



LCIE

RFID 13,56MHz Template: Release May 28<sup>th</sup>, 2020

# TEST REPORT

N°: 169599-757498-A

Version : 01

## Subject

Radio spectrum matters  
tests according to standards:  
47 CFR Part 15.225 & RSS 210 Issue 10 & RSS-Gen Issue 5

## Issued to

HORIBA France SAS  
14 Boulevard Thomas Gobert – Passage Jobin Yvon  
92120-PALAISEAU  
France

## Apparatus under test

↳ Product  
↳ Trade mark  
↳ Manufacturer  
↳ Model under test  
↳ Serial number  
↳ FCC ID  
↳ IC

NFC reader  
HORIBA  
HORIBA FRANCE SAS  
1300064890 (n° SAP)  
-  
2AYO6-1300046203  
26734-1300046203

## Conclusion

See Test Program chapter

## Test date

: October 21, 2020 to March 22, 2021

## Test location

Moirans

## Test Site

6500A-1 & 6500A-3

## Registration Number

197516

## Designation Number

FR0008

## Sample receipt date

October 21, 2020

## Composition of document

38 pages

## Document issued on

March 24, 2021

Written by :  
**Armand MAHOUNGOU**  
Tests operator

Approved by :  
**Arnaud FAYETTE**  
Technical manager  
  
LABORATOIRE CENTRAL DES INDUSTRIES ELECTRIQUES  
33 avenue du Général Leclerc  
F - 92266 FONTENAY AUX ROSES

This document shall not be reproduced, except in full, without the written approval of the LCIE. This document contains results related only to the items tested. It does not imply the conformity of the whole production to the items tested. Unless otherwise specified or rule defined by the test method, the decision of conformity doesn't take into account the uncertainty of measures. This document doesn't anticipate any certification decision.

**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	March 24, 2021	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.*



## SUMMARY

1.	TEST PROGRAM .....	4
2.	EQUIPMENT UNDER TEST: CONFIGURATION (DECLARED BY PROVIDER) .....	5
3.	OCCUPIED BANDWIDTH.....	10
4.	20DB EMISSION BANDWIDTH .....	13
5.	FREQUENCY TOLERANCE .....	16
6.	AC POWER LINE CONDUCTED EMISSIONS.....	20
7.	FIELD STRENGTH OUTSIDE OF THE BANDS 13.110-14.010 MHZ .....	28
8.	FIELD STRENGTH WITHIN THE BAND 13.110-14.010MHZ.....	34
9.	UNCERTAINTIES CHART .....	38

## 1. TEST PROGRAM

### References

- 47 CFR Part 15.225 (2020)
- RSS 210 Issue 10
- RSS Gen Issue 5
- ANSI C63.10 (2013)

### Radio requirement:

Clause (47CFR Part 15.225 & RSS-210 Issue 10 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth <a href="#">P</a>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
20dB Emission Bandwidth <a href="#">P</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="#">P</a>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA(2)	<input type="checkbox"/> NP(1)
Frequency Tolerance <a href="#">P</a>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Field strength within the band 13.110-14.010MHz <a href="#">P</a>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Field strength outside of the bands 13.110-14.010 MHz <a href="#">P</a>	<input checked="" type="checkbox"/> PASS	<input type="checkbox"/> FAIL	<input type="checkbox"/> NA	<input type="checkbox"/> NP(1)
Receiver Radiated Emissions <a href="#">P</a>	<input checked="" type="checkbox"/> PASS (3)	<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

(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

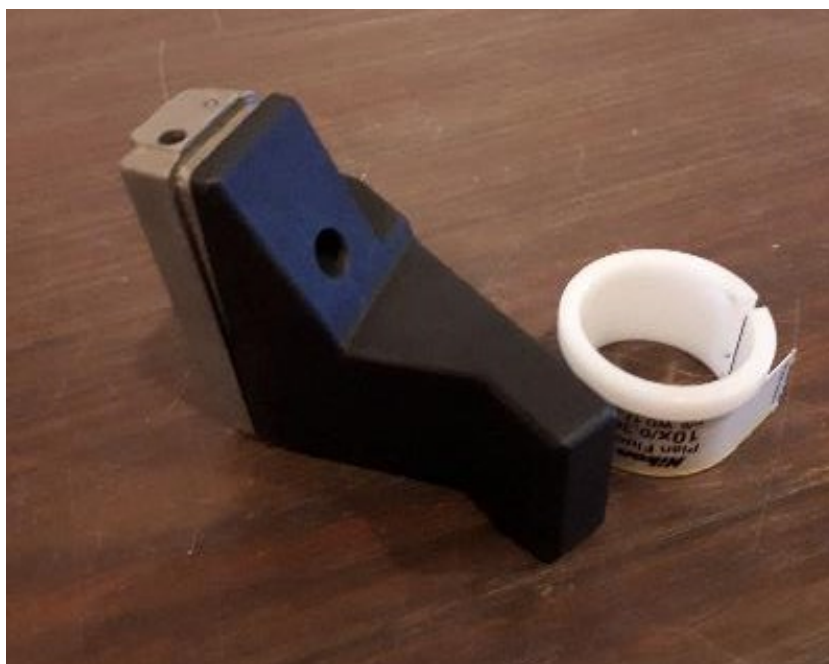
NP: Test Not Performed

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

### 2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):  
HORIBA 1300064890 (n° SAP)

Serial Number: -



Equipment Under Test



Auxiliary equipment

**Power supply:**

Name	Type	Rating	Reference / Sn	Comments
Supply1	<input checked="" type="checkbox"/> AC <input type="checkbox"/> DC <input type="checkbox"/> Battery			

**Inputs/outputs - Cable:**

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
1	Subd-9	1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Power supply	1.8	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

**Auxiliary equipment used during test:**

Type	Reference	Sn	Comments
Laptop DELL	Latitude 7390	-	Use to set the EUT
Power supply MEANWELL	GSM60A12	-	Use to set the EUT
Power card	1300015270 D	-	Use to set the EUT
Main Darwin card	1300019284 M	-	Use to set the EUT



# **Equipment information:**

Type:	<input checked="" type="checkbox"/> <b>RFID</b>		
Frequency band:	[13.110 to 14.010] MHz		
Number of Channel:	1		
Antenna Type:	<input checked="" type="checkbox"/> Integral	<input type="checkbox"/> External	<input type="checkbox"/> Dedicated
Transmit chains:	1		
Receiver chains:	1		
Type of equipment:	<input checked="" type="checkbox"/> Stand-alone	<input type="checkbox"/> Plug-in	<input type="checkbox"/> Combined
Equipment arrangement:	<input type="checkbox"/> Tabletop	<input type="checkbox"/> Floor-standing	<input checked="" type="checkbox"/> Multiple orientations
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"/> -30°C
	Tnom:	20°C	
	Tmax:	<input type="checkbox"/> 35°C	<input checked="" type="checkbox"/> 50°C <input type="checkbox"/> X°C
Operating voltage:	Vmin:	<input checked="" type="checkbox"/> 102V/60Hz	<input type="checkbox"/> X VDC
	Vnom:	<input checked="" type="checkbox"/> 120V/60Hz	<input type="checkbox"/> X VDC
	Vmax:	<input checked="" type="checkbox"/> 138V/60Hz	<input type="checkbox"/> X VDC

Hardware information		
HVIN	V. :	NFC Reader



## 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	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
20dB Emission Bandwidth	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
Frequency Tolerance	<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()
Field strength within the band 13.110-14.010MHz	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()
Field strength outside of the bands 13.110-14.010 MHz	<input checked="" type="checkbox"/> Test mode 1	<input type="checkbox"/> Alternative test mode()

## 2.3. EQUIPMENT LABELLING

No labelling
--------------

## 2.4. EQUIPMENT MODIFICATION

☒ None      ☐ 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 52.5dB $\mu$ V 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 dB $\mu$ V/m.

