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Bluetooth Low Energy Template: Release August 20th, 2016

TEST REPORT

N°: 146019-698067A

Version : 01

Subject

Radio spectrum matters
tests according to standards:
47 CFR Part 15.247 [Pb](#)

Issued to

SAGEMCOM BROADBAND SAS
250 Route de l' Empereur
92500- RUEIL MALMAISON
FRANCE

Apparatus under test

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

DCIWA384 UHD AIt US
SAGEMCOM
SAGEMCOM
MiniBox (253697290)
616476080862
VW3DCIWA384

Test date

: December 5, 2016 to December 21, 2016

Test location

Fontenay Aux Roses & Ecuelles

Composition of document

47 pages

Document issued on

February 13, 2017

Written by :
Mathieu CERISIER
Tests operator



F. Fayette

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1. TEST PROGRAM

References

- 47 CFR Part 15.247
- KDB 558074 D01 DTS Meas Guidance v03r05
- ANSI C63.10-2013

Radio requirement:

Clause (47CFR Part 15.247) Test Description	Test result - Comments			
Occupied Bandwidth ℱ	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
6dB Bandwidth ℱ	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA()	<input type="checkbox"/> NP(1)
Duty Cycle ℱ	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Maximum Conducted Output Power ℱ	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Power Spectral Density ℱ	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Conducted Spurious Emission at the Band Edge ℱ	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA()	<input type="checkbox"/> NP(1)
Unwanted Emissions into Non-Restricted Frequency Bands ℱ	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA()	<input type="checkbox"/> NP(1)
AC Power Line Conducted Emission ℱ	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA(2)	<input type="checkbox"/> NP(1)
Unwanted Emissions into Restricted Frequency Bands ℱ	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Receiver Radiated emissions ℱ	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
This table is a summary of test report, see conclusion of each clause of this test report for detail.				

(1): Limited program

(2): EUT not directly or indirectly connected to the AC Power Public Network

PASS: EUT complies with standard's requirement

FAIL: EUT does not comply with standard's requirement

NA: Not Applicable

NP: Test Not Performed

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

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

SAGEMCOM MiniBox (253697290)

Serial Number: 253697290-A01



Equipment Under Test



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Equipment Under Test

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
1	Power supply	1	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	-
2	Ethernet	2.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	-

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop	-	-	Use to set the EUT
Power supply°1	MSA-Z3800IC12.0-48W-P	191360131-XX	-
Power supply°2	NBS42C120380M2	191357366-XX	-
Power supply°3	LPL-C64612038026	191359307-XX	-



Equipment information:

Bluetooth LE Type:	<input checked="" type="checkbox"/> BLE	<input type="checkbox"/> v4.0	<input type="checkbox"/> v4.1	<input type="checkbox"/> v4.2
Frequency band:	[2400 – 2483.5] MHz			
Number of Channel:	40			
Spacing channel:	2MHz			
Channel bandwidth:	1MHz			
Spectrum Modulation:	<input checked="" type="checkbox"/> DSSS			
Antenna Type:	<input checked="" type="checkbox"/> Integral	<input type="checkbox"/> External	<input type="checkbox"/> Dedicated	
Antenna connector:	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Temporary for test	
Transmit chains:	1			
	Single antenna			
Receiver chains	1			
Type of equipment:	<input checked="" type="checkbox"/> Stand-alone	<input type="checkbox"/> Plug-in	<input type="checkbox"/> Combined	
Ad-Hoc mode:	<input type="checkbox"/> Yes		<input checked="" type="checkbox"/> No	
Duty cycle:	<input checked="" type="checkbox"/> Continuous duty	<input type="checkbox"/> Intermittent duty	<input type="checkbox"/> 100% duty	
Equipment type:	<input checked="" type="checkbox"/> Production model		<input type="checkbox"/> Pre-production model	
Operating temperature range:	Tmin:	<input type="checkbox"/> -20°C	<input checked="" type="checkbox"/> 0°C	<input type="checkbox"/> X°C
	Tnom:	20°C		
	Tmax:	<input type="checkbox"/> 35°C	<input type="checkbox"/> 55°C	<input checked="" type="checkbox"/> 45°C
Type of power source:	<input checked="" type="checkbox"/> AC power supply	<input type="checkbox"/> DC power supply	<input type="checkbox"/> Battery	
Operating voltage range:	Vnom:	<input checked="" type="checkbox"/> 120V/60Hz	<input type="checkbox"/> X Vdc	

Antenna Characteristic

Antenna assembly	Gain (dBi)	Frequency Band (MHz)	Impedance(Ω)
1	3.1	2400-2483.5	50



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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	<input checked="" type="checkbox"/>

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 "TERATERM" are used to set the product:

- See document "FCC part15 - Bluetooth compliance test commands of M384US-4L mainboard.pdf" for the command used during test.



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2.3. EQUIPMENT LABELLING



Power supply n°1



Power supply n°2



Power supply n°3

2.4. EQUIPMENT MODIFICATION

None Modification:

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Mathieu CERISIER
Date of test : December 15, 2016
Ambient temperature : 24 °C
Relative humidity : 41 %

3.2. TEST SETUP

- The Equipment Under Test is installed:

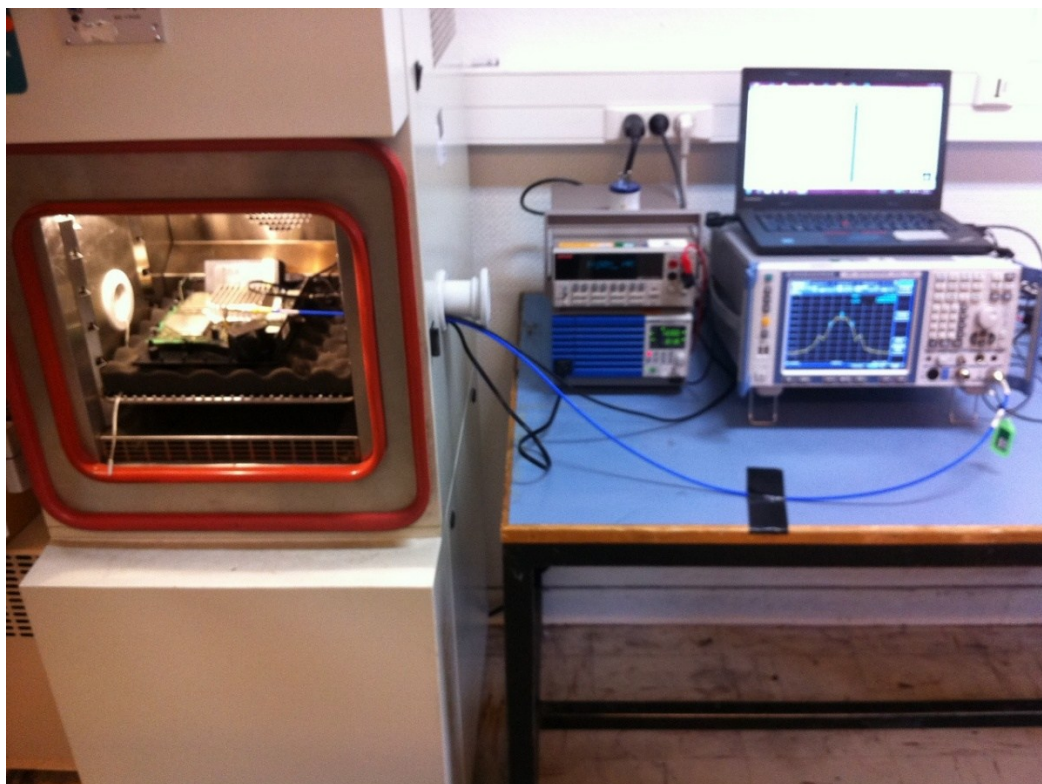
- On a table
- In an anechoic chamber
- In climatic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

- RSS-Gen Issue 4 § 6.6
- ANSI C63.10 § 6.9.2



Photograph for Occupied bandwidth



3.1. LIMIT

None

3.2. TEST EQUIPMENT LIST

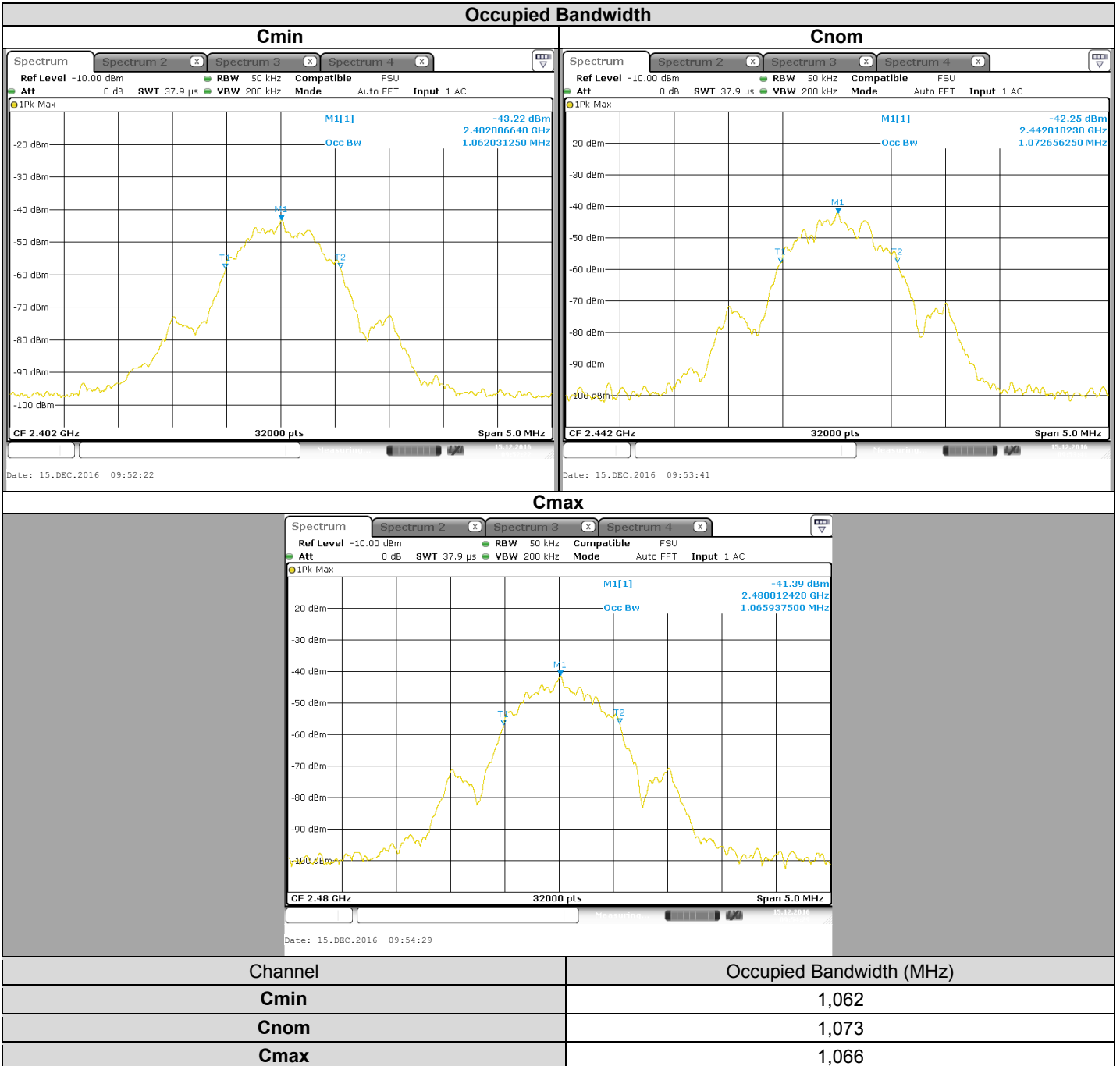
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Calibration date	Calibration due
Multi-meter	KEITHLEY	2000	A1241084	2016/05	2018/05
Programmable AC/DC power supply	-; KIKUSUI	PCR500M	A7049006	Verified with calibrated multimeter	Verified with calibrated multimeter
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2017/09
RF cable & 20 dB attenuator	Télédyne	920-0202-048	A5329676	2016/09	2017/09

