FCC ID: XYN2738 IC: 8748A-2738

EMI – TEST REPORT

- FCC Part 15.249 -

Deutsche Akkreditierungsstelle D-PL-12030-01-01

Test Report No. : T36144-00-02KJ	18. December 2012 Date of issue

Type / Model Name : 2738

Product Description : Remote Control 2.4 GHz

Applicant : ruwido austria gmbh

Address : Koestendorfer Str. 8

5202 NEUMARKT, AUSTRIA

Manufacturer : ruwido austria gmbh

Address : Koestendorfer Str. 8

5202 NEUMARKT, AUSTRIA

Licence holder : ruwido austria gmbh

Address : Koestendorfer Str. 8

5202 NEUMARKT, AUSTRIA

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

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September, 2011)

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 C - Intentional Radiators (September, 2011)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.205	Restricted bands of operation
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.
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

2 SUMMARY

2.1 Test result summary

Operating in the 2400 MHz – 2483.5 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS Gen, 7.2.4	Conducted limits	not applicable
15.249(a)(e)	RSS210, A8.2(b)	Field strength of fundamental	passed
15.249 (d)	RSS-210, A8.5	Field strength of harmonics	passed
15.209 (a)	RSS-Gen, 7.2.5	Radiated emission limits	passed
15.215 (c)	RSS-210, A8.1(a)	20 dB bandwith	passed
15.35 (c)	RSS-Gen, 4.5	Duty cycle correction	passed
15.203 (a)	RSS-Gen, 7.1.2	Antenna application	passed
15.109 (a)	RSS-Gen, 6.1	Receiver radiated emissions	passed

The mentioned RSS Rule Parts in the above table are related to:
RSS Gen, Issue 3, December 2010
RSS 210, Issue 8, December 2010
RSS 102, Issue 4, March 2010

2.2 GENERAL REMARKS:

The EUT uses a KLR3012A Kleer® technology chip which is designed for the frequency band from 2400 MHz to 2483.5 MHz and has an integrated printed antenna. A temporary connector can not be implemented due to the small size of the module. A suitable test fixture can also not used to convert radiated measurements to conducted measurements therefore all measurements were performed radiated.

Items	Description
RF Module type	KLR3012A
Power type	3 VDC battery powerd
Modulation	FHSS
Data rate	≈ 2.37 Mb/s peak data rate
Frequency range	2400 MHz to 2483.5 MHz
Channel spacing	5 MHz
Channel numbers	16
Antenna type	Integrated

Channel	Frequency [MHz]
0	2403
1	2408
2	2413
3	2418
4	2423
5	2428
6	2433
7	2438
8	2443
9	2448
10	2453
11	2458
12	2463
13	2468
14	2473
15	2478

2.3 FINAL ASSESSMENT:

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

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

Testing commenced on : 11. June 2012

Testing concluded on : 24. July 2012

Checked by:

Klaus Gegenfurtner
I confirm the correctness and Integrity of this documents
2012.12.18 09:15:26 +01'00'

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

Tested by:

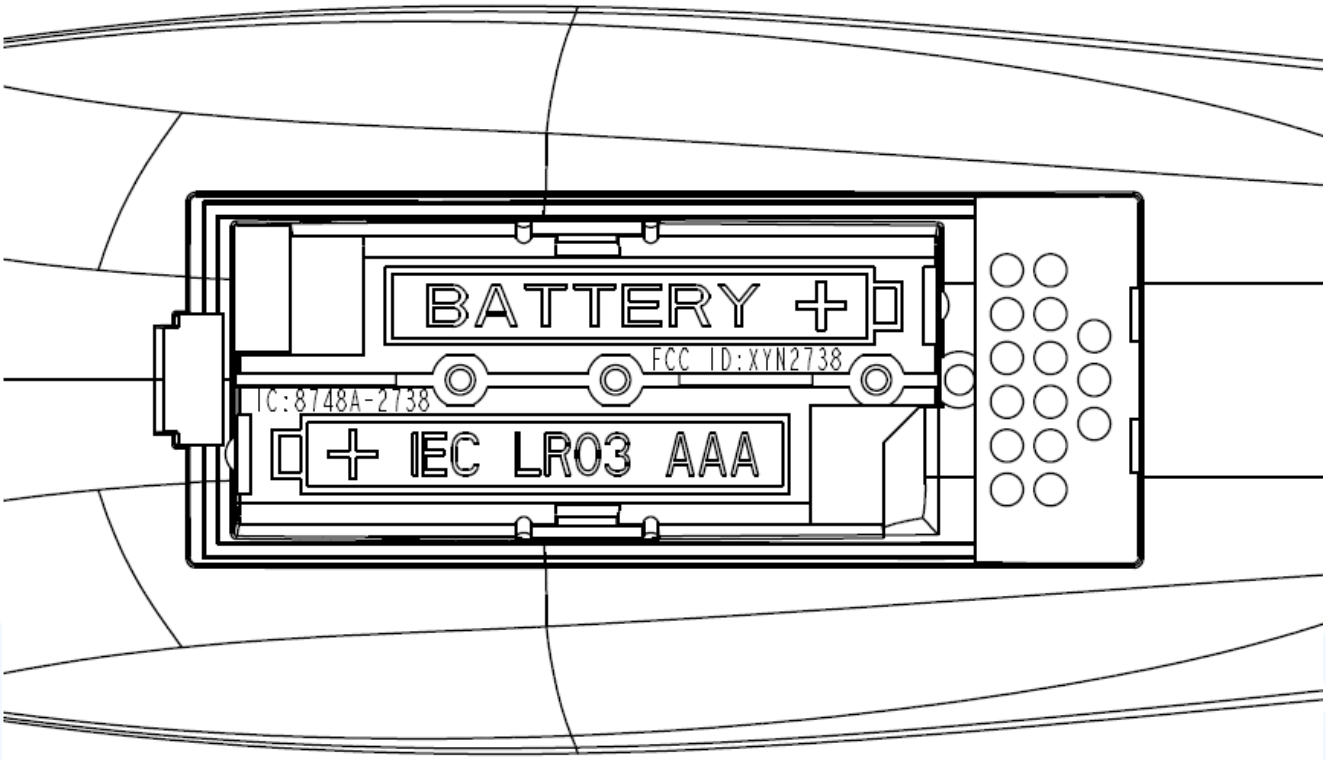
Josef Knab
I'm the autor of this document
2012.12.18 09:14:14 +01'00'

