433MHz Template: Release February 06th, 2020

TEST REPORT

N°: 166092-748231-B(FILE#1040131) **Version : 02**

Subject	**Radio spectrum matters** **tests according to standards:** **47 CFR Part 15.231 & RSS-210 Issue 9 & RSS-Gen Issue 5**
Issued to	**ASTEEL FLASH DEVELOPPEMENT** 43 Chemin du Vieux Chêne 38240 - MEYLAN FRANCE
Apparatus under test	
↳ Product	**Home automation gateway module**
↳ Trade mark	**OVERKIZ / SOMFY**
↳ Manufacturer	**OVERKIZ**
↳ Model under test	**Smartkiz PCBA / TaHoma Beecon PCBA**
↳ Serial number	**O17196101F22180055**
↳ FCC ID	**DWNBEECONPCB**
Conclusion	See Test Program chapter
Test date	February 19, 2020 to February 20, 2020
Test location	Moirans
Test Site	6500A-1 & 6500A-3
Sample receipt date	February 19, 2020
Composition of document	43 pages
Document issued on	April 7, 2020

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	February 26 , 2020	Majid MOURZAGH	Creation of the document
02	March 26, 2020	Majid MOURZAGH	Correction on Page 1 Trade Mark & Manufacturer informations

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

References

- **47 CFR Part 15.231**
- **RSS 210 Issue 9**
- **RSS Gen Issue 5**
- **ANSI C63.10-2013**

Radio requirement:

Clause (47CFR Part 15.231 & RSS-249 Issue 2 & RSS-Gen Issue 5) Test Description	Test result - Comments			
Occupied Bandwidth	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
20 dB bandwidth	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Frequency Tolerance	☐ PASS	☐ FAIL	☐ NA	☐ NP(1)
Limit of Transmission Time	☑ PASS	☐ FAIL	☐ NA	☐ NP(1)
Field strength of fundamental & Field strength of harmonics	☑ 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.				

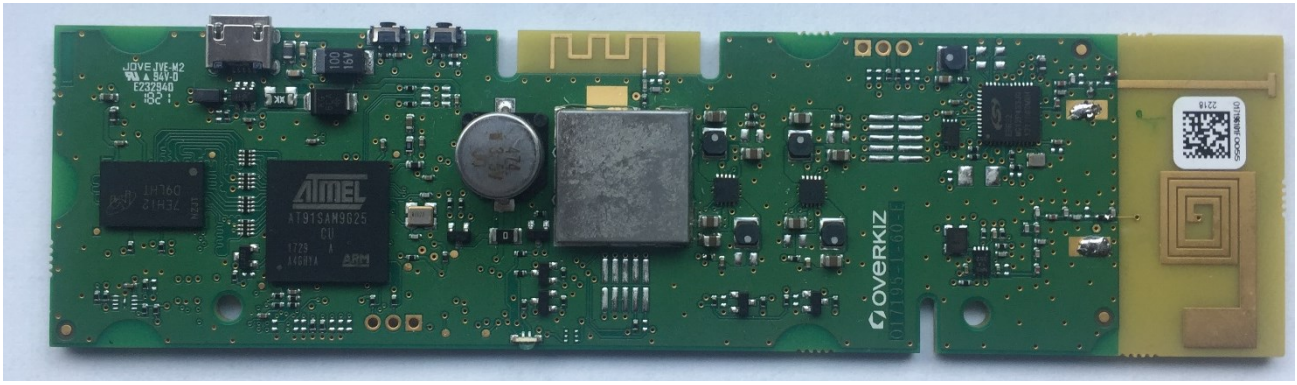
(1): Limited program
(2): EUT not directly or indirectly connected to the AC Power Public Network

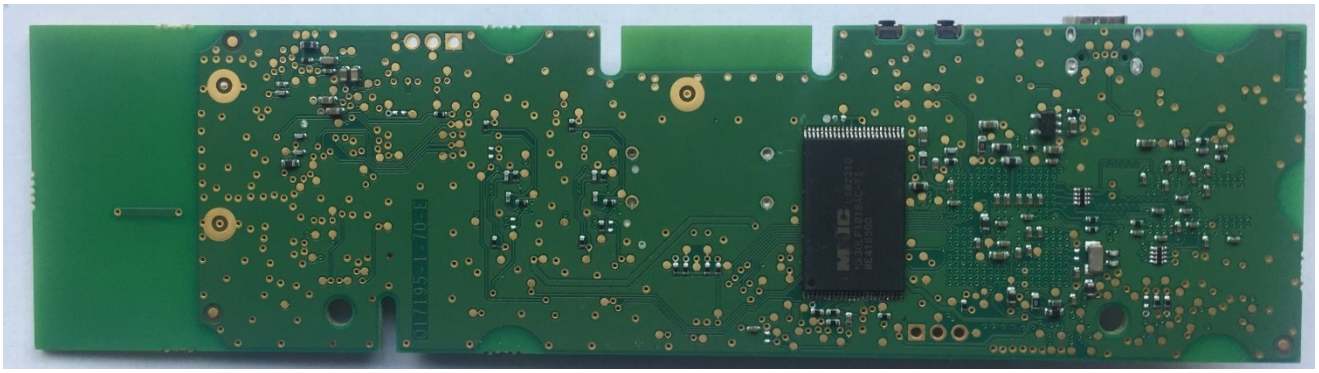
PASS: EUT complies with standard's requirement
FAIL: EUT does not comply with standard's requirement
NA: Not Applicable
NP: Test Not Performed

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

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):
OVERKIZ / SOMFY Smartkiz PCBA / TaHoma Beecon PCBA
Serial Number: O17196101F22180055





Equipment Under Test

Power supply:
During all the tests, EUT is supplied by V_{nom}: 5VDC
For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply1	☐ AC ☑ DC ☐ Battery	5Vusb	/	/

Voltage table used (for Power Line Conducted Emissions):

Type	Measurement performed:	
☑ AC	☑ **120VAC/60Hz**	☑ **240VAC/50Hz**

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
1	µUSB	2	☐	☑	☑	/

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop	DELL	/	Use to set the EUT
DUB-E100 USB 2.0 Ethernet Adapter	D-Link DUB-E100	S7291J3002309	/
USB 2.0 7-Port Mobile Powered Hub	/	D14-00015584	/
USB Testeur	/	/	/-

Equipment information:

Type:	**RTS**		
Number of Channel:	1		
Spacing channel:	None		
Channel bandwidth:	100 kHz		
Channel tested:	F_{nom}: 433.42 MHz		
Antenna Type:	☑ Integral	☐ External	☐ Dedicated
Antenna connector:	☐ Yes	☐ No	☑ Temporary for test
Transmit chains:	☑ 1	☐ 2	
Receiver chains	None		
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:	Tnom:	20°C	
Type of power source:	☐ AC power supply	☑ DC power supply	☐ Battery
Operating voltage range:	Vnom:	☐ 120V/60Hz	☑ 5 Vdc

Antenna Characteristic			
Antenna assembly	**Gain (dBi)**	**Frequency Band (MHz)**	**Impedance(Ω)**
1	0	433.42	50

CHANNEL PLAN	
Channel	**Frequency (MHz)**
Cnom	433.42

Hardware information		
Software (if applicable):	**V. :**	**KIZOS: kizos-P000503-2019.6.4-14i.tar**

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 mode 2	Permanent reception

Test	Running mode	
Occupied Bandwidth	☑ Test mode 1 (1)	☐ Alternative test mode()
20 dB bandwidth	☑ Test mode 1 (1)	☐ Alternative test mode()
Duty cycle	☑ Test mode 1 (1)	☐ Alternative test mode()
Frequency Tolerance	☑ Test mode 1 (1)	☐ Alternative test mode()
Limit of Transmission Time	☑ Test mode 1 (1)	☐ Alternative test mode()
Field strength of fundamental & Field strength of harmonics	☑ 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()
Receiver Radiated emissions	☐ Test mode 2 (1)	☐ Alternative test mode()

(1) Following commands with the specific test software are used to set the product
The EUT is set in the following modes during tests with simulator / software v2.0
- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception
All tests are performed Cnom (RTS)

Following commands with the specific test software “
(2)

Command
Permanent Emission (RTS – 15.231) :
init % Initialisation sx1243 init test % Initialisation RTS (Test mode) sx1243 tx on % Pure Carrier frequency sx1243 data on % Modulated Carrier frequency sx1243 stop

2.3. EQUIPMENT LABELLING

None

2.4. EQUIPMENT MODIFICATION

☑ None ☐ Modification:

3. OCCUPIED BANDWIDTH

3.1. TEST CONDITIONS

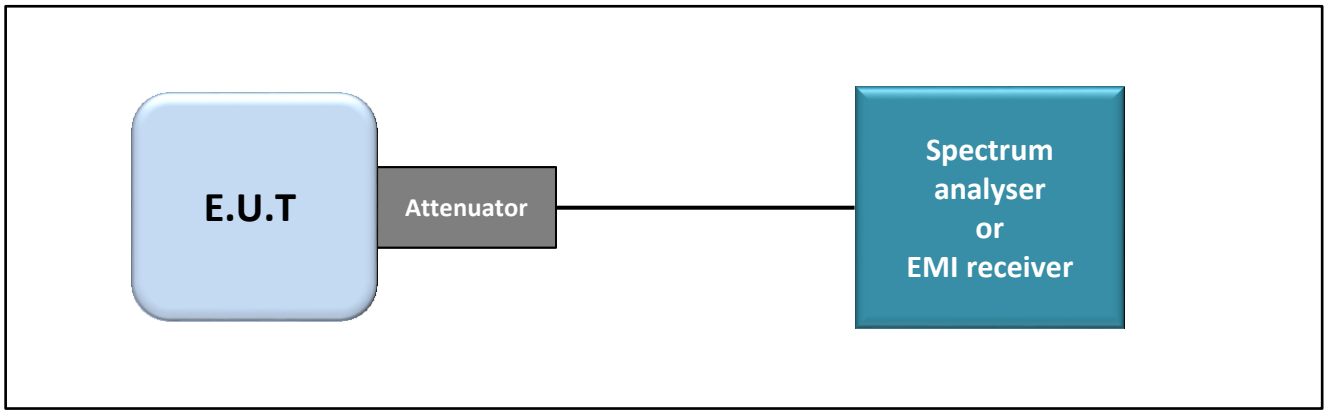
Test performed by	: Majid MOURZAGH
Date of test	: February 20, 2020
Ambient temperature	: 22 °C
Relative humidity	: 35 %

3.2. TEST SETUP

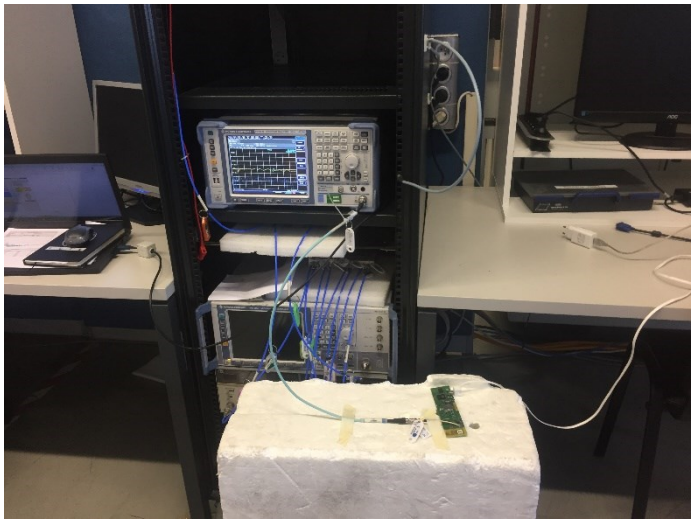
- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

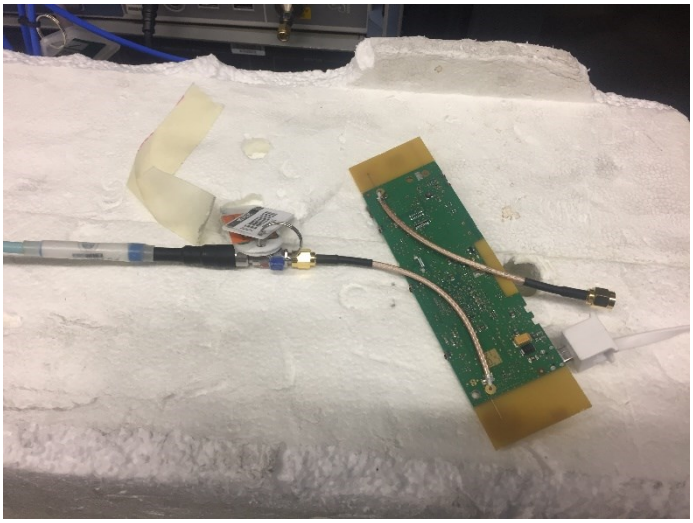
- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ RSS-Gen Issue 5 § 6.7



