REPORT FCC
FCC CFR 47 PART 15
E.M.I. Test report

Report Reference No. ..... :	131348R3TRFFCC
Tested by ..... :	D. Guarnone
Approved by ..... :	G. Curioni
Date of issue ..... :	2010-02-26
Testing Laboratory ..... :	**Nemko Spa**
Address ..... :	Via del Carroccio, 4 I-20046 Biassono (Italy)
Testing location/ procedure ..... :	FCC CFR 47 PART 15 subpart B ☒ FCC CFR 47 PART 15 subpart C ☒
Testing location/ address ..... :	Nemko Spa - Via del Carroccio 4 - I-20046 Biassono (Italy)
Applicant's name ..... :	**e-DATA GmbH**
Address ..... :	Mollenbachstr.19 71220 Leonberg
Test specification:	
Standard ..... :	FCC CFR 47 PART 15
Test procedure ..... :	FCC CFR 47 (July 10, 2008)
Non-standard test method……..:	N/A
Test Report Form No. ..... :	TRF EMC FCC
TRF Originator ..... :	Nemko Spa
Master TRF ..... :	2005-04

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Test item description..... :	**Badge reader**
Trade Mark..... :	e-DATA
Manufacturer..... :	**e-DATA GmbH**
Model ..... :	**RFID TT1000**
Serial Number ..... :	**102500**
Ratings..... :	110÷ 230 Vac, 50/60 Hz

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PROJECT HISTORY		
Report number	**Modification to the report / comments**	**Date**
131348TRFFCC	First release	2009-09-17
131348R1TRFFCC	Performed new radiated emission measurements in the frequency range 30 MHz 1 GHz.	2009-11-10
131348R2TRFFCC	Added frequency stability measurement data. Corrected limits according to clause 15.225 Performed peak and average scans above 1 GHz. Classified equipment as class A equipment.	2010-02-08
131348R3TRFFCC	Removed radiated emission with rod antenna. Conducted emissions: applied 15.207 conducted limits. Added measurements of variation of radiated signal level of the fundamental frequency component of the emission performed with the supply voltage varied between 85% and 115% of the nominal rated supply. Test set up photos collected in a single paragraph.	2010-02-26
REMARKS		

PRODUCT VARIANTS COVERED BY THIS REPORT		
Variant model	**Difference against the main model**	**Additional test performed**
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REMARKS		

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1) General consideration

The test result presented in this report refers only to the tested item.

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Verification attaches to all items marketed by the manufacturer or importer which are identical as stated in FCC §2.908 to the sample tested and found acceptable by the manufacturer.

As Stated in §15.15 The compliance with limit expressed in FCC chapter 15 subpart B, chapter 15 subpart C will not prevent harmful interference under all circumstances.

This test report refers only to emission tests. As stated in FCC §15.17 parties responsible for the equipment are advised to keep care to electromagnetic susceptibility during the design of their equipment so as to reduce the susceptibility for receiving harmful interference.

Possible test case verdicts:

P = Pass, **F** = Fail, **N** = Not applicable, **—** = No verdict required. Placed in the column to the right (Verdict)

2) Equipment Under Test (E.U.T.) description

2.1) E.U.T general declarations

Model	RFID TT1000
Manufacturer:	**e-DATA GmbH**
Trade mark:	e-DATA
Copy of marking	--
Serial number:	102500
Mechanical data:	Weight : --
RF frequency	13.56 MHz
Clock:	600MHz
Class A digital device	NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operatedin a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

2.2) E.U.T. general description

Badge reader (RFID 13.56 MHz)

2.3) E.U.T. configuration

The E.U.T. is composed by single unit

2.4) E.U.T. ports

Name	Type*	Cable Max. >3m	Cable Shielded	Description
Enclosure	N/E	—	—	—
Mains	AC	☐	☐	three wires
RJ12	TP I/O	☒	☐	modem, RS485
RJ45	TP	☒	☒	Ethernet
USB	I/O	☐	☐	

*Note:

AC = AC Power Port	DC = DC Power Port	N/E = Non-Electrical

I/O = Signal/Control Input or Output Port	TP = Telecommunication Ports

3) Test Laboratory information

Radiated and conduced measurements were performed at Nemko S.p.a. EMC testing laboratory, located at the following address

NEMKO S.p.a.
Via del Carroccio 4 I-20046 Biassono (Italy)

NEMKO S.p.a is CAB recognised body by MRA for FCC CFR 47 testing , see Official journal of European community L202/32 date 06/11/2002 decision 20/2002 and web link:
http://europa.eu.int/comm/enterprise/international/indexb1.htm

Nemko S.p.A. measurement facility is listed according to requirements of section 2.948 of FCC rules; Nemko S.p.A. Registration number is 481407.
http://gullfoss2.fcc.gov/prod/oet/cf/eas/reports/TestFirmSearch.cfm

4) Date of test

The test started on 2009-09-14 and ended on 2009-09-17. By D. Guarnone.

Radiated emission (30-1000 MHz) Retested on 2009-10-06. By G. Curioni.

Radiated emission (9 KHz-1000 MHz, 1 GHz- 6 GHz) Retested on 2010-02-05. By D. Guarnone.

5) Reference document

FCC CFR 47, Part 15	Code of Federal Regulations, Title 47 Part 15 Radio Frequency Devices Subpart B, Unintentional radiators (Last revision (July 10, 2008)).
FCC CFR 47, Part 15	Code of Federal Regulations, Title 47 Part 15 Radio Frequency Devices Subpart C, Intentional radiator (Last revision (July 10, 2008)).
CISPR 16-1-1 (Ed2.2)	Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus.
ANSI C63.4–2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
ANSI C63.10-2009	American National Standard for Testing Unlicensed Wireless Devices Sponsored by the Accredited Standards Committee C63® —Electromagnetic Compatibility Accredited by the American National Standards Institute
CISPR 16-1-2 (Ed1.2)	Specification for radio disturbance and immunity measuring apparatus and methods Part 1-2: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Conducted disturbances.
CISPR 16-1-4 (Ed2.2)	Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Radiated disturbances.
CISPR 16-2-1 (Ed2.0)	Specification for radio disturbance and immunity measuring apparatus and methods - Part 2-1: Methods of measurement of disturbances and immunity - Conducted disturbance measurements.
CISPR 16-2-3 (Ed2.0)	Specification for radio disturbance and immunity measuring apparatus and methods Part 2-3: Methods of measurement of disturbances and immunity - Radiated disturbance measurements.
NEMKO WML0177	General routines for using instruments at Nemko.
NEMKO WML0077	General routines to perform EMC tests
NEMKO WML1002	Measurement Uncertainty - Policy and Statement.

6) Test equipment list

6.1) Test equipment list

Kind of test	Equipment	Model	Manufacturer	Serial Number
Radiated Emission	Trilog Broad Band Antenna 25 MHz÷2 GHz	VULB 9168	Schwarzbeck	VULB 9168-242
Radiated Emission	EMI receiver 20 Hz ÷ 8 GHz	ESU8	R&S	100202
Radiated Emission	Semi-anechoic chamber	10m semi-anechoic chamber	Nemko	530
Radiated Emission	Shielded room	10m control room	Siemens	1947
Radiated Emission	Turn-table	HCT	R&S	835 803/03
Radiated Emission	Antenna mast	HCM	R&S	836 529/05
Radiated Emission	Controller	HCC	R&S	836 620/7
Conducted Emission	EMI receiver 9 kHz ÷ 3 GHz	R&S	ESCI	100888
Conducted Emission	LISN 9 kHz ÷ 30 MHz	ESH2-Z5	R&S	872 460/041
Conducted Emission	Shielded room	--	Siemens	009
Radiated Emission	Loop antenna	HFH2-Z2	R&S	831247/011
Radiated Emission	Bilog antenna 1 ÷ 18 GHz	Schwarzbeck	STLP 9148-123	123
Radiated Emission	Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137
Environment	Thermohygrometer data loggers	175-H2	TESTO	20012380
Radiated Emission	AC power source	HP	6834A	3432A-00125

6.2 Best measurement capability

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the Nemko Spa Technical Procedure WML1002. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Hereafter the best measurement capability for Nemko Spa laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	Antenna distance 1m, 3m, 10m	± 5.0 dB	(1)
Conducted Emission	9 kHz ÷ 30 MHz	± 3.0 dB	(1)

NOTES:
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k =2 which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %

7) Test condition

7.1) Environmental condition

Temperature	299÷304 ℃
Relative humidity	45÷55%
Atmospheric Pressure (QNH)	985÷1010 hPa
E.U.T. supply voltage	120 Vac
E.U.T. voltage frequency	60 Hz

7.2) E.U.T. operating condition

The E.U.T. was tested with rated voltage supplied and with following operating mode:

Reading the badge

7.3) E.U.T. test setup

During radiated emissions test the E.U.T. has been placed on a rotating wooden table h 0.8m over a ground reference floor. The measurement antenna has been raised up and the table has been rotated in order to find the maximum level of the emissions. The position of the the E.U.T. on the table has been changed in order to find the configuration which produce the maximum level of emissions.The Ethernet cable has been exposed for one meter on the table and connected to personal computer outside the environment of test.The telephone cable has been exposed for one meter on the table and connected to line simulator outside the environment of test.

