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902MHz-928MHz Template: Release October 14<sup>th</sup>, 2019

# TEST REPORT

N°: 164827-746022-D

Version : 01

<b>Subject</b>	<b>Radio spectrum matters tests according to standards: 47 CFR Part 15.249 &amp; RSS-210 Issue 9 &amp; RSS-Gen Issue 5</b>
<b>Issued to</b>	<b>MICROPORT CRM Parc d'Affaires NOVEOS - 4 avenue Réaumur 92143 Clamart FRANCE</b>
<b>Apparatus under test</b>	
↳ Product	<b>Pacemaker</b>
↳ Trade mark	<b>MICROPORT CRM</b>
↳ Manufacturer	<b>MICROPORT CRM s.r.l</b>
↳ Model under test	<b>BOREA SR 1200</b>
↳ Serial number	<b>N21GE015 for radiated test N38G2062 for conducted test</b>
↳ FCC ID	<b>YSG1311</b>
↳ IC	-
<b>Conclusion</b>	See Test Program chapter
<b>Test date</b>	December 9, 2019 to December 20, 2019
<b>Test location</b>	Fontenay Aux Roses & Ecuelles
<b>Test Site</b>	6230B-1
<b>Sample receipt date</b>	December 9, 2019
<b>Composition of document</b>	26 pages
<b>Document issued on</b>	March 26, 2020

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**Tests operator**

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## PUBLICATION HISTORY

<b>Version</b>	<b>Date</b>	<b>Author</b>	<b>Modification</b>
01	March 26, 2020	Armand MAHOUNGOU	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.*



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## 1. TEST PROGRAM

### References

- 47 CFR Part 15.249
- RSS 210 Issue 9
- RSS Gen Issue 5
- ANSI C63.10-2013

### Radio requirement:

Clause (47CFR Part 15.249 & RSS-249 Issue 2 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth <a href="#">f</a>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Field strength of fundamental & Field strength of harmonics <a href="#">f</a>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA()	<input type="checkbox"/> NP(1)
AC Power Line Conducted Emission <a href="#">f</a>	<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 <a href="#">f</a>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Receiver Radiated emissions <a href="#">f</a>	<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 SR 1200**, SN: **N21GE015**. See Table below for difference between products.

BOREA SR 1200	ALIZEA SR 1300	CELEA SR 1100
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):

**MICROPORT CRMBOREA SR 1200** Serial Number: N21GE015 for radiated test & N38G2062 for conducted test



Equipment Under Test



**Auxiliary equipment used during test:**

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

**Equipment information:**

Frequency band:	[2400 – 2483.5] MHz		
Number of Channel:	1		
Channel bandwidth:	1 MHz		
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:	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	
Receiver chains:	<input checked="" type="checkbox"/> 1	<input type="checkbox"/> 2	
Type of equipment:	<input checked="" type="checkbox"/> Stand-alone	<input type="checkbox"/> Plug-in	<input type="checkbox"/> Combined
Ad-Hoc mode:	<input type="checkbox"/> Yes		<input checked="" type="checkbox"/> No
Duty cycle:	<input type="checkbox"/> Continuous duty	<input type="checkbox"/> Intermittent duty	<input checked="" 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
	Tnom:	27°C	
	Tmax:	<input type="checkbox"/> 35°C	<input type="checkbox"/> 55°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:	Vnom:	<input type="checkbox"/> 120V/60Hz	<input checked="" type="checkbox"/> 3,2 Vdc

Antenna Characteristic			
Antenna assembly	Gain (dBi)	Frequency Band (MHz)	Impedance(Ω)
1	-21.4	2400 – 2483.5	50

CHANNEL PLAN	
Channel	Frequency (MHz)
Cnom	2426MHz

Modulation Type	Worst Case Modulation
CW	<input checked="" type="checkbox"/>

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

### 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()
Field strength of fundamental & Field strength of harmonics	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
AC Power Line Conducted Emission	<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 16, 2019  
Ambient temperature : 26°C  
Relative humidity : 49%

#### 3.2. TEST SETUP

- The Equipment Under Test is installed:

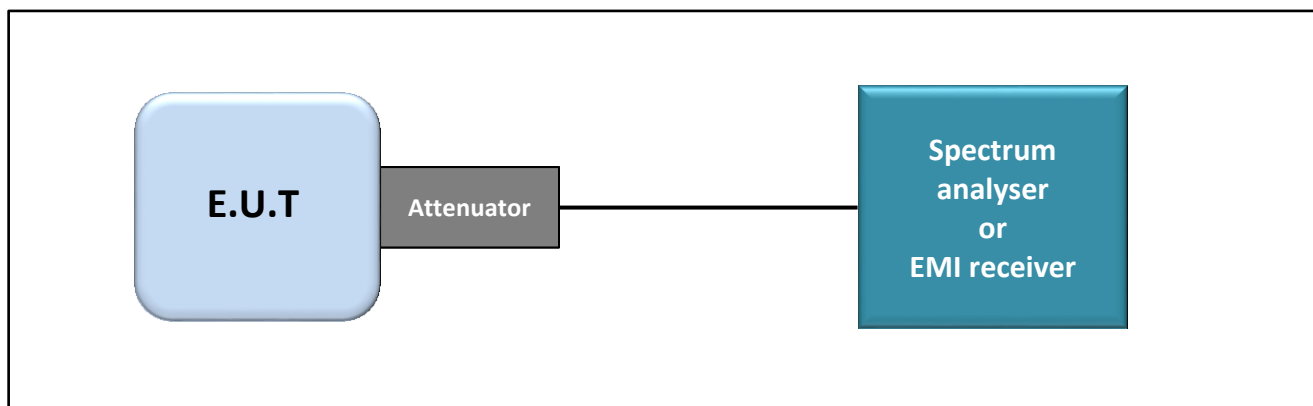
- On a table
- In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- Conducted Method
- Radiated Method

