TEST REPORT

N° 76177-564496

FCC REGISTRATION NUMBER: 888863
INDUSTRY CANADA NUMBER: 6231A

ISSUED TO : **THALES TRANSPORTATION SYSTEMS**
CENTRE DU BOIS DES BORDES
91229 BRETIGNY SUR ORGE
France

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

Apparatus under test :
Product : Card reader
Trade mark : THALES
Manufacturer : THALES
Model : CSC KIT POST OH 12
Serial number : /

Test date : September, 2007

Composition of document : 22 pages

Fontenay-Aux-Roses, January 14th, 2008

The technical manager,

Eric ROUSSEL

LABORATOIRE CENTRAL
DES INDUSTRIES ELECTRIQUES
S.A. au capital de 15.745.984 €
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33 Avenue du Général Leclerc
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1 – GENERAL

1.1 – Summary of test results

Radiated emissions are made on open area test site located "rue Théo Bonhomme, Moret-Sur-Loing (77, France)". A description of the test facility is on file with the FCC (FCC registration number 888863).

47 CFR Part 15			
Paragraph No.	**Name of test**	**Remarks**	**Result**
§ 15.207 (a)	Power line conducted limits		PASS
§ 15.225 (a) (b) (c)	Field strength within the band 13.110-14.010 MHz		PASS
§ 15.209 (d)	Field strength outside of the bands 13.110-14.010 MHz		PASS
§ 15.225 (e)	Frequency stability over extreme temperature and voltage conditions		PASS
§ 15.205 (a) (b) (c)	Restricted bands of operation		PASS

NA : Not Applicable

1.2 – References

Measurements were performed in accordance with the following standards:

47 CFR Part 15 of September 9, 200 7 : Code of federal regulations – Telecommunication –Radiofrequency devices

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.

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

RSS-102 of November 2005: Radio Frequency Exposure Compliance of Radiocommunication Apparatus

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

1.3 - Equipment under test specification

1.3.1 – General equipment information

Applicant : **THALES TRANSPORT SERVICES**
CENTRE DU BOIS DES BORDES
91229 BRETIGNY SUR ORGE
France

Manufacturer : **THALES TRANSPORT SERVICES**
CENTRE DU BOIS DES BORDES
91229 BRETIGNY SUR ORGE
France

Frequency band : 13.110-14.010MHz
Number of channel : 1
Channel spacing : /
Modulation :
User frequency adjustment : NO
User power adjustment : NO
Type of antenna : Integrated
Is the operation point to point? NO

Cables :

Type	EUT port	Long (m)	Shielded	Number of wire
Power	RS 232	2 m	NO	2
RS 232	RS 232	3 m	YES	9

Note : the RS232 cable was equipped with 2 ferrites.

The equipment was powered by a 110V - 60Hz to 12V dc converter.

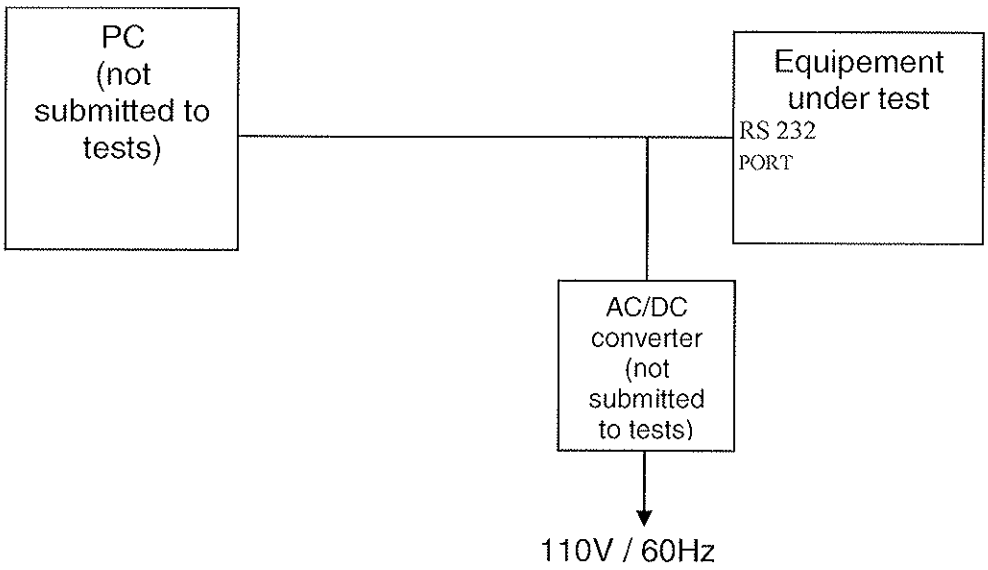
1.3.2 – Description of modifications

The equipment has not been modified during tests.

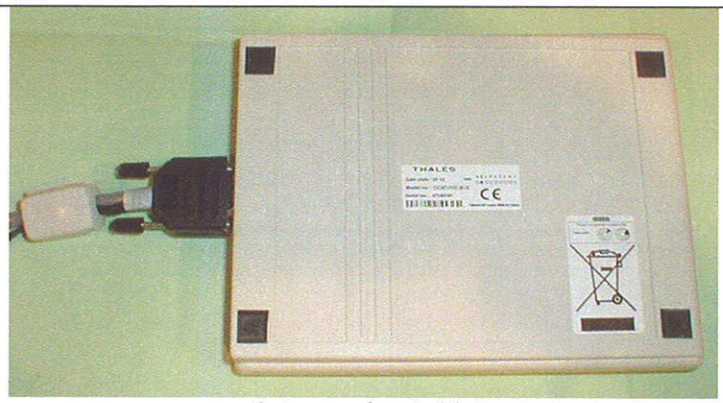
1.3.3 – Description of operation

The equipment was configured in the following operation mode:
- Card reading with specific software.

