TEST REPORT

N°: 154772-719315 **Version : 01**

Subject	**Radio spectrum matters** **tests according to standards:** **47 CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5**
Issued to	**NXP Semiconductors** 2 Esplanade Anton Philips, Campus Effiscience, Colombelles BP20000, 14906 - Caen Cedex 9 France

Apparatus under test

Product	JN5189-001-M10
Trade mark	**NXP**
Manufacturer	**NXP Semiconductors**
Model under test	**JN5189-001-M10 & JN5189-001-M13**
Serial number	**-**
FCC ID	**XXMJN5189M1013**
IC ID	**8764A-JN5189M1013**

Test date	: April 6, 2018 to April 20, 2018
Test location	Fontenay Aux Roses
Test Site	6230B-1
Composition of document	51 pages
Document issued on	April 8, 2019

Written by :
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Approved by
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Technical manager

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	April 24, 2018	Julien PALARD	Creation of the document

SUMMARY

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1. TEST PROGRAM

References

- **47 CFR Part 15.247**
- **RSS 247 Issue 2**
- **RSS Gen Issue 5**
- **KDB 558074 D01 DTS Meas Guidance v04**
- **ANSI C63.10-2013**

Radio requirement:

Clause (47CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
6dB Bandwidth	☑ PASS	☐ FAIL	☐ NA()	☐ NP(1)
Duty Cycle	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Maximum Conducted Output Power	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Power Spectral Density	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Conducted Spurious Emission at the Band Edge	☑ PASS	☐ FAIL	☐ NA()	☐ NP(1)
Unwanted Emissions into Non-Restricted Frequency Bands	☑ PASS	☐ FAIL	☐ NA()	☐ NP(1)
AC Power Line Conducted Emission	☑ PASS	☐ FAIL	☐ NA(2)	☐ NP(1)
Unwanted Emissions into Restricted Frequency Bands	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Receiver Radiated emissions	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
This table is a summary of test report, see conclusion of each clause of this test report for detail.				

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

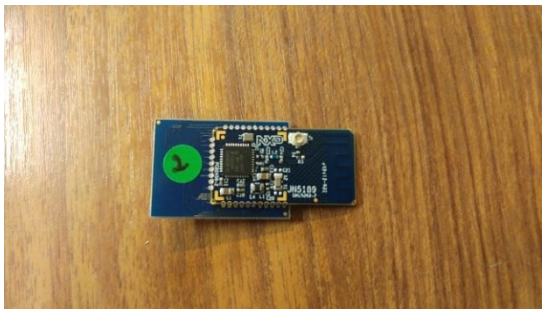
PASS: EUT complies with standard's requirement
FAIL: EUT does not comply with standard's requirement
NA: Not Applicable
NP: Test Not Performed

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

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

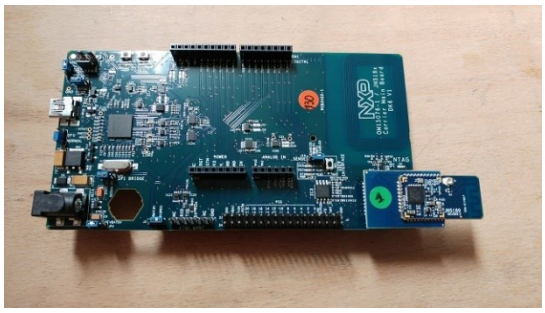
NXP JN5189-001-M10 & JN5189-001-M13 **Serial Number: -**



M10

M13

Equipment Under Test



Equipment Under Test

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
1	USB cable		☐	☐	☑	Interface PC – CMET - Device

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Carrier main noard	OM15076-1 / JN418x	-	To connect the EUT
Laptop	LENOVO	-	-

Equipment information:

Type:	☑ **ZIGBEE**		☐ **RF4CE**	
Frequency band:	[2400 – 2483.5] MHz			
Number of Channel:	16			
Spacing channel:	5MHz			
Channel bandwidth:	2MHz			
Antenna Type:	☑ Integral	☑ External	☐ Dedicated	
Antenna connector:	☑ Yes	☐ No	☐ Temporary for test	
Transmit chains:	1			
Receiver chains	1			
Type of equipment:	☐ Stand-alone	☑ Plug-in	☐ Combined	
Ad-Hoc mode:	☐ Yes		☑ No	
Duty cycle:	☐ Continuous duty	☐ Intermittent duty	☑ 100% duty	
Equipment type:	☑ Production model		☐ Pre-production model	
Operating temperature range:	Tmin:	☐ -20°C	☐ 0°C	☑ -40°C
	Tnom:	20°C		
	Tmax:	☐ 35°C	☐ 55°C	☑ 105°C
Type of power source:	☐ AC power supply	☑ DC power supply	☐ Battery	
Operating voltage range:	Vnom:	☐ 120V/60Hz	☑ 3.3 Vdc	

Antenna Characteristic			
Antenna assembly	**Gain (dBi)**	**Frequency Band (MHz)**	**Impedance(Ω)**
1 (Internal PCB antenna)	1.8	2400 – 2483.5	50
2 (External µFL antenna)	2	2400 – 2483.5	50

CHANNEL PLAN	
Channel	**Frequency (MHz)**
Cmin: 11	2405
12	2410
13	2415
14	2420
15	2425
16	2430
17	2435
Cmid: 18	2440
19	2445
20	2450
21	2455
22	2460
23	2465
24	2470
25	2475
Cmax: 26	2480

DATA RATE		
Data Rate (Mbps)	**Modulation Type**	**Worst Case Modulation**
0.25	O-QPSK	☑

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 :” CMET for JN5189 certification.pdf” for the commands use during the test.

2.3. EQUIPMENT LABELLING

2.4. EQUIPMENT MODIFICATION

☑ None ☐ Modification:

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

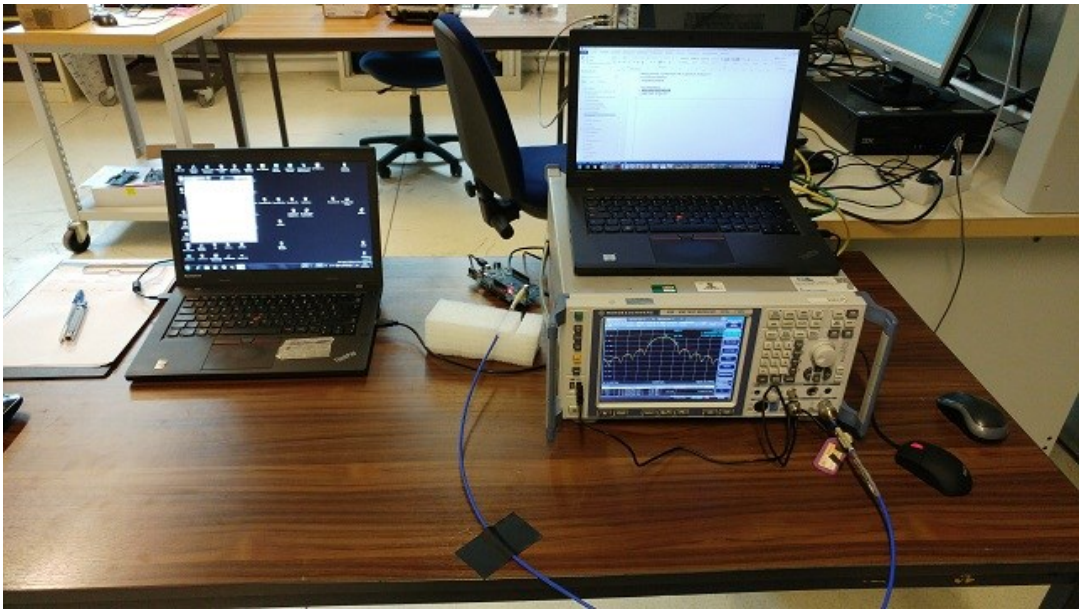
Test performed by : Julien PALARD
Date of test : April 17, 2018
Ambient temperature : 24 °C
Relative humidity : 41 %

3.2. TEST SETUP

- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ RSS-Gen Issue 5 § 6.6
☑ ANSI C63.10 § 6.9.2



Photograph for Occupied bandwidth

3.1. LIMIT

None

3.2. TEST EQUIPMENT LIST

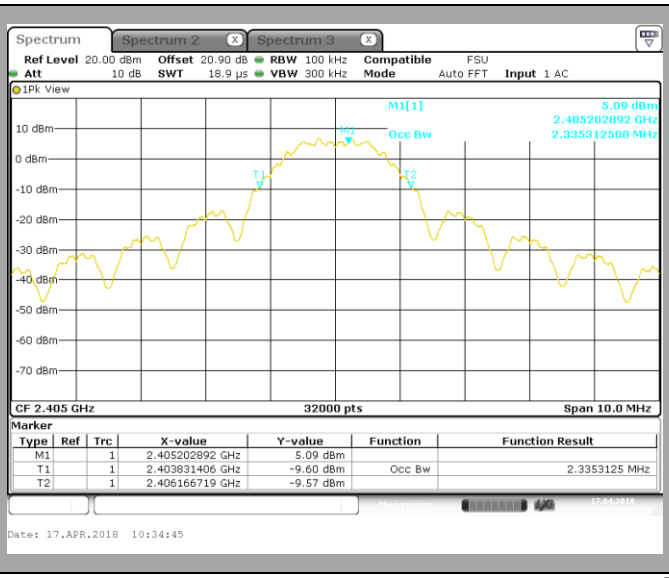
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
RF cable & 20 dB attenuator	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09

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

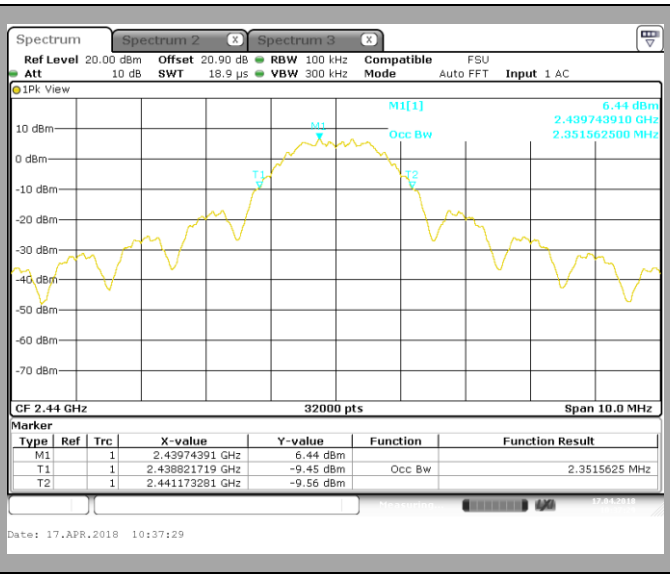
3.3. RESULTS

Occupied Bandwidth

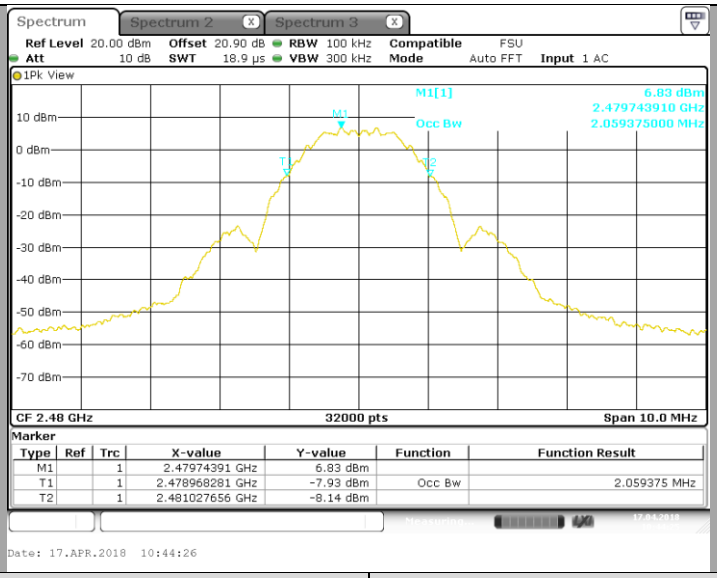
Cmin



Cnom



Cmax



Channel	Occupied Bandwidth (MHz)
Cmin	2.335
Cnom	2.351
Cmax	2.059

3.1. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **NXP JN5189-001-M10 & JN5189-001-M13**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS-GEN ISSUE 5** limits.

4. 6DB EMISSION BANDWIDTH

4.1. TEST CONDITIONS

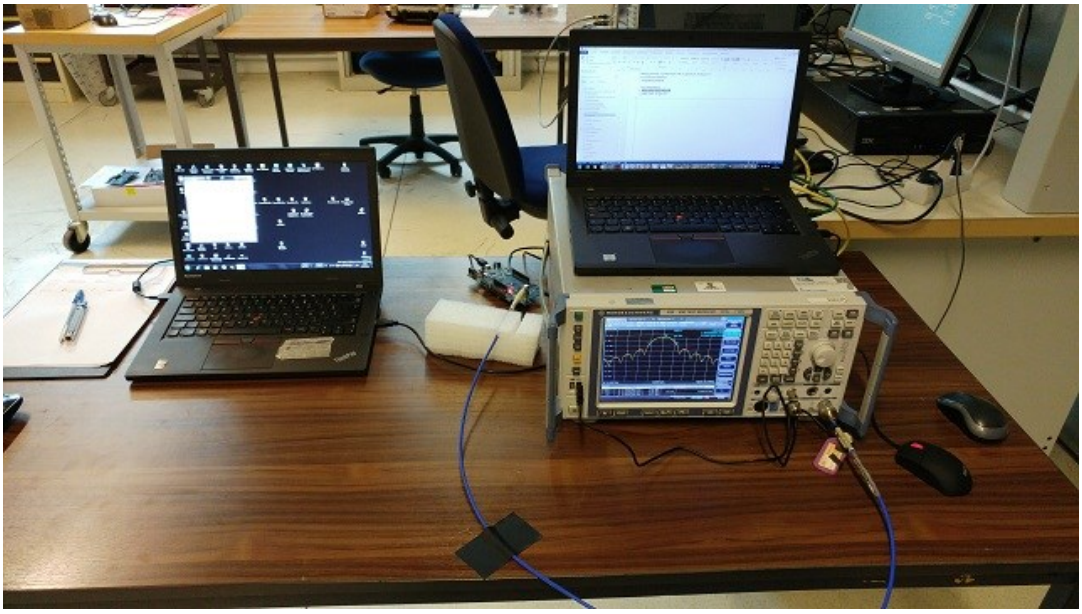
Test performed by : Julien PALARD
Date of test : April 17, 2018
Ambient temperature : 24 °C
Relative humidity : 41 %

4.2. TEST SETUP

- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ KDB 558074 D01 DTS Meas Guidance v04 § 8.1
☐ KDB 558074 D01 DTS Meas Guidance v04 § 8.2



Photograph for 6dB emission bandwidth

4.3. LIMIT

The 6dB bandwidth shall be at least 500kHz

4.4. TEST EQUIPMENT LIST

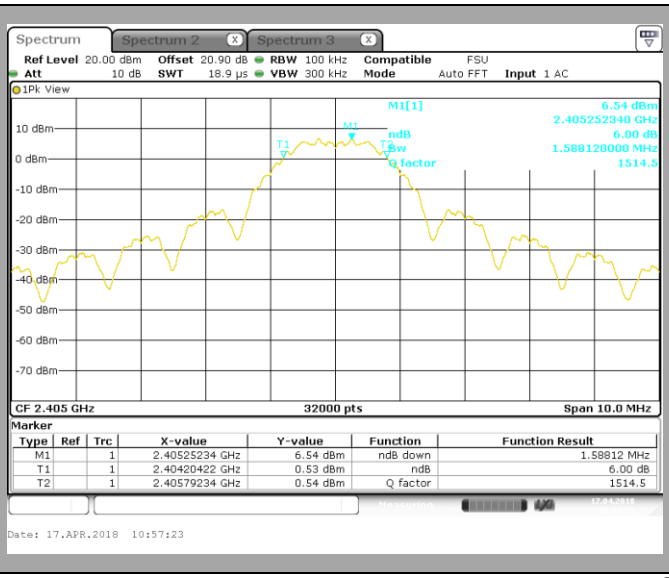
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
RF cable & 20 dB attenuator	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09

