

R041-08-101280-1A - DM / CHB

RADIO TEST REPORT

According to the standard(s):

FCC part 15: 10/2007

Equipment under test:

FAREBOX FBE420
FCC ID: U36-FBE420


Company:

AFFILIATED COMPUTER SERVICES SOLUTIONS FRANCE

Diffusion: Mr VILLERET

(Company: **AFFILIATED COMPUTER SERVICES
SOLUTIONS FRANCE**)

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NAME OF THE EQUIPMENT UNDER TEST (E.U.T.) : FAREBOX FBE420

Serial number : Proto 0001

Part number : 87728593V01

Software Version : None

MANUFACTURER'S NAME : AFFILIATED COMPUTER SERVICES
SOLUTIONS FRANCE

APPLICANT'S ADDRESS:

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SOLUTIONS FRANCE

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Person(s) present during the tests : Mr CHAPIGNAC & Mr VILLERET

Responsible : Mr CHAPIGNAC

DATE(S) OF TESTS : March, the 17th 18th and 21th of 2008

TESTS LOCATION(S) : Emitech Grand Sud Laboratory in
Vendargues (34)
Open area test site in Salinelles (30)
FCC Registration number: 8127-19

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 FAREBOX FBE420 (denominated hereafter E.U.T.: equipment under test) according to document(s) listed below.

2. REFERENCE DOCUMENT(S)

FCC Part 15 (February 2006)

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

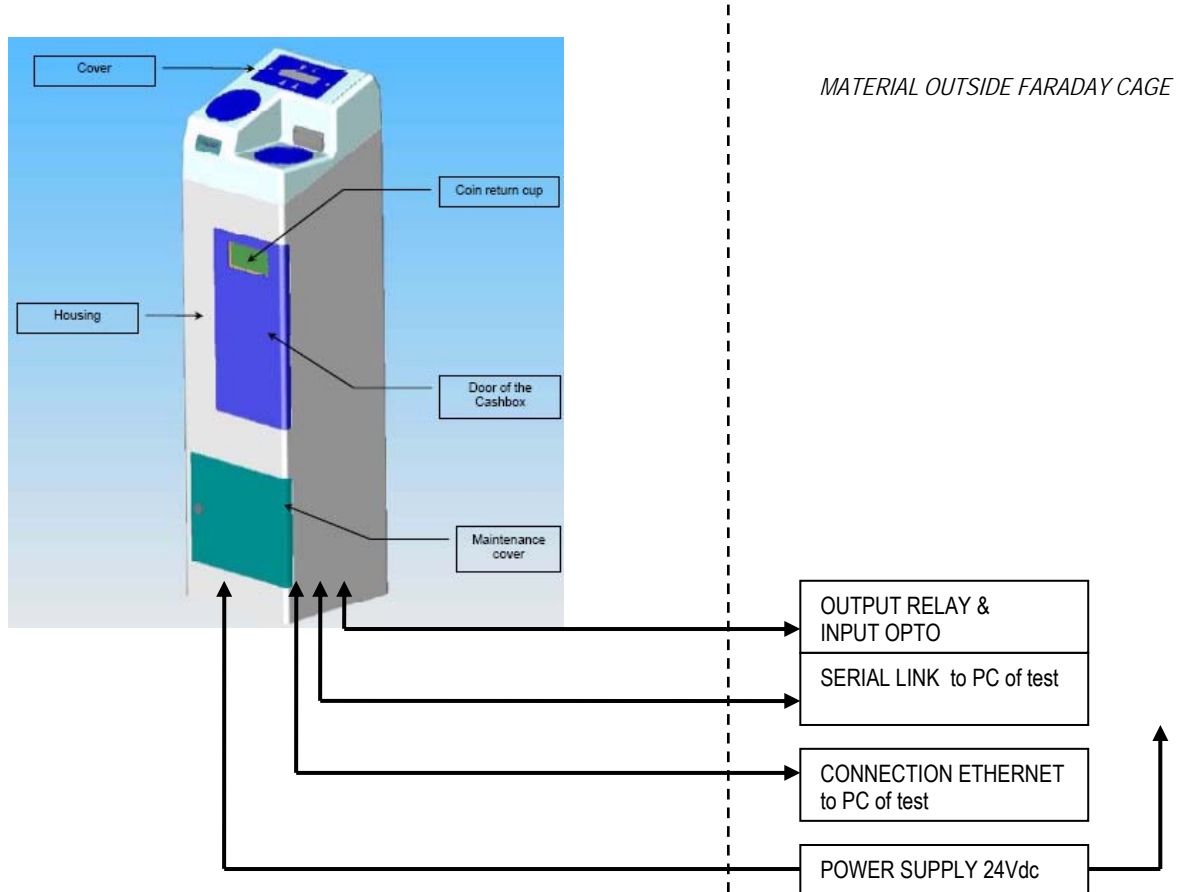
3. EQUIPMENT UNDER TEST CONFIGURATION

Product description: FCC ID: U36-FBE420
 ITU emission code: /
 Utilization: RFID TAG reader
 Antenna type: Incorporated antenna
 Antenna gain: Unknown
 Operating frequency range: 13.56 MHz
 Number of channels: 1
 Channel spacing: /
 Modulation: /
 Power source: 12 and 24Vdc
 Power level and frequency range are not user adjustable

Equipment modifications applied before tests: None

4. EQUIPMENT UNDER TEST CONFIGURATION SCHEME

The farebox is a piece of equipment that is installed on buses and is for use by passengers for cash transactions to purchase tickets, for issuing of magnetic tickets and for the validation of magnetic tickets or Contactless smart cards.