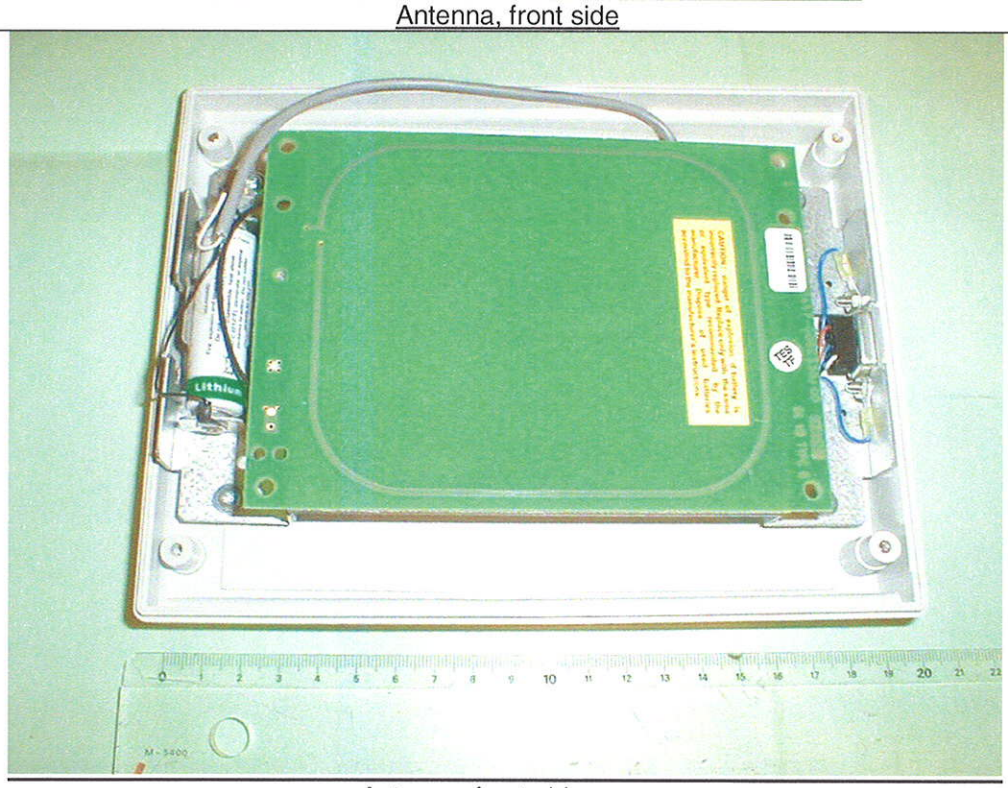
1.3.4 – System diagram



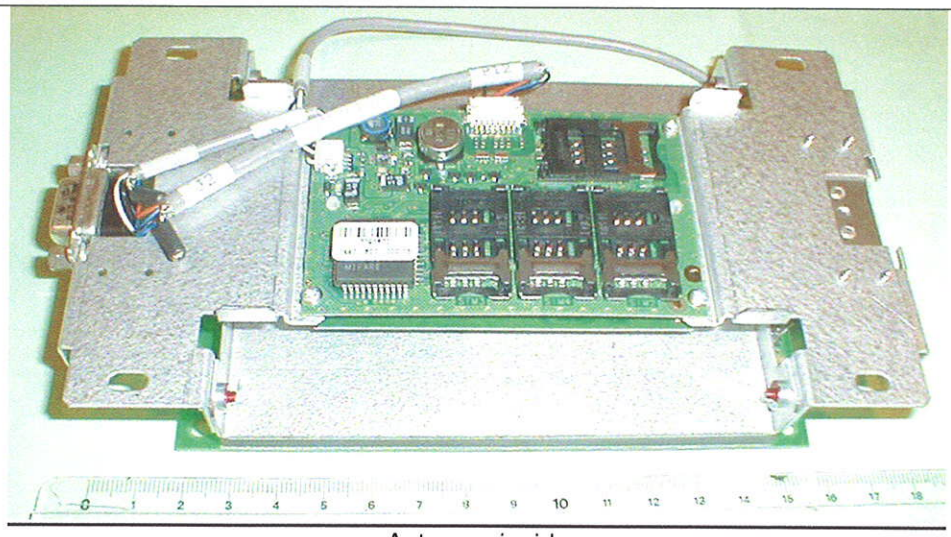
1.3.5 – Photograph of the sample



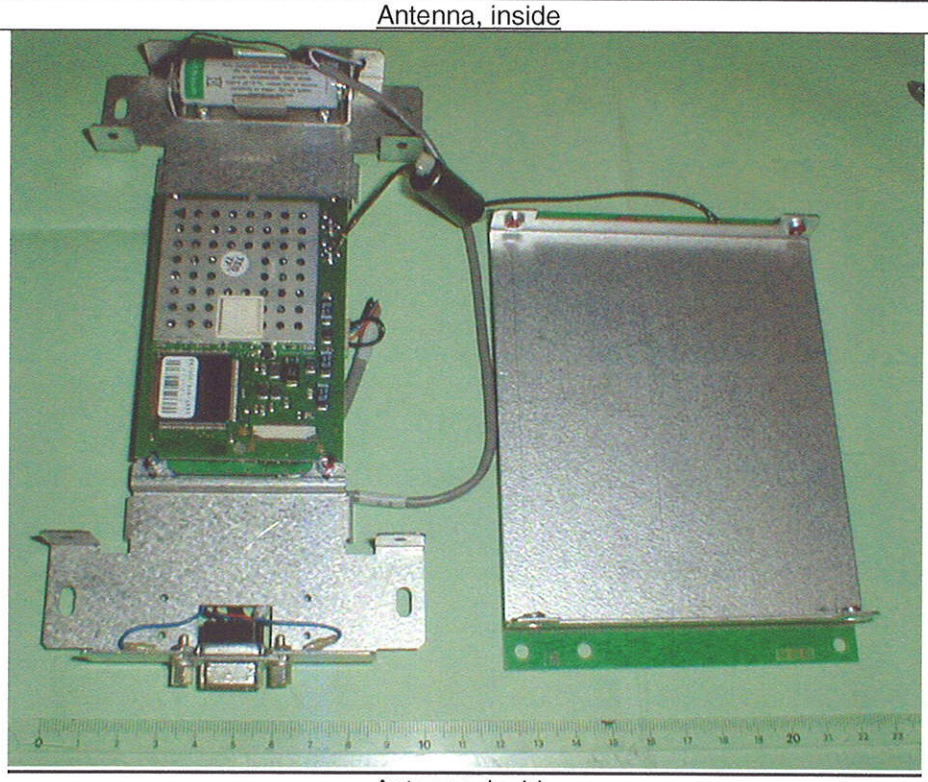
Antenna, front side



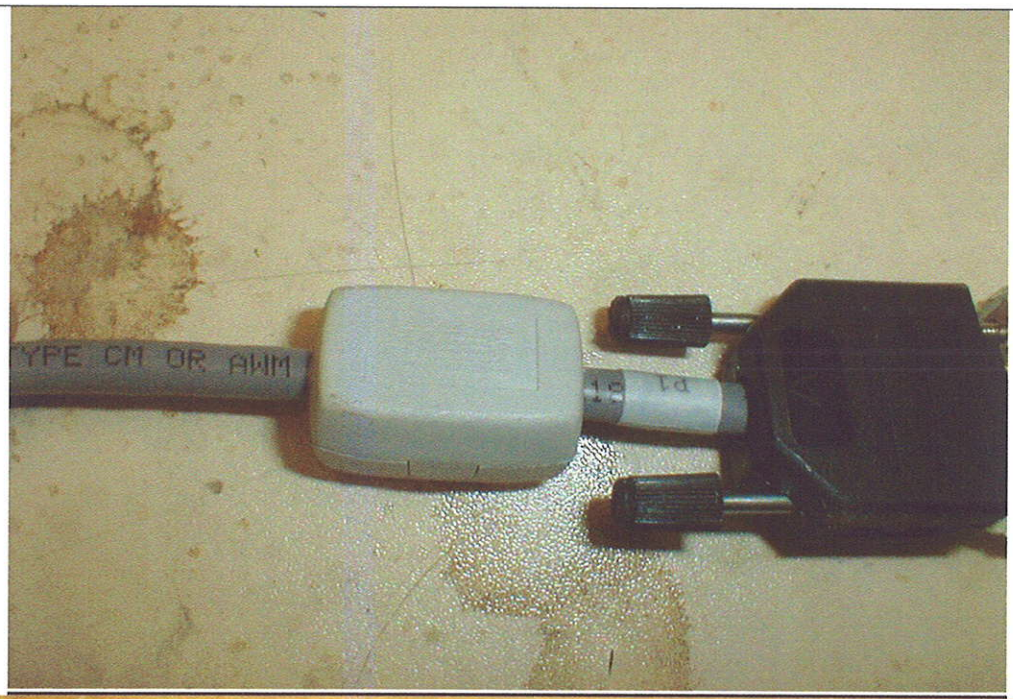
Antenna, front side open

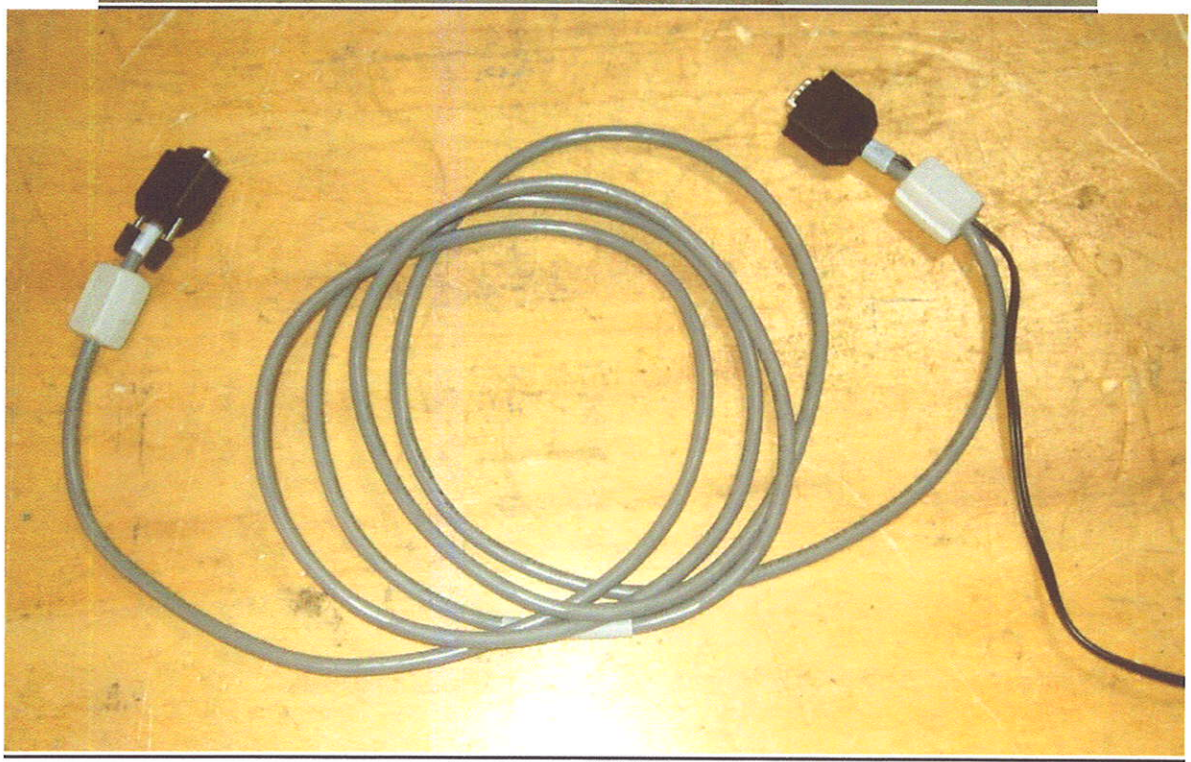


