



TEST REPORT

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Composition of document

RADIO

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Standards

47 CFR Part 15.247
RSS-210, Issue 8
RSS-Gen, Issue 3

Issued to

WITHINGS
20 rue Rouget de Lisle
92130 Issy-Les-Moulineaux, France

Apparatus under test

Trade mark
Manufacturer
Type
Serial number
IC
FCC ID

Withings Aura Bedside Device
Withings AuraTM
Withings
WSD01
0024E4182A06
XNAWSD01
11411A-WSD01

Test date

2014/06/11 to 2014/06/27

Tests performed by

Arnaud Fayette

Test site

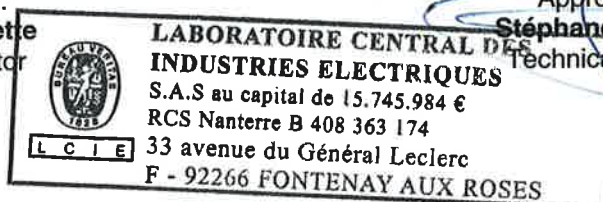
Fontenay aux Rose

Date of issue

2014/07/09

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1. TEST PROGRAM

• **References**

- Standards:
- 47 CFR Part 15C
 - RSS-210
 - RSS-Gen
 - CISPR 16-4-2
 - ANSI C63.10

Standard Section	Test Description	TEST RESULT - Comments
RSS-Gen § 4.6.1	Occupied Bandwidth	PASS
CFR 47 § 15.247 (a) (2) RSS-210 § A8.2(a)	-6dB Bandwidth	PASS
CFR 47 § 15.247 (b) RSS-210 § A8.4(4)	Maximum Output Power	PASS
CFR 47 § 15.247 (e) RSS-210 § A8.2 (b)	Power Spectral Density	PASS
CFR 47 § 15.247 (d) RSS-210 § A8.5	Conducted Spurious Emission at the Band Edge	PASS
CFR 47 § 15.247 (d) RSS-210 § A8.5	Unwanted Emissions into Non-Restricted Frequency Bands	PASS
CFR 47 § 15.207 RSS-Gen § 7.2.4	AC Power Line Conducted Emissions	PASS
CFR 47 § 15.209 (a) CFR 47 § 15.205 (a) CFR 47 § 15.247 (d) RSS-210 § A8.5	Unwanted Emissions into Restricted Frequency Bands	PASS
RSS-Gen § 4.10	Receiver Radiated emissions	PASS (Include in unwanted emission into restricted frequency bands)

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

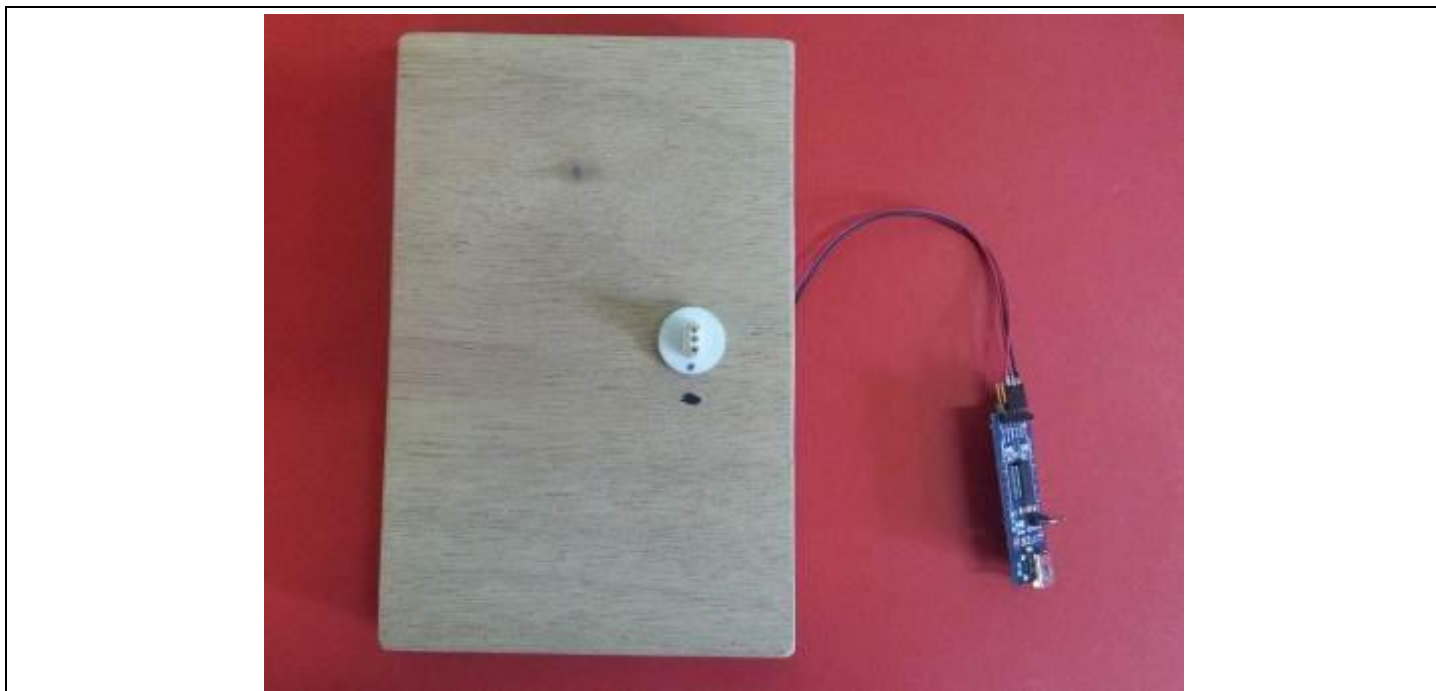


Photograph of EUT



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

- Personal Computer
- USB port to Uart port



Photograph of AE

- **Input/output:**

- Input Power
- 3 Usb

- **Software identification:**

- Software version: firmware_wsd01_20140522-113550_emc_radio

- **Equipment information:**

- Wifi Version: Bluetooth V4
- Modulation technology: GFSK
- Transmit operating mode: Single antenna
- Number of transmit chains: 1
- Number of receiver chains: 1
- Type of the equipment: Stand-alone equipment
- Type of power source: External power supply
- Test source voltage: 120V/60Hz
- Antenna type: Integral
- Test sequence/test software used: See 2.2. Running Mode
- Duty Cycle: Continuous duty
- Equipement type: Pre-production model



- Operating frequency range

Frequency Band (MHz)
2400MHz to 2483,5MHz

- Antenna Characteristics:

Antenna Gain (dBi)
3.3

-Channel plan:

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	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	39	2480

-Data Rate

Data Rate (Mbps)	Modulation Type
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 terterm test software are used to set the product:

See « WS01_EMI_test_v5.txt » file.

2.3. EQUIPEMENT LABELLING



2.4. EQUIPMENT MODIFICATIONS

No equipment modification has been necessary during testing.



3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Arnaud Fayette
Date of test : 26/06/2014
Ambient temperature : 24°C
Relative humidity : 51%

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 conducted access. The product has been tested according to the RSS-GEN § 4.6.1 reference method.

Spectrum Analyzer Setting:

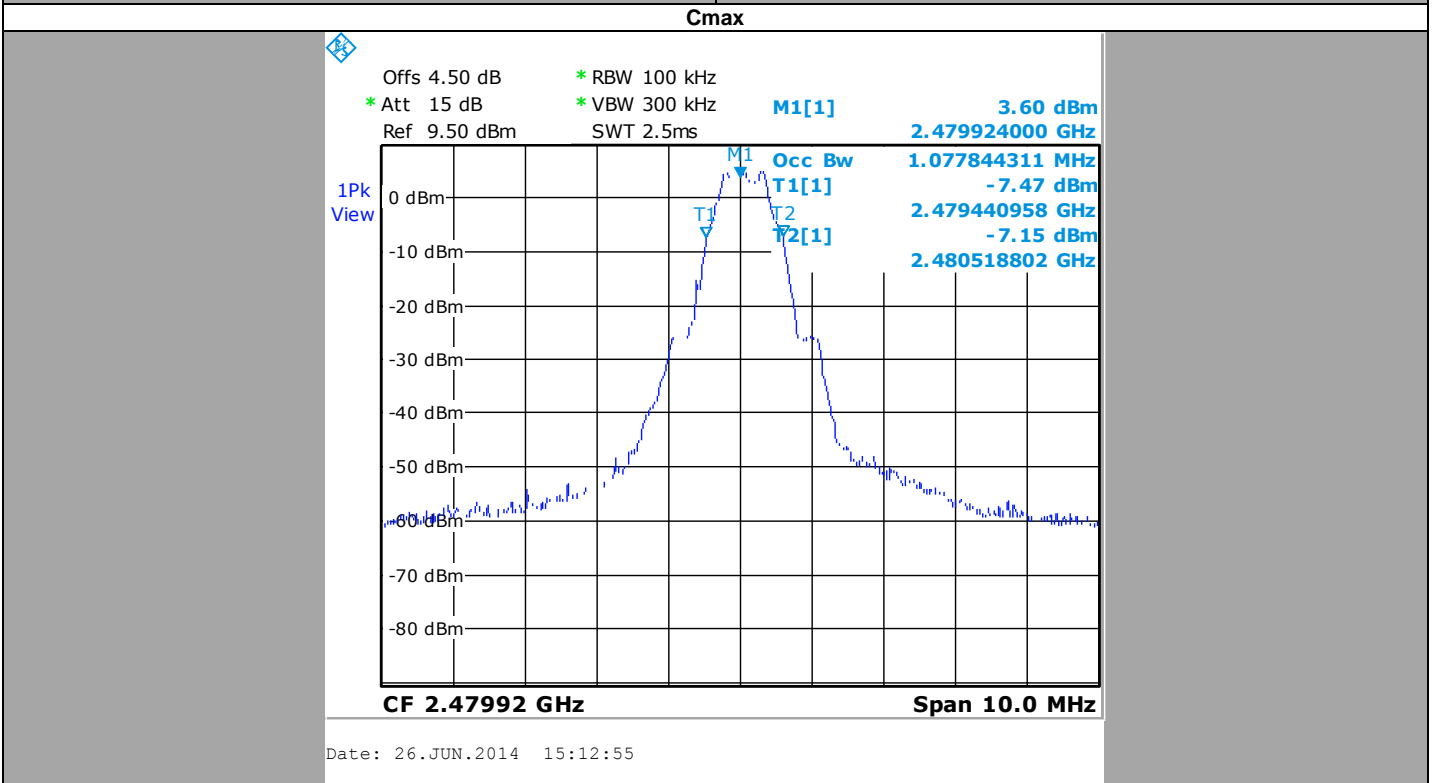
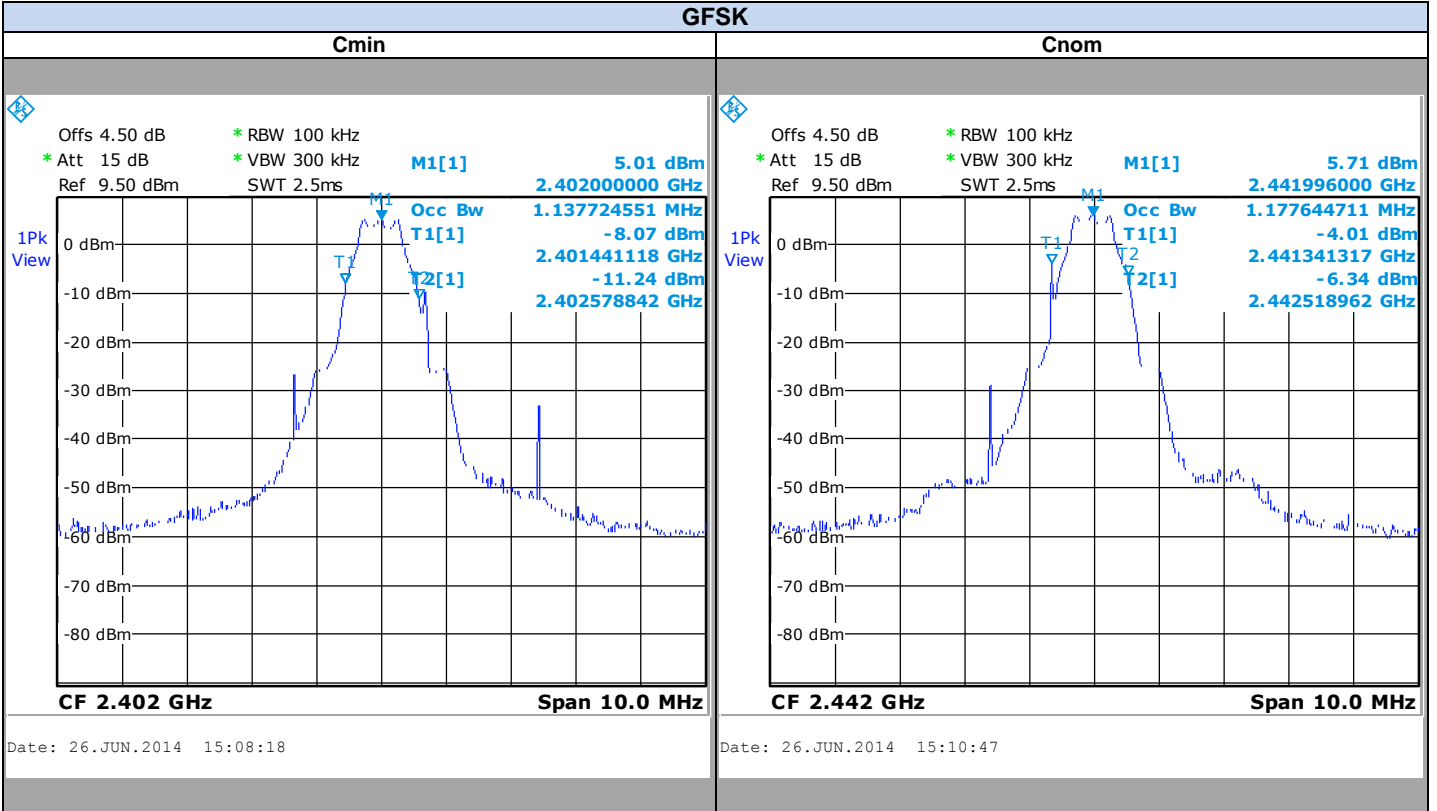
Center frequency= Cmin or Cnom or Cmax
Span= Above the emission spectrum
Amplitude= Sufficient to observe the signal amplitude
RBW= 1% of span
VBW= 3*RBW
Sweep= Auto
Trace= Max Hold
Detector= Peak
Occupied Bandwidth 99% activated



