



LCIE

Bluetooth Low Energy Template: Release September 27, 2019

TEST REPORT

N°: 165231-747369-A(FILE#1031502)

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
38EQI Plant
31 rue Pierre Mendès France
38320 – Eybens
FRANCE

Apparatus under test

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

PowerTag F160 3P/3P+N
Schneider Electric
Schneider Electric
A9MEM1580
Sample RF
2AH7L-MEM158X
21522-MEM158X

Conclusion

See Test Program chapter

Test date

January 24, 2020 to February 4, 2020

Test location

Fontenay Aux Roses

Test Site

6230B-1

Sample receipt date

January 24, 2020

Composition of document

57 pages

Document issued on

March 31, 2020

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	March 25, 2020	Majid MOURZAGH	Creation of the document
02	March 31, 2020	Majid MOURZAGH	Modification of model name

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

All test are performed on the product powered by 480Vac/60Hz.
See below for details of the "Powertag HR" range:

Product Technical specification overview

> Aim of the project :

- Enlarge PowerTag Energy Sensors range with a rating of **160A**

> Installation / compatibility

- The PowerTag HR is a component of the panel board
- Is is always put inside the panel board behind the front cover

> Main electrical product requirements

- 3P - 3P+N
- Networks : 100V/173VAC ; 120V/208VAC ; 230V/400VAC ; 277V/480VAC ; 50-60Hz
- OVC IV – PD3
- Ib = 25A ; Imax = 160A
- Energy Measurement Class 1

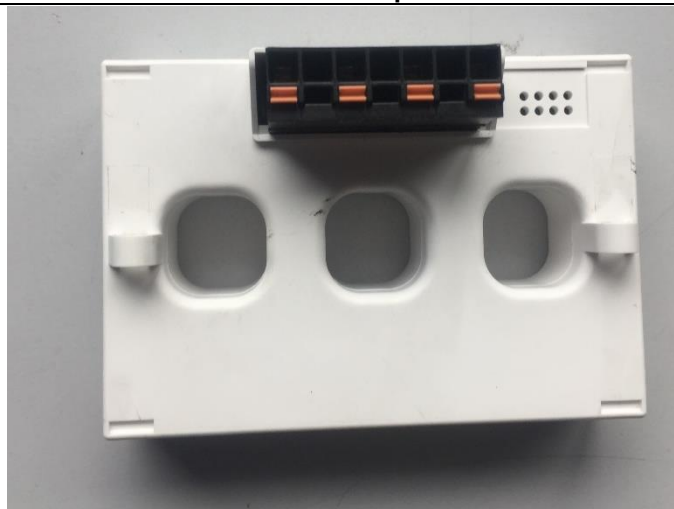
Note: The PowerTag HR = PowerTag F160 3P/3P+N

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

Schneider Electric A9MEM1580

Serial Number: Sample RF



Equipment Under Test

Power supply:

During all the tests, EUT is supplied by V_{nom} : 480Vac/60Hz

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

Name	Type	Rating	Reference / Sn	Comments
Supply1	☒ AC	480Vac 50- 60Hz	/	Configuration n°1 for radiated methode
Supply2	☒ AC	100Vac 50 – 60Hz	/	Configuration n°2 for AC Power Line Conducted Emissions
Supply 2	☒ DC	4.4 VDC	/	Configuration n°3 for conducted methode



Voltage table used (for Power Line Conducted Emissions):

Type	Measurement performed:	
☒ AC	☐ 480VAC/60Hz	☒ 100VAC/50Hz
☒ DC	☐ +12VDC	☒ -4.4VDC
☐ Battery	☐ +3.6VDC	☐ -....VDC
☐ USB (Laptop auxiliary)	☐ 120VAC/60Hz (Laptop auxiliary)	☐ 240VAC/50Hz(Laptop auxiliary)

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Supply1	3 Lines + Neutral	1.8	☐	☐	☒	Configuration n°1
Supply2	3 Lines + Neutral	1.8	☐	☐	☒	Configuration n°2

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop HP	EliteBook 8570p	/	/
Interface Board	Not communicated	/	/
AC source 1kW	KEYSIGHT	AC6802A	AC source 1kW

Equipment information:

Type:	☒ ZIGBEE	☐ RF4CE
Spacing channel:	5MHz	
Channel bandwidth:	2MHz	
Antenna Type:	☒ Integral	☐ External ☐ Dedicated
Antenna connector:	☐ Yes	☒ No ☐ Temporary for test
Transmit chains:	1	
	Single antenna	
	Gain: 4.4dBi	
Beam forming gain:	No	
Type of equipment:	☒ Stand-alone	☐ Plug-in ☐ Combined
Duty cycle:	☒ Continuous duty	☐ Intermittent duty ☐ 100% duty
Equipment type:	☒ Production model	☐ Pre-production model
Type of power source:	☒ AC power supply	☒ DC power supply Used temporary for test ☐ Battery
Operating voltage range:	Vnom:	☒ 4.4Vdc Used temporary for test



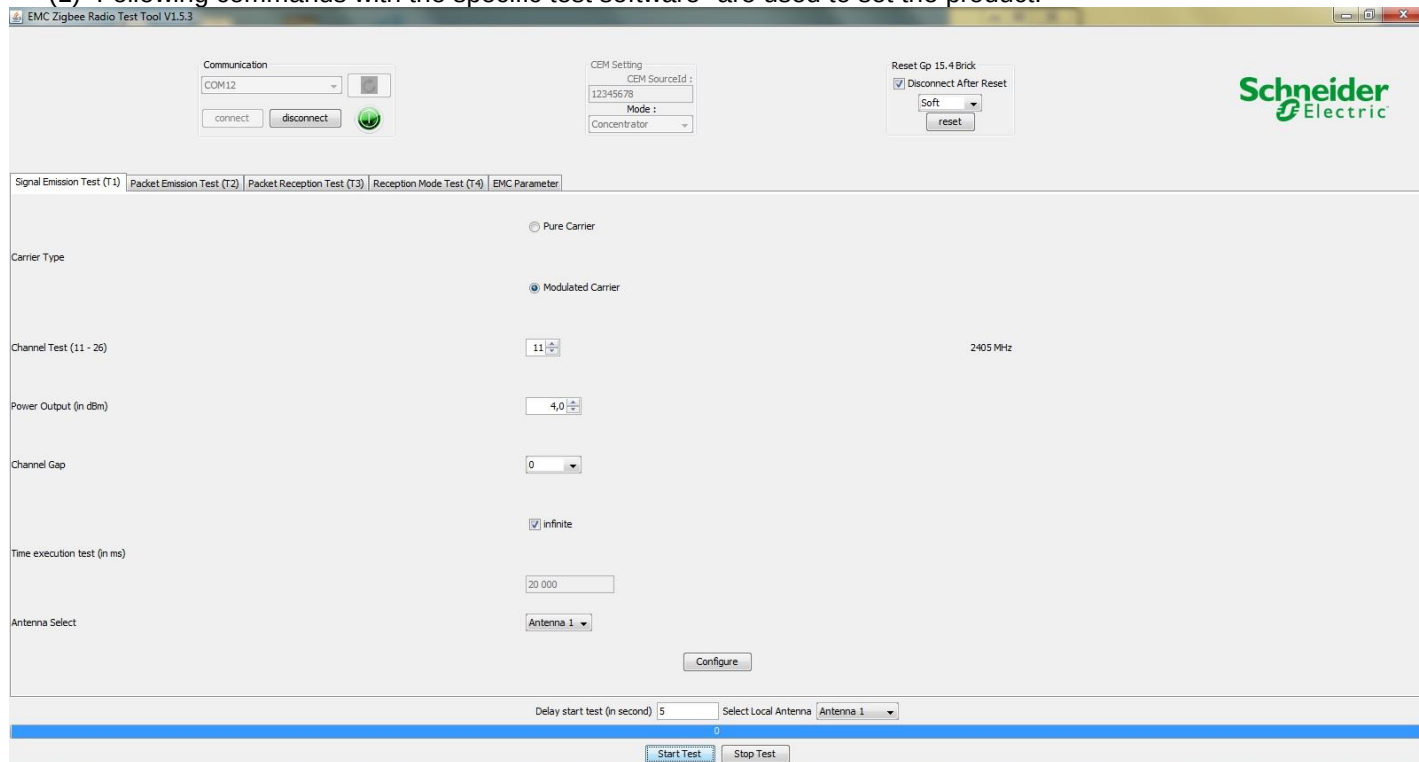
CHANNEL PLAN	
Channel	Frequency (MHz)
Cmin: 11	2405
12	2410
13	2415
14	2420
15	2425
16	2430
17	2435
Cmid: 18	2440
19	2445
20	2450
21	2455
22	2460
23	2465
24	2470
25	2475
Cmax: 26	2480

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

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 reception
Test	Running mode
Occupied Bandwidth	☒ Test mode 1 (1) ☐ Alternative test mode()
6dB Bandwidth	☒ Test mode 1 (1) ☐ Alternative test mode()
Maximum Conducted Output Power	☒ Test mode 1 (1) ☐ Alternative test mode()
Power Spectral Density	☒ Test mode 1 (1) ☐ Alternative test mode()
Conducted Spurious Emission at the Band Edge	☒ Test mode 1 (1) ☐ Alternative test mode()
Unwanted Emissions into Non-Restricted Frequency Bands	☒ Test mode 1 (1) ☐ Alternative test mode()
AC Power Line Conducted Emission	☒ Test mode 1 (1) ☐ Alternative test mode()
Unwanted Emissions into Restricted Frequency Bands	☒ Test mode 1 (1) ☐ Alternative test mode()

(1) Following commands with the specific test software are used to set the product:



The screenshot shows the EMC Zigbee Radio Test Tool V1.5.3 interface. The top section includes communication settings (COM12, connect/disconnect buttons), CEM settings (CEM SourceId: 12345678, Mode: Concentrator), and a reset button. The Schneider Electric logo is visible in the top right. The main section is divided into tabs: Signal Emission Test (T1), Packet Emission Test (T2), Packet Reception Test (T3), Reception Mode Test (T4), and EMC Parameter. The Packet Emission Test (T2) tab is selected. The configuration area includes: Carrier Type (Modulated Carrier selected), Channel Test (11 - 26), Power Output (4.0 dBm), Channel Gap (0), Time execution test (infinite), and Antenna Select (Antenna 1). A 'Configure' button is present. At the bottom, there is a 'Delay start test (in second)' field set to 5, a 'Select Local Antenna' dropdown set to Antenna 1, and 'Start Test' and 'Stop Test' buttons.



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

2.4. EQUIPMENT LABELLING

None

2.5. EQUIPMENT MODIFICATION

☒ None ☐ Modification:

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Majid Mourzagh
Date of test : January 27, 2020
Ambient temperature : 23 °C
Relative humidity : 36 %

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:

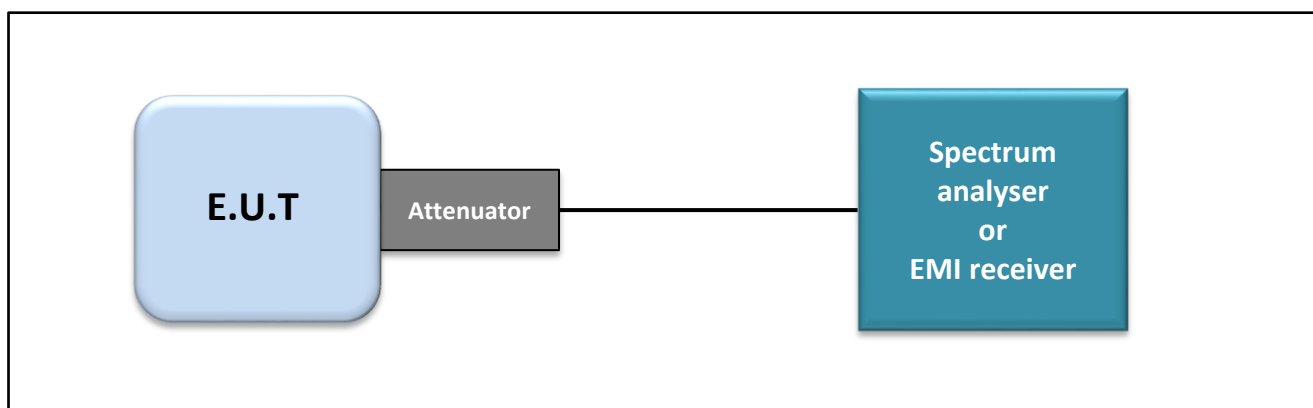
- ☒ Conducted Method
☐ Radiated Method

- Test Procedure:

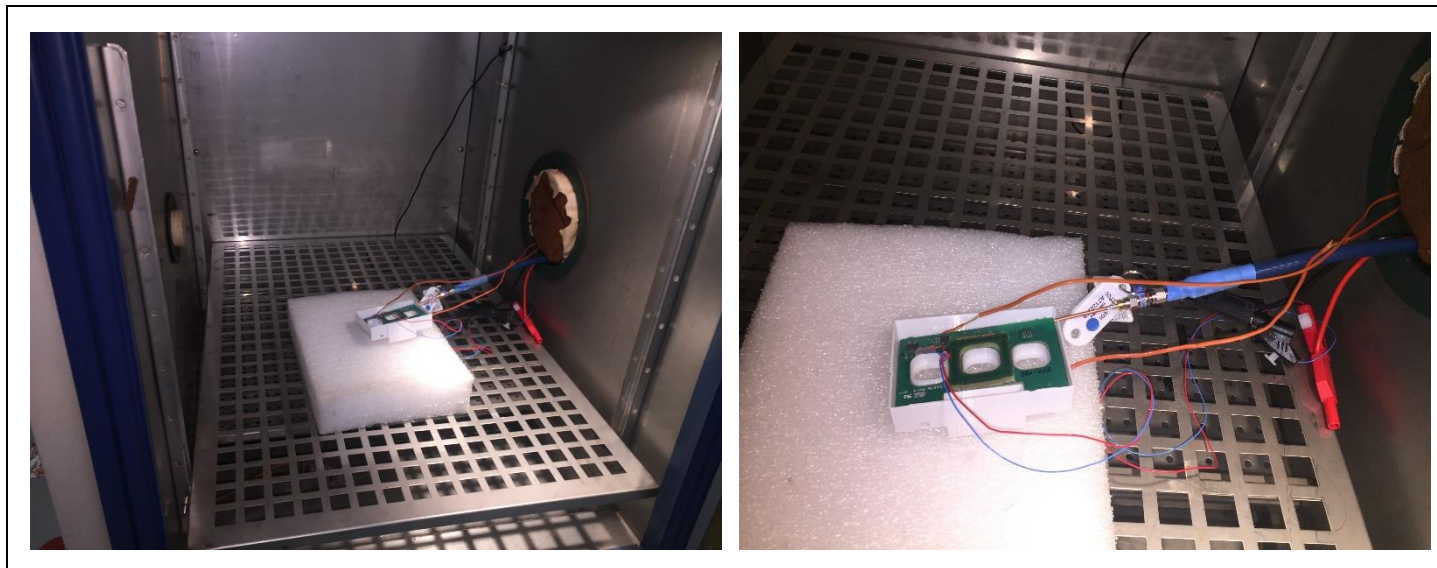
- ☒ RSS-Gen Issue 5 § 6.7
☐ ANSI C63.10 § 6.9.2

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**

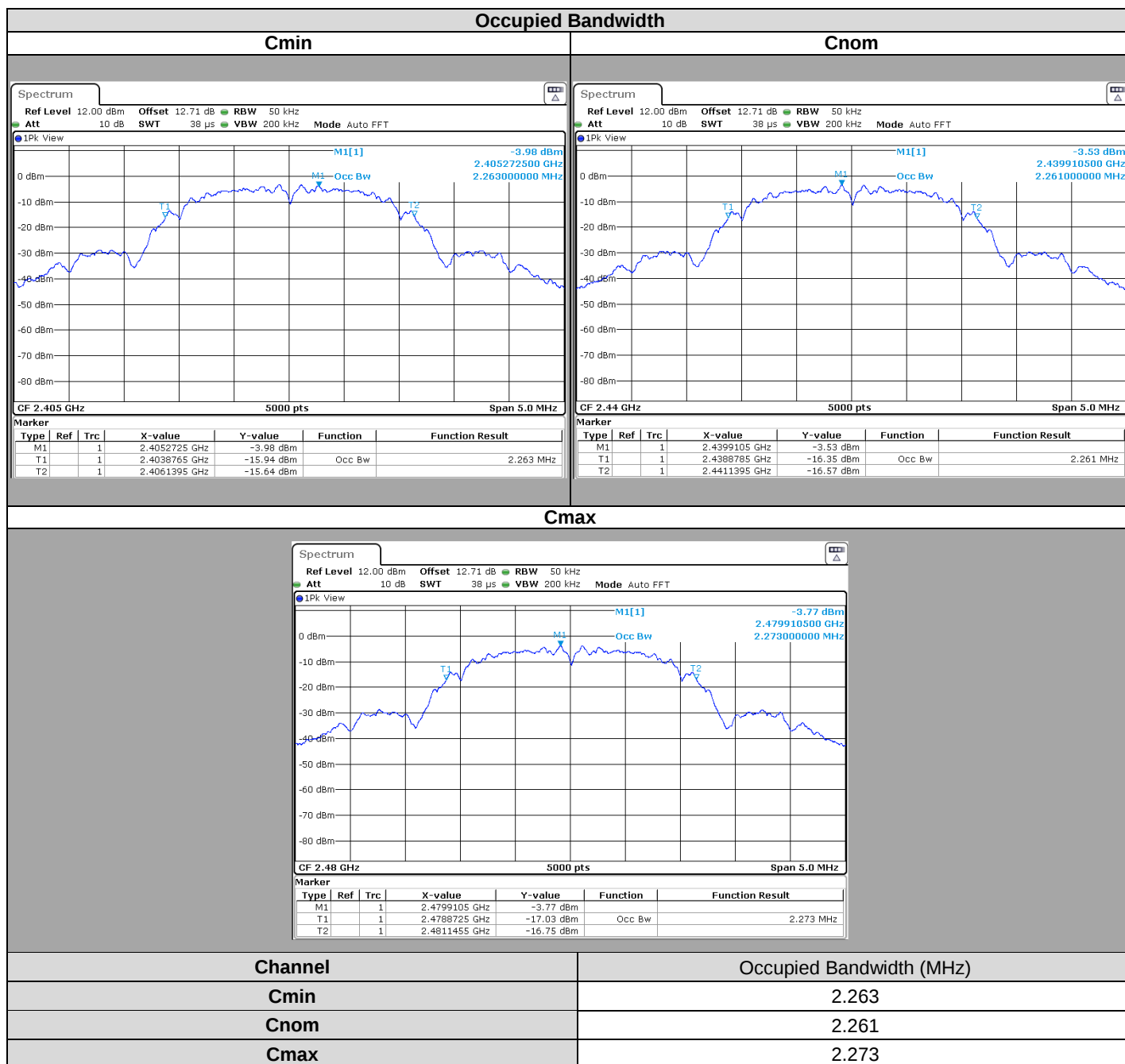
None

3.4. **TEST EQUIPMENT LIST**

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	02/20
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
AC source 1kW	KEYSIGHT	AC6802A	A7042305		
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	03/20
SMA 1.5m	SUCOFLEX	18GHz	A5329863	11/18	03/20

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 A9MEM1580**, SN: **Sample RF**, 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 : Majid Mourzagh
Date of test : January 27, 2020
Ambient temperature : 23 °C
Relative humidity : 36 %

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:

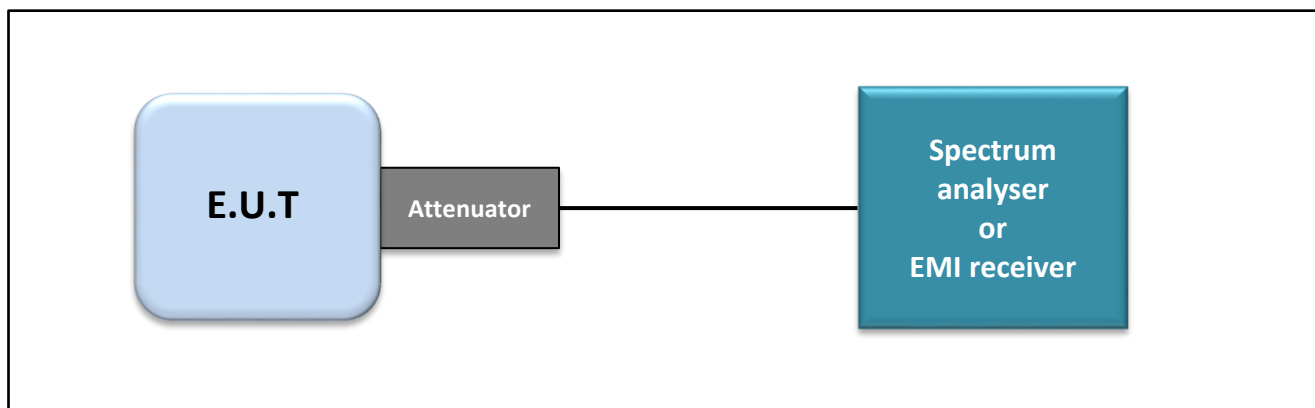
- ☒ Conducted Method
☐ Radiated Method

- Test Procedure:

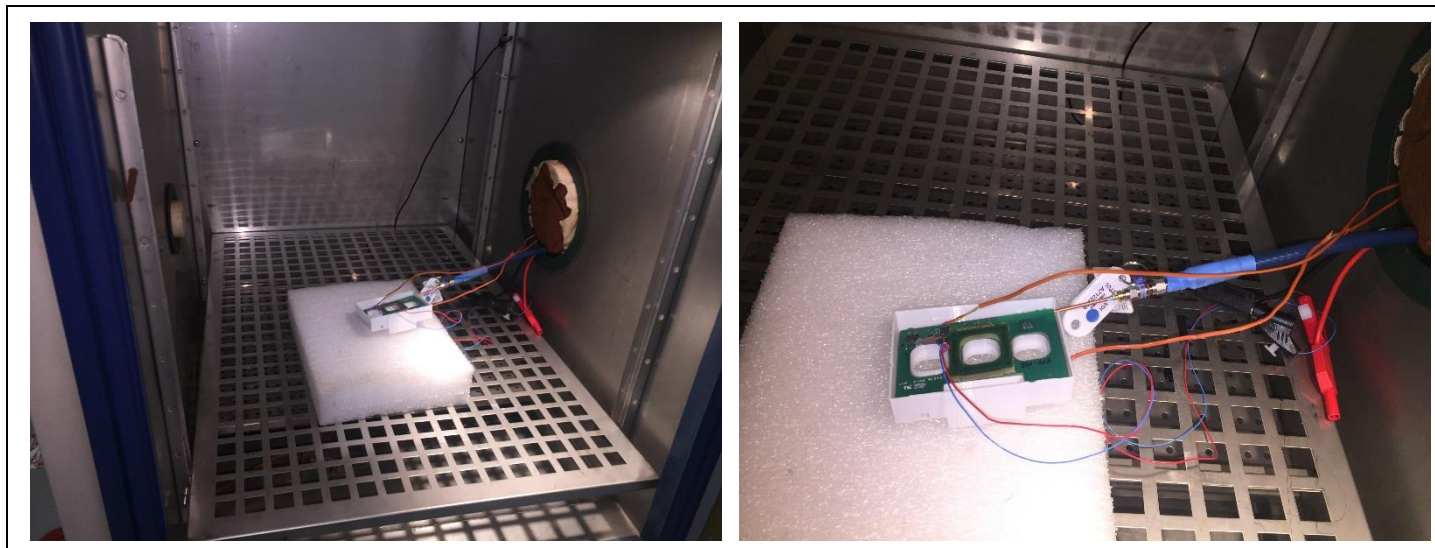
- ☒ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.2

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

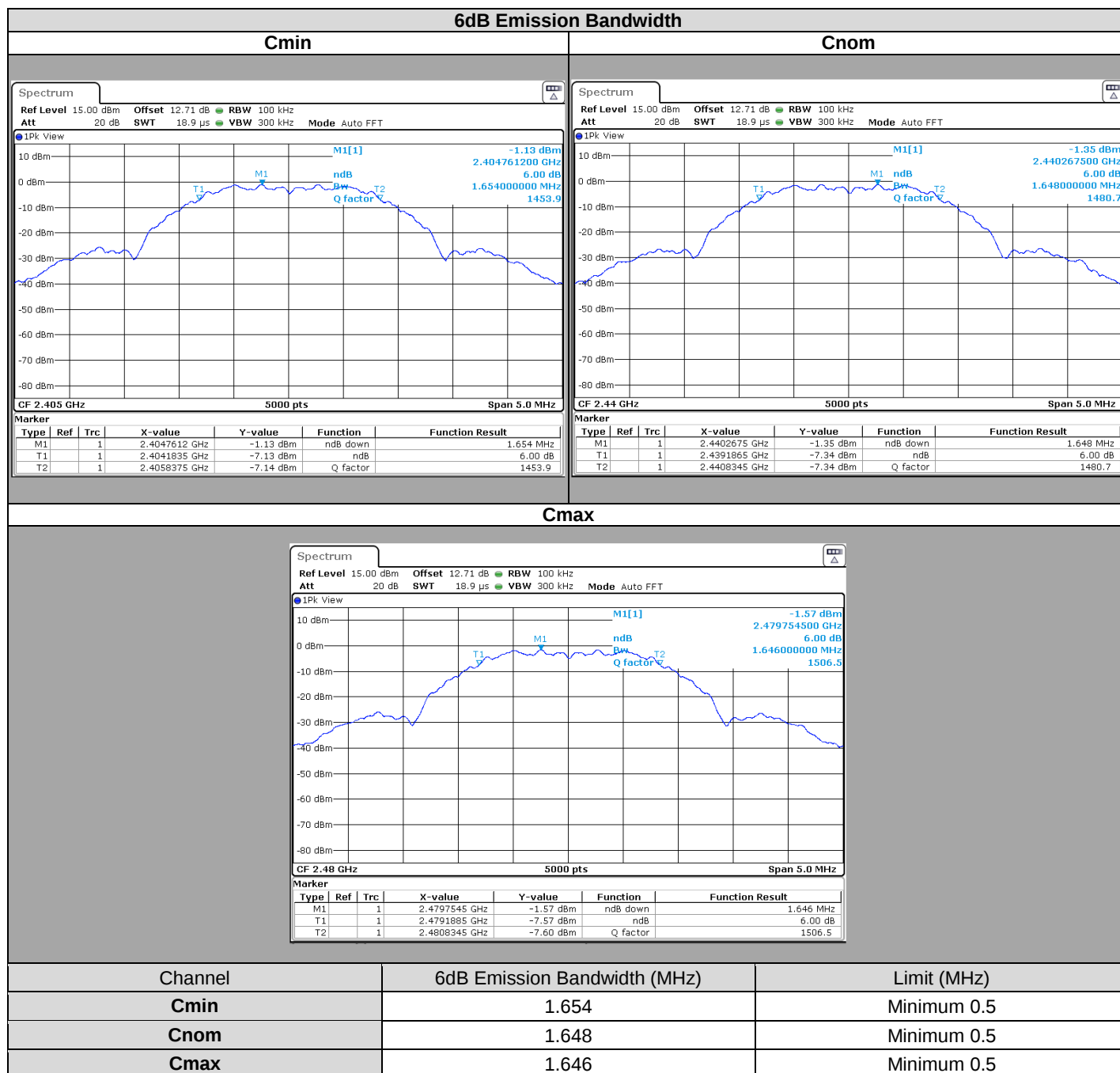
The 6dB bandwidth shall be at least 500kHz

4.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	02/20
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
AC source 1kW	KEYSIGHT	AC6802A	A7042305		
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	03/20
SMA 1.5m	SUCOFLEX	18GHz	A5329863	11/18	03/20

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 A9MEM1580**, SN: **Sample RF**, 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 : Majid Mourzagh
Date of test : January 27, 2020
Ambient temperature : 23 °C
Relative humidity : 36 %

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

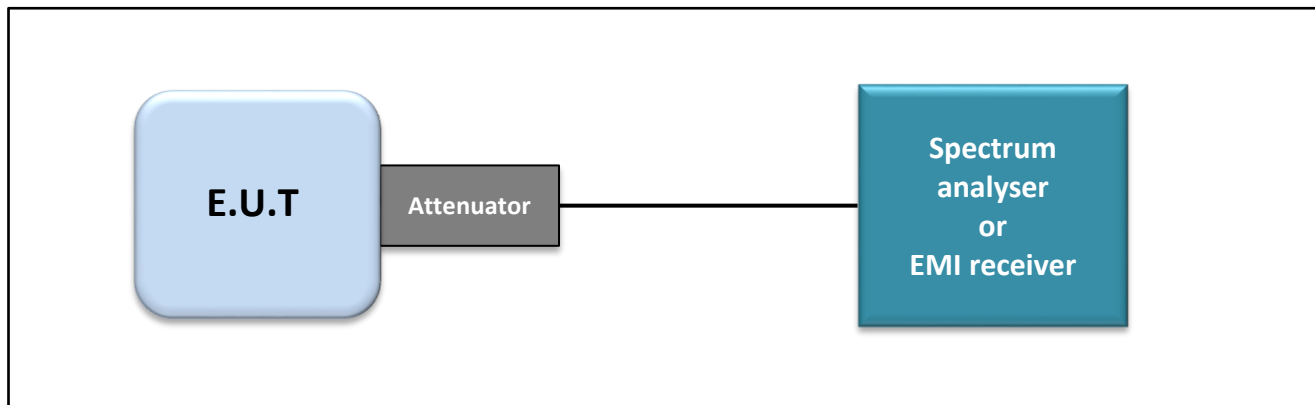
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

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

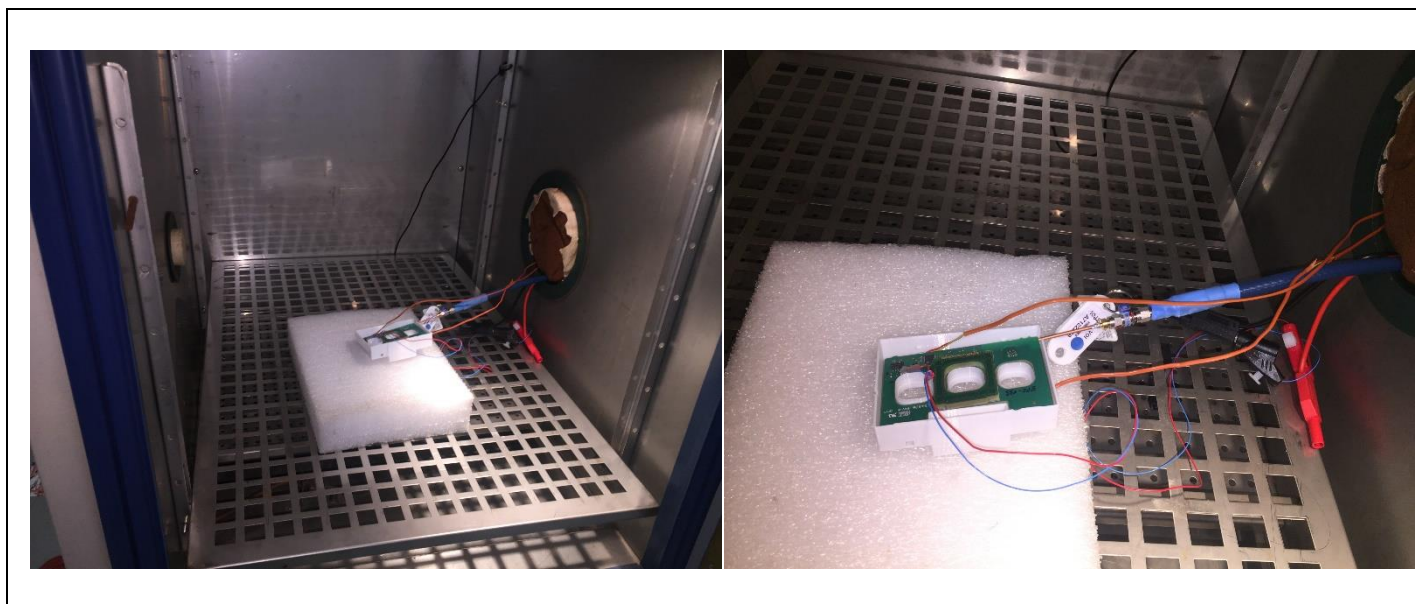
- ☐ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.3.1.2

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

- Set the RBW = 1 MHz.
- Set the VBW $\geq 3 \times$ RBW
- Set the span $\geq 1.5 \times$ DTS bandwidth.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- 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

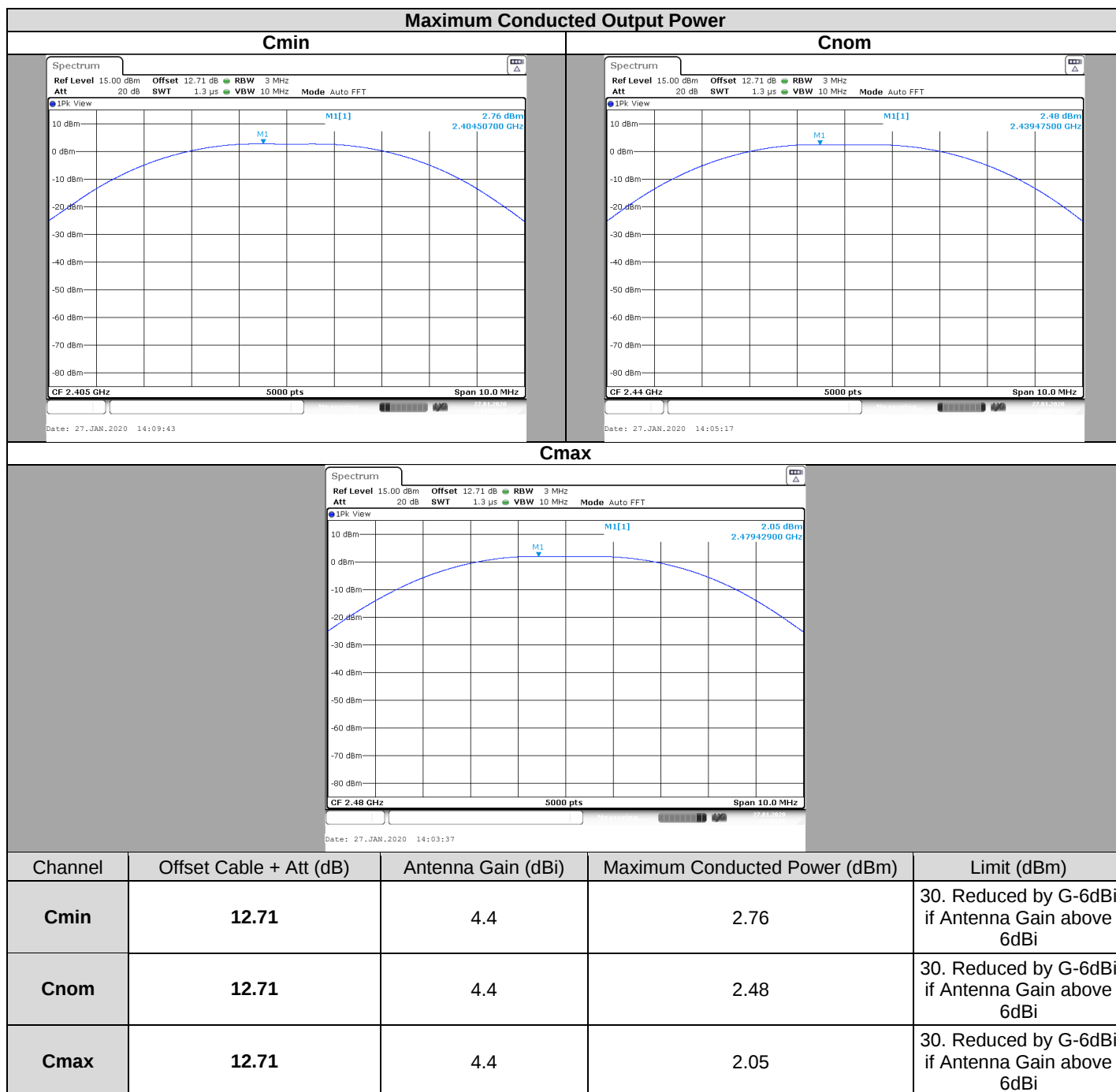


5.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	02/20
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
AC source 1kW	KEYSIGHT	AC6802A	A7042305		
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	03/20
SMA 1.5m	SUCOFLEX	18GHz	A5329863	11/18	03/20

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 A9MEM1580**, SN: **Sample RF**, 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 : Majid Mourzagh
Date of test : January 27, 2020
Ambient temperature : 23 °C
Relative humidity : 36 %

6.2. TEST SETUP

- The Equipment Under Test is installed:

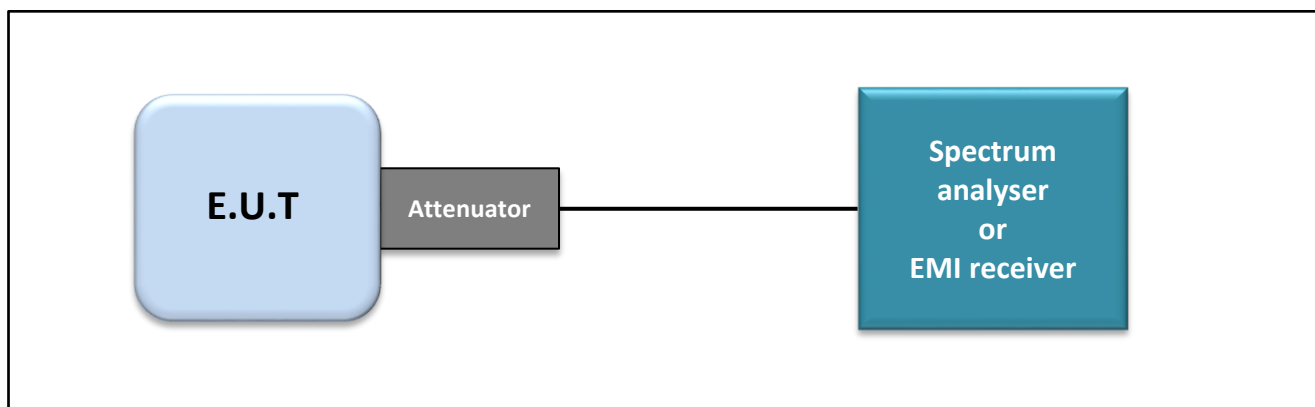
- ☒ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

