



LCIE

TEST REPORT

N°: 149895-708328-A (FILE#953583-A2)

Version : 01

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

BABOLAT VS
33 Quai Paul Sédallian
69009 - LYON
FRANCE

Apparatus under test

- ↗ Product
- ↗ Trade mark
- ↗ Manufacturer
- ↗ Model under test
- ↗ Serial number

Tennis player movement recorder

BABOLAT
FLEX
BABOLAT Pulse

00000000
00000003
2AAESPULSE2018
12112A-BVSPULSE18

↗ FCCID

↗ IC

Conclusion

See Test Program chapter §1

Test date

August 22, 2017 to September 8, 2017

Test location

MOIRANS

IC Test site

6500A-1

Composition of document

50 pages

Document issued on

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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 4
- 558074 D01 DTS Measurement Guidance v04

EMISSION TEST	LIMITS			RESULTS
Limits for conducted disturbance at mains ports 150kHz-30MHz	Frequency	Quasi-peak value (dBμV)	Average value (dBμV)	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
	150-500kHz	66 to 56	56 to 46	
	0.5-5MHz	56	46	
	5-30MHz	60	50	
Radiated emissions 9kHz-30MHz <i>CFR 47 §15.209 (a)</i> <i>CFR 47 §15.247 (d)</i> <i>RSS-247 §5.5</i>	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			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Radiated emissions 30MHz-25GHz* <i>CFR 47 §15.209 (a)</i> <i>CFR 47 §15.247 (d)</i> <i>RSS-247 §5.5</i>	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			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Bandwidth 6dB <i>CFR 47 §15.247 (a) (2)</i> <i>RSS-247 §5.2</i>	At least 500kHz			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Power spectral Density <i>CFR 47 §15.247 (e)</i> <i>RSS-247 §5.2</i>	Limit: 8dBm/3kHz			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Maximum Peak Output Power <i>CFR 47 §15.247 (b)</i> <i>RSS-247 §5.4</i>	Limit: 30dBm Conducted or Radiated measurement			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Band Edge Measurement <i>CFR 47 §15.209 (a)</i> <i>CFR 47 §15.247 (d)</i> <i>RSS-247 §5.5</i>	Limit: -20dBc or Radiated emissions limits in restricted bands			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Occupied bandwidth <i>RSS-Gen §4.6.1</i>	No limit			<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL <input type="checkbox"/> NA <input type="checkbox"/> NP
Receiver Spurious Emission** <i>RSS-Gen §4.10</i>	See RSS-Gen §4.10			<input type="checkbox"/> PASS <input type="checkbox"/> FAIL <input checked="" type="checkbox"/> NA <input type="checkbox"/> 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):

BABOLAT Pulse

Serial Number: 00000003
00000000



Photography of EUT

Power supply :

Type	Reference	Sn	Rating
AC/DC adapter (USB)	ETA-U90EWE	RT1D918R	100-240 =>5.3V (2A)

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Access 1	USB port (Charge only)	0.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Only in charging mode

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop	LENOVO L450	/	/



Equipment information:

Bluetooth LE Type:	<input checked="" type="checkbox"/> BLE	<input type="checkbox"/> v4.0	<input checked="" type="checkbox"/> v4.1	<input type="checkbox"/> v4.2
Frequency band:	[2400 – 2483.5] MHz			
Spectrum Modulation:	<input checked="" type="checkbox"/> DSSS (Tested like it)			
Number of Channel:	40			
Spacing channel:	2MHz			
Channel bandwidth:	1MHz			
Antenna Type:	<input checked="" type="checkbox"/> Integral	<input type="checkbox"/> External	<input type="checkbox"/> Dedicated	
Antenna connector:	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Temporary for test	
Transmit chains:	1			
	Single antenna			
	Gain: 2.5dBi			
Beam forming gain:	No			
Receiver chains	1			
Type of equipment:	<input checked="" type="checkbox"/> Stand-alone	<input type="checkbox"/> Plug-in	<input type="checkbox"/> Combined	
Ad-Hoc mode:	<input type="checkbox"/> Yes		<input checked="" type="checkbox"/> No	
Adaptivity mode:	<input type="checkbox"/> Yes (Load Based)	<input type="checkbox"/> Off mode	<input checked="" type="checkbox"/> No	
	Clear Channel Assessment Time:		-	
Duty cycle:	<input checked="" type="checkbox"/> Continuous duty	<input type="checkbox"/> Intermittent duty	<input type="checkbox"/> 100% duty	
Equipment type:	<input checked="" type="checkbox"/> Production model		<input type="checkbox"/> Pre-production model	
Operating temperature range:	Tmin:	<input type="checkbox"/> -20°C	<input type="checkbox"/> 0°C	<input checked="" type="checkbox"/> -10°C
	Tnom:	20°C		
	Tmax:	<input type="checkbox"/> 35°C	<input type="checkbox"/> 55°C	<input checked="" type="checkbox"/> 55°C
Type of power source:	<input type="checkbox"/> AC power supply	<input type="checkbox"/> DC power supply	<input checked="" type="checkbox"/> Battery	
Operating voltage range:	Vnom:	<input type="checkbox"/> 230V/50Hz	<input checked="" type="checkbox"/> 4Vdc	
Geo-location capability:	<input type="checkbox"/> 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)		<input checked="" type="checkbox"/> No	



CHANNEL PLAN			
Channel	Frequency (MHz)	Channel	Frequency (MHz)
Cmin: 0	2402	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
Cmid:19	2440	Cmax: 39	2480

DATA RATE		
Data Rate (Mbps)	Modulation Type	Worst Case Modulation
1	GFSK	<input checked="" type="checkbox"/>

2.2. EUT CONFIGURATION

The EUT is set in the following modes during tests with simulator / software:

- 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.

The EUT is set in the following modes during tests:

TX Mode

- Permanent emission with modulation on a fixed channel in the data rate that produced the highest power
- Permanent reception

Following commands with the specific test software "Prodtest BLE SDK 5.0.3 Package" are used to set the product:

Continuous Modulation emission (TX)

`prodtest -p <COM port number> start_cont_tx <FREQUENCY> <PAYLOAD_TYPE>`

Charging Mode:

EUT is set in charging mode , plugged on USB DC charging adapter see §2.1



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

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

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

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

2.5. 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 : September 8, 2017
Test performed by : Jonathan PAUC
Atmospheric pressure (hPa) : 991
Relative humidity (%) : 41
Ambient temperature (°C) : 23

3.2. TEST SETUP

Mains terminals

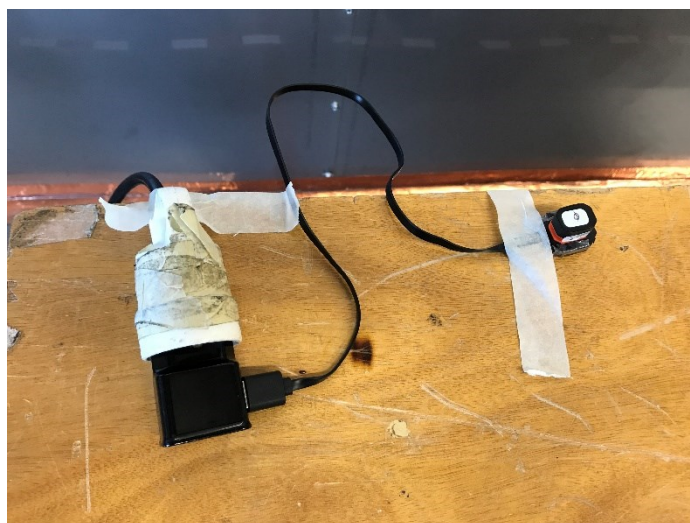
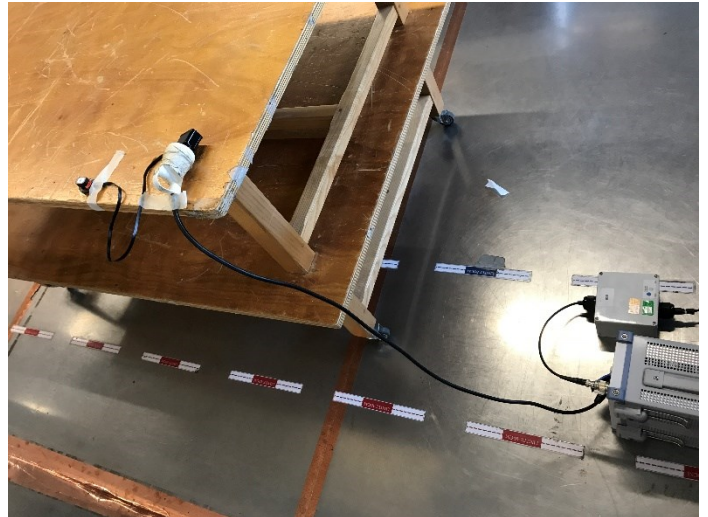
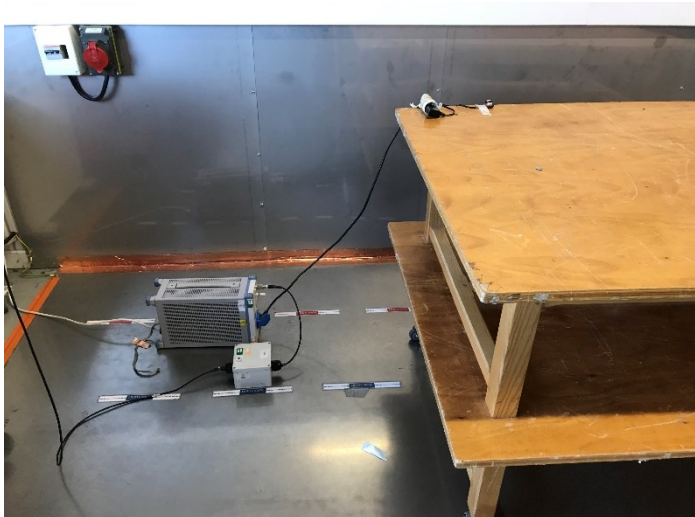
The EUT and auxiliaries are set:

- ☒ 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 by V_{nom} .

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 120V/60Hz power line voltage 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 50 Ω / 50 μ H. 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. 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	02/17	02/18
LISN	RHODE & SCHWARZ	ENV216	C2320291	12/16	12/17
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	08/16	08/17*
Thermo-hygrometer	OREGON	BAR916	B4206011	10/16	10/17
Transient limiter	RHODE & SCHWARZ	ESH3-Z2	A7122204	01/17	01/18

*Under derogation

3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

3.6. TEST RESULTS

Measurements are performed on the phase (L1) and neutral (N) of the power line.

Results: (PEAK detection)

Measure on L1: graph **Emc#1** (see annex 1)
Measure on N: graph **Emc#2** (see annex 1)

3.7. CONCLUSION

Conducted emission data measurement performed on the sample of the product BABOLAT Pulse, SN : 00000003 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 :	August 25th, 2017	September 8 th , 2017
Test performed by :	Jonathan PAUC	Jonathan PAUC
Atmospheric pressure (hPa) :	990	998
Relative humidity (%) :	45	44
Ambient temperature (°C) :	21	21

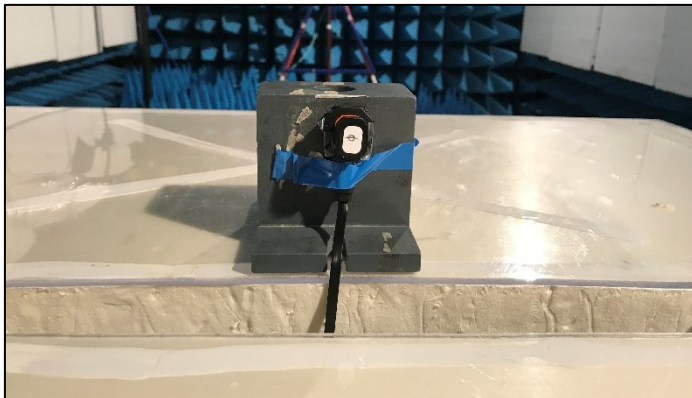
4.2. TEST SETUP

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} .



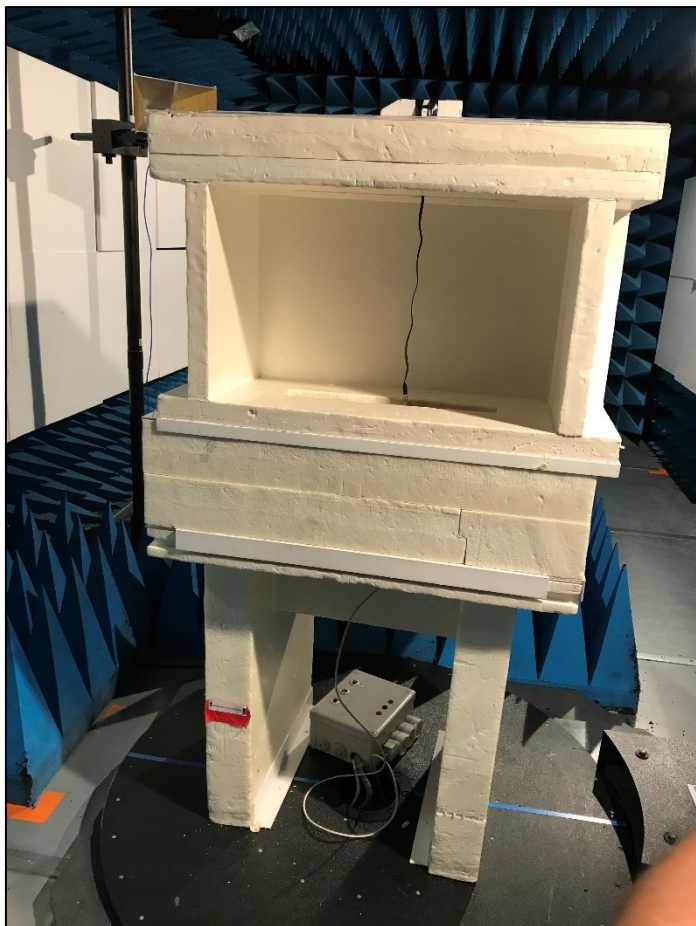
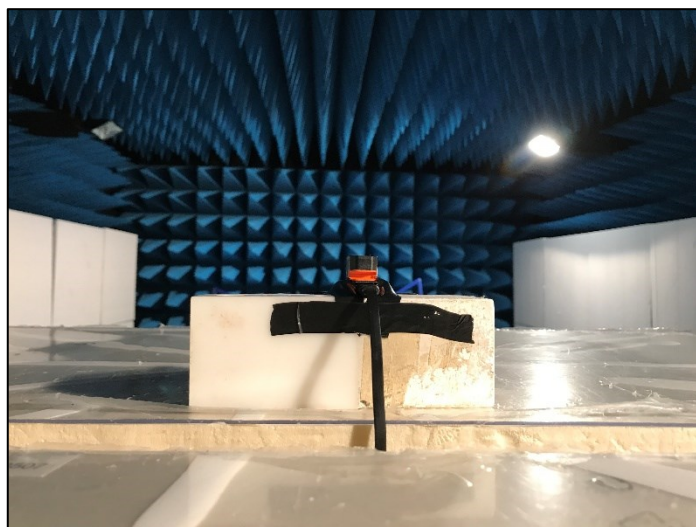
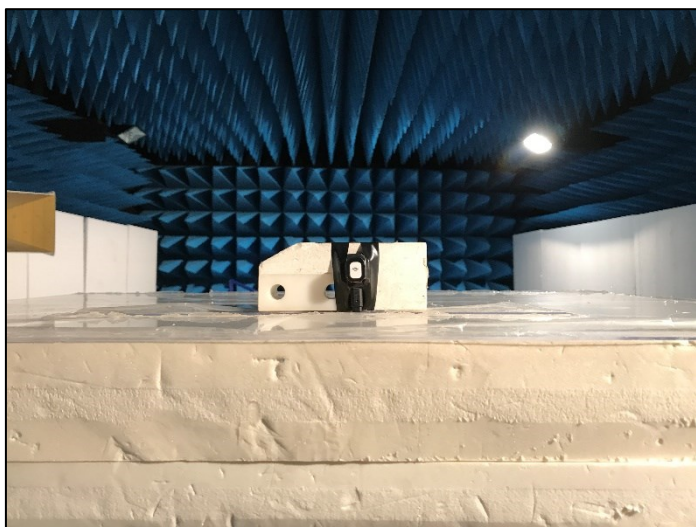
Axis XY



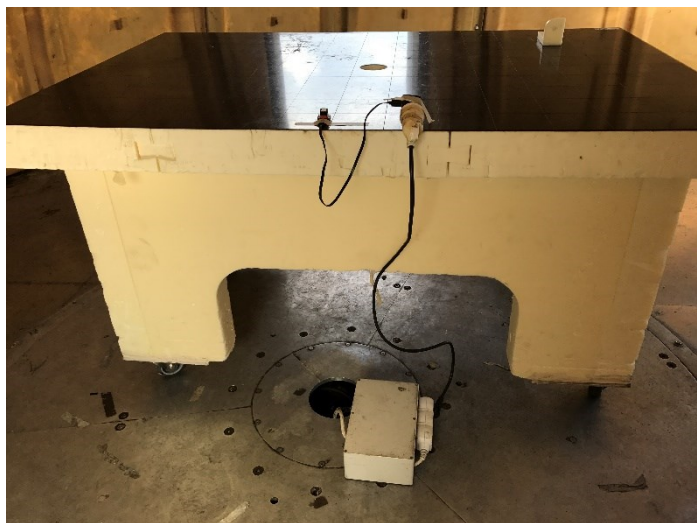
Axis Z



Test setup in anechoic chamber <1GHz



Test setup in anechoic chamber >1GHz



Test setup in open area test field >1GHz



4.3. TEST METHOD

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

Pre-characterisation measurement: (9kHz – 25GHz)

A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber for frequency from 30MHz to 12.75GHz. 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 12.75GHz.

