



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

- FCC Part 15.249, RSS210 -

Type / Model Name : fidbox V6.1

Product Description : Bluetooth module, low energy 4.0

Applicant : fp floor protector GmbH

Address : Waldgasse 2

2700 WIENER NEUSTADT - AUSTRIA

Manufacturer : fp floor protector GmbH

Address : Waldgasse 2

2700 WIENER NEUSTADT - AUSTRIA

Licence holder : fp floor protector GmbH

Address : Waldgasse 2

2700 WIENER NEUSTADT - AUSTRIA

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

POSITIVE

Test Report No. :

T40709-00-01TK

10. June 2016

Date of issue



Deutsche
Akkreditierungsstelle
D-PL-12030-01-01
D-PL-12030-01-02

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.

Contents

1 TEST STANDARDS	3
2 EQUIPMENT UNDER TEST	4
2.1 Photo documentation of the EUT – Detailed photos see Attachment A	4
2.2 Equipment category	4
2.3 Short description of the equipment under test (EUT)	4
2.4 Variants of the EUT	4
2.5 Operation frequency and channel plan	5
2.6 Transmit operating modes	5
2.7 Antenna	5
2.8 Power supply system utilised	5
2.9 Peripheral devices and interface cables	5
2.10 Determination of worst case conditions for final measurement	6
3 TEST RESULT SUMMARY	7
3.1 Final assessment	7
4 TEST ENVIRONMENT	8
4.1 Address of the test laboratory	8
4.2 Environmental conditions	8
4.3 Statement of the measurement uncertainty	8
4.4 Measurement protocol for FCC and IC	9
5 TEST CONDITIONS AND RESULTS	10
5.1 AC power line conducted emissions	10
5.2 Field strength of fundamental	11
5.3 Out-of-band emission, radiated	14
5.4 EBW and OBW	21
5.5 Correction for pulse operation (duty cycle)	24
5.6 Antenna application	28
6 USED TEST EQUIPMENT AND ACCESSORIES	29

Attachment A as separate supplement

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September, 2015)

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, 2015)	
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: 2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10: 2013	Testing Unlicensed Wireless Devices
ANSI C95.1:2005	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2013	Uncertainty in EMC measurement
CISPR 22: 2008 EN 55022: 2010	Information technology equipment

2 EQUIPMENT UNDER TEST

2.1 Photo documentation of the EUT – Detailed photos see Attachment A

2.2 Equipment category

Bluetooth Low Energy device, fixed equipment.

2.3 Short description of the equipment under test (EUT)

The EUT is a Bluetooth 4.0 Low Energy system. The EUT is compatible with the standard 802.15.1. It supports the 2.4 GHz frequency band. A single PCB antenna is used within the system. The modulation used by the EUT is GFSK with a data rate of 1000 kbits which means worst case for testing. The EUT uses serial production firmware that allows to be connected with a companion device. Else the advertising sequence can be started manually. During test the device is connected with the ccDebugger device using a wired test connection. The output power is set to +4 dBm representing the maximum output power of the chipset. The EUT has only one integrated antenna, no temporary connector and no external antenna can be connected. The EUT is run with a 3.0V Lithium cell battery. There are no external connectors.

Number of tested samples: 1
MAC address: 32:30:34:39:39:30
Serial number: N/A
Firmware version: Test Software Smart RF Studio 7 Version 2.3.1

Items	Description
BT type	4.0 Low Energy
BT chipset type	Texas Instruments CC2541
Modulation	GFSK
Frequency range	2400 MHz to 2483.5 MHz
Channel numbers	40
Data rate (kbps)	1000
Antenna type	PCB

EUT configuration:

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

2.4 Variants of the EUT

None



FCC ID: 2ADQTV61

IC: 12568A-V61

2.5 Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
37	2402	9	2422	18	2442	28	2462
0	2404	10	2424	19	2444	29	2464
1	2406	38	2426	20	2446	30	2466
2	2408	11	2428	21	2448	31	2468
3	2410	12	2430	22	2450	32	2470
4	2412	13	2432	23	2452	33	2472
5	2414	14	2434	24	2454	34	2474
6	2416	15	2436	25	2456	35	2476
7	2418	16	2438	26	2458	36	2478
8	2420	17	2440	27	2460	39	2480

Note: the marked frequencies are determined for final testing.

2.6 Transmit operating modes

The EUT uses GFSK and provide following data rate:

1000 kbps (kbps = *kilobits per second*)

2.7 Antenna

The following antennas shall be used with the EUT:

Characteristic	Certification name	Plug	Frequency range (GHz)	Gain (dBi)
Omni	PCB antenna	none	2.4 - 2.4835	N/A

2.8 Power supply system utilised

Power supply voltage, V_{nom} : 3 VDC, Thin cell (U10004 Lithium Cell)

2.9 Peripheral devices and interface cables

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

- Laptop computer Model : Toshiba TECRA A11-127
- Test adaptor Model : Texas Instruments, ccDebugger
-

2.10 Determination of worst case conditions for final measurement

Measurements were performed 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:

IEEE Standard	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate
802.15.1	00 to 39	37, 18, 39	+4 dBm	DSSS	GFSK	1000 kbps

1000 kbps, GFSK with TX continuous modulated.

2.10.1 Test jig

No test jig was used for test.

2.10.2 Test software

The EUT was tested with TI's test software platform SmartRF™ Studio 7. This software allows to set the parameters for channel frequency, TX continuous modulated and output power. The output power is set to +4 dBm representing the highest output power being used in the end application.

3 TEST RESULT SUMMARY

Operating in the 2400 MHz – 2483.5 MHz band:

FCC Rule Part	RSS Rule Part	Description	Result
15.35(c)	RSS-Gen, 6.10	Pulsed operation	passed
15.203	RSS Gen, 8.3	Antenna requirement	passed
15.204	RSS Gen, 8.2	External radio frequency power amplifiers	passed
15.205(a)	RSS Gen, 8.1	Emissions in restricted bands	passed
15.207(a)	RSS Gen, 8.8	AC power line conducted emissions	passed
15.215(c)	-	EBW	passed
-	RSS-Gen, 6.6	OBW	passed
15.249(a)	RSS-210, A2.9(a)	Field strength of fundamental	passed
15.249(d)	RSS-210, A2.9(b)	Out-of-band emission, radiated	passed
-	RSS-Gen, 6.11	Transmitter frequency stability	not applicable

The mentioned RSS Rule Parts in the above table are related to:

RSS Gen, Issue 4, November 2014

RSS 210, Issue 8, December 2010

3.1 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 February 2016

Testing concluded on : 06 May 2016

Checked by: Tested by:

Klaus Gegenfurtner
Teamleader Radio

Tobias Kammerer
Radio Team

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

CSA Group Bayern GmbH
Ohmstrasse 1-4
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. It is noted that the expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$. The true value is located in the corresponding interval with a probability of 95 %. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 / 11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, CSA Group Bayern 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 and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

4.4 Measurement protocol for FCC and IC

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 Open Site under the Canadian Test-Sites File-No:

IC 3009A-1

The anechoic chamber site is a listed chamber under the Canadian Test-Sites File-No:

IC 3009A-02

In compliance with RSS 210 testing for RSS compliance may be achieved by following the procedures set out in 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.

