



LCIE

TEST REPORT

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Version : 01

Subject	Electromagnetic compatibility and Radio spectrum Matters (ERM) tests according to standards: FCC CFR 47 Part 15, Subpart C (Partial Test) RSS-247 Issue 2.0
Issued to	CXIGNITED 286 Avenue de Pastré ZI les Paluds 13400 - AUBAGNE FRANCE
Apparatus under test	Hot Spot V2 TAGSYS SA TAGSYS RFID HOT SPOT V2 (Modular FCCID : QHKRTILHSCORE) 16540-A0
Conclusion	See Test Program chapter
Test date	June 26, 2019
Test location	MOIRANS
IC Test site	6500A-1 & 6500A-3
Composition of document	27 pages
Document issued on	July 8, 2019

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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 (Comments)
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 : (Declaration of provider)	Measure at 3m 30MHz-88MHz : 40 dBµV/m 88MHz-216MHz : 43.5 dBµV/m 216MHz-960MHz : 46.0 dBµV/m 960MHz-1GHz : 54.0 dBµV/m 1GHz – 25GHz: 54.0 dBµV/m (AV) 74.0 dBµV/m (PK)			☒ PASS ☐ FAIL ☐ NA ☐ NP
Maximum Peak Output Power CFR 47 §15.247 (b) RSS-247 §5.4	Limit: 21dBm Conducted or Radiated measurement			☒ PASS ☐ FAIL ☐ NA ☐ NP
Hopping Channel Separation CFR 47 §15.247 (a) (1) RSS-247 §5.1	Minimum between: Two-third 20dB Bandwidth or 25kHz Whichever is greater			☐ PASS ☐ FAIL ☐ NA ☒ NP
Number of Hopping Frequencies CFR 47 §15.247 (a) (1) (iii) RSS-247 §5.1	At least 15 channels used			☐ PASS ☐ FAIL ☐ NA ☒ NP
Time of Occupancy (Dwell Time) CFR 47 §15.247 (a) (1) (iii) RSS-247 §5.1	Maximum 0.4 sec within 31.6sec			☐ PASS ☐ FAIL ☐ NA ☒ NP
Band Edge Measurement CFR 47 §15.209 (a) CFR 47 §15.247 (d) RSS-247 §5.5	Limit: -20dBc			☒ 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. JUSTIFICATION

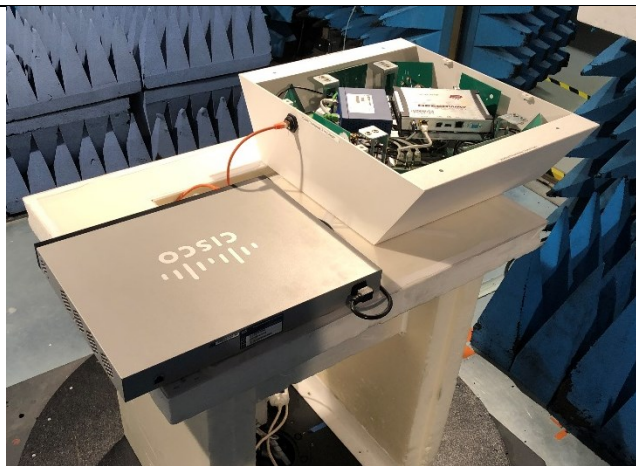
This test report and results shows that modification of type of antenna on modular FCCID: QHKRTILHSCORE is without impact on precedent results.

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES):

Equipment under test (EUT):

HOT SPOT V2 (Modular FCCID : QHKRTILHSCORE)

Serial Number: 16540-A0



Photography of EUT

Power supply:

During all the tests, EUT is supplied by V_{nom} : 56VDC

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

Name	Type	Rating	Reference / Sn	Comments
Supply1	☒ AC ☐ DC ☐ Battery	100-240VAC to 56VDC 2A to 1.1A 50-60Hz	CISCO:SF350-48MP/ DNI214900RB	-

Inputs/outputs - EUT:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Supply1	RJ45	1.5	☐	☒	☒	-



Inputs/outputs – Power Supply:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Supply1	AC	2.0	☐	☐	☒	
Access1	RJ45 Input (5 to 24)	10.0	☐	☒	☒	Only one input and output used (the other aren't connected)
Access2	RJ45 Output (29 to 48)	1.5	☐	☒	☒	Only one output used (the other aren't connected)
Access3	RJ45 Input (1 up to 4)	-	☐	☒	☐	Not used
Access4	RJ45 (G1 to G2)	-	☐	☒	☐	Not used
Access5	USB	-	☐	☒	☐	Not used
Access6	RJ-45+SFP (combo ports 1 to 4)	-	☐	☒	☐	Not used

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Power Node V2	-	16577-A0	-
Laptop	Dell latitude	-	-

Equipment information:

Frequency band:	[2400 – 2483.5] MHz		
Spectrum Modulation:	☒ FHSS		
Number of Channel:	Minimum:	15	
Antenna Type:	☒ Integral	☐ External	☐ Dedicated
Antenna connector:	☒ Yes	☐ No	☐ Temporary for test
Transmit chains:	☐ 1		
	Single antenna		
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 DAA)	☐ Off mode	☐ No
	Clear Channel Assessment Time:		Xµs
Duty cycle:	☒ Continuous duty	☐ Intermittent duty	☐ 100% duty
Equipment type:	☒ Production model		☐ Pre-production model
Type of power source:	☐ AC power supply	☒ DC power supply	☐ Battery
Operating voltage range:	Vnom:	☐ 110V/60Hz	☒ 54Vdc

Channel Plan :

Frequency Range 1
Frequency Range 2
Frequency Range 3

Cmin
Cmid
Cmax

2400.4
2441.7
2472.9



2.1. EUT CONFIGURATION

The EUT is set in the following modes during tests:

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

All tests are performed at Cmin, Cmid and Cmax.

2.2. EQUIPMENT MODIFICATIONS

☒ None ☐ Modification:

2.3. 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.