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 25GHz:

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 25GHz.

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

ANECHOIC CHAMBER					
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Amplifier 9kHz - 40GHz	LCIE SUD EST	-	A7102082	07/17	07/18
Antenna Bi-log	CHASE	CBL6111A	C2040172	06/16	06/18
Antenna horn 18GHz	EMCO	3115	C2042029	08/16	08/17
Cable Measure @3m 18GHz	-	-	A5329038	10/16	10/17
Cable Measure @3m	-	-	A5329206	06/17	06/18
Cable 40GHz 2m coudé			A5329720	05/16	05/17**
Cable 40GHz 2m coudé			A5329721	05/16	05/17**
Semi-Anechoic chamber #3	SIEPEL	-	D3044017	03/16	03/19
Radiated emission comb generator	BARDET	-	A3169050	-	-
HF Radiated emission comb generator	LCIE SUD EST	-	A3169088	-	-
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060050	08/16	08/17
BAT EMC	NEXIO	v3.9.0.10	L1000115	-	-
Thermo-hygrometer (C3)	OREGON	BAR206	B4204078	10/16	10/17
Thermo-hygrometer (PM2)	KIMO	HQ 210	B4206022	08/16	08/17
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371	-	-
Table	LCIE	-	F2000461	-	-

** : under derogation



OATS					
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna Bi-log	CHASE	CBL6111A	C2040051	06/16	06/18
Cable	SUCOFLEX	106G	A5329061	04/17	04/18
Cable (OATS)	-	-	A5329623	03/17	03/18
Radiated emission comb generator	BARDET	-	A3169050	-	-
OATS	-	-	F2000409	08/16	08/17
Receiver 20-1000MHz	ROHDE & SCHWARZ	ESVS30	A2642006	05/15	05/17
Thermo-hygrometer (PM2)	KIMO	HQ 210	B4206022	08/16	08/17
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	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	Mode	EUT position	Channel	Comments
Emr# 1	H & V	TX	Axis XY	Min	See annex 1
Emr# 2	H & V	TX	Axis Z	Min	See annex 1
Emr# 3	H & V	TX	Axis XY	Mid	See annex 1
Emr# 4	H & V	TX	Axis Z	Mid	See annex 1
Emr# 5	H & V	TX	Axis XY	Max	See annex 1
Emr# 6	H & V	TX	Axis Z	Max	See annex 1

4.6.2. Pre-characterization at 3 meters [1GHz-12.75GHz]

See graphs for 1GHz-12.75GHz:

Graph identifier	Polarization	Mode	EUT position	Channel	Comments
Emr# 7	H	TX	Axis XY	Min	See annex 1
Emr# 8	V	TX	Axis XY	Min	See annex 1
Emr# 9	H	TX	Axis Z	Min	See annex 1
Emr# 10	V	TX	Axis Z	Min	See annex 1
Emr# 11	H	TX	Axis XY	Mid	See annex 1
Emr# 12	V	TX	Axis XY	Mid	See annex 1
Emr# 13	H	TX	Axis Z	Mid	See annex 1
Emr# 14	V	TX	Axis Z	Mid	See annex 1
Emr# 15	H	TX	Axis XY	Max	See annex 1
Emr# 16	V	TX	Axis XY	Max	See annex 1
Emr# 17	H	TX	Axis Z	Max	See annex 1
Emr# 18	V	TX	Axis Z	Max	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)
41.853	22.0	QP	V	56	100	13.7	35.7	40.0	-4.3
56.843	24.8	QP	V	126	110	8.1	32.9	40.0	-7.1
66.601	20.5	QP	V	37	123	7.7	28.2	40.0	-11.8
77.328	25.8	QP	V	0	100	8.5	34.3	40.0	-5.7

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 12.75GHz

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)
1664.500	74.5	Pk	V	33	150	-13.2	61.3	74.0	-12.7
1664.750	56.0	Av	V	98	150	-13.2	42.8	54.0	-11.2
2369.680	52.3	Pk	V	210	150	-9.9	42.4	74.0	-31.6
2369.680	24.8	Av	V	200	150	-9.9	14.9	54.0	-39.1
2385.811	50.8	Pk	V	195	150	-9.8	41.0	74.0	-33.0
2385.811	29.9	Av	V	234	150	-9.8	20.0	54.0	-34.0
2489.443	50.8	Pk	V	234	150	-9.5	41.3	74.0	-32.7
2489.443	27.0	Av	V	234	150	-9.5	17.4	54.0	-36.6
2495.999	52.8	Pk	V	234	150	-9.5	43.3	74.0	-30.7
2495.999	22.5	Av	V	234	150	-9.5	13.0	54.0	-41.0
4803.070	49.8	Pk	V	232	150	-2.8	47.0	74.0	-27.0
4803.070	24.5	Av	V	232	150	-2.8	21.7	54.0	-32.3
4880.080	50.8	Pk	V	232	150	-2.6	48.2	74.0	-25.8
4880.080	26.3	Av	V	232	150	-2.6	23.7	54.0	-30.3
4959.130	48.7	Pk	V	232	150	-2.4	46.3	74.0	-27.7
4959.130	34.4	Av	V	232	150	-2.4	32.1	54.0	-21.9
7205.165	47.4	Pk	V	232	150	2.1	49.5	74.0	-24.5
7205.165	34.0	Av	V	232	150	2.1	36.1	54.0	-17.9
7318.895	51.8	Pk	V	232	150	2.2	54.0	74.0	-20.0
7318.895	29.4	Av	V	232	150	2.2	31.6	54.0	-22.4
7438.745	51.6	Pk	V	232	150	2.3	53.9	74.0	-20.1
7438.745	23.4	Av	V	232	150	2.3	25.7	54.0	-28.3

None significative frequency observed from 12.75GHz to 25GHz.

Note: Measures have been done at 3m distance.

4.7. CONCLUSION

Radiated emission data measurement performed on the sample of the product BABOLAT Pulse, SN: 00000003 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

ate of test : August 22, 2017
est performed by : Jonathan PAUC
tmospheric pressure (hPa) : 990
elative humidity (%) : 45
nambient temperature (°C) : 21

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 13.7dB

☐ **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) $\geq 3 \times$ 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.

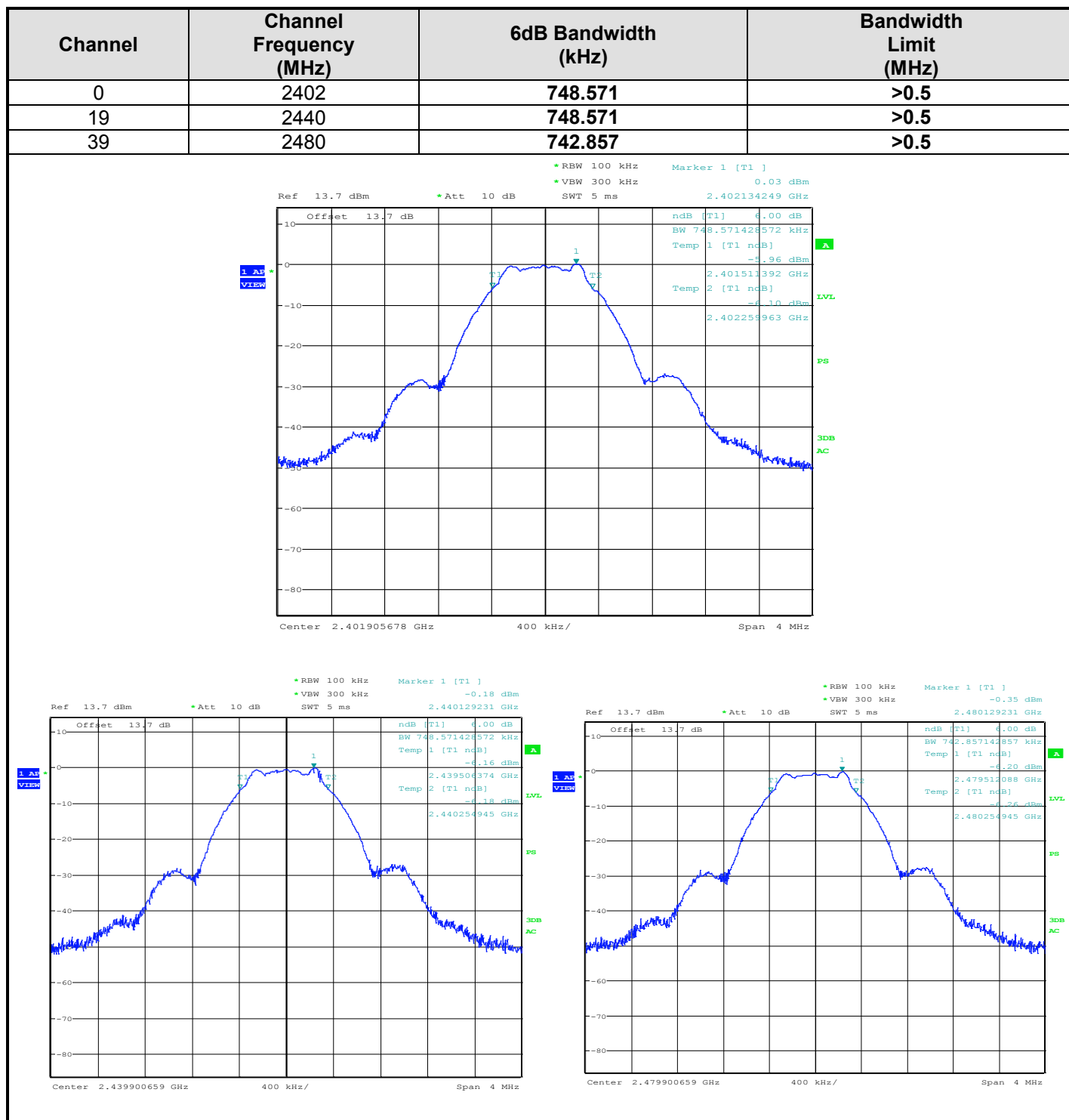
5.3. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122268	06/17	06/18
Cable SMA	-	18G	A5329373	12/16	12/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/17	03/18

5.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

5.5. TEST SEQUENCE AND RESULTS



5.6. CONCLUSION

Bandwidth measurement performed on the sample of the product BABOLAT Pulse, SN: 00000000, 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 : August 22, 2017
Test performed by : Jonathan PAUC
Atmospheric pressure (hPa) : 990
Relative humidity (%) : 45
Ambient temperature (°C) : 21

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 13.7dB

☐ **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:

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



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 \geq 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.

- Set the RBW \geq DTS bandwidth.
- Set VBW $\geq 3 \times$ RBW.
- Set span $\geq 3 \times$ RBW
- Sweep time = auto couple.
- Detector = peak.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- 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.

- Set the RBW = 1 MHz.
- Set the VBW $\geq 3 \times$ RBW
- Set the span $\geq 1.5 \times$ DTS bandwidth.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- 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	-	A7122268	06/17	06/18
Cable SMA	-	18G	A5329373	12/16	12/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/17	03/18

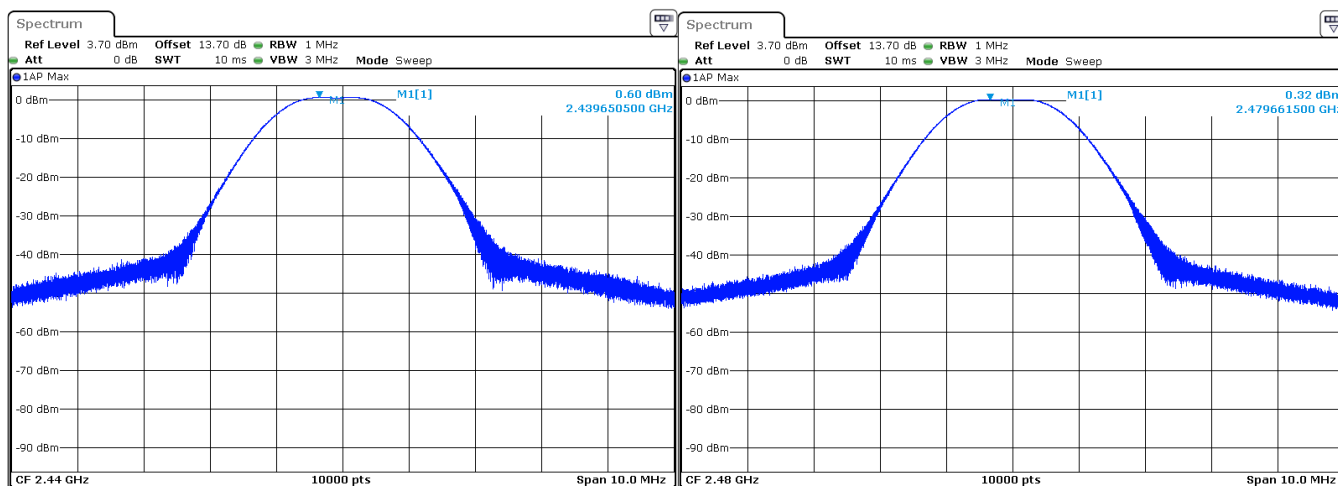
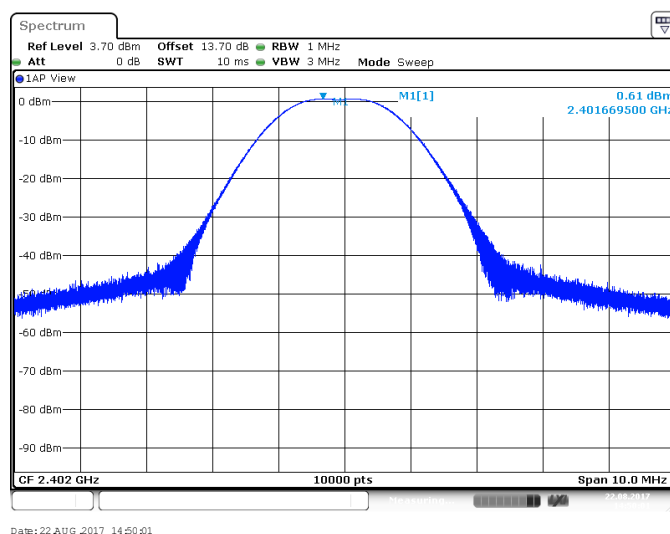
6.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

6.5. TEST SEQUENCE AND RESULTS

Modulation:

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)	FC (dB)
0	2402	0.61	30.0	13.7
19	2440	0.60	30.0	13.7
39	2480	0.32	30.0	13.7



6.6. CONCLUSION

Maximum Peak Output Power measurement performed on the sample of the product BABOLAT Pulse, SN: 00000000, 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 : August 22, 2017
Test performed by : Jonathan PAUC
Atmospheric pressure (hPa) : 990
Relative humidity (%) : 45
Ambient temperature (°C) : 21

