



L C I E

TEST REPORT

N°120636-641067B

FCC REGISTRATION NUMBER: 166175
MRA DESIGNATION NUMBER: FR0010
INDUSTRY CANADA NUMBER: 6230B

ISSUED TO : **INGENICO**
28-32 Boulevard de Grenelle
75015 PARIS - France

SUBJECT : **ELECTROMAGNETIC COMPATIBILITY TESTS ACCORDING TO THE
STANDARD 47 CFR PART 15, SUBPART C, 15.225 and RSS-Gen Issue 3,
RSS-210 Issue 8 and RSS-102 Issue 4**

Apparatus under test

Product : Payment terminal
Trade mark : Ingenico
Manufacturer : Ingenico
Model : ISC480 INT
Reference : ISC480 Cless intern
Serial number : 13049SC00000118

Applicant : **INGENICO**
FCC ID : **XKB-ISC480CLINT**
IC : **2586D-ISC480CLINT**

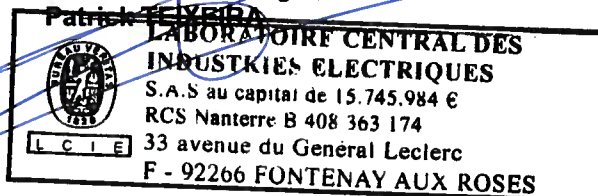
Test date : April 2013

Composition of document : 23 pages

Fontenay-Aux-Roses, June 25th, 2013

Written by
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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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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 (Remark 1)

Remark 1:

The major difference between INGENICO ISC480 INT & INGENICO ISC480 (already certified under FCC ID: XKB-ISC480CL and IC: 2586D-ISC480CL) is RFID antenna positioning:

ISC480 → RFID external antenna

ISC480 INT → RFID internal antenna

Consequently, due to the differences between these 2 versions, frequency stability tests results performed on ISC480 remains fully applicable for ISC480 INT and has not been re-performed.

So, tests results for INGENICO ISC480 INT are retrieved from INGENICO ISC480 (FCC ID: XKB-ISC480 IC: 2586D-ISC480CL) in test report N°118072-636270A.

1.2 – References

Measurements were performed in accordance with the following standards:

47 CFR Part 15 of October, 2012: Code of federal regulations – Telecommunication – Radiofrequency devices

RSS-Gen of December 2010: 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 December 2010: 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 modelling – 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



1.3 - Equipment under test specification

1.3.1 – General equipment information

Applicant	: INGENICO 9 Avenue de la Gare Rovaltain TGV BP 25156 26958 VALENCE FRANCE
Manufacturer	: INGENICO 28-32 Boulevard de Grenelle 75015 PARIS - France
Dimensions	: 220 x 200 x 48 mm
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
Internal frequencies	: Ethernet 25 MHz, Thunder3 quartz 12MHz, Video oscillator 24 MHz, Booster3 processor quartz 32.7 kHz + 18.4 MHz, Contactless microcontroller quartz 27.12 MHz, DAC + Ampli (12 MHz)
External links	: Port 1 : Mini USB Port 2 : Power supply DELTA <u>Note</u> : power supply is an option for this equipment

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.

1.3.4 – Photographs of the sample

General view of the ISC480 INT



Power supply of the ISC480 INT

1.3.5 – Auxiliary equipment

None

2- TEST RESULTS

2.1 Power line conducted emission test

2.1.1 - General

The product has been tested with 120V / 60Hz 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 analyser	ROHDE & SHWARZ	ESI40	A2642010	2012/09	2013/09
V ISLN	ROHDE & SHWARZ	ENV216	C2320162	2012/09	2013/10



