FCC ID: BWY-MCAIRE001

EMI – TEST REPORT

- FCC Part 15.247, RSS210 -

DAkkS Deutsche Akkreditierungsstelle D-PL-12030-01-01

Test Report No. : T36291-00-00HS	17. December 2012 Date of issue

Type / Model Name : McAIRE

Product Description : AV product with WLAN Module

Applicant : McIntosh Laboratory, Inc.

Address : 2 Chambers Street
BINGHAMTON, NY 13903, USA

Manufacturer : McIntosh Laboratory, Inc.

Address : 2 Chambers Street
BINGHAMTON, NY 13903, USA

Licence holder : McIntosh Laboratory, Inc.

Address : 2 Chambers Street
BINGHAMTON, NY 13903, USA

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

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (September, 2012)

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, 2012)

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
CISPR 22: 2005 EN 55022: 2006	Information technology equipment
KDB 558074 D01 v02	Guidance for performing compliance measurements on DTS operating under Section 15.247, 2012-10-4.

2 SUMMARY

2.1 Test result summery

WLAN device using digital modulation:

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.	AC power line conducted emissions	passed
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	Spurious emissions conducted	passed
15.247(d)	RSS-Gen, 7.2.2	Spurious emissions conducted, 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
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 AV-device with WLAN capability. The EUT operates as client only. The WLAN is compatible with 802.11b, g Standard. It supports the 2.4 GHz frequency band only. The firmware does not support the ad-hoc modes.

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

Note: The firmware of the EUT permits only to operate on the channels mentioned in the table above.

Antennas

The following antenna is intended for use:

Number	Characteristic	Model number	Plug	Frequency range (GHz)	Gain (dBi)	Cable loss (dB)	Effective gain (dBi)
1	Omni	122448 McAire Antenna EA-79B_2E	R-SMA	2.4	2.8	0	2.8

Note: Effective gain = Gain – Cable loss;

Transmit operating modes

Both modules 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 : 15 November 2012

Testing concluded on : 20 November 2012

Checked by:

Klaus Gegenfurtner
I confirm the correctness and Integrity of this documents
2012.12.18 08:04:01 +01'00'

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

Tested by:

Hermann Smetana
I am the author of this document
2012.12.17 13:15:45 +01'00'

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

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – Detailed photos see attachment A, T36291-00

3.2 Power supply system utilised

Power supply voltage, V_{nom} : 100 VAC to 240 VAC

3.3 Short description of the equipment under test (EUT)

The EUT has different ways to support audio files. One of the important is internet radio per WLAN.

Number of tested samples: 1
Serial number: ACE1002

EUT operation mode:

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

- 802.11 b, TX continuous mode, modulated

- 802.11g, TX continuous mode, modulated

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 : _____

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 is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „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, 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 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

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.

4.4.1.3 Details of test procedures

The test methods used comply with CISPR Publication 22, EN 55022 - " Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.1.4 Conducted emission

The final level, expressed in dBµV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit or to the CISPR limit.

To convert between dBµV and µV, the following conversion formula applies:

$$dB\mu V = 20*\log(\mu V)$$
$$\mu V = 10^{(dB\mu V/20)}$$

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 50 Ω / 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 re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

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 cannot be set by application software.

The test software for the EUT provides the special test mode TX continuous, modulated but no power setting. The EUT is set with test modulation to transmit random data during the tests with a duty cycle (x) of nearly x = 1 from an internal packet generator.

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	Pmax	DSSS	DBPSK	1 Mbps
802.11g	1 to 11	1, 6, 11	Pmax	OFDM	BPSK	6 Mbps

5 TEST CONDITIONS AND RESULTS

5.1 Conducted emissions

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

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up – Detailed photos see attachment B, T36291-00

5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):
Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.4 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin: -15.7 dB at 0.7 MHz

Limit according to FCC Part 15, Section 15.207(a):

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

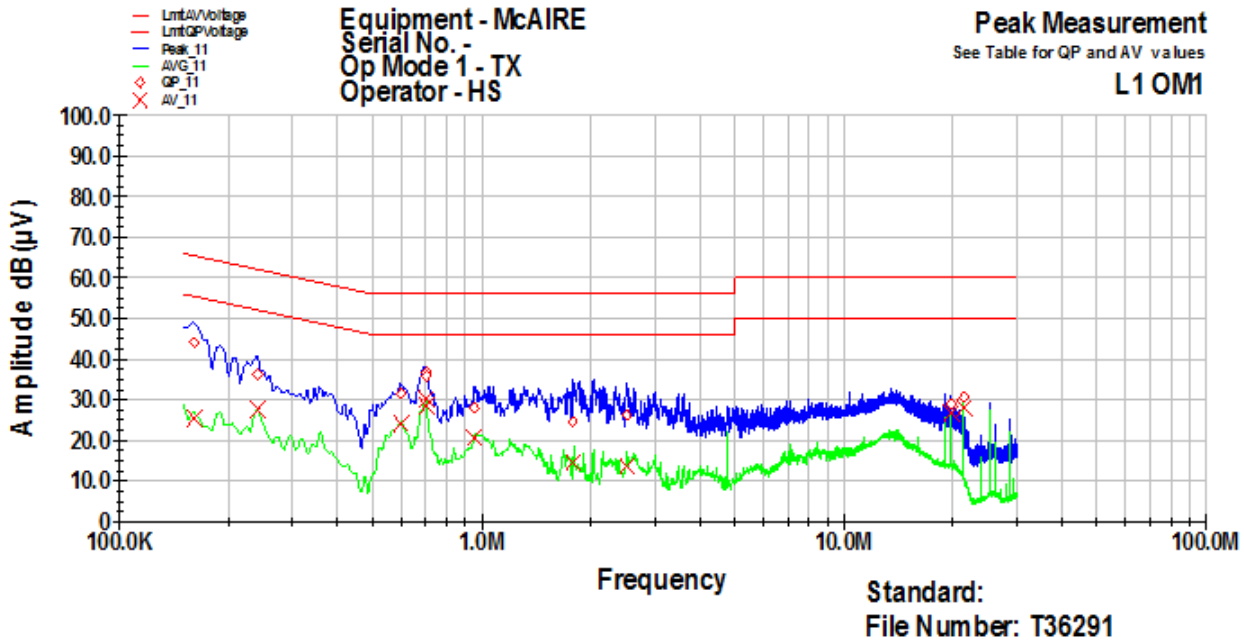
* Decreases with the logarithm of the frequency

The requirements are **FULFILLED.**

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

5.1.6 Test protocol

Test point L1 Result: passed
Operation mode: 802.11 b, TX continuous mode, modulated
Remarks:



Frequency	QP Level	QP Margin	QP Limit	AV Level	AV Margin	AV Limit
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB
0.16	44.0	-21.4	65.5	25.3	-30.1	55.5
0.24	36.3	-25.8	62.1	27.5	-24.6	52.1
0.6	31.6	-24.4	56.0	24.1	-21.9	46.0
0.7	36.8	-19.2	56.0	30.3	-15.7	46.0
0.705	35.7	-20.3	56.0	28.6	-17.4	46.0
0.955	28.0	-28.0	56.0	20.6	-25.4	46.0
1.785	24.4	-31.6	56.0	14.4	-31.6	46.0
2.515	26.1	-29.9	56.0	13.4	-32.5	46.0
19.755	29.0	-31.0	60.0	26.8	-23.3	50.0
21.405	30.5	-29.5	60.0	28.1	-21.9	50.0

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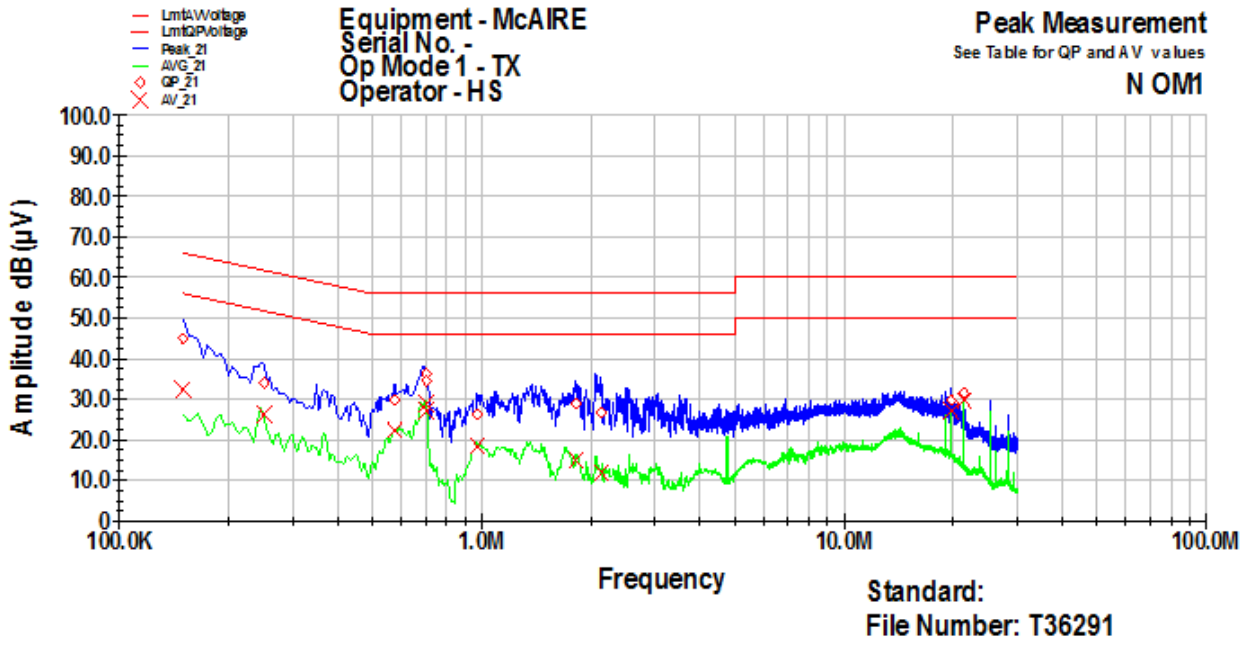
Test point N Result: passed
Operation mode: 802.11 b, TX continuous mode, modulated
Remarks:



Frequency	QP Level	QP Margin	QP Limit	AV Level	AV Margin	AV Limit
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB
0.15	44.8	-21.2	66.0	32.2	-23.8	56.0
0.25	34.2	-27.6	61.8	26.4	-25.3	51.8
0.575	29.6	-26.4	56.0	22.2	-23.8	46.0
0.7	36.0	-20.0	56.0	29.0	-17.0	46.0
0.705	34.4	-21.6	56.0	27.3	-18.7	46.0
0.97	26.4	-29.6	56.0	18.6	-27.4	46.0
1.82	28.8	-27.2	56.0	14.9	-31.1	46.0
2.135	26.6	-29.4	56.0	12.0	-34.0	46.0
19.755	29.9	-30.1	60.0	27.3	-22.7	50.0
21.41	31.3	-28.7	60.0	29.9	-20.1	50.0

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 – Detailed photos see attachment B, T36291-00

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 is 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: 300 kHz, VBW: 1 MHz, Detector: Peak, Sweep time: 5 s

5.2.5 Test result

WLAN Standard 802.11b

Channel	Centre frequency	EBW 6 dB	Minimum limit
	(MHz)	(MHz)	(MHz)
1	2412	12.000	0.5
6	2432	12.000	0.5
11	2462	12.000	0.5

WLAN Standard 802.11g

Channel	Centre frequency	EBW 6 dB	Minimum limit
	(MHz)	(MHz)	(MHz)
1	2412	16.480	0.5
6	2432	16.560	0.5
11	2462	16.480	0.5

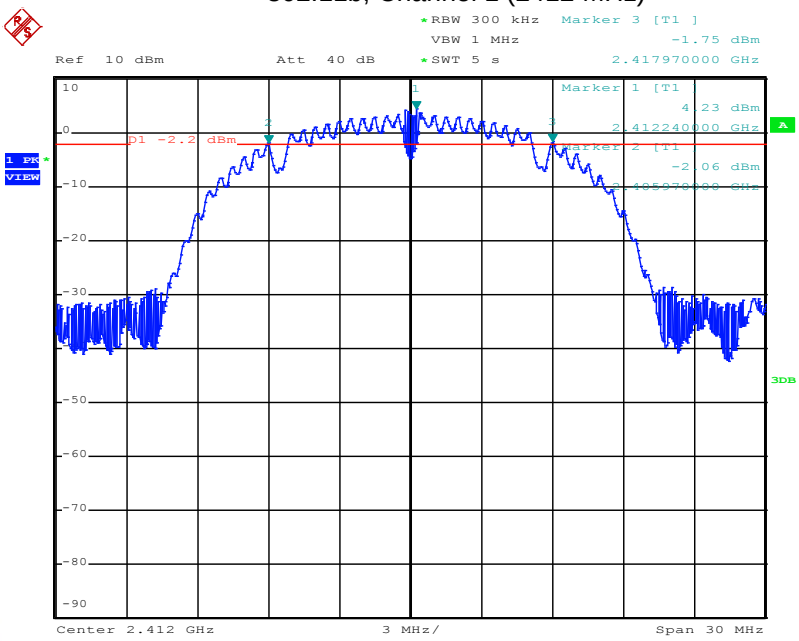
The requirements are **FULFILLED.**

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

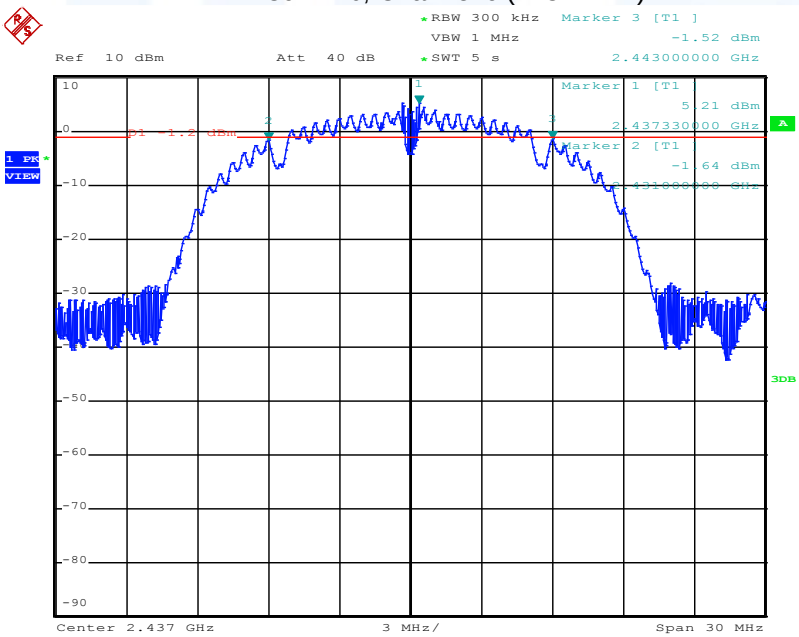
5.2.6 Test protocols

EBW:

802.11b, Channel 1 (2412 MHz)



802.11b, Channel 6 (2437 MHz)