During the conducted emission test the E.U.T. was placed in a shielded room on a wooden table h 0.8m and with a distance from shielded wall more than 0.4m.The Ethernet cable has been exposed for one meter on the table and connected to personal computer outside the environment of test. The telephone cable has been exposed for one meter on the table and connected to line simulator outside the environment of test

The E.U.T. has been supplied at 120 Vac, 60 Hz.

8) Summary of test result

Port	Test	Test method	**Test Result**
Enclosure	Radiated emission	FCC §15.31 –FCC §15.33 – FCC §15.35 FCC §15.109, FCC §15.209	**P**
AC Power	Conducted	FCC §15.31 –FCC §15.33 – FCC §15.35 FCC §15.107, FCC §15.207	**P**

9) Test result

9.1) Radiated emission test

Test result: PASS

Test equipment list
The equipment used for the test is described in the following table

Kind of test	Equipment	Model	Manufacturer	Serial Number
Radiated Emission	Trilog Broad Band Antenna 25 MHz÷2 GHz	VULB 9168	Schwarzbeck	VULB 9168-242
Radiated Emission	EMI receiver 20 Hz ÷ 8 GHz	ESU8	R&S	100202
Radiated Emission	Semi-anechoic chamber	10m semi-anechoic chamber	Nemko	530
Radiated Emission	Shielded room	10m control room	Siemens	1947
Radiated Emission	Turn-table	HCT	R&S	835 803/03
Radiated Emission	Antenna mast	HCM	R&S	836 529/05
Radiated Emission	Controller	HCC	R&S	836 620/7
Conducted Emission	EMI receiver 9 kHz ÷ 3 GHz	R&S	ESCI	100888
Conducted Emission	LISN 9 kHz ÷ 30 MHz	ESH2-Z5	R&S	872 460/041
Conducted Emission	Shielded room	--	Siemens	009
Radiated Emission	Loop antenna	HFH2-Z2	R&S	831247/011
Radiated Emission	Bilog antenna 1 ÷ 18 GHz	Schwarzbeck	STLP 9148-123	123
Radiated Emission	Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137
Environment	Thermohygrometer data loggers	175-H2	TESTO	20012380
Radiated Emission	AC power source	HP	6834A	3432A-00125

Test method description

According to CISPR 16 and according to sub part 15.31(e) of FCC CFR 47 PART 15

Radiated emission was measured on four sides of EUT with horizontal and vertical polarization of antenna, scanning with the antenna from 1 to 4 metres in height looking for the maximum emission.

Measurement distance: 10 m from 9 KHz to 30 MHz (limits correlated by 40 dB/decade)
10 m from 30 MHz to 6000 MHz

Test Limits for Unintentional radiator

Test limits for class A, stated in FCC §15.109 , reported in the following table, were applied

Frequency (MHz)	Filed strenght limit uV/m	Field strenght limit dBuV/m
30	90	39.1
88	90	39.1
88	150	43.5
216	150	43.5
216	210	46.4
960	210	46.4
Above 960	300	49.5

Test Limits for Intentional radiator

Test limits stated in FCC §15.209 , reported in the following table, were applied

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

Section 15.225 Operation within the band 13.110 – 14.010 MHz.

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15.848 microvolts/meter at 30 meters.

(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

((d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

(e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.
(f) In the case of radio frequency powered tags designed to operate with a device authorized under this section, the tag may be approved with the device or be considered as a separate device subject to its own authorization. Powered tags approved with a device under a single application shall be labeled with the same identification number as the device.

15.31(e)
The measurements of input power or the radiated signal level of the fundamental frequency component of the emission has been performed from 85% of Vnominal to 115 of Vnominal (85% of 110 Vac, 230 Vac, 115% of 230 Vac).

Frequency	Limit at 300m	Limit at 300 m	Limit at 10 m
MHz	uV/m	dBuV/m	dBuV/m
0.009	266.7	48.5	107.6
0.49	4.9	13.8	72.9
0.49	49.0	33.8	52.9
1.705	14.1	23.0	42.1
1.705	30.0	29.5	48.6
13.11	30.0	29.5	48.6
13.11	106.0	40.5	59.6
13.41	106.0	40.5	59.6
13.41	334.0	50.5	69.6
13.553	334.0	50.5	69.6
13.553	15848.0	84.0	103.1
13.567	15848.0	84.0	103.1
13.567	334.0	50.5	69.6
13.71	334.0	50.5	69.6
13.71	106.0	40.5	59.6
14.01	106.0	40.5	59.6
14.01	30.0	29.5	48.6
30	30.0	29.5	48.6

Test Result

The E.U.T. complied with the test specification limits
For test result see annex 1

9.2) Conducted emission test

Test result: PASS

Test equipment list

The equipment used for the test is described in the following table

Equipment	Model	Manufacturer	Serial Number
EMI receiver 9 kHz ÷ 3 GHz	R&S	ESCI	100888
LISN 9 kHz ÷ 30 MHz	ESH2-Z5	R&S	872 460/041
Shielded room	--	Siemens	009

Test method description

Conducted emission was measured connecting AC power through a LISN and connecting LISN to EMI Receiver, according to CISPR 16

Test Limits

Test limits stated in 47 CFR §15.107, CFR §15.207 , reported in the following table, were applied

Frequency (MHz)	Quasi-Peak (dBµV)	Average (dBµV)
0.15 to 0.50	66 to 56 *	56 to 46 *
0.50 to 5	56	46
5 to 30	60	50

* Decreases with the logarithm of the frequency.

Test Result

The E.U.T. complied with the test specification limits
For test result see annex 2

9.3) Frequency tolerance of the carrier signal

Test result: PASS

Test equipment list

The equipment used for the test is described in the following table

Equipment	Model	Manufacturer	Serial Number
Spectrum Analyzer 9kHz÷2000 MHz	R3261C	Advantest	51720267
Climatic Chamber	VC7150	Vötsch Industrietechnik	59566038380010

Test method description

According to cluase 6.8.1 and 6.8.2 of ANSI C63.10-2009

The E.U.T. has been placed in climatic chamber and powered by means a programmable AC power source.
The measurements of frequency tolerance versus temperature have been performed from -20 ℃ to + 50℃ w ith 10℃ step.

The measurements of frequency tolerance versus voltage have been performed from 85% of Vnominal to 115 of Vnominal (85% of 110 Vac, 230 Vac, 115% of 230 Vac)

Test Limits

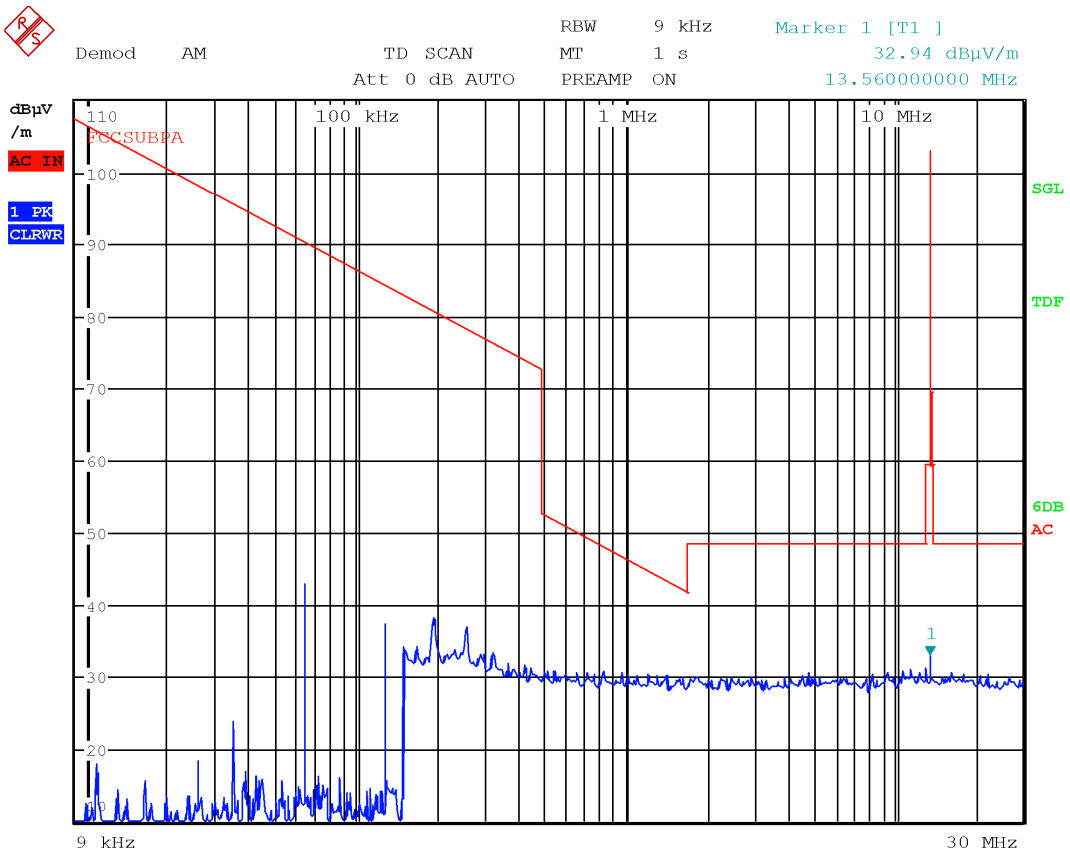
Test limits stated in 47 Section 15.225, reported in the following table, were applied

Test Result

The E.U.T. complied with the test specification limits
See annex 3.