Test set up of Occupied Bandwidth





Photograph for Occupied bandwidth

3.3. LIMIT

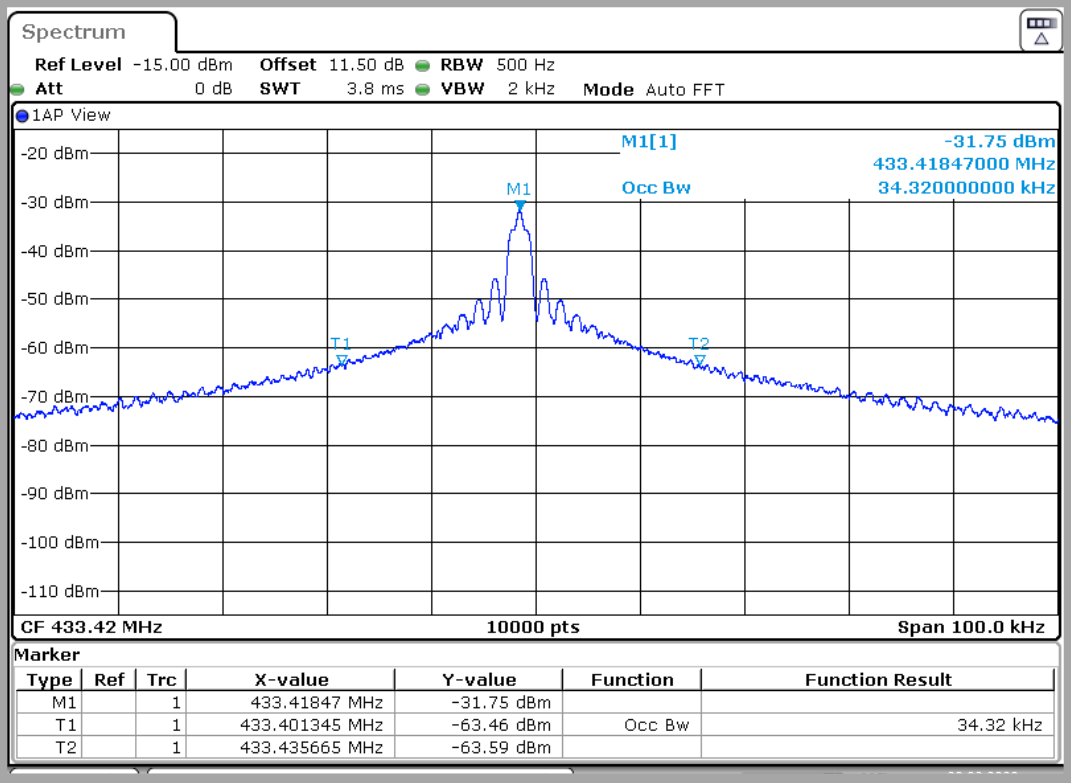
None

3.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/21	05/23
Attenuator 10dB	AEROFLEX	_	A7122269	12/17	04/20
Cable Measure	_	36G	A5329604	02/19	02/20
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20

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

3.5. RESULTS

Occupied Bandwidth	
Cnom	
	
Cmax	
Channel	Occupied Bandwidth (kHz)
Cnom	34.32

3.6. CONCLUSION

Occupied Channel Bandwidth measurement performed on the sample of the product **OVERKIZ / SOMFY** Smartkiz **PCBA / TaHoma Beecon PCBA**, SN: **O17196101F22180055**, 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

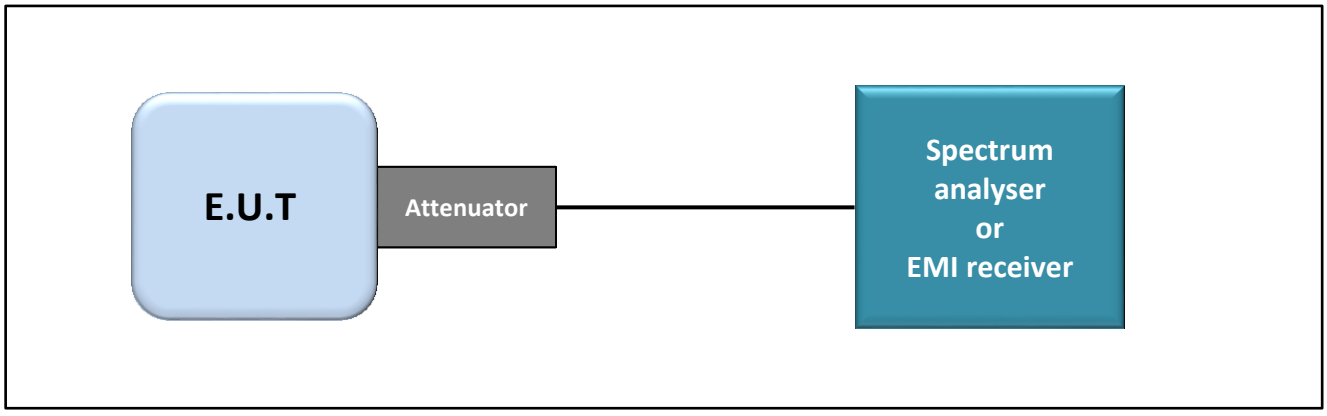
Test performed by	: Majid MOURZAGH
Date of test	: February 20, 2020
Ambient temperature	: 22 °C
Relative humidity	: 35 %

4.2. TEST SETUP

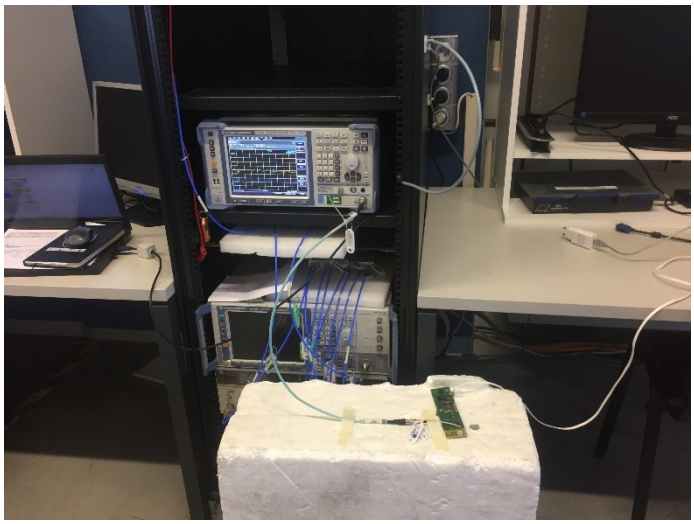
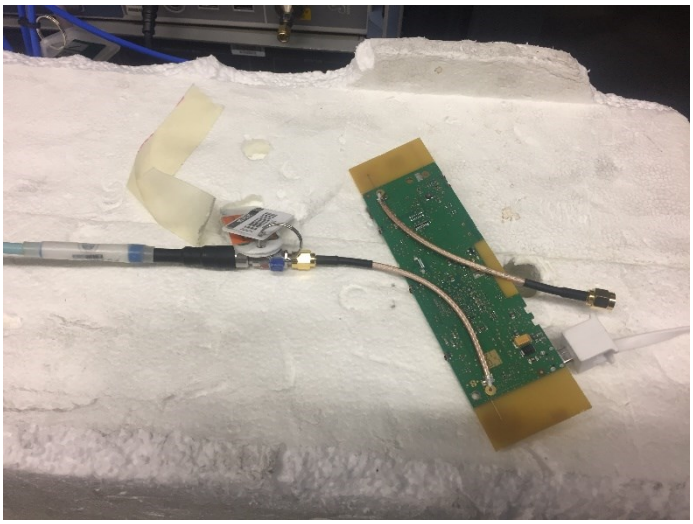
- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

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

- Test Procedure:
☑ ANSI C63.10 § 6.9.2



Test set up of 20dB Emission Bandwidth

Photograph for 20dB emission bandwidth

4.3. LIMIT

The bandwidth shall be less than 0.25% of the center frequency (for frequency between 70MHz and 900MHz)
The bandwidth shall be less than 0.50% of the center frequency (for frequency above 900MHz)

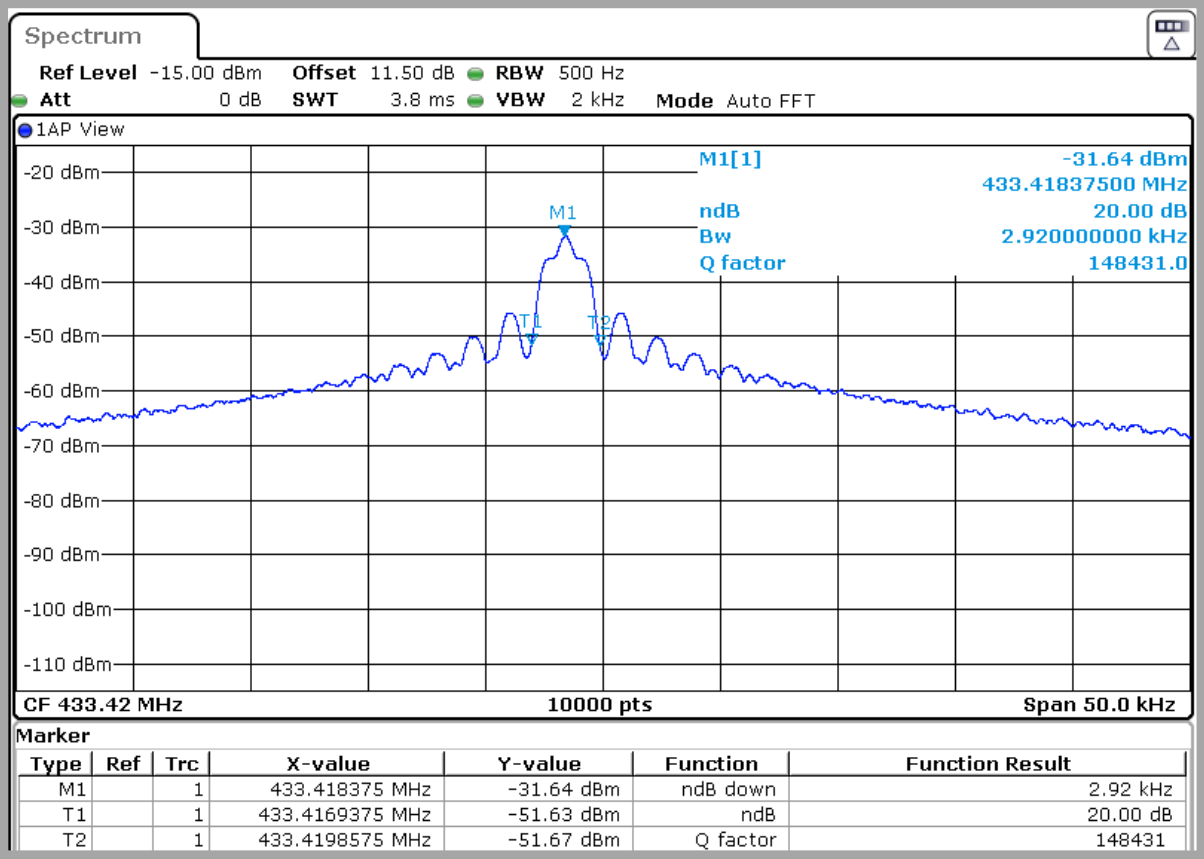
4.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/21	05/23
Attenuator 10dB	AEROFLEX	_	A7122269	12/17	04/20
Cable Measure	_	36G	A5329604	02/19	02/20
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20

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

4.5. RESULTS

Cmin Cnom



Channel	20dB Bandwidth (kHz)
Cnom	2.92

4.6. CONCLUSION

20dB Emission Bandwidth measurement performed on the sample of the product **OVERKIZ / SOMFY** Smartkiz **PCBA / TaHoma Beecon PCBA**, SN: **O17196101F22180055**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 9** limits.

5. LIMIT OF TRANSMISSION TIME

5.1. TEST CONDITIONS

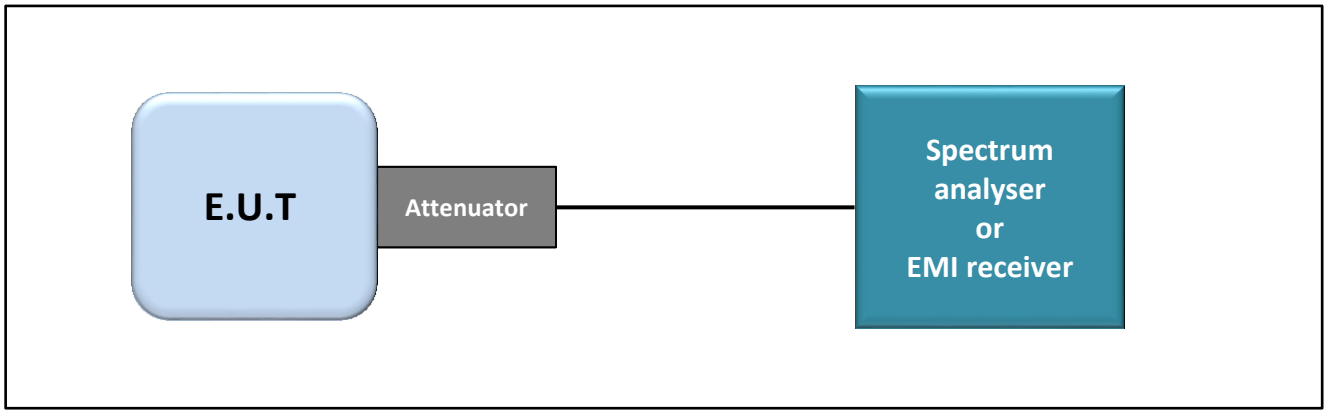
Test performed by	: Majid MOURZAGH
Date of test	: February 21, 2020
Ambient temperature	: 20 °C
Relative humidity	: 36 %

5.2. TEST SETUP

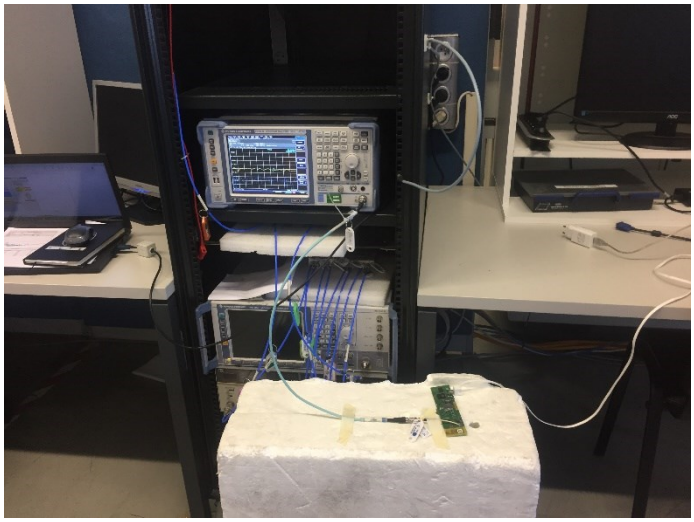
- The Equipment Under Test is installed:
☑ On a table
☐ In an anechoic chamber

