



TEST REPORT

FCC REGISTRATION NUMBER: 166175
INDUSTRY CANADA NUMBER: 6231A

N° 81575-571409C

ISSUED TO : **THALES TRANSPORT SERVICES**
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**

Apparatus under test :
Product : 13.56MHz RFID modular transmitter
Trade mark : THALES
Manufacturer : THALES
Model : TXV4READER
Reference : Antenna 61988246
Serial number : -
FCC ID : V33TXV4READER
IC : 7678A-TXV4READER

Test date : February 2009

Composition of document : 19 pages

Fontenay-Aux-Roses, the 7th July 2009

The technical manager,

Eric ROUSSEL



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**1 – GENERAL****1.1 – Summary of test results**

Radiated emissions are made in the anechoic chamber, located at Fontenay-Aux-Roses (92260, FRANCE). A description of the test facility is on file with the FCC.

47 CFR Part 15			
Paragraph No.	Name of test	Remarks	Result
§ 15.207 (a)	Power line conducted limits	1	P
§ 15.209 (a) (b) (c) (d) §15.225 (d)	Radiated measurement of spurious emissions Field strength outside of the bands 13.110-14.010 MHz		P
§15.225 (a) (b) (c)	Field strength within the band 13.110-14.010 MHz		P
§15.225 (e)	Frequency stability over extreme temperature and voltage conditions		P

P: Pass, F: Fail, NA : Not Applicable

1: The carrier frequency of the transmitter is 13.56MHz, The measured level at this frequency is above the limits but measurements with antenna replaced by a 50 ohms load comply with the limits.

Note:

The TXV4READER can be used with one of three different antennas.

This report 81575-571409C includes the measurements results for the antenna 61988246 only.

The measurements results for the antenna 61785069 are given in the test report 81575-571409A.

The measurements results for the antenna 2447-609-400 are given in the test report 81575-571409B.

1.2 – References

Measurements were performed in accordance with the following standards :

47 CFR Part 15 of September 9, 2007: 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

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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

Dimensions :
Frequency band : 13.56MHz
Number of channel : 1
Channel spacing : -
User frequency adjustment : no
User power adjustment : no
Type of antenna : Loop antenna
Is the operation point to point? : no
Power supply : 24V DC mother board voltage
12V DC radio module voltage

Cables

Type	EUT port	Long (m)	Shielded	Number of wire
DC power supply	Power supply	2	no	2

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:

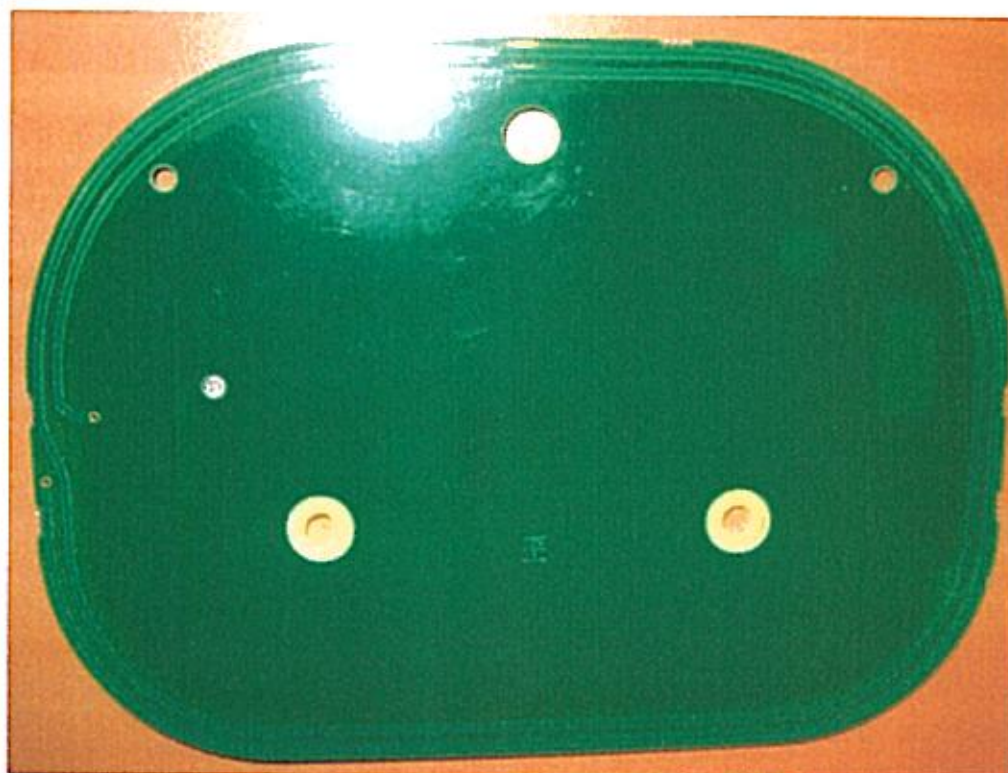
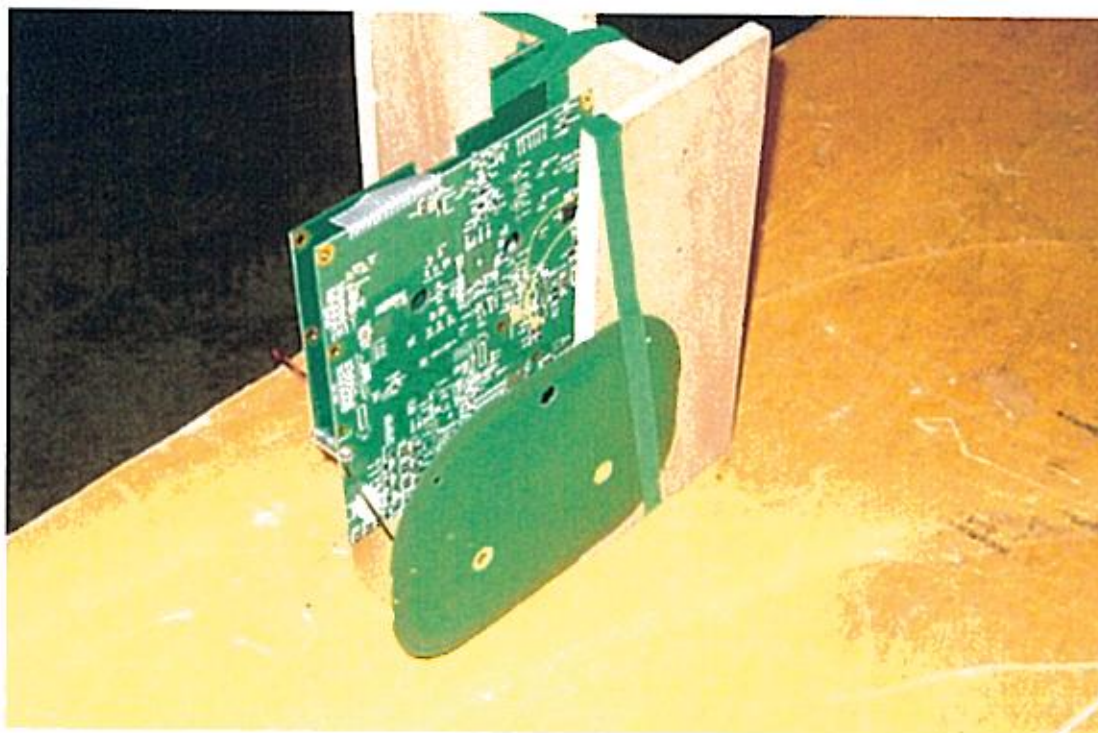
- Maximum transmission power : permanently emission at 13.56MHz with its modulation

