

TEST REPORT

N°: 678683-CR2015-12-07

JDE : 138395

Subject

**Electromagnetic compatibility (EMC) :
Publication CFR 47 PART 15 of 2013**

Issued to

SAGEMCOM BROADBAND SAS
250 Route de l'Empereur
92848 RUEIL MALMAISON
France

Apparatus under test

☞ Product

WIFI home router

☞ Trade mark

OPTIMUM

☞ Manufacturer

SAGEMCOM BROADBAND SAS

☞ Models under test

FAST 5260CV (& FAST 5260)

☞ Serial number

NQ1529409006864

FCC ID

VW3FAST5260CV (& VW3FAST5260)

Test date

November 13th, 2015

Test location

Ecuelles

Test performed by

Laurent DENEUX

Composition of document

30 pages

Document issued on

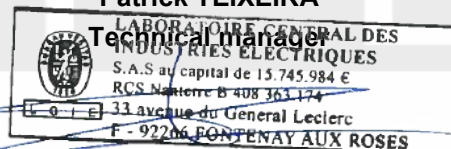
November 25th, 2015

Corrected issued on

December 7th, 2015

**Written by :
Laurent DENEUX
Tests operator**

**Approved by :
Patrick TEIXEIRA
Technical manager**



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SUMMARY

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1. Test Program

References

- ✓ CFR 47 Part 15 Subpart C - Radio frequency devices - Intentional radiators October 2013
- ✓ ANSI C63.4 of 2009

Emission tests:

Test Description	Main characteristics	Test result - Comments
Measurement of radiated electric field in shielded room FCC Part 15.209	<input type="checkbox"/> Class A <input type="checkbox"/> Class B	<input type="checkbox"/> PASS <input type="checkbox"/> FAIL <input checked="" type="checkbox"/> NA <input type="checkbox"/> NP (Limited Program)
Measurement of radiated electric field in open space FCC Part 15.209	<input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP (Limited Program)
Measurement of conducted disturbance on the AC main power port FCC Part 15.207	<input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP (Limited Program)

The product is Compliant according to CFR 47 Part 15 Subpart C - Radio frequency devices - Intentional radiators October 2013 standard.

PASS: EUT complies with standard's requirement

FAIL: EUT does not comply with standard's requirement

NA: Not Applicable

NP: Test Not Performed

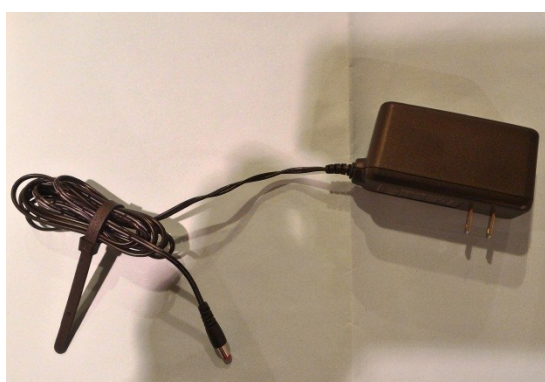
2. Equipment Description (declared by provider)

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT): FAST 5260CV (& FAST 5260)
Serial Number: NQ1529409006864



WIFI home router



Power supply n° 1
Model: **NBS30E120250VU**
Manufacturer : **NETBIT**



Power supply n°2
Model: **MSA-C2500IS 12.0-30D-US**
Manufacturer : **MOSO**

Equipment Under Test

Note: All these tests have been performed on the worst model FAST 5260CV model equipped with 2 usb ports. Due to the similarity between FAST 5260CV and FAST 5260 (the only difference is that FAST 5260 is equipped with only 1 usb port), all results recorded in this test report are applicable for both models FAST 5260 CV & FAST 5260.



Inputs/outputs - Cable:

Access	Type	Length used (m)	Shielded	Under test	Comments
Power supply AC up	-	-	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
LAN 1	Ethernet	2.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cat. 5e UTP
LAN 2	Ethernet	2.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cat. 5e UTP
LAN 3	Ethernet	2.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cat. 5e UTP
LAN 4	Ethernet	2.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cat. 5e UTP
WAN	Ethernet	10	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Cat. 5e UTP

Supporting Equipment Used During Test:

Product	Trade mark	model	Comments
Power supply	SAGEMCOM BROADBAND SAS	NBS30E120250VU	12V-DC
Power supply	SAGEMCOM BROADBAND SAS	MSA-C2500IS 12.0-30D-US	12V-DC

Auxiliary equipment (AE) used for testing:

Product	Trade mark	model	Comments
Computer	LENOVO	-	No subject to the test
WIFI 2.4GHz/ 5GHz router	NETGEAR	-	No subject to the test
Switch Ethernet	NETGEAR	F5605	No subject to the test
USB key	lexar	-	No subject to the test

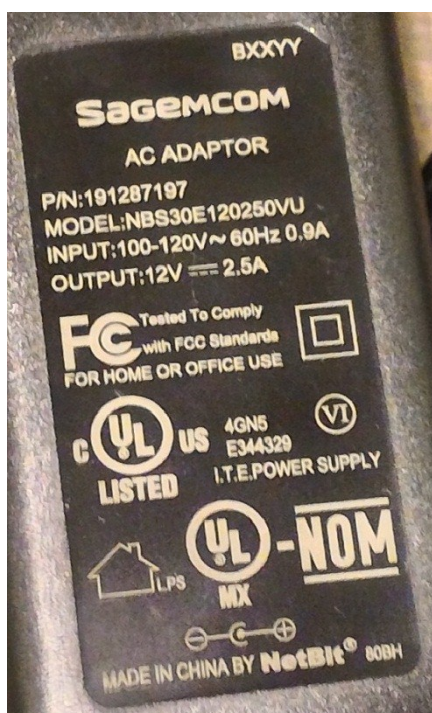
Equipment information: (Declared by provider)

Apparatus Description				
Type of power source:	<input checked="" type="checkbox"/> AC power supply	<input type="checkbox"/> DC power supply	<input type="checkbox"/> Battery (Li-ion)	
Test source voltage:	Vmin-Vmax:	<input checked="" type="checkbox"/> 120V -60Hz	<input type="checkbox"/> 7.4Vdc	
Operating Modes	Mode 1	The EUT is set in the following modes during tests: - power supply NBS30E120250VU - Permanent emission with modulation on a fixed channel in the data rate that produced the highest power (802.11g and 802.11ac) - link between WIFI home router and computer on the cable Ethernet (continuous ping)		
	Mode 2	The EUT is set in the following modes during tests: - power supply MSA-C2500IS 12.0-30D-US - Permanent emission with modulation on a fixed channel in the data rate that produced the highest power (802.11g and 802.11ac) - link between WIFI home router and computer on the cable Ethernet (continuous ping)		
	Mode 3	-		
	Mode 4	-		

2.2. EQUIPMENT LABELLING



Wifi home router



Power supply n° 1



Power supply n°2

2.3. EQUIPMENT MODIFICATIONS

☒ None ☐ Modification:



3. Measurement of radiated emissions – FCC Part. 15.209

3.1. ENVIRONMENTAL CONDITIONS

Test performed by : Laurent DENEUX
Date of test : November 13th , 2015
Ambient temperature : 19°C
Relative humidity : 47%

3.2. TEST SETUP

Specifications:

Frequency	30 – 1000 MHz	RBW 120 kHz
	1-18GHz	RBW 1MHz
Detector	Quasi-Peak below 1GHz	
	Peak and average value above 1GHz	

Pre characterization in semi anechoic room is performed to define the critical frequencies

Operating conditions:

- The Equipment under Test is installed:

- ☐ Measure in semi anechoic room
- ☒ Measure in open area site

- Measuring distance:

- ☐ 3m
- ☒ 10m

- Deviation method:

- ☐ Yes
- ☒ No

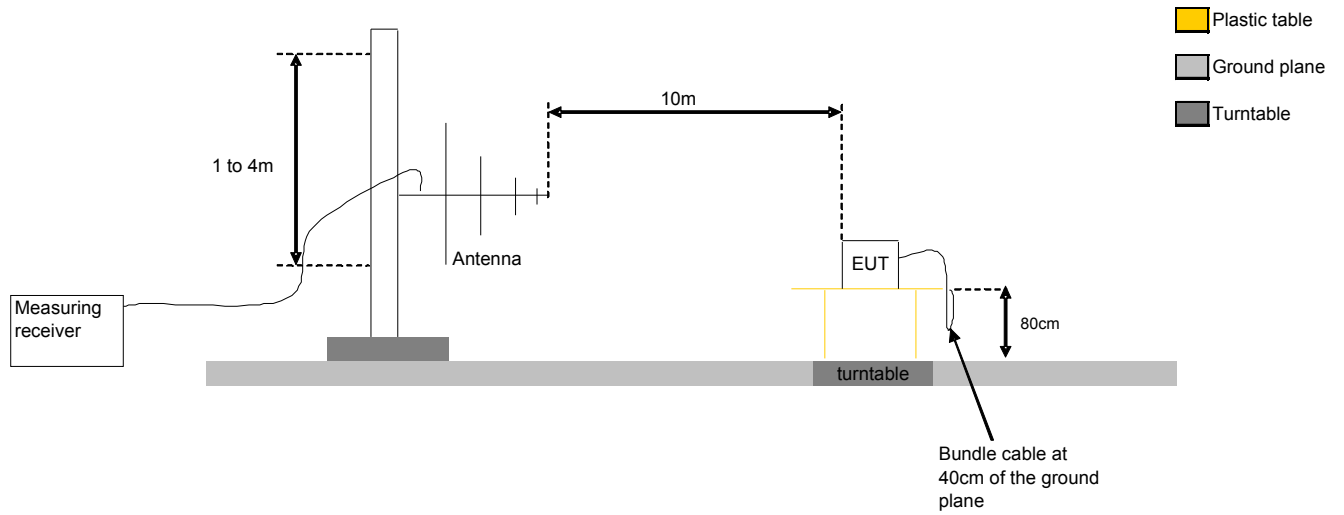
-Product installation:

- ☒ The EUT was tested as a table top equipment and was placed on a non-conducting platform the top of which is 0.8m above the metal ground plane.
- ☐ The EUT is at 10cm height from reference plane

The radiated measurements were performed in both vertical and horizontal polarization.
The worst case has been recorded after maximization levels.

Operating mode:

- ☒ Mode 1 ☒ Mode 2 ☐ Mode 3 ...



Test Set up for radiated measurement in open area test site



Measurement of radiated disturbances



Measurement of radiated disturbances



Measurement of radiated disturbances



3.3. LIMIT

☐ at 3m Class B

Frequency Bands/frequencies	dB (μV/m) quasi-peak	dB (μV/m) peak	dB (μV/m) average
30-88MHz	40	-	-
88 – 216MHz	43.5	-	-
216 – 960 MHz	46	-	-
960 – 1000 MHz	53.9	-	-
1000-6000MHz	-	73.9	53.9

☒ at 10m Class B

Frequency Bands/frequencies	dB (μV/m) quasi-peak	dB (μV/m) peak	dB (μV/m) average
30-88MHz	29.5	-	-
88 – 216MHz	33	-	-
216 – 960 MHz	35.5	-	-
960 – 1000 MHz	43.5	-	-
1000-6000MHz	-	63.5	43.5

3.4. TEST EQUIPMENT LIST

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Open test site	LCIE	-	F2000400	2015-06	2016-06
EMI Test Receiver	ROHDE & SCHWARZ	ESIB	A2642021	2015-01	2016-01
Preamplifier	HELVETT PACKARD	8449B	A7080071	2015-07	2016-07
Bilog antenna	CHASE	CBL 6112A	C2040040	2015-03	2016-03
Horn	ETS	3115	C2042023	2015-03	2016-03
Cable	-	-	A5329542	2015-02	2016-02
Cable	-	-	A5329449	2015-10	2016-10
Cable	-	-	A5329368	2015-03	2016-03
cable	-	-	A5329444	2015-10	2016-10
Supplementary information: -					

3.5. RESULTS

Diagram N°1

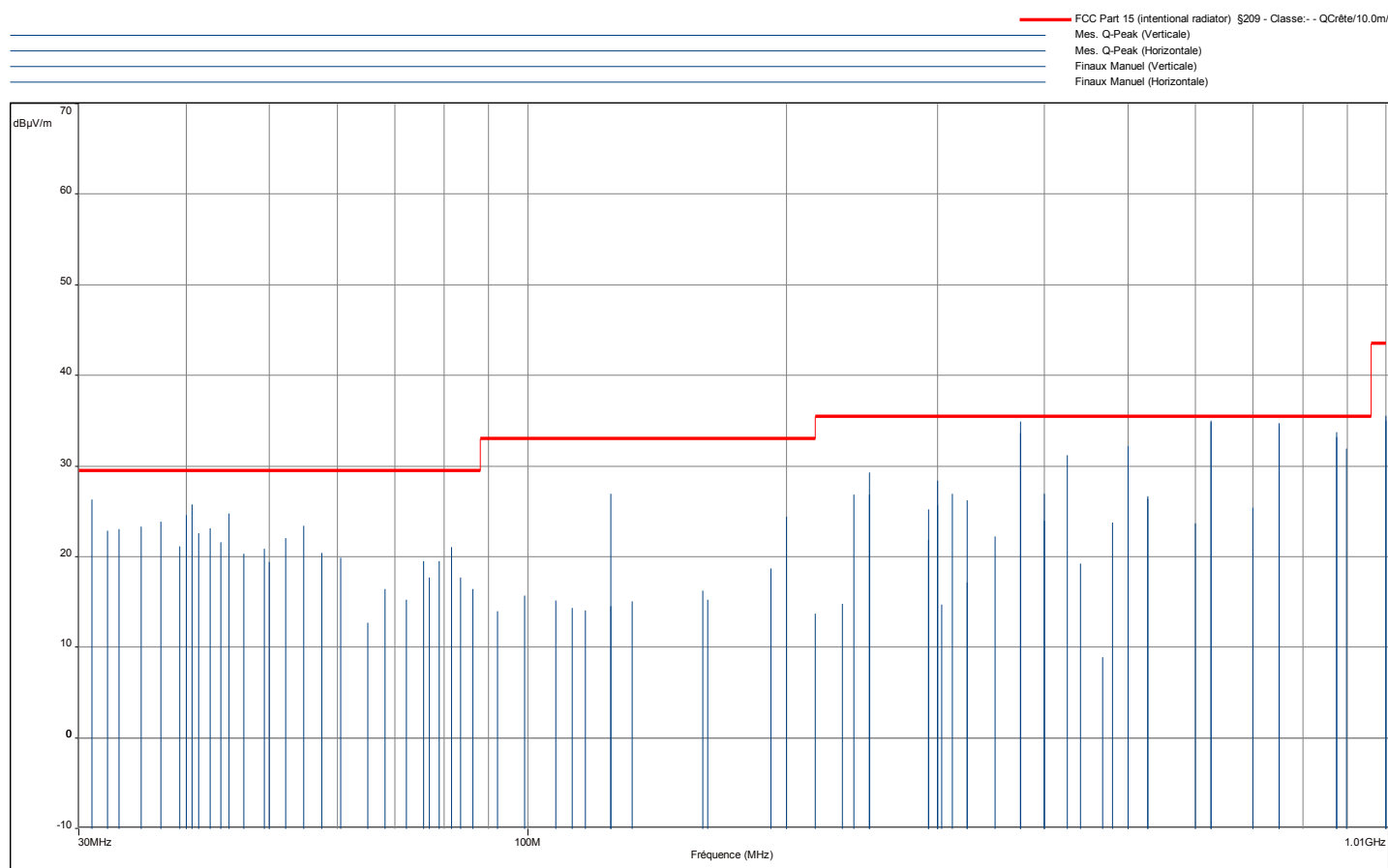
FCC Part.15 class B (30 to 1000MHz)

SAGEMCOM BROADBAND SAS

WIFI BOX

TYPE : FAST 5260CV + Power supply NBS30E120250VU

Quasi peak measurement



The radiated measurements were performed in both vertical and horizontal polarization.
The worst case has been recorded after maximization levels.

