TEST REPORT

N°: 157205-726501-A **Version : 02**

Subject	**Radio spectrum matters tests according to standards: 47 CFR Part 15.247**
Issued to	**SAGEMCOM BROADBAND SAS 250 Route de l' Empereur 92500 – RUEIL MALMAISON FRANCE**
Apparatus under test	
Product	**Sound Box**
Trade mark	**Sagemcom®**
Manufacturer	**SAGEMCOM**
Model under test	**Sound Box SBDV01**
Serial number	**253770742**
FCC ID	**VW3SBDV01**

Test date	September 13, 2018 to October 2, 2018
Test location	Fontenay Aux Roses
Test Site	6230B-1
Composition of document	61 pages
Document issued on	November 19, 2018

Written by :
Armand MAHOUNGOU
Tests operator

LABORATOIRE CENTRAL DES INDUSTRIES ELECTRIQUES S.A.S au capital de 15.745.984 € 33, Avenue du Général Leclerc L C I E F - 92260 FONTENAY AUX ROSES

Approved by:
Arnaud FAYETTE
Technical manager

PUBLICATION HISTORY

Version	Date	Author	Modification
01	October 8, 2018	Armand MAHOUNGOU	Creation of the document
02	November 19, 2018	Armand MAHOUNGOU	Customer request withdraw all picture of the EUT from test report Add clarification on limit P29/62 & 33/62 Add conducted measurement at 240V / 50 Hz P41-42/62

SUMMARY

1. TEST PROGRAM

References

- **47 CFR Part 15.247**
- **ANSI C63.10-2013**

Radio requirement:

Clause (47CFR Part 15.247) 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. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):
Sagemcom® Sound Box SBDV01 **Serial Number: 253770742**
Power supply : NBC80A200400M2

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Cable	Power supplay	-	☐	☐	☐	-
Ethernet cable	-	-	☐	☐	☐	-

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop computer	-	-	-

Equipment information:

Bluetooth LE Type:	☑ **BLE**	☐ **v4.0**	☐ **v4.1**	☑ **v4.2**	☑ **v5.0**
Frequency band:	[2400 – 2483.5] MHz				
Number of Channel:	40				
Spacing channel:	2MHz				
Channel bandwidth:	1MHz for 4.2 / 2MHz for 5.0				
Antenna Type:	☑ Integral	☐ External	☐ Dedicated		
Antenna connector:	☑ Yes	☐ No	☐ Temporary for test		
Transmit chains:	1				
	Single antenna				
Receiver chains	1				
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined		
Ad-Hoc mode:	☐ Yes	☑ No			
Duty cycle:	☑ Continuous duty	☐ Intermittent duty	☐ 100% duty		
Equipment type:	☑ Production model	☐ Pre-production model			
Operating temperature range:	Tmin:	☐ -20°C	☑ 0°C	☐ X°C	
	Tnom:	20°C			
	Tmax:	☐ 35°C	☐ 55°C	☑ 40°C	
Type of power source:	☑ AC power supply	☐ DC power supply	☐ Battery		
Operating voltage range:	Vnom:	☑ 120V/60Hz	☐ X Vdc		
	Vnom:	☑ 240V/50Hz	☐ X Vdc		

Antenna Characteristic			
Antenna assembly	**Gain (dBi)**	**Frequency Band (MHz)**	**Impedance(Ω)**
1	4.72	2400 – 2483.5	50

CHANNEL PLAN			
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
Cmin: 0	2402	**Cmid: 20**	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	**Cmax: 39**	2480

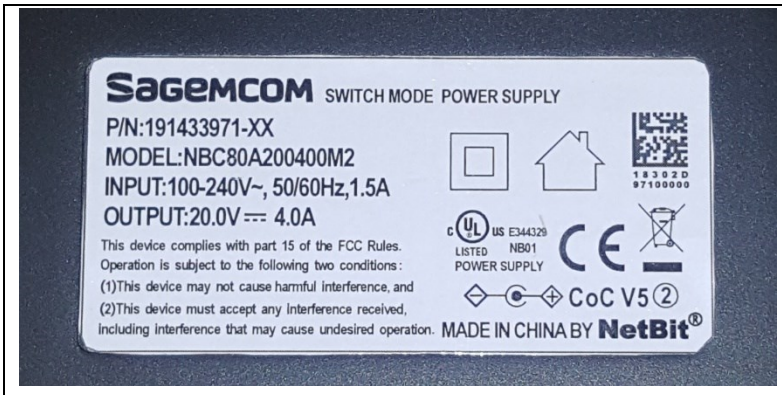
DATA RATE		
Data Rate (Mbps)	**Modulation Type**	**Worst Case Modulation**
1	GFSK	☑

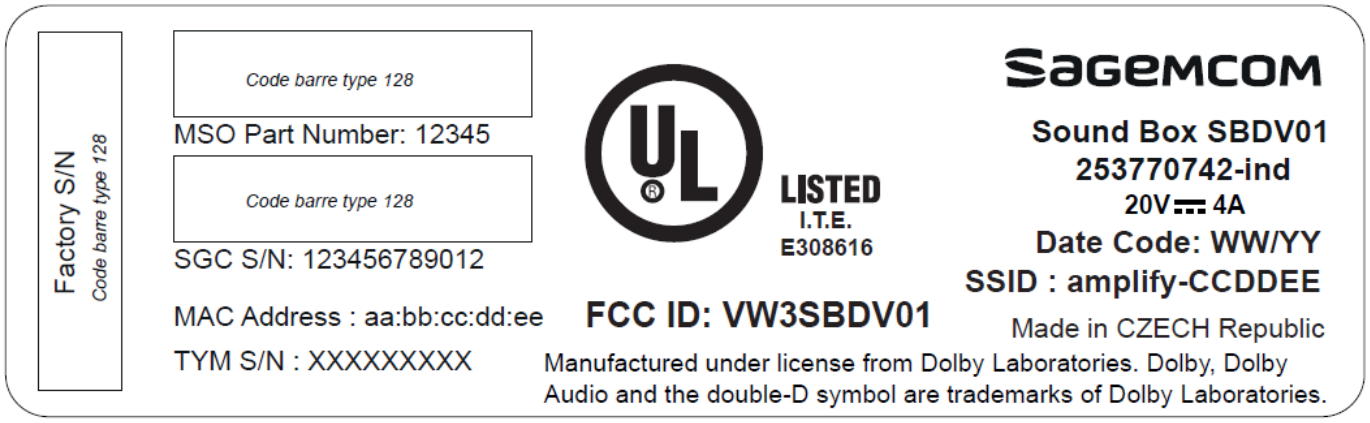
2.2. RUNNING MODE

The EUT is set in the following modes during tests:
- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception

Following commands with the specific test software "**Tera-Term**" are used to set the product:
- See document: 998050_02_Bluetooth test commands of PONY 2,4GHz, for the commands used during test.

2.3. EQUIPMENT LABELLING





2.4. EQUIPMENT MODIFICATION

☑ None ☐ Modification:

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

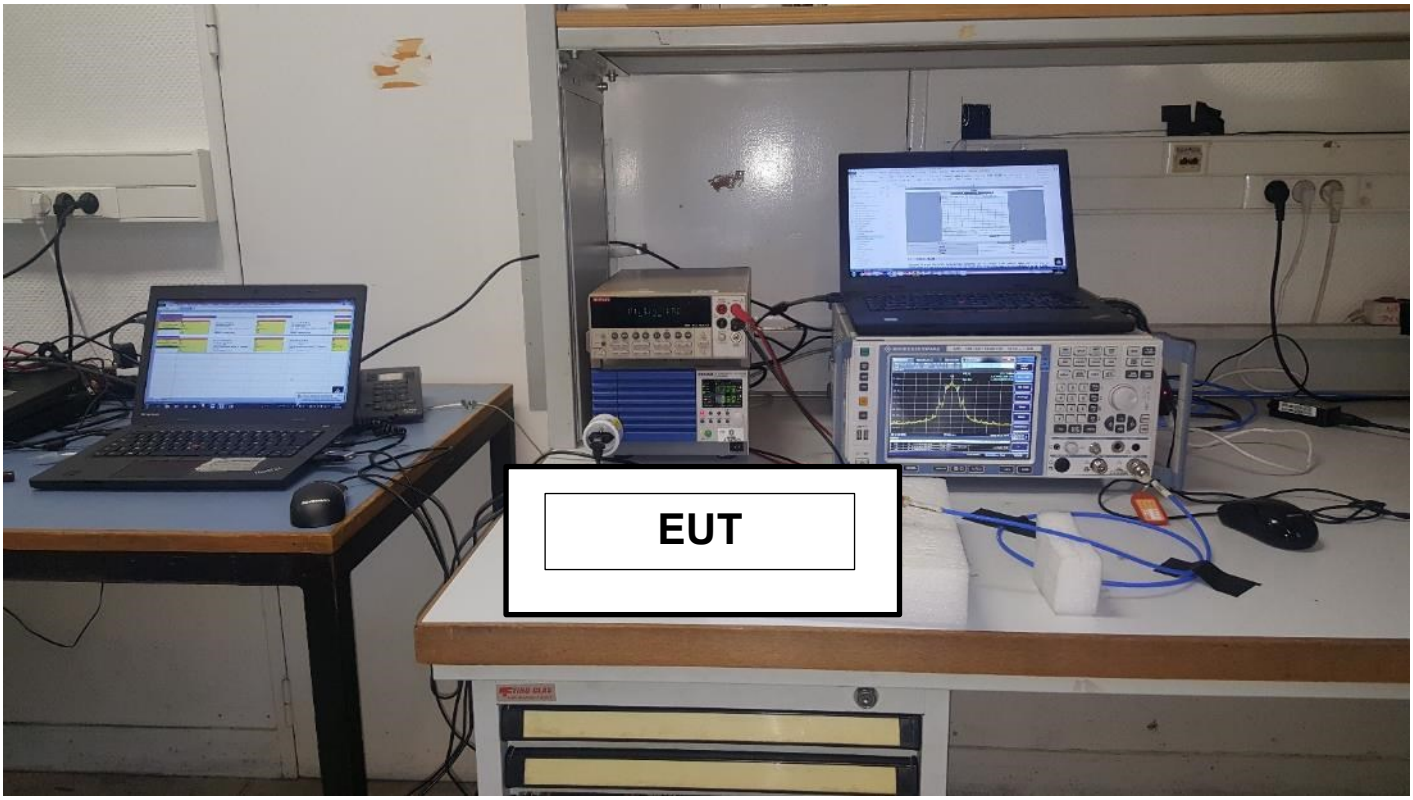
Test performed by : Armand MAHOUNGOU
Date of test : September 25, 2018
Ambient temperature : 28 °C
Relative humidity : 48 %

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:
☑ ANSI C63.10 § 6.9.2



Photograph for Occupied bandwidth

3.1. LIMIT

None

3.2. TEST EQUIPMENT LIST

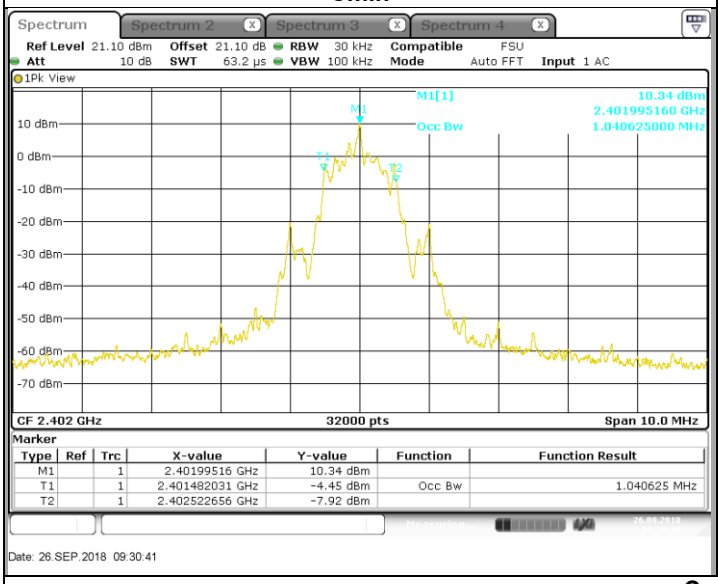
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/11	2018/11
Multimeter	KEITHLEY	2000	A1242090	2017/05	2019/05
Power supply	KIKUSUI	PCR500M	A7040079	Cal with Multimeter	Cal with Multimeter
Cable	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10

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

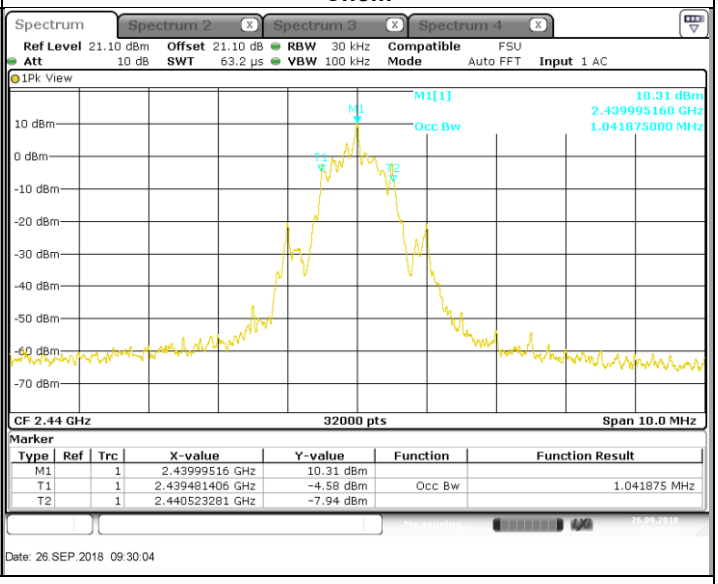
3.3. RESULTS

Occupied Bandwidth for BLE 4.2

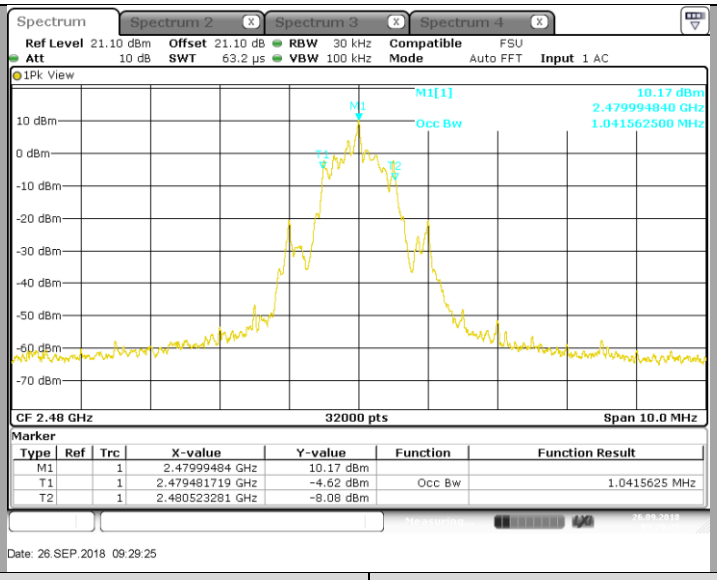
Cmin



Cnom



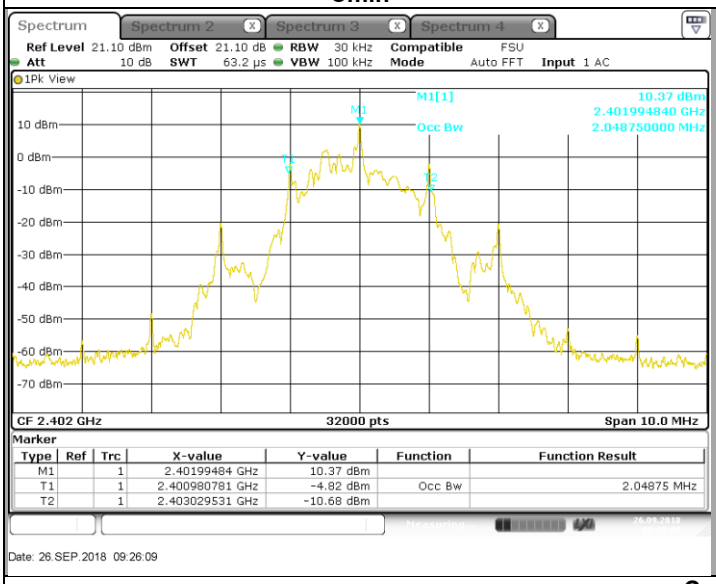
Cmax



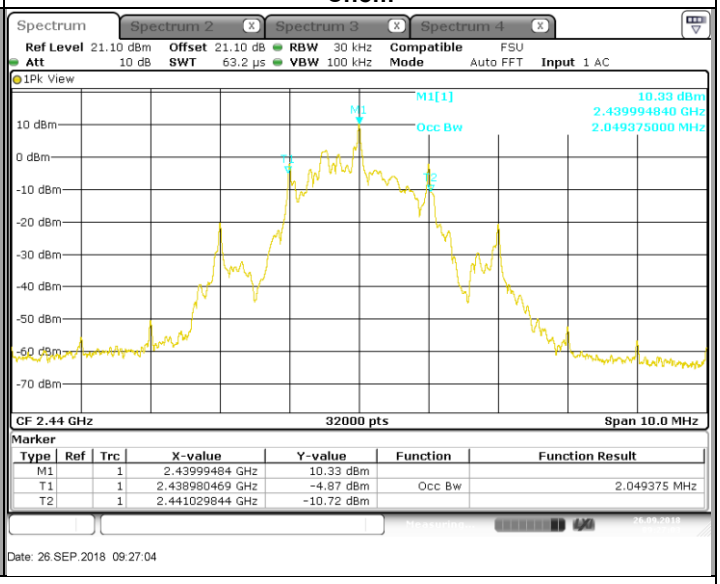
Channel	Occupied Bandwidth (MHz)
Cmin	1.041
Cnom	1.042
Cmax	1.041

Occupied Bandwidth for BLE 5.0

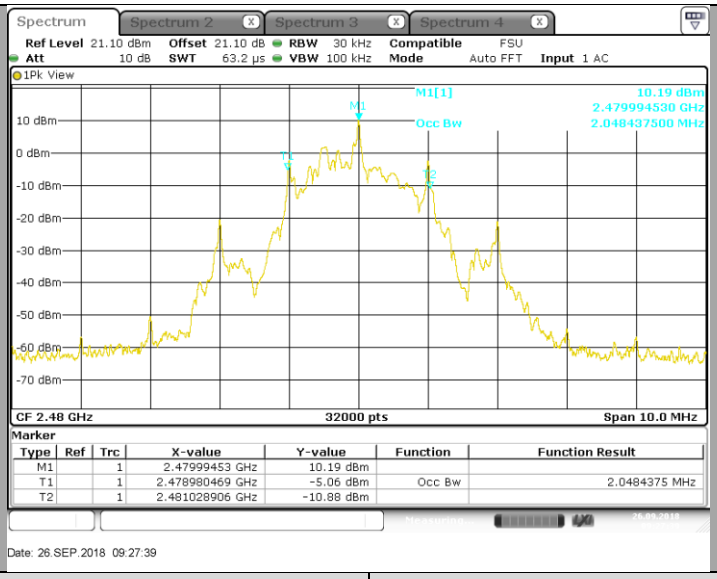
Cmin



Cnom



Cmax



Channel	Occupied Bandwidth (MHz)
Cmin	2.049
Cnom	2.049
Cmax	2.048

3.1. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **Sagemcom® Sound Box SBDV01**, SN: **253770742**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247** limits.

4. 6DB EMISSION BANDWIDTH

4.1. TEST CONDITIONS

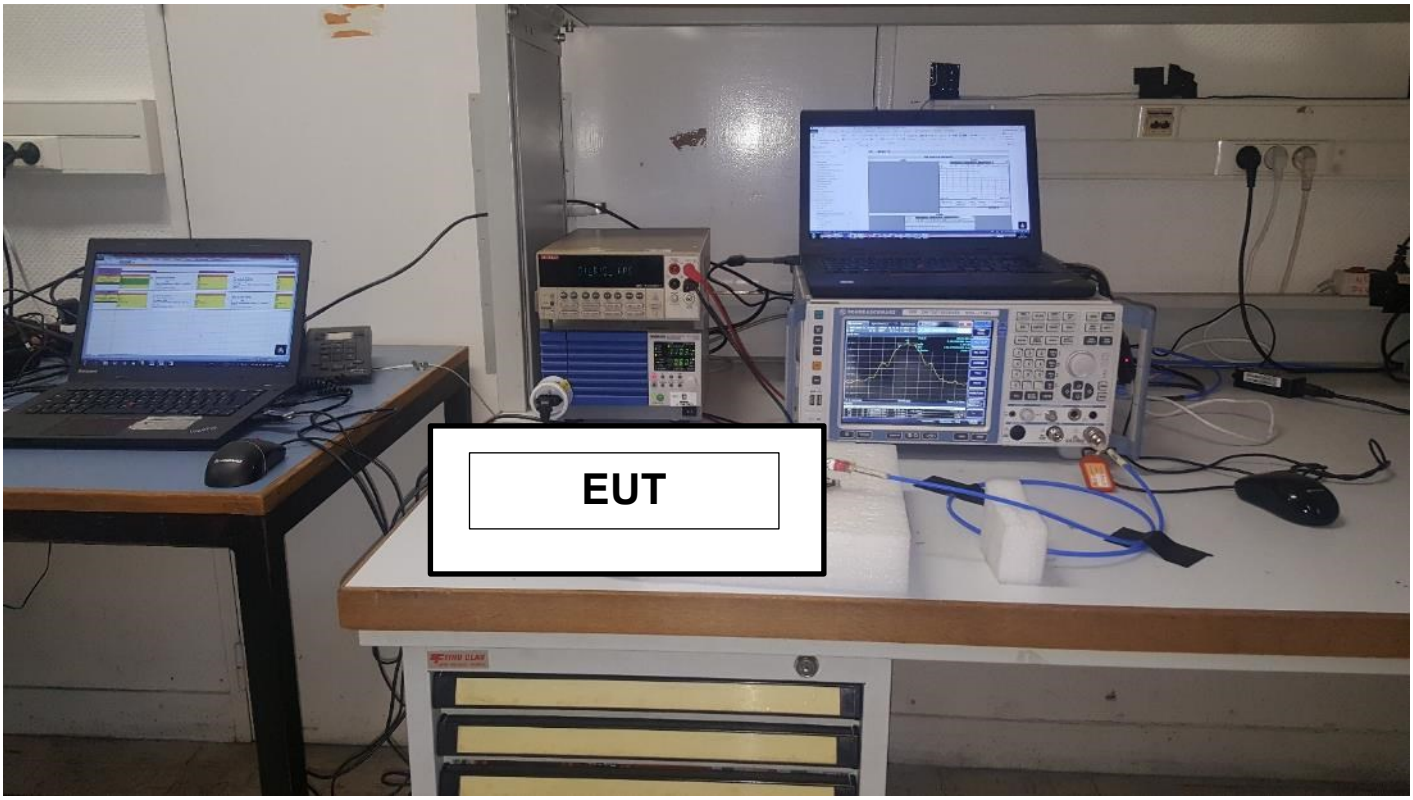
Test performed by : Armand MAHOUNGOU
Date of test : September 25, 2018
Ambient temperature : 28 °C
Relative humidity : 48 %

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 § 11.8.1
☑ ANSI C63.10 § 11.8.2



Photograph for 6dB emission bandwidth

4.3. LIMIT

The 6dB bandwidth shall be at least 500kHz

4.4. TEST EQUIPMENT LIST

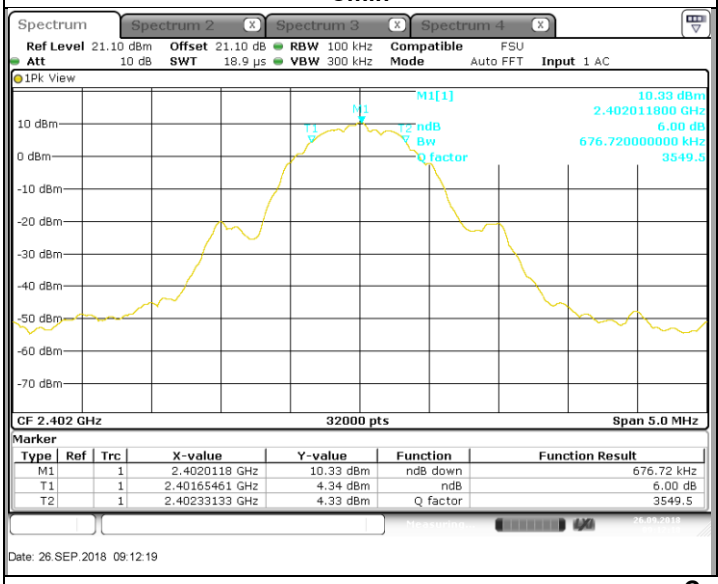
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/11	2018/11
Multimeter	KEITHLEY	2000	A1242090	2017/05	2019/05
Power supply	KIKUSUI	PCR500M	A7040079	Cal with Multimeter	Cal with Multimeter
Cable	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10

