TEST REPORT

N°: 162484-739650-A (FILE#1007666) **Version : 04**

Subject	**Electromagnetic compatibility and Radio spectrum Matters (ERM) tests according to standards: FCC CFR 47 Part 15, Subpart C RSS-247 Issue 2.0**
Issued to	**ISKN** 22 avenue Benoit Frachon 38400 St Martin d'Hères FRANCE
Apparatus under test	
↳ Product	Smart Device
↳ Trade mark	**ISKN**
↳ Manufacturer	**ISKN**
↳ Model under test	**TB1E1**
↳ Serial number	**200228 / 200230**
↳ FCCID	**2ACQC – TB1E1**
↳ IC	**12188A – TB1E1**
Conclusion	See Test Program chapter
Test date	July 24, 2019 to July 31, 2019
Test location	FONTENAY AUX ROSES
IC Test site	6230B-1
Composition of document	48 pages
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PUBLICATION HISTORY

Version	Date	Author	Modification
01	August 6, 2019	Majid MOURZAGH	Creation of the document
02	September 16, 2019	Majid MOURZAGH	Modification about IC
03	November 8, 2019	Majid MOURZAGH	Modification about FCCID/Model
04	January 14, 2020	Majid MOURZAGH	Correction tabs peak & average separately

SUMMARY

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1. TEST PROGRAM

Standard:

- **FCC Part 15, Subpart C 15.247**
- **ANSI C63.10 (2013)**
- **RSS-247 Issue 2.0**
- **RSS-Gen Issue 5**
- **558074 D01 DTS Measurement Guidance v05**

EMISSION TEST	LIMITS			RESULTS
Limits for conducted disturbance at mains ports 150kHz-30MHz	**Frequency**	**Quasi-peak value (dBµV)**	**Average value (dBµV)**	☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 9kHz-30MHz *CFR 47 §15.209 (a)* *CFR 47 §15.247 (d)* *RSS-247 §5.5*	**Measure at 300m** 9kHz-490kHz : 67.6dBµV/m /F(kHz) **Measure at 30m** 490kHz-1.705MHz : 87.6dBµV/m /F(kHz) 1.705MHz-30MHz : 29.5 dBµV/m			☐ **PASS** ☐ **FAIL** ☑ **NA** ☐ **NP**
Radiated emissions 30MHz-25GHz* *CFR 47 §15.209 (a)* *CFR 47 §15.247 (d)* *RSS-247 §5.5* ***Highest frequency : 216Mhz*** ***(Declaration of provider)***	**Measure at 3m** 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m Above 960MHz : 54.0 dBµV/m			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Bandwidth 6dB *CFR 47 §*15.247 (a) (2) *RSS-247 §5.2*	**At least 500kHz**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Power spectral Density *CFR 47 §15.247 (e)* *RSS-247 §5.2*	**Limit: 8dBm/3kHz**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Maximum Peak Output Power *CFR 47 §15.247 (b)* *RSS-247 §5.4*	**Limit: 30dBm** Conducted or Radiated measurement			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Band Edge Measurement *CFR 47 §15.209 (a)* *CFR 47 §15.247 (d)* *RSS-247 §5.5*	**Limit: -20dBc or** **Radiated emissions limits in restricted bands**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Occupied bandwidth *RSS-Gen §6.7*	**No limit**			☑ **PASS** ☐ **FAIL** ☐ **NA** ☐ **NP**
Receiver Spurious Emission** *RSS-Gen §7.3*	**Measure at 3m** 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m Above 960MHz : 54.0 dBµV/m			☐ **PASS** ☐ **FAIL** ☑ **NA** ☐ **NP**

***§15.33:** The highest internal source of a testing device is defined like more the highest frequency generated or used in the testing device or on which the testing device works or agrees.
- If the highest frequency of the internal sources of the testing device is lower than 108 MHz, measurement must be only performed until 1GHz.
- If the highest frequency of the internal sources of the testing device ranges between 108 MHz and 500 MHz, measurement must be only performed until 2GHz.
- If the highest frequency of the internal sources of the testing device ranges between 500 MHz and 1 GHz, measurement must be only performed until 5GHz.

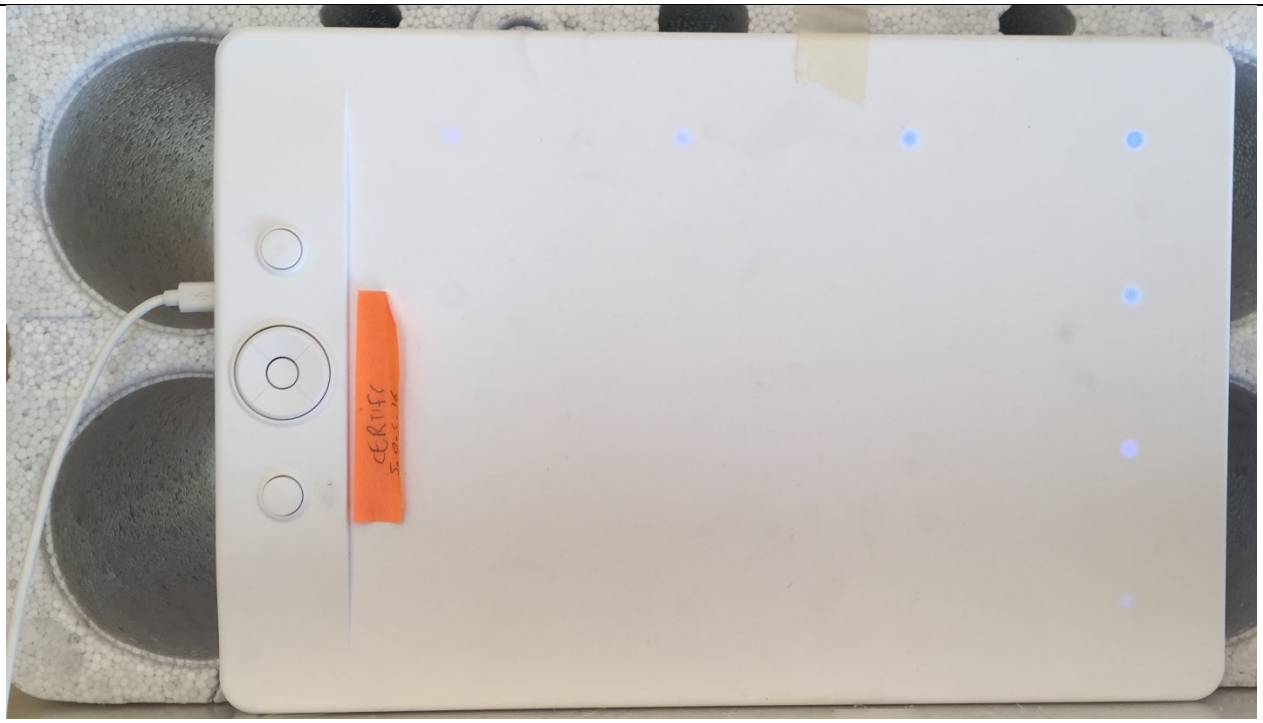
If the highest frequency of the internal sources of the testing device is above 1 GHz, measurement must be only performed until 5 times the highest frequency or 40 GHz, while taking smallest of both.

**Testing covered the receive mode, and receiver spurious emissions are considered to be the same as transmitter.

2. SYSTEM TEST CONFIGURATION

2.1. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):
TB1E1
Serial Number : 200228 / 200230



Photography of EUT

Power supply:
During all the tests, EUT is supplied by V_{nom}: 3.7Vdc
For measurement with different voltage, it will be presented in test method.

Name	Type	Rating	Reference / Sn	Comments
Supply1	☐ AC ☐ DC ☑ Battery ☐USB	3.7Vdc	/	/
Supply2	☐ AC ☐ DC ☐ Battery ☑USB	5Vusb	/	/

Voltage table used:

Type	Measurement performed:	
☐ AC	☐ **120VAC/60Hz**	☐ **240VAC/50Hz**
☐ DC	☐ **+....VDC**	☐ **-....VDC**
☑ Battery	☑ **+**3.7**VDC**	☐ **...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
µUSB	USB	1	☐	☑	☑	/

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop	DELL Latitude E5530	/	/
AC Adapter for Laptop	DELL LA65NS0-00	/	Input: AC 100-240V (1.5A) Output: DC 19.5V(3.34A)
Power supply AC/DC	KEYSIGHT	AC6802A	A7042305

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: 1.95dBi			
Beam forming gain:	No			
Receiver chains	1			
Type of equipment:	☑ Stand-alone	☐ Plug-in	☐ Combined	
Ad-Hoc mode:	☐ Yes		☑ No	
Adaptivity mode:	☐ Yes (Load Based)	☐ Off mode	☑ No	
	Clear Channel Assessment Time:		Xµs	
Duty cycle:	☑ Continuous duty	☐ Intermittent duty	☐ 100% duty	
Equipment type:	☑ Production model		☐ Pre-production model	
Operating temperature range:	Tmin:	☐ -20°C	☑ 0°C	☐ X°C
	Tnom:	20°C		
	Tmax:	☑ 35°C	☐ 55°C	☐ X°C
Type of power source:	☐ AC power supply	☑ DC power supply	☑ Battery	
Operating voltage range:	Vnom:	☐ 230V/50Hz	☑ 3.7Vdc	
Geo-location capability:	☐ Yes (The geographical location determined by the equipment is not accessible to the end user as defined in section 4.3.2.12.2 of ETSI EN 300 328 V2.1.1 standard)		☑ No	
Minimum performance criteria for Receiver blocking test:	☑ PER less than or equal to 10%		☐ Alternative performance criteria (4)	

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		
Data Rate (Mbps)	**Modulation Type**	**Worst Case Modulation**
1	GFSK	☑
2	GFSK	☐

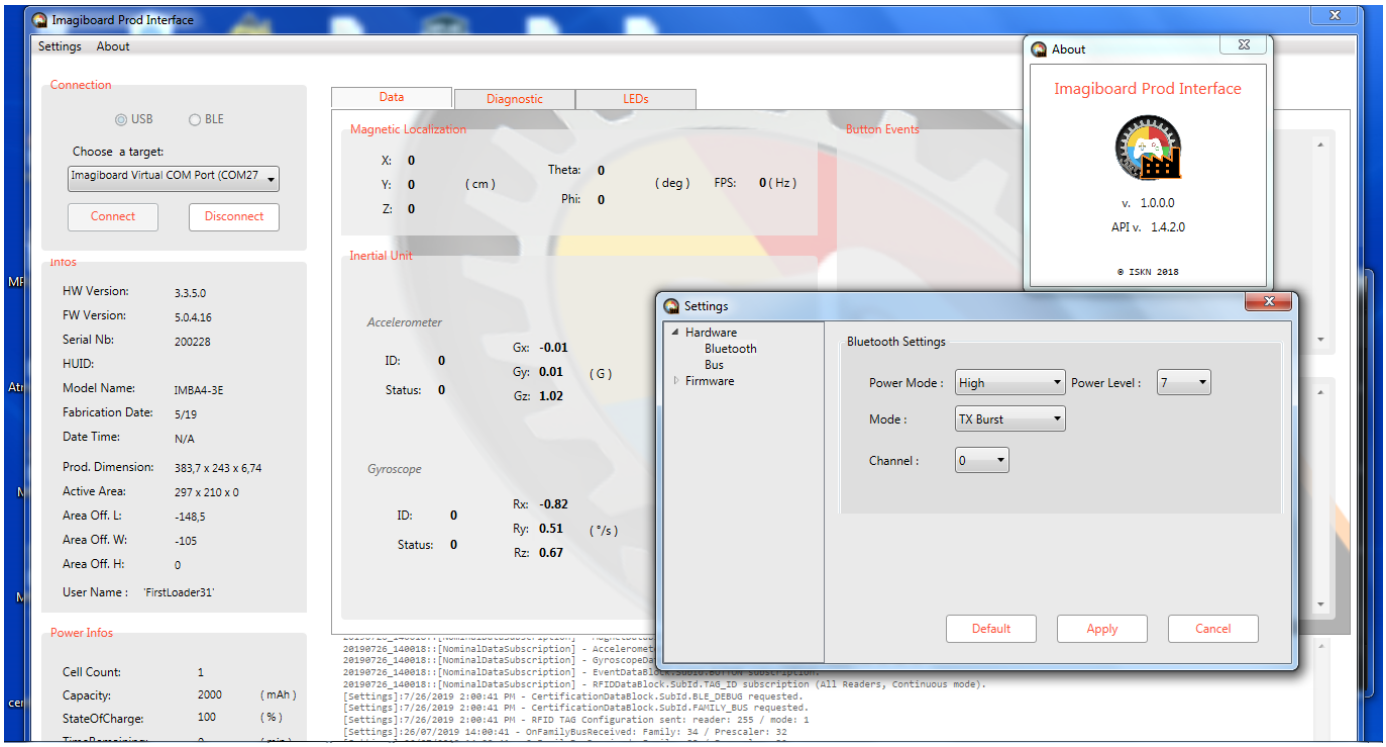
2.2. EUT CONFIGURATION

Hardware information		
Firmware (if applicable):	V. :	3.3.5.0
Software (if applicable):	V. :	5.0.4.16
/		

The EUT is set in the following modes during tests with simulator / software (v….):
- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception

All tests are performed at Cmin, Cmid and Cmax.

Following commands with the specific test software “Imagiboard Prod Interface” are used to set the product:



2.3. EQUIPMENT MODIFICATIONS

☑ None ☐ Modification:

2.4. FIELD STRENGTH CALCULATION

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

FS = RA + AF + CF – AG

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5dBµV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 are added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBµV/m.
FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBµV/m
The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.
Level in µV/m = Common Antilogarithm [(32dBµV/m)/20] = 39.8 µV/m.