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

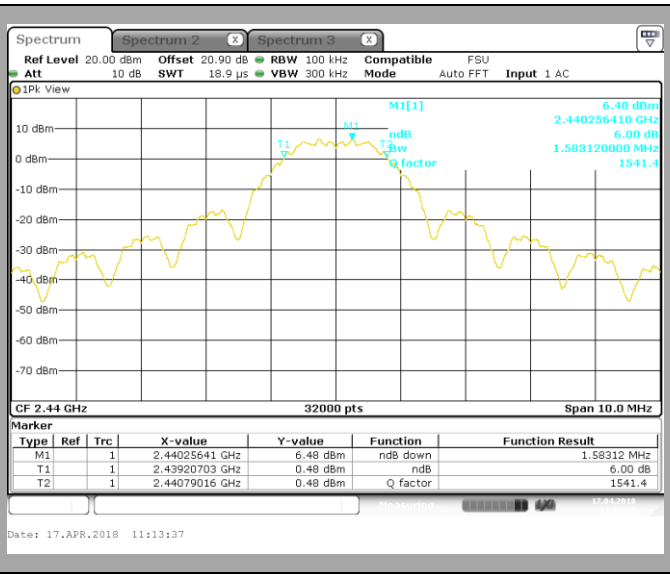
4.5. RESULTS

6dB Emission Bandwidth

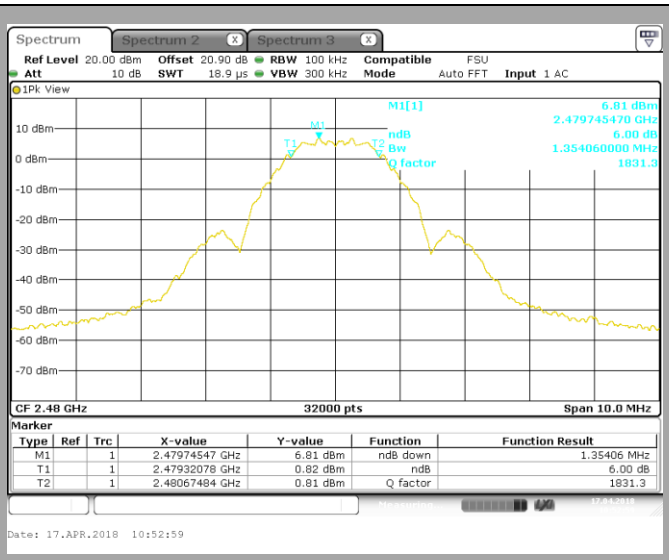
Cmin



Cnom



Cmax



Channel	6dB Emission Bandwidth (MHz)	Limit (MHz)
Cmin	1.588	Minimum 0.5
Cnom	1.583	Minimum 0.5
Cmax	1.354	Minimum 0.5

4.6. CONCLUSION

6dB Emission Bandwidth measurement performed on the sample of the product **NXP JN5189-001-M10 & JN5189-001-M13**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

5. DUTY CYCLE

5.1. TEST CONDITIONS

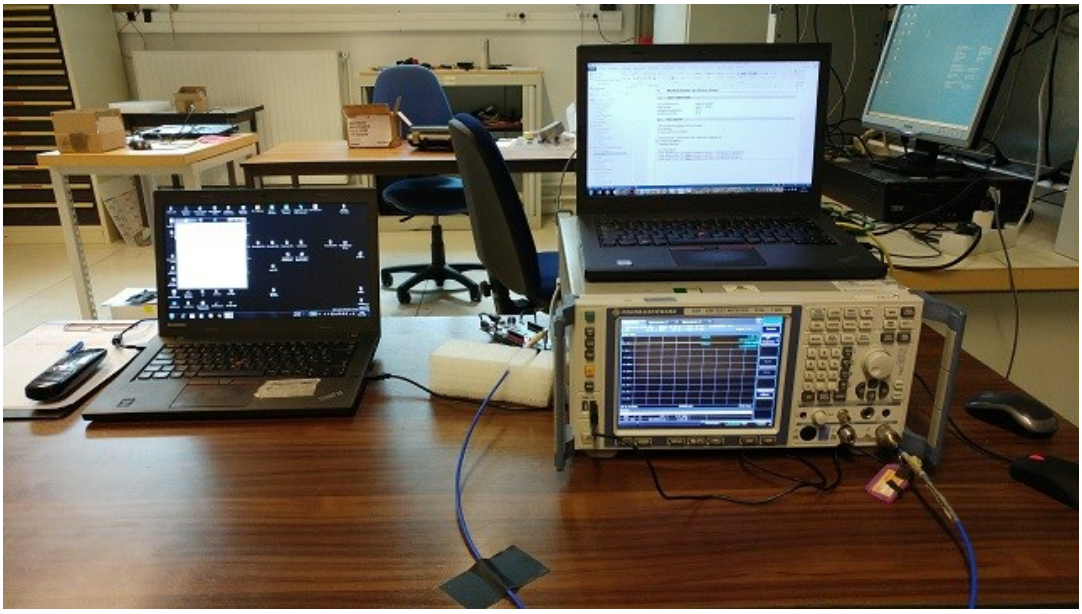
Test performed by : Julien PALARD
Date of test : April 17, 2018
Ambient temperature : 24 °C
Relative humidity : 41 %

5.2. TEST SETUP

- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ KDB 558074 D01 DTS Meas Guidance v04 § 6.0 b)



Photograph for Duty Cycle

5.3. LIMIT

None

5.4. TEST EQUIPMENT LIST

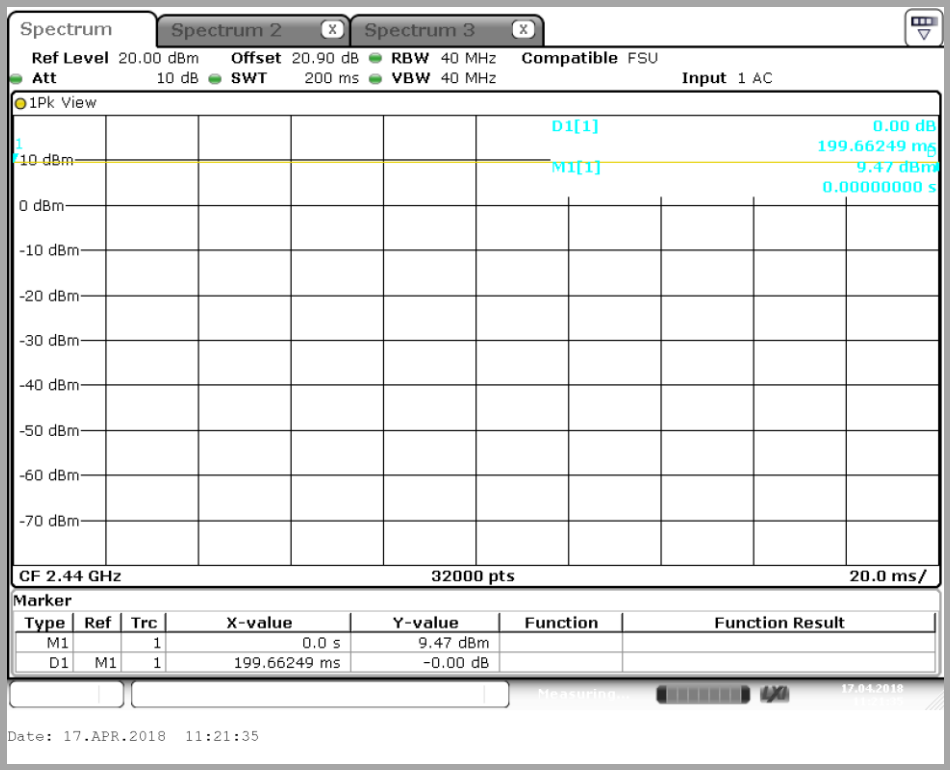
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
RF cable & 20 dB attenuator	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09

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

5.5. RESULTS

Duty Cycle

Channel



Channel	Duty Cycle (%)	Duty Cycle Correction (dB)
Channel	100	0

5.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **NXP JN5189-001-M10 & JN5189-001-M13**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

6. MAXIMUM CONDUCTED OUTPUT POWER

6.1. TEST CONDITIONS

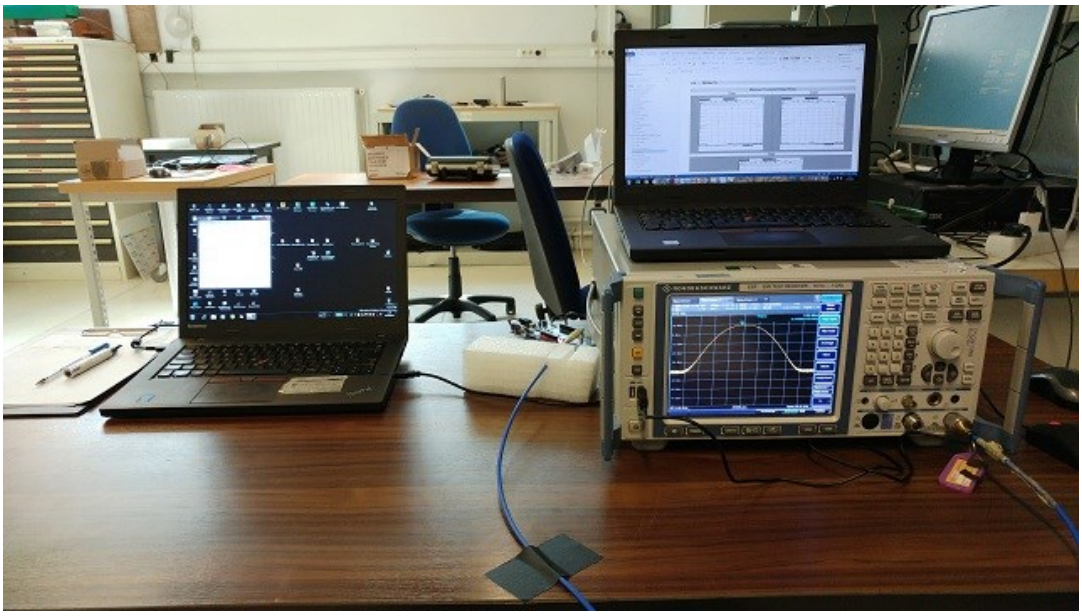
Test performed by : Julien PALARD
Date of test : April 17, 2018
Ambient temperature : 24 °C
Relative humidity : 41 %

6.2. TEST SETUP

- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ KDB 558074 D01 DTS Meas Guidance v04 § 9.1.1 (RBW≥DTS bandwidth)
☐ KDB 558074 D01 DTS Meas Guidance v04 § 9.2.2.2 (Method AVGSA-1)
☐ KDB 558074 D01 DTS Meas Guidance v04 § 9.2.2.4 (Method AVGSA-2)



Photograph for Maximum Conducted Output Power

6.3. LIMIT

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

6.4. TEST EQUIPMENT LIST

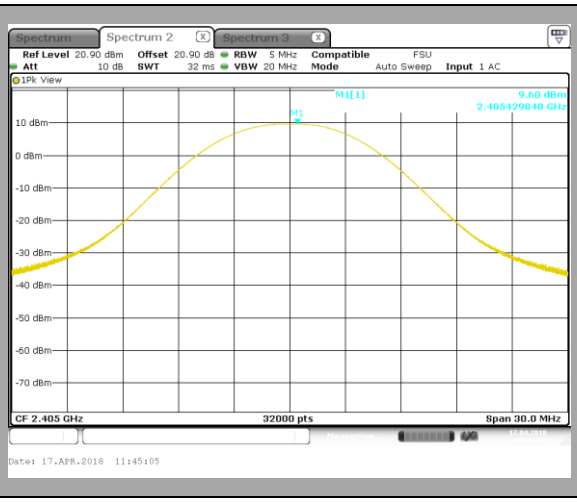
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
RF cable & 20 dB attenuator	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09

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

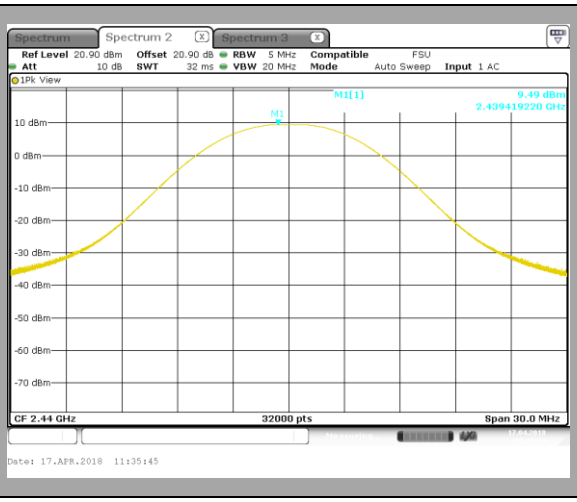
6.5. RESULTS

Maximum Conducted Output Power

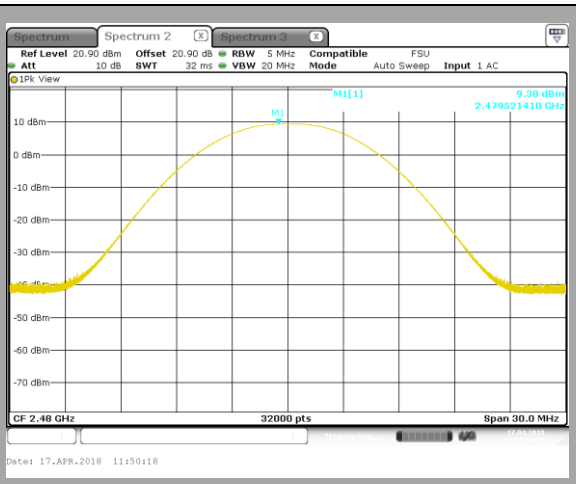
Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	**20.9**	1.8	9.60	30
Cnom	**20.9**	1.8	9.49	30
Cmax	**20.9**	1.8	9.38	30

6.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **NXP JN5189-001-M10 & JN5189-001-M13**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

7. POWER SPECTRAL DENSITY

7.1. TEST CONDITIONS

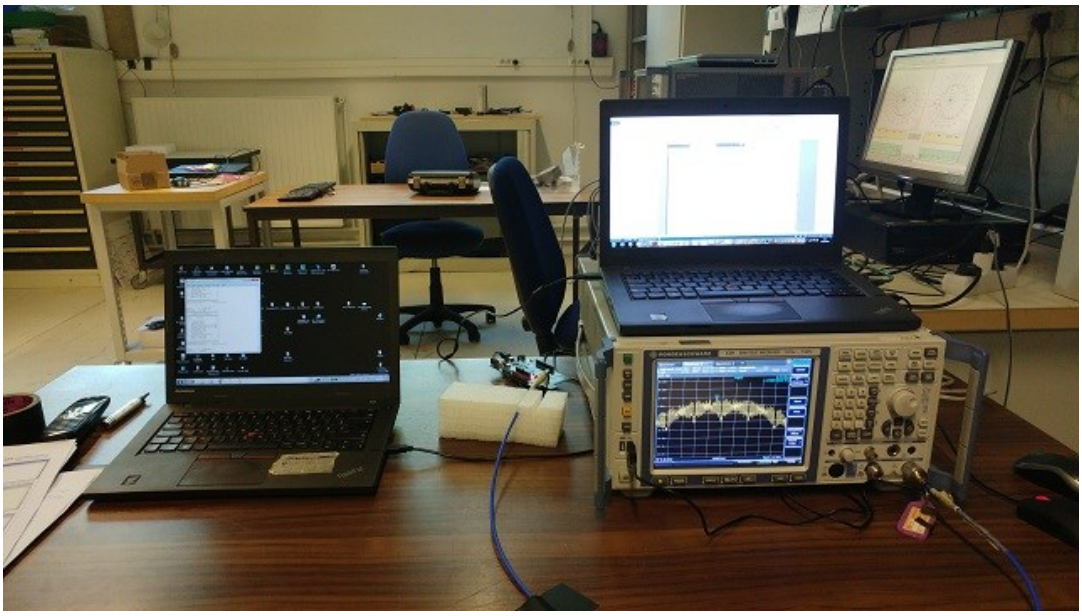
Test performed by : Julien PALARD
Date of test : April 17, 2018
Ambient temperature : 24 °C
Relative humidity : 41 %

7.2. TEST SETUP

- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ KDB 558074 D01 DTS Meas Guidance v04 § 10.2 (Method PKPSD)
☐ KDB 558074 D01 DTS Meas Guidance v04 § 10.3 (Method AVGPSD-1)



Photograph for Power Spectral Density

7.3. LIMIT

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

7.4. TEST EQUIPMENT LIST

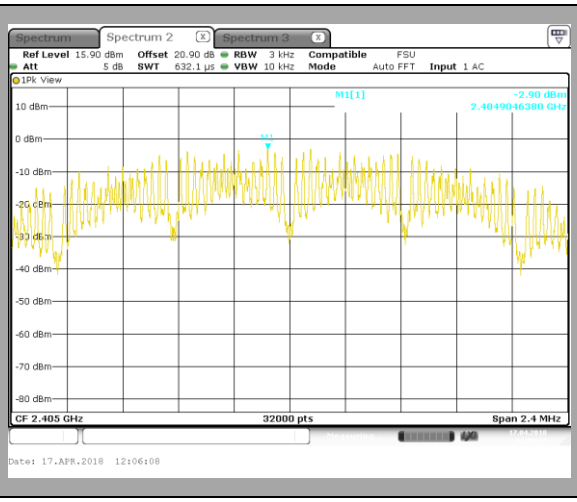
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
RF cable & 20 dB attenuator	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09