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

The 32 dB $\mu$ V/m value can be mathematically converted to its corresponding level in  $\mu$ V/m.

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32\text{dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}.$$

## 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 : Armand MAHOUGOU  
Date of test : March 18, 2021  
Ambient temperature : 22°C  
Relative humidity : 41%

#### 3.2. TEST SETUP

- The Equipment Under Test is installed:

- ☐ On a table
- ☒ In a climatic chamber
- ☐ In an anechoic chamber

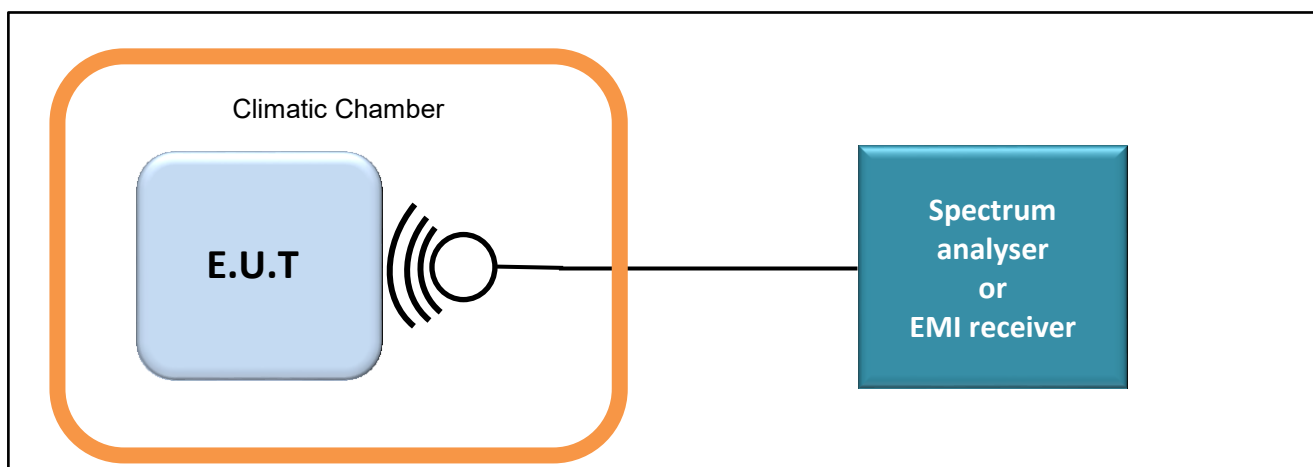
- Measurement is performed with a spectrum analyzer in:

- ☐ Conducted Method
- ☒ Radiated Method

The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

- Test Procedure:

- ☒ RSS-Gen Issue 5 § 6.7
  - RBW used in the range of 1% to 5% of the anticipated emission bandwidth
  - Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
  - Detector = Peak.
  - Trace mode = Max Hold.
  - Sweep = Auto couple.
  - Allow the trace to stabilize.
  - OBW 99% function of spectrum analyzer used



Test set up of Occupied Bandwidth



Photograph for Occupied bandwidth

### 3.3. LIMIT

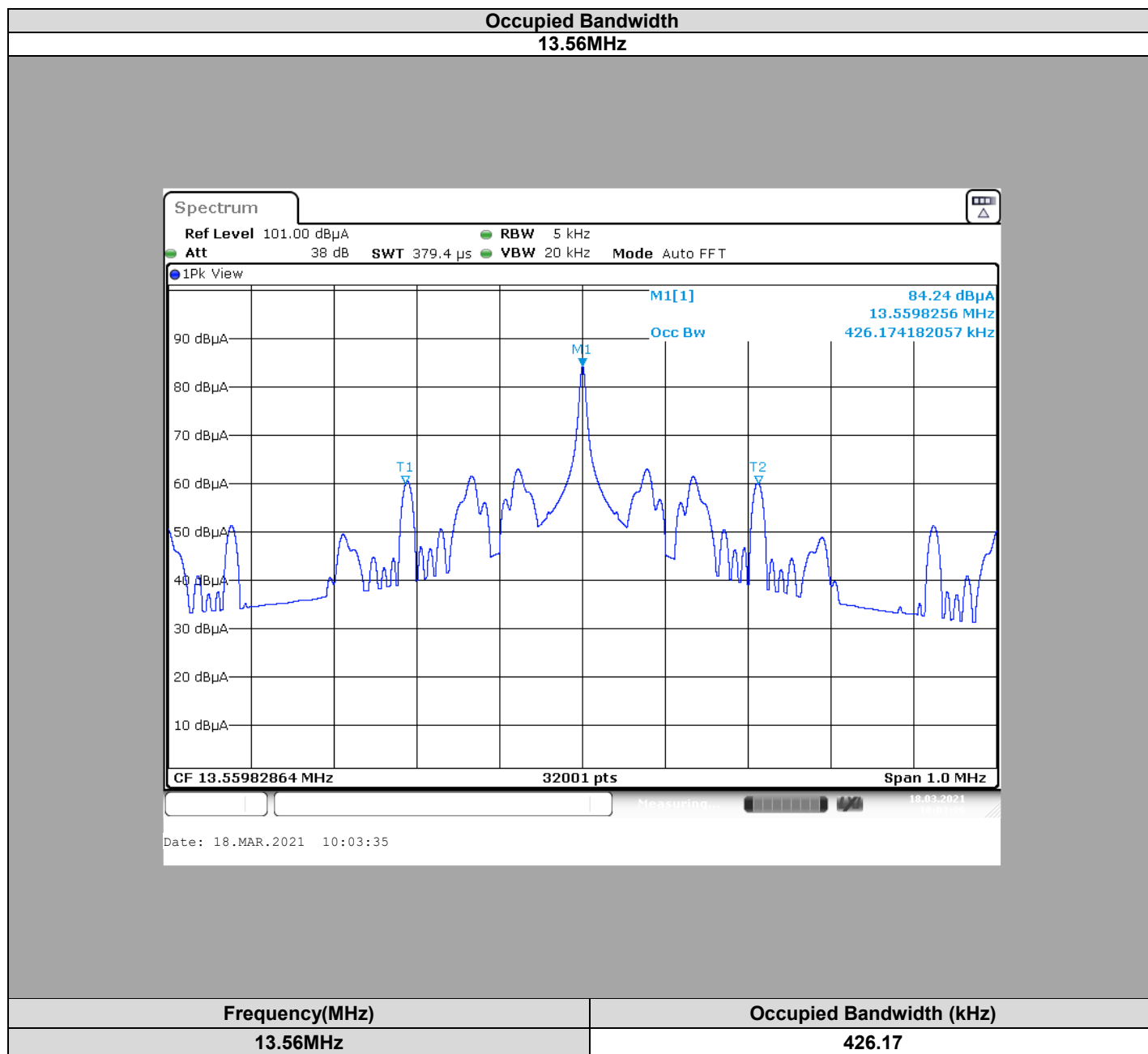
None

### 3.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Climatic chamber	SECASI	SLT34	D1024029	See Hygrometer	
Hygrometer	AOIP	TM360	B4041042	2019/04	2021/04
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2019/01	2021/01
Multimeter	KEITHLEY	2000	A1242090	2021/03	2023/03
Power supply	KIKUSUI	PCR500M	A7040079	See Multimeter	
13,56MHz Test fixture Antenna	-	-	A5329422	Cal with EMI receiver	

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 **HORIBA 1300064890 (n° SAP)**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the **RSS-GEN** limits.

