



FCC ID: T4YH42TBTWMGBS

Registration No. DAT-P-207/05

EMI -- TEST REPORT

- FCC Part 15.247 -

Test Report No. :	T33864-00-01HS	05 March 2010 Date of issue
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Type / Model Name : H42

Product Description : Communicator with Barcode reader, GSM, Bluetooth, GPS, WLAN and Card reader

Applicant : GOTIVE a.s.

Address : Bajkalká 21/A
82101 BRATISLAVA, SLOVAKIA

Manufacturer : GOTIVE a.s.

Address : Bajkalká 21/A
82101 BRATISLAVA, SLOVAKIA

Licence holder : GOTIVE a.s.

Address : Bajkalká 21/A
82101 BRATISLAVA, SLOVAKIA

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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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 (October 1, 2008)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October 1, 2008)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.205	Restricted bands of operation
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.247	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: 2003	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C95.1:1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

2 SUMMARY

GENERAL REMARKS:

The EUT consists of a WLAN-Module. The EUT showed its compliance to the FCC requirements was fully equipped with all options. The listed variants are subsets of the EUT.

Product Code	Product name - short	Product Name
H42TBTWB	H42T.BTW.B	H42 - BCR - Traffic Red
H42TBTWB1	H42T.BTW.B.1	H42 - BCR - Blue Sky
H42TBTWB2	H42T.BTW.B.2	H42 - BCR - Industrial Grey
H42TBTWMG	H42T.BTW.MG	H42 - GSM&GPS - Traffic Red
H42TBTWMG1	H42T.BTW.MG.1	H42 - GSM&GPS - Blue Sky
H42TBTWMG2	H42T.BTW.MG.2	H42 - GSM&GPS - Industrial Grey
H42TBTWMGB	H42T.BTW.MG.B	H42 - GSM&GPS&BCR - Traffic Red
H42TBTWMGB1	H42T.BTW.MG.B.1	H42 - GSM&GPS&BCR - Blue Sky
H42TBTWMGB2	H42T.BTW.MG.B.2	H42 - GSM&GPS&BCR - Industrial Grey
H42TBTWBS	H42T.BTW.B.S	H42 - BCR&SCR - Traffic Red
H42TBTWBS1	H42T.BTW.B.S.1	H42 - BCR&SCR - Blue Sky
H42TBTWBS2	H42T.BTW.B.S.2	H42 - BCR&SCR - Industrial Grey
H42TBTWMGS	H42T.BTW.MG.S	H42 - GSM&GPS&SCR - Traffic Red
H42TBTWMGS1	H42T.BTW.MG.S.1	H42 - GSM&GPS&SCR - Blue Sky
H42TBTWMGS2	H42T.BTW.MG.S.2	H42 - GSM&GPS&SCR - Industrial Grey
H42TBTWMGBS	H42T.BTW.MG.B.S	H42 - GSM&GPS&BCR&SCR - Traffic Red
H42TBTWMGBS1	H42T.BTW.MG.B.S.1	H42 - GSM&GPS&BCR&SCR - Blue Sky
H42TBTWMGBS2	H42T.BTW.MG.B.S.2	H42 - GSM&GPS&BCR&SCR - Industrial Grey
H42TBTWBA	H42T.BTW.B.A	H42 - BCR&SCRI - Traffic Red
H42TBTWBA1	H42T.BTW.B.A.1	H42 - BCR&SCRI - Blue Sky
H42TBTWBA2	H42T.BTW.B.A.2	H42 - BCR&SCRI - Industrial Grey
H42TBTWMGA	H42T.BTW.MG.A	H42 - GSM&GPS&SCRI - Traffic Red
H42TBTWMGA1	H42T.BTW.MG.A.1	H42 - GSM&GPS&SCRI - Blue Sky
H42TBTWMGA2	H42T.BTW.MG.A.2	H42 - GSM&GPS&SCRI - Industrial Grey
H42TBTWMGBA	H42T.BTW.MG.B.A	H42 - GSM&GPS&BCR&SCRI - Traffic Red
H42TBTWMGBA1	H42T.BTW.MG.B.A.1	H42 - GSM&GPS&BCR&SCRI - Blue Sky
H42TBTWMGBA2	H42T.BTW.MG.B.A.2	H42 - GSM&GPS&BCR&SCRI - Industrial Grey

Available Features in WLAN:

The WLAN module is compatible with 802.11b, 802.11g Standard. It supports the 2.4 GHz frequency band:
- 802.11b/g Mode 2.400 GHz – 2.4835 GHz

The module use DSSS or OFDM modulation and is capable to 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

There is only one internally antenna is printed on PCB-Board (030GB018C-AT&S-FE0508).

Pre-scan has been performed to determine the worst-case mode from all possible combinations between available modulations and data rates. The maximum output power depends on used data rate.

As worst case the following data rates are used:

- 802.11b: 11 Mbps, max. Power set 30
- 802.11g: 12 Mbps, max. Power set 30

The US version of the firmware supports the following listed channels and is fixed to a maximum output power setting of 30:

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802.11b/g mode:

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

The test software for the EUT provides free power setting, the special test mode RX and the TX continuous mode modulated. The tests were performed using the country setting US, Pattern (0101010101...), packet sending. The EUT was set with test modulation to transmit data during the tests with a duty cycle (X) of about X=1.

FINAL ASSESSMENT:

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

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

Testing commenced on : 18 November 2009

Testing concluded on : 23 November 2009

Checked by:

Tested by:

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

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

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT – See to attachment A

3.2 Power supply system utilised

Power supply voltage : Lithium-ion battery 3.7 VDC, AC mains adapter (100 V - 240 V / 50/60 Hz / 1 ϕ)

3.3 Short description of the equipment under test (EUT)

The EUT is a hand held communicator supports the user with following mobile features for the logistic management:

Communication

- GSM data only
- GPRS data only
- WLAN 802.11b/g
- Bluetooth

Capture

- Bar Code Reader
- Smart Card Reader
- Imager
- Fingerprint Reader

Navigation

- Global Positioning System (GPS)

Number of tested samples: 1
Serial number: Prototype

EUT operation mode:

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

- TX continuous mode, unmodulated
- TX continuous mode modulated
- RX-Mode

EUT configuration:

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

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

- AC mains adapter, (100V - 240V 50/60 Hz) Model : Fairway, Model: WN20U-050
- _____ Model : _____
- _____ Model : _____

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 Strasskirchen
Germany

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners gmbh, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production processes may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for specific tests. The manufacturer has the sole responsibility of continued compliance of the EUT.

4.4 Measurement protocol for FCC, VCCI and AUSTEL

4.4.1 GENERAL INFORMATION

4.4.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

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.

5 TEST CONDITIONS AND RESULTS

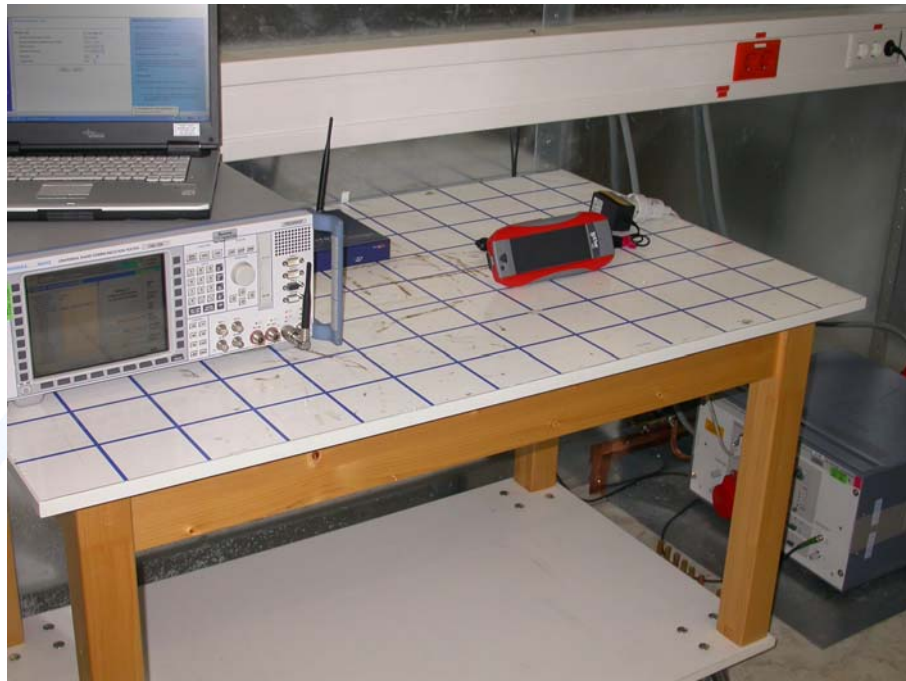
5.1 Conducted emissions

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



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 limits in the following table.