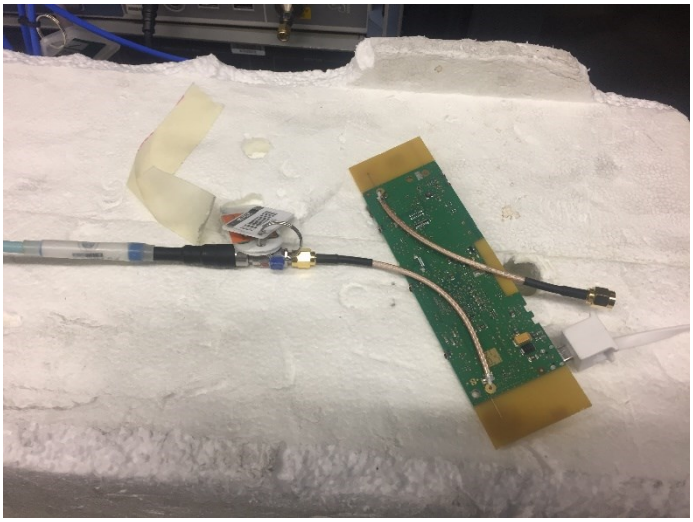
- Measurement is performed with a spectrum analyzer in:
☑ Conducted Method
☐ Radiated Method

- Test Procedure:
☑ ANSI C63.10 § 11.6



Test set up of Limit of Transmission Time





Photograph for Limit of Transmission Time

5.3. LIMIT

None

5.4. TEST EQUIPMENT LIST

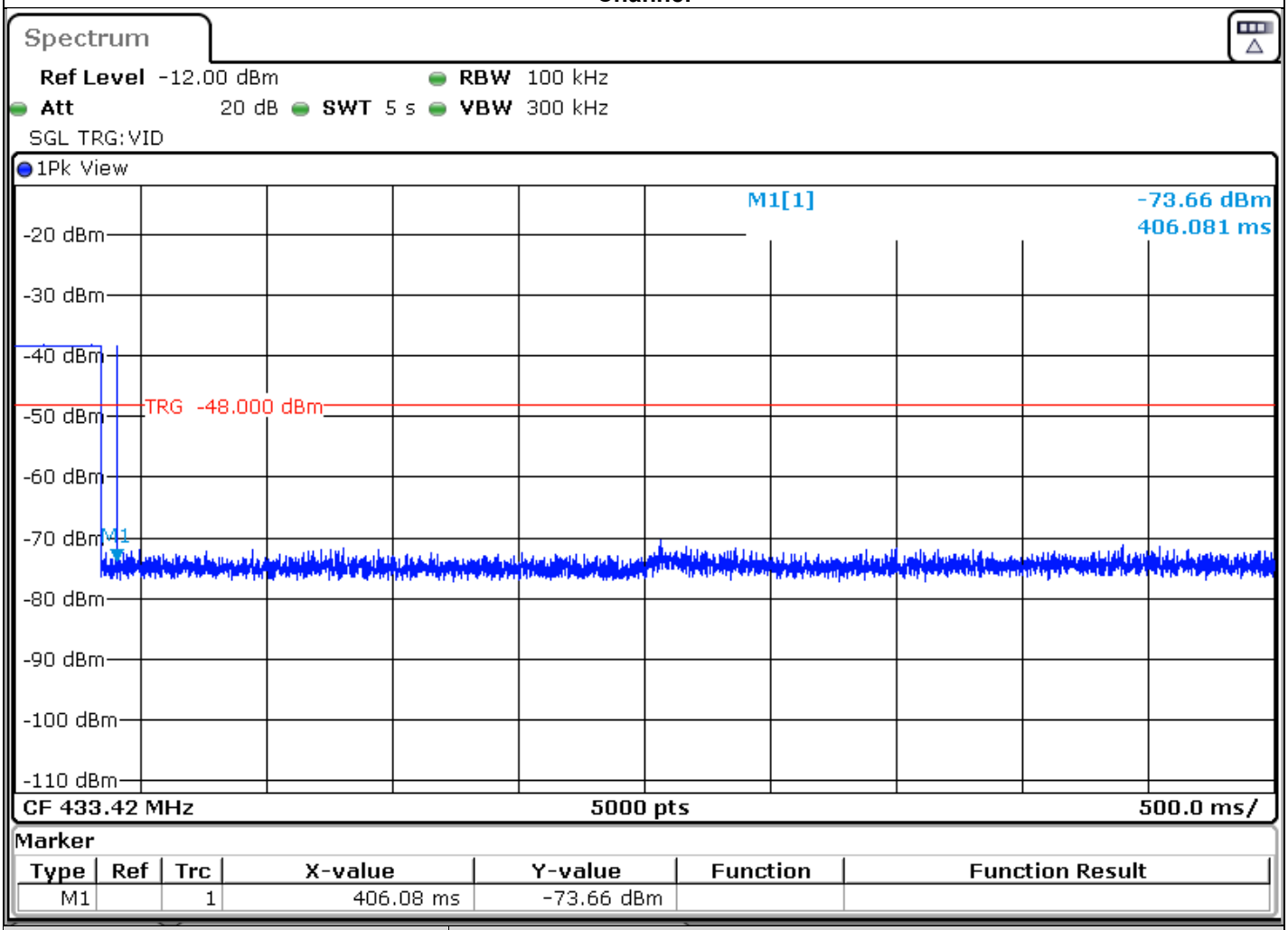
TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Spectrum analyzer	ROHDE & SCHWARZ	FSV 40	A4060059	05/21	05/23
Attenuator 10dB	AEROFLEX	_	A7122269	12/17	04/20
Cable Measure	_	36G	A5329604	02/19	02/20
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20

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

5.5. RESULTS

Limit of transmission time

Channel



Channel	Transmission time (%)
Channel	8.14

5.6. CONCLUSION

Duty Cycle measurement performed on the sample of the product **OVERKIZ / SOMFY Smartkiz PCBA / TaHoma Beecon PCBA**, SN: **O17196101F22180055**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 9** limits.

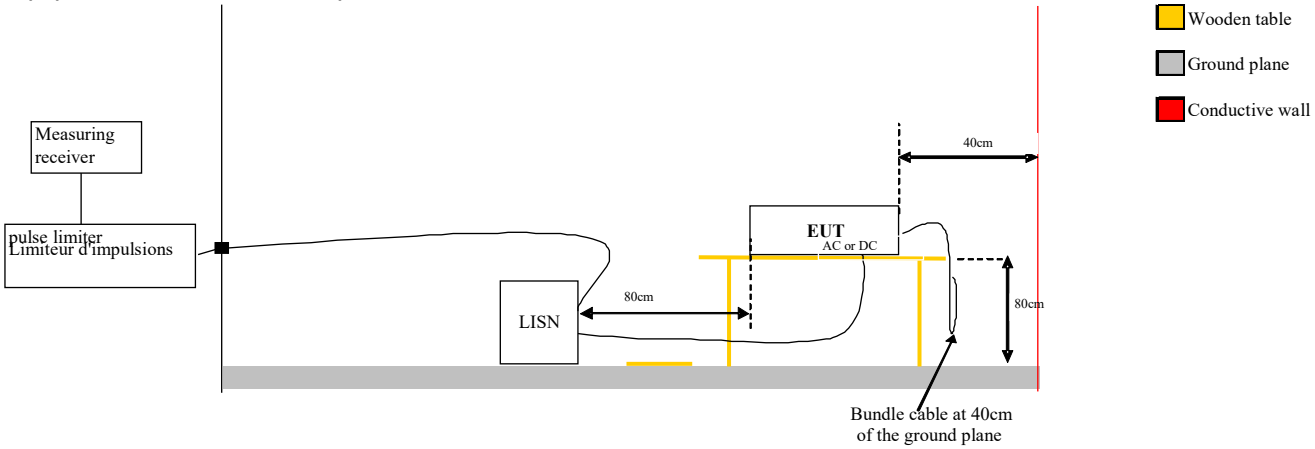
6. AC POWER LINE CONDUCTED EMISSIONS

6.1. TEST CONDITIONS

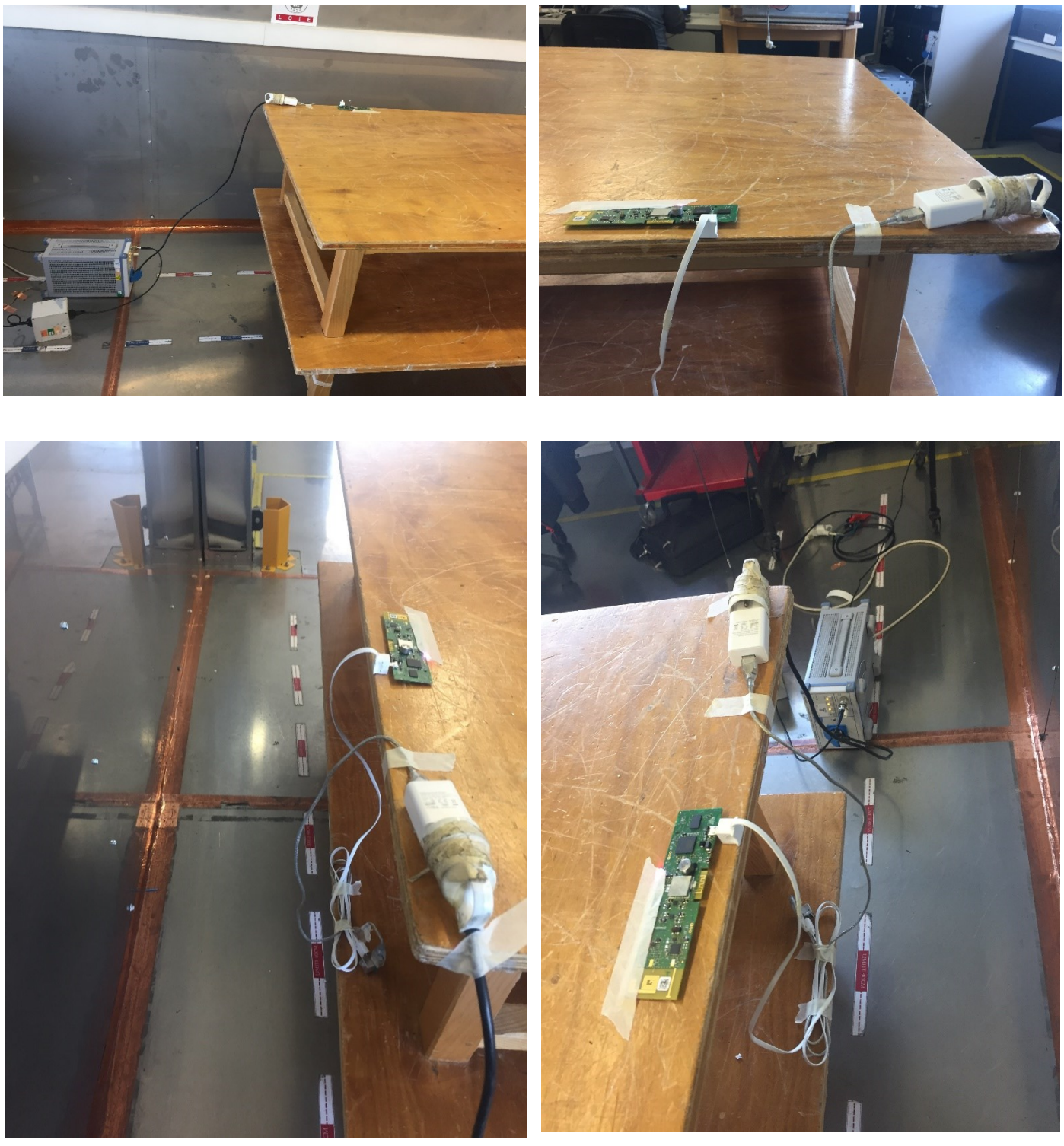
Test performed by	: Majid MOURZAGH
Date of test	: February 21, 2020
Ambient temperature	: 20 °C
Relative humidity	: 36 %

6.2. 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 Conducte



Photograph for AC Power Line Conducted Emissions (Front view)

6.3. 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

6.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
BAT EMC	NEXIO	v3.19.1.18	L1000115		
Cable + self	_	_	A5329585	12/18	02/20
EMC comb generator	LCIE SUD EST	_	A3169098		
LISN	ROHDE & SCHWARZ	ENV216	C2320291	02/19	02/20
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	12/17	02/20
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Transient limiter	ROHDE & SCHWARZ	ESH3-Z2	A7122204	02/19	02/20

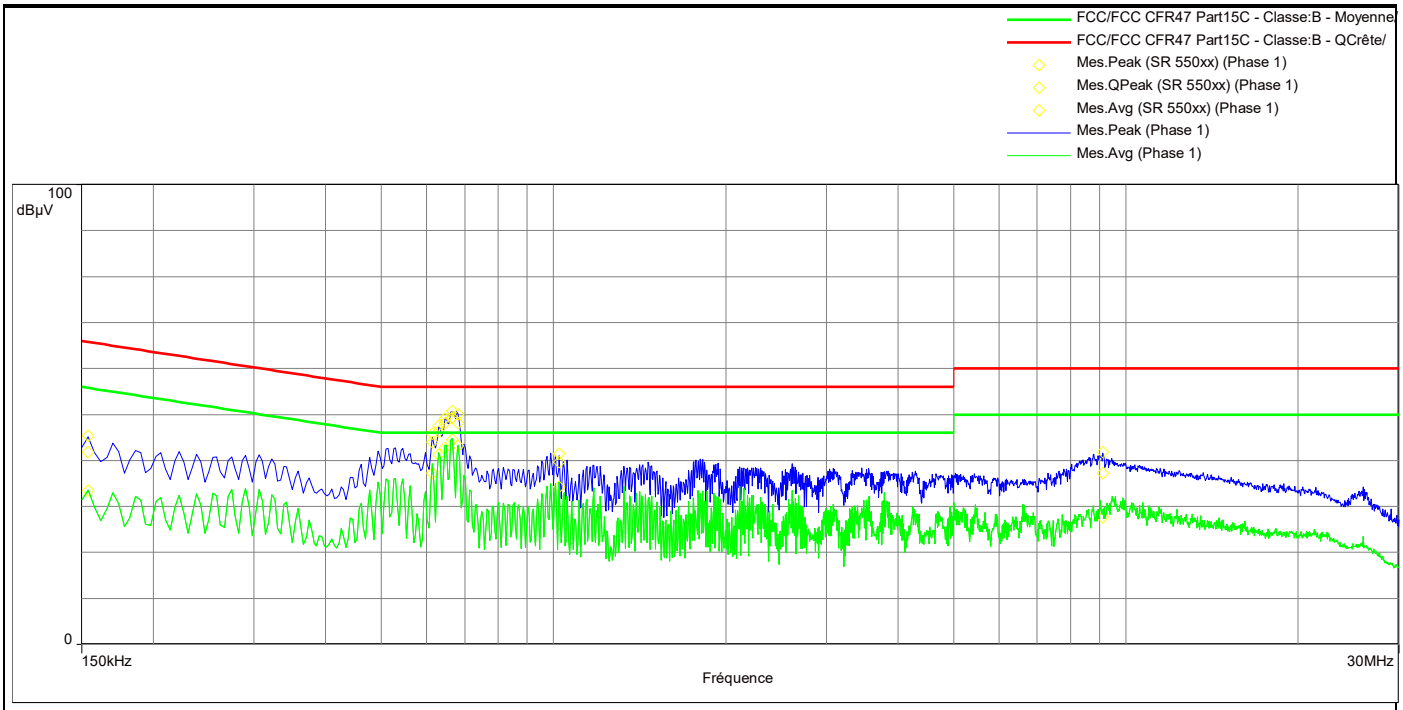
Note: In our quality system, the test equipment calibration due is more & less 2 months