## 4. 20dB EMISSION BANDWIDTH

### 4.1. TEST CONDITIONS

Test performed by : Armand MAHOUGOU  
Date of test : March 18, 2021  
Ambient temperature : 22 °C  
Relative humidity : 41 %

### 4.2. TEST SETUP

- The Equipment under Test is installed:

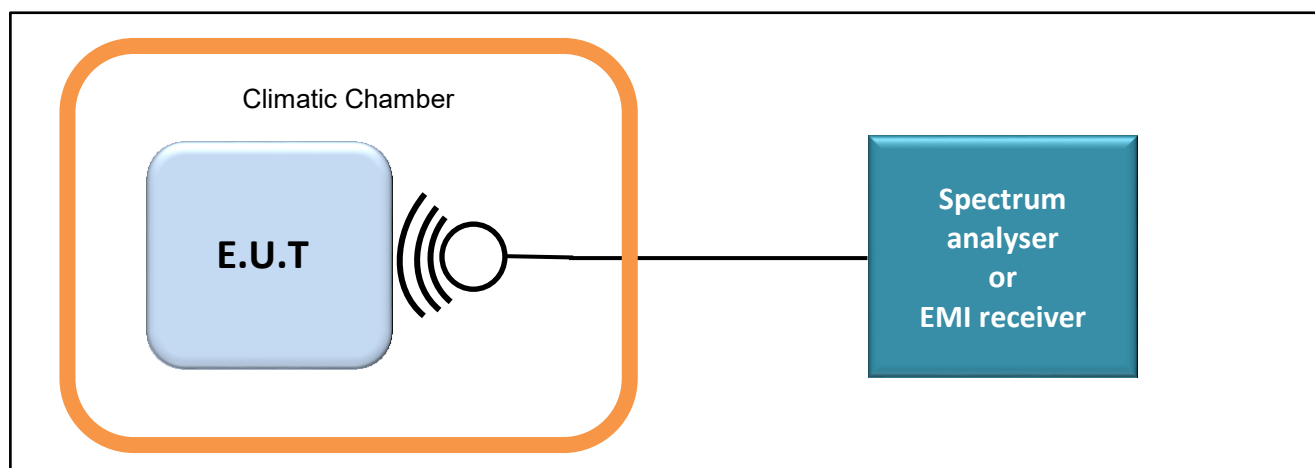
- ☒ On a table
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- ☐ Conducted Method
- ☒ Radiated Method

- Test Procedure:

- ☒ ANSI C63.10 § 6.9



Test set up of Occupied Bandwidth



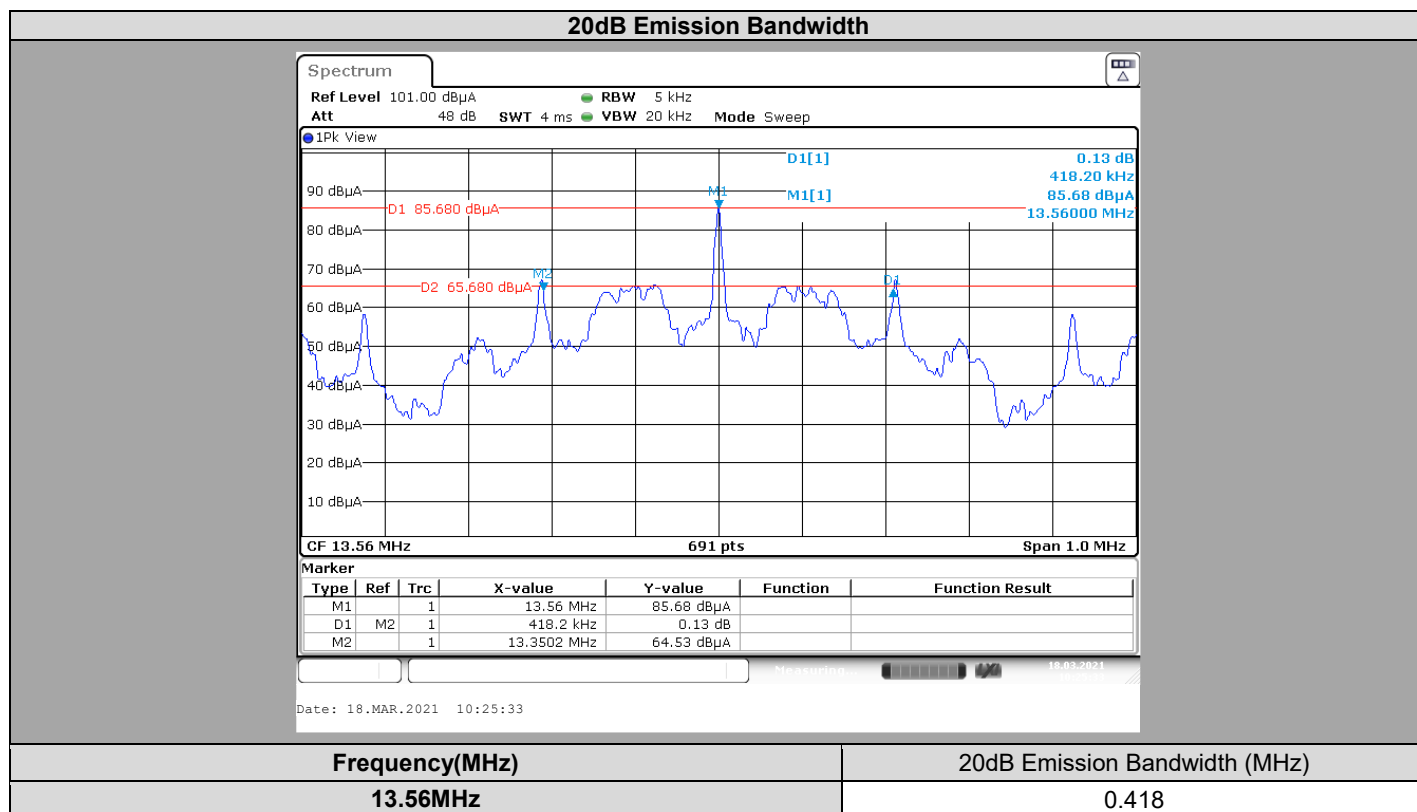
Photograph for 20dB emission bandwidth

#### 4.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Climatic chamber	SECASI	SLT34	D1024029	See Hygrometer	
Hygrometer	AOIP	TM360	B4041042	2019/04	2021/04
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2019/01	2021/01
Multimeter	KEITHLEY	2000	A1242090	2021/03	2023/03
Power supply	KIKUSUI	PCR500M	A7040079	See Multimeter	
13,56MHz Test fixture Antenna	-	-	A5329422	Cal with EMI receiver	

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

#### 4.4. RESULTS



#### 4.5. CONCLUSION

20dB Emission Bandwidth measurement performed on the sample of the product **HORIBA 1300064890 (n° SAP)**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.225 & RSS 210 limits.

