



L C I E

Rapport d'essai / Test report

N° 200710-4113CR-R1-E JDE : 79207

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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 : L400-2 (ANTENNAS AERO-LB AND AERO-LC)
- N° de série / serial number * : H0744002C0 *
- FCC ID : QHKMEDIOL400CHAN2

* : information donnée par le client / information given by the customer

Date des essais / Test date : Du 14 décembre 2007 au 18 janvier 2008 / From December 14th, 2007 to January 18th, 2008

Lieu d'essai / Test location : LCIE
ZI des Blanchisseries
38500 VOIRON – France

Test réalisé par / Test performed by : Laurent CHAPUS

Ce document comporte / Composition of document : 38 pages.

VOIRON, LE 6 FÉVRIER 2008 / FEBRUARY 6TH, 2008

Ecrit par / Written by
Laurent CHAPUS



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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

General conclusion:

Measures performed on the sample of the product L400-2, 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 L400-2 is tested with the 13.56MHz antennas:

- AERO-LC (output RF power set at 2W)
- AERO-LB (output RF power set at 4W)

Standard positions of antennas are vertical (RF connector on lower edge) or horizontal.

The L400-2 reader is considered as a computer peripheral device as it is used in conjunction with a PC.

2.2. HARDWARE IDENTIFICATION

• **Equipment under test (EUT):**

L400-2

Serial number: H0744002C0

FCC ID: QHKMEDIOL400CHAN2

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 L400-2 reader :**

- * Serial RS232 connector (DB9 connector)
- * USB port
- * Ethernet 10/100 (RJ45 connector)
- * Channel 1 antenna connector (SMA reverse connector)
- * Channel 2 antenna connector (SMA reverse 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 (Serial number)	FCC ID	Description	Cable description
HEWLETT PACKARD –Vectra VL420.DT Sn: FR14122957	DOC	Laptop Personal Computer	Power cable: unshielded Serial cable: shielded
HEWLETT PACKARD P/N: C4742-60101 Sn: C990897683	DOC	Keyboard	PS2 cable (1.2m)
DELL M/N : M-UK Sn : HCJ61966988	DOC	Mouse	USB cable (1.2m)
Hewlett Packard P/N : D2846 Sn : JP4001000	DOC	Video Monitor	Standard AC power cable SVGA cable, shielded
TAGSYS - RFID tag (I-Code1/270TL)	-		
TAGSYS - RFID tag (ISO 15693)	-		
TAGSYS- AERO LC antenna	-	13.56MHz RF antenna	BNC, 50Ω, 6 ferrites on reader's side
TAGSYS- AERO LB antenna	-	13.56MHz RF antenna	BNC, 50Ω, 6 ferrites on reader's side

- I/O cables used for testing:**

- 1x Antenna RF cable, coaxial 50Ω: 3m (with six ferrites on reader's side)
- 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
- 3x Mains AC power supply cables, unshielded: 1.8m (EUT, PC and monitor)

2.3. EQUIPMENT MODIFICATIONS

No equipment modification has been necessary during testing.

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 V1.0.8

2.5. EUT CONFIGURATION

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

2.6. SPECIAL ACCESSORIES

The RF antenna cable is coaxial 50Ω with six ferrites on the reader's side.

Ethernet, serial and I/Os cable are shielded.

USB is standard cable.

3. RADIATED EMISSION DATA

3.1. CLIMATIC CONDITIONS

Date of test : December 14th, 2007 to January 18th, 2008
Test performed by : Laurent CHAPUS
Atmospheric pressure : 970mb -980mb
Relative humidity : 35%-45%
Ambient temperature : 20°C-25°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 and horizontal positions for worst case measurement.



*Radiated emission test setup
(AERO-LB and AERO-LC antennas, in vertical position)*

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.

The RF output power is set at the maximum rated power for each antenna.

Worst case setup is search for:

- Antenna position
- RF channel selection (Ch1 or Ch2)

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: AERO-LC ANTENNA graph#1 (See annex 1)
 See graphs for 150kHz-30MHz band: 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:

AERO-LC ANTENNA

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

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.

3 axis measurements were performed for antenna positions.

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

AERO-LC Antenna (vertical position):

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 * ¹	84.0	83.6	-0.4	90°	V / 0°	37.9
27.12	29.5	22.7	-6.8	90°	V / 0°	39.7

AERO-LC Antenna (horizontal position):

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 * ¹	84.0	64.8	-19.2	180°	V / 90°	37.9
27.12	29.5	NT	-	-		39.7

NT: Not Traceable



AERO-LB Antenna (vertical position):

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 * ¹	84.0	76.6	-7.4	90°	V / 0°	37.9
27.12	29.5	10.2	-19.3	90°	V / 0°	39.7

AERO-LB Antenna (horizontal position):

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 * ¹	84.0	54.1	-29.9	180°	V / 90°	37.9
27.12	29.5	NT	-	-		39.7

*¹: 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 84 dBμV/m	30
13.410-13.553 13.567-13.710	334 50.5 dBμV/m	30
13.110-13.410 13.710-14.010	106 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.



AERO-LC ANTENNA (Worst case final data result):

No	Frequency (MHz)	QPeak Limit (dBμV/m)	Qpeak * (dBμV/m)	Qpeak-Limit (Margin, dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	37.950	40.0	35.8	-4.2	320	V	100	11.5	
2	67.760	40.0	34.3	-5.7	254	V	150	9.8	
3	87.510	40.0	37.9	-2.1	14	V	100	9.2	
4	499.966	46.0	42.6	-3.4	190	H	250	21.3	
5	800.031	46.0	40.9	-5.1	244	H	360	26.3	
6	813.560	46.0	41.9	-4.1	200	V	200	26.5	
7	840.675	46.0	42.5	-3.5	250	V	205	26.9	
8	867.833	46.0	41.7	-4.3	215	V	250	27.3	

AERO-LB ANTENNA (Worst case final data result):

No	Frequency (MHz)	QPeak Limit (dBμV/m)	Qpeak * (dBμV/m)	Qpeak-Limit (Margin, dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)	Comments
1	37.950	40.0	35.8	-4.2	320	V	100	11.5	
2	87.510	40.0	38.4	-1.6	260	V	100	9.2	
3	800.031	46.0	40.9	-5.1	244	H	360	26.3	
4	813.574	46.0	41.4	-4.6	160	H	100	26.5	
5	840.717	46.0	42.5	-3.5	205	V	250	26.9	
6	867.816	46.0	40.8	-5.2	190	H	100	27.3	

*: 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)**

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 $+50^{\circ}\text{C}$ at the nominal power voltage and the primary power voltage is varied from 85% to 115% of the rated supply voltage at 20°C .

4.1. Temperature and voltage fluctuation

Temperature has been set at $+20^{\circ}\text{C}$, -20°C and $+50^{\circ}\text{C}$.

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
Voltage			
Mains voltage: 110V/60Hz			
Frequency (MHz)	13.559451	13.559450	13.559492
Carrier level	0 dBc	REF	-0.1 dBc
Mains voltage: 93.5V/60Hz			
Frequency (MHz)	13.559451	13.559450	13.559492
Carrier level	0 dBc	0 dBc	-0.1 dBc
Mains voltage: 126V/60Hz			
Frequency (MHz)	13.559451	13.559450	13.559492
Carrier level	0 dBc	0 dBc	-0.1 dBc

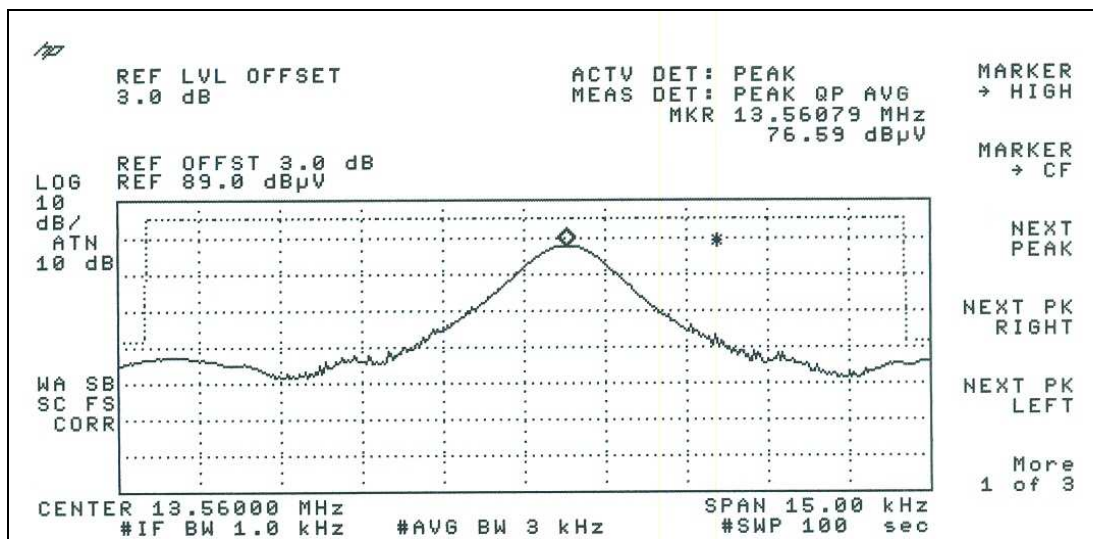
Frequency drift measured is 42Hz when the temperature is varied from -20°C to $+50^{\circ}\text{C}$ and voltage is varied from 110V/60Hz $\pm 15\%$.

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

Date of test : January 18th, 2008
Test performed by : Laurent CHAPUS
Atmospheric pressure : 970mb
Relative humidity : 40%
Ambient temperature : 22°C