Antenna, inside



Antenna, inside





Ferrites on RS232 cable

2 – TEST RESULTS

2.1 – Power line conducted emission test

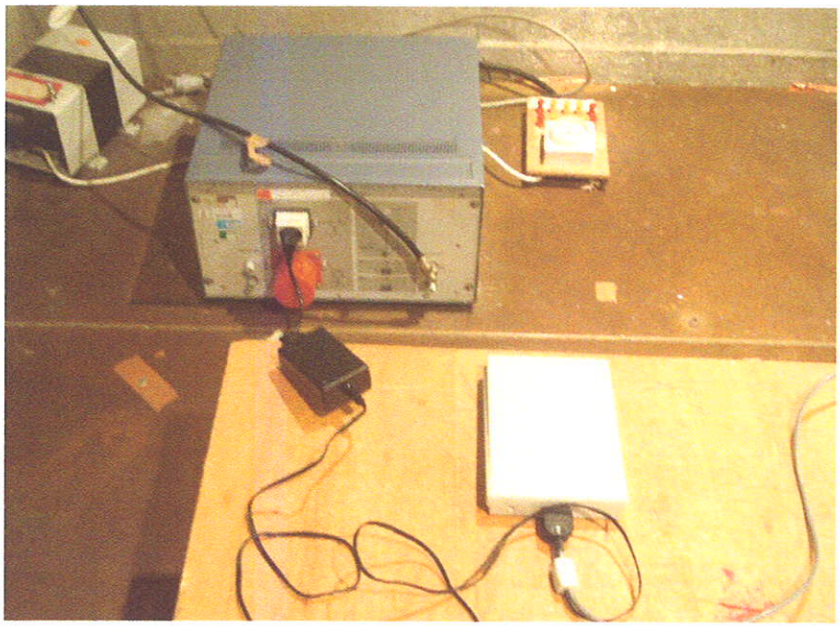
2.1.1 - General

The product has been tested with 110V/60Hz power line voltage and compared to the FCC part 15 subpart C §15.207 limits.

