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TEST REPORT

N°98535-595734-B

**FCC REGISTRATION NUMBER: 166175
INDUSTRY CANADA NUMBER: 6230B**

ISSUED TO : **INGENICO**
190-192 Avenue Charles de Gaulle
92220 NEUILLY SUR SEINE

SUBJECT : **ELECTROMAGNETIC COMPATIBILITY TESTS ACCORDING TO THE
STANDARD 47 CFR PART 15, SUBPART C, 15.225 and RSS-GEN, RSS-102,
RSS-210**

Apparatus under test :
Product : ISC 350
Trade mark : INGENICO
Manufacturer : INGENICO
Model : ISC 350 01T1119A *
Reference : -
Serial number :

INGENICO

Applicant
FCC ID : **XKBISC350CL**
IC : **2586D-ISC350CL**

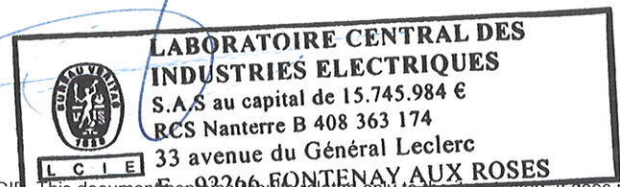
Test date : March and April 2010

Composition of document : 27 pages
* Information given by the customer

Fontenay-Aux-Roses, July 20th, 2010

Written by
Gilles DE BUYSER

The technical manager,
Philippe SISSOKO



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1 – GENERAL

1.1 – Summary of test results

Radiated emissions are made in anechoic chamber, located at Fontenay-Aux-Roses (92260, FRANCE).
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INDUSTRY CANADA NUMBER: 6230B

A description of the test facility is on file with the FCC.

47 CFR Part 15 & RSS 210			
Paragraph No.	Name of test	Remarks	Result
§ 15.203	Antenna requirement	Internal antenna	Pass
§ 15.205	Restricted band operation		Pass
§ 15.207 (a) & RSS GEN §7.2.2	Power line conducted limits		Pass
§ 15.209 (a) (b) (c) (d) & table 3 RSS 210	Radiated measurement of spurious emissions		Pass
§15.225 (a) (b) (c) & RSS 210	Field strength within the band 13.110-14.010 MHz		Pass
§15.225 (d) & A2.6 of RSS 210	Field strength outside of the bands 13.110-14.010 MHz		Pass
§15.225 (e) & A.2 of RSS 210	Frequency stability over extreme temperature and voltage conditions		Pass

NA : Not Applicable

Remark:

1.2 – References

Measurements were performed in accordance with the following standards:

47 CFR Part 15 of October, 2009: Code of federal regulations – Telecommunication –Radiofrequency devices

RSS-Gen of June 2007: General Requirements and Information for the Certification of Radiocommunication Equipment

RSS-102 of Mars 2010: Radio Frequency Exposure Compliance of Radiocommunication Apparatus

RSS-210 of June 2007: Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment

ANSI C63.4 of December 11, 2003: American national standard for methods of measurement of radio noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.

CISPR 16-4-2 of November, 2003: International electrotechnical commission - Specification for radio disturbance and immunity measuring apparatus and methods – Uncertainties, statistics and limit modeling – Uncertainty in EMC measurements.



1.3 – test methodology

Radio performance tests procedures given in part 15:

Paragraph 33: frequency range of radiated measurements

Paragraph 35: measurement detector functions and bandwidths

Paragraph 203: antenna requirement

Paragraph 205: restricted bands of operation

Paragraph 207: conducted limits

Paragraph 209: radiated emission limits; general requirements

Paragraph 225: radiated emission limits; general requirements



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1.3 - Equipment under test specification

1.3.1 – General equipment information

Applicant	:	INGENICO 1, rue claude Chappe BP 346 07503 Guilherrand Granges – France
Manufacturer	:	INGENICO 190-192 Avenue Charles de Gaulle 92220 NEUILLY SUR SEINE – France
Dimensions	:	
Frequency band	:	13.56 MHz
Number of channel	:	1
Channel spacing	:	-
User frequency adjustment	:	No
User power adjustment	:	No
Type of antenna	:	Dedicated loop antenna permanently connected on the PCB
Is the operation point to point?	:	No
Power supply	:	120V 60Hz
	:	
		Port 1 : DC Power supply input, USB 2.0 device full speed, Rs485 Tailgate, Rs232 (Tx,Rx) : MiniDIN 9cts
		Port 2 : USB 2.0 Host high speed : Type A USB connector on the rear side
		Port 3 : Port Ethernet 10/100 BaseT : RJ45 modular jack 10/100 BaseT 8pi with Network presence and activity Leds
External links		Port 4 : USB 2.0 Host high speed. 5V 500mA max : Type A USB connector on the left side
		Port 5 (Option) : External VGA (analog output + synchro) for an external display monitor Rs232 (Tx,Rx, Rts, Cts) 5V supply output : 16 pins AVX 9257 serie.

1.3.2 – Description of modifications

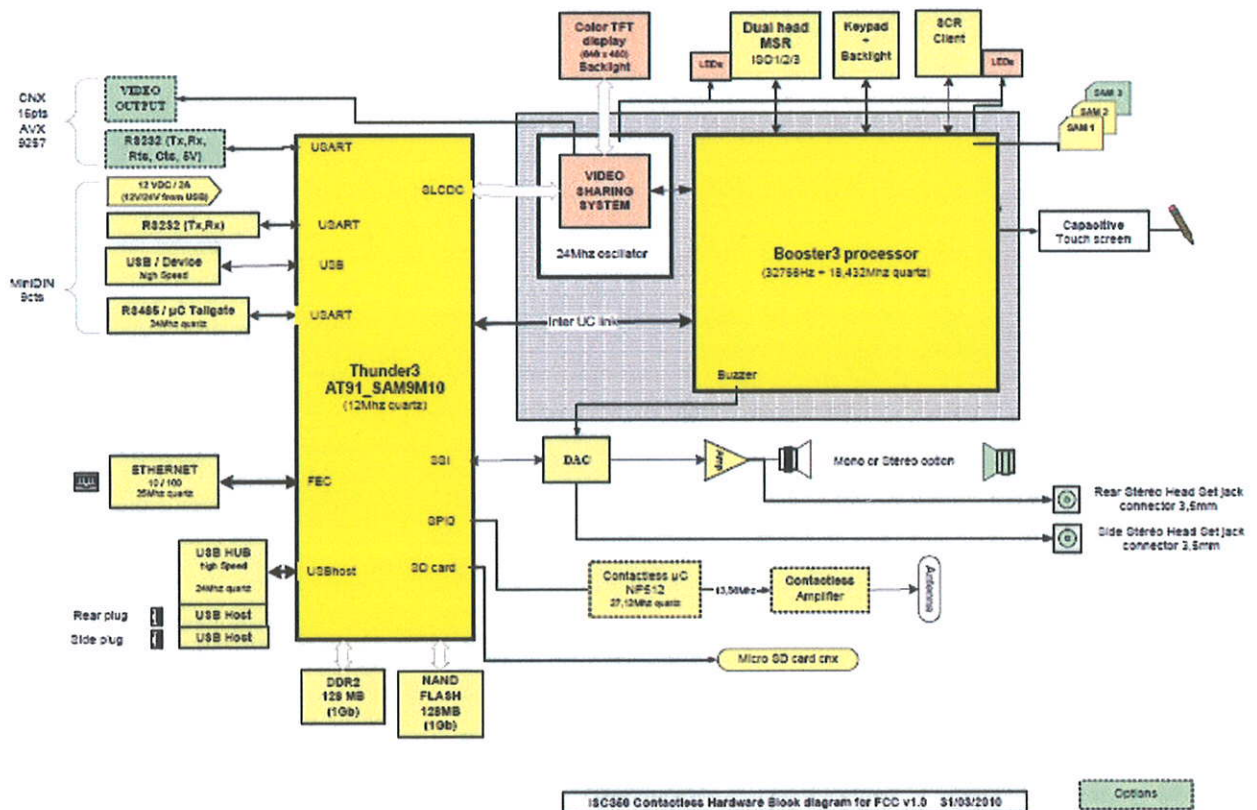
The equipment has not been modified during tests.

1.3.3 – Description of operation

The equipment was configured in the following operation mode:

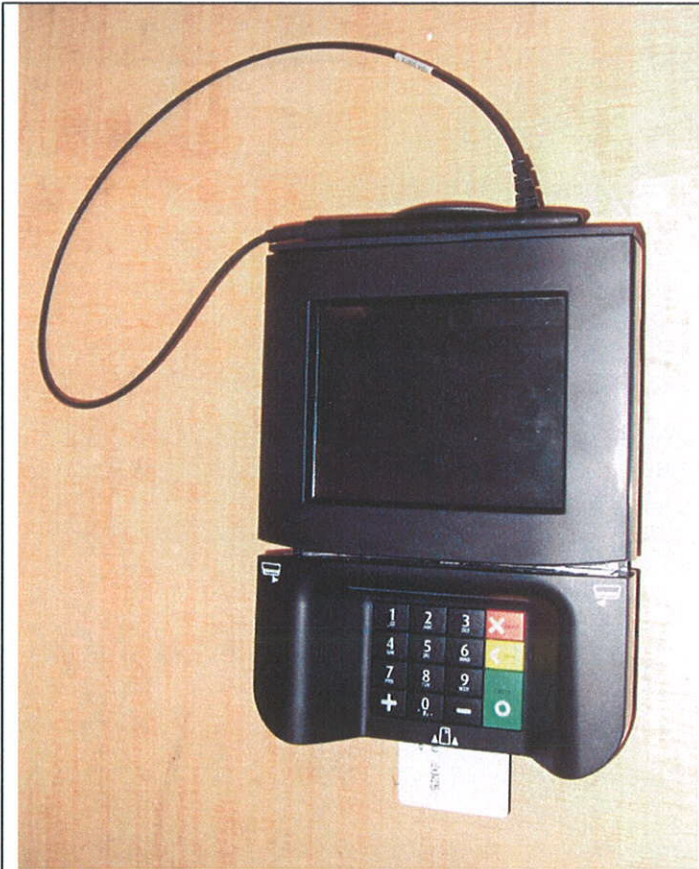
- Maximum transmission power: Permanently emission at 13.56 MHz with the usual modulation.