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

5.1.4 Description of Measurement

The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a line impedance stabilization network (LISN) with 50Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 cm above the floor and is positioned 40 cm from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

To convert between dBμV and μV, the following conversions apply:

$$\text{dB}\mu\text{V} = 20 \log \mu\text{V}$$

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

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 15.1 dB at 585 kHz in RX-Mode

The requirements are **FULFILLED**.

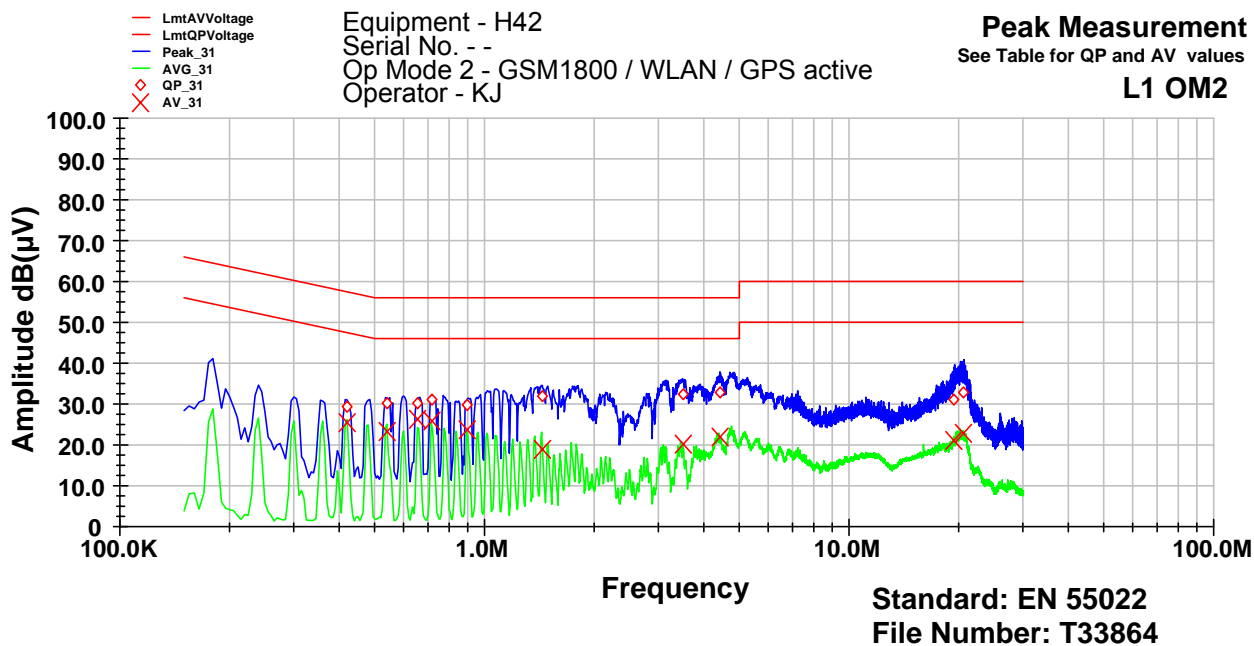
Remarks: For detailed test result please refer to following test protocols

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5.1.6 Test protocol

Test point L1
Operation mode: TX continuous mode modulated
Remarks:

Result: passed

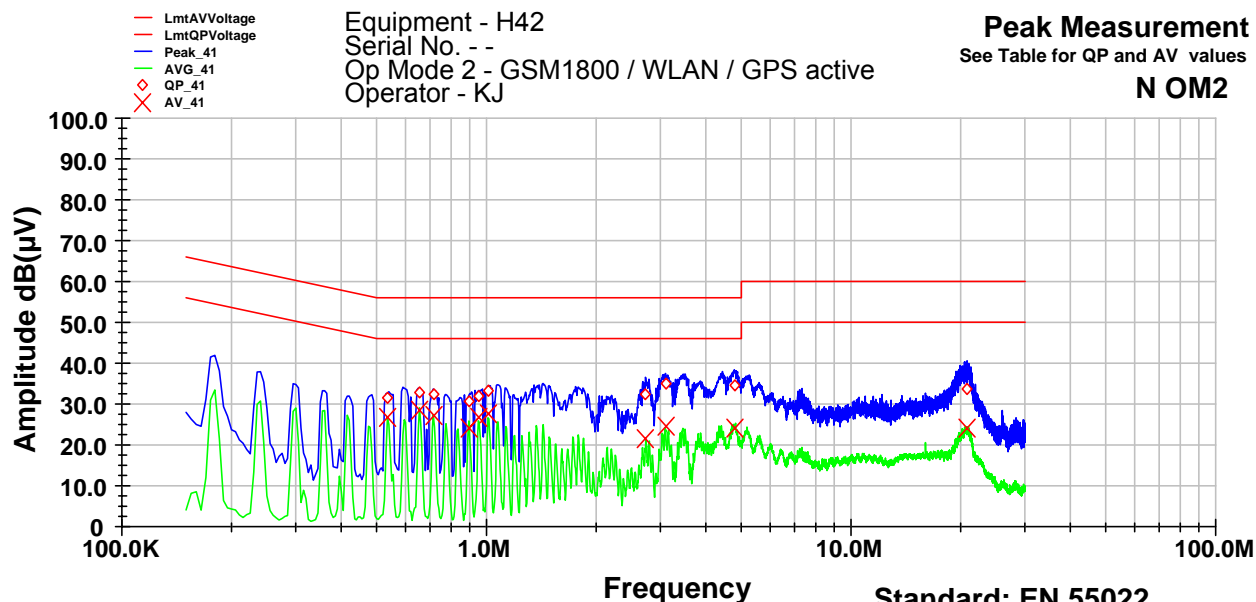


Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.42	29.2	-28.2	57.4	25.4	-22.0	47.4
0.54	30.4	-25.6	56.0	23.0	-23.0	46.0
0.655	30.4	-25.6	56.0	26.2	-19.8	46.0
0.715	30.9	-25.1	56.0	25.6	-20.4	46.0
0.895	29.6	-26.4	56.0	23.7	-22.3	46.0
1.44	32.0	-24.0	56.0	19.0	-27.0	46.0
3.5	32.2	-23.8	56.0	20.1	-25.9	46.0
4.425	32.9	-23.1	56.0	22.0	-24.0	46.0
19.485	31.0	-29.0	60.0	21.1	-28.9	50.0
20.645	32.8	-27.3	60.0	23.0	-27.0	50.0

FCC ID: T4YH42TBTWMGBS

Test point N
Operation mode: TX continuous mode modulated
Remarks:

Result: passed



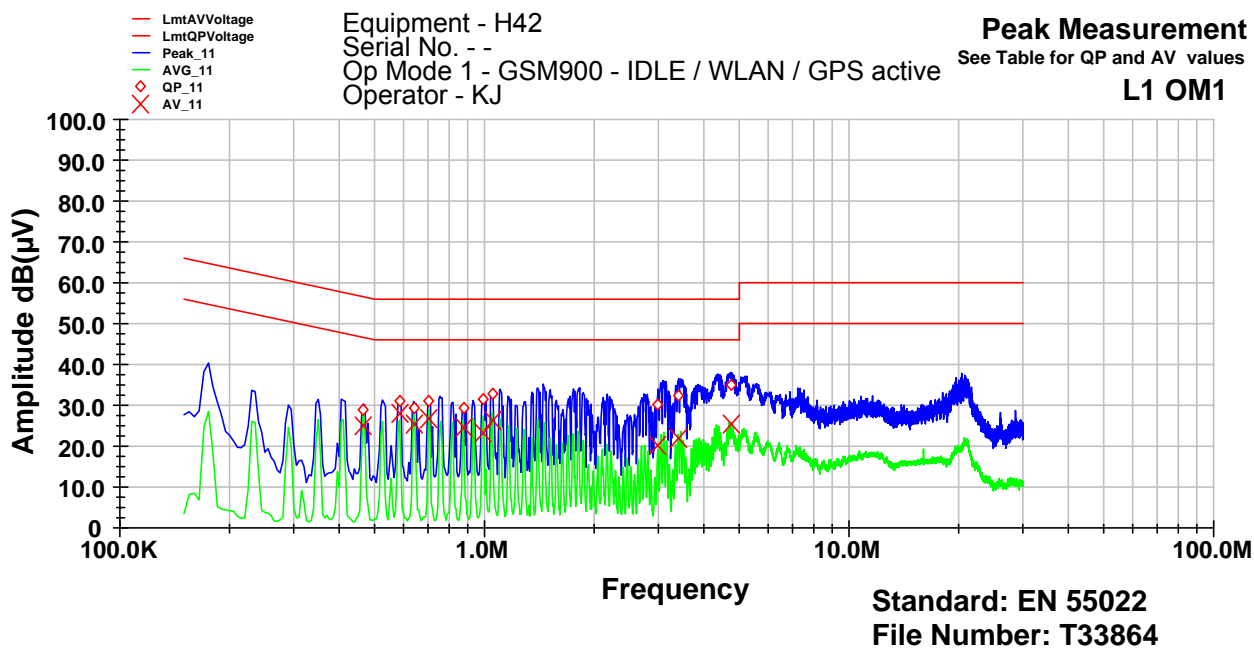
Standard: EN 55022
File Number: T33864

Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.535	31.6	-24.4	56.0	26.9	-19.1	46.0
0.655	32.8	-23.2	56.0	28.6	-17.4	46.0
0.715	32.4	-23.6	56.0	27.3	-18.8	46.0
0.895	30.8	-25.2	56.0	23.9	-22.1	46.0
0.95	32.1	-23.9	56.0	26.6	-19.4	46.0
1.01	33.3	-22.7	56.0	27.5	-18.5	46.0
2.73	32.2	-23.8	56.0	21.4	-24.6	46.0
3.095	34.9	-21.1	56.0	24.4	-21.6	46.0
4.785	34.6	-21.4	56.0	24.0	-22.0	46.0
20.775	33.8	-26.2	60.0	24.2	-25.8	50.0

FCC ID: T4YH42TBTWMGBS

Test point L1
Operation mode: RX-Mode
Remarks:

Result: passed

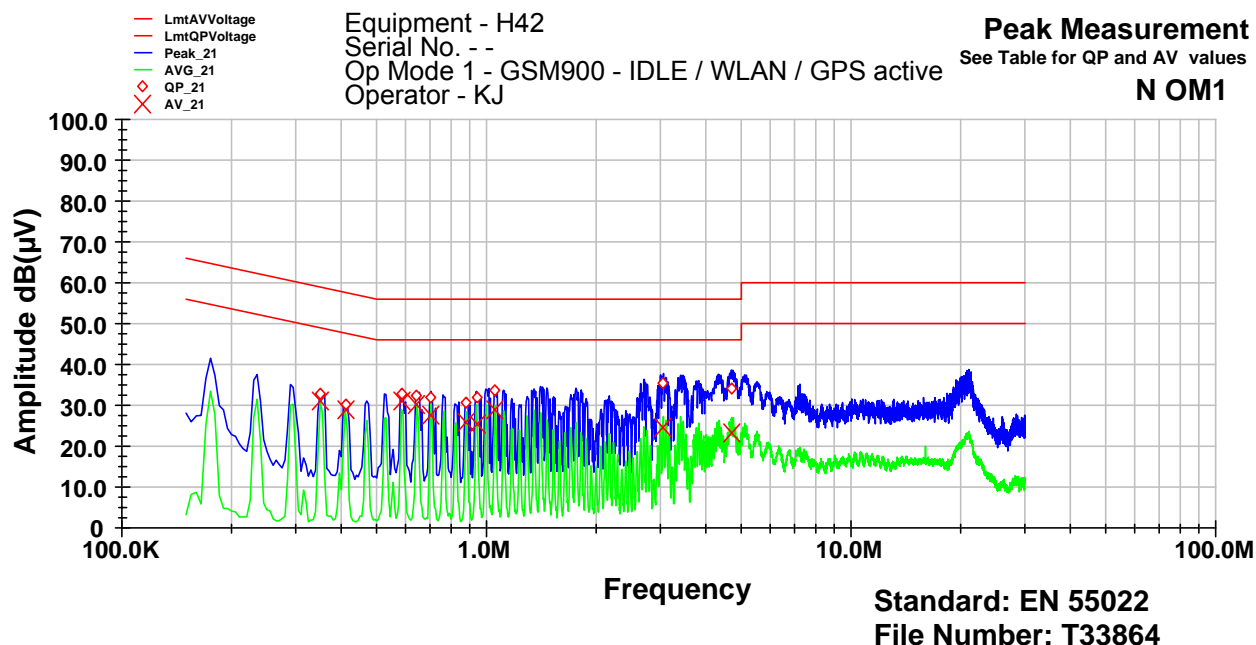


Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.465	28.9	-27.7	56.6	24.9	-21.7	46.6
0.585	31.0	-25.0	56.0	27.9	-18.1	46.0
0.64	29.5	-26.5	56.0	25.2	-20.8	46.0
0.705	30.9	-25.1	56.0	26.9	-19.1	46.0
0.875	29.2	-26.8	56.0	24.5	-21.5	46.0
0.99	31.3	-24.7	56.0	23.3	-22.7	46.0
1.05	32.6	-23.4	56.0	26.2	-19.8	46.0
2.995	30.4	-25.6	56.0	20.3	-25.7	46.0
3.41	32.3	-23.7	56.0	22.0	-24.0	46.0
4.735	35.0	-21.0	56.0	25.3	-20.7	46.0

FCC ID: T4YH42TBTWMGBS

Test point N
Operation mode: RX-Mode
Remarks:

Result: passed



Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.35	32.7	-26.3	59.0	31.0	-17.9	49.0
0.41	30.3	-27.3	57.6	28.8	-18.8	47.6
0.585	33.0	-23.0	56.0	30.9	-15.1	46.0
0.645	32.6	-23.4	56.0	30.3	-15.7	46.0
0.705	31.8	-24.2	56.0	27.5	-18.5	46.0
0.88	30.6	-25.4	56.0	25.8	-20.2	46.0
0.94	32.0	-24.0	56.0	25.6	-20.4	46.0
1.055	33.5	-22.5	56.0	28.9	-17.1	46.0
3.055	35.3	-20.7	56.0	24.7	-21.3	46.0
4.705	34.1	-21.9	56.0	23.3	-22.7	46.0

FCC ID: T4YH42TBTWMGBS

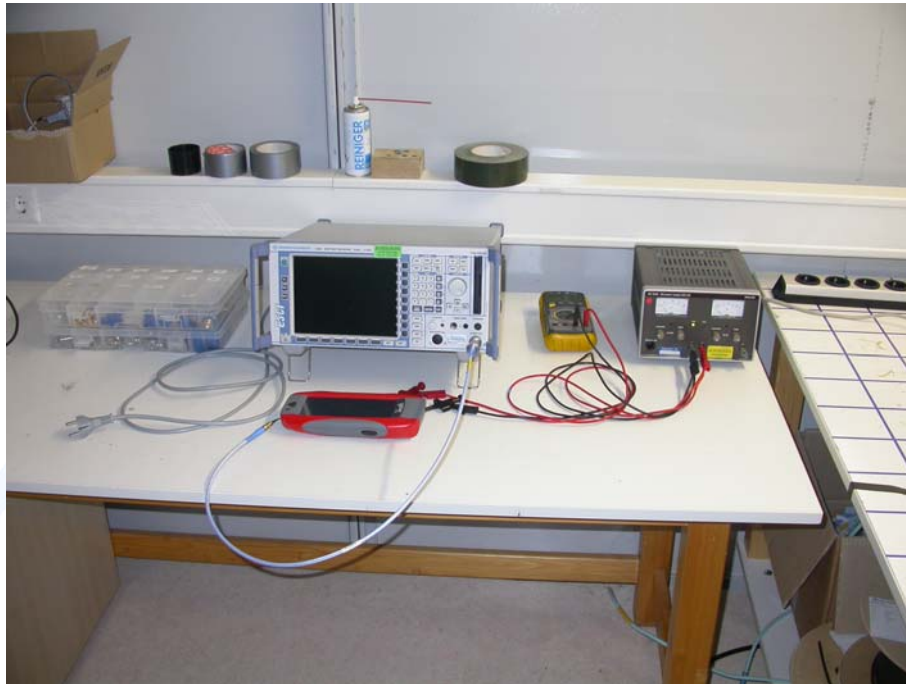
5.2 Maximum output power conducted

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

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 (b):

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.

