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RFID 125kHz Template: Release April 14th, 2021

TEST REPORT

N°: 173535-768500-C Version : 02

Subject Radio spectrum matters

tests according to standards:

47 CFR Part 15.209 & Part 15.207 & RSS-Gen Issue 5

Issued to MICROPORT CRM

Parc d'Affaires NOVEOS-4 avenue Réaumur

92143-Clamart

FRANCE

Apparatus under test

♦ Product Inductive Head

☼ Trade mark☼ ManufacturerMICROPORT CRM s.r.IMICROPORT CRM s.r.I

♦ Serial number
 ♦ FCC ID
 ♦ IC
 RA2106021E
 YSGB10031
 10270A-B10031

Conclusion See Test Program chapter

Test date : September 6, 2021 to September 8, 2021

Test location Moirans

Test Site 6500A-1 & 6500A-3

Registration Number 197516 **Designation Number** FR0008

Sample receipt date September 6, 2019

Composition of document 32 pages **Document issued on** May 6, 2022

Written by : Laurent DENEUX Tests operator

Approved by:

LAHABAMORE GENXIAN SAS INDUSTRIES ELECTRICOTES SASCATUSAN 103 174 RCS Name of General Lectors

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LCIE

Laboratoire Central des Industries Electriques Une société de Bureau Veritas 33, Av du Général Leclerc 92266 Fontenay Aux Roses FRANCE Tél: +33 1 40 95 60 60 contact@lcie.fr www.lcie.fr



PUBLICATION HISTORY

Version	Date	Author	Modification
01	October 14, 2021	Laurent DENEUX	Creation of the document
02	April 28, 2022	Laurent DENEUX	Frequency band and adding comment for each pictures.

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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4	TECT	DDO	GRAM
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References

- 47 CFR Part 15.209 & 15.207
- RSS Gen Issue 5
- ANSI C63.10-2013

Radio requirement:

Clause (47CFR Part 15.209 & 15.207 & RSS-Gen Issue 5) Test Description	Test result - Comments				
Occupied Bandwidth	☑ PASS	□ FAIL	□ NA	□ NP(1)	
AC Power Line Conducted Emission	☑ PASS	□ FAIL	□ NA(2)	□ NP(1)	
Transmitter Radiated Emission	☑ PASS	□ FAIL	□ NA	□ NP(1)	
Receiver Radiated Emissions	☑ PASS (3)	□ FAIL	□ NA	□ NP(1)	
This table is a summary of test report, see conclusion of each clause of this test report for detail.					

(1): Limited program

(2): EUT not directly or indirectly connected to the AC Power Public Network
(3): Testing covered the receive mode, and receiver spurious emissions are considered to be the same as transmitter.

PASS: EUT complies with standard's requirement FAIL: EUT does not comply with standard's requirement

NA: Not Applicable NP: Test Not Performed



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

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT): MICROPORT CRM s.r.I CPR4





Serial Number: Sn

Equipment Under Test

Power supply:

Name	Туре	Rating	Reference / Sn	Comments
Supply1	☐ AC ☑ DC ☐ Battery	5V-DC	-	-

Inputs/outputs - Cable:

Access	Туре	Length used (m)	Declared <3m	Shielded	Under test	Comments
1	USB	2.8			\checkmark	-

Auxiliary equipment used during test:

Туре	Reference	Sn	Comments
Implant	DDDR	843ZK042	Sorin Group
Laptop	DELL Latitude 5400	-	Use to send command



Equipment information: ☑ RFID Type: Frequency band: [9-70] kHz Number of Channel: Antenna Type: ☑ Integral ☐ External ☐ Dedicated Antenna Requirements §15.203 The transmitter uses an integral antenna and it permanently connected Transmit chains: Receiver chains Type of equipment: ☑ Stand-alone ☐ Plug-in ☐ Combined ☐ Floor-standing ☑ Multiple orientations Equipment arrangement: □ Tabletop ☑ Production model Equipment type: ☐ Pre-production model Operating temperature range: Tnom: 20°C

Hardware information				
Software (if applicable):	V. :	-		

Vnom:

□ 120V/60Hz

☑ 5 VDC

Operating voltage:



2.2. 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	☑ Test mode 1	☐ Alternative test mode()	
AC Power Line Conducted Emission	☑ Test mode 1	☐ Alternative test mode()	
Transmitter Radiated Emission	☑ Test mode 1	☐ Alternative test mode()	

2.3. EQUIPMENT LABELLING



2.4. EQUIPMENT MODIFICATION



2.5. FIELD STRENGTH CALCULATION

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow:

FS = RA + AF + CF - AG

Where FS = Field Strength

RA = Receiver Amplitude AF = Antenna Factor CF = Cable Factor AG = Amplifier Gain

Assume a receiver reading of 52.5dBµV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 are added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBµV/m.