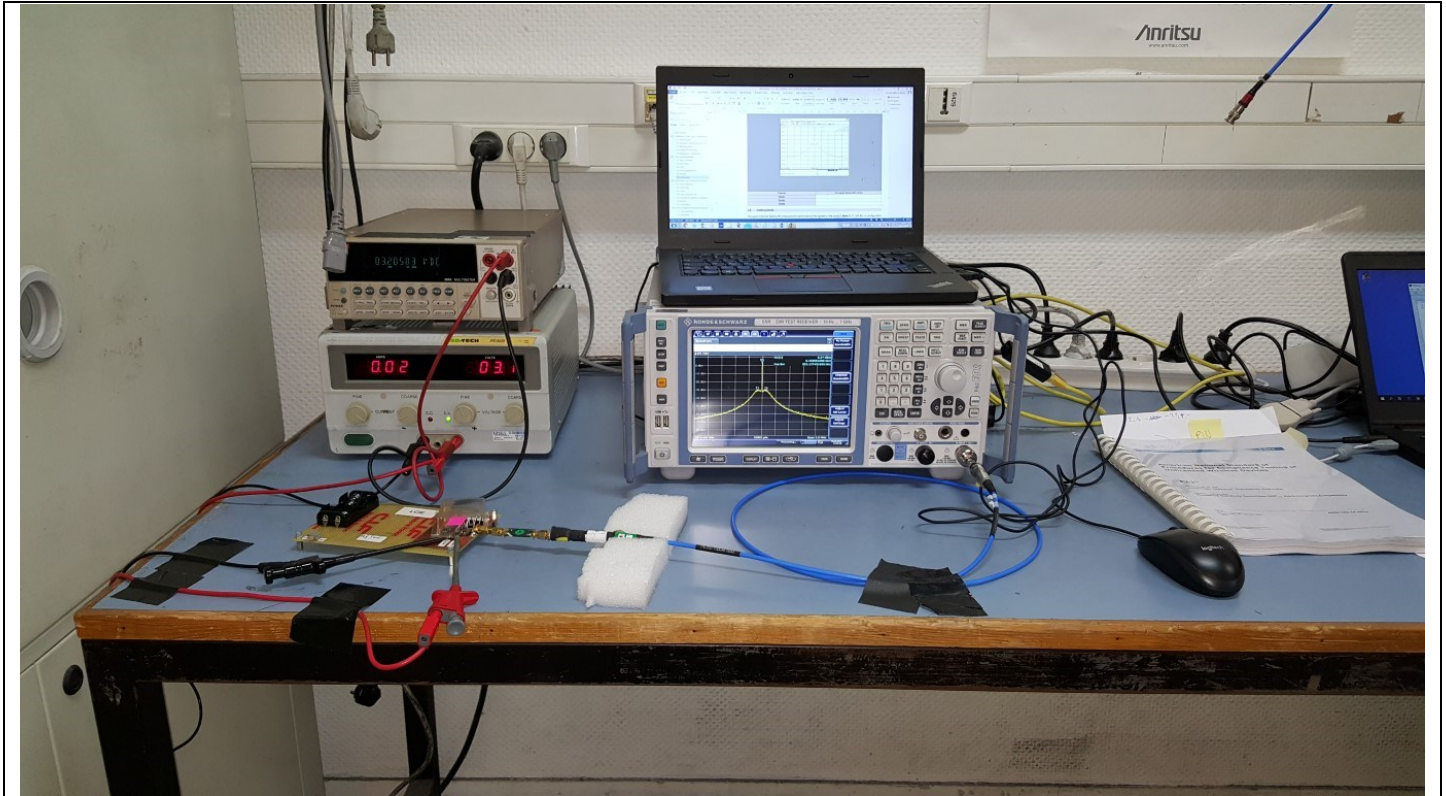
- Test Procedure:

- RSS-Gen Issue 5 § 6.7



Test set up of Occupied Bandwidth





Photograph for Occupied bandwidth

### 3.3. LIMIT

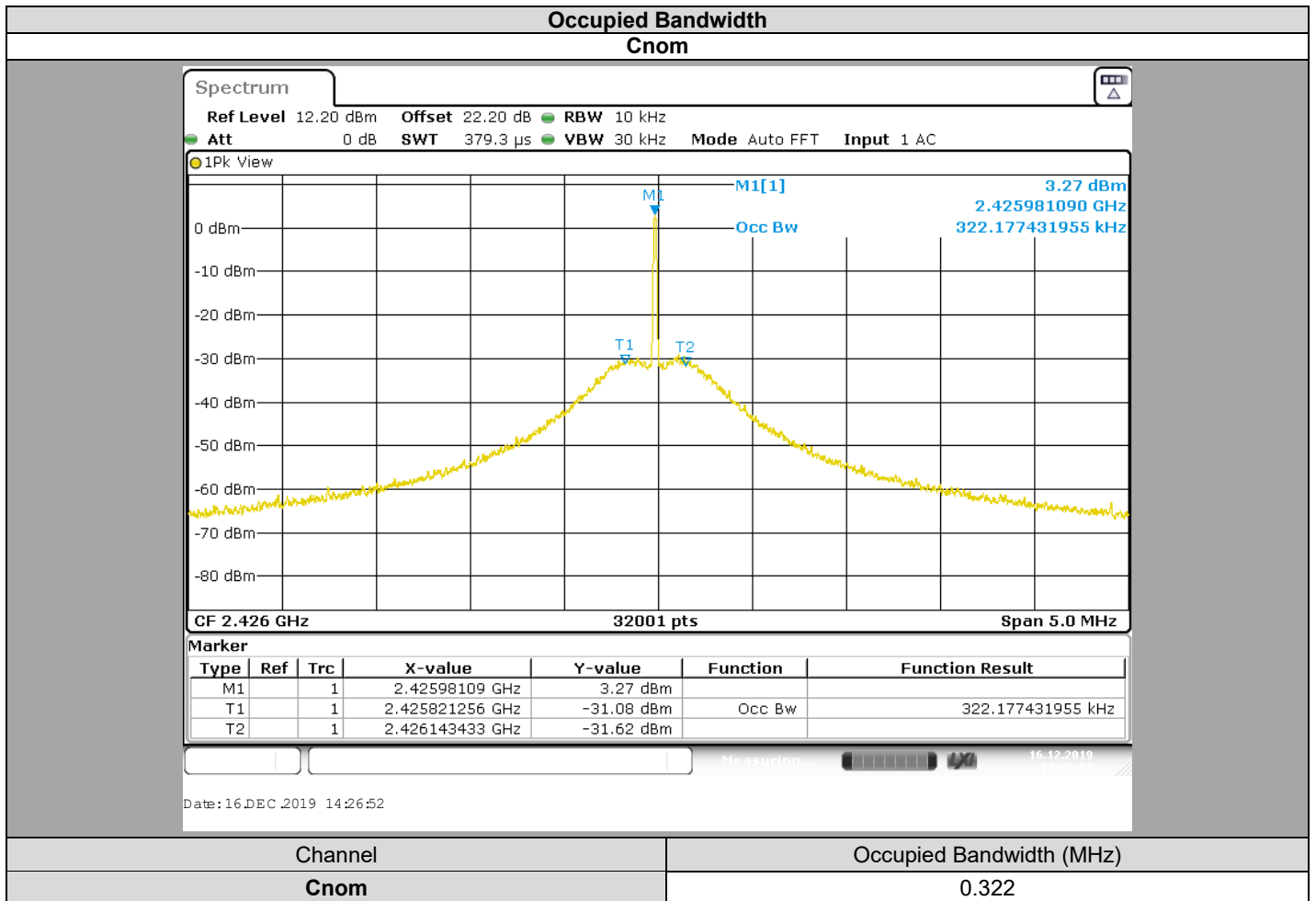
None

### 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 SR 1200**, SN: **N38G2062** in configuration and description presented in this test report, show levels **compliant** to the RSS-GEN Issue 5 limits.

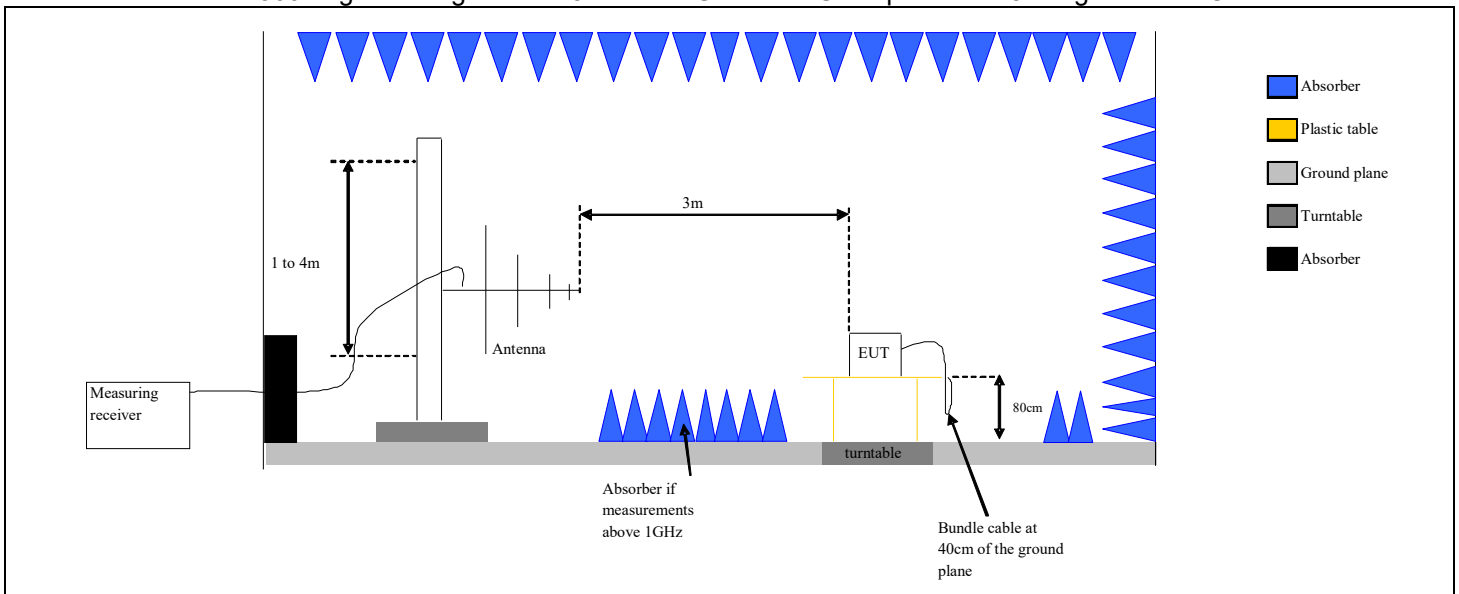
## 4. FIELD STRENGTH OF EMISSION & FIELD STRENGTH OF HARMONICS

### 4.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
 Date of test : December 11, 2019  
 Ambient temperature : 26°C  
 Relative humidity : 48%

### 4.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013). The EUT is placed in a full anechoic chamber. Distance between measuring antenna and the EUT is **3m**. Test is performed in horizontal (H) and vertical (V) polarization with a horn antenna above 1GHz. Measurement bandwidth was 1MHz above 1GHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. The EUT is placed at 1.5m high above 1GHz