6.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

6.6. RESULTS

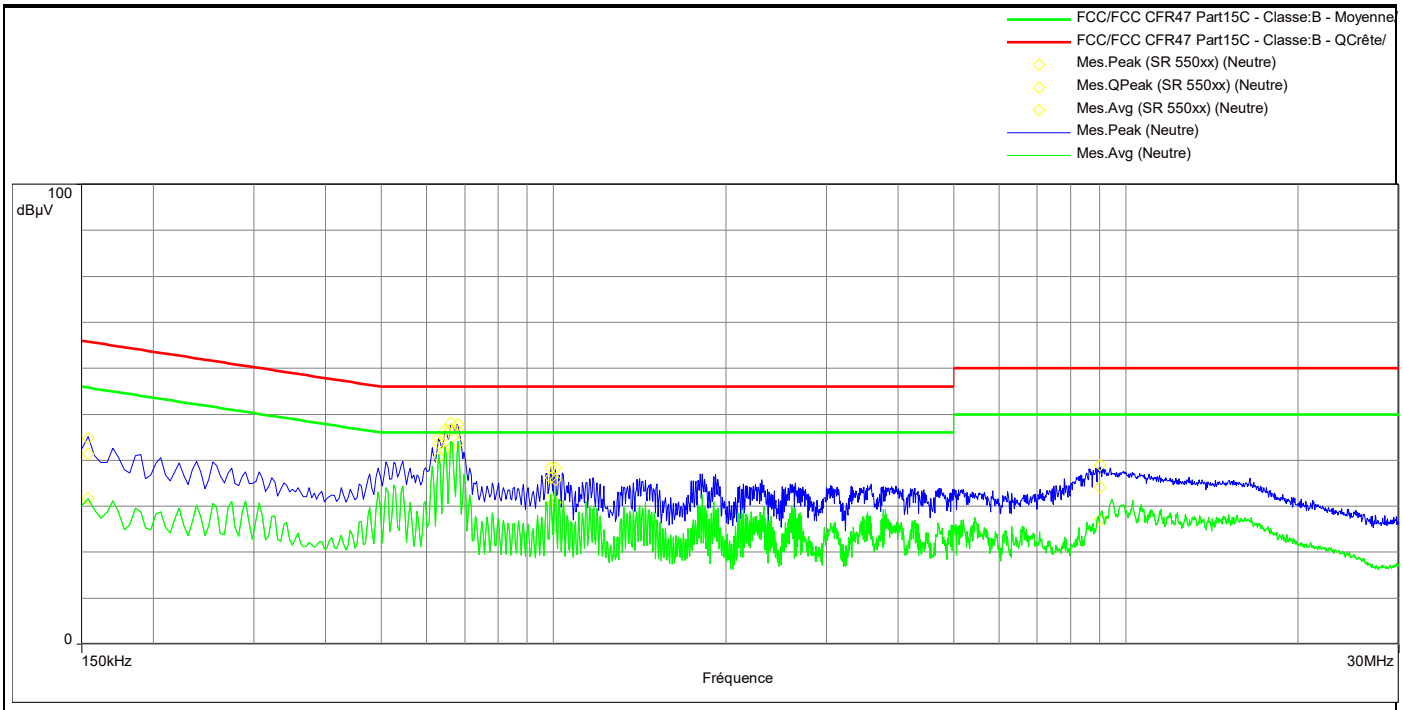
CONDUCTED EMISSIONS			
Graph name:	Emc#1	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Line 120VAC /60Hz	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



Spurious emissions

Frequency (MHz)	Mes.Peak (dBµV)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.154	45.4	41.9	65.8	-23.9	33.4	55.8	-22.4	Phase 1	19.4
0.614	45.8	44.0	56.0	-12.0	37.3	46.0	-8.7	Phase 1	19.7
0.630	47.5	46.3	56.0	-9.7	41.2	46.0	-4.8	Phase 1	19.7
0.646	49.2	48.1	56.0	-7.9	42.7	46.0	-3.3	Phase 1	19.6
0.666	50.8	49.4	56.0	-6.6	44.5	46.0	-1.5	Phase 1	19.6
0.682	50.1	48.1	56.0	-7.9	43.2	46.0	-2.8	Phase 1	19.6
1.024	41.4	39.7	56.0	-16.3	34.2	46.0	-11.8	Phase 1	19.6
9.104	41.8	37.2	60.0	-22.8	27.6	50.0	-22.4	Phase 1	20.2

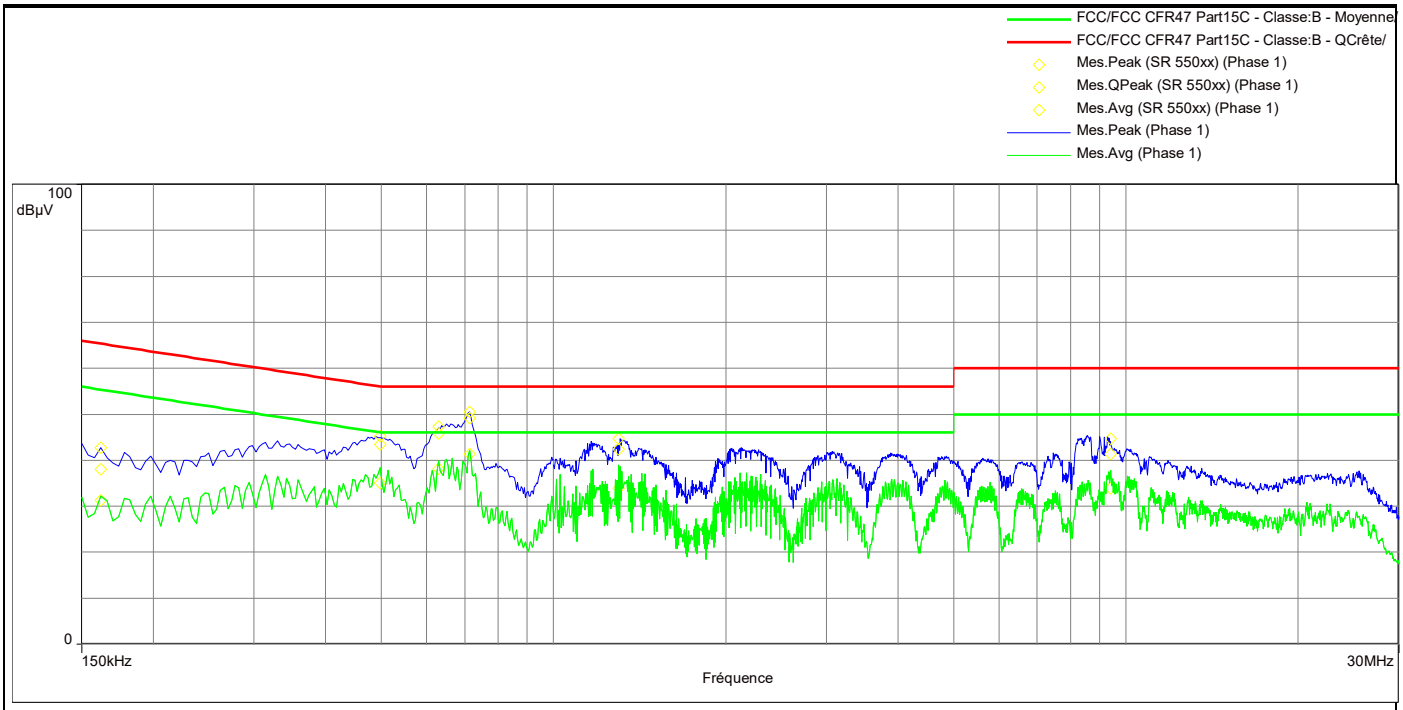
CONDUCTED EMISSIONS			
Graph name:	Emc#2	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Neutral 120VAC /60Hz	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Neutral	**VBW :**	30kHz



Spurious emissions

Frequency (MHz)	Mes.Peak (dBµV)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.154	44.8	41.4	65.8	-24.4	31.7	55.8	-24.1	Neutre	19.4
0.630	44.9	43.6	56.0	-12.4	40.7	46.0	-5.3	Neutre	19.7
0.646	46.5	45.3	56.0	-10.7	42.0	46.0	-4.0	Neutre	19.6
0.662	48.2	46.6	56.0	-9.4	42.7	46.0	-3.3	Neutre	19.6
0.682	47.8	46.4	56.0	-9.6	43.8	46.0	-2.2	Neutre	19.6
0.990	38.4	36.2	56.0	-19.8	31.4	46.0	-14.6	Neutre	19.6
1.008	38.4	35.8	56.0	-20.2	30.8	46.0	-15.2	Neutre	19.6
9.020	39.0	34.1	60.0	-25.9	27.1	50.0	-22.9	Neutre	20.1

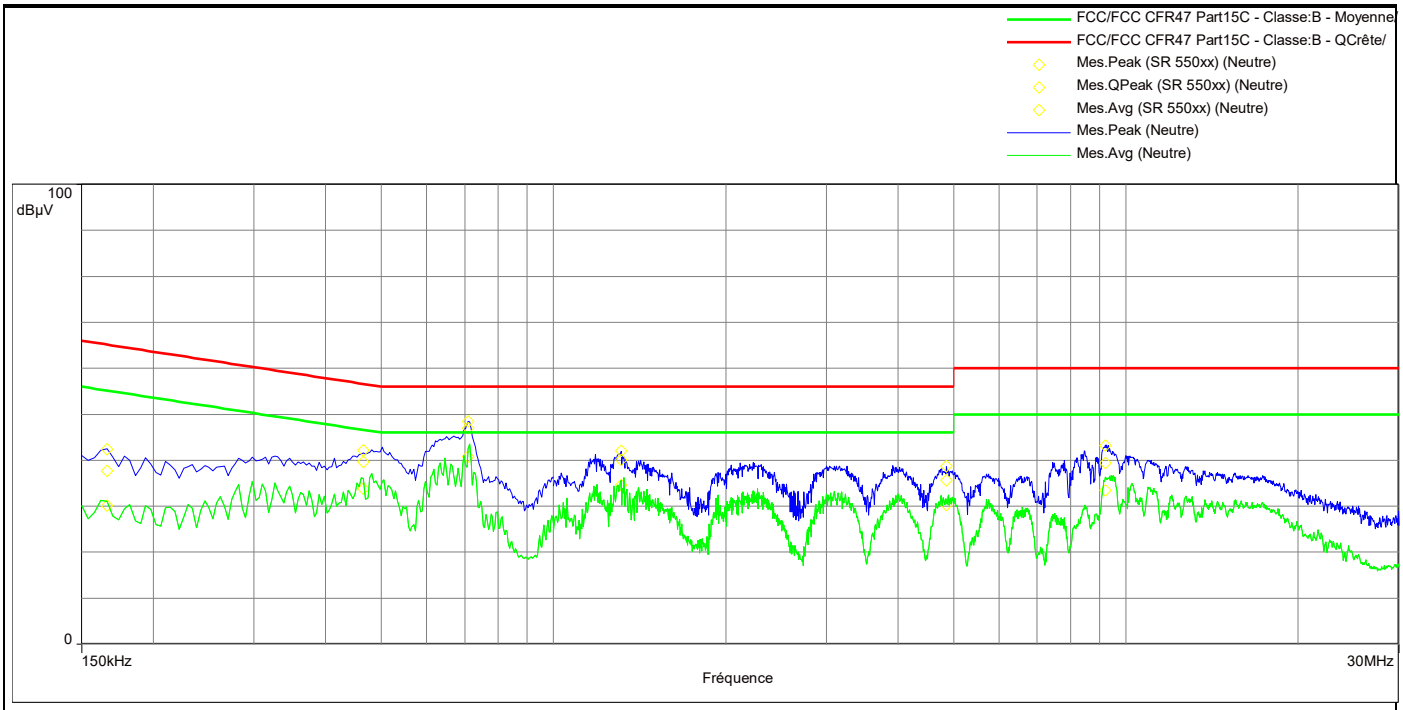
CONDUCTED EMISSIONS			
Graph name:	Emc#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Line 240VAC /50Hz	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240VAC / 50Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



Spurious emissions

Frequency (MHz)	Mes.Peak (dBµV)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.162	42.7	38.0	65.4	-27.3	31.3	55.4	-24.0	Phase 1	19.5
0.498	45.3	43.4	56.0	-12.6	35.1	46.0	-10.9	Phase 1	19.6
0.630	47.3	45.8	56.0	-10.2	38.1	46.0	-7.9	Phase 1	19.7
0.714	50.5	49.2	56.0	-6.8	41.4	46.0	-4.6	Phase 1	19.6
1.300	44.7	42.4	56.0	-13.6	34.0	46.0	-12.0	Phase 1	19.6
9.400	44.6	41.3	60.0	-18.7	33.9	50.0	-16.1	Phase 1	20.2

CONDUCTED EMISSIONS			
Graph name:	Emc#4	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Neutral 240VAC /50Hz	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240VAC / 50Hz	**RBW :**	10kHz
Line:	Neutral	**VBW :**	30kHz



Spurious emissions

Frequency (MHz)	Mes.Peak (dBµV)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.166	42.4	37.6	65.2	-27.5	30.2	55.2	-25.0	Neutre	19.5
0.466	42.1	39.6	56.6	-17.0	33.8	46.6	-12.8	Neutre	19.6
0.710	48.4	46.9	56.0	-9.1	40.8	46.0	-5.2	Neutre	19.6
1.312	42.0	40.1	56.0	-15.9	34.6	46.0	-11.4	Neutre	19.6
4.860	38.7	35.6	56.0	-20.4	30.3	46.0	-15.7	Neutre	19.8
9.200	43.2	39.5	60.0	-20.5	33.5	50.0	-16.5	Neutre	20.2

6.7. CONCLUSION

Ac Power Line Conducted Emission measurement performed on the sample of the product **OVERKIZ / SOMFY** Smartkiz **PCBA / TaHoma Beecon PCBA**, SN: **O17196101F22180055**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 9** limits.