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



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3.3. RESULTS



3.1. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **SAGEMCOM MiniBox (253697290)**, SN: **616476080862** 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 : Mathieu CERISIER
Date of test : December 15, 2016
Ambient temperature : 24 °C
Relative humidity : 41 %

4.2. TEST SETUP

- The Equipment Under Test is installed:

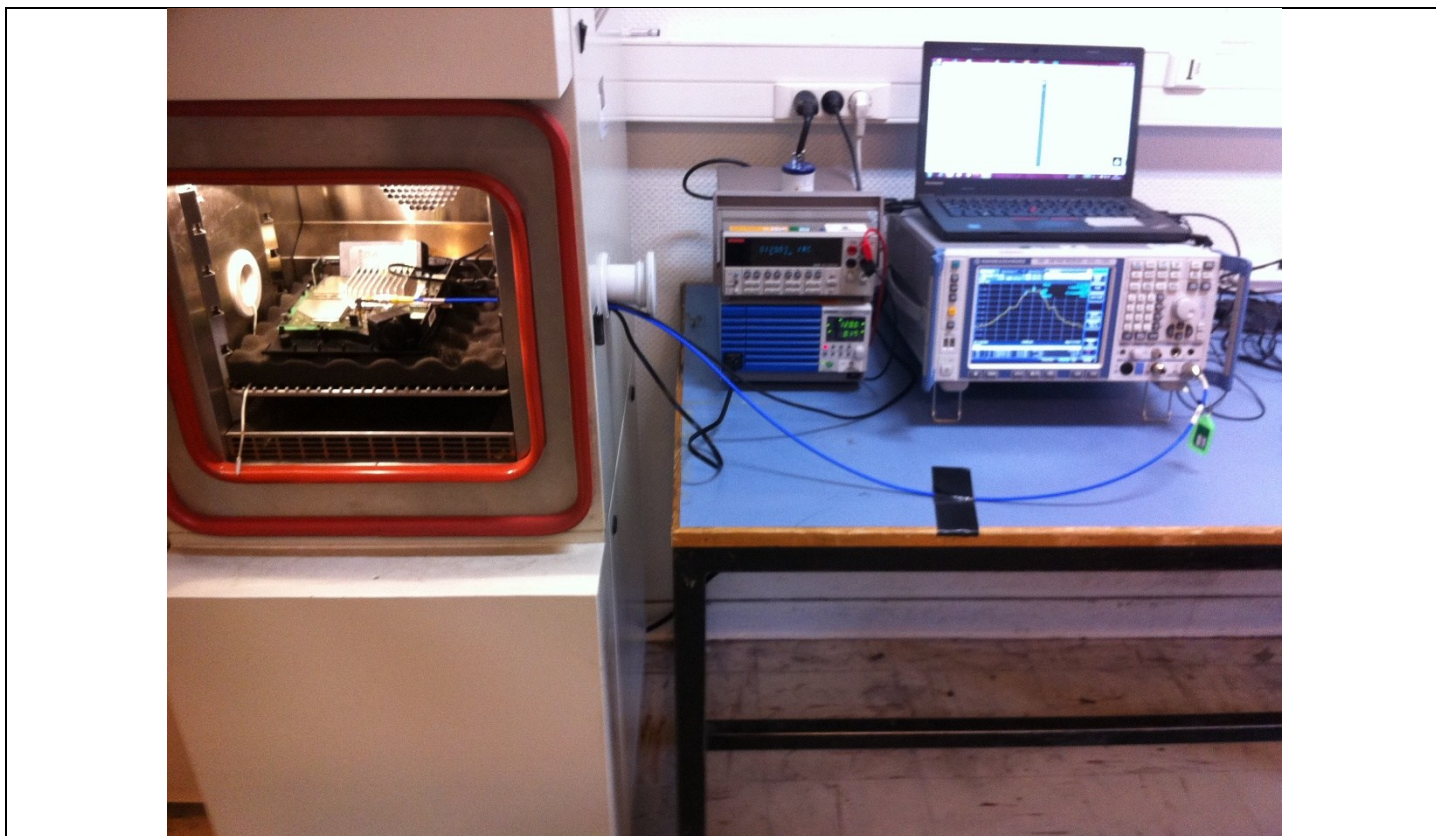
- On a table
- In an anechoic chamber
- In climatic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

- KDB 558074 D01 DTS Meas Guidance v03r05 § 8.1
- KDB 558074 D01 DTS Meas Guidance v03r05 § 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	Calibration date	Calibration due
Multi-meter	KEITHLEY	2000	A1241084	2016/05	2018/05
Programmable AC/DC power supply	-; KIKUSUI	PCR500M	A7049006	Verified with calibrated multimeter	Verified with calibrated multimeter
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2017/09
RF cable & 20 dB attenuator	Télédyne	920-0202-048	A5329676	2016/09	2017/09

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 **SAGEMCOM MiniBox (253697290)**, **SN: 616476080862**, 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 : Mathieu CERISIER
Date of test : December 15, 2016
Ambient temperature : 24 °C
Relative humidity : 41 %

5.2. TEST SETUP

- The Equipment Under Test is installed:

- On a table
- In an anechoic chamber
- In climatic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

- KDB 558074 D01 DTS Meas Guidance v03r05 § 6.0 b)



Photograph for Duty Cycle

5.3. LIMIT

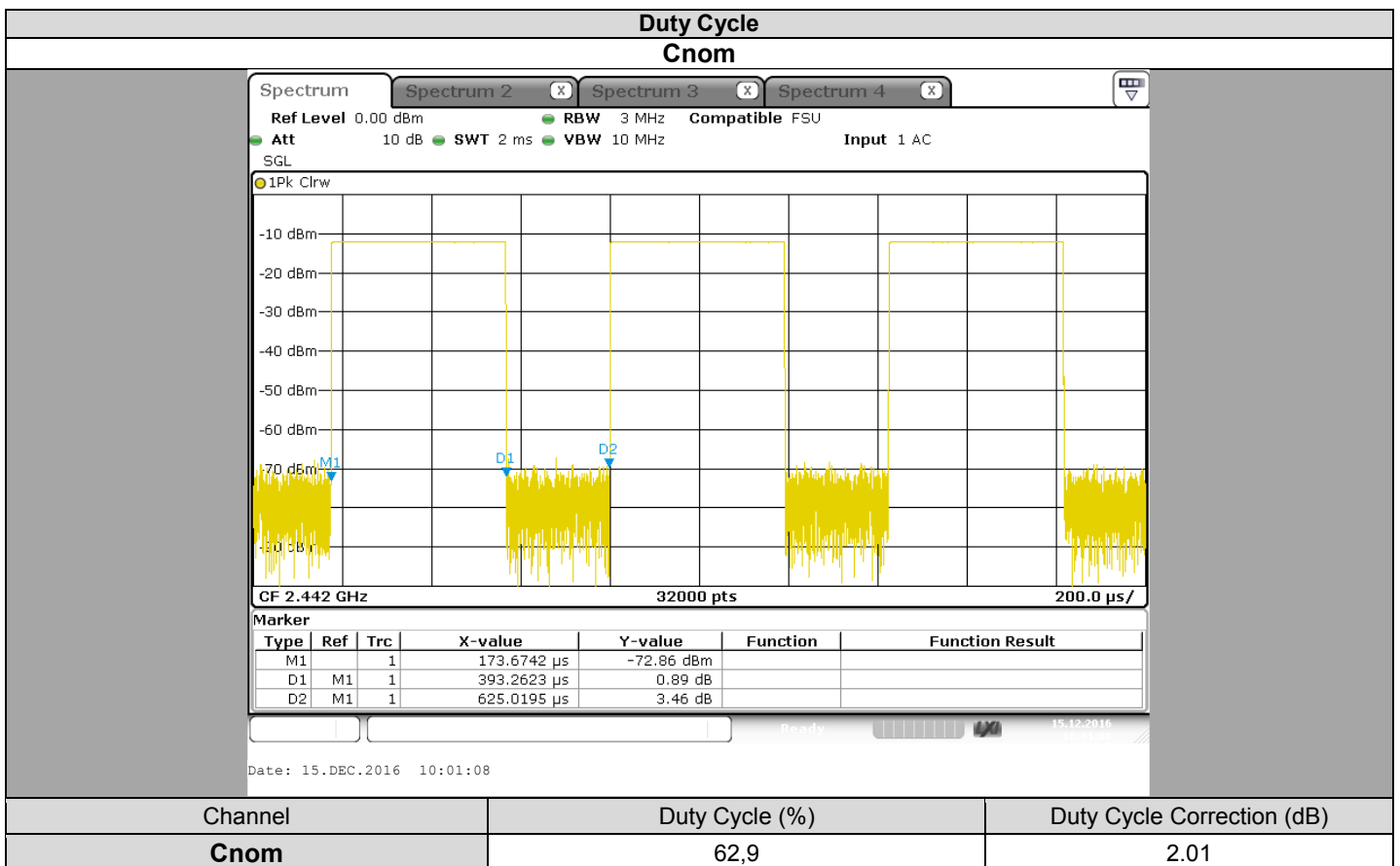
None

5.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Calibration date	Calibration due
Multi-meter	KEITHLEY	2000	A1241084	2016/05	2018/05
Programmable AC/DC power supply	-; KIKUSUI	PCR500M	A7049006	Verified with calibrated multimeter	Verified with calibrated multimeter
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2017/09
RF cable & 20 dB attenuator	Télédyne	920-0202-048	A5329676	2016/09	2017/09

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

5.5. RESULTS



5.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **SAGEMCOM MiniBox (253697290)**, SN: **616476080862** 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 : Mathieu CERISIER
Date of test : December 15, 2016
Ambient temperature : 24 °C
Relative humidity : 41 %

6.2. TEST SETUP

- The Equipment Under Test is installed:

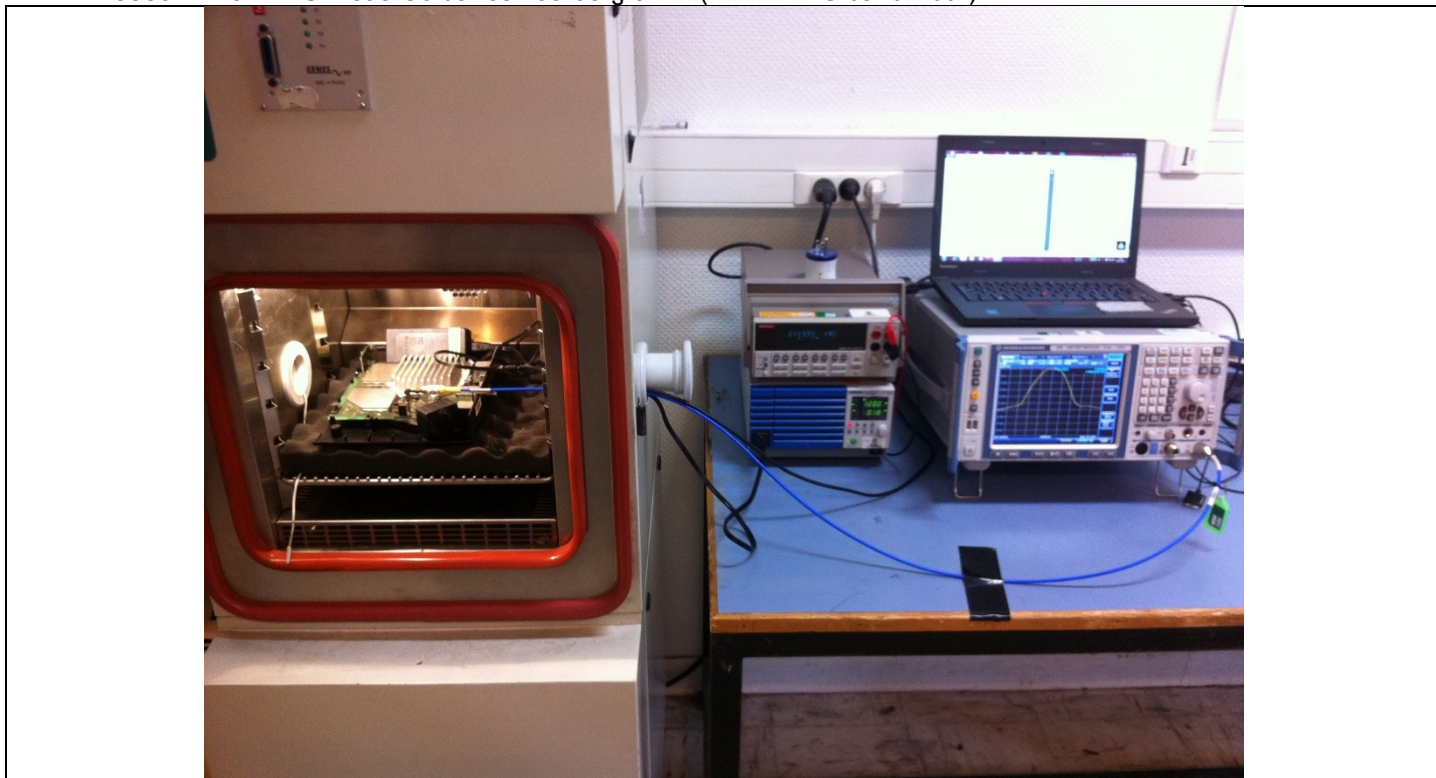
- On a table
- In an anechoic chamber
- In climatic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