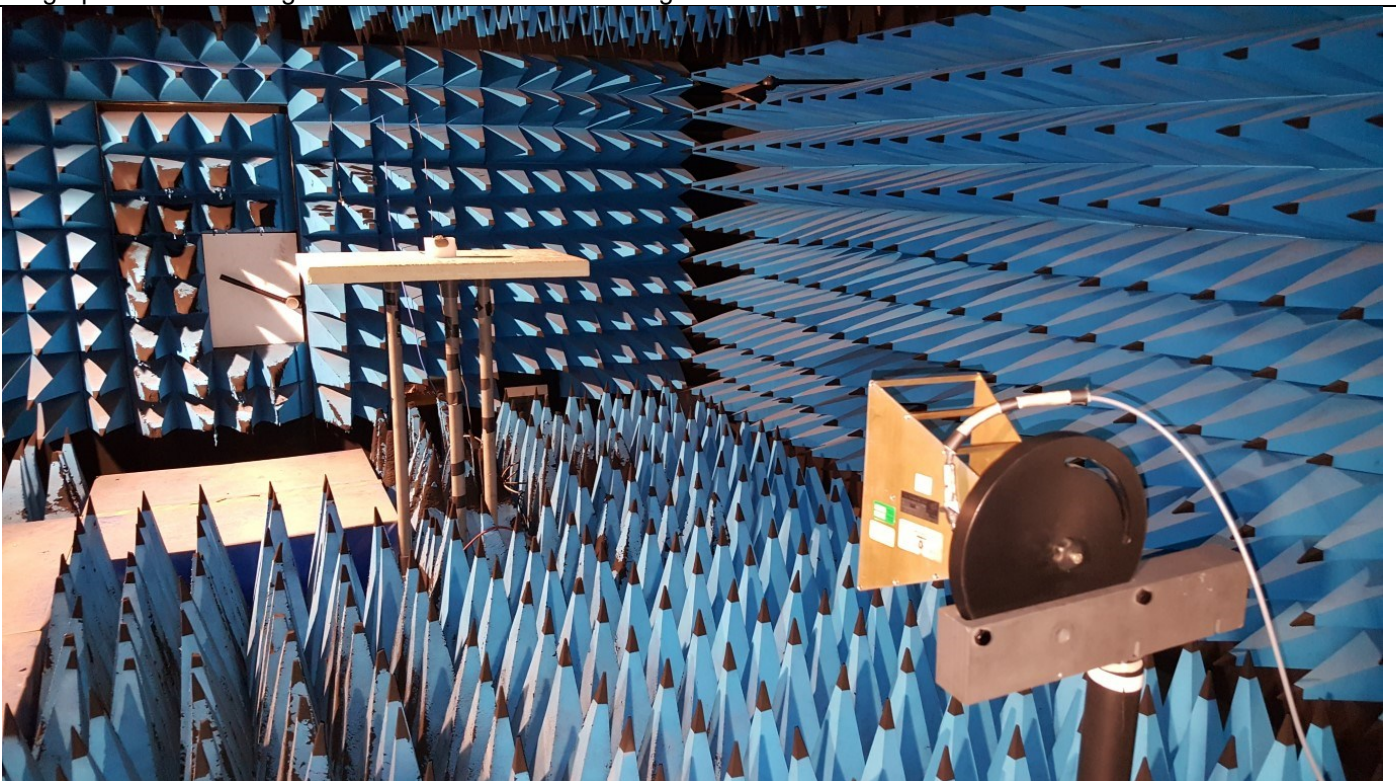




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Photograph for Field strength of fundamental & Field strength of harmonics





Photograph for Field strength of fundamental & Field strength of harmonics

#### 4.3. LIMIT

Field strength of fundamental: 50mV/m (93.98dBµV/m) at 3m  
 Field strength of harmonics: 500µV/m (53.98dBµV/m) at 3m

#### 4.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
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
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

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

#### 4.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None       Divergence:

#### 4.6. RESULTS

Cnom			
Polarization	Frequency (MHz)	Peak Level (dBµV/m)	FCC Limit (dBµV/m)
Vertical	2426	84,54	93.98
Horizontal	2426	88,80	93.98
Horizontal	4850	48.93	53.98

#### 4.7. CONCLUSION

Field strength of fundamental & Field strength of harmonics measurement performed on the sample of the product **MICROPORT CRM BOREA SR 1200**, SN: **N21GE015**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.249 & RSS 210 Issue 9 limits.

## 5. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

### 5.1. TEST CONDITIONS

Test performed by : Laurent DENEUX & Armand MAHOUNGOU  
 Date of test : December 4, 2019 to January 8, 2020  
 Ambient temperature : 17°C & 26°C  
 Relative humidity : 44% & 48%

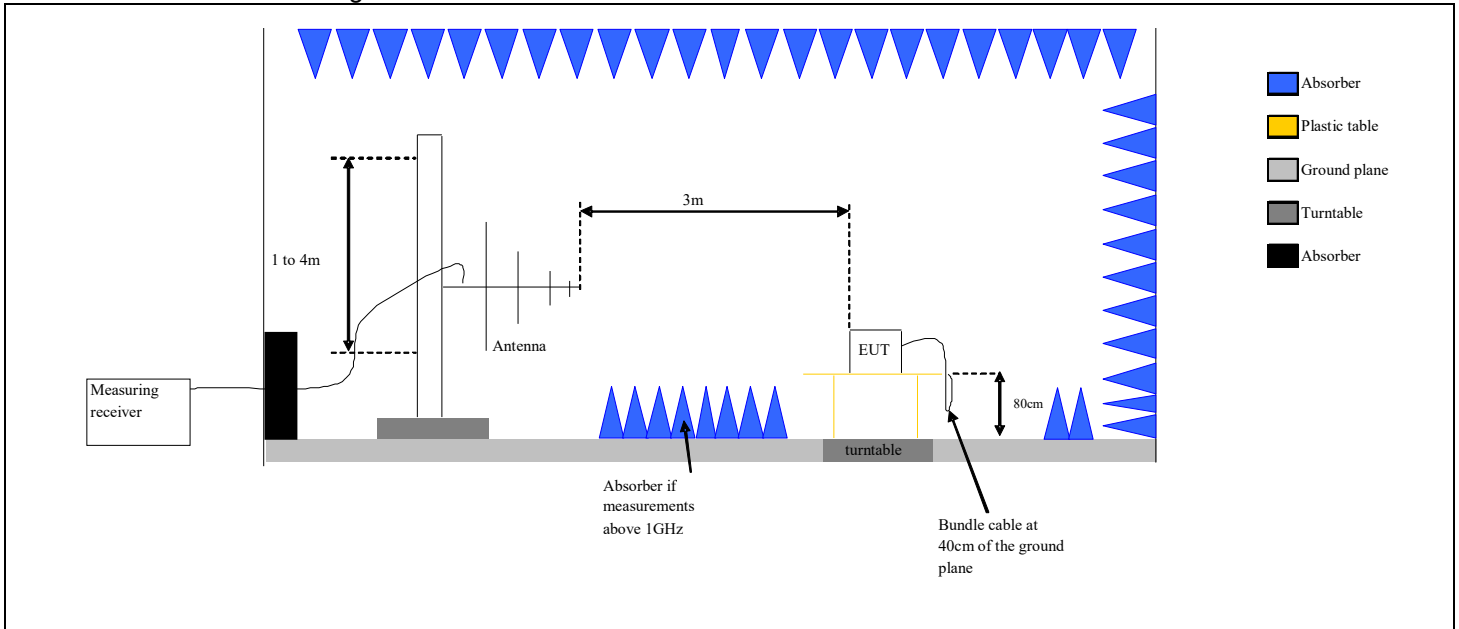
### 5.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013).