2.5. 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. CONDUCTED EMISSION DATA

3.1. ENVIRONMENTAL CONDITIONS

Date of test	:	July 30, 2019
Test performed by	:	Majid Mourzagh
Atmospheric pressure (hPa)	:	988
Relative humidity (%)	:	38
Ambient temperature (°C)	:	23

3.2. TEST SETUP

Mains terminals

The EUT and auxiliaries are set:

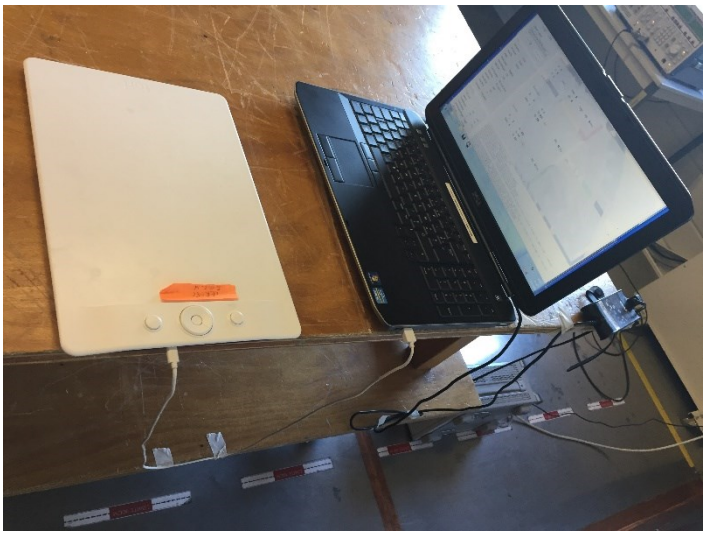
☑ 80cm above the ground on the non-conducting table (Table-top equipment)

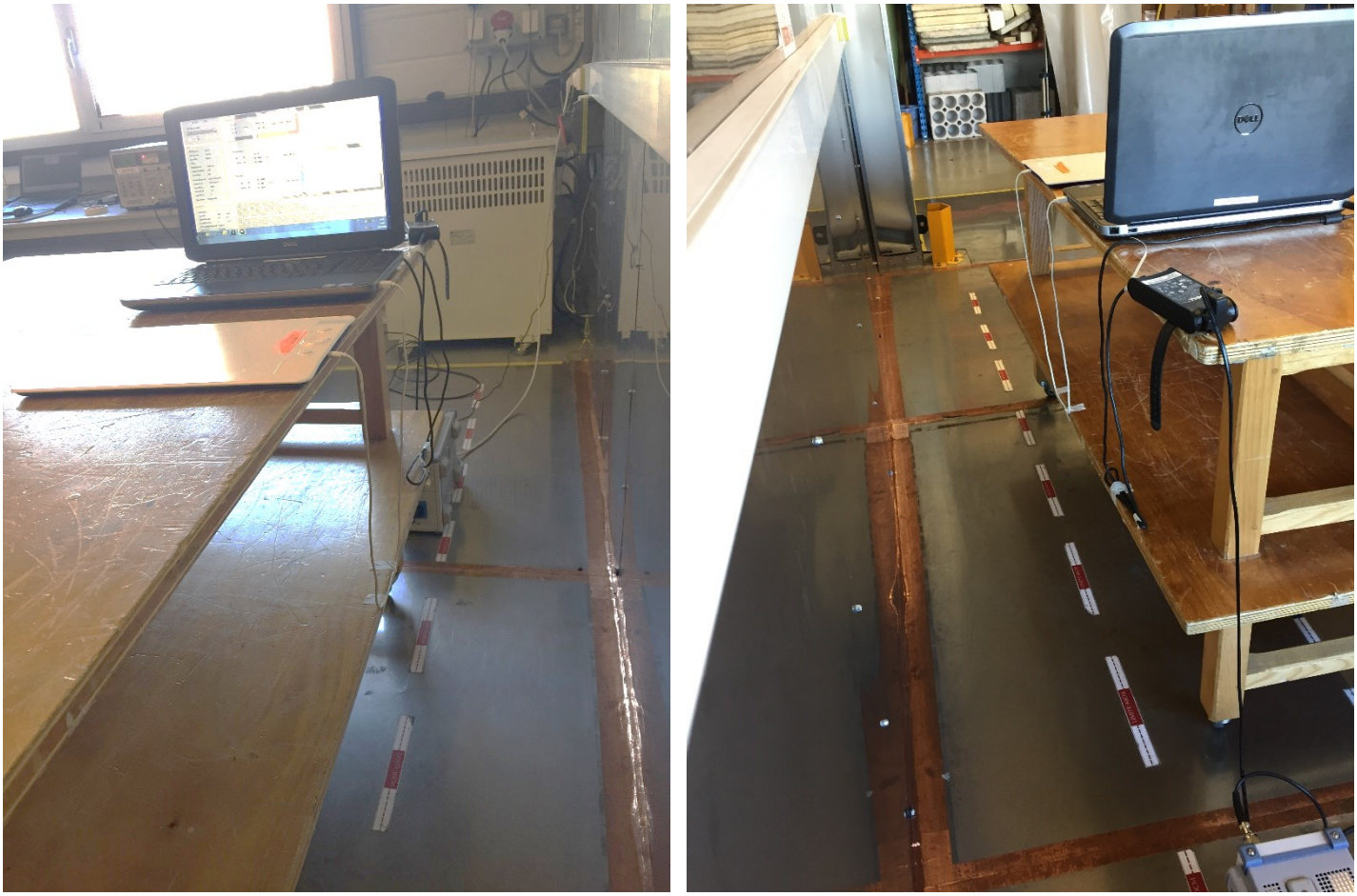
☐ 10cm above the ground on isolating support (Floor standing equipment)

The distance between the EUT and the LISN is 80cm. The EUT is 40cm away for the vertical ground plane.

The EUT is powered through laptop powered by 120Vac/60Hz and 240Vac/50Hz.

The EUT is powered through a LISN (measure). Auxiliaries are powered by another LISN.





Test setup

3.3. TEST METHOD

The product has been tested according to ANSI C63.10 and FCC Part 15 subpart C. The product has been tested with a voltage sets (see the table voltage in §2.2) and compared to the FCC Part 15 limits. Measurement bandwidth was 9kHz from 150kHz to 30MHz. 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. The Peak data are shown on plots in annex 1. Quasi-Peak and Average measurements are detailed in a table with frequencies and levels measured. Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on the following page.
Measurements are performed on the phase (L1) and neutral (N) of power line voltage (for example). Graphs are obtained in PEAK detection. Measures are also performed in Quasi-Peak and Average for any strong signal.

3.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Cable + self	-	-	A5329578	10/18	10/19
EMC comb generator	LCIE SUD EST	-	A3169098	-	-
LISN	RHODE & SCHWARZ	ENV216	C2320291	02/19	02/20
Receiver 9kHz - 30MHz	ROHDE & SCHWARZ	ESHS10	A2642028	11/18	11/19
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204	02/19	02/20

3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

3.6. TEST RESULTS

USB tests Results (Laptop measurement):
Measurements are performed on the phase (L1) and neutral (N) of the power line.
Results: (PEAK detection)

Graph identifier		Line	Comments	
Emc#	1	Phase	120VAC/60Hz	See Annex
Emc#	2	Neutral	120VAC/60Hz	See Annex
Emc#	3	Phase	240VAC/50Hz	See Annex
Emc#	4	Neutral	240VAC/50Hz	See Annex

3.7. CONCLUSION

Conducted emission data measurement performed on the sample of the product **TB1E1**, SN:200228 in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

4. RADIATED EMISSION DATA

4.1. ENVIRONMENTAL CONDITIONS

Date of test	:	July 25, 2019
Test performed by	:	Majid Mourzagh
Atmospheric pressure (hPa)	:	987
Relative humidity (%)	:	39
Ambient temperature (°C)	:	25

4.2. TEST SETUP

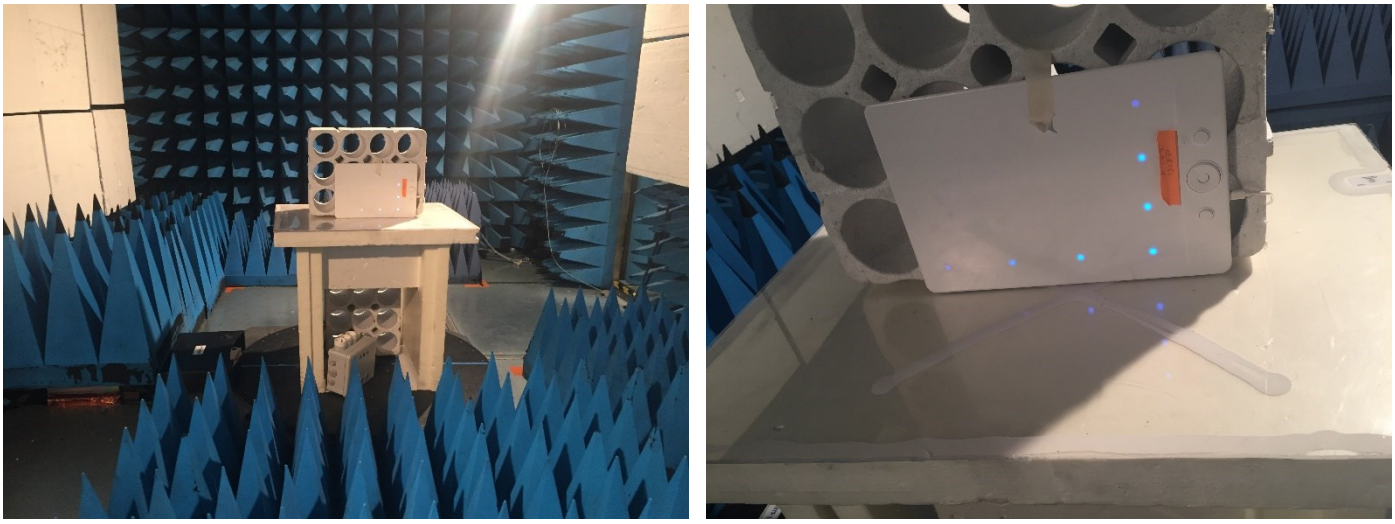
The installation of EUT is identical for pre-characterization measures in a 3 meters semi- anechoic chamber and for measures on the 10 meters Open site.
The EUT and auxiliaries are set:
☑ 80cm above the ground on the non-conducting table (Table-top equipment) - Below 1GHz
☑ 150cm above the ground on the non-conducting table (Table-top equipment) - Above 1GHz
☐ 10cm above the ground on isolating support (Floor standing equipment)
The EUT is powered by V_{nom}.

Axis Z

Axis XY

Test setup on OATS

Axis XY



Axis Z

Test setup in anechoic chamber

4.3. TEST METHOD

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

Pre-characterisation measurement: (9kHz – 3.6GHz)
A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber for frequency from 30MHz to 3.6GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test to maximize the emission measurement. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration.
The pre-characterization graphs are obtained in PEAK detection and PEAK/AVERAGE from 1GHz to 3.6GHz.

Characterization on 10 meters open site from 9kHz to 1GHz:
Radiated Emissions were measured on an open area test site. A description of the facility is on file with the FCC. The product has been tested at a distance of **10 meters** from the antenna and compared to the FCC part 15 subpart C limits. Measurement bandwidth was 9kHz below 30MHz and 120kHz from 30 MHz to 1GHz. Test is performed in horizontal (H) and vertical (V) polarization, the loop antenna was rotated during the test to maximize the emission measurement. The height antenna is varied from 1m to 4m. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown.
Frequency list has been created with anechoic chamber pre-scan results.

Characterization on 3 meters full anechoic chamber from 1GHz to 26GHz:
The product has been tested at a distance of **3 meters** from the antenna and compared to the FCC part 15 subpart C limits. Measurement bandwidth was 1MHz from 1GHz to 26GHz.
Test is performed in horizontal (H) and vertical (V) polarization. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on all axis of EUT used in normal configuration. A summary of the worst case emissions found in all test configurations and modes is shown.The height antenna 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.

4.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Amplifier 9kHz - 40GHz	LCIE SUD EST	_	A7102082	10/18	10/19
Antenna horn 18GHz	EMCO	3115	C2042029	09/18	09/20
Emission Cable C3	-	6GHz	A5329069	11/18	11/19
Emission Cable C3	-	6GHz	A5329637	02/19	02/20
Emission Cable (SMA 30cm)	TELEDYNE	26GHz	A5329873	01/19	01/20
Emission Cable (SMA 1m)	TELEDYNE	26GHz	A5329874	01/19	01/20
Emission Cable (SMA 3.3m)	TELEDYNE	26GHz	A5329875	01/19	01/20
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	03/17	03/20
Comb RADIO	YORK	25MHz - 26GHz	A3169114	-	-
High Pass (4.8-18GHz)	BL Microwave	SH4800-1800	A7484034	05/17	05/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/18	03/20
BAT EMC	NEXIO	v3.17.0.10	L1000115	-	-
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	10/18	10/20
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371	-	-
Table C3	LCIE	-	F2000461	-	-
Rehausse Table C3	LCIE	-	F2000511	-	-
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444	-	-
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	12/17	12/19
Turntable / Mast controller (OATS)	ETS Lindgren	Model 2066	F2000372	-	-
Antenna mast (OATS)	ETS Lindgren	2071-2	F2000392	-	-
Turntable (OATS)	ETS Lindgren	Model 2187	F2000403	-	-
Table C1/OATS	MATURO Gmbh	-	F2000437	-	-

4.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☑ None ☐ Divergence:

4.6. TEST RESULTS

4.6.1. Pre-characterization at 3 meters [30MHz-1GHz]

See graphs for 30MHz-1GHz:

Graph identifier		Polarization	EUT position	Comments	
Emr#	1	Horizontal / Vertical	Axis XY	/	See annex 1
Emr#	2	Horizontal / Vertical	Axis Z	/	See annex 1

4.6.2. Pre-characterization at 3 meters [1GHz-3.6GHz]

See graphs for 1GHz-3.6GHz:

Graph identifier		Polarization	EUT position	Comments	
Emr#	3	Horizontal / Vertical	Axis XY	/	See annex 1
Emr#	4	Horizontal / Vertical	Axis Z	/	See annex 1

4.6.3. Characterization on 10 meters open site from 30MHz to 1GHz

Worst case final data result:

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)
60.000	20.5	QP	V	45	100	8.1	28.6	40.0	**-11.4**
72.000	19.0	QP	V	0	100	8.6	27.6	40.0	**-12.4**
300.000	18.3	QP	V	240	120	16.6	34.9	46.0	**-11.1**
488.000	15.5	QP	V	0	110	21.8	37.3	46.0	**-8.7**
498.000	20.5	QP	H	240	250	22.0	42.5	46.0	**-3.5**
600.000	20.5	QP	H	180	240	24.5	45.0	46.0	**-1.0**
621.000	20.5	QP	V	45	120	24.8	45.3	46.0	**-0.7**
623.000	20.5	QP	V	180	110	24.8	45.3	46.0	**-0.7**
636.000	20.5	QP	V	240	110	25.0	45.5	46.0	**-0.5**

