TEST REPORT

RADIO

Number	133305-667820D
Composition of document	30 pages
FCC Registration Number	166175
Industry Canada Number	6230B
Standards	47 CFR Part 15.207 47 CFR Part 15.209 RSS-Gen, Issue 4
Issued to	SAFRAN MORPHO 18, Chaussée Jules CESAR F-95520 OSNY France
Apparatus under test	Physical Access Control – MA SIGMA Lite Series
Trade mark	Morpho
Manufacturer	Morpho
Reference	MA SIGMA Lite Series
Model	MPH-AC001A
Serial number	15210ML0000002
IC	11472A-MPHAC001A
FCC ID	ZBW-MPHAC001A
Test date	2015/07/07 to 2015/07/31
Tests performed by	Irina MATEI & Armand MAHOUNGOU
Test site	Fontenay aux Roses
Date of issue	2015/08/11

Written by :
Armand MAHOUNGOU & Laurent DENEUX & Stéphane CAMBOUE
Tests operator

Approved by :
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SUMMARY

1. TEST PROGRAM

- **References**

Standards: - 47 CFR Part 15C
- RSS-210
- RSS-Gen
- CISPR 16-4-2
- ANSI C63.4

Standard Section	Test Description	TEST RESULT - Comments
CFR 47 § 15.203	Antenna Requirement	PASS (Internal Antenna)
CFR 47 § 15.205	Restricted Band Operation	PASS
RSS-Gen § 4.6.1	99% Occupied Bandwidth	PASS (No Limit applicable)
CFR 47 § 15.207 RSS-210 §2.5.1	AC Power Line Conducted Emissions	PASS
CFR 47 § 15.209 (a) RSS-210 §2.5.1	Radiated emissions	PASS

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

2.1. HARDWARE & SOFTWARE IDENTIFICATION

- **Equipment under test (EUT):**

Photograph of EUT

- **Auxiliary equipment (AE) used for testing:**

Power supply POE-164

Power supply FW7362/12

Prox card

Photograph of AE (Not sell with the product)

- **Input/output:**

- Input Power
- Ethernet

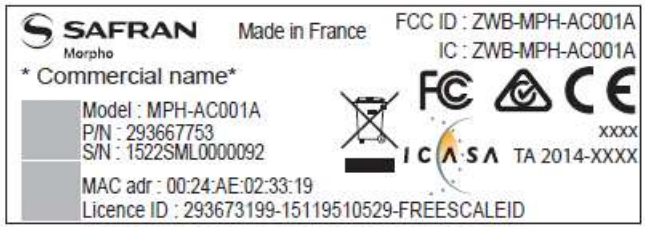
- **Equipment information:**

- External antenna connector: No
- Frequency used: 125KHz
- Modulation: No modulation
- Number of channel: 1
- Antenna type: Integral
- Stand By mode: No
- Type of power source: External power supply
- Power supply: Vmin : 108 V
  Vnom: 120 V
  Vmax : 132 V
- Temperature range: Tmin: -30°C (IC) -20°C (FCC)
  Tnom: 20°C
  Tmax: +60°C

2.2. RUNNING MODE

The EUT is set in the following modes during tests:
- Permanent emission-reception with modulation powered by Power supply POE-164
- Permanent emission-reception with modulation powered by Power supply FW7362/12

2.3. EQUIPEMENT LABELLING



2.4. EQUIPMENT MODIFICATIONS

No equipment modification has been necessary during testing.

3. 99% OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : 2015/07/31
Ambient temperature : 24°C
Relative humidity : 42%

3.2. TEST SETUP

The Equipment Under Test is installed on a table and set in permanent emission with modulation. Measurement is performed with a spectrum analyzer on the EUT with a test fixture. The product has been tested according to the RSS-GEN § 4.6.1 reference method.

Spectrum Analyzer Setting:
Center frequency= 125kHz
Span= At least the emission spectrum
Amplitude= Sufficient to observe the signal amplitude
RBW= 1% of span
VBW= 3*RBW
Sweep= Auto
Trace= Max Hold
Detector= Peak
Occupied Bandwidth 99% activated

Power supply FW7362/12

Power supply POE-164

Photograph for 99% Occupied Bandwidth

3.3. RESULTS

Power supply FW7362/12

Temperature	**Tnom**
Voltage	**Vnom**
Frequency	Fnom
Occupied Bandwidth (kHz)	61,0778

Power supply POE-164

Temperature	**Tnom**
Voltage	**Vnom**
Frequency	Fnom
99% Occupied Bandwidth (kHz)	61,2774

