FCC ID: EROKBRFUSB

Registration No. DAT-P-207/05

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

- FCC Part 15.249 -

Test Report No. :	**T33922-00-01HS**	18. February 2010 Date of issue

Type / Model Name : Keyboard KBRFUSB

Product Description : Wireless radio keyboard

Applicant **:** ruwido austria gmbh

Address : Koestendorfer Str. 8

5202 NEUMARKT, AUSTRIA

Manufacturer **:** ruwido austria gmbh

Address : Koestendorfer Str. 8

5202 NEUMARKT, AUSTRIA

Licence holder **:** Crestron Electronics, Inc.

Address : 15 Volvo Drive

Rockleigh, NJ 07647, USA

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

Deutscher Akkreditierungs Rat DAR

DAT-P-207/05-00

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October, 2008)

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, 2008)

Part 15, Subpart B, Section 15.107	AC Line conducted emissions ☐ Class A device ☐ Class B device
Part 15, Subpart B, Section 15.109	Radiated emissions, general requirements
Part 15, Subpart B, Section 15.111	Antenna power conduction

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2008)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
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
Part 15, Subpart C, Section 15.249	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz
ANSI C63.4: 2009	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C95.1:1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 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 a wireless keyboard based on wireless USB-Protocol. Keyboard (transceiver) and a receiver have to be always paired to a system. The transceiver provides 1 - 79 channels in the 2.4 GHz frequency range. In the case a transmitting channel will be disturbed by another application, a dynamic channel selection switch to an undisturbed channel and helps to be less sensible against interference. The EUT is limited by firmware to 250 kbps (8DR mode) and the DSSS modulation method of the base band. The operation mode TX and standby alternate in order to save power.

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 December 2009

Testing concluded on : 10 January 2010

Checked by:

Klaus Gegenfurtner
I confirm the correctness and integrity of this document
2010.02.18 15:01:36 +01'00'

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

Tested by:

Hermann Smetana
I am the author of this document
2010.02.18 14:51:46 +01'00'

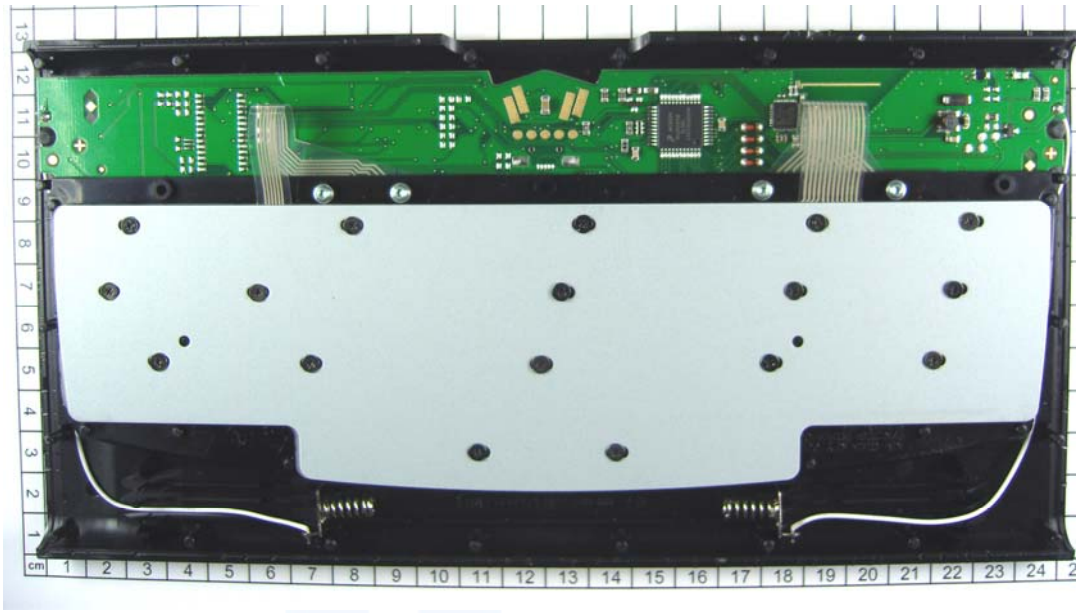
Hermann Smetana
Dipl.-Ing.(FH)
Radio Expert

