

# EMI - T E S T R E P O R T

- FCC Part 15B -



**Test Report No. :** T35019-00-08HU

**18. May 2011**

Date of issue

**Type / Model Name** : RTR-300

**Product Description** : Wireless Dongle

**Applicant** : T&D CORPORATION

**Address** : 817-1 Shimadachi Matsumoto City  
NAGANO 390-0852 JAPAN

**Manufacturer** : T&D CORPORATION

**Address** : 817-1 Shimadachi Matsumoto City  
NAGANO 390-0852 JAPAN

**Licence holder** : T&D CORPORATION

**Address** : 817-1 Shimadachi Matsumoto City  
NAGANO 390-0852 JAPAN

**Test Result** according to the  
standards listed in clause 1 test  
standards:

**POSITIVE**



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, 2010)**

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, 2010)**

Part 15, Subpart B, Section 15.107	AC Line conducted emissions,	Class B
Part 15, Subpart B, Section 15.109	Radiated emissions, general requirements,	Class B

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.

CISPR 16-4-2: 2003

Uncertainty in EMC measurement

CISPR 22: 2005  
EN 55022: 2006

Information technology equipment

## 2 SUMMARY

### GENERAL REMARKS:

The EuT is capable to exchange data with a PC via USB port. The EuT can also be connected to an AC Adapter (sold separately) and used as a Repeater.

This test report describes the radiated disturbance by the data transfer via USB port and conducted disturbance produced by using an AC Adapter.

The measurement has been performed in Standby (Dongle Open).

The EuT is declared as Class B digital device.

### 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 : 07. March 2011

Testing concluded on : 06. April 2011

Checked by:

Tested by:

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Harald Buchwald  
Dipl. Ing.(FH)  
Manager: EMC

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Markus Huber

### **3 EQUIPMENT UNDER TEST**

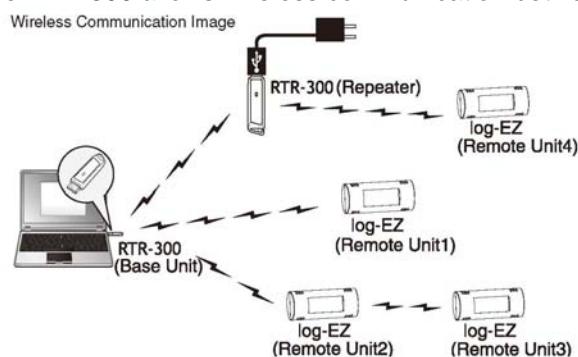
#### **3.1 Photo documentation of the EUT – Detailed photos see Attachment A1**

#### **3.2 Power supply system utilised**

Power supply voltage : 5.0 V / DC (USB power)

#### **3.3 Short description of the equipment under test (EUT)**

The EuT is a wireless dongle. The RTR-300 allows wireless communication between RTR-322 units and a PC.



Number of tested samples: 1

Serial number: see Photo documentation of the EuT / Equipment Under Test

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

- Standby (Dongle Open)

-  
-  
-

#### **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:**

- Test Software  
- Laptop  
-  
-  
-  
-  
-  
-  
-

Model : Supplied by manufacturer T&D

Model : Fa. mikes testingpartners gmbh

Model : \_\_\_\_\_

Model : \_\_\_\_\_

Model : \_\_\_\_\_

Model : \_\_\_\_\_

mikes

## **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 processes may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests. The manufacturer has the sole responsibility of continued compliance of the EUT.

## 4.4 Measurement Protocol for FCC, VCCI and AUSTEL

### 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.

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.

#### 4.4.1.2 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 in order to obtain maximum disturbances from the unit.