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

4.6.4. Characterization on 3meters anechoic chamber from 1GHz to 26GHz

Worst case final data result:

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/QP/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Transducer Factor (dB)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
2273.980	68.0	Pk	V	180	150	-31.8	36.2	74.0	**-37.8**
2306.260	68.0	Pk	V	180	150	-31.8	36.2	74.0	**-37.8**
2338.280	73.0	Pk	V	180	150	-31.8	41.2	74.0	**-32.8**
2370.250	71.0	Pk	V	180	150	-31.8	39.2	74.0	**-34.8**
2378.270	70.0	Pk	H	0	150	-31.8	38.2	74.0	**-35.8**
2483.720	64.0	Pk	V	180	150	-31.6	32.4	74.0	**-41.6**
2483.720	64.0	Pk	V	180	150	-31.6	32.4	74.0	**-41.6**
2485.720	64.2	Pk	H	0	150	-31.6	32.6	74.0	**-41.4**
2487.730	64.0	Pk	V	180	150	-31.6	32.4	74.0	**-41.6**
2489.690	63.3	Pk	V	180	150	-31.6	31.7	74.0	**-42.3**
2491.700	65.0	Pk	H	0	150	-31.6	33.4	74.0	**-40.6**
2493.700	65.3	Pk	V	180	150	-31.6	33.7	74.0	**-40.3**
2495.740	65.0	Pk	V	180	150	-31.6	33.4	74.0	**-40.6**
2497.620	66.0	Pk	H	0	150	-31.6	34.4	74.0	**-39.6**
3325.70	84.0	Pk	V	0	150	-28.7	55.3	74.0	**-18.7**
3499.90	83.2	Pk	V	0	150	-28.2	55.0	74.0	**-19.0**
3527.72	82.8	Pk	V	0	150	-28.1	54.7	74.0	**-19.3**
3350.14	84.0	Pk	V	0	150	-28.7	55.3	74.0	**-18.7**
4804.780	77.0	Pk	V	180	150	-26.0	51.0	74.0	**-23.0**
4884.530	75.9	Pk	V	180	150	-25.9	50.0	74.0	**-24.0**
4960.430	75.8	Pk	H	0	150	-25.8	50.0	74.0	**-24.0**
7326.500	73.0	Pk	V	180	150	-21.1	51.9	74.0	**-22.1**
7439.280	73.0	Pk	H	0	150	-20.9	52.1	74.0	**-21.9**
9608.300	72.0	Pk	V	180	150	-5.5	66.5	74.0	**-7.5**
9768.500	67.0	Pk	H	0	150	-4.8	62.2	74.0	**-11.8**
9920.000	70.0	Pk	V	180	150	-4.4	65.6	74.0	**-8.4**
12011.300	64.0	Pk	V	180	150	-2.7	61.3	74.0	**-12.7**
12211.100	63.8	Pk	H	0	150	-2.7	61.1	74.0	**-12.9**
12398.300	62.8	Pk	V	180	150	-2.3	60.5	74.0	**-13.5**
14410.700	63.0	Pk	H	0	150	1.0	64.0	74.0	**-10.0**
14650.100	65.0	Pk	V	180	150	0.8	65.8	74.0	**-8.2**
14882.300	63.0	Pk	H	0	150	0.3	63.3	74.0	**-10.7**
16815.500	66.0	Pk	V	180	150	-0.3	65.7	74.0	**-8.3**

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)
2273.980	60.2	Av	V	180	150	-31.8	28.4	54.0	**-25.6**
2306.260	58.5	Av	V	180	150	-31.8	26.7	54.0	**-27.3**
2338.280	58.0	Av	V	180	150	-31.8	26.2	54.0	**-27.8**
2370.250	65.8	Av	V	180	150	-31.8	34.0	54.0	**-20.0**
2378.270	65.0	Av	H	0	150	-31.8	33.2	54.0	**-20.8**
2483.720	57.3	Av	V	180	150	-31.6	25.7	54.0	**-28.3**
2483.720	57.3	Av	V	180	150	-31.6	25.7	54.0	**-28.3**
2485.720	57.0	Av	H	0	150	-31.6	25.4	54.0	**-28.6**
2487.730	57.3	Av	V	180	150	-31.6	25.7	54.0	**-28.3**
2489.690	57.0	Av	V	180	150	-31.6	25.4	54.0	**-28.6**
2491.700	57.0	Av	H	0	150	-31.6	25.4	54.0	**-28.6**
2493.700	56.9	Av	V	180	150	-31.6	25.3	54.0	**-28.7**
2495.740	55.5	Av	V	180	150	-31.6	23.9	54.0	**-30.1**
2497.620	56.0	Av	H	0	150	-31.6	24.4	54.0	**-29.6**
3325.70	72.5	Av	V	0	150	-28.7	43.8	54.0	**-10.2**
3499.90	71.7	Av	V	0	150	-28.2	43.5	54.0	**-10.5**
3527.72	71.9	Av	V	0	150	-28.1	43.8	54.0	**-10.2**
3350.14	72.0	Av	V	0	150	-28.7	43.3	54.0	**-10.7**
4804.780	74.8	Av	V	180	150	-26.0	48.8	54.0	**-5.2**
4884.530	74.6	Av	V	180	150	-25.9	48.7	54.0	**-5.3**
4960.430	74.0	Av	H	0	150	-25.8	48.2	54.0	**-5.8**
7326.500	71.0	Av	V	180	150	-21.1	49.9	54.0	**-4.1**
7439.280	70.5	Av	H	0	150	-20.9	49.6	54.0	**-4.4**
9608.300	58.9	Av	V	180	150	-5.5	53.4	54.0	**-0.6**
9768.500	57.1	Av	H	0	150	-4.8	52.3	54.0	**-1.7**
9920.000	57.4	Av	V	180	150	-4.4	53.0	54.0	**-1.0**
12011.300	53.3	Av	V	180	150	-2.7	50.6	54.0	**-3.4**
12211.100	52.1	Av	H	0	150	-2.7	49.4	54.0	**-4.6**
12398.300	52.3	Av	V	180	150	-2.3	50.0	54.0	**-4.0**
14410.700	51.8	Av	H	0	150	1.0	52.8	54.0	**-1.2**
14650.100	52.1	Av	V	180	150	0.8	52.9	54.0	**-1.1**
14882.300	51.9	Av	H	0	150	0.3	52.2	54.0	**-1.8**
16815.500	47.0	Av	V	180	150	-0.3	46.7	54.0	**-7.3**

Note: Measures have been done at 3m distance.

4.7. CONCLUSION

Radiated emission data measurement performed on the sample of the product **TB1E1**, SN:200228, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

5. BANDWIDTH (15.247)

5.1. TEST CONDITIONS

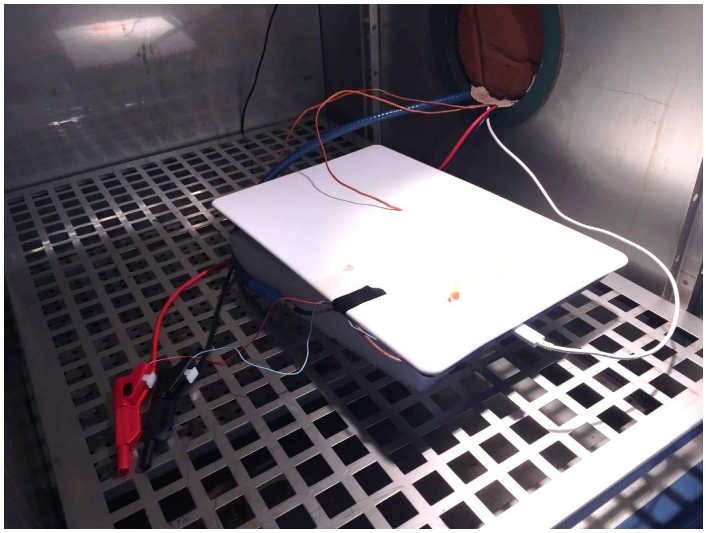
Date of test	:	July 29, 2019
Test performed by	:	Majid MOURZAGH
Atmospheric pressure (hPa)	:	988
Relative humidity (%)	:	33
Ambient temperature (°C)	:	22

5.2. SETUP

☑ ***Conducted measurement:***
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.
Offset: Attenuator+cable 10.7dB

☐ ***Radiated measurement:***
The EUT is placed in an anechoic chamber; 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, a delta marker is used to measure the frequency difference as the emission bandwidth.

Measurement Procedure: §8.1 Option 1 (DTS Measurement Guidance)
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.



5.3. TEST EQUIPMENT LIST

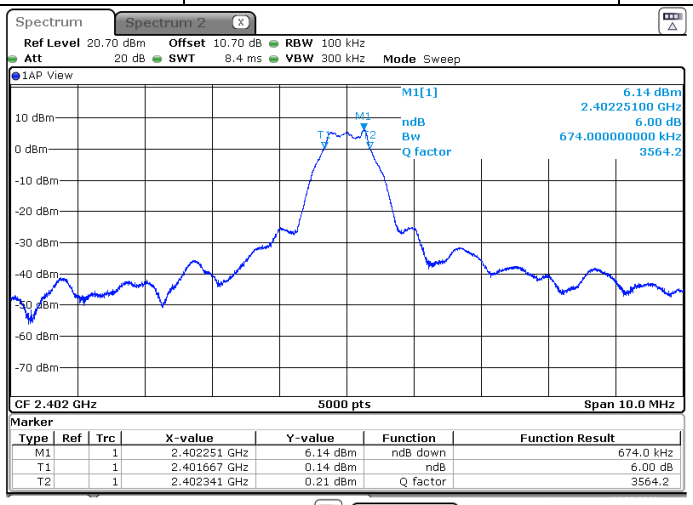
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122269	12/17	12/19
Cable SMA	-	18GHz	A5329863	11/18	11/19
Cable SMA	-	18GHz	A5329864	11/18	11/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	12/17	12/19
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20

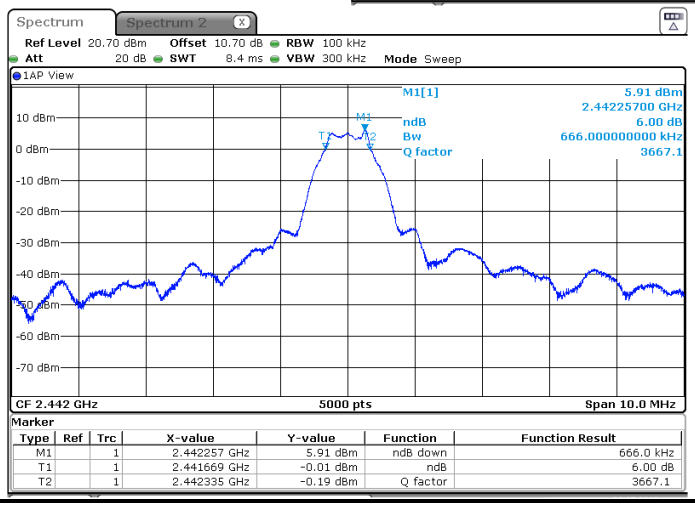
5.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

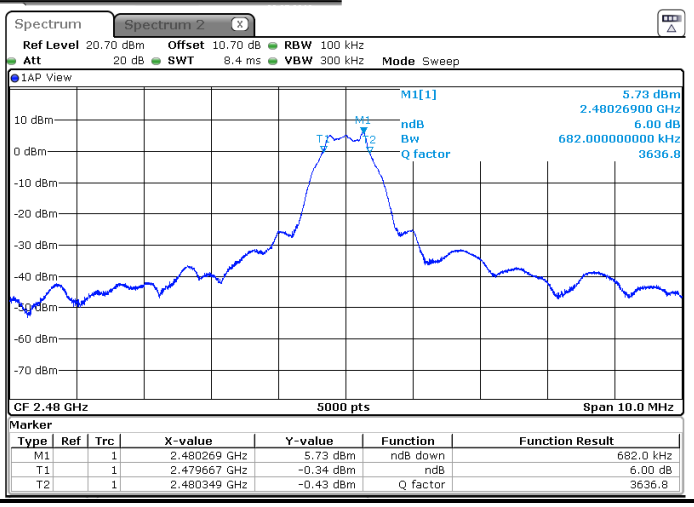
☑ None ☐ Divergence:

5.5. TEST SEQUENCE AND RESULTS

Channel	Channel Frequency (MHz)	6dB Bandwidth (MHz)	Bandwidth Limit (MHz)
Cmin	2402	**0.674**	**>0.5**
Cmed	2442	**0.666**	**>0.5**
Cmax	2480	**0.682**	**>0.5**







5.6. CONCLUSION

Bandwidth measurement performed on the sample of the product **TB1E1**, SN: 200230, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

6. MAXIMUM PEAK OUTPUT POWER (15.247)

6.1. TEST CONDITIONS

Date of test	:	July 29, 2019
Test performed by	:	Majid MOURZAGH
Atmospheric pressure (hPa)	:	988
Relative humidity (%)	:	33
Ambient temperature (°C)	:	22

6.2. SETUP

☑ ***Conducted measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency.
Offset: Attenuator+cable 10.7dB

☐ ***Radiated measurement:***
The EUT is placed in an anechoic chamber; the center frequency of the spectrum analyzer is set to the fundamental frequency.
The product has been tested at a distance of 3 meters from the antenna. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT. A summary of the worst case emissions found in all test configurations and modes is shown on following table. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.
To demonstrate compliance with peak output power requirement of section 15.247 (b), the transmitter's peak output power is calculated using the following equation:

$$E = \frac{\sqrt{30PG}}{d}$$

Where:
- E is the measured maximum fundamental field strength in V/m.
- G is the numeric gain of the transmitting antenna with reference to an isotropic radiator.
- d is the distance in meters from which the field strength was measured.
- P is the power in watts for which you are solving:

$$P = \frac{(E\,d)^2}{30G}$$

Maximum peak conducted output power

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.