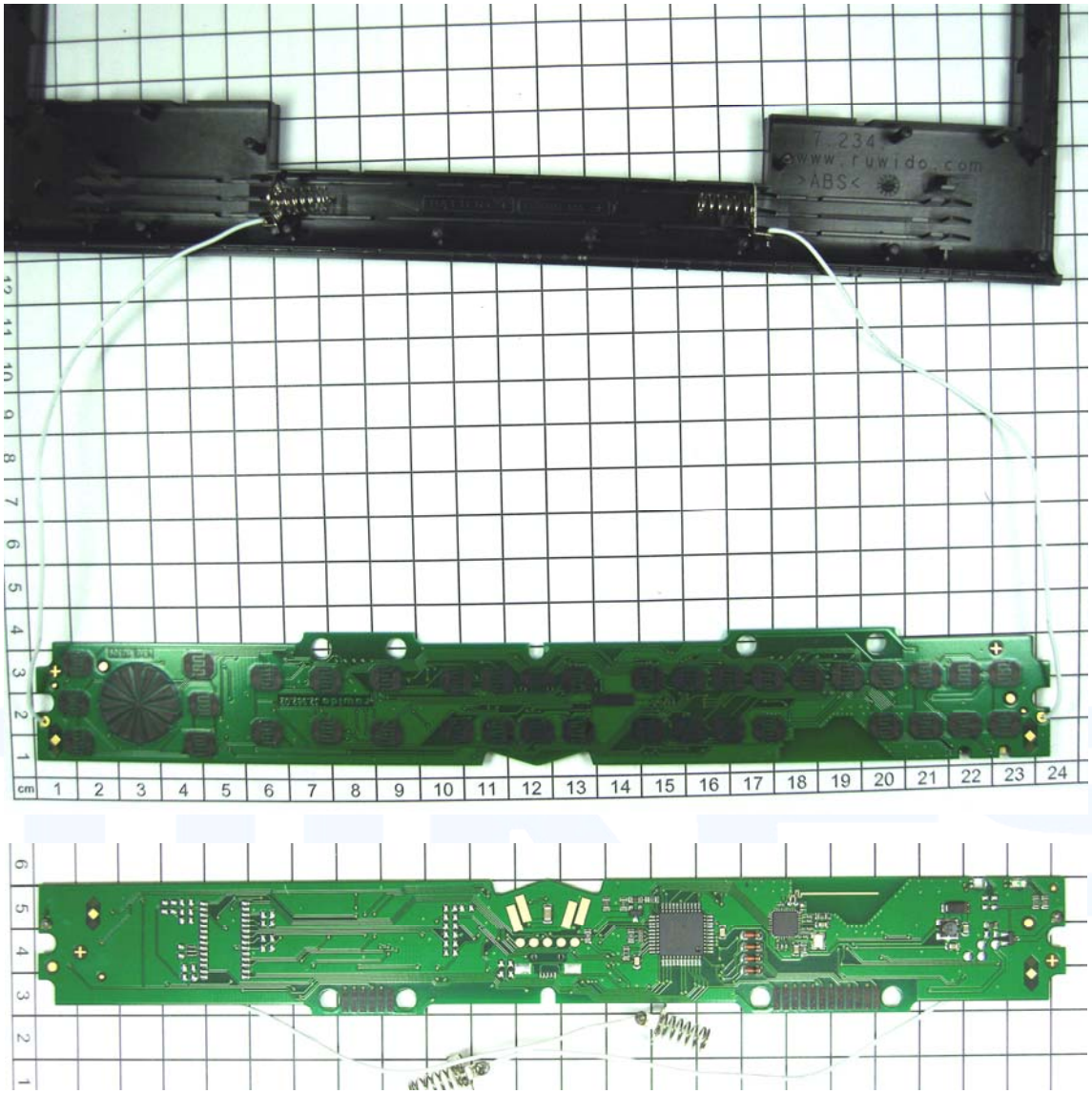
3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT

External view:

Internal views:




www.ruwido.com
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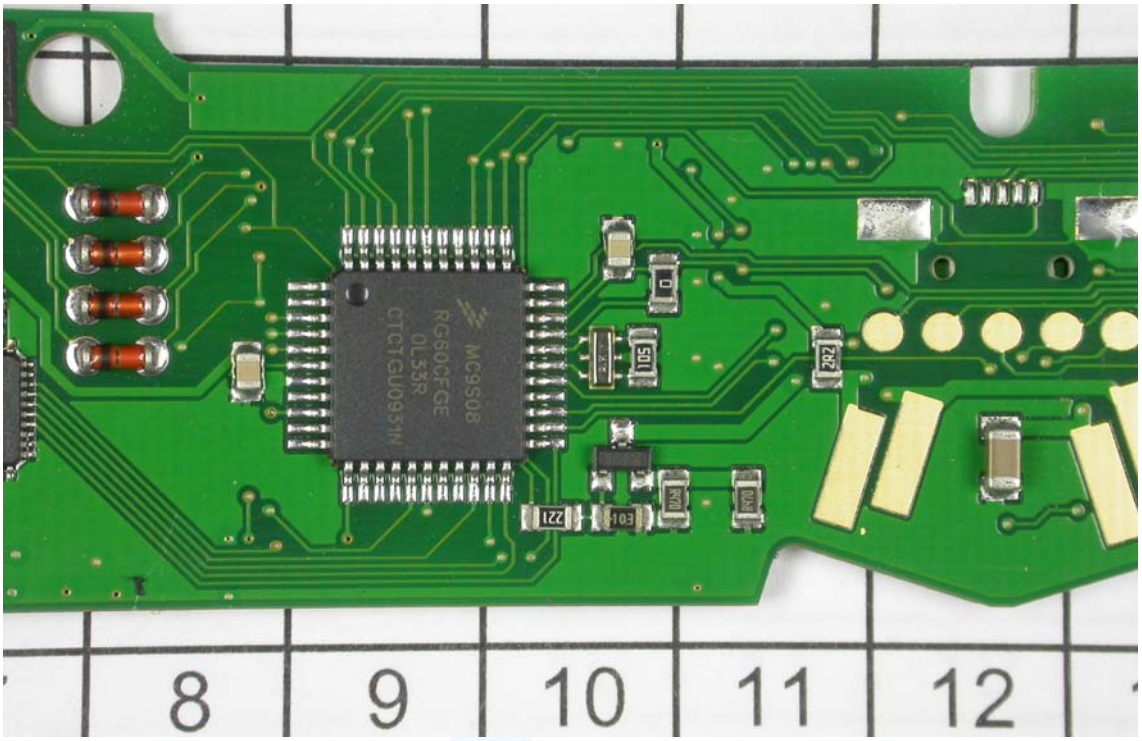
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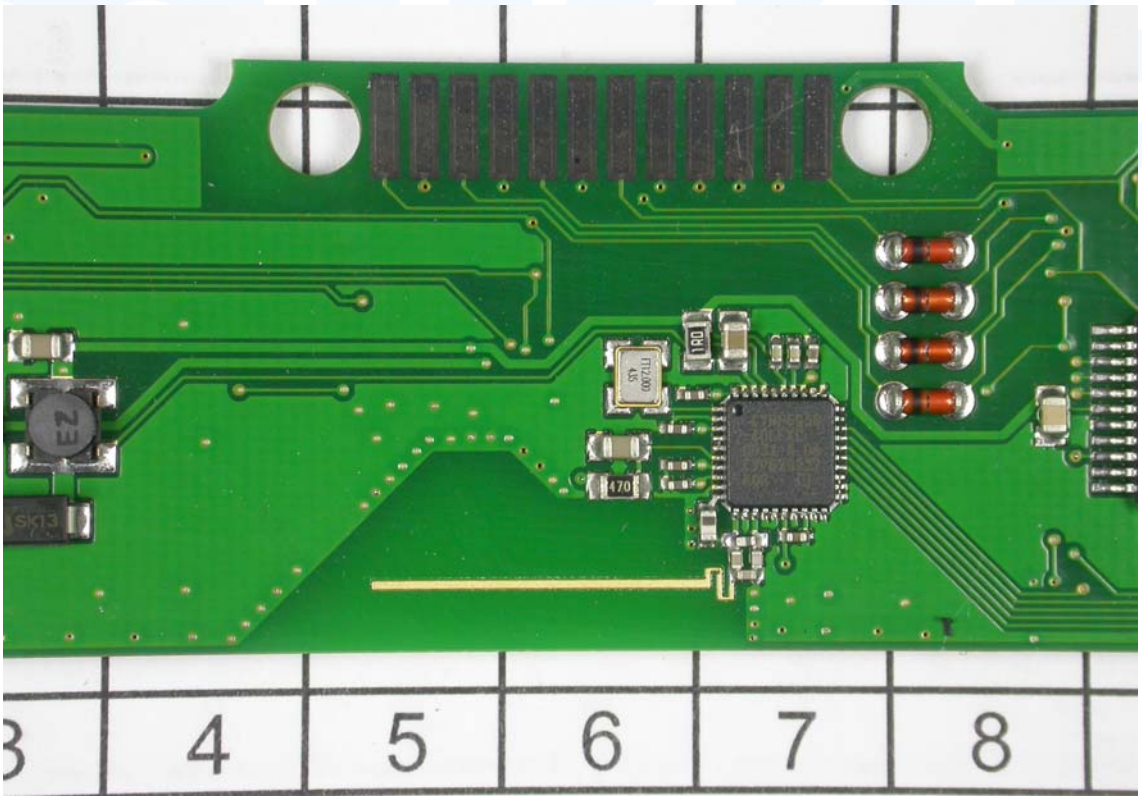
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3.2 Power supply system utilised

Power supply voltage : 3 VDC (2* AAA battery)

3.3 Short description of the equipment under test (EUT)

The EUT is a wireless keyboard operating in the 2.4 GHz range. The EUT save battery power through limiting transmission power and goes immediately in standby mode if it is not in use. The EUT is designed for easy use without limiting cables.

Number of tested samples: 1 keyboard
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:

- No peripheral devices were connected. Model :
- Model :
- 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 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.

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.

4.4.1.3 Details of test procedures

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.

4.4.1.4 Conducted emission

The final level, expressed in dBµV, 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 dBµV and µV, the following conversion formula apply:

dBµV = 20*log(µV);
µV = 10^(dBµV/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 50Ω/50 µH (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.

4.4.1.5 Radiated emission (electrical field 30 MHz - 1 GHz)

Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised 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 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with 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 that 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 screened room located outside the test area. The antenna is positioned 3, 10 or 30 m horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 m and the EUT is rotated 360 degrees.
The final level in dBµV/m is calculated by add on the reading value from the EMI receiver (level dBµV) the correction factor. The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:
30 MHz – 1000 MHz: RBW: 120 kHz

Example:

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

4.4.1.6 Radiated emission (electrical field 1 GHz - 40 GHz)

Radiated emissions from the EUT are measured in the frequency range 1 GHz up to the maximum frequency as specified in 47 CFR Part 15, Subpart A, 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. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is following set out in ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. Measurements are made in both the horizontal and vertical polarization planes in a fully anechoic room using a spectrum analyser set to max peak detector function and a resolution 1 MHz and video bandwidth 3 MHz for peak and 10 Hz for average measurement. The conditions determined as worst case will then be used for the final measurements. When the EUT is larger than the beam width of the measuring antenna it will be moved over the surface for the four sides of the equipment. Where appropriate, the test distance may be reduced in order to detect emissions under better uncertainty and are calculated at the specified test distance.