## 5. FREQUENCY TOLERANCE

### 5.1. TEST CONDITIONS

Test performed by : Armand MAHOUNGOU  
Date of test : October 27, 2020  
Ambient temperature : 22°C  
Relative humidity : 41%

### 5.2. TEST SETUP

- The Equipment Under Test is installed:

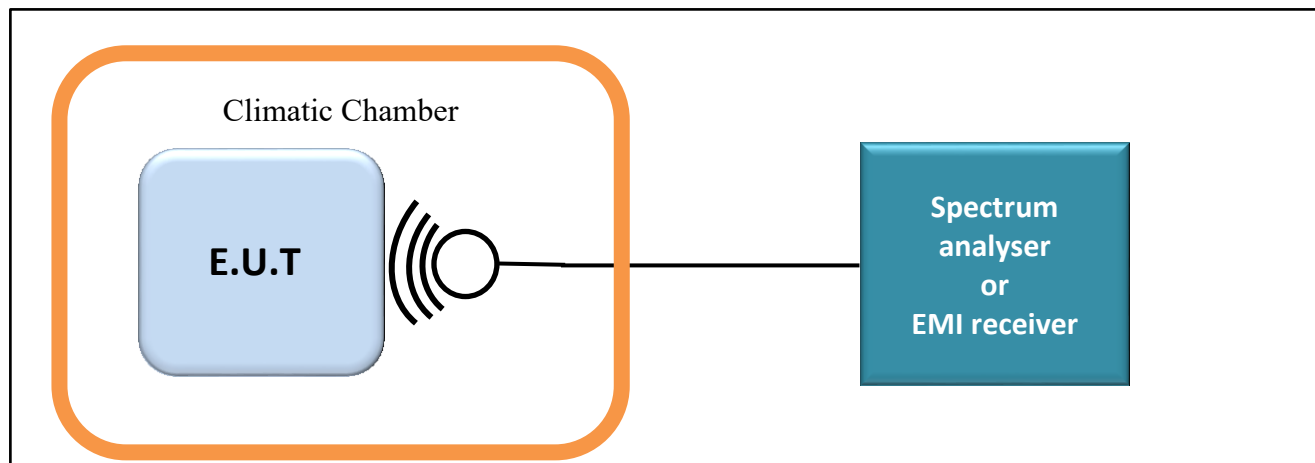
- ☐ On a table
- ☒ In a climatic chamber
- ☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:

- ☐ Conducted Method
- ☒ Radiated Method

- Test Procedure:

- ☒ ANSI C63.10 § 6.8



Test set up of Occupied Bandwidth





Photograph for Frequency Tolerance in normal test condition



Photograph for Frequency Tolerance in extreme test condition



### 5.3. LIMIT

$\pm 0.01\%$  ( $\pm 100\text{ppm}$ )

### 5.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Climatic chamber	SECASI	SLT34	D1024029	See Hygrometer	
Hygrometer	AOIP	TM360	B4041042	2019/01	2021/01
EMI receiver	ROHDE & SCHWARZ	ESR 7	A2642023	2019/01	2021/01
Multimeter	KEITHLEY	2000	A1242090	2019/05	2021/05
Power supply	KIKUSUI	PCR500M	A7040079	See Multimeter	
13,56MHz Test fixture Antenna	-	-	A5329422	Cal with EMI receiver	

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

## 5.5. RESULTS

EUT activation:	Startup								
Voltage:	Vnom								
Temperature:	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C
Frequency (MHz)	13,5606797	13,5607015	13,5607312	13,5607328	13,5607203	13,5607	13,5606719	13,5606625	13,5606547
Frequency Drift (%)	0,0050	0,0052	0,0054	0,0054	0,0053	0,0052	0,0050	0,0049	0,0048
EUT activation:	2min								
Voltage:	Vnom								
Temperature:	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C
Frequency (MHz)	13,5606844	13,5607062	13,5607328	13,5607328	13,5607187	13,5606969	13,5606703	13,5606609	13,5606562
Frequency Drift (%)	0,0050	0,0052	0,0054	0,0054	0,0053	0,0051	0,0049	0,0049	0,0048
EUT activation:	5min								
Voltage:	Tnom								
Temperature:	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C
Frequency (MHz)	13,5606937	13,560725	13,5607359	13,5607281	13,5607078	13,5606875	13,5606656	13,5606578	13,5606625
Frequency Drift (%)	0,0051	0,0053	0,0054	0,0054	0,0052	0,0051	0,0049	0,0049	0,0049
EUT activation:	10min								
Voltage:	Tnom								
Temperature:	-30°C	-20°C	-10°C	0°C	10°C	20°C	30°C	40°C	50°C
Frequency (MHz)	13,5606953	13,5607281	13,5607344	13,5607265	13,5607062	13,5606844	13,560664	13,5606562	13,560664
Frequency Drift (%)	0,0051	0,0054	0,0054	0,0054	0,0052	0,0050	0,0049	0,0048	0,0049

Temperature	Tnom		
Voltage:	Vmin	Vnom	Vmax
Frequency (MHz)	13,5606797	13,5606812	13,5606781
Frequency Drift (%)	0,0050	0,0050	0,0050

## 5.6. CONCLUSION

Frequency tolerance measurement performed on the sample of the product **HORIBA 1300064890 (n° SAP)**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.225 & RSS 210 limits.

## 6. AC POWER LINE CONDUCTED EMISSIONS

### 6.1. TEST CONDITIONS

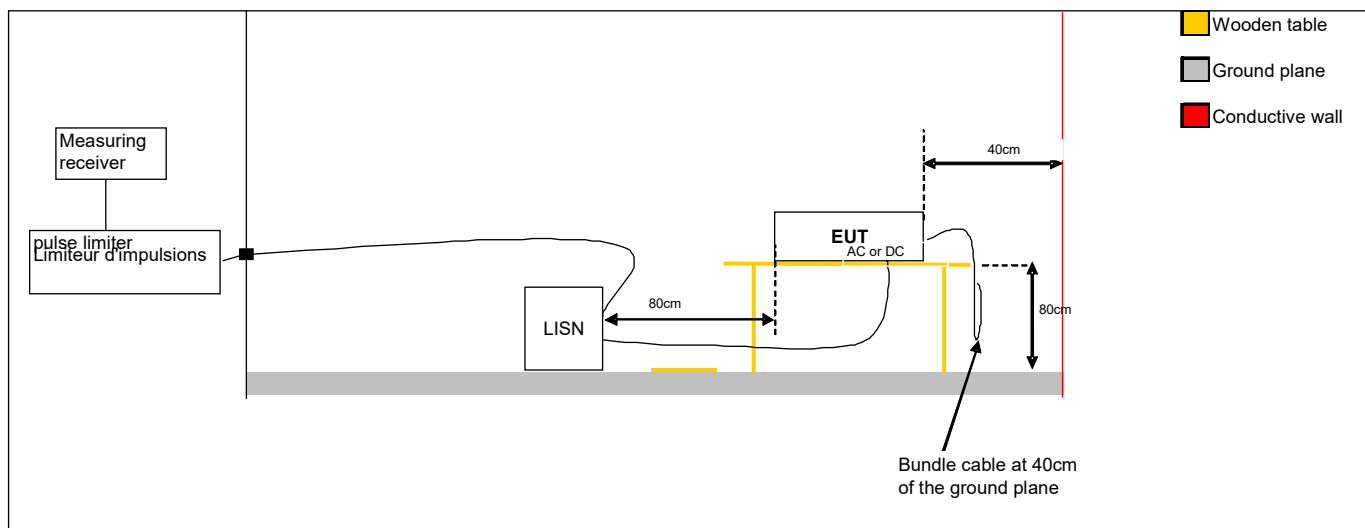
Test performed by : Laurent DENEUX  
 Date of test : October 22, 2020  
 Ambient temperature : 21 °C  
 Relative humidity : 48 %

### 6.2. 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 / 50μH. Interconnecting cables and equipment's were moved to position that maximized emission.

