FCC ID: VGO-A360CAM IC: 7219A-A360CAM

EMI – TEST REPORT

- FCC Part 15.247, RSS210 -

Test Report No. : **T38010-00-02TK**	11. June 2014 Date of issue

Type / Model Name : Airtraq A-360

Product Description : Wi-Fi Camera

Applicant : PRODOL MEDITEC S.A.

Address : Muelle Tomas Olabarri, 5 3d

48930 Las Arenas, Vizcaya, SPAIN

Manufacturer : Bizintek Innova S.L

Address : Av. de la Ribera de Axpe, Ed. 11B mod. 210

48950 Erandio, SPAIN

Licence holder : PRODOL MEDITEC S.A.

Address : Muelle Tomas Olabarri, 5 3d

48930 Las Arenas, Vizcaya, SPAIN

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

Deutsche Akkreditierungsstelle D-PL-12030-01-00

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ATTACHMENT NONE

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September, 2013)

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, 2013)

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 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz

FCC Rules and Regulations Part 1, Subpart I - Procedures Implementing the National Environmental Policy Act of 1969

Part 1, Subpart I, Section 1.1310	Radiofrequency radiation exposure limits
Part 1, Subpart 2, Section 2.1093	Radiofrequency radiation exposure evaluation: portable device

OET Bulletin 65, 65A, 65B, 65C Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

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 C63.10: 2009	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: 2003	Uncertainty in EMC measurement
KDB 558074 D01 v03r01	Guidance for performing compliance measurements on DTS operating under Section 15.247, April 9, 2013.
KDB 447498 D01 v05r02	Mobile and Portable Devices RF Exposure Procedures and Equipment Autorization Polices

2 SUMMARY

2.1 Test result summary

WLAN device using digital modulation:

Operating in the 2400 MHz – 2483.5 MHz:

FCC Rule Part	RSS Rule Part	Description	Result
15.207(a)	RSS Gen, 7.2.4.	AC power line conducted emissions	not applicable
15.247(a)(2)	RSS210, A8.2(a)	-6 dB EBW	passed
15.247(b)(3)	RSS-210, A8.4(4)	Peak power	passed
15.247(d)	RSS-210, A8.5	Out-of-band emission, radiated	passed
15.247(d)	RSS-Gen, 7.2.2	Emissions in restricted bands	passed
15.247(e)	RSS-210, A8.2(b)	PSD	passed
15.35(c)	RSS-Gen, 4.5	Pulsed operation	not applicable
15.247(i)	RSS 102, 2.5.2	MPE	passed
KDB 447498	RSS 102, 4	RF exposure consideration for SAR	passed
15.247(b)(4)	RSS-Gen, 7.1.2	Antenna requirement	passed
	RSS-Gen, 7.2.6	Transmitter frequency stability	not applicable
	RSS-Gen, 4.6.1	99 % Bandwidth	passed
OET Bulletin 65	RSS102, 3.2	Co-location, Co-transmission	not applicable

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 is a WLAN system. The WLAN module is compatible with the standards 802.11b and 802.11g. It supports the 2.4 GHz frequency band. Only one antenna port is used with a single antenna system. The EUT must be controlled via terminal programm to select the modulation and data rate manually. For test setup the corresponding device is a tablet computer receiving and visualising the streaming data. Video streaming is mandatory for modulation type and data rate selection.

Operation frequency and channel plan

The operating frequency is 2400 MHz to 2483.5 MHz.

Channel plan WLAN Standard 802.11b/g:

Channel	Frequency
1	2412 MHz
2	2417 MHz
3	2422 MHz
4	2427 MHz
5	2432 MHz
6	2437 MHz
7	2442 MHz
8	2447 MHz
9	2452 MHz
10	2457 MHz
11	2462 MHz

Antenna

The EUT has only an integrated antenna. An external antenna cannot be connected.

Number	Characteristic	Certification name	Plug	Frequency range (GHz)	Gain (dBi)	Cable loss	Effective Gain
1	Omni	Anaren 66089-2430	U.FL	2.4	3	-	3

Transmit operating modes

The EUT use DSSS or OFDM modulation and may provide following data rates:
- 802.11b mode 11, 5.5, 2, 1 Mbps (Mbps = *megabits per second)*
- 802.11g mode 54, 48, 36, 24, 18, 12, 9, 6 Mbps

2.3 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 : 10 April 2014

Testing concluded on : 22 May 2014

Checked by:

Eduard Stangl
I confirm the correctness and integrity of this document
2014.06.16 09:00:35 +02'00'

Eduard Stangl
Technical Manager

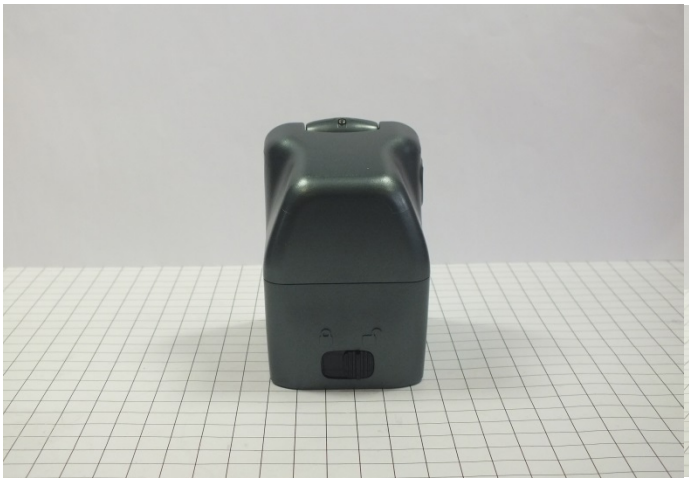
Tested by:

Tobias Kammerer
I`m the author of this document
2014.06.16 08:12:12 +02'00'

