



L C I E

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.



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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

| 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)

°: 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

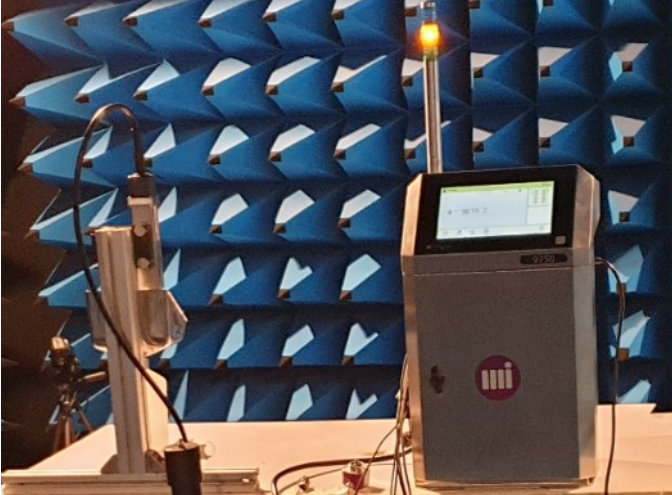
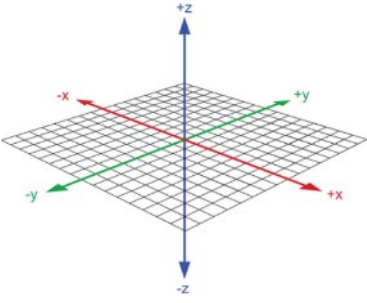
Beta1 and Beta2 are continuous inkjet printers with TAG reading on consumable cartridges, identical electronic cards, but supplied by two different power supplies.

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

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

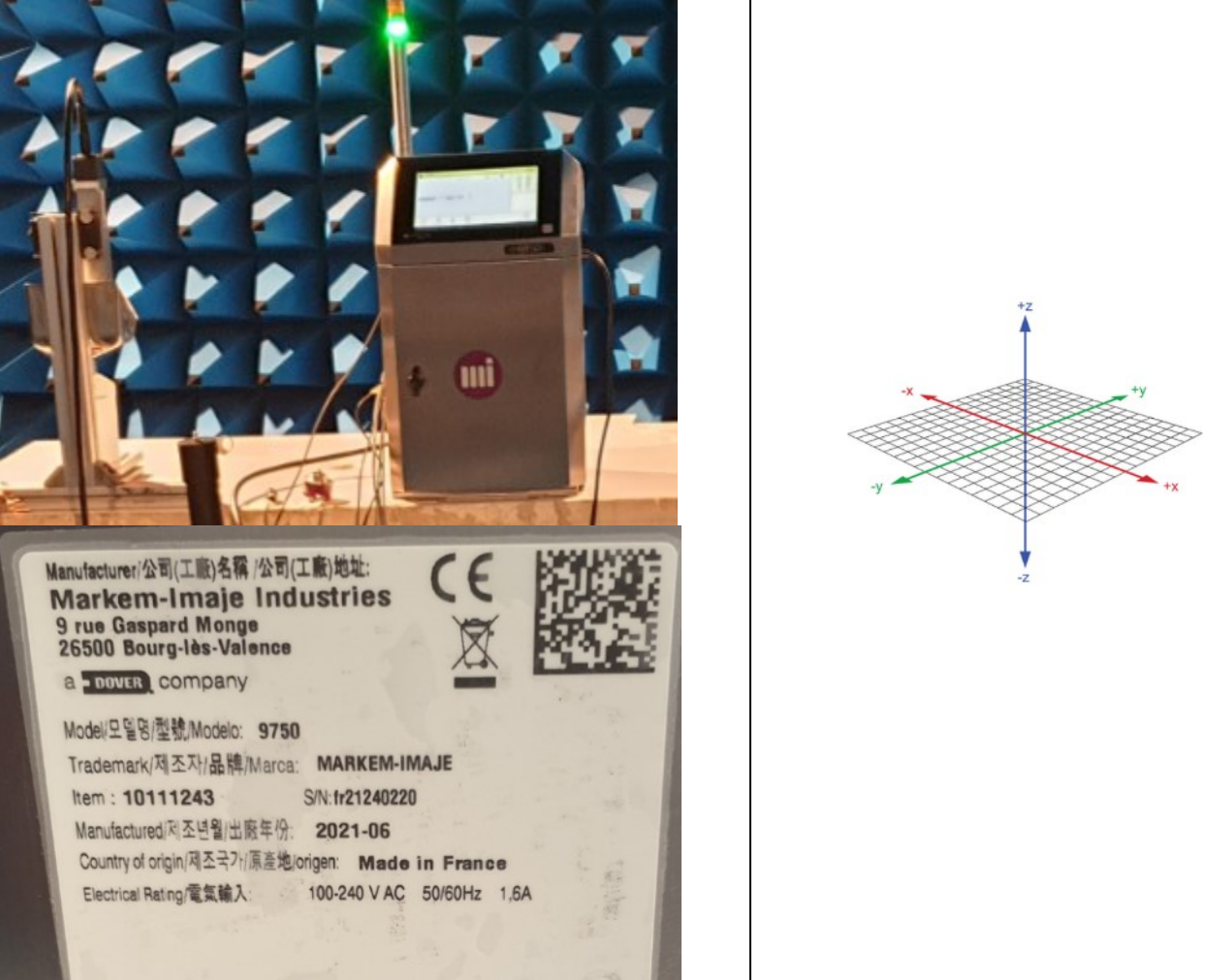
2.2. HARDWARE IDENTIFICATION (EUT AND AUXILIARIES)

Equipment under test (EUT):

| | |
|--|--|
| Model under test : | 9750 |
| Serial Number: | FR21240050(Beta2) |
|  | |
|  | |
| <p>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</p> <p>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</p> | |
| Dimensions: | 405mm x 300mm x 645mm (Length x Width x Height) for Beta2 with supply Meanwell |
| Type : | Table-Top |



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| | |
|---|---|
| Model under test : | 9750 |
| Serial Number: | fr21240220(Beta1) |
|  | |
| 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 | | | | |



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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 | - |

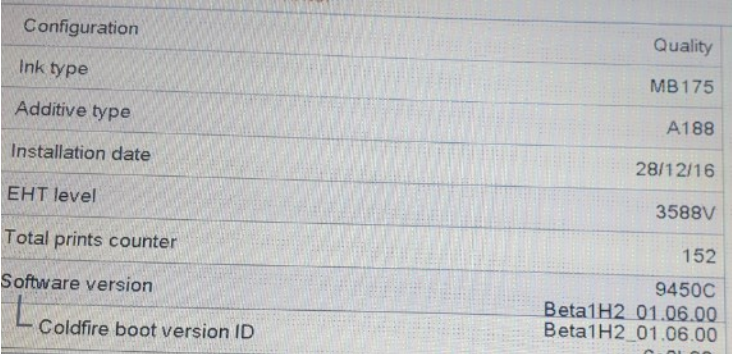
NC: Not communicated by provider

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



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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)

