



LCIE

Zigbee & RF4CE Template: Release August 08th, 2017

TEST REPORT

N°: 154772-719318

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

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France

Apparatus under test

Product	JN5189-001-M16
Trade mark	NXP
Manufacturer	NXP Semiconductors
Model under test	JN5189T-001-M16
Serial number	-
FCC ID	XXMJN5189M16
IC ID	8764A-JN5189M16

Test date

: April 6, 2018 to April 20, 2018

Test location

Fontenay Aux Roses

Test Site

6230B-1

Composition of document

52 pages

Document issued on

April 8, 2019

Written by :
Julien PALARD
Tests operator



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PUBLICATION HISTORY

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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 Pb	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
6dB Bandwidth Pb	☒ PASS	☐ FAIL	☐ NA()	☐ NP(1)
Duty Cycle Pb	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Maximum Conducted Output Power Pb	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Power Spectral Density Pb	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Conducted Spurious Emission at the Band Edge Pb	☒ PASS	☐ FAIL	☐ NA()	☐ NP(1)
Unwanted Emissions into Non-Restricted Frequency Bands Pb	☒ PASS	☐ FAIL	☐ NA()	☐ NP(1)
AC Power Line Conducted Emission Pb	☒ PASS	☐ FAIL	☐ NA(2)	☐ NP(1)
Unwanted Emissions into Restricted Frequency Bands Pb	☒ PASS	☐ FAIL	☐ NA	☐ NP(1)
Receiver Radiated emissions Pb	☒ 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. INFORMATIONS

-Tests are performed on the most complete product **NXP JN5189T-001-M16**, SN: -. See Table below for difference between products.

Product <u>name</u>	MEM high	MEM Low	NTAG <u>embedded</u>	No NTAG <u>embedded</u>	Power amplifier
JN5189-001-M16	☒			☒	☒
JN5189T-001-M16	☒		☒		☒
JN5188-001-M16		☒		☒	☒
JN5188T-001-M16		☒	☒		☒

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):
NXP JN5189T-001-M16

Serial Number: -



M16

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 board	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 μ FL 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	☒

2.3. 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 "CMET for JN5189 certification.pdf" are used to set the product:

2.4. EQUIPMENT LABELLING



2.5. 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:

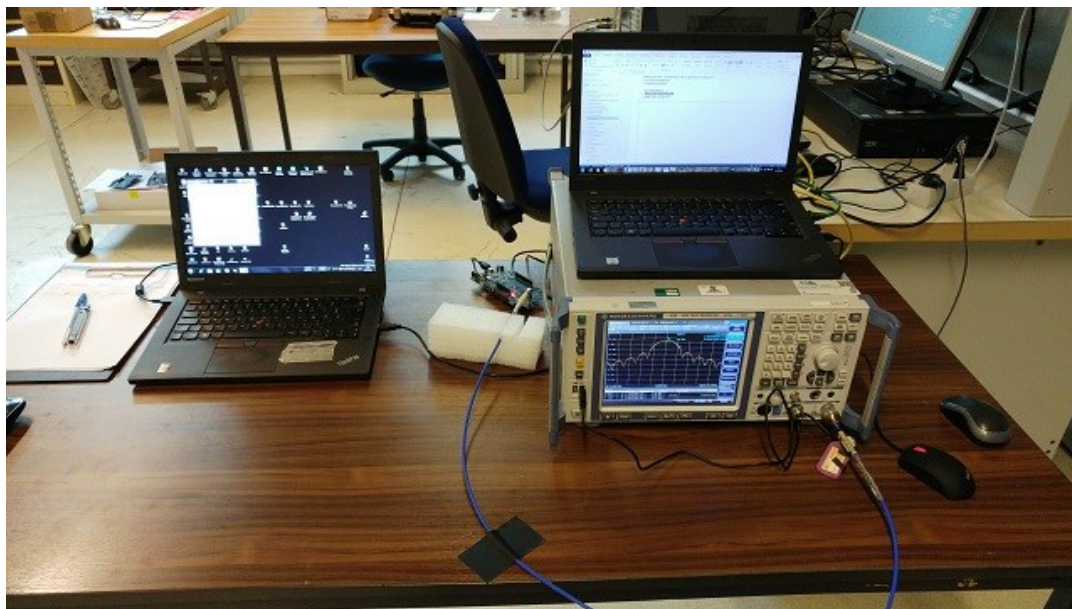
- ☒ On a table
- ☐ In an anechoic chamber

- 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

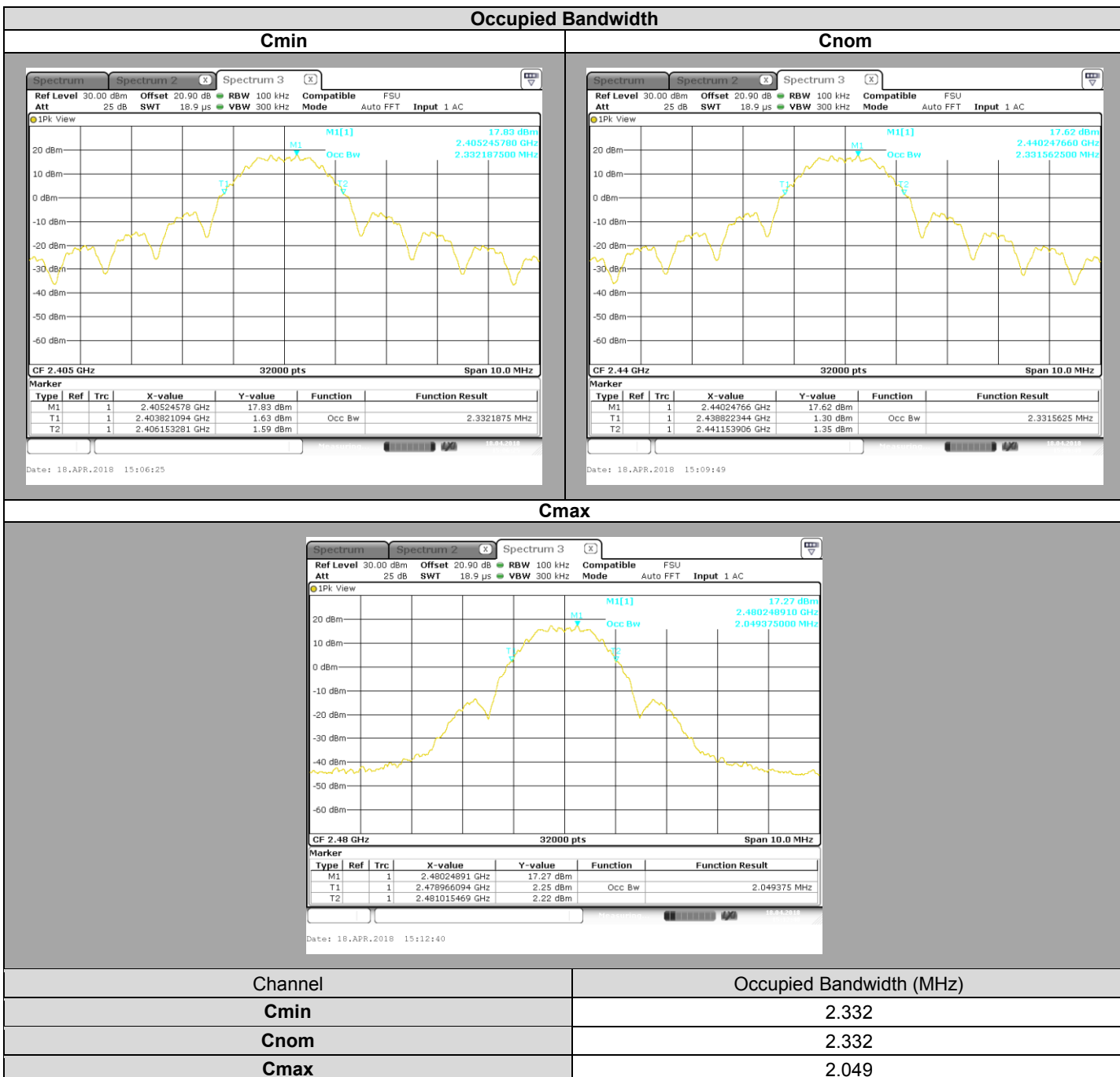
None

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



3.1. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **NXP JN5189T-001-M16**, 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:

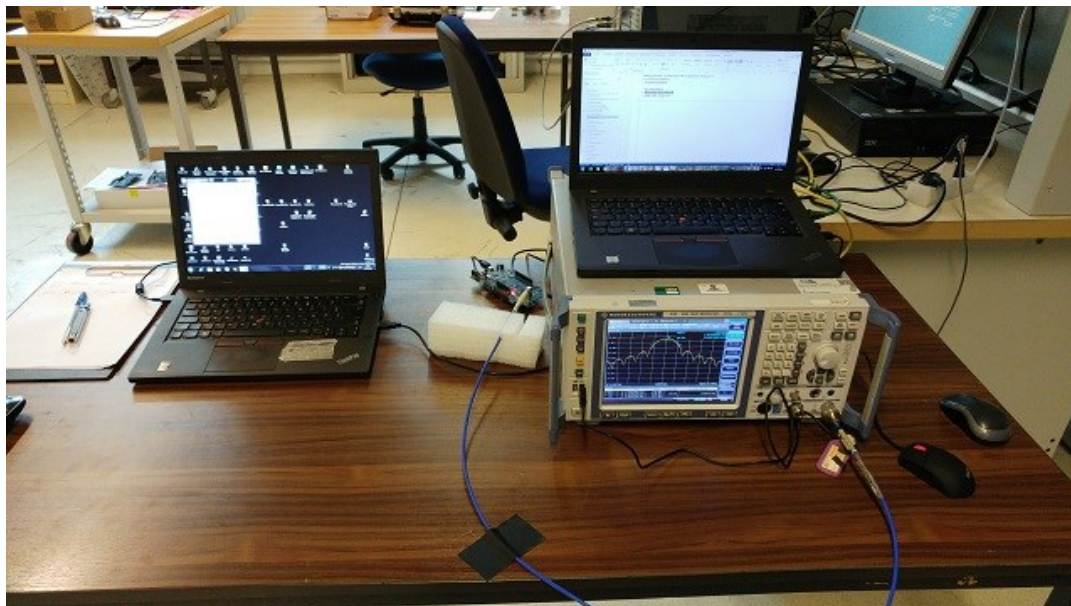
- ☒ On a table
- ☐ In an anechoic chamber

- 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

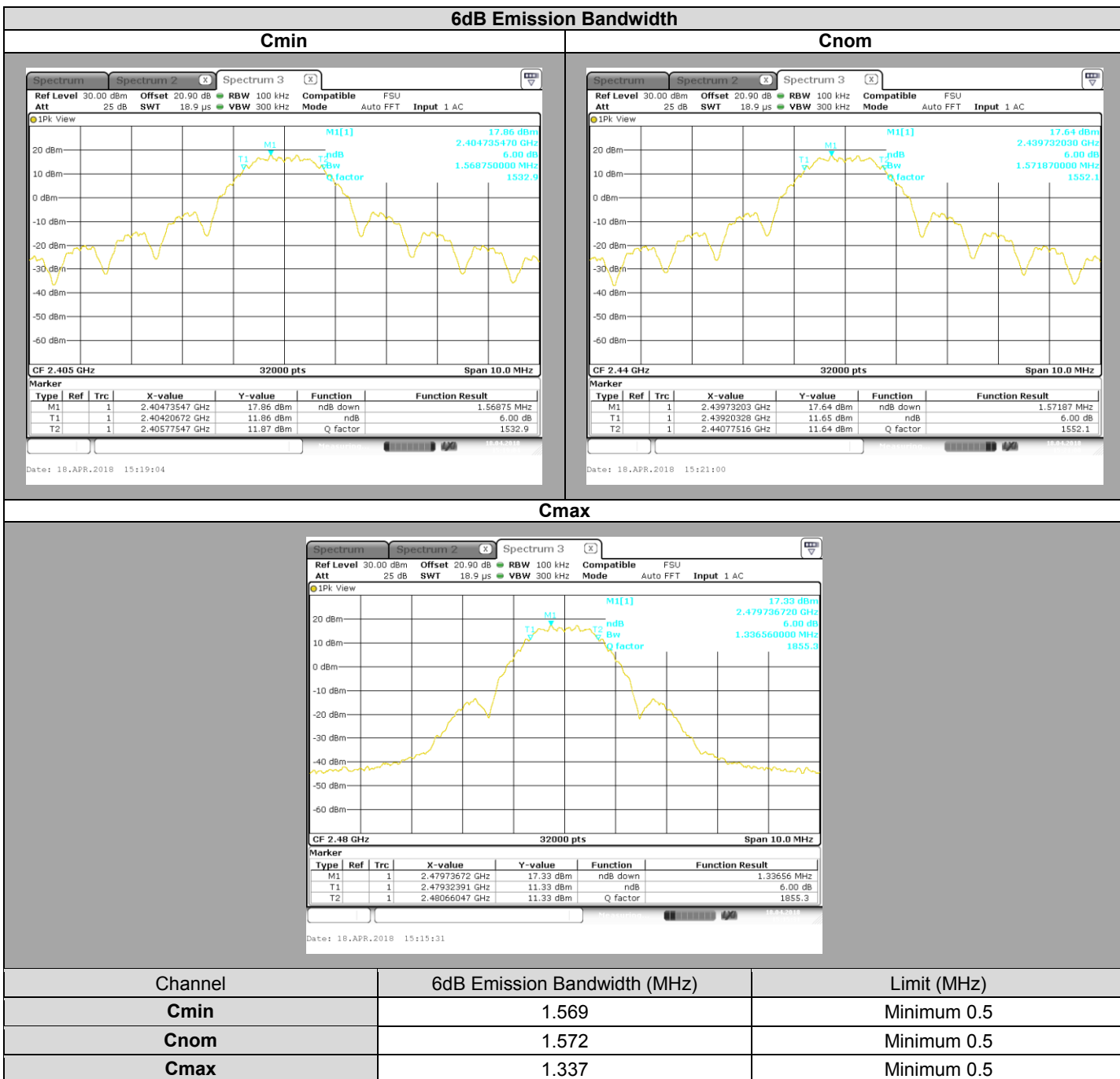
The 6dB bandwidth shall be at least 500kHz

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



4.6. CONCLUSION

6dB Emission Bandwidth measurement performed on the sample of the product **NXP JN5189T-001-M16**, 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:

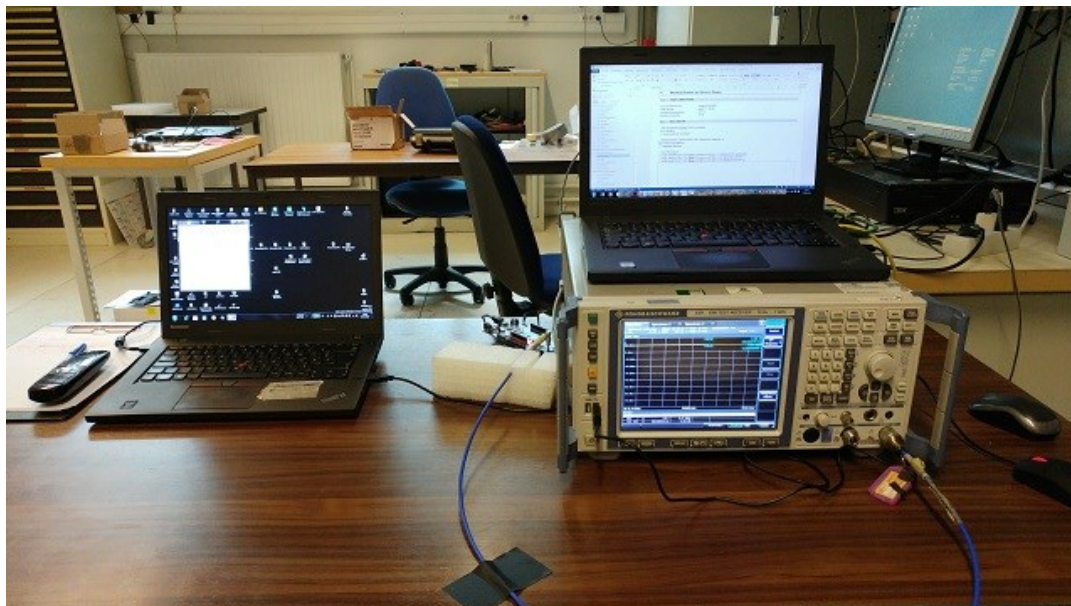
- ☒ On a table
- ☐ In an anechoic chamber

- 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

5.1. LIMIT

None

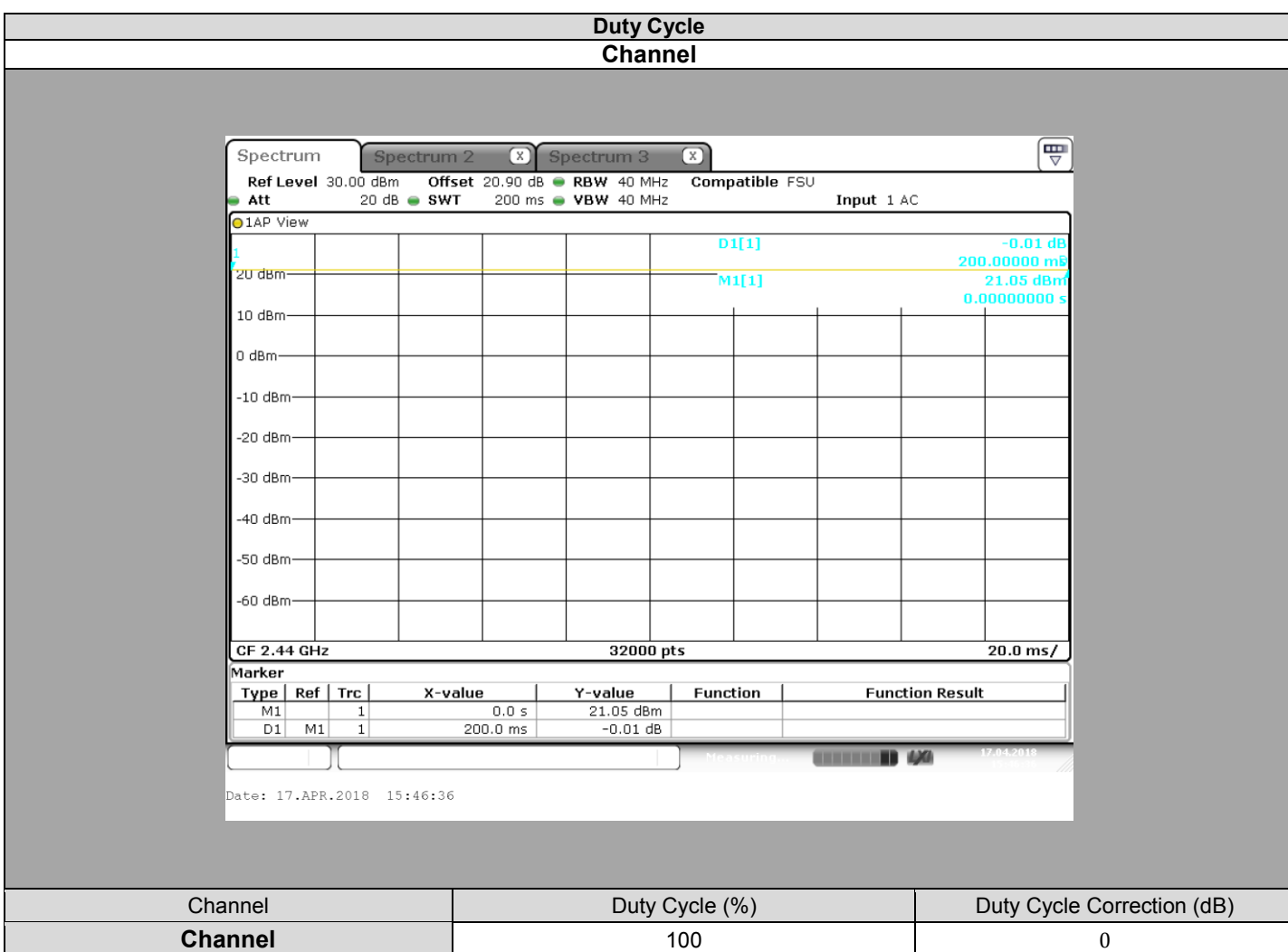


5.2. TEST EQUIPMENT LIST

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

5.3. RESULTS



5.4. CONCLUSION

Duty Cycle measurement performed on the sample of the product **NXP JN5189T-001-M16**, 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:

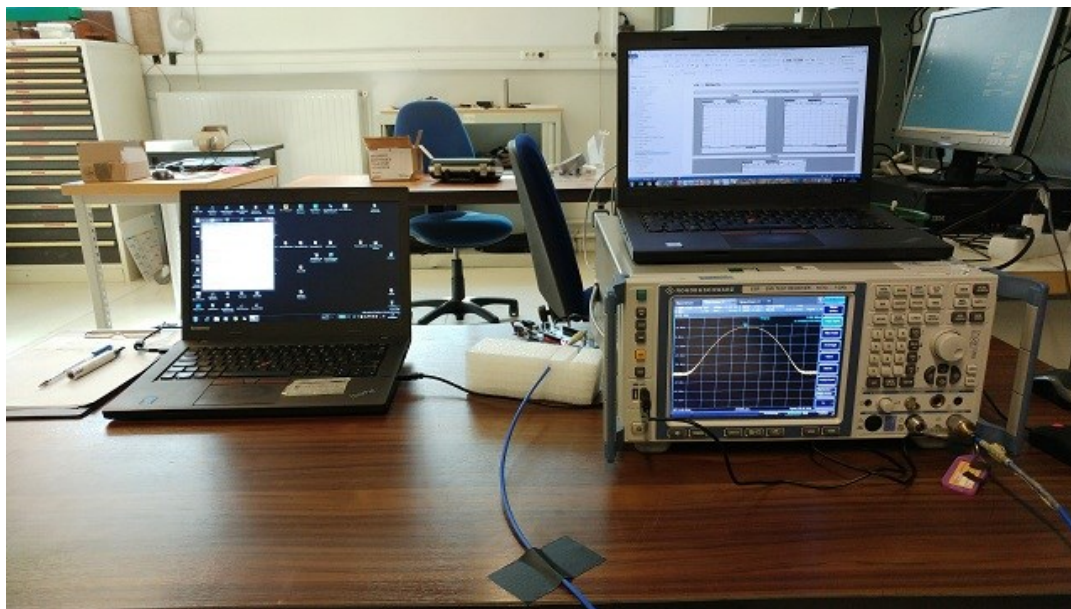
- ☒ On a table
- ☐ In an anechoic chamber

- 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

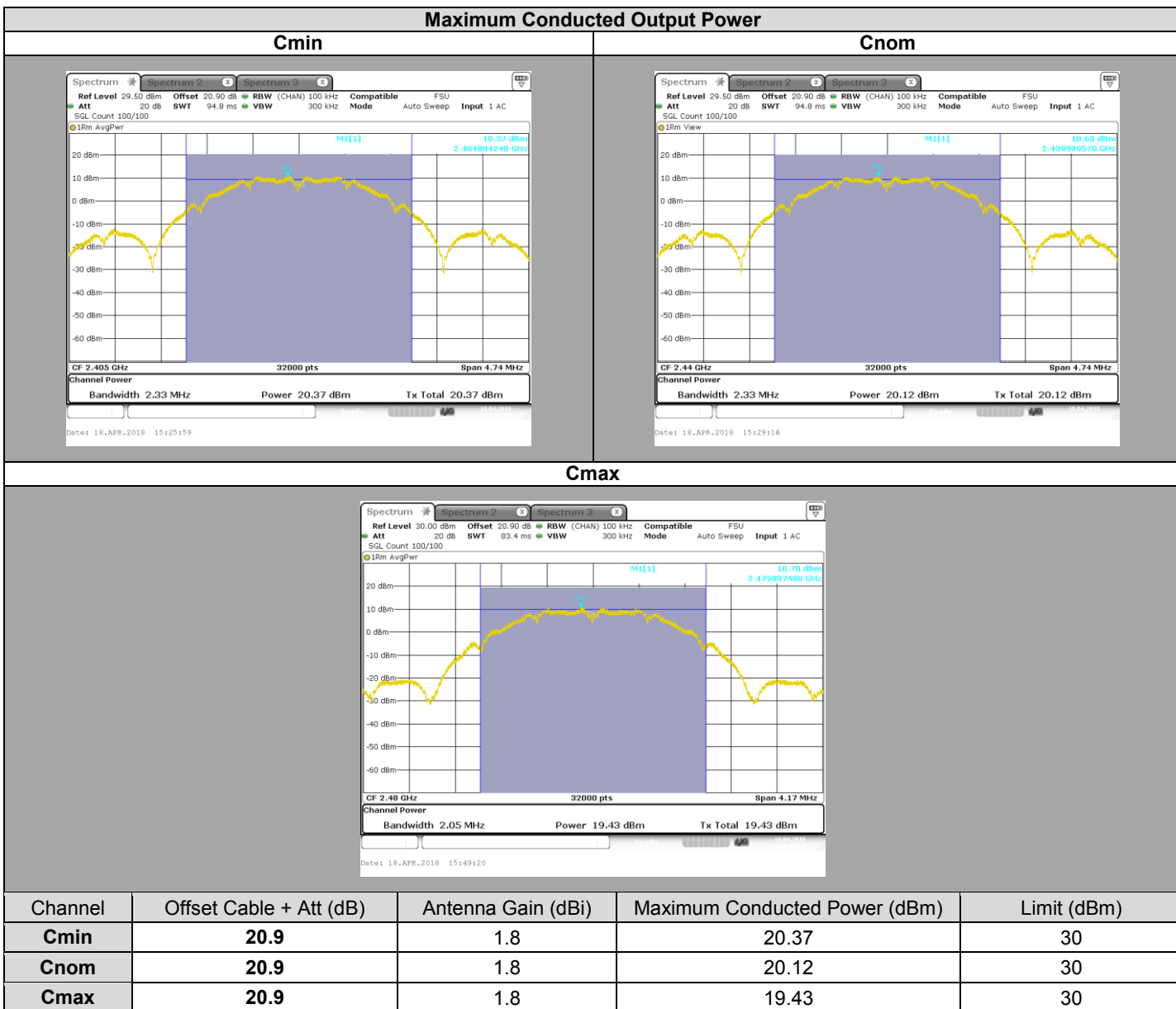
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

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



6.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **NXP JN5189T-001-M16**, 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:

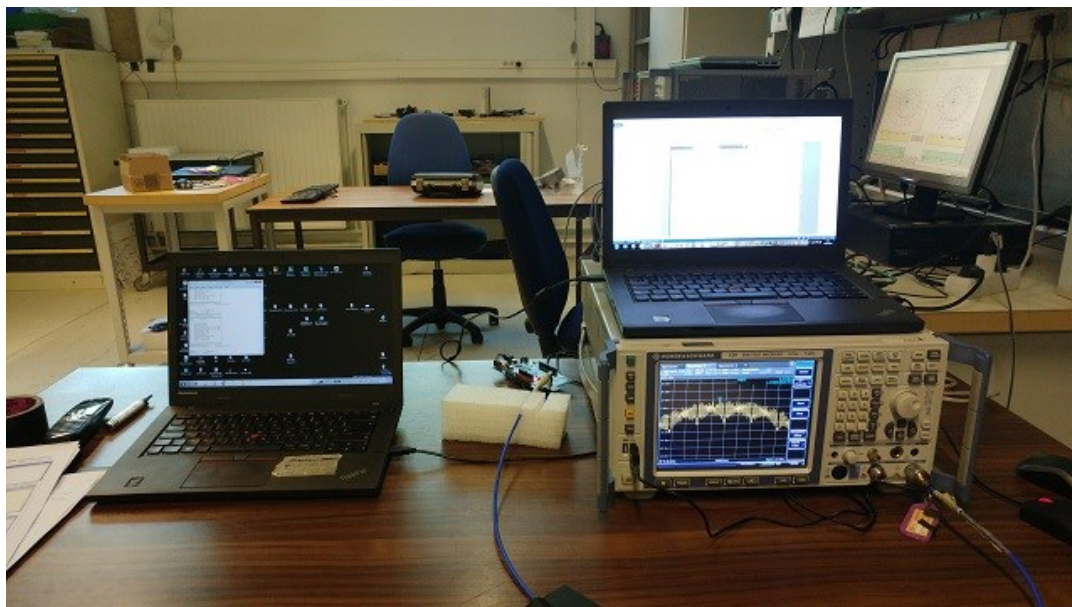
- ☒ On a table
- ☐ In an anechoic chamber

- 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 AVGPS-1)



Photograph for Power Spectral Density



7.3. LIMIT

Power Spectral Density:

2400MHz-2483.5MHz: Shall not exceed 8dBm/3kHz

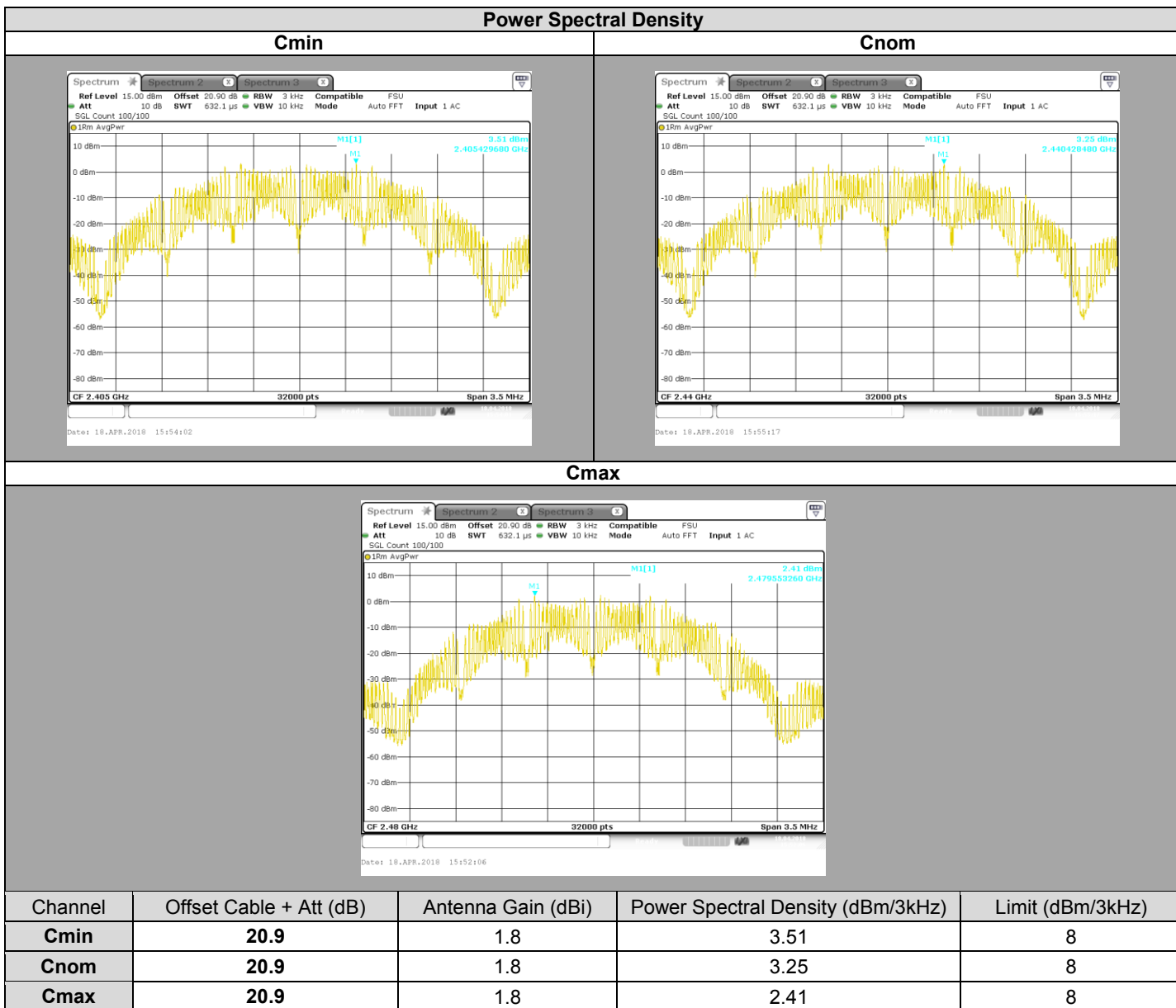
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

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



7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **NXP JN5189T-001-M16**, 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:

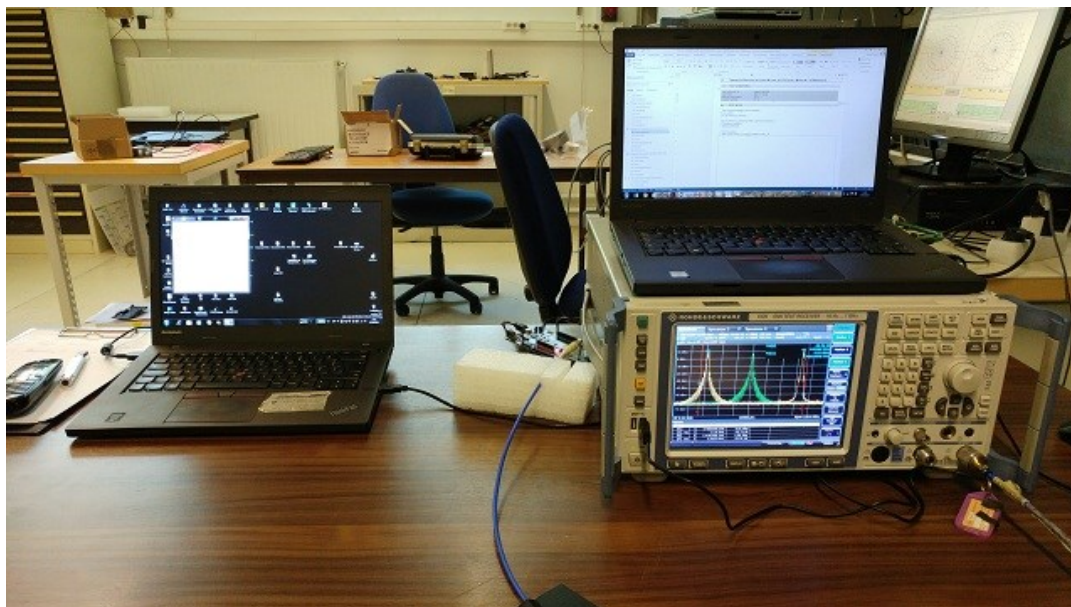
- ☒ On a table
- ☐ In an anechoic chamber

- 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

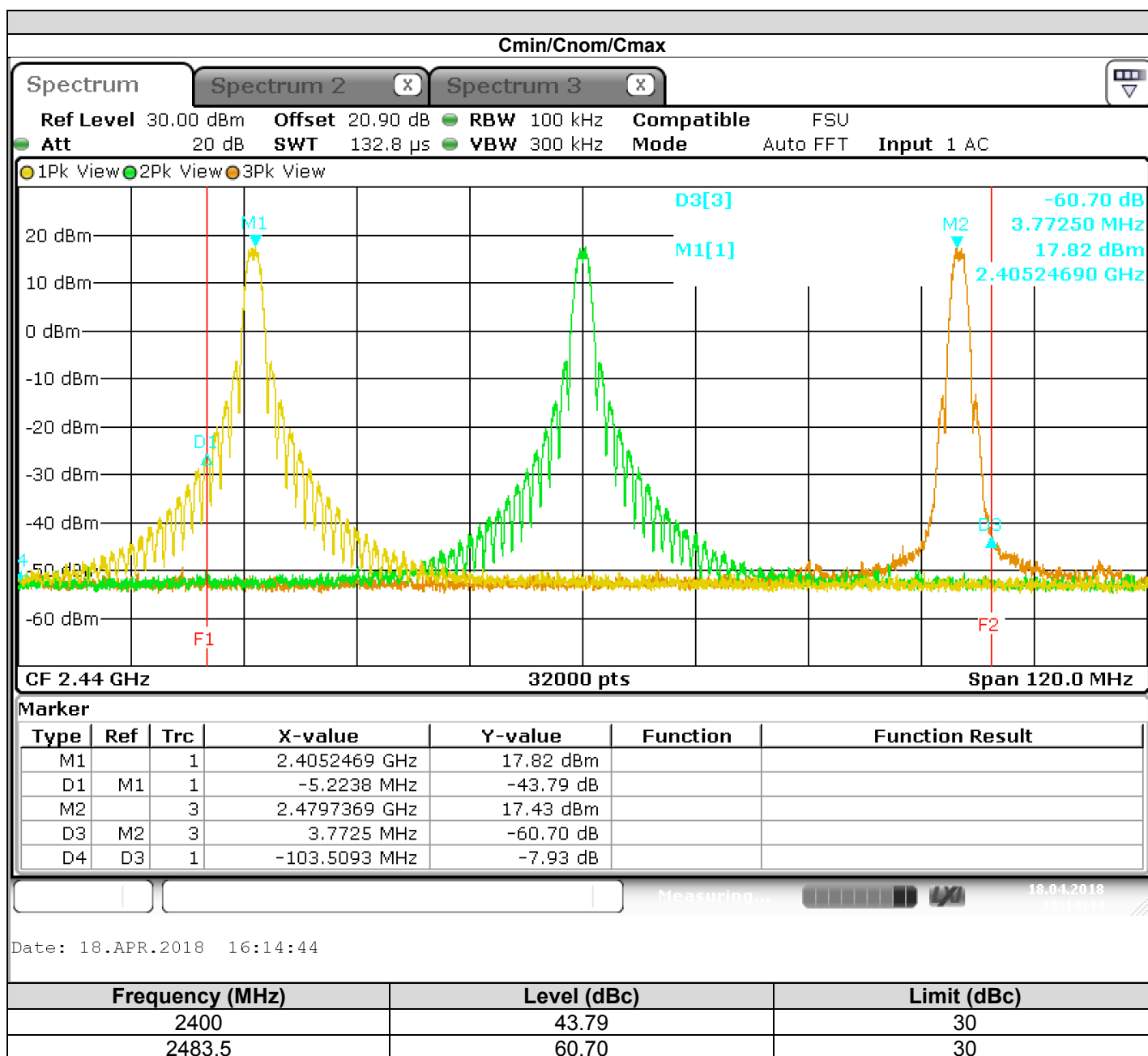
All Spurious Emissions must be at least 30dB (Average Conducted Power) below the Fundamental Radiator Level at the Band Edge "2400MHz & 2483,5MHz"

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



8.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **NXP JN5189T-001-M16**, 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:

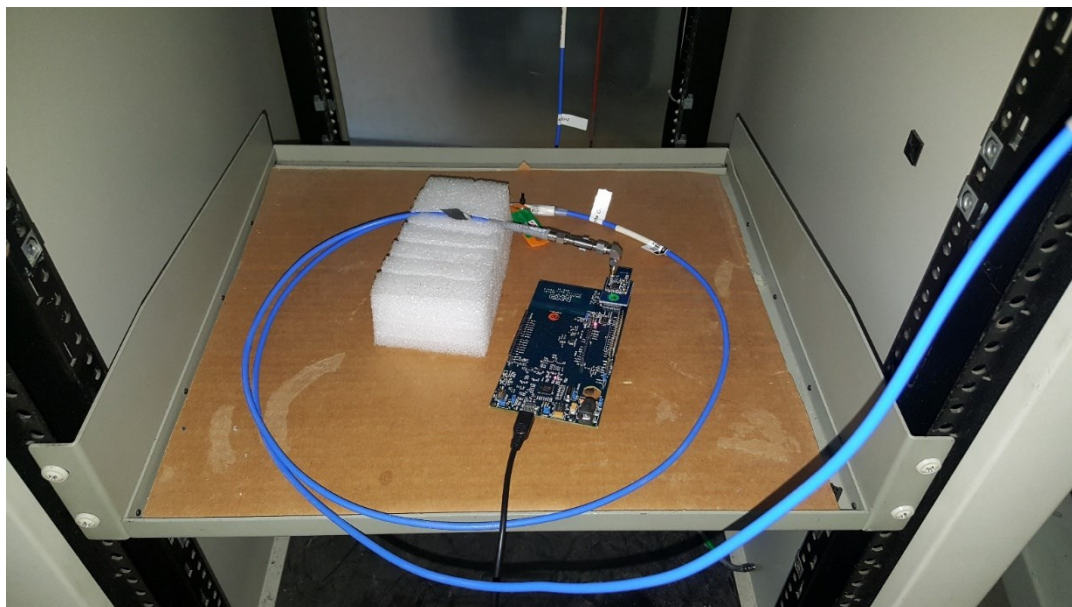
- ☒ On a table
- ☐ In an anechoic chamber

- 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

9.3. LIMIT

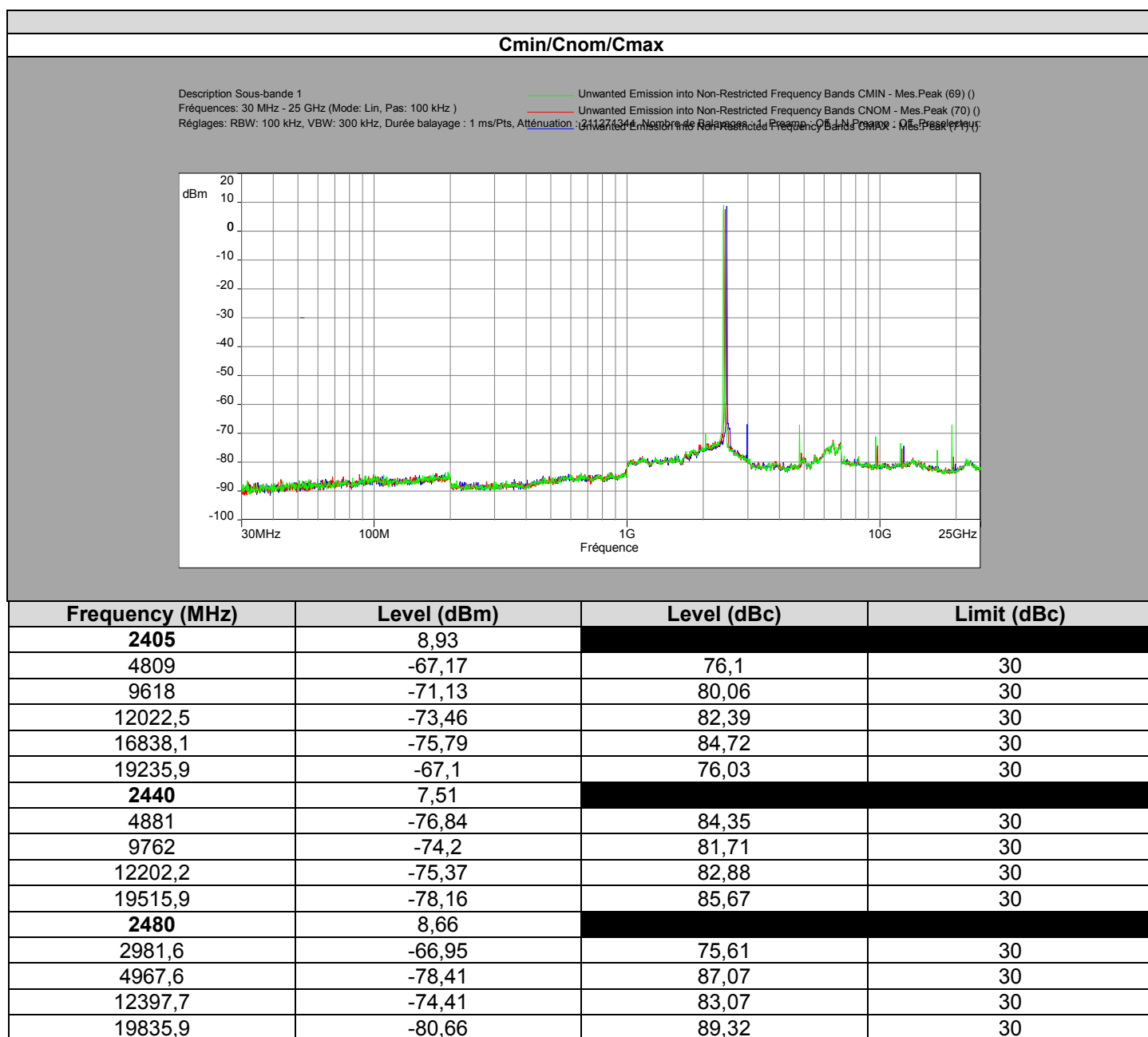
All Spurious Emissions must be at least 30dB (Average Conducted Power) below the Fundamental Radiator Level