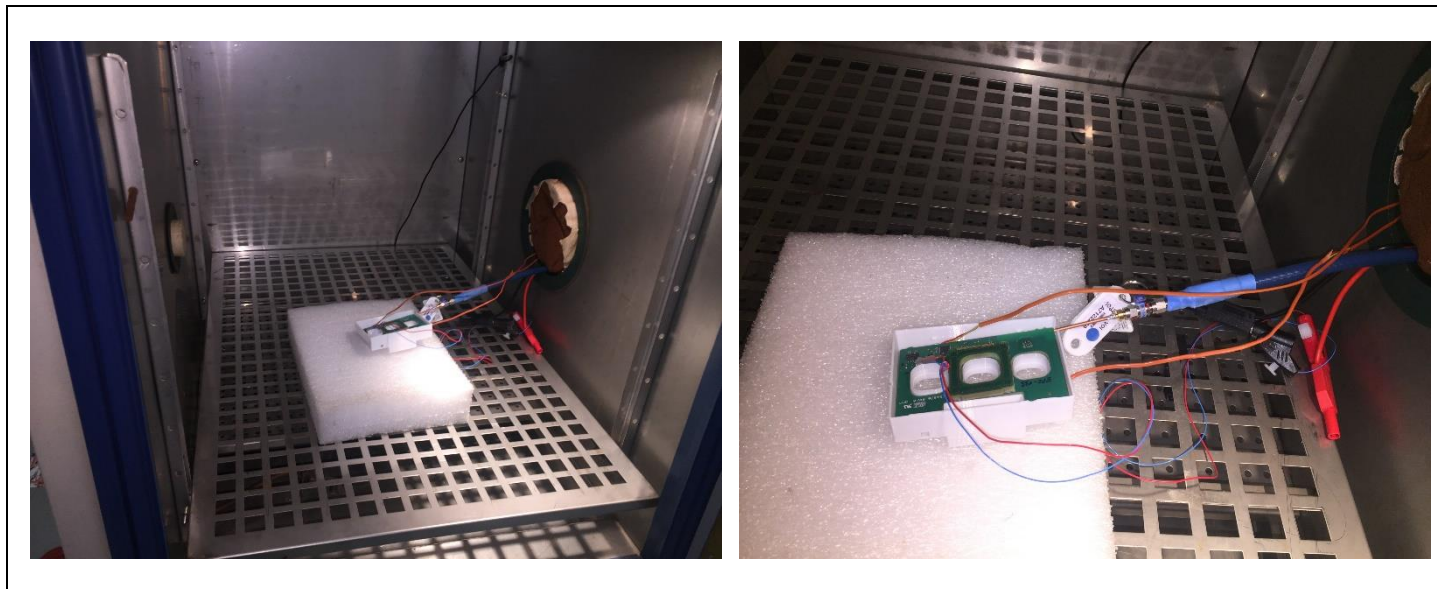
- ☒ Conducted Method
☐ Radiated Method

- 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

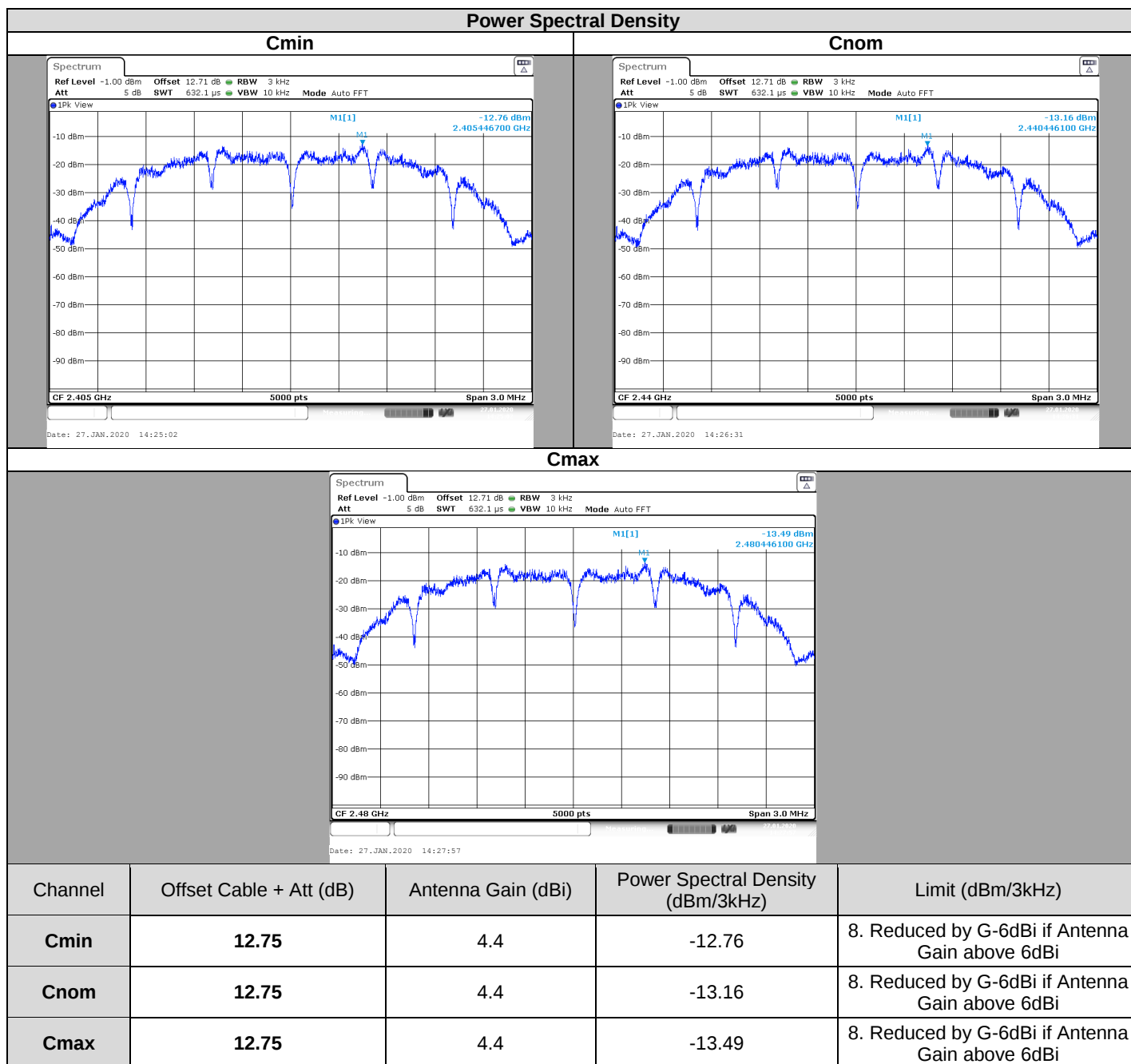
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

6.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	02/20
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
AC source 1kW	KEYSIGHT	AC6802A	A7042305		
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	03/20
SMA 1.5m	SUCOFLEX	18GHz	A5329863	11/18	03/20

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 A9MEM1580**, SN: **Sample RF**, 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 : Majid Mourzagh
Date of test : January 27, 2020
Ambient temperature : 23 °C
Relative humidity : 36 %

7.2. TEST SETUP

- The Equipment Under Test is installed:

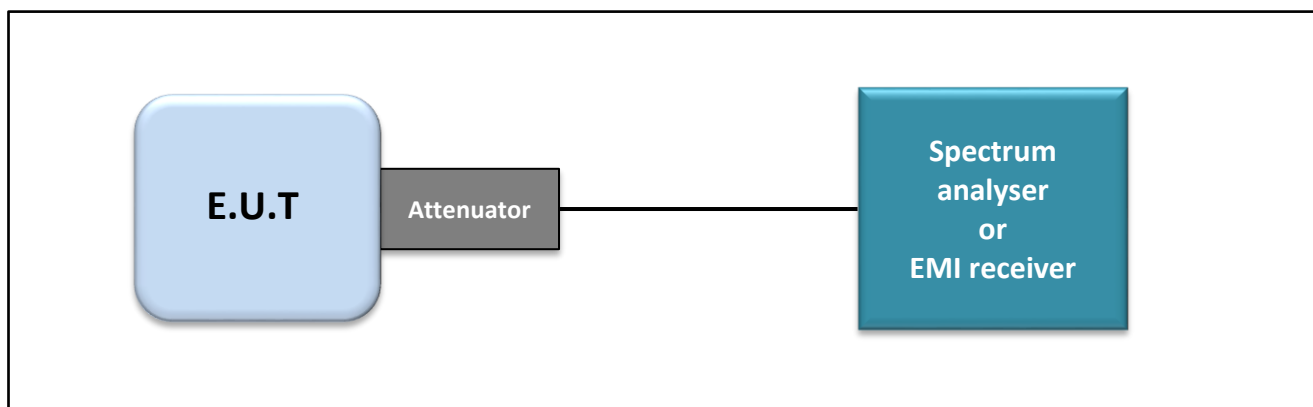
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

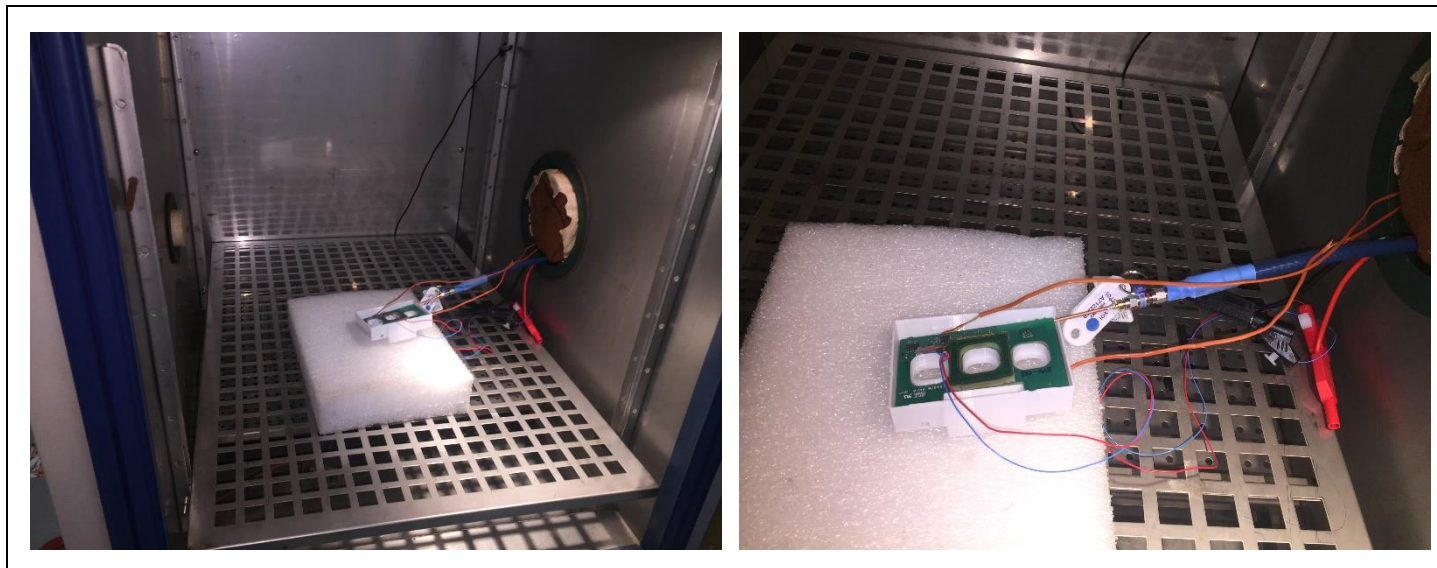
- ☒ Conducted Method
- ☐ Radiated Method

- 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

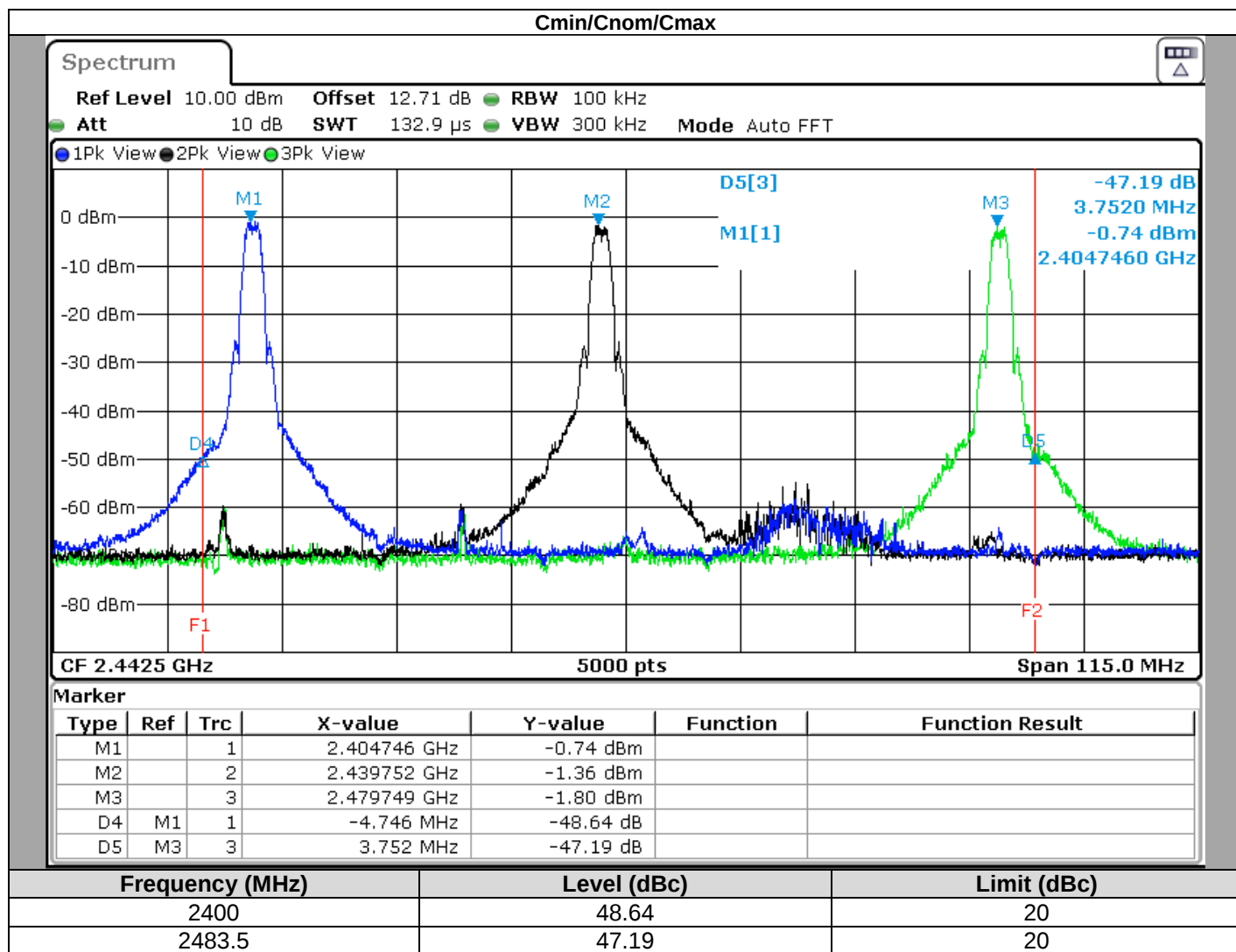
All Spurious Emissions must be at least 20dB below the Fundamental Radiator Level at the Band Edge Edge “2400MHz & 2483,5MHz”

7.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	02/20
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
AC source 1kW	KEYSIGHT	AC6802A	A7042305		
SMA 1.5m	SUCOFLEX	18GHz	A5329864	11/18	03/20
SMA 1.5m	SUCOFLEX	18GHz	A5329863	11/18	03/20

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 A9MEM1580**, SN: **Sample RF**, 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 : Majid Mourzagh
Date of test : January 27, 2020
Ambient temperature : 23 °C
Relative humidity : 36 %

8.2. TEST SETUP

- The Equipment under Test is installed:

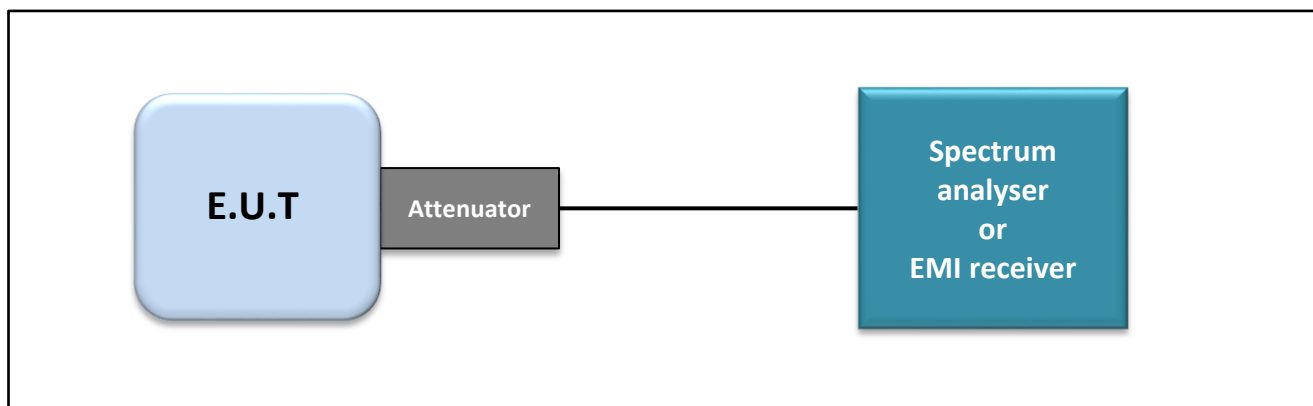
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

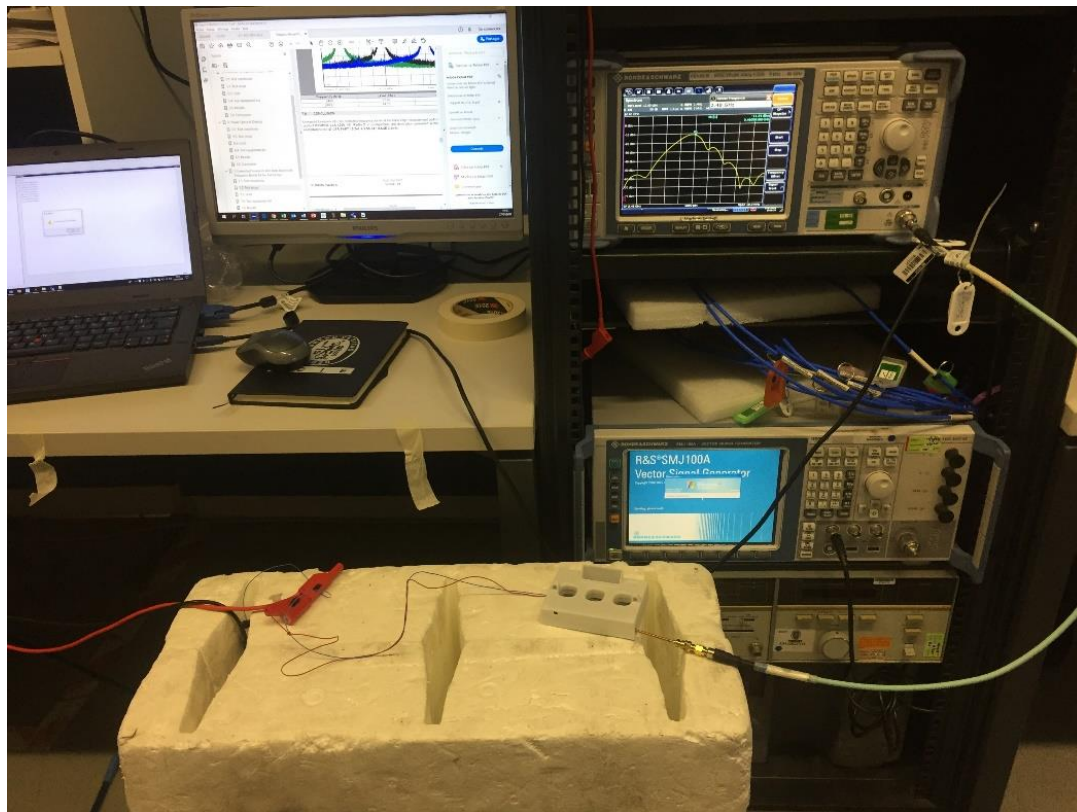
- ☒ Conducted Method
- ☐ Radiated Method

