



LCIE

TEST REPORT

N°: 173186-767202-B(FILE#2615290)

Version: 01

Subject

Electromagnetic compatibility tests according to the standards:

FCC CFR 47 Part 15, Subpart B

ANSI C63.4 (2014)

ICES-003 Ed7.0 (2020)

Issued to

MARKEM-IMAJE

9 rue Gaspard Monge

26500 - BOURG-LES-VALENCE

Apparatus under test

↳ Product

Ink Jet Printer

↳ Trade mark

MARKEM IMAJE

↳ Manufacturer

Markem-Imaje Industries

↳ Model under test

9750

↳ Serial number

FR21240050(Beta2) and fr21240220(Beta1)

↳ FCCID

2AAW8-MI9700

↳ IC

11372A-MI9700

Conclusion

See Test Program chapter

Test date

June 22, 2021 to June 28, 2021

Test location

LCIE Grenoble

FCC Test site

FR0008 - 197516

ISED Test site

FR0008 - 6500A

Sample receipt date

June 22, 2021

Composition of document

33 pages

Document issued on

August 18, 2021

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PUBLICATION HISTORY

Version	Date	Author	Modification
01	August 18, 2021	Mamady FOFANA	Creation of the document

Each new edition of this test report replaces and cancels the previous edition. The control of the old editions of report is under responsibility of client.



SUMMARY

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1. TEST PROGRAM

1.1. REQUIREMENTS FOR DISTURBANCE EMISSIONS

Standard:

- ✓ FCC Part 15, Subpart B (Digital Devices)
- ✓ ANSI C63.4 (2014)
- ✓ ICES-003 Ed7.0 (2020)
- ✓ Requirements for disturbance emissions – Class B

Requirements for disturbance emissions - Class B					
EMISSION TEST		LIMITS			RESULTS (Comments)
Limits for conducted disturbance 150kHz-30MHz FCC §15.107		Access: AC power			PASS
		Frequency	Quasi-peak	Average	
		150-500kHz	66 to 56 dBµV	56 to 46 dBµV	
		0.5-5MHz	56 dBµV	46 dBµV	
		5-30MHz	60 dBµV	50 dBµV	
Radiated emissions 30MHz-1GHz FCC §15.109		Access: Enclosure port of ancillary equipment			PASS
		Frequency	Quasi-peak @10m		
		30MHz-88MHz	40.0 dBµV/m		
		88MHz-216MHz	43.5 dBµV/m		
		216MHz-960MHz	46.0 dBµV/m		
		Above 960MHz	54.0 dBµV/m		
Radiated emissions 1GHz- 6GHz* FCC §15.109		Access: Enclosure port of ancillary equipment			PASS
		Frequency	Peak @3m	Average @3m	
		1- 6GHz	74.0 dBµV/m	54.0 dBµV/m	

NA: Not Applicable / NP: Not Performed, not requested by the customer (It cannot be taken into account for the declaration of conformity)

^D: Divergence, the last version is used to make it possible to test the product with the standard which describes the current state of the art and thus to answer as well as possible his environment of final use.

***§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.

Special condition for intentional radiator:

- For a composite system comprised of a digital device using a clock frequency of 1 GHz as the highest frequency for the digital logic and an intentional radiator operating at 2.4 GHz, the composite is required to be investigated to the upper frequency of 24 GHz (in this case, 10 times the intentional radiator frequency is the higher frequency).
- For a composite system comprised of a digital device using a clock frequency of 2 GHz as the highest frequency for the digital logic and an intentional radiator operating at 913 MHz, the composite is required to be investigated to the upper frequency of 10 GHz (in this case, 5 times the unintentional radiator clock frequency is the higher frequency).

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

2.1. INFORMATIONS

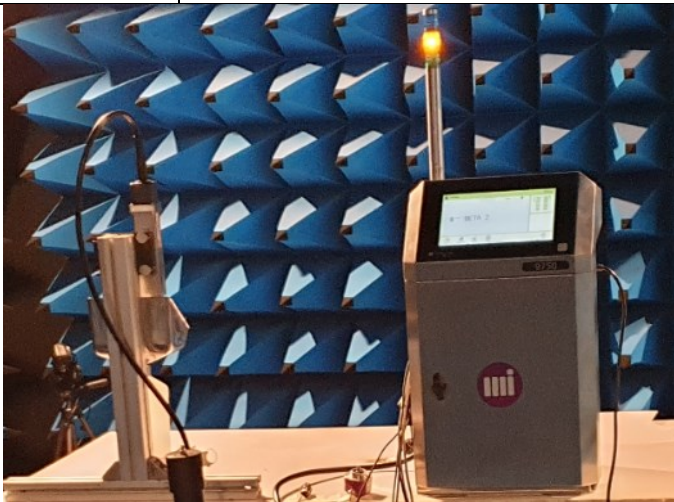
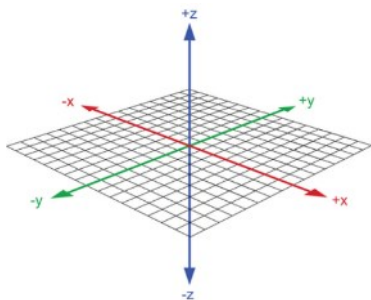
Beta1 and Beta2 are continuous inkjet printers with TAG reading on consumable cartridges, identical electronic cards, but supplied by two different power supplies.

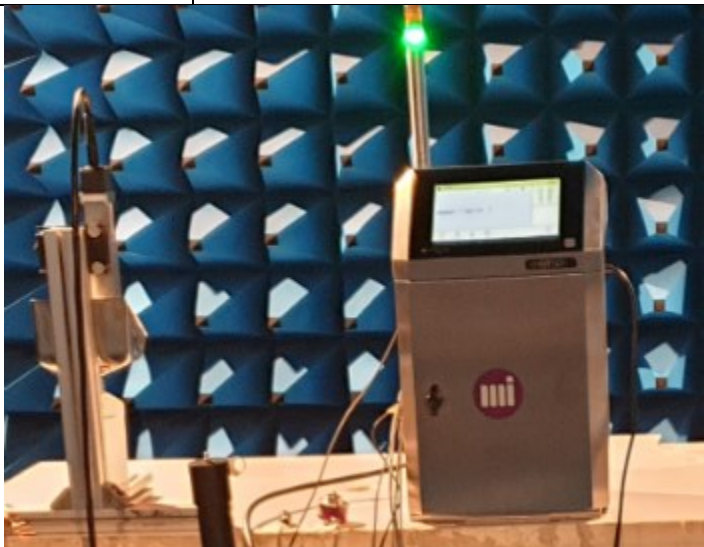
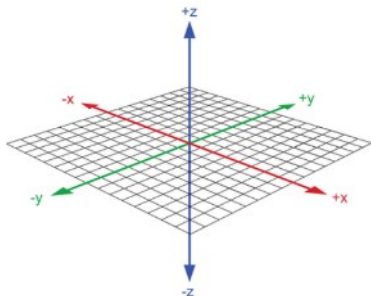
- Meanwell: LRS-100-24)
- (TDK: HWS100 A-24/A)

These printers are equipped with the TCO module and the air compressor module

2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES)

Equipment under test (EUT):

Model under test :	9750
Serial Number:	FR21240050(Beta2)
 Manufacturer/公司(工廠)名稱/公司(工廠)地址: Markem-Imaje Industries 9 rue Gaspard Monge 26500 Bourg-lès-Valence a DOVER company Model/모델명/型號/Modelo: 9750 Trademark/제조사/品牌/Marca: MARKEM-IMAJE Item : 10111243 S/N: FR21240050 Manufactured/제조년월/出廠年份: 2021-06 Country of origin/제조국가/原產地/origin: Made in France Electrical Rating/電氣輸入: 100-240 V AC 50/60Hz 1,6A 	
Dimensions:	405mm x 300mm x 645mm (Length x Width x Height) for Beta2 with supply Meanwell
Type :	Table-Top

Model under test :	9750
Serial Number:	fr21240220(Beta1)
  Manufacturer/公司(工廠)名稱/公司(工廠)地址: Markem-Image Industries 9 rue Gaspard Monge 26500 Bourg-lès-Valence a DOVER company Model/모델명/型號/Modelo: 9750 Trademark/제조사/品牌/Marca: MARKEM-IMAGE Item : 10111243 S/N: fr21240220 Manufactured/제조년월/出廠年份: 2021-06 Country of origin/제조국가/原產地/origin: Made in France Electrical Rating/電氣輸入: 100-240 V AC 50/60Hz 1,6A	
Dimensions:	405mm x 300mm x 645mm (Length x Width x Height) for Beta1 with supply TDK
Type :	Table-Top

Power supply:

During all the tests, EUT is supplied by V_{nom} : **230VAC**

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

Name	Type	Rating	Reference / Sn	Comments
Supply1	AC	100-240V 50-60Hz	Meanwell (LRS-100-24)	-
Supply2	AC	100-240V 50-60Hz	TDK(HWS100A-24)/A	-

NC: Not communicated by provider

Earth:

Access	Type	Length (m)	Width (m)	Thickness (m)	Under test	Comments
Earth	None					

Inputs/outputs - Cable:

Access	Type	Length used (m)	Declared <3m	Shielded	Under test	Comments
Supply1	C13 (3 wires: L+N+PE)	2	Yes	No	Yes	-
Supply2	C13 (3 wires: L+N+PE)	2	Yes	No	Yes	-
Access1	Umbilical cable side EUT	3	No	Yes	Yes	-
Access2	Umbilical cable side printing head	3	No	Yes	Yes	-
Access3	Beacon cable	3	No	No	Yes	-
Access4	Tachymeter cable	5	No	Yes	Yes	-
Access5	DTop cable	5	No	No	Yes	-
Access6	USB	2	Yes	Yes	Yes	-
Access7	Ethernet	10	No	Yes	Yes	-

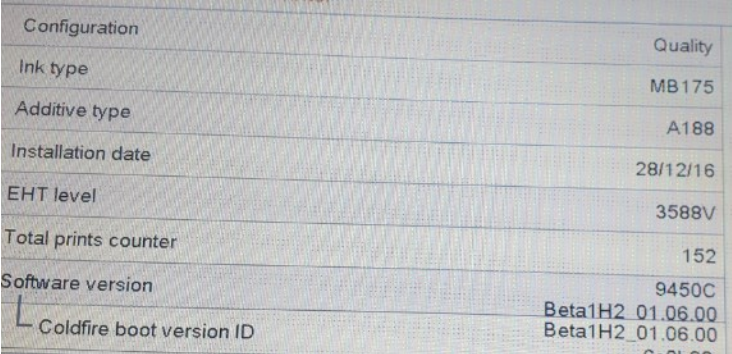
NC: Not communicated by provider

Auxiliary equipment used during test:

Type	Reference	Sn	Comments
Laptop	DELL	-	-
Printing Head	IMAJE A46508	FR20122032	-
DTop	IMAJE A35355/B	C122	-
Pulse encoder	IMAJE A35356	200502111757 178	-
Beacon	PATLITE MP	06809M	-

NC: Not communicated by provider

2.3. EUT CONFIGURATION

Hardware information			
Highest internal frequency (PLL, Quartz, Clock, Microprocessor...):	F_{Highest}:	600	MHz
Sensitive frequencies: (in addition to stepped frequencies for 61000-4-3 and 61000-4-6)	None declared by provider		
Software (if applicable):	V. :		
Time necessary for the EUT to be exercised and to respond:	Dwell:	1	s

NC: Not communicated by provider

Running mode n°1: With supply Meanwell: LRS-100-24)

- Continuous printing every second is performed during emission

Running mode n°2: With supply (TDK: HWS100 A-24/A)

- Continuous printing every second is performed during emission

2.4. EQUIPMENT MODIFICATIONS DURING THE TESTS

Modification:

- EUT Beta2 with the customer's ferrite on the screen cable
- EUT Beta1 with shielded power supply (TDK) and customer's ferrite on the screen cable





2.5. 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

2.6. 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. MEASUREMENT OF CONDUCTED EMISSION

3.1. ENVIRONMENTAL CONDITIONS

Date of test	: June 23, 2021	June 24, 2021
Test performed by	: Mamady FOFANA	Mamady FOFANA
Atmospheric pressure (hPa)	: 992	994
Relative humidity (%)	: 51	54
Ambient temperature (°C)	: 23	24

3.2. TEST SETUP

Mains terminals

The EUT and auxiliaries are set 80cm above the ground on the non-conducting table (Table-top equipment).

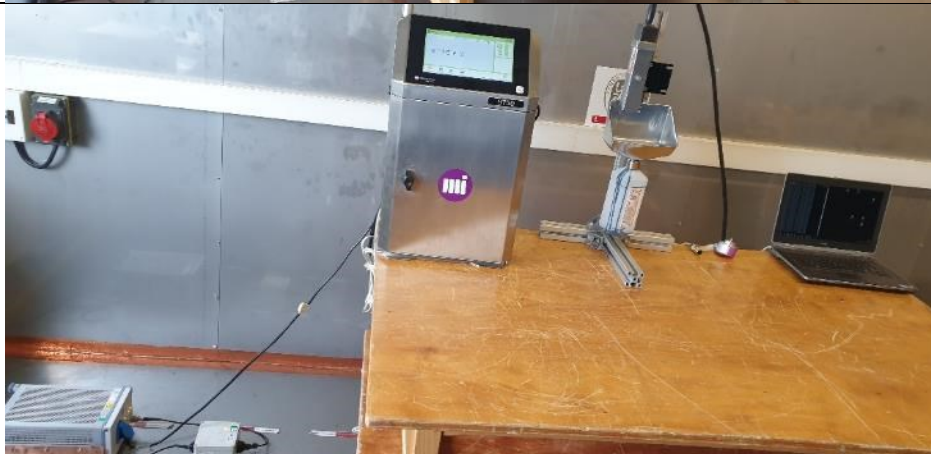
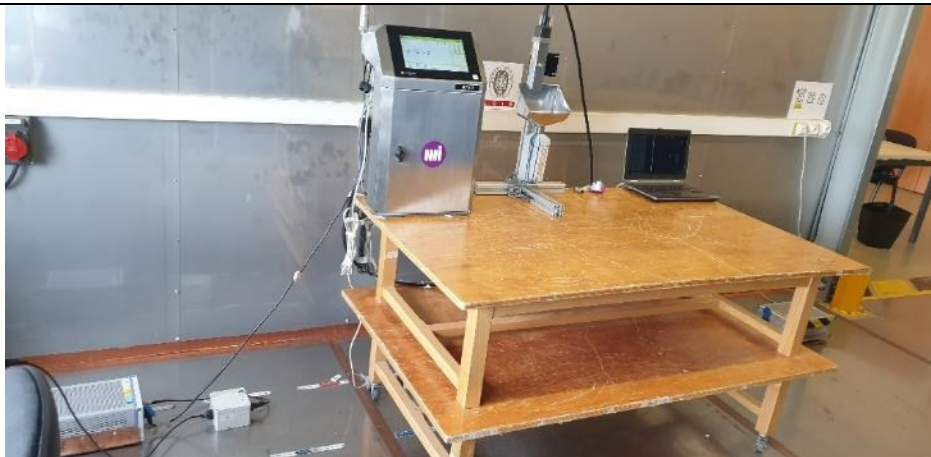
The EUT is powered by V_{nom} .

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



Test setup for Beta 1 with Supply TDK

Test setup



Test setup for Beta 2 with Supply (Meanwell)
Test setup



3.3. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
BAT EMC	NEXIO	v3.19.1.23	L1000115	-	-
EMC comb generator	LCIE SUD EST	—	A3169098	-	-
LISN	ROHDE & SCHWARZ	ENV216	C2320123	09/20	09/21
LISN	ROHDE & SCHWARZ	ENV216	C2320291	06/20	06/21
Spectrum Analyzer 9kHz - 30MHz	ROHDE & SCHWARZ	ESHS10	A2642028	01/20	01/22
Thermo-hygrometer (PM3)	KIMO	HQ 210	B4206022	01/21	01/23
Transient limiter	ROHDE & SCHWARZ	ESH3-Z2	A7122204	08/20	08/21
Load 50Ω - BNC	AEROFLEX	—	A7152072	06/20	06/21
Load 50Ω - N	AEROFLEX	—	A7152067	07/20	07/21
Cable + self	—	—	A5329585	07/20	07/21
Probe - Current	SCHAFFNER	CSP9160	A1290017	11/20	11/21
Coupling Decoupling Network	TESEQ	CDN T08	C2320373	11/20	11/21

3.4. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None



3.5. TEST RESULTS – RUNNING MODE N°1 AND MODE N°2

Mains terminals:

Supply1 (Meanwell)

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

Results: (PEAK detection)

Graph identifier	Line	Comments	
Emc# 1	Phase1	100VAC/60Hz	See below
Emc# 2	Neutral	100VAC/60Hz	See below
Emc# 3	Phase1	240VAC/50Hz	See below
Emc# 4	Neutral	240VAC/50Hz	See below

Supply2(TDK)

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

Results: (PEAK detection)

Graph identifier	Line	Comments	
Emc# 5	Phase1	100VAC/60Hz	See below
Emc# 6	Neutral	100VAC/60Hz	See below
Emc# 7	Phase1	240VAC/50Hz	See below
Emc# 8	Neutral	240VAC/50Hz	See below



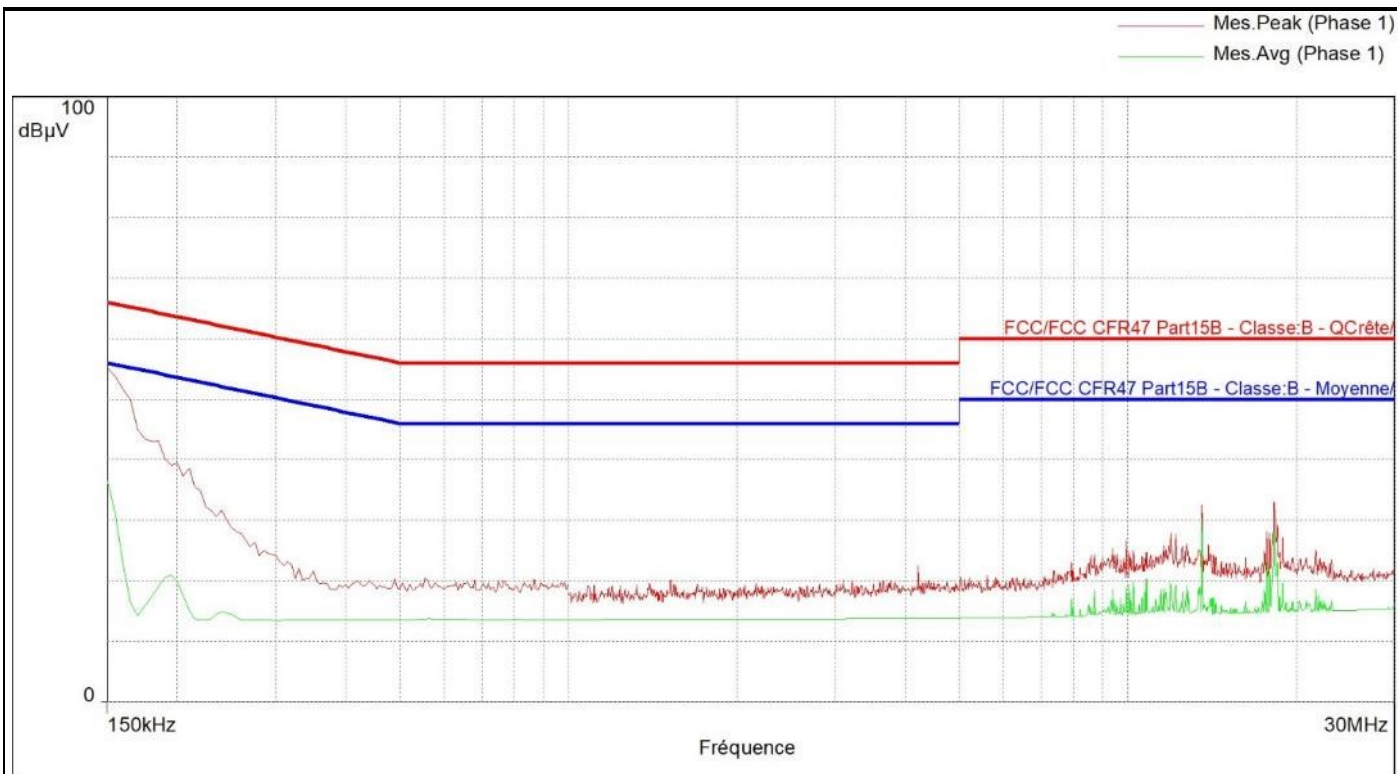
L C I E

CONDUCTED EMISSIONS

Graph name: Emc#1 Test configuration:1
Limit: FCC CFR47 Part15B
Class: B Test-Phase1

Frequency range: [150kHz - 30MHz]