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

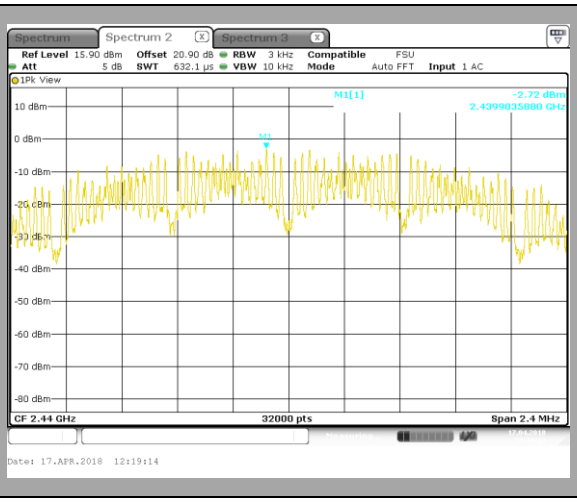
7.5. RESULTS

Power Spectral Density

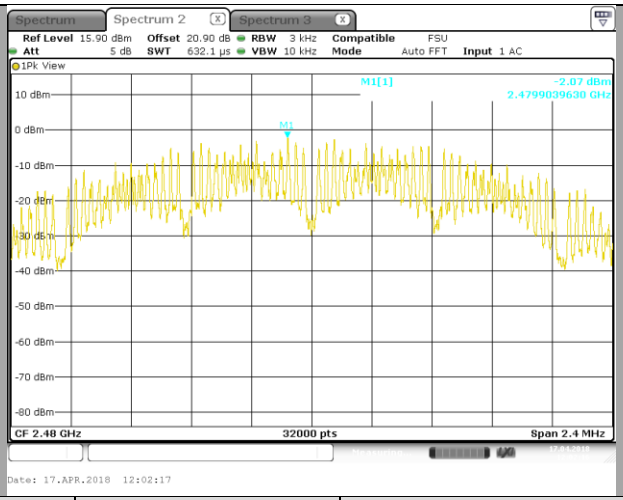
Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Cmin	**20.9**	1.8	-2.90	8
Cnom	**20.9**	1.8	-2.72	8
Cmax	**20.9**	1.8	-2.07	8

7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **NXP JN5189-001-M10 & JN5189-001-M13**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

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

8.1. TEST CONDITIONS

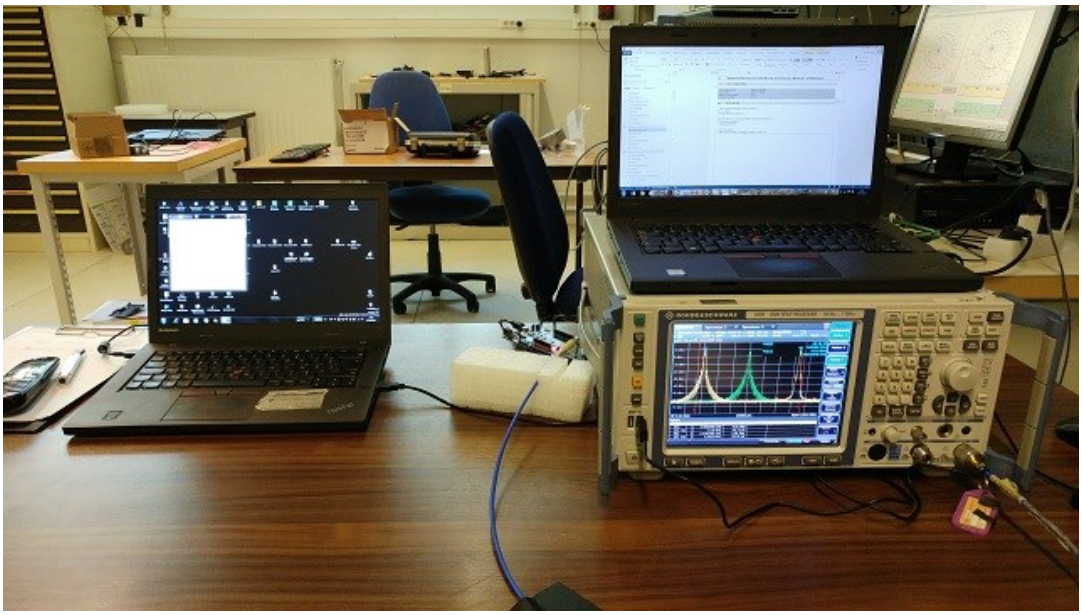
Test performed by : Julien PALARD
Date of test : April 17, 2018
Ambient temperature : 24 °C
Relative humidity : 41 %

8.2. TEST SETUP

- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ KDB 558074 D01 DTS Meas Guidance v04 § 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 (Maximum Conduted Power) below the Fundamental Radiator Level at the Band Edge Edge “2400MHz & 2483,5MHz”

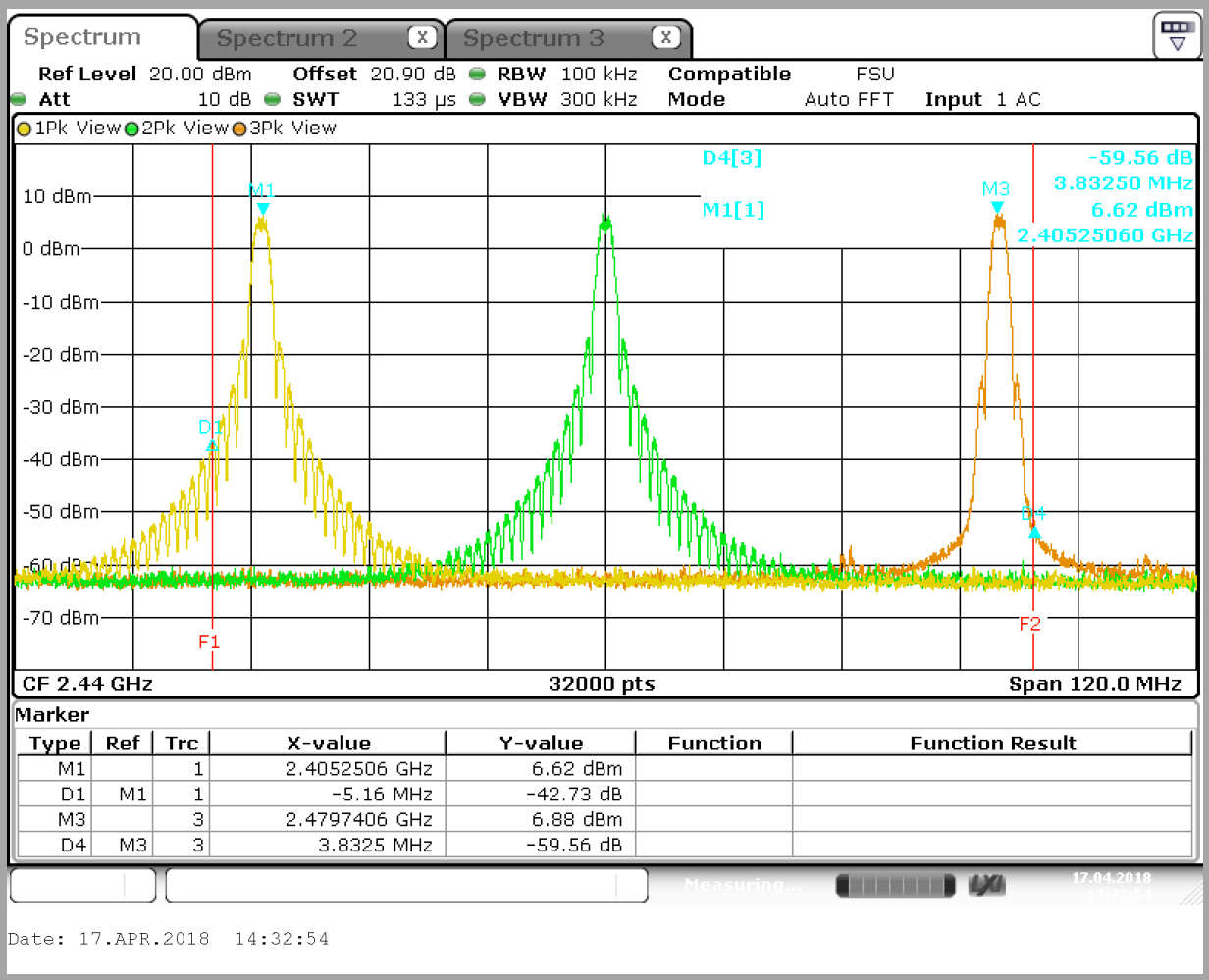
8.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
RF cable & 20 dB attenuator	TELEDYNE	920-0202-048	A5329674	2017/10	2018/10
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2016/09	2018/09

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

8.5. RESULTS

Cmin/Cnom/Cmax



Frequency (MHz)	Level (dBc)	Limit (dBc)
2400	42.73	20
2483.5	59.56	20

8.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **NXP JN5189-001-M10 & JN5189-001-M13,** SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

9. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

9.1. TEST CONDITIONS

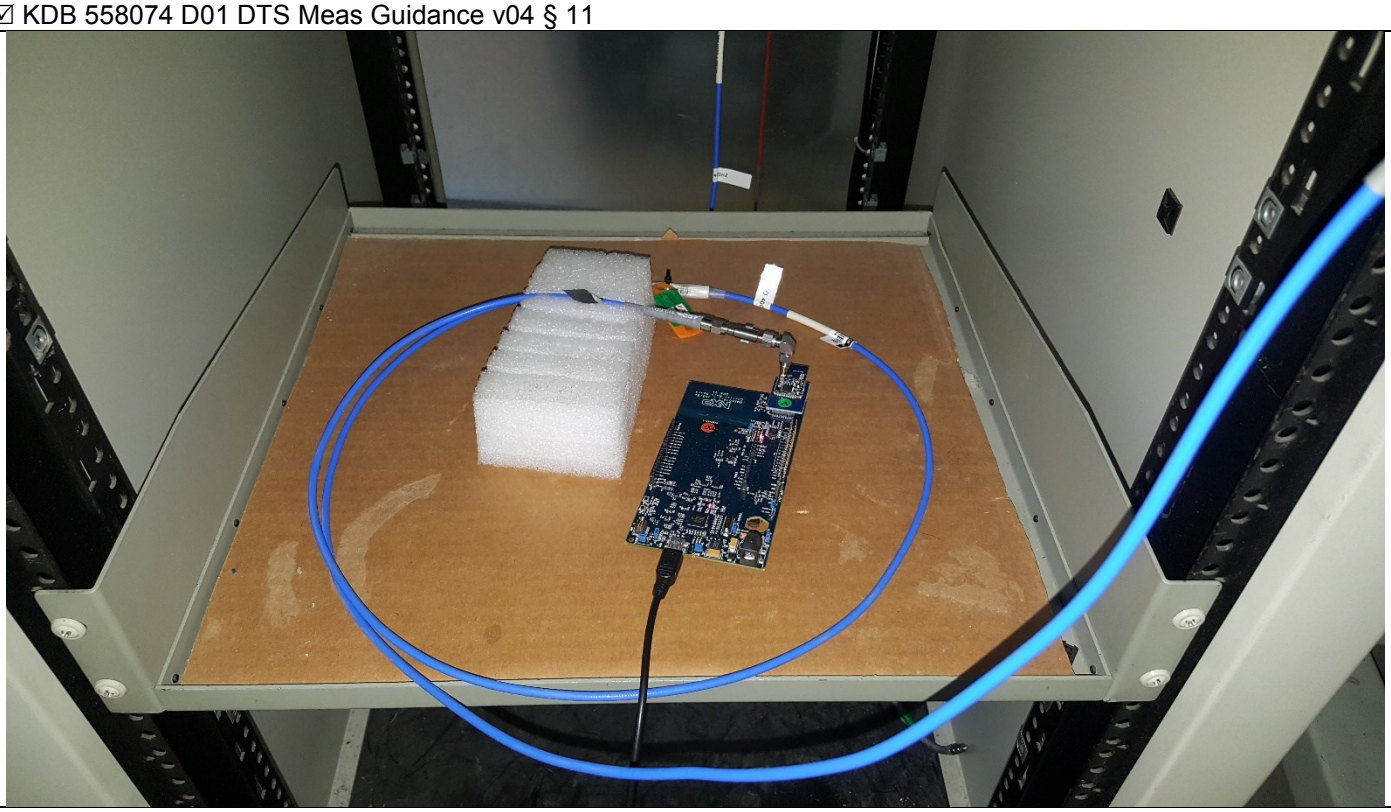
Test performed by	: Armand MAHOUNGOU
Date of test	: April 16, 2018
Ambient temperature	: 26 °C
Relative humidity	: 45 %

9.2. TEST SETUP

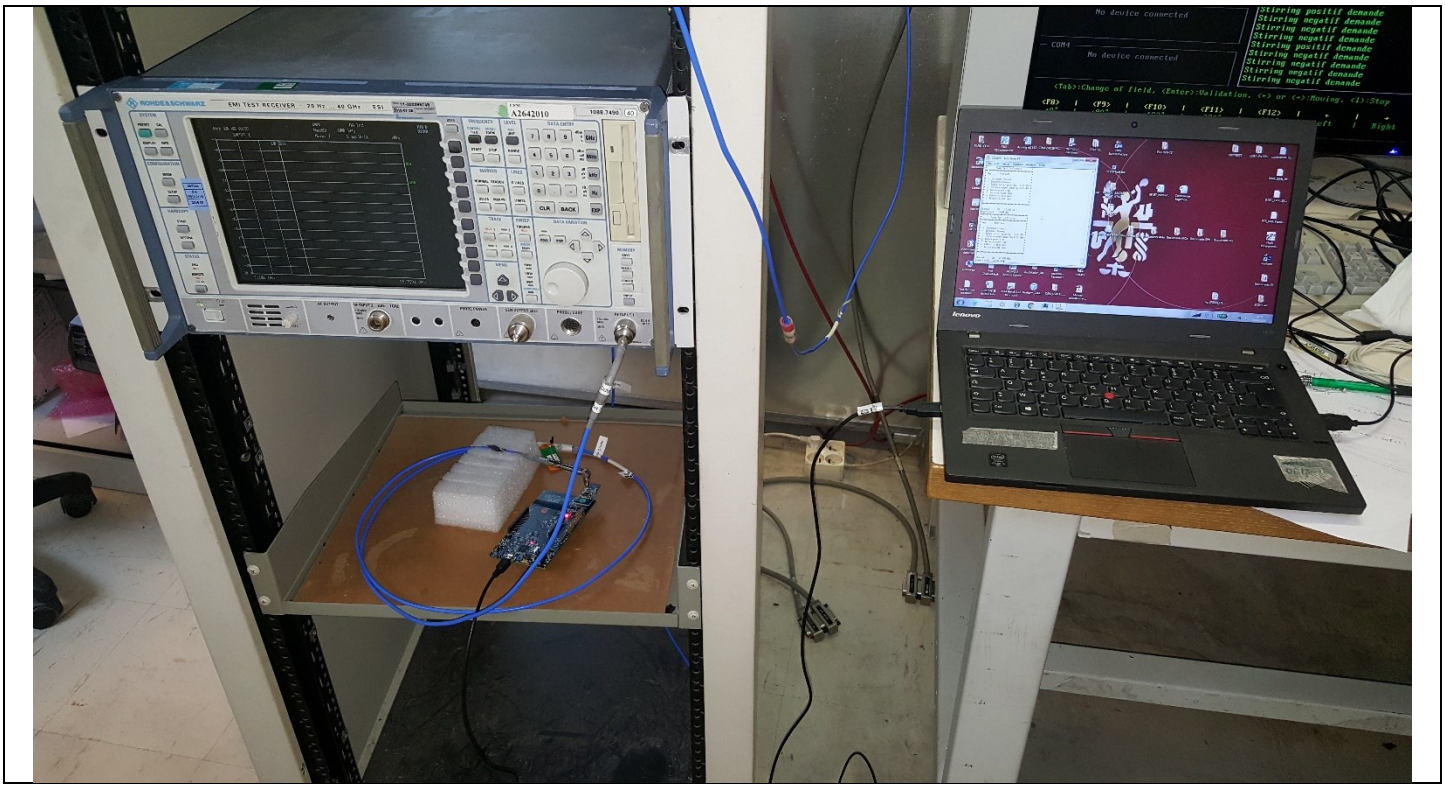
- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ KDB 558074 D01 DTS Meas Guidance v04 § 11



Photograph for Unwanted Emission into non-restricted frequency bands



Photograph for Unwanted Emission into non-restricted frequency bands

9.1. LIMIT

All Spurious Emissions must be at least Choose limit below the Fundamental Radiator Level

9.2. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2017/07	2018/07
Rejector filter 2,4GHz	-	2.45GHz	A7484048	2017/09	2018/09
cable	Télédyne	084-0555-2MTR	A5329758	2017/10	2018/10
Attenuator 3dB	WEINSCHEL	WA54-3-12	A7122223	2017/10	2018/10

