

FCC ID:Y722011001

EMI - TEST REPORT

- FCC Part 15.209 -



Test Report No. :	T34125-00-02HS	01. March 2011 Date of issue
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Type / Model Name : i-Read

Product Description : RFID Reader

Applicant : ROYAL TAG SA

Address : Via Industria 1

6933 MUZZANO, SWITZERLAND

Manufacturer : ROYAL TAG SA

Address : Via Industria 1

6933 MUZZANO, SWITZERLAND

Licence holder : ROYAL TAG SA

Address : Via Industria 1

6933 MUZZANO, SWITZERLAND

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October, 2009)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October, 2009)

Part 15, Subpart B, Section 15.109	Radiated emissions, general requirements
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FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2009)

Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements

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.
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CISPR 16-4-2: 2003	Uncertainty in EMC measurement
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CISPR 22: 2005 EN 55022: 2006	Information technology equipment
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2 SUMMARY

GENERAL REMARKS:

The EUT operates at frequency 134.2 kHz. Due the EUT is a RFID device the RX mode makes sense only if before a TX signal has provided the tag with power. After reading cycle the device goes automatically in standby mode. Therefore the TX mode and the standby mode are measured for the EUT as worst case. USB connection is only possible in standby mode. Is USB connected RFID function is not available.

FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 08 March 2010

Testing concluded on : 11 March 2010

Checked by:

Tested by:

Klaus Gegenfurtner
Dipl.-Ing.(FH)
Manager: Radio Group

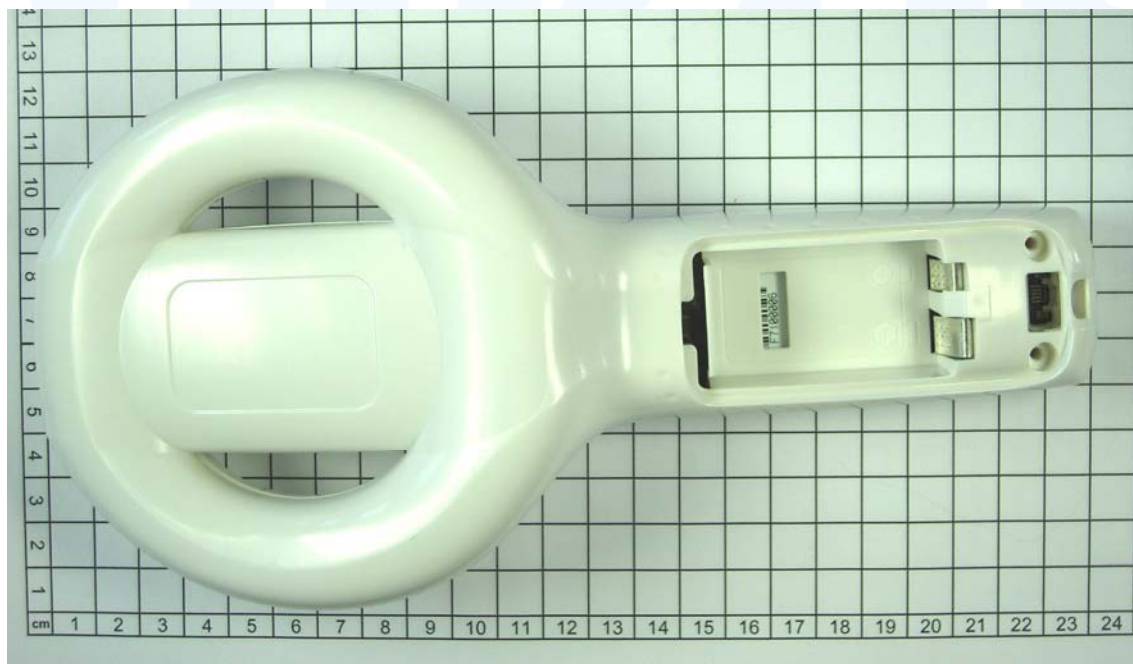
Hermann Smetana
Dipl.-Ing.(FH)
Radio Expert