5. SUMMARY OF TEST RESULTS

Tests designation	Results satisfying?	Comments
Conducted emissions - section 15.207	YES	
Radiated emissions - section 15-209 (below 30MHz)	YES	
Radiated emissions - section 15-209 (above 30MHz)	YES	
Field strength - section 15-225	YES	
Frequency tolerance - section 15.225	YES	

N.P.: Not Performed.

N.A.: Not Applicable.

- In emission:

Sample subject to the test complies with prescriptions of the standard(s) FCC part 15: 10/2007 according to limits specified in this test report.

6. CONDUCTED EMISSIONS – SECTION 15.207

Standard: FCC part 15: 10/2007

Test method: ANSI C63.4:2003

Test configuration:

Tested cable(s)	Measure with	E.U.T. height
24Vdc power supply	L.I.S.N.	80 cm
12Vdc power supply	L.I.S.N.	80 cm

Frequency band	Tested cable(s)	Resolution bandwidth	Video bandwidth	Detection mode
150kHz-30MHz	24Vdc power supply	10KHz	30kHz	Peak
150kHz-30MHz	12Vdc power supply	10KHz	30kHz	Peak

RF antenna is replaced by a 50 Ohms load.

Test method deviation: No

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH
Cable			2724
Cable			2703
LISN	PMM	L3-25	0833
Receiver	Agilent Technologies	E7405A	2161
Shielding enclosure	RAY PROOF	C.GS1	1423
Software	Nexio	BAT EMC v.3.4.1.7	0000
Surges Suppressor	Hewlett Packard	11947A	0239

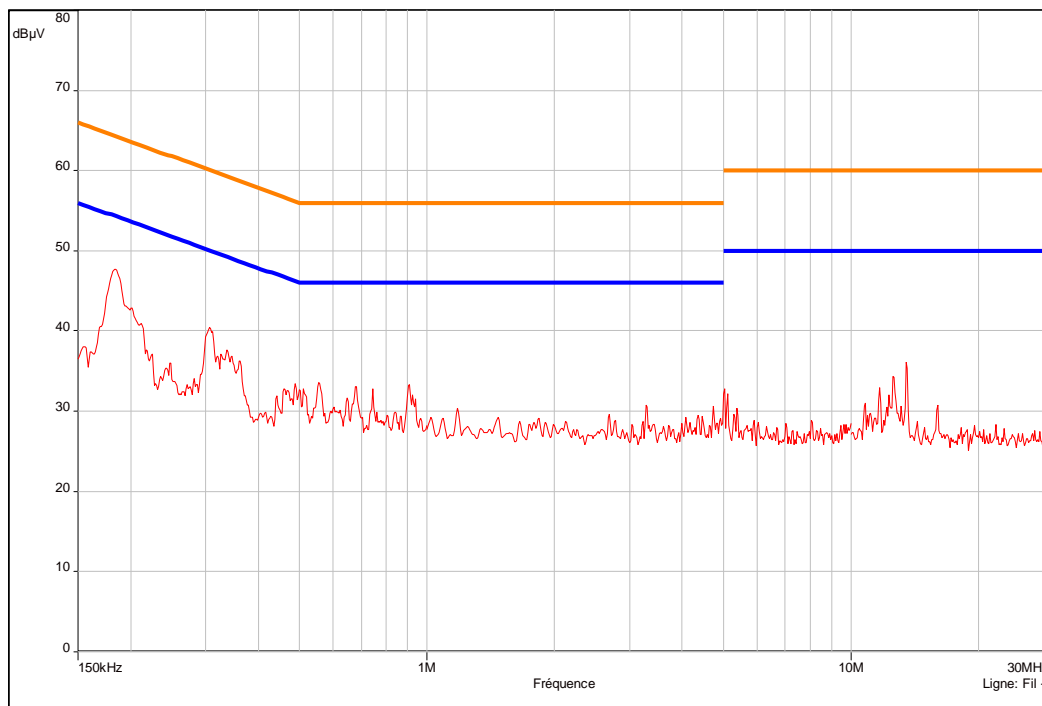
Results: See Graph(s) hereafter. Limits on the graphs are average and quasi-peak limits (upper limit).

