



# Rapport d'essai / Test report

N° 200802-4315CR-A1-R2-E

JDE : 79855

**DELIVRE A / ISSUED TO**

: TAGSYS S.A.  
180, Chemin de Saint Lambert  
13821 LA PENNE SUR HUVEAUNE  
FRANCE

**Objet / Subject**

: Essais de compatibilité électromagnétique conformément aux normes  
FCC CFR 47 Part 15, Subpart C.  
*Electromagnetic compatibility tests according to the standards FCC CFR  
47 Part 15, Subpart B and Subpart C*

**Matériel testé / Apparatus under test :**

- Produit / Product : Lecteur de tag RFID / RFID tag reader
  - Marque / Trade mark : TAGSYS
  - Constructeur / Manufacturer : TAGSYS
  - Type / Model : L400-4
  - N° de série / serial number \* : H0744002C0 \*
  - FCC ID : QHKMEDIOL400CHAN4
- \* : information donnée par le client / information given by the customer

**Date des essais / Test date**

: Du 18 au 25 Février 2008 / From February 18<sup>th</sup> to 25<sup>th</sup>, 2008

**Lieu d'essai / Test location**

: LCIE  
ZI des Blanchisseries  
38500 VOIRON – France

**Test réalisé par / Test performed by**

: Laurent CHAPUS / Anthony MERLIN

**Ce document comporte / Composition of document :** 35 pages.

VOIRON, LE 25 MARS 2008 / MARCH 28<sup>TH</sup>, 2008

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## 1. TEST PROGRAM

### **Standard : FCC CFR 47, PART 15, Subpart C**

ANSI C63-4 (2003).

Requirements for intentional radiator. Chapter 15.225 (Operation within the band 13.110-14.010MHz)

### **Standard : FCC CFR 47, PART 15, Subpart B**

ANSI C63-4 (2003).

Requirements for unintentional radiator. Class B computer peripheral.

- Radiated emissions from 30MHz to 1GHz
- Conducted emissions from 150kHz to 30MHz

Note: The L400-4 reader is considered as a computer peripheral device as it is used in conjunction with a PC.

### **General conclusion:**

Measures performed on the sample of the product L400-4, SN: H0744002C0, in configuration and description presented in this test report, show compliance levels with FCC CFR 47, Part 15 B and Part 15 C.

## 2. SYSTEM TEST CONFIGURATION

### 2.1. JUSTIFICATION

The system was configured for testing in a typical fashion (as a customer would normally use it).

The L400-4 is tested with the 13.56MHz antennas:

- 2x TR-CAu (output RF power set at 2W)
- 4x AERO-LB (output RF power set at 2W)

The standard position of TR-CAu antenna is vertical.

The standard position of AERO-LB antennas is horizontal.

Four channels of the L400 reader are used in a multiplexer mode.

### 2.2. HARDWARE IDENTIFICATION

- **Equipment under test (EUT):**

**L400-4**

Serial number: H0744002C0

**FCC ID: QHKMEDIOL400CHAN4**

The L400 reader is supplied with the AC/DC power adapter SWITCHBOX model FDF0453-A  
(Input: 100-240V / 50-60Hz ; Output : 18-24Vdc / 2.5A)

- **Input/output on the L400-4 reader :**

- \* Serial RS232 connector (DB9 connector)
- \* USB port
- \* Ethernet 10/100 (RJ45 connector)
- \* Channel 1 to 4 antenna connectors (SMA connector)
- \* I/O ports (DB9 connector)
- \* Power supply (24Vdc)
- \* TAGSYS Service connector (for TAGSYS internal use only)

• **Auxiliaries used for testing:**

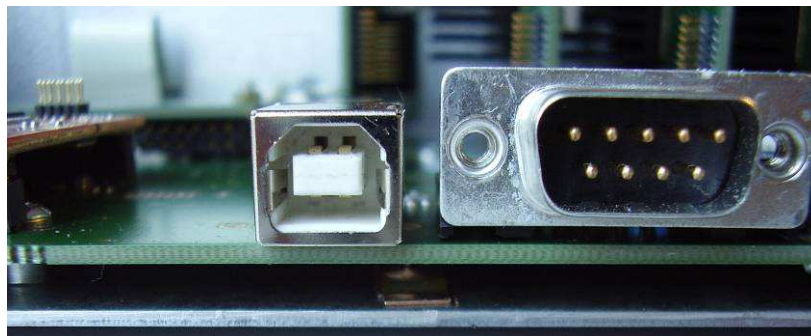
| Trade Mark – Model Number<br>(Serial number)                                                                                | FCC ID | Description              | Cable description                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------|--------|--------------------------|----------------------------------------------------------------------------------------------|
| TOSHIBA SATELITE S1410-704<br>(PS141E-04YCM-3V)<br>sn: 13594938G<br>with its power supply unit (PA3201U-1ACA SEB100P2-15.0) | D.O.C  | Laptop Personal Computer | Power cable: unshielded<br>USB cable: shielded<br>Ethernet cable: shielded                   |
| TAGSYS - RFID tag (I-Code1/270TL)                                                                                           | -      | Textile application TAG  |                                                                                              |
| TAGSYS - RFID tag (ISO 15693)                                                                                               | -      | Textile application TAG  |                                                                                              |
| 2x TAGSYS- TR-CAu antennas                                                                                                  | -      | 13.56MHz RF antenna      | 2x BNC, 50Ω (1.2m & 1.5m) 6 ferrites on reader's side on each antenna (with extension cords) |
| 4x TAGSYS- AERO LB antenna                                                                                                  | -      | 13.56MHz RF antenna      | BNC, 50Ω, 6 ferrites on reader's side on each antenna                                        |

• **I/O cables used for testing:**

- 4x Antenna RF cables, coaxial 50Ω
- 1x Serial RS232 cable, shielded: 1.5m
- 1x I/O cable, DB9 connector, shielded: 1.5m
- 1x USB cable, shielded: 1.8m
- 1x Ethernet cable, Cat5e, FTP, shielded: 5m
- 2x Mains AC power supply cables, unshielded: 1.8m (EUT and PC)

## 2.3. EQUIPMENT MODIFICATIONS

Added metallic contact between housing and PCB ground.



## 2.4. EUT EXERCISE SOFTWARE

The EUT exercise program used during radiated and conducted testing was exercised the L400 reader in a manner similar to a typical use.

The test program permits the continuous reading of a RFID tag.

PC Software used: TAGSYS EXPLORER V1.1.2



## **2.5. EUT CONFIGURATION**

Tests are performed with RFID tags compatible to I-Code1 (220TL) and ISO 15693 standards.

### **Configuration A for TR-CAu antenna:**

The 2 antennas TRCAu are connected on channel 1, 2, 3, 4 of the reader.

The RF output power is set at 2W (Software controlled).

Distance between antennas is 1.5m.

### **Configuration B for AERO-LB antenna:**

The 4 antennas AERO-LB are connected on channel 1, 2, 3, 4 of the reader.

The RF output power is set at 2W (Software controlled).

Distance between antennas is 25cm.

## **2.6. SPECIAL ACCESSORIES**

RF antenna cables are coaxial 50Ω with six ferrites on the reader's side.

Ethernet, serial and I/Os cables are shielded.

USB is standard cable.

### 3. RADIATED EMISSION DATA

#### 3.1. CLIMATIC CONDITIONS

Date of test : February 19<sup>th</sup>, 2008  
Test performed by : Laurent CHAPUS / Anthony Merlin  
Atmospheric pressure : 979mb  
Relative humidity : 31%  
Ambient temperature : 21.5°C

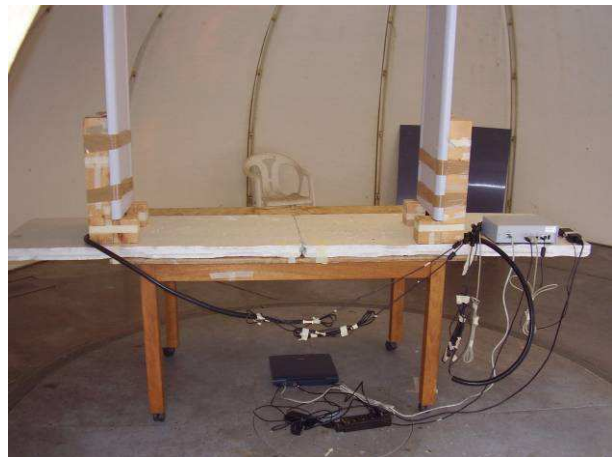
#### 3.2. TEST SETUP

The installation of EUT is identical for pre-characterization measurement in a 3 meters full anechoic chamber and for measures on a 10 meters Open site.

Power supply: 230V/50Hz

The EUT is placed on a non-conducting table of 80cm height.

Antennas are set in vertical (TR-CAU) and horizontal (AERO-LB) positions.



Radiated emission test setup

#### Equipment configuration and running mode:

A RFID tag is placed in the vicinity of the antenna. The reader is communicating with the PC with the USB link. The Ethernet cable is connected to the PC. A ping function is performed on the LAN.



### 3.3. TEST SEQUENCE AND RESULTS

#### 3.3.1. Pre-characterization at 3 meters [9kHz-30MHz]

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.

The distance between EUT and antenna is 3 meters. Pre-characterization is performed in vertical (V) polarization and the loop antenna position was rotated during the test for maximized the emission measurement.

Frequency band investigated is 9kHz to 30MHz.

The pre-characterization graphs are obtained in PEAK detection.

See graphs for 150kHz-30MHz band: 2x TR-CAu ANTENNA graph#1 (See annex 1)  
See graphs for 150kHz-30MHz band: 4x AERO-LB ANTENNA graph#2 (See annex 1)  
(Note: no frequency observed in the band 9kHz to 150kHz)

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

A pre-scan of all the setup has been performed in a 3 meters full anechoic chamber.

The distance between EUT and antenna is 3 meters. Test is performed in horizontal (H) and vertical (V) polarization with a log-periodic antenna Chase CBL6111A. The EUT is being rotated on 360° during the measurement. The pre-characterization graphs are obtained in PEAK detection.

See graphs for 30MHz-1GHz:

##### 2x TR-CAu ANTENNA

H polarization graph#3 (See annex 1)  
V polarization graph#4 (See annex 1)

##### 4x AERO-LB ANTENNA

H polarization graph#5 (See annex 1)  
V polarization graph#6 (See annex 1)

#### 3.3.3. Characterization on 10 meters open site below 30 MHz

The product has been tested according to ANSI C63.4 (2003), FCC part 15 subpart C. 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 §15.225 limits in the frequency range 13.553MHz 13.567MHz. Measurement bandwidth was 9kHz.

Antenna height was 1m for both horizontal and vertical polarization.

Antenna was rotated around its vertical axis.

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

A summary of the worst case emissions found in all test configurations and modes is shown on clauses 3.2.1.

##### TR-CAu Antenna:

| Frequency<br>(MHz)   | QPeak Limit<br>(dBµV/m)<br>@ 30m | QPeak<br>(dBµV/m) | QPeak-Lmt<br>(Margin dB) | Turntable<br>Angle<br>(deg) | Ant. Pol./<br>Angle (deg) | Tot Corr<br>(dB) |
|----------------------|----------------------------------|-------------------|--------------------------|-----------------------------|---------------------------|------------------|
| 13.56 * <sup>1</sup> | 84.0                             | 79.2              | -4.8                     | 180°                        | V / 0°                    | 37.9             |
| 27.12 * <sup>1</sup> | 29.5                             | 16.2              | -13.3                    | 180°                        | V / 0°                    | 39.7             |



**AERO-LB Antenna:**

| Frequency (MHz)      | QPeak Limit (dBμV/m) @ 30m | QPeak (dBμV/m) | QPeak-Lmt (Margin dB) | Turntable Angle (deg) | Ant. Pol./ Angle (deg) | Tot Corr (dB) |
|----------------------|----------------------------|----------------|-----------------------|-----------------------|------------------------|---------------|
| 13.56 * <sup>1</sup> | 84.0                       | 66.0           | <b>-18.0</b>          | 90°                   | V / 0°                 | 37.9          |
| 27.12 * <sup>1</sup> | 29.5                       | 2.0            | <b>-27.5</b>          | 90°                   | V / 0°                 | 39.7          |

\*<sup>1</sup>: Measure have been done at 10m distance and corrected according to requirements of 15.209.e)  
(M@30m = M@10m-19.1dB)

**Limits Subclause §15.225**

| Frequency (MHz)                | Field strength (μV/m) | Measurement distance (m) |
|--------------------------------|-----------------------|--------------------------|
| 13.553-13.567                  | 15 848<br>84 dBμV/m   | 30                       |
| 13.410-13.553<br>13.567-13.710 | 334<br>50.5 dBμV/m    | 30                       |
| 13.110-13.410<br>13.710-14.010 | 106<br>40.5 dBμV/m    | 30                       |

See chapter 5 of this test report for band edge measurements.