- Test Procedure:

- ☒ 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

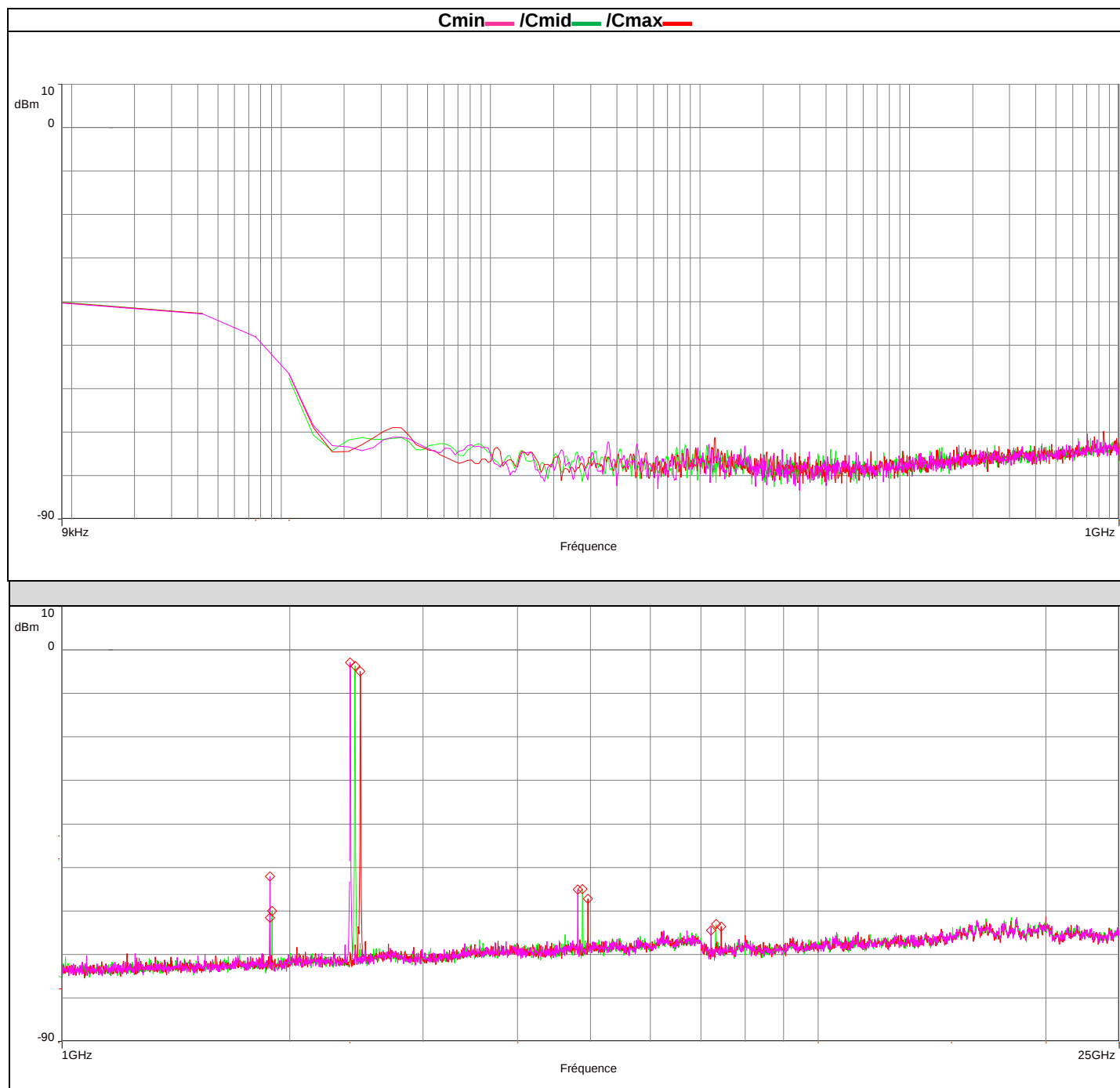
All Spurious Emissions must be at least 20 below the Fundamental Radiator Level

8.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	—	A7122269	12/18	02/20
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
AC source 1kW	KEYSIGHT	AC6802A	A7042305		
BAT EMC	NEXIO	v3.9.0.10	L1000115		
Cable Measure	—	36G	A5329604	02/19	02/20

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	-2.94		
1883.54	-52.04	49.1	20
4810	-55.10	52.16	20
7215	-64.51	61.57	20
2440.00	-3.64		
1895.44	-60	51.34	20
4880	-54.98	59.41	20
7320	-63.05	1.29	20
2480.00	-4.93		
1883.26	-61.54	56.61	20
4960	-57.21	52.28	20
7440	-63.57	58.64	20

8.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **Schneider Electric A9MEM1580**, SN: **Sample RF**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

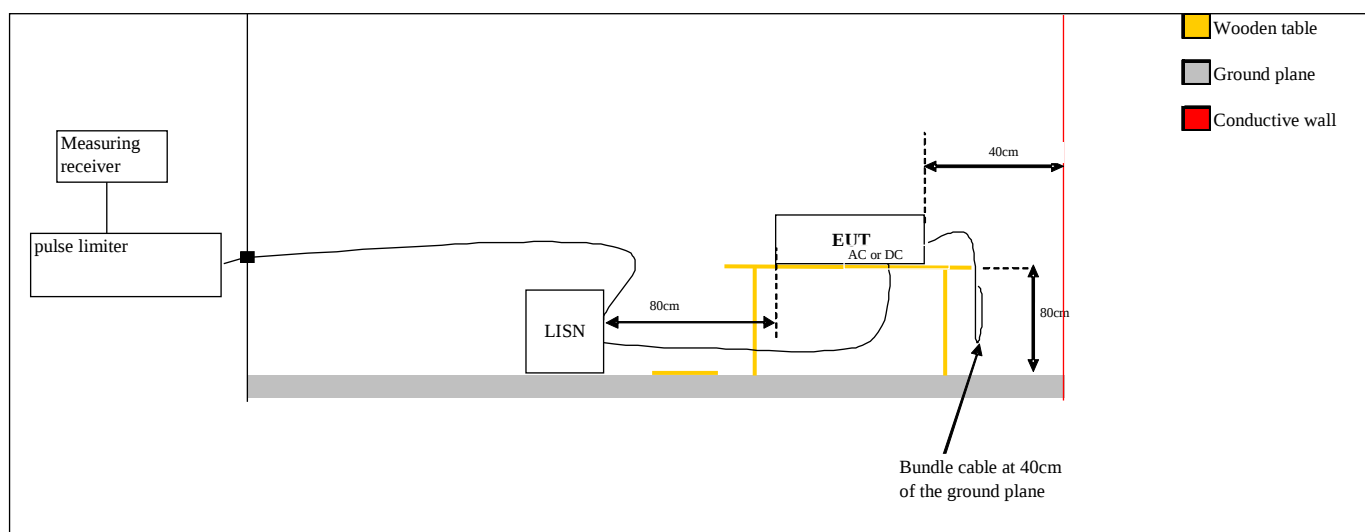
9. AC POWER LINE CONDUCTED EMISSIONS

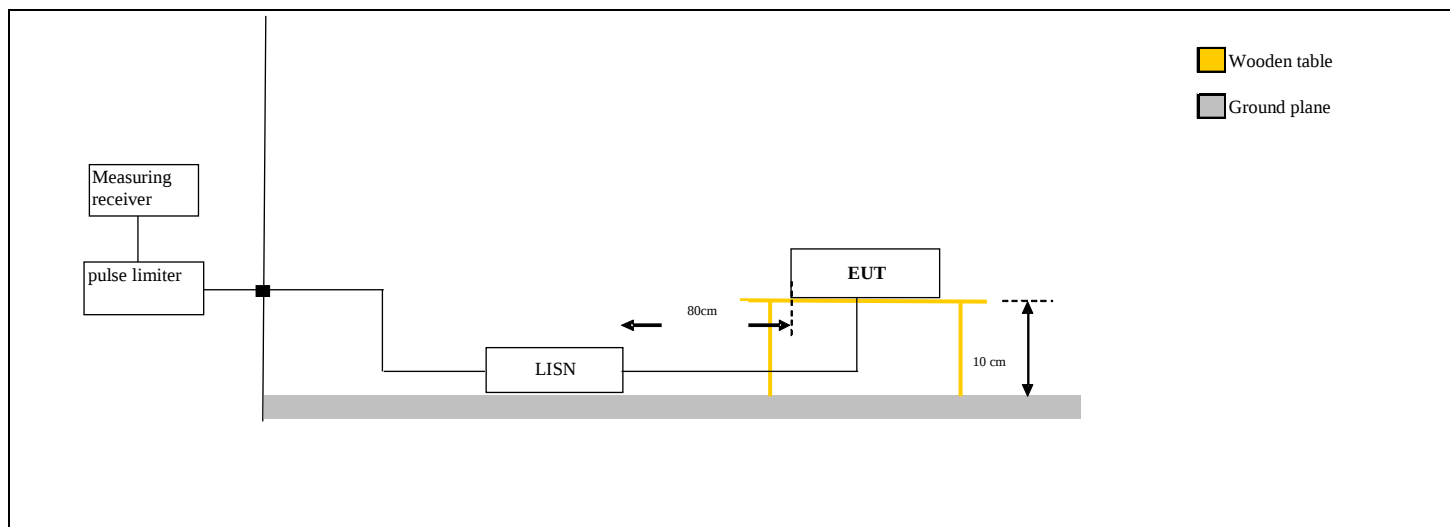
9.1. TEST CONDITIONS

Test performed by : Majid MOURZAGH
 Date of test : February 3, 2020
 Ambient temperature : 23 °C
 Relative humidity : 40 %

9.2. 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.





Test set up of AC Power Line Conducted Emissions



Photograph for AC Power Line Conducted Emissions (Front view)



9.3. LIMIT

Frequency range	Level	Detector
0,15kHz to 0,5MHz	66dB μ V to 56 μ V*	QPeak
	56dB μ V to 46 μ V*	Average
0,5MHz to 5MHz	56dB μ V	QPeak
	46dB μ V	Average
5MHz to 30MHz	60B μ V	QPeak
	50dB μ V	Average

*Decreases with the logarithm of the frequency

9.4. TEST EQUIPMENT LIST

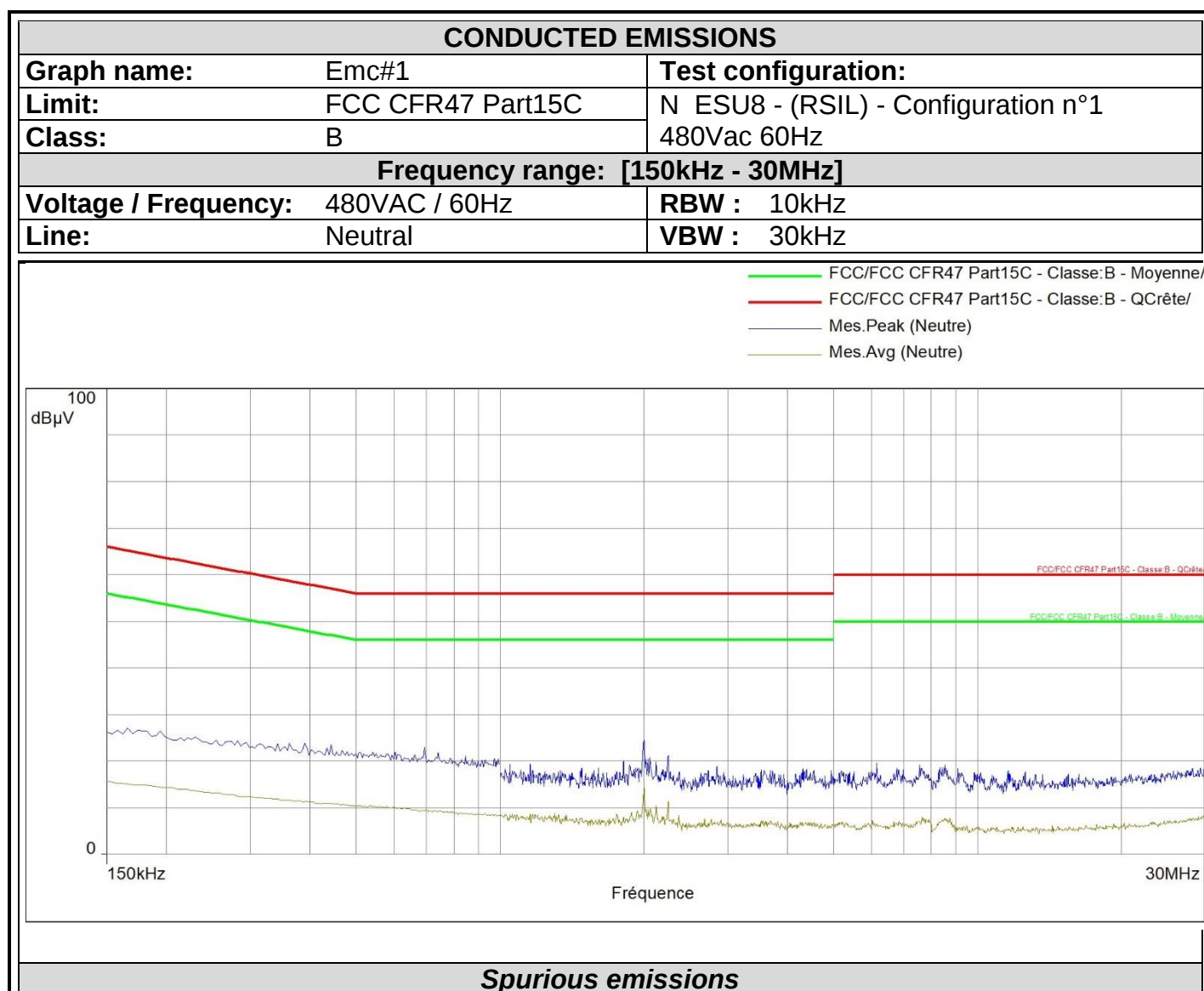
TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
BAT EMC	NEXIO	v3.19.1.18	L1000115		
Cable + self	—	—	A5329585	12/18	02/20
EMC comb generator	LCIE SUD EST	—	A3169098		
LISN tri-phase	ROHDE & SCHWARZ	ESH2-Z5	C2320063	10/19	10/20
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	12/17	02/20
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Transient limiter	ROHDE & SCHWARZ	ESH3-Z2	A7122204	02/19	02/20

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:

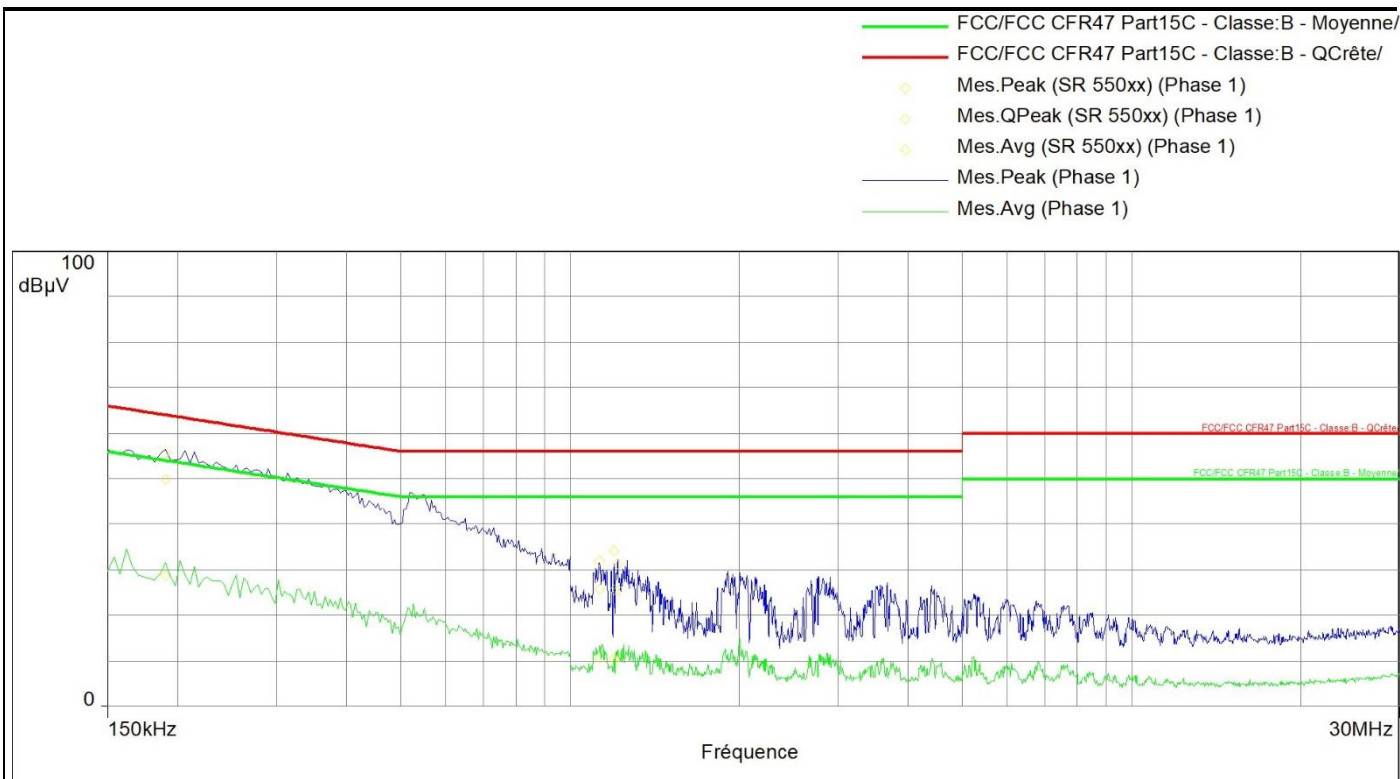
9.6. RESULTS



Frequency (MHz)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
No significant frequency observed								

CONDUCTED EMISSIONS

Graph name:	Emc#2	Test configuration: L1 ESU8 - (RSIL) - Configuration n°1 480Vac 60Hz
Limit:	FCC CFR47 Part15C	
Class:	B	
Frequency range: [150kHz - 30MHz]		
Voltage / Frequency:	480VAC / 60Hz	RBW : 10kHz
Line:	Phase1	VBW : 30kHz

