

R041-07-101281-4A - AA / SM-CHB

RADIO TEST REPORT

According to the standard(s):

FCC part 15: 02/2006

Equipment under test:

RFID Tunnel Tag Reader 50x50 370

FCC ID: QHKL200TUNANT500

Company:

TAGSYS

Diffusion: Mr DOTTE

(Company: TAGSYS)

Number of pages: 22 including 1 annex

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EQUIPMENT UNDER TEST (E.U.T.) : RFID Tunnel Tag Reader 50x50 370

Serial number : T0534003

Part number : Model A0

Software Version : V 6.10

MANUFACTURER'S NAME : TAGSYS

APPLICANT'S ADDRESS:

Company : TAGSYS

Address : 180, Chemin de Saint Lambert
13821 LA PENNE-SUR-HUVEAUNE
FRANCE

Person(s) present during the tests : Mr DOTTE, Mr d'ANNUNZIO, Mr PELLET,
and Mr TRAN

Responsible : Mr DOTTE

DATE(S) OF TESTS : May from 17th to 20th and june the 5th and the
8th of 2007

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

TESTS SUPERVISOR(S) : None

TESTS OPERATOR(S) : Augustin ALVAREZ

CONTENTS

1. INTRODUCTION.....	4
2. REFERENCE DOCUMENT(S).....	4
3. EQUIPMENT UNDER TEST CONFIGURATION.....	4
4. EQUIPMENT UNDER TEST CONFIGURATION SCHEME.....	5
5. SUMMARY OF TEST RESULTS.....	6
6. CONDUCTED EMISSIONS – SECTION 15.207.....	7
7. RADIATED EMISSIONS - SECTION 15-209.....	10
a) Radiated emissions (below 30MHz)	10
b) Radiated emissions (above 30MHz).....	11
8. OPERATION WITHIN THE BAND 13.110-14.010 MHZ - SECTION 15-225.....	15
a) Field strength.....	15
b) Frequency tolerance.....	17
ANNEX: PHOTOGRAPH(S).....	16

1. INTRODUCTION

This document submits the results of Electromagnetic Compatibility tests performed on the equipment **RFID Tunnel Tag Reader 50x50 370** (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

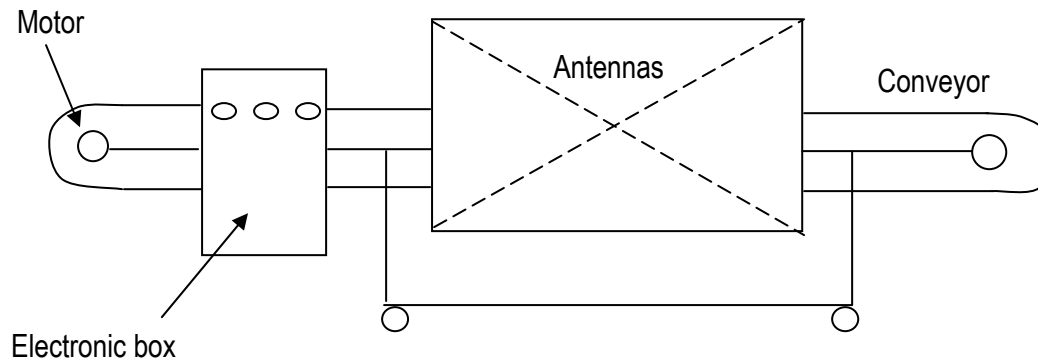
ANSI C 63.4 (2003)

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: QHKL200TUNANT500
ITU emission code: -
Utilization: RFID Passive TAG Reader
Antenna type: 4 Loop Antennas
Antenna gain: unknown
Operating frequency range: 13.560 MHz
Number of channels: Single channel Operation at 13.56MHz
Channel spacing: Single channel Operation at 13.56MHz
Modulation: ASK 10%
Power source: Mains Supply Voltage
Power level and frequency range are not user adjustable

4. EQUIPMENT UNDER TEST CONFIGURATION SCHEME

Modifications applied: RF emitting power limited at 1.25W when powered by 110Vac/60Hz supply,
Cable path shorted and optimized,
Filter SCHAFFNER FN 2310X-3-06 at the entry of the main frame,
Ferrite beads on RFID, I/O and motor cables and on power supply wires,
All shields as short as possible to the main frame
RS232 shield to main frame

5. SUMMARY OF TEST RESULTS

Tests designation	Results satisfying?	Comments
Conducted emissions - section 15.207	YES	With modifications
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:**

With the modifications, sample subject to the tests complies with prescriptions of the standard(s) FCC part 15: 02/2006 according to limits specified in this test report.