Worst frequencies for radiated emissions

Frequency (MHz)	Peak Level dBμV/m)	Limit
375	34.94	35.5
500	32.21	35.5
625	35.05	35.5
750	34.79	35.5
875	33.75	35.5
999.9	35.54	43.5



Diagram N°2

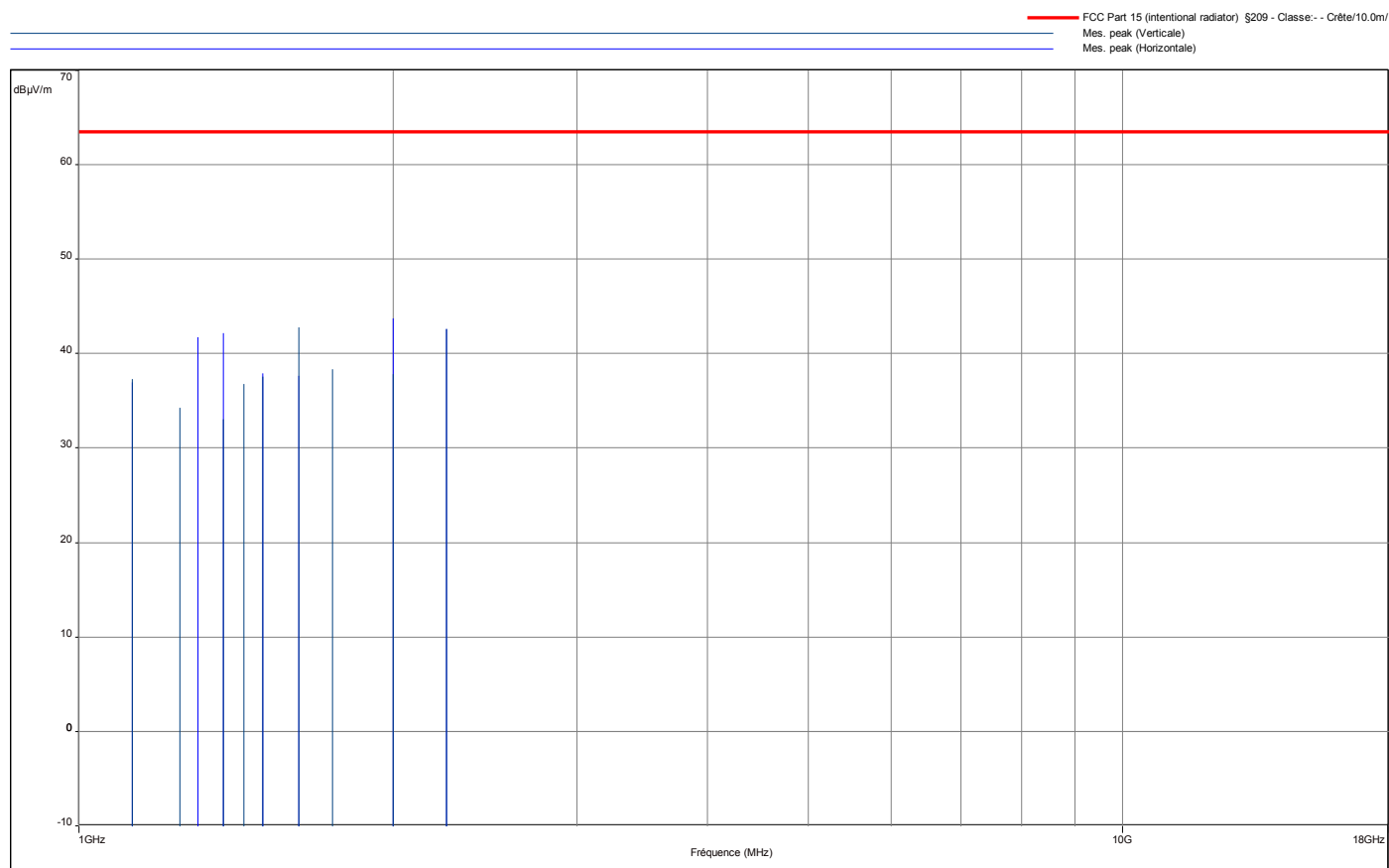
FCC Part.15 class B (1 to 18GHz)

SAGEMCOM BROADBAND SAS

WIFI BOX

TYPE : FAST 5260CV + Power supply NBS30E120250VU

peak measurement



The radiated measurements were performed in both vertical and horizontal polarization.
The worst case has been recorded after maximization levels.



Diagram N°3

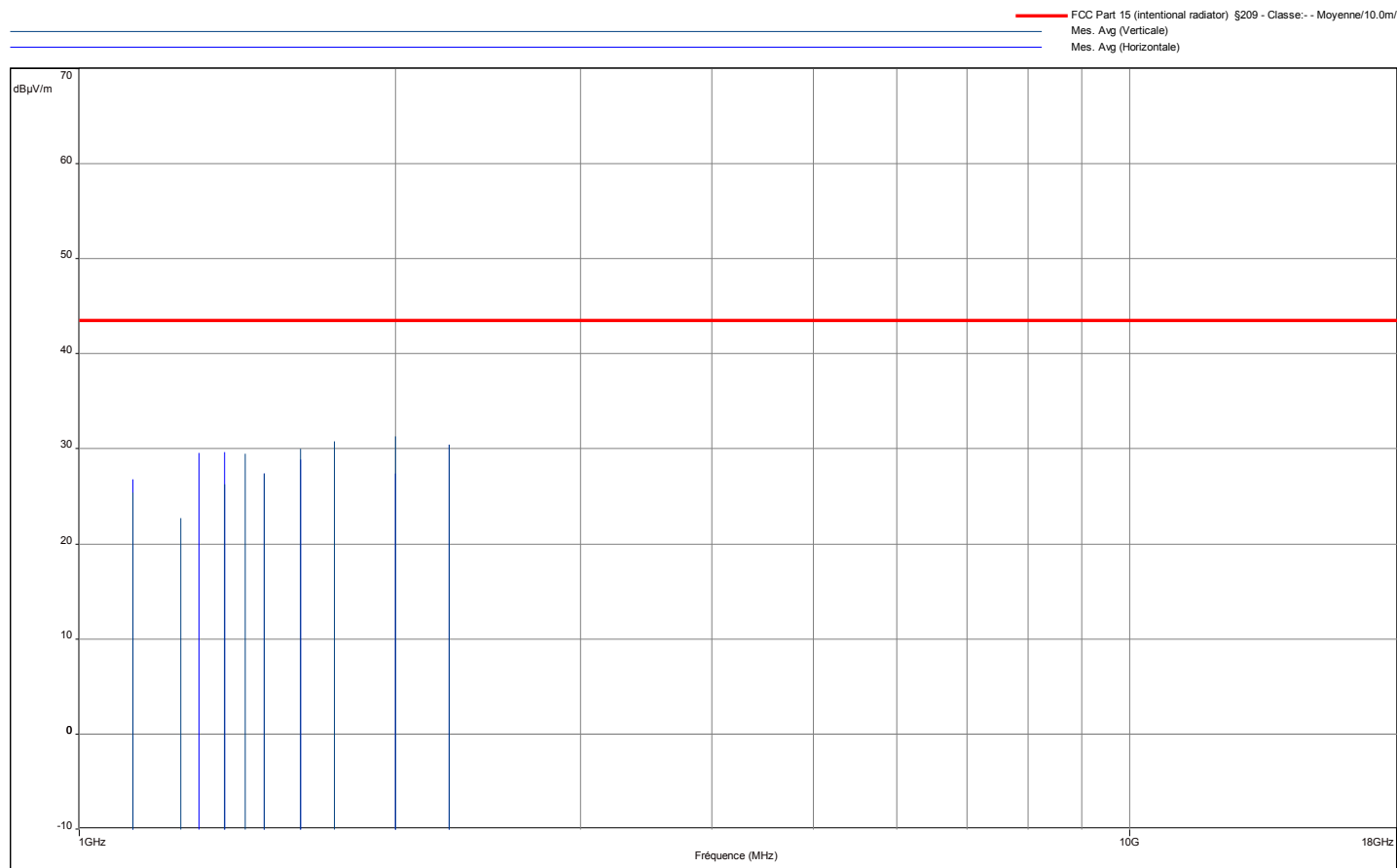
FCC Part.15 class B (1 to 18GHz)

SAGEMCOM BROADBAND SAS

WIFI BOX

TYPE : FAST 5260CV + Power supply NBS30E120250VU

Average value measurement



The radiated measurements were performed in both vertical and horizontal polarization.
The worst case has been recorded after maximization levels.