The equipment was set up with the following elements:

- The radio module is connected to a mother board (Ref: YJCO417/EN4462_D/CS) from THALES
- Some non-conductive (wood) plates hold the antenna in its usual position
- The antenna used is : Antenna TX pedestal 61988246

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1.3.4 – Photographs of the sample



2- TEST RESULTS

2.1 – Field strength within the band 13.110-14.010MHz

2.1.1 – General

The product has been tested with 24V dc power supply 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

2.1.2 – 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.

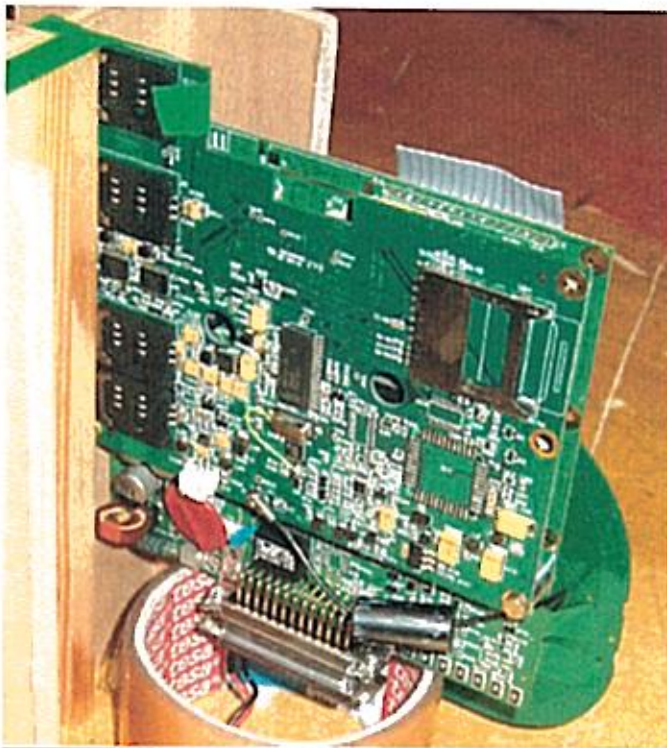
The measuring value has been extrapolated to a 30m distance measured level according to § 15.31 (f) (2) by the following formula:

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

E_{30m} is the field strength at 30m in $\mu V/m$

E_d is the field strength at the measured distance in $\mu V/m$

D is the used distance between antenna and EUT in m



2.1.3 – Equipment list

Description	Manufacturer	Model	Identifier	Cal. Due
EMI receiver	RHODE & SCHWARZ	ESI40	A2642010	04/2009
Spectrum analyseur	ROHDE & SCHWARZ	FSL6	A4060032	08/2009
Semi-anechoic chamber	SIEPEL	C01	D3044008	12/2009
Loop antenna	ROHDE & SHWARZ	HF H2 Z2	C2040007	01/2010
DC power supply	ISO-TECH	IPS1603D	A7042247	/

2.1.4 – Uncertainty

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

2.1.5 – Test results

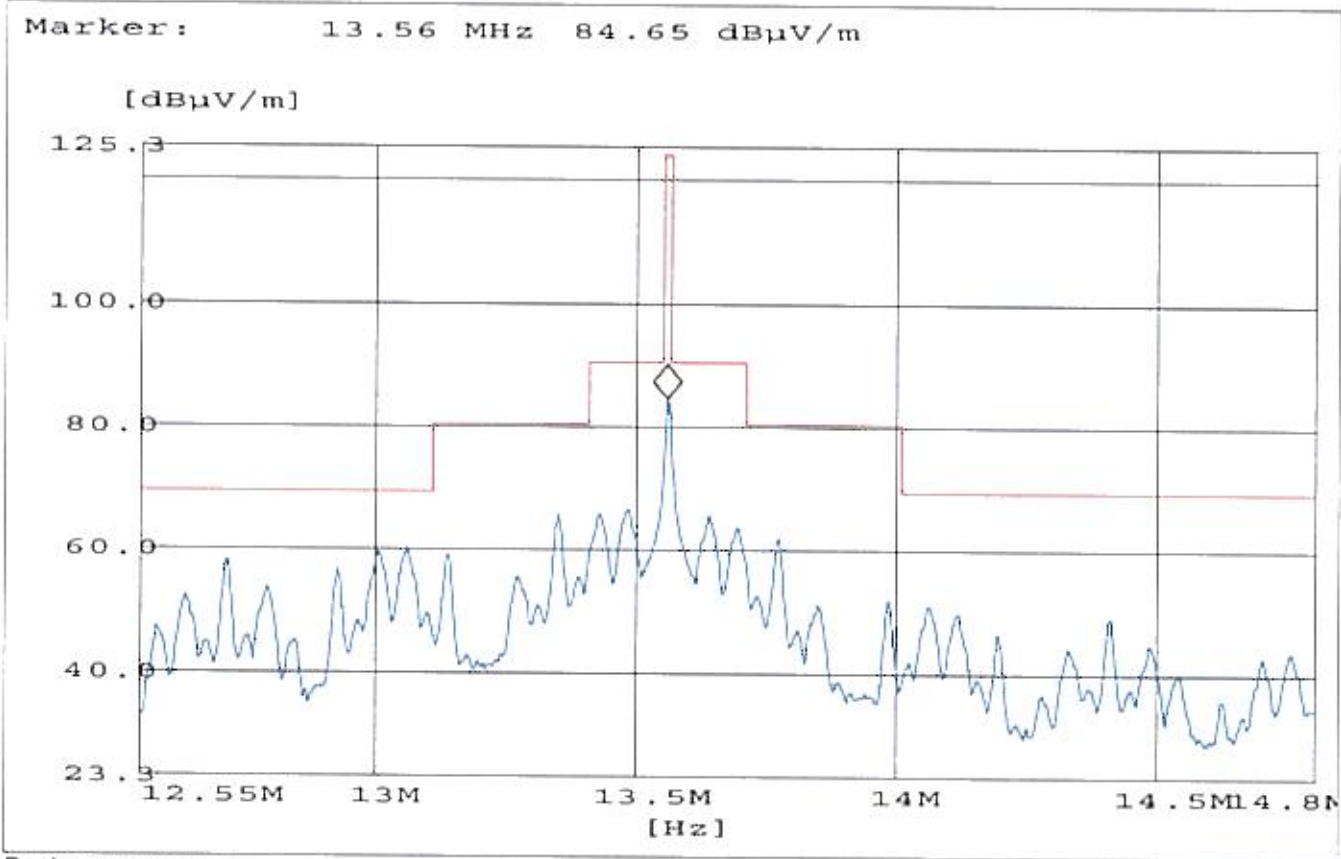
The measure result at 3 m is 84.3 dB μ V/m for 13.56 MHz
The 30 m measure corrected is M@3m - 40dB