6. CONDUCTED EMISSIONS – SECTION 15.207

Standard: FCC part 15: 02/2006

Test method: ANSI C63.4:2003

Test configuration:

Tested cable(s)	Measure with	E.U.T. height
Main power supply 110 Vac/60 Hz	L.I.S.N.	10 cm

Frequency band	Tested cable(s)	Resolution bandwidth	Video bandwidth	Detection mode
150kHz-1MHz	Main power supply 110Vac/60Hz	10KHz	30kHz	Peak
1MHz-10MHz	Main power supply 110Vac/60Hz	10kHz	30kHz	Peak
10MHz-30MHz	Main power supply 110Vac/60Hz	10KHz	30kHz	Peak

Test method deviation: No

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH
Cable		N-5m	2713
Cable		N-1m	2703
LISN	PMM	L3-25	0821
Receiver	Agilent Technologies	8568B	0809
Shielding enclosure	RAY PROOF	C.GS1	1423
Software	Nexio	BAT EMC v.3.1.7.1	0000
Surges Suppressor	Hewlett Packard	11947A	0238

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

With dummy loads, no level over limits is noticed.

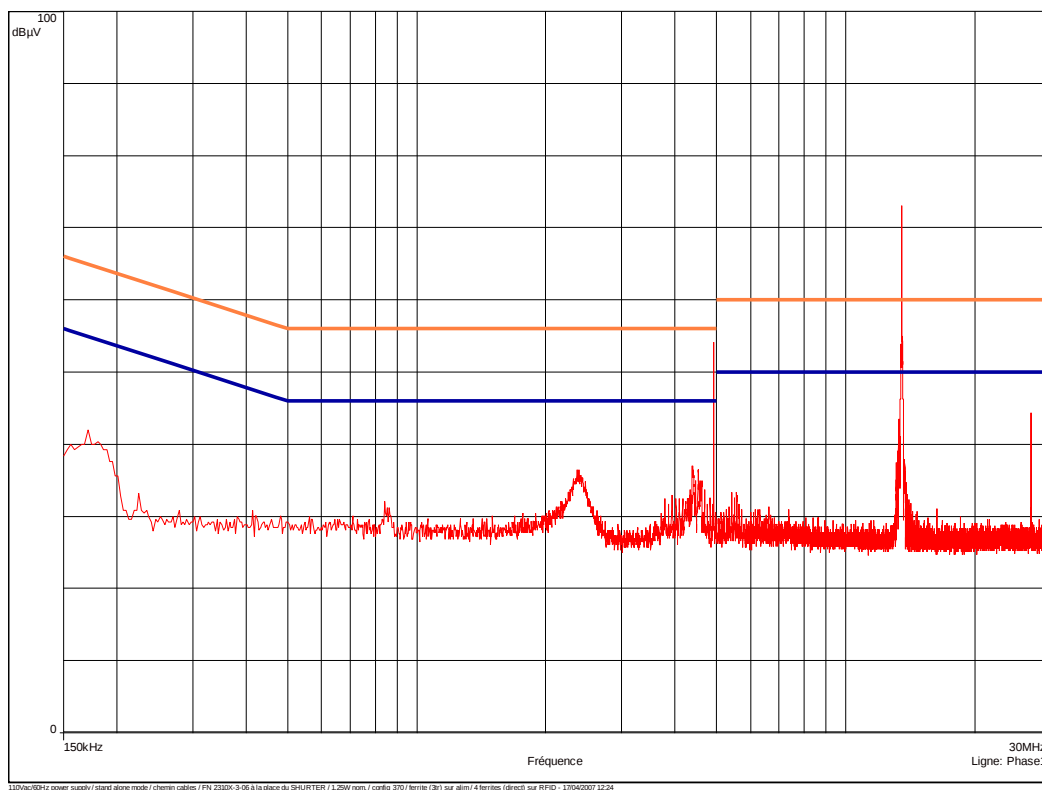
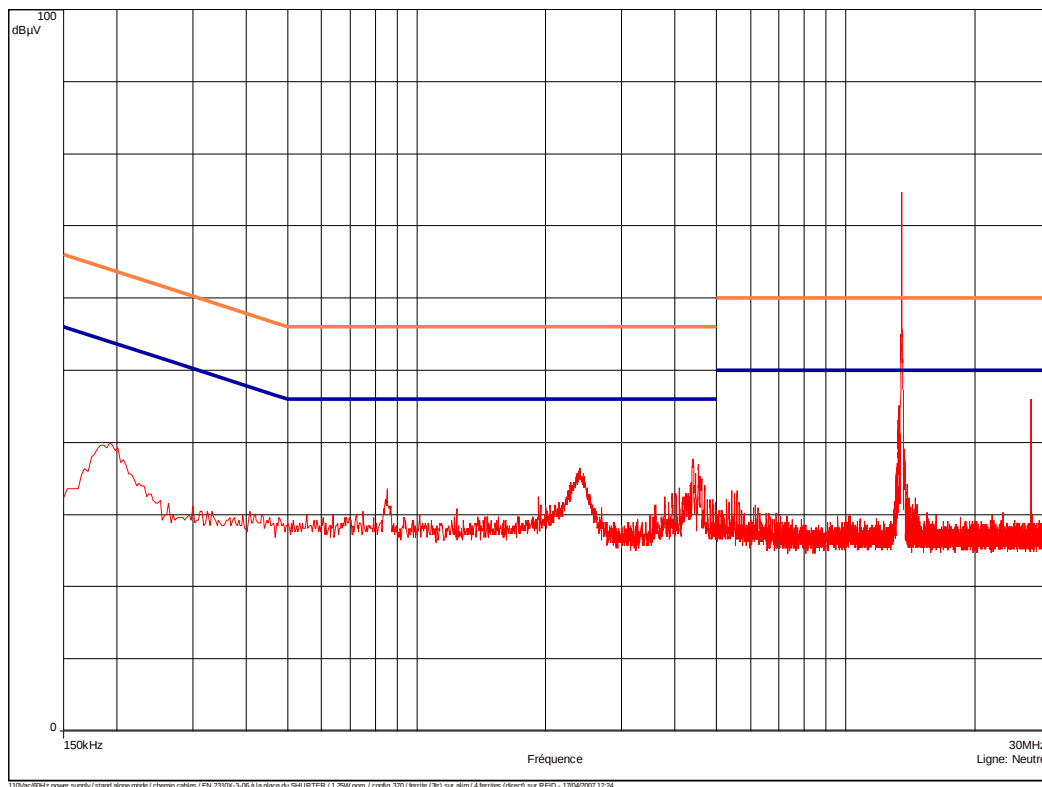
With modifications listed hereafter: RF emitting power limited at 1.25W,
Cable path shorted and optimized,
Filter SCHAFFNER FN 2310X-3-06 at the entry of the main frame,
Ferrite beads on RFID cables and power supply wires.