### 4.4.2 DETAILS OF TEST PROCEDURES

#### 4.4.2.1 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."

## **5 TEST CONDITIONS AND RESULTS**

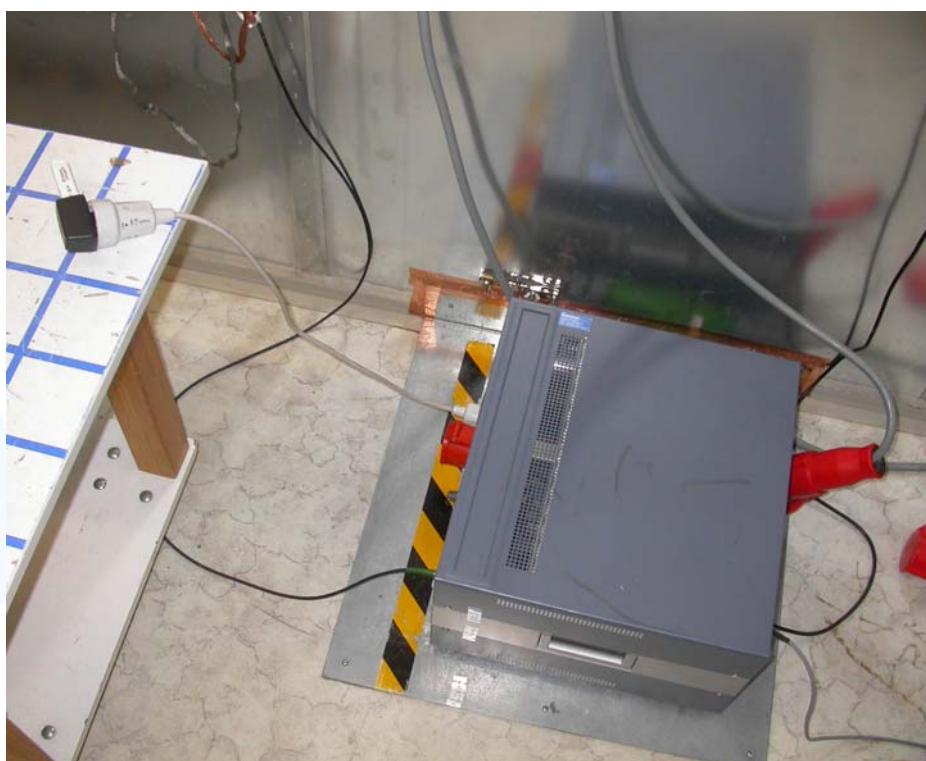
### **5.1 Conducted emissions**

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

#### **5.1.1 Description of the test location**

Test location: Shielded Room S2

#### **5.1.2 Photo documentation of the test set-up**



#### **5.1.3 Applicable standard**

According to FCC Part 15B, Section 15.107(a):

Except as shown in paragraphs (b) and (c) of this Section, for an unintentional radiator that is designed to be connected to the public utility AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency

#### 5.1.4 Description of Measurement

The correction factors for cable loss and antenna gain are stored in the memory of the EMI receiver therefore the final level (dB $\mu$ V) appears directly in the reading of the EMI receiver. This level is compared to the FCC limit.

To convert between dB $\mu$ V and  $\mu$ V, the following conversions apply:

$$\begin{aligned} \text{dB}\mu\text{V} &= 20(\log \mu\text{V}) \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)} \end{aligned}$$

The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a line impedance stabilization network (LISN) with  $50\Omega/50 \mu\text{H}$  (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 appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

#### 5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 16.7 dB at 395 kHz

The requirements are **FULFILLED**.