See graphics in annex

Result: PASS
Limit: → None

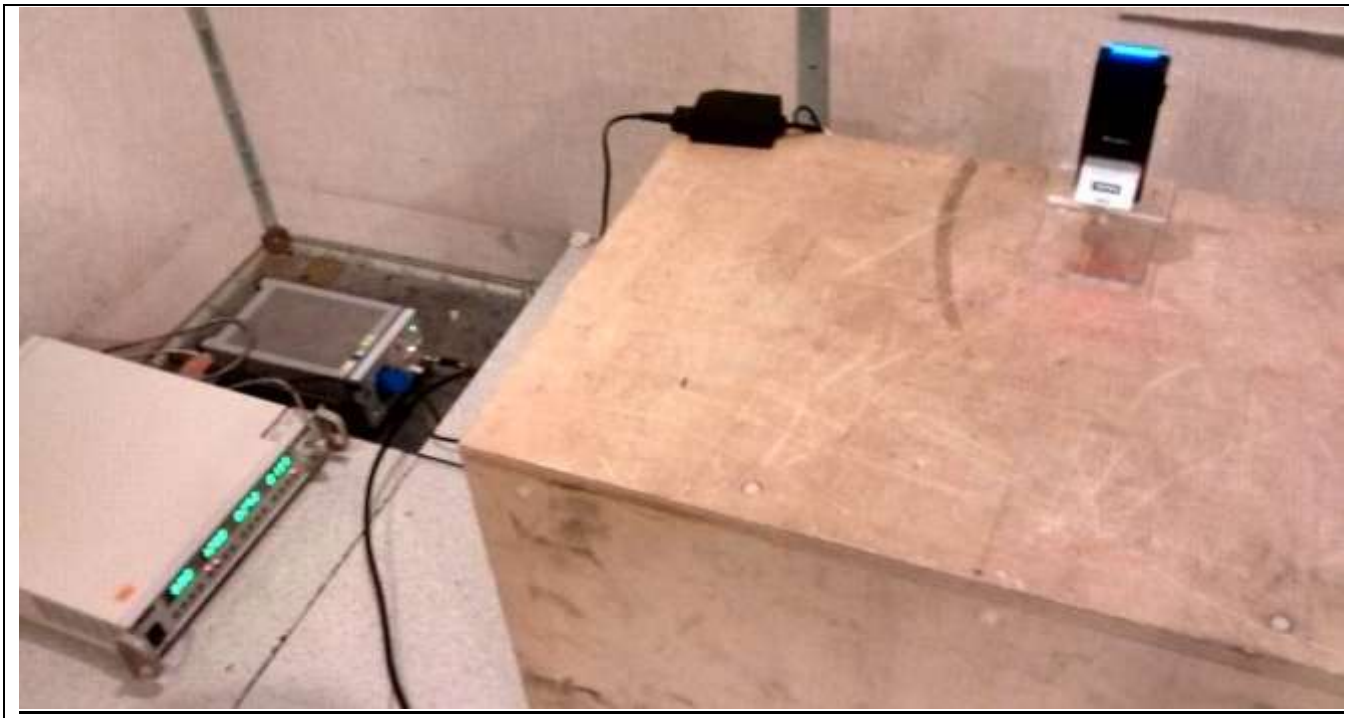
4. AC POWER LINE CONDUCTED EMISSIONS

4.1. TEST CONDITIONS

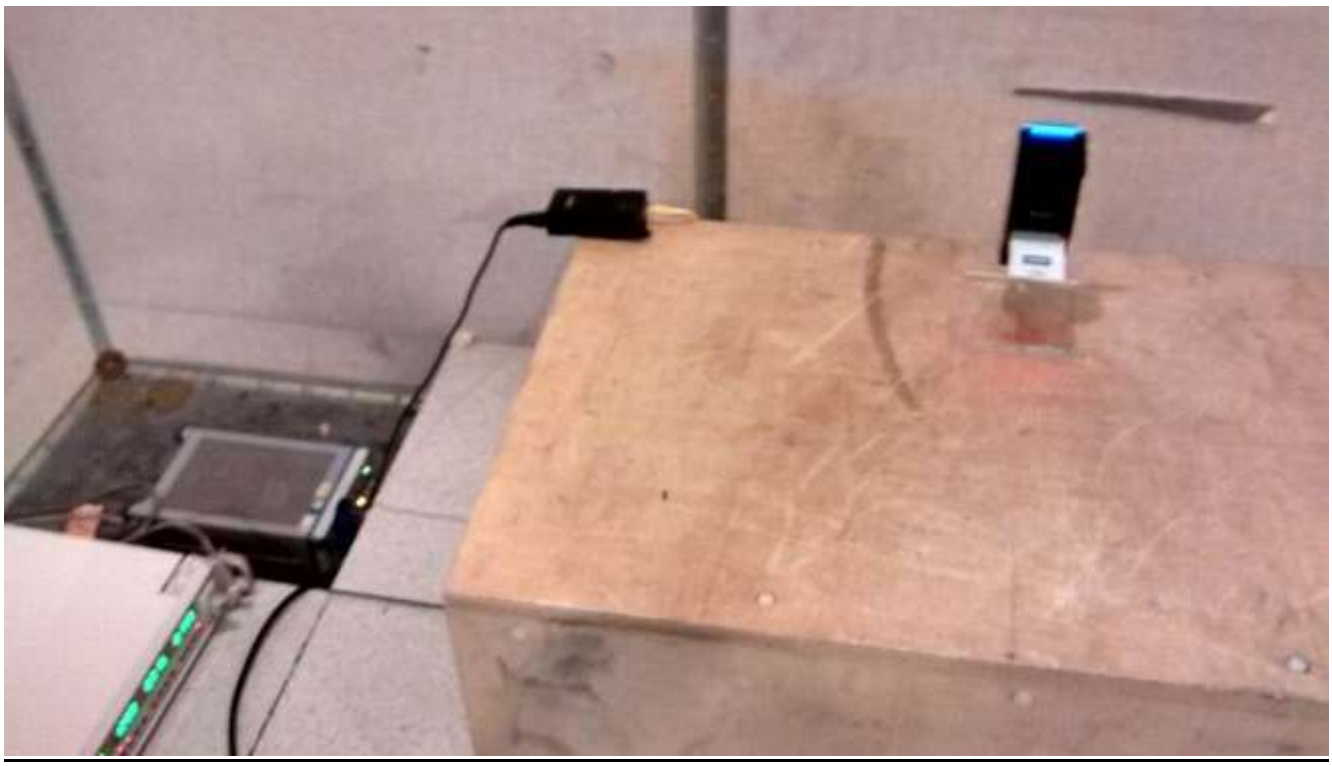
Test performed by : Armand MAHOUNGOU
Date of test : 2015/07/03
Ambient temperature : 27°C
Relative humidity : 52%

4.2. TEST SETUP

The product has been tested according to ANSI C63.4-(2003) 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.



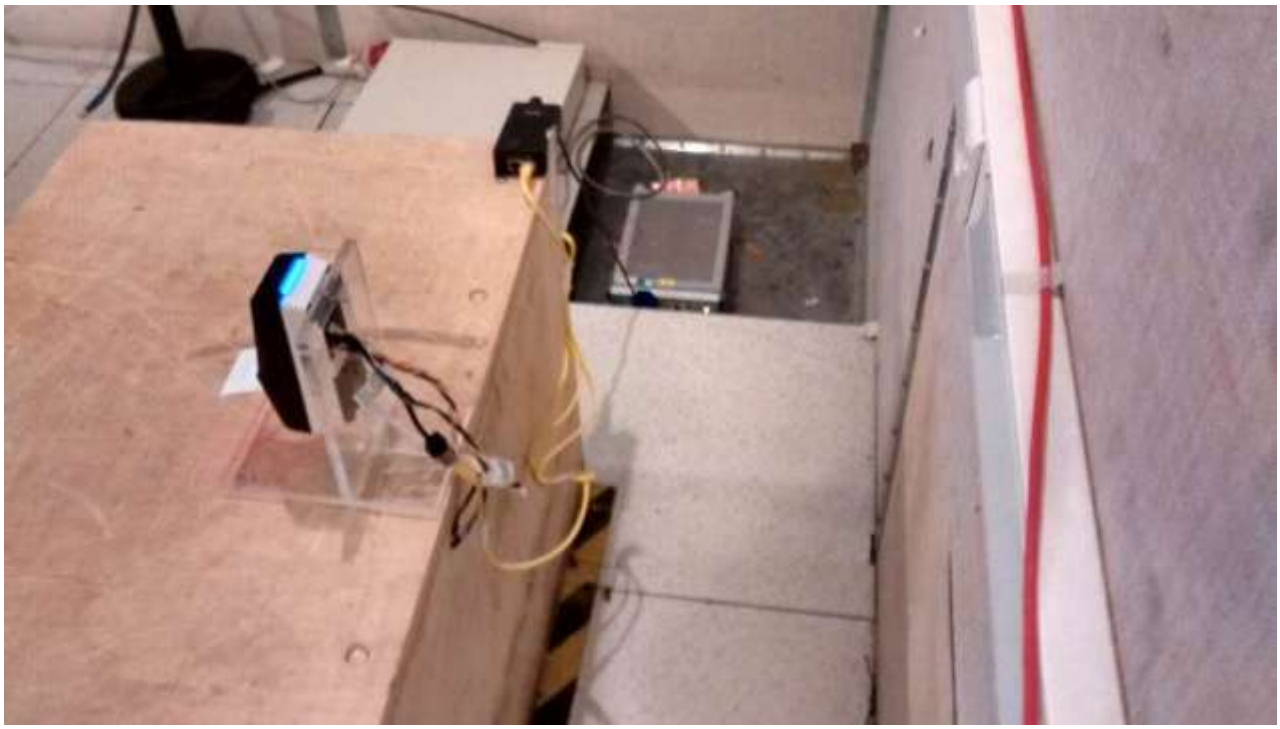
Power supply FW7362/12



Power supply POE-164

Photograph for AC Power Line Conducted Emissions (Front view)

Power supply FW7362/12



Power supply POE-164

Photograph for AC Power Line Conducted Emissions (Rear view)

4.3. RESULTS

Power supply POE-164
Phase Line

Frequency (MHz)	Peak Level (dBµV/m)	Quasi-Peak Level (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Average Level (dBµV/m)	Average Limit (dBµV/m)
0.155	53.36	-	65.7	37.51	55.7
0.435	55.04	-	57.1	45.2	47.1
1.21	42.12	-	56	32.45	46
4.72	40.78	-	56	30.73	46
13.74	48.61	-	60	41.05	50
25.33	48.56	-	60	42.22	50

Power supply POE-164
Neutral Line

Frequency (MHz)	Peak Level (dBµV/m)	Quasi-Peak Level (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Average Level (dBµV/m)	Average Limit (dBµV/m)
0.155	51.66	-	65.7	34.42	55.7
0.435	54.46	-	57.1	44.45	47.1
1.21	40.48	-	56	31.34	46
4.72	38.77	-	56	29.98	46
12.48	49.95	-	60	45.80	50
24.93	48.99	-	60	42.62	50

Power supply FW7362/12
Phase Line

Frequency (MHz)	Peak Level (dBµV/m)	Quasi-Peak Level (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Average Level (dBµV/m)	Average Limit (dBµV/m)
0.155	46.53	-	65.7	26.45	55.7
0.64	32.88	-	56	28.57	46
24	37.54	-	60	32.84	50
26.02	35.47	-	60	26.02	50

Power supply FW7362/12
Neutral Line

Frequency (MHz)	Peak Level (dBµV/m)	Quasi-Peak Level (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Average Level (dBµV/m)	Average Limit (dBµV/m)
0.155	46.53	-	65.7	26.45	55.7
0.64	32.88	-	56	28.57	46
24	37.54	-	60	32.84	50
26.02	35.47	-	60	26.02	50

See annex for graphics

Result: PASS
Limit: → **Quasi-Peak**
0,15kHz to 0,5MHz: 66dBµV/m to 56dBµV/m*
0,5MHz to 5MHz: 56dBµV/m
5MHz to 30MHz: 60dBµV/m