 $FS = 52.5 + 7.4 + 1.1 - 29 = 32 dB\mu V/m$

The 32 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

Level in μ V/m = Common Antilogarithm [(32dB μ V/m)/20] = 39.8 μ V/m.

2.6. CALIBRATION DATE

The calibration intervals are extended at 12+2 months. This extended interval is based on the fact that there is sufficient calibration data to statistically establish a trend or based on experience of use of the test equipment to assure good measurement results for a longer period.



3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by : Julien Palard
Date of test : September 13, 2021

Ambient temperature : 25 °C Relative humidity : 37 %

3.2. TEST SETUP

- The Equipment Under Test is installed:

☑ On a table

☐ In an anechoic chamber

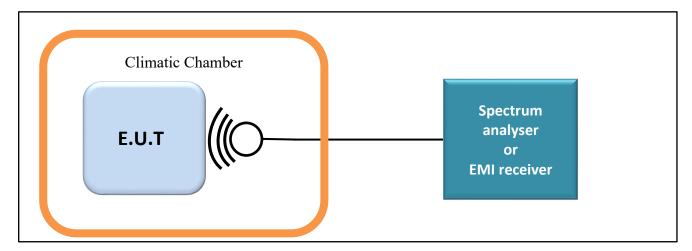
- Measurement is performed with a spectrum analyzer in:

☐ Conducted Method

☑ Radiated Method

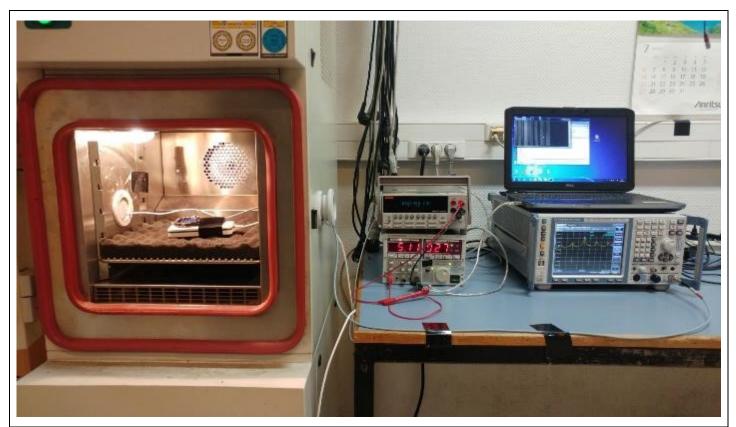
- Test Procedure:

☑ RSS-Gen Issue 5 § 6.7



Test set up of Occupied Bandwidth





Photograph for Occupied bandwidth

3.3. LIMIT

None

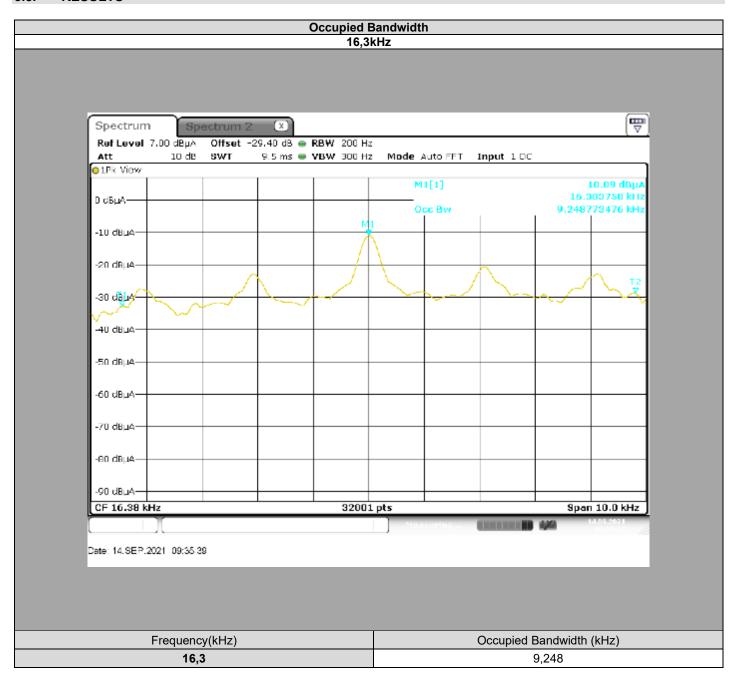
3.4. TEST EQUIPMENT LIST

Test equipment used in Climatic Chamber							
Description	Manufacturer	Model	Identifier	Last Calibration date	Calibration due date		
Power supply	ROHDE & SCHWARZ	NGSM 32/10	A7040074	See Multimeter			
Multimeter	KEITHLEY	2000	A1242090	2021/03	2023/03		
Climatic chamber	SECASI	SLT34	D1024029	See Hygrometer			
Hygrometer	AOIP	TM360	B4041042	2021/04	2023/04		
13,56MHz Test fixture Antenna	-	-	A5329422	See EMI receiver			
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2021/09	2023/09		

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 s.r.l** CPR4, SN: **RA2106021E**, in configuration and description presented in this test report, show levels **compliant** to the **RSS-GEN ISSUE 5** limits.



4. 20dB Emission Bandwidth

4.1. TEST CONDITIONS

Test performed by : Julien Palard
Date of test : September 13, 2021

Ambient temperature : 25 °C Relative humidity : 37 %

4.2. TEST SETUP

- The Equipment Under Test is installed:

☐ On a table

☑ In a climatic chamber

☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

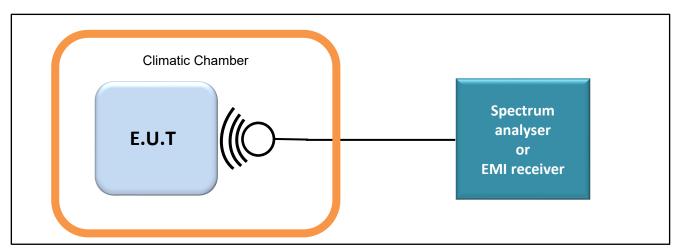
☑ Conducted Method

□ Radiated Method

- Test Procedure:

☑ ANSI C63.10 § 6.9.2:

The EUT is placed in an anechoic chamber; levels have been corrected to be in compliant with the Peak Output Power measured. The EUT is turn ON and using the MaxHold function, the frequency separation of two frequencies that were attenuated 20dB from the Peak Output Power level. A delta marker is used to measure the frequency difference as the emission bandwidth.



Test set up of 20dB Emission Bandwidth





Photograph for 20dB emission bandwidth

4.3. LIMIT

No Limit

4.4. TEST EQUIPMENT LIST

Test equipment used in Climatic Chamber						
Description	Manufacturer	Model	Identifier	Last Calibration date	Calibration due date	
Power supply	ROHDE & SCHWARZ	NGSM 32/10	A7040074	See Multimeter		
Multimeter	KEITHLEY	2000	A1242090	2021/03	2023/03	
Climatic chamber	SECASI	SLT34	D1024029	See Hygrometer		
Hygrometer	AOIP	TM360	B4041042	2021/04	2023/04	
13,56MHz Test fixture Antenna	-	-	A5329422	See EMI receiver		
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642026	2021/09	2023/09	

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



4.5. RESULTS



4.6. CONCLUSION

20dB Emission Bandwidth measurement performed on the sample of the product **MICROPORT CRM s.r.l** CPR4, SN: RA2106021E, in configuration and description presented in this test report, show levels compliant to the 47 CFR PART 15.225 & RSS 210 limits.



5. AC POWER LINE CONDUCTED EMISSIONS

5.1. TEST CONDITIONS

Test performed by : Laurent DENEUX Date of test : September 7, 2021

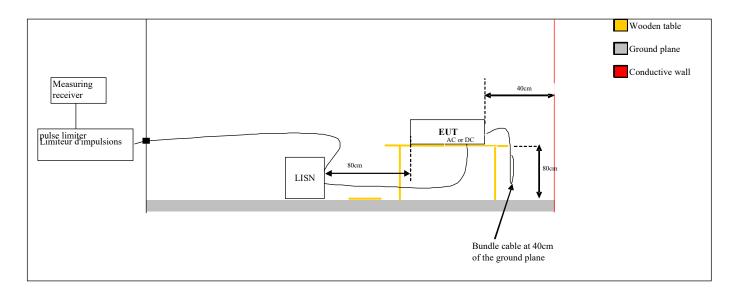
Ambient temperature : 21 °C Relative humidity : 49 %