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	3.51 dB	3.6 dB

2.1.5 – Test results

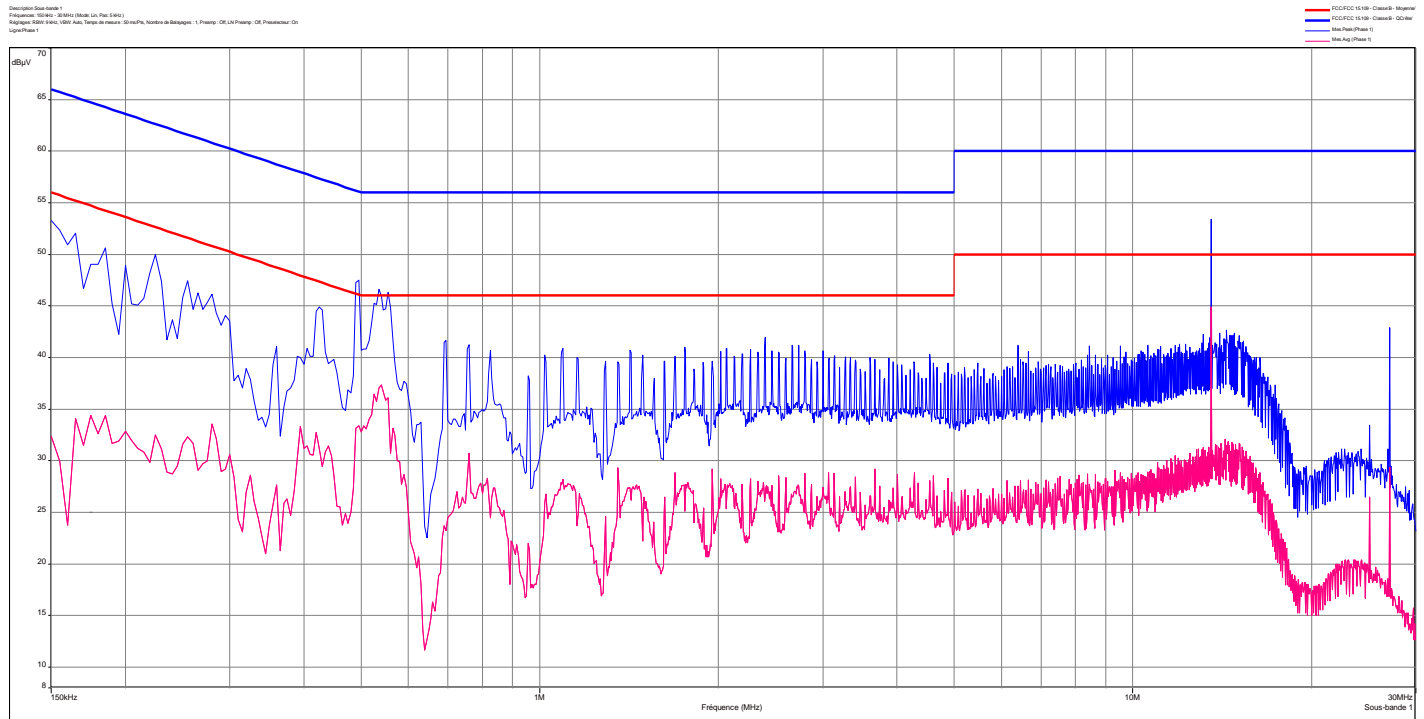
Conducted measurement on conductor 1

Frequency (MHz)	Peak measurements (dBµV)	Quasi-Peak measurements (dBµV)	Quasi-Peak limits (dBµV)	Average measurement (dBµV)	Average limits (dBµV)
0.49	47.25	-	56	33	46
13.56	53.4	-	60	44.9	50
27.115	42.9	-	60	27	50