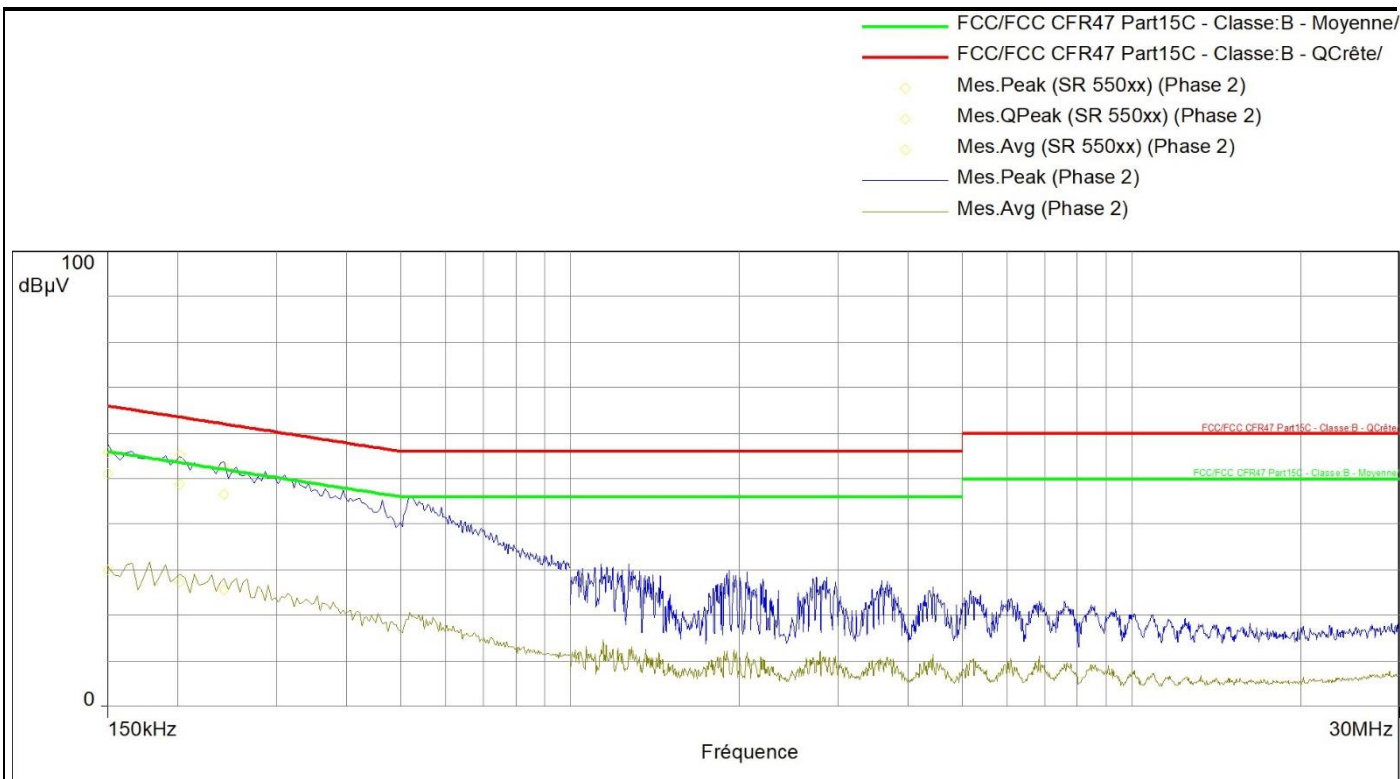


Spurious emissions

Frequency (MHz)	Mes.QPeak (dBμV)	LimQP (dBμV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBμV)	LimAvg (dBμV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.19	49.84	64.04	-14.20	28.72	54.04	-25.32	Phase 1	9.93
1.128	25.71	56.00	-30.29	10.52	46.00	-35.48	Phase 1	10.03
1.196	25.56	56.00	-30.44	10.44	46.00	-35.56	Phase 1	10.03
1.216	25.59	56.00	-30.41	10.79	46.00	-35.21	Phase 1	10.03

CONDUCTED EMISSIONS

Graph name:	Emc#3	Test configuration: L2 ESU8 - (RSIL) - Configuration n°1 480Vac 60Hz
Limit:	FCC CFR47 Part15C	
Class:	B	
Frequency range: [150kHz - 30MHz]		
Voltage / Frequency:	480VAC / 60Hz	RBW : 10kHz
Line:	Phase2	VBW : 30kHz

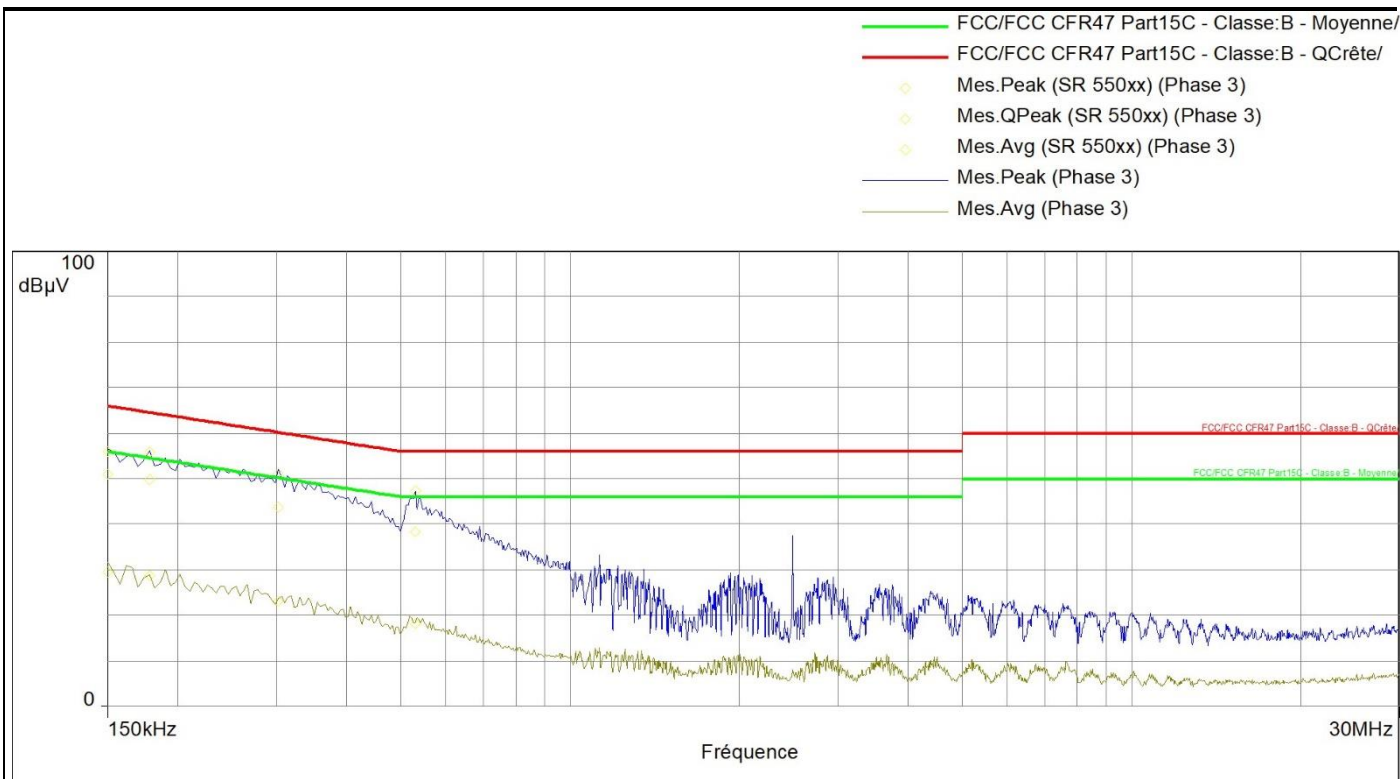


Spurious emissions

Frequency (MHz)	Mes.QPeak (dBμV)	LimQP (dBμV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBμV)	LimAvg (dBμV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.15	51.14	66.00	-14.86	29.93	56.00	-26.07	Phase 2	9.92
0.202	48.80	63.53	-14.73	27.29	53.53	-26.23	Phase 2	9.93
0.242	46.50	62.03	-15.53	25.51	52.03	-26.52	Phase 2	9.92

CONDUCTED EMISSIONS

Graph name:	Emc#4	Test configuration: L3 ESU8 - (RSIL) - Configuration n°1 480Vac 60Hz
Limit:	FCC CFR47 Part15C	
Class:	B	
Frequency range: [150kHz - 30MHz]		
Voltage / Frequency:	480VAC / 60Hz	RBW : 10kHz
Line:	Phase2	VBW : 30kHz

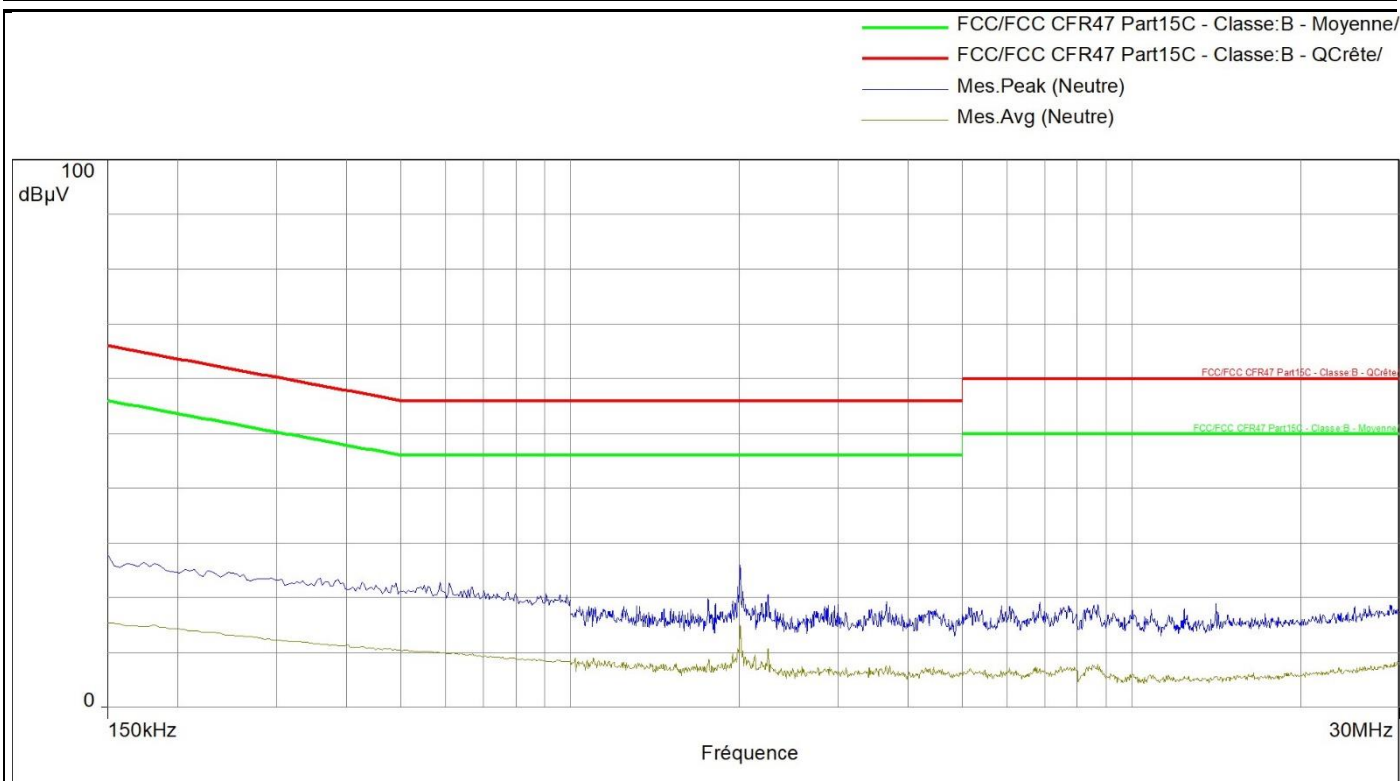


Spurious emissions

Frequency (MHz)	Mes.QPeak (dBμV)	LimQP (dBμV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBμV)	LimAvg (dBμV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.15	50.99	66.00	-15.01	29.55	56.00	-26.45	Phase 3	9.92
0.178	49.93	64.58	-14.65	28.69	54.58	-25.89	Phase 3	9.94
0.302	43.76	60.19	-16.43	23.00	50.19	-27.18	Phase 3	9.93
0.53	38.29	56.00	-17.71	18.11	46.00	-27.89	Phase 3	9.97

CONDUCTED EMISSIONS

Graph name:	Emc#5	Test configuration:
Limit:	FCC CFR47 Part15C	N ESU8 - (RSIL) – Configuration n°2
Class:	B	100Vac 50Hz
Frequency range: [150kHz - 30MHz]		
Voltage / Frequency:	100VAC / 50Hz	RBW : 10kHz
Line:	Neutral	VBW : 30kHz

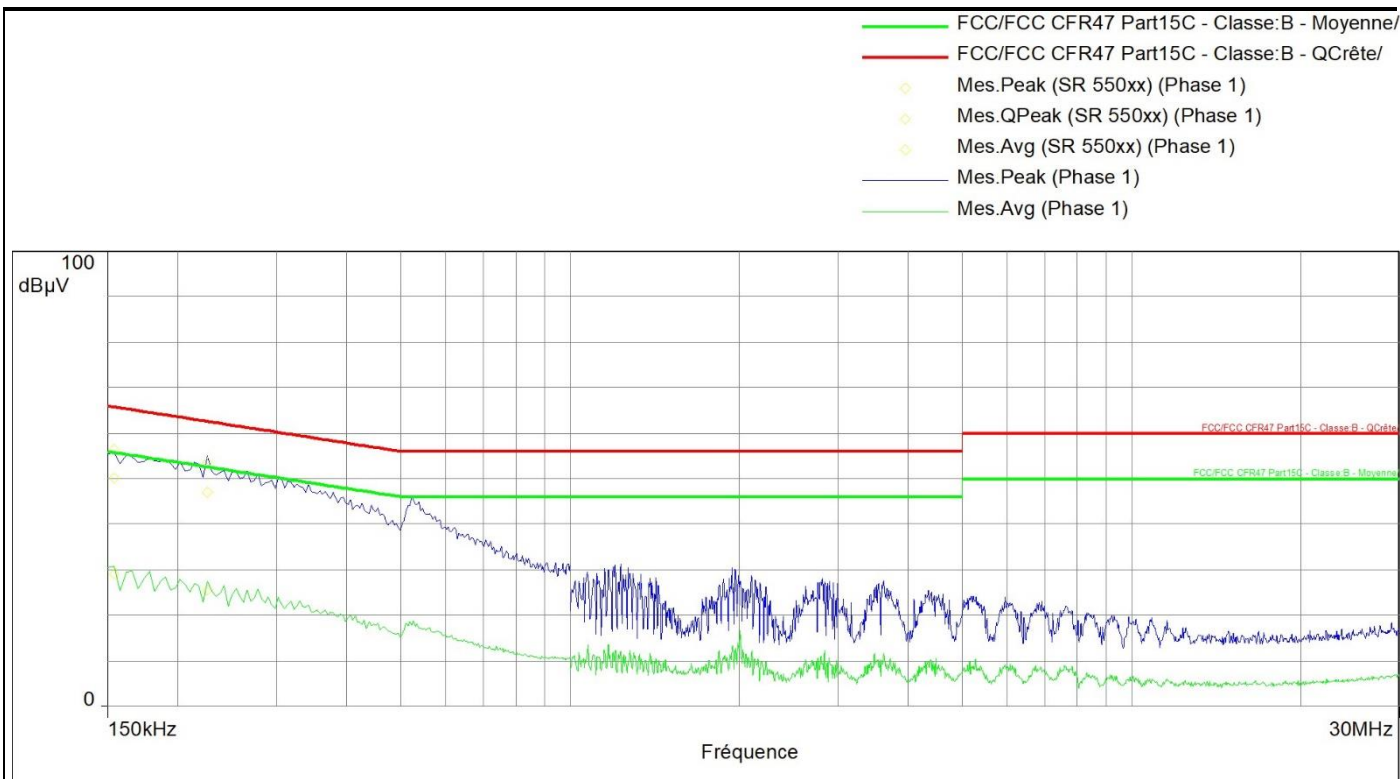


Spurious emissions

Frequency (MHz)	Mes.QPeak (dBμV)	LimQP (dBμV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBμV)	LimAvg (dBμV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
No significant frequency observed								

CONDUCTED EMISSIONS

Graph name:	Emc#6	Test configuration: L1 ESU8 - (RSIL) - Configuration n°2 100Vac 50Hz
Limit:	FCC CFR47 Part15C	
Class:	B	
Frequency range: [150kHz - 30MHz]		
Voltage / Frequency:	100VAC / 50Hz	RBW : 10kHz
Line:	Phase1	VBW : 30kHz

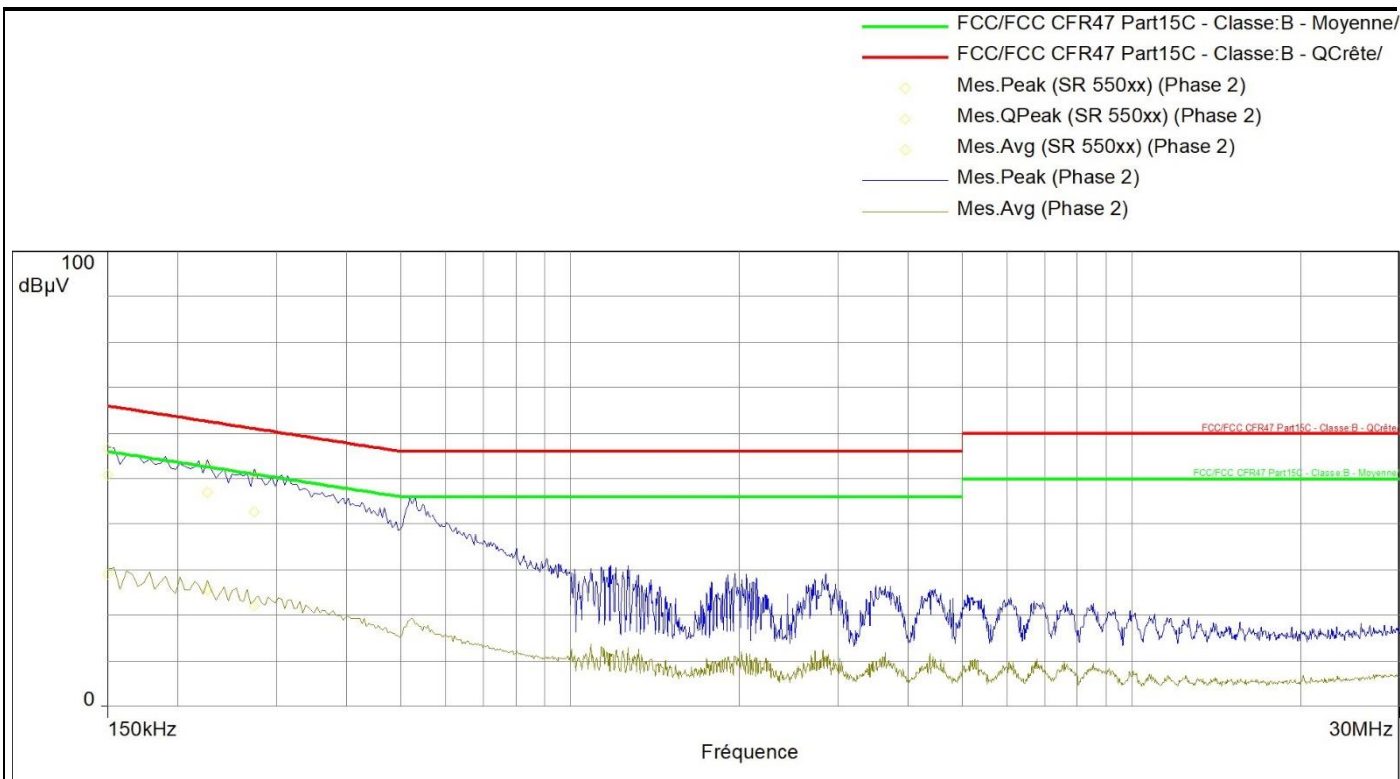


Spurious emissions

Frequency (MHz)	Mes.QPeak (dBμV)	LimQP (dBμV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBμV)	LimAvg (dBμV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.154	50.23	65.78	-15.55	29.01	55.78	-26.77	Phase 1	9.92
0.226	46.96	62.60	-15.63	25.54	52.60	-27.06	Phase 1	9.94