The equipment used the software program provided by INGENICO during the sequence test. iSC350 is based on Telium 2 Architecture (proprietary OS)

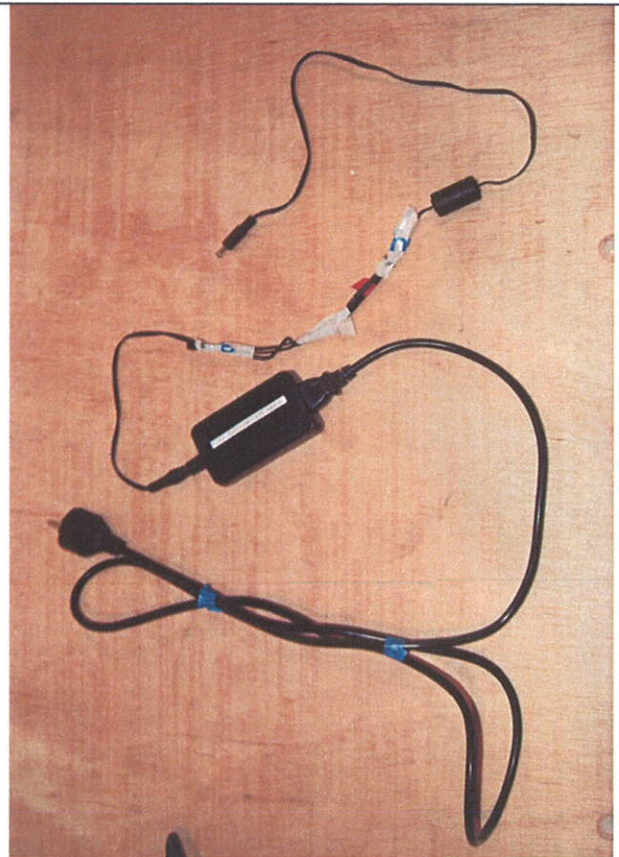


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1.3.4 – Photographs of the sample



General view of the ISC350



Power supply of the ISC350



Power supply marking plate

1.3.5 – Auxiliary equipments

None

2- TEST RESULTS

2.1 Power line conducted emission test

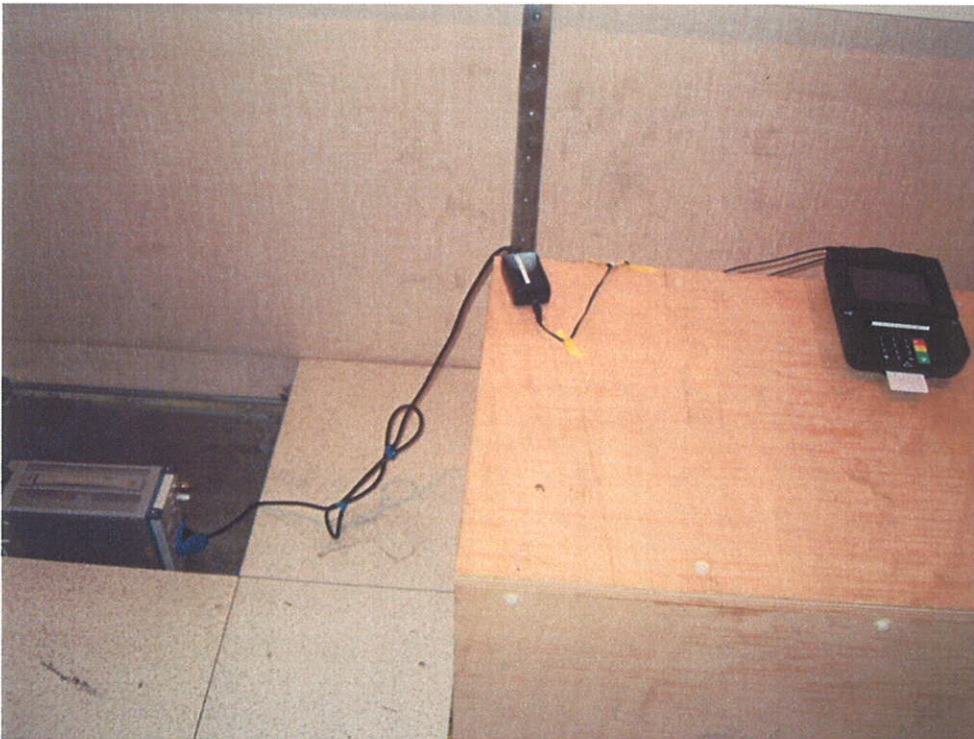
2.1.1 - General

The product has been tested with 120 V / 60 Hz power line voltage and compared to the FCC part 15 subpart C § 15.207 limits.

The 6 dB resolution bandwidth was 9 kHz from 150 kHz to 30 MHz.

2.1.2 - Test setup

The EUT is placed on a table at 0.8 m height. The cable of the power port has been shorted to 1 meter length. The EUT is powered through the LISN.





2.1.3 – Equipment list

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyseur	ROHDE & SHWARZ	ESI40	A2642010	08/2009	08/2010
Pulse limiter	ROHDE & SHWARZ	ESH3-Z2	A2649005	04/2010	04/2010
V ISLN	ROHDE & SHWARZ	ENV216	C2320163	08/2009	08/2010

2.1.4 – Uncertainty

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR 16-4-2. The conformity of the sample is directly established by the applicable limits values.

Kind of measurement	Wide uncertainty laboratory (k=2) ± x	CISPR uncertainty limit ± y
Measurement of conducted disturbances in voltage on the power port	3.57 dB	3.6 dB

2.1.5 – Test results

Conducted measurement on conductor 1

Frequency (MHz)	Peak measurements (dBµV)	Quasi-Peak measurements (dBµV)	Quasi-Peak limits (dBµV)	Average measurement (dBµV)	Average limits (dBµV)
0.20	48.5	46.4	63.6	34.7	53.6
0.47	42.8	40.9	56.5	29.0	46.5
2.11	38.4	36.5	56	27.7	46
3.69	54.7	52.2	56	44.0	46
9.06	38.2	-	60	29.0	50
27.12	41.5	41.4	60	41.1	50

Conducted measurement on conductor 2

Frequency (MHz)	Peak measurements (dBµV)	Quasi-Peak measurements (dBµV)	Quasi-Peak limits (dBµV)	Average measurement (dBµV)	Average limits (dBµV)
0.20	52.5	50.9	63.6	37.3	53.6
0.47	45.2	44.0	56.5	32.0	46.5
3.16	47.9	46.5	56	36.1	46
3.69	53.8	52.3	56	44.1	46
16.59	34.6	-	60	24.2	50
27.12	41.0	40.8	60	40.7	50

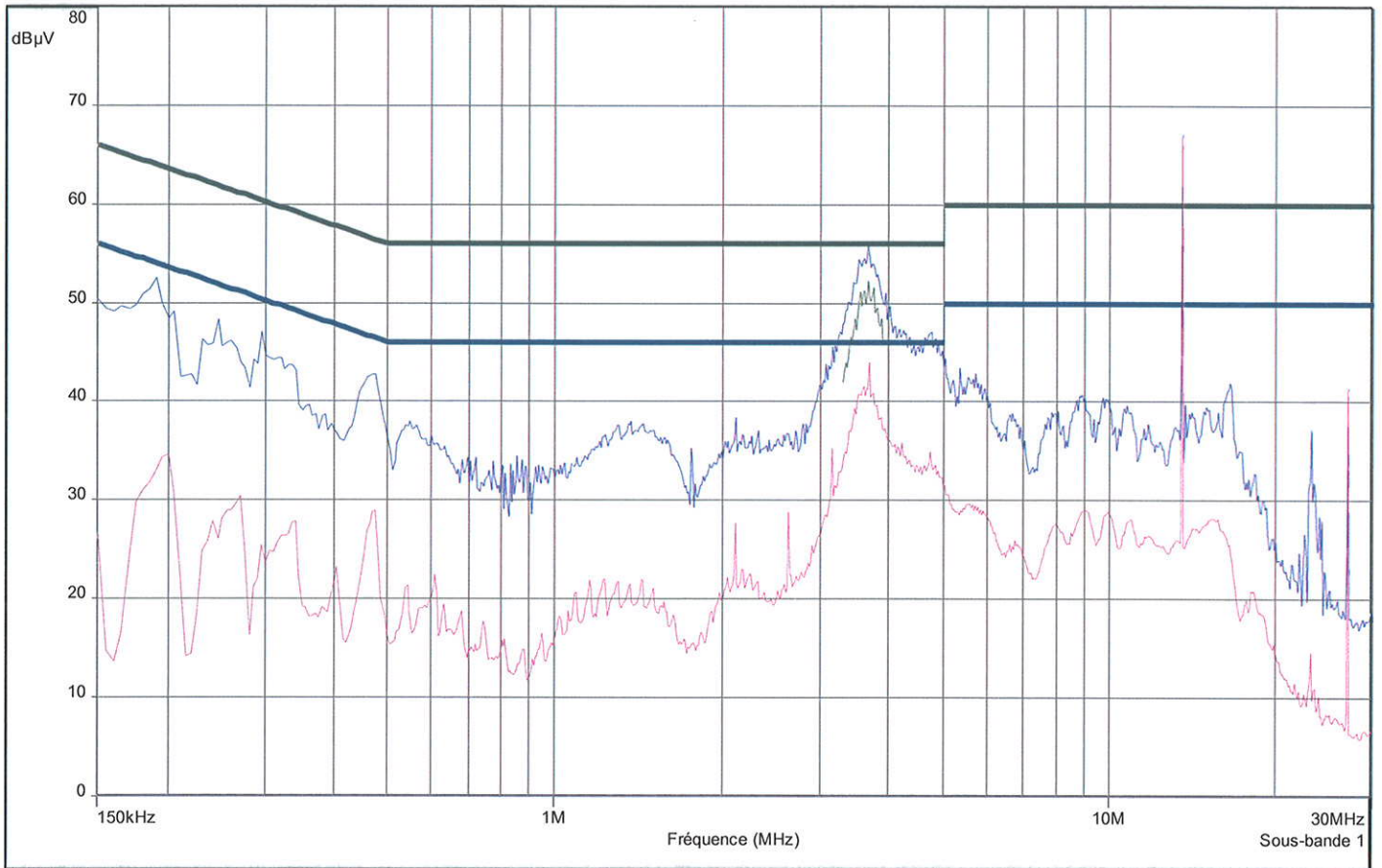
Remark:

The carrier of the transmitter is at 13.56 MHz, measurements with the antenna removed are given in annex to show the compliance at this frequency. The antenna was replaced by a dummy load.

Measurement diagram for conductor 1

Fréquence (MHz) : 150 kHz - 30 MHz (Pas: 5 kHz)
 Réglage: RBW: 9 kHz, VBW: Auto, Temps de mesure : 50 ms/Pts, nombre de Balayages 1
 Ligne : Phase1

— FCC 15.109 - Classe:B - Moyenne/
 — FCC 15.109 - Classe:B - QCrête/
 — Mes.Peak (Phase1)
 — Mes.QPeak (Phase1)
 — Mes.Avg (Phase1)

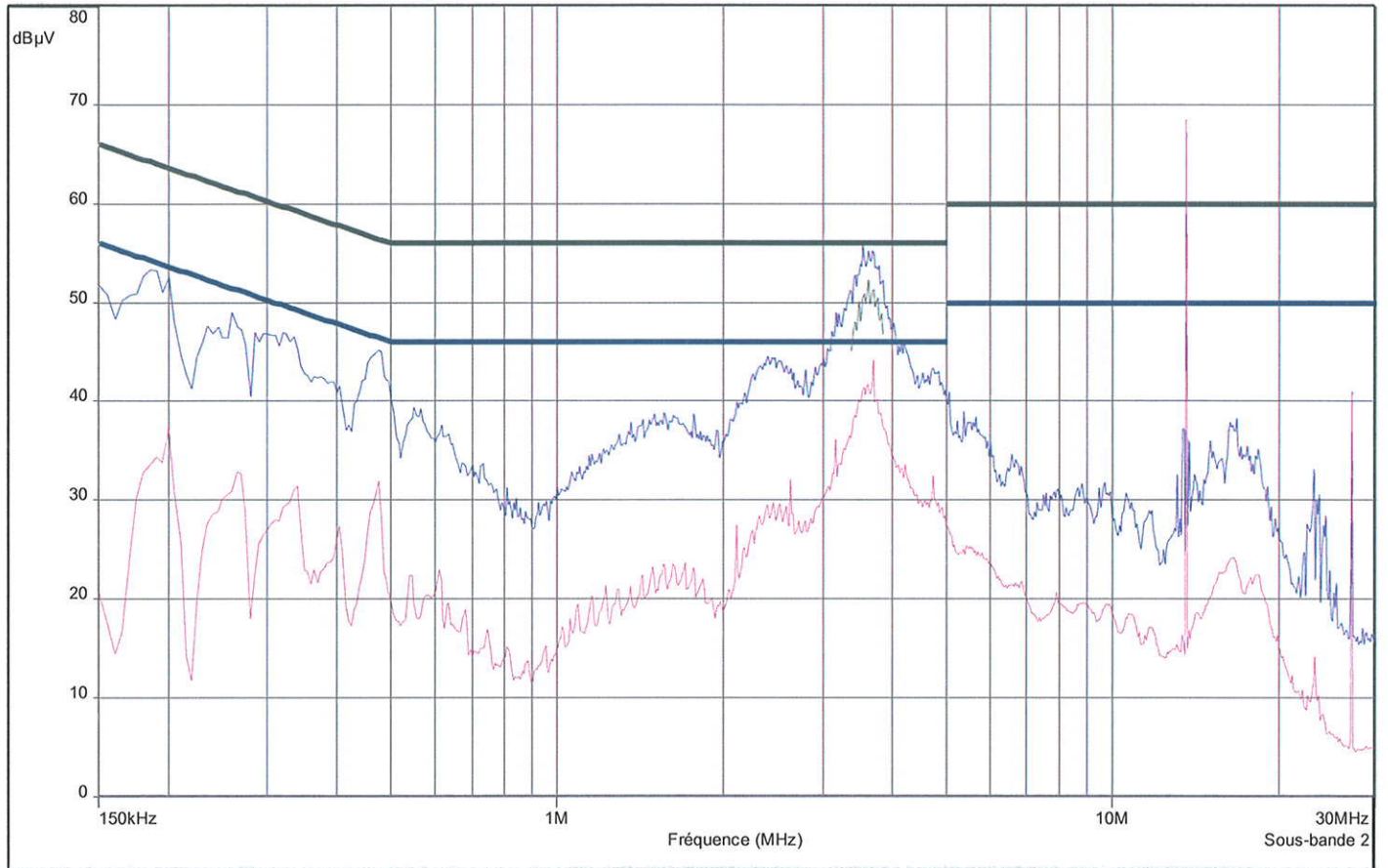


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Measurement diagram for conductor 2

Fréquence (MHz) : 150 kHz - 30 MHz (Pas: 5 kHz)
Réglage: RBW: 9 kHz, VBW: Auto, Temps de mesure : 50 ms/Pts, nombre de Balayages 1
Ligne : Neutre

— FCC 15.109 - Classe:B - Moyenne/
— FCC 15.109 - Classe:B - QCrête/
— Mes.Peak (Neutre)
— Mes.QPeak (Neutre)
— Mes.Avg (Neutre)



2.2 – Field strength within the band 13.110-14.010MHz

2.2.1 – General

The product has been tested with 120 V / 60 Hz power line voltage on charger and compared to the FCC part 15 subpart C §15.225 (a) (b) and (c) limits.

The 6dB resolution bandwidth was :

- 9 KHz from 150 kHz to 30 MHz

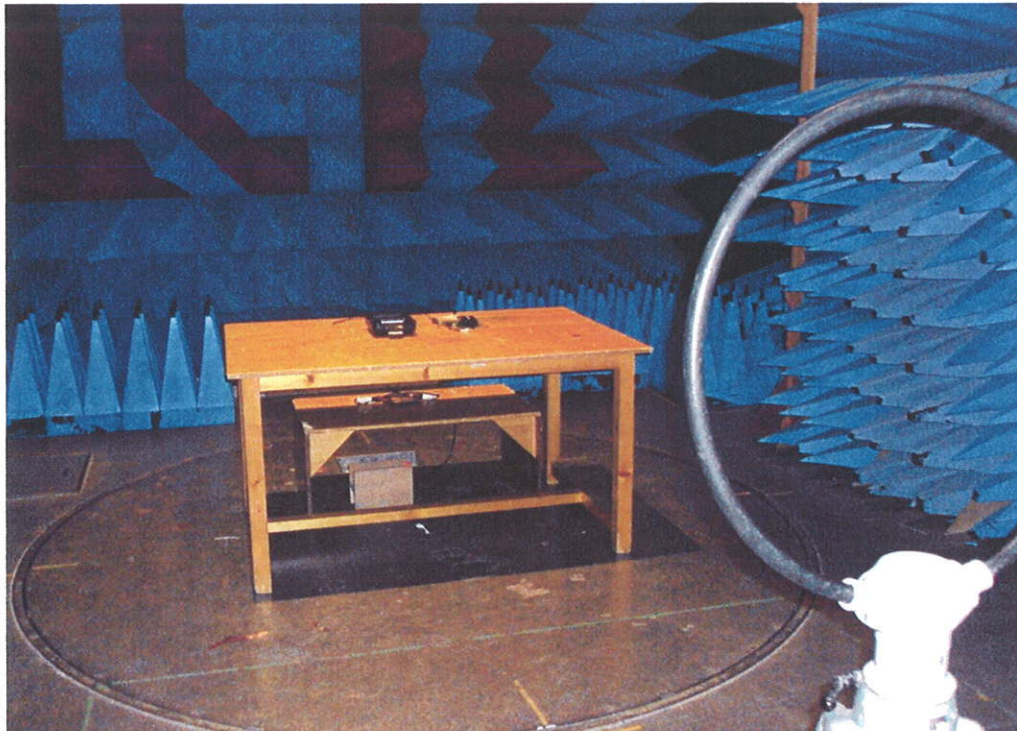
2.2.2 – Test setup

The EUT is placed at 3m distance of the loop antenna on a table 80cm height. The level has been maximised by turning the EUT with the rotating table and with the antenna at 0° and 90° around its vertical and horizontal axes. Antenna height was 1m. Pre scans were performed on the EUT put on its three axes to determine the position with maximum radiation.