Photograph for Occupied Bandwidth



3.3. GRAPHICS & RESULTS





Temperature	Tnom		
Voltage	Vnom		
Frequency	Cmin	Cnom	Cmax
Occupied Bandwidth (MHz)	1.14	1.18	1.08

Result: **PASS**

Limit: → None



4. -6dB BANDWIDTH

4.1. TEST CONDITIONS

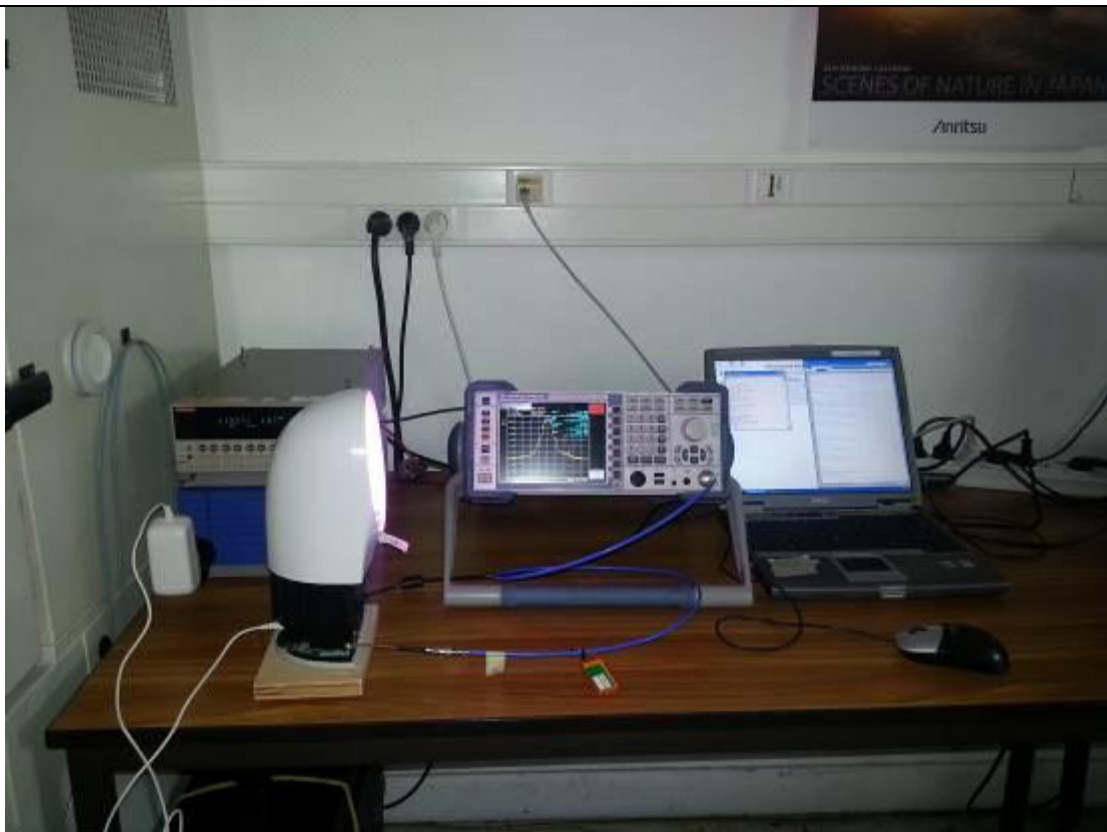
Test performed by :Arnaud Fayette
Date of test :26/06/2014
Ambient temperature :24°C
Relative humidity :51%

4.2. 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 conducted access. The product has been tested according to the FCC KDB 558074 D01 DTS Meas Guidance v03r1 § 8.1.

Spectrum Analyzer Setting:

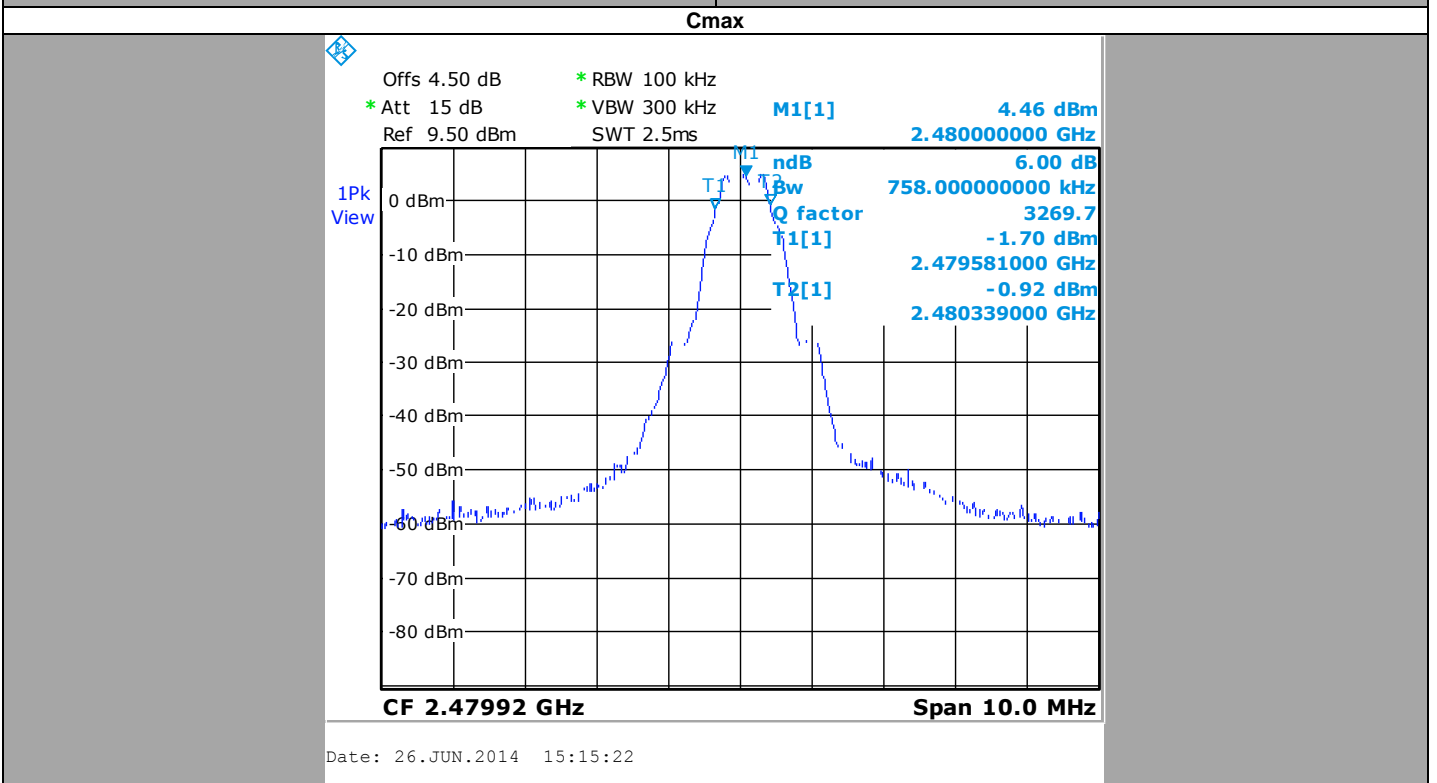
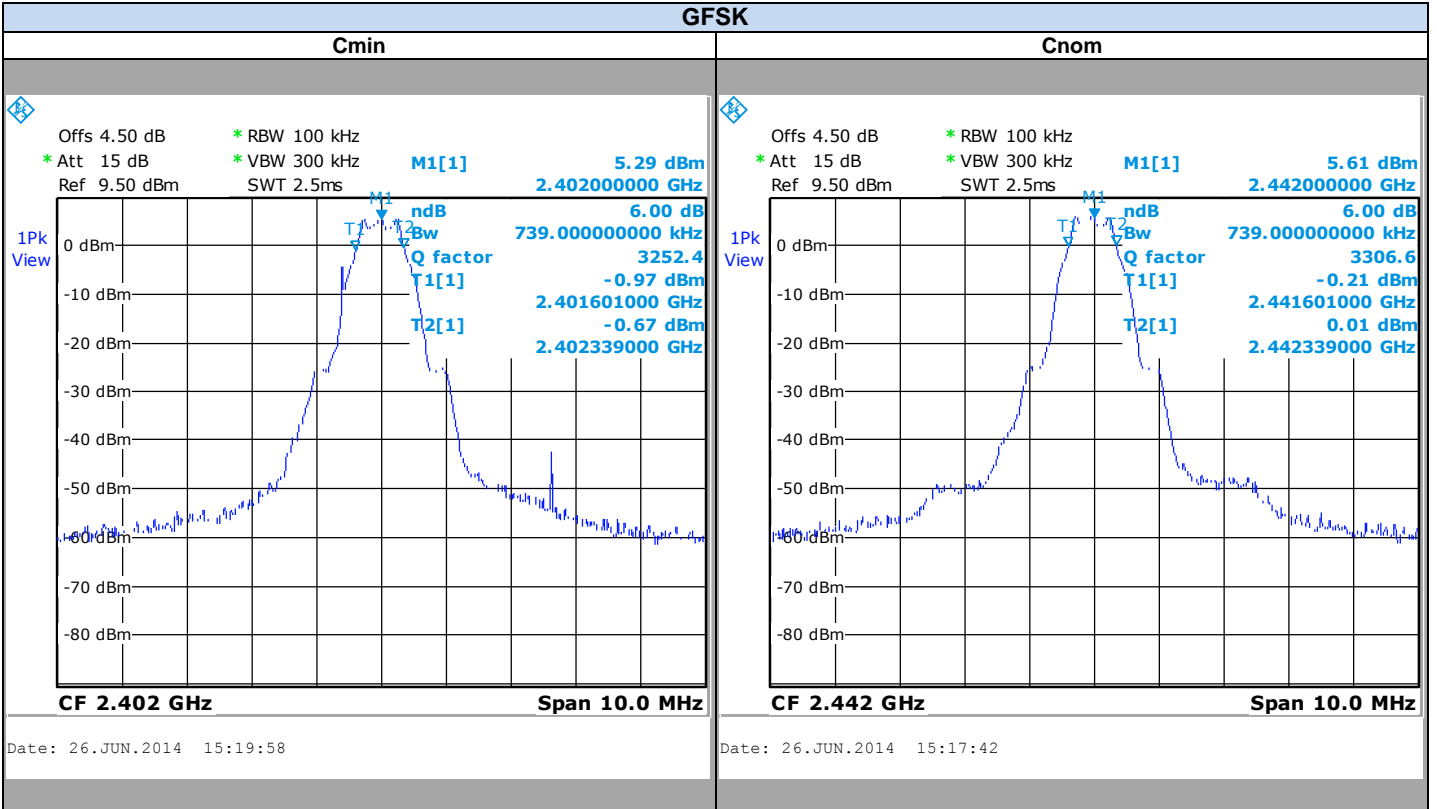
Center frequency= Cmin or Cnom or Cmax
Span= At least twice the emission spectrum
Amplitude= Sufficient to observe the signal amplitude
RBW= 100kHz
VBW= 300kHz
Sweep= Auto
Trace= Max Hold
Detector= Peak