Diagram N°4

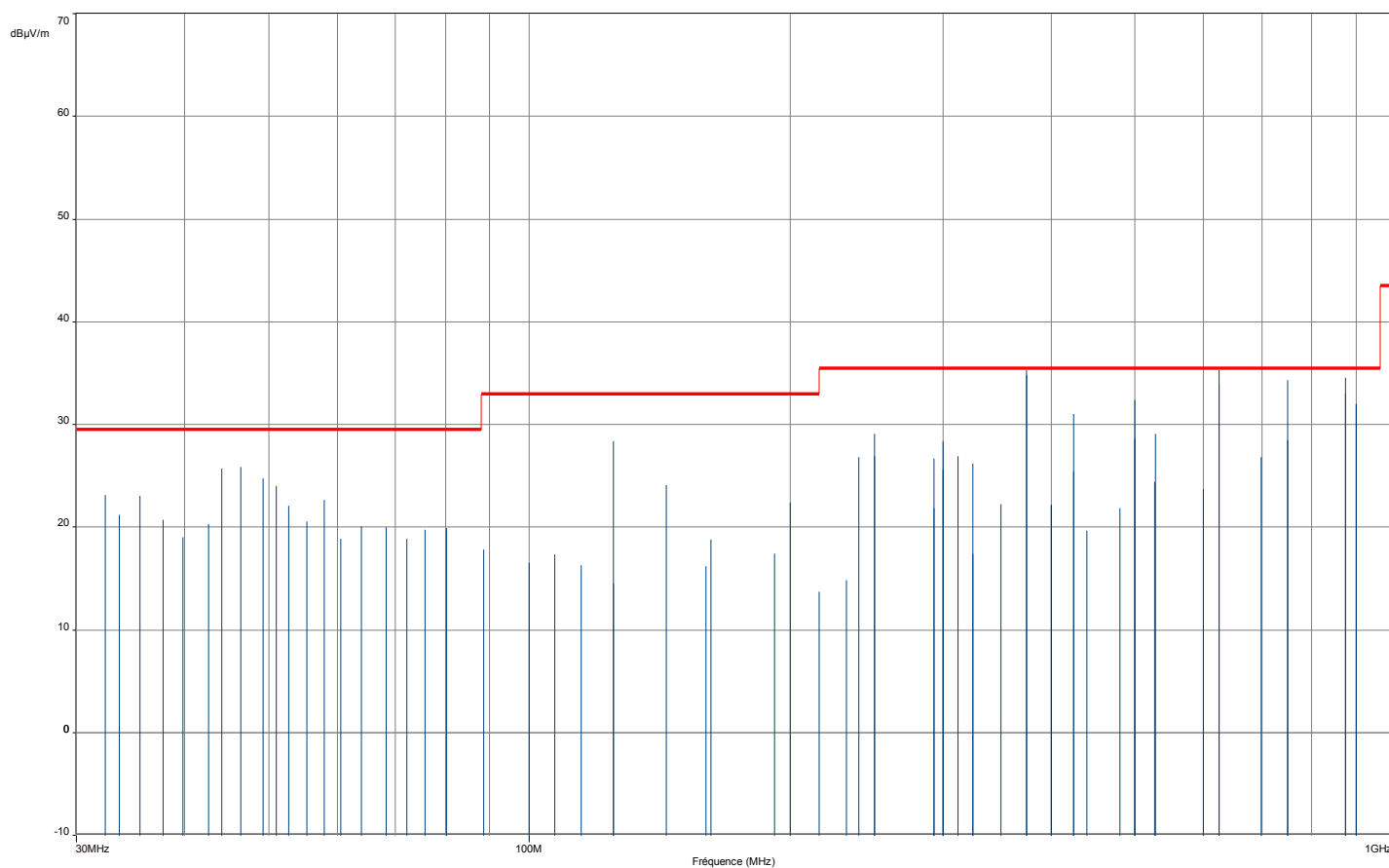
FCC Part.15 class B (30 to 1000MHz)

SAGEMCOM BROADBAND SAS

WIFI BOX

TYPE : FAST 5260CV + Power supply MSA-C2500IS 12.0-30D-US

Quasi peak measurement



The radiated measurements were performed in both vertical and horizontal polarization.
The worst case has been recorded after maximization levels.

Worst frequencies for radiated emissions

Frequency (MHz)	Peak Level dBμV/m)	Limit
375	35.3	35.5
500	32.40	35.5
625	35.35	35.5
750	34.35	35.5
875	34.6	35.5
999.9	34.8	43.5



Diagram N°5

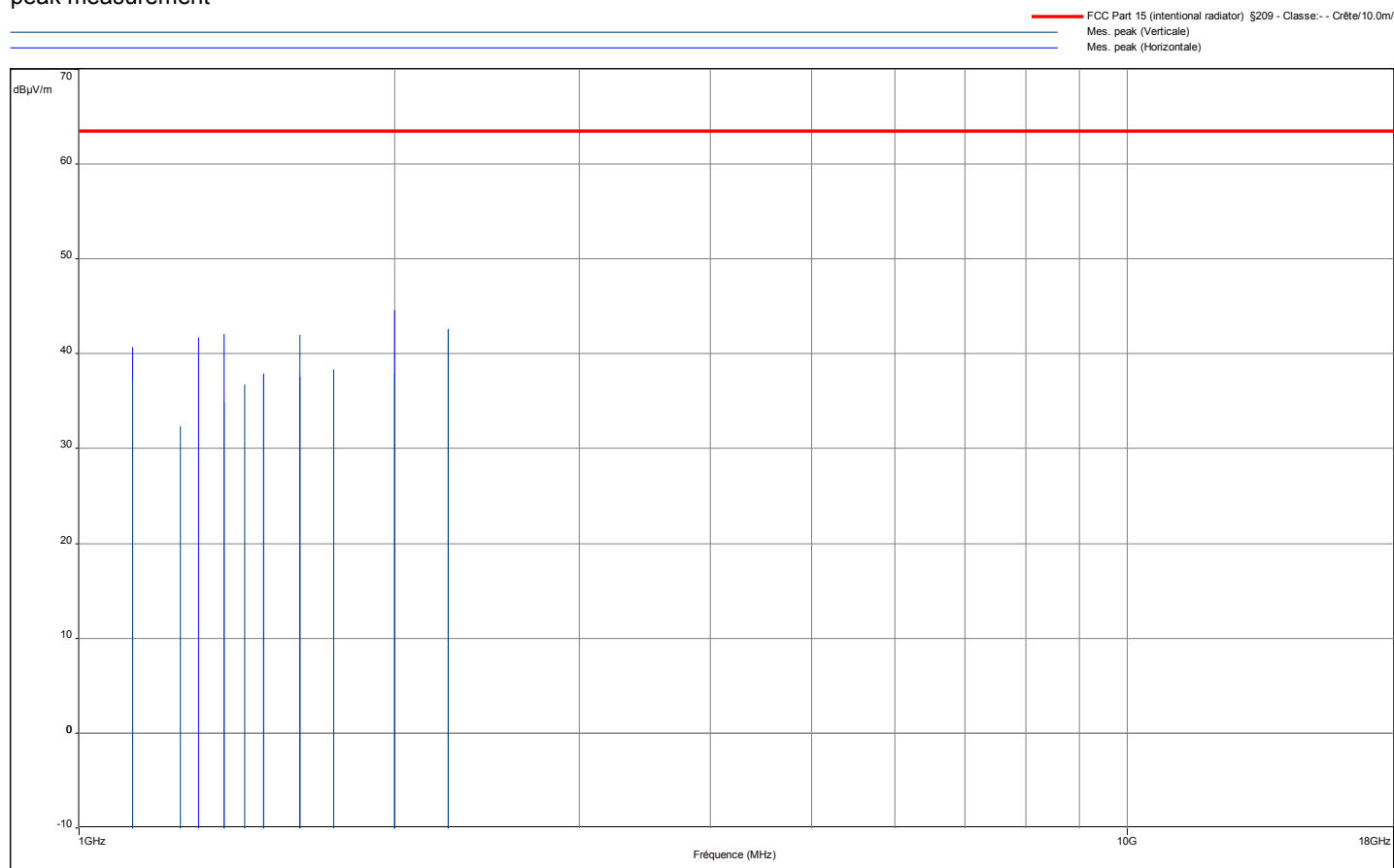
FCC Part.15 class B (1 to 18GHz)