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3 EQUIPMENT UNDER TEST

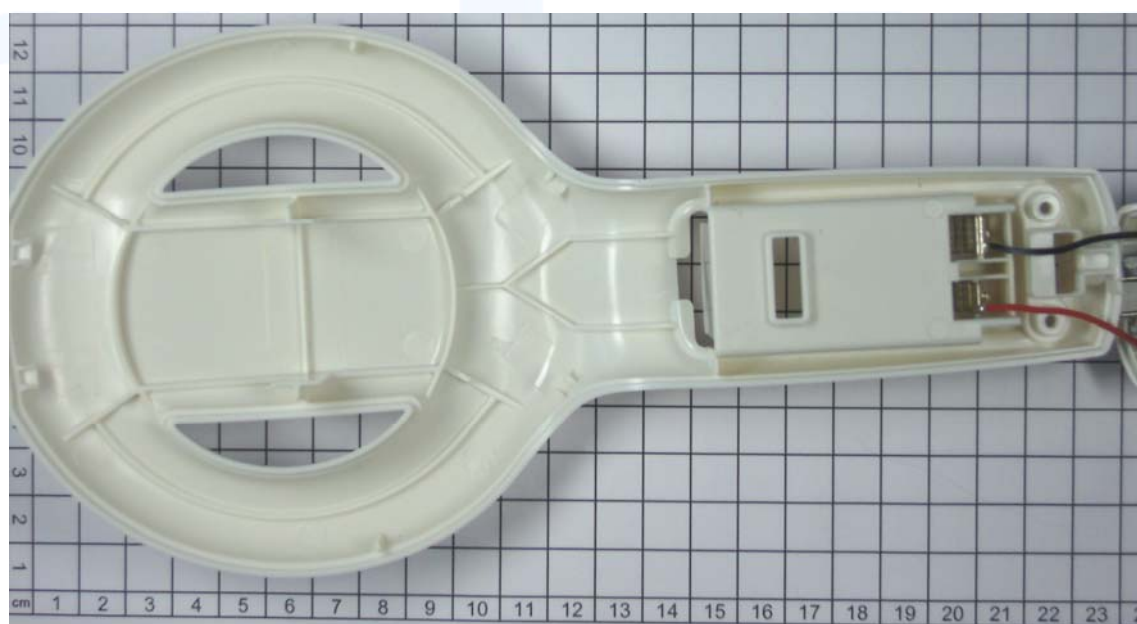
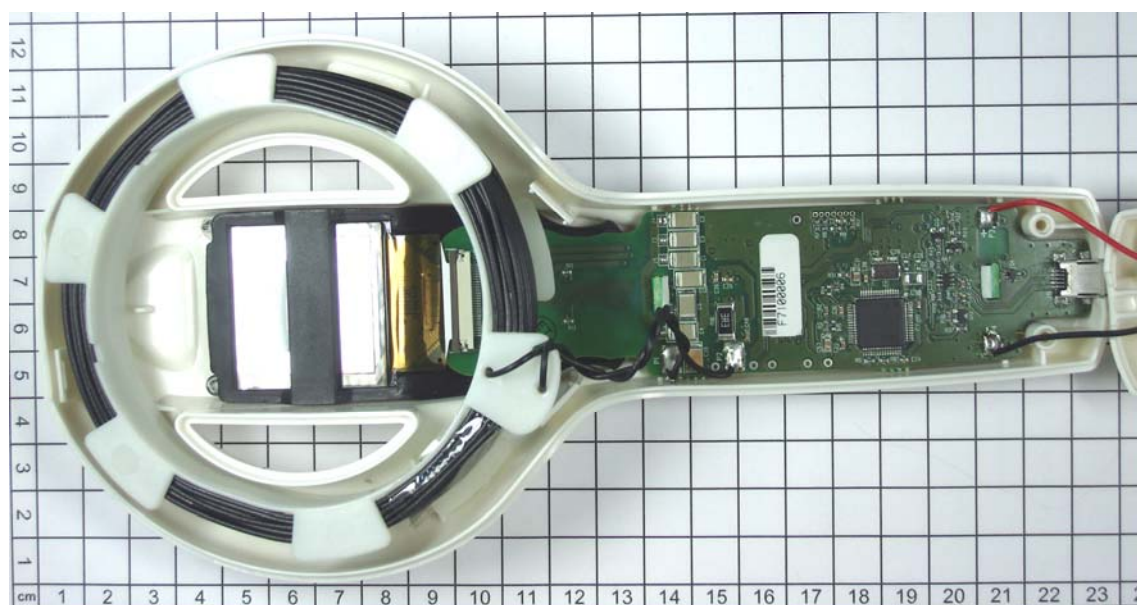
3.1 Photo documentation of the EUT