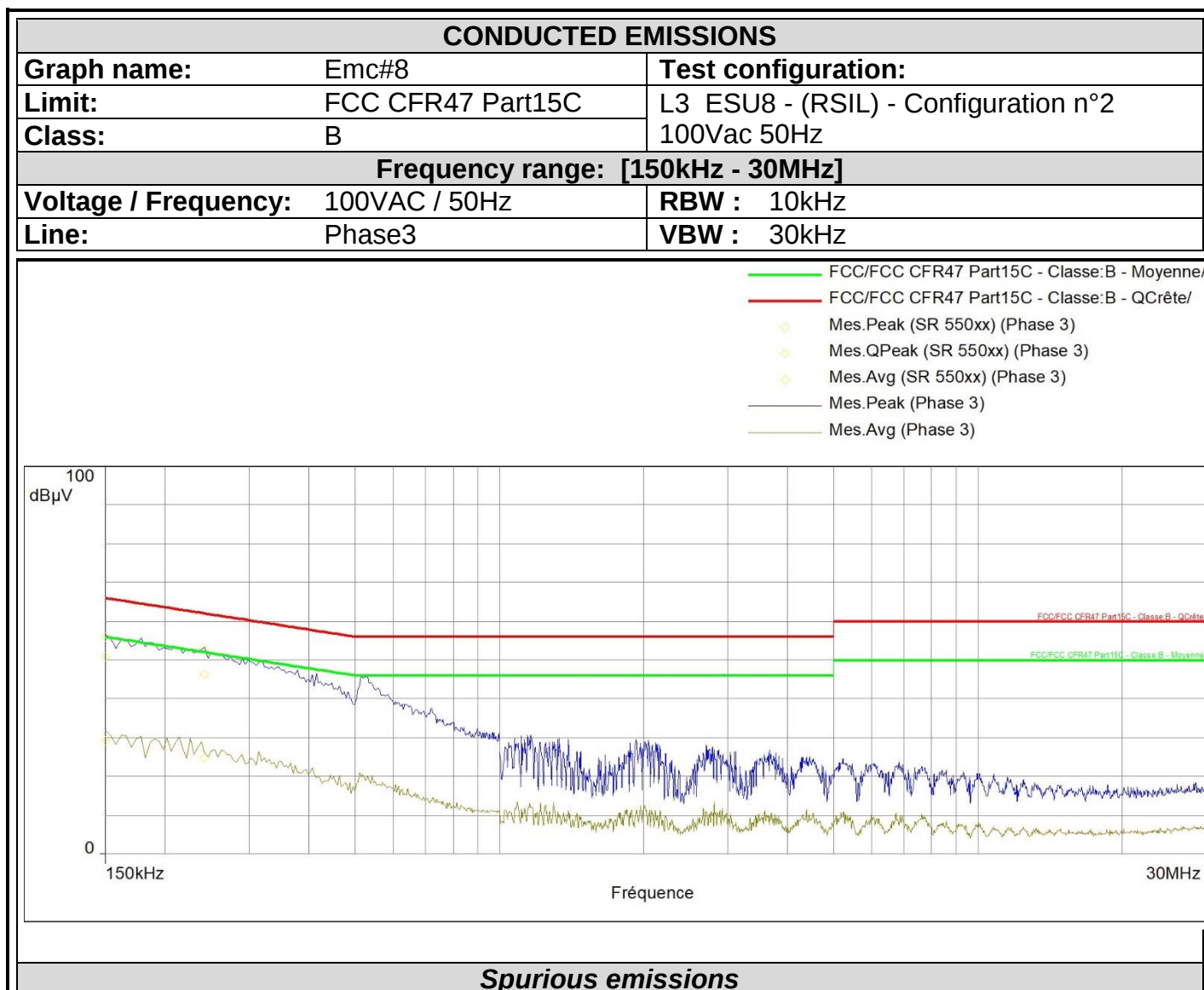
CONDUCTED EMISSIONS

Graph name:	Emc#7	Test configuration: L2 ESU8 - (RSIL) - Configuration n°2 100Vac 50Hz
Limit:	FCC CFR47 Part15C	
Class:	B	
Frequency range: [150kHz - 30MHz]		
Voltage / Frequency:	100VAC / 50Hz	RBW : 10kHz
Line:	Phase2	VBW : 30kHz



Spurious emissions

Frequency (MHz)	Mes.QPeak (dBμV)	LimQP (dBμV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBμV)	LimAvg (dBμV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.15	50.76	66.00	-15.24	29.11	56.00	-26.89	Phase 2	9.92
0.226	47.02	62.60	-15.57	25.52	52.60	-27.07	Phase 2	9.94
0.274	42.82	61.00	-18.18	22.15	51.00	-28.85	Phase 2	9.94



Frequency (MHz)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.15	50.76	66.00	-15.24	29.21	56.00	-26.79	Phase 3	9.92
0.242	46.15	62.03	-15.88	24.70	52.03	-27.33	Phase 3	9.92

9.7. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **Schneider Electric A9MEM1580**, SN: **Sample RF**, 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. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

10.1. TEST CONDITIONS

Test performed by : Majid Mourzagh
 Date of test : January 24, 2020
 Ambient temperature : 22 °C
 Relative humidity : 39 %

10.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013) and FCC part15 subpart C.

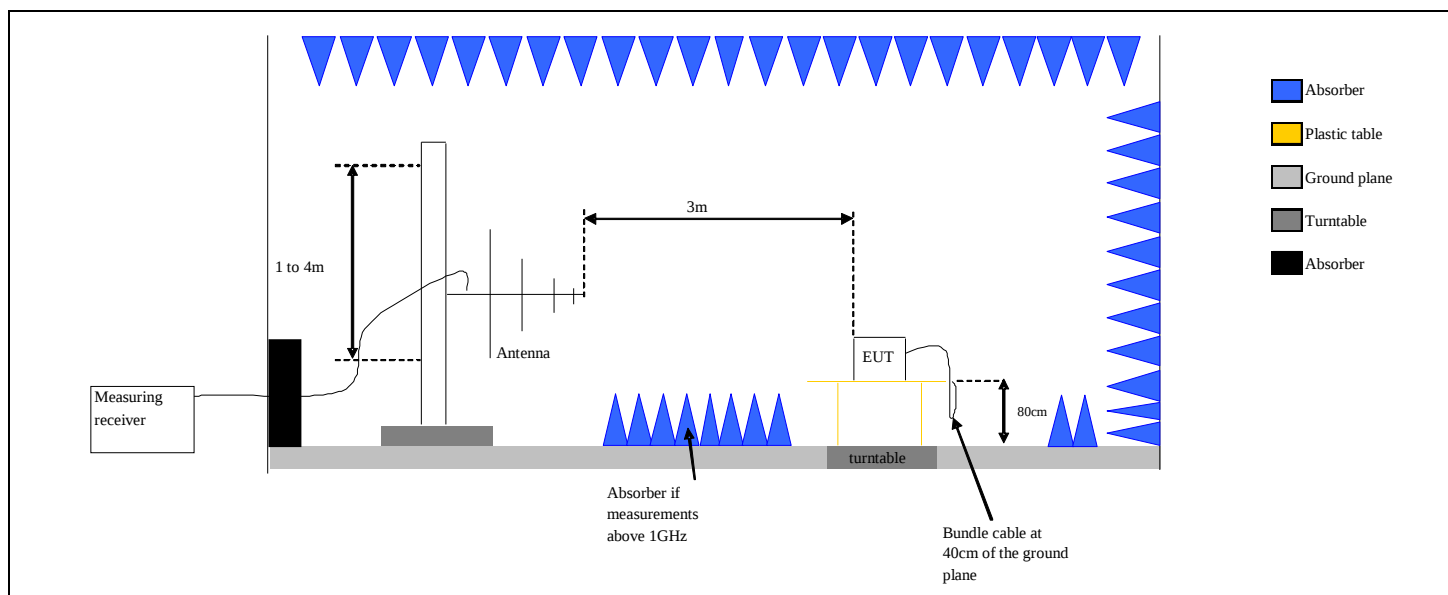
Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration.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

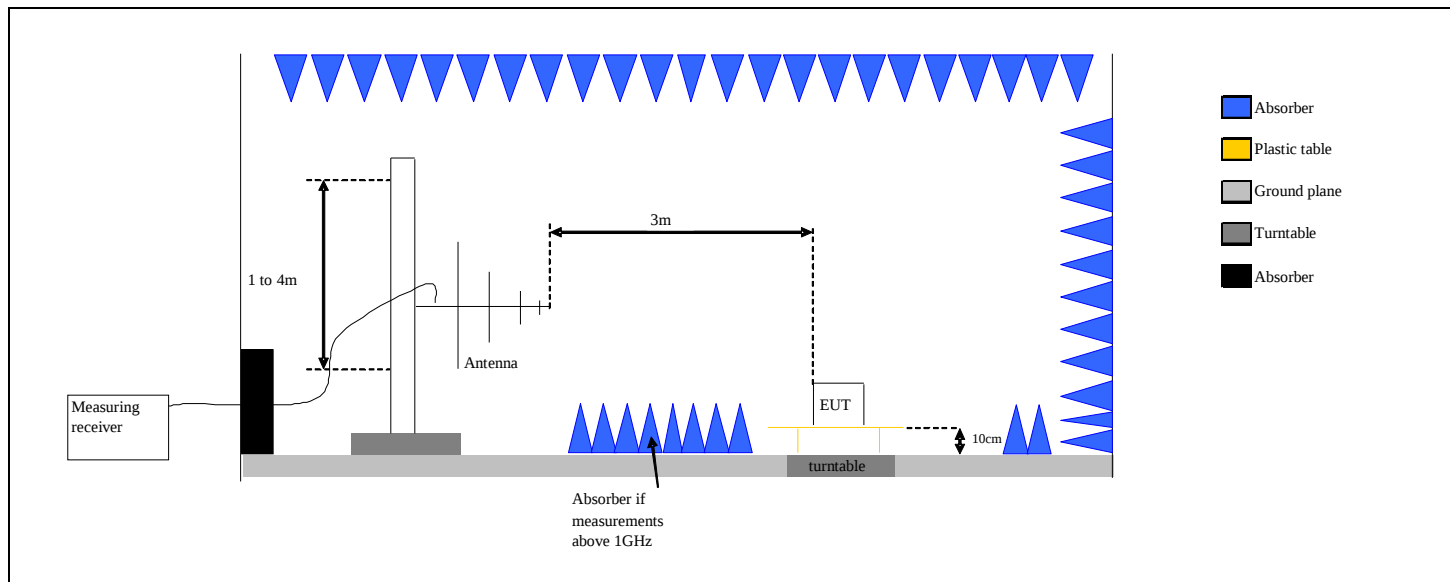
Test is performed in horizontal (H) and vertical (V) polarization with **bilog** between 30MHz & 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used 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 **3m**. The height antenna is varied from 1m to 4m from 30MHz to 1GHz and above 1GHz is:

☐ On mast, varied from 1m to 4m

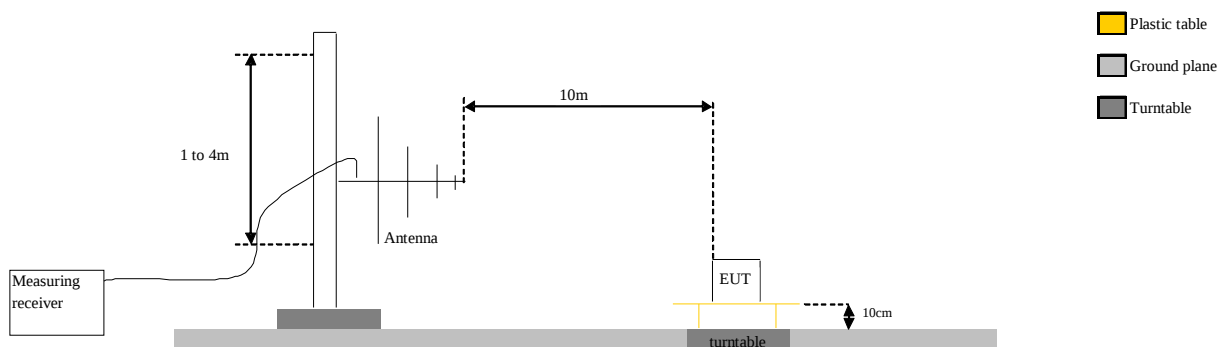
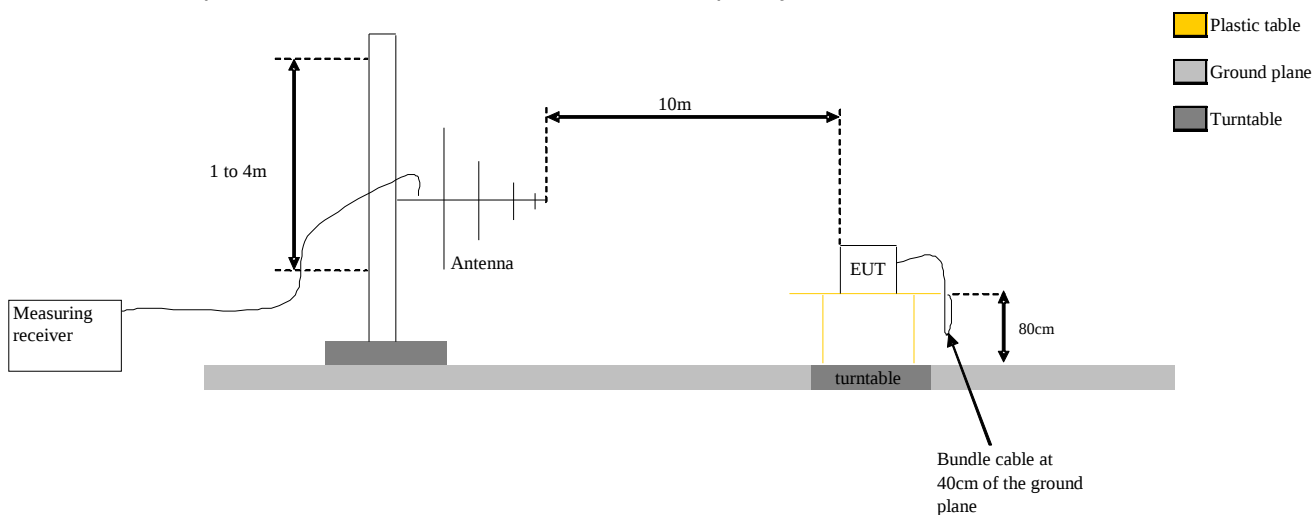
☒ Fixed and centered on the EUT (EUT smaller than the beamwidth of the measurement antenna, ANSI C63.10 §6.6.5)

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

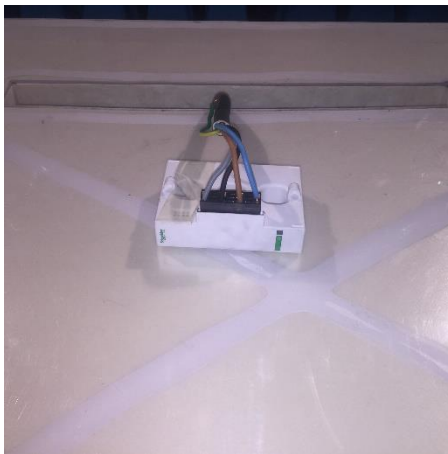




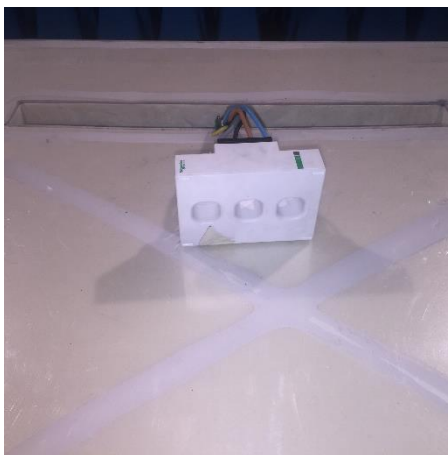
Test set up of Unwanted Emissions in Restricted Frequency Bands in semi anechoic chamber



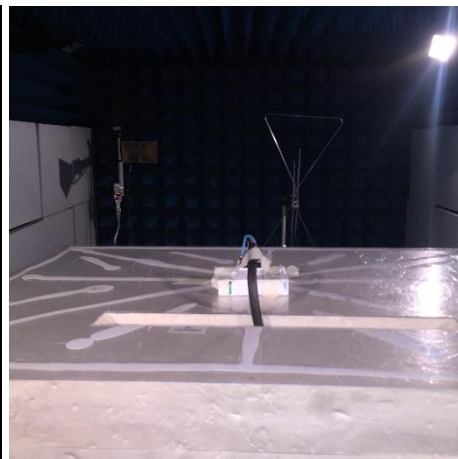
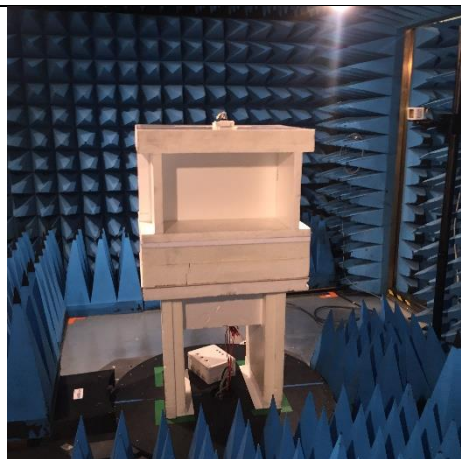
Test Set up for radiated measurement in open area test site



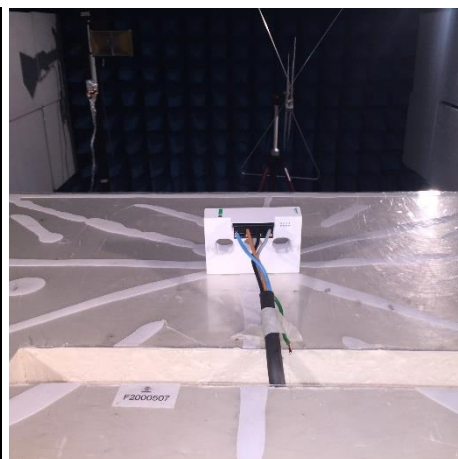
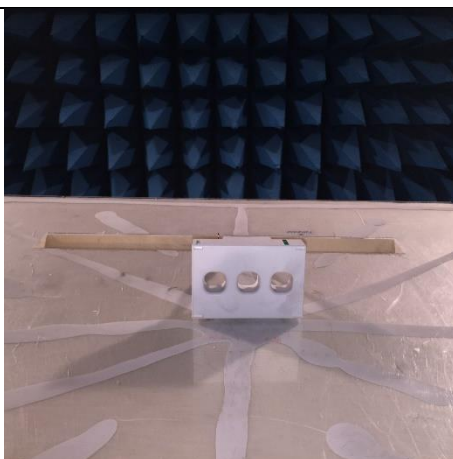
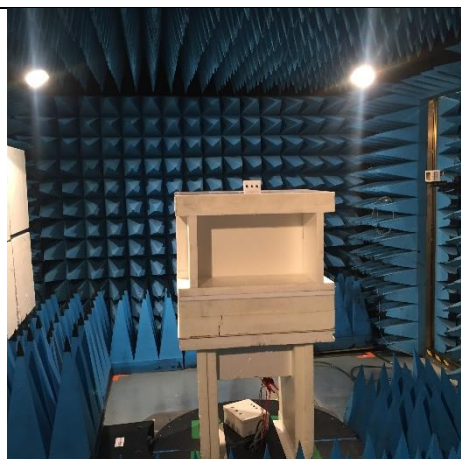
Axis XY on FAR (under 1GHz)