Nota: measurement at 4.98MHz is transient.

Tunnel Tag Reader 50x50 370

Conducted voltage emission (measurement): Main power supply 110Vac/60Hz in peak detection.
With modifications

17/04/2007



Class: B of the standard

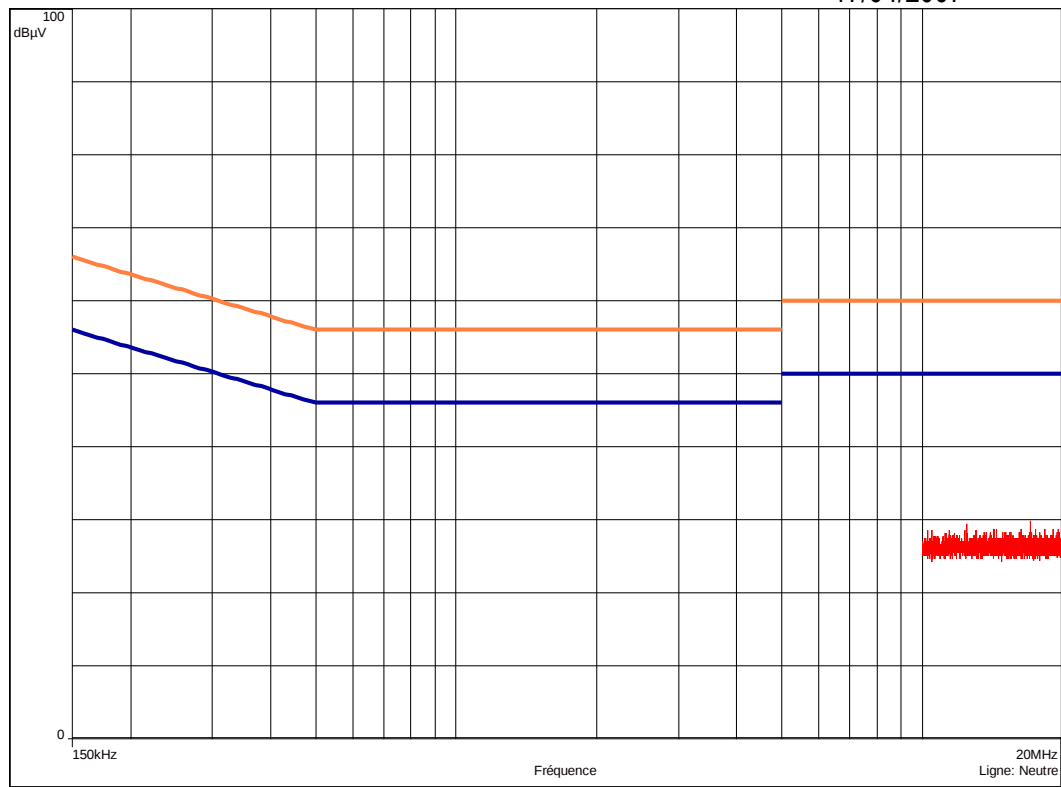
Tunnel Tag Reader 50x50 370

Conducted voltage emission (measurement): Main power supply 110Vac/60Hz in peak detection.