Tobias Kammerer
Radio Team

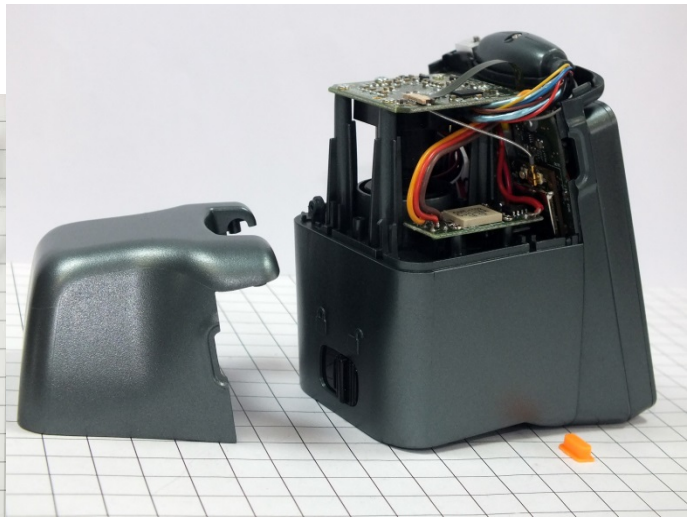
3 EQUIPMENT UNDER TEST

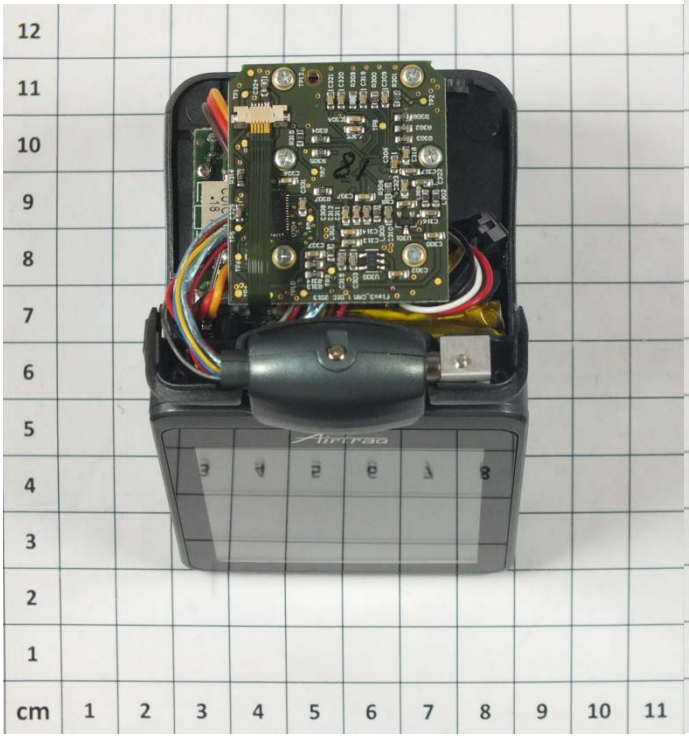
3.1 Photo documentation of the EUT

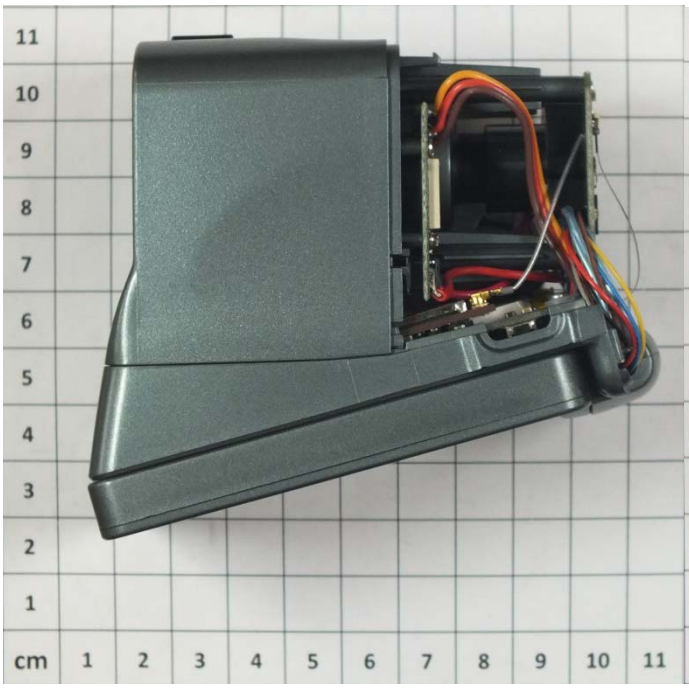


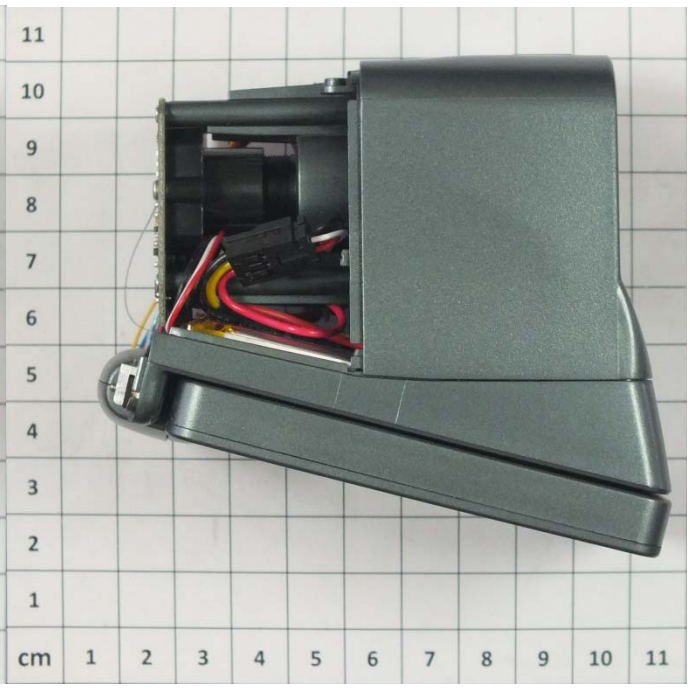

Airtraq

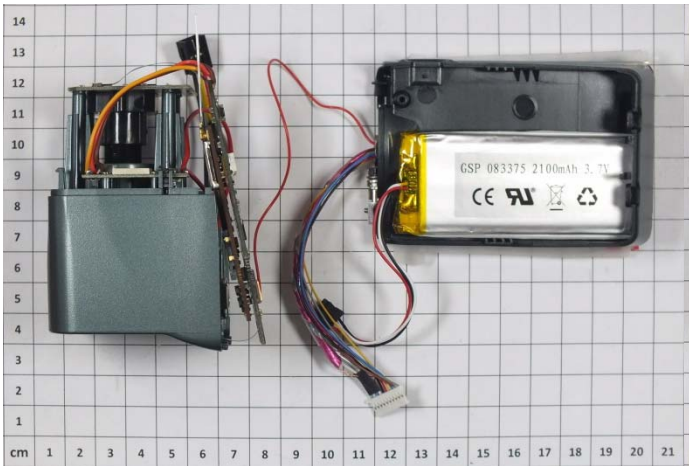

Airtraq







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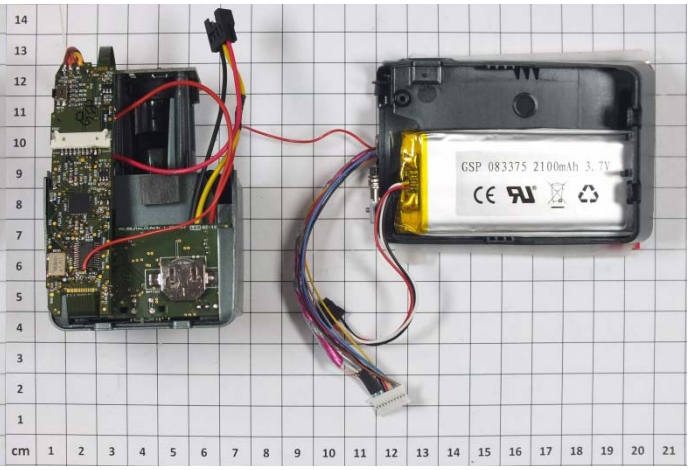
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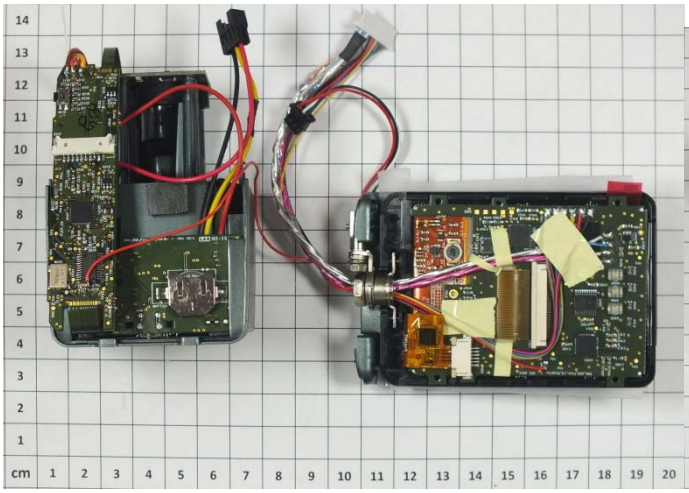
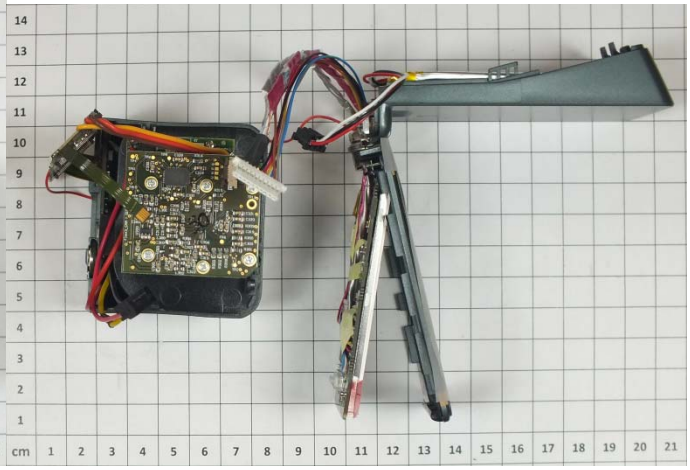
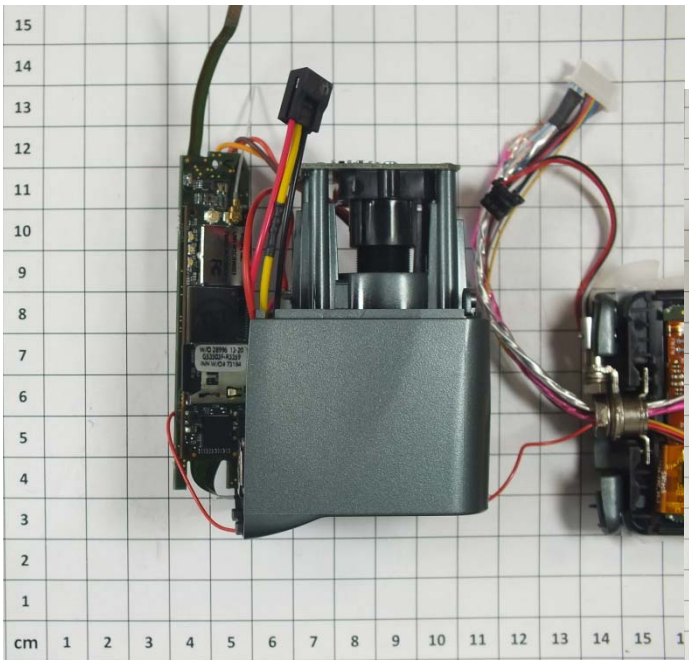
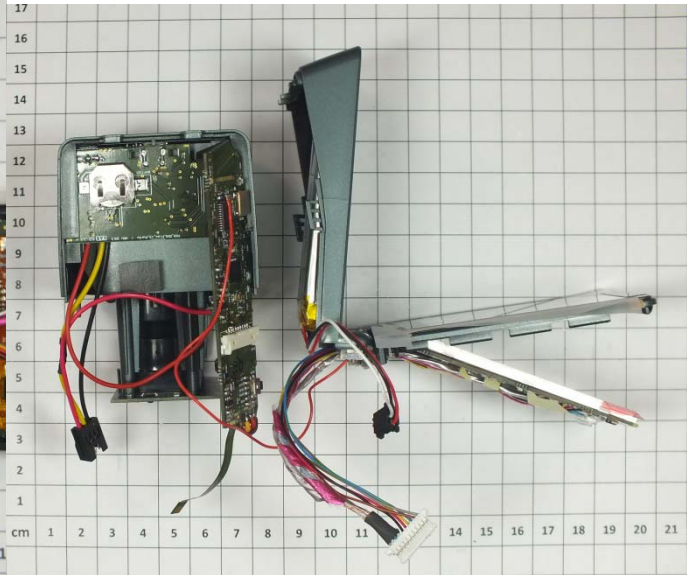
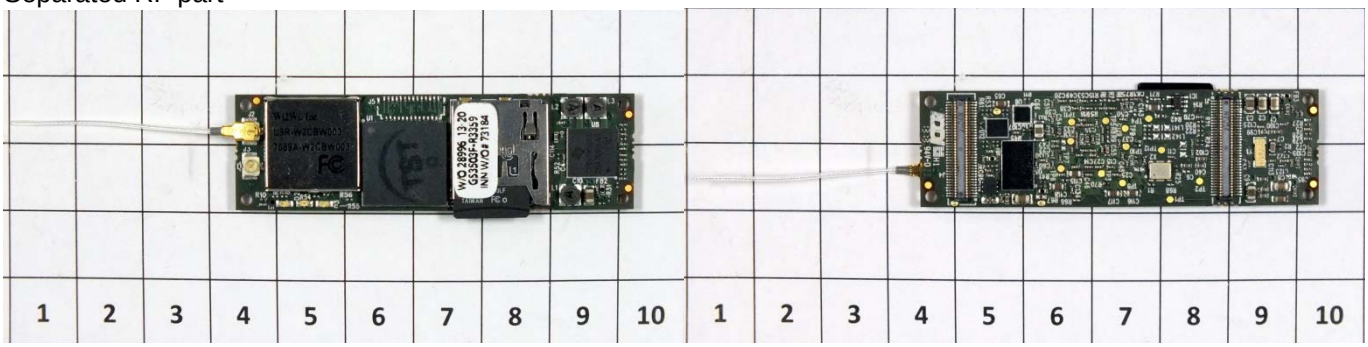


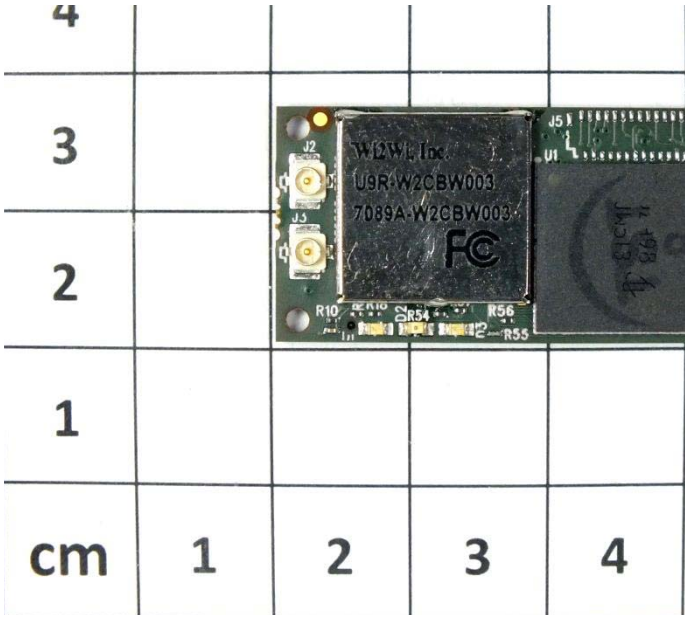






Separated RF part





3.2 Power supply system utilised

Power supply voltage, V_{nom} : 5 V DC / USB powered (charging only)

3.3 Short description of the equipment under test (EUT)

The EUT is a battery powered, handheld, wireless camera system with LCD display for live video streaming. A corresponding device like a personal computer, a tablet computer or a smart phone is required to transmit a wireless live video stream. The charging mode or being connected to a PC via USB cable prohibits wireless transmission.

Number of tested samples: 1
Serial number: 3d26

EUT operation mode:

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

- TX continuous, active streaming

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

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

The Open Area test site is a listed Open Site 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 and applying the CISPR 22 limits.

4.4.1.1 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.

4.4.1.2 Details of test procedures

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.

4.5 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.

The tests are carried out in the following frequency band:

2400 MHz – 2483.5 MHz

Preliminary tests were performed to find the worst case mode from all possible combinations between available modulations and data rates. The maximum output power depends on used data rate. The output power can not be set by application software and is fixed by the manufacturer.

The test software for the EUT provides free channel setting, the special test mode is TX continuous mode, modulated with streaming. A special RX continuous mode is not provided. The EUT was set with test modulation to transmit data during the tests with a duty cycle (x) of x = 0.961 (802.11b) and 0.895 (802.11g). A correction factor of 0.2 dB for 802.11b and 0.5 dB for 802.11g is taken into account. Pre-measurements were performed to determine the worst case emission conditions. The worst case conditons are 1 Mbits per second for CCK-Modulation and 6 Mbits per second for OFDM-Modulation.

Following channels and test modes has been selected for the final test as listed below:

WLAN	Available channel	Tested channels	Power setting	Modulation	Modulation type	Data rate
802.11b	1 to 11	1, 6, 11	Max.	CCK	DSSS	1 Mbps
802.11g	1 to 11	1, 6, 11	Max.	OFDM	BPSK	6 Mbps

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 because the EUT does not transmit when charging or being connected to a personal computer.

5.2 Emission bandwidth

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

5.2.1 Description of the test location

Test location: AREA4

5.2.2 Photo documentation of the test set-up

5.2.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(2):
Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 – 2483.5 MHz and 5725 – 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.2.4 Description of Measurement

The bandwidth was measured at an amplitude level reduced from the reference level of a modulated channel by a ratio of -6 dB. The reference level is the level of the highest signal amplitude observed at the transmitter at either the fundamental frequency or the first order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical. An alternative is to use the bandwidth measurement of the analyser.

Spectrum analyser settings:
RBW: 100 kHz, VBW: 300 kHz, Detector: Peak, Sweep time: Auto sweep

The table below shows the settings according to ANSI C63.4:

Fundamental frequency	Minimum resolution bandwidth
9 kHz to 30 MHz	1 kHz
30 to 1000 MHz	10 kHz
1000 MHz to 40 GHz	100 kHz

5.2.5 Test result

WLAN Standard 802.11b

Channel	Centre frequency (MHz)	6 dB bandwidth (MHz)	Minimum limit (MHz)
1	2412	10.060	0.5
6	2437	10.072	0.5
11	2462	10.048	0.5

WLAN Standard 802.11g

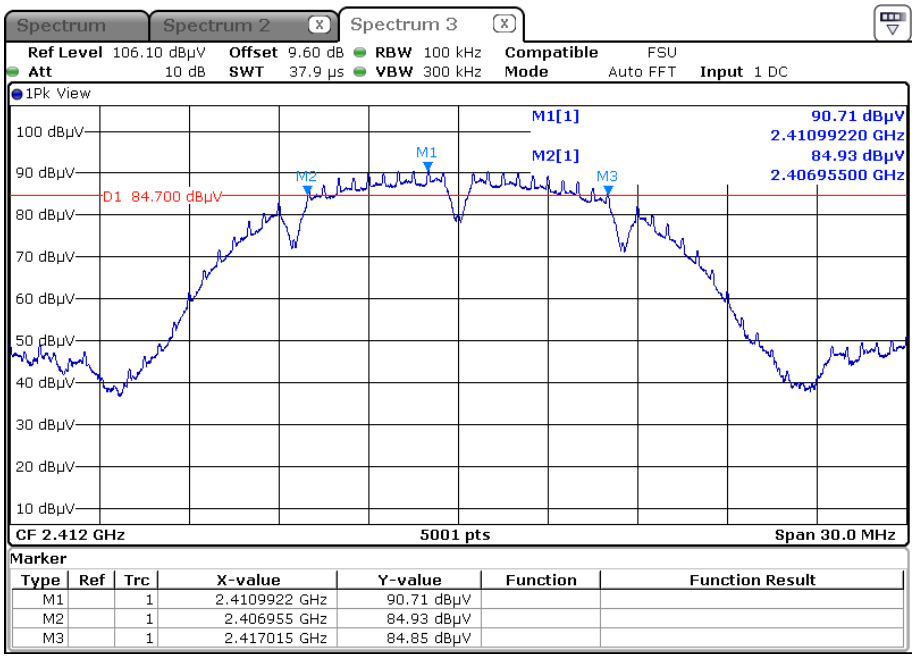
Channel	Centre frequency (MHz)	6 dB bandwidth (MHz)	Minimum limit (MHz)
1	2412	16.269	0.5
6	2437	15.105	0.5
11	2462	15.087	0.5

The requirements are **FULFILLED.**

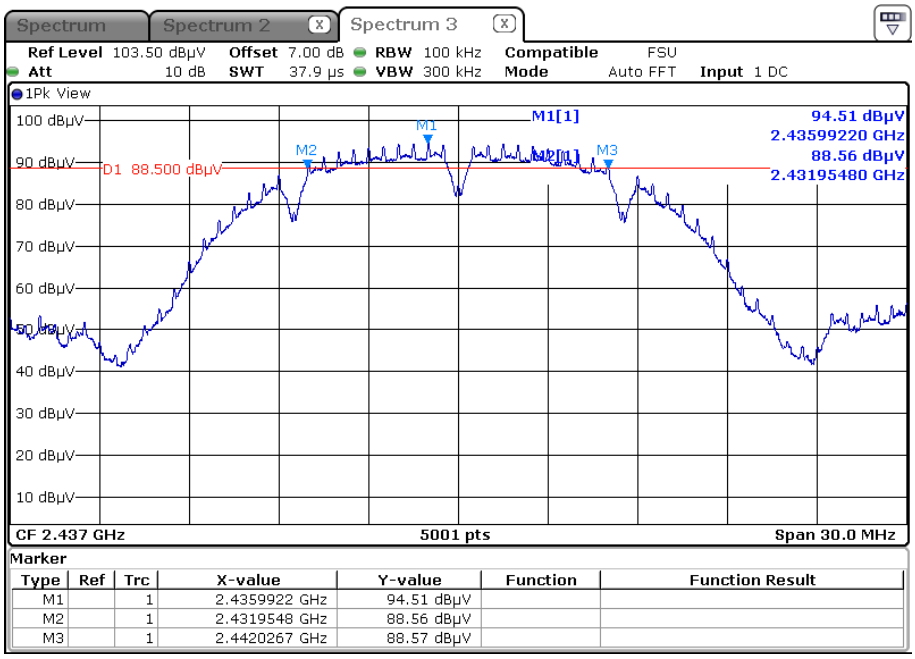
Remarks: For detailed test results please refer to following test protocols.