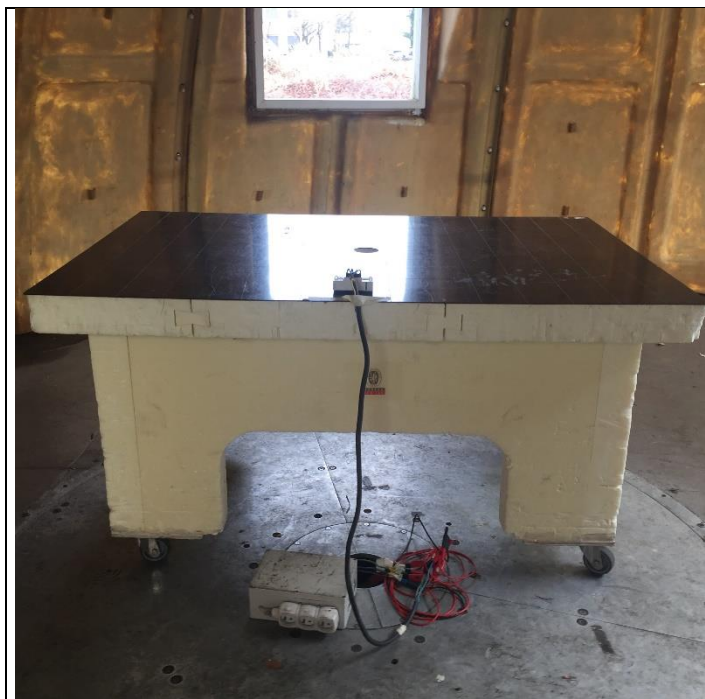
Axis Z on FAR (under 1GHz)



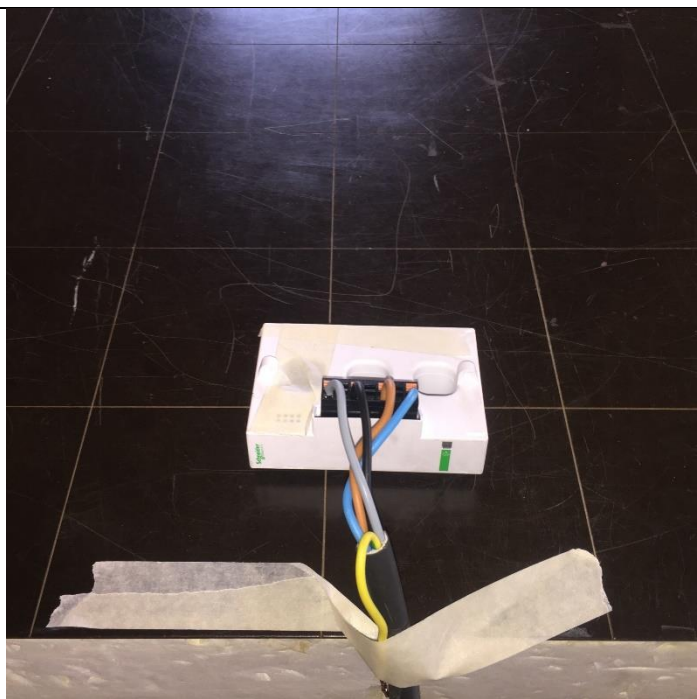
Axis XY on FAR (above 1GHz)



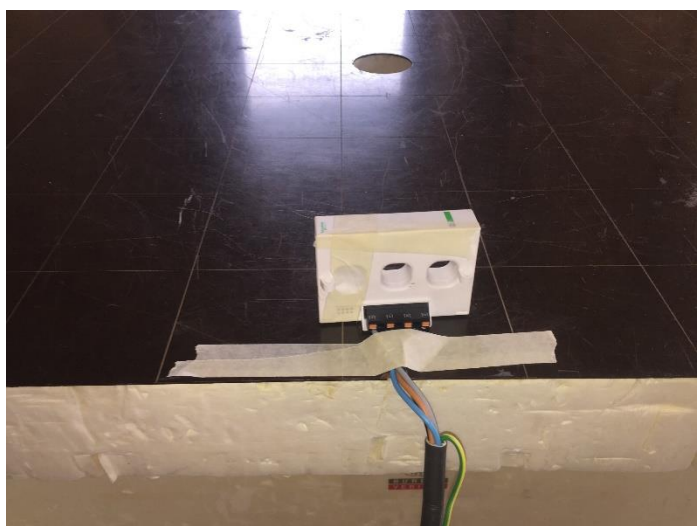
Axis Z on FAR (above 1GHz)



Axis XY on OATS



Axis Z on OATS



Photograph for Unwanted Emission in restricted frequency bands

10.3. 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	35.5dB 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

10.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_D ate	Cal_Due
Amplifier 9kHz - 40GHz	LCIE SUD EST	—	A7102082	10/18	03/20
Antenna Bi-Log	CHASE	UPA6192	C2040221	01/18	01/20
Antenna horn 18GHz	EMCO	3115	C2042029	09/17	09/20
BAT EMC	NEXIO	v3.9.0.10	L1000115		
Emission Cable (SMA 1m)	TELEDYNE	26GHz	A5329874	01/19	01/20
Emission Cable (SMA 3.3m)	TELEDYNE	26GHz	A5329875	01/19	01/20
Emission Cable (SMA 30cm)	TELEDYNE	26GHz	A5329873	01/19	01/20
Emission Cable <1GHz (Ampl <-> Cage)	-	18GHz	A5329562	08/19	08/20
Emission Cable <1GHz (Ampl <-> Cage)	-	18GHz	A5329907	08/19	08/20
Rehausse Table C3	LCIE	—	F2000507		
Rehausse Table C3	LCIE	—	F2000511		
Semi-Anechoic chamber #3 (BF)	SIEPEL	—	D3044017_BF	03/17	03/20
Semi-Anechoic chamber #3 (VSWR)	SIEPEL	—	D3044017_VSWR	03/17	03/20
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	09/19	09/21
Table C3	LCIE	—	F2000461		
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371		
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444		
Antenna Bi-log	CHASE	CBL6111A	C2040051	06/19	06/20
Antenna mast (OATS)	ETS Lingren	2071-2	F2000392		
Cable (OATS)	—	1GHz	A5329623	03/19	03/20
Emission Cable	SUCOFLEX	6GHz	A5329061	02/19	02/20
OATS	—	—	F2000409	02/19	02/20
Radiated emission comb generator	BARDET	—	A3169050		
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	12/17	02/20
Table C1/OATS	LCIE	—	F2000445		
Turntable (OATS)	ETS Lingren	Model 2187	F2000403		
Turntable / Mast controller (OATS)	ETS Lingren	Model 2066	F2000372		

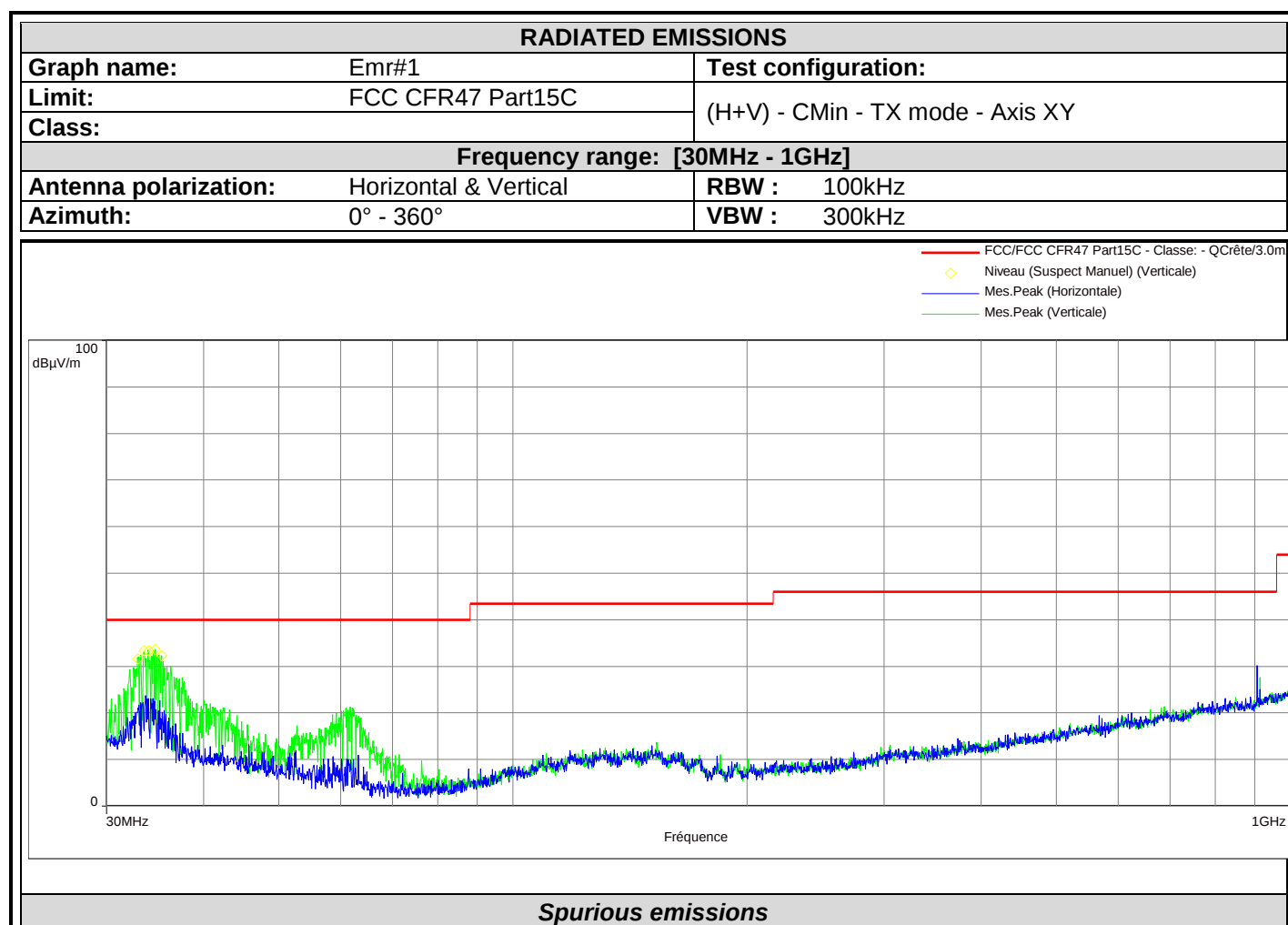
Note: In our quality system, the test equipment calibration due is more & less 2 months

10.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

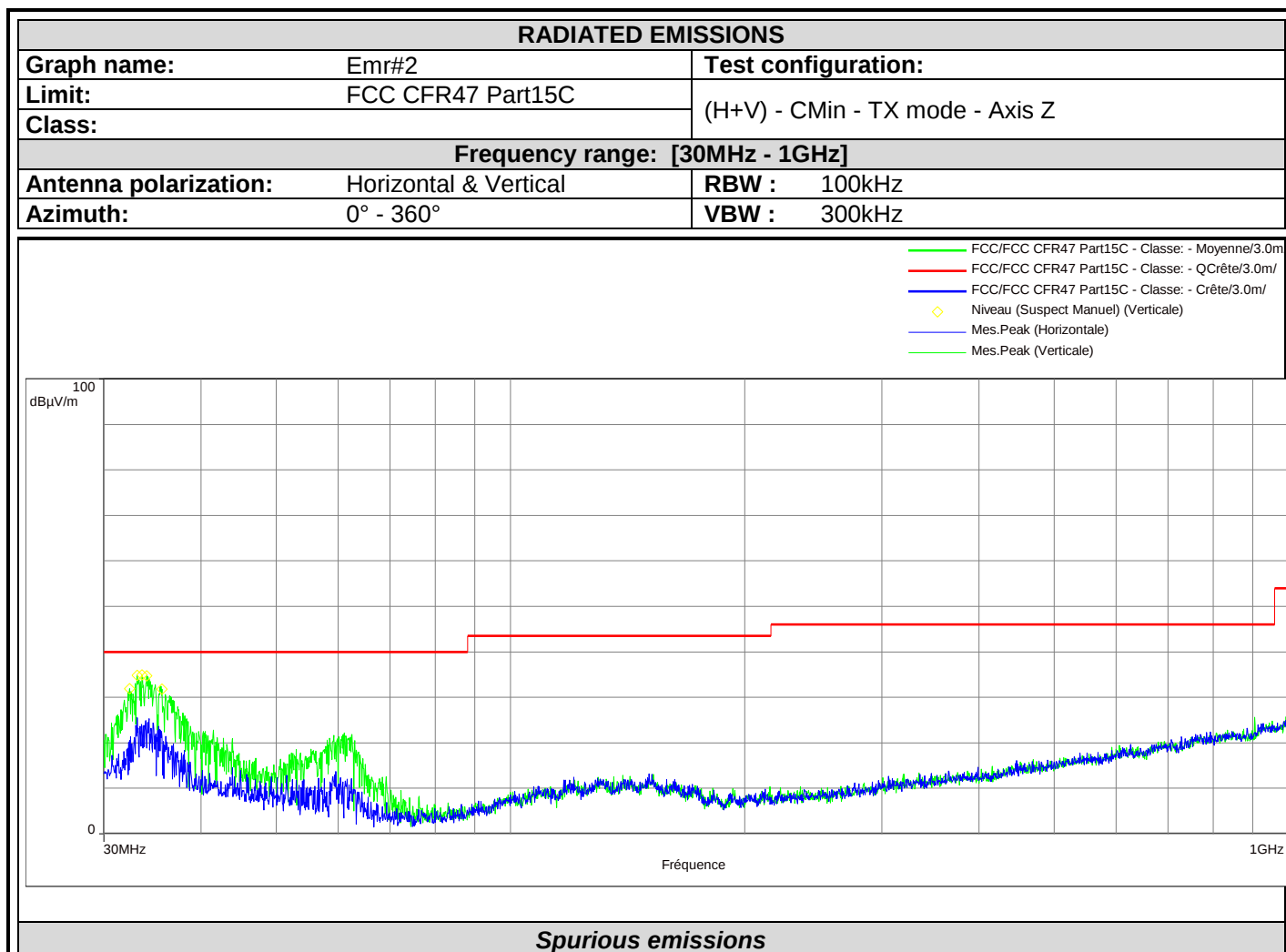
☒ None ☐ Divergence:

10.6. RESULTS

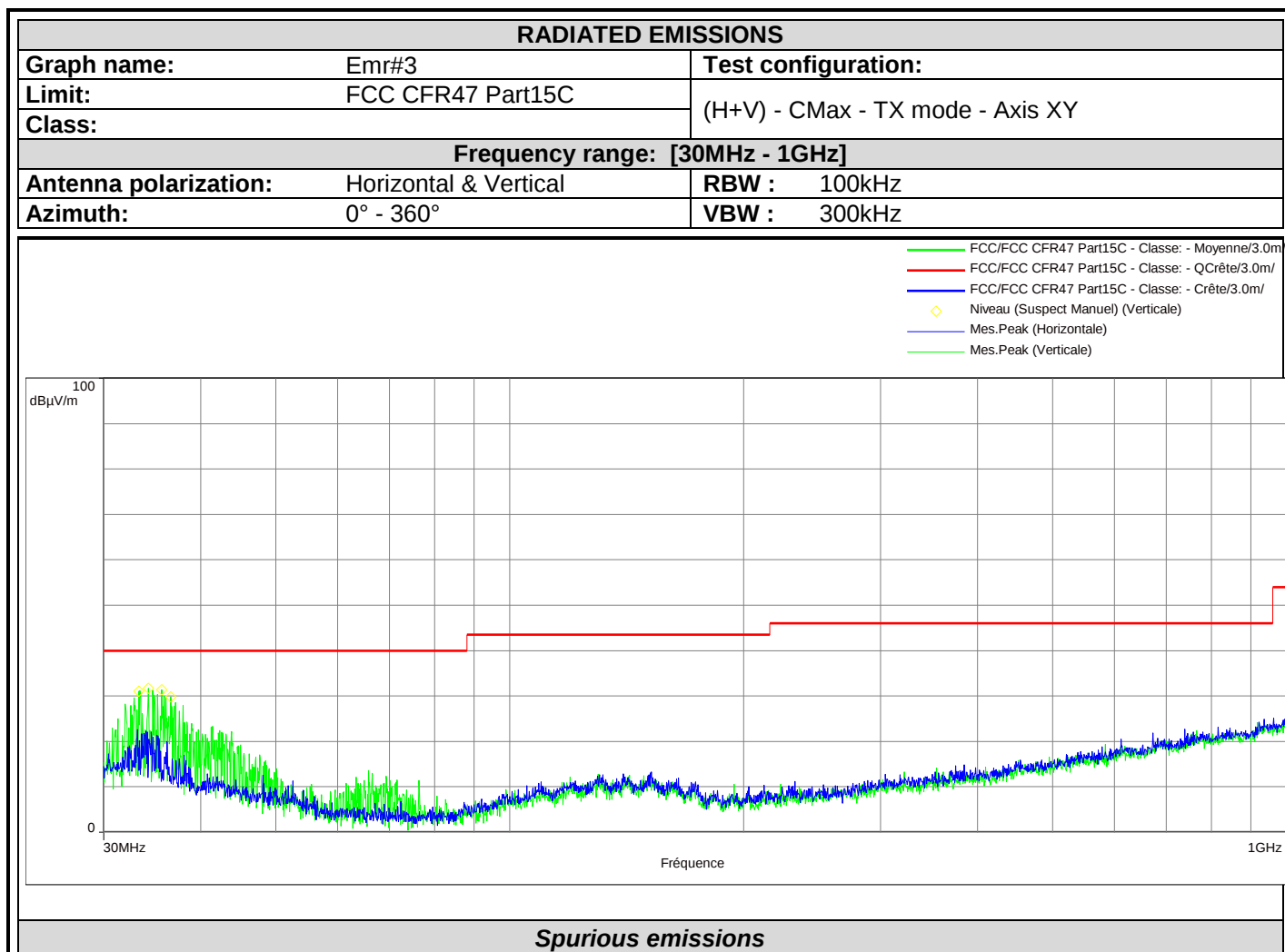
See Test results in §8.5 (Band edge measurement):