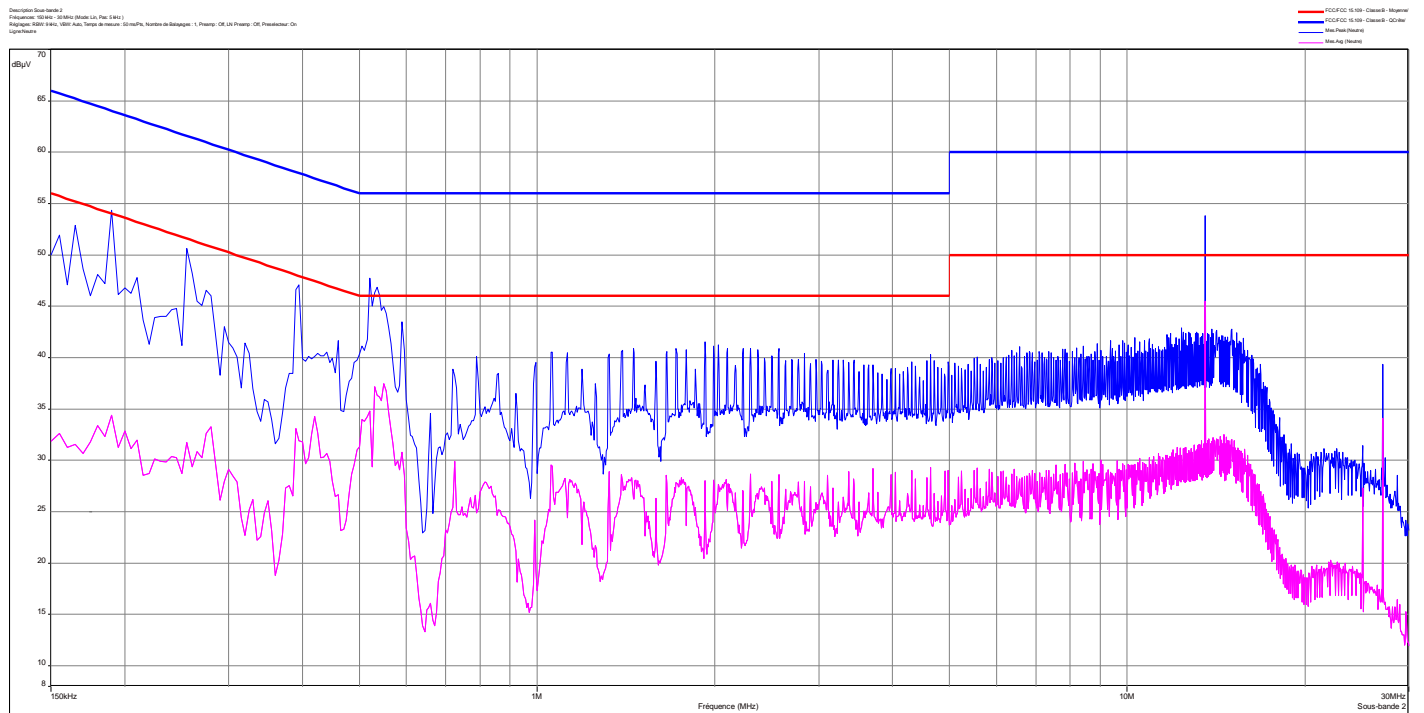
Conducted measurement on conductor 2

Frequency (MHz)	Peak measurements (dBµV)	Quasi-Peak measurements (dBµV)	Quasi-Peak limits (dBµV)	Average measurement (dBµV)	Average limits (dBµV)
0.53	46.8	-	56	36.4	46
13.56	53.8	-	60	44.3	50
27.125	39.3	-	60	34	50

Measurement diagram for conductor 1



Measurement diagram for conductor



2.2 – Field strength within the band 13.110-14.010MHz

2.2.1 – General

The product has been tested with 120V / 60Hz 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



2.2.3 – Equipment list

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyser	ROHDE & SHWARZ	ESI40	A2642010	2012/09	2013/09
Loop antenna	ROHDE & SHWARZ	HFH H2 Z2	C2040007	2012/08	2013/08
Spectrum analyser	ROHDE & SHWARZ	FSL	A4060032	2012/12	2013/12

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 56,53dB 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	16.53	84.0

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)

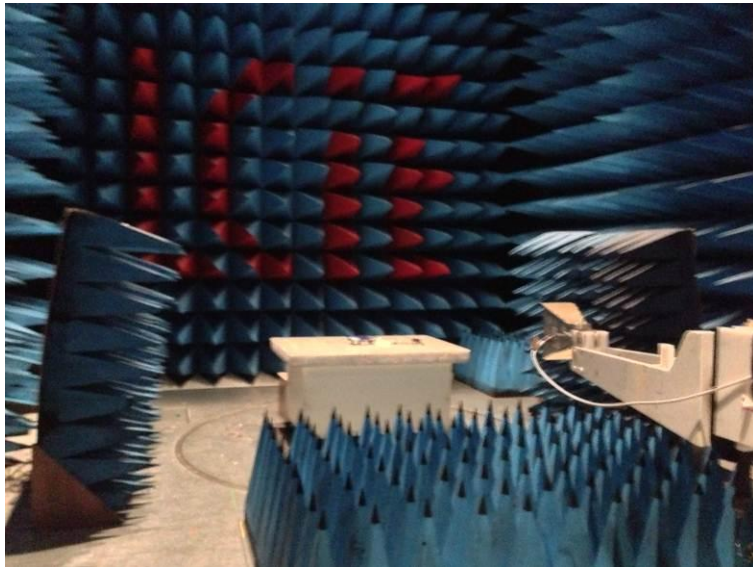
-Frequency range: 30 MHz to 18000 MHz

Measuring Distance: **3 m**

Antenna:

- BiLog (30 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 BiLog (30 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 analyser	ROHDE & SCHWARZ	ESI40	A2642010	2012/09	2013/09
BiLog antenna	SCHWARZBECK	VULB 9160	C2040150	2012/12	2013/12
Horn antenna	EMCO	3115	C2042018	2012/04	2013/04
Loop antenna	ROHDE & SCHWARZ	HFH H2 Z2	C2040007	2012/08	2013/08

