



**Telecommunications & Telematics
for Transports Lab.**

TEST REPORT

Ref. No. ARSH00145

Date: 2007-11-15

Measurements performed in accordance with:



**FCC Rules : Code of Federal Regulations (CFR) no. 47 -
PART 15 – RADIO FREQUENCY DEVICES**

PRODUCT : RFID TRANSCEIVER MODULE

TESTED MODEL : RFID 13

FCC ID : UKMRFID13

APPLICANT : EUROTECH S.p.A. – Via F. Solari, 3/A – 33020 Amaro (UD) - Italy

MANUFACTURER : EUROTECH S.p.A. – Via F. Solari, 3/A – 33020 Amaro (UD) - Italy

TRADEMARK : EUROTECH

OTHER INFORMATION

Testing dates : 2007-11-12 ÷ 2007-11-13

Tested samples No. : 1

Testing Laboratory : IMQ S.p.A. Via Quintiliano, 43 I-20138 MILANO

Tested by : R. Radice Signature: *Roberto Radice* Date : 2007-11-15

Checked by: R. Colombo Signature: *Roberto Colombo* Date : 2007-11-15
(EMC and R&TTE Lab. Deputy)

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2007-11-15	Test Results and Evaluation Report

NOTICE: The results of tests and checks reported in this Test Report refer exclusively to the samples tested and described in the Report itself. This report shall not be reproduced partially or in its entirety without the written approval of IMQ S.p.A.

IMQ S.p.A. - Via Quintiliano, 43 – I-20138 MILANO

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1 GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST

1.1 APPLICANT

NAME	EUROTECH S.p.A.
ADDRESS	Via F. Solari, 3/A – 33020 Amaro (UD)
COUNTRY	ITALY

1.2 MANUFACTURER

NAME	EUROTECH S.p.A.
ADDRESS	Via F. Solari, 3/A – 33020 Amaro (UD)
COUNTRY	ITALY

1.3 EQUIPMENT CLASSIFICATION

According to the definition 15.3 (o) EUT is a **Intentional Radiator operating within the bands 13.553 - 13.567 MHz** so it shall fulfil provisions of 47CFR Part 15 Subpart C – Intentional radiators – and Section 15.225

1.4 BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Parameters	Value
Type of equipment :	▪ RFID TRANSCEIVER MODULE
Model :	▪ RFID 13
FCC ID. :	▪ UKMRFID13
Trade Name	▪ EUROTECH
Data cable :	▪ /
Telecom cable :	▪ /
Power supply type :	▪ DC 3.3V, 100 mA max.
AC power input cable :	▪ /
DC power input cable :	▪ /

1.5 FEATURE OF EQUIPMENT UNDER TEST

Power specification:	▪ 3.3 V dc
Operating frequency:	▪ 13.560 MHz
Assigned frequency band:	▪ 13.553÷13.567 MHz
Maximum RF output H/E field/ power :	▪ < 15.848 μ V/m at 30meter
Modulation:	▪ /
Antenna:	▪ Integrated antenna with 4 loops (board 03B07)
Microprocessor:	▪ ATMEL AT91SAM7S64
RF Integrated:	▪ Multiple Protocol Contactless Reader IC Philips type CL RC632
Quartz:	▪ 13.56MHz ▪ 18.432MHz
Main SW identification	▪ /
Main HW Board identification	▪ /
Peripherals included (for system application)	▪ None
Interfaces :	▪ None
Integrated interfaces :	▪ None
AC adapter:	▪ Power Supply SAC mod. SA115-05U Input 100-240V 50-60Hz 0.4A Output 5V 1A 5W

2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST

2.1 ENVIRONMENTAL CONDITIONS

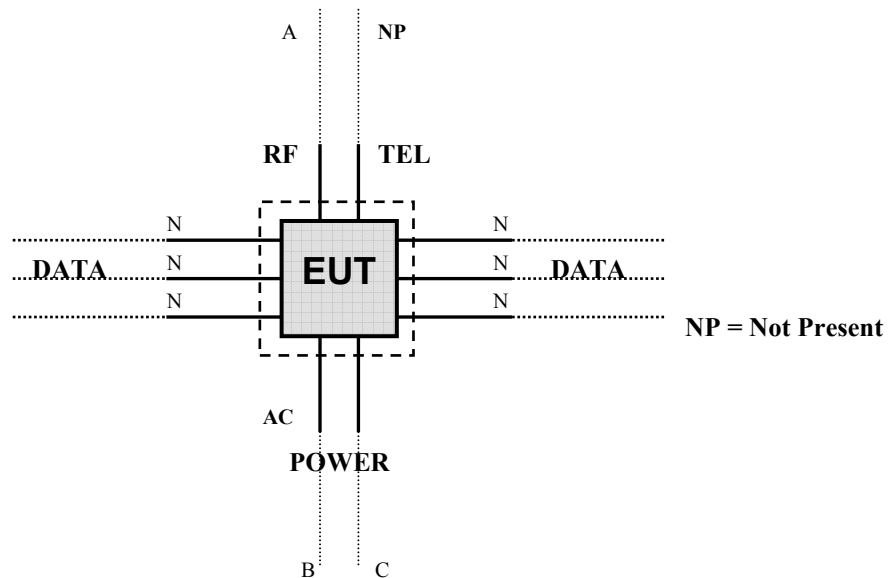
TEST CONDITIONS	MEASURED
Ambient Temperature	20 ÷ 25 °C
Relative Humidity	50 ÷ 60 %
Atmospheric Pressure	900 ÷ 1000 mbar