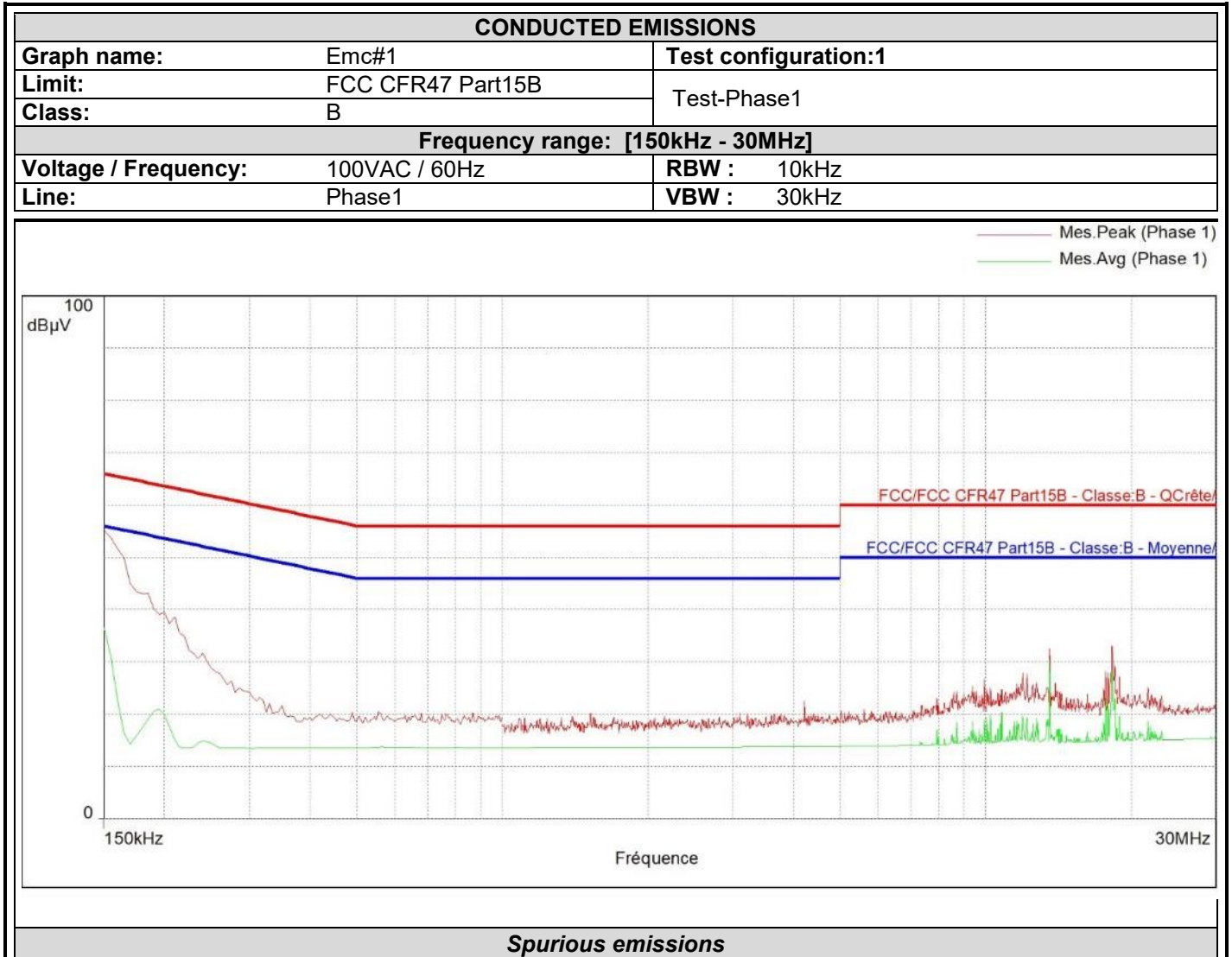
Measurements are performed on the phase (L1) and neutral (N) of the power line.

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 |



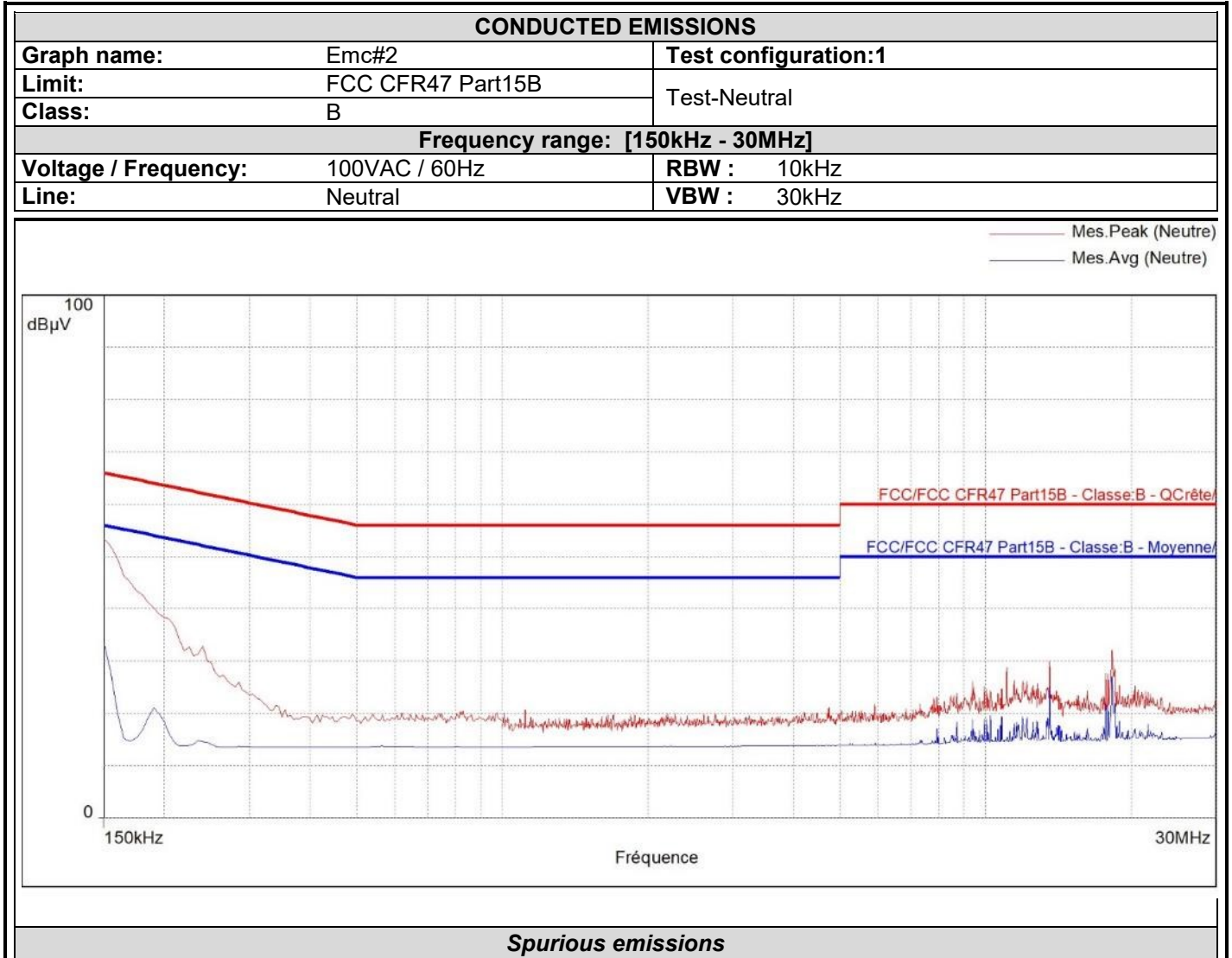
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| Frequency (MHz) | Mes.QPeak (dBµV) | LimQP (dBµV) | Mes.QPeak-LimQP (dB) | Mes.Avg (dBµV) | LimAvg (dBµV) | Mes.Avg-LimAvg (dB) | Line | Correction (dB) |
|-----------------|------------------|--------------|----------------------|----------------|---------------|---------------------|---------|-----------------|
| 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 |