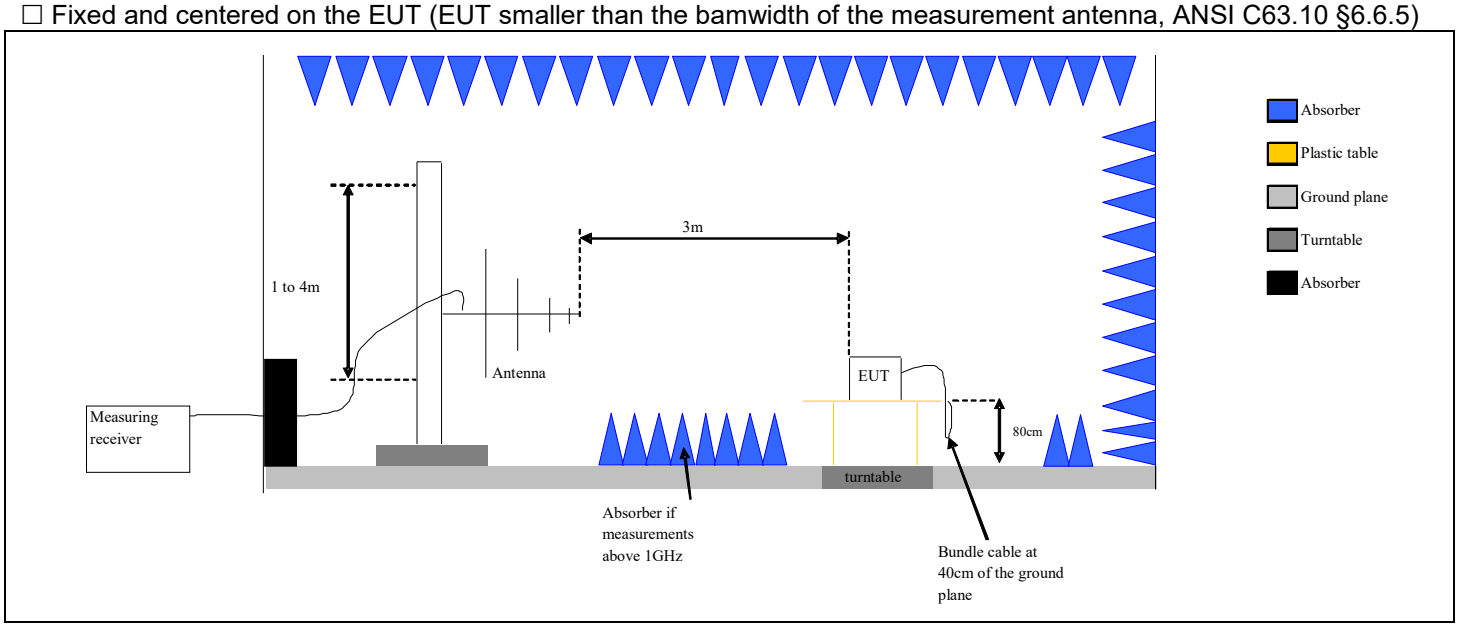
7. FIELD STRENGHT OF EMISSION & FIELD STRENGHT OF HARMONICS

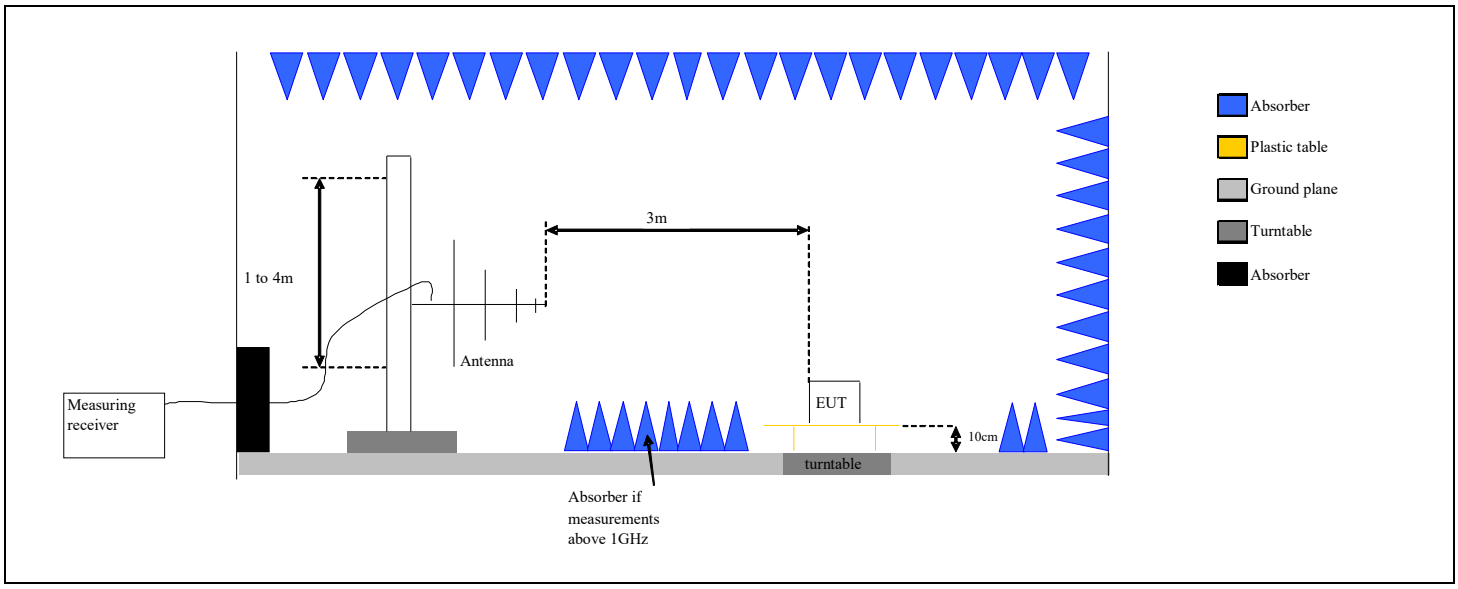
7.1. TEST CONDITIONS

Test performed by	: Majid MOURZAGH	: Majid MOURZAGH
Date of test	: February 19, 2020	: February 20, 2020
Ambient temperature	: 21 °C	: 22 °C
Relative humidity	: 38 %	: 35 %

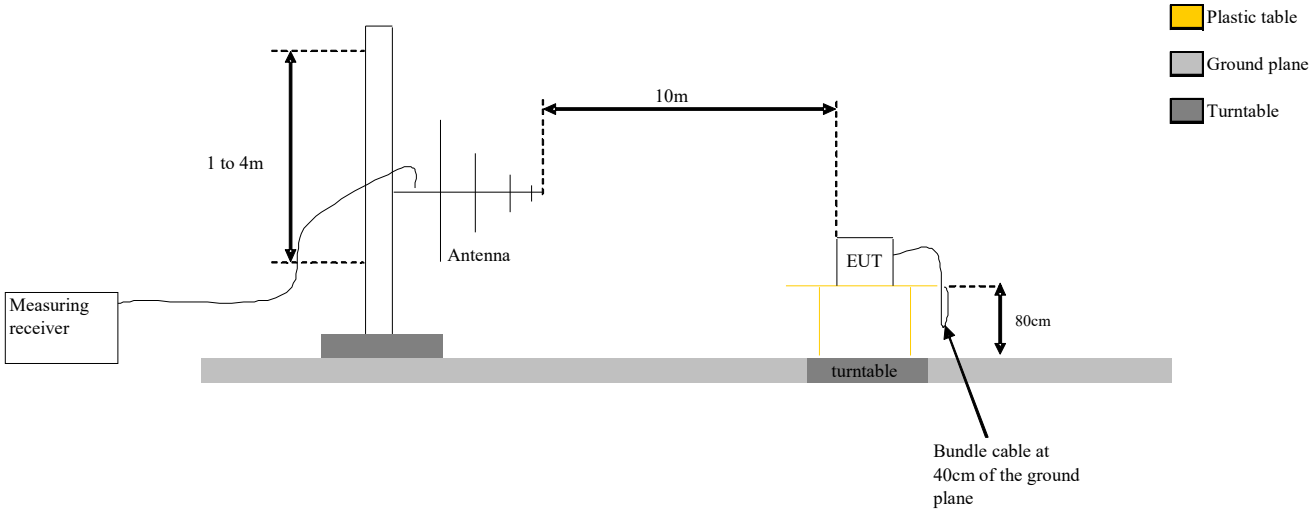
7.2. TEST SETUP

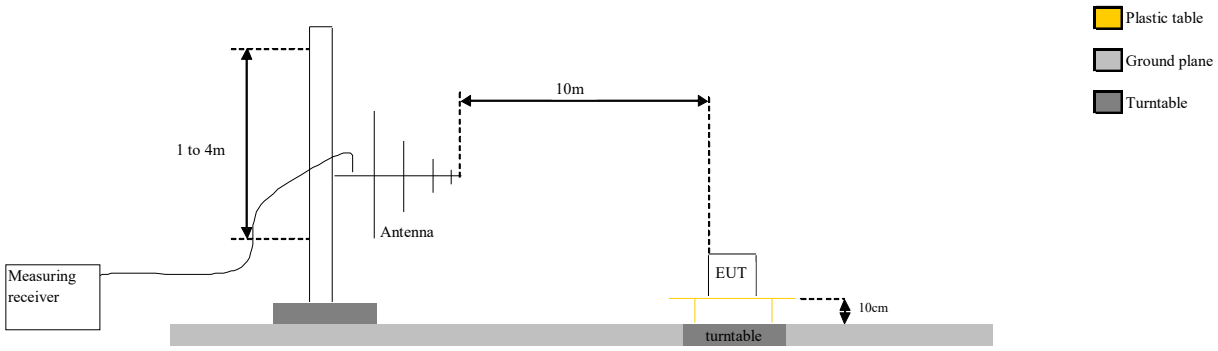
The product has been tested according to ANSI C63.10 (2013) and FCC part 15 subpart C.
Test is performed in horizontal (H) and vertical (V) polarization with **bilog** between 30MHz & 1GHz and with a horn antenna above 1GHz. Measurement bandwidth was 120kHz below 1GHz and 1MHz above 1GHz. The level has 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 **Distance**.
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 bamwidth of the measurement antenna, ANSI C63.10 §6.6.5)



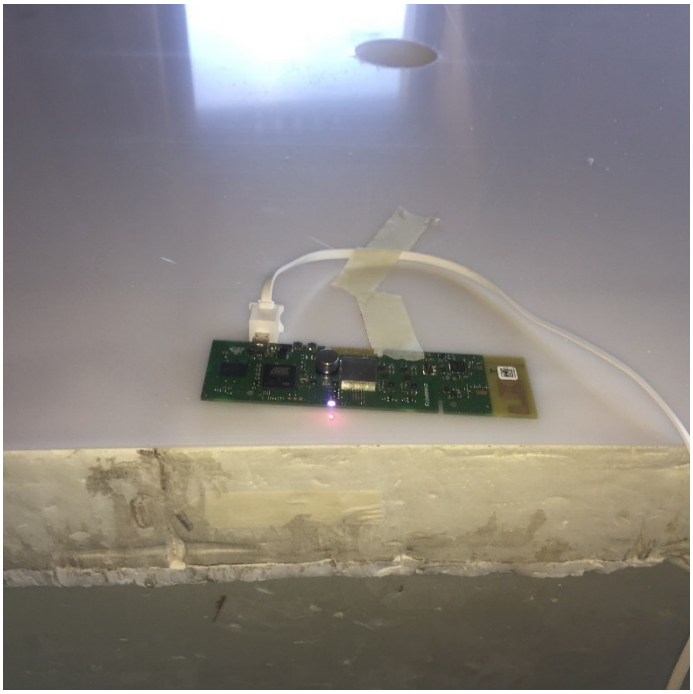


Test set up of Unwanted Emissions in Restricted Frequency Bands in semi anechoic chamber

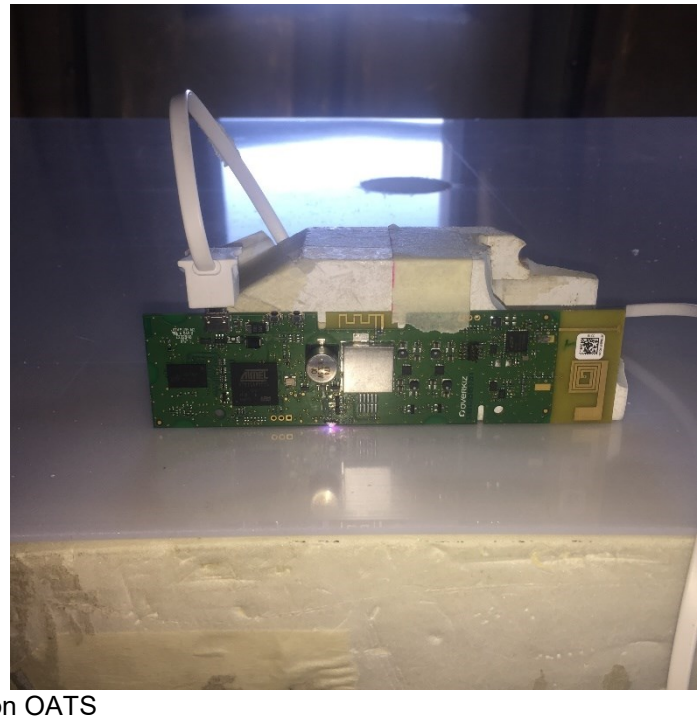




Test Set up for radiated measurement in open area test site

Axis XY on OATS

Axis Z on OATS

Photograph for Field strength of fundamental & Field strength of harmonics

7.3. LIMIT

§15.231		
Measure at 10m		
Frequency range	**Level**	**Detector**
260MHz to 470MHz	60.35-71.4dBµV/m	QPeak
Measure at 3m		
Frequency range	**Level**	**Detector**
260MHz to 470MHz	70.85-81.90dBµV/m	QPeak

7.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Antenna Bi-log	CHASE	CBL6111A	C2040051	06/19	06/20
Antenna mast (OATS)	ETS Lingren	2071-2	F2000392		
Cable (OATS)	_	1GHz	A5329623	03/19	03/20
Emission Cable	SUCOFLEX	6GHz	A5329061	02/19	02/20
OATS	_	_	F2000409	02/19	02/20
Radiated emission comb generator	BARDET	_	A3169050		
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	12/17	02/20
Table C1/OATS	LCIE	_	F2000445		
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Turntable (OATS)	ETS Lingren	Model 2187	F2000403		
Turntable / Mast controller (OATS)	ETS Lingren	Model 2066	F2000372		

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

7.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

7.6. RESULTS

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
433.420	57.2	QP	H	200	250	21.0	78.2	80.8	**-2.6**	Axis Z Worst case
433.420	53.5	QP	V	45	170	21.0	74.5	80.8	**-6.3**	Axis Z Worst case

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

7.7. CONCLUSION

Field strength of fundamental & Field strength of harmonics measurement performed on the sample of the product **OVERKIZ / SOMFY** Smartkiz **PCBA / TaHoma Beecon PCBA**, SN: **O17196101F22180055**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 9** limits.