5.2.6 Test protocols

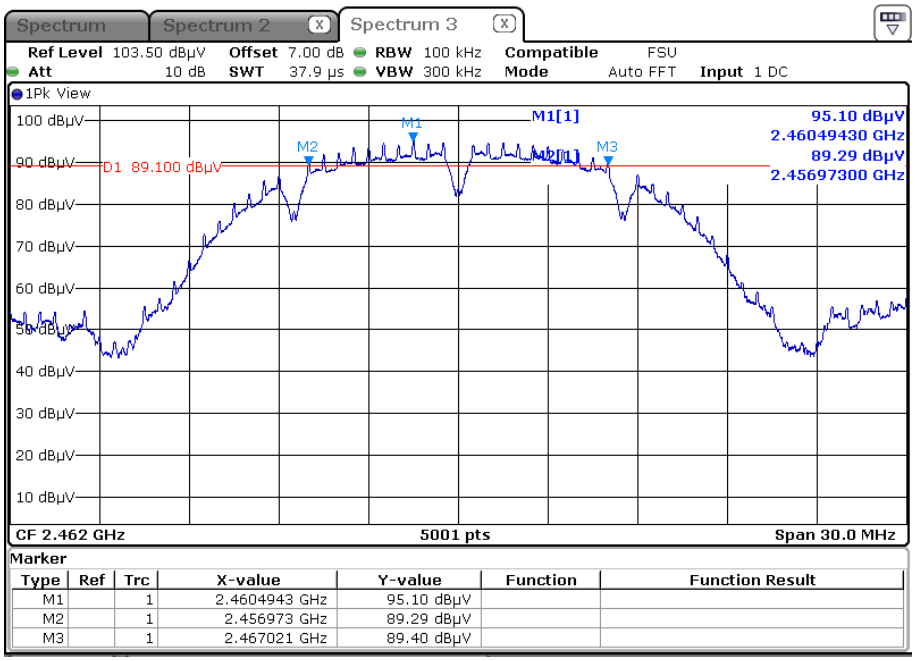
802.11b, Channel 1 (2412 MHz)



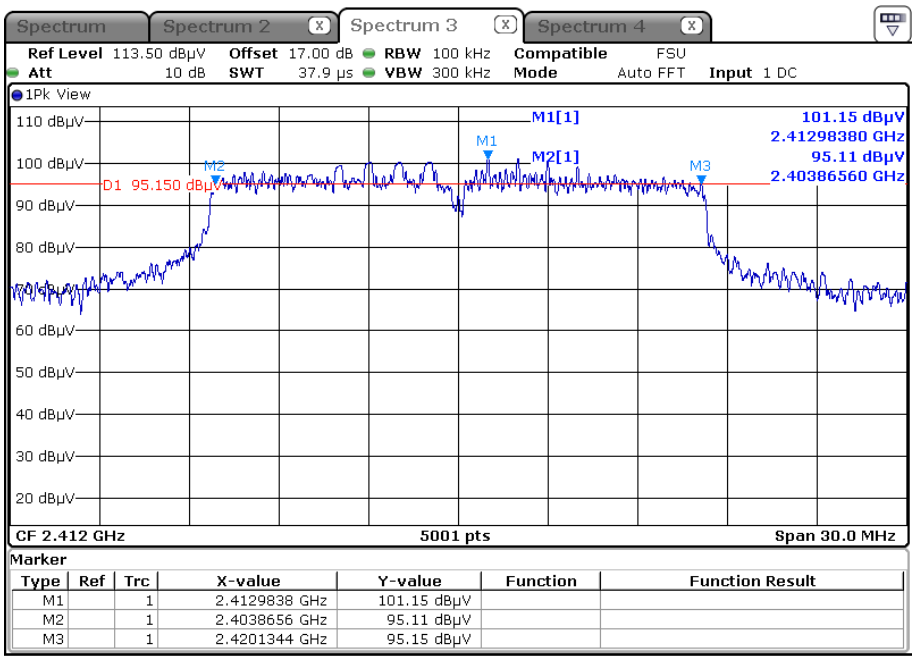
802.11b, Channel 6 (2437 MHz)



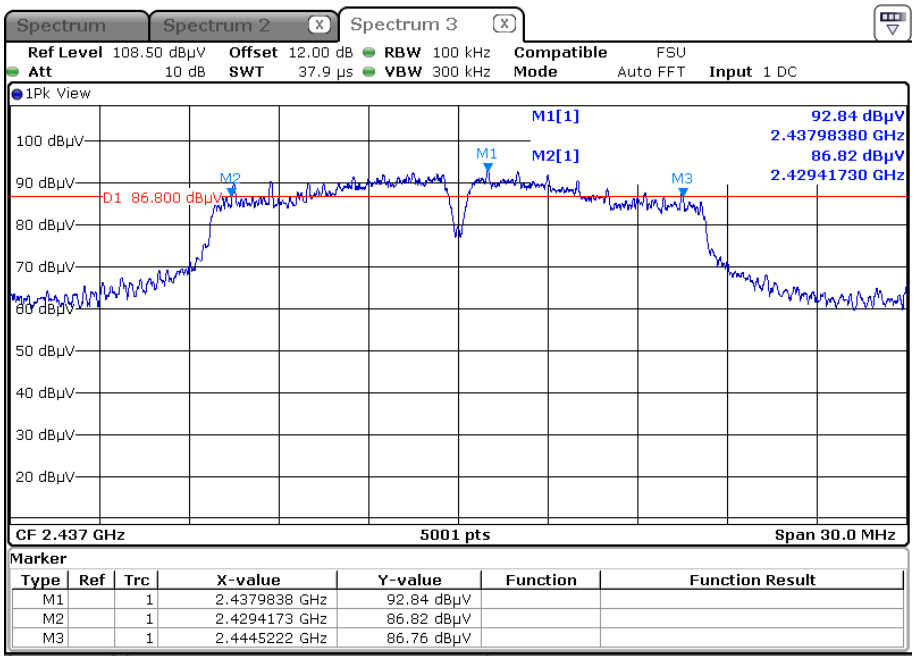
802.11b, Channel 11 (2462 MHz)



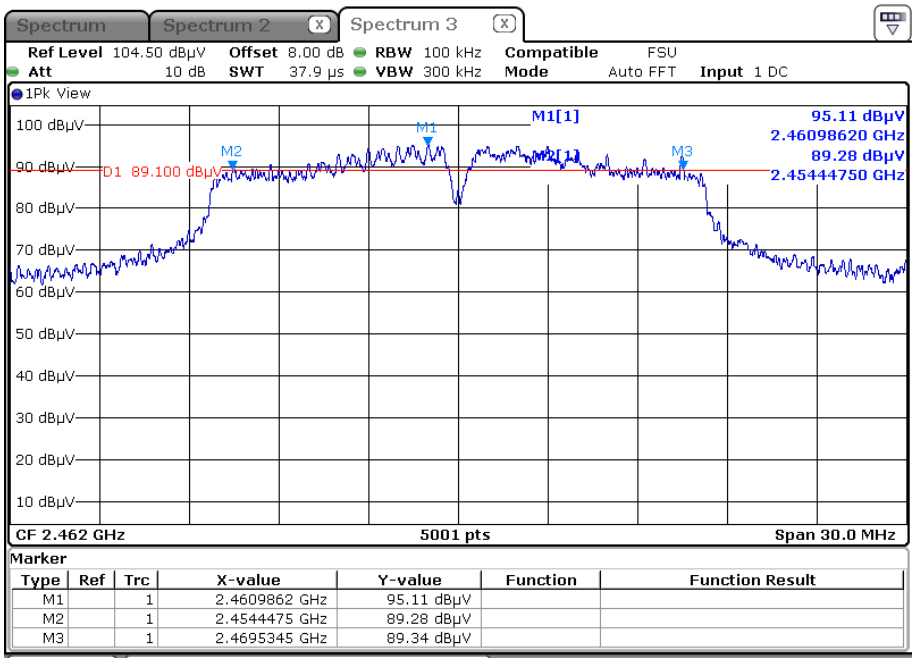
802.11g, Channel 1 (2412 MHz)



802.11g, Channel 6 (2437 MHz)



802.11g, Channel 11 (2462 MHz)



5.3 Occupied bandwidth

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

5.3.1 Description of the test location

Test location: AREA4

5.3.2 Photo documentation of the test set-up

5.3.1 Applicable standard

According to RSS-Gen, 4.6.1:
When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99 % emission bandwidth, as calculated or measured.

5.3.2 Description of Measurement

The bandwidth was measured with the function “bandwidth measurement” of the spectrum analyser. The EUT is connected via suitable attenuator at the spectrum analyser. The measurement is repeated for every different modulation standard of the EUT and recorded.

Spectrum analyser settings:
RBW: 300 kHz, VBW: 1 MHz, Detector: sampling detector, Sweep time: Auto sweep

5.3.3 Test result

WLAN Standard 802.11b

Channel	Centre frequency (MHz)	99 % bandwidth (MHz)
1	2412	14.013
6	2437	14.067
11	2462	14.037

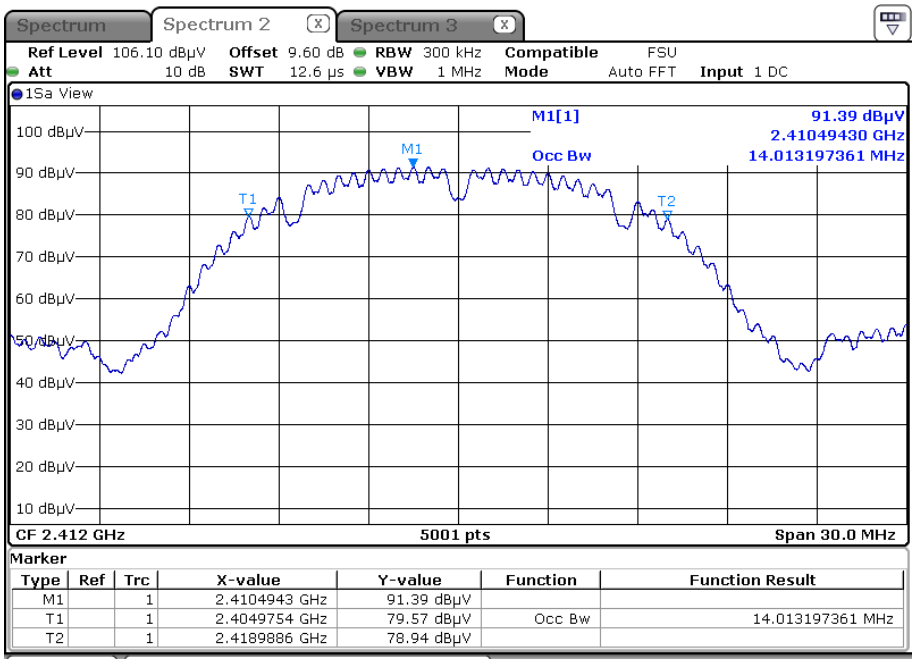
WLAN Standard 802.11g

Channel	Centre frequency (MHz)	99 % bandwidth (MHz)
1	2412	16.911
6	2437	16.773
11	2462	16.707

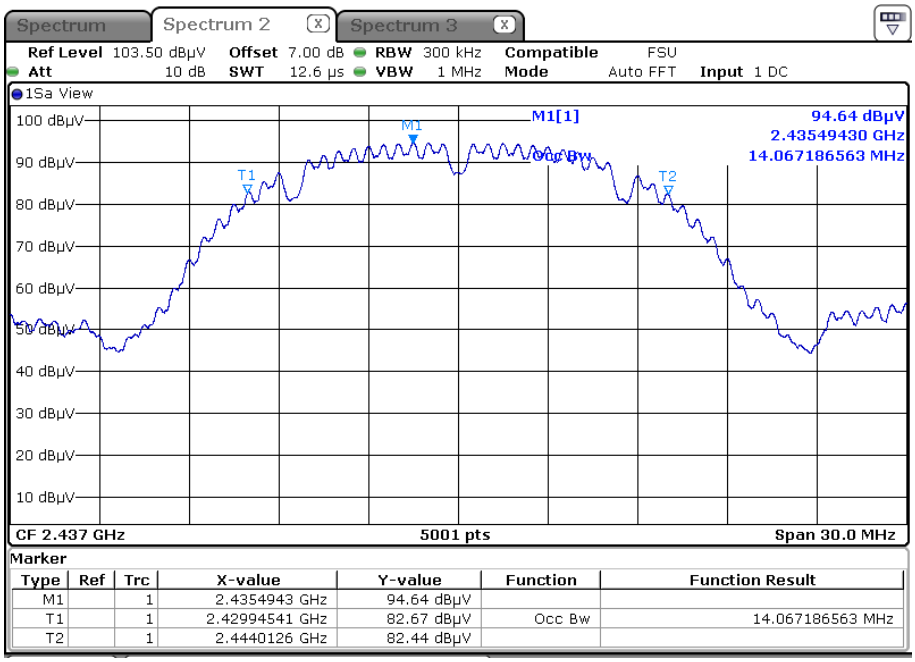
Remarks: For detailed test result please refer to following test protocols. The RSS Gen defines no limit for the occupied bandwidth!

5.3.4 Test protocols

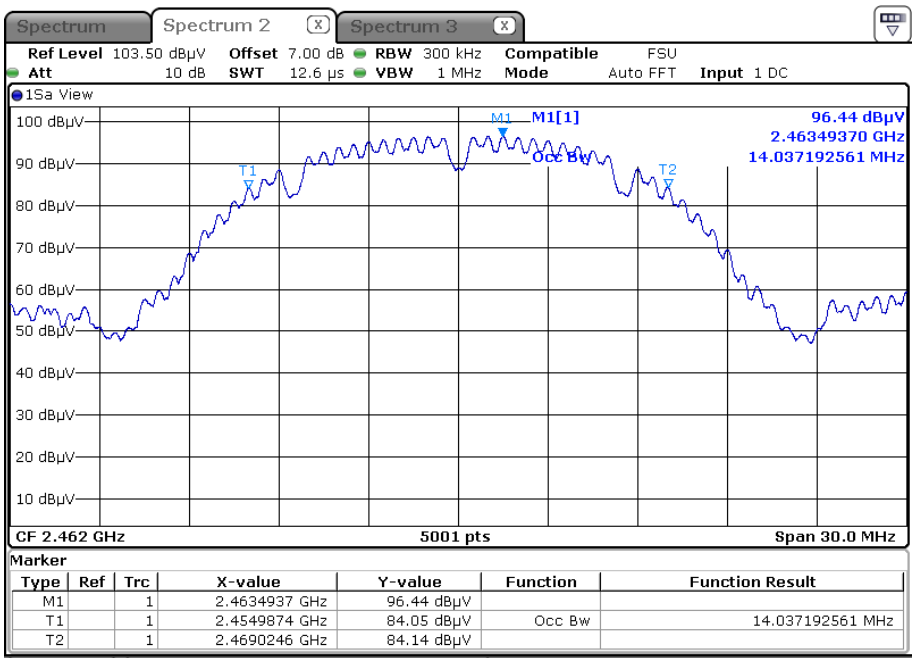
802.11b, Channel 1 (2412 MHz)