Remarks: \_\_\_\_\_

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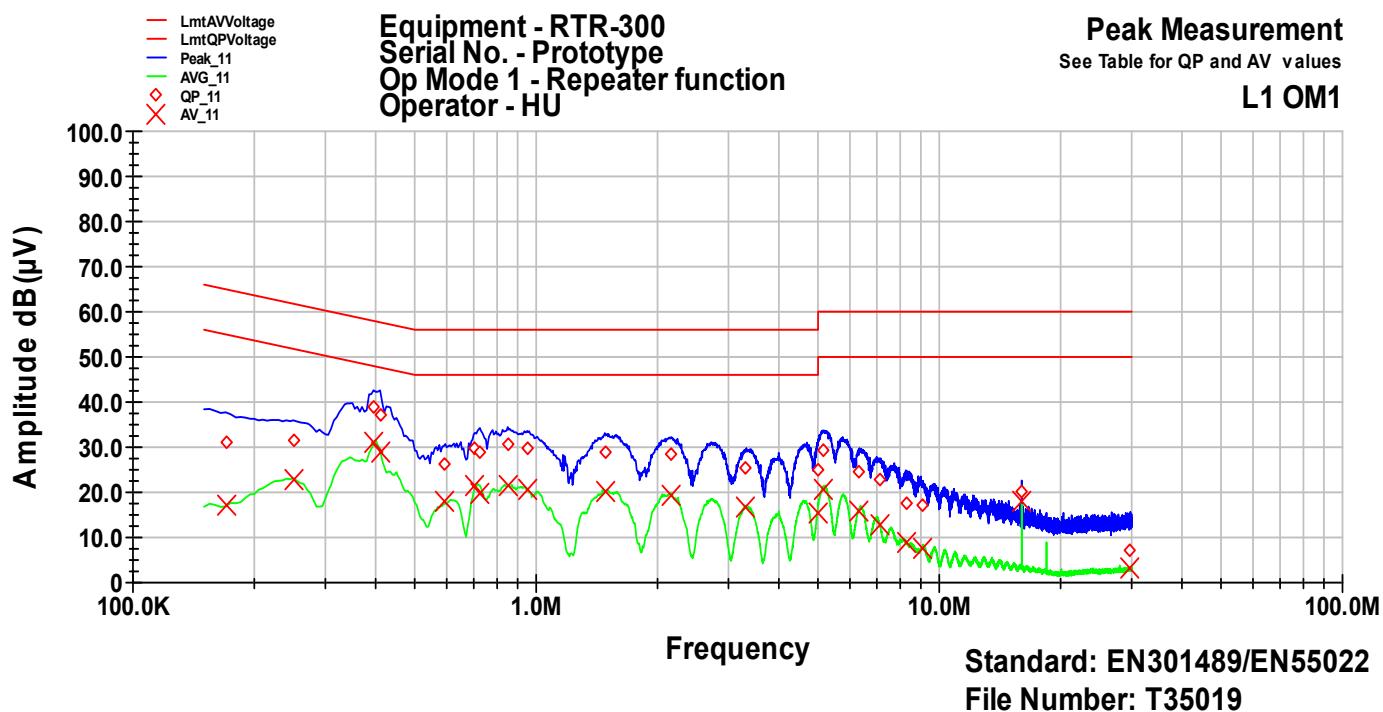
### 5.1.6 Test protocol

Test point L1

Result: passed

Operation mode:

Remarks:

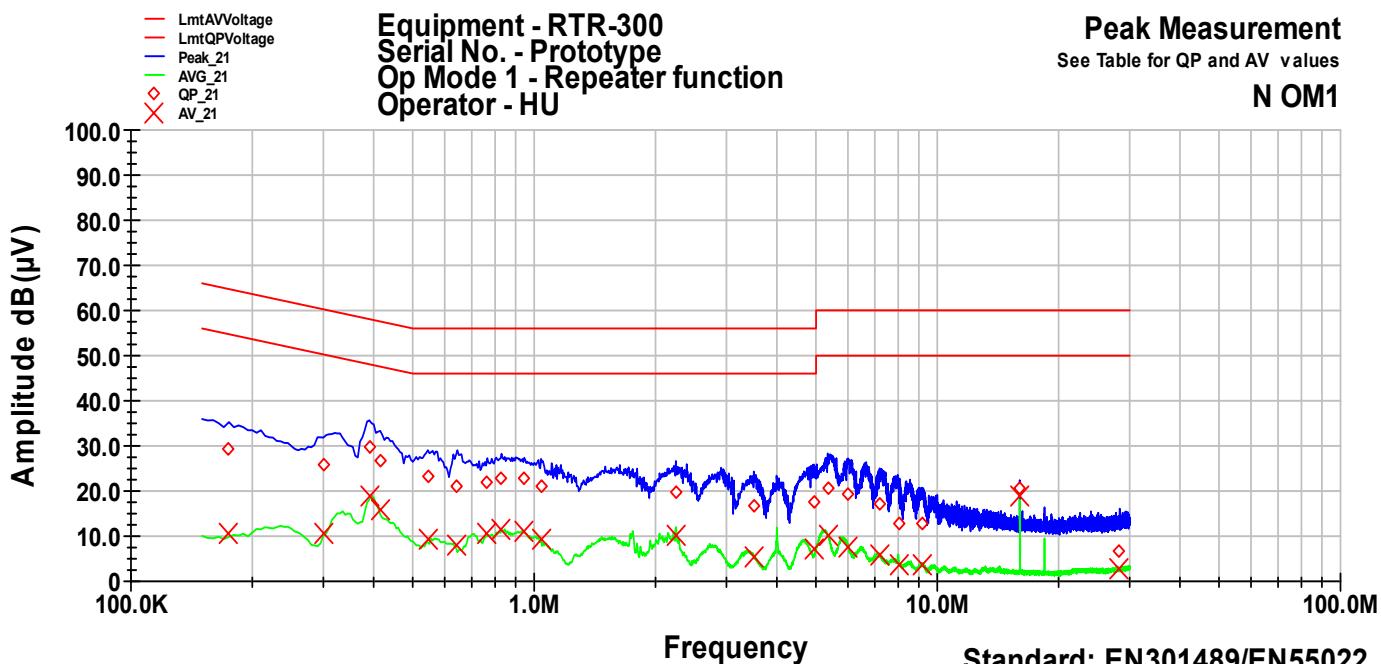


Frequency	QP Level	QP Margin	QP Limit	AV Level	AV Margin	AV Limit
MHz	dB(μV)	dB	dB	dB(μV)	dB	dB
0.17	31.2	-33.8	65.0	17.3	-37.7	55.0
0.25	31.6	-30.1	61.8	22.8	-28.9	51.8
0.395	38.7	-19.2	58.0	31.3	-16.7	48.0
0.41	37.0	-20.6	57.6	28.8	-18.9	47.6
0.595	26.4	-29.6	56.0	18.0	-28.0	46.0
0.7	29.6	-26.4	56.0	21.3	-24.7	46.0
0.725	28.9	-27.1	56.0	19.8	-26.2	46.0
0.85	30.4	-25.6	56.0	21.5	-24.5	46.0
0.95	29.9	-26.1	56.0	20.5	-25.5	46.0
1.48	29.1	-26.9	56.0	20.4	-25.6	46.0
2.165	28.3	-27.7	56.0	19.4	-26.6	46.0
3.32	25.2	-30.8	56.0	16.6	-29.4	46.0
5	25.1	-30.9	56.0	15.2	-30.8	46.0
5.145	29.5	-30.5	60.0	20.5	-29.5	50.0
6.335	24.3	-35.7	60.0	15.7	-34.3	50.0
7.145	23.0	-37.0	60.0	13.0	-37.0	50.0
8.255	17.6	-42.4	60.0	8.8	-41.2	50.0
9.11	17.1	-42.9	60.0	7.5	-42.5	50.0
16	20.2	-39.8	60.0	18.0	-32.0	50.0
29.75	7.3	-52.7	60.0	3.1	-46.9	50.0

Test point N

Result: passed

Operation mode:  
Remarks:



Frequency	QP Level	QP Margin	QP Limit	AV Level	AV Margin	AV Limit
MHz	dB(μV)	dB	dB	dB(μV)	dB	dB
0.175	29.3	-35.4	64.7	10.7	-44.0	54.7
0.3	26.0	-34.3	60.2	10.6	-39.6	50.2
0.39	29.7	-28.4	58.1	18.9	-29.2	48.1
0.415	26.6	-30.9	57.5	15.6	-31.9	47.5
0.545	23.3	-32.7	56.0	9.4	-36.6	46.0
0.645	21.3	-34.8	56.0	7.9	-38.1	46.0
0.765	21.9	-34.1	56.0	10.6	-35.4	46.0
0.83	23.0	-33.0	56.0	11.6	-34.5	46.0
0.945	23.0	-33.0	56.0	11.2	-34.8	46.0
1.04	21.0	-35.0	56.0	9.3	-36.7	46.0
2.245	19.8	-36.2	56.0	10.0	-36.0	46.0
3.505	16.8	-39.2	56.0	5.6	-40.4	46.0
4.935	17.4	-38.6	56.0	6.9	-39.0	46.0
5.345	20.7	-39.3	60.0	10.1	-40.0	50.0
6.02	19.3	-40.7	60.0	7.4	-42.6	50.0
7.19	17.0	-43.0	60.0	5.8	-44.2	50.0
8.06	12.6	-47.4	60.0	3.7	-46.3	50.0
9.145	12.9	-47.1	60.0	3.7	-46.3	50.0
16	20.6	-39.4	60.0	18.7	-31.3	50.0
28.31	6.9	-53.1	60.0	2.7	-47.3	50.0

