TEST REPORT

N°: 170687-760709-A(FILE#1053662) **Version : 03**

Subject	**Radio spectrum matters** **tests according to standards:** **47 CFR Part 15.247 & RSS-247 Issue 2 & RSS-Gen Issue 5**
Issued to	**BIOCORP** Parc Technologique de Lavaur- La Bechade 63500 – ISSOIRE France
Apparatus under test	
↳ Product	**Smart cap for insulin pen**
↳ Trade mark	**BIOCORP**
↳ Manufacturer	**BIOCORP**
↳ Model under test	**SoloSmart mini**
↳ Serial number	**None**
↳ FCC ID	**2AYCW-EFD2**
↳ IC	**26747-EFD2**
Conclusion	See Test Program chapter
Test date	January 28, 2021 to February 5, 2021
Test location	Moirans
FCC Test site	FR0008 - 197516
ISED Test site	FR0008 - 6500A
Sample receipt date	January 28, 2021
Composition of document	50 pages
Document issued on	March 25, 2022

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	February 15, 2021	Majid MOURZAGH	Creation of the document
02	March10, 2022	Majid MOURZAGH	Correction test site FCC/ISED on page 1
03	March 25, 2022	Majid MOURZAGH	p1: Correction name and address p4: Correction AC power test result

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	☑ **PASS**	☐ **FAIL**	☐ **NA**	☐ **NP(1)**
6dB Bandwidth	☑ **PASS**	☐ **FAIL**	☐ **NA()**	☐ **NP(1)**
Duty Cycle	☐ **PASS**	☐ **FAIL**	☑ **NA**	☐ **NP(1)**
Maximum Conducted Output Power	☑ **PASS**	☐ **FAIL**	☐ **NA**	☐ **NP(1)**
Power Spectral Density	☑ **PASS**	☐ **FAIL**	☐ **NA**	☐ **NP(1)**
Conducted Spurious Emission at the Band Edge	☑ **PASS**	☐ **FAIL**	☐ **NA()**	☐ **NP(1)**
Unwanted Emissions into Non-Restricted Frequency Bands	☑ **PASS**	☐ **FAIL**	☐ **NA()**	☐ **NP(1)**
AC Power Line Conducted Emission	☑ **PASS**	☐ **FAIL**	☐ **NA(2)**	☐ **NP(1)**
Unwanted Emissions into Restricted Frequency Bands	☑ **PASS**	☐ **FAIL**	☐ **NA**	☐ **NP(1)**
Receiver Radiated emissions	☐ **PASS**	☐ **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

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):

BIOCORP SoloSmart mini **Serial Number: None**

Equipment Under Test

Power supply:

During all the tests, EUT is supplied by V_{nom}

For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply1	☐ AC ☑ DC ☐ Battery	5Vdc 2A	/	/
Supply2	☐ AC ☐ DC ☑ Battery	3.7Vdc 130mAh	/	/

Voltage table used (for Power Line Conducted Emissions):

Type	Measurement performed:	
☐ AC	☐ **120VAC/60Hz**	☐ **240VAC/50Hz**
☐ DC	☐ **+12VDC**	☐ **-....VDC**
☑ Battery	☑ **+3.7VDC**	☐ **-....VDC**
☑ USB (Laptop auxiliary)	☐ **120VAC/60Hz (Laptop auxiliary)**	☐ **240VAC/50Hz(Laptop auxiliary)**

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Supply1	USB	0.5	☐	☑	☑	

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop LENOVO	L460	/	/
Development map	ARM mbed	-	Used for the configuration of the product
Switching Adapter INPUT:100-240 50/60Hz 0.3Amax OUTPUT:5V 2A	SOY-0500200EU	-	Used during test:"AC Power Line Conducted Emission"

Equipment information:

Bluetooth LE Type:	☑ **BLE**	☐ **v4.1**	☐ **v4.2**	☐ **v5.0**
Frequency band:	[2400 – 2483.5] MHz			
Spectrum Modulation:	☑ DSSS (Tested like it)			
Number of Channel:	40			
Spacing channel:	2MHz			
Channel bandwidth:	☑ 1MHz		☐ 2MHz	
Antenna Type:	☑ Integral	☐ External	☐ Dedicated	
Antenna connector:	☐ Yes	☐ No	☑ Temporary for test	
Transmit chains:	1			
	Single antenna			
	Gain: 0.5dBi			
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined	
Duty cycle:	☐ Continuous duty	☐ Intermittent duty	☑ 100% duty	
Equipment type:	☑ Production model		☐ Pre-production model	
Operating temperature range:	Tmin:	☐ -20°C	☐ 0°C	☑ 5°C
	Tnom:	20°C		
	Tmax:	☐ 35°C	☐ 55°C	☑ 35°C
Type of power source:	☐ AC power supply	☑ DC power supply	☑ Battery	
Operating voltage range:	Vnom:	☑ 5Vdc	☑ 3.7Vdc	

CHANNEL PLAN			
Channel	**Frequency (MHz)**	**Channel**	**Frequency (MHz)**
Cmin: 0	2402	**Cmid: 20**	2442
1	2404	21	2444
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			
Available	**Data Rate (Mbps)**	**Modulation Type**	**Worst Case Modulation**
☑	1	GFSK	☑

2.2. RUNNING MODE

Test mode	Description of test mode
Test mode 1	Connected on loading Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
Test mode 2	Connected on loading Permanent reception

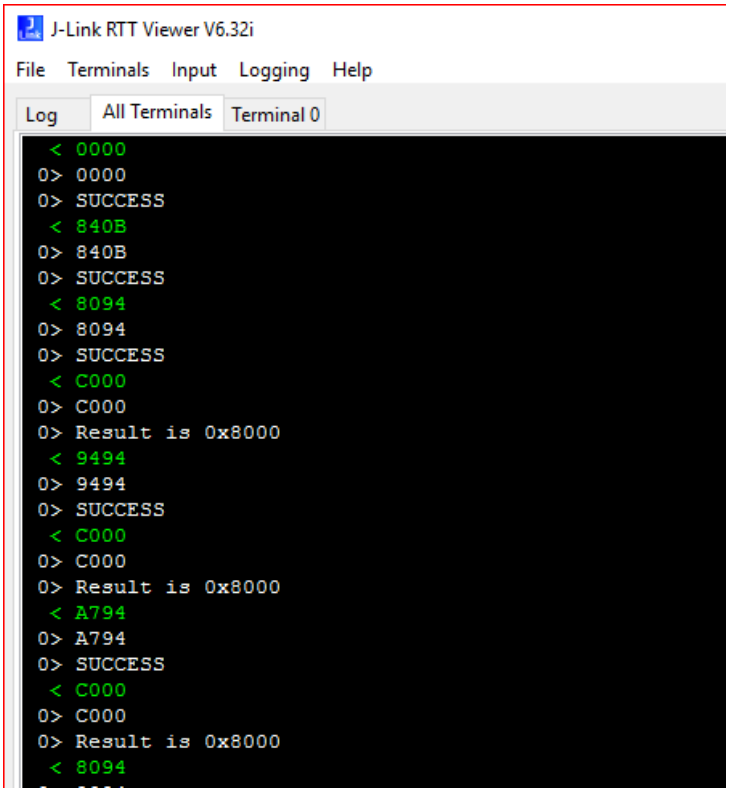
Test	Running mode	
Occupied Bandwidth	☑ Test mode 1 (1)	☐ Alternative test mode()
6dB Bandwidth	☑ Test mode 1 (1)	☐ Alternative test mode()
Duty Cycle	☑ Test mode 1 (1)	☐ Alternative test mode()
Maximum Conducted Output Power	☑ Test mode 1 (1)	☐ Alternative test mode()
Power Spectral Density	☑ Test mode 1 (1)	☐ Alternative test mode()
Conducted Spurious Emission at the Band Edge	☑ Test mode 1 (1)	☐ Alternative test mode()
Unwanted Emissions into Non-Restricted Frequency Bands	☑ Test mode 1 (1)	☐ Alternative test mode()
AC Power Line Conducted Emission	☐ Test mode 1 (1)	☐ Alternative test mode()
Unwanted Emissions into Restricted Frequency Bands	☑ Test mode 1 (1)	☐ Alternative test mode()

(1) Following commands with the specific test software “Jlink RTT” are used to set the product:

a. – See the command used during test (provided by customer).

Hardware information		
Software (if applicable):	V. :	JLink RTT Client V6.80a

Set power level tested : 840B (hexadecimal)
Set TX modulated Channel Min : 8094 (hexadecimal)
Set TX modulated Channel Mid: 9494 (hexadecimal)
Set TX modulated Channel Max: A794 (hexadecimal)
Set RX Channel Min : 4094 (hexadecimal)
Set RX Channel Max : 6794 (hexadecimal)
Return number of packet received on RX mode : C000 (hexadecimal)



2.3. EQUIPMENT LABELLING

None

2.4. EQUIPMENT MODIFICATION

☑ None ☐ Modification:

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

Test performed by	: Majid MOURZAGH
Date of test	: February 1, 2021
Ambient temperature	: 23 °C
Relative humidity	: 30 %

3.2. TEST SETUP

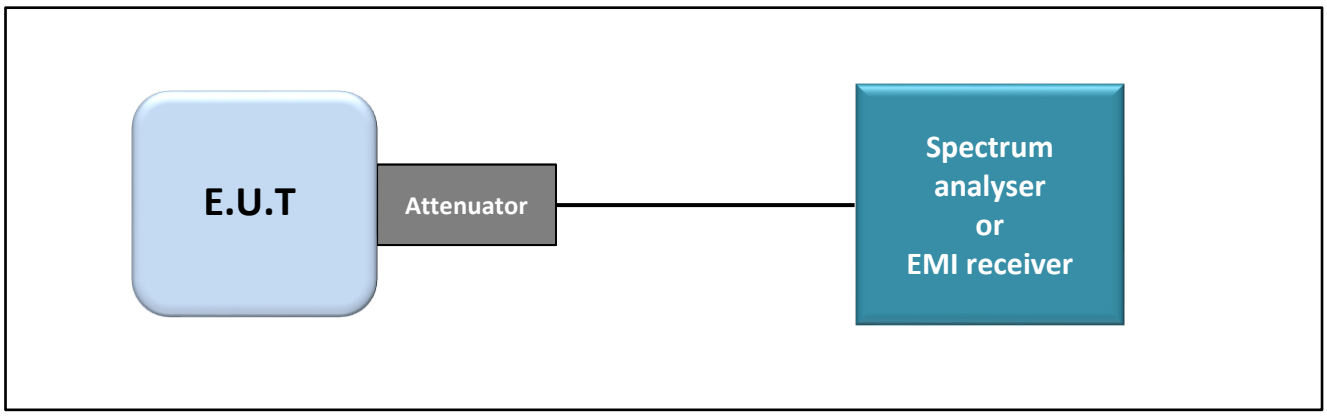
- The Equipment under Test is installed:
☐ On a table
☑ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

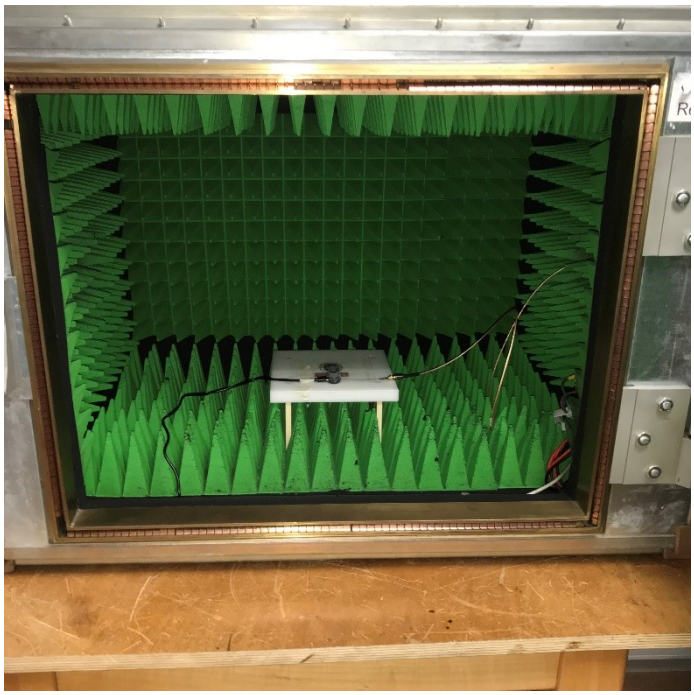
- Test Procedure:
☐ RSS-Gen Issue 5 § 6.7
☑ ANSI C63.10 § 6.9.2

Measurement Procedure:

a) RBW shall be in the range of 1% to 5% of the anticipated occupied bandwidth
b) Set the video bandwidth (VBW) ≥ 3 x 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

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Attenuator 10dB	AEROFLEX	_	A7122267	05/19	05/21
Cable SMA UFL	_	_	A5329762	06/20	06/21
Full Anechoic Room	SIEPEL	_	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	01/21
SMA 1.5m	SUCOFLEX	18GHz	A5329863	11/18	01/21
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/19	05/21
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
SOFT	LCIE SUD EST	LCIE FCC 247 (BLE_ZIGBEE...)	L2000059	-	-

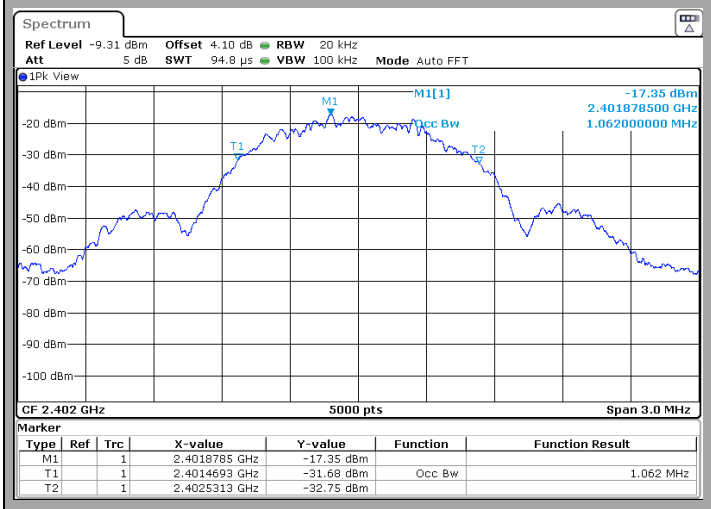
Note: In our quality system, the test equipment calibration due is more & less 2 months