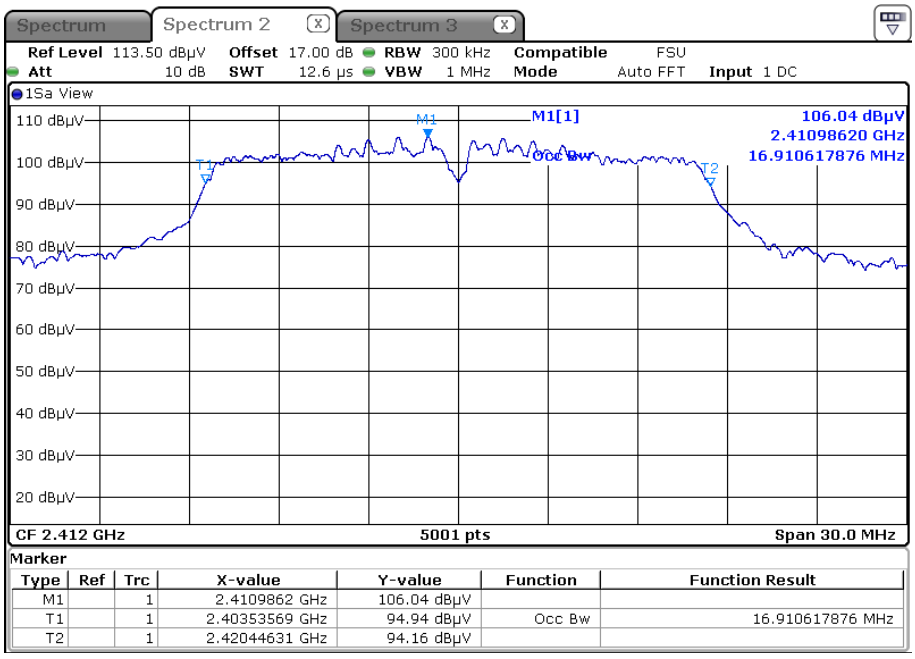
802.11b, Channel 6 (2437 MHz)



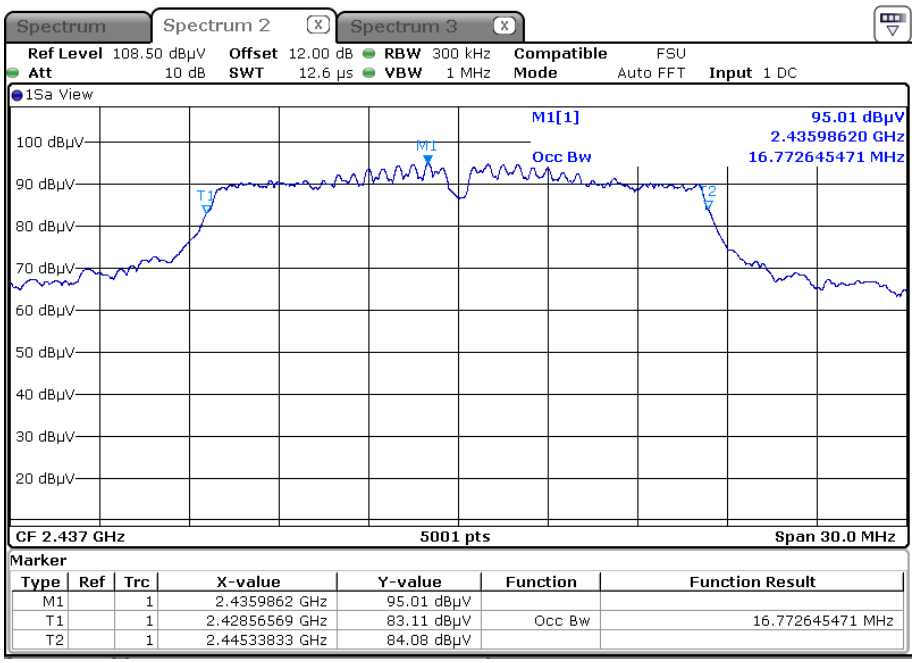
802.11b, Channel 11 (2462 MHz)



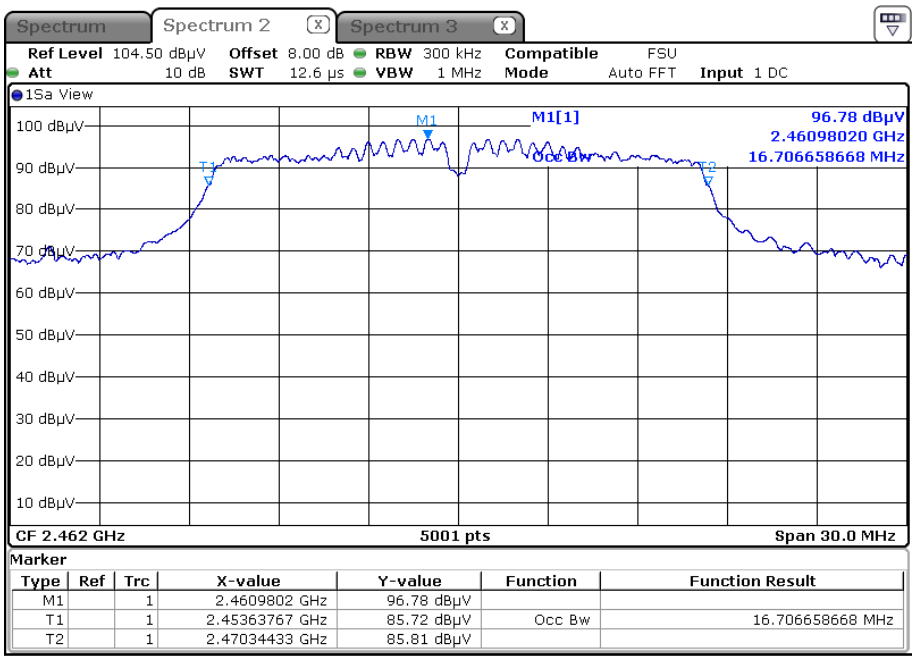
802.11g, Channel 1 (2412 MHz)



802.11g, Channel 6 (2437 MHz)



802.11g, Channel 11 (2462 MHz)



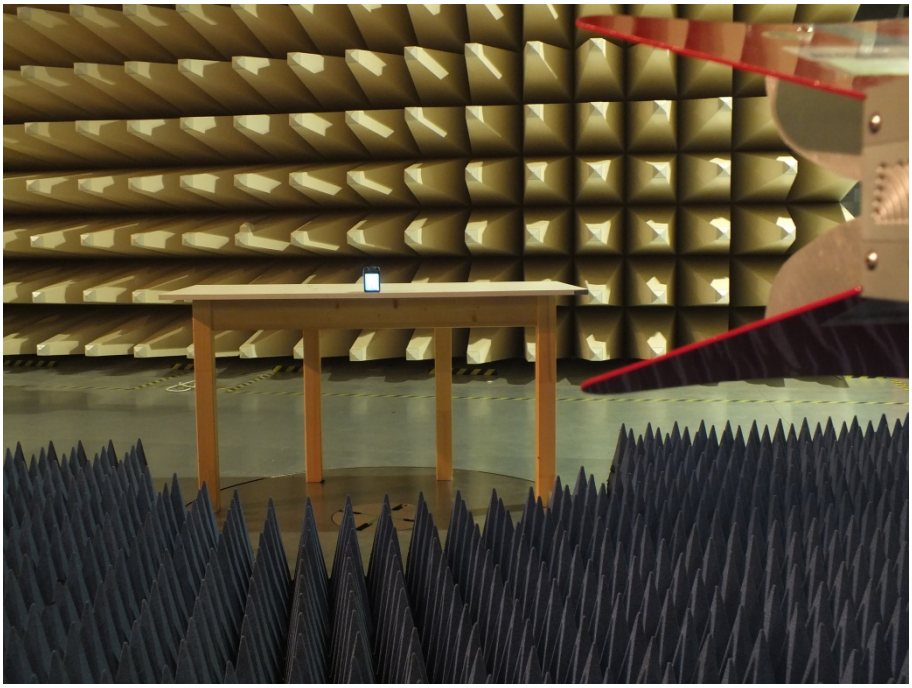
5.4 Maximum peak radiated output power

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

5.4.1 Description of the test location

Test location: Anechoic chamber 1

5.4.2 Photo documentation of the test set-up



5.4.3 Applicable standard

According to FCC Part 15, Section 15.247(b)(3):
For systems using digital modulation in the 2400-2483.5 MHz and 5725 – 5850 MHz bands, the maximum peak output power of the transmitter shall not exceed 1 Watt. The limit is based on transmitting antennas of directional gain that do not exceed 6 dBi.

5.4.4 Description of Measurement

The maximum peak radiated output power is measured using a spectrum analyser with the function “integrated bandpower measurement” following the procedure set out in OET 558074, item 9.1.2. The EUT is set in TX continuous streaming mode while measuring. The radiated measurement was performed in a fieldstrength measurement. Therefore the formula set out in OET 558074, item 12.2.2 e) is changed into the following term:

$$EIRP = E + 20*\log_{10} 3 - 104.8$$

5.4.5 Test result

802.11b, 1 Mbps, TX		Test results radiated			
		Fieldstrength E (dBµV/m)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
Lowest frequency: CH1					
T_{nom}	V_{nom}	94.65	-0.6	36.0	-36.6
Middle frequency: CH6					
T_{nom}	V_{nom}	92.51	-2.7	36.0	-38.7
Highest frequency: CH11					
T_{nom}	V_{nom}	93.25	-2.0	36.0	-38.0

802.11g, 6 Mbps, TX		Test results radiated			
		Fieldstrength E (dBµV/m)	EIRP (dBm)	EIRP Limit (dBm)	Margin (dB)
Lowest frequency: CH1					
T_{nom}	V_{nom}	104.23	9.0	36.0	-27.0
Middle frequency: CH6					
T_{nom}	V_{nom}	98.54	3.3	36.0	-32.7
Highest frequency: CH11					
T_{nom}	V_{nom}	102.50	7.2	36.0	-28.8

Peak Power Limit according to FCC Part 15, Section 15.247(b)(3):

Frequency (MHz)	EIRP Limit	
	(dBm)	(Watt)
902-928	36	4.0
2400-2483.5	**36**	**4.0**
5725-5850	36	4.0

The requirements are **FULFILLED.**

Remarks: _____

_____

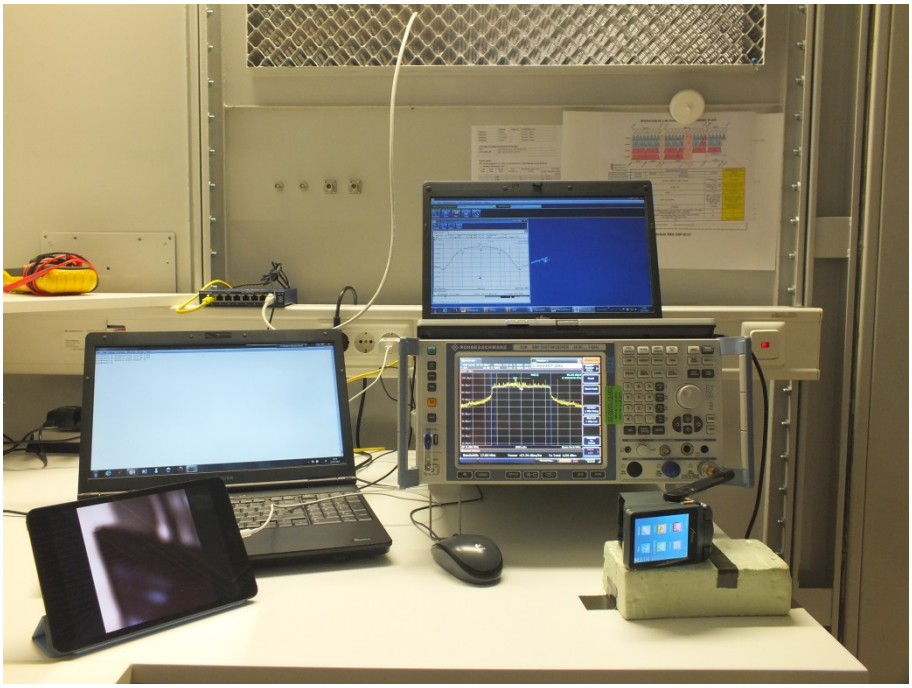
5.5 Power spectral density radiated

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

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15, Section 15.247(e):
For digitally modulated systems, the power spectral density radiated from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the radiated output power shall be used to determine the power spectral density.

5.5.4 Description of Measurement

The measurement is performed relatively to the measured fieldstrength value at 3 m measurement distance using the procedure 10.2 set out in KDB-558074. The power measurement was done using the integrated band power method. Therefore the PKPSD is measured. The maximum peak was located with the spectrum analyser and marker set to peak. The corrective offset is taken into account with an amplitude offset and can be viewed in the plots.

Spectrum analyser settings:
RBW: 100 kHz, VBW: 300 kHz, Detector: Peak, Sweep time: Auto sweep

5.5.5 Test result

WLAN Standard 802.11b

802.11b, 1 Mbps, 1 TX		Test results conducted			
		Fieldstrength E (dBµV/m)	PD [Pmax] (dBm/3kHz)	EIRP Limit (dBm/3kHz)	Margin (dB)
Lowest frequency: CH1					
T_{nom}	V_{nom}	90.7	-4.5	14.0	-18.5
Middle frequency: CH6					
T_{nom}	V_{nom}	94.5	-0.7	14.0	-14.7
Highest frequency: CH11					
T_{nom}	V_{nom}	95.1	-0.2	14.0	-14.2

WLAN Standard 802.11g

802.11g, 6 Mbps, 1 TX		Test results conducted			
		Fieldstrength E (dBµV/m)	PD [Pmax] (dBm/3kHz)	EIRP Limit (dBm/3kHz)	Margin (dB)
Lowest frequency: CH1					
T_{nom}	V_{nom}	101.2	5.9	14.0	-8.1
Middle frequency: CH6					
T_{nom}	V_{nom}	92.8	-2.4	14.0	-16.4
Highest frequency: CH11					
T_{nom}	V_{nom}	95.1	-0.1	14.0	-14.1

Power spectral density limit according to FCC Part 15, Section 15.247(e):

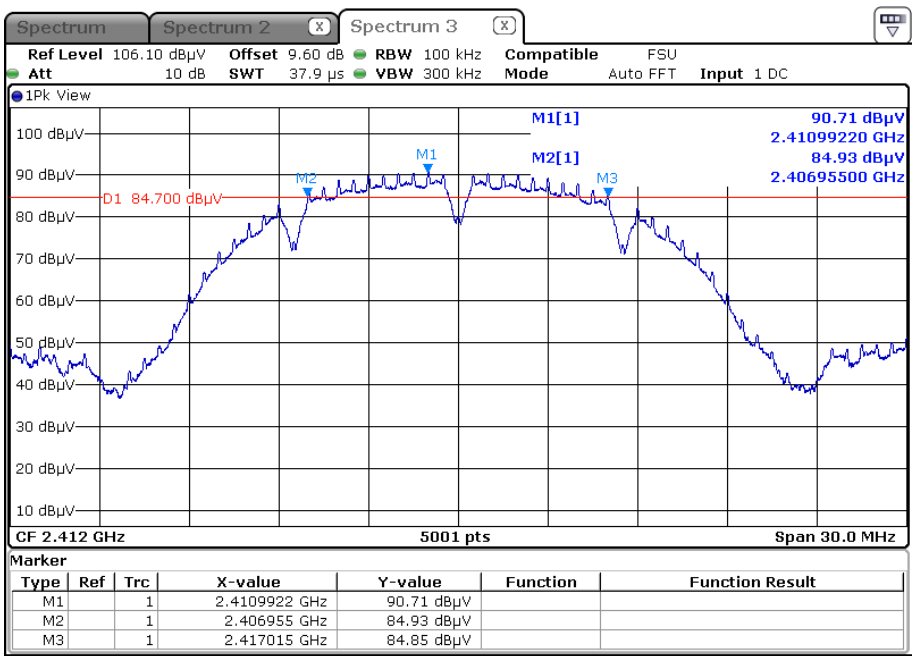
Frequency (MHz)	Power spectral density limit (EIRP) (dBm/3 kHz)
2400 - 2483.5	14