SAGEMCOM BROADBAND SAS

WIFI BOX

TYPE : FAST 5260CV + Power supply MSA-C2500IS 12.0-30D-US

peak measurement



The radiated measurements were performed in both vertical and horizontal polarization.
The worst case has been recorded after maximization levels.



Diagram N°6

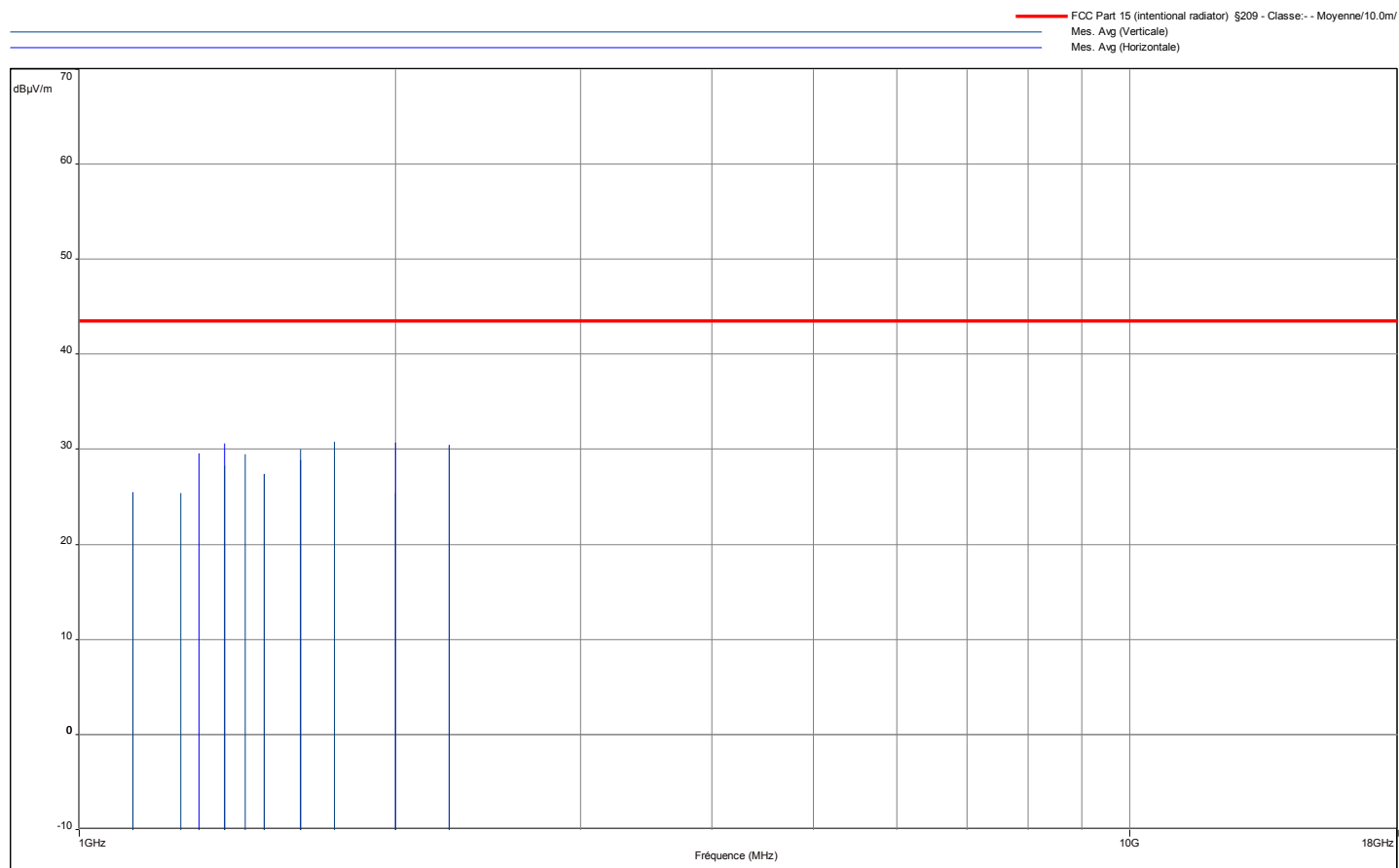
FCC Part.15 class B (1 to 18GHz)

SAGEMCOM BROADBAND SAS

WIFI BOX

TYPE : FAST 5260CV + Power supply MSA-C2500IS 12.0-30D-US

Average value measurement



The radiated measurements were performed in both vertical and horizontal polarization.
The worst case has been recorded after maximization levels.



3.6. CONCLUSION

Measurements of Radiated Emissions, performed on the sample of the product **FAST 5260CV** (& FAST 5260), SN: NQ1529409006864 , in configuration and description presented in this test report, show levels **conform to** the FCC part 15.209 limits.

As a consequence, FAST 5260 version is thereby considered as compliant with the FCC part 15.209 limits.



4. Measurement of conducted disturbance – FCC Part 15.207

4.1. ENVIRONMENTAL CONDITIONS

Test performed by : Laurent DENEUX
Date of test : November 13th .2015
Ambient temperature : 21°C
Relative humidity : 55%

4.2. TEST SETUP

Specifications:

Frequency 0.15 – 30 MHz RBW 9 kHz
Detector Peak , Quasi Peak and average

The measurement is performed on power supply with a LISN and telecommunication lines with RSI or current clamp for shielded cables.

Operating conditions:

- Deviation method:

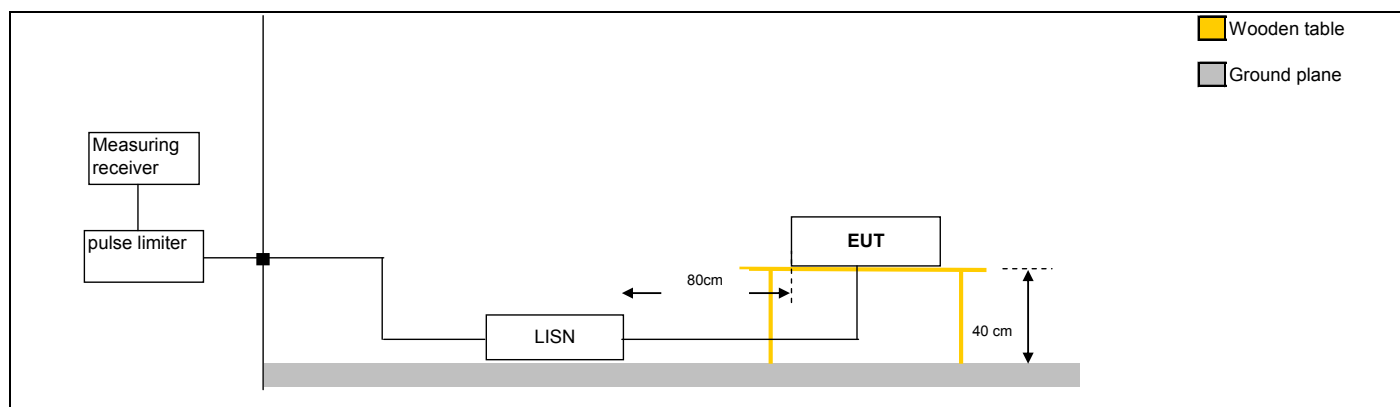
- ☐ Yes
☒ No

-Product installation:

- ☒ The EUT is installed on a wooden table 80 cm above the reference plane, at 80cm of the LISN and at 40cm of the vertical conductive wall
☐ The EUT is installed on a wooden table 40 cm above the reference plane, at 80cm of the LISN.
☐ The EUT is installed 10 cm above the reference plane, at 80cm of the LISN..