Voltage table used (for Power Line Conducted Emissions):

Type	Measurement performed:	
<input checked="" type="checkbox"/> AC / <input checked="" type="checkbox"/> DC (Auxiliary used)	<input checked="" type="checkbox"/> 120VAC/60Hz	<input checked="" type="checkbox"/> 240VAC/50Hz
<input type="checkbox"/> USB (Laptop auxiliary)	<input type="checkbox"/> 120VAC/60Hz (Laptop auxiliary)	<input type="checkbox"/> 240VAC/50Hz(Laptop auxiliary)





Photograph for AC Power Line Conducted Emissions (Front view)



Photograph for AC Power Line Conducted Emissions (Rear view)



### 6.3. LIMIT

Frequency range	Level	Detector
0,15kHz to 0,5MHz	66dB $\mu$ V to 56 $\mu$ V*	QPeak
	56dB $\mu$ V to 46 $\mu$ V*	Average
0,5MHz to 5MHz	56dB $\mu$ V	QPeak
	46dB $\mu$ V	Average
5MHz to 30MHz	60B $\mu$ V	QPeak
	50dB $\mu$ V	Average

\*Decreases with the logarithm of the frequency

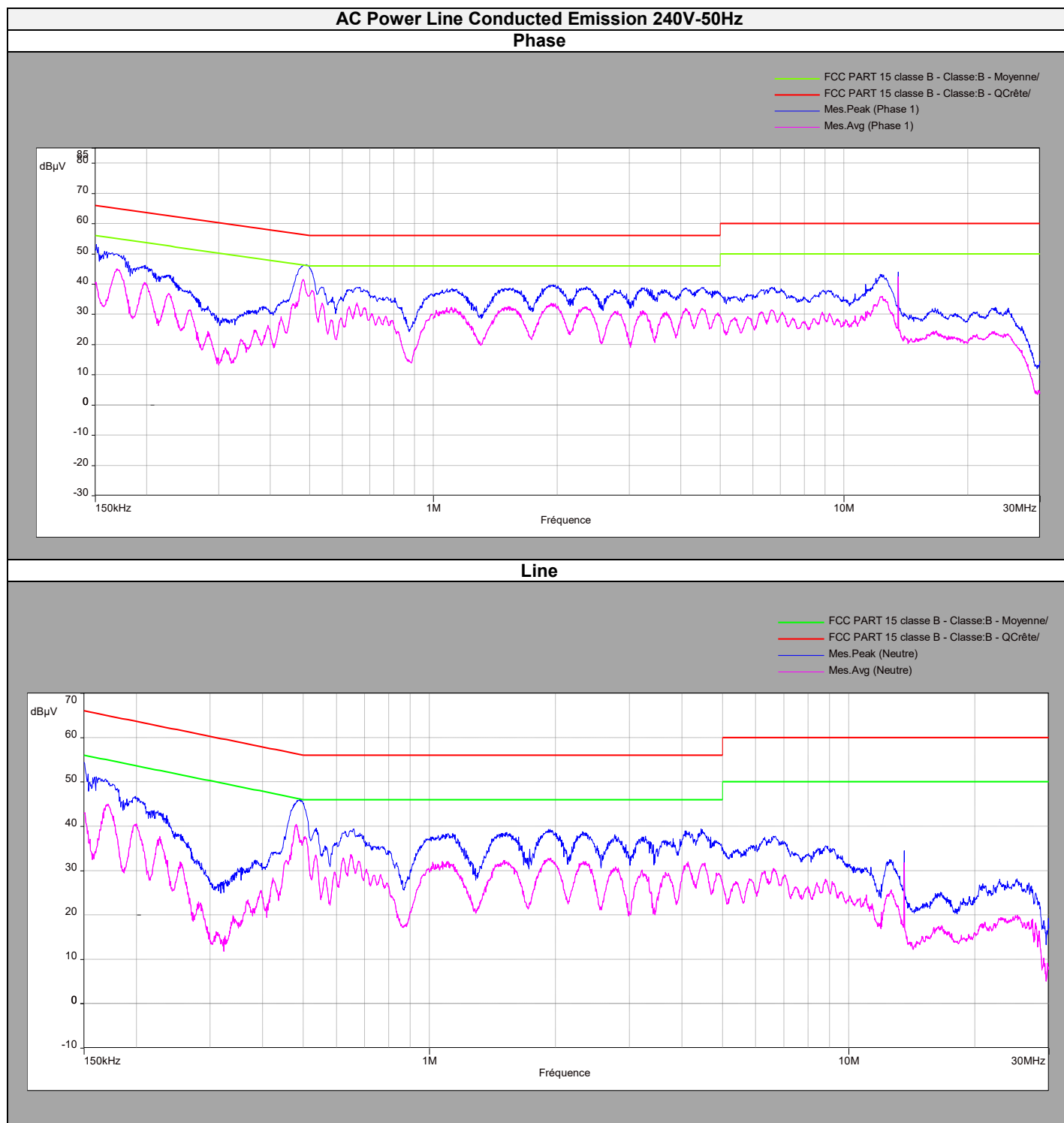
### 6.4. TEST EQUIPMENT LIST

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2018-10	2020-10
V ISLN	ROHDE & SCHWARZ	NSLK 8127	C2320091	2019-02	2021-02
Cable	-	-	A5329417	2019-12	2020-12
Cable	-	-	A5329589	2020-10	2021-10
Ground plane	LCIE	-	-	-	-

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

☒ None      ☐ Divergence:

## 6.6. RESULTS



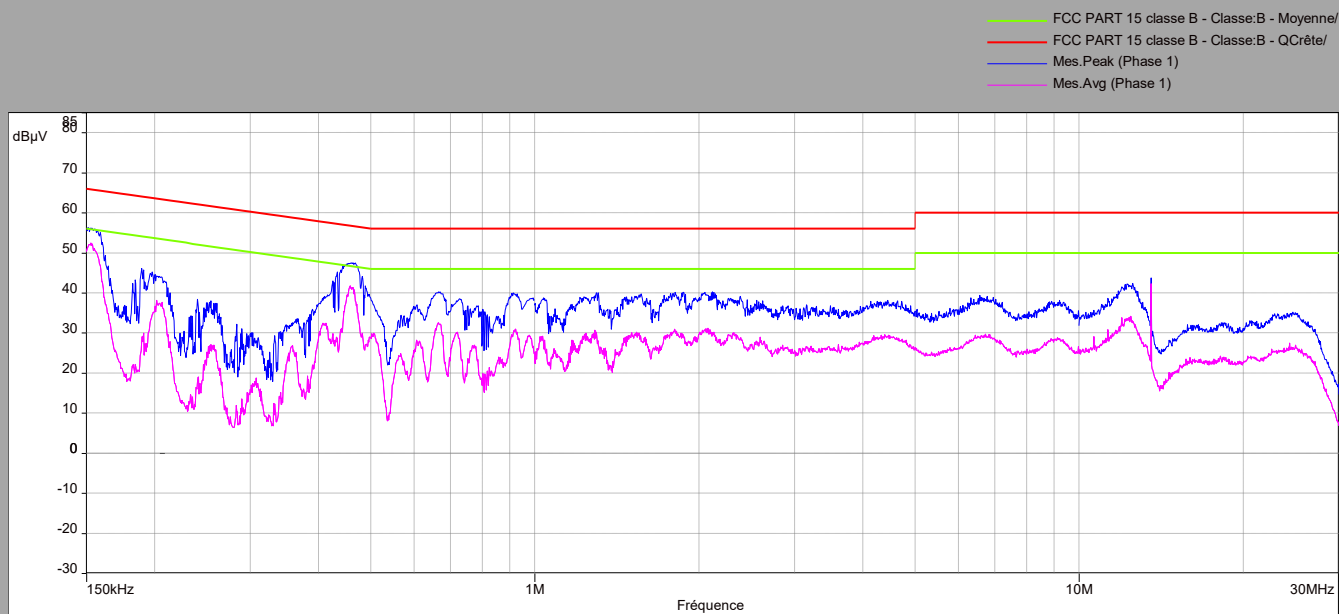


Phase Line							
Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Margin Quasi-Peak (dBμV)	Average Level (dBμV)	Average Limit (dBμV)	Margin Average (dBμV)
0,169	50	-	65	15	45	55	10
0,483	46,2	-	56,2	10	41,2	46,2	5
1,95	39,2	-	56	16,8	33	46	13
13,56	44	-	60	16	42	50	8
25,11	32,1	-	60	27,9	22,9	50	27,1