The 6dB 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

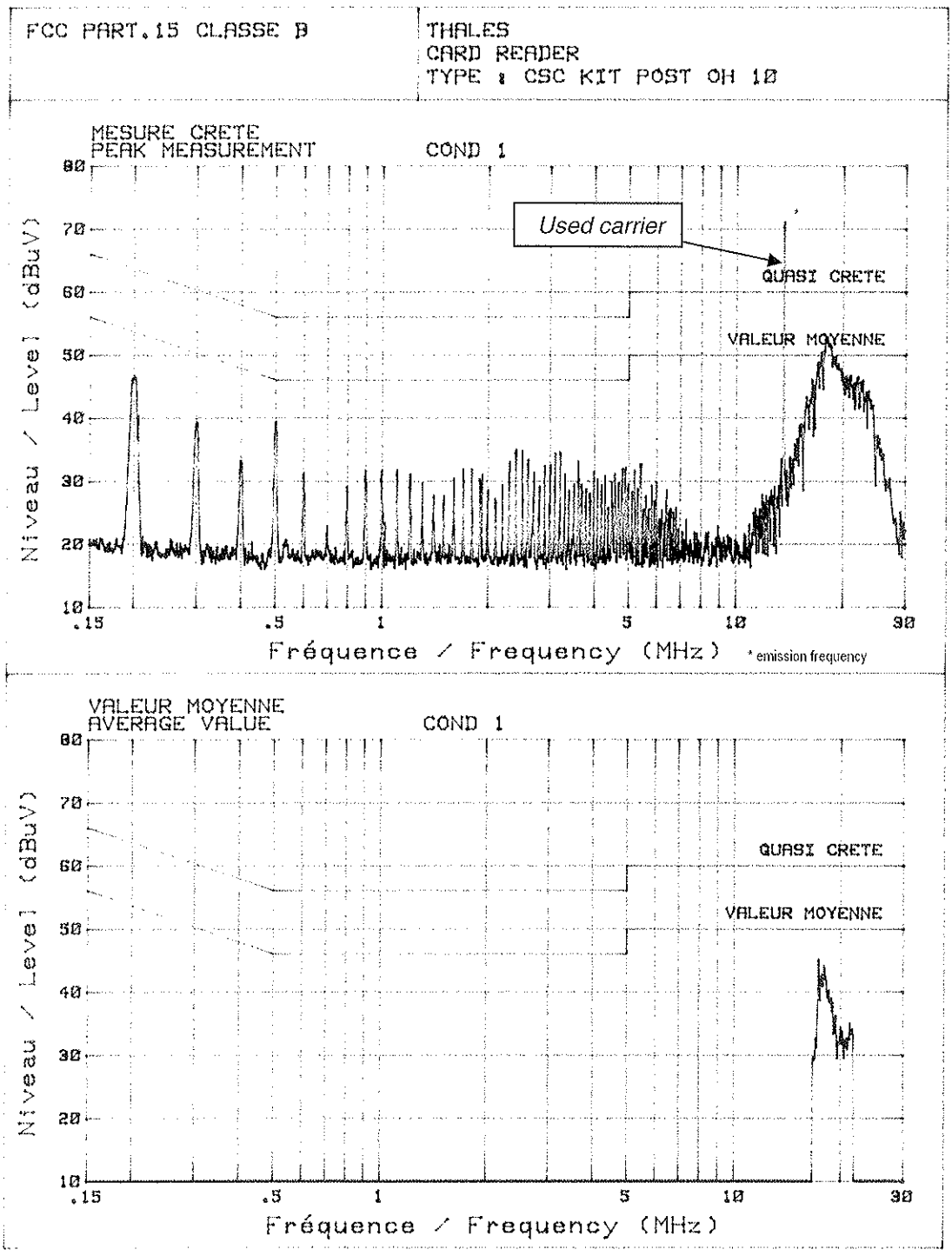
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyzer	HEWLETT PACKARD	8566B	A4060004	07/2007	07/2008
Preselector	HEWLETT PACKARD	85685A	A4069001	07/2007	07/2008
Quasi-Peak adaptator	HEWLETT PACKARD	85650A	A4069003	07/2007	07/2008
V LISN	ROHDE & SCHWARZ	ESH2-Z5	A4069002	19/03/2007	03/2008

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.

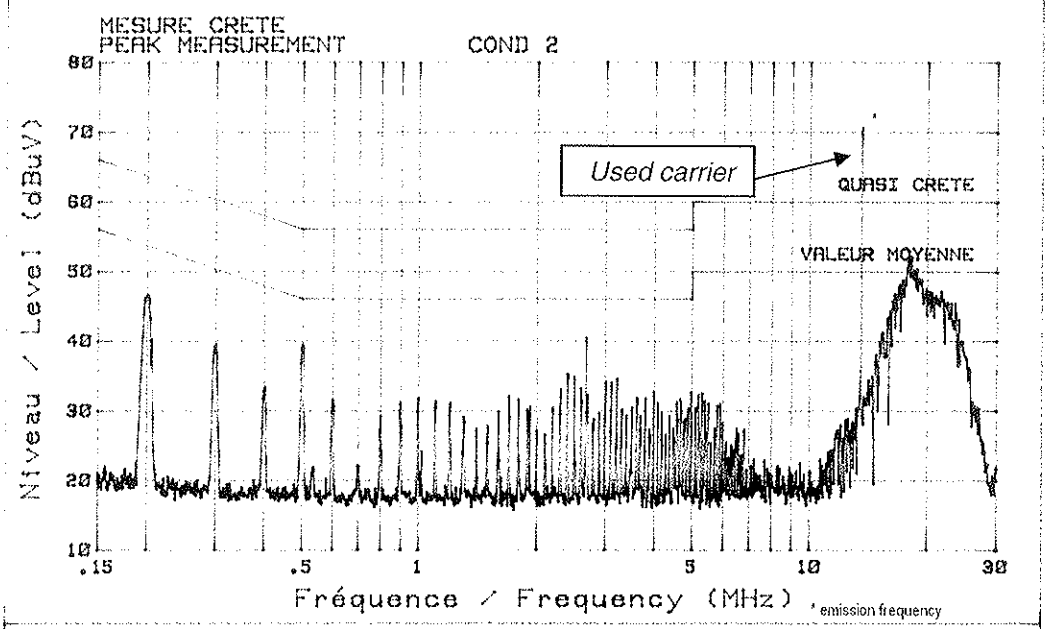
Kind of measurement	**Wide uncertainty laboratory (k=2) ±x**	**CISPR uncertainty limit ±y**
Measurement of conducted disturbances in voltage on the power port	3.57 dB	3.6 dB