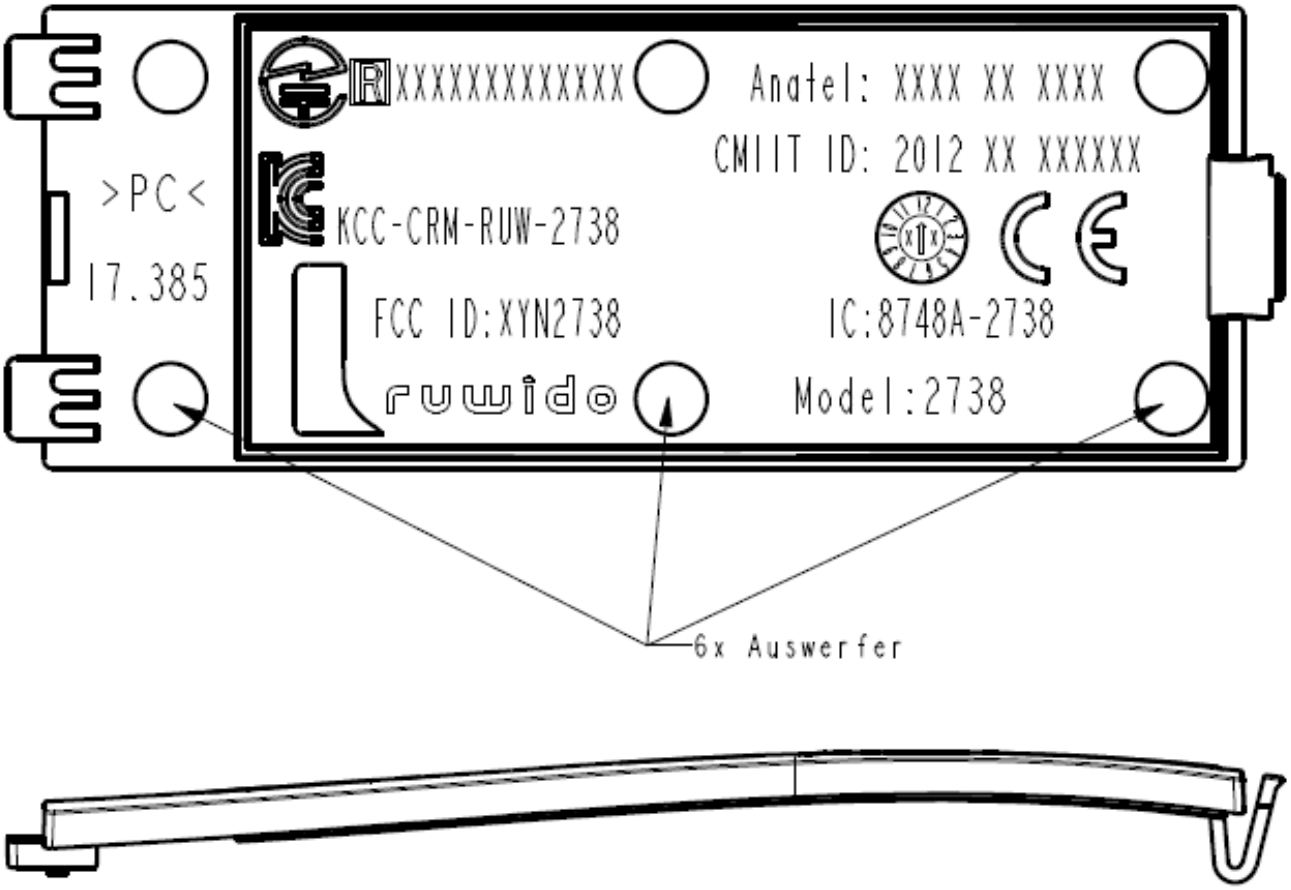
Josef Knab
Radio Senior Expert

3 EQUIPMENT UNDER TEST

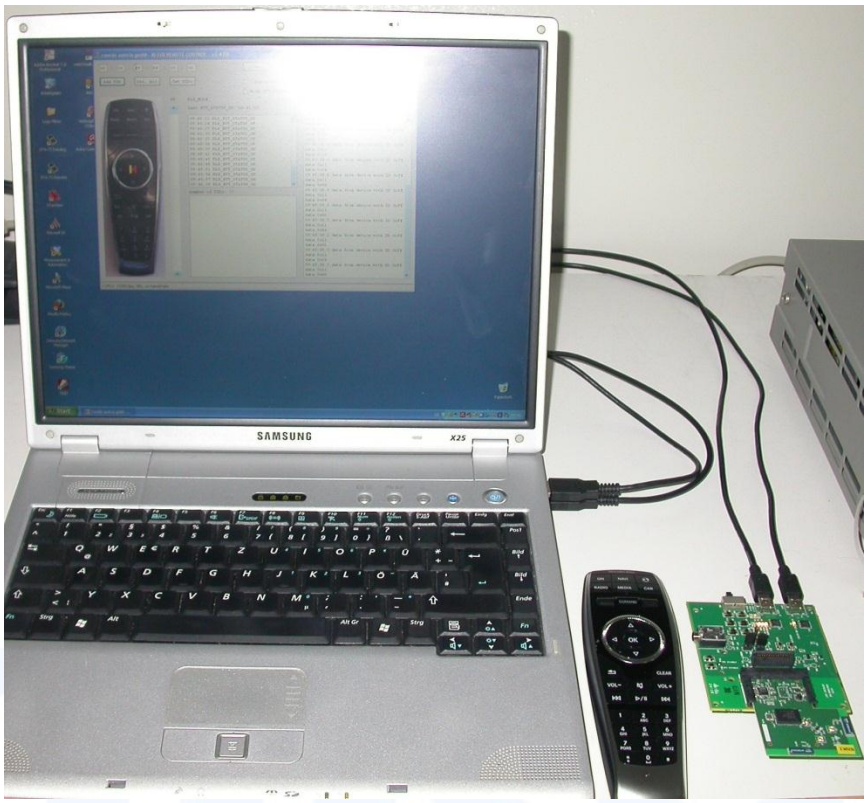
3.1 Photo documentation of the EUT – Internal photos see attachment A

Lable placement
(inside the battery compartment and also inside of the battery cover)