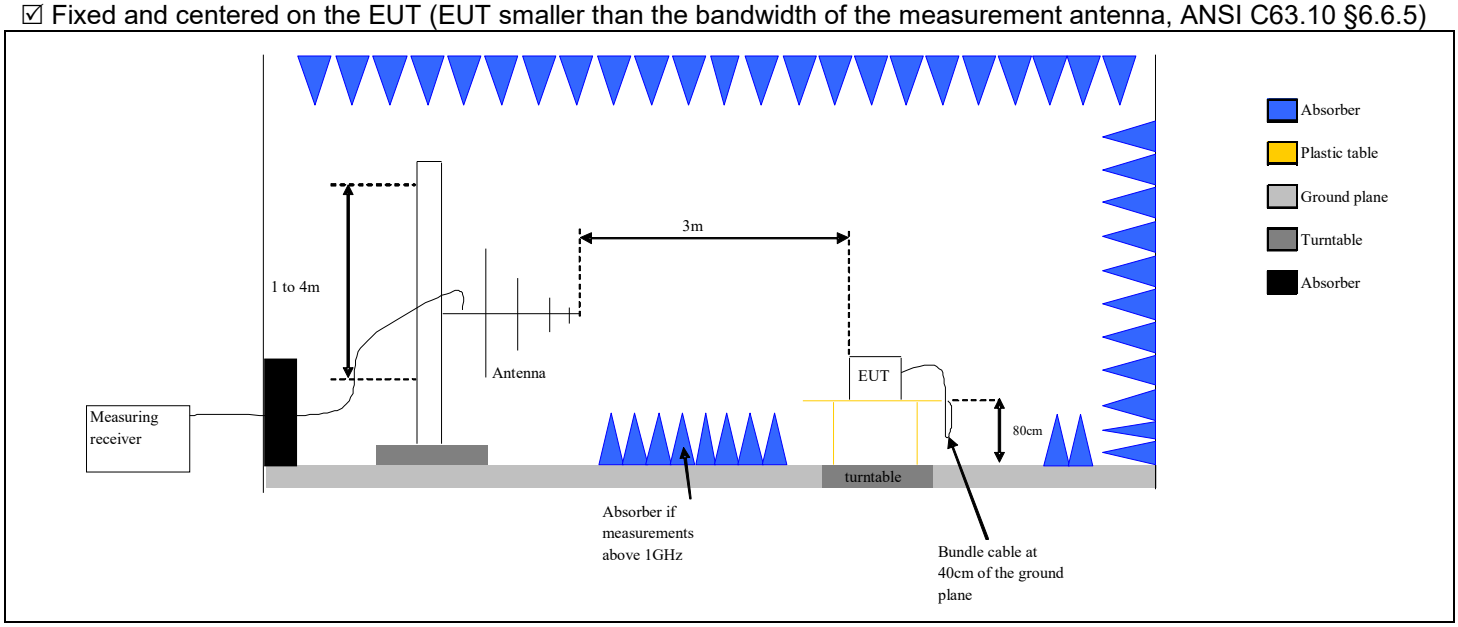
8. UNWANTED EMISSIONS IN RESTRICTED FREQUENCY BANDS

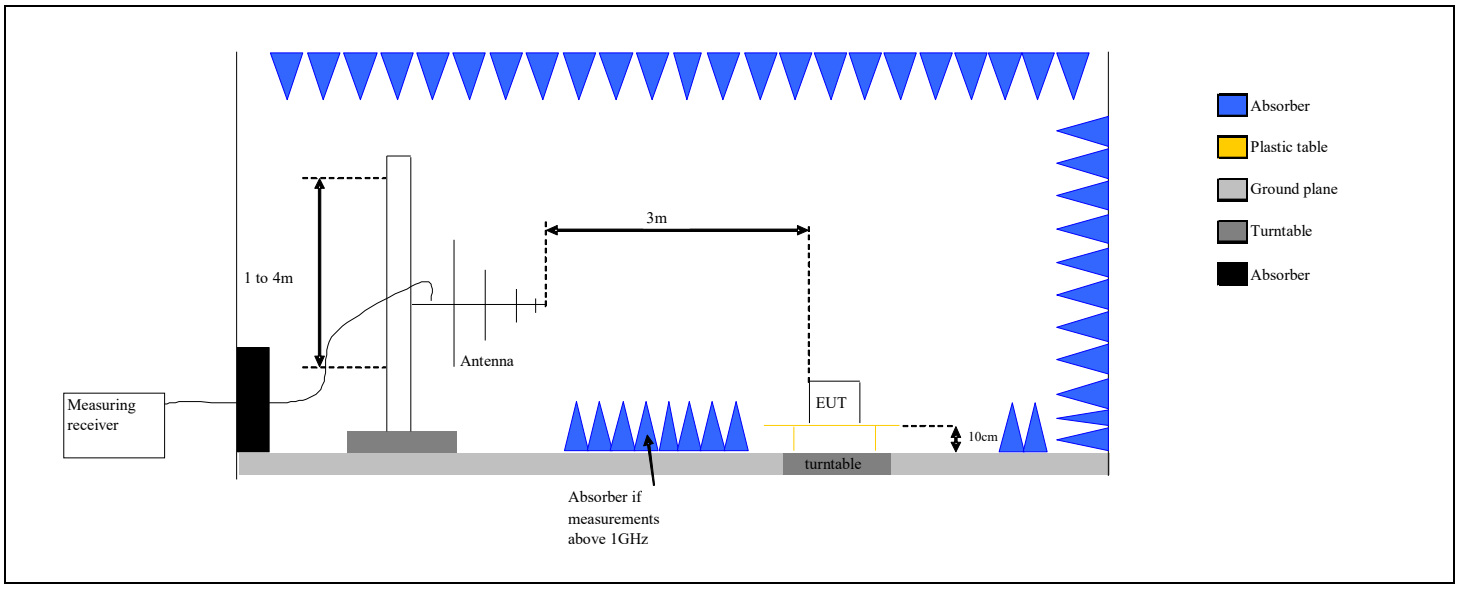
8.1. TEST CONDITIONS

Test performed by	: Majid MOURZAGH	: Majid MOURZAGH
Date of test	: February 19, 2020	: February 20, 2020
Ambient temperature	: 21 °C	: 22 °C
Relative humidity	: 38 %	: 35 %

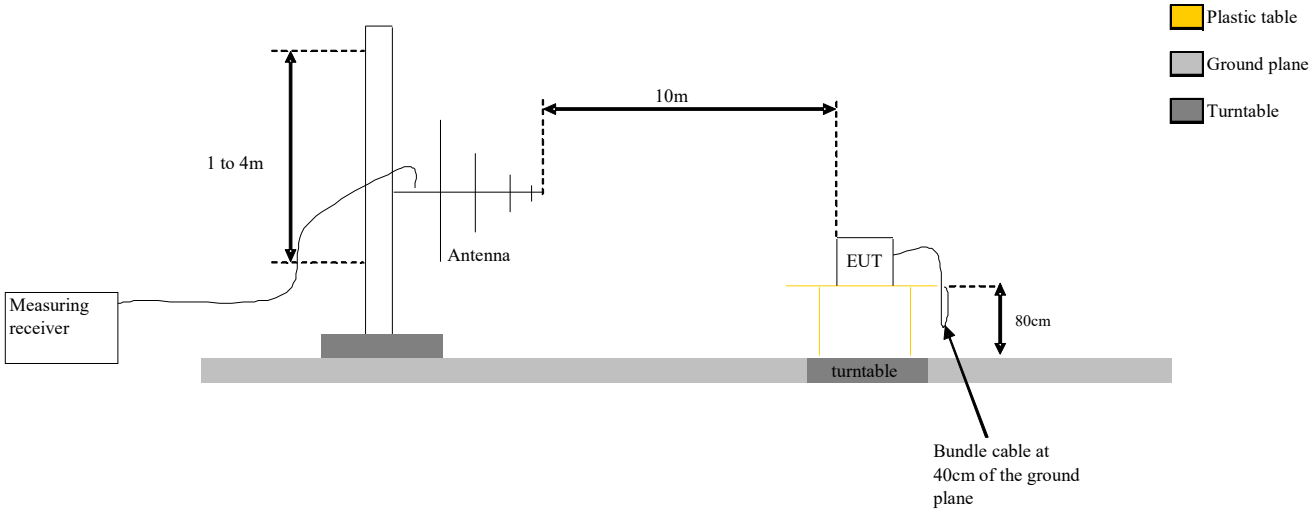
8.2. TEST SETUP

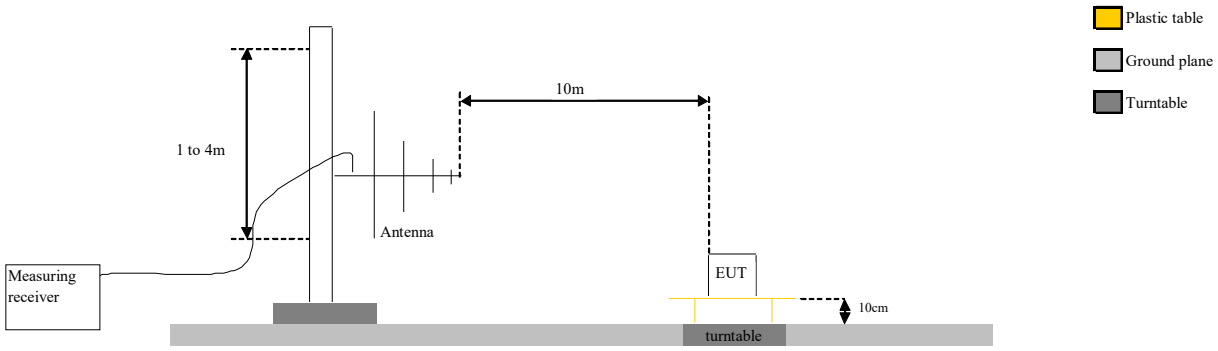
The product has been tested according to ANSI C63.10 (2013) and FCC part 15 subpart C.
Test is performed in parallel, perpendicular and ground parallel axis with a loop antenna below 30MHz. Measurement bandwidth was 200Hz below 150kHz and 9kHz between 150kHz & 30MHz. The level has been maximised by the turntable rotation of 360 degrees range on all axis of EUT used in normal configuration. Antenna height was 1m. The EUT is placed **in a semi-anechoic chamber**. 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 **Distance**.
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 bandwidth of the measurement antenna, ANSI C63.10 §6.6.5)





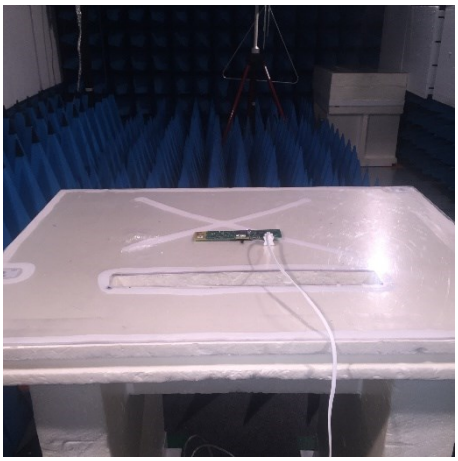
Test set up of Unwanted Emissions in Restricted Frequency Bands in semi anechoic chamber