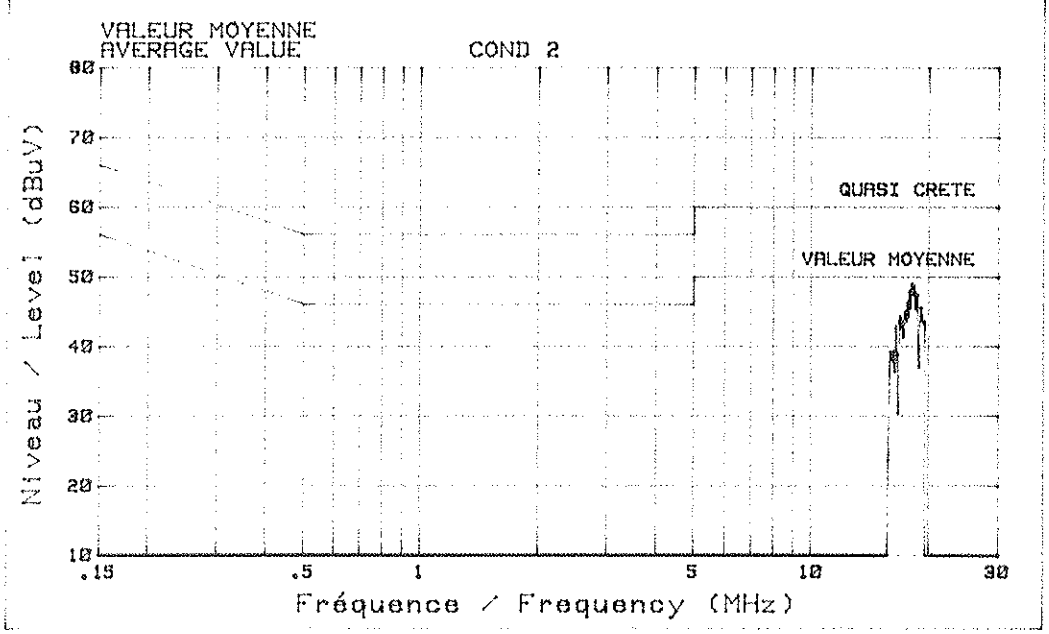
2.1.5 – Test results



FCC PART.15 CLASSE B

THALES
CARD READER
TYPE : CSC KIT POST OH 10

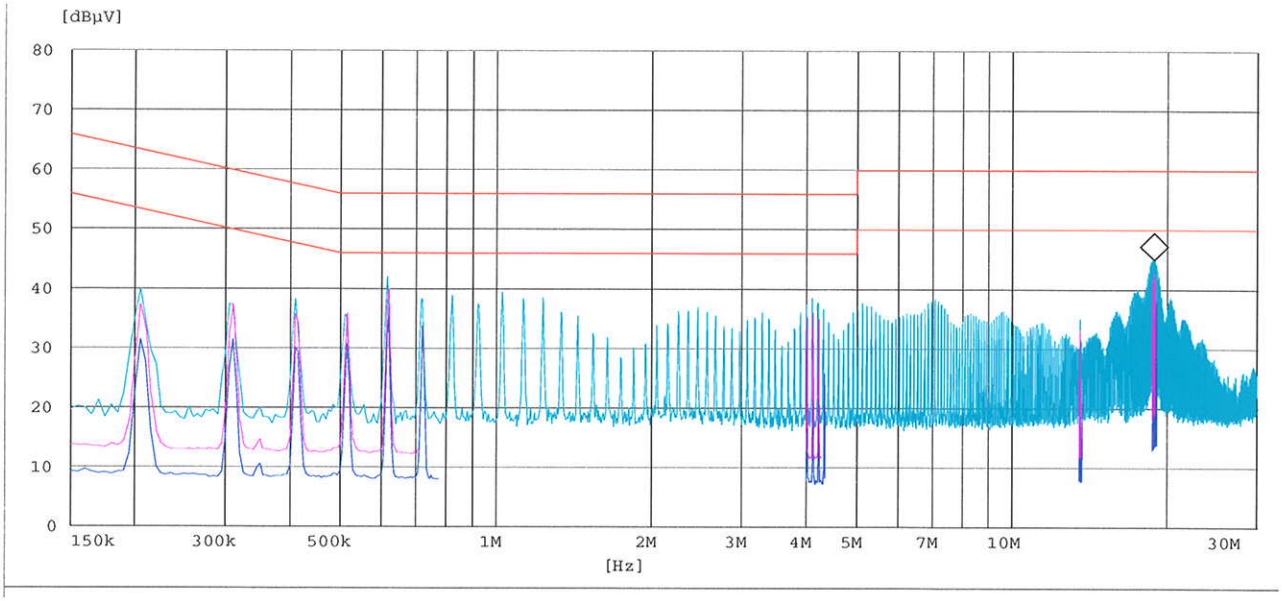




Frequency (MHz)	Peak value ($dB_{\mu V}$)	Average value ($dB_{\mu V}$)	Average limit ($dB_{\mu V}$)	Quasi Peak value ($dB_{\mu V}$)	Quasi Peak limit ($dB_{\mu V}$)
0.20	47.0	44.9	53.6	46.1	63.6
0.50	39.7	36.9	46	38.8	56
2.57	40.8	38.2	46	40.0	56
16.25	48.5	46.6	50	47.9	60
16.83	52.6	49.5	50	51.2	60
18.68	50.5	47.7	50	49.3	60
22.60	47.6	45.4	50	46.7	60

To demonstrate the compliance at 13.56 MHz, the antenna was shielded for the two following conducted measurements:

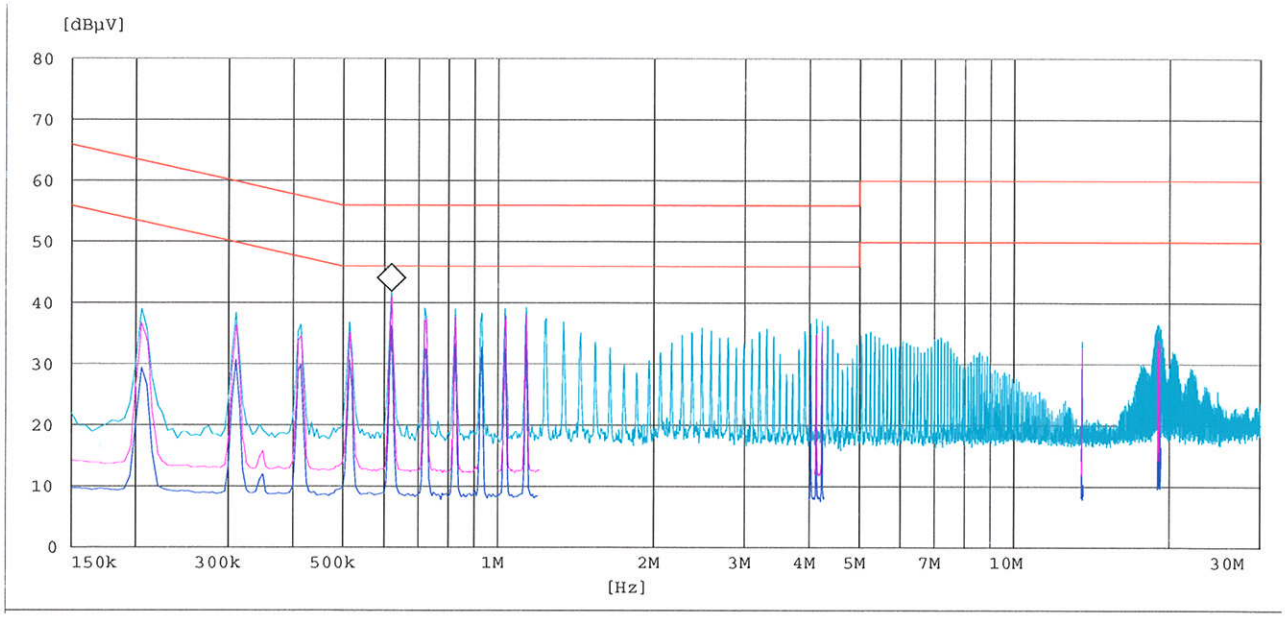
Conductor 1:



Frequency (MHz)	Peak value ($dB_{\mu V}$)	Average value ($dB_{\mu V}$)	Average limit ($dB_{\mu V}$)	Quasi Peak value ($dB_{\mu V}$)	Quasi Peak limit ($dB_{\mu V}$)
13.56	35.2	33.2	50	32.9	60

The setting and test setup were the same as described in 2.1.1 and 2.1.2

Conductor 2:



Frequency (MHz)	Peak value ($dB_{\mu V}$)	Average value ($dB_{\mu V}$)	Average limit ($dB_{\mu V}$)	Quasi Peak value ($dB_{\mu V}$)	Quasi Peak limit ($dB_{\mu V}$)
13.56	33.9	32.6	50	32.5	60

The setting and test setup were the same as described in 2.1.1 and 2.1.2

2.2 – Field strength within the band 13.110-14.010MHz

2.2.1 – General

The product has been tested with 110V/60Hz power line voltage and compared to the FCC part 15 subpart C §15.225 (a) (b) and (c) limits.

The 6 dB resolution bandwidth was:

- 9 kHz from 13.110-14.010 MHz

The measurements were performed with a Quasi-peak detector.

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.

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 µV/m
E_d is the field strength at the measured distance in µV/m
D is the used distance between antenna and EUT in m

2.2.3 – Equipment list

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyseur	HEWLETT PACKARD	8566B	A4060004	07/2007	07/2008
Preselector	HEWLETT PACKARD	85685A	A4069001	07/2007	07/2008
Quasi-Peak adaptator	HEWLETT PACKARD	85650A	A4069003	07/2007	07/2008
Loop antenna	ROHDE & SHWARZ	HFH H2 Z2	C2040007	14/09/07	09/2008

2.2.4 – Uncertainty

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

2.2.5 – Test results

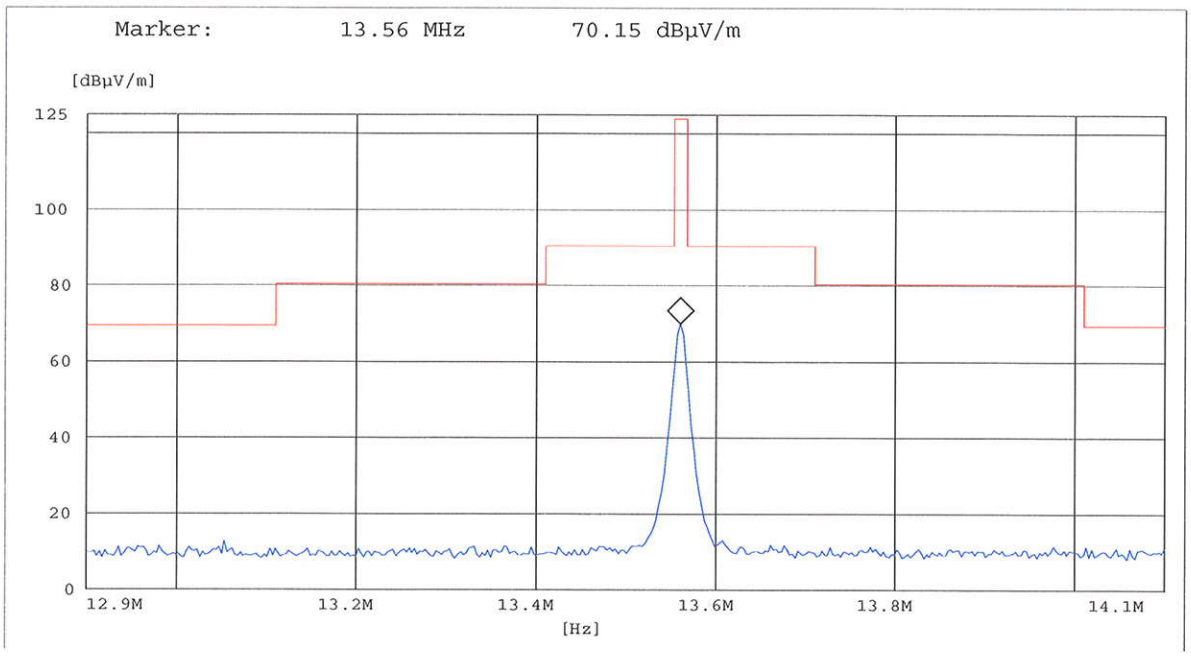
The measure result at 3 m is 70dBµV/m for 13.569 MHz
The 30 m measure corrected is M@3m – 40dB