FAREBOX FBE420

Conducted voltage emission (measurement): 24Vdc power supply
in peak detection

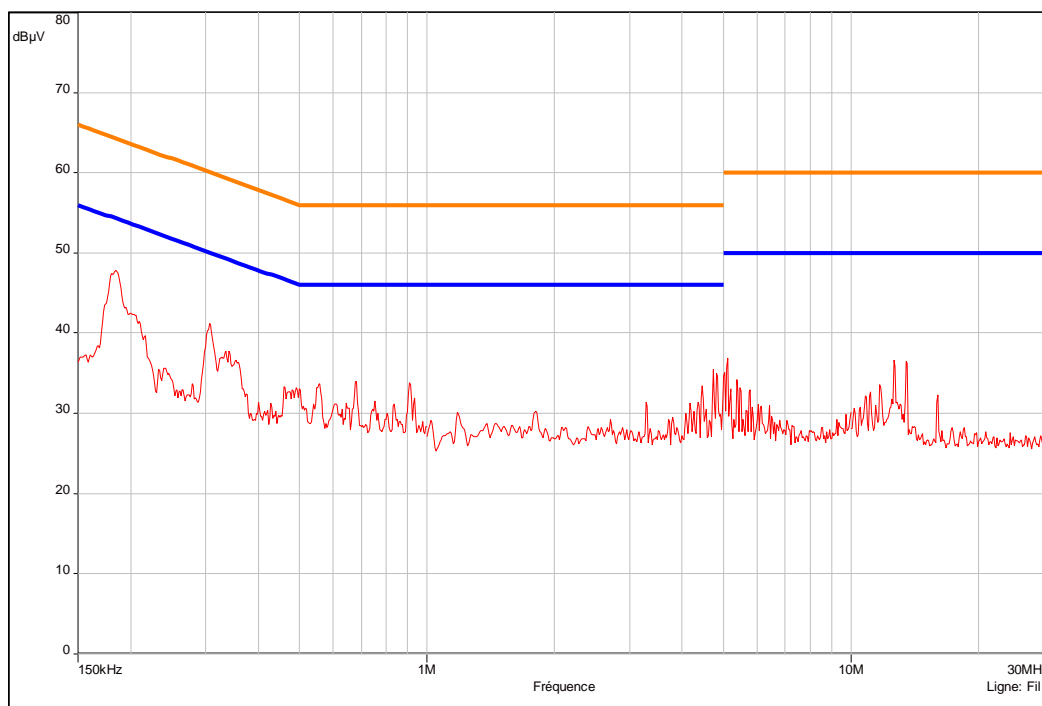
17/03/2008

— Civil/EN 55022 Ed.98 - Classe:B - Moyenne/
— Civil/EN 55022 Ed.98 - Classe:B - QCrête/
— Mes.Peak (Fil +)



Alimentation 24Vdc / 50 Ohms load - 17/03/2008 14:38 - 640

— Civil/EN 55022 Ed.98 - Classe:B - Moyenne/
— Civil/EN 55022 Ed.98 - Classe:B - QCrête/
— Mes.Peak (Fil -)



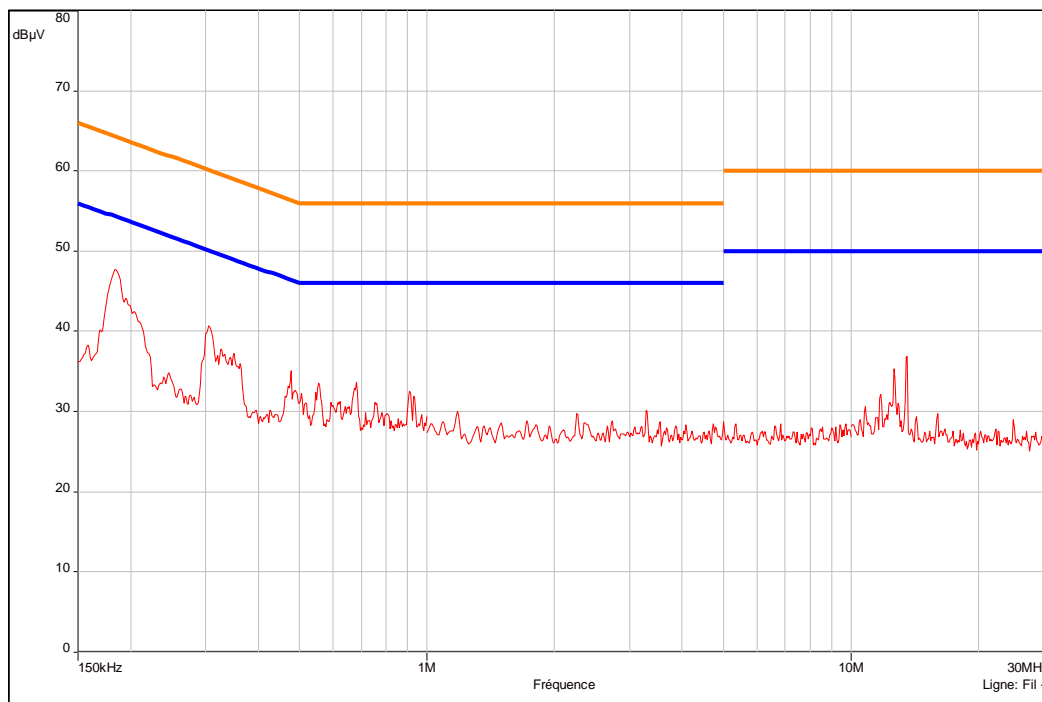
Alimentation 24Vdc / 50 Ohms load - 17/03/2008 14:38 - 640