2.2 DESCRIPTION OF SUPPORT EQUIPMENT

Here following the details concerning equipment needed for correct operation or loading of the EUT:

EQUIPMENT	MANUFACTURER	MODEL
AC/DC Adapter	SAC	SA115-05U

2.3 INTERFACE IDENTIFICATION AND CONNECTION DIAGRAM OF TEST SYSTEM



#	Interface	Description	Maximum length	Ref. Document
1	Enclosure	Open frame board	/	/
2	AC mains power input/output port	Port not present	/	/
3	DC power port	3,3V dc furnished on test jig board.	/	/
4	Signal / control port	Port not present	/	/
5	Antenna port (RF)	Integrated antenna with n°4 loops (board 03B07)	/	See Technical Data "RFID HF WL1x1x" sheet n°10

3 OPERATION OF EQUIPMENT UNDER TEST

3.1 OPERATING TEST CONDITIONS

Ref.	Description
#1	Continuous transmission

4 TESTS IDENTIFICATION AND RESULTS

TABLE 1 : SUMMARY OF TESTS

CFR47 Part 15 Section	Title	Operating condition	Result	Test details
15.203	Antenna Requirements	/	PASS	1
15.207	Conducted Emission	#1	PASS	2
15.209	Radiated Emission	#1	PASS	3
15.225 (a) 15.225 (b) 15.225 (c)	Field strength (Operation within the band 13.110 – 14.010MHz)	#1	PASS	4
15.225 (d)	Field strength (Operation outside the band 13.110 – 14.010MHz)	#1	PASS	3
15.225 (e)	Frequency tolerance of the carrier	#1	PASS	5

4.1 METHODS OF MEASUREMENT

All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4-2003 (excluding sub-par. 4.1.5.2, 5.7.9 and 14) and Section 15.31 of CFR47 Part 15 – Subpart A (General).

Additional test requirements have been adopted according to the reference Section indicated in the Test Table

4.2 FREQUENCY RANGE INVESTIGATED

- a. Conducted emission tests : from 150 kHz to 30 MHz.
- b. Radiated emission tests : from 9 kHz to 1 GHz

5 MEASUREMENTS AND TESTS DATA

TEST No. 1	Title "Antenna Requirements"	47CFR Part 15 Ref. Section
		15.203 / 15.204
TEST REQUIREMENTS	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.	

Antenna specifications	
N° of authorized antenna types:	▪ 1 (board 03B07)
Antenna type :	▪ Integrated loop coil antenna
Antenna size :	▪ N°4 loops External dimensions: 14,86 x 14,275mm Internal dimensions: 9,83 x 9,83mm
Total gain :	▪ /
External power amplifiers:	▪ Not present

Test Result:

The transmitter meets the requirements of section 15.203 and 15.204

TEST No. 2	Title "Conducted emission"	47CFR Part 15 Ref. Section
		15.207
TEST REQUIREMENTS	Test setup	ANSI C63.4
	Limits of mains terminal disturbance voltage	15.207 (a)
	Frequency range	150 kHz – 30 MHz
	IF bandwidth	9 kHz
	EMC class	B