- KDB 558074 D01 DTS Meas Guidance v03r05 § 9.1.1 (RBW \geq DTS bandwidth)



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

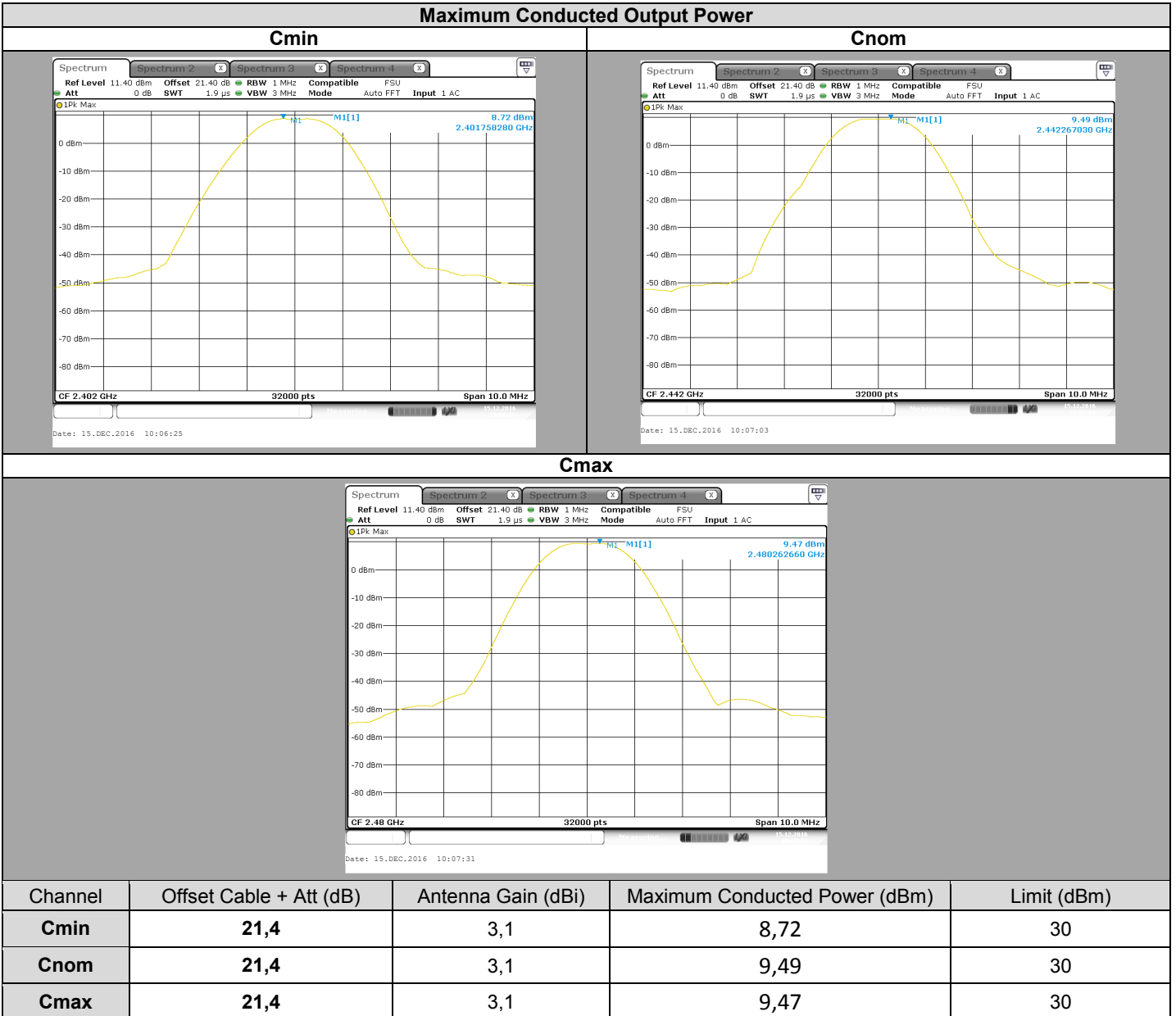
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Calibration date	Calibration due
Multi-meter	KEITHLEY	2000	A1241084	2016/05	2018/05
Programmable AC/DC power supply	-; KIKUSUI	PCR500M	A7049006	Verified with calibrated multimeter	Verified with calibrated multimeter
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2017/09
RF cable & 20 dB attenuator	Télédyne	920-0202-048	A5329676	2016/09	2017/09

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



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6.5. RESULTS



6.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **SAGEMCOM MiniBox (253697290)**, SN: **616476080862** 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 : Mathieu CERISIER
Date of test : December 15, 2016
Ambient temperature : 24 °C
Relative humidity : 41 %

7.2. TEST SETUP

- The Equipment Under Test is installed:

- On a table
- In an anechoic chamber
- In climatic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

- KDB 558074 D01 DTS Meas Guidance v03r05 § 10.2 (Method PKPSD)



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

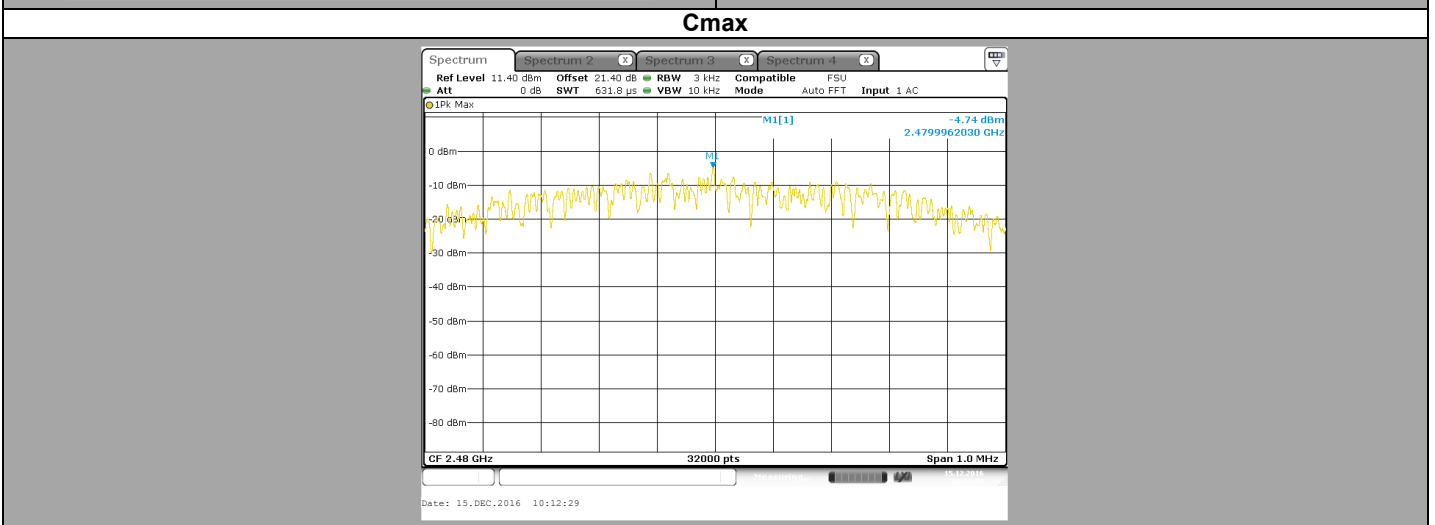
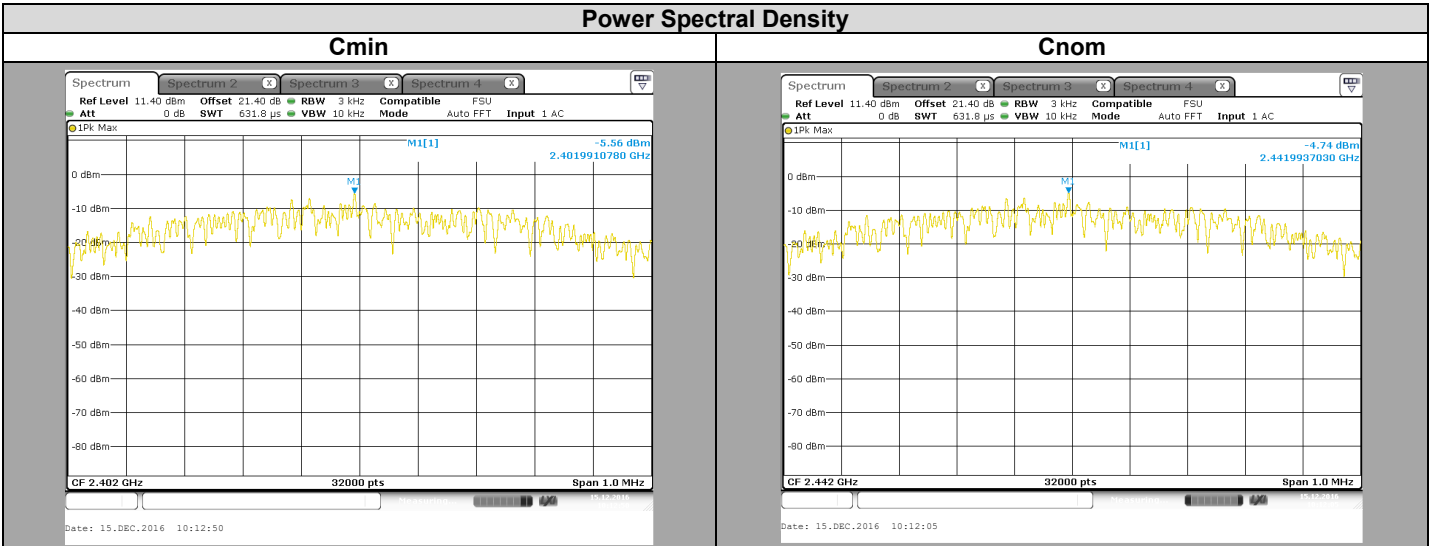
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Calibration date	Calibration due
Multi-meter	KEITHLEY	2000	A1241084	2016/05	2018/05
Programmable AC/DC power supply	-; KIKUSUI	PCR500M	A7049006	Verified with calibrated multimeter	Verified with calibrated multimeter
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2017/09
RF cable & 20 dB attenuator	Télédyne	920-0202-048	A5329676	2016/09	2017/09

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



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7.5. RESULTS



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Cmin	21,4	3,1	-5,56	8
Cnom	21,4	3,1	-4,74	8
Cmax	21,4	3,1	-4,74	8

7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **SAGEMCOM MiniBox (253697290)**, **SN: 616476080862** 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 : Mathieu CERISIER
Date of test : December 15, 2016
Ambient temperature : 24 °C
Relative humidity : 41 %

8.2. TEST SETUP

- The Equipment Under Test is installed:

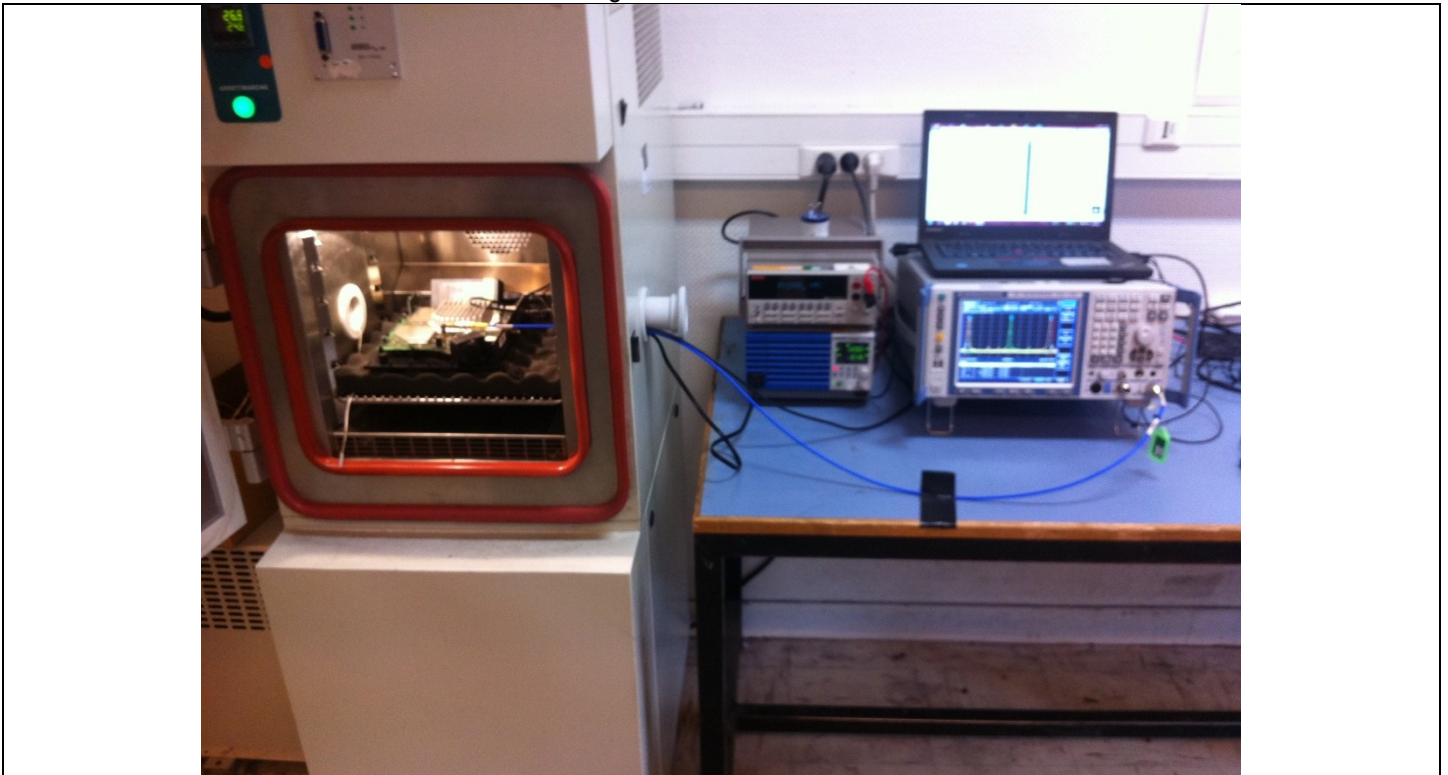
- On a table
- In an anechoic chamber
- In climatic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

- KDB 558074 D01 DTS Meas Guidance v03r05 § 11



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



8.3. LIMIT

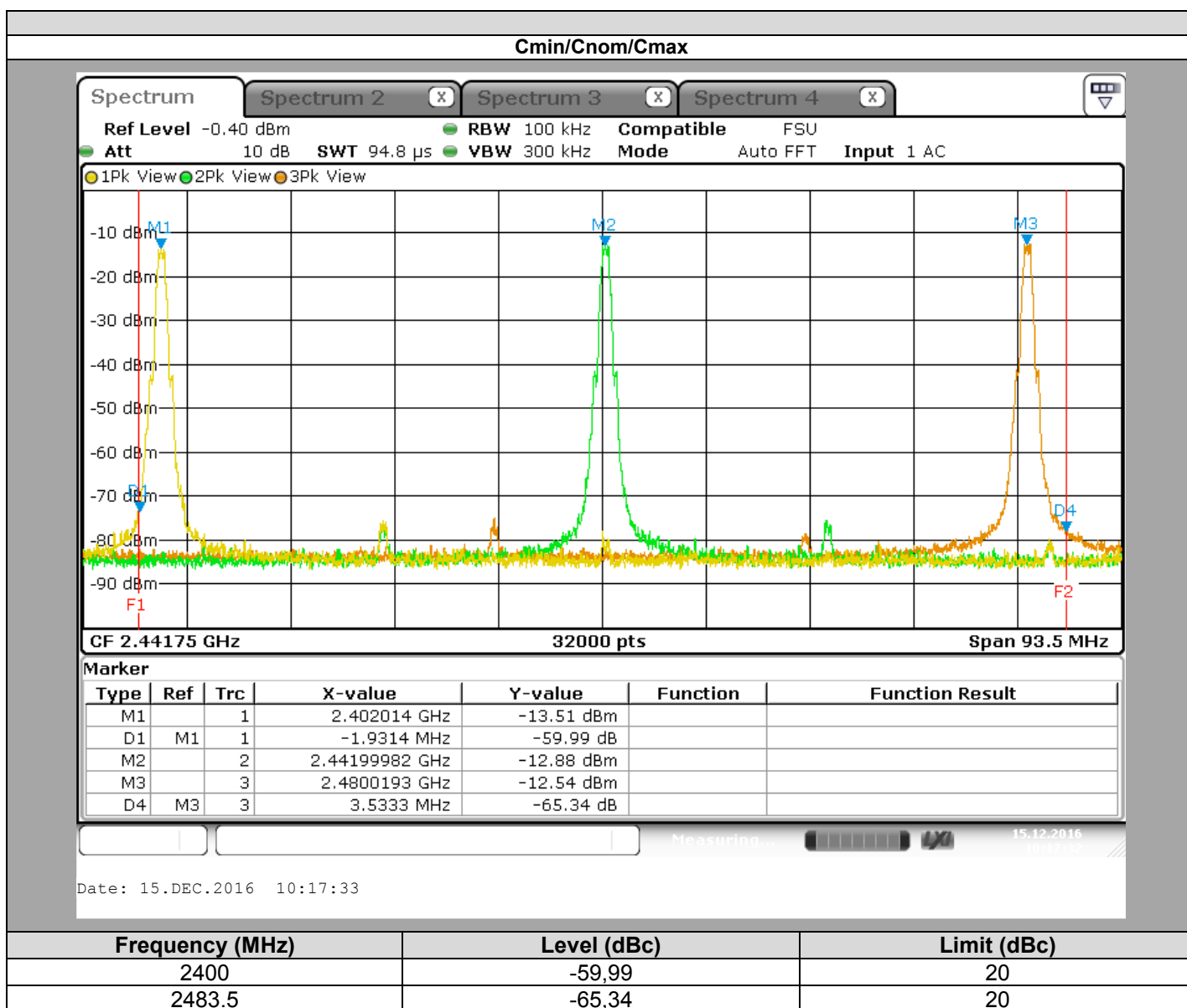
All Spurious Emissions must be at least 20dB below the Fundamental Radiator Level at the Band Edge Edge “2400MHz & 2483,5MHz”

8.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Calibration date	Calibration due
Multi-meter	KEITHLEY	2000	A1241084	2016/05	2018/05
Programmable AC/DC power supply	-; KIKUSUI	PCR500M	A7049006	Verified with calibrated multimeter	Verified with calibrated multimeter
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2017/09
RF cable & 20 dB attenuator	Télédyne	920-0202-048	A5329676	2016/09	2017/09

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

8.5. RESULTS



8.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **SAGEMCOM MiniBox (253697290)**, SN **616476080862**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247** limits.

9. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

9.1. TEST CONDITIONS

Test performed by : Mathieu CERISIER
Date of test : December 21, 2016
Ambient temperature : 24 °C
Relative humidity : 47 %

9.2. TEST SETUP

- The Equipment Under Test is installed:

- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

- KDB 558074 D01 DTS Meas Guidance v03r05 § 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

9.4. TEST EQUIPMENT LIST

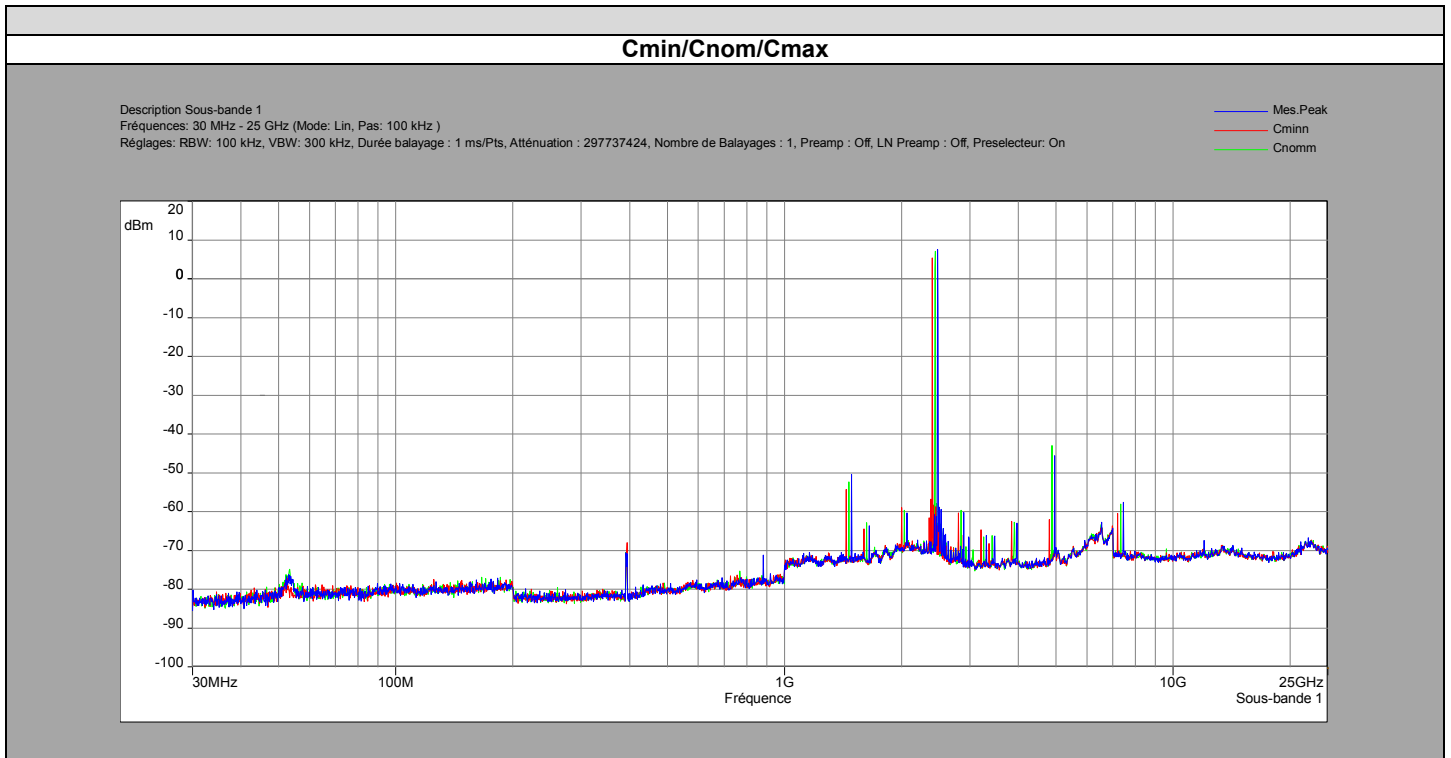
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2016/07	2017/07
cable	Télédyne	084-0555-2MTR	A5329758	2016/10	2017/10
Attenuator 3dB	WEINSCHEL	WA54-3-12	A7122223	2016/10	2017/10
Programmable AC/DC power supply	-; KIKUSUI	PCR500M	A7040079	2016/06	2018/06
Multi-meter	KEITHLEY	2000	A1242090	voir etiquette	voir étiquette
Filter	PASTERNAK	PE8213	A7480048	2015/09	2017/09