FAREBOX FBE420

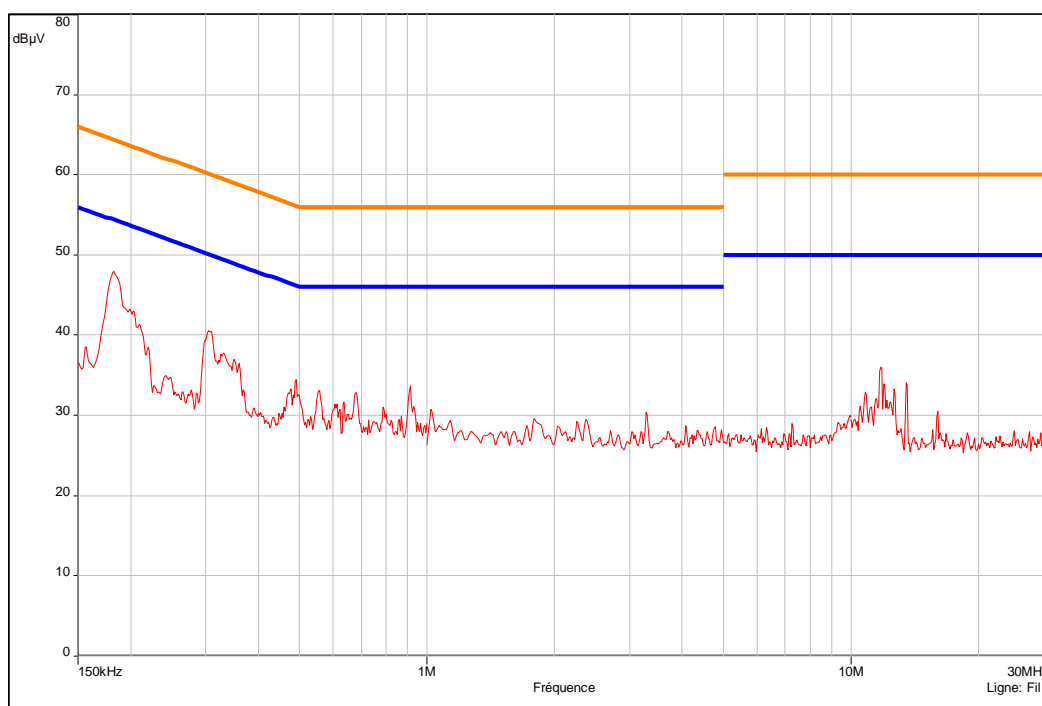
Conducted voltage emission (measurement): 12Vdc power supply
in peak detection

17/03/2008

— Civi/EN 55022 Ed.98 - Classe:B - Moyenne/
— Civi/EN 55022 Ed.98 - Classe:B - QCrête/
— Mes. Peak (Fil +)



— Civi/EN 55022 Ed.98 - Classe:B - Moyenne/
— Civi/EN 55022 Ed.98 - Classe:B - QCrête/
— Mes. Peak (Fil -)



7. RADIATED EMISSIONS - SECTION 15-209

a) Radiated emissions (below 30MHz)

Standard: FCC part 15: 10/2007

Test method: ANSI C63.4:2003

Test configuration:

Frequency band	Tested side	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
9kHz-35kHz	Front side	1kHz	3kHz	Peak	80cm
35kHz-75kHz	Front side	1kHz	3kHz	Peak	80cm
75kHz-150kHz	Front side	1kHz	3kHz	Peak	80cm
150kHz-240kHz	Front side	10kHz	30kHz	Peak	80cm
240kHz-500kHz	Front side	10kHz	30kHz	Peak	80cm
500kHz-1.1MHz	Front side	10kHz	30kHz	Peak	80cm
1.1MHz-2.4MHz	Front side	10kHz	30kHz	Peak	80cm
2.4MHz-5.5MHz	Front side	10kHz	30kHz	Peak	80cm
5.5MHz-12.5MHz	Front side	10kHz	30kHz	Peak	80cm
12.5MHz-30MHz	Front side	10kHz	30kHz	Peak	80cm

Test was performed in 24Vdc only (worst case).

Test method deviation:

- Measurements are made in peak detection instead of average mode
- Measurements are given in dB μ A/m instead of μ V/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
Antenna	Electro-Metrics	ALR-25	0263
Cable			2702
Cable			2704
Cable			2711
Cable		N-5m	2898
Preamplifier	Miteq	AU-1447	3199
Receiver	Agilent Technologies	E7405A	2161
Shielded enclosure	Ray Proof	C.GS1	1423

Results: See Graph(s) (measurement).

b) Radiated emissions (above 30MHz)

Standard: FCC part 15: 10/2007

Test method: ANSI C63.4:2003

Test configuration:

Frequency band	Configuration	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
30MHz-1GHz	Front side 24Vdc power supply	100kHz	300kHz	Peak	80cm
1GHz-1.5GHz	Front side 24Vdc power supply	1MHz	3MHz	Peak	80cm
30MHz-1.5GHz	Front side 12Vdc power supply	100kHz	300kHz	Peak	80cm
1GHz-1.5GHz	Front side 12Vdc power supply	1MHz	3MHz	Peak	80cm
30MHz-1.5GHz	Open area measurement (24Vdc)	120kHz	300kHz	Quasi peak	80cm
1GHz-1.5GHz	Open area measurement (24Vdc)	1MHz	3MHz	Average	80cm

Measurement has been performed to 10th harmonic of higher internal frequency of the system.
Open area test site were done with 24Vdc power supply (worst case).