9.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2017/07	2018/07
Rejector filter 2,4GHz	-	2.45GHz	A7484048	2017/09	2018/09
cable	Télédyn	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

9.5. RESULTS



9.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **NXP JN5189T-001-M16**, 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

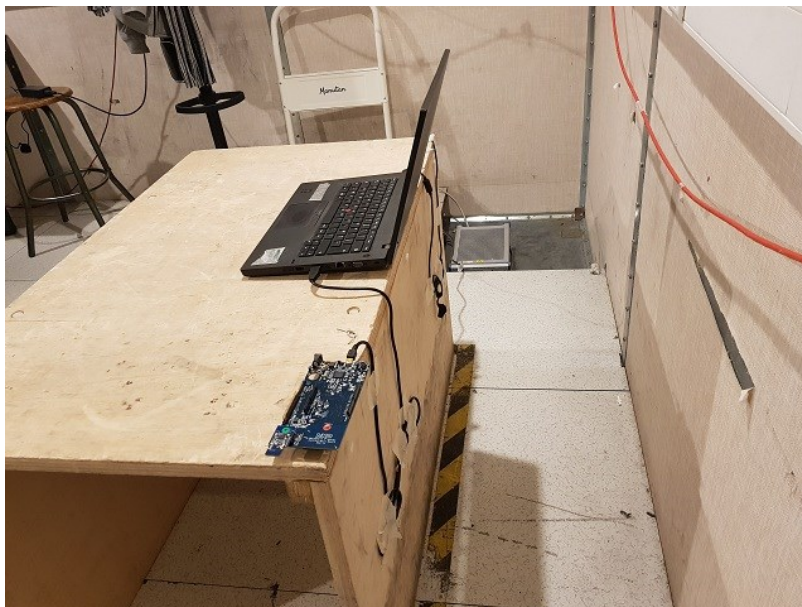
Test performed by : Willy DACLINAT
Date of test : April 19, 2018
Ambient temperature : 26 °C
Relative humidity : 45 %

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 $50\Omega / 50\mu\text{H}$. Interconnecting cables and equipment's were moved to position that maximized emission.



Photograph for AC Power Line Conducted Emissions (Front view)



Photograph for AC Power Line Conducted Emissions (Rear view)

10.1. LIMIT

Quasi-Peak

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

0,5MHz to 5MHz: 56dB μ V

5MHz to 30MHz: 60dB μ V

Average

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

0,5MHz to 5MHz: 46dB μ V

5MHz to 30MHz: 50dB μ V

*Decreases with the logarithm of the frequency

10.2. 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

10.3. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None

☐ Divergence:

10.4. RESULTS ON M16 WITH INTERNAL PCB ANTENNA

Channel Phase

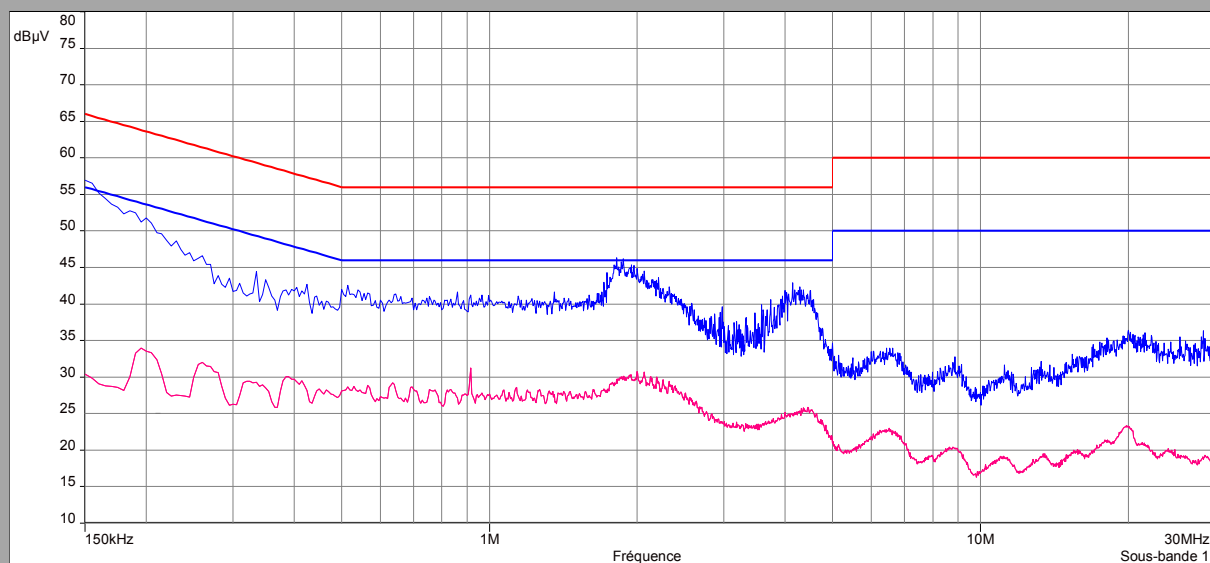
Description Sous-bande 1

Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)

Réglages: RBW: 9 kHz, VBW: Auto, Durée balayage: 50 ms/Pts, Atténuation: 33219936, Nombre de Balayages: 1, Preamp: Off, LN Preamp: Off, Mes. Peak (Phase 1)

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

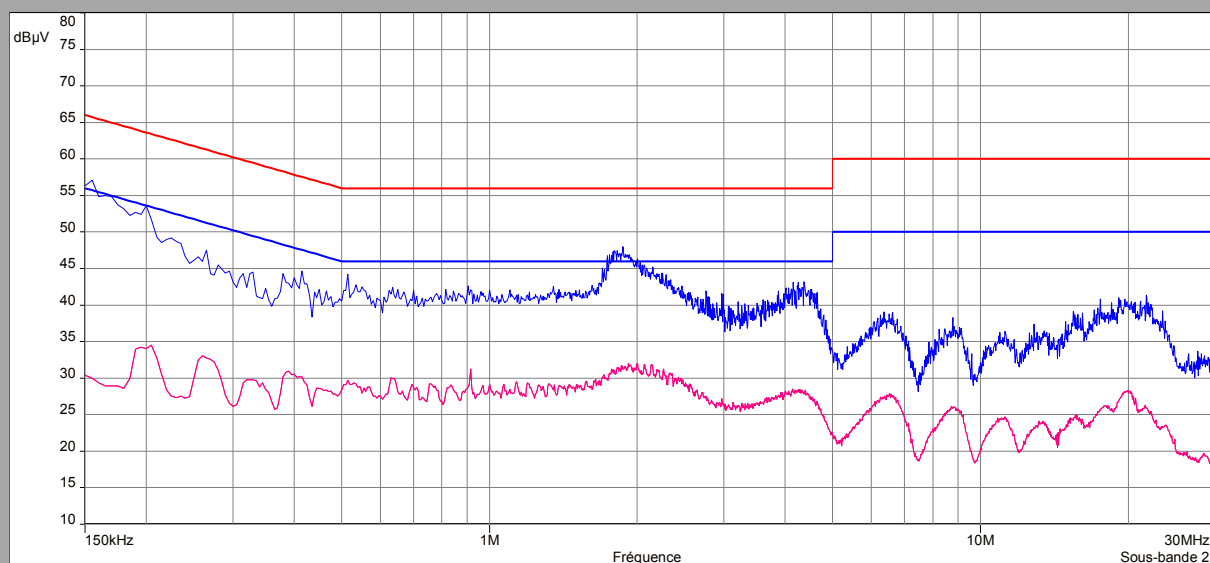
Description Sous-bande 2

Fréquences: 150 kHz - 30 MHz (Mode: Lin, Pas: 5 kHz)

Réglages: RBW: 9 kHz, VBW: Auto, Durée balayage: 50 ms/Pts, Atténuation: 148794136, Nombre de Balayages: 1, Preamp: Off, LN Preamp: Off, Mes. Peak (Neutre)

Ligne: Neutre

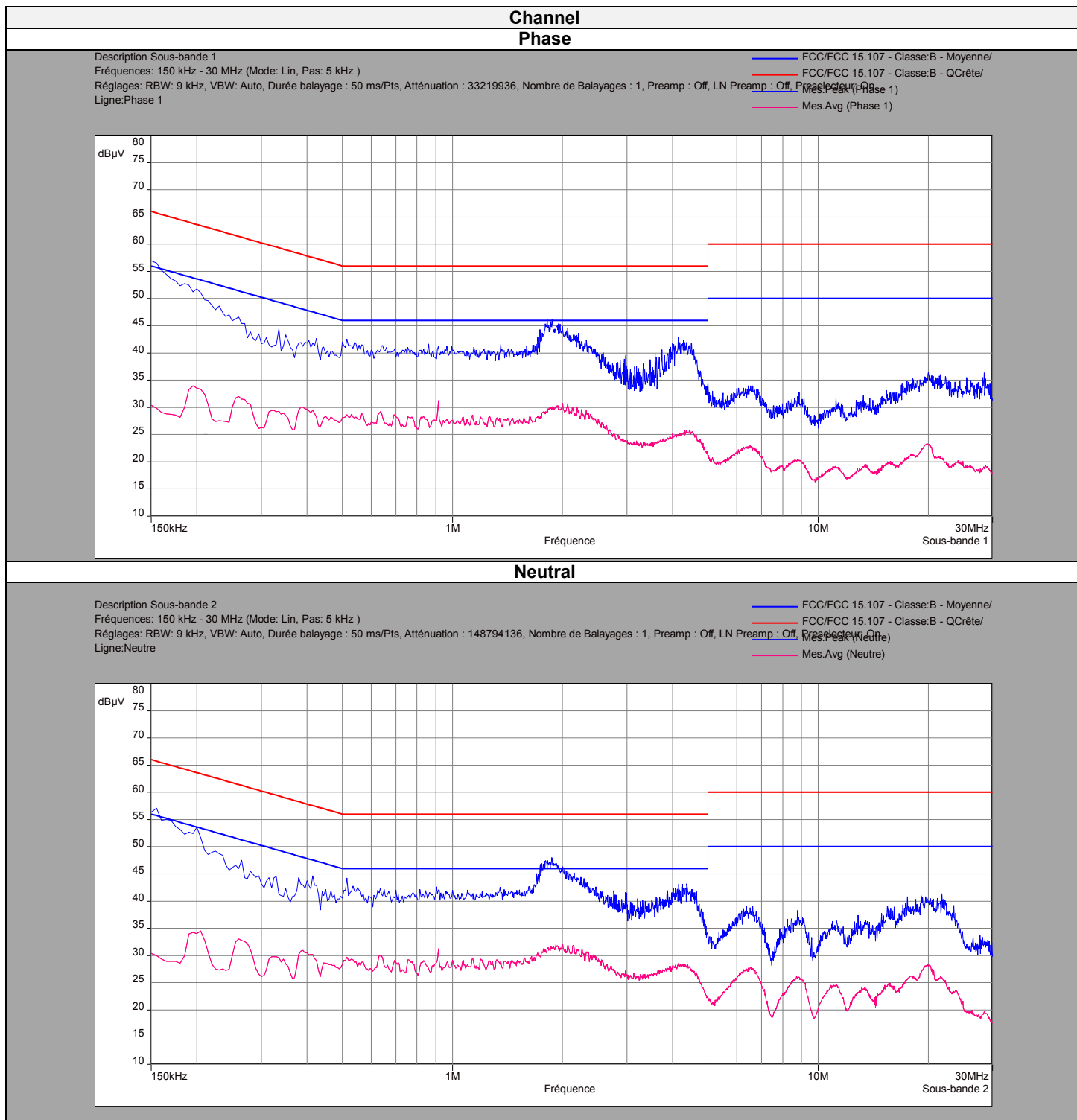
— FCC/FCC 15.107 - Classe: B - Moyenne/
 — FCC/FCC 15.107 - Classe: B - QCrête/
 — Mes. Peak (Neutre)
 — Mes. Avg (Neutre)



Phase Line – M16							
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 – M16							
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

10.5. RESULTS ON M16 WITH μ FL ANTENNA



Phase Line – M16							
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 – M16							
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

10.6. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **NXP JN5189T-001-M16**, 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.