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



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9.5. RESULTS



Frequency (MHz)	Level (dBm)	Level (dBc)	Limit (dBc)
2402	5,374		
2806,6	-60,278	65,652	20
1441	-54,247	59,621	20
393,5	-67,96	73,334	20
2442	7,127		
4884	-42,908	50,035	20
1465	-52,315	59,442	20
390,7	-70,506	77,633	20
2480	5,757		
4960	-45,556	51,313	20
1487,8	-50,367	56,124	20
390,5	-70,637	76,394	20

9.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **SAGEMCOM MiniBox (253697290)**, SN: **616476080862**, 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

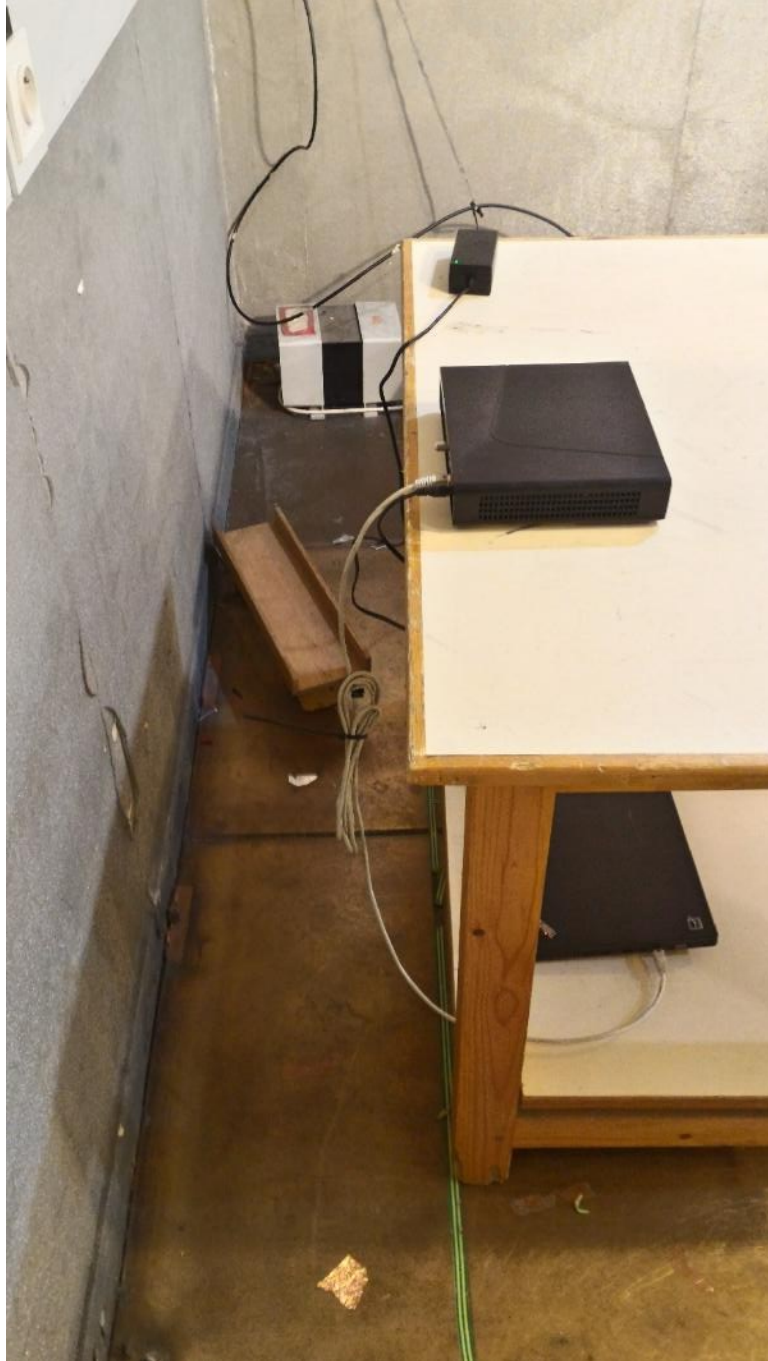
Test performed by : Laurent DENEUX
Date of test : December 5, 2016
Ambient temperature : 21°C
Relative humidity : 53%

10.2. TEST SETUP

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



Photograph for AC Power Line Conducted Emissions (Front view)



Photograph for AC Power Line Conducted Emissions (Rear view)



10.3. LIMIT

Quasi-Peak

0,15kHz to 0,5MHz: 66dB μ V to 56dB μ V*

0,5MHz to 5MHz: 56dB μ V

5MHz to 30MHz: 60dB μ V

Average

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

0,5MHz to 5MHz: 46dB μ V

5MHz to 30MHz: 50dB μ V

*Decreases with the logarithm of the frequency

10.4. TEST EQUIPMENT LIST

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2015-12	2016-12
V ISLN	ROHDE & SCHWARZ	ESH2-Z5	C2322001	2016-05	2017-05
Pulse limiter	ROHDE & SCHWARZ	ESH3-Z2	A2649008	2016-03	2017-03
Cable	-	-	A5329417	2016-10	2017-10
Cable	-	-	A5329589	2016-10	2017-10
Ground plane	LCIE	-	-	-	-

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

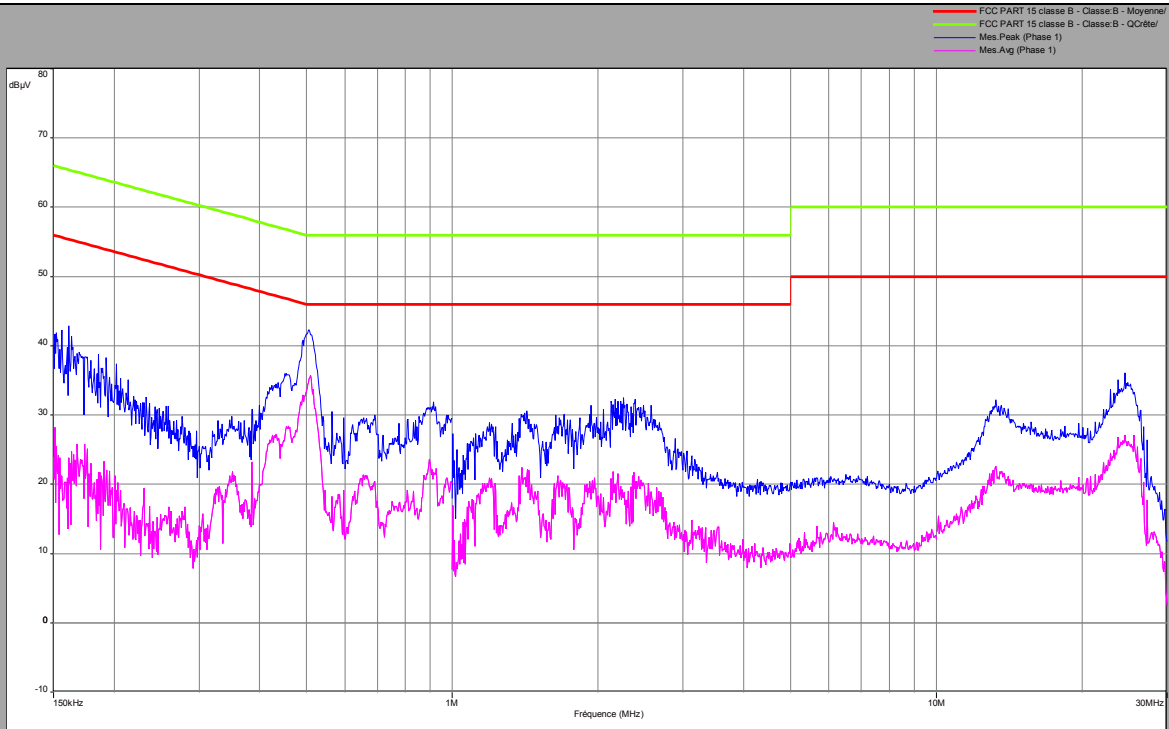
None Divergence:



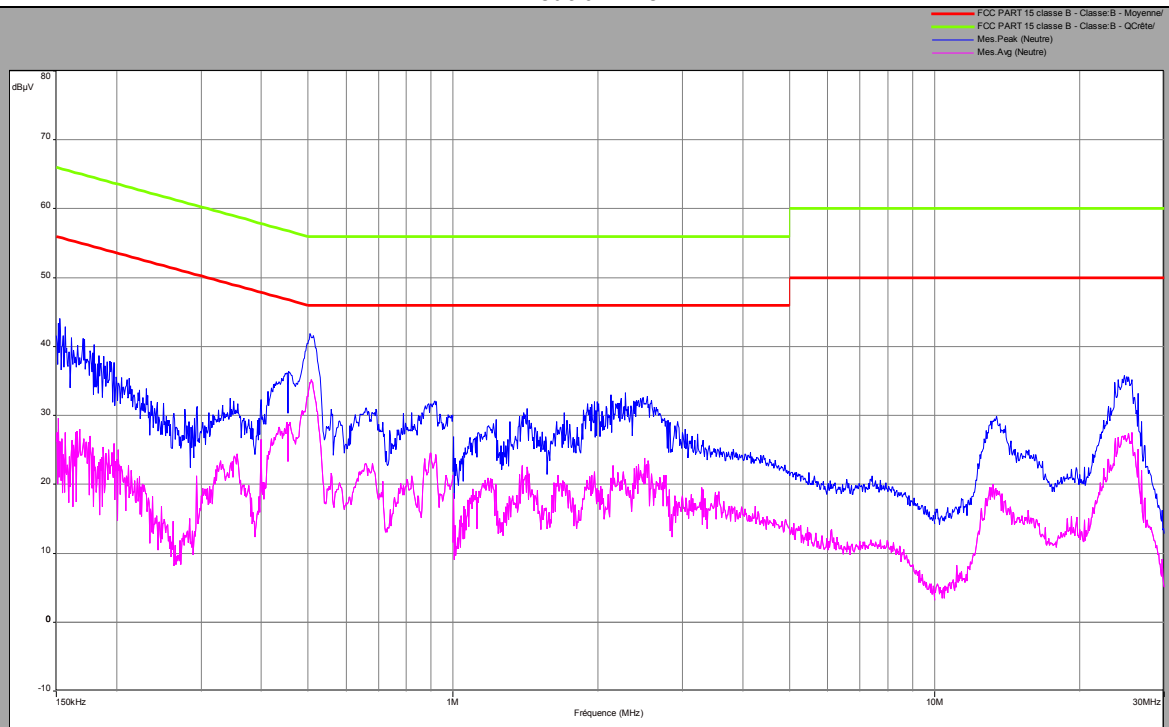
L C I E

10.6. RESULTS

Phase Line



Neutral Line





L C I E

Phase Line							
Frequency (MHz)	Peak Level (dB μ V)	Quasi-Peak Level (dB μ V)	Quasi-Peak Limit (dB μ V)	Margin Quasi-peak limit	Average Level (dB μ V)	Average Limit (dB μ V)	Margin Average Limit
0,161	42,8	-	64,5	21,7	28,2	55,4	27,2
0,505	42,3	-	62,4	20,1	35,7	52,4	16,7
2,376	31,7	-	56	24,3	21,7	46	24,3
13,26	32,2	-	60	27,8	22,6	50	27,4
24,54	36	-	60	24	26,9	50	23,1

Neutral Line							
Frequency (MHz)	Peak Level (dB μ V)	Quasi-Peak Level (dB μ V)	Quasi-Peak Limit (dB μ V)	Margin Quasi-peak limit	Average Level (dB μ V)	Average Limit (dB μ V)	Margin Average Limit
0,152	44	-	65,8	21,8	29,6	55,8	26,2
0,511	41,3	-	61,4	20,1	35,3	51,4	16,1
2,282	33,3	-	56	22,7	21,8	46	24,2
13,312	29,5	-	60	30,5	20	50	30
25,572	35,3	-	60	24,7	27	50	23