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

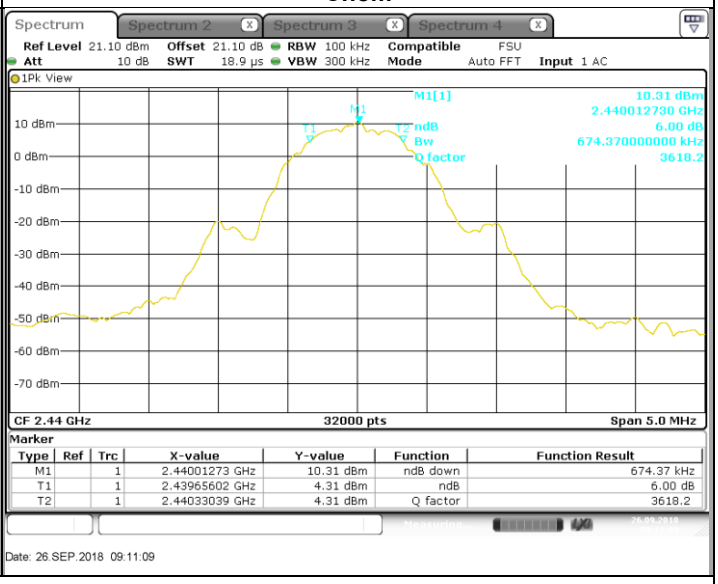
4.5. RESULTS

6dB Emission Bandwidth for BLE 4.2

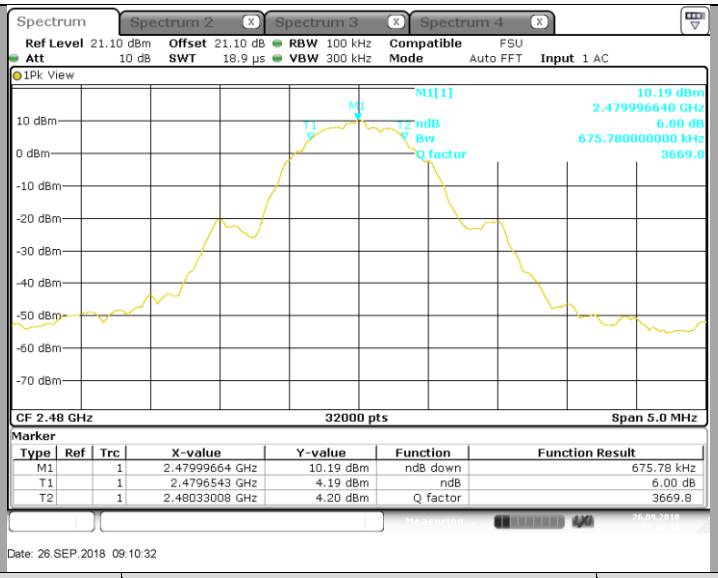
Cmin



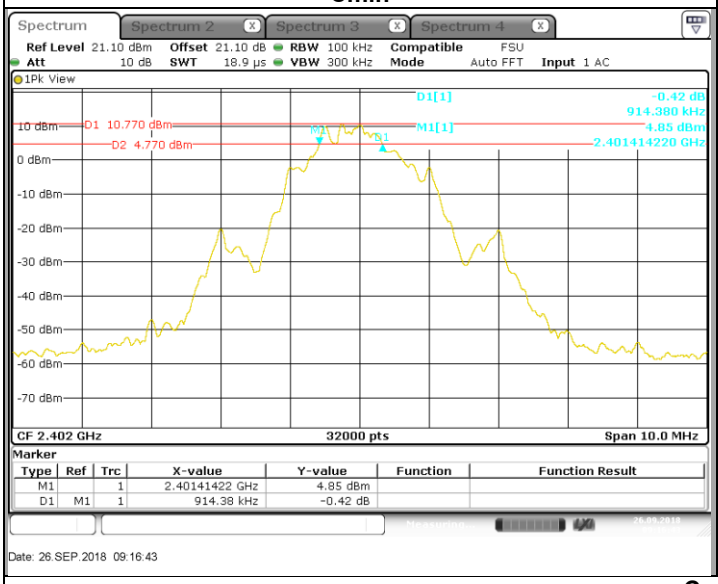
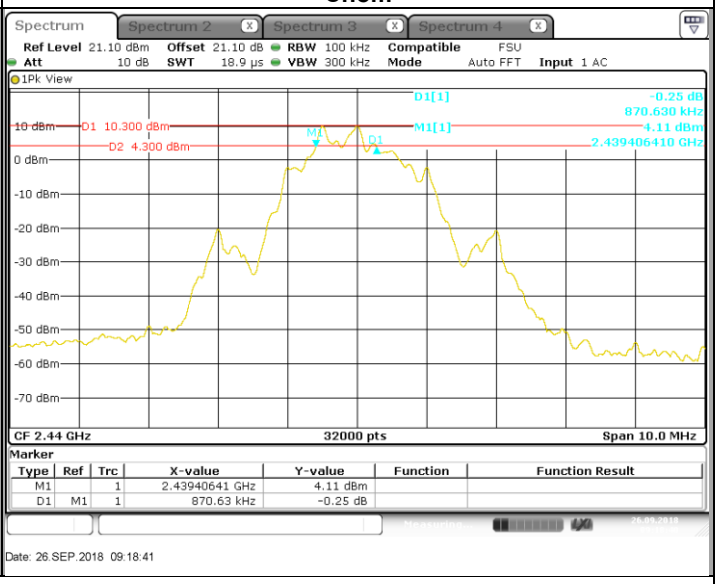
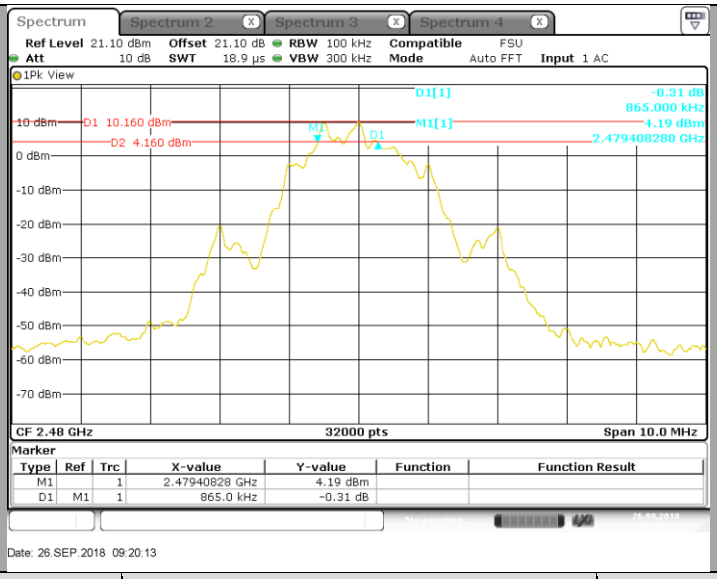
Cnom



Cmax



Channel	6dB Emission Bandwidth (MHz)	Limit (MHz)
Cmin	0.677	Minimum 0.5
Cnom	0.674	Minimum 0.5
Cmax	0.676	Minimum 0.5

6dB Emission Bandwidth for BLE 5.0	
Cmin	**Cnom**
	
Cmax	
	

Channel	6dB Emission Bandwidth (MHz)	Limit (MHz)
Cmin	0.914	Minimum 0.5
Cnom	0.871	Minimum 0.5
Cmax	0.865	Minimum 0.5

4.6. CONCLUSION

6dB Emission Bandwidth measurement performed on the sample of the product **Sagemcom® Sound Box SBDV01**, SN: **253770742**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247** limits.

5. DUTY CYCLE

5.1. TEST CONDITIONS

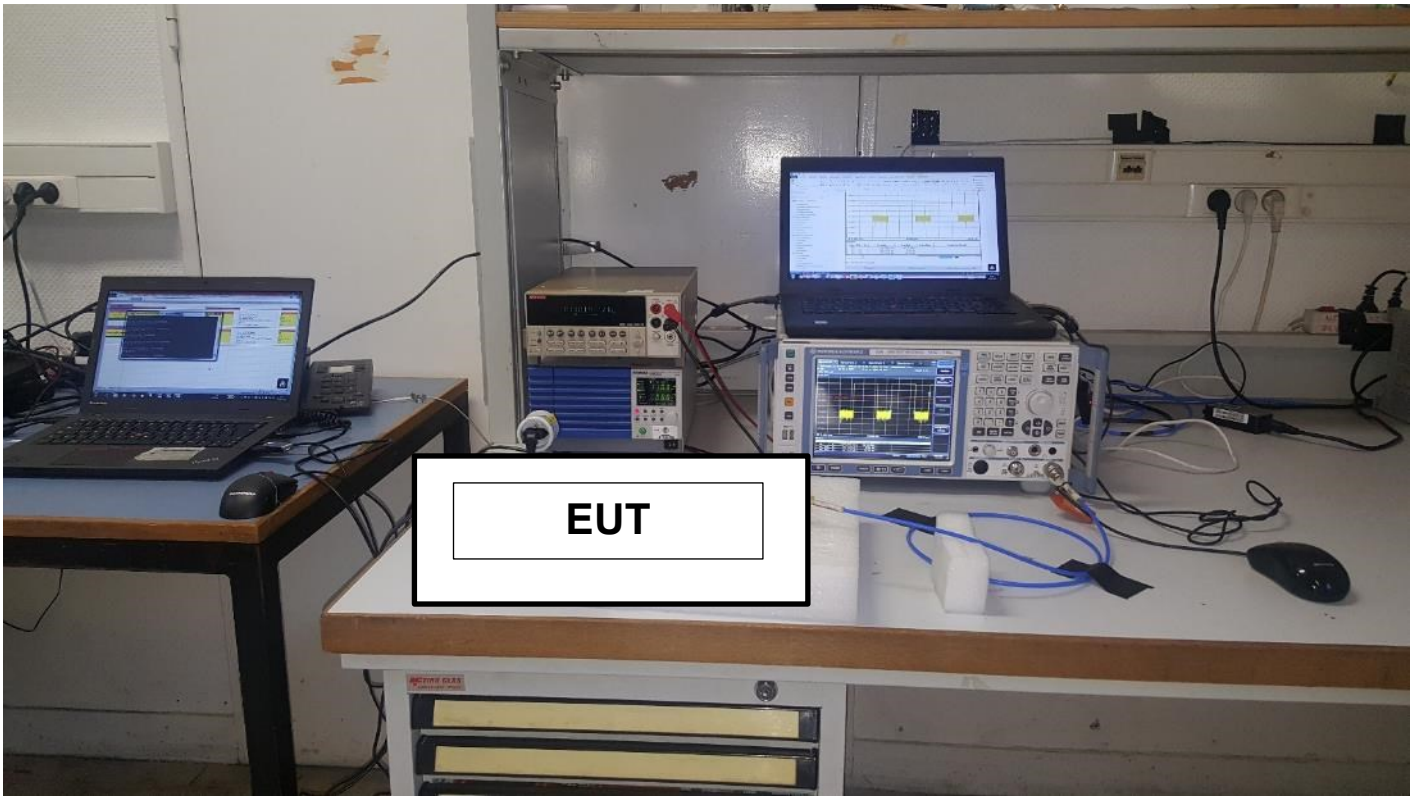
Test performed by : Armand MAHOUNGOU
Date of test : September 25, 2018
Ambient temperature : 28 °C
Relative humidity : 48 %

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 § 11.6 b)



Photograph for Duty Cycle

5.3. LIMIT

None

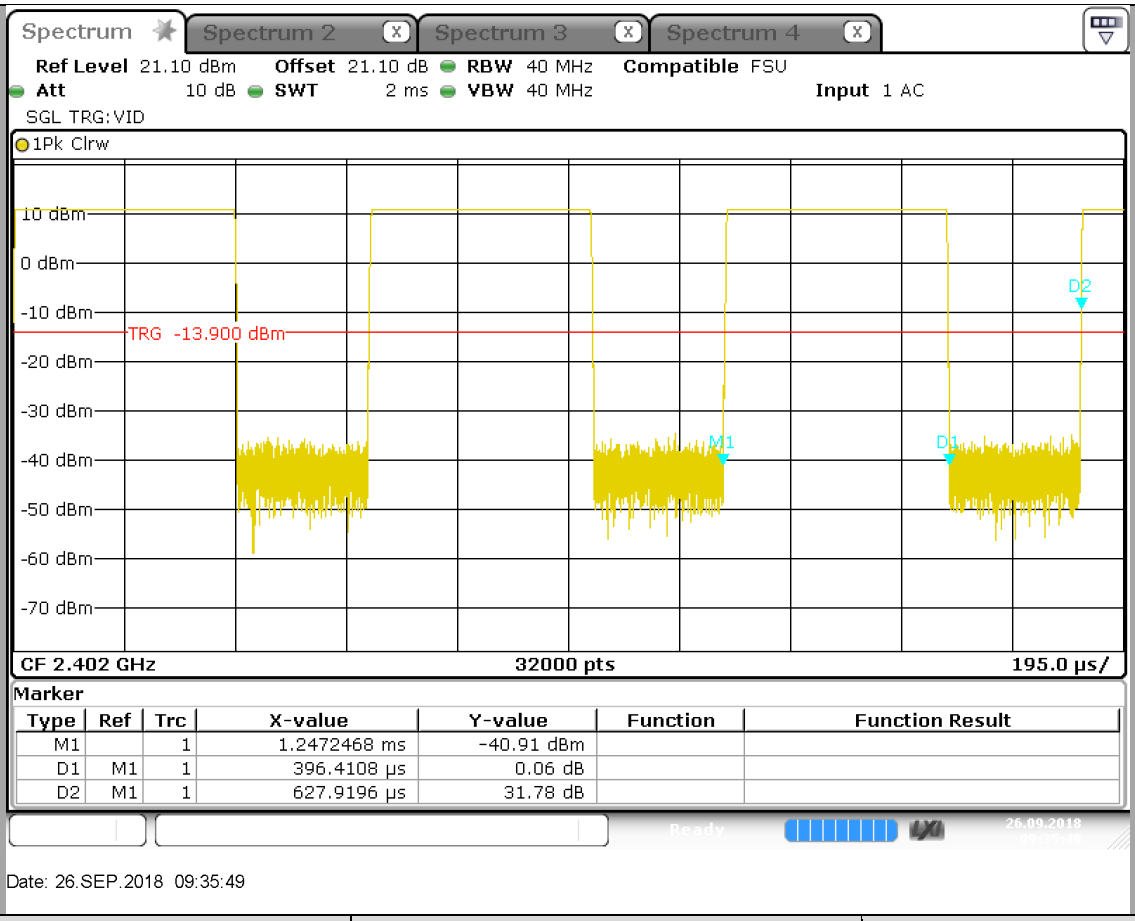
5.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/11	2018/11
Multimeter	KEITHLEY	2000	A1242090	2017/05	2019/05
Power supply	KIKUSUI	PCR500M	A7040079	Cal with Multimeter	Cal with Multimeter
Cable	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10

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

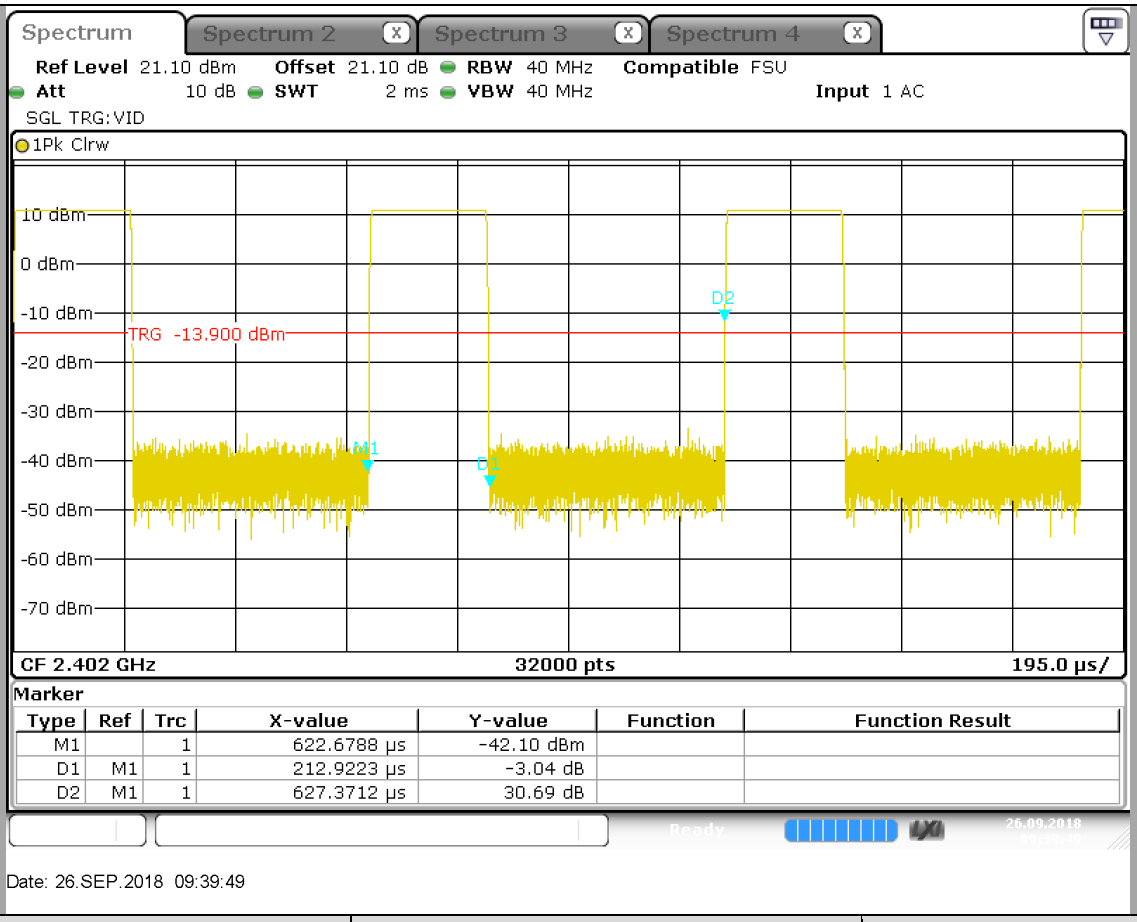
5.5. RESULTS

Duty Cycle for BLE 4.2		
Cmin		



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Cmin	63.13	3.99

Duty Cycle for BLE 5.0
Cmin



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Channel	33.94	9.38

5.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **Sagemcom® Sound Box SBDV01**, SN: **253770742**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247** limits.

6. MAXIMUM CONDUCTED OUTPUT POWER

6.1. TEST CONDITIONS

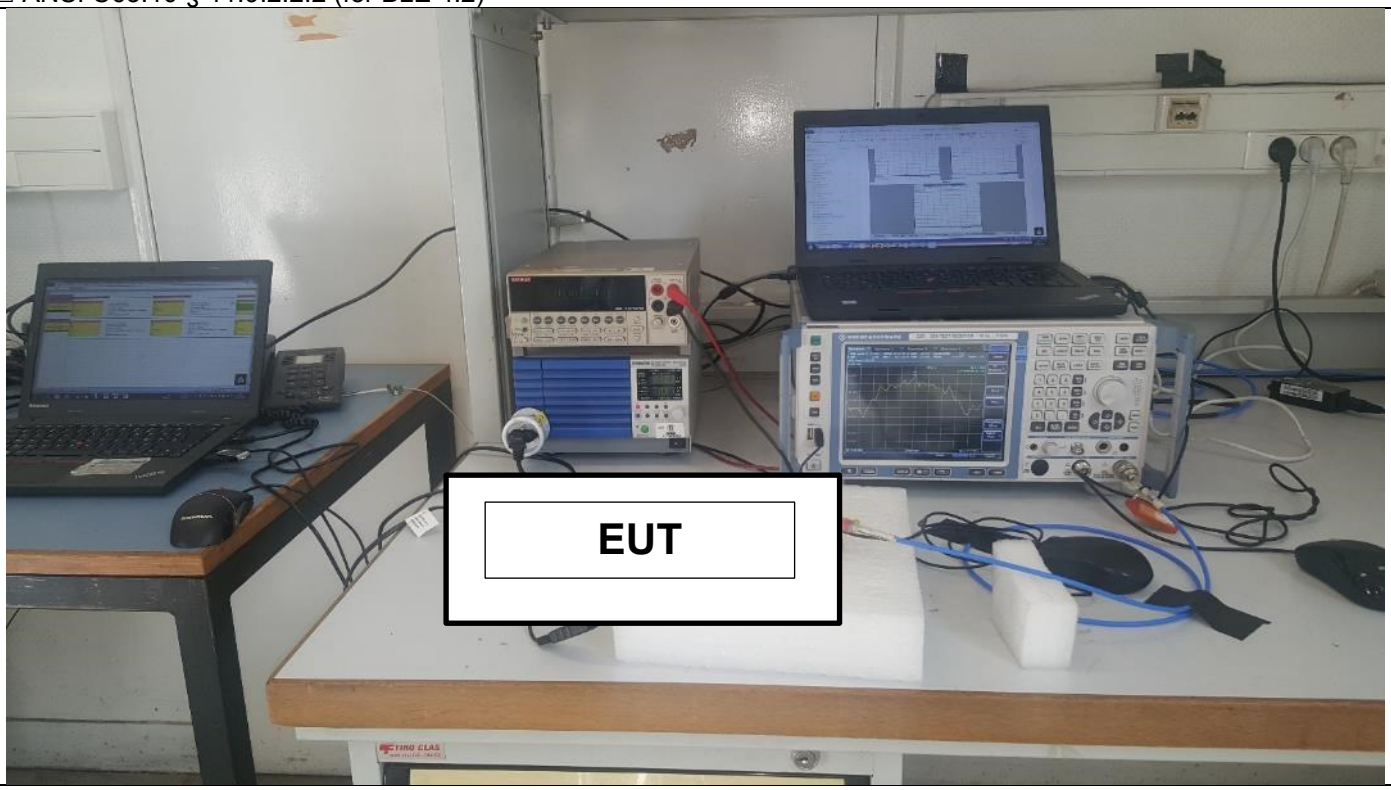
Test performed by : Armand MAHOUNGOU
Date of test : September 25, 2018
Ambient temperature : 28 °C
Relative humidity : 48 %

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 § 11.9.1.1 (for BLE 5.0)
☑ ANSI C63.10 § 11.9.2.2.2 (for BLE 4.2)



Photograph for Maximum Conducted Output Power

6.3. LIMIT

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

6.4. TEST EQUIPMENT LIST

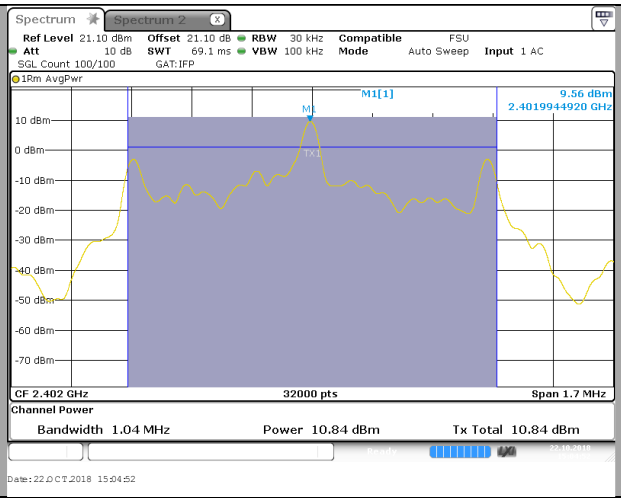
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/11	2018/11
Multimeter	KEITHLEY	2000	A1242090	2017/05	2019/05
Power supply	KIKUSUI	PCR500M	A7040079	Cal with Multimeter	Cal with Multimeter
Cable	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10