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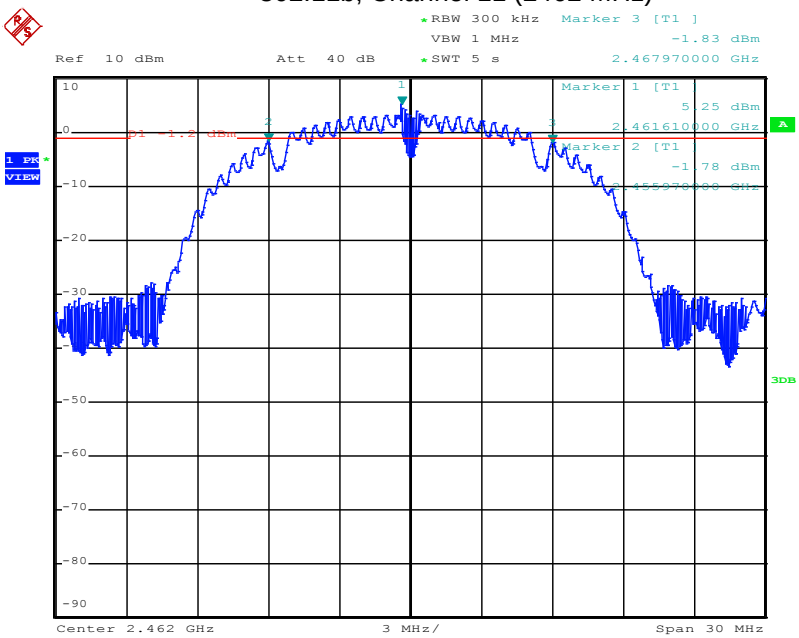
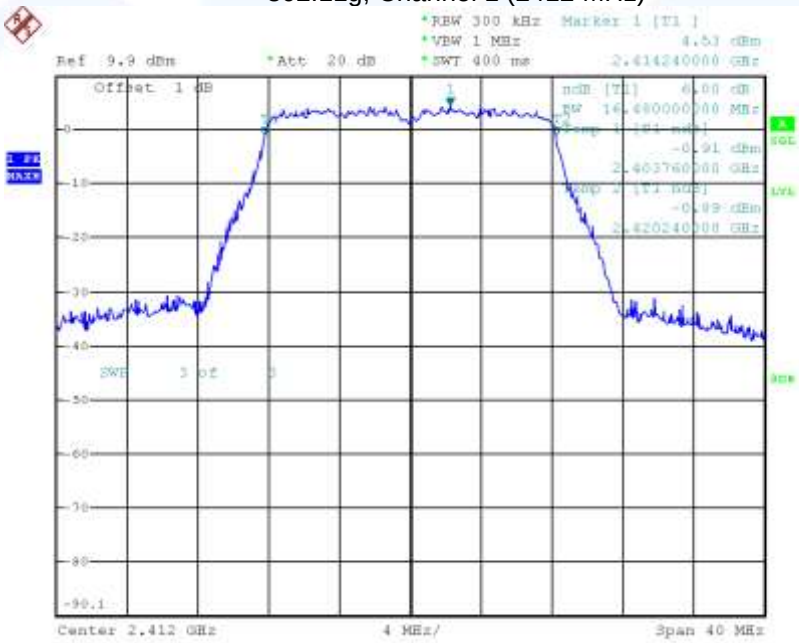
802.11b, Channel 11 (2462 MHz)

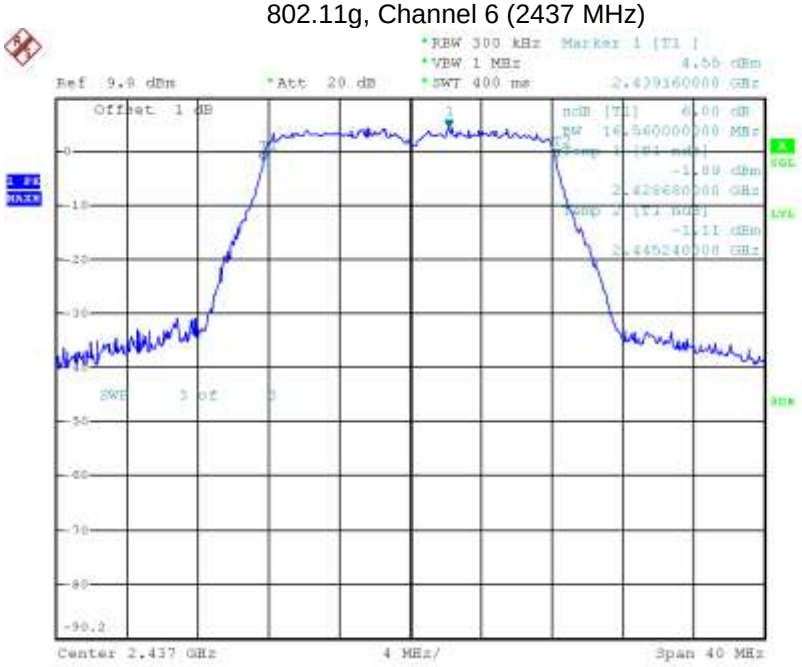


802.11g, Channel 1 (2412 MHz)

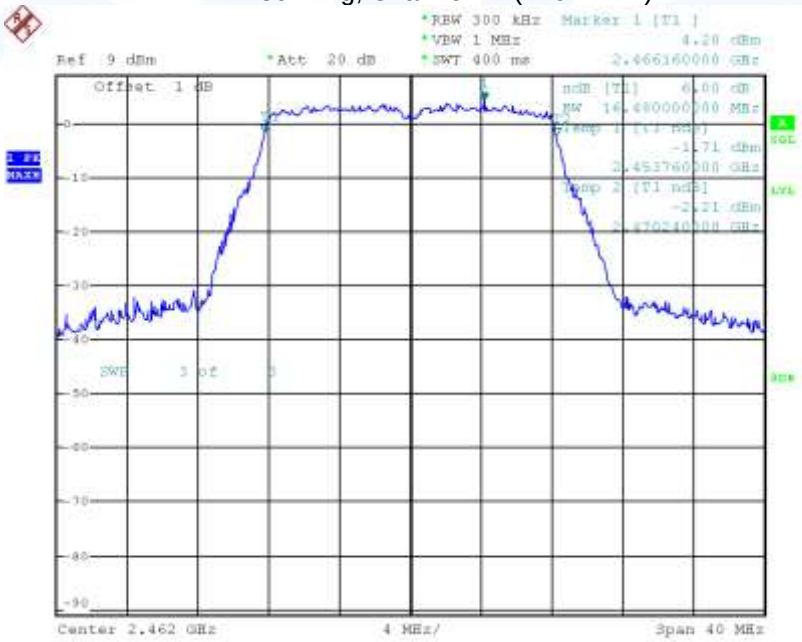


FCC ID: BWY-MCAIRE001

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 – Detailed photos see attachment B, T36291-00

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

5.3.3 Test result

WLAN Standard 802.11b

Channel	Centre frequency	OBW 99%
	(MHz)	(MHz)
1	2412	16.200
6	2432	16.140
11	2462	16.200

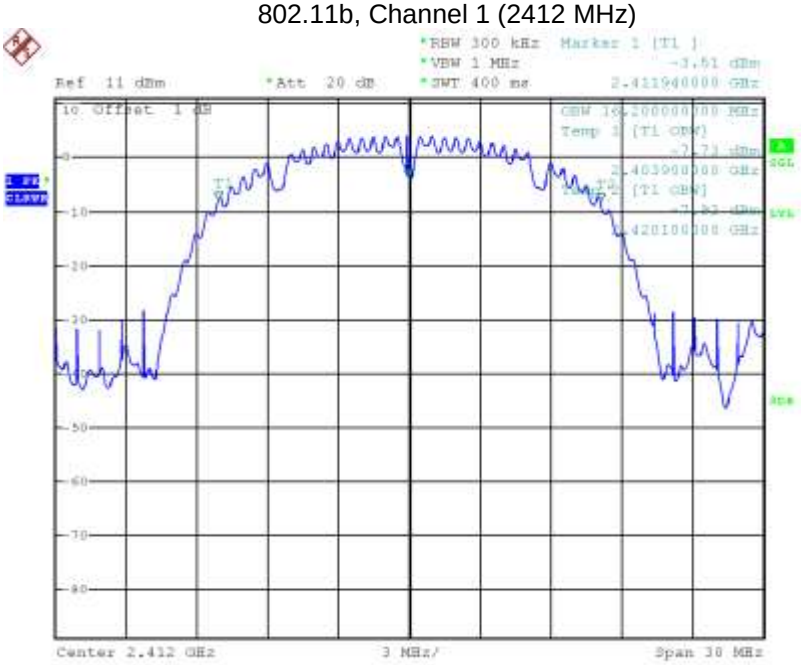
WLAN Standard 802.11g

Channel	Centre frequency	OBW 99%
	(MHz)	(MHz)
1	2412	16.920
6	2432	16.920
11	2462	16.860

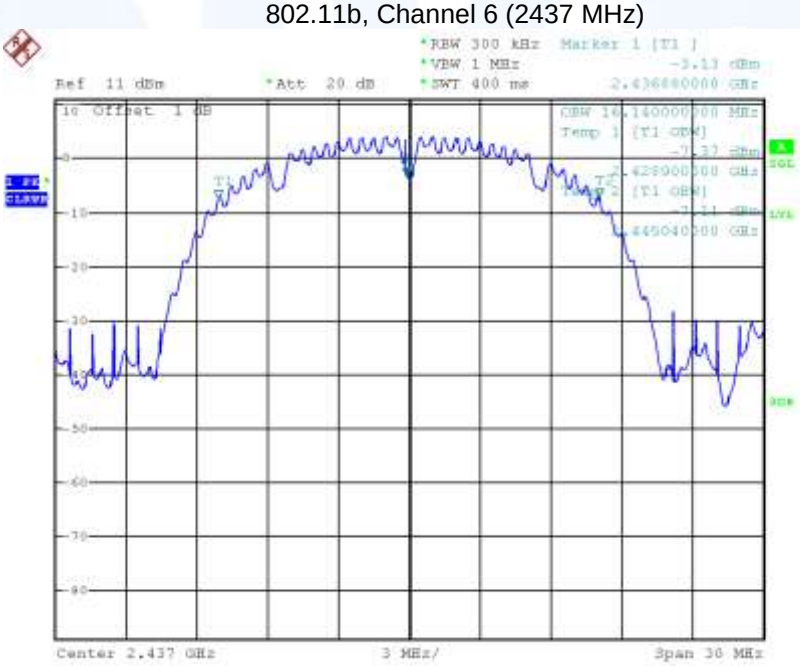
Remarks: For detailed test result please refer to following test protocols. The RSS Gen defines no limit for the occupied bandwidth!

5.3.4 Test protocols OBW99:

802.11b, Channel 1 (2412 MHz)



802.11b, Channel 6 (2437 MHz)



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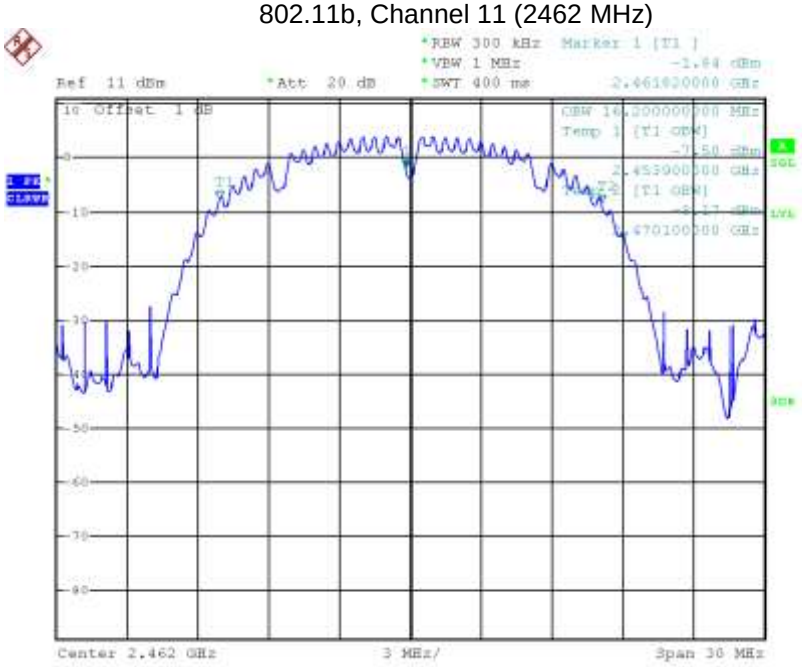
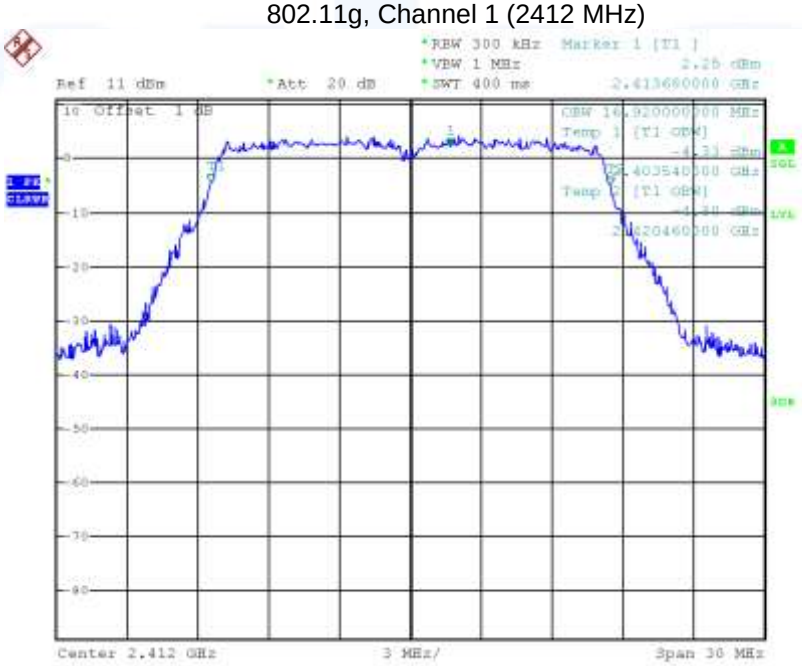
802.11b, Channel 11 (2462 MHz)

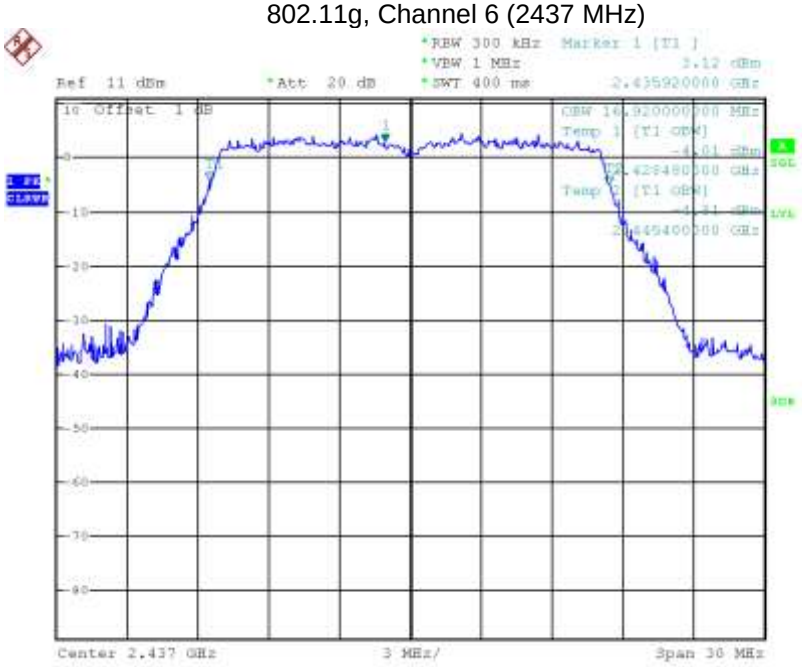


802.11g, Channel 1 (2412 MHz)

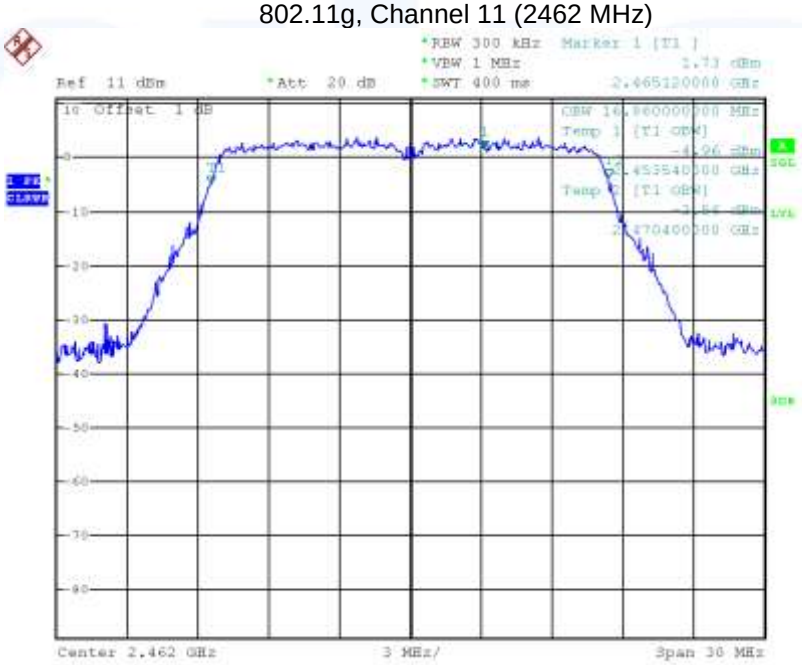


FCC ID: BWY-MCAIRE001

802.11g, Channel 6 (2437 MHz)



802.11g, Channel 11 (2462 MHz)



5.4 Maximum peak conducted output power

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

5.4.1 Description of the test location

Test location: AREA4

5.4.2 Photo documentation of the test set-up – Detailed photos see attachment B, T36291-00

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 output power is measured conducted using a spectrum analyser in a test setup following the procedures set out in KDB 558074 for DTS under Item 8.1.2. The EUT is set while measuring in TX continuous mode with a duty cycle, x = 1.