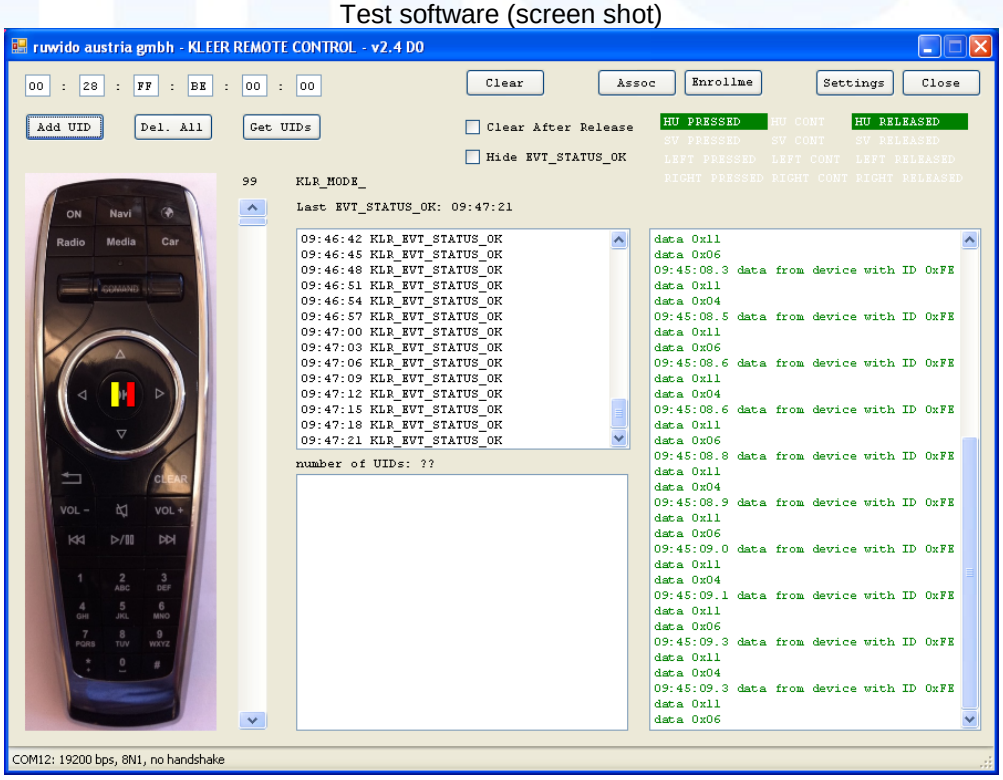




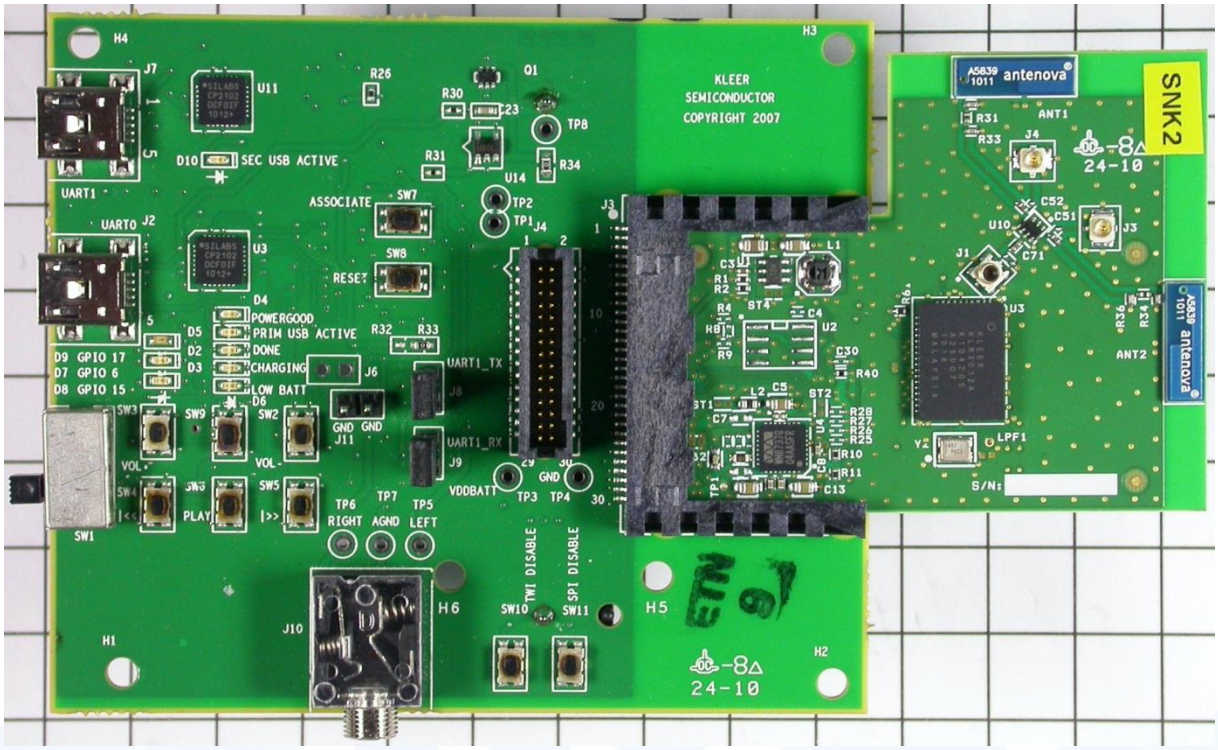
3.2 Photo of the test setup

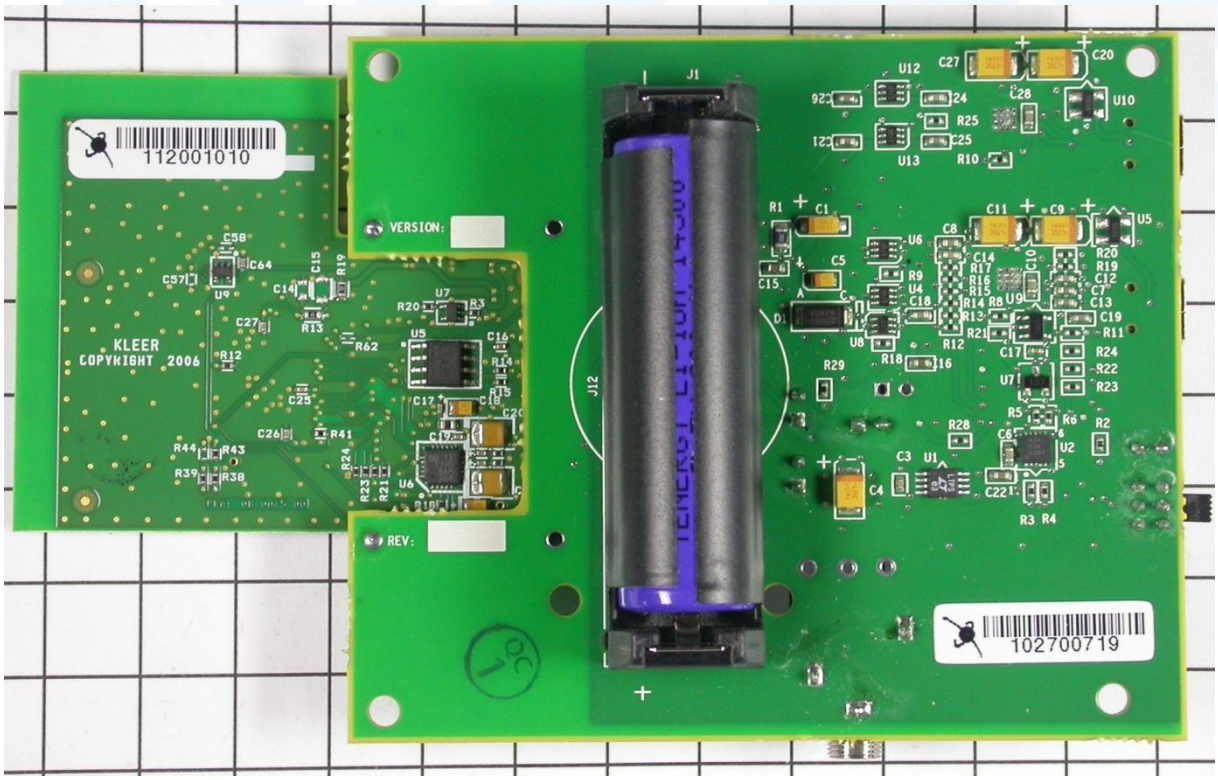


Test software (screen shot)



Receiver test board





3.3 Power supply system utilised

Power supply voltage : 3.0 V DC (battery powered)

3.4 Short description of the equipment under test (EUT)

The EuT is a Remote control unit for car multimedia equipment and operate in the frequency band from 2400 MHz to 2483.5 MHz.

Number of tested samples: 1
Serial number: A 222 820 6089
Firmware: 1.11.129

EUT operation mode:

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

- cont. TX at CH0, CH8 and CH15 (2403MHz, 2443 MHz and 2478 MHz)

- standby

-

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:

- _____ Model : _____
- _____ Model : _____
- _____ Model : _____
- _____ 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

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 open area test site is a listed under the Canadian Test-Sites File-No:

IC 3009A

In compliance with RSS 210 testing for RSS compliance may be achieved by following the procedures set out in ANSI C63.4, ANSI C63.10 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 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 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 conversions 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.

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

Description of measurement

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 centimetres to the ground plane are bundled in the center in a serpentine fashion so that 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. The antenna is positioned 3, 10 or 30 meters 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 meters and the EUT is rotated 360 degrees.
The final level in dBµV/m is calculated to add on the reading from the EMI receiver (dBµV) the antenna and cable loss 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	Level	+	Factor	=	Level	-	CISPR Limit	=	Delta
(MHz)	(dBµV)		(dB/m)		(dBµV/m)		(dBµV/m)		(dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

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

Description of measurement

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 a video bandwidth 3 MHz for peak measurements. For average measurements a resolution bandwidth 1 MHz and video bandwidth 10 Hz or the duty cycle correction will be use. 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.

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: Not applicable because the EuT is battery powered.

5.2 Radiated emission of the fundamental wave

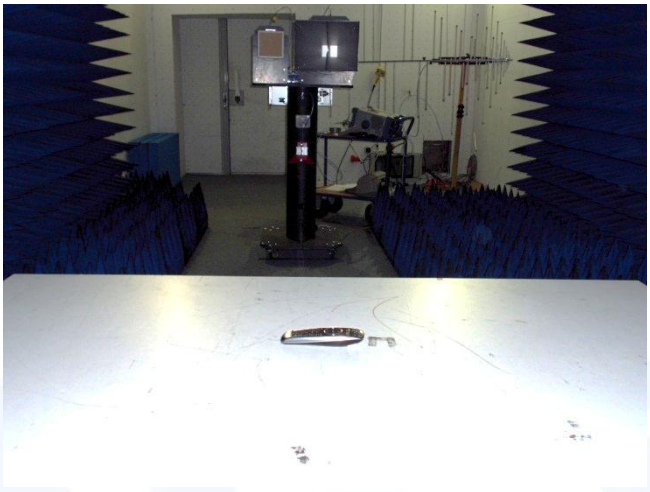
For test instruments and accessories used see section 6 Part **CPR 3**.

5.2.1 Description of the test location

Test location: Anechoic chamber 2

Test distance: 3m

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:
Peak measurement: RBW: 1 MHz VBW: 3 MHz Detector: Max peak

5.2.5 Test result

Channel	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)
0	2403	102.4	-	1000	-10.5	91.9	-	94.0	2.1
9	2443	102.6	-	1000	-10.4	92.2	-	94.0	1.8
15	2478	103.1	-	1000	-10.0	93.1	-	94.0	0.9

Note: The correction factor includes cable loss and antenna factor.

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: No average measurement performed, because the peak limits met the average limits.

5.3 Spurious emissions radiated

For test instruments and accessories used see section 6 Part **SER1, SER 2, SER 3**.

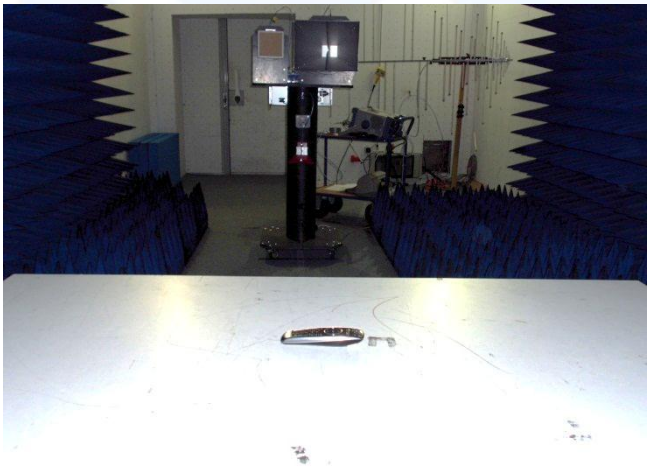
5.3.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 2

Test distance: 3 m

5.3.2 Photo documentation of the test set-up



5.3.1 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.