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 further measurement the EUT is set in X position with the following settings:

Operation modes:
TX: The EUT is limited to 250 kbps (8DR mode). Power setting: max = 7
Standby: After activity the transmitter falls in standby.
The most important mode is the 8DR mode at a data rate of 250 kbps for the worst case.

Modulation types:
For the 8DR packet the modulation DSSS used. GFSK for the 1 Mbps is disabled by firmware.

Following channels were selected for the final test as listed below:

Available Channel	Tested Channel	Modulation	Modulation Type	Data Rate (kbps)
1 to 79	1, 39, 79	DSSS	32 chip 8DR	250

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 is battery powered.

5.2 Radiated emission of the fundamental wave

For test instruments and accessories used see section 6 Part **CPR 3**.

5.2.1 Description of the test location

Test location: Anechoic Chamber A2
Test distance: 3 metres

5.2.2 Photo documentation of the test set-up

5.2.3 Applicable standard

According to FCC Part 15C, Section 15.249(a):
The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the effective limits.

5.2.4 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate linear polarized antennas.
Analyser settings:
RBW: 1 MHz VBW: 1 MHz Detector: Max peak

5.2.5 Test result

Frequency (MHz)	Reading level PK (dBµV)	Reading level AV (dBµV)	Bandwidth (kHz)	Correction factor (dB)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
2403	101.3		1000	-10.1	91.2		94.0	-2.8
2441	100.2		1000	-10.0	90.2		94.0	-3.8
2481	100.0		1000	-10.0	90.0		94.0	-4.0

Average-Limit according to FCC Part 15C, Section 15.249(a):

Frequency	Field strength of fundamental	
(MHz)	(mV/m)	dB(µV/m)
902 - 928	50	94
2400 - 2483.5	**50**	**94**
5725-5875	50	94
24000 - 24250	250	108

Peak-Limit according to FCC Part 15C, Section 15.249(e):
However the peak fieldstrength shall not exceed the maximum permitted average limit by more than 20 dB.

The requirements are **FULFILLED.**

Remarks: _____

_____

5.3 Spurious emissions radiated

For test instruments and accessories used see section 6 Part **SER 1, SER 2, SER 3**.

5.3.1 Description of the test location

Test location: OATS1
Test location: Anechoic Chamber A2

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 15.249 (d):
Emission radiated outside of the specified frequency bands, except harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limit in FCC Part 15C, Section 15.209, whichever is the lesser attenuation.

5.3.4 Description of Measurement

The radiated emissions from the EUT are measured in the frequency range of 9 kHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. The set up of the EUT will be in accordance to ANSI C63.4. In the frequency range above 1 GHz a spectrum analyser is used with appropriate linear polarized antennas. If the emission level 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. During the test, the EUT was set into continuous transmitting mode modulated.
Instrument settings:

10 MHz – 30 MHz:	RBW:	9kHz
30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 40 GHz	RBW = VBW:	1 MHz

5.3.5 Test result f < 1 GHz

Channel 1

Frequency (MHz)	Reading level QP (dBµV)	Reading level AV (dBµV)	Bandwidth (kHz)	Correction factor (dB)	Corrected level QP dB(µV/m)	Corrected level AV dB(µV/m)	Limit dB(µV/m)	Delta (dB)
-	-							

Channel 39

Frequency (MHz)	Reading level QP (dBµV)	Reading level AV (dBµV)	Bandwidth (kHz)	Correction factor (dB)	Corrected level QP dB(µV/m)	Corrected level AV dB(µV/m)	Limit dB(µV/m)	Delta (dB)
-	-							

Channel 79

Frequency (MHz)	Reading level QP (dBµV)	Reading level AV (dBµV)	Bandwidth (kHz)	Correction factor (dB)	Corrected level QP dB(µV/m)	Corrected level AV dB(µV/m)	Limit dB(µV/m)	Delta (dB)
-	-							

Note: The correction factor takes into account cable loss and antenna factor.

Remark: No emission could be detected within 20 dB to the limit in the range 10 MHz to 1 GHz.

