



TEST REPORT

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Composition of document

RADIO

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70 pages

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6230B

Standards

47 CFR Part 15.247
RSS-247, Issue 1
RSS-Gen, Issue 4

Issued to

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2 Esplanade Anton Philips
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Apparatus under test

Trade mark
Manufacturer
Type
Serial number
IC
FCC ID

JN5179-001-M06
NXP
NXP Semiconductors
JN5179-001-M06
No serial number
8764A-JN5179M6
XXMJN5179M6

Test date

2016/02/04 to 2016/02/11

Tests performed by

Armand MAHOUNGOU

Test site

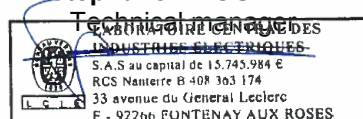
Fontenay aux Roses/ Ecuelles

Date of issue

2016/04/18

Written by :
Armand MAHOUNGOU
Tests operator

Approved by :
Stéphane PHOUDIAH



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1. TEST PROGRAM

• References

Standards:

- 47 CFR Part 15C
- RSS-247
- RSS-Gen
- CISPR 16-4-2
- ANSI C63.10 (2013)
- DTS measurement guidance 558074 D01 v03r04

Standard Section	Test Description	TEST RESULT - Comments
RSS-Gen § 6.6	Occupied Bandwidth	PASS
CFR 47 § 15.247 (a) (2) RSS-247 § 5.2 (1)	-6dB Bandwidth	PASS
CFR 47 § 15.247 (b) RSS-247 § 5.4 (4)	Maximum Output Power	PASS
CFR 47 § 15.247 (e) RSS-247 § 5.2 (2)	Power Spectral Density	PASS
CFR 47 § 15.247 (d) RSS-247 § 5.5	Conducted Spurious Emission at the Band Edge	PASS
CFR 47 § 15.247 (d) RSS-247 § 5.5	Unwanted Emissions into Non-Restricted Frequency Bands	PASS
CFR 47 § 15.207 RSS-Gen § 8.8	AC Power Line Conducted Emissions	PASS
CFR 47 § 15.209 (a) CFR 47 § 15.205 (a) CFR 47 § 15.247 (d) RSS-Gen § 8.10	Unwanted Emissions into Restricted Frequency Bands	PASS
RSS-Gen § 7.1	Receiver Radiated emissions	PASS (Include in Unwanted Emissions 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. GENERAL DESCRIPTION

"The JN5179-001-M06 module provides designers with a ready-made component that provides a fully integrated solution for applications, using the IEEE802.15.4 standard in the 2.4 GHz - 2.5 GHz ISM frequency band, including ZigBee Smart Energy, Light Link and Home Automation and can be quickly and easily included in product designs. The module integrates all of the RF components required, removing the need to perform expensive RF design and test. Products can be designed by simply connecting sensors and switches to the module IO pins. The module uses NXP's single chip IEEE802.15.4 wireless microcontroller, allowing designers to make use of the extensive chip development support material.

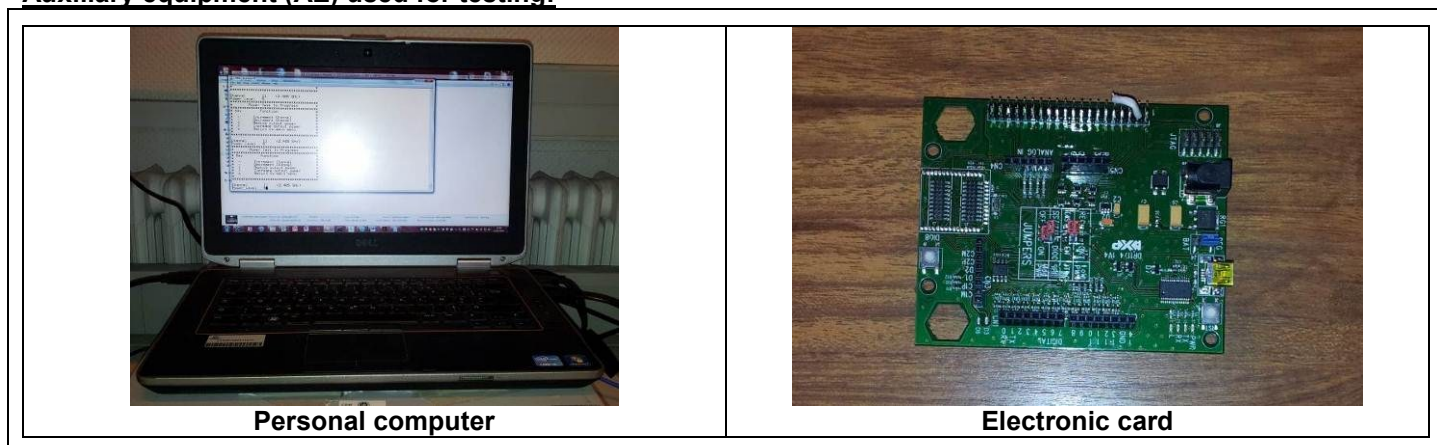
2.2. HARDWARE & SOFTWARE IDENTIFICATION

- Equipment under test (EUT):**



Photograph of EUT

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



Photograph of AE

- Input/output:**

- Usb
- Input Power

- Software identification:**

- Software version:CMET version 5



• **Equipment information:**

- Modulation technology: DSSS modulation
- Transmit operating mode: ☒ Single antenna: The EUT transmit on one antenna among the two antennas available. The EUT can't transmit on the two antenna simultaneously
- Number of transmit chains: ☒ 1
- Number of receiver chains: ☒ 1
- Antenna type: ☐ Integral ☒ External
- Beamforming gain: ☐ Yes (dB) ☒ No
- Type of the equipment: ☐ Stand-alone equipment ☒ Plug-in radio device ☐ Combined equipment
- Temperature range: Tmin: ☐ -20°C ☐ 0°C ☒ -40°C
Tnom: ☒ 20°C
Tmax: ☐ +35°C ☐ 55°C ☒ +85°C
- Test source voltage : Vnom: ☐ 120V/60Hz ☒ 3.3 Vdc
Note: the mother board is connected to the PC with USB. A LDO on the mother board generates the 3.3V voltage from the USB 5V supply.
- Type of power source: ☐ Battery (Alkaline/Lithium-Ion/Lead acid/Other) ☐ Internal power supply
☒ External power supply ☐ Car Charger
- Test sequence/test software used: See 2.2. Running Mode
- Ad-hoc mode: ☐ Yes ☒ No
- Duty Cycle: ☐ Continuous duty ☐ Intermittent duty ☒ Continuous operation
- Equipment type: ☐ Representative production model ☒ Pre-production model

- Antenna Gain:

Antenna A	Antenna B
Gain (dBi)	Gain (dBi)
2	2

- Operating frequency range:

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



-Channel plan:

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

-Data Rate:

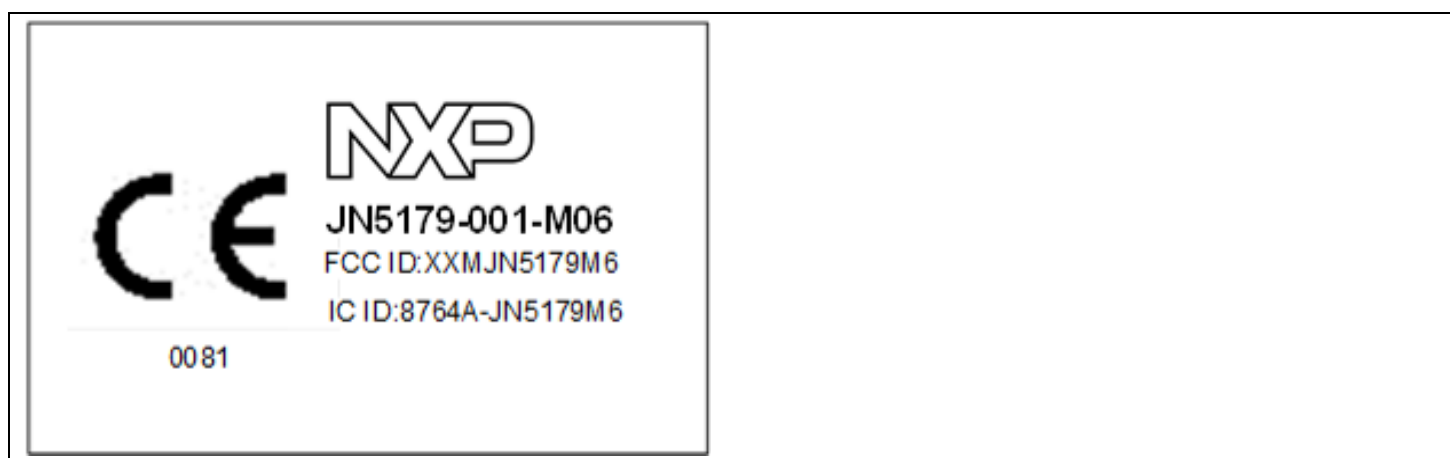
Data Rate (Mbps)	Modulation Type	Worst Case Modulation
0,25	O-QPSK	☐



2.3. RUNNING MODE

- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception
- The following procedure is used to set the equipment:
- TERATERM : User guide Rev. 01.00 – 2/5/2016

2.4. EQUIPEMENT LABELLING



2.5. EQUIPMENT MODIFICATIONS

No equipment modification has been necessary during testing.



3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

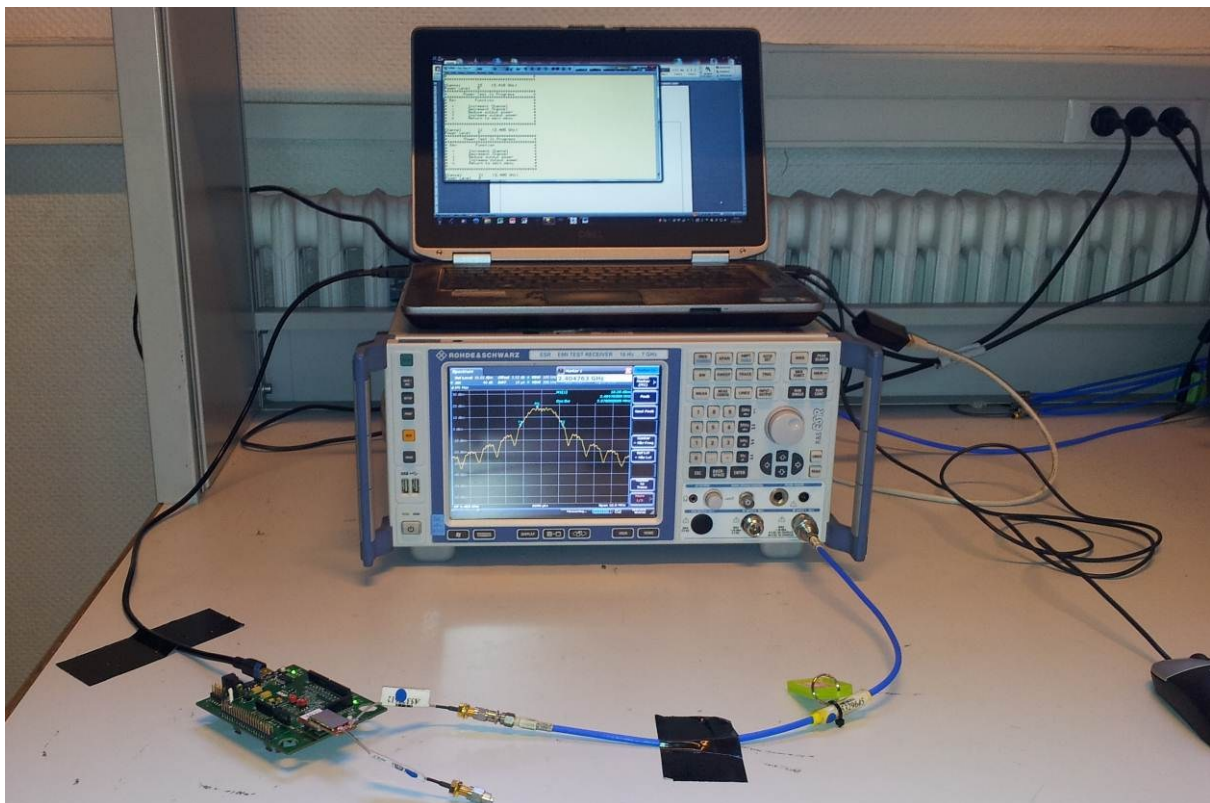
Test performed by : Armand MAHOUNGOU
Date of test : 2016/02/10
Ambient temperature : 22°C
Relative humidity : 48%

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 § 6.6 reference method.

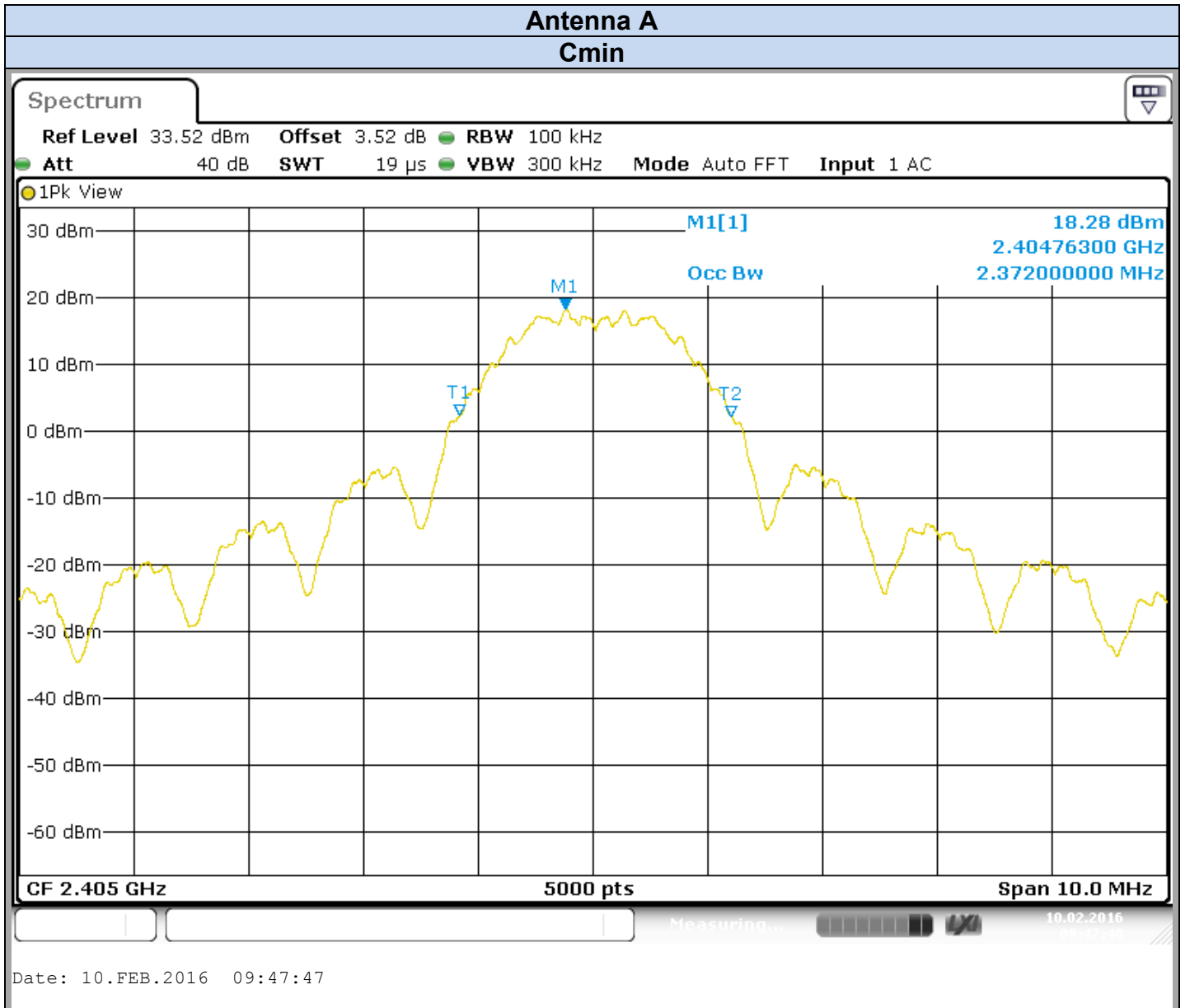
Spectrum Analyzer Setting:

Center frequency= Cmin or Cnom or Cmax
Span= Above the emission spectrum
Amplitude= Sufficient to observe the signal amplitude
RBW= 1% to 5% of the occupied bandwidth (OBW)
VBW $\geq$ 3*RBW
Sweep= Auto
Trace= Max Hold
Detector= Peak
Occupied Bandwidth 99% activated