Frequency MHz	Maximum Quasi Peak (30m) dB μ V/m	Quasi Peak Limit (30m) dB μ V/m
13.56	44.3	84

2.1.6 – 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 12.6 to 14.8 MHz with RBW=9kHz and VBW=30kHz (measurement @ 3m)



Peak measurement

The 99% occupied bandwidth is 8.0 kHz.

2.2 – Field strength outside the 13.110-14010MHz band

2.2.1 – General

The product has been tested with 24V dc power supply 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.

-Frequency range: 9 kHz to 30 MHz

Measuring Distance: **3 m**

Antenna:

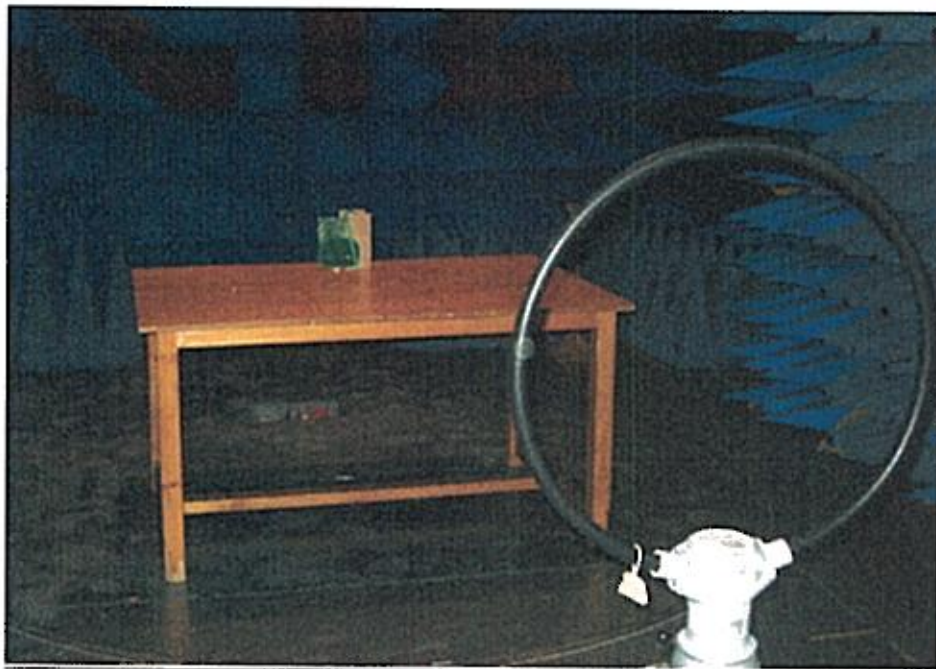
- Loop antenna (9 KHz to 30 MHz)

-Frequency range: 30 MHz to 1000 MHz

Measuring Distance: **3 m**

Antenna:

- biconical (30 MHz to 200 MHz)
- logperiodic (200 MHz to 1000MHz)



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 in horizontal and vertical polarity. 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) or Log periodic (200 to 1000MHz) 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. Pre scans were performed on the EUT put on its three axes to determine the position with maximum radiation.

2.2.2 – Equipment list

Description	Manufacturer	Model	Identifier
EMI receiver	ROHDE & SHWARZ	ESI40	A2642009
Semi-anechoic chamber	SIEPEL	C01	D3044008
Biconical antenna	EATON	96002	C2040010
Logperiodic antenna	AMPLIFIER RESEARCH	AT1080	C2042043
Loop antenna	ROHDE & SHWARZ	HF H2 Z2	C2040007
DC power supply	ISO-TECH	IPS1603D	A7042247

2.2.3 – 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 on the open area test site	5.07 dB	5.2 dB

2.2.4 – Test results

3m radiated measurements from 9 kHz to 30 MHz

Frequency (MHz)	Level Quasi peak @ 3m (dBµV/m)	Limit Quasi peak @ 3m (dBµV/m)
27.12	31.5	69.5

