



LCIE

Bluetooth Low Energy Template: Release October 11th, 2019

TEST REPORT

N°: 164827-746022-A

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	MICROPORT CRM Parc d’Affaires NOVEOS - 4 avenue Réaumur 92143 Clamart FRANCE
Apparatus under test	Pacemaker MICROPORT CRM MICROPORT CRM s.r.l BOREA DR 1500 N38GF05A for radiated test N38G2062 for conducted test YSG1614 -
Conclusion	See Test Program chapter
Test date	December 9, 2019 to December 20, 2019
Test location	Fontenay Aux Roses & Ecuelles
Test Site	6230B-1
Sample receipt date	December 4, 2019
Composition of document	43 pages
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Fayette

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	March 26, 2020	Armand MAHOUGOU	Creation of the document

Each new edition of this test report replaces and cancels the previous edition. The control of the old editions of report is under responsibility of client.



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 v05r02
- 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 ↗	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP(1)
6dB Bandwidth ↗	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA() <input type="checkbox"/> NP(1)
Duty Cycle ↗	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP(1)
Maximum Conducted Output Power ↗	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP(1)
Power Spectral Density ↗	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP(1)
Conducted Spurious Emission at the Band Edge ↗	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA() <input type="checkbox"/> NP(1)
Unwanted Emissions into Non-Restricted Frequency Bands ↗	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA() <input type="checkbox"/> NP(1)
AC Power Line Conducted Emission ↗	<input type="checkbox"/> PASS <input type="checkbox"/> FAIL <input checked="" type="checkbox"/> NA(2) <input type="checkbox"/> NP(1)
Unwanted Emissions into Restricted Frequency Bands ↗	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP(1)
Receiver Radiated emissions ↗	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> 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 product **BOREA DR 1500**, SN: **N38GF05A**. See Table below for difference between products.

BOREA DR 1500	ALIZEA DR 1600	CELEA DR 1400
Tested product	Embedded Software is slightly different from BOREA. But these differences do not impact the radio functionality of the implant. The hardware and mechanical structure are strictly the same than BOREA.	Embedded Software is slightly different from BOREA. But these differences do not impact the radio functionality of the implant. The hardware and mechanical structure are strictly the same than BOREA.

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

BOREA DR 1500

Serial Number: N38GF05A for radiated test & N38G2062 for conducted test



Equipment Under Test



Power supply:

During all the tests, EUT is supplied by V_{nom} : **3.20VDC**
 For measurement with different voltage, it will be presented in test method.

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop computer	-	-	-
CPR3	-	CN1709012S	-
Dongle	-	XA1311038E	-

Equipment information:

Bluetooth LE Type:	<input type="checkbox"/> BLE	<input type="checkbox"/> v4.0	<input type="checkbox"/> v4.1	<input checked="" type="checkbox"/> v4.2
Frequency band:	[2400 – 2483.5] MHz			
Number of Channel:	40			
Spacing channel:	2MHz			
Channel bandwidth:	1MHz			
Antenna Type:	<input checked="" type="checkbox"/> Integral	<input type="checkbox"/> External	<input type="checkbox"/> Dedicated	
Antenna connector:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Temporary for test	
Transmit chains:	1 Single antenna			
Receiver chains	1			
Type of equipment:	<input checked="" type="checkbox"/> Stand-alone	<input type="checkbox"/> Plug-in	<input type="checkbox"/> Combined	
Duty cycle:	<input checked="" type="checkbox"/> Continuous duty	<input type="checkbox"/> Intermittent duty	<input type="checkbox"/> 100% duty	
Equipment type:	<input checked="" type="checkbox"/> Production model		<input type="checkbox"/> Pre-production model	
Operating temperature range:	Tmin:	<input type="checkbox"/> -20°C	<input type="checkbox"/> 0°C	<input checked="" type="checkbox"/> 25°C
	Tnom:	27°C		
	Tmax:	<input type="checkbox"/> 35°C	<input type="checkbox"/> 55°C	<input checked="" type="checkbox"/> 45°C
Type of power source:	<input type="checkbox"/> AC power supply	<input type="checkbox"/> DC power supply	<input checked="" type="checkbox"/> Battery	
Operating voltage range:	V_{nom} :	<input type="checkbox"/> 120V/60Hz	<input checked="" type="checkbox"/> 3.2 Vdc	
		<input type="checkbox"/> 240V/50Hz	<input type="checkbox"/> X Vdc	

Antenna Characteristic			
Antenna assembly	Gain (dBi)	Frequency Band (MHz)	Impedance(Ω)
1	-22,7	2400-2483.5	50

Hardware information		
Software (if applicable):	V. :	ROM V2.48

CHANNEL PLAN			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
Cmin: 0	2402	Cmid: 20	2442
1	2404	21	2444



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2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
19	2440	Cmax: 39	2480

DATA RATE		
Data Rate (Mbps)	Modulation Type	Worst Case Modulation
1	GFSK	<input checked="" type="checkbox"/>

2.3. RUNNING MODE

Test mode	Description of test mode	
Test mode 1	Permanent emission with modulation on a fixed channel in the data rate that produced the highest power	
Test	Running mode	
Occupied Bandwidth	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
6dB Bandwidth	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
Duty Cycle	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
Maximum Conducted Output Power	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
Power Spectral Density	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
Conducted Spurious Emission at the Band Edge	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
Unwanted Emissions into Non-Restricted Frequency Bands	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
Unwanted Emissions into Restricted Frequency Bands	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()

2.4. EQUIPMENT LABELLING



2.5. EQUIPMENT MODIFICATION

None Modification:

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU
Date of test : December 12, 2019
Ambient temperature : 26°C
Relative humidity : 49%

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:

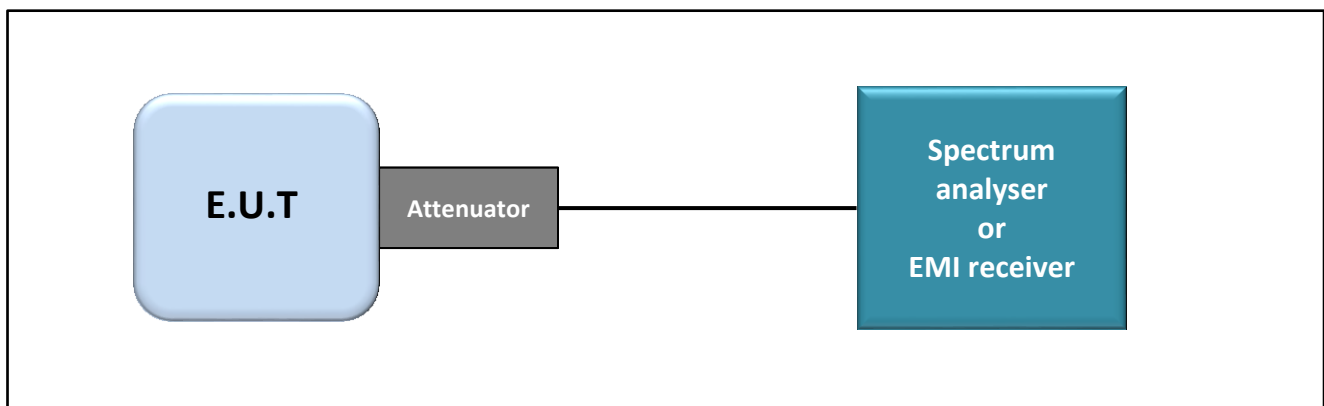
- Conducted Method
- Radiated Method

- Test Procedure:

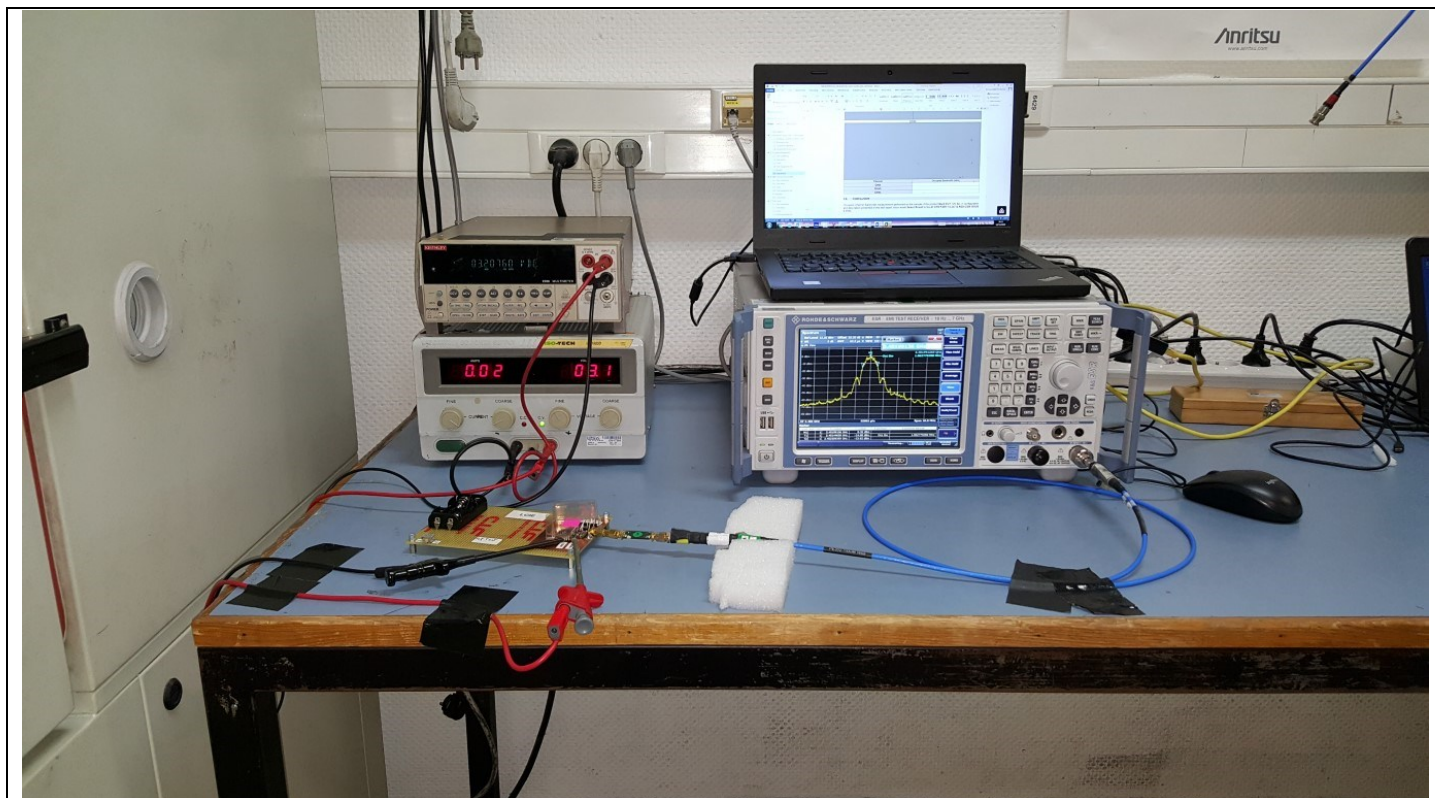
- RSS-Gen Issue 5 § 6.7
- ANSI C63.10 § 6.9.2

Measurement Procedure:

- a) RBW shall be in the range of 1% to 5% of the anticipated occupied bandwidth
- b) Set the video bandwidth (VBW) $\geq 3 \times$ RBW
- c) SPAN = Capture all products of the modulation process
- d) Detector = Peak.
- e) Trace mode = max hold.
- f) Sweep = auto couple.
- g) Allow the trace to stabilize.
- h) OBW 99% function of spectrum analyzer used



Test set up of Occupied Bandwidth



Photograph for Occupied bandwidth

3.3. LIMIT

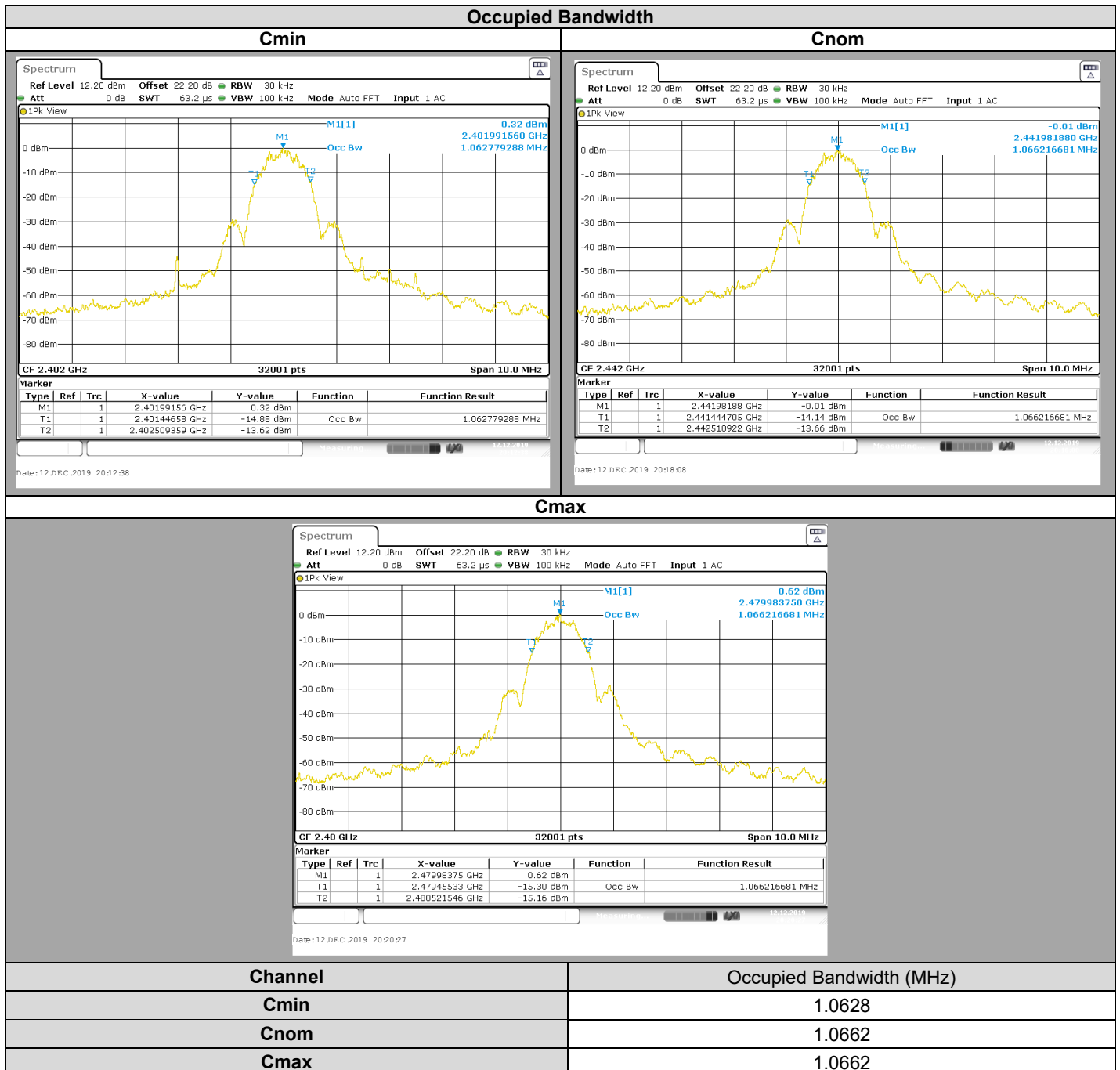
None

3.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable + Attenuateur 20dB	PASTERNAK	PE350-150CM	A5329866	2018/12	2019/12
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2019/01	2021/01
Multimeter	KEITHLEY	2000	A1242090	2019/05	2021/05
DC Power Supply	ISOTECH	IPS1603D	A7042247	See Multimeter	See Multimeter