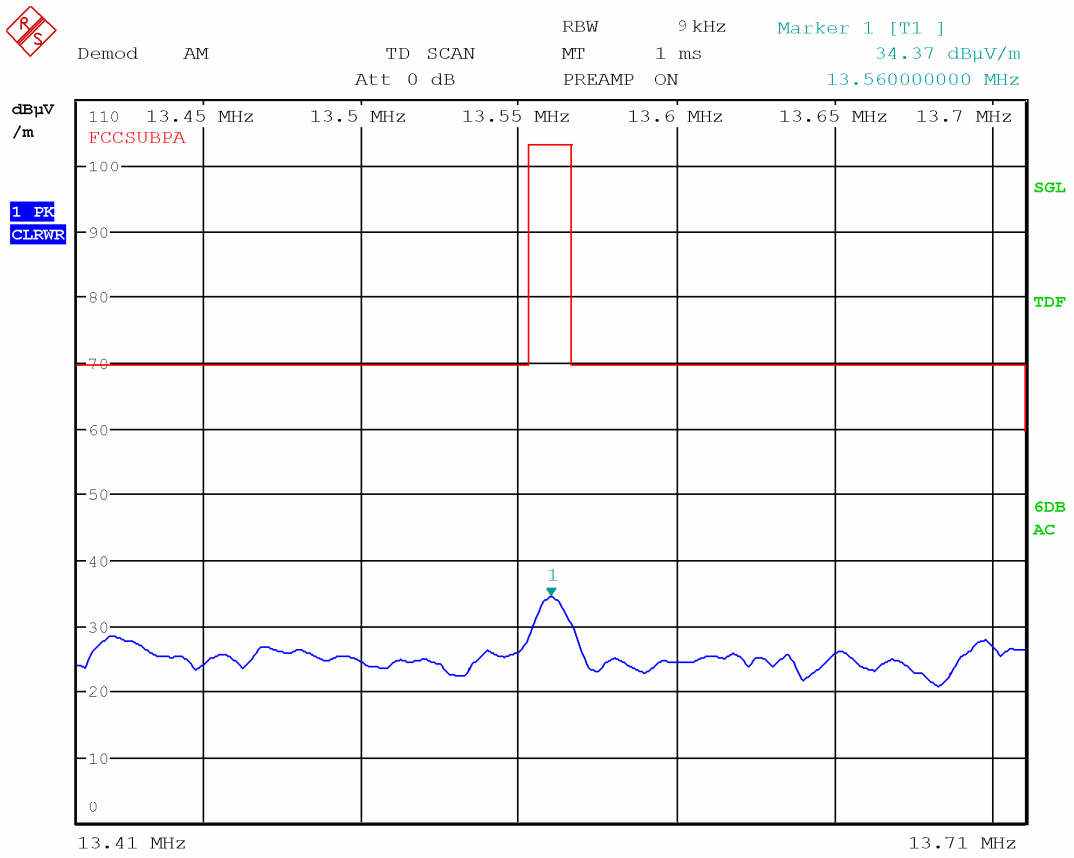
Annex 1 Radiated emission test plots

Operation mode: Reading the badge Result: ■ - passed
Remarks: 0.009 MHz to 30 MHz (loop antenna)



Date: 5.FEB.2010 11:24:18

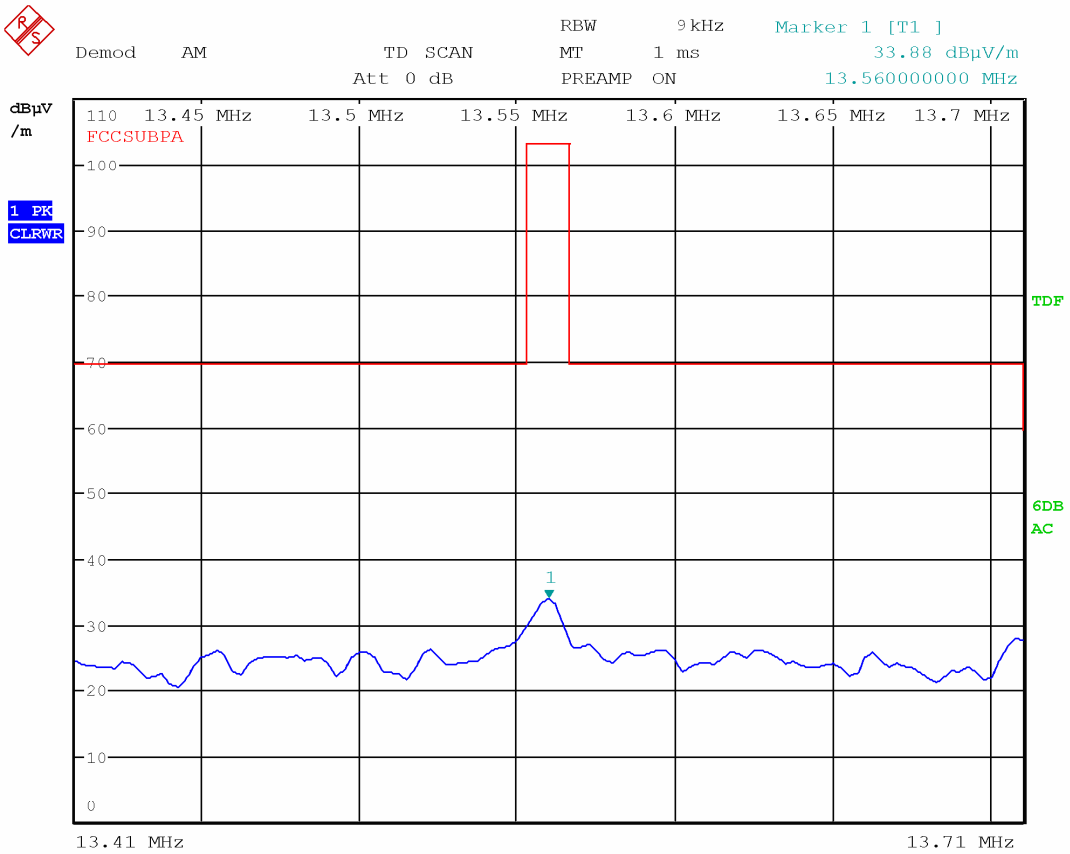
Operation mode: Reading the badge Result: ■ - passed
Remarks: 13.110 MHz to 14.010 MHz (230 Vac)



Date: 26.FEB.2010 15:00:18

Frequency (MHz)	Qp Level dBuV/m	QP limit dBuV	Remarks
13.56075	34.4	103.1	--

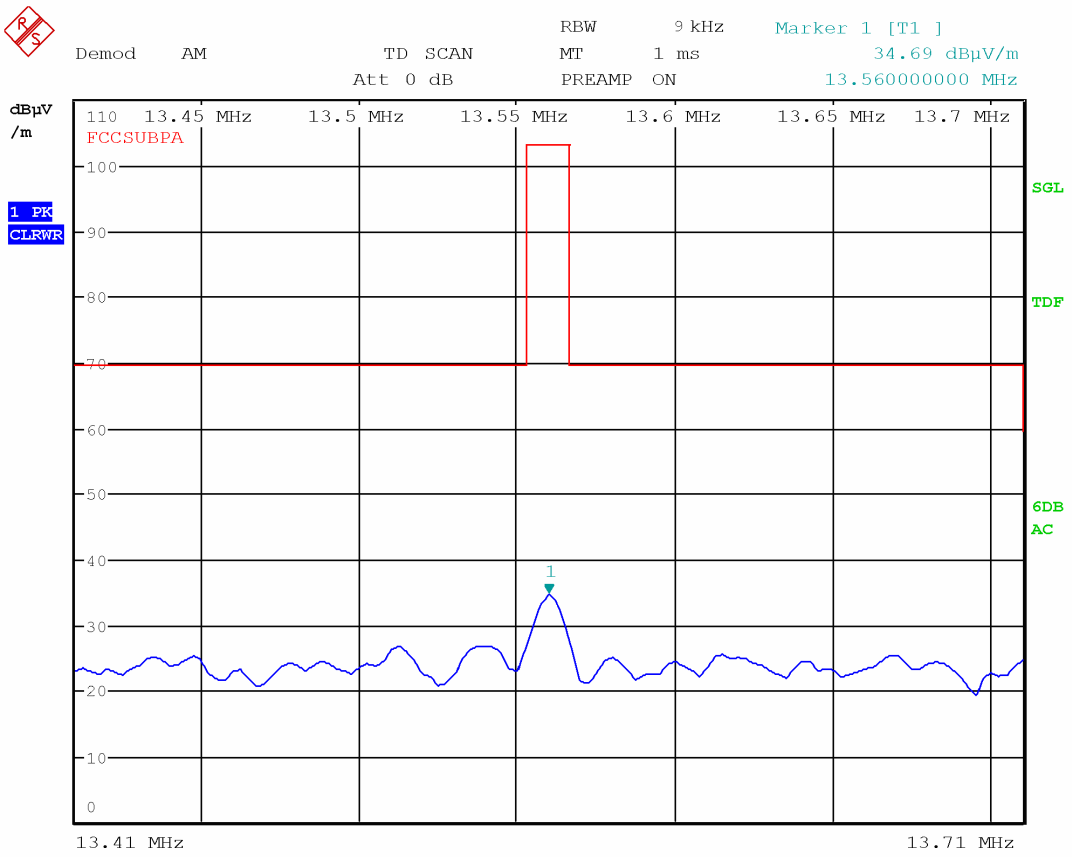
Operation mode: Reading the badge Result: ■ - passed
Remarks: 13.110 MHz to 14.010 MHz (Vnominal -15%)