4.4.1.3 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 C63.10 "Testing Unlicensed Wireless Devices". 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 C63.10 and applying the CISPR 22 limits.

5 TEST CONDITIONS AND RESULTS

5.1 AC power line 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, the EUT is battery powered and has no externally connectable cables.

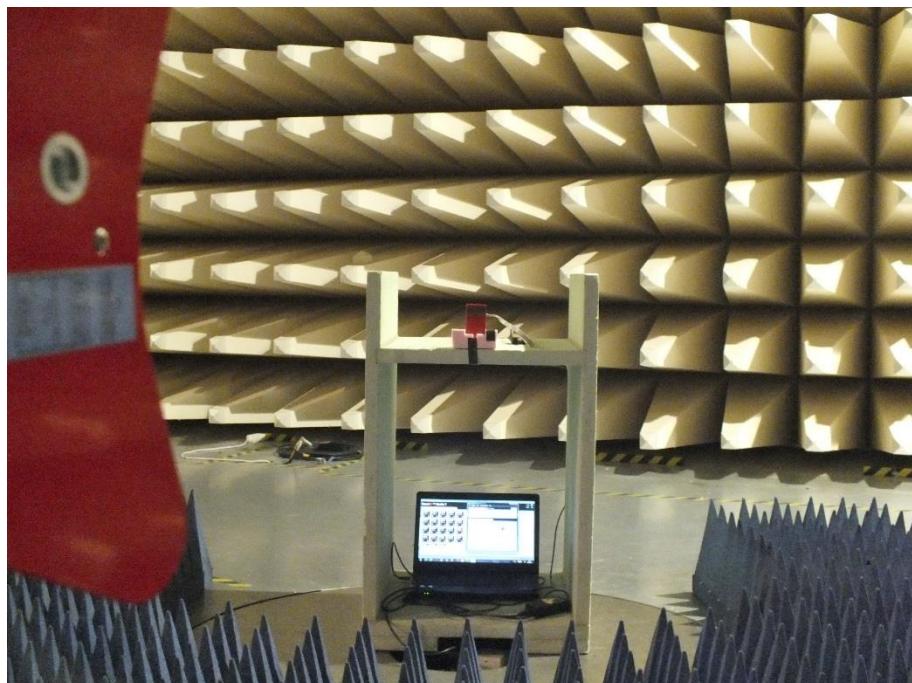
5.2 Field strength of fundamental

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

5.2.1 Description of the test location

Test location: Anechoic chamber 1
Test distance: 3 m

5.2.2 Photo documentation of the test set-up



5.2.1 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.

5.2.2 Description of Measurement

The radiated emission of the fundamental wave from the EUT is measured using a spectrum analyser and appropriate linear polarized antennas. The set up of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 6.5. The EUT is measured in TX continuous mode modulated under normal conditions.

Analyser settings:

Peak measurement:	RBW: 3 MHz	VBW: 10 MHz	Detector: Max peak
AV measurement:	RBW: 1 MHz	VBW: 10 Hz	Detector: Max peak

5.2.3 Test result

Frequency	Reading level PK	Bandwidth	Correction factor	Corrected level PK	Limit PK	Duty cycle correction factor K_E	Corrected level AV	Limit AV
(MHz)	(dB μ V)	(kHz)	(dB)	dB(μ V/m)	dB(μ V/m)	(dB)	dB(μ V/m)	dB(μ V/m)
2402	108.4	1000	-12.1	96.3	114	-49.3	47.0	94
2442	106.5	1000	-10.9	95.6	114	-49.3	46.3	94
2480	106.8	1000	-10.9	95.9	114	-49.3	46.6	94

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

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

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

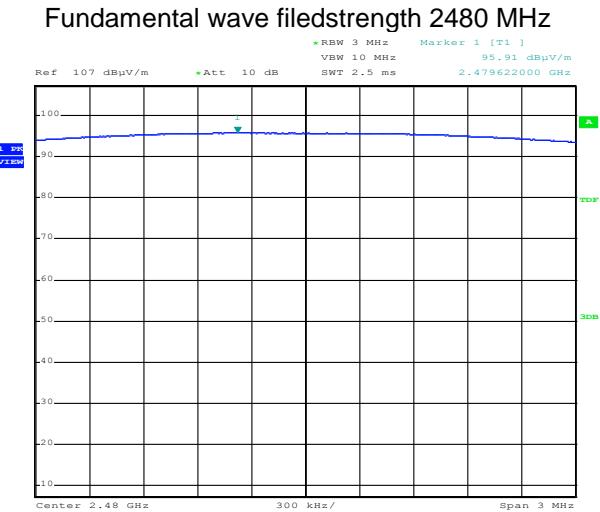
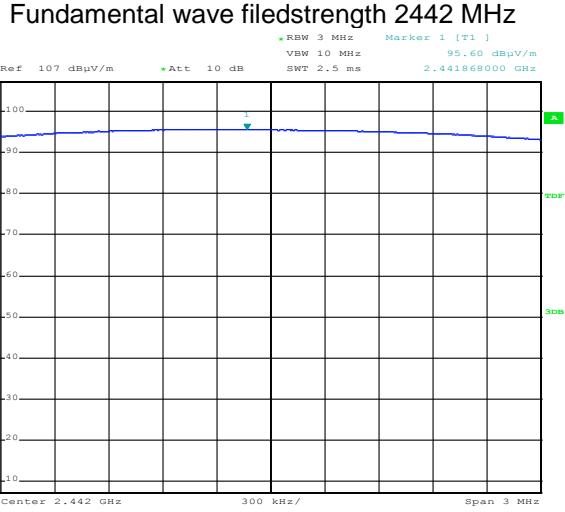
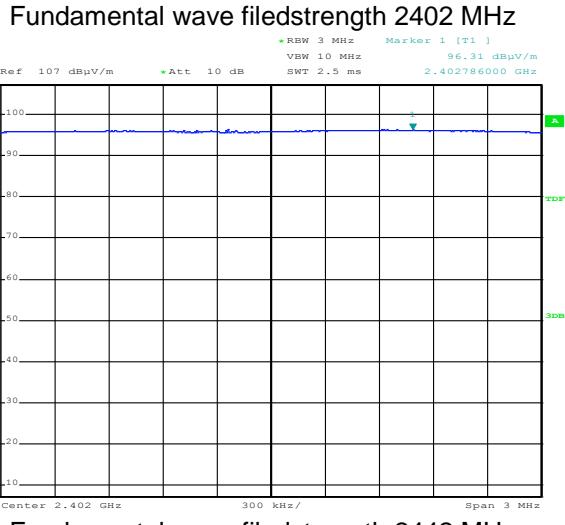
Peak-Limit according to FCC Part 15C, Section 15.249(e):

However the peak fieldstrength shall not exceed the maximum permitted average limit by more than 20 dB.