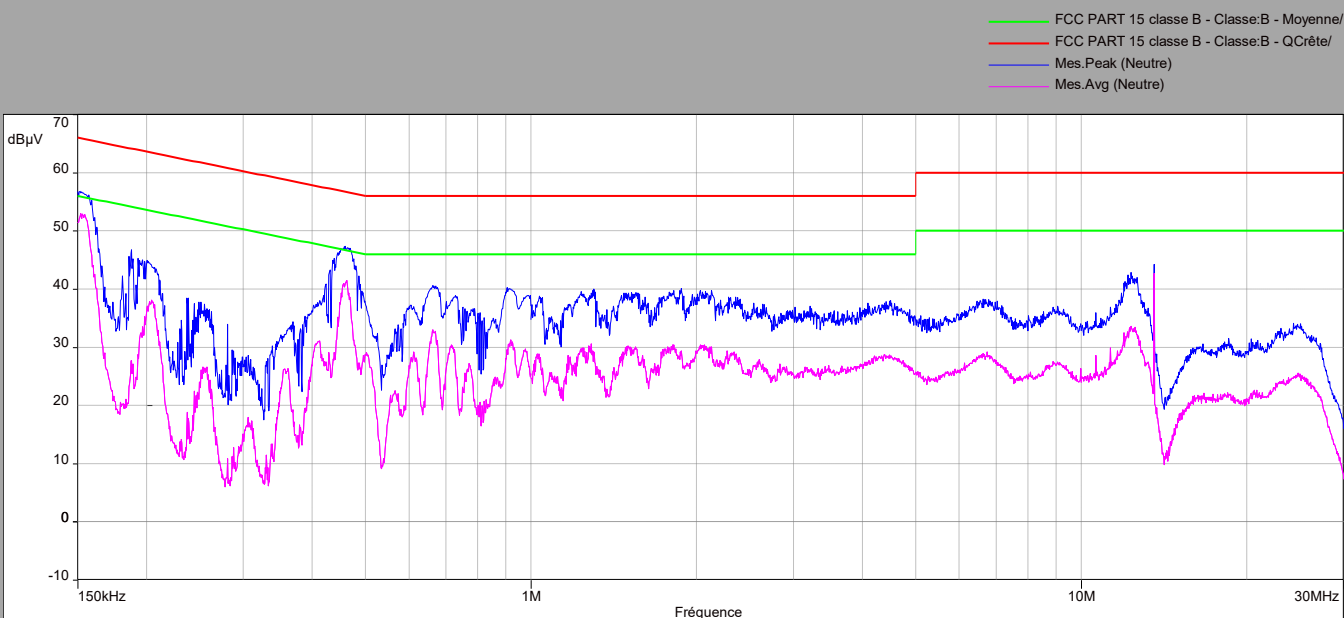
Neutral Line							
Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Margin Quasi-Peak (dBμV)	Average Level (dBμV)	Average Limit (dBμV)	Margin Average (dBμV)
0,169	50,3	-	65	14,7	44,7	55	10,3
0,486	45,8	-	56,2	10,4	40,4	46,2	5,8
1,93	39,2	-	56	16,8	31,7	46	14,3
13,56	33,2	-	60	26,8	30,4	50	19,6
23,91	27,6	-	60	32,4	17,6	50	32,4

## AC Power Line Conducted Emission 120V-60Hz

### Phase



### Line



Phase Line							
Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Margin Quasi-Peak (dBμV)	Average Level (dBμV)	Average Limit (dBμV)	Margin Average (dBμV)
0,154	56,1	-	65,8	9,7	52,3	55,8	3,5
0,46	47,4	-	56,7	9,3	41,3	46,7	5,4
1,86	39,6	-	56	16,4	29,3	46	16,7
13,56	43,7	-	60	16,3	42	50	8
25,52	33,4	-	60	26,6	23,7	50	26,3

Neutral Line							
Frequency (MHz)	Peak Level (dBμV)	Quasi-Peak Level (dBμV)	Quasi-Peak Limit (dBμV)	Margin Quasi-Peak (dBμV)	Average Level (dBμV)	Average Limit (dBμV)	Margin Average (dBμV)
0,152	56,3	-	65,8	9,5	53	55,8	2,8
0,462	46,9	-	56,7	9,8	41,4	46,7	5,3
0,666	40,5	-	56	15,5	32,5	46	13,5
13,56	44,2	-	60	15,8	42,7	50	7,3
24,55	33,7	-	60	26,3	24	50	26

## 6.7. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **HORIBA 1300064890 (n° SAP)**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.225 & RSS Gen limits.

## 7. FIELD STRENGTH OUTSIDE OF THE BANDS 13.110-14.010 MHz

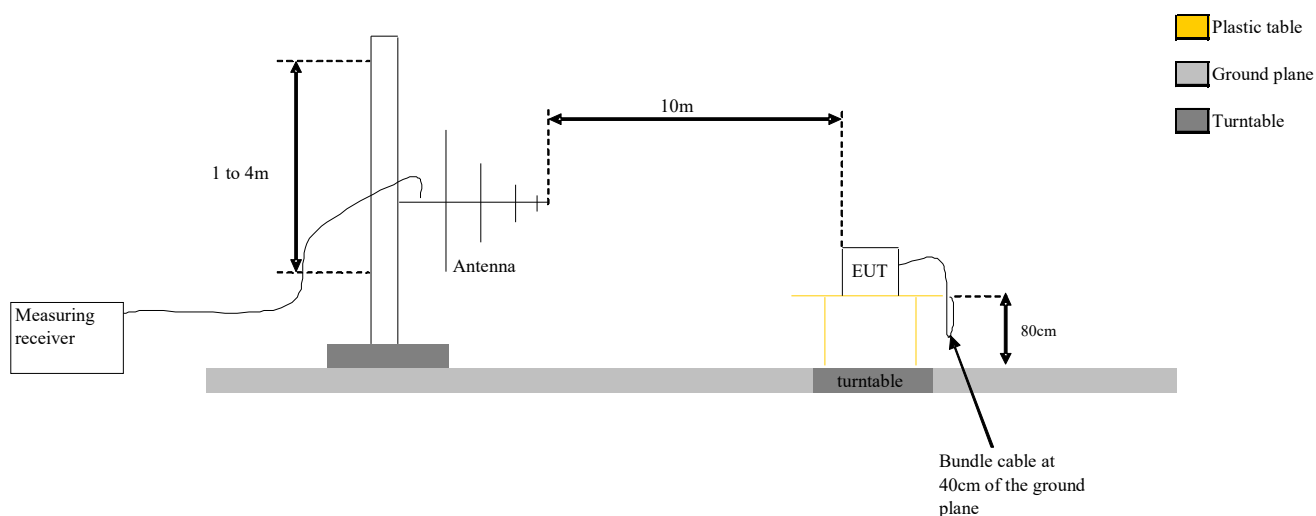
### 7.1. TEST CONDITIONS

Test performed by : Laurent DENEUX  
 Date of test : October 23, 2020  
 Ambient temperature : 20 °C  
 Relative humidity : 49 %