The requirements are **FULFILLED.**

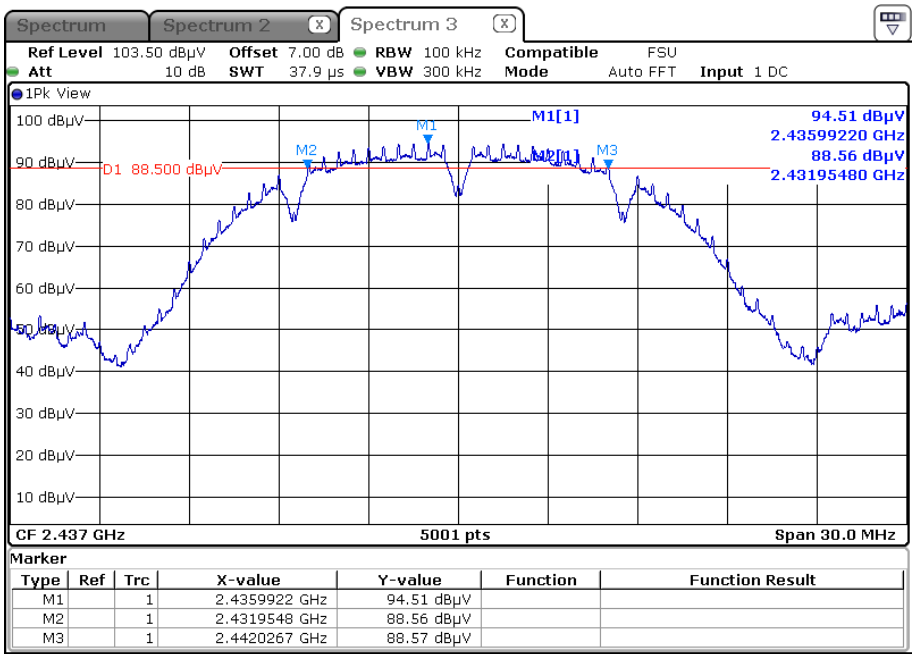
Remarks: For detailed test results please refer to following test protocols.

5.5.6 Test protocols

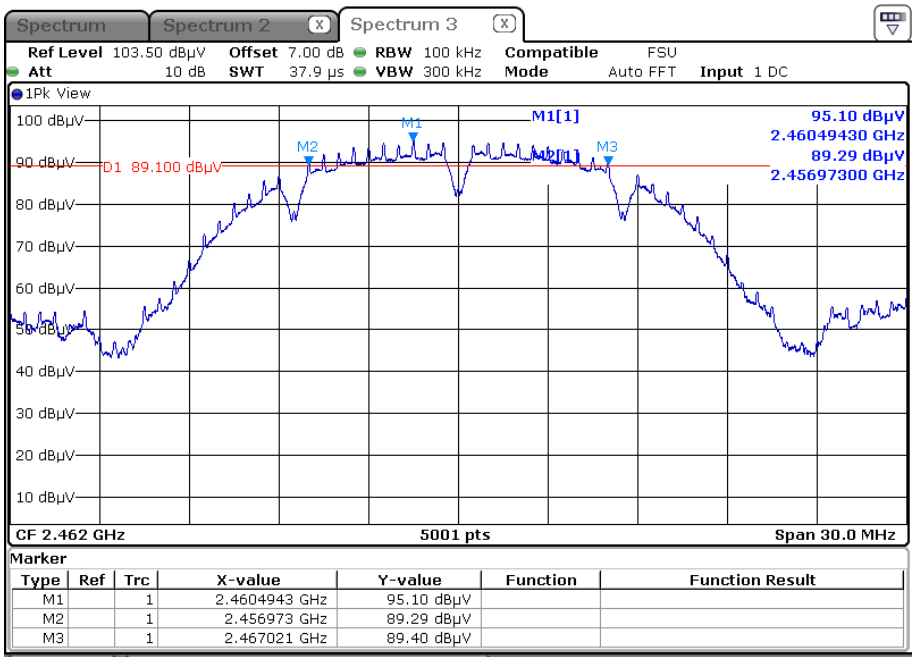
802.11b, Channel 1 (2412 MHz)



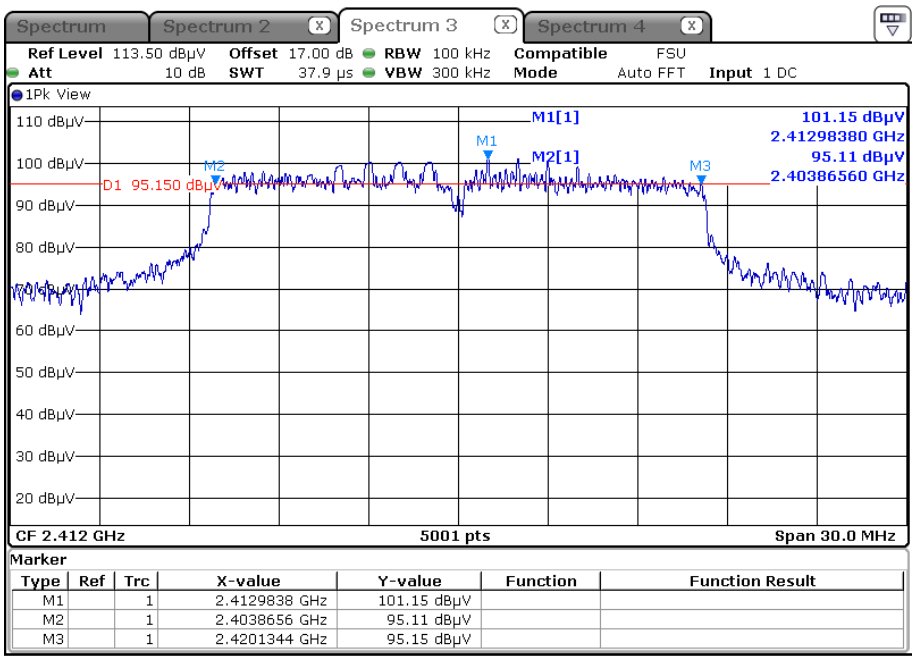
802.11b, Channel 6 (2437 MHz)



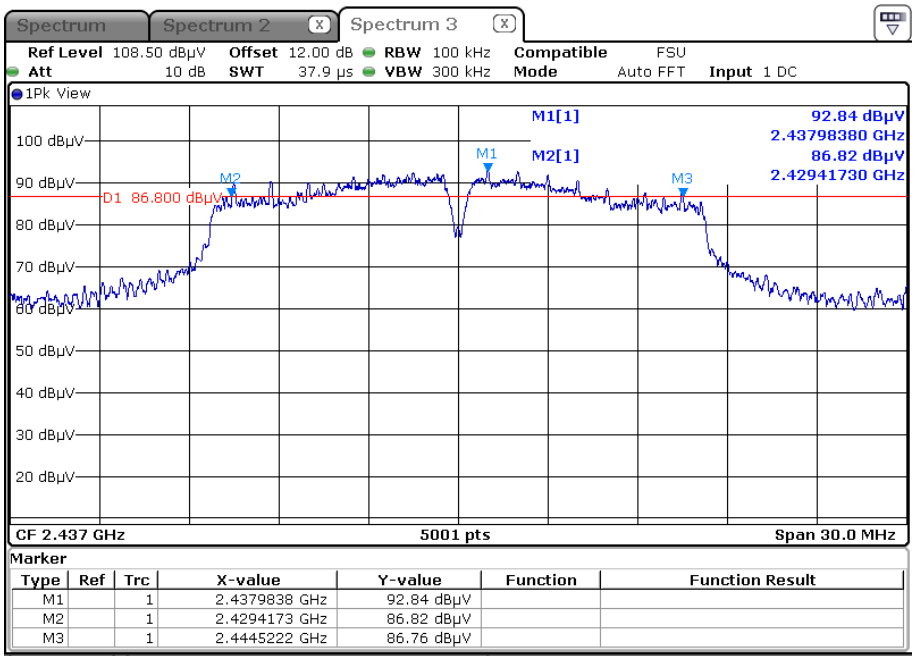
802.11b, Channel 11 (2462 MHz)



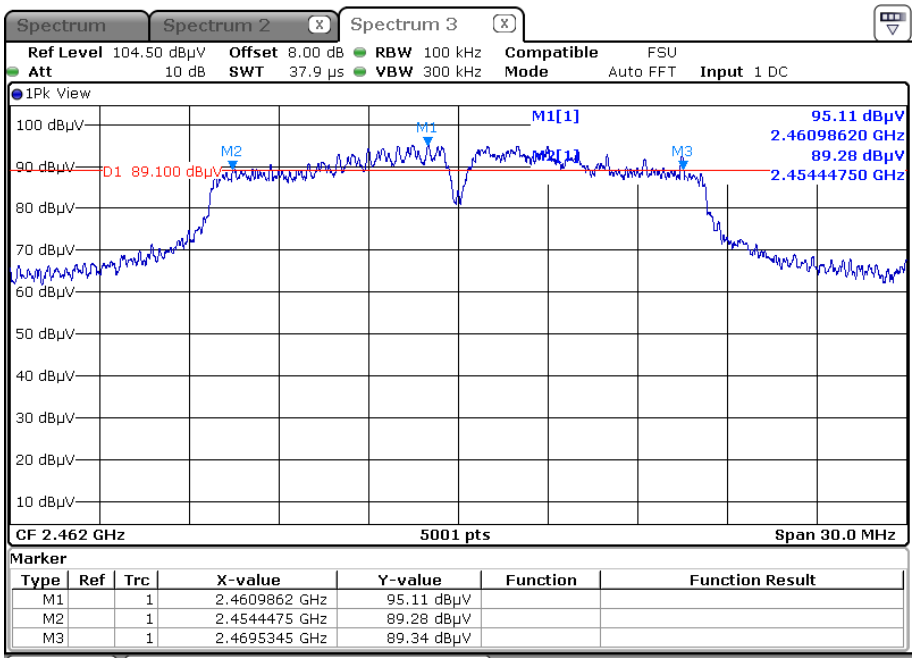
802.11g, Channel 1 (2412 MHz)



802.11g, Channel 6 (2437 MHz)



802.11g, Channel 11 (2462 MHz)



5.6 Radiated emissions in restricted bands

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

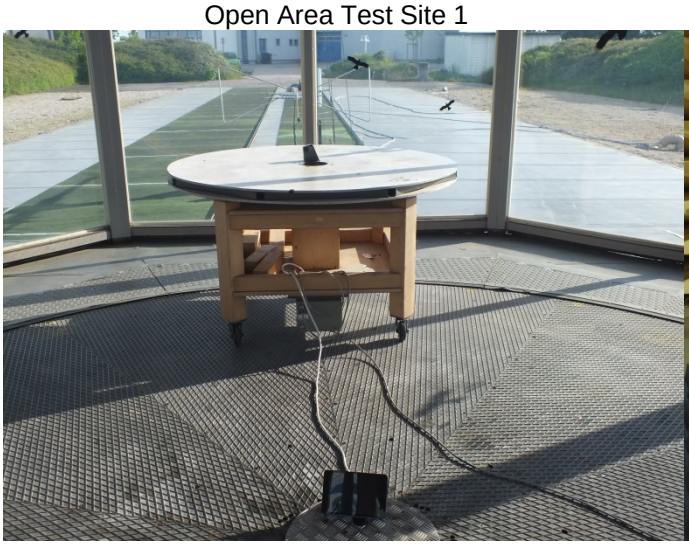
5.6.1 Description of the test location

Test location: OATS 1
Test location: Anechoic chamber 1

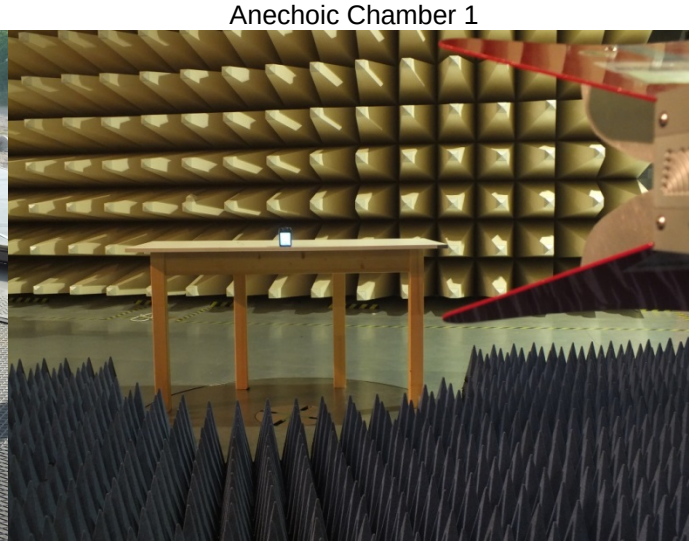
Test distance: 3 m

5.6.2 Photo documentation of the test set-up

Open Area Test Site 1



Anechoic Chamber 1



According to FCC Part 15, Section 15.205(a):
In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

5.6.3 Description of Measurement

The restricted bands are measured radiated. The span of the spectrum analyser is set wide enough to capture the restricted band and measure the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation. The restricted bands are measured falling emisiions into it and the nearest restricted band are checked for emissions also the restricted band for the harmonics of the carrier.