Frequency MHz	Maximum Quasi Peak (30m) dBµV/m	Quasi Peak Limit (30m) dBµV/m
13.56	30	84

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 12.9 to 14.1 MHz with RBW=9kHz (measurement @ 3m)



The 99 % emission BW is 22.0 kHz with RBW=9kHz and VBW=30kHz

2.3 – Field strength outside the 13.110-14.010 MHz band

2.3.1 – General

The product has been tested with 110 V/60 Hz power line voltage and compared to the FCC part 15 subpart C § 15.209 limits.

The 6 dB resolution bandwidth was:

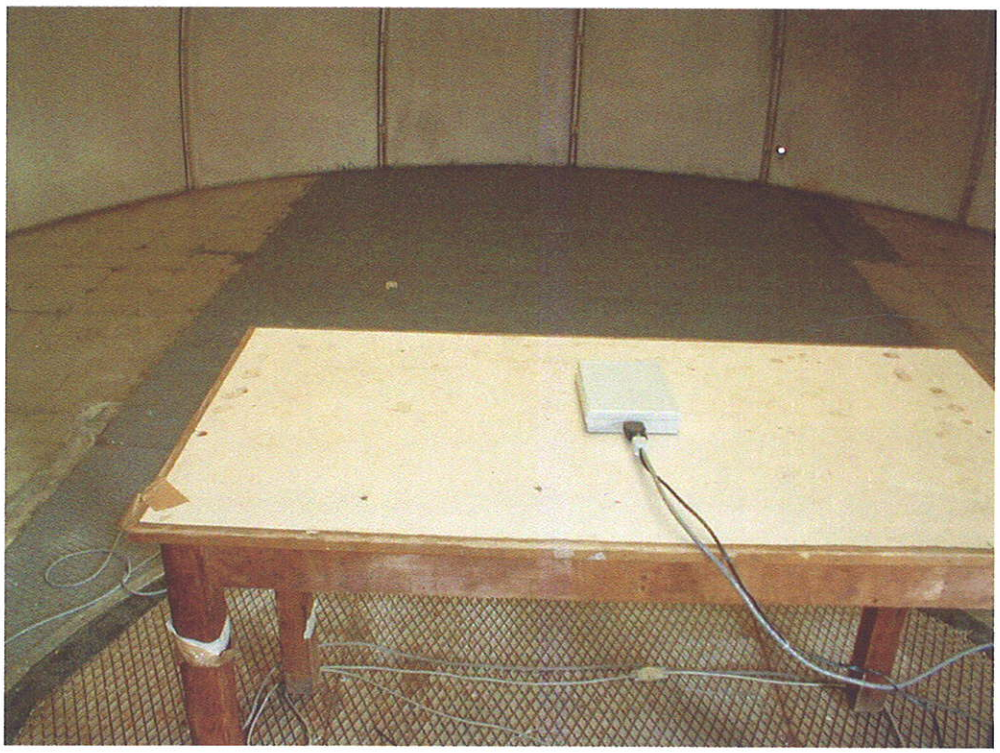
- 200 Hz from 9 kHz to 150 kHz.
- 9 kHz from 150 kHz to 30 MHz.
- 120 kHz from 30 MHz to 1000 MHz.
- 1 MHz from 1 GHz to 18 GHz.

The measurements were performed with a Quasi-peak detector from 0.009 to 1000MHz.

2.3.2 – Test setup

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.

The EUT is placed at 10m 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.



2.3.3 – Equipment list

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum analyseur	HEWLETT PACKARD	8566B	A4060004	07/2007	07/2008
Preselector	HEWLETT PACKARD	85685A	A4069001	07/2007	07/2008
Quas-Peak adaptator	HEWLETT PACKARD	85650A	A4069003	07/2007	07/2008
Bilog antenna	CHASE	CBL 6112A	C2040040	06/09/2007	09/2008
Horn antenna	EMCO	3115	C2042016	11/09/07	09/2008
Loop antenna	ROHDE & SHWARZ	HFH H2 Z2	C2040007	14/09/07	09/2008