5.2. TEST SETUP

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

Voltage table used (for Power Line Conducted Emissions):

Туре	Measuremer	nt performed:
☐ AC / ☐ DC (Auxiliary used)	☐ 120VAC/60Hz	☐ 240VAC/50Hz
☑ USB (Laptop auxiliary)	☑ 120VAC/60Hz (Laptop auxiliary)	







Photograph for AC Power Line Conducted Emissions (Front view)







5.3. LIMIT

Frequency range	Level	Detector
0.45kHz to 0.5MHz	66dBμV to 56μV*	QPeak
0,15kHz to 0,5MHz	56dBμV to 46μV*	Average
0,5MHz to 5MHz	56dBµV	QPeak
U,SIVIEZ TO SIVIEZ	46dBμV	Average
5MHz to 30MHz	60BµV	QPeak
SIVIEZ TO SOIVIEZ	50dBμV	Average

^{*}Decreases with the logarithm of the frequency

5.4. TEST EQUIPMENT LIST

		Test equipme	ent used		
Description	Manufacturer	Model	Identifier	Last Calibration date	Calibration due date
Recepteur	R&S	ESU	A2642018	10/2020	10/2022
Pulse limiter	R&S	ESH3-Z2	A2649008	20/06/2021	06/2022
Cable	-	-	A5329417	22/12/2020	12/2021
V ISLN	R&S	ESH2-Z5	C2322002	22/10/2020	10/2021
Articial hand	LCIE	-	A7484061	10/2019	10/2021
Reference ground plan 3 x 3m	L.C.I.E.	-	-	-	-

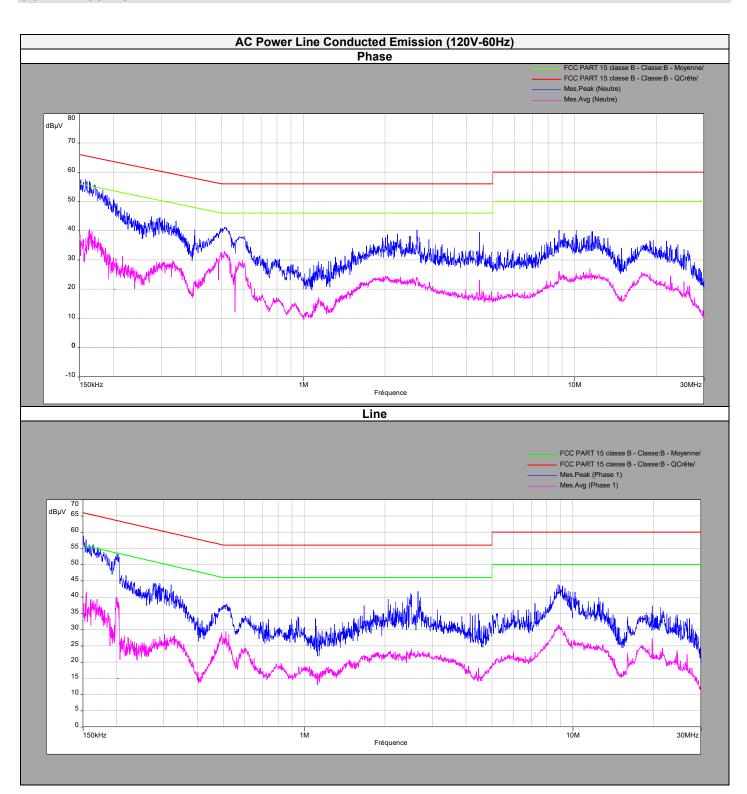
Note: In our quality system, the test equipment calibration due is more & less 2 months