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

3.5. RESULTS



3.6. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **MICROPORT CRM BOREA DR 1500**, SN: **N38G2062**, 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 : Armand MAHOUNGOU
Date of test : December 12, 2019
Ambient temperature : 26°C
Relative humidity : 49%

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:

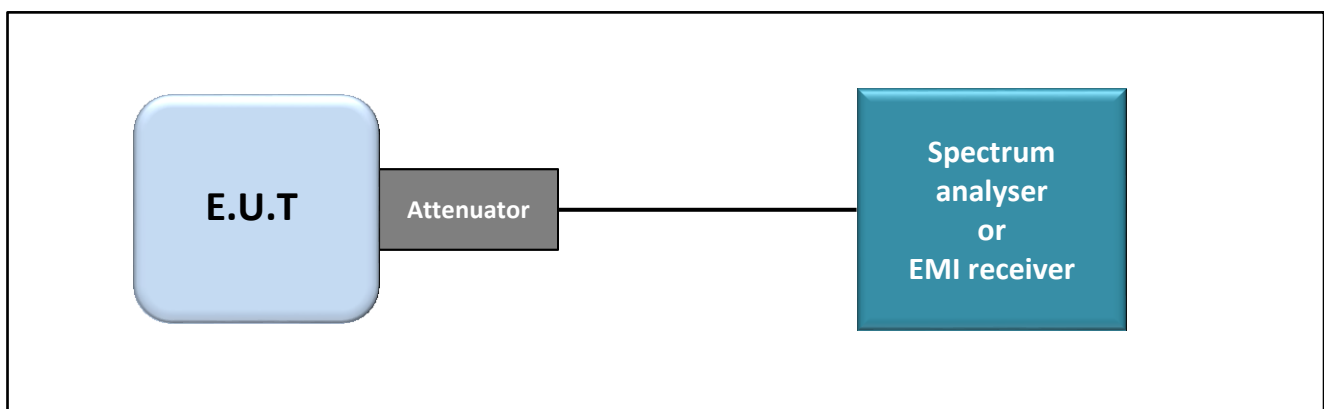
- Conducted Method
- Radiated Method

- Test Procedure:

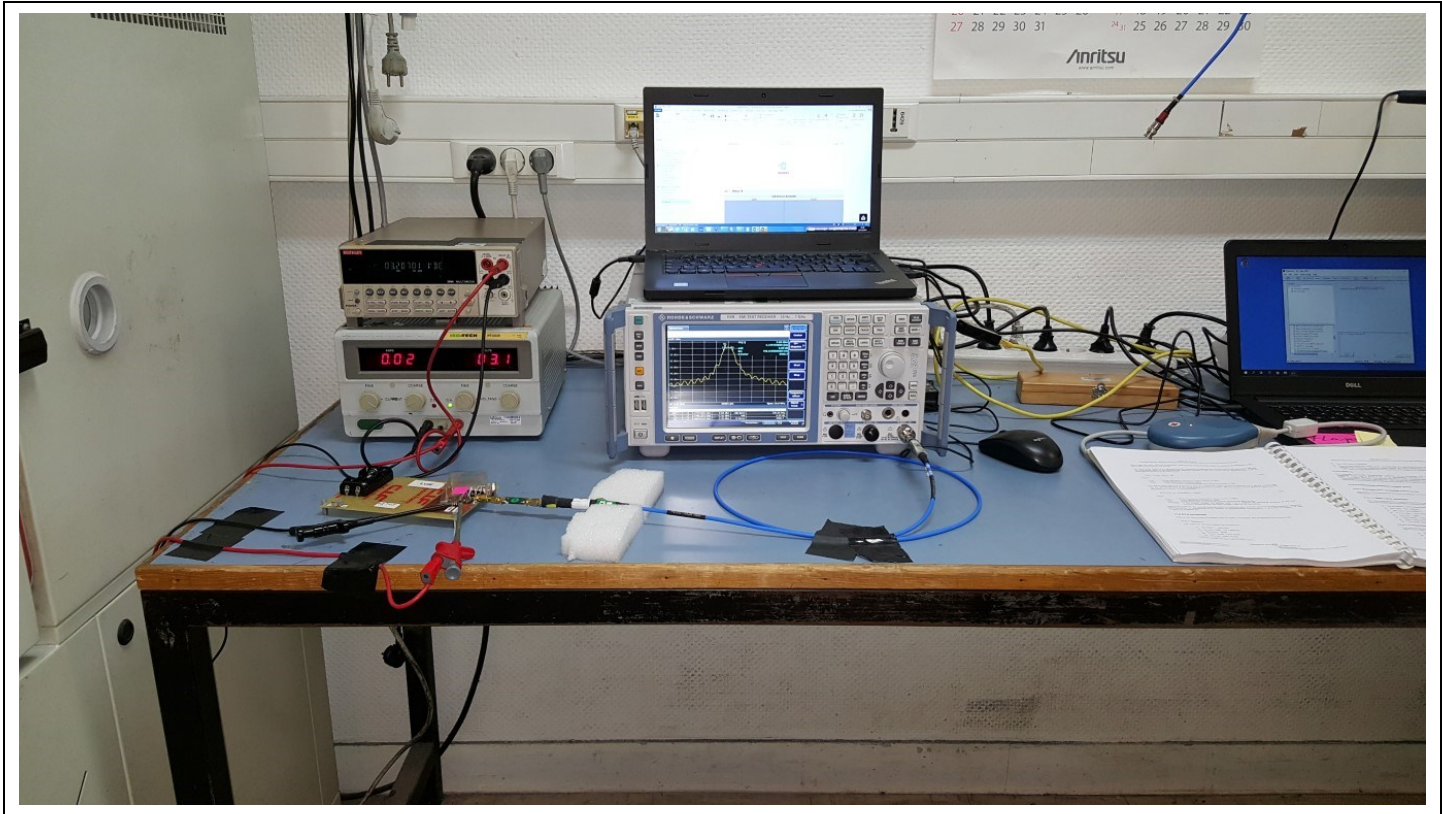
- ANSI C63.10 § 11.8.1
- ANSI C63.10 § 11.8.2

Measurement Procedure:

1. Set resolution bandwidth (RBW) = 100kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer.



Test set up of 6dB Emission Bandwidth



Photograph for 6dB emission bandwidth

4.3. LIMIT

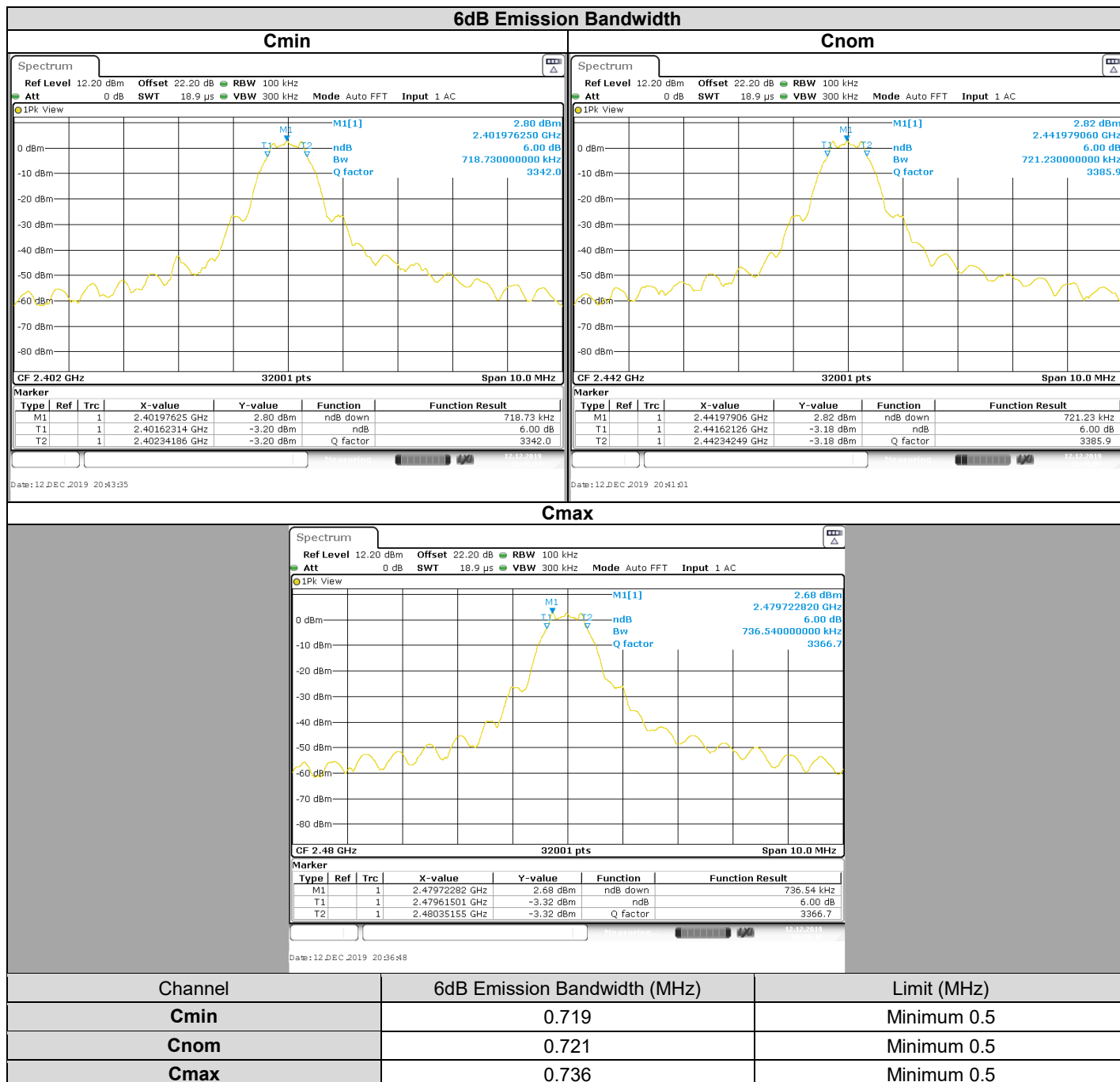
Frequency range	The 6dB bandwidth Limit
2400MHz to 2483.5MHz	≥ 500kHz

4.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable + Attenuateur 20dB	PASTERNAK	PE350-150CM	A5329866	2018/12	2019/12
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2019/01	2021/01
Multimeter	KEITHLEY	2000	A1242090	2019/05	2021/05
DC Power Supply	ISOTECH	IPS1603D	A7042247	See Multimeter	See Multimeter

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 **MICROPORT CRM BOREA DR 1500**, SN: **N38G2062**, 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 : Armand MAHOUNGOU
Date of test : December 12, 2019
Ambient temperature : 26°C
Relative humidity : 49%

5.2. TEST SETUP

- The Equipment under Test is installed:

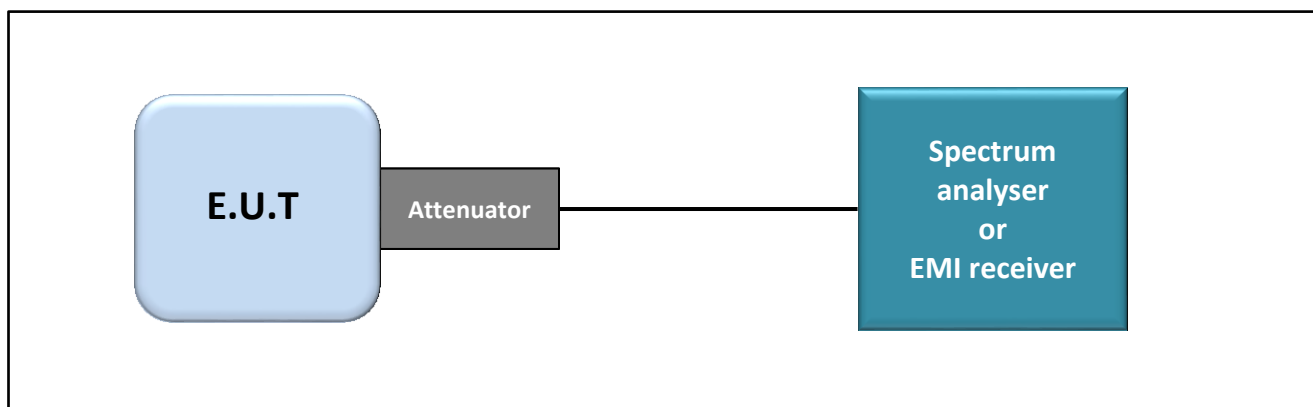
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

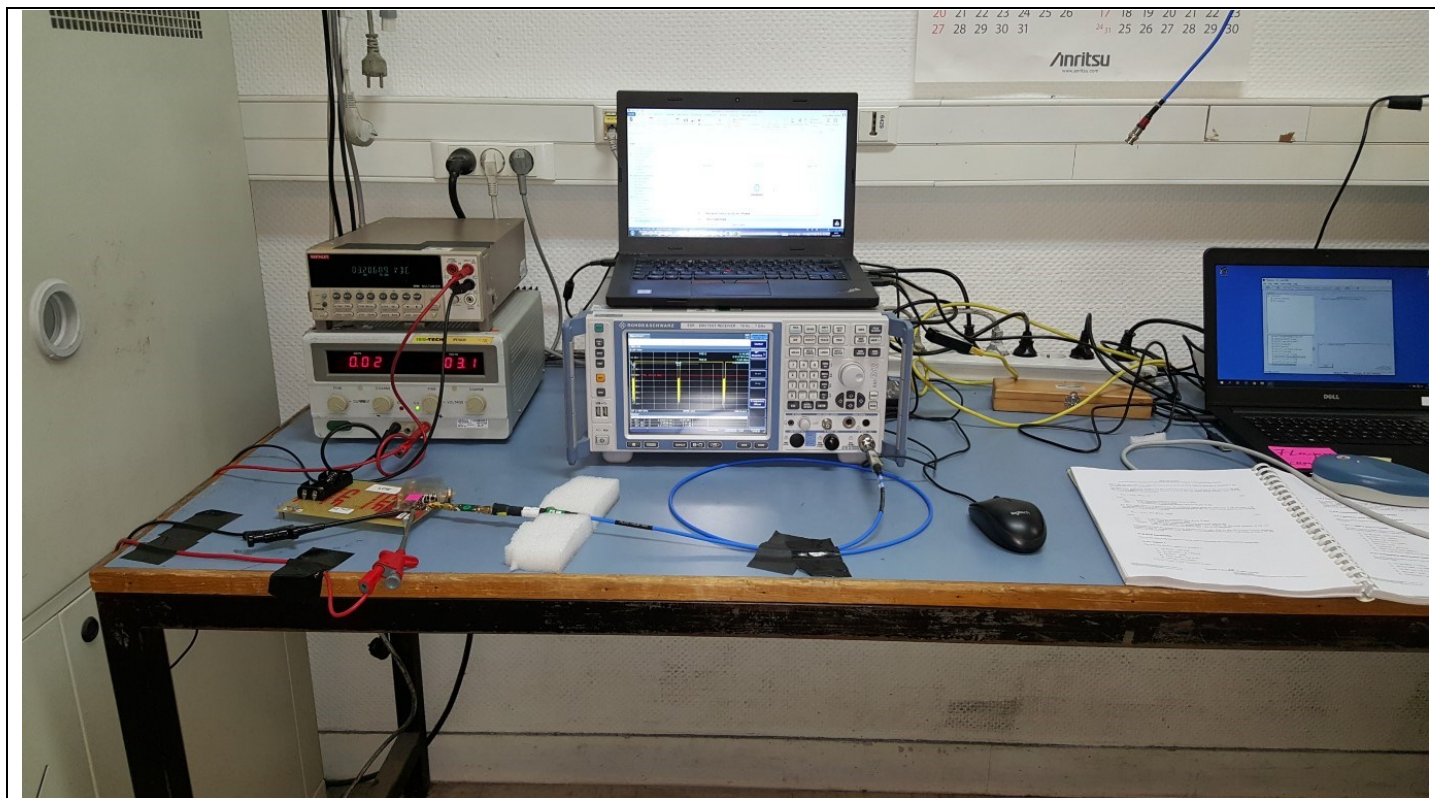
- Conducted Method
- Radiated Method

- Test Procedure:

- ANSI C63.10 § 11.6



Test set up of Duty Cycle



Photograph for Duty Cycle

5.3. LIMIT

None

5.4. TEST EQUIPMENT LIST

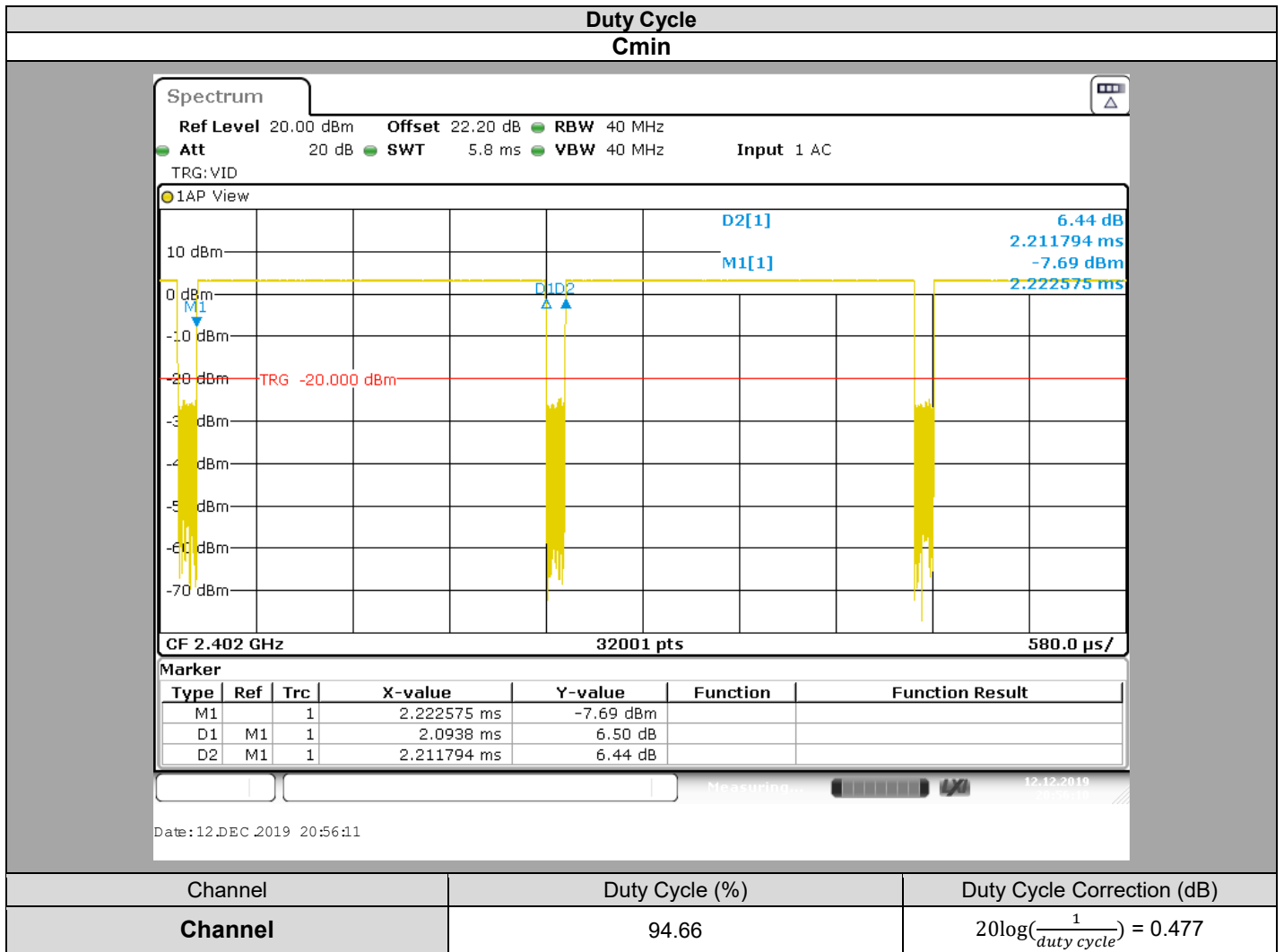
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable + Attenuateur 20dB	PASTERNAK	PE350-150CM	A5329866	2018/12	2019/12
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2019/01	2021/01
Multimeter	KEITHLEY	2000	A1242090	2019/05	2021/05
DC Power Supply	ISOTECH	IPS1603D	A7042247	See Multimeter	See Multimeter

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



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5.5. RESULTS



5.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **MICROPORT CRM BOREA DR 1500**, SN: **N38G2062**, 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 : Armand MAHOUGOU
Date of test : December 12, 2019
Ambient temperature : 26°C
Relative humidity : 49%

6.2. TEST SETUP

- The Equipment under Test is installed:

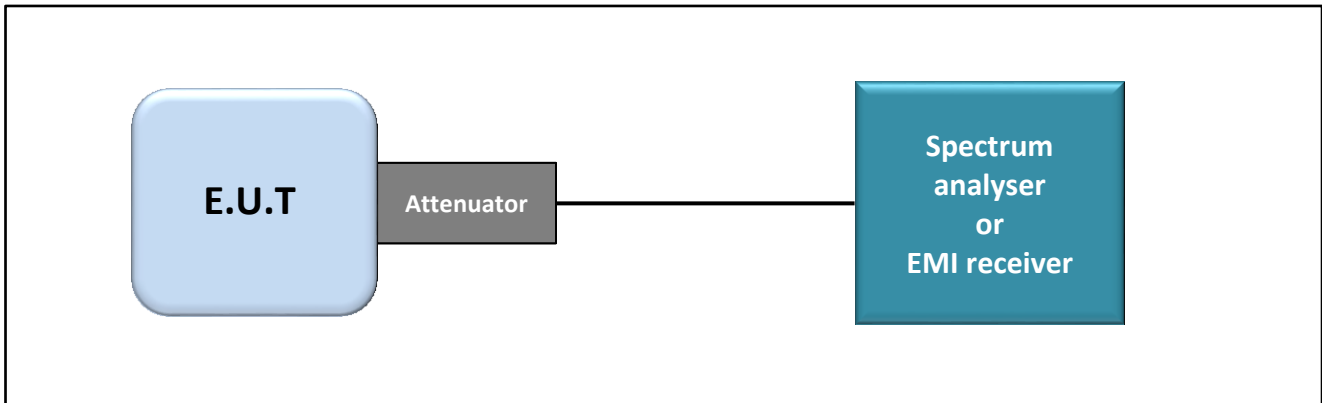
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

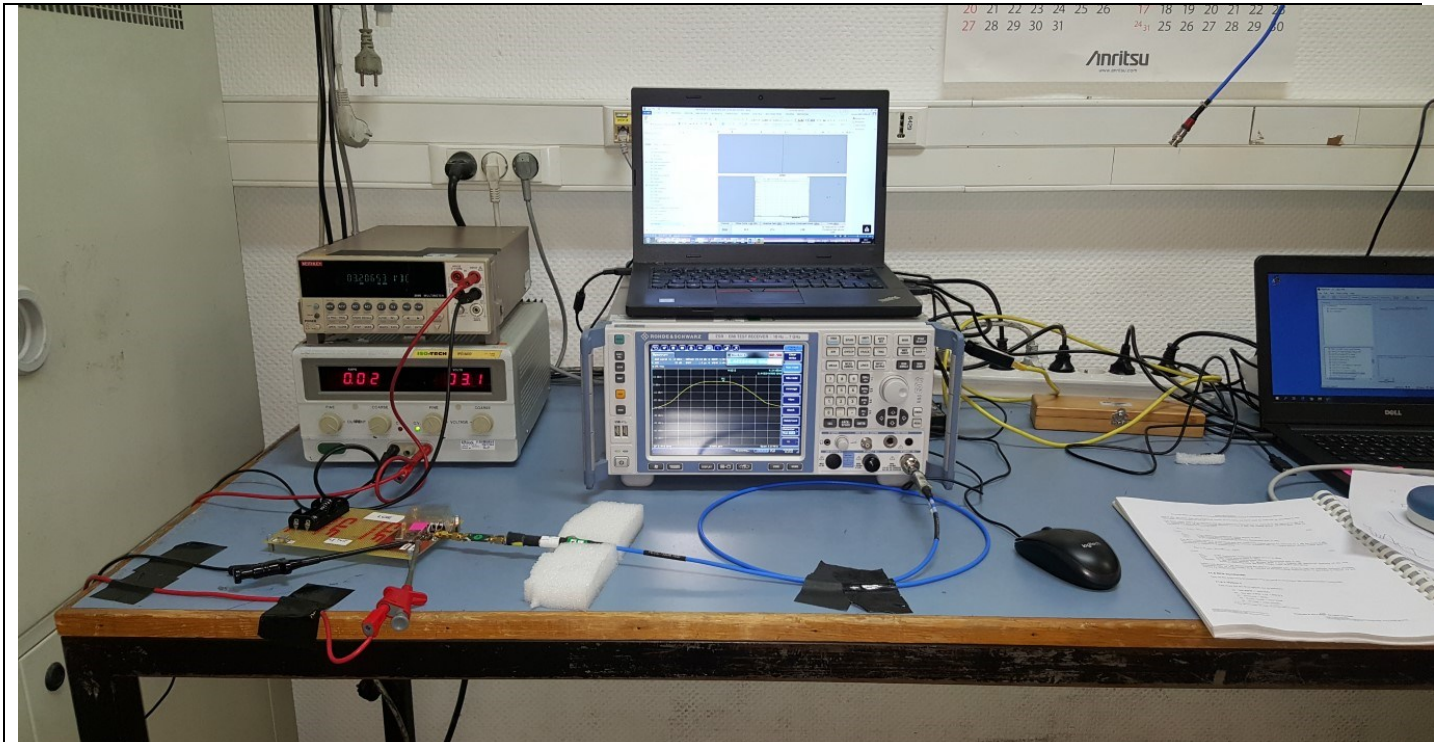
- ANSI C63.10 § 11.9.1.1
- ANSI C63.10 § 11.9.1.2
- ANSI C63.10 § 11.9.2.2.2 (Method AVGSA-1)
- ANSI C63.10 § 11.9.2.2.4 (Method AVGSA-2)



Test set up of Maximum Conducted Output Power



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Photograph for Maximum Conducted Output Power

6.3. LIMIT

Frequency range	Maximum Conducted Output Power
2400MHz to 2483.5MHz	≤30dBm*

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

6.4. TEST EQUIPMENT LIST

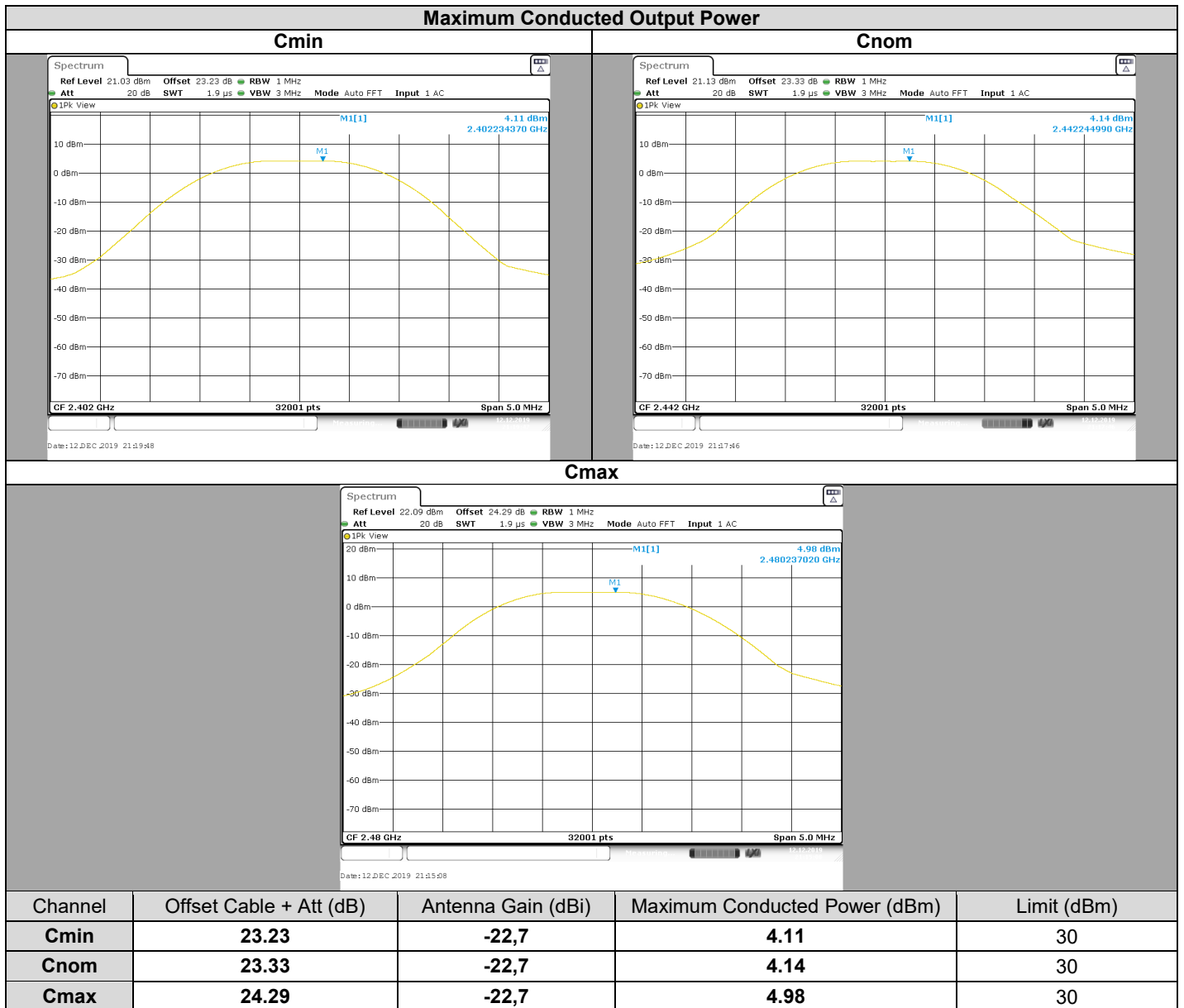
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable + Attenuateur 20dB	PASTERNAK	PE350-150CM	A5329866	2018/12	2019/12
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2019/01	2021/01
Multimeter	KEITHLEY	2000	A1242090	2019/05	2021/05
DC Power Supply	ISOTECH	IPS1603D	A7042247	See Multimeter	See Multimeter

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



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6.5. RESULTS



6.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **MICROPORT CRM BOREA DR 1500**, SN: **N38G2062**, 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 : Armand MAHOUNGOU
Date of test : December 12, 2019
Ambient temperature : 26°C
Relative humidity : 49%

7.2. TEST SETUP

- The Equipment Under Test is installed:

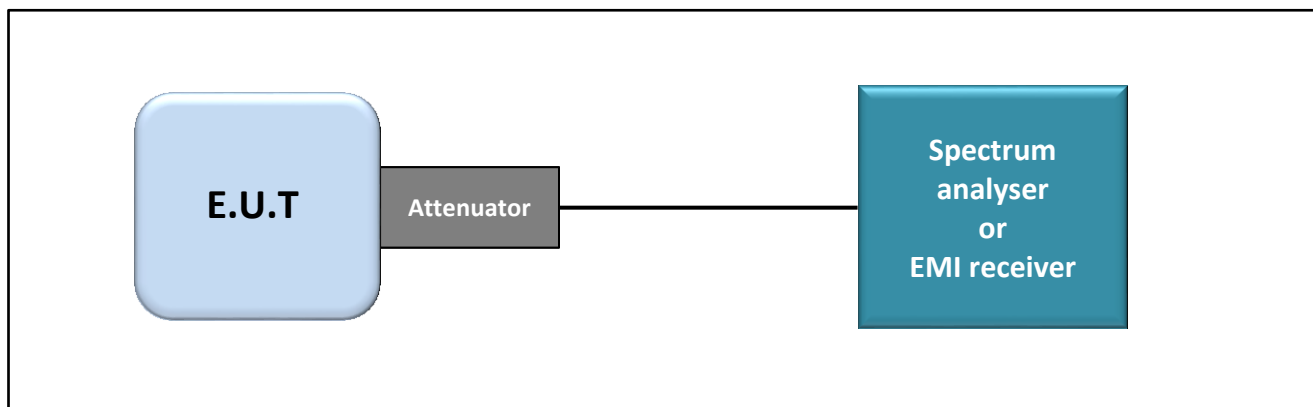
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

- Test Procedure:

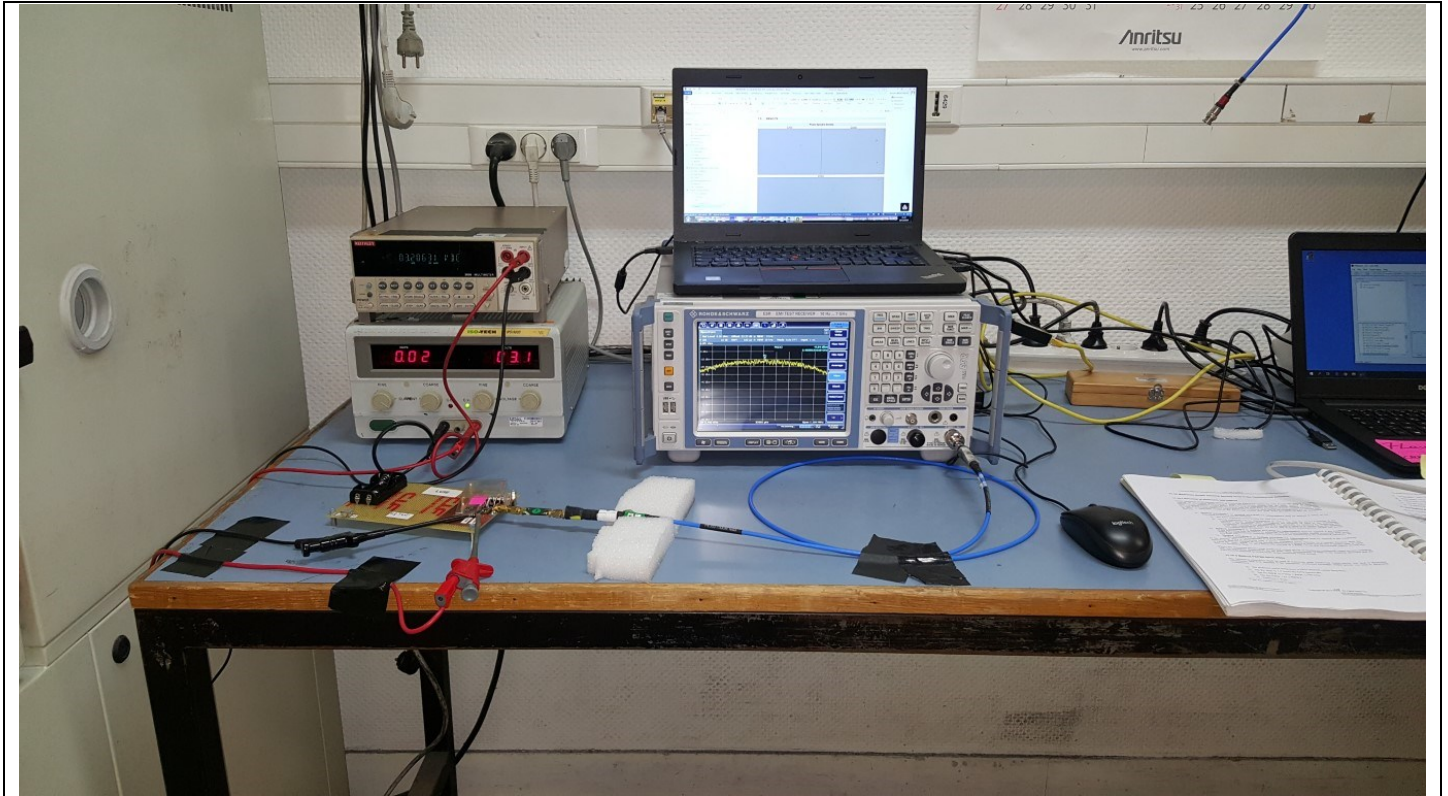
- ANSI C63.10 § 11.10.2 (Method PKPSD)
- ANSI C63.10 § 11.10.3 (Method AVGPS-1)



Test set up of Power Spectral Density



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Photograph for Power Spectral Density

7.3. LIMIT

Frequency range	Power Spectral Density
2400MHz to 2483.5MHz	$\leq 8\text{dBm}/3\text{kHz}^*$

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

7.4. TEST EQUIPMENT LIST

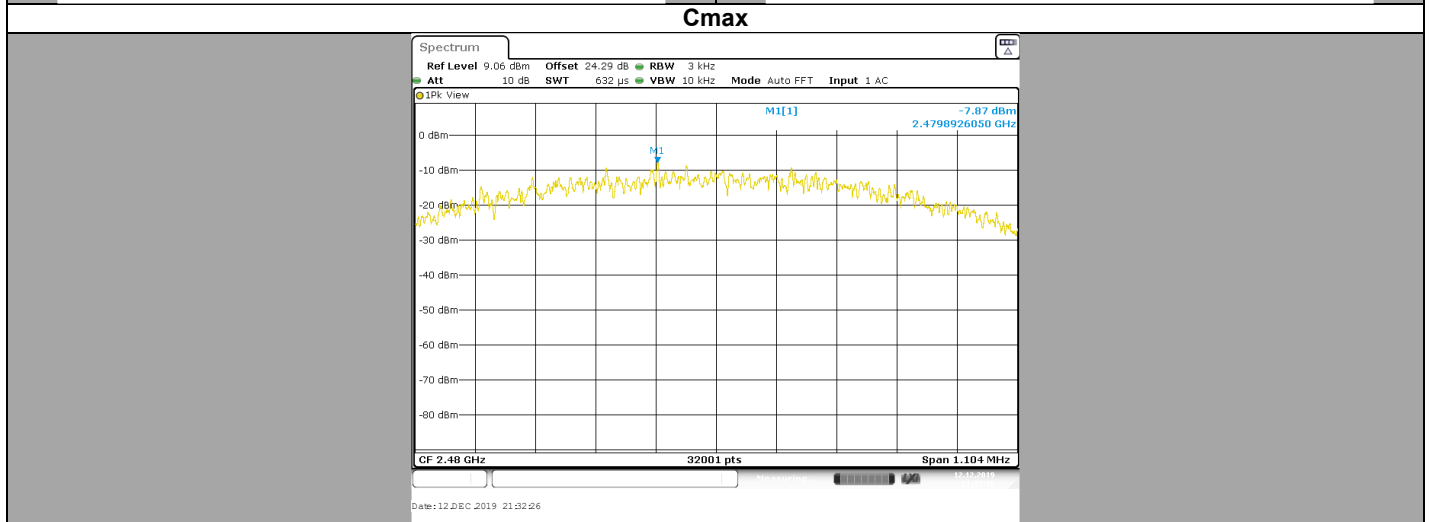
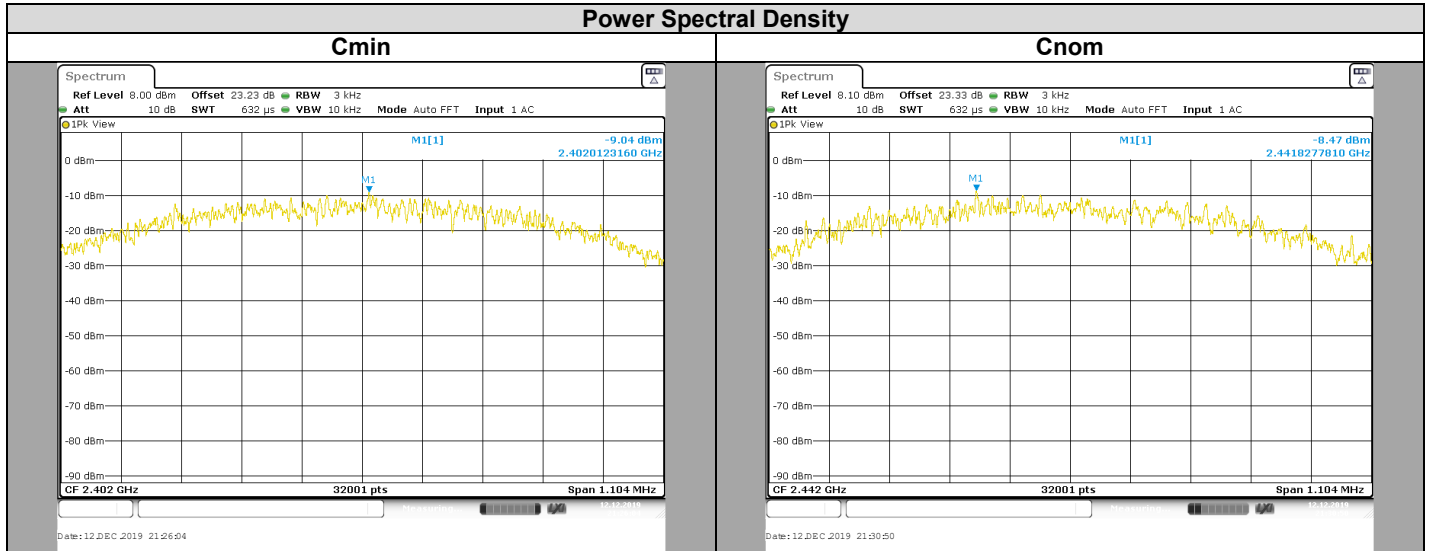
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable + Attenuateur 20dB	PASTERNAK	PE350-150CM	A5329866	2018/12	2019/12
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2019/01	2021/01
Multimeter	KEITHLEY	2000	A1242090	2019/05	2021/05
DC Power Supply	ISOTECH	IPS1603D	A7042247	See Multimeter	See Multimeter

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



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7.5. RESULTS



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Cmin	23.23	-22,7	-9.04	8
Cnom	23.33	-22,7	-8.47	8
Cmax	24.29	-22,7	-7.87	8

7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **MICROPORT CRM BOREA DR 1500**, SN: **N38G2062**, 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 : Armand MAHOUNGOU
Date of test : December 12, 2019
Ambient temperature : 26°C
Relative humidity : 49%

8.2. TEST SETUP

- The Equipment Under Test is installed:

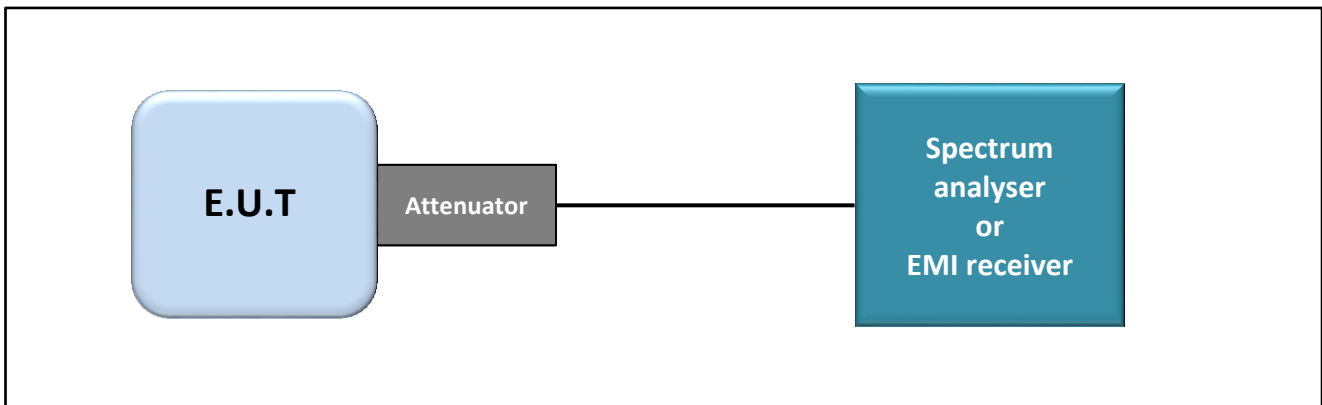
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

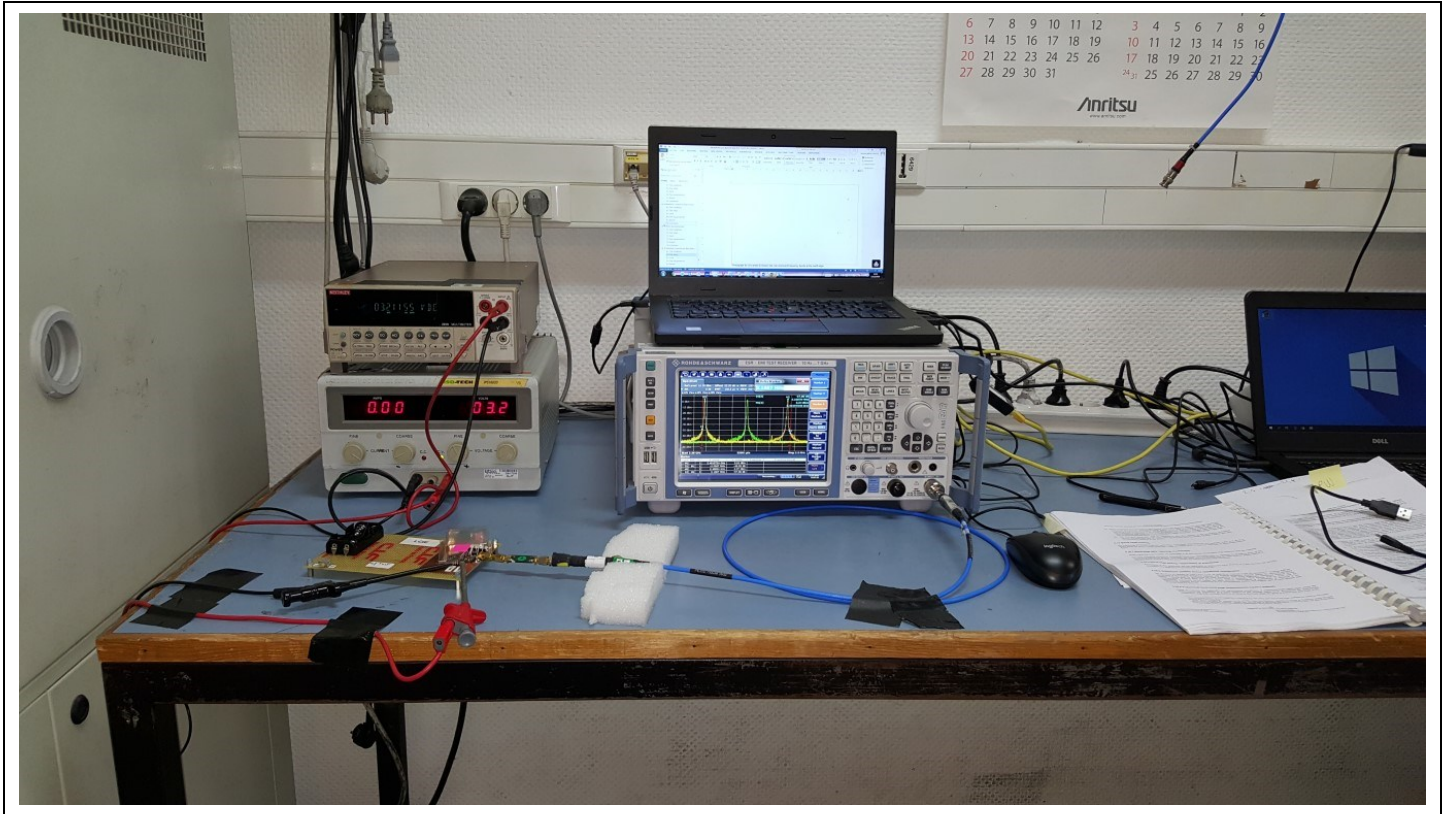
- Conducted Method
- Radiated Method

- Test Procedure:

- ANSI C63.10 § 11.11



Test set up of Unwanted Emissions into Non-Restricted Frequency Bands at the Band Edge



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 Conduced Power) below the Fundamental Radiator Level at the Band Edge "2400MHz & 2483,5MHz"

8.4. TEST EQUIPMENT LIST

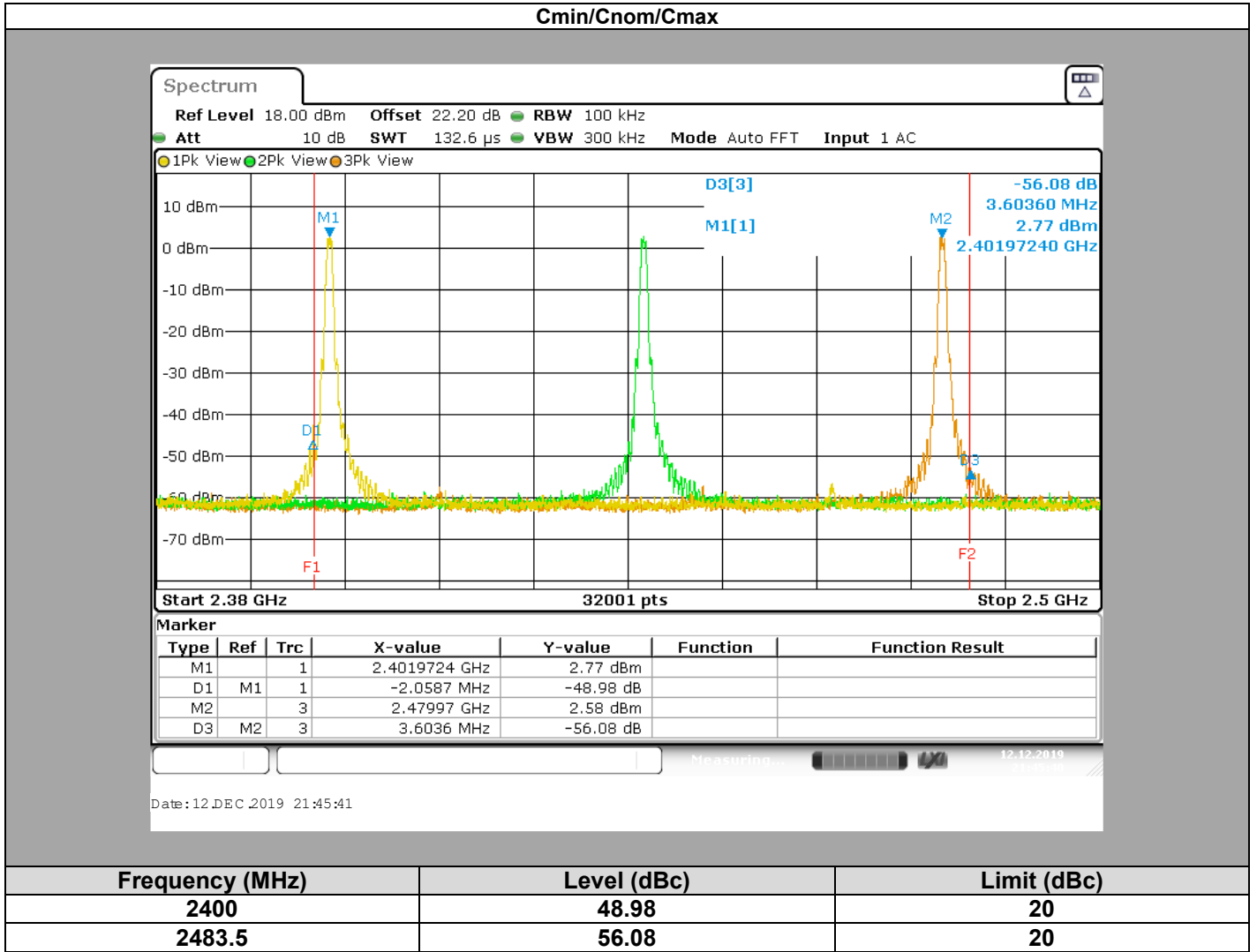
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable + Attenuateur 20dB	PASTERNAK	PE350-150CM	A5329866	2018/12	2019/12
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2019/01	2021/01
Multimeter	KEITHLEY	2000	A1242090	2019/05	2021/05
DC Power Supply	ISOTECH	IPS1603D	A7042247	See Multimeter	See Multimeter

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



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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 **MICROPORT CRM BOREA DR 1500**, SN: **N38G2062**, 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 : December 10, 2019
Ambient temperature : 24°C
Relative humidity : 48%

9.2. TEST SETUP

- The Equipment under Test is installed:

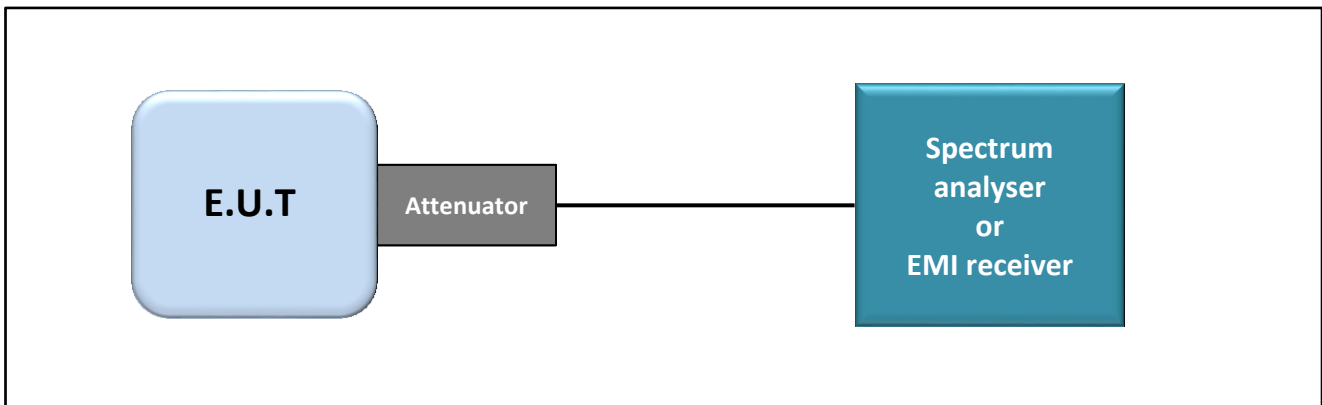
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

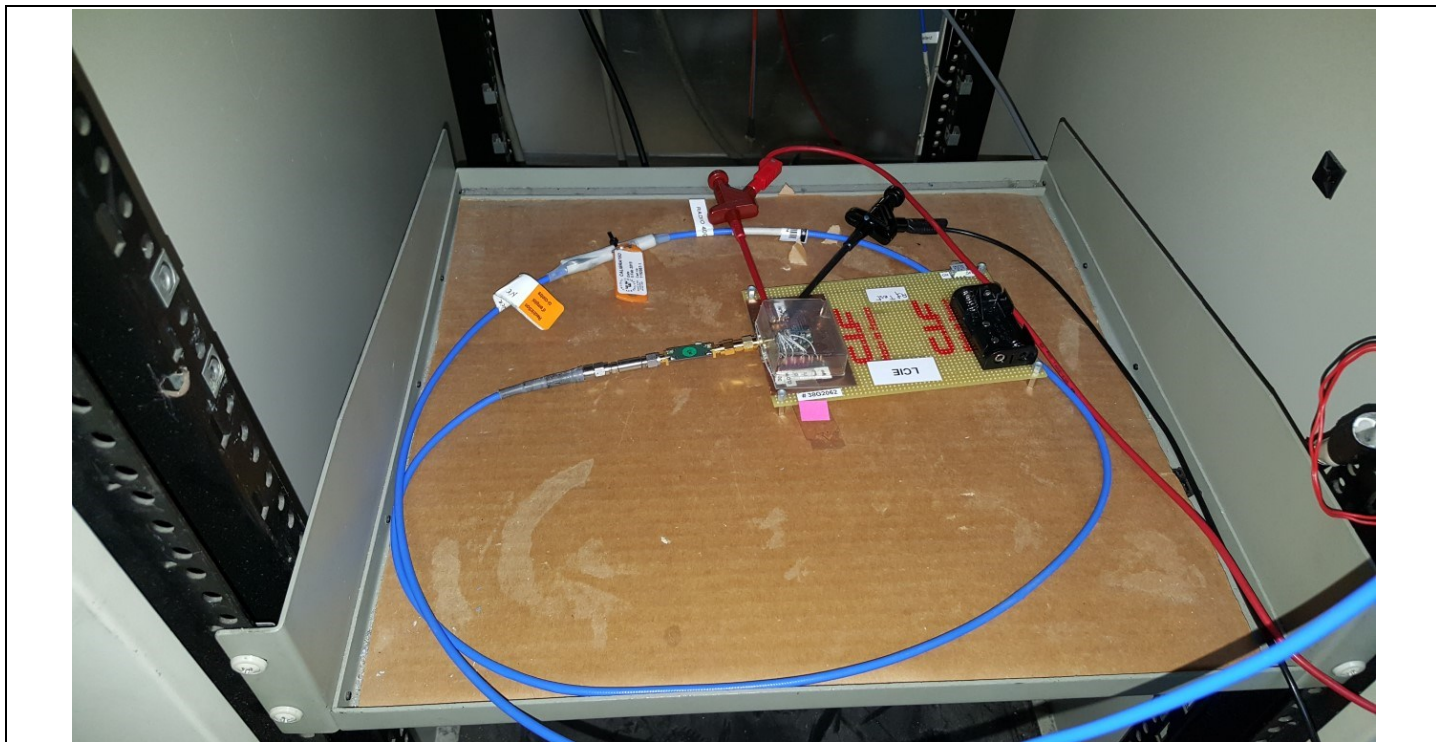
- Conducted Method
- Radiated Method

- Test Procedure:

- ANSI C63.10 § 11.11



Test set up of Unwanted Emissions into Non-Restricted Frequency Bands



Photograph for Unwanted Emission into non-restricted frequency bands



Photograph for Unwanted Emission into non-restricted frequency bands



9.3. LIMIT

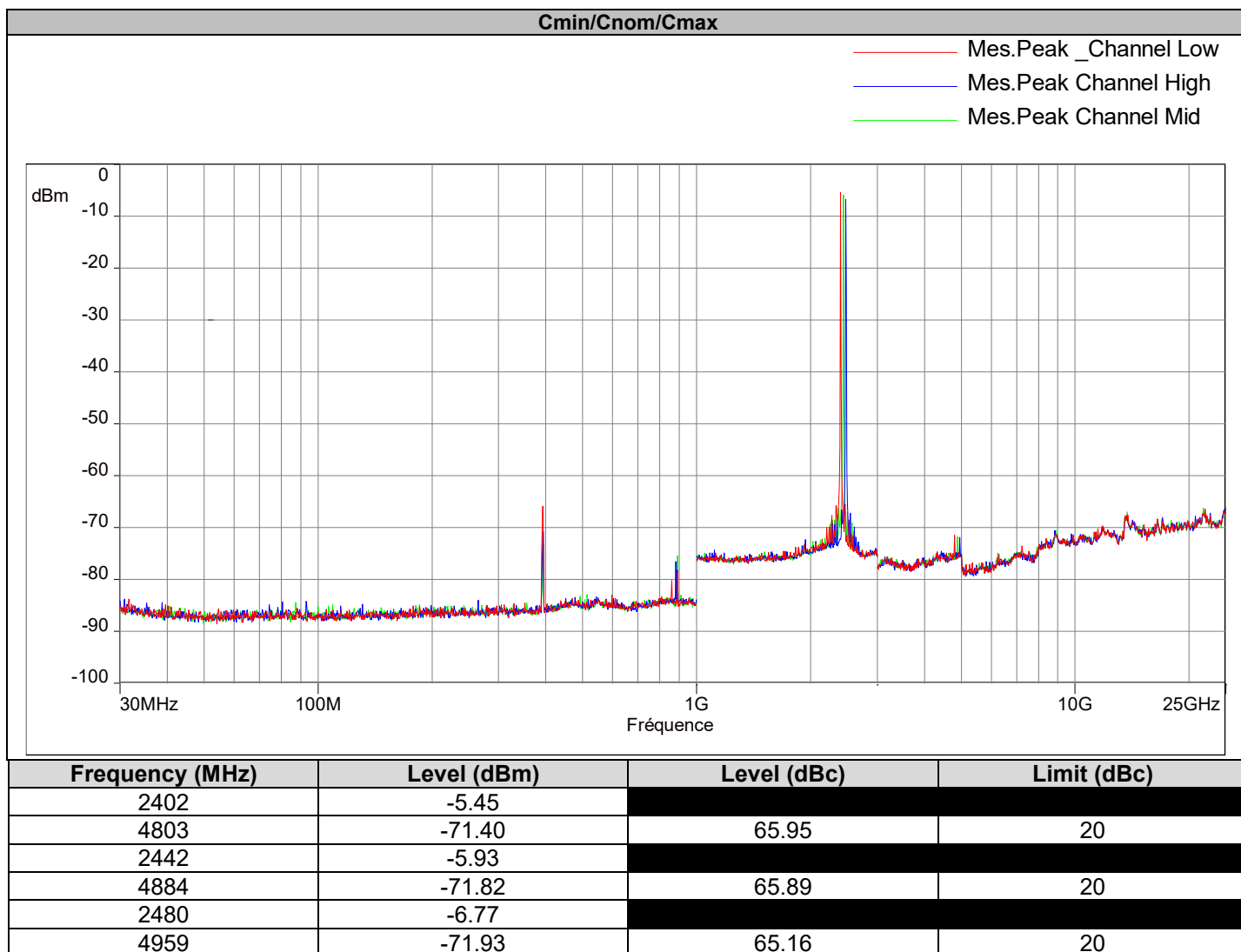
All Spurious Emissions must be at least 20dB (Maximum Conducted Power) below the Fundamental Radiator Level

9.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
EMI Receiver	ROHDE & SCHWARZ	ESU26	A2642018	2019/01	2021/01
Multimeter	KEITHLEY	2000	A1242090	2019/05	2021/05
DC Power Supply	ISOTECH	IPS1603D	A7042247	See Multimeter	See Multimeter
High Pass Filter 2,4GHz	WAINWRIGHT	WHK12-2494	A7484068	2019/07	2021/07
Cable Conducted S36 chamber	TELEDYNE	084-0555-2MTR	A5329758	2019/02	2020/02
Attenuator 3dB Cable Spurious Conducted	-	WA54-3-12	A7122223	2019/02	2020/02