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

The product has been tested according to ANSI C63.4 (2003), FCC part 15 subpart C. 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 §15.209 limits. Measurement bandwidth was 120kHz from 30 MHz to 1GHz.

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.

2 axis measurements were performed for antennas positions (vertical and horizontal positions, with 360° rotation)  
A summary of the worst case emissions found in all test configurations and modes is shown on clause 3.2.2.

**TR-CAu ANTENNA:**

| No | Frequency (MHz) | QPeak Limit (dBμV/m) | Qpeak * (dBμV/m) | Qpeak-Limit (Margin, dB) | Angle (deg) | Pol | Hgt (cm) | Tot Corr (dB) | Comments |
|----|-----------------|----------------------|------------------|--------------------------|-------------|-----|----------|---------------|----------|
| 1  | 40.675          | 40                   | 33.1             | <b>-6.9</b>              | 75          | V   | 250      | 11.5          |          |
| 2  | 67.801          | 40                   | 33.1             | <b>-6.9</b>              | 130         | V   | 250      | 9.8           |          |
| 3  | 732.23          | 46                   | 36.7             | <b>-9.3</b>              | 200         | H   | 100      | 25.7          |          |
| 4  | 962.737         | 54                   | 46.0             | <b>-8.0</b>              | 225         | H   | 250      | 29.0          |          |
| 5  | 976.285         | 54                   | 47.7             | <b>-6.3</b>              | 235         | H   | 200      | 29.3          |          |
| 6  | 989.834         | 54                   | 48.1             | <b>-5.9</b>              | 200         | H   | 250      | 29.5          |          |

**AERO-LB ANTENNA:**

| No | Frequency (MHz) | QPeak Limit (dBμV/m) | Qpeak * (dBμV/m) | Qpeak-Limit (Margin, dB) | Angle (deg) | Pol | Hgt (cm) | Tot Corr (dB) | Comments |
|----|-----------------|----------------------|------------------|--------------------------|-------------|-----|----------|---------------|----------|
| 1  | 40.68           | 40                   | 32.8             | -7.2                     | 325         | H   | 400      | 11.5          |          |
| 2  | 67.799          | 40                   | 26.4             | -13.6                    | 140         | H   | 400      | 9.8           |          |
| 3  | 299.83          | 46                   | 43.7             | -2.3                     | 120         | V   | 200      | 17.6          |          |
| 4  | 499.241         | 46                   | 41.0             | -5.0                     | 75          | V   | 100      | 21.3          |          |
| 5  | 732.226         | 46                   | 38.6             | -7.4                     | 14          | H   | 200      | 25.7          |          |
| 6  | 962.705         | 54                   | 43.3             | -10.7                    | 320         | H   | 250      | 29            |          |
| 7  | 976.266         | 54                   | 46.9             | -7.1                     | 120         | H   | 250      | 29.3          |          |
| 8  | 989.822         | 54                   | 48.2             | -5.8                     | 130         | H   | 200      | 29.5          |          |

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

**RESULTS: PASS**

**3.4. FIELD STRENGTH CALCULATION**

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

$$FS = RA + AF + CF - AG$$

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

Assume a receiver reading of 52.5dBμV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 is added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBμV/m.

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

The 32 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

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

**4. FUNDAMENTAL FREQUENCY TOLERANCE (15.225E)****4.1. CLIMATIC CONDITIONS**

Date of test : February 25<sup>th</sup>, 2008  
Test performed by : Laurent CHAPUS  
Atmospheric pressure : 981mb  
Relative humidity : 31%  
Ambient temperature : 21.5°C

**4.2. TEST SETUP**

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency when the temperature is varied from -20°C to +50°C at the nominal power voltage and the primary power voltage is varied from 85% to 115% of the rated supply voltage at 20°C.

The equipment under test is placed in climatic chamber. The frequency drift is measured with a frequency counter.

**4.3. Temperature and voltage fluctuation**

Temperature has been set at +20°C, -20°C and +50°C.

Voltage is varied from 93.5V/60Hz to 126.5V/60Hz

Frequency of carrier: 13.56 MHz

Upper limit: 13.561356 MHz

Lower limit: 13.558644 MHz

| Temperature               | -20°C     | 20°C             | +50°C     |
|---------------------------|-----------|------------------|-----------|
| <b>Voltage</b>            |           |                  |           |
| Mains voltage: 110V/60Hz  |           |                  |           |
| Frequency (MHz)           | 0,000000  | <b>13,559583</b> | +0,000010 |
| Carrier level             | -0,26 dBc | <b>REF</b>       | -0,02 dBc |
| Mains voltage: 93.5V/60Hz |           |                  |           |
| Frequency (MHz)           | -0,000001 | 0,000000         | +0,000005 |
| Carrier level             | -0,26 dBc | +0,02 dBc        | -0,02 dBc |
| Mains voltage: 126V/60Hz  |           |                  |           |
| Frequency (MHz)           | +0,000000 | -0,000001        | +0,000003 |
| Carrier level             | -0,26 dBc | -0,02 dBc        | -0,11 dBc |

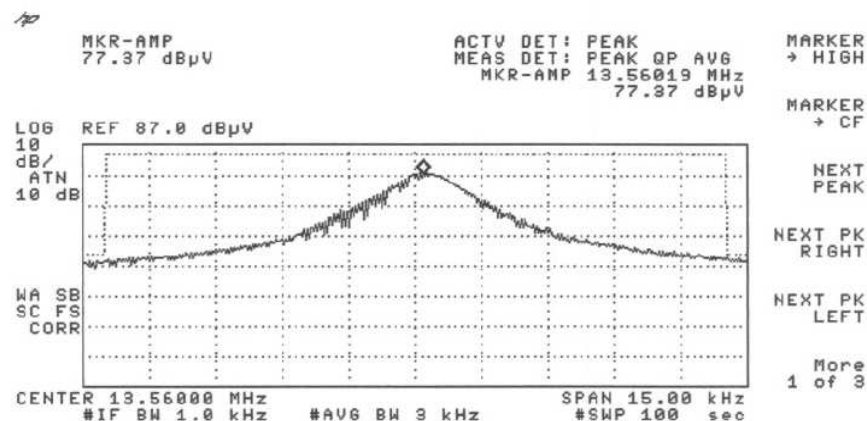
Frequency drift measured is 10Hz when the temperature is varied from -20°C to +50°C and voltage is varied from 110V/60Hz  $\pm 15\%$ .

**5. BAND-EDGE COMPLIANCE §15.209****5.1. CLIMATIC CONDITIONS**

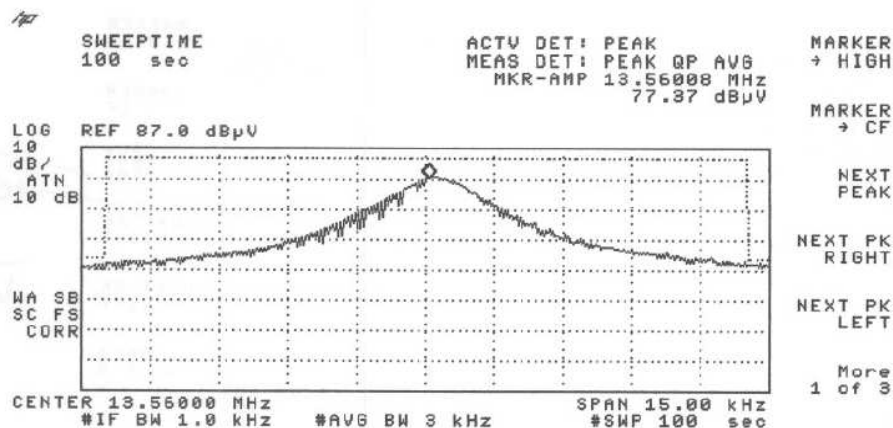
Date of test : February 21<sup>th</sup>, 2008  
Test performed by : Laurent CHAPUS  
Atmospheric pressure : 980mb  
Relative humidity : 30%  
Ambient temperature : 21.5°C

**5.2. EQUIPMENT CONFIGURATION**

The equipment is configured for tag reading, ISO 15693 and I-Code 1 (C270) standards.

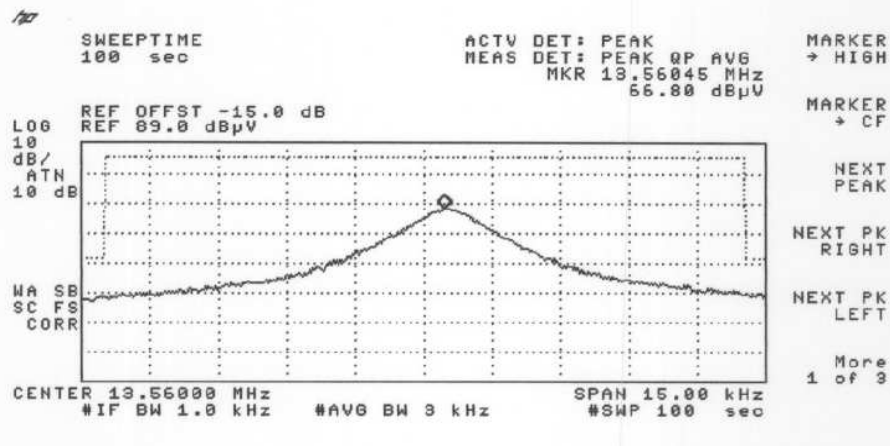
**5.3. Frequency band 13.553-13.567MHz – TR-CAu antenna (TAG ISO 15693)**