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

9.3. RESULTS

M13

Cmin/Cnom/Cmax

Description Sous-bande 1

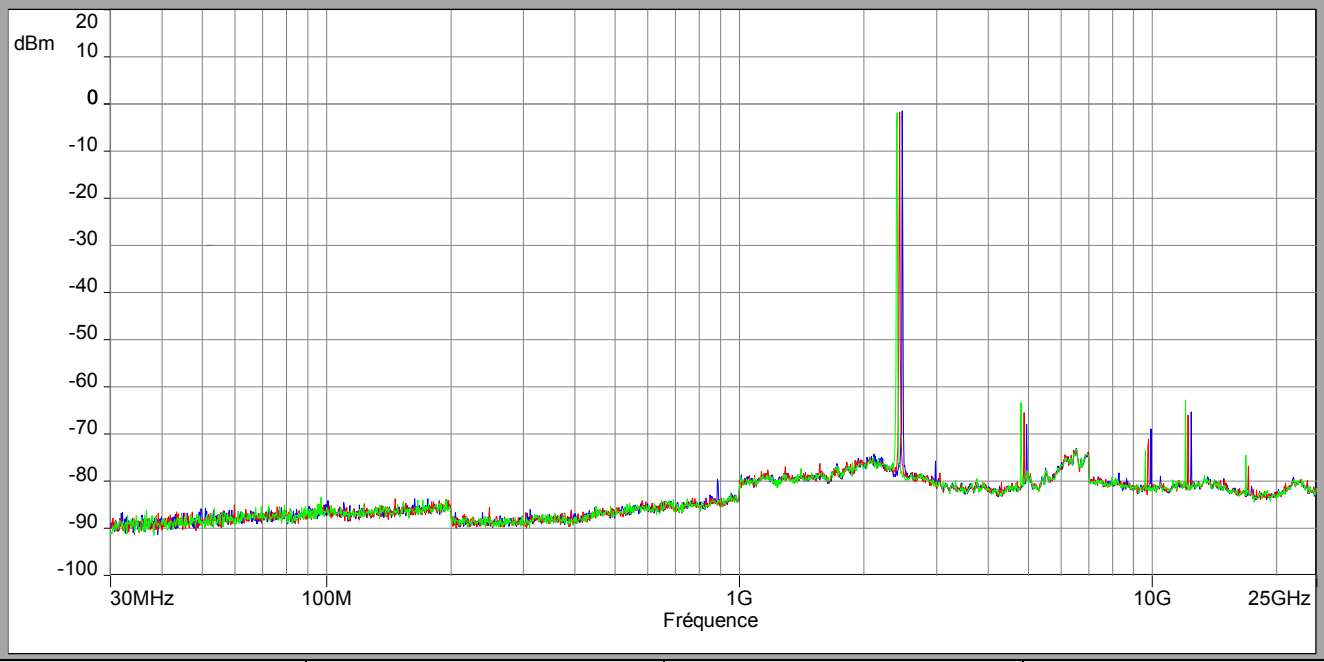
Fréquences: 30 MHz - 25 GHz (Mode: Lin, Pas: 100 kHz)

Réglages: RBW: 100 kHz, VBW: 300 kHz, Durée balayage : 1 ms/Pts, Atténuation : 215793808, Nombre de Balayages

Mes.Peak Channel Low

Mes.Peak Channel Middle

Mes.Peak Channel High



Frequency (MHz)	Level (dBm)	Level (dBc)	Limit (dBc)
2405	**-1.82**		
4809	-63.31	61.49	20
9618	-73.41	71.58	20
12022.5	-62.84	61.02	20
16831.5	-74.54	72.72	20
2440	**-1.72**		
4879	-65.44	63.72	20
9762	-71.15	69.43	20
12197.6	-65.95	64.23	20
17076.3	-76.80	75.08	
2480	**-1.47**		
4961	-67.96	66.49	20
9918	-68.93	67.46	20
12397.5	-65.31	63.84	20

9.4. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **NXP JN5189-001-M10 & JN5189-001-M13**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

10. AC POWER LINE CONDUCTED EMISSIONS

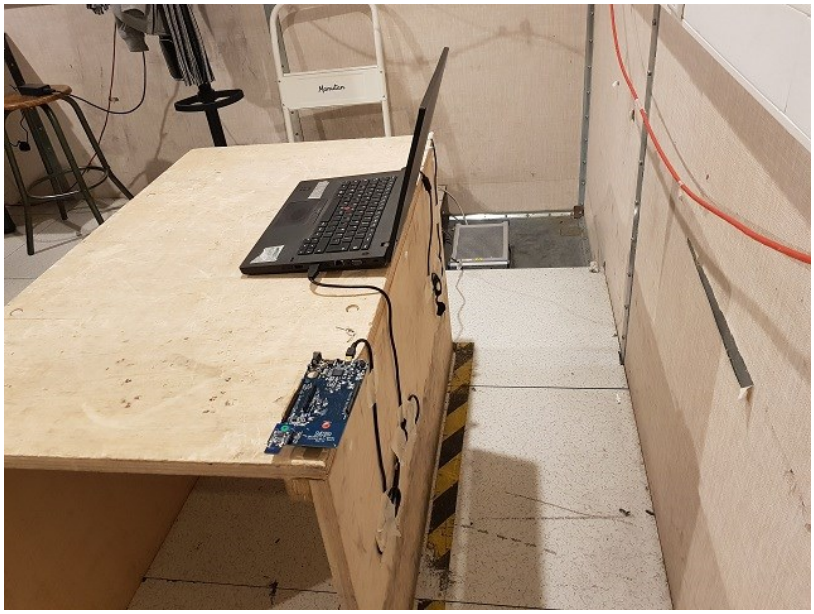
10.1. TEST CONDITIONS

Test performed by : Willy DACLINAT
Date of test : April 19, 2018
Ambient temperature : 26 °C
Relative humidity : 45 %

10.2. TEST SETUP

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

Photograph for AC Power Line Conducted Emissions (Front view)



Photograph for AC Power Line Conducted Emissions (Rear view)

10.3. LIMIT

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

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

*Decreases with the logarithm of the frequency

10.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI Receiver	ROHDE & SCHWARZ	ESU26	A2642018	2016/10	2018/10
RSIL	ROHDE & SCHWARZ	ENV215	C2320162	2018/01	2019/01
Cable	-	-	A5329414	2017/06	2018/06

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

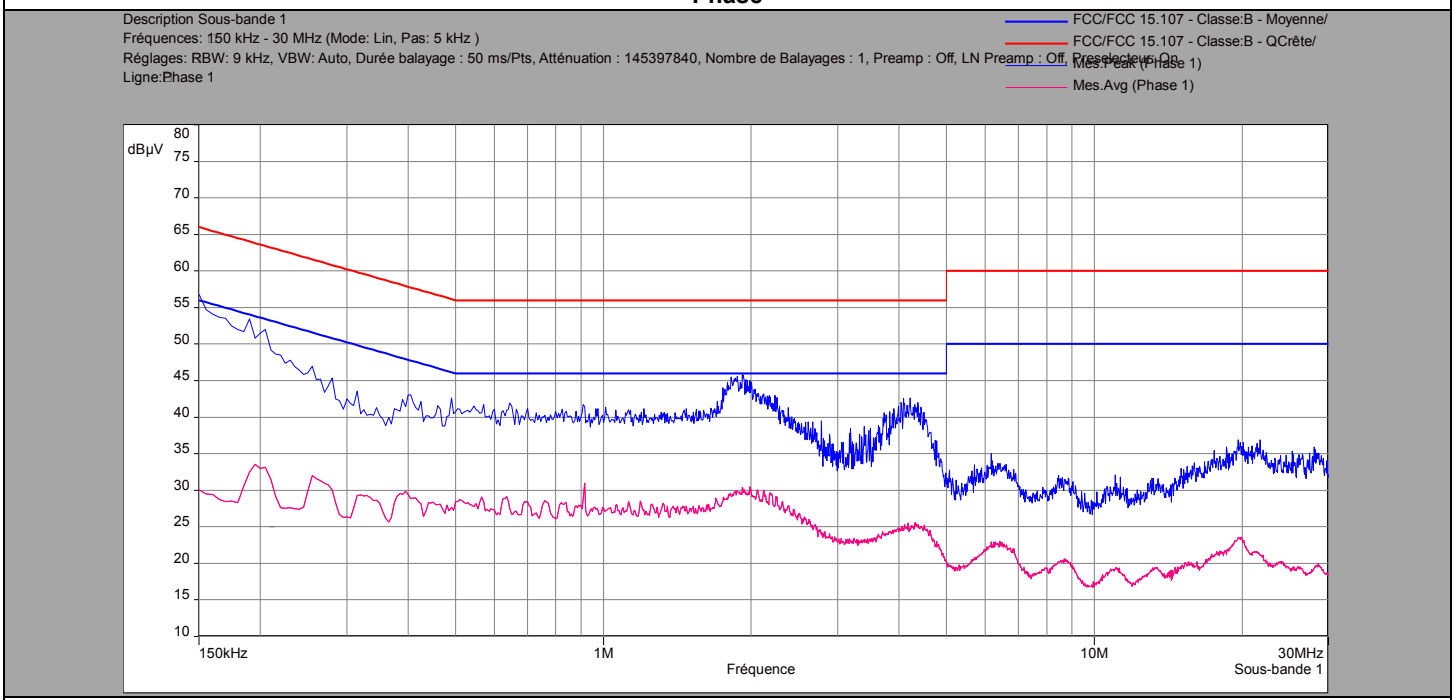
10.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

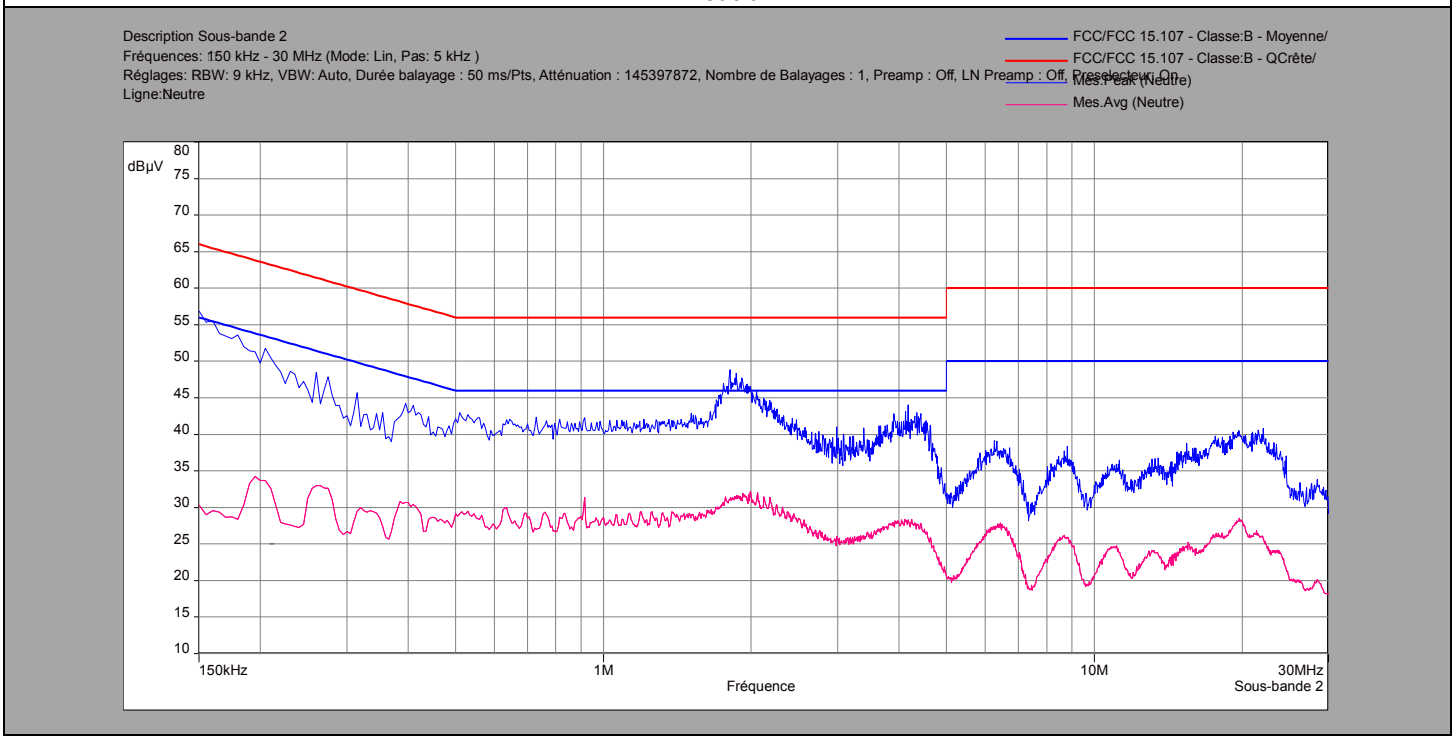
10.6. RESULTS ON M10

Channel

Phase



Neutral



Phase Line – M10							
Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Margin Quasi-Peak (dBµV)	Average Level (dBµV)	Average Limit (dBµV)	Margin Average (dBµV)
0,195	53,45	-	63,82	10,37	33,53	53,82	20,29
0,255	46,98	-	61,59	14,61	32,01	51,59	19,58
0,315	43,54	-	59,83	16,29	29,28	49,83	20,55
0,915	41,74	-	56	14,26	30,94	46	15,06
1,92	45,83	-	56	10,17	30,39	46	15,61
2,78	39,47	-	56	16,53	23,89	46	22,11
4,09	42,55	-	56	13,45	24,44	46	21,56
6,17	34,99	-	60	25,01	22,94	50	27,06
11,03	32,06	-	60	27,94	18,96	50	31,04
19,66	36,9	-	60	23,1	23,36	50	26,64
21,75	36,92	-	60	23,08	21,12	50	28,88
28,08	25,95	-	60	34,05	19,36	50	30,64

Neutral Line – M10							
Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Margin Quasi-Peak (dBµV)	Average Level (dBµV)	Average Limit (dBµV)	Margin Average (dBµV)
0,205	51,8	-	63,4	11,6	33,69	53,4	19,71
0,26	48,49	-	61,43	12,94	32,96	51,43	18,47
0,275	47,86	-	60,97	13,11	32,61	50,97	18,36
0,315	45,67	-	59,84	14,17	29,96	49,84	19,88
0,395	44,23	-	57,96	13,73	30,67	47,96	17,29
0,73	42,36	-	56	13,64	29,33	46	16,67
0,915	42,25	-	56	13,75	31,34	46	14,66
1,81	48,88	-	56	7,12	31,16	46	14,84
2,99	41,05	-	56	14,95	26,07	46	19,93
4,18	44,01	-	56	11,99	28,22	46	17,78
6,26	39,16	-	60	20,84	27,34	50	22,66
8,805	38,36	-	60	21,64	25,57	50	24,43
11,25	36,51	-	60	23,49	24,72	50	25,28
15,43	38,78	-	60	21,22	23,9	50	26,1
19,72	40,18	-	60	19,82	28,55	50	21,45
22,08	40,78	-	60	19,22	25,65	50	24,35
28,48	33,81	-	60	26,19	20,13	50	29,87

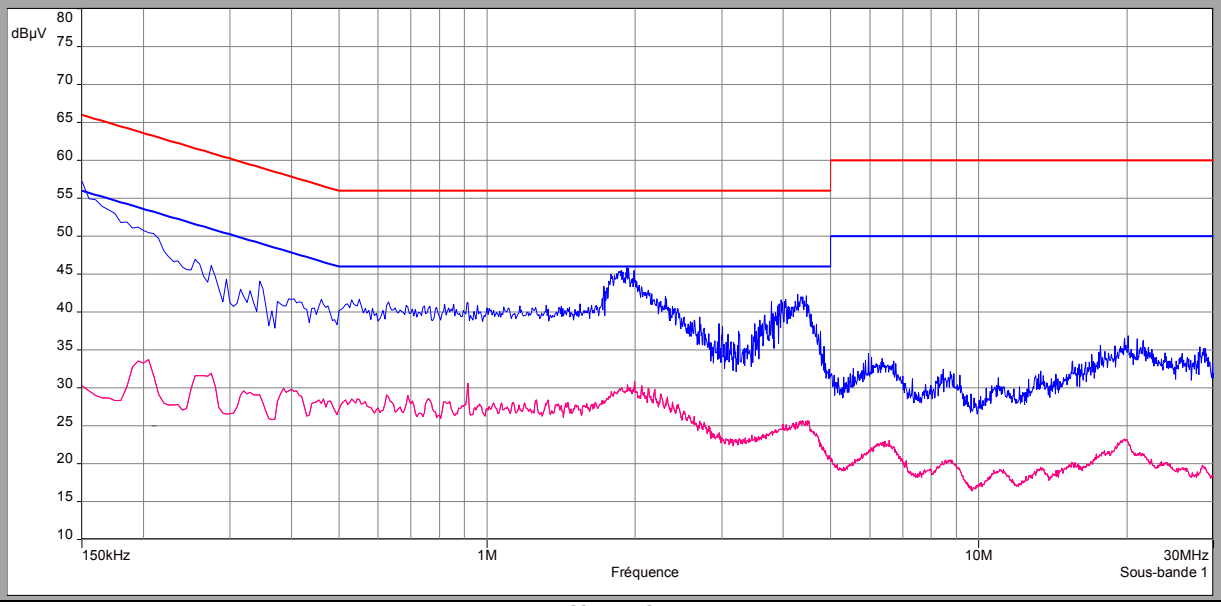
10.1. RESULTS ON M13

Channel

Phase

Description Sous-bande 1
Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)
Réglages: RBW: 9 kHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 150605936, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Presélecteur: On
Ligne:Phase 1