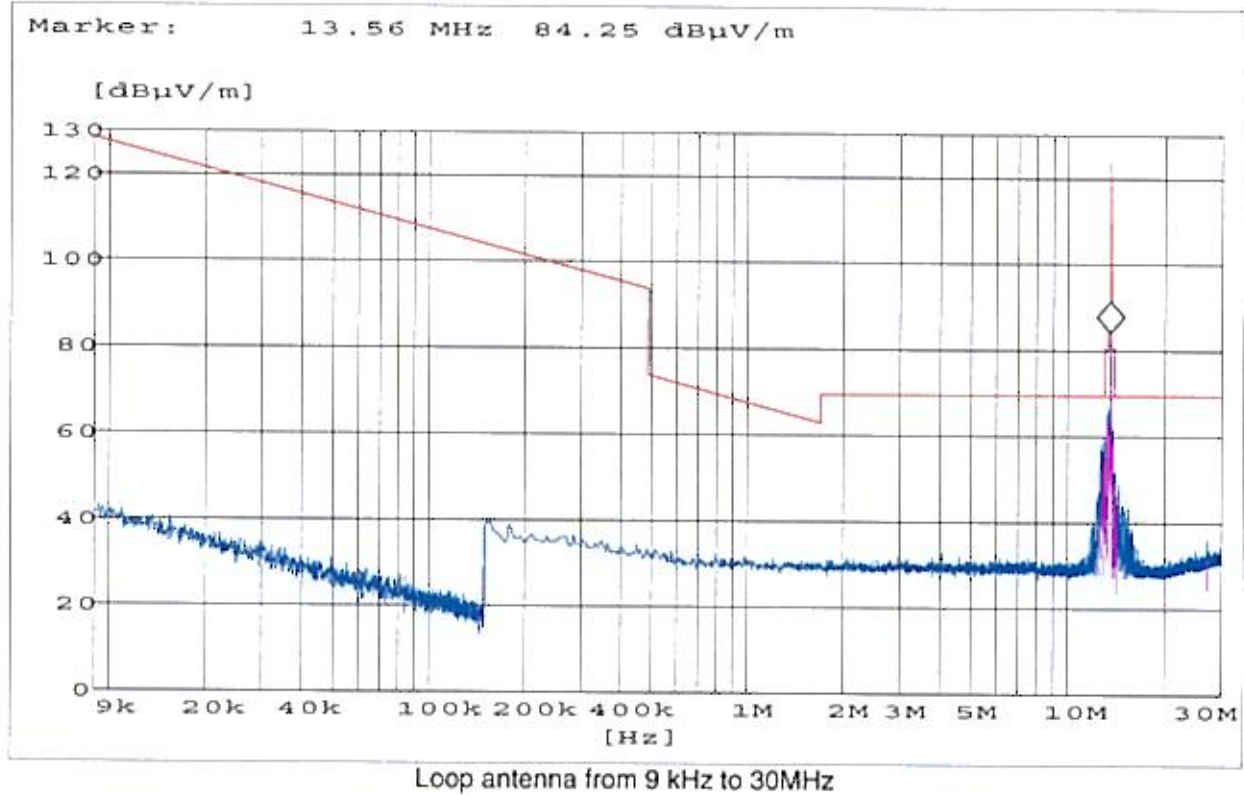
3 m radiated measurements from 30 to 1000 MHz

Frequency (MHz)	Quasi-peak measurements @ 3m (dBµV/m)	Limits Quasi peak @ 3m (dBµV/m)
40.68	29.8	40
149.16	28.1	43.5
257.69	32.6	46
271.19	37.4	46
284.78	30.2	46
298.37	34.7	46

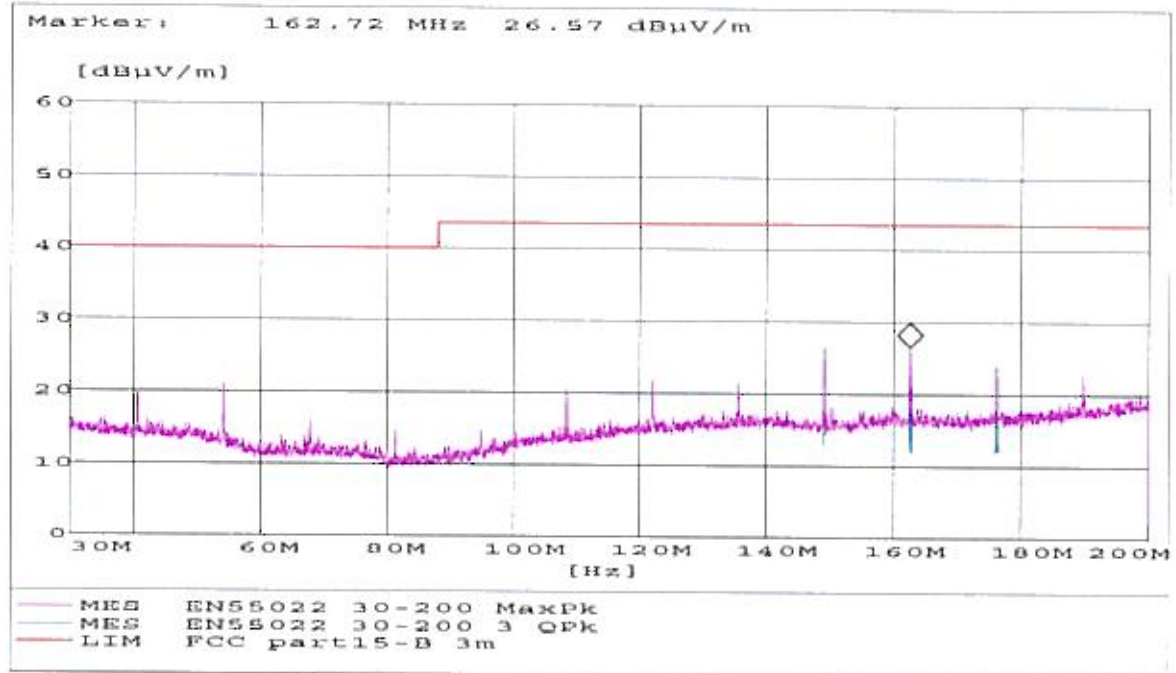
FCC ID : V33TXV4READER
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2.2.5 – Measurements diagrams

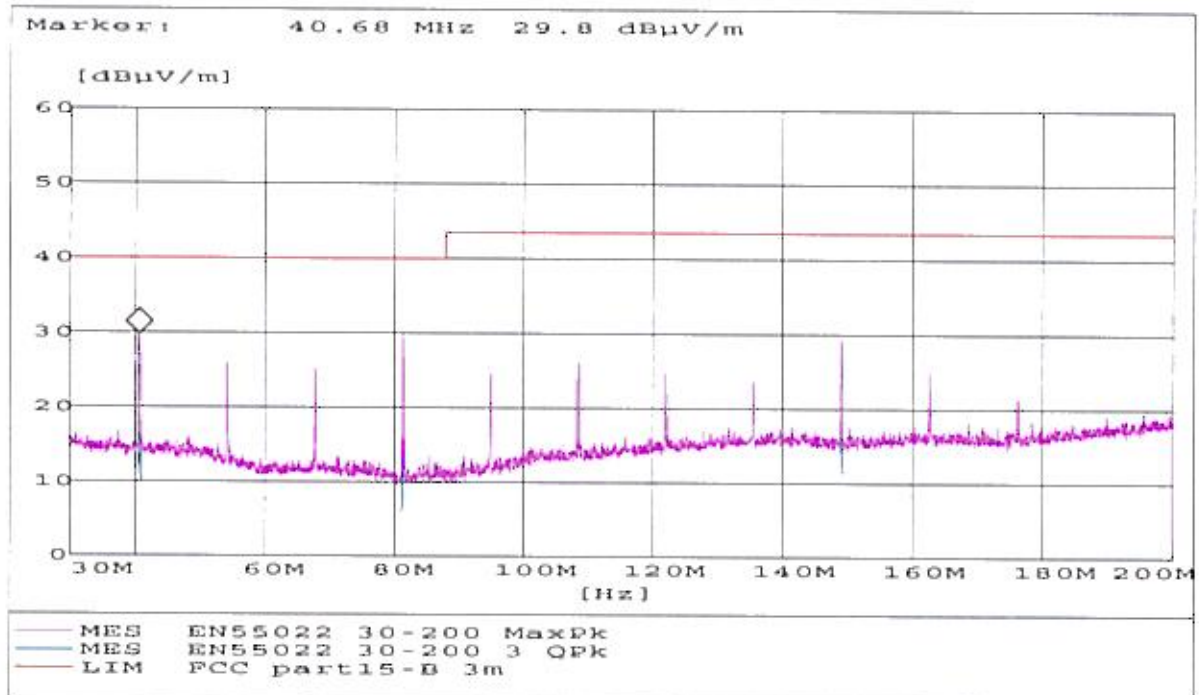
3m radiated measurements from 9 kHz to 30 MHz