3.5. RESULTS

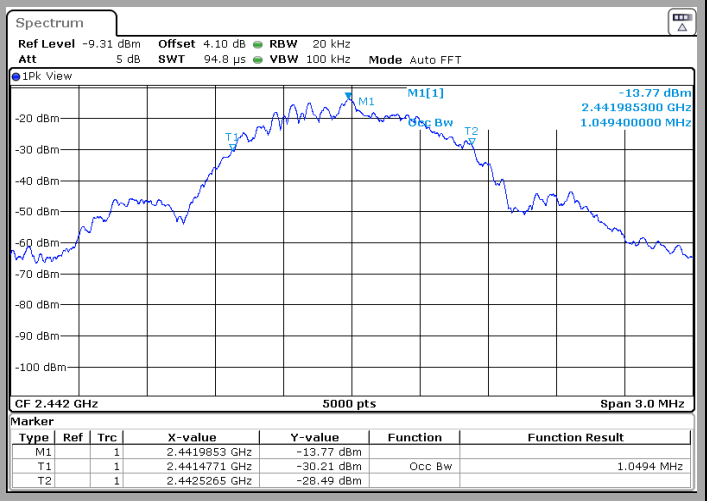
1MBits/s

Occupied Bandwidth

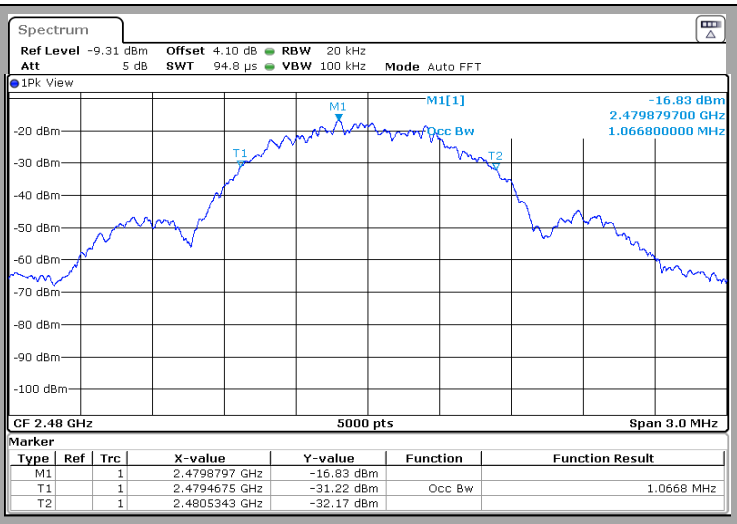
Cmin



Cnom



Cmax



Channel	Occupied Bandwidth (MHz)
Cmin	1.062
Cnom	1.049
Cmax	1.067

3.6. *CONCLUSION*

Occupied Channel Bandwidth measurement performed on the sample of the product **BIOCORP SoloSmart mini**, SN: **None**, 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	: Majid MOURZAGH
Date of test	: February 1, 2021
Ambient temperature	: 23 °C
Relative humidity	: 30 %

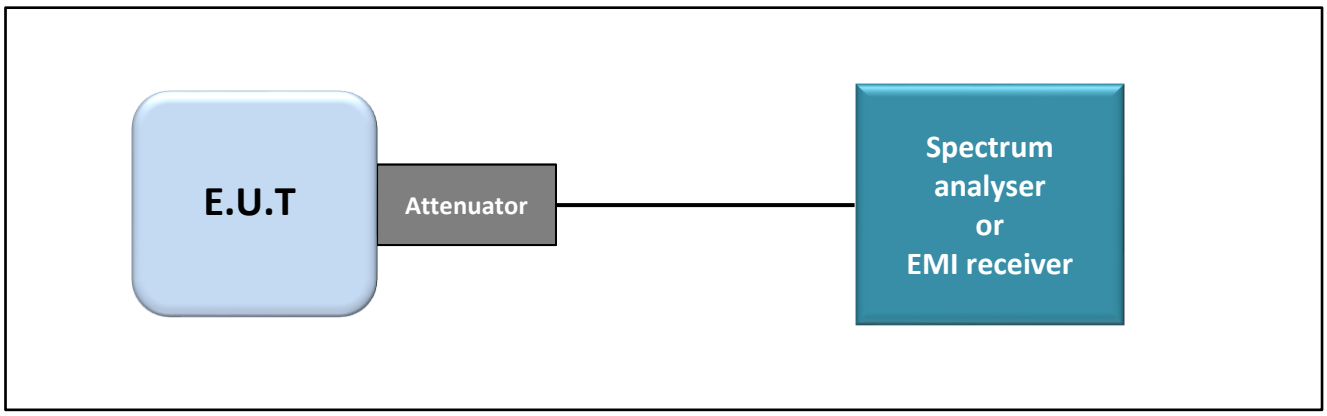
4.2. TEST SETUP

- The Equipment under Test is installed:
☐ On a table
☑ In an anechoic chamber

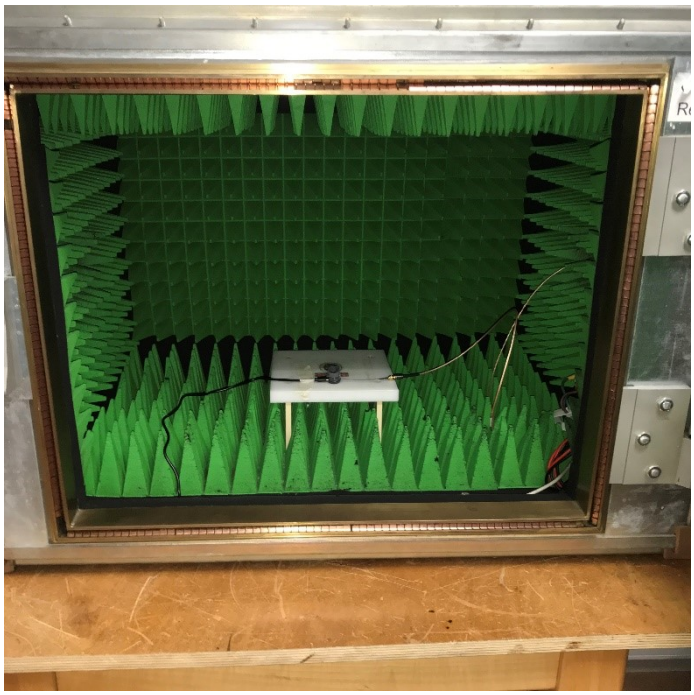
- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.2

Measurement Procedure:
1. Set resolution bandwidth (RBW) = 100kHz.
2. Set the video bandwidth (VBW) ≥ 3 x 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

The 6dB bandwidth shall be at least 500kHz

4.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Attenuator 10dB	AEROFLEX	_	A7122267	05/19	05/21
Cable SMA UFL	_	_	A5329762	06/20	06/21
Full Anechoic Room	SIEPEL	_	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	01/21
SMA 1.5m	SUCOFLEX	18GHz	A5329863	11/18	01/21
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/19	05/21
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
SOFT	LCIE SUD EST	LCIE FCC 247 (BLE_ZIGBEE...)	L2000059	-	-

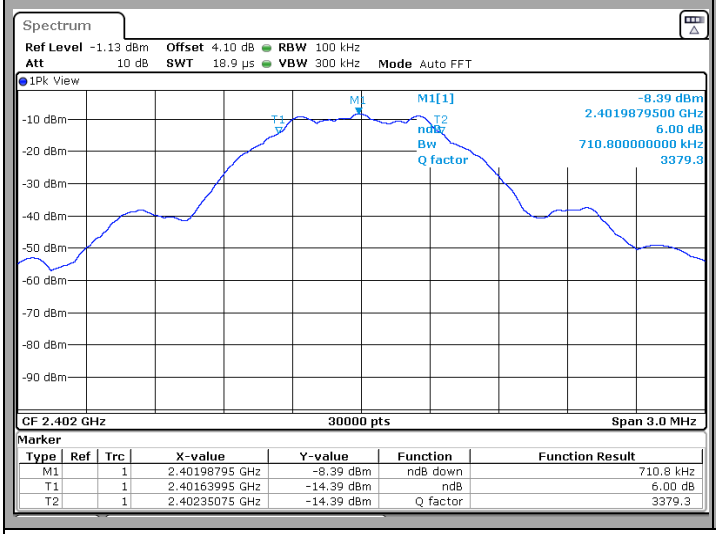
Note: In our quality system, the test equipment calibration due is more & less 2 months

4.5. RESULTS

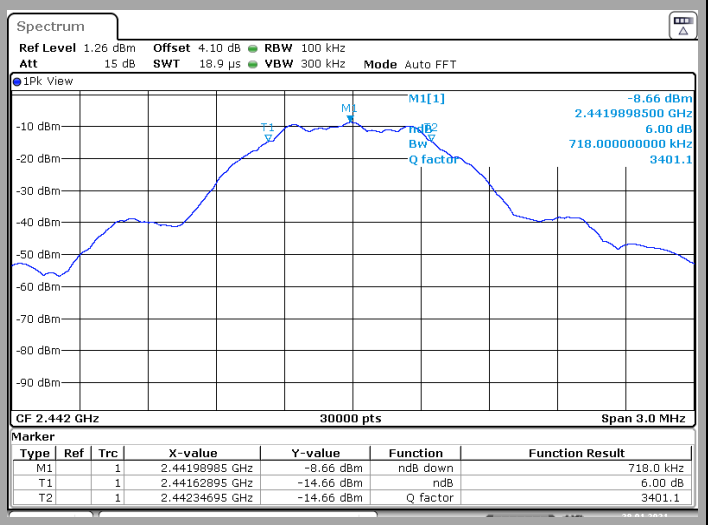
1MBits/s

6dB Emission Bandwidth

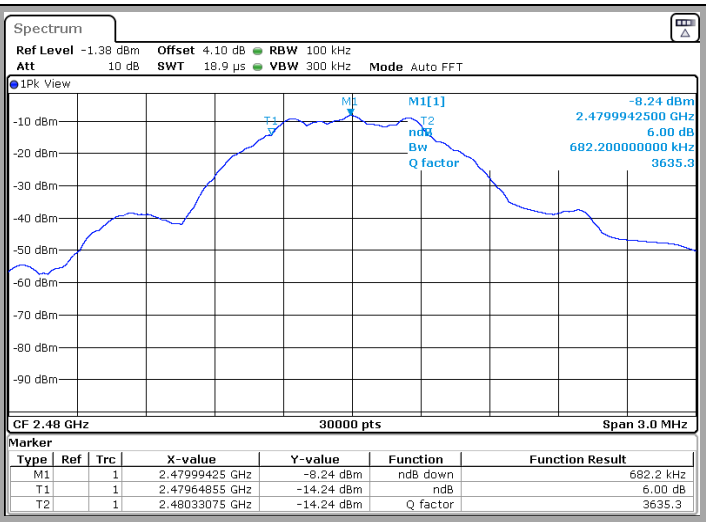
Cmin



Cnom



Cmax



Channel	6dB Emission Bandwidth (kHz)	Limit (MHz)
Cmin	0.711	Minimum 0.5
Cnom	0.718	Minimum 0.5
Cmax	0.682	Minimum 0.5

4.6. CONCLUSION

6dB Emission Bandwidth measurement performed on the sample of the product **BIOCORP SoloSmart mini**, SN: **None**, 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. MAXIMUM CONDUCTED OUTPUT POWER

5.1. TEST CONDITIONS

Test performed by	: Majid MOURZAGH
Date of test	: February 1, 2021
Ambient temperature	: 23 °C
Relative humidity	: 30 %

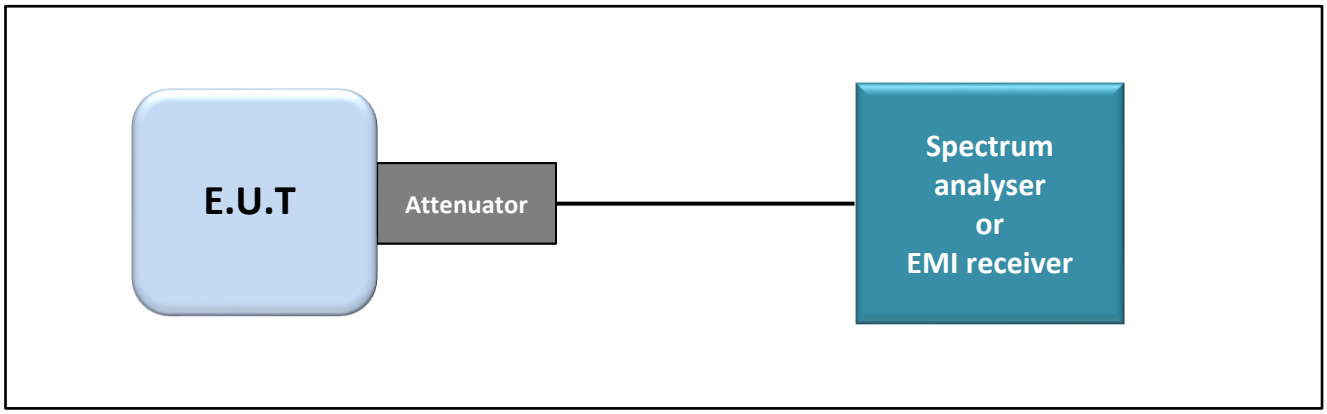
5.2. TEST SETUP

- 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:
☑ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.3.1.1
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.
a) Set the RBW ≥ DTS bandwidth.
b) Set VBW ≥ 3 x RBW.
c) Set span ≥ 3 x RBW
d) Sweep time = auto couple.
e) Detector = peak.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use peak marker function to determine the peak amplitude level.