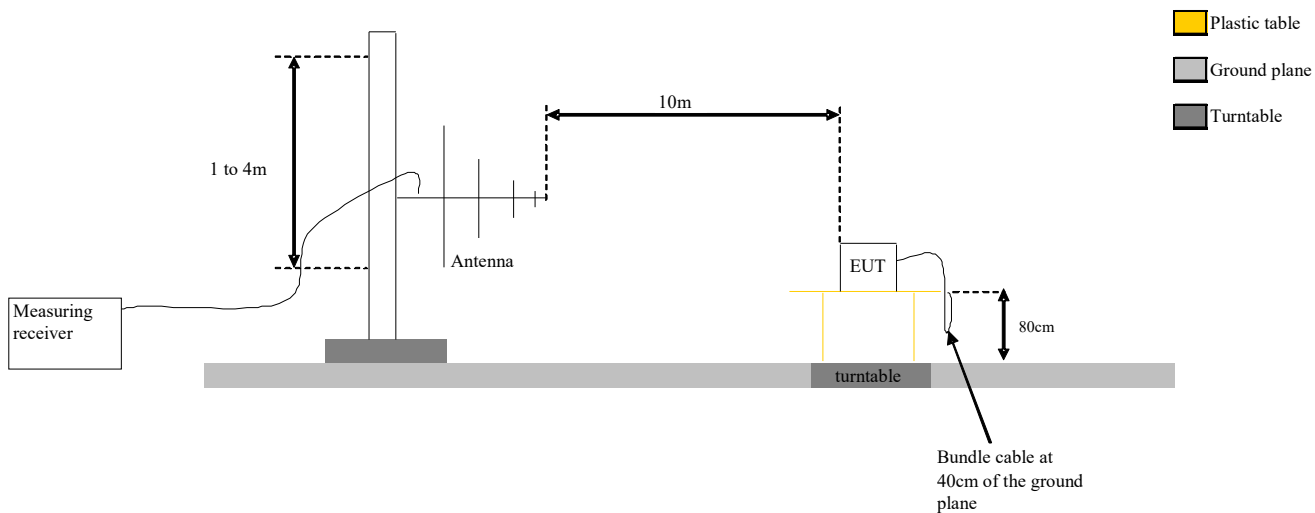
Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on the 3 axis of EUT. Antenna height was 1m.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

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 place at 1.5m high above 1GHz and at 0.8m high under 1GHz. Distance between measuring antenna and the EUT is 10m

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



Photograph for Unwanted Emission in restricted frequency bands





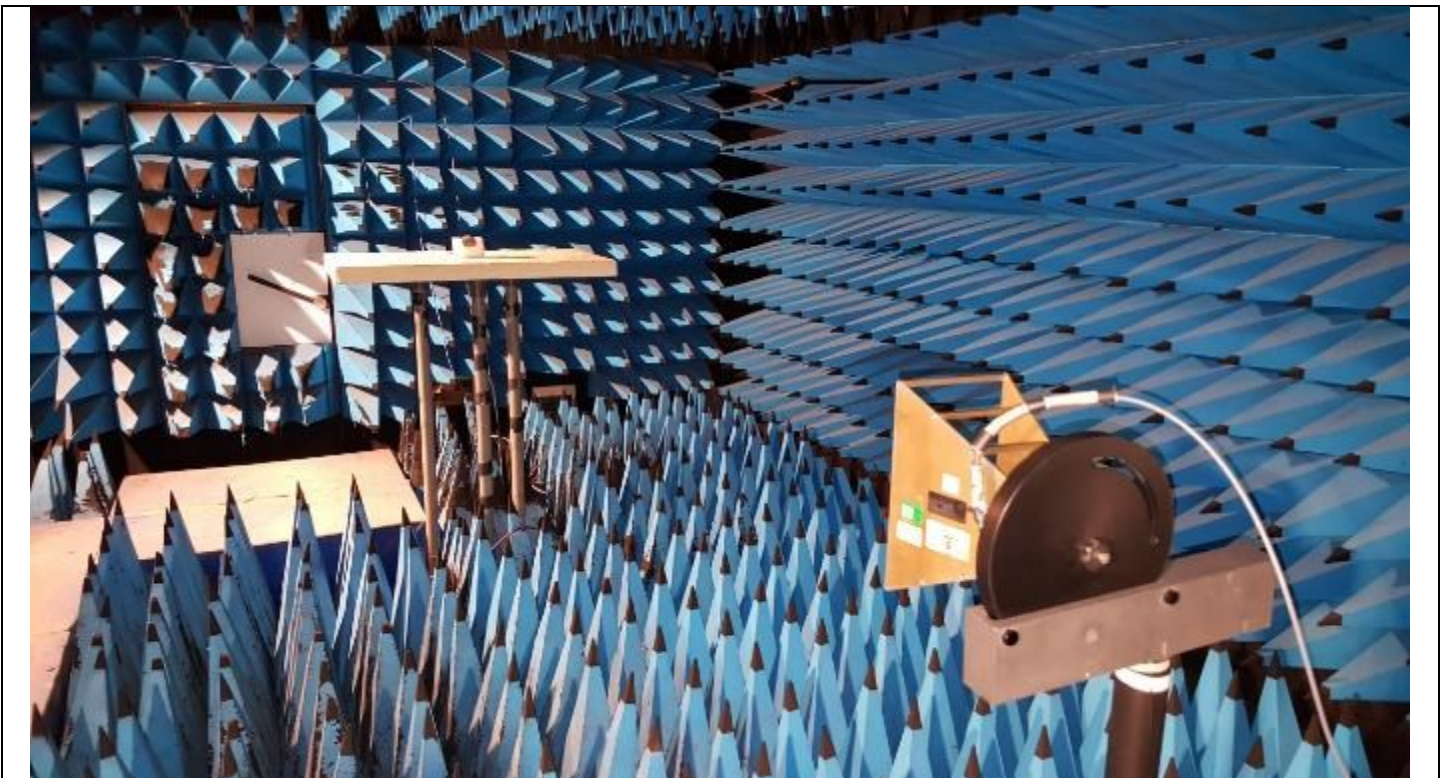
Photograph for Unwanted Emission in restricted frequency bands