With modifications

With dummy loads on RF outputs

17/04/2007



7. RADIATED EMISSIONS - SECTION 15-209

a) Radiated emissions (below 30MHz)

Standard: FCC part 15: 02/2006

Test method: ANSI C63.4:2003

Test configuration:

Frequency band	Tested side	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
9kHz-35kHz	Left side	100Hz	300Hz	Peak	10cm
35kHz-75kHz	Left side	100Hz	300Hz	Peak	10cm
75kHz-150kHz	Left side	100Hz	300Hz	Peak	10cm
150kHz-240kHz	Left side	10kHz	30kHz	Peak	10cm
240kHz-500kHz	Left side	10kHz	30kHz	Peak	10cm
500kHz-1.1MHz	Left side	10kHz	30kHz	Peak	10cm
1.1MHz-2.4MHz	Left side	10kHz	30kHz	Peak	10cm
2.4MHz-5.5MHz	Left side	10kHz	30kHz	Peak	10cm
5.5MHz-12.5MHz	Left side	10kHz	30kHz	Peak	10cm
12.5MHz-30MHz	Left side	10kHz	30kHz	Peak	10cm

Test method deviation:

- 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 20dB / decade (worst case).

Test equipment list:

CATEGORY	BRAND	TYPE	N° EMITECH
Antenna	Electro-Metrics	ALR-25	0263
Cable		N-1m	2703
Cable		N-1m	2704
Cable		N-5m	2713
Preamplifier	Miteq	AU-1447	3199
Receiver	Agilent Technologies	E7405A	0809
Shielded enclosure	Ray Proof	C.GS1	1423
Software	Nexio	BAT EMC v.3.1.7.1	0000

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

b) Radiated emissions (above 30MHz)**Standard:** FCC part 15: 02/2006**Test method:** ANSI C63.4:2003**Test configuration:**

Frequency band	Configuration	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
30MHz-200MHz	Left side (pre-measurement in semi anechoic chamber)	100kHz	300kHz	Peak	10cm
200MHz-1GHz	Left side (pre-measurement in semi anechoic chamber)	100kHz	300kHz	Peak	10cm
30MHz-1GHz	Open area measurement	120kHz	300kHz	Quasi peak	10cm

Test method deviation:

- Measurements are given in dB μ V/m instead of μ V/m

Measuring distance: 3 meters from nearest part of the equipment to receiving antenna**Test equipment list:**

CATEGORY	BRAND	MODEL NUMBER	N° EMITECH
Antenna	Electro-Metrics	BIA-30HF	0824
Cable		N-17m	3620
Log-periodic antenna	Rohde & Schwarz	HL223	3126
OATS	Emitech	Salinelles	3482
Receiver	Rohde & Schwarz	ESVS10	3211