Analyser settings:
Band power measuring function:
RBW= 1 MHz, VBW= 3 MHz, Span: > EBW, Trace mode: max hold, Channel BW= 20 MHz.

5.4.5 Test result

802.11b, 1 Mbps, 1 TX		Test results conducted		
Duty cycle: 100%				
Chain 1		A [Pmax] (dBm)	Limit (dBm)	Margin (dB)
Lowest frequency: CH1				
T_{nom}	V_{nom}	17.7	30.0	-12.3
Middle frequency: CH6				
T_{nom}	V_{nom}	18.0	30.0	-12.0
Highest frequency: CH11				
T_{nom}	V_{nom}	17.8	30.0	-12.2

Note: 1 dB cable loss is taken into account.

802.11g, 6 Mbps, 1 TX		Test results conducted		
Duty cycle: 100%				
Chain 1		A [Pmax] (dBm)	Limit (dBm)	Margin (dB)
Lowest frequency: CH1				
T_{nom}	V_{nom}	21.2	30.0	-8.8
Middle frequency: CH6				
T_{nom}	V_{nom}	21.1	30.0	-8.9
Highest frequency: CH11				
T_{nom}	V_{nom}	20.8	30.0	-9.2

Note: 1 dB cable loss is taken into account.

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

Frequency (MHz)	Peak Power Limit	
	(dBm)	(Watt)
902-928	30	1.0
2400-2483.5	**30**	**1.0**
5725-5850	30	1.0

The requirements are **FULFILLED.**

Remarks:

5.5 Power spectral density

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

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up – Detailed photos see attachment B, T36291-00

5.5.3 Applicable standard

According to FCC Part 15, Section 15.247(e):
For digitally modulated systems, the power spectral density conducted 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 conducted output power shall be used to determine the power spectral density.

5.5.4 Description of Measurement

The measurement is performed using the procedure set out in KDB-558074.. Therefore the Item 9.1, Option 1 is measured. The cable loss of 1.0 dB @ 2.45 GHz is taken into account with an amplitude offset. BWCF= -15.2 dB.

Spectrum analyser settings:
RBW: 100 kHz, VBW: 300 kHz, Detector: Peak, Sweep time: auto, Trace: max hold;

5.5.5 Test result

802.11b, 1 Mbps, 1 TX Duty cycle: 100%		Test results conducted		
Chain 1		PD [Pmax] (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Lowest frequency: CH1				
T_{nom}	V_{nom}	-12.1	8.0	-20.1
Middle frequency: CH6				
T_{nom}	V_{nom}	-11.8	8.0	-19.8
Highest frequency: CH11				
T_{nom}	V_{nom}	-11.8	8.0	-19.8

802.11g, 6 Mbps, 1 TX Duty cycle: 100%		Test results conducted		
Chain 1		PD [Pmax] (dBm/3kHz)	Limit (dBm/3kHz)	Margin (dB)
Lowest frequency: CH1				
T_{nom}	V_{nom}	-14.3	8.0	-22.3
Middle frequency: CH6				
T_{nom}	V_{nom}	-14.4	8.0	-22.4
Highest frequency: CH11				
T_{nom}	V_{nom}	-14.6	8.0	-22.6

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

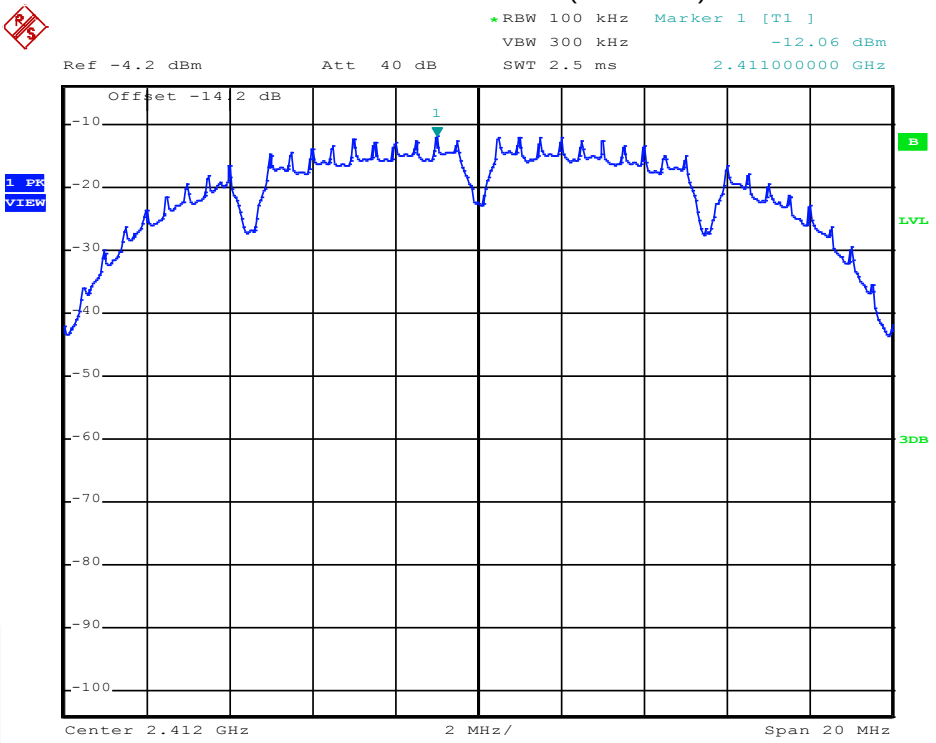
Frequency (MHz)	Power spectral density limit (dBm/3 kHz)
2400 - 2483.5	8

The requirements are **FULFILLED.**

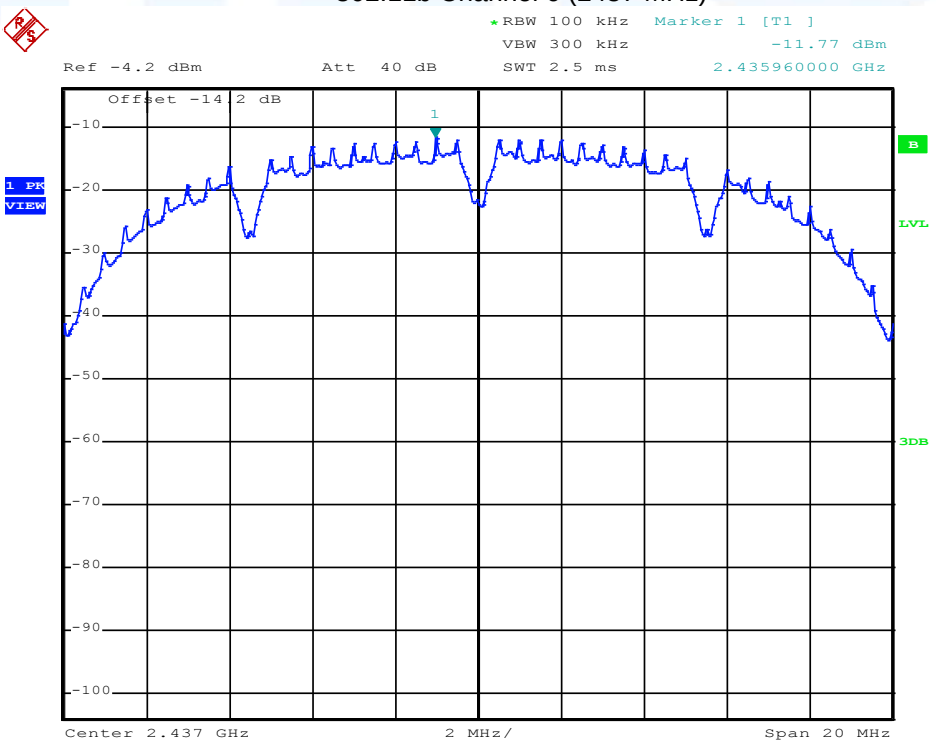
Remarks: For detailed test results please refer to following test protocols.

5.5.6 Power spectral density plots

802.11b Channel 1 (2412 MHz)

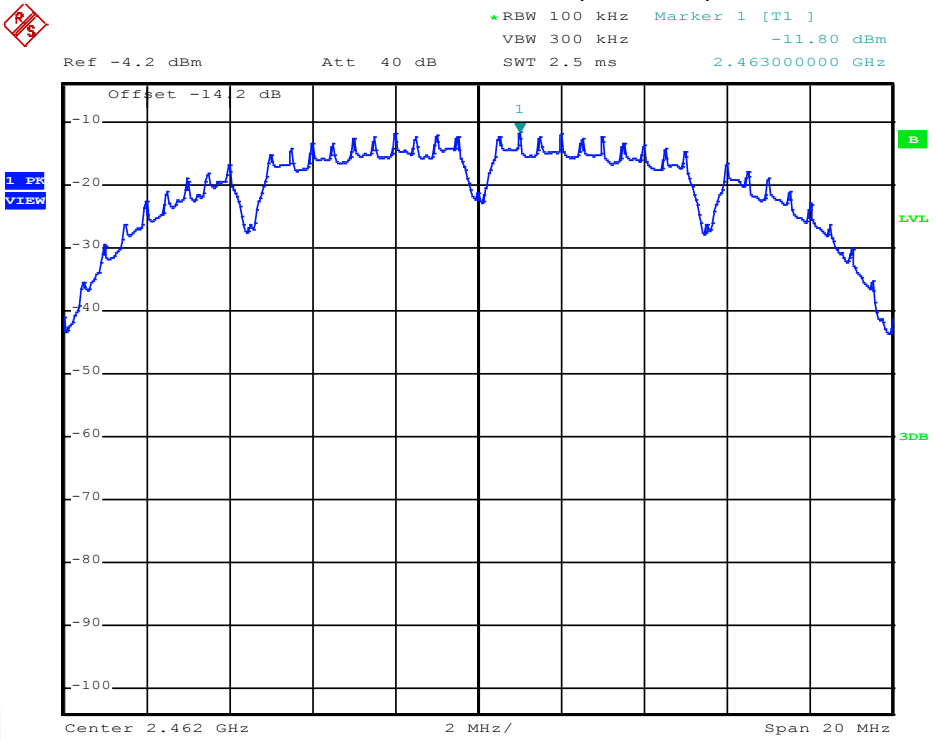


802.11b Channel 6 (2437 MHz)

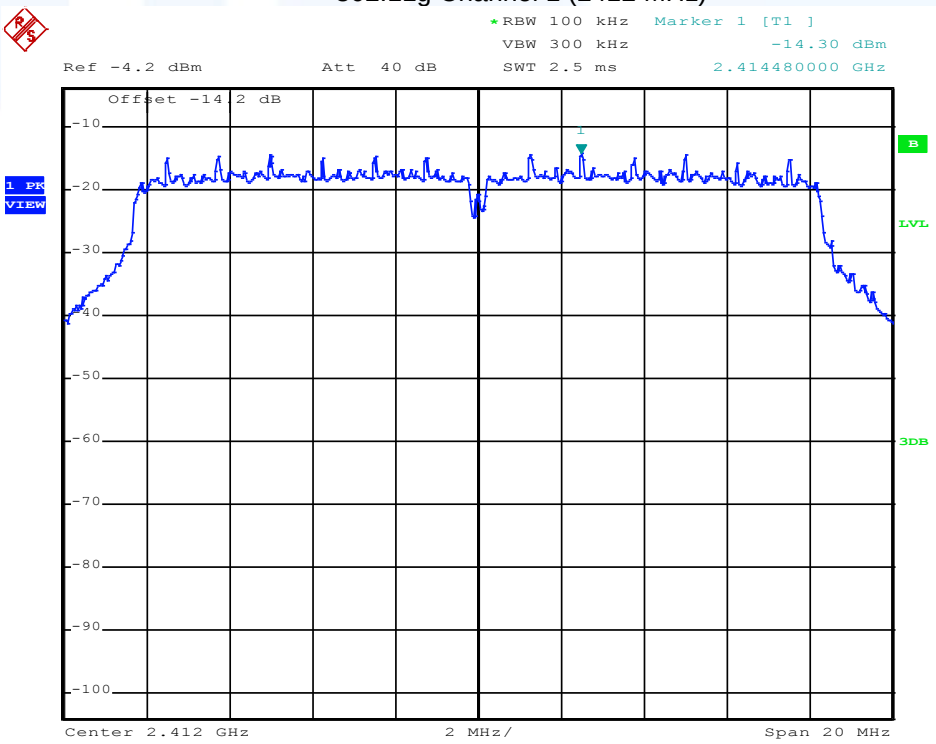


FCC ID: BWY-MCAIRE001

802.11b Channel 11 (2462 MHz)

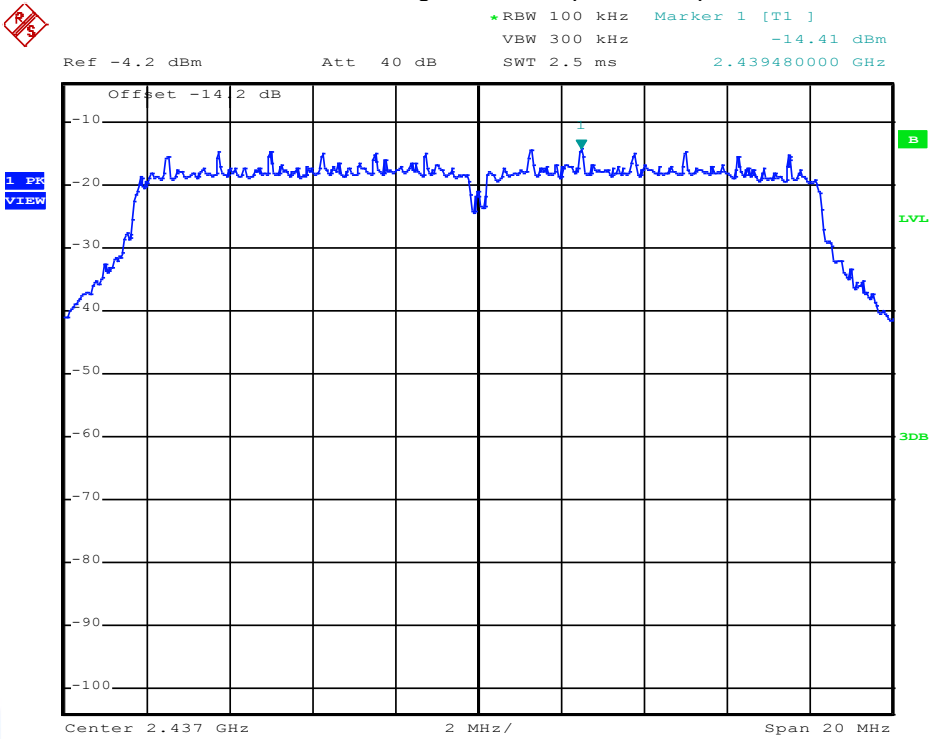


802.11g Channel 1 (2412 MHz)

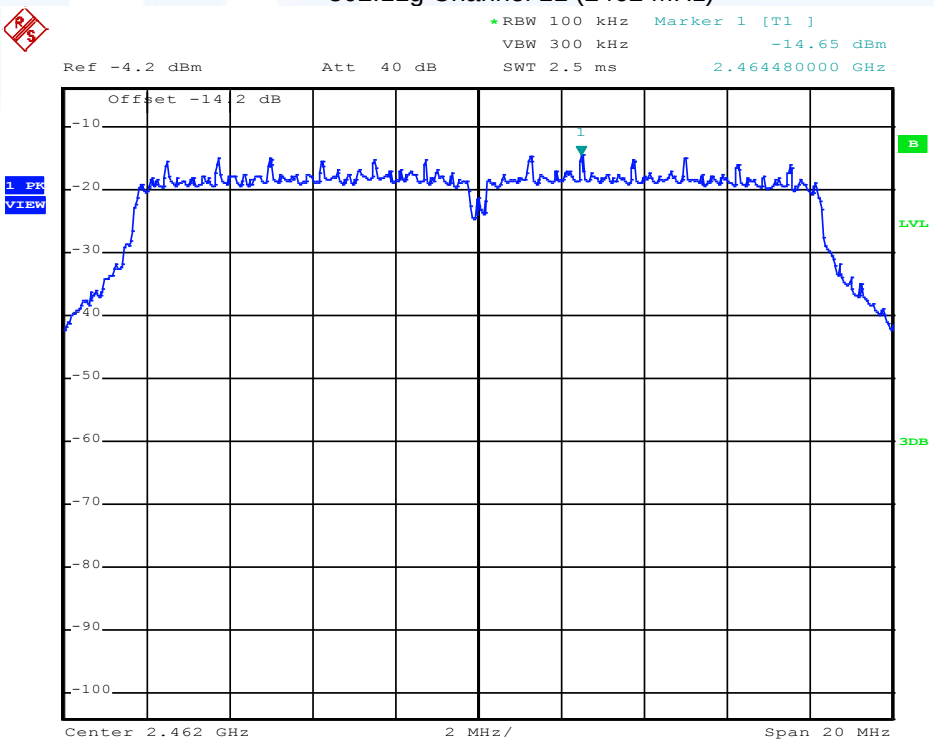


FCC ID: BWY-MCAIRE001

802.11g Channel 6 (2437 MHz)



802.11g Channel 11 (2462 MHz)



5.6 Spurious emissions conducted

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

5.6.1 Description of the test location

Test location: AREA4

5.6.2 Photo documentation of the test set-up – Detailed photos see attachment B, T36291-00

5.6.3 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)).