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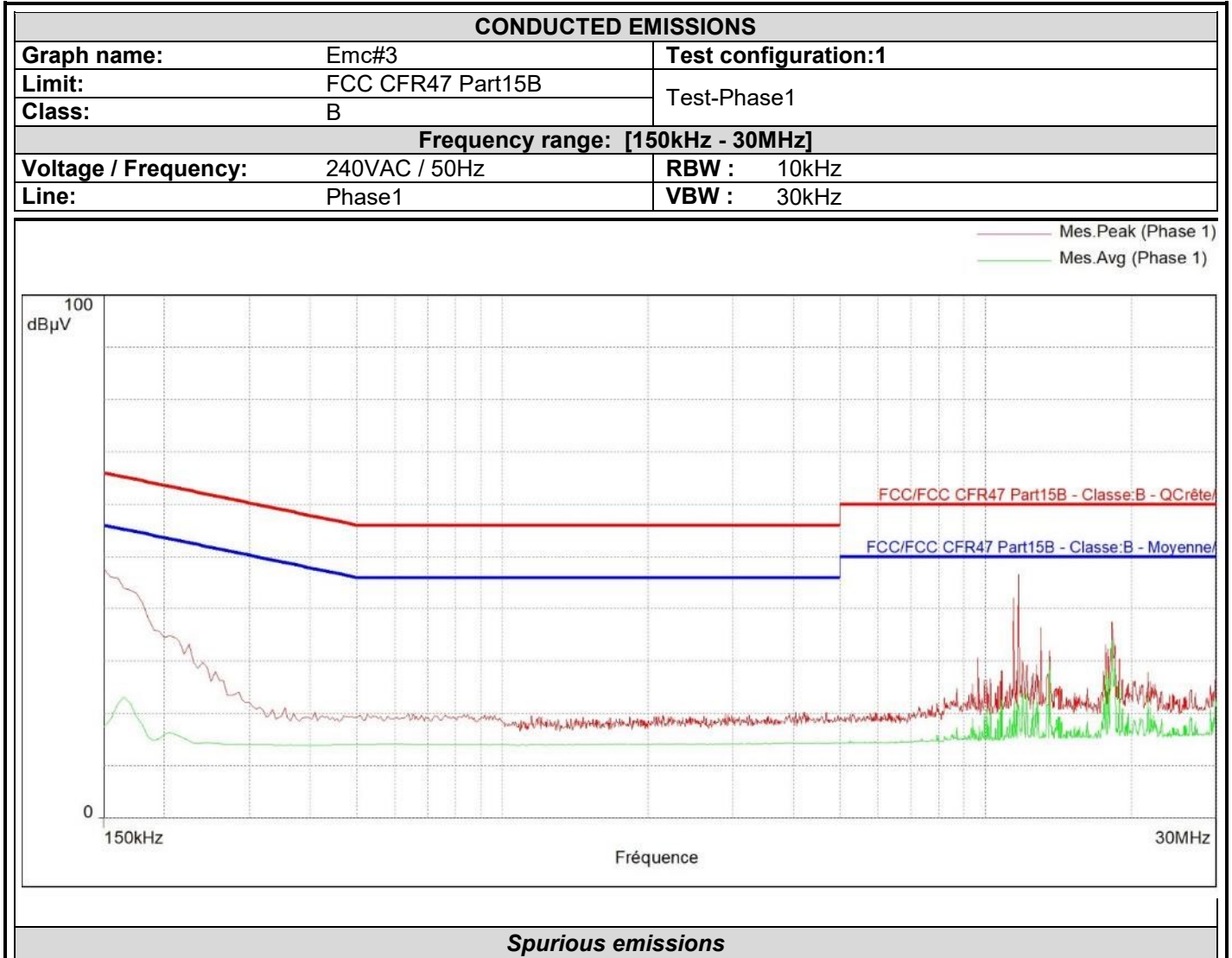


Spurious emissions

| 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 |



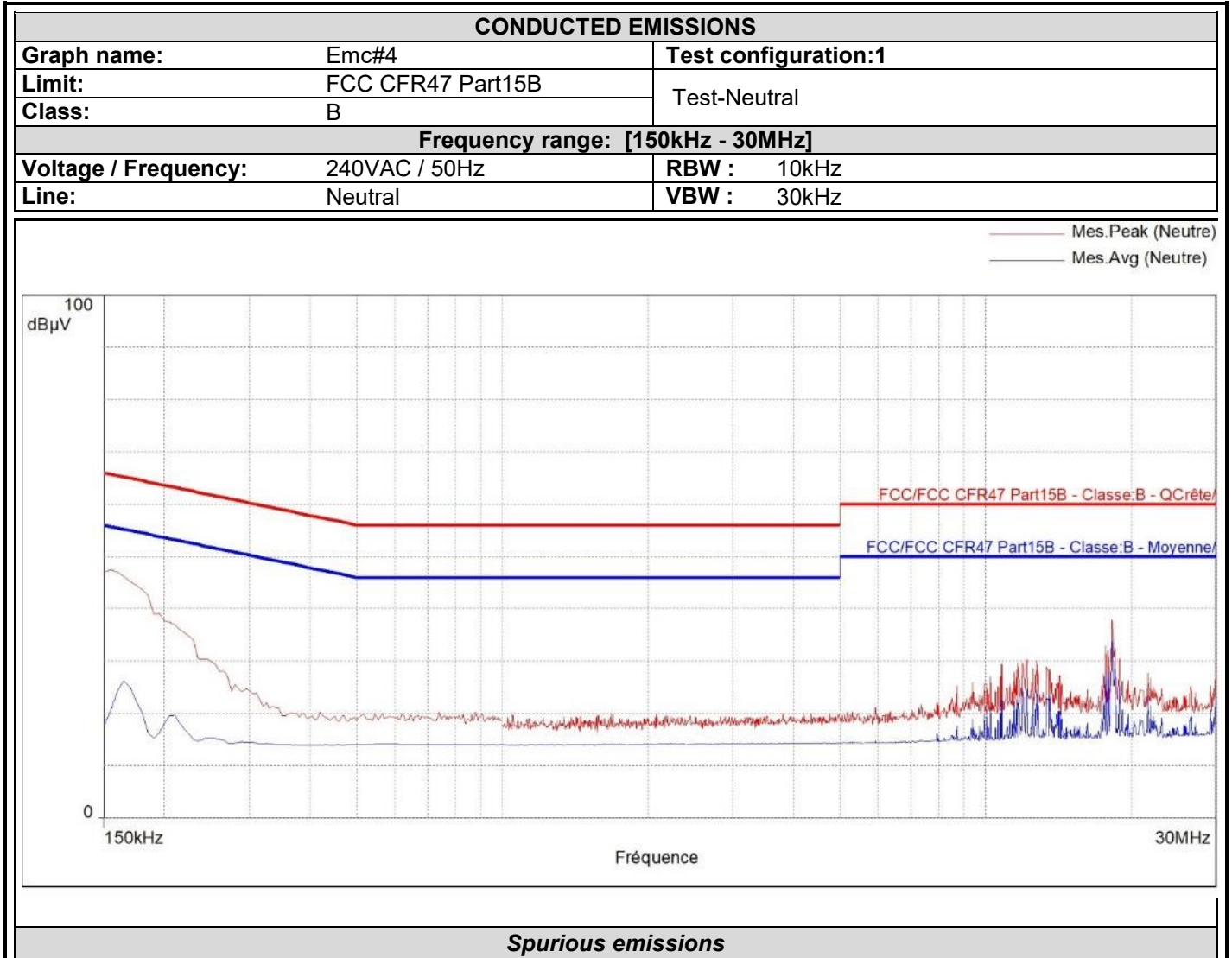
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| Frequency (MHz) | Mes.QPeak (dBµV) | LimQP (dBµV) | Mes.QPeak-LimQP (dB) | Mes.Avg (dBµV) | LimAvg (dBµV) | Mes.Avg-LimAvg (dB) | Line | Correction (dB) |
|-----------------|------------------|--------------|----------------------|----------------|---------------|---------------------|---------|-----------------|
| 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 |