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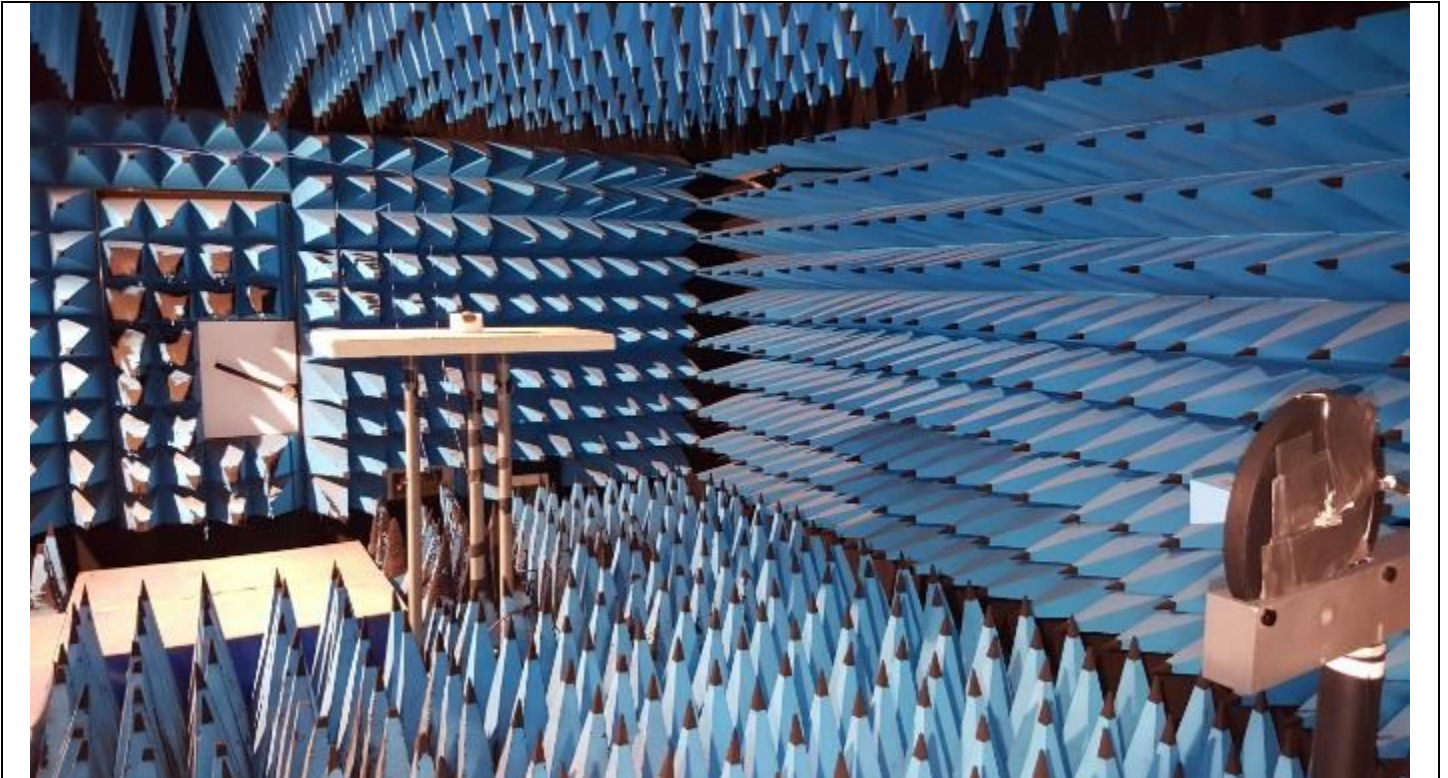
Photograph for Unwanted Emission in restricted frequency bands



Photograph for Unwanted Emission in restricted frequency bands



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Photograph for Unwanted Emission in restricted frequency bands