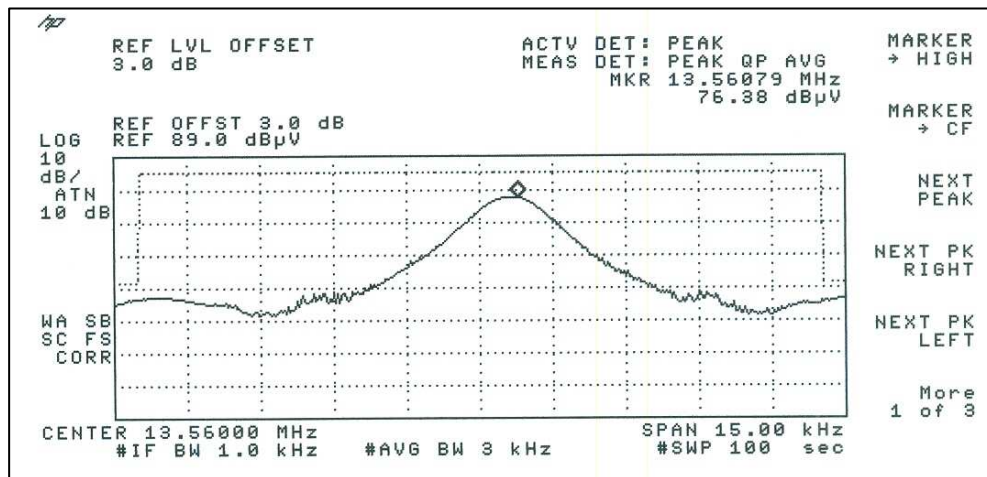
5.2. EQUIPMENT CONFIGURATION

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

5.3. Frequency band 13.553-13.567MHz - AERO-LB antenna (TAG ISO 15693)

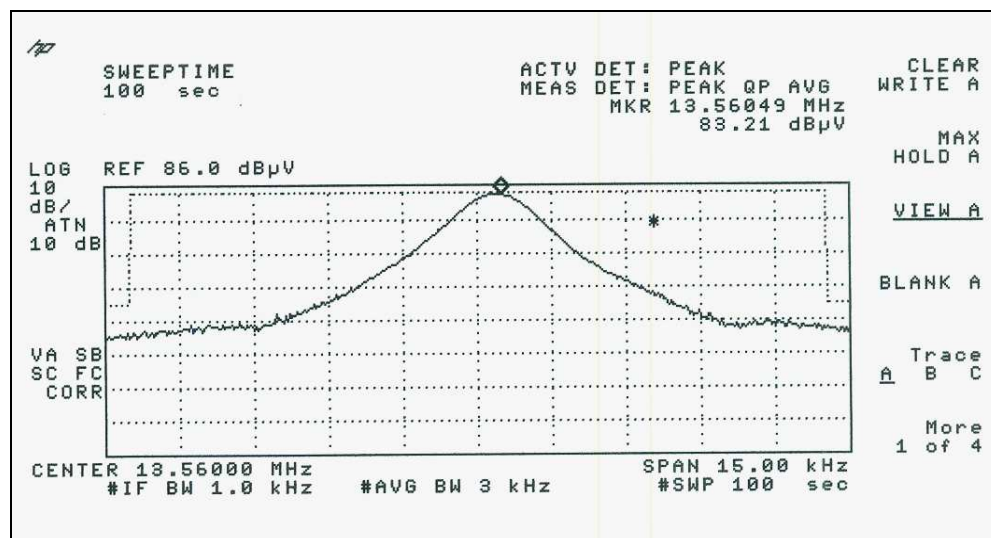
RBW = 1kHz, VBW = 3kHz

5.4. Frequency band 13.553-13.567MHz - AERO-LB antenna (TAG I-CODE1)

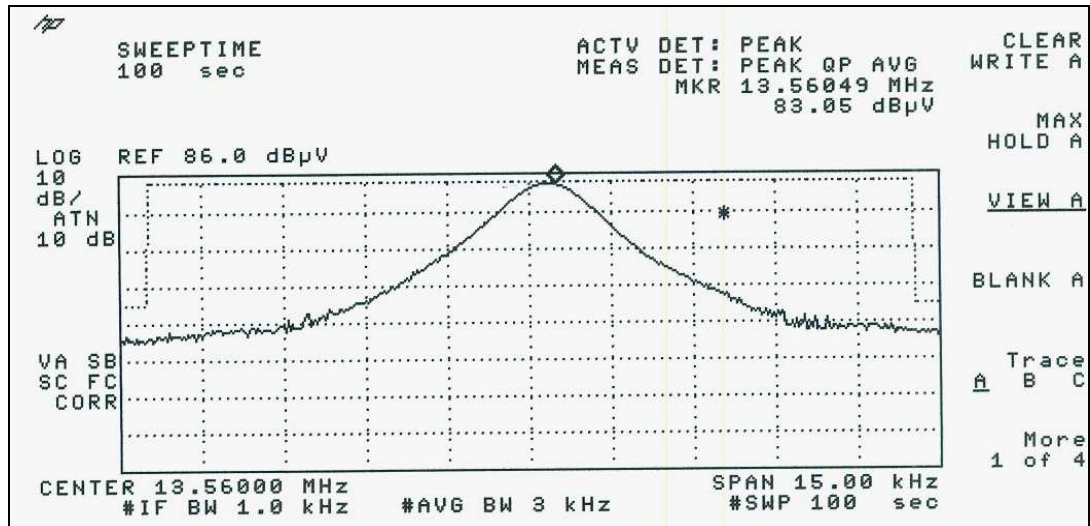


RBW = 1kHz, VBW = 3kHz

5.5. Frequency band 13.553-13.567MHz - AERO-LC antenna (TAG ISO 15693)



RBW = 1kHz, VBW = 3kHz
 (Degraded performance modulation parameters)

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

RBW = 1kHz, VBW = 3kHz
(Degraded performance modulation parameters)



5.7. Frequency band 13.110-14.010MHz

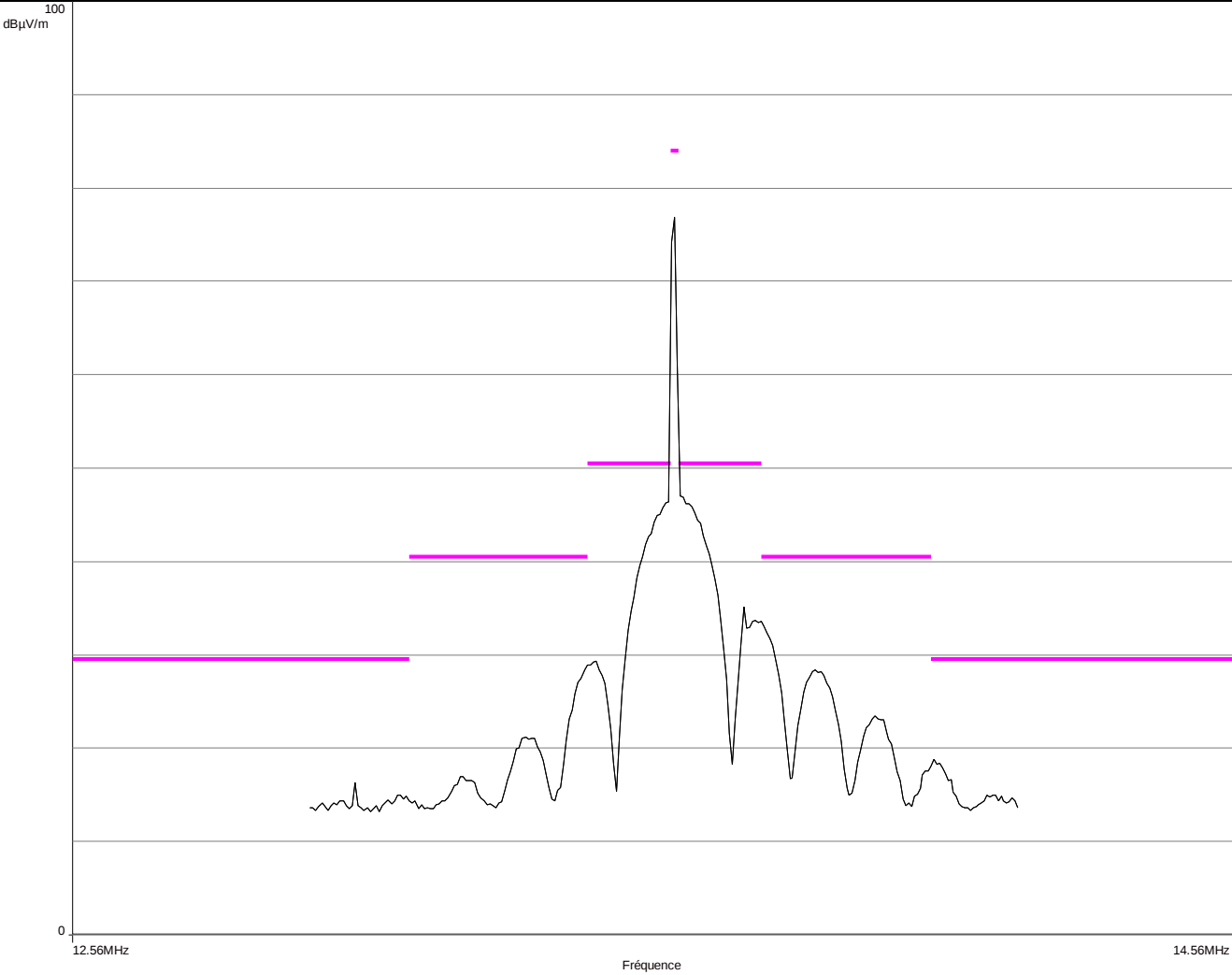
Following plots show radiated emission level in the frequency band 13.110-14.010MHz with a RBW of 9kHz and a quasi-peak detector.

The graphs are obtained with a measuring receiver ESH3.

Graph name	Antenna type / Position	Output power	TAG read	Modulation parameters	Comments
EMR#1	AERO-LB / Vertical	4W	ISO 15693	Command Modulation Depth: 10% EOF modulation Depth: 10% Data coding mode: 1 of 256	Degraded modulation performances
EMR#2	AERO-LB / Vertical	4W	I-Code 1	Bit coding: Standard	Degraded modulation performances
EMR#3	AERO-LB / Horizontal	4W	ISO 15693	Command Modulation Depth: 10% EOF modulation Depth: 100% Data coding mode: 1 of 4	Worst case modulation parameters
EMR#4	AERO-LB / Horizontal	4W	I-Code 1	Bit coding: FAST	Worst case modulation parameters
EMR#5	AERO-LC / Vertical	2W	ISO 15693	Command Modulation Depth: 10% EOF modulation Depth: 10% Data coding mode: 1 of 4	Degraded modulation performances
EMR#6	AERO-LC / Vertical	2W	I-Code 1	Bit coding: Standard	Degraded modulation performances
EMR#7	AERO-LC / Horizontal	2W	ISO 15693	Command Modulation Depth: 10% EOF modulation Depth: 100% Data coding mode: 1 of 4	Worst case modulation parameters
EMR#8	AERO-LC / Horizontal	2W	I-Code 1	Bit coding: FAST	Worst case modulation parameters

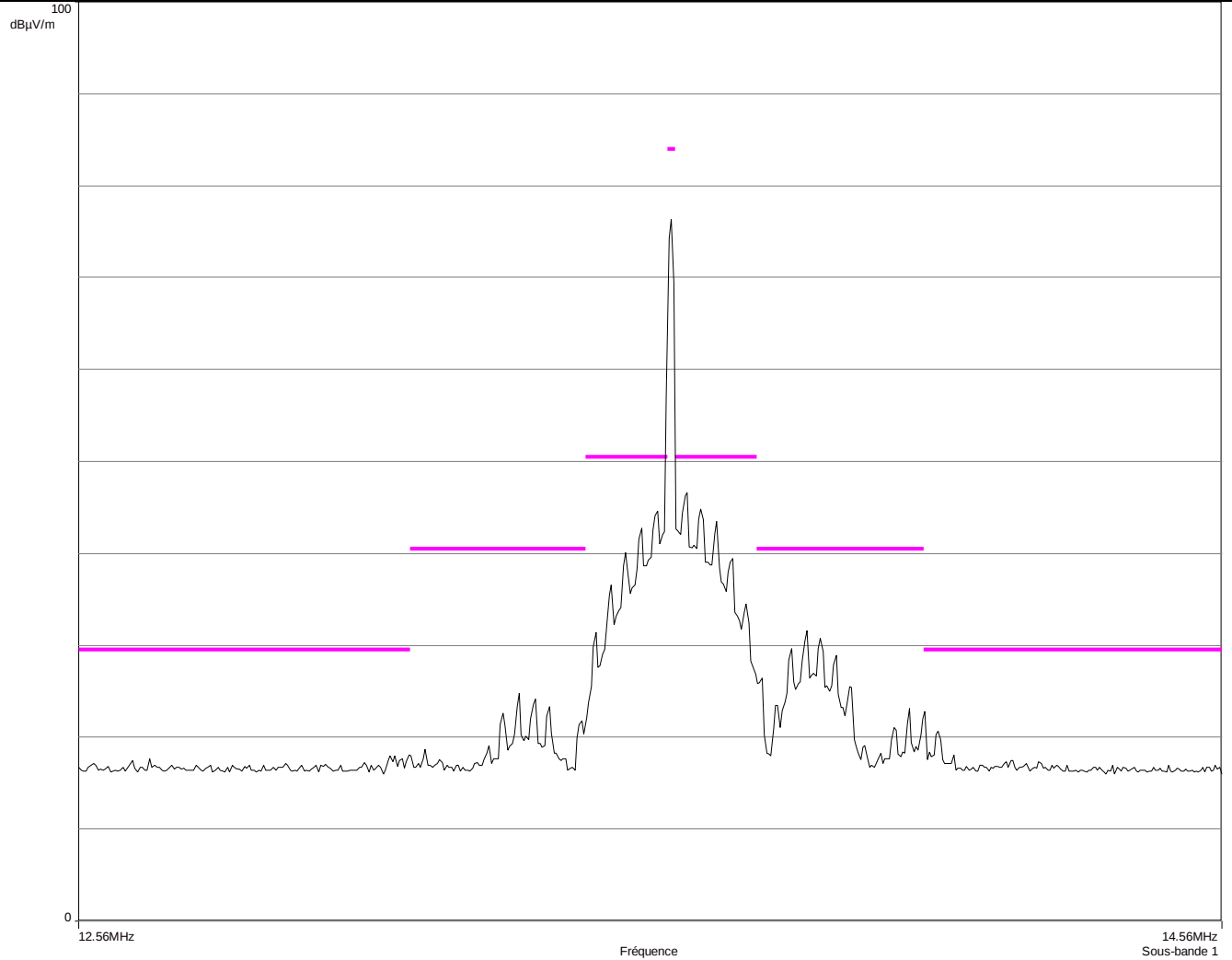


RADIATED EMISSIONS		Test configuration: L400-2 / AERO-LB antenna (4W) Vertical position of antenna Degraded modulation performances
Graph name:	Emr#1	
Voltage / Frequency	230/50Hz	
TAG	ISO15693	
RBW / Detector	9kHz / Quasi-Peak	