The requirements are **FULFILLED**.

Remarks:

5.2.4 Test protocols



5.3 Out-of-band emission, 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 distance: 3 m

Test location: Anechoic chamber 1
Test distance: 3 m

5.3.2 Photo documentation of the test set-up

Test setup 30 MHz – 1000 MHz:



Test setup 1 GHz – 18 GHz:



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 setup of the EUT and the measurement procedure is in accordance to ANSI C63.10, Item 6.3. 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 testing is stopped and peak values will be reported, otherwise, the emission is measured in average mode again and reported. The EUT is measured in TX continuous mode modulated under normal conditions.

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 – 25 GHz	RBW: 1 MHz

5.3.1 Test result

Note:

Pre-measurements were performed in the frequency range 9 kHz to 30 MHz and 18 GHz to 25 GHz.
The EUT showed no detectable suspects.

5.3.2 Test result f = 30 MHz - 1000 MHz

Frequency (MHz)	Reading Vert. (dB μ V)	Reading Hor. (dB μ V)	Correct. Vert. (dB)	Correct. Hor. (dB)	Level Vert. (dB μ V/m)	Level Hor. (dB μ V/m)	Limit (dB μ V/m)	Dlimit (dB)
150.00	0.5	-2.6	13.4	14.3	13.9	11.7	43.5	-29.6
300.00	-0.9	1.5	16.5	15.9	15.6	17.4	46.0	-28.6
450.00	-0.5	-0.3	20.4	20.0	19.9	19.7	46.0	-26.1
600.00	-1.0	-0.7	24.1	23.7	23.1	23.0	46.0	-22.9
750.00	-0.2	0.3	26.8	26.3	26.6	26.6	46.0	-19.4
900.00	1.6	0.7	28.9	28.4	30.5	29.1	46.0	-15.5

Note:

The correction factor includes cable loss and antenna factor. No emission difference could be detected for the intentional radiated frequencies 2402 MHz, 2442 MHz and 2480 MHz within the frequency range from 30 MHz to 1000 MHz.

FCC ID: 2ADQTV61
IC: 12568A-V61
5.3.3 Test result f > 1 GHz

CH37, 2402 MHz								
Test conditions:								
TX continuous, P = 4 dBm			Test results					
Start frequency (MHz)	Stop frequency (MHz)	RBW (kHz)	Maximum emission		AV Limit (dB μ V/m)	Duty cycle correction (dB)	Margin (dB)	Detector
			(MHz)	(dB μ V/m)				
1000	2400	1000	2400.00	73.1	54.0	-49.3	-30.2	PK
2483.5	4000	1000	3728.17	40.9	54.0	0.0	-13.1	PK
4000	8000	1000	7235.00	44.5	54.0	0.0	-9.5	PK
8000	12000	1000	11956.00	47.5	54.0	0.0	-6.5	PK
12000	18000	1000	17841.00	51.9	54.0	0.0	-2.1	PK
Measurement uncertainty			± 6 dB					

CH18, 2442 MHz								
Test conditions:								
TX continuous, P = 4 dBm			Test results					
Start frequency (MHz)	Stop frequency (MHz)	RBW (kHz)	Maximum emission		AV Limit (dB μ V/m)	Duty cycle correction (dB)	Margin (dB)	Detector
			(MHz)	(dB μ V/m)				
1000	2400	1000	1731.15	40.6	54.0	0.0	-13.4	PK
2483.5	4000	1000	3743.71	41.1	54.0	0.0	-12.9	PK
4000	8000	1000	7519.00	44.2	54.0	0.0	-9.8	PK
8000	12000	1000	11949.00	47.8	54.0	0.0	-6.2	PK
12000	18000	1000	16876.50	51.5	54.0	0.0	-2.5	PK
Measurement uncertainty			± 6 dB					

CH39, 2480 MHz								
Test conditions:								
TX continuous, P = 4 dBm			Test results					
Start frequency (MHz)	Stop frequency (MHz)	RBW (kHz)	Maximum emission		AV Limit (dB μ V/m)	Duty cycle correction (dB)	Margin (dB)	Detector
			(MHz)	(dB μ V/m)				
1000	2400	1000	1774.55	40.2	54.0	0.0	-13.8	PK
2483.5	4000	1000	2483.50	63.3	54.0	-49.3	-40.0	PK
4000	8000	1000	4950.00	43.9	54.0	0.0	-10.1	PK
8000	12000	1000	11980.00	47.9	54.0	0.0	-6.1	PK
12000	18000	1000	17958.00	53.2	54.0	0.0	-0.8	PK
Measurement uncertainty			± 6 dB					

FCC ID: 2ADQTV61
IC: 12568A-V61

Limit according to FCC Part 15C, Section 15.209:

Frequency (MHz)	15.209 Limits (μ V/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	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

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

Fundamental frequency (MHz)	Field strength of harmonics (μ V/m)	dB(μ V/m)
902 - 928	500	54
2400 - 2483.5	500	54
5725 - 5875	500	54
24000 - 24250	2500	68

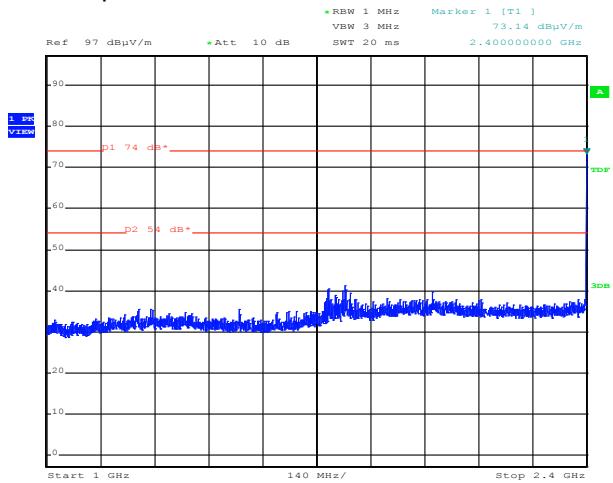
The requirements are **FULFILLED**.