The measuring value has been extrapolated to a 30m distance measured level according to § 15.31 (f) (2) by the following formula:

$$E_{30m} = E_d \times \left(\frac{d}{30}\right)^2$$

E_{30m} is the field strength at 30m in $\mu\text{V/m}$
 E_d is the field strength at the measured distance in $\mu\text{V/m}$
 d is the used distance between antenna and EUT in m



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Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyseur	ROHDE & SHWARZ	ESI40	A2642010	08/2009	08/2010
Loop antenna	ROHDE & SHWARZ	HFH H2 Z2	C2040007	03/2010	03/2011

2.2.4 – Uncertainty

Kind of measurement	Wide uncertainty laboratory (k=2) $\pm x$	CISPR uncertainty limit $\pm y$
E field measurement	4.75 dB	Not defined

2.2.5 – Test results

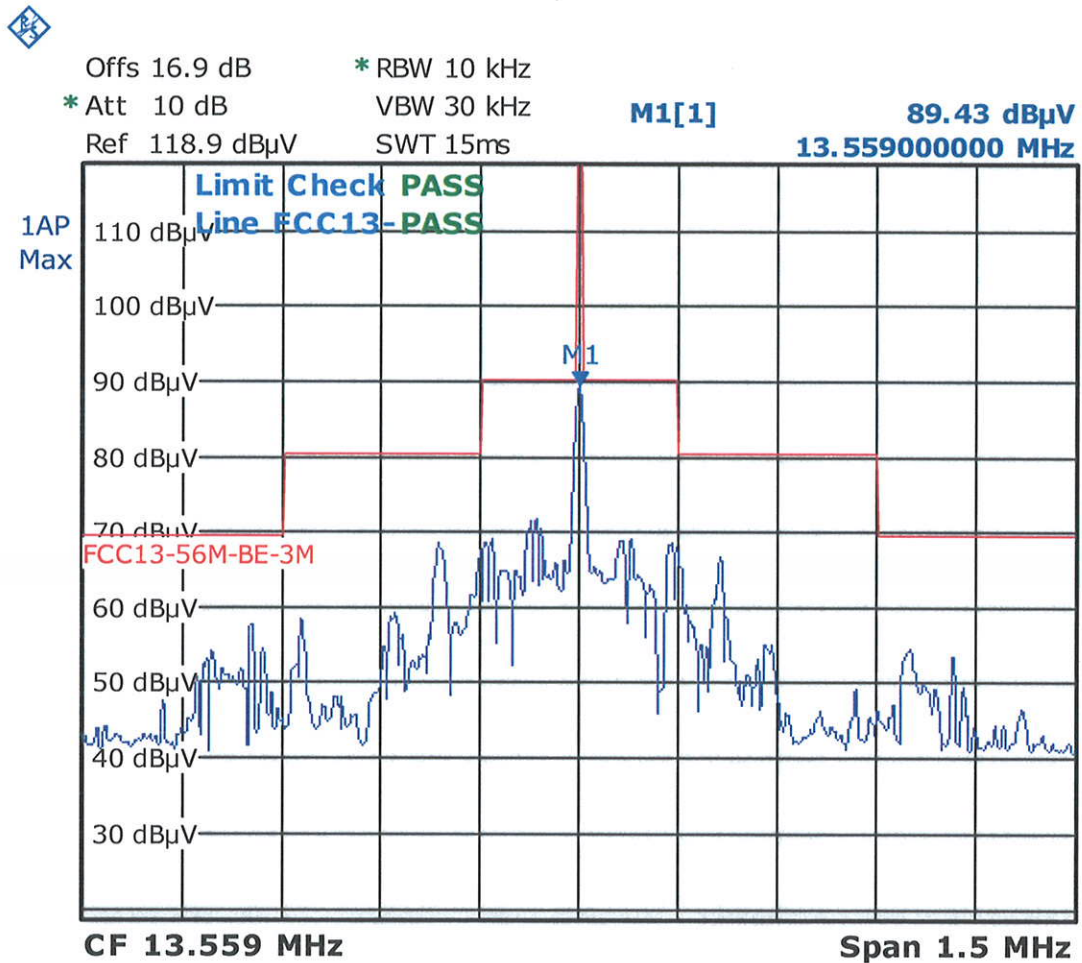
The measure result at 3 m is 89.3 dB μ V/m for 13.56 MHz
The 30 m measure corrected is M@3m - 40dB

Frequency MHz	Maximum Quasi Peak (30m) dB μ V/m	Quasi Peak Limit (30m) dB μ V/m
13.56	49.3	84.0

2.2.6 – Band-edge compliance

Frequency (MHz)	Field strength (µV/m)	Measurement distance (m)
13.553-13.567	15848 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
Outside 13.110-14.010	30 29.5 dBµV/m	30

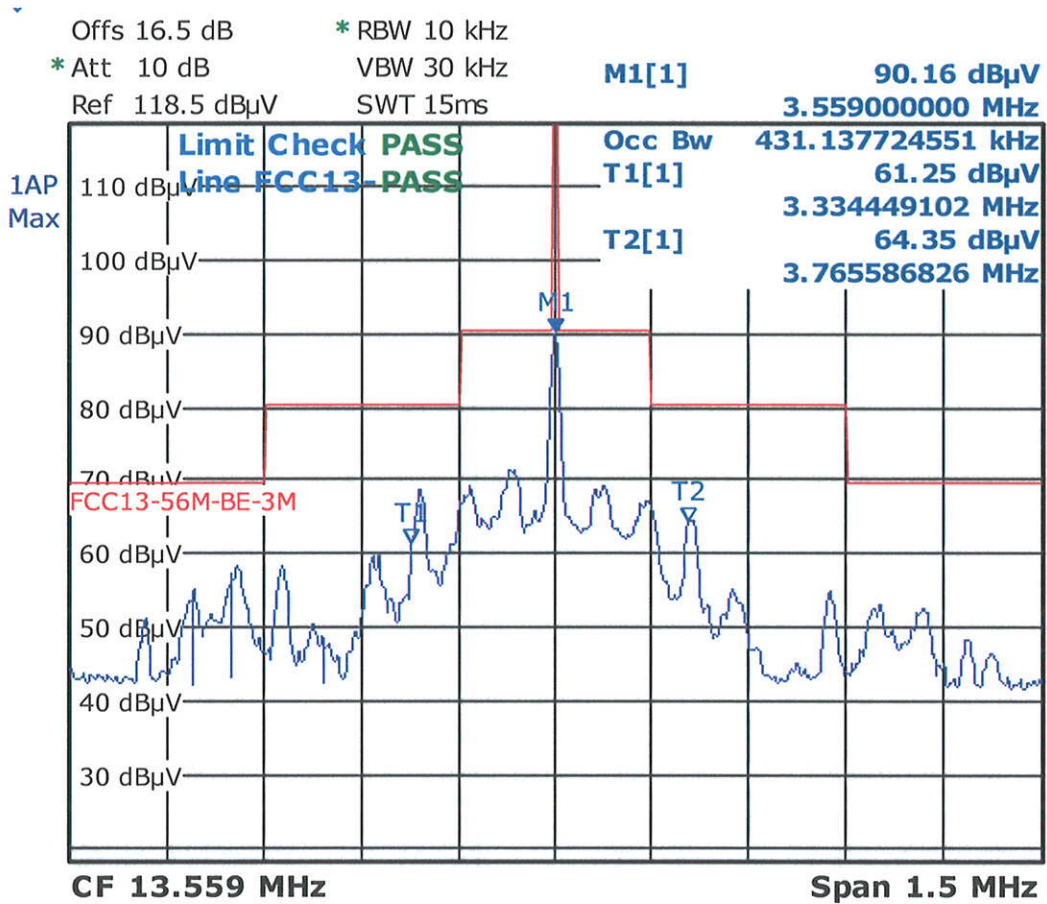
Graph from 12.5 to 14.5 MHz with RBW=10kHz and VBW=30kHz (measurement @ 3m)





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The 99% occupied bandwidth is 431 kHz.



2.3 – Field strength outside the 13.110-14010MHz band

2.3.1 – General

The product has been tested with 120 V / 60 Hz power line voltage on charger and compared to the FCC part 15 subpart C § 15.209 limits.

The 6dB resolution bandwidth was:

- 200 Hz from 9 kHz to 150 kHz.
- 9 kHz from 150 kHz to 30 MHz.
- 120 kHz from 30 MHz to 1000 MHz.
- 1 MHz from 1 GHz to 18 GHz.