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

*Decreases with the logarithm of the frequency

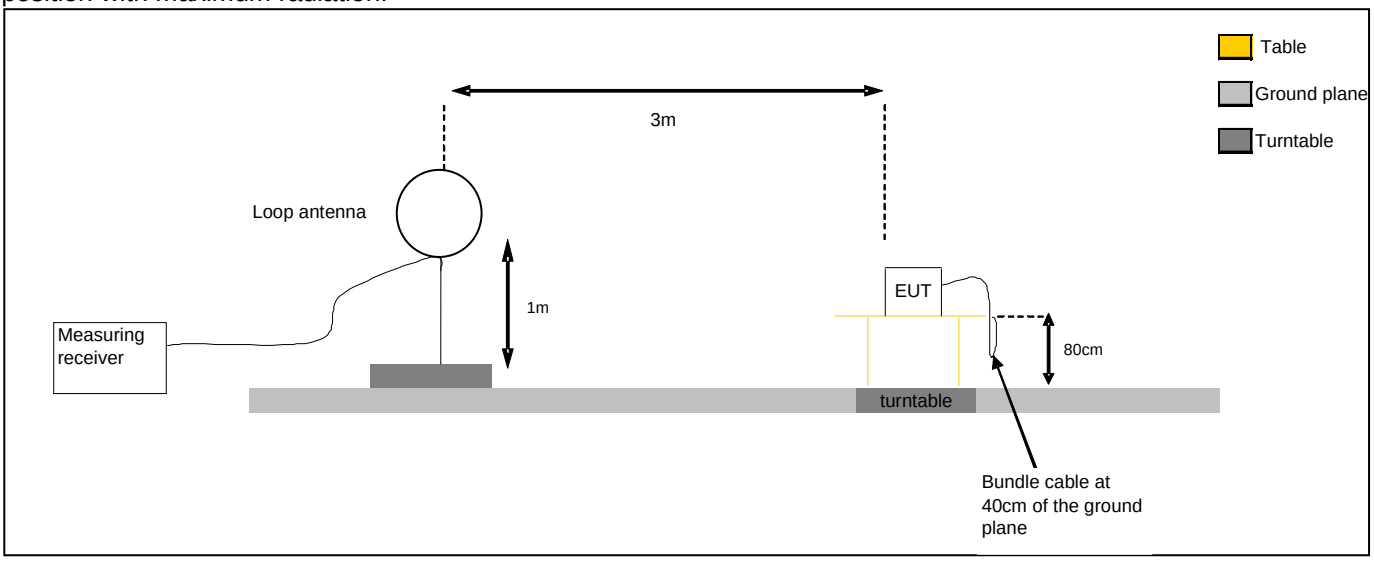
5. RADIATED EMISSIONS

5.1. TEST CONDITIONS

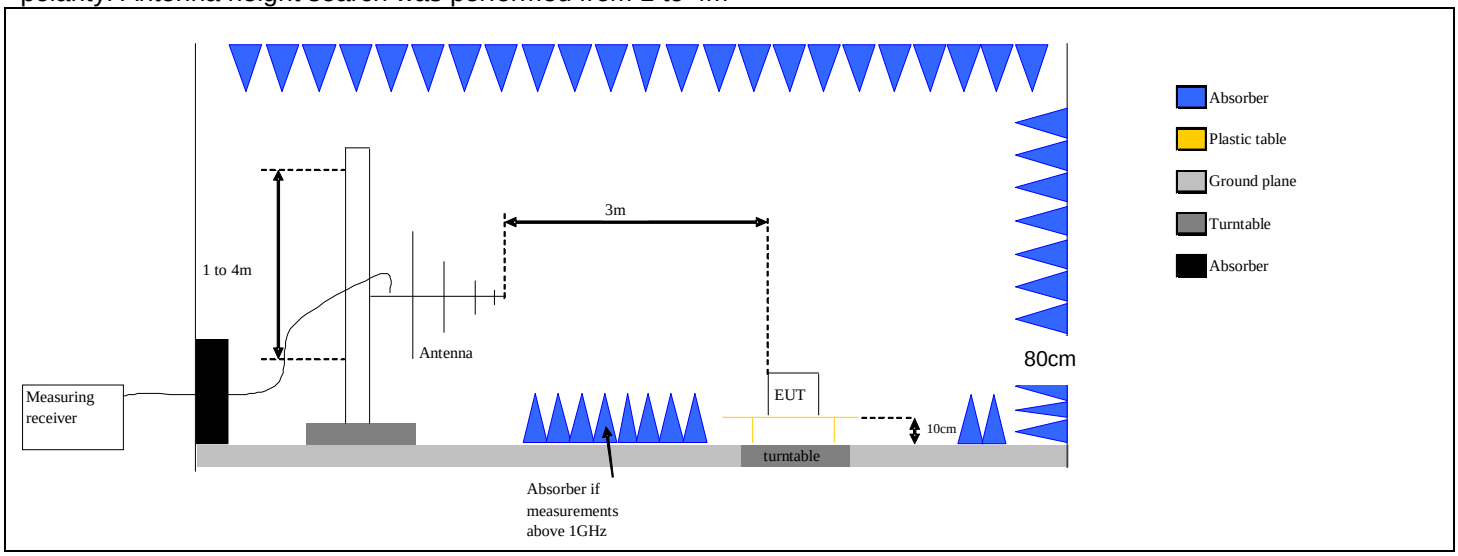
Test performed by : Irina MATEI
Date of test : 2015/07/10
Ambient temperature : 24°C
Relative humidity : 42%

5.2. TEST SETUP

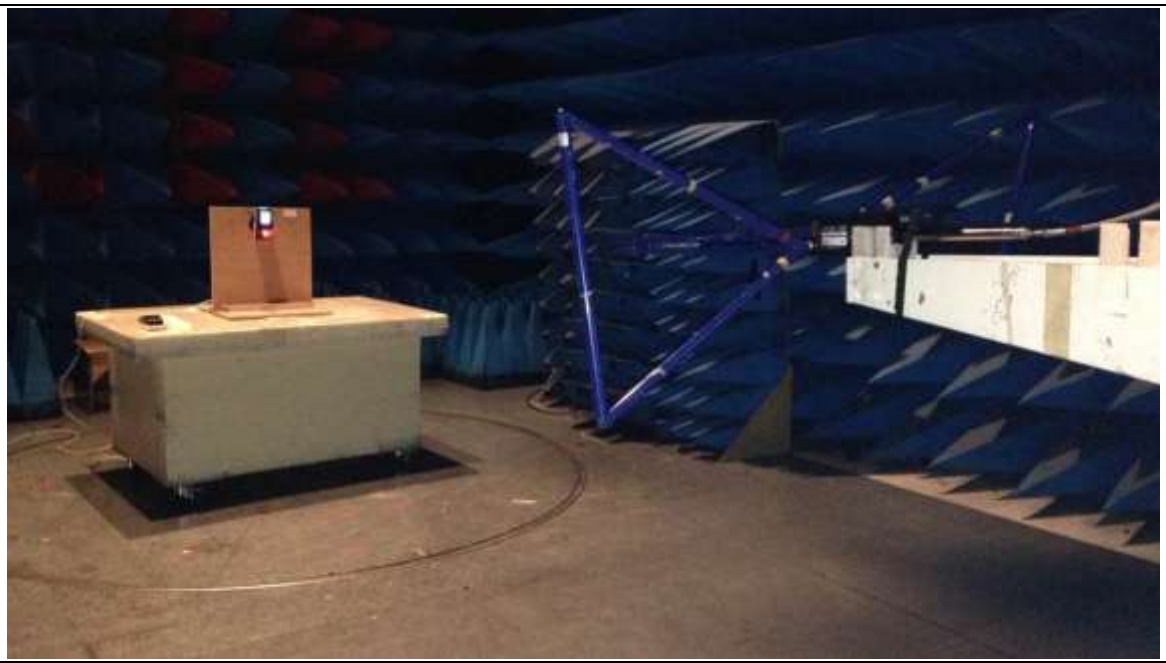
The EUT is placed at 3m distance of the loop antenna (0.009 to 30MHz) on a table 80cm height. The level has been maximised by turning the EUT with the rotating table and with the antenna at 0° and 90° around its vertical and horizontal axes. Antenna height was 1m. Pre scans were performed on the EUT put on its three axes to determine the position with maximum radiation.



The EUT is placed at 3m distance of the Bilog (30 to 1000MHz) or horn (above 1GHz) antenna on a table 80cm height. The level has been maximised by turning the EUT with the rotating table and with the antenna in horizontal and vertical polarity. Antenna height search was performed from 1 to 4m



Photograph for Field strength below 30MHz



Photograph for Field strength above 30MHz

5.3. RESULTS

- **Characterization (9kHz to 30MHz):**

Power supply FW7362/12
Perpendicular antenna
Below 30MHz

Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (3m) (dBµV/m)
0.116	47.7	-	106.3
0.126	35.02	-	105.6
0.144	50.79	-	104.4
0.56	59.99	-	72.5
0.59	59.69	-	72.1
1.62	52.25	-	63.3
3.55	47.24	-	69.5
5.68	45.74	-	69.5
6.7	46.8	-	69.5

Power supply FW7362/12
Paralell antenna
Below 30MHz

Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (3m) (dBµV/m)
0.126	65.3	-	105.6
0.71	55.1	-	70.5
0.81	55.65	-	69.4
0.87	56.3	-	68.7
1.93	51.79	-	69.5
3.86	51.8	-	69.5
4.97	51.02	-	69.5

- **Characterization (9kHz to 30MHz):**

Power supply POE-164
Perpendicular antenna
Below 30MHz

Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (3m) (dBµV/m)
0.024	56.49	-	120.1
0.051	53.03	-	113.4
0.106	49.68	-	107.1
0.147	48.2	-	104.2
1.01	54.8	-	67.4
2.94	49.3	-	69.5
3.93	46.98	-	69.5
4.97	46.30	-	69.5
7.11	43.98	-	69.5

Power supply POE-164
Paralell antenna
Below 30MHz

Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (3m) (dBµV/m)
0.028	65.8	-	118.6
0.056	65.9	-	112.5
0.083	65.9	-	109.1
0.126	66.1	-	105.3
0.710	55.3	-	70.6
0.910	54.5	-	68.4
3.04	53.5	-	69.5
5.07	50.6	-	69.5
7.21	48.5	-	69.5

Result: PASS
Limit: → 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 69.5dBµV/m (3m) QPeak

Characterization (30MHz to 6GHz)