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

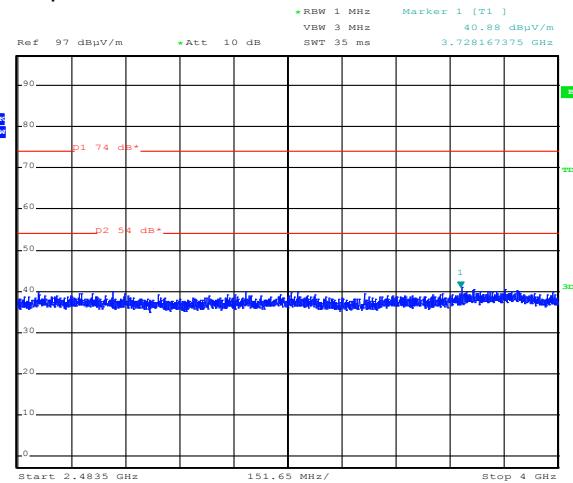
5.3.4 Test protocols

Channel 37, 2402 MHz

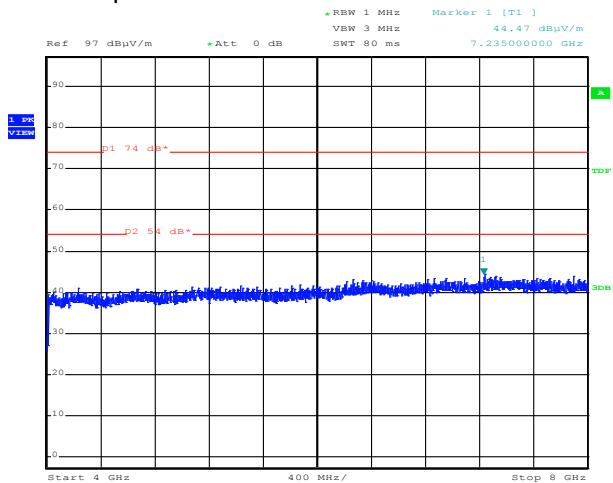
Spurious emissions from 1 to 2.4 GHz



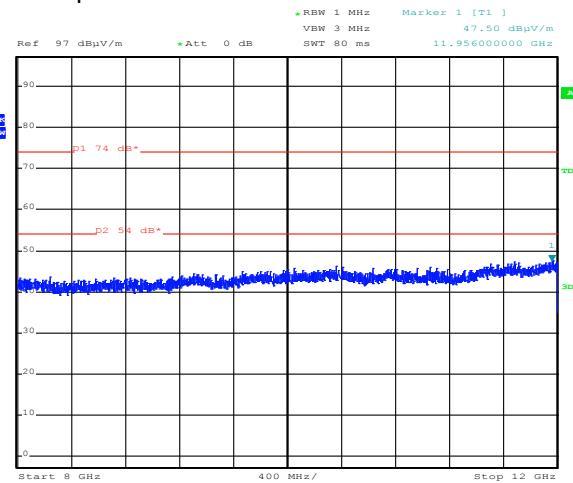
Spurious emissions from 2.4835 to 4 GHz



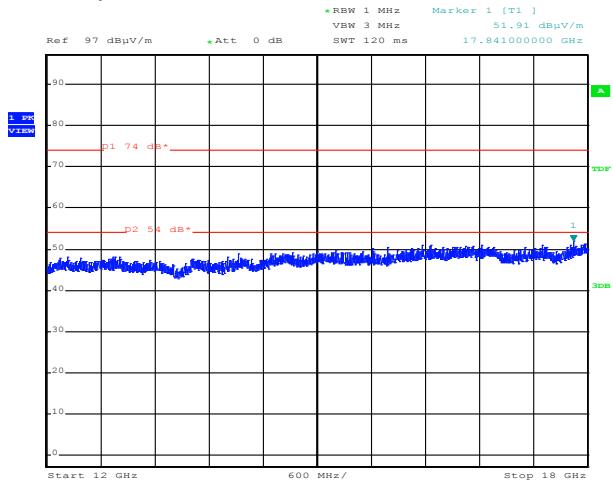
Spurious emissions from 4 to 8 GHz

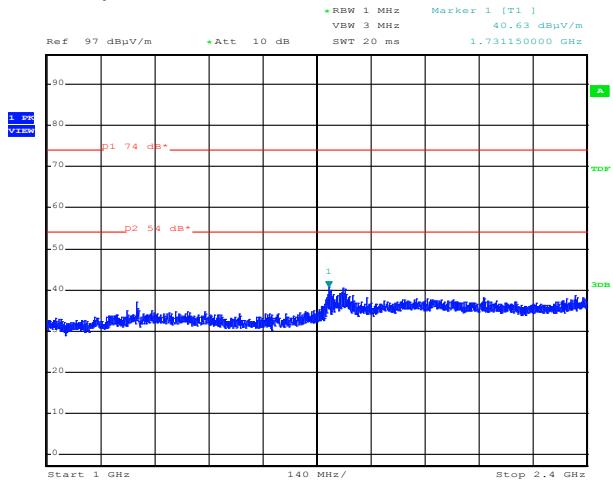
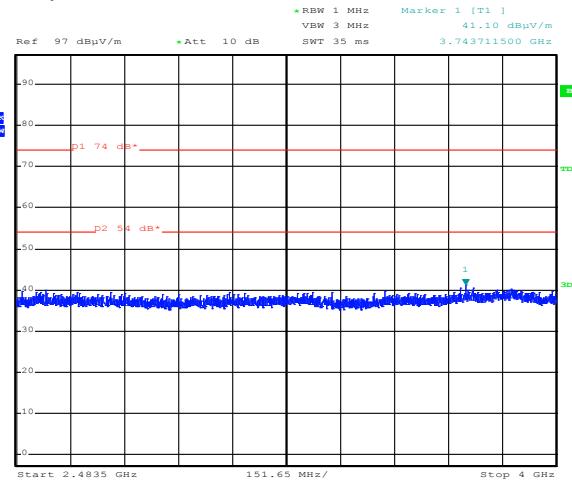
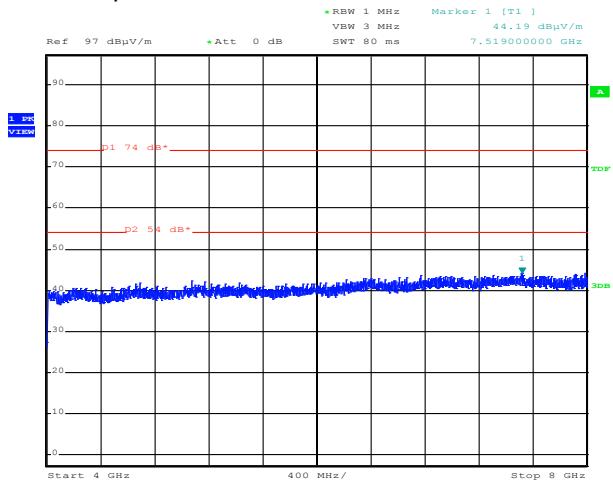
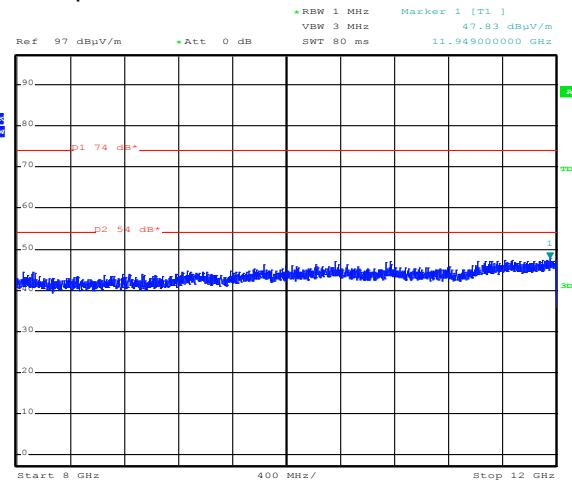
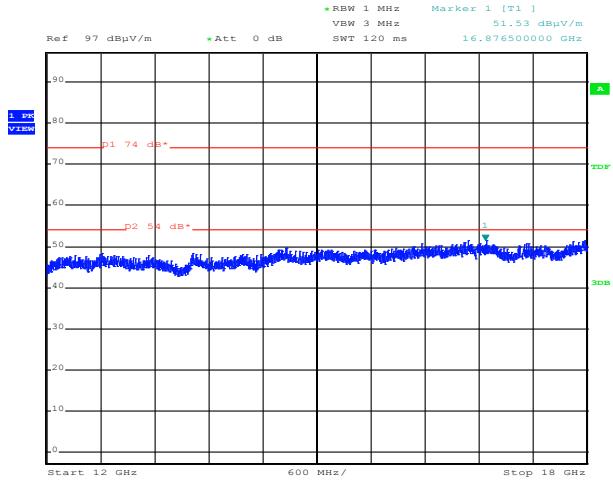