RBW = 1kHz, VBW = 3kHz

**5.4. Frequency band 13.553-13.567MHz – TR-CAu antenna (TAG I-CODE1)**

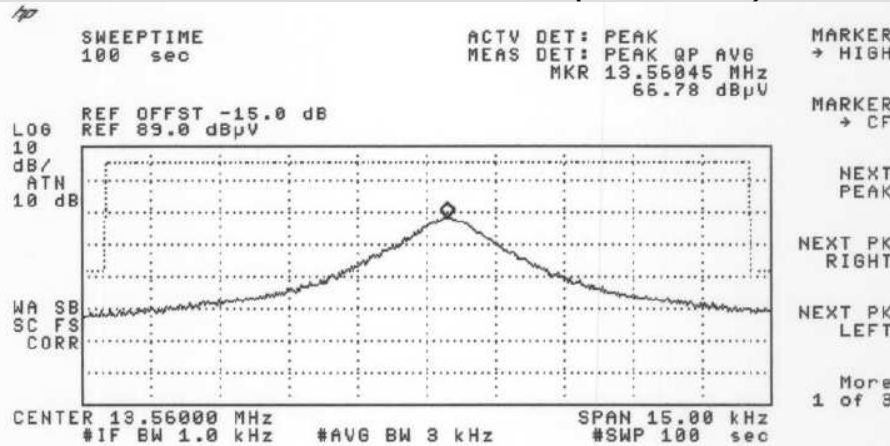
RBW = 1kHz, VBW = 3kHz

**5.5. Frequency band 13.553-13.567MHz – 4x AERO-LB antenna (TAG ISO 15693)**



RBW = 1kHz, VBW = 3kHz

**5.6. Frequency band 13.553-13.567MHz - 4x AERO-LB antenna (TAG I-CODE1)**



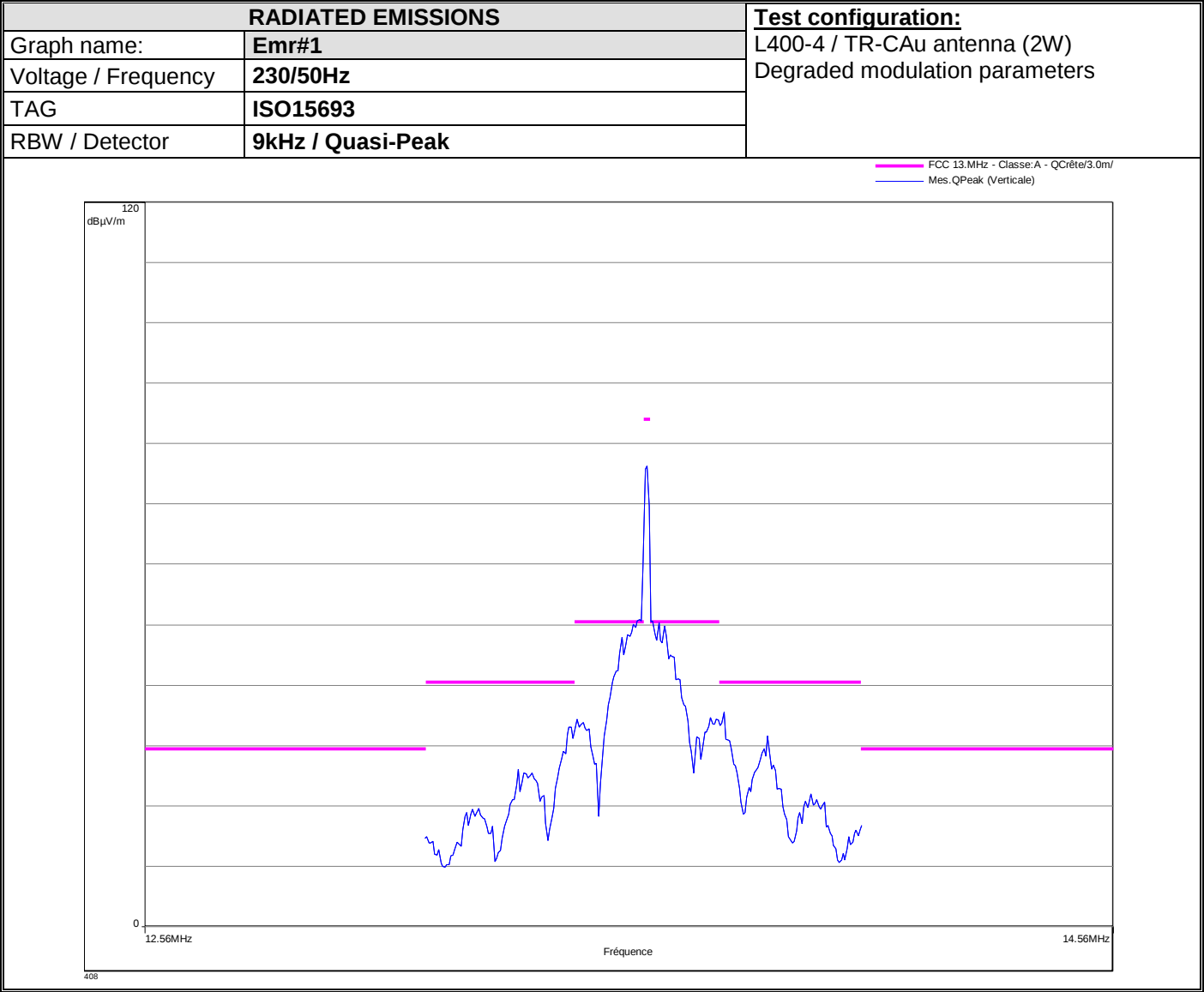
RBW = 1kHz, VBW = 3kHz

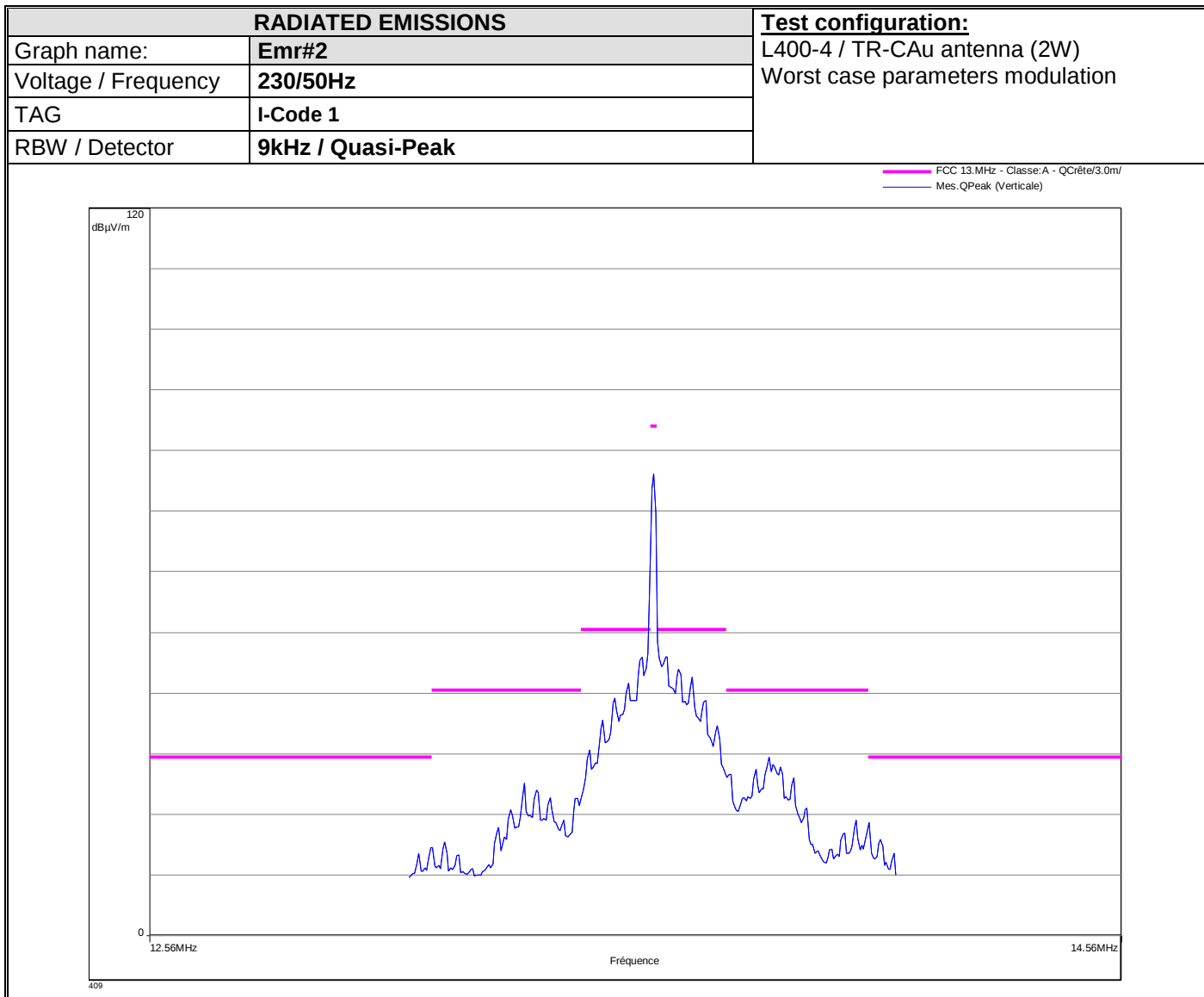
**5.7. Frequency band 13.110-14.010MHz**

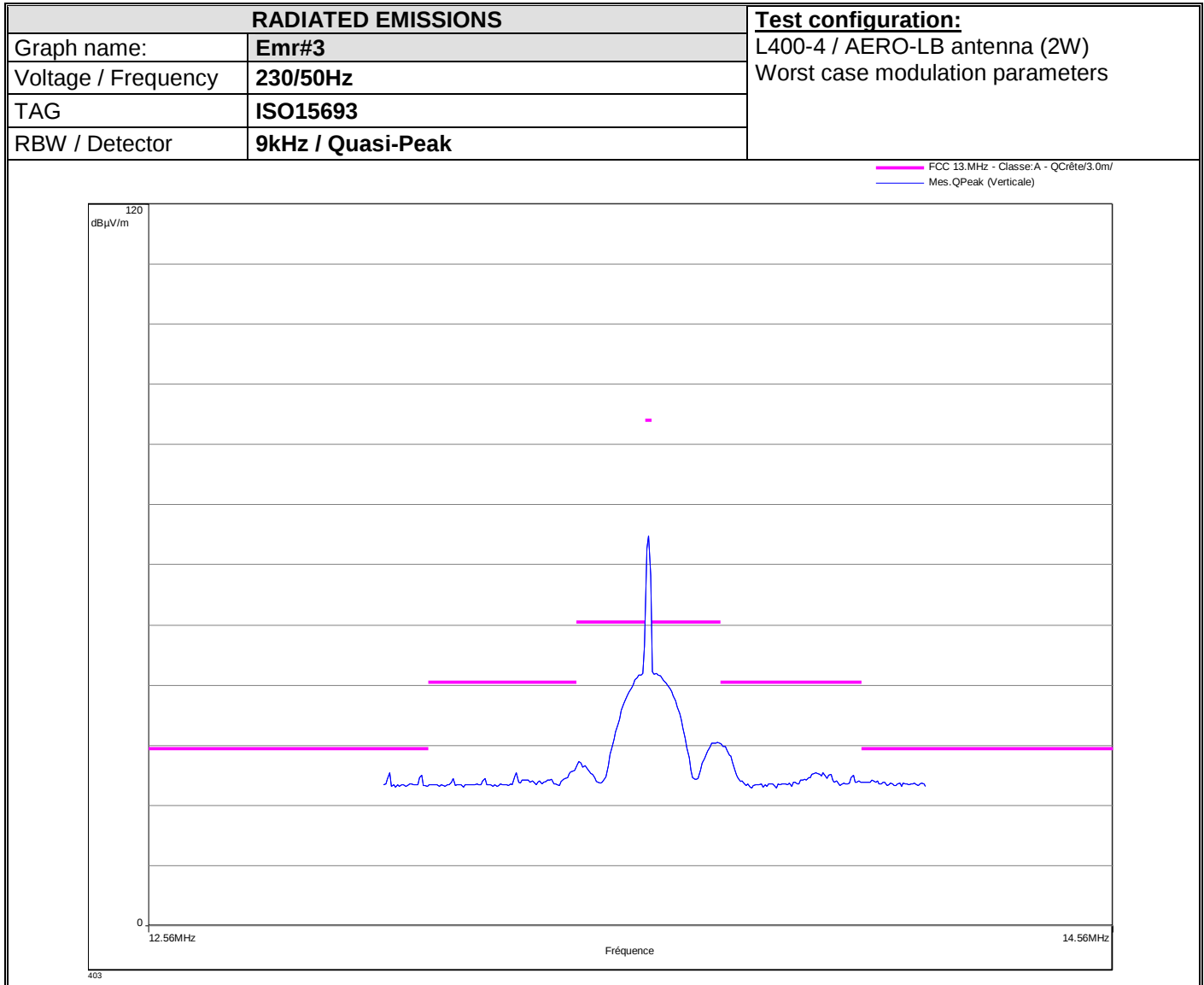
Following plots show radiated emission level in the frequency band 13.110-14.010MHz with a RBW of 9kHz and a quasi-peak detector.