Power supply POE
Vertical Polarization

Below 1GHz

Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)
30.85	39.75	35.68	40
47.95	41.3	33.35	40
53.55	40.28	38	40
86.1	34.03	-	40
108.3	30.88	-	43.5
125	28.7	-	43.5
192	28.2	-	43.5
216.02	30.41	-	46
264.02	33.58	-	46
393.44	30.74	-	46
600.02	31.9	-	46

Above 1GHz

Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
2807	28.9	53.9	42.38	73.9

Power supply POE
Horizontal Polarization

Below 1GHz

Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)
86.1	34.91	-	40
125	34.4	-	43.5
141.2	32.47	-	43.5
216.02	33.24	-	46
393.44	27.71	-	46

Above 1GHz

Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
1584	25.59	53.9	37.42	73.9

- **Characterization (30MHz to 6GHz):**

Power supply FW7362/12
Vertical Polarization

Below 1GHz

Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)
32.6	37.92	-	40
43.8	37.27	-	40
66.3	33.84	-	40
91.05	29.28	-	43.5
108.3	30.75	-	43.5
125	33.88	-	43.5
141.2	30.15	-	43.5
192	30.91	-	43.5
216.02	33.37	-	46
264.02	30.76	-	46
393.44	29.44	-	46
600.02	31.06	-	46
792.02	31.84	-	46

Above 1GHz

Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
1533.5	25.4	53.9	35.06	73.9

Power supply FW7362/12
Horizontal Polarization

Below 1GHz

Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)
81.2	26.03	-	40
125	35.62	-	43.5
143.3	33.12	-	43.5
216.02	37.46	-	46

Above 1GHz

Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
1188	26.57	53.9	36.12	73.9

See annex for graphics

Result: PASS
Limit: →

30MHz to 88MHz:	100µV/m (3m) or 40dBµV/m (3m) QPeak
88MHz to 216MHz:	150µV/m (3m) or 43.5dBµV/m (3m) QPeak
216MHz to 960MHz:	200µV/m (3m) or 46dBµV/m (3m) QPeak
960MHz to 1000MHz:	500µV/m (3m) or 53.9dBµV/m (3m) QPeak
Above 1000MHz:	500µV/m (3m) or 53.9dBµV/m (3m) Average or 73.9dBµV/m (3m) Peak

6. TEST EQUIPMENT LIST

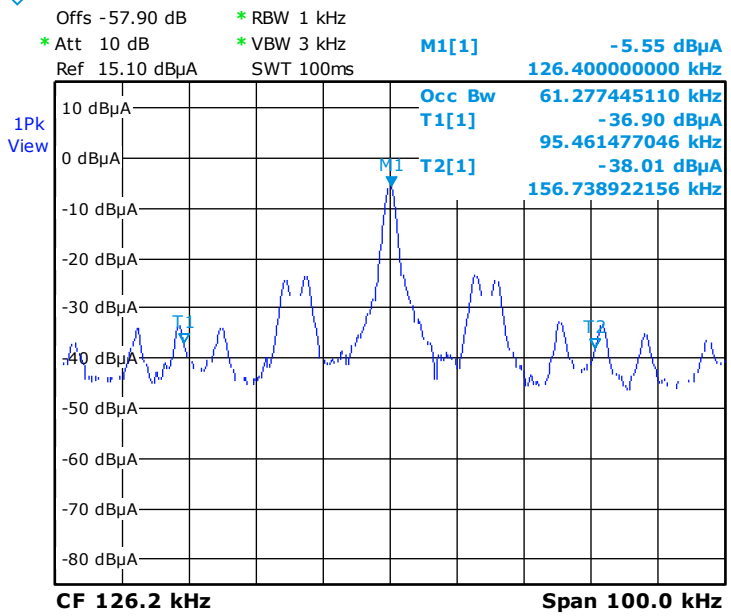
Radiated emissions					
Apparatus	**Trade Mark**	**Type**	**Registration number**	**Calibration date**	**Calibration due**
Semi anechoic chamber	SIEPEL	-	D3044008	2014/09	2015/09
EMI receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2015/01	2016/01
Loop antenna	SCHWARZBECK	FMZB 1513	C2040209	2014/09	2015/09
Cable	CABLES & CONNECTIQUES	3.5MD/CSU528AA-TDINOX/3.5MD/7000	A5329457	2015/02	2016/02
Cable	CABLES & CONNECTIQUES	3.5MD/CSU528AA/3.5MD/4000	A5329374	2015/06	2016/06
Cable	CABLES & CONNECTIQUES	2.9MD/CSU440AA/2.9MD/2000	A5329358	2014/12	2015/12
Cable	CABLES & CONNECTIQUES	3.5MD/CSU528AA/3.5MD/4000	A5329374	2015/06	2016/06
Cable	CABLES & CONNECTIQUES	3.5MD/CSU528AA-TDINOX/3.5MD/7000	A5329457	2015/02	2016/02
Preamplifier	LCIE	-	A7086012	2015/05	2016/05
Horn antenna	EMCO	3115	C2042018	2015/05	2016/05
Bilog antenna	CHASE	CBL6111C	C2040124	2014/09	2015/09
Software	NEXIO	BAT-EMC	-	-	-
AC Power Line Conducted Emissions					
Semi anechoic chamber 11,8x8,1x9,5m	SIEPEL	C01	D3044008		
EMI receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2015/01	2016/01
Cable	CABLES & CONNECTIQUES	-	A5329411	2015/06	2016/06
V LISN	ROHDE & SCHWARZ	ENV216	C2320162	2015/04	2016/04
Semi anechoic chamber	SIEPEL	-	D3044008	2014/09	2015/09
Semi anechoic chamber	SIEPEL	-	D3044008	2014/09	2015/09
Occupied Bandwidth					
Apparatus	**Trade Mark**	**Type**	**Registration number**	**Calibration date**	**Calibration due**
Climatic chamber	SECASI Technologies	SLT-34	D1024029	Verified with calibrated Thermoter	Verified with calibrated Thermoter
Spectrum analyzer	ROHDE & SCHWARZ	FSL6	A4060032	2015/04	2017/04
Multi-meter	KEITHLEY	2000	A1241084	2014/02	2016/02
Programmable AC/DC power supply	KIKUSUI	PCR500M	A7040079	2014/05	2016/05
Thermometer	AOIP	TM 6630	B4041042	2014/12	2016/06

7. UNCERTAINTIES CHART

Kind of test	Measurement uncertainties (k=2) ±x(dB) / (Hz)	Limit for uncertainties ±y(dB)
TRANSMITTER REQUIREMENTS		
Radio frequency	$\pm 2.10^{-8}$ Hz	$\pm 1.10^{-7}$ Hz
RF Conducted power	±0.6 dB	±1.5 dB
Spurious emissions • Frequency < 1000 MHz • Frequency > 1000 MHz	 ±3.9 dB ±3.1 dB	±6 dB
Spurious in conduction	±1.6 dB	±3 dB
Temperature	±0.5°C	±1°C
Humidity	±2.5 %	±10 %

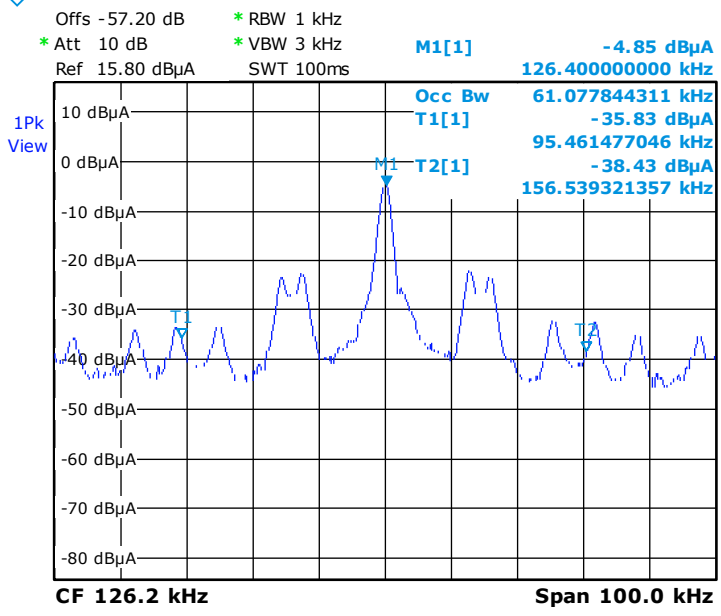
8. ANNEX (GRAPHS)