Voltage / Frequency: 100VAC / 60Hz RBW : 10kHz
Line: Phase1 VBW : 30kHz



Spurious emissions

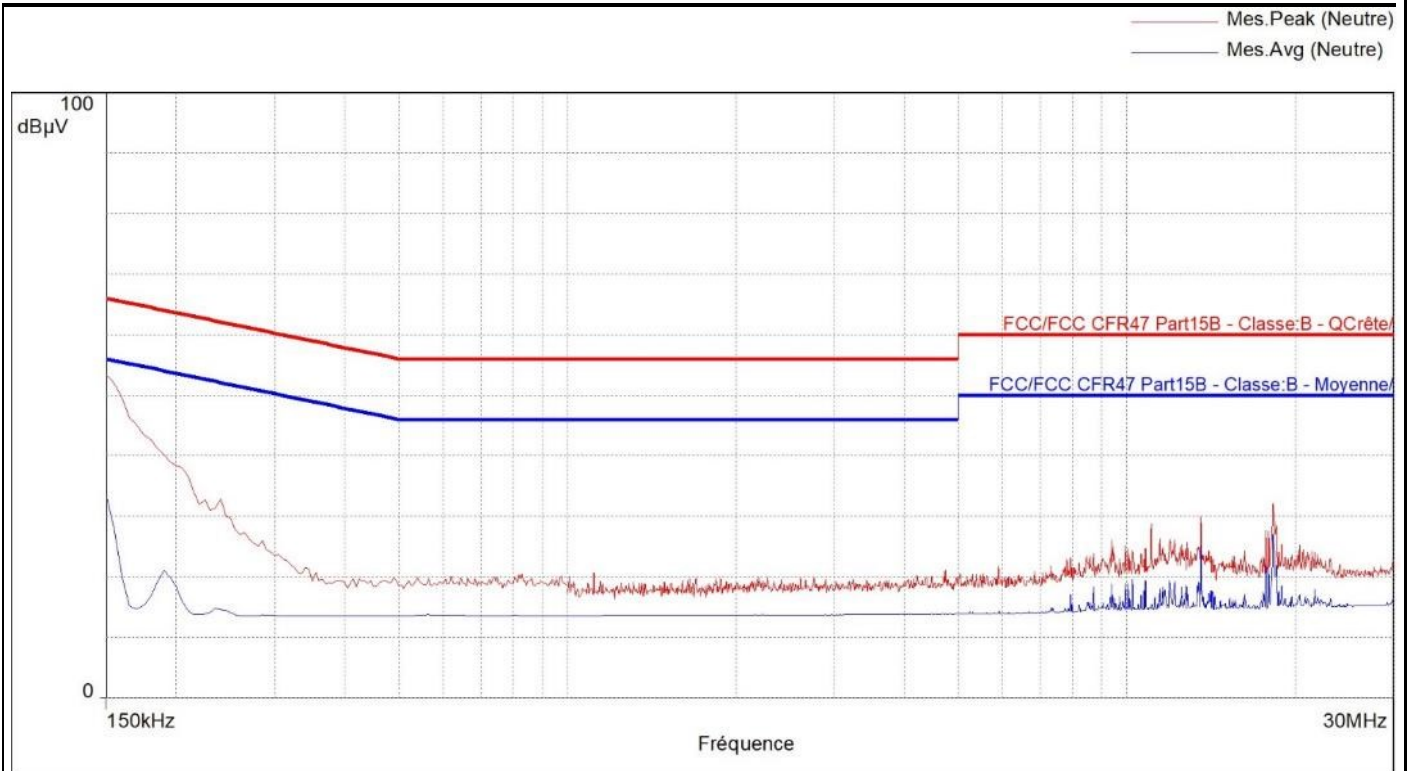
Frequency (MHz)	Mes.QPeak (dBμV)	LimQP (dBμV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBμV)	LimAvg (dBμV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.150	50.1	66.0	-15.9	32.6	56.0	-23.4	Phase 1	19.4
0.310	13.9	60.0	-46.0	7.6	50.0	-42.4	Phase 1	19.5
4.216	11.7	56.0	-44.3	7.8	46.0	-38.2	Phase 1	19.8
13.600	21.0	60.0	-39.0	16.7	50.0	-33.3	Phase 1	20.4
18.240	29.6	60.0	-30.4	26.3	50.0	-23.7	Phase 1	20.7
27.448	12.4	60.0	-47.6	8.7	50.0	-41.3	Phase 1	21.2



L C I E

CONDUCTED EMISSIONS

Graph name:	Emc#2	Test configuration:1	
Limit:	FCC CFR47 Part15B	Test-Neutral	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	100VAC / 60Hz	RBW :	10kHz
Line:	Neutral	VBW :	30kHz



Spurious emissions

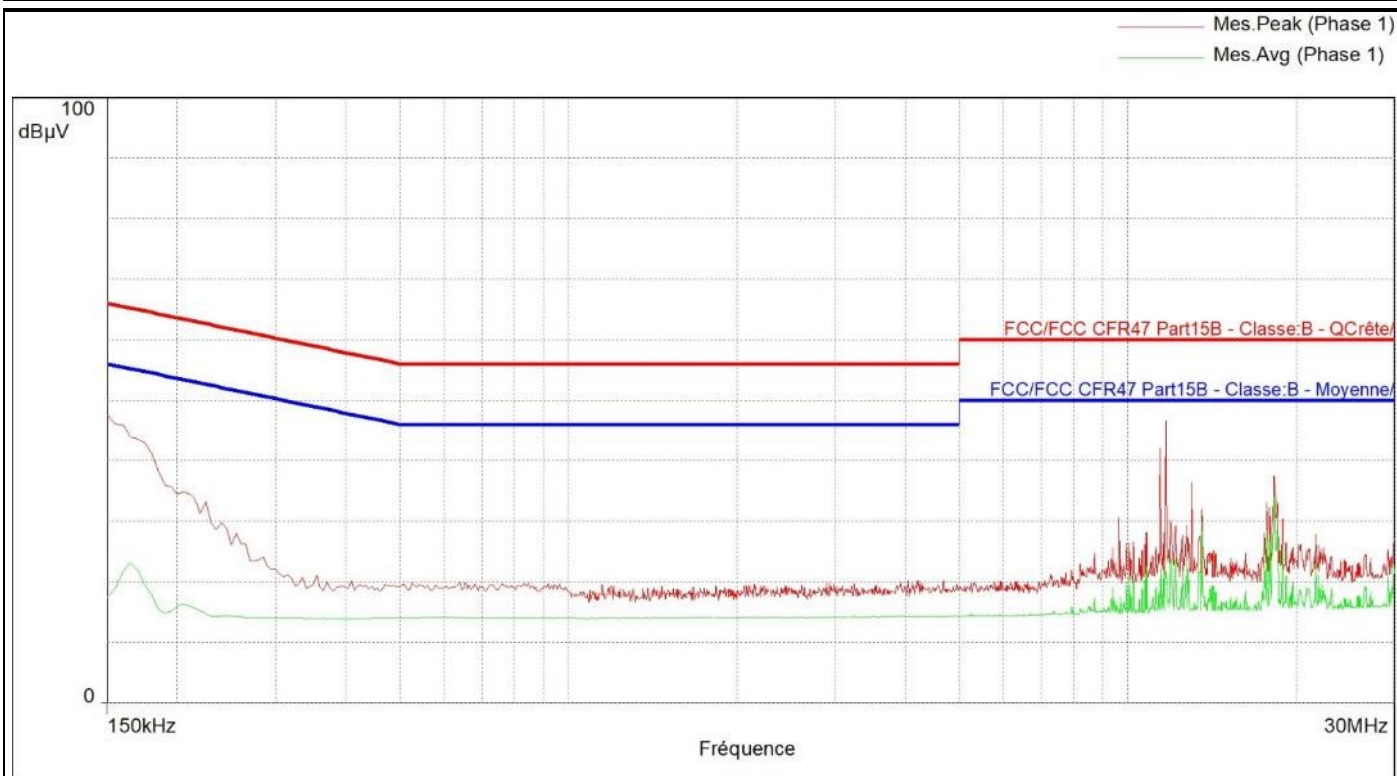
Frequency (MHz)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.150	49.7	66.0	-16.3	31.8	56.0	-24.2	Neutral	19.4
0.190	35.1	64.0	-28.9	20.0	54.0	-34.1	Neutral	19.6
1.144	10.9	56.0	-45.1	7.3	46.0	-38.7	Neutral	19.6
11.072	14.8	60.0	-45.2	10.2	50.0	-39.8	Neutral	20.3
13.556	30.7	60.0	-29.3	22.2	50.0	-27.8	Neutral	20.4
18.240	28.8	60.0	-31.2	25.6	50.0	-24.4	Neutral	20.7



L C I E

CONDUCTED EMISSIONS

Graph name:	Emc#3	Test configuration:1 Test-Phase1
Limit:	FCC CFR47 Part15B	
Class:	B	
Frequency range: [150kHz - 30MHz]		
Voltage / Frequency:	240VAC / 50Hz	RBW : 10kHz
Line:	Phase1	VBW : 30kHz