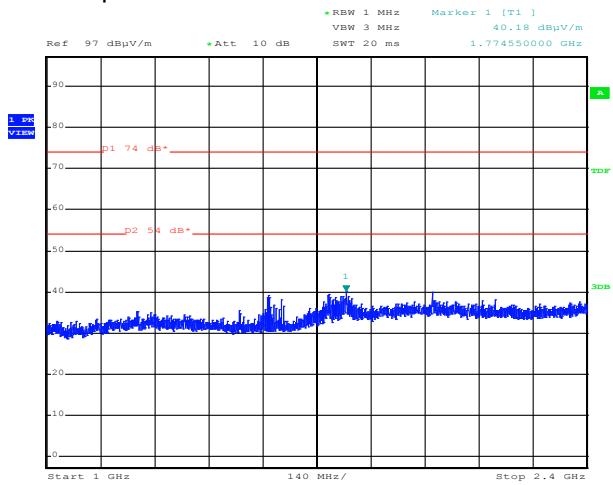
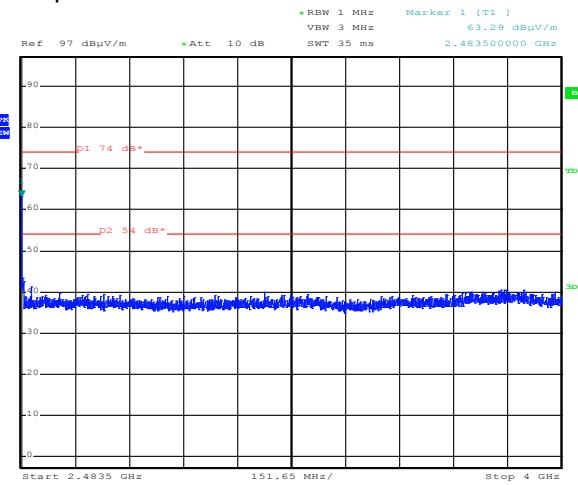
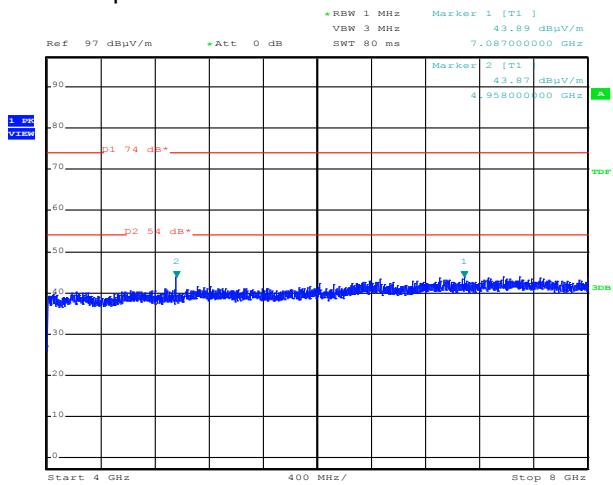
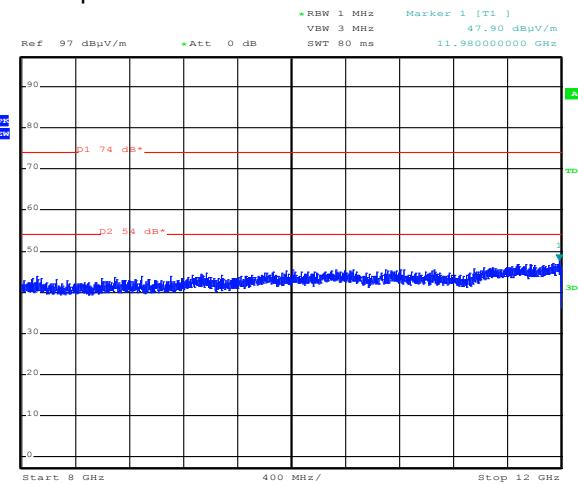
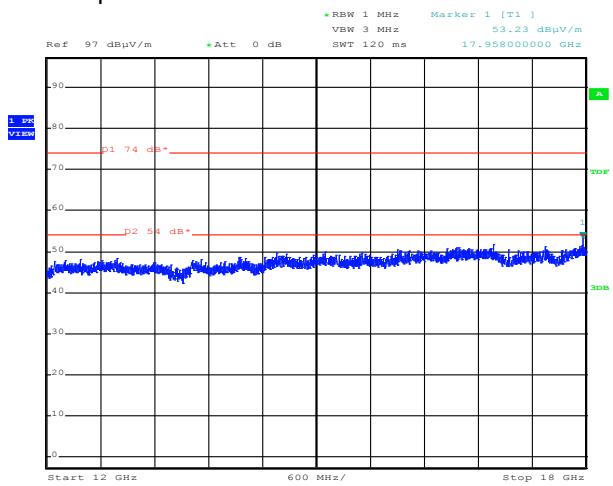
Spurious emissions from 8 to 12 GHz