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 graph from 30 to 1000 MHz

<u>Frequency (MHz)</u>	<u>Peak measurements @ 3m (dBμV/m)</u>	<u>Limits @ 3m (dBμV/m)</u>
40.6	29	40.0
100	33.5	43.5
233.4	42.9	46.0
300	31	46.0
533.4	32	46.0
800	35	46.0

3 m radiated measurement graph from 1 to 6 GHz

<u>Frequency (MHz)</u>	<u>Peak measurements (dBμV/m)</u>	<u>Peak limits (dBμV/m)</u>	<u>Average measurement (dBμV/m)</u>	<u>Average limits (dBμV/m)</u>
1199	36	74	27	54

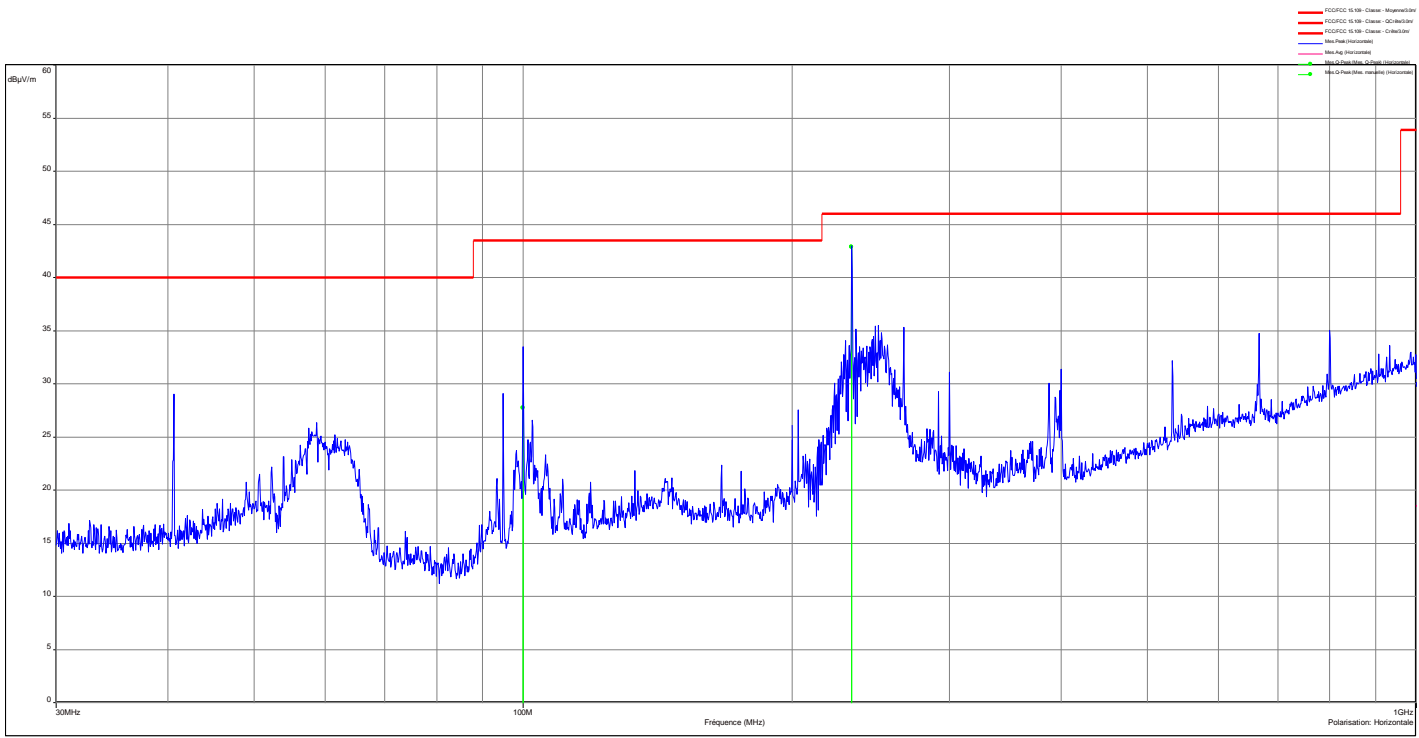
2.3.5 – Test results on receiver

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

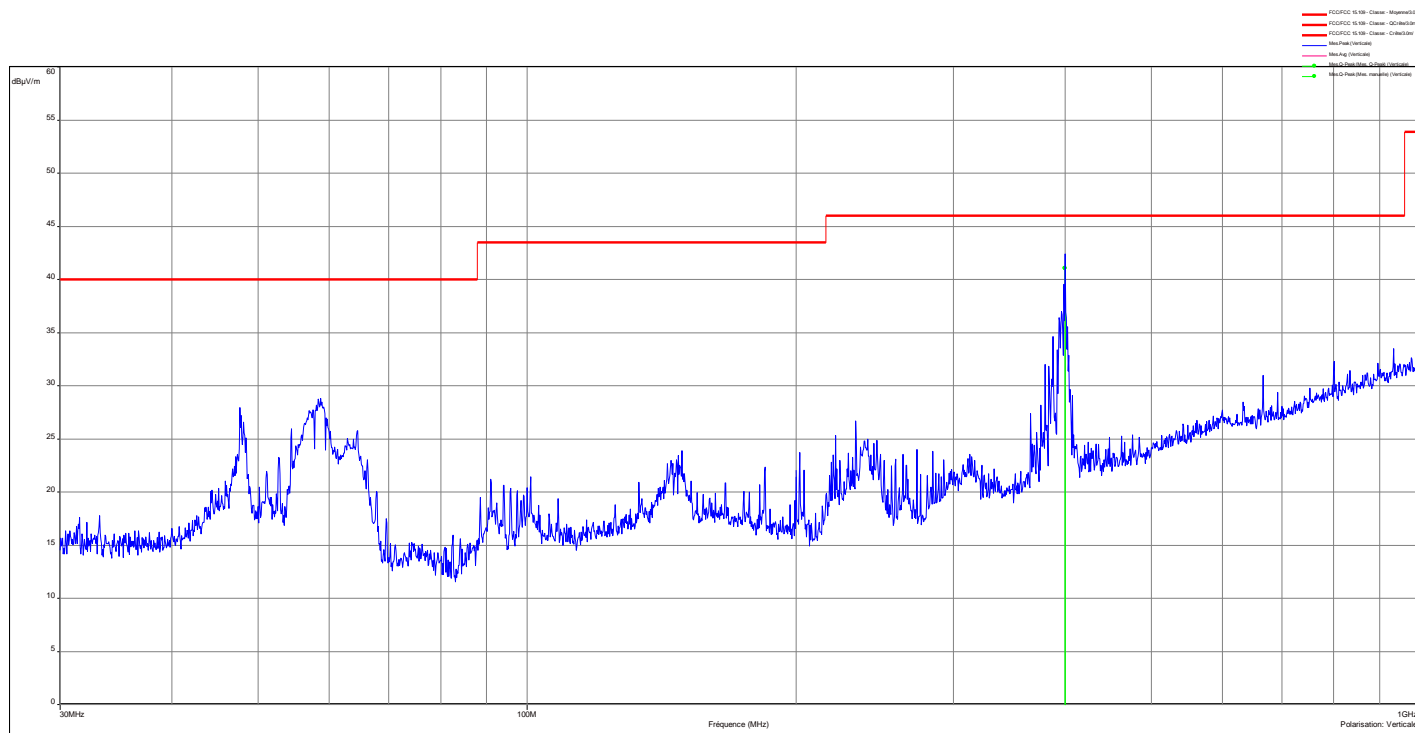
3 m radiated measurement graph from 30 to 1000 MHz