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

2.4. 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. RADIATED EMISSION DATA

3.1. ENVIRONMENTAL CONDITIONS

Date of test : June 26, 2019
Test performed by : Gaëtan DESCHAMPS
Atmospheric pressure (hPa) : 990
Relative humidity (%) : 30
Ambient temperature (°C) : 25

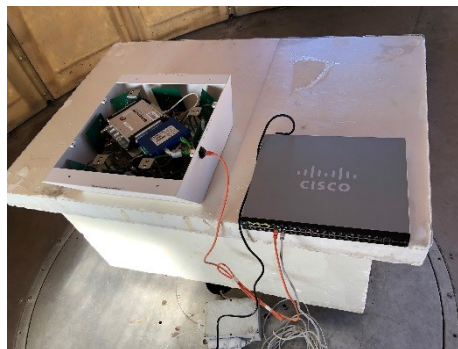
3.2. TEST SETUP

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.

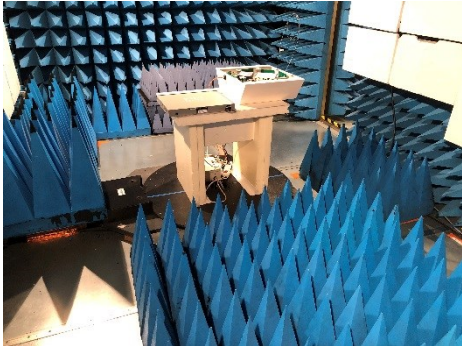
The EUT and auxiliaries are set:

- ☒ 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)

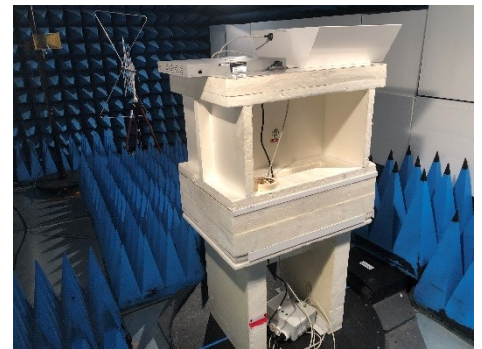
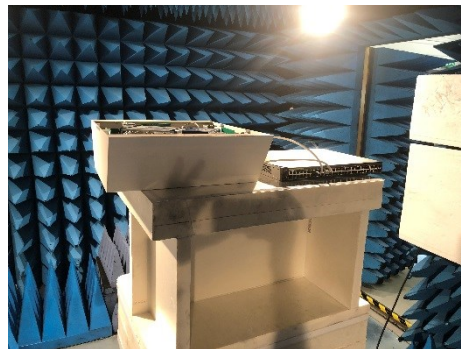
The EUT is powered by V_{nom} .



Test setup on OATS



Test setup in anechoic chamber <1GHz



Test setup in anechoic chamber >1GHz

3.3. 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 25GHz. 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 25GHz.

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.

3.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Amplifier 9kHz - 40GHz	LCIE SUD EST	—	A7102082	10/18	10/19
Antenna Bi-log	CHASE	CBL6111A	C2040051	01/18	03/19
Antenna Bi-log	CHASE	CBL6111A	C2040172	09/18	09/20
Antenna horn 18GHz	EMCO	3115	C2042029	09/18	09/20
Emission Cable	SUCOFLEX	6GHz	A5329061	03/18	03/19
Emission Cable C3	-	6GHz	A5329069	11/18	11/19
Cable (OATS)	-	1GHz	A5329623	03/18	03/19
Cable SMA Emission C3	-	6GHz	A5329637	02/18	05/19
Cable SMA 30cm coudé	TELEDYNE	26GHz	A5329873	01/19	01/20
Cable SMA 1m	TELEDYNE	26GHz	A5329874	01/19	01/20
Cable SMA 3.3m	TELEDYNE	26GHz	A5329875	01/19	01/20
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	-	-
High Pass (1-15GHz)	WAINRIGHT	WHKX 1.03/15G-10SS	A7484035	05/17	05/19
OATS	-	-	F2000409	02/19	02/20
Receiver 20Hz – 8GHz	ROHDE & SCHWARZ	ESU8	A2642019	12/17	03/19
Spectrum analyzer	ROHDE & SCHWARZ	FSU 26	A4060058	06/18	06/19
BAT EMC	NEXIO	v3.17.0.10	L1000115	-	-
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	08/18	08/20
Turntable chamber (Cage#3)	ETS Lingren	Model 2165	F2000371	-	-
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	-	-
Table C3	LCIE	-	F2000461	-	-
Rehausse Table C3	LCIE	-	F2000511	-	-
Turntable controller (Cage#3)	ETS Lingren	Model 2090	F2000444	-	-