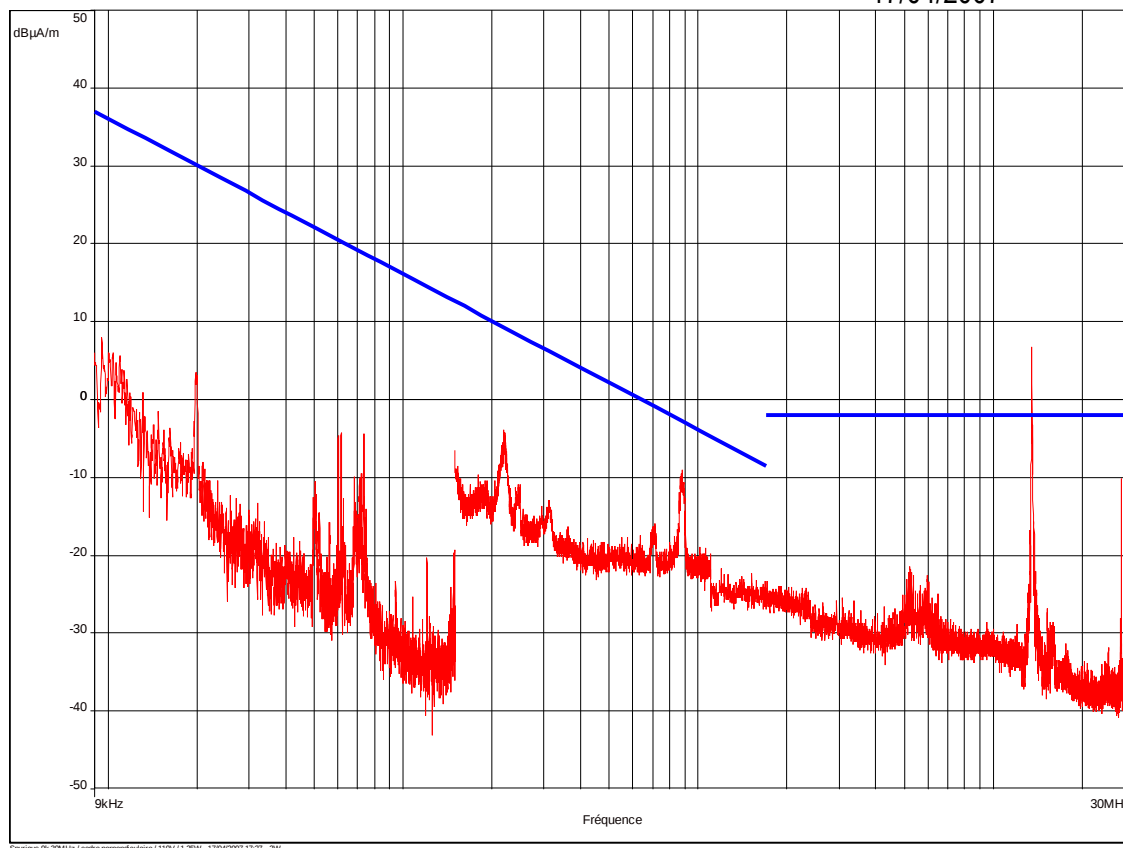
Results: See **Graph(s)** (indoor pre-measurements) and **Board(s)** hereafter

With modification listed hereafter: RF emitting power at 1.25W,
Cable path shorted and optimized,
Filter SCHAFFNER FN 2310X-3-06 at the entry of the main frame,
Ferrite beads on RFID, I/O and motor cables and on power supply wires,
All shields as short as possible to the main frame
RS232 shield to main frame.