- ☑ ***RBW ≥ DTS bandwidth*** ***§9.1.1 (DTS Measurement Guidance)***

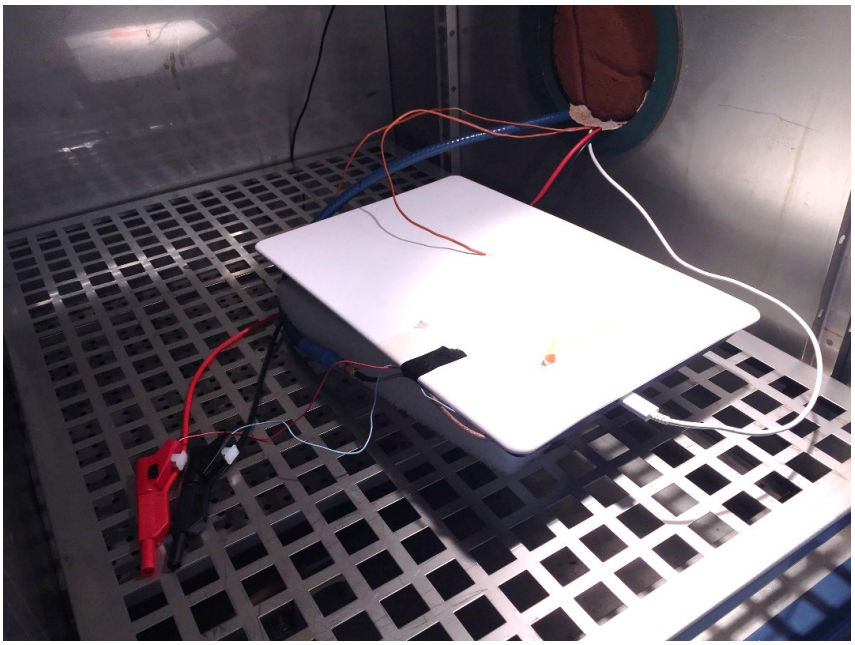
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

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.

- ☐ ***Integrated band power method***

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



6.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122269	12/17	12/19
Cable SMA	-	18GHz	A5329863	11/18	11/19
Cable SMA	-	18GHz	A5329864	11/18	11/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	12/17	12/19
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20

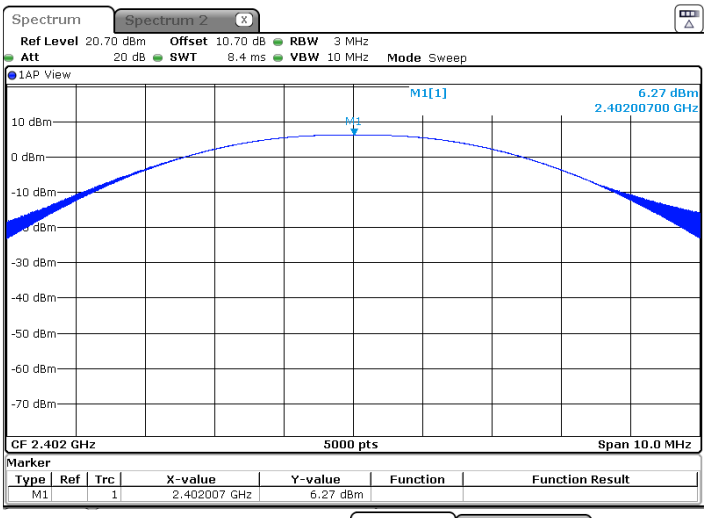
6.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

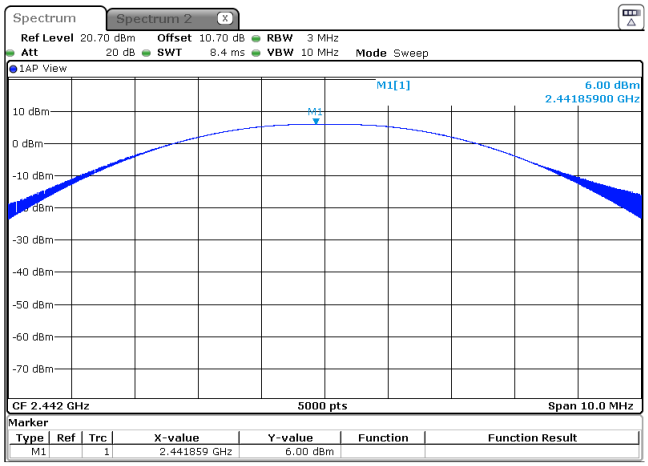
☑ None ☐ Divergence:

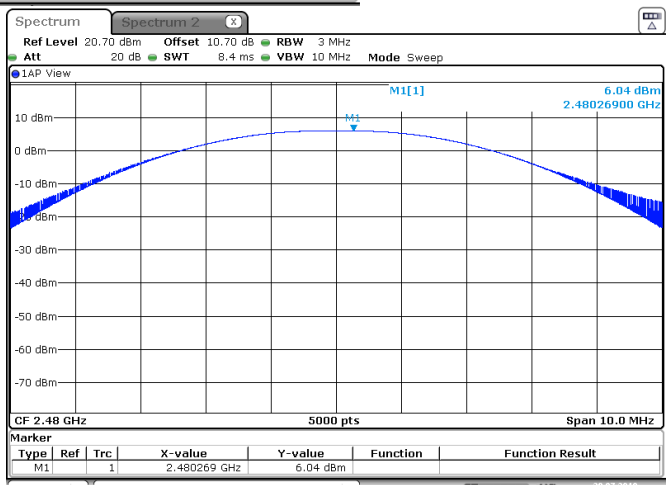
6.5. TEST SEQUENCE AND RESULTS

Modulation:

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
Cmin	2402	**6.27**	30.0
Cmed	2440	**6.00**	30.0
Cmax	2480	**6.04**	30.0







6.6. CONCLUSION

Maximum Peak Output Power measurement performed on the sample of the product **TB1E1**, SN: 200230, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

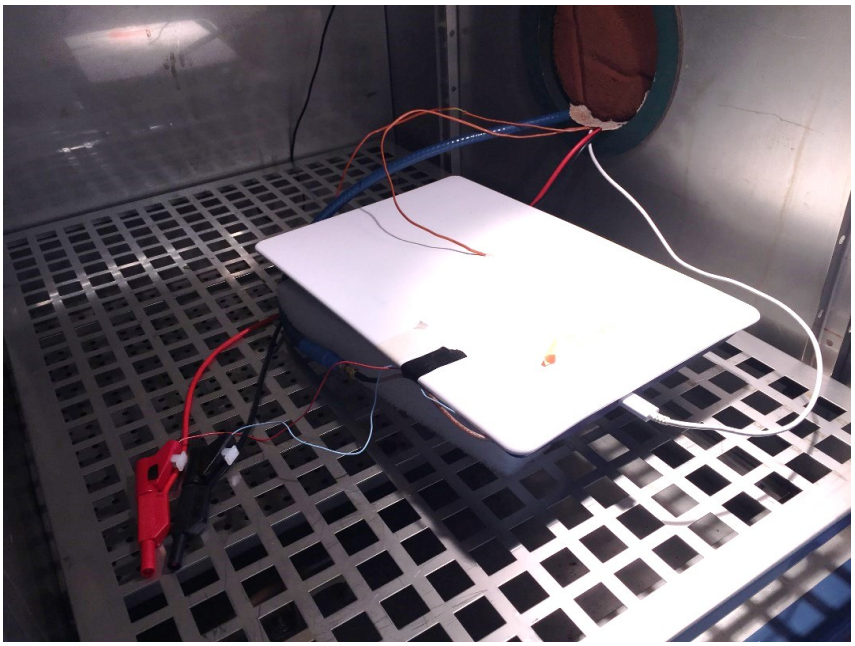
7. POWER SPECTRAL DENSITY (15.247)

7.1. TEST CONDITIONS

Date of test	:	July 29, 2019
Test performed by	:	Majid MOURZAGH
Atmospheric pressure (hPa)	:	988
Relative humidity (%)	:	33
Ambient temperature (°C)	:	22

7.2. SETUP

☑ ***Conducted measurement:***
The EUT is turned ON and connected to measurement instrument; the center frequency of the spectrum analyzer is set to the fundamental frequency.
Offset: Attenuator+cable 10.7dB



☐ ***Radiated measurement:***

The EUT is placed in an anechoic chamber; the center frequency of the spectrum analyzer is set to the fundamental frequency.

The product has been tested at a distance of 3 meters from the antenna. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurement performed on 3 axis of EUT. A summary of the worst case emissions found in all test configurations and modes is shown on following table. The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

To demonstrate compliance with peak output power requirement of section 15.247 (b), the transmitter's peak output power is calculated using the following equation:

$$E = \frac{\sqrt{30PG}}{d}$$

Where:

- E is the measured maximum fundamental field strength in V/m.
- G is the numeric gain of the transmitting antenna with reference to an isotropic radiator.
- d is the distance in meters from which the field strength was measured.
- P is the power in watts for which you are solving:

$$P = \frac{(Ed)^2}{30G}$$

Measurement Procedure PKPSD: §10.2 (DTS Measurement Guidance)

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.

7.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122269	12/17	12/19
Cable SMA	-	18GHz	A5329863	11/18	11/19
Cable SMA	-	18GHz	A5329864	11/18	11/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	12/17	12/19
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20

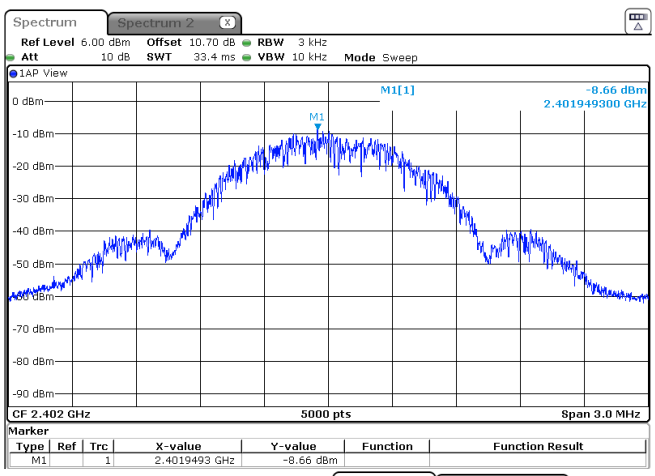
7.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

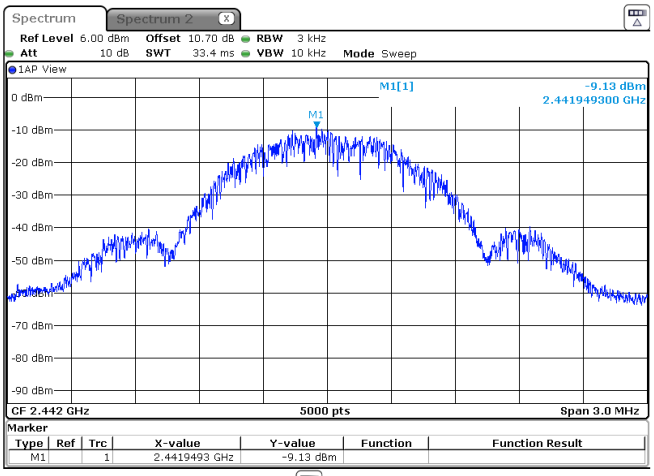
☑ None ☐ Divergence:

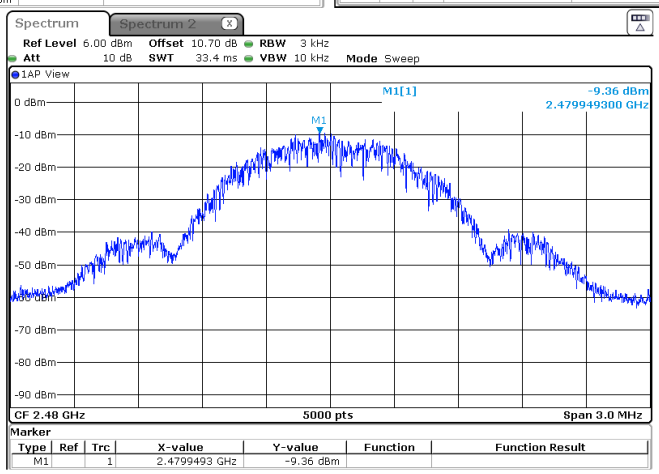
7.5. TEST SEQUENCE AND RESULTS

Modulation:

Channel	Channel Frequency (MHz)	Power Spectral Density (dBm)	PSD Limit (dBm)
Cmin	2402	**-8.66**	8.0
Cmed	2442	**-9.13**	8.0
Cmax	2480	**-9.36**	8.0







7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product **TB1E1**, SN: 200230, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

8. BAND EDGE MEASUREMENT (15.247)

8.1. TEST CONDITIONS

Date of test	:	July 29, 2019
Test performed by	:	Majid Mourzagh
Atmospheric pressure (hPa)	:	989
Relative humidity (%)	:	40
Ambient temperature (°C)	:	24

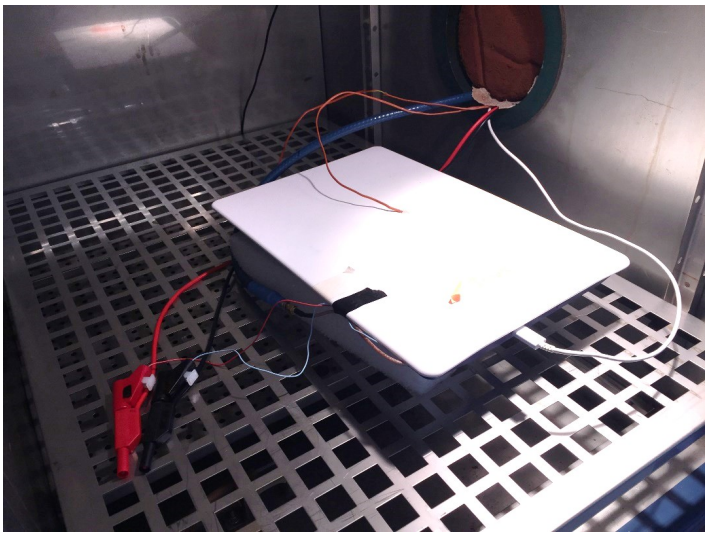
8.2. LIMIT

RF antenna conducted test: § 11 (DTS Measurement Guidance)
Set RBW = 100 kHz, Video bandwidth (VBW) > RBW, scan up through 10th harmonic. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. Note: If the device complies with the use of power option 2 the attenuation under this paragraph shall be 30 dB instead of 20 dB. *For -20dBc limit, lowest power output level is considered, worst case.*

Radiated emission test: § 12 (DTS Measurement Guidance)
Applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. For measurements above 1 GHz, set RBW = 1MHz, VBW = 10 Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation; use the settings shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation. See results in Radiated emissions section before.