Spurious emissions

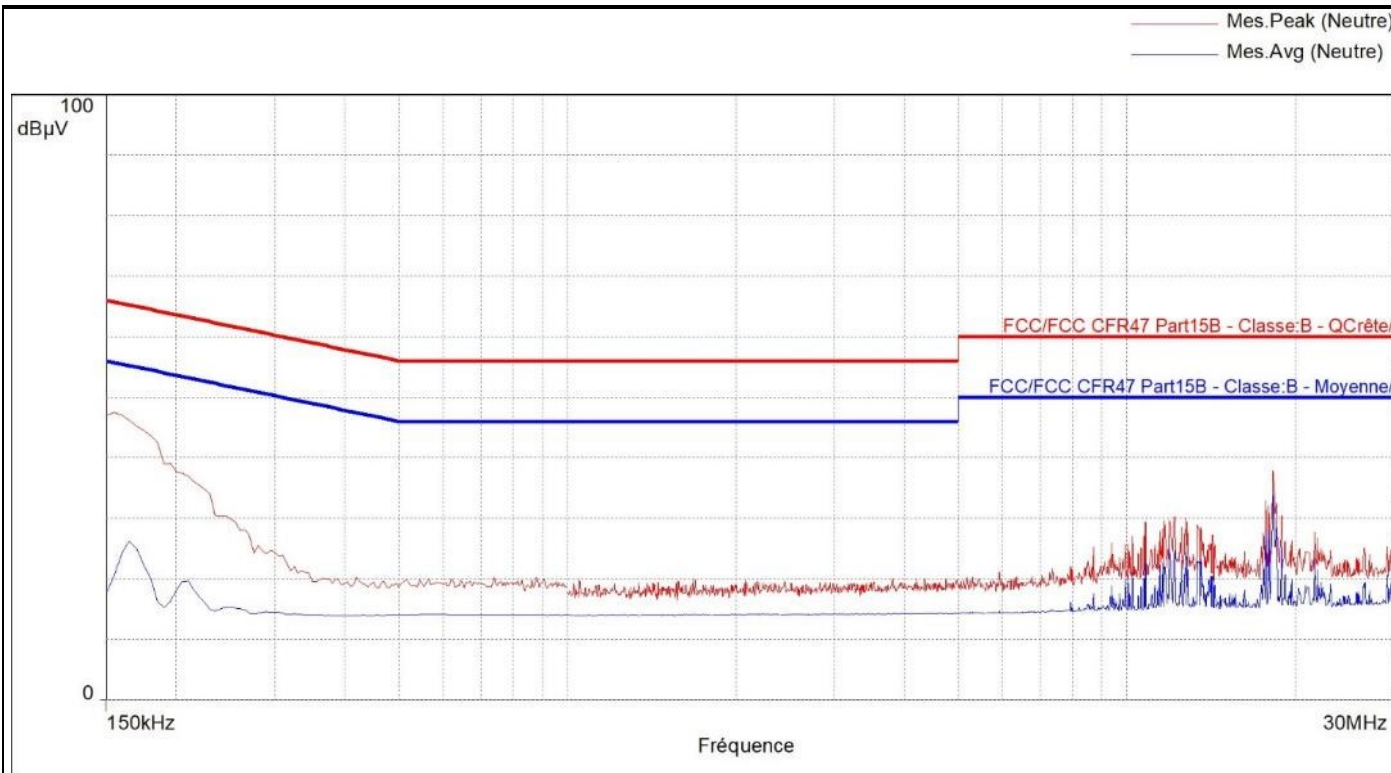
Frequency (MHz)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.150	40.5	66.0	-25.5	16.7	56.0	-39.3	Phase 1	19.4
0.215	28.2	63.0	-34.8	13.5	53.0	-39.5	Phase 1	19.6
2.200	11.1	56.0	-44.9	7.6	46.0	-38.4	Phase 1	19.7
11.712	24.2	60.0	-35.8	20.3	50.0	-29.7	Phase 1	20.3
13.052	18.0	60.0	-42.0	12.7	50.0	-37.3	Phase 1	20.4
18.240	34.8	60.0	-25.2	31.5	50.0	-18.5	Phase 1	20.7
29.908	24.6	60.0	-35.4	22.0	50.0	-28.0	Phase 1	21.4



L C I E

CONDUCTED EMISSIONS

Graph name:	Emc#4	Test configuration:1	
Limit:	FCC CFR47 Part15B	Test-Neutral	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240VAC / 50Hz	RBW :	10kHz
Line:	Neutral	VBW :	30kHz



Spurious emissions

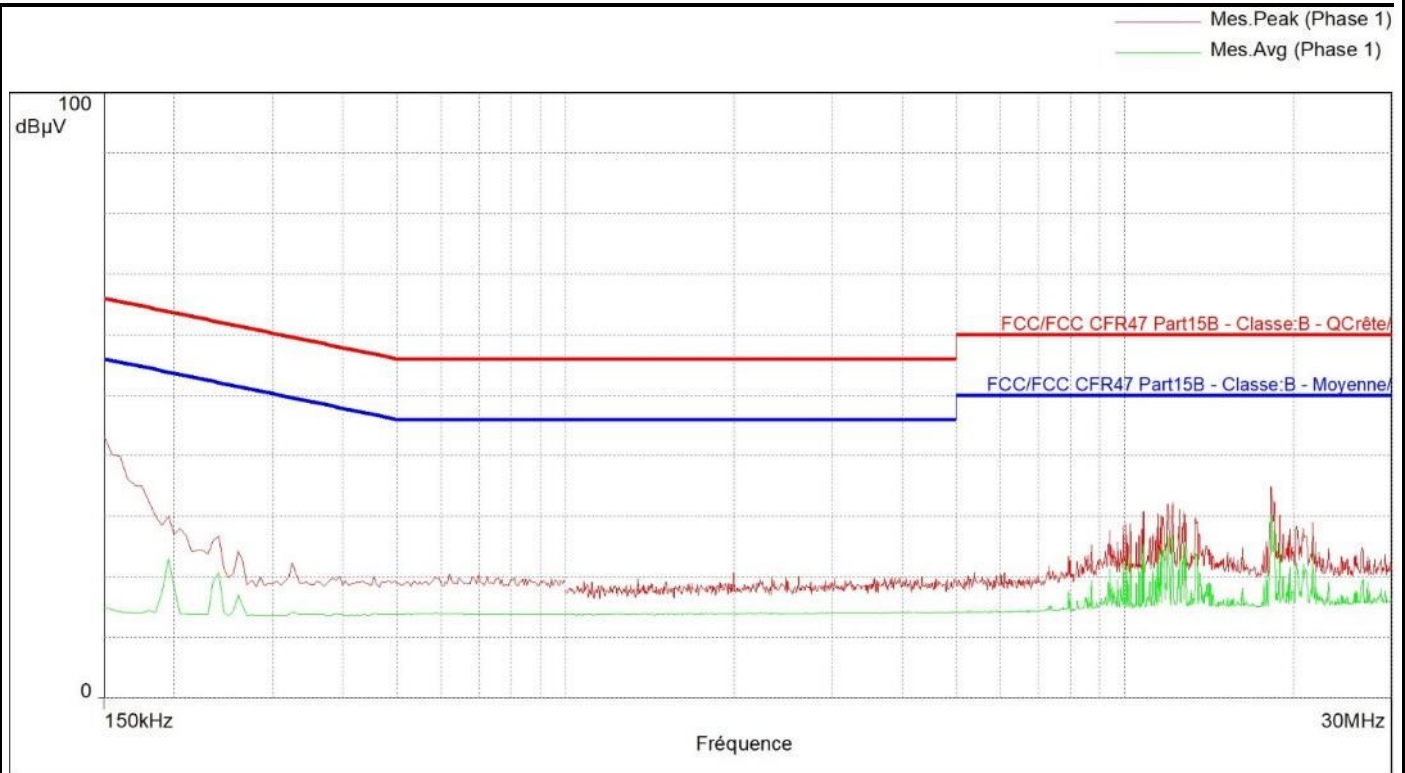
Frequency (MHz)	Mes.QPeak (dBμV)	LimQP (dBμV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBμV)	LimAvg (dBμV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.150	41.5	66.0	-24.5	17.5	56.0	-38.5	Neutral	19.4
0.260	23.0	61.4	-38.4	12.0	51.4	-39.5	Neutral	19.5
0.915	11.0	56.0	-45.0	7.4	46.0	-38.6	Neutral	19.6
4.752	11.1	56.0	-44.9	7.8	46.0	-38.2	Neutral	19.8
10.792	26.0	60.0	-34.0	22.2	50.0	-27.8	Neutral	20.3
12.748	27.8	60.0	-32.2	23.8	50.0	-26.2	Neutral	20.4
13.356	26.4	60.0	-33.6	22.8	50.0	-27.2	Neutral	20.4
18.240	34.7	60.0	-25.3	31.4	50.0	-18.6	Neutral	20.7



L C I E

CONDUCTED EMISSIONS

Graph name:	Emc#5	Test configuration:2
Limit:	FCC CFR47 Part15B	Test- Phase1
Class:	B	
Frequency range: [150kHz - 30MHz]		
Voltage / Frequency:	100VAC / 60Hz	RBW : 10kHz
Line:	Phase1	VBW : 30kHz



Spurious emissions

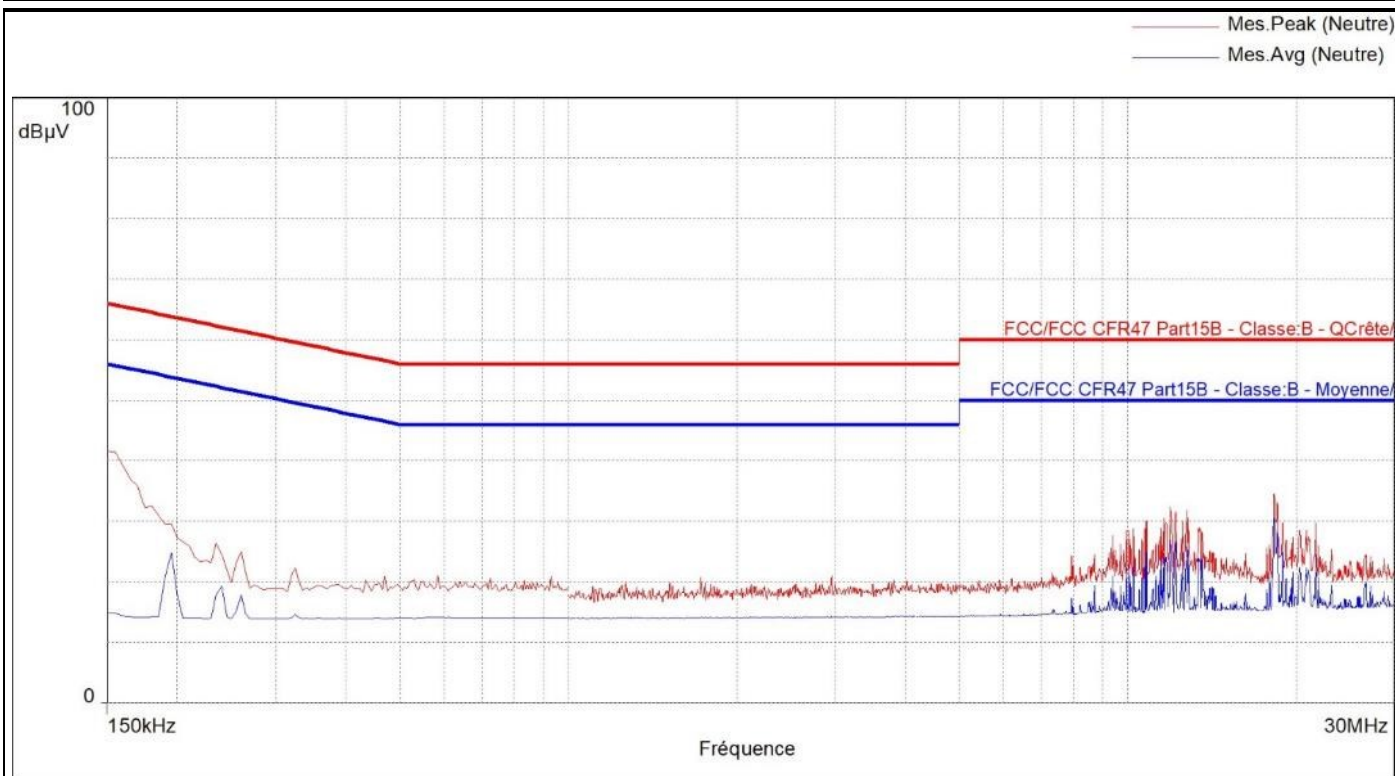
Frequency (MHz)	Mes.QPeak (dBµV)	LimQP (dBµV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBµV)	LimAvg (dBµV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.150	33.4	66.0	-32.6	11.9	56.0	-44.1	Phase 1	19.4
0.195	25.4	63.8	-38.4	22.7	53.8	-31.1	Phase 1	19.6
1.364	10.7	56.0	-45.3	7.4	46.0	-38.6	Phase 1	19.6
10.792	28.5	60.0	-31.5	24.7	50.0	-25.3	Phase 1	20.3
12.192	24.3	60.0	-35.7	21.0	50.0	-29.0	Phase 1	20.4
21.664	26.6	60.0	-33.4	24.0	50.0	-26.0	Phase 1	20.9