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

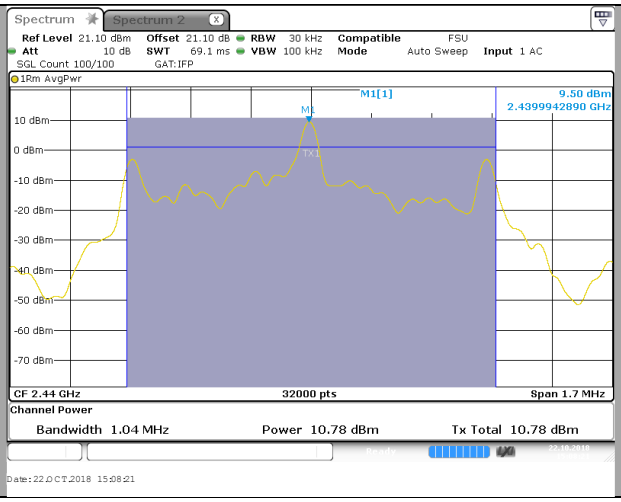
6.5. RESULTS

Maximum Conducted Output Power for BLE 4.2

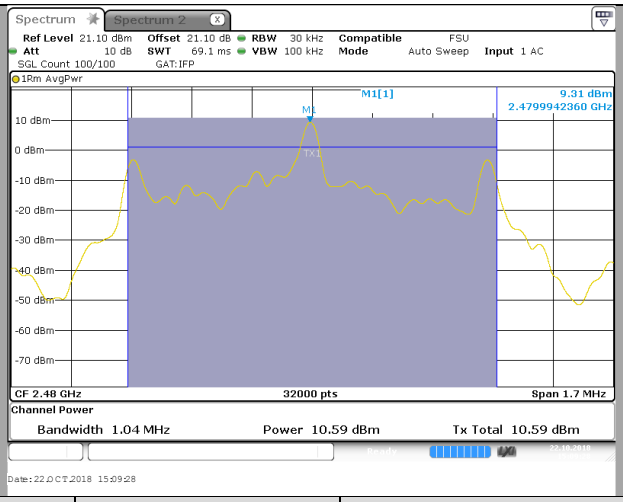
Cmin



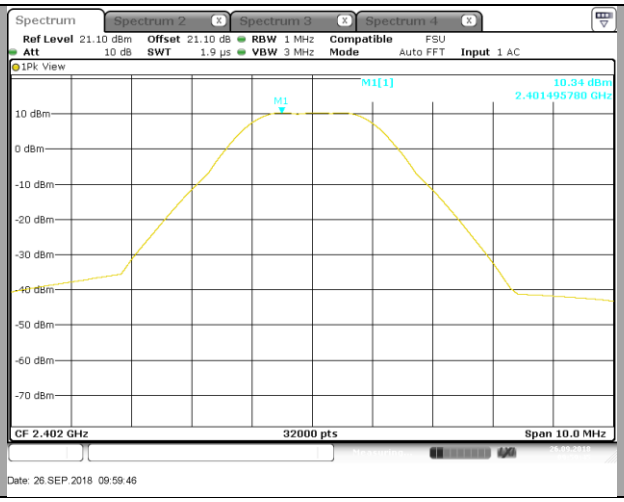
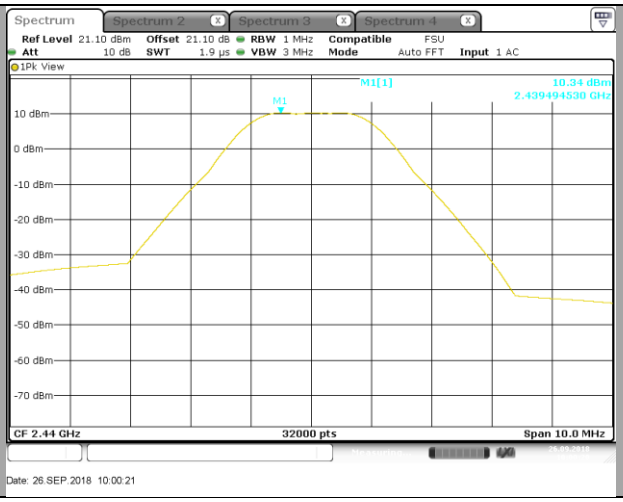
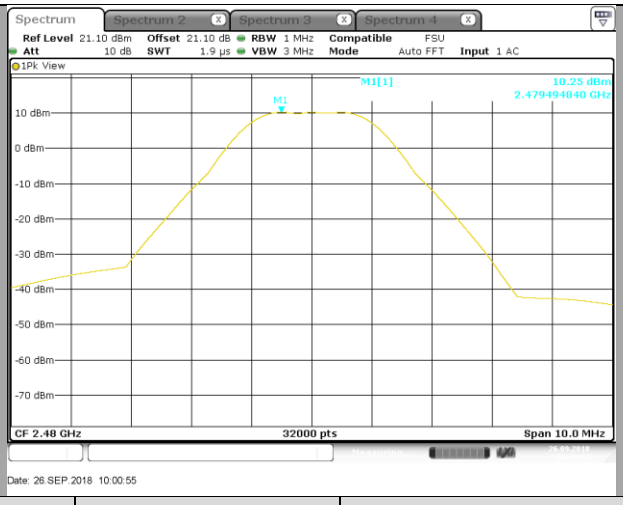
Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	**21.10**	**3**	**10.84**	30
Cnom	**21.10**	**3**	**10.78**	30
Cmax	**21.10**	**3**	**10.59**	30

Maximum Conducted Output Power for BLE 5.0	
Cmin	Cnom
	
Cmax	
	

Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	**21.10**	**3**	**10.34**	30
Cnom	**21.10**	**3**	**10.34**	30
Cmax	**21.10**	**3**	**10.25**	30

6.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **Sagemcom® Sound Box SBDV01**, SN: **253770742**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247** limits.

7. POWER SPECTRAL DENSITY

7.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : September 25, 2018
Ambient temperature : 28 °C
Relative humidity : 48 %

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 § 11.10.2 (for BLE 5.0)
☑ ANSI C63.10 § 11.10.3 (for BLE 4.2)

Photograph for Power Spectral Density

7.3. LIMIT

Power Spectral Density:
2400MHz-2483.5MHz: Shall not exceed 8dBm/3kHz
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

7.4. TEST EQUIPMENT LIST

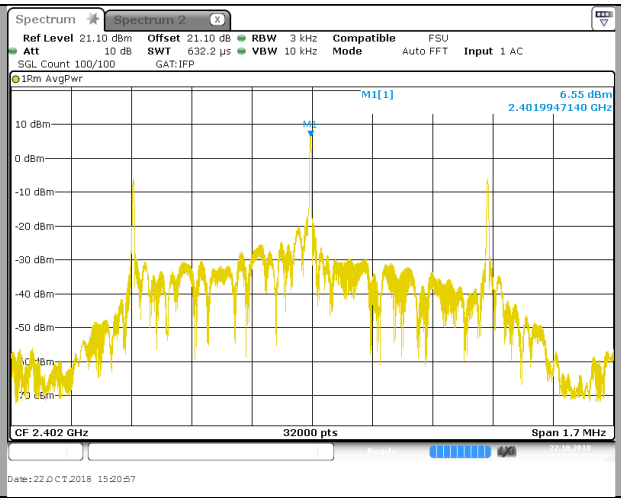
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/11	2018/11
Multimeter	KEITHLEY	2000	A1242090	2017/05	2019/05
Power supply	KIKUSUI	PCR500M	A7040079	Cal with Multimeter	Cal with Multimeter
Cable	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10

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

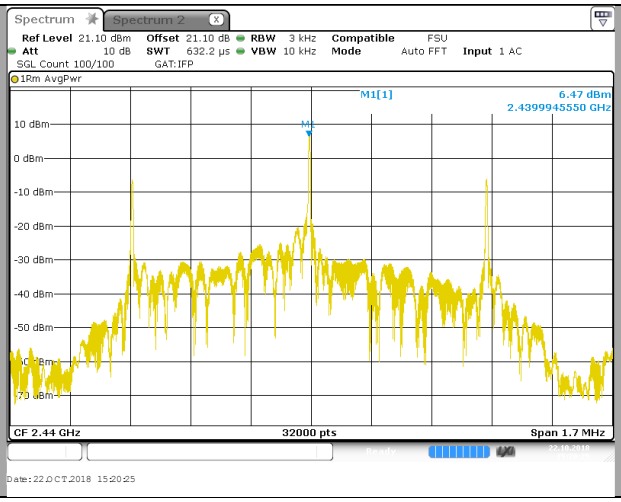
7.5. RESULTS

Power Spectral Density for BLE 4.2

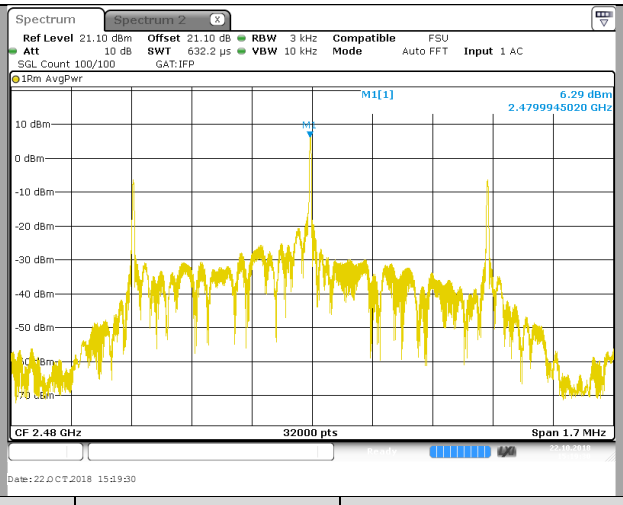
Cmin



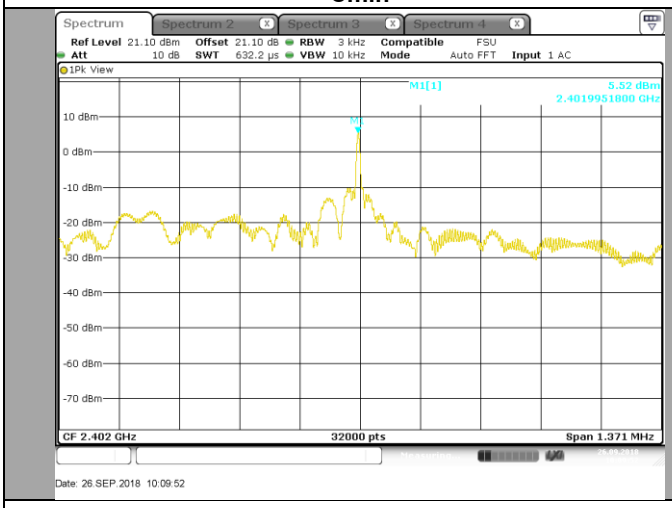
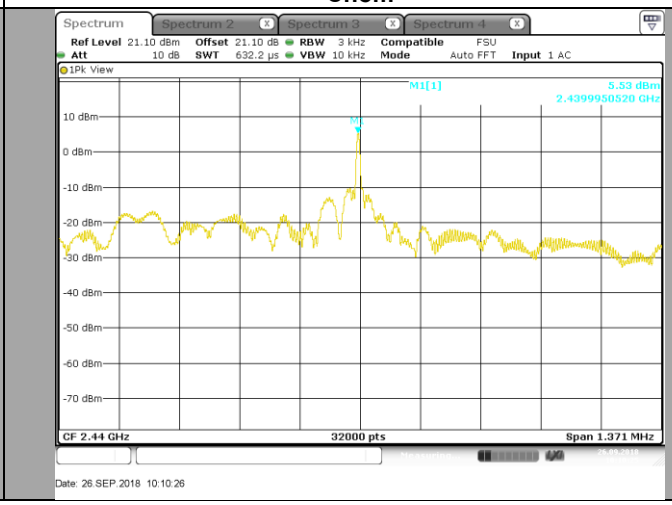
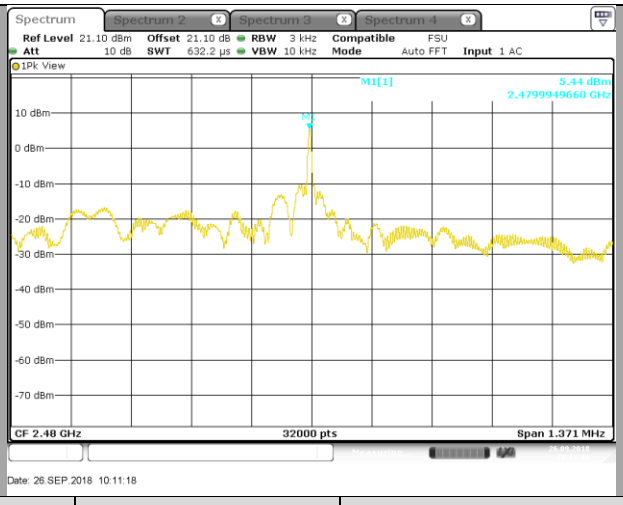
Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Cmin	**21.10**	**3**	**6.55**	8
Cnom	**21.10**	**3**	**6.47**	8
Cmax	**21.10**	**3**	**6.29**	8

Power Spectral Density for BLE 5.0	
Cmin	**Cnom**
	
Cmax	
	

Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Cmin	**21.10**	**3**	**5.52**	8
Cnom	**21.10**	**3**	**5.53**	8
Cmax	**21.10**	**3**	**5.44**	8

7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **Sagemcom® Sound Box SBDV01**, SN: **253770742**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247** limits.

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

8.1. TEST CONDITIONS

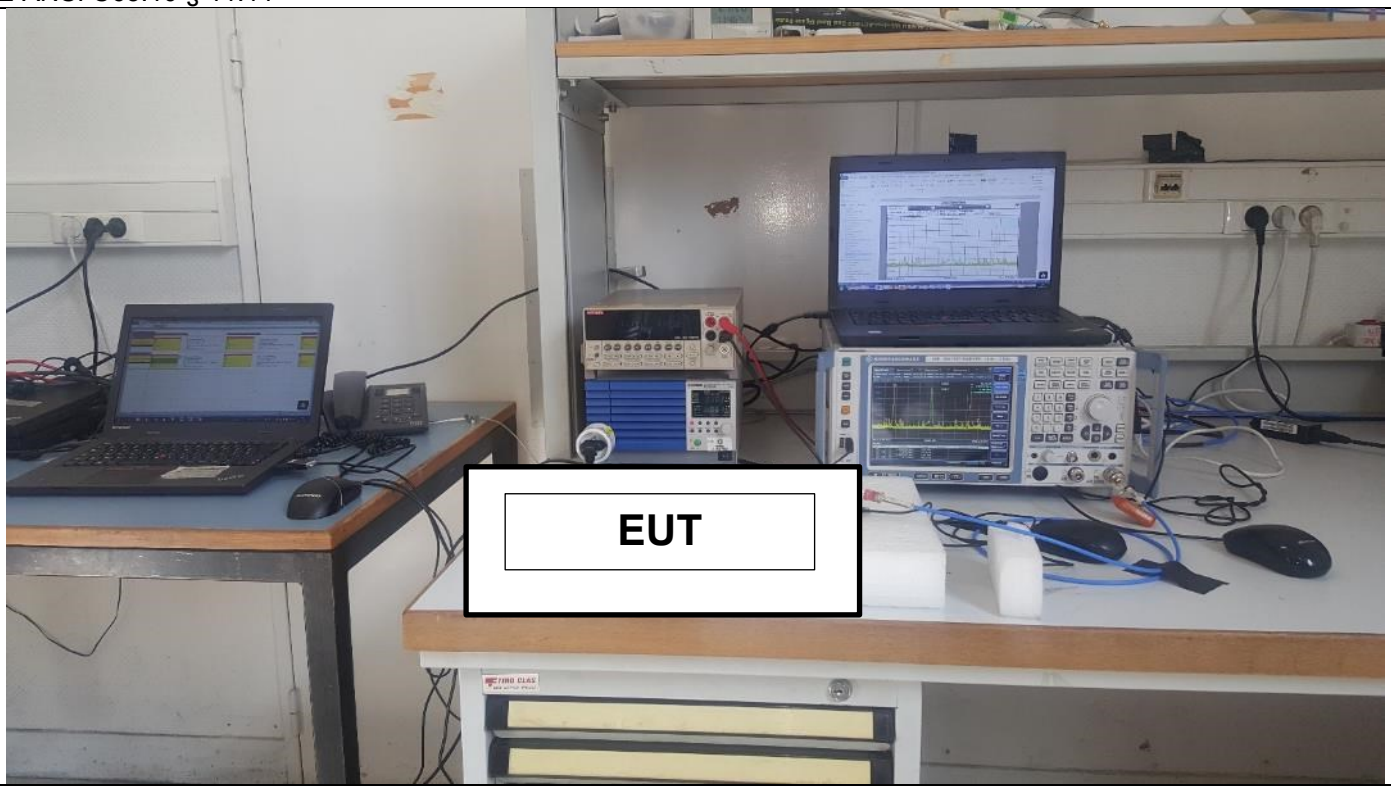
Test performed by : Armand MAHOUNGOU
Date of test : September 25, 2018
Ambient temperature : 28 °C
Relative humidity : 48 %

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 § 11.11



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

8.3. LIMIT

All Spurious Emissions must be at least 20dB below the Fundamental Radiator Level at the Band Edge Edge “2400MHz & 2483,5MHz” for BLE 5.0

All Spurious Emissions must be at least 30dB below the Fundamental Radiator Level at the Band Edge Edge “2400MHz & 2483,5MHz” for BLE 4.2

8.4. TEST EQUIPMENT LIST

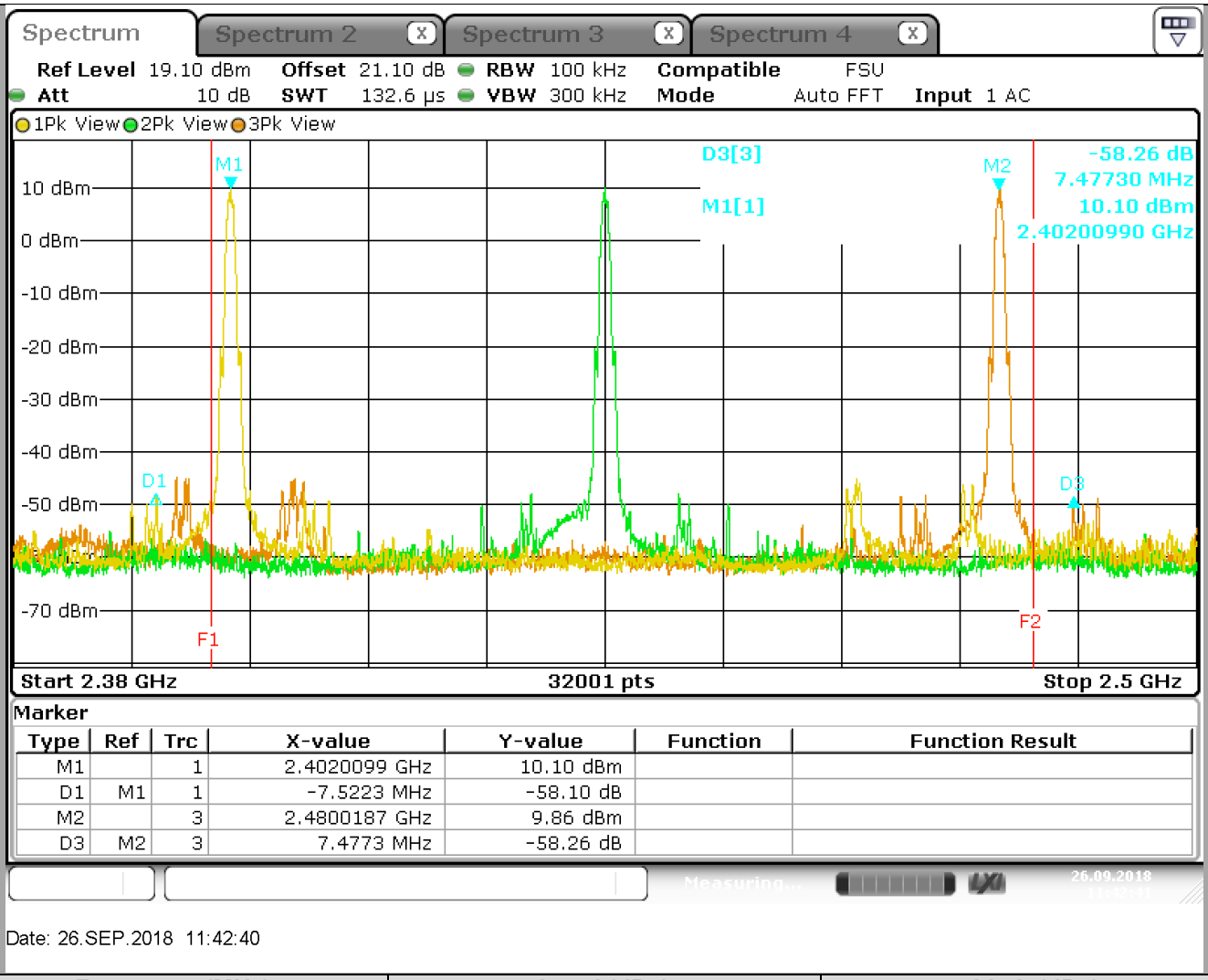
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/11	2018/11
Multimeter	KEITHLEY	2000	A1242090	2017/05	2019/05
Power supply	KIKUSUI	PCR500M	A7040079	Cal with Multimeter	Cal with Multimeter
Cable	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10

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

8.5. RESULTS

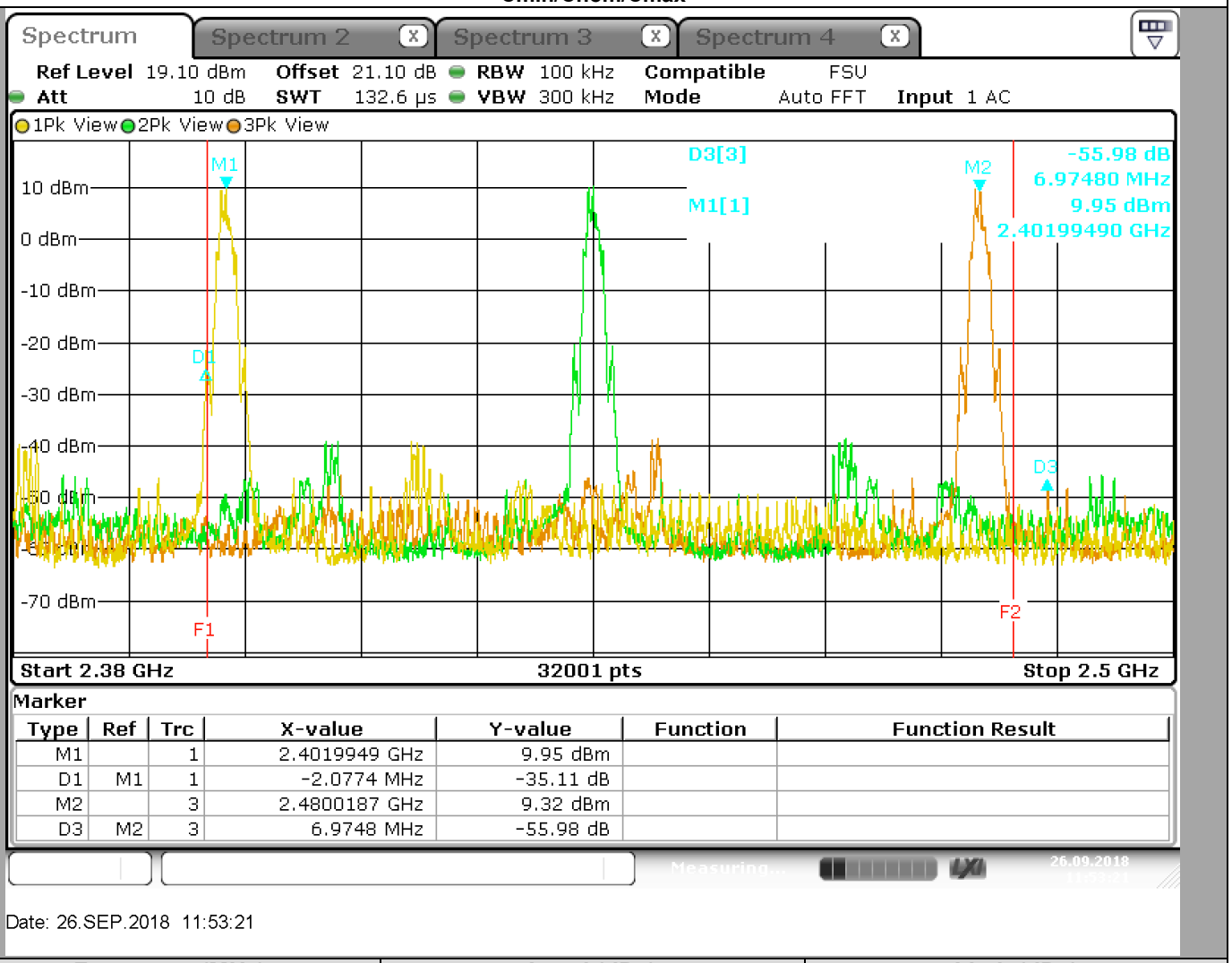
BLE 4.2

Cmin/Cnom/Cmax



Frequency (MHz)	Level (dBc)	Limit (dBc)
2400	58.10	30
2483.5	58.26	30

BLE 5.0
Cmin/Cnom/Cmax



Frequency (MHz)	Level (dBc)	Limit (dBc)
2400	35.11	20
2483.5	55.98	20

8.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **Sagemcom® Sound Box SBDV01**, SN: **253770742**, in configuration and description presented in this test report, show levels **Select Result** to the **47 CFR PART 15.247** limits.

9. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

9.1. TEST CONDITIONS

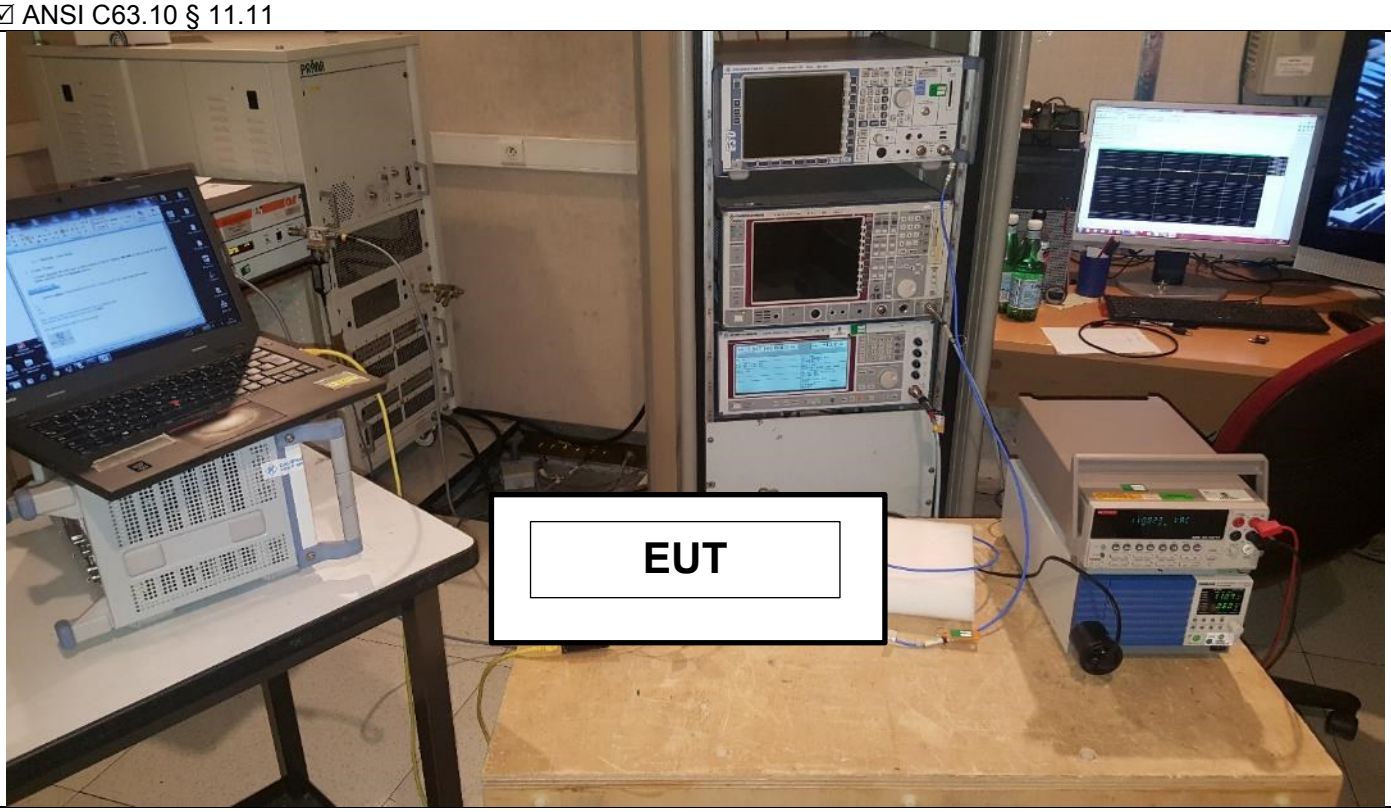
Test performed by : Armand MAHOUNGOU
Date of test : October 1, 2018
Ambient temperature : 28 °C
Relative humidity : 49 %

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 § 11.11



Photograph for Unwanted Emission into non-restricted frequency bands

9.3. LIMIT

All Spurious Emissions must be at least 20 below the Fundamental Radiator Level for BLE 5.0

All Spurious Emissions must be at least 30 below the Fundamental Radiator Level for BLE 4.2

9.4. TEST EQUIPMENT LIST

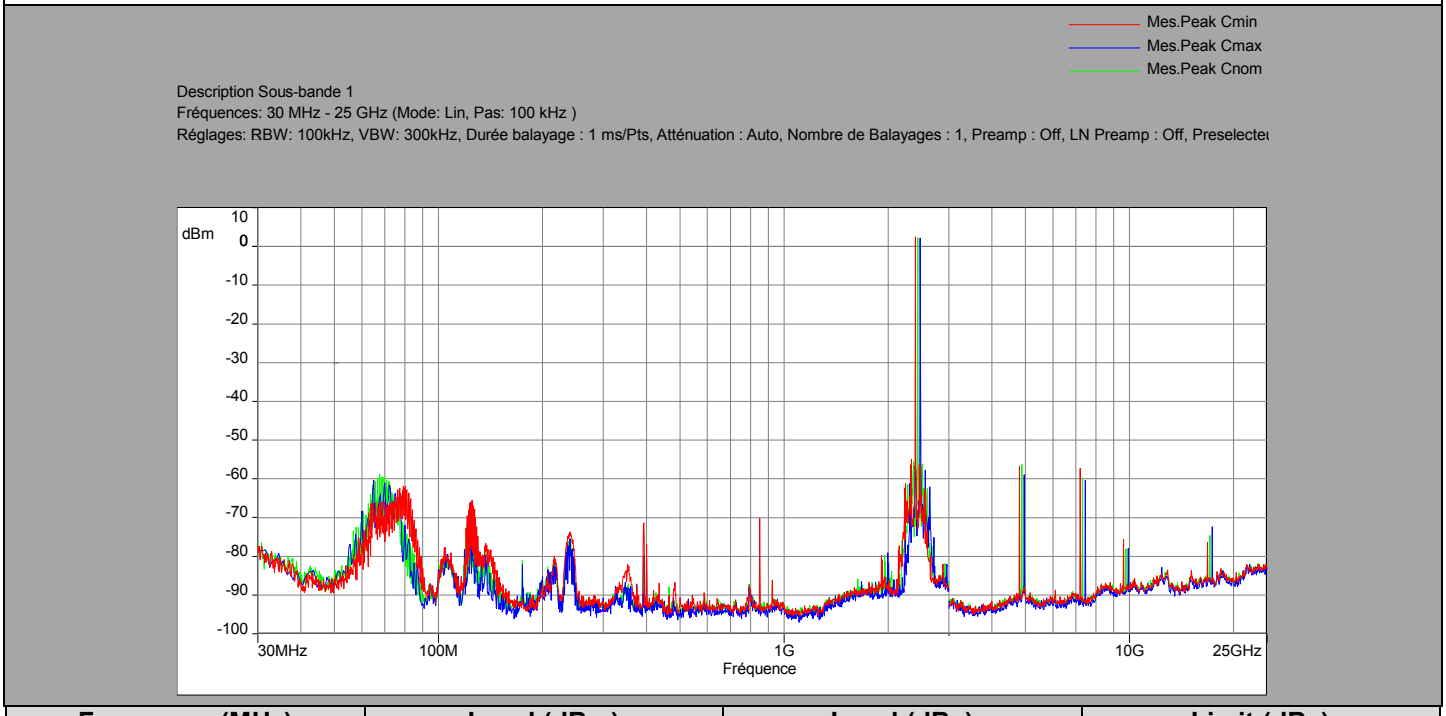
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2018/07	2020/07
Multimeter	KEITHLEY	2000	A1242090	2017/05	2019/05
Power supply	KIKUSUI	PCR500M	A7040079	Cal with Multimeter	Cal with Multimeter
Cable	Télédyne	084-0555-2MTR	A5329758	2017/10	2018/10
Attenuator 3dB	WEINSCHEL	WA54-3-12	A7122223	2017/10	2018/10

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

9.5. RESULTS

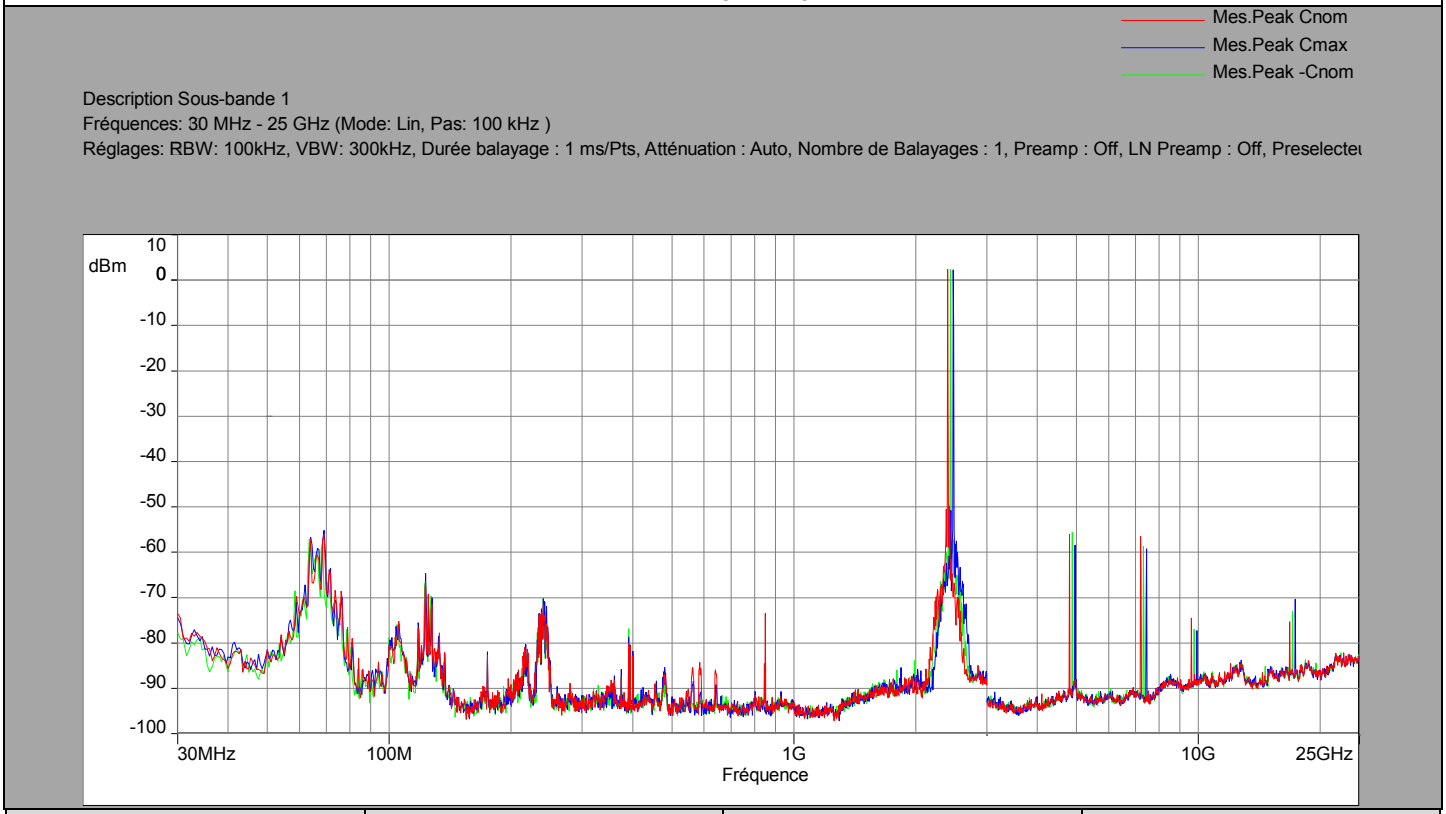
BLE 4.2

Cmin/Cnom/Cmax



Frequency (MHz)	Level (dBm)	Level (dBc)	Limit (dBc)
2402	2.46		
4804	-56.79	54.33	30
7206	-57.80	55.34	30
9607	-75.65	73.19	30
16814	-76.38	73.92	30
2440	2.27		
4882	-56.33	54.06	30
7323	-59.76	57.49	30
9763	-78.05	75.78	30
17086	-74.64	72.37	30
2480	2.20		
4960	-58.95	56.75	30
7440	-60.35	58.15	30
9920	-78.00	75.80	30
17360	-72.35	70.15	30

BLE 5.0
Cmin/Cnom/Cmax



Frequency (MHz)	Level (dBm)	Level (dBc)	Limit (dBc)
2402	2.35		
4804	-56.05	53.70	20
7206	-56.47	54.12	20
9607	-74.50	72.15	20
16814	-75.39	73.04	20
2440	2.32		
4882	-55.58	53.26	20
7323	-58.70	56.38	20
9763	-76.95	74.63	20
17086	-73.02	70.70	20
2480	2.23		
4960	-58.39	56.16	20
7440	-59.30	53.07	20
9920	-77.30	75.07	20
17360	-70.31	68.08	20

9.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **Sagemcom® Sound Box SBDV01**, SN: **253770742**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247** limits.

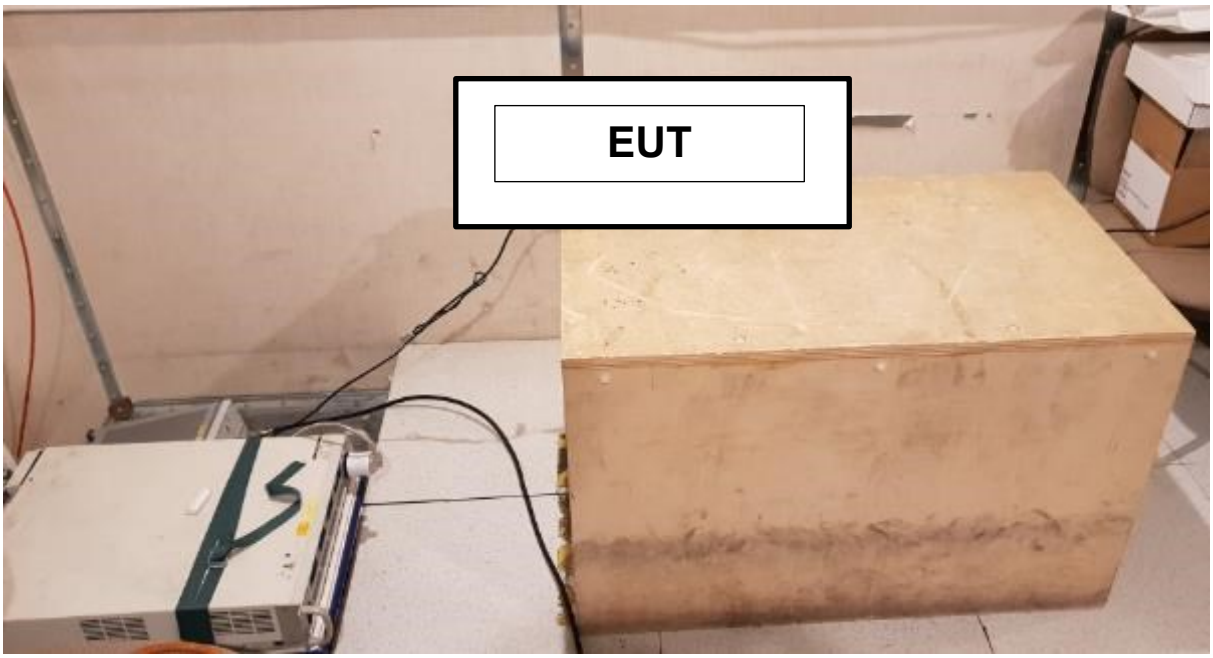
10. AC POWER LINE CONDUCTED EMISSIONS

10.1. TEST CONDITIONS

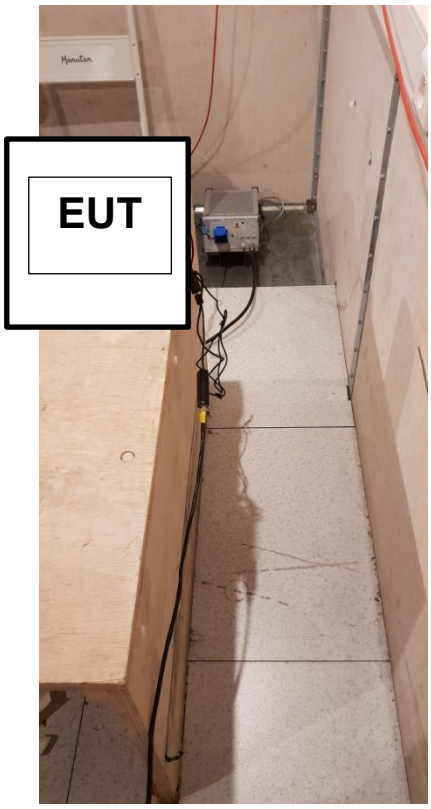
Test performed by	: Armand MAHOUNGOU
Date of test	: September 24, 2018
Ambient temperature	: 23 °C
Relative humidity	: 45 %

10.2. TEST SETUP

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



Photograph for AC Power Line Conducted Emissions (Front view)



Photograph for AC Power Line Conducted Emissions (Rear view)

10.3. LIMIT

Quasi-Peak
0,15kHz to 0,5MHz: 66dBµV to 56dBµV*
0,5MHz to 5MHz: 56dBµV
5MHz to 30MHz: 60dBµV

Average
0,15kHz to 0,5MHz: 56dBµV to 46dBµV*
0,5MHz to 5MHz: 46dBµV
5MHz to 30MHz: 50dBµV

*Decreases with the logarithm of the frequency

10.4. TEST EQUIPMENT LIST

Description	Constructor	Model	N°	Cal. Date	Cal. Due
EMI Receiver	ROHDE & SCHWARZ	ESU26	A2642018	2016/10	2018/10
RSIL	ROHDE & SCHWARZ	ENV215	C2320162	2018/01	2019/01
Cable	-	-	A5329712	2018/03	2019/03

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

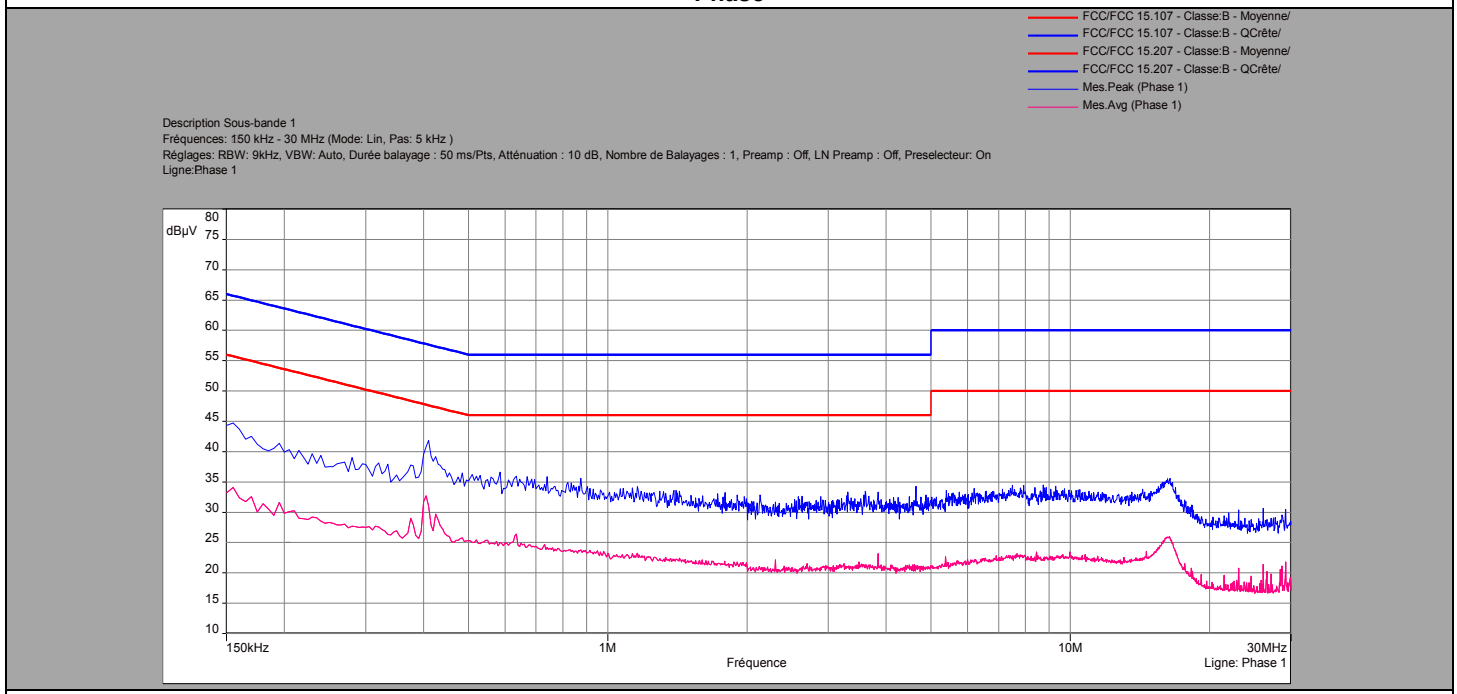
10.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

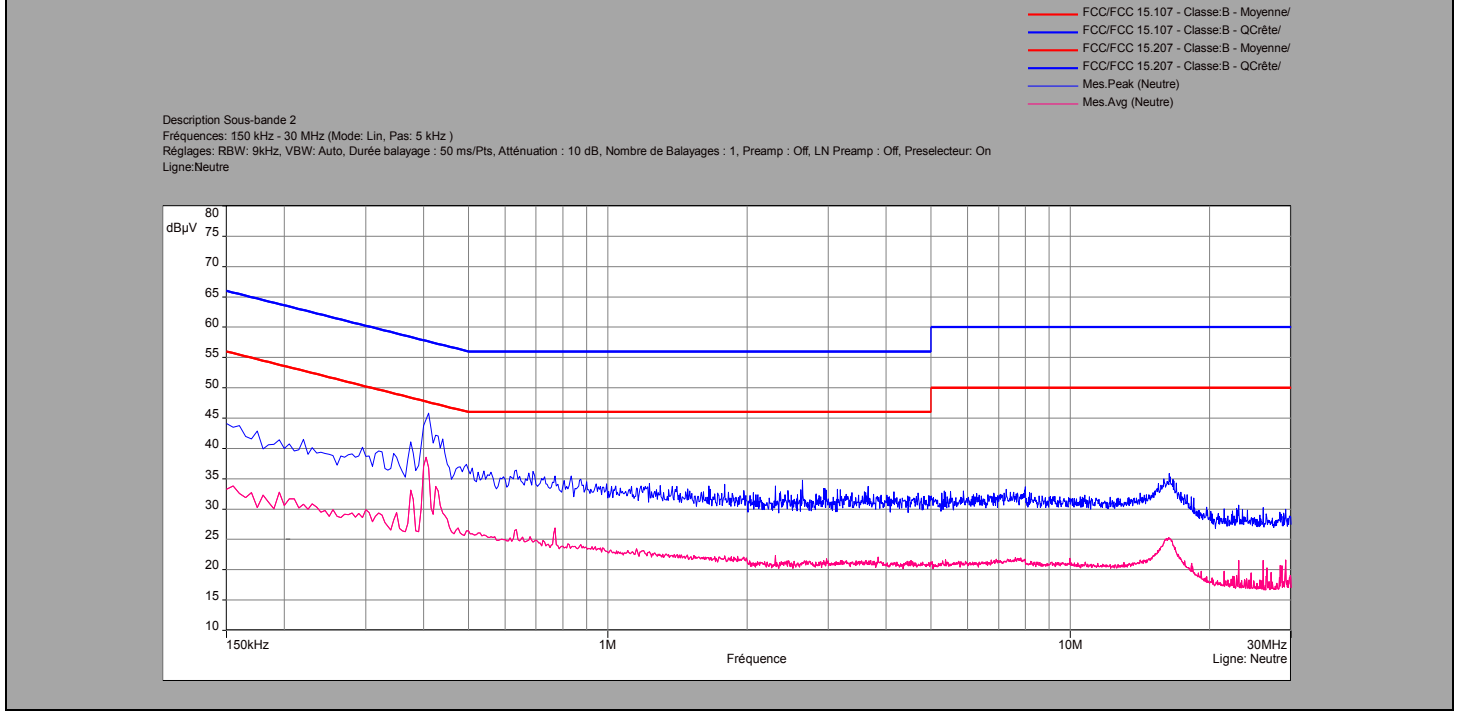
10.6. RESULTS

BLE 4.2 120V / 60Hz

Phase



Line

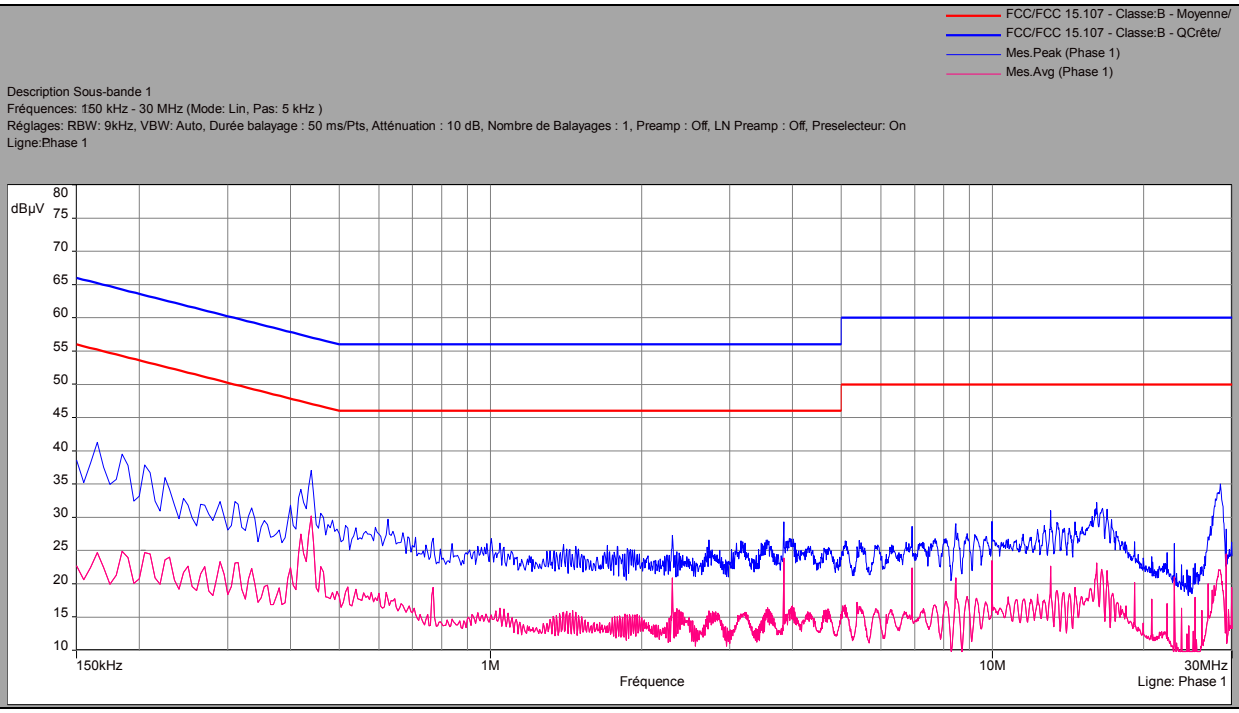


Phase Line BLE 4.2 120V / 60Hz							
Frequency (MHz)	**Peak Level (dBµV)**	**Quasi-Peak Level (dBµV)**	**Quasi-Peak Limit (dBµV)**	**Margin Quasi-Peak (dBµV)**	**Average Level (dBµV)**	**Average Limit (dBµV)**	**Margin Average (dBµV)**
0.41	41.9	-	57.65	15,75	32.7	47.65	15,95
2.305	32.83	-	56	23.17	22.14	46	23.86
3.840	33.31	-	56	24.64	23.16	46	22.84
23.13	30.38	-	60	29.62	20.76	50	29.24
26.11	30.63	-	60	29.37	21.37	50	28.63
29.23	30.46	-	60	29.54	21.82	50	28.18