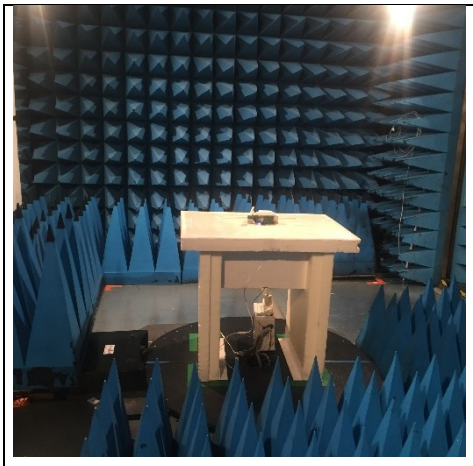
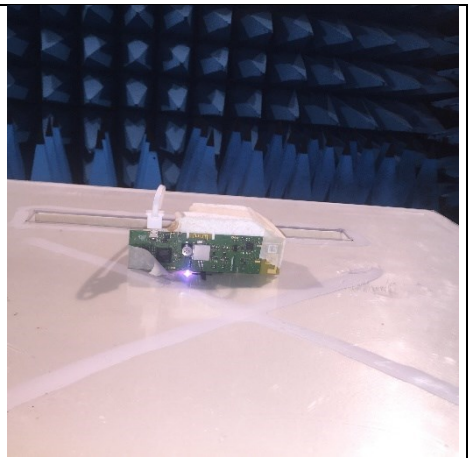
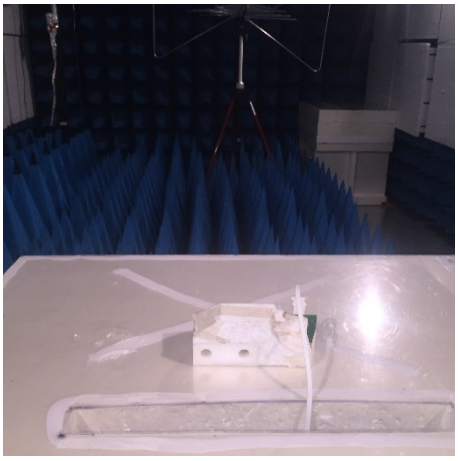


Test Set up for radiated measurement in open area test site



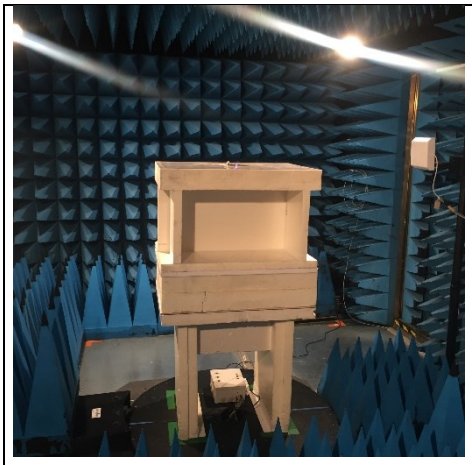
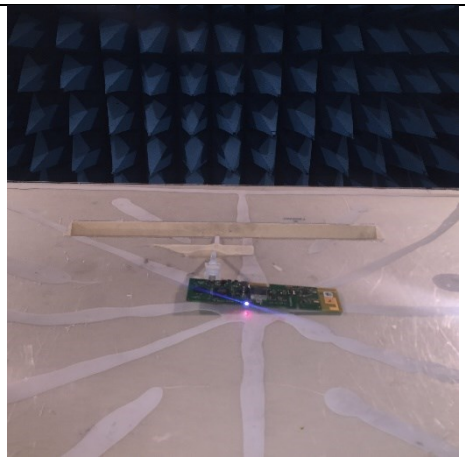


Axis XY on FAR (30MHz-1GHz)

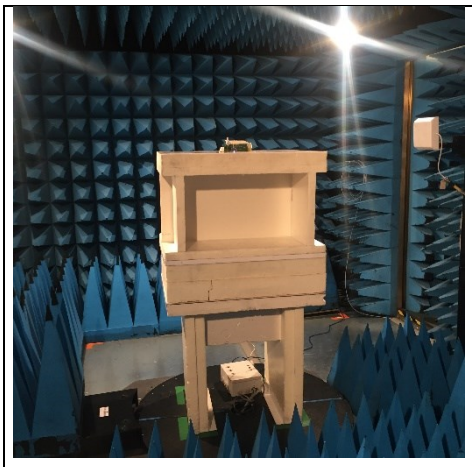
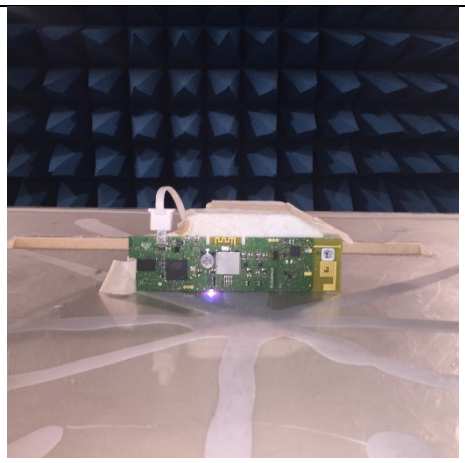
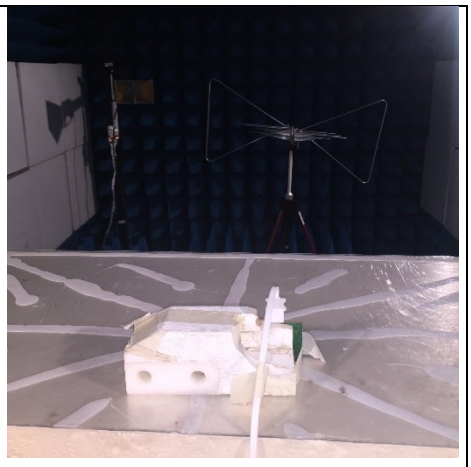




Axis Z on FAR (30MHz-1GHz)

Photograph for Unwanted Emission in restricted frequency bands

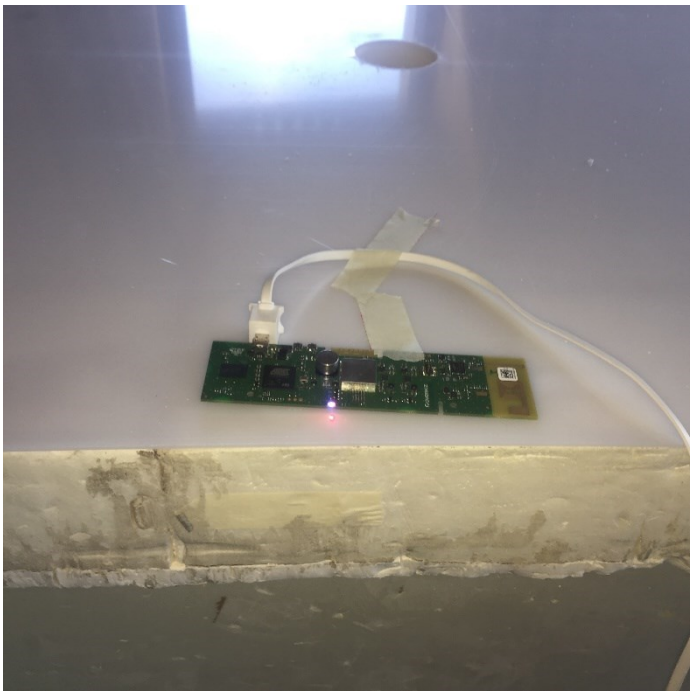




Axis XY on FAR (above 1GHz)

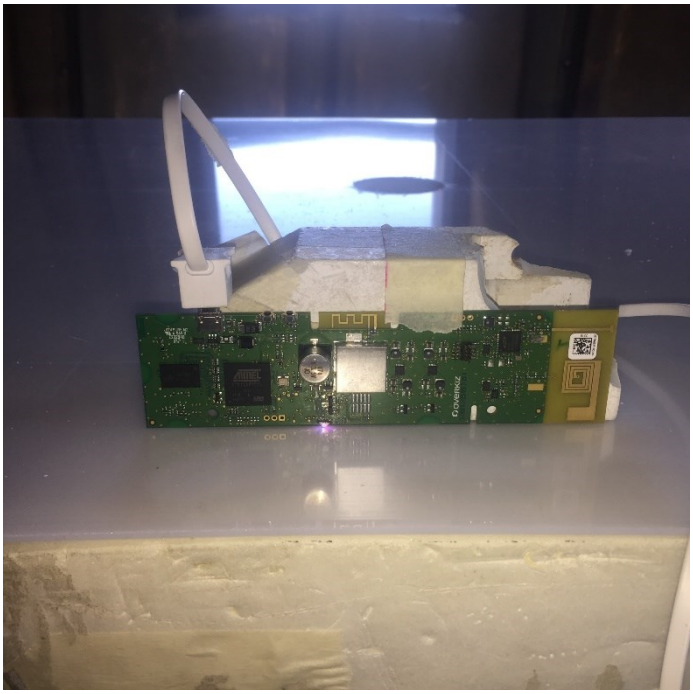




Axis Z on FAR (above 1GHz)

Photograph for Unwanted Emission in restricted frequency bands

Axis XY on OATS

Axis Z on OATS

Photograph for Unwanted Emission in restricted frequency bands

8.3. LIMIT

§15.231		
Measure at 10m		
Frequency range	**Level**	**Detector**
30 MHz to 40.66MHz	29.5dBµV/m	QPeak
40.66MHz to 40.7MHz	36.5dBµV/m	QPeak
40.7MHz to 70MHz	29.5dBµV/m	QPeak
70MHz to 130MHz	31.4dBµV/m	QPeak
130MHz to 174MHz	31.4 to 41dBµV/m	QPeak
174MHz to 260MHz	41dBµV/m	QPeak
260MHz to 470MHz	41-50.5dBµV/m	QPeak
Above 470MHz	51.4dBµV/m	QPeak
Measure at 3m		
Frequency range	**Level**	**Detector**
30 MHz to 40.66MHz	40dBµV/m	QPeak
40.66MHz to 40.7MHz	47dBµV/m	QPeak
40.7MHz to 70MHz	40dBµV/m	QPeak
70MHz to 130MHz	41.9dBµV/m	QPeak
130MHz to 174MHz	41.9 to 51.5dBµV/m	QPeak
174MHz to 260MHz	51.5dBµV/m	QPeak
260MHz to 470MHz	51.5-61dBµV/m	QPeak
Above 470MHz	61.9dBµV/m	QPeak

8.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED on FAR					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Amplifier 9kHz - 40GHz	LCIE SUD EST	_	A7102082	10/18	03/20
Antenna Bi-Log	CHASE	UPA6192	C2040221	01/18	01/20
Antenna horn 18GHz	EMCO	3115	C2042029	09/17	09/20
BAT EMC	NEXIO	v3.19.1.18	L1000115		
Comb EMR HF	YORK	CGE01	A3169114		
Emission Cable (SMA 1m)	TELEDYNE	26GHz	A5329874	01/19	01/20
Emission Cable (SMA 3.3m)	TELEDYNE	26GHz	A5329875	01/19	01/20
Emission Cable (SMA 30cm)	TELEDYNE	26GHz	A5329873	01/19	01/20
Emission Cable <1GHz (Ampl <-> Cage)	-	18GHz	A5329562	08/19	08/20
Emission Cable <1GHz (Ampl <-> Cage)	-	18GHz	A5329907	08/19	08/20
Multimeter - CEM	FLUKE	87	A1240251	11/18	11/20
Rehausse Table C3	LCIE	_	F2000507		
Rehausse Table C3	LCIE	_	F2000511		
Semi-Anechoic chamber #3 (BF)	SIEPEL	_	D3044017_BF	03/17	03/20
Semi-Anechoic chamber #3 (VSWR)	SIEPEL	_	D3044017_VSWR	03/17	03/20
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	09/19	09/21
Table C3	LCIE	_	F2000461		
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371		
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444		

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

TEST EQUIPMENT USED on OATS					
Description	**Manufacturer**	**Model**	**Identifier**	**Cal_Date**	**Cal_Due**
Antenna Bi-log	CHASE	CBL6111A	C2040051	06/19	06/20
Antenna mast (OATS)	ETS Lingren	2071-2	F2000392		
Cable (OATS)	_	1GHz	A5329623	03/19	03/20
Emission Cable	SUCOFLEX	6GHz	A5329061	02/19	02/20
OATS	_	_	F2000409	02/19	02/20
Radiated emission comb generator	BARDET	_	A3169050		
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	12/17	02/20
Table C1/OATS	LCIE	_	F2000445		
Turntable (OATS)	ETS Lingren	Model 2187	F2000403		
Turntable / Mast controller (OATS)	ETS Lingren	Model 2066	F2000372		

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

8.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☐ None ☐ Divergence:

8.6. RESULTS

Results in the frequency band [30-1000] MHz: Worst case presented see test results in §8.6(Cnom, Cmin, Cmid or Cmax):

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.