L C I E

CONDUCTED EMISSIONS

Graph name:	Emc#6	Test configuration:2	
Limit:	FCC CFR47 Part15B	Test- Neutral	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	100VAC / 60Hz	RBW :	10kHz
Line:	Neural	VBW :	30kHz



Spurious emissions

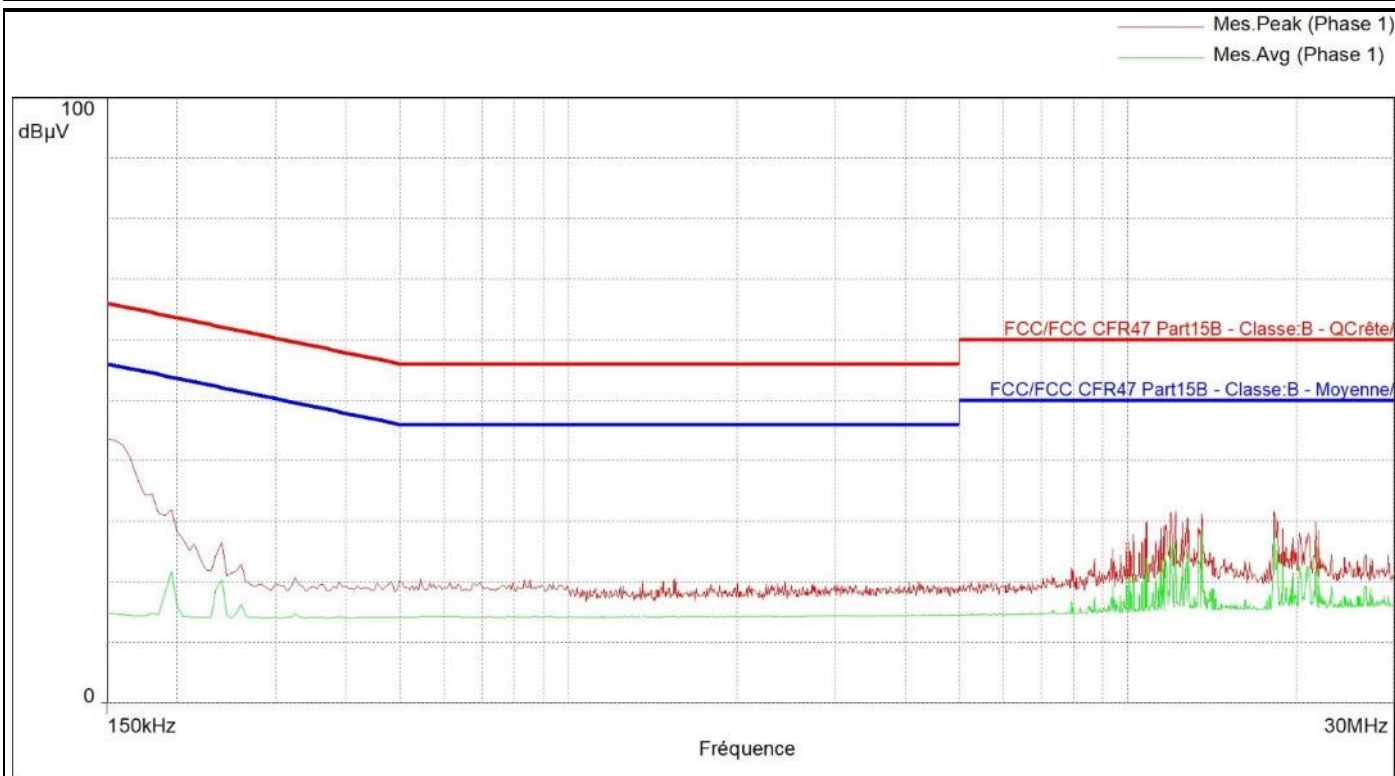
Frequency (MHz)	Mes.QPeak (dBμV)	LimQP (dBμV)	Mes.QPeak-LimQP (dB)	Mes.Avg (dBμV)	LimAvg (dBμV)	Mes.Avg-LimAvg (dB)	Line	Correction (dB)
0.150	33.4	66.0	-32.6	12.1	56.0	-43.9	Neutral	19.4
0.235	19.2	62.3	-43.0	17.0	52.3	-35.3	Neutral	19.5
1.692	10.9	56.0	-45.1	7.5	46.0	-38.5	Neutral	19.6
11.892	30.4	60.0	-29.6	26.8	50.0	-23.2	Neutral	20.3
18.240	31.4	60.0	-28.6	28.1	50.0	-21.9	Neutral	20.7
21.664	26.8	60.0	-33.2	24.2	50.0	-25.8	Neutral	20.9



L C I E

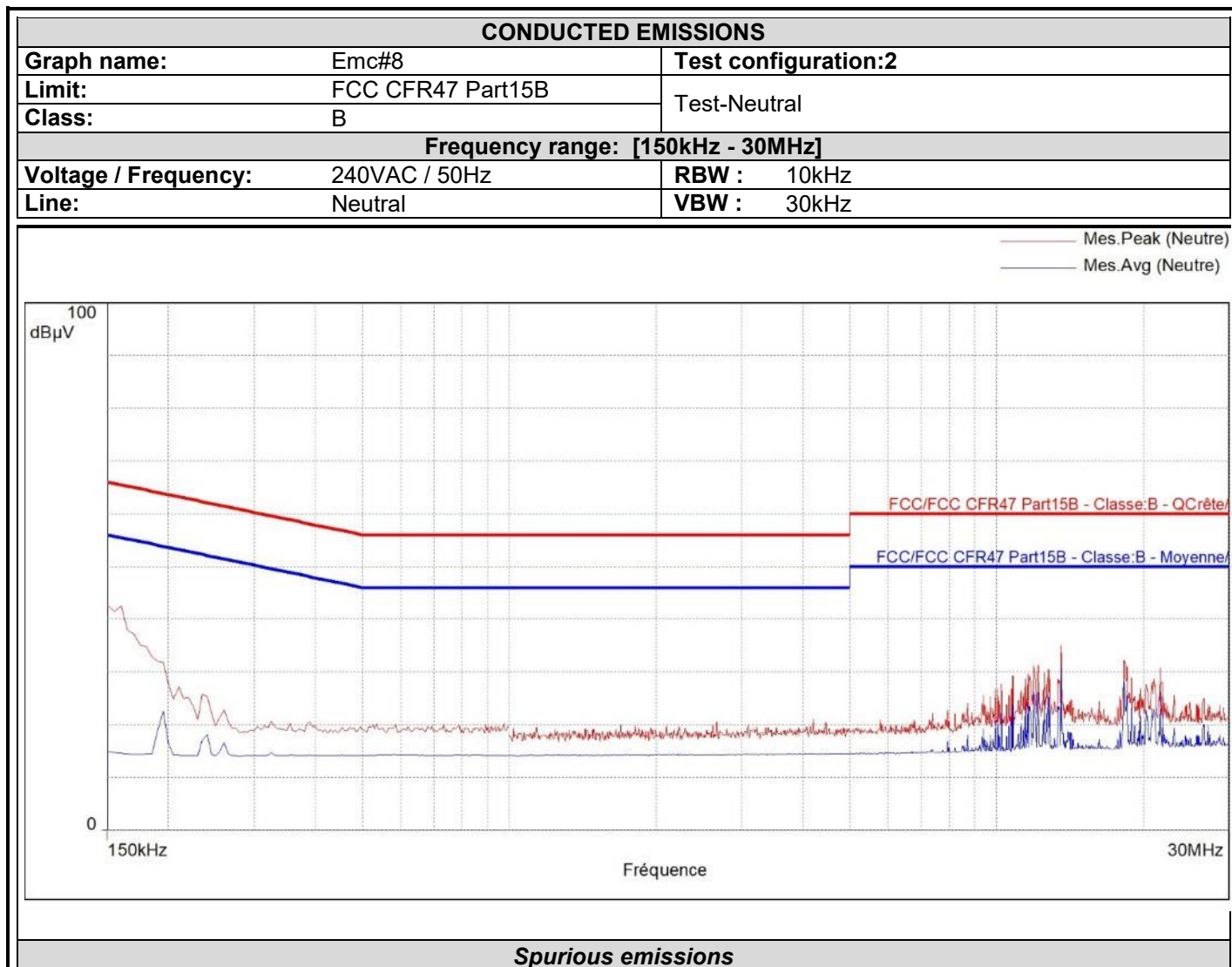
CONDUCTED EMISSIONS

Graph name:	Emc#7	Test configuration:2	
Limit:	FCC CFR47 Part15B	Test- Phase1	
Class:	B		
Frequency range: [150kHz - 30MHz]			
Voltage / Frequency:	240VAC / 50Hz	RBW :	10kHz
Line:	Phase1	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	33.7	66.0	-32.3	11.4	56.0	-44.6	Phase 1	19.4
0.190	22.1	64.0	-41.9	17.2	54.0	-36.8	Phase 1	19.6
1.392	10.7	56.0	-45.3	7.4	46.0	-38.6	Phase 1	19.6
12.196	29.6	60.0	-30.4	26.0	50.0	-24.0	Phase 1	20.4
18.240	28.6	60.0	-31.4	25.3	50.0	-24.7	Phase 1	20.7
29.116	16.7	60.0	-43.3	13.5	50.0	-36.5	Phase 1	21.3



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	32.7	65.7	-33.0	10.5	55.7	-45.2	Neutre	19.4
0.190	23.0	64.0	-41.1	18.1	54.0	-36.0	Neutre	19.6
1.000	10.9	56.0	-45.1	7.4	46.0	-38.6	Neutre	19.6
10.244	25.6	60.0	-34.4	21.8	50.0	-28.2	Neutre	20.2
10.792	27.3	60.0	-32.7	23.5	50.0	-26.5	Neutre	20.3
13.556	30.9	60.0	-29.1	22.8	50.0	-27.2	Neutre	20.4
18.240	29.5	60.0	-30.5	26.1	50.0	-23.9	Neutre	20.7
21.664	28.4	60.0	-31.6	26.1	50.0	-23.9	Neutre	20.9

3.6. CONCLUSION

The sample of the equipment 9750, Sn : FR21240050(Beta2) and fr21240220(Beta1), tested in the configuration presented in this test report **satisfies** to requirements of the product family standard applied (See §Test Program) for conducted emissions.

4. MEASUREMENT OF RADIATED EMISSION

4.1. ENVIRONMENTAL CONDITIONS

Date of test	: June 22, 2021	June 29, 2021
Test performed by	: Mamady FOFANA	Mamady FOFANA
Atmospheric pressure (hPa)	: 992	993
Relative humidity (%)	: 51	52
Ambient temperature (°C)	: 22.6	22

4.2. TEST SETUP

The EUT and auxiliaries are set 80cm above the ground on the non-conducting table (Table-top equipment).
The EUT is powered by V_{nom} .

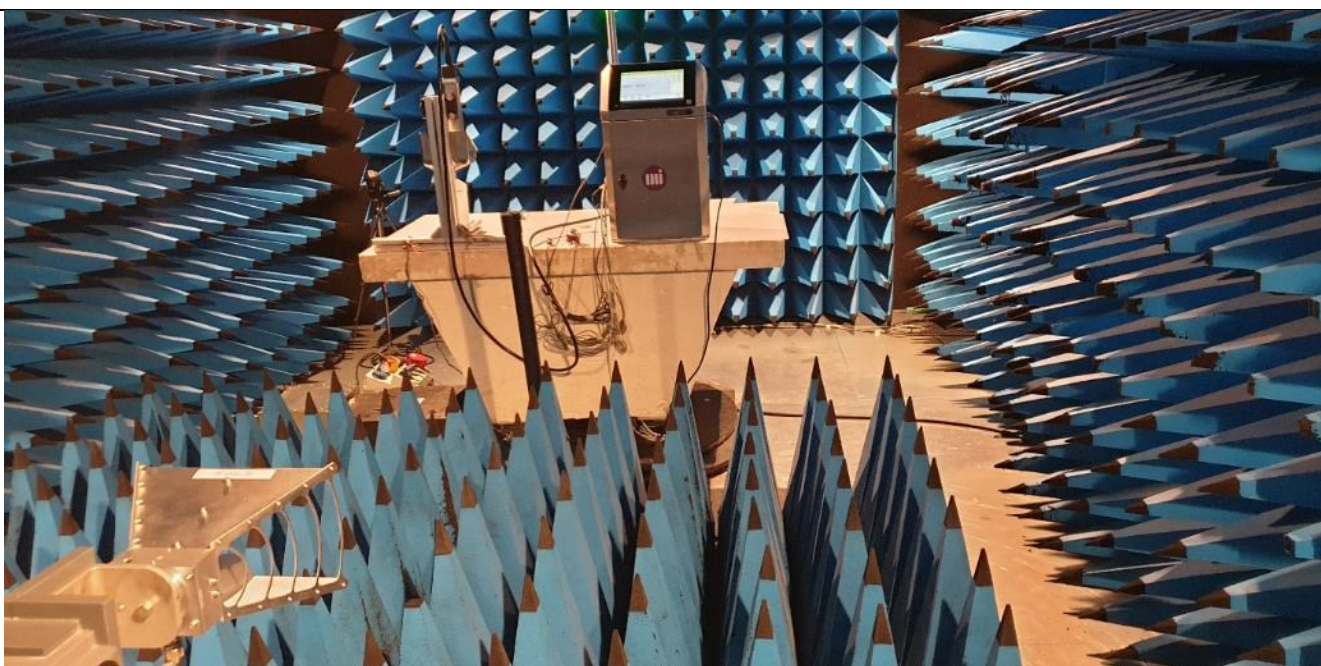


Test setup in anechoic chamber – Frequency <1GHz





Test setup on OATS



Test setup in anechoic chamber – Frequency <1GHz



4.3. TEST METHOD

4.3.1. 30MHz –1GHz

Pre-qualification measurement

A pre-scan of all the setup has been performed in a 3 meters semi-anechoic chamber. Test is performed with antenna centered on EUT in horizontal (H) and vertical (V) polarization, continuous linear turntable azimuth search was performed with 360 degrees range. Measurements are performed on all axis of EUT used in normal configuration. The pre-characterization graphs are obtained in PEAK detection.

Qualification

The installation of EUT is identical than for pre-qualification measurements on an Open Area Test Site with a 10 meters distance between EUT and antenna. In this case, it corrected according to requirements of 15.209.e), $M@3m = M@10m + 10.5dB$. Test is performed in horizontal (H) and vertical (V) polarization and the height antenna is varied from 1m to 4m. Continuous linear turntable azimuth search was performed with 360 degrees range. Measurements are 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.

4.3.2. 1GHz – 6GHz:

Pre-qualification measurement

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber. Test is performed with antenna centered on EUT in horizontal (H) and vertical (V) polarization, continuous linear turntable azimuth search was performed with 360 degrees range. Measurements are performed on all axis of EUT used in normal configuration. The pre-characterization graphs are obtained in PEAK and AVERAGE detection.

Qualification

The installation of EUT is identical for pre-characterization measurements. Test is performed in horizontal (H) and vertical (V) polarization and the height antenna is on mast, varied from 1m to 4m.

Minimal beamwidth of the measurement antenna used: AINFO 10180 / $w@3m = 1.4m < 14GHz$ / $w@3m = 0.8m < 18GHz$

Continuous linear turntable azimuth search was performed with 360 degrees range. Measurements are 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.



4.4. TEST EQUIPMENT LIST

TEST EQUIPMENT USED					
Description	Manufacturer	Model	Identifier	Cal_Date	Cal_Due
Amplifier 100kHz - 18GHz	LCIE SUD EST	—	A7085027	11/20	11/21
Antenna Bi-Log XWing	TESEQ	CBL6144	C2040146	03/17	03/22
Antenna horn 18GHz	AINFO	LB	C2042078	04/21	04/23
BAT EMC	NEXIO	v3.19.1.23	L1000115	—	—
Cable 0.75m	SUCOFLEX	18GHz	A5329919	11/20	11/21
Cable 2.2m N	SUCOFLEX	SF118A/2x11N/2.2M	A5329990	11/20	11/21
Cable 5m	SUCOFLEX	18GHz	A5329918	11/20	11/21
CALCUL_FACTEURS	LCIE SUD EST	V4	L2000035	—	—
Diameter 1.2m / Height 2.25m	LCIE	VSWR 1GHz - 18GHz	D3044015_VSWR	06/19	06/22
HF Radiated emission comb generator	LCIE SUD EST	—	A3169088	—	—
Radiated emission comb generator	BARDET	—	A3169050	—	—
Semi-Anechoic chamber #2	SIEPEL	—	D3044015	06/19	06/22
Spectrum Analyzer 9kHz - 6GHz	ROHDE & SCHWARZ	FSL6	A4060049	04/20	04/22
Table C2/OATS	LCIE	—	F2000438	—	—
Thermo-hygrometer (C2)	LACROSS Techn.	WS-2357	B4206015	12/20	12/22
Thermo-hygrometer (PM1/2/3)	KIMO	HQ 210	B4206022	01/21	01/23
Turntable chamber (Cage#2)	ETS Lingren	Model 2165	F2000404	—	—
Turntable controller (Cage#2)	ETS Lingren	Model 2066	F2000393	—	—
Antenna Bi-log	CHASE	CBL6111A	C2040051	06/19	06/21
Antenna Mat (OATS)	ETS Lingren	2071-2	F2000392	—	—
BAT EMC	NEXIO	v3.19.1.23	L1000115	—	—
Biconic Antenna	EATON	94455-1	C2040234	03/21	03/23
Cable (OATS)	—	1GHz	A5329623	05/20	05/21
CALCUL_FACTEURS	LCIE SUD EST	V4	L2000035	—	—
Emission Cable	SUCOFLEX	6GHz	A5329061	06/20	06/21
Emission Cable	MICRO-COAX	1GHz	A5329656	08/20	08/21
OATS	—	—	F2000409	04/21	04/22
Radiated emission comb generator	BARDET	—	A3169050	—	—
Receiver 20-1000MHz	ROHDE & SCHWARZ	ESVS30	A2642006	03/20	03/22
Table C2/OATS	LCIE	—	F2000438	—	—
Turntable (OATS)	ETS Lingren	Model 2187	F2000403	—	—
Turntable / Mast controller (OATS)	ETS Lingren	Model 2066	F2000372	—	—

4.5. DIVERGENCE, ADDITION OR SUPPRESSION ON THE TEST SPECIFICATION

None

4.6. TEST RESULTS – RUNNING MODE N°1 AND RUNNING MODE N°2

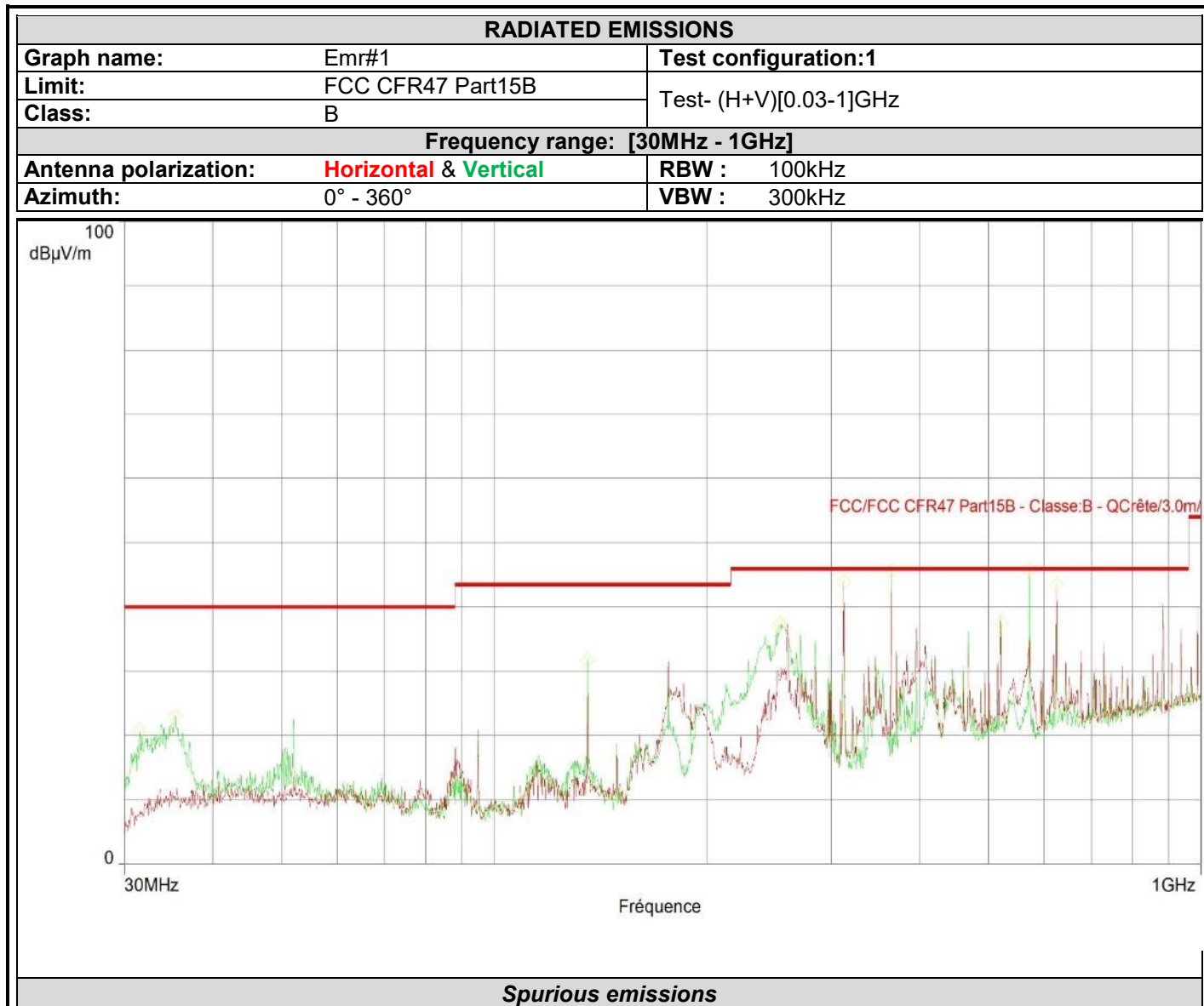
4.6.1. 30MHz –1GHz

Pre-qualification measurement

Graph identifier		Polarization	EUT position	Comments	
Emr#	1	Horizontal & Vertical	Axis XY	EUT Beta2 with the customer's ferrite on the screen cable	See below
Emr#	2	Horizontal & Vertical	Axis XY	EUT Beta1 with shielded power supply (TDK) and customer's ferrite on the screen cable and inversion of the switch to better order the cables for OATS measurements	See below



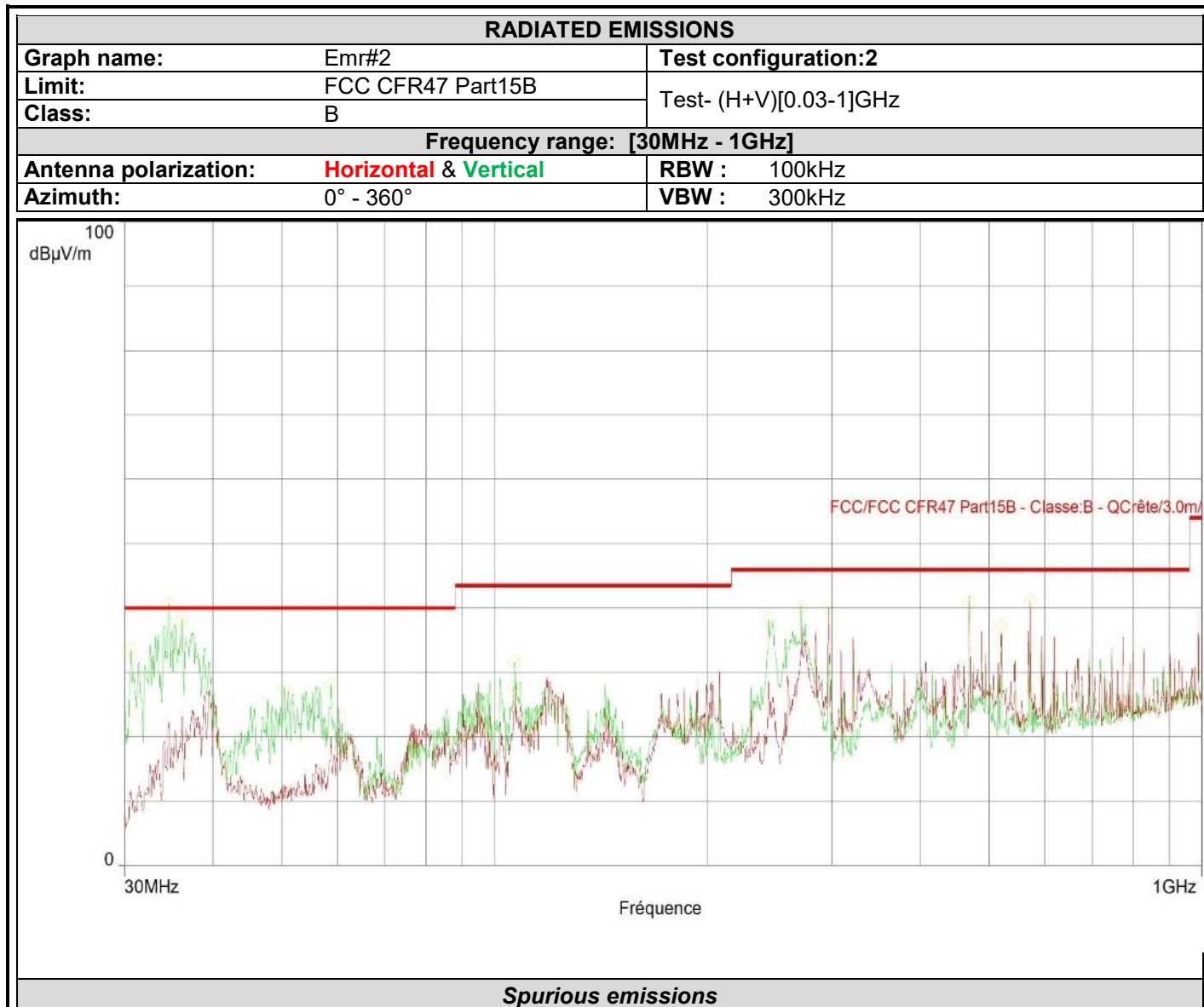
L C I E



Frequency (MHz)	Peak Level (dBµV/m)	Polarization	Correction (dB)
312.000	43.9	Horizontal	-11.9
520.040	37.5	Horizontal	-6.1
624.000	43.5	Horizontal	-5.4
253.440	37.3	Vertical	-13.2
254.320	37.4	Vertical	-13.2
364.000	45.6	Vertical	-9.9
572.080	45.9	Vertical	-6.0



L C I E



Frequency (MHz)	Peak Level (dBµV/m)	Polarization	Correction (dB)
296.680	40.0	Horizontal	-12.5
468.040	40.9	Horizontal	-7.1
520.040	37.2	Horizontal	-6.1
572.080	41.2	Horizontal	-6.0
30.629	33.6	Vertical	-21.1
34.641	40.6	Vertical	-18.7
36.154	38.3	Vertical	-18.2
50.417	27.4	Vertical	-16.4
58.730	28.2	Vertical	-15.9
244.040	38.2	Vertical	-13.5
271.200	40.1	Vertical	-12.9

Qualification

The frequency list is created from the results obtained during the pre-qualification.
Measurements are performed using a QUASI-PEAK detection.

• For Beta2

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)
312	19,5	QP	V	0	205	-	17,4	36,9	46,0	-9,1
353,32	23,5	QP	V	360	100	-	18,9	42,4	46,0	-3,6
364	22,5	QP	V	360	100	-	19,1	41,6	46,0	-4,4
520	20,5	QP	H	360	400	-	24,0	44,5	46,0	-1,5
572,08	17,5	QP	V	399	100	-	25,9	43,4	46,0	-2,6
624	18,0	QP	V	0	100	-	26,8	44,8	46,0	-1,2

• For Beta1

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)
30,629	17,5	QP	V	0	280	-	14,1	31,6	40,0	-8,4
34,641	19,5	QP	V	360	100	-	14,4	33,9	40,0	-6,1
36,154	19,6	QP	V	0	100	-	14,5	34,1	40,0	-5,9
54,417	20,5	QP	V	360	100	-	11,1	31,6	40,0	-8,4
58,73	22,5	QP	V	255	100	-	9,8	32,3	40,0	-7,7
244,04	23,5	QP	V	0	100	-	15,0	38,5	46,0	-7,5
271,2	27,2	QP	V	360	100	-	16,3	43,5	46,0	-2,5
296,68	26,5	QP	H	160	300	-	17,1	43,6	46,0	-2,4
448,04	22,5	QP	H	0	400	-	21,9	44,4	46,0	-1,6
520	20,5	QP	H	360	400	-	24,0	44,5	46,0	-1,5

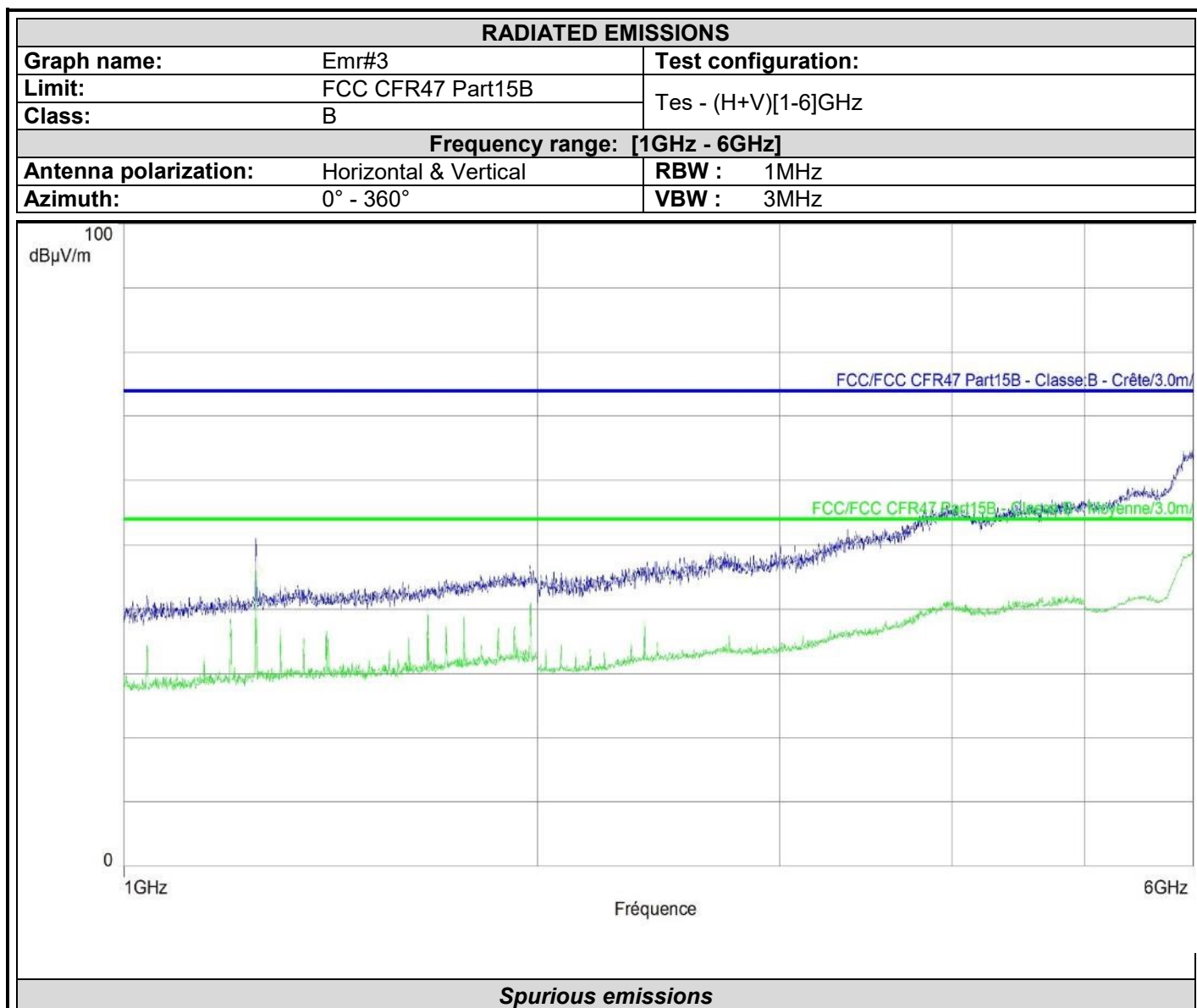
4.6.2. 1GHz - 6GHz

Pre-qualification measurement

Graph identifier	Polarization	EUT position	Comments
Emr# 3	Vertical & Horizontal	Axis XY	For Beta2 See below
Emr# 4	Vertical & Horizontal	Axis XY	For Beta1 See below



L C I E

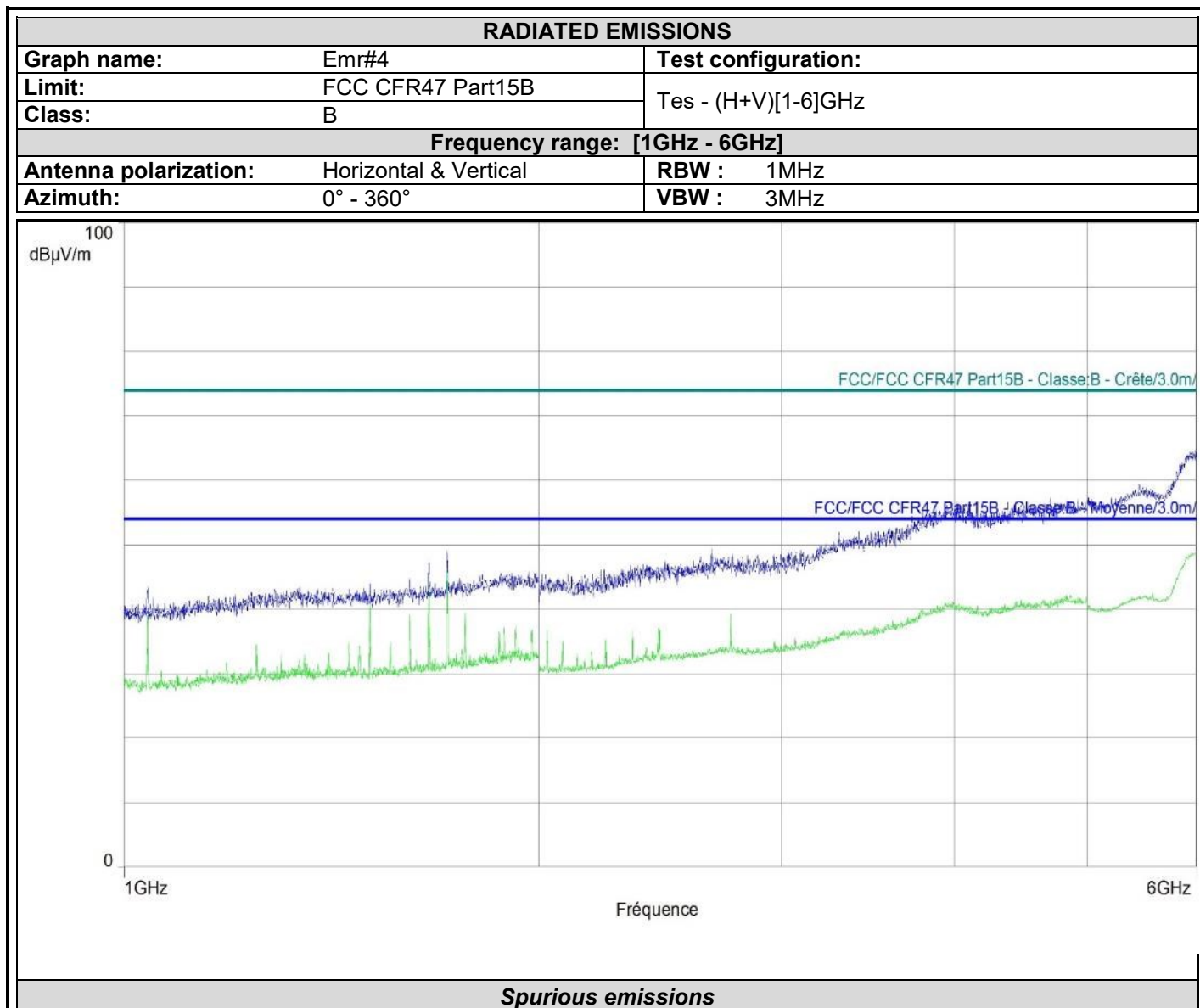


Frequency (MHz)	Average (dBµV/m)	Lim.Average (dBµV/m)	Average-Lim.Average (dB)	Commentaire	Polarization	Correction (dB)
1248.250	46.0	54.0	-8.0	Horizontal	Horizontal	0.1

- Does not come from EUT,



L C I E



No significant frequency observed

Qualification

The frequency list is created from the results obtained during the pre-qualification. Measurements are performed using a PEAK and AVERAGE detection.

No significant frequency observed

4.7. CONCLUSION

The sample of the equipment 9750, Sn : FR21240050(Beta2) and fr21240220(Beta1),, tested in the configuration presented in this test report **satisfies** to requirements of the product family standard applied (See §Test Program) for radiated emissions.

5. 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 (monophasé /triphase) 10kHz-150kHz <i>Measurement of conducted disturbances in voltage on the power port (single & three phases) 10kHz-150kHz</i>	3.27dB	3.8dB
Mesure des perturbations conduites en tension sur le réseau d'énergie (monophasé /triphase) 150kHz-30MHz <i>Measurement of conducted disturbances in voltage on the power port (single & three phases) 150kHz-30MHz</i>	3.29dB	3.4dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication <i>Measurement of conducted disturbances in voltage on the telecommunication port.</i>	3.26dB	5dB
Mesure des perturbations discontinues conduites en tension <i>Measurement of discontinuous conducted disturbances in voltage</i>	3.33dB	3.4dB
Mesure des perturbations conduites en courant <i>Measurement of conducted disturbances in current</i>	2.67dB	2.9dB
Mesure du champ électrique rayonné en cage de Faraday semi-anéchoïque de 30MHz à 1GHz <i>Measurement of radiated electric field in half-anechoic Faraday room From 30MHz to 1GHz</i>	5.06dB	5.3dB
Mesure du champ électrique rayonné en cage de Faraday semi-anéchoïque de 1GHz à 6GHz <i>Measurement of radiated electric field in half-anechoic Faraday room From 1GHz to 6GHz</i>	5.18dB	5.2dB
Mesure du champ électrique rayonné en cage de Faraday semi-anéchoïque de 6GHz à 18GHz <i>Measurement of radiated electric field in half-anechoic Faraday room From 6GHz to 18GHz</i>	5.21dB	5.5dB
Mesure du champ électrique rayonné sur le site en espace libre de Moirans 30MHz – 1GHz. <i>Measurement of radiated electric field on the Moirans open area test site 30MHz – 1GHz.</i>	5.2dB	6.3dB
Mesure du champ électrique rayonné IN SITU de 30 à 1000 MHz <i>IN SITU measurement of radiated electric field from 30 to 1000MHz</i>	A l'étude / Under consideration	5.2dB
Mesure de la puissance perturbatrice <i>Measurement of disturbance power</i>	3.32dB	4.5dB
Mesure des harmoniques de courant <i>Measurement of current harmonics</i>	11.11%	/
Mesure du flicker <i>Flicker measurement</i>	9.26%	/

Les valeurs d'incertitudes calculées du laboratoire étant inférieures aux valeurs d'incertitudes limites établies par le CISPR, la conformité de l'échantillon est établie directement par les niveaux limites applicables. Ce tableau regroupe l'ensemble des incertitudes maximales pour les essais réalisables dans le laboratoire, qu'ils aient été ou non réalisés dans le cadre du présent rapport / *The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR. The conformity of the sample is directly established by the applicable limits values. This table includes all uncertainties maximum feasible for testing in the laboratory, whether or not made in this report*