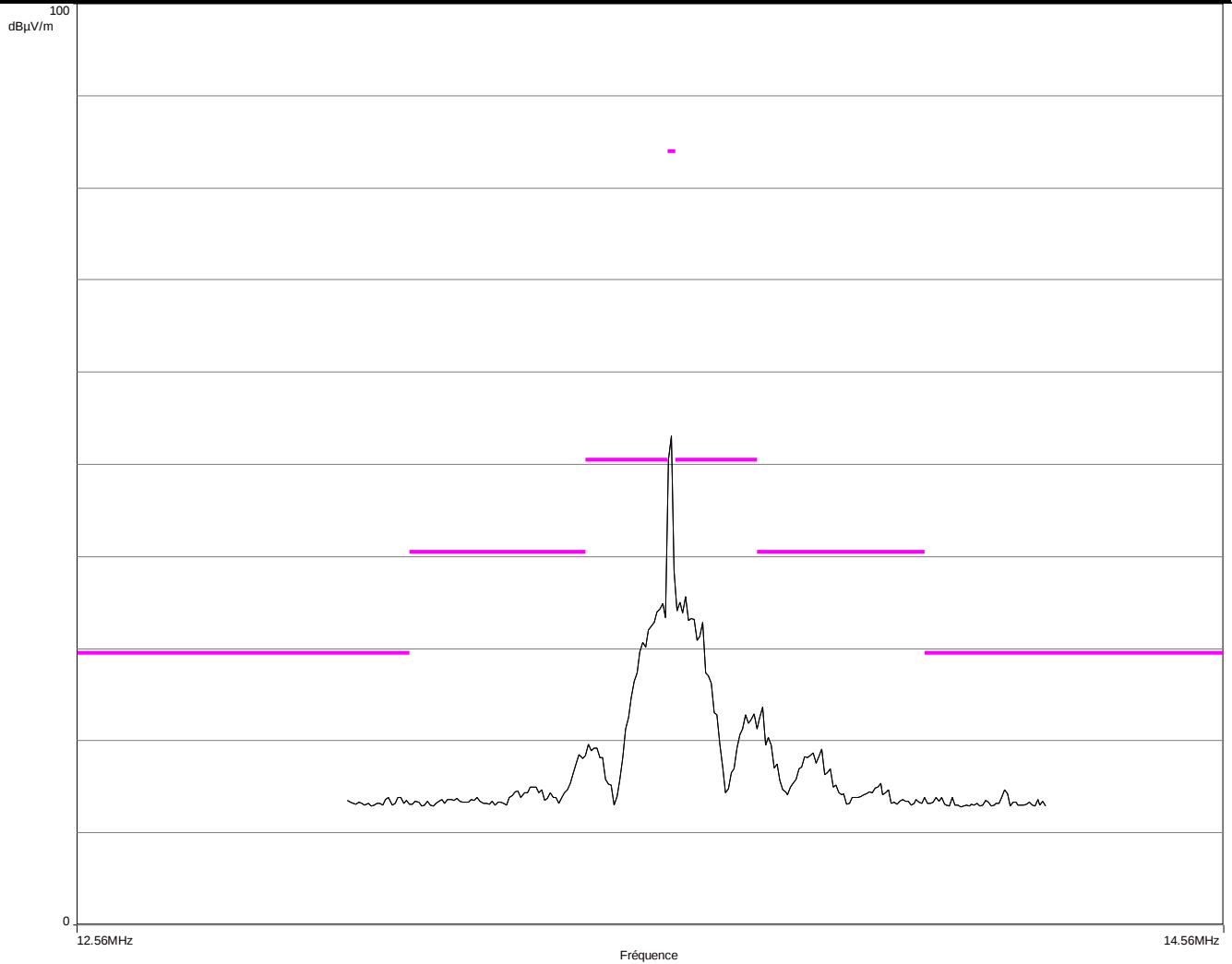


RADIATED EMISSIONS		Test configuration: L400-2 / AERO-LB antenna (4W) Vertical position of antenna Degraded modulation performances
Graph name:	Emr#2	
Voltage / Frequency	230/50Hz	
TAG	I-Code 1	
RBW / Detector	9kHz / Quasi-Peak	



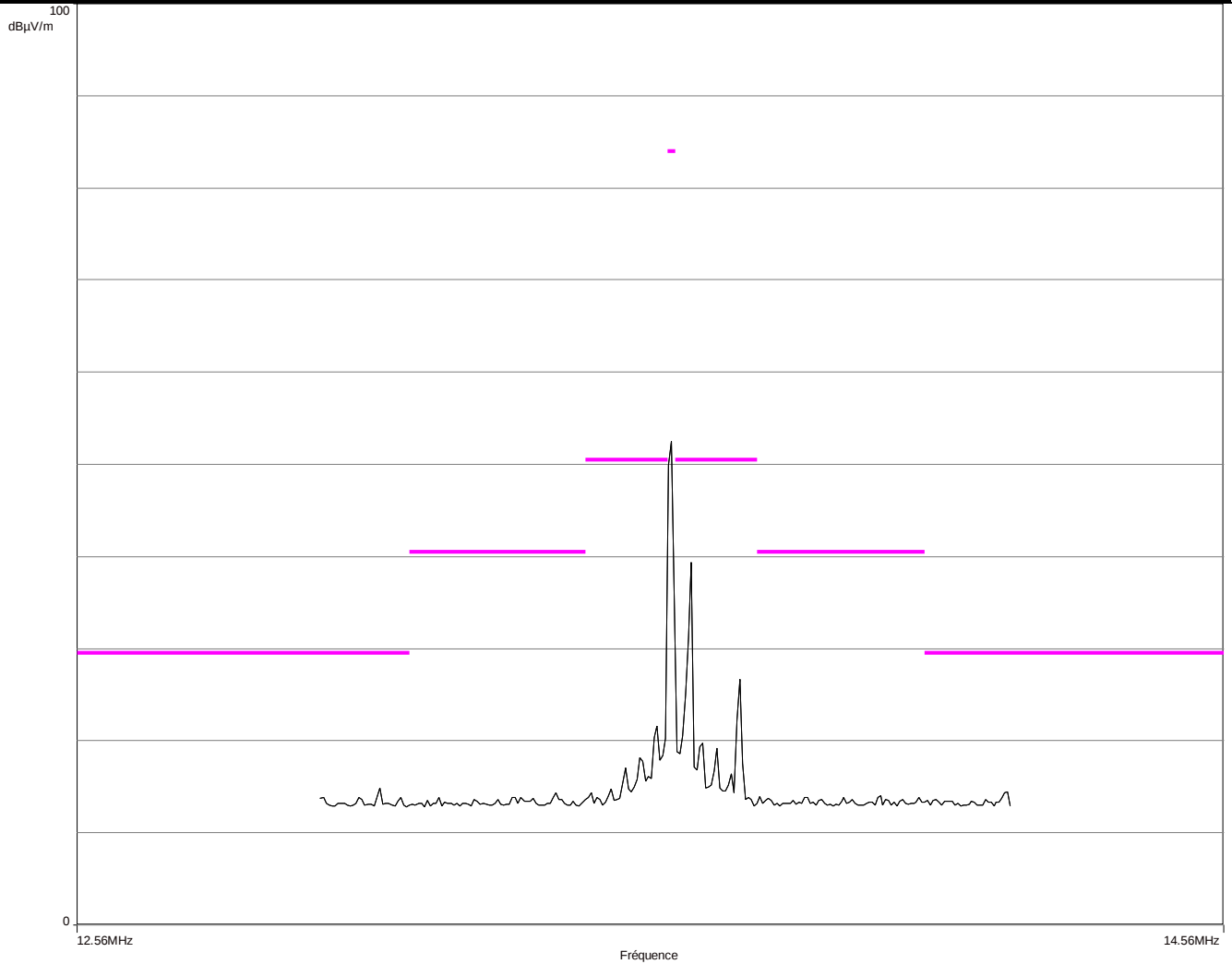


RADIATED EMISSIONS		Test configuration: L400-2 / AERO-LB antenna (4W) Horizontal position of antenna Worst case modulation parameters
Graph name:	Emr#3	
Voltage / Frequency	230/50Hz	
TAG	ISO15693	
RBW / Detector	9kHz / Quasi-Peak	



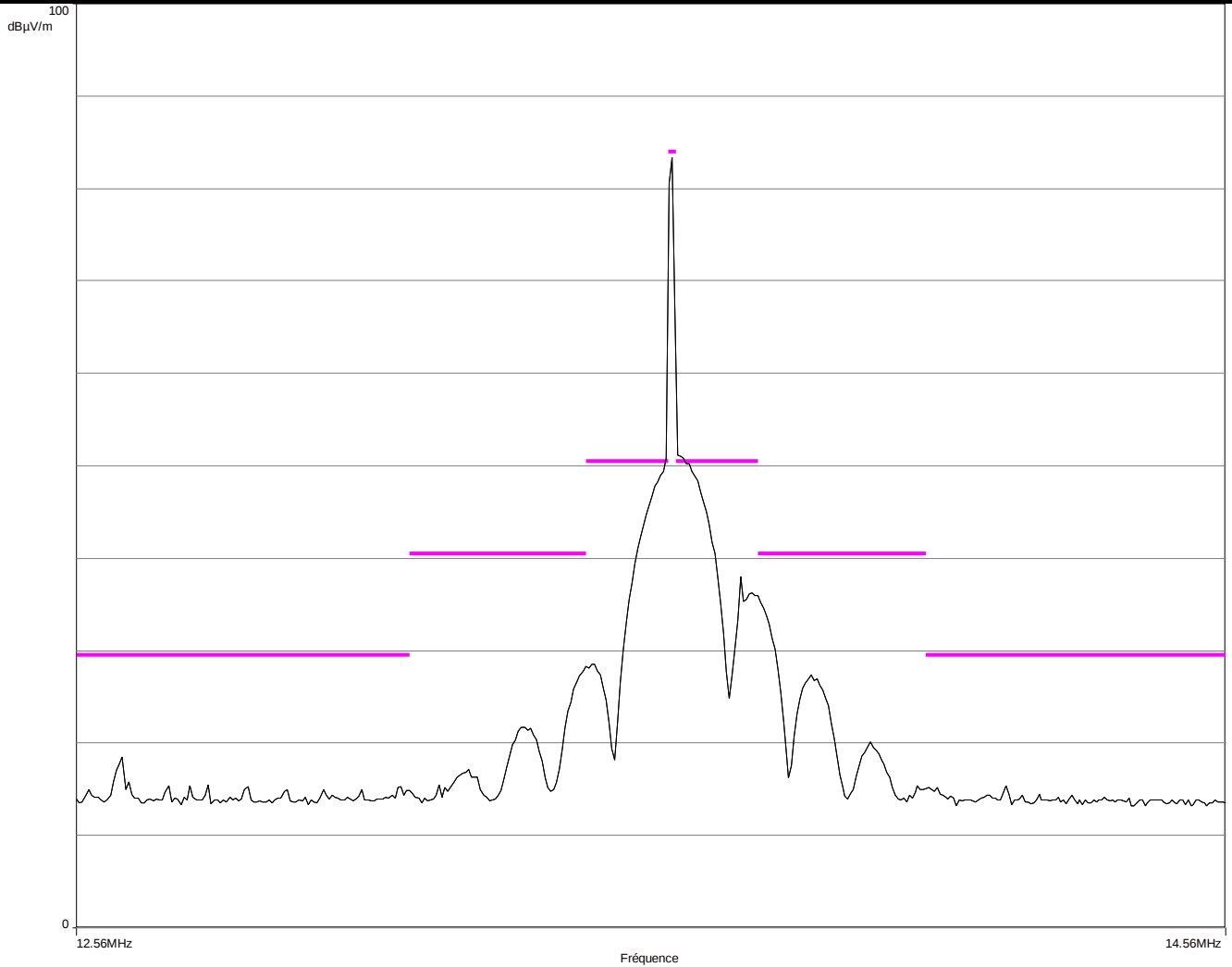


RADIATED EMISSIONS		Test configuration: L400-2 / AERO-LB antenna (4W) Horizontal position of antenna Worst case modulation parameters
Graph name:	Emr#4	
Voltage / Frequency	230/50Hz	
TAG	I-Code 1	
RBW / Detector	9kHz / Quasi-Peak	