Date: 26.FEB.2010 15:03:24

Frequency (MHz)	Qp Level dBuV/m	QP limit dBuV	Remarks
13.56075	33.8	103.1	--

Operation mode: Reading the badge Result: ■ - passed
Remarks: 13.110 MHz to 14.010 MHz (Vnominal+15%)

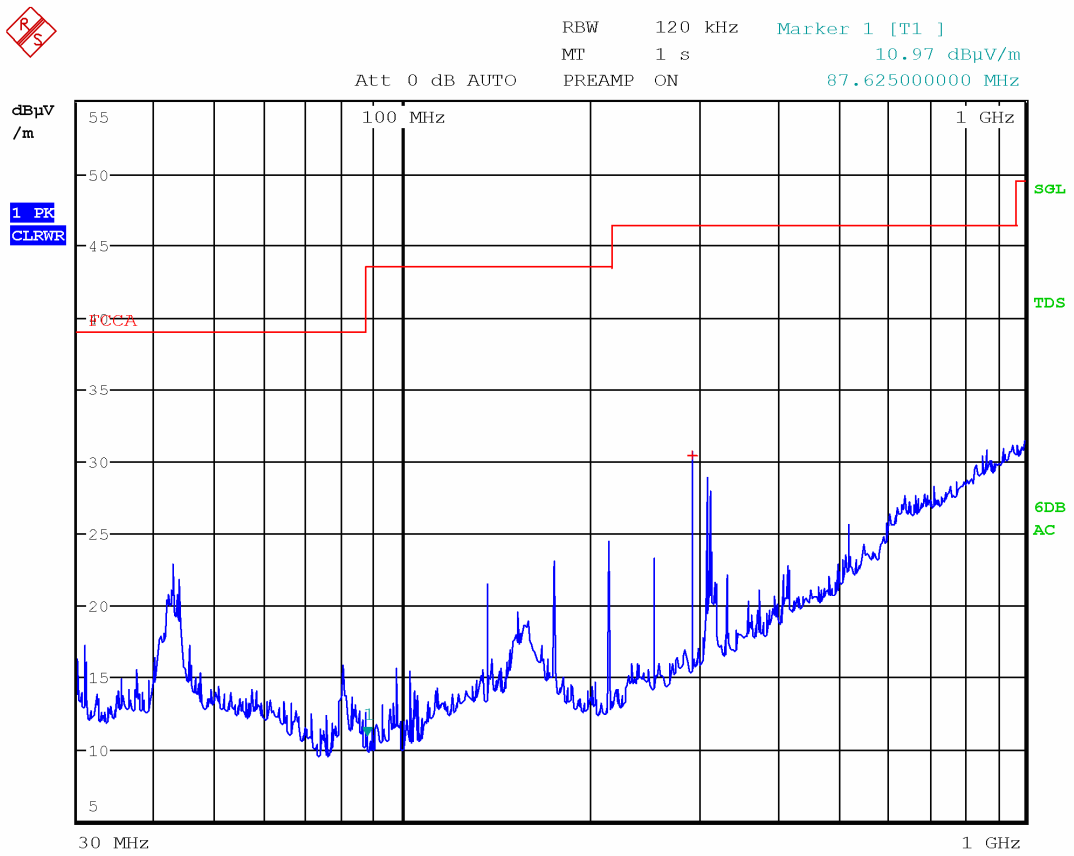


Date: 26.FEB.2010 15:01:43

Frequency (MHz)	Qp Level dBuV/m	QP limit dBuV	Remarks
13.56075	34.7	103.1	--

Operation mode: Reading the badge
Remarks: Vertical Polarization
30 MHz to 1000 MHz