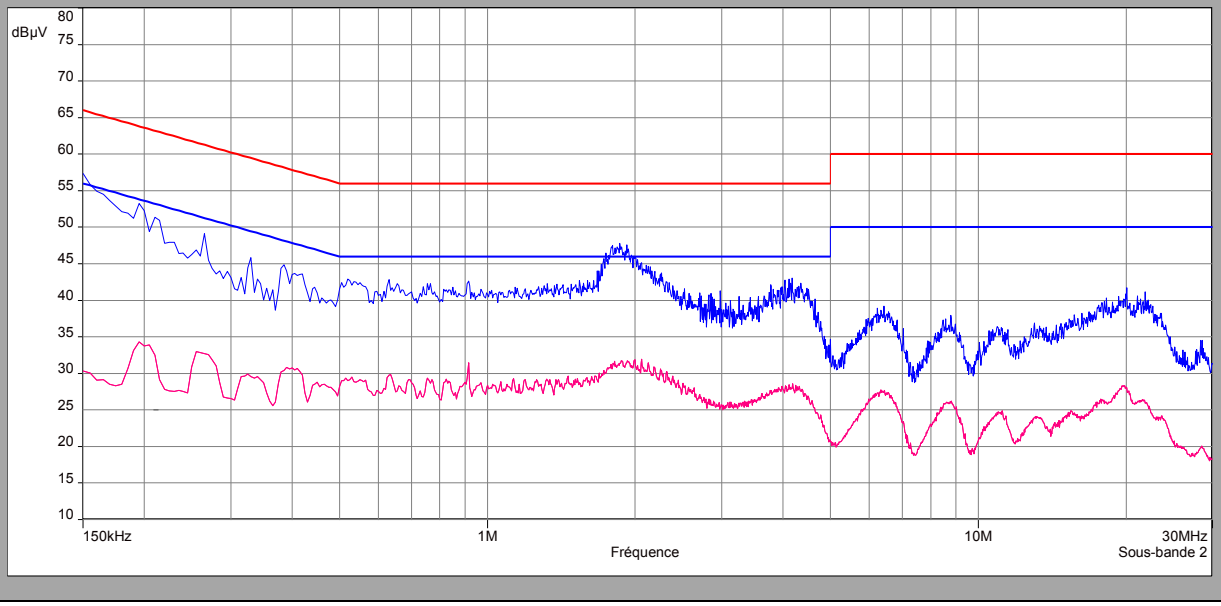
FCC/FCC 15.107 - Classe:B - Moyenne/
FCC/FCC 15.107 - Classe:B - QCrête/
Mes.Peak (Phase 1)
Mes.Avg (Phase 1)



Neutral

Description Sous-bande 2
Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)
Réglages: RBW: 9 kHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 147110168, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Presélecteur: 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 – M13							
Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Margin Quasi-Peak (dBµV)	Average Level (dBµV)	Average Limit (dBµV)	Margin Average (dBµV)
0,205	50,49	-	63,4	12,91	33,76	53,4	19,64
0,275	46,11	-	60,97	14,86	31,9	50,97	19,07
0,295	44,32	-	60,38	16,06	26,52	50,38	23,86
0,345	44,08	-	59,08	15	29,07	49,08	20,01
0,915	41,26	-	56	14,74	30,61	46	15,39
1,92	45,86	-	56	10,14	29,53	46	16,47
2,7	39,32	-	56	16,68	25,62	46	20,38
4,28	42,31	-	56	13,69	24,54	46	21,46
6,57	32,19	-	60	27,81	23,08	50	26,92
8,47	32,46		60	27,54	19,88	50	30,12
10,96	31,36	-	60	28,64	18,79	50	31,21
20,12	36,83	-	60	23,17	22,52	50	27,48
21	36,45	-	60	23,55	20,84	50	29,16
28,14	35,38	-	60	24,62	18,5	50	31,5

Neutral Line – M13							
Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Margin Quasi-Peak (dBµV)	Average Level (dBµV)	Average Limit (dBµV)	Margin Average (dBµV)
0,195	53,26	-	63,82	10,56	24,29	53,82	29,53
0,265	49,14	-	61,27	12,13	32,68	51,27	18,59
0,33	45,83	-	59,45	13,62	29,54	49,45	19,91
0,385	44,87	-	58,17	13,3	30,39	48,17	17,78
0,915	42,61	-	56	13,39	31,42	46	14,58
1,92	47,59	-	56	8,41	31,48	46	14,52
2,98	41,3	-	56	14,7	25,35	46	20,65
4,18	43,05	-	56	12,95	27,93	46	18,07
6,42	39,23	-	60	20,77	26,69	50	23,31
8,78	37,93		60	22,07	25,5	50	24,5
13,01	36,89	-	60	23,11	23,73	50	26,27
20,07	41,68	-	60	18,32	27,91	50	22,09
28,57	34,51	-	60	25,49	20,05	50	29,95

10.2. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **NXP JN5189-001-M10 & JN5189-001-M13**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.247 & RSS 247 ISSUE 2 limits.

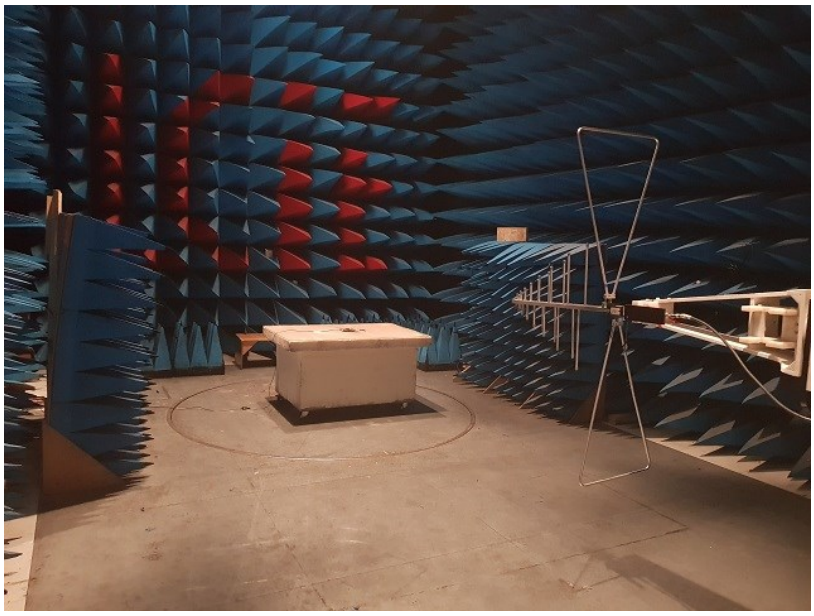
11. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

11.1. TEST CONDITIONS

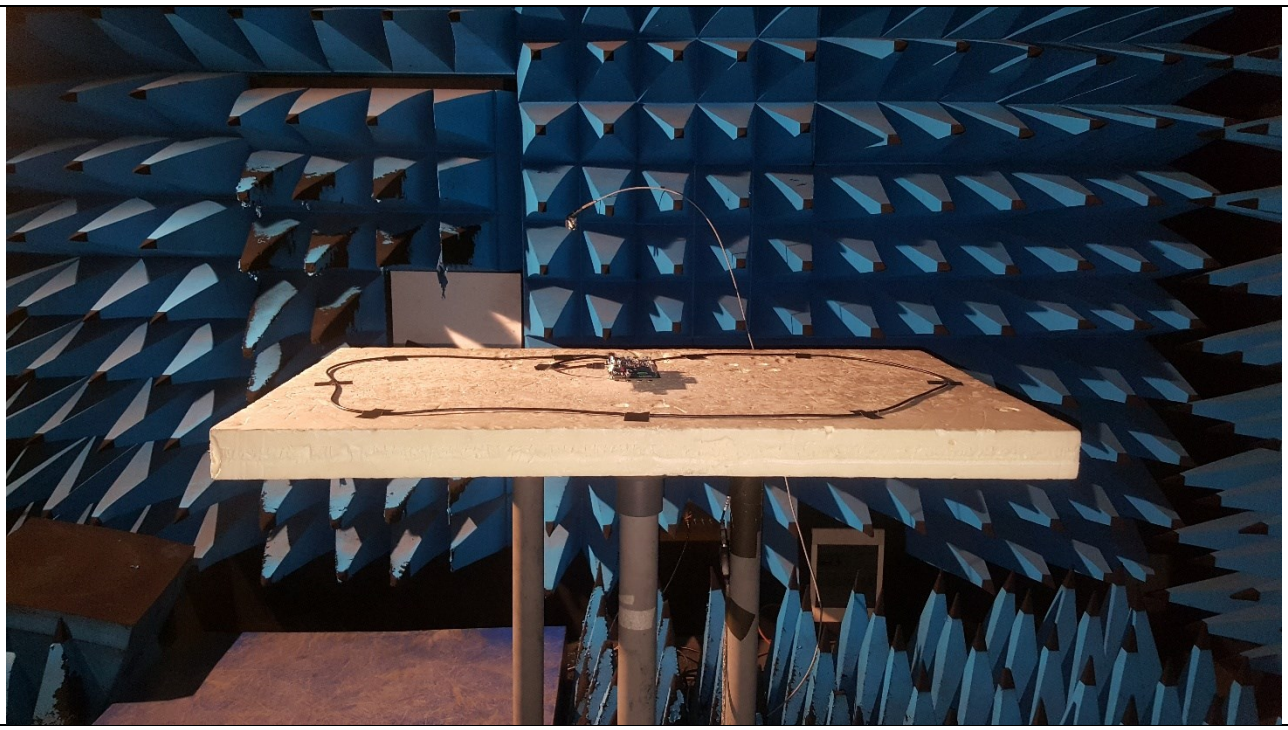
Test performed by : Armand MAHOUNGOU
Date of test : April 16, 2018
Ambient temperature : 26 °C
Relative humidity : 45 %

11.2. TEST SETUP

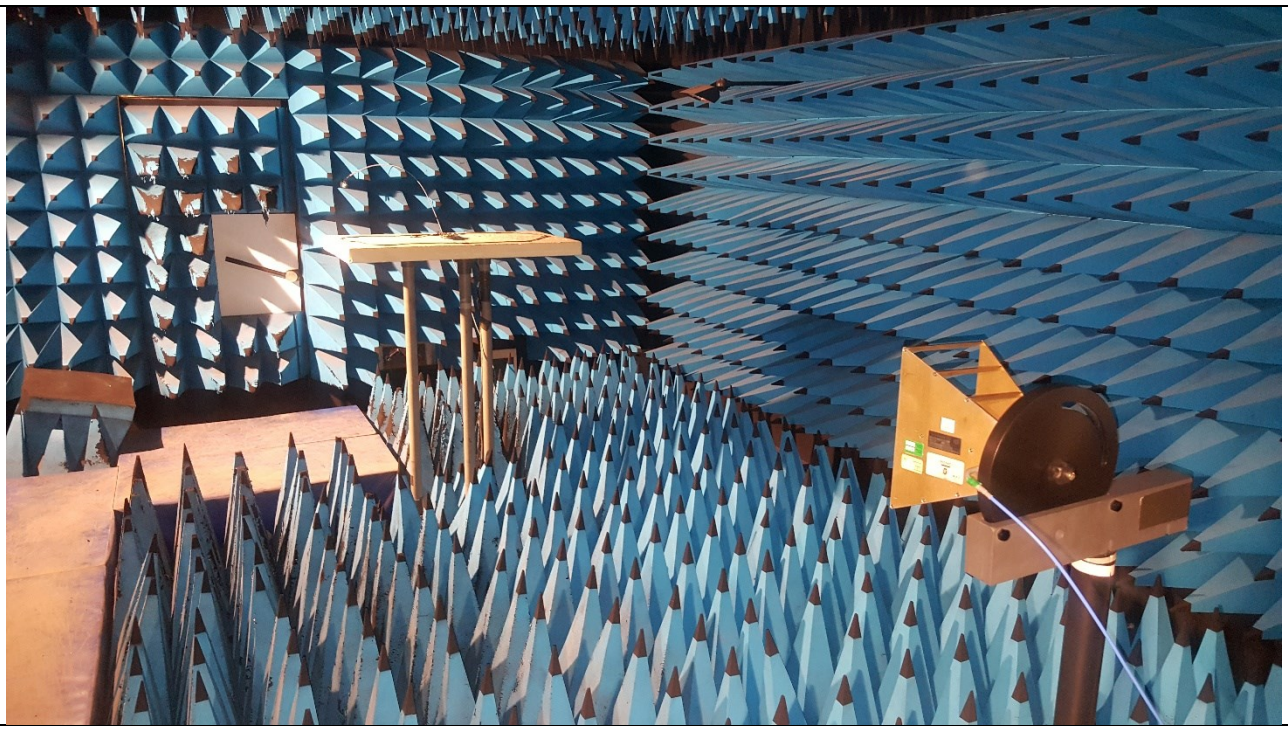
The product has been tested according to ANSI C63.10 (2013). The EUT is placed **ina semi-anechoic chamber**. Distance between measuring antenna and the EUT is **3m**. Test is performed in horizontal (H) and vertical (V) polarization with **bilog** antenna below 1GHz and with a horn antenna above 1GHz. 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. The EUT is place at 1.5m high above 1GHz and at 0.8m high under 1GHz.



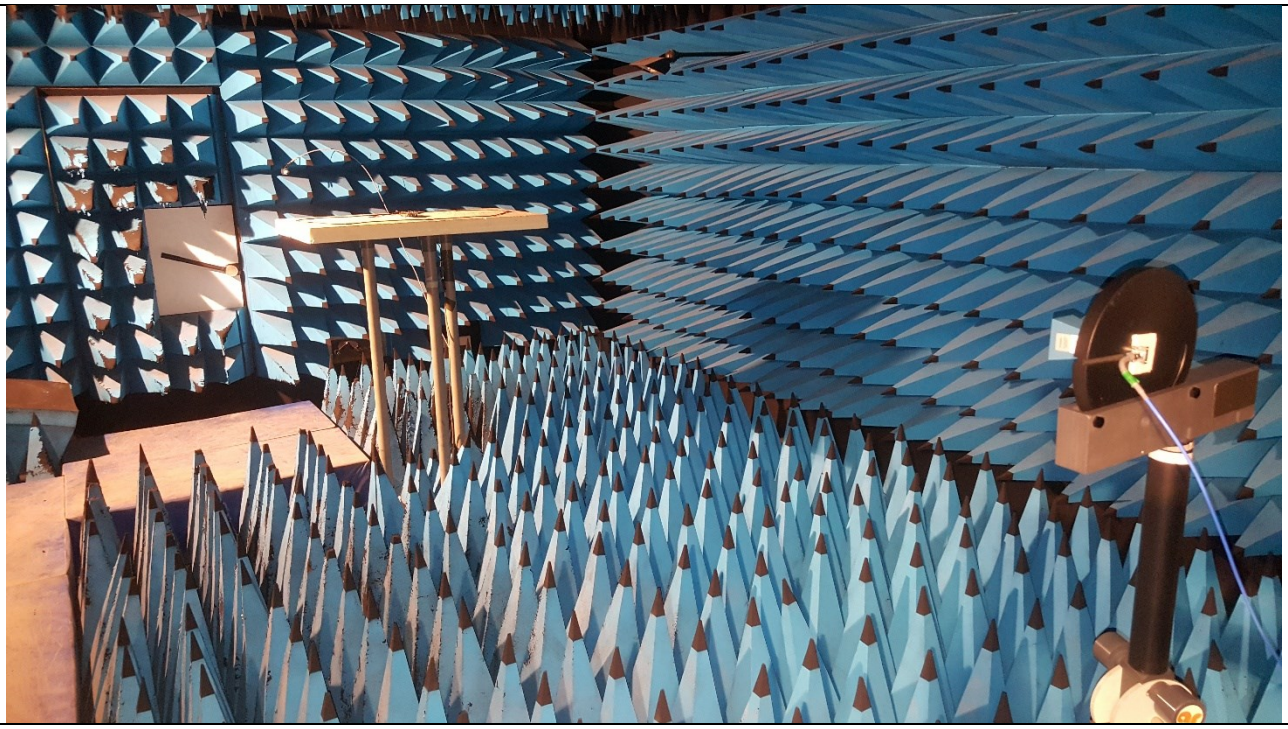
Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands **(M10)**