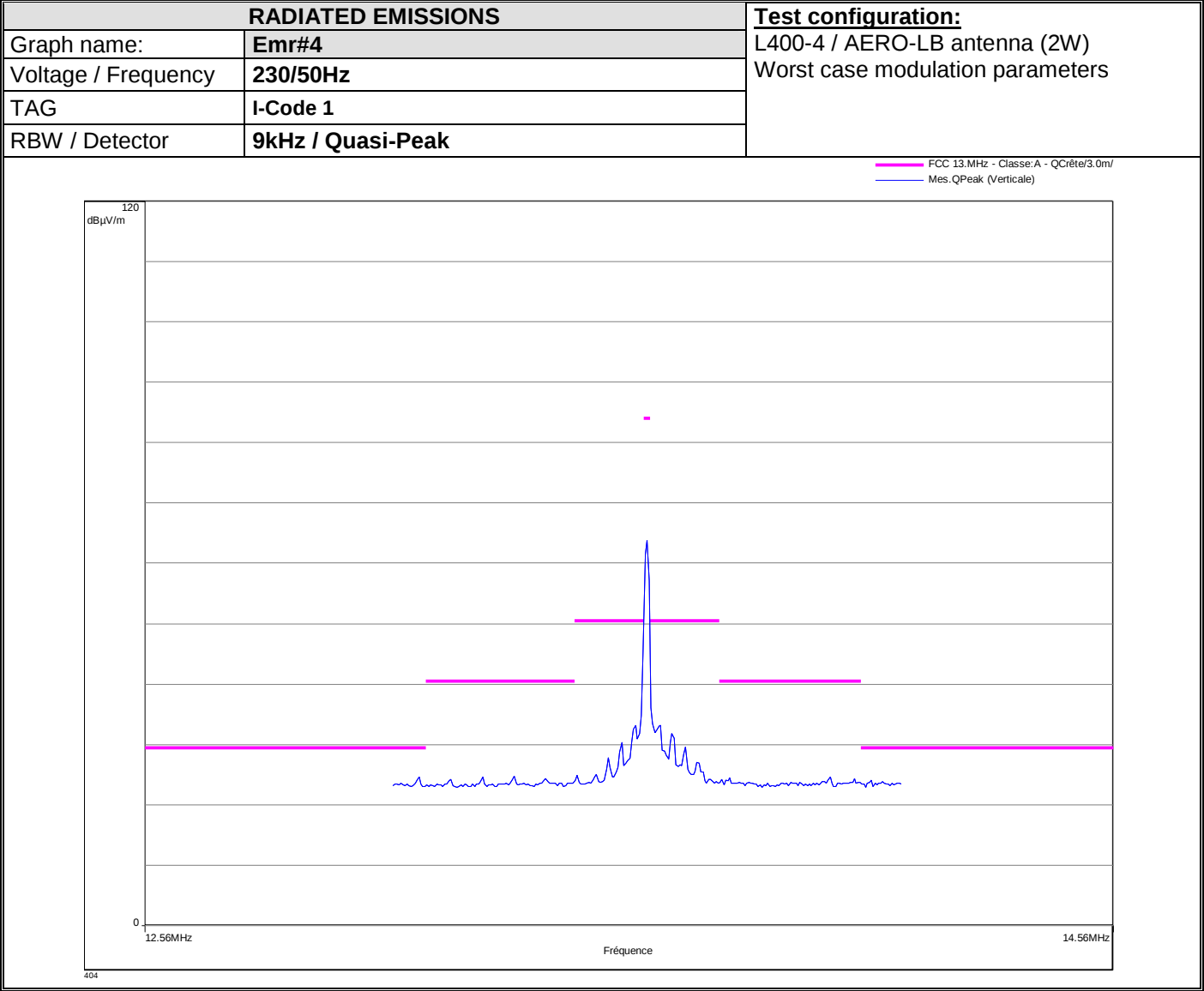
The graphs are obtained with a measuring receiver ESH3.

| Graph name | Antenna type | Output power | TAG read  | Modulation parameters                                                                   | Comments                         |
|------------|--------------|--------------|-----------|-----------------------------------------------------------------------------------------|----------------------------------|
| EMR#1      | TR-CAu       | 2W           | ISO 15693 | Command Modulation Depth: 10%<br>EOF modulation Depth: 10%<br>Data coding mode: 1 of 4  | Degraded modulation parameters   |
| EMR#2      | TR-CAu       | 2W           | I-Code 1  | Bit coding: FAST                                                                        | Worst case modulation parameters |
| EMR#3      | AERO-LB      | 2W           | ISO 15693 | Command Modulation Depth: 10%<br>EOF modulation Depth: 100%<br>Data coding mode: 1 of 4 | Worst case modulation parameters |
| EMR#4      | AERO-LB      | 2W           | I-Code 1  | Bit coding: FAST                                                                        | Worst case modulation parameters |









**6. CONDUCTED EMISSION DATA****6.1. CLIMATIC CONDITIONS**

Date of test : February 21<sup>st</sup>, 2008  
Test performed by : Laurent CHAPUS  
Atmospheric pressure : 977mb  
Relative humidity : 33%  
Ambient temperature : 22°C

**6.2. SETUP FOR CONDUCTED EMISSIONS MEASUREMENT**

The product has been tested according to ANSI C63.4-(2003) and FCC Part 15 subpart C.

The product has been tested with 110V/60Hz power line voltage and compared to the FCC Part 15 subpart C §15.207 limits. Measurement bandwidth was 9kHz from 150 kHz to 30 MHz.

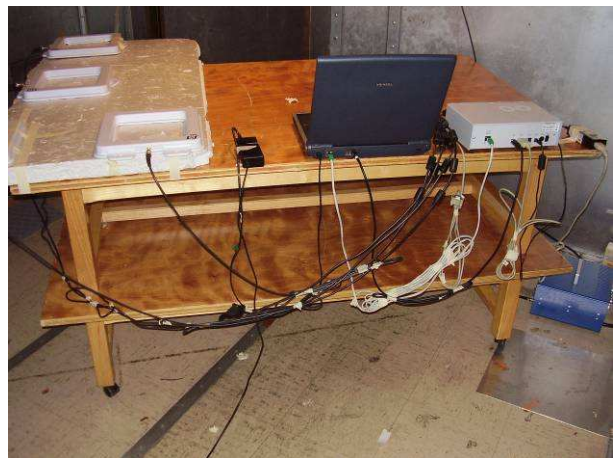
Measurement is made with a Rohde & Schwarz ESH3 receiver in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement for any strong signal. If the average limit is met when using a Quasi-Peak detector, the EUT shall be deemed to meet both limits and measurement with the average detector is unnecessary. The LISN (measure) is 50Ω / 50μH.

The Peak data are shown on plots in annex 1. Quasi-Peak and Average measurements are detailed in a table with frequencies and levels measured.

Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on the following page.

### 6.3. TEST SETUP

The EUT is placed on a table at 0.8m height. The cable has been shorted to 1meter length. The EUT is powered through the LISN (measure). The peripheral equipment (PC/monitor) is connected to a separate LISN.



**6.4. TEST SEQUENCE AND RESULTS**

Measurements are performed on the phase (L1) and neutral (N) of power lines of the reader.  
A measurement is also performed with a 50Ω dummy load replacing the transmitter antenna in order to demonstrate that some 13.56MHz may be cross-coupled to AC line connection.  
Graphs are obtained in PEAK detection.  
Measures are also performed in Quasi-Peak and Average for any strong signal.

**TR-CAu antenna:**

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

**AERO-LB antenna:**

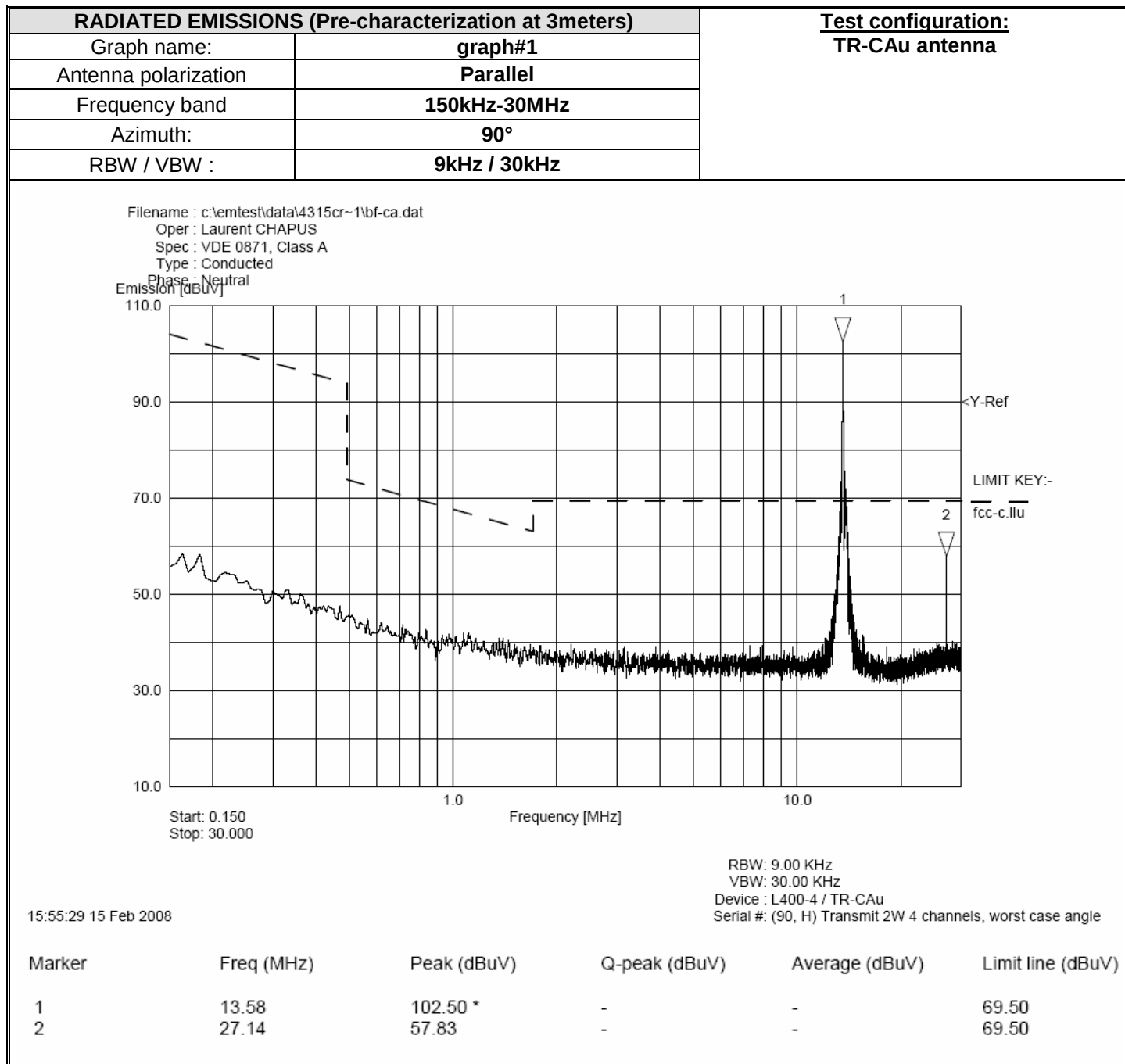
|                |             |               |
|----------------|-------------|---------------|
| Measure on L1: | graph Emc#3 | (see annex 1) |
| Measure on N:  | graph Emc#4 | (see annex 1) |

**Dummy load (50Ω) replacing the antenna at the end of the cable:**

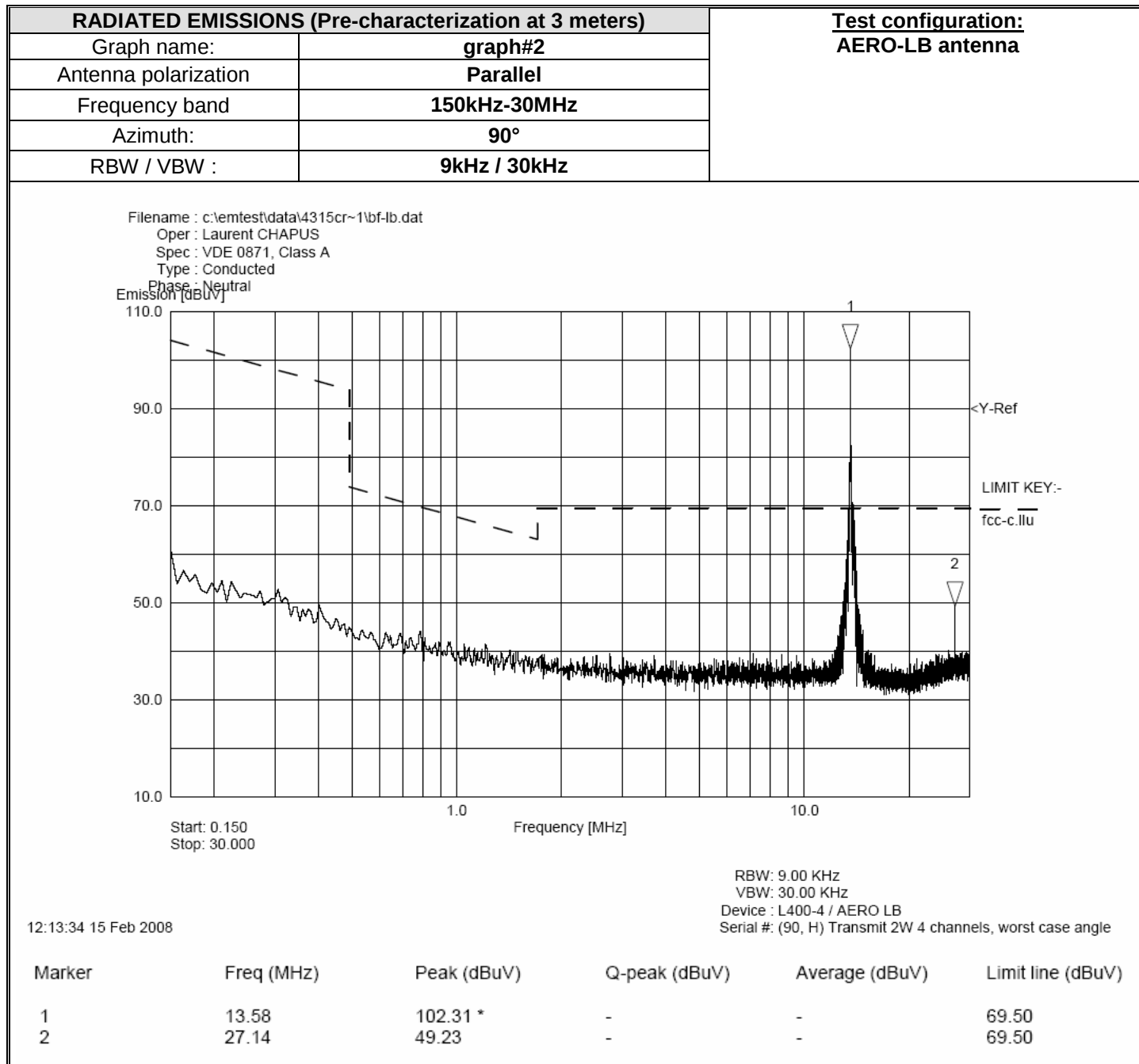
|                |             |               |
|----------------|-------------|---------------|
| Measure on L1: | graph Emc#5 | (see annex 1) |
| Measure on N:  | graph Emc#6 | (see annex 1) |