Result: ■ - passed



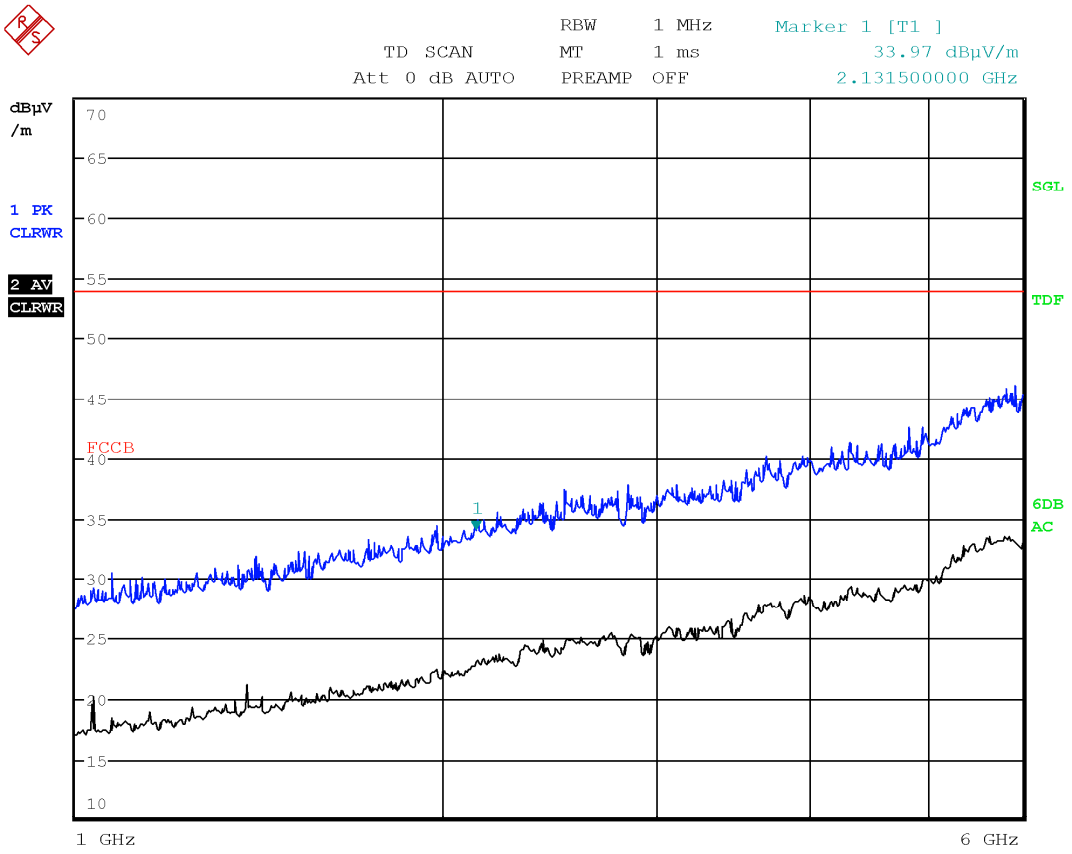
Date: 5.FEB.2010 14:58:37

Frequency (MHz)	Qp Level dBuV/m	QP limit dBuV	Remarks
292.5	31.2	46.4	--

Operation mode: Reading the badge

Result: ■ - passed

Remarks: Vertical Polarization
1000 MHz to 6000 MHz

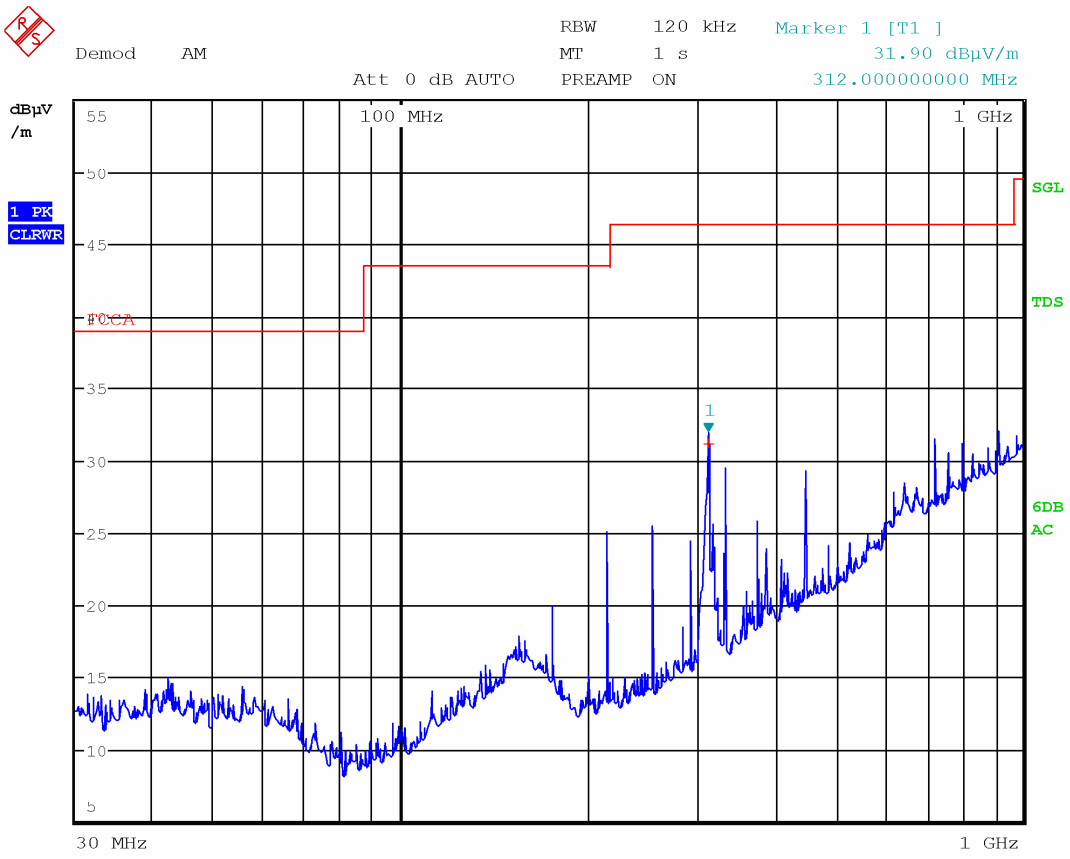


Date: 5.FEB.2010 15:10:10

Operation mode: Reading the badge

Remarks: Horizontal Polarization
30 MHz to 1000 MHz

Result: ■ - passed



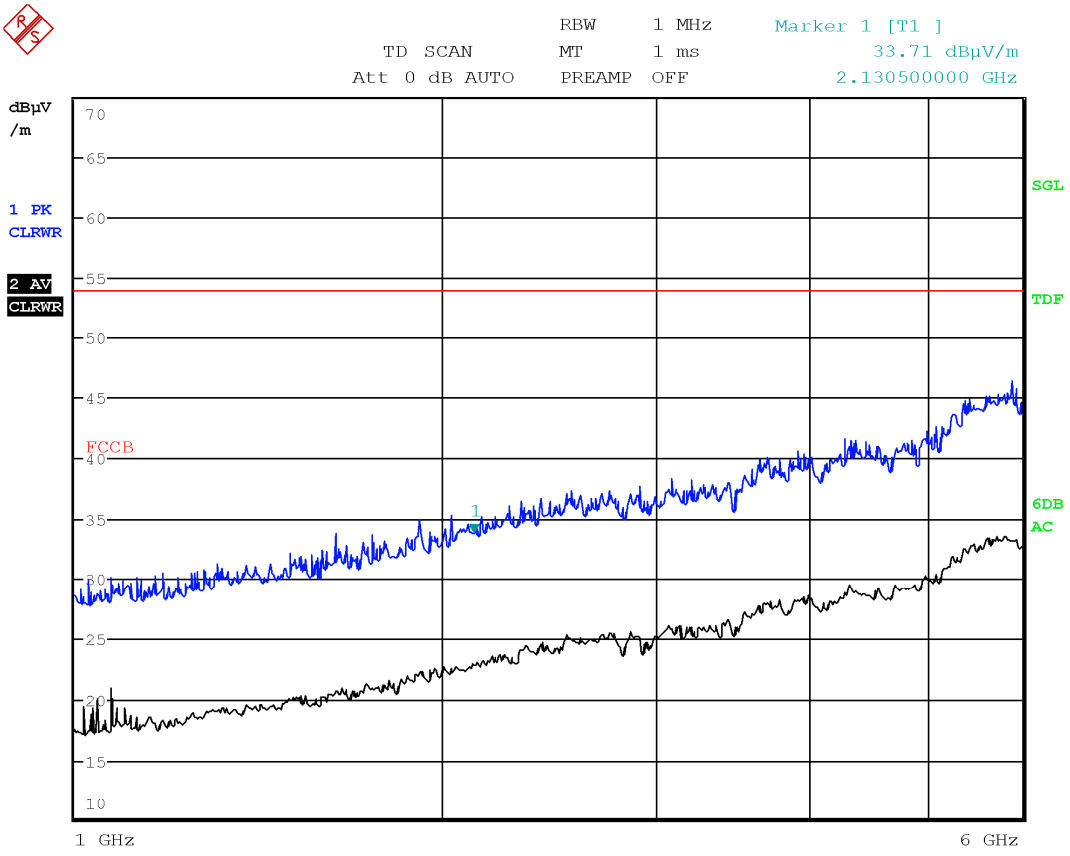
Date: 5.FEB.2010 15:01:07

Frequency (MHz)	Qp Level dBuV/m	QP limit dBuV	Remarks
312	30.7	46.4	--
--	--	--	--