3.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

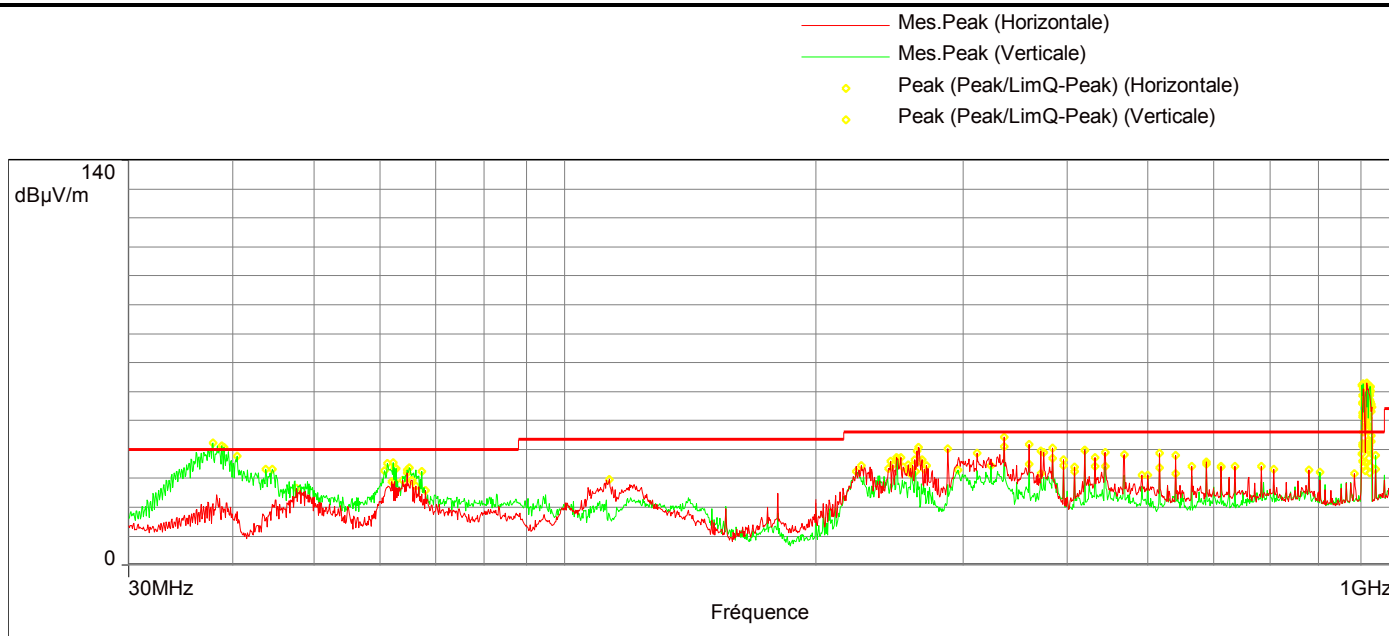
3.6. TEST RESULTS

See graphs:

Graph identifier	Polarization	EUT position	Comments
Emr# 1	H/V	Axis XY	- See below

RADIATED EMISSIONS

Graph name:	Emr#1	Test configuration:
Limit:	FCC CFR47 Part15C	HS (H+V) - Configuration 1 <1GHz
Class:	B	
Frequency range: [30MHz - 1GHz]		
Antenna polarization:	Horizontal & Vertical	RBW : 100kHz
Azimuth:	0° - 360°	VBW : 300kHz



Spurious emissions

Frequency (MHz)	Peak (dBµV/m)	LimQP (dBµV/m)	Peak-LimQP (dB)	Polarization	Correction (dB)
47.646	26.6	40.0	-13.4	Horizontal	-23.9
62.045	28.8	40.0	-11.2	Horizontal	-27.2
62.538	28.8	40.0	-11.2	Horizontal	-27.2
63.949	29.4	40.0	-10.6	Horizontal	-27.1
64.680	31.8	40.0	-8.2	Horizontal	-27.1
65.428	29.2	40.0	-10.8	Horizontal	-27.1
65.632	29.3	40.0	-10.7	Horizontal	-27.1
66.261	27.3	40.0	-12.7	Horizontal	-27.1
68.029	25.8	40.0	-14.2	Horizontal	-27.0
113.096	29.5	43.5	-14.0	Horizontal	-22.3
226.880	34.3	46.0	-11.7	Horizontal	-21.2
244.520	33.5	46.0	-12.5	Horizontal	-20.1
245.760	35.9	46.0	-10.1	Horizontal	-20.0
247.400	34.7	46.0	-11.3	Horizontal	-19.9
250.000	37.2	46.0	-8.8	Horizontal	-19.8
250.560	35.5	46.0	-10.5	Horizontal	-19.8
251.040	36.6	46.0	-9.4	Horizontal	-19.8
252.720	37.2	46.0	-8.8	Horizontal	-19.7
254.400	33.9	46.0	-12.1	Horizontal	-19.7