☐ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.3.1.2
This procedure may be used when the maximum available RBW of the measurement instrument is less than the DTS bandwidth.
a) Set the RBW = 1 MHz.
b) Set the VBW ≥ 3 x RBW
c) Set the span ≥ 1.5 x DTS bandwidth.
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the instrument's band/channel power measurement function with the band limits set equal to the DTS bandwidth edges



Test set up of Maximum Conducted Output Power

Photograph for Maximum Conducted Output Power

5.3. LIMIT

Maximum Conducted Output power:
2400MHz-2483.5MHz: Shall not exceed 30dBm
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

5.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Attenuator 10dB	AEROFLEX	_	A7122267	05/19	05/21
Cable SMA UFL	_	_	A5329762	06/20	06/21
Full Anechoic Room	SIEPEL	_	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	01/21
SMA 1.5m	SUCOFLEX	18GHz	A5329863	11/18	01/21
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/19	05/21
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
SOFT	LCIE SUD EST	LCIE FCC 247 (BLE_ZIGBEE...)	L2000059	-	-

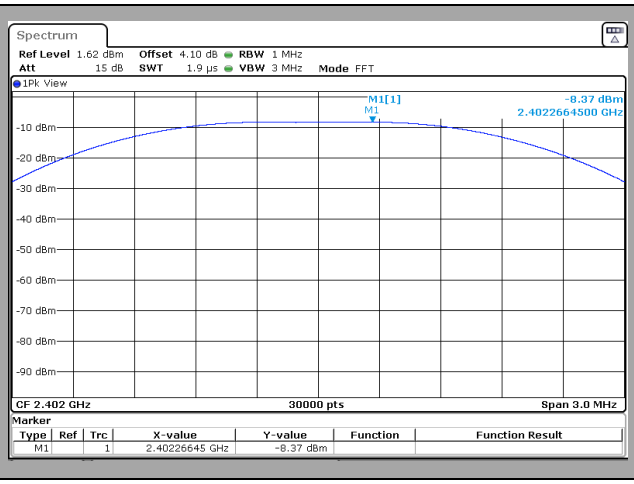
Note: In our quality system, the test equipment calibration due is more & less 2 months

5.5. RESULTS

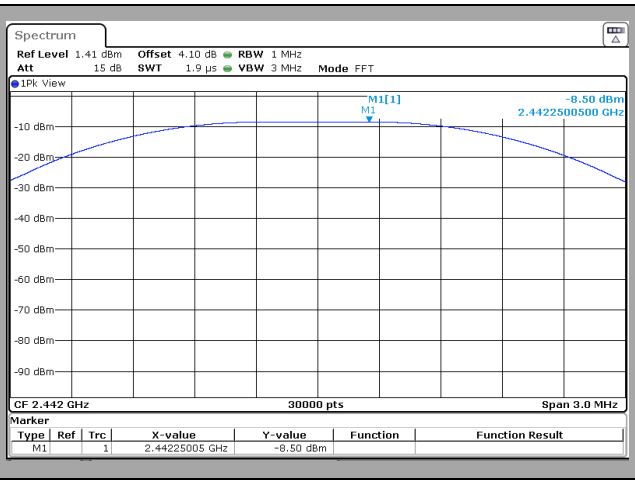
1MBits/s

Maximum Conducted Output Power

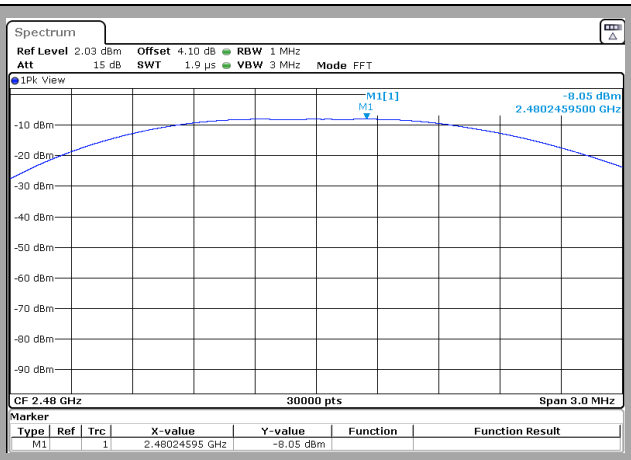
Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Maximum Conducted Power (dBm)	Limit (dBm)
Cmin	**13.7**	0.5	-8.37	30. Reduced by G-6dBi if Antenna Gain above 6dBi
Cnom	**13.7**	0.5	-8.50	30. Reduced by G-6dBi if Antenna Gain above 6dBi
Cmax	**13.7**	0.5	-8.05	30. Reduced by G-6dBi if Antenna Gain above 6dBi

5.6. CONCLUSION

Maximum Conducted Output Power measurement performed on the sample of the product **BIOCORP SoloSmart mini**, SN: **None**, 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. POWER SPECTRAL DENSITY

6.1. TEST CONDITIONS

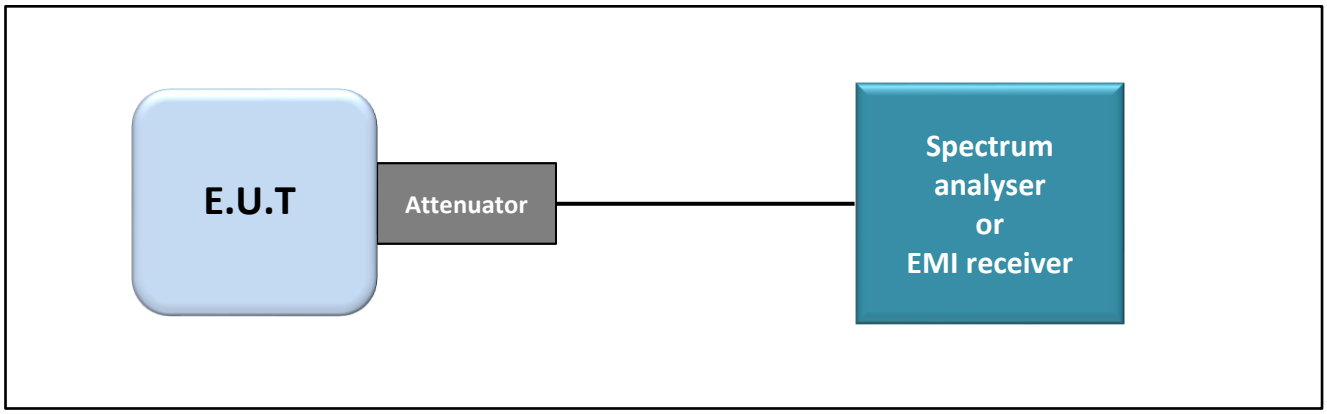
Test performed by	: Majid MOURZAGH
Date of test	: February 1, 2021
Ambient temperature	: 23 °C
Relative humidity	: 30 %

6.2. TEST SETUP

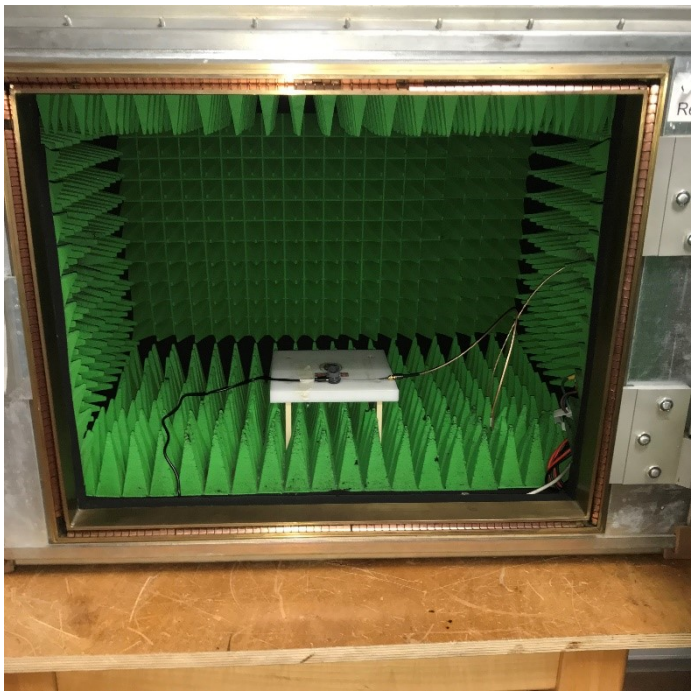
- The Equipment Under Test is installed:
☐ On a table
☑ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.4 (Method PKPSD)
a) Set analyzer center frequency to DTS channel center frequency.
b) Set the span to 1.5 times the DTS bandwidth.
c) Set the RBW to: 3 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.



Test set up of Power Spectral Density



Photograph for Power Spectral Density

6.3. LIMIT

Power Spectral Density:
2400MHz-2483.5MHz: Shall not exceed 8dBm/3kHz
Limits are reduced by G-6dBi if Overall Antenna Gain above 6dBi

6.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Attenuator 10dB	AEROFLEX	_	A7122267	05/19	05/21
Cable SMA UFL	_	_	A5329762	06/20	06/21
Full Anechoic Room	SIEPEL	_	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	01/21
SMA 1.5m	SUCOFLEX	18GHz	A5329863	11/18	01/21
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/19	05/21
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
SOFT	LCIE SUD EST	LCIE FCC 247 (BLE_ZIGBEE...)	L2000059	-	-

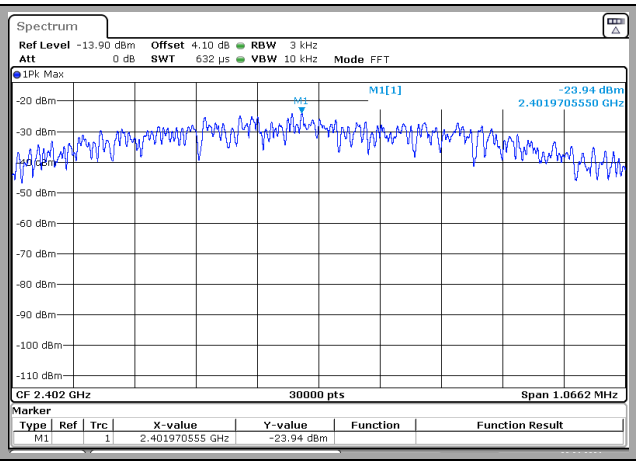
Note: In our quality system, the test equipment calibration due is more & less 2 months

6.5. RESULTS

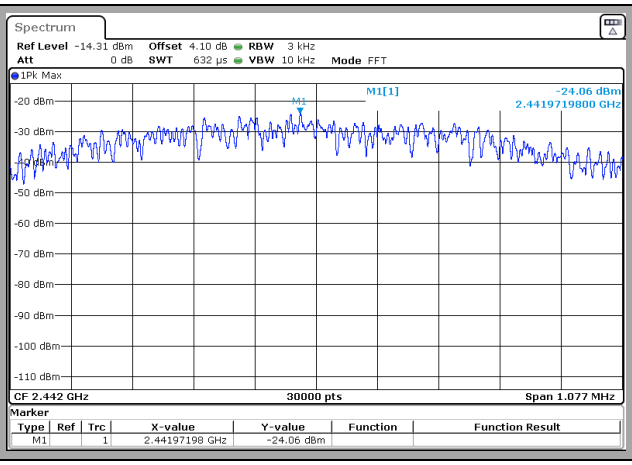
1MBits/s

Power Spectral Density

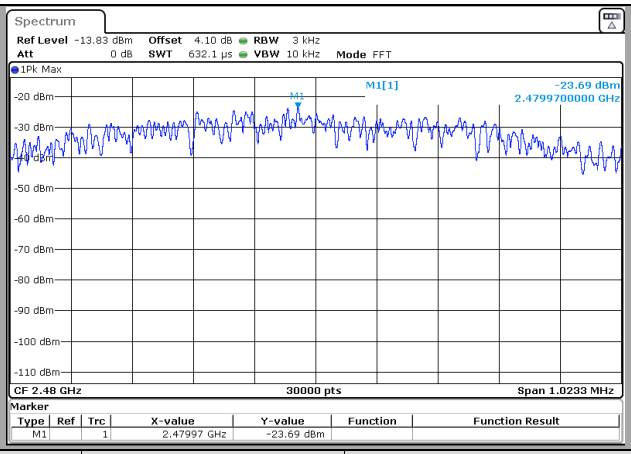
Cmin



Cnom



Cmax



Channel	Offset Cable + Att (dB)	Antenna Gain (dBi)	Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Cmin	**13.7**	0.5	-23.94	8. Reduced by G-6dBi if Antenna Gain above 6dBi
Cnom	**13.7**	0.5	-24.06	8. Reduced by G-6dBi if Antenna Gain above 6dBi
Cmax	**13.7**	0.5	-23.69	8. Reduced by G-6dBi if Antenna Gain above 6dBi

6.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **BIOCORP SoloSmart mini**, SN: **None**, 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. UNWANTED EMISSIONS INTO NON-RESTRICTED FREQUENCY BANDS AT THE BAND EDGE

7.1. TEST CONDITIONS

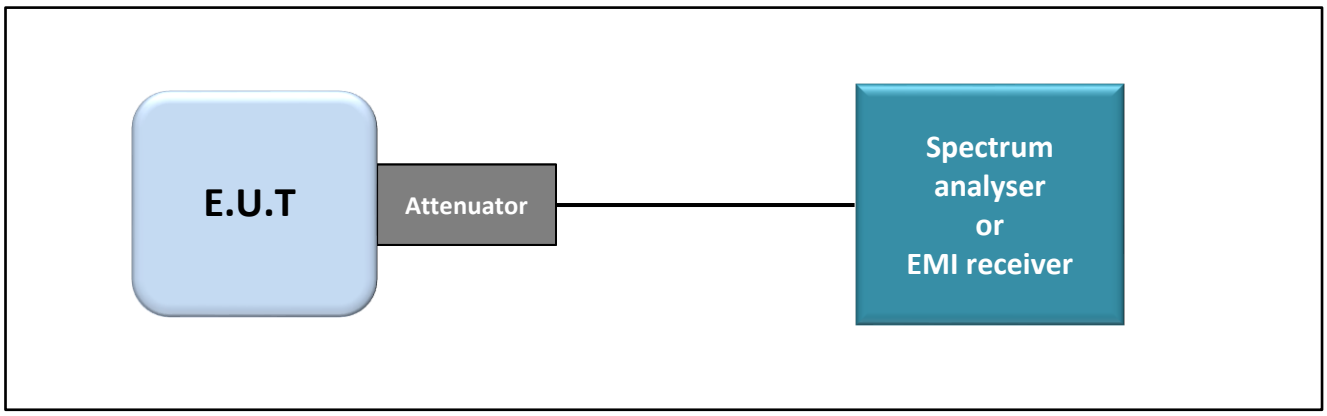
Test performed by	: Majid MOURZAGH
Date of test	: February 1, 2021
Ambient temperature	: 23 °C
Relative humidity	: 30 %

7.2. TEST SETUP

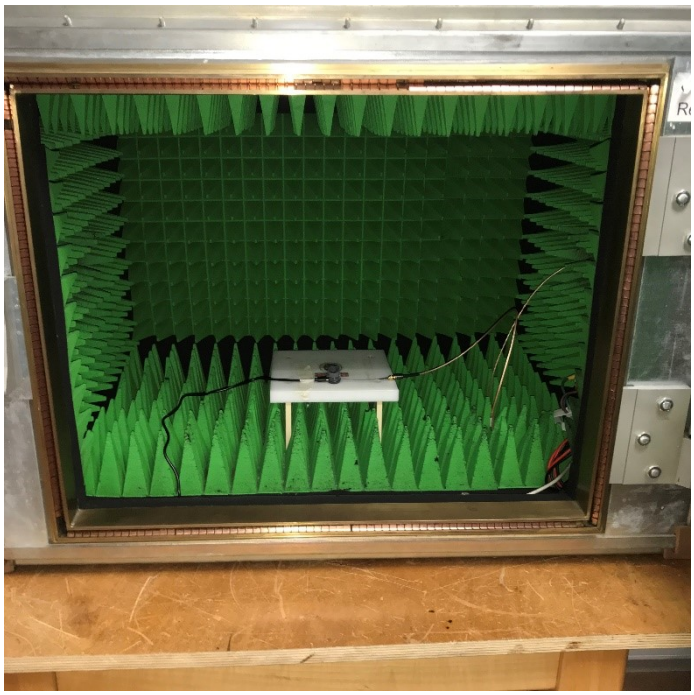
- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.5



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

7.3. LIMIT

All Spurious Emissions must be at least 20dB below the Fundamental Radiator Level at the Band Edge Edge “2400MHz & 2483,5MHz”