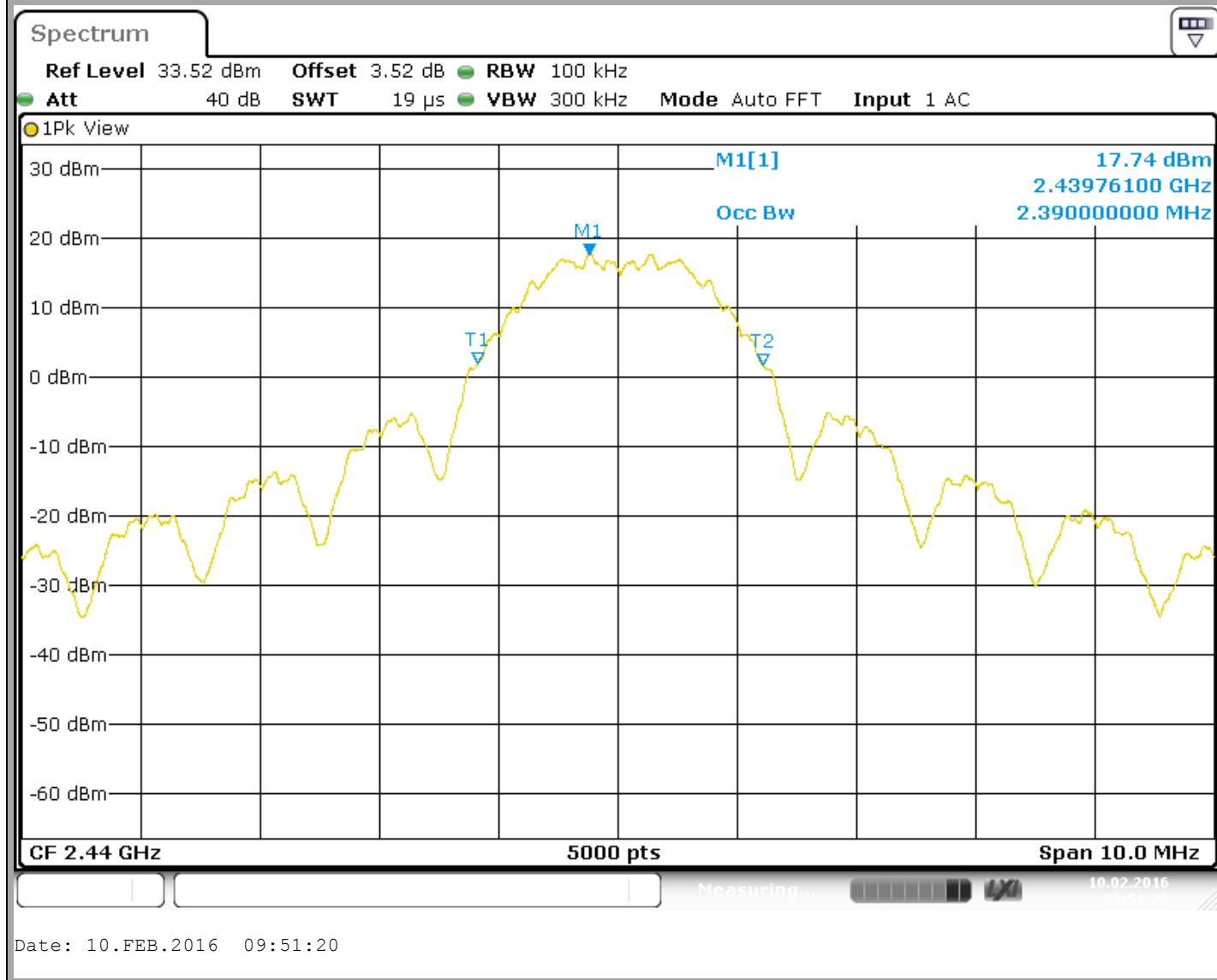


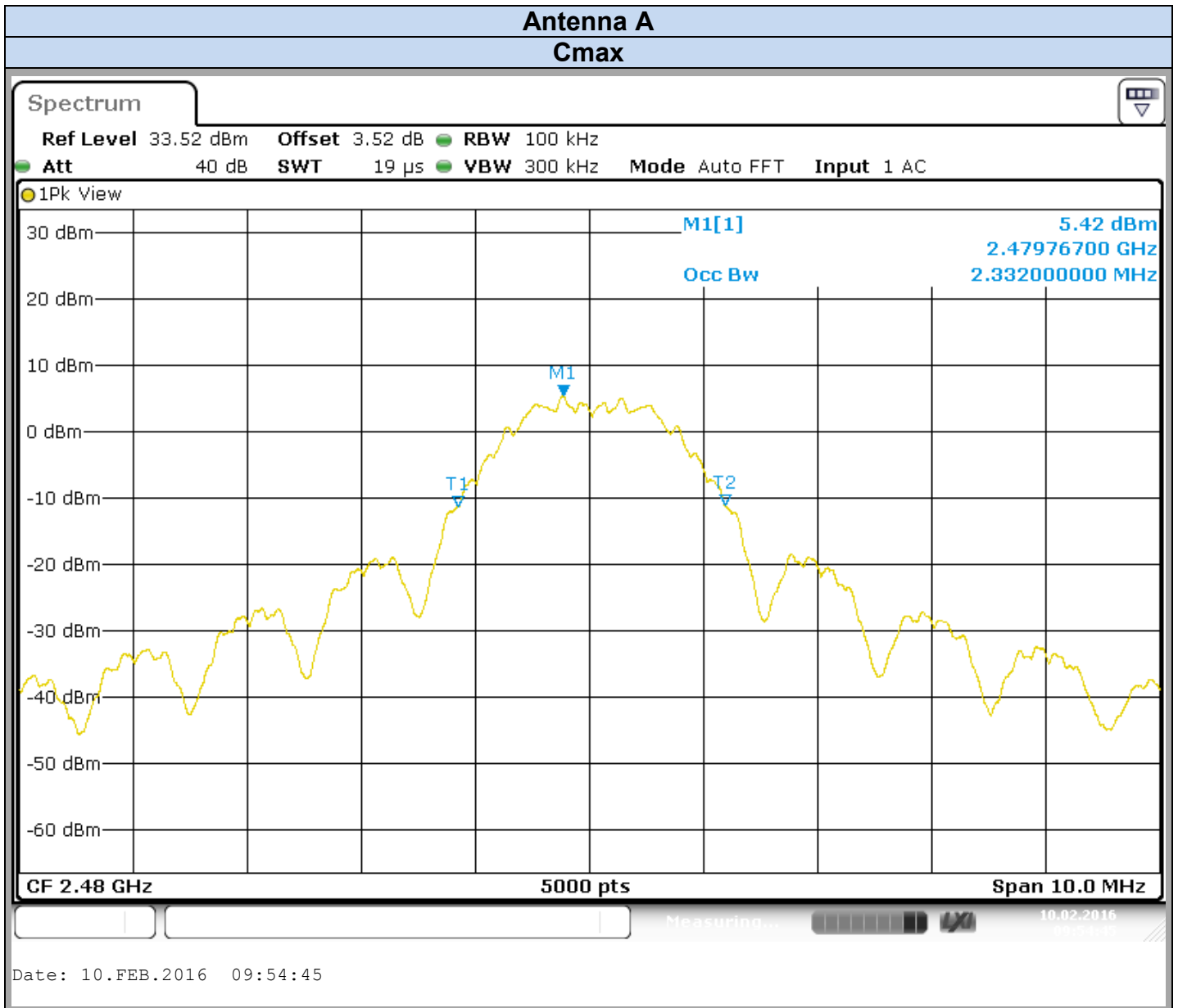
Photograph for Occupied Bandwidth

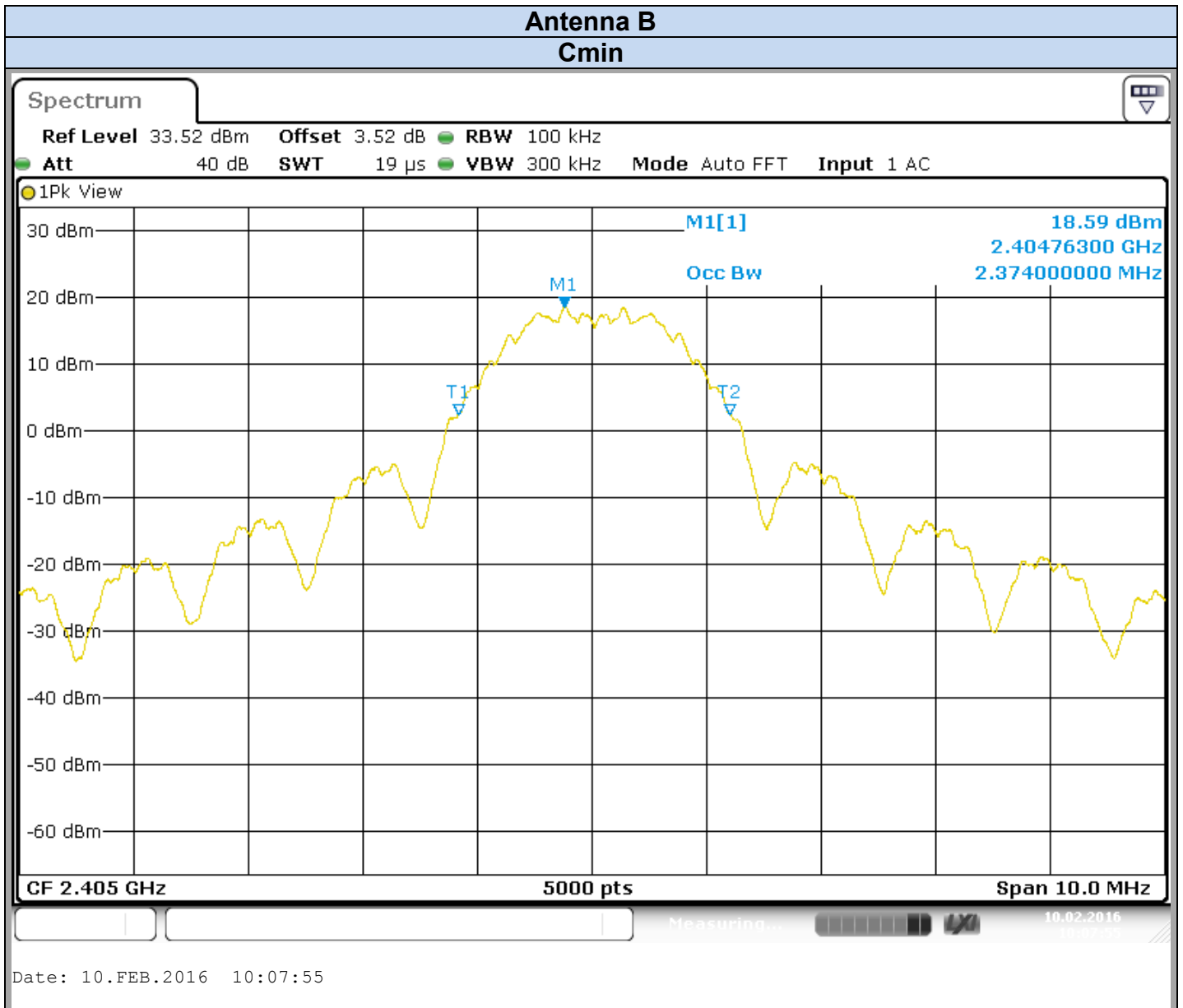
3.3. GRAPHICS & RESULTS



Antenna A Cnom

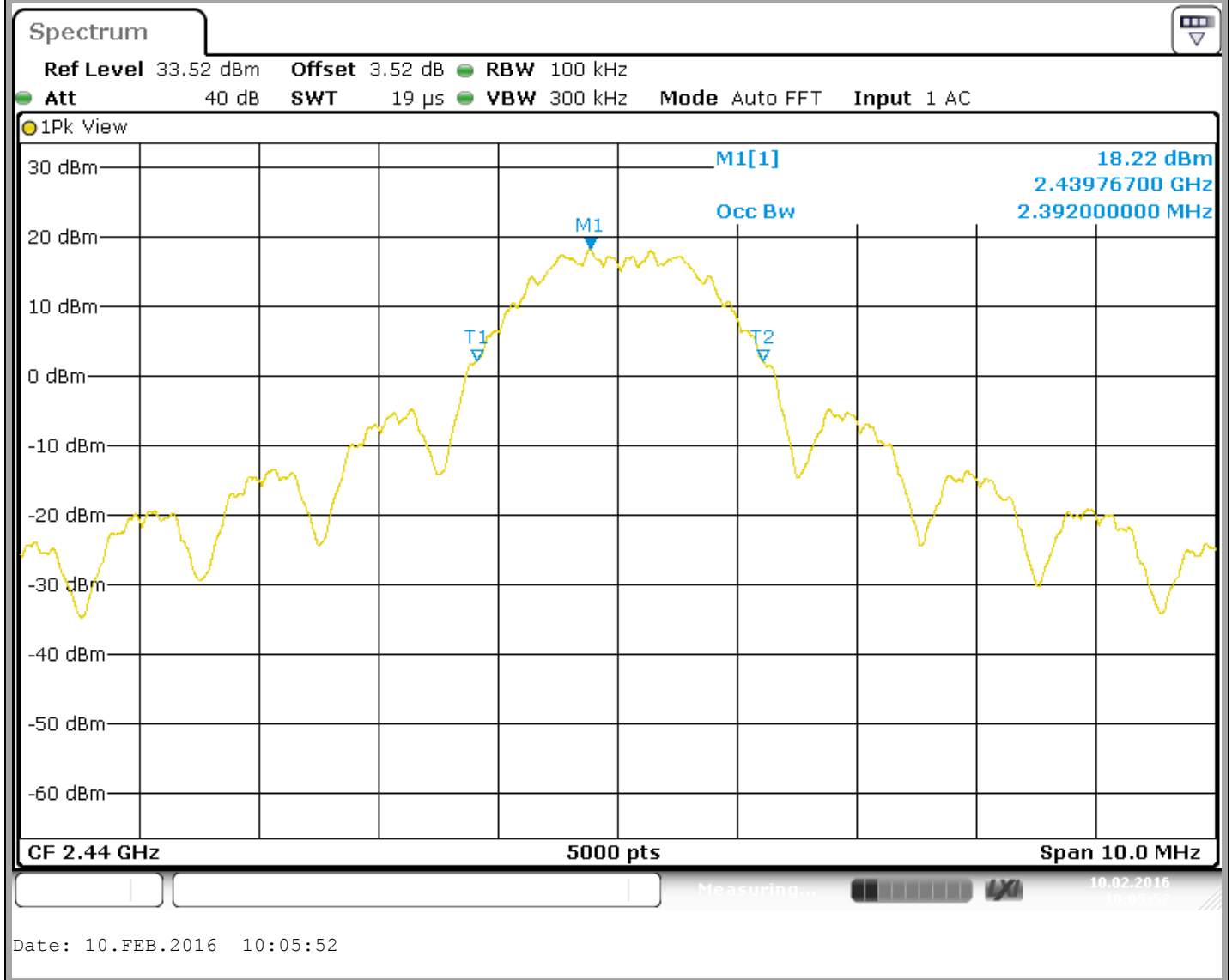


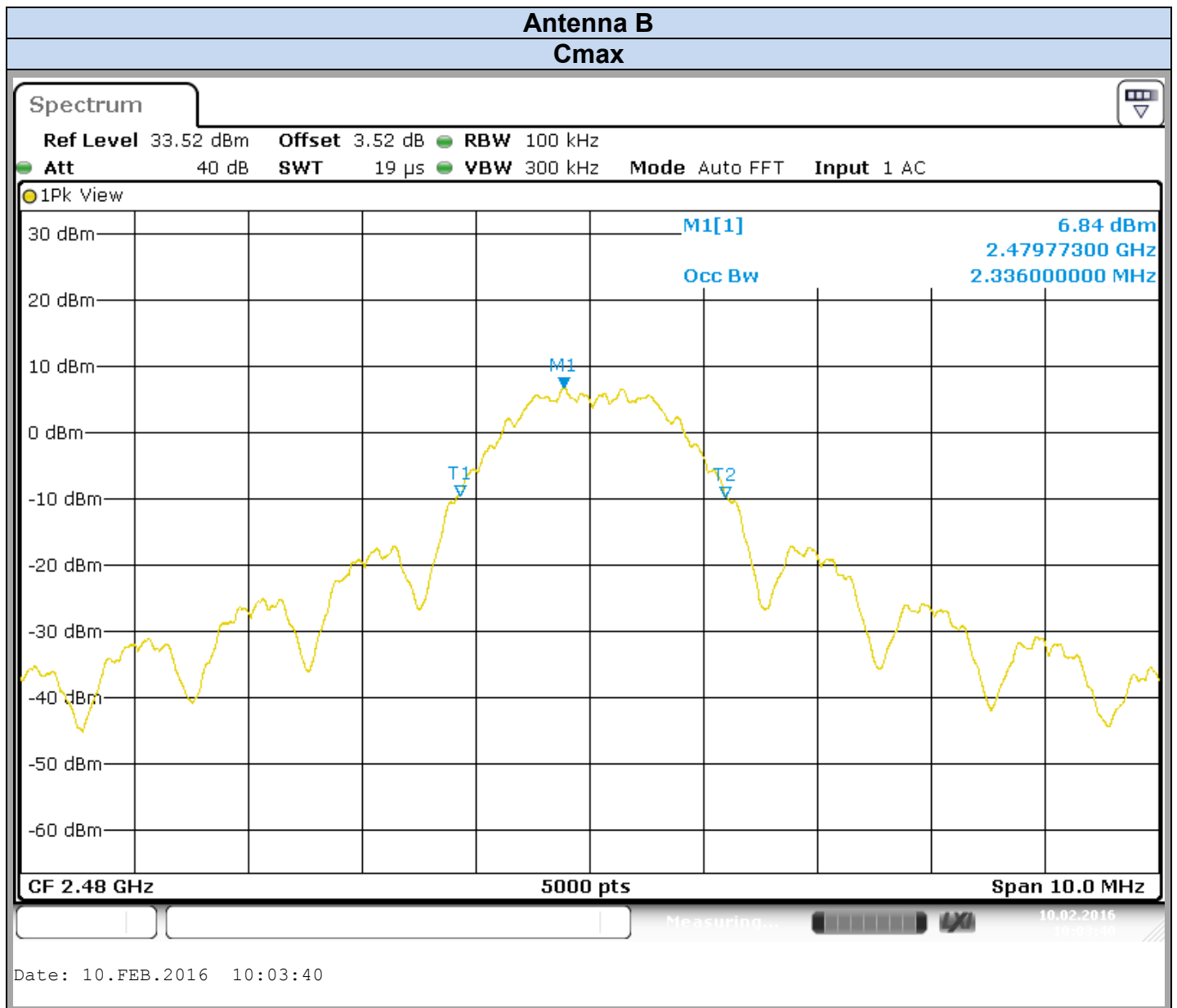






Antenna B Cnom





Antenna A			
Temperature	Tnom		
Voltage	Vnom		
Frequency	Cmin	Cnom	Cmax
Occupied Bandwidth (MHz)	2.372	2.390	2.334



Antenna B			
Temperature	Tnom		
Voltage	Vnom		
Frequency	Cmin	Cnom	Cmax
Occupied Bandwidth (MHz)	2.372	2.392	2.336

Result: **PASS**

Limit: → None



4. -6dB BANDWIDTH

4.1. TEST CONDITIONS

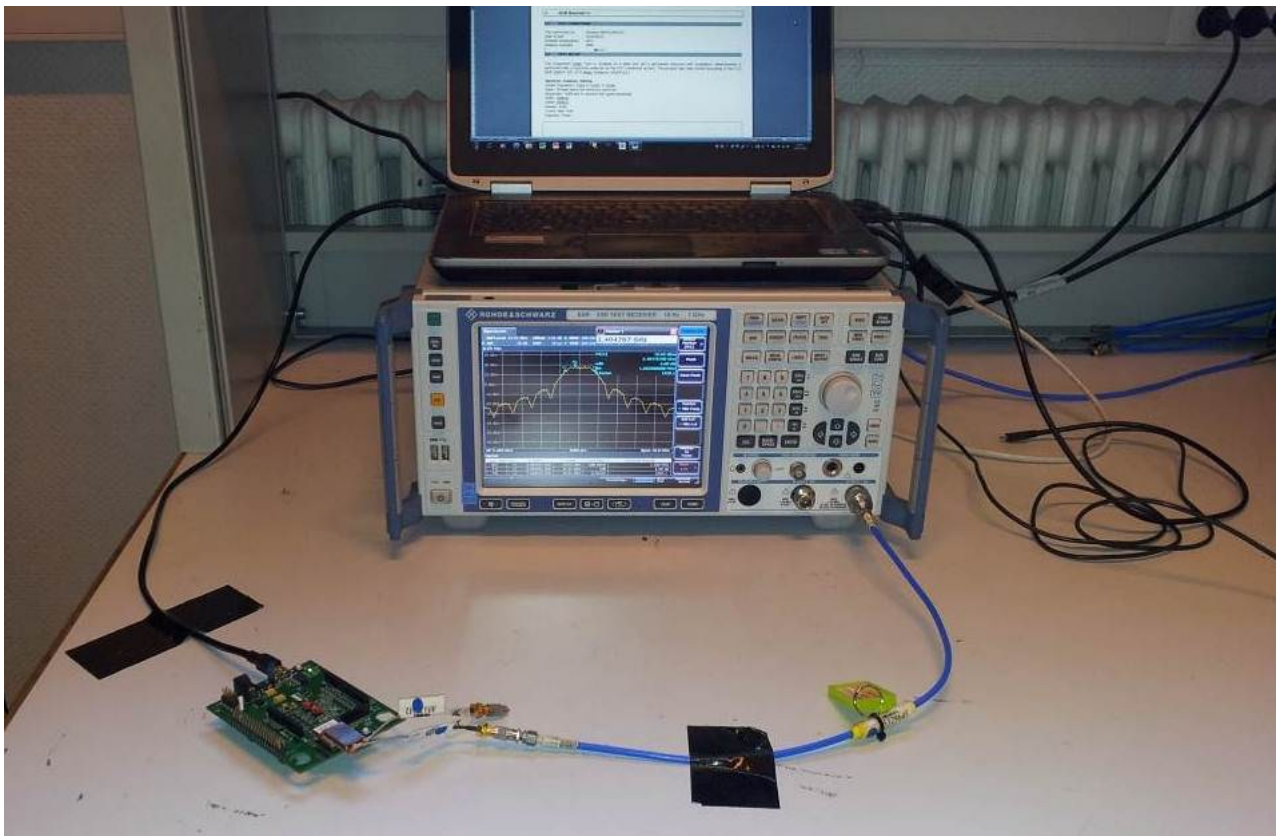
Test performed by : Armand MAHOUNGOU
Date of test : 2016/02/10
Ambient temperature : 22°C
Relative humidity : 48%

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 v03r04 § 8.1.

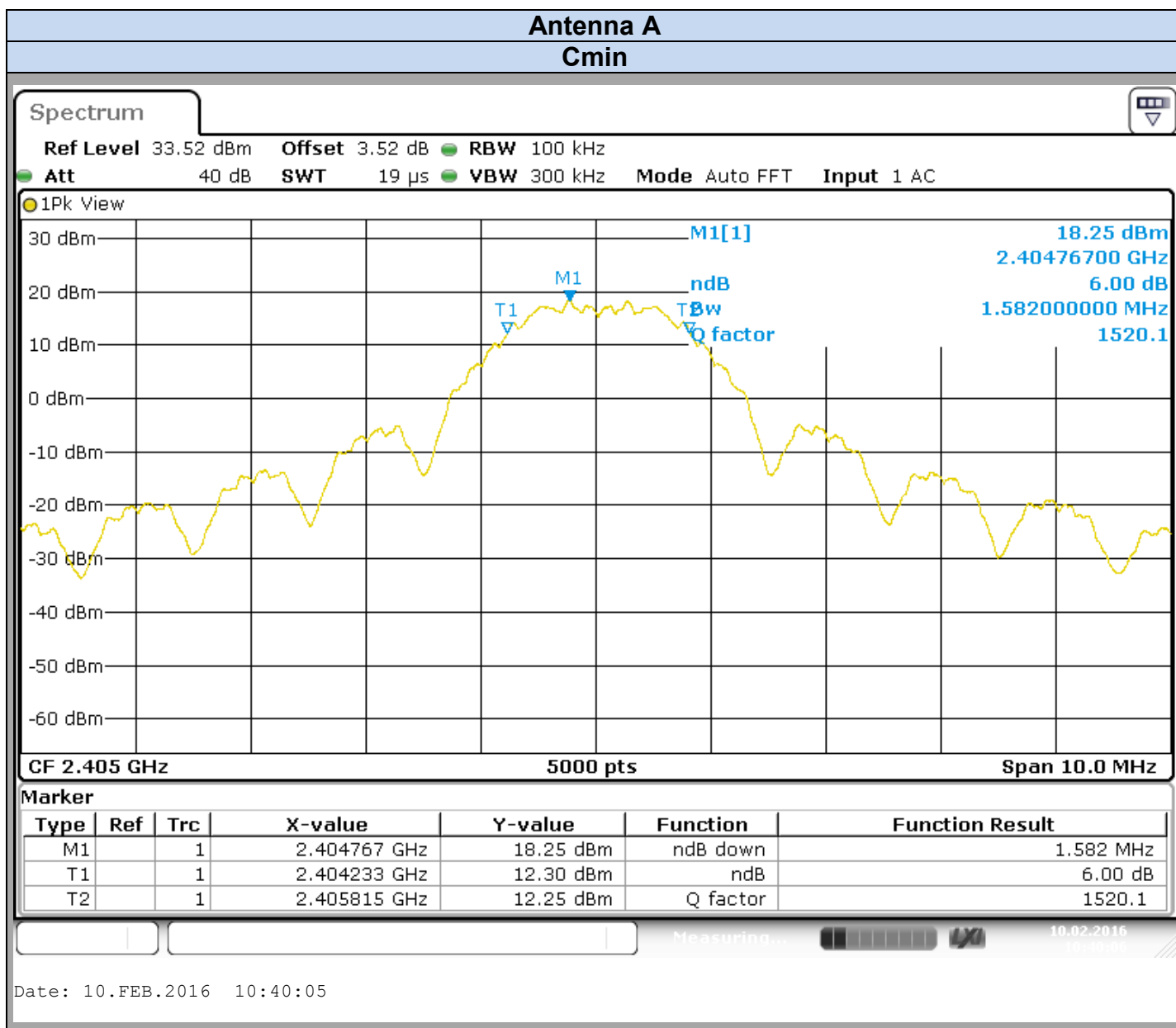
Spectrum Analyzer Setting:

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

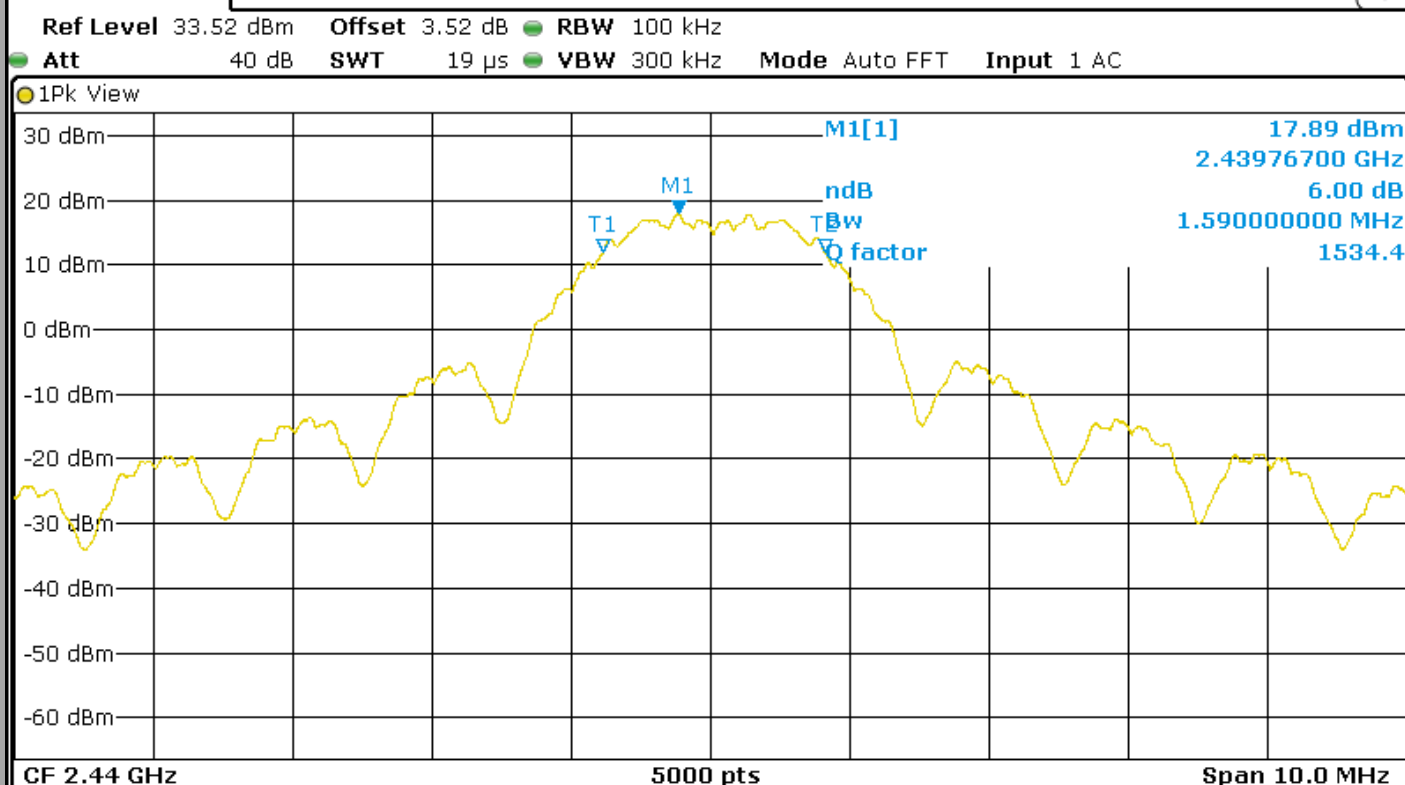
4.3. GRAPHICS & RESULTS



Antenna A

Cnom

Spectrum



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.439767 GHz	17.89 dBm	ndB down	1.59 MHz
T1		1	2.439227 GHz	11.94 dBm	ndB	6.00 dB
T2		1	2.440817 GHz	11.89 dBm	Q factor	1534.4

Measuring...