L C I E

### 5.3. LIMIT

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



#### 5.4. TEST EQUIPMENT LIST

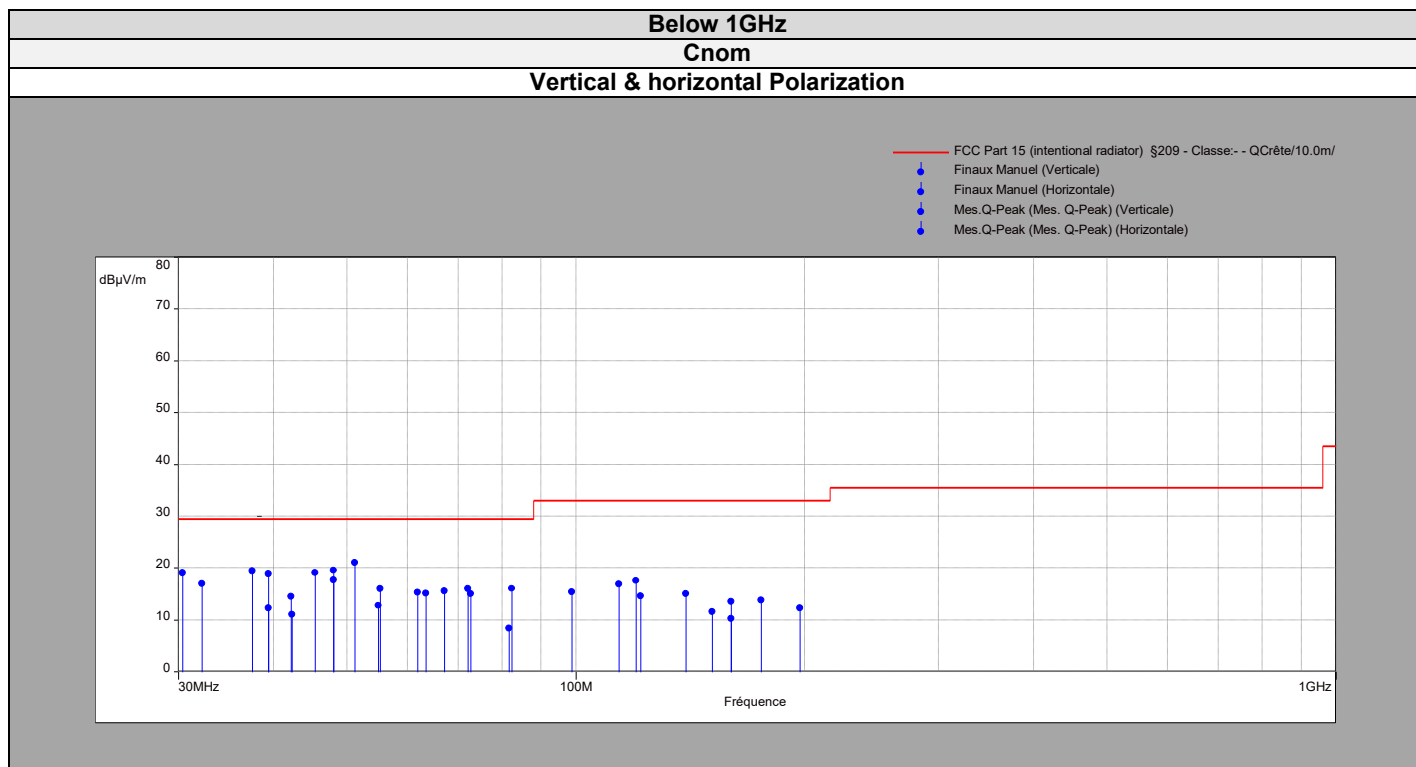
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Open test site	LCIE	-	F2000400	2019-06	2020-06
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2018-10	2020-10
Cable	-	-	A5329444	2019-12	2020-12
Bilog antenna	CHASE	CBL 6112A	C2040040	2019-04	2020-04
Cable	-	-	A5329442	2019-12	2020-12
Cable	-	-	A5329876	2019-12	2020-12
loop antenna	RHODE & SCHWARZ	HFH2-Z2	C2040007	2018-11	2020-11
Cable	-	-	A5329416	2019-12	2020-12
Cable	-	-	A5329444	2019-12	2020-12
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

#### 5.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None       Divergence:

## 5.6. RESULTS





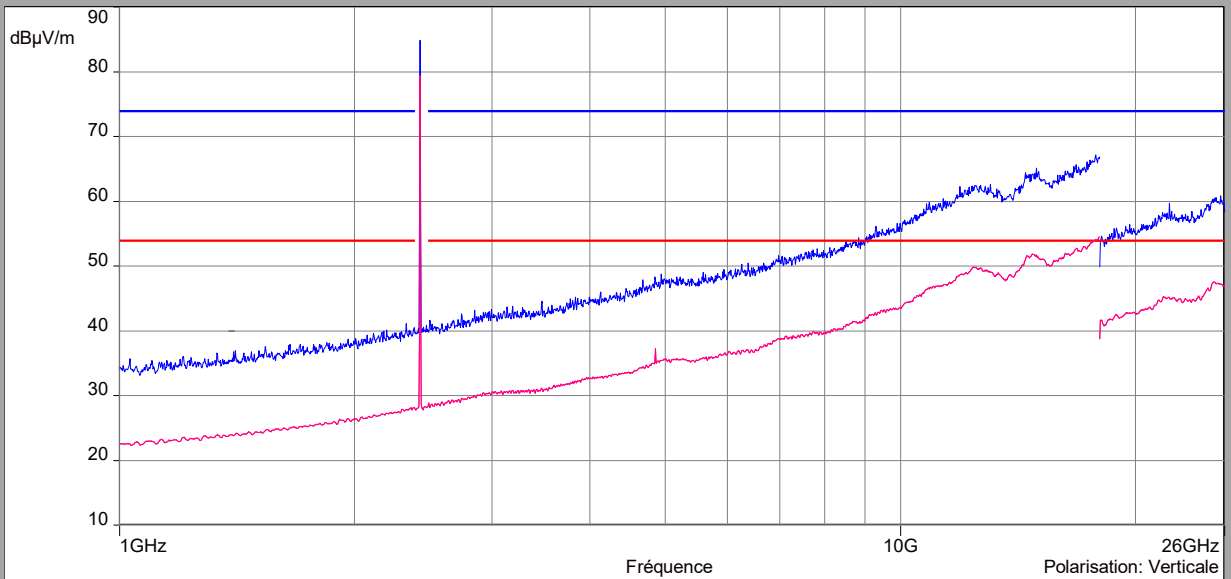
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### Above 1GHz

Cnom

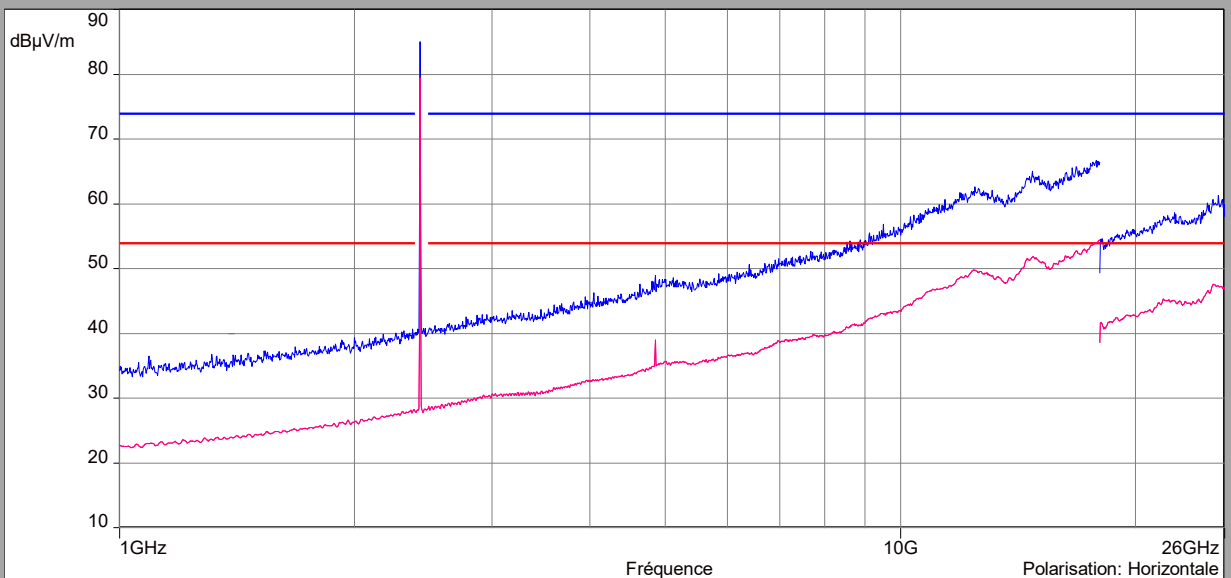
#### Vertical Polarization

- 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)