10.7. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **SAGEMCOM MiniBox (253697290)**, SN: **616476080862** 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 : Laurent DENEUX
Date of test : December 5, 2016 to December 9, 2016
Ambient temperature : 23 °C
Relative humidity : 45 %

11.2. TEST SETUP

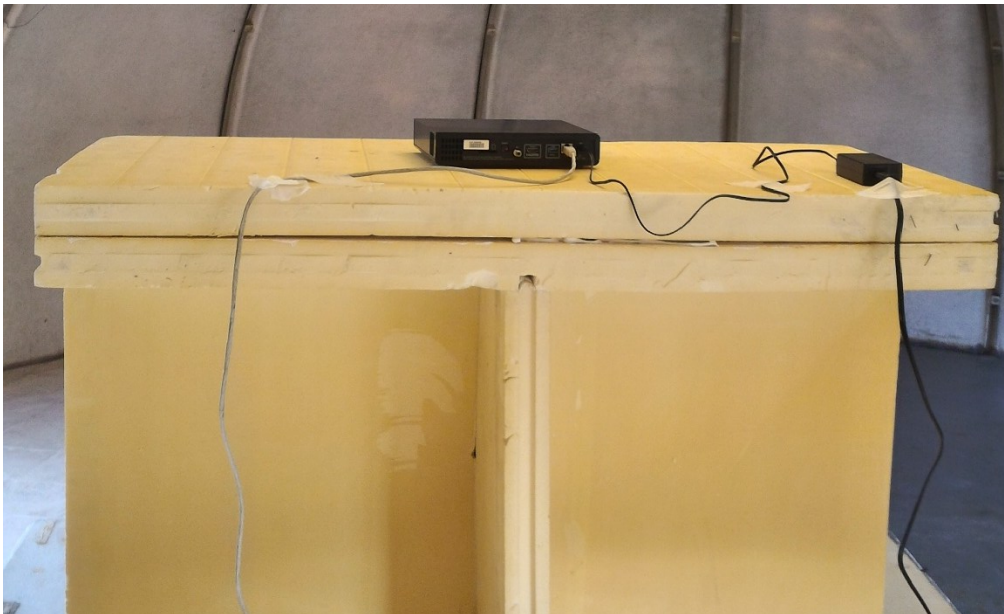
The product has been tested according to ANSI C63.10 (2013). The EUT is placed **on an open area test site**. Distance between measuring antenna and the EUT is **10m**. Test is performed in horizontal (H) and vertical (V) polarization with **bilog** antenna below 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height search was performed from 1 to 4m. The EUT is place at 1.5m high above 1GHz and at 0.8m high under 1GHz.



Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands

11.3. LIMIT

Limit at 3m:

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

Limit at 10m:

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

11.4. TEST EQUIPMENT LIST

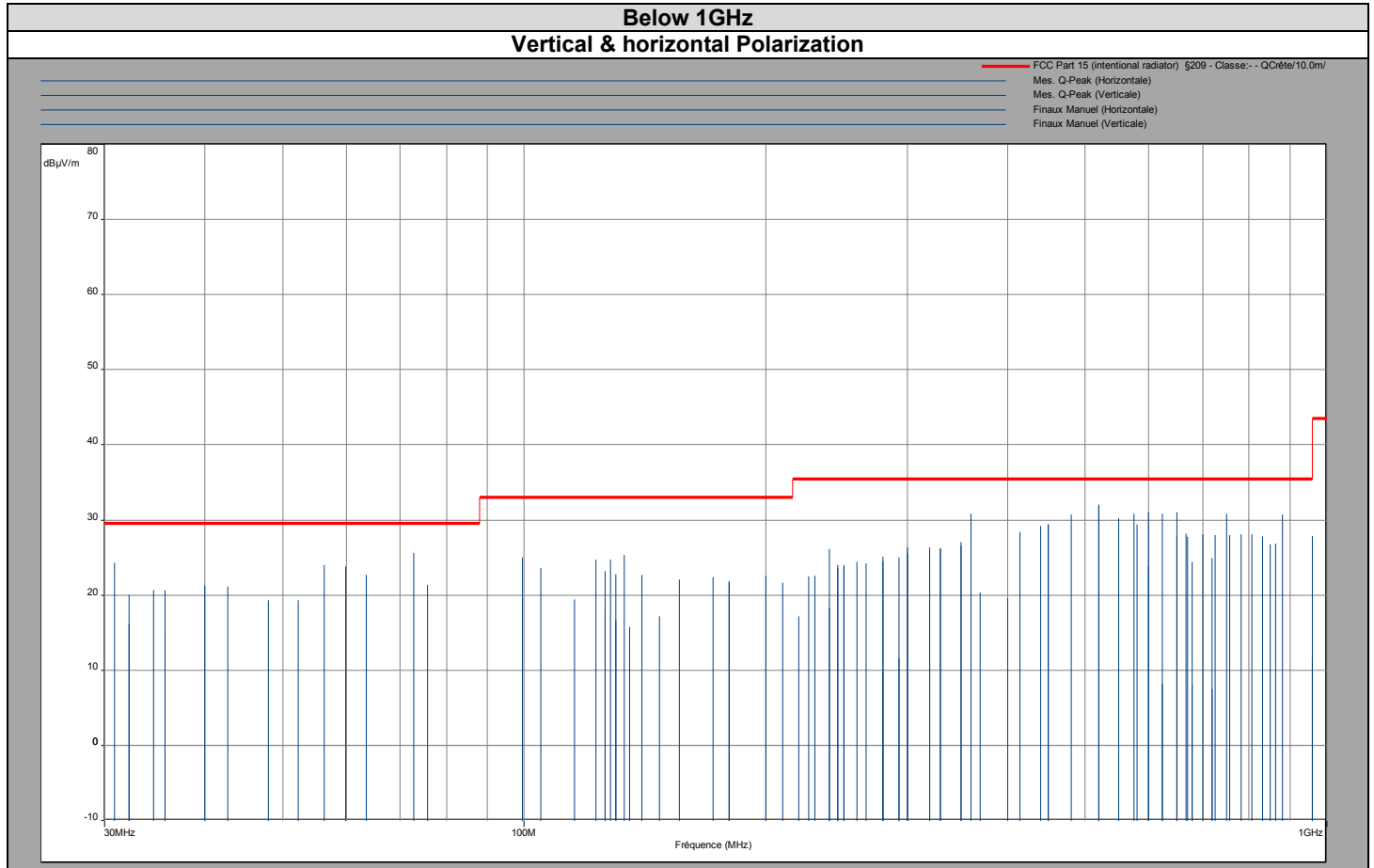
Apparatus	Trade Mark	Type	Registration number	Cal. Date	Cal. Due
Open test site	LCIE	-	F2000400	2016-05	2017-05
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2015-12	2016-12
Preamplifier	HELWETT PACKARD	8449B	A7080071	2016-01	2017-01
Bilog antenna	CHASE	CBL 6112A	C2040040	2016-01	2017-01
Horn	ETS	3115	C2042023	2016-01	2017-01
Measurement horn antenna 18-26,5GHz	PASTERNAK	PE9852/2F-20	C2042048	2015/05	2017/05
Cable	-	-	A5329542	2016-03	2017-03
Cable	-	-	A5329449	2016-10	2017-10
Cable	-	-	A5329368	2016-05	2017-05
Cable	-	-	A5329444	2016-10	2017-10

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:

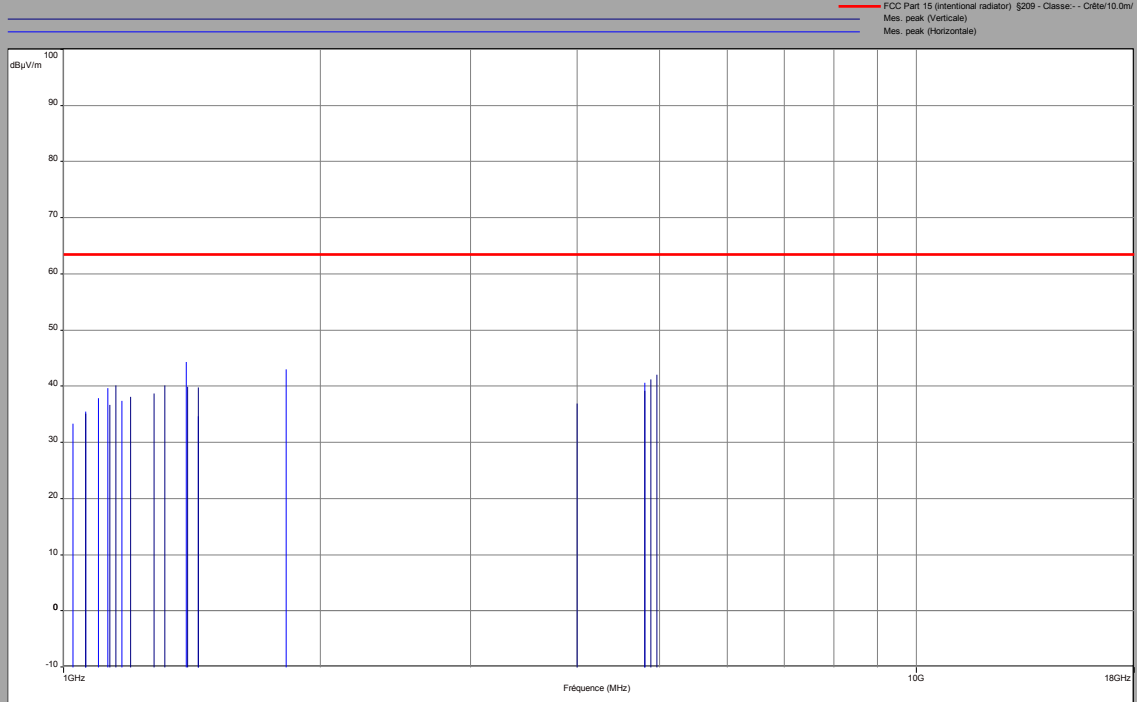
11.6. RESULTS





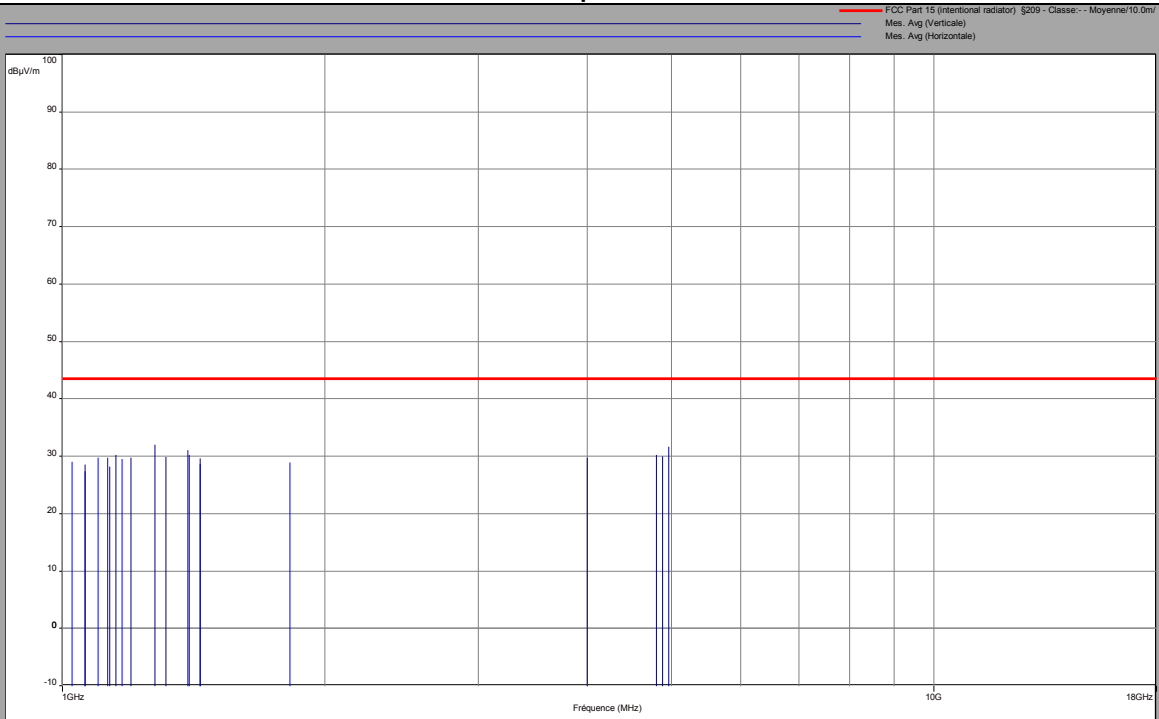
L C I E

Above 1GHz
Cmin/Cnom/Cmax
Vertical Polarization



No interference has been observed between 18GHz and 26GHz

Horizontal polarization

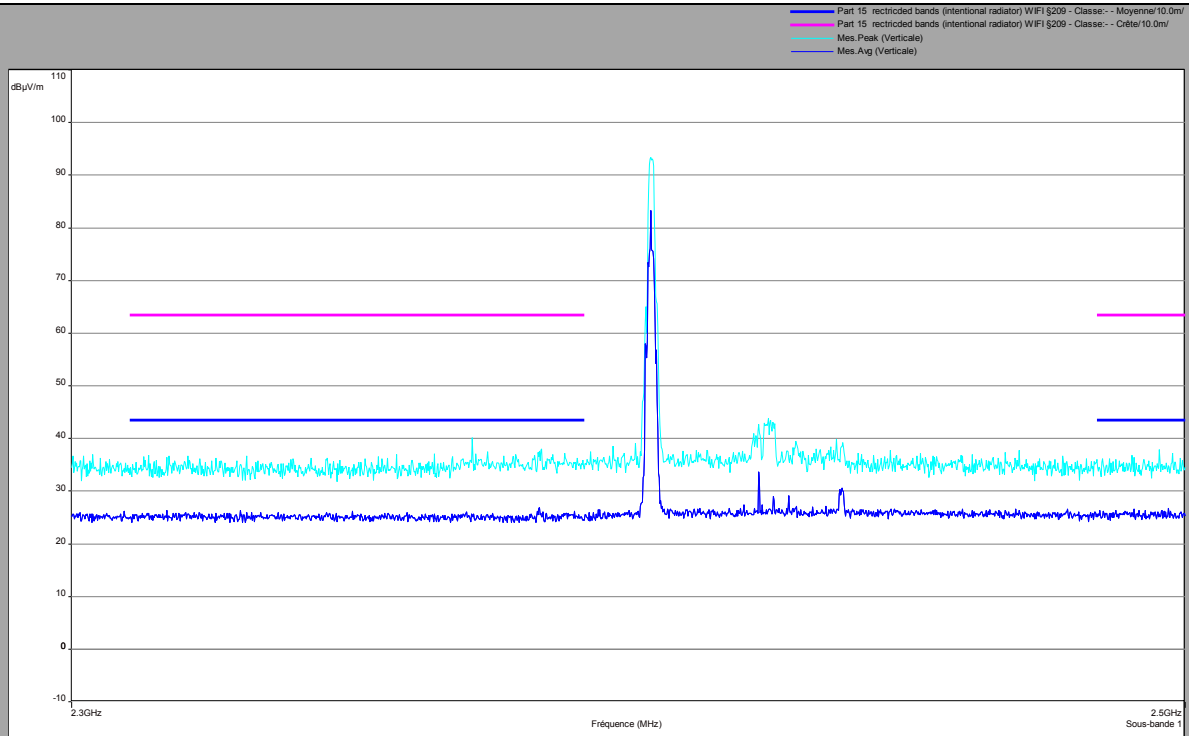


No interference has been observed between 18GHz and 26GHz

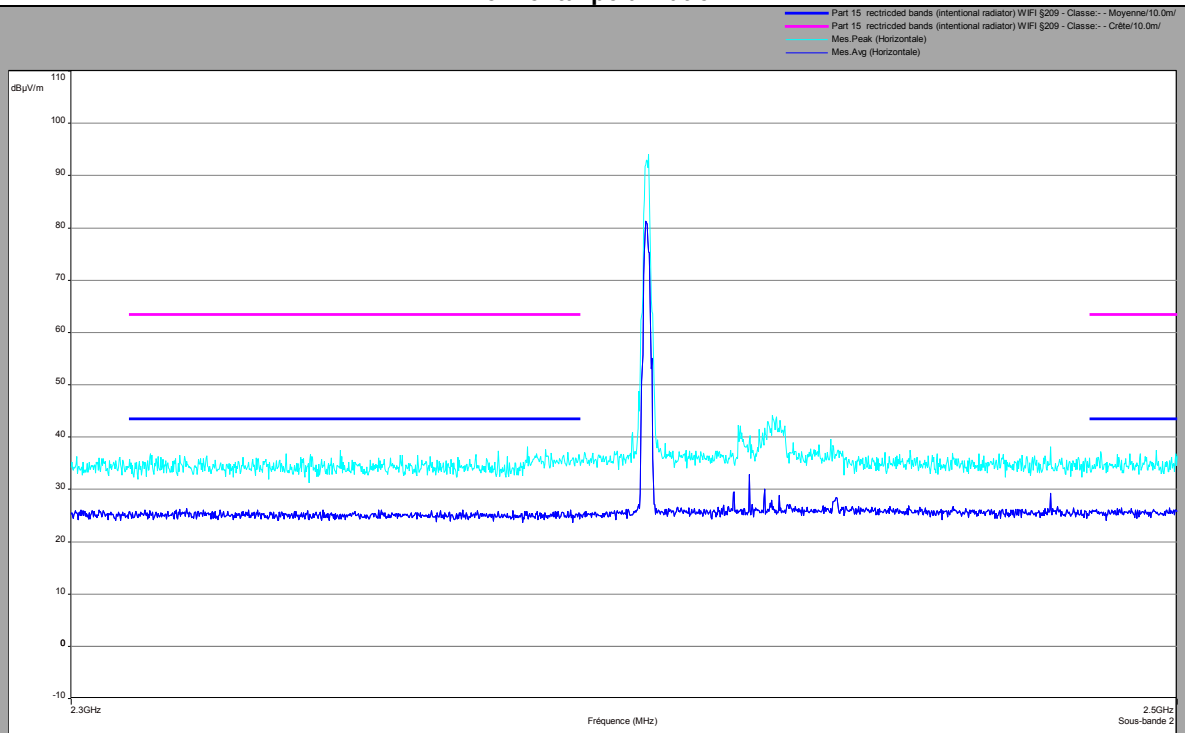
Above 1GHz Zoom 2310MHz-2500MHz

Cmin

Vertical Polarization



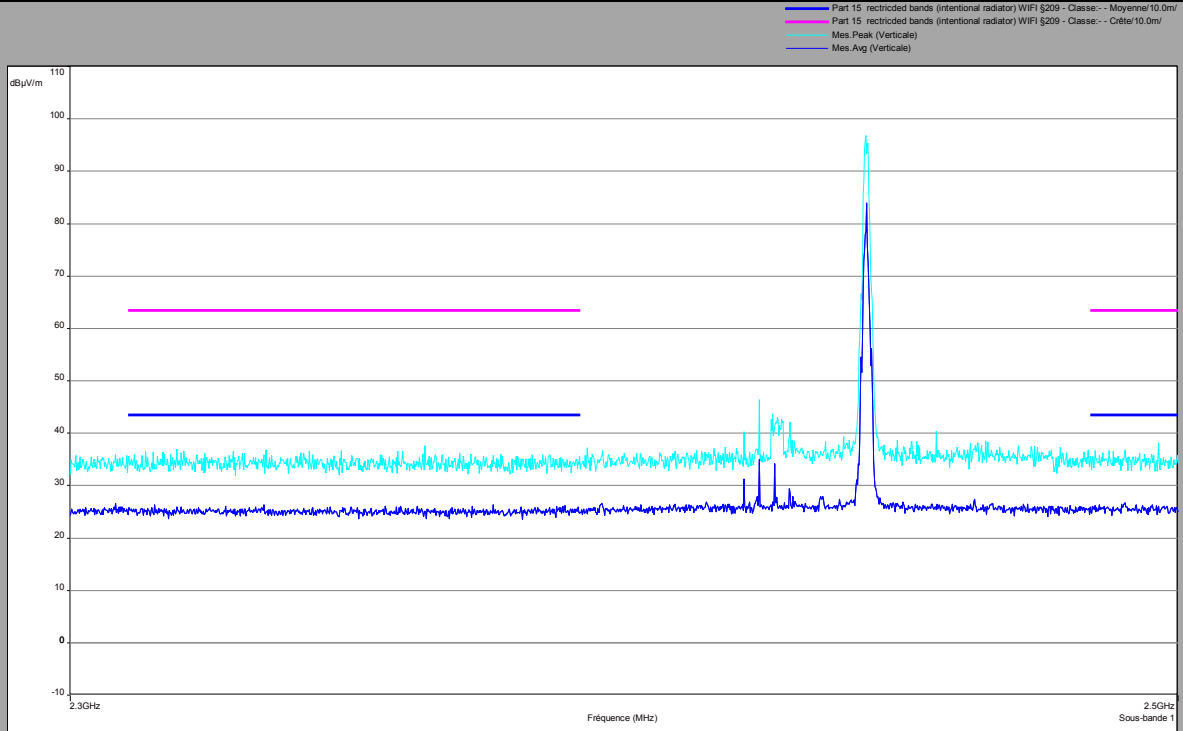
Horizontal polarization



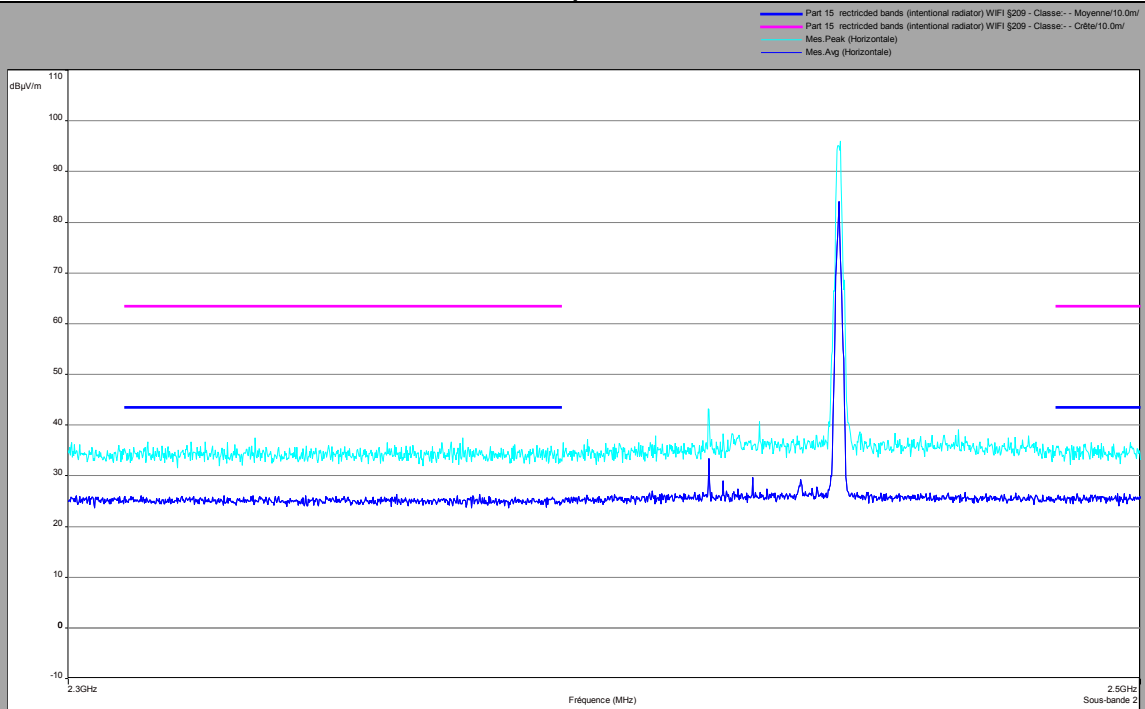
Above 1GHz Zoom 2310MHz-2500MHz

Cnom

Vertical Polarization



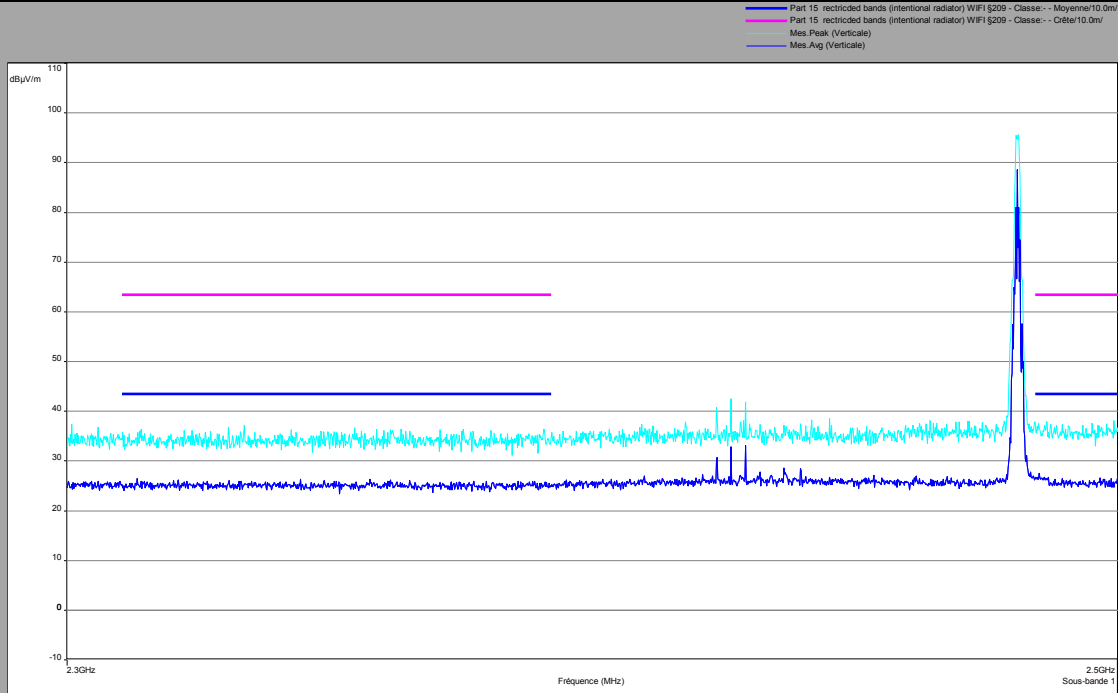
Horizontal polarization



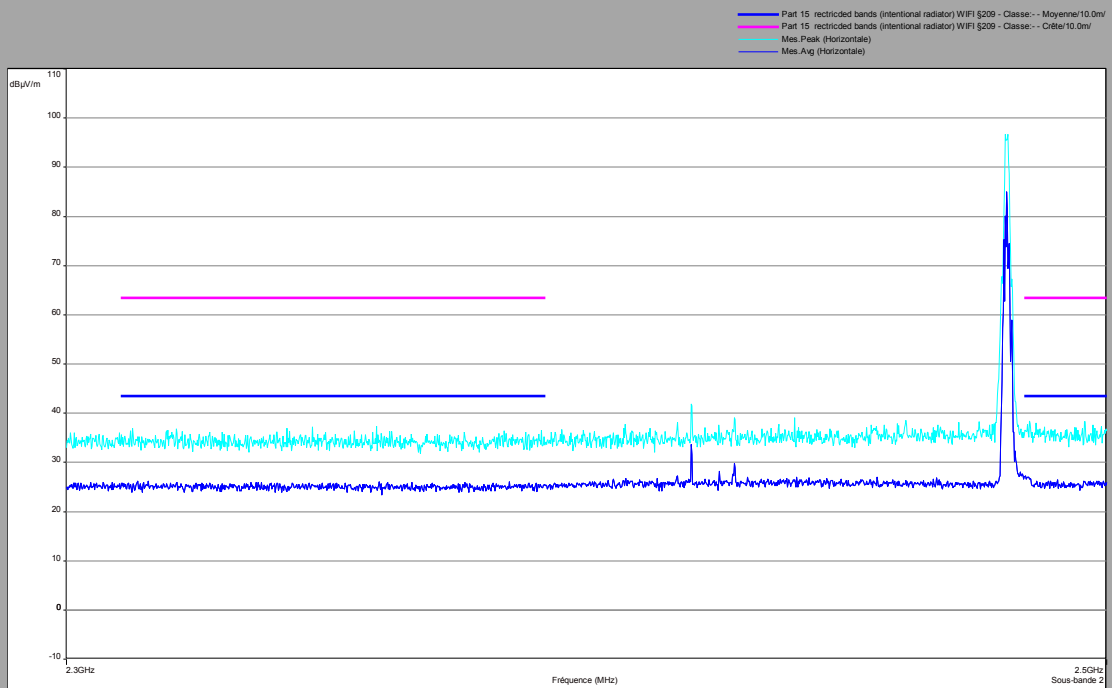
Above 1GHz Zoom 2310MHz-2500MHz

Cmax

Vertical Polarization



Horizontal polarization





L C I E

Polarisation	Frequency (MHz)	level Quasi peak (dBµV/m)	limit FCC	Margin
vertical	30,9	24,37	29,5	5,13
vertical	32,2	20,04	29,5	9,46
vertical	34,5	20,73	29,5	8,77
vertical	35,7	20,66	29,5	8,84
vertical	40	21,33	29,5	8,17
vertical	42,7	21,21	29,5	8,29
vertical	48	19,31	29,5	10,19
vertical	52,3	19,37	29,5	10,13
vertical	56,3	24,07	29,5	5,43
vertical	59,9	23,82	29,5	5,68
vertical	63,6	22,76	29,5	6,74
vertical	72,8	25,65	29,5	3,85
vertical	75,8	21,43	29,5	8,07
vertical	99,5	25,02	33	7,98
vertical	105	23,6	33	9,4
vertical	115,4	19,46	33	13,54
vertical	122,9	24,71	33	8,29
vertical	128	24,81	33	8,19
vertical	133,3	25,35	33	7,65
vertical	147,5	17,22	33	15,78
vertical	156	22,1	33	10,9
vertical	172	22,39	33	10,61
vertical	180	21,92	33	11,08
vertical	200	22,62	33	10,38
vertical	210	21,73	33	11,27
vertical	220	17,26	35,5	18,24
vertical	226	22,53	35,5	12,97
vertical	230	22,59	35,5	12,91
vertical	240	18,37	35,5	17,13
vertical	245,8	23,6	35,5	11,9
vertical	250	24	35,5	11,5
vertical	266,6	24,2	35,5	11,3
vertical	280	25,19	35,5	10,31
vertical	300	25,7	35,5	9,8
vertical	320	24,71	35,5	10,79
vertical	330	26,29	35,5	9,21
vertical	350	27,1	35,5	8,4



L C I E

Polarisation	Frequency (MHz)	level Quasi peak (dB μ V/m)	limit FCC	Margin
vertical	370	20,4	35,5	15,1
vertical	400	19,61	35,5	15,89
vertical	440	29,22	35,5	6,28
vertical	450	29,47	35,5	6,03
vertical	480	30,81	35,5	4,69
vertical	520	31,92	35,5	3,58
vertical	580	29,47	35,5	6,03
vertical	600	23,88	35,5	11,62
vertical	650	28,03	35,5	7,47
vertical	668	28,26	35,5	7,24
vertical	700	28,14	35,5	7,36
vertical	725	27,97	35,5	7,53
vertical	756	27,97	35,5	7,53
vertical	782	28,09	35,5	7,41
vertical	806	28,14	35,5	7,36
vertical	850	26,77	35,5	8,73
vertical	864	26,93	35,5	8,57
vertical	880	30,75	35,5	4,75



L C I E

Polarisation	Frequency (MHz)	level Quasi peak (dB μ V/m)	limit FCC	Margin