5.3.2 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:

9 kHz – 150 kHz	RBW:	200 Hz
150 kHz - 30 MHz	RBW:	9 kHz
30 MHz – 1000 MHz:	RBW:	120 kHz
1000 MHz – 40 GHz	RBW:	1 MHz

5.3.3 Test result f < 1 GHz

Channel 0

Frequency (MHz)	Reading level QP (dBµV)	Reading level AV (dBµV)	Bandwidth (kHz)	Correction factor (dB/m)	Corrected level QP dB(µV/m)	Corrected level AV dB(µV/m)	Limit dB(µV/m)	Delta (dB)
0.009 – 0.150	-	-	0.2	-	-	-	-	> 6
0.150 – 30	-	-	9	-	-	-		> 6
30 – 1000	-	-	120	-	-	-		> 6

Channel 9

Frequency (MHz)	Reading level QP (dBµV)	Reading level AV (dBµV)	Bandwidth (kHz)	Correction factor (dB/m)	Corrected level QP dB(µV/m)	Corrected level AV dB(µV/m)	Limit dB(µV/m)	Delta (dB)
0.009 – 0.150	-	-	0.2	-	-	-	-	> 6
0.150 – 30	-	-	9	-	-	-		> 6
30 – 1000	-	-	120	-	-	-		> 6

Channel 15

Frequency (MHz)	Reading level QP (dBµV)	Reading level AV (dBµV)	Bandwidth (kHz)	Correction factor (dB/m)	Corrected level QP dB(µV/m)	Corrected level AV dB(µV/m)	Limit dB(µV/m)	Delta (dB)
0.009 – 0.150	-	-	0.2	-	-	-	-	> 6
0.150 – 30	-	-	9	-	-	-		> 6
30 – 1000	-	-	120	-	-	-		> 6

5.3.4 Test result f > 1 GHz

Channel 1

Frequency (MHz)	Level PK (dBµV)	Duty Cycle Correction (dB)	Level AV (dBµV)*)	Correction factor (dB/m)	Corrected level PK dB(µV/m)	Corrected level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1007.5	61.8	-20	41.8	-15.1	46.7	26.7	74.0	54.0	27.3
1008.3	60.6	-20	40.6	-15.1	45.5	25.5	74.0	54.0	28.5
1041.3	58.3	-20	38.3	-14.9	43.4	23.4	74.0	54.0	30.6
1057.0	57.9	-20	37.9	-14.9	43.0	23.0	74.0	54.0	31.0
1104.3	56.7	-20	36.7	-14.9	41.8	21.8	74.0	54.0	32.2
1342.0	56.1	-20	36.1	-13.9	42.2	22.2	74.0	54.0	31.8
1345.0	56.1	-20	36.1	-13.9	42.2	22.2	74.0	54.0	31.8
1391.9	56.9	-20	36.9	-13.9	43.0	23.0	74.0	54.0	31.0
1456.0	56.3	-20	36.3	-14.1	42.2	22.2	74.0	54.0	31.8
1502.1	54.8	-20	34.8	-15.1	39.7	19.7	74.0	54.0	34.3
4806.0	63.0	-20	43.0	3.6	66.6	46.6	74.0	54.0	7.4
9612.0	41.6	-20	21.6	9.7	51.3	31.3	74.0	54.0	22.7
12015.0	42.0	-20	22.0	2.1	44.1	24.1	74.0	54.0	29.9

Channel 9

Frequency (MHz)	Level PK (dBµV)	Duty Cycle Correction (dB)	Level AV (dBµV)*)	Correct. Factor (dB/m)	Corrected Level PK dB(µV/m)	Corrected Level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1008.3	60.8	-20	40.8	-15.1	45.7	25.7	74.0	54.0	28.3
1055.1	59.2	-20	39.2	-14.9	44.3	24.3	74.0	54.0	29.7
1104.3	55.8	-20	35.8	-14.9	40.9	20.9	74.0	54.0	33.1
1151.1	51.5	-20	31.5	-14.0	37.5	17.5	74.0	54.0	36.5
1343.5	56.9	-20	36.9	-13.9	43.0	23.0	74.0	54.0	31.0
1440.6	56.0	-20	36.0	-14.0	42.0	22.0	74.0	54.0	32.0
1502.9	55.7	-20	35.7	-15.1	40.6	20.6	74.0	54.0	33.4
1551.6	55.6	-20	35.6	-15.9	39.7	19.7	74.0	54.0	34.3
4887.6	48.4	-20	28.4	3.7	52.1	32.1	74.0	54.0	21.9
7331.4	39.5	-20	19.5	7.2	46.7	26.7	74.0	54.0	27.3
9775.2	47.8	-20	27.8	9.9	57.7	37.7	74.0	54.0	16.3

Channel 15

Frequency (MHz)	Level PK (dBµV)	Duty Cycle Correction (dB)	Level AV (dBµV)*)	Correct. Factor (dB/m)	Corrected Level PK dB(µV/m)	Corrected Level AV dB(µV/m)	Limit PK dB(µV/m)	Limit AV dB(µV/m)	Delta (dB)
1008.3	60.9	-20	40.9	-15.1	45.8	25.8	74.0	54.0	28.2
1057.0	57.4	-20	37.4	-14.9	42.5	22.5	74.0	54.0	31.5
1105.8	57.2	-20	37.2	-14.8	42.4	22.4	74.0	54.0	31.6
1168.8	54.2	-20	34.2	-13.9	40.3	20.3	74.0	54.0	33.7
1342.8	56.7	-20	36.7	-13.9	42.8	22.8	74.0	54.0	31.2
1455.6	56.7	-20	36.7	-14.1	42.6	22.6	74.0	54.0	31.4
1489.0	54.3	-20	34.3	-14.9	39.4	19.4	74.0	54.0	34.6
1518.8	51.2	-20	31.2	-15.4	35.8	15.8	74.0	54.0	38.2
1536.6	55.0	-20	35.0	-15.7	39.3	19.3	74.0	54.0	34.7
1550.5	53.2	-20	33.2	-15.9	37.3	17.3	74.0	54.0	36.7
1695.3	53.3	-20	33.3	-14.7	38.6	18.6	74.0	54.0	35.4
4956.0	49.5	-20	29.5	3.7	53.2	33.2	74.0	54.0	20.8
9912.0	48.5	-20	28.5	9.7	58.2	38.2	74.0	54.0	15.8

*) Average values were calculated from the subtraction of peak values minus correction duty cycle factor.

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):

Fundamental 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 (25000 MHz). The average values were calculated from the subtraction of peak values minus correction duty cycle factor.

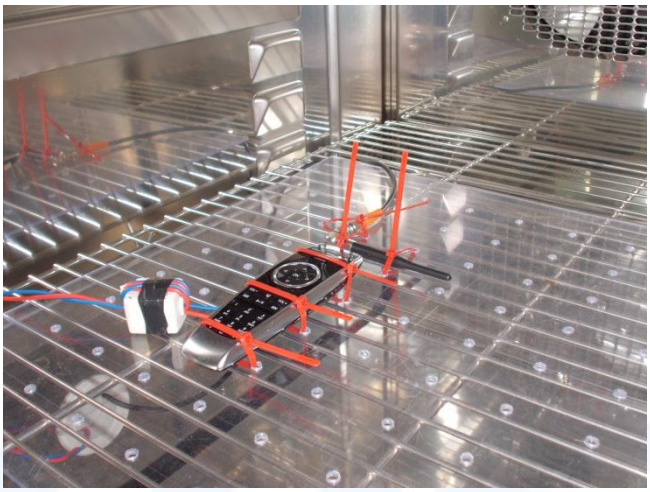
5.4 20 dB bandwidth

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 alternative provisions to the general emission limits, as contained in Section 15.217 through Section 15.257, must be designed to ensure that the 20 dB bandwidth of the emission is contained within the frequency band 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: 10 MHz
Sweep time: 10 s Detector: PK