Test method deviation: No

Measuring distance: 3 meters

Test equipment list:

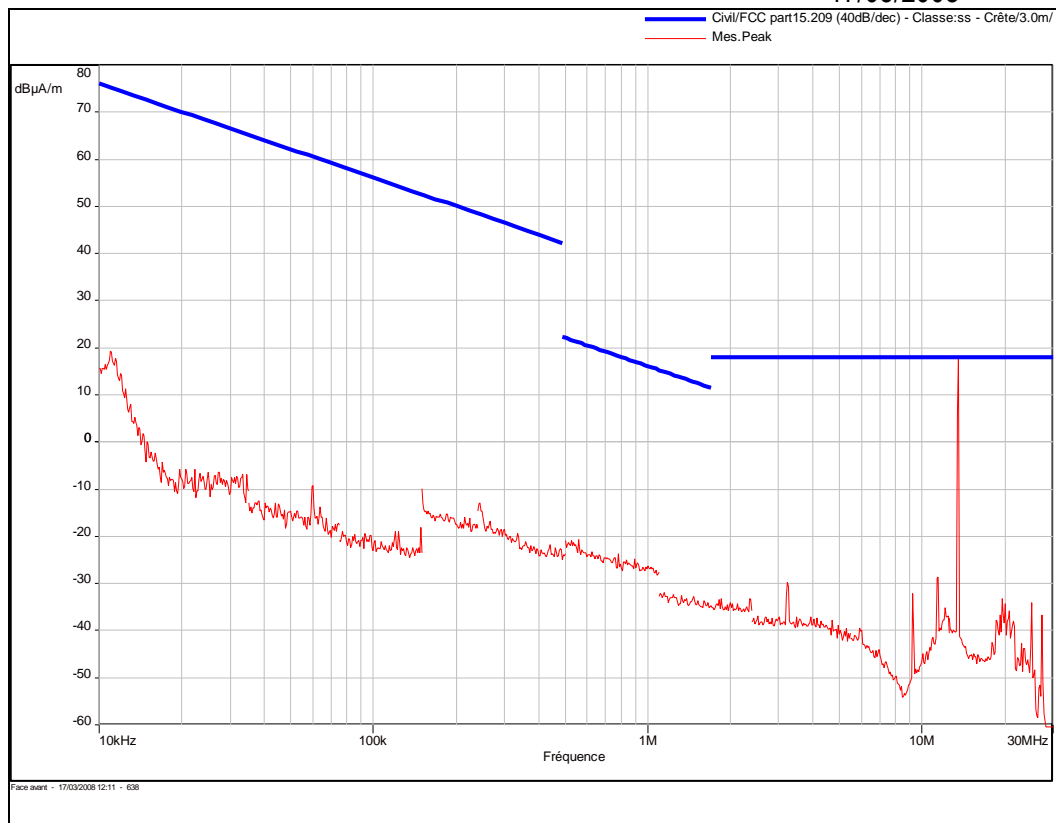
CATEGORY	BRAND	MODEL NUMBER	N° EMITECH
Antenna	Electro-Metrics	BIA-30HF	0824
Antenna	Emco	3115	1053
Cable		N-17m	3620
Cable		N-8m	3694
Cable		N-8m	2715
Log-periodic antenna	Rohde & Schwarz	HL223	3126
OATS	Emitech	Salinelles	3482
Preamplifier	Microwave	C005180F-4B1	2165
Preamplifier	Mini-circuit	ZFL-1000LN	1119
Receiver	Agilent Technologies	E7405A	2161
Software	Nexio	BAT EMC v.3.4.1.7	0000

Results: See Graph(s) (indoor pre-measurements) and Board(s) hereafter

FAREBOX FBE420

Radiated magnetic emission: front side 24Vdc power supply
(pre-measurement in semi anechoic chamber) 45°acw – peak detection - distance: 3m

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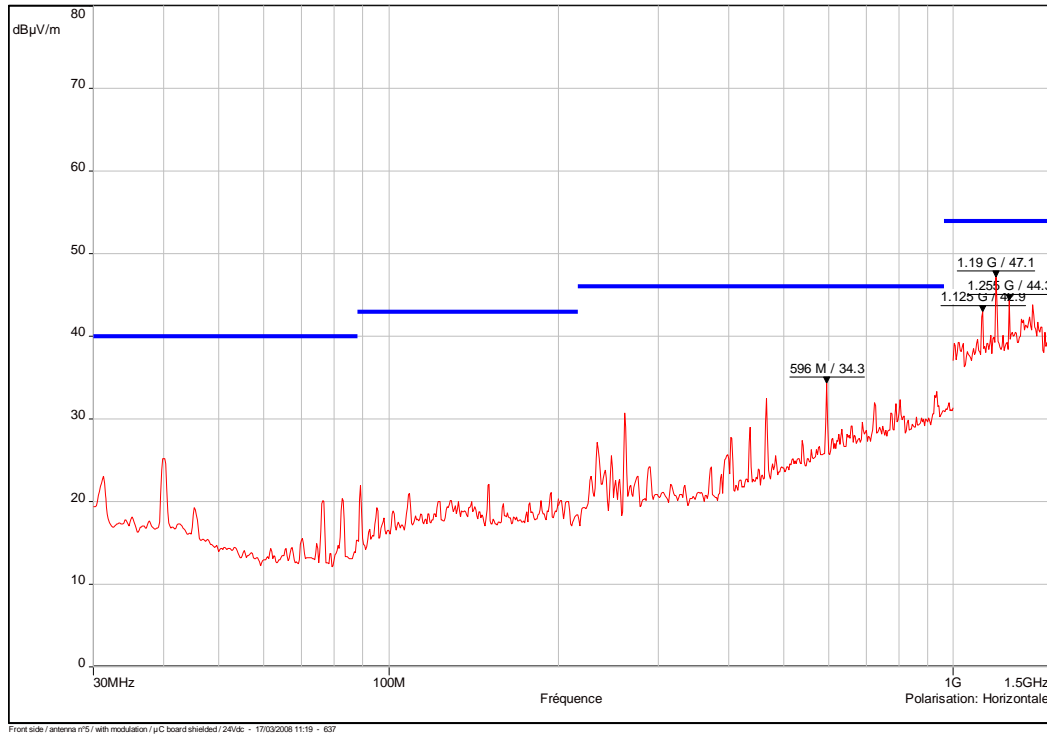
Limit indicated on this plot is calculated with 40 dB/decade extrapolation factor and 51.5 dB conversion factor.