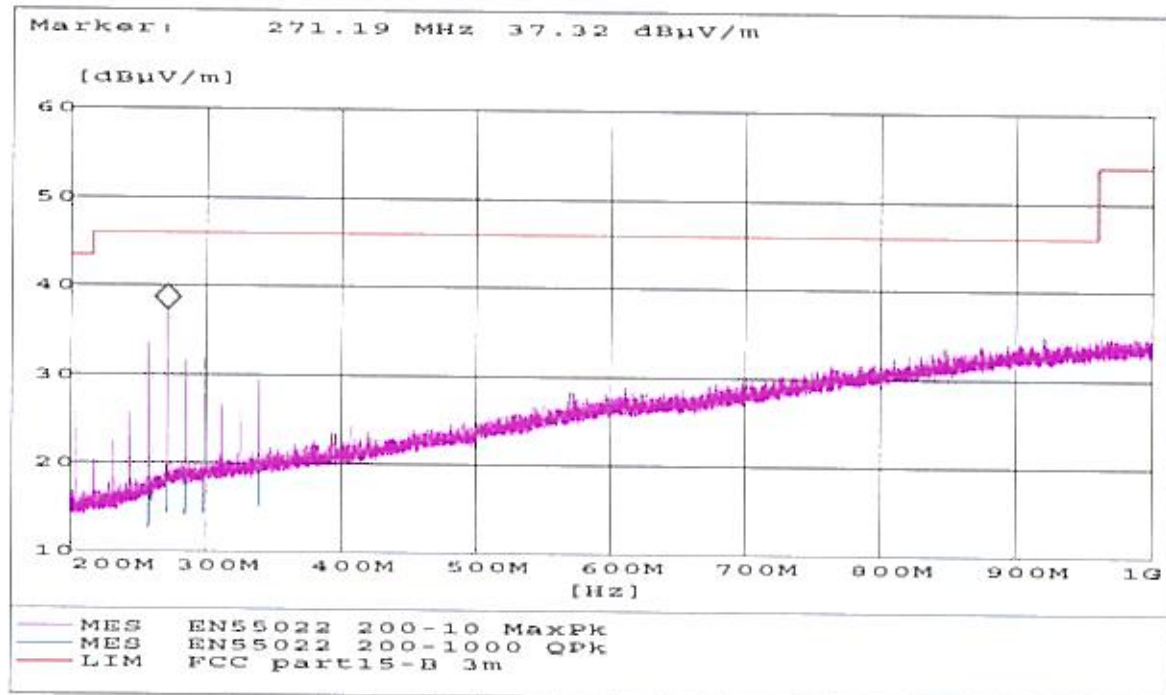
3 m radiated measurements from 30 to 1000 MHz