## 5.2 Radiated emissions

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

### 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

Open area test site



### 5.2.3 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.

According to FCC Part 15C, Section 15.209:

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

### 5.2.4 Description of Measurement

The spurious emissions 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 antenna was positioned 3, 10 or 30 m horizontally from the EUT. 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). 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).

Radiated emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 dB( $\mu$ V/m) non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3 m horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 metres, measurement scans are made with horizontal and vertical antenna polarization and the EUT is rotated 360 degrees. The radiated emissions from the EUT are measured in the frequency range of 1 GHz to maximum frequency as specified in section 15.33, using a spectrum analyser and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 metre non-conducting table 80 centimetres above the ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4. The Interface cables that are closer than 40 cm to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 cm from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3 m horizontally from the EUT.

Measurements are made in horizontal and vertical polarization in a fully anechoic chamber. All tests are performed at a test distance of 3 m. Hand-held or body-worn devices are rotated through three orthogonal axes to determine the attitude of the highest emission shall be used for final testing. During the tests the EUT is rotated 360° and the cables and equipment are placed and moved in position in such a way to find the maximum emission level. For testing above 1 GHz, the emission level of the EUT in peak mode complies to the average limit is 20 dB lower, 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.

The resolution bandwidth during the measurement is as following:

9 kHz – 150 kHz: RBW: 200 Hz

150 kHz – 30 MHz: RBW: 9 kHz

30 MHz – 1000 MHz: RBW: 120 kHz

### 5.2.5 Test result

Frequency (MHz)	L: QP (dB $\mu$ V)	L: AV (dB $\mu$ V)	Bandwidth (kHz)	Correct. (dB)	L: QP dB( $\mu$ V/m)	L: AV dB( $\mu$ V/m)	Limit dB( $\mu$ V/m)	Delta (dB)
0.009 – 0.490	---	---	0.2				108.5 - 13.8	>20
0.490 – 1.705	---	---	9				33.8 - 22.9	>20
1.705 - 30	---	---	9				29.5	>20
30 – 88	---	---	120				40	>20
88 – 216	---	---	120				43.5	>20
216 - 960	---	---	120				46	>20
Above 960	---	---	120				54	>20

Note: No unwanted emissions could be measured!

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

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	( $\mu$ V/m)	dB( $\mu$ V/m)	
<b>0.009-0.490</b>	<b>2400/F(kHz)</b>	--	<b>300</b>
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30

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

Frequency (MHz)	Limit ( $\mu$ V/m)	Limit dB( $\mu$ 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.

## 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.
A 4	ESHS 30	02-02/03-05-002	18/06/2011	18/06/2010		
	NNLK 8129	02-02/20-05-001			22/06/2011	22/12/2010
	ESH 2 - Z 5	02-02/20-05-004	13/03/2011	13/03/2008	22/06/2011	22/12/2010
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155			06/10/2011	06/04/2011
	SP 103 /3.5-60	02-02/50-05-182				
SER 1	FMZB 1516	01-02/24-01-018			16/02/2012	16/02/2011
	ESCI	02-02/03-05-005	19/11/2011	19/11/2010		
	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	11/06/2011	11/06/2010		
	VULB 9168	02-02/24-05-005	07/03/2012	07/03/2011	17/09/2011	17/03/2011
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				