Operation mode: Reading the badge

Remarks: Horizontal Polarization
1000 MHz to 6000 MHz

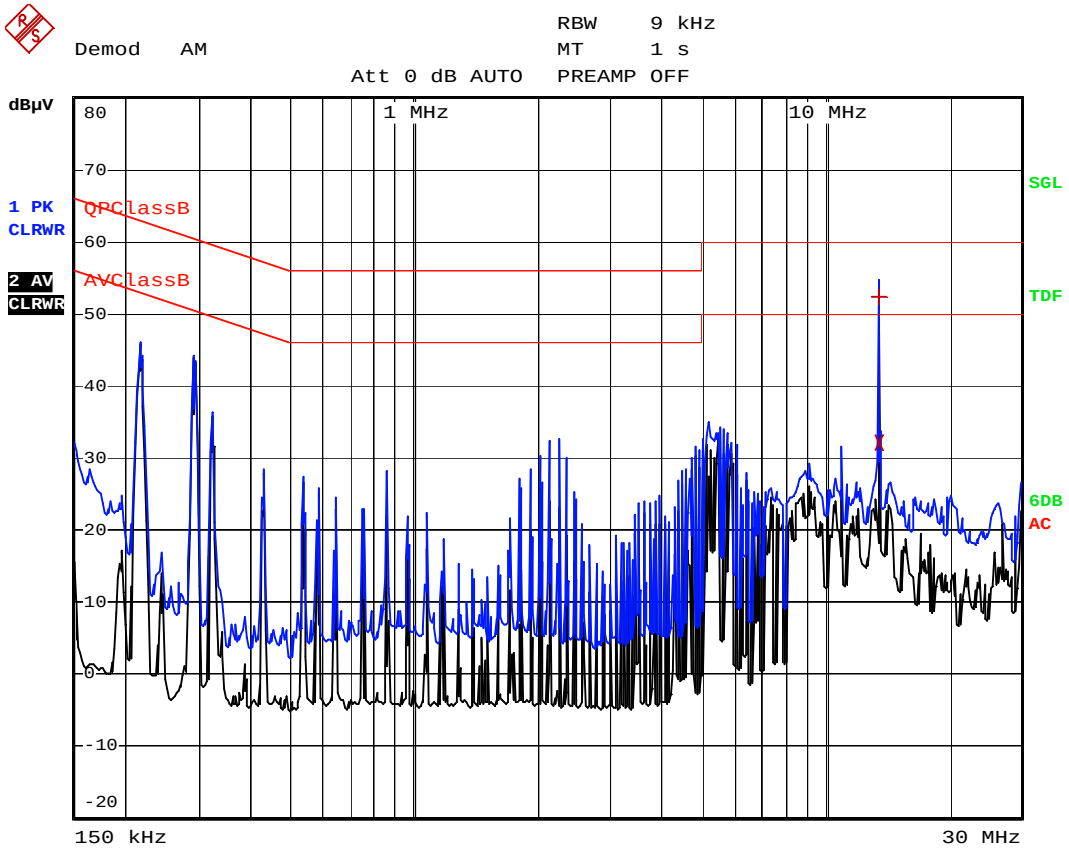
Result: ■ - passed



Date: 5.FEB.2010 15:09:31

Annex 2 Conducted emission test plots

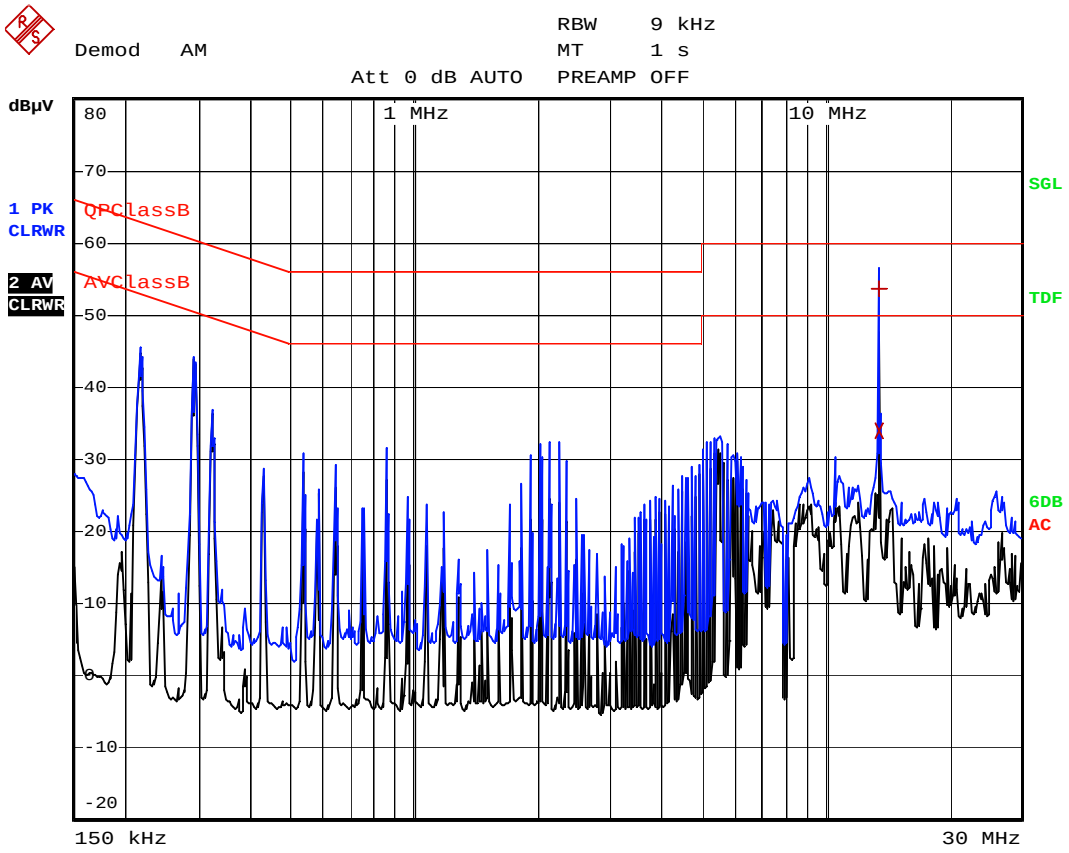
Test point Phase line Result: ■ - passed
Operation mode: Reading the badge
Remarks:



Date: 5.FEB.2010 15:20:58

Frequency (MHz)	Qp Level dBuV	QP limit dBuV	Average Level dBuV	Average Limit dBuV	Remarks
13.5580	52.4	60	32.2	50	--

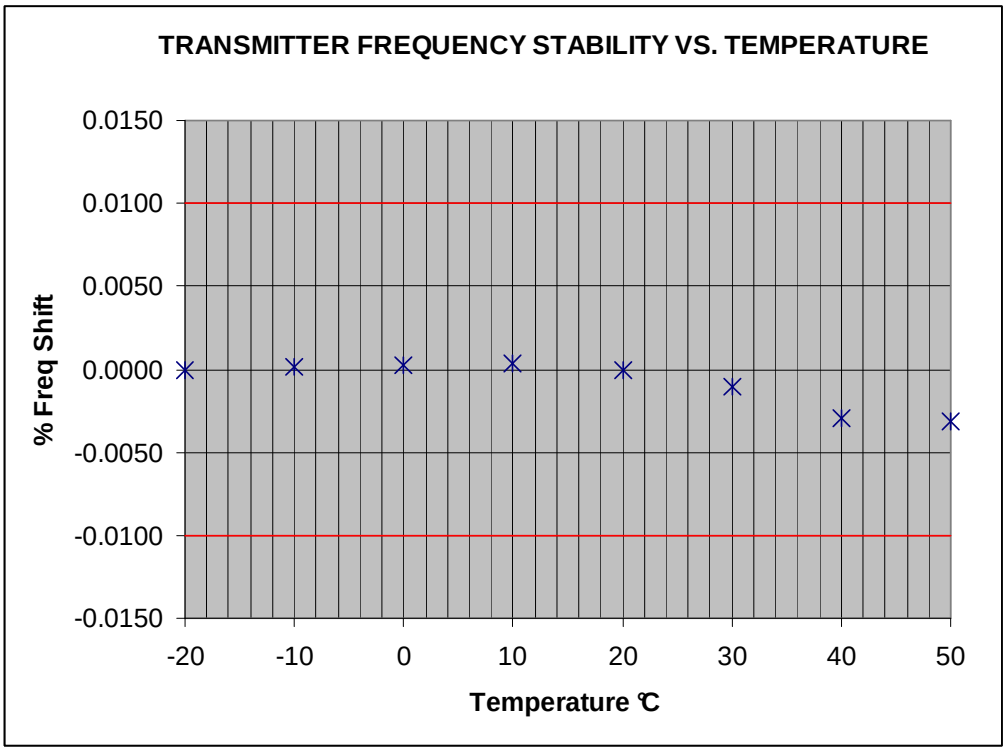
Test point Neutral line Result: ■ - passed
Operation mode: Reading the badge
Remarks:

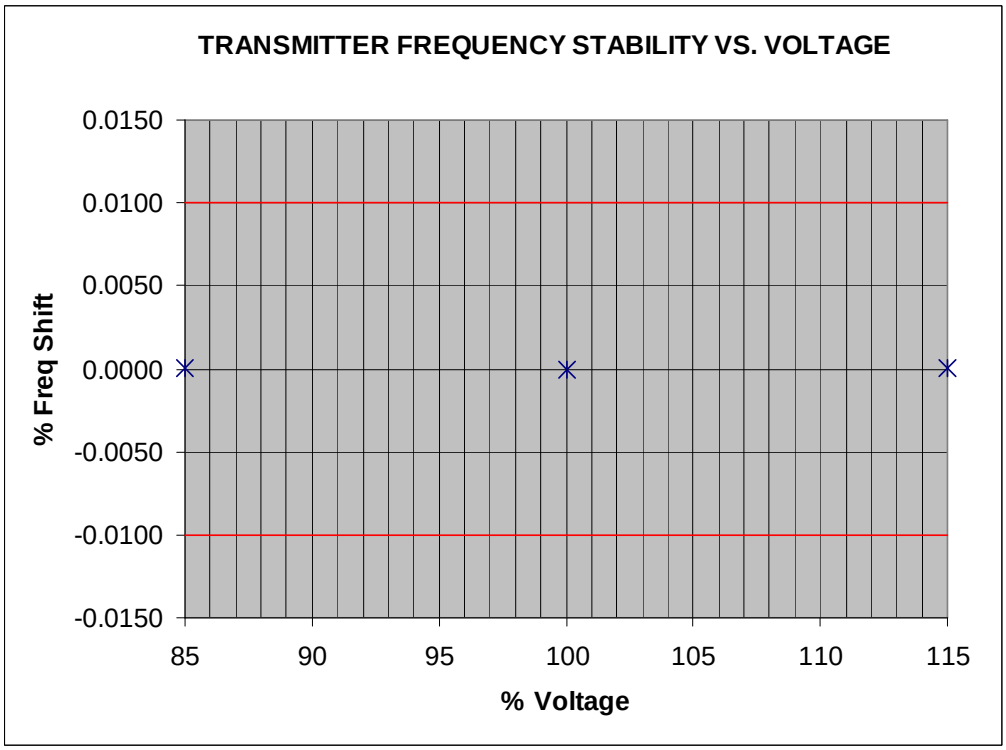


Date: 5.FEB.2010 15:25:29

Frequency (MHz)	Qp Level dBuV	QP limit dBuV	Average Level dBuV	Average Limit dBuV	Remarks
13.5580	53.6	60	33.9	50	--

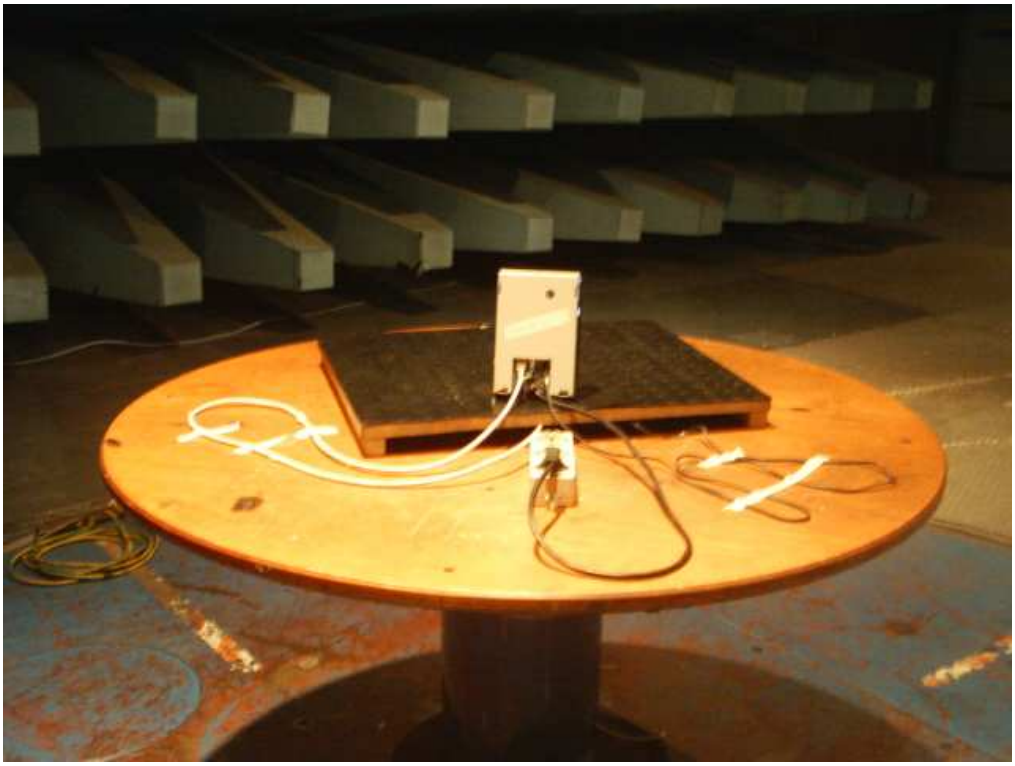
Annex 3 Frequency tolerance of the carrier signal test plots