5.4.5 Test result

Operating frequency band (MHz)	20 dB Bandwidth Channel 0 (MHz)	20 dB Bandwidth Channel 9 (MHz)	20 dB Bandwidth Channel 15 (MHz)
f_{low} > 2400	f_{low} = 2400.63	f_{low} = 2441.50	f_{low} = 2475.59
f_{high}< 2483.5	f_{high} = 2404.49	f_{high} = 2444.56	f_{high} = 2480.48

80% bandwidth of the permitted band: 66.8 MHz

Maximum frequency drift under extreme conditions: 73 kHz

Limit according to FCC Part 15C, Section 15.215(c):
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.**

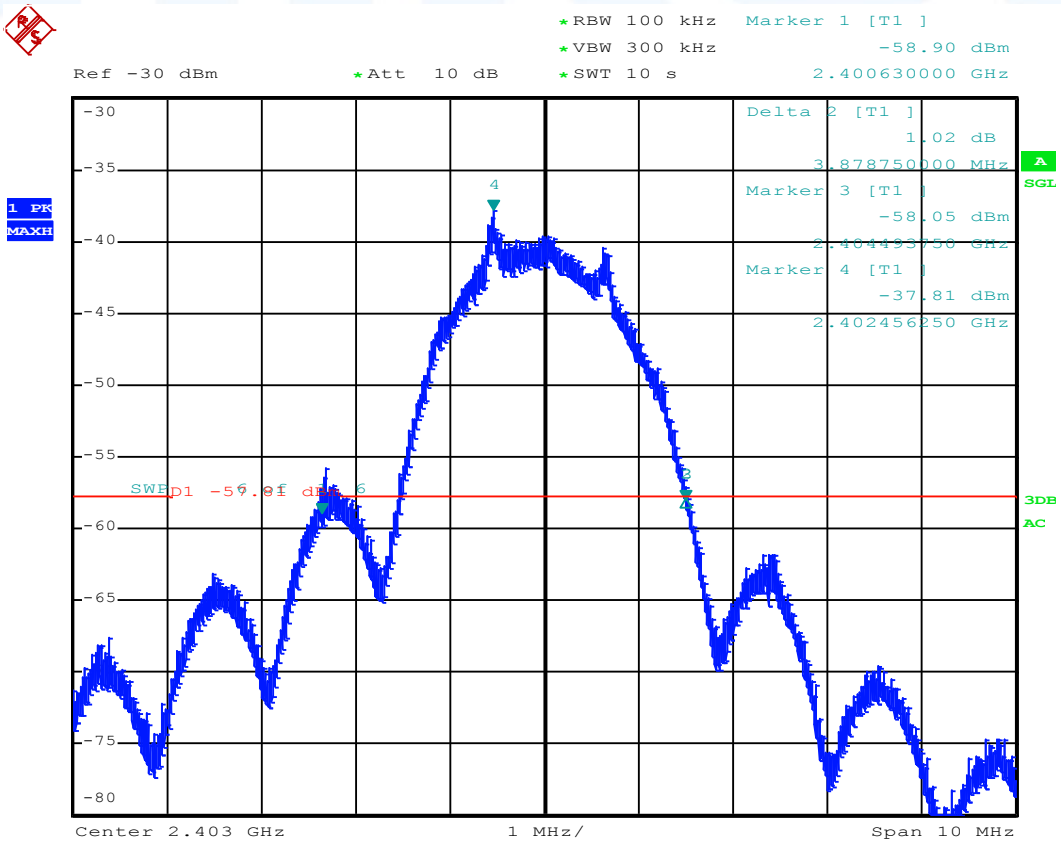
Remarks: For detailed test result please refer to following test protocols.

To show the compliance under frequency stability, the EuT was tested under extreme voltage and tempreature conditions. Due to the fact of the small frequency drift, the measurement where only performend at the worst case conditions.

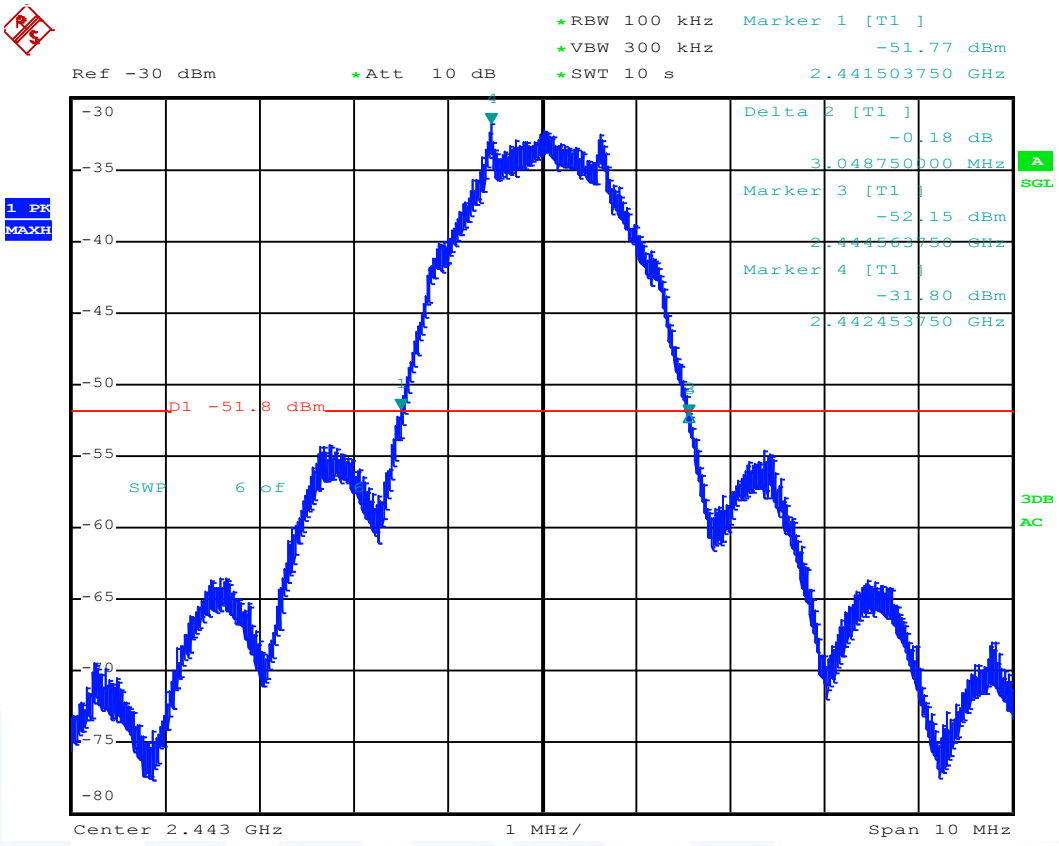
5.4.6 Test protocols

Test conditions		Test result					
		Channel 0		Channel 9		Channel 15	
		Frequency reading (MHz)	Frequency error (kHz)	Frequency reading (MHz)	Frequency error (kHz)	Frequency reading (MHz)	Frequency error (kHz)
T_{max}(70°C)	2.2 V_{min}	2403.060	60	2443.020	20	2478.028	28
	3.2 V_{max}	2403.010	10	2443.055	55	2478.020	20
T_{nom}(20°C)	3.0 V_{nom}	2403.053	53	2443.045	45	2478.040	40
T_{min}(-25°C)	2.2 V_{min}	2403.058	58	2443.050	50	2478.073	73
	3.2 V_{max}	2403.040	40	2443.025	25	2478.060	60