Horizontal	126	23,19	33	9,81
Horizontal	130	22,86	33	10,14
Horizontal	135,2	13,57	33	19,43
Horizontal	140	22,73	33	10,27
Horizontal	180	21,66	33	11,34
Horizontal	240	26,21	35,5	9,29
Horizontal	245,8	24,06	35,5	11,44
Horizontal	250	23,82	35,5	11,68
Horizontal	260	24,41	35,5	11,09
Horizontal	280	24,55	35,5	10,95
Horizontal	292,8	25,03	35,5	10,47
Horizontal	300	26,35	35,5	9,15
Horizontal	320	26,36	35,5	9,14
Horizontal	330	26,18	35,5	9,32
Horizontal	350	26,58	35,5	8,92
Horizontal	360	30,92	35,5	4,58
Horizontal	415	28,44	35,5	7,06
Horizontal	450	29,47	35,5	6,03
Horizontal	520	32,08	35,5	3,42
Horizontal	550	30,23	35,5	5,27
Horizontal	575	30,87	35,5	4,63
Horizontal	600	31,03	35,5	4,47
Horizontal	624	30,92	35,5	4,58
Horizontal	650	31,03	35,5	4,47
Horizontal	670	27,85	35,5	7,65
Horizontal	680	24,47	35,5	11,03
Horizontal	720	24,95	35,5	10,55
Horizontal	750	30,87	35,5	4,63
Horizontal	832	27,85	35,5	7,65
Horizontal	960,1	27,93	43,5	15,57



L C I E

Above 1GHz								
Cmin/Cnom/Cmax								
Polarization	Frequency (MHz)	Duty cycle correction (dB)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin Average	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin Peak level
Vertical	1062	2,01	30,6	43,5	12,9	35,09	63,5	28,41
Vertical	1134	2,01	30,25	43,5	13,25	36,67	63,5	26,83
Vertical	1152	2,01	32,3	43,5	11,2	40,15	63,5	23,35
Vertical	1198	2,01	31,77	43,5	11,73	38,19	63,5	25,31
Vertical	1278	2,01	34,03	43,5	9,47	38,68	63,5	24,82
Vertical	1314	2,01	31,86	43,5	11,64	40,11	63,5	23,39
Vertical	1398	2,01	32,27	43,5	11,23	39,87	63,5	23,63
Vertical	1440	2,01	31,68	43,5	11,82	39,8	63,5	23,7
Vertical	2390	2,01	29,01	43,5	14,49	38	63,5	25,5
Vertical	2483.5	2,01	29,41	43,5	14,09	37,5	63,5	26
Vertical	4000	2,01	31,74	43,5	11,76	36,9	63,5	26,6
Vertical	4802.8	2,01	32,24	43,5	11,26	39,79	63,5	23,71
Vertical	4882.5	2,01	32,06	43,5	11,44	41,28	63,5	22,22
Vertical	4962.1	2,01	33,68	43,5	9,82	42,06	63,5	21,44
Horizontal	1026	2,01	31,05	43,5	12,45	33,41	63,5	30,09
Horizontal	1062	2,01	29,38	43,5	14,12	35,47	63,5	28,03
Horizontal	1098	2,01	31,78	43,5	11,72	37,9	63,5	25,6
Horizontal	1127.6	2,01	31,84	43,5	11,66	39,72	63,5	23,78
Horizontal	1170	2,01	31,53	43,5	11,97	37,42	63,5	26,08
Horizontal	1392	2,01	33,12	43,5	10,38	44,3	63,5	19,2
Horizontal	1440	2,01	30,74	43,5	12,76	34,66	63,5	28,84
Horizontal	1824	2,01	30,9	43,5	12,6	43,03	63,5	20,47
Horizontal	2390	2,01	28,01	43,5	15,49	38	63,5	25,5
Horizontal	2483.5	2,01	29,01	43,5	14,49	38,4	63,5	25,1

11.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **SAGEMCOM MiniBox (253697290)**, SN: **616476080862** 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