8.3. SETUP

The EUT is placed in an anechoic chamber; levels have been corrected to be in compliant with Peak Output Power measurement. The EUT is turn ON; the graphs of the restrict frequency band are recorded with a display line indicating the highest level and other the 20dB offset below to show compliance with 15.247 (d) and 15.205. The emissions in restricted bands are compared to 15.209 limits.
RBW: 100kHz
VBW: 300kHz



8.4. TEST EQUIPMENT LIST

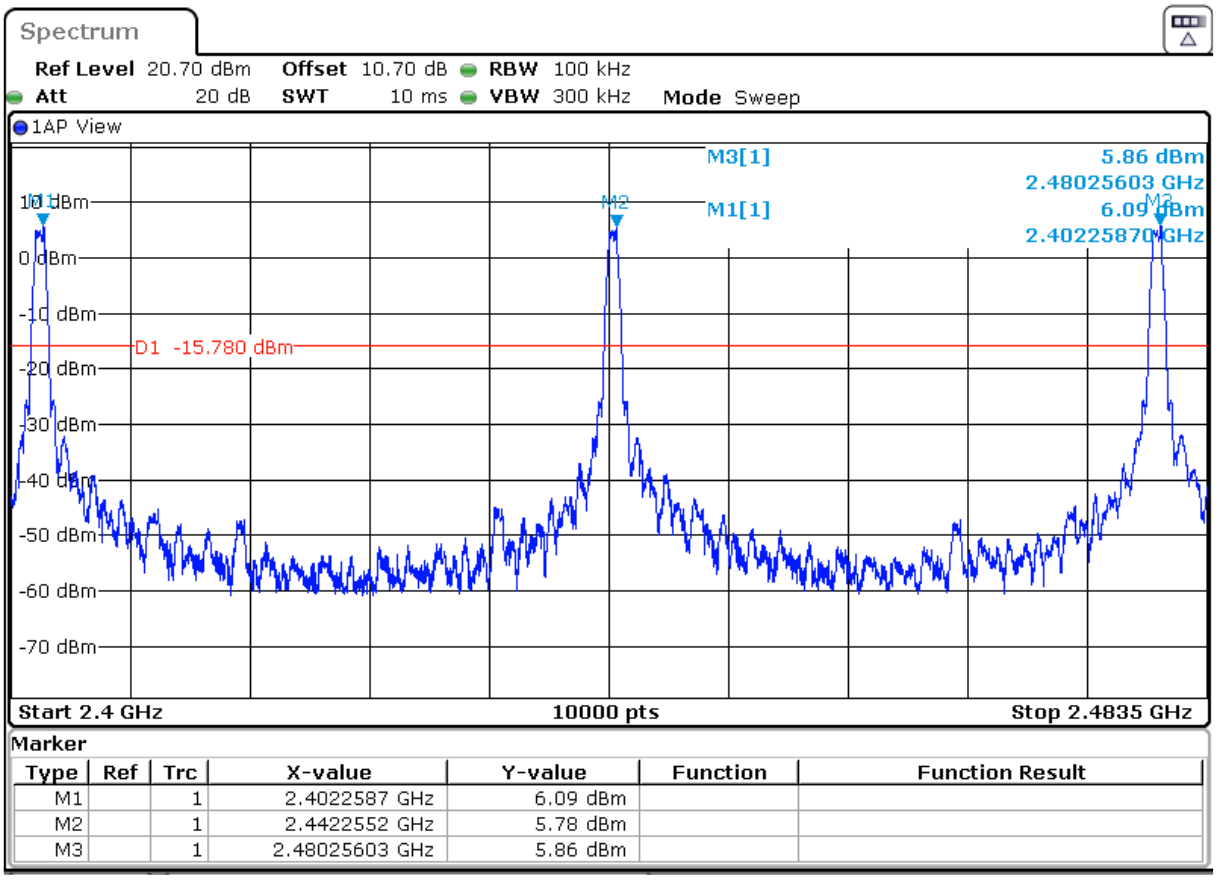
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122269	12/17	12/19
Cable SMA	-	18GHz	A5329863	11/18	11/19
Cable SMA	-	18GHz	A5329864	11/18	11/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	12/17	12/19
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20

8.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

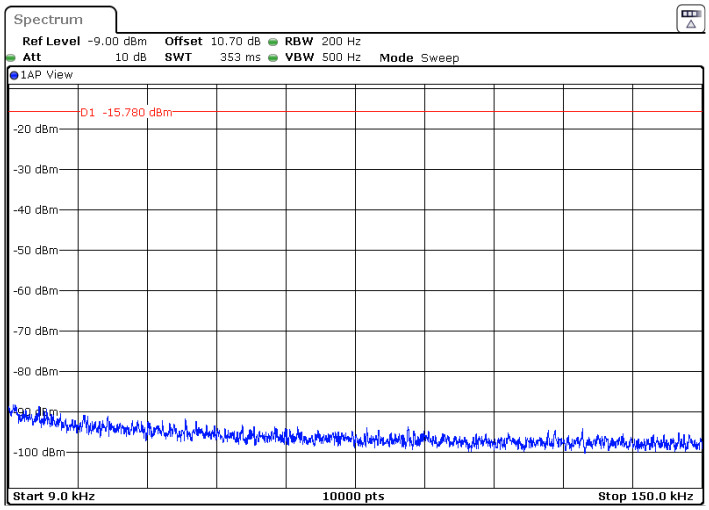
☑ None ☐ Divergence:

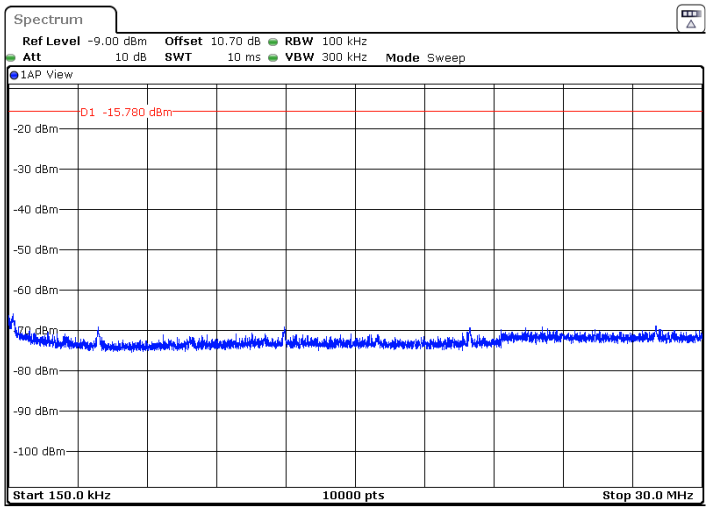
8.6. TEST SEQUENCE AND RESULTS

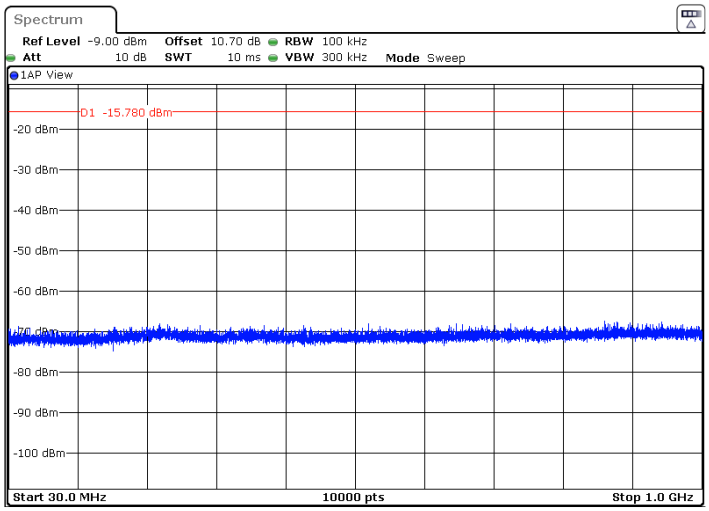
Offset: Attenuator+cable 10.7dB
GRAPH / MODULATION.

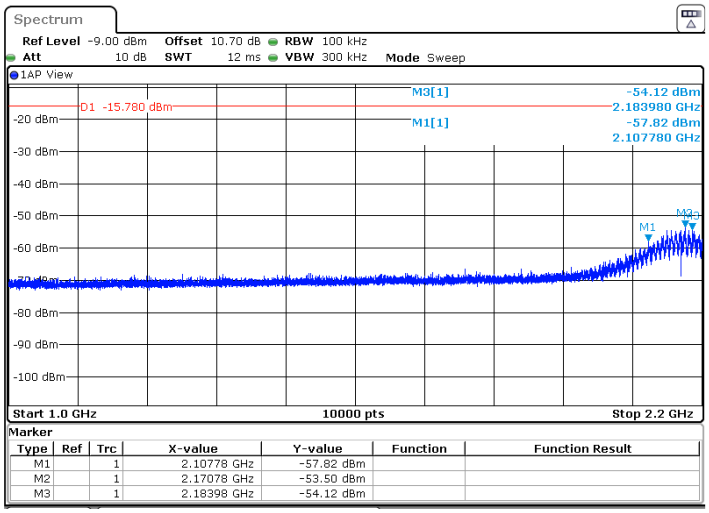


Worst case in Cmid, display line set at -15.78dBm





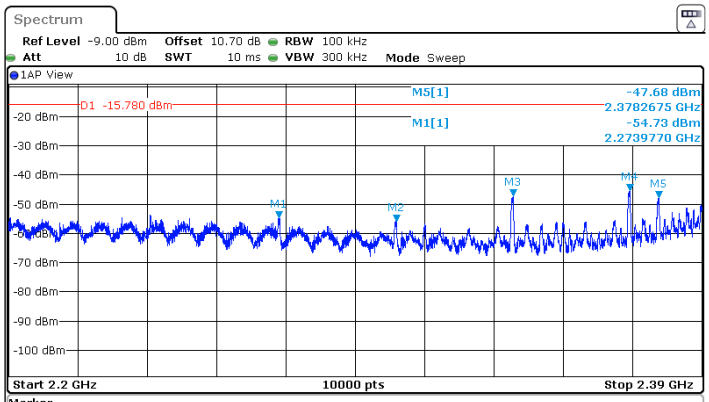




Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.10778 GHz	-57.82 dBm		
M2		1	2.17078 GHz	-53.50 dBm		
M3		1	2.18398 GHz	-54.12 dBm		

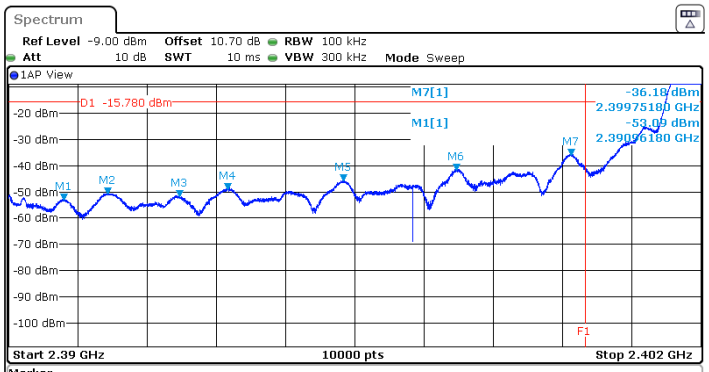
.



Marker

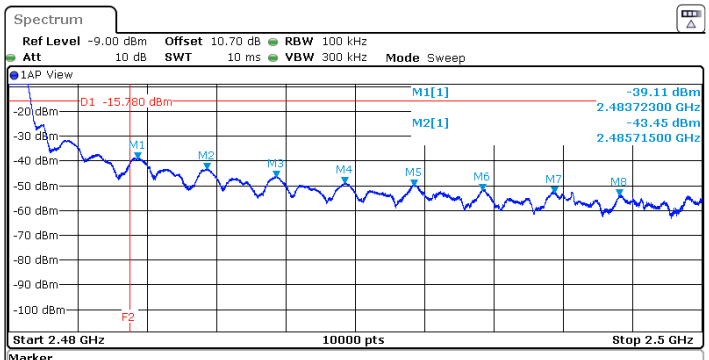
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.273977 GHz	-54.73 dBm		
M2		1	2.306258 GHz	-55.70 dBm		
M3		1	2.338273 GHz	-47.09 dBm		
M4		1	2.37025 GHz	-45.40 dBm		
M5		1	2.3782675 GHz	-47.68 dBm		

See final data result §4.6.4



Marker

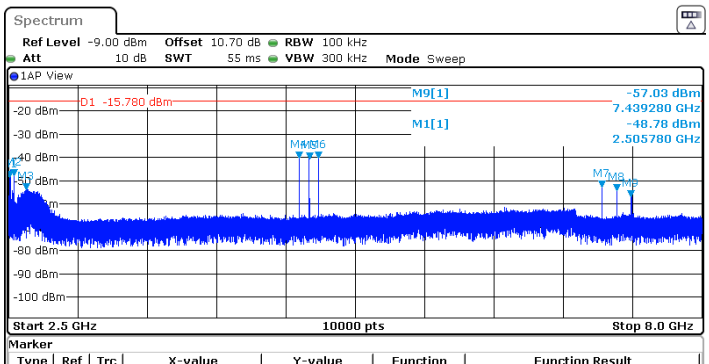
Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.3909618 GHz	-53.09 dBm		
M2		1	2.3917202 GHz	-50.88 dBm		
M3		1	2.3929586 GHz	-51.92 dBm		
M4		1	2.3937926 GHz	-49.08 dBm		
M5		1	2.3958014 GHz	-45.79 dBm		
M6		1	2.3977682 GHz	-41.84 dBm		
M7		1	2.3997518 GHz	-36.18 dBm		



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.483723 GHz	-39.11 dBm		
M2		1	2.485715 GHz	-43.45 dBm		
M3		1	2.487733 GHz	-46.50 dBm		
M4		1	2.489685 GHz	-49.20 dBm		
M5		1	2.491691 GHz	-50.04 dBm		
M6		1	2.493679 GHz	-51.80 dBm		
M7		1	2.495743 GHz	-52.91 dBm		
M8		1	2.497621 GHz	-53.94 dBm		