5.3.6 Test result f > 1 GHz

Channel 1 (2403 MHz)

Antenna		Power Setting	Frequency	Peak		Average	
Type	Gain (dBi)		(MHz)	Value dB(µV/m)	Limit dB(µV/m)	Value dB(µV/m)	Limit dB(µV/m)
PCB	1.5	7	1600	47.7	74		54
PCB	1.5	7	4805	52.6	74		54

Channel 39 (2441 MHz)

Antenna		Power	Frequency	Peak		Average	
Type	Gain (dBi)	Setting (∆dB)	(MHz)	Value dB(µV/m)	Limit dB(µV/m)	Value dB(µV/m)	Limit dB(µV/m)
PCB	1.5	7	1624	50.9	74		54
PCB	1.5	7	4875	46.0	74		54

Channel 79 (2481 MHz)

Antenna		Power	Frequency	Peak		Average	
Type	Gain (dBi)	Setting (∆dB)	(MHz)	Value dB(µV/m)	Limit dB(µV/m)	Value dB(µV/m)	Limit dB(µV/m)
PCB	1.5	7	1654	53.5	74		54
PCB	1.5	7	4962	43.5	74		54

5.3.6.1 Radiated emissions in restricted bands

Channel 1 (2403 MHz)
Nearest restricted band: 2310 - 2390 MHz

Antenna		Power	Frequency	Peak		Average	
Type	Gain (dBi)	setting (∆dB)	(MHz)	Value dB(µV/m)	Limit dB(µV/m)	Value dB(µV/m)	Limit dB(µV/m)
PCB	1.5	7	2390	36.3	74		54

Channel 79 (2481 MHz)
Nearest restricted band: 2483.5-2500 MHz

Antenna		Power	Frequency	Peak		Average	
Type	Gain (dBi)	setting (∆dB)	(MHz)	Value dB(µV/m)	Limit dB(µV/m)	Value dB(µV/m)	Limit dB(µV/m)
PCB	1.5	7	2483.5	44.6	74		54
PCB	1.5	7	2484.1	48.9	74		54

Limit according to FCC Part 15C, Section 15.209:

Frequency (MHz)	15.209 Limits dB(µV/m)	Measurement distance (m)
0.009 - -0.49	2400/f(kHz)	300
0.49 – 1.705	24000/f(kHz)	30
1.705 – 30.0	30	30
30-88	40	3
88-216	43,5	3
216-960	46	3
Above 960	54	3

Average limit according to FCC Part 15C, Section 15.249(a):

Frequency	Field strength of harmonics	
(MHz)	(µV/m)	dB(µV/m)
902 - 928	500	54
2400 - 2483.5	500	54
5725-5875	500	54
24000 - 24250	2500	68

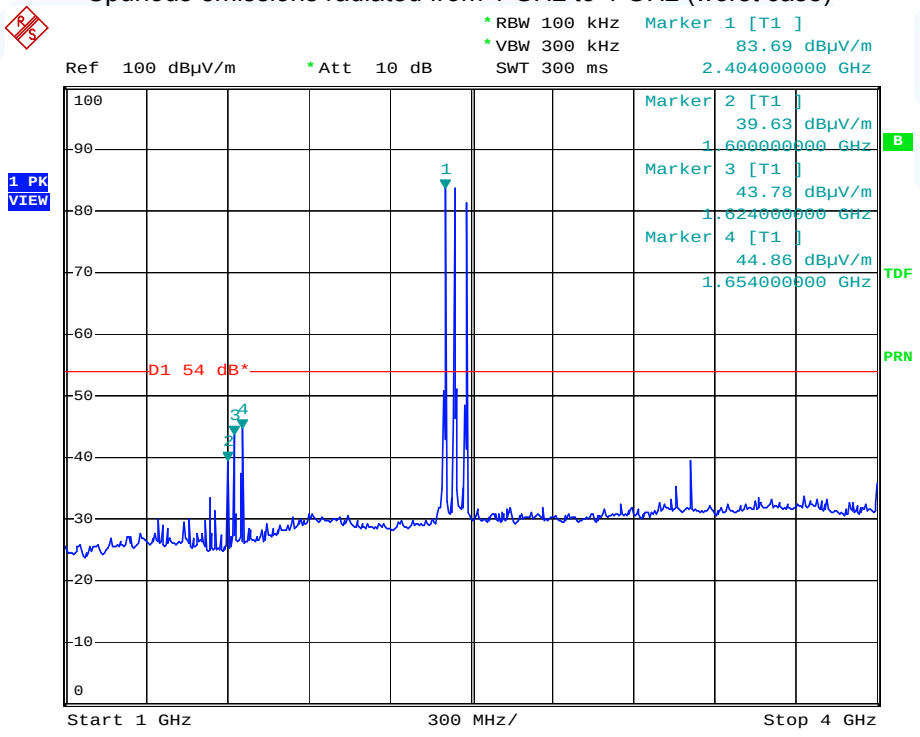
The requirements are **FULFILLED.**

Remarks: The measurement was performed up to the 10th harmonic . For detailed test results please see following test protocols.

