

**R051-24-10-104464-2/A Ed. 0**

**RADIO test report**

**according to standard:  
FCC Part 15**

**Equipment under test:  
RFID 13.56 MHZ READER  
404305128**

**FCC ID:  
T2X-V2-CLESS**

**Company:  
PARKEON**

**DISTRIBUTION: Mr MAUREL**

**Company: PARKEON**

**Number of pages: 33 including 4 annexes**

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			Name	Visa	Name	Visa
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This document is the result of testing a specimen or a sample of the product submitted. It does not imply an assessment of the conformity of the whole manufactured products of the tested sample.



**PRODUCT:** **RFID 13.56 MHz READER**

**Reference / model:** 404305128 (MODULE)  
404304686 (AGATE CONTACTLESS ANTENNA)

**Trade mark:** PARKEON

**Serial number:** S020T300780B (MODULE)  
S0250304499D (AGATE CONTACTLESS ANTENNA)

**MANUFACTURER:** PARKEON

**COMPANY SUBMITTING THE PRODUCT:**

**Company:** PARKEON

**Address:** 6 rue Isaac Newton  
25075 BESANCON Cedex 9  
FRANCE

**Responsible:** Mr MAUREL

**DATE(S) OF TEST:** 16 to 18 November 2010

**TESTING LOCATION:** EMITECH ATLANTIQUE laboratory at ANGERS (49) FRANCE  
EMITECH ATLANTIQUE open area test site in LA POUEZE (49)  
FRANCE  
FCC Registration Number: 101696/FRN: 0006 6490 08

**TESTED BY:** M. DUMESNIL

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## **1. INTRODUCTION**

This report presents the results of radio test carried out on the following equipment:  
RFID 13.56 MHZ READER – 404305128 in accordance with normative reference.

## **2. PRODUCT DESCRIPTION**

Class:	B (residential environment)
Utilization:	RFID reader
Antenna type and gain:	Dedicated antenna, unknown gain
Operating frequency range:	from 13.553 MHz to 13.567 MHz
Number of channels:	1
Channel spacing:	not concerned
Frequency generation:	crystal
Modulation:	ASK
Power source:	115 V.a.c

Power level, frequency range and channels characteristics are not user adjustable.  
The details pictures of the product and the circuit boards are joined with this file.

## **3. NORMATIVE REFERENCE**

The standards and testing methods related throughout this report are those listed below.  
They are applied on the whole test report even though the extensions (version, date and amendment) are not repeated.

FCC Part 15 (2009)	Radio Frequency Devices
ANSI C63.4 (2003)	Methods of Measurement of Radio-Noise Emissions from Low-voltage Electrical and Electronics Equipment in the range of 9 kHz to 40 GHz.

#### **4. TEST METHODOLOGY**

Radio performance tests procedures given in part 15:

Subpart B –Unintentional Radiators

Paragraph 107: Conducted limits

Paragraph 109: Radiated emission limits

Paragraph 111: Antenna power conduction limits for receivers

Subpart C – Intentional Radiators

Paragraph 203: Antenna requirement

Paragraph 205: Restricted bands of operation

Paragraph 207: Conducted limits

Paragraph 209: Radiated emission limits; general requirements

Paragraph 212: Modular transmitter

Paragraph 215: Additional provisions to the general radiated emission limitations

Paragraph 225: Operation within the band 13.110-14.010 MHz

#### **5. ADD ATTACHMENTS FILES**

***“Synoptic “***

***“Block diagram “***

***“External photos and Product labeling “***

***“Assembly of components “***

***“Internal photos “***

***“Layout pcb “***

***“Bil of materials “***

***“Schematics “***

***“Product description “***

***“User guide “***

## 6. TESTS RESULTS SUMMARY

### 6.1 unintentional radiator (subpart B)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.107	CONDUCTED LIMITS	X				
FCC Part 15.109	RADIATED EMISSION LIMITS	X				Note 4 and 5
FCC Part 15.111	ANTENNA POWER CONDUCTED LIMITS FOR RECEIVER			X		

NAp: Not Applicable

NAs: Not Asked

### 6.2 intentional radiator (subpart C)

Test procedure	Description of test	Respected criteria?				Comment
		Yes	No	NAp	NAs	
FCC Part 15.203	ANTENNA REQUIREMENT	X				Note 1
FCC Part 15.205	RESTRICTED BANDS OF OPERATION	X				
FCC Part 15.207	CONDUCTED LIMITS	X				
FCC Part 15.209	RADIATED EMISSION LIMITS; general requirements	X				Note 2
FCC Part 15.212	MODULAR TRANSMITTERS	X				
FCC part 15.215	ADDITIONAL PROVISIONS TO THE GENERAL RADIATED EMISSION LIMITATIONS					
	(a) Alternative to general radiated emission limits	X				
	(b) Unwanted emissions outside of §15.225 frequency bands	X				Note 3
	(c) 20 dB bandwidth and band-edge compliance			X		
FCC Part 15.225	OPERATION WITHIN THE BAND 13.110-14.010 MHZ					
	(a) Field strength within the band 13.553-13.567 MHz	X				Note 4 and 5
	(b) Field strength within the bands 13.410-13.553 MHz and 13.567-13.710 MHz	X				Note 4 and 5
	(c) Field strength within the bands 13.110-13.410 MHz and 13.710-14.010 MHz	X				Note 4 and 5
	(d) Field strength outside the band 13.110-14.010 MHz	X				Note 4 and 5
	(e) Carrier frequency tolerance	X				Note 4 and 5
	(f) Powered tags			X		Note 4 and 5

NAp: Not Applicabl

NAs: Not Asked

*Note 1: Dedicated antenna. Professionally installed equipment.*

*Note 2: See FCC part 15.225 (d).*

*Note 3: See FCC part 15.209. Unwanted emissions levels are all below the fundamental emission field strength level.*

*Note 4: Openings in the case have been sealed with copper scotch to simulate the closed metal box the module will be fitted in.*

*Note 5: This test has been realized with:*

- a ferrite Würth Elektronik reference 7427122 with two turns on the power cable.*
- two ferrites Würth Elektronik on the antenna cable; the first reference 7427153 with a single turn and the second reference 74271132 with three turns (see photos in annex 4).*

### **Conclusion:**

The sample of RFID 13.56 MHZ READER – 404305128 submitted to the tests complies with the regulations of the standard FCC Part 15 in accordance with the limits or criteria defined in this report.

**7. MEASUREMENT OF THE CONDUCTED DISTURBANCES****Standard:** FCC Part 15**Test procedure:** Paragraph 15.107**Limits:** Class B**Test equipments:**

TYPE	BRAND	EMITECH NUMBER
AC Power supply ALT 2000	K. SERRAS	2441
Test receiver ESH3	Rohde & Schwarz	1058
Pulse limiter ESH3-Z2	Rohde & Schwarz	0976
Artificial main network L3-25	PMM	0834
Spectrum analyzer FSEA	Rohde & Schwarz	5071
Transient limiter 11947 A	Hewlett Packard	1092
50 $\Omega$ resistor load 3018 NM	Inmet	1953

**Software used:** BAT-EMC V3.5.0.2**Test set up:**

The test unit is placed on a wooden table, 0.8 m over an horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane.

The equipment is powered with the AC power operating voltage of 115 V / 60 Hz.

The antenna of the EUT is replaced by a 50  $\Omega$  resistor load (see photos in annex 3).

**Frequency range:** 150 kHz - 30 MHz**Detection mode:** Peak / Quasi-Peak / Average**Bandwidth:** 10 kHz (Peak)  
9 kHz (Quasi-Peak / Average)**Equipment under test operating condition:**

The equipment is blocked in standby mode.