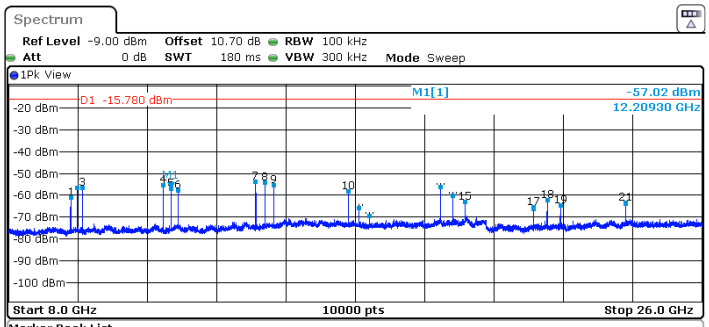
See final data result §4.6.4



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.50578 GHz	-48.78 dBm		
M2		1	2.54428 GHz	-47.94 dBm		
M3		1	2.64053 GHz	-53.93 dBm		
M4		1	4.80478 GHz	-40.38 dBm		
M5		1	4.88453 GHz	-40.53 dBm		
M6		1	4.96043 GHz	-40.28 dBm		
M7		1	7.20663 GHz	-52.84 dBm		
M8		1	7.32653 GHz	-54.32 dBm		
M9		1	7.43928 GHz	-57.03 dBm		

See final data result §4.6.4



Marker Peak List

No	X-value	Y-value	No	X-value	Y-value
1	9.608300 GHz	-61.135 dBm	12	17.359100 GHz	-69.678 dBm
2	9.768500 GHz	-56.579 dBm	13	19.218500 GHz	-56.167 dBm
3	9.919700 GHz	-56.637 dBm	14	19.533500 GHz	-60.099 dBm
4	12.011300 GHz	-55.414 dBm	15	19.841300 GHz	-63.118 dBm
5	12.211100 GHz	-56.998 dBm	16	21.616100 GHz	-66.186 dBm
6	12.398300 GHz	-57.764 dBm	17	21.619700 GHz	-65.350 dBm
7	14.410700 GHz	-53.791 dBm	18	21.979700 GHz	-62.366 dBm
8	14.650100 GHz	-54.145 dBm	19	22.321700 GHz	-64.475 dBm
9	14.882300 GHz	-55.501 dBm	20	24.017300 GHz	-63.864 dBm
10	16.815500 GHz	-58.116 dBm	21	24.022700 GHz	-63.620 dBm

See final data result §4.6.4

8.7. CONCLUSION

Band Edge Measurement performed on the sample of the product **TB1E1**, SN: 200230, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.

9. OCCUPIED BANDWIDTH

9.1. TEST CONDITIONS

Date of test	:	July 29, 2019
Test performed by	:	Majid MOURZAGH
Atmospheric pressure (hPa)	:	988
Relative humidity (%)	:	33
Ambient temperature (°C)	:	22

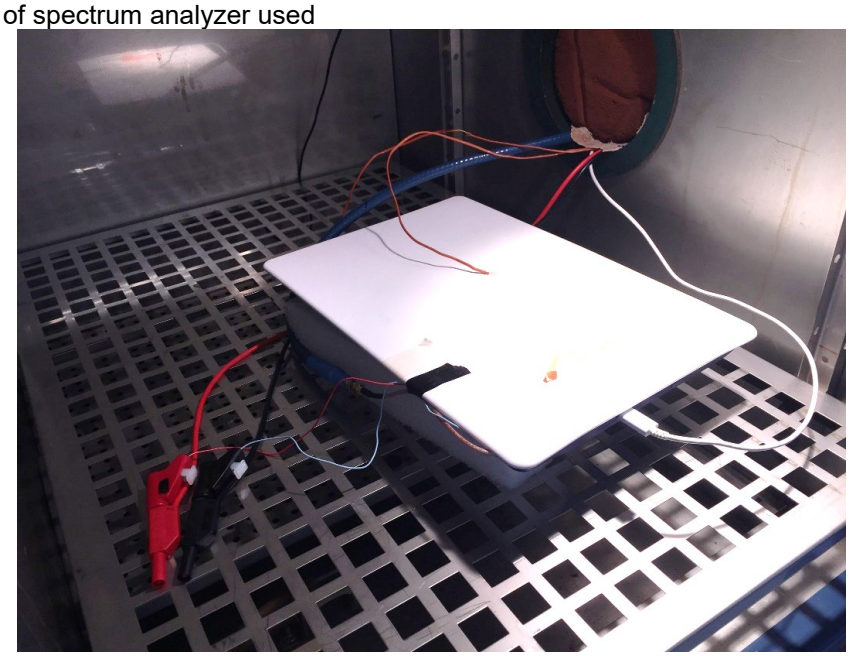
9.2. SETUP

☑ ***Conducted measurement:***
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.
Offset: Attenuator+cable 10.7dB

☐ ***Radiated measurement:***
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.

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



9.3. TEST EQUIPMENT LIST

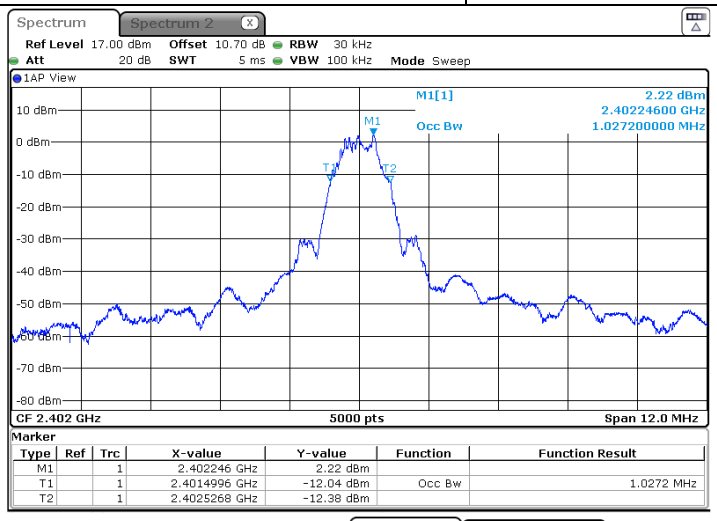
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122269	12/17	12/19
Cable SMA	-	18GHz	A5329863	11/18	11/19
Cable SMA	-	18GHz	A5329864	11/18	11/19
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	12/17	12/19
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20

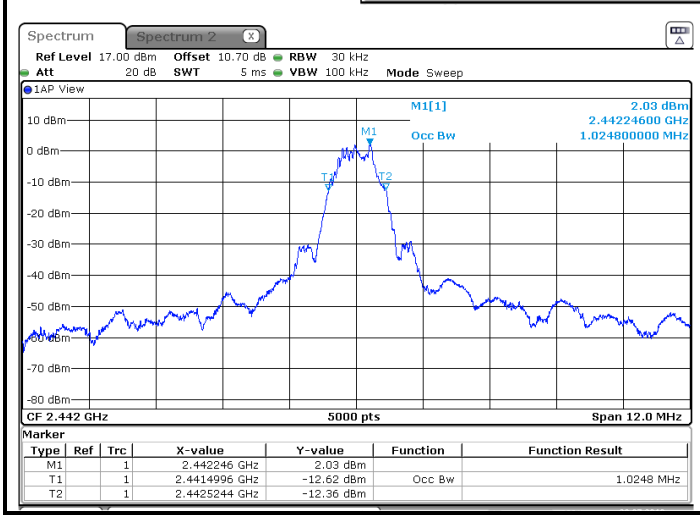
9.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

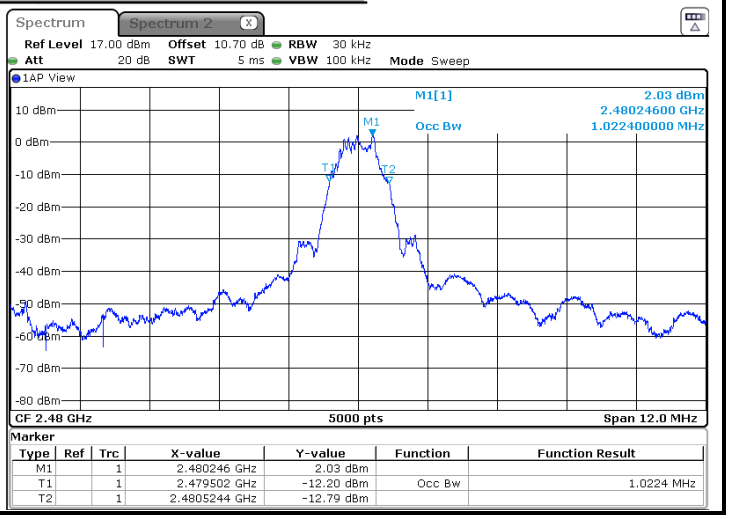
☑ None ☐ Divergence:

9.5. TEST SEQUENCE AND RESULTS

Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)
Cmin	2402	**1.0272**
Cmed	2442	**1.0248**
Cmax	2480	**1.0224**

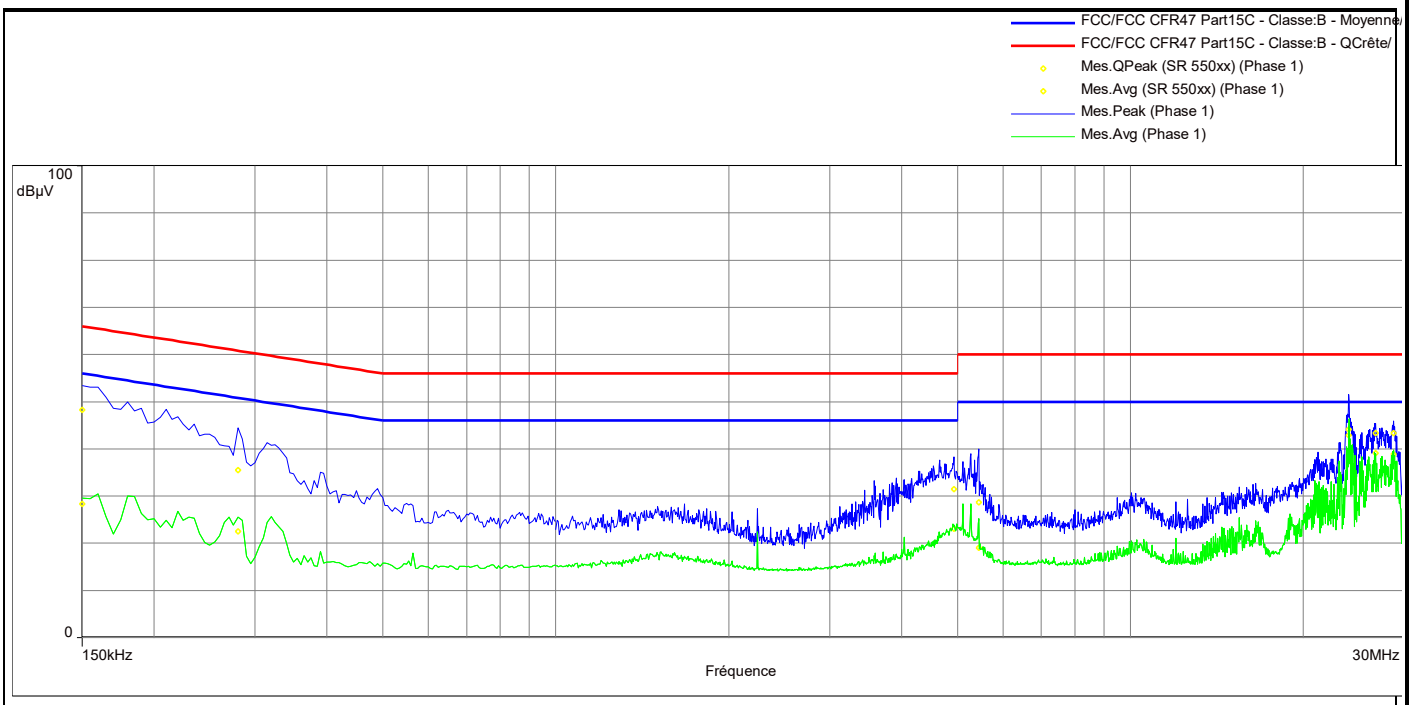






10. ANNEX 1 (GRAPHS)

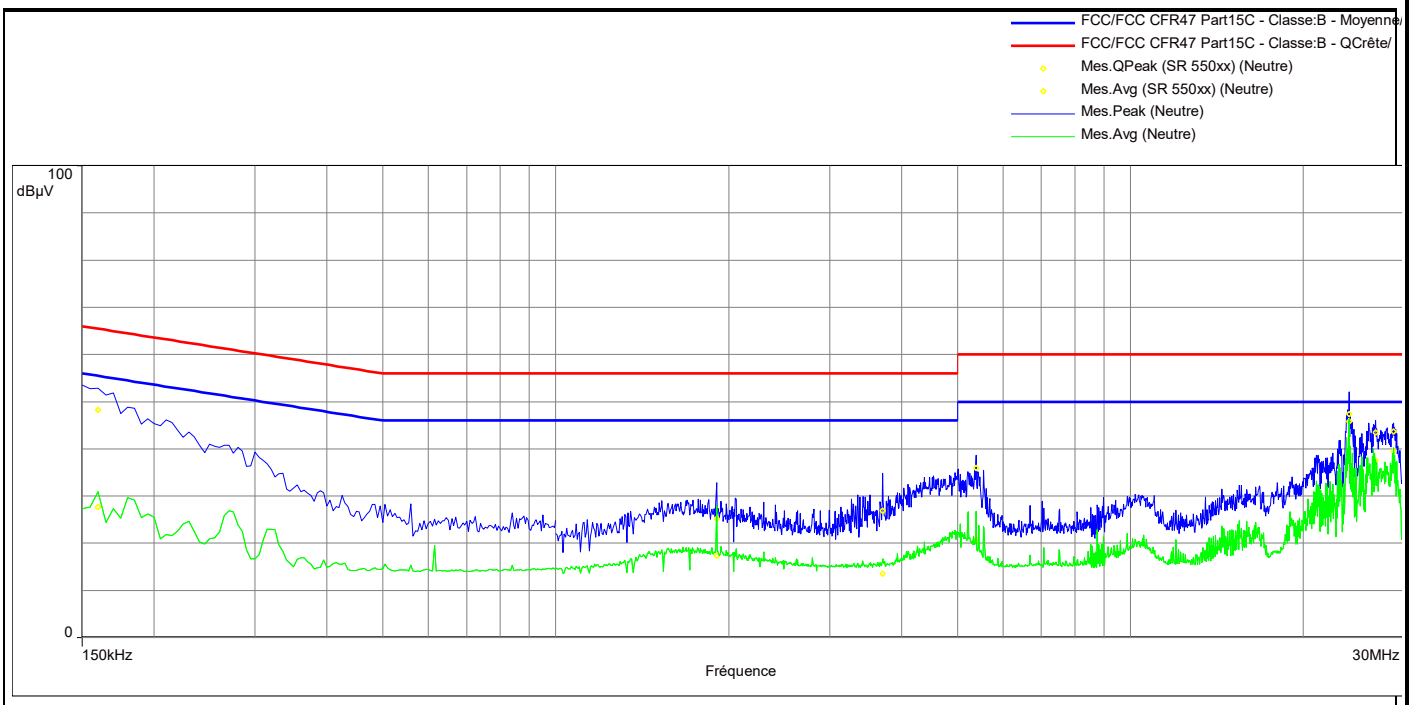
CONDUCTED EMISSIONS			
Graph name:	Emc#1	**Test configuration:**	
Limit:	FCC CFR47 Part15C	L1-120V/60Hz	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