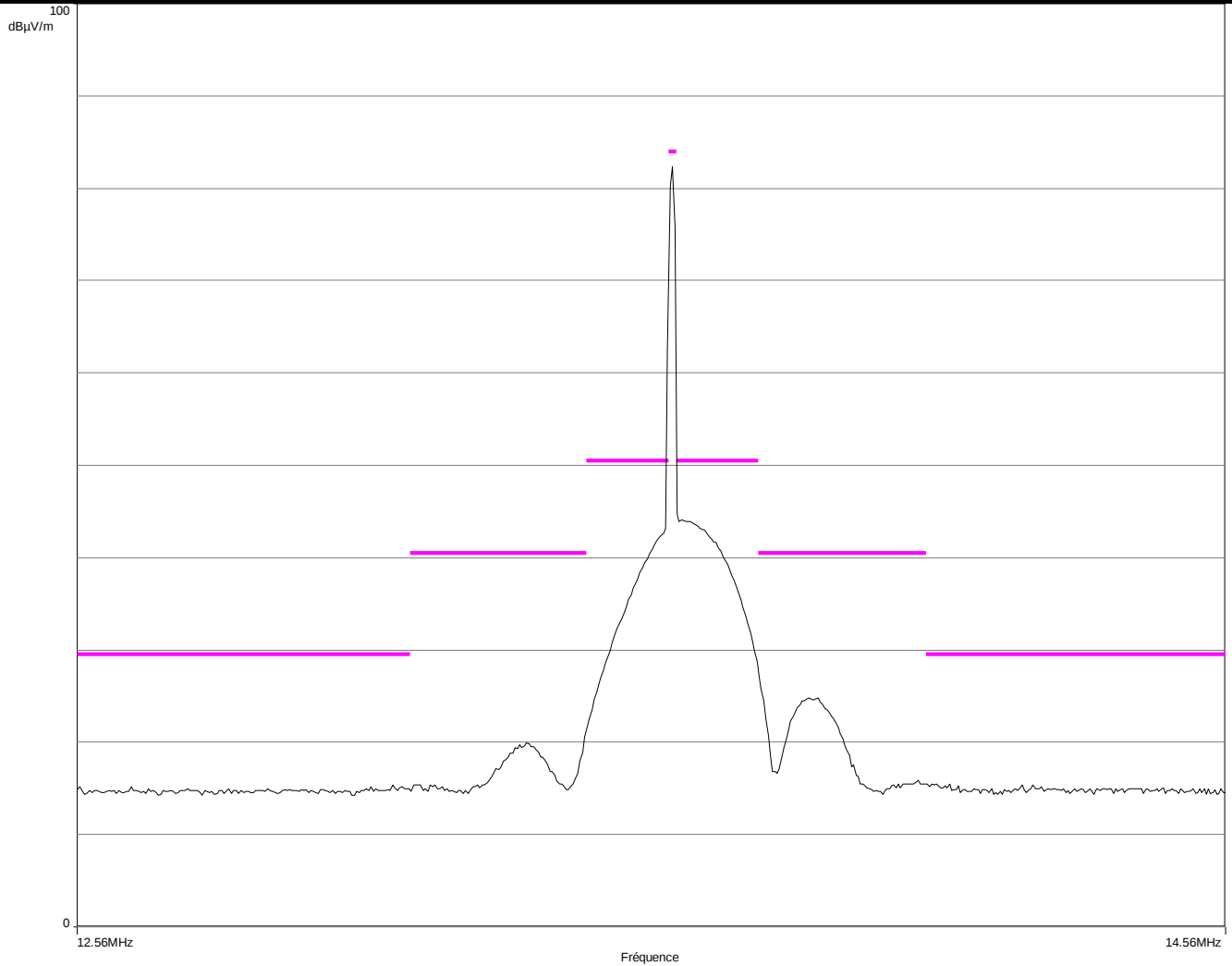


RADIATED EMISSIONS		Test configuration: L400-2 / AERO-LC antenna (2W) Vertical position of antenna Degraded modulation performances
Graph name:	Emr#5	
Voltage / Frequency	230/50Hz	
TAG	ISO15693	
RBW / Detector	9kHz / Quasi-Peak	

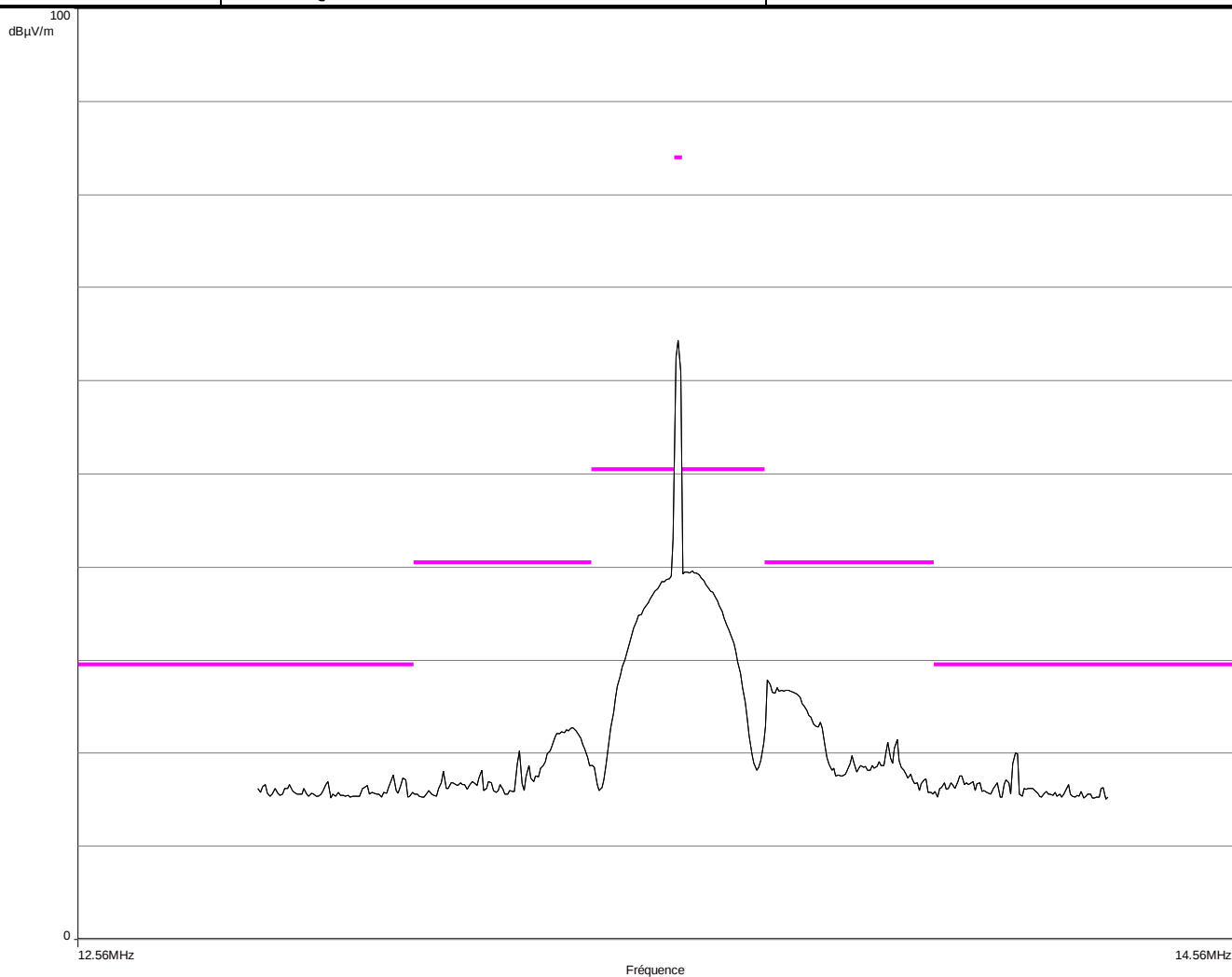




RADIATED EMISSIONS		Test configuration: L400-2 / AERO-LC antenna (2W) Vertical position of antenna Degraded modulation performances
Graph name:	Emr#6	
Voltage / Frequency	230/50Hz	
TAG	I-Code 1	
RBW / Detector	9kHz / Quasi-Peak	

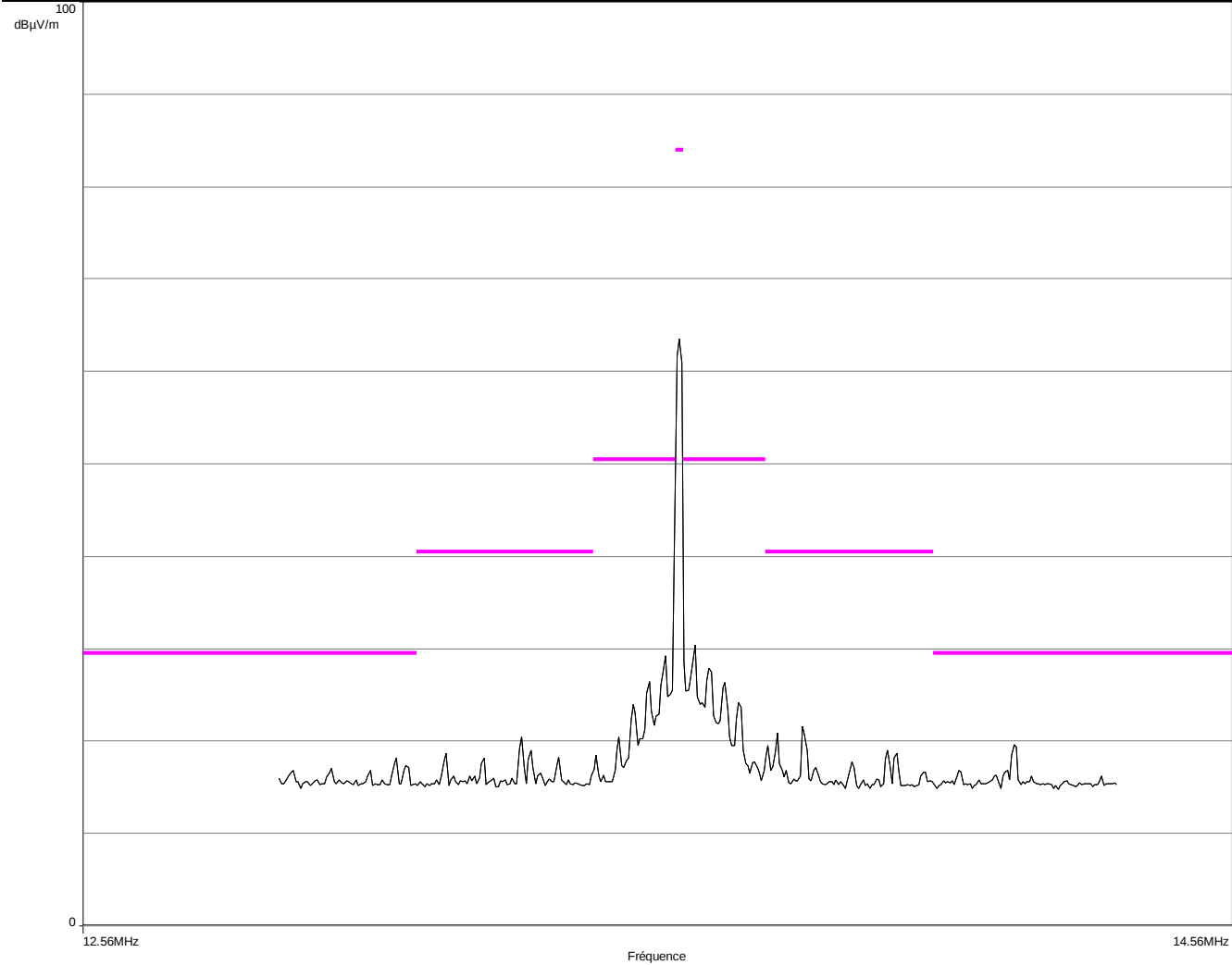


RADIATED EMISSIONS		Test configuration: L400-2 / AERO-LC antenna (2W) Horizontal position of antenna Worst case modulation parameters
Graph name:	Emr#7	
Voltage / Frequency	230/50Hz	
TAG	ISO15693	
RBW / Detector	9kHz / Quasi-Peak	





RADIATED EMISSIONS		Test configuration: L400-2 / AERO-LC antenna (2W) Horizontal position of antenna Worst case modulation parameters
Graph name:	Emr#8	
Voltage / Frequency	230/50Hz	
TAG	I-Code 1	
RBW / Detector	9kHz / Quasi-Peak	



6. CONDUCTED EMISSION DATA

6.1. CLIMATIC CONDITIONS

Date of test : December 18th, 2008
Test performed by : Laurent CHAPUS
Atmospheric pressure : 975mb
Relative humidity : 35%
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.