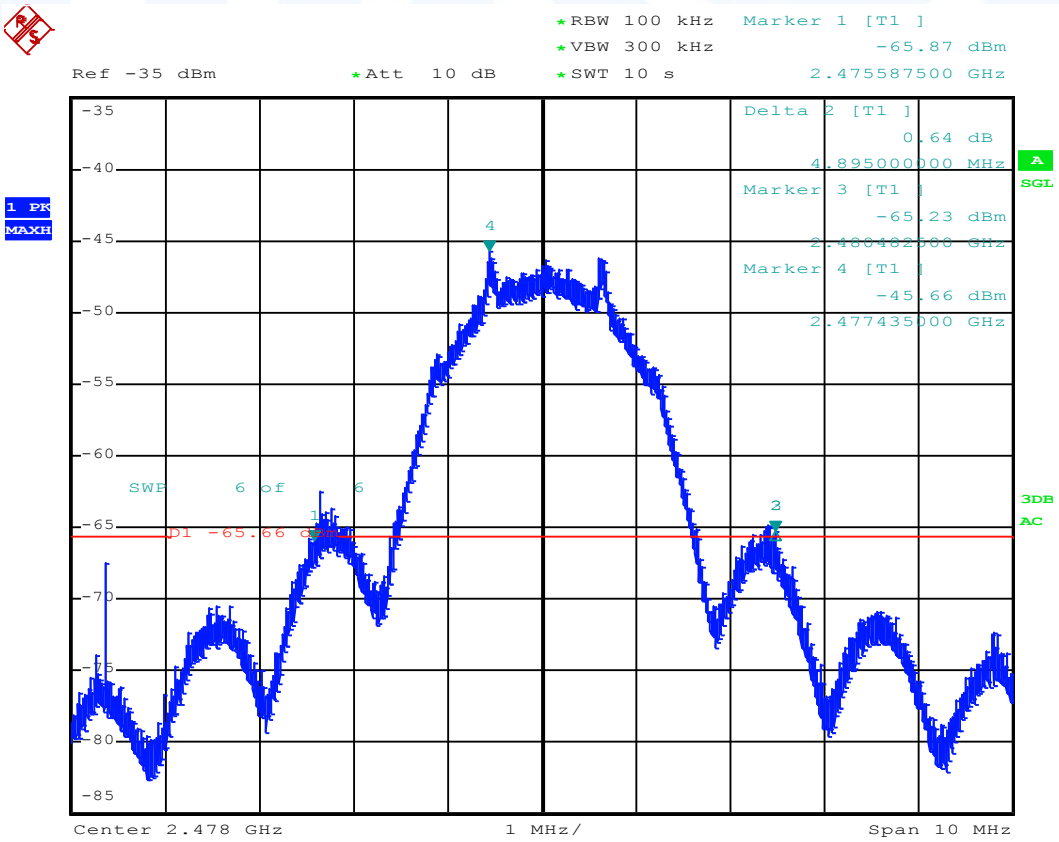
20 dB bandwidth – Channel 0



20 dB bandwidth – Channel 9



20 dB bandwidth – Channel 15



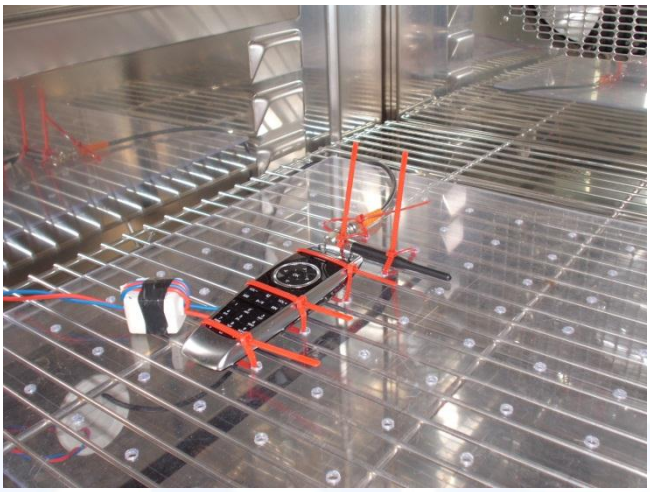
5.5 Correction for pulse operation (duty cycle)

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

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15A, Section 15.35(c):
When the radiated emission limits are expressed in terms of average value and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete puls train, including blanking intervals, as long as the pulse train does not exceed 0.1s. In cases where the puls train exceeds 0.1s, the measured field strength shall be determined from the average absolute voltage during a 0.1s interval during which the field strength is at its maximum. The exact method of calculating the average field strength shall be submitted.

5.5.4 Description of Measurement

The duty cycle factor (dB) is calculated applying the following formula:

$K_E = 20 \log ((tiB*p)/Tw)$ =20 log ((0.0885*4)/100)) = -49.0 dB

K_E	pulse operation correction factor	(dB)
t_{iw}	pulse duration for one complete pulse track	(ms)
t_{iB}	pulse duration for one pulse	(ms)
T_w	a period of the pulse track	(ms)
p	number of pulses in one train	

5.5.5 Test result

Duty cycle	t_{iW} (ms)	T_W (ms)	t_{iB} (ms)	p	K_E (dB)
Within 100 ms	-	100	0.0885	4	-49.0 (max. -20 dB)

Remarks: The pulse train (*Tw*) exceeds 100 ms, therefore the duty cycle have been calculated by averaging the sum of the pulse widths over the 100 ms width with the highest average value.

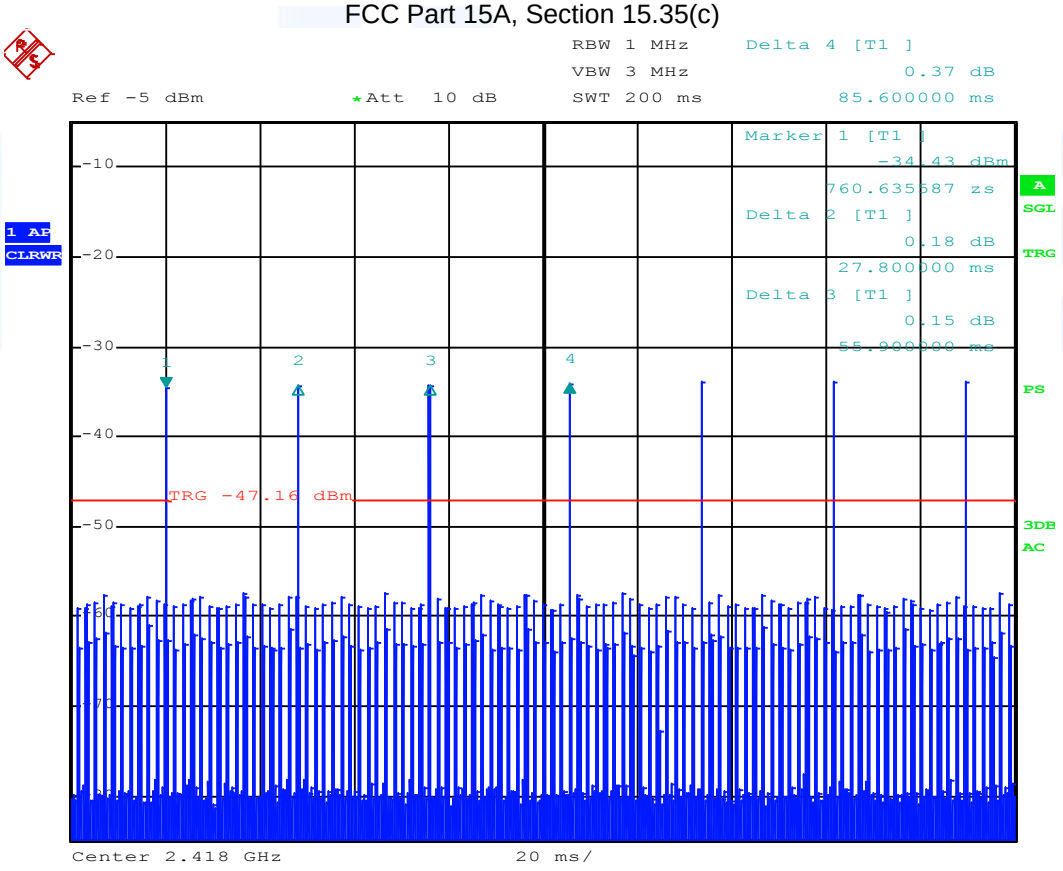
For detailed results, please see the test protocol below.

The maximum correction is limited to 20 dB.