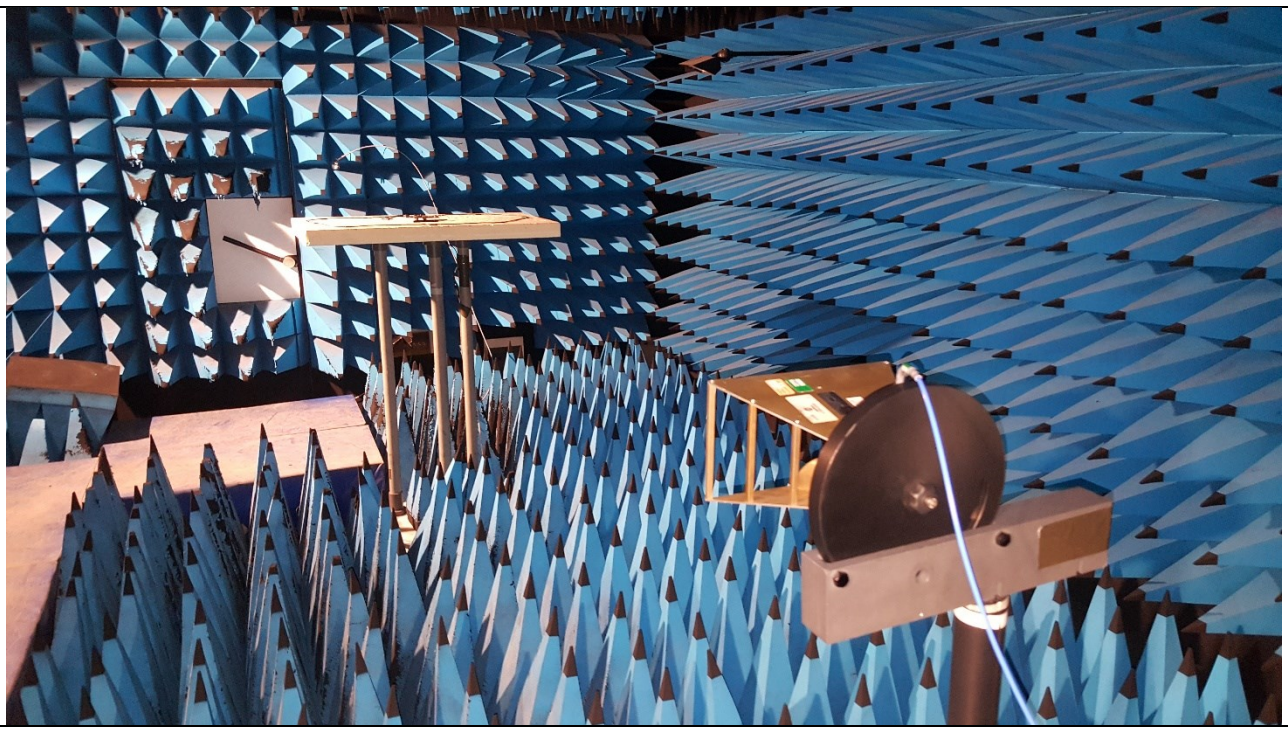


Photograph for Unwanted Emission in restricted frequency bands **(M10)**

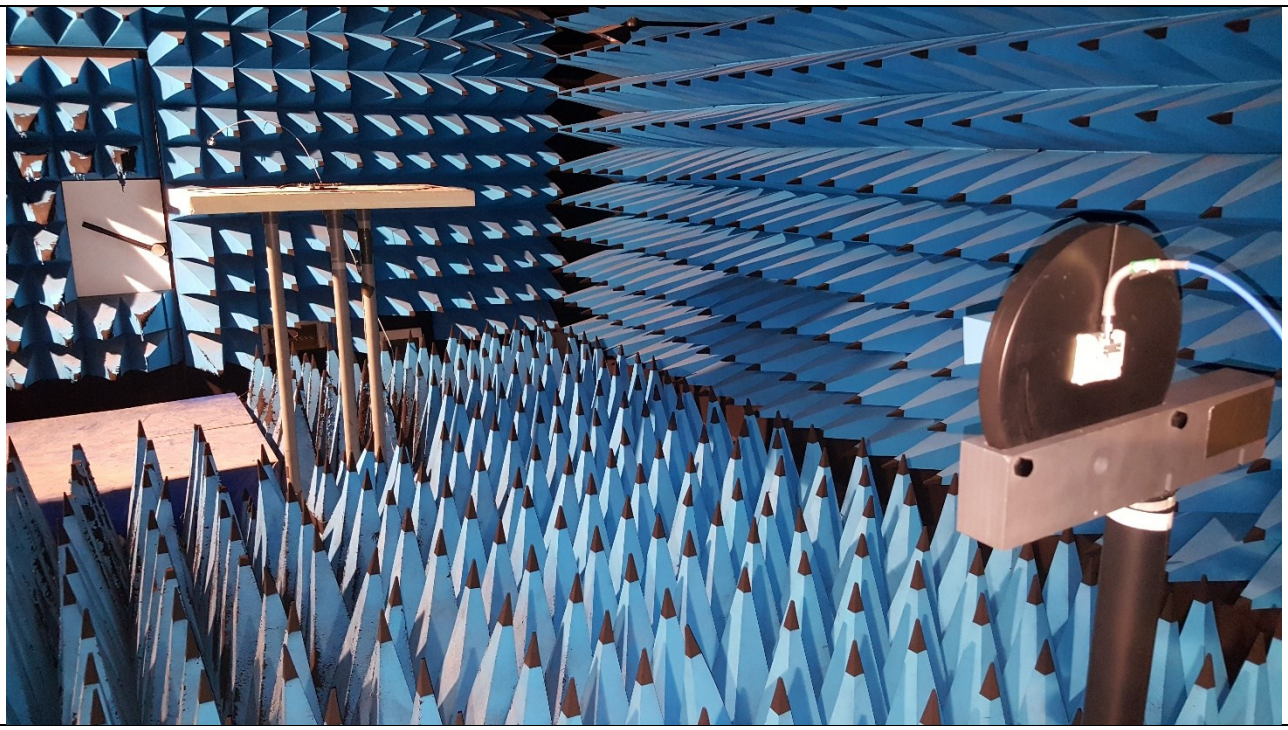


Photograph for Unwanted Emission in restricted frequency bands **(M10)**

Photograph for Unwanted Emission in restricted frequency bands **(M13)**



Photograph for Unwanted Emission in restricted frequency bands **(M13)**



Photograph for Unwanted Emission in restricted frequency bands **(M13)**

11.3. LIMIT

Limit at 3m:

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

Limit at 10m:

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

11.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Semi anechoic chamber	SIEPEL	-	D3044008	2017/06	2018/06
EMI receiver	ROHDE & SCHWARZ	ESU26	A2642018	2016/07	2018/07
Bilog antenna	SCHWARZBECK	VULB 9160	C2040150	2017/03	2018/03
RF cable	RADIALL; CDI	30990-7M	A5329711	2017/03	2018/03
Cable	CABLES & CONNECTIQUES	3.5MD/CSU528AA/3.5MC/4000	A5329436	2017/03	2018/03
Full anachoic chamber	SIEPEL	-	D3044019	2014/10	2018/10
Preamplifier	LCIE; LCIE	LCIE-ALB-001	A7080073	2017/08	2018/08
Horn antenna	AH SYSTEMS	SAS 571	C2042041	2017/04	2018/04
Measurement horn antenna 18-26,5GHz	PASTERNACK	PE9852/2F-20	C2042048	2017/05	2019/05
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2017/07	2018/07
cable	Télédyne	084-0505-1MTR	A5329757	2017/03	2018/03
cable	Télédyne	084-0555-3MTR	A5329760	2017/03	2018/03
cable	Télédyne	084-555-1.5MTR	A5329759	2017/03	2018/03
Rejector filter 2,4GHz	-	2.45GHz	A7484048	2017/09	2018/09

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

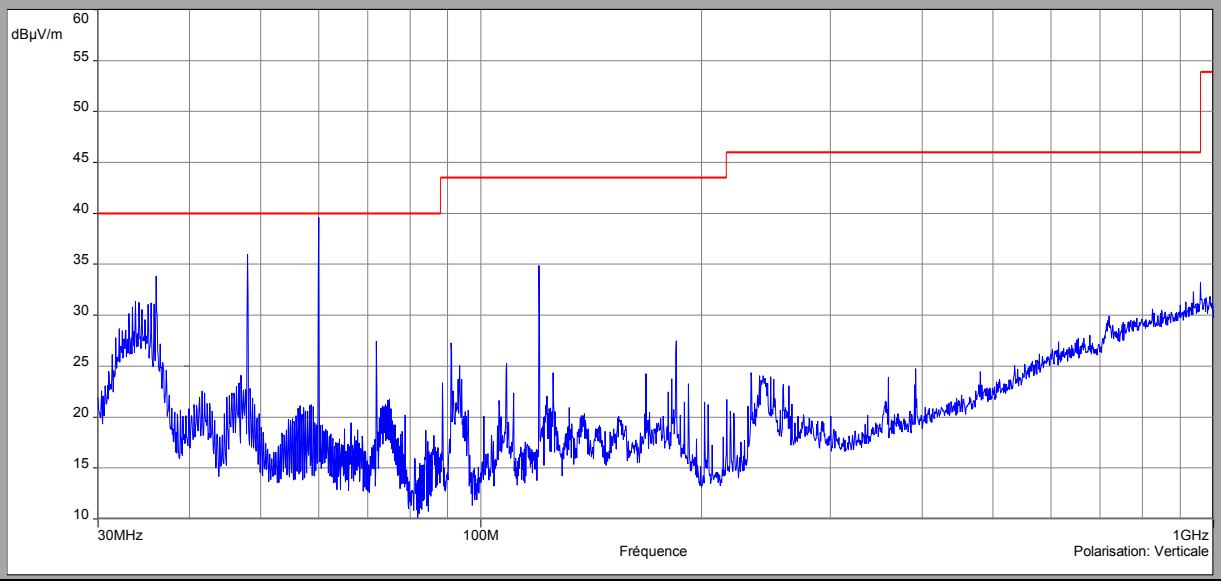
☑ None ☐ Divergence:

11.6. RESULTS

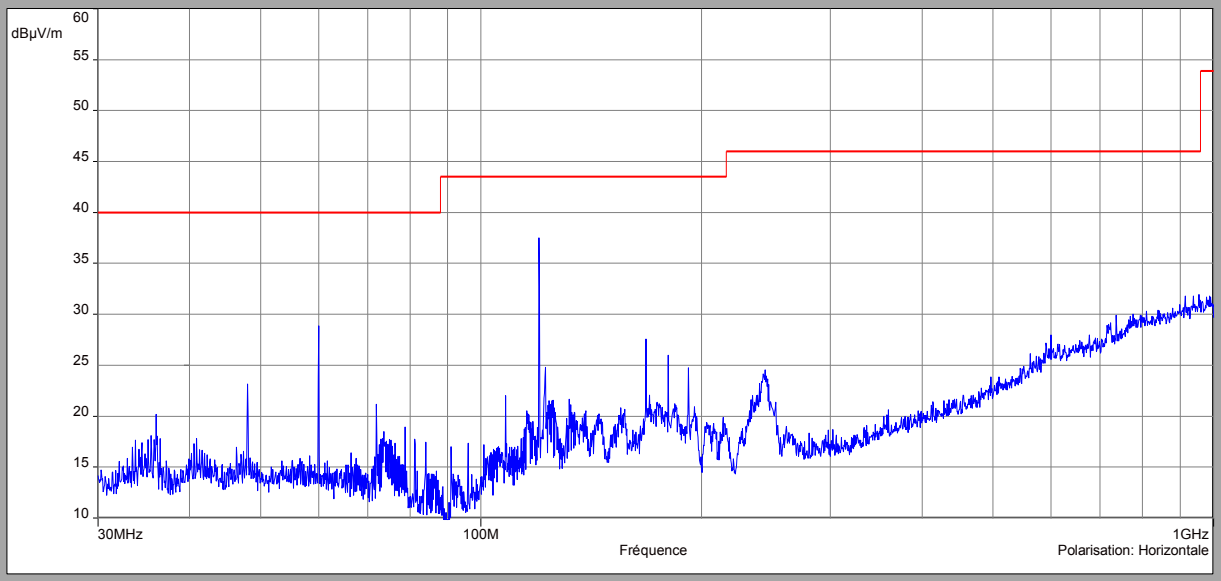
Below 1GHz_M10

Channel

Vertical Polarization



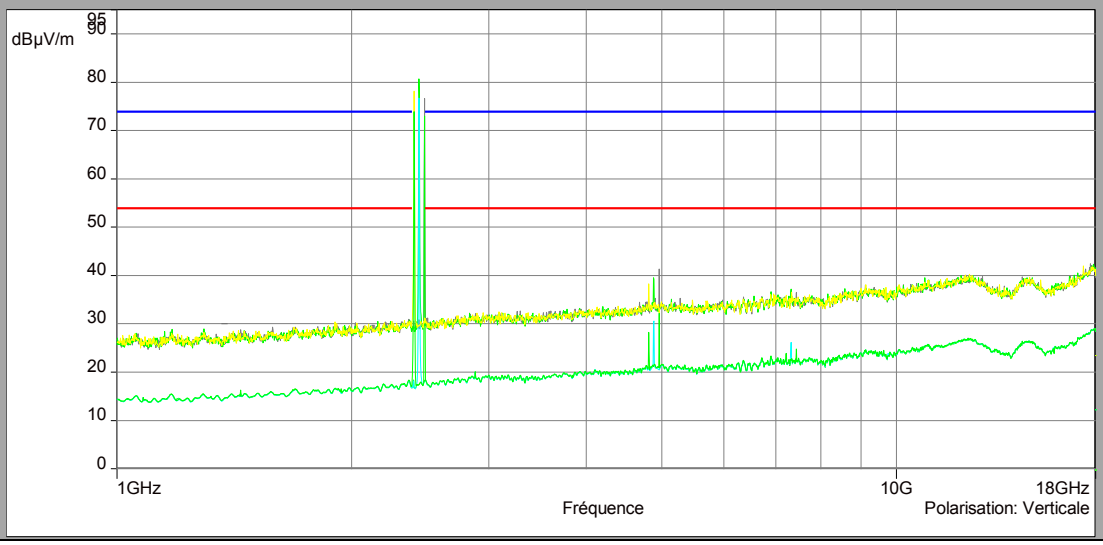
Horizontal polarization



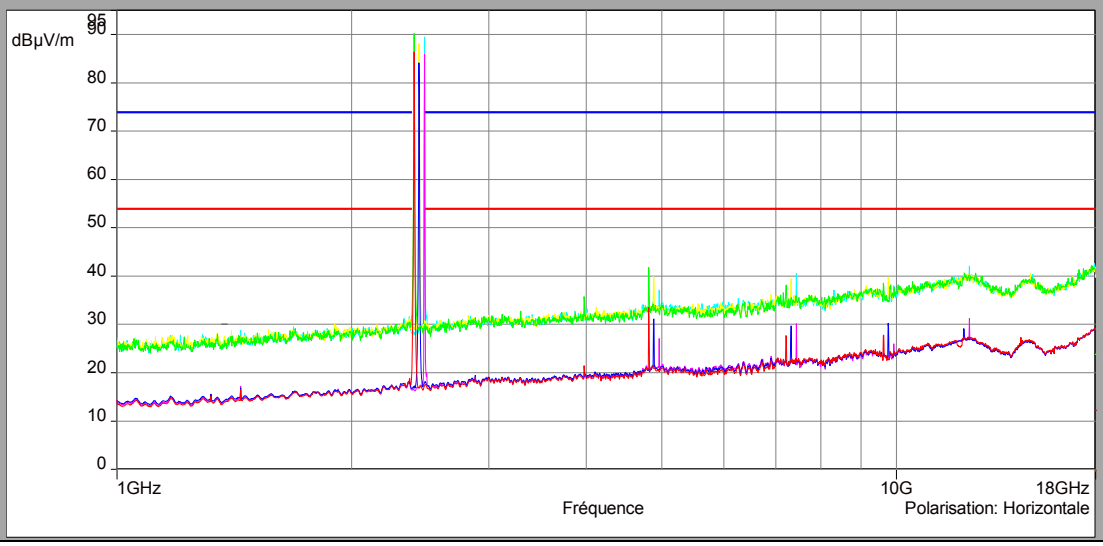
Above 1GHz _ M10

Cmin/Cnom/Cmax

Vertical Polarization



Horizontal polarization



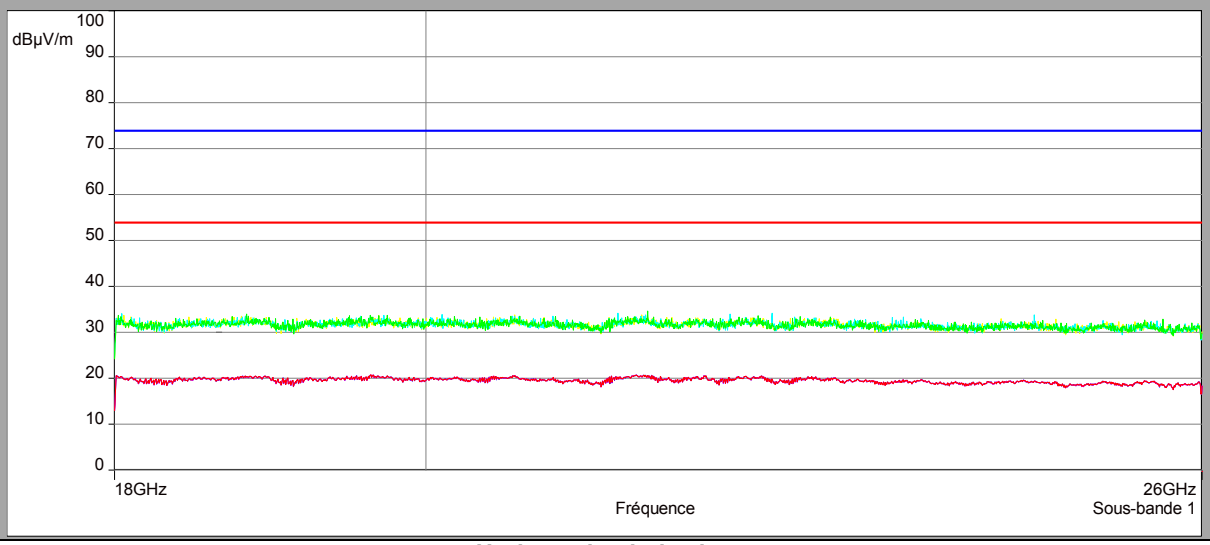
Above 1GHz _ M10

Cmin/Cnom/Cmax

Vertical Polarization

Description Sous-bande 1
Fréquences: 18 GHz - 26 GHz (Mode: Lin, Pas: 500 kHz)
Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 10 ms/Pts, Atténuation : 159630152, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Pre
Polarisation:Horizontale
Distance: 3 m