External views:

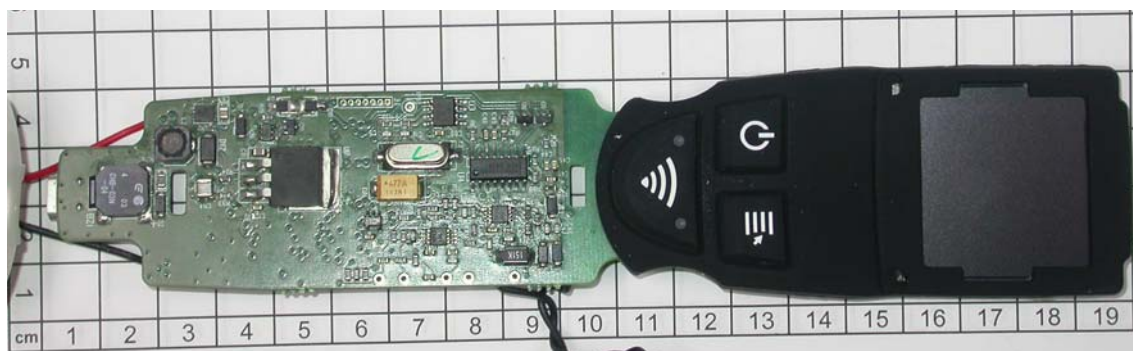
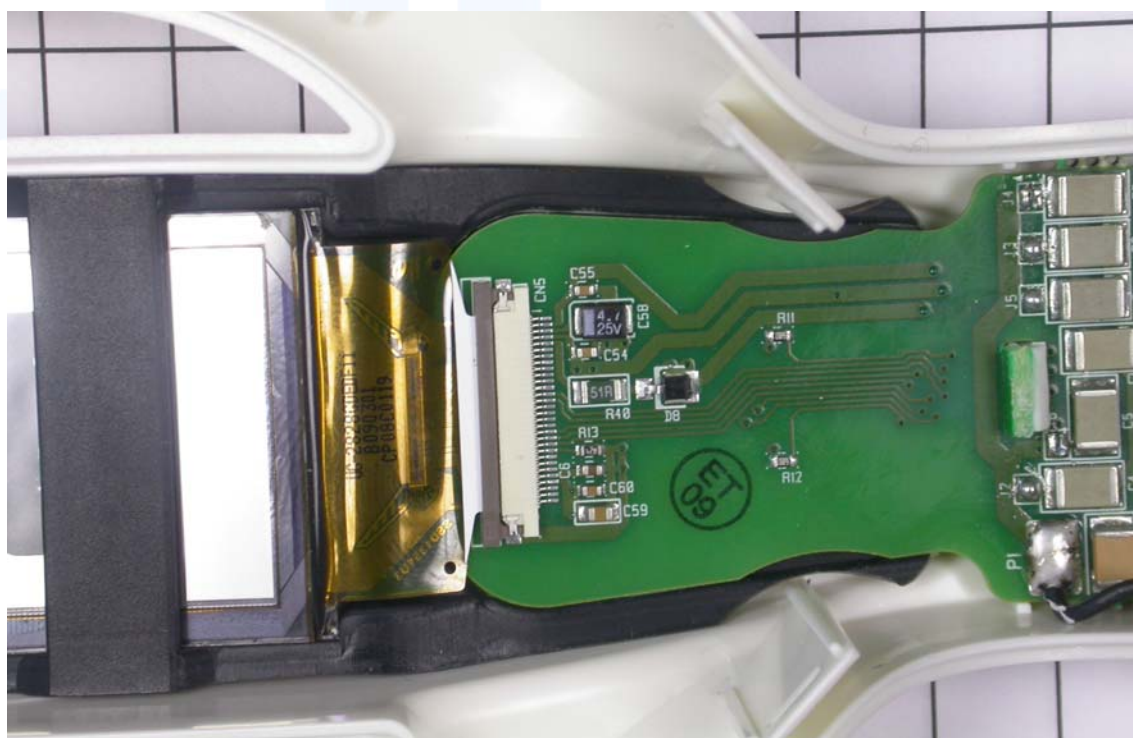
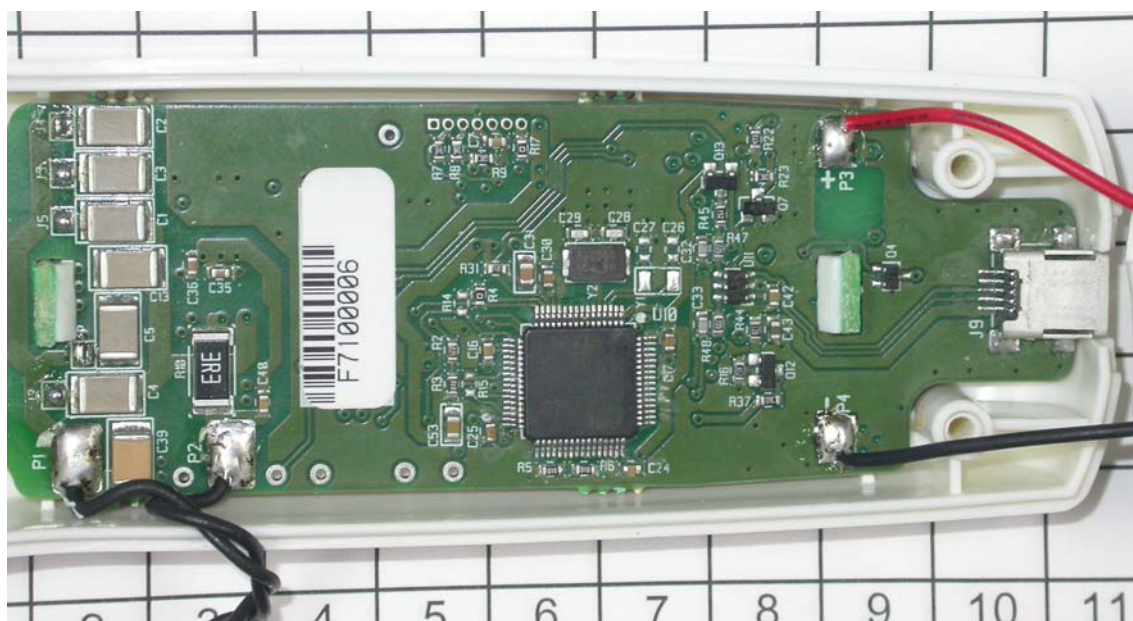