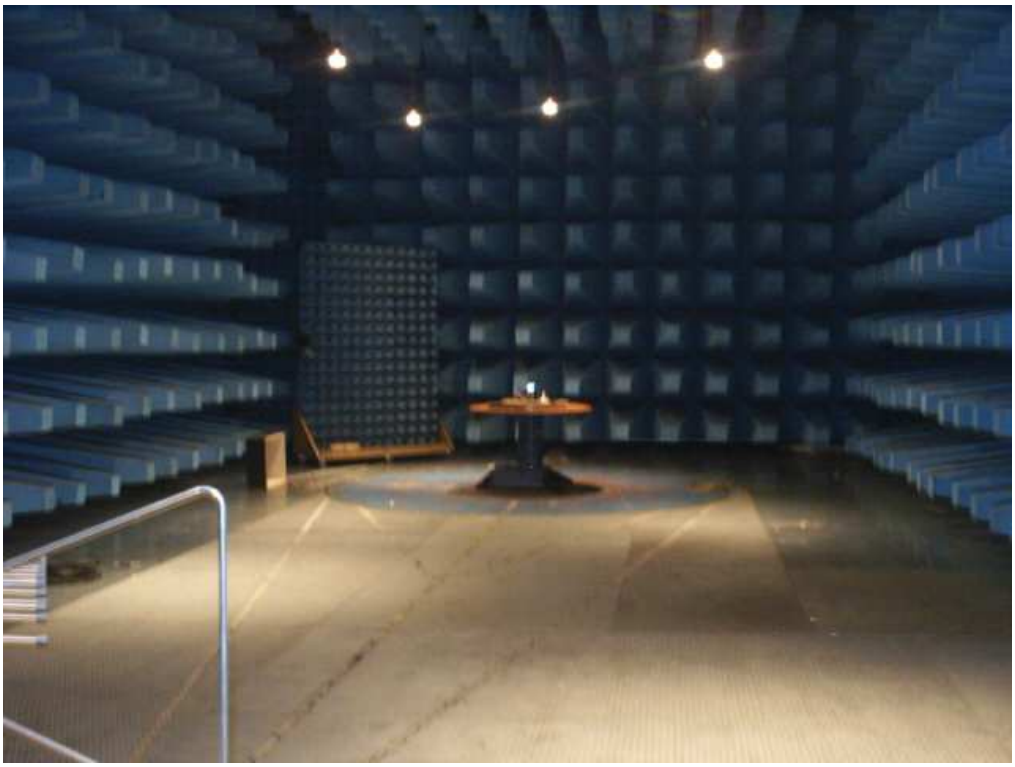


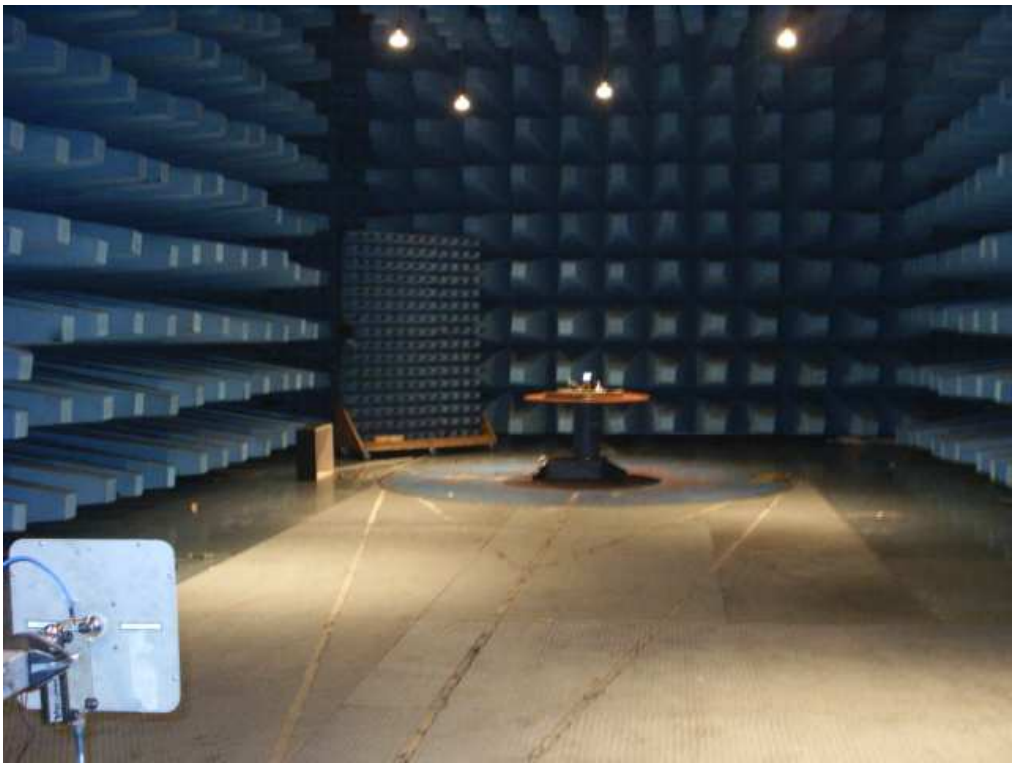


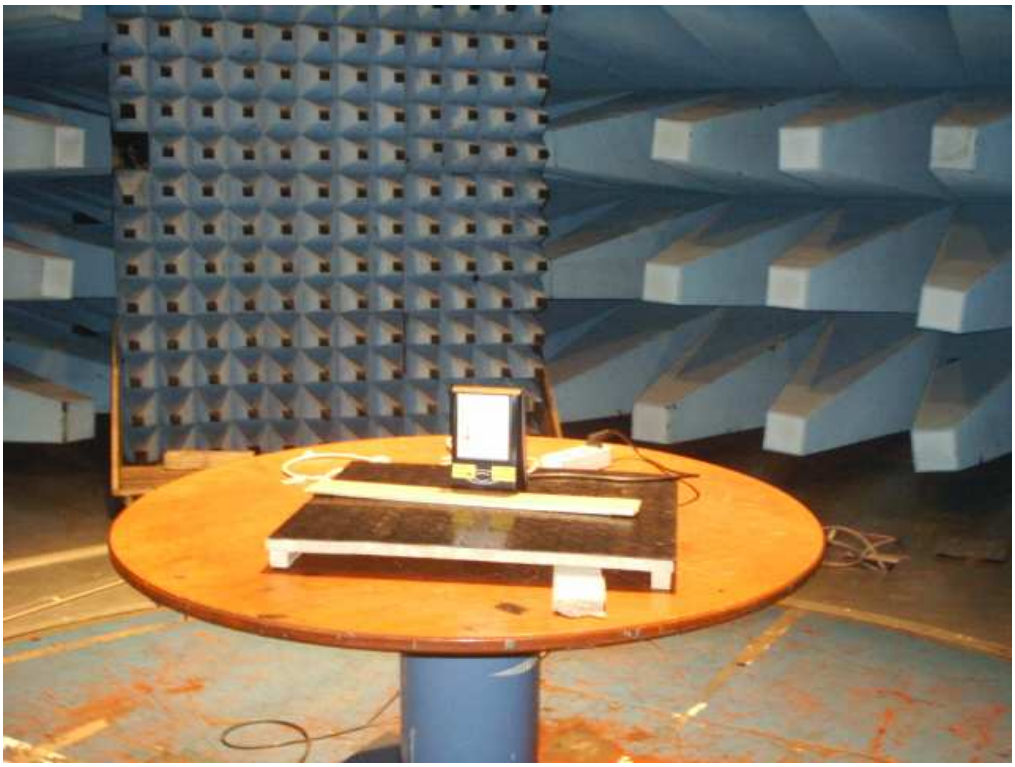
Annex 4 Test set up Photos

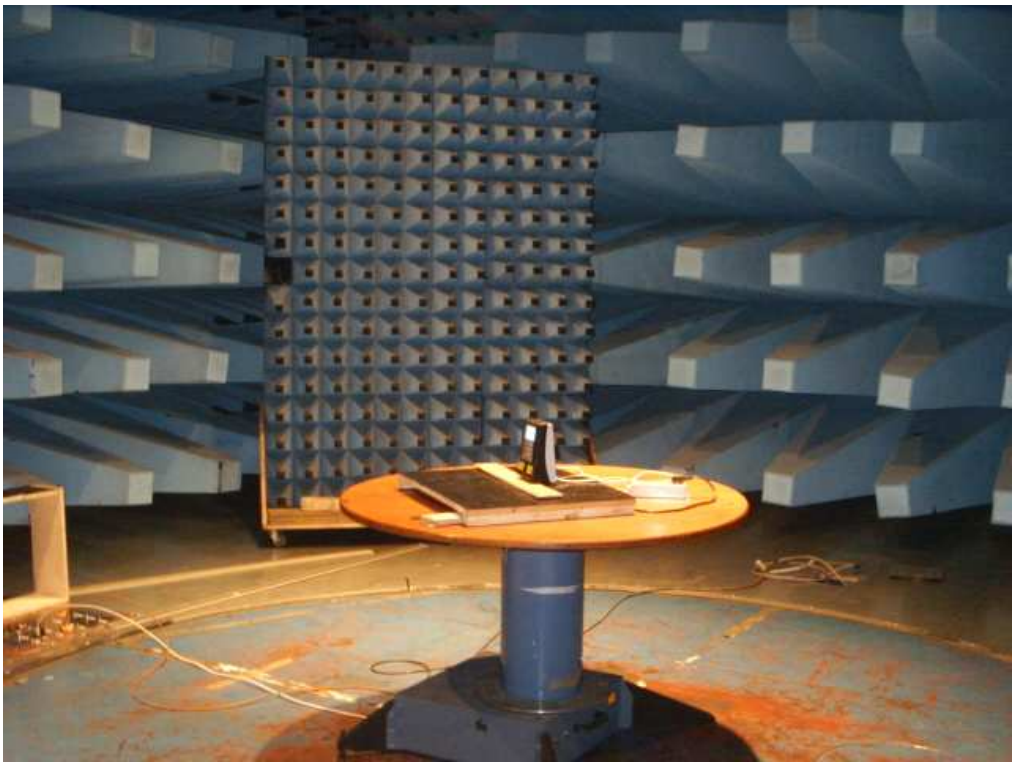
Radiated emissions











Conducted emissions

Frequency toolerance set up

Annex 5 E.U.T. Photos

