

R041-12-106607-2A - DM / CHB

RADIO TEST REPORT

According to the standard(s):

FCC part 15 Subpart C

RSS-Gen:2010

RSS-210:2010

Equipment under test:

RAL STAINER

FCC ID: RWI405000

IC ID: 10861A-405000

Company:

RAL DIAGNOSTICS

Diffusion: Mr WALLART

(Company: ILSA FRANCE)

Number of pages: 28 including 1 annex

Ed.	Date	Modified page(s)	Written by		Technical verification and Quality approval	
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NAME OF THE EQUIPMENT UNDER TEST (E.U.T.) : RAL STAINER

Serial number : 6877 0580

Part number : 405 000 / 414 195

Software Version : /

MANUFACTURER'S NAME : RAL DIAGNOSTICS

APPLICANT'S ADDRESS (PRODUCTION SITE):

Company : ILSA FRANCE

Address : Rue de la Comtesse
25640 MARCHAUX
FRANCE

Person(s) present during the tests : Nobody

Responsible : Mr WALLART

DATE(S) OF TESTS : September, the 18th to 21st and December,
the 17th to 18th of 2012

TESTS LOCATION(S) : Emitech Grand Sud Laboratory in
VENDARGUES (34) - FRANCE
Open area test site in SALINELLES (30) -
FRANCE
FCC Registration number: 8127-19
IC Filling number : 4379C-1

TESTS SUPERVISOR(S) : None

TESTS OPERATOR(S) : David MONTAULON

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1. INTRODUCTION

This document submits the results of Electromagnetic Compatibility tests performed on the equipment **RAL STAINER** (denominated hereafter E.U.T.: equipment under test) according to document(s) listed below.

2. REFERENCE DOCUMENT(S)**FCC Part 15**

Code of Federal Regulations
Title 47 – Telecommunications
Chapter 1 – Federal Communications Commission
Part 15 – Radio frequency devices
Subpart C – Intentional Radiators

ANSI C 63.4 (2003)

American National Standard for Methods of measurement of
Radio-Noise from low-voltage
Electrical and Electronic Equipment in the Range of 9 kHz to
40 GHz

RSS-210:2010
Issue 8, December 2010

Low-power Licence-exempt Radiocommunication Devices
(All Frequency Bands): Category I Equipment

RSS-Gen: 2010
Issue 3, December 2010

General Requirements and Information for the Certification of
Radiocommunication Equipment

3. EQUIPMENT UNDER TEST CONFIGURATION**Product description:**

The **RAL STAINER** is radio equipment with a contactless card interface.

FCC ID: RWI405000

IC ID: 10861A-405000

Utilization: RFID TAG reader

Antenna type: Incorporated antenna

Antenna gain: Unknown

Operating frequency range: 13.56MHz (RFID)

Internal highest frequency: 13.56MHz

Power source: 110Vac/50Hz (stand alone) or mains voltage (with docking)

Power level and frequency range are not user adjustable

Equipment modifications applied before tests:

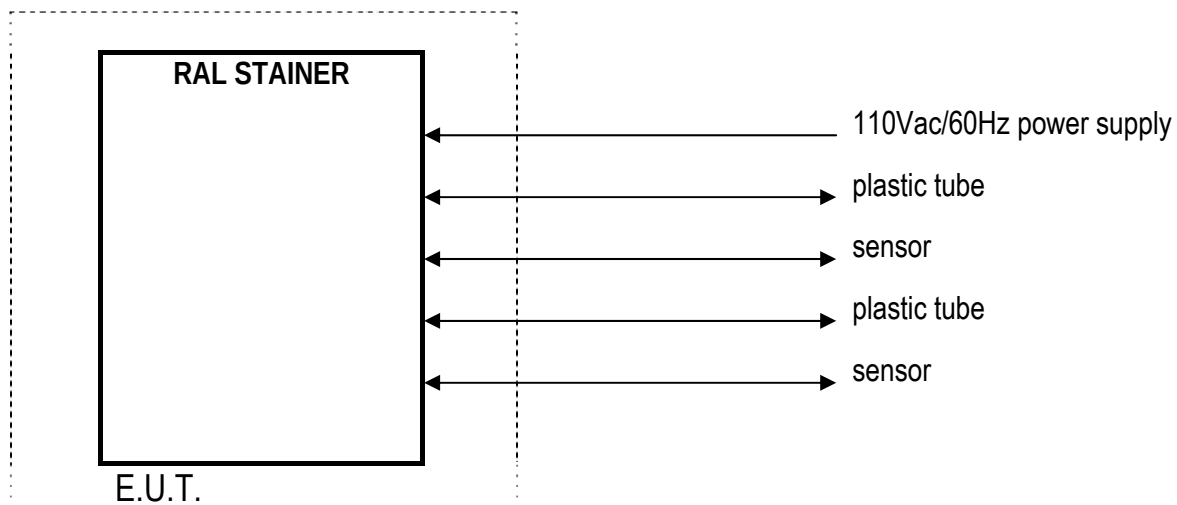
-Add 2 ferrites 742 715 3 (WĖ) with one loop on RFID flex cable near RF module and middle flat cable:



-Place an HF gasket between RFID door parts an frame:



4. EQUIPMENT UNDER TEST CONFIGURATION SCHEME



5. SUMMARY OF TEST RESULTS

Tests designation	Results satisfying?	Comments
Antenna requirement - Section 15.203	YES	Integrated antenna
Restricted band of operation - Section 15.205	YES	
Conducted emissions - Section 15.207, RSS-Gen: 2010 § 7.2.2.	YES	
Radiated emissions (below 30MHz) - Section 15.209 & RSS-210: 2010 (§2.7 table 3)	YES	
Radiated emissions (above 30MHz) - Section 15.209, RSS-210: 2010 (§2.7 table 2)	YES	
Field strength - Section 15.225, RSS-210: 2010 (annex A.2.6)	YES	
Frequency tolerance - Section 15.225	YES	
Occupied bandwidth - CNR-Gen § 4.6	YES	

N.P.: Not Performed.

N.A.: Not Applicable.

6. CONDUCTED EMISSION

Temperature (°C): 25.6

Humidity (%HR): 53.5

Pressure (hPa): 1003

Standards: FCC part 15, RSS-210:2010

Test methods: FCC part 15.207, RSS-Gen: 2010 § 7.2.2.

Test configuration:

Tested cable(s)	Measure with	E.U.T. height
110Vac/60Hz power supply	L.I.S.N.	40cm
110Vac/60Hz power supply / RF on 50 Ohms load	L.I.S.N.	40cm

Frequency band	Tested cable(s)	Resolution bandwidth	Video bandwidth	Detection mode
150kHz-30MHz	110Vac/60Hz power supply	10kHz	30kHz	Peak
150kHz-30MHz	110Vac/60Hz power supply / RF on 50 Ohms load	10kHz	30kHz	Peak

Test method deviation: No

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	CAL DATE	DUE DATE
AC power source	KIKUSUI	PCR2000L	0800	-	-
Cable		N-1m	2706	29 mar 2011	29 may 2013
Cable	C&C	N-6m	5015	11 oct 2010	27 dec 2012
Limiter	Hewlett Packard	11947A	0239	06 oct 2011	06 dec 2012
LISN	PMM	L3-25	0833	8 sep 2011	08 sep 2013
Receiver	Agilent Technologies	E7405A	2161	11 jun 2012	11 aug 2014
Shielded enclosure	RAY PROOF	C.GS3	1123	-	-
Software	Nexio	BAT EMC	0000	-	-