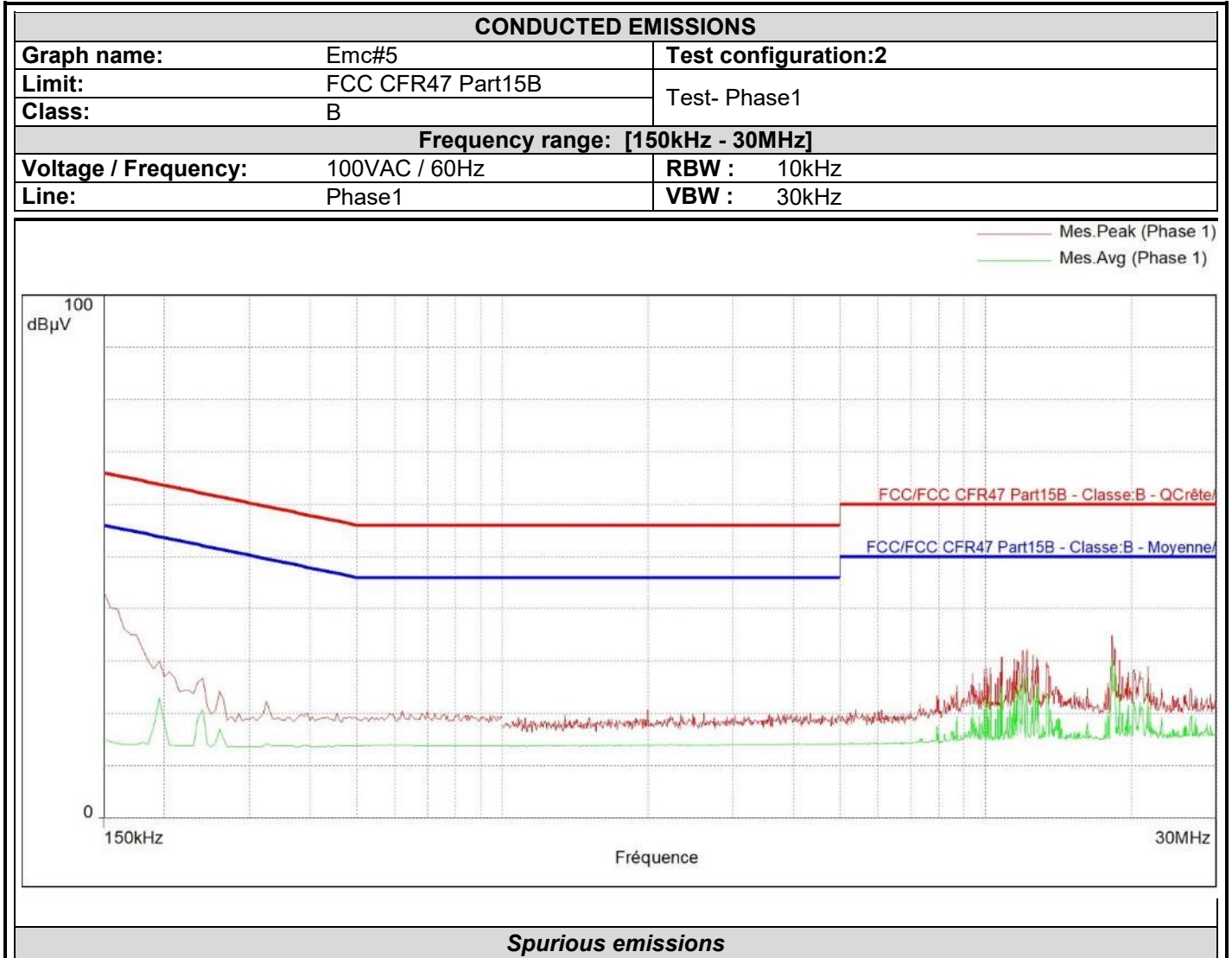
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| Frequency (MHz) | Mes.QPeak (dBµV) | LimQP (dBµV) | Mes.QPeak-LimQP (dB) | Mes.Avg (dBµV) | LimAvg (dBµV) | Mes.Avg-LimAvg (dB) | Line | Correction (dB) |
|-----------------|------------------|--------------|----------------------|----------------|---------------|---------------------|---------|-----------------|
| 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 |



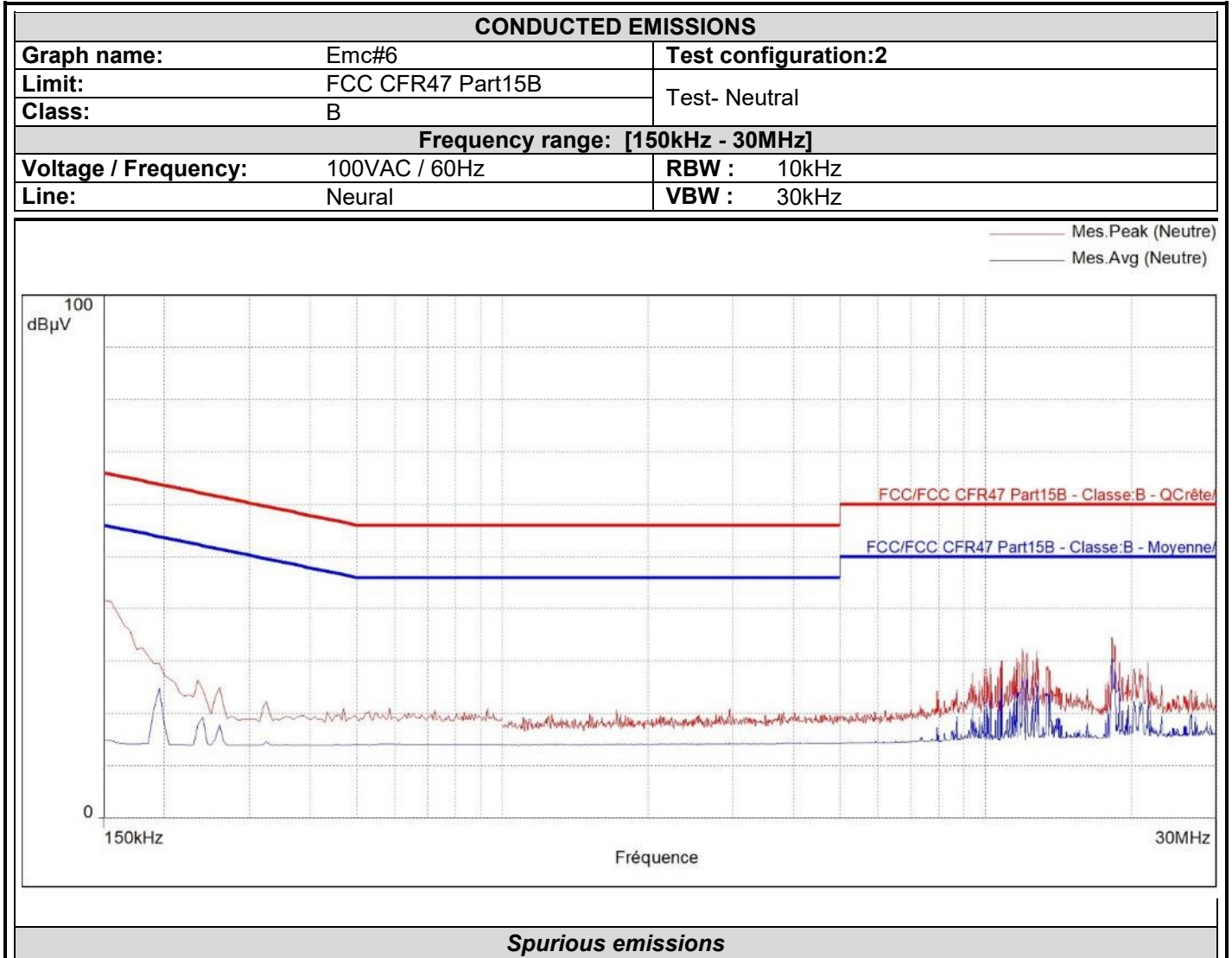
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| Frequency (MHz) | Mes.QPeak (dBµV) | LimQP (dBµV) | Mes.QPeak-LimQP (dB) | Mes.Avg (dBµV) | LimAvg (dBµV) | Mes.Avg-LimAvg (dB) | Line | Correction (dB) |
|-----------------|------------------|--------------|----------------------|----------------|---------------|---------------------|---------|-----------------|
| 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 |