Spectrum analyser settings:
RBW: 1 MHz, VBW: 3 MHz, Sweep: Auto, Detector function: Peak

5.6.1 Test result

Emissions from 30 MHz – 1000 MHz, SER2

Frequency: Auto						
Test conditions: Active video streaming, auto connect to tablet PC						
			Test results			
Start f	Stop f	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
30	1000	120	280.00	34.0	46.0	-12.0
30	1000	120	288.00	38.4	46.0	-7.6
30	1000	120	312.00	32.3	46.0	-13.7
30	1000	120	480.00	35.6	46.0	-10.4
30	1000	120	504.00	34.0	46.0	-12.0
30	1000	120	696.00	34.0	46.0	-12.0
30	1000	120	780.00	36.8	46.0	-9.2
30	1000	120	840.00	37.9	46.0	-8.1
30	1000	120	888.00	38.9	46.0	-7.1
30					28.3	
Measurement uncertainty					±6 dB	

Emissions from 1 GHz – 25 GHz, SER 3

WLAN Standard 802.11b

Lowest frequency: CH1						
Test conditions: TX, 1 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		AVLimit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	2400	1000	1109.50	50.3	54.0	-3.7
2483.5	4000	1000	2700.25	42.6	54.0	-11.4
4000	12000	1000	4824.00	49.7	54.0	-4.3
12000	18000	1000	17842.50	49.1	54.0	-4.9
18000	25000	1000	24834.63	45.9	54.0	-8.1
Measurement uncertainty					±6 dB	

Middle frequency: CH6						
Test conditions: TX, 1 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		AV Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	2400	1000	1859.50	46.1	54.0	-7.9
2483.5	4000	1000	3790.75	42.4	54.0	-13.1
4000	12000	1000	4874.00	51.7	54.0	-1.0
12000	18000	1000	17949.75	48.6	54.0	-4.9
18000	25000	1000	24834.63	45.9	54.0	-5.9
Measurement uncertainty					±6 dB	

Highest frequency: CH11						
Test conditions: TX, 1 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		AV Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	2400	1000	1439.50	48.6	54.0	-5.4
2483.5	4000	1000	2760.25	45.3	54.0	-8.7
4000	12000	1000	9849.00	52.0	54.0	-2.0
12000	18000	1000	17940.00	48.8	54.0	-5.2
18000	25000	1000	24834.63	45.9	54.0	-8.1
Measurement uncertainty				±6 dB		

WLAN Standard 802.11g

Lowest frequency: CH1						
Test conditions: TX, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		AVLimit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	2400	1000	1439.50	46.9	54.0	-7.1
2483.5	4000	1000	2760.25	43.5	54.0	-10.5
4000	12000	1000	9648.00	50.1	54.0	-3.9
12000	18000	1000	17946.00	48.5	54.0	-5.5
18000	25000	1000	24834.63	45.9	54.0	-8.1
Measurement uncertainty				±6 dB		

Middle frequency: CH6						
Test conditions: TX, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		AV Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	2400	1000	1440.25	44.8	54.0	-9.2
2483.5	4000	1000	3816.25	42.3	54.0	-11.7
4000	12000	1000	4876.00	52.6	54.0	-1.4
12000	18000	1000	17998.50	48.8	54.0	-5.2
18000	25000	1000	24834.63	45.9	54.0	-8.1
Measurement uncertainty				±6 dB		

Highest frequency: CH11						
Test conditions: TX, 6 Mbps						
			Test results			
Start f	Stop f	RBW	Maximum emission		AV Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
1000	2400	1000	1439.50	46.7	54.0	-7.3
2483.5	4000	1000	2760.25	42.4	54.0	-11.6
4000	12000	1000	9848.00	52.7	54.0	-1.4
12000	18000	1000	17943.75	48.3	54.0	-5.7
18000	25000	1000	24834.63	45.9	54.0	-8.1
Measurement uncertainty				±6 dB		

Radiated limits according to FCC Part 15 Section 15.209(a) for spurious emissions which fall in restricted bands:

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

Restricted bands of operation:

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 1427	8.025 – 8.5
4.17725 – 4.17775	37.5 – 38.25	1435 – 1626.5	9.0 – 9.2
4.20725 – 4.20775	73 – 74.6	1645.5 – 1646.5	9.3 – 9.5
6.215 – 6.218	74.8 – 75.2	1660 – 1710	10.6 – 12.7
6.26775 – 6.26825	108 – 121.94	1718.8 – 1722.2	13.25 – 13.4
6.31175 – 6.31225	123 – 138	2200 – 2300	14.47 – 14.5
8.291 – 8.294	149.9 – 150.05	2310 – 2390	15.35 – 16.2
8.362 – 8.366	156.52475 – 156.52525	2483.5 – 2500	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	2690 – 2900	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3260 – 3267	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3332 – 3339	31.2 – 31.8
12.51975 – 12.52025	240 – 285	3345.8 – 3358	36.43 – 36.5
12.57675 – 12.57725	322 – 335.4	3600 – 4400	Above 38.6

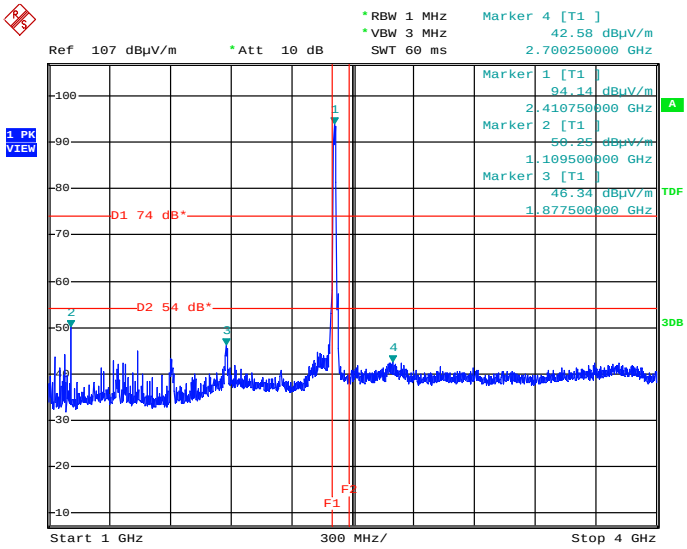
The requirements are **FULFILLED.**

Remarks: The measurement was performed up to the 10th harmonic. All emissions not reported in this test report are more than 20 dB below the specified limit. For detailed test results please see the following test protocols.

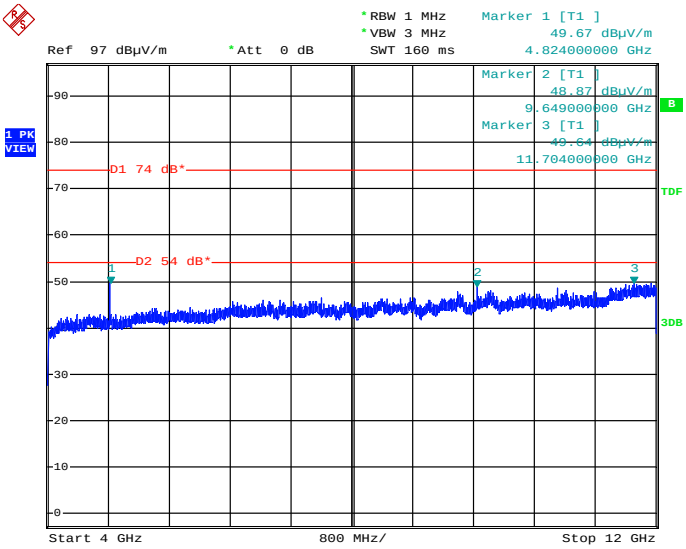
5.6.3 Test protocols

802.11b, Channel 1 (2412 MHz)

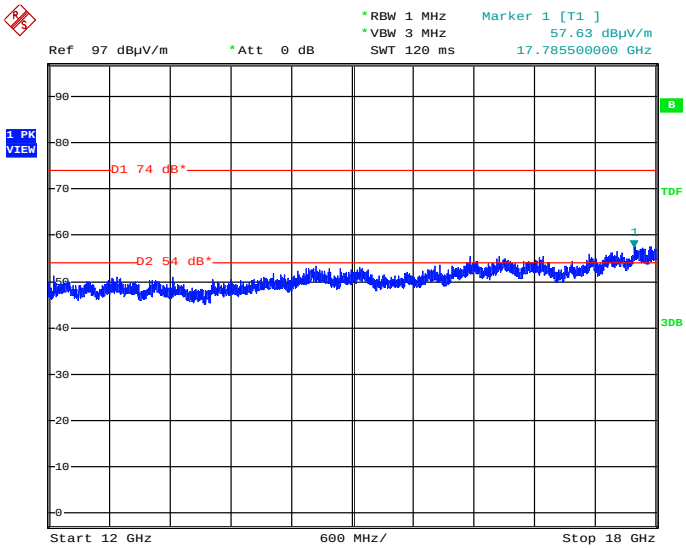
1 GHz -4 GHz



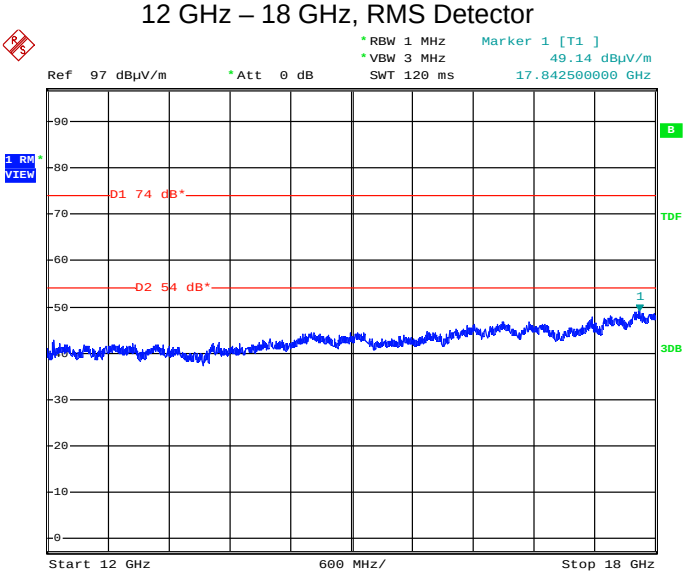
4 GHz -12 GHz



12 GHz – 18 GHz

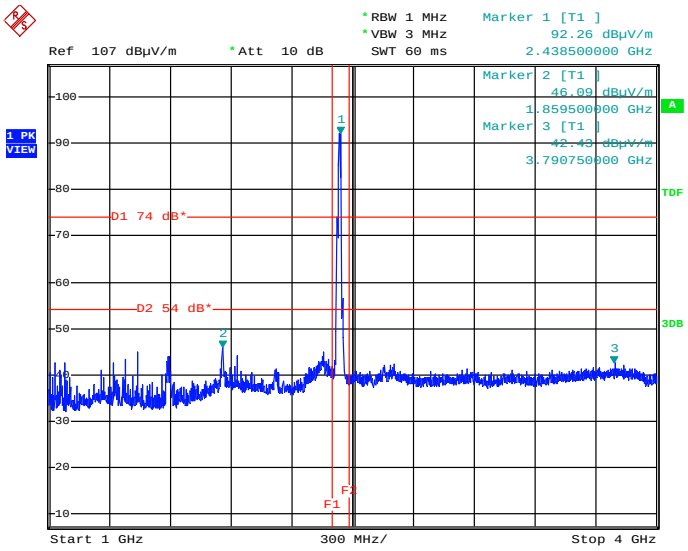


12 GHz – 18 GHz, RMS Detector

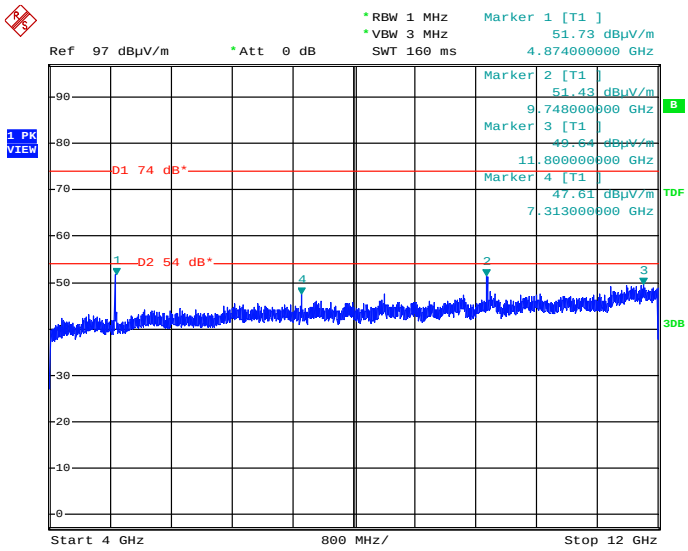


802.11b, Channel 6 (2437 MHz)