99% Occupied Bandwidth
Power supply POE-164



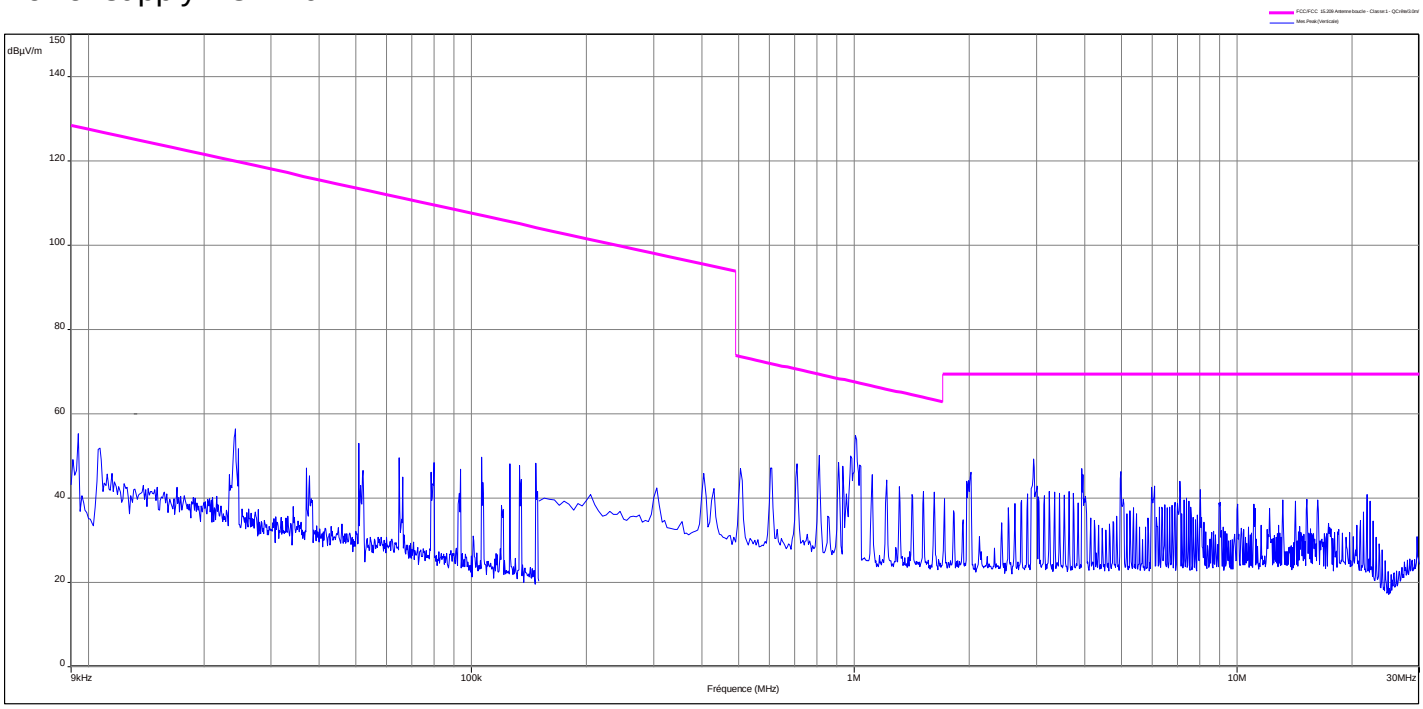
Date: 31.JUL.2015 09:45:42

99% Occupied Bandwidth
Power supply FW7362/12

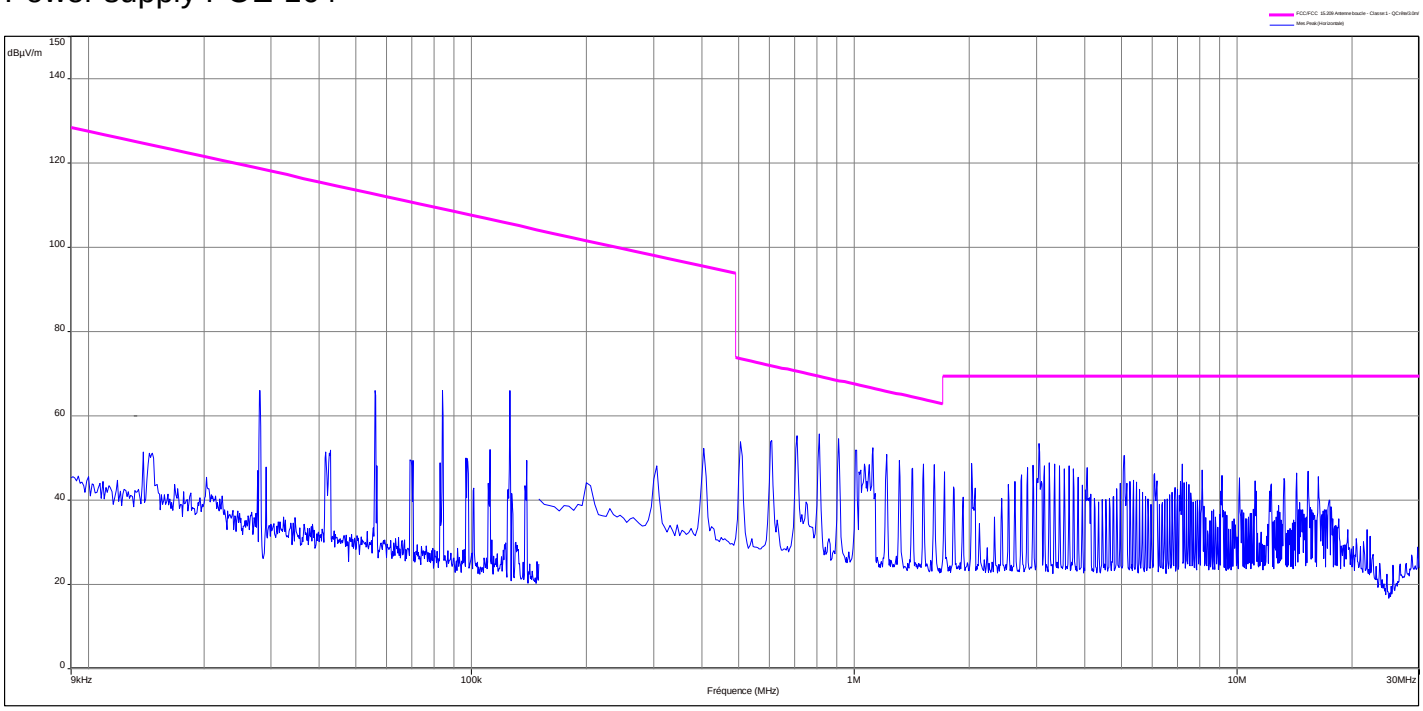


Date: 31.JUL.2015 09:32:22

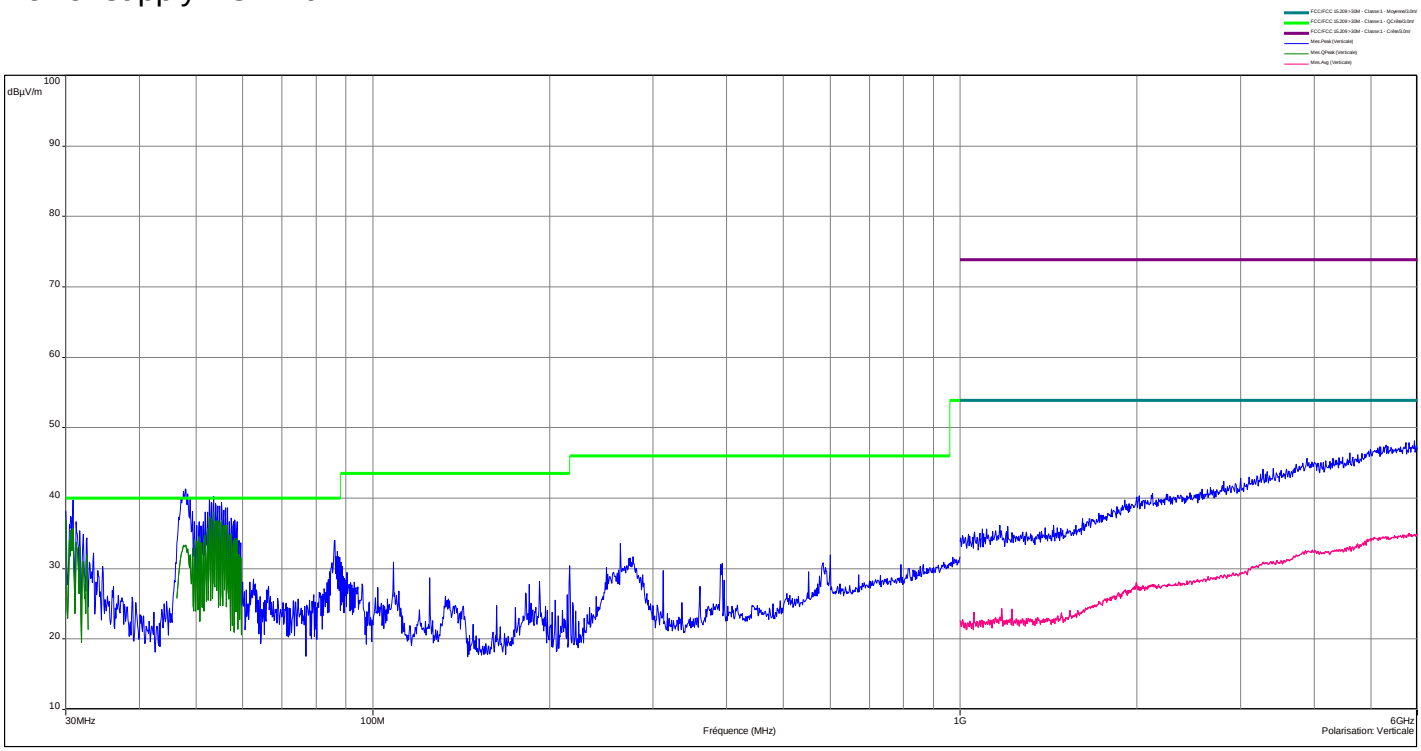
Radiated Emission
Perpendicular polarization
Power supply POE-164