Spurious emissions from 12 to 18 GHz



Channel 18, 2442 MHz
Spurious emissions from 1 to 2.4 GHz

Spurious emissions from 2.4835 to 4 GHz

Spurious emissions from 4 to 8 GHz

Spurious emissions from 8 to 12 GHz

Spurious emissions from 12 to 18 GHz


Channel 39, 2480 MHz
Spurious emissions from 1 to 2.4 GHz

Spurious emissions from 2.4835 to 4 GHz

Spurious emissions from 4 to 8 GHz

Spurious emissions from 8 to 12 GHz

Spurious emissions from 12 to 18 GHz


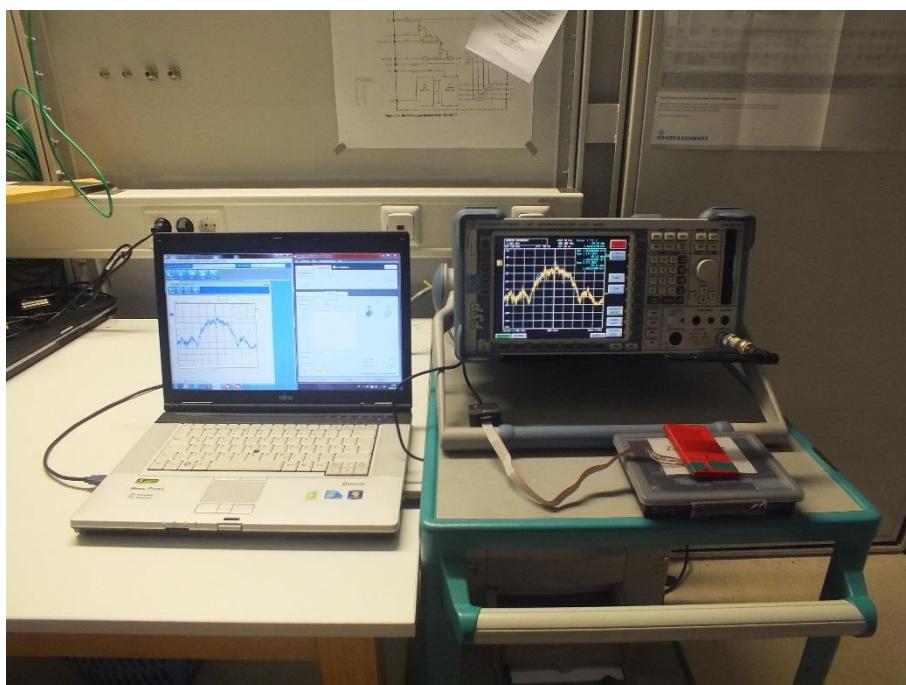
5.4 EBW and OBW

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 (99%). The x-dB-down (OBW) function of the analyser is used. The measurement is performed with normal modulation in TX continuous mode.

Spectrum analyser settings:

RBW: 30 kHz, VBW: 100 kHz, Span: 3 MHz, Trace mode: max. hold, Detector: max. peak;

5.4.5 Test result

Centre f (MHz)	20dB bandwidth f_1	20dB bandwidth f_2	Measured EBW (MHz)
2402.006000	2401.40525	2402.60675	1.201500
2442.017625	2441.42250	2442.61275	1.190250
2480.013500	2479.42250	2480.60450	1.182000

Centre f (MHz)	99% bandwidth f_1	99% bandwidth f_2	Measured OBW (MHz)
2401.994000	2401.45400	2402.53400	1.080000
2442.015000	2441.48400	2442.54600	1.062000
2480.012000	2479.47800	2480.54600	1.068000

Operating frequency band (MHz)	20 dB Bandwidth (MHz)
$f_{low} > 2400$	$f_{low} = 2401.405$
$f_{high} < 2483.5$	$f_{high} = 2480.605$
Operating Band occupancy	79.20
Operating channel occupancy percentage	60.08 %

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. Due to the channelising of the operating band into 39 channels with 20 dB channel bandwidth of 1.22 MHz within a channel pattern of 2 MHz the limit central 80% of the permitted band can not be applied. Therefore the stability of the EUT will be shown staying within the central 80% of the operating channel.

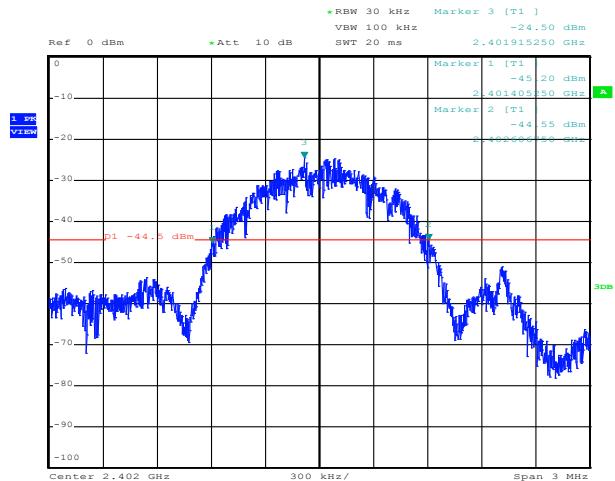
The requirements are **FULFILLED**.

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

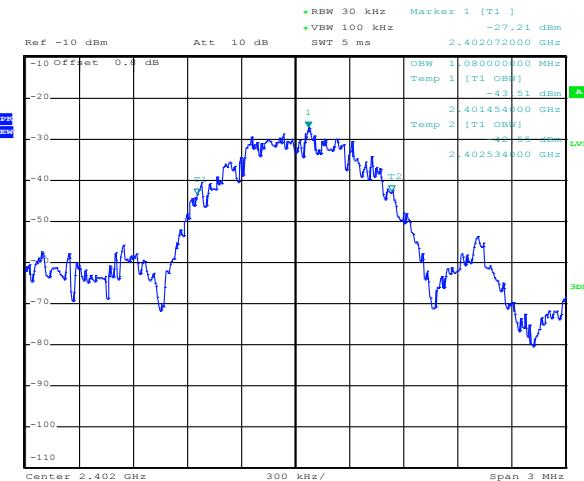
The OBW99 is measured for RSS only.