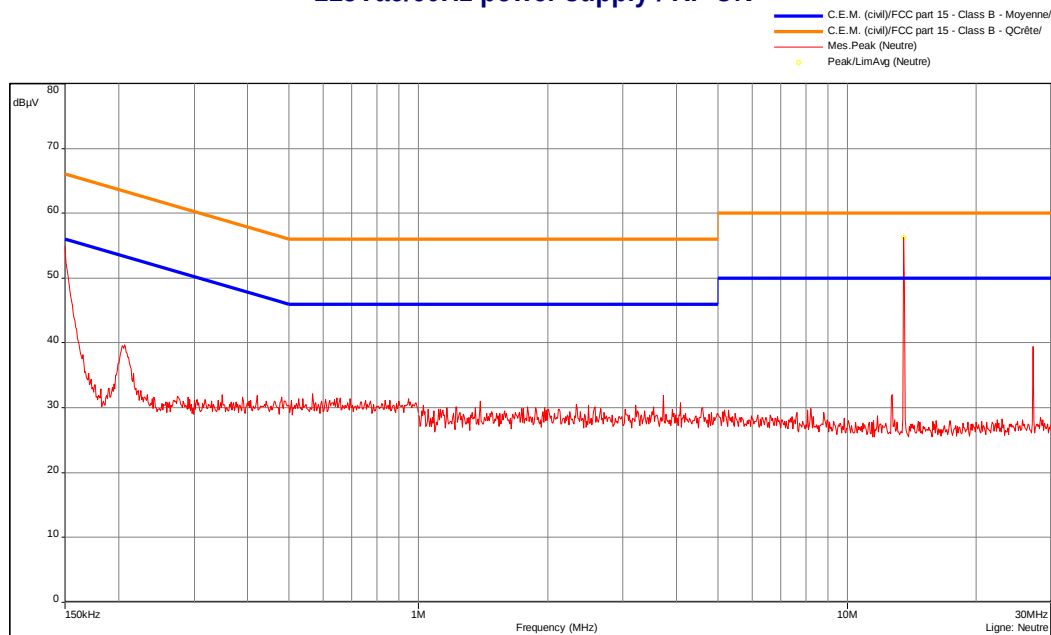
BAT-EMC software version: V3.6.0.24

Results: See Graph(s) hereafter.

Limits on the graphs are average and quasi-peak limits (upper limit).

Conducted voltage emission (measurement)

115Vac/60Hz power supply / RF ON

EMI968


Date: 18/09/2012 14:36:30

Technician: DM

Class: B of the standard

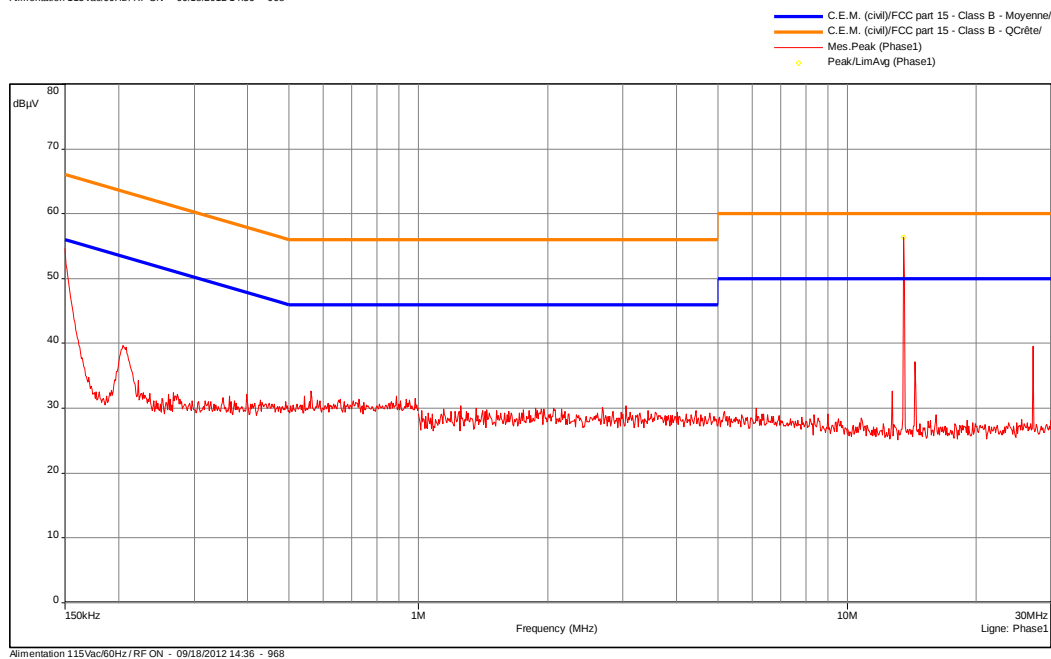
Detection:
Peak

T (°C): 25.6

H (%): 53.5

P (hpa): 1003

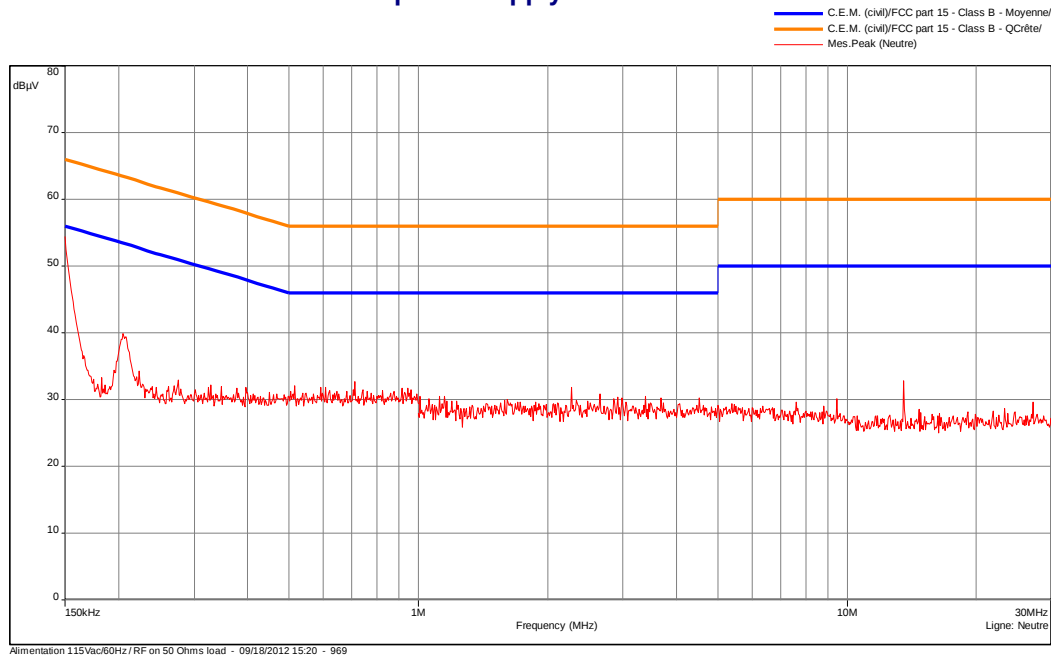
Modification(s) during test:



Conducted voltage emission (measurement)