7.4. TEST EQUIPMENT LIST

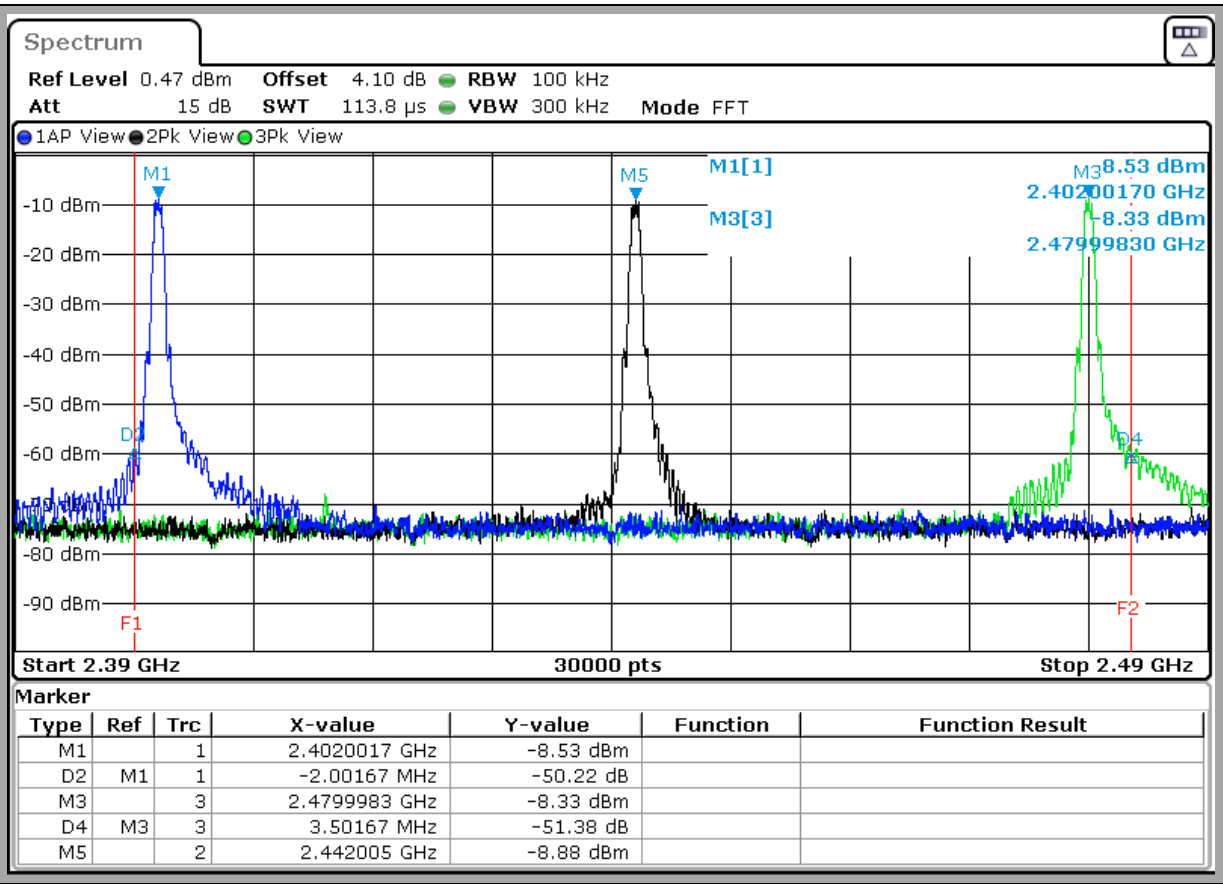
TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Attenuator 10dB	AEROFLEX	_	A7122267	05/19	05/21
Cable SMA UFL	_	_	A5329762	06/20	06/21
Full Anechoic Room	SIEPEL	_	D3044024		
Multimeter - CEM	FLUKE	87	A1240251	11/18	01/21
SMA 1.5m	SUCOFLEX	18GHz	A5329863	11/18	01/21
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/19	05/21
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
SOFT	LCIE SUD EST	LCIE FCC 247 (BLE_ZIGBEE...)	L2000059	-	-

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

7.5. RESULTS

1MBits/s

Cmin/Cnom/Cmax



Frequency (MHz)	Level (dBc)	Limit (dBc)
2400	**-50.22**	**20**
2483.5	**-51.38**	**20**

7.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands at the band edge measurement performed on the sample of the product **BIOCORP SoloSmart mini**, SN: **None**, 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

8.1. TEST CONDITIONS

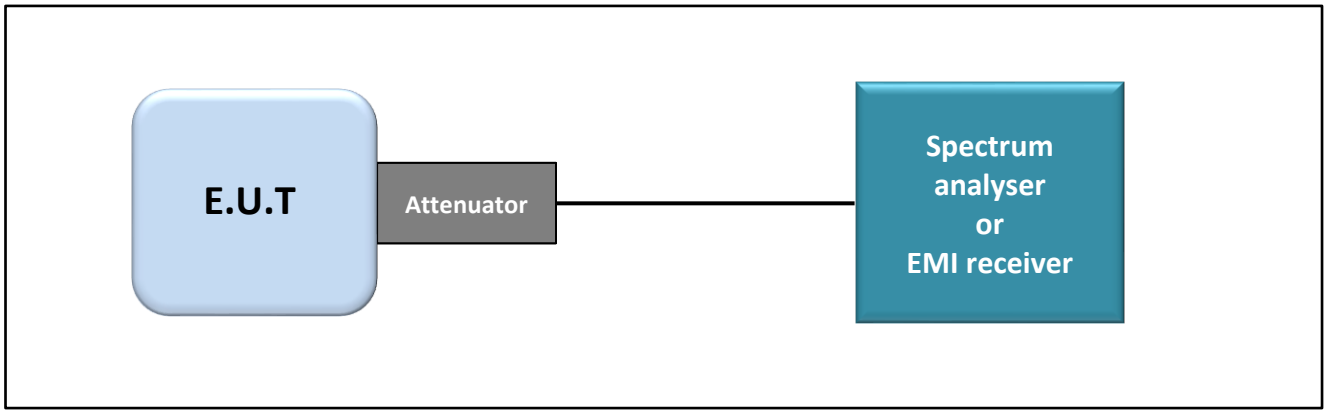
Test performed by	: Majid MOURZAGH
Date of test	: February 1, 2021
Ambient temperature	: 23 °C
Relative humidity	: 30 %

8.2. TEST SETUP

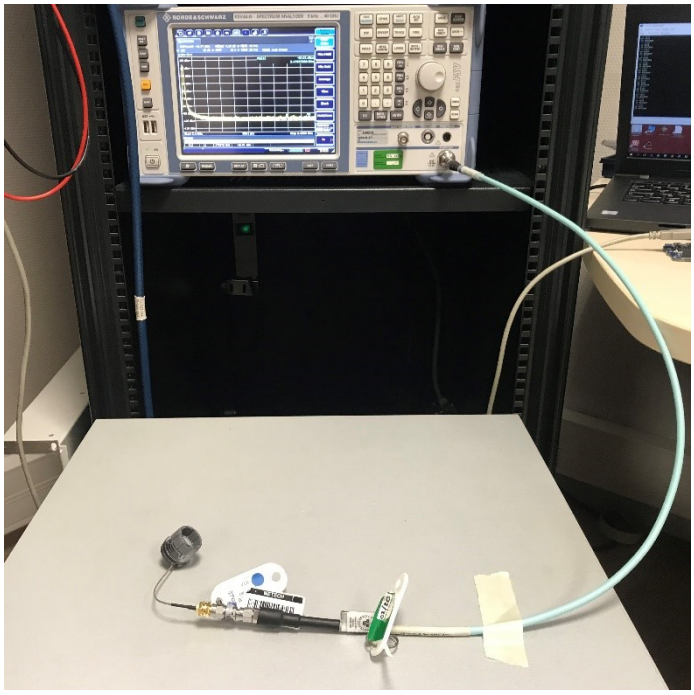
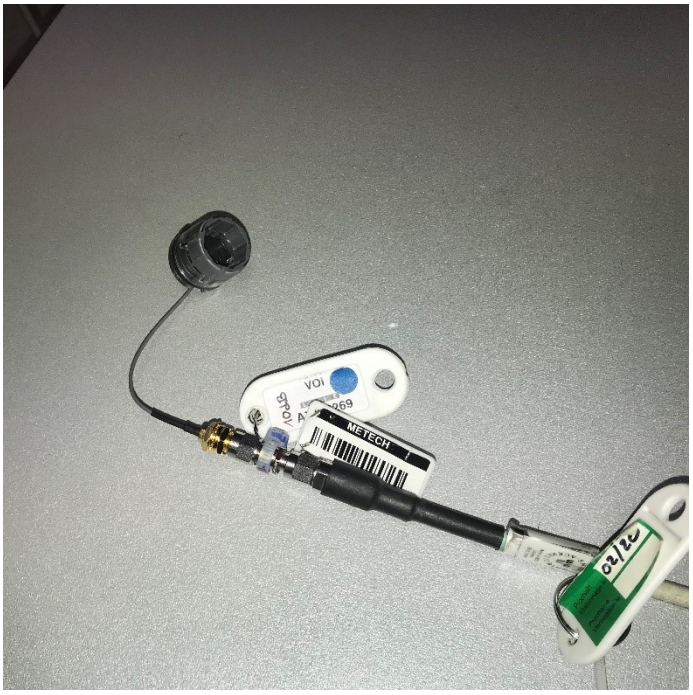
- The Equipment under Test is installed:
☑ On a table
☐ In an anechoic chamber

- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ KDB 558074 D01 DTS Meas Guidance v05r02 § 8.5



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

Photograph for Unwanted Emission into non-restricted frequency bands

8.3. LIMIT

All Spurious Emissions must be at least 20 below the Fundamental Radiator Level

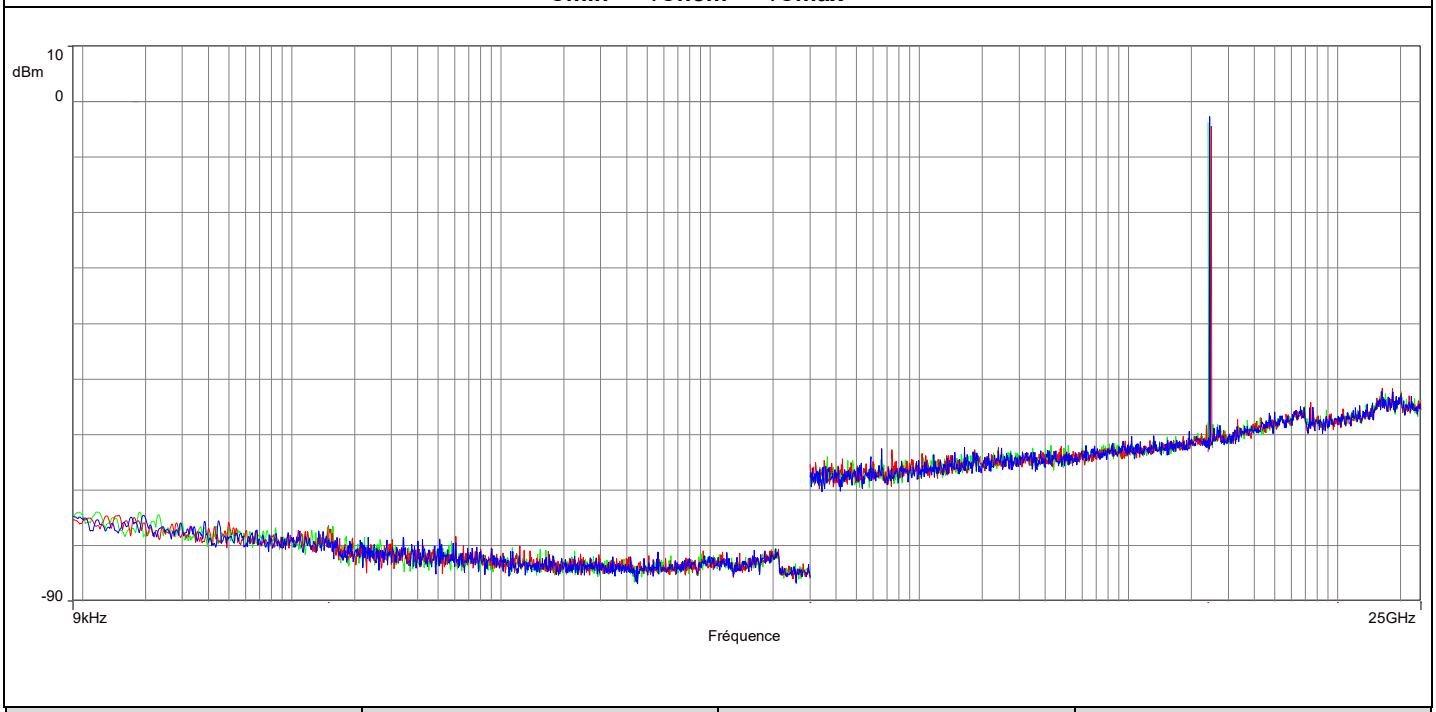
8.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Attenuator 10dB	AEROFLEX	_	A7122269	09/20	03/22
Cable Measure	_	36G	A5329604	10/20	10/21
Multimeter - CEM	FLUKE	87	A1240251	11/18	01/21
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/19	05/21
Thermo-hygrometer	TESTO	608-H1	B4204120	12/20	12/22
BAT EMC	NEXIO	v3.19.1.23	L1000115	-	-

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

8.5. RESULTS

1MBits/s



Frequency (MHz)	Level (dBm)	Level (dBc)	Limit (dBc)
2402.00	-4.49		
2442.00	-2.69		
2480.00	-3.75		

8.6. CONCLUSION

Unwanted Emission into non-restricted frequency bands measurement performed on the sample of the product **BIOCORP SoloSmart mini**, SN: **None**, in configuration and description presented in this test report, show levels **compliant** to the **47 CFR PART 15.247 & RSS 247 ISSUE 2** limits.