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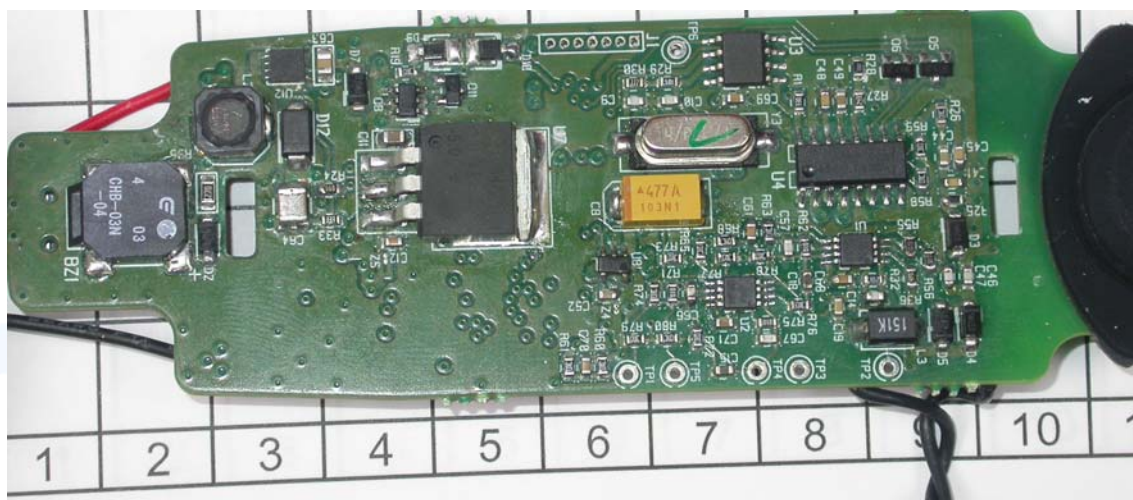
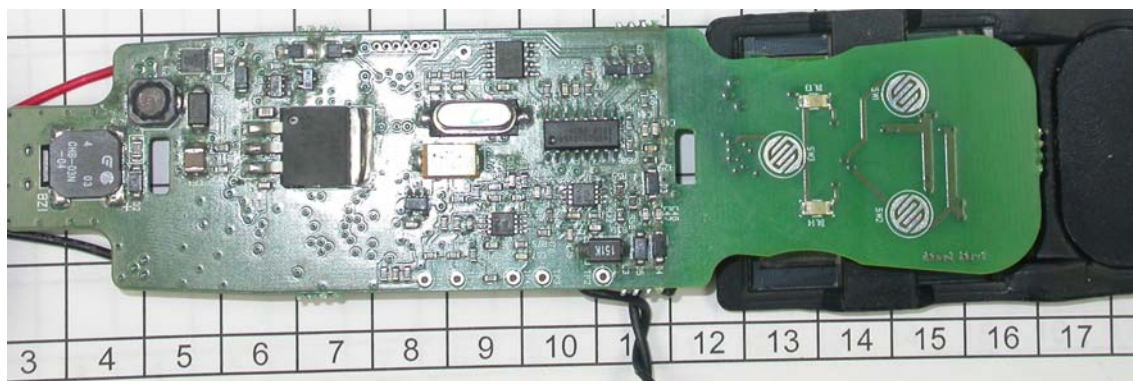
Internal views:



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3.2 Power supply system utilised

Power supply voltage : 9 VDC Battery

3.3 Extreme test conditions

The EUT is designed for the temperature range: 0°C to 35°C , $T_{\text{nom}} = 20^{\circ}\text{C}$;
The extreme voltage for this battery supplied equipment is $V_{\text{nom}} = V_{\text{max}} = 9\text{ V}$;
 $V_{\text{min}} = 0.9 V_{\text{nom}} = 8.1\text{ V}$;

3.4 Short description of the equipment under test (EUT)

The EUT is a mobile RFID reader. The identified tags and the read data can be stored onto PC via USB cable. The reader has a special mode for reading animal tags. In this mode animal specific data are read, stored internally and are available for storing to PC on request.

Number of tested samples: 1
Serial number: Prototype

EUT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- TX mode

- Standby mode

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- Notebook	Model : Siemens Life book 1410
- USB cable, 1m	Model : General purpose
-	Model :

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners gmbh, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production process of devices may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for the specific test. The manufacturer has the sole responsibility of continued compliance of the EUT.

4.4 Measurement protocol for FCC

4.4.1 GENERAL INFORMATION

4.4.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.2 DETAILS OF TEST PROCEDURES

General Standard information

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.3 Conducted emission

Description of measurement

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit or to the CISPR limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\text{dB}\mu\text{V} = 20 \cdot \log(\mu\text{V});$$

$$\mu\text{V} = 10^{(\text{dB}\mu\text{V}/20)};$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin of a peak mode measurement appears to be less than 20 dB, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency (MHz)	Level (dB μ V)	+	Factor (dB/m)	=	Level (dB μ V/m)	-	CISPR Limit (dB μ V/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

4.5 Determination of worst case measurement conditions

Measurements have been made in all three orthogonal axes and the settings of the EUT were changed to locate at which position and at what setting of the EUT produce the maximum of the emissions. For the final measurement the EUT is set in Y position with the fixed settings by the manufacturer:

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5 TEST CONDITIONS AND RESULTS

5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: NONE

Remarks: The measurement is not applicable. The EUT has no AC mains connections and the RFID function is disabled when the device is connected via USB (data exchange).

5.2 Field strength of the fundamental wave

For test instruments and accessories used see section 6 Part CPR 1.

5.2.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.2.2 Photo documentation of the test set-up



5.2.1 Applicable standard

According to FCC Part 15C, Section 15.209:

The emissions from intentional radiators shall not exceed the effective field strength limits.

5.2.2 Description of Measurement

The magnetic field strength from the EUT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The set up of the Equipment under test will be in accordance to ANSI C63.4. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31(f)(2)(2). The final measurement will be performed with an EMI Receiver set to Quasi peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209(d)(2).

