dBμV/m)	Avg (dBμV/m)	Lim.Avg (dBμV/m)	Polarization	Correction (dB)
14010.667	54.6	83.5	45.5	63.5	Vertical	2.3
19631.583	56.1	83.5	47.0	63.5	Horizontal	2.7
18005.833	54.3	83.5	45.6	63.5	Vertical	0.9
19170.167	56.0	83.5	46.4	63.5	Vertical	2.4
20343.833	55.8	83.5	47.1	63.5	Vertical	2.4
22150.417	55.2	83.5	45.6	63.5	Vertical	1.6

9.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **SCHNEIDER ELECTRIC Extension Zigbee module**, SN: **HRB76894 03**, 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. UNCERTAINTIES CHART

Type de mesure / Kind of measurement	Incertitude élargie laboratoire / Wide uncertainty laboratory (k=2) ± x	Incertitude limite du CISPR / CISPR uncertainty limit ± y
Measurement of conducted disturbances in voltage on the power port	3.29dB	3.4 dB
Measurement of conducted disturbances in voltage on the telecommunication port.	3.26 dB	5dB
Measurement of discontinuous conducted disturbances in voltage	3.33 dB	3.4 dB
Measurement of conducted disturbances in current	2.67 dB	2.9dB
Spurious emission, radiated (Semi anechoic chamber & open test site)	5.60 dB	6 dB
Spurious emission, radiated (Full anechoic chamber above 1GHz)	±3.8 dB	±6 dB
Occupied Channel Bandwidth	±2.8 %	±5 %
RF power, conducted	±1.2 dB	±1.5 dB
Power Spectral Density, Conducted	±1.7 dB	±3 dB
Spurious emission, conducted	±2.3 dB	±3 dB
Temperature	±0.75 °C	±3 °C
Supply Voltages	±1.7 %	±3 %

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