## Results:

### Measurement on the mains power supply:

The measurement is made with peak detector.

Curve N° 1: measurement on the Neutral with peak detector

Curve N° 2: measurement on the Line with peak detector

The frequencies which are not 6 dB under the Quasi-Peak limit are analyzed with Quasi-Peak and Average detector.

The results are noted if necessary in the following tables and on the following curves.

Measurement with Quasi-Peak detector:

FREQUENCIES (MHz)	QUASI-PEAK		
	LIMITS (dB $\mu$ V)	NEUTRAL (dB $\mu$ V)	LINE (dB $\mu$ V)
16.22	60	49	48.5

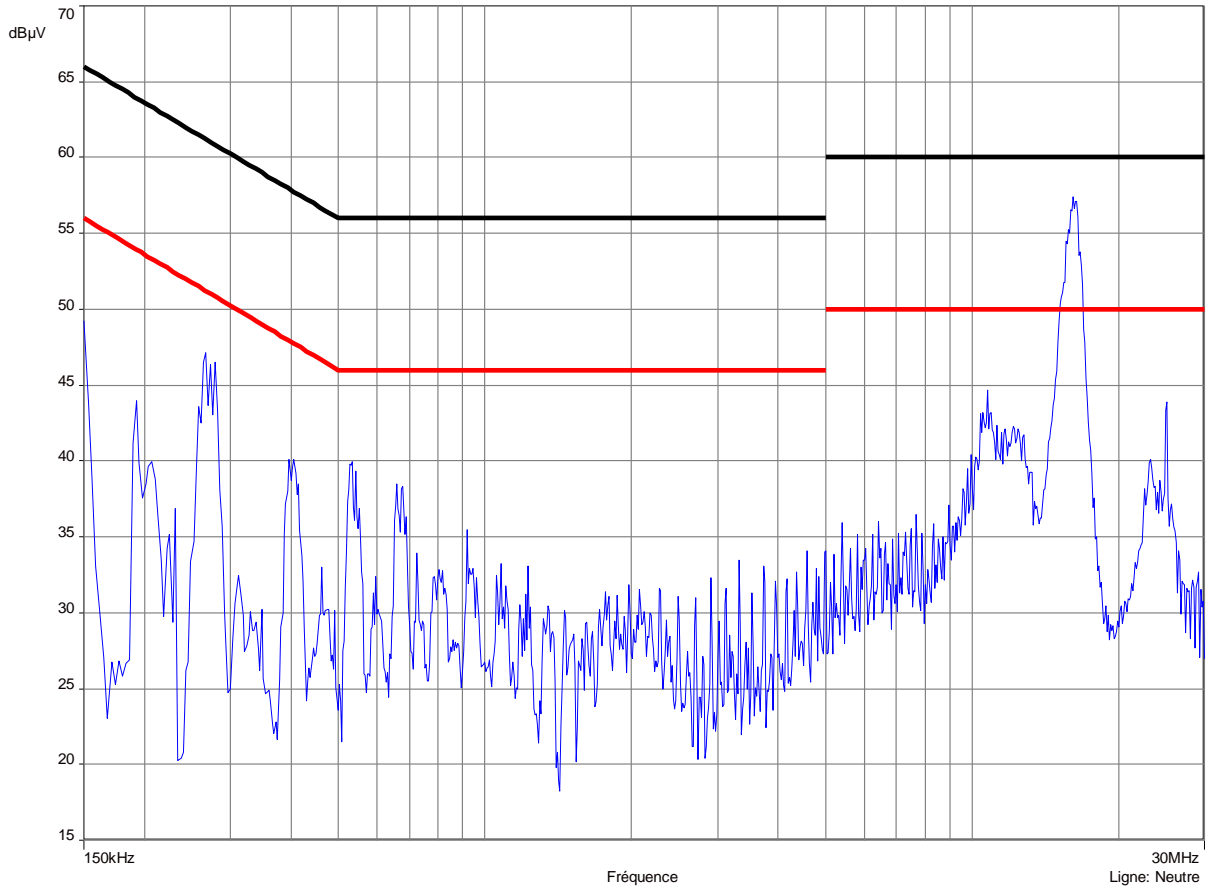
Curve N° 3: average measurement on the Neutral, for the frequency range: 0.15 MHz to 0.3 MHz and from 14.8 MHz to 17.8 MHz.

Curve N° 4: measurement on the Line, for the frequency range: 0.15 MHz to 0.3 MHz and from 14.8 MHz to 17.8 MHz.

# CURVE N°1.:

Peak measurement on the Neutral.

*The RF emission from the EUT is OFF.*



RBW = 10 kHz

VBW = 10 kHz

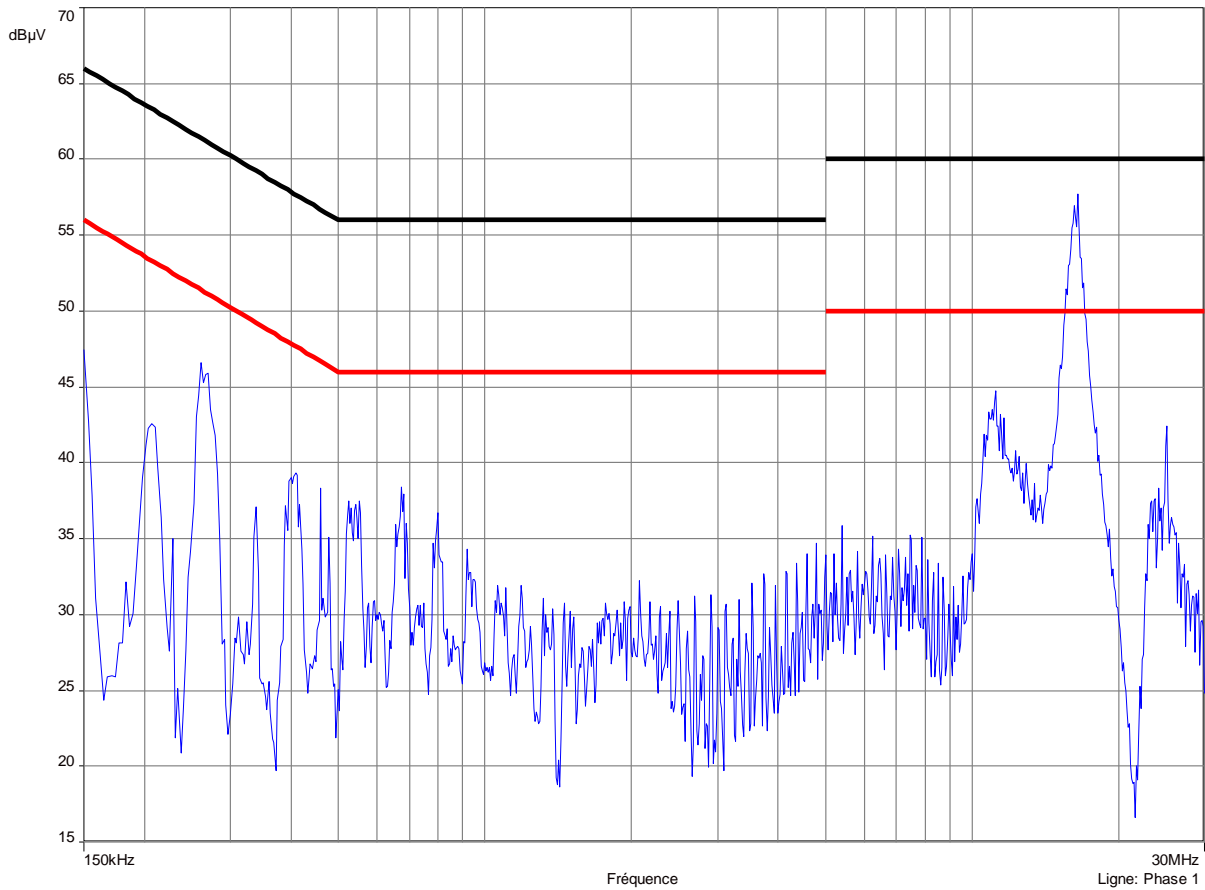
Sweep time = 500 ms/MHz

Max-Hold mode = 6 s

## CURVE N°2.:

Peak measurement on the Line.