Operating mode:

- ☒ Mode 1 ☒ Mode 2 ☐ Mode 3 ...



Test set up of conducted emission on power supply



Test set up of conducted emission on power supply



Test set up of conducted emission on power supply



4.3. LIMIT

☐ Power supply Class A

Frequency Bands/frequencies	dB (μV/m) quasi-peak	dB (μV/m) average
0.15-0.5MHz	79	66
0.5-30 MHz	73	60

☒ Power supply Class B

Frequency Bands/frequencies	dB (μV/m) quasi-peak	dB (μV/m) average
0.15-0.5MHz	66-56	56-46
0.5-5 MHz	56	46
5-30 MHz	60	50



4.4. TEST EQUIPMENT LIST

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	ROHDE & SCHWARZ	ESU	A2642018	2015/01	2016/01
Pulse limiter	RHODE & SCHWARZ	ESH3-Z2	A2649008	2015/02	2016/02
V ISLN	ROHDE & SCHWARZ	ESH3-Z5	C2322002	2015/06	2016/06
Ground plan	LCIE	-	-	-	-
absorber	LCIE	-	A5329589	2015/07	2016/07
Cable	-	-	A5329417	2015/10	2016/10

4.5. RESULTS

Diagram N°1

FCC Part.15 class B

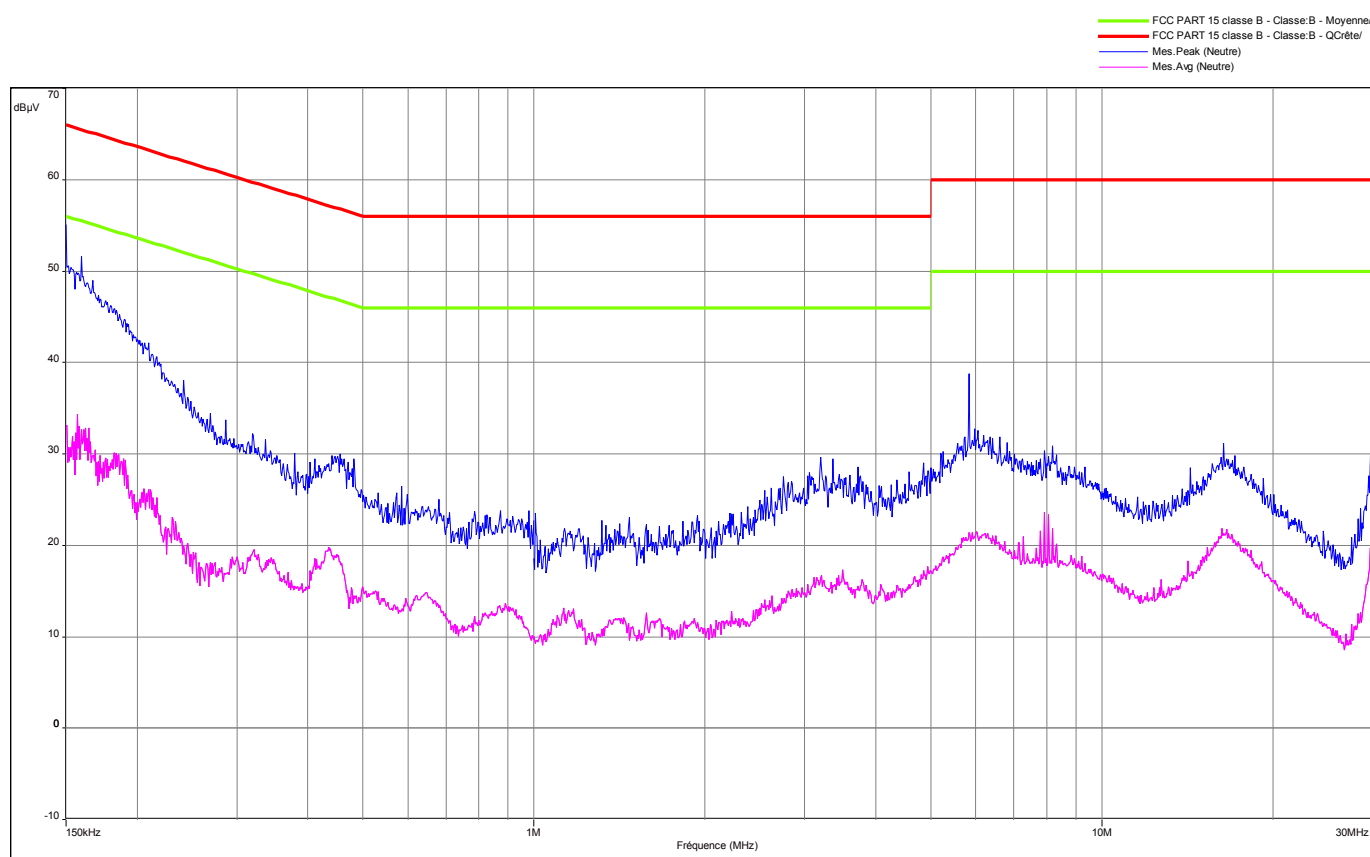
SAGEMCOM BROADBAND SAS

WIFI BOX

TYPE : FAST 5260CV + Power supply NBS30E120250VU

CONDUCTOR 1 ; 120V-60Hz

Peak and average value



Worst frequencies for measurement on main power supply –voltage

Frequency kHz	conductor	conducted level dBμV					
		peak detection	Quasi peak limit	Margin / Quasi peak limit	Average value	Average value limit	Margin / average value limit
160	1	51.7	65.5	-13.8	34.3	55.5	-21.2
455	1	30	56.8	-26.8	20	46.8	-26.8
3202	1	29.7	56	-26.3	17.3	46	-28.7
5840	1	39	60	-21	24	50	-26
16378	1	31	60	-29	22	50	-28