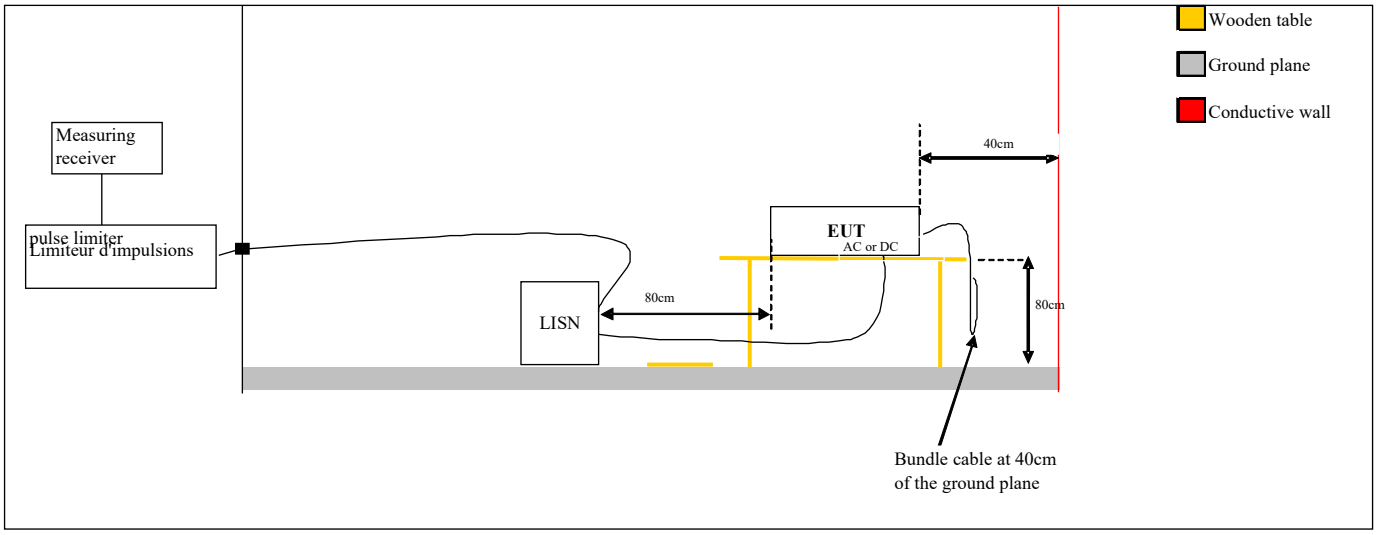
9. AC POWER LINE CONDUCTED EMISSIONS

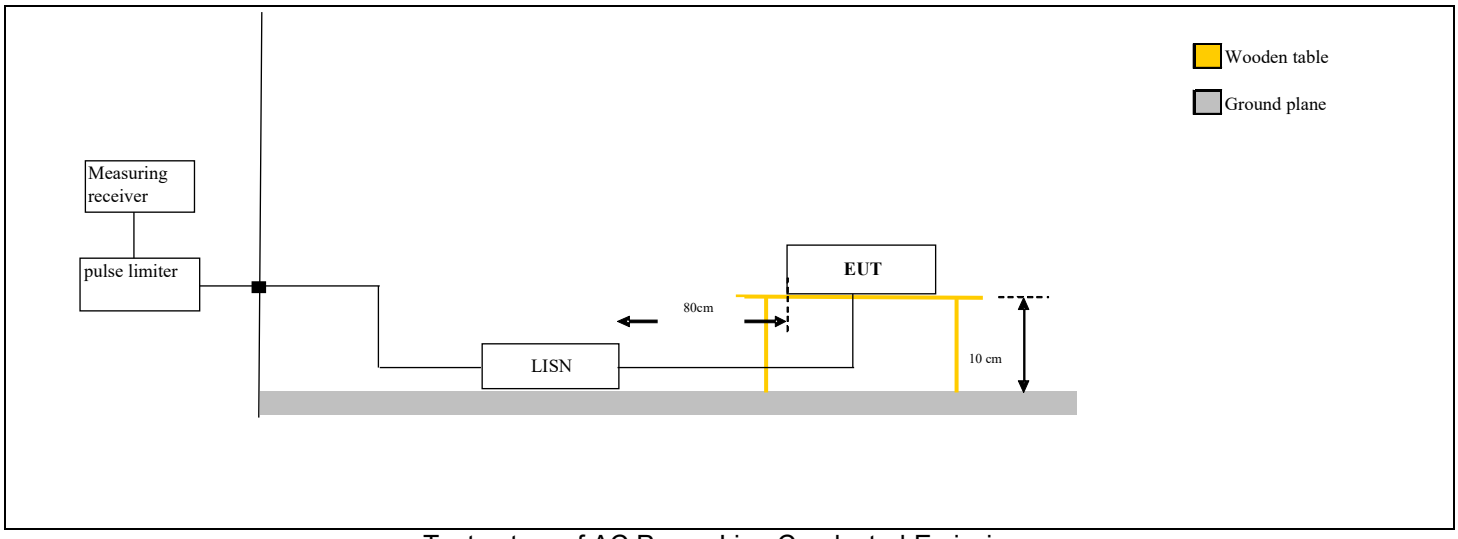
9.1. TEST CONDITIONS

Test performed by	: Majid MOURZAGH
Date of test	: February 5, 2021
Ambient temperature	: 23 °C
Relative humidity	: 40 %

9.2. TEST SETUP

The product has been tested according to ANSI C63.10 (2013) method. The EUT is placed on the ground reference plane, at 80cm from the LISN. The distance between the EUT and the vertical ground plane is 40cm. Auxiliaries are powered by another LISN. The cable has been shorted to 1meter length. The EUT is powered through the LISN. Measurement is made with a receiver in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement for any strong signal. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary. The LISN (measure) is 50Ω / 50µH. Interconnecting cables and equipment's were moved to position that maximized emission.





Test set up of AC Power Line Conducted Emissions

Photograph for AC Power Line Conducted Emissions .

9.3. LIMIT

Frequency range	Level	Detector
0,15kHz to 0,5MHz	66dBµV to 56µV*	QPeak
	56dBµV to 46µV*	Average
0,5MHz to 5MHz	56dBµV	QPeak
	46dBµV	Average
5MHz to 30MHz	60BµV	QPeak
	50dBµV	Average

*Decreases with the logarithm of the frequency

9.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
BAT EMC	NEXIO	v3.19.1.23	L1000115		
Cable + self	_	_	A5329578	02/20	02/21
EMC comb generator	LCIE SUD EST	_	A3169098		
LISN	ROHDE & SCHWARZ	ENV216	C2320291	06/20	06/21
Spectrum Analyzer 9kHz - 30MHz	ROHDE & SCHWARZ	ESHS10	A2642028	01/20	01/22
Transient limiter	ROHDE & SCHWARZ	ESH3-Z2	A7122204	08/20	08/21
Multimeter - CEM	FLUKE	87	A1240251	11/18	01/21

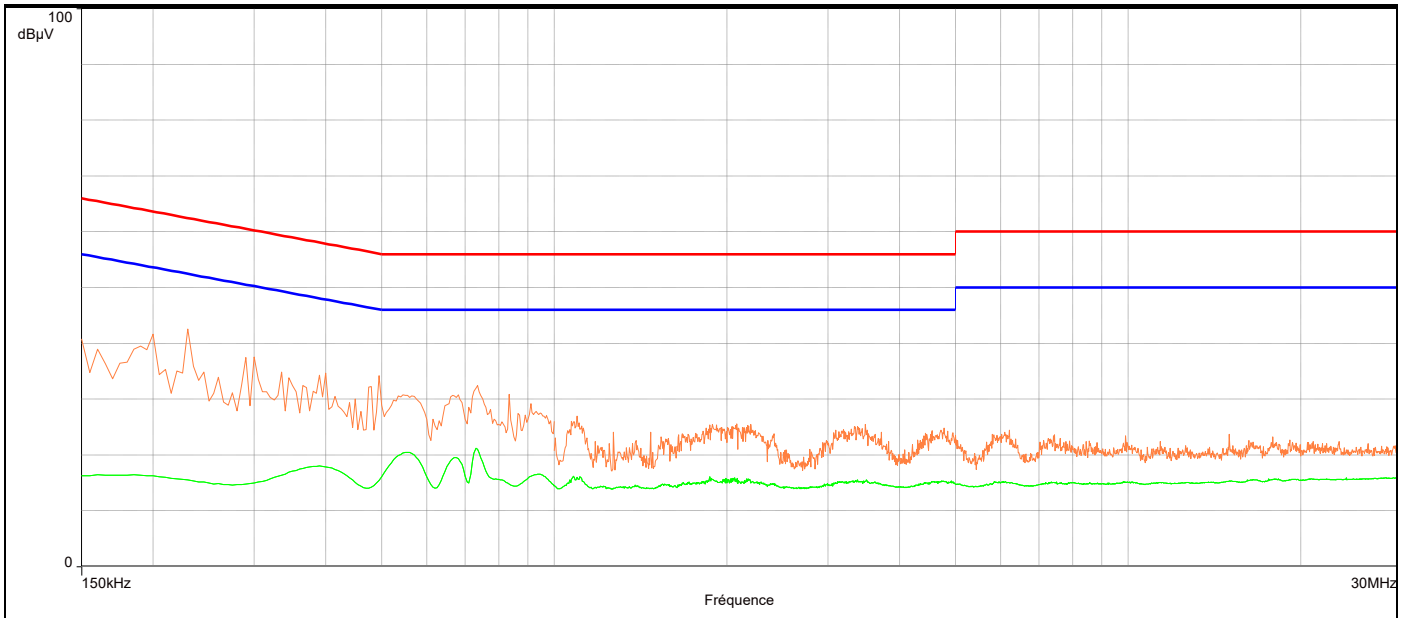
Note: In our quality system, the test equipment calibration due is more & less 2 months

9.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

9.6. RESULTS

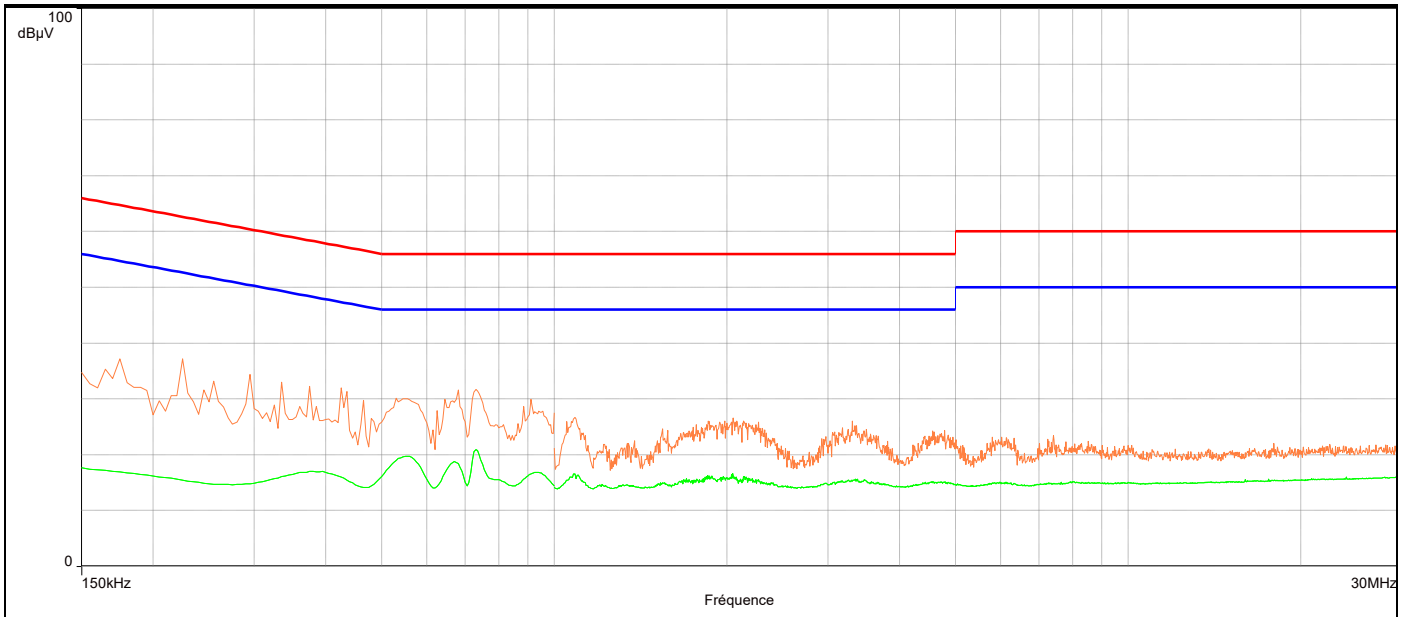
CONDUCTED EMISSIONS			
Graph name:	Emc#1	**Test configuration:**	
Limit:	FCC CFR47 Part15C	240/50Hz - Line	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240VAC / 50Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



Spurious emissions

Frequency (MHz)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.200	21.3	63.6	-42.3	14.4	53.6	-39.2	Phase 1	19.6
0.230	19.6	62.4	-42.8	13.1	52.4	-39.4	Phase 1	19.5
0.495	18.7	56.1	-37.4	13.2	46.1	-32.9	Phase 1	19.6
1.096	21.2	56.0	-34.8	13.9	46.0	-32.1	Phase 1	19.5
2.080	20.4	56.0	-35.6	12.8	46.0	-33.2	Phase 1	19.6
6.208	16.5	60.0	-43.5	10.7	50.0	-39.3	Phase 1	20.0

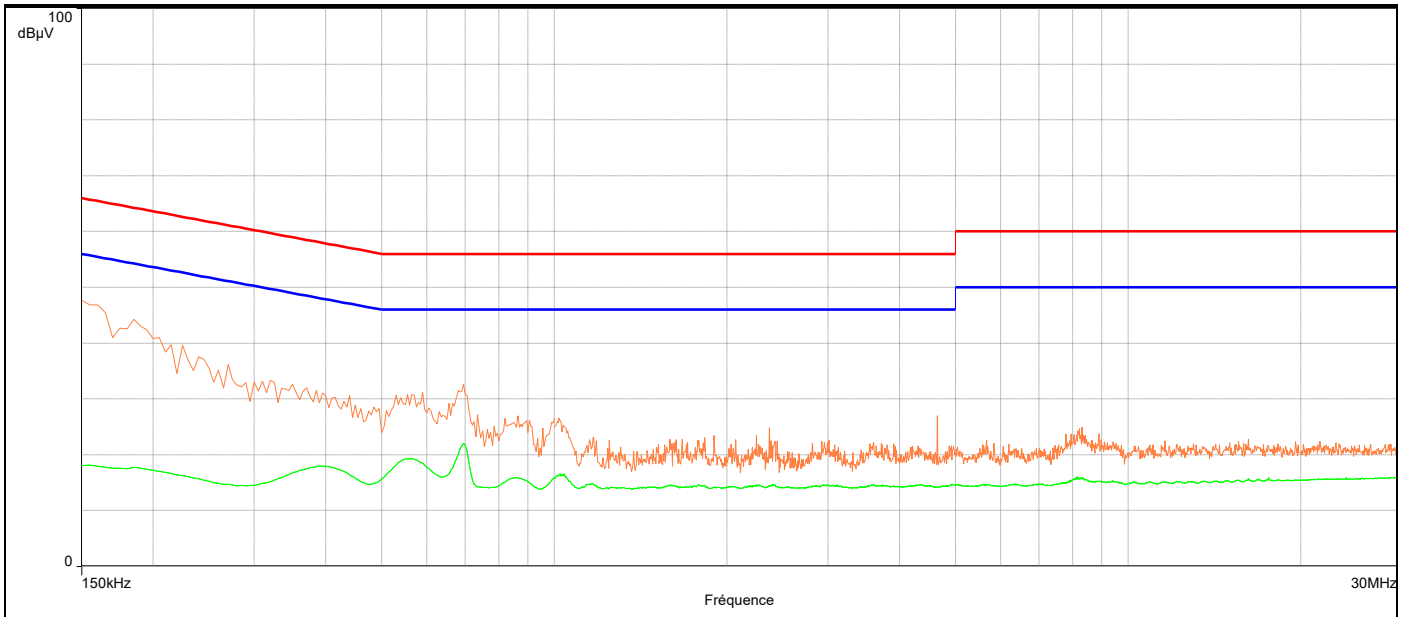
CONDUCTED EMISSIONS			
Graph name:	Emc#2	**Test configuration:**	
Limit:	FCC CFR47 Part15C	240/50Hz - Neutral	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240VAC / 50Hz	**RBW :**	10kHz
Line:	Neutral	**VBW :**	30kHz