5.4.6 Test protocols

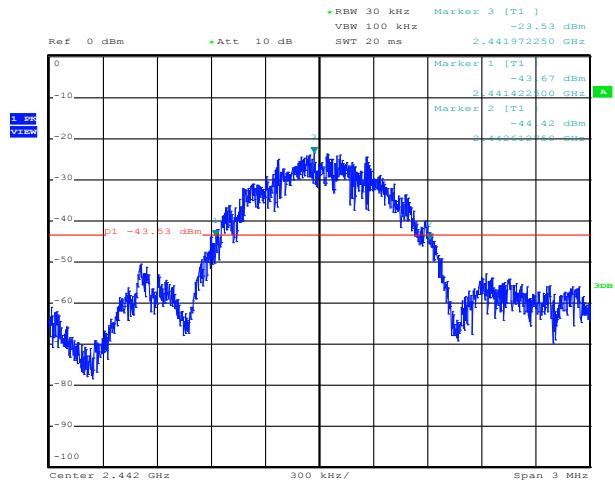
20 dB bandwidth 2402 MHz



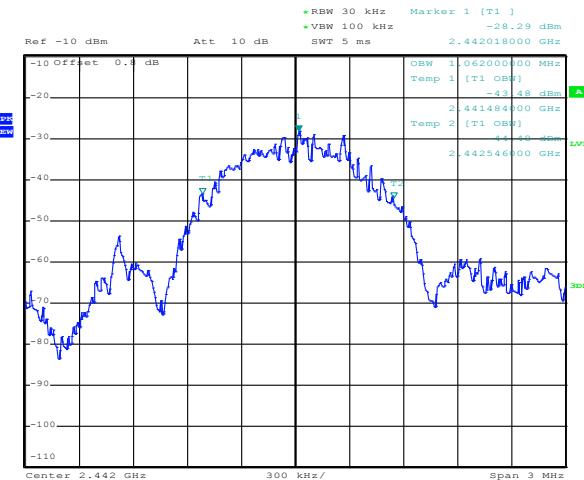
OBW 99% 2402 MHz



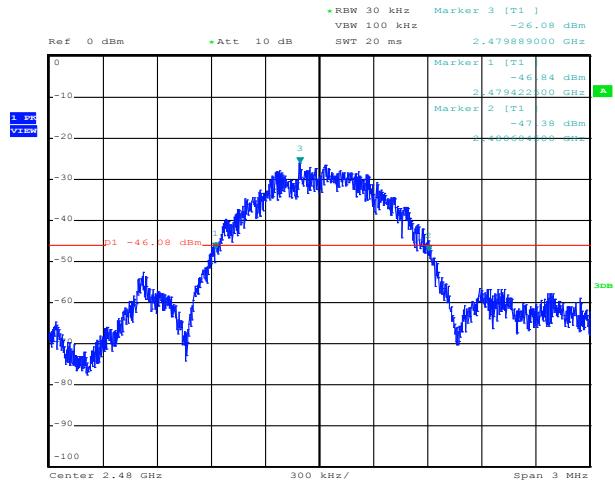
2442 MHz



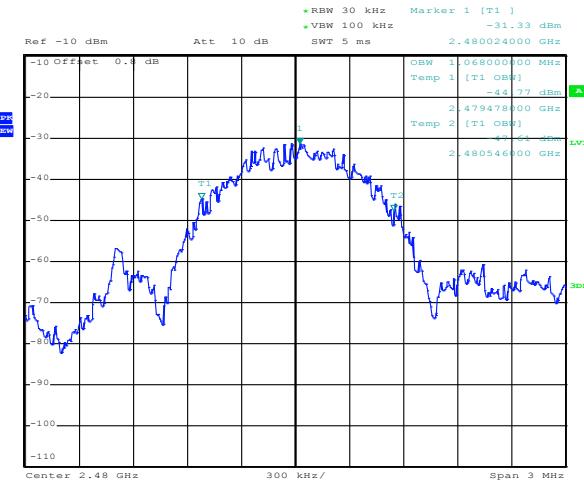
2442 MHz



2480 MHz



2480 MHz



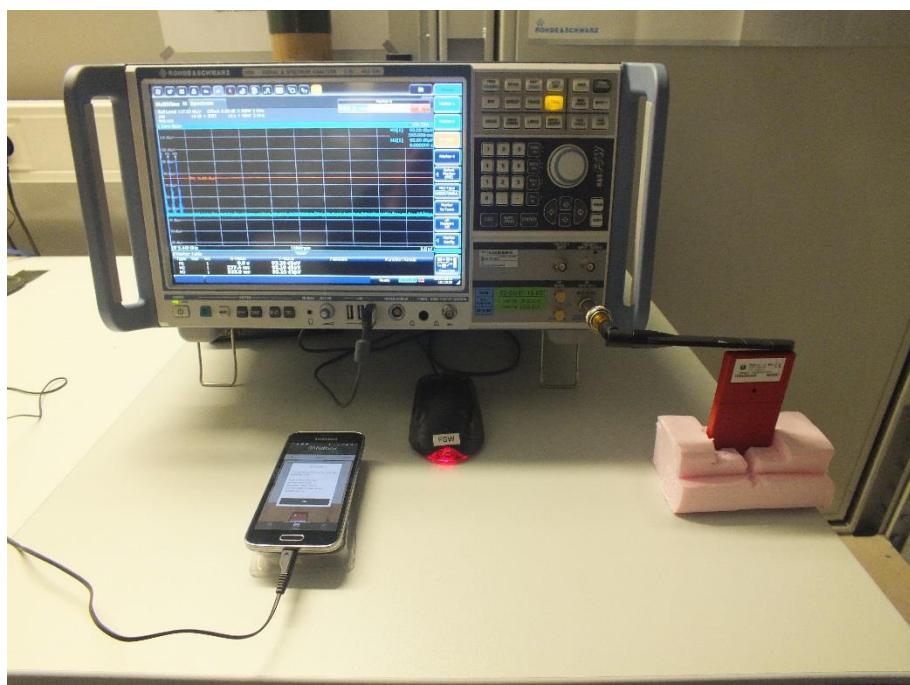
5.5 Correction for pulse operation (duty cycle)

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 pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1s. In cases where the pulse 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:

$$KE = 20 \log ((t_{IW}/T_W) * (t_{IB}/T_B))$$

KE : pulse operation correction factor

t_{IW} : pulse duration for one complete pulse track

t_{IB} : pulse duration for one pulse

T_W : a period of the pulse track

T_B : a period of one pulse

5.5.5 Test result

Active connection to companion device:

CH	t_{iw} (ms)	T_w (ms)	t_{iB} (ms)	T_B (ms)	K_E (dB)
37	100	100	0.244	100	-52.3

Advertising mode:

CH	t_{iw} (ms)	T_w (ms)	t_{iB} (ms)	T_B (ms)	K_E (dB)
18	100	100	0.34165	100	-49.3

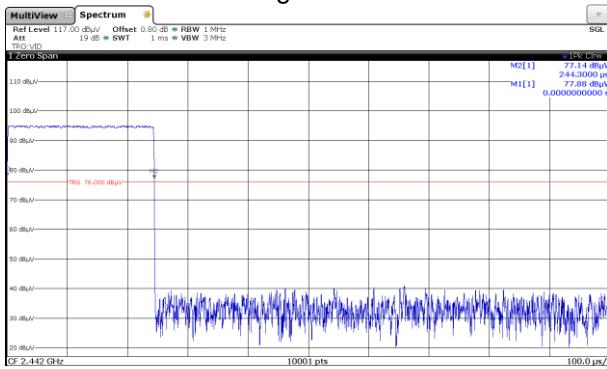
Remarks: The pulse train (T_w) exceeds 100 ms, therefore the duty cycle have been calculated by averaging the sum of the pulse widths over the 100 ms with the highest average value.
For detailed results, please see the test protocol below.