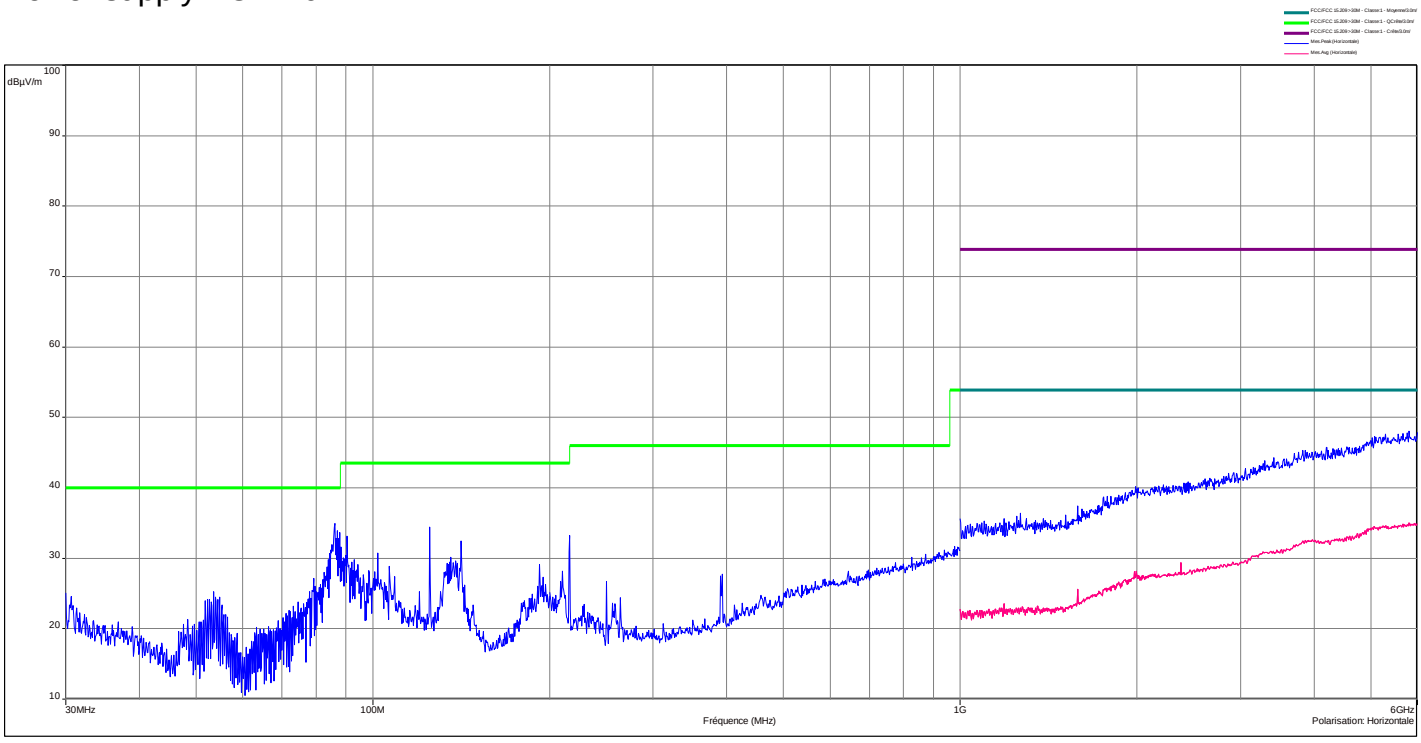
Radiated Emission
Parralel polarization
Power supply POE-164



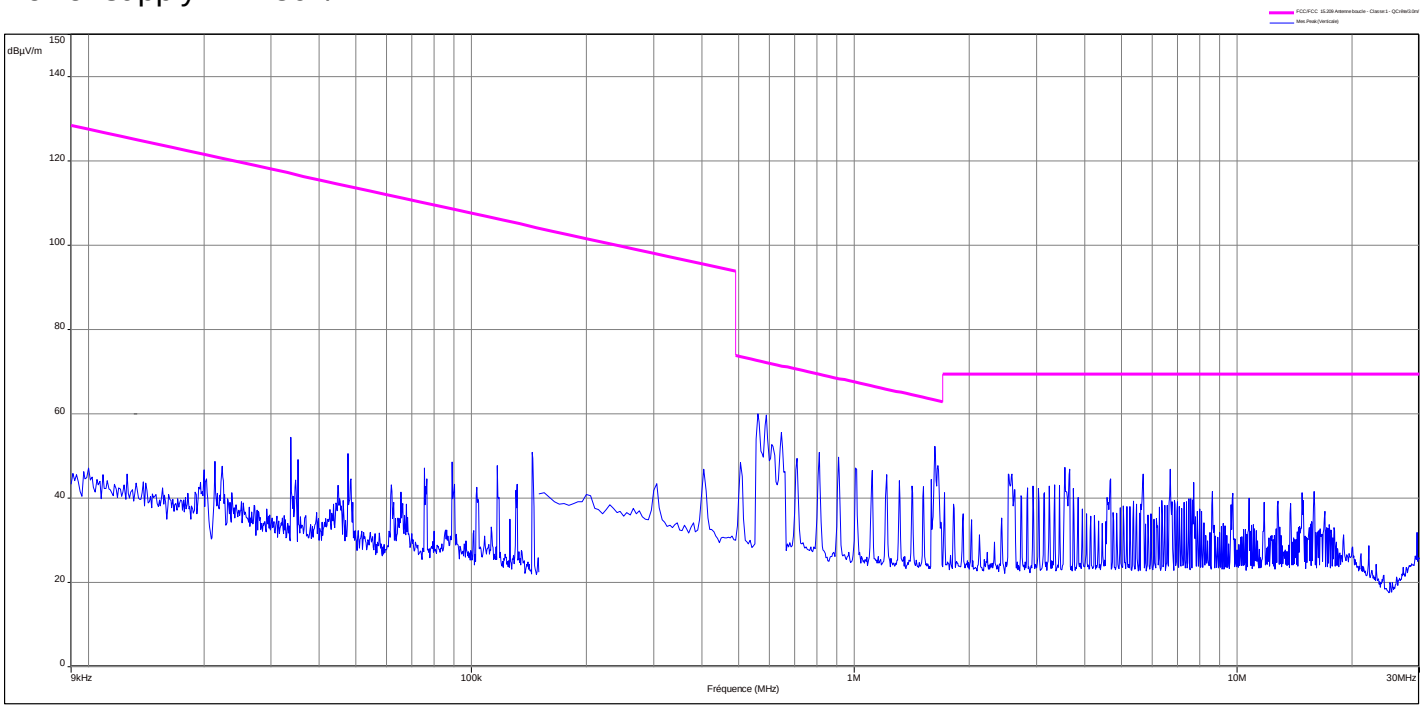
Radiated Emission
Vertical polarization
Power supply POE-164



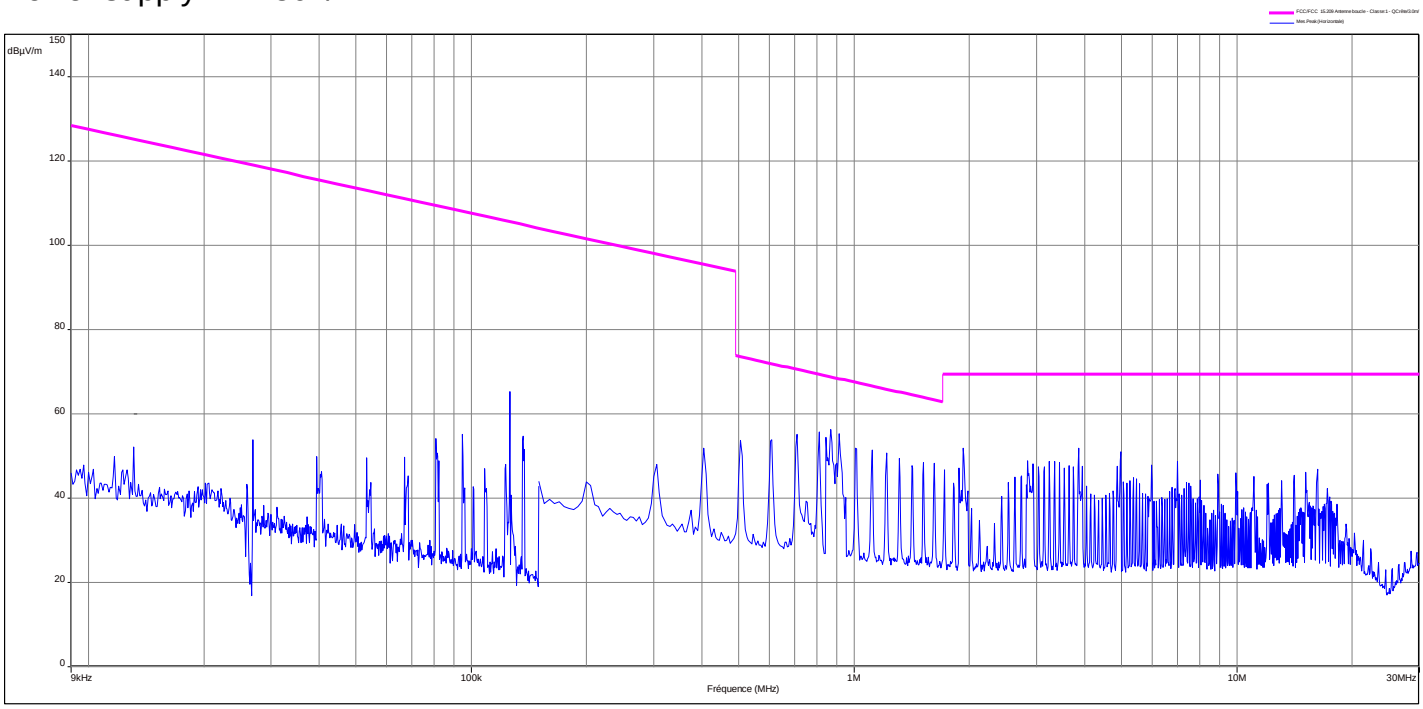
Radiated Emission
Horizontal polarization
Power supply POE-164