-Frequency range: 9 kHz to 30 MHz

Measuring Distance: **3 m**

Antenna:

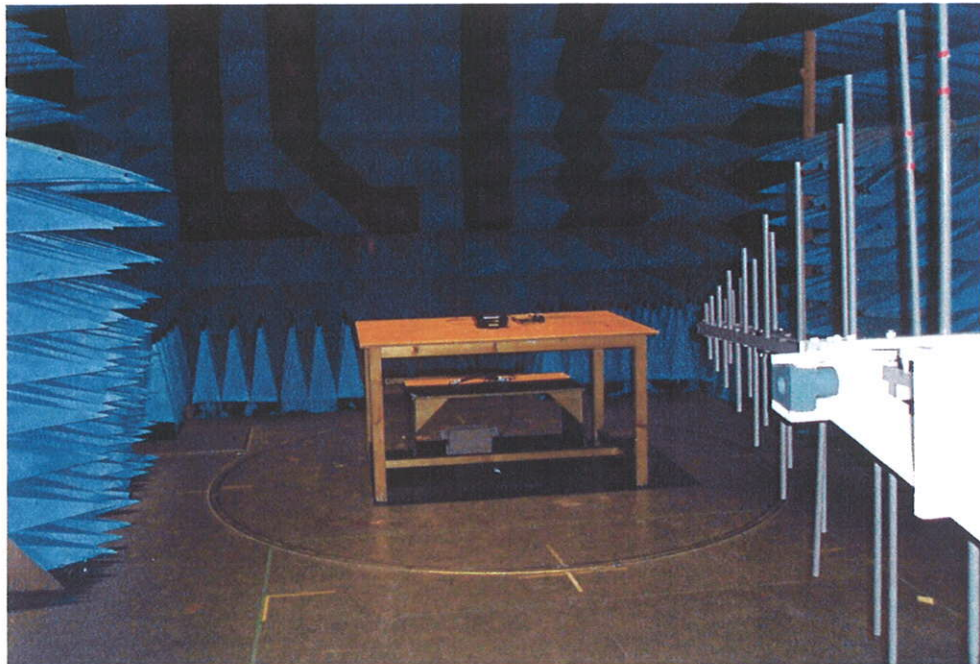
- Loop antenna (9 KHz to 30 MHz)

-Frequency range: 30 MHz to 18000 MHz

Measuring Distance: **3 m**

Antenna:

- Biconical (30 MHz to 200 MHz)
- Log-periodic (200 MHz to 1000 MHz)
- horn (1000 MHz to 18000 MHz)



The EUT is placed at 3m distance of the loop antenna (0.009 to 30MHz) on a table 80cm height. The level has been maximised by turning the EUT with the rotating table and with the antenna at 0° and 90° around its vertical and horizontal axes. Antenna height was 1m. Pre scans were performed on the EUT put on its three axes to determine the position with maximum radiation.

The EUT is placed at 3m distance of the Biconical (30 to 200MHz), Log-periodic (200 to 1000MHz) or horn (above 1GHz) antenna on a table 80cm height. The level has been maximised by turning the EUT with the rotating table and with the antenna in horizontal and vertical polarity. Antenna height search was performed from 1 to 4m.

2.3.2 – Equipment list

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyseur	ROHDE & SHWARZ	ESI40	A2642010	08/2009	08/2010
Biconical antenna	EATON	96002	C2040010	08/2008	06/2011
Logperiodic antenna	AMPLIFIER RESEARCH	AT1080	C2040032	03/2009	06/2010
Horn antenna	EMCO	3115	C2042018	09/2009	09/2011
Loop antenna	ROHDE & SHWARZ	HFH H2 Z2	C2040007	03/2010	03/2011

2.3.3 – Uncertainty

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR 16-4-2. The conformity of the sample is directly established by the applicable limits values.

Kind of measurement	Wide uncertainty laboratory (k=2) ± x	CISPR uncertainty limit ± y
E field measurement within the band 150kHz-30MHz	4.75 dB	Not defined
Measurement of radiated electric field from 30 to 200MHz in horizontal position on the Fontenay-aux-Roses site (with EATON 96002 antenna)	4.80 dB	5.2 dB
Measurement of radiated electric field from 30 to 200MHz in vertical position on the Fontenay-aux-Roses site (with EATON 96002 antenna)	5.03 dB	5.2 dB
Measurement of radiated electric field from 200 to 1000MHz on the Fontenay-aux-Roses site	5.07 dB	5.2 dB

2.3.4 – Test results on transmitter

3 m radiated measurement from 9 kHz to 30 MHz

Frequency (MHz)	Level @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
0.067	60.1	111.0
0.135	55.4	105.0
0.650	46.2	71.3
27.12	56.6	69.5

3 m radiated measurement graph from 30 to 1000 MHz

Frequency (MHz)	Quasi-peak measurements @ 3m (dBµV/m)	Limits @ 3m (dBµV/m)
54.2	30.2	40
133.3	35.7	43.5
163.9	27.0	43.5
186.7	33.7	43.5
213.3	33.4	43.5
218.2	32.7	46
400.0	37.9	46



3 m radiated measurement graph from 1 to 6 GHz

No spurious frequency observed in this range

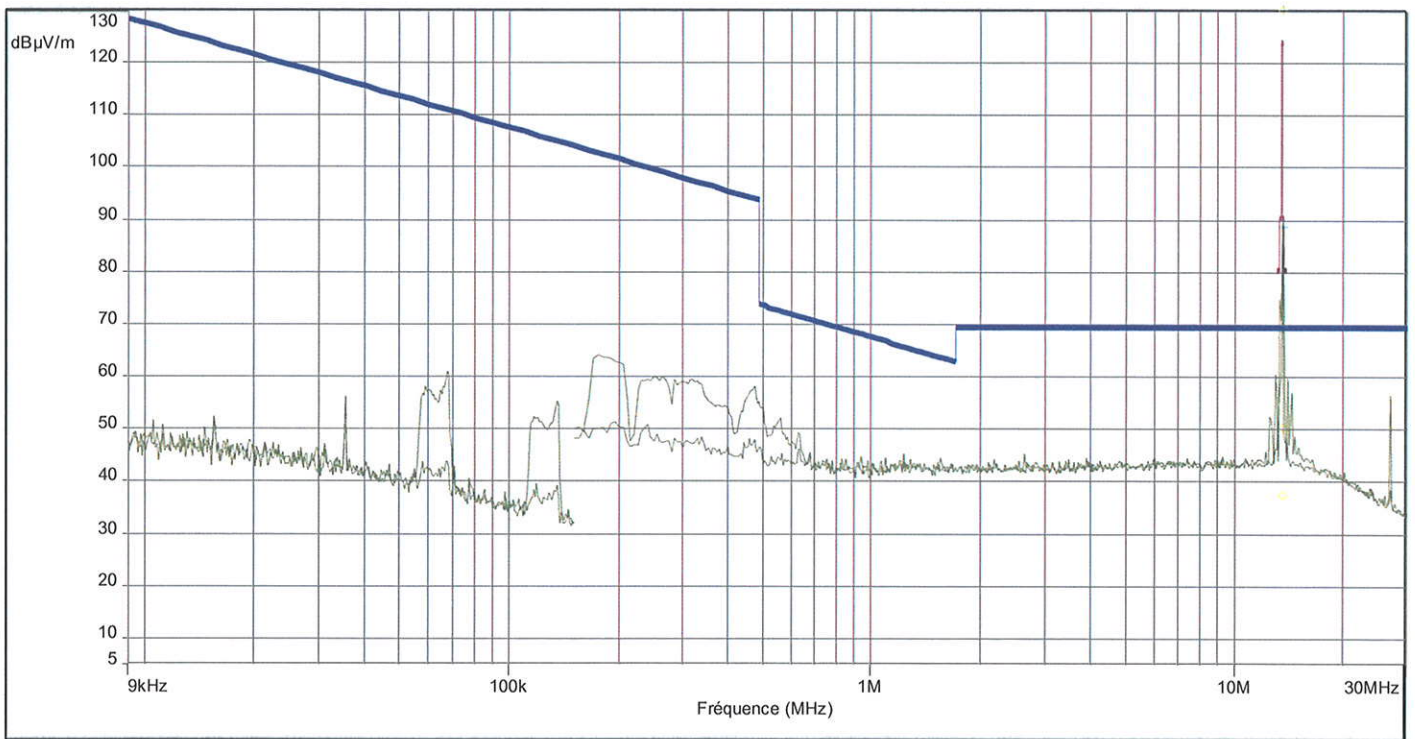
2.3.5 – Test results on receiver

The RFID receiver works at the same time as the transmitter. Spurious emissions for transmitter already represents the receive mode.