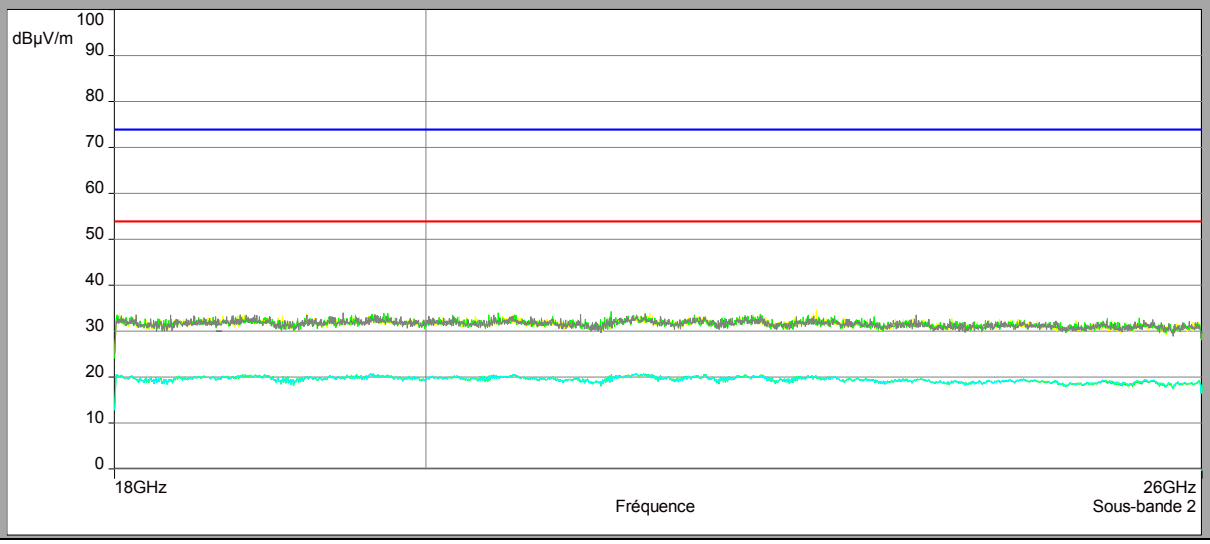
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Avg Channel Low (Horizontale)
Mes.Avg Channel High (Horizontale)
Mes.Peak Channel Low (Horizontale)
Mes.Peak Channel High (Horizontale)
Mes.Avg Channel Middle (Horizontale)
Mes.Peak Channel Middle (Horizontale)



Horizontal polarization

Description Sous-bande 2
Fréquences: 18 GHz - 26 GHz (Mode: Lin, Pas: 500 kHz)
Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 10 ms/Pts, Atténuation : 207944144, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Pre
Polarisation:Verticale
Distance: 3 m

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Avg Channel Middle (Verticale)
Mes.Peak Channel Middle (Verticale)
Mes.Avg Channel Low (Verticale)
Mes.Avg Channel High (Verticale)
Mes.Peak Channel Low (Verticale)



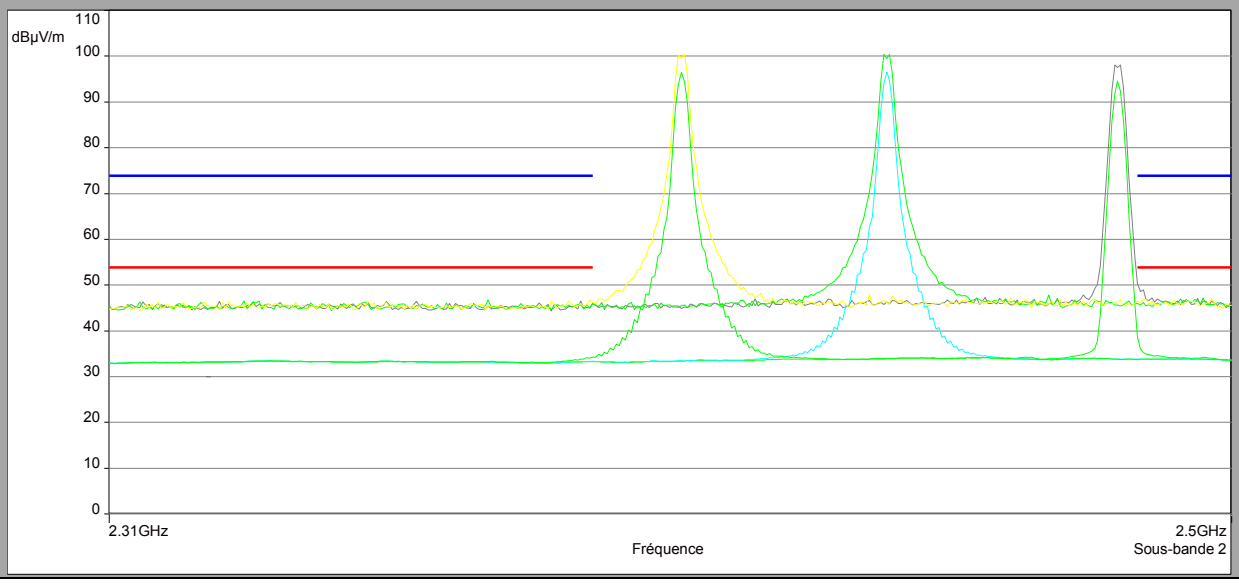
Above 1GHz Zoom 2310MHz-2500MHz _ M10

Cmin/Cnom/Cmax

Vertical Polarization

Description Sous-bande 2
Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 500 kHz)
Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 157128816, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Preselecteur: Off
Polarisation:Verticale
Distance: 3 m

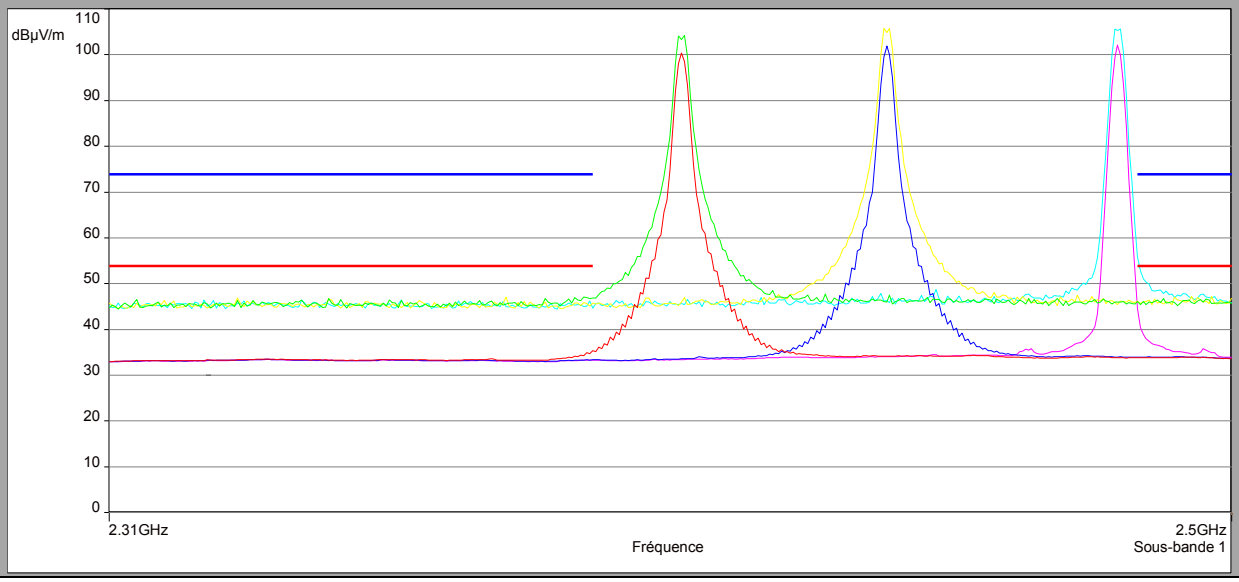
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Avg Channel Low (Verticale)
Mes.Peak Channel Low (Verticale)
Mes.Avg Channel Middle (Verticale)
Mes.Peak Channel Middle (Verticale)
Mes.Avg Channel High (Verticale)
Mes.Peak Channel High (Verticale)



Horizontal polarization

Description Sous-bande 1
Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 500 kHz)
Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 157128912, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Preselecteur: Off
Polarisation:Horizontale
Distance: 3 m

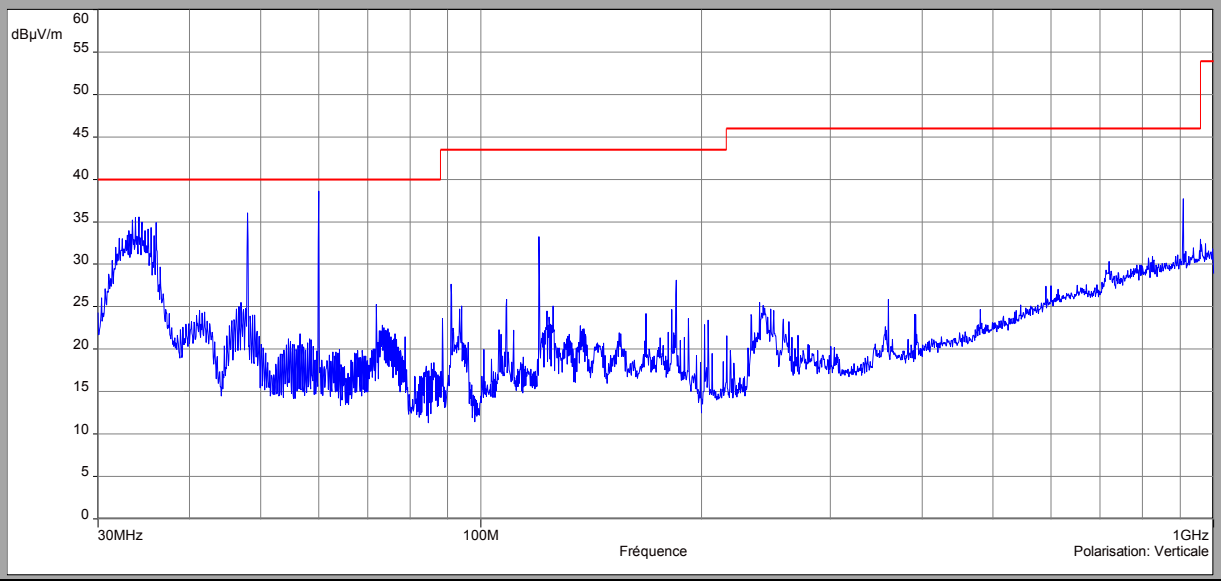
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Avg Channel Low (Horizontale)
Mes.Peak Channel Low (Horizontale)
Mes.Avg Channel Middle (Horizontale)
Mes.Peak Channel Middle (Horizontale)
Mes.Avg Channel High (Horizontale)
Mes.Peak Channel High (Horizontale)