Aero-LB antenna:

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

Aero-LC 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:

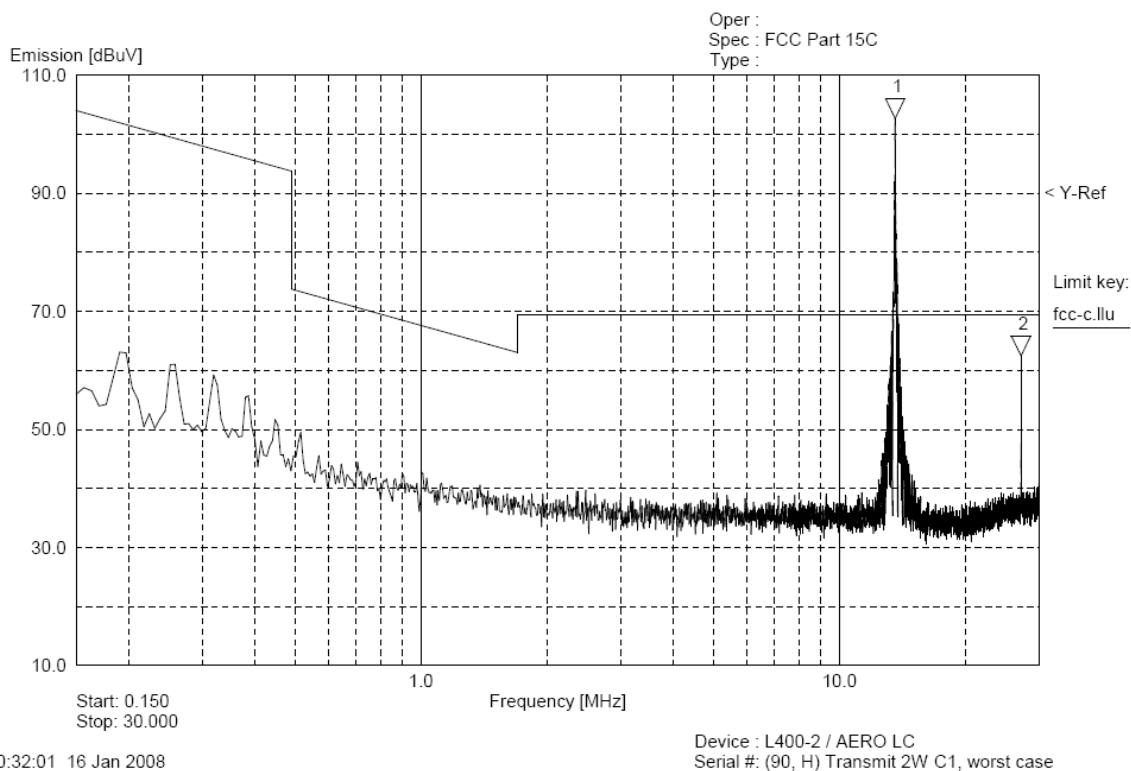
Measure on L1:	graph Emc#5	(see annex 1)
Measure on N:	graph Emc#6	(see annex 1)

RESULT: PASS

7. ANNEX 1 (GRAPHS)

RADIATED EMISSIONS (Pre-characterization at 3meters)		Test configuration: AERO-LC antenna
Graph name:	graph#1	
Antenna polarization	Parallel	
Frequency band	150kHz-30MHz	
Azimuth:	90°	
RBW / VBW :	9kHz / 30kHz	

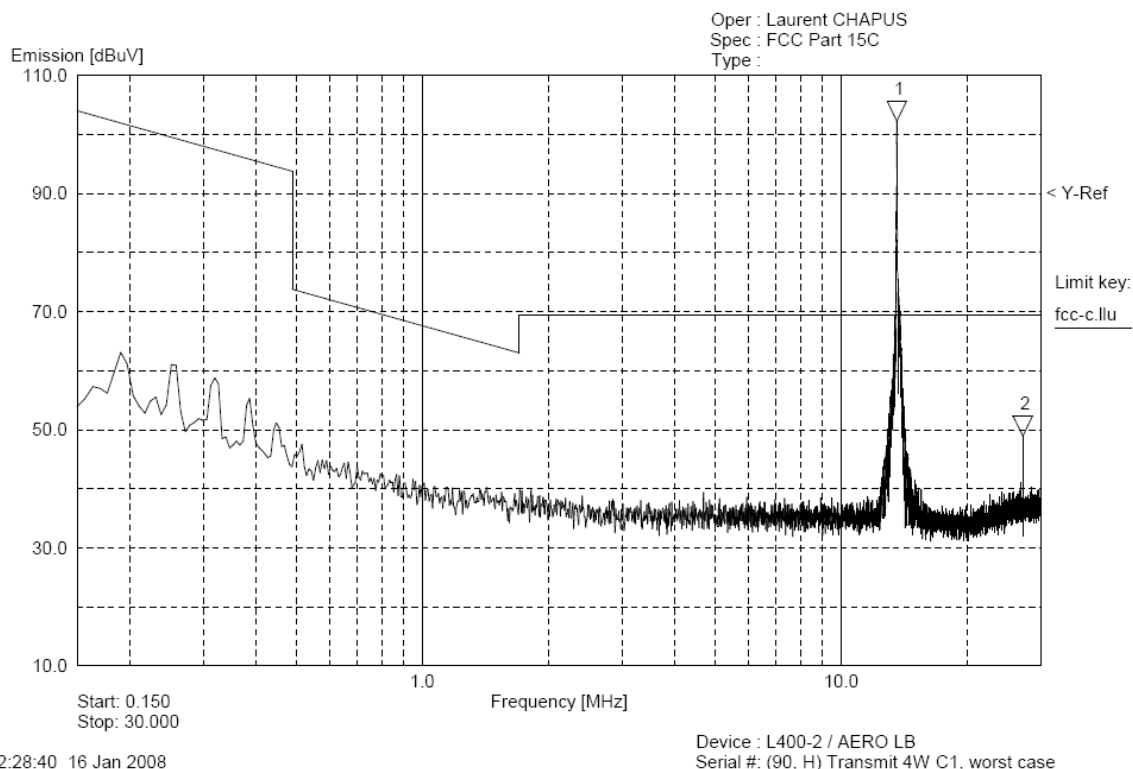
RADIATED EMISSION -TAGSYS RFID



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

RADIATED EMISSIONS (Pre-characterization at 3 meters)		Test configuration: AERO-LB antenna
Graph name:	graph#2	
Antenna polarization	Parallel	
Frequency band	150kHz-30MHz	
Azimuth:	90°	
RBW / VBW :	9kHz / 30kHz	

RADIATED EMISSION -TAGSYS RFID

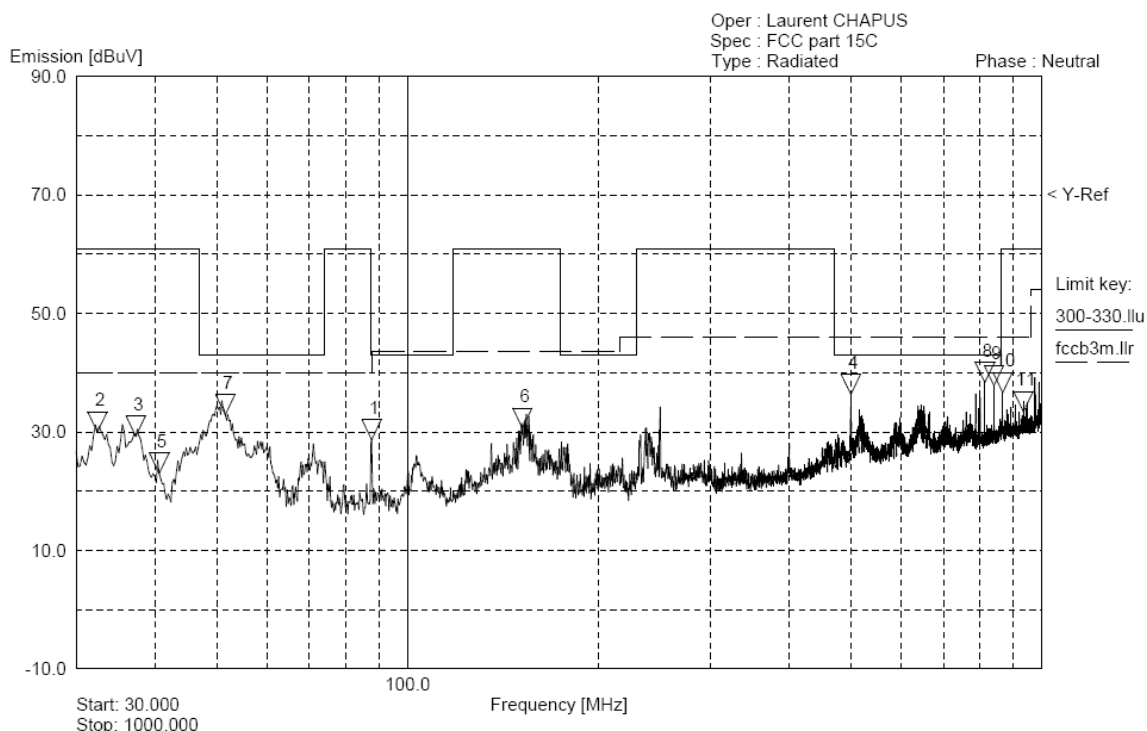


Marker 1 is carrier frequency (13.56MHz)

Marker 2 is 27.12MHz

RADIATED EMISSIONS (3meters)		Test configuration: AERO-LC antenna
Graph name:	graph#3	
Antenna polarisation	Horizontal	
Frequency band	30MHz – 1GHz	
Azimuth:	From 0° to 360° (Max-hold measurement)	
RBW / VBW :	120kHz / 300kHz	

RADIATED EMISSIONS - TAGSYS RFID



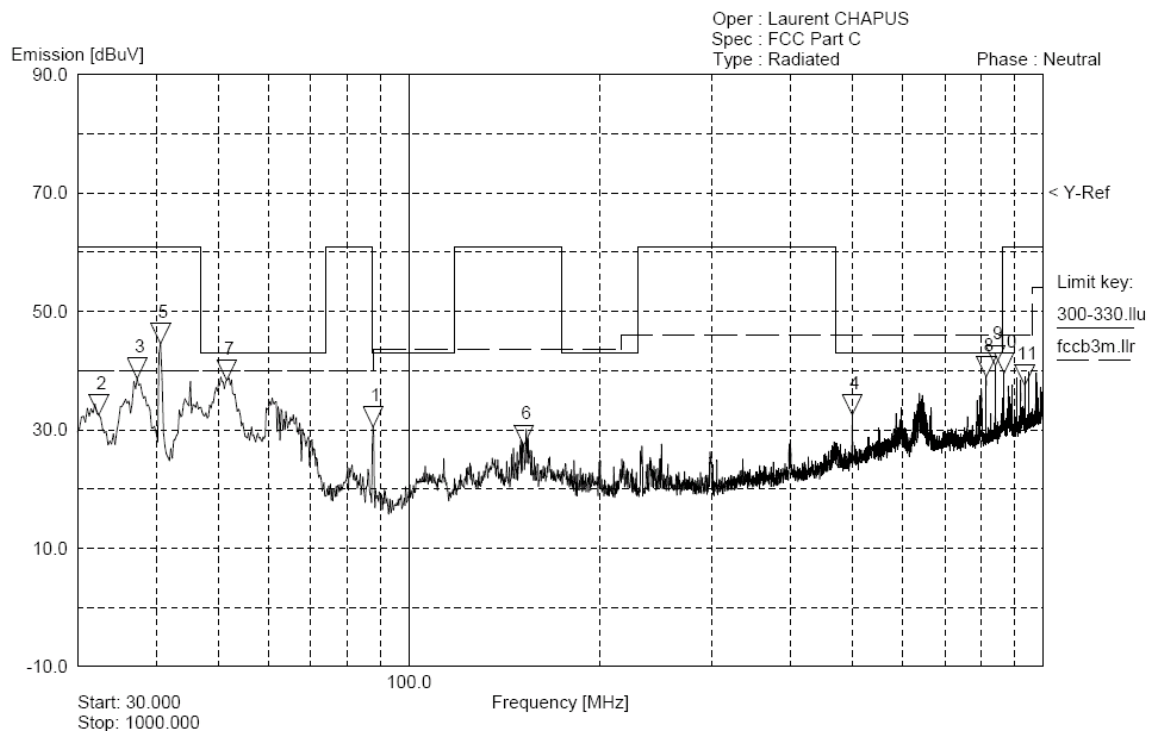
15:37:36 16 Jan 2008

Device : L400-2 Reader (AERO-LC)
Serial #: (2W, channel 2) V-Pol H

Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	87.76	28.66	-	-	43.00
2	32.42	29.99	-	-	61.00
3	37.28	29.28	-	-	61.00
4	500.0	36.33	-	-	43.00
5	40.58	23.01	-	-	61.00
6	151.7	30.63	-	-	61.00
7	51.60	32.92	-	-	43.00
8	813.5	38.36	-	-	43.00
9	840.8	37.81	-	-	43.00
10	867.9	36.64	-	-	61.00
11	935.6	33.44	-	-	61.00

RADIATED EMISSIONS (3meters)		Test configuration: AERO-LC antenna
Graph name:	graph#4	
Antenna polarisation	Vertical	
Frequency band	30MHz – 1GHz	
Azimuth:	From 0° to 360° (Max-hold measurement)	
RBW / VBW :	120kHz / 300kHz	