5.2.4 Description of Measurement

The transmitter output was connected to the spectrum analyser through an attenuator. The center frequency of the spectrum analyser is set to the fundamental frequency. The span of the spectrum analyser should be larger than the emission bandwidth (EBW). To get the total power of the occupied bandwidth the function "Channel Power Measurement" of the analyser has been used. The channel bandwidth has been set to EBW. With Peak detector and Power Mode "Max Hold" the result is the summed maximum output power of the EBW. To determine the max output power the worst case power setting is used dependent of the antenna gain. The cable loss or other external attenuation was taken into account and expressed in a correction factor. The absolute maximum peak output power is calculated and compared with the limit.

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Spectrum analyser settings:

RBW: 1 MHz
 Detector: Peak
 Power Mode: Max. Hold

VBW: 300 kHz
 Sweep time: 1 s
 Channel bandwidth: 20 MHz

5.2.5 Test result

WLAN Standard 802.11b

Channel	Frequency (MHz)	Power setting	Measured power (dBm)	Cable loss correction (dB)	Corr. peak power (dBm)	Peak power limit (dBm)	Delta (dB)
1	2412	30	20.6	2.4	23.0	30	-7.0
6	2437	30	20.7	2.4	23.1	30	-6.9
11	2462	30	20.5	2.4	22.9	30	-7.1

The cable loss correction takes account of the overall loss of the measurement cable: 20 cm U-FL-Cable + 1.5 m
 Measure cable = 2.4 dB at 2.45 GHz

WLAN Standard 802.11g

Channel	Frequency (MHz)	Power setting	Measured power (dBm)	Cable loss correction (dB)	Corr. peak power (dBm)	Peak power limit (dBm)	Delta (dB)
1	2412	30	16.2	2.4	18.6	30	-11.4
6	2437	30	16.1	2.4	18.5	30	-11.5
11	2462	30	16.1	2.4	18.5	30	-11.5

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:

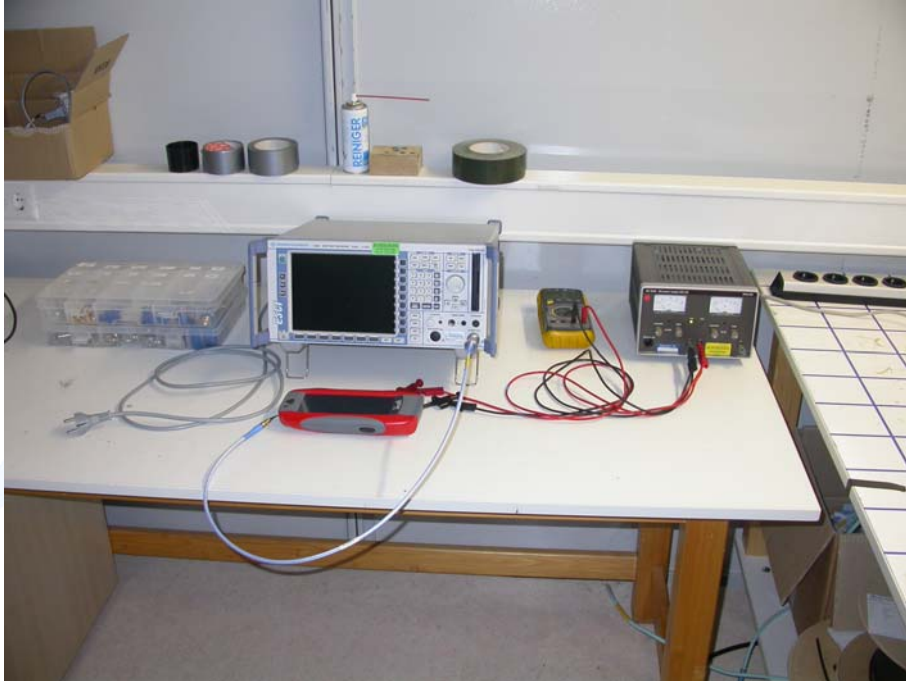
5.3 6 dB bandwidth

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



5.3.3 Applicable standard

According to FCC Part 15, Section 15.247(a)(2):

Systems using digital modulation techniques may operate in the 902 MHz - 928 MHz, 2400 MHz – 2483.5 MHz and 5725 MHz – 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.3.4 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

Detector: PEAK

VBW: 300 kHz

Sweep time: 5 s

FCC ID: T4YH42TBTWMGBS

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

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

5.3.5 Test result

WLAN Standard 802.11b

Channel number	Fundamental frequency (MHz)	6 dB Bandwidth (MHz)	Minimum limit (MHz)
1	2412	10.5	0.5
6	2437	10.8	0.5
11	2462	10.5	0.5

WLAN Standard 802.11g

Channel number	Fundamental frequency (MHz)	6 dB Bandwidth (MHz)	Minimum limit (MHz)
1	2412	16.56	0.5
6	2437	16.50	0.5
11	2462	16.56	0.5

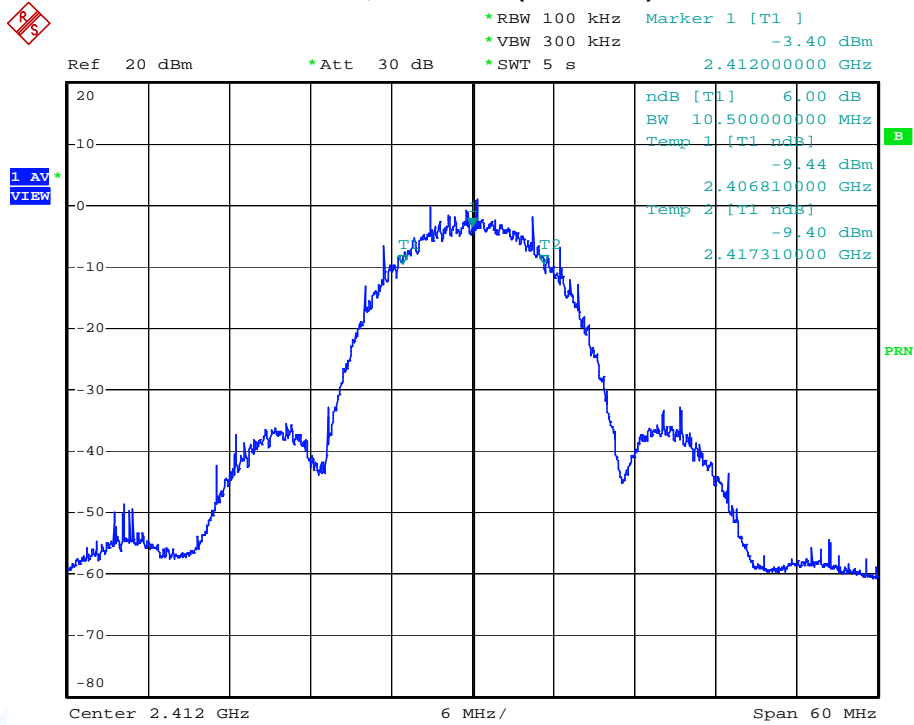
The requirements are **FULFILLED**.