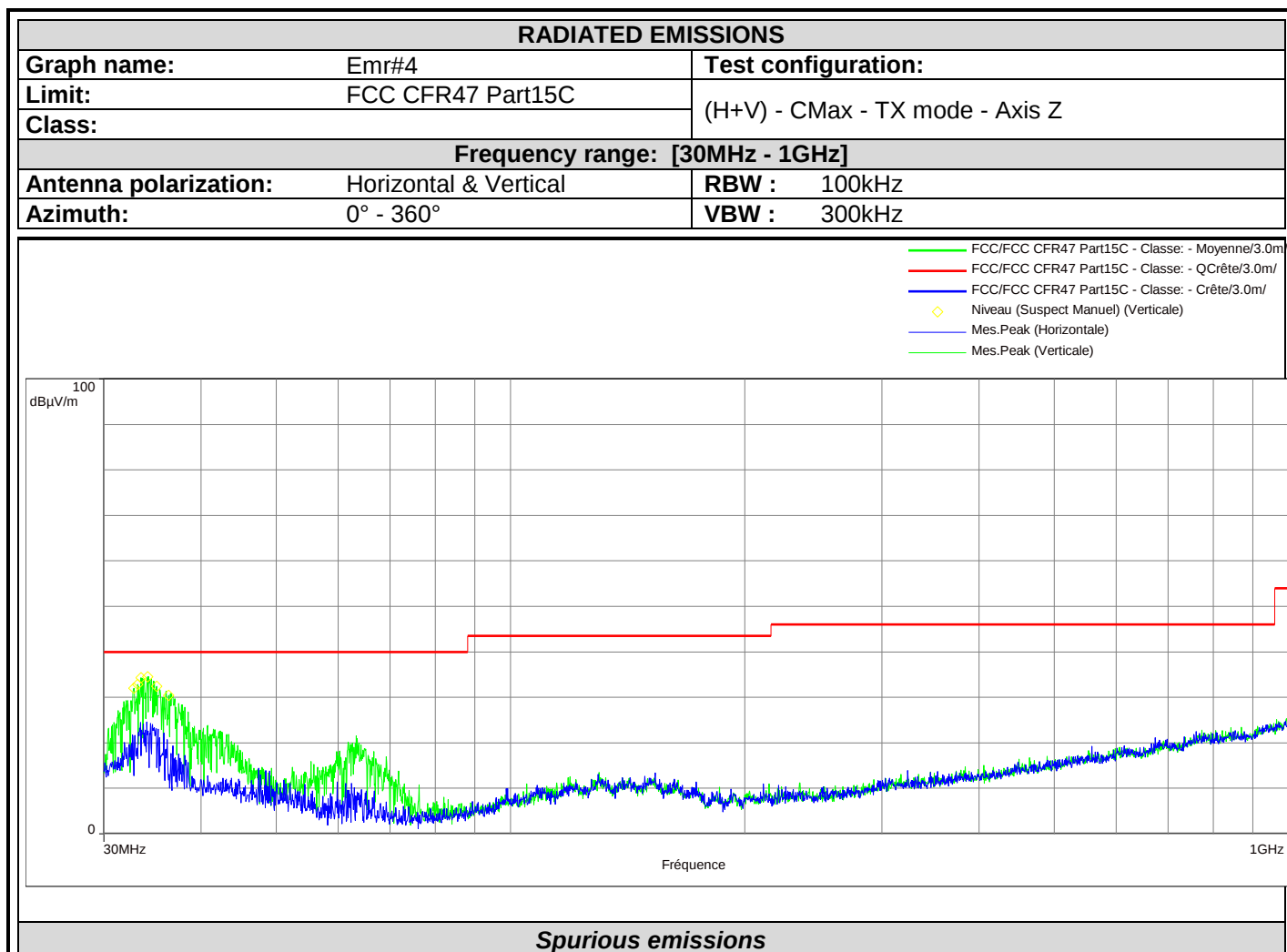
Frequency (MHz)	Peak Level (dBuV/m)	Polarization	Correction (dB)
32.910	31.6	Vertical	-15.1
33.540	33.3	Vertical	-15.2
34.026	33.4	Vertical	-15.2
34.656	33.7	Vertical	-15.3
35.335	32.3	Vertical	-15.6



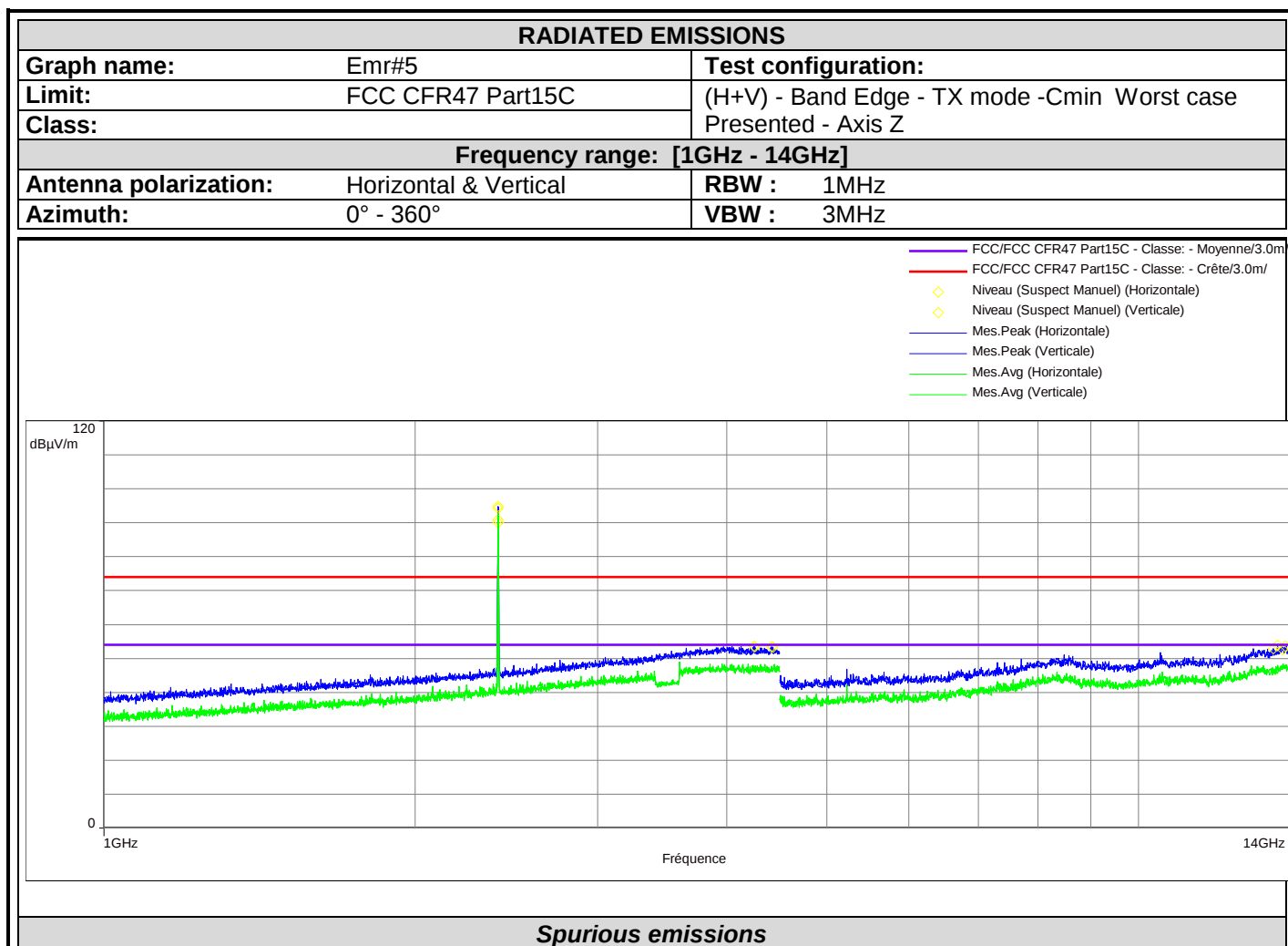
Frequency (MHz)	Peak Level (dBμV/m)	Polarization	Correction (dB)
32.376	31.9	Vertical	-15.0
33.104	34.8	Vertical	-15.1
33.589	35.0	Vertical	-15.2
34.074	34.8	Vertical	-15.2
35.626	31.8	Vertical	-15.7



Frequency (MHz)	Peak Level (dBµV/m)	Polarization	Correction (dB)
33.298	31.0	Vertical	-15.1
34.268	31.7	Vertical	-15.3
35.626	31.4	Vertical	-15.7
36.596	29.8	Vertical	-16.2

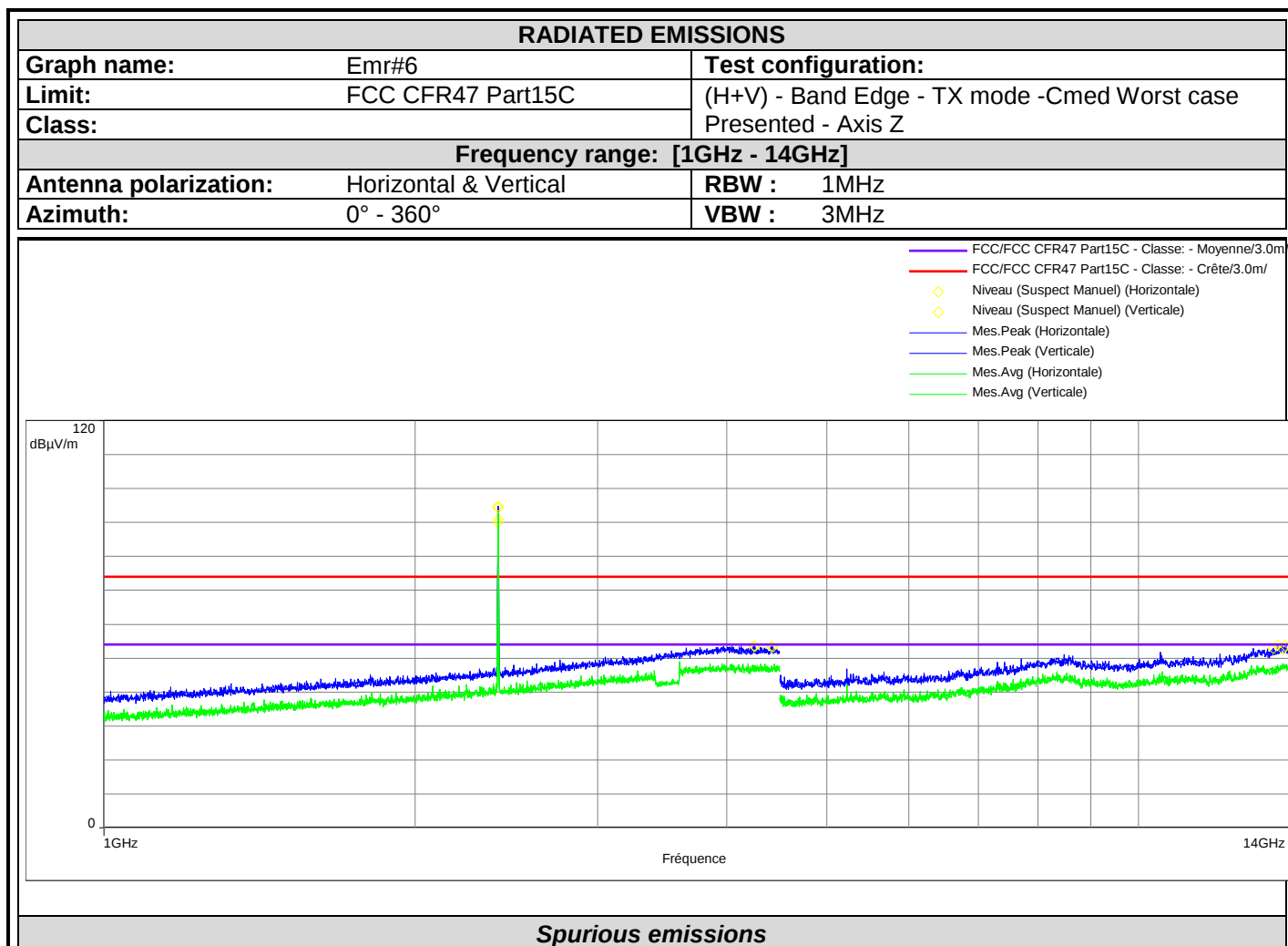


Frequency (MHz)	Peak Level (dBµV/m)	Polarization	Correction (dB)
32.764	32.0	Vertical	-15.1
33.152	32.9	Vertical	-15.1
33.492	34.4	Vertical	-15.2
34.171	34.5	Vertical	-15.2
35.092	32.4	Vertical	-15.4
36.354	30.4	Vertical	-16.1



Frequency (MHz)	Peak Level (dBμV/m)	Limit Peak (dBμV)	Polarization Worst case	Correction (dB)
2405.500	90.9	74	Vertical	33.4
4259.000	53.5	74	Vertical	38.2
4433.500	53.4	74	Vertical	38.2
13639.594	53.8	74	Vertical	-14.3
13793.375	52.6	74	Vertical	-14.0

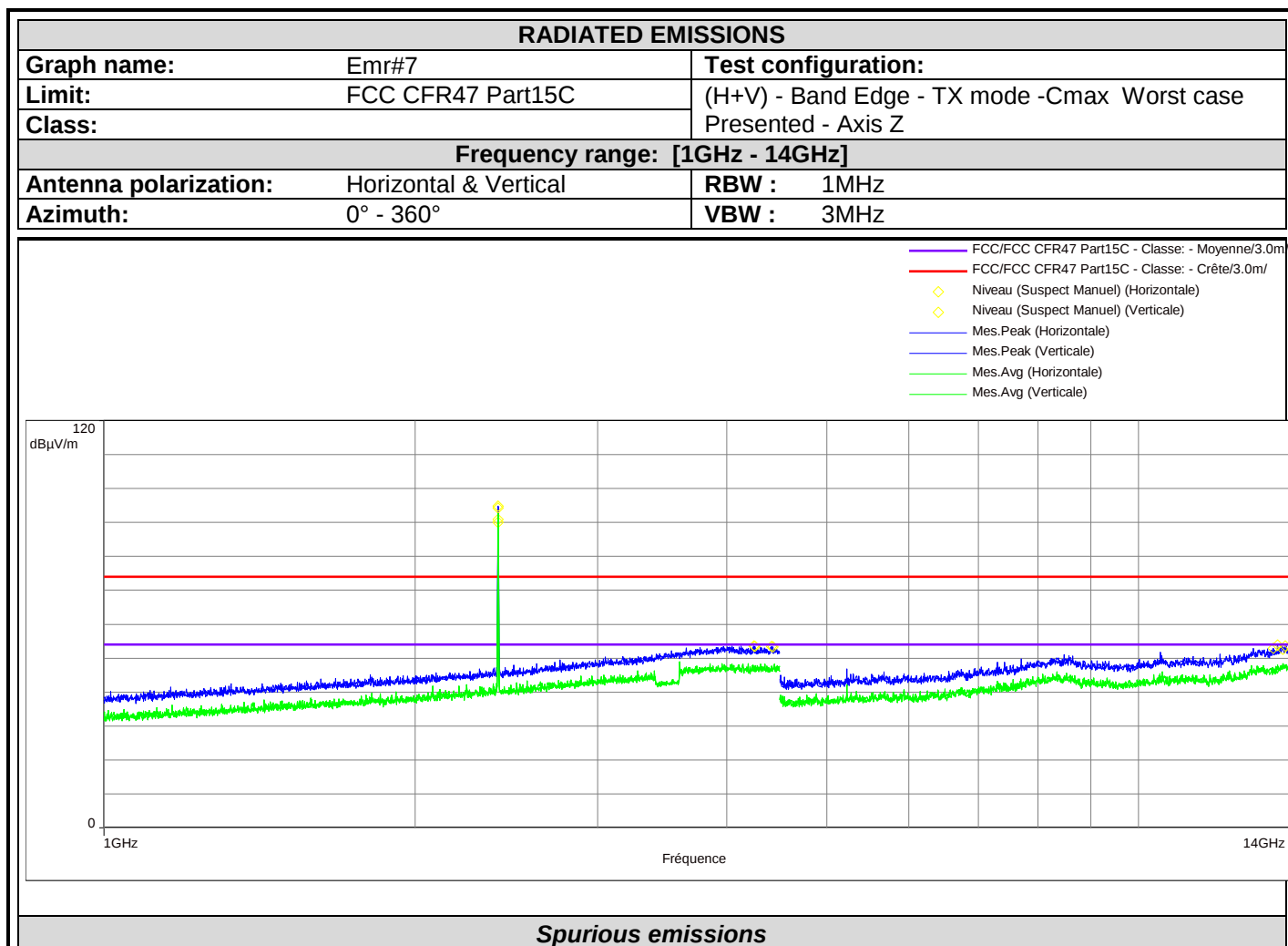
Frequency (MHz)	Average Level (dBμV/m)	Limit Average (dBμV)	Polarization Worst case	Correction (dB)
2405.500	88.94	54	Vertical	33.4
4259.000	47.8	54	Vertical	38.2
4433.500	47.8	54	Vertical	38.2
13639.594	46.47	54	Vertical	-14.3
13793.375	52.6	54	Vertical	-14.0



Spurious emissions

Frequency (MHz)	Peak Level (dBμV/m)	Limit Peak (dBμV)	Polarization Worst case	Correction (dB)
2405.000	94.3	74	Vertical	33.4
4250.000	53.6	74	Vertical	38.2
4420.000	53.5	74	Vertical	38.2
13499.469	52.9	74	Vertical	-14.6
13862.250	53.6	74	Vertical	-13.8

Frequency (MHz)	Average Level (dBμV/m)	Limit Average (dBμV)	Polarization Worst case	Correction (dB)
2405.000	92.77	54	Vertical	33.4
4250.000	48.23	54	Vertical	38.2
4420.000	48.11	54	Vertical	38.2
13499.469	48.13	54	Vertical	-14.6
13862.250	47.25	54	Vertical	-13.8



Spurious emissions

Frequency (MHz)	Peak Level (dBμV/m)	Limit Peak (dBμV)	Polarization Worst case	Correction (dB)
2404.500	94.9	74	Vertical	33.4
4250.000	53.6	74	Vertical	38.2
4420.000	53.5	74	Vertical	38.2
13499.469	52.9	74	Vertical	-14.6
13862.250	53.6	74	Vertical	-13.8

Frequency (MHz)	Average Level (dBμV/m)	Limit Average (dBμV)	Polarization Worst case	Correction (dB)
2404.500	92.64	54	Vertical	33.4
4250.000	46.92	54	Vertical	38.2
4420.000	48.23	54	Vertical	38.2
13499.469	48.11	54	Vertical	-14.6
13862.250	47.82	54	Vertical	-13.8

QUALIFICATION (30MHz-1GHz): 10 meters measurement on the Open Area Test Site.
Frequency list has been created with semi-anechoic chamber pre-scan results.
Measurements are performed using a QUASI-PEAK detection.

Test Frequency (MHz)	Meter Reading dB(μV)	Detector (Pk/QP/A v)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Transducer Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
32.000	19.3	QP	V	300	110	18.6	37.9	40.0	-2.1	Worst case
32.700	16.5	QP	V	180	100	18.2	34.7	40.0	-5.3	Worst case
33.200	14.5	QP	V	145	100	18.0	32.5	40.0	-7.5	Worst case
34.000	18.0	QP	V	270	110	17.5	35.5	40.0	-4.5	Worst case
34.700	15.8	QP	V	270	100	17.1	32.9	40.0	-7.1	Worst case
35.000	14.6	QP	V	180	110	17.0	31.6	40.0	-8.4	Worst case
35.800	17.6	QP	V	200	120	16.6	34.2	40.0	-5.8	Worst case

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

QUALIFICATION (1GHz- 26GHz): 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	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Transducer Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No significant frequency observed									

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

10.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **Schneider Electric A9MEM1580**, SN: **Sample RF**, 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. 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
Mesure des perturbations conduites en tension sur le réseau d'énergie <i>Measurement of conducted disturbances in voltage on the power port</i>	3.51 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication <i>Measurement of conducted disturbances in voltage on the telecommunication port.</i>	3.26 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension <i>Measurement of discontinuous conducted disturbances in voltage</i>	3.45 dB	3.6 dB
Mesure des perturbations conduites en courant <i>Measurement of conducted disturbances in current</i>	3.09 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Moirans <i>Measurement of radiated electric field on the Moirans open area test site</i>	5.20 dB	6.3 dB

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