5.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

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5.6. RESULTS

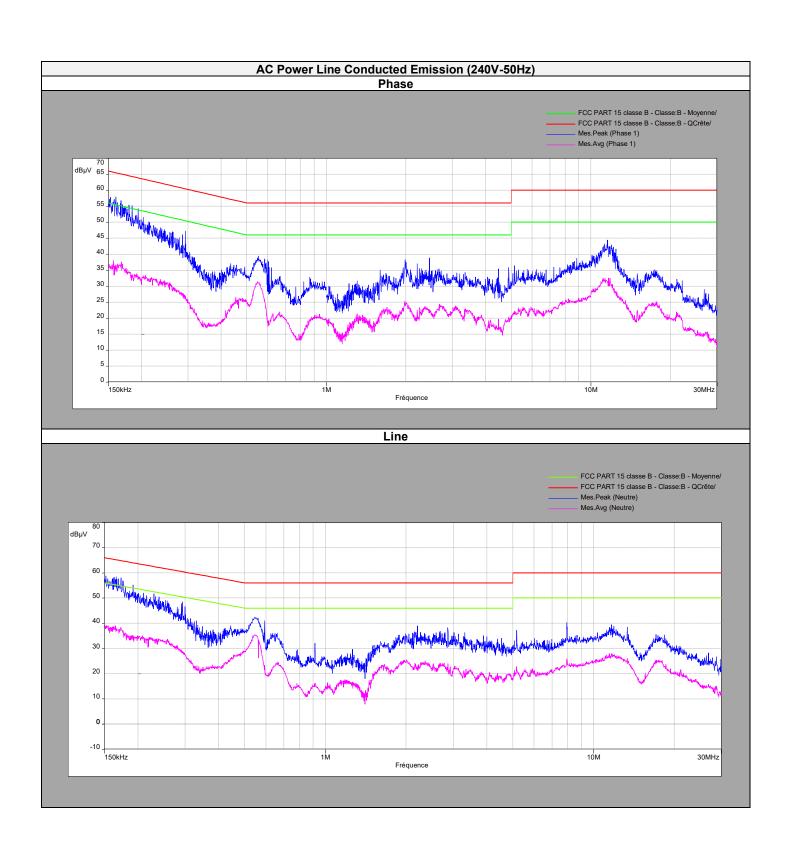




		Phase	e Line		
Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.15	57.4	-	64	6.6	40
0.51	40.6	-	56	15.4	32.6
2.62	40.2	-	56	15.8	24
8.76	40.2	-	60	19.8	25.1
22.6	25	-	60	35	23.5

	Neutral Line						
Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)		
0.15	58.8	-	66	7.2	41.6		
0.51	37.2	-	56	18.8	29.5		
2.5	40.7	-	56	15.3	23.5		
8.91	43	-	60	17	30.2		
19.76	37.3	-	60	22.7	26.5		







	Phase Line						
Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)		
0.15	57.6	-	66	8.4	37		
0.54	39.5	-	56	16.5	31		
2	38.2	-	56	17.8	25		
11.55	44.4	-	60	15.6	31.1		
17.26	34.8	-	60	25.2	23.4		

		Neutra	al Line		
Frequency (MHz)	Peak Level (dBµV)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Average Level (dBµV)	Average Limit (dBµV)
0.15	55.4	-	66	10.6	38.2
0.54	42.2	-	56	13.8	35.4
2.2	39	-	56	17	22.3
7.95	40.2	-	60	19.8	35.8
13.37	38.5	-	60	21.5	26

5.7. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product MICROPORT CRM s.r.l CPR4, SN: RA2106021E, in configuration and description presented in this test report, show levels compliant to the 47 CFR PART 15.207 & RSS Gen ISSUE 5 limits.



6. TRANSMITTER RADIATED EMISSION

6.1. TEST CONDITIONS

Test performed by : Laurent DENEUX

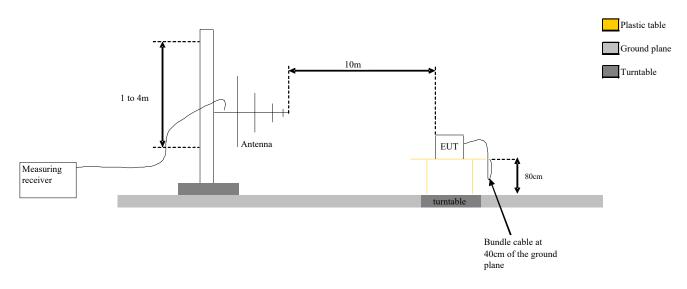
Date of test : September 6, 2021 to September 8, 2021

Ambient temperature : 21 °C Relative humidity : 42 %

6.2. TEST SETUP

The product has been tested according to ANSI C63.10 and FCC part 15 subpart C:

Frequency range :	Below 30MHz	From 30MHz to 1GHz	Above 1GHz
Antenna Polarization :	Parallel, Perpendicular And Ground parallel	Horizontal And Vertical	Horizontal And Vertical
Antenna Height :	1m Varied from 1m to 4m		Varied from 1m to 4m
Antenna Type :	Loop	Bi-Log	Horn
RBW Filter :	200Hz below 150kHz 9kHz above 150kHz		1MHz
Maximization :	Turn	table rotation of 360 degrees r	ange
EUT height :	3.0	3m	1.5m
Test site :	Open Aera Test Site	Open Aera Test Site	Open Aera Test Site
Distance EUT-Antenna :	3m	10m	10m



Test Set up for radiated measurement in open area test site





Photograph for Transmitter Radiated Emission







1GHz-6GHz

Photograph for Transmitter Radiated Emission



6.3. LIMIT

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



6.4. TEST EQUIPMENT LIST

	Test e	equipment use	d		
Description	Manufacturer	Model	Identifier	Last Calibration date	Calibration due date
Open test site	LCIE	-	F2000400	2021-02	2022-02
EMI Test Receiver	ROHDE & SCHWARZ	ESU	A2642018	2020-10	2022-10
Preamplifier	HELWETT PACKARD	8449B	A4069002	2020-09	2022-09
Signal Generator	R&S	SMR20	A5444002	2020-07	2022-07
Cable	-	-	A5329442	2020-12	2021-12
Cable	-	-	A5329542	2020-11	2021-11
Horn antenna	ETS	3115	C2042016	2021-04	2023-04
Cable			A5329361	2020-12	2021-12
Antenne bilog	CHASE	CBL 6112A	C2040040	2021-04	2022-04
Cable	-	-	A5329876	2020-12	2021-12
Cable	-	-	A5329449	2020-12	2021-12
Loop antenna	R&S	HFH2-Z2	C2040269	2020-09	2022-09
Cable	-	-	A53291007	2021-02	2022-02

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

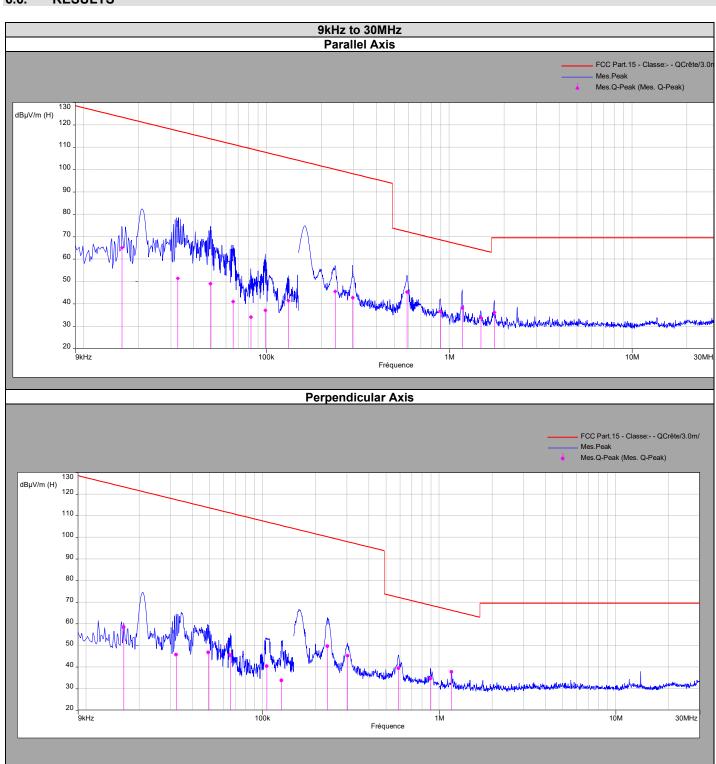
6.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

✓ None	☐ Divergence:			