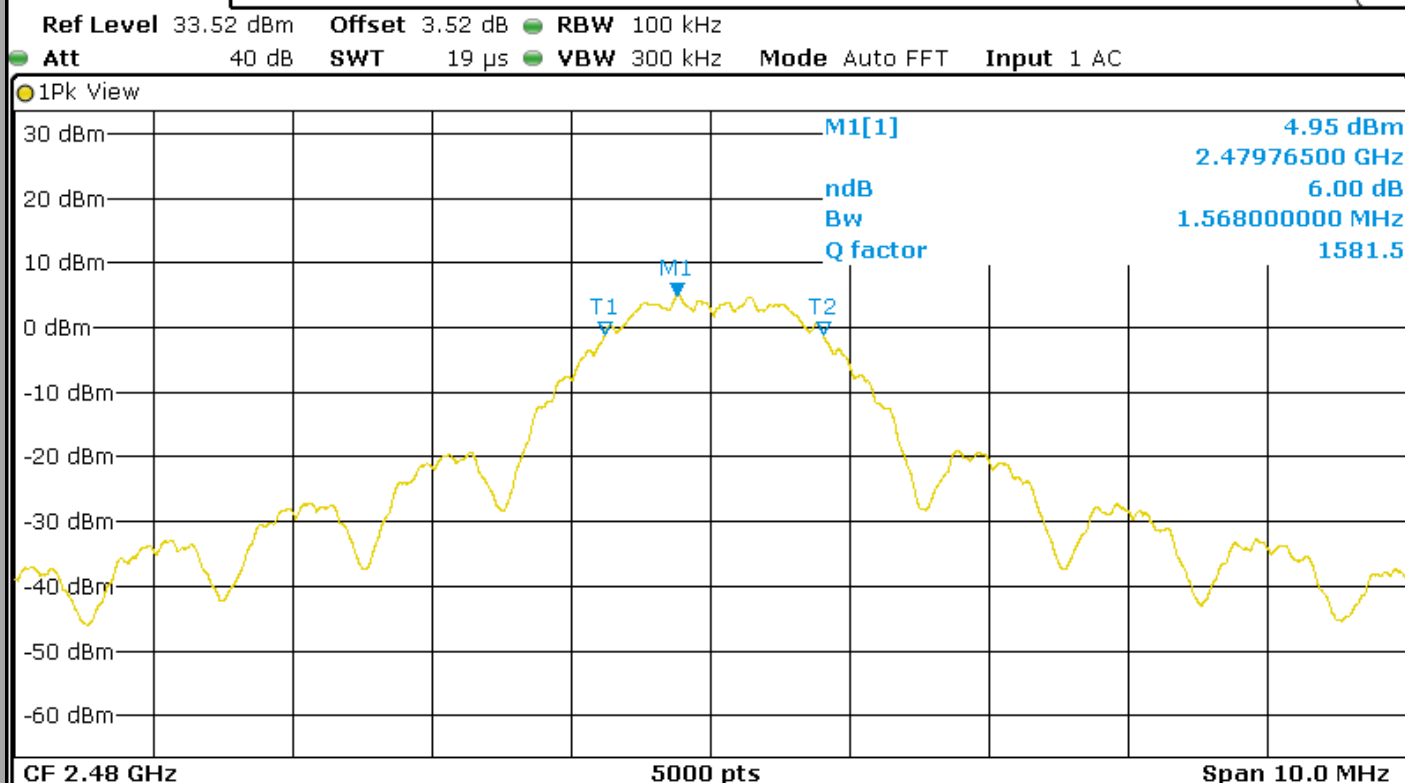
 10.02.2016
 10:46:19

Date: 10.FEB.2016 10:46:19

Antenna A

Cmax

Spectrum



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.479765 GHz	4.95 dBm	ndB down	1.568 MHz
T1		1	2.479239 GHz	-1.02 dBm	ndB	6.00 dB
T2		1	2.480807 GHz	-1.09 dBm	Q factor	1581.5

Measuring...

10.02.2016
10:29:55

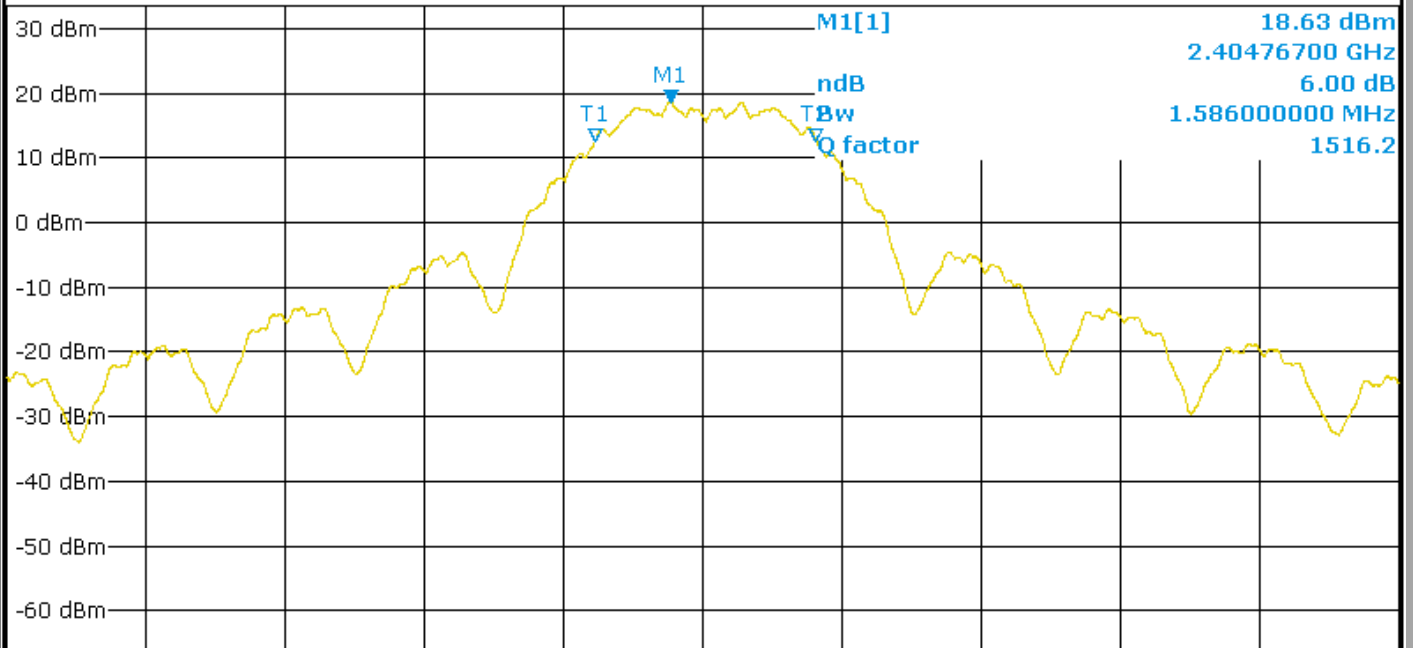
Date: 10.FEB.2016 10:29:55

Antenna B Cmin

Spectrum

Ref Level 33.52 dBm **Offset** 3.52 dB **RBW** 100 kHz
Att 40 dB **SWT** 19 μ s **VBW** 300 kHz **Mode** Auto FFT **Input** 1 AC

1Pk View



CF 2.405 GHz

5000 pts

Span 10.0 MHz

Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.404767 GHz	18.63 dBm	ndB down	1.586 MHz
T1		1	2.404229 GHz	12.66 dBm	ndB	6.00 dB
T2		1	2.405815 GHz	12.65 dBm	Q factor	1516.2

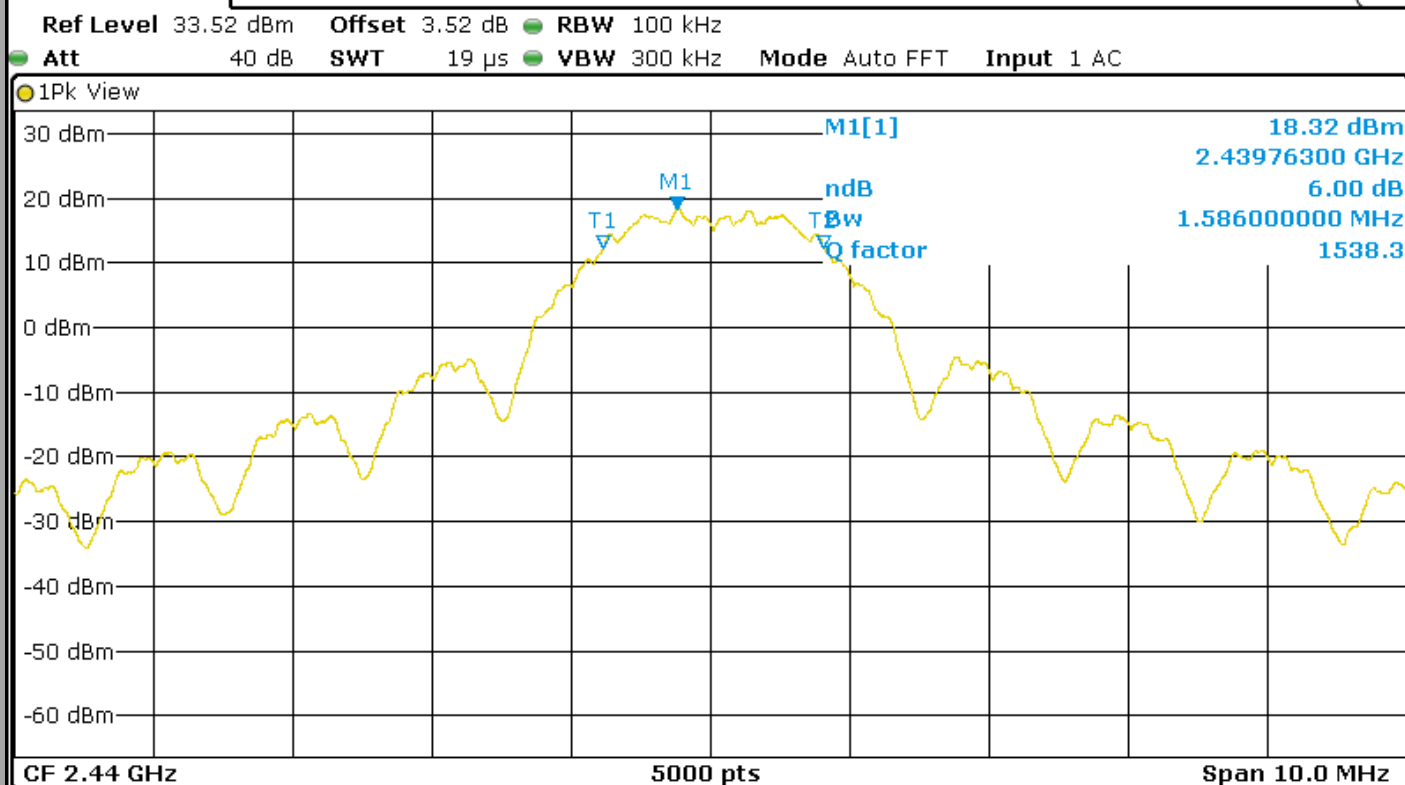
Measuring...

10.02.2016
10:16:00

Date: 10.FEB.2016 10:16:00

Antenna B Cnom

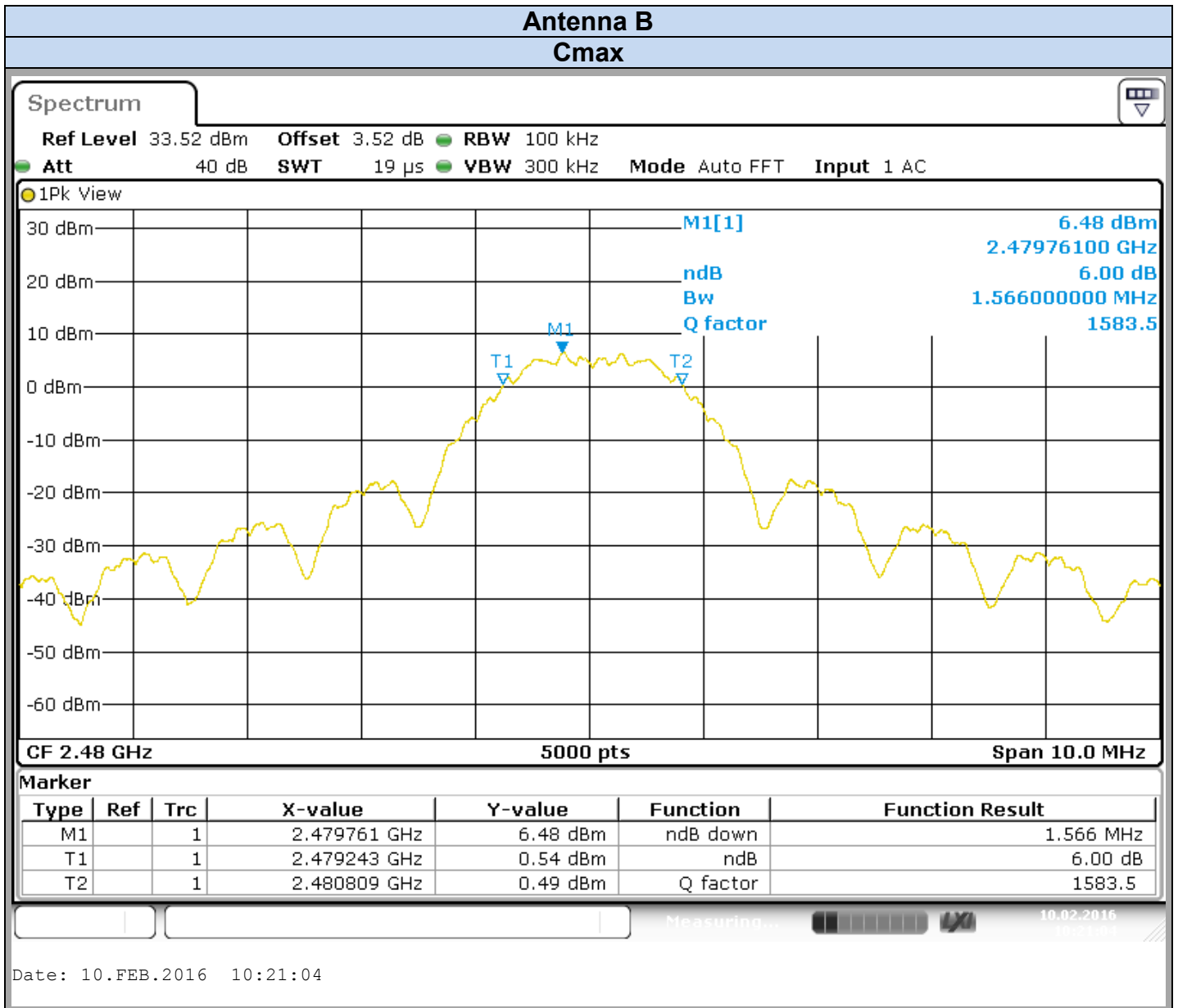
Spectrum



Measuring...

10.02.2016
10:18:05

Date: 10.FEB.2016 10:18:05



Antenna A			
Temperature	Tnom		
Voltage	Vnom		
Frequency	Cmin	Cnom	Cmax
-6dB Bandwidth (MHz)	1.582	1.590	1.568



Antenna B			
Temperature	Tnom		
Voltage	Vnom		
Frequency	Cmin	Cnom	Cmax
-6dB Bandwidth (MHz)	1.586	1.586	1.566

Result: **PASS**

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



5. MAXIMUM CONDUCTED POWER

5.1. TEST CONDITIONS

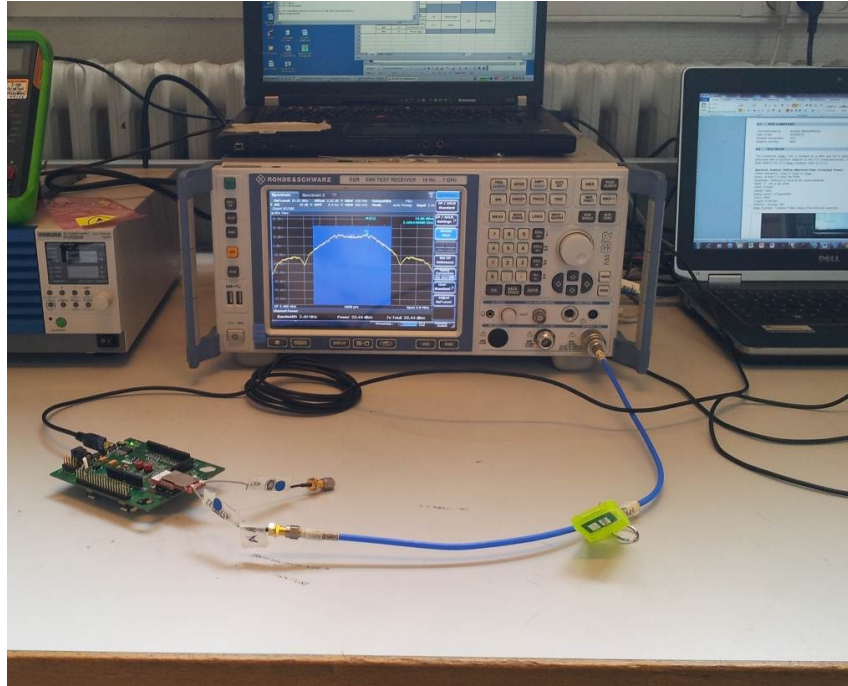
Test performed by : Armand MAHOUNGOU
Date of test : 2016/03/11
Ambient temperature : 22°C
Relative humidity : 48%