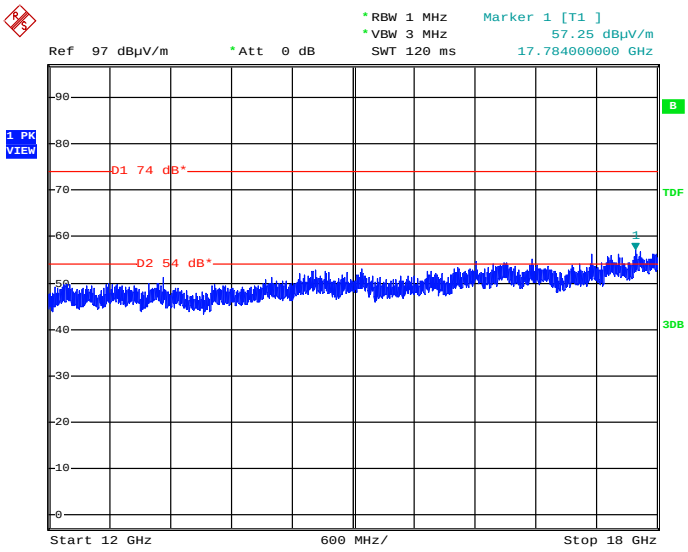
1 GHz -4 GHz



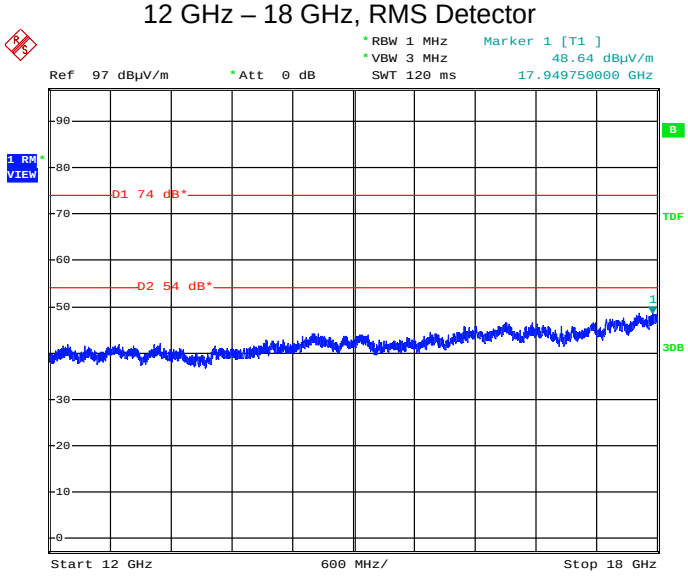
4 GHz -12 GHz



12 GHz – 18 GHz

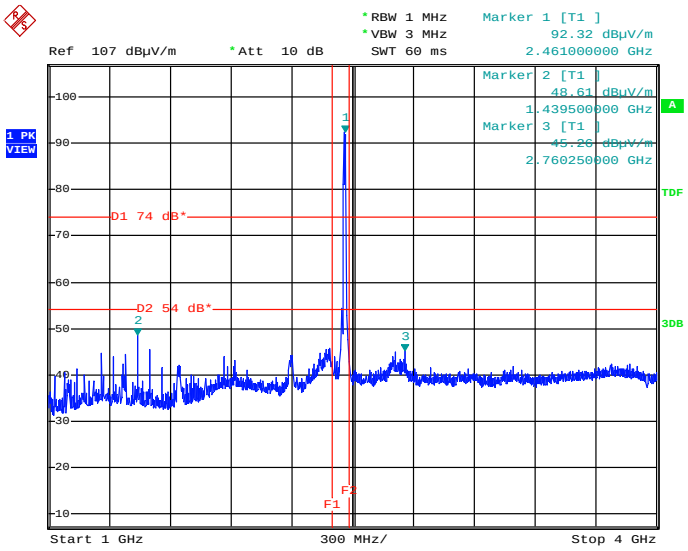


12 GHz – 18 GHz, RMS Detector

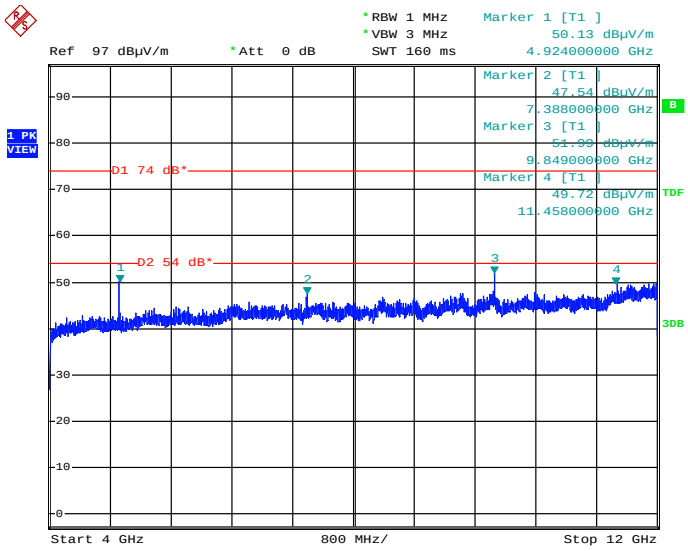


802.11b, Channel 11 (2462 MHz)

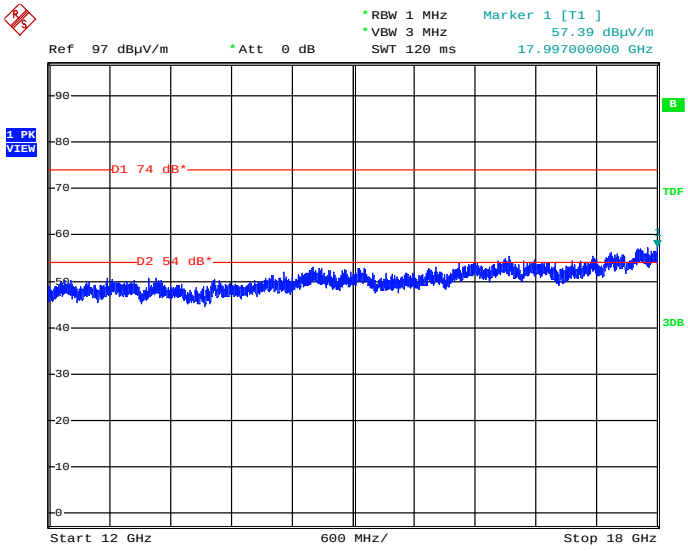
1 GHz -4 GHz



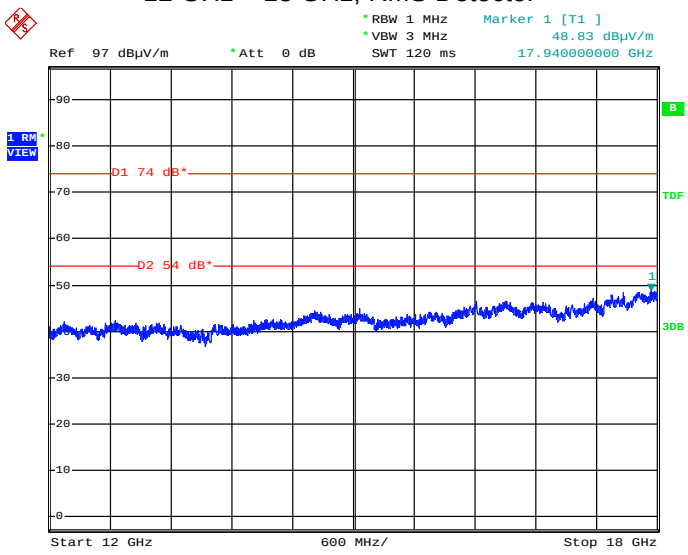
4 GHz -12 GHz



12 GHz – 18 GHz

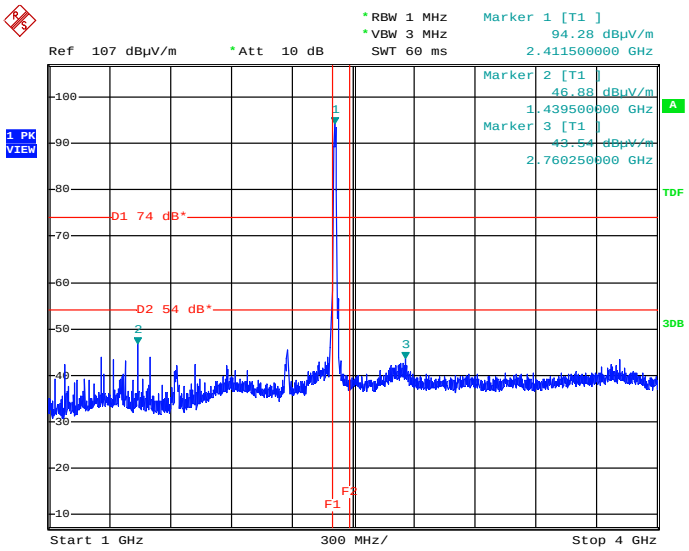


12 GHz – 18 GHz, RMS Detector

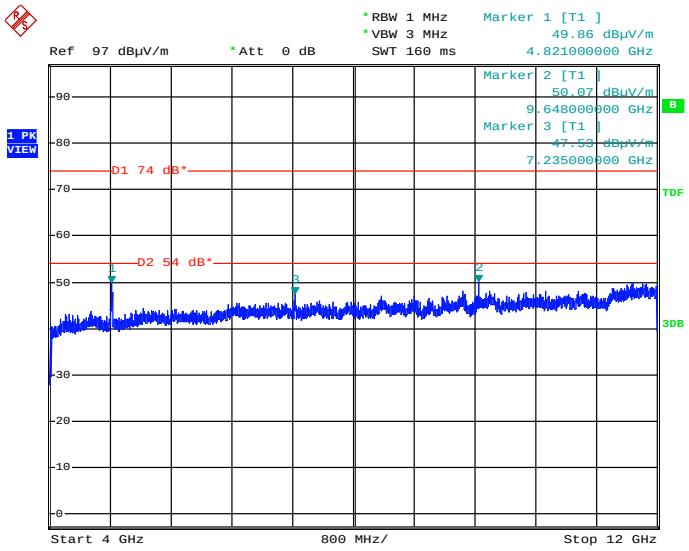


802.11g, Channel 1 (2412 MHz)

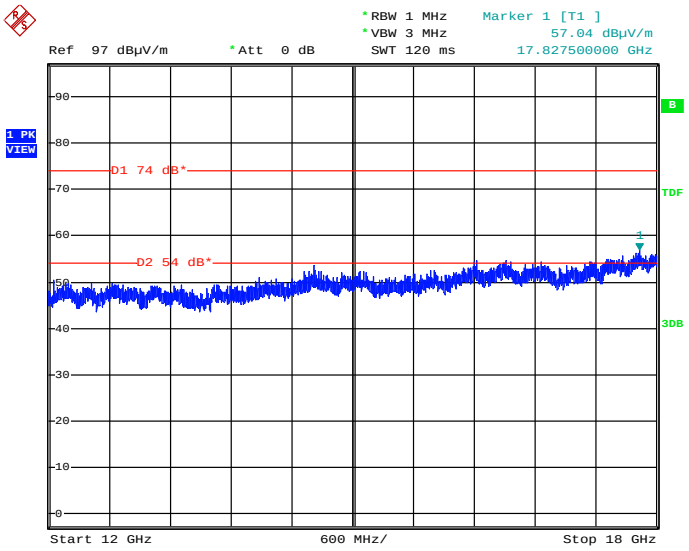
1 GHz -4 GHz



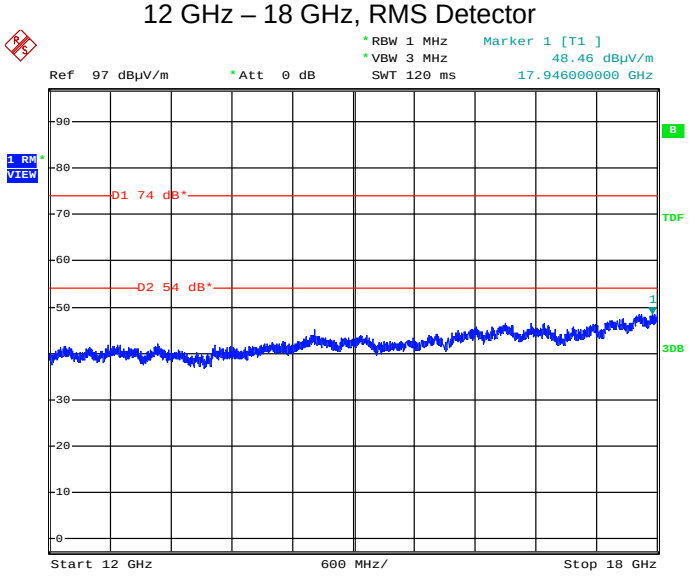
4 GHz -12 GHz



12 GHz – 18 GHz

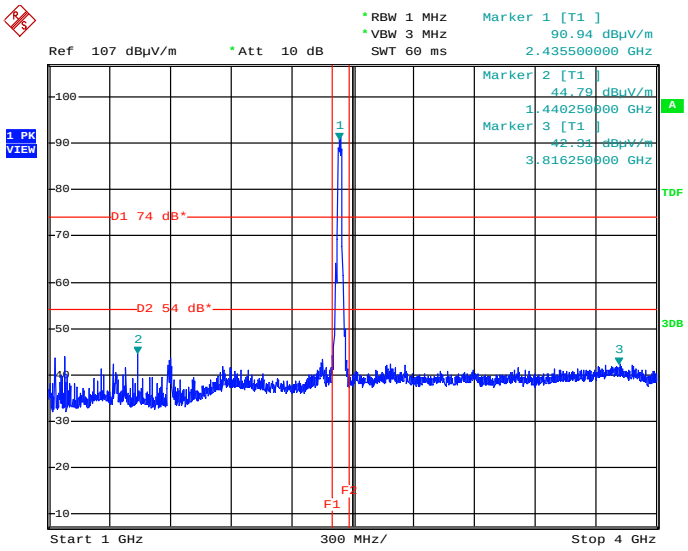


12 GHz – 18 GHz, RMS Detector

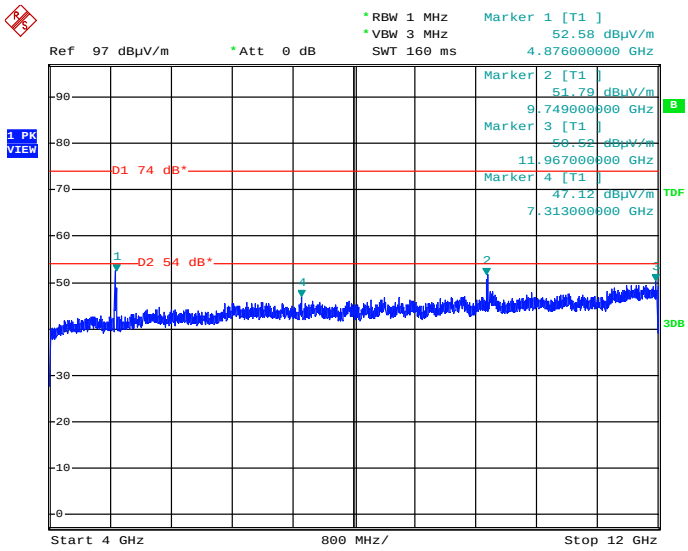


802.11g, Channel 6 (2437 MHz)