FAREBOX FBE420

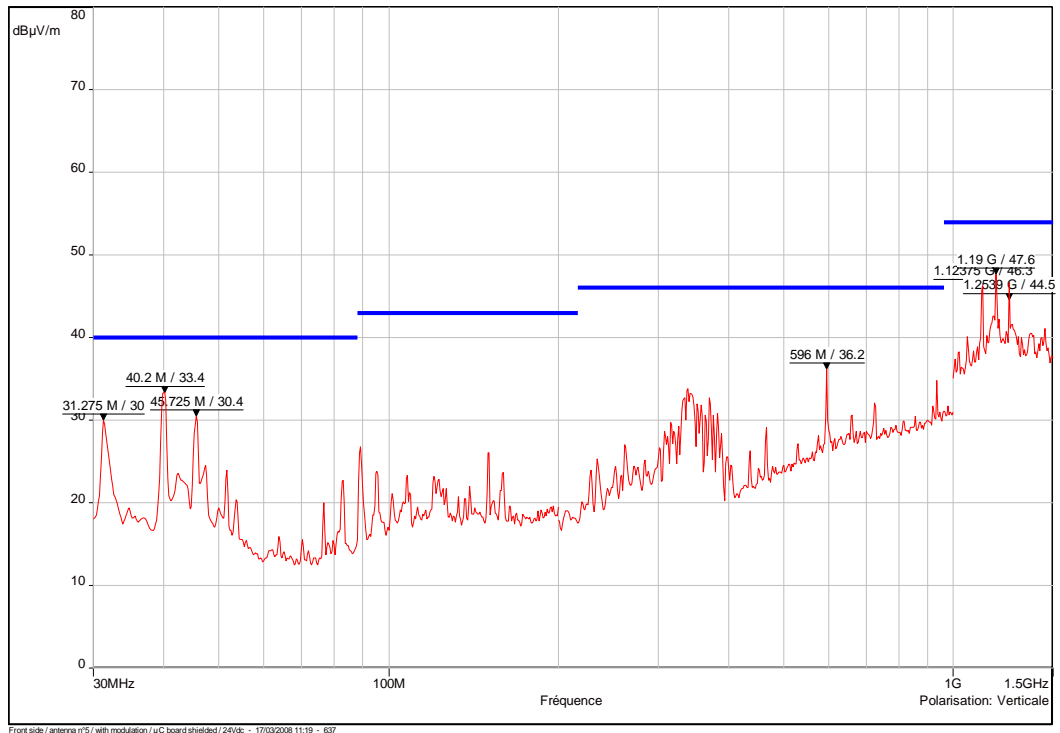
Front side 24Vdc power supply (pre-measurement):
peak detection - distance : 3m

17/03/2008

— Civil/FCC Part. 15 - Classe:B - QCrête/3.0m/
— Mes.Peak (Horizontale)



— Civil/FCC Part. 15 - Classe:B - QCrête/3.0m/
— Mes.Peak (Verticale)