**RESULT: PASS**

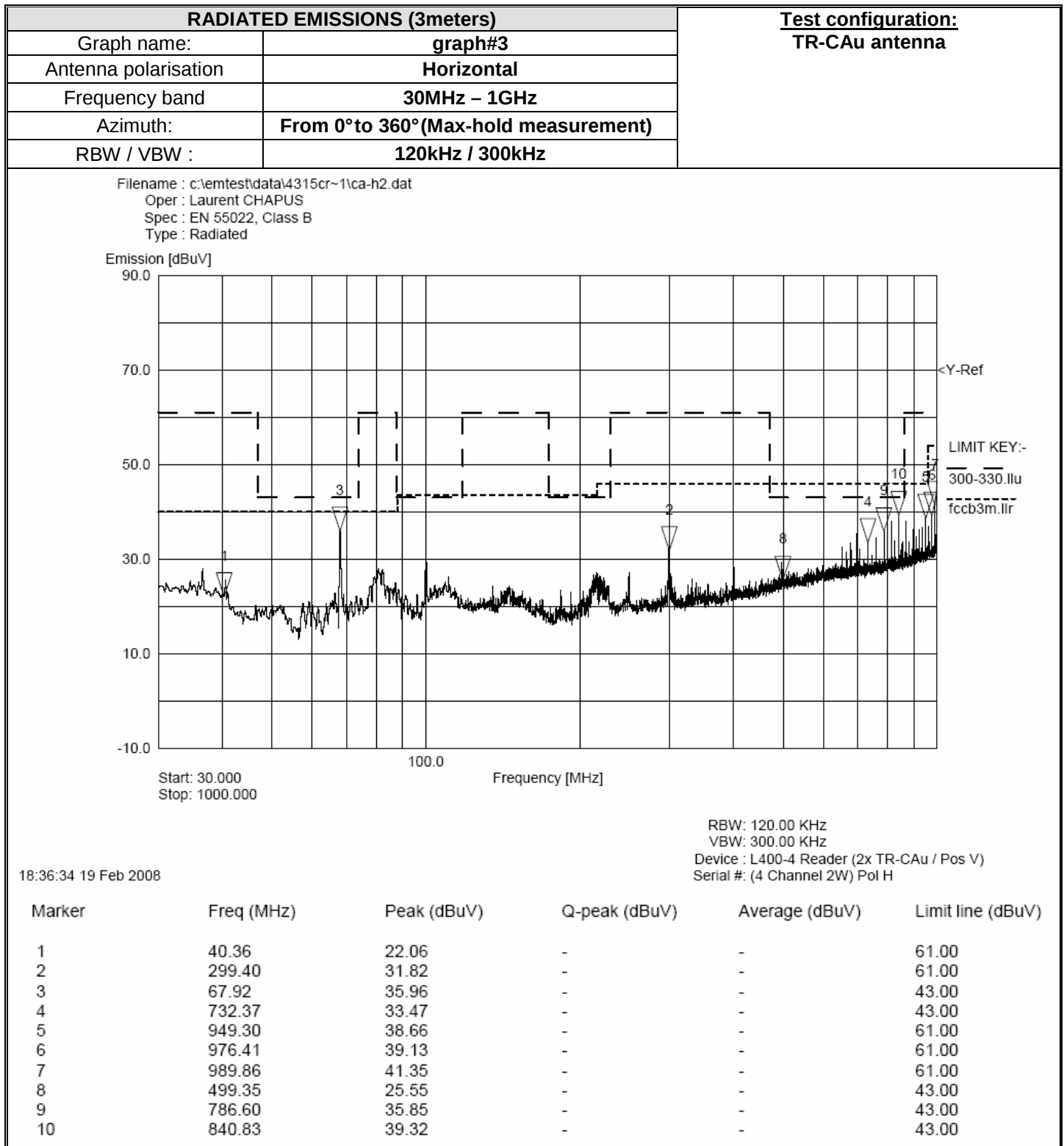
## 7. ANNEX 1 (GRAPHS)

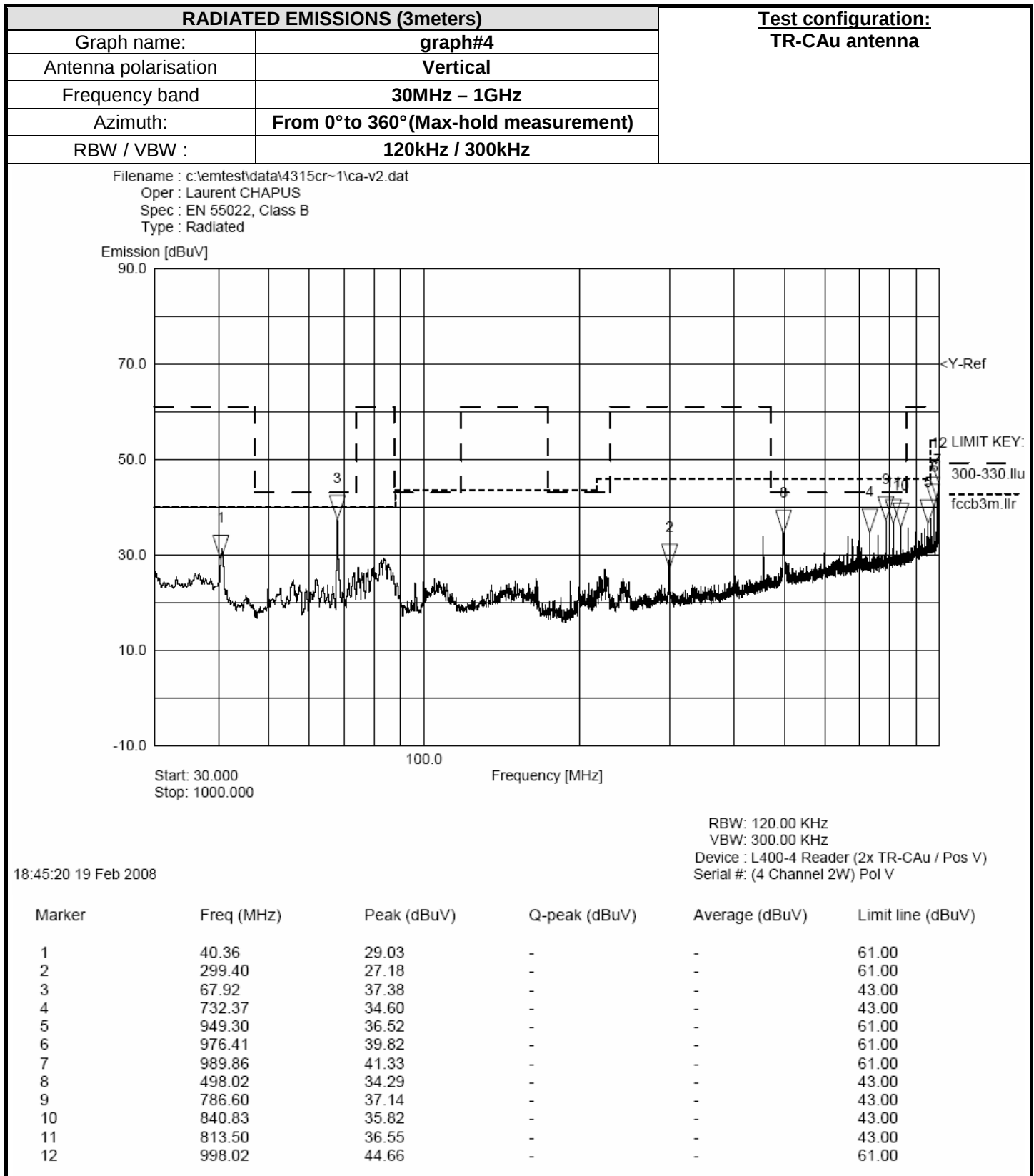


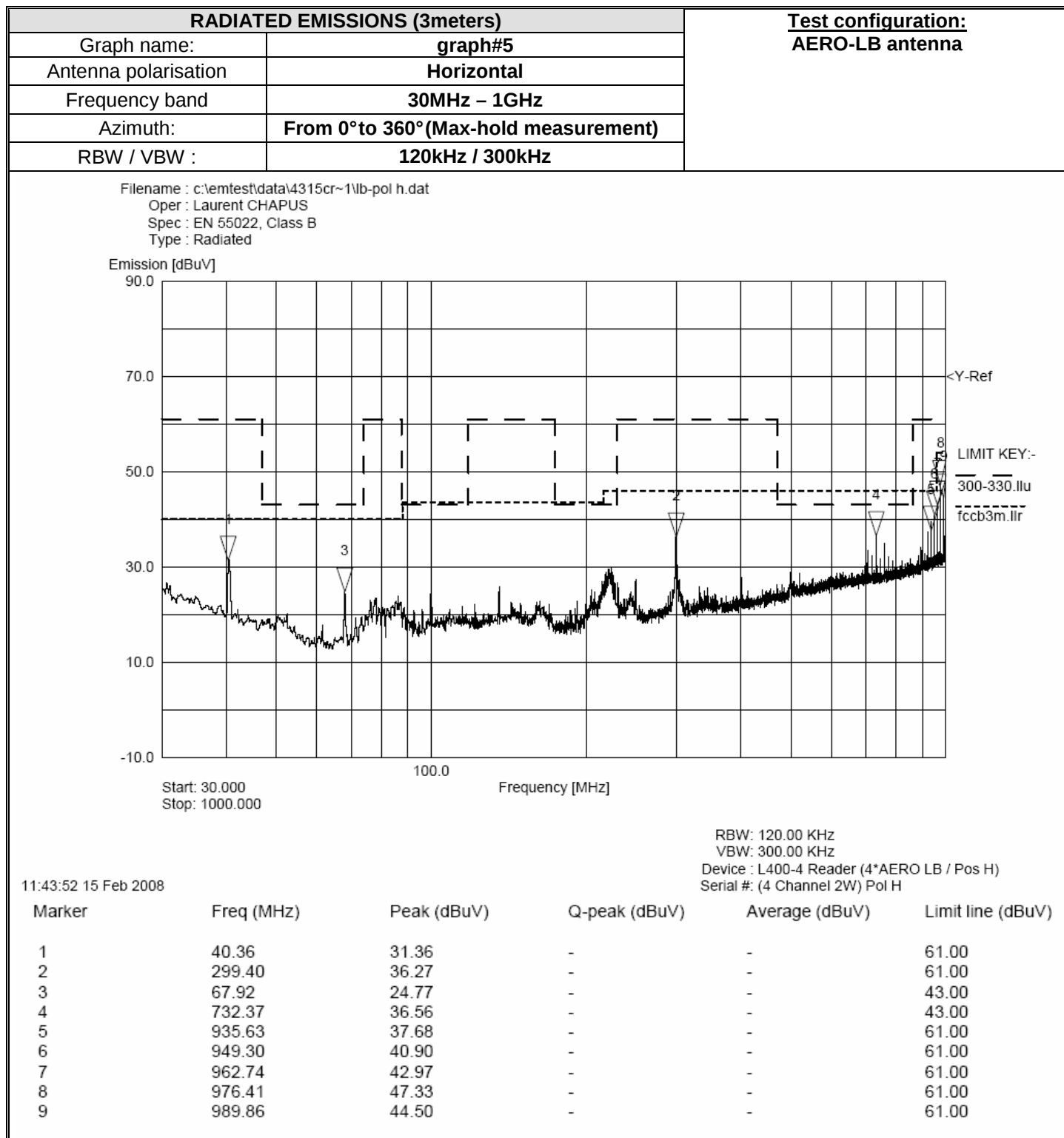
Marker 1 is carrier frequency (13.56MHz)  
 Marker 2 is 27.12MHz