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 v03r4 § 9.2.2.2

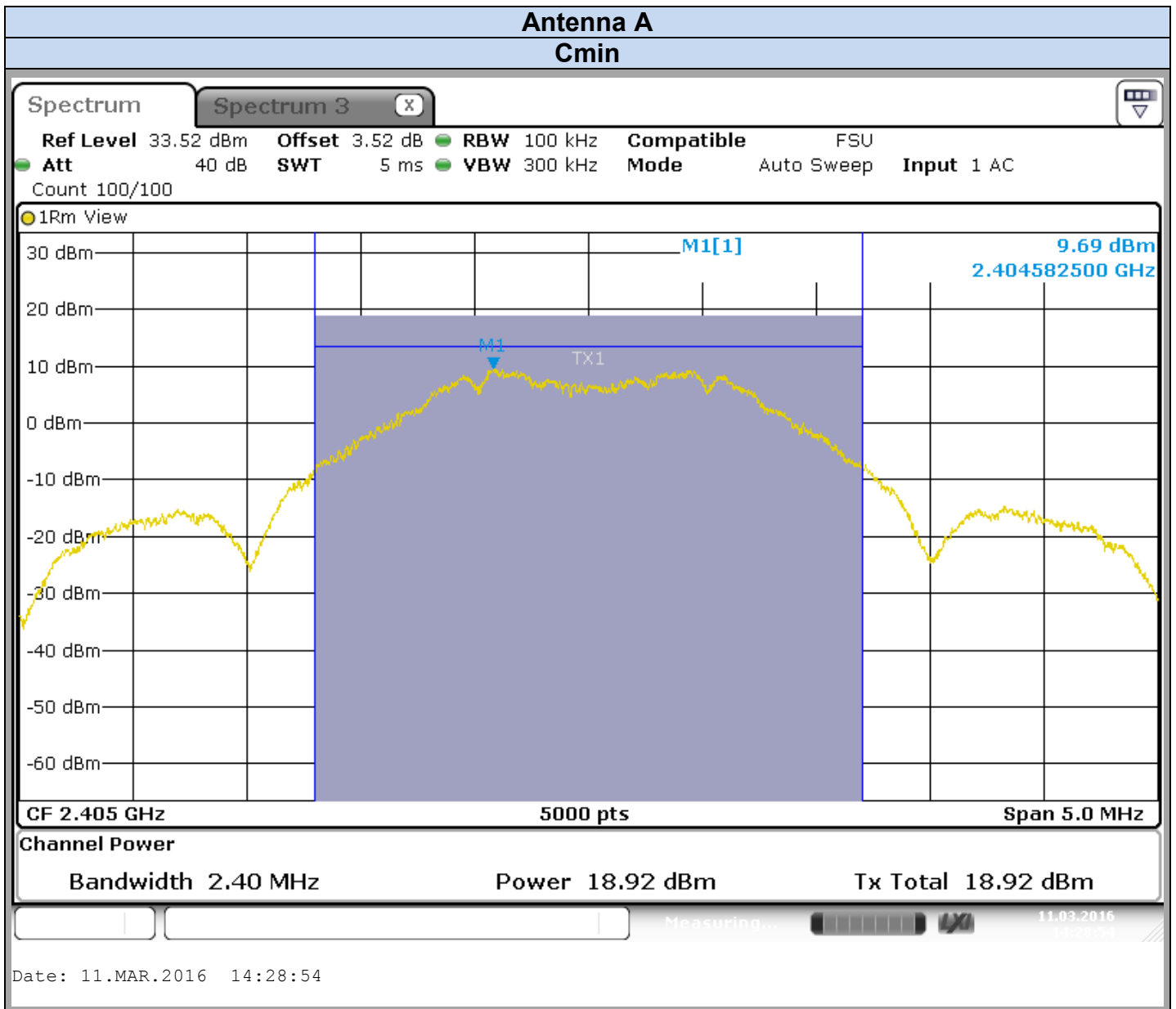
Spectrum Analyzer Setting (Maximum Peak Conducted Power):

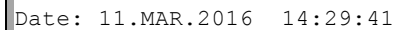
Center frequency= Cmin or Cnom or Cmax
Span≥ At least 1.5 times the OBW
Amplitude= Sufficient to observe the signal amplitude
RBW= 1% to 5% of the OBW
VBW≥ 3*RBW
Sweep= Auto
Sweep points= 2*Span/RBW
Trace= RMS
Trigger= Free Run
Detector= Average 100
Meas Fonction= Channel Power inside of the emission spectrum

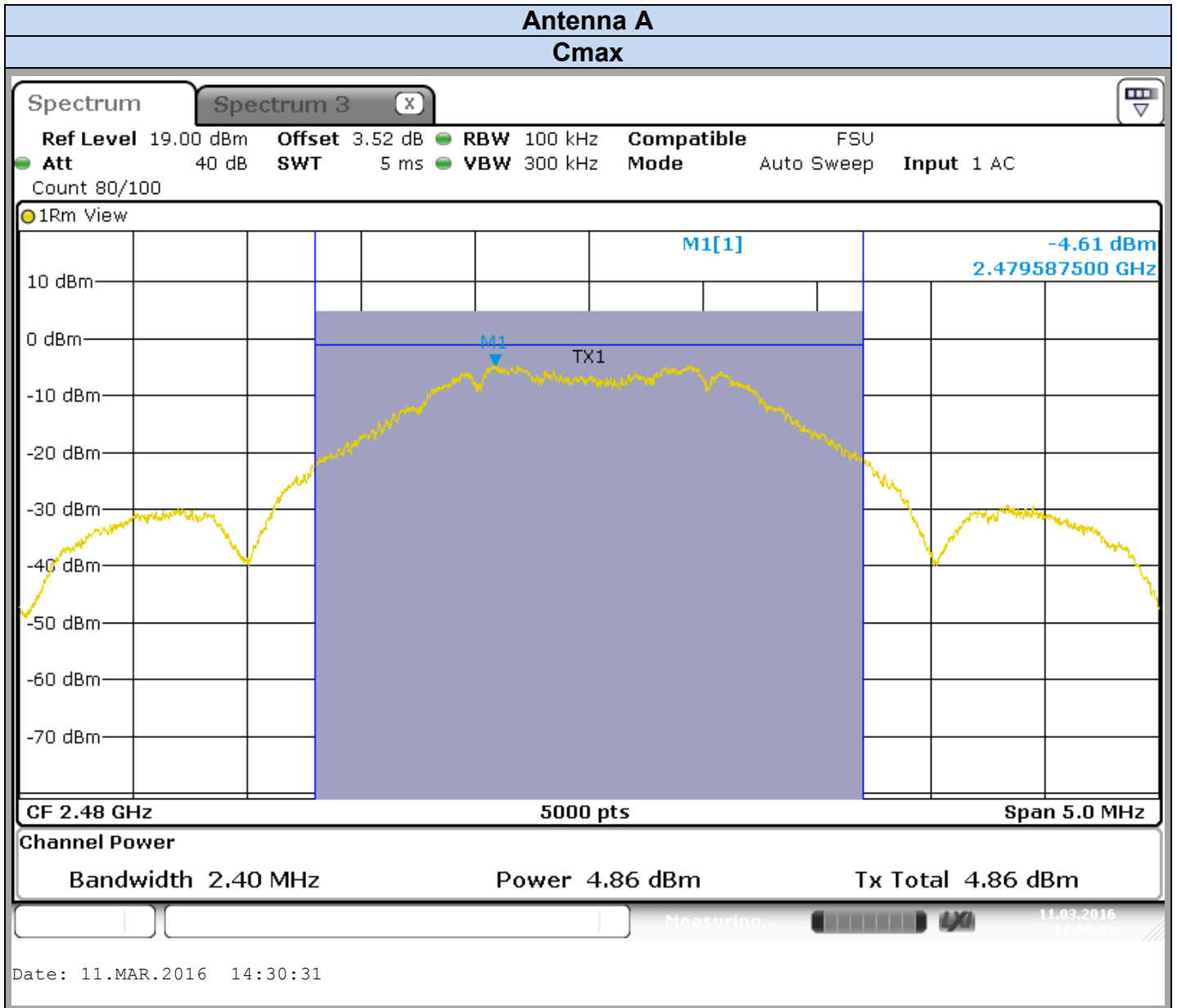


Photograph for Maximum Conducted Power

5.3. GRAPHICS & RESULTS

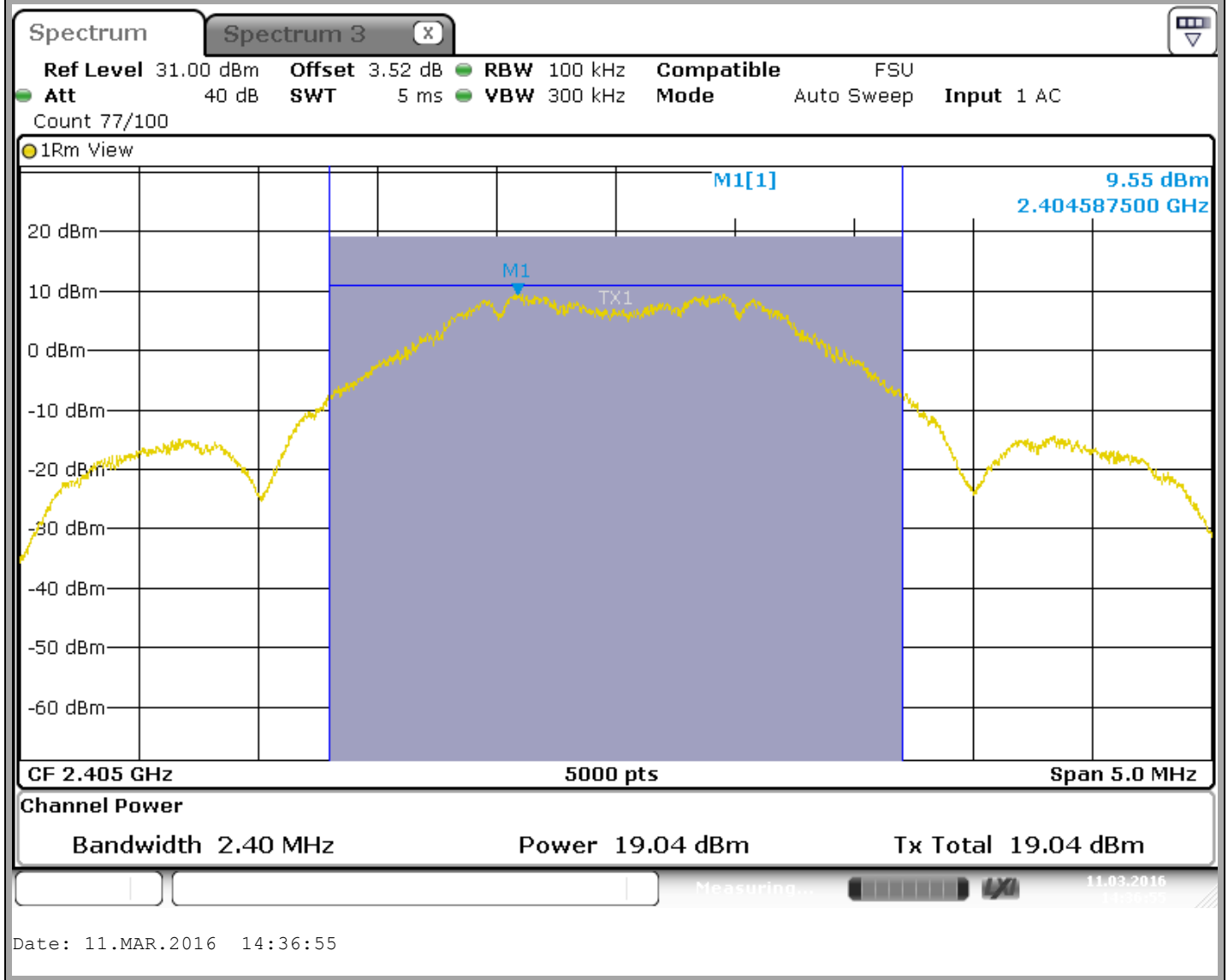


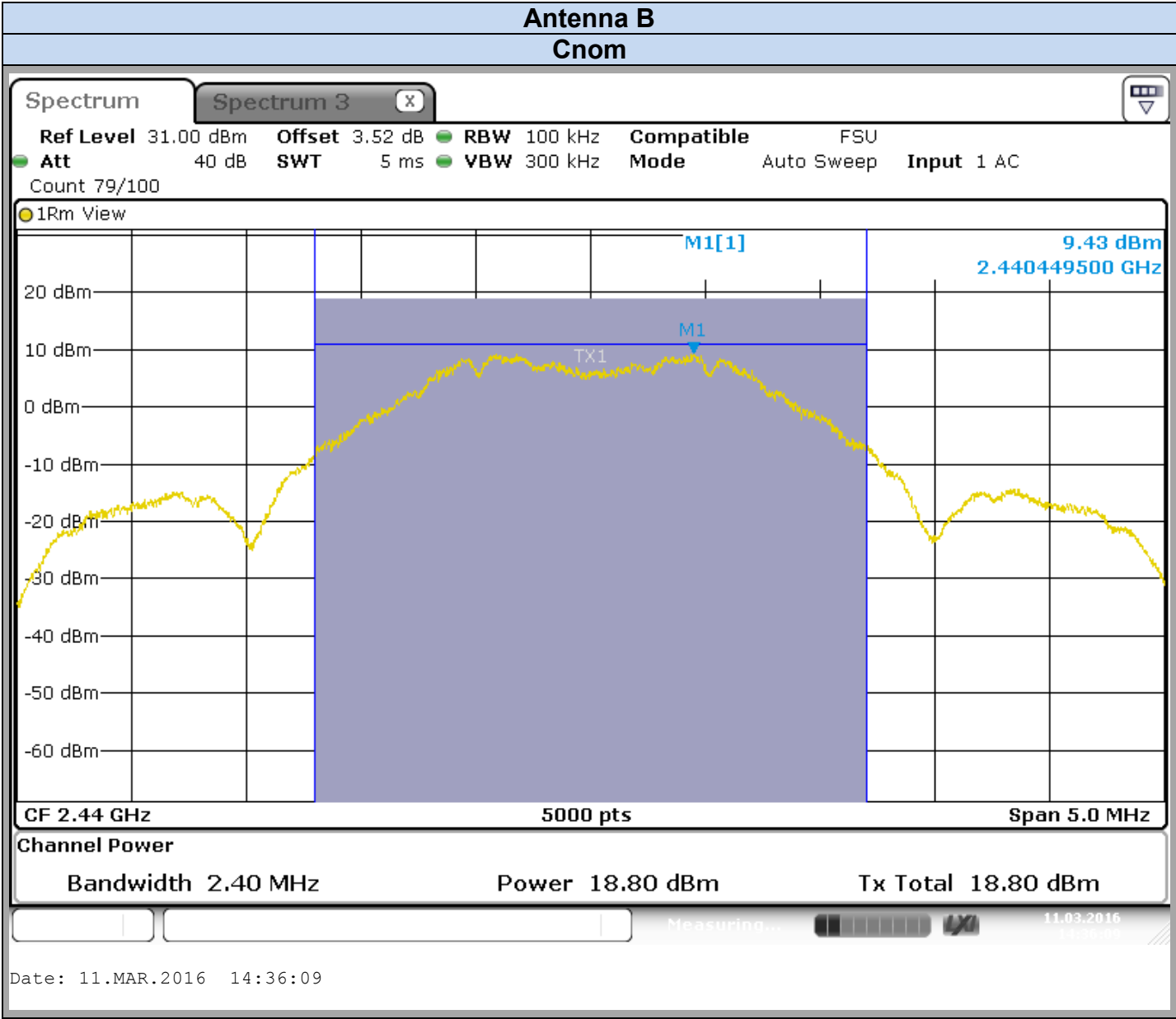


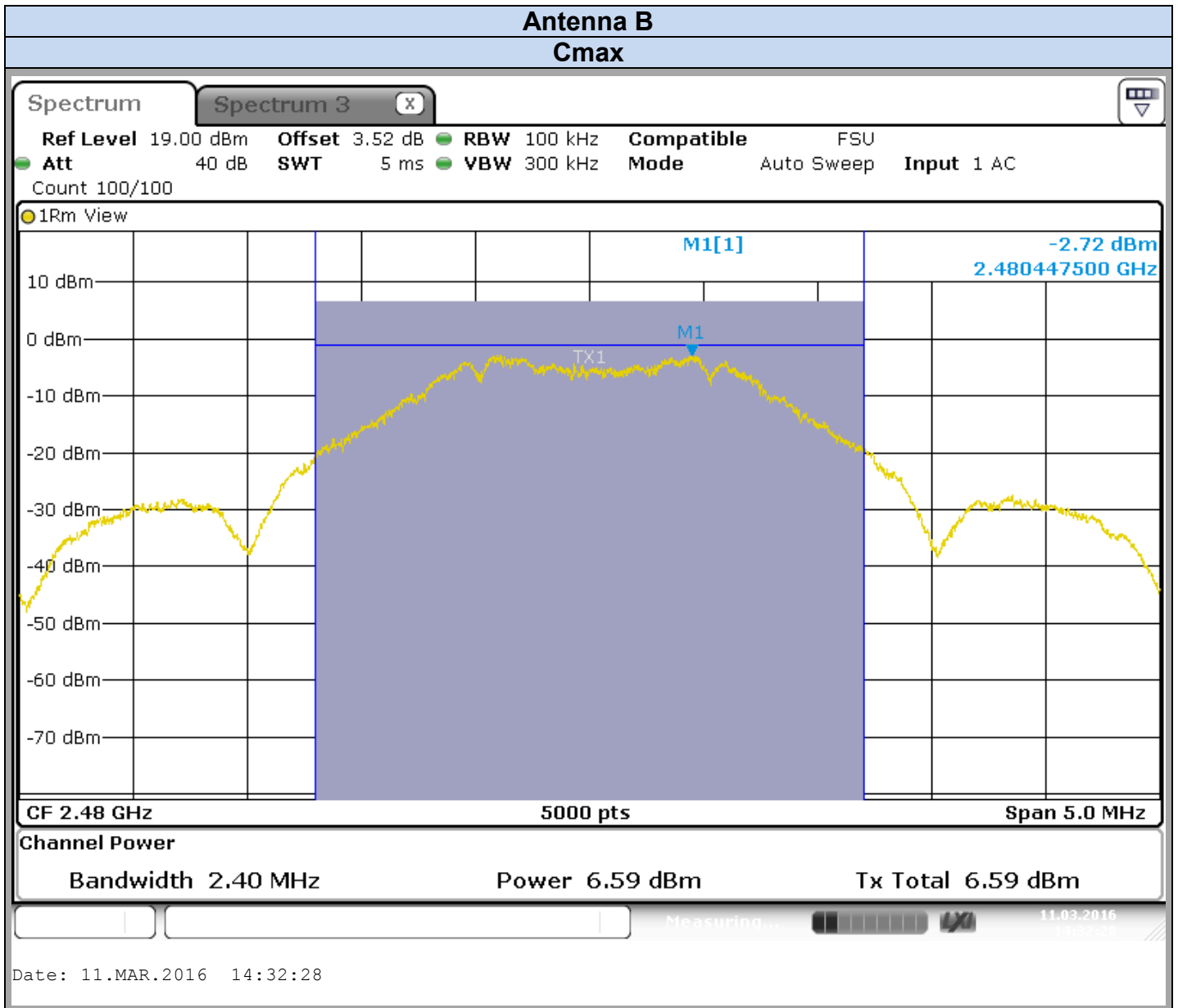




Antenna B Cmin









Spectrum Analyzer Offset:
Cable Loss=**0.52dB** + Attenuator= **3dB**

Antenna A			
Channel	Overall Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	2	18,92	30
Cnom	2	18,73	30
Cmax	2	4,86	30

Antenna B			
Channel	Overall Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	2	19,04	30
Cnom	2	18,8	30
Cmax	2	6,59	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

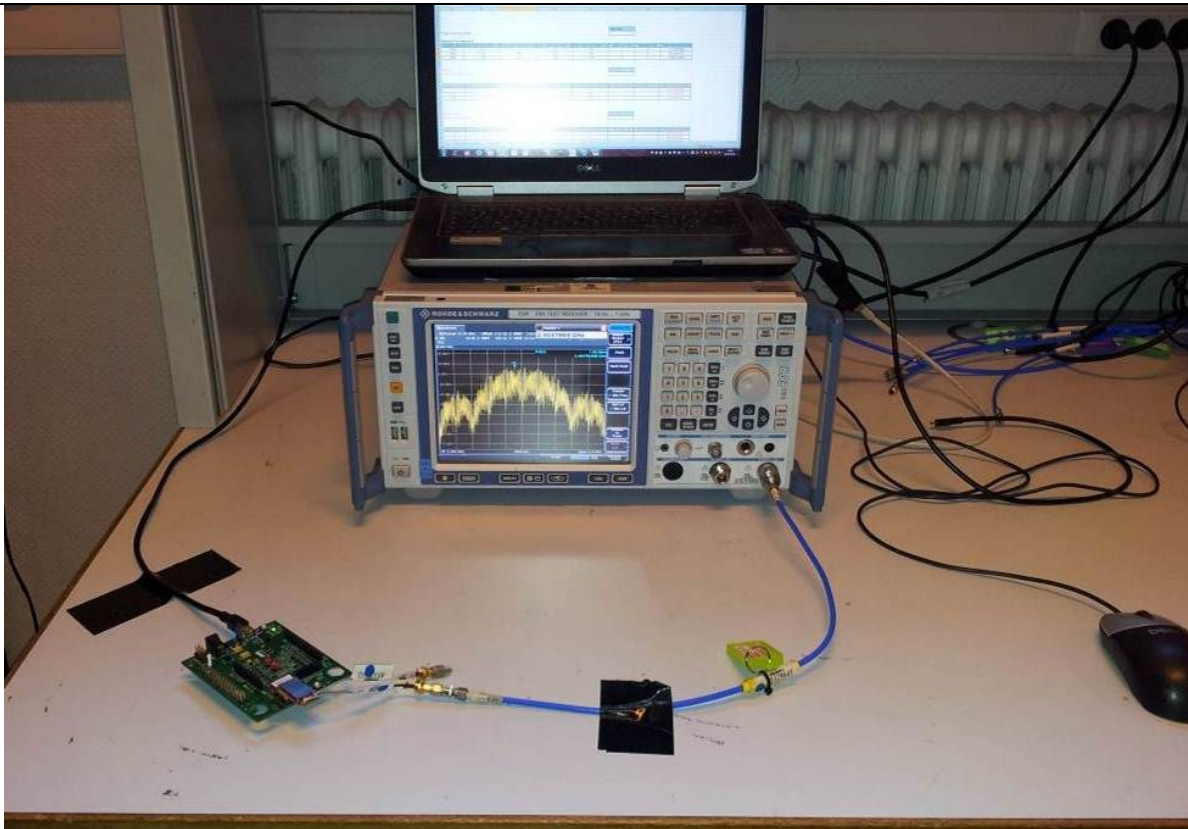
Test performed by : Armand MAHOUNGOU
Date of test : 2016/03/11
Ambient temperature : 22°C
Relative humidity : 48%

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 v03r4 § 10.3.