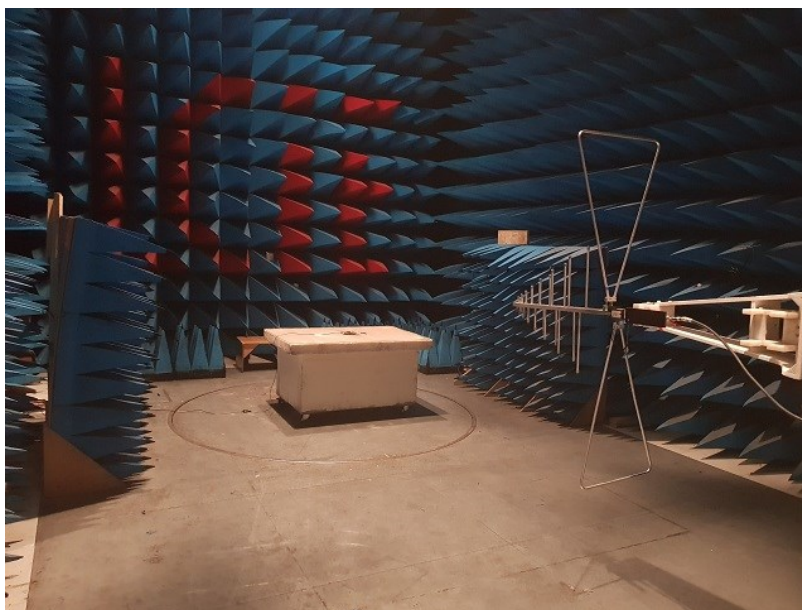
11. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

11.1. TEST CONDITIONS

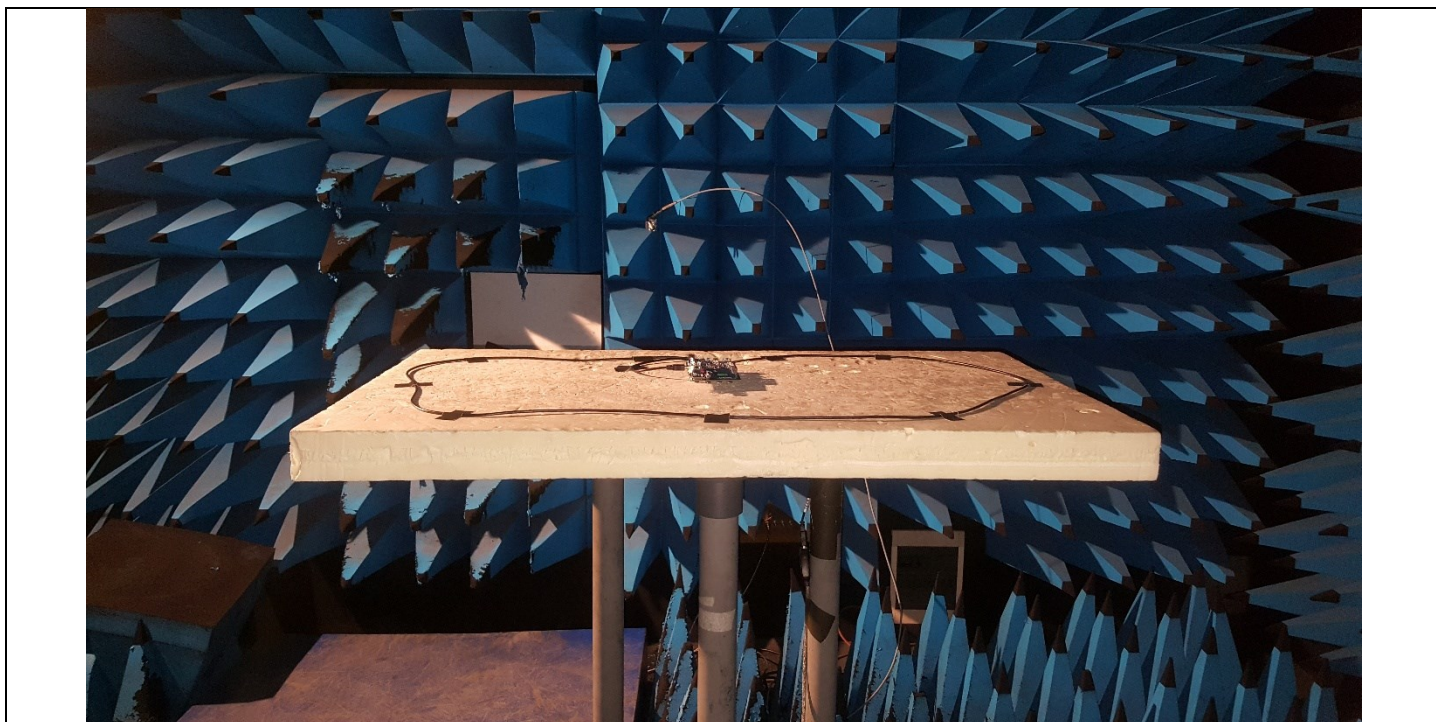
Test performed by : Armand MAHOUNGOU
Date of test : April 16, 2018
Ambient temperature : 26 °C
Relative humidity : 45 %

11.2. TEST SETUP

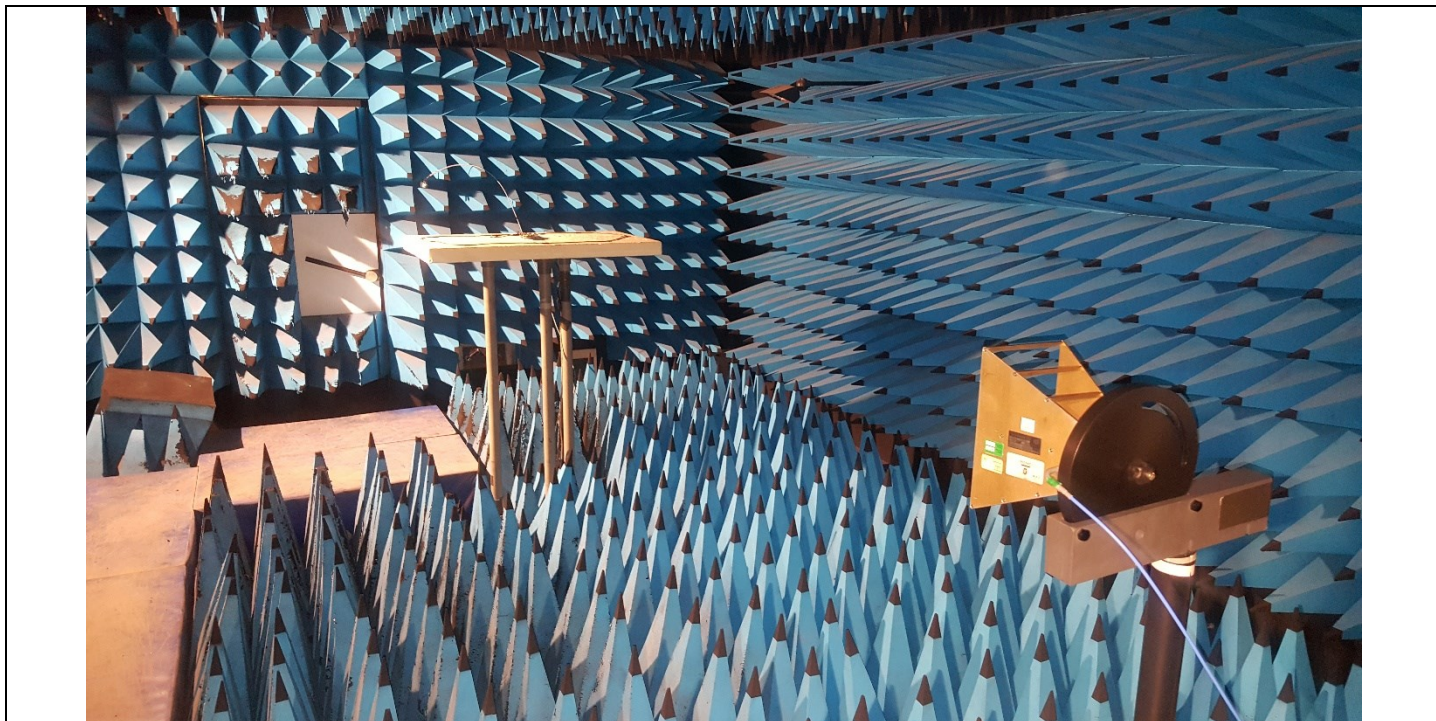
The product has been tested according to ANSI C63.10 (2013). The EUT is placed **ina semi-anechoic chamber**. Distance between measuring antenna and the EUT is **3m**. Test is performed in horizontal (H) and vertical (V) polarization with **bilog** antenna below 1GHz and with a horn antenna above 1GHz.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



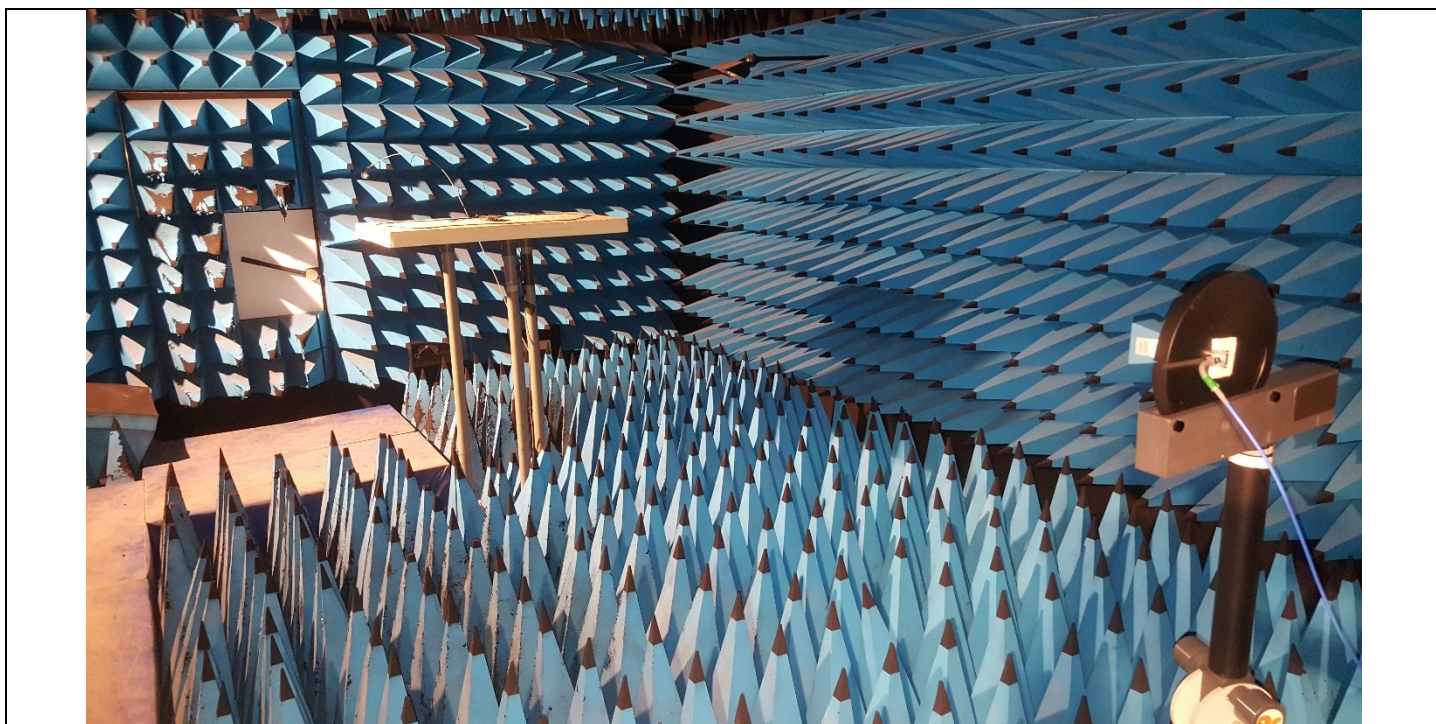
Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands

11.3. LIMIT

Limit at 3m:

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

Limit at 10m:

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

11.4. TEST EQUIPMENT LIST

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 anechoic 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	PASTERNAK	PE9852/2F-20	C2042048	2017/05	2019/05
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2017/07	2018/07
cable	Télédyn	084-0505-1MTR	A5329757	2017/03	2018/03
cable	Télédyn	084-0555-3MTR	A5329760	2017/03	2018/03
cable	Télédyn	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

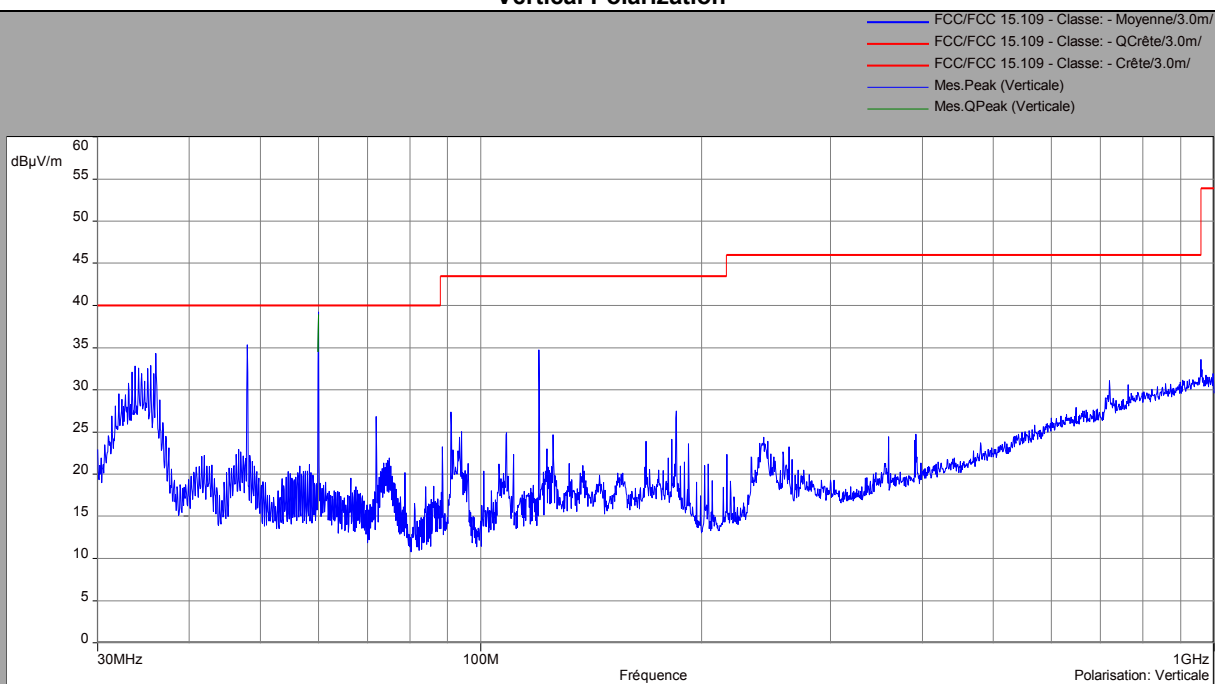
☒ None
 ☐ Divergence:

11.6. RESULTS ON M16 WITH INTERNAL PCB ANTENNA

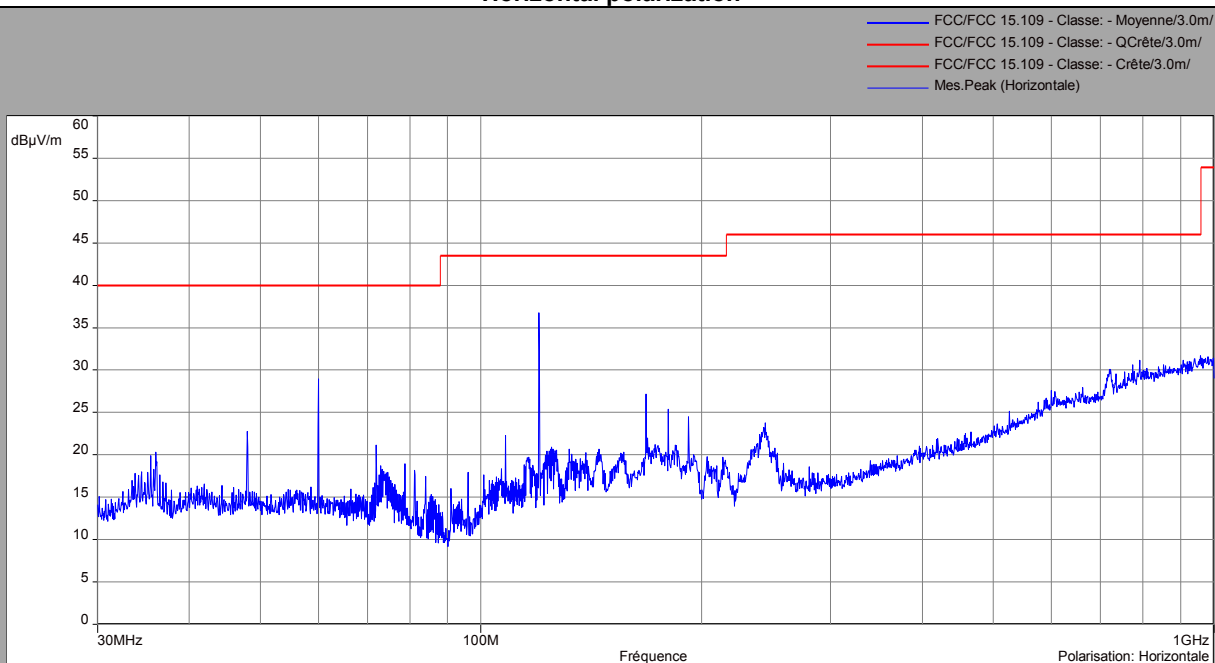
Below 1GHz

Channel

Vertical Polarization



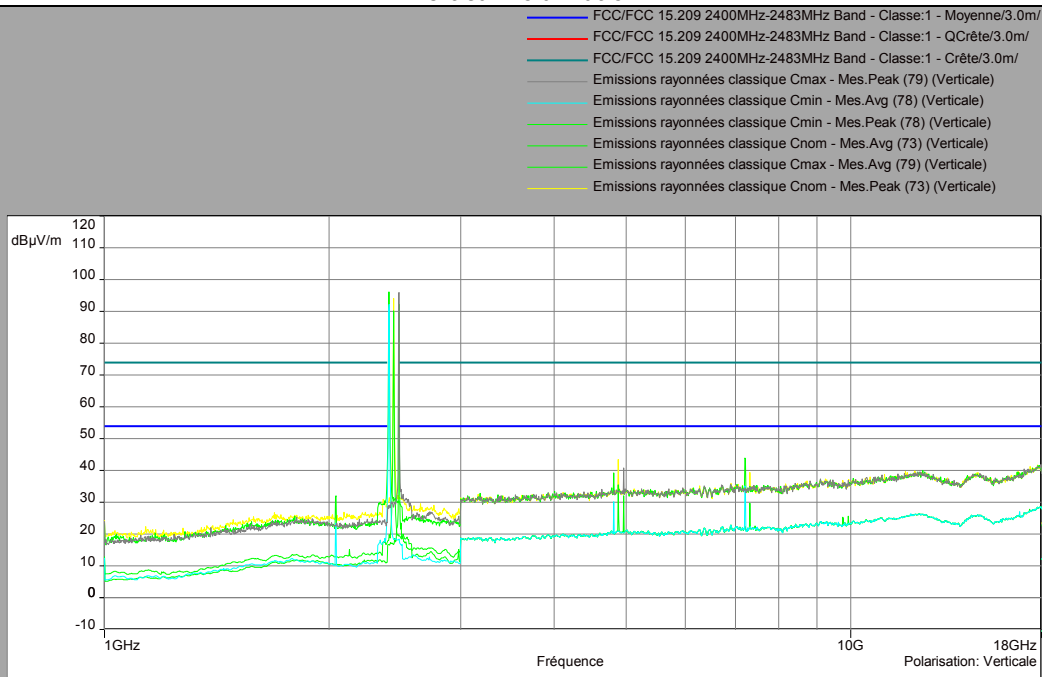
Horizontal polarization



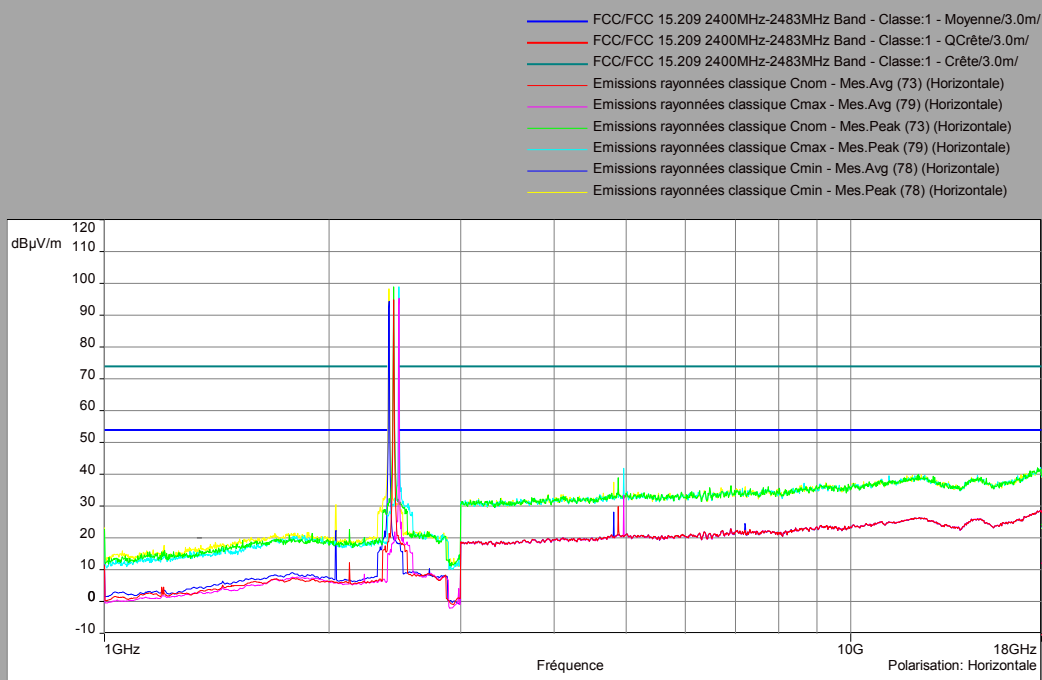
Above 1GHz

Cmin/Cnom/Cmax

Vertical Polarization



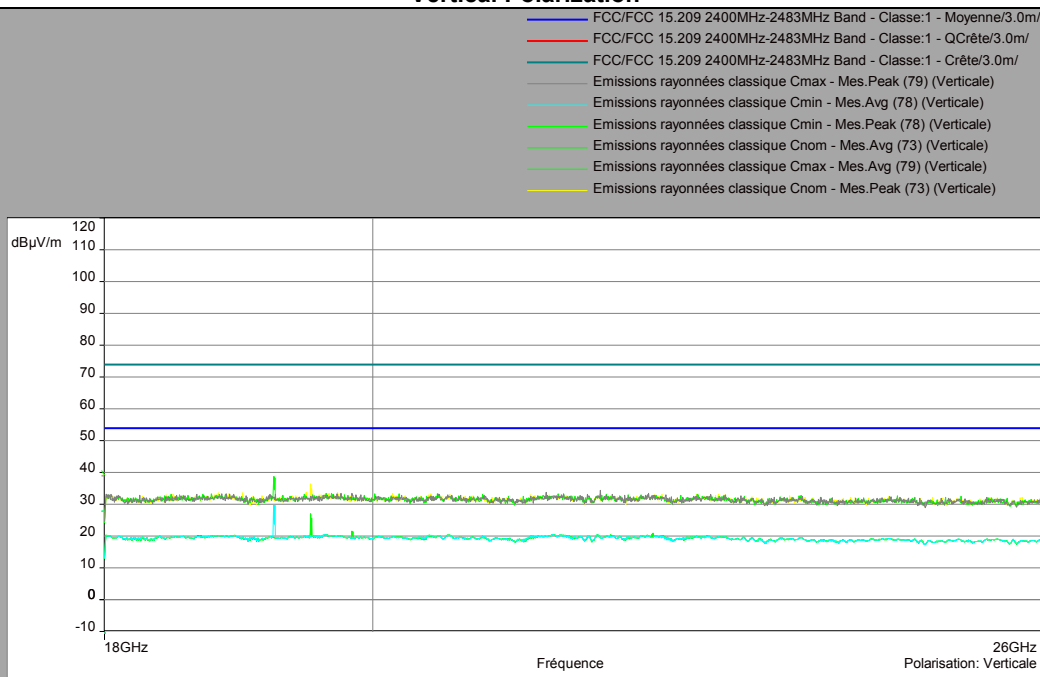
Horizontal polarization



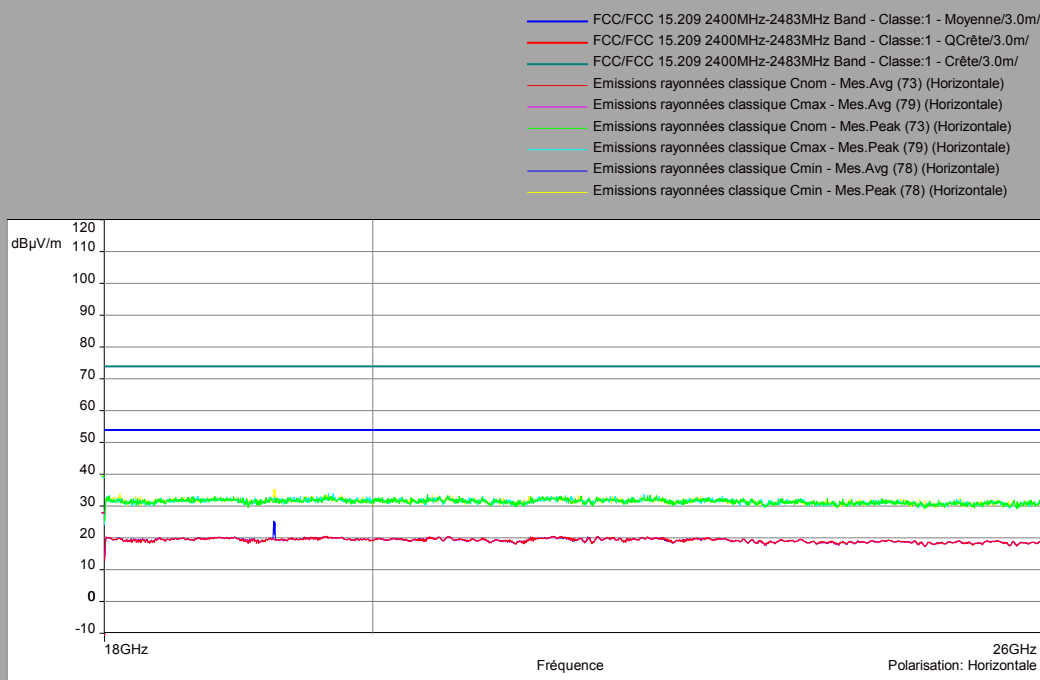
Above 1GHz

Cmin/Cnom/Cmax

Vertical Polarization



Horizontal polarization



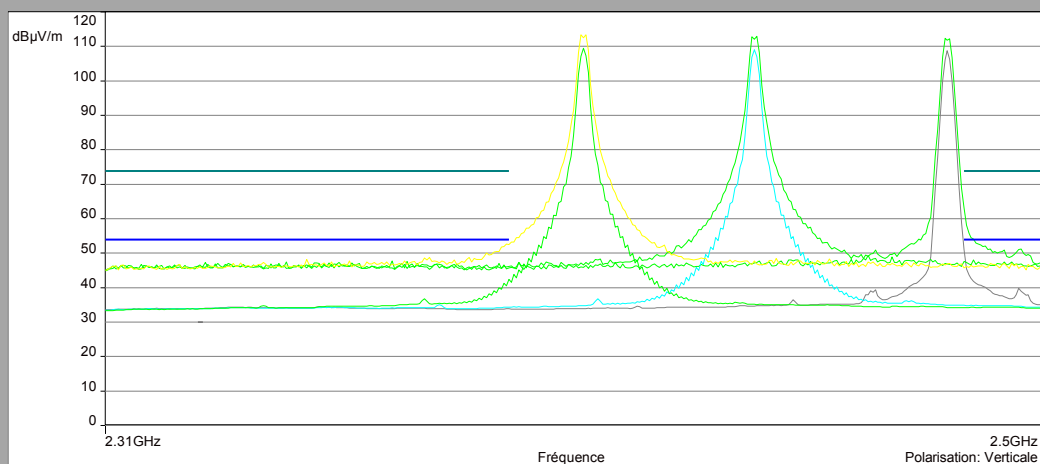
Above 1GHz Zoom 2310MHz-2500MHz

Cmin/Cnom/Cmax

Vertical Polarization

Description Sous-bande 2 : FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
 Fréquences: 2.31 GHz - 2.5 GHz (Mode: LCR) - FCC 15.209 2400MHz-2483MHz Band - Classe:1 - QCrête/3.0m/
 Réglages: RBW: 1 MHz, VBW: Auto, Durée de balayage: 550.000 2400MHz-2483MHz Band - Classe:1 - Nombre de Balayages: 1, Preamp: On: 20 dB, LN Preamp: Off, Preselect
 Polarisation: Verticale
 Distance: 3 m

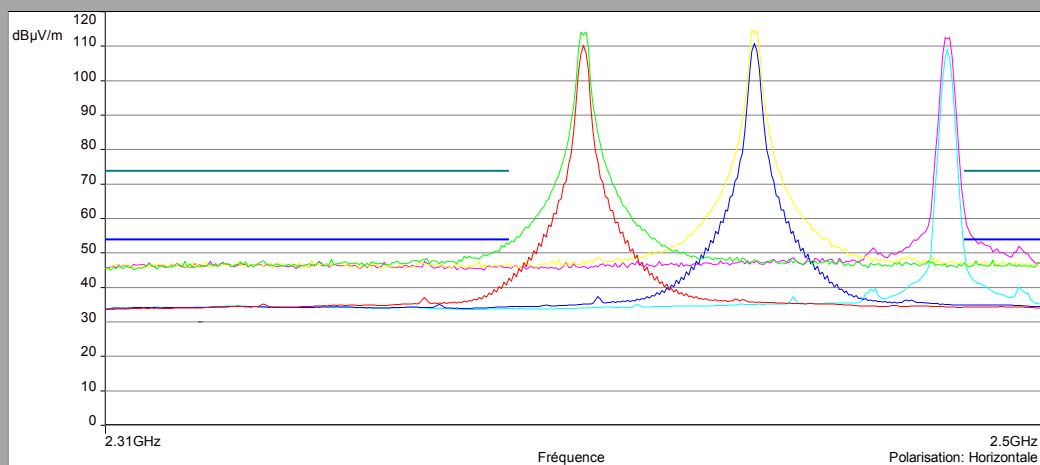
Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal min - REGULAR target 0 - Mes.Avg (74) (Verticale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal min - REGULAR target 0 - Mes.Peak (74) (Verticale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal nom - REGULAR target 0 - Mes.Avg (75) (Verticale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal nom - REGULAR target 0 - Mes.Peak (75) (Verticale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal max - PROP 2 target -1 - Mes.Peak (76) (Verticale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal max - PROP 2 target -1 - Mes.Avg (76) (Verticale)