115Vac/60Hz power supply / RF on 50 Ohms load

EMI969



Date: 18/09/2012 15:20:22

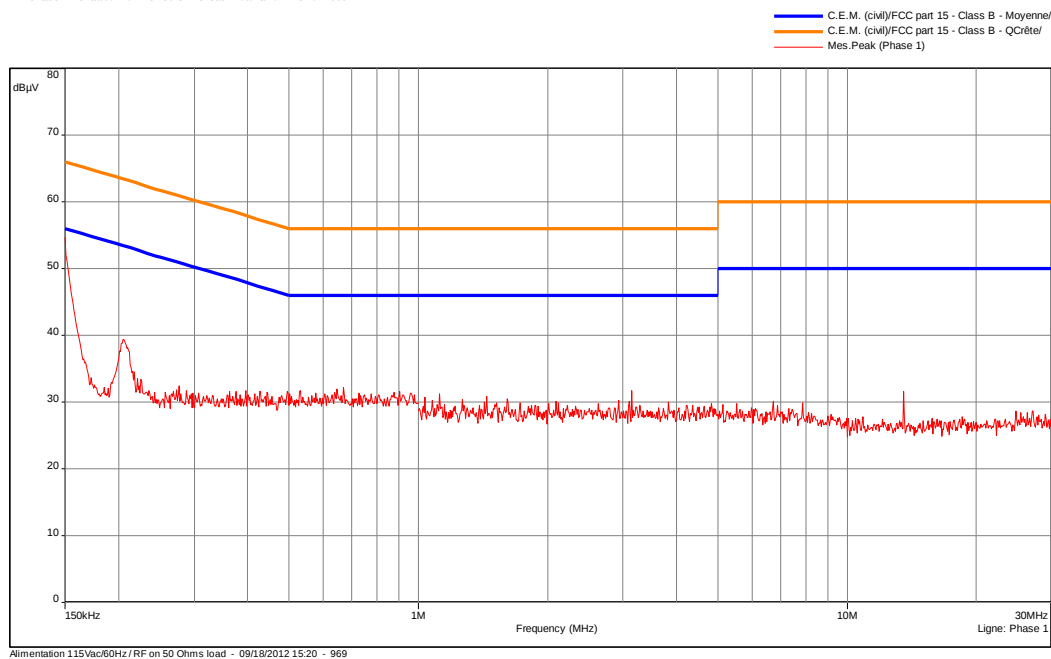
Technician: DM

Class: B of the standard

Detection:
Peak

T (°C): 25.6
H (%): 53.5
P (hpa): 1003

Modification(s) during test:



7. RADIATED EMISSIONS – SECTION 15.209 – RSS-210:2010 (§2.7 TABLE 2 & 3)

Temperature (°C): 25.5

Humidity (%HR): 51.8

Pressure (hPa): 1003

a) Radiated emissions (below 30MHz)

Standards: FCC part 15 Subpart C 15.209 & RSS-210: 2010 (§2.7)

Test methods: ANSI C63.4:2003 & RSS-Gen: 2010

Test configuration:

Frequency band	Tested side	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
9kHz-150kHz	Front side / antenna 0°	200Hz	1kHz	Peak	80cm
9kHz-150kHz	Front side / antenna 45°	200Hz	1kHz	Peak	80cm
9kHz-150kHz	Front side / antenna 90°	200Hz	1kHz	Peak	80cm
150kHz-30MHz	Front side / antenna 0°	10kHz	30kHz	Peak	80cm
150kHz-30MHz	Front side / antenna 45°	10kHz	30kHz	Peak	80cm
150kHz-30MHz	Front side / antenna 90°	10kHz	30kHz	Peak	80cm

Measurement is done with an antenna position of 0°, 90° and 45°.

Test method deviation:

Measurements are made in peak detection instead of average mode in frequency band 9 kHz-500 kHz

- Measurements are given in dBμA/m instead of μV/m
- Measuring distance is 3 meters instead of 30 and 300 meters

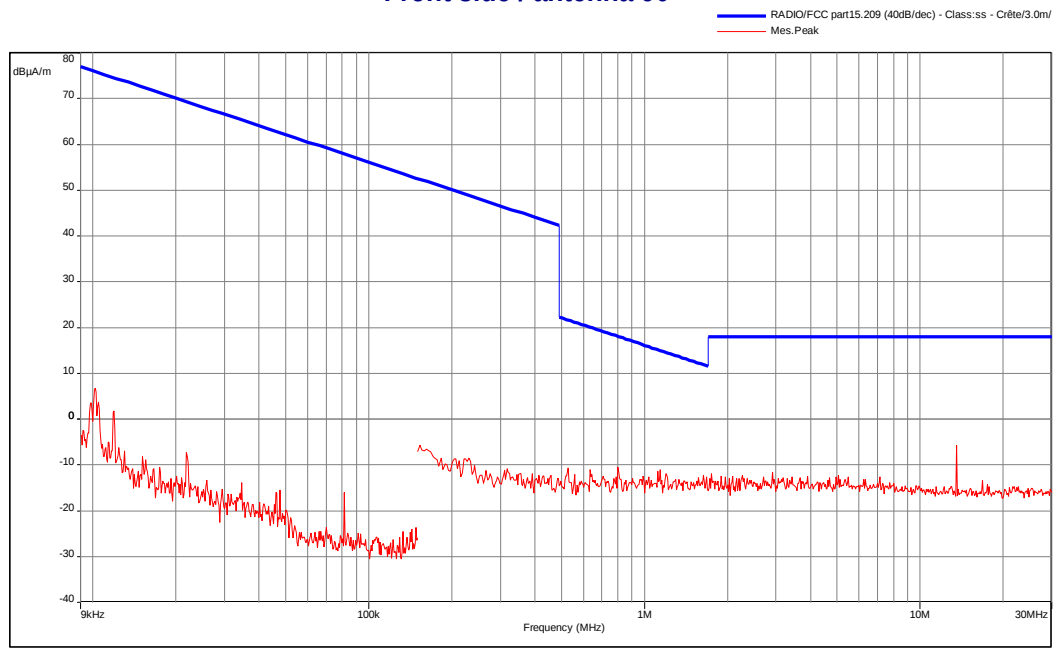
Radiated emissions limits in this frequency band are specified at 30 or 300 meters. Measurement distance used during the test, subject of this report, is 3 meters. Then published limits come from a theoretical conversion using an extrapolation factor of 40dB / decade.

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	CAL DATE	DUE DATE
Antenna	Rohde & Schwarz	HFH2-Z2	5825	18 aug 2010	19 oct 2012
Cable		N-1.5m	3621	25 jul 2011	25 sept 2013
Cable		N-1m	2705	4 may 2011	4 jul 2013
Cable		N-5m	2716	12 jan 2011	11 fev 2013
Receiver	Agilent	E4440A	5824	24 aug 2011	24 act 2013
Shielded enclosure	RAY PROOF	C.GS3	1123	-	-
Software	Nexio	BAT EMC	0000	-	-

BAT-EMC software version: V3.6.0.24

Results: See Graph(s) hereafter (pre-measurement).