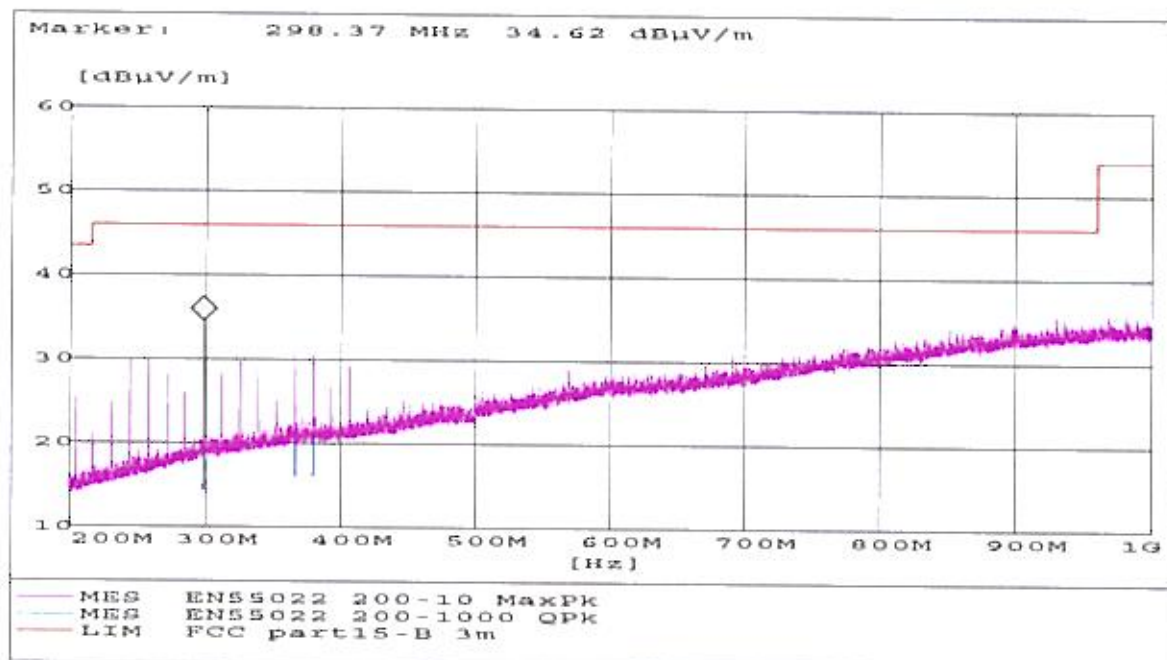
Horizontal antenna from 30MHz to 200MHz



Vertical antenna from 30MHz to 200MHz



Horizontal antenna from 200MHz to 1000MHz



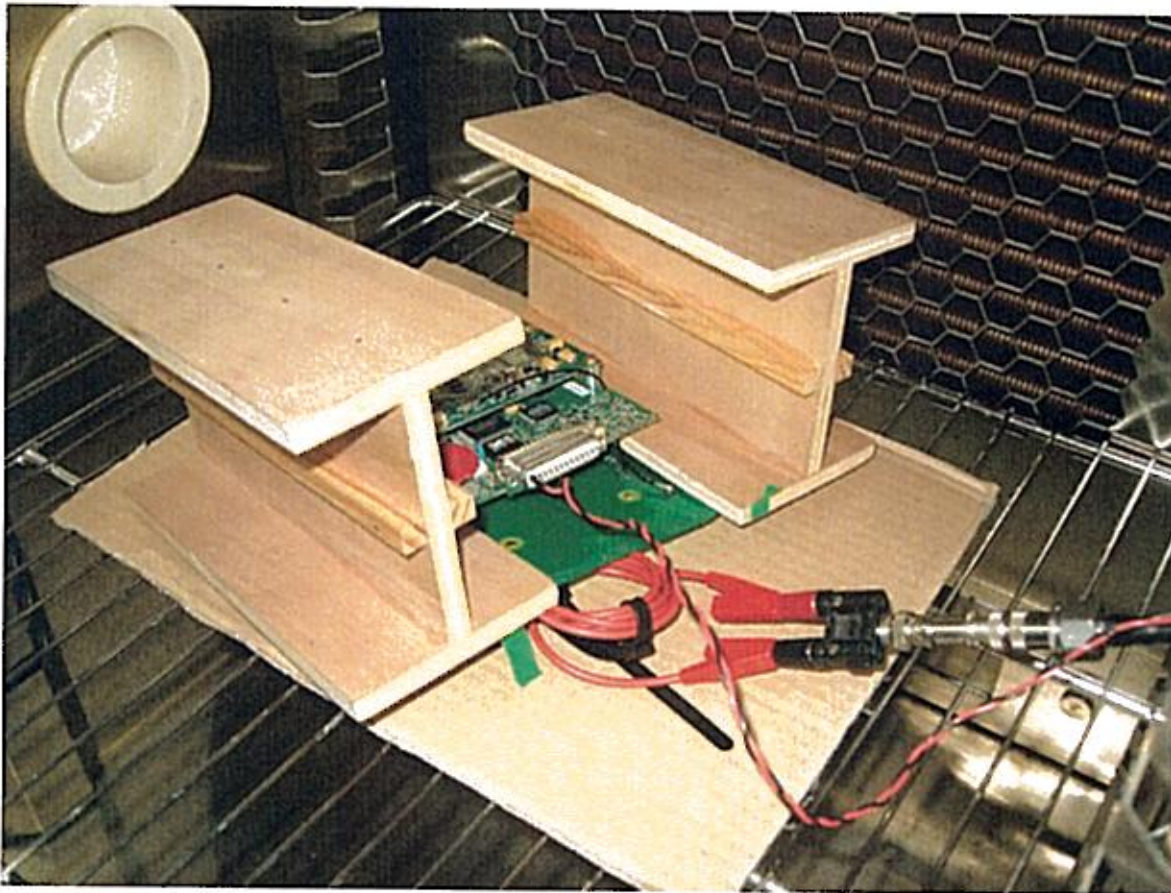
Verical antenna from 200MHz to 1000MHz

2.3 – Frequency stability over extreme voltage and temperature condition

2.3.1 – General

The product has been tested inside a climatic chamber and compared to the FCC part 15 subpart C § 15.225 (e) limits. It was powered by a 24V dc power supply.

2.3.2 – Test setup



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2.3.3 – Equipment list

Description	Manufacturer	Model	Identifier	Cal. Due
Spectrum analyseur	ROHDE & SCHWARZ	FSL6	A4060032	08/2009
Voltmeter	HP	3478A	A1240034	05/2009
Climatic chamber	CLIMATS	EX2223-HB	D1024022	02/2009
DC power supply	ISO-TECH	IPS1603D	A7042247	/

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
Frequency stability	±10 ⁻⁷ of frequency

2.3.5 – Test results

Temperature	Voltage	Frequency	Limits
20 °C	24V	13.561206	Reference
20 °C	20.4V	13.561206	
20 °C	27.6V	13.561206	
-30 °C	24V	13.561245	
-30 °C	20.4V	13.561245	
-30 °C	27.6V	13.561245	
-20 °C	24V	13.561285	
-20 °C	20.4V	13.561285	
-20 °C	27.6V	13.561285	
50 °C	24V	13.561158	
50 °C	20.4 V	13.561166	
50 °C	27.6 V	13.561158	

2.4 – Power line conducted emission test

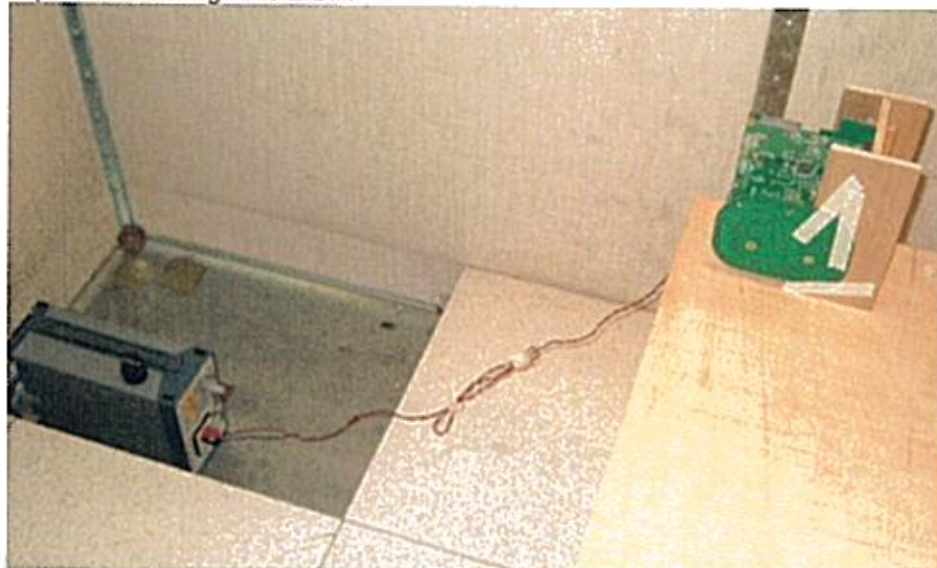
2.4.1 - General

The product has been tested with 24V DC 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.

2.4.2 – 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.