5.6.4 Description of measurement

The spurious emissions are measured conducted using a spectrum analyser in a test setup following the procedures set out in KDB 558074 for DTS, Item 10.1.2. The frequency spectrum outside the operating frequency range (2400 - 2483.5 MHz) is scanned for emissions exceed the limits. The measurement is performed at normal test conditions in modulated TX continuous mode. The reference power is determined with a separate measurement of the channel with the highest power.
For emissions greater than 30 MHz but less than or equal 1000 MHz a maximum ground reflection factor of 4.7.dB is added.

Spectrum analyser settings:
RBW: 1 MHz, VBW: 3 MHz, Detector: Max peak, Trace Mode: Max hold, Sweep time:10 s, Bandwidth: 20 MHz;

5.6.5 Test result

802.11b:

Lowest frequency: CH1						
Test conditions: 1 TX , Pmax, 1 Mbps						
Reference power level:					4.2	dBm
Chain1			Test results			
Start *f*	Stop *f*	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)	(dB)
30	1000	100	281	-59.4	-15.8	-43.6
1000	2400	100	2400	-40.6	-15.8	-24.8
2483.5	5000	100	2563	-53.1	-15.8	-37.3
5000	15000	100	13931	-57.6	-15.8	-41.8
15000	25000	100	24888	-54.5	-15.8	-38.7
Measurement uncertainty				±3 dB		

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Middle frequency: CH6						
Test conditions: 1 TX , Pmax, 1 Mbps						
Reference power level:					4.2	dBm
Chain1			Test results			
Start *f*	Stop *f*	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)	(dB)
30	1000	100	720	-67.1	-15.8	-51.3
1000	2400	100	2400	-49.4	-15.8	-33.6
2483.5	5000	100	2487	-49.4	-15.8	-33.6
5000	15000	100	14132	-57.4	-15.8	-41.6
15000	25000	100	24903	-53.9	-15.8	-38.1
Measurement uncertainty				±3 dB		

Highest frequency: CH11						
Test conditions: 1 TX , Pmax, 1 Mbps						
Reference power level:					4.2	dBm
Chain1			Test results			
Start *f*	Stop *f*	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)	(dB)
30	1000	100	513	-67.1	-15.8	-51.3
1000	2400	100	2385	-57.0	-15.8	-41.2
2483.5	5000	100	2520	-56.3	-15.8	-40.5
5000	15000	100	14852	-58.1	-15.8	-42.3
15000	25000	100	24937	-52.6	-15.8	-36.8
Measurement uncertainty				±3 dB		

802.11g:

Lowest frequency: CH1						
Test conditions: 1 TX , Pmax, 6 Mbps						
Reference power level:					1.2	dBm
Chain1			Test results			
Start *f*	Stop *f*	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)	(dB)
30	1000	100	587	-66.7	-18.8	-47.9
1000	2400	100	2399	-40.6	-18.8	-21.8
2483.5	5000	100	2511	-54.1	-18.8	-35.3
5000	15000	100	14038	-57.8	-18.8	-39.0
15000	25000	100	24930	-54.0	-18.8	-35.2
Measurement uncertainty				±3 dB		

Middle frequency: CH6						
Test conditions: 1 TX , Pmax, 6 Mbps						
Reference power level:					1.2	dBm
Chain1			Test results			
Start *f*	Stop *f*	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)	(dB)
30	1000	100	805	-67.1	-18.8	-48.3
1000	2400	100	2372	-48.5	-18.8	-29.7
2483.5	5000	100	2503	-49.0	-18.8	-30.2
5000	15000	100	13779	-58.0	-18.8	-39.2
15000	25000	100	24875	-52.4	-18.8	-33.6
Measurement uncertainty				±3 dB		

Highest frequency: CH11						
Test conditions: 1 TX , Pmax, 6 Mbps						
Reference power level:					1.2	dBm
Chain1			Test results			
Start *f*	Stop *f*	RBW	Maximum emission		Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBm)	(dB)
30	1000	100	278	-67.5	-18.8	-48.7
1000	2400	100	2400	-46.2	-18.8	-27.4
2483.5	5000	100	2517	-46.6	-18.8	-27.8
5000	15000	100	14088	-57.0	-18.8	-38.2
15000	25000	100	24956	-53.7	-18.8	-34.9
Measurement uncertainty				±3 dB		

Limit 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.

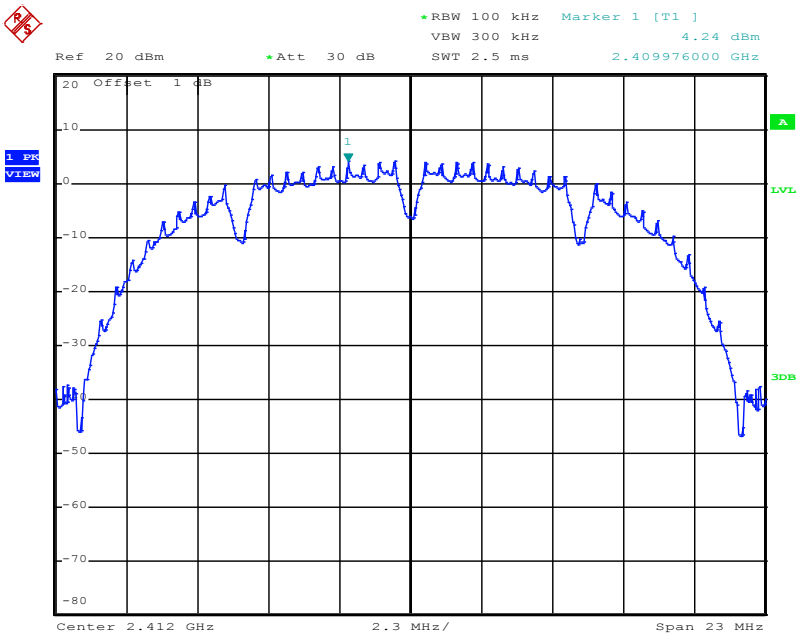
Frequency	Spurious emission limit
(MHz)	
Below 960	20 dB below the highest level of the desired power
Above 960	20 dB below the highest level of the desired power

The requirements are **FULFILLED.**

Remarks: For detailed test results please refer to following test protocols. Only the worst cases of the plots are listed.

5.6.6 Test protocols

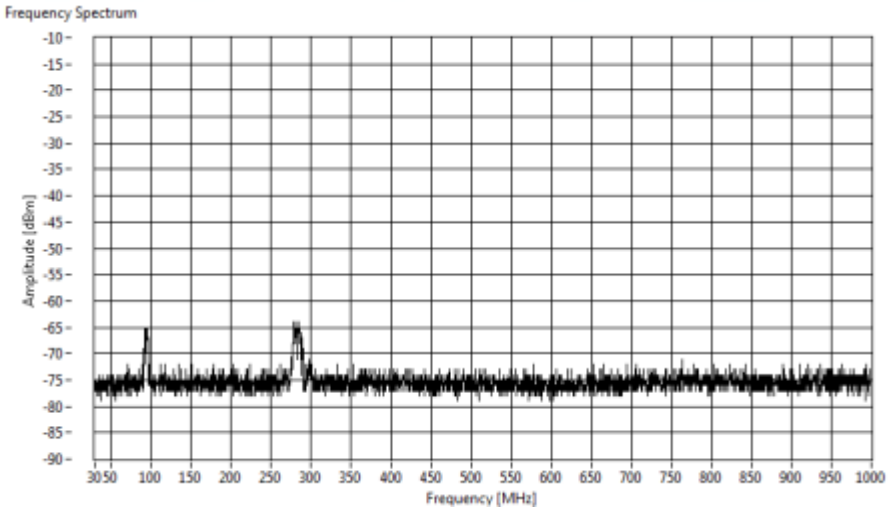
Determination of the reference level and limit



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

802.11b, Ch1

Spurious emissions conducted from 30 MHz to 1 GHz



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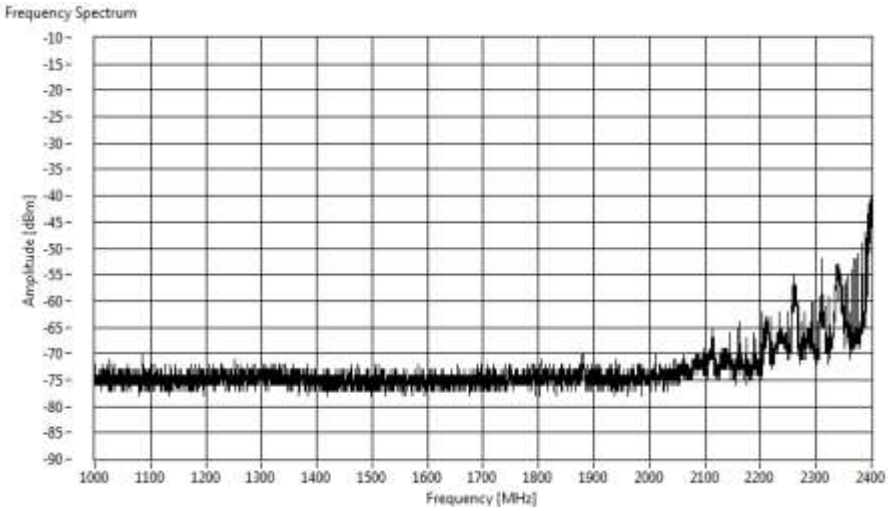
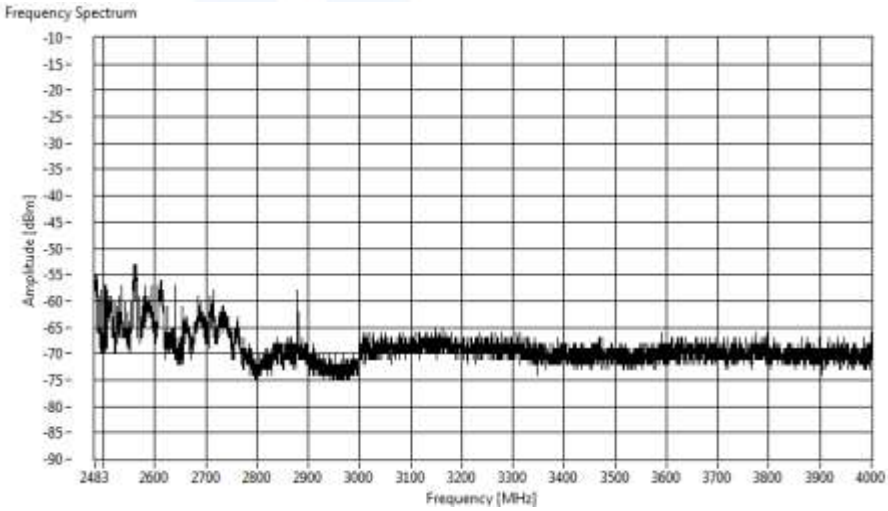
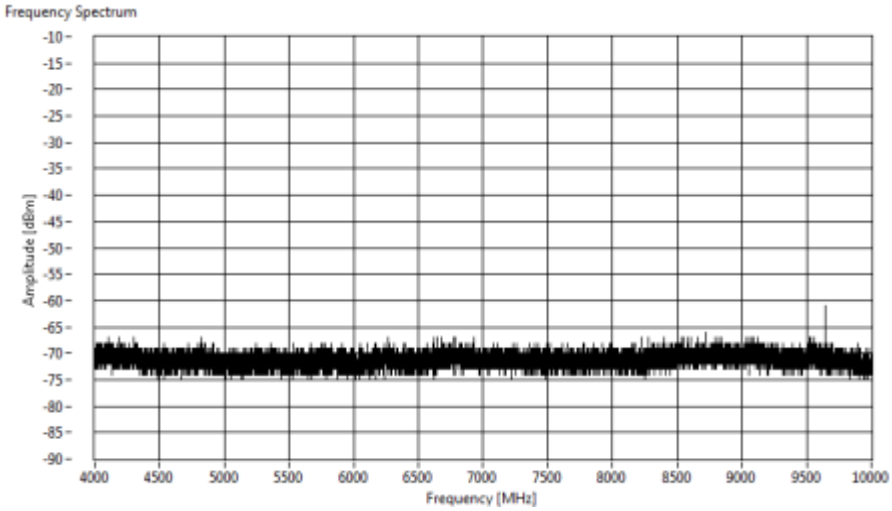
Spurious emissions conducted from 1 GHz to 2.4 GHz