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 **MICROPORT CRM BOREA DR 1500**, SN: **N38G2062**, 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. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

10.1. TEST CONDITIONS

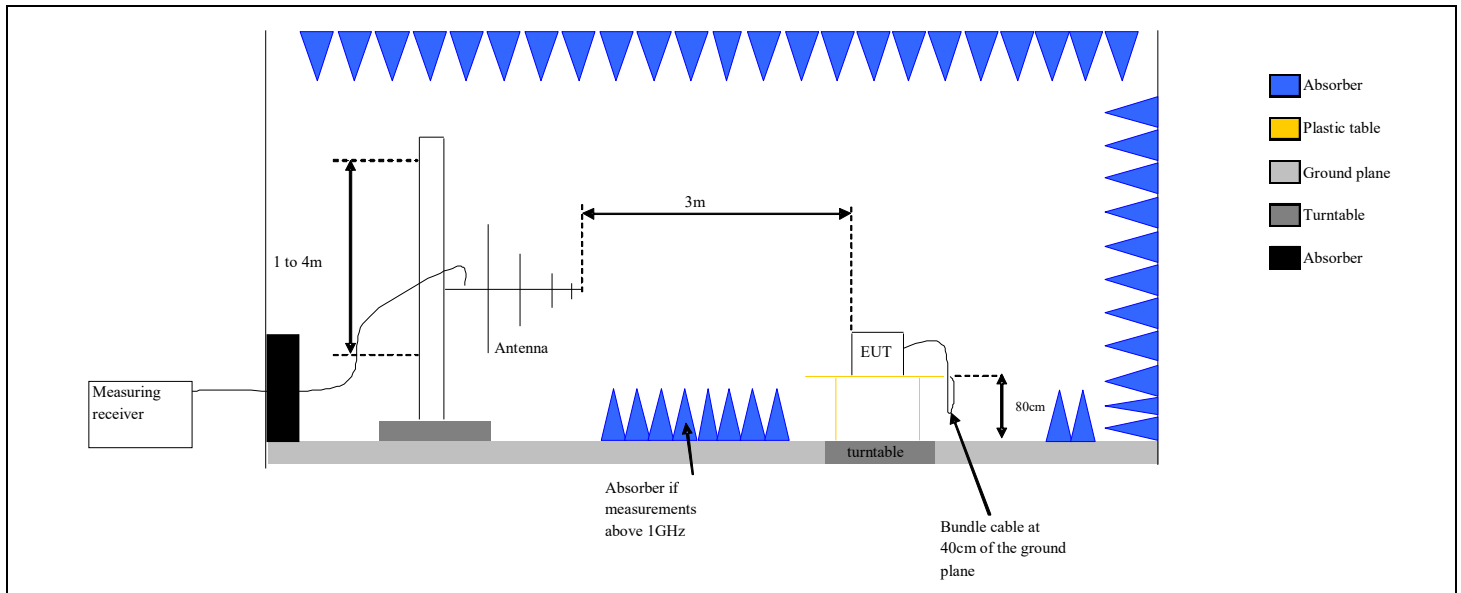
Test performed by : Laurent DENEUX & Armand MAHOUNGOU
 Date of test : December 4, 2019 to December 11, 2019
 Ambient temperature : 22°C & 26°C
 Relative humidity : 44% & 48%

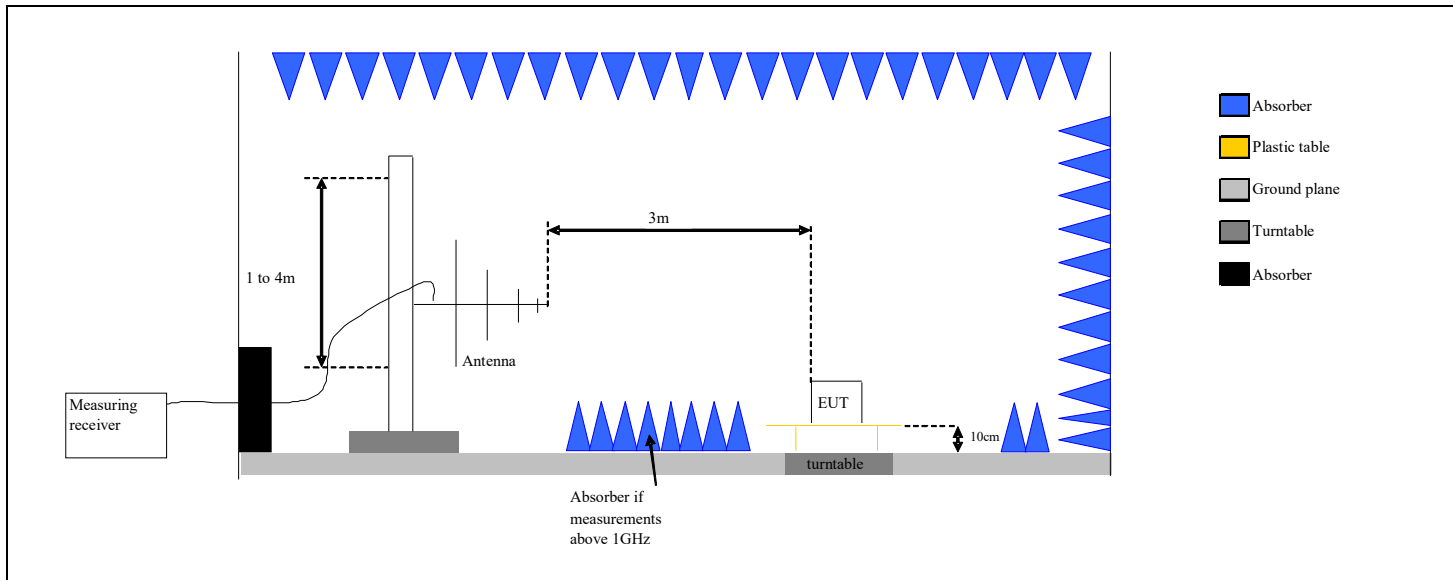
10.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013) and FCC part15 subpart C.

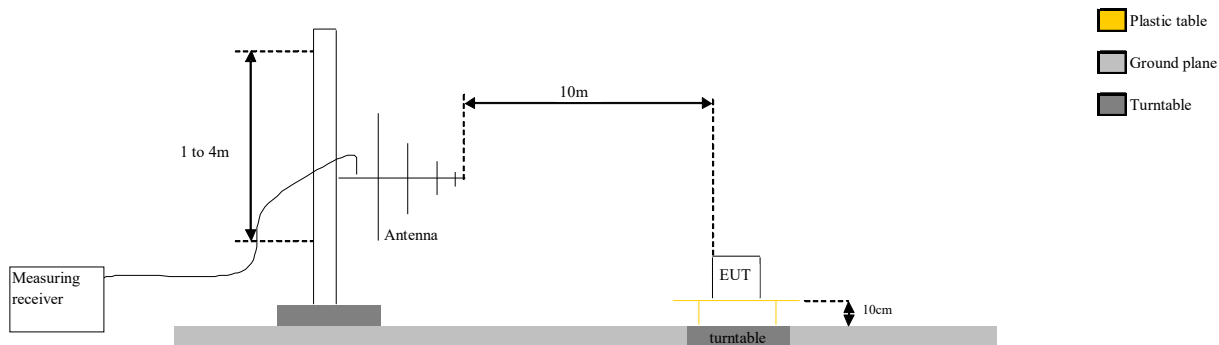
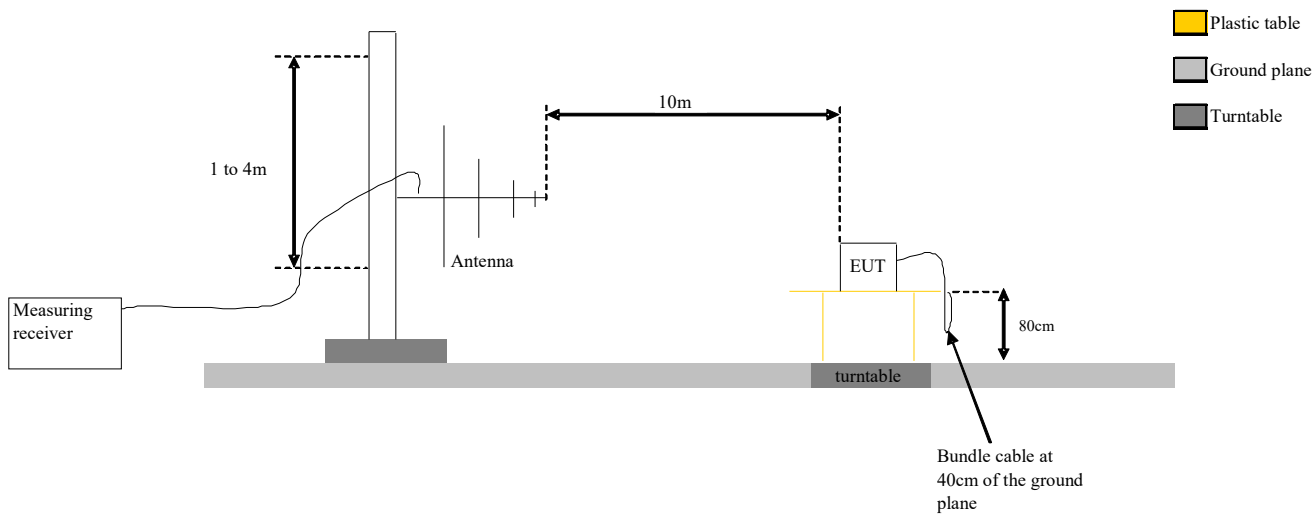
Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height was 1m. The EUT is placed **on an open area test site**. Distance between measuring antenna and the EUT is **10m**.

Test is performed in horizontal (H) and vertical (V) polarization with **bilog** between 30MHz & 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. The EUT is placed **in a full anechoic chamber** above 1GHz and **on an open area test site** from 30MHz to 1GHz. Distance between measuring antenna and the EUT is **3m**.





Test set up of Unwanted Emissions in Restricted Frequency Bands in semi anechoic chamber



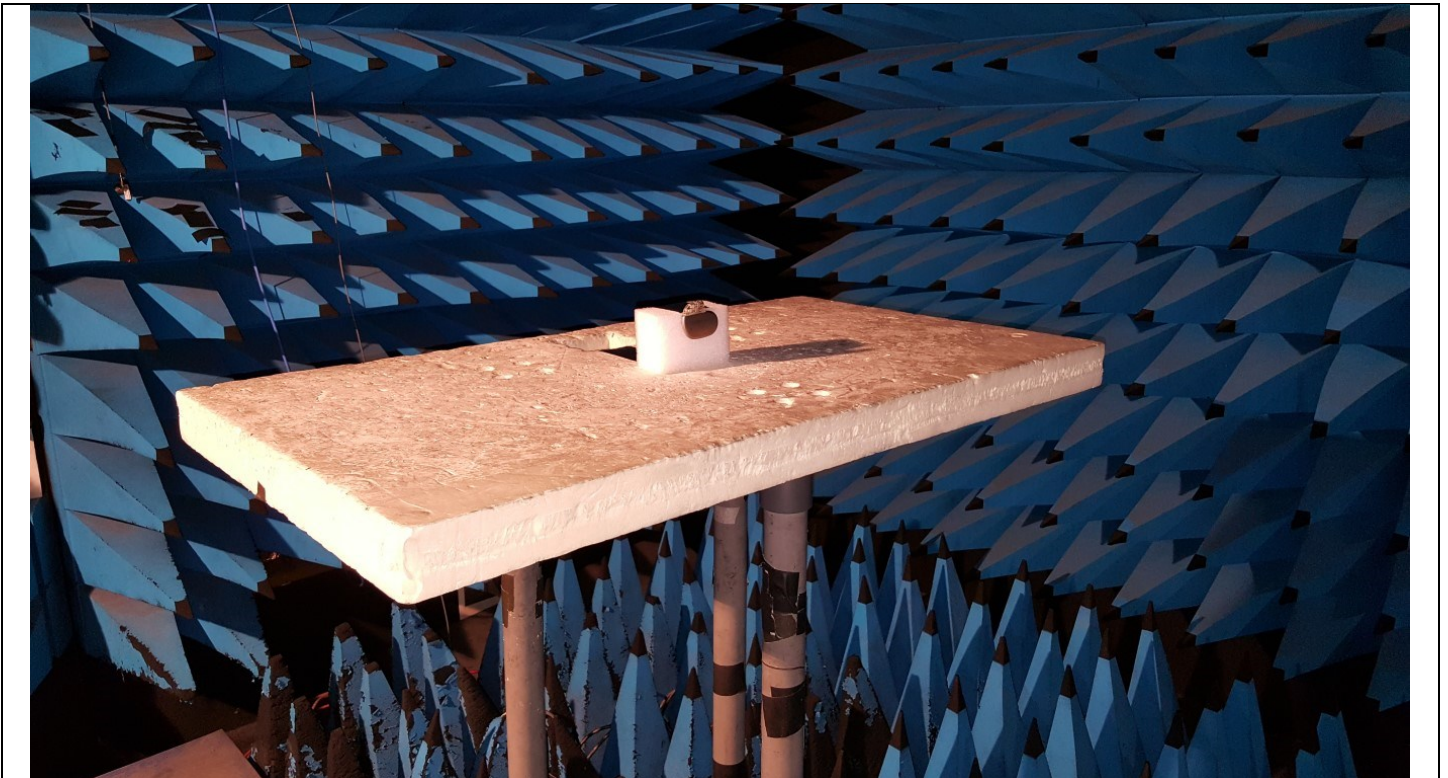
Test Set up for radiated measurement in open area test site