5.5.6 Test protocol

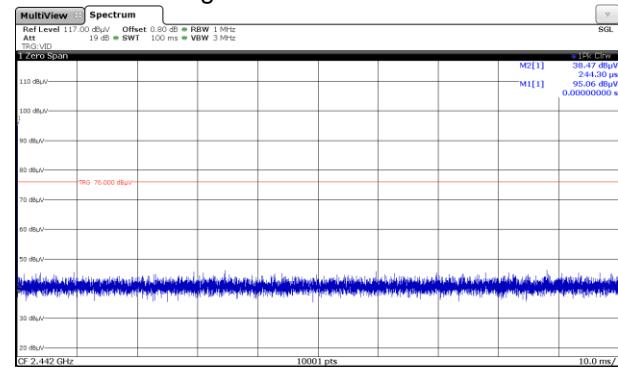
Correction for Pulse Operation (Duty Cycle) FCC Part 15A, Section 15.35(c)

Active connection to companion device:

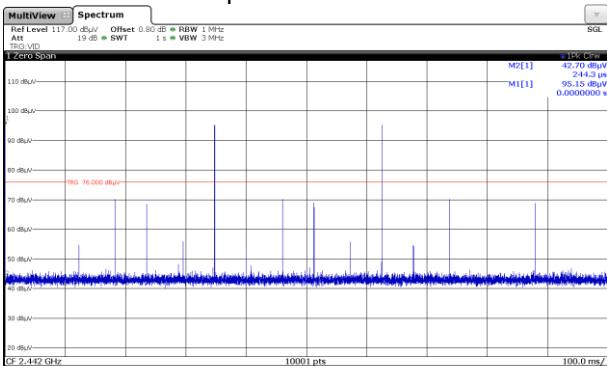
Single burst



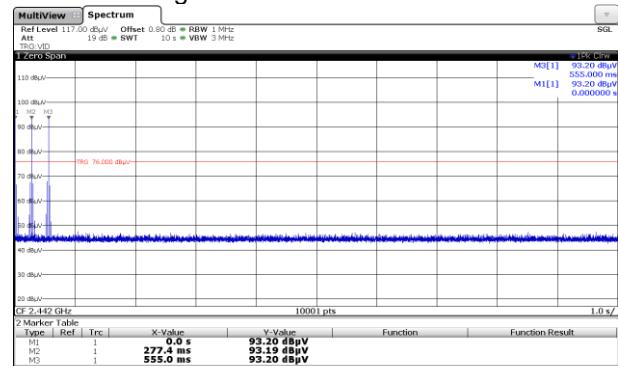
Single burst within 100 ms



Pulse sequence within 1 second



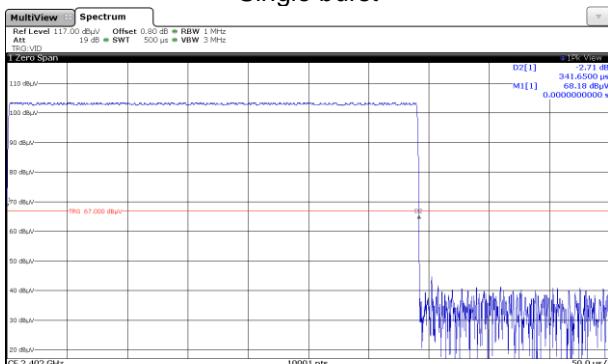
Single burst within 10 seconds



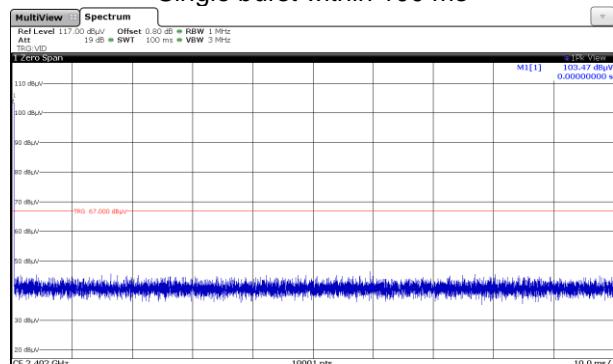
FCC ID: 2ADQTV61
IC: 12568A-V61

Advertising mode without connection to companion device:

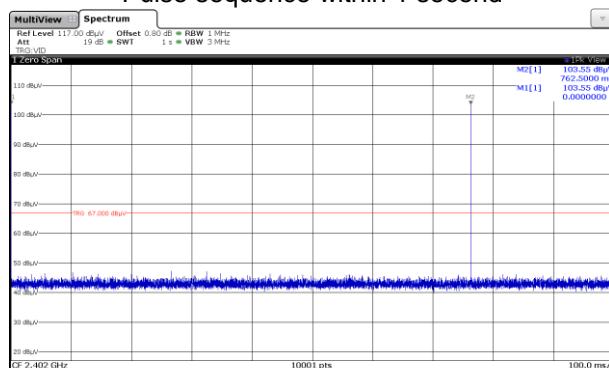
Single burst



Single burst within 100 ms



Pulse sequence within 1 second



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.

5.6.2 Result

The EUT uses an integrated PCB antenna. No other antenna than the 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.

The requirements are **FULFILLED**.

Remarks:

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 AFS4-01000400-10-10P-4 BBHA 9120 E 251 3117 Sucoflex N-2000-SMA SF104/11N/11N/1500MM SF104/11SMA/11N/1500MM	02-02/11-05-001 02-02/17-13-002 02-02/24-05-006 02-02/24-05-009 02-02/50-05-075 02-02/50-13-015 02-02/50-13-016	01/10/2016 19/04/2017 24/05/2017	01/10/2015 19/04/2016 24/05/2016		
DC	FSW43	02-02/11-15-001	05/08/2016	05/08/2015		
MB	FSP 40	02-02/11-11-001	28/10/2016	28/10/2015		
SER 2	ESVS 30 VULB 9168 NW-2000-NB KK-EF393/U-16N-21N20 m KK-SD_7/8-2X21N-33,0M	02-02/03-05-003 02-02/24-05-005 02-02/50-05-113 02-02/50-12-018 02-02/50-15-028	09/07/2016 20/04/2017	09/07/2015 20/04/2016	20/10/2016	20/04/2016
SER 3	FSP 30 AFS4-01000400-10-10P-4 AMF-4F-04001200-15-10P BBHA 9120 E 251 3117 WBH2-18NHG WHJS 1000-10EE Sucoflex N-2000-SMA WHK 3.0/18G-10EF SF104/11N/11N/1500MM SF104/11SMA/11N/1500MM SF104/11SMA/11N/1500MM	02-02/11-05-001 02-02/17-13-002 02-02/17-13-003 02-02/24-05-006 02-02/24-05-009 02-02/24-08-002 02-02/50-05-070 02-02/50-05-075 02-02/50-05-180 02-02/50-13-015 02-02/50-13-016 02-02/50-13-017	01/10/2016 19/04/2017 24/05/2017 19/04/2017	01/10/2015 19/04/2016 24/05/2016 19/04/2016	19/10/2016 19/10/2016 19/10/2016	19/04/2016 19/04/2016 19/04/2016