Horizontal antenna from 30 to 1000 MHz



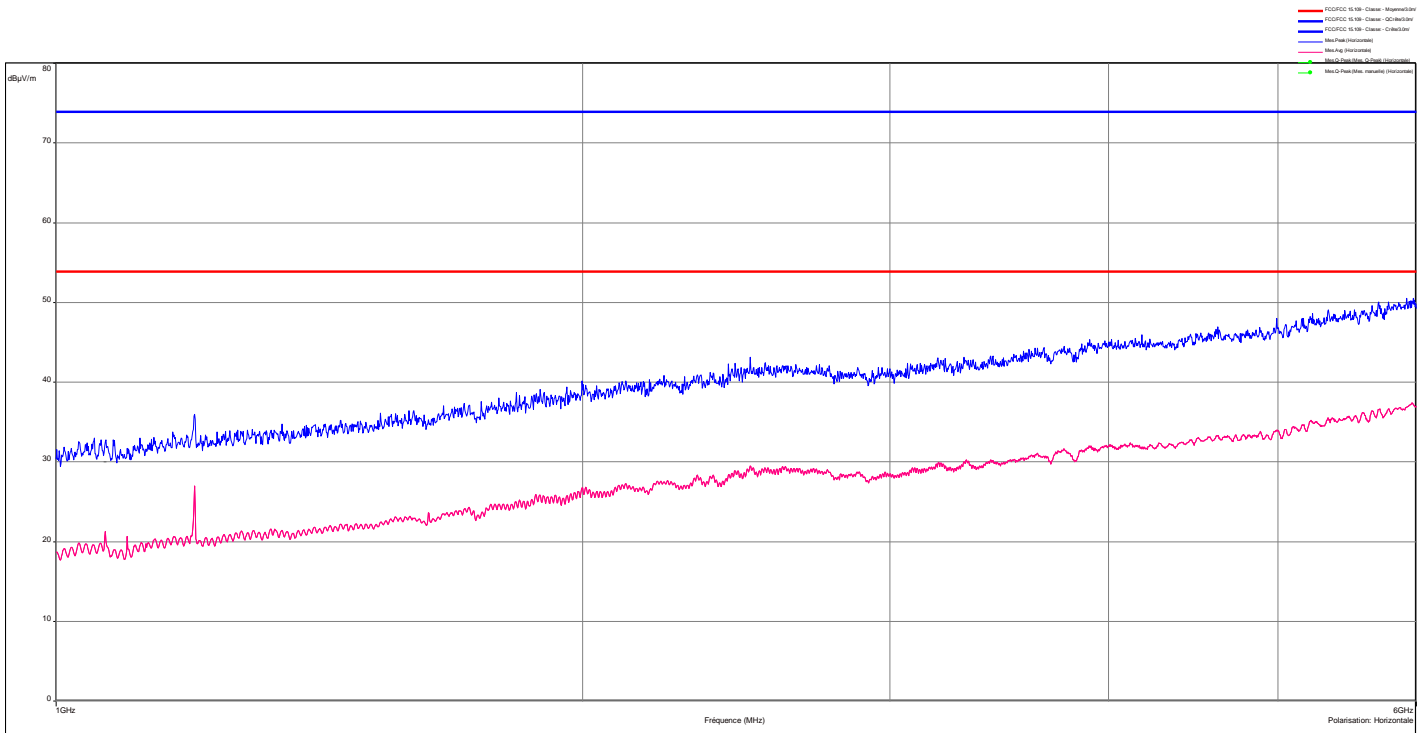


Vertical antenna from 30 to 1000 MHz



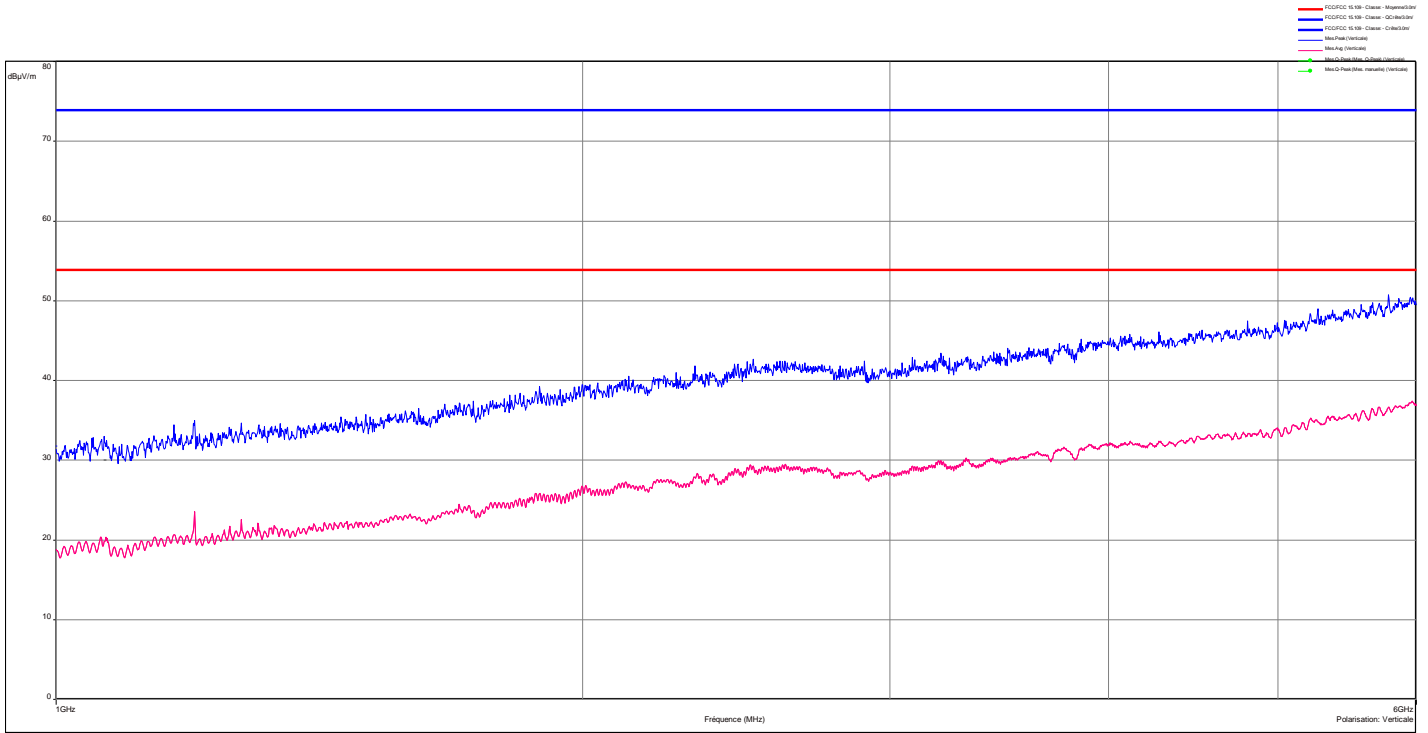


Horizontal antenna from 1000 to 6000 MHz





Vertical antenna from 1000 to 6000 MHz

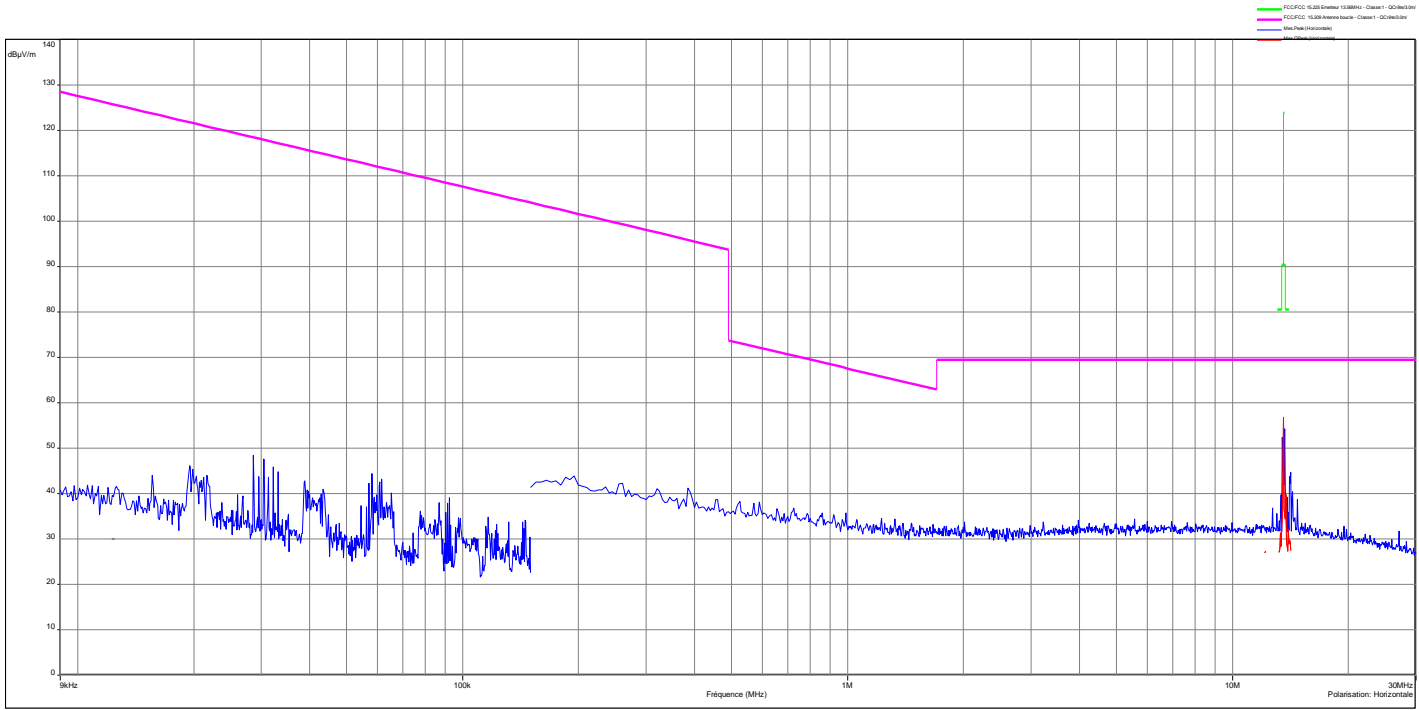


2.3.7 – Measurements diagrams

3 m radiated measurement from 9 kHz to 30 MHz

Perpendicular antenna from 9 KHz to 30 MHz

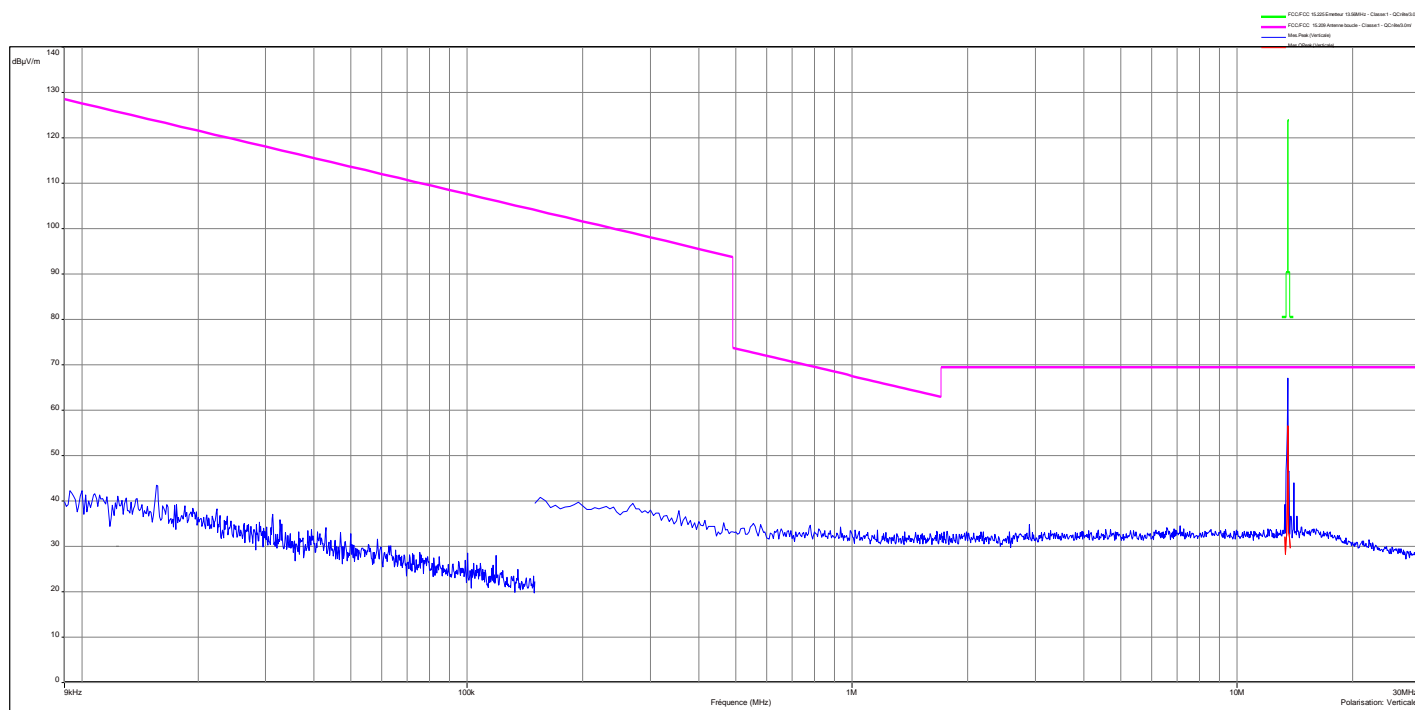
Loop antenna measurements





Parallel antenna from 9 KHz to 30 MHz

Loop antenna measurements



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 INGENICO ISC480 (FCC ID: XKB-ISC480CL IC: 2586D-ISC480CL) in test report N°118072-636270A





2.4.3 – Equipment list

Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyser	ROHDE & SCHWARZ	FSL	A4060032	2012/12	2013/12
Climatic chamber	CLIMATS	-	D1025029	2012/02	2013/02
AC power supply	ADAPTIVE POWER SYSTEMS	FC210	A7360017	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 INGENICO ISC480 (FCC ID: XKB-ISC480CL IC: 2586D-ISC480CL) in test report N°118072-636270A

Temperature	Voltage	Frequency (MHz)	Limits
20 °C	120V	13.55991	Reference
20 °C	138V	13.55991	Fmin = 13.546350 - Fmax = 13.573469
20 °C	102V	13.55991	
- 20 °C	120V	13.55991	
- 20 °C	138V	13.55991	
- 20 °C	102V	13.55991	
- 30 °C	120V	13.55991	
- 30 °C	138V	13.55991	
- 30 °C	102V	13.55991	
+ 50 °C	120V	13.55991	
+ 50 °C	138V	13.55991	
+ 50 °C	102V	13.55991	

End of test report