Spurious emissions

Frequency (MHz)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.175	23.2	64.7	-41.5	14.6	54.7	-40.1	Neutre	19.5
0.225	20.5	62.6	-42.1	12.0	52.6	-40.6	Neutre	19.5
0.425	19.0	57.4	-38.3	12.6	47.4	-34.8	Neutre	19.5
0.730	27.6	56.0	-28.4	19.5	46.0	-26.5	Neutre	19.5
1.088	21.2	56.0	-34.8	13.6	46.0	-32.4	Neutre	19.5
2.048	21.1	56.0	-34.9	12.8	46.0	-33.2	Neutre	19.6
4.788	16.5	56.0	-39.5	10.3	46.0	-35.7	Neutre	19.8
6.028	15.6	60.0	-44.4	9.8	50.0	-40.2	Neutre	20.0

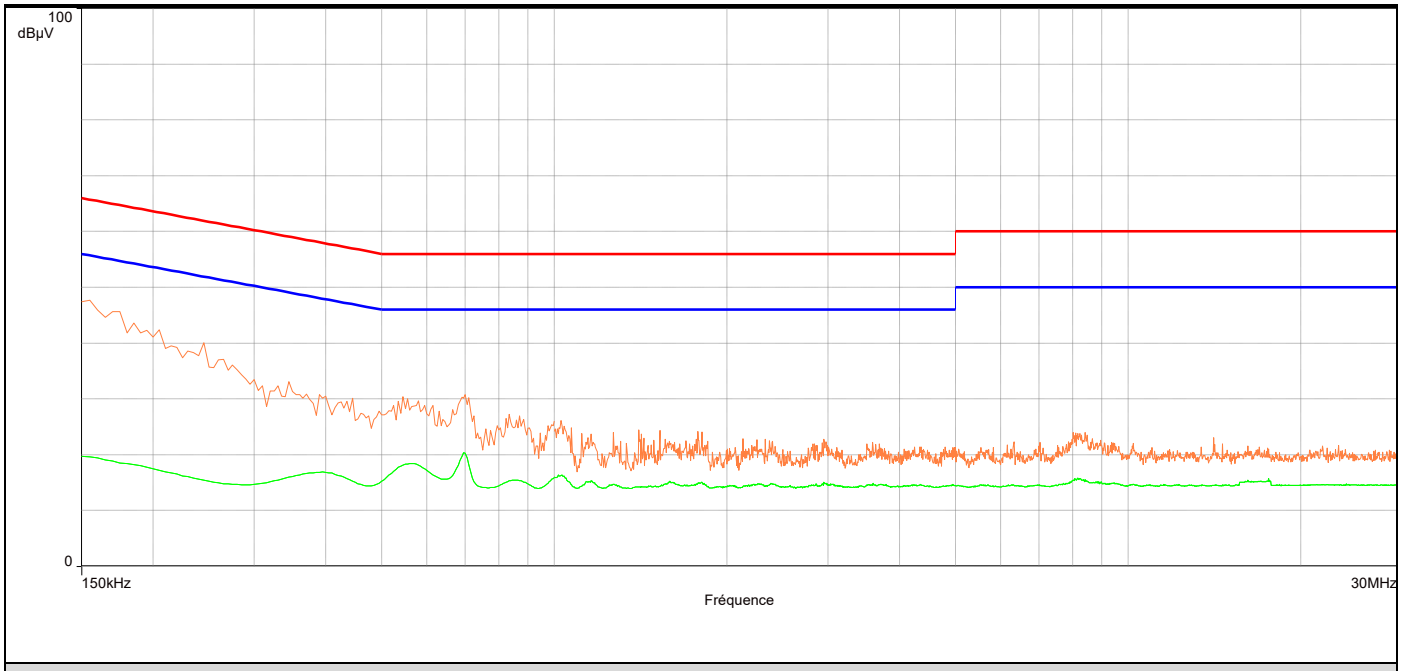
CONDUCTED EMISSIONS			
Graph name:	Emc#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	110/60Hz - Line	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	110VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



Spurious emissions

Frequency (MHz)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.150	34.2	66.0	-31.8	16.6	56.0	-39.4	Phase 1	19.4
0.270	22.6	61.1	-38.5	10.9	51.1	-40.2	Phase 1	19.5
0.695	26.9	56.0	-29.1	21.6	46.0	-24.4	Phase 1	19.5
1.020	21.5	56.0	-34.5	15.0	46.0	-31.0	Phase 1	19.5
4.648	11.4	56.0	-44.6	7.8	46.0	-38.2	Phase 1	19.8
8.320	17.2	60.0	-42.8	12.2	50.0	-37.8	Phase 1	20.2

CONDUCTED EMISSIONS			
Graph name:	Emc#4	**Test configuration:**	
Limit:	FCC CFR47 Part15C	110/60Hz - Neutral	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	110VAC / 60Hz	**RBW :**	10kHz
Line:	Neutral	**VBW :**	30kHz



Spurious emissions

Frequency (MHz)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.155	35.1	65.7	-30.7	18.8	55.7	-37.0	Neutre	19.4
0.245	25.0	61.9	-36.9	12.9	51.9	-39.1	Neutre	19.5
0.700	25.0	56.0	-31.0	19.6	46.0	-26.4	Neutre	19.5
1.780	16.0	56.0	-40.0	11.0	46.0	-35.0	Neutre	19.6
8.020	16.9	60.0	-43.1	12.0	50.0	-38.0	Neutre	20.1

9.7. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **BIOCORP SoloSmart mini**, SN: **None**, in configuration and description presented in this test report, show levels **compliant** to the 47 CFR PART 15.247 & RSS 247 ISSUE 2 limits.

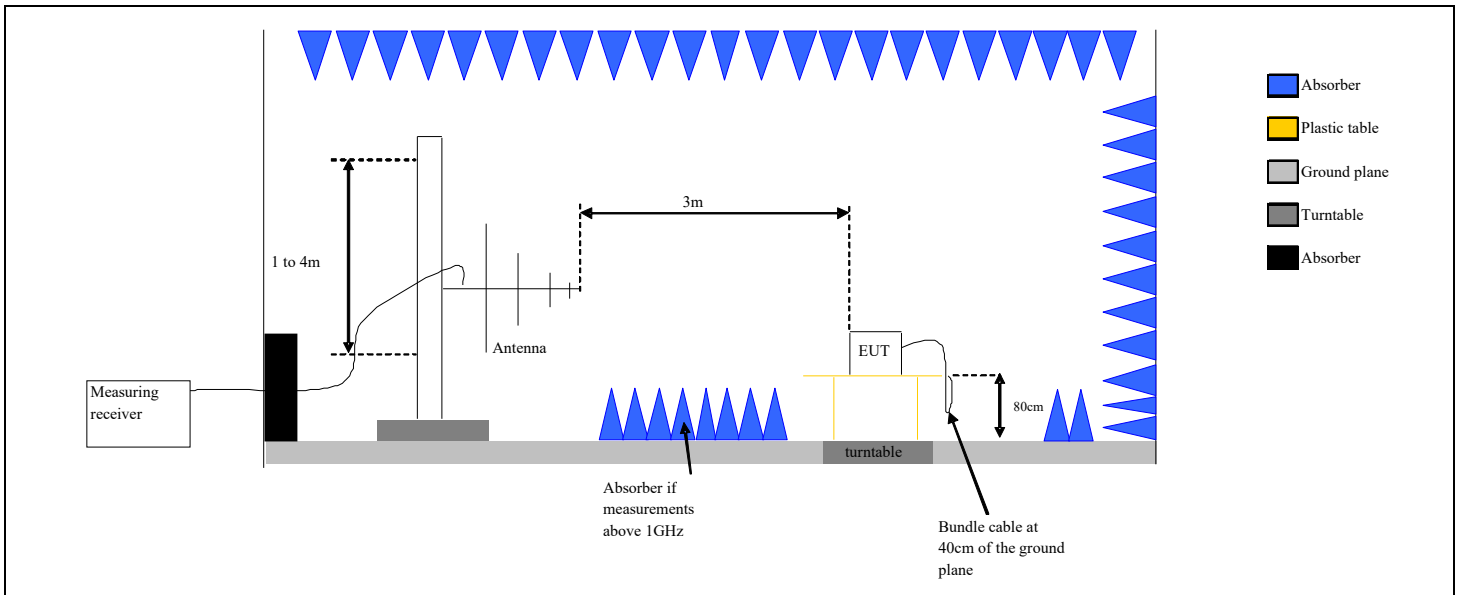
10. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

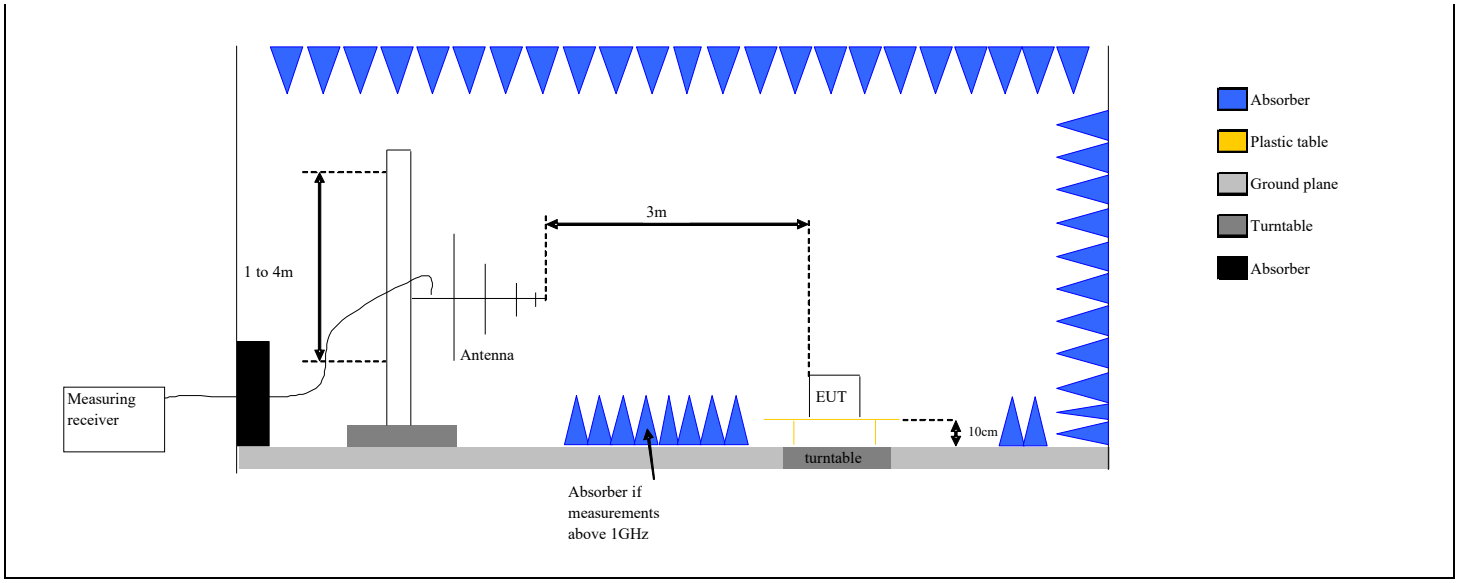
10.1. TEST CONDITIONS

Test performed by	: Majid MOURZAGH
Date of test	: February 2, 2021
Ambient temperature	: 23 °C
Relative humidity	: 38 %

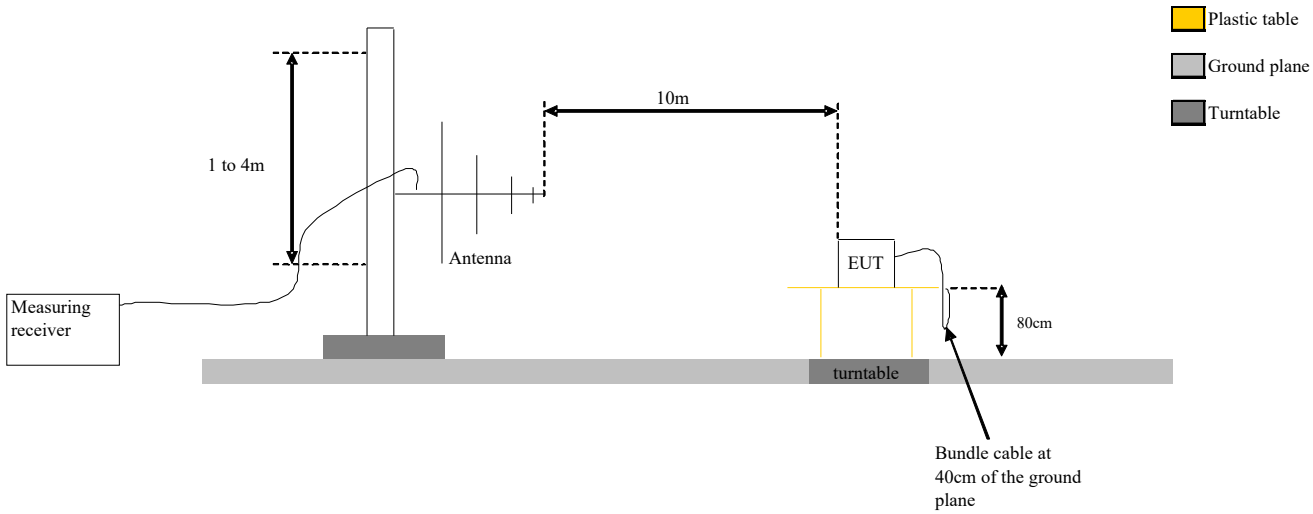
10.2. TEST SETUP

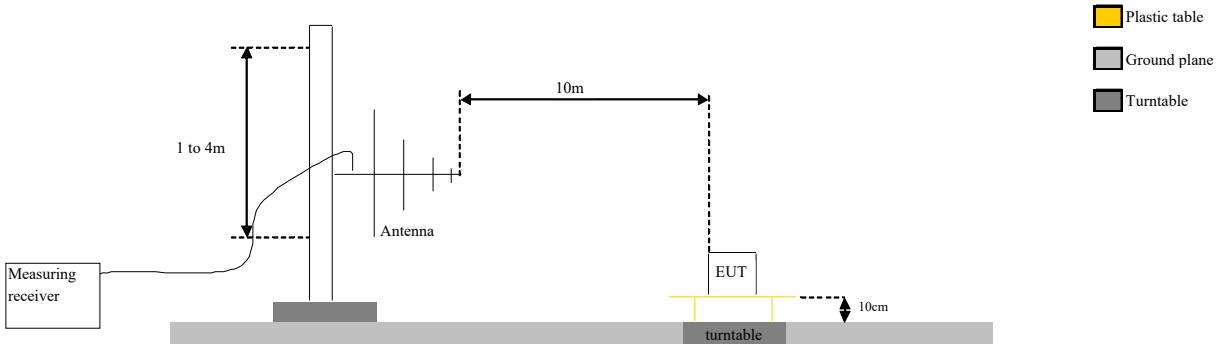
The product has been tested according to ANSI C63.10 (2013) and FCC part15 subpart C.
Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration. Antenna height was 1m. The EUT is placed **Select Test Site**. Distance between measuring antenna and the EUT is **Distance**.
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 all axis of EUT used in normal configuration. The EUT is place 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**.
The height antenna is varied from 1m to 4m from 30MHz to 1GHz and above 1GHz is:
☐ On mast, varied from 1m to 4m
☐ Fixed and centered on the EUT (EUT smaller than the beamwidth of the measurement antenna, ANSI C63.10 §6.6.5)
Frequency list has been created with anechoic chamber pre-scan results.