*The RF emission from the EUT is OFF.*



RBW = 10 kHz

VBW = 10 kHz

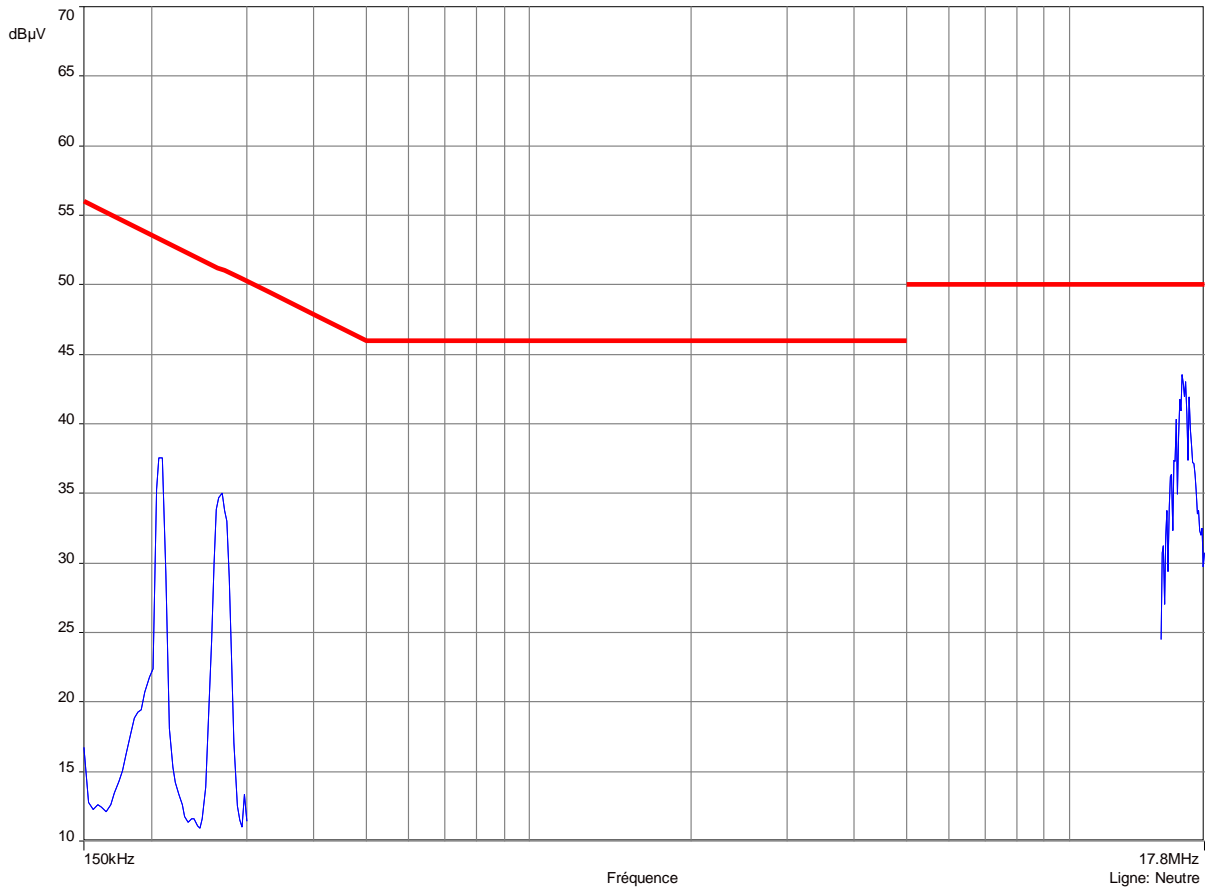
Sweep time = 500 ms/MHz

Max-Hold mode = 6 s

### CURVE N°3.:

Average measurement on the Neutral, from 0.15 MHz to 0.3 MHz  
and from 14.8 MHz to 17.8 MHz.

*The RF emission from the EUT is OFF.*



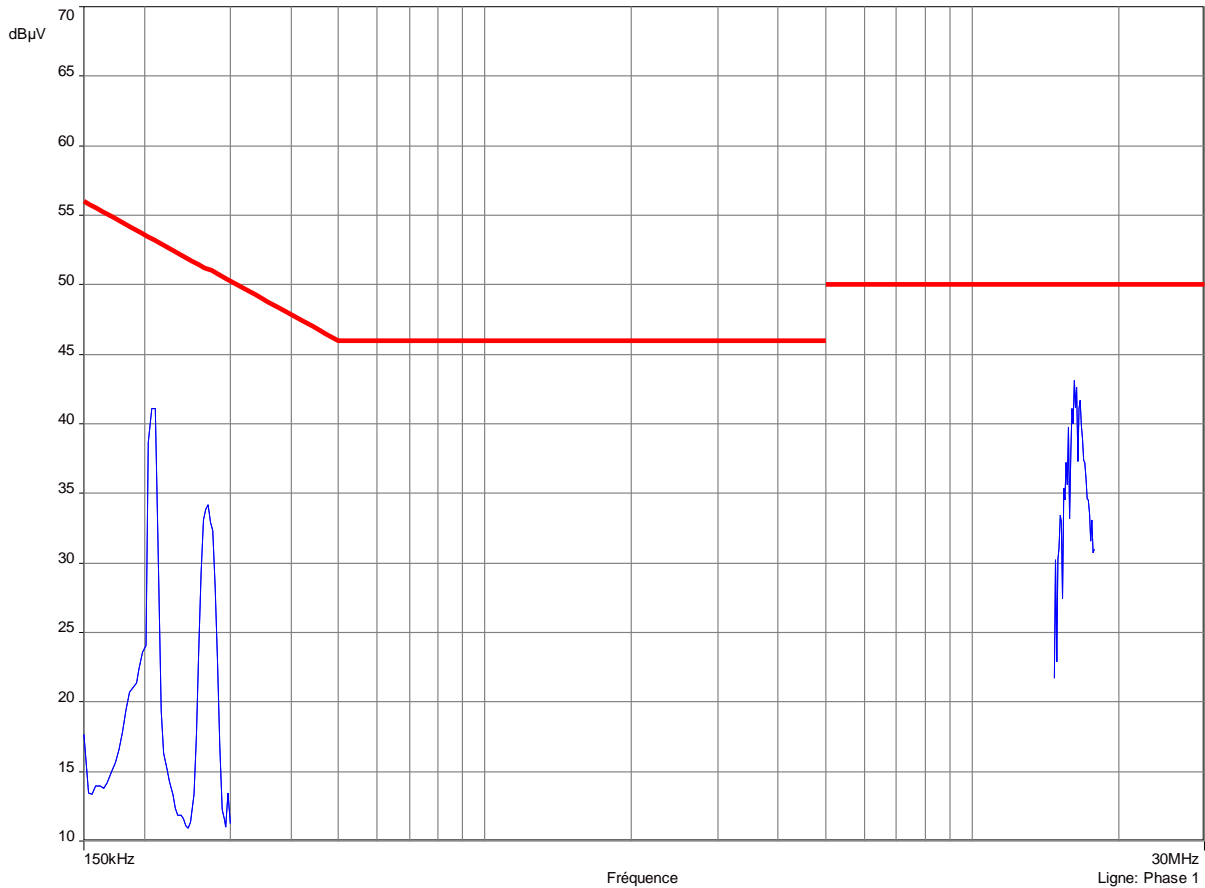
RBW = 9 kHz

Sweep time = 100 ms/pts

## CURVE N°4.:

Average measurement on the Line, from 0.15 MHz to 0.3 MHz  
and from 14.8 MHz to 17.8 MHz.