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

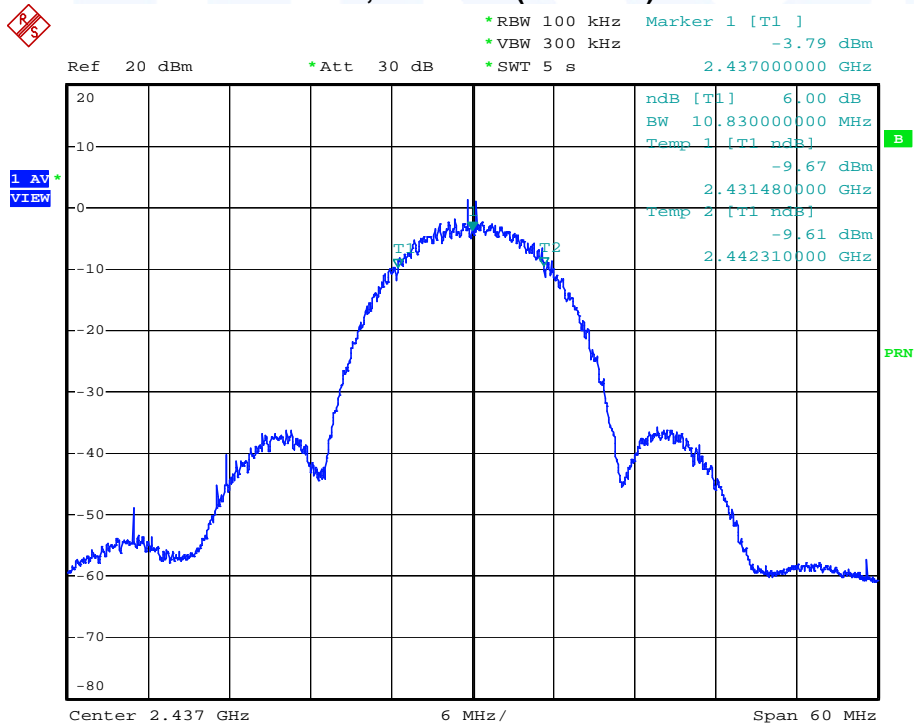
FCC ID: T4YH42TBTWMGBS

5.3.6 Test protocols

802.11b, Channel 1 (2412 MHz)

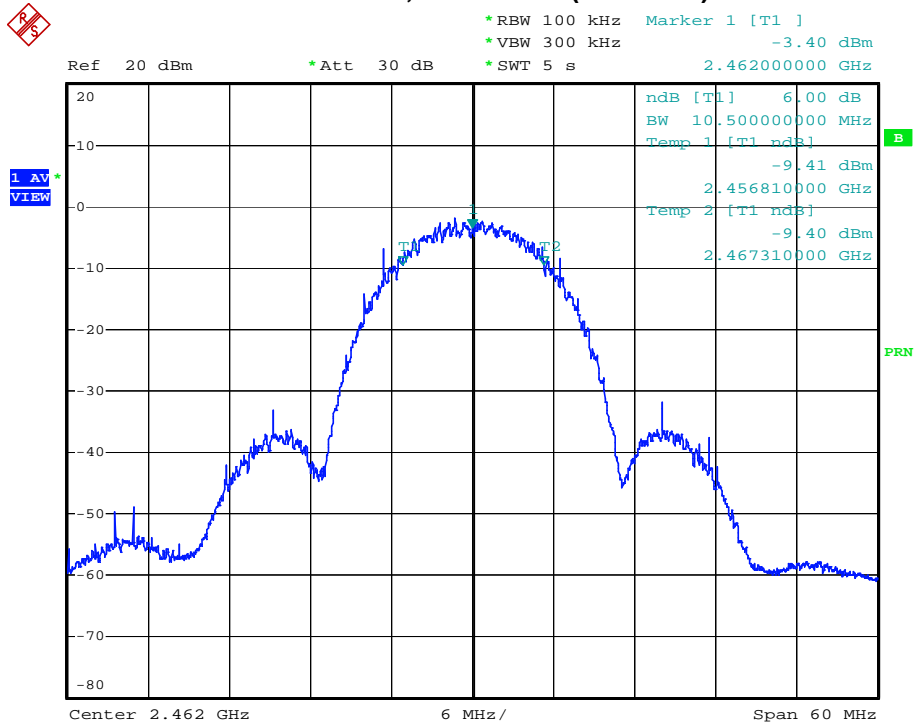


802.11b, Channel 6 (2437 MHz)

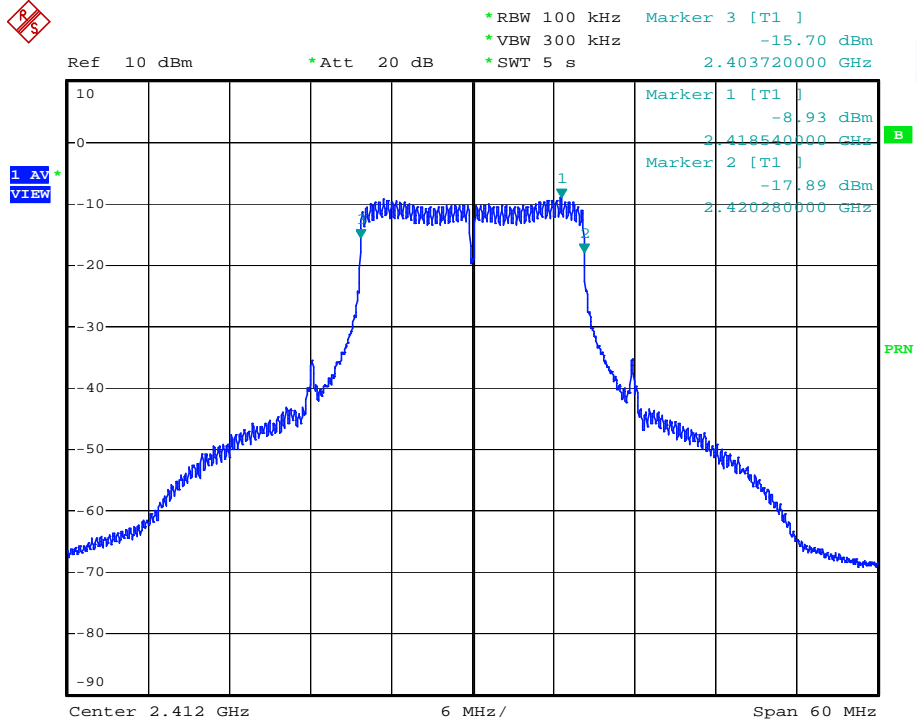


FCC ID: T4YH42TBTWMGBS

802.11b, Channel 11 (2462 MHz)

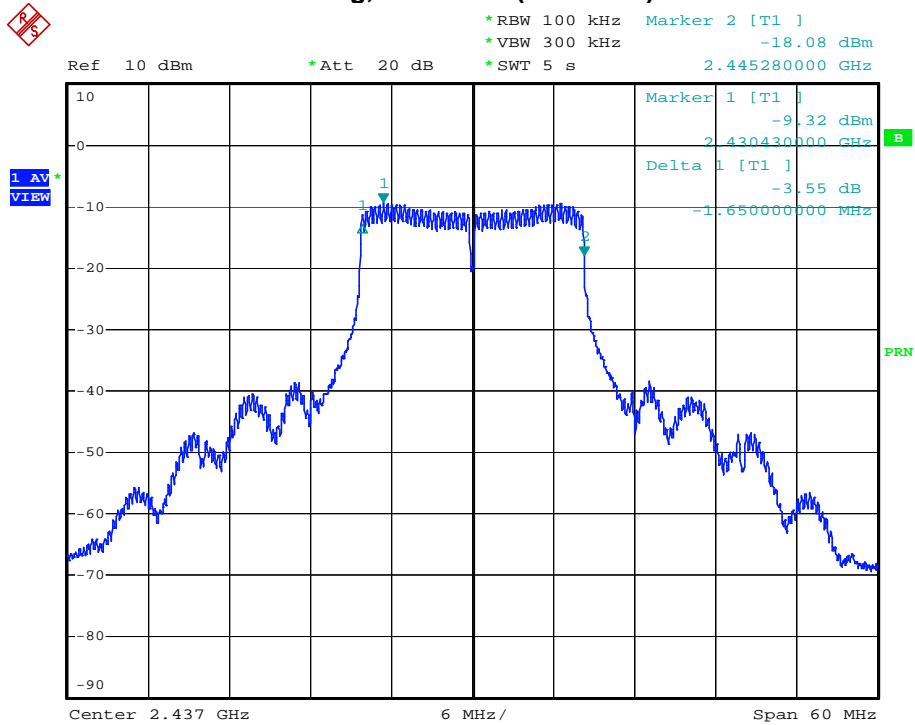


802.11g, Channel 1 (2412 MHz)