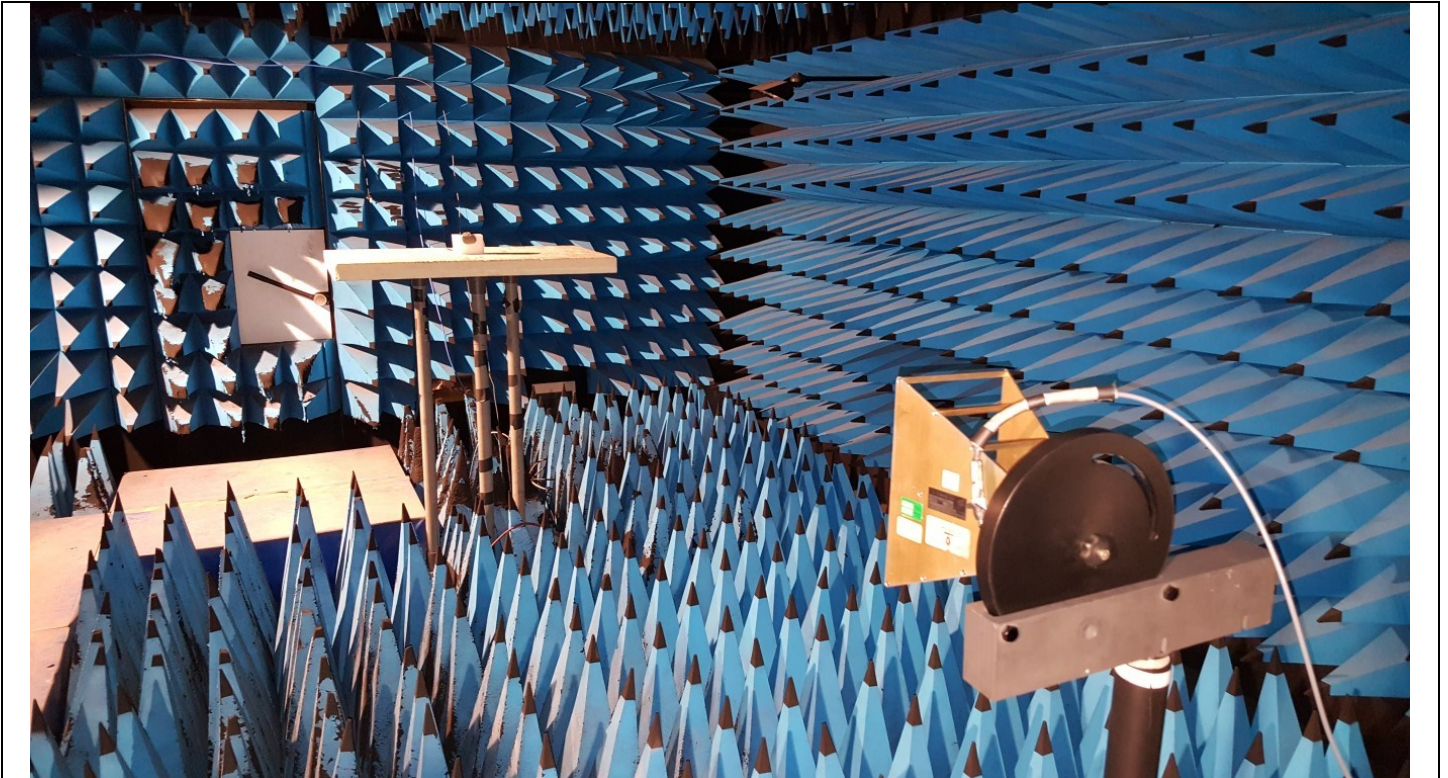
L C I E



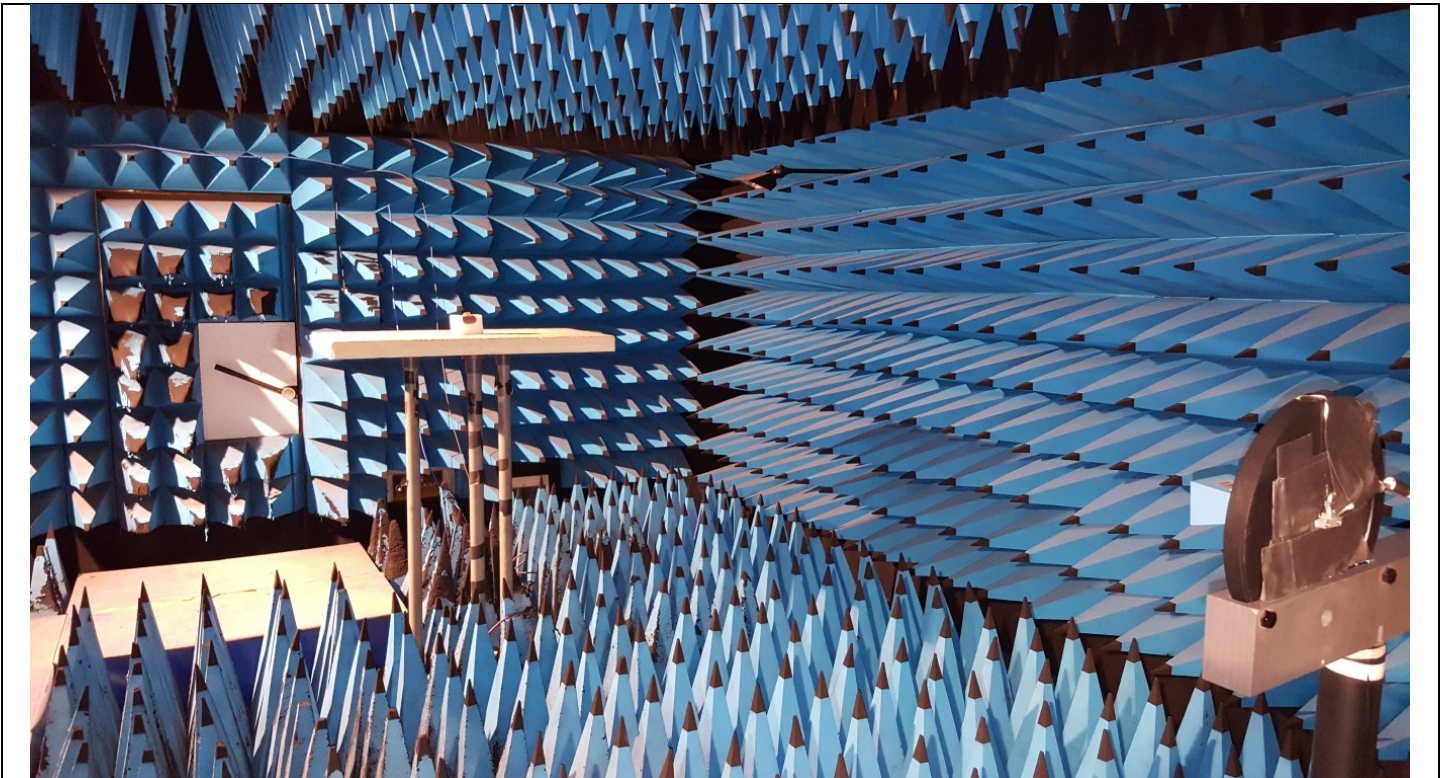
Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands



L C I E

10.3. LIMIT

Measure at 300m		
Frequency range	Level	Detector
9kHz-490kHz	67.6dB μ V/m /F(kHz)	QPeak
Measure at 30m		
Frequency range	Level	Detector
490kHz-1.705MHz	87.6dB μ V/m /F(kHz)	QPeak
1.705MHz-30MHz	29.5dB μ V/m	QPeak
Measure at 10m		
Frequency range	Level	Detector
30MHz to 88MHz	29.5dB μ V/m	QPeak
88MHz to 216MHz	33dB μ V/m	QPeak
216MHz to 960MHz	35.5B μ V/m	QPeak
960MHz to 1000MHz	43.5dB μ V/m	QPeak
Above 1000MHz	63.5dB μ V/m	Peak
	43.5dB μ V/m	Average
Measure at 3m		
Frequency range	Level	Detector
30MHz to 88MHz	40dB μ V/m	QPeak
88MHz to 216MHz	43.5dB μ V/m	QPeak
216MHz to 960MHz	46B μ V/m	QPeak
960MHz to 1000MHz	54dB μ V/m	QPeak
Above 1000MHz	74dB μ V/m	Peak
	54dB μ V/m	Average



10.4. TEST EQUIPMENT LIST

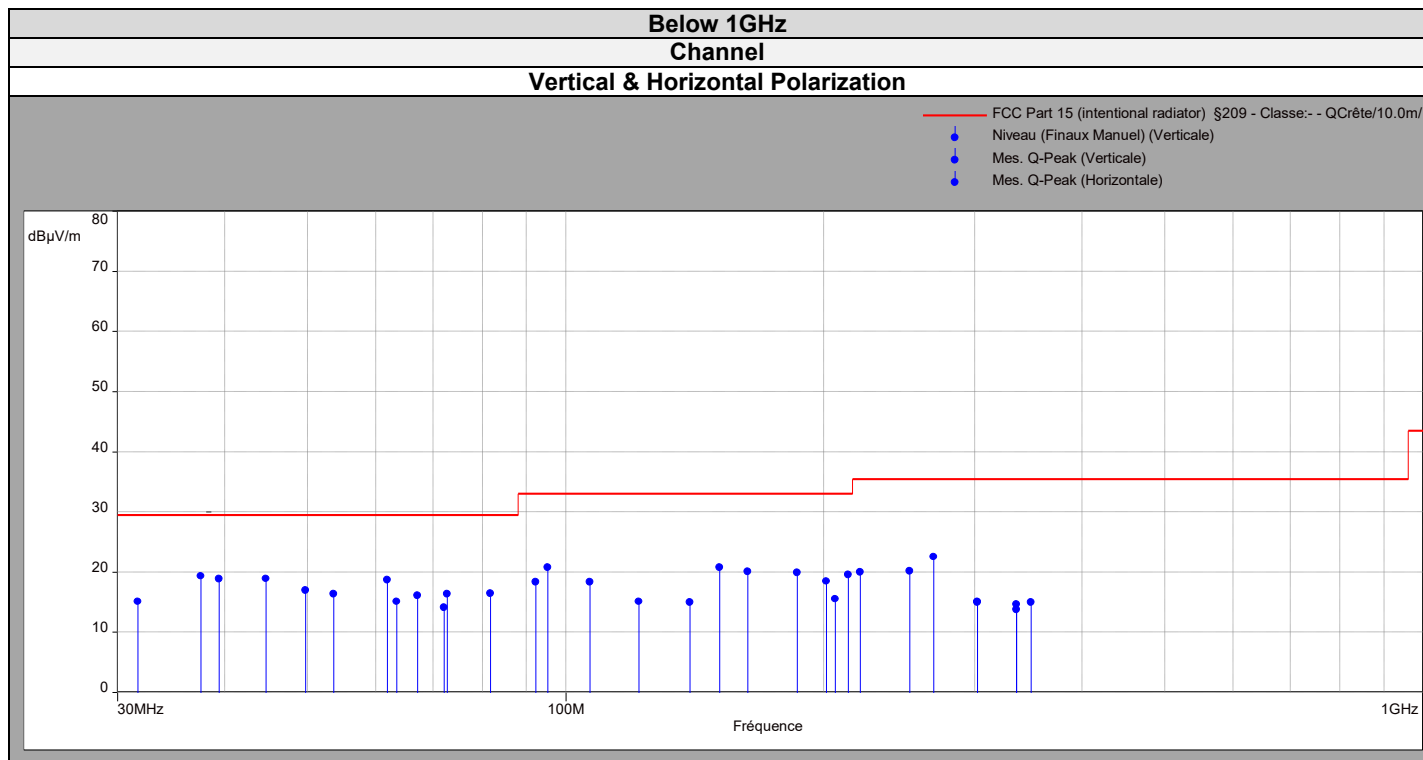
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Open test site	LCIE	-	F2000400	2019-06	2020-06
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2018-10	2020-10
Cable	-	-	A5329444	2019-12	2020-12
Bilog antenna	CHASE	CBL 6112A	C2040040	2019-04	2020-04
Cable	-	-	A5329442	2018-09	2019-09
Cable	-	-	A5329876	2018-11	2019-11
Preamplifier	HEWLETT PACKARD	8449B	A4069002	2018-04	2020-04
Horn	EMCO	3115	C2042016	2019-06	2020-06
loop antenna	RHODE & SCHWARZ	HFH2-Z2	C2040007	2018-11	2020-11
Cable	-	-	A5329416	2018-12	2019-12
Full anechoic chamber	SIEPEL	-	D3044019	2018/10	2022/10
Preamplifier	LCIE	LCIE-ALB-001	A7080073	2018/12	2020/12
Horn antenna	AH SYSTEMS	SAS 571	C2042041	2019/11	2021/11
Horn antenna (18-26,5GHz)	PASTERNAK	PE9852/2F-20	C2042048	2017/12	2019/12
EMI Receiver	ROHDE & SCHWARZ	ESU26	A2642018	2019/01	2021/01
Cable S36 chamber	PASTERNAK	PE360-1500CM	A5329870	2019/01	2020/01
Cable S36 chamber	PASTERNAK	PE360-1000CM	A5329871	2019/01	2020/01
Cable S36 chamber	PASTERNAK	PE360-3000CM	A5329872	2019/01	2020/01
High Pass Filter 2,4GHz	WAINWRIGHT	WHK12-2494	A7484068	2019/07	2021/07

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





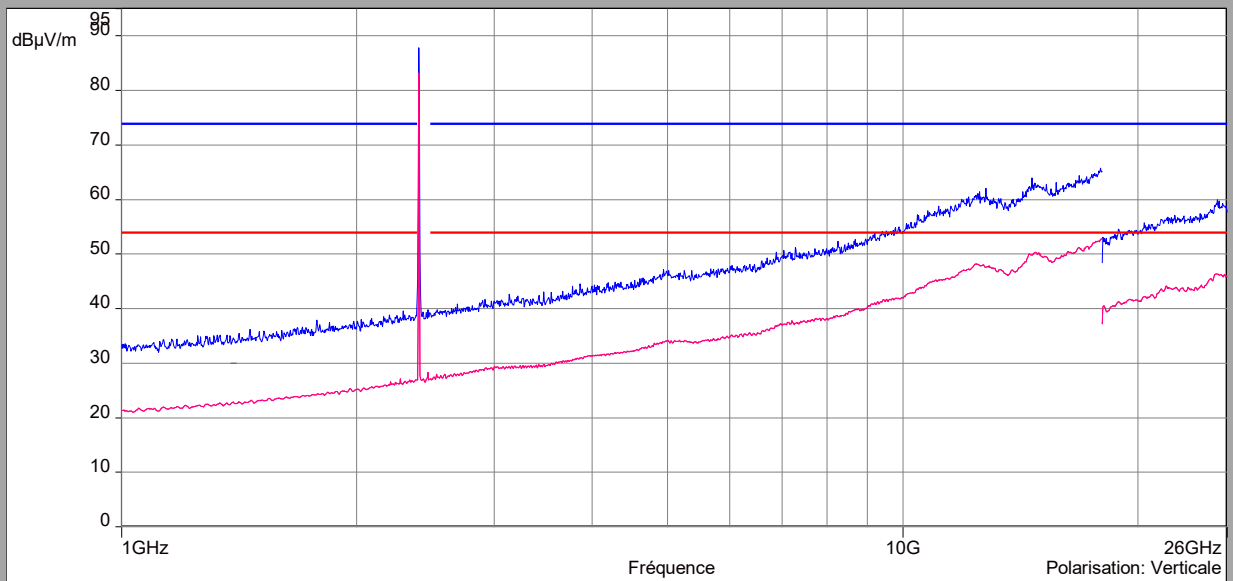
L C I E

Above 1GHz

Cmin

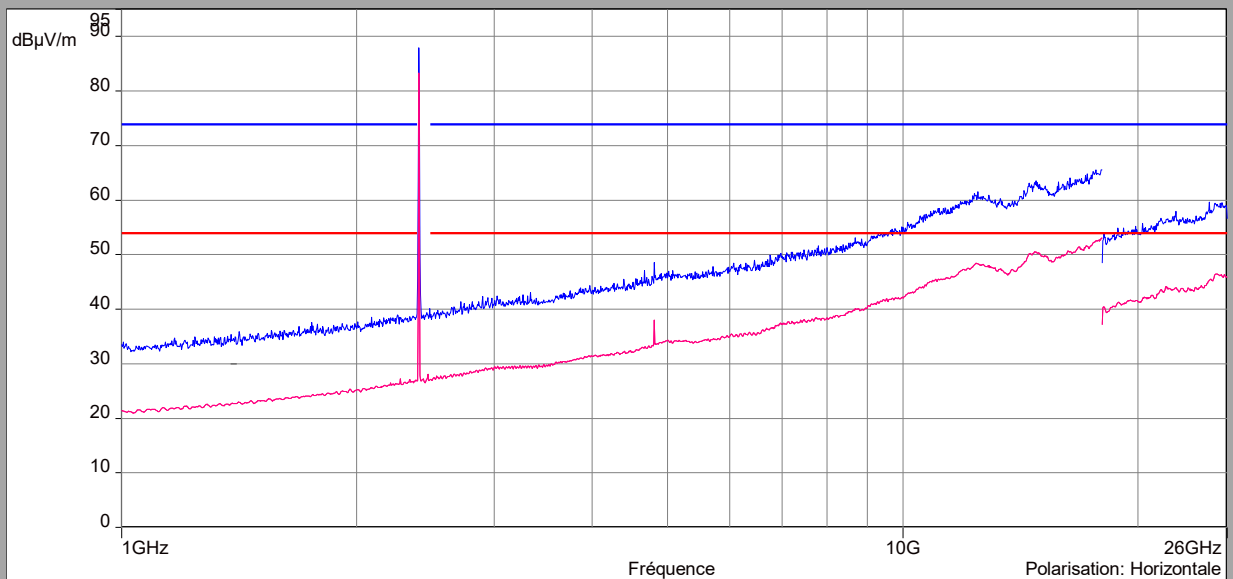
Vertical Polarization

- 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 (Verticale)
- Mes.Avg (Verticale)