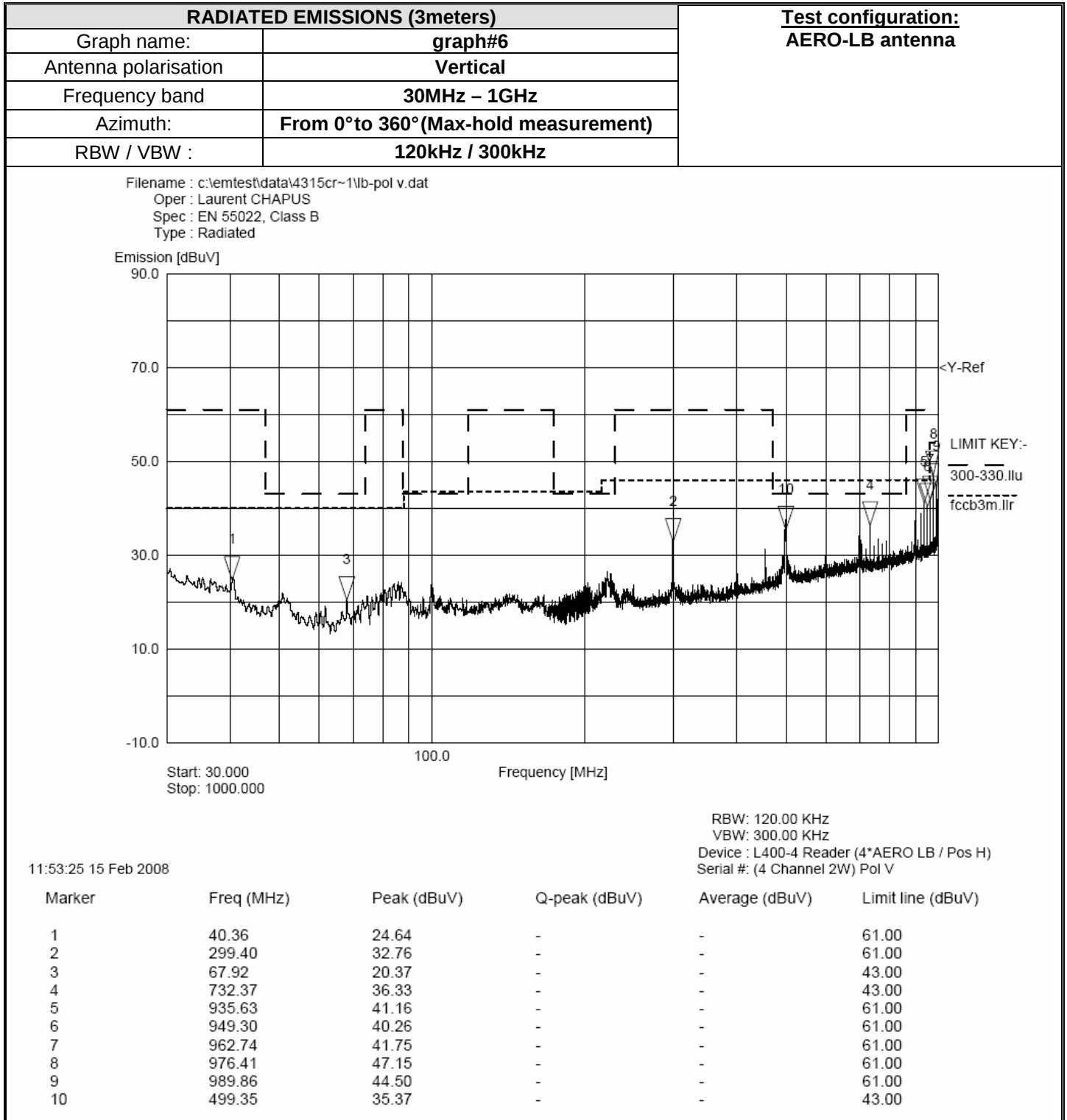


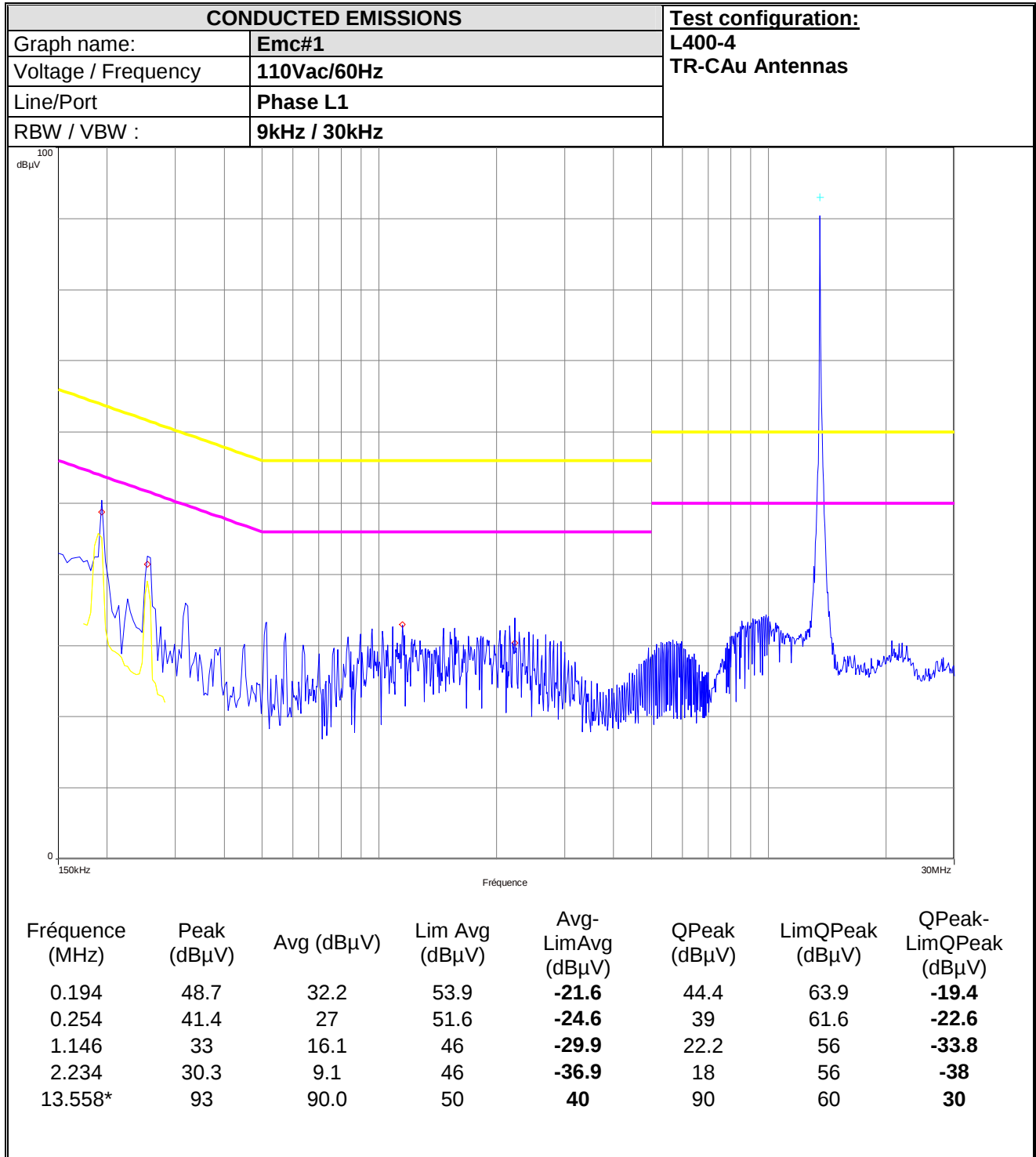
Marker 1 is carrier frequency (13.56MHz)  
 Marker 2 is 27.12MHz