Photograph for -6dB Bandwidth



4.1. GRAPHICS & RESULTS





Temperature	Tnom		
Voltage	Vnom		
Frequency	Cmin	Cnom	Cmax
-6dB Bandwidth (MHz)	0.739	0.739	0.758

Result: PASS

Limit: → The -6dB bandwidth must be greater than 500kHz



5. MAXIMUM CONDUCTED POWER

5.1. TEST CONDITIONS

Test performed by : Arnaud Fayette
Date of test : 26/06/2014
Ambient temperature : 24°C
Relative humidity : 51%

5.2. 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 conducted access. The product has been tested according to the FCC KDB 558074 D01 DTS Meas Guidance v03r1 § 9.1.2.

Spectrum Analyzer Setting (Maximum Peak Conducted Power):

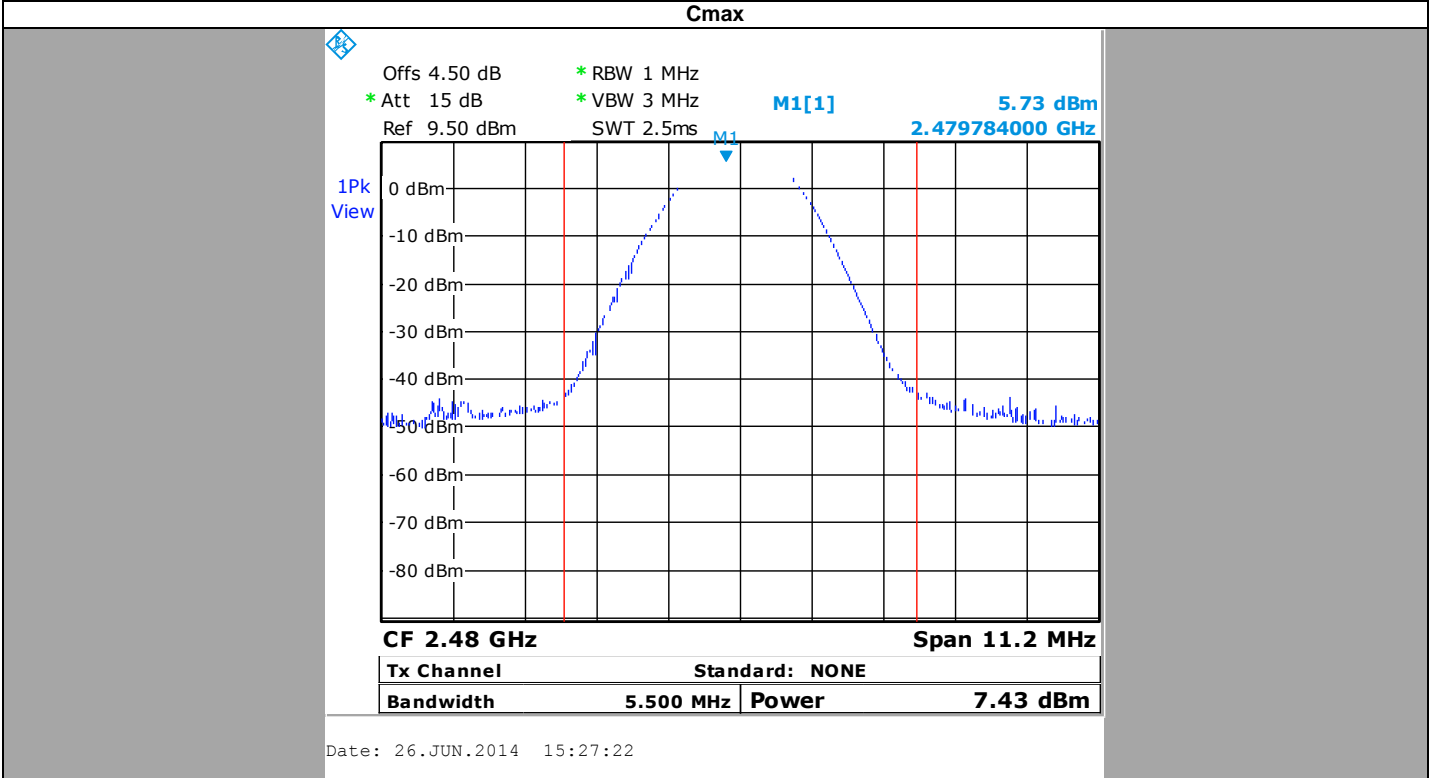
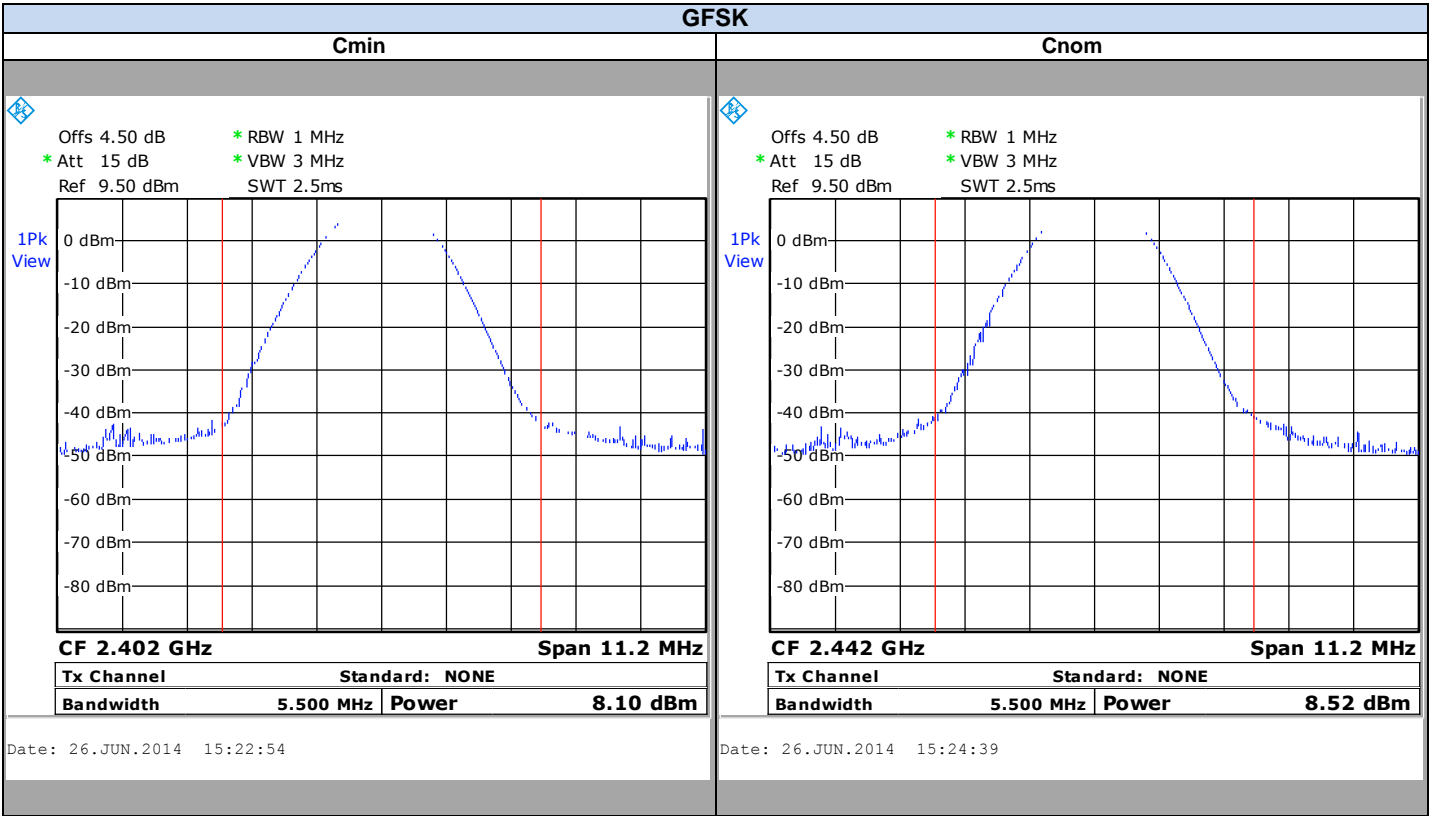
Center frequency= Cmin or Cnom or Cmax
Span= At least twice the emission spectrum
Amplitude= Sufficient to observe the signal amplitude
RBW= 1MHz
VBW= 3MHz
Sweep= Auto
Trace= Max Hold
Detector= Peak
Meas Fonction= Channel Power inside of the emission spectrum



Photograph for Maximum Conducted Power



5.1. GRAPHICS & RESULTS





Spectrum Analyzer Offset:
Cable Loss=1.5dB + Attenuator= 3dB

Channel	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	3.3	8.10	30
Cnom	3.3	8.52	30
Cmax	3.3	7.43	30

Result: PASS

Limit: → The Maximum Conducted Power must be lower than 30dBm
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi



6. POWER SPECTRAL DENSITY

6.1. TEST CONDITIONS

Test performed by : Arnaud Fayette
Date of test : 26/06/2014
Ambient temperature : 21°C
Relative humidity : 55%

6.2. 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 conducted access. The product has been tested according to the FCC KDB 558074 D01 DTS Meas Guidance v03r1 § 10.2 & FCC KDB 662911 D01 Multiple Transmitter Output v02 § E) 2) b).