2.3.6 – Measurements diagrams

3 m radiated measurement from 9 kHz to 30 MHz

- FCC 15.209 Antenne boucle - Classe:1 - QCrête/3.0m/
- FCC 15.225 Emetteur 13.56MHz - Classe:1 - QCrête/3.0m/
- Mes.Peak (Horizontal)
- Mes.Peak (Vertical)
- Suspect Manuel (Horizontal)
- Mes. peak (Horizontal)
- Mes. Q-Peak (Horizontal)
- + Mes. manuelle (Horizontal)
- + Mes. peak (Horizontal)
- + Mes. Q-Peak (Horizontal)
- + Mes. manuelle (Horizontal)



FCC 15.209 Antenne boucle1

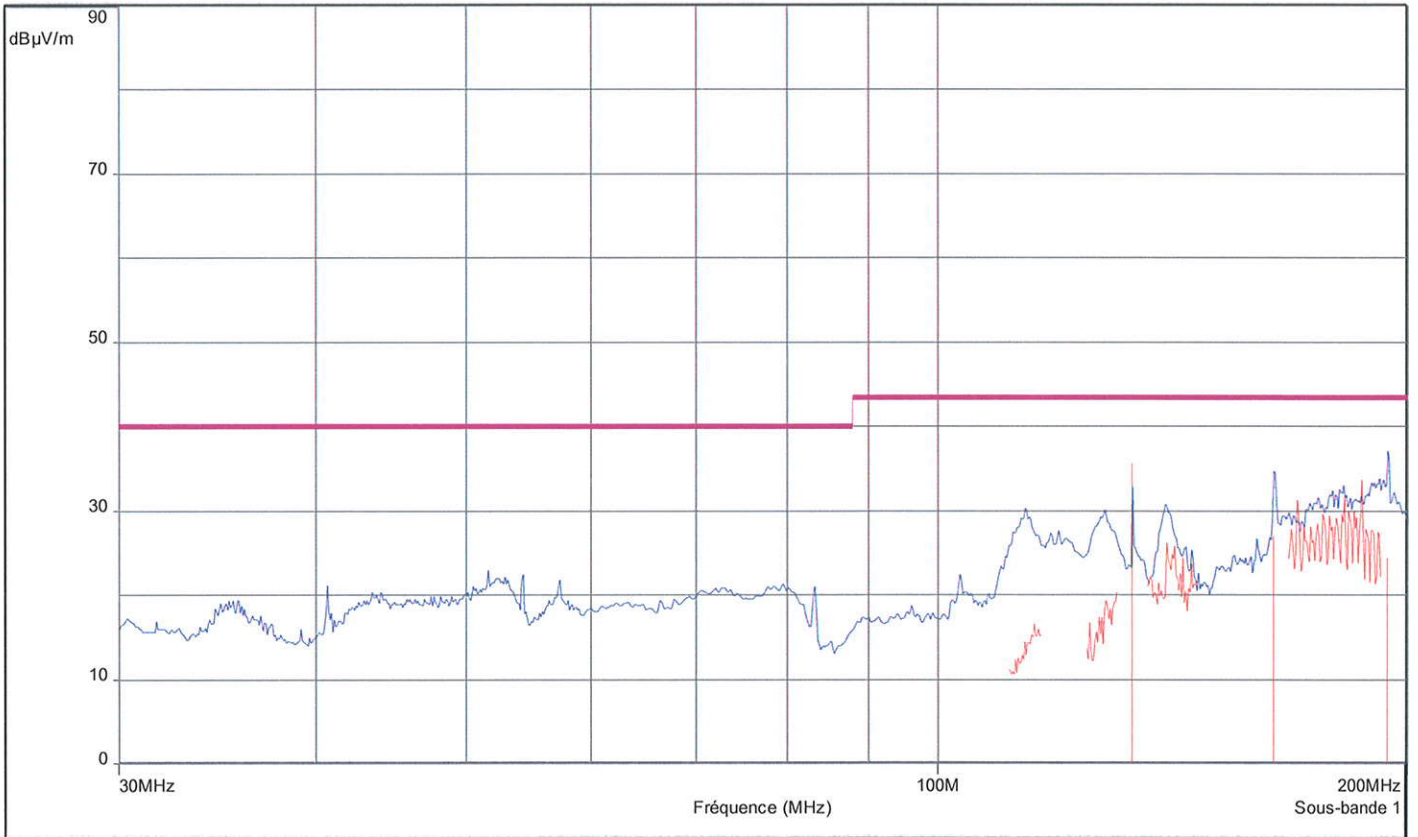
Loop antenna measurements

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3 m radiated measurement graph from 30 to 1000 MHz

Fréquence (MHz) : 30 MHz - 200 MHz (Pas: 50 kHz)
Réglage: RBW: 120 kHz, VBW: Auto, Temps de mesure : 50 ms/Pts, nombre de Balayages 1
Polarisation : Horizontal
Distance: 3 m

- FCC 15.209 >30M - Classe:1 - QCrête/3.0m/
- Mes.Peak (Horizontal)
- Mes.QPeak (Horizontal)
- Suspect Manuel (Horizontal)
- Mes. peak (Horizontal)
- Mes. Q-Peak (Horizontal)
- Mes. manuelle (Horizontal)



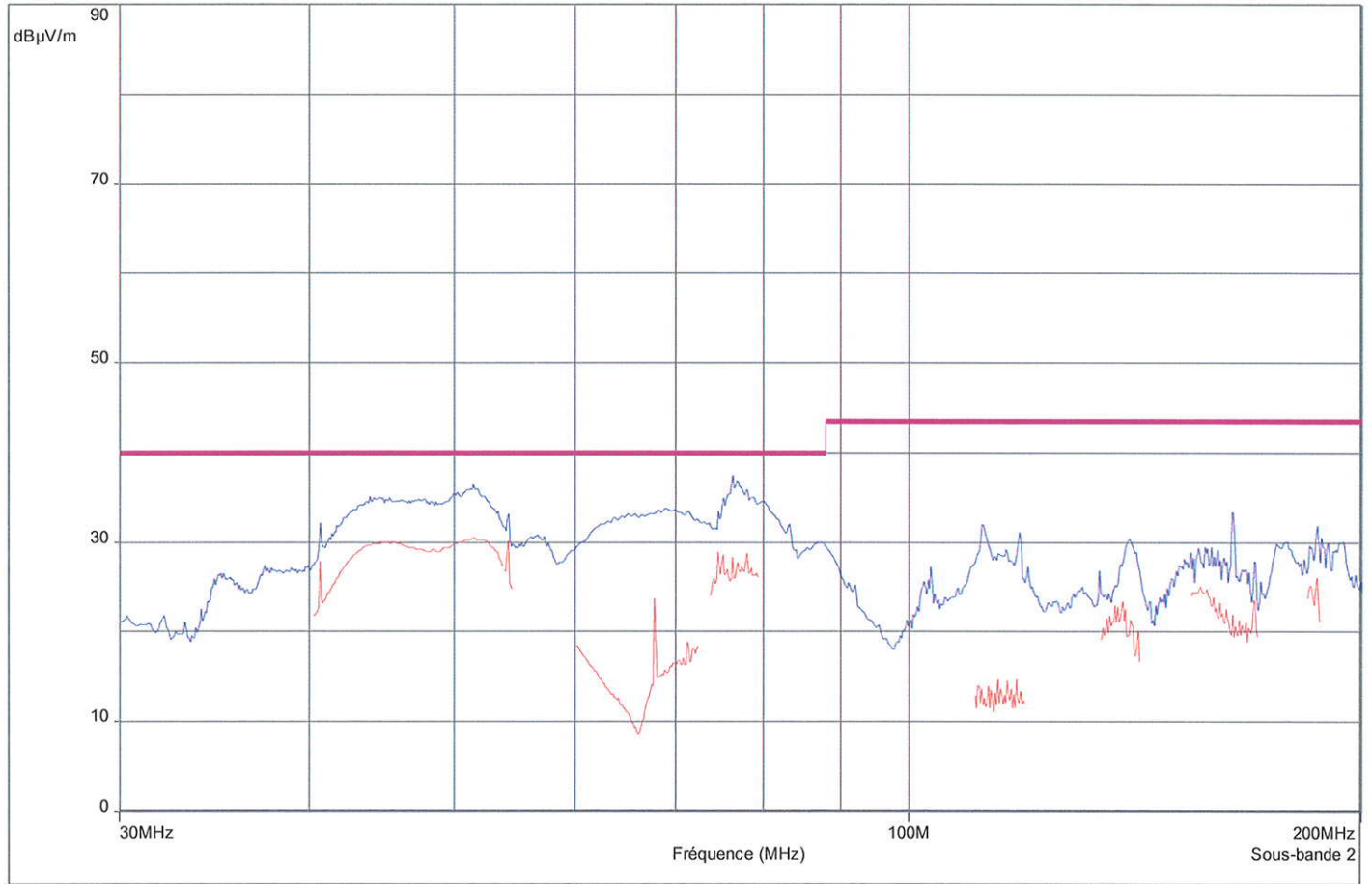
EN 55022 (1008) + A1(2000) + A2 (2003)B

Horizontal antenna from 30 to 200 MHz

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Fréquence (MHz) : 30 MHz - 200 MHz (Pas: 50 kHz)
 Réglage: RBW: 120 kHz, VBW: Auto, Temps de mesure : 50 ms/Pts, nombre de Balayages 1
 Polarisation : Vertical
 Distance: 3 m

— FCC 15.209 >30M - Classe:1 - QCrête/3.0m/
 — Mes.Peak (Vertical)
 — Mes.QPeak (Vertical)