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 13.7dB

☐ **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 $\geq 3 \times$ 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	-	A7122268	06/17	06/18
Cable SMA	-	18G	A5329373	12/16	12/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/17	03/18



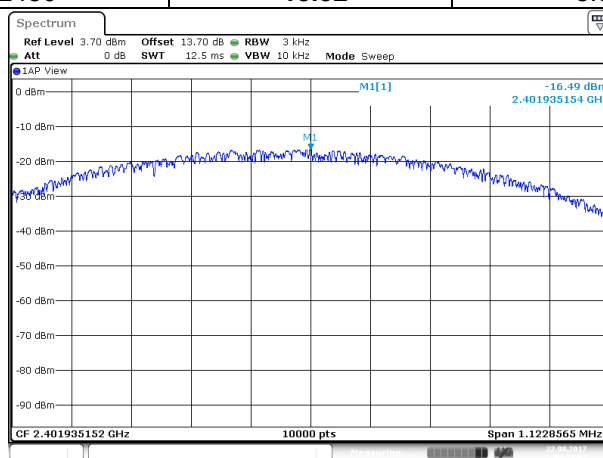
7.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

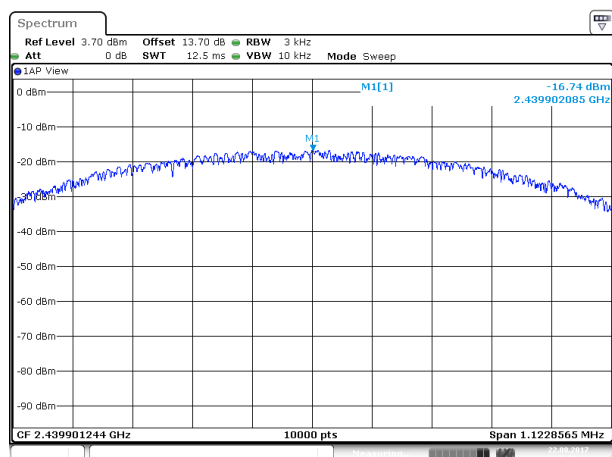
7.5. TEST SEQUENCE AND RESULTS

Modulation:

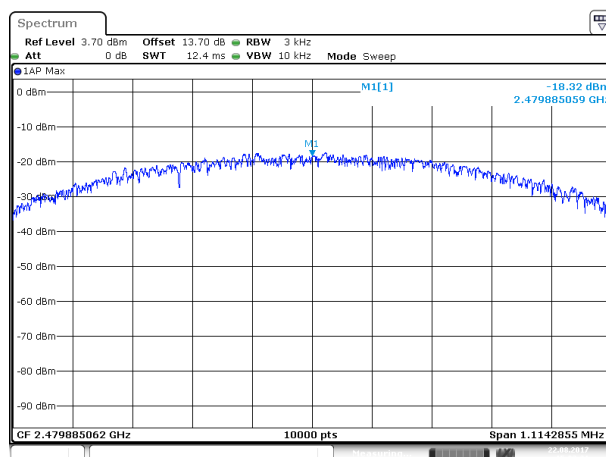
Channel	Channel Frequency (MHz)	Power Spectral Density (dBm)	PSD Limit (dBm)	FC (dB)
0	2402	-16.49	8.0	13.7
19	2440	-16.74	8.0	13.7
39	2480	-18.32	8.0	13.7



Date: 22 AUG 2017 14:59:01



Date: 22 AUG 2017 15:01:02



Date: 22 AUG 2017 15:02:21

7.6. CONCLUSION

Power Spectral Density measurement performed on the sample of the product BABOLAT Pulse, SN:00000000, 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 : August 22, 2017
Test performed by : Jonathan PAUC
Atmospheric pressure (hPa) : 990
Relative humidity (%) : 41
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

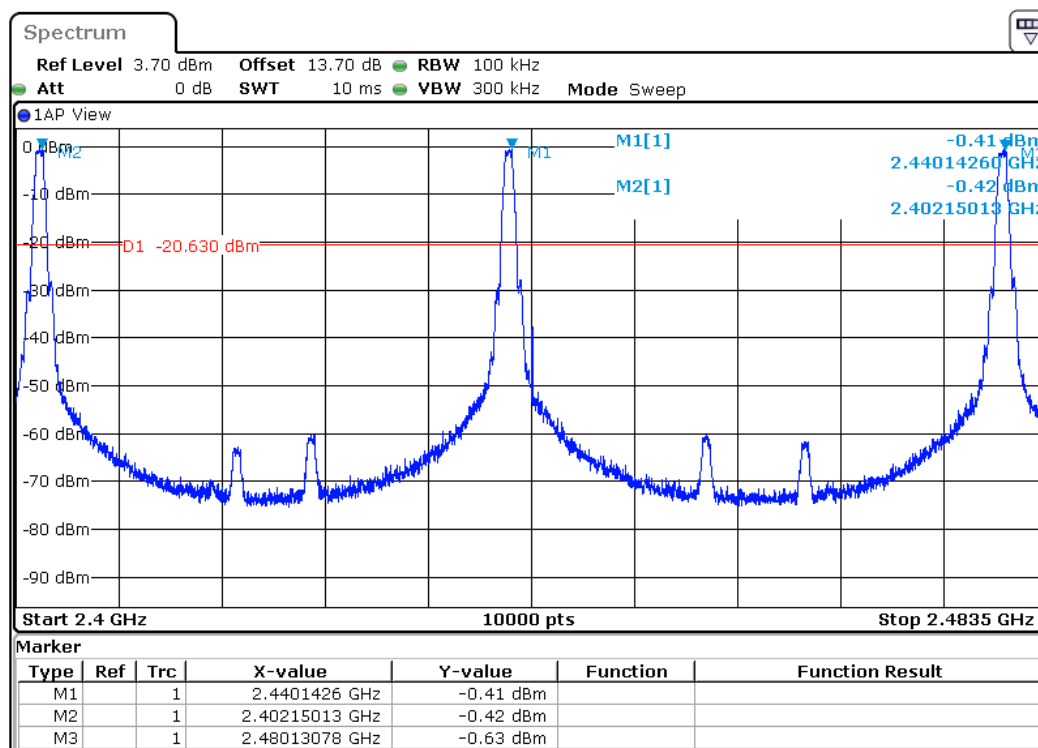
DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Attenuator 10dB	AEROFLEX	-	A7122268	06/17	06/18
Cable SMA	-	18G	A5329373	12/16	12/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/17	03/18

8.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

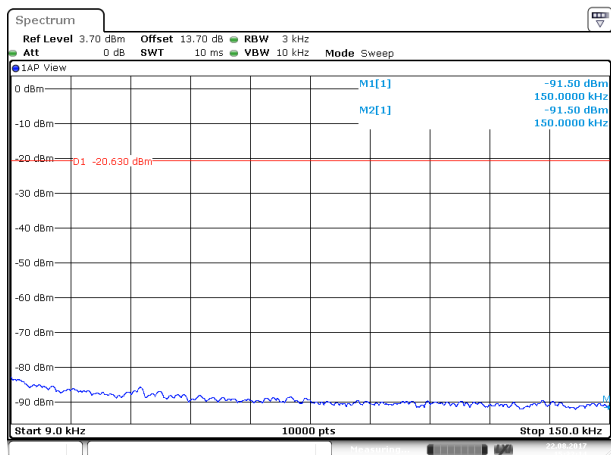
8.6. TEST SEQUENCE AND RESULTS

Offset: Attenuator+cable 13.7dB

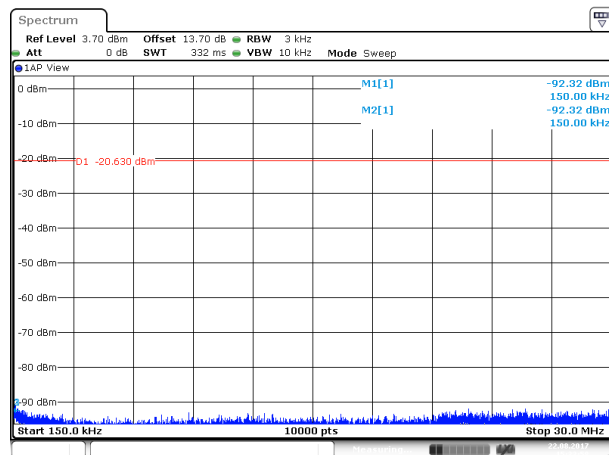


-20dBc limit used

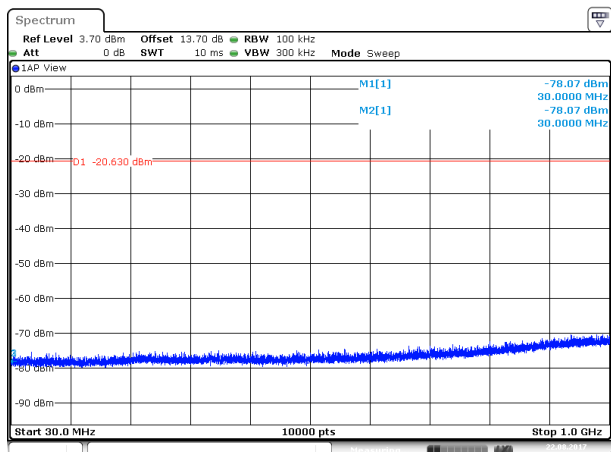
Worst case : Cmax , limit at -20.63dBm



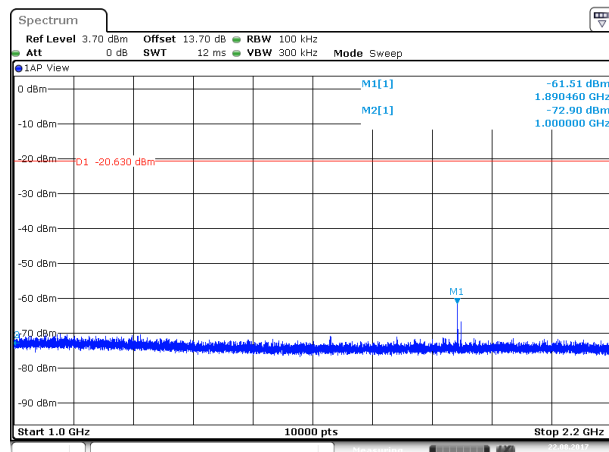
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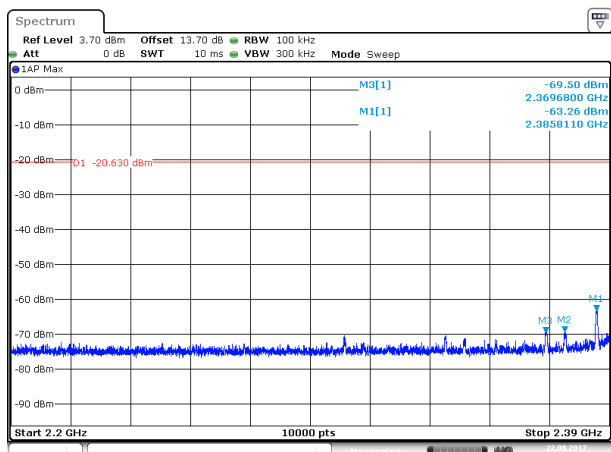
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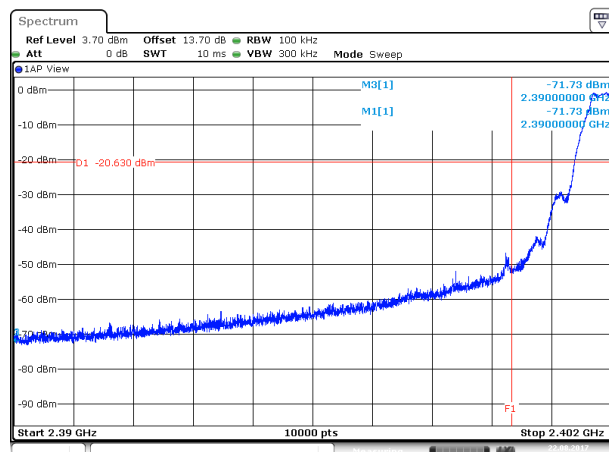
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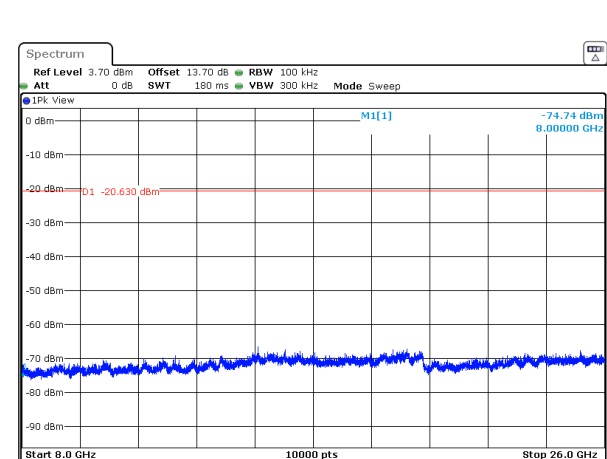
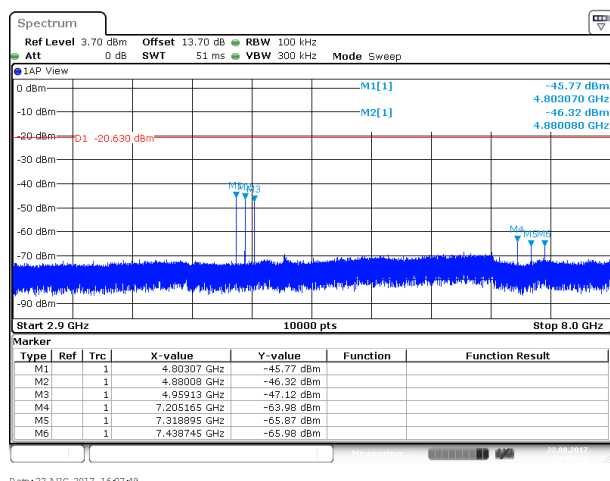
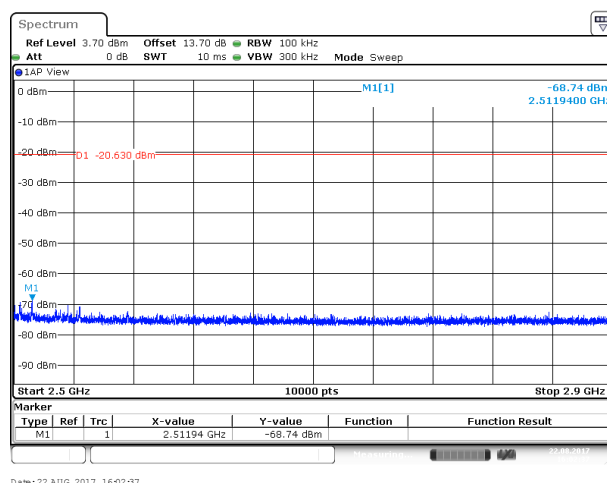
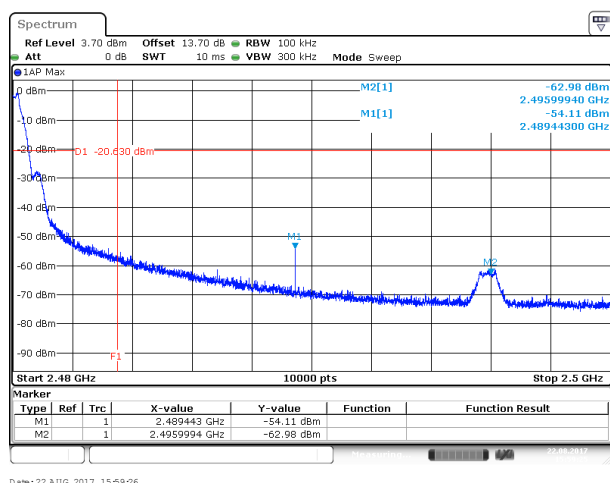
Date: 22 AUG 2017 15:40:50



Date: 22 AUG 2017 15:46:53



Date: 22 AUG 2017 15:48:47



8.7. CONCLUSION

Band Edge Measurement performed on the sample of the product BABOLAT Pulse, SN: 00000000, 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 : August 22, 2017
Test performed by : Jonathan PAUC
Atmospheric pressure (hPa) : 990
Relative humidity (%) : 41
Ambient temperature (°C) : 25