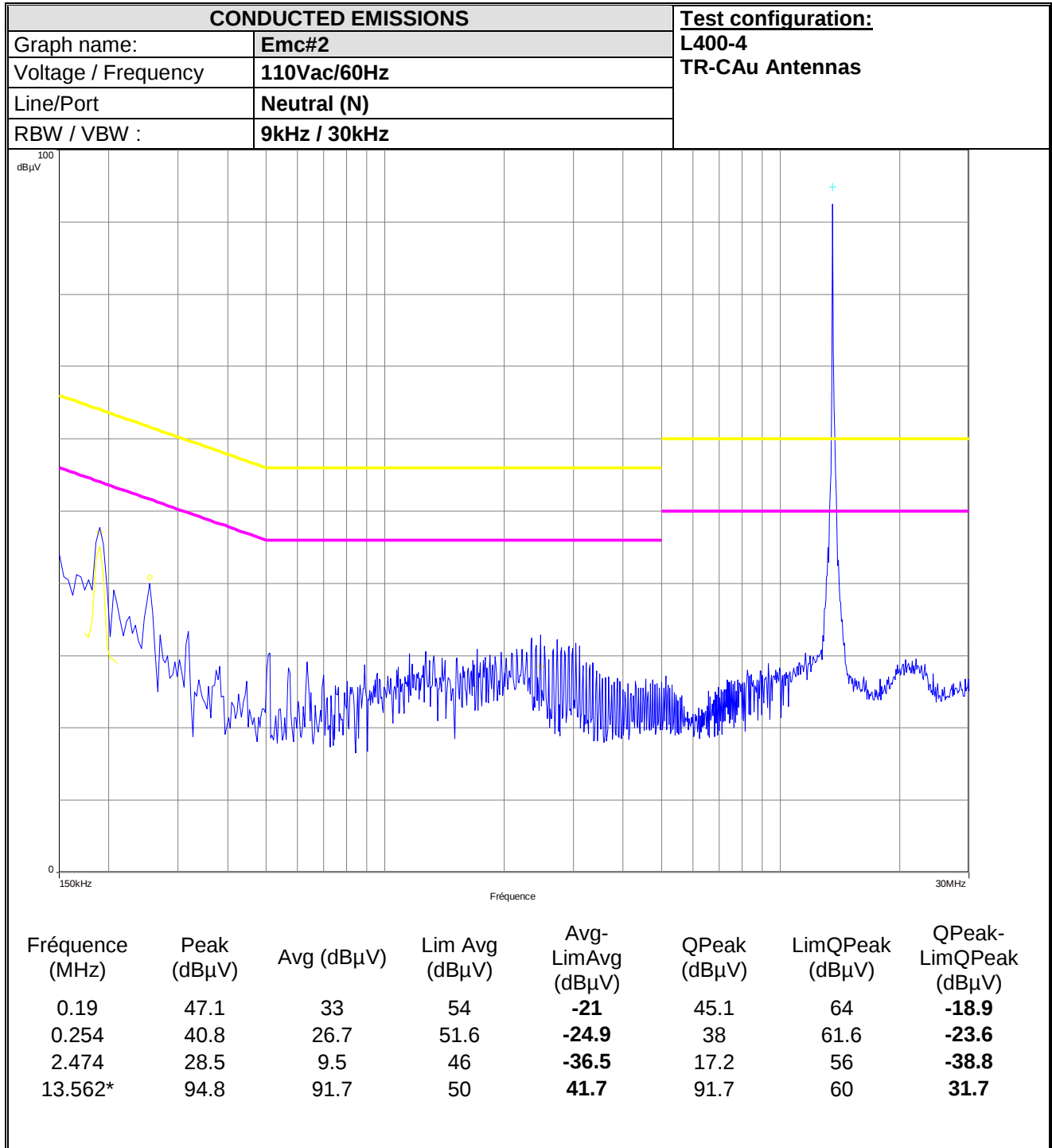




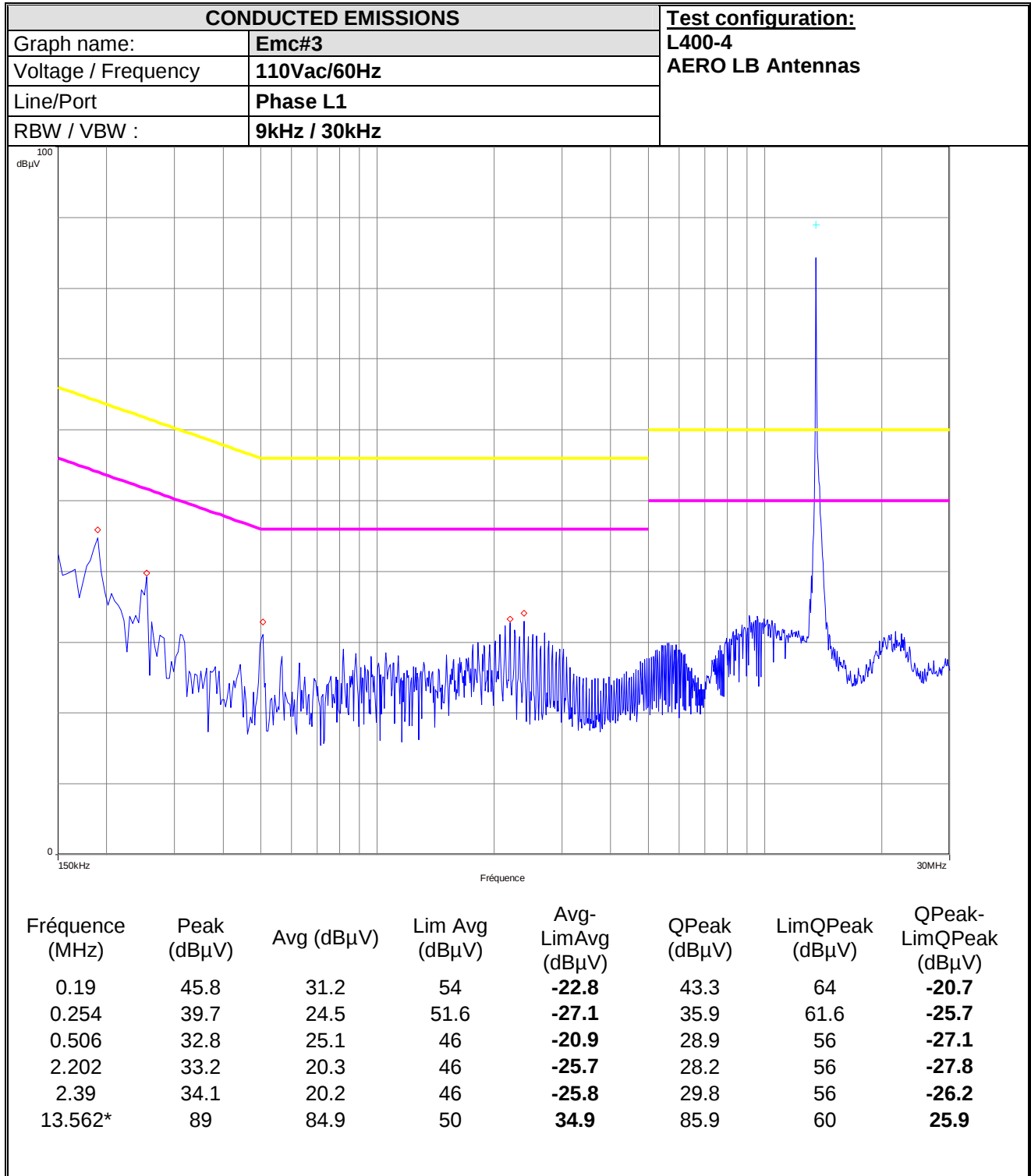




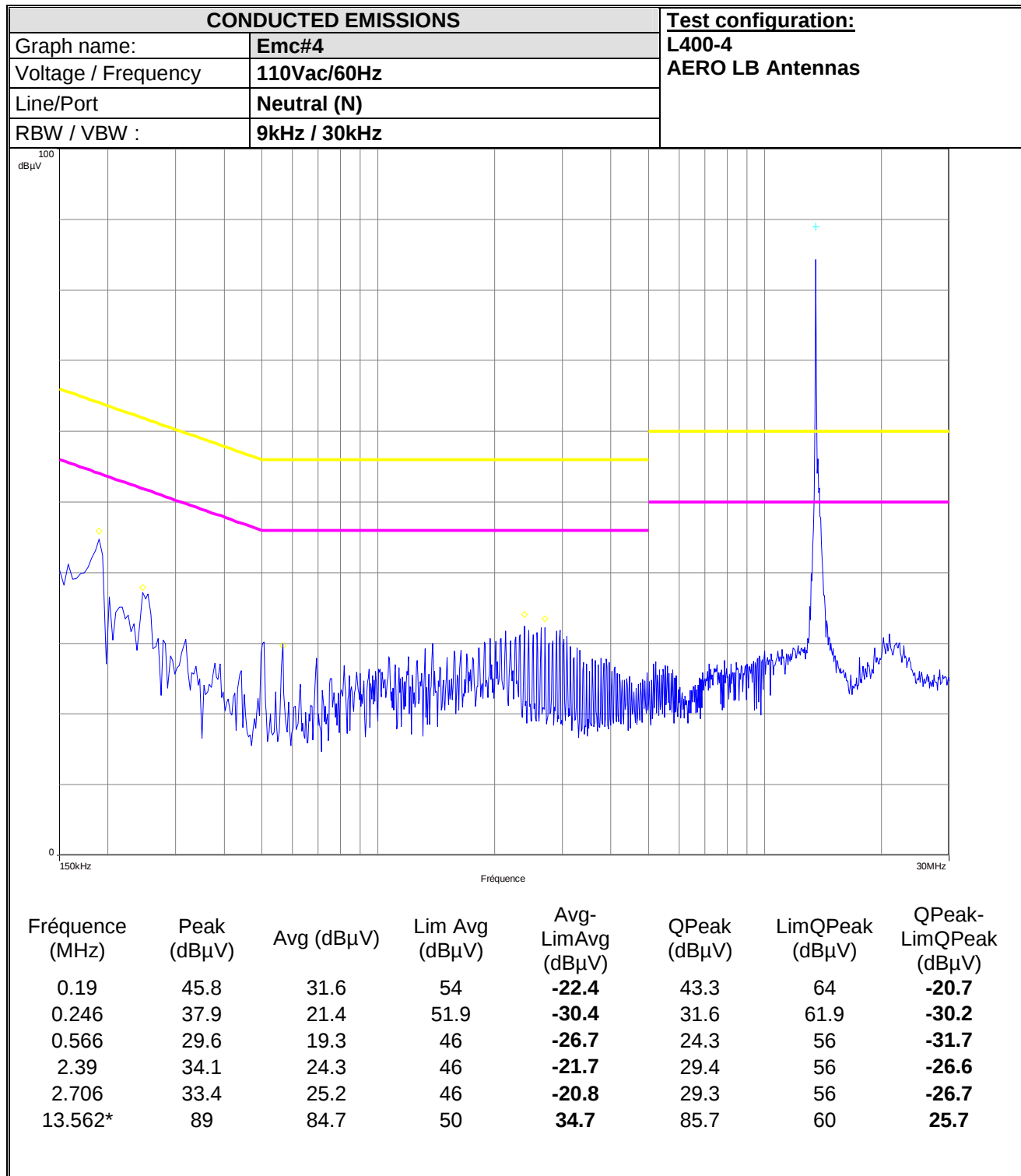
\*: Carrier frequency (see measurement with dummy load replacing the RF antenna)



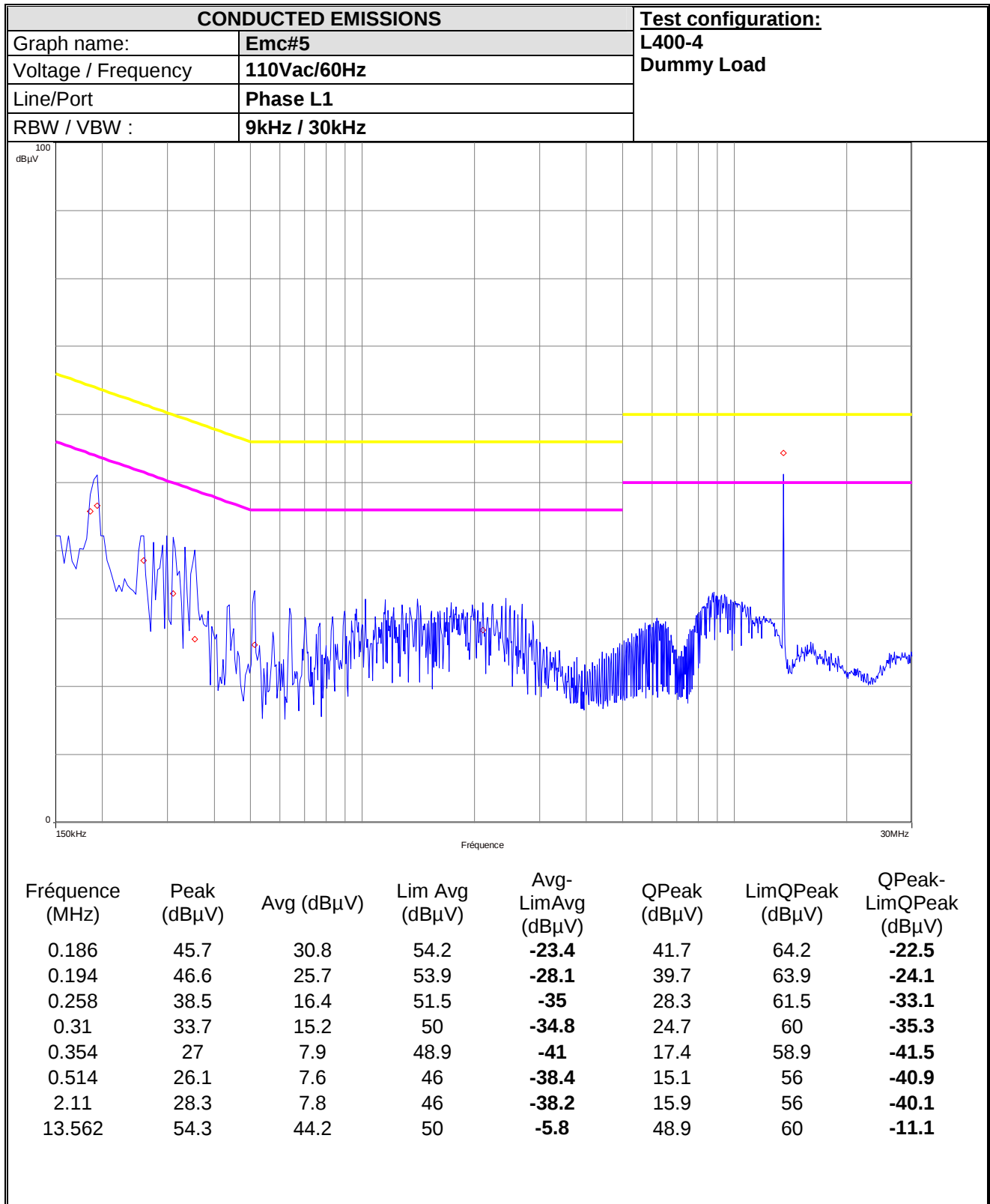
\*: Carrier frequency (see measurement with dummy load replacing the RF antenna)