Spectrum Analyzer Setting:

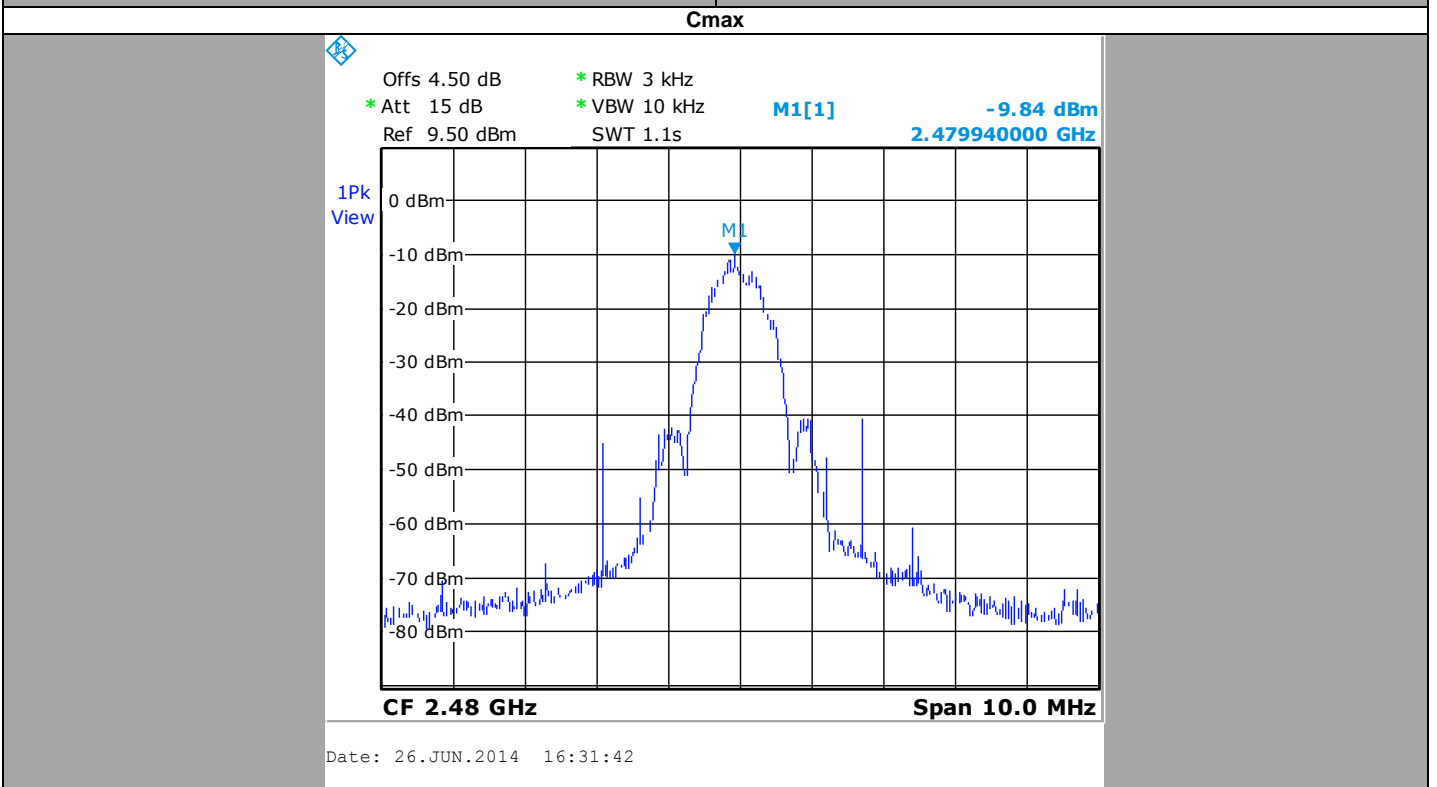
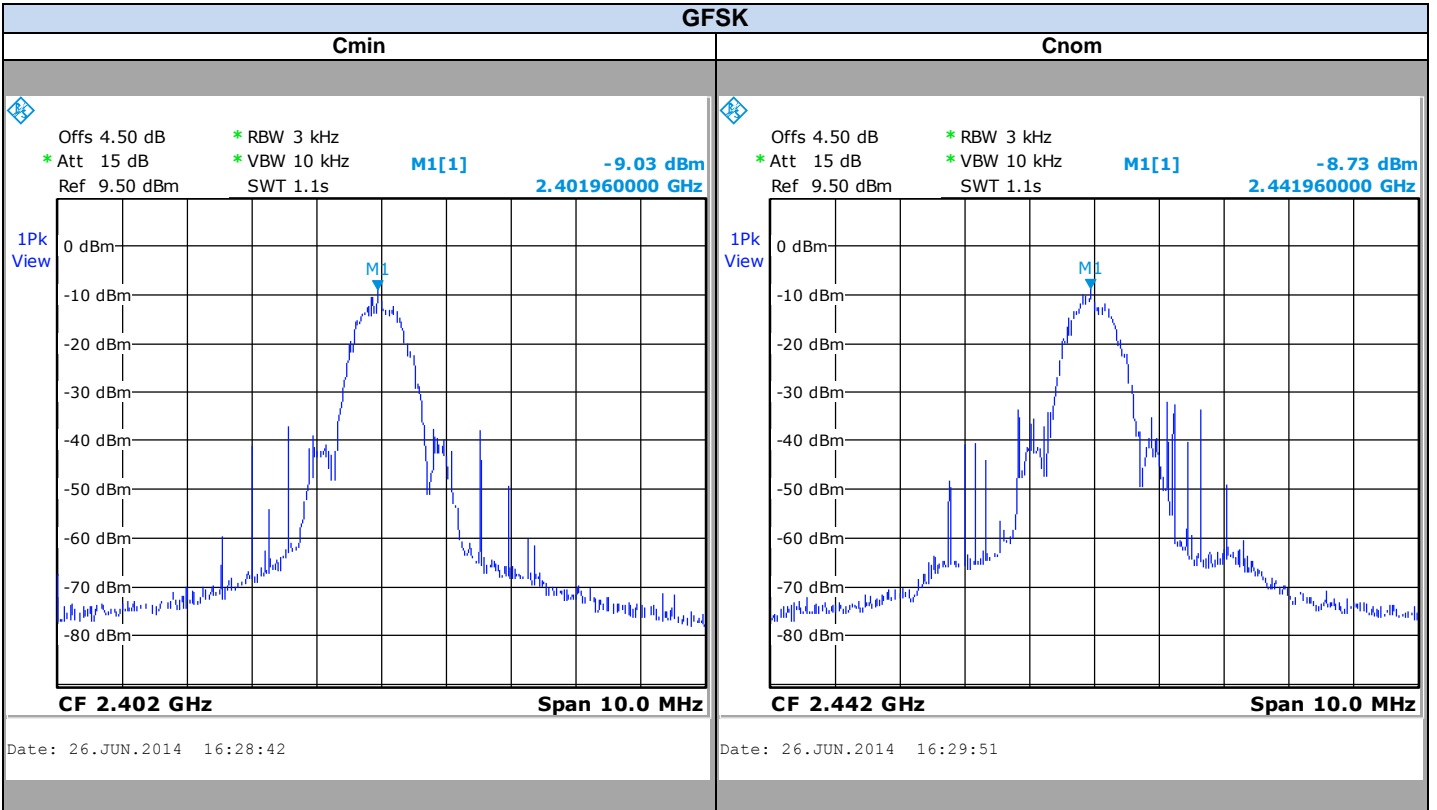
Center frequency= Cmin or Cnom or Cmax
Span= At least twice the emission spectrum
Amplitude= Sufficient to observe the signal amplitude
RBW= 3kHz
VBW= 10kHz
Sweep= Auto
Trace= Max Hold
Detector= Peak



Photograph for Power Spectral Density



6.1. GRAPHICS & RESULTS





Spectrum Analyzer Offset:
Cable Loss=1.5dB + Attenuator= 3dB

Channel	Tx1 (dBm)	Overall Antenna Gain (dBi)	Power spectral density (dBm/3kHz)	Limit (dBm)
Cmin	-9.03	3.3	-9.03	8
Cnom	-8.73	3.3	-8.73	8
Cmax	-9.84	3.3	-9.84	8

Result: PASS

Limit: → The Power Spectral Density must be lower than 8dBm/3kHz
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi



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

7.1. TEST CONDITIONS

Test performed by :Arnaud Fayette
Date of test : 27/06/2014
Ambient temperature : 24°C
Relative humidity : 45%

7.2. 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 conducted access. The product has been tested according to the FCC KDB 558074 D01 DTS Meas Guidance v03r1 § 11.2 & FCC KDB 662911 D01 Multiple Transmitter Output v02 § E) 3) b).

Spectrum Analyzer Setting:

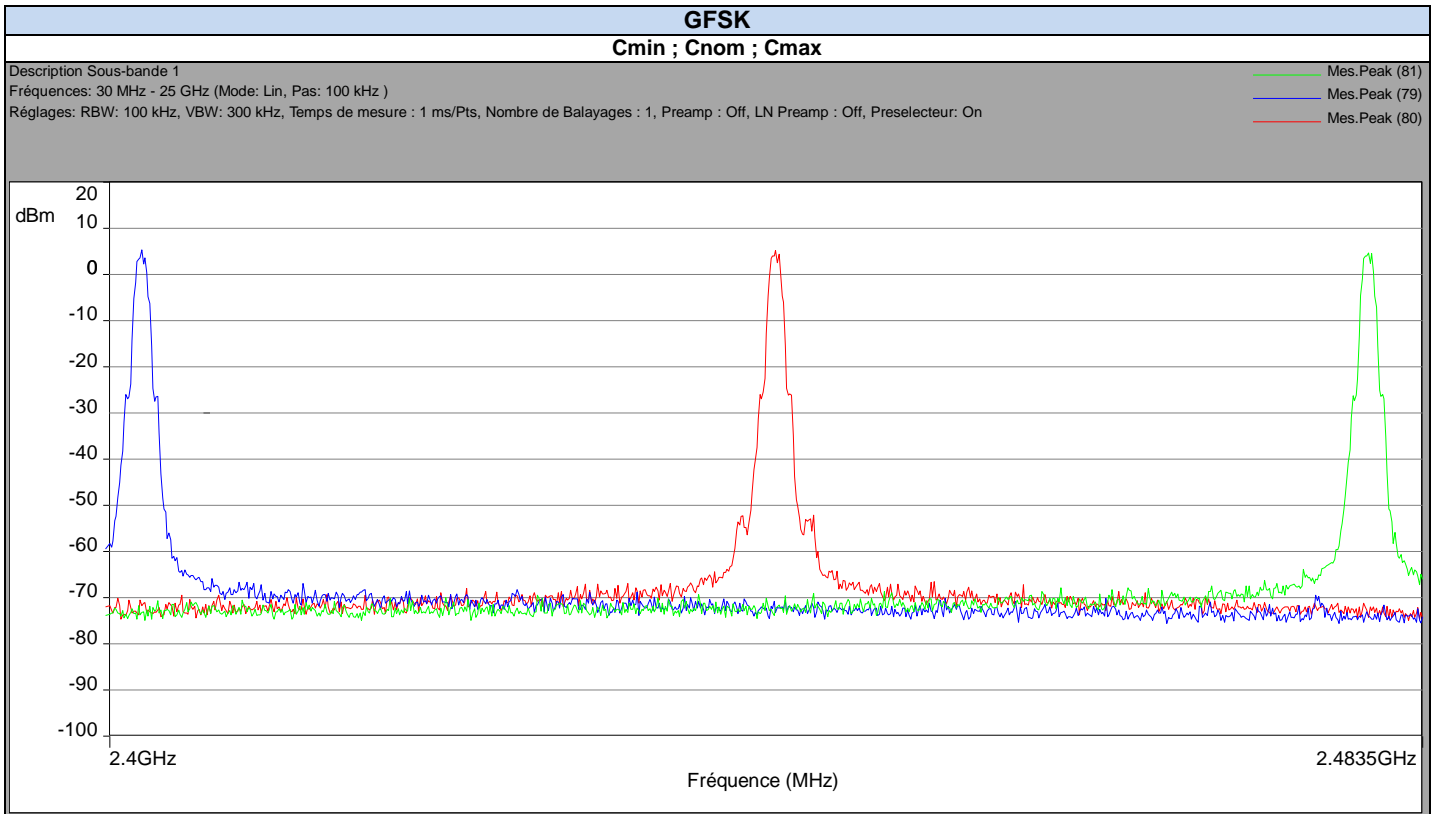
Start frequency= 2380MHz
Stop frequency= 2500MHz
Amplitude= Sufficient to observe the signal amplitude
RBW= 100kHz
VBW= 300kHz
Sweep Time= Auto
Sweep Point= 1200
Trace= Max Hold
Detector= Peak



Photograph for Unwanted Emissions into Non-Restricted Frequency Bands At the Band Edge



7.1. GRAPHICS & RESULTS



Temperature	Tnom	
Voltage	Vnom	
Conducted Spurious Emission at the Band Edge (MHz)	2400	2483,5
Spurious Level (dBc)	-63.281	-67.142

Result: PASS

Limit: → All Spurious Emissions must be at least 20dB (Maximum Conducted Power) below the Fundamental Radiator Level at the Band Edge "2400MHz & 2483,5MHz"



8. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

8.1. TEST CONDITIONS

Test performed by :Arnaud Fayette
Date of test :27/06/2014
Ambient temperature :23°C
Relative humidity :44%

8.2. 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 conducted access. The product has been tested according to the FCC KDB 558074 D01 DTS Meas Guidance v03r1 § 11.3 & FCC KDB 662911 D01 Multiple Transmitter Output v02 § E) 3) b).

Spectrum Analyzer Setting:

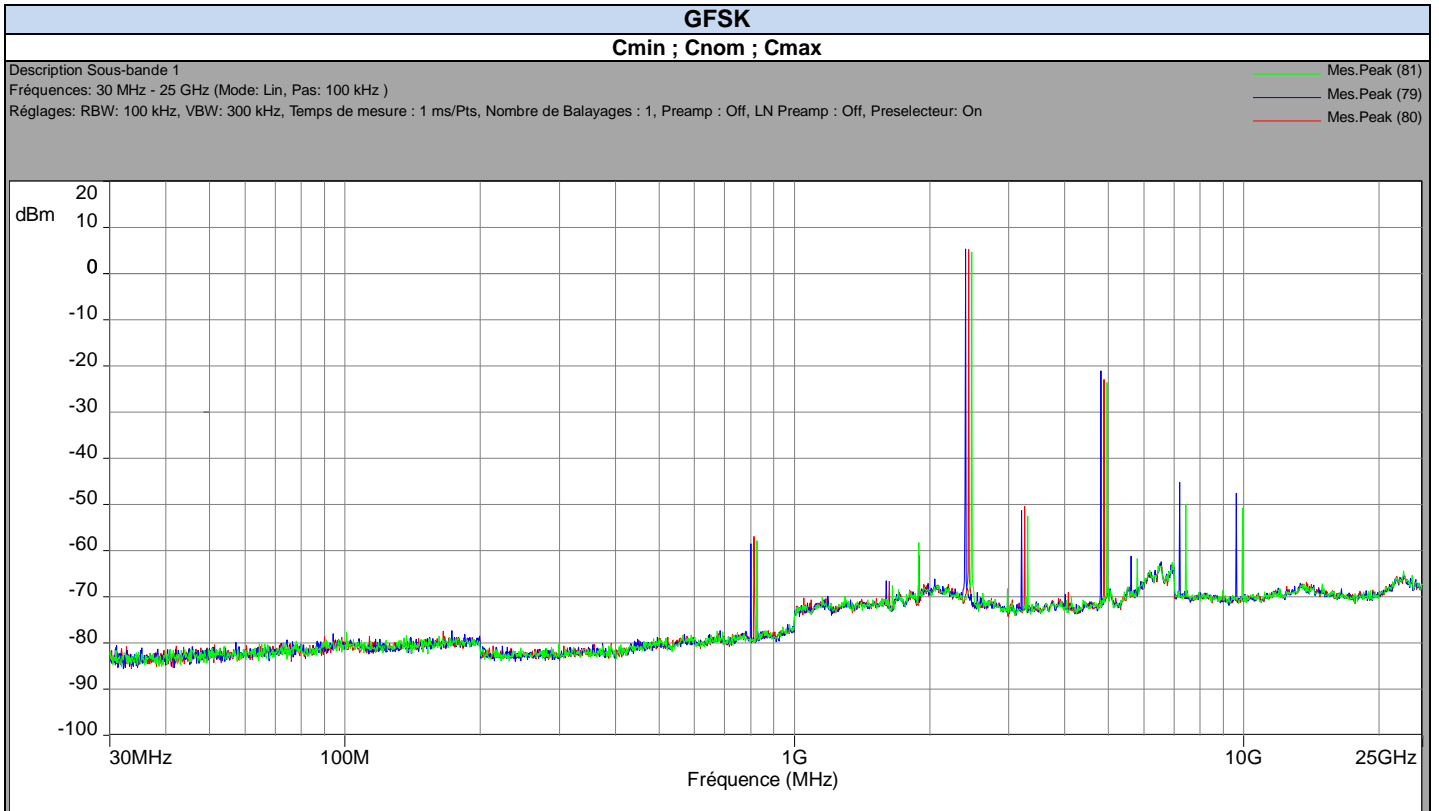
Start frequency= 30MHz
Stop frequency= 25GHz
Amplitude= Sufficient to observe the signal amplitude
RBW= 100kHz
VBW= 300kHz
Sweep Time= Auto
Sweep Point= 249700
Trace= Max Hold
Detector= Peak



Photograph for Unwanted Emissions into Non-Restricted Frequency Bands



8.3. GRAPHICS & RESULTS



Frequency (MHz)	Spurious Level (dBm)	Spurious Level (dBc)
4803.5	-21.059	-15.786
4884.4	-22.911	-17.638
4960.4	-23.552	-18.279

Result: PASS

Limit: → All Spurious Emissions must be at least 20dB (Maximum Conducted Power) below the Fundamental Radiator Level outside of the 2400MHz-2483,5MHz band



9. AC POWER LINE CONDUCTED EMISSIONS

9.1. TEST CONDITIONS

Test performed by : Gilles DE BUYSER
Date of test : 2014/06/13
Ambient temperature : 19°C
Relative humidity : 54%

9.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2009) 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)



Photograph for AC Power Line Conducted Emissions (Global view)

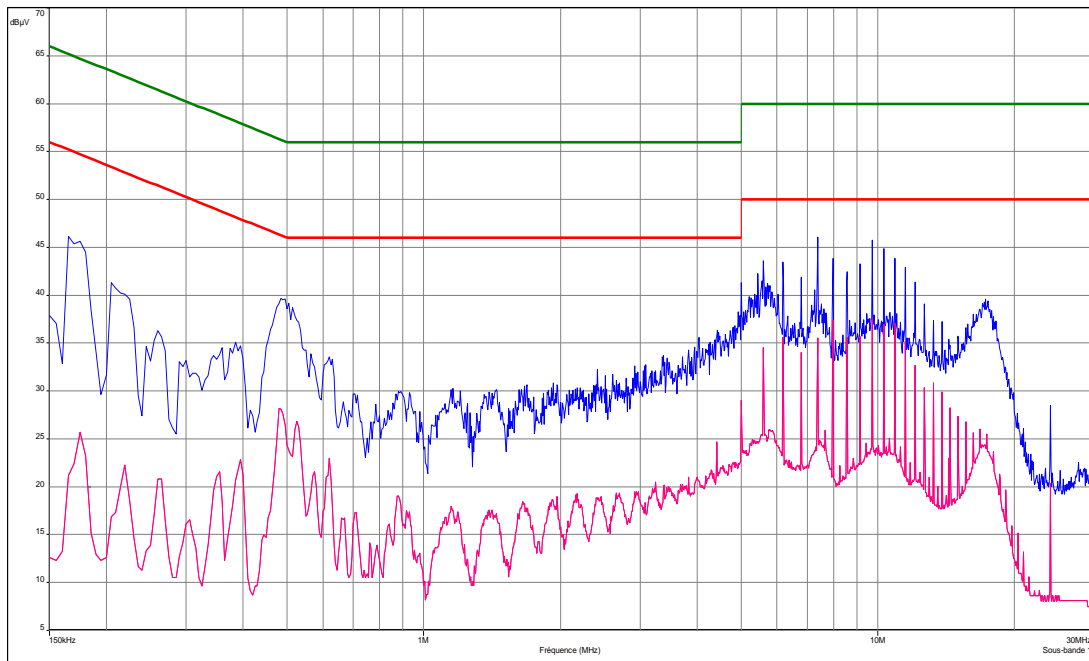


9.3. RESULTS

Phase Line

Description Sous-bande 1
Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)
Réglages: RBW: 9 kHz, VBW: Auto, Temps de mesure : 50 ms/Pts, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Preselecteur: On
Ligne: Phase 1