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 13.7dB

☐ **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) $\geq 3 \times$ 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	-	A7122268	06/17	06/18
Cable SMA	-	18G	A5329373	12/16	12/17
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/17	03/18

9.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

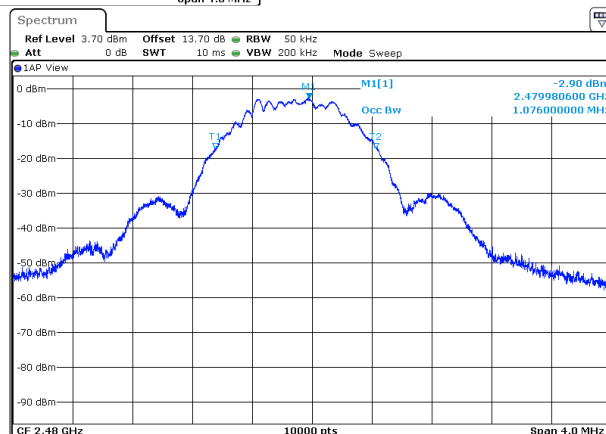
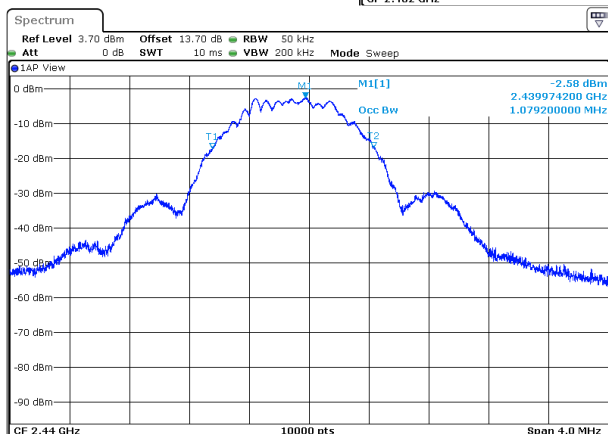
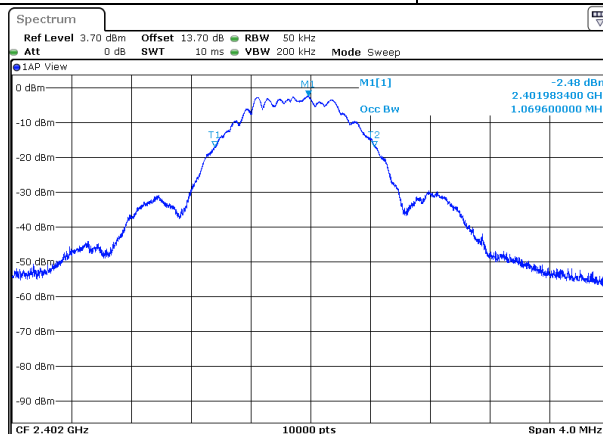
☒ None ☐ Divergence:



L C I E

9.5. TEST SEQUENCE AND RESULTS

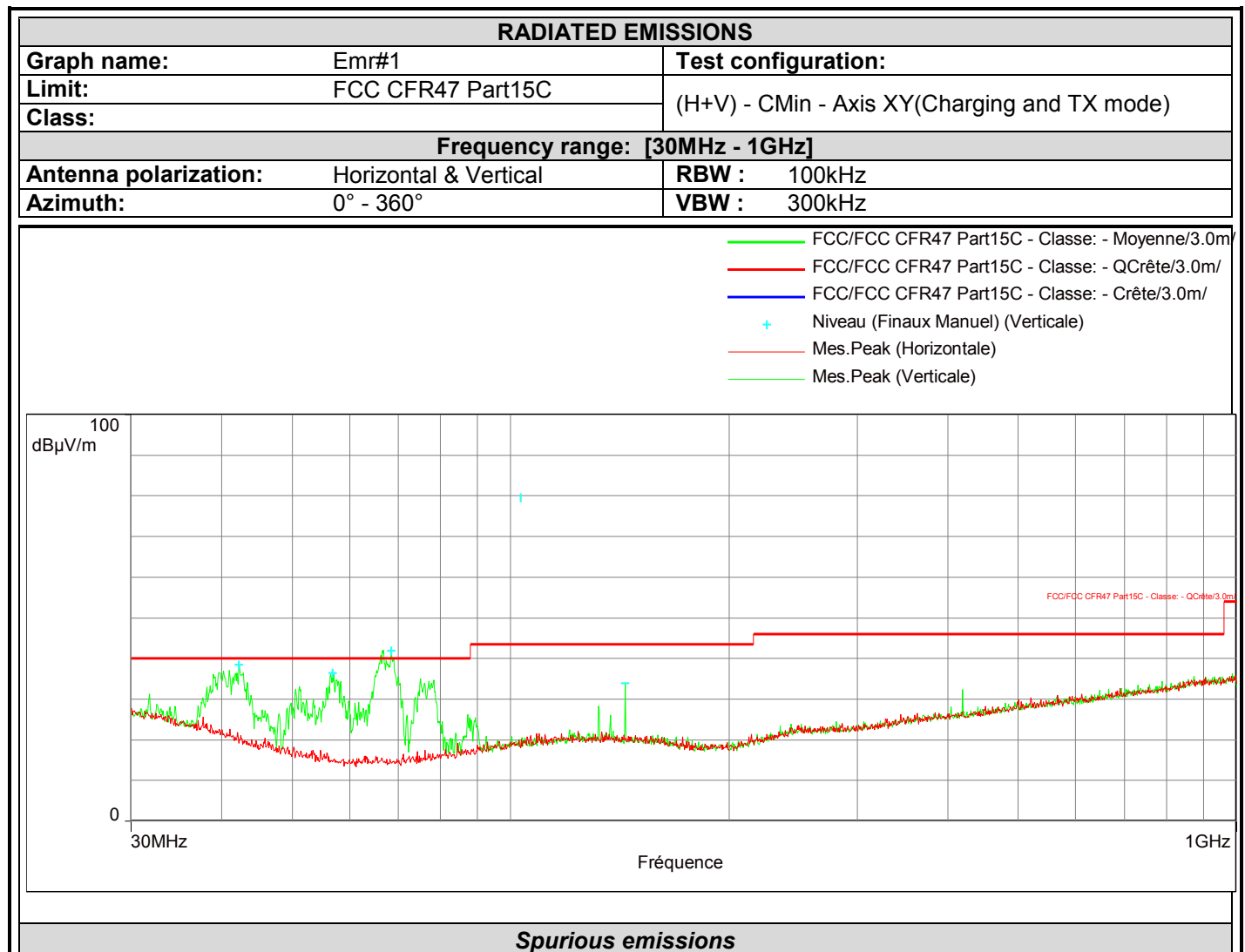
Channel	Channel Frequency (MHz)	99% Occupied Bandwidth (MHz)
0	2402	1.069
19	2440	1.079
39	2489	1.076





L C I E

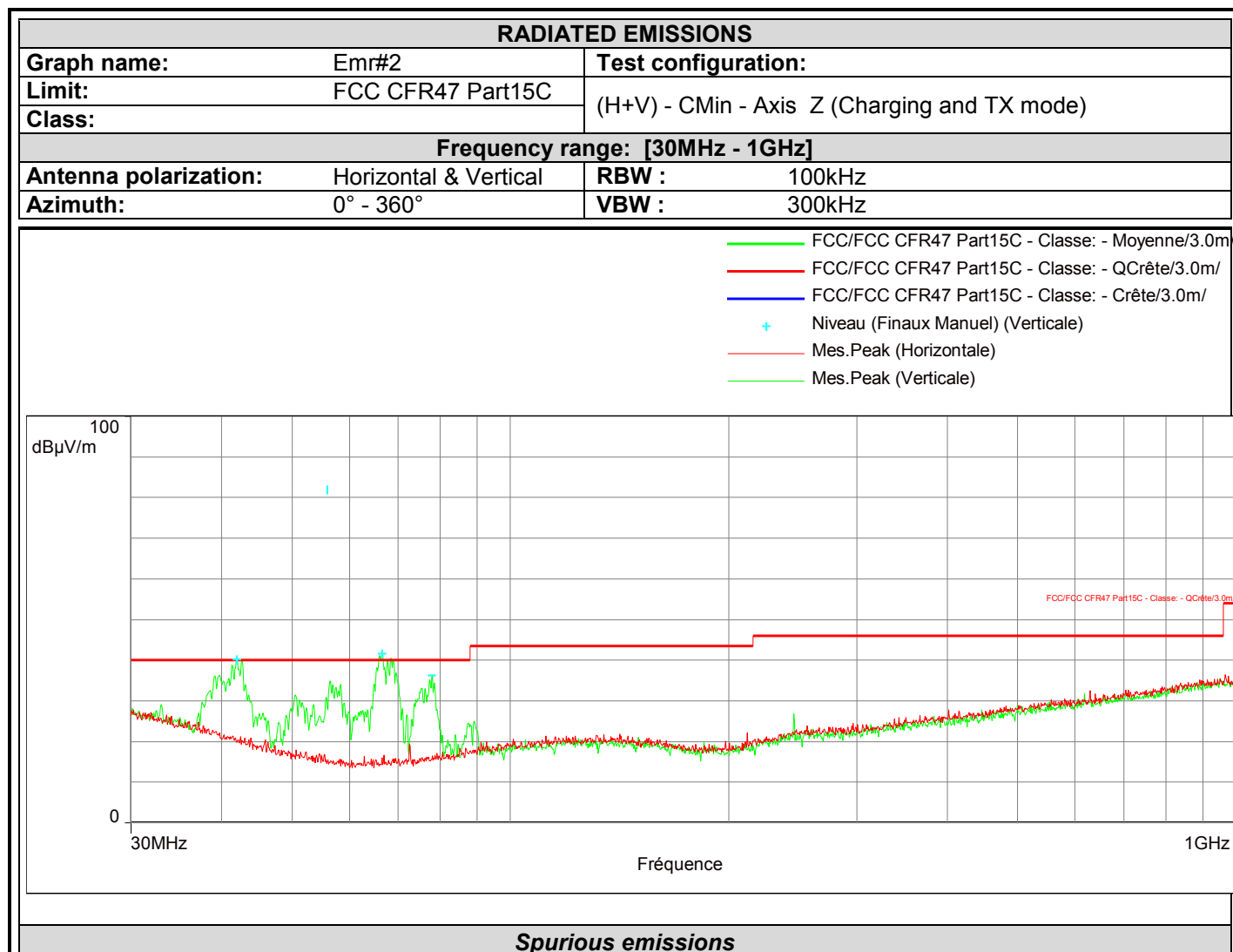
10. ANNEX 1 (GRAPHS)



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
42.223	38.4	Vertical
56.860	36.4	Vertical
68.437	41.9	Vertical
143.747	33.9	Vertical



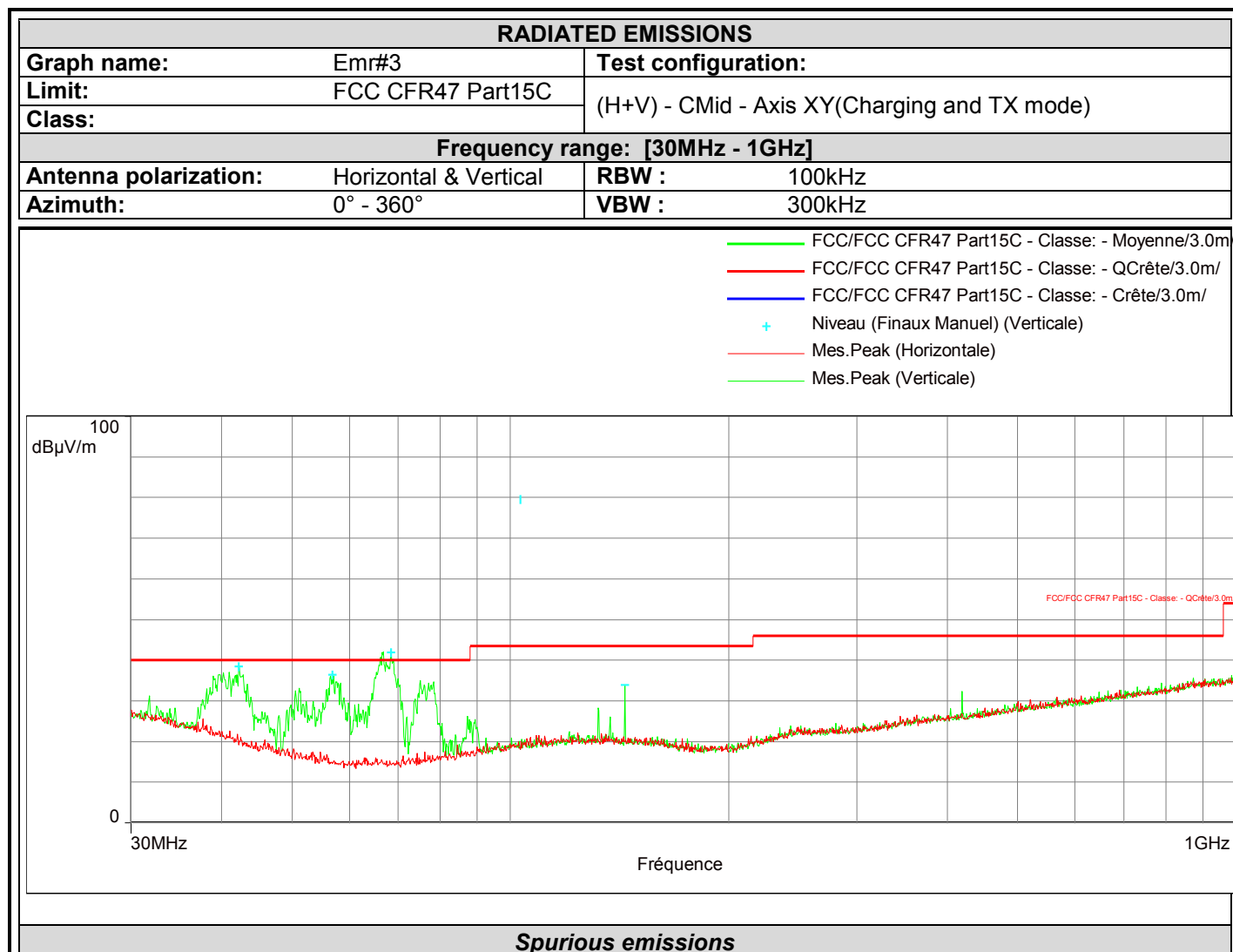
LCIE



Frequency (MHz)	Peak Level (dBµV/m)	Polarization
41.968	40.2	Vertical
66.550	41.6	Vertical
77.991	36.3	Vertical



L C I E



Frequency (MHz)	Peak Level (dBµV/m)	Polarization
42.223	38.4	Vertical
56.860	36.4	Vertical
68.437	41.9	Vertical
143.747	33.9	Vertical

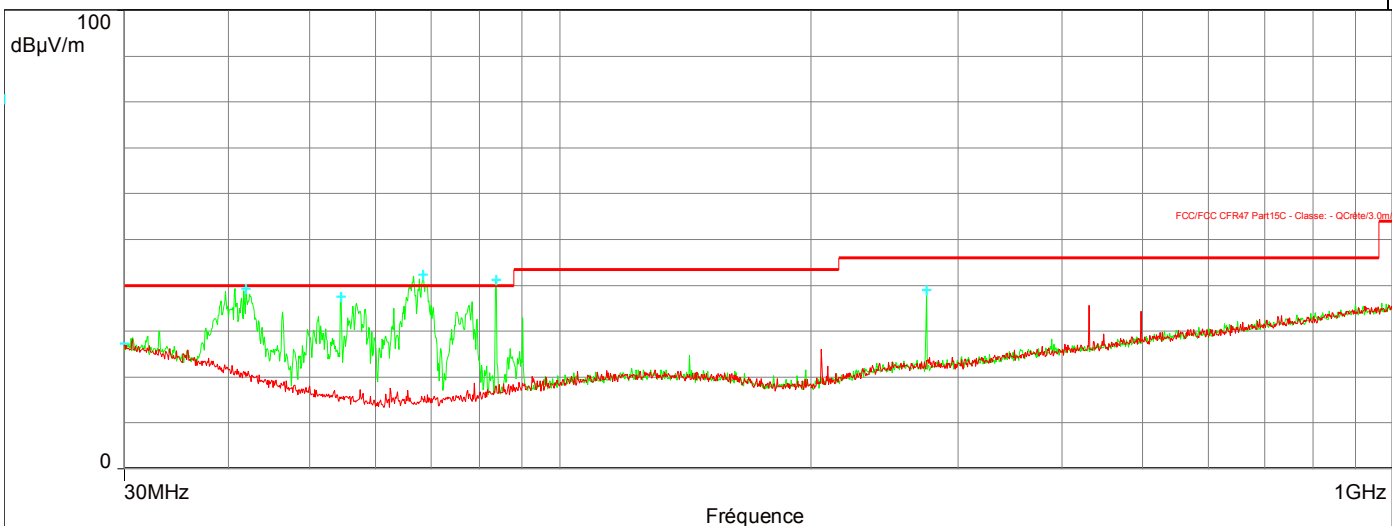


L C I E

RADIATED EMISSIONS

Graph name:	Emr#4	Test configuration:
Limit:	FCC CFR47 Part15C	(H+V) - CMid - - Axis Z - (Charging and TX mode)
Class:		
Frequency range: [30MHz - 1GHz]		
Antenna polarization:	Horizontal & Vertical	RBW : 100kHz
Azimuth:	0° - 360°	VBW : 300kHz