Spectrum Analyzer Setting:

Center frequency= Cmin or Cnom or Cmax
Span $\geq$ At least 1.5 times the OBW
Amplitude= Sufficient to observe the signal amplitude
 $3\text{kHz} \leq \text{RBW} \leq 100\text{kHz} := 3\text{kHz}$
 $\text{VBW} \geq 3 \cdot \text{RBW} = 10\text{kHz}$
Sweep= Auto
Sweep points $\geq 2 \cdot \text{Span} / \text{RBW}$
Trace= Average 100
Detector= RMS



Photograph for Power Spectral Density

Antenna A
Cmin

Spectrum Spectrum 3

Ref Level 23.00 dBm Offset 3.52 dB RBW 3 kHz Compatible FSU
Att 40 dB SWT 1.3 ms VBW 10 kHz Mode Auto FFT Input 1 AC
Count 100/100

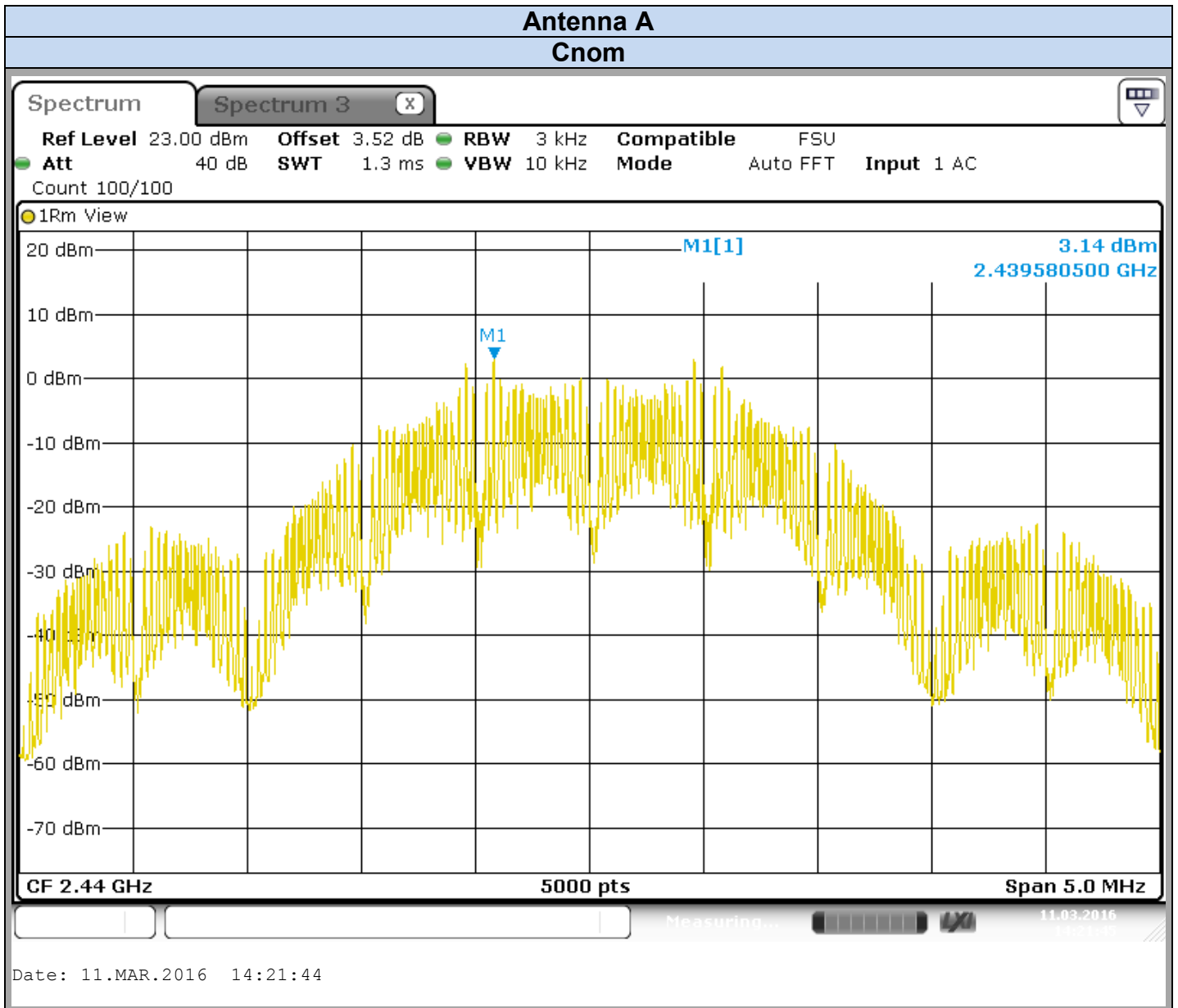
1Rm View

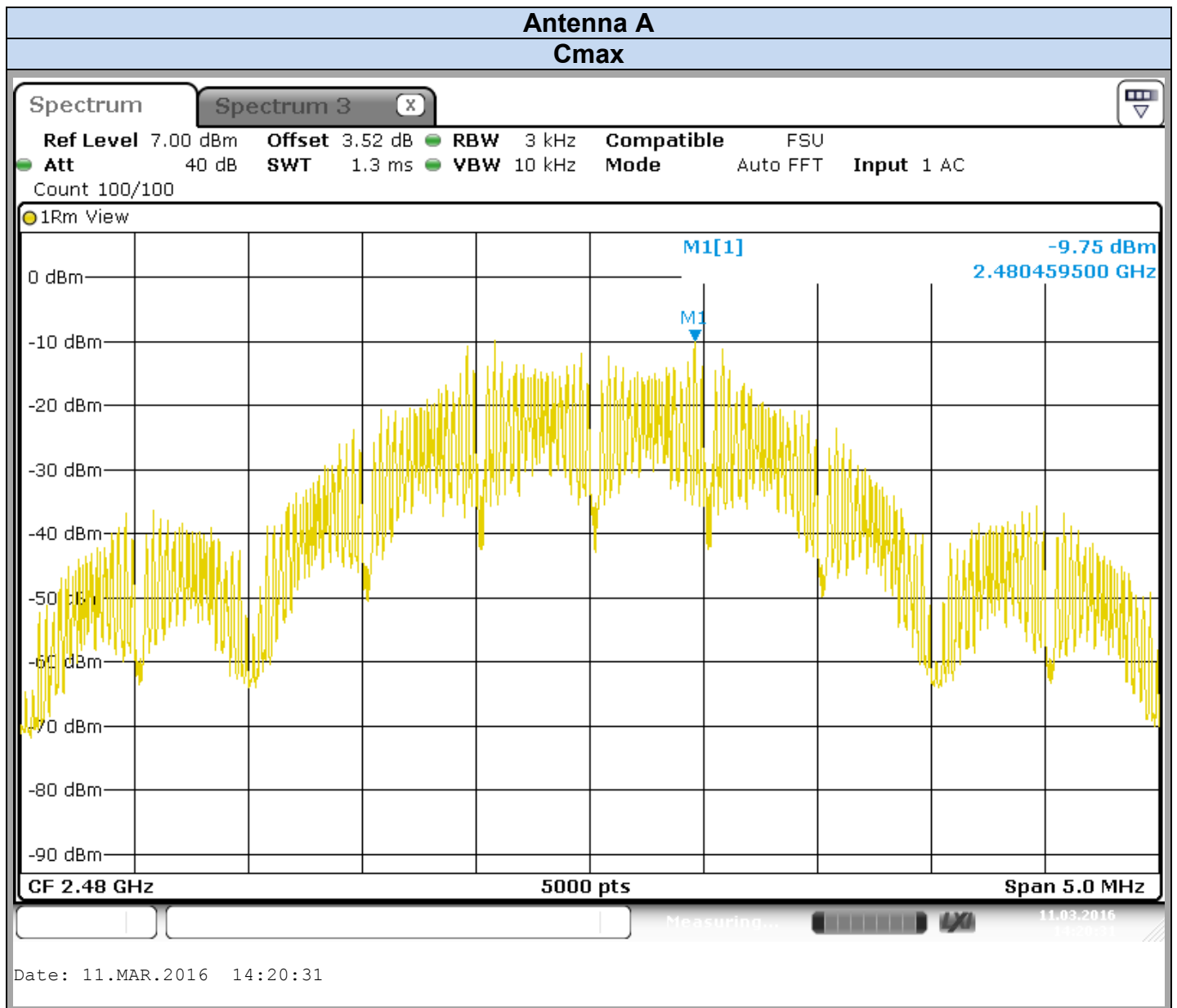
20 dBm
10 dBm
0 dBm
-10 dBm
-20 dBm
-30 dBm
-40 dBm
-50 dBm
-60 dBm
-70 dBm

M1[1]
3.12 dBm
2.405453500 GHz

CF 2.405 GHz 5000 pts Span 5.0 MHz

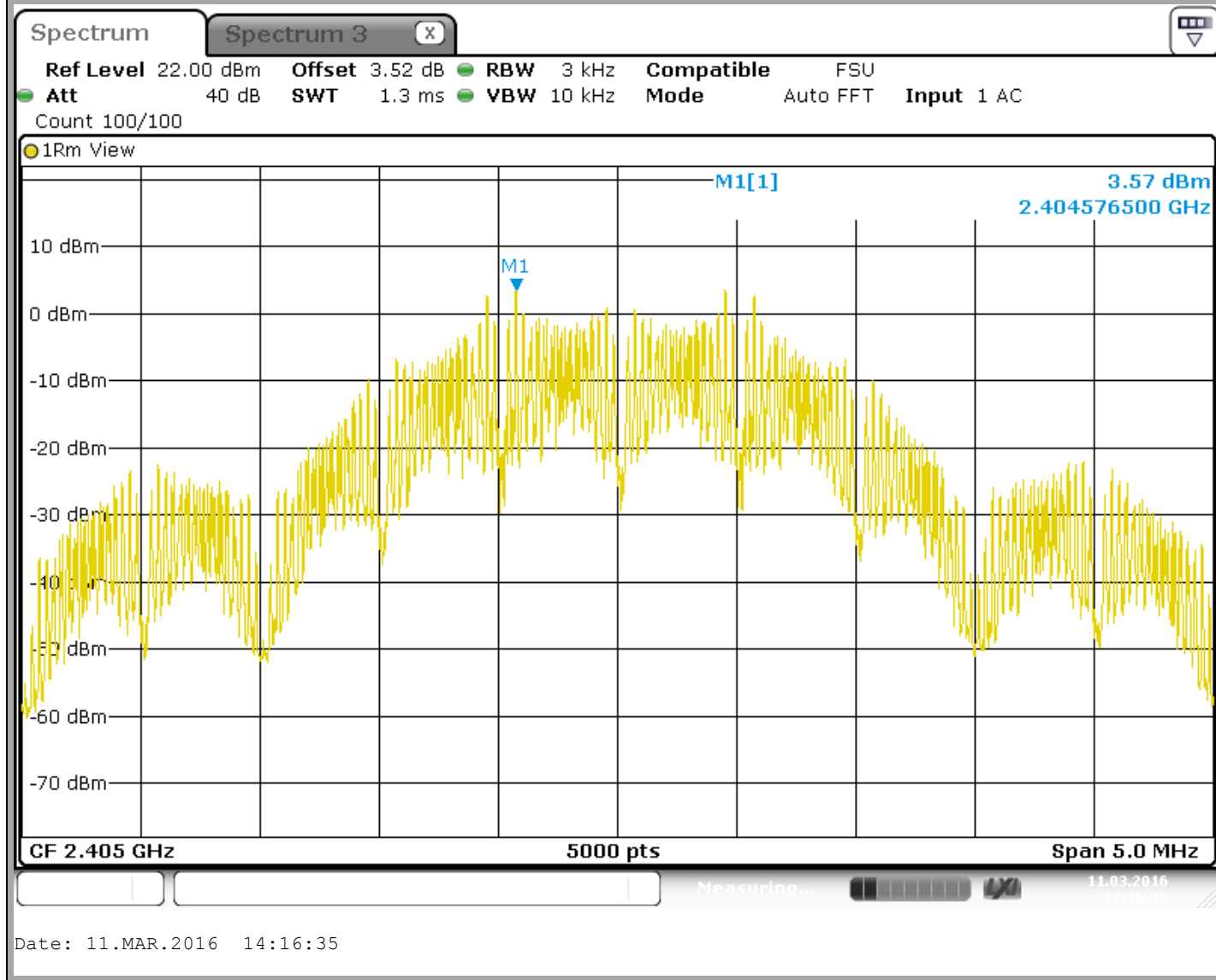
Measuring... 11.03.2016 14:22:55





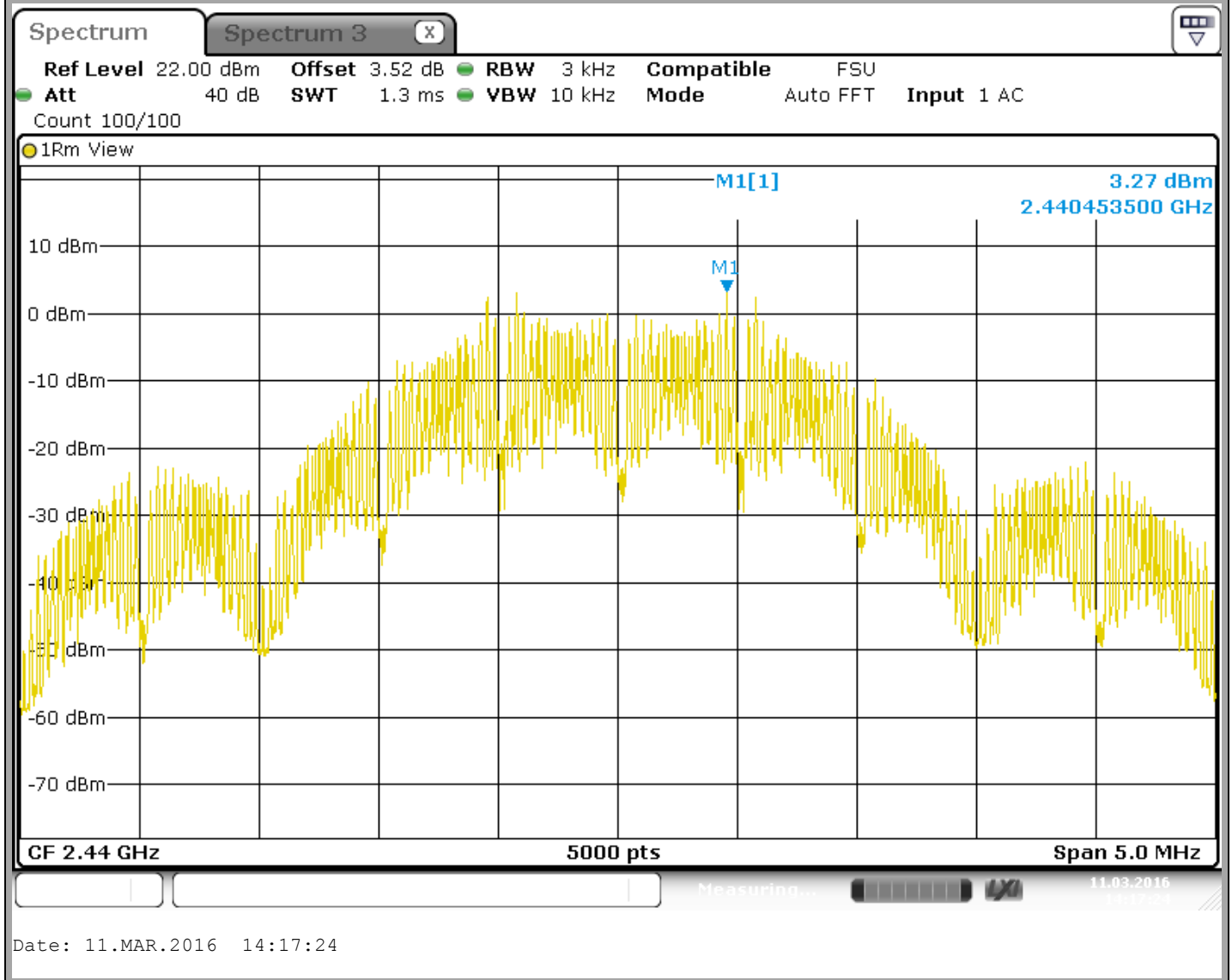


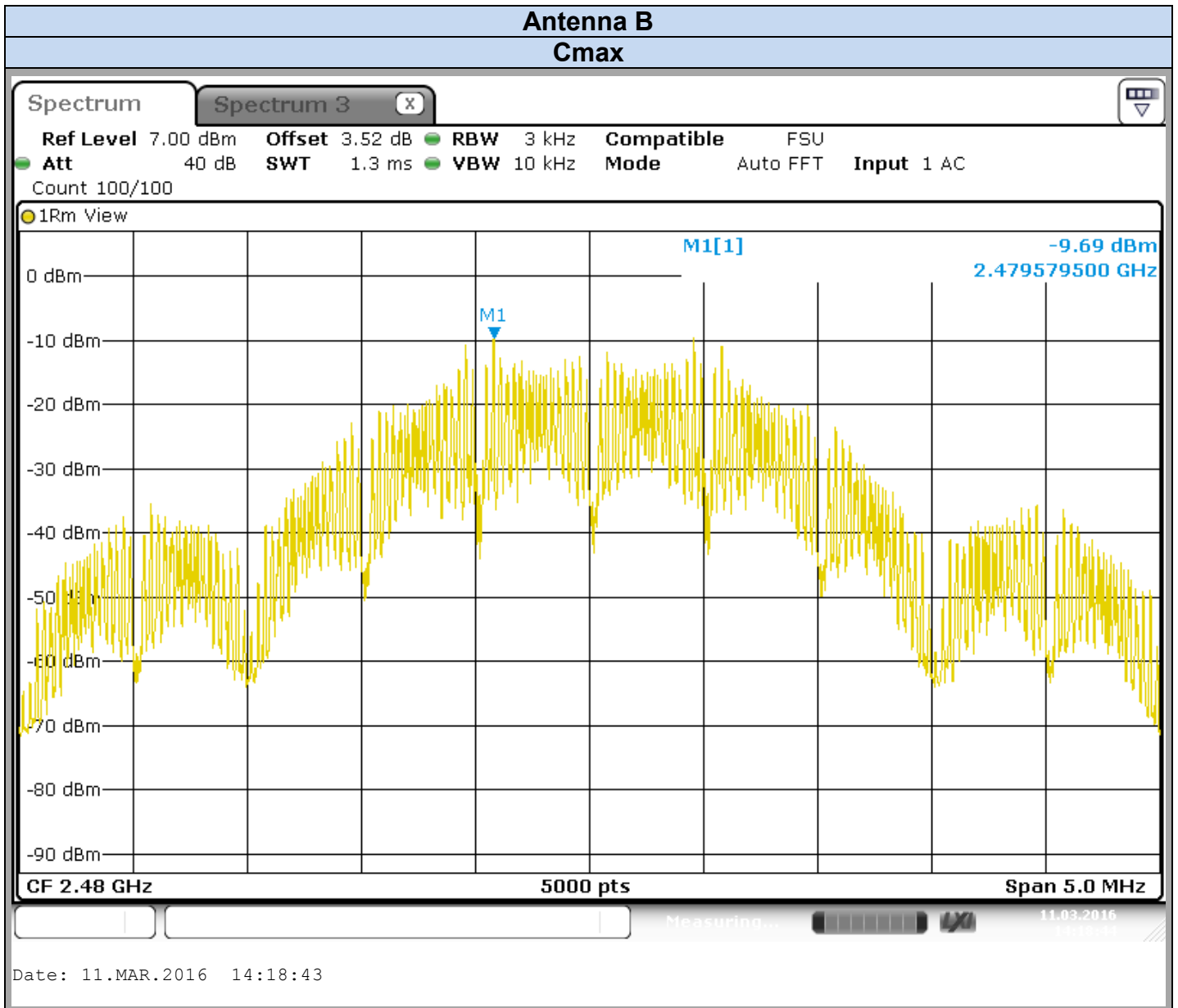
Antenna B Cmin





Antenna B Cnom







Spectrum Analyzer Offset:
Cable Loss=**0.52dB** + Attenuator= **3dB**

Antenna A			
Channel	Antenna Gain (dBi)	Power spectral density (dBm/3kHz)	Limit (dBm)
Cmin	2	3,12	8
Cnom	2	3,14	8
Cmax	2	-9,75	8

Antenna B			
Channel	Antenna Gain (dBi)	Power spectral density (dBm/3kHz)	Limit (dBm)
Cmin	2	3,57	8
Cnom	2	3,27	8
Cmax	2	-9,69	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

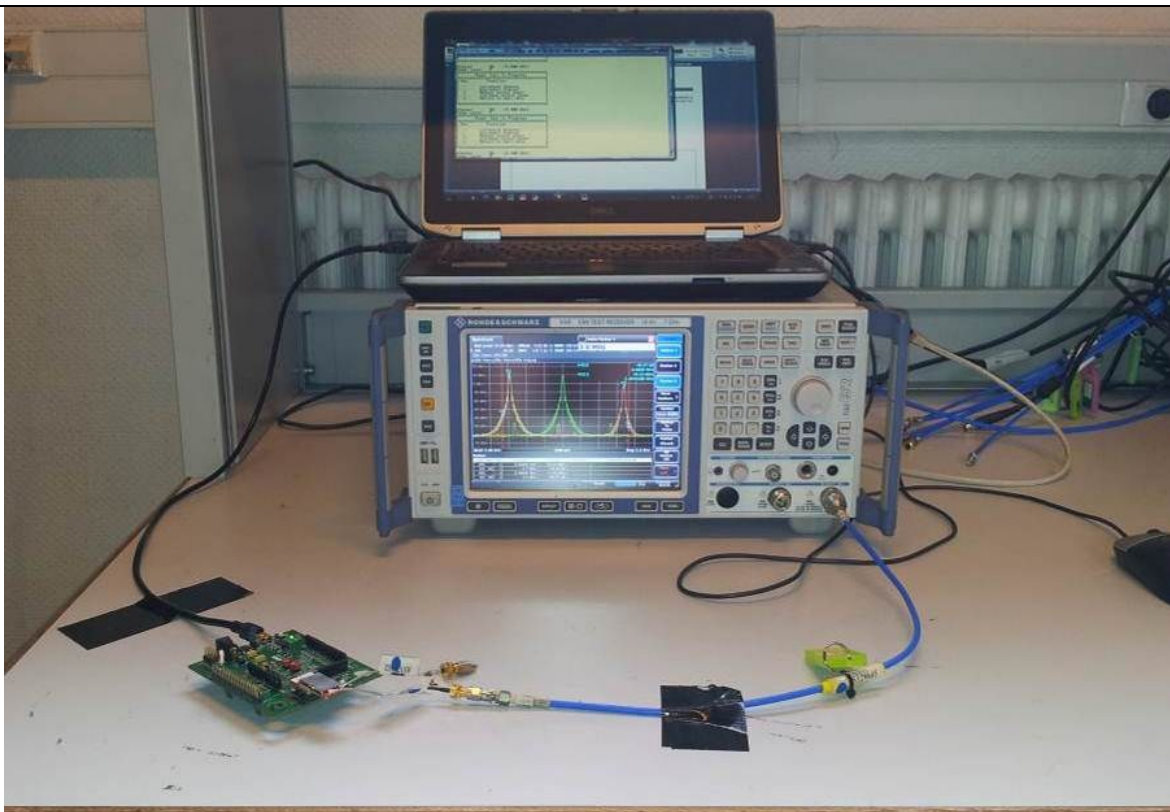
Test performed by : Armand MAHOUNGOU
Date of test : 2016/03/11
Ambient temperature : 22°C
Relative humidity : 48%

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 v03r4 § 11.0.