RADIATED EMISSIONS - TAGSYS RFID



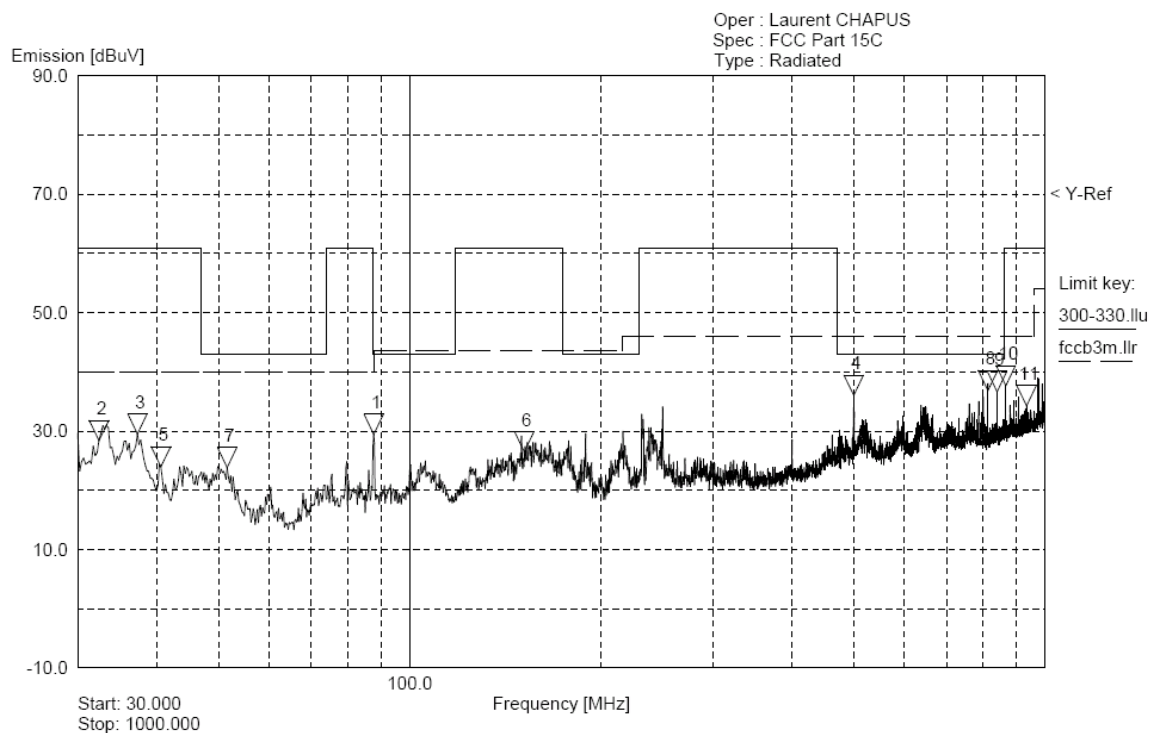
15:45:36 16 Jan 2008

Device : L400-2 Reader (AERO-LC)
Serial #: (2W, channel 2) V-Pol V

Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	87.76	30.48	-	-	43.00
2	32.42	32.49	-	-	61.00
3	37.28	38.68	-	-	61.00
4	500.0	32.54	-	-	43.00
5	40.58	44.56	-	-	61.00
6	151.7	27.37	-	-	61.00
7	51.60	38.37	-	-	43.00
8	813.5	38.96	-	-	43.00
9	840.8	40.84	-	-	43.00
10	867.9	39.58	-	-	61.00
11	935.6	37.52	-	-	61.00

RADIATED EMISSIONS (3meters)		Test configuration: AERO-LB antenna
Graph name:	graph#5	
Antenna polarisation	Horizontal	
Frequency band	30MHz – 1GHz	
Azimuth:	From 0° to 360° (Max-hold measurement)	
RBW / VBW :	120kHz / 300kHz	

RADIATED EMISSIONS - TAGSYS RFID



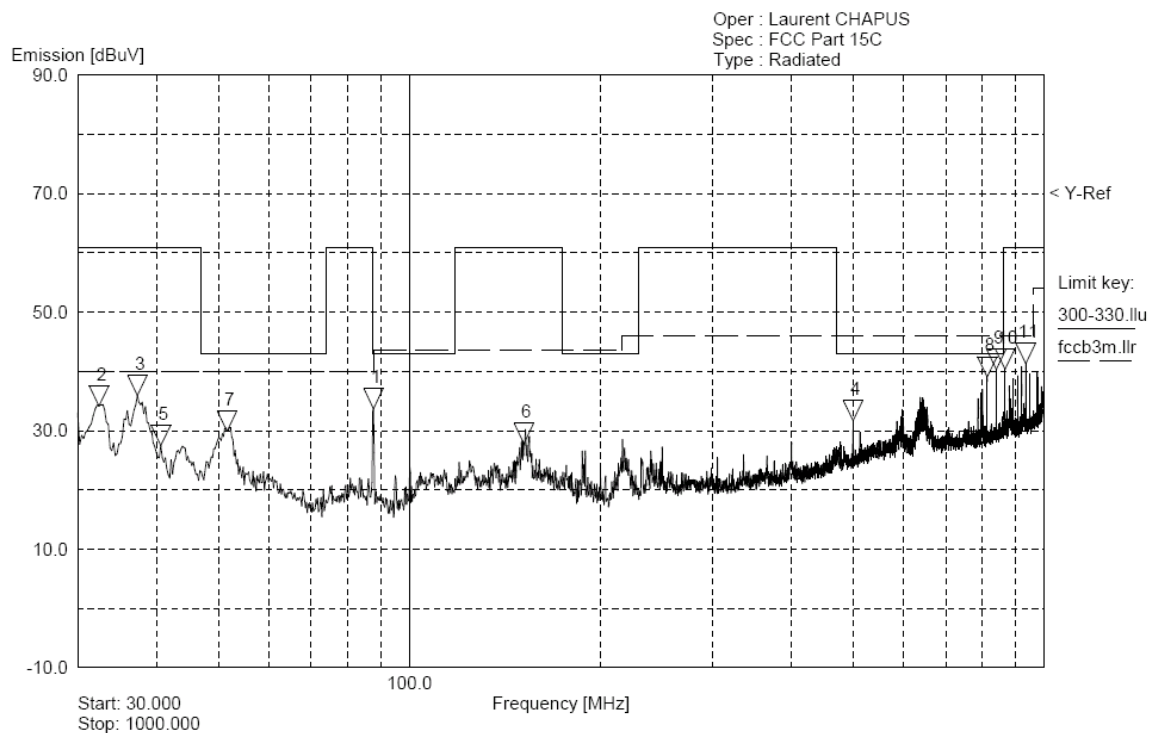
14:48:50 16 Jan 2008

Device : L400-2 Reader (AERO-LB)
Serial #: (4W, channel 2) V-Pol H

Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	87.76	29.45	-	-	43.00
2	32.42	28.41	-	-	61.00
3	37.28	29.52	-	-	61.00
4	500.0	36.04	-	-	43.00
5	40.58	23.97	-	-	61.00
6	151.5	26.50	-	-	61.00
7	51.60	23.82	-	-	43.00
8	813.5	36.86	-	-	43.00
9	840.8	36.66	-	-	43.00
10	867.9	37.69	-	-	61.00
11	935.6	34.27	-	-	61.00

RADIATED EMISSIONS (3meters)		Test configuration: AERO-LB antenna
Graph name:	graph#6	
Antenna polarisation	Vertical	
Frequency band	30MHz – 1GHz	
Azimuth:	From 0° to 360° (Max-hold measurement)	
RBW / VBW :	120kHz / 300kHz	

RADIATED EMISSIONS - TAGSYS RFID



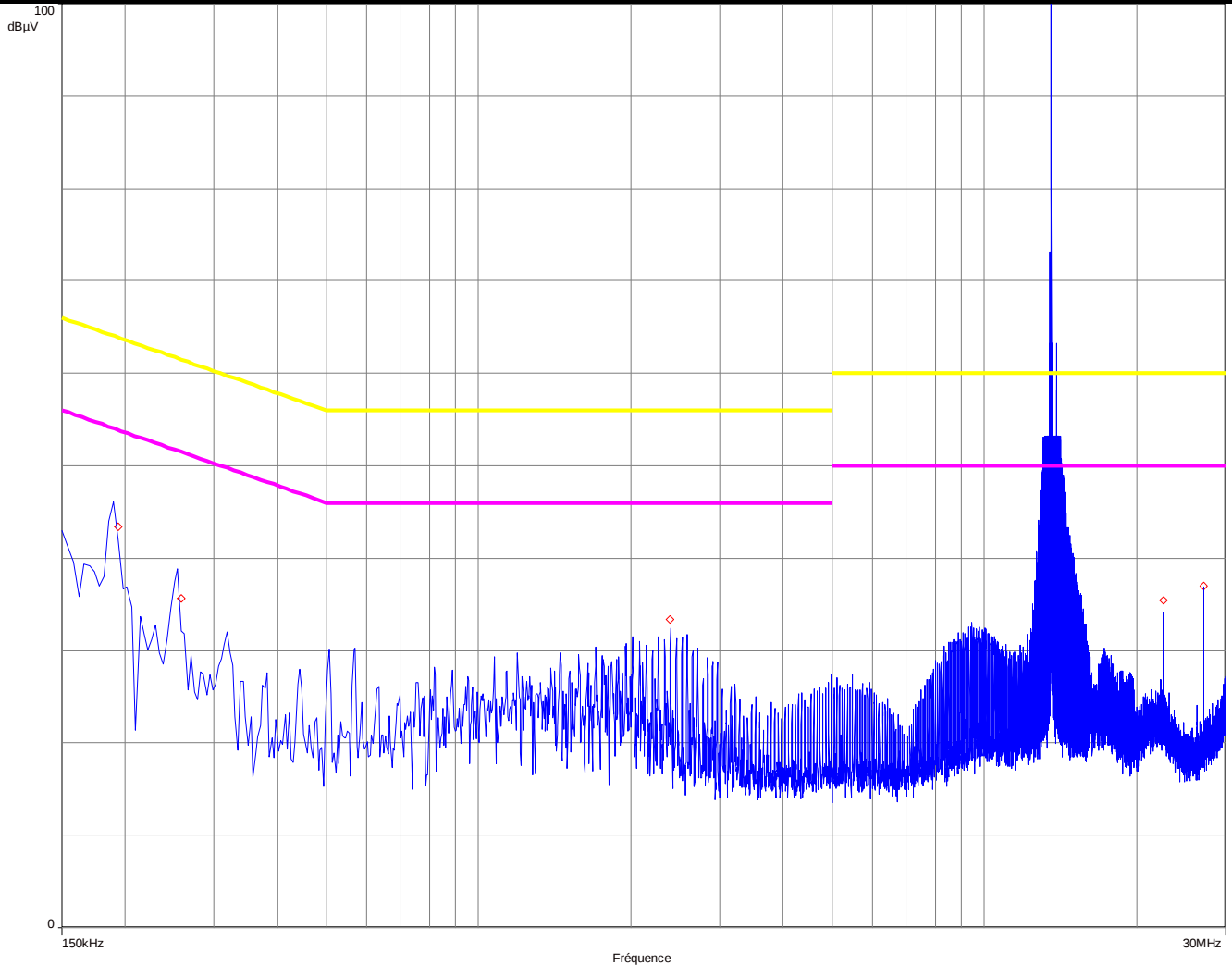
14:39:12 16 Jan 2008

Device : L400-2 Reader (AERO-LB)
Serial #: (4W, channel 2) V-Pol V

Marker ▽	Frequency [MHz]	Peak [dBuV]	Q-Peak [dBuV]	Average [dBuV]	Limit [dBuV]
1	87.76	33.71	-	-	43.00
2	32.42	34.16	-	-	61.00
3	37.28	35.95	-	-	61.00
4	500.0	31.70	-	-	43.00
5	40.58	27.48	-	-	61.00
6	151.5	27.82	-	-	61.00
7	51.60	29.90	-	-	43.00
8	813.5	39.08	-	-	43.00
9	840.8	40.32	-	-	43.00
10	867.9	40.38	-	-	61.00
11	935.6	41.32	-	-	61.00



CONDUCTED EMISSIONS		Test configuration:
Graph name:	Emc#1	AERO-LB antenna 4W
Voltage / Frequency	110V/620Hz	
Line/Port	Phase (L1)	
RBW / VBW :	9kHz / 30kHz	