- FCC/FCC CFR47 Part15C - Classe: - Moyenne/3.0m/
- FCC/FCC CFR47 Part15C - Classe: - QCrête/3.0m/
- FCC/FCC CFR47 Part15C - Classe: - Crête/3.0m/
- + Niveau (Finaux Manuel) (Horizontale)
- + Niveau (Finaux Manuel) (Verticale)
- Mes.Peak (Horizontale)
- Mes.Peak (Verticale)

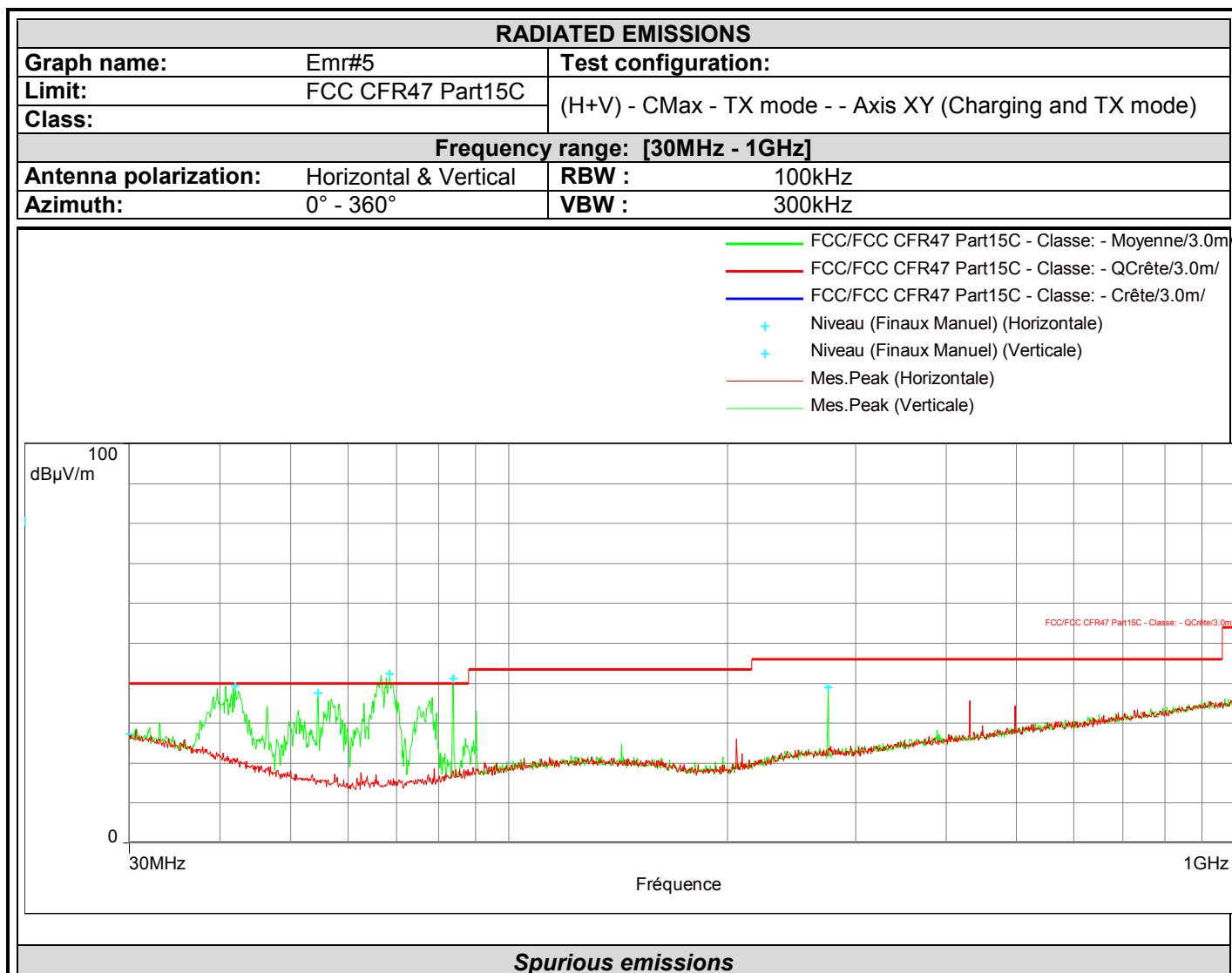


Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
30.000	27.3	Horizontal
41.968	39.4	Vertical
54.565	37.5	Vertical
68.471	42.3	Vertical
83.737	41.3	Vertical
275.080	39.0	Vertical



L C I E

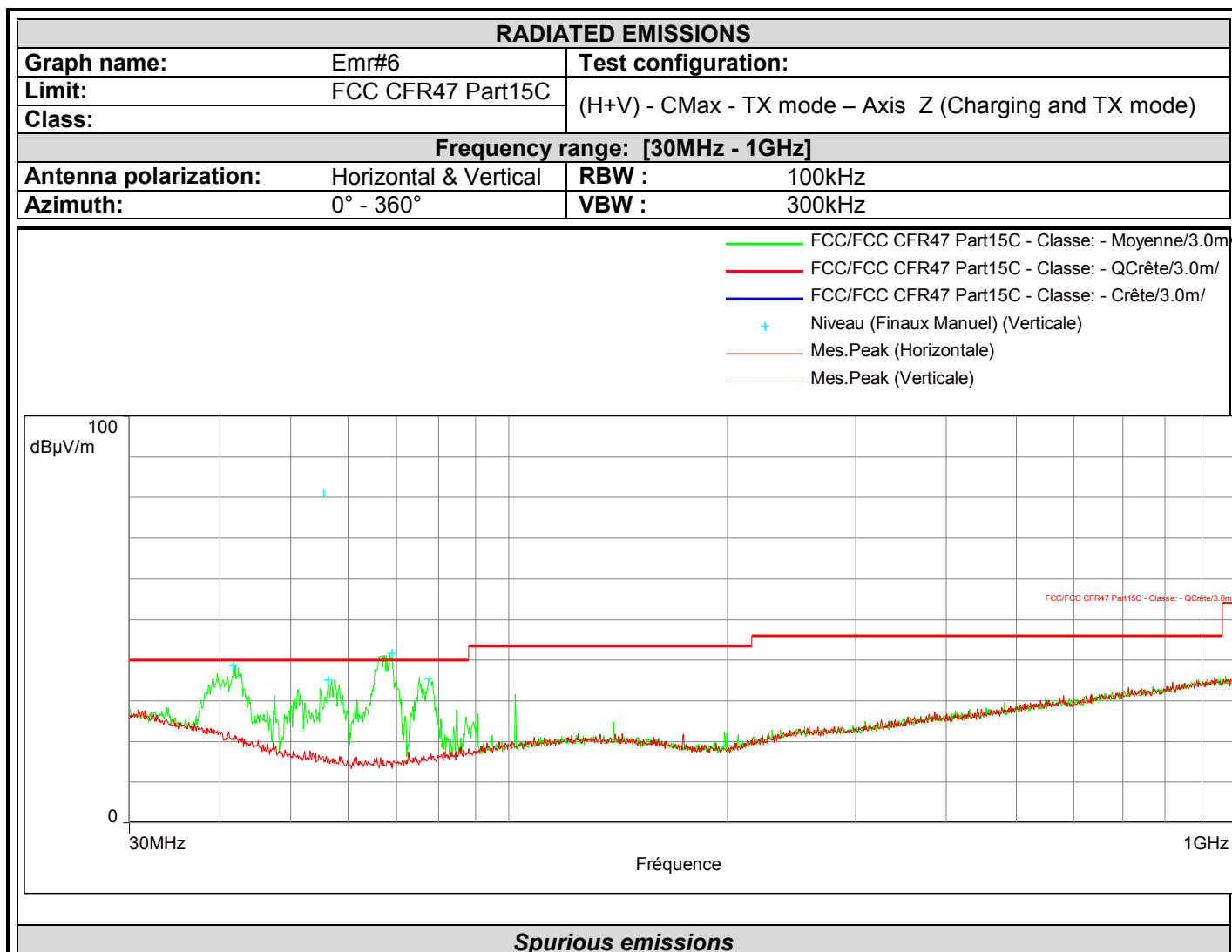


Spurious emissions

Frequency (MHz)	Peak Level (dBµV/m)	Polarization
30.000	27.3	Horizontal
41.968	39.4	Vertical
54.565	37.5	Vertical
68.471	42.3	Vertical
83.737	41.3	Vertical
275.080	39.0	Vertical



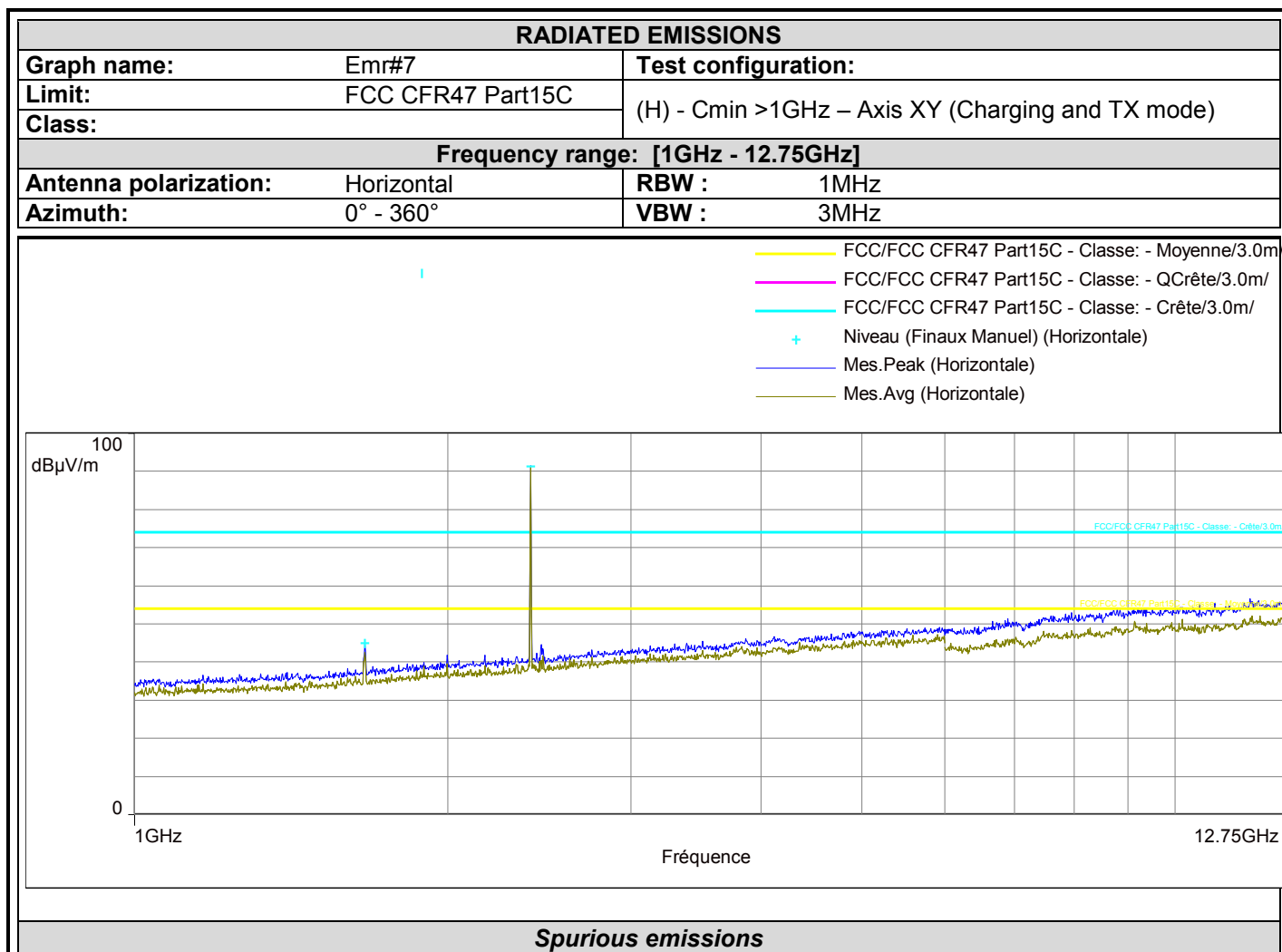
L C I E



Frequency (MHz)	Peak Level (dBµV/m)	Polarization
41.747	38.7	Vertical
56.401	35.2	Vertical
69.015	41.8	Vertical
77.481	35.5	Vertical