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: RBW: 200 Hz

Example:

$$\begin{array}{rclclclcl} \text{Frequency} & & \text{Level} & + & \text{Factor} & = & \text{Level} & - & \text{Limit} & = & \text{Delta} \\ (\text{MHz}) & & (\text{dB}\mu\text{V}) & & (\text{dB/m}) & & \text{dB}(\mu\text{V/m}) & & \text{dB}(\mu\text{V/m}) & & (\text{dB}) \\ 1.705 & & 5 & + & 20 & = & 25 & - & 30 & = & -5 \end{array}$$

5.2.3 Test result

The measurement value is calculated from a distance of 3 m to 300 m by subtracting the factor 40 dB/decade.

f (kHz)	Level AV (dBμV)	Ant. factor (dB/m)	Field strength dB(μV/m)	Distance Corr. dB	Corrected level AV dB(μV/m)	Limit dB(μV/m)	Delta (dB)
134.2	83.6	20	103.6	-80	23.6	25.0	-1.4

Limit according to FCC Part 15C, Section 15.209(a):

Frequency (MHz)	Field strength of fundamental wave		Measurement distance (metres)
	(μV/m)	dB(μV/m)	
0.009-0.490	2400/F(kHz)	25.0 (134.2 kHz)	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30

The requirements are **FULFILLED**.

Remarks:

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5.3 Spurious emissions (TX mode)

For test instruments and accessories used see section 6 Part SER 1, SER 2.

5.3.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.3.2 Photo documentation of the test set-up



5.3.3 Applicable standard

According to FCC Part 15C, Section 15.209:

The emissions from intentional radiators shall not exceed the effective field strength limits.

5.3.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.4. If the emission level of the EUT in peak mode complies with the average limit, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported. USB is not connected.

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: RBW: 200 Hz
 150 kHz – 30 MHz: RBW: 9 kHz
 30 MHz – 1000 MHz: RBW: 120 kHz

5.3.5 Test result

Frequency range 9 kHz - 30 MHz:

f (kHz)	Level AV (dBμV)	Ant. factor (dB/m)	Field strength dB(μV/m)	Distance Corr. dB	Corrected level AV dB(μV/m)	Limit dB(μV/m)	Delta (dB)
340	39.1	20	59.1	-80	-20.9	17.0	-37.9
403	45.7	20	65.7	-80	-14.3	15.5	-29.8

Frequency range 30 MHz – 1000 MHz:

f (MHz)	Level QP (dBμV)	Corr. factor (dB/m)	Field strength dB(μV/m)	Corrected level QP dB(μV/m)	Limit dB(μV/m)	Delta (dB)
-	-	-	-	-	-	-

No emission could be detected within 20 dB to the limit.

Limit according to FCC Part 15 Subpart 15.209(a):

Frequency (MHz)	Field strength of spurious emissions		Measurement distance
	(μV/m)	dB(μV/m)	(metres)
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

The requirements are **FULFILLED**.

Remarks: The measurement was performed according to FCC Part 15A, Section 15.33(a4), up to 1 GHz.

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5.4 Spurious emissions (Standby mode)

For test instruments and accessories used see section 6 Part **SER 2**.

5.4.1 Description of the test location

Test location: OATS1

Test distance: 3 metres

5.4.2 Photo documentation of the test setup



5.4.3 Applicable standard

According to FCC Part 15B, Section 15.109 (a):

Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 m shall not exceed the given limit.

5.4.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.4. If the emission level of the EUT in peak mode complies with the average limit, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average/quasipeak mode again and reported.

Instrument settings:

30 MHz – 1000 MHz: RBW: 120 kHz

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5.4.5 Test result

Standby mode with USB-connection:

f (MHz)	Level AV (dB μ V)	Level QP (dB μ V)	Corr. factor (dB)	Corr. level QP dB(μ V/m)	Corr. Level AV dB(μ V/m)	Limit dB(μ V/m)	Delta (dB)
-	-	-					

Limit according to FCC Part 15B, Section 15.109(a):

Frequency (MHz)	Limit (μ V/m)	Limit (dB μ V/m)
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

The requirements are **FULFILLED**.

Remarks: The measurement was performed according to FCC Part 15A, Section 15.33(b), up to 1 GHz.
No emission could be detected within 20 dB to the limit.