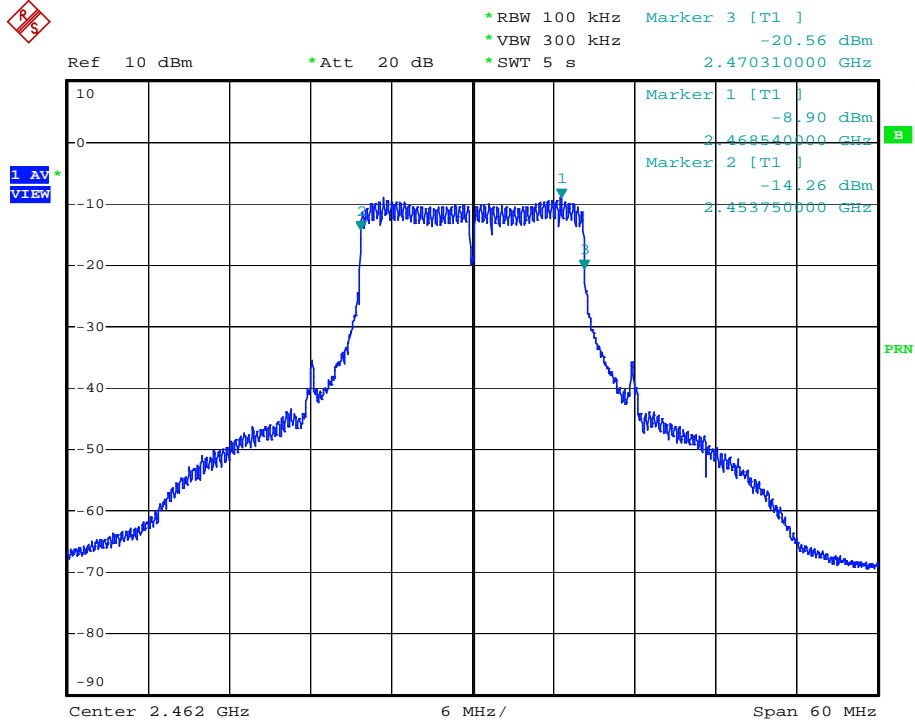


FCC ID: T4YH42TBTWMGBS

802.11g, Channel 6 (2437 MHz)



802.11g, Channel 11 (2462 MHz)



FCC ID: T4YH42TBTWMGBS

5.4 Spurious emissions

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

5.4.1 Description of the test location

Test location: OATS1
Test location: Anechoic Chamber A2

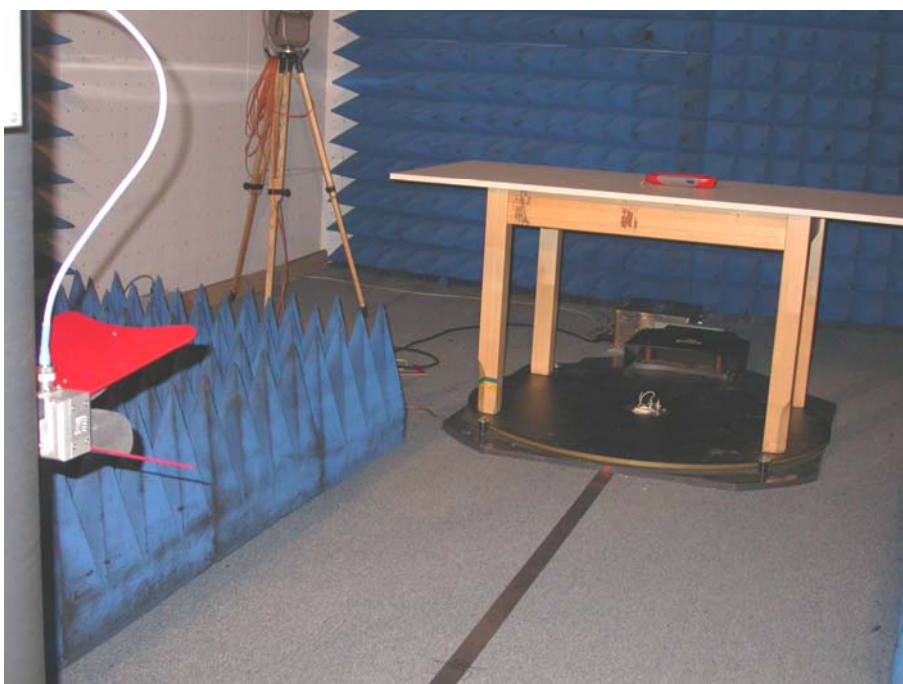
Test distance: 3 metres

5.4.2 Photo documentation of the test set-up

Open area test site



Anechoic chamber



5.4.3 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)).

5.4.4 Description of measurement

Radiated spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linear polarized antennas. The measurements are made with 120 kHz bandwidth and quasi-peak detection. The EUT is placed on a 1.0 X 1.5 m non-conducting table 80 cm above the ground plane. The set up of the equipment under test will be in accordance to ANSI C63.4.

The antenna was positioned 3 m horizontally from the EUT. To locate maximum emissions from the EUT the antenna is shifted in height from 1 m to 4 m, after the EUT is rotated 360 degrees. The measurement scan is made in horizontal and vertical polarization of the antenna.

For the radiated measurement up from 1 GHz to maximum frequency as specified in Section 15.33, a spectrum analyser and appropriate linear polarized antennas are used. The EUT is placed on a 1.0 X 1.5 m non-conducting table 80 cm above the ground plane of a fully anechoic chamber. The set up of the EUT will be in accordance to ANSI C63.4. For testing above 1 GHz, 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.

5.4.5 Test result

5.4.5.1 RF conducted test

Spectrum analyser settings:

RBW 100 kHz

VBW 300 kHz

Detector max. Peak Hold

Sweep time auto

WLAN Standard 802.11b

Channel 1 (2412 MHz), max. level 18.6 dBm				Channel 11 (2462 MHz), max. level 18.5 dBm			
Frequency (MHz)	Peak Power (dBm)	Limit (-20 dB) (dBm)	Delta (dB)	Frequency (MHz)	Peak Power (dBm)	Limit (-20 dB) (dBm)	Delta (dB)
30-1000	< -65	-1.4		30-1000	< -65	-1.5	
4822	-58.7	-1.4	-57,3				

WLAN Standard 802.11g

Channel 1 (2412 MHz), max. level 16.2 dBm				Channel 11 (2462 MHz), 16.1 dBm			
Frequency (MHz)	Peak Power (dBm)	Limit (-20 dB) (dBm)	Delta (dB)	Frequency (MHz)	Peak Power (dBm)	Limit (-20 dB) (dBm)	Delta (dB)
30-1000	< -65	-3.8		30-1000	< -65	-3.9	

5.4.5.2 Radiated emission test

WLAN Standard 802.11b

Channel 1 (2412 MHz)

Nearest restricted band: 2310 - 2390 MHz

Antenna		Power Setting	Frequency (MHz)	Peak		Average	
Type	Gain (dBi)			Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
Internal antenna	2.7	30	2385	47.7	74		

Channel 11 (2462 MHz)

Nearest restricted band: 2483.5 - 2500 MHz

Antenna		Power setting	Frequency (MHz)	Peak		Average	
Type	Gain (dBi)			Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
Internal antenna	2.7	30	2499	46.8	74		

FCC ID: T4YH42TBTWMGBS

WLAN Standard 802.11g

Channel 1 (2412 MHz)

Nearest restricted band: 2310 - 2390 MHz

Antenna		Power Setting (ΔdB)	Frequency (MHz)	Peak		Average	
Type	Gain (dBi)			Value (dBμV/m)	Limit (dBμV/m)	Value (dBμV/m)	Limit (dBμV/m)
Internal antenna	2.7	30	2390			50.0	54

Remark: All other emissions falling in restricted bands are at least 10 dB below the appropriate limit (see table below).