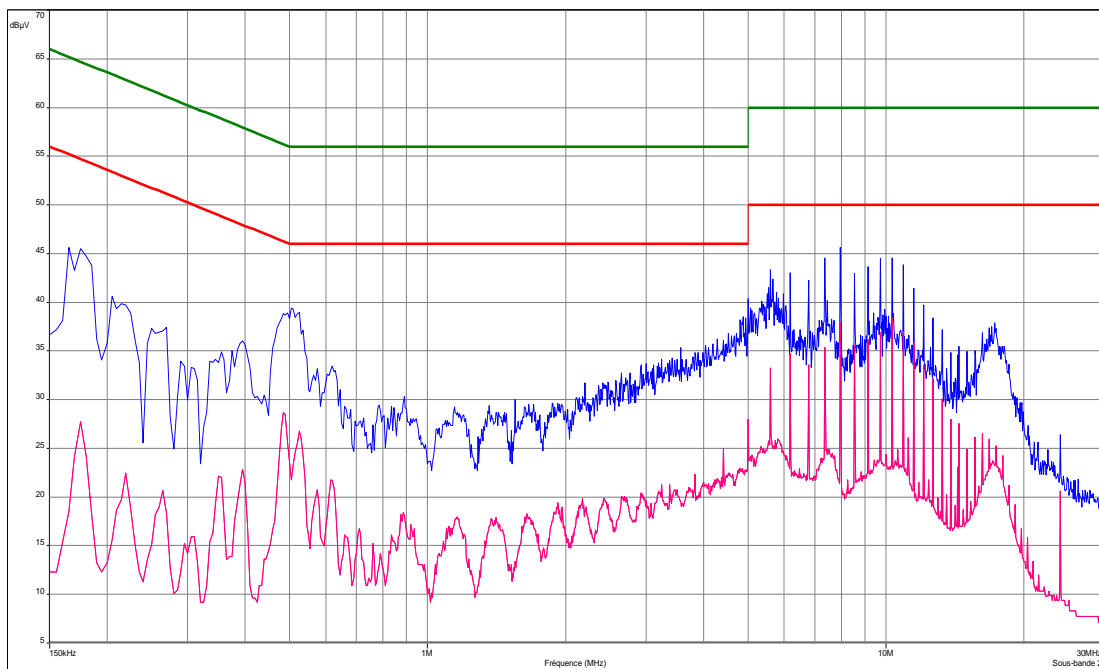
FCC/FCC 15.107 - Classe:B - Moyenne/
FCC/FCC 15.107 - Classe:B - QCrête/
Mes.Peak (Phase 1)
Mes.Avg (Phase 1)



Neutral Line

Description Sous-bande 2
Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)
Réglages: RBW: 9 kHz, VBW: Auto, Temps de mesure : 50 ms/Pts, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Preselecteur: On
Ligne: Neutre

FCC/FCC 15.107 - Classe:B - Moyenne/
FCC/FCC 15.107 - Classe:B - QCrête/
Mes.Peak (Neutre)
Mes.Avg (Neutre)





Phase Line

Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.175	46.2	-	64.7	25.7	54.7
0.495	39.6	-	56.2	28.2	46.2
5.00	41.3	-	56	29.0	46
7.96	43.9	-	60	37.7	50
9.73	45.8	-	60	37.6	50
10.90	43.8	-	60	37.1	50

Neutral Line

Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.175	45.5	-	64.7	27.7	54.7
0.49	38.7	-	56.2	28.7	46.2
5.00	40.4	-	56	28.0	46
7.95	45.6	-	60	37.9	50
10.31	44.5	-	60	38.4	50
10.90	43.9	-	60	37.0	50

Result: PASS

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/m to 46dBµV*
0,5MHz to 5MHz: 46dBµV
5MHz to 30MHz: 50dBµV

*Decreases with the logarithm of the frequency



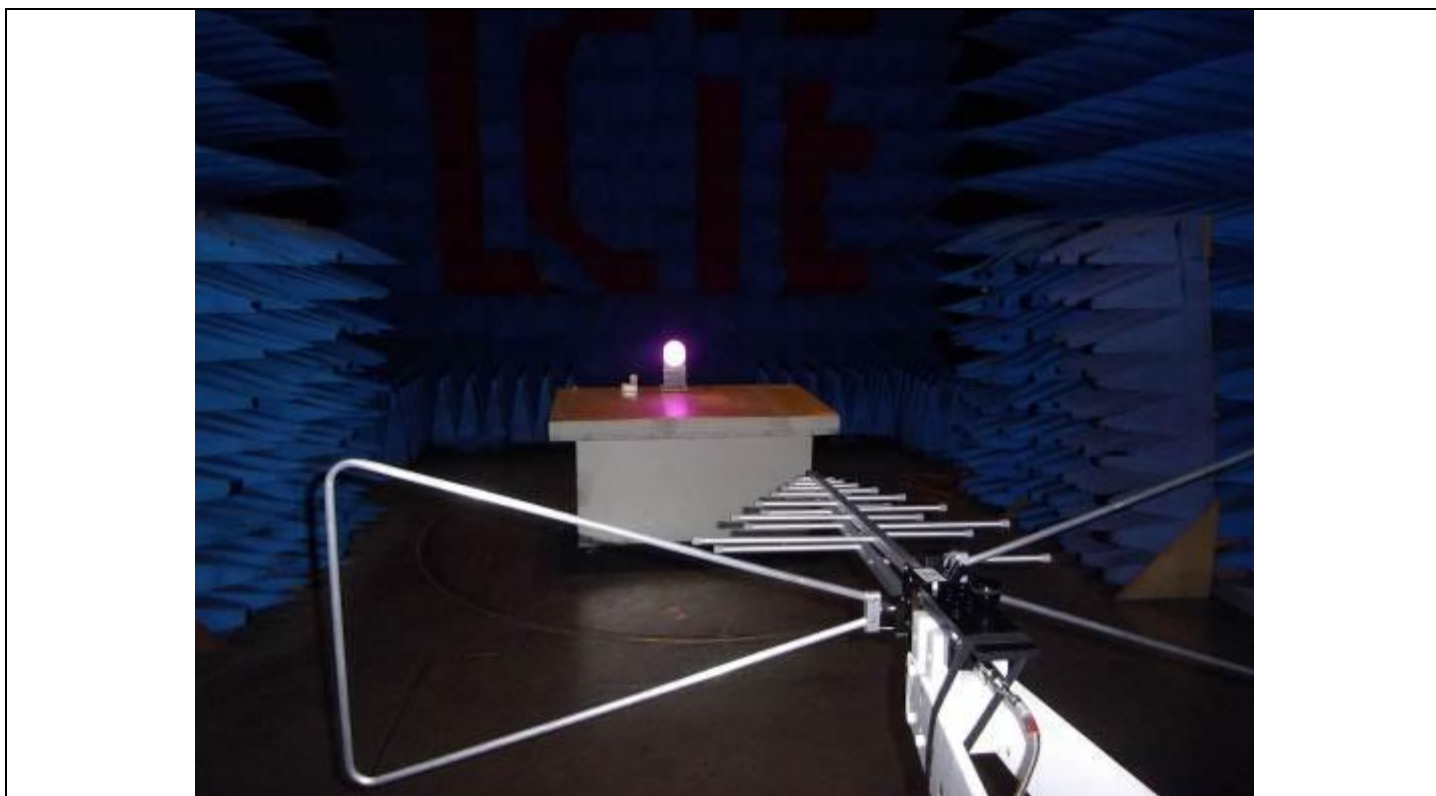
10. UNWANTED EMISSIONS INTO RESTRICTED FREQUENCY BANDS

10.1. TEST CONDITIONS

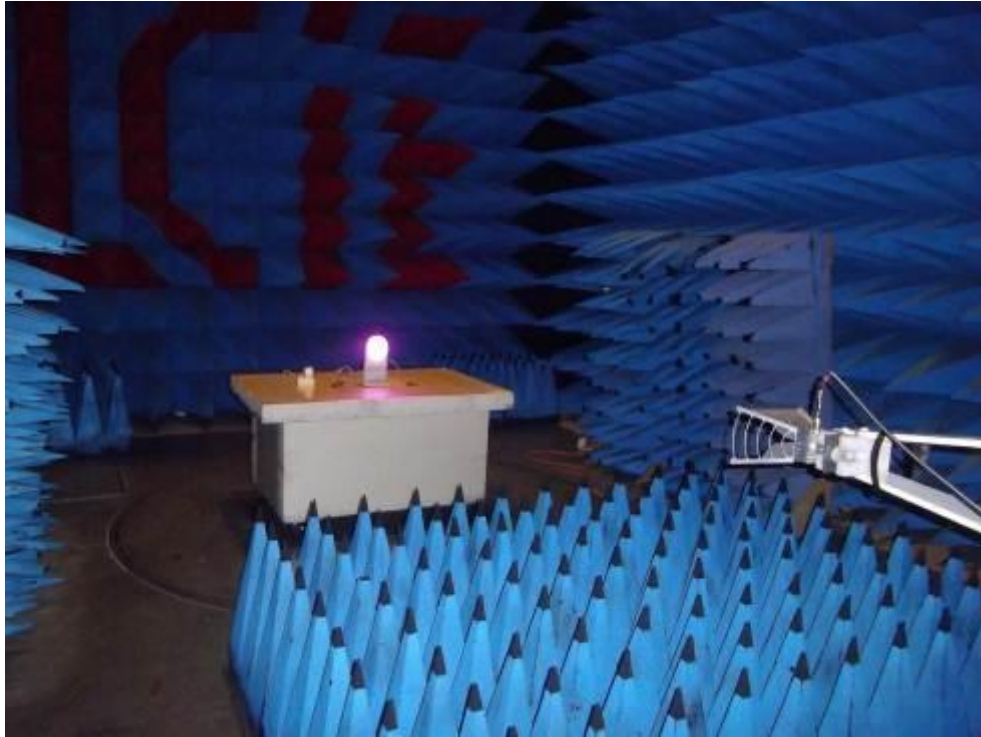
Test performed by : Gilles DE BUYSER
Date of test : 2014/06/11
Ambient temperature : 18°C
Relative humidity : 52%

10.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2009). 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 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.



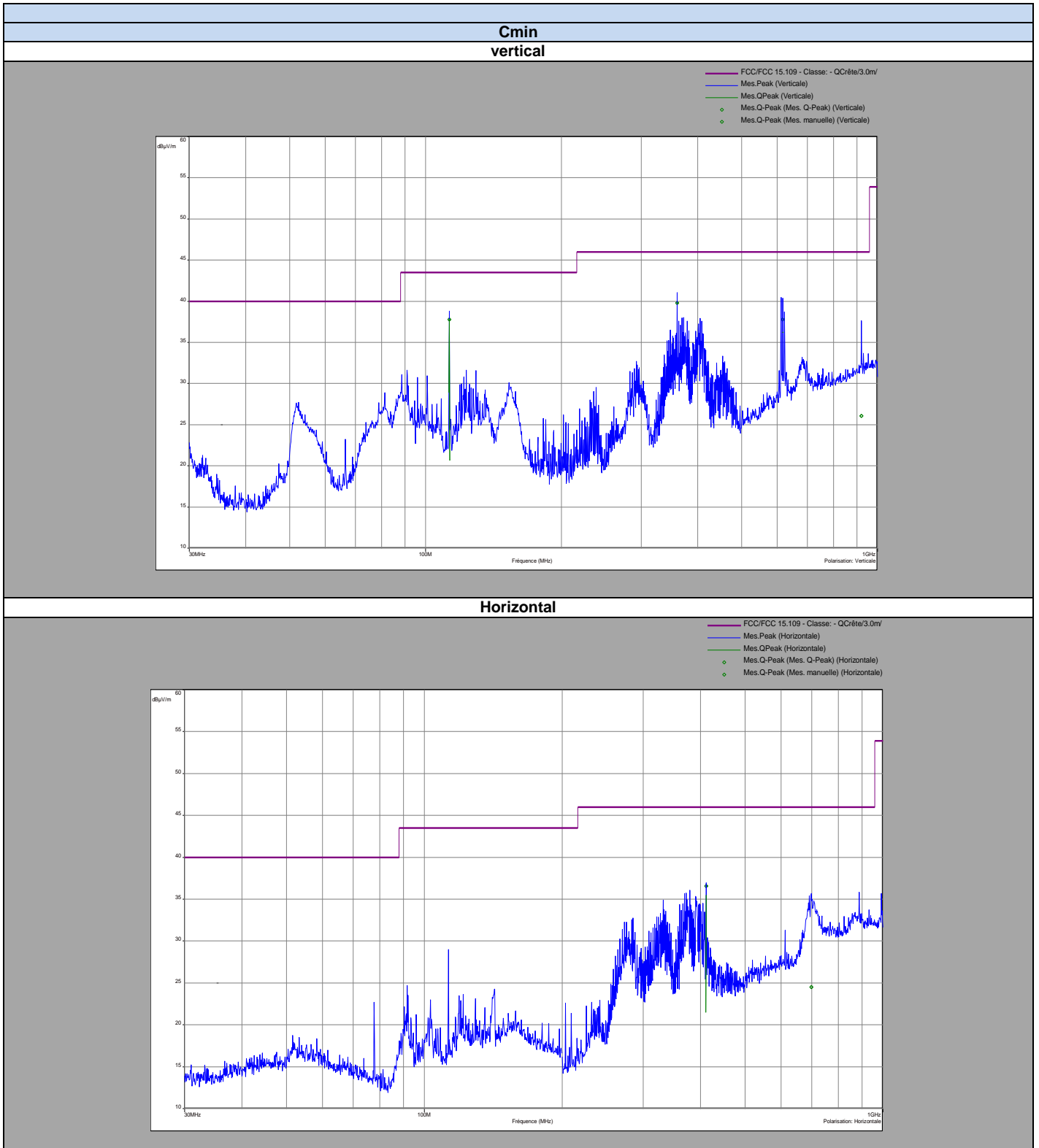
Photograph for Unwanted Emissions into Restricted Frequency Bands