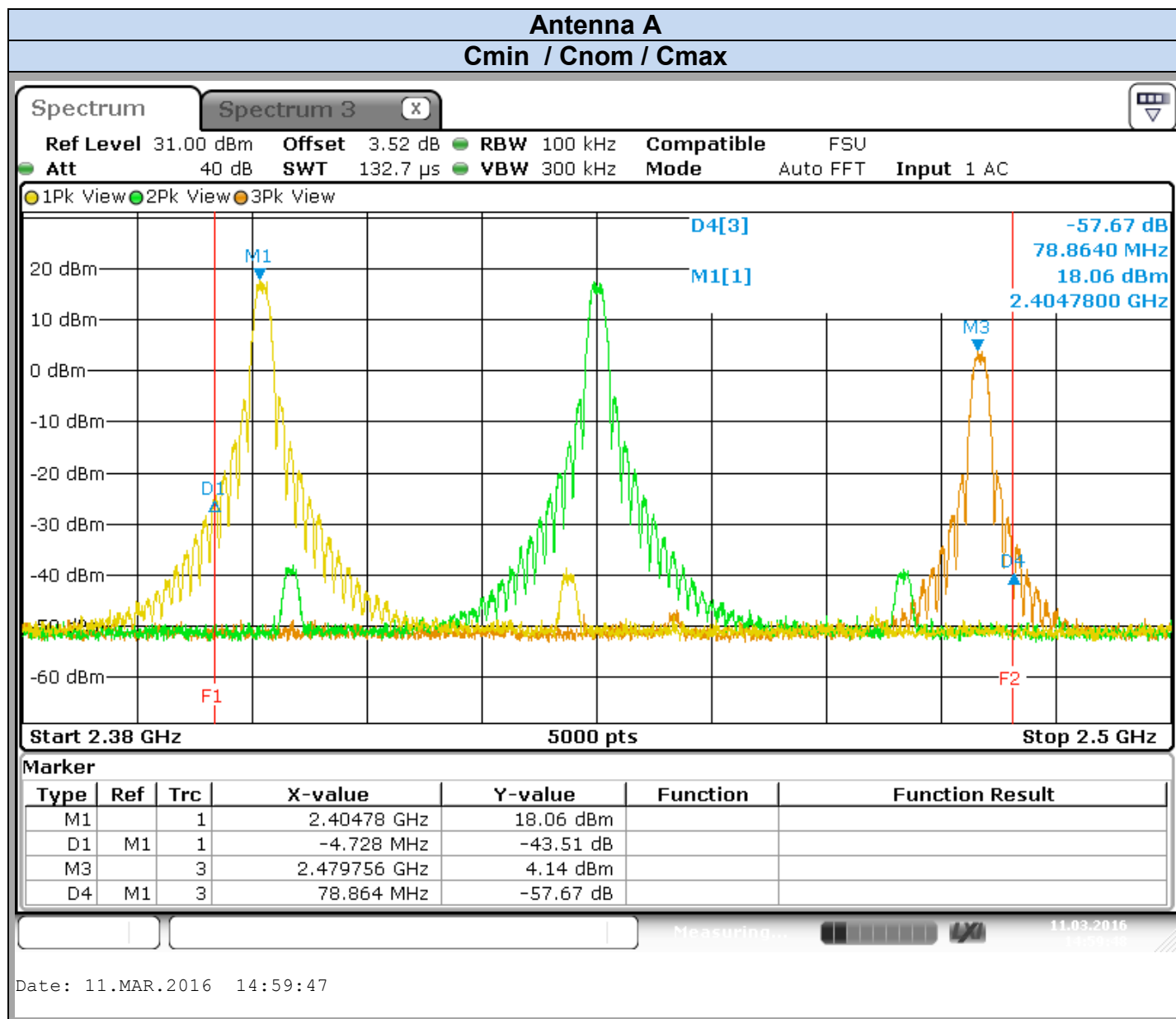
Spectrum Analyzer Setting:

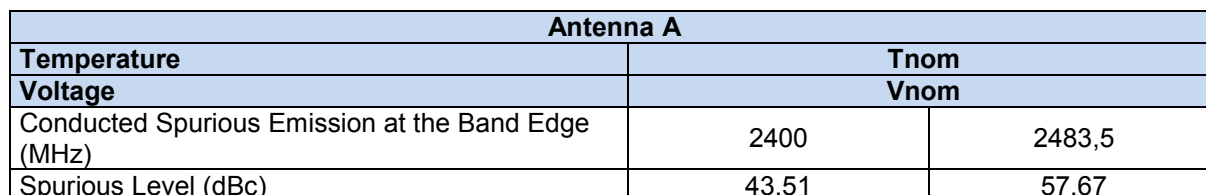
Start frequency= 2380MHz
Stop frequency= 2500MHz
span ≥ 1.5 times the DTS Bandwidth
Amplitude= Sufficient to observe the signal amplitude
RBW= 100kHz
VBW ≥ 300 kHz
Sweep Time= Auto Couple
Detector= Peak
Trace= Max Hold



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

7.3. GRAPHICS & RESULTS







Antenna B		
Temperature	Tnom	
Voltage	Vnom	
Conducted Spurious Emission at the Band Edge (MHz)	2400	2483,5
Spurious Level (dBc)	42.91	55.92

Result: **PASS**

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



8. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS

8.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : 2016/02/11
Ambient temperature : 22°C
Relative humidity : 49%

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 v03r4 § 11.0.

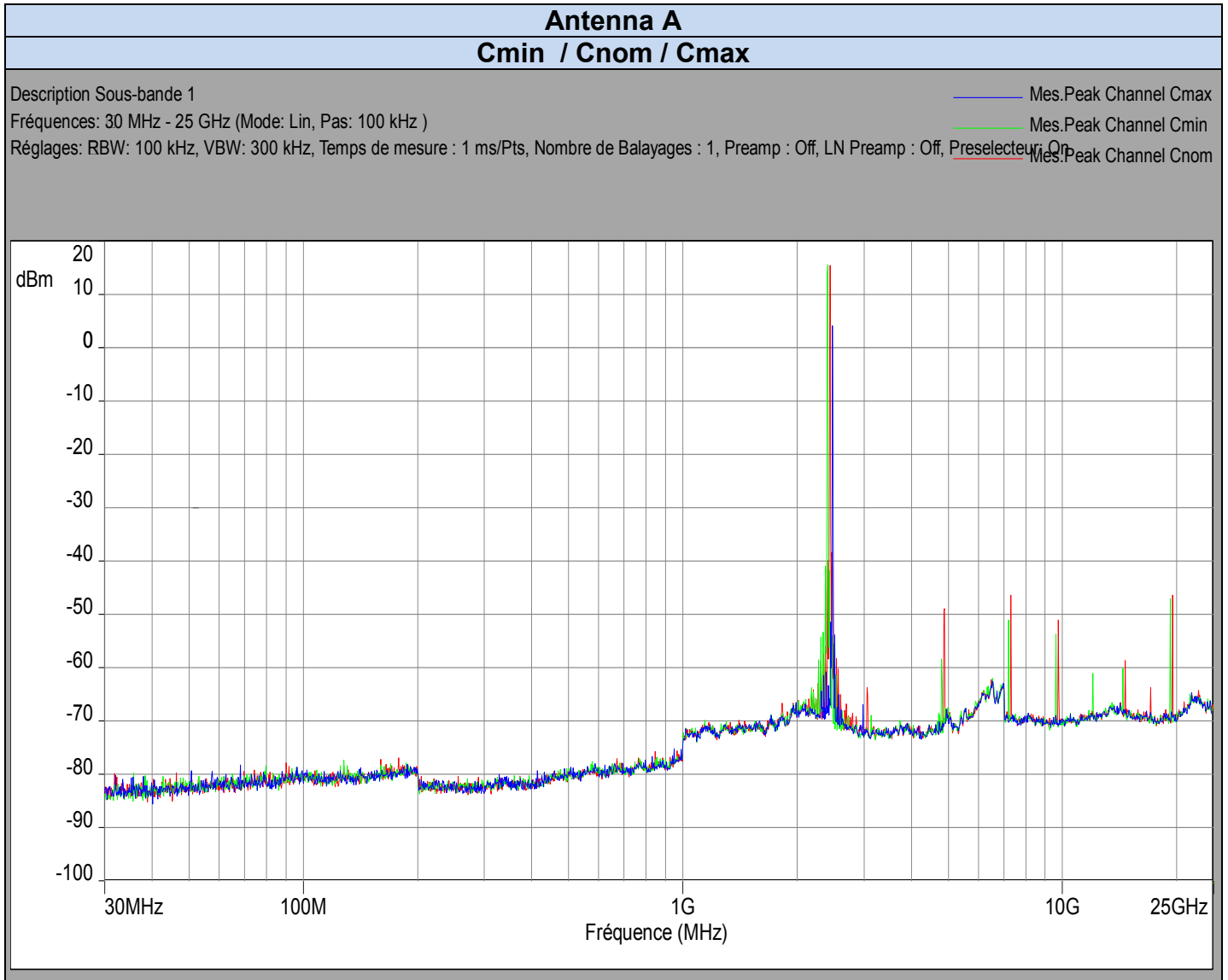
Spectrum Analyzer Setting:

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



Antenna B

Cmin / Cnom / Cmax

Description Sous-bande 1

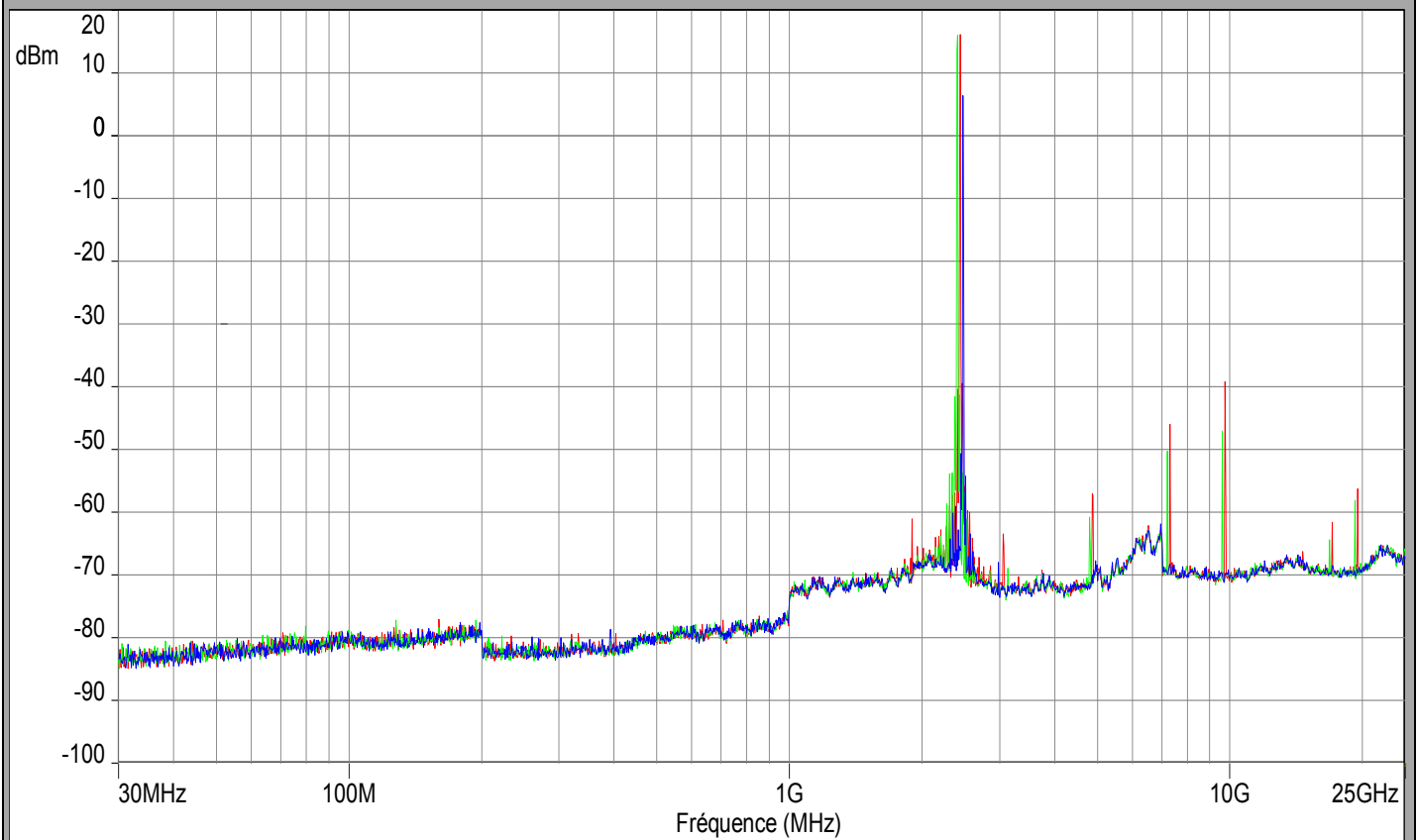
Fréquences: 30 MHz - 25 GHz (Mode: Lin, Pas: 100 kHz)

Réglages: RBW: 100 kHz, VBW: 300 kHz, Temps de mesure : 1 ms/Pts, Nombre de Balayages : 1, Preamp : Off, LN Preamp : Off, Preselecteur : On

Mes.Peak Channel Cmax

Mes.Peak Channel Cmin

Mes.Peak Channel Cnom





Antenna A		
Frequency (MHz)	Spurious Level (dBm)	Spurious Level (dBc)
4809	-58.36	74.02
4881	-48.99	64.51
7216.6	-51.04	66.70
7318.6	-46.38	61.90
9618.1	-53.72	69.38
9762.1	-51.01	66.53
12027.6	-61.11	76.77
14433.1	-60.15	75.81
14637.1	-58.64	74.16
17076.5	-63.75	79.27
19236.1	-47.04	62.70
19516.1	-46.39	61.91

Antenna B		
Frequency (MHz)	Spurious Level (dBm)	Spurious Level (dBc)
4809.1	-60.74	76.79
4879	-57.01	73.19
7213.5	-50.26	66.31
7318.8	-46.01	62.19
9618.1	-47.08	63.13
9758.1	-39.19	55.37
16837.7	-64.38	80.43
17083.6	-61.62	77.80
19236.2	-58.16	74.21
19516.1	-56.27	72.45

Result: **PASS**

Limit: → All Spurious Emissions must be at least 30dB (Average Conducted Power) below the Fundamental Radiator Level outside of the 2400MHz-2483,5MHz band



9. AC POWER LINE CONDUCTED EMISSIONS

9.1. TEST CONDITIONS

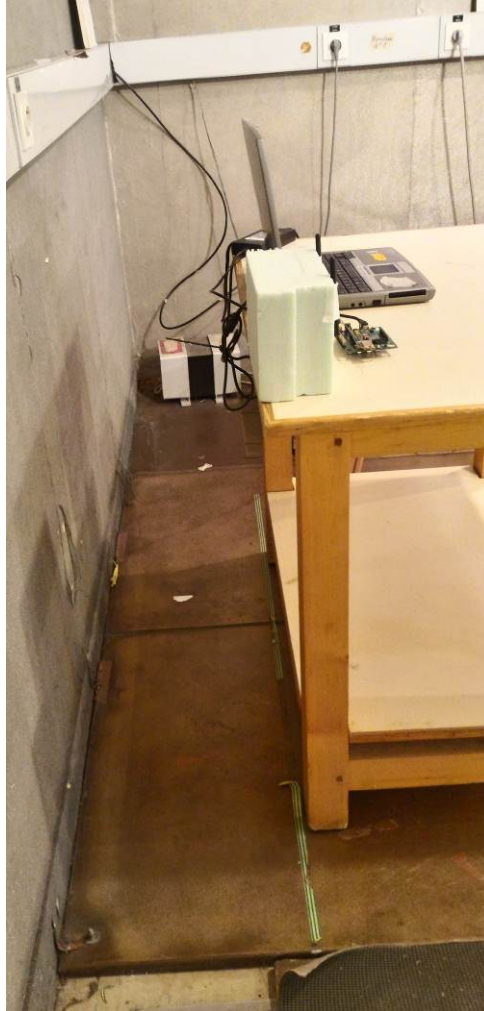
Test performed by : Laurent DENEUX
Date of test : February 4th, 2016
Ambient temperature : 22°C
Relative humidity : 50%

9.2. 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.



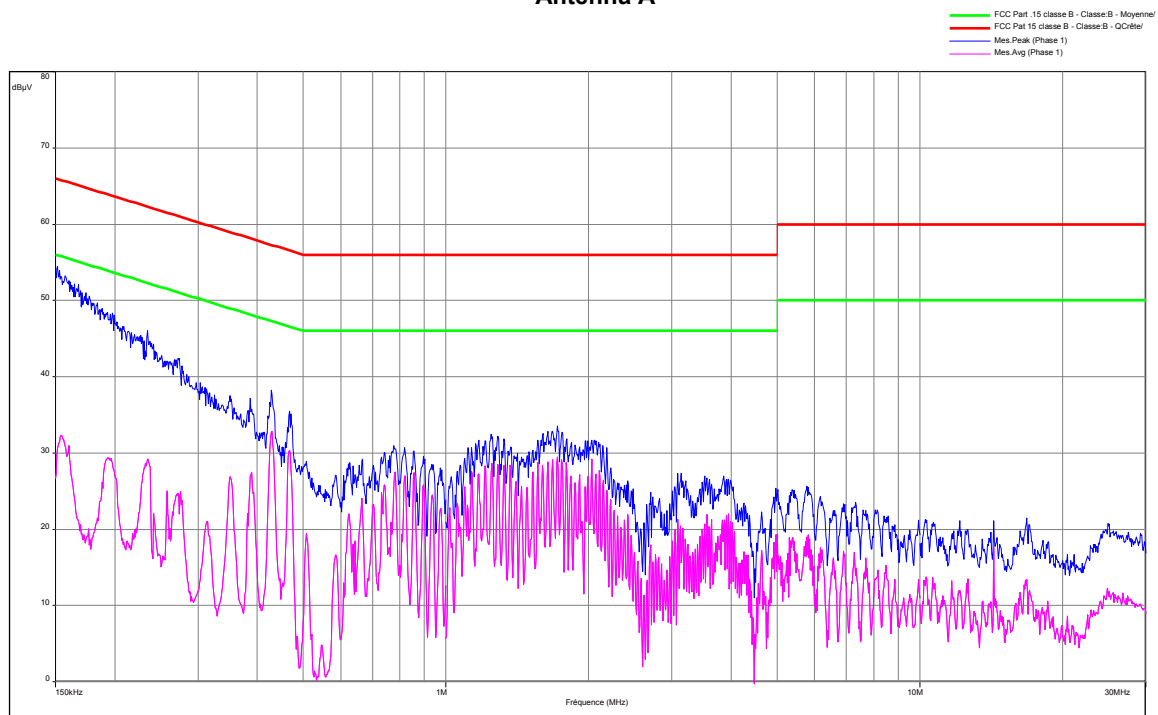
Photograph for AC Power Line Conducted Emissions (product)



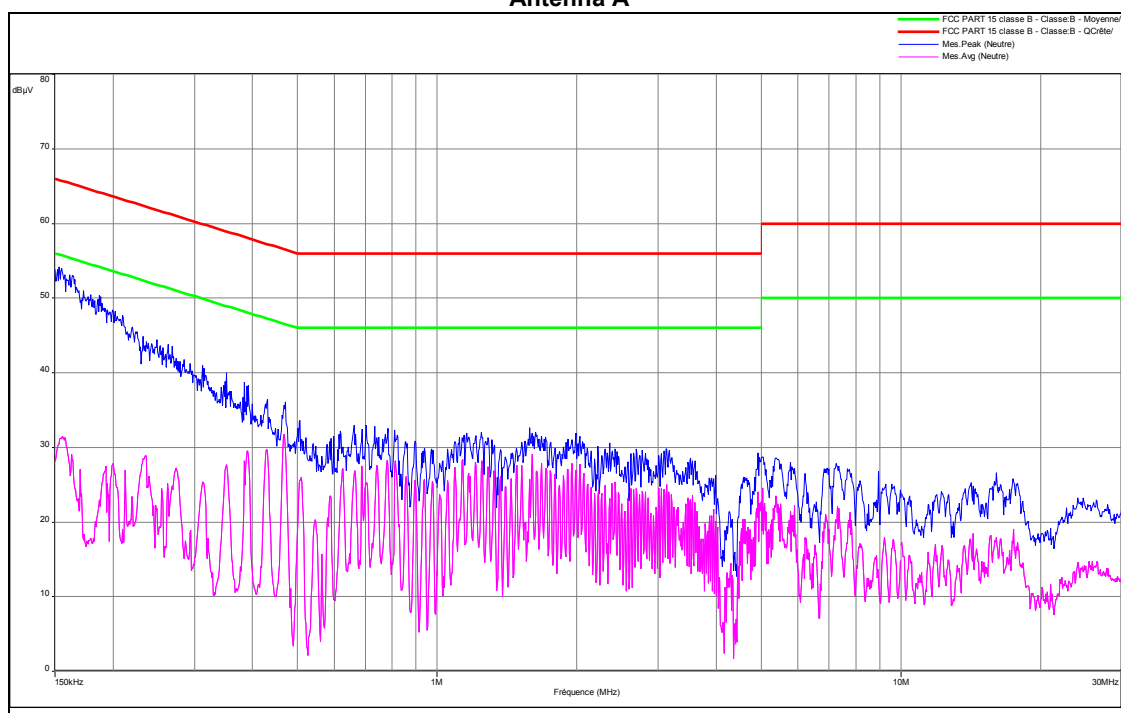
Photograph for AC Power Line Conducted Emissions (Rear view)