5.5.6 Test protocol

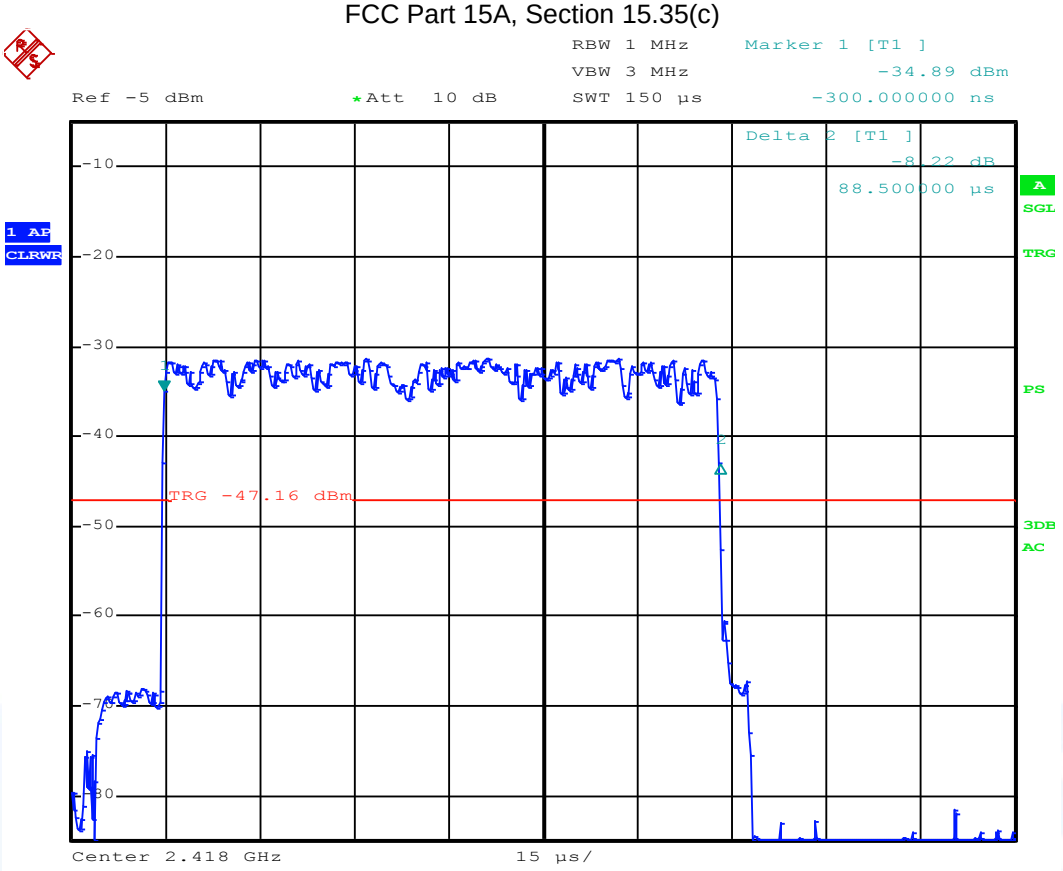
Correction for Pulse Operation (Duty Cycle)

FCC Part 15A, Section 15.35(c)



Correction for Pulse Operation (Duty Cycle)

FCC Part 15A, Section 15.35(c)



5.6 Antenna application

5.6.1 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.

Remarks: The EUT use an integrated PCB antenna. No other antenna than that furnished by the responsible party or external power amplifier can be applied by a customer.

The antenna of the EUT meets the requirement of FCC Part 15C, Section 15.203 and 15.204.

5.7 Receiver radiated emissions

For test instruments and accessories used see section 6 Part **SER1, SER2** and **SER3**.

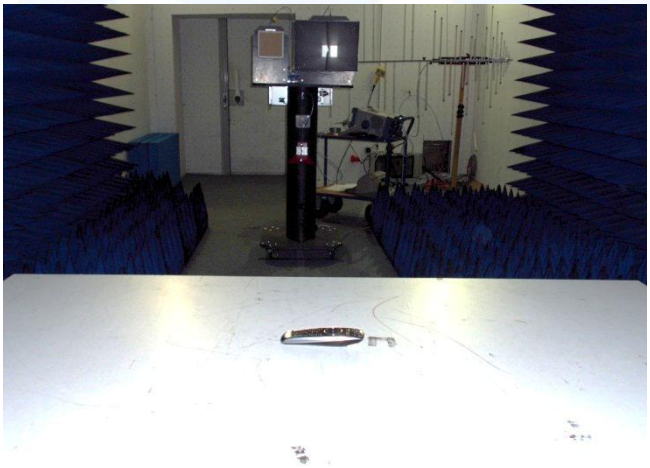
5.7.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 2

Test distance: 3 m

5.7.2 Photo documentation of the test set-up



5.7.3 Applicable standard

According to FCC Part 15C, 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.

5.7.4 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. 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 transmitting mode, modulated.
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)	Reading level QP (dBµV)	Reading level AV (dBµV)	Bandwidth (kHz)	Correction factor (dB/m)	Corrected level QP dB(µV/m)	Corrected level AV dB(µV/m)	Limit dB(µV/m)	Delta (dB)
30 – 1000	-	-	120	-	-	-	-	> 6

5.7.6 Test result f > 1 GHz

Frequency (MHz)	Reading level PK (dBµV)	Bandwidth (kHz)	Correct. factor (dB/m)	Corrected level PK dB(µV/m)	Limit dB(µV/m)	Delta (dB)
1000 - 12500	-	1000	-	-	-	> 6

Limit according to FCC Part 15C, Section 15.109:

Frequency (MHz)	15.109 Limits dB(µV/m)	Measurement distance (m)
30-88	40	3
88-216	43,5	3
216-960	46	3
Above 960	54	3

The requirements are **FULFILLED.**

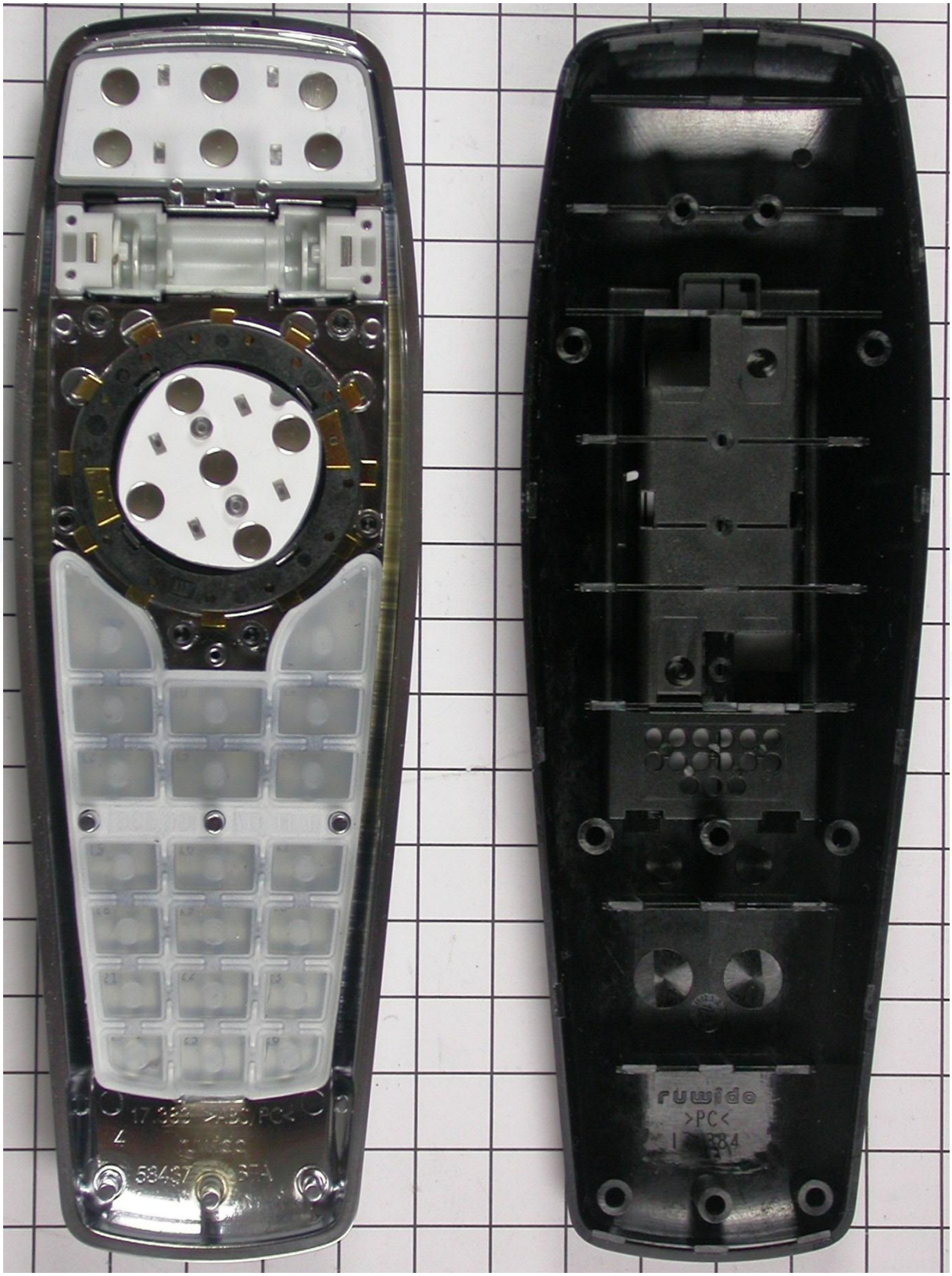
Remarks: The measurement was performed up to the 5th harmonic (12500 MHz).