Diagram N°2

FCC Part.15 class B

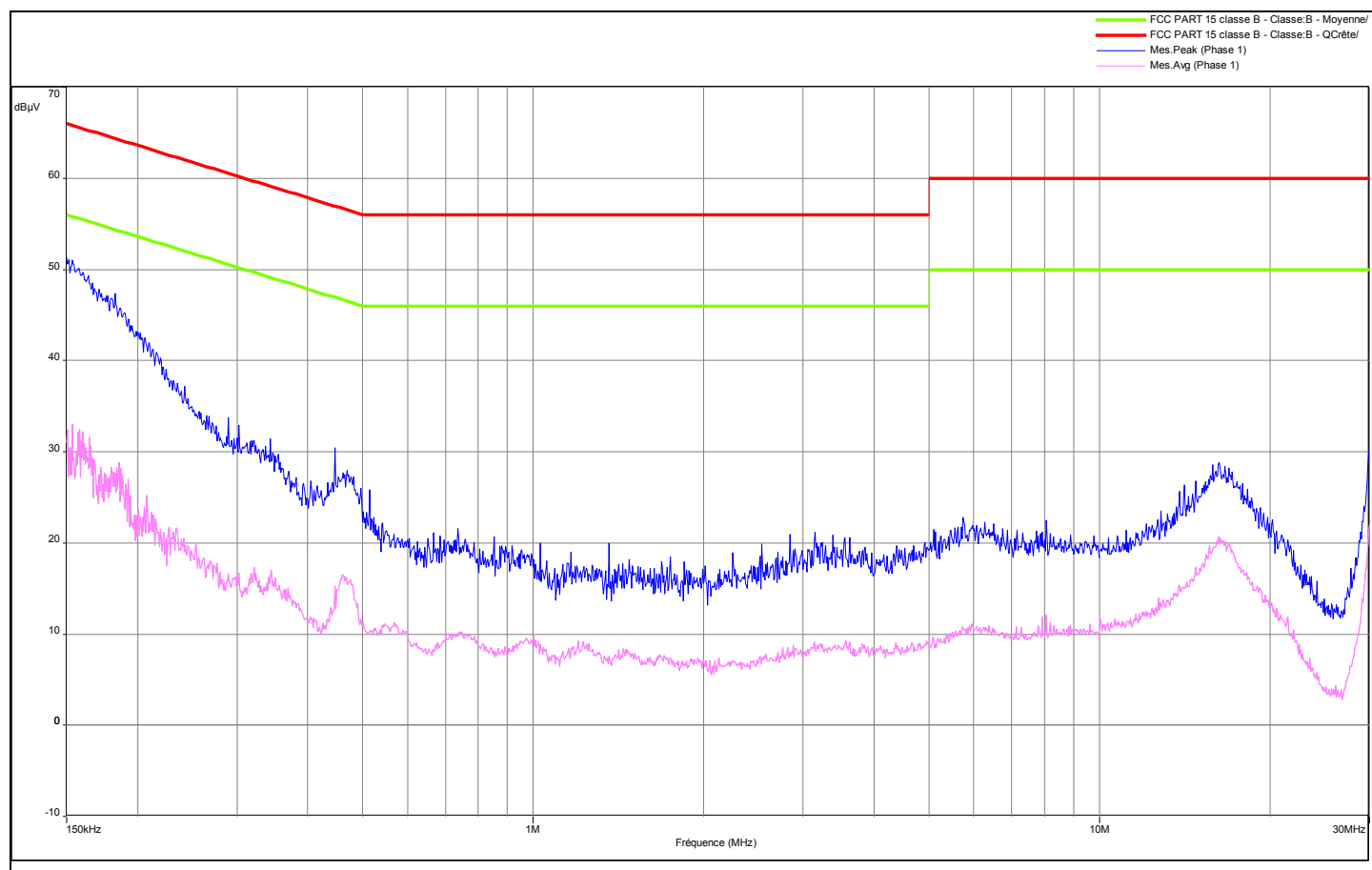
SAGEMCOM BROADBAND SAS

WIFI BOX

TYPE : FAST 5260CV + Power supply NBS30E120250VU

CONDUCTOR 2 ; 120V-60Hz

Peak and average value



Worst frequencies for measurement on main power supply –voltage

Frequency kHz	conductor	conducted level dBμV					
		peak detection	Quasi peak limit	Margin / Quasi peak limit	Average value	Average value limit	Margin / average value limit
153.3	2	51	65.7	-14.7	33	55.7	-22.7
447	2	30.5	56.9	-26.4	17	46.9	-29.9
2844	2	21	56	-35	9	46	-37
16278	2	29	60	-31	20	50	-30
30000	2	30	60	-30	22	50	-28

Diagram N°3

FCC Part.15 class B

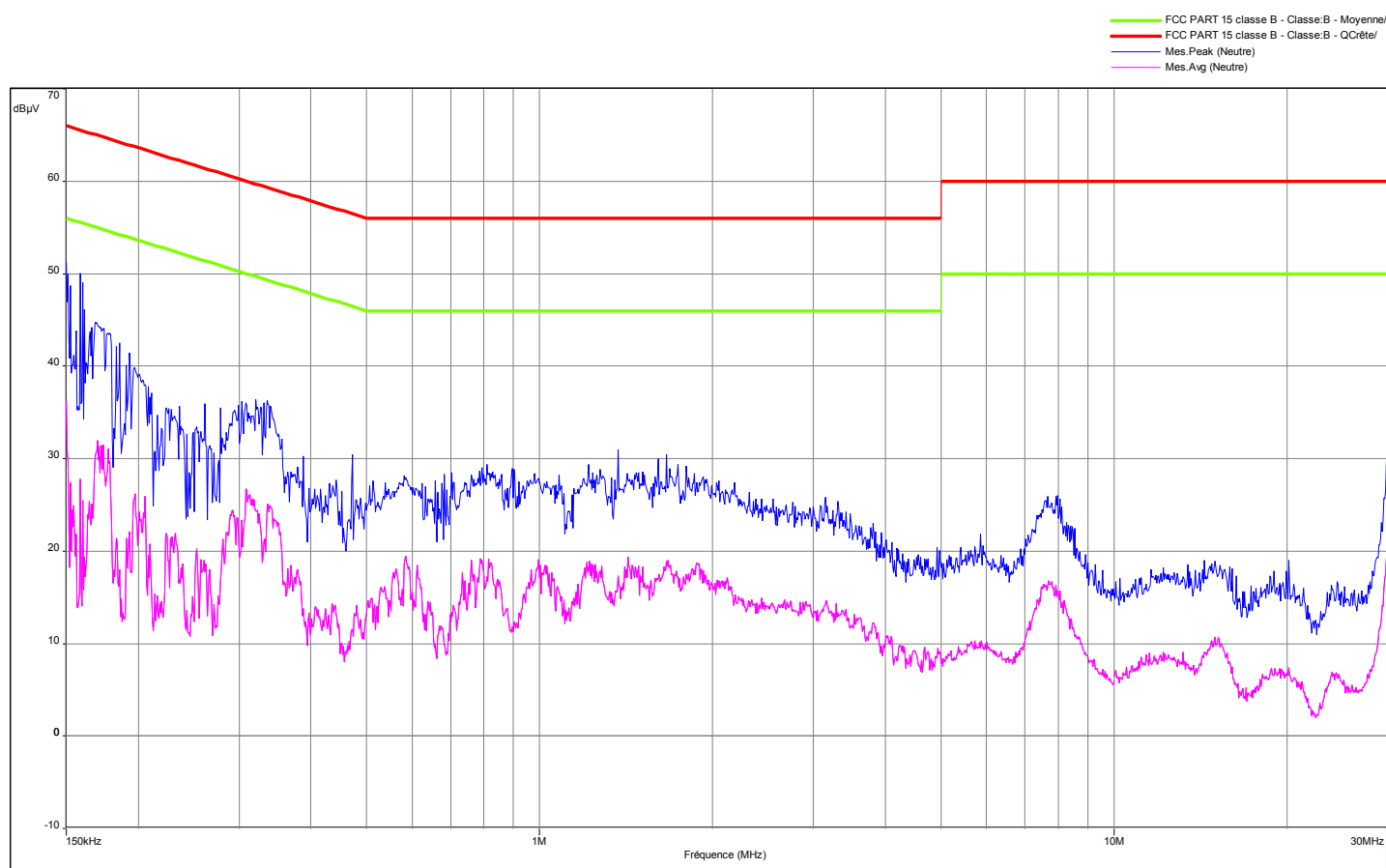
SAGEMCOM BROADBAND SAS

WIFI BOX

TYPE : FAST 5260CV + Power supply MSA-C2500IS 12.0-30D-US

CONDUCTOR 1 ; 120V-60Hz

Peak and average value



Worst frequencies for measurement on main power supply –voltage

Frequency kHz	conductor	conducted level dBμV					
		peak detection	Quasi peak limit	Margin / Quasi peak limit	Average value	Average value limit	Margin / average value limit
161.5	1	47.8	65.4	-17.6	32.8	55.4	-22.6
295	1	37.6	60.3	-22.7	27	50.3	-23.3
2370	1	26.6	56	-29.4	15	46	-31
8400	1	25.3	60	-34.7	15	50	-35
30000	1	25.4	60	-34.6	18.5	50	-31.5