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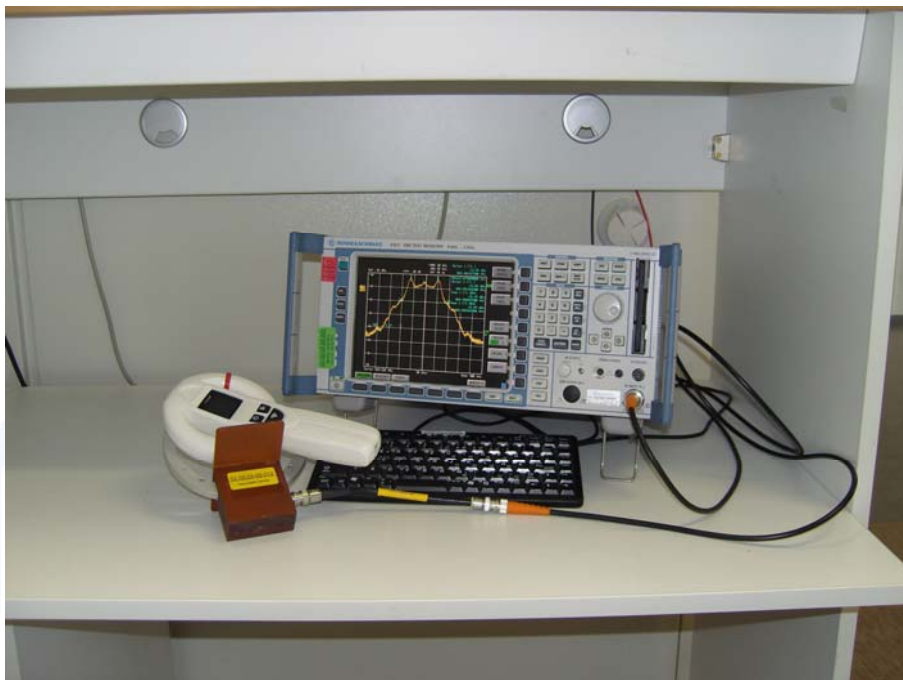
5.5 Emission bandwidth

For test instruments and accessories used see section 6 Part MB.

5.5.1 Description of the test location

Test location: AREA4

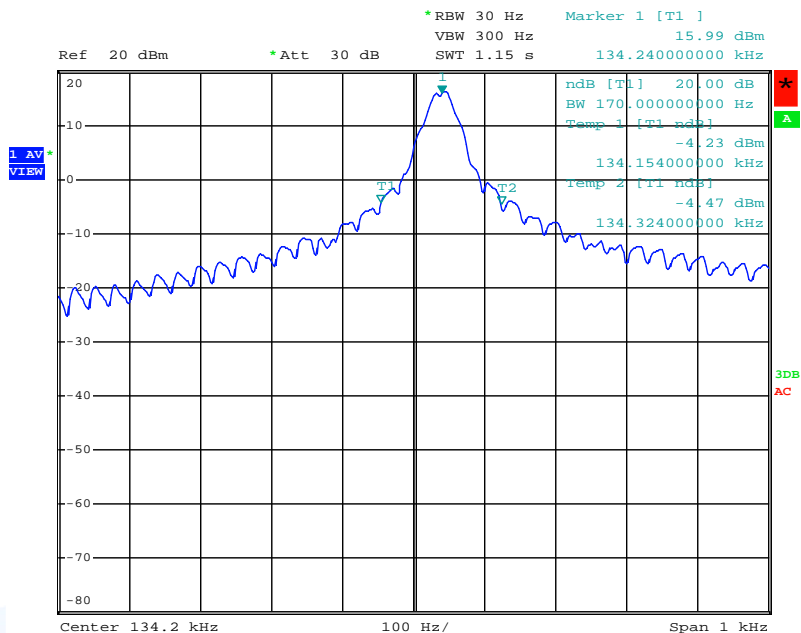
5.5.2 Photo documentation of the test set-up



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5.5.3 Test protocol

Emission Bandwidth plots



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6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
CPR 1	FMZB 1516	01-02/24-01-018			02/15/2011	02/15/2010
	ESCI	02-02/03-05-005	11/10/2010	11/10/2009		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
MB	ESCI	02-02/03-05-005	11/10/2010	11/10/2009		
	HZ-10	02-02/24-05-012				
	WK-340/40	02-02/45-05-001	06/17/2014	06/17/2009	06/10/2010	12/10/2009
	6543A	02-02/50-05-157				
SER 1	FMZB 1516	01-02/24-01-018			02/15/2011	02/15/2010
	ESCI	02-02/03-05-005	11/10/2010	11/10/2009		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 2	ESVS 30	02-02/03-05-006	08/05/2010	08/05/2009		
	VULB 9168	02-02/24-05-005	05/06/2011	05/06/2008	04/08/2010	10/08/2009
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				