*The RF emission from the EUT is OFF.*



RBW = 9 kHz

Sweep time = 100 ms/pts

## Test conclusion:

RESPECTED STANDARD

**8. RADIATED EMISSION LIMITS**

**Standard:** FCC Part 15

**Test procedure:** paragraph 109

**Limit class:** Class B

**Test equipments:**

TYPE	BRAND	EMITECH NUMBER
Test receiver ESH3	Rohde & Schwarz	1058
Test receiver ESVS10	Rohde & Schwarz	1219
Spectrum analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna HP 11966 C	Hewlett Packard	0728
Log periodic antenna HL 223	Rohde & Schwarz	1999
Open area test site	EMITECH	1274
Multimeter 77-2	Fluke	0812
Variac R213	Dereix	1419
Meteo station meteostar	Bioblock Scientific	0943

**Test set up:**

The system is tested in an open area test site (OATS).

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuths correspond to the front of the equipment under test (see photos in annex 3).

**Frequency range:** From 9 kHz to 1000 MHz. The highest frequency used is 27 MHz.

**Detection mode:** Quasi-peak ( $F < 1$  GHz)

**Bandwidth:** 120 kHz ( $F < 1$  GHz)

**Distance of antenna:** 3 meters

**Antenna height:** 1 to 4 meters

**Antenna polarization:** vertical and horizontal (only the highest level is recorded)

**Equipment under test operating condition:**

The equipment is blocked in standby mode.

### Results:

Ambient temperature (°C): 15

Relative humidity (%): 75

Power source: 115 Va.c through a variac

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
35.8	QP	100	220	120	V	37.6	40	2.4
55	QP	100	94	120	V	33.9	40	6.1
73.26	QP	100	77	120	V	25.8	40	14.2
144.30	QP	221	100	120	H	40.1	43.5	3.4
152.50	QP	220	89	120	H	36.9	43.5	6.6
161.60	QP	201	234	120	H	34.5	43.5	9
304.20	QP	113	134	120	H	37.2	46	8.8
528.82	QP	157	340	120	H	27	46	19

*Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.*

### Test conclusion:

RESPECTED STANDARD

**9. MEASUREMENT OF THE CONDUCTED DISTURBANCES****Standard:** FCC Part 15**Test procedure:** Paragraph 15.207**Test equipments:**

TYPE	BRAND	EMITECH NUMBER
AC Power supply ALT 2000	K. SERRAS	2441
Test receiver ESH3	Rohde & Schwarz	1058
Pulse limiter ESH3-Z2	Rohde & Schwarz	0976
Artificial main network L3-25	PMM	0834
Spectrum analyzer FSEA	Rohde & Schwarz	5071
Transient limiter 11947 A	Hewlett Packard	1092
50 $\Omega$ resistor load 3018 NM	Inmet	1953

**Software used:** BAT-EMC V3.5.0.2**Test set up:**

The test unit is placed on a wooden table, 0.8 m over an horizontal reference plane and 0.4 m from a vertical reference plane. It is powered by an artificial main network placed on the ground reference plane.

The equipment is powered with the AC power operating voltage of 115 V / 60 Hz.

The antenna of the EUT is replaced by a 50  $\Omega$  resistor load (see photos in annex 3).

**Frequency range:** 150 kHz - 30 MHz**Detection mode:** Peak / Quasi-Peak / Average**Bandwidth:** 10 kHz (Peak)  
9 kHz (Quasi-Peak / Average)**Equipment under test operating condition:**

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.



## Results:

### Measurement on the mains power supply:

The measurement is made with peak detector.

Curve N° 5: measurement on the Neutral with peak detector

Curve N° 6: measurement on the Line with peak detector

The frequencies which are not 6 dB under the Quasi-Peak limit are analyzed with Quasi-Peak and Average detector.

The results are noted if necessary in the following tables and on the following curves.

Measurement with Quasi-Peak detector:

FREQUENCIES (MHz)	QUASI-PEAK		
	LIMITS (dB $\mu$ V)	NEUTRAL (dB $\mu$ V)	LINE (dB $\mu$ V)
16.22	60	49.5	48.9

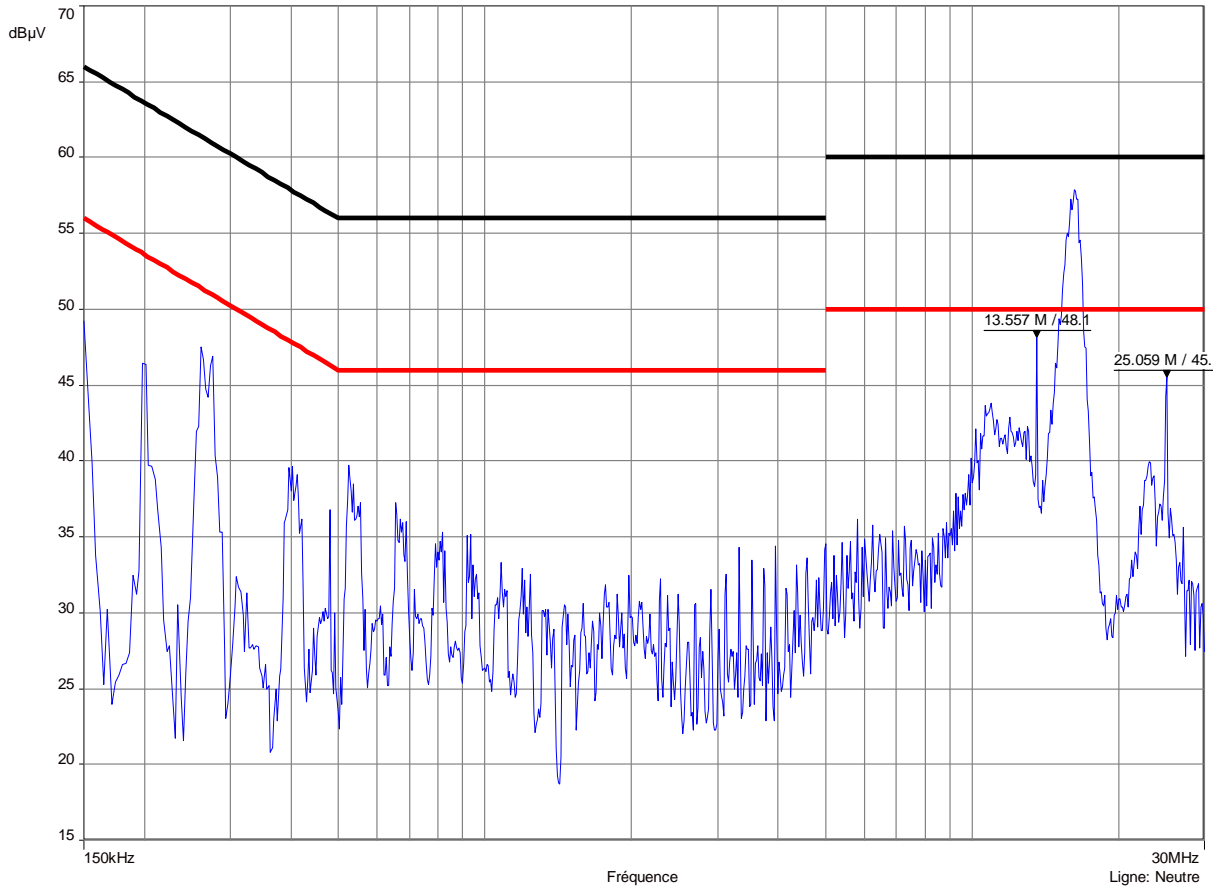
Curve N° 7: average measurement on the Neutral, for the frequency range: 0.15 MHz to 0.3 MHz, from 11.1 MHz to 11.3 MHz, from 13.5 MHz to 13.6 MHz, from 14.8 MHz to 17.8 MHz and from 25 MHz to 25.1 MHz.