Spurious emissions conducted from 2.4 GHz to 4 GHz

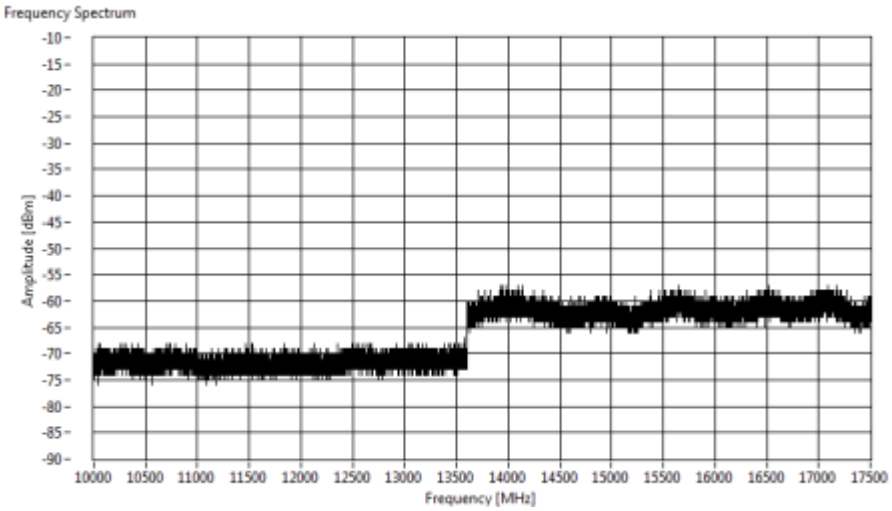


Spurious emissions conducted from 4 GHz to 10 GHz

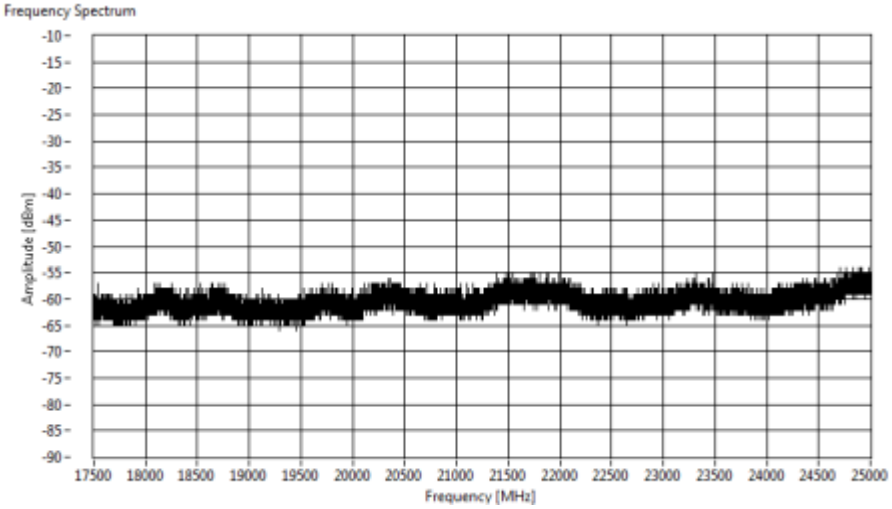


FCC ID: BWY-MCAIRE001

Spurious emissions conducted from 10 GHz to 17.5 GHz

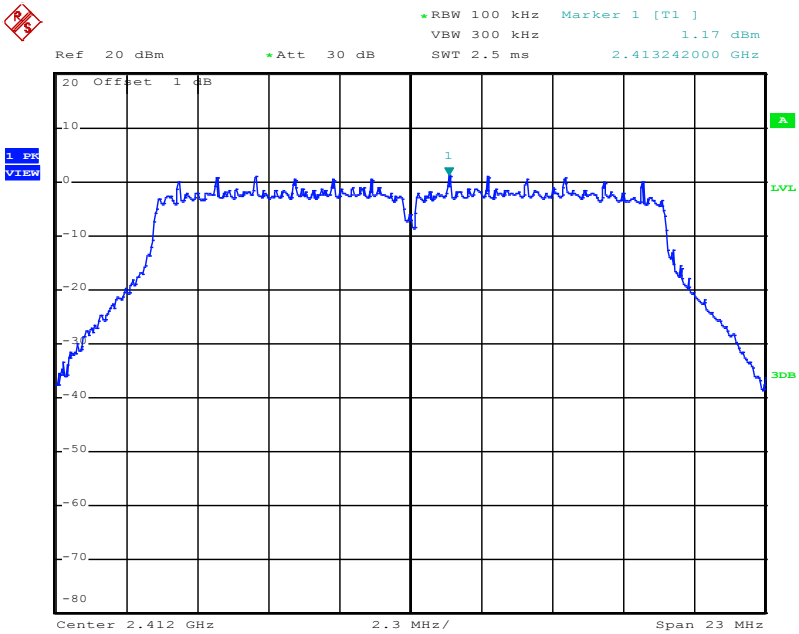


Spurious emissions conducted from 8 GHz to 25 GHz



FCC ID: BWY-MCAIRE001

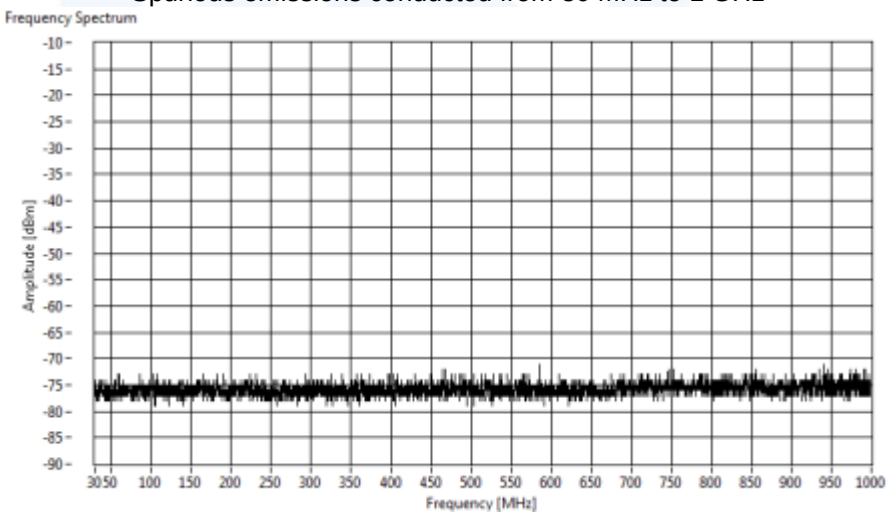
Determination of the reference level and limit



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

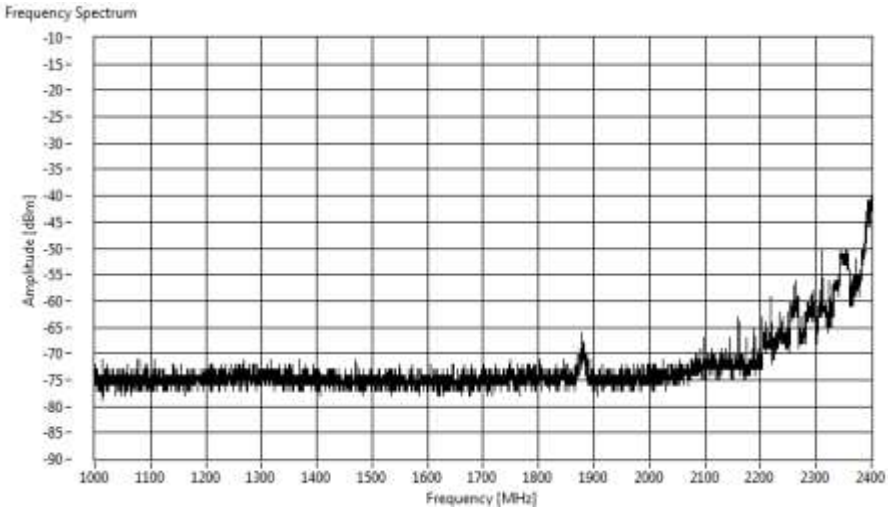
802.11g, Ch1

Spurious emissions conducted from 30 MHz to 1 GHz

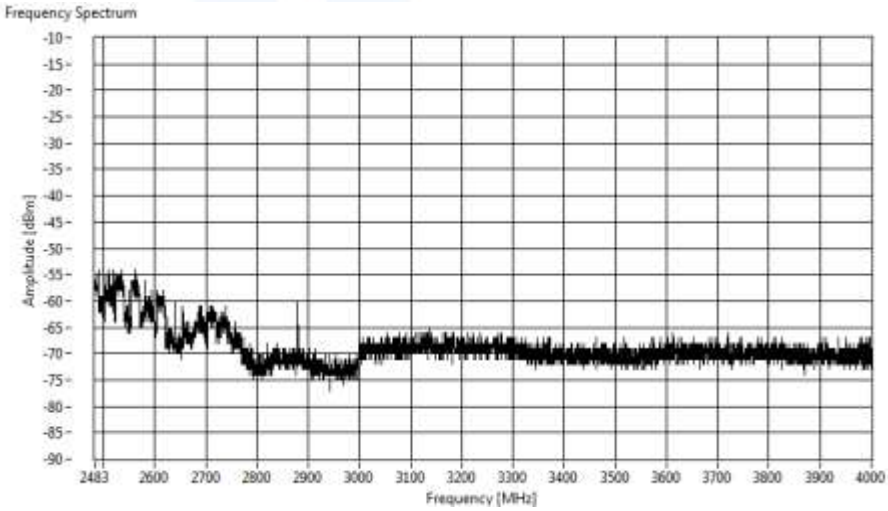


FCC ID: BWY-MCAIRE001

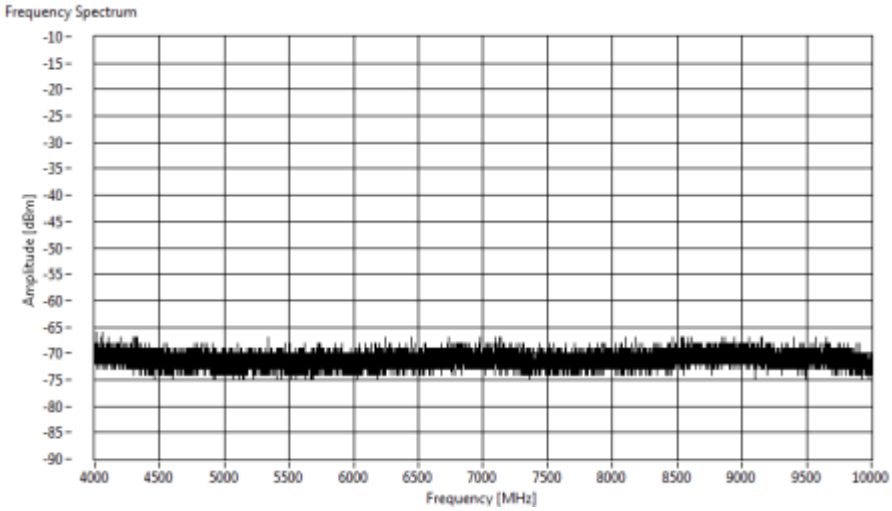
Spurious emissions conducted from 1 GHz to 2.4 GHz



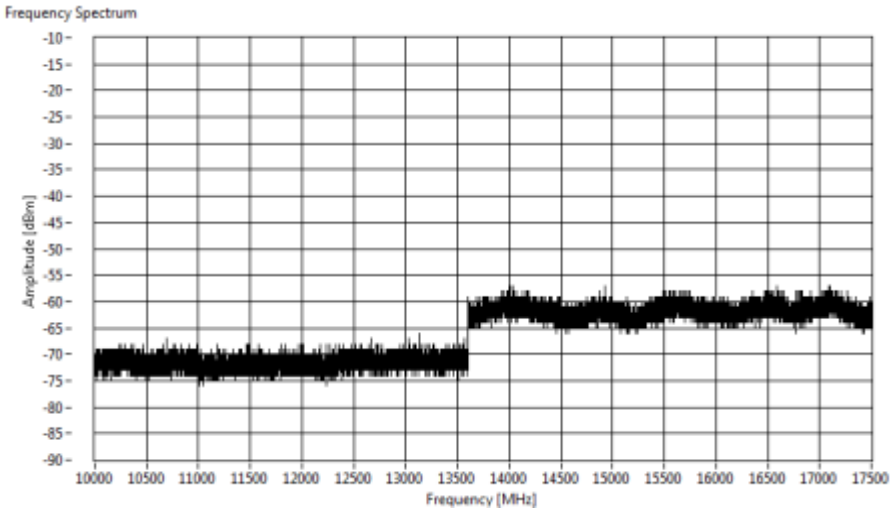
Spurious emissions conducted from 2.4 GHz to 4 GHz



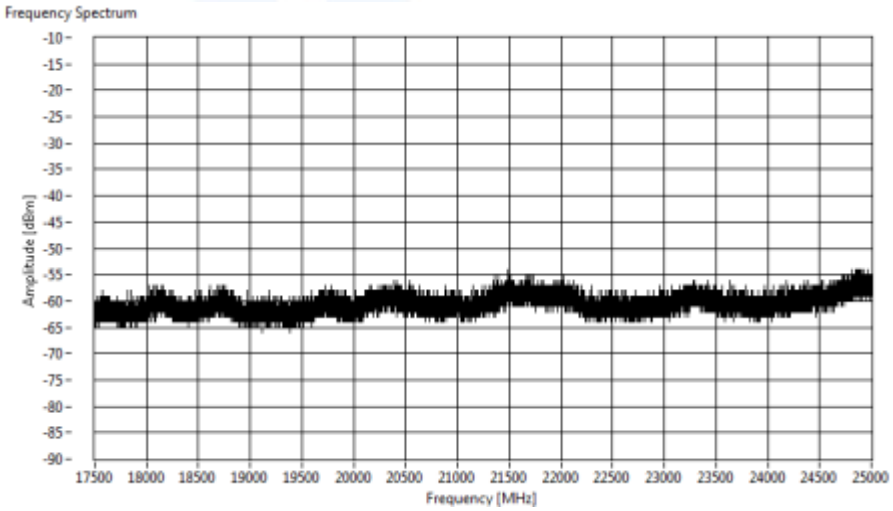
Spurious emissions conducted from 4 GHz to 10 GHz



Spurious emissions conducted from 10 GHz to 17.5 GHz



Spurious emissions conducted from 17.5 GHz to 25 GHz



5.7 Spurious emissions conducted, in restricted bands

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

5.7.1 Description of the test location

Test location: AREA4

5.7.1 Photo documentation of the test set-up – Detailed photos see attachment B, T36291-00

5.7.2 Applicable standard

According to FCC Part 15, Section 15.247(d):
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 spurious emissions falling in the restricted bands are measured conducted using a spectrum analyser in a test setup following the procedures set out in KDB 558074 D01 for DTS, item 10.2. The conducted limit in EIRP is calculated according KDB 558074 D01, Item 10.2.2.1 from the absolute radiated limit. The cable loss is taken into account with an amplitude offset. The measurement is performed at normal test conditions in modulated TX continuous mode.

Spectrum analyser settings:

9 kHz < f < 150 kHz:	RBW: 300 Hz,	VBW: 1 kHz,	Detector: Max peak,	Trace Mode: Max hold
150 kHz < f < 30 MHz:	RBW: 10 kHz,	VBW: 30 kHz,	Detector: Max peak,	Trace Mode: Max hold
30 MHz < f < 1000 MHz:	RBW: 100 kHz,	VBW: 300 kHz,	Detector: Max peak,	Trace Mode: Max hold
f > 1000 MHz:	RBW: 1 MHz,	VBW: 3 MHz,	Detector: Max peak,	Trace Mode: Max hold

5.7.4 Determination of the requirement for measuring the restricted bands:

Restricted band 2310 – 2390 MHz:	Is next to the operating band, has to be measured.
Restricted band 2483.5 – 2500 MHz:	Is next to the operating band, has to be measured.
Restricted band 2655 – 2290 MHz:	Is next to the operating band, has to be measured for RSS.
Restricted band 4500 – 5150 MHz:	Harmonics of the carrier may appear. The spurious emission measurement under item 5.5 shows no harmonic at 4824 – 4922 MHz and no other emissions. No requirement to measure.
Restricted band 5350 – 5460 MHz:	No Harmonics, no other emission, no requirement to measure.
Restricted band 7250 – 7750 MHz:	Harmonics of the carrier may appear. The spurious emission measurement under item 5.5 shows no harmonic at 4824 – 4922 MHz and no other emissions. No requirement to measure.
Higher restricted bands:	No Harmonics, no other emission, no requirement to measure.

5.7.5 Test result

G_{out} is the assumed antenna gain out of operating band.
G_{in} is the in-band antenna gain of operating band.

802.11b:

PK-measurement							
Lowest frequency: CH1							
Test conditions: 1 TX , Pmax, 1 Mbps							
Chain1			Test results				
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2388	-26.4	2.8	-24.0	-2.4
2483.5	2500	1000	2485	-35.0	2.8	-24.0	-11.0
2655	2900	1000	2687	-47.0	2.8	-24.0	-23.0
Measurement uncertainty				±3 dB			

AV-measurement							
Lowest frequency: CH1							
Test conditions: 1 TX , Pmax, 1 Mbps							
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2388	-50.9	2.8	-44.0	-6.9
2483.5	2500	1000	2485	-53.2	2.8	-44.0	-9.2
Measurement uncertainty				±3 dB			

PK-measurement							
Middle frequency: CH6							
Test conditions: 1 TX , Pmax, 1 Mbps							
Chain1			Test results				
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2389	-32.0	2.8	-24.0	-8.0
2483.5	2500	1000	2487	-31.7	2.8	-24.0	-7.7
2655	2900	1000	2762	-48.6	2.8	-24.0	-24.6
Measurement uncertainty				±3 dB			

AV-measurement							
Middle frequency: CH6							
Test conditions: 1 TX , Pmax, 1 Mbps			Test results				
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2389	-50.4	2.8	-44.0	-6.4
2483.5	2500	1000	2487	-49.2	2.8	-44.0	-5.2
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH11							
Test conditions: 1 TX , Pmax, 1 Mbps							
Chain1			Test results				
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2390	-35.6	2.8	-24.0	-11.6
2483.5	2500	1000	2484	-25.4	2.8	-24.0	-1.4
2655	2900	1000	2662	-44.8	2.8	-24.0	-20.8
Measurement uncertainty				±3 dB			

AV-measurement							
Highest frequency: CH11							
Test conditions: 1 TX , Pmax, 1 Mbps			Test results				
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2390	-50.0	2.8	-44.0	-6.0
2483.5	2500	1000	2484	-52.7	2.8	-44.0	-8.7
Measurement uncertainty				±3 dB			

802.11g:

PK-measurement							
Lowest frequency: CH1							
Test conditions: 1 TX , Pmax, 6 Mbps							
Chain1			Test results				
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2389	-28.5	2.8	-24.0	-4.5
2483.5	2500	1000	2486	-39.6	2.8	-24.0	-15.6
2655	2900	1000	2713	-46.8	2.8	-24.0	-22.8
Measurement uncertainty				±3 dB			

AV-measurement							
Lowest frequency: CH1							
Test conditions: 1 TX , Pmax, 6 Mbps							
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	AV Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2389	-47.4	2.8	-44.0	-3.4
2483.5	2500	1000	2486	-53.2	2.8	-44.0	-9.2
Measurement uncertainty				±3 dB			

PK-measurement							
Middle frequency: CH6							
Test conditions: 1 TX , Pmax, 6 Mbps							
Chain1			Test results				
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2374	-36.0	2.8	-24.0	-12.0
2483.5	2500	1000	2497	-35.3	2.8	-24.0	-11.3
2655	2900	1000	2709	-50.0	2.8	-24.0	-26.0
Measurement uncertainty				±3 dB			

AV-measurement							
Middle frequency: CH6							
Test conditions: 1 TX , Pmax, 6 Mbps			Test results				
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2374	-46.8	2.8	-44.0	-2.8
2483.5	2500	1000	2497	-45.9	2.8	-44.0	-1.9
Measurement uncertainty				±3 dB			

PK-measurement							
Highest frequency: CH11							
Test conditions: 1 TX , Pmax, 6 Mbps							
Chain1			Test results				
Start *f*	Stop *f*	RBW	Maximum emission		G_{out}	Limit	Margin
(MHz)	(MHz)	(kHz)	(MHz)	(dBm)	(dBi)	(dBm)	(dB)
2310	2390	1000	2362	-42.0	2.8	-24.0	-18.0
2483.5	2500	1000	2485	-29.4	2.8	-24.0	-5.4
2655	2900	1000	2665	-48.4	2.8	-24.0	-24.4
Measurement uncertainty				±3 dB			

AV-measurement							
Highest frequency: CH11							
Test conditions: 1 TX , Pmax, 6 Mbps			Test results				
f	A	RBW	G_{in}		EIRP	AV Limit	Margin
(MHz)	(dBm)	(kHz)	(dBi)	(dBi)	(dBm)	(dBm)	(dB)
2310	2390	1000	2362	-49.5	2.8	-44.0	-5.5
2483.5	2500	1000	2485	-44.7	2.8	-44.0	-0.7
Measurement uncertainty				±3 dB			

Limit according to FCC Part 15, Section 15.247(d):
Attenuation below the general limits specified in Section 15.209(a) is not required.