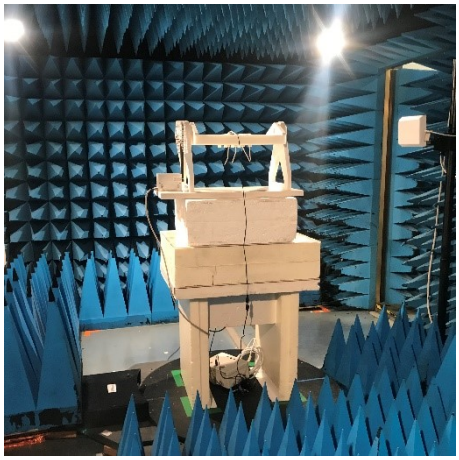
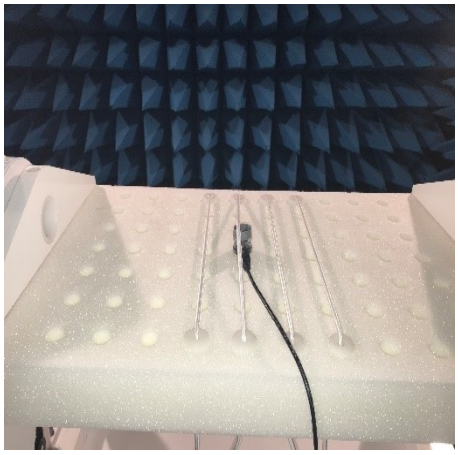
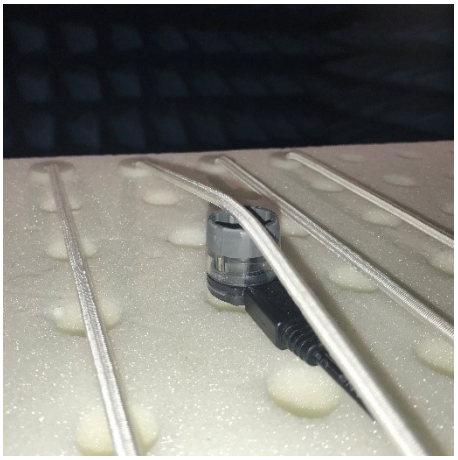


Test set up of Unwanted Emissions in Restricted Frequency Bands in semi anechoic chamber

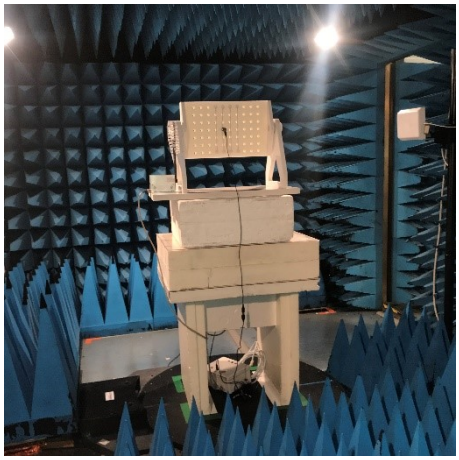
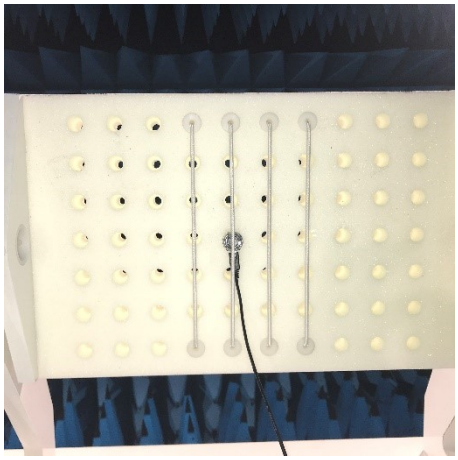
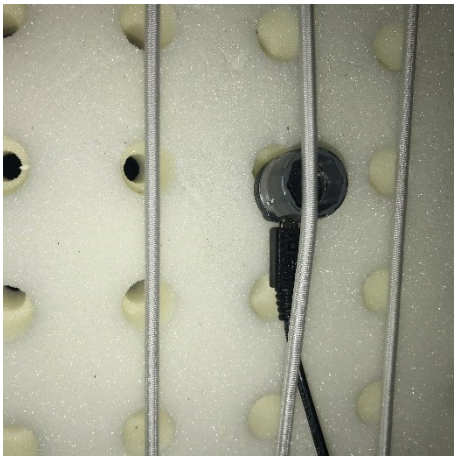




Test Set up for radiated measurement in open area test site

Axis XY on FAR

Axis Z on FAR

Photograph for Unwanted Emission in restricted frequency bands

Axis XY on OATS

Axis Z on OATS

10.3. 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
Measure at 10m		
Frequency range	**Level**	**Detector**
30MHz to 88MHz	29.5dBµV/m	QPeak
88MHz to 216MHz	33dBµV/m	QPeak
216MHz to 960MHz	35.5BµV/m	QPeak
960MHz to 1000MHz	43.5dBµV/m	QPeak
Above 1000MHz	63.5dBµV/m	Peak
	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
	54dBµV/m	Average

10.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Antenna Bi-log	CHASE	CBL6111A	C2040051	06/19	06/21
Antenna Biconic	EMCO	3104C	C2040175	03/20	03/22
Antenna Mat (OATS)	ETS Lingren	2071-2	F2000392		
Cable (OATS)	_	1GHz	A5329623	05/20	05/21
CALCUL_FACTEURS	LCIE SUD EST	V4	L2000035		
Emission Cable	SUCOFLEX	6GHz	A5329061	06/20	06/21
Emission Cable	MICRO-COAX	1GHz	A5329656	08/20	08/21
OATS	_	_	F2000409	04/20	04/21
Radiated emission comb generator	BARDET	_	A3169050		
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	11/20	11/22
Table C1/OATS	LCIE	_	F2000445		
Turntable (OATS)	ETS Lingren	Model 2187	F2000403		
Turntable / Mast controller (OATS)	ETS Lingren	Model 2066	F2000372		
BAT EMC	NEXIO	v3.19.1.23	L1000115	-	-

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

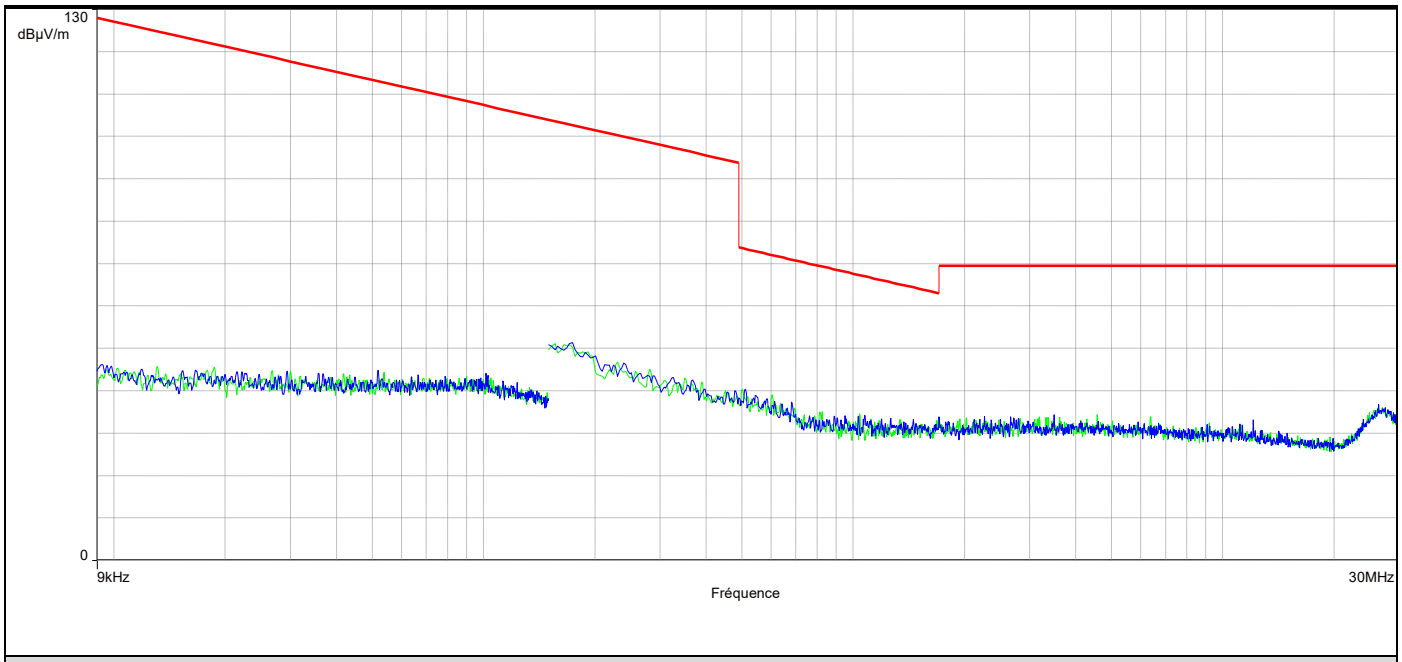
10.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

10.6. RESULTS

Results in the frequency band [0.009-30] MHz:
No significant frequency observed due to RF module (See test results in §8.5).

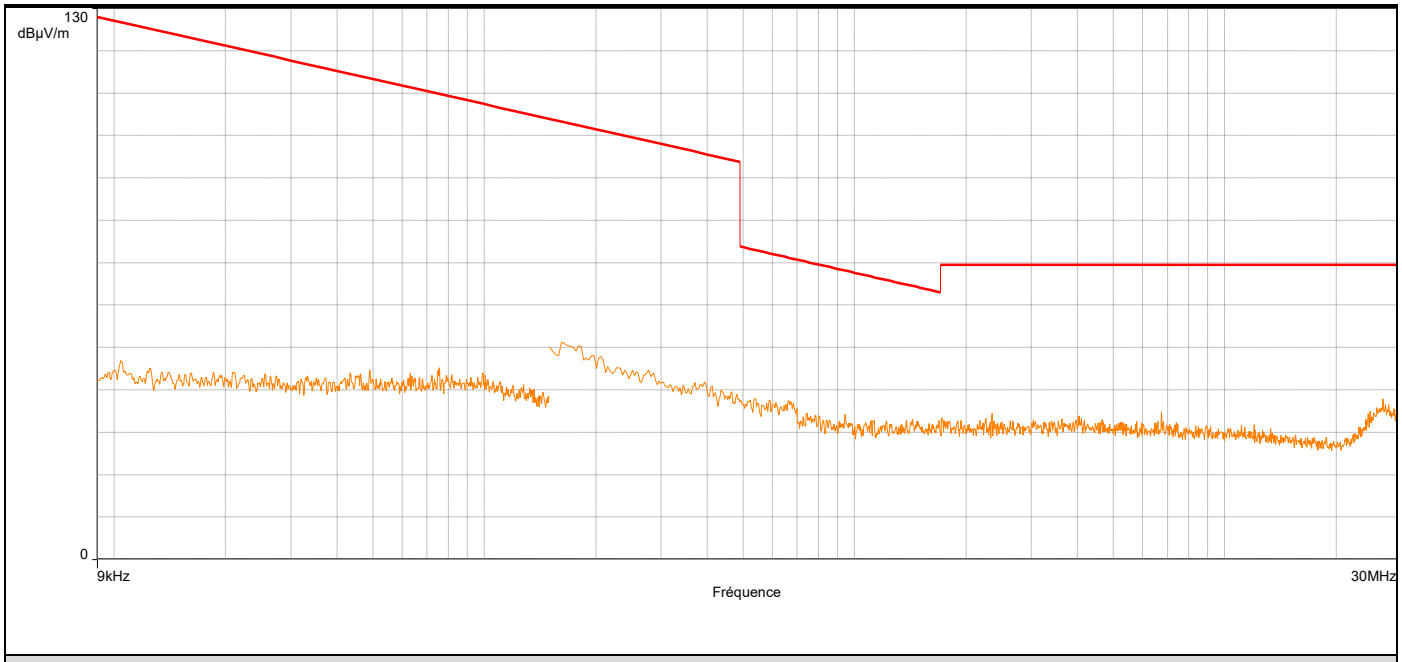
RADIATED EMISSIONS			
Graph name:	Emr#1	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(0°/90°) - Worst case presented - TX mode - Axis XY	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	0°/90°	RBW :	500Hz/10kHz
Azimuth:	0° - 360°	VBW :	10kHz/30kHz



Spurious emissions

No significative frequency observed

RADIATED EMISSIONS			
Graph name:	Emr#2	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(180°) - Worst case presented - TX mode - Axis XY	
Class:			
Frequency range: [9kHz - 30MHz]			
Antenna polarization:	180°	RBW :	500Hz/10kHz
Azimuth:	0° - 360°	VBW :	10kHz/30kHz