Curve N° 8: average measurement on the Line, for the frequency range: 0.15 MHz to 0.3 MHz, from 11.1 MHz to 11.3 MHz, from 13.5 MHz to 13.6 MHz, from 14.8 MHz to 17.8 MHz and from 25 MHz to 25.1 MHz.

# CURVE N°5.:

Peak measurement on the Neutral.

*The RF emission from the EUT is ON.*



RBW = 10 kHz

VBW = 10 kHz

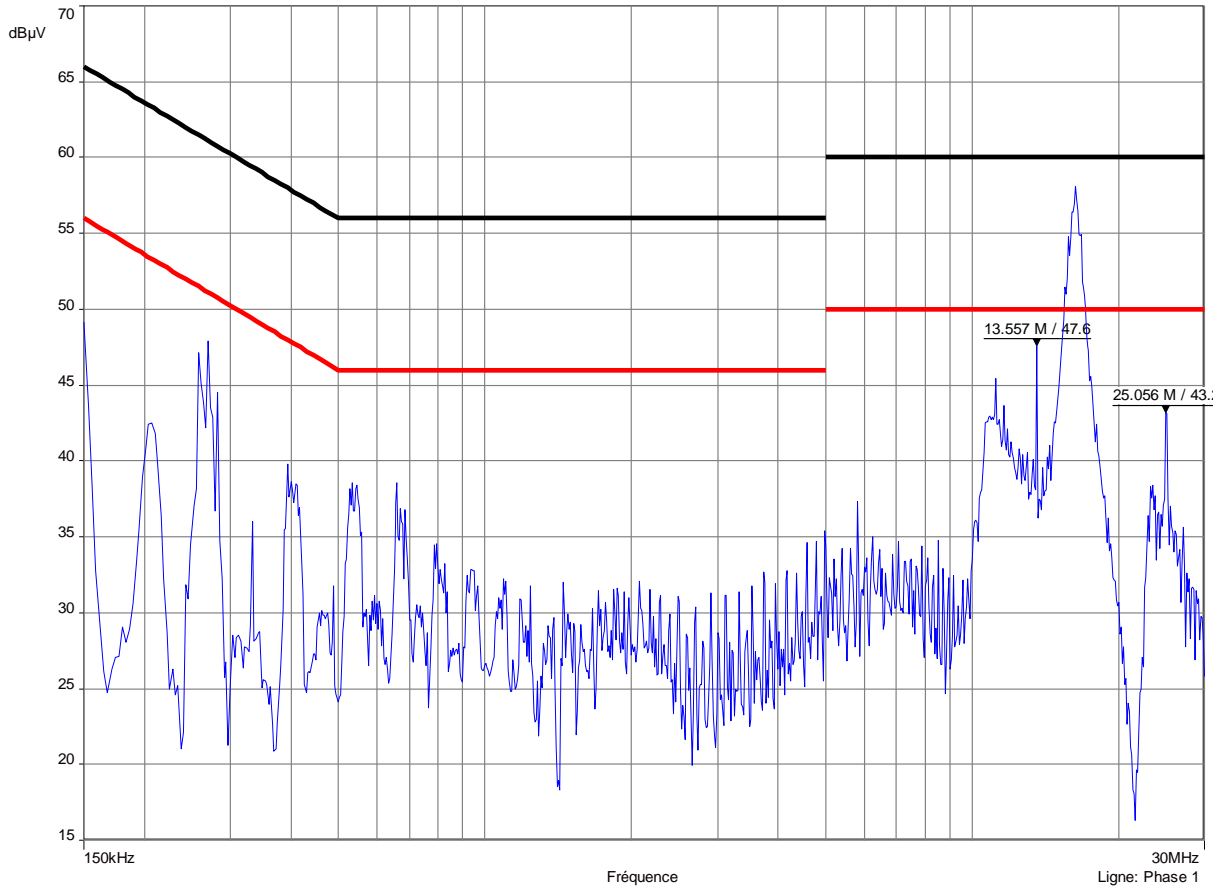
Sweep time = 500 ms/MHz

Max-Hold mode = 6s

## CURVE N°6.:

Peak measurement on the Line.

*The RF emission from the EUT is ON.*



RBW = 10 kHz

VBW = 10 kHz

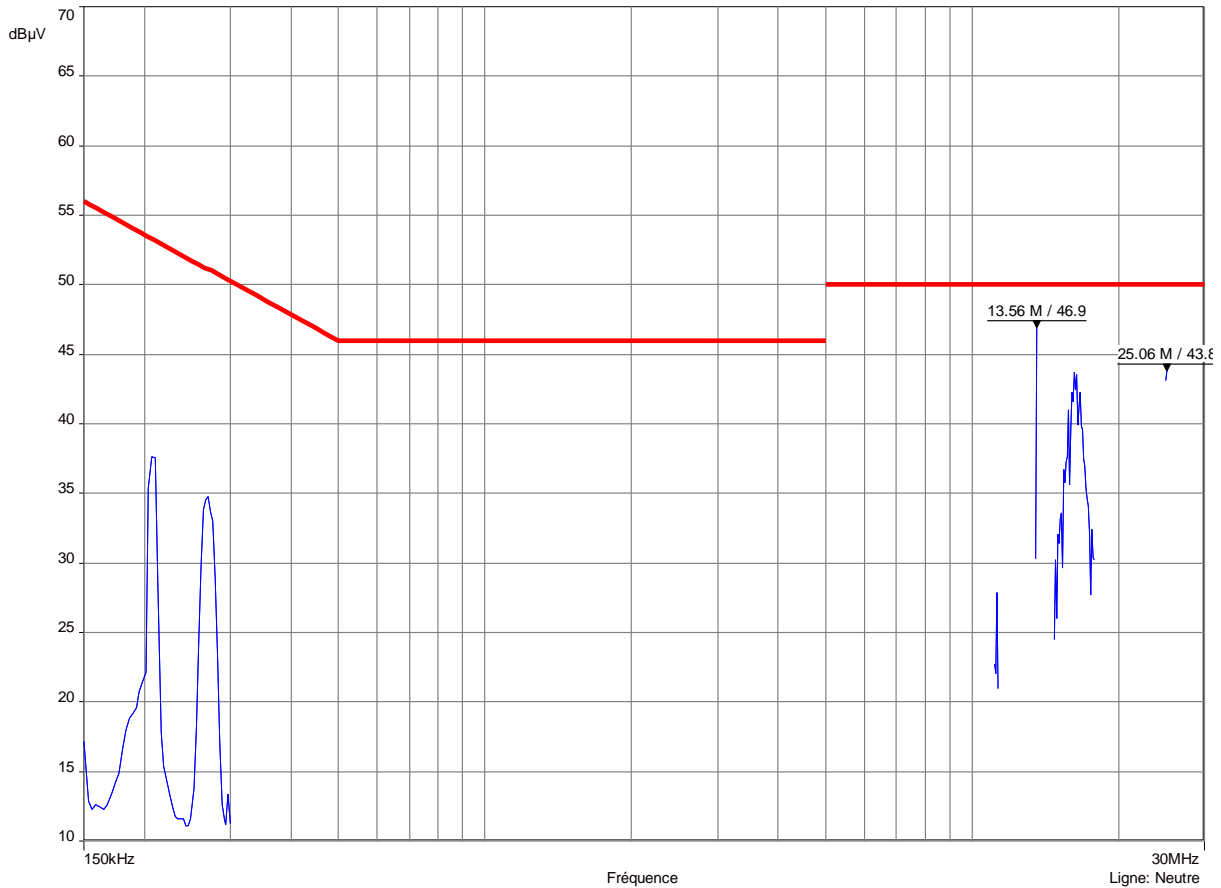
Sweep time = 500 ms/MHz

Max-Hold mode = 6 s

# CURVE N°7.:

Average measurement on the Neutral, from 0.15 to 0.3 MHz, from 11.1 to 11.3 MHz, from 13.5 to 13.6 MHz, from 14.8 to 17.8 MHz and from 25 to 25.1 MHz.