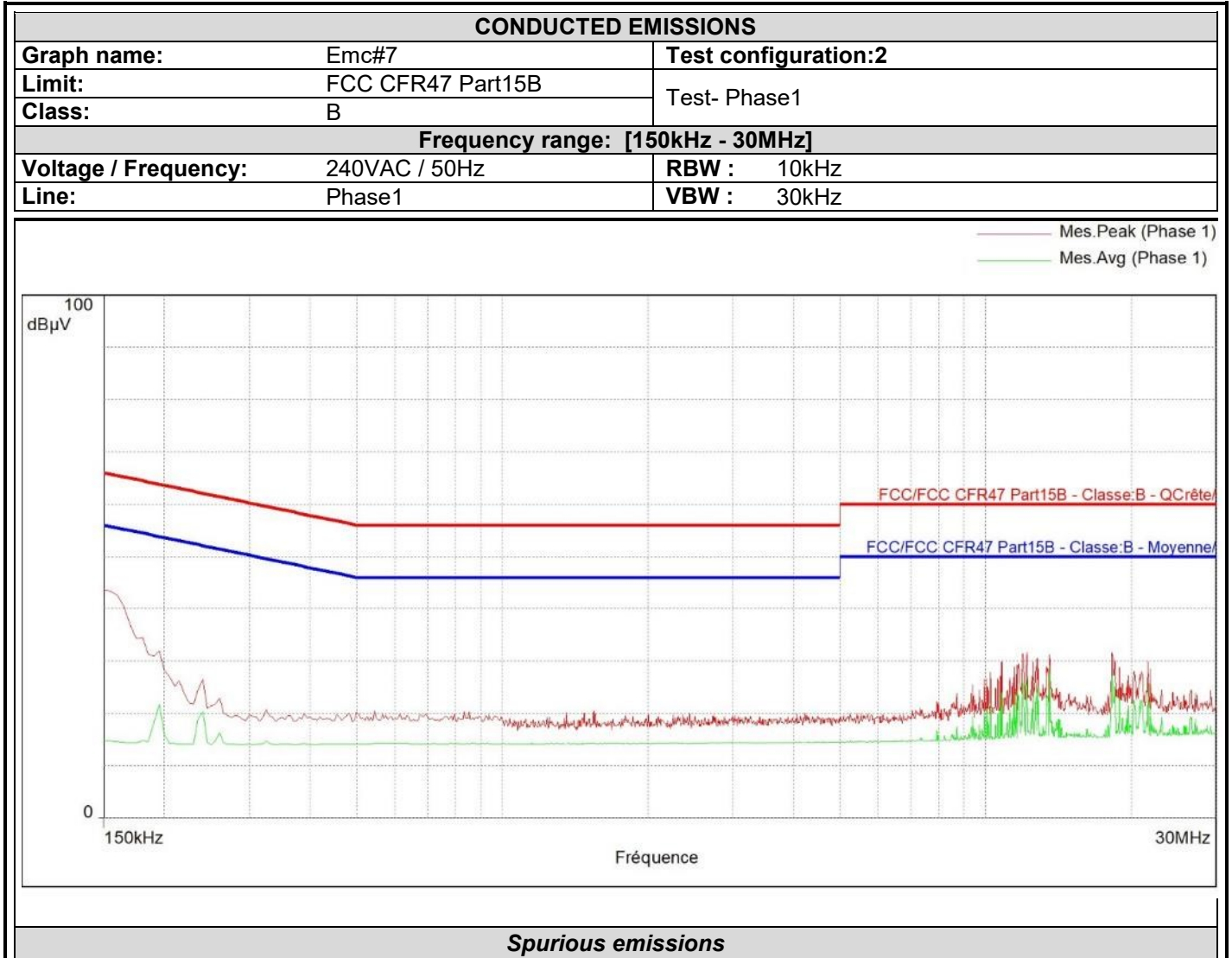
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| Frequency (MHz) | Mes.QPeak (dBµV) | LimQP (dBµV) | Mes.QPeak-LimQP (dB) | Mes.Avg (dBµV) | LimAvg (dBµV) | Mes.Avg-LimAvg (dB) | Line | Correction (dB) |
|-----------------|------------------|--------------|----------------------|----------------|---------------|---------------------|---------|-----------------|
| 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 |



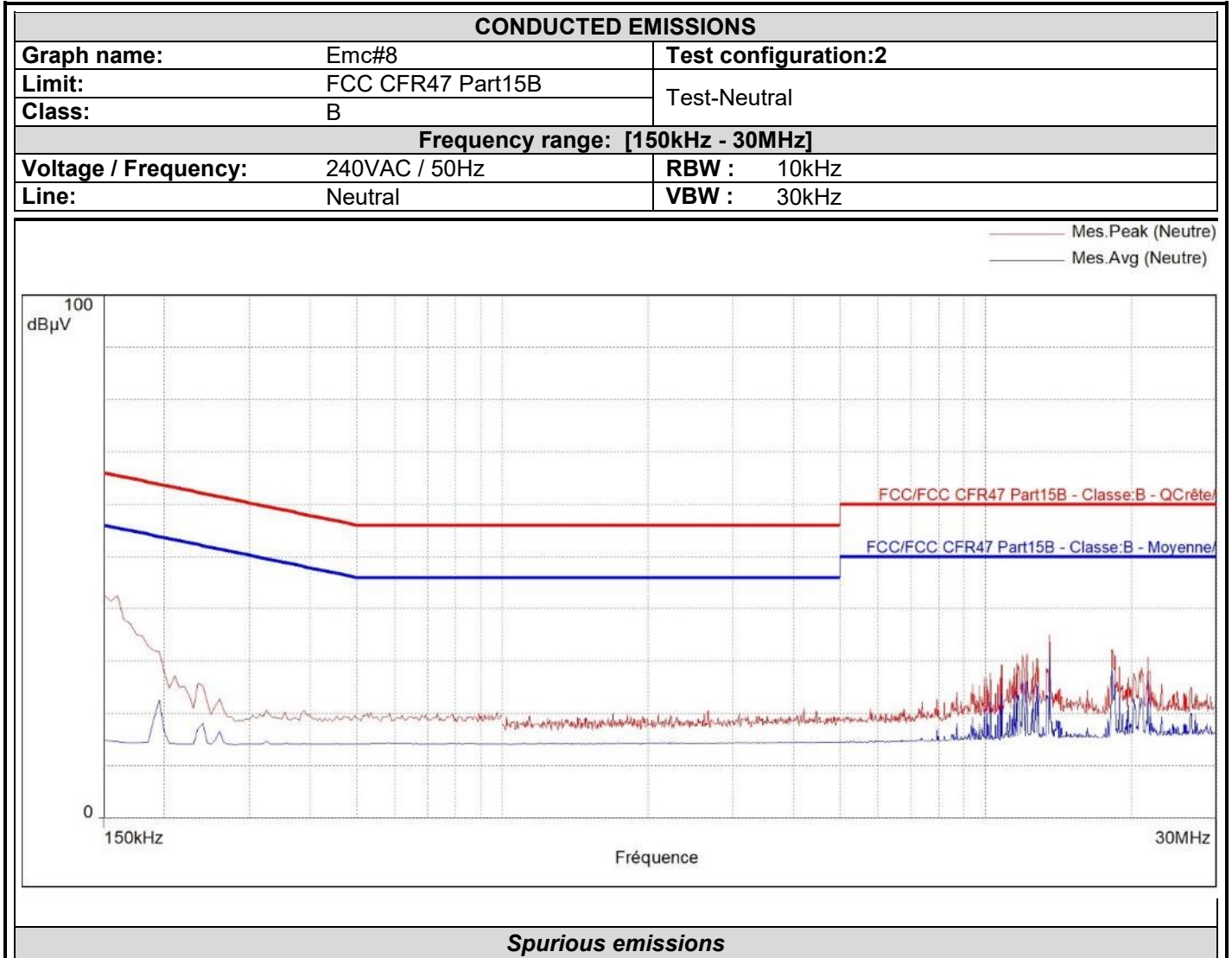
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| Frequency (MHz) | Mes.QPeak (dBµV) | LimQP (dBµV) | Mes.QPeak-LimQP (dB) | Mes.Avg (dBµV) | LimAvg (dBµV) | Mes.Avg-LimAvg (dB) | Line | Correction (dB) |
|-----------------|------------------|--------------|----------------------|----------------|---------------|---------------------|---------|-----------------|
| 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 |