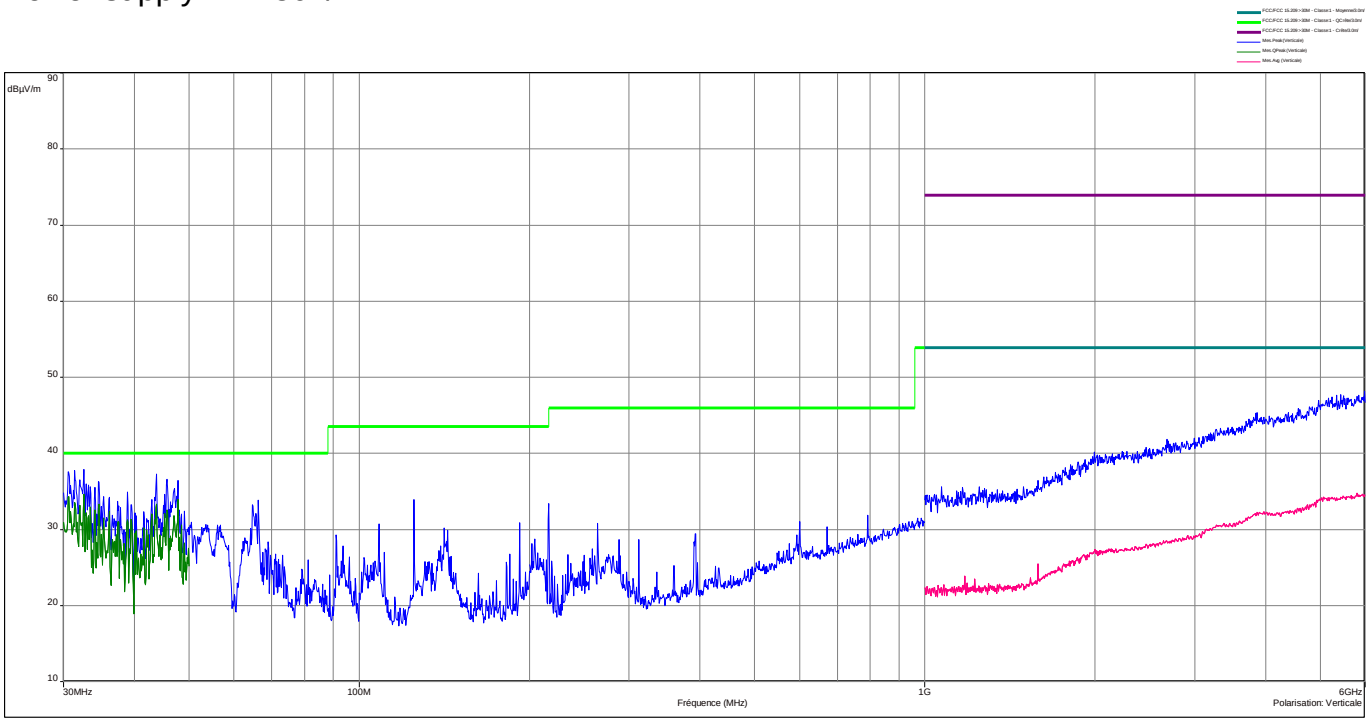
Radiated Emission
Perpendicular polarization
Power supply FW7362/12



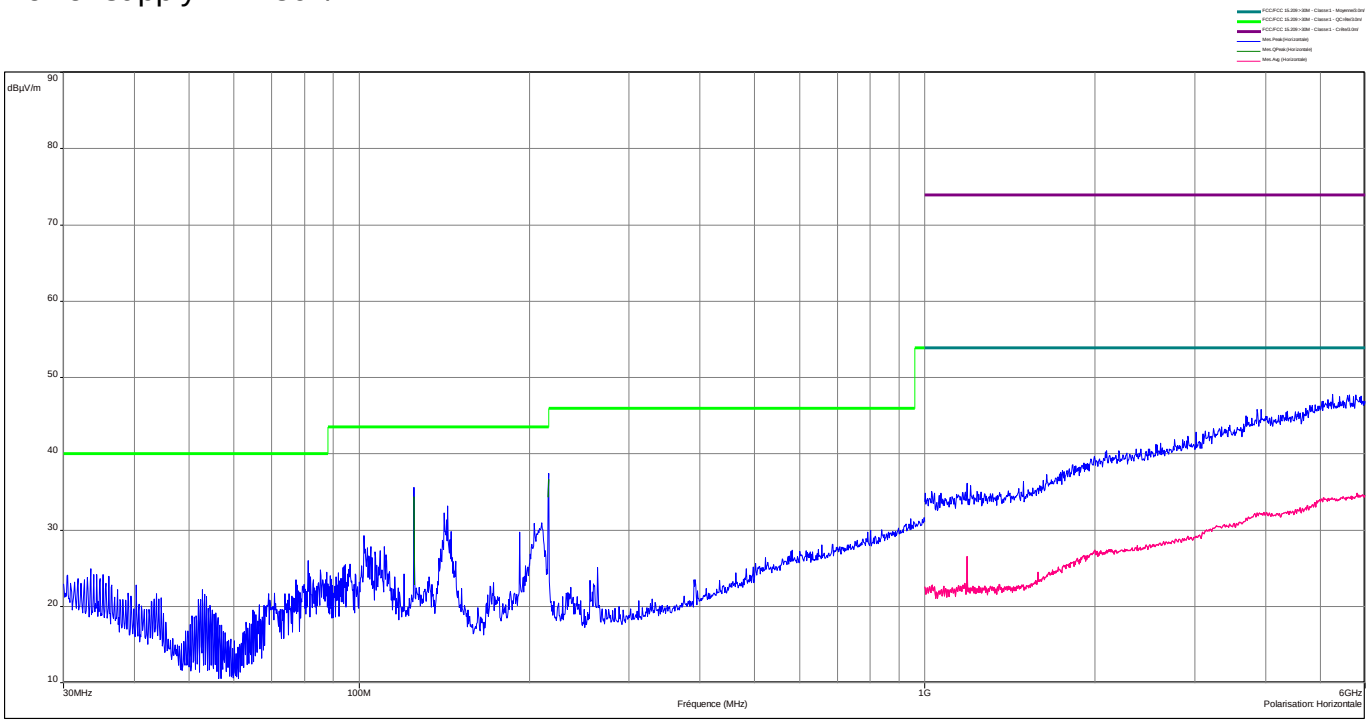
Radiated Emission
Parallel polarization
Power supply FW7362/12