*The RF emission from the EUT is ON.*



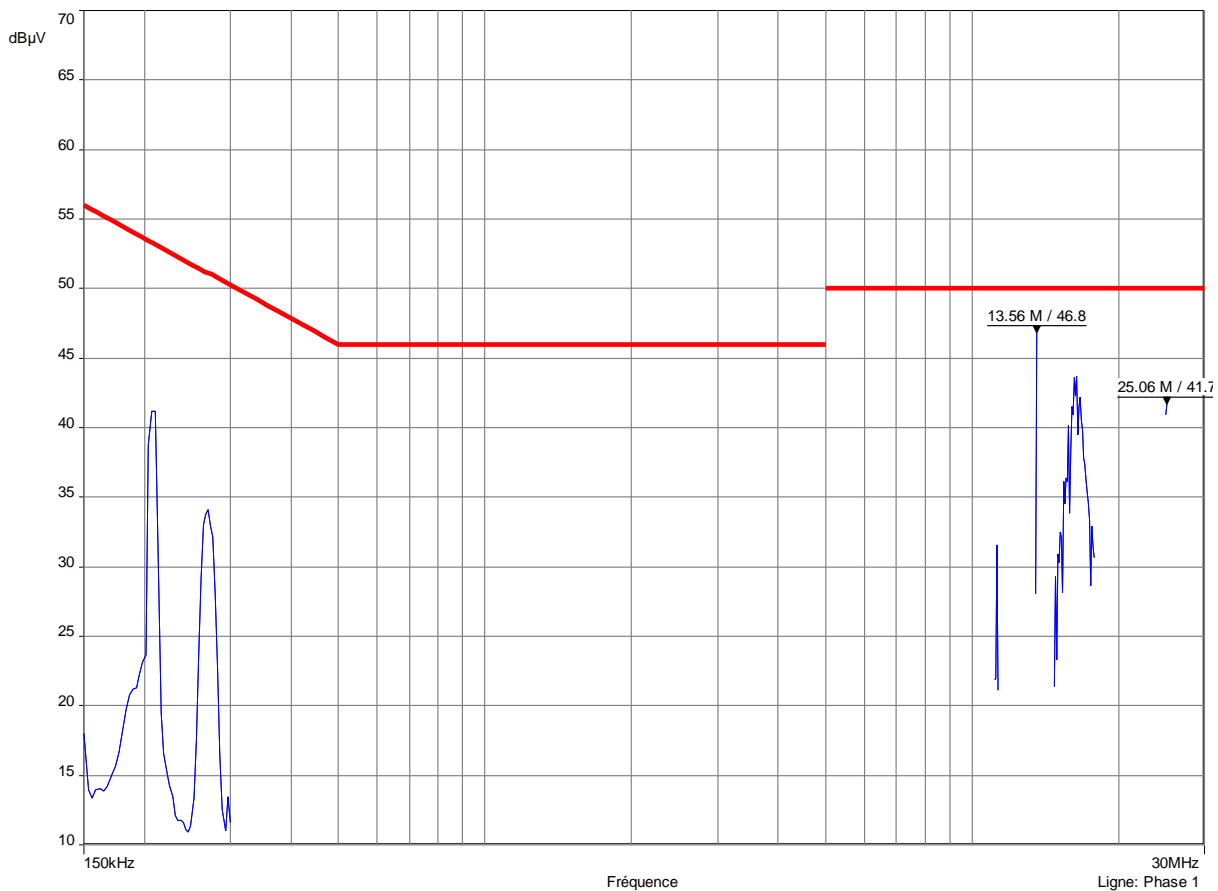
RBW = 9 kHz

Sweep time = 100 ms/pts

## CURVE N°8.:

Average measurement on the Line, from 0.15 to 0.3 MHz, from 11.1 to 11.3 MHz, from 13.5 to 13.6 MHz, from 14.8 to 17.8 MHz and from 25 to 25.1 MHz.

*The RF emission from the EUT is ON.*



RBW = 9 kHz

Sweep time = 100 ms/pts

## Test conclusion:

RESPECTED STANDARD

**10. OPERATION WITHIN THE BAND 13.110 – 14.010 MHz**

**Standard:** FCC Part 15

**Test procedure:** paragraph 15.225

**Test equipment:**

TYPE	BRAND	EMITECH NUMBER
Test receiver ESH3	Rohde & Schwarz	1058
Spectrum analyzer FSP7	Rohde & Schwarz	6796
Loop antenna 6502	EMCO	1406
Open area test site	EMITECH	1274
Multimeter 77-2	Fluke	0812
Variac R213	Dereix	1419
Modulation analyzer HP8901B	Hewlett Packard	1211
Multimeter 187	Fluke	4117
Climatic chamber	MPC	2593
Meteo station meteostar	Bioblock scientific	0943
Meteo station AB888	Oregon scientific	1539

**Test set up:**

The system is tested in an open area test site (OATS).

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuth corresponds to the front of the equipment under test.

The frequency stability measure is realized in near-field.

**Distance of antenna:** 10 meters

**Antenna height:** 1 meter

**Antenna polarization:** oriented in the vertical plane. The lowest point of the loop is 1m above ground level.

**Equipment under test operating condition:**

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.

The equipment is blocked in continuous unmodulated transmission mode for the measure of frequency stability.

## Results:

### Carrier field strength

Ambient temperature (°C): 15  
Relative humidity (%): 75

Power source: 115 Va.c through a variac

	Field strength (dBμV/m) at frequency: 13.56 MHz
Normal test conditions	57.52
Limits (dBμV/m)	103.08*
Margin (dB)	45.56

Polarization of test antenna: perpendicular at the equipment at 0 degrees

Position of equipment: see photos in annex 3 (azimuth: 0 degrees)

\* The applicable limit at 30 m is extrapolated at 10 m by using the square of an inverse linear distance (40 dB/ decade)

### Frequency stability

			Measured frequency difference (ppm) At frequency: 13.559774 MHz	Limits (ppm)
Normal test conditions	Temperature (°C): 20	Nominal power source (V): 115		±100
		Minimal power source (V): 97.75	-0.15	
		Maximal power source (V): 132.25	-0.15	
Extreme test conditions	Minimal temperature (°C): -20	Nominal power source (V): 115	-6.78	
	Maximal temperature (°C): +50	Nominal power source (V): 115	-0.15	

### Field strength within the band 13.110-14.010 MHz

See spectrum mask in annex 1.