Radiated magnetic field emission (measurement)
EMI971
Front side / antenna 90°

Date: **21/09/2012 14:02:14**

Technician: **DM**

Class: **ss of the standard**

Detection:
Peak

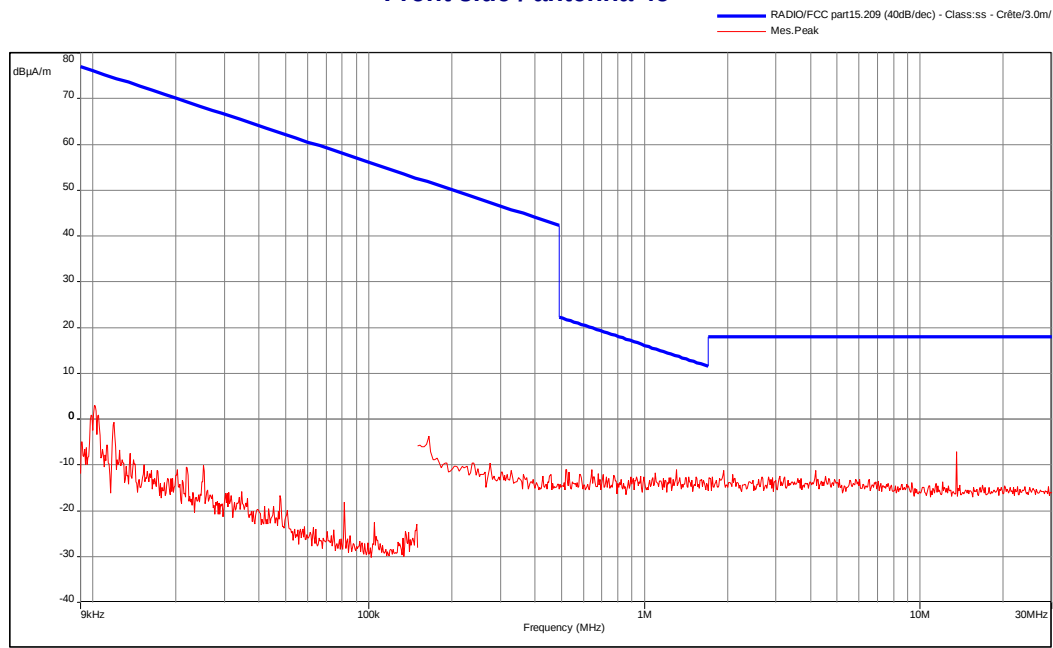
T (°C): **25.5**

H (%): **51.8**

P (hpa): **1003**

Modification(s) during test:

Limit indicated on this plot is calculated with 40 dB/decade extrapolation factor and 51.5 dB conversion factor.

Radiated magnetic field emission (measurement)
EMI974
Front side / antenna 45°

Date: **21/09/2012 14:17:55**

Technician: **DM**

Class: **ss of the standard**

Detection:
Peak

T (°C): **25.5**

H (%): **51.8**

P (hpa): **1003**

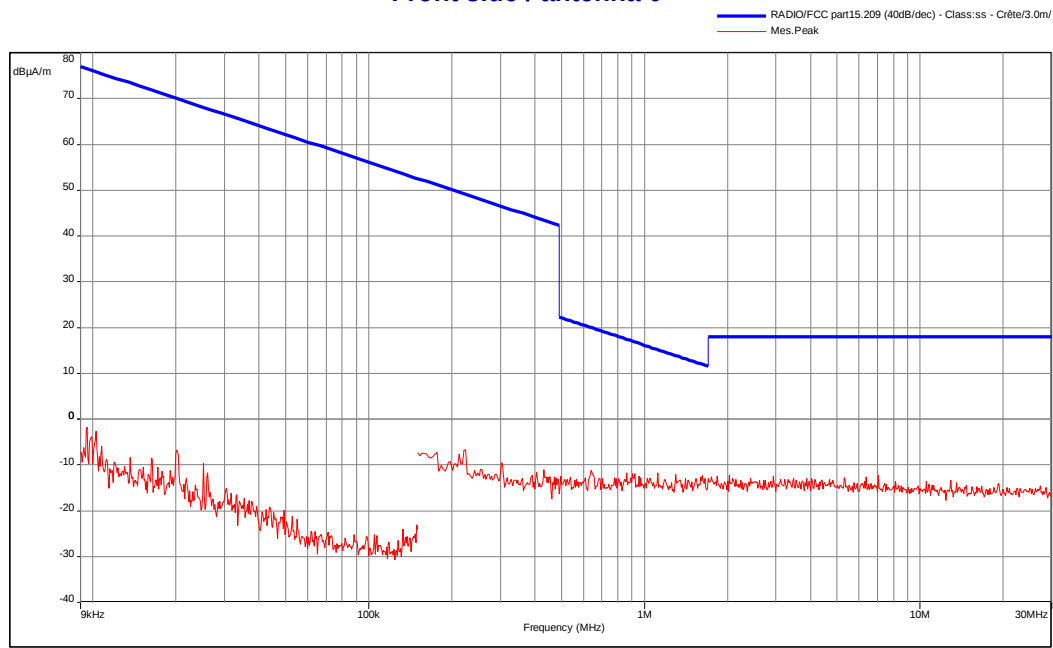
Modification(s) during test:

Limit indicated on this plot is calculated with 40 dB/decade extrapolation factor and 51.5 dB conversion factor.

Radiated magnetic field emission (measurement)

EMI975

Front side / antenna 0°



Date: 21/09/2012 14:21:12

Technician: DM

Class: ss of the standard

Detection:
Peak

T (°C): 25.5

H (%): 51.8

P (hpa): 1003

Modification(s) during test:

Face avant / antenne 0° - 09/21/2012 14:21 - 975

Limit indicated on this plot is calculated with 40 dB/decade extrapolation factor and 51.5 dB conversion factor.

b) Radiated emissions pre-measurement (above 30MHz)

Standards: FCC part 15 Subpart C 15.209 & RSS-210: 2010 (§2.7)

Test methods: ANSI C63.4:2003 & RSS-Gen: 2010

Test configuration:

Frequency band	Tested side	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
30MHz-1GHz	Left side / RF ON	100kHz	300kHz	Peak	80cm
30MHz-1GHz	Left side / RF OFF / cycle mode	100kHz	300kHz	Peak	80cm

Test method deviation: No

Measuring distance: 3 meters

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	CAL DATE	DUE DATE
Antenna	Electro-Metrics	BIA-30HF	1107	03 mar 2011	03 may 2015
Antenna	Rohde & Schwarz	HL223	1137	03 mar 2011	03 may 2015
Cable		N-1m	3240	17 sept 2012	17 nov 2014
Cable		N-5m	2715	12 jan 2011	11 fev 2013
Receiver	Agilent	E4440A	5824	24 aug 2011	24 oct 2013
Shielded enclosure	RAY PROOF	C.GS3	1123	-	-
Software	Nexio	BAT EMC	0000	-	-

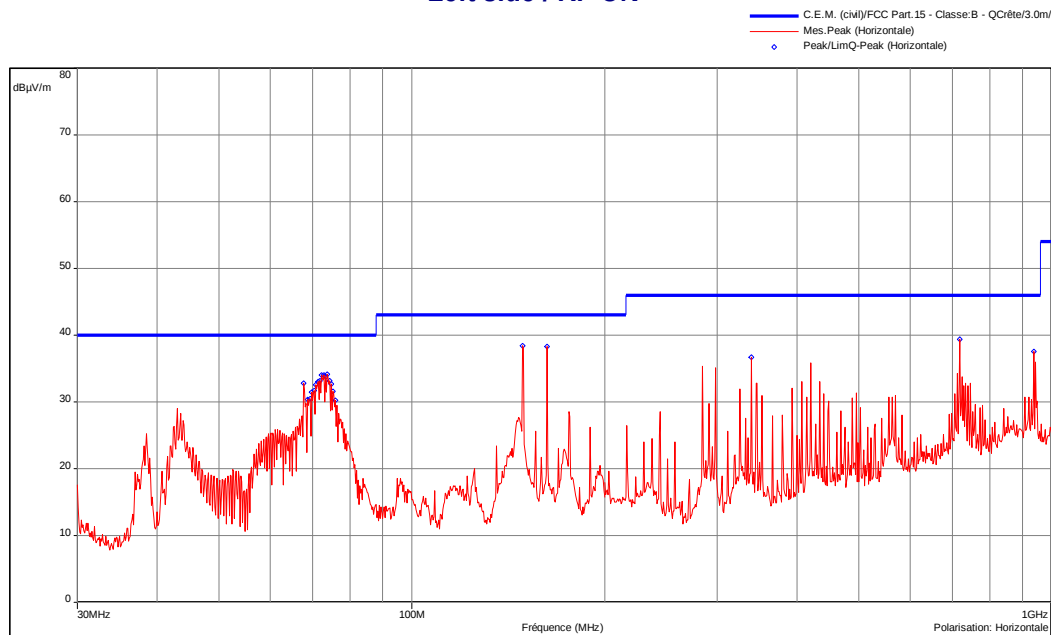
BAT-EMC software version: V3.6.0.24

Results: See Graph(s) (indoor pre-measurement)