Photograph for Unwanted Emissions into Restricted Frequency Bands

10.3. RESULTS

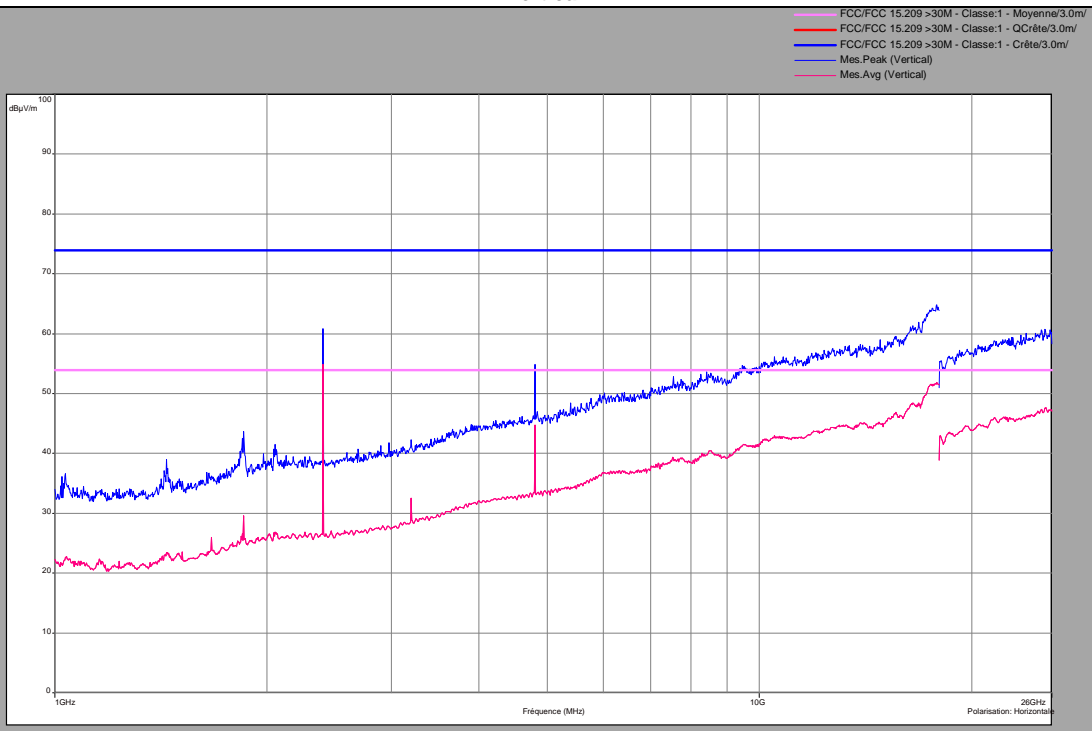
Below 1GHz



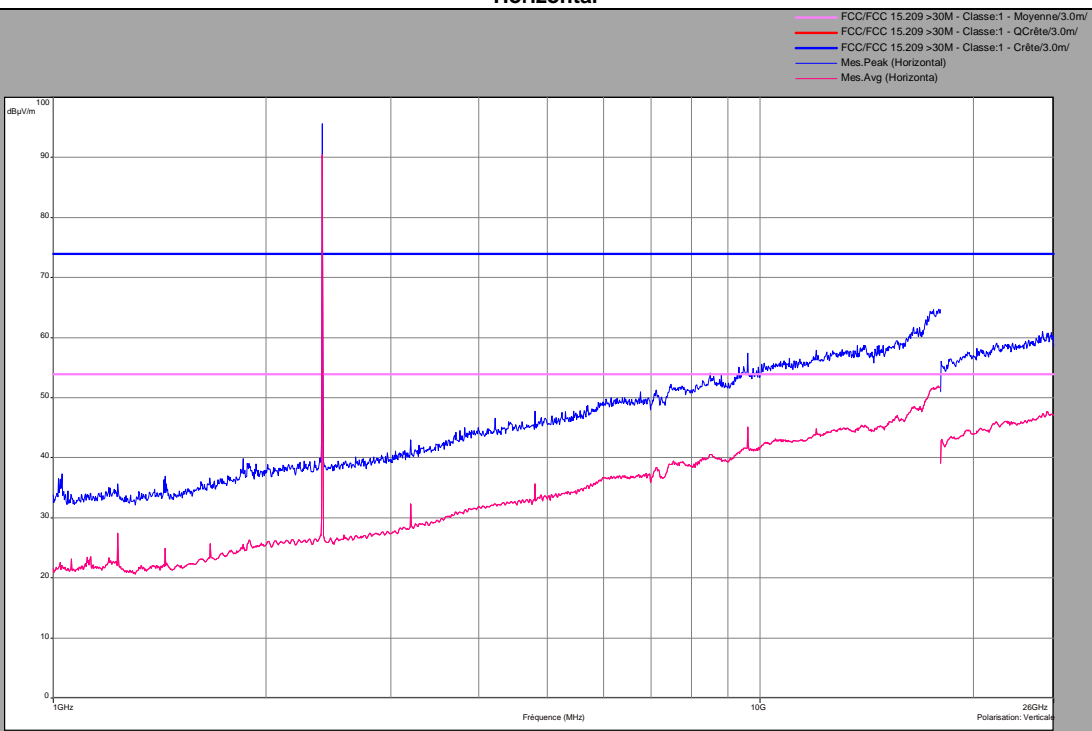


Above 1GHz

Cmin
vertical



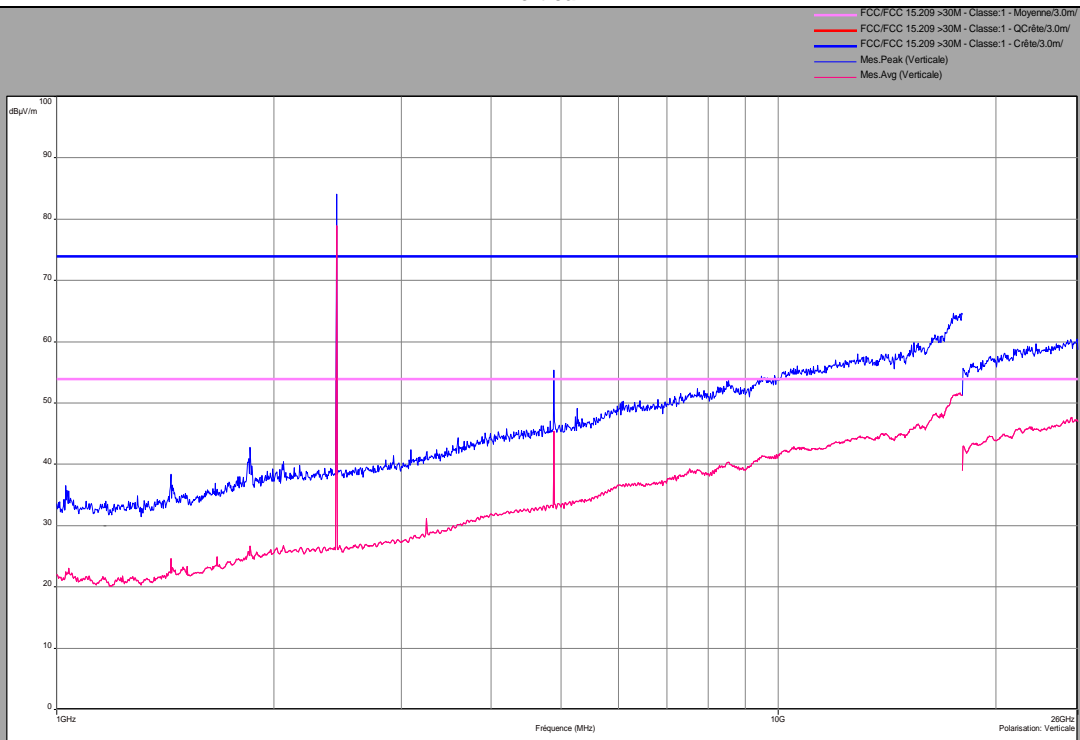
Horizontal



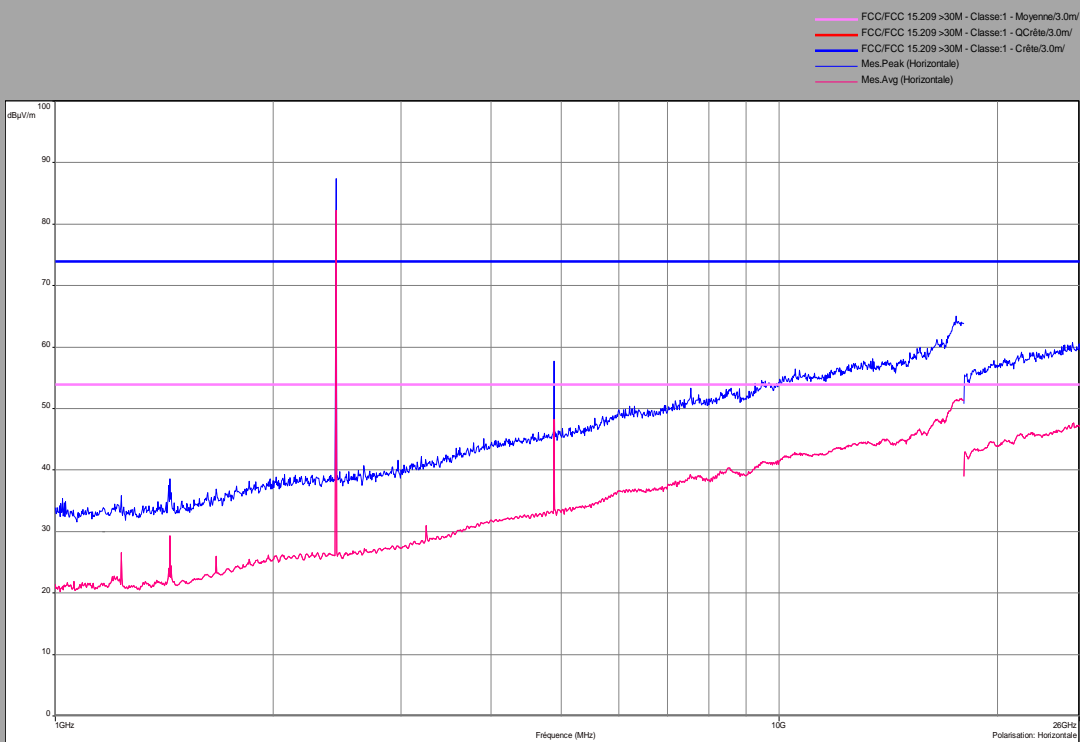


Above 1GHz

Cnom
vertical



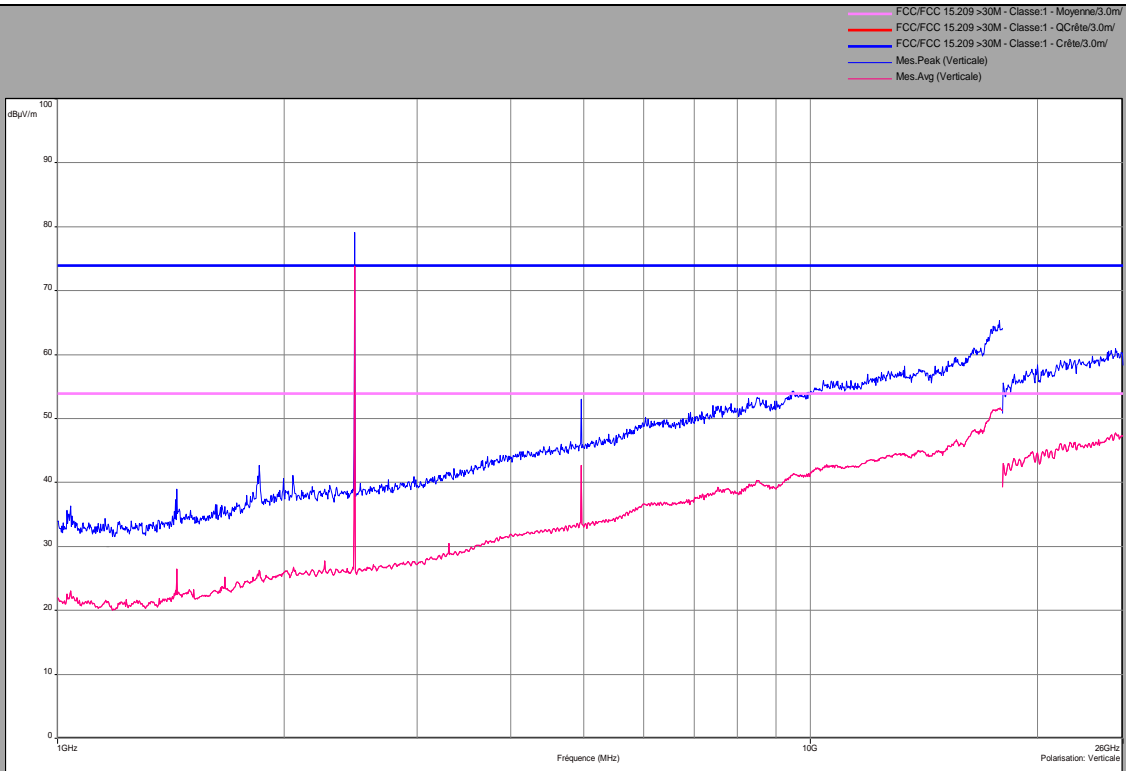
Horizontal



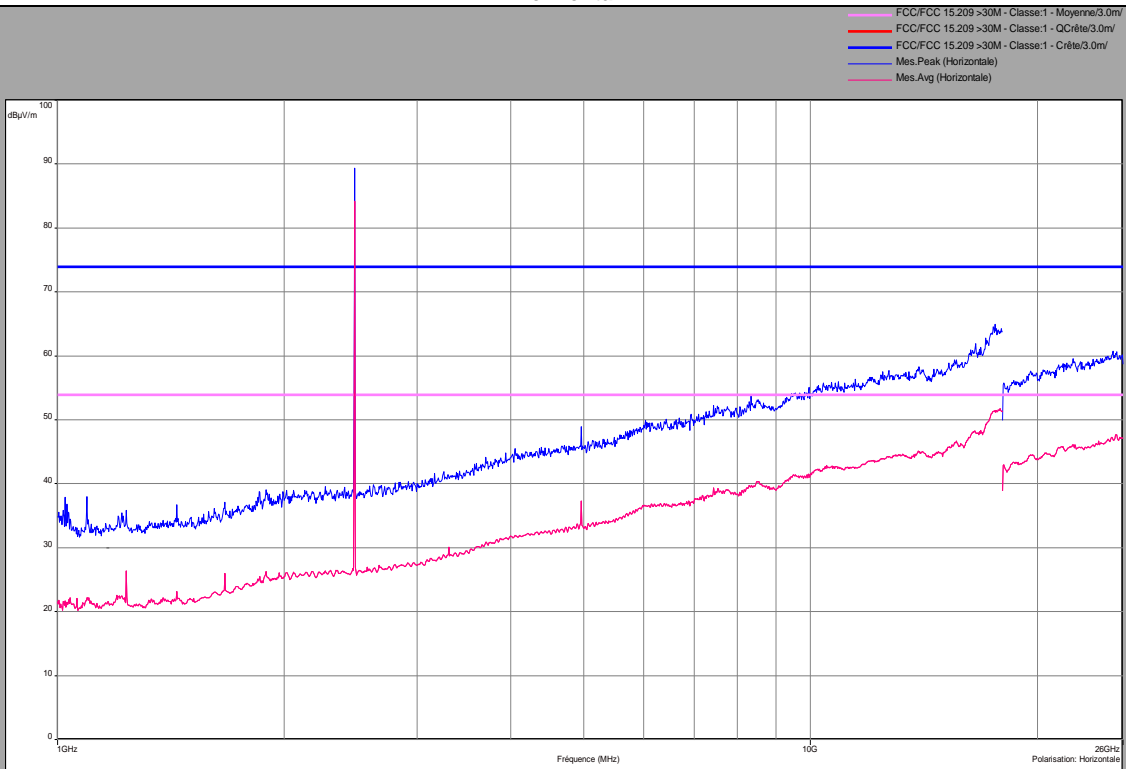


Above 1GHz

Cmax
vertical



Horizontal





• Characterization in a semi anechoic chamber (30MHz to 26GHz):

Below 1GHz

Cmin

Polarisation	Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)
Vertical	112.8	38.6	37.8	43.5
Vertical	360.0	40.5	39.8	46
Horizontal	411.4	37.7	36.6	46
Vertical	617.2	41.3	37.8	46
Horizontal	697.5	27.6	24.5	46
Vertical	920.4	30.8	26.1	46

Above 1GHz

Cmin

Polarisation	Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
Horizontal	2400	49.1	54	61.0	74
Horizontal	3202	32.4	54	42.9	74
Horizontal	4804	35.7	54	47.7	74
Horizontal	9608	47.1	54	57.4	74
Vertical	4804	44.8	54	54.9	74

Cnom

Polarisation	Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
Horizontal	4884	48.2	54	57.7	74
Horizontal	7543	39.3	54	53.2	74
Vertical	1851	26.7	54	42.8	74
Vertical	4884	45.4	54	55.3	74

Cmax

Polarisation	Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
Horizontal	2483.5	27.0	54	38.8	74
Horizontal	4960	37.3	54	48.9	74
Vertical	4960	42.7	54	53.0	74

Result: PASS

Limit: → 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



11. TEST EQUIPMENT LIST

Unwanted Emissions into Restricted Frequency Bands & Receiver Spurious Emissions					
Apparatus	Trade Mark	Type	Registration number	Calibration date	Calibration due
Cable	-	-	A5329261	2014/05	2015/05
Cable	CABLES & CONNECTIQUES	-	A5329374	2014/05	2015/05
Cable	CABLES & CONNECTIQUES	-	A5329459	2014/04	2015/04
Preamplifier	LCIE	LCIE-ALB-001	A7080073	2013/11	2014/11
Bilog antenna	SCHWARZBECK	VULB 9160	C2040150	2014/06	2015/06
Horn antenna 18-26,5GHz	AH SYSTEMS	SAS572	C2042026	2014/01	2016/01