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| 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

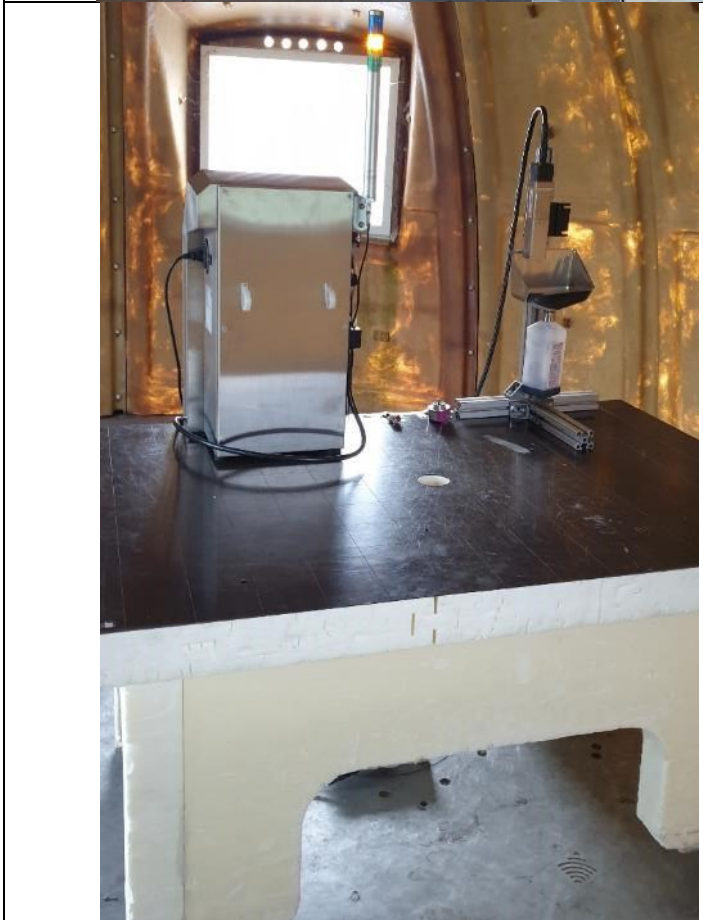
The EUT and auxiliaries are set 80cm above the ground on the non-conducting table (Table-top equipment).
The EUT is powered by V_{nom} .



Test setup in anechoic chamber – Frequency <1GHz



L C I E

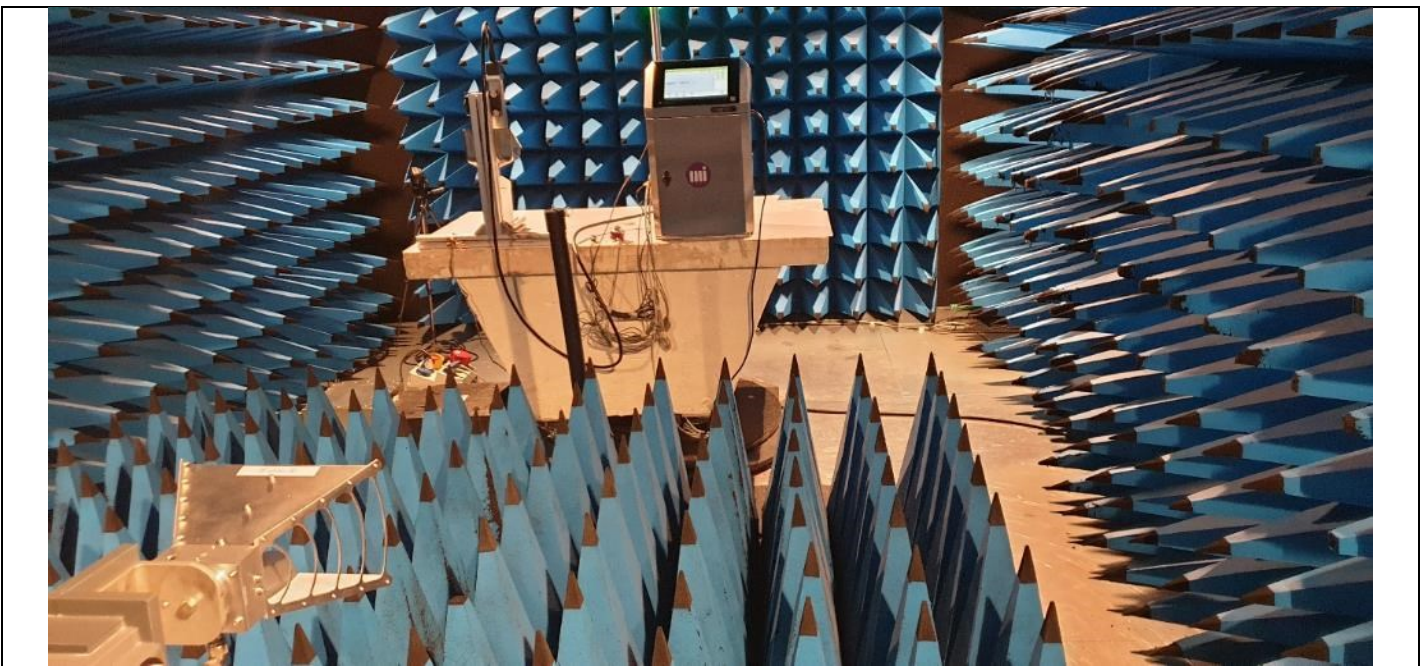




L C I E



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.