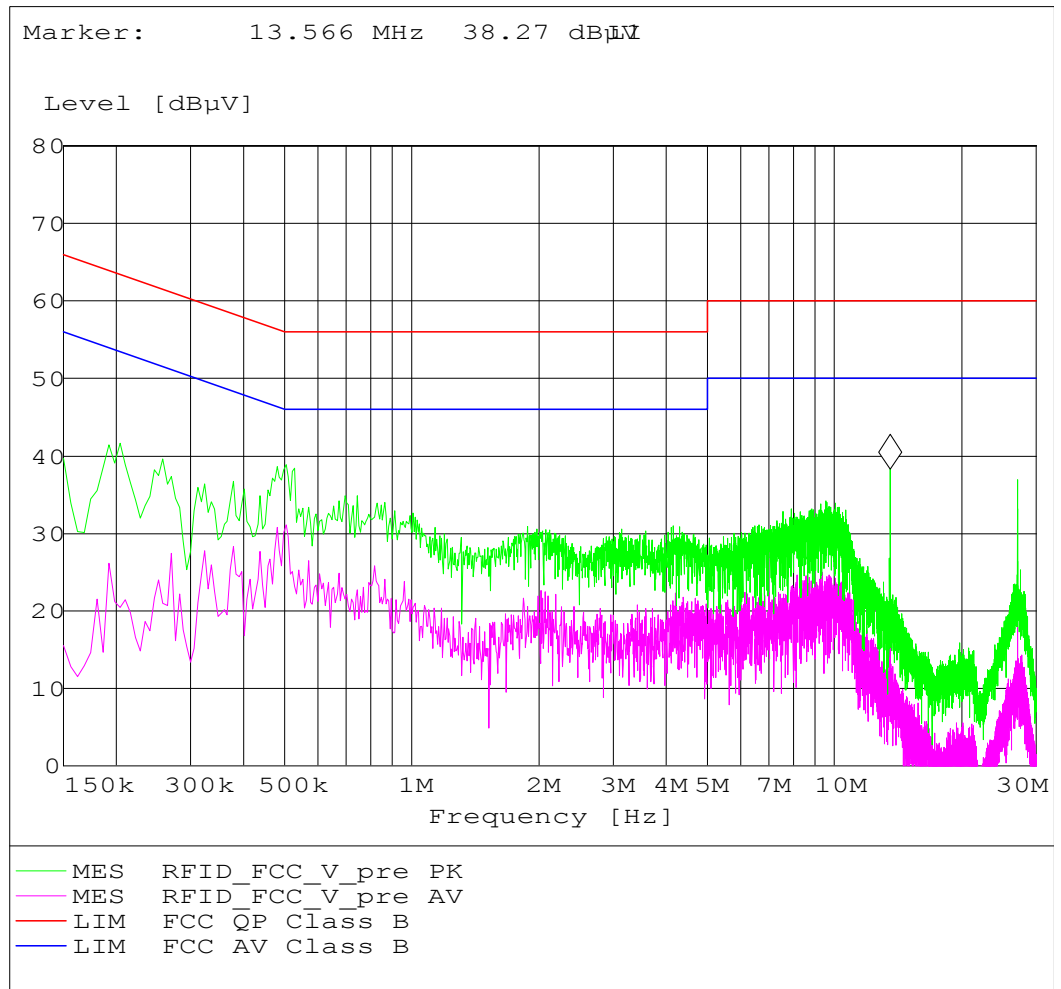
	PORT UNDER TEST	OPERATING CONDITION	RESULT
TEST DATA	AC mains power input port	#1	Complies
	Note: In search of max noise (phase(s) and neutral). The measurements with Quasi-Peak detector are performed only for frequencies for which the Peak values are \geq (Q.P. limit - 6 dB).		

Test Result:

Within the specifications

MEASUREMENTS RESULTS

CONDUCTED DISTURBANCE ON AC MAINS POWER PORT OF AC/DC ADAPTER



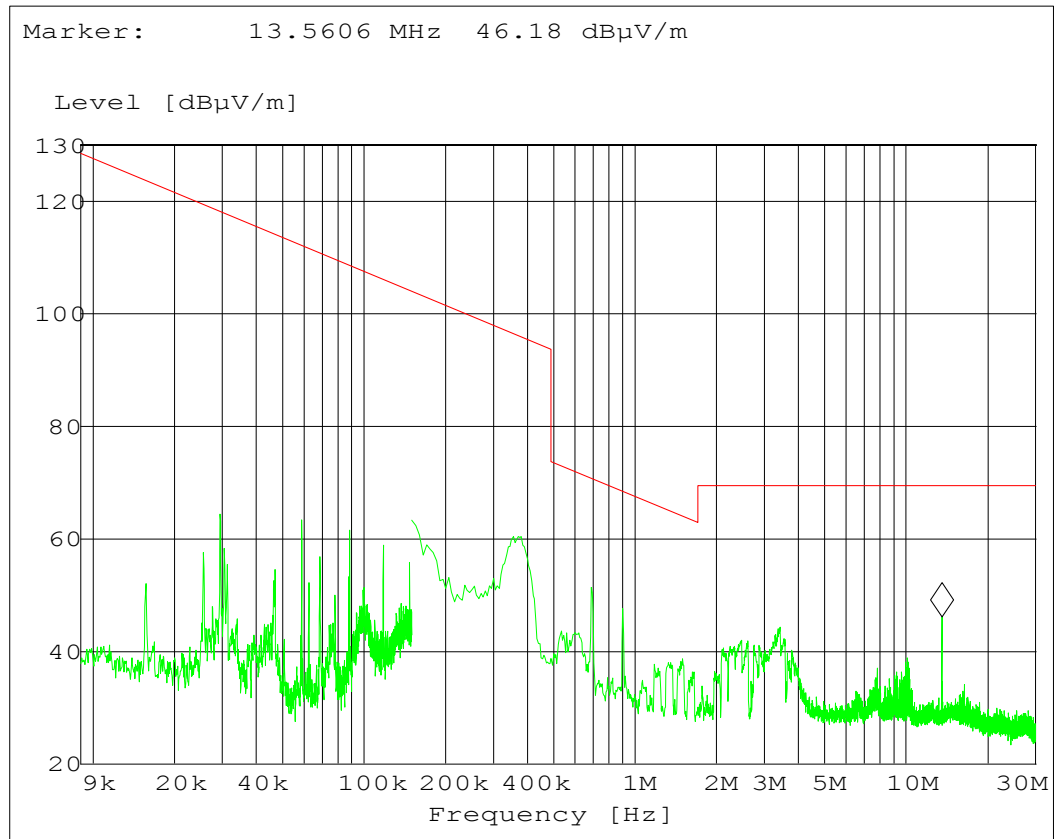
TEST No. 3	Title "Radiated disturbances"	47CFR Part 15 Ref. Section
		15.209 15.225 d)
TEST REQUIREMENTS	Test setup	ANSI C63.4
	Test facility	Anechoic chamber
	Test distance	3 m (*)
	Limits for radiated disturbances	15.209 (a)
	Frequency range	9 kHz to 1 GHz
	RBW (below 150 kHz)	200 Hz
	RBW (150kHz to 30 MHz)	9 kHz
	RBW (above 30 MHz)	100 kHz
	EMC class	B
Note	(*) In accordance with part 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is: Extrapolation (dB) = $40\log(300\text{meter} / 3\text{meter}) = +80\text{db}$ Extrapolation (dB) = $40\log(30\text{meter} / 3\text{meter}) = +40\text{db}$	

	PORT UNDER TEST	OPERATING CONDITION	RESULT
TEST DATA	Enclosure	#1	Complies
	Note: In search of max noise (EUT rotation: from 0° to 360°; receiving antenna height: from 1 to 4m; receiving antenna polarization: horizontal and vertical). The measurements with Quasi-Peak detector, below 1000 MHz are performed only for frequencies for which the Peak values are \geq (Q.P. limit - 6 dB).		

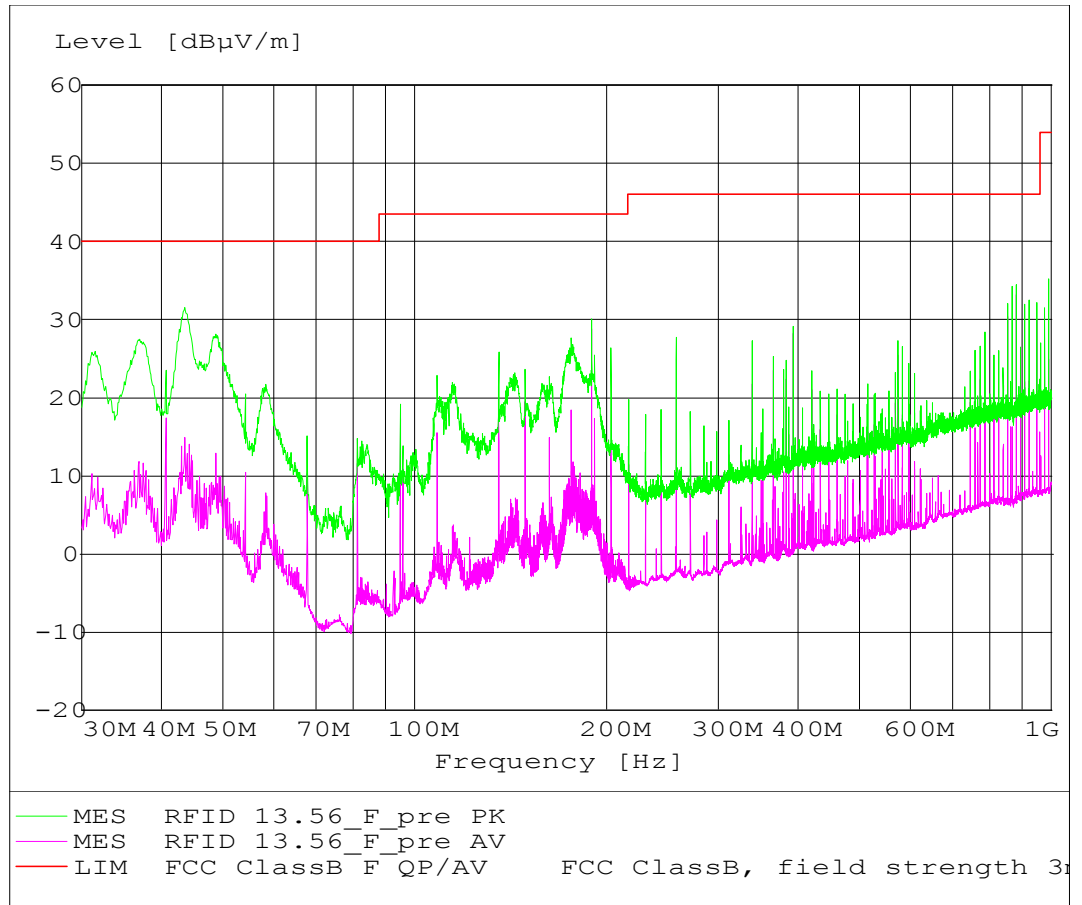
Modification during the test:

- None

MEASUREMENTS RESULTS (9kHz to 30 MHz)



MEASUREMENTS RESULTS (30 MHz to 1000 MHz)

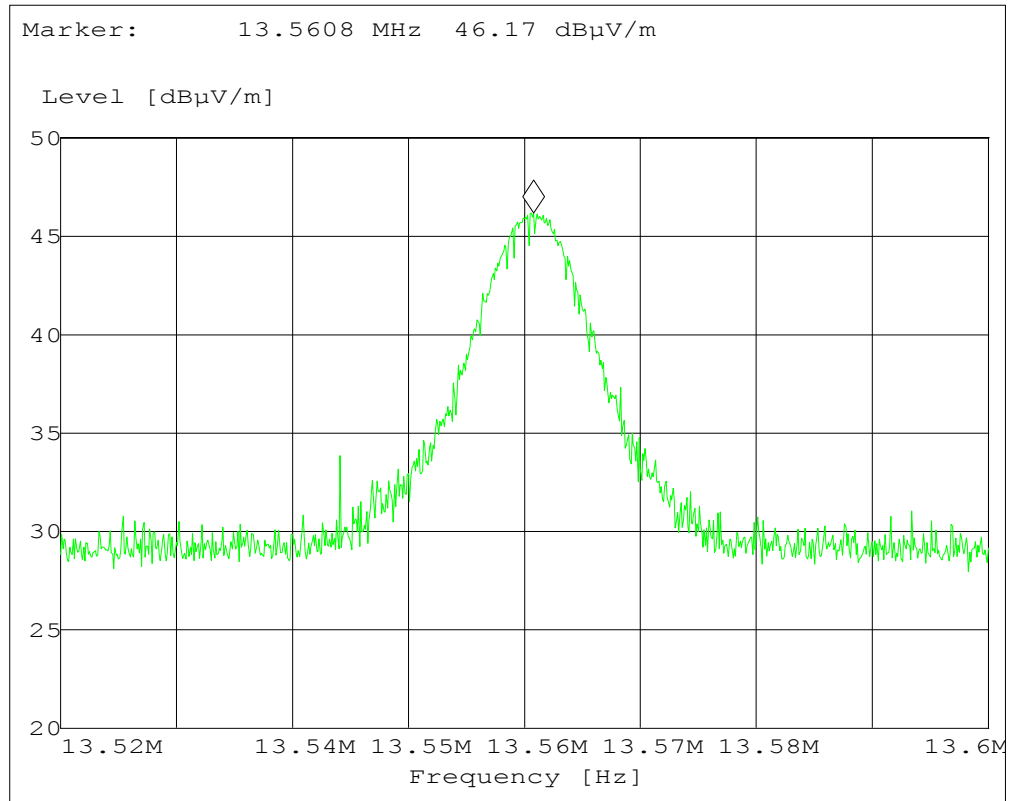


TEST No. 4	Title	47CFR Part 15 Ref. Section
TEST REQUIREMENTS	"Field strength within the assigned band"	15.225 (a)
	Test setup	ANSI C63.4
	Test facility	Semi-anechoic chamber
	Test distance	3 m
	Limits for radiated disturbances ($\mu\text{V}/\text{m}$)	15.848 $\mu\text{V}/\text{m}$ @ 30 m
	Limits for radiated disturbances ($\text{dB}\mu\text{V}/\text{m}$)	84 $\text{dB}\mu\text{V}/\text{m}$ @ 30 m (124 $\text{dB}\mu\text{V}/\text{m}$ @ 3 m)*
	frequency range	13.553 – 13.567 MHz
	if bandwidth (below 150 kHz)	200 Hz
Note	(*) In accordance with part 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limit at 3 meter is: Extrapolation (dB) = $40\log(30\text{meter} / 3\text{meter}) = +40\text{db}$	

Modification during the test:

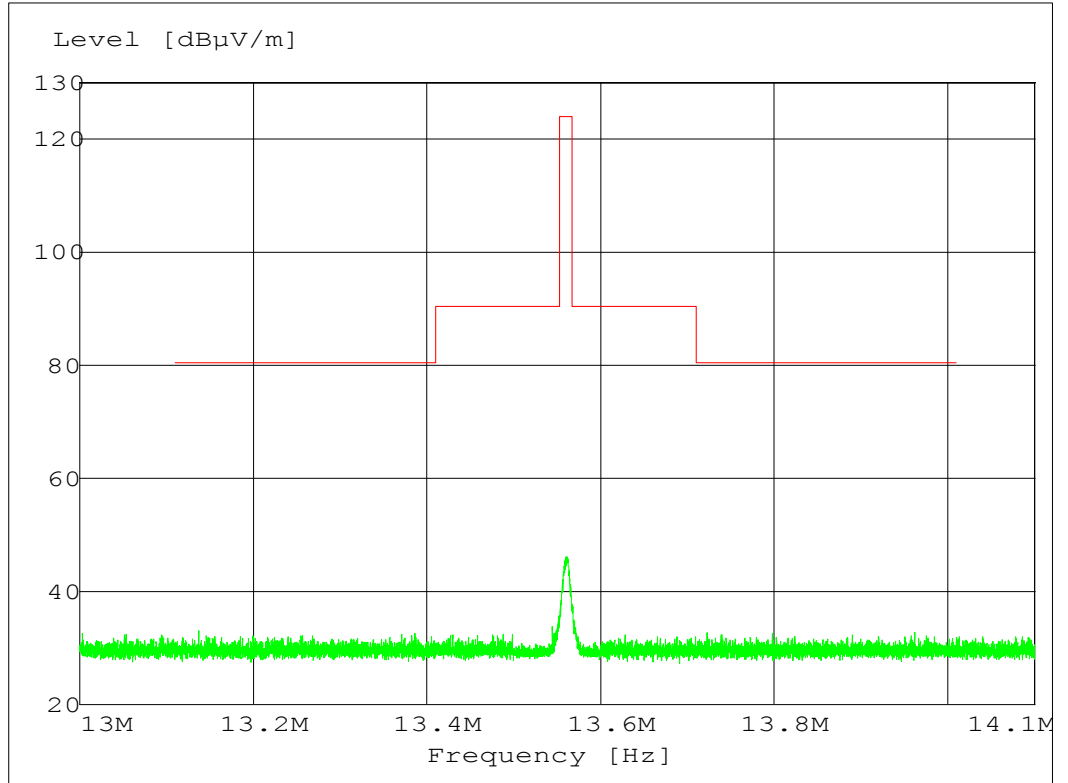
- None

MEASUREMENTS RESULTS



Test conditions				Measured power		
Frequency: 13.5608 MHz				MEAS (dB μ V/m) at 3 meter	(dB μ V/m) at 30 meter	(μ V/m) at 30 meter
T _{nom}	25°C	V _{nom}	3 (V)	46,17	6,17	2,035
Measurement uncertainty				< \pm 1.5 dB		

MEASUREMENTS RESULTS (13.110÷14.010 MHz)



TEST No. 5	Title "frequency tolerance"	47CFR Part 15 Ref. Section
		15.225 (e)
TEST REQUIREMENTS	Test setup	ANSI C63.4
	Test facility	Climatic chamber
	Limits for radiated disturbances	± 0.01 % of operating frequency
	frequency range	13.553 – 13.567 MHz
	Power supply	external test power source
	Power supply variation	from 85% to 110% of the rated supply voltage
	Modulation state	ON

Modification during the test:

- None

MEASUREMENTS RESULTS

Frequency drift limits : ± 1.3560 kHz

Test conditions		Measured frequency (kHz)	Frequency drift (kHz)
Power supply voltage	Temperature		
3.3 V	+20 °C	13560.5	----
3.3 V	-20 °C	13560.8	0,3
	+50 °C	13560.4	0.1
2.82 V (*)	+20 °C	13560.8	0,3
3.63 V		13560.8	0,3

(*) = minimum voltage level of equipment.

6 ADDITIONAL TECHNICAL INFORMATION

6.1 ELECTROMAGNETICALLY RELEVANT COMPONENTS:

Components	N°	Manufacturer	Type – Technical data
Radio Module			
See Technical document			
Host Equipment			
Demo Board		/	/