Tunnel Tag Reader 50x50 370

Radiated magnetic emission: – peak detection - Distance: 3m

17/04/2007



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

$$L = 20 \log(L_s) - 51.5 + 40 \quad (F < 490 \text{ kHz})$$

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

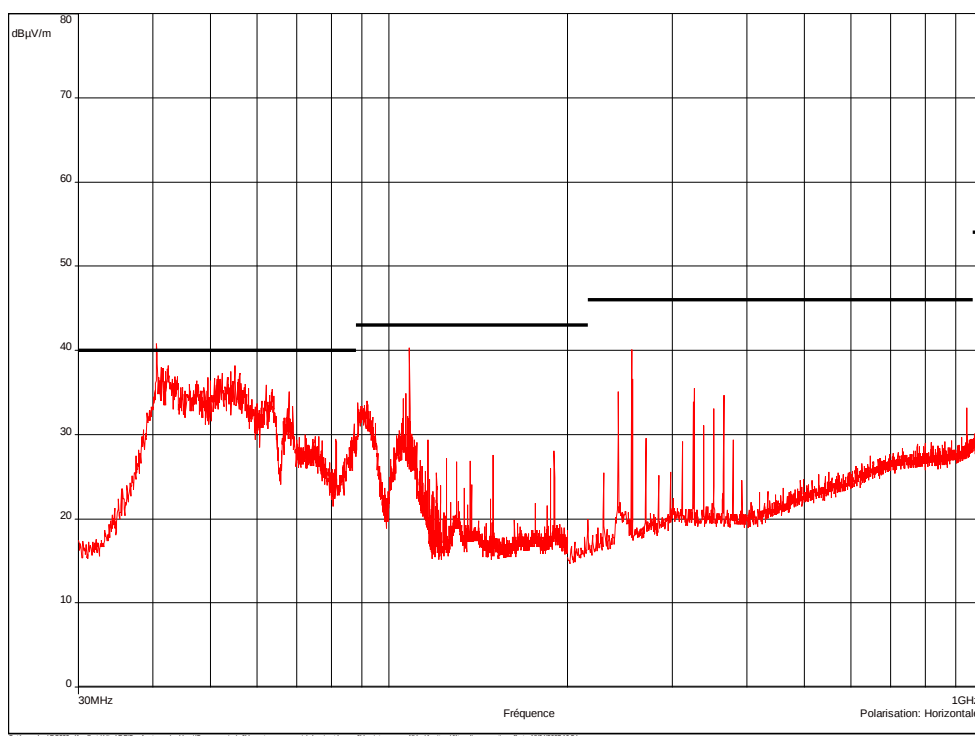
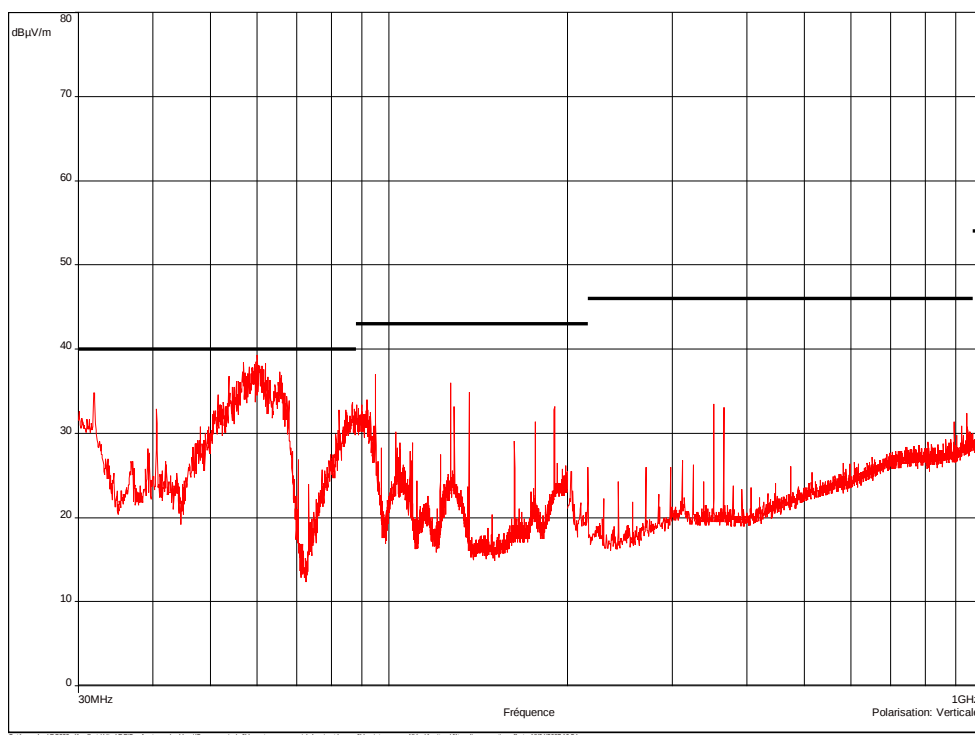
with L : limit of this graph (in dBμA/m) and Ls : limit of the standard (in μV/m)

For a 40 dB/decade extrapolation factor, please add 40 dB on graph limit below 490 kHz and 20 dB above.

Tunnel Tag Reader 50x50 370

Radiated electric emission (pre-measurement): left side – peak detection - Distance: 3m
With modifications

17/04/2007



Radiated electric emission on Open Area Test Site – Quasi peak detection - Distance: 3m

VERTICAL POLARIZATION

Frequency (MHz)	Azimut (degrees)	Antenna height (cm)	Measure (dB μ V/m)	Standard limit (dB μ V/m)	Comments
30-34	60	100	20.0 max (peak)	40	C
40.7	0	100	26.4	40	C
60.0	0	100	25.3	40	C
94.8	FM Band		32.0 max	43	(*)
127.4	0	400	24.2	43	C
136.4	0	100	22.1	43	C
189.8	0	100	28.8	43	C
352.5	0	150	33.3	46	C
366.1	0	150	33.3	46	C

C= Compliant

NC= Not compliant

(*) Maximum ambient measurement with 10 kHz resolution bandwidth in peak detection

HORIZONTAL POLARIZATION

Frequency (MHz)	Azimut (degrees)	Antenna height (cm)	Measure (dB μ V/m)	Standard limit (dB μ V/m)	Comments
40.7	90	400	30.2	40	C
40-70	100	350	21.0 max (peak)	40	C
67.8	130	400	29.7	40	C
108.4	160	360	28.9	43	C
243.6	140	100	29.2	46	C
256.4	140	100	35.7	46	C
325.4	190	100	39.8	46	C
366.1	190	100	37.2	46	C

C= Compliant

NC= Not compliant

All other radiated emissions are very lower than limit.