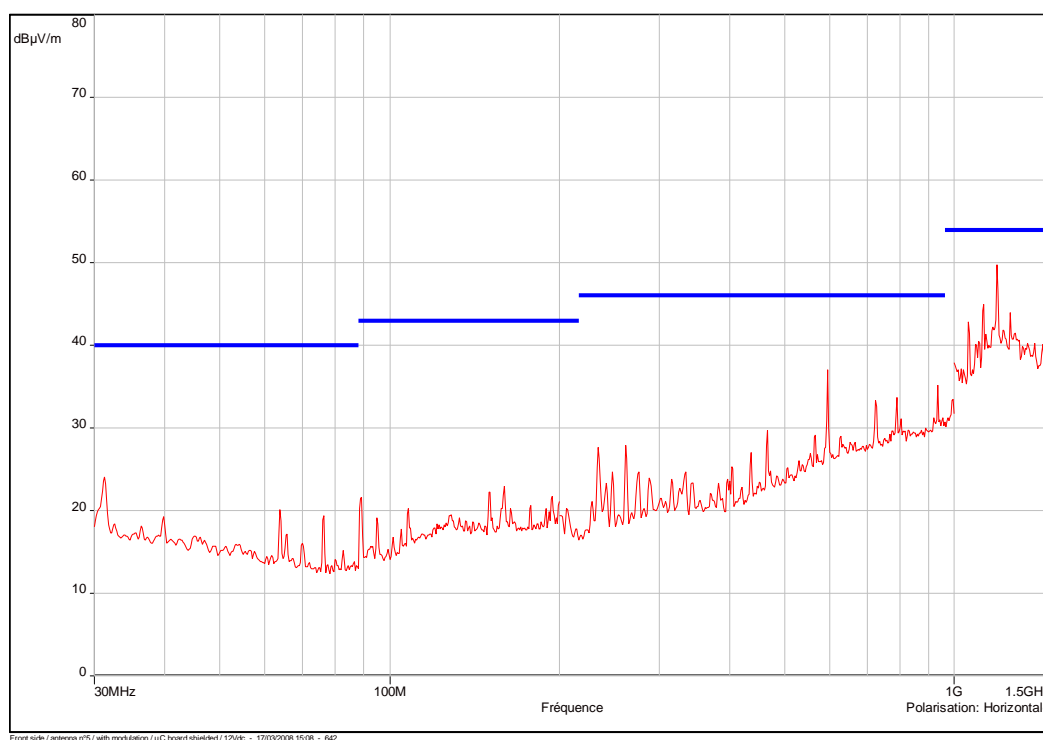


FAREBOX FBE420

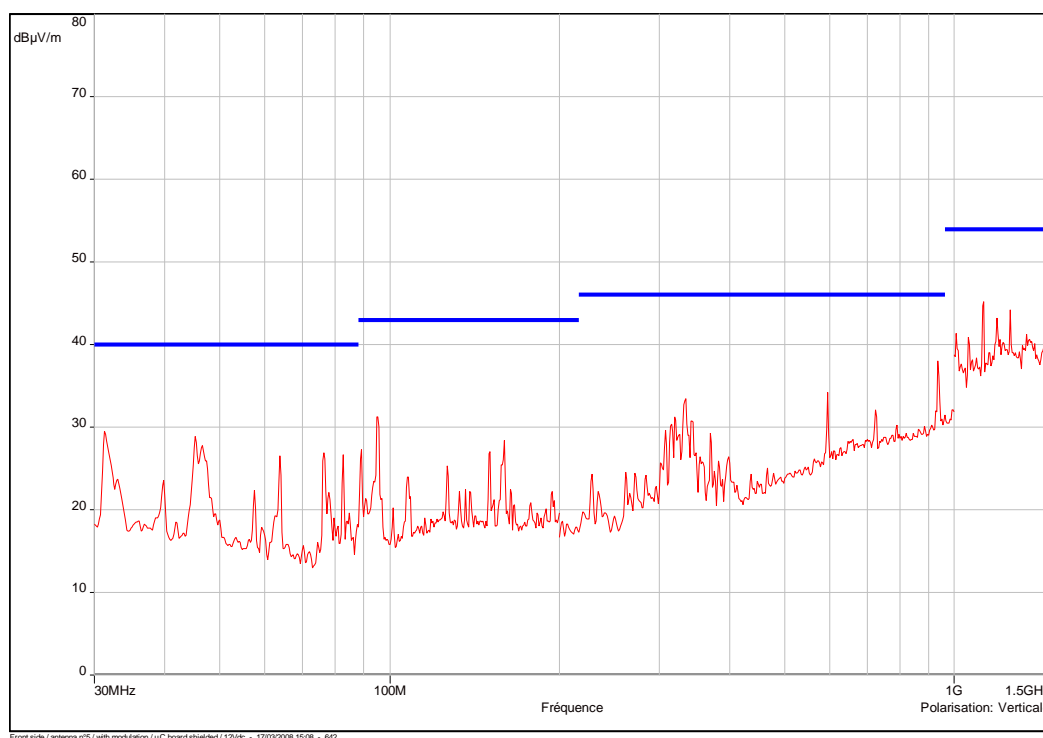
Front side 12Vdc power supply (pre-measurement):
peak detection - distance : 3m

17/03/2008

— Civil/FCC Part. 15 - Classe:B - QCrête/3.0m/
— Mes.Peak (Horizontale)



— Civil/FCC Part. 15 - Classe:B - QCrête/3.0m/
— Mes.Peak (Verticale)



c) Final radiated electric emission on Open Area Test Site – Quasi peak detection - Distance: 3m

FAREBOX FBE420 24VDC POWER SUPPLY

Frequency (MHz)	Polarization	Azimut (degrees)	Antenna height (cm)	Measure (dB μ V/m)	Standard limit (dB μ V/m)	Comments
31.28	Vertical	0	100	6.70	40	C
40.68	Vertical	340	100	38.50	40	C
48.01	Vertical	210	100	29.10	40	C
149.16	Vertical	310	100	42.30	43	C
330.00	Vertical	0	140	40.20	46	C
594.00	Vertical	55	140	42.20	46	C
1190.00	Vertical	219	100	43.66	54	C
1120.00	Vertical	220	209	42.73	54	C
1250.00	Vertical	305	100	44.70	54	C
149.16	Horizontal	71	100	35.00	43	C
230.53	Horizontal	0	100	38.90	46	C
230.98	Horizontal	0	100	36.10	46	C
487.29	Horizontal	0	196	45.50	46	C
594.00	Horizontal	336	215	44.40	46	C
1120.00	Horizontal	45	300	46.43	54	C
1190.00	Horizontal	0	112	49.50	54	C
1250.00	Horizontal	36	103	45.90	54	C

C= Compliant

NC= Not compliant

All other radiated emissions are very lower than limit.

8. OPERATION WITHIN THE BAND 13.110-14.010 MHz - SECTION 15-225**a) Field strength**

Standard: FCC part 15: 10/2007

Test method: ANSI C63.4:2003

Test configuration:

Frequency band	Tested side	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
13.11MHz-14.01MHz	Front side (24Vdc)	10kHz	30kHz	Peak	80cm

Test was performed with 24VBdc power supply (worst case)

Test method deviation:

Measurements are given in dB μ A/m instead of dB μ V/m (conversion factor: 51.5 dB)

Measuring distance is 3 or 10 meters instead of 30 m

Test equipment list:

CATEGORY	BRAND	MODEL NUMBER	N° EMITECH
Antenna	Electro-Metrics	ALR-25	0263
Cable		N-5m	2898
Cable		N-17m	3620
OATS	Emitech	Salinelles	3482
Preamplifier	MINI-CIRCUITS	RF	1321
Receiver	Agilent Technologies	Agilent E7405A	2161

Results: See Graph(s) hereafter.