6.2 RFI SUPPRESSION DEVICES:

Components	N°	Manufacturer	Type – Technical data
None			

6.3 EMI PROTECTION DEVICES:

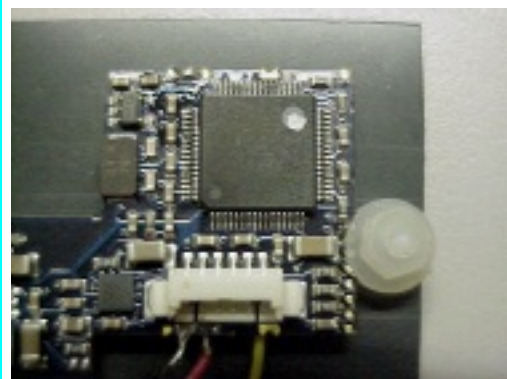
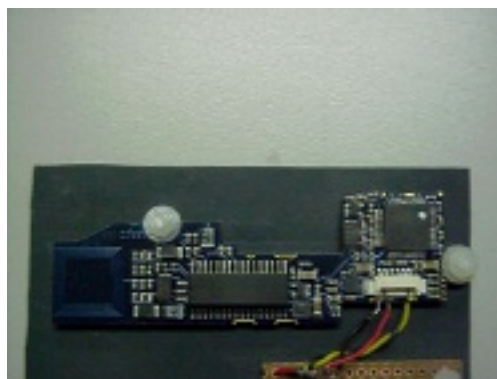
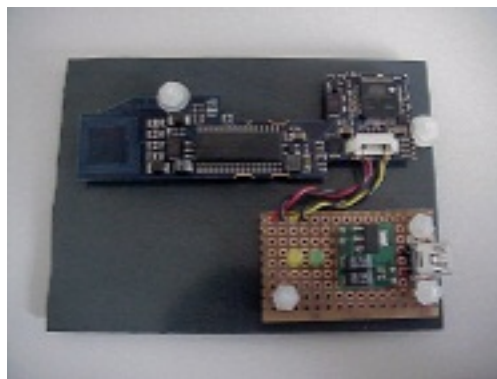
Components	N°	Manufacturer	Type – Technical data
None			

7 TECHNICAL DOCUMENTATION

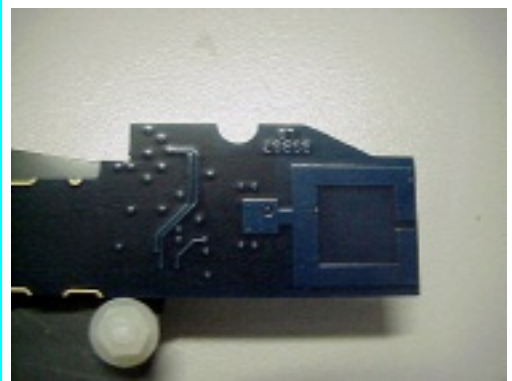
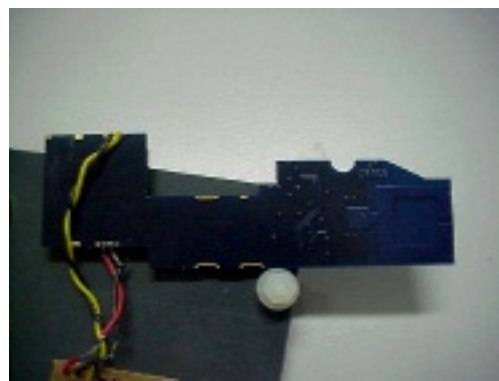
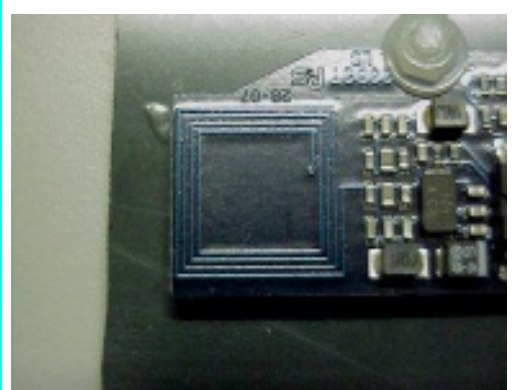
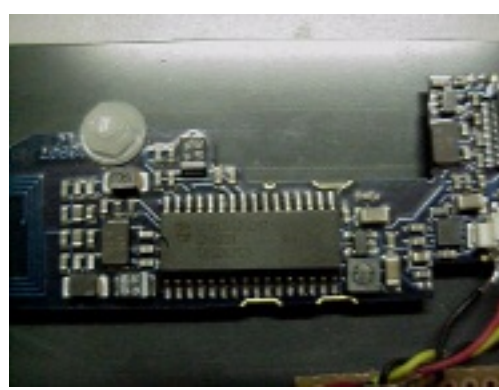
DOCUMENT	REFERENCE
Bill of materials	Sheet 8 and 9 of "RFID HF WL1x1x – Technical Data"
Electronic diagram	Eurotech RFID13 R01 – Rev 0 April 27, 2007
Radio Layout	RFID13 R01 – Rev 1 – 03 July 2007
Manual	RFID HF WL1x1x – Technical Data Rev. 1.0 October 2007