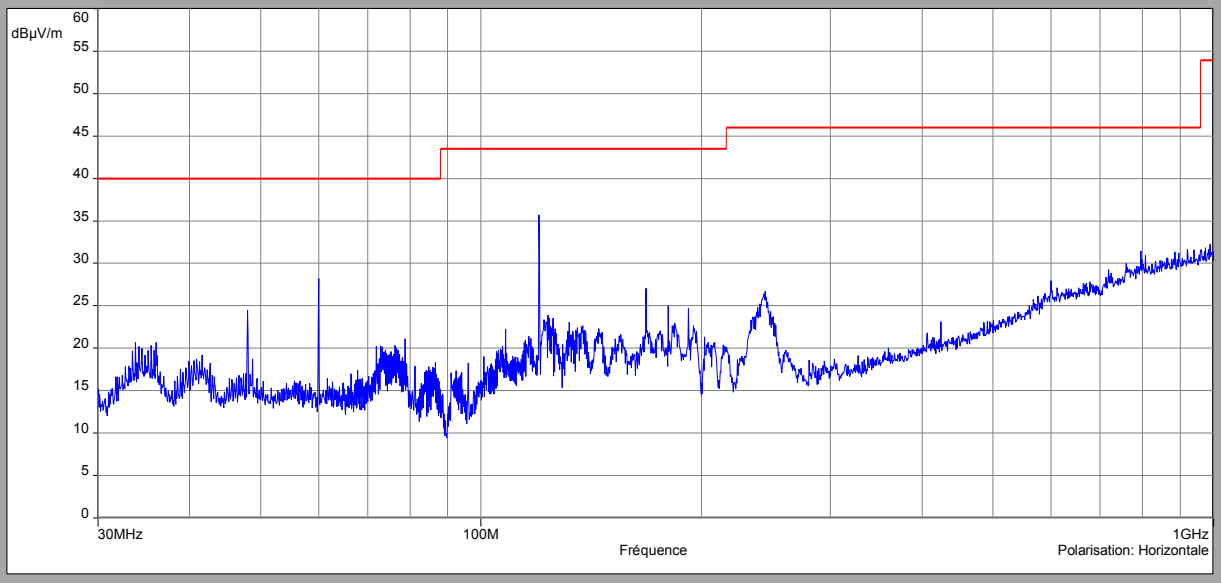
Below 1GHz _ M13

Channel

Vertical Polarization



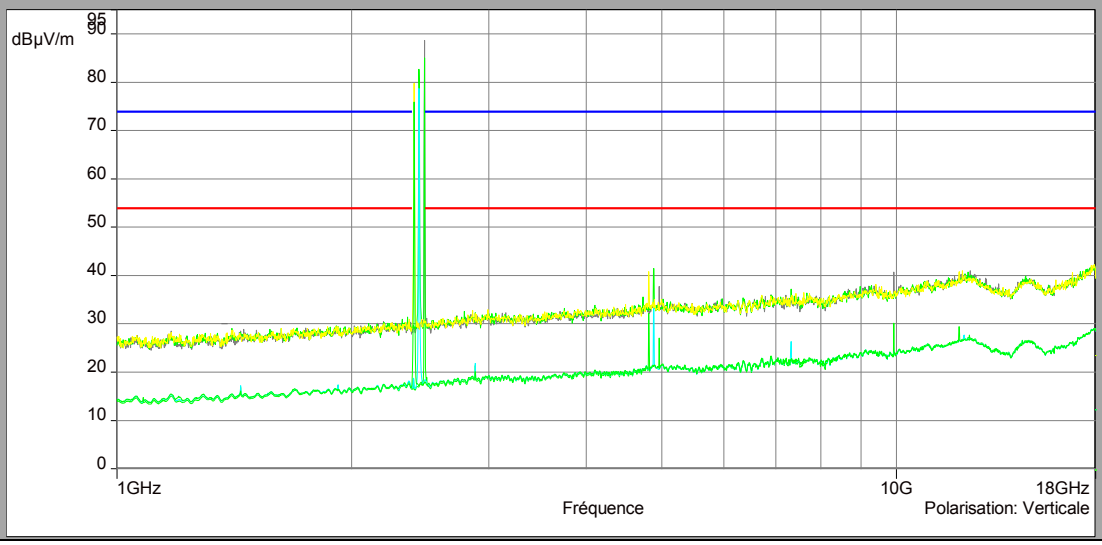
Horizontal polarization



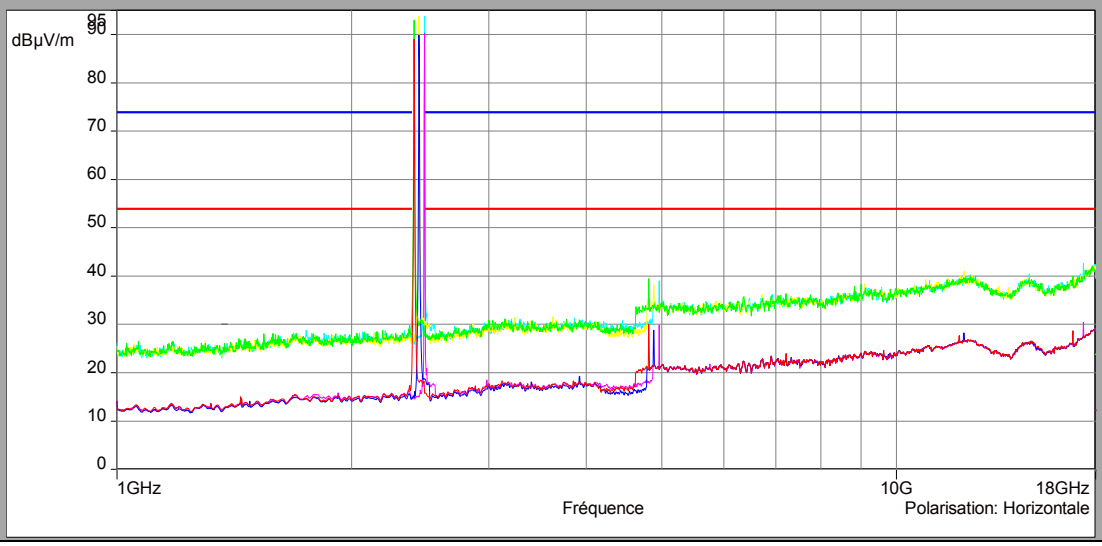
Above 1GHz _ M13

Cmin/Cnom/Cmax

Vertical Polarization



Horizontal polarization



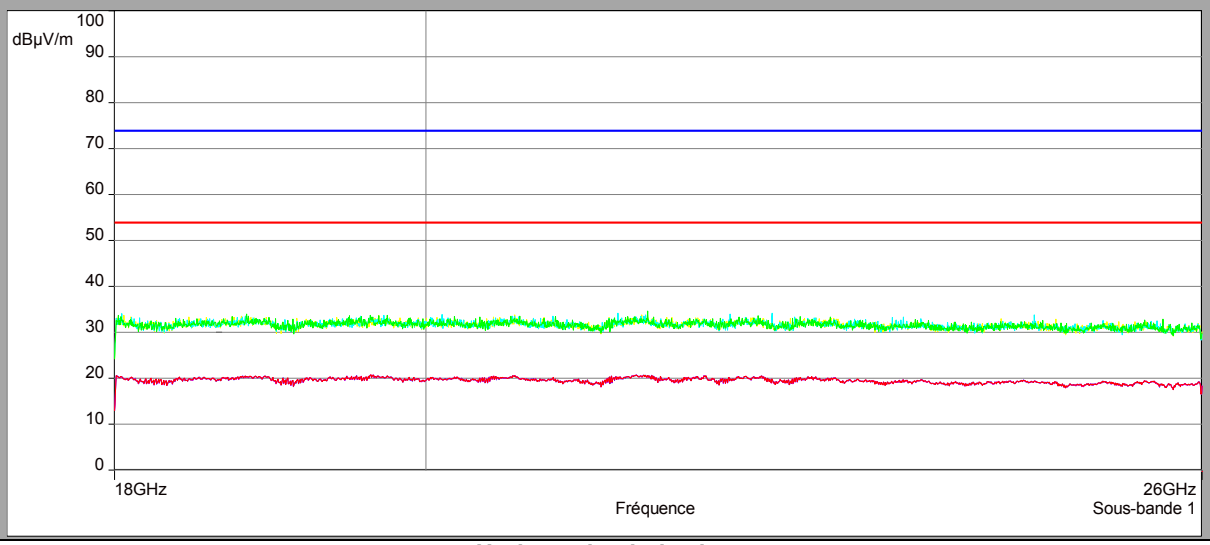
Above 1GHz _ M13

Cmin/Cnom/Cmax

Vertical Polarization

Description Sous-bande 1
Fréquences: 18 GHz - 26 GHz (Mode: Lin, Pas: 500 kHz)
Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 10 ms/Pts, Atténuation : 159630152, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Pre
Polarisation:Horizontale
Distance: 3 m

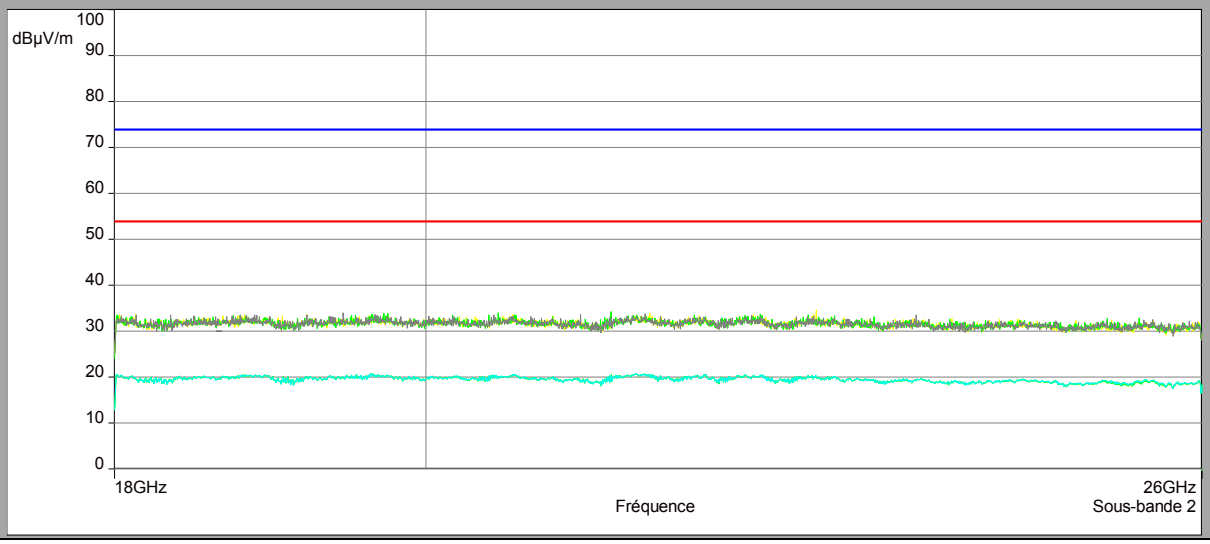
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Avg Channel Low (Horizontale)
Mes.Avg Channel High (Horizontale)
Mes.Peak Channel Low (Horizontale)
Mes.Peak Channel High (Horizontale)
Mes.Avg Channel Middle (Horizontale)
Mes.Peak Channel Middle (Horizontale)



Horizontal polarization

Description Sous-bande 2
Fréquences: 18 GHz - 26 GHz (Mode: Lin, Pas: 500 kHz)
Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 10 ms/Pts, Atténuation : 207944144, Nombre de Balayages : 1, Preamp : On: 20 dB, LN Preamp : Off, Pre
Polarisation:Verticale
Distance: 3 m

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Peak Channel High (Verticale)
Mes.Avg Channel Middle (Verticale)
Mes.Peak Channel Middle (Verticale)
Mes.Avg Channel Low (Verticale)
Mes.Avg Channel High (Verticale)
Mes.Peak Channel Low (Verticale)



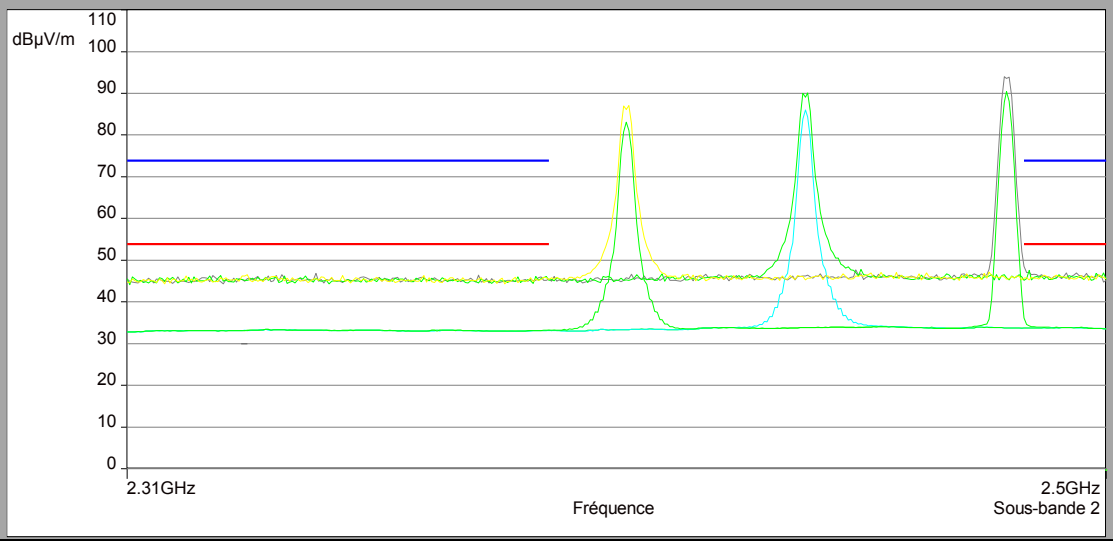
Above 1GHz Zoom 2310MHz-2500MHz _ M13

Cmin/Cnom/Cmax

Vertical Polarization

Description Sous-bande 2
Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 500 kHz)
Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 1539319112, Nombre de Balayages : 1, Preamp : On: 20 dB, LN
Polarisation:Verticale
Distance: 3 m

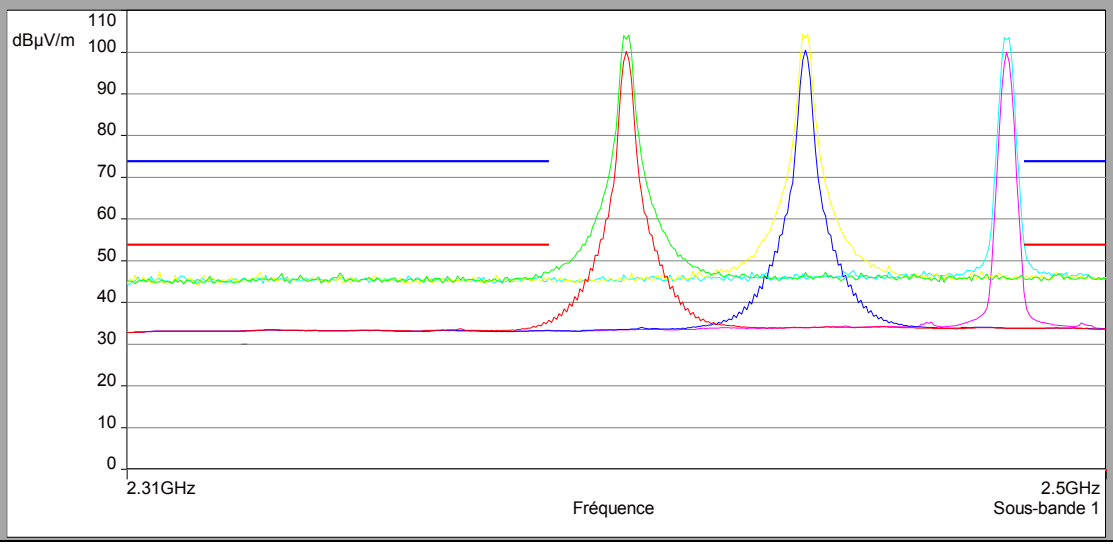
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Avg Channel Low (Verticale)
Mes.Peak Channel Low (Verticale)
Mes.Avg Channel Middle (Verticale)
Mes.Peak Channel Middle (Verticale)
Mes.Avg Channel High (Verticale)
Mes.Peak Channel High (Verticale)



Horizontal polarization

Description Sous-bande 1
Fréquences: 2.31 GHz - 2.5 GHz (Mode: Lin, Pas: 500 kHz)
Réglages: RBW: 1 MHz, VBW: Auto, Durée balayage : 50 ms/Pts, Atténuation : 1544299116, Nombre de Balayages : 1, Preamp : On: 20 dB, LN
Polarisation:Horizontale
Distance: 3 m

FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Crête/3.0m/
Mes.Avg Channel Low (Horizontale)
Mes.Peak Channel Low (Horizontale)
Mes.Avg Channel Middle (Horizontale)
Mes.Peak Channel Middle (Horizontale)
Mes.Avg Channel High (Horizontale)
Mes.Peak Channel High (Horizontale)



Below 1GHz_M10					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dBµV/m)**
Verticale	36	33.84	-	40	6.16
Verticale	48	35.99	-	40	4.01
Verticale	60	-	39.19	40	0.81
Verticale	72	27.43	-	40	12.57
Verticale	91.05	27.29	-	43.5	16.21
Verticale	108.3	25.26	-	43.5	18.24
Horizontale	120	37.50	-	43.5	6
Horizontale	168	27.57	-	43.5	15.93
Horizontale	180	25.97	-	43.5	17.53
Verticale	184.6	27.49	-	43.5	16.01
Horizontale	192	24.75	-	43.5	18.75
Verticale	233.78	24.36	-	46	21.64
Horizontale	244	24.57	-	46	21.43
Verticale	248.54	23.97	-	46	22.03
Verticale	360.02	23.92	-	46	22.08
Verticale	391.88	24.76	-	46	21.24
Verticale	480.02	24.46	-	46	21.54
Verticale	720.02	29.91	-	46	16.09
Verticale	960.02	33.25	-	54	20.75

Above 1GHz _ M10								
Cmin/Cnom/Cmax								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dBµV/m)**
Horizontale	2390	35.35	35.35	54	18.65	46.81	74	27.19
Verticale	2390	34.31	34.31	54	19.69	46.15	74	27.85
Horizontale	2483.5	44.53	44.53	54	9.47	55.78	74	18.22
Verticale	2483.5	38.61	38.61	54	15.39	50.26	74	23.74
Horizontale	3975	21.47	21.47	54	32.53	35.76	74	38.24
Horizontale	4809	33.49	33.49	54	20.51	41.79	74	32.71
Horizontale	4879	31.16	31.16	54	22.84	39.93	74	34.07
Verticale	4961	32.20	32.20	54	21.80	41.37	74	32.27
Horizontale	7216.5	27.66	27.66	54	26.34	38.20	74	35.80
Horizontale	7321.5	29.68	29.68	54	24.32	39.42	74	34.58
Horizontale	7441.5	30.09	30.09	54	23.91	40.55	74	33.45
Horizontale	9622	27.75	27.75	54	26.25	38.53	74	35.47
Horizontale	9758	30.19	30.19	54	23.81	39.79	74	34.21
Horizontale	12197.5	29.15	29.15	54	24.85	40.19	74	33.81
Verticale	12402.5	31.20	31.20	54	22.80	42.10	74	31.90

Below 1GHz_M13					
Polarization	**Frequency (MHz)**	**Peak Level (dBµV/m)**	**QPeak Level (dBµV/m)**	**Limit (dBµV/m)**	**Margin (dBµV/m)**
Verticale	34.1	35.56	-	40	4.44
Verticale	36	34.89	-	40	5.11
Verticale	48	36.07	-	40	3.93
Verticale	60	-	38.08	40	1.92
Verticale	72	25.26	-	40	14.74
Verticale	91.05	27.65	-	43.5	15.85
Verticale	108.3	25.84	-	43.5	17.66
Horizontale	120	35.70	-	43.5	7.8
Horizontale	168	27.05	-	43.5	16.45
Horizontale	180	24.97	-	43.5	18.53
Verticale	184.6	28.12	-	43.5	15.38
Horizontale	192	24.68	-	43.5	18.82
Verticale	233.78	24.05	-	46	21.95
Horizontale	244	26.68	-	46	19.32
Verticale	248.54	24.74	-	46	21.26
Verticale	360.02	25.86	-	46	20.14
Verticale	391.88	24.08	-	46	21.92
Verticale	480.02	24.68	-	46	21.32
Verticale	720.02	30.34	-	46	15.66
Verticale	908.54	37.71	-	46	8.29
Verticale	960.02	32.96	-	54	21.04

Above 1GHz _ M13								
Cmin/Cnom/Cmax								
Polarization	**Frequency (MHz)**	**Average Level (dBµV/m)**	**Average Level + Duty Cycle Factor (dBµV/m)**	**Average Limit (dBµV/m)**	**Average Margin Level (dBµV/m)**	**Peak Level (dBµV/m)**	**Peak Limit (dBµV/m)**	**Peak Margin Level (dBµV/m)**
Horizontale	2390	35.69	35.69	54	18.31	47.09	74	26.91
Verticale	2390	33.25	33.25	54	20.75	45.35	74	28.65
Horizontale	2483.5	42.44	42.44	54	11.56	54.16	74	19.84
Verticale	2483.5	36.13	36.13	54	17.87	48.50	74	25.50
Verticale	4811	32.10	32.10	54	21.90	40.84	74	33.16
Verticale	4881	33.58	33.58	54	20.42	41.40	74	32.60
Verticale	4961	27.04	27.04	54	26.96	37.77	74	36.23
Verticale	7321.5	26.35	26.35	54	27.65	37.21	74	36.79
Horizontale	9622	30.17	30.17	54	23.83	40.76	74	33.24
Horizontale	17356.5	30.43	30.43	54	23.57	42.62	74	31.38

11.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **NXP JN5189-001-M10 & JN5189-001-M13**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.247 & RSS 247 ISSUE 2 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