## Test conclusion:

RESPECTED STANDARD

**11. FIELD STRENGTH OUTSIDE THE BAND 13.110-14.010 MHZ**

**Standard:** FCC Part 15

**Test procedure:** paragraph 209  
paragraph 15.225 (d)

**Test equipments:**

TYPE	BRAND	EMITECH NUMBER
Test receiver ESH3	Rohde & Schwarz	1058
Test receiver ESVS10	Rohde & Schwarz	1219
Spectrum analyzer FSP40	Rohde & Schwarz	4088
Loop antenna 6502	EMCO	1406
Biconical antenna HP 11966 C	Hewlett Packard	0728
Open area test site	EMITECH	1274
Multimeter 77-2	Fluke	0812
Variac R213	Dereix	1419
Meteo station meteostar	Bioblock scientific	0943

**Test set up:**

The system is tested in an open area test site (OATS).

The test unit is placed on a rotating table, 0.8 m from a ground plane. Zero degree azimuths correspond to the front of the equipment under test (see photos in annex 3).

**Frequency range:** From 9 kHz to 10<sup>th</sup> harmonic of the highest fundamental frequency.

**Detection mode:** Quasi-peak ( $F < 1$  GHz)

**Bandwidth:** 10 kHz ( $F \leq 30$  MHz)  
120 kHz ( $30 \text{ MHz} < F < 1$  GHz)

**Distance of antenna:** 10 meters ( $F \leq 30$  MHz)  
3 meters ( $F > 30$  MHz)

**Antenna height:** 1 meter ( $F \leq 30$  MHz)  
1 to 4 meters ( $F > 30$  MHz)

**Antenna polarization:** oriented in the vertical plane. The lowest point of the loop is 1 m above ground level ( $F \leq 30$  MHz)  
vertical and horizontal (only the highest level is recorded) ( $F > 30$  MHz)

**Equipment under test operating condition:**

The equipment under test is blocked in continuous transmission mode, modulated by internal data signal, at the highest output power level which the transmitter is intended to operate.



## Results:

Ambient temperature (°C): 15  
Relative humidity (%): 75

Power source: 115 Va.c through a variac

FREQUENCIES (MHz)	Detector P: Peak QP: Quasi-Peak	Antenna height (cm)	Azimuth (degree)	resolution bandwidth (kHz)	Polarization H: Horizontal V: Vertical	Field strength (dBμV/m)	Limits (dBμV/m)	Margin (dB)
27.12	QP	100	100	10	V	15.34	48.63*	33.29
40.68	QP	100	280	120	V	36.4	40	3.6
54.24	QP	100	91	120	V	32.5	40	7.5
67.80	QP	109	93	120	V	25.6	40	14.4
81.36	QP	145	110	120	V	29.6	40	10.4
108.48	QP	185	98	120	H	34.7	43.5	8.8
122.04	QP	173	108	120	H	36.4	43.5	7.1
135.60	QP	100	39	120	V	43.5	43.5	0

\* The applicable limit at 30 m is extrapolated at 10 m by using the square of an inverse linear distance (40 dB/decade)

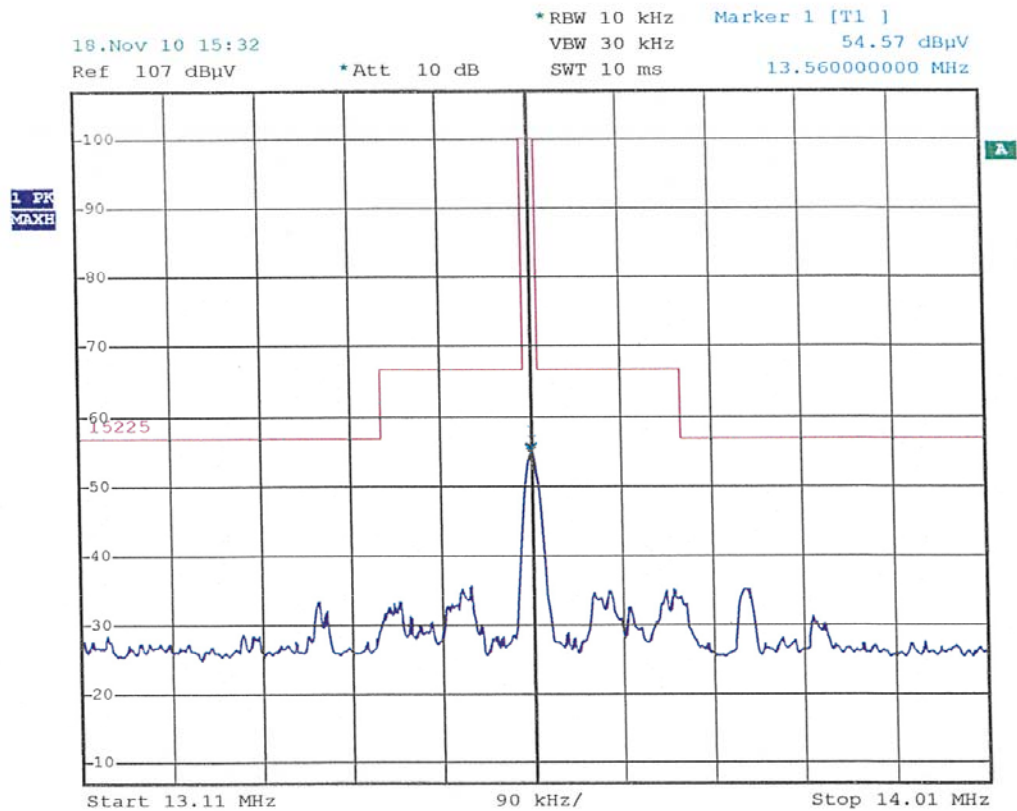
*Note: any spurious which has more than 20 dB of margin compared to the applicable limit is not necessarily reported.*