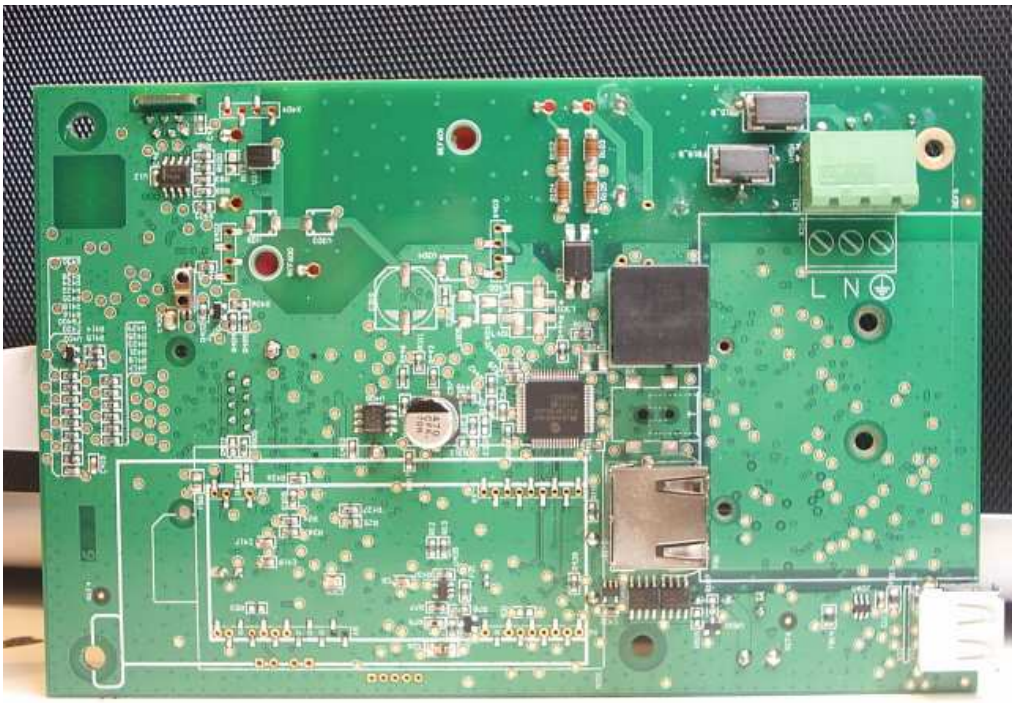
16K2 Programmed card
HID Default Keys
Format: H10301
f/c = 1
card = 1

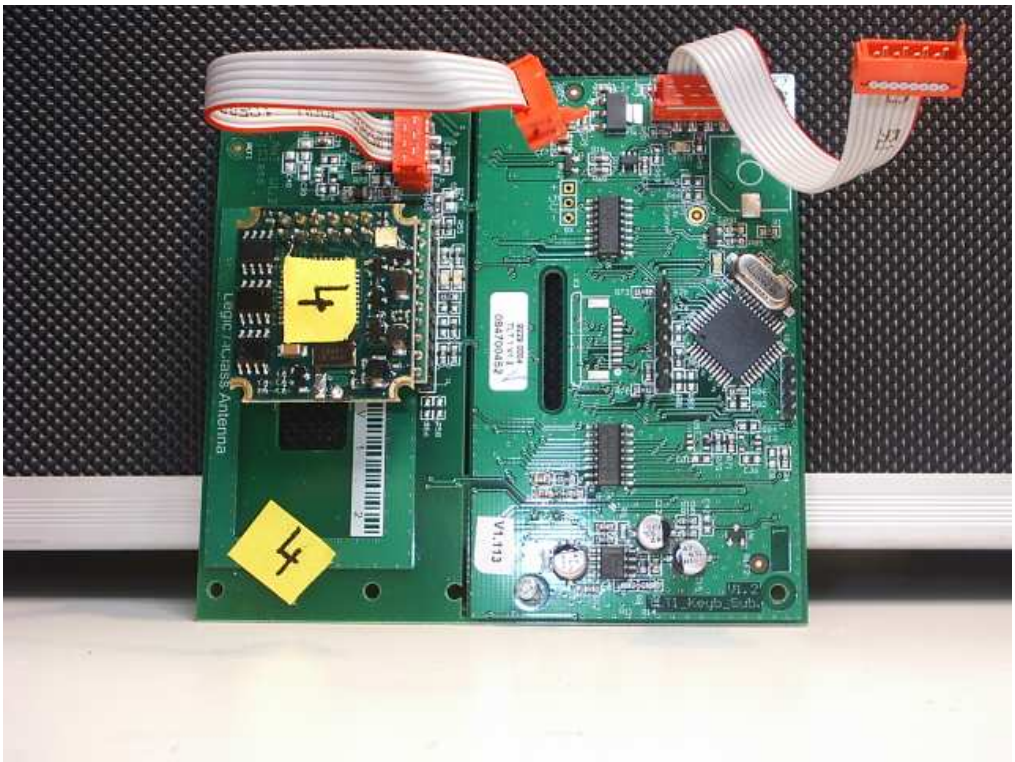
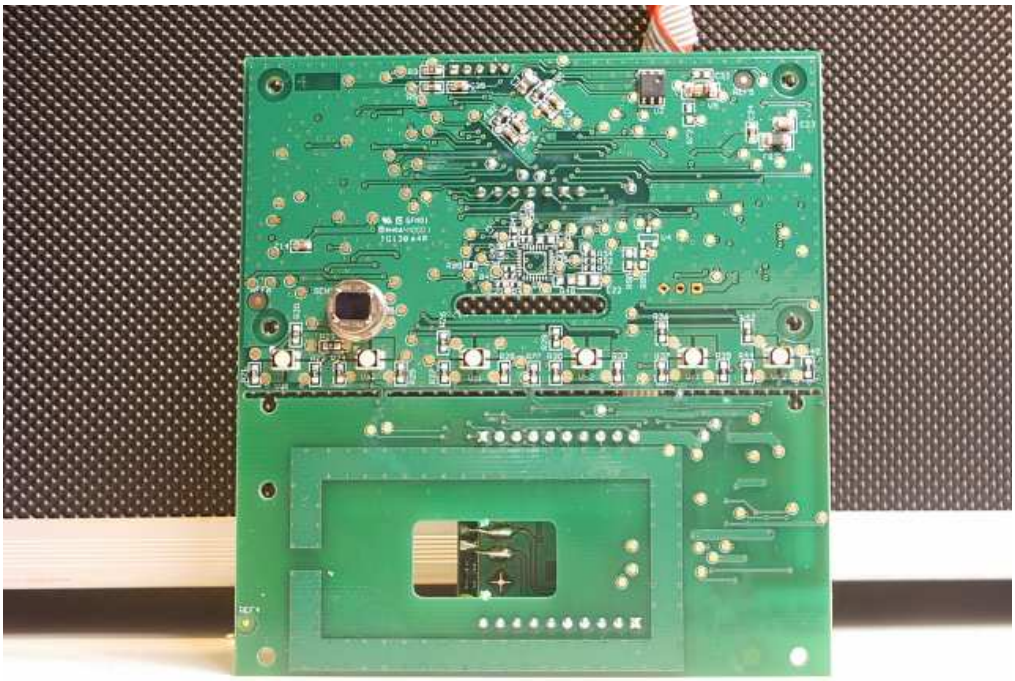
Check Net State (0)...
F1
F2

11.10.2009 22 08
Accettato
00523
F1
F2

4
4

4
400v
22 μF
KXG
400v
22 μF
SCHURTER


L N


Legic / Class Antenna