Horizontal polarization

- 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 (Horizontale)
- Mes.Avg (Horizontale)





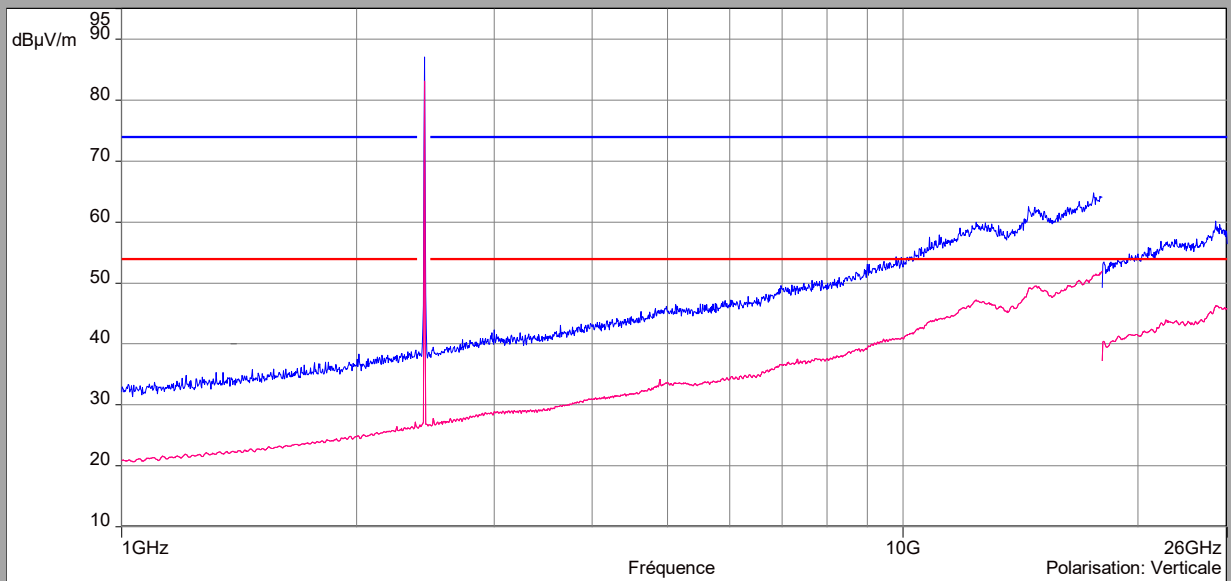
L C I E

Above 1GHz

Cnom

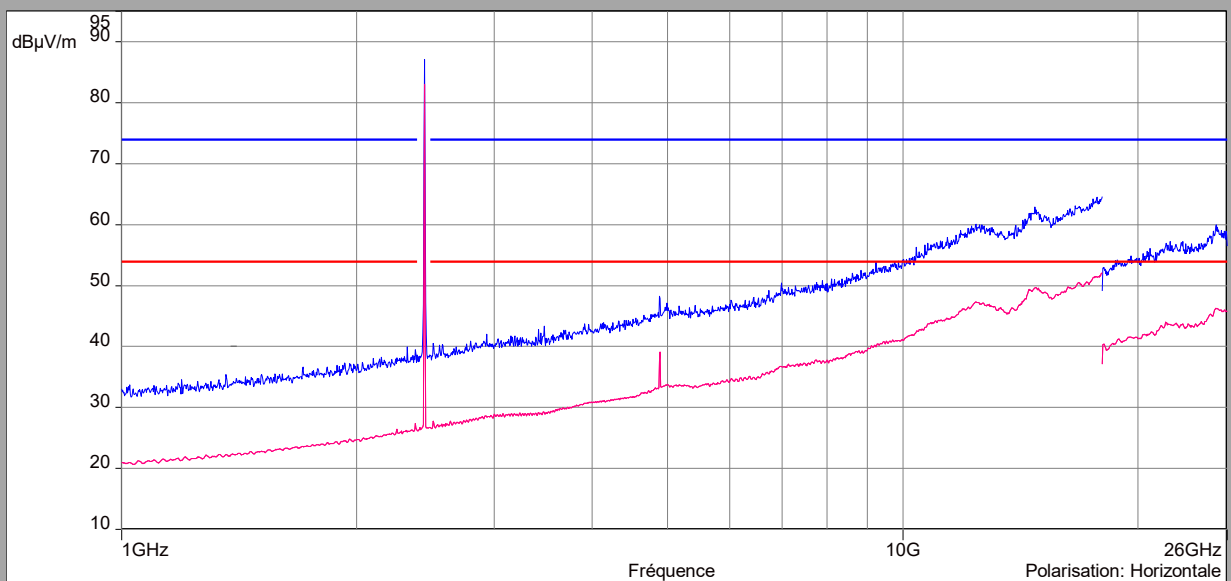
Vertical Polarization

- 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 (Verticale)
- Mes.Avg (Verticale)



Horizontal polarization

- 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 (Horizontale)
- Mes.Avg (Horizontale)





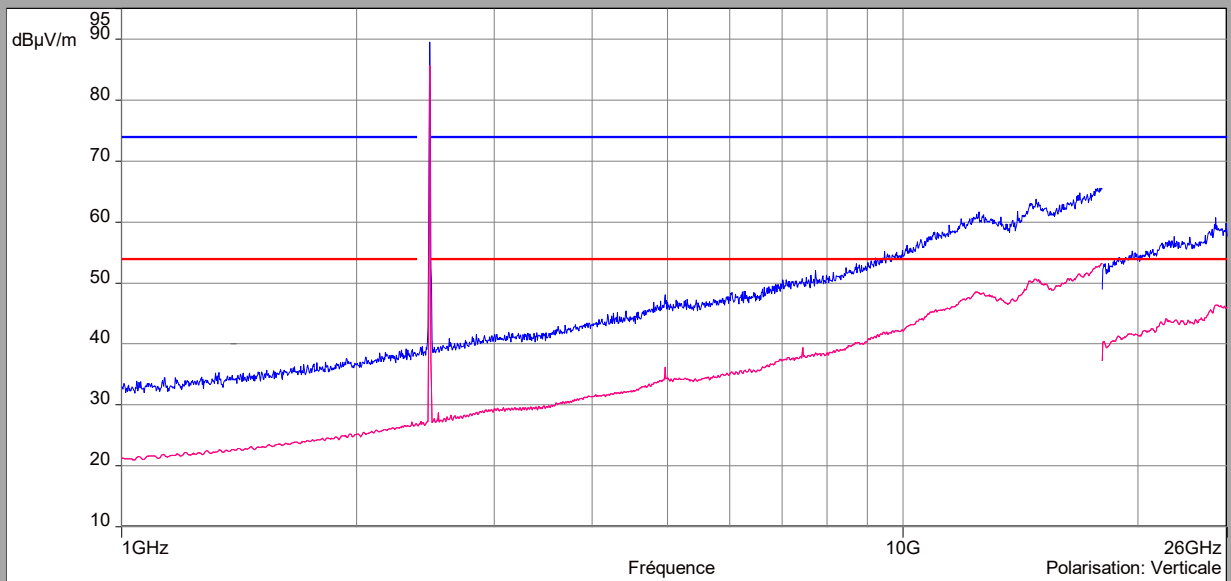
L C I E

Above 1GHz

Cmax

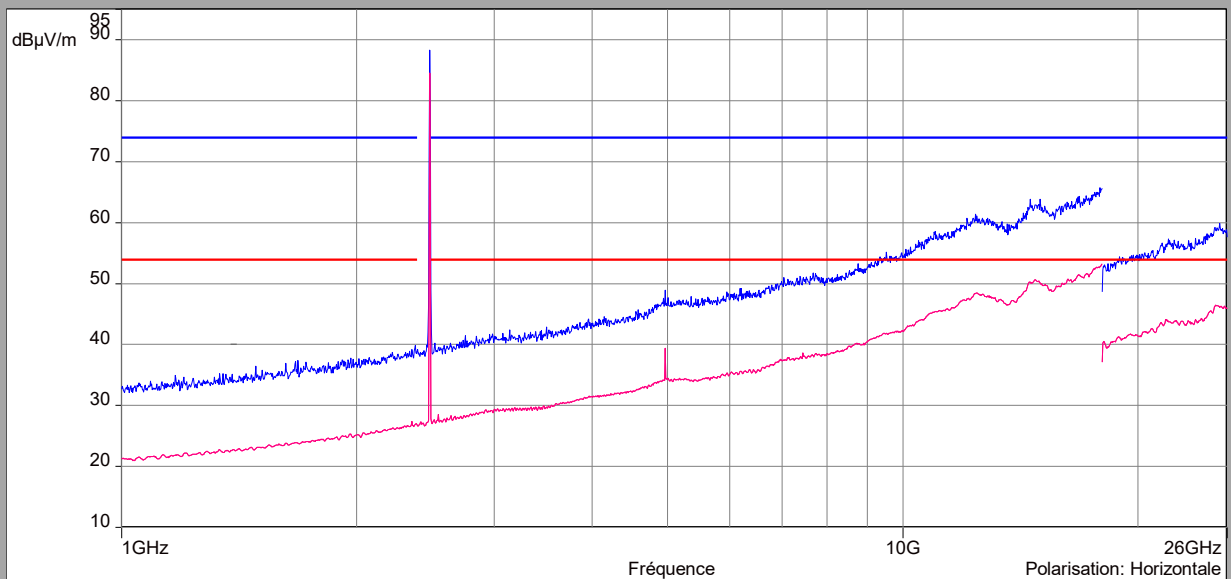
Vertical Polarization

- 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 (Verticale)
- Mes.Avg (Verticale)



Horizontal polarization

- 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 (Horizontale)
- Mes.Avg (Horizontale)





L C I E

Above 1GHz Zoom 2310MHz-2500MHz

Cmin/Cnom/Cmax

Vertical Polarization

- 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 C39 - Verticale (Verticale)
- Mes.Peak_Channel C20 - Verticale (Verticale)
- Mes.Avg_Channel C20 - Verticale (Verticale)
- Mes.Peak_Channel C0 - Verticale (Verticale)
- Mes.Peak_Channel C39 - Verticale (Verticale)
- Mes.Avg_Channel C0 - Verticale (Verticale)

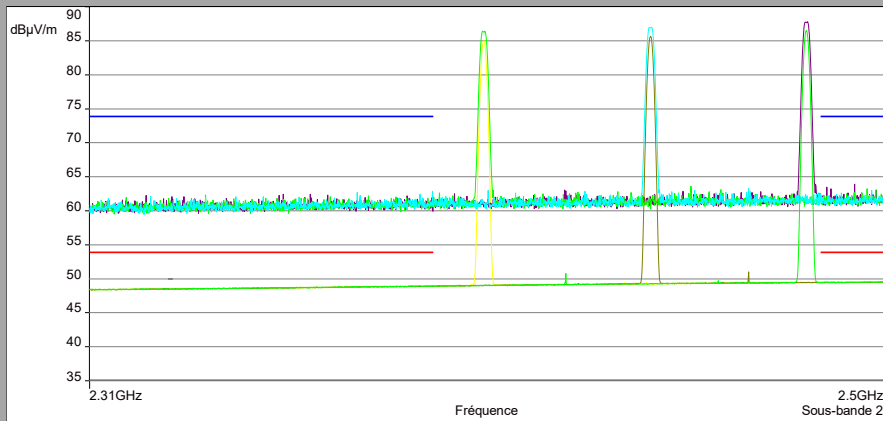
Description Sous-bande 2

Fréquences:2.31 GHz - 2.5 GHz (Mode analyseur) 32001 Points

Réglages: RBW: 1MHz, VBW: 3MHz, Durée balayage : 2 ms/Pts, Atténuation : 0 dB, Nombre de Balayages : 1, Preamp :

Polarisation:Verticale

Distance: 3 m



Horizontal polarization

- 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 C0 - Horizontale (Horizontale)
- Mes.Peak_Channel C39 - Horizontale (Horizontale)
- Mes.Avg_Channel C0 - Horizontale (Horizontale)
- Mes.Avg_Channel C39 - Horizontale (Horizontale)
- Mes.Peak_Channel C20 - Horizontale (Horizontale)
- Mes.Avg_Channel C20 - Horizontale (Horizontale)

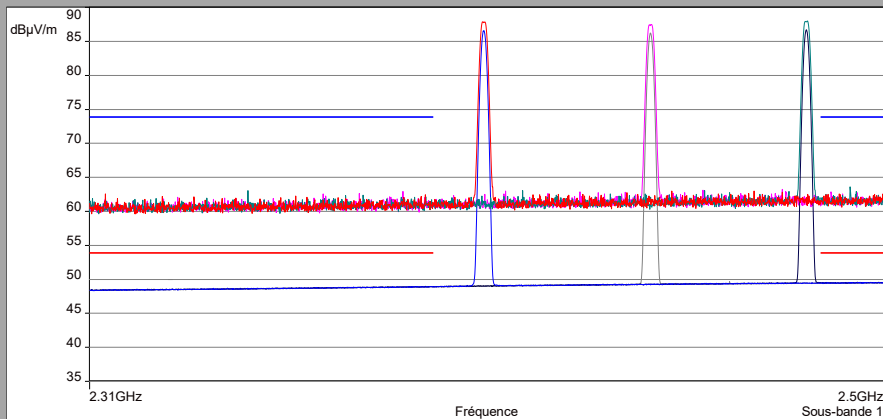
Description Sous-bande 1

Fréquences:2.31 GHz - 2.5 GHz (Mode analyseur) 32001 Points

Réglages: RBW: 1MHz, VBW: 3MHz, Durée balayage : 2 ms/Pts, Atténuation : 0 dB, Nombre de Balayages : 1, Preamp :

Polarisation:Horizontale

Distance: 3 m





L C I E

9kHz to 30MHz				
Polarization	Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)
all emissions were greater than 20 dB below the limit				

30MHz to 1GHz					
Polarization	Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)	Margin Level (dBµV/m)
Vertical	37.5	-	19.36	29.5	10.14
Vertical	39.4	-	18.84	29.5	10.66
Vertical	42.2	-	20.47	29.5	9.03
Vertical	48	-	19.58	29.5	9.92
Horizontal	55	-	18.94	29.5	10.56
Horizontal	61.9	-	18.72	29.5	10.78
Vertical	55.3	-	16.71	29.5	12.79
Vertical	186.1	-	19.87	33	13.13
Vertical	213.6	-	19.89	33	13.11
Vertical	251.9	-	20.16	35.5	15.34

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	2390	48,87	49,347	54	4,653	62,45	74	11,55
Verticale	2390	48,84	49,317	54	4,683	62,64	74	11,36
Horizontale	2483.5	49,38	49,857	54	4,143	62,46	74	11,54
Verticale	2483.5	49,39	49,867	54	4,133	63,88	74	10,12
Horizontale	4803	38,98	39,457	54	14,543	49,57	74	24,43
Horizontale	4882	40,12	40,597	54	13,403	49,3	74	24,7
Horizontale	4960	40,38	40,857	54	13,143	49,96	74	24,04
Verticale	7440	40,39	40,867	54	13,133	53,06	74	20,94

10.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **MICROPORT CRM BOREA DR 1500**, SN: **N38GF05A** for radiated test and **N38G2062** for conducted test, 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. UNCERTAINTIES CHART

47 CFR Part 15.209 & 15.207 Kind of test	Wide uncertainty laboratory (k=2) $\pm x(\text{dB}) / (\text{Hz}) /$ 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