### 7.2. 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
Antenna Polarization :	Parallel, Perpendicular And Ground parallel	Horizontal And Vertical
Antenna Height :	1m	Varied from 1m to 4m
Antenna Type :	Loop	Bi-Log
RBW Filter :	200Hz below 150kHz 9kHz above 150kHz	120kHz
Maximization :	Turntable rotation of 360 degrees range	
EUT height :	0.8m	
Test site :	Open Aera Test Site	Open Aera Test Site
Distance EUT-Antenna :	10m	10m



Test Set up for radiated measurement in open area test site



Photograph for Field strength outside of the bands 13.110-14.010 MHz

### 7.3. 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	35.5dB $\mu$ 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



#### 7.4. TEST EQUIPMENT LIST

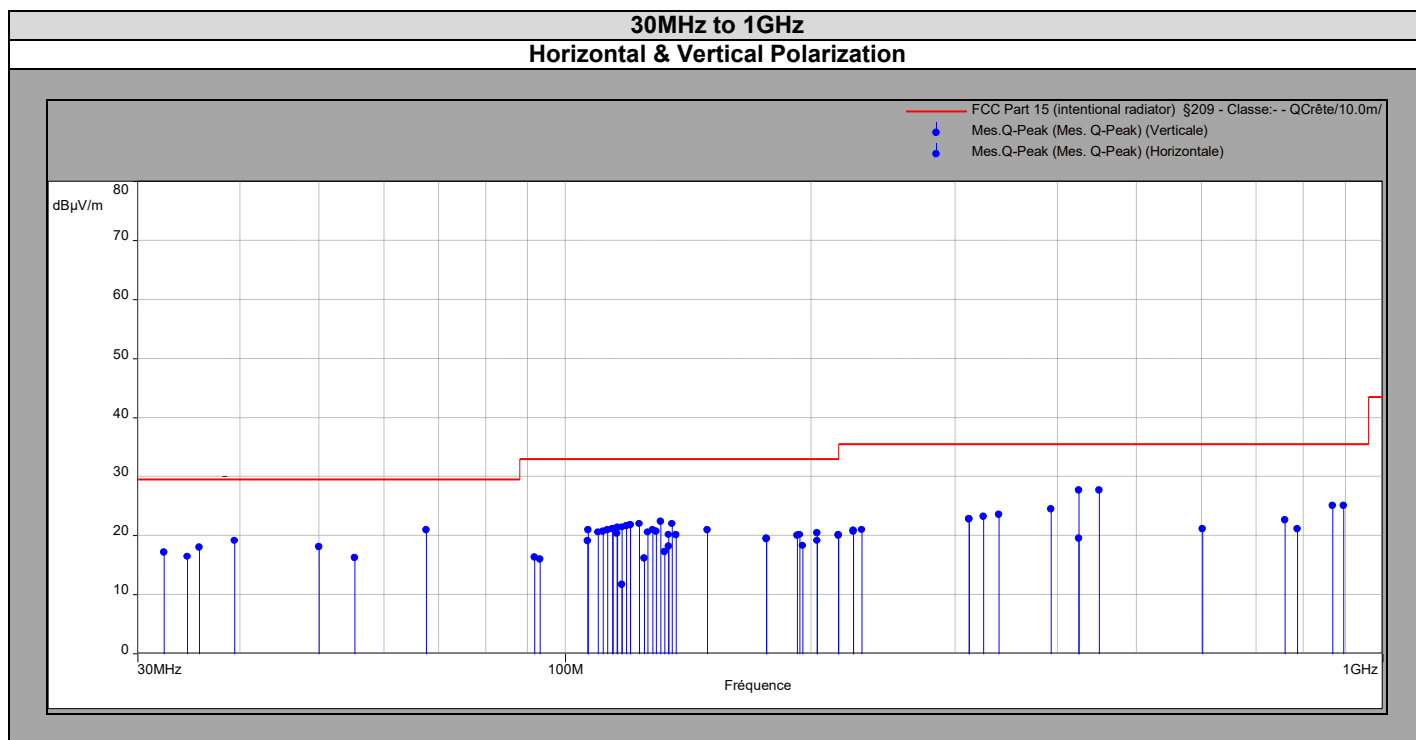
Test equipment used					
Description	Manufacturer	Model	Identifier	Last Calibration date	Calibration due date
Open test site	LCIE	-	F2000400	2020-09	2021-09
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2018-10	2020-10
Cable	-	-	A5329444	2019-12	2020-12
Bilog antenna	CHASE	CBL 6112A	C2040040	2020-05	2021-05
Cable	-	-	A5329442	2019-12	2020-12
Cable	-	-	A5329876	2019-12	2020-12
loop antenna	ROHDE & SCHWARZ	HFH2-Z2	C2040269	2020-09	2022-09
Cable	-	-	A5329416	2019-12	2020-12

Note: In our quality system, the test equipment calibration due is more & less 3 months

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

☒ None      ☐ Divergence:

## 7.6. RESULTS





9kHz to 30MHz					
Polarization	Frequency (MHz)	Peak Level (dBμV/m)	QPeak Level (dBμV/m)	Limit (dBμV/m)	Margin QPeak (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 QPeak (dBμV/m)
Vertical	67.6	-	20.96	29.5	8.54
Vertical	112.7	-	20.96	33	12.04
Vertical	114.2	-	21.1	33	11.9
Vertical	117.3	-	21.49	33	11.51
Vertical	120.2	-	21.87	33	11.13
Vertical	123.2	-	22.02	33	10.98
Vertical	126.2	-	20.58	33	12.42
Vertical	127.9	-	21.03	33	11.97
Vertical	129.3	-	20.69	33	12.31
Vertical	130.8	-	22.42	33	10.58
Vertical	312	-	22.78	35.5	12.72
Vertical	339	-	23.54	35.5	11.96
Vertical	392.7	-	24.46	35.5	11.04
Vertical	425	-	27.66	35.5	7.84
Horizontal	135.2	-	22.04	33	10.96
Horizontal	203.4	-	20.45	33	12.55
Horizontal	216	-	20.13	33	12.87
Horizontal	225	-	20.86	35.5	14.64
Horizontal	312	-	22.78	35.5	12.72
Horizontal	325	-	23.18	35.5	12.32
Horizontal	450	-	27.65	35.5	7.85
Horizontal	759.4	-	22.68	35.5	12.82
Horizontal	867.9	-	25.09	35.5	10.41
Horizontal	895	-	25.09	35.5	10.41

## 7.7. CONCLUSION

Field strength outside of the bands 13.110-14.010 MHz measurement performed on the sample of the product **HORIBA 1300064890 (n° SAP)**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.225 & RSS-Gen limits.