FAREBOX FBE420 with 24Vdc power supply:

Carrier measurement at 10m: 9.3 dB μ A/m (\approx 60.8 dB μ V/m)

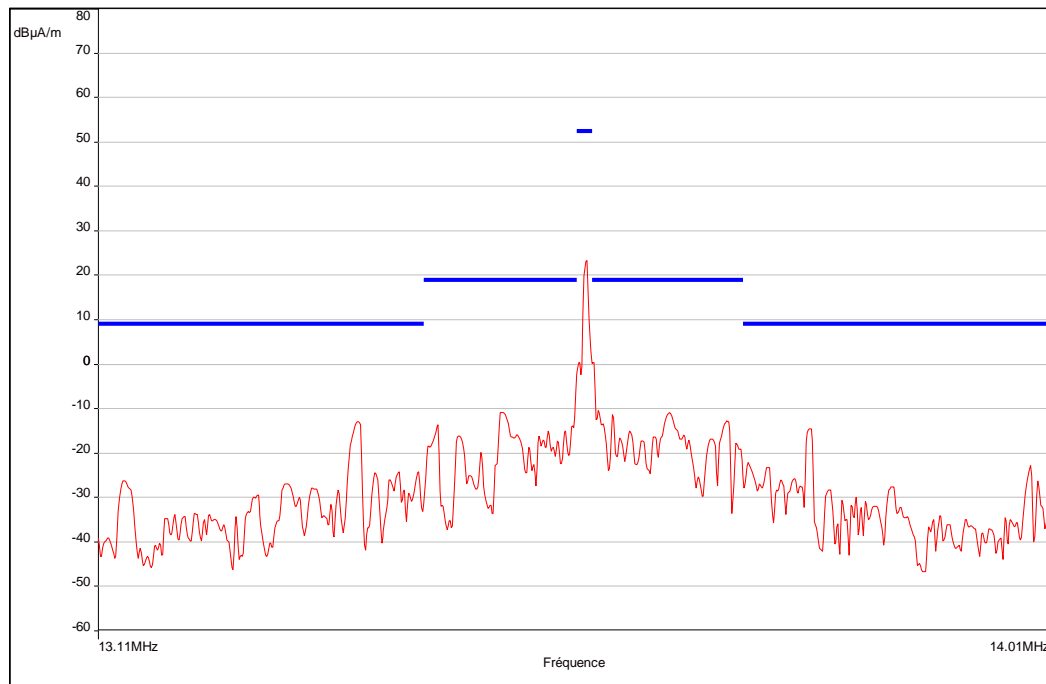
Using an extrapolation factor of 40 dB/decade (as described in section 15.31 (f)), the level is about 40.8 dB μ V/m (109.7 μ V/m) for a limit at 15.848 mV/m.

FAREBOX FBE420

Radiated magnetic emission: front side with 24Vdc power supply
(Pre-measurement in semi anechoic chamber) 45°acw – peak detection - distance: 3m

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Fréquence : 13.11 MHz - 14.01 MHz (Mode analyseur)
Réglage: RBW: 1 kHz, VBW: 3 kHz, Temps de mesure : 10 ms/Pts, nombre de Balayages: 5
Polarisation : Circulaire
Distance: 3 m



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Limit indicated on this plot is calculated with 20 dB/decade extrapolation factor and 51.5 dB conversion factor.

$$L = 20 \log (L_s) - 51.5 + 20 (F > 490 \text{ kHz})$$

with L: limit of this graph (in dBµA/m) and Ls: limit of the standard (in µV/m)

For a 40 dB/decade extrapolation factor, please add 20 dB on graph limit.

b) Frequency tolerance*Temperature: 23°C**Humidity: 31%**Pressure: 1023 hPa*Standard: FCC part 15: 10/2007Test method: ANSI C63.4:2003Test method deviation: NoTest equipment list:

CATEGORY	BRAND	MODEL NUMBER	N° EMITECH
Climatic enclosure	Sécasi	SM600C	1670
Power supply	Kikusui	PCR2000L	800
Spectrum analyzer	Hewlett Packard	8590L	2001

H field is detected by a near field probe.

Results: See Board(s) hereafter

Test condition	Frequency (MHz)	Limit ($\pm 0.01\%$)	Comments
Nominal voltage (24Vdc) Nominal temperature (23°C)	13.56049	-	-
115% voltage (27.6V)	13.56049 (0Hz)	$\pm 1.356\text{kHz}$	C
85% voltage (20.4V)	13.56049 (0Hz)	$\pm 1.356\text{kHz}$	C
-20°C, nominal voltage	13.56056(+70Hz)	$\pm 1.356\text{kHz}$	C
+50°C, nominal voltage	13.56053 (+40Hz)	$\pm 1.356\text{kHz}$	C

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

ANNEX: PHOTOGRAPH(S)

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

FAREBOX FBE420

Radiated electric
field emission on
OATS



Conducted
emissions
measurement