Conversion formula: EIRP = E + 20 log (d) – 104.8;
E: Field strength (dB(mV/m));

The applicable limit is calculated to subtract the antenna gain from the general limit.
E.g.: PK limit = -21.2 dBm – 2.8 dBi = -24.0 dBm; AV limit = -41-2 dBm - 2.8 dBi = -44.0 dBm;

Frequency	General limit radiated	Calculated PK limit	Calculated AV limit
(MHz)	(mV/m)	EIRP (dBm)	EIRP (dBm)
216 - 960	200	-33.9	-53.9
Above 960	500	-24.0	-44.0

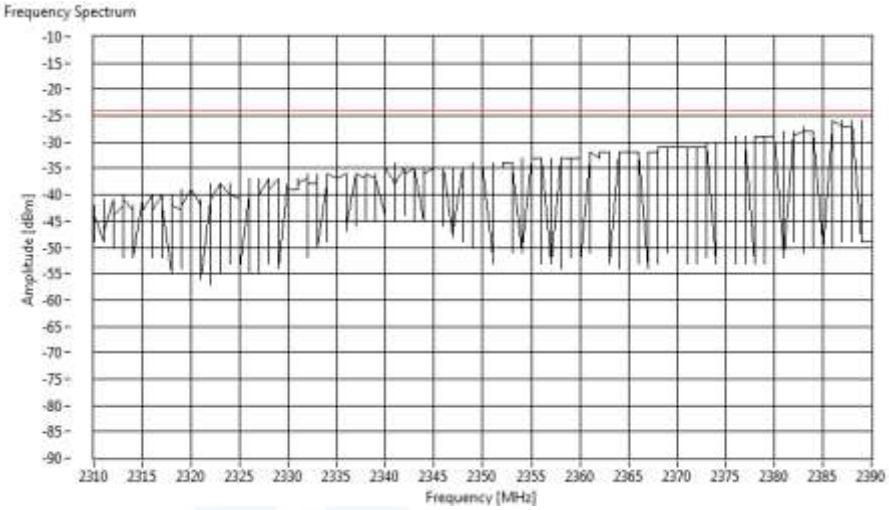
The requirements are **FULFILLED.**

Remarks: For detailed test results please see the following test protocols. Only the worst cases of the plots are listed.

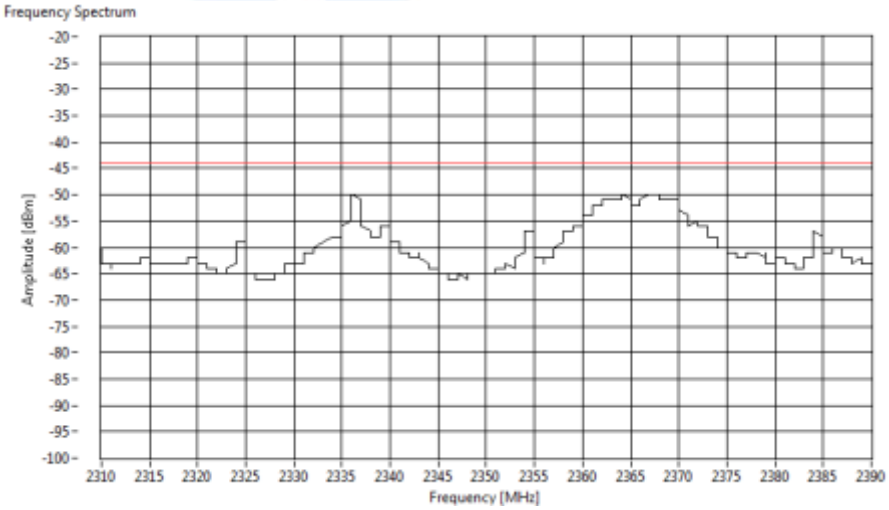
5.7.6 Test protocols of restricted band emissions

Standard 802.11b:

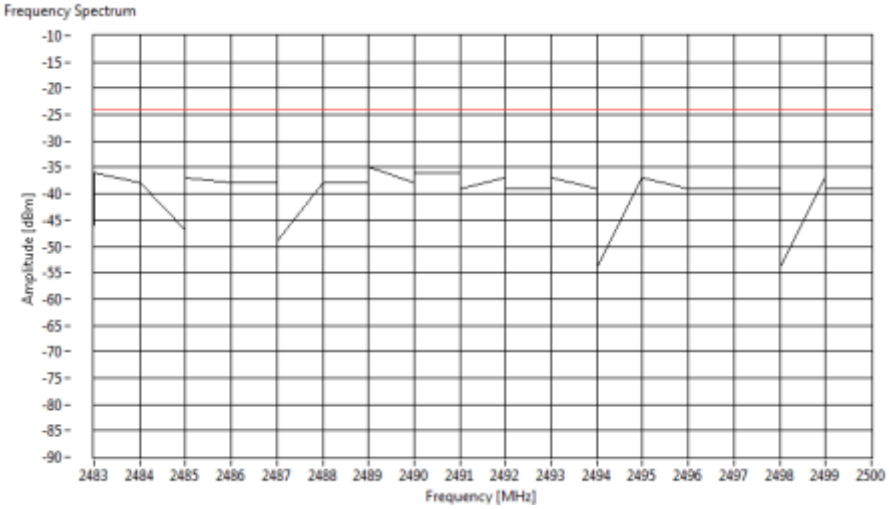
Channel 1b, 2412 MHz, PK



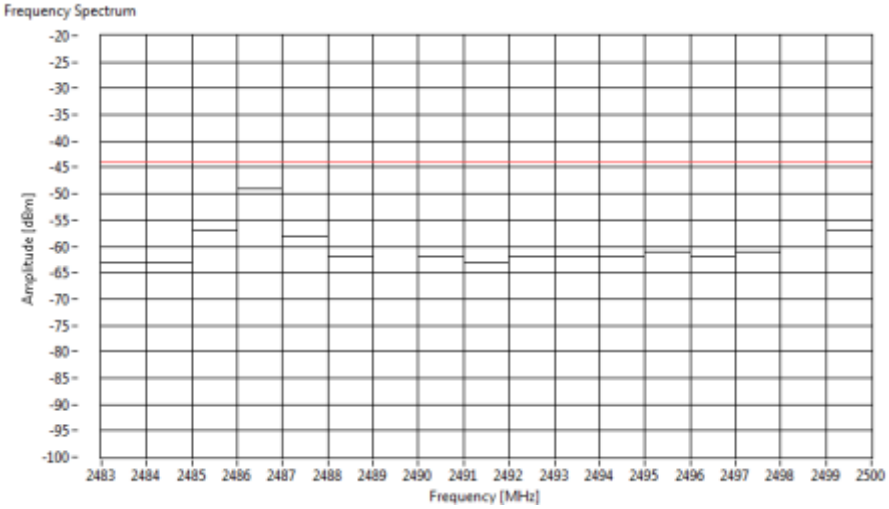
AV



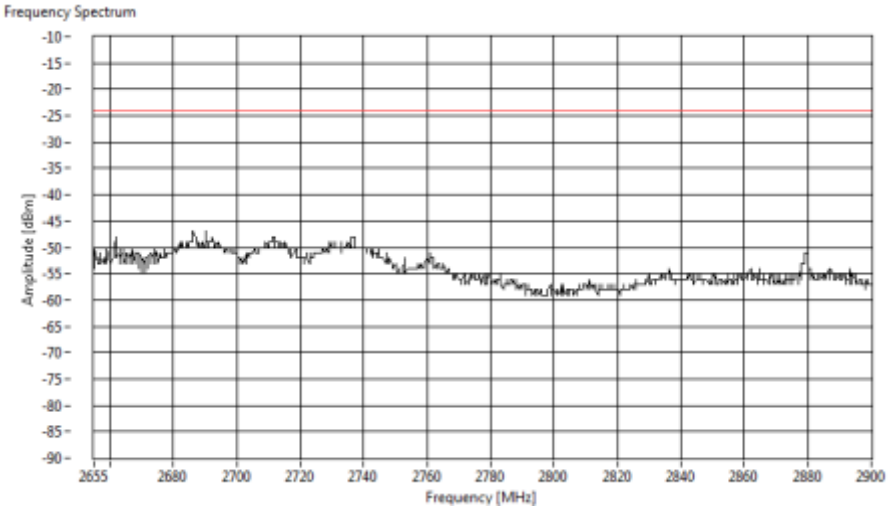
PK


Frequency Spectrum
Amplitude [dBm]
Frequency [MHz]

AV


Frequency Spectrum
Amplitude [dBm]
Frequency [MHz]

PK


Frequency Spectrum
Amplitude [dBm]
Frequency [MHz]

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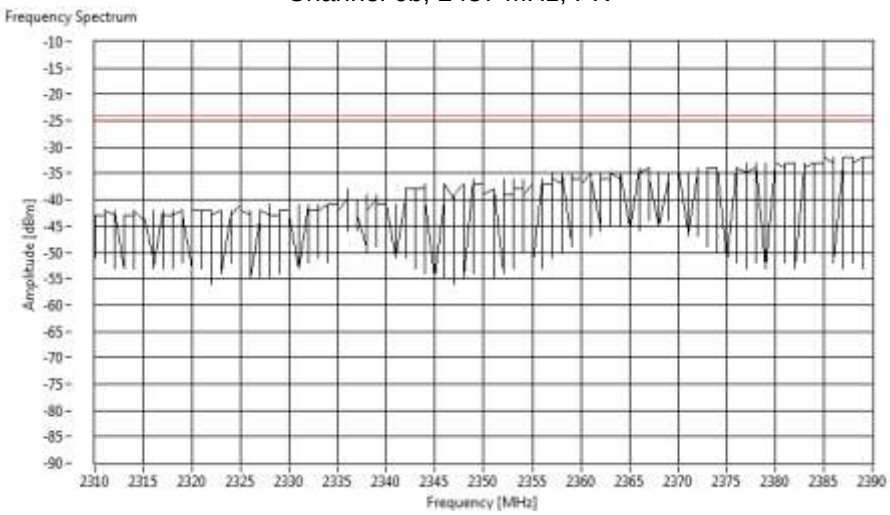
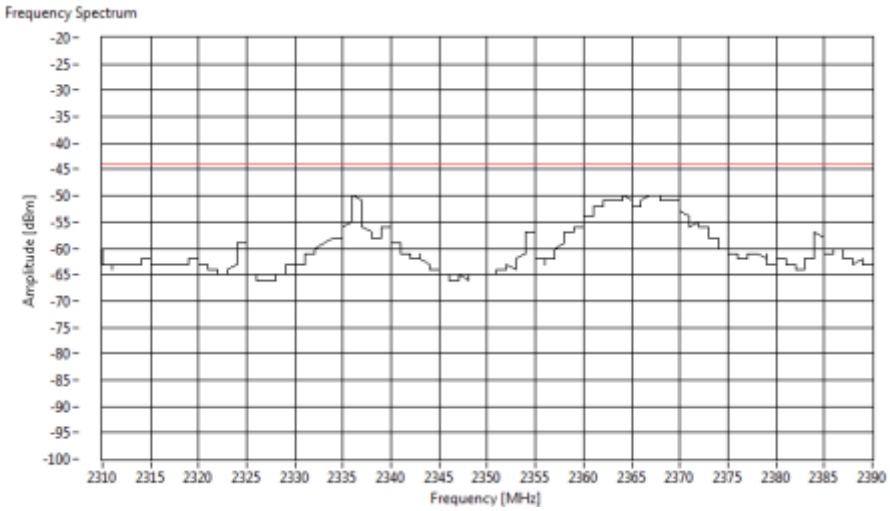
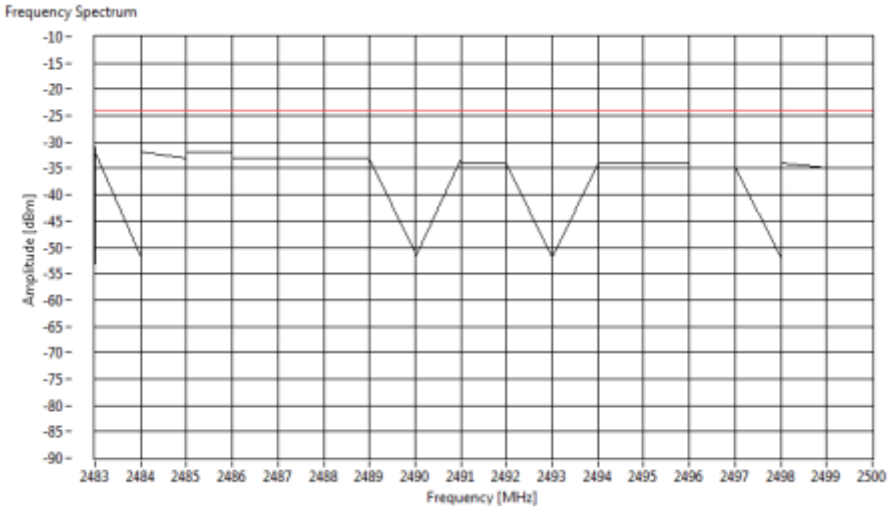
Channel 6b, 2437 MHz, PK