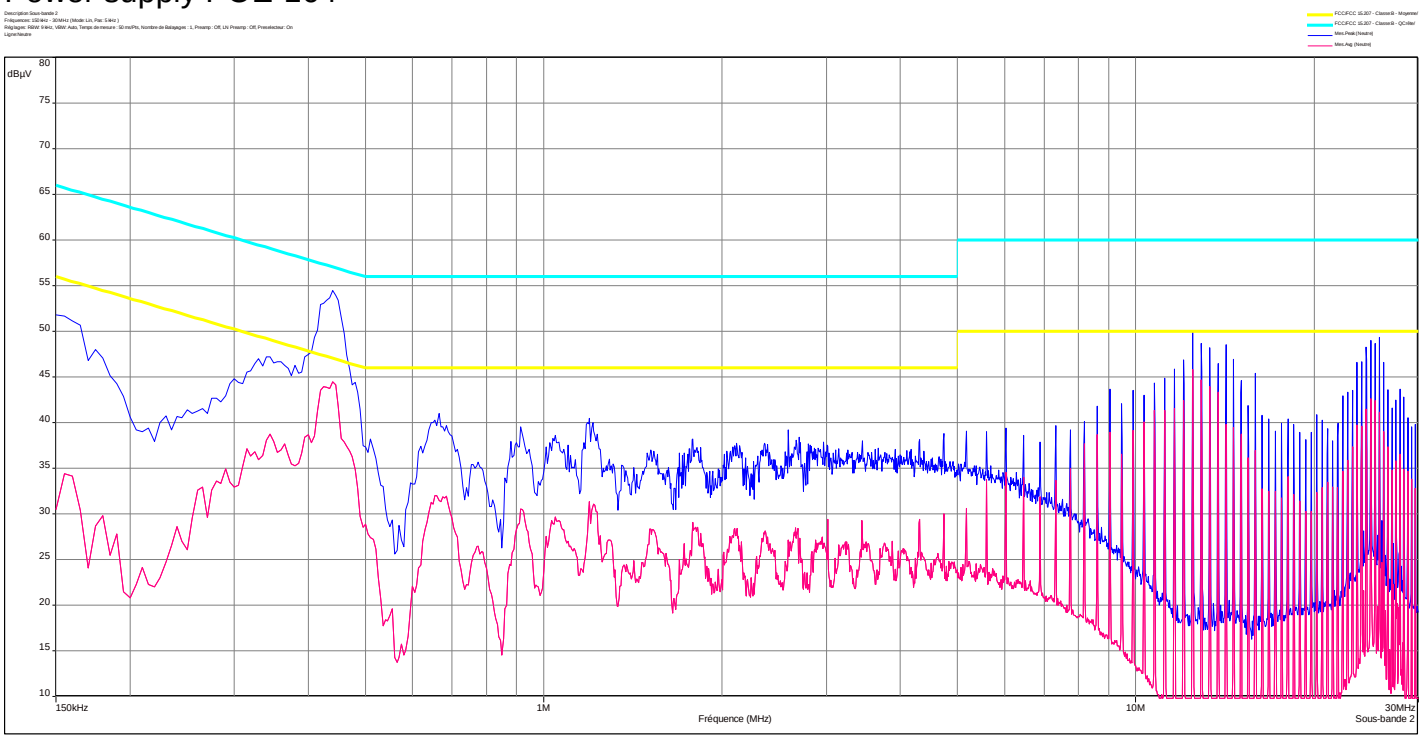
Radiated Emission
Vertical polarization
Power supply FW7362/12



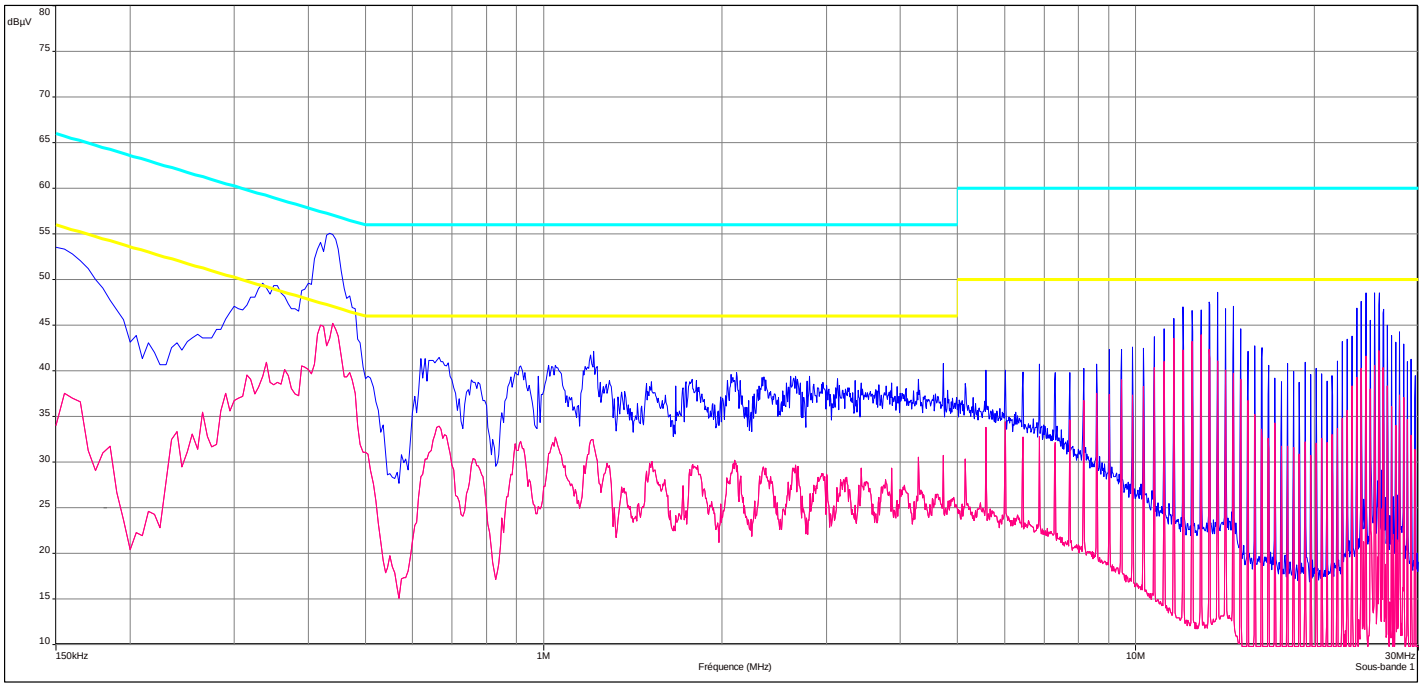
Radiated Emission
Horizontal polarization
Power supply FW7362/12



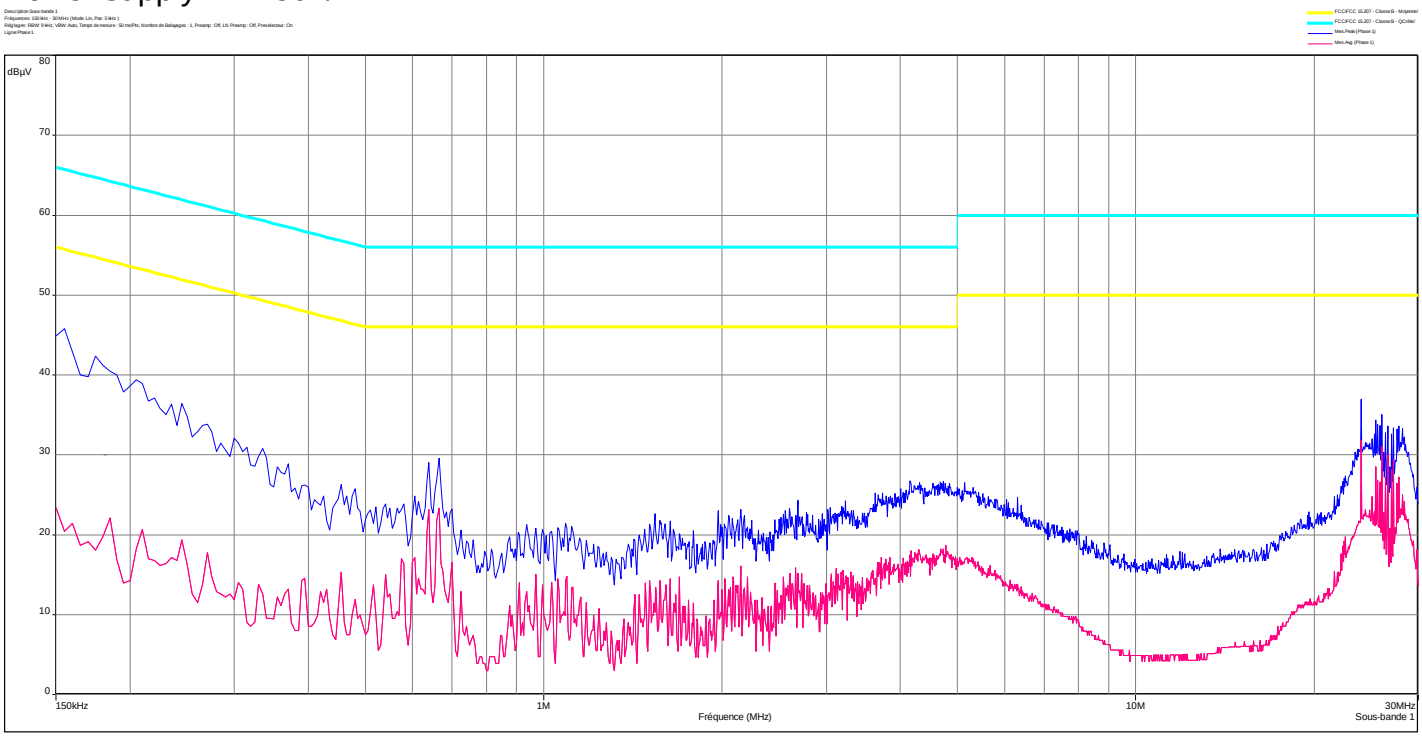
Conducted Emission
Phase
Power supply POE-164



Conducted Emission
Neutral
Power supply POE-164



Conducted Emission
Phase
Power supply FW7362/12



Conducted Emission
Neutral
Power supply FW7362/12