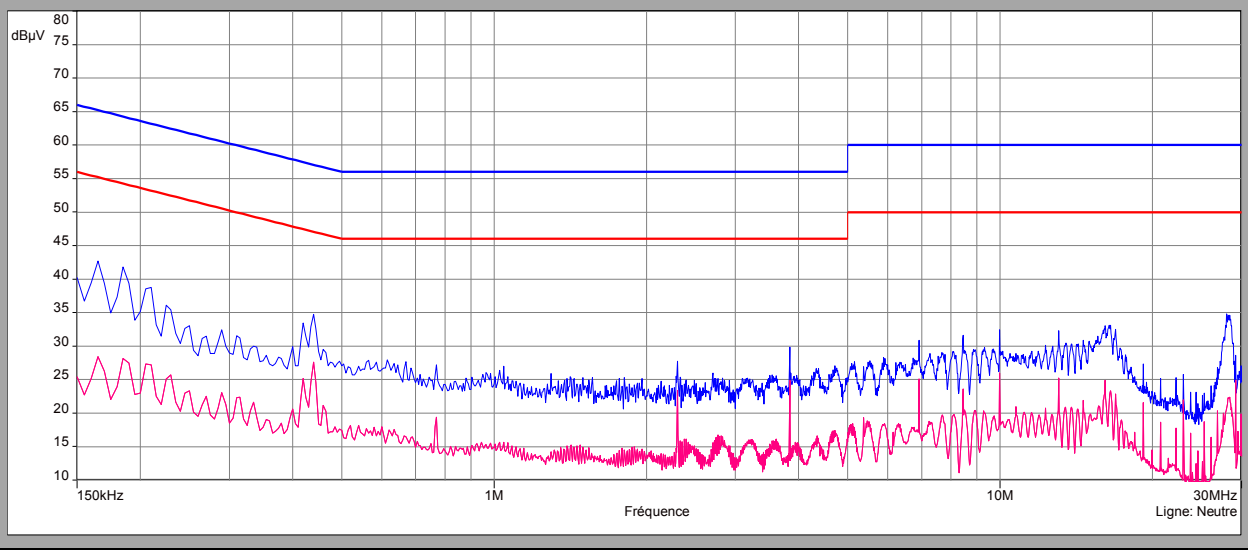
Neutral Line BLE 4.2 120V / 60Hz							
Frequency (MHz)	**Peak Level (dBµV)**	**Quasi-Peak Level (dBµV)**	**Quasi-Peak Limit (dBµV)**	**Margin Quasi-Peak (dBµV)**	**Average Level (dBµV)**	**Average Limit (dBµV)**	**Margin Average (dBµV)**
0.41	45.8	-	57.65	11.85	38.56	47.65	9.09
0.77	35.45	-	56	20.55	26.86	46	19.14
2.305	33.83	-	56	22.17	22.37	46	23.63
23.13	30.69	-	60	29.31	21.51	50	28.49
26.11	30.27	-	60	29.73	21.52	50	28.48
29.23	30.01	-	60	29.99	21.61	50	28.39

BLE 4.2 240V / 50Hz

Phase



Line



Phase Line BLE 4.2 240V / 50Hz							
Frequency (MHz)	**Peak Level (dBµV)**	**Quasi-Peak Level (dBµV)**	**Quasi-Peak Limit (dBµV)**	**Margin Quasi-Peak (dBµV)**	**Average Level (dBµV)**	**Average Limit (dBµV)**	**Margin Average (dBµV)**
0.44	37.06	-	57.06	20.0	30.17	47.06	16.89
2.305	27.27	-	56	28.73	20.89	46	25.11
3.840	29.32	-	56	26.68	23.89	46	22.11
13.05	31.02	-	60	28.98	22.62	50	27.38
16.13	27.80	-	60	20.80	23.12	50	26.88
28.22	35.02	-	60	24.98	22.11	50	27.89

Neutral Line BLE 4.2 240V / 50Hz							
Frequency (MHz)	**Peak Level (dBµV)**	**Quasi-Peak Level (dBµV)**	**Quasi-Peak Limit (dBµV)**	**Margin Quasi-Peak (dBµV)**	**Average Level (dBµV)**	**Average Limit (dBµV)**	**Margin Average (dBµV)**
0.44	34.74	-	57.06	22.32	27.59	47.06	19.47
2.305	27.75	-	56	28.25	23.37	46	22.63
3.840	29.88	-	56	26.12	24.91	46	21.09
13.05	32.30	-	60	27.70	25.23	50	24.77
16.13	33.12	-	60	26.88	24.86	50	25.14
28.22	34.82	-	60	25.18	22.33	50	27.67

10.7. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **Sagemcom® Sound Box SBDV01**, SN: **253770742**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.247 limits.

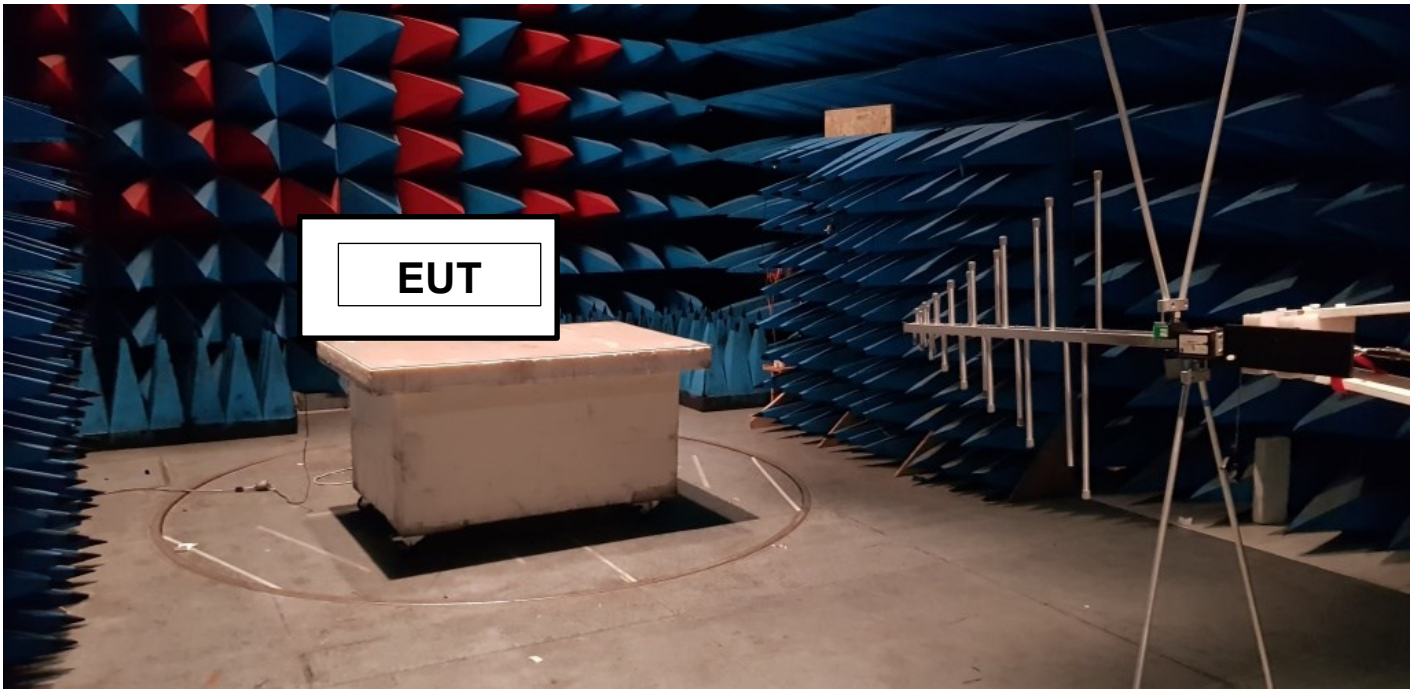
11. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

11.1. TEST CONDITIONS

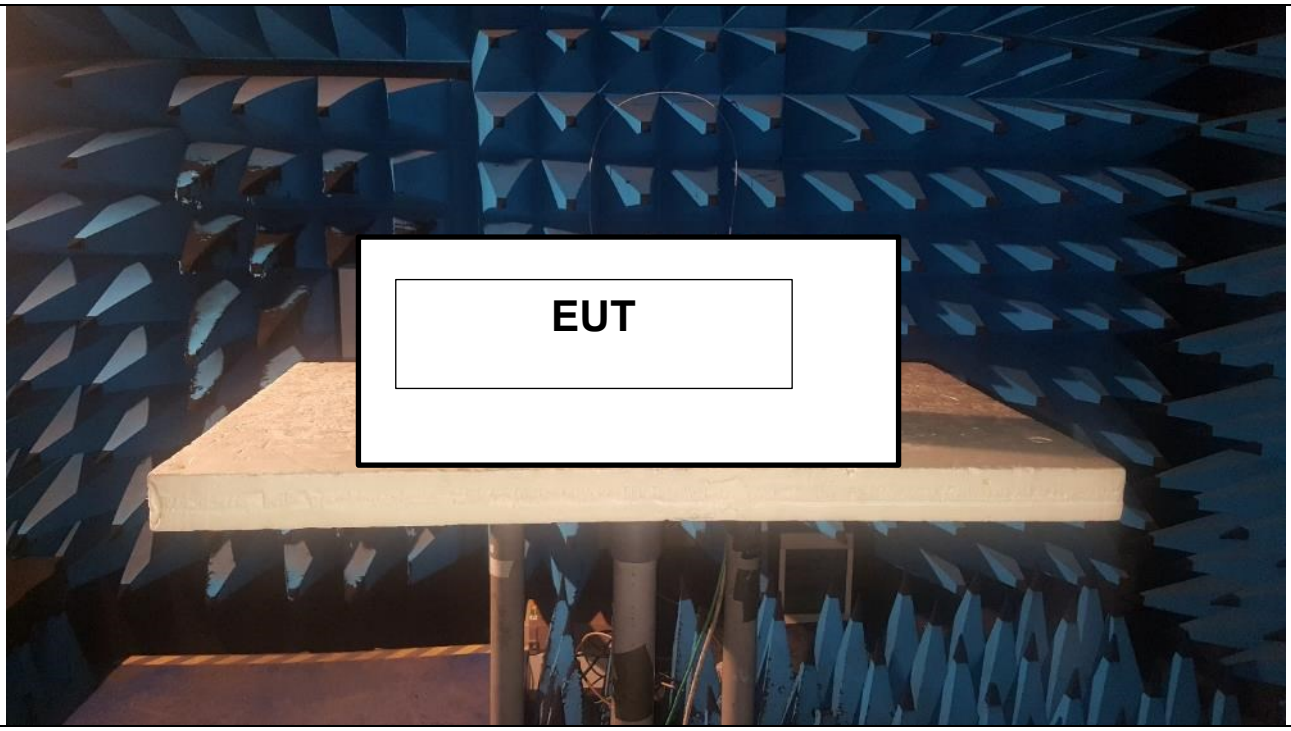
Test performed by : Armand MAHOUNGOU
Date of test : October 1, 2018
Ambient temperature : 28 °C
Relative humidity : 49 %

11.2. TEST SETUP

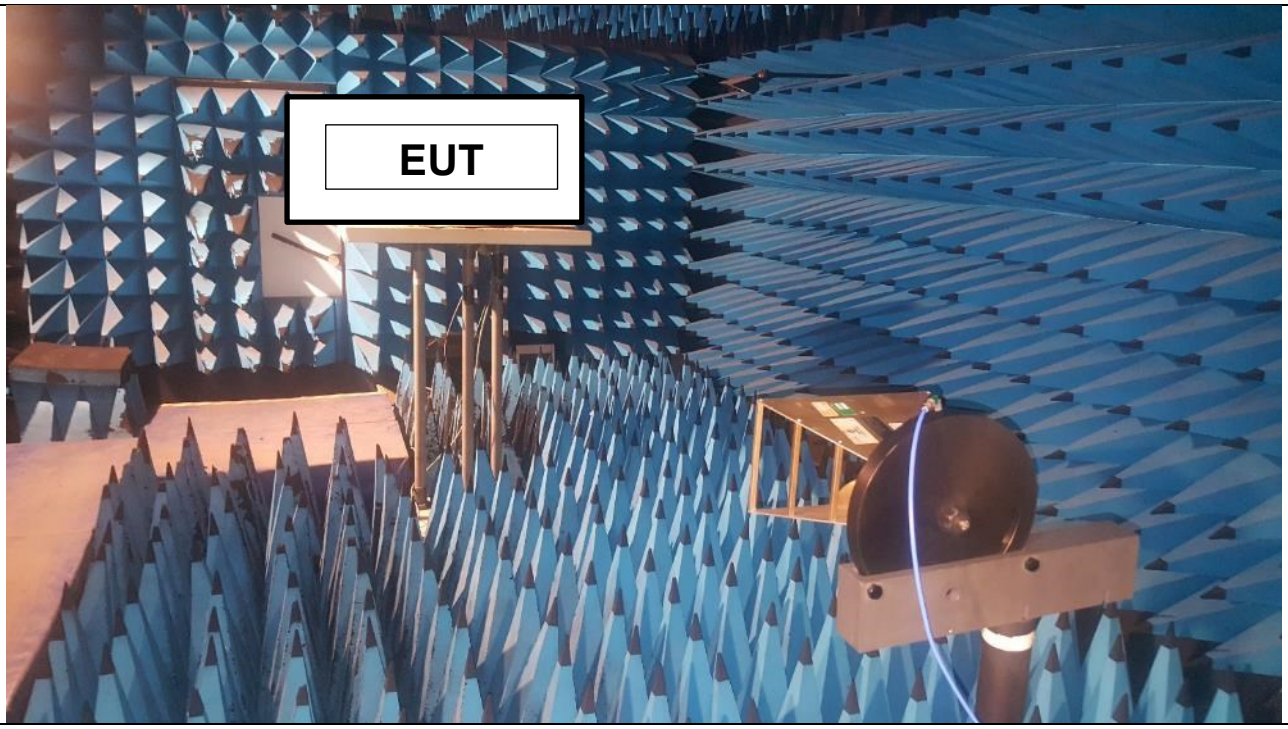
The product has been tested according to ANSI C63.10 (2013).
Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. 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 the 3 axis of EUT. Antenna height search was performed from 1 to 4m. The EUT is place at 1.5m high above 1GHz and at 0.8m high under 1GHz. The EUT is placed **in a full anechoic chamber** above 1GHz and **in a semi-anechoic chamber** from 30MHz to 1GHz. Distance between measuring antenna and the EUT is **3m**.



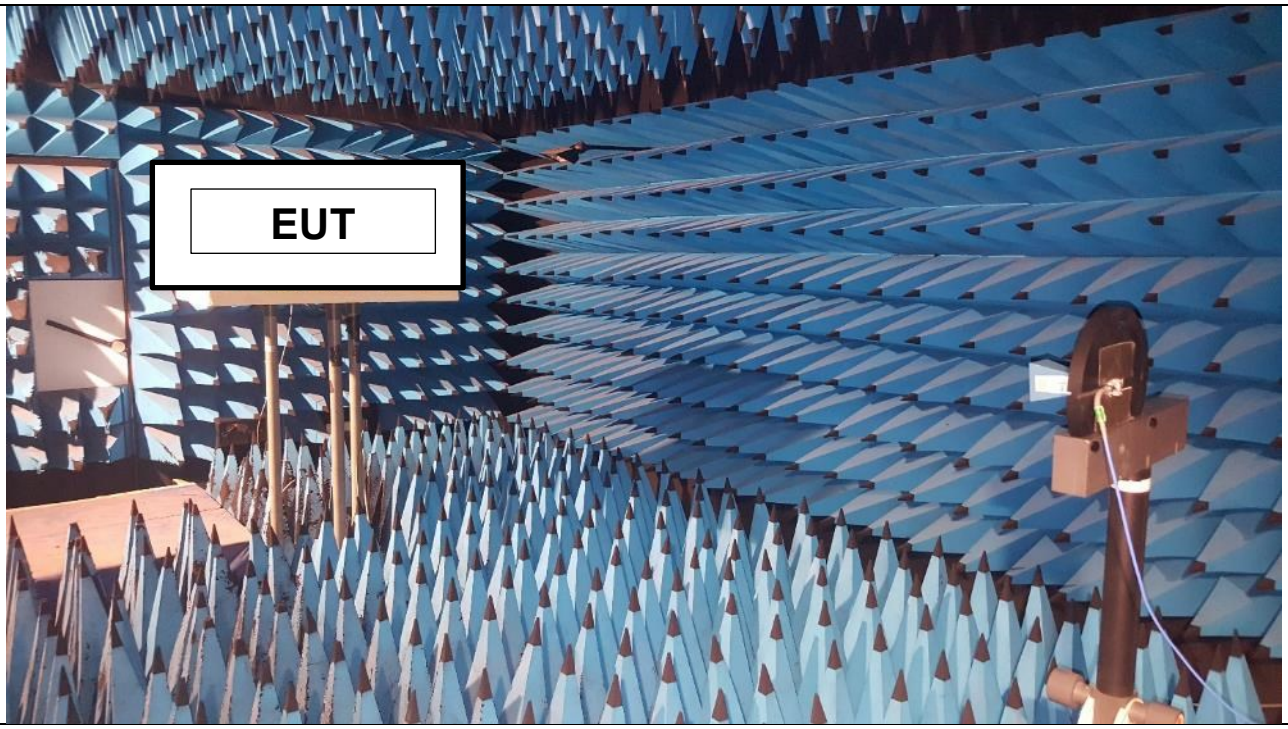
Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands

11.3. LIMIT

Limit at 3m:

9kHz to 0,490MHz: 2400/F(kHz)µV/m (300m) or 20log(2400/F(kHz))dBµV/m (3m) QPeak
0,490MHz to 1.705MHz: 240000/F(kHz)µV/m (30m) or 20log(240000/F(kHz))dBµV/m (3m) QPeak
1.705MHz to 30MHz: 30µV/m (30m) or dBµV/m (3m) QPeak
30MHz to 88MHz: 40dBµV/m QPeak
88MHz to 216MHz: 43,5dBµV/m QPeak
216MHz to 960MHz: 46dBµV/m QPeak
960MHz to 1000MHz: 54dBµV/m QPeak
Above 1000MHz: 74dBµV/m Peak
54dBµV/m Average

Limit at 10m:

30MHz to 88MHz: 29.5dBµV/m QPeak
88MHz to 216MHz: 33dBµV/m QPeak
216MHz to 960MHz: 35.5dBµV/m QPeak
960MHz to 1000MHz: 43.5dBµV/m QPeak
Above 1000MHz: 63.5BµV/m Peak
43.5BµV/m Average

11.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2018/07	2019/07
Full anachoic chamber	SIEPEL	-	D3044019	2014/10	2018/10
Preamplifier	LCIE	LCIE-ALB-001	A7080073	2016/10	2018/10
Horn antenna	AH SYSTEMS	SAS 571	C2042041	2017/09	2019/09
Horn antenna (18-26,5GHz)	PASTERNACK	PE9852/2F-20	C2042048	2017/12	2019/12
Cable	Télédyne	084-0505-1MTR	A5329757	2018/03	2019/03
Cable	Télédyne	084-0555-3MTR	A5329760	2018/03	2019/03
Cable	Télédyne	084-555-1.5MTR	A5329759	2018/03	2019/03
Multimeter	KEITHLEY	2000	A1242090	2017/05	2019/05
Power supply	KIKUSUI	PCR500M	A7040079	Cal with Multimeter	Cal with Multimeter
Bilog antenna	SCHWARZBECK	VULB9160	C2040150	2018/04	2019/04
Cable	-	-	A5329711	2018/06	2019/06
Horn antenna	A-infoMW	Broadband 1-18	C2042056	2016/07	2018/07
SEMI ANECHOIC CHAMBER	SIEPEL	ANE	D3044008	2014/10	2018/10
EMI Receiver	ROHDE & SCHWARZ	ESU26	A2642018	2016/10	2018/10
Preamplifier	LCIE	-	A7086012	2018/03	2019/03
Loop antenna	SCHWARZBECK	FMZB1513	C2040209	2018/03	2020/03
Rejector filter 2,4GHz	-	2.45GHz	A7484048	2017/11	2018/11

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

11.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

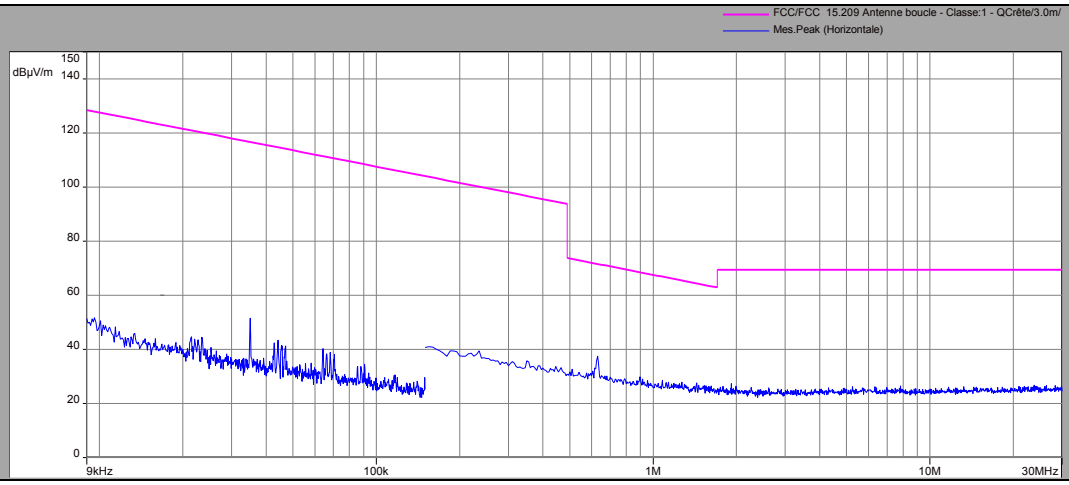
☑ None ☐ Divergence:

11.6. RESULTS

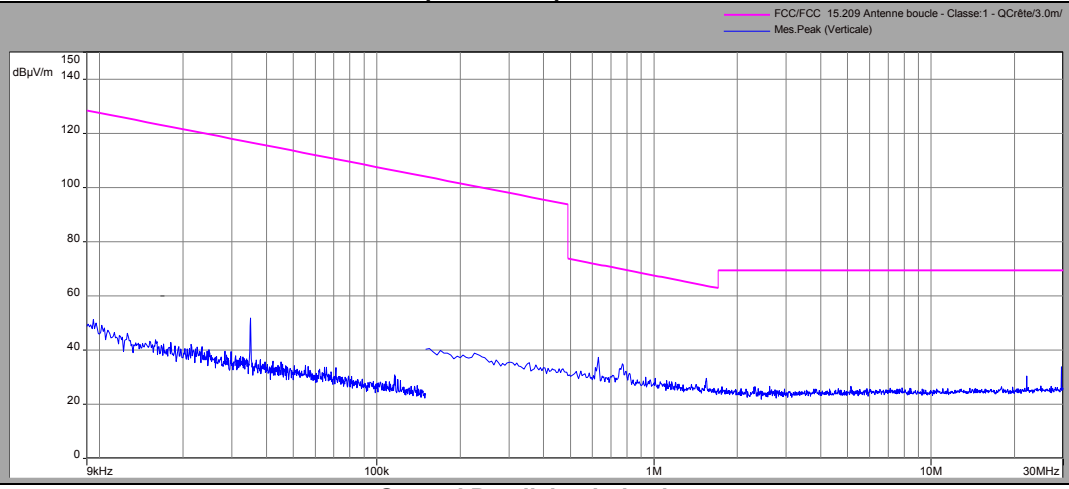
BLE 4.2 9kHz – 30 MHz

Cmin

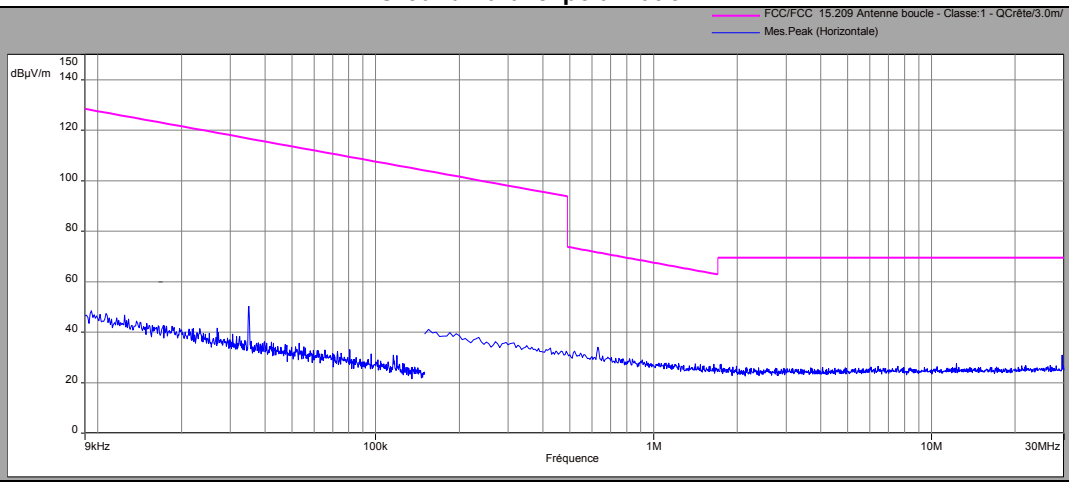
Parallel Polarization



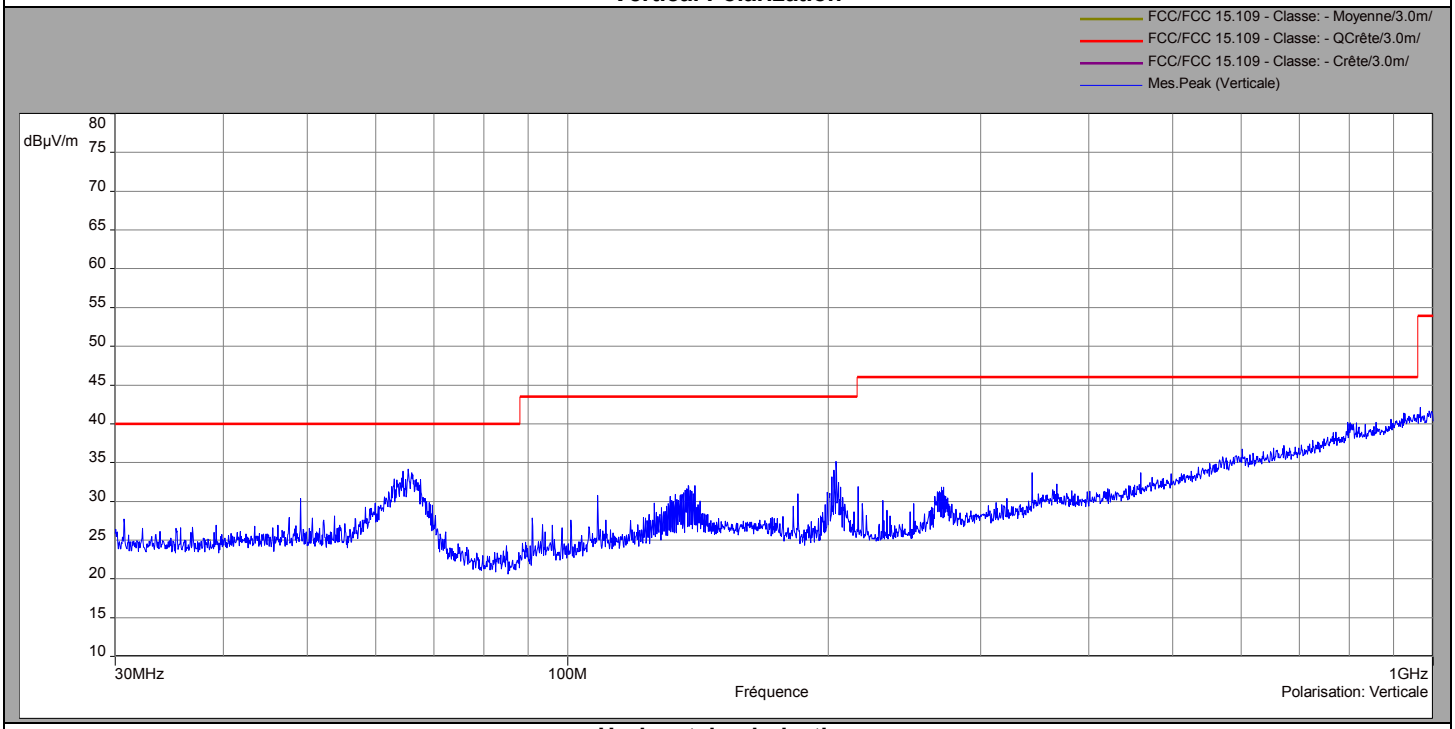
Perpendicular polarization



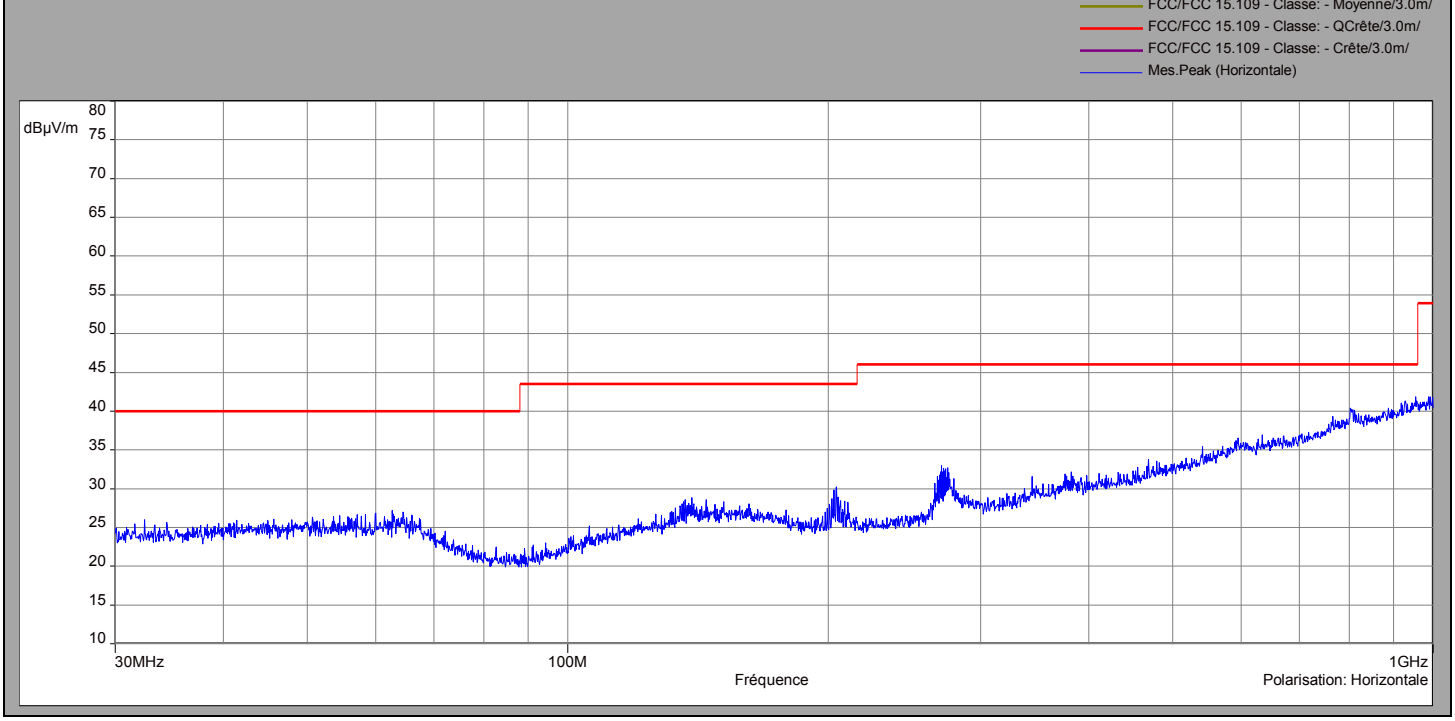
Ground Parallel polarization



BLE 4.2 30MHz – 1GHz
Channel
Vertical Polarization



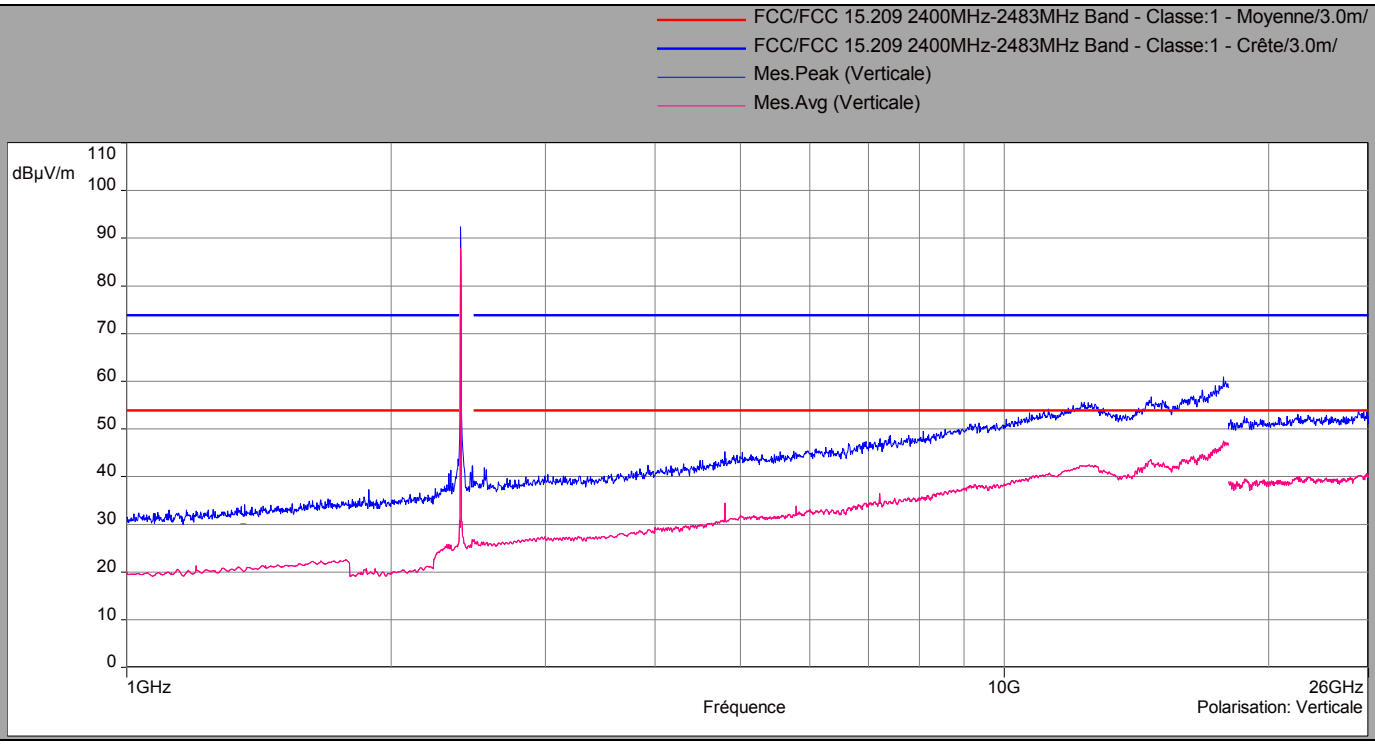
Horizontal polarization



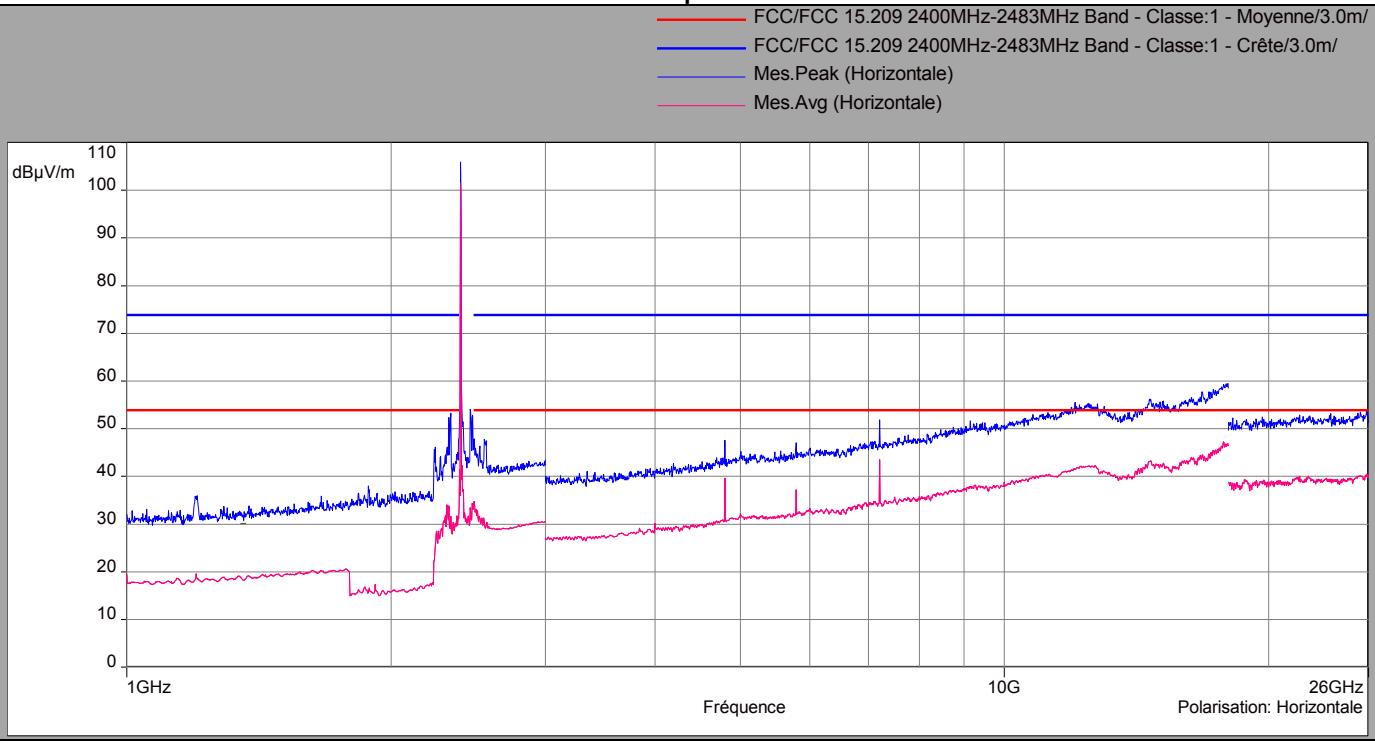
BLE 4.2 Above 1GHz

Cmin

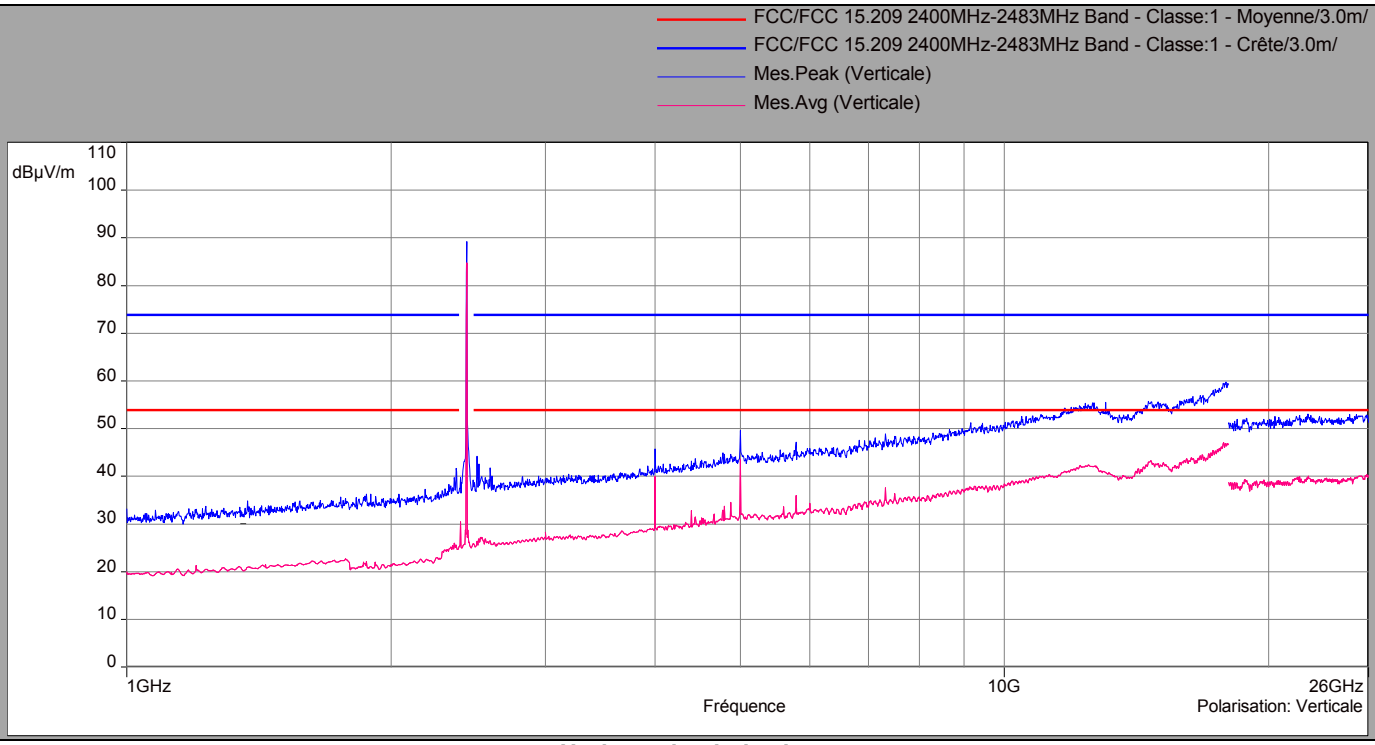
Vertical Polarization



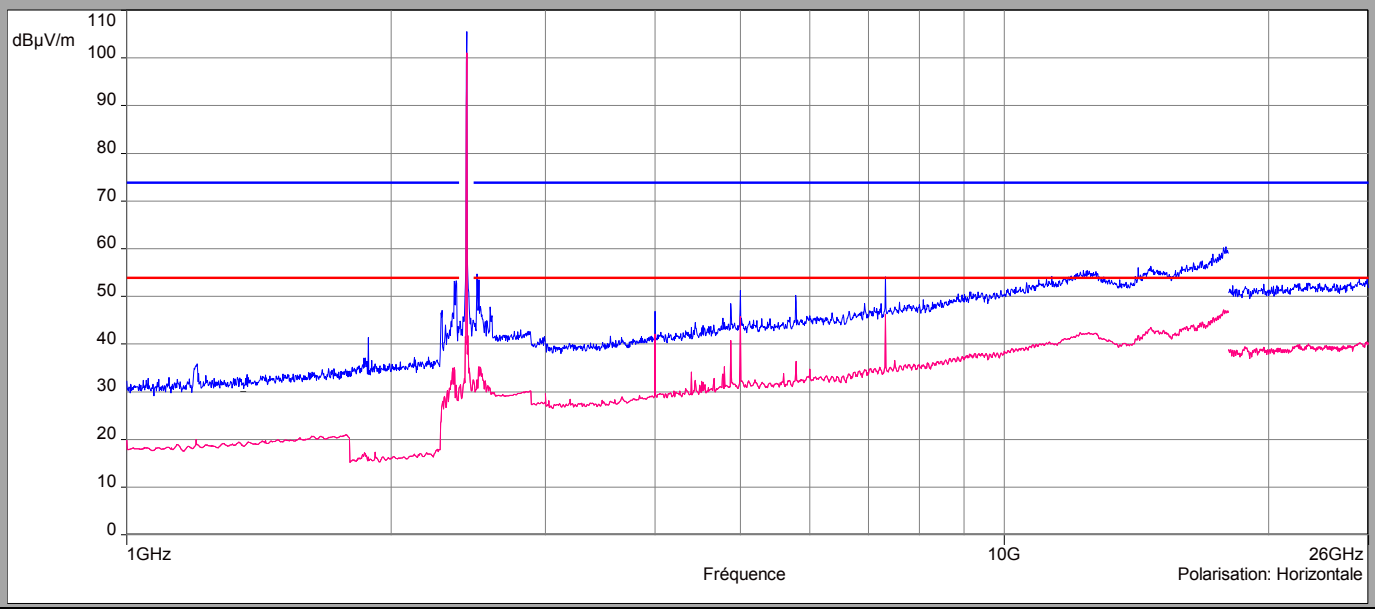
Horizontal polarization



BLE 4.2 Above 1GHz
Cnom
Vertical Polarization



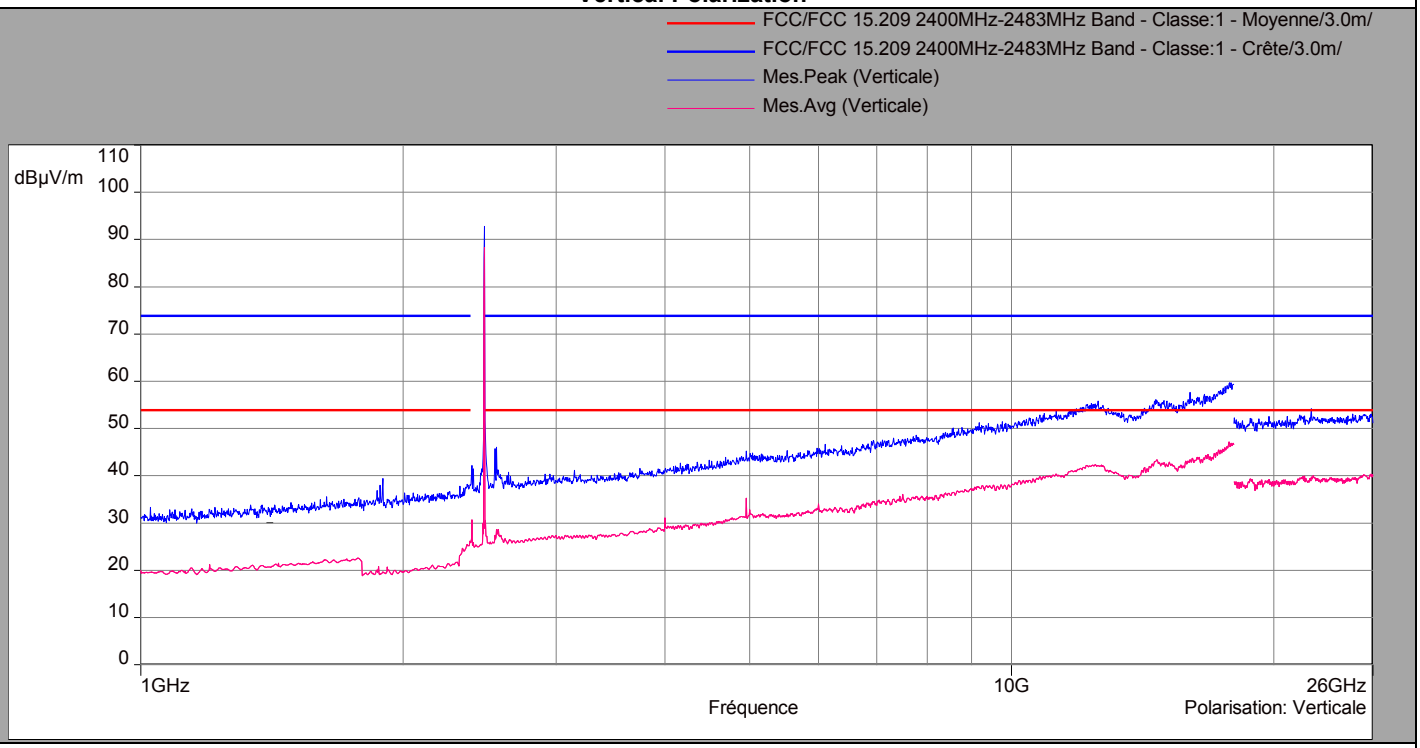
Horizontal polarization



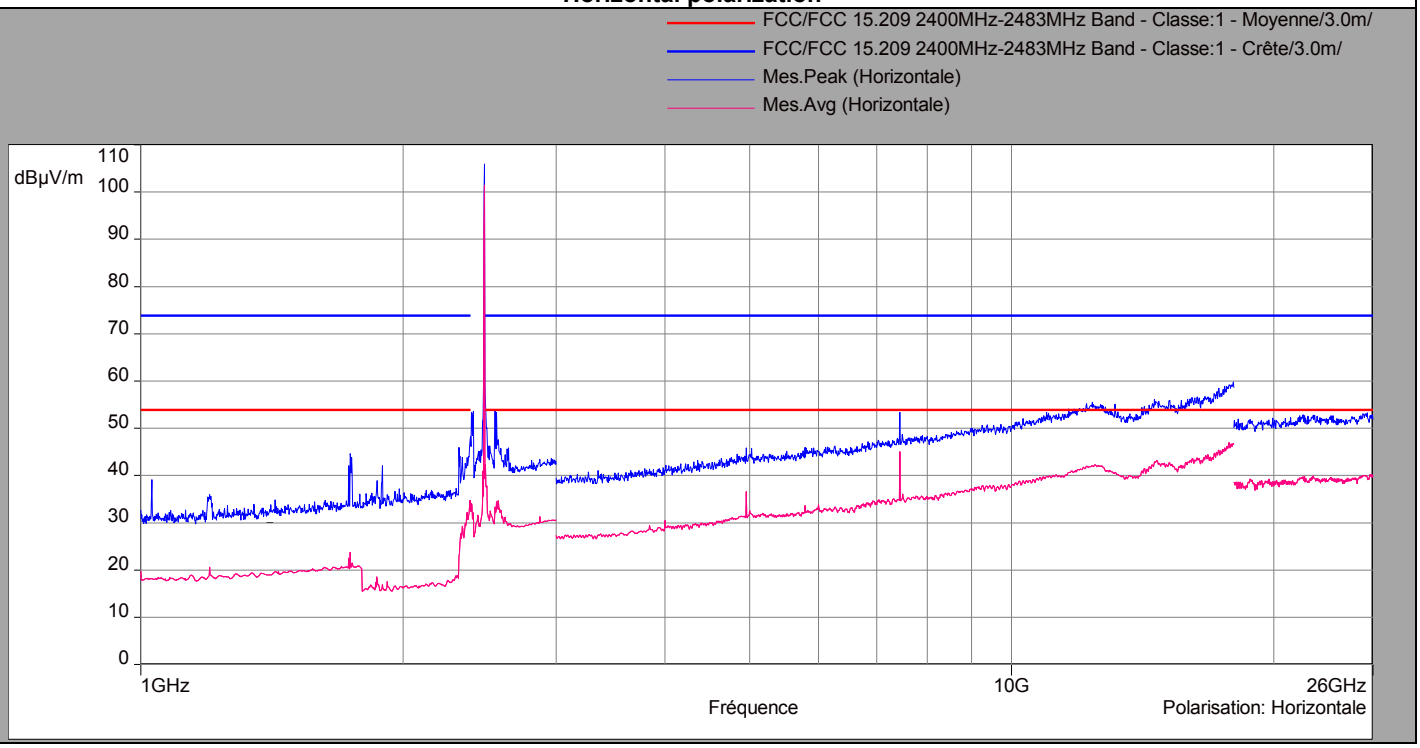
BLE 4.2 Above 1GHz

Cmax

Vertical Polarization



Horizontal polarization



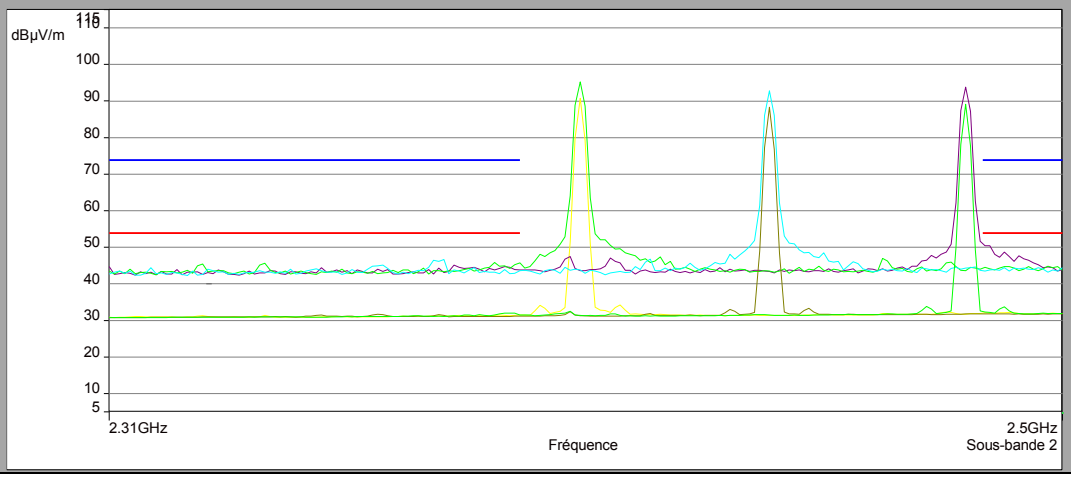
BLE 4.2 Above 1GHz Zoom 2310MHz-2500MHz

Cmin/Cnom/Cmax

Vertical Polarization

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Avg Cmax - Verticale (Verticale)
Mes.Peak Cnom - Verticale (Verticale)
Mes.Avg Cnom - Verticale (Verticale)
Mes.Peak Cmin - Verticale (Verticale)
Mes.Peak Cmax - Verticale (Verticale)
Mes.Avg Cmin - Verticale (Verticale)

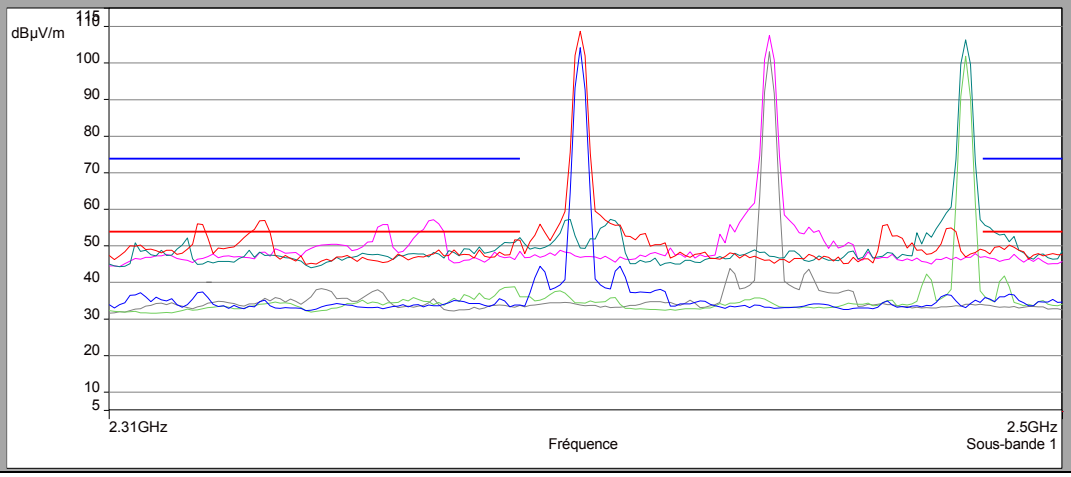
Description Sous-bande 2
Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 1 MHz)
Réglages: RBW: 1MHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : Auto, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Preselecteu
Polarisation:Verticale
Distance: 3 m



Horizontal polarization

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Peak Cmin - Horizontale (Horizontale)
Mes.Peak Cmax - Horizontale (Horizontale)