Nota: 0° corresponds to tunnel tag reader set with conveyor motor and electronic box directed to receiving antenna

8. OPERATION WITHIN THE BAND 13.110-14.010 MHz - SECTION 15-225

a) Field strength

Standard: FCC part 15: 02/2006

Test method: ANSI C63.4:2003

Test configuration:

Frequency band (MHz)	Tested side	Resolution bandwidth	Video bandwidth	Detection mode	E.U.T. height
13.11-14.01	Open area measurement	10kHz	30kHz	Peak	10cm

Test method deviation:

- Measurements are given in dB μ A/m instead of μ V/m (conversion factor: 51.5 dB)
- Measuring distance is 3 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 (pre-measurement at 3m in semi anechoic chamber).

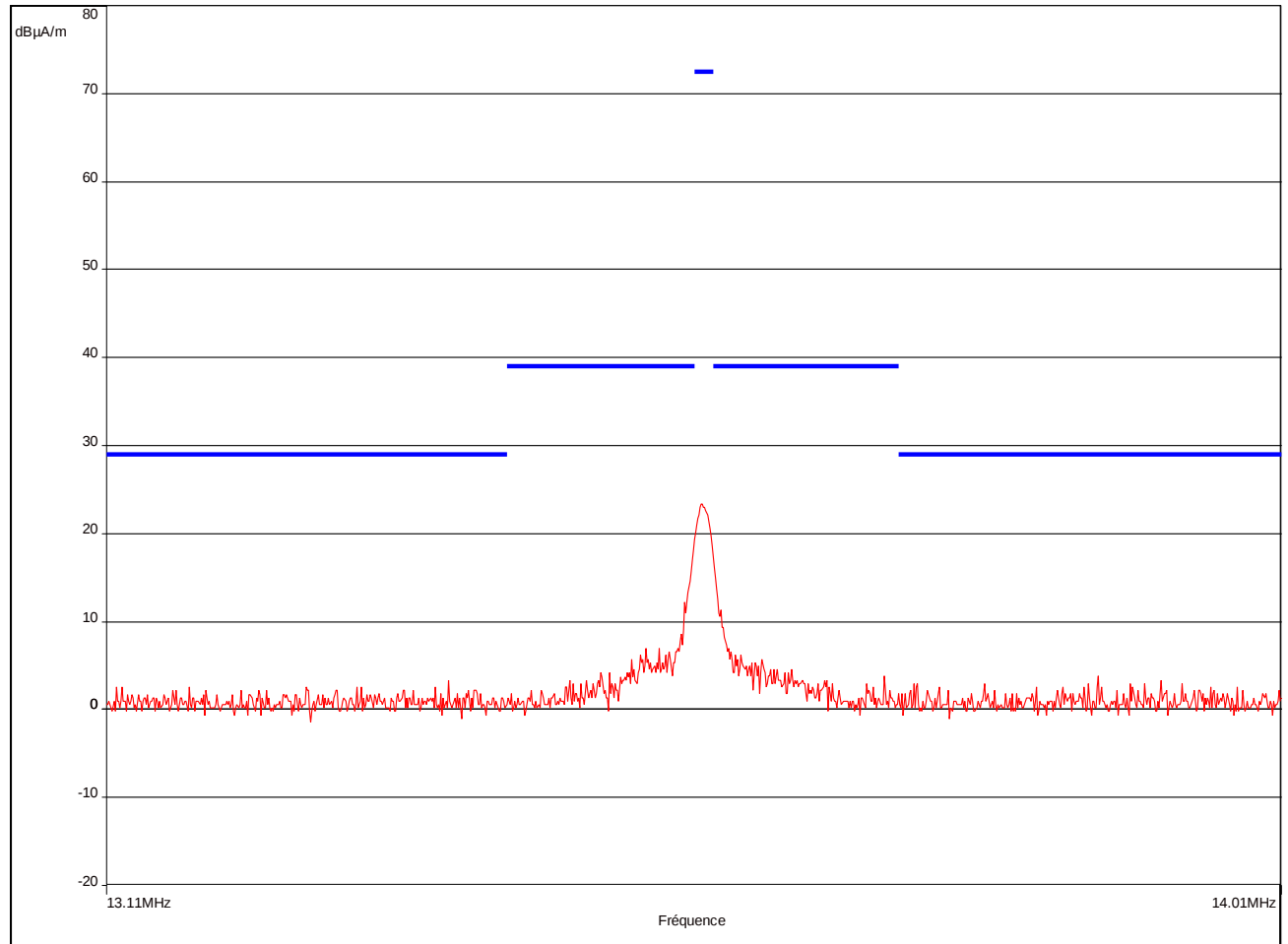
Carrier measurement at 3m: 25.8 dB μ A/m ($\approx$ 77.3 dB μ V/m)

Using an extrapolation factor of 40 dB/decade (as described in section 15.31 (f)), the level is about 37.3 dB μ V/m (73.3 μ V/m) at 30 meters for a limit at 15.848 mV/m.