2.4.3 – Equipment list

Description	Manufacturer	Model	Identifier
EMI receiver	ROHDE & SCHWARZ	ESI40	A2642010
V LISN	ROHDE & SCHWARZ	ESH3-Z5	A2322003
Pulse limiter	ROHDE & SCHWARZ	ESH3-Z2	A2649005

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) $\pm x$	CISPR uncertainty limit $\pm y$
Measurement of conducted disturbances in voltage on the power port	3.57 dB	3.6 dB

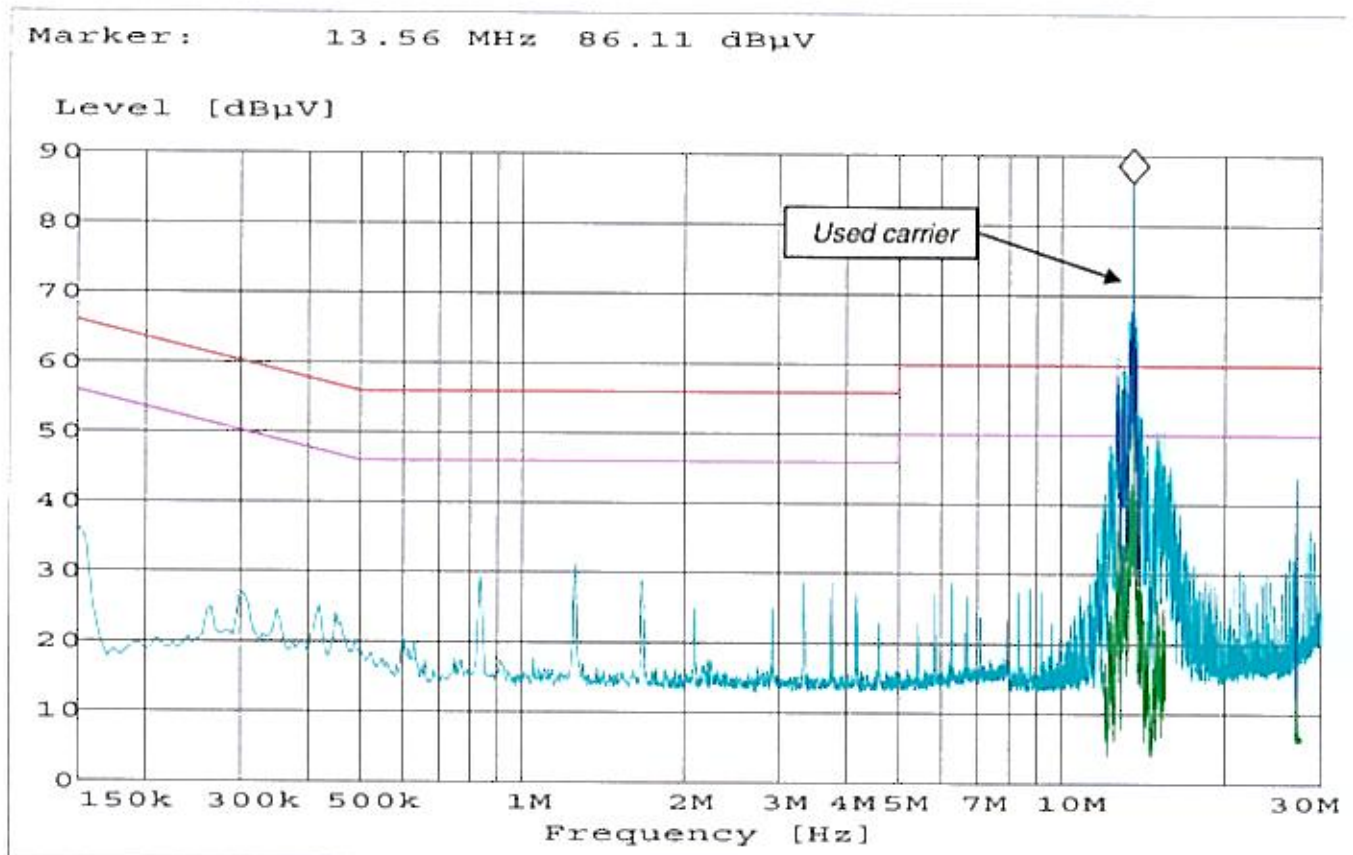
2.4.5 – Test results

Frequency (MHz)	Peak value (dB μ V)	Average value (dB μ V)	Average limit (dB μ V)	Quasi Peak value (dB μ V)	Quasi Peak limit (dB μ V)
0.15	36.9	32.2	56	-	66
1.25	31.1	9.8	46	-	56
3.76	28.9	7.6	46	-	56
6.27	28.9	-	50	-	60
13.56	89.9	79.5	50	89.9	60
27.12	44.0	35.0	50	42.8	60

Disturbances around 13.56MHz are generated by the transmitter antenna, a measurement with the antenna removed and replaced by a load is given to show the compliance in those frequencies, see diagrams on page 19.

2.4.6 – Measurements diagrams

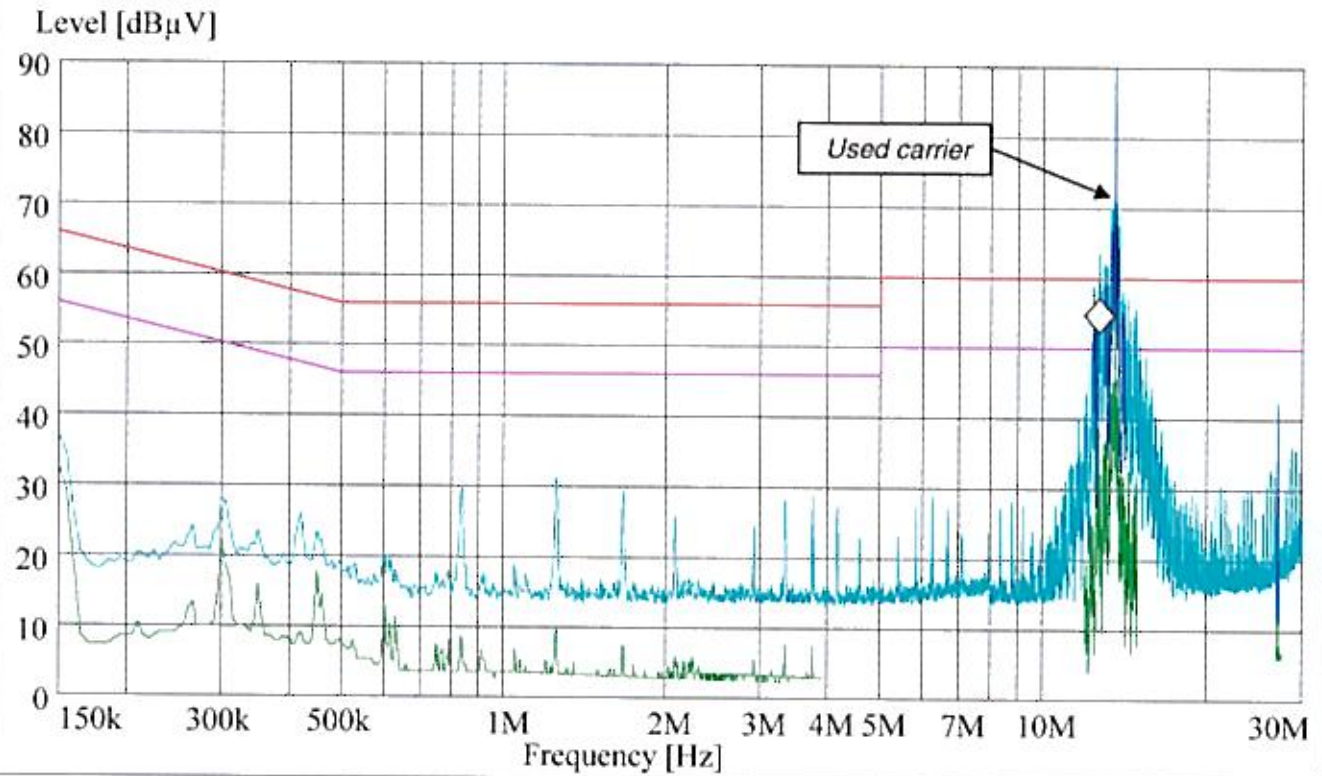
Conducted measurements from 150 kHz to 30 MHz