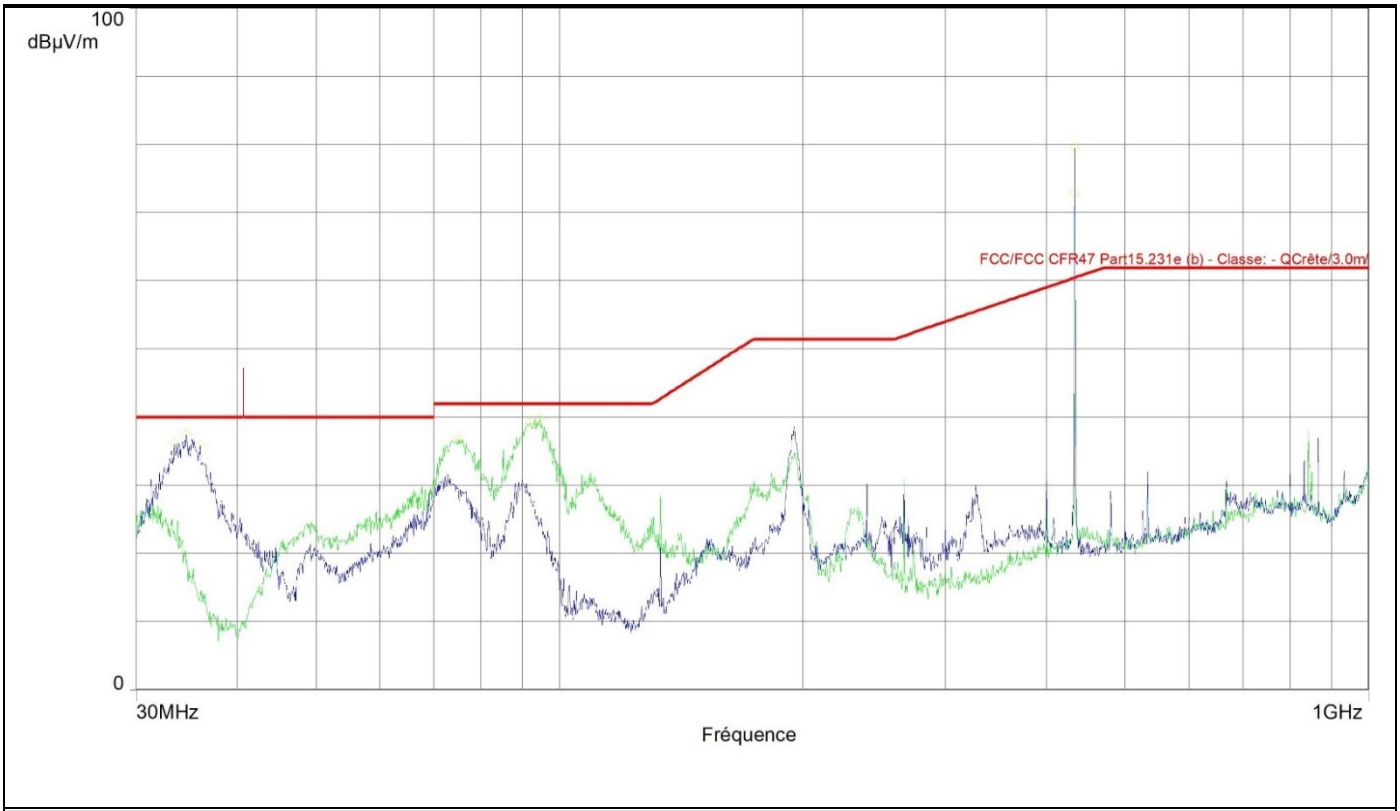
Test Frequency (MHz)	Meter Reading dB(µV)	Detector (Pk/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Transducer Factor (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
34.165	15.1	QP	H	0	120	17.4	32.5	40	**-7.5**	Worst case
35.151	15.9	QP	H	0	120	16.9	32.8	40	**-7.2**	Worst case
195.427	24.1	QP	H	0	120	11.1	35.2	51.5	**-16.3**	Worst case
72.874	22	QP	V	0	120	7.9	29.9	41.9	**-12.0**	Worst case
76.07	21.3	QP	V	0	120	8.2	29.5	41.9	**-12.4**	Worst case
77.532	20.5	QP	V	0	120	8.4	28.9	41.9	**-13.0**	Worst case
90.146	22.5	QP	V	0	120	-13.5	36	41.9	**-5.9**	Worst case
91.285	23.2	QP	V	0	120	-12.1	35.3	41.9	**-6.6**	Worst case
92.985	21.4	QP	V	0	120	-10.3	31.7	41.9	**-10.2**	Worst case

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

Results in the frequency band [1-26] GHz:

CNom

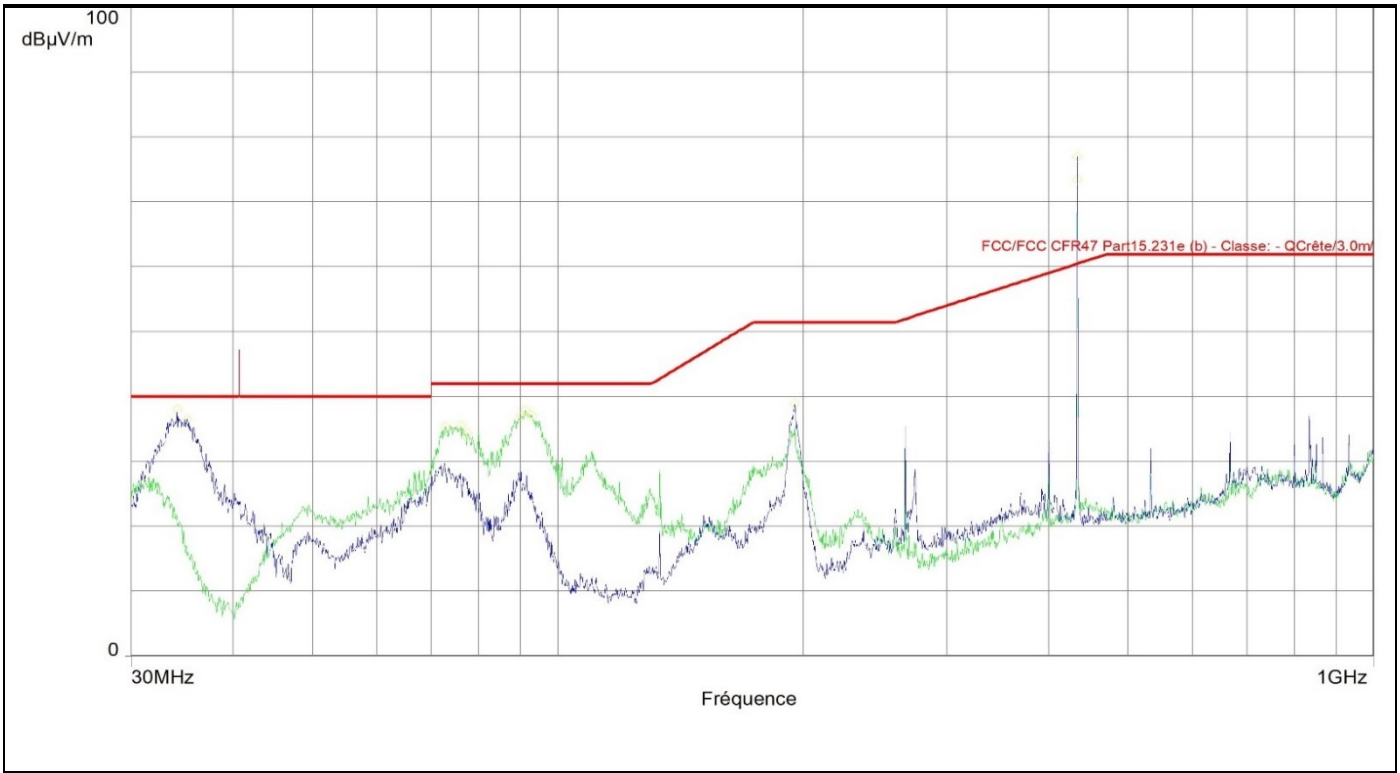
RADIATED EMISSIONS			
Graph name:	Emr#1	**Test configuration:**	
Limit:	FCC CFR47 Part15.231e (b)	RTS (H+V)[0.03-1]GHz axis XY	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:		**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization	Correction (dB)
33.400	36.2	Horizontal	-3.8
34.590	37.5	Horizontal	-2.9
35.984	35.9	Horizontal	-3.3
433.440*	79.6	Horizontal	-11.2
74.965	36.8	Vertical	-19.8
92.016	39.2	Vertical	-11.3
94.532	39.7	Vertical	-9.0
433.440*	72.8	Vertical	-9.1

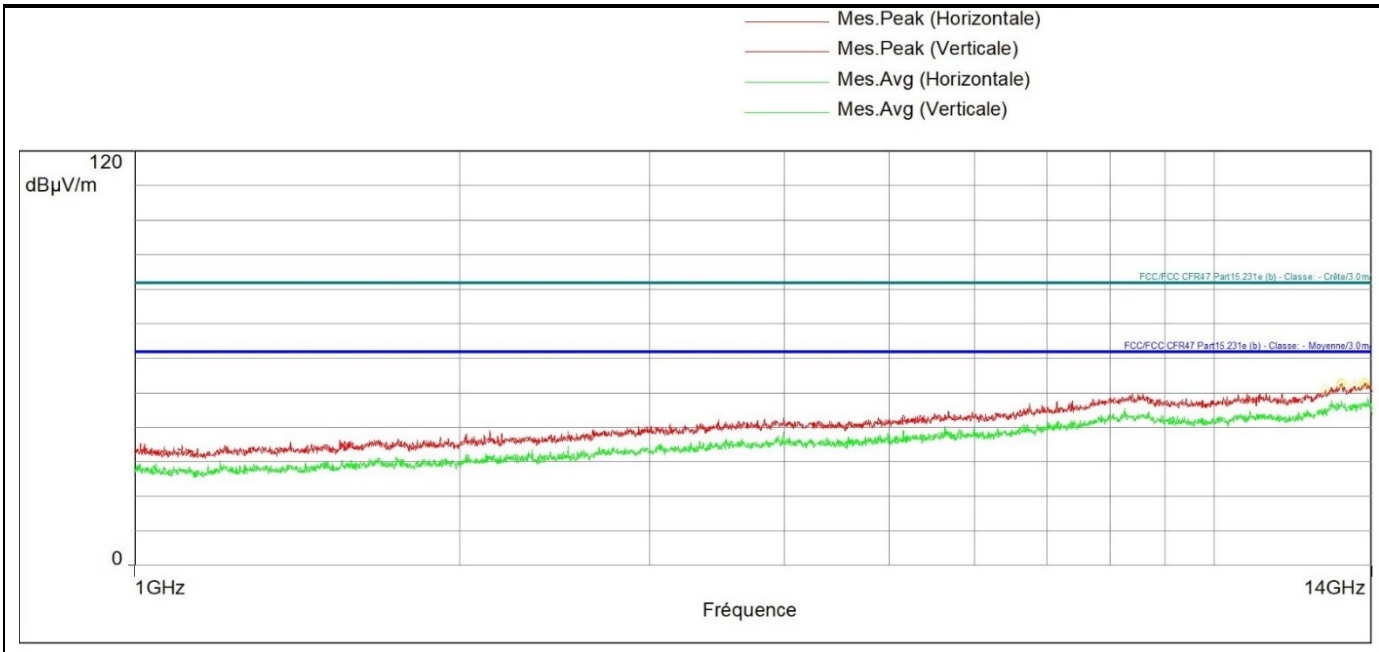
RADIATED EMISSIONS			
Graph name:	Emr#2	**Test configuration:**	
Limit:	FCC CFR47 Part15.231e (b)	RTS (H+V)[0.03-1]GHz Axis Z	
Class:			
Frequency range: [30MHz - 1GHz]			
Antenna polarization:		**RBW :**	100kHz
Azimuth:	0° - 360°	**VBW :**	300kHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization	Correction (dB)
34.165	38.0	Horizontal	-3.2
35.151	36.5	Horizontal	-2.7
195.427	38.9	Horizontal	7.1
433.440	77.0	Horizontal	-11.2
72.874	35.4	Vertical	-21.3
76.070	35.6	Vertical	-19.1
77.532	34.3	Vertical	-18.2
90.146	37.0	Vertical	-13.5
91.285	38.0	Vertical	-12.1
92.985	37.1	Vertical	-10.3
433.440	73.5	Vertical	-9.1

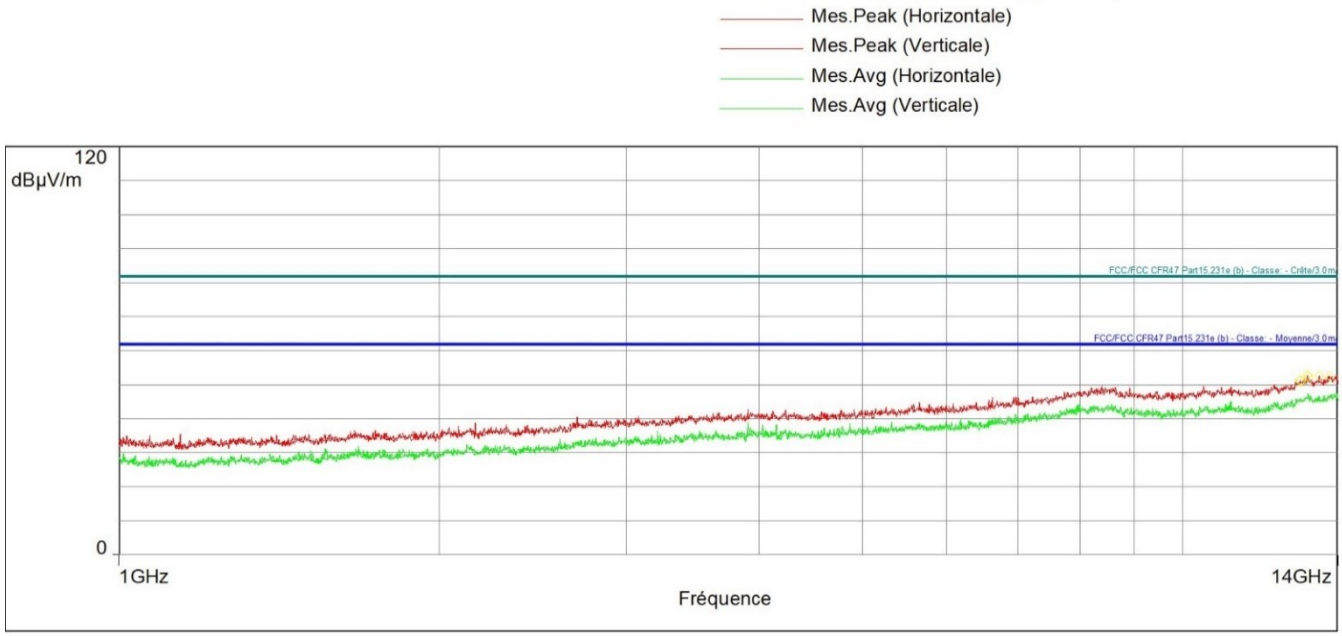
RADIATED EMISSIONS			
Graph name:	Emr#3	**Test configuration:**	
Limit:	FCC CFR47 Part15.231e (b)	RTS(H+V)[1-14]GHz Axis XY	
Class:			
Frequency range: [1GHz - 14GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization	Correction (dB)
No significant frequency observed			

RADIATED EMISSIONS			
Graph name:	Emr#4	**Test configuration:**	
Limit:	FCC CFR47 Part15.231e (b)	RTS(H+V)[1-14]GHz Axis Z	
Class:			
Frequency range: [1GHz - 14GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization	Correction (dB)
No significant frequency observed			

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										

8.7. CONCLUSION

Unwanted Emission in restricted frequency bands measurement performed on the sample of the product **OVERKIZ / SOMFY** Smartkiz **PCBA / TaHoma Beecon PCBA**, SN: **O17196101F22180055**, in configuration and description presented in this test report, show levels **compliant** to the **PART 15.231 & RSS 210 ISSUE 9** limits.

9. 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	/
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