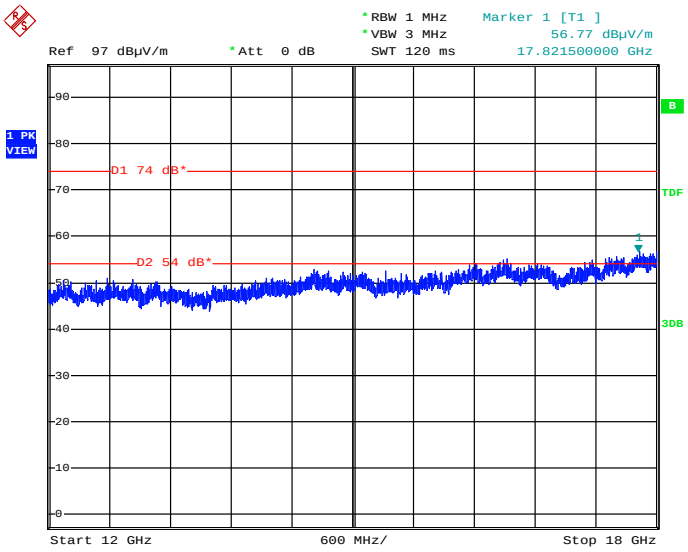
1 GHz -4 GHz



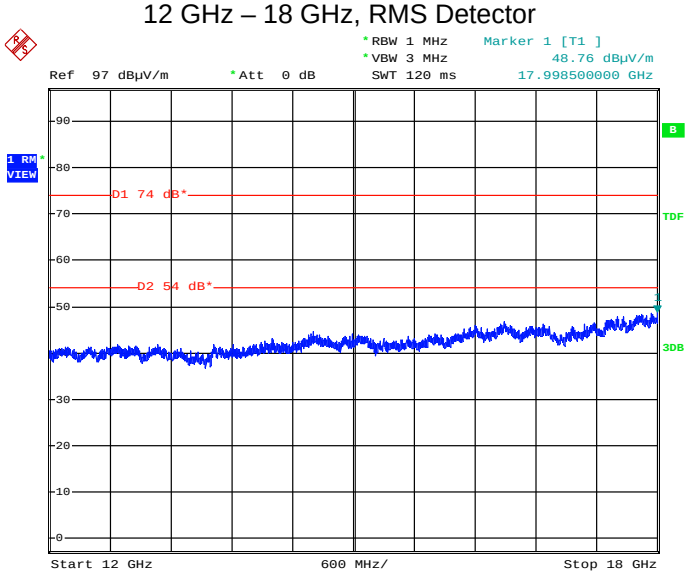
4 GHz -12 GHz



12 GHz – 18 GHz

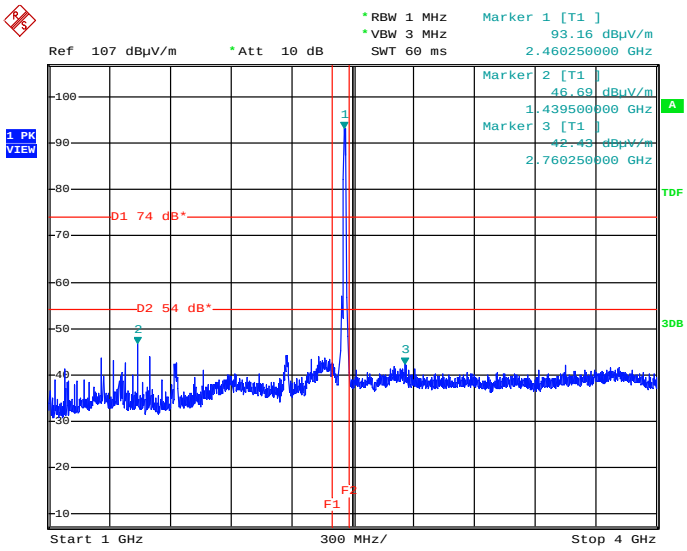


12 GHz – 18 GHz, RMS Detector

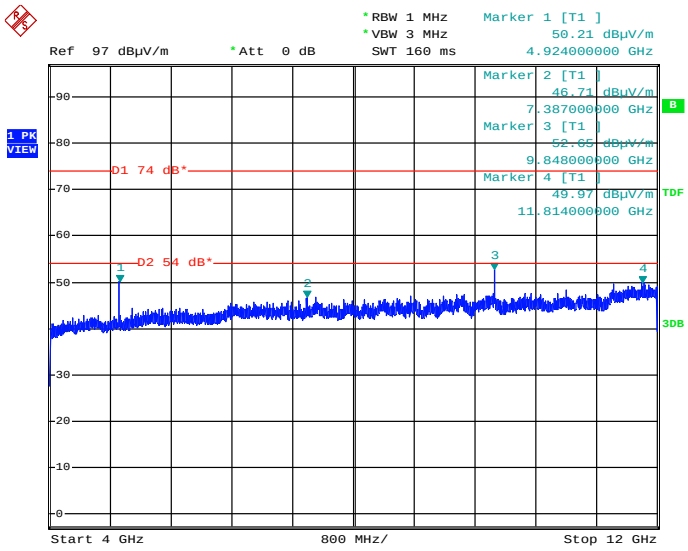


802.11g, Channel 11 (2462 MHz)

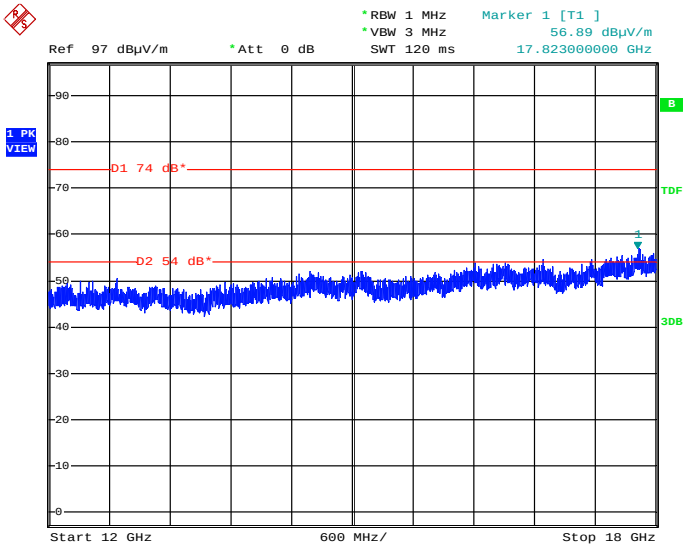
1 GHz -4 GHz



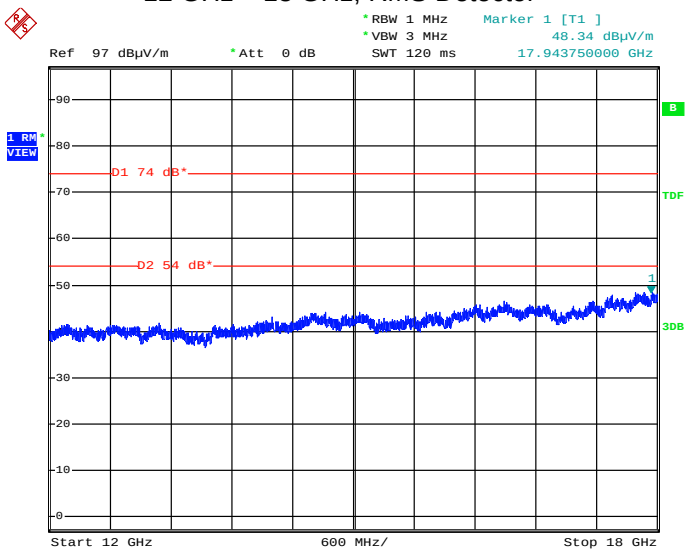
4 GHz -12 GHz



12 GHz – 18 GHz

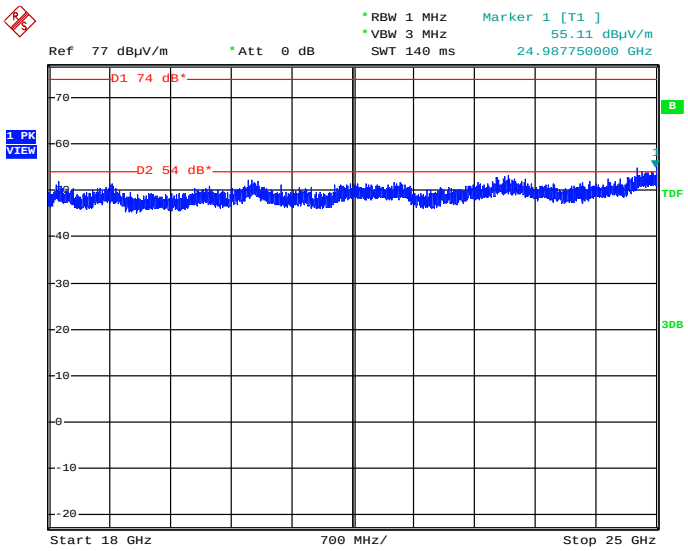


12 GHz – 18 GHz, RMS Detector

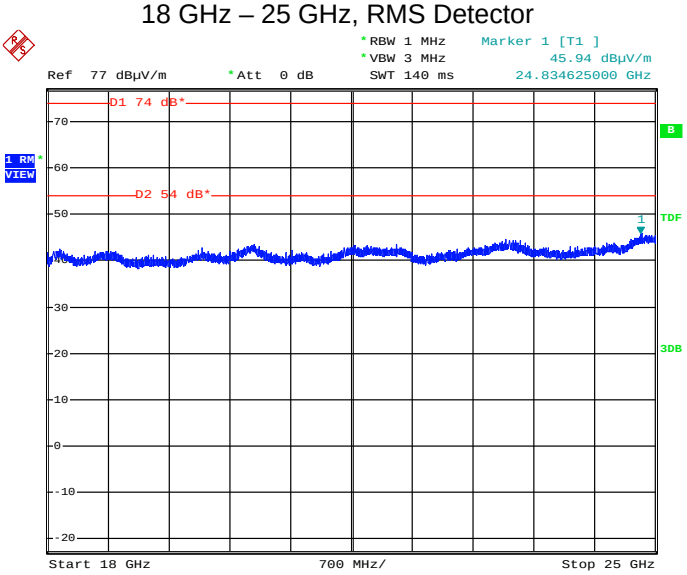


All Modulations, all channels.

18 GHz – 25 GHz



18 GHz – 25 GHz, RMS Detector



5.7 Spurious emissions radiated

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

5.7.1 Description of the test location

Test location: NONE
Test location: NONE

Test distance: -

5.7.2 Applicable standard

According to FCC Part 15, Section 15.247(d):
In any 100 kHz bandwidth outside the frequency bands 2400 – 2483.50 MHz and 5725 – 5850 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a) (see Section 15.205(c)).

5.7.3 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.4. If the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported.

Test receiver settings for SER2:
RBW: 120 MHz, Detector: Quasi peak, Sweep time : 1 s

Spectrum analyser settings for SER3:
RBW: 100 kHz, VBW: 300 kHz, Detector: Max. peak, Trace: Max. hold, Sweep: Auto

5.7.4 Test result

Note:
Measurements were performed in the frequency range from 1 GHz up to 25 GHz with the analyser settings for restricted band measurements to show compliance for emissions falling into restricted bands, else the band edge compliance is fulfilled. In the frequency ranges from 9 kHz up to 30 MHz and from 18 GHz up to 25 GHz no emission can be detected.
According to FCC Part 15, Section 15.205(a):
In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limit specified in Section 15.209(a).

Limit according to FCC Part 15, Section 15.247(d) for emissions falling not in restricted bands:
In any 100 kHz bandwidth outside the frequency bands 2400 – 2483.50 MHz and 5725 – 5850 MHz, the digitally modulated radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or an radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

Frequency (MHz)	Spurious emission limit
Below 1000	20 dB below the highest level of the desired power
Above 1000	20 dB below the highest level of the desired power

The requirements are **FULFILLED.**

Remarks: _____

5.8 RF exposure consideration for SAR test exclusion

According to KDB 447498 D01 General RF Exposure Guidance v05r02 chapter 4.3.1 the 1-g SAR number is calculated for a distance of **5** mm using the following formula.

$$\left(\frac{Max.\ Pchannel\ (mW)}{Distance\ (mm)}\right) * \sqrt{f(GHz)} \leq 3$$

Where:

Max. Pchannel = EIRP (mW)
Distance = 5 mm
f (GHz) = Channel frequency (MHz) divided by thousand

5.8.1 Test result

WLAN Standard 802.11b

Channel frequency (MHz)	EIRP (dBm)	EIRP (mW)	1-g SAR (1)	Limit 1-g SAR (1)
2412	-0.6	0.87	0.27	3.0
2437	-2.7	0.53	0.17	3.0
2462	-2.0	0.63	0.20	3.0

WLAN Standard 802.11g

Channel frequency (MHz)	EIRP (dBm)	EIRP (mW)	1-g SAR (1)	Limit 1-g SAR (1)
2412	9.0	7.89	2.45	3.0
2437	3.3	2.13	0.66	3.0
2462	7.2	5.30	1.66	3.0

The limits for SAR test exclusion threshold are given in KDB 447498 D01 General RF Exposure Guidance Appendix A.

The requirements are **FULFILLED.**

Remarks: _____

_____

5.9 Antenna application

5.9.1 Applicable standard

According to FCC Part 15C, Section 15.203:
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 manufacturer may design the unit that broken antennas can be replaced by the user, but the use of a standard antenna jack is prohibited.

The EUT has an integrated antenna. No other antenna can be used with the device.

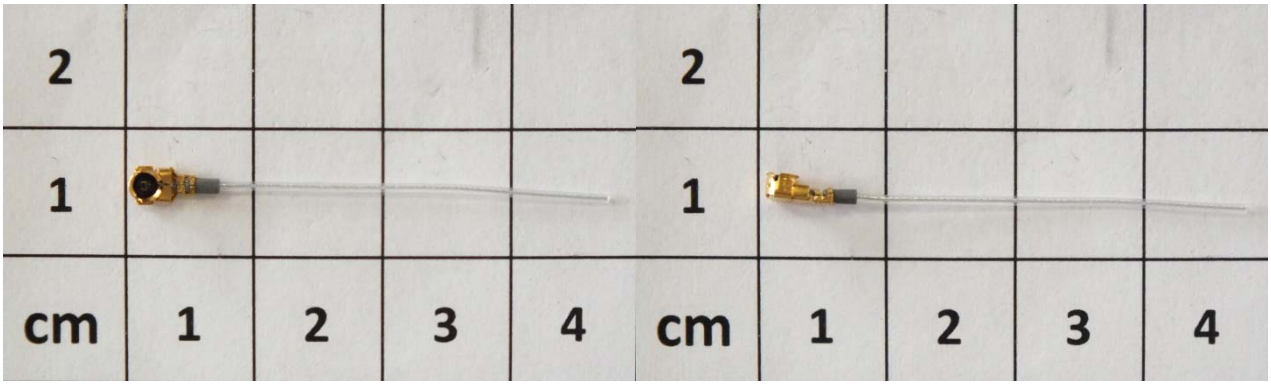
All supplied antennas meet the requirements of part 15.203 and 15.204.

5.9.2 Antenna requirements

According to FCC Part 15C, Section 15.247(b)(4):
The conducted output power limit specified in paragraph (b) of 15.247 is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from intentional radiator shall be reduced below the stated values in paragraph (b)(1), (b)(2) and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The output power has not to be reduced using the antenna type Anaren 66089-2430.

5.9.3 Photo documentation of the used antenna



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	30/09/2014	30/09/2013		
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	3117	02-02/24-05-009	07/05/2015	07/05/2014		
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				
	SF104/11N/11N/1500MM	02-02/50-13-015				
MB	ESR 7	02-02/03-13-001	21/05/2014	21/05/2013		
SER 1	FMZB 1516	01-02/24-01-018			13/02/2015	13/02/2014
	ESCI	02-02/03-05-005	12/12/2014	12/12/2013		
SER 2	ESVS 30	02-02/03-05-006	28/06/2014	28/06/2013		
	VULB 9168	02-02/24-05-005	08/04/2015	08/04/2014	08/10/2014	08/04/2014
	S10162-B	02-02/50-05-031				
	NW-2000-NB	02-02/50-05-113				
	KK-EF393/U-16N-21N20 m	02-02/50-12-018				
SER 3	FSP 40	02-02/11-11-001	30/09/2014	30/09/2013		
	JS4-18004000-30-5A	02-02/17-05-017				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	AFS4-01000400-10-10P-4	02-02/17-13-002				
	AMF-4F-04001200-15-10P	02-02/17-13-003				
	3117	02-02/24-05-009	07/05/2015	07/05/2014		
	BBHA 9170	02-02/24-05-014				
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				
	KMS102-0.2 m	02-02/50-11-020				
	SF104/11N/11N/1500MM	02-02/50-13-015				