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2013/04	2014/04
Horn antenna	A-INFOMW	LB-10180-NF	C2042051	2014/04	2015/04
Semi anechoic chamber	SIEPEL	-	D3044008	2011/04	2014/04
AC Power Line Conducted Emissions					
Apparatus	Trade Mark	Type	Registration number	Calibration date	Calibration due
Cable	CABLES & CONNECTIQUES	-	A5329411	2014/05	2015/05
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2013/04	2014/04
V LISN	ROHDE & SCHWARZ	ENV216	C2320162	2014/03	2015/03
Semi anechoic chamber	SIEPEL	-	D3044008	2011/04	2014/04
Occupied Bandwidth, -6dB Bandwidth, Maximum Peak Output Power, Power Spectral Density and Unwanted Emissions into Non-Restricted Frequency Bands					
Apparatus	Trade Mark	Type	Registration number	Calibration date	Calibration due
Programmable AC/DC power supply	KIKUSUI	PCR500M	A7040079	2014/05	2015/05
Attenuator	MINI CIRCUITS	BW-S3W2+	A7122237	2013/07	2014/07
RF cable	Télédyne	920-0202-024	A5329674	2014/04	2015/04
Multi-meter	KEITHLEY	2000	A1241084	2014/02	2016/02
Spectrum analyzer	ROHDE & SCHWARZ	FSL6	A4060032	2012/11	2014/11
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2013/04	2014/04
Multi-meter	KEITHLEY	2000	A1241084	2014/02	2016/02
Measurement RF cable	-	-	A5329592	2014/05	2015/05
Programmable AC/DC power supply	-; KIKUSUI	PCR500M	A7040079	2014/05	2015/05
Attenuator 3dB	WEINSCHEL	WA54-3-12	A7122223	2013/12	2014/12

Note: In our Quality System, the calibration due of our equipments is more or less 2 months.



12. UNCERTAINTIES CHART

Kind of test	Measurement uncertainties (k=2) $\pm x(\text{dB}) / (\text{Hz})$	Limit for uncertainties $\pm y(\text{dB})$
TRANSMITTER REQUIREMENTS		
Radio frequency	$\pm 2 \cdot 10^{-8}$ Hz	$\pm 1 \cdot 10^{-7}$ Hz
RF Conducted power	± 0.6 dB	± 1.5 dB
Spurious emissions <ul style="list-style-type: none"> • Frequency < 1000 MHz • Frequency > 1000 MHz 	± 3.9 dB ± 3.1 dB	± 6 dB
Spurious in conduction	± 1.6 dB	± 3 dB
Temperature	$\pm 0.5^\circ\text{C}$	$\pm 1^\circ\text{C}$
Humidity	± 2.5 %	± 10 %