Channel 11 (2462 MHz)

Nearest restricted band: 2483.5 - 2500 MHz

Antenna		Power Setting (ΔdB)	Frequency (MHz)	Peak		Average	
Type	Gain (dBi)			Value (dBμV/m)	Limit (dBμV/m)	Value (dBμV/m)	Limit (dBμV/m)
Internal antenna	2.7	30	2483.5			49.9	54

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

Frequency (MHz)	Field strength of spurious emissions		Measurement distance
	(μV/m)	(dBμV/m)	(m)
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

FCC ID: T4YH42TBTWMGBS

The requirements are **FULFILLED**.

Remarks: Only spurious emissions falling not in restricted bands have been measured conducted.
The measurement was performed up to the 10th harmonic. For detailed test results please refer to
following test protocols.

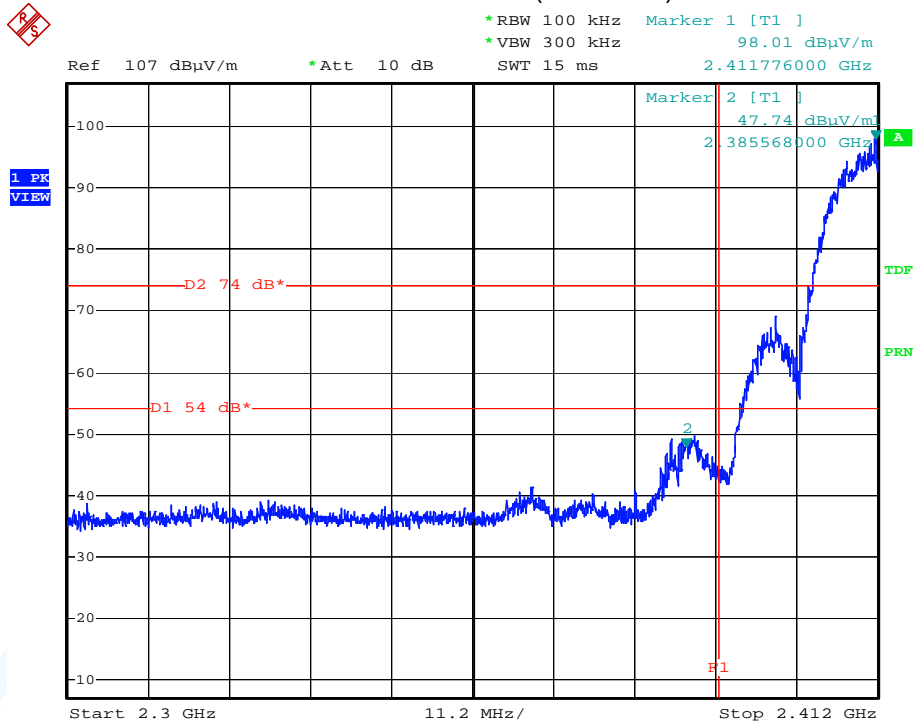
mikes

FCC ID: T4YH42TBTWMGBS

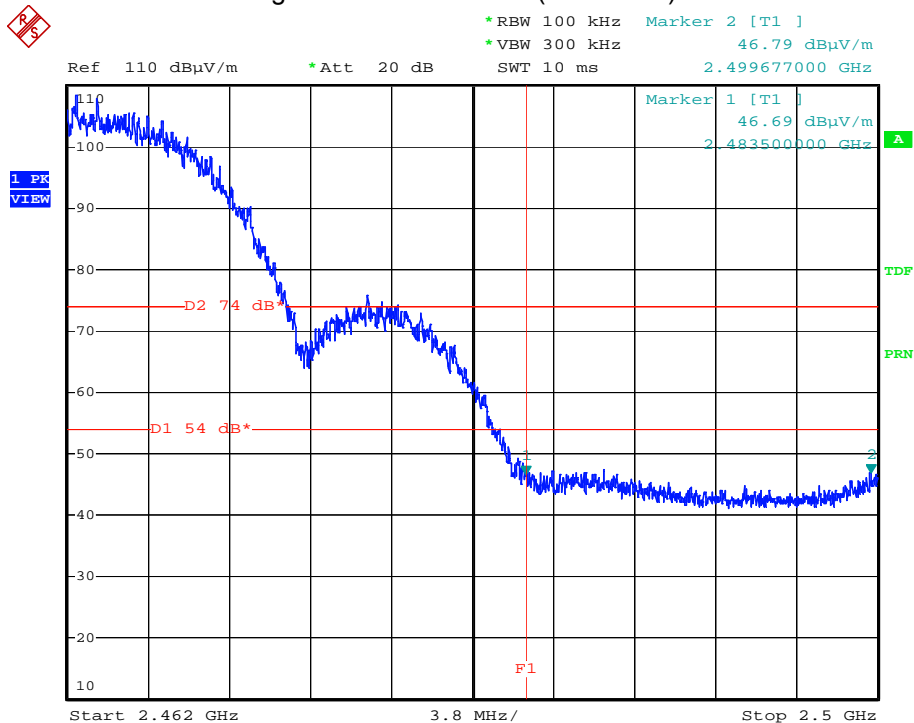
5.4.6 Test protocols

Plots of spurious emissions in the nearest restricted bands

Lower channel 802.11b (2412 MHz)

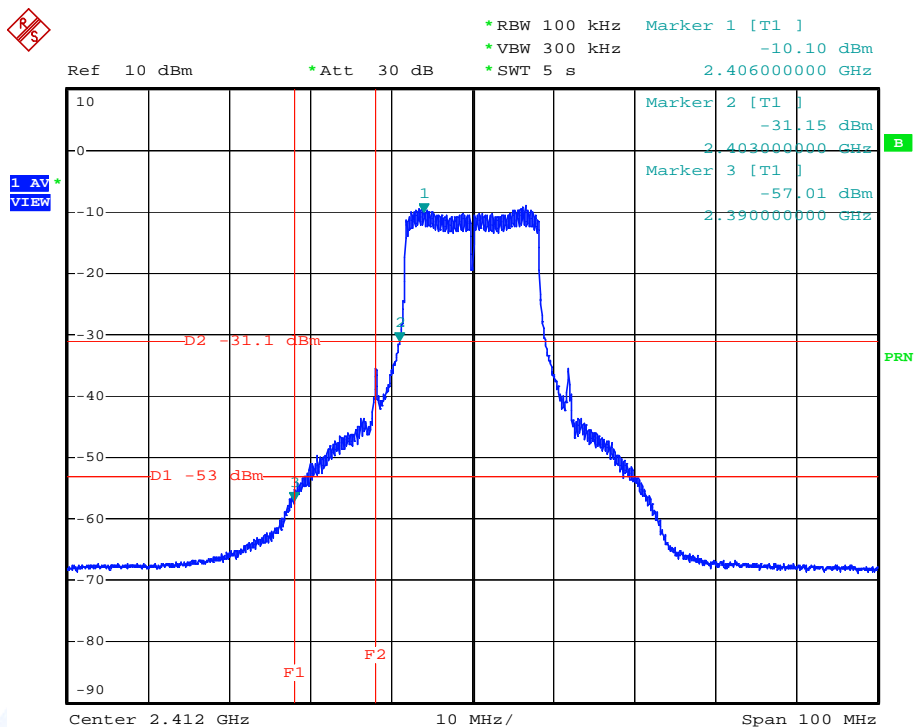


Higher channel 802.11b (2462 MHz)