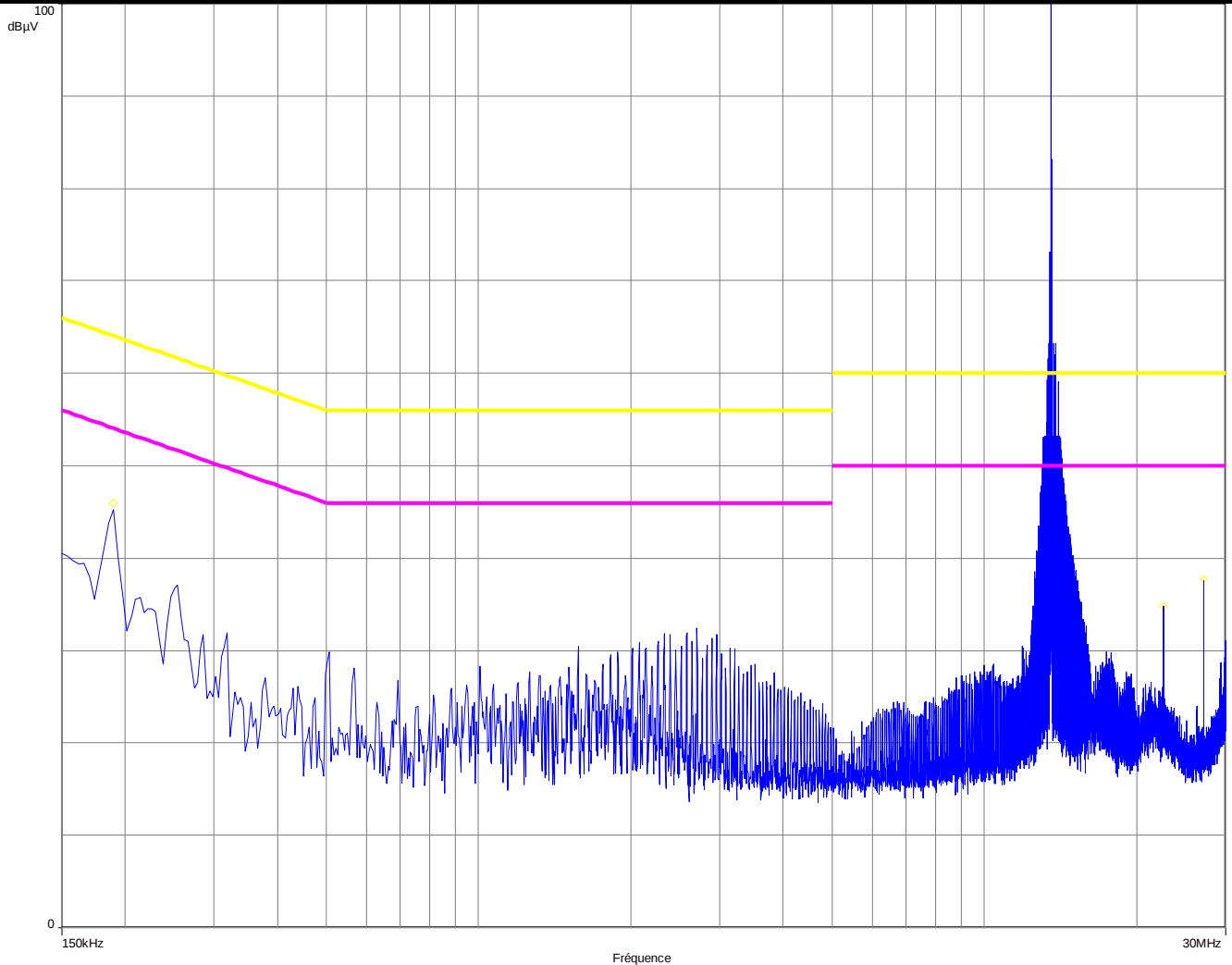


Frequency (MHz)	Measure Peak dBμV	Measure Average dBμV	Limit Average dBμV	Avg-Lim (Margin) dB	Measure Quasi-Peak dBμV	Limit QPeak dBμV	QPeak-Lim (Margin) dB
0.194	43.4	22.4	54.0	-31.6	34.4	64.0	-29.6
0.258	35.6	11.8	51.6	-39.8	25.6	61.6	-36.0
2.394	33.3	20.9	46.0	-25.1	28.5	56.0	-27.5
13.562 *	108.0	107.0	50.0	57.0	107.0	60.0	47.0
22.598	35.4	26.2	50.0	-23.8	30.2	60.0	-29.8
27.122	37.0	31.9	50.0	-18.1	31.9	60.0	-28.1

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



CONDUCTED EMISSIONS		Test configuration: AERO-LB antenna 4W
Graph name:	Emc#2	
Voltage / Frequency	110V/620Hz	
Line/Port	Neutral (N)	
RBW / VBW :	9kHz / 30kHz	

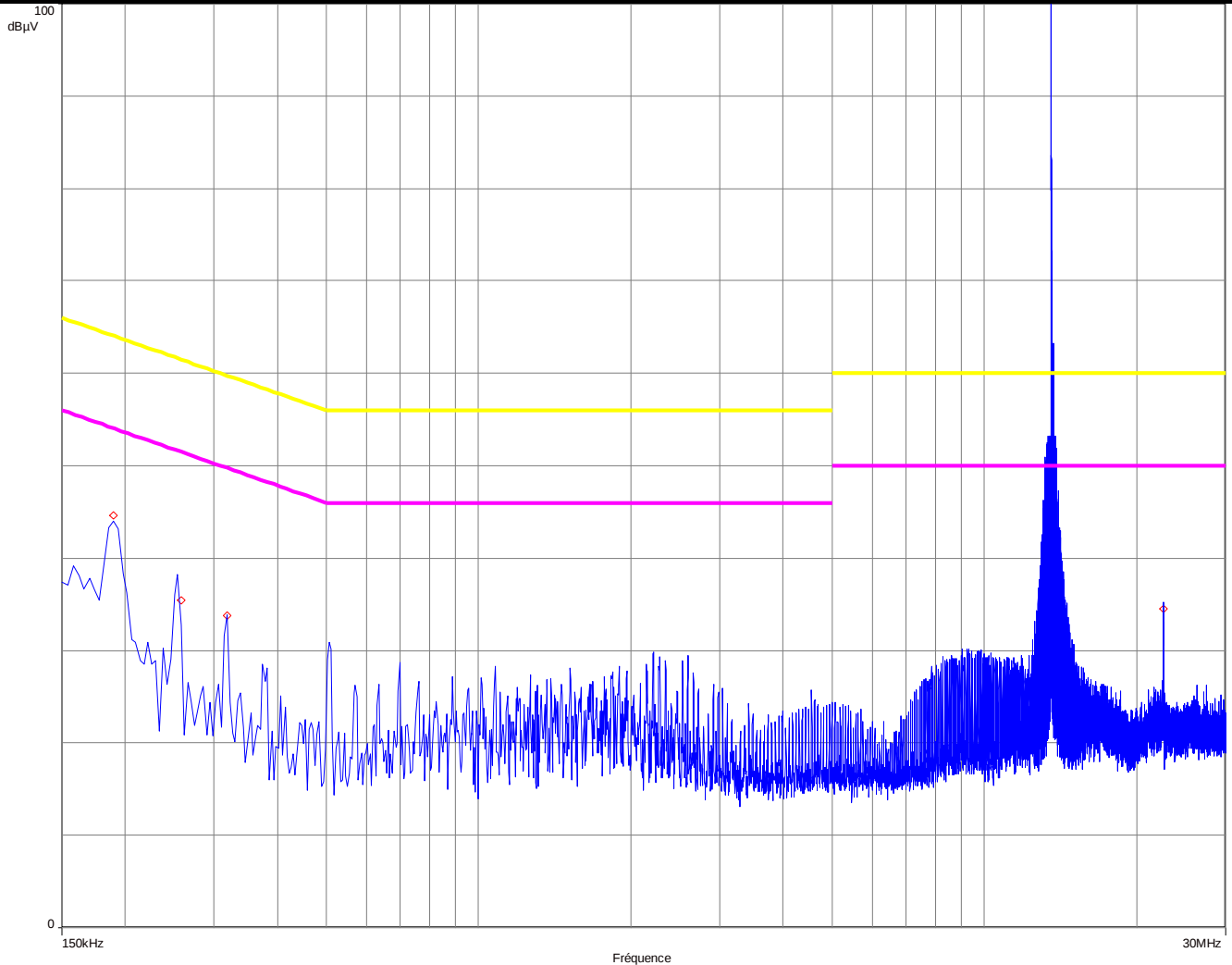


Frequency (MHz)	Measure Peak dBμV	Measure Average dBμV	Limit Average dBμV	Avg-Lim (Margin) dB	Measure Quasi-Peak dBμV	Limit QPeak dBμV	QPeak-Lim (Margin) dB
0.190	45.9	31.9	54.0	-22.1	43.6	64.0	-20.4
13.562 *	108.0	107.0	50.0	57.0	107.0	60.0	47.0
22.598	34.8	26.5	50.0	-23.5	30.4	60.0	-29.6
27.122	37.7	32.3	50.0	-17.7	32.3	60.0	-27.7

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



CONDUCTED EMISSIONS		Test configuration: AERO-LC antenna 2W
Graph name:	Emc#3	
Voltage / Frequency	110V/620Hz	
Line/Port	Phase (L1)	
RBW / VBW :	9kHz / 30kHz	

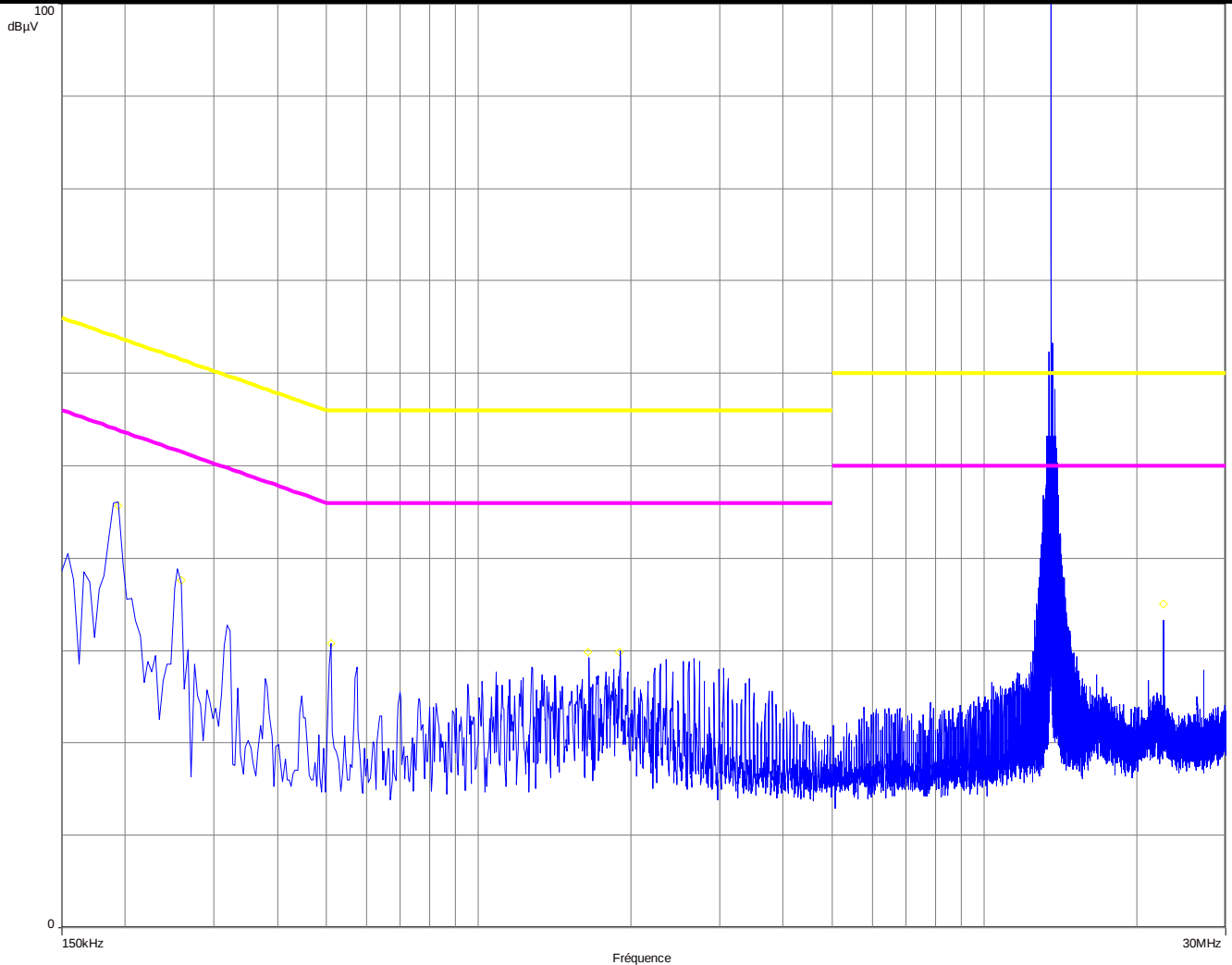


Frequency (MHz)	Measure Peak dBμV	Measure Average dBμV	Limit Average dBμV	Avg-Lim (Margin) dB	Measure Quasi-Peak dBμV	Limit QPeak dBμV	QPeak-Lim (Margin) dB
0.190	44.6	30.2	54.0	-23.8	42.4	64.0	-21.6
0.258	35.4	13.4	51.6	-38.2	25.4	61.6	-36.2
0.318	33.8	20.3	49.8	-29.5	30.0	59.8	-29.8
13.562 *	105.0	104.0	50.0	54.0	104.0	60.0	44.0
22.606	34.5	21.2	50.0	-28.8	27.2	60.0	-32.8