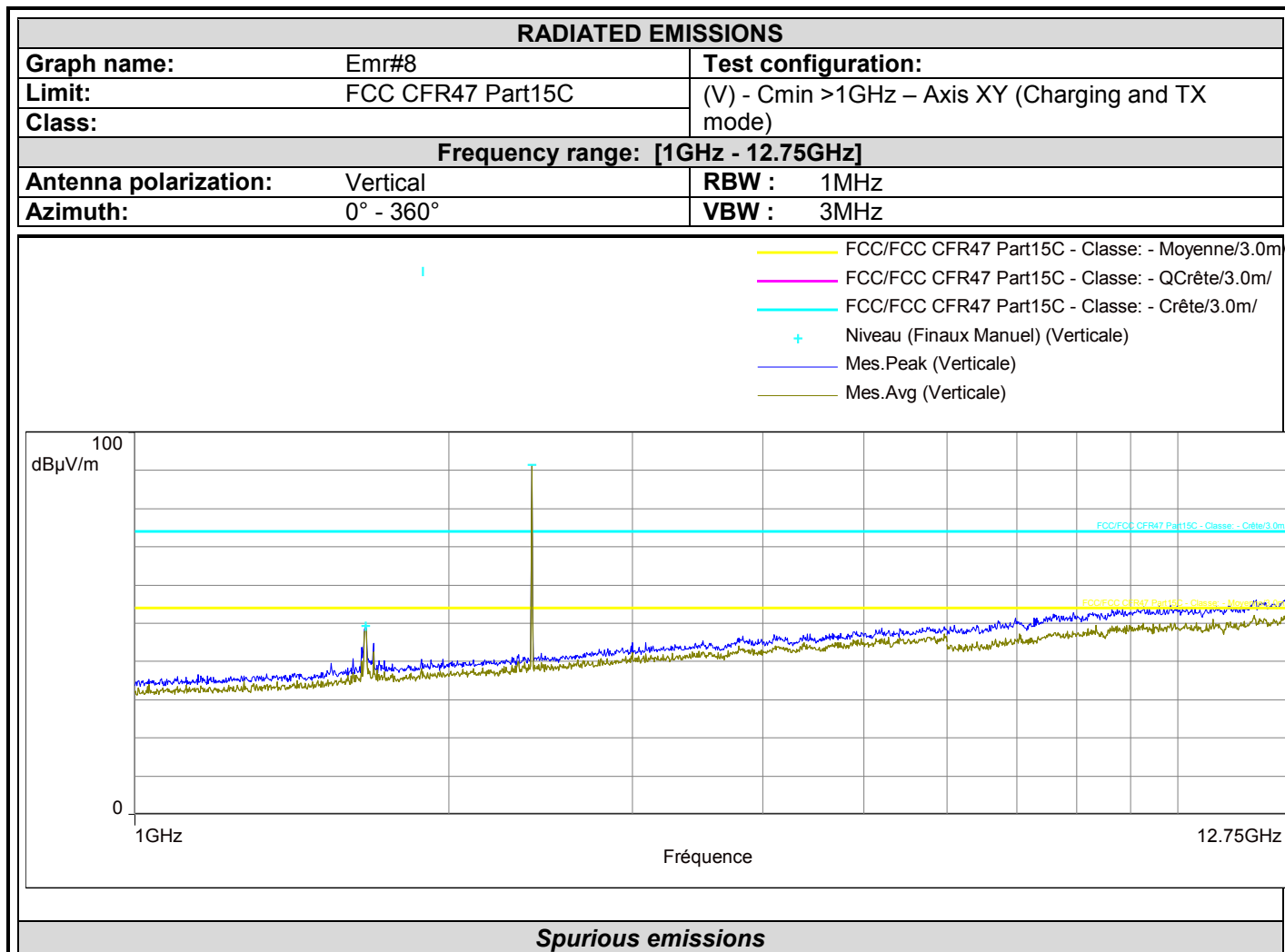


L C I E





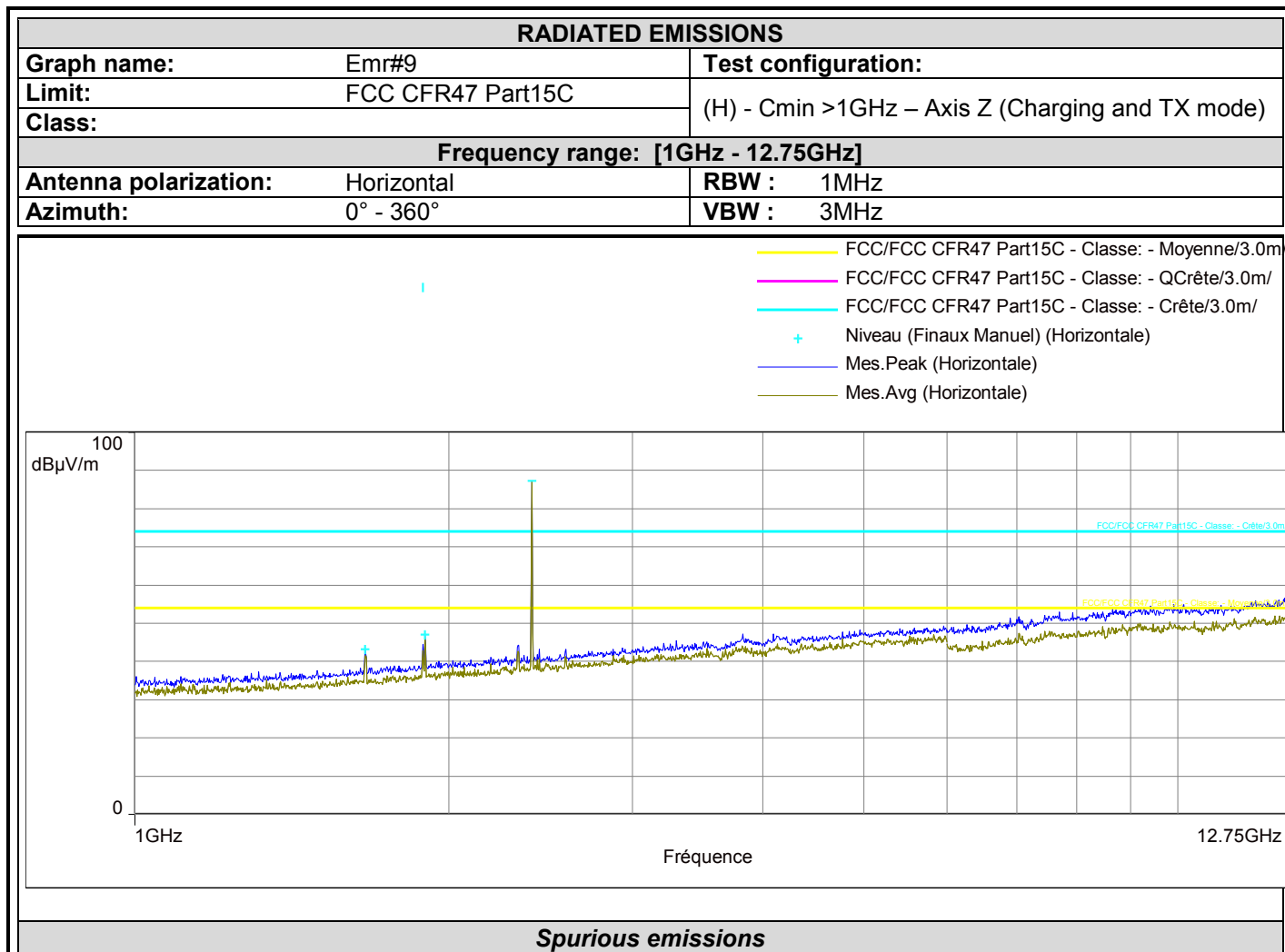
L C I E



Frequency (MHz)	Peak Level (dBµV/m)	Polarization
1664.500	49.3	Vertical
2401.750	91.4	Vertical



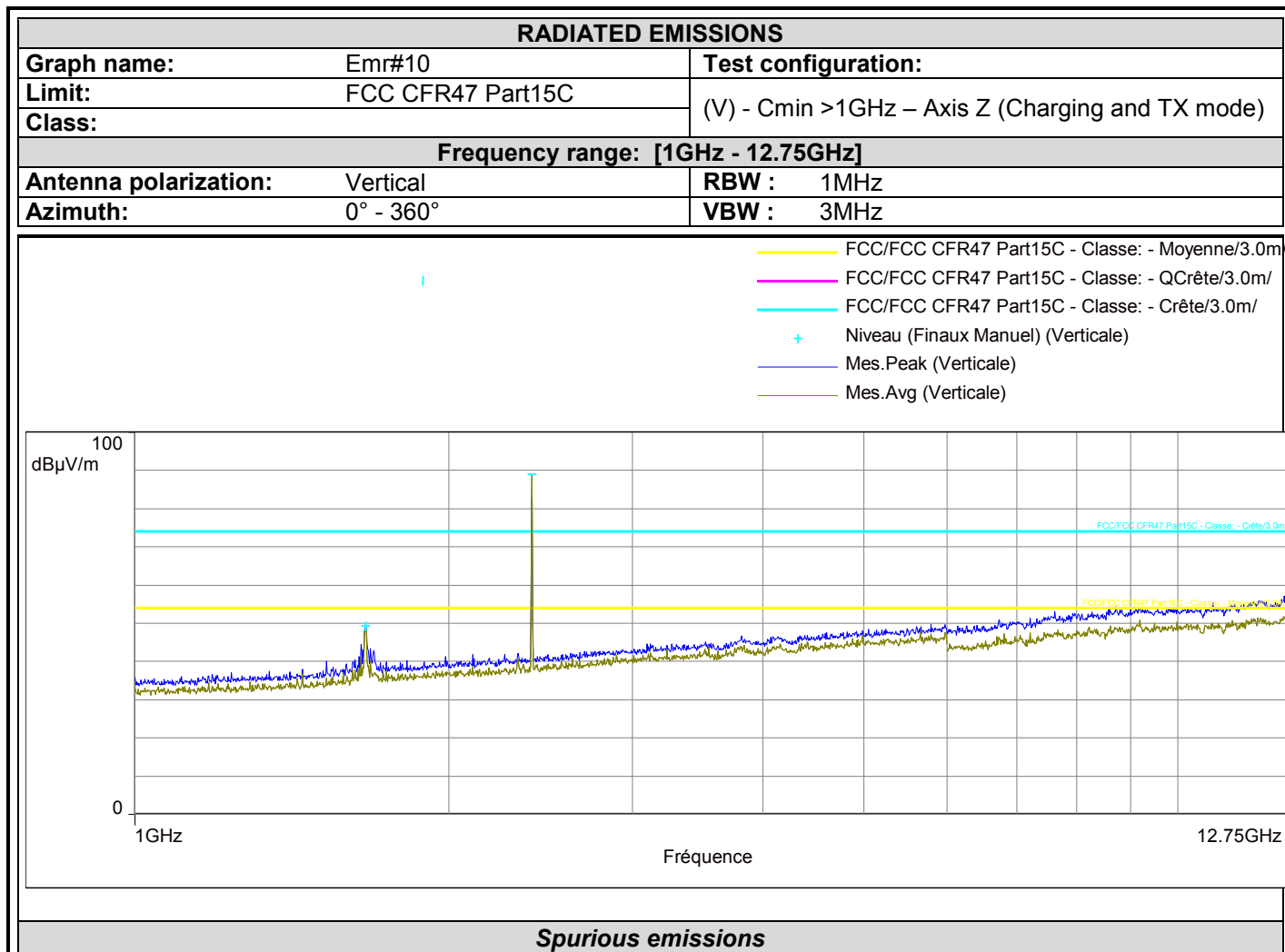
L C I E



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
1661.000	43.2	Horizontal
1897.500	47.1	Horizontal
2401.750	87.4	Horizontal



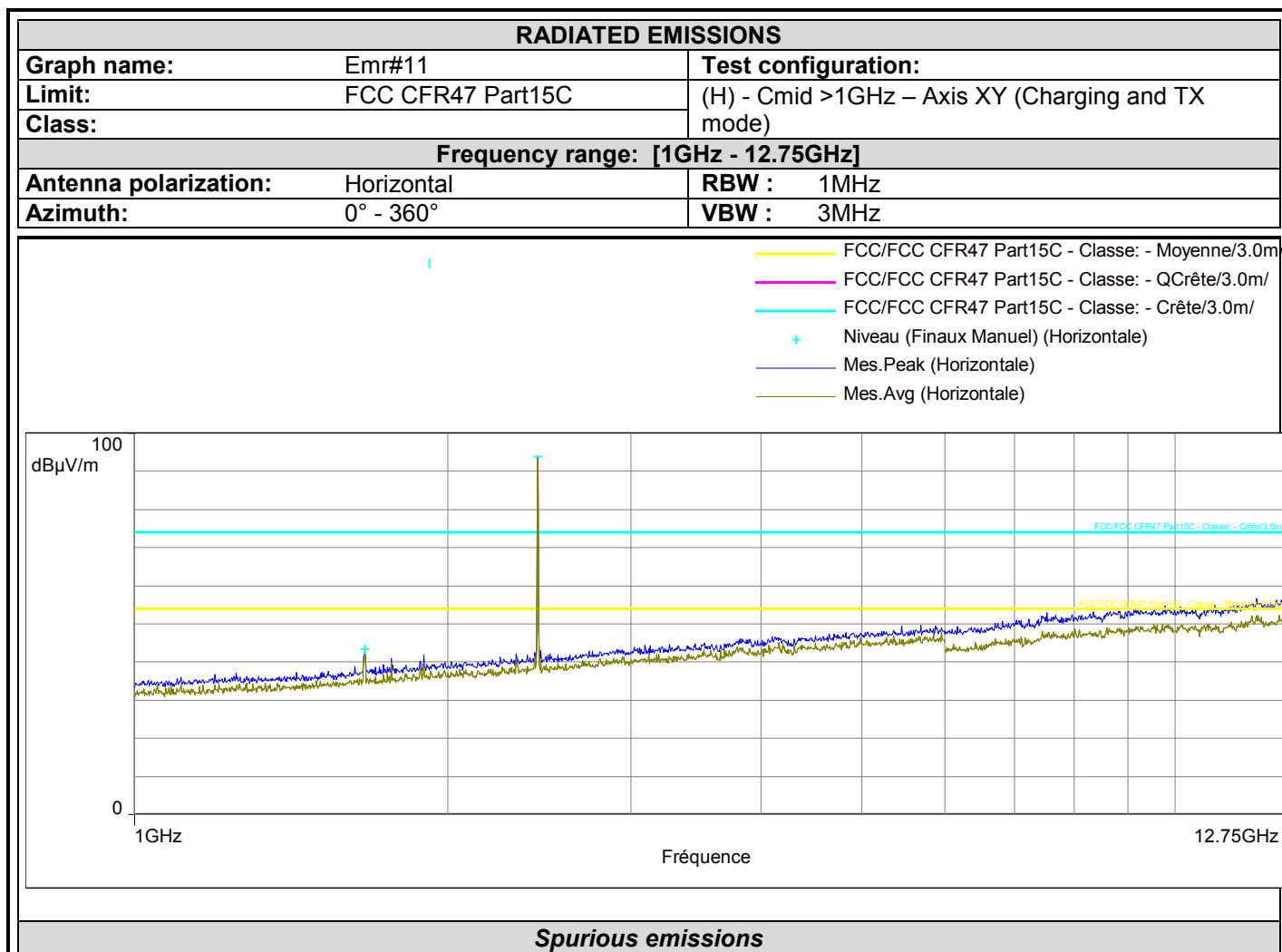
L C I E



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
1664.750	49.4	Vertical
2402.000	89.1	Vertical



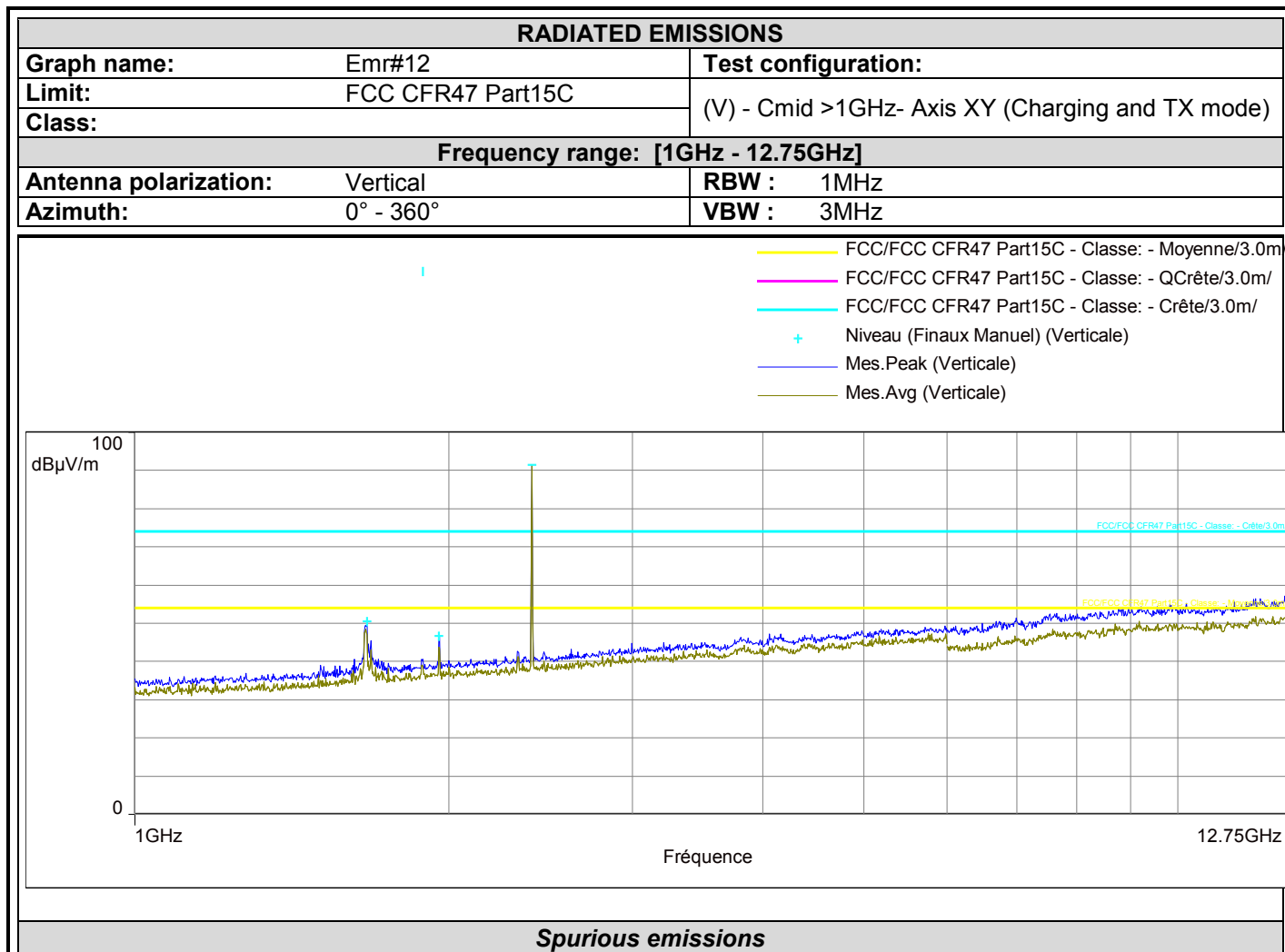
L C I E



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
1664.000	43.3	Horizontal
2439.750	94.0	Horizontal