Tunnel Tag Reader 50x50 370

Radiated magnetic field emission: in peak detection - Distance: 3m

20/04/2007



porteuse / modifs conduit / 110V / 1.25W - 20/04/2007 09:53 - 20V

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

$$L = 20 \log(L_s) - 51.5 + 40 \quad (F > 490 \text{ kHz})$$

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

b) Frequency tolerance

Standard: FCC part 15: 02/2006

Test method: FCC part 15: 02/2006

Measurement condition: A near field probe is set near a RFID module in the climatic chamber. The frequency band is measured.

Test method deviation: Due to equipment size, only the RFID module is set in the climatic chamber.

Test equipment list:

CATEGORY	BRAND	MODEL NUMBER	N° EMITECH
AC power supply	KIKUSUI	PCR2000L	0800
Spectrum analyser	Hewlett Packard	HP 8590L	2001
Climatic chamber	Secasi	SM600C	1670

Operating mode during the test: Modulation and multiplexed emission.

Results :

Voltage	Temperature	Frequency (MHz)	Variation
Nominal : 110V / 60Hz	Nominal : 20 °C	13.560255	-
110V	Temperature high: 55 °C	13.560255	none
	Temperature low : -20 °C:	13.560255	none
Voltage high: 126.5V	20 °C	13.560255	none
Voltage low: 93.5V		13.560255	none

The frequency is maintained within +/- 0.01% of operating frequency for these parameters

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

ANNEX: PHOTOGRAPH(S)

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

RFID Tunnel Tag Reader 50x50 370

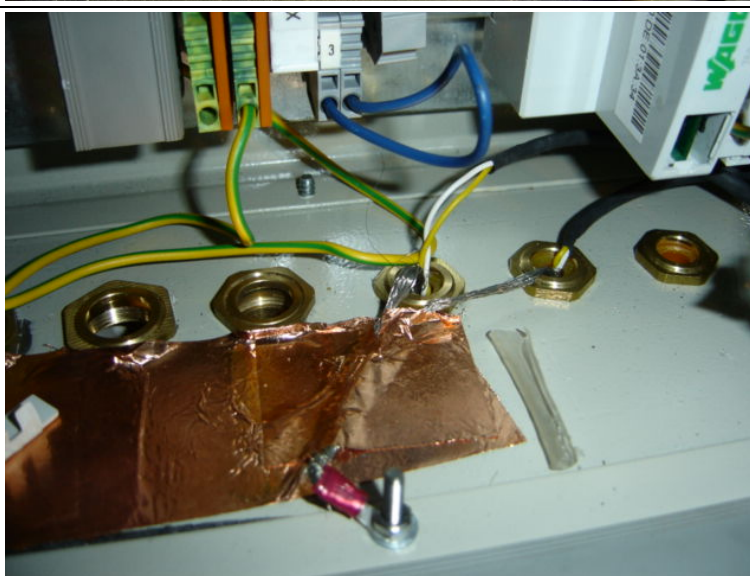
E.U.T. Photograph(s)



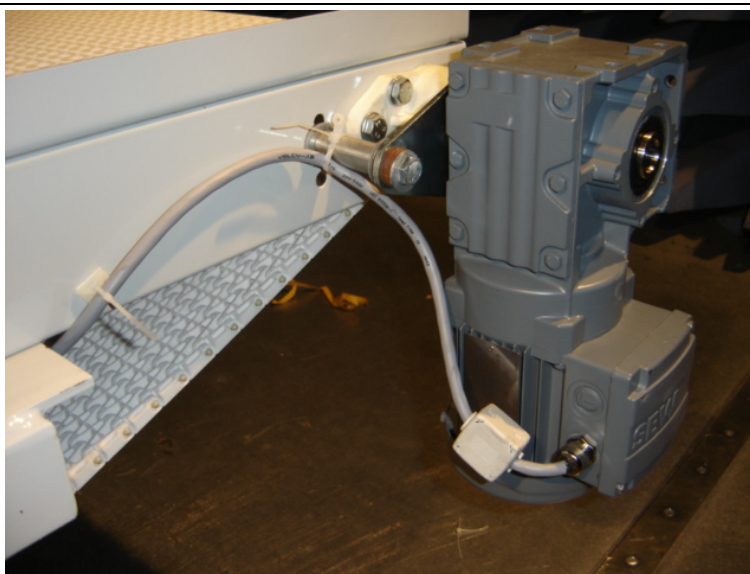
Radiated field
emission on OATS



Modifications



Modifications



Modifications