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 40	02-02/11-11-001	02/09/2012	02/09/2011		
	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	16/02/2013	16/02/2012		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				
DC	ESCI	02-02/03-05-005	21/11/2012	21/11/2011		
	MetraHIT World	02-02/32-10-001	25/08/2012	25/08/2011		
	WK-340/40	02-02/45-05-001	31/05/2013	31/05/2012		
	6543A	02-02/50-05-157				
MB	ESCI	02-02/03-05-005	21/11/2012	21/11/2011		
	MetraHIT World	02-02/32-10-001	25/08/2012	25/08/2011		
	WK-340/40	02-02/45-05-001	31/05/2013	31/05/2012		
	6543A	02-02/50-05-157				
SER 1	FMZB 1516	01-02/24-01-018			16/02/2013	16/02/2012
	ESCI	02-02/03-05-005	21/11/2012	21/11/2011		
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 2	ESVS 30	02-02/03-05-006	26/06/2013	26/06/2012		
	VULB 9168	02-02/24-05-005	16/03/2013	16/03/2012	16/09/2012	16/03/2012
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N_20m	02-02/50-12-018				
SER 3	FSP 30	02-02/11-05-001	05/10/2012	05/10/2011		
	FSP 40	02-02/11-11-001	02/09/2012	02/09/2011		
	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	16/02/2013	16/02/2012		
	R1 _ 18 - 40 GHz	02-02/30-09-002			19/12/2012	19/12/2011
	Sucoflex N-1000-SMA	02-02/50-05-072				
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				

7 Attachment A – Internal photos




94V-0
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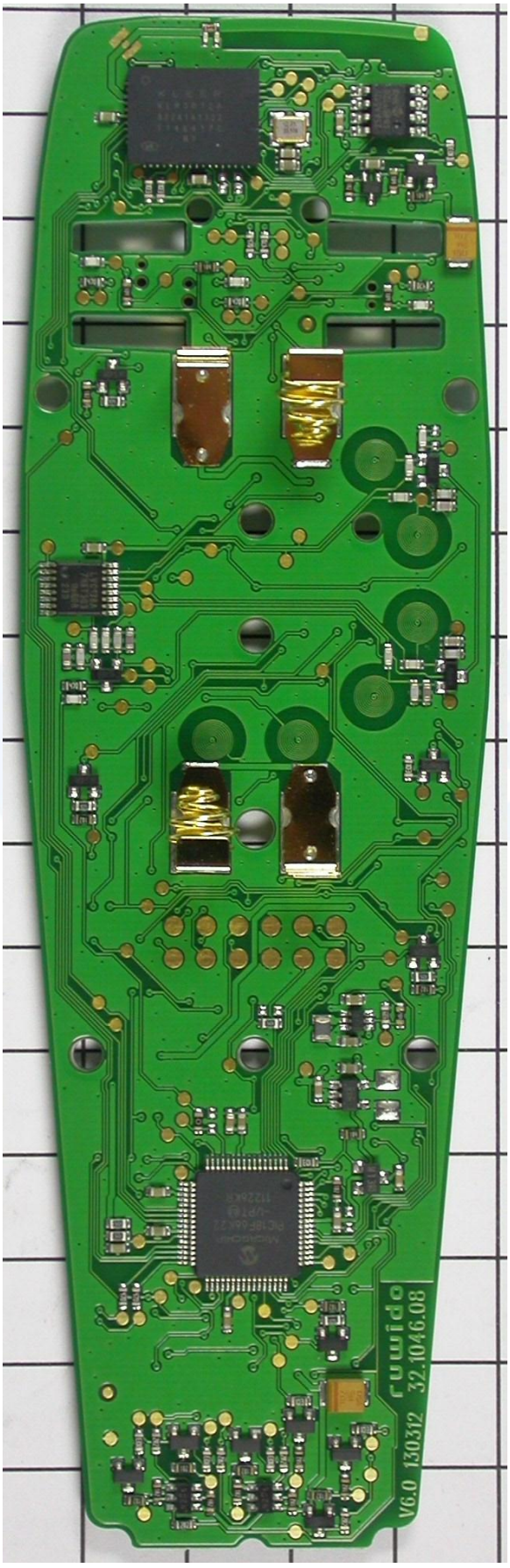
312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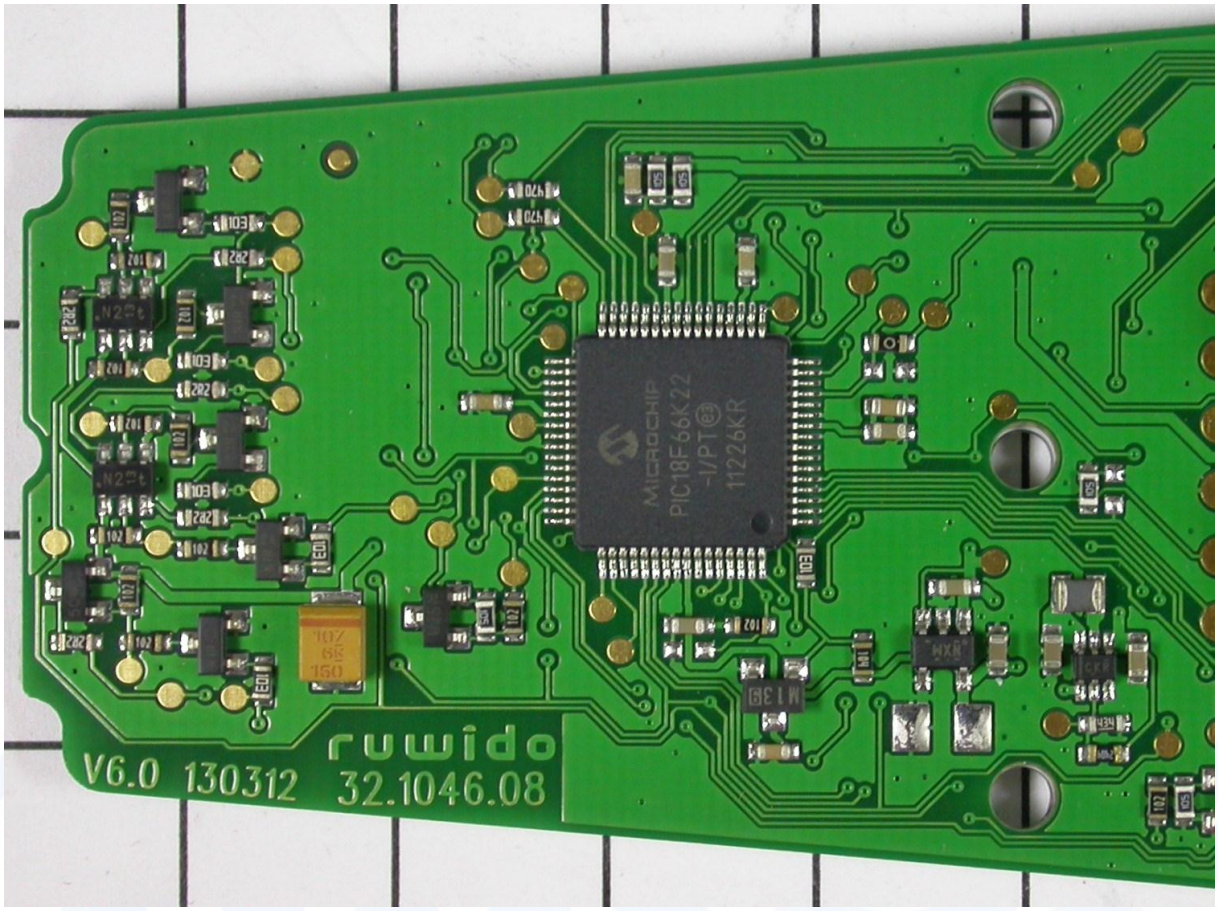
MICROCHIP
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ruwido
V6.0 130312 32.1046.08