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



CONDUCTED EMISSIONS		Test configuration: AERO-LC antenna 2W
Graph name:	Emc#4	
Voltage / Frequency	110V/620Hz	
Line/Port	Neutral (N)	
RBW / VBW :	9kHz / 30kHz	

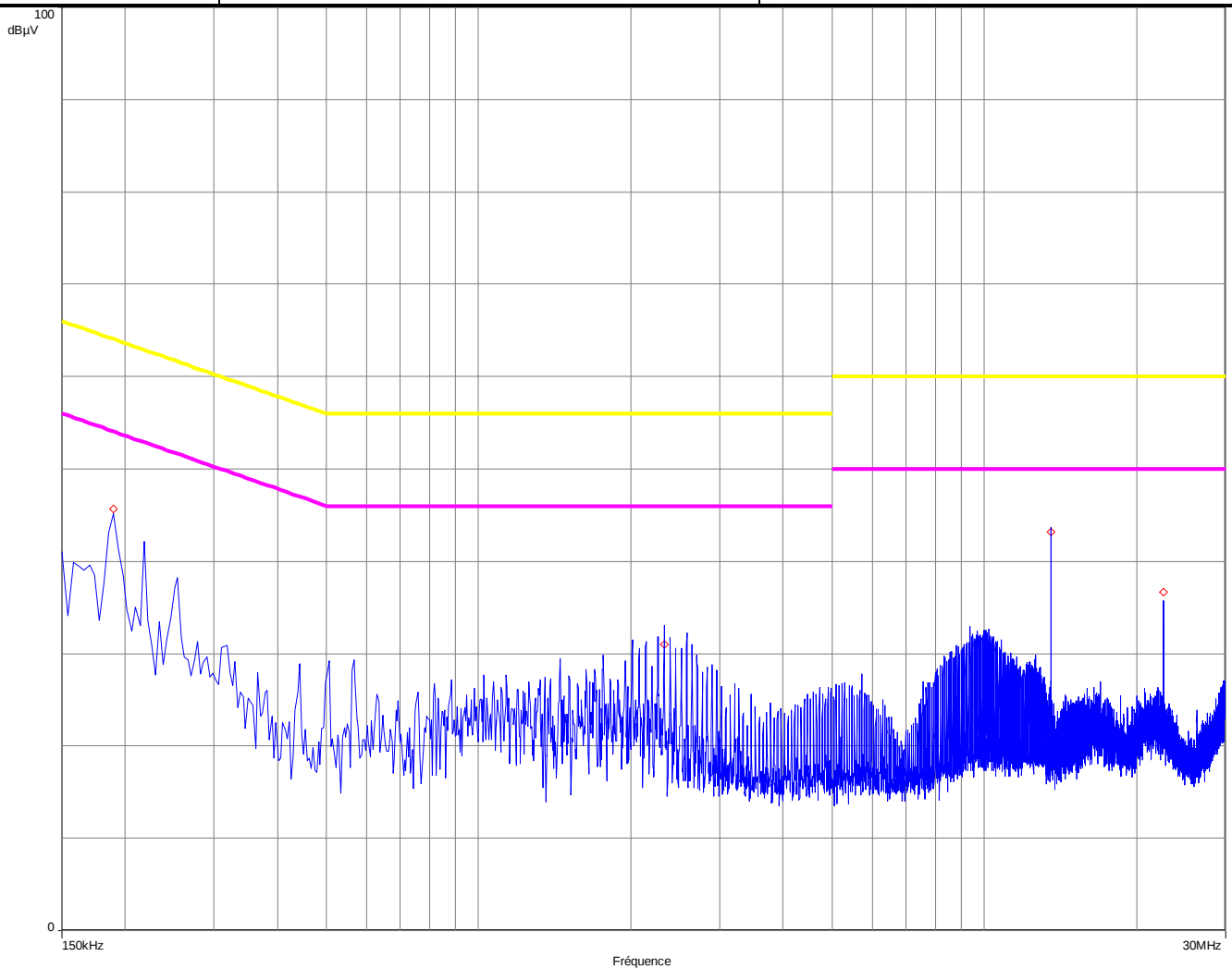


Frequency (MHz)	Measure Peak dBμV	Measure Average dBμV	Limit Average dBμV	Avg-Lim (Margin) dB	Measure Quasi-Peak dBμV	Limit QPeak dBμV	QPeak-Lim (Margin) dB
0.194	45.6	28.9	53.9	-24.9	40.9	63.9	-22.9
0.258	37.6	19.9	51.6	-31.7	30.2	61.6	-31.4
0.510	30.8	19.7	46.0	-26.3	26.5	56.0	-29.5
1.646	29.9	18.3	46.0	-27.7	22.2	56.0	-33.8
1.902	29.8	20.3	46.0	-25.7	24.6	56.0	-31.4
13.562 *	105.0	104.0	50.0	54.0	104.0	60.0	44.0
22.602	35.0	25.8	50.0	-24.2	29.7	60.0	-30.3

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



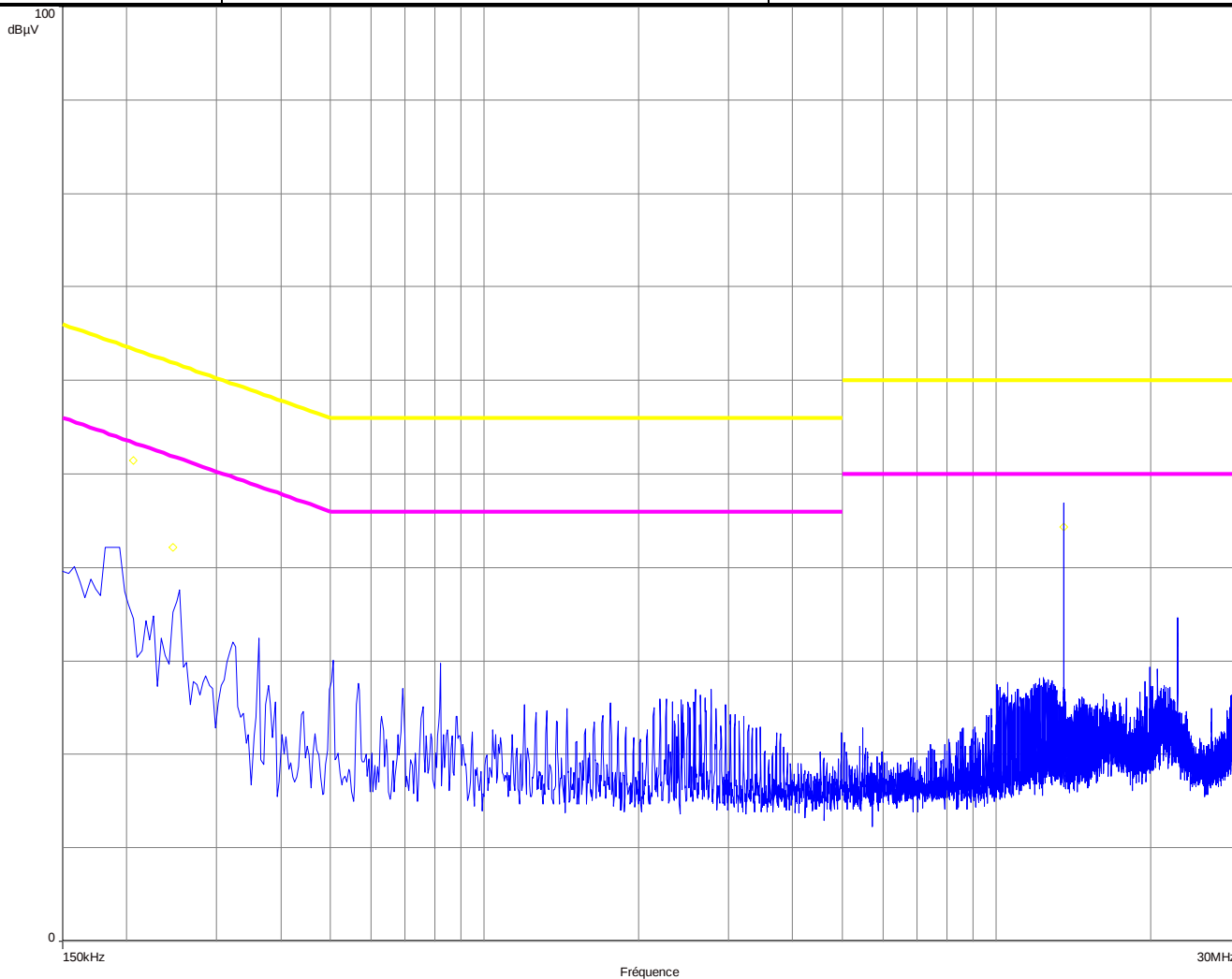
CONDUCTED EMISSIONS		Test configuration:
Graph name:	Emc#7	Dummy load replacing antenna
Voltage / Frequency	110V/620Hz	
Line/Port	Phase (L1)	
RBW / VBW :	9kHz / 30kHz	



Frequency (MHz)	Measure Peak dBμV	Measure Average dBμV	Limit Average dBμV	Avg-Lim (Margin) dB	Measure Quasi-Peak dBμV	Limit QPeak dBμV	QPeak-Lim (Margin) dB
0.190	45.6	31.9	54.0	-22.1	43.4	64.0	-20.6
2.330	31.0	18.7	46.0	-27.3	25.9	56.0	-30.1
13.562	43.2	42.3	50.0	-7.7	42.3	60.0	-17.7
22.590	36.6	26.7	50.0	-23.3	30.2	60.0	-29.8



CONDUCTED EMISSIONS		Test configuration:
Graph name:	Emc#8	Dummy load replacing antenna
Voltage / Frequency	110V/620Hz	
Line/Port	Neutral (N)	
RBW / VBW :	9kHz / 30kHz	



Frequency (MHz)	Measure Peak dBμV	Measure Average dBμV	Limit Average dBμV	Avg-Lim (Margin) dB	Measure Quasi-Peak dBμV	Limit QPeak dBμV	QPeak-Lim (Margin) dB
0.206	51.4	15.7	53.9	-38.1	37.4	63.9	-26.4
0.246	42.1	21.6	51.6	-30.0	33.2	61.6	-28.4
13.562	44.3	43.4	50.0	-6.6	43.4	60.0	-16.6



8. TEST EQUIPMENT LIST

	N°LCIE	TYPE	COMPANY	REF	SN
RADIATED EMISSION MEASUREMENT					
	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
X	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)			
X	A5329058VO	Cable OATS (Mast at 3m)			
CONDUCTED MEASUREMENT EMISSION					
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)			
MISCELLANEOUS (CONTROL EQUIPMENT)					
	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
	A1240170VO	Multimeter	Fluke	87	75250745
X	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 laboratoire / Wide uncertainty laboratory (k=2) $\pm x$	Incertitude limite du CISPR / CISPR uncertainty limit $\pm y$
Mesure des perturbations conduites en tension sur le réseau d'énergie <i>Measurement of conducted disturbances in voltage on the power port</i>	3.57 dB	3.6 dB
Mesure des perturbations conduites en tension sur le réseau de télécommunication <i>Measurement of conducted disturbances in voltage on the telecommunication port.</i>	3.28 dB	A l'étude / Under consid.
Mesure des perturbations discontinues conduites en tension <i>Measurement of discontinuous conducted disturbances in voltage</i>	3.47 dB	3.6 dB
Mesure des perturbations conduites en courant <i>Measurement of conducted disturbances in current</i>	2.90 dB	A l'étude / Under consid.
Mesure du champ électrique rayonné sur le site en espace libre de Voiron <i>Measurement of radiated electric field on the Voiron open area test site</i>	5.07 dB	5.2 dB