Radiated electric emission (measurement)

EMI1009

Left side / RF ON



Left side / RF ON - 17/12/2012 11:00 - 1009

Date: 17/12/2012 11:00:18

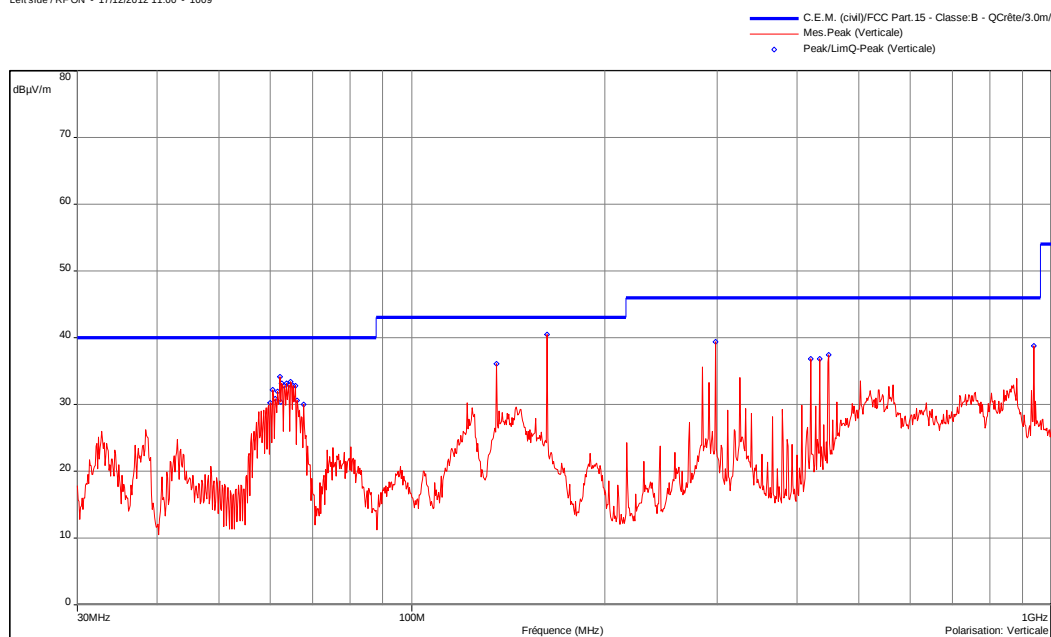
Technician: DM

Class: B of the standard

Detection:
Peak

T (°C): 26.1
H (%): 53.2
P (hpa): 1003

Modification(s) during test:

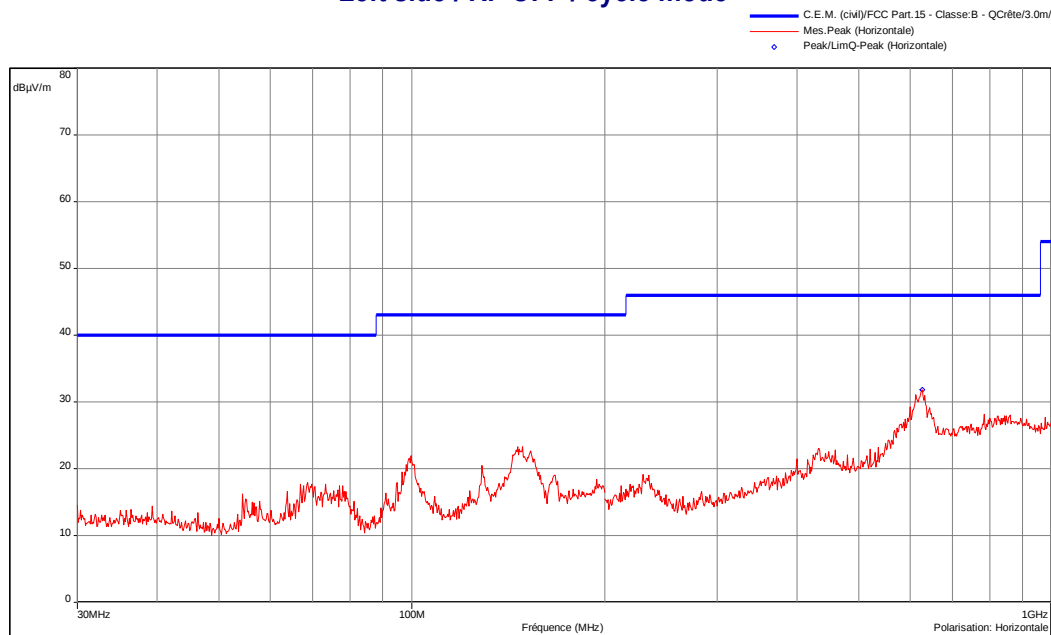


Left side / RF ON - 17/12/2012 11:00 - 1009

Radiated electric emission (measurement)

Left side / RF OFF / cycle mode

EMI960



Left side / Stand by mode - 21/09/2012 11:57 - 960

Date: 21/09/2012 11:57:26

Technician: DM

Class: Sb of the standard

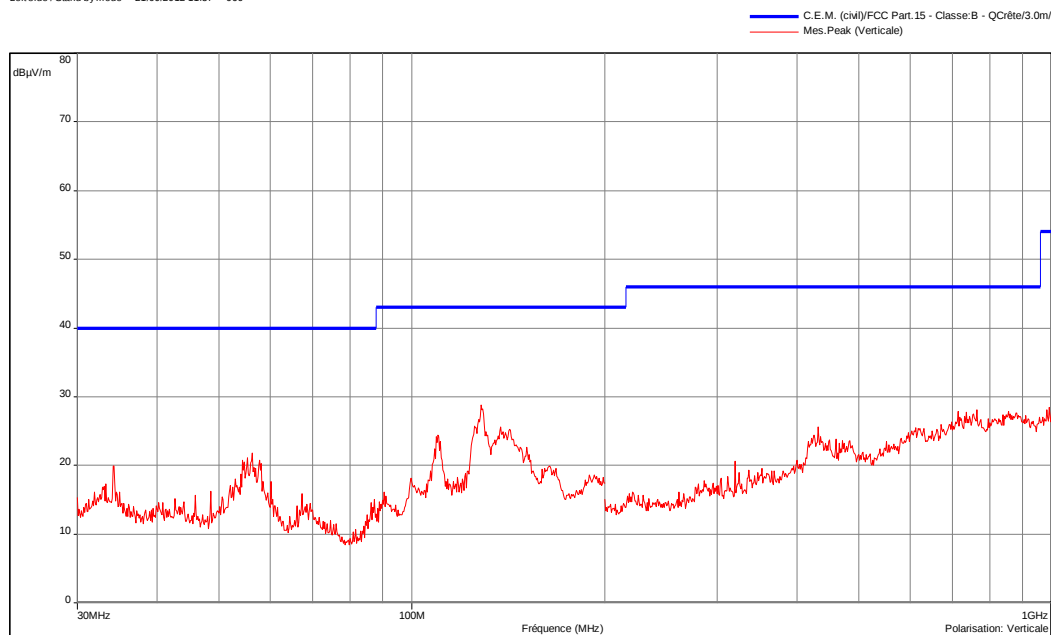
Detection:
Peak

T (°C): 26.1

H (%): 53.2

P (hpa): 1003

Modification(s) during test:



Left side / Stand by mode - 21/09/2012 11:57 - 960

c) Final radiated electric emission on Open Area Test Site

Test configuration:

Frequency band	Tested side	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
30MHz-1GHz	(Open area measurement)	120kHz	300kHz	Quasi peak	80cm

For each measured frequencies, E.U.T. is set via a turntable in order to find the highest level. Test antenna is set between 1m and 4m in order to find the highest level in vertical and horizontal polarization. Only highest levels are recorded. E.U.T. is powered at its nominal power supply.