Horizontal polarization

Description Sous-bande 1 : FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
 Fréquences: 2.31 GHz - 2.5 GHz (Mode: LCR) - FCC 15.209 2400MHz-2483MHz Band - Classe:1 - QCrête/3.0m/
 Réglages: RBW: 1 MHz, VBW: Auto, Durée de balayage: 550.000 2400MHz-2483MHz Band - Classe:1 - Nombre de Balayages: 1, Preamp: On: 20 dB, LN Preamp: Off, Preselect
 Polarisation: Horizontale
 Distance: 3 m

Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal min - REGULAR target 0 - Mes.Avg (74) (Horizontale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal min - REGULAR target 0 - Mes.Peak (74) (Horizontale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal nom - REGULAR target 0 - Mes.Avg (75) (Horizontale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal nom - REGULAR target 0 - Mes.Peak (75) (Horizontale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal max - PROP 2 target -1 - Mes.Peak (76) (Horizontale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal max - PROP 2 target -1 - Mes.Avg (76) (Horizontale)



Below 1GHz					
Polarization	Frequency (MHz)	Peak Level (dBμV/m)	QPeak Level (dBμV/m)	Limit (dBμV/m)	Margin (dBμV/m)
Horizontale	36	20,34		40	19,66
Verticale	36	34,31		40	5,69
Horizontale	48	22,74		40	17,26
Verticale	48	35,44		40	4,56
Horizontale	60	28,96		40	11,04
Verticale	60	-	39,24	40	0,76
Horizontale	72	21,16		40	18,84
Verticale	72	26,83		40	13,17
Verticale	91,1	27,36		43,5	16,14
Horizontale	108	22,26		43,5	21,24
Verticale	108	24,913		43,5	18,587
Horizontale	120	36,76		43,5	6,74
Verticale	120	34,71		43,5	8,79
Horizontale	168	27,18		43,5	16,32
Verticale	168	23,87		43,5	19,63
Horizontale	180	25,37		43,5	18,13
Verticale	184,6	27,46		43,5	16,04
Horizontale	192	24,51		43,5	18,99
Verticale	216,6	22,31		43,5	21,19
Horizontale	244,1	23,75		46	22,25
Verticale	244,1	24,38		46	21,62
Verticale	360,02	24,46		46	21,54
Verticale	391,88	24,7		46	21,3
Horizontale	526,16	25,15		46	20,85
Horizontale	719,66	30,08		46	15,92
Verticale	720,02	31,06		46	14,94
Verticale	763,94	30,57		46	15,43
Horizontale	792,38	31,18		46	14,82
Verticale	960,02	33,59		54	20,41

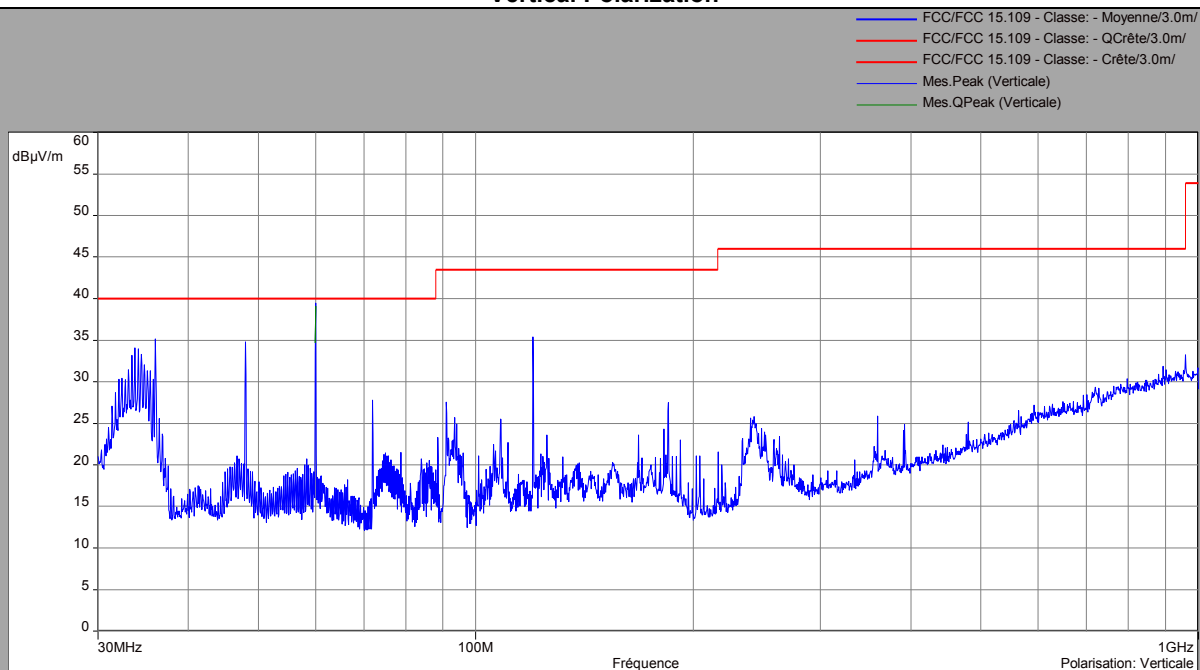
Above 1GHz								
Cmin/Cnom/Cmax								
Polarization	Frequency (MHz)	Average Level (dBμV/m)	Average Level + Duty Cycle Factor (dBμV/m)	Average Limit (dBμV/m)	Average Margin Level (dBμV/m)	Peak Level (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin Level (dBμV/m)
Horizontale	2,013	12,15	12,15	54	41,85	22,68	74	51,32
Horizontale	2,043	22,4	22,4	54	31,6	30,46	74	43,54
Verticale	2,043	23,12	23,12	54	30,88	32,01	74	41,99
Horizontale	2390	42,72	42,72	54	11,28	53,29	74	20,71
Verticale	2390	42,45	42,45	54	11,55	52,52	74	21,48
Horizontale	2483,5	51,402	51,402	54	2,598	63,01	74	10,99
Verticale	2483,5	51,12	51,12	54	2,88	63,13	74	10,87
Horizontale	4809	28,14	28,14	54	25,86	37,49	74	36,51
Verticale	4809	30,22	30,22	54	23,78	39,18	74	34,82
Horizontale	4881	29,82	29,82	54	24,18	38,89	74	35,11
Verticale	4881	35,47	35,47	54	18,53	43,45	74	30,55
Horizontale	4959	33,49	33,49	54	20,51	41,86	74	32,14
Verticale	4959	32,08	32,08	54	21,92	40,77	74	33,23
Verticale	7213,5	35,19	35,19	54	18,81	43,97	74	30,03
Verticale	7318,5	29,64	29,64	54	24,36	39,42	74	34,58
Horizontale	19236	25,39	25,39	54	28,61	38,71	74	35,29
Verticale	19236	29,67	29,67	54	24,33	43,97	74	30,03
Verticale	19524	25,57	25,57	54	28,43	36,41	74	37,59