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### Above 1GHz Zoom 2310MHz-2500MHz

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)

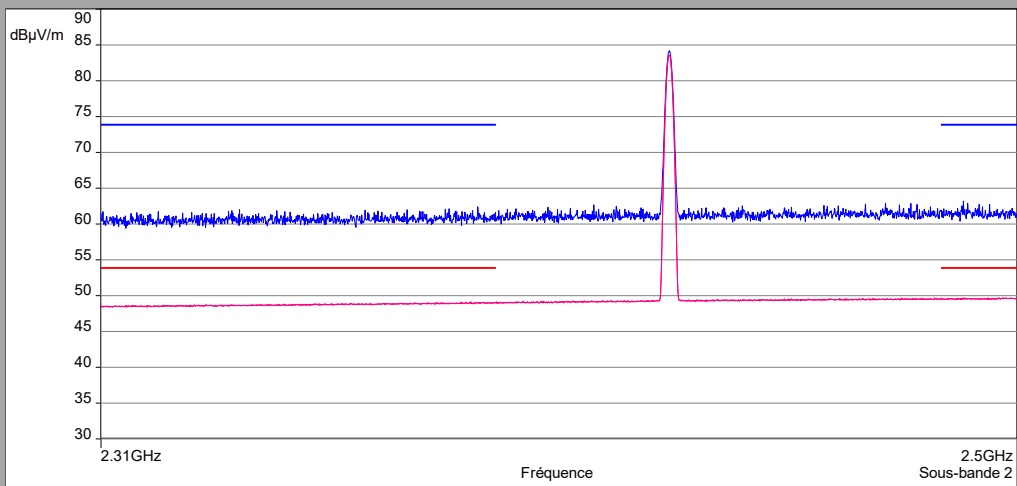
Description Sous-bande 2

Fréquences:2.31 GHz - 2.5 GHz (Mode analyseur) 30001 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 (Horizontale)
- Mes.Avg (Horizontale)

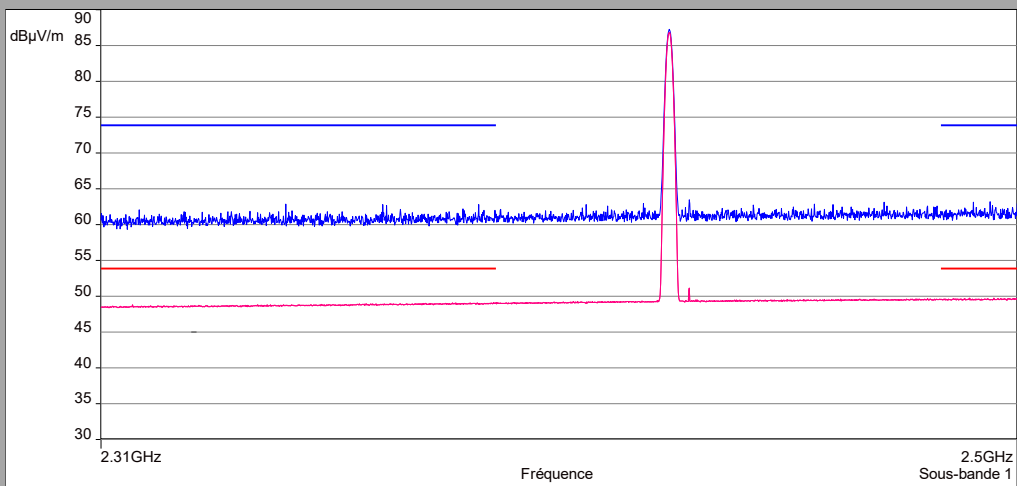
Description Sous-bande 1

Fréquences:2.31 GHz - 2.5 GHz (Mode analyseur) 30001 Points

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

Polarisation:Horizontale

Distance: 3 m







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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				

Below 1GHz					
Polarization	Frequency (MHz)	Peak Level (dBµV/m)	QPeak Level (dBµV/m)	Limit (dBµV/m)	Margin Level (dBµV/m)
Vertical	30.4	-	19.06	29.5	10.44
Vertical	37.5	-	19.36	29.5	10.14
Vertical	39.4	-	18.84	29.5	10.66
Vertical	45.4	-	19.15	29.5	10.35
Vertical	48	-	19.58	29.5	9.92
Vertical	51.2	-	21.02	29.5	8.48
Vertical	72.1	-	16.04	29.5	13.46
Vertical	114	-	16.88	29.5	12.62
Horizontal	120	-	17.64	29.5	11.86

Above 1GHz							
Cmin/Cnom/Cmax							
Polarization	Frequency (MHz)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Average Margin Level (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Peak Margin Level (dBµV/m)
Horizontal	2390	49,11	54	4,89	62,84	74	11,16
Vertical	2390	49,04	54	4,96	62,43	74	11,57
Horizontal	2483.5	49,41	54	4,59	63,16	74	10,84
Vertical	2483.5	49,36	54	4,64	63,2	74	10,8
Horizontal	4850	39,02	54	14,98	48,93	74	25,07

5.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product MICROPORT CRM BOREA SR 1200, SN: N21GE015, in configuration and description presented in this test report, show levels compliant to the 47 CFR PART 15.249 & RSS 210 Issue 9 limits.

## 6. 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 (Ecuellas)	4,88	6.3
Measurement of radiated electric field from 1 to 18GHz on the Ecuellas site	5.16	/
Measurement of radiated electric field from 30 to 1000MHz in vertical position on the OATS (Ecuellas)	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 (Ecuellas)	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