Line 0V

FCC ID : V33TXV4READER
IC: 7678A-TXV4READER

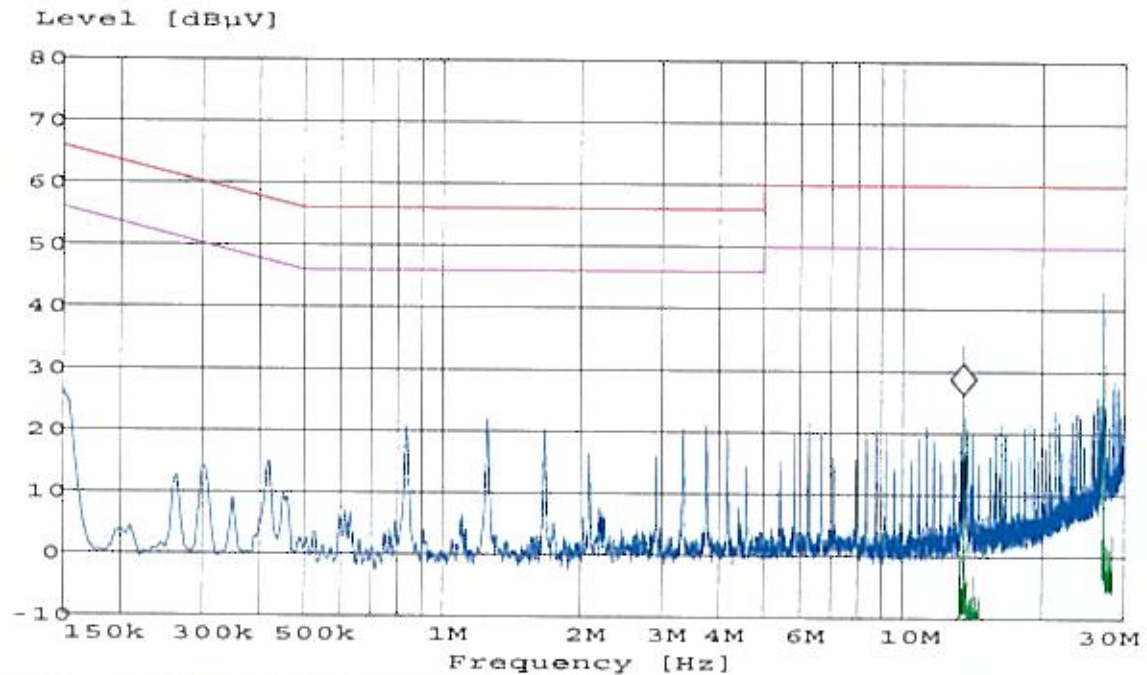
Marker: 12.7 MHz 52.28 dB μ V



Line +24V

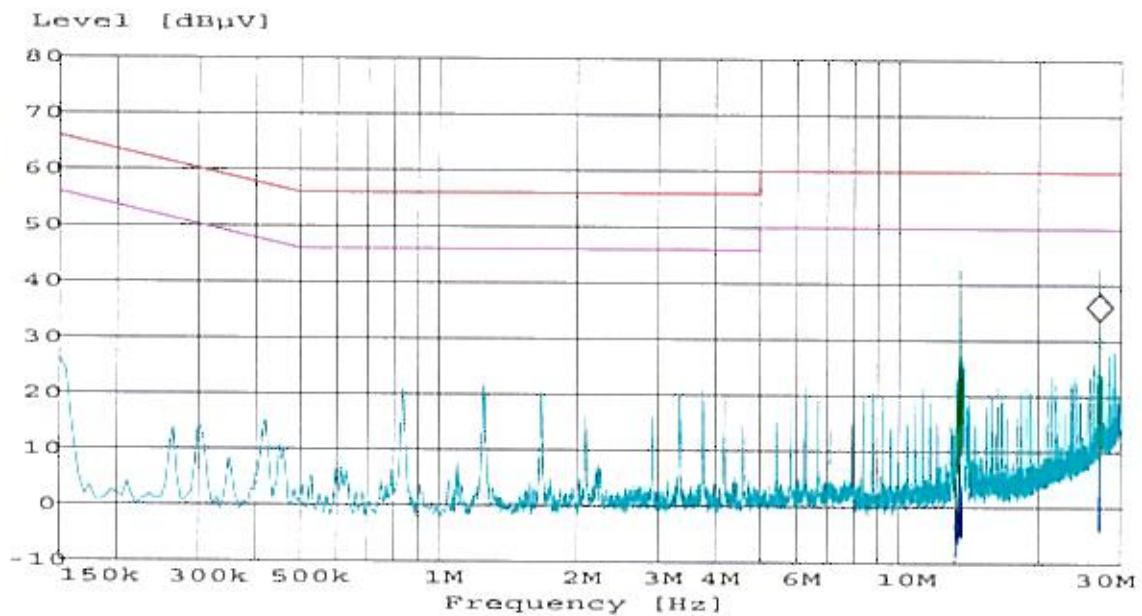
FCC ID : V33TXV4READER
IC: 7678A-TXV4READER

Marker: 13.56 MHz 26.38 dBµV



Line 0V, the antenna is removed

Marker: 27.12 MHz 33.61 dBµV



Line +24V, the antenna is removed

End of test report