Measuring distance: 3 meters

Test equipment list (Open area measurement):

CATEGORY	BRAND	TYPE	N° EMITECH	CAL DATE	DUE DATE
Antenna	Electro-Metrics	BIA-30HF	1107	03 mar 2011	03 may 2015
Antenna	Rohde & Schwarz	HL223	3126	03 mar 2011	03 may 2015
Antenna	Rohde & Schwarz	HFH2-Z2	5825	22 oct 2012	22 dec 2014
Controller	Heinrich Deisel	HD100	4036	-	-
Antenna mast	Heinrich Deisel	MA240	4037	-	-
Cable		N-20m	8385	25 aug 2011	25 oct 2013
Open area test site	Emitech	Salinelles	3482	04 mar 2011	04 may 2014
Receiver	Agilent Technologies	E4440A	5824	24 aug 2011	24 act 2013
Turntable	Heinrich Deisel	D4420	4038	-	-

Results: See Board(s) below

Frequency (MHz)	Polarization	Azimut (degree)	Antenna Height (cm)	Measure (dBμV/m)	Limit (dBμV/m)	Comments
67.80	Horizontal	0	250	27.77	40	C
72.30	Horizontal	0	250	27.50	40	C
149.17	Horizontal	316	150	36.32	43	C
162.71	Horizontal	65	117	40.22	43	C
162.71	Vertical	70	120	42.57	43	C
135.60	Vertical	0	100	34.16	43	C
64.50	Vertical	0	100	26.51	40	C
298.40	Vertical	0	160	40.78	46	C
420.40	Vertical	255	160	41.97	46	C
433.92	Vertical	278	170	39.24	46	C
447.52	Vertical	278	170	37.67	46	C
501.73	Vertical	40	100	38.65	46	C
339.00	Horizontal	0	100	43.20	46	C
718.68	Horizontal	0	100	37.03	46	C
938.56	Horizontal	0	0	23.92	46	C

C= Compliant

NC= Not compliant

All other spurious are at least 20dB below the limit.

8. OPERATION WITHIN THE BAND 13.110-14.010 MHZ – SECTION 15.225 & RSS-210:2010

Standards: FCC part 15 Subpart C 15.225 & RSS-210:2010

Test methods: ANSI C63.4:2003 & RSS-Gen: 2010

Test configuration:

Frequency	Test configuration	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
13.56MHz	Test antenna 0°	10kHz	30kHz	Quasi -peak	80cm
13.56MHz	Test antenna 45°	10kHz	30kHz	Quasi -peak	80cm
13.56MHz	Test antenna 90°	10kHz	30kHz	Quasi -peak	80cm

Measure is done with an antenna position of 0°, 90° and 45°.

Test method deviation: Measurements are given in dBμA/m instead of dBμV/m (conversion factor: 51.5dB).

Measuring distance is 10 meters instead of 30.

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	CAL DATE	DUE DATE
Antenna	Rohde & Schwarz	HFH2-Z2	5825	18 aug 2010	19 oct 2012
Cable	N	20m	8385	25 aug 2011	25 oct 2013
Controller	Heinrich Deisel	HD100	4036	-	-
Open area test site	Emitech	Salinelles	3482	04 mar 2011	04 may 2014
Receiver	Agilent	E4440A	5824	24 aug 2011	24 oct 2013
Turntable	Heinrich Deisel	D4420	4038	-	-

Results: See Graph(s) hereafter.

Carrier measurement at 10m: -19.65 dBμA/m (≈ 31.85dBμV/m)

Using an extrapolation factor of 40 dB/decade (as described in section 15.31 (f)), the level is about 11.85dBμV/m (3.91μV/m) for a limit at 15.848 mV/m.

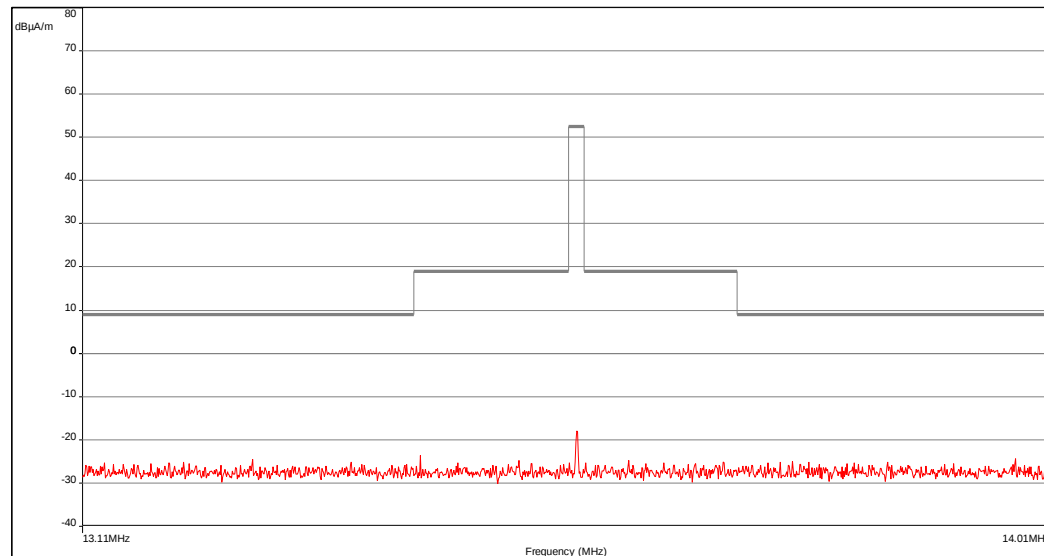
Radiated magnetic field emission (measurement)

EMI976

Front side / antenna 0° / 13.56MHz

Frequency (MHz) : 13.11 MHz - 14.01 MHz (Analyzer mode)
 Settings: RBW: 1 kHz, VBW: 3 kHz, Holding time: 1 ms/Pt, sweep count 10
 Polarisation : Circulaire
 Distance: 3 m

RADIO/FCC Part.15 (13.56MHz) - Class:em - QCrête/3.0m/
 Mes. Peak



Front side / antenne 0° / 13.56MHz - 09/21/2012 14:26 - 976

Date: 21/09/2012 14:26:28

Technician: DM

Class: em of the standard

Detection:
Peak

T (°C): 25.5
H (%): 51.8
P (hpa): 1003

Modification(s) during test:

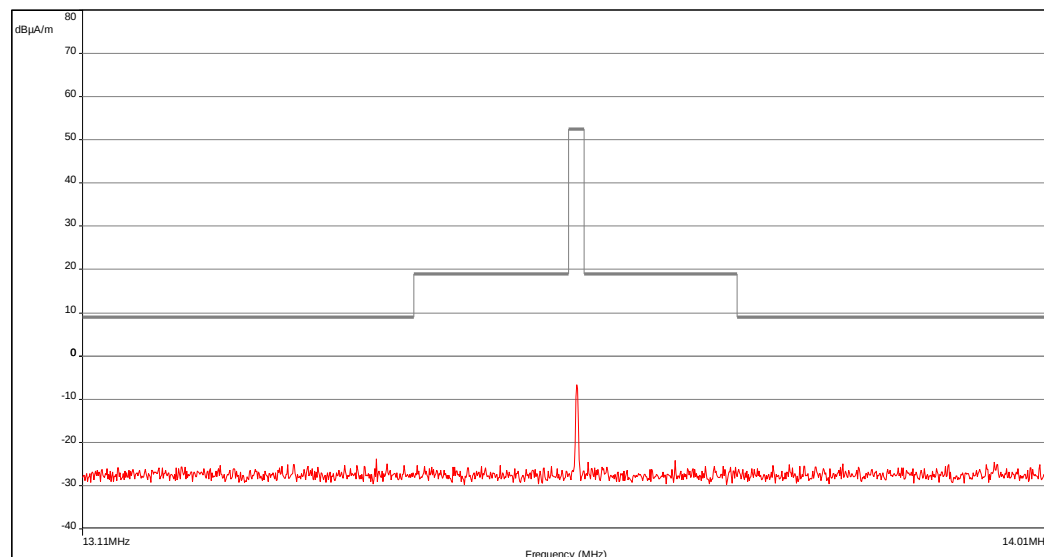
Radiated magnetic field emission (measurement)

EMI972

Front side / antenna 90° / 13.56MHz

Frequency (MHz) : 13.11 MHz - 14.01 MHz (Analyzer mode)
 Settings: RBW: 1 kHz, VBW: 3 kHz, Holding time: 1 ms/Pt, sweep count 10
 Polarisation : Circulaire
 Distance: 3 m

RADIO/FCC Part.15 (13.56MHz) - Class:em - QCrête/3.0m/
 Mes. Peak



Front side / antenne 90° / 13.56MHz - 09/21/2012 14:07 - 972

Date: 21/09/2012 14:07:41

Technician: DM

Class: em of the standard

Detection:
Peak

T (°C): 25.5
H (%): 51.8
P (hpa): 1003

Modification(s) during test:

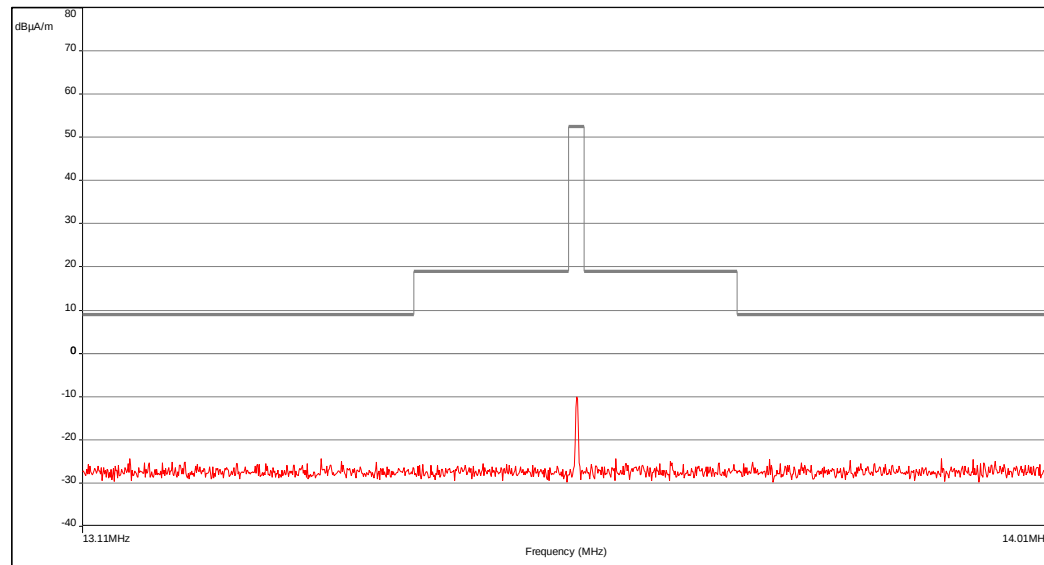
Radiated magnetic field emission (measurement)

EMI973

Front side / antenna 45° / 13.56MHz

Frequency (MHz) : 13.11 MHz - 14.01 MHz (Analyzer mode)
 Settings: RBW: 1 kHz, VBW: 3 kHz, Holding time: 1 ms/Pt, sweep count 10
 Polarisation : Circulaire
 Distance: 3 m

RADIO/FCC Part.15 (13.56MHz) - Class:em - QCrête/3.0m/
 Mes. Peak



Front side / antenne 45° / 13.56MHz - 09/21/2012 14:12 - 973

Date: 21/09/2012 14:12:05

Technician: DM

Class: em of the standard

Detection:
Peak

T (°C): 25.5
H (%): 51.8
P (hpa): 1003

Modification(s) during test:

9. FREQUENCY TOLERANCE – SECTION 15.225

Standard: FCC part 15 Subpart C 15.225

Test method: FCC part 15 Subpart C 15.225

Test configuration: A near field probe detects field near equipment (relative measurement).

Resolutions:

Frequency	Resolution bandwidth	Video bandwidth
13.56MHz	300Hz	1kHz

Test method deviation: E.U.T. is powered by 110Vac/60Hz power voltage by an external source.

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	CAL DATE	DUE DATE
Antenna	Emitech	3.5 cm	4653	-	-
Climatic enclosure	Secasi	SM600C	1670	20 jan 2012	20 mar 2014
Power supply	KIKUSUI	PCR2000L	0800	-	-
Spectrum analyser	Agilent Technologies	E4440A	5824	24 aug 2011	24 oct 2013

Standard limits: +/- 0.01% of the operating frequency

Results: See **Board(s)** below

E.U.T. operating mode: with modulation

Condition	Temperature	Power supply	Measured Frequency (MHz)	Frequency tolerance (kHz)	Limit (kHz)
Normal condition	20°C Humidity 31%	93.5Vac/60Hz	13.560116	-	+/-1.35606
		110Vac/60Hz	13.560126	+0.010	
		126.5Vac/60Hz	13.560116	0.000	
Extreme condition	-30°C	93.5Vac/60Hz	13.560092	-0.024	
		110Vac/60Hz	13.560101	-0.015	
		126.5Vac/60Hz	13.560092	0.000	
	+50°C	93.5Vac/60Hz	13.560133	+0.017	
		110Vac/60Hz	13.560150	+0.034	
		126.5Vac/60Hz	13.560154	+0.038	

N.P.: Not Performed.

10. OCCUPIED BANDWIDTH – CNR-Gen § 4.6

Standard: CNR-Gen § 4.6

Test method: CNR-Gen § 4.6

Test configuration: A near field probe detects field near equipment (relative measurement).