Diagram N°4

FCC Part.15 class B

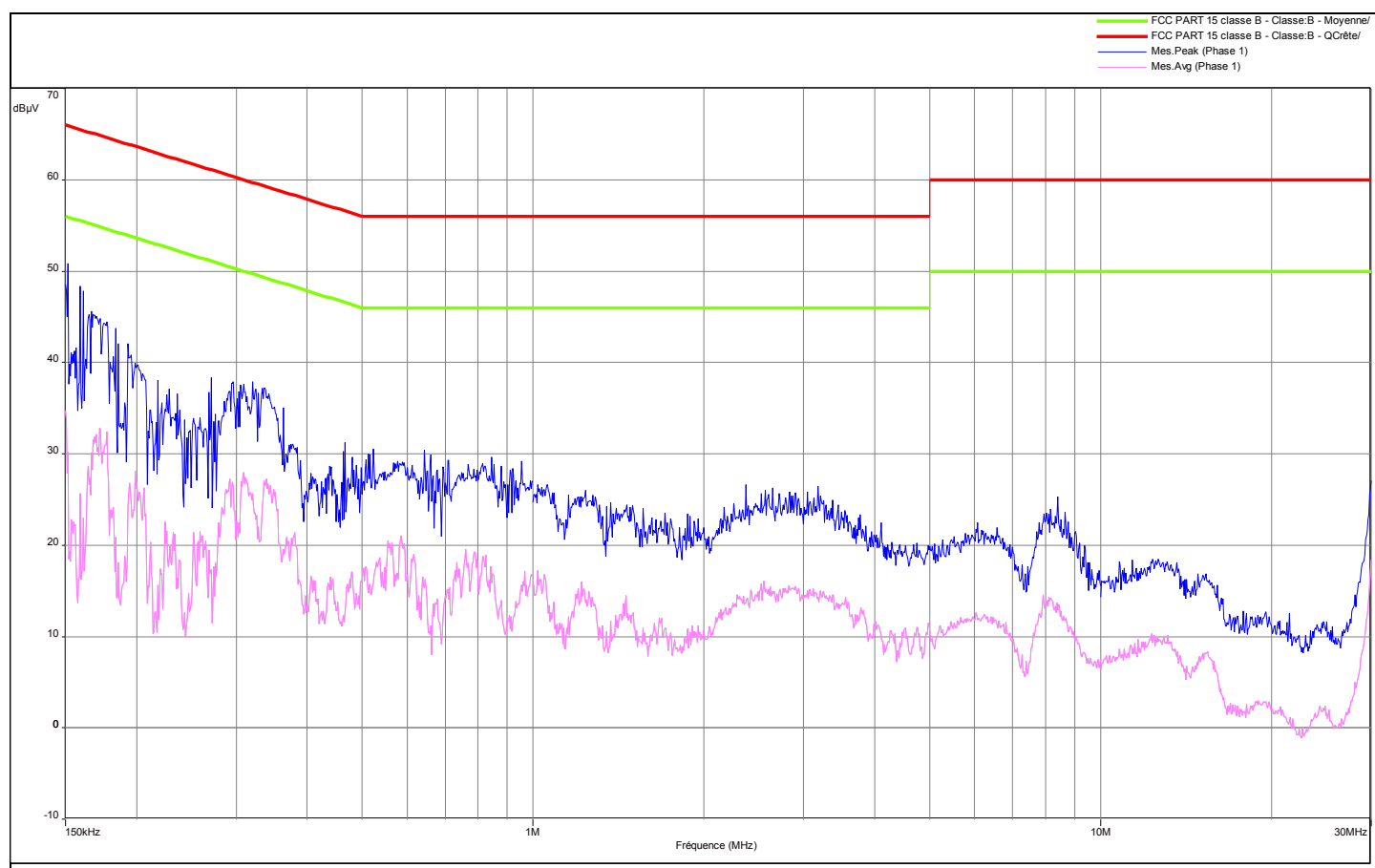
SAGEMCOM BROADBAND SAS

WIFI BOX

TYPE : FAST 5260CV + Power supply MSA-C2500IS 12.0-30D-US

CONDUCTOR 2 ; 120V-60Hz

Peak and average value



Worst frequencies for measurement on main power supply –voltage

Frequency kHz	conductor	conducted level dBμV					
		peak detection	Quasi peak limit	Margin / Quasi peak limit	Average value	Average value limit	Margin / average value limit
158	2	48.3	65.5	-17.2	32	55.5	-23.5
309	2	37.6	60	-22.4	28	50	-22
1368	2	31	56	-25	19	46	-27
7978	2	26	60	-34	17	50	-33
30000	2	30	60	-30	21.2	50	-28.8



4.6. CONCLUSION

Measures of Conducted Emission, performed on the sample of the product **FAST 5260CV** (& FAST 5260), SN: NQ1529409006864, in configuration and description presented in this test report, show levels **conform to** the FCC part 15.207 limits.

As a consequence, FAST 5260 version is thereby considered as compliant with the FCC part 15.207 limits.



5. Uncertainties Chart

Kind of measurement	Wide uncertainty laboratory (k=2) $\pm x$ (dB)	CISPR uncertainty limit $\pm y$ (dB)
Measurement of conducted disturbances in voltage on the AC power port on the Fontenay-aux-Roses site.	3.51	3.6
Measurement of discontinuous conducted disturbances in voltage on the AC power port on the Fontenay-aux-Roses site. (S48 room)	3.45	3.6
Measurement of conducted disturbances in voltage on the AC power port on the Ecuelles site.	3.86	3.6
In Situ measurement of conducted disturbances in voltage on the AC power port with ESH2 receiver	3.51	3.6
Measurement of conducted disturbances in voltage on the DC power port on the Fontenay-aux-Roses site.	3.49	3.6
Measurement of conducted disturbances in voltage on the DC power port on the Ecuelles site.	3.72	3.6
Measurement of conducted disturbances in voltage on the telecommunication port.	3.26	Under consideration
Measurement of conducted disturbances in voltage on the telecommunication port at Ecuelles Site.	3.45	Under consideration
Measurement of conducted disturbances in current	3.09	Under consideration
Measurement of radiated electric field from 30 to 200MHz on the Fontenay-aux-Roses site (with EATON 96002 antenna)	5.2	5.2
Measurement of radiated electric field from 200 to 1000MHz on the Fontenay-aux-Roses site	5.3	5.2
Measurement of radiated electric field from 1 to 18GHz on the Fontenay-aux-Roses site	4.8	Under consideration
Measurement of radiated electric field from 30 to 80MHz in horizontal position on the Ecuelles site (dipole antenna)	3.77	5.2
Measurement of radiated electric field from 30 to 80MHz in vertical position on the Ecuelles site (dipole antenna)	4.12	5.2
Measurement of radiated electric field from 80 to 1000MHz in horizontal position on the Ecuelles site (R&S HL023 A2 logper antenna)	4.19	5.2
Measurement of radiated electric field from 80 to 1000MHz in vertical position on the Ecuelles site (R&S HL023 A2 logper antenna)	4.50	5.2
Measurement of radiated electric field from 30 to 1000MHz in horizontal position on the Ecuelles site (CBL6112 bilog antenna)	4.24	5.2
Measurement of radiated electric field from 30 to 1000MHz in vertical position on the Ecuelles site (CBL6112 bilog antenna)	4.55	5.2
Measurement of radiated electric field from 1 to 18GHz on the Ecuelles site	5.16	Under consideration
Measurement of current harmonics	11.11%	/
Flicker measurement	9.26%	/
Measurement of disturbance power	3.32	4.5
Immunity to conducted disturbances, induced by radio-frequency fields	2.36	/
Immunity to conducted disturbances, induced by radio-frequency fields with injection clamp	2.76	/
Immunity to radiated electromagnetic field	2.64	/
EMF measurement according to EN62233 from 10KHz to 400KHz	23,51%	/

Unless otherwise specified, the decision of conformity takes into account the uncertainty of measures.

End of test report