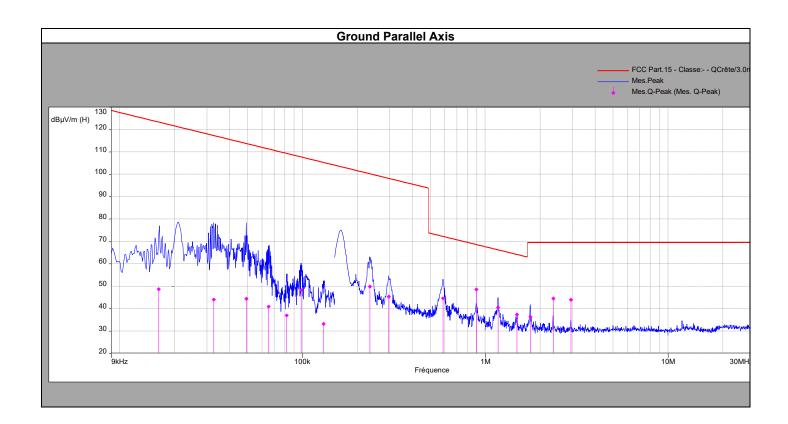
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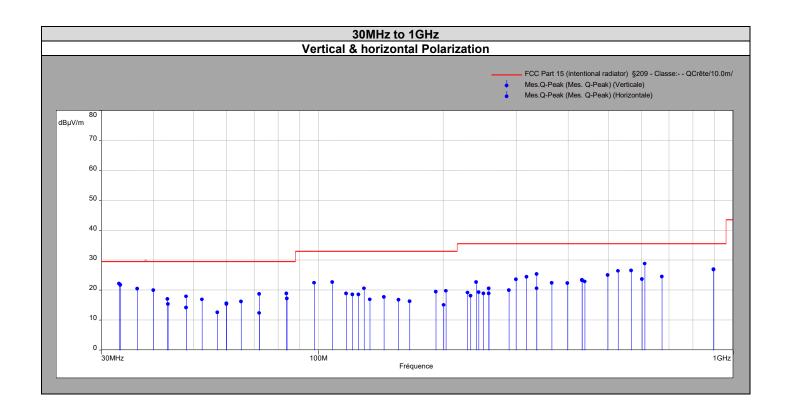
6.6. RESULTS













9kHz to 30MHz				
Polarization	Frequency (kHz)	Peak Level (dBµV/m)	· · · · · · · · · · · · · · · · · · ·	
Parallel Axis	16.37	-	65.13	123.2
Parallel Axis	32.7	-	51.2	117.3
Parallel Axis	49.14	-	49.08	113.7
Parallel Axis	65.1	-	45.5	111.1
Ground Parallel Axis	98.3	-	48.3	107.7
Ground Parallel Axis	233.5	-	49.9	100.2
Ground Parallel Axis	587.5	-	51.82	72.2
Ground Parallel Axis	893.5	-	48.54	68.6
Ground Parallel Axis	1.174	-	40.51	66.2

	30MHz to 1GHz				
Polarization	Frequency (MHz)	Peak Level (dBµV/m)	4		
Vertical	33.1	-	22.09	29.5	
Vertical	33.3	-	21.68	29.5	
Vertical	108	-	22.6	33	
Vertical	528	-	26.46	35.5	
Vertical	567.2	-	26.47	35.5	
Vertical	602.7	-	23.69	35.5	
Vertical	673.3	-	24.45	35.5	
Horizontal	317.5	-	24.37	35.5	
Horizontal	365.1	-	22.41	35.5	
Horizontal	432	-	23.41	35.5	
Horizontal	612	-	28.89	35.5	
Horizontal	896.3	-	26.83	35.5	

Above 1GHz						
Polarization	Frequency (MHz)	Duty cycle correction (dB)	Average Level (dBµV/m)	Average Limit (dBµV/m)	Peak Level (dBµV/m)	Peak Limit (dBµV/m)
all emissions were greater than 20 dB below the limit						

6.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product MICROPORT CRM s.r.l CPR4, SN: RA2106021E, in configuration and description presented in this test report, show levels compliant to the 47 CFR PART 15.209 & RSS-Gen ISSUE 5 limits.



7. UNCERTAINTIES CHART

47 CFR Part 15.209 & 15.207 Kind of test	Wide uncertainty laboratory (k=2) ±x(dB) / (Hz)/ ms	Uncertainty limit
Measurement of conducted disturbances in voltage on the AC power port (9 kHz – 150 kHz)	2,67	3.8
Measurement of conducted disturbances in voltage on the AC power port (150 kHz - 30 MHz)	2,67	3.4
Measurement of conducted disturbances in voltage on the telecommunication port. (AAN)	3,67	5.0
Measurement of conducted disturbances in current (current clamp)	2,73	2.9
Measurement of disturbance power	2,67	4.5
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC V01	4,48	/
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC C01	4,48	/
Measurement of radiated electric field from 30 to 1000MHz in horizontal position on the OATS (Ecuelles)	4,88	6.3
Measurement of radiated electric field from 1 to 18GHz on the Ecuelles site	5.16	1
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	1

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