EN 55022 (1998) + A1(2000) + A2 (2003)B

Vertical antenna from 30 to 200 MHz



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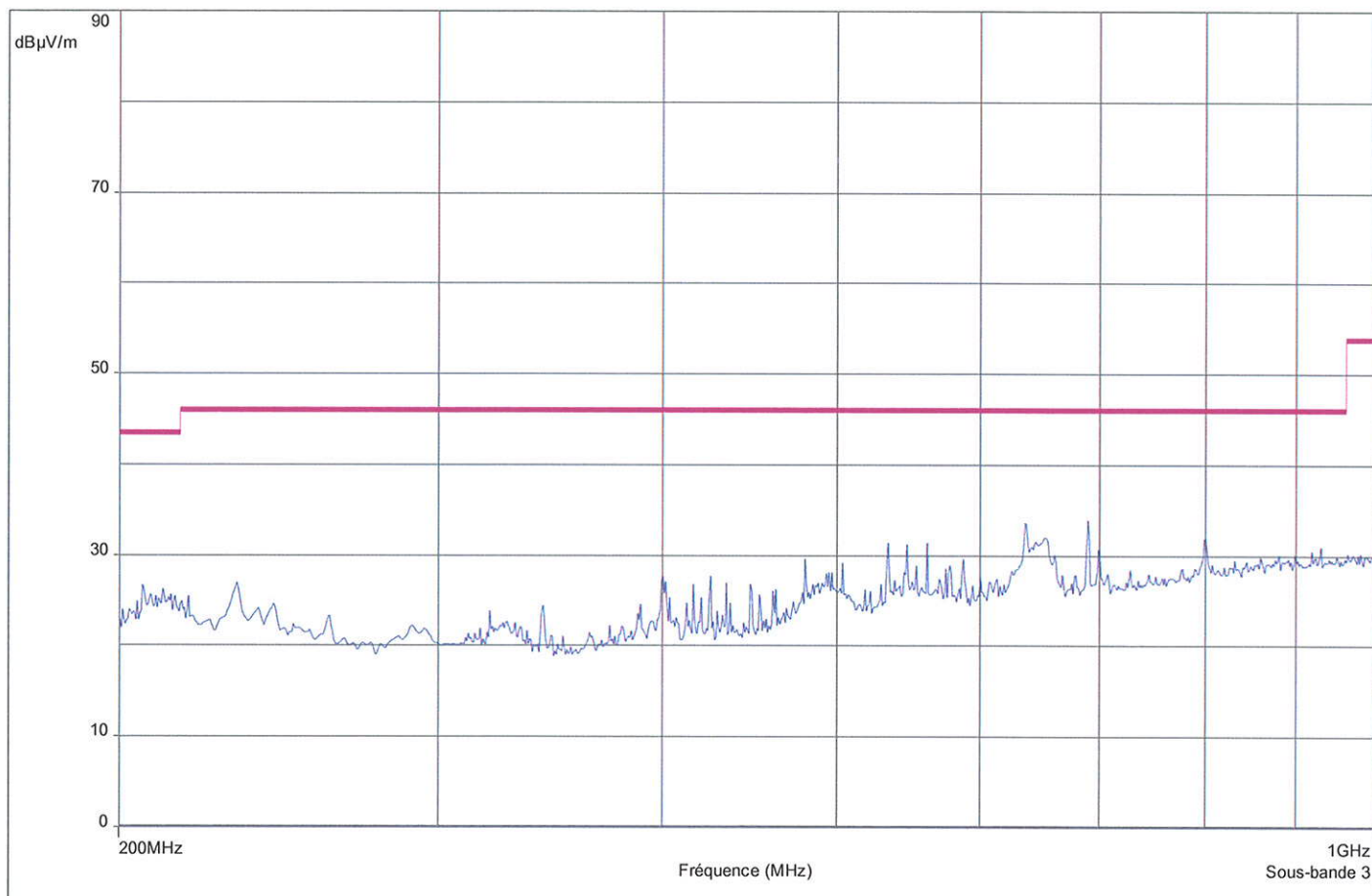
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Fréquence (MHz) : 200 MHz - 1 GHz (Pas: 60 kHz)
Réglage: RBW: 120 kHz, VBW: Auto, Temps de mesure : 50 ms/Pts, nombre de Balayages 1
Polarisation : Vertical
Distance: 3 m

— FCC 15.209 >30M - Classe:1 - QCrête/3.0m/
— Mes.Peak (Vertical)



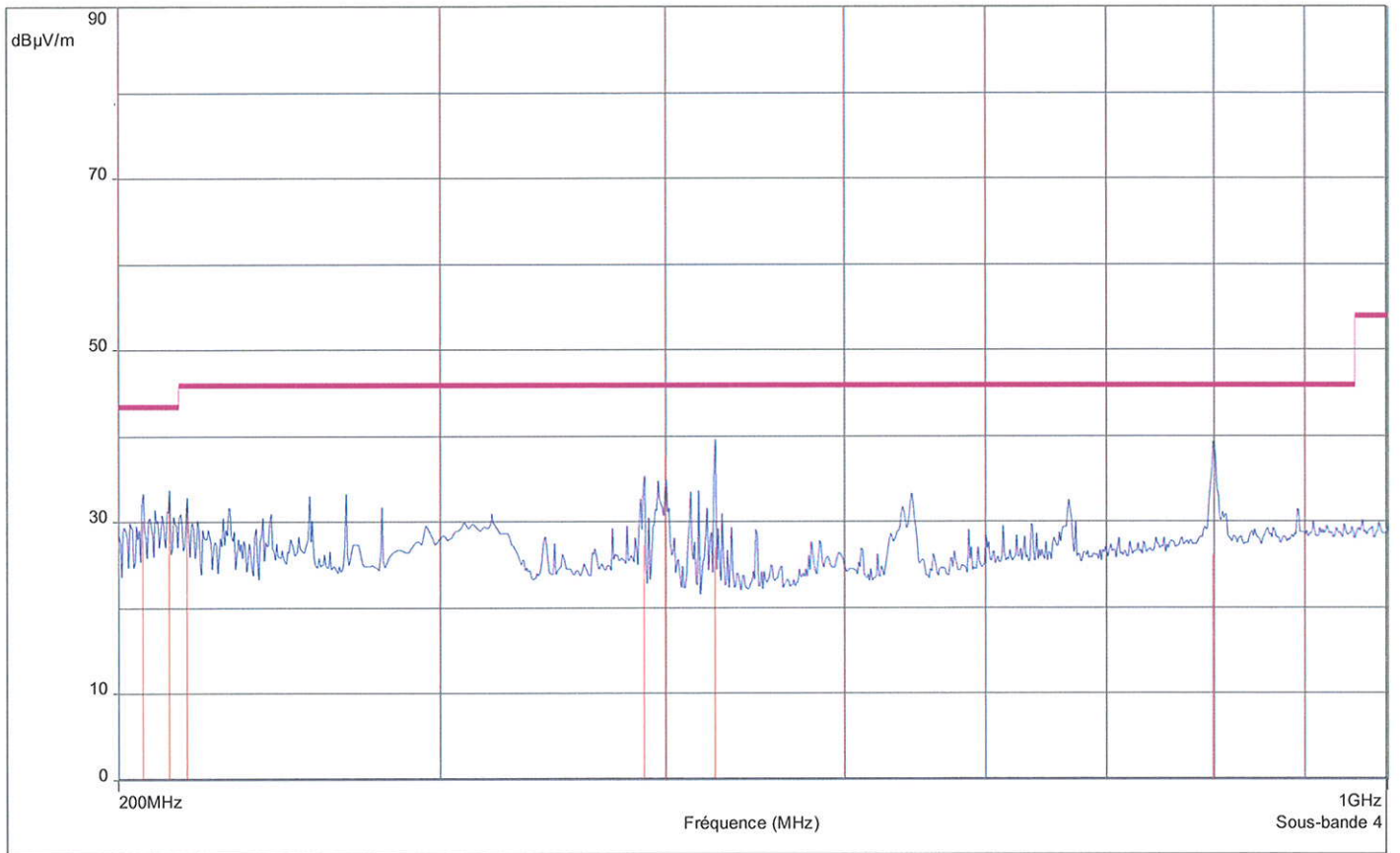
EN 55022 (1998) + A1(2000) + A2 (2003)B

Vertical antenna from 200 to 1000 MHz

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Fréquence (MHz) : 200 MHz - 1 GHz (Pas: 60 kHz)
 Réglage: RBW: 120 kHz, VBW: Auto, Temps de mesure : 50 ms/Pts, nombre de Balayages 1
 Polarisation : Horizontal
 Distance: 3 m

— FCC 15.209 >30M - Classe:1 - QCrête/3.0m/
 — Mes.Peak (Horizontal)
 — Suspect Manuel (Horizontal)
 — Mes. peak (Horizontal)
 — Mes. Q-Peak (Horizontal)
 — Mes. manuelle (Horizontal)