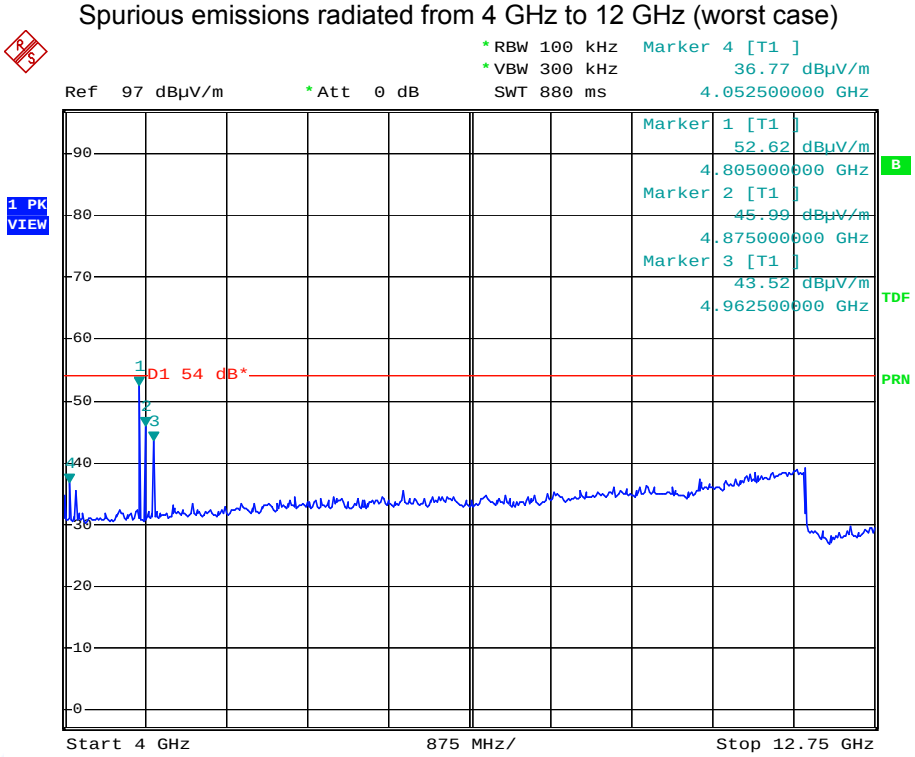
5.3.7 Test protocols

Plots of spurious emissions radiated out of operating frequency bands (-20 dBc)

Spurious emissions radiated from 1 GHz to 4 GHz (worst case)

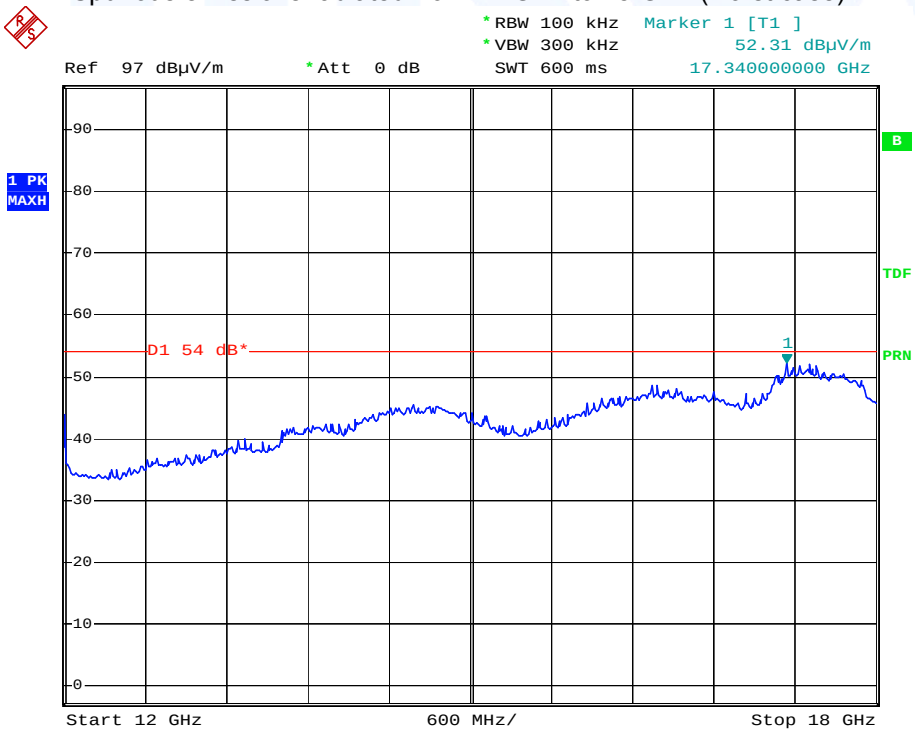


Spurious emissions radiated from 4 GHz to 12 GHz (worst case)