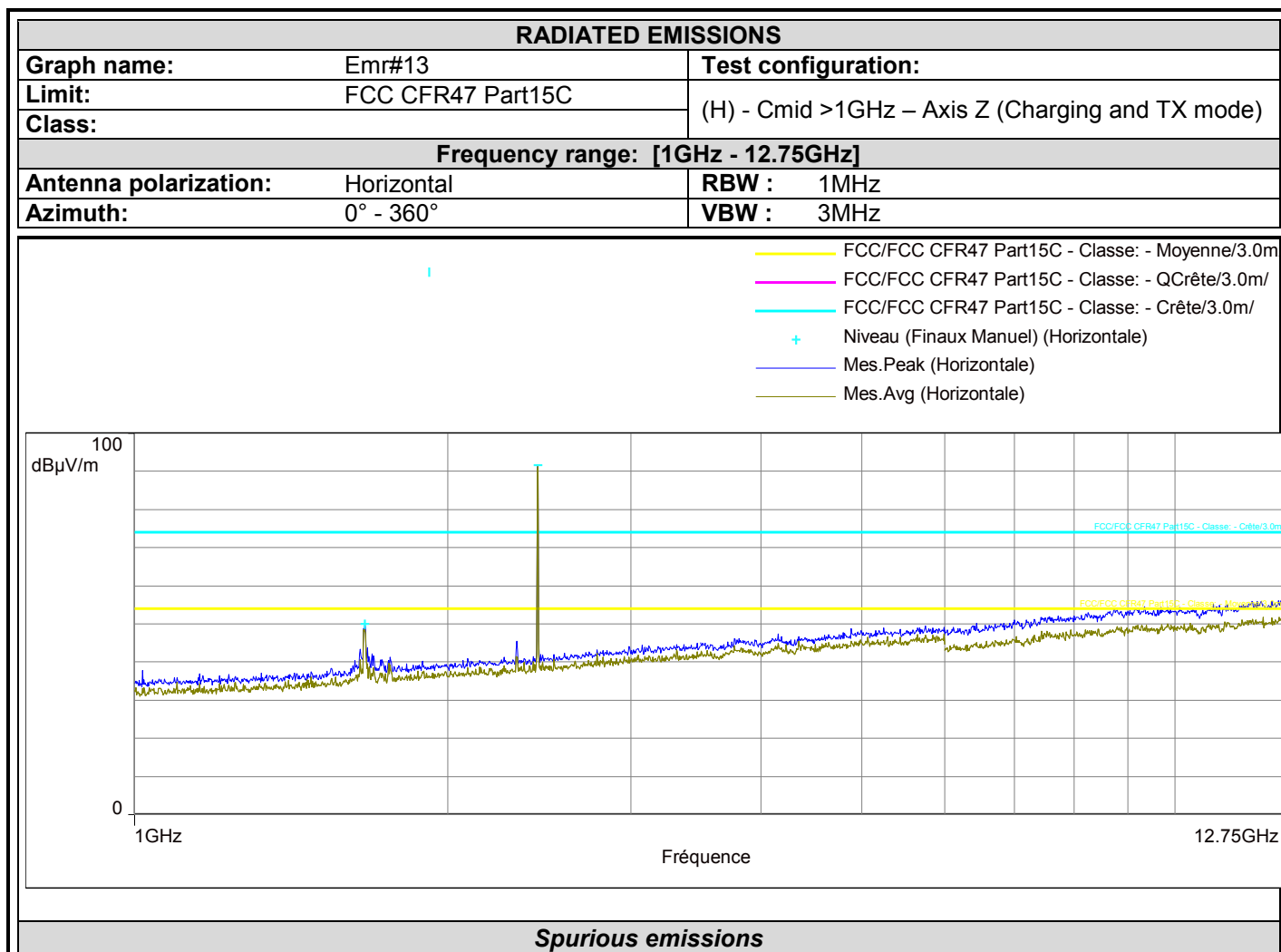
L C I E



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
1669.750	50.5	Vertical
1956.750	46.7	Vertical
2401.750	91.5	Vertical



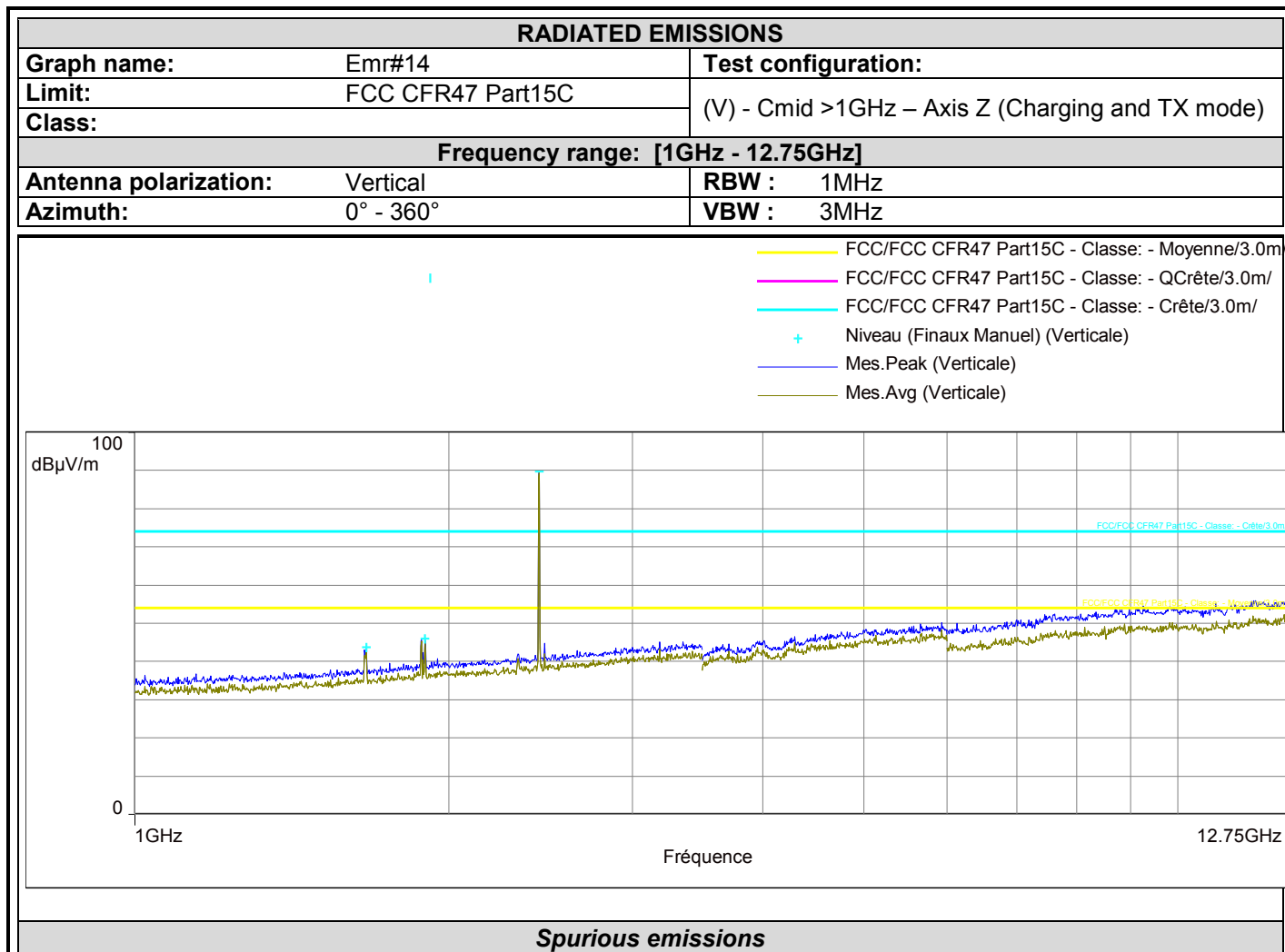
L C I E



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
1664.750	49.9	Horizontal
2440.250	91.7	Horizontal



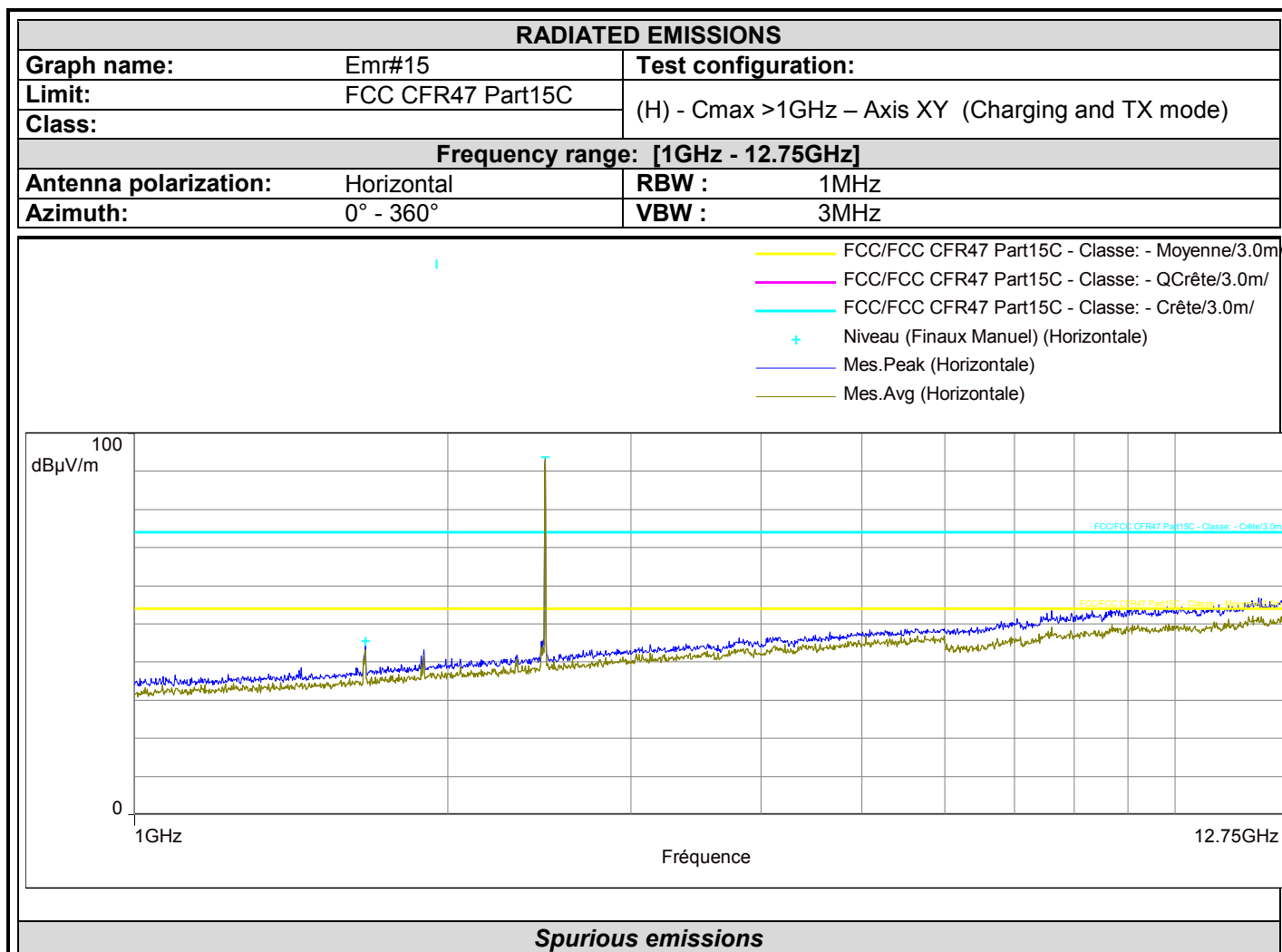
L C I E



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
1666.500	43.7	Vertical
1897.500	46.0	Vertical
2440.250	89.7	Vertical



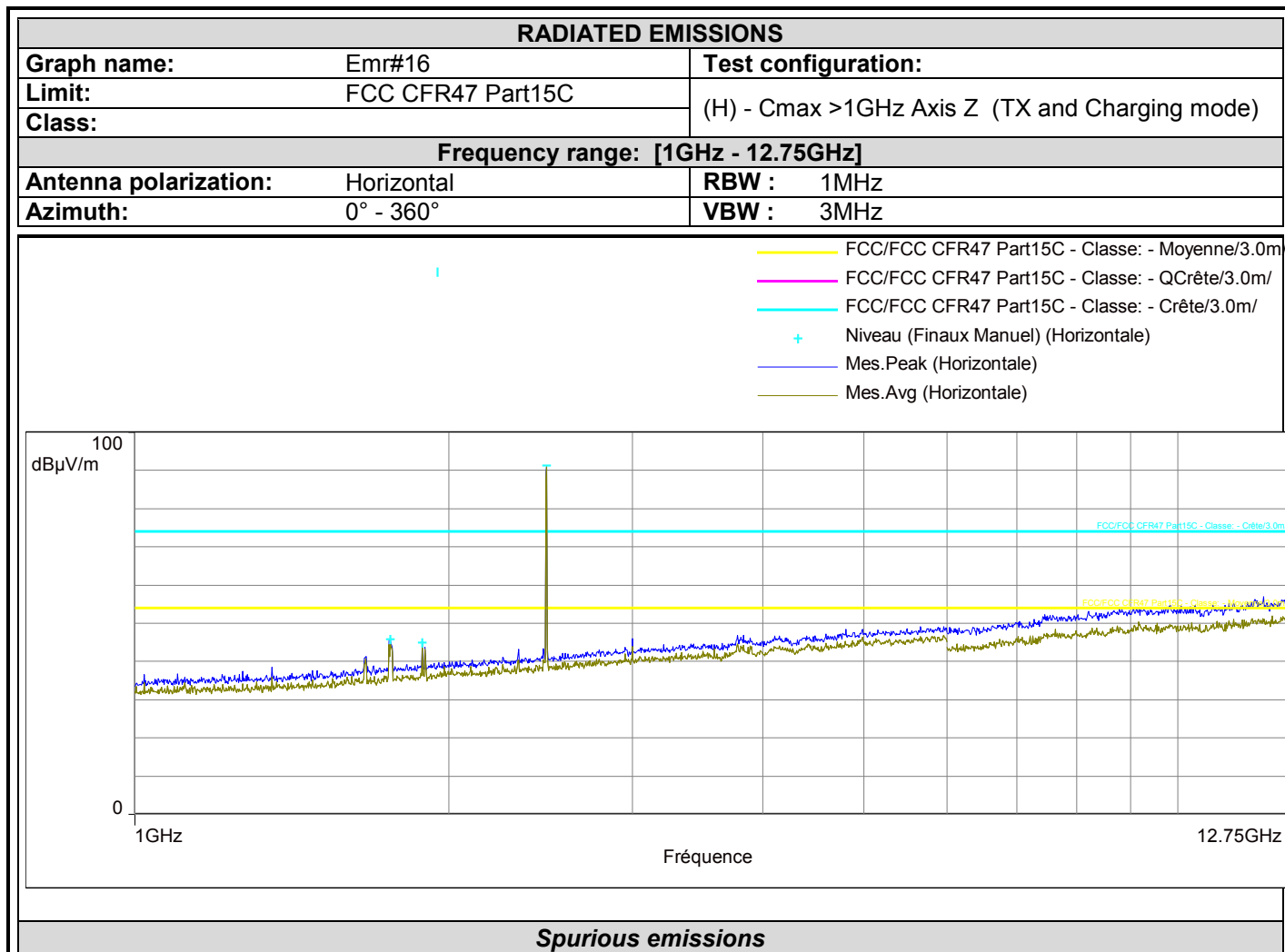
L C I E



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
1666.000	45.4	Horizontal
2479.750	93.8	Horizontal