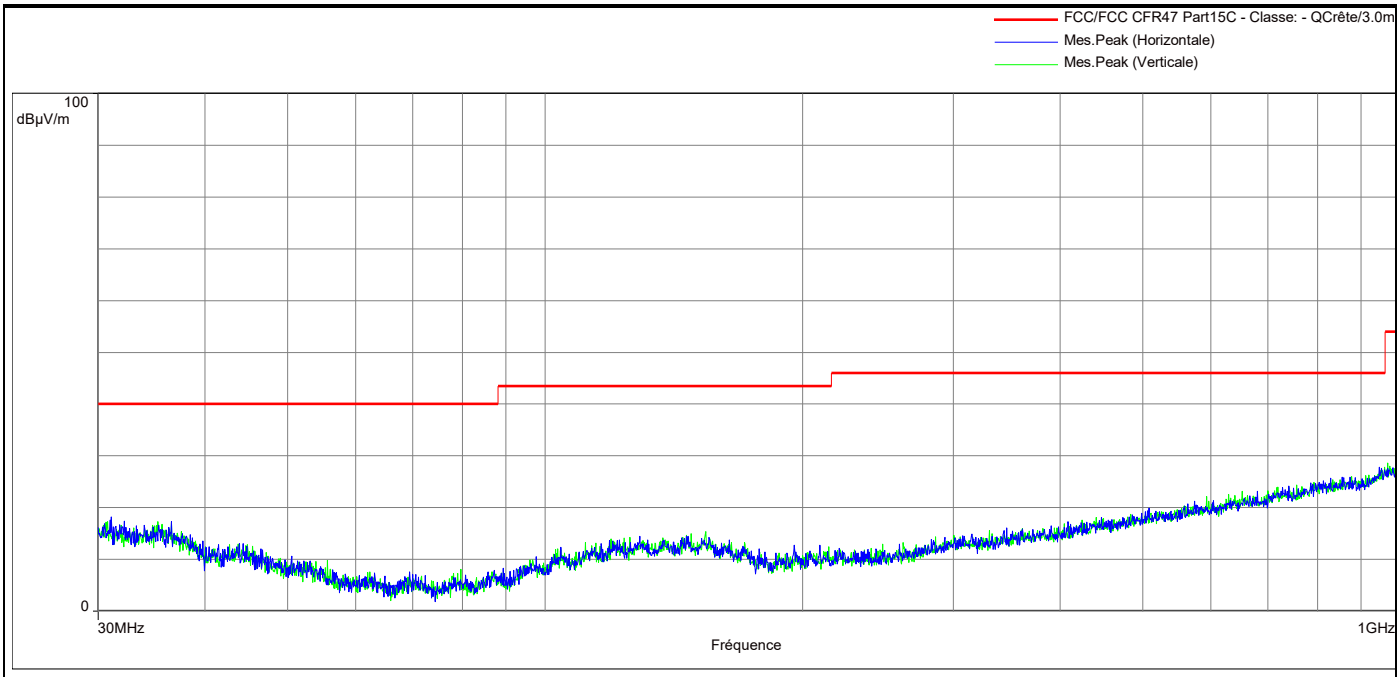


Spurious emissions

No significative frequency observed

Results in the frequency band [30-1000] MHz: Worst case presented see test results in §8.5(Cmin, Cmid or Cmax):

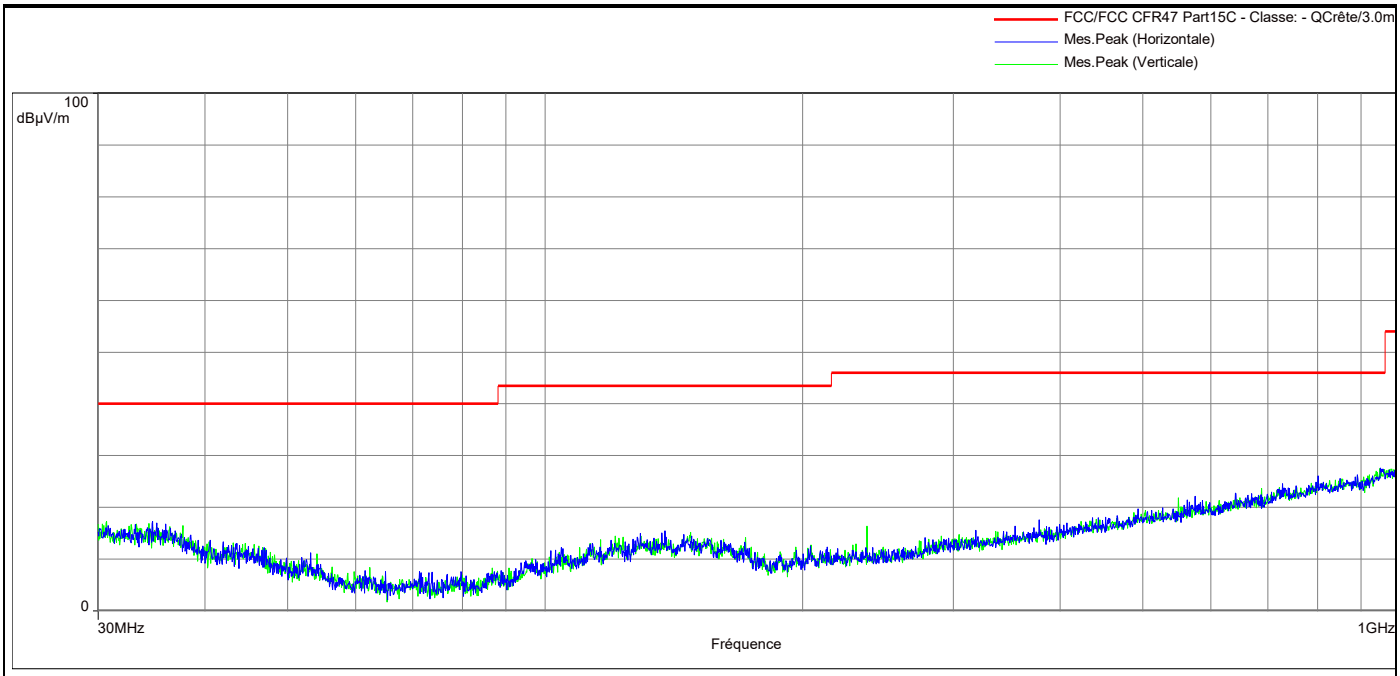
RADIATED EMISSIONS			
Graph name:	Emr#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - CMax - RX mode - Axis XY	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:		**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

No significative frequency observed

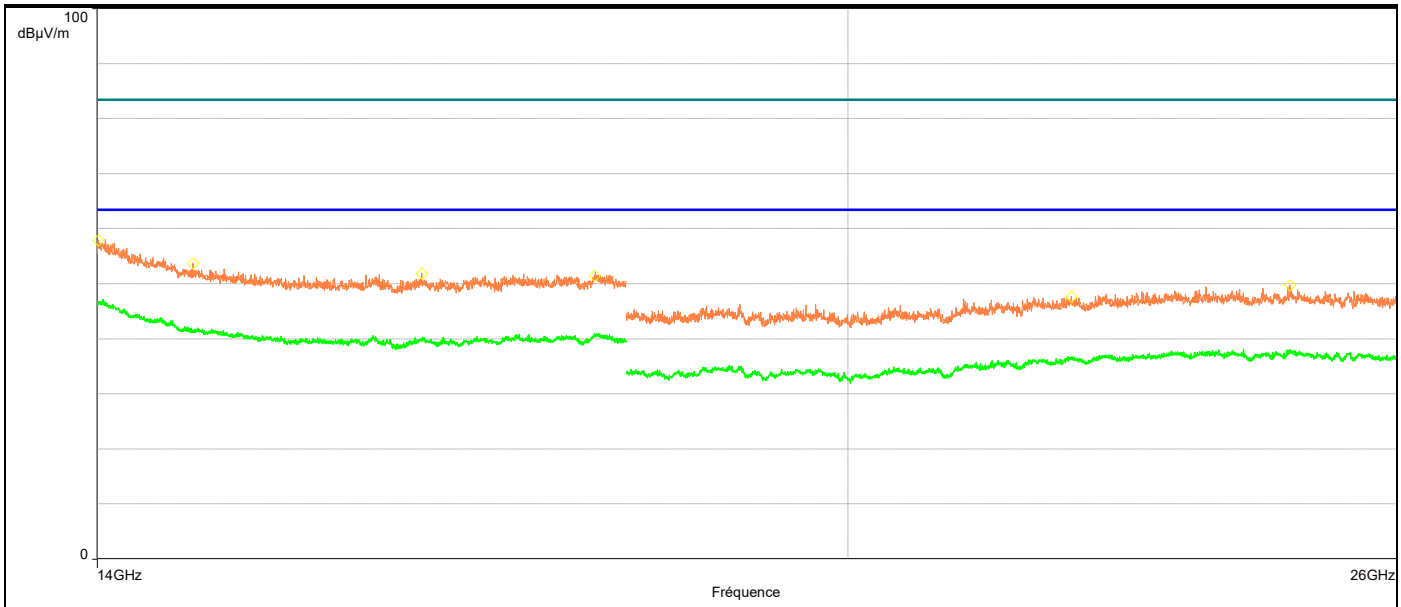
RADIATED EMISSIONS			
Graph name:	Emr#4	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V) - CMax - RX mode - Axis Z	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:		**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

No significative frequency observed

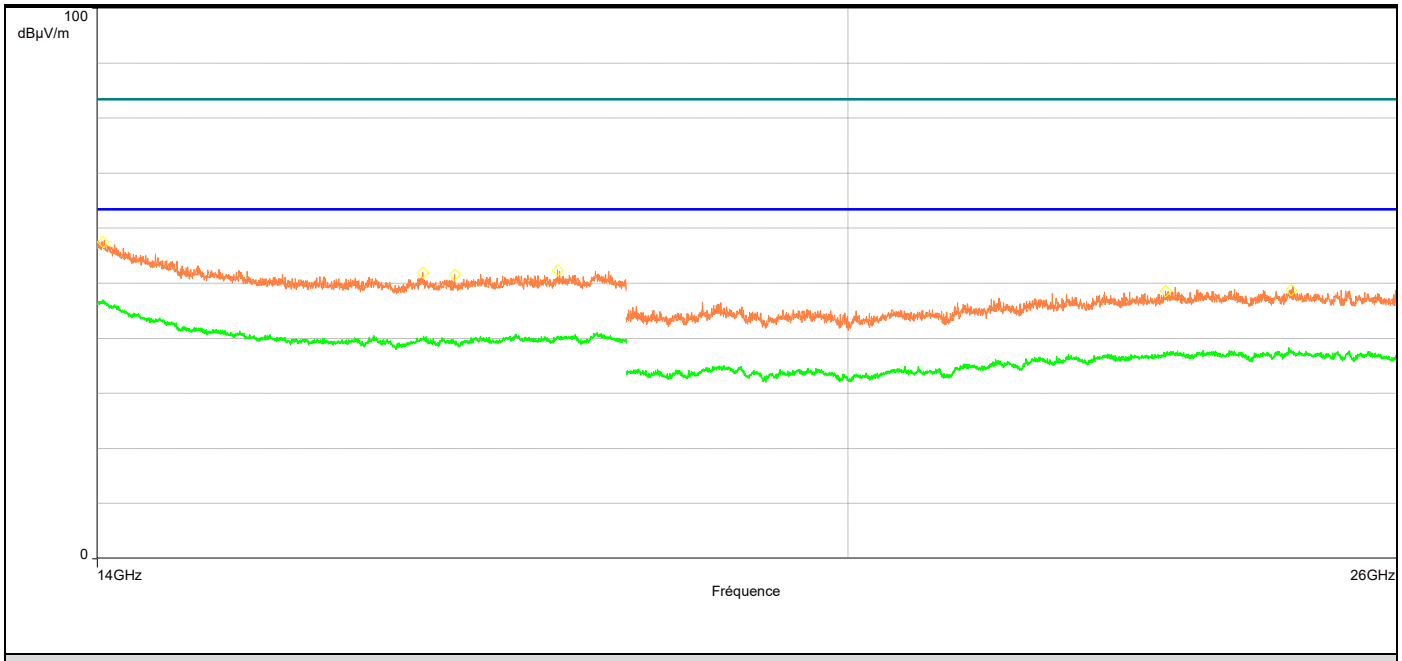
RADIATED EMISSIONS			
Graph name:	Emr#5	**Test configuration:**	
Limit:	FCC CFR47 Part15C @1m	(H+V) - Worst case presented - TX mode - Axis XY	
Class:			
Frequency range: [14GHz - 26GHz]			
Antenna polarization:		**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization	Correction (dB)
14009.000	57.8	Horizontal	5.6
14655.500	53.8	Horizontal	0.3
16339.000	51.8	Horizontal	-2.2
17729.000	51.5	Horizontal	-1.6
22243.000	47.7	Horizontal	-0.9
24668.000	49.7	Horizontal	0.1

RADIATED EMISSIONS			
Graph name:	Emr#6	**Test configuration:**	
Limit:	FCC CFR47 Part15C @1m	(H+V) - Worst case presented - TX mode - Axis Z	
Class:			
Frequency range: [14GHz - 26GHz]			
Antenna polarization:		**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization	Correction (dB)
14020.000	58.3	Horizontal	5.6
14582.500	54.6	Horizontal	0.8
16347.000	51.7	Horizontal	-2.2
17418.000	52.2	Vertical	-2.7
23470.000	49.1	Vertical	-0.3
25354.000	48.4	Vertical	0.5

QUALIFICATION (30MHz-1GHz): 10 meters measurement on the Open Area Test Site.
Frequency list has been created with semi-anechoic chamber pre-scan results.
Measurements are performed using a QUASI-PEAK detection.

Test Frequency (MHz)	Meter Reading dB(µV)	Detector (Pk/QP/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Transducer Factor (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
No significant frequency observed										

Note: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)
(M@3m = M@10m+10.5dB)

QUALIFICATION (1GHz- 25GHz): The frequency list is created from the results obtained during the pre-characterization in anechoic chamber.
Measurements are performed using a PEAK and AVERAGE detection.

Test Frequency (MHz)	Meter Reading dB(µV)	Detector (Pk/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Transducer Factor (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
No significant frequency observed see test results in §8.5(Cmin, Cmid or Cmax)										

10.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **BIOCORP SoloSmart mini**, SN: **None**, 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

Type de mesure / *Kind of measurement*	**Incertitude élargie laboratoire / *Wide uncertainty laboratory* (k=2) ± x**	**Incertitude limite du CISPR / *CISPR uncertainty limit* ± y**
Measurement of conducted disturbances in voltage on the power port	3.29dB	3.4 dB
Measurement of conducted disturbances in voltage on the telecommunication port.	3.26 dB	5dB
Measurement of discontinuous conducted disturbances in voltage	3.33 dB	3.4 dB
Measurement of conducted disturbances in current	2.67 dB	2.9dB
Spurious emission, radiated (Semi anechoic chamber & open test site)	*5.60 dB*	*6 dB*
Spurious emission, radiated (Full anechoic chamber above 1GHz)	*±3.8 dB*	*±6 dB*
Occupied Channel Bandwidth	*±2.8 %*	*±5 %*
RF power, conducted	*±1.2 dB*	*±1.5 dB*
Power Spectral Density, Conducted	*±1.7 dB*	*±3 dB*
Spurious emission, conducted	*±2.3 dB*	*±3 dB*
Temperature	*±0.75 °C*	*±3 °C*
Supply Voltages	*±1.7 %*	*±3 %*

Les valeurs d'incertitudes calculées du laboratoire étant inférieures aux valeurs d'incertitudes limites établies par la norme, la conformité de l'échantillon est établie directement par les niveaux limites applicables. / *The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the standard. The conformity of the sample is directly established by the applicable limits values.*