Resolutions:

Frequency	Resolution bandwidth	Video bandwidth
13.56MHz	100Hz	300Hz

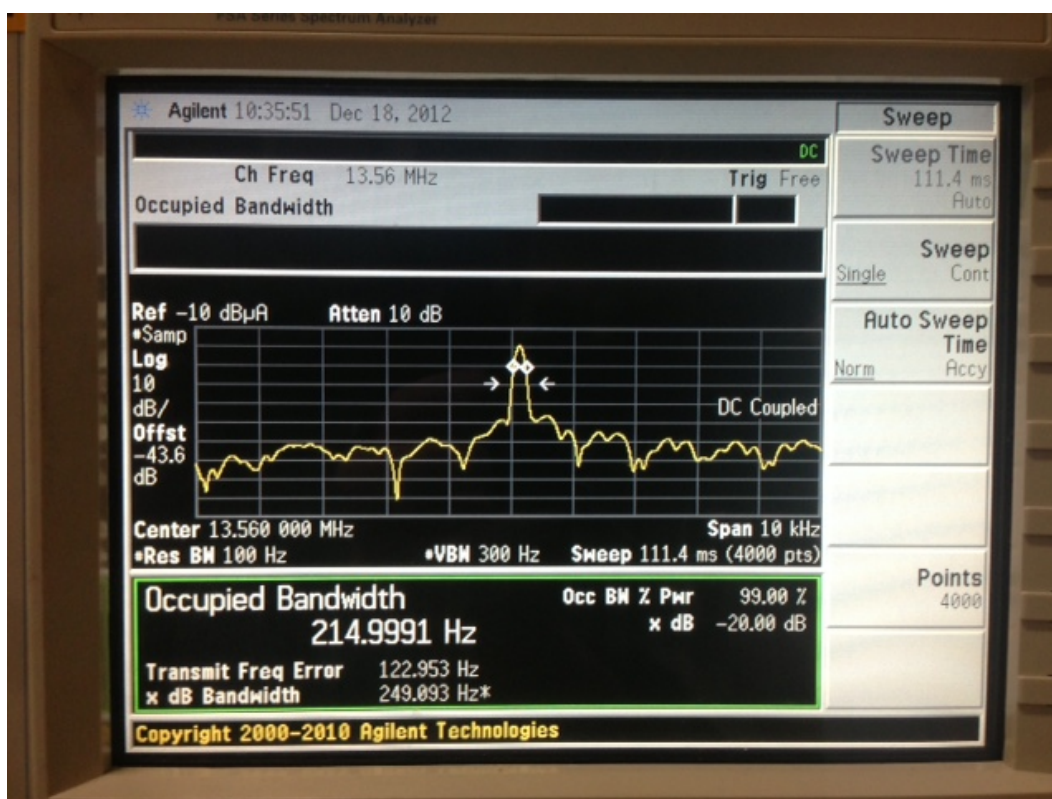
Test method deviation: E.U.T. is powered by 115Vac/60Hz power voltage.

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH	CAL DATE	DUE DATE
Antenna	Emitech	3.5 cm	4653	-	-
Power supply	KIKUSUI	PCR2000L	0800	-	-
Spectrum analyser	Agilent Technologies	E4440A	5824	24 aug 2011	24 oct 2013

Standard limits: 14 kHz

Results: Occupied bandwidth = 215Hz



□□□ End of report – 1 annex to be forwarded □□□

ANNEX: PHOTOGRAPH(S)

EQUIPMENT UNDER TEST (E.U.T.) PHOTOGRAPH(S)

RAL STAINER

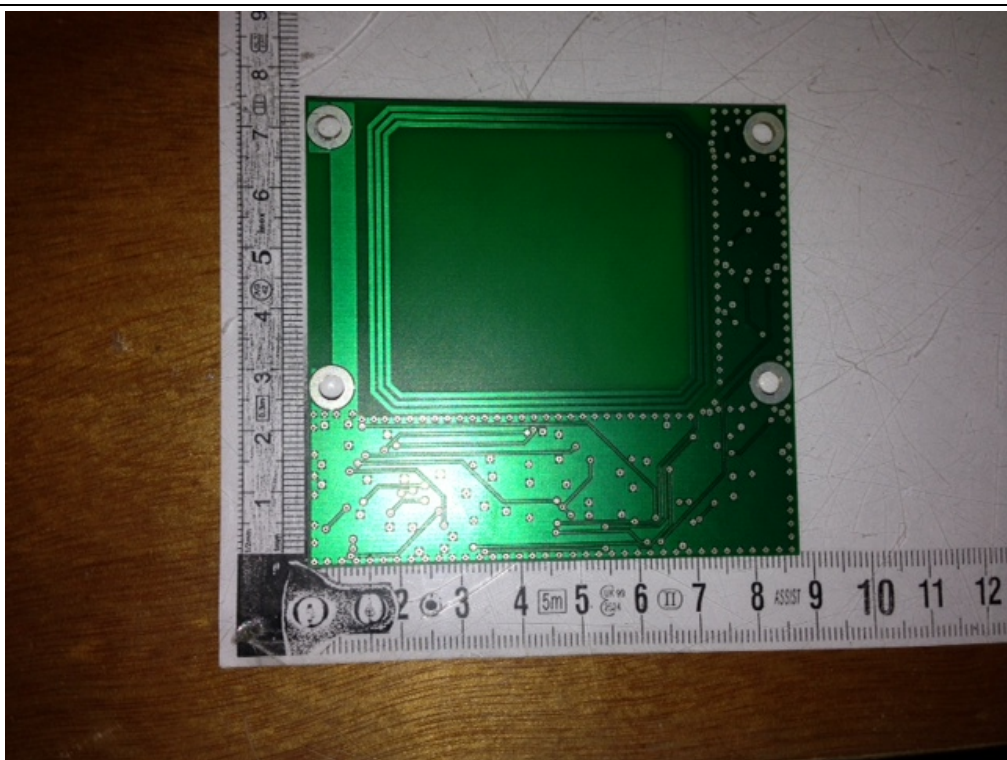
E.U.T. marking plate



RFID board



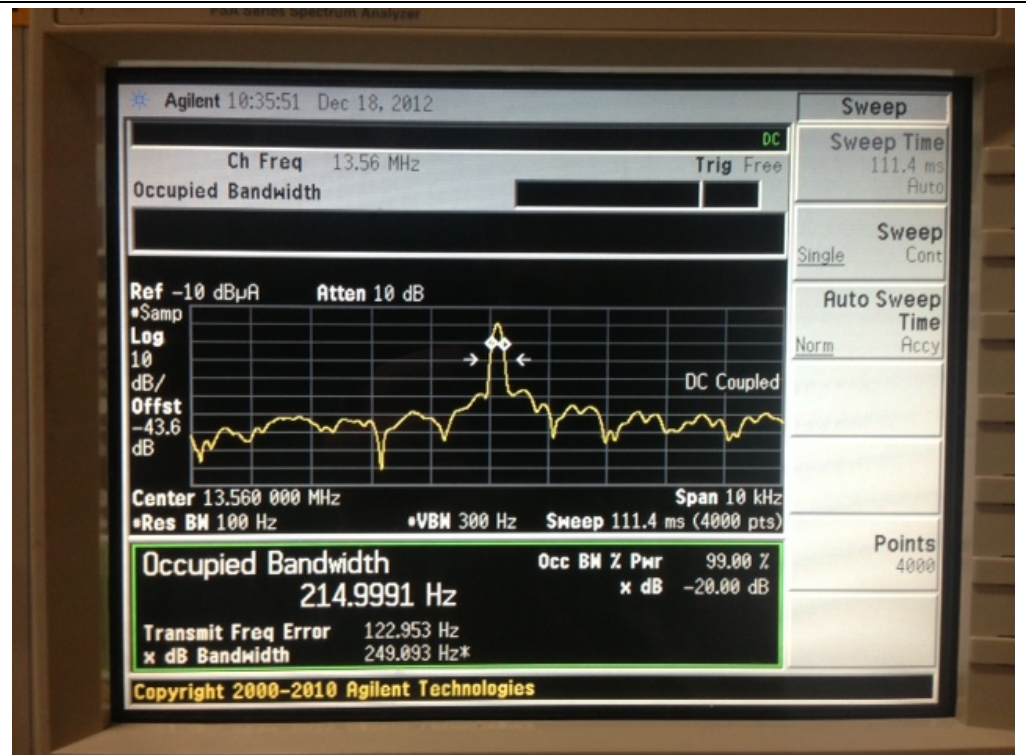
RFID board



Frequency tolerance



Occupied bandwidth



Radiated measurement



**Radiated
measurement**