9.3. RESULTS

Phase Line Antenna A



Neutral Line Antenna A





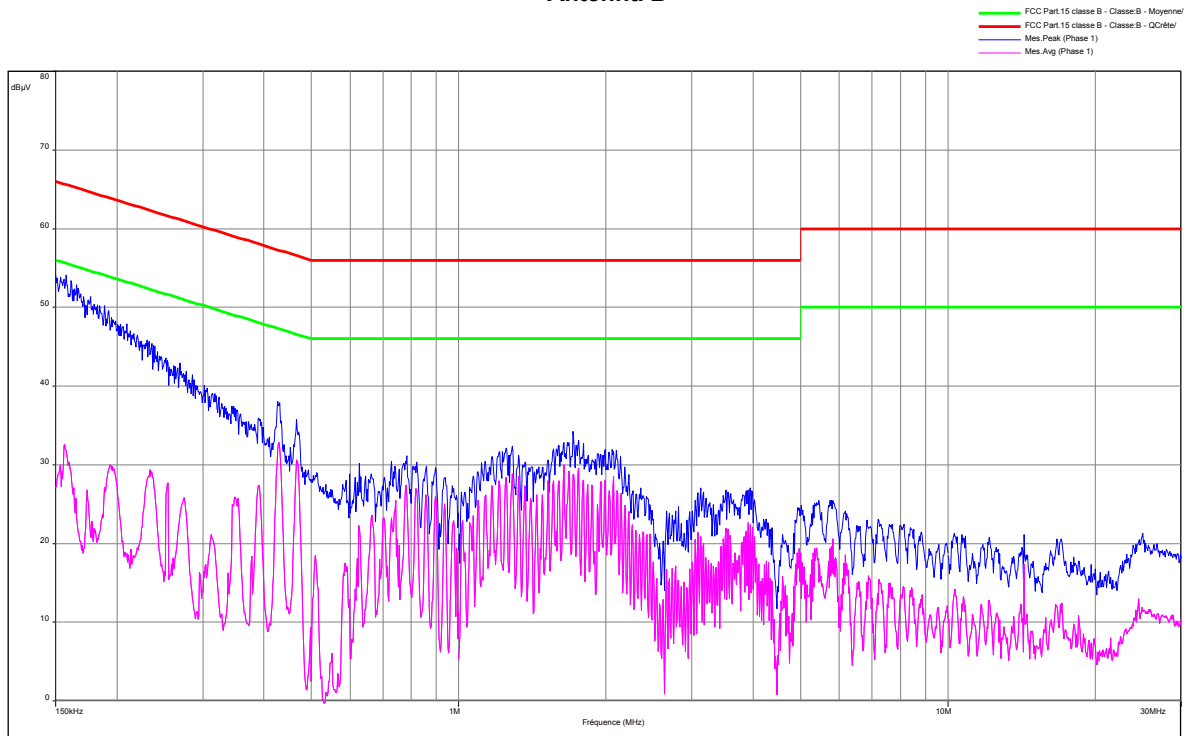
Phase Line

Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.151	54.4	-	65.9	32.2	55.9
0.428	38.2	-	57.2	32.6	47.2
0.776	31	-	56	27.4	46
1.72	33.5	-	56	29.2	46
14.31	21	-	60	17.6	50

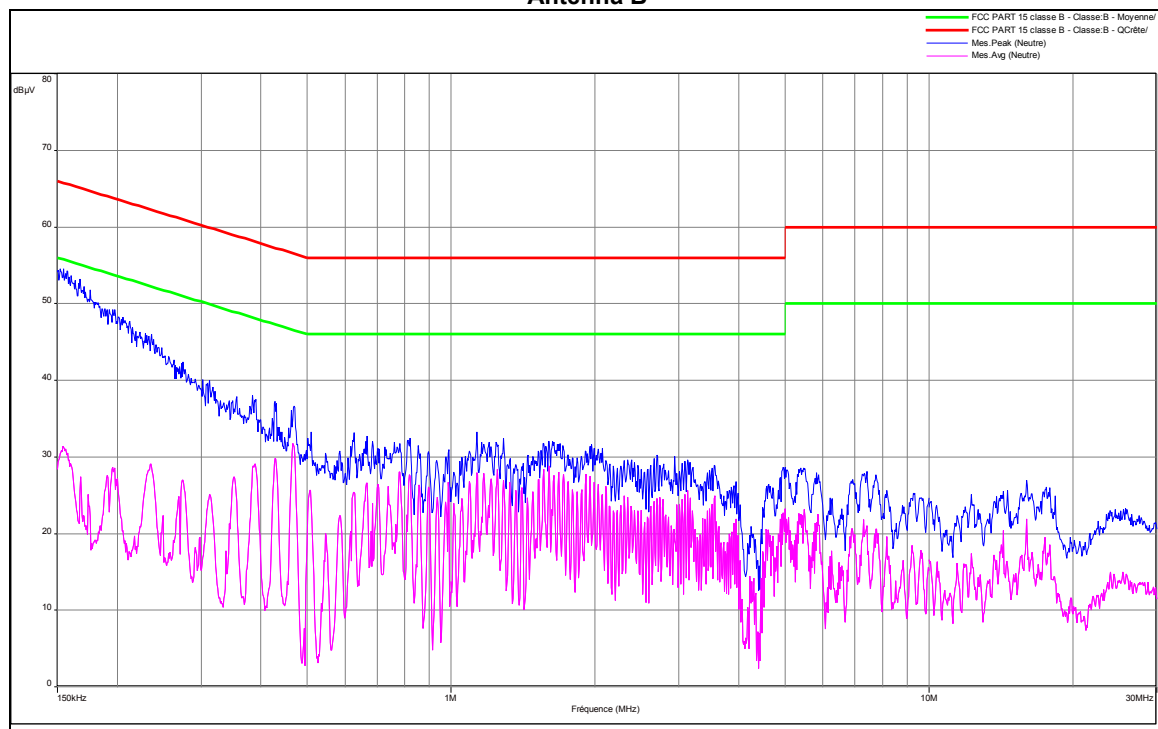
Neutral Line

Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.155	54	-	65.7	31.3	55.7
0.470	36	-	56.4	31.7	46.4
1.584	32.6	-	56	29	46
4.924	29.2	-	56	24.5	46
7.24	27.8	-	60	22	50

Phase Line Antenna B



Neutral Line Antenna B





Phase Line

Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.157	54	-	65.9	32.4	55.9
0.430	38	-	57.2	32.5	47.2
1.286	32.3	-	56	28	46
1.716	34.2	-	56	29.3	46
14.31	21	-	60	17.3	50

Neutral Line

Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Average Level (dBμV)	Average Limit (dBμV)
0.155	54.5	-	65.7	31.2	55.7
0.470	36.4	-	56.6	31.4	46.6
1.132	33.2	-	55	28.3	45
1.598	31.5	-	55	28.8	45
16	26.7	-	60	22	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 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 : Laurent DENEUX
Date of test : February 4th, 2016
Ambient temperature : 19°C
Relative humidity : 51%

10.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed in a semi-anechoic chamber. Distance between measuring antenna and the EUT is 10m. 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 placed at 1.5m high above 1GHz and at 0.8m high under 1GHz.



Photograph for Unwanted Emissions into Restricted Frequency Bands



Photograph for Unwanted Emissions into Restricted Frequency Bands



Photograph for Unwanted Emissions into Restricted Frequency Bands

10.3. RESULTS

Below 1GHz Antenna A

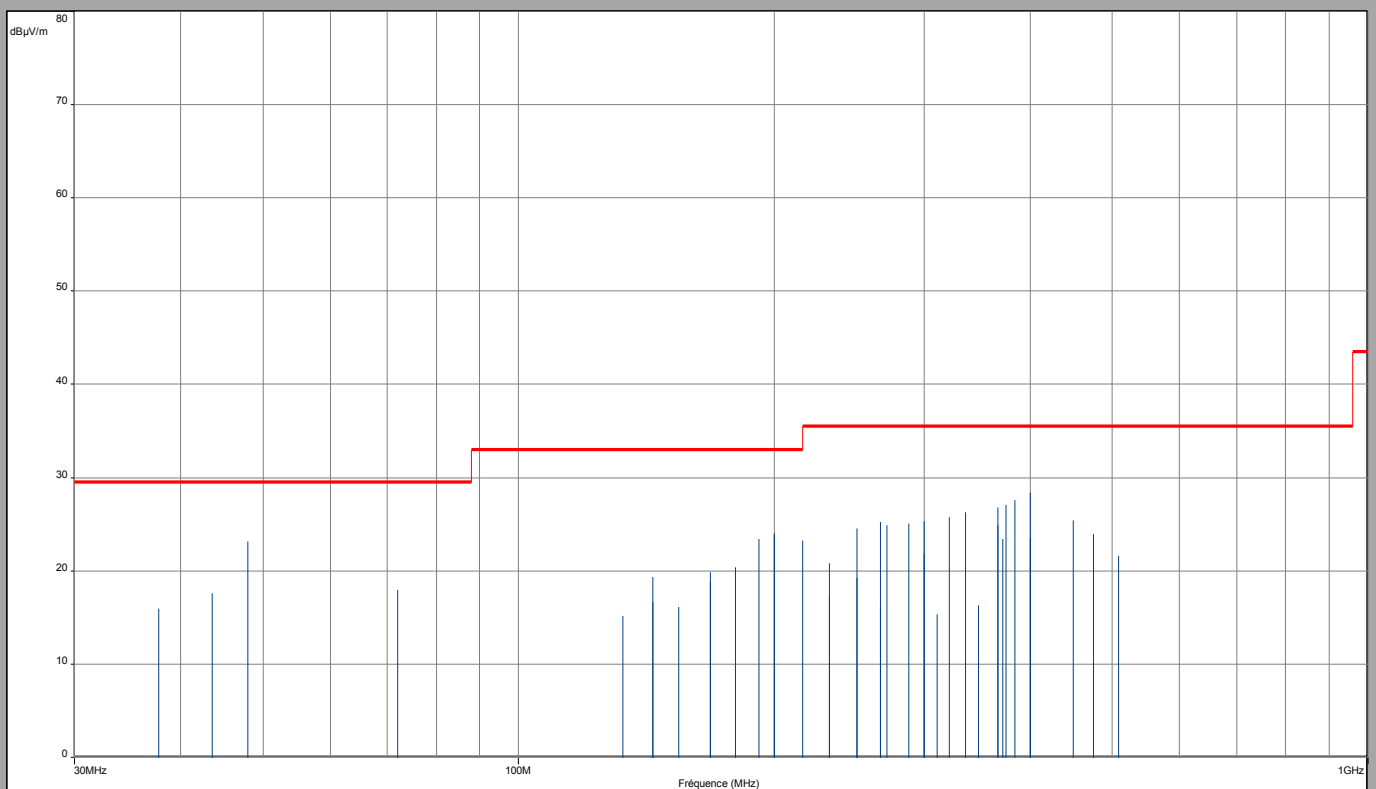
C11,C18 & C26 Vertical &horizontal

FCC Part.15 class B

NXP
ZIGBEE module
Type : JN5179-001-M06

Quasi peak measurement

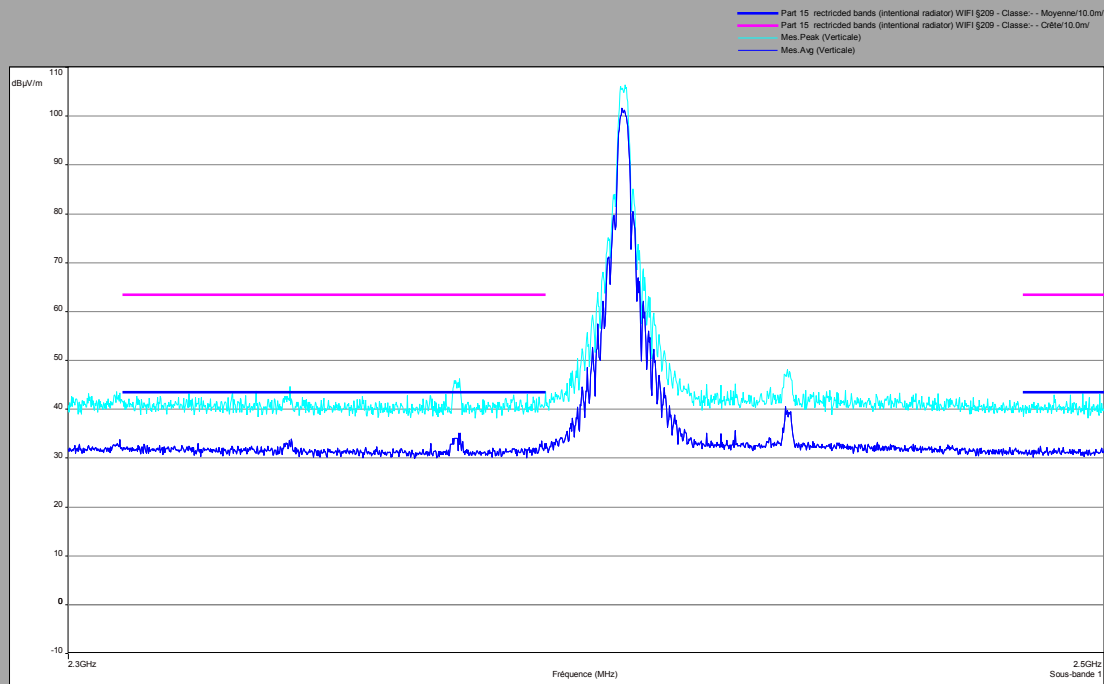
— FCC Part 15 (intentional radiator) §209 - Classe:- - QCrête/10.0m/
Mes. Q-Peak (Verticale)
Mes. Q-Peak (Horizontale)