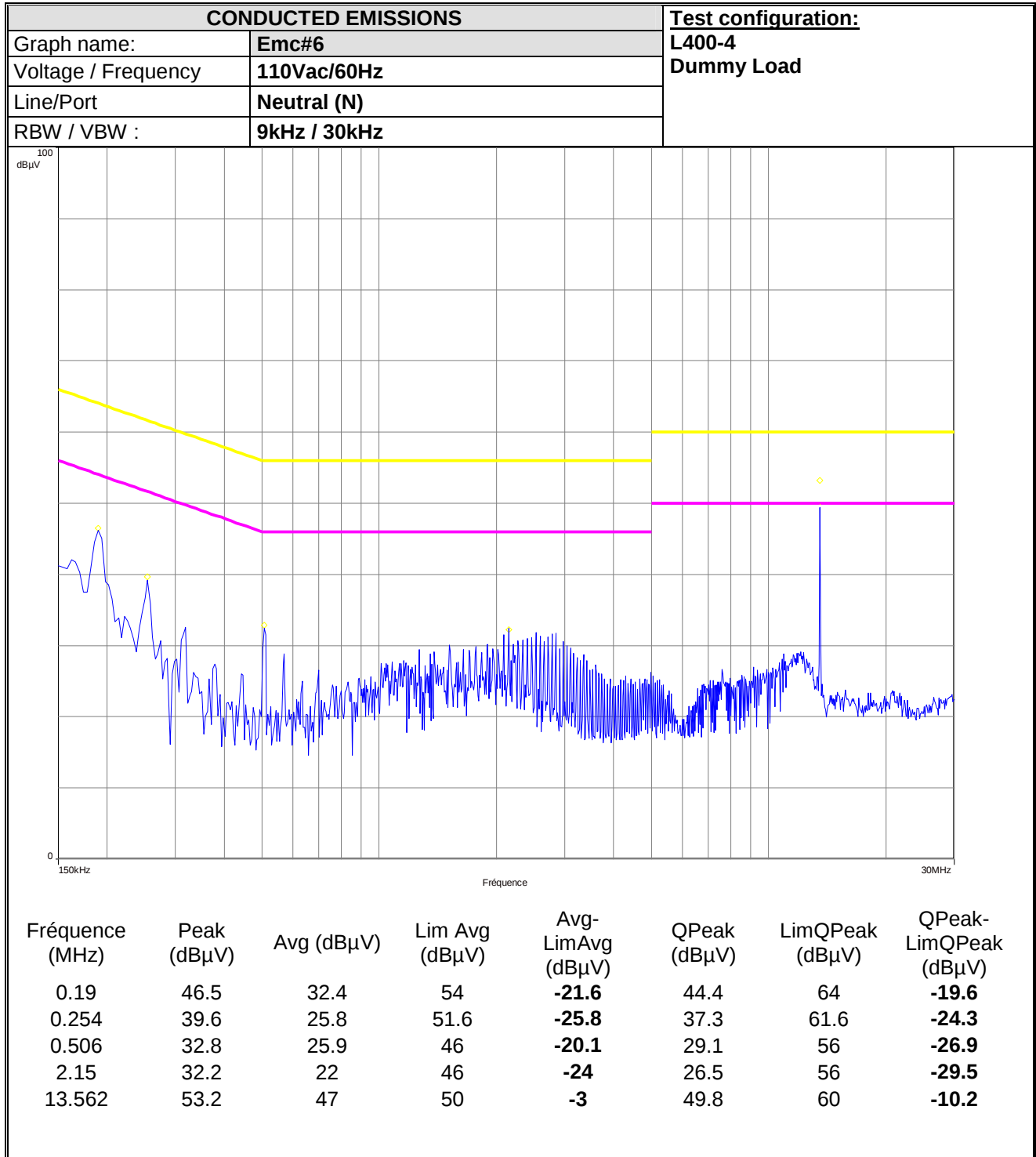


\*: Carrier frequency (see measurement with dummy load replacing the RF antenna)



\*: Carrier frequency (see measurement with dummy load replacing the RF antenna)







## 8. TEST EQUIPMENT LIST

|                                          | N°LCIE     | TYPE                                | COMPANY              | REF            | SN          |
|------------------------------------------|------------|-------------------------------------|----------------------|----------------|-------------|
| <b>RADIATED EMISSION MEASUREMENT</b>     |            |                                     |                      |                |             |
|                                          | C2040057VO | Antenna monopole                    | AH SYSTEM            | SAS-551        | 181         |
|                                          | A7102026VO | Amplifier 8-26GHz                   | ALDETEC              | ALS01452       | 1           |
| X                                        | C4040009VO | Air Compressor                      | ATLAS COPCO          | LX111          | 0615-038    |
| X                                        | A3169050VO | Radiated emission comb generator    | BARDET               |                | PR17B       |
| X                                        | C2040051VO | Antenna Bi-log                      | CHASE                | CBL6111A       | 1628        |
| X                                        | C2040052VO | Antenna Loop                        | ELECTRO-METRICS      | EM-6879        | 690234      |
|                                          | C2042027VO | Antenna horn                        | EMCO                 | 3115           | 6382        |
| X                                        | C2040050VO | Antenna biconic                     | EMCO                 | 3104C          | 9401-4636   |
| X                                        | C2040056VO | Antenna log-periodic                | EMCO                 | 3146           | 2178        |
| X                                        | F2000286VO | Turntable controller                | EMCO                 | 1060-10        | 1217        |
| X                                        | F2000287VO | Antenna mast controller             | EMCO                 | 1050           | 8811-1295   |
| X                                        | F2000288VO | Antenna mast                        | EMCO                 | 1050           |             |
| X                                        | F2000289VO | Turntable                           | EMCO                 | 1060           |             |
| X                                        | F2000371VO | Turntable chamber                   | ETS Lingren          | Model 2065     | F2000371VO  |
| X                                        | F2000372VO | Turntable controller chamber        | ETS Lingren          | Model 2066     | F2000372VO  |
| X                                        | D3044009VO | Anechoic chamber                    | EUROSHIELD           | RDF-F-60-060   | 1213        |
|                                          | A7102024VO | Amplifier 8 GHz                     | HEROTEK              | A1080304A      | 222033      |
| X                                        | A4060016VO | Spectrum analyzer 9kHz –1.8GHz      | HEWLETT PACKARD      | 8591E          | 3536A00384  |
| X                                        | A7102019VO | Amplifier 9 KHz – 1300 MHz          | HEWLETT PACKARD      | 8447F Opt 64   | 3113A06394  |
|                                          | A4060018VO | Spectrum Analyzer 9KHz – 26.5GHz    | HEWLETT PACKARD      | 8593E          | 3409u00537  |
| X                                        | A4049059VO | Adapter quasi-peak                  | HEWLETT PACKARD      | HP85650A       | 2811A01134  |
| X                                        | A4060019VO | Spectrum analyzer display           | HEWLETT PACKARD      | HP85662A       | 2816A16603  |
| X                                        | A4060017VO | Spectrum analyzer                   | HEWLETT PACKARD      | HP8568B        | 2732A04155  |
| X                                        | A4060027VO | Pre-selector RF                     | HEWLETT PACKARD      | HP85685A       | 2837A00784  |
|                                          | A5329032VO | Absorption clamp                    | LUTHI                | MDS21          | 2826        |
|                                          | A5329044VO | Absorption clamp                    | RHODE ET SCHWARZ     | 85024A         | 194.0100.50 |
| X                                        | A2640011VO | Measurement receiver 9kHz–30MHz     | ROHDE ET SCHWARZ     | ESH3           | 972079/117  |
|                                          | C2042028VO | Antenna horn 26GHz                  | SCHWARZBECK          | BBHA 9170      | BBHA9170232 |
| X                                        | A5329045VO | Cable IMR&EMR (Anechoic chamber)    | SMEE                 | KX13           |             |
| X                                        | A5329048VO | Cable EMR OATS                      | SUCOFLEX             | 106G           | 553         |
|                                          | A5329038VO | Cable coaxial 3.5 m (Blue)          | SUHNER               | SUCOFLEX 106   | 26732/6     |
| X                                        | A5329056VO | Cable Radiat EMI (Pre-amp/Analyzer) |                      |                |             |
| X                                        | A5329057VO | Cable Radiat. EMI (Pre-amp/cage)    |                      |                |             |
| X                                        | A5329059VO | Cable OATS (Mast at 10m)            |                      |                |             |
|                                          | A5329058VO | Cable OATS (Mast at 3m)             |                      |                |             |
| <b>CONDUCTED MEASUREMENT EMISSION</b>    |            |                                     |                      |                |             |
| X                                        | A3169049VO | Conducted emission comb generator   | BARDET               |                | CGPR12      |
|                                          | C2320059VO | LISN                                | EMCO                 | 3810/2SH       | 9511/1182   |
| X                                        | C2320068VO | LISN (Auxiliaries) 50Ω / 50μH       | EMCO                 | 3825/2         | 9309/2122   |
| X                                        | A4049061VO | Transient limiter                   | HEWLETT PACKARD      | 11947A         | 3107A01596  |
| X                                        | A2120003VO | Programable PSU, HAR/FLK            | HEWLETT PACKARD      | 6842A          | 3531A00109  |
|                                          | A4060016VO | Spectrum analyzer 9kHz –1.8GHz      | HEWLETT PACKARD      | 8591E          | 3536A00384  |
|                                          | A5329036VO | Direct Injection Module 100 Ohms    | LCIE                 | MID01-100 ohms |             |
|                                          | A5329042VO | Ferrite Tube                        | LUTHI                | FTC 101        | 4485        |
|                                          | A1092042VO | Ferrite Tube                        | LUTHI                | FTC101         | 4763        |
| X                                        | D3044010VO | Faraday Cage                        | RAY PROOF            |                | 4854        |
|                                          | C2320062VO | LISN tri-phase ESH2-Z5              | RHODE ET SCHWARZ     | 33852.19.53    | 841223/008  |
|                                          | C2320063VO | LISN tri-phase ESH2-Z5              | RHODE ET SCHWARZ     | 33852.19.53    | 841223/007  |
|                                          | C2320066VO | RSI 4 wires                         | RHODE ET SCHWARZ     | ENY41          | 838119/023  |
|                                          | C2320067VO | RSI 2 x 2 wires                     | RHODE ET SCHWARZ     | ENY22          | 836727/015  |
| X                                        | A2640011VO | Measurement receiver 9kHz–30MHz     | ROHDE ET SCHWARZ     | ESH3           | 972079/117  |
|                                          | A1290017VO | Current probe                       | SCHAFFNER            | CSP9160        | 1097        |
|                                          | A5329037VO | Current injection probe             | SCHAFFNER            | CIP8213        | 52          |
|                                          | A4040050VO | Click-meter (Discontinuous noise)   | SCHAFFNER            | DIA1512D       | 22338       |
|                                          | A4089117VO | Voltage probe                       | SMEE                 |                |             |
| X                                        | C2320061VO | LISN (Measure) 50Ω / 50μH           | TELEMETER ELECTRONIC | NNB-2/16Z      | 98010       |
| X                                        | A5329061VO | Cable Conduct. EMI (Analyzer/cage)  |                      |                |             |
| X                                        | A5329060VO | Cable Conduct. EMI (LISN/cage)      |                      |                |             |
| <b>MISCELLANEOUS (CONTROL EQUIPMENT)</b> |            |                                     |                      |                |             |
|                                          | A6440068VO | Data Logger                         | AGILENT              | 34970A         | US37043935  |



|   | N°LCIE     | TYPE                           | COMPANY         | REF                | SN         |
|---|------------|--------------------------------|-----------------|--------------------|------------|
|   | A6440068VO | Data Logger Board              | AGILENT         | 34901A             | MY41037442 |
| X | D1022117VO | Climatic chamber               | BIA CLIMATIC    | CL 6-25            | 200 105 6  |
|   | A7043037VO | Power supply DC 30V 10A        | ELC             | AL924              | 95/00600   |
| X | A1240170VO | Multimeter                     | Fluke           | 87                 | 75250745   |
|   | A1240171VO | Multimeter                     | FLUKE           | 189                | 89770115   |
|   | A4024018VO | Oscilloscope 500 MHz           | Hewlett Packard | 54542C             | US36040602 |
|   | A4024019VO | Oscilloscope                   | Hewlett Packard | 54720A             | 7426600    |
| X | B4204052VO | Thermo-hygrometer              | HUGER           |                    |            |
|   | A7043036VO | Power supply DC 300W / 150V-6A | SODILEC         | 7SDLIN/GB AUTO 300 | 493711     |
|   | A4083040VO | Oscilloscope 100 MHz 500Ms/s   | Tektronix       | TDS30-25           | H712103    |
| x | A2120003VO | Programable PSU, HAR/FLK       | HEWLETT PACKARD | 6842A              | 3531A00109 |



## 9. UNCERTAINTIES CHART

| Type de mesure / Kind of measurement                                                                                                                                       | Incertitude élargie<br>laboratoire /<br>Wide uncertainty<br>laboratory<br>(k=2) $\pm x$ | Incertitude<br>limite du CISPR<br>/ CISPR<br>uncertainty limit<br>$\pm y$ |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Mesure des perturbations conduites en tension sur le réseau d'énergie<br><i>Measurement of conducted disturbances in voltage on the power port</i>                         | 3.57 dB                                                                                 | 3.6 dB                                                                    |
| Mesure des perturbations conduites en tension sur le réseau de télécommunication<br><i>Measurement of conducted disturbances in voltage on the telecommunication port.</i> | 3.28 dB                                                                                 | A l'étude /<br>Under consid.                                              |
| Mesure des perturbations discontinues conduites en tension<br><i>Measurement of discontinuous conducted disturbances in voltage</i>                                        | 3.47 dB                                                                                 | 3.6 dB                                                                    |
| Mesure des perturbations conduites en courant<br><i>Measurement of conducted disturbances in current</i>                                                                   | 2.90 dB                                                                                 | A l'étude /<br>Under consid.                                              |
| Mesure du champ électrique rayonné sur le site en espace libre de Voiron<br><i>Measurement of radiated electric field on the Voiron open area test site</i>                | 5.07 dB                                                                                 | 5.2 dB                                                                    |