11.1. RESULTS ON M16 WITH EXTERNAL μ FL ANTENNA

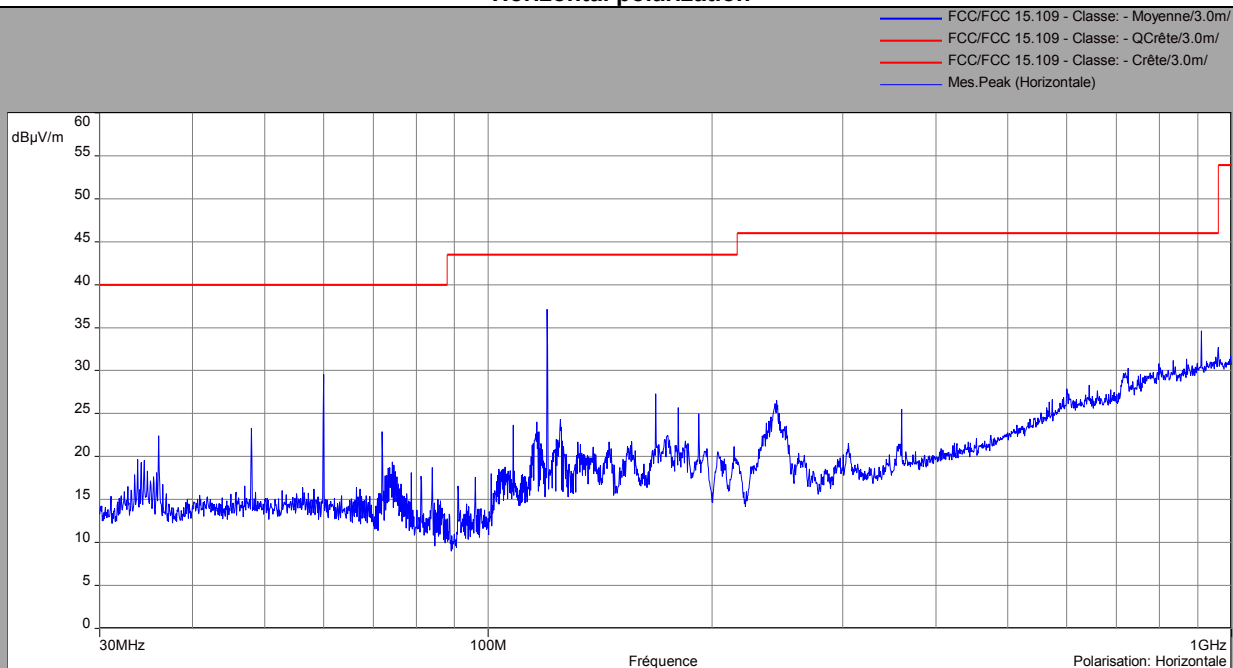
Below 1GHz

Channel

Vertical Polarization



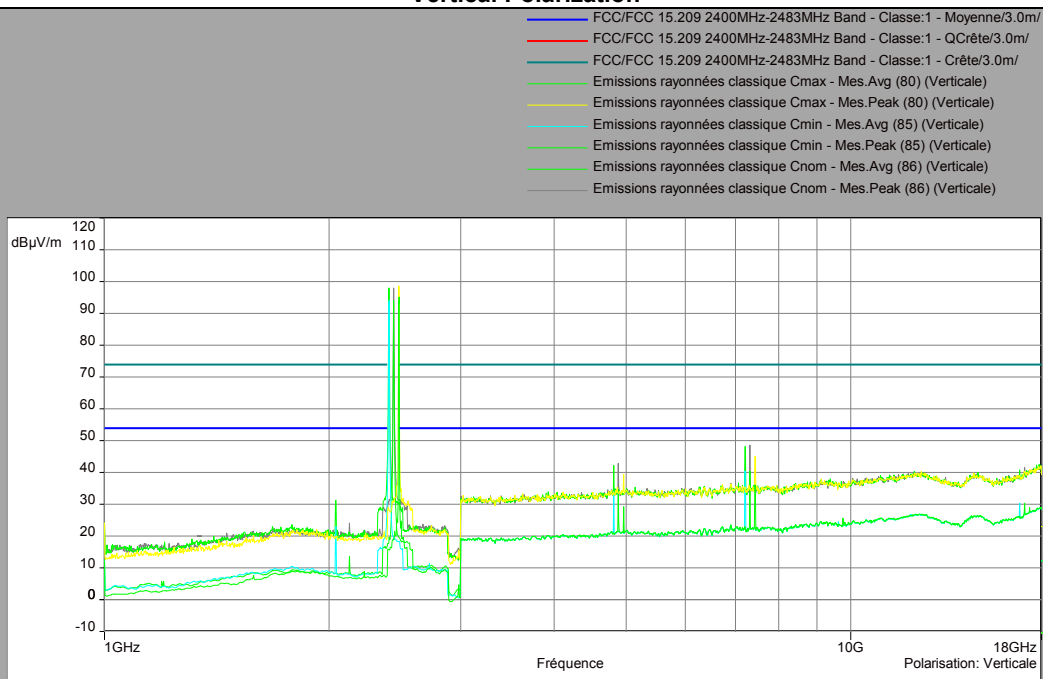
Horizontal polarization



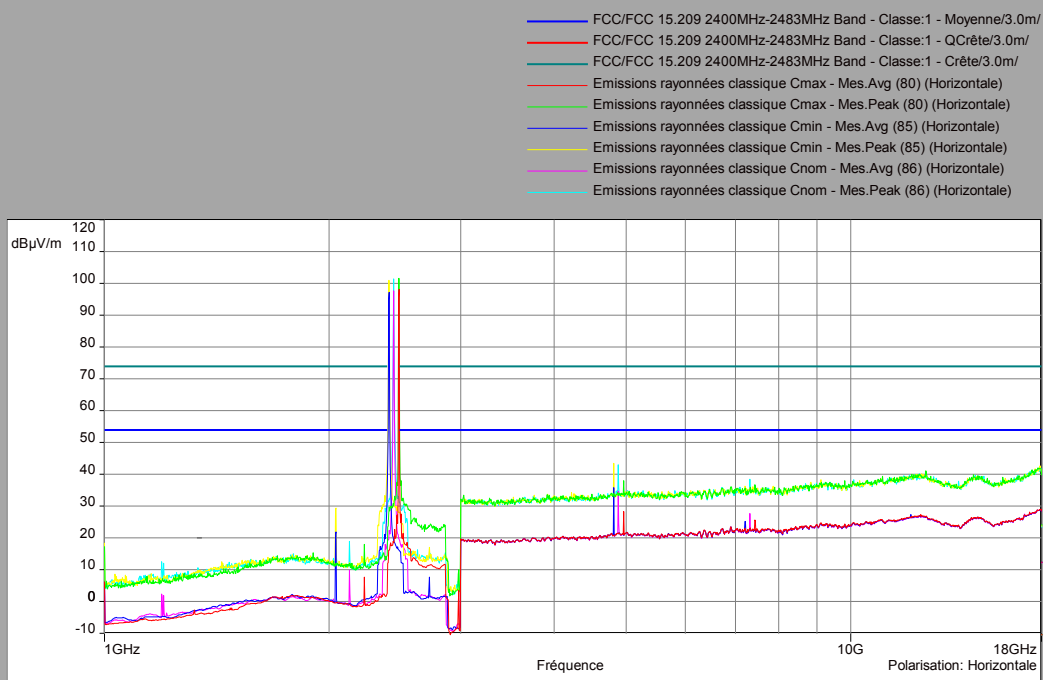
Above 1GHz

Cmin/Cnom/Cmax

Vertical Polarization



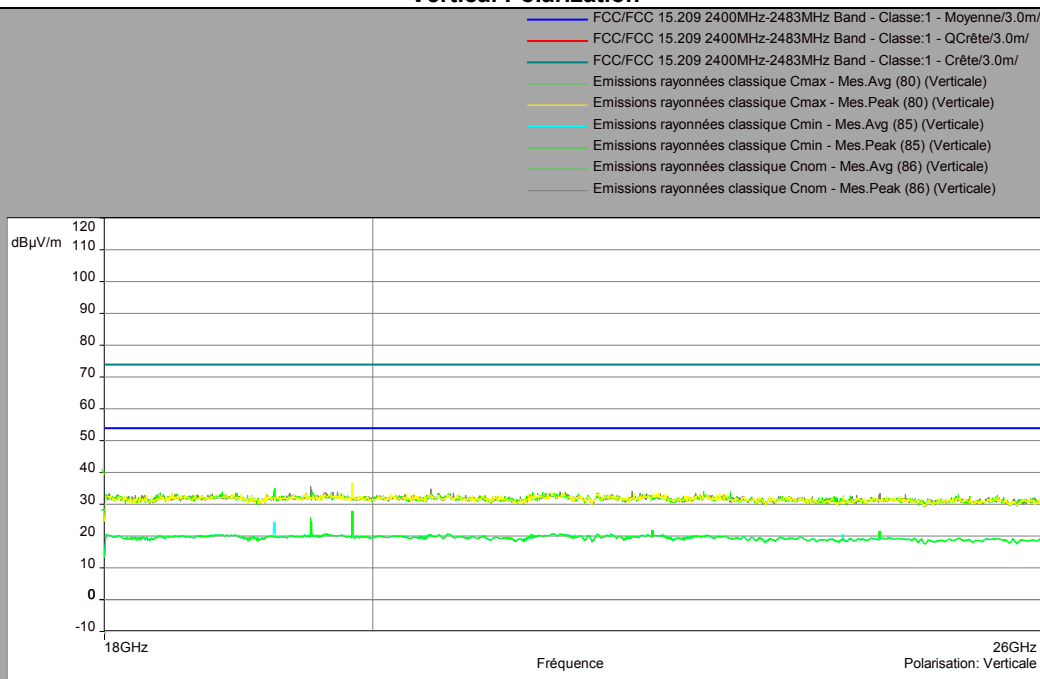
Horizontal polarization



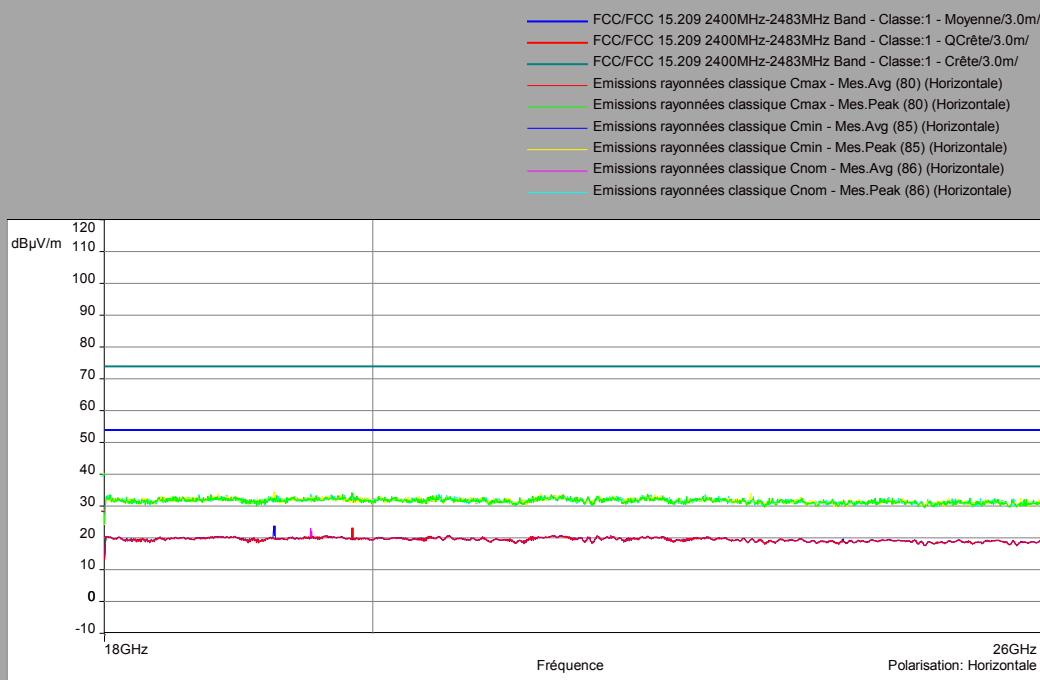
Above 1GHz

Cmin/Cnom/Cmax

Vertical Polarization



Horizontal polarization



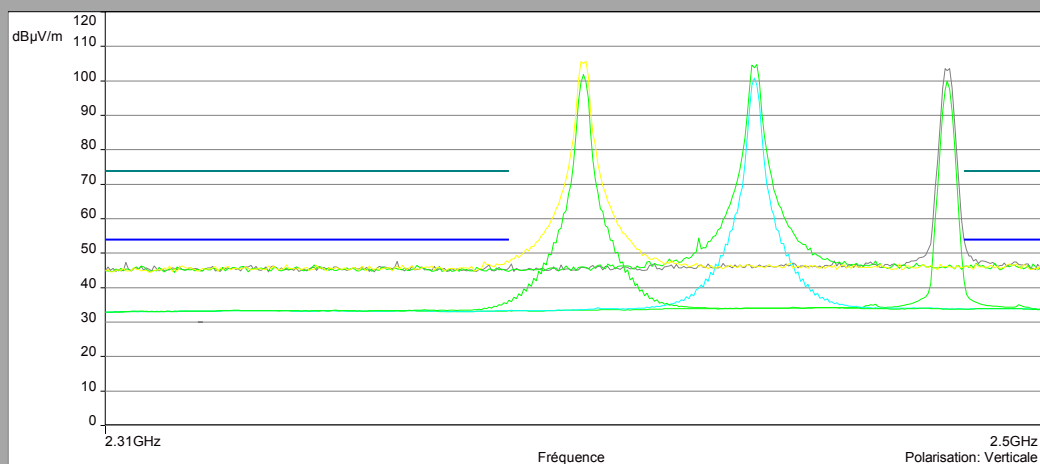
Above 1GHz Zoom 2310MHz-2500MHz

Cmin/Cnom/Cmax

Vertical Polarization

Description Sous-bande 2 : FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
 Fréquences: 2.31 GHz - 2.5 GHz (Mode: F) - Classe:1 - QCrête/3.0m/
 Réglages: RBW: 1 MHz, VBW: Auto, Durée de l'analyse: 500 ms, Niveau de référence: -150.729632, Nombre de Balayages: 1, Preamp: On: 20 dB, LN Preamp: Off, Preselecteur: Off
 Polarisation: Verticale
 Distance: 3 m

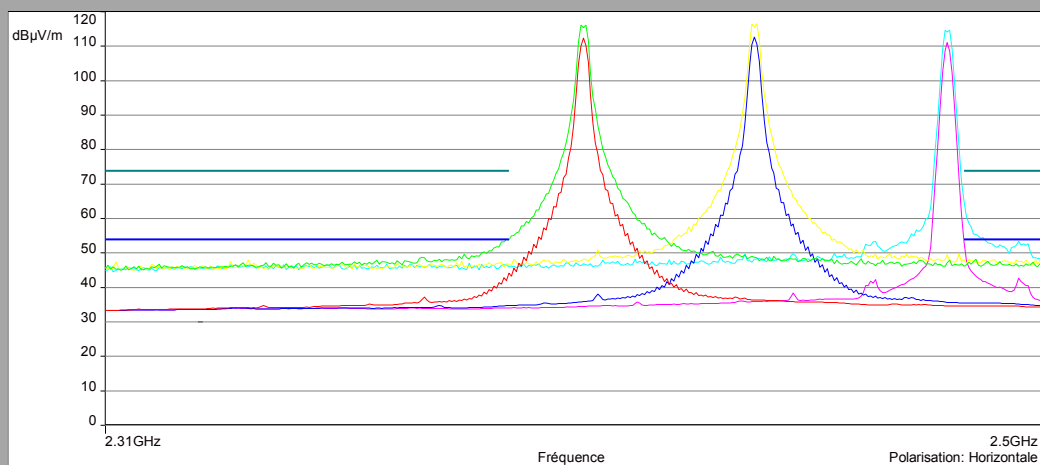
Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal min - REGULAR Target 0 - Mes.Avg (81) (Verticale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal min - REGULAR Target 0 - Mes.Peak (81) (Verticale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal nom - REGULAR Target 0 - Mes.Avg (82) (Verticale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal nom - REGULAR Target 0 - Mes.Peak (82) (Verticale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal max - PROP 2 Target -1 - Mes.Avg (83) (Verticale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal max - PROP 2 Target -1 - Mes.Peak (83) (Verticale)



Horizontal polarization

Description Sous-bande 1 : FCC/FCC 15.209 2400MHz-2483MHz Band - Classe:1 - Moyenne/3.0m/
 Fréquences: 2.31 GHz - 2.5 GHz (Mode: F) - Classe:1 - QCrête/3.0m/
 Réglages: RBW: 1 MHz, VBW: Auto, Durée de l'analyse: 500 ms, Niveau de référence: -150.729632, Nombre de Balayages: 1, Preamp: On: 20 dB, LN Preamp: Off, Preselecteur: Off
 Polarisation: Horizontale
 Distance: 3 m

Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal min - REGULAR Target 0 - Mes.Avg (81) (Horizontale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal min - REGULAR Target 0 - Mes.Peak (81) (Horizontale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal nom - REGULAR Target 0 - Mes.Avg (82) (Horizontale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal nom - REGULAR Target 0 - Mes.Peak (82) (Horizontale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal max - PROP 2 Target -1 - Mes.Avg (83) (Horizontale)
 Emissions rayonnées classique 2400MHz-2483.5MHz band edge Canal max - PROP 2 Target -1 - Mes.Peak (83) (Horizontale)



Below 1GHz					
Polarization	Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)	Margin (dBµV/m)
Horizontale	36	22,41		40	17,59
Verticale	36	35,15		40	4,85
Horizontale	48	23,31		40	16,69
Verticale	48	34,78		40	5,22
Horizontale	60	29,57		40	10,43
Verticale	60	-	39,14	40	0,86
Horizontale	72	22,88		40	17,12
Verticale	72	27,8		40	12,2
Verticale	91,1	27,54		43,5	15,96
Horizontale	108	23,63		43,5	19,87
Verticale	108	25,52		43,5	17,98
Horizontale	120	37,15		43,5	6,35
Verticale	120	35,37		43,5	8,13
Horizontale	168	27,3		43,5	16,2
Verticale	168	23,61		43,5	19,89
Horizontale	180	25,67		43,5	17,83
Verticale	184,6	27,48		43,5	16,02
Horizontale	192	24,98		43,5	18,52
Verticale	216,6	21,53		43,5	21,97
Horizontale	244,1	26,5		46	19,5
Verticale	244,1	25,81		46	20,19
Horizontale	360,02	25,48		46	20,52
Verticale	360,02	25,87		46	20,13
Verticale	391,88	24,88		46	21,12
Verticale	480,02	25,14		46	20,86
Horizontale	725,42	30,25		46	15,75
Horizontale	798,8	30,82		46	15,18
Horizontale	910,58	34,6		46	11,4
Horizontale	960,02	32,73		54	21,27
Verticale	960,02	33,24		54	20,76

Above 1GHz								
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	1,1935	2,376	2,376	54	51,624	12,52	74	61,48
Horizontale	2,043	21,83	21,83	54	32,17	29,35	74	44,65
Verticale	2,043	25,38	25,38	54	28,62	31,24	74	42,76
Horizontale	2,128	9,83	9,83	54	44,17	18,98	74	55,02
Verticale	2,128	13,47	13,47	54	40,53	24,11	74	49,89
Horizontale	2,2305	7,66	7,66	54	46,34	17,98	74	56,02
Horizontale	2390	44,08	44,08	54	9,92	53,81	74	20,19
Verticale	2390	36,35	36,35	54	17,65	47,37	74	26,63
Horizontale	2483,5	53,26	53,26	54	0,74	65,03	74	8,97
Verticale	2483,5	42,15	42,15	54	11,85	53,77	74	20,23
Horizontale	4809	35,79	35,79	54	18,21	43,39	74	30,61
Verticale	4809	34,15	34,15	54	19,85	42,24	74	31,76
Horizontale	4881	34,71	34,71	54	19,29	42,96	74	31,04
Verticale	4881	34,74	34,74	54	19,26	42,83	74	31,17
Horizontale	4959	28,33	28,33	54	25,67	37,9	74	36,1
Verticale	4959	29,24	29,24	54	24,76	39,34	74	34,66
Verticale	7213,5	40,42	40,42	54	13,58	48,16	74	25,84
Horizontale	7318,5	27,65	27,65	54	26,35	38,52	74	35,48
Verticale	7318,5	40,43	40,43	54	13,57	48,61	74	25,39
Horizontale	7438,5	25,67	25,67	54	28,33	36,73	74	37,27
Verticale	7438,5	36,07	36,07	54	17,93	45,01	74	28,99
Verticale	16831,5	30,25	30,25	54	23,75	40,78	74	33,22
Verticale	17076,5	30,3	30,3	54	23,7	41,6	74	32,4
Horizontale	19236	23,8	23,8	54	30,2	34,55	74	39,45
Verticale	19244	24,31	24,31	54	29,69	35,05	74	38,95
Verticale	19516	25,77	25,77	54	28,23	35,65	74	38,35
Horizontale	19836	23,11	23,11	54	30,89	34,27	74	39,73
Verticale	19836	27,89	27,89	54	26,11	36,8	74	37,2

11.2. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **NXP JN5189T-001-M16**, 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) $\pm x(\text{dB}) / (\text{Hz}) / \text{ms}$	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