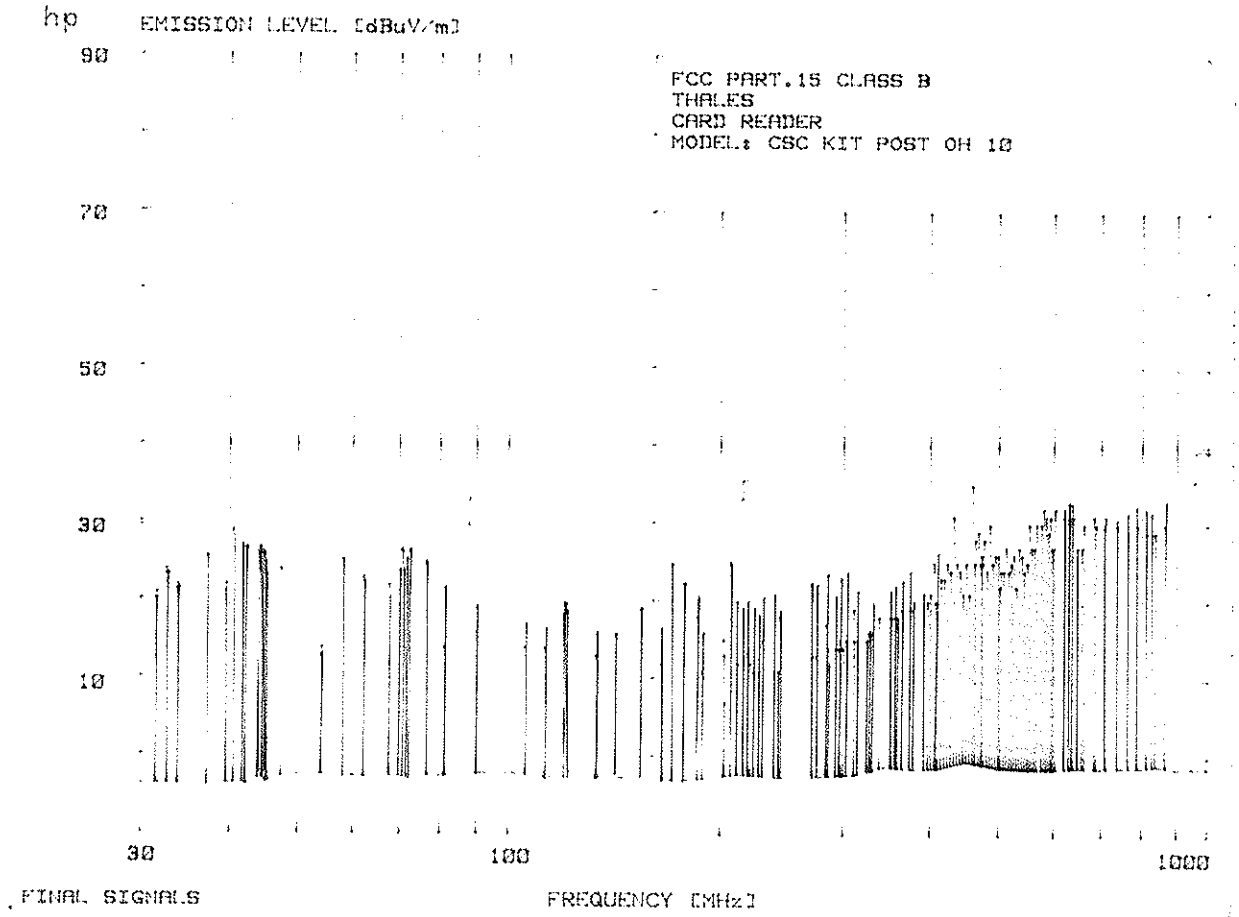
2.3.4 – Uncertainty

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
E field measurement within the band 150kHz-30MHz	4.75 dB	Not defined
Measurement of radiated electric field on the open area test site	5.07 dB	5.2 dB

2.3.5 – Test results

Frequency (MHz)	Level @ 3m (dBµV/m)	Limit @ 3m (dBµV/m)
0.009	50	128.5
0.019	38	122.0
0.066	54	111.2
0.139	44	104.7
0.147	35	104.2
0.153	64	103.9
0.159	60	103.5
0.182	62	102.4
0.231	45	100.3
0.347	52	96.7
0.452	56	94.5
0.551	51	72.7
0.594	54	72.1
0.620	50	71.7
0.717	60	70.4
0.739	58	70.2
0.863	60	68.8
1.007	57	67.5
1.310	61	65.2
1.550	52	63.7
1.790	49	69.5
2.000	45	69.5
2.260	46	69.5
2.500	47	69.5
2.740	55	69.5
2.940	59	69.5
3.220	62	69.5
3.490	47	69.5
3.970	55	69.5
4.347	41	69.5
27.119	42	69.5



10 m radiated measurement graph from 30 to 1000 MHz

Frequency (MHz)	Quasi-peak measurements @ 10m (dBµV/m)	Limits @ 10m (dBµV/m)
42.3	28.6	29.5
71.9	26.3	29.5
447.3	35.1	35.5
625.2	32.6	35.5
786.7	32.0	35.5
871.5	33.1	35.5

No frequency from the equipment higher than 1GHz.

The spurious emissions of the receiver are the same as the transmitter spurious.

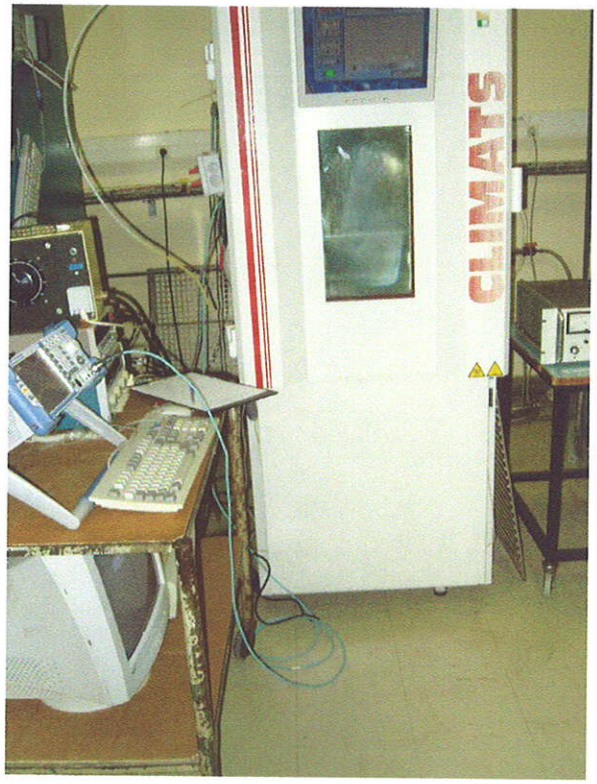
This device complies with FCC part 15B class B as a computer peripheral and a DoC report has been issued separately.

2.4 – Frequency stability over extreme voltage and temperature condition

2.4.1 – General

The equipment was placed in a climatic chamber and power by a variable power source.

2.4.2 – Test setup



2.4.3 – Equipment list

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE & SCHWARZ	FSL6	A4060032	05/2007	05/2008
Climatic chamber	CLIMATS	PCH60	D1024022	02/2007	02/2008
Multimeter	KEITHLEY	2000	A1241084	10/2007	10/2008
Variable transformer	ADB	/	C1184011	Inspected during test	

2.4.4 – Test results

Temperature	Voltage	Measured value	Limit value	Verdict
22°C	115V	13.55960 MHz	Reference	PASS
-30°C	115V	13.55960 MHz	13.55824418 MHz - 13.56095596 MHz	PASS
-20°C	115V	13.55960 MHz		PASS
+50°C	115V	13.55960 MHz		PASS
22°C	93.5V	13.55960 MHz		PASS
22°C	132.5V	13.55960 MHz		PASS
-30°C	93.5V	13.55960 MHz		PASS
-30°C	132.5V	13.55960 MHz		PASS
+50°C	93.5V	13.55960 MHz		PASS
+50°C	132.5V	13.55960 MHz		PASS

End of test report