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	48.3	66.0	-17.7	28.4	56.0	-27.6	Phase 1	19.4
0.280	35.5	60.8	-25.3	22.5	50.8	-28.3	Phase 1	19.4
4.930	31.5	56.0	-24.5	23.1	46.0	-22.9	Phase 1	19.8
5.445	28.7	60.0	-31.3	19.0	50.0	-31.0	Phase 1	19.9
23.995	44.1	60.0	-15.9	42.9	50.0	-7.1	Phase 1	21.2
26.695	43.4	60.0	-16.6	39.1	50.0	-10.9	Phase 1	21.3
28.690	43.4	60.0	-16.6	38.8	50.0	-11.2	Phase 1	21.4

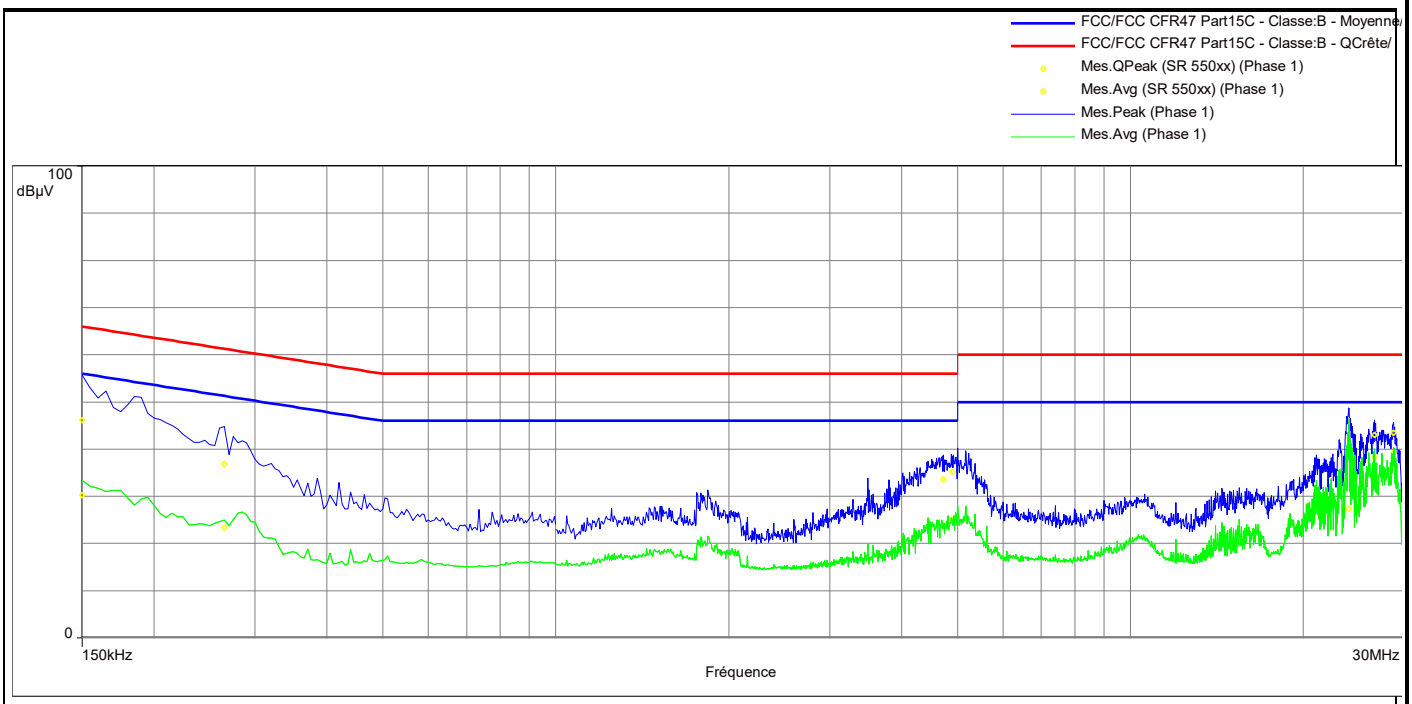
CONDUCTED EMISSIONS			
Graph name:	Emc#2	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Neutral-120V/60Hz	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	120VAC / 60Hz	**RBW :**	10kHz
Line:	Neutral	**VBW :**	30kHz



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)
0.160	48.2	65.5	-17.2	27.6	55.5	-27.8	Neutre	19.4
1.905	25.2	56.0	-30.8	17.4	46.0	-28.6	Neutre	19.6
3.705	26.8	56.0	-29.2	13.6	46.0	-32.4	Neutre	19.8
5.385	36.0	60.0	-24.0	20.7	50.0	-29.3	Neutre	19.9
24.000	47.4	60.0	-12.6	45.8	50.0	-4.2	Neutre	21.2
26.695	43.5	60.0	-16.5	37.6	50.0	-12.4	Neutre	21.3
28.690	43.7	60.0	-16.3	39.5	50.0	-10.5	Neutre	21.4

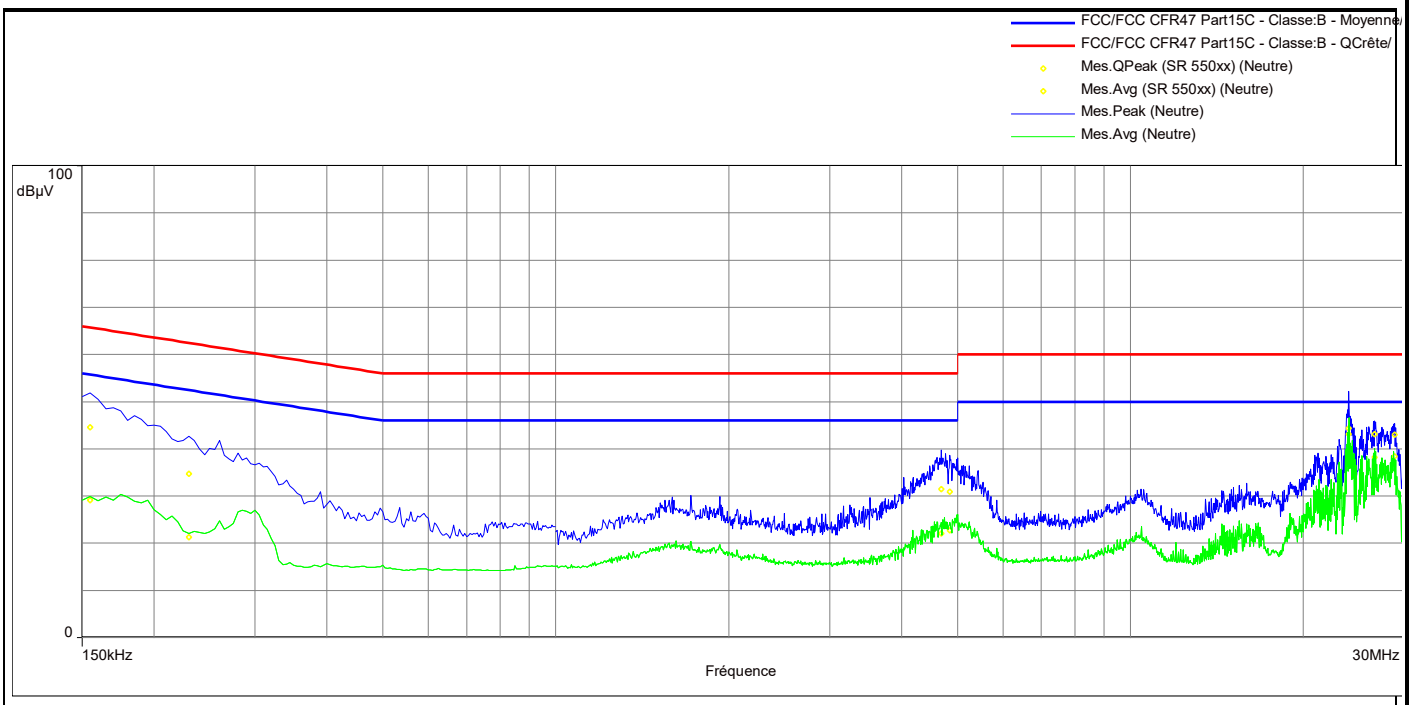
CONDUCTED EMISSIONS			
Graph name:	Emc#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	L1-240V/50Hz	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240VAC / 50Hz	**RBW :**	10kHz
Line:	Phase	**VBW :**	30kHz



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)
0.150	46.2	66.0	-19.8	30.2	56.0	-25.8	Phase 1	19.4
0.265	36.8	61.3	-24.5	23.4	51.3	-27.8	Phase 1	19.4
4.730	33.6	56.0	-22.4	23.6	46.0	-22.4	Phase 1	19.8
4.895	35.2	56.0	-20.8	25.1	46.0	-20.9	Phase 1	19.8
23.990	40.2	60.0	-19.8	27.3	50.0	-22.7	Phase 1	21.2
26.580	43.0	60.0	-17.0	38.3	50.0	-11.7	Phase 1	21.3
28.690	43.4	60.0	-16.6	39.2	50.0	-10.8	Phase 1	21.4

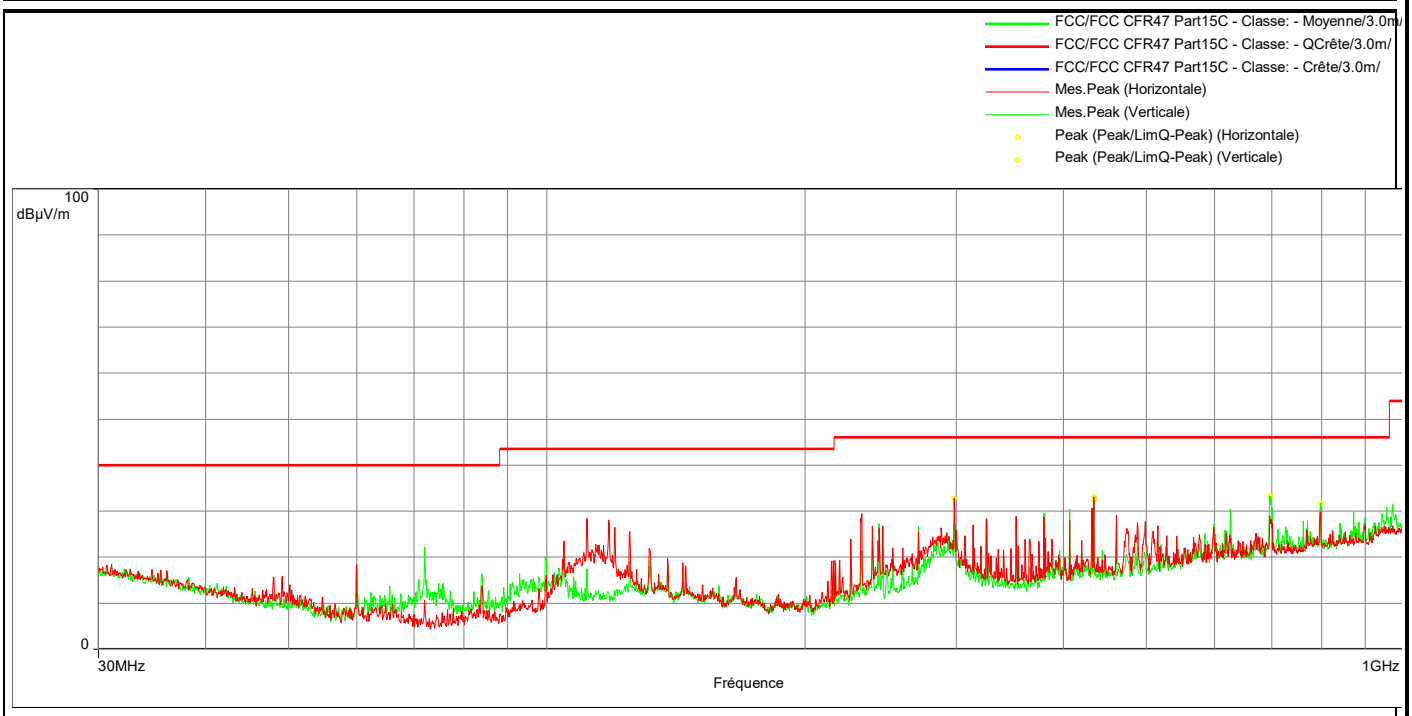
CONDUCTED EMISSIONS			
Graph name:	Emc#4	**Test configuration:**	
Limit:	FCC CFR47 Part15C	Neutral-240V/50Hz	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240VAC / 50Hz	**RBW :**	10kHz
Line:	Neutral	**VBW :**	30kHz



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)
0.155	44.6	65.7	-21.2	29.2	55.7	-26.6	Neutre	19.4
0.230	34.8	62.4	-27.7	21.3	52.4	-31.2	Neutre	19.5
4.685	31.4	56.0	-24.6	22.0	46.0	-24.0	Neutre	19.8
4.850	30.9	56.0	-25.1	22.8	46.0	-23.2	Neutre	19.8
23.995	44.4	60.0	-15.6	43.1	50.0	-6.9	Neutre	21.2
26.580	43.1	60.0	-16.9	38.2	50.0	-11.8	Neutre	21.3
28.805	43.0	60.0	-17.0	38.4	50.0	-11.6	Neutre	21.4