Date: 11.DEC.2009 13:33:26

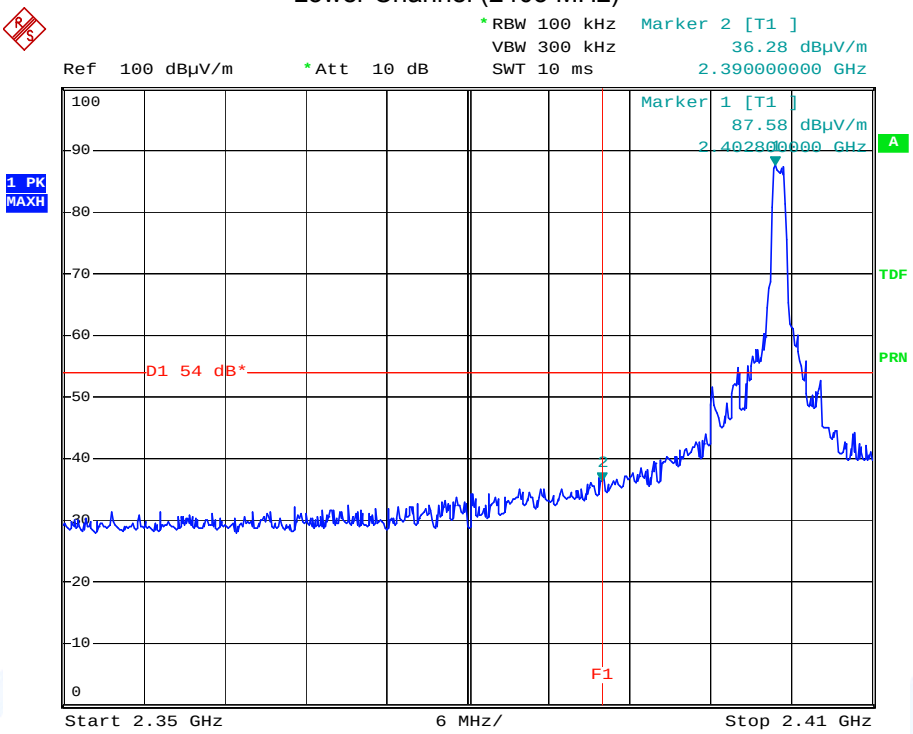
Spurious emissions radiated from 12 GHz to 18 GHz (worst case)



Remark: All peak emissions were below the limits of part 15.209. Up from 12 GHz to 25 GHz no emission could be detected.

Plots of spurious emissions in the nearest restricted bands:

Lower Channel (2403 MHz)



Higher Channel (2481 MHz)

5.4 20 dB bandwidth

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

5.4.1 Description of the test location

Test location: AREA4

5.4.2 Photo documentation of the test set-up

5.4.3 Applicable standard

According to FCC Part 15, Section 15.215(c):
Intentional radiators operating under the provisions to the general emission limits, as contained in Section 15.217 through Section 15.257, must designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band is designated in the rule section under which the equipment is operated.

5.4.4 Description of Measurement

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio of -20 dB. The reference level is the level of the highest signal amplitude observed from the transmitter at the fundamental frequency. Alternative is the x-dB-down function of the analyser used. The EBW is than directly shown in the marker display. The measurement is performed with normal modulation and a transfer rate means the worst case.
Spectrum analyser settings:

RBW:	100 kHz	VBW:	300 kHz	Span:	5 MHz
Sweep time:	2.5 ms	Detector:	Peak		

5.4.5 Test result

Operating frequency band (MHz)		20 dB Bandwidth (kHz)
f_{low} > 2400		f_{low} = 2403.000
f_{high}< 2483.5		f_{high} = 2481.870

Limit according to FCC Part 15C, Section 15.215(c):
The EUT must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band is designated in the rule section under which the equipment is operated. The requirement includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well the frequency stability. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

The requirements are **FULFILLED.**

Remarks: The EUT stay in the limits of the operating band.

5.5 Antenna application

5.5.1 Applicable standard

According to FCC Part 15C, Section 15.203(a):
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 EUT's antenna meets the requirement of FCC Part 15C, Section 15.203 and 15.204

5.5.2 Result

The EUT use a dipole antenna is printed on PCB. The antenna's gain is 1.5 dBi and meets the requirement.

Remarks:

5.6 Receiver conducted disturbance

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

5.6.1 Description of the test location

Test location: NONE

Remarks: The measurement is not applicable. The EUT is battery powered.

5.7 Receiver radiated emissions

For test instruments and accessories used see section 6 Part **SER2** and **SER3**.

5.7.1 Description of the test location

Test location: OATS1
Test location: Anechoic Chamber A2

Test distance: 3 metres

5.7.2 Photo documentation of the test set-up

5.7.3 Applicable standard

According to FCC Part 15C, Section 15.209(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.

5.7.4 Description of Measurement

The 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. In the frequency range above 1 GHz a spectrum analyser is used with appropriate linear polarized antennas. The set up of the EUT will be in accordance to ANSI C63.4. If the emission level 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. During the test, the EUT was set into continuous receiving mode.
Instrument settings:

30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 40 GHz	RBW = VBW:	1 MHz

5.7.5 Test result f < 1 GHz

Frequency (MHz)	L: QP (dBµV)	L: AV (dBµV)	Bandwidth (kHz)	Correct. (dB)	L: QP dB(µV/m)	L: AV dB(µV/m)	Limit dB(µV/m)	Delta (dB)
175	22.4		120	14.2	36.6		43.5	-6.9
256	23.8		120	14.7	38.5		46.0	-7.5
288	25.6		120	16.0	41.6		46.0	-4.4
432	25.2		120	20.1	45.3		46.0	-0.7
496	22.0		120	21.8	43.8		46.0	-2.2

f > 1 GHz

Frequency (MHz)	L: PK (dBµV)	L: AV (dBµV)	Correct. (dB)	L: PK dB(µV/m)	L: AV dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1888				45.4		54.0	-8.6

Limit according to FCC Part 15C, Section 15.209:

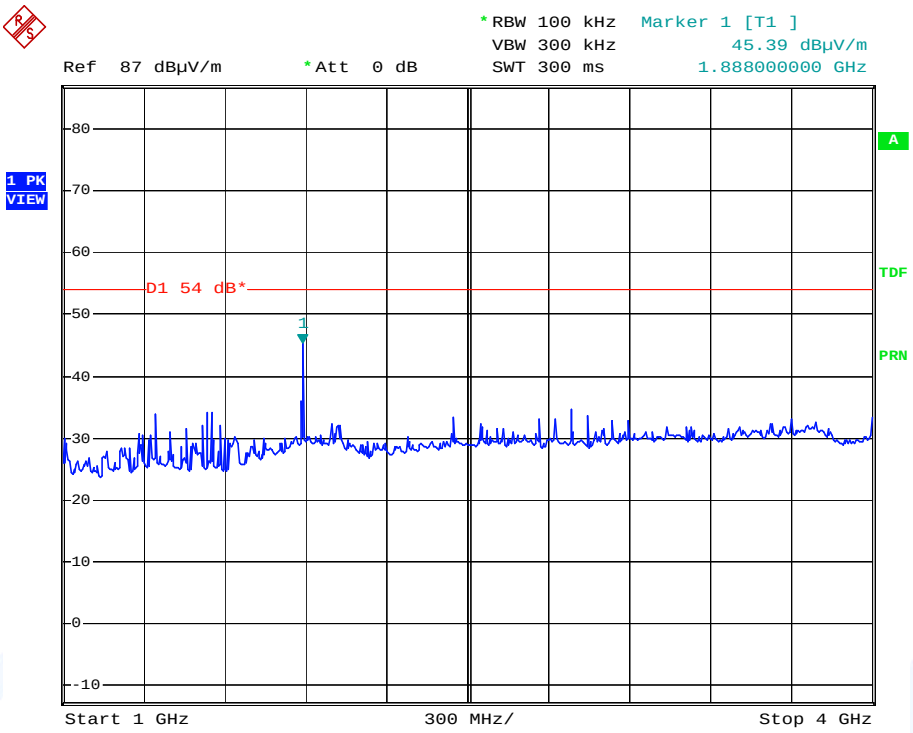
Frequency (MHz)	15.209 Limits dB(µV/m)	Measurement distance (m)
0.009 - -0.49	2400/f(kHz)	300
0.49 – 1.705	24000/f(kHz)	30
1.705 – 30.0	30	30
30-88	40	3
88-216	43,5	3
216-960	46	3
Above 960	54	3

The requirements are **FULFILLED.**

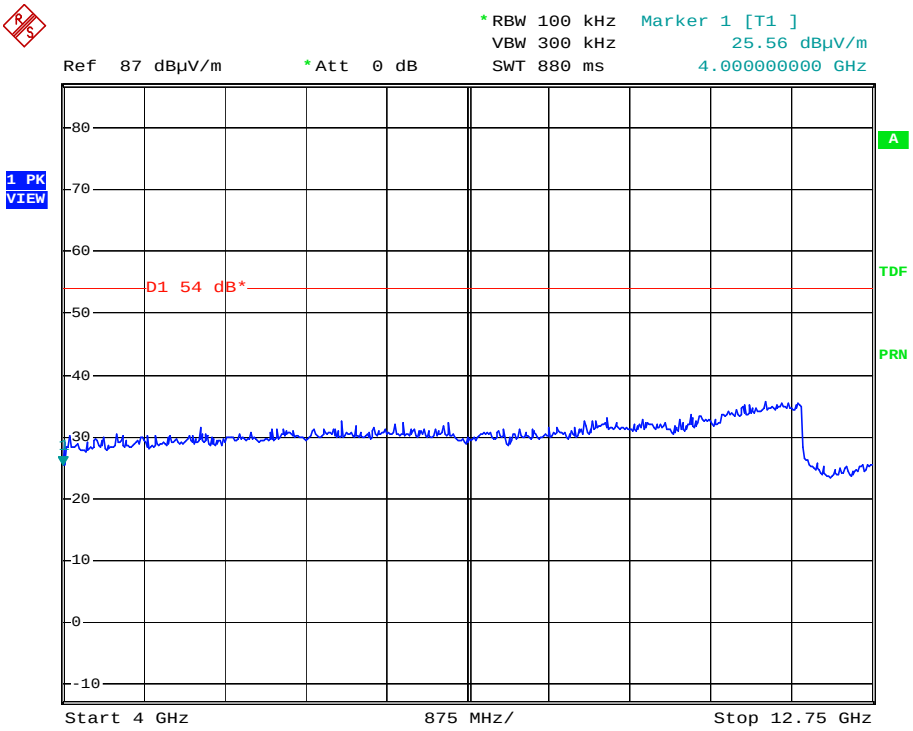
Remarks: During the test, the EUT was set into continuous receiving mode. The measurement was performed up to the 5th harmonic (12500 MHz).

5.7.6 Test protocols

Radiated spurious emissions from 1 GHz to 4 GHz (worst case)



Radiated spurious emissions from 4 GHz to 12 GHz (worst case)



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 3	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	AFS4-01000400-10-10P-4	02-02/17-05-003				
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	02/10/2011	02/10/2010		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				
MB	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	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				
SER 3	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	AFS4-01000400-10-10P-4	02-02/17-05-003				
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	02/10/2011	02/10/2010		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				