## Test conclusion:

RESPECTED STANDARD

□□□ End of report, 4 annexes to be forwarded □□□

## ANNEX 1: SPECTRUM MASK



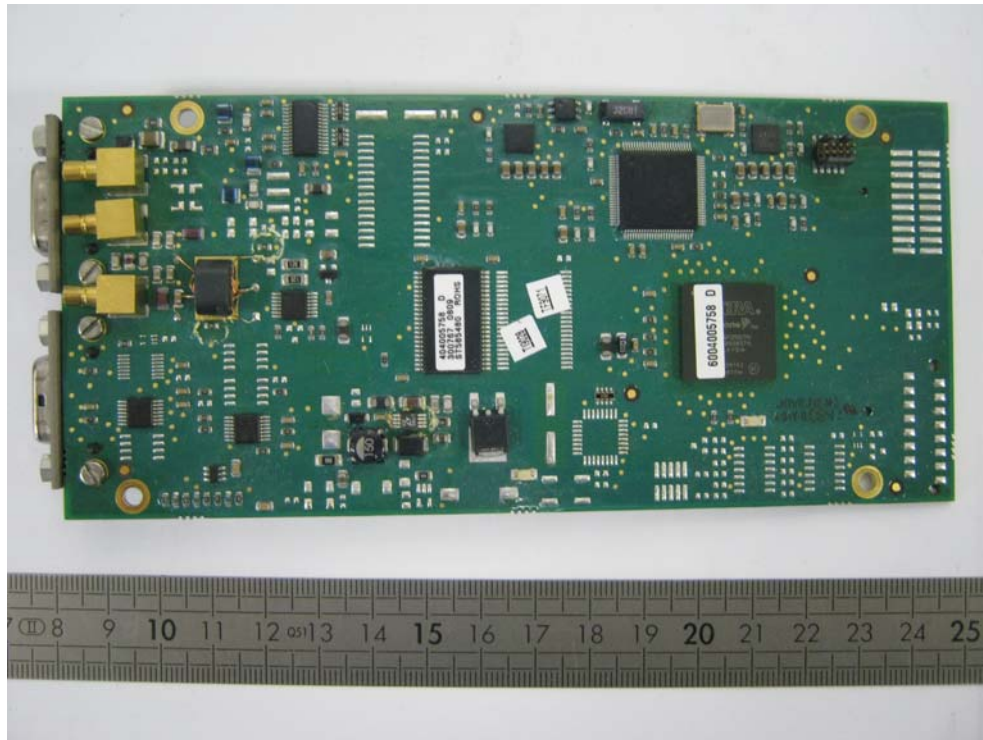
Date: 18.NOV.2010 15:32:04

## ANNEX 2: PHOTOS OF THE EQUIPMENT UNDER TEST

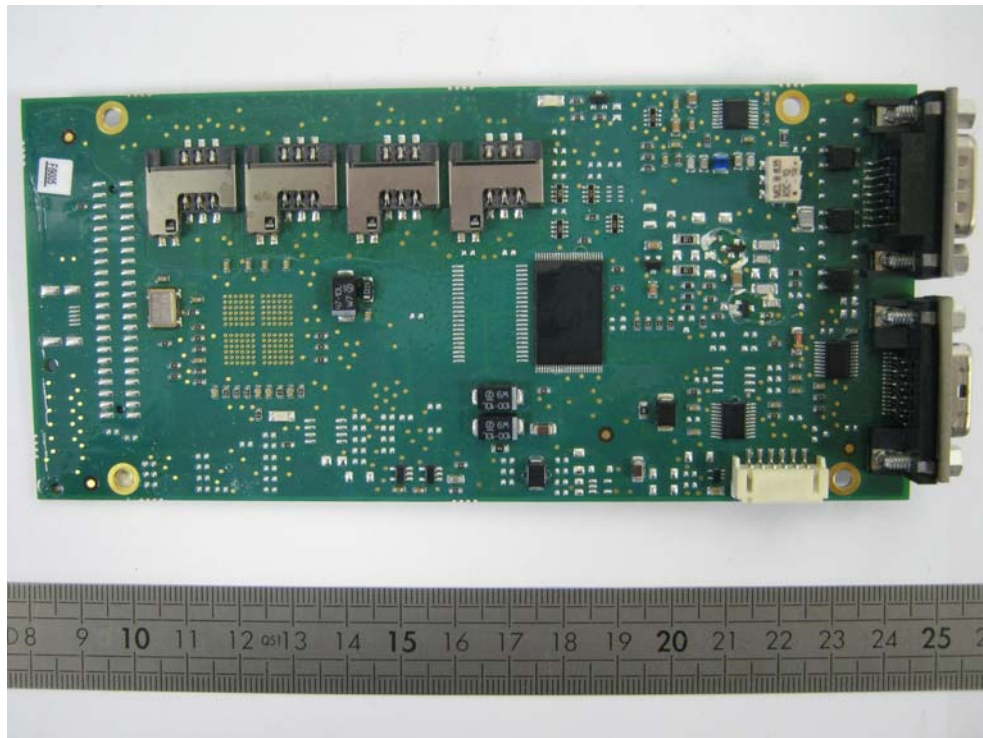
### GENERAL VIEW



**PRINTED CIRCUIT BOARD: FACE 1**



**PRINTED CIRCUIT BOARD: FACE 2**

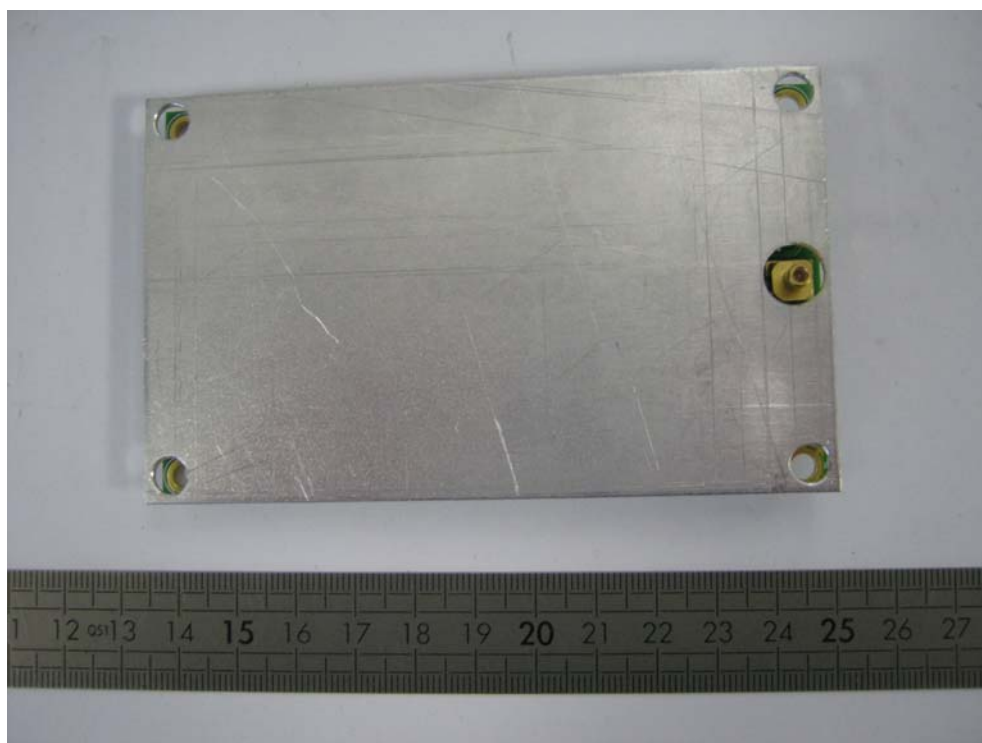




ANTENNA: FACE 1

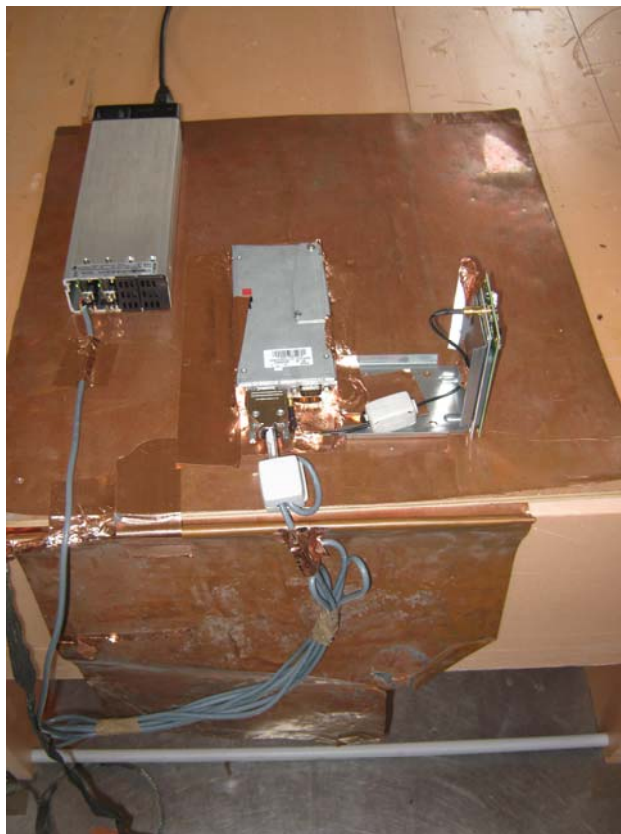


ANTENNA: FACE 2:



## ANNEX 3: TEST SET UP AND OPEN AREA TEST SITE

### RADIATED MEASUREMENTS



**CONDUCTED MEASUREMENTS**





**OPEN AREA TEST SITE**





## ANNEX 4: MODIFICATIONS