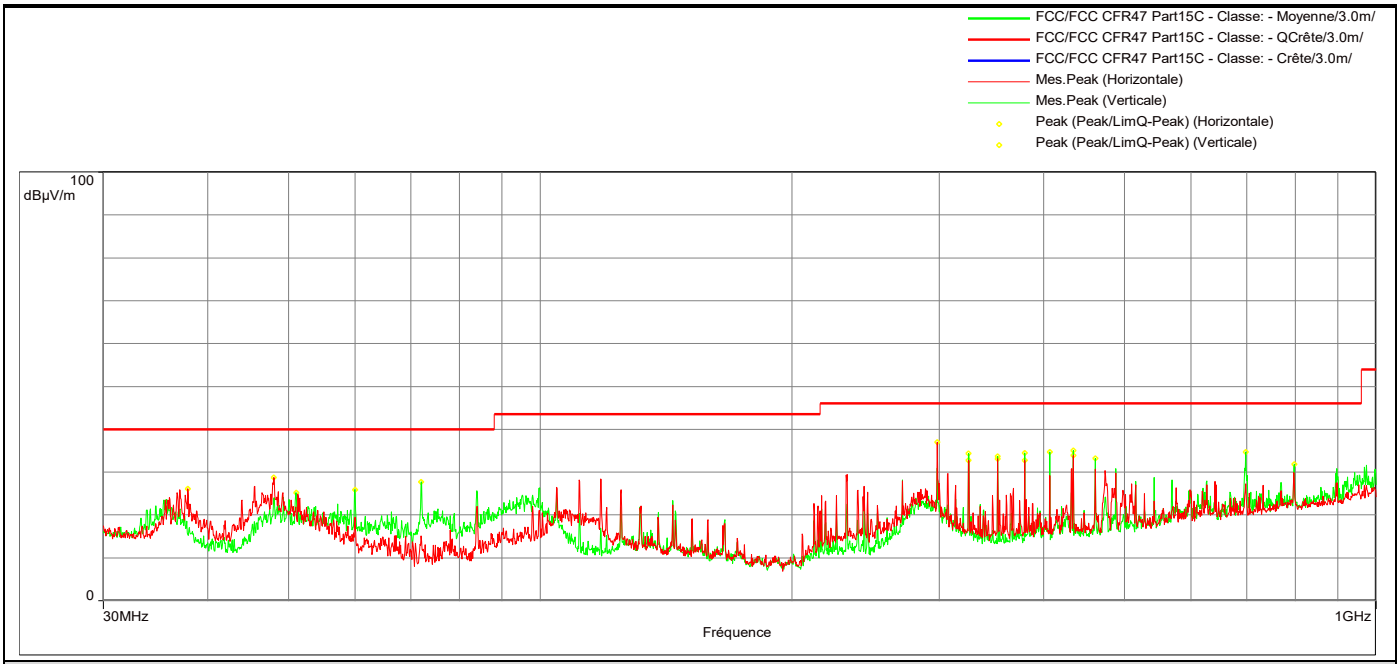
EMISSIONS RAYONNEES			
Courbe:	Emr#1	**Configuration:**	
Limite:	FCC CFR47 Part15C	C3 - FSV(H+V)[0.03-1]GHz - Axis XY	
Classe:			
Bande de fréquence: [30MHz - 1GHz]			
Polarisation d'antenne:	Horizontal & Vertical	**RBW :**	100kHz
Azimut:	0° - 360°	**VBW :**	300kHz



Emissions non essentielles

Frequency (MHz)	Peak (dBµV/m)	LimQP (dBµV/m)	Peak-LimQP (dB)	Angle (°)	Line	Correction (dB)
298.320	32.8	46.0	-13.2	14.0	Horizontal	-19.0
433.960	33.1	46.0	-12.9	323.0	Horizontal	-16.4
433.960	32.4	46.0	-13.6	43.0	Vertical	-16.4
696.400	33.2	46.0	-12.8	212.0	Vertical	-11.9
698.560	33.2	46.0	-12.8	193.0	Vertical	-11.9
797.600	31.7	46.0	-14.3	317.0	Vertical	-10.1

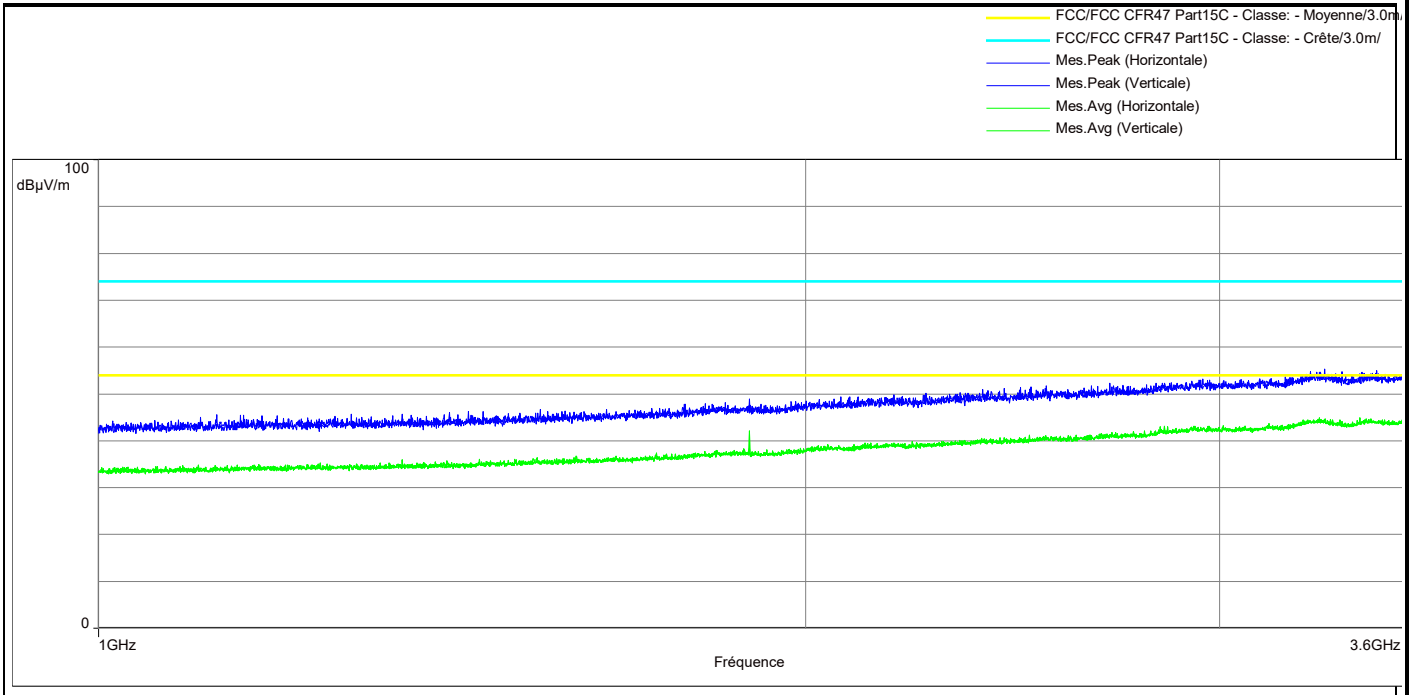
EMISSIONS RAYONNEES			
Courbe:	Emr#2	**Configuration:**	C3 - FSV(H+V)[0.03-1]GHz - Axis Z
Limite:	FCC CFR47 Part15C		
Classe:			
Bande de fréquence: [30MHz - 1GHz]			
Polarisation d'antenne:	Horizontal & Vertical	**RBW :**	100kHz
Azimut:	0° - 360°	**VBW :**	300kHz



Emissions non essentielles

Frequency (MHz)	Peak (dBµV/m)	LimQP (dBµV/m)	Peak-LimQP (dB)	Angle (°)	Line	Correction (dB)
37.871	26.1	40.0	-13.9	252.0	Horizontal	-17.0
48.003	28.7	40.0	-11.3	81.0	Horizontal	-20.6
298.320	37.0	46.0	-9.0	359.0	Horizontal	-19.0
325.440	32.7	46.0	-13.3	359.0	Horizontal	-18.4
352.560	33.1	46.0	-12.9	358.0	Horizontal	-18.0
379.680	32.7	46.0	-13.3	327.0	Horizontal	-17.5
433.960	33.9	46.0	-12.1	27.0	Horizontal	-16.4
51.012	25.2	40.0	-14.8	47.0	Vertical	-21.8
59.988	25.9	40.0	-14.1	155.0	Vertical	-25.3
72.024	27.8	40.0	-12.2	354.0	Vertical	-26.2
325.440	34.4	46.0	-11.6	1.0	Vertical	-18.4
352.560	33.7	46.0	-12.3	1.0	Vertical	-18.0
379.680	34.4	46.0	-11.6	359.0	Vertical	-17.5
406.840	34.7	46.0	-11.3	1.0	Vertical	-17.0
433.960	35.1	46.0	-10.9	1.0	Vertical	-16.4
461.080	33.2	46.0	-12.8	16.0	Vertical	-15.8
698.000	34.8	46.0	-11.2	184.0	Vertical	-11.9
797.640	31.8	46.0	-14.2	299.0	Vertical	-10.1

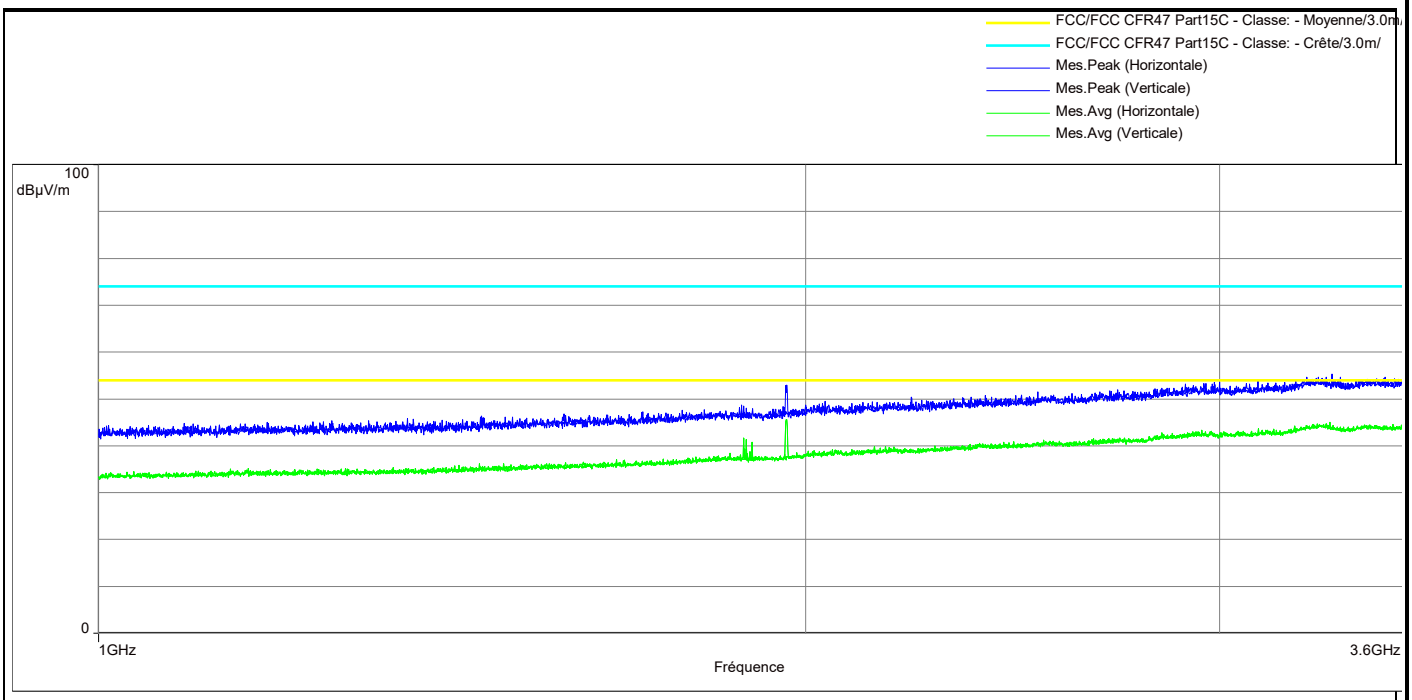
RADIATED EMISSIONS			
Graph name:	Emr#3	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V)[1-3.6]GHz - Axis XY	
Class:			
Frequency range: [1GHz - 3.6GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

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)
3325.70	72.5	Av	V	0	150	-28.7	43.8	54.0	**-10.2**
3499.90	71.7	Av	V	0	150	-28.2	43.5	54.0	**-10.5**
3325.70	84.0	Pk	V	0	150	-28.7	55.3	74.0	**-18.7**
3499.90	83.2	Pk	V	0	150	-28.2	55.0	74.0	**-19.0**

RADIATED EMISSIONS			
Graph name:	Emr#4	**Test configuration:**	
Limit:	FCC CFR47 Part15C	(H+V)[1-3.6]GHz --Axis Z	
Class:			
Frequency range: [1GHz - 3.6GHz]			
Antenna polarization:	Horizontal & Vertical	**RBW :**	1MHz
Azimuth:	0° - 360°	**VBW :**	3MHz



Spurious emissions

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)
3527.72	71.9	Av	V	0	150	-28.1	43.8	54.0	**-10.2**
3350.14	72.0	Av	V	0	150	-28.7	43.3	54.0	**-10.7**
3527.72	82.8	Pk	V	0	150	-28.1	54.7	74.0	**-19.3**
3350.14	84.0	Pk	V	0	150	-28.7	55.3	74.0	**-18.7**

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**
Mesure des perturbations conduites en tension sur le réseau d'énergie *Measurement of conducted disturbances in voltage on the power port*	3.51 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication *Measurement of conducted disturbances in voltage on the telecommunication port.*	3.26 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension *Measurement of discontinuous conducted disturbances in voltage*	3.45 dB	3.6 dB
Mesure des perturbations conduites en courant *Measurement of conducted disturbances in current*	3.09 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Moirans *Measurement of radiated electric field on the Moirans open area test site*	5.20 dB	6.3 dB

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.*