EN 55022 (1008) + A1(2000) + A2 (2003)B

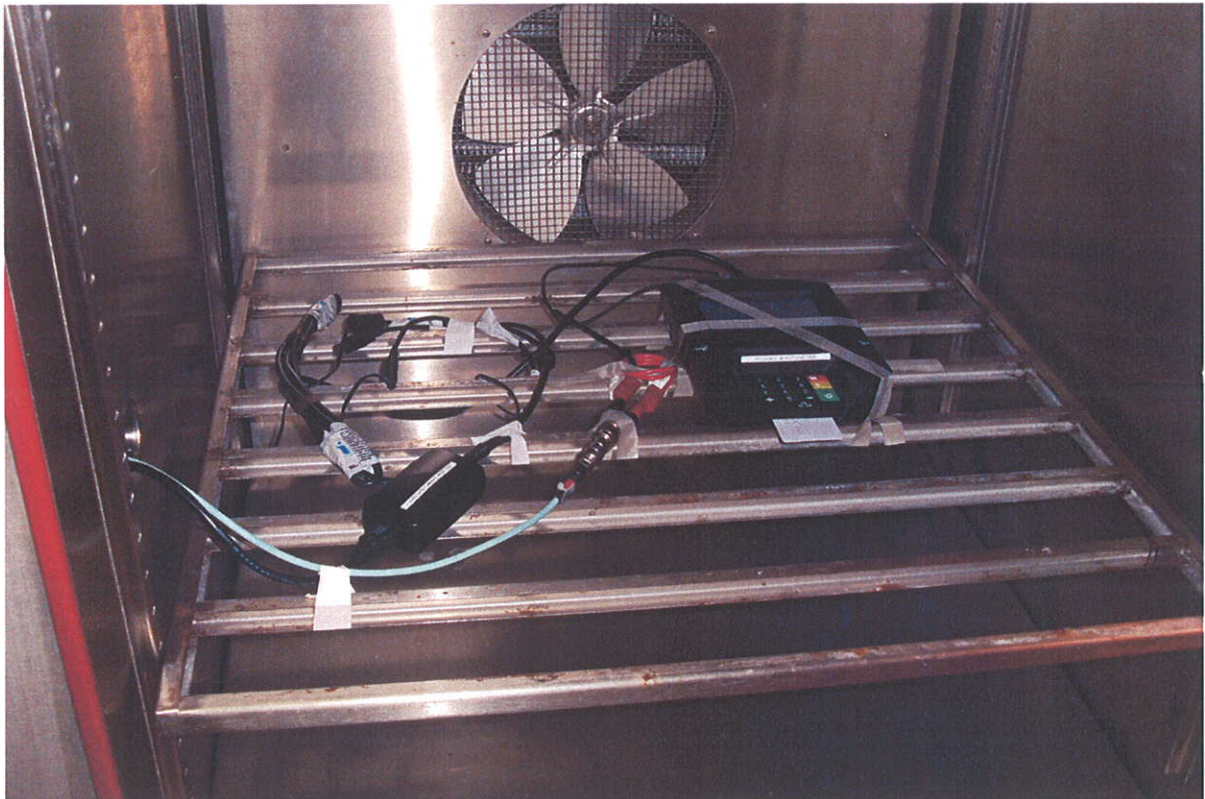
Horizontal antenna from 200 to 1000 MHz

2.4 – Frequency stability over extreme voltage and temperature condition

2.4.1 – General

The product has been powered with AC power supply and it was tested inside a climatic chamber and compared to the FCC part 15 subpart C § 15.225 (e) limits.

2.4.2 – Test setup



2.4.3 – Equipment list

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyseur	ROHDE & SCHWARZ	FSL6	A4060032	08/2008	08/2010
Voltmeter	HELWETT PACKARD	3478A	A1240034	05/2008	05/2010
Climatic chamber	CLIMATS	-	D1025029	05/2009	05/2011
AC power supply	CALIFORNIA INSTRUMENT	1501L	A7042261	Inspected before test	-

2.4.4 – Uncertainty

The uncertainty values calculated by the laboratory are lower than limit uncertainty values defined by the CISPR 16-4-2. The conformity of the sample is directly established by the applicable limits values.

Kind of measurement	Wide uncertainty laboratory (k=2) ± x
Frequency stability	±10 ⁻⁷ of frequency

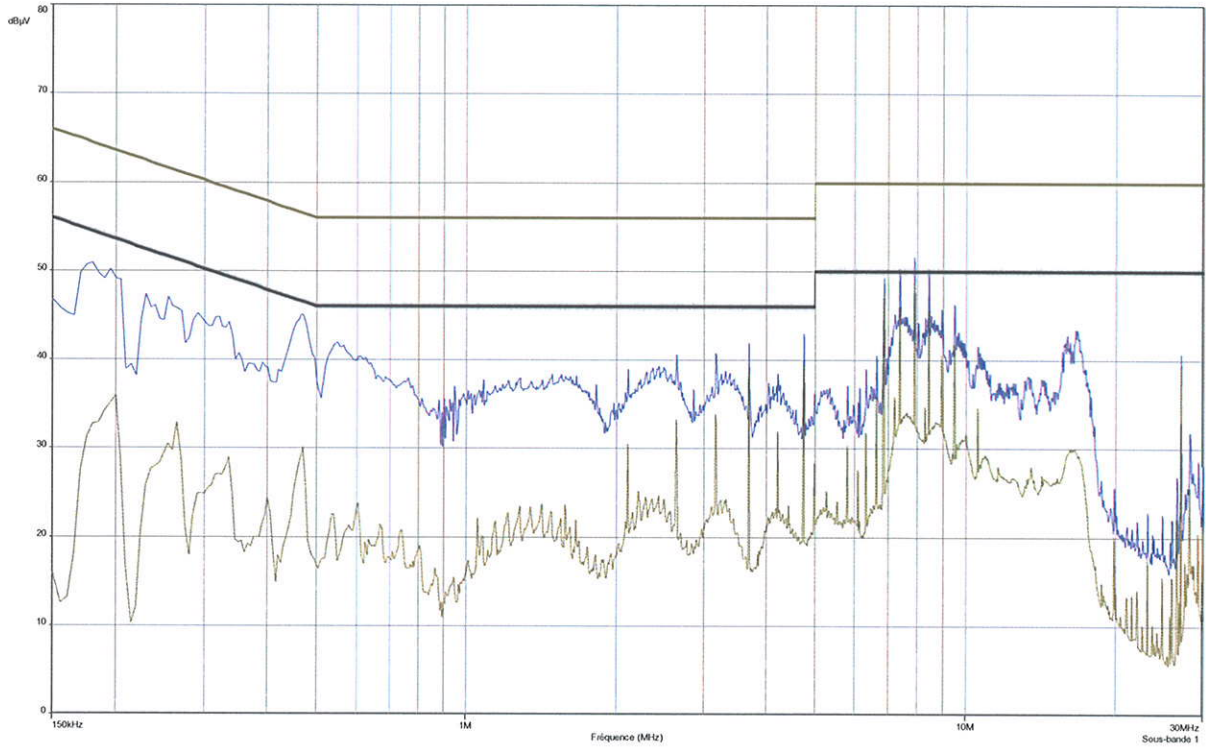
2.4.5 – Test results

Temperature	Voltage	Frequency (MHz)	Limits
20 °C	120V	13.559400	Reference
20 °C	138V	13.559400	Fmin = 13.558044 - Fmax = 13.560756
20 °C	102 V	13.559400	
- 20 °C	120V	13.559400	
-20 °C	138V	13.559400	
- 20 °C	102 V	13.559400	
+ 50 °C	120V	13.559600	
+ 50 °C	138V	13.559600	
+ 50 °C	102 V	13.559400	

Remark:

The security system of the equipment forbids a use at -30 °C, see the manufacturer data for the allowable temperature. The ISC 350 is not intended for external use.

ANNEX

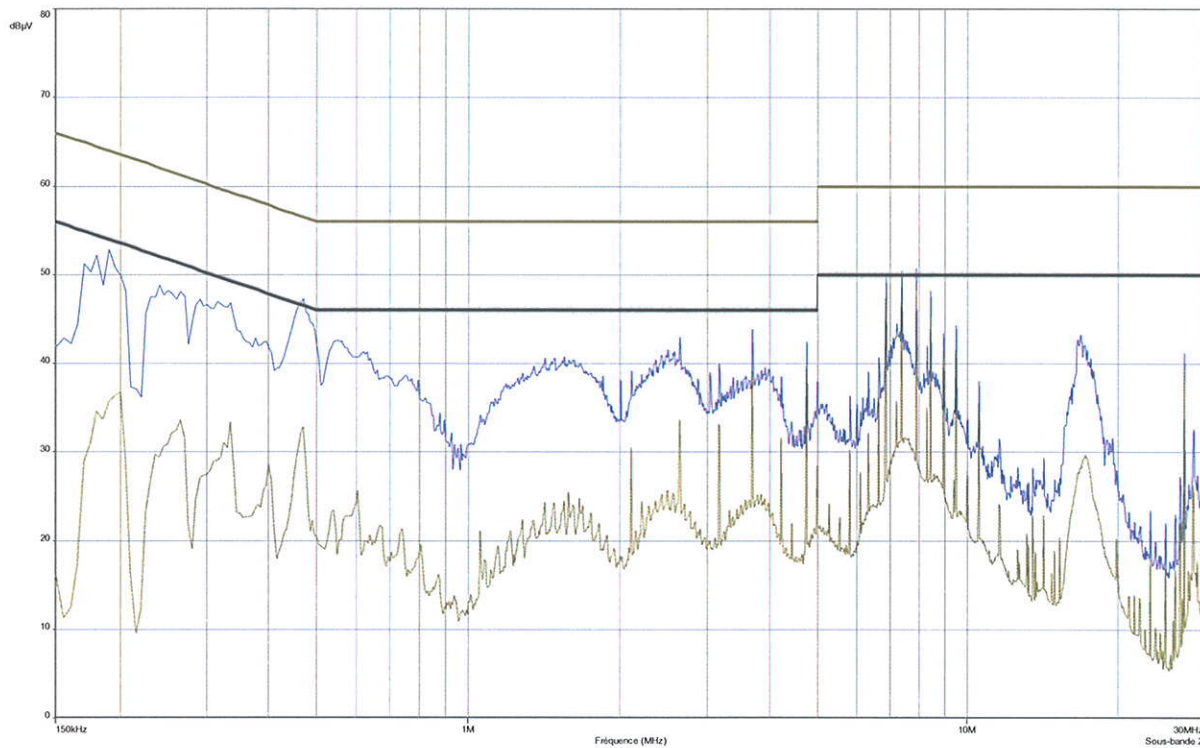


Measurement diagram for conductor 1, the antenna is removed from the equipment



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Measurement diagram for conductor 2, the antenna is removed from the equipment

End of test report