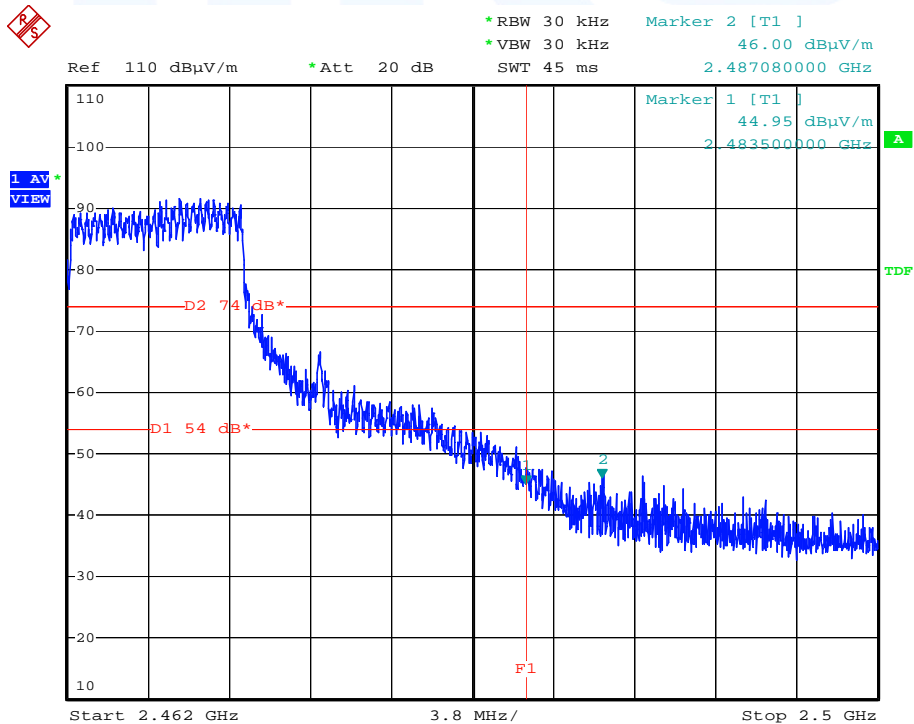
FCC ID: T4YH42TBTWMGBS

Lower channel 802.11g (2412 MHz)



Comment: H42, Power set 30, NC, Chlg,

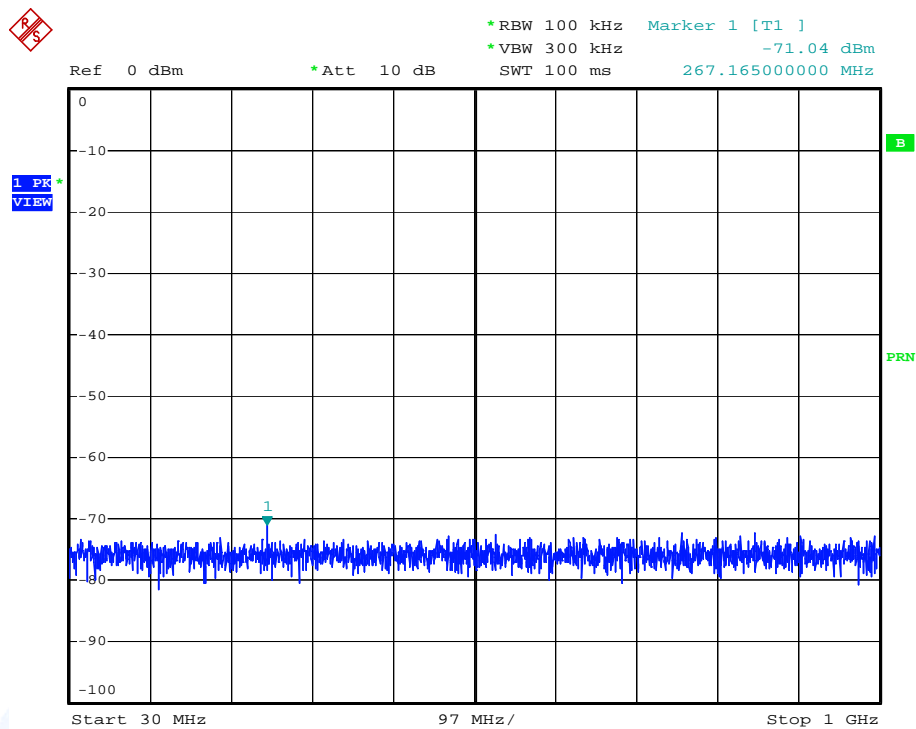
Higher channel 802.11g (2462 MHz)



Comment: H42, CH11b, NC, Power set 30, PCB-Ant, hor.

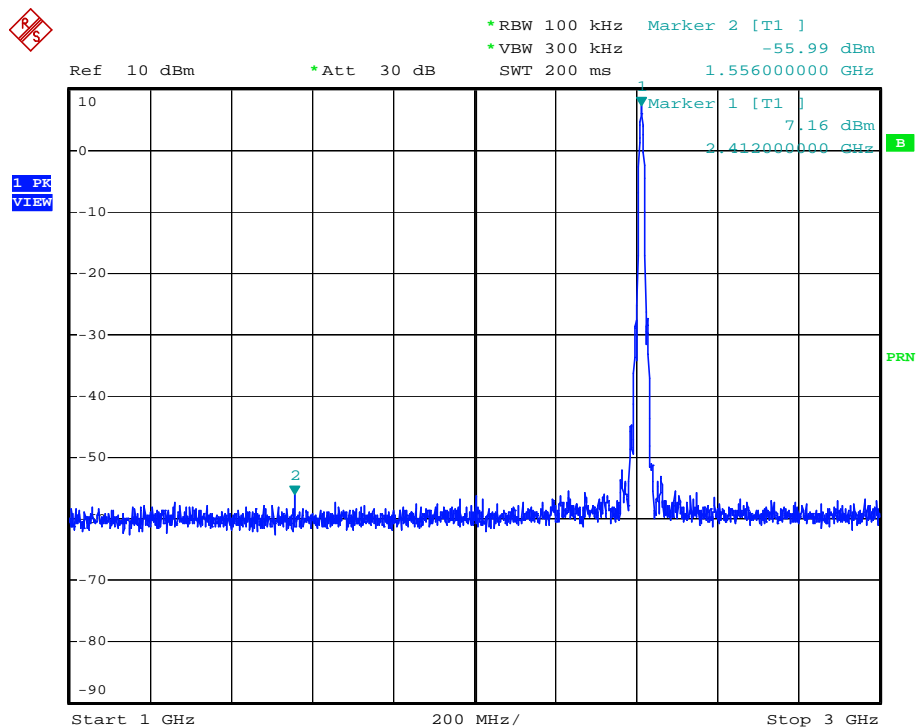
FCC ID: T4YH42TBTWMGBS

Conducted spurious emissions from 30 MHz to 1 GHz (worst case)



Comment: H42, Power set 30, NC, Ch1b

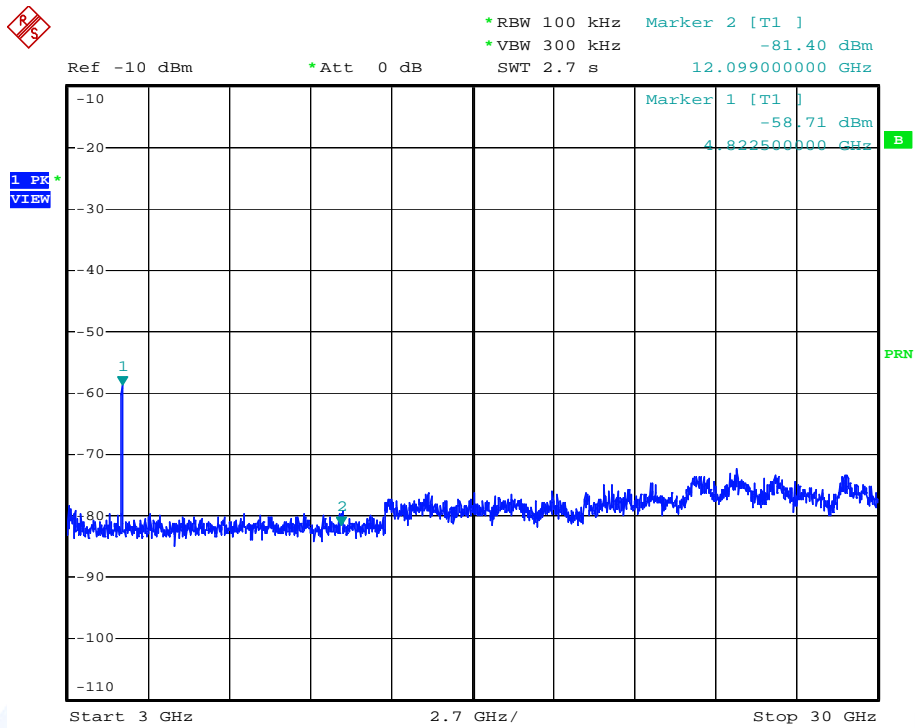
Conducted spurious emissions from 1 GHz to 3 GHz (worst case)