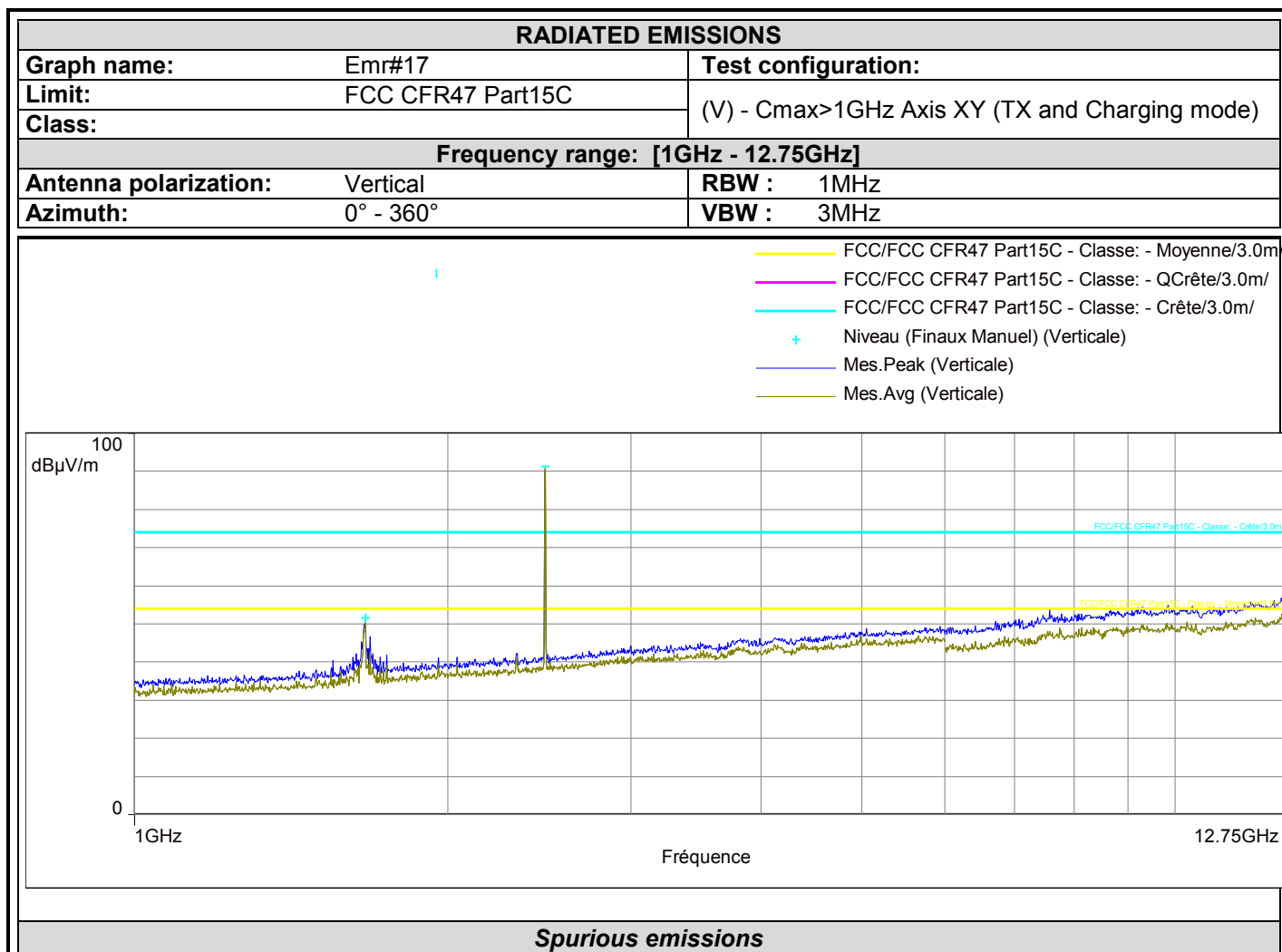
L C I E



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
1758.250	45.8	Horizontal
1885.250	44.9	Horizontal
2479.750	91.4	Horizontal



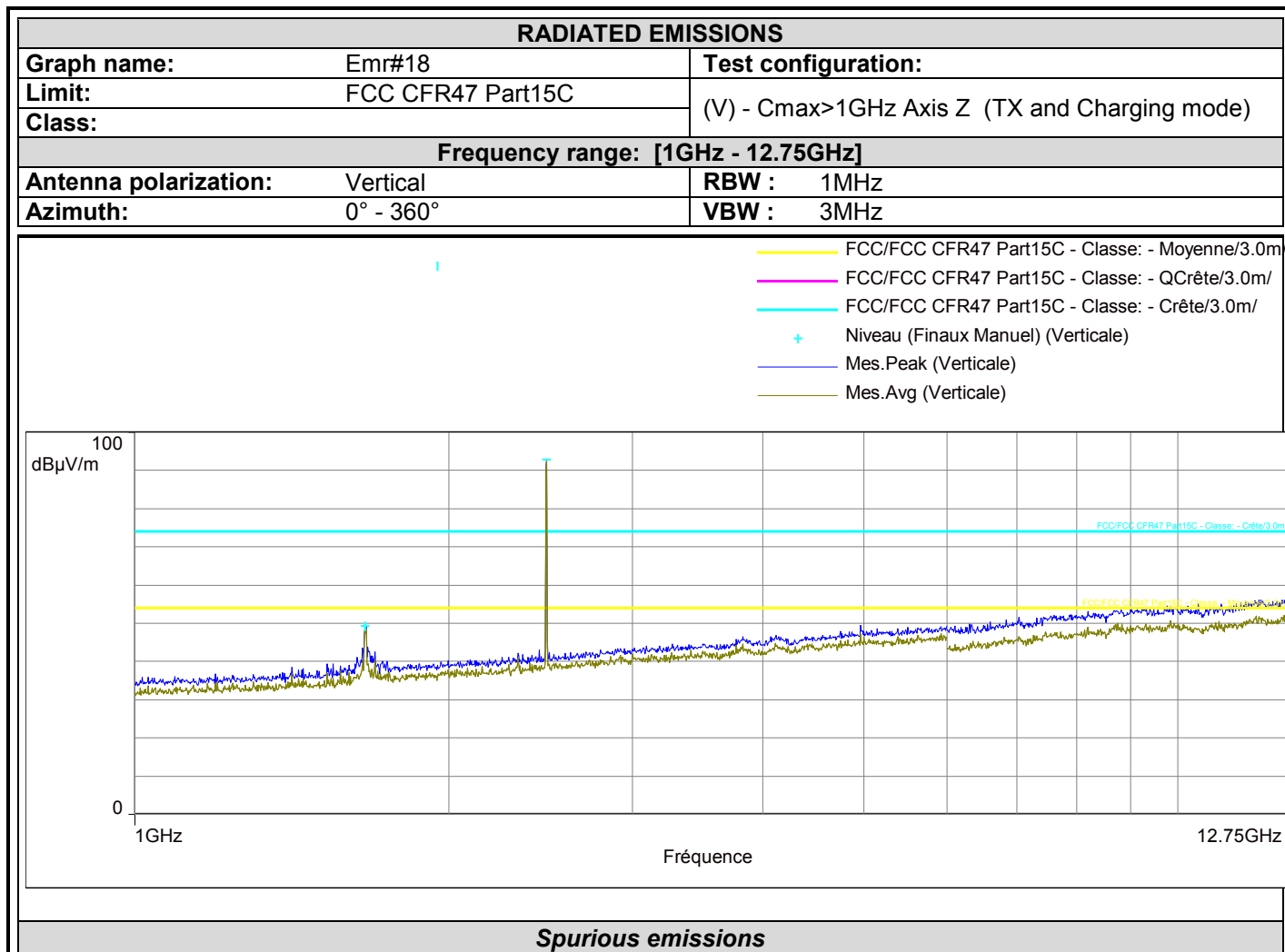
L C I E



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
1665.750	51.7	Vertical
2479.750	91.4	Vertical



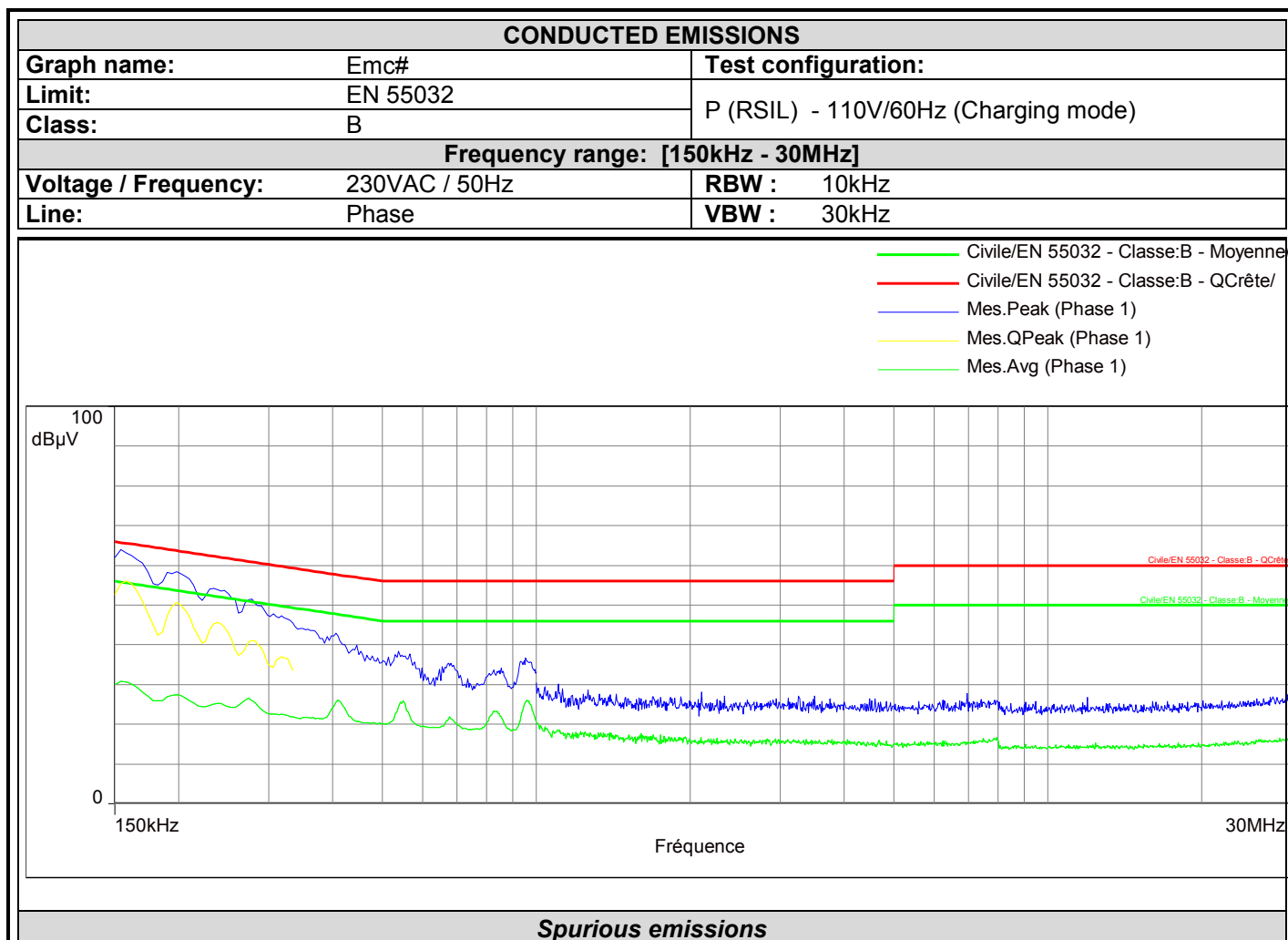
L C I E



Frequency (MHz)	Peak Level (dBμV/m)	Polarization
1662.250	49.3	Vertical
2479.750	92.9	Vertical

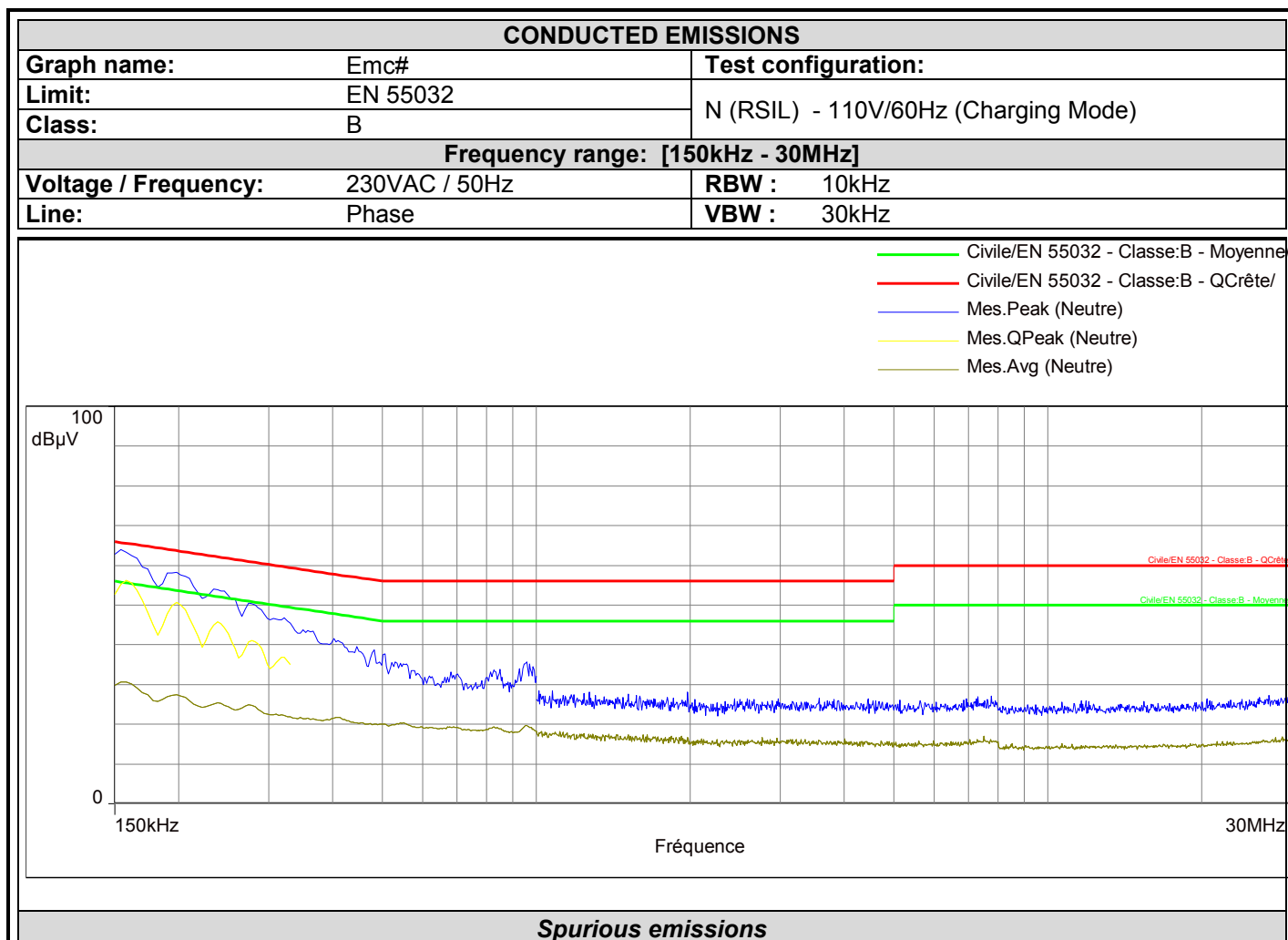


L C I E





L C I E



11. UNCERTAINTIES CHART

Type de mesure / Kind of measurement	Incertitude élargie laboratoire / Wide uncertainty laboratory (k=2) $\pm x$	Incertitude limite du CISPR / CISPR uncertainty limit $\pm y$
Mesure des perturbations conduites en tension sur le réseau d'énergie <i>Measurement of conducted disturbances in voltage on the power port</i>	3.51 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication <i>Measurement of conducted disturbances in voltage on the telecommunication port.</i>	3.26 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension <i>Measurement of discontinuous conducted disturbances in voltage</i>	3.45 dB	3.6 dB
Mesure des perturbations conduites en courant <i>Measurement of conducted disturbances in current</i>	3.09 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Moirans <i>Measurement of radiated electric field on the Moirans open area test site</i>	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.