Frequency (MHz)	Peak (dB μ V/m)	LimQP (dB μ V/m)	Peak-LimQP (dB)	Polarization	Correction (dB)
257.760	34.8	46.0	-11.2	Horizontal	-19.7
258.680	32.4	46.0	-13.6	Horizontal	-19.7
259.440	33.3	46.0	-12.7	Horizontal	-19.6
261.080	34.3	46.0	-11.7	Horizontal	-19.6
262.520	36.4	46.0	-9.6	Horizontal	-19.6
264.480	39.4	46.0	-6.6	Horizontal	-19.6
265.640	40.8	46.0	-5.2	Horizontal	-19.6
266.320	36.0	46.0	-10.0	Horizontal	-19.6
267.880	36.4	46.0	-9.6	Horizontal	-19.6
269.640	33.2	46.0	-12.8	Horizontal	-19.5
271.280	34.3	46.0	-11.7	Horizontal	-19.5
288.000	40.2	46.0	-5.8	Horizontal	-19.3
312.000	38.6	46.0	-7.4	Horizontal	-18.8
336.000	44.3	46.0	-1.7	Horizontal	-18.2
360.040	41.7	46.0	-4.3	Horizontal	-17.7
372.000	39.4	46.0	-6.6	Horizontal	-17.4
375.040	38.8	46.0	-7.2	Horizontal	-17.3
384.000	40.5	46.0	-5.5	Horizontal	-17.1
396.000	36.3	46.0	-9.7	Horizontal	-16.9
408.040	33.8	46.0	-12.2	Horizontal	-16.6
420.040	39.8	46.0	-6.2	Horizontal	-16.4
432.040	37.2	46.0	-8.8	Horizontal	-16.1
444.040	38.9	46.0	-7.1	Horizontal	-15.8
468.040	38.2	46.0	-7.8	Horizontal	-15.4
492.040	31.2	46.0	-14.8	Horizontal	-14.9
500.040	31.1	46.0	-14.9	Horizontal	-14.8
516.040	38.6	46.0	-7.4	Horizontal	-14.4
540.040	37.9	46.0	-8.1	Horizontal	-14.0
564.040	34.2	46.0	-11.8	Horizontal	-13.5
588.040	35.6	46.0	-10.4	Horizontal	-13.0
612.000	34.2	46.0	-11.8	Horizontal	-12.7
636.040	34.2	46.0	-11.8	Horizontal	-12.5
684.040	34.0	46.0	-12.0	Horizontal	-12.2
708.040	33.2	46.0	-12.8	Horizontal	-11.9
780.040	32.8	46.0	-13.2	Horizontal	-10.7
883.600	31.6	46.0	-14.4	Horizontal	-9.5
902.760	38.5	46.0	-7.5	Horizontal	-9.3
903.280	51.3	46.0	5.3	Horizontal	-9.3
903.760	52.7	46.0	6.7	Horizontal	-9.3
904.280	41.3	46.0	-4.7	Horizontal	-9.2
904.760	35.9	46.0	-10.1	Horizontal	-9.2
905.280	60.8	46.0	14.8	Horizontal	-9.2
905.760	46.0	46.0	0.0	Horizontal	-9.2
906.760	40.6	46.0	-5.4	Horizontal	-9.2
907.280	55.7	46.0	9.7	Horizontal	-9.2
907.760	60.6	46.0	14.6	Horizontal	-9.2
908.240	40.9	46.0	-5.1	Horizontal	-9.2
908.760	49.0	46.0	3.0	Horizontal	-9.2
910.760	32.5	46.0	-13.5	Horizontal	-9.1
911.760	35.6	46.0	-10.4	Horizontal	-9.1
912.280	55.6	46.0	9.6	Horizontal	-9.1
912.760	57.6	46.0	11.6	Horizontal	-9.1
913.280	57.7	46.0	11.7	Horizontal	-9.1
913.760	52.7	46.0	6.7	Horizontal	-9.1
914.760	61.1	46.0	15.1	Horizontal	-9.0
915.280	47.3	46.0	1.3	Horizontal	-9.0
915.760	63.0	46.0	17.0	Horizontal	-9.0
916.280	48.6	46.0	2.6	Horizontal	-9.0
916.760	60.8	46.0	14.8	Horizontal	-9.0
917.280	46.5	46.0	0.5	Horizontal	-9.0
917.760	55.1	46.0	9.1	Horizontal	-9.0
918.280	55.1	46.0	9.1	Horizontal	-9.0



Frequency (MHz)	Peak (dB μ V/m)	LimQP (dB μ V/m)	Peak-LimQP (dB)	Polarization	Correction (dB)
918.760	60.9	46.0	14.9	Horizontal	-9.0
919.760	59.2	46.0	13.2	Horizontal	-9.0
920.280	37.0	46.0	-9.0	Horizontal	-9.0
920.760	54.3	46.0	8.3	Horizontal	-8.9
921.760	57.2	46.0	11.2	Horizontal	-8.9
922.280	58.7	46.0	12.7	Horizontal	-8.9
922.760	31.8	46.0	-14.2	Horizontal	-8.9
923.760	56.3	46.0	10.3	Horizontal	-8.9
924.280	54.7	46.0	8.7	Horizontal	-8.9
925.760	53.0	46.0	7.0	Horizontal	-8.8
926.280	42.8	46.0	-3.2	Horizontal	-8.8
926.760	44.6	46.0	-1.4	Horizontal	-8.8
927.280	54.5	46.0	8.5	Horizontal	-8.8
937.560	33.1	46.0	-12.9	Horizontal	-8.6
37.854	42.2	40.0	2.2	Vertical	-18.3
38.806	41.3	40.0	1.3	Vertical	-18.7
39.044	40.8	40.0	0.8	Vertical	-18.8
40.455	37.8	40.0	-2.2	Vertical	-19.4
43.821	33.0	40.0	-7.0	Vertical	-21.5
44.586	33.2	40.0	-6.8	Vertical	-22.0
60.821	32.6	40.0	-7.4	Vertical	-27.2
61.314	35.2	40.0	-4.8	Vertical	-27.2
62.300	35.5	40.0	-4.5	Vertical	-27.2
62.521	33.6	40.0	-6.4	Vertical	-27.2
62.776	33.4	40.0	-6.6	Vertical	-27.2
64.646	33.0	40.0	-7.0	Vertical	-27.1
65.156	33.5	40.0	-6.5	Vertical	-27.1
67.400	32.3	40.0	-7.7	Vertical	-27.0
223.520	32.4	46.0	-13.6	Vertical	-21.4
250.000	36.4	46.0	-9.6	Vertical	-19.8
260.080	31.5	46.0	-14.5	Vertical	-19.6
260.600	32.2	46.0	-13.8	Vertical	-19.6
263.000	32.4	46.0	-13.6	Vertical	-19.6
295.920	32.8	46.0	-13.2	Vertical	-19.2
324.000	34.3	46.0	-11.7	Vertical	-18.5
336.000	41.1	46.0	-4.9	Vertical	-18.2
360.000	35.0	46.0	-11.0	Vertical	-17.7
372.040	31.7	46.0	-14.3	Vertical	-17.4
384.040	37.0	46.0	-9.0	Vertical	-17.1
396.040	34.3	46.0	-11.7	Vertical	-16.9
408.040	32.4	46.0	-13.6	Vertical	-16.6
420.040	39.8	46.0	-6.2	Vertical	-16.4
432.040	34.1	46.0	-11.9	Vertical	-16.1
444.040	34.1	46.0	-11.9	Vertical	-15.8
516.040	33.5	46.0	-12.5	Vertical	-14.4
540.040	31.6	46.0	-14.4	Vertical	-14.0
588.040	34.9	46.0	-11.1	Vertical	-13.0
612.000	33.8	46.0	-12.2	Vertical	-12.7
804.040	32.1	46.0	-13.9	Vertical	-10.3
902.760	62.2	46.0	16.2	Vertical	-9.3
903.280	42.0	46.0	-4.0	Vertical	-9.3
903.760	55.8	46.0	9.8	Vertical	-9.3
904.280	58.7	46.0	12.7	Vertical	-9.2
904.760	56.1	46.0	10.1	Vertical	-9.2
905.280	62.8	46.0	16.8	Vertical	-9.2
906.280	51.6	46.0	5.6	Vertical	-9.2
906.760	34.1	46.0	-11.9	Vertical	-9.2
907.280	52.8	46.0	6.8	Vertical	-9.2
908.280	40.5	46.0	-5.5	Vertical	-9.2
909.280	57.9	46.0	11.9	Vertical	-9.2
909.760	57.2	46.0	11.2	Vertical	-9.2
910.760	40.7	46.0	-5.3	Vertical	-9.1



Frequency (MHz)	Peak (dB μ V/m)	LimQP (dB μ V/m)	Peak-LimQP (dB)	Polarization	Correction (dB)
911.280	59.9	46.0	13.9	Vertical	-9.1
911.760	56.0	46.0	10.0	Vertical	-9.1
912.280	50.2	46.0	4.2	Vertical	-9.1
912.760	48.3	46.0	2.3	Vertical	-9.1
913.280	58.1	46.0	12.1	Vertical	-9.1
913.760	54.8	46.0	8.8	Vertical	-9.1
914.280	54.6	46.0	8.6	Vertical	-9.1
914.760	51.6	46.0	5.6	Vertical	-9.0
915.280	53.7	46.0	7.7	Vertical	-9.0
915.760	41.6	46.0	-4.4	Vertical	-9.0
916.760	62.2	46.0	16.2	Vertical	-9.0
917.280	54.3	46.0	8.3	Vertical	-9.0
917.760	50.9	46.0	4.9	Vertical	-9.0
918.280	41.6	46.0	-4.4	Vertical	-9.0
918.760	42.9	46.0	-3.1	Vertical	-9.0
919.760	41.2	46.0	-4.8	Vertical	-9.0
920.240	39.4	46.0	-6.6	Vertical	-9.0
920.760	40.3	46.0	-5.7	Vertical	-8.9
921.280	60.0	46.0	14.0	Vertical	-8.9
921.760	60.7	46.0	14.7	Vertical	-8.9
922.280	59.7	46.0	13.7	Vertical	-8.9
922.760	61.6	46.0	15.6	Vertical	-8.9
923.760	61.6	46.0	15.6	Vertical	-8.9
924.280	60.2	46.0	14.2	Vertical	-8.9
924.760	34.2	46.0	-11.8	Vertical	-8.9
925.760	55.5	46.0	9.5	Vertical	-8.8
937.560	37.9	46.0	-8.1	Vertical	-8.6



QUALIFICATION (30MHz-1GHz): 10 meters measurement on the Open Area Test Site.

Frequency list has been created with semi-anechoic chamber pre-scan results.

Measurements are performed using a QUASI-PEAK detection.

Test Frequency (MHz)	Meter Reading dB(μV)	Detector (Pk/QP/Av)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
37.854	22.2	QP	V	0	400	-	17.3	39.5	40.0	-0.5	
62.300	24.5	QP	V	210	400	-	7.8	32.3	40.0	-7.7	
265.640	13.2	QP	H	330	310	-	16.2	29.4	46.0	-16.6	
288.000	16.6	QP	H	210	235	-	16.6	33.2	46.0	-12.8	
336.000	20.3	QP	H	200	250	-	17.9	38.2	46.0	-7.8	
360.040	18.0	QP	H	190	250	-	18.6	36.6	46.0	-9.4	
384.000	17.6	QP	H	185	250	-	19.4	37.0	46.0	-9.0	
420.040	13.4	QP	H	310	190	-	20.4	33.8	46.0	-12.2	
444.040	13.3	QP	H	260	150	-	21.0	34.3	46.0	-11.7	
468.040	11.7	QP	H	360	160	-	21.6	33.3	46.0	-12.7	
516.040	14.2	QP	H	360	140	-	22.8	37.0	46.0	-9.0	
540.040	12.5	QP	H	320	150	-	23.3	35.8	46.0	-10.2	
588.040	9.2	QP	H	0	135	-	24.3	33.5	46.0	-12.5	
780.040	3.9	QP	H	280	100	-	28.0	31.9	46.0	-14.1	

Note: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)

(M@3m = M@10m+10.5dB)



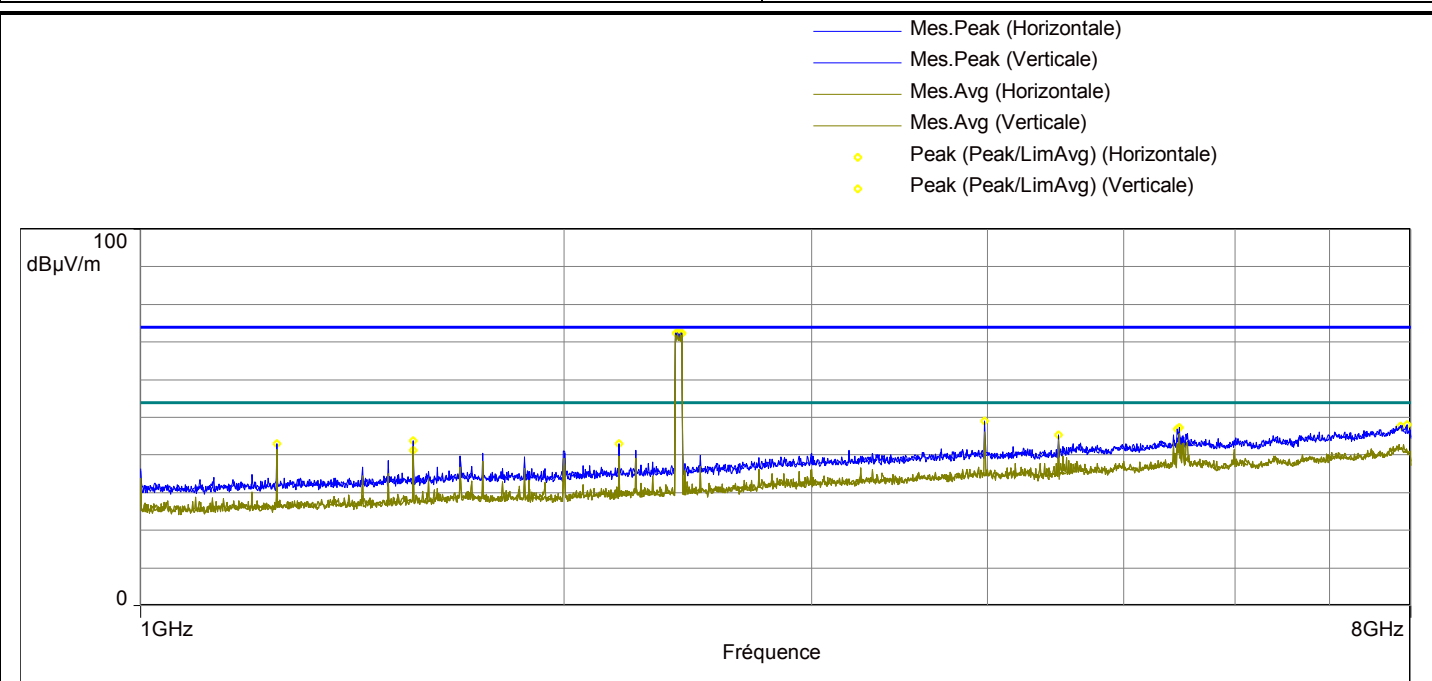
Pre-characterisation measurement (1GHz-25GHz): pre-scan measurement at 3m (PEAK and AVERAGE detection, graph examples)

See graphs for frequency range [1-8]GHz:

Graph identifier		Polarization	EUT position	Comments	
Emr#	2	H/V	Axis XY	-	See below

RADIATED EMISSIONS

Graph name: Emr#2		Test configuration:	
Limit: FCC CFR47 Part15C		HS (H+V) - Configuration 1 [1-8]GHz	
Class: B		Frequency range: [1GHz - 8GHz]	
Antenna polarization: Horizontal & Vertical		RBW :	1MHz
Azimuth: 0° - 360°		VBW :	3MHz



Spurious emissions

Frequency (MHz)	Peak (dBμV/m)	LimM (dBμV/m)	Peak-LimM (dB)	Polarization	Correction (dB)
1562.800	41.2	54.0	-12.8	Horizontal	-33.5
2409.450*	72.3	54.0	18.3	Horizontal	-31.4
2423.800*	72.2	54.0	18.2	Horizontal	-31.4
3982.000	49.1	54.0	-4.9	Horizontal	-26.2
5476.950	47.3	54.0	-6.7	Horizontal	-23.7
7871.400	47.6	54.0	-6.4	Horizontal	-19.2
1249.900	42.9	54.0	-11.1	Vertical	-34.4
1562.800	43.8	54.0	-10.2	Vertical	-33.5
2187.550	43.1	54.0	-10.9	Vertical	-31.6
2403.150*	72.3	54.0	18.3	Vertical	-31.4
2420.300*	72.4	54.0	18.4	Vertical	-31.4
2424.850*	72.4	54.0	18.4	Vertical	-31.4
4494.050	45.4	54.0	-8.6	Vertical	-26.6
5455.650	46.9	54.0	-7.1	Vertical	-23.8
7949.000	48.1	54.0	-5.9	Vertical	-18.8

*Carrier Frequencies



Precharacterization for frequency range [8-25]GHz

No significant frequency observed due to RF module.

QUALIFICATION (1GHz-25GHz): 3 meters measurement in full anechoic chamber. 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.

No significant suspect frequency observed.

3.7. CONCLUSION

Radiated emission data measurement performed on the sample of the product **HOT SPOT V2 (Modular FCCID : QHKRTLHSCORE)**, SN: 16540-A0, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.



4. MAXIMUM PEAK OUTPUT POWER (15.247)

4.1. ENVIRONMENTAL CONDITIONS

Date of test : June 26, 2019
Test performed by : Gaëtan DESCHAMPS
Atmospheric pressure (hPa) : 990
Relative humidity (%) : 30
Ambient temperature (°C) : 25

4.2. EQUIPMENT CONFIGURATION

Hopping sequence: ☒ ON ☐ OFF

4.3. TEST 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 and using 3MHz RBW and 10MHz VBW.

The captured power is measured and recorded; the measurement is repeated until all frequencies required were complete.

☒ **Radiated measurement:**

The product has been tested at a distance of 3 meters from the antenna and using 1MHz RBW and 3MHz VBW. Antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. 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, utilizing a RBW $\geq$ the 20 dB bandwidth of the emission, VBW > RBW, peak detector function. Follow the procedures in C63.4-1992 with respect to maximizing the emission.
- 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:

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



4.4. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna horn 18GHz	EMCO	3115	C2042029	09/18	09/20
Antenna horn 18GHz	AINFO	LB	C2042055	09/18	09/20
Attenuator 10dB	AEROFLEX	-	A7122268	05/19	05/21
Cable SMA - Substitution C3	-	-	A5329352	10/18	10/19
Cable SMA Substitution C3	-	6GHz	A5329635	02/18	02/19
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	03/16	03/19
Comb RADIO	YORK	25MHz - 26GHz	A3169114	-	-
Frequency generator 10MHz - 27GHz	RHODE & SCHWARZ	SMR 27	A5442045	10/18	10/19
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	-	-
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/18	03/20

*Note: In our quality system, the test equipment calibration due is more & less 4 months

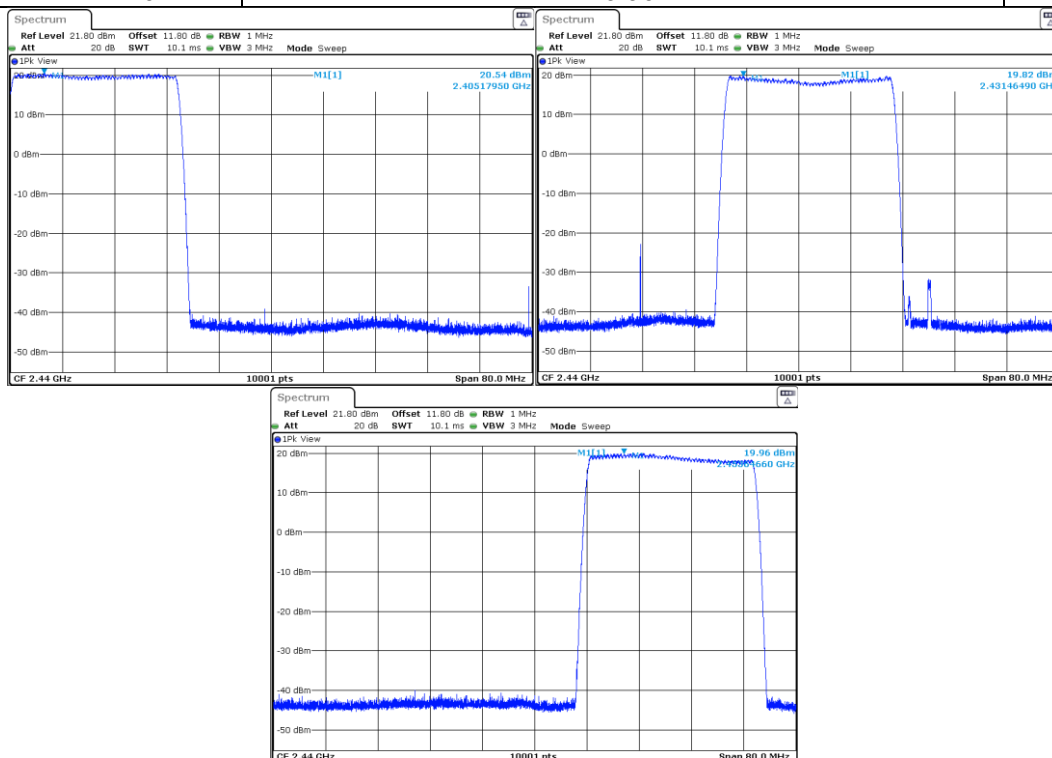
4.1. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

☒ None ☐ Divergence:

4.2. TEST RESULTS

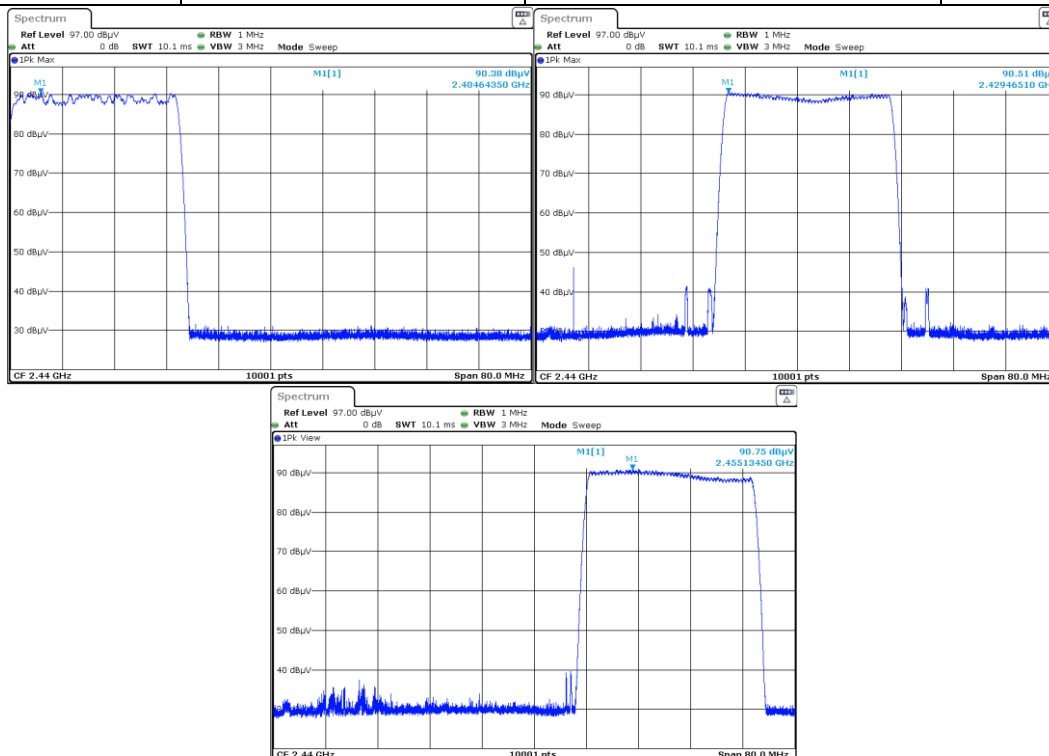
Conducted measurement performed:

Channel	Channel Frequency (MHz)	Peak Output Power (dBm)	Power Limit (dBm)
Cmin	2400.4	20.54	21
Cmid	2441.7	19.82	21
Cmax	2472.9	19.96	21



Radiated measurement performed:

Channel	Channel Frequency (MHz)	Field Strength 3m (dBμV)	Calculated EIRP (dBm)	Power Limit (dBm)
Cmin	2400.4	90.38	23.99	27
Cmid	2441.7	90.50	24.2	27
Cmax	2472.9	90.75	24.7	27



4.3. CONCLUSION

Maximum Peak Output Power measurement performed on the sample of the product **HOT SPOT V2 (Modular FCCID : QHKRTILHSCORE)**, SN: **16540-A0**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.



5. BAND EDGE MEASUREMENT (15.247)

5.1. ENVIRONMENTAL CONDITIONS

Date of test : June 26, 2019
Test performed by : Gaëtan DESCHAMPS
Atmospheric pressure (hPa) : 990
Relative humidity (%) : 30
Ambient temperature (°C) : 25

5.2. LIMIT

RF antenna conducted test:

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:

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.

5.3. EQUIPMENT CONFIGURATION

Hopping sequence: ☒ ON ☐ OFF

5.4. 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



5.5. TEST EQUIPMENT LIST

DESCRIPTION	MANUFACTURER	MODEL	N° LCIE	Cal_Date	Cal_Due
Antenna horn 18GHz	EMCO	3115	C2042029	09/18	09/20
Antenna horn 18GHz	AINFO	LB	C2042055	09/18	09/20
Attenuator 10dB	AEROFLEX	-	A7122268	05/19	05/21
Cable SMA - Substitution C3	-	-	A5329352	10/18	10/19
Cable SMA Substitution C3	-	6GHz	A5329635	02/18	02/19
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	03/16	03/19
Comb RADIO	YORK	25MHz - 26GHz	A3169114	-	-
Frequency generator 10MHz - 27GHz	RHODE & SCHWARZ	SMR 27	A5442045	10/18	10/19
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	-	-
Spectrum analyzer	ROHDE & SCHWARZ	FSV 30	A4060051	03/18	03/20

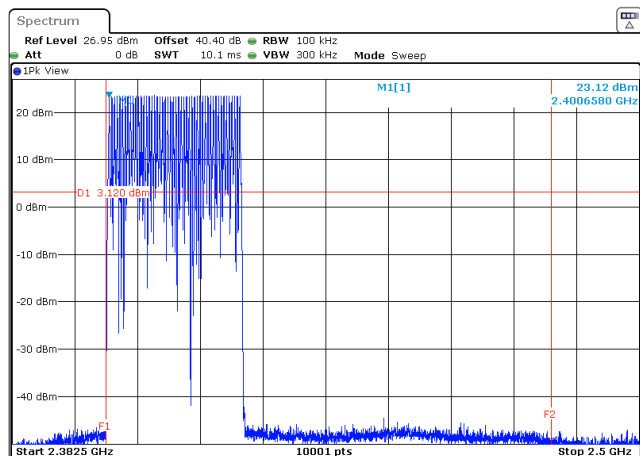
*Note: In our quality system, the test equipment calibration due is more & less 4 months

5.6. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

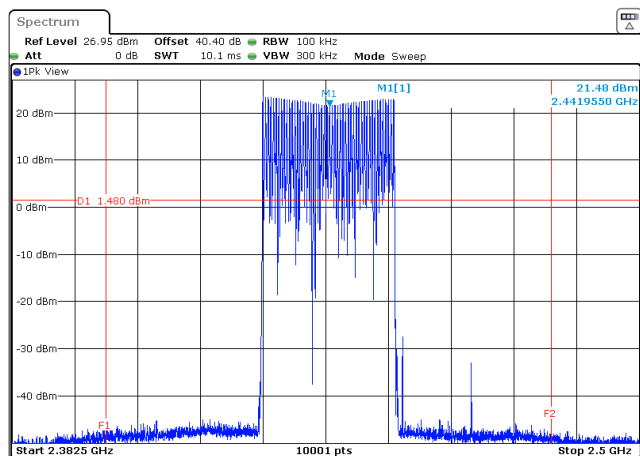
☐ None ☒ Divergence: Measurement performed around the band [2400-2483.5]GHz

5.7. TEST SEQUENCE AND RESULTS

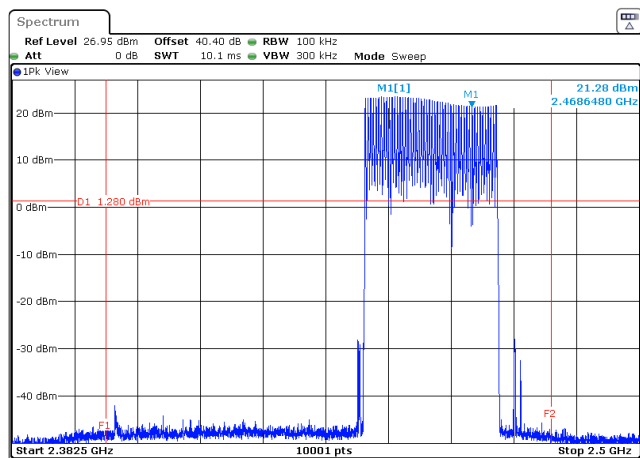
GRAPH / MODULATION. Cmin



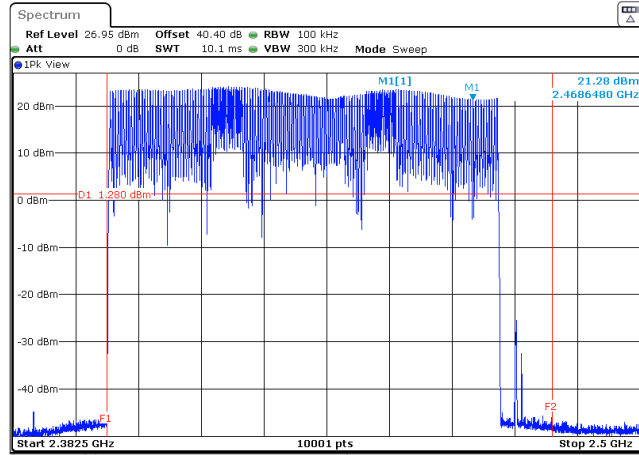
Cmid



Cmax:



Measure performed with Cmin, Cmid and Cmax:



5.8. CONCLUSION

Band edge measurement performed on the sample of the product **HOT SPOT V2 (Modular FCCID : QHKRTILHSCORE)**, SN: **16540-A0**, in configuration and description presented in this test report, show levels below the FCC CFR 47 Part 15 and RSS-247 limits.



6. 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.