Mes.Avg Cmin - Horizontale (Horizontale)
Mes.Avg Cmax - Horizontale (Horizontale)
Mes.Peak Cnom - Horizontale (Horizontale)
Mes.Avg Cnom - Horizontale (Horizontale)

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

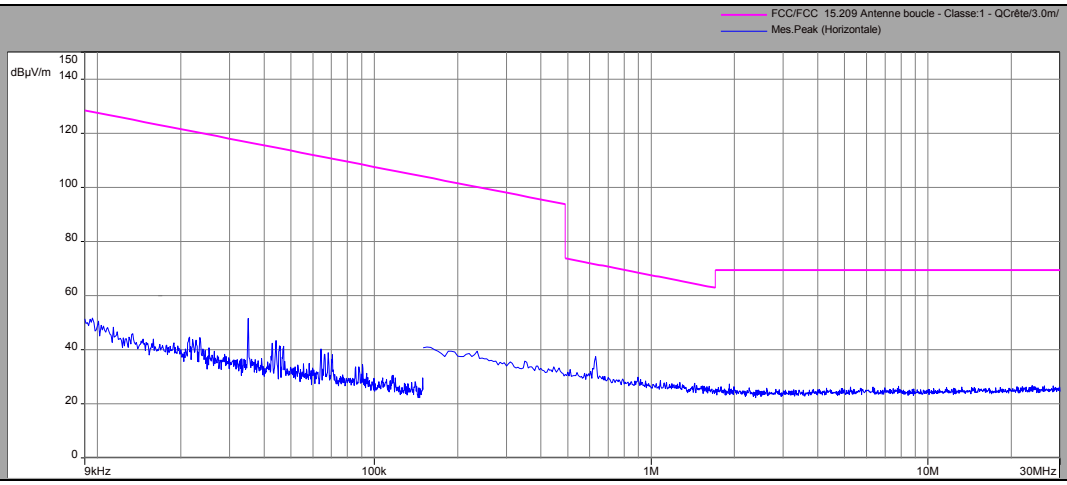


BLE 4.2 9kHz to 30MHz				
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**
all emissions were greater than 20 dB below the limit				

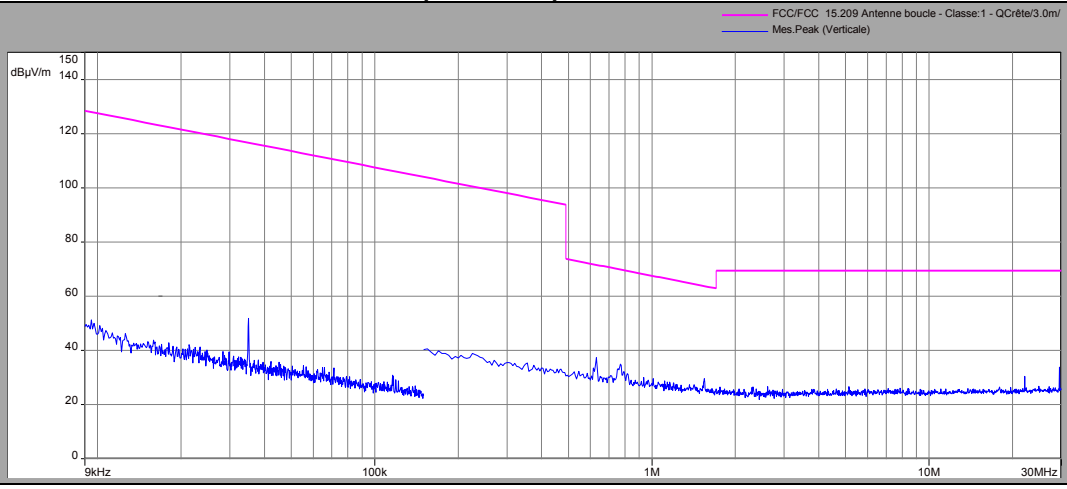
BLE 4.2 30MHz – 1GHz					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dB)**
Verticale	65.4	34.15	-	40.0	5.85
Verticale	49.15	30.37	-	40.0	9.62
Verticale	108.3	30.79	-	43.5	12.71
Verticale	204.26	35.14	-	43.5	8.36
Horizontale	204.32	30.23	-	43.5	13.27
Verticale	796.58	40.19	-	46.0	5.81

BLE 4.2 Above 1GHz Cmin/Cnom/Cmax								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dB)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dB)**
Horizontale	2390	33.80	37.79	54	20.20	51.52	74	22.48
Verticale	2390	31.46	35.45	54	22.54	45.76	74	28.24
Horizontale	2483.5	36.11	40.10	54	17.89	55.67	74	18.33
Verticale	2483.5	32.27	36.26	54	21.73	50.40	74	23.60
Verticale	5000	43.60	47.59	54	10.40	49.58	74	24.42
Horizontale	4804	39.68	43.67	54	14.32	47.58	74	26.42
Horizontale	5791	37.13	41.12	54	16.87	47.01	74	26.99
Horizontale	7206	43.46	47.45	54	10.54	51.85	74	22.15
Horizontale	7319	46.22	50.21	54	07.78	54.09	74	19.91

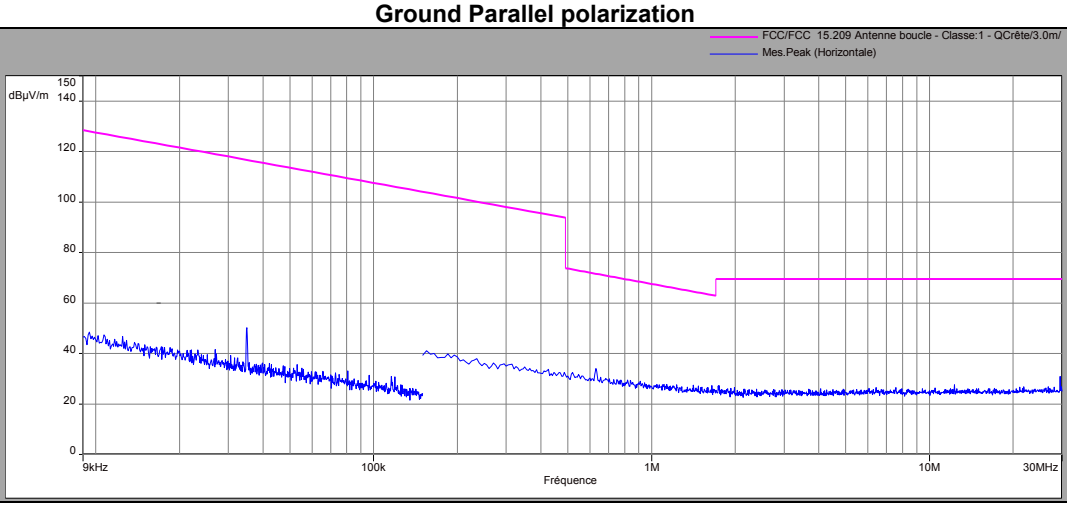
BLE 5.0 9kHz – 30 MHz
Cmin
Parallel Polarization



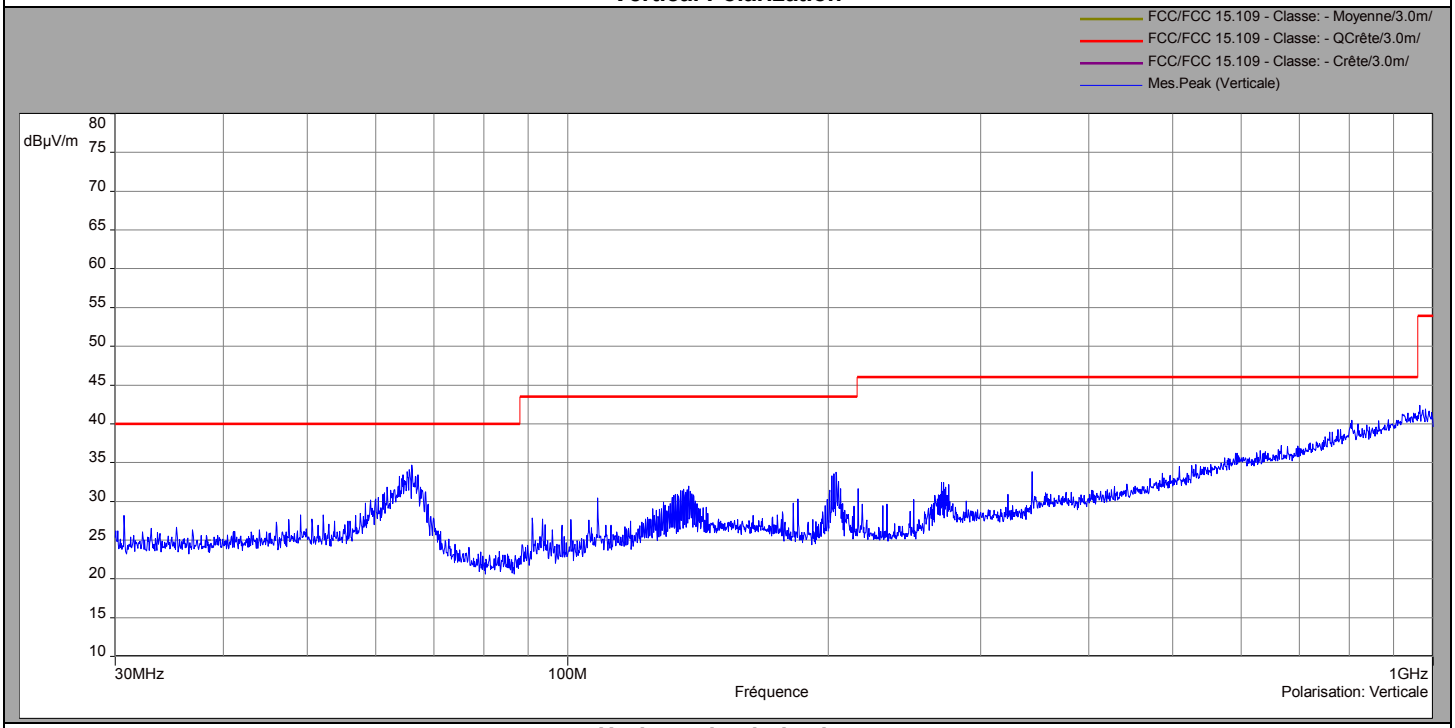
Perpendicular polarization



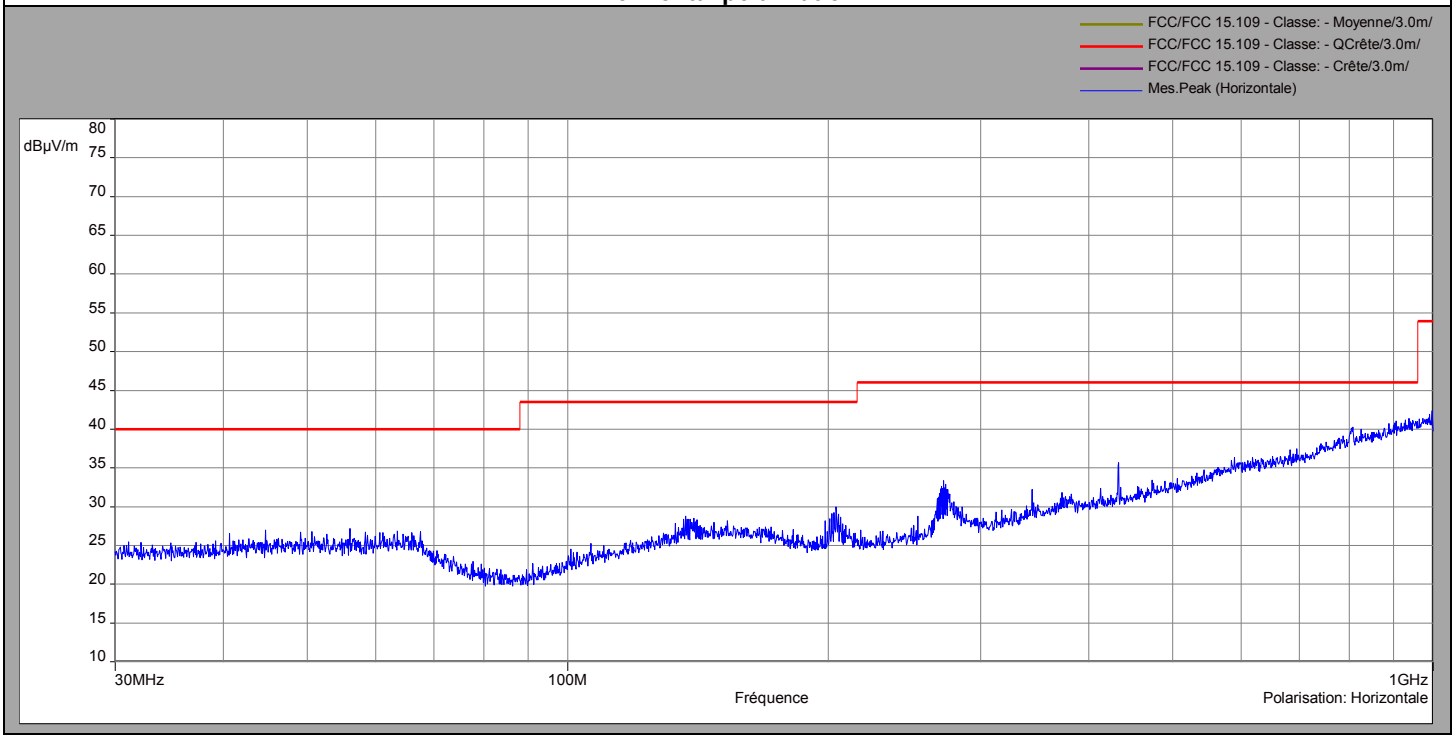
Ground Parallel polarization



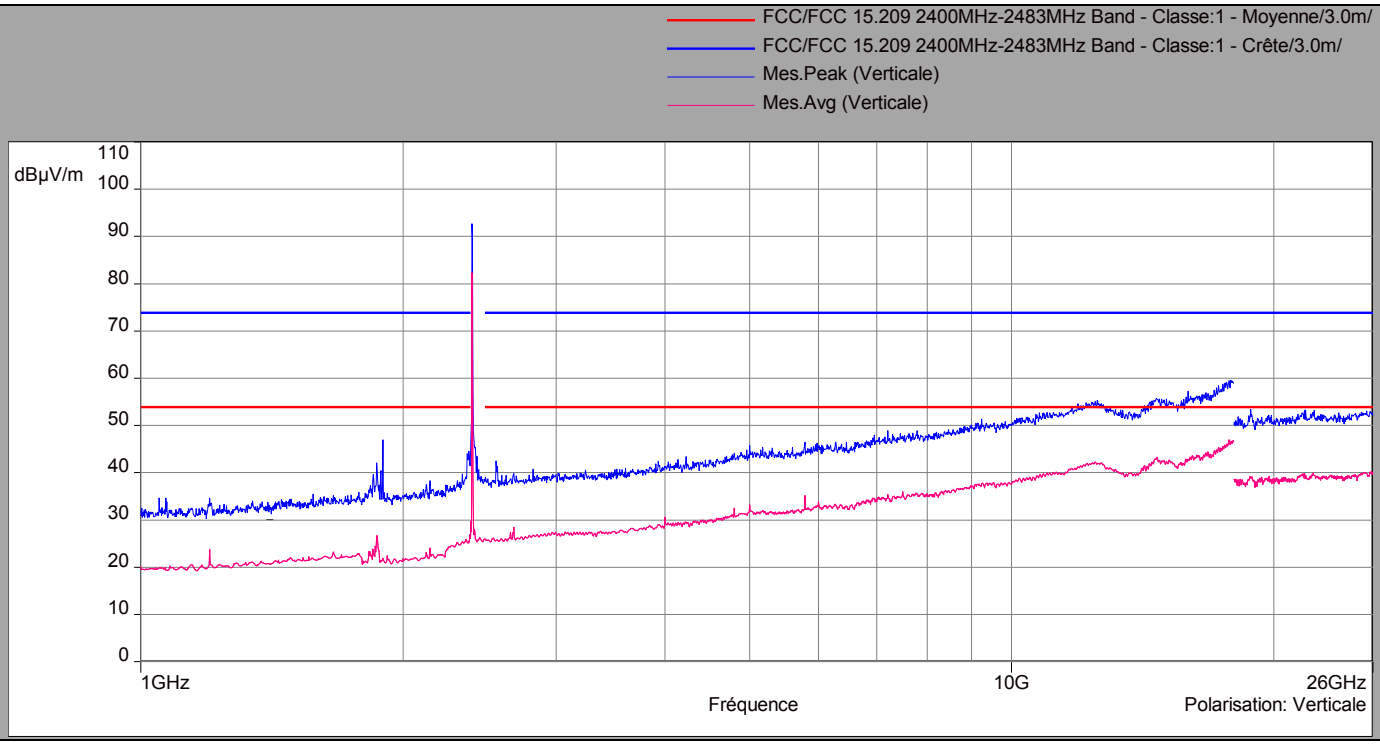
BLE 5.0 Below 1GHz
Channel
Vertical Polarization