## 8. FIELD STRENGTH WITHIN THE BAND 13.110-14.010MHz

### 8.1. TEST CONDITIONS

Test performed by : Laurent DENEUX  
 Date of test : October 23, 2020  
 Ambient temperature : 20 °C  
 Relative humidity : 49 %

### 8.2. TEST SETUP

Measurement procedure:

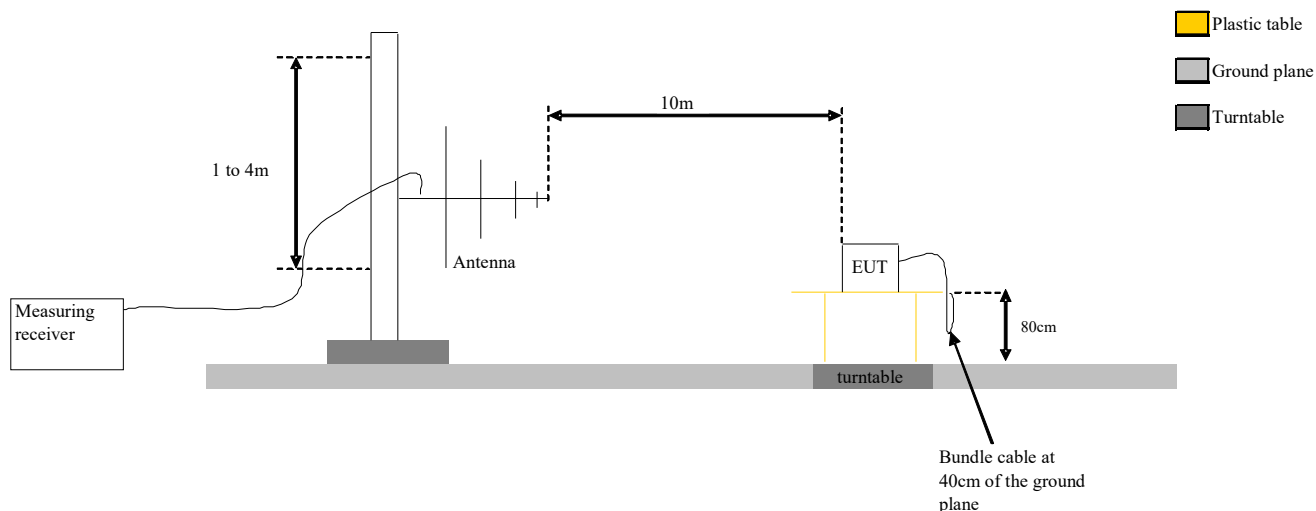
- ☒ Open Area Test Site
- ☐ Open Area Test Site + Test fixture in climatic chamber

The product has been tested according to ANSI C63.10.

The EUT is placed **on an open area test site**. Distance between measuring antenna and the EUT is **3m**.

Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz.

Measurement bandwidth was 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration. Antenna height search was performed from 1 to 4m. The EUT is place at 0.8m.



Test Set up for radiated measurement in open area test site

For measurement with test fixture is used, the power level calibration of the spectrum analyzer shall then be related to the power level or field strength measured with temperature during OATS measure taking in consideration in climatic chamber. The calculation will be used to calculate the absolute level of the sideband power.

#### Frequency band 13.110-14.010MHz

Following plots show radiated emission level in the frequency band 13.110-14.010MHz with a RBW of 9kHz and a quasi-peak detector. The graphs are obtained with a measuring receiver.

#### Frequency band 13.553-13.567MHz

Following plots show radiated emission level in the frequency band 13.55.-13.567MHz with a RBW of 1kHz. The graphs are obtained with a measuring receiver.



Photograph for Field strength within the band 13.110-14.010MHz

### 8.3. LIMIT

Frequency (MHz)	Field strength ( $\mu\text{V/m}$ ) @30m	Field strength ( $\text{dB}\mu\text{V/m}$ ) @30m	Field strength ( $\text{dB}\mu\text{V/m}$ ) @3m
13.553-13.567	15 848	84.0	124.0
13.410-13.553 13.567-13.710	334.0	50.5	90.5
13.110-13.410 13.710-14.010	106.0	40.5	80.5
Below 13.110MHz Above 14.010MHz	30.0	29.5	69.5

### 8.4. TEST EQUIPMENT LIST

Test equipment used					
Description	Manufacturer	Model	Identifier	Last Calibration date	Calibration due date
Open test site	LCIE	-	F2000400	2020-09	2021-09
EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	A2642021	2018-10	2020-10
Cable	-	-	A5329444	2019-12	2020-12
Bilog antenna	CHASE	CBL 6112A	C2040040	2020-05	2021-05
Cable	-	-	A5329442	2019-12	2020-12
Cable	-	-	A5329876	2019-12	2020-12
loop antenna	ROHDE & SCHWARZ	HFH2-Z2	C2040269	2020-09	2022-09
Cable	-	-	A5329416	2019-12	2020-12

Note: In our quality system, the test equipment calibration due is more & less 3 months

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

☒ None      ☐ Divergence:

## 8.6. RESULTS

Parallel Axis			
Frequency (MHz)	Peak Level (dBµV/m) (3m)	QPeak Level (dBµV/m) (3m)	Limit (dBµV/m) (3m)
Below 13.110	-	29.4	69.5
13.110 to 13.410	-	30.2	80.5
13.410 to 13.553	-	33.5	90.5
13.553 to 13.567	-	62.8	124.0
13.567 to 13.710	-	34.1	90.5
13.710 to 14.010	-	32.1	80.5
Above 14.010	-	28.9	69.5

Ground Parallel Axis			
Frequency (MHz)	Peak Level (dBµV/m) (3m)	QPeak Level (dBµV/m) (3m)	Limit (dBµV/m) (3m)
Below 13.110	-	28.7	69.5
13.110 to 13.410	-	30.6	80.5
13.410 to 13.553	-	32.9	90.5
13.553 to 13.567	-	45.8	124.0
13.567 to 13.710	--	33.1	90.5
13.710 to 14.010	-	29.7	80.5
Above 14.010	-	28.8	69.5

Perpendicular Axis			
Frequency (MHz)	Peak Level (dBµV/m) (3m)	QPeak Level (dBµV/m) (3m)	Limit (dBµV/m) (3m)
Below 13.110	-	26.5	69.5
13.110 to 13.410	-	28.4	80.5
13.410 to 13.553	-	32.4	90.5
13.553 to 13.567	-	55.7	124
13.567 to 13.710	-	32	90.5
13.710 to 14.010	-	30.8	80.5
Above 14.010	-	29.5	69.5

## 8.7. CONCLUSION

Field strength within the band 13.110-14.010MHz measurement performed on the sample of the product **HORIBA 1300064890 (n° SAP)**, SN: -, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.225 & RSS 210 limits.

## 9. UNCERTAINTIES CHART

47 CFR Part 15.209 & 15.207 Kind of test	Wide uncertainty laboratory (k=2) $\pm x(\text{dB}) / (\text{Hz}) / \text{ms}$	Uncertainty limit
Measurement of conducted disturbances in voltage on the AC power port (9 kHz – 150 kHz)	2,67	3.8
Measurement of conducted disturbances in voltage on the AC power port (150 kHz – 30 MHz)	2,67	3.4
Measurement of conducted disturbances in voltage on the telecommunication port. (AAN)	3,67	5.0
Measurement of conducted disturbances in current (current clamp)	2,73	2.9
Measurement of disturbance power	2,67	4.5
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC V01	4,48	/
Measurement of radiated magnetic field from 10kHz to 30MHz in SAC C01	4,48	/
Measurement of radiated electric field from 30 to 1000MHz in horizontal position on the OATS (Ecuelles)	4,88	6.3
Measurement of radiated electric field from 1 to 18GHz on the Ecuelles site	5.16	/
Measurement of radiated electric field from 30 to 1000MHz in vertical position on the OATS (Ecuelles)	4,99	6.3
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC C01	5,08	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC C01	5,16	6.3
Measurement of radiated electric field from 30 to 1000MHz in horizontal position in SAC V01	5,08	6.3
Measurement of radiated electric field from 30 to 1000MHz in vertical position in SAC V01	5,15	6.3
Measurement of radiated electric field from 1 to 6 GHz C01	5,1	5.2
Measurement of radiated electric field from 1 to 6 GHz V01	4,85	5.2
Measurement of radiated magnetic field from 10kHz to 30MHz on the OATS (Ecuelles)	4,48	/

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report