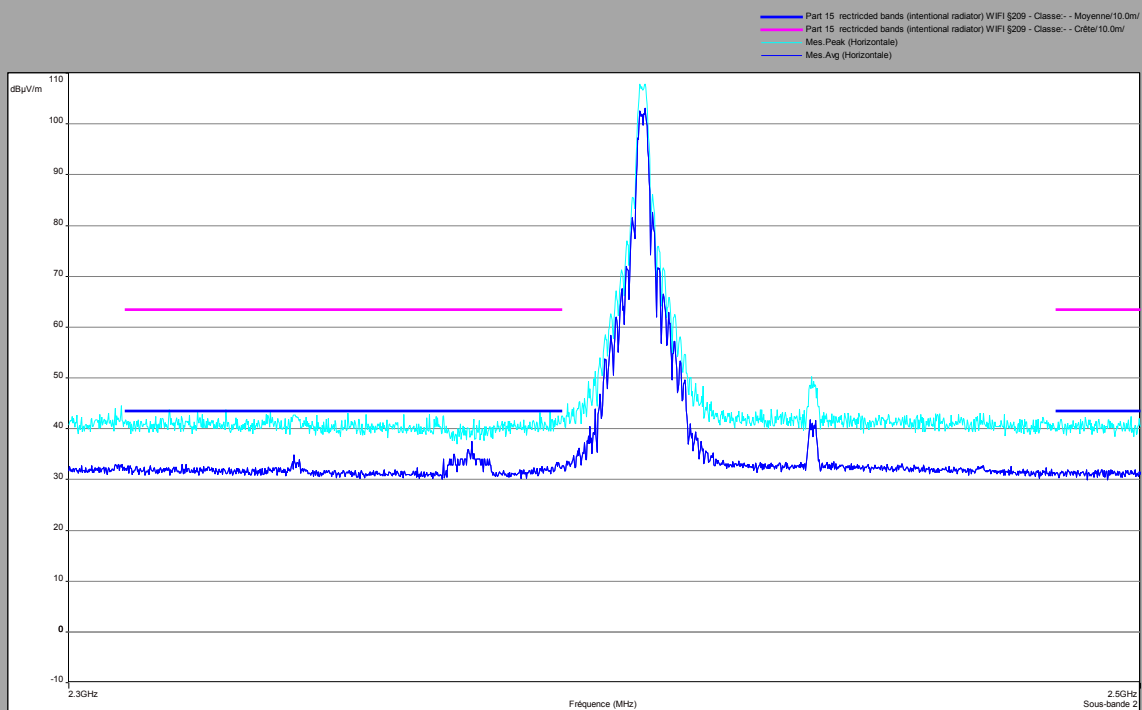
**Above 1GHz
Antenna A**

C11

Vertical



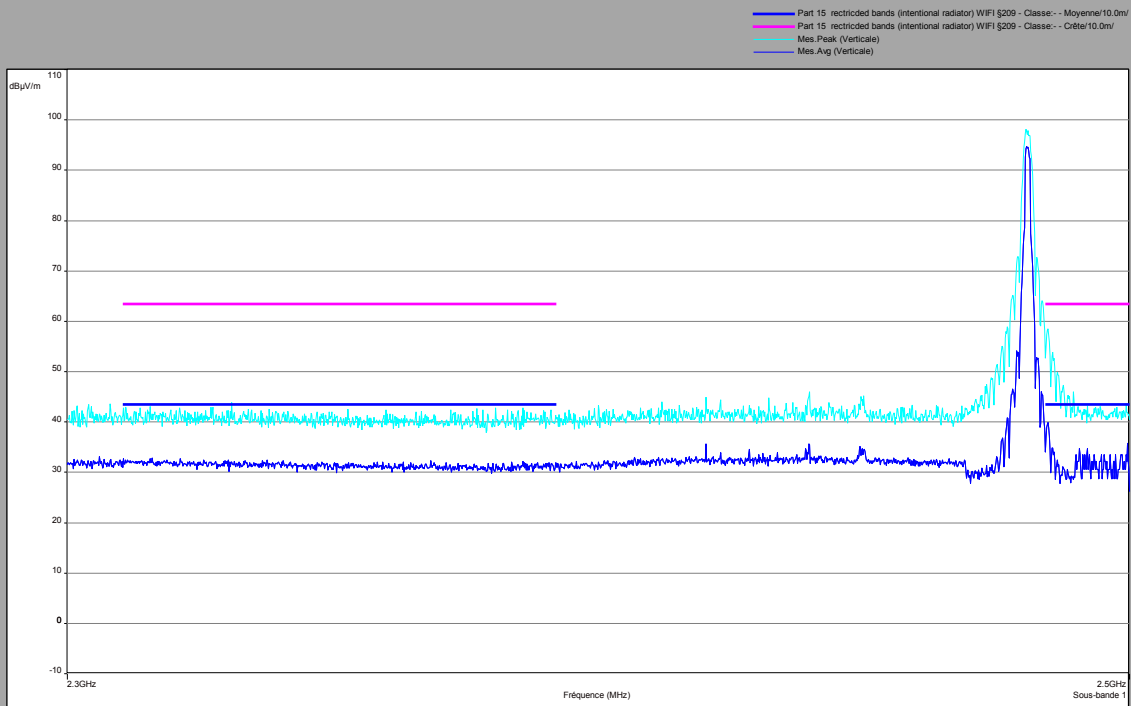
Horizontal



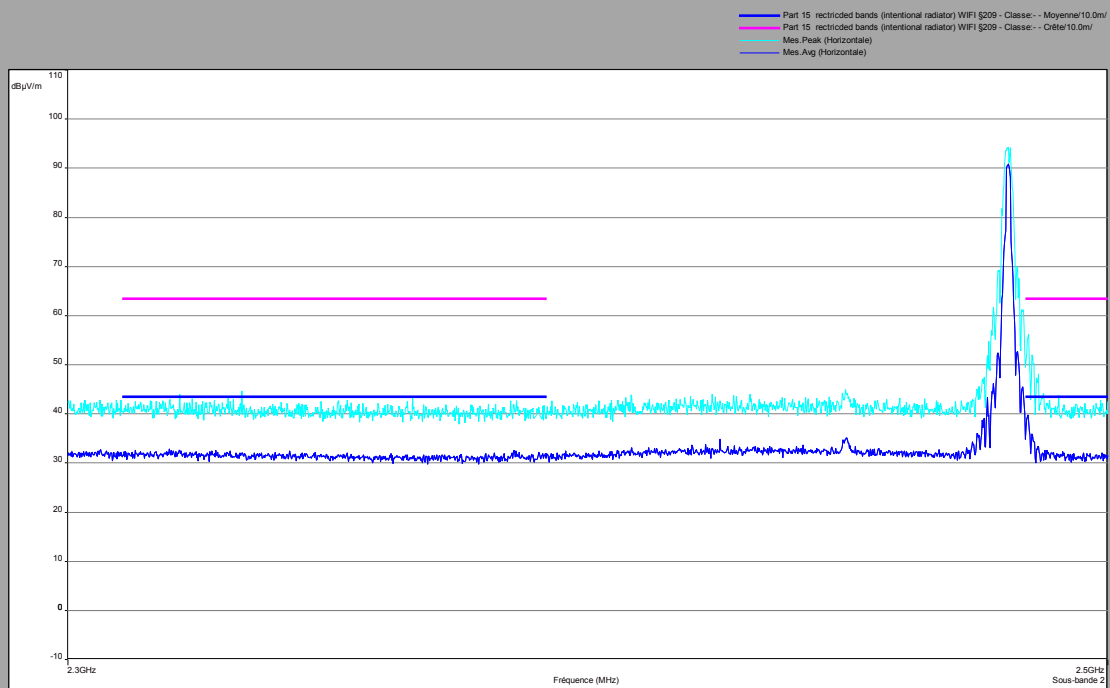
Above 1GHz Antenna A

C26

Vertical

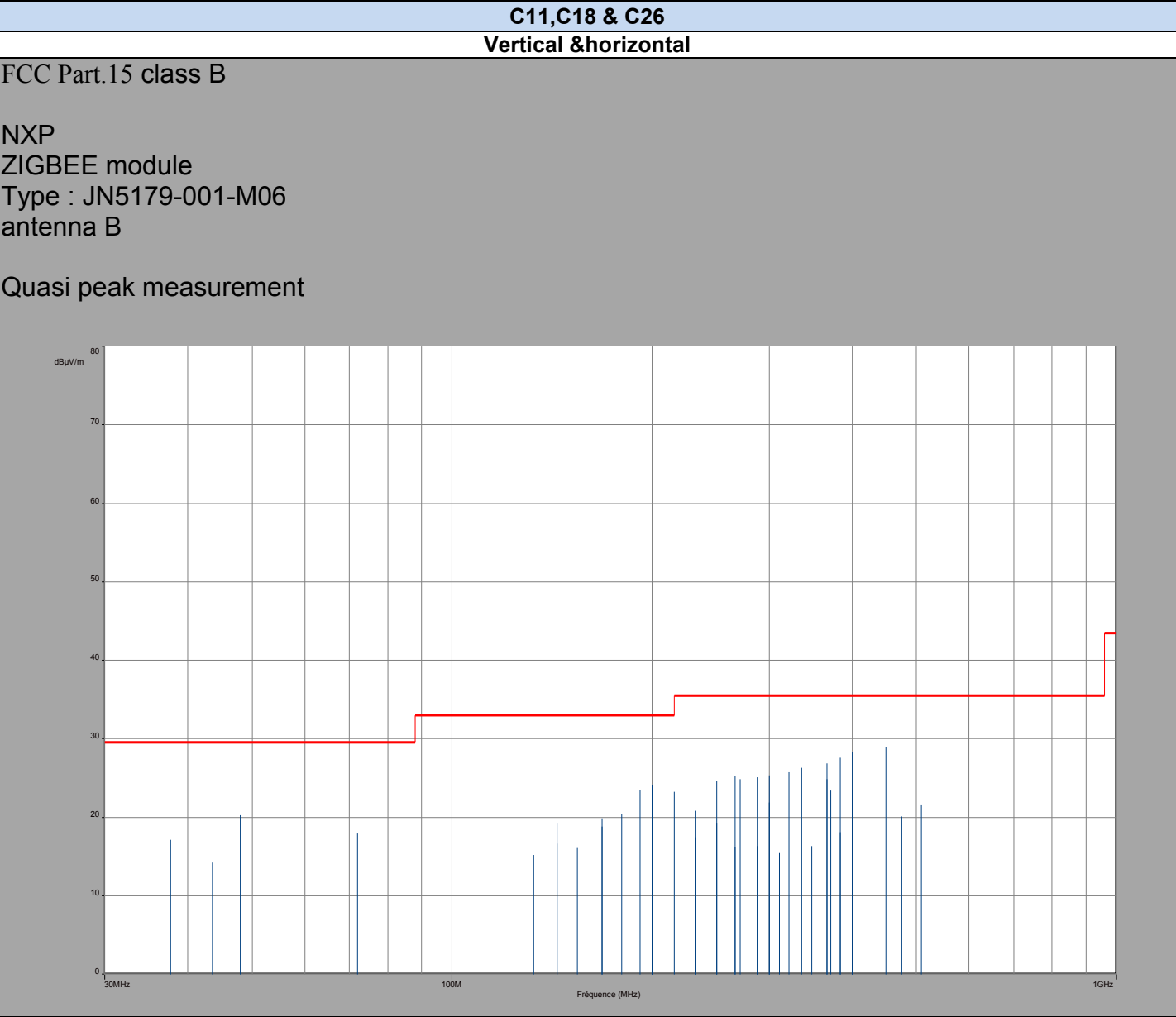


Horizontal





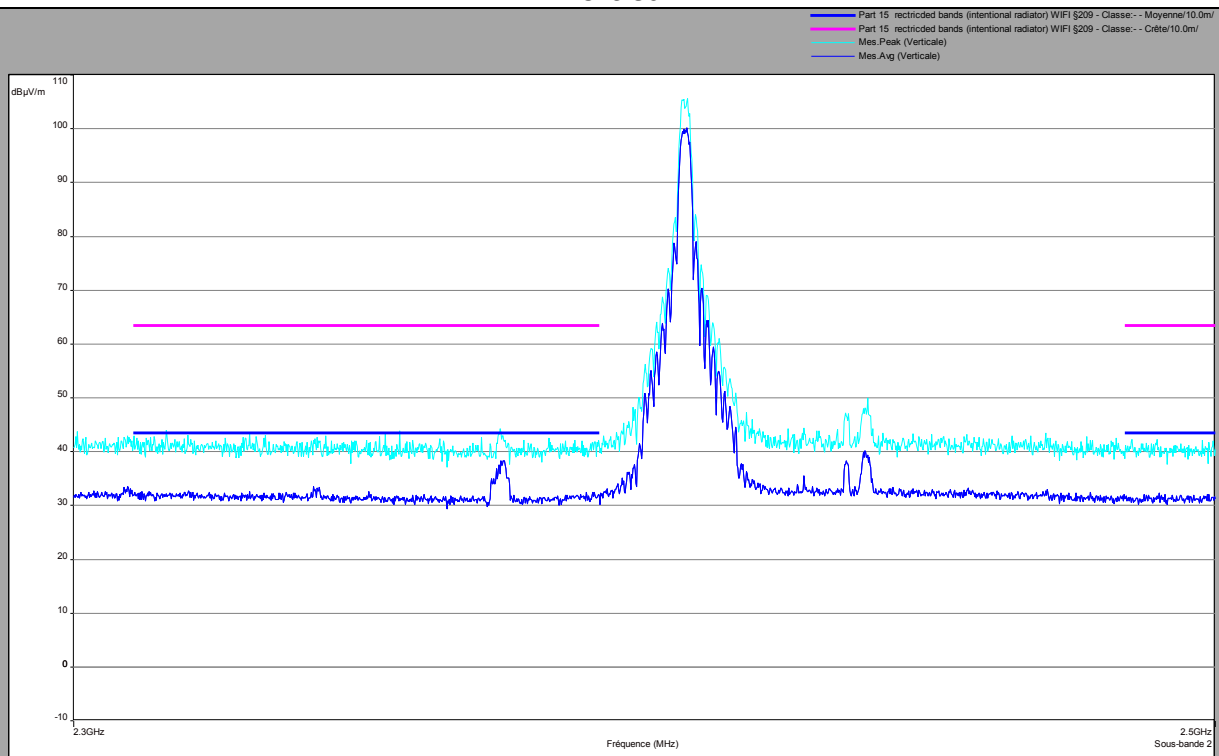
Below 1GHz
Antenna B



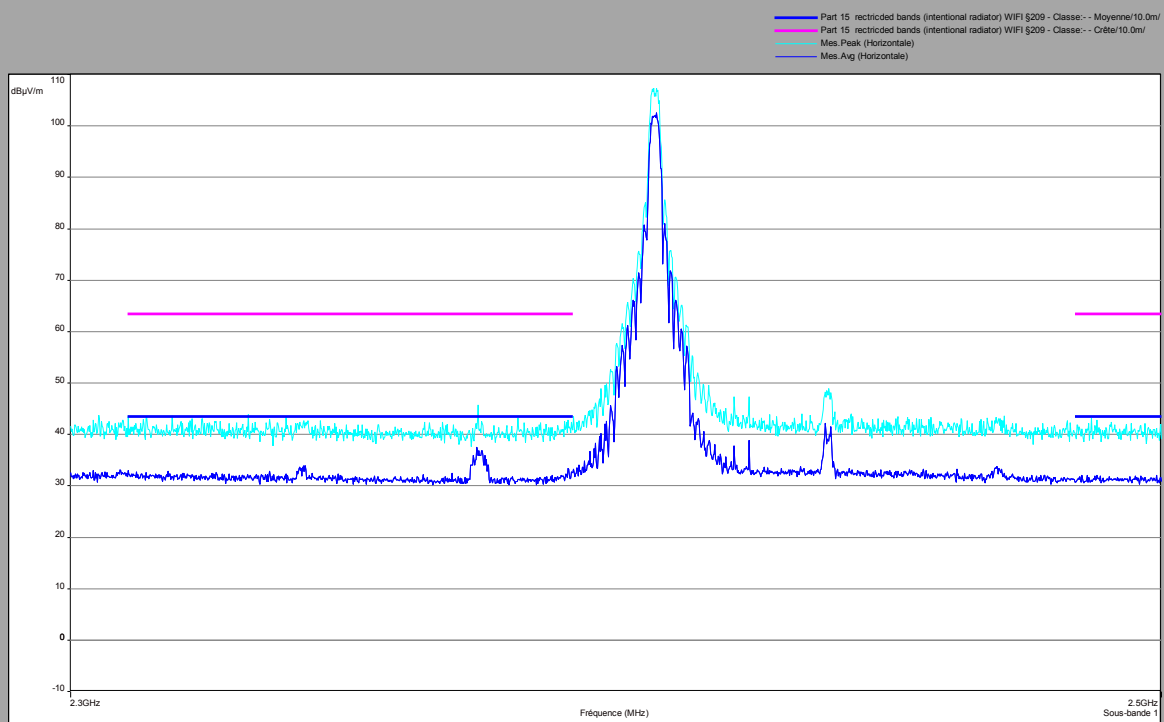
Above 1GHz Antenna B

C11

Vertical



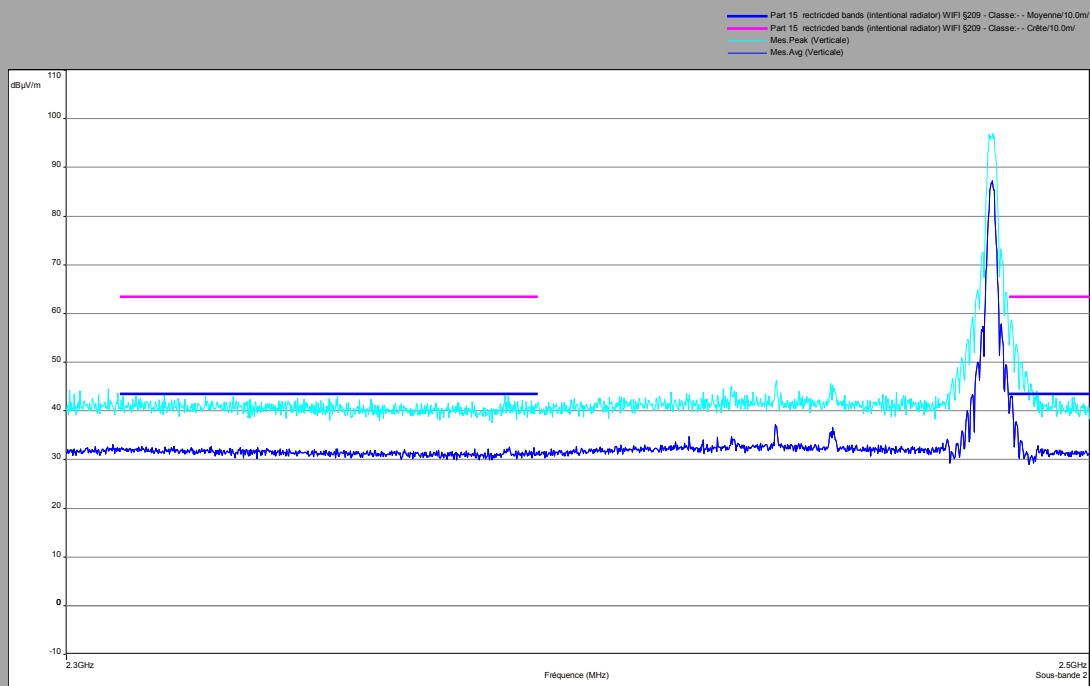
Horizontal



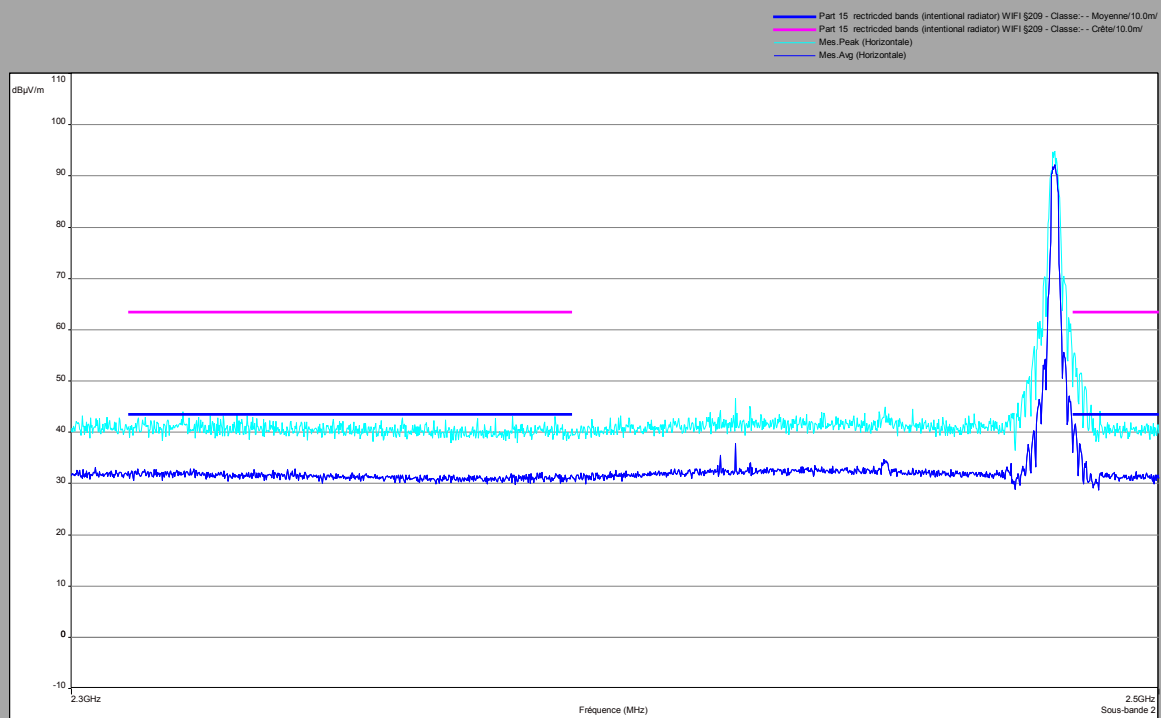
Above 1GHz Antenna B

C26

Vertical



Horizontal





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

Below 1GHz

Antenna A

C11 18 and 26

Polarisation	Frequency (MHz)	QPeak Level (dBμV/m)	Limit (dBμV/m)
Vertical	37.7	15.99	29.5
Vertical	43.6	17.67	29.5
Vertical	48	23.22	29.5
Vertical	72	17.97	29.5
Vertical	132.6	15.23	33
Vertical	144	19.34	33
Vertical	168	19.87	33
Vertical	192	23.48	33
Vertical	200	24.07	33
Vertical	232	20.86	35.5
Vertical	250	19.29	35.5
Vertical	266.9	25.26	35.5
Vertical	271.5	24.9	35.5
Vertical	288	25.14	35.5
Vertical	300	21.87	35.5
Vertical	311	15.41	35.5
Vertical	321.4	25.77	35.5
Vertical	347.8	16.31	35.5
Vertical	366.3	24.9	35.5
Vertical	375	27.07	35.5
Vertical	384	27.6	35.5
Vertical	400	28.37	35.5
Vertical	450	25.45	35.5
Vertical	475	23.97	35.5
Vertical	508.4	21.63	35.5



Below 1GHz
Antenna A
C11 18 and 26

Polarisation	Frequency (MHz)	QPeak Level (dBµV/m)	Limit (dBµV/m)
Horizontal	144	16.65	33
Horizontal	154.4	16.12	33
Horizontal	168	18.81	33
Horizontal	180	20.43	33
Horizontal	200	23.93	33
Horizontal	216	23.3	35.5
Horizontal	232.4	17.47	35.5
Horizontal	250	24.6	35.5
Horizontal	266.9	16.18	35.5
Horizontal	300	25.33	35.5
Horizontal	336	26.34	35.5
Horizontal	366.3	26.88	35.5
Horizontal	371.9	23.45	35.5
Horizontal	400	23.5	35.5

Above 1GHz
Antenna A
C11

Polarisation	Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
Vertical	2372	38.3	43.5	43.3	63.5
Vertical	2388	32.4	43.5	41.7	65.5
Vertical	4810	39.3	43.5	51.9	63.5
Horizontal	2373	37.5	43.5	45.7	63.5
Horizontal	2389	33.3	43.5	42.8	63.5
Horizontal	4810	37.5	43.5	45.5	63.5

C18

Polarisation	Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
Vertical	4880	38.7	43.5	43.7	63.5
Vertical	7320	36.3	43.5	39.6	63.5
Horizontal	4880	36.6	43.5	44.9	63.5

C26

Polarisation	Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
Vertical	2483.5	39.9	43.5	58.5	63.5
Vertical	4960	37.4	43.5	43	63.5
Horizontal	2483.5	39.7	43.5	56.2	63.5
Horizontal	4960	34.2	43.5	41.9	63.5



Below 1GHz
Antenna B
C11 18 and 26

Polarisation	Frequency (MHz)	QPeak Level (dBµV/m)	Limit (dBµV/m)
Vertical	37.7	17.14	29.5
Vertical	43.6	14.21	29.5
Vertical	48	20.3	29.5
Vertical	72	17.97	29.5
Vertical	132.6	15.23	33
Vertical	144	19.34	33
Vertical	168	19.87	33
Vertical	192	23.48	33
Vertical	200	24.07	33
Vertical	232	20.86	35.5
Vertical	250	19.29	35.5
Vertical	266.9	25.26	35.5
Vertical	271.5	24.9	35.5
Vertical	288	25.14	35.5
Vertical	300	21.87	35.5
Vertical	311	15.41	35.5
Vertical	321.4	25.77	35.5
Vertical	347.8	16.31	35.5
Vertical	366.3	24.9	35.5
Vertical	384	27.6	35.5
Vertical	400	28.37	35.5
Vertical	508.4	21.63	35.5



Below 1GHz
Antenna B
C11 18 and 26

Polarisation	Frequency (MHz)	QPeak Level (dBµV/m)	Limit (dBµV/m)
Horizontal	144	16.65	33
Horizontal	154.4	16.12	33
Horizontal	168	18.81	33
Horizontal	180	20.43	33
Horizontal	200	23.93	33
Horizontal	216	23.3	33
Horizontal	232.4	17.47	35.5
Horizontal	250	24.6	35.5
Horizontal	266.9	16.18	35.5
Horizontal	288	16.31	35.5
Horizontal	300	25.33	35.5
Horizontal	336	26.34	35.5
Horizontal	366.3	26.88	35.5
Horizontal	371.9	23.45	35.5
Horizontal	384	18.15	35.5
Horizontal	400	23.5	35.5
Horizontal	450.1	29	35.5
Horizontal	475	20.09	35.5

Antenna B
above 1GHz
C11

Polarisation	Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
Vertical	2373	35	43.5	46.2	63.5
Vertical	2389	33.5	43.5	41	65.5
Vertical	4810	38.2	43.5	44.3	63.5
Horizontal	2373	38.7	43.5	41.5	63.5
Horizontal	2387	33.4	43.5	43.5	63.5
Horizontal	4810	39.4	43.5	42.3	63.5

C18

Polarisation	Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
Vertical	4880	38.7	43.5	44.7	63.5
Vertical	7320	36.2	43.5	40	63.5
Horizontal	4880	37.3	43.5	45.7	63.5



C26

Polarisation	Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
Vertical	2483.5	42.7	43.5	58.7	63.5
Vertical	4960	32.6	43.5	41.5	63.5
Horizontal	2483	41.6	43.5	55.4	63.5
Horizontal	4960	33.7	43.5	42.2	63.5

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

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
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2015/03	2016/03
Cable	sans; ATEM	SMA 0.5m	A5329645	2015/08	2016/08
Attenuator 3dB	MINI CIRCUITS	BW-S3W2+	A7122244	2015/10	2017/10
Cable	-	CASS-0627	A5329611	2015/04	2016/04
Cable	-	CASS-0627	A5329612	2015/04	2016/04
Load 50 ohms	DICONEX	17-3126	A7152019	2015/07	2016/07
Unwanted Emissions into Restricted Frequency Bands & Receiver Spurious Emissions					
Apparatus	Trade Mark	Type	Registration number	Calibration date	Calibration due
EMI receiver	ROHDE & SCHWARZ	ESI40 1088 740K40	A2642010	2015/05	2016/05
Measurement RF cable	-	-	A5329592	2014/05	2016/05
Attenuator 3dB	WEINSCHEL	WA54-3-12	A7122223	2015/06	2016/06
Rejector filter 2,4GHz	-	2.45GHz	A7484048	2015/12	2016/12
Rejector filter 2,4GHz	-	2.45GHz	A7484037	2015/11	2016/11
Open test site	LCIE	-	F2000400	2015-06	2016-06
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2015-12	2016-12
Preamplifier	HEWLETT PACKARD	8449B	A7080071	2015-07	2016-07
Bilog antenna	CHASE	CBL 6112A	C2040040	2015-04	2016-04
Horn antenna	EMCO	3115	C2042016	2015-03	2016-03
Cable	-	-	A5329368	2015-11	2016-11
cable	-	-	A5329444	2015-11	2016-11
Cable	-	-	A5329449	2015-11	2016-11
cable	-	-	A5329542	2015-02	2016-02
AC Power Line Conducted Emissions					
Apparatus	Trade Mark	Type	Registration number	Calibration date	Calibration due
Receiver	ROHDE & SCHWARZ	ESIB 26	A2642021	2015-12	2016-12
V ISLN	ROHDE & SCHWARZ	ESH2-Z5	C2322001	2015-06	2016-06
Pulse limiter	ROHDE & SCHWARZ	ESH3-Z2	A2649007	2015-07	2016-07
Cable	-	-	A5329417	2015-10	2016-10
Ground plane	LCIE	-	-	-	-



12. UNCERTAINTIES CHART

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