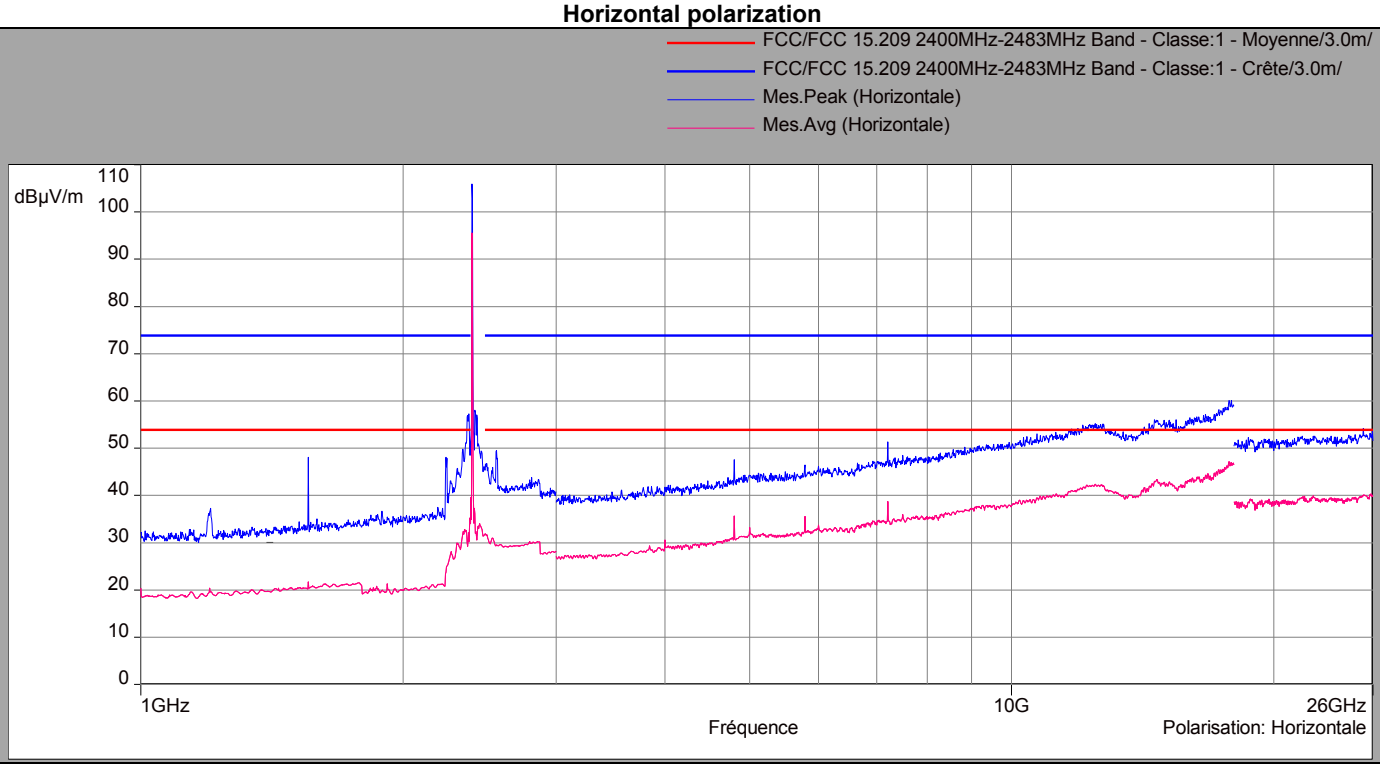
Horizontal polarization



BLE 5.0 Above 1GHz
Cmin
Vertical Polarization

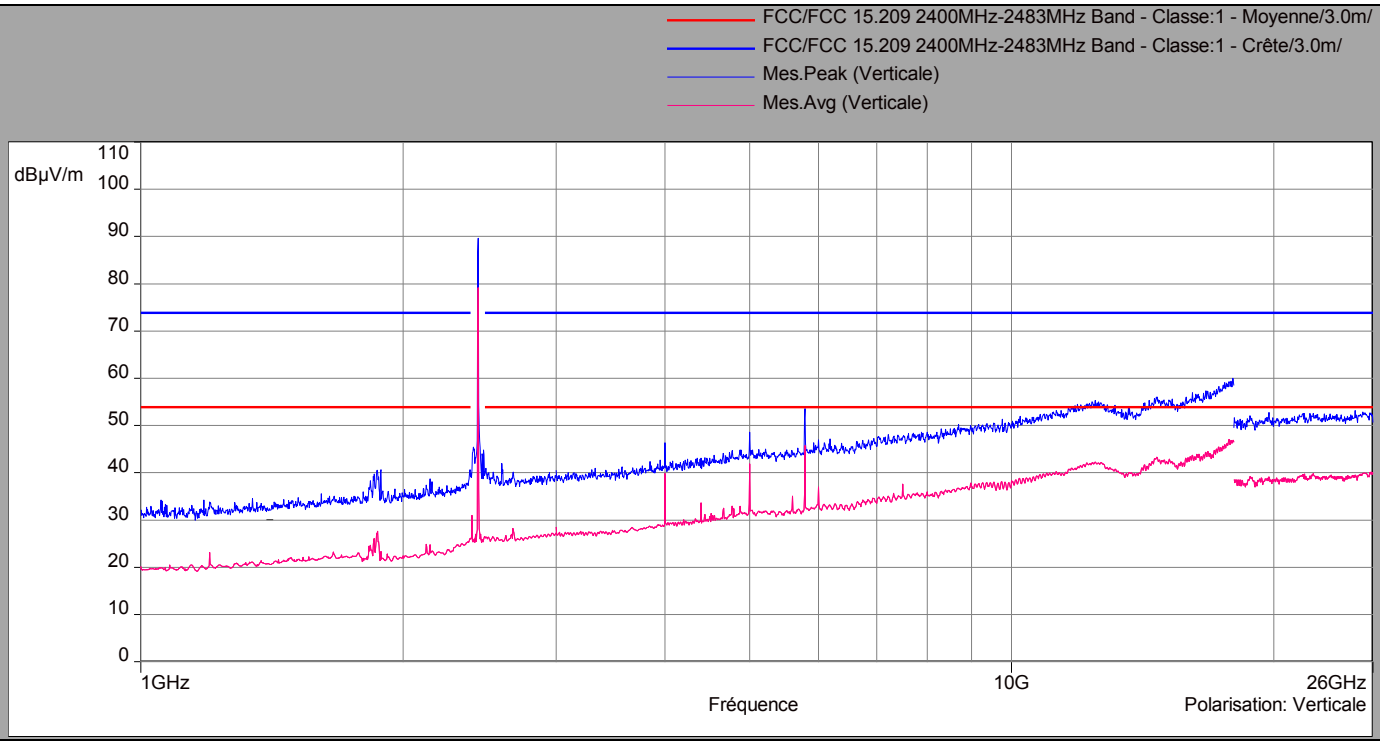


Horizontal polarization

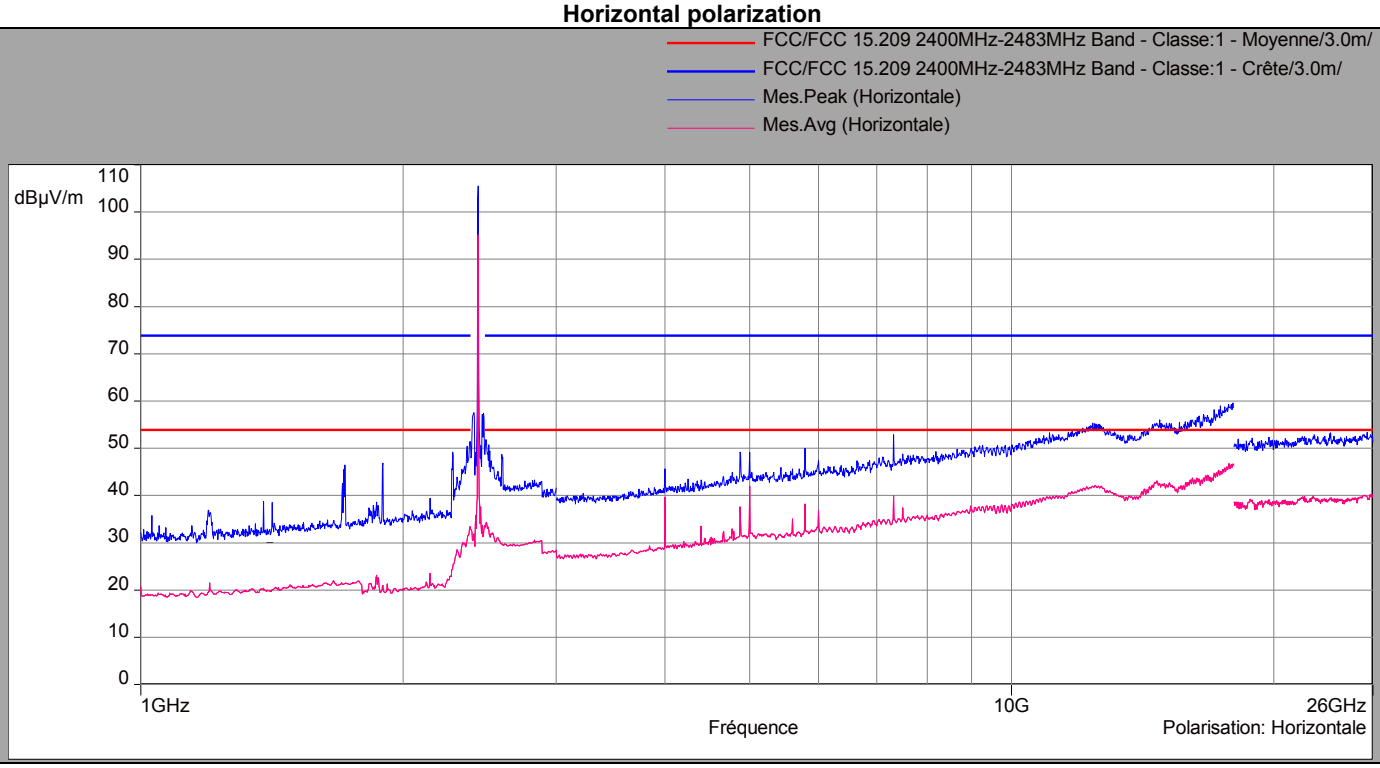


BLE 5.0 Above 1GHz

Cnom
Vertical Polarization

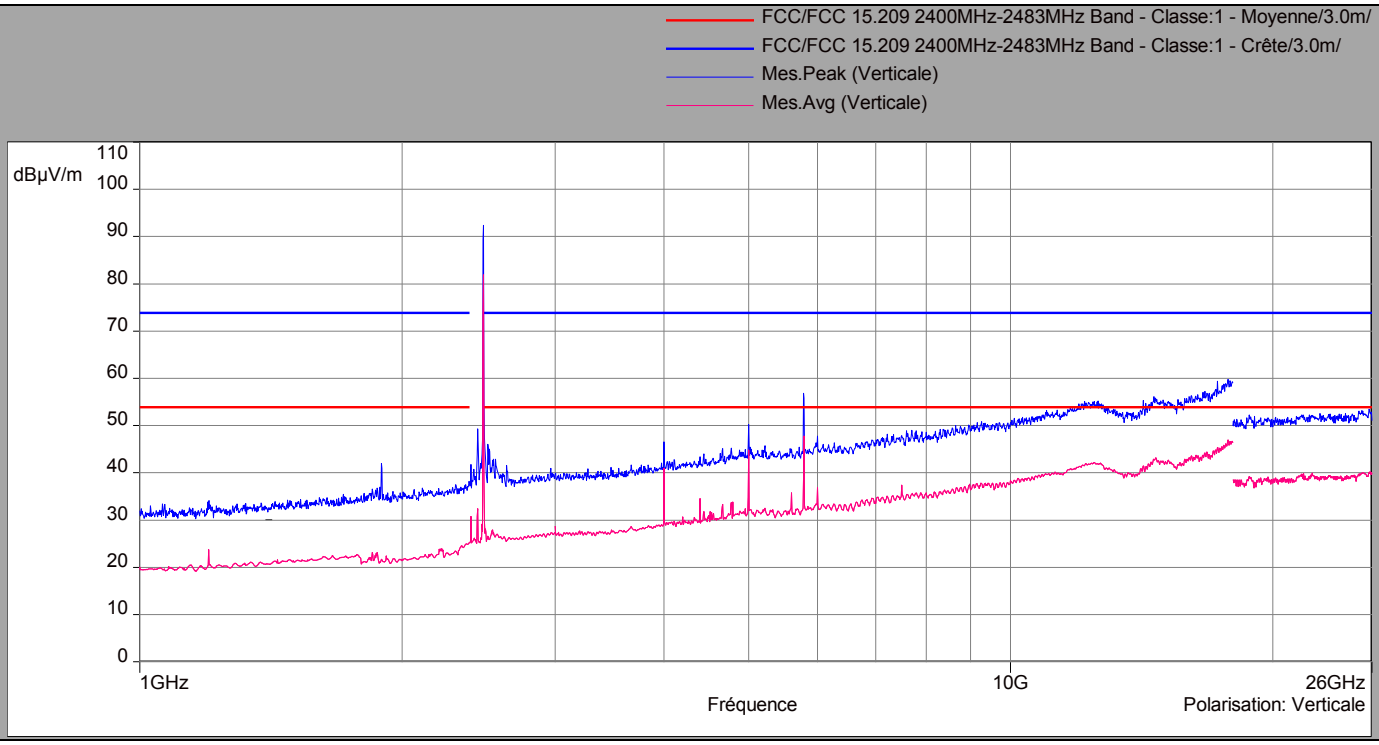


Horizontal polarization

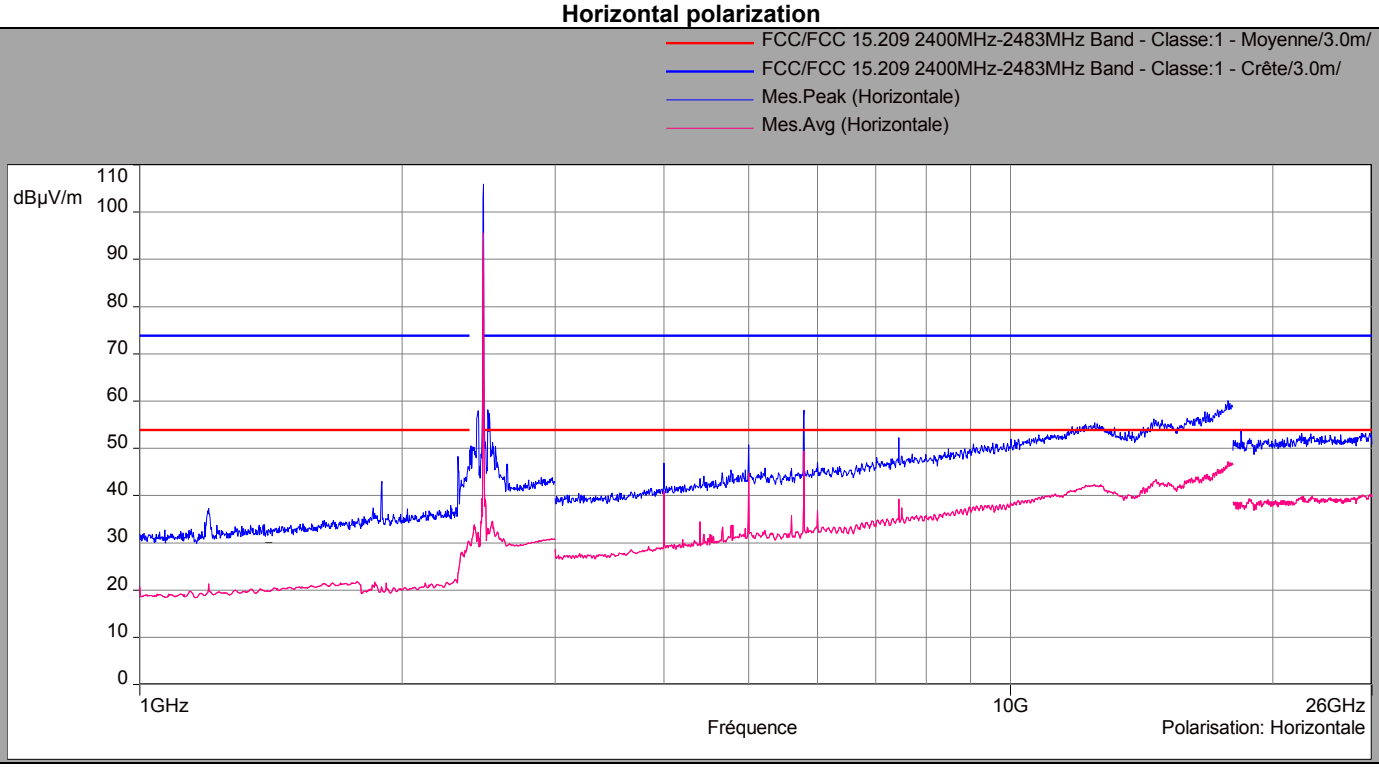


BLE 5.0 Above 1GHz
Cmax

Vertical Polarization



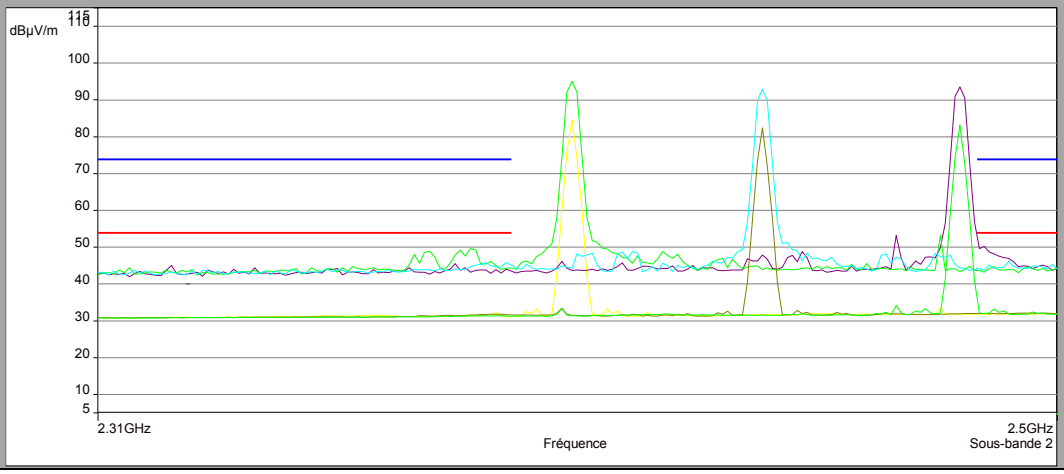
Horizontal polarization



BLE 5.0 Above 1GHz Zoom 2310MHz-2500MHz
Cmin/Cnom/Cmax
Vertical Polarization

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Avg Cmax - Verticale (Verticale)
Mes.Peak Cnom - Verticale (Verticale)
Mes.Avg Cnom - Verticale (Verticale)
Mes.Peak Cmin - Verticale (Verticale)
Mes.Peak Cmax - Verticale (Verticale)
Mes.Avg Cmin - Verticale (Verticale)

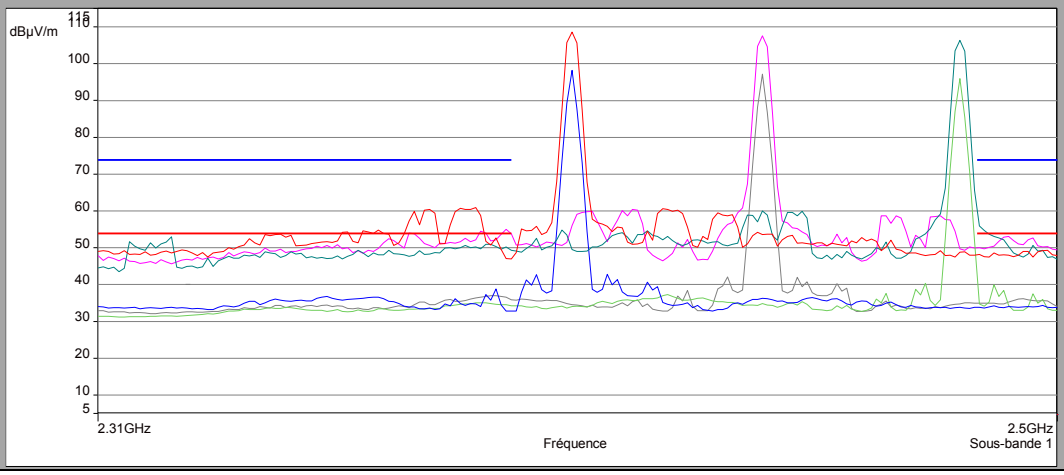
Description Sous-bande 2
Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 1 MHz)
Réglages: RBW: 1MHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : Auto, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Preselecte
Polarisation:Verticale
Distance: 3 m



Horizontal polarization

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Peak Cmin - Horizontale (Horizontale)
Mes.Peak Cmax - Horizontale (Horizontale)
Mes.Avg Cmin - Horizontale (Horizontale)
Mes.Avg Cmax - Horizontale (Horizontale)
Mes.Peak Cnom - Horizontale (Horizontale)
Mes.Avg Cnom - Horizontale (Horizontale)

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



BLE 5.0 9kHz to 30MHz

Polarization	Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)
all emissions were greater than 20 dB below the limit				

BLE 5.0 30MHz – 1GHz					
Polarization	Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
Verticale	66.05	34.68	-	40.0	5.32
Verticale	108.3	30.47	-	43.5	13.03
Verticale	138.0	31.94	-	43.5	11.56
Verticale	204.3	33.79	-	43.5	9.71
Verticale	271.9	32.44	-	46.0	13.55
Horizontale	271.9	33.38	-	46.0	12.62
Horizontale	432.8	35.69	-	46.0	10.31

BLE 5.0 Above 1GHz Cmin/Cnom/Cmax								
Polarization	Frequency (MHz)	Average Level (dBµV/m)	Average Level + Duty Cycle Factor (dBµV/m)	Average Limit (dBµV/m)	Average Margin Level (dB)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin Level (dB)
Horizontale	1558	21.67	31.05	54	32.33	48.06	74	25.94
Horizontale	1715	21.94	31.32	54	32.06	46.43	74	27.57
Horizontale	1865	23.10	32.48	54	30.90	46.45	74	27.55
Verticale	1897	22.11	31.49	54	31.89	46.92	74	27.08
Horizontale	2390	32.77	42.15	54	21.23	47.01	74	26.99
Verticale	2390	31.13	40.51	54	22.87	44.35	74	29.65
Horizontale	2483.5	34.77	44.15	54	19.23	55.98	74	18.02
Verticale	2483.5	32.06	41.44	54	21.94	49.66	74	24.34
Horizontale	4000	39.58	48.96	54	14.42	45.62	74	28.38
Horizontale	5000	41.95	51.33	54	12.05	49.07	74	24.93
Horizontale	5789	47.79	57.17	54	06.21	58.10	74	15.90
Horizontale	7206	38.76	48.14	54	15.24	51.31	74	22.69

11.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **Sagemcom® Sound Box SBDV01**, SN: **253770742**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.247 limits.

12. UNCERTAINTIES CHART

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

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