8 PHOTOGRAPHIC DOCUMENTATION

8.1 EUT IDENTIFICATION



Equipment under test identification: Demo board + Radio module

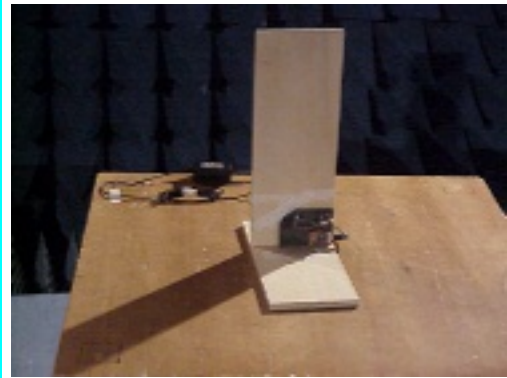


Equipment under test identification: Demo board + Radio module

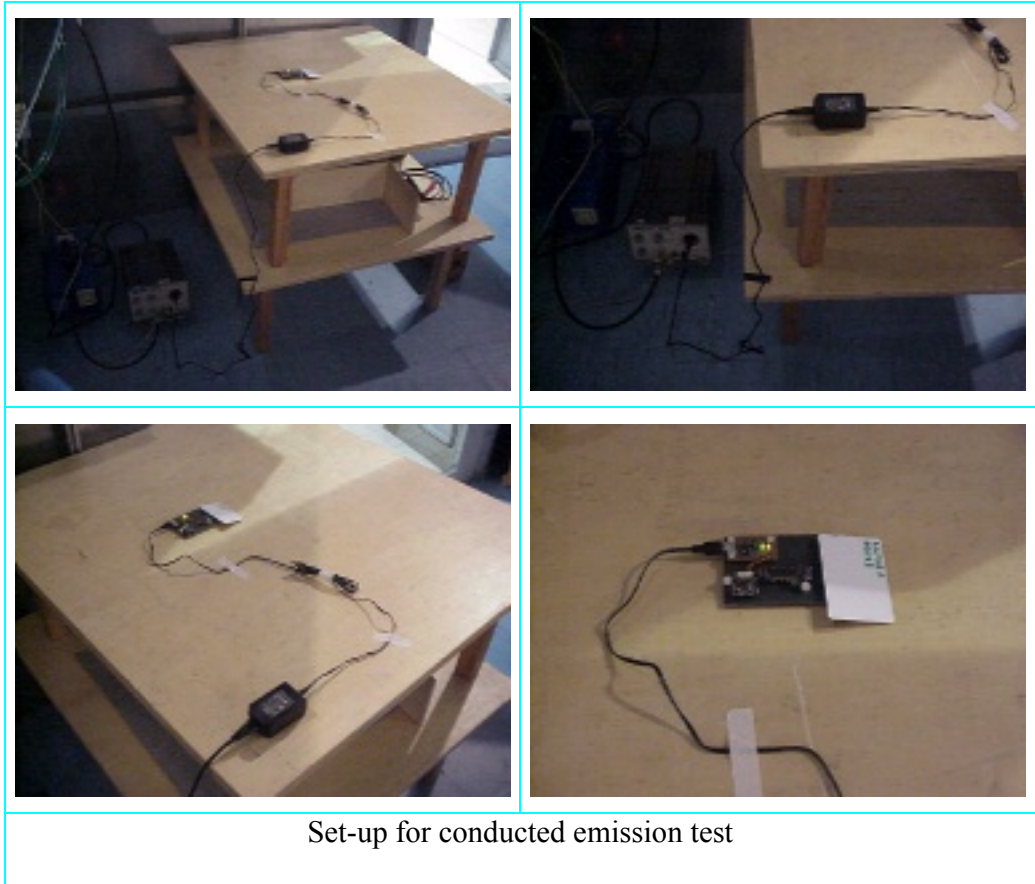


AC/DC power supply

8.2 TEST SET-UP



Set up of Radiated emission test



9 MEASUREMENT AND TEST EQUIPMENT INSTRUMENTATION

INSTRUMENTS	MANUFACTURER	MODEL	IMQ SERIAL NUMBER	Ref. TEST
Artificial Mains V-network	COMTEST	/	S-02405	2
Software for test automation	Rohde & Schwarz	ES-K1 V.1.60	-	2÷4
Receiver/Spectrum analyzer	Rohde & Schwarz	ESMI	S-02349 + S-02350	2÷4
Spectrum Analyzer	Rohde & Schwarz	FSP40	S-03629	5
Antenna loop	Rohde & Schwarz	HFH2-Z2	S02508	3÷5
Antenna BilogP	ARA	LPD-2513	S-02385	3
System Power Supply	Hewlett Packard	6038A	S-03529	5
Climatic chamber	Angelantoni	UV 300	P00484	5