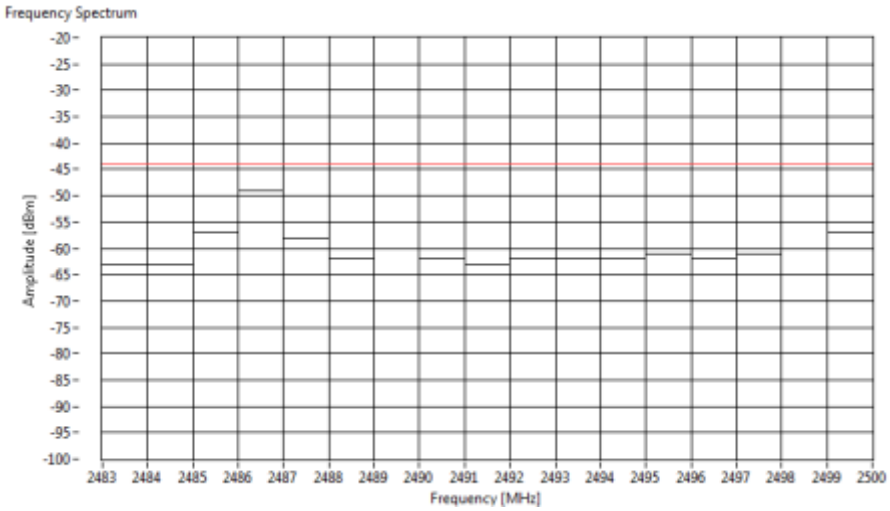
AV



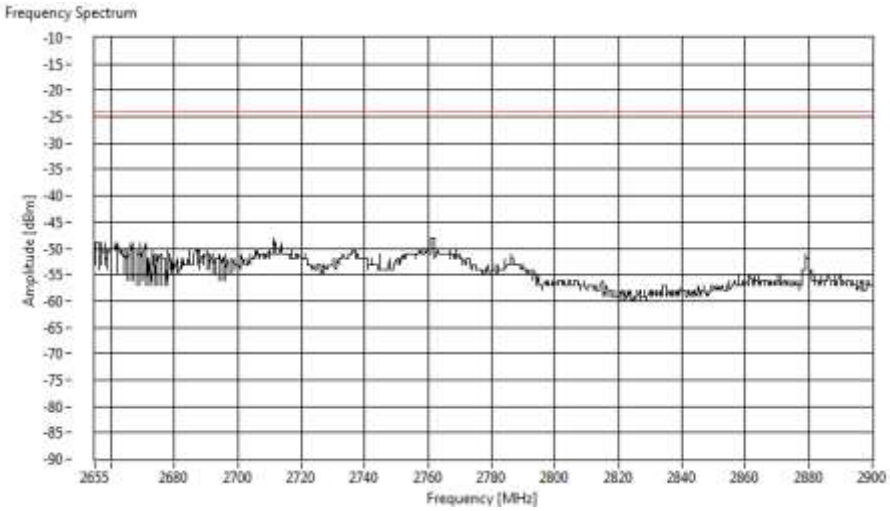
PK



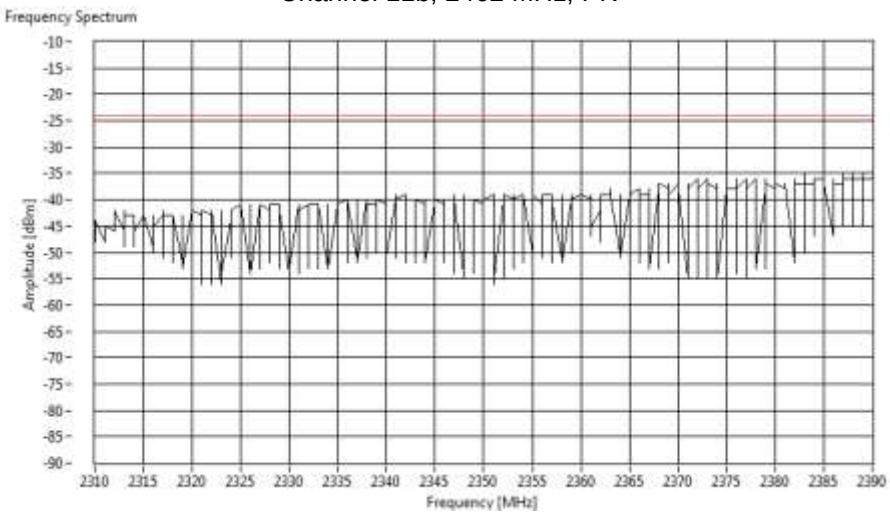
AV



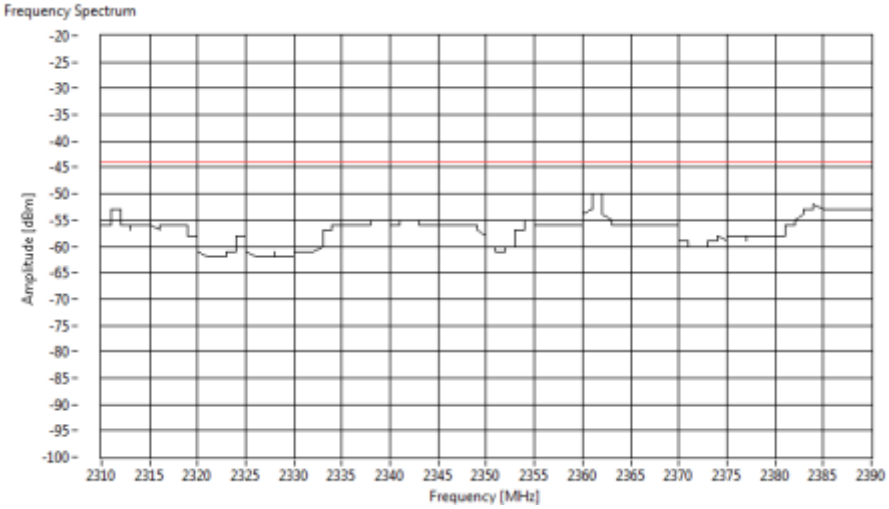
PK



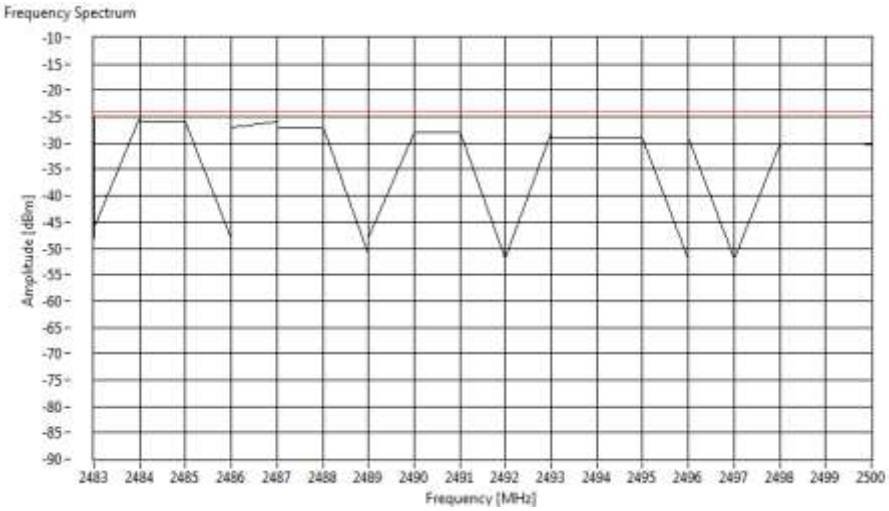
Channel 11b, 2462 MHz, PK



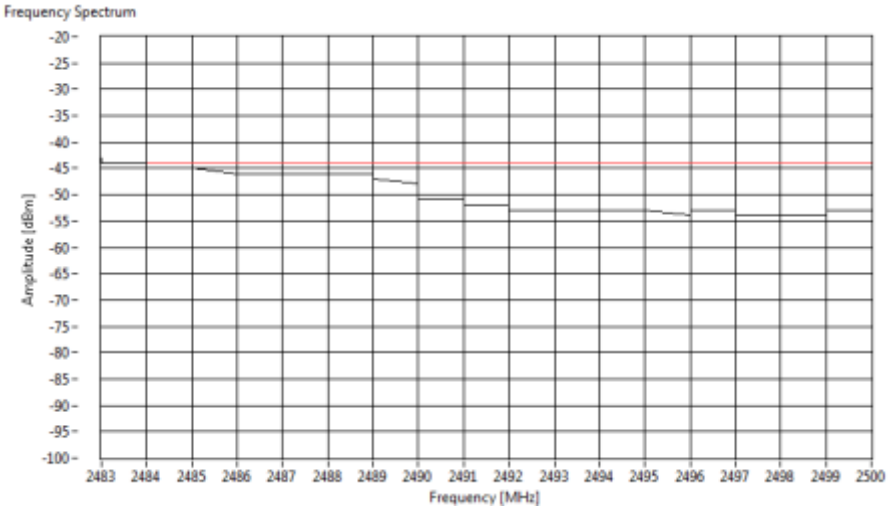
AV


Frequency Spectrum
Amplitude [dBm]
Frequency [MHz]

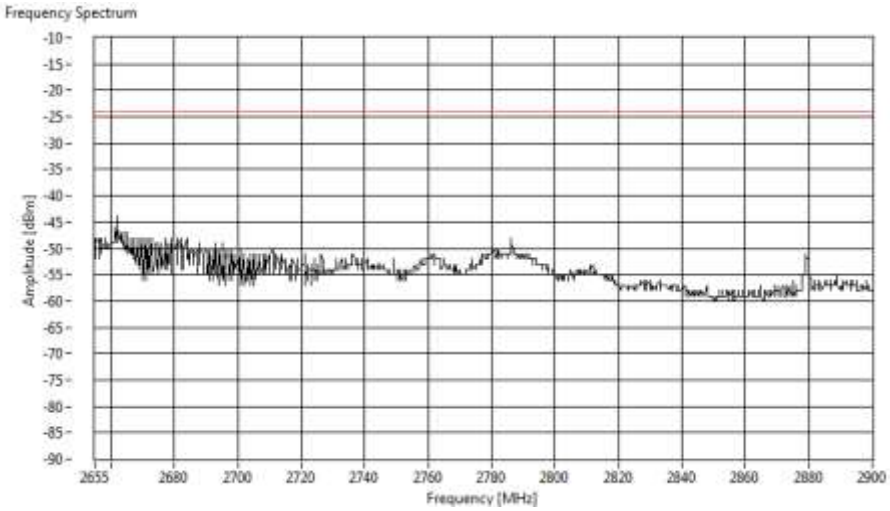
PK


Frequency Spectrum
Amplitude [dBm]
Frequency [MHz]

AV

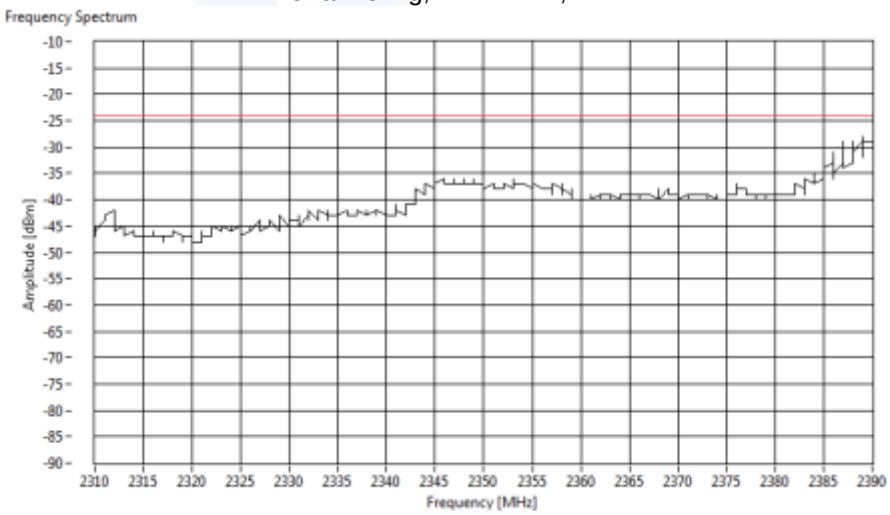

Frequency Spectrum
Amplitude [dBm]
Frequency [MHz]

PK

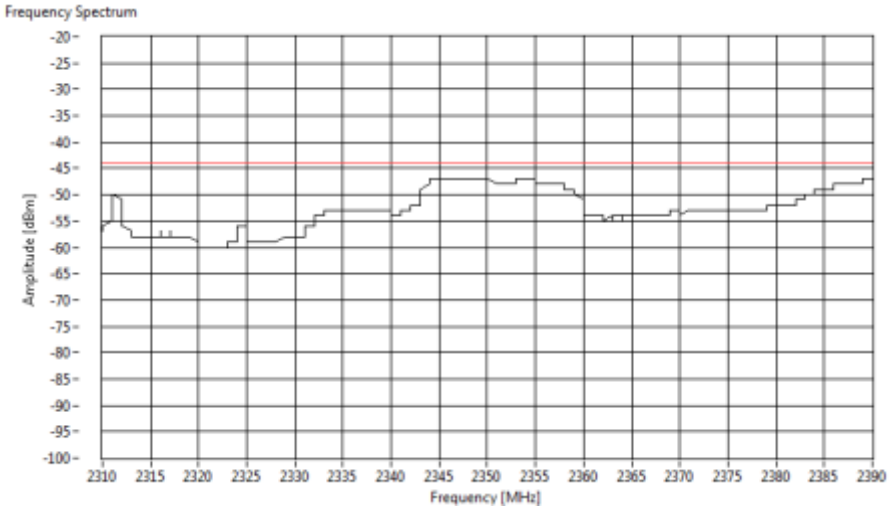


Standard 802.11g:

Channel 1g, 2412 MHz, PK

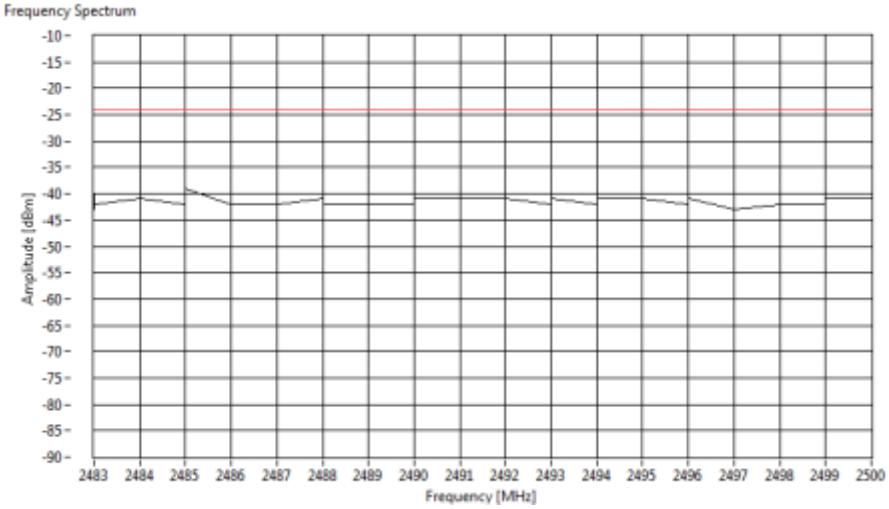


AV

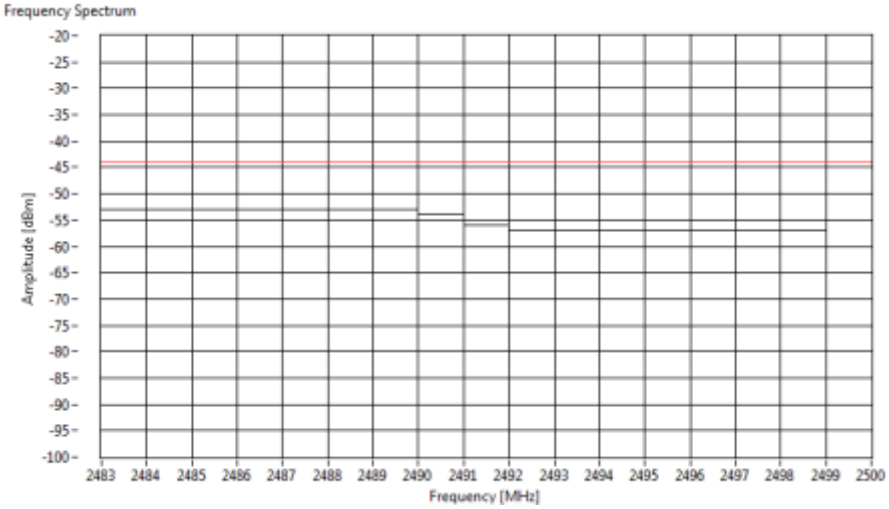


FCC ID: BWY-MCAIRE001

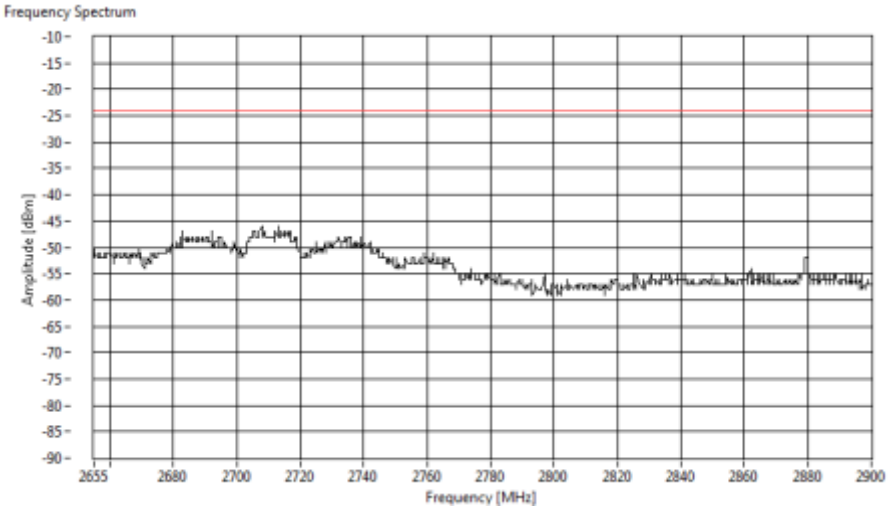
PK



AV

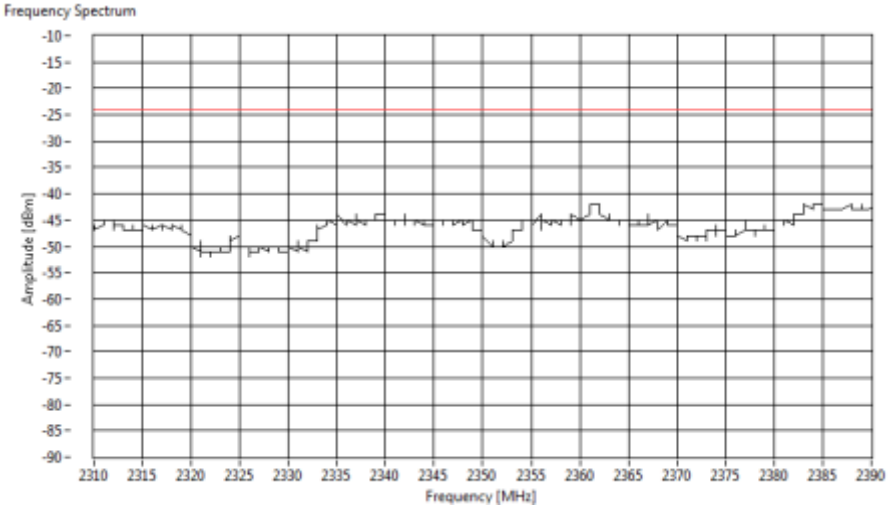


PK

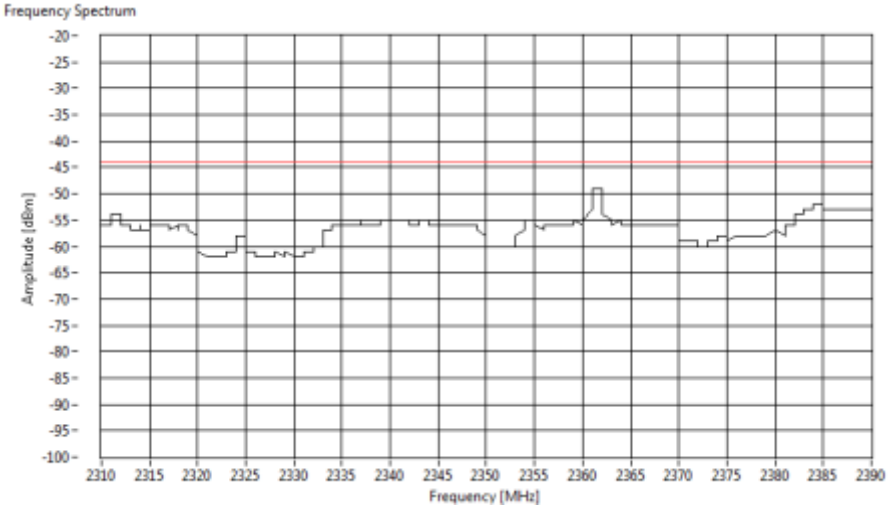


FCC ID: BWY-MCAIRE001

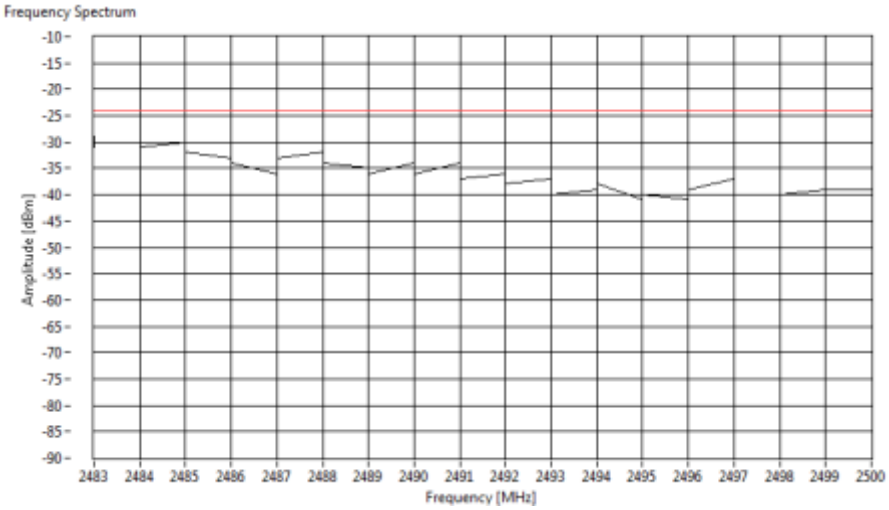
Channel 11g, 2462 MHz, PK



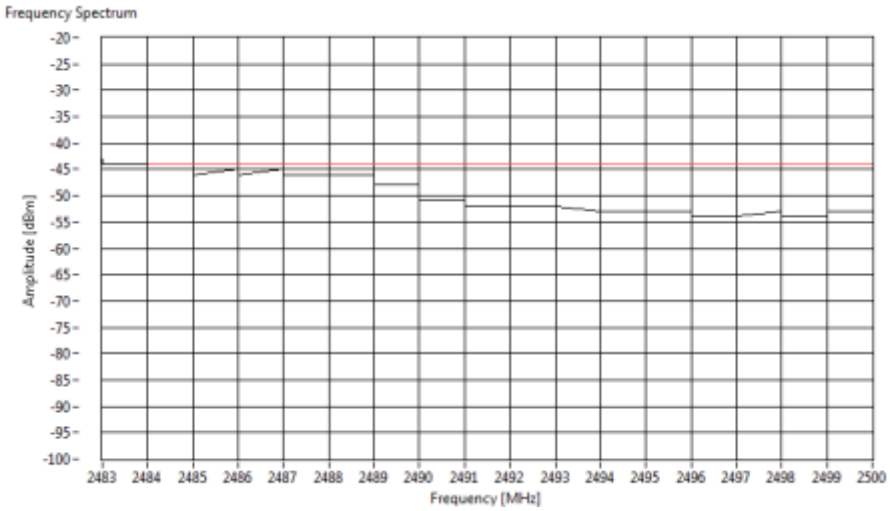
AV



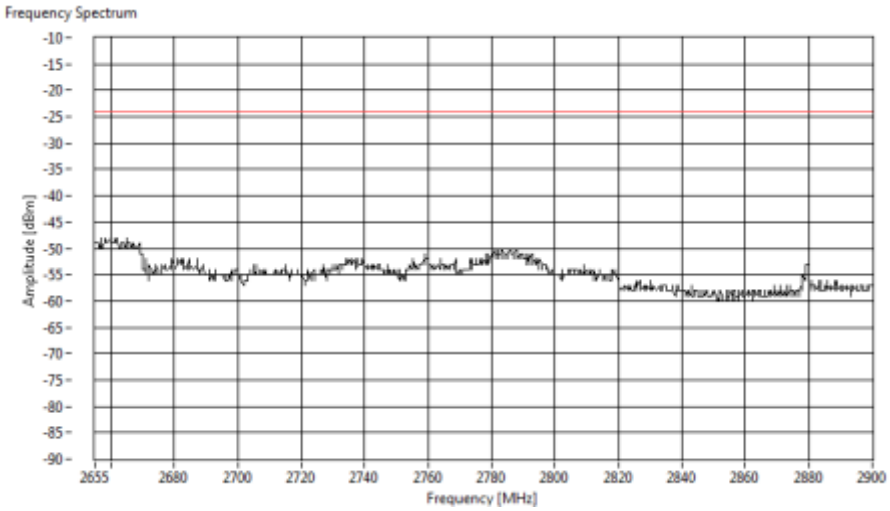
PK



AV


Frequency Spectrum
Amplitude [dBm]
Frequency [MHz]

PK


Frequency Spectrum
Amplitude [dBm]
Frequency [MHz]

5.8 Radiated emission (cabinet radiation), in restricted bands

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

5.8.1 Description of the test location

Test location: Anechoic chamber 1

Test distance: 3 m

5.8.2 Photo documentation of the test setup – Detailed photos see attachment B, T36291-00

5.8.3 Applicable standard

According to KDB 558074 D01 DTS Measurement Guide:
If conducted measuements are performed an additional radiated test for cabinet emissions will also be required.

5.8.4 Description of Measurement

The radiated power of the spurious emissions in restricted bands from the EUT is measured in a test setup following the procedures set out in ANSI C63.10. If the emission level of the EUT 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.

Instrument settings:
30 MHz – 1000 MHz: RBW: 120 kHz
1000 MHz – 25000 MHz RBW: 1 MHz, VBW: 3 MHz, Trace mode: max hold

5.8.5 Test result

802.11b:

PK-measurement					
CH1					
Test conditions: 1 TX , Pmax, 1 Mbps					
		Test results			
Start *f*	Stop *f*	Maximum emission		Limit	Margin
(MHz)	(MHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
2310	2390	2338.8	50.4	74.0	-23.6
2483.5	2500	2483.6	44.9	74.0	-29.1
2655	2900	2686.8	53.2	74.0	-20.8
Measurement uncertainty			±3 dB		

PK-measurement					
CH6					
Test conditions: 1 TX , Pmax, 1 Mbps					
		Test results			
Start *f*	Stop *f*	Maximum emission		Limit	Margin
(MHz)	(MHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
2310	2390	2389.6	46.4	74.0	-27.6
2483.5	2500	2486.9	47.8	74.0	-26.2
2655	2900	2688.0	50.8	74.0	-23.2
Measurement uncertainty			±3 dB		

PK-measurement					
CH11					
Test conditions: 1 TX , Pmax, 1 Mbps					
		Test results			
Start *f*	Stop *f*	Maximum emission		Limit	Margin
(MHz)	(MHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
2310	2390	2383.3	44.2	74.0	-29.8
2483.5	2500	2484.7	52.9	74.0	-21.1
2655	2900	2880.4	53.7	74.0	-20.3
Measurement uncertainty			±3 dB		

802.11g:

PK-measurement					
CH1					
Test conditions: 1 TX , Pmax, 6 Mbps					
		Test results			
Start *f*	Stop *f*	Maximum emission		Limit	Margin
(MHz)	(MHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
2310	2390	2389.7	51.3	74.0	-22.7
2483.5	2500	2483.9	44.2	74.0	-29.8
2655	2900	2709.4	52.7	74.0	-21.3
Measurement uncertainty			±3 dB		

PK-measurement					
CH6					
Test conditions: 1 TX , Pmax, 6 Mbps					
		Test results			
Start *f*	Stop *f*	Maximum emission		Limit	Margin
(MHz)	(MHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
2310	2390	2372.6	46.9	74.0	-27.1
2483.5	2500	2493.3	49.7	74.0	-24.3
2655	2900	2760.7	51.3	74.0	-22.7
Measurement uncertainty			±3 dB		

PK-measurement					
CH11					
Test conditions: 1 TX , Pmax, 6 Mbps					
		Test results			
Start *f*	Stop *f*	Maximum emission		Limit	Margin
(MHz)	(MHz)	(MHz)	(dBµV/m)	(dBµV/m)	(dB)
2310	2390	2389.8	49.2	74.0	-24.8
2483.5	2500	2483.5	52.1	74.0	-21.9
2655	2900	2889.4	53.9	74.0	-20.1
Measurement uncertainty			±3 dB		

FCC ID: BWY-MCAIRE001

Radiated limits according to FCC Part 15C, 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: _____

_____

5.9 Maximum permissible exposure (MPE)

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

5.9.1 Description of the test location

Test location: AREA4

5.9.2 Applicable standard

According to FCC Part 15, Section 15.247(i):
Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.
The test methods used comply with ANSI/IEEE C95.1, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".
This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

5.9.3 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.4 of this document. Through the Friis transmission formula, the known maximum gain of the antenna and the maximum power, can be calculated the MPE in a defined distance away from the product.

Friis transmission formula:

$$P_d = \frac{P_{out} * G}{4 * \Pi * r^2}$$

Where:
P_d =power density (mW/cm^2)
P_{out} = output power to antenna (mW)
G = gain of antenna (linear scale)
r = distance between antenna and observation point (cm)

According to FCC Rules 47CFR 2.1093(b) the EUT is not a portable device. The EUT is designed to be used that radiating structures are 20 cm outside of the body of the user. (r = 20 cm)

5.9.4 Test result

WLAN Standard 802.11b

Worst case: Antenna EA-79B_2E with an antenna gain of 2.8 dBi, Power setting: max

Channel No.	Power	A (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
1	Pmax	17.7	2.8	58.88	1.91	0.1122	0.0223	1.0
6	Pmax	18.0	2.8	63.10	1.91	0.1202	0.0239	1.0
11	Pmax	17.8	2.8	60.26	1.91	0.1148	0.0228	1.0

WLAN Standard 802.11g

Worst case: Antenna EA-79B_2E with an antenna gain of 2.8 dBi, Power setting: max

Channel No.	Power	A (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm^2)	Limit S_{eq} (mW/cm^2)
1	Pmax	21.2	2.8	131.83	1.91	0.2512	0.0500	1.0
6	Pmax	21.1	2.8	128.82	1.91	0.2455	0.0488	1.0
11	Pmax	20.8	2.8	120.23	1.91	0.2291	0.0456	1.0

Limits for maximum permissible exposure (MPE):

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(B) Limits for General Population / Uncontrolled Exposure				
0.3 – 3.0	614	1.63	100	30
3.0 – 30	824/*f*	2.19/*f*	180/ f^2	30
30 - 300	27.5	0.073	0.2	30
300-1500	---	---	*f*/1500	30
1500-100000	**---**	**---**	**1.0**	**30**

f = Frequency in MHz

The requirements are **FULFILLED.**

Remarks: _____

_____

5.10 Co-location and Co-transmission

Applicable standard:
OET Bulletin 65, Edition 97-01, Section 2: Multiple-transmitter sites and Complex Environments

The FCC's MPE limits vary with frequency. Therefore, in mixed or broadband RF fields where several sources and frequencies are involved, the fraction of the recommended limit (in terms of power density or square of the electric or magnetic field strength) incurred within each frequency interval should be determined, and the sum of all fractional contributions should not exceed 1.0, or 100 % in terms of percentage.

Remarks: Not applicable, the EUT has only one transmitter.

5.11 Antenna application

5.11.1 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 antenna with R-SMA connector. A broken antenna can be replaced by the user.

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

5.11.2 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.

Defacto EIRP-Limit (Pout = 30 – (Gx – 6))

Antenna	G_{Tx}	Cond. limit	max. G	A [Pmax]	Limit P_{out}	Reduction	P set
	(dBi)	(dBm)	(dBi)	(dBm)	(dBm)	(dB)	2.4 GHz
EA-79B_2E	2.8	30.0	6.0	21.2	33.2	-12.0	Pmax

The output power has not to be reduced using the antenna type "122448 McAire Antenna EA-79B_2E".

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	ESHS 30	02-02/03-05-002	11/07/2013	11/07/2012		
	NNLK 8129	02-02/20-05-001	09/07/2012	09/01/2012		
	ESH 2 - Z 5	02-02/20-05-004	12/05/2013	12/05/2011	12/03/2013	12/09/2012
	N-4000-BNC	02-02/50-05-138				
	N-1500-N	02-02/50-05-140				
	ESH 3 - Z 2	02-02/50-05-155	02/04/2013	02/10/2012		
CPC 3	FSP 40	02-02/11-11-001	18/09/2013	18/09/2012		
MB	FSP 40	02-02/11-11-001	18/09/2013	18/09/2012		
SEC 1-3	FSP 40	02-02/11-11-001	18/09/2013	18/09/2012		
SER 3	FSP 40	02-02/11-11-001	18/09/2013	18/09/2012		
	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				