LCIE

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

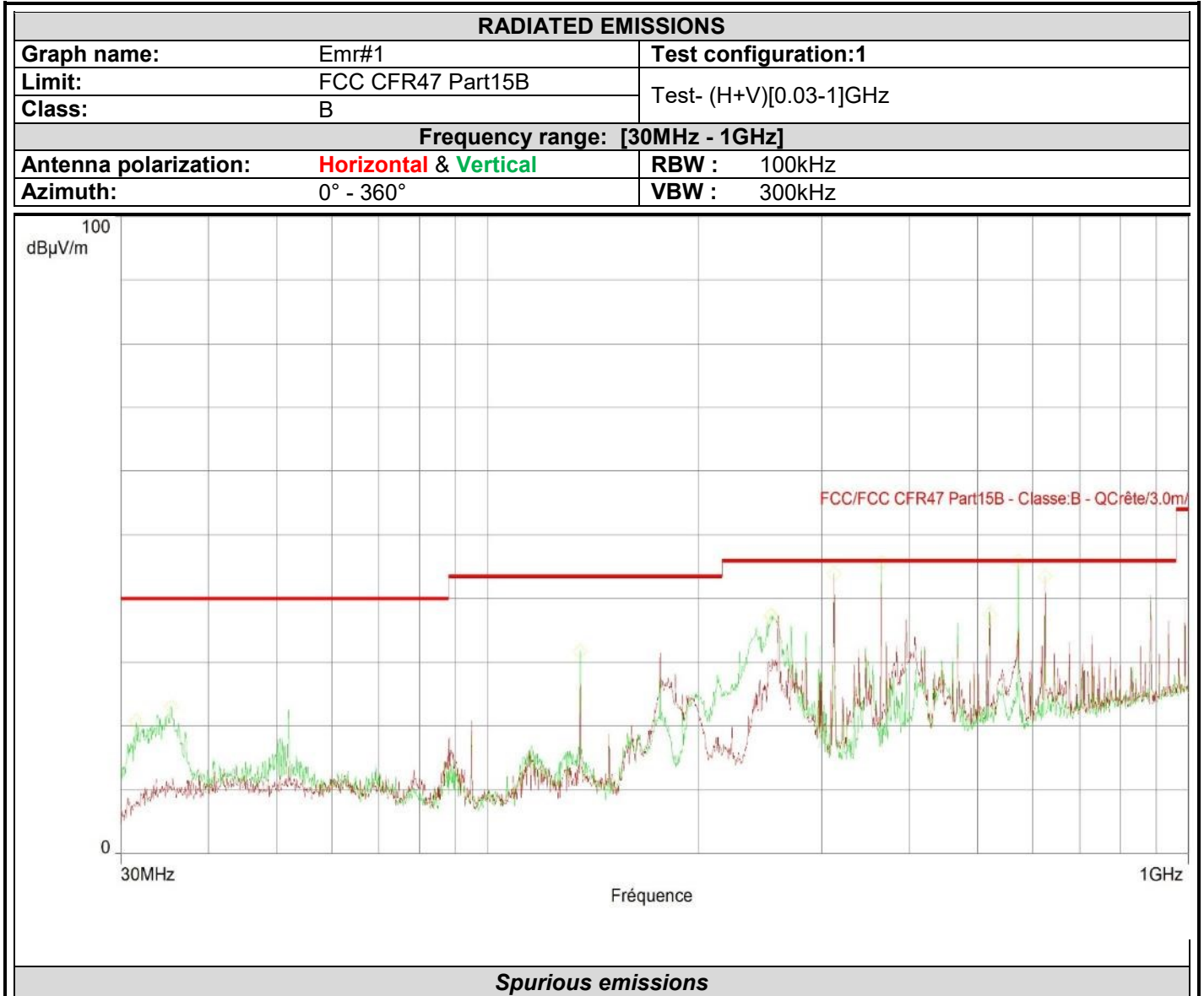
4.6.1. 30MHz –1GHz

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 |



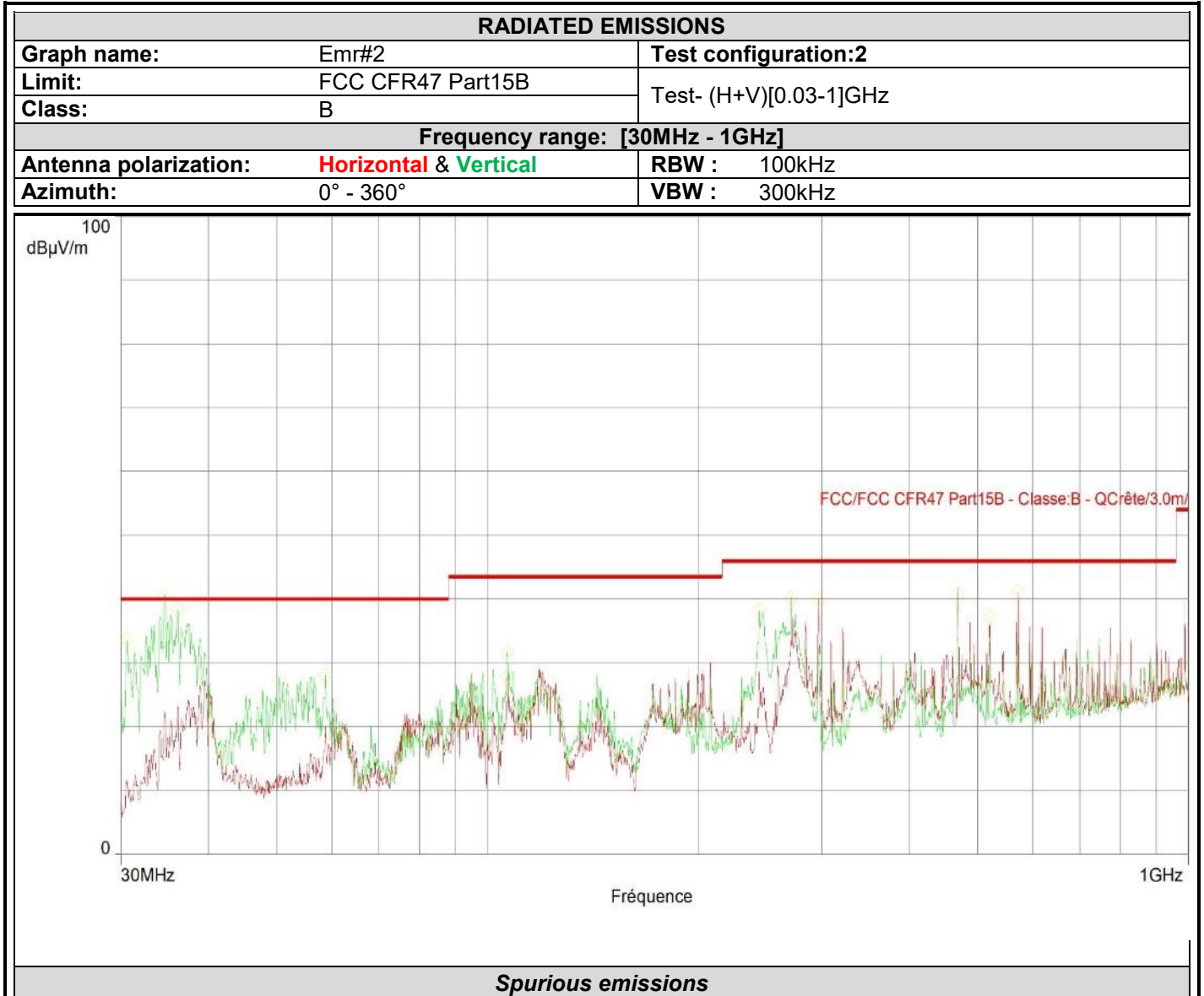
L C I E



| 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 |

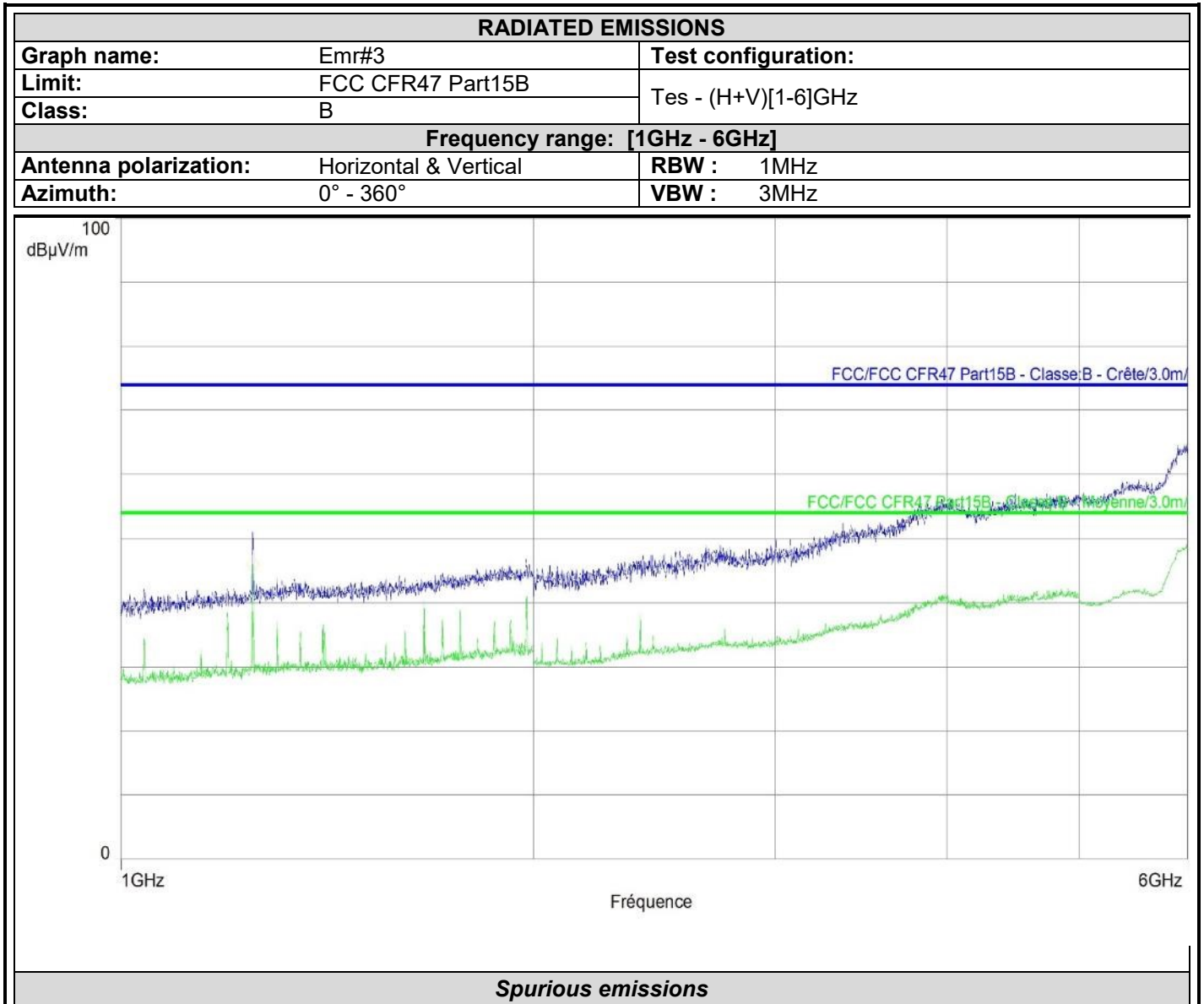
4.6.2. 1GHz - 6GHz

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 |



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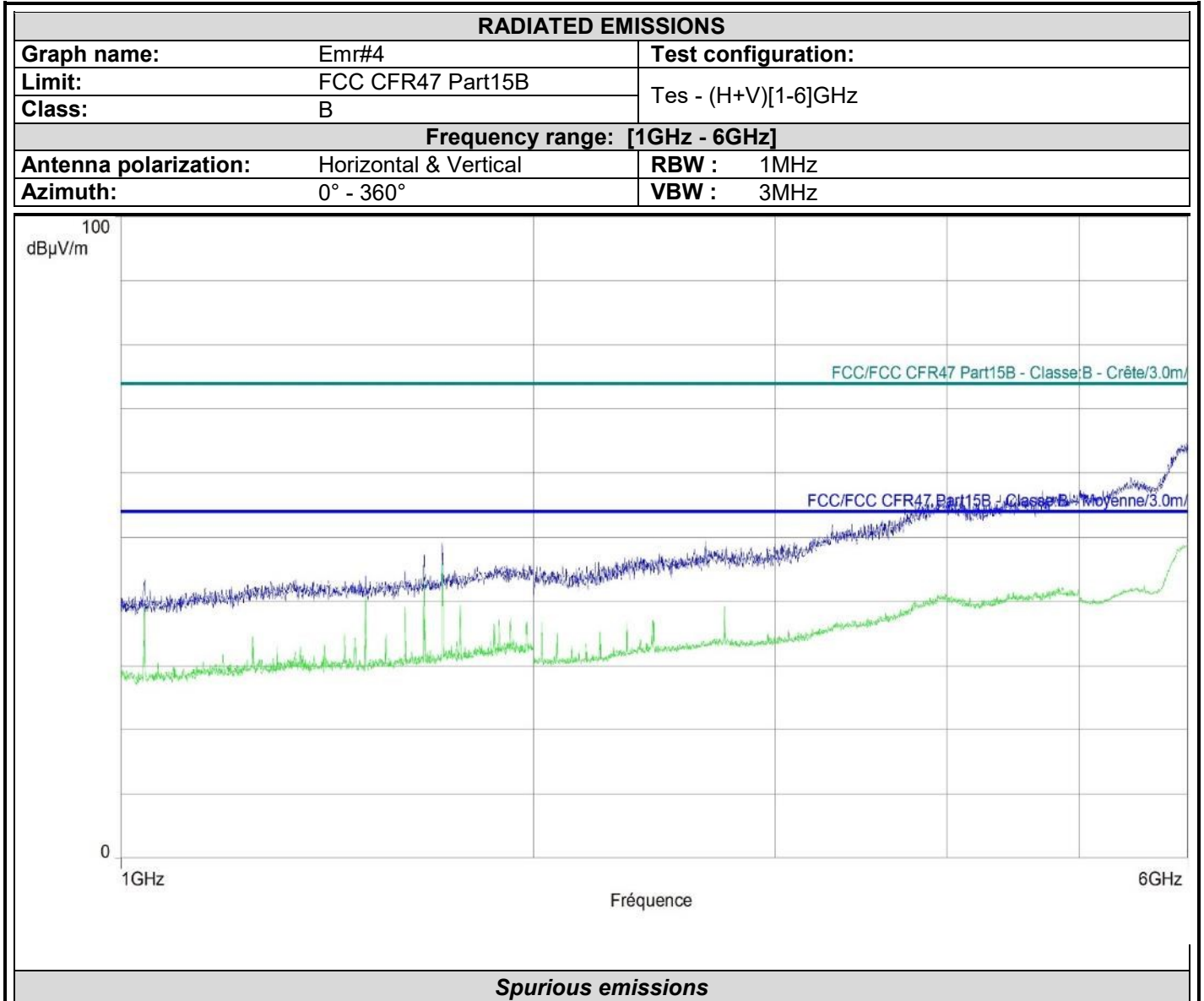


| Frequency (MHz) | Average (dBµV/m) | Lim.Average (dBµV/m) | Average-Lim.Average (dB) | Commentaire | Polarization | Correction (dB) |
|-----------------|------------------|----------------------|--------------------------|-------------|--------------|-----------------|
| 1248.250 | 46.0 | 54.0 | -8.0 | 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) ±x | Incertitude limite du CISPR / CISPR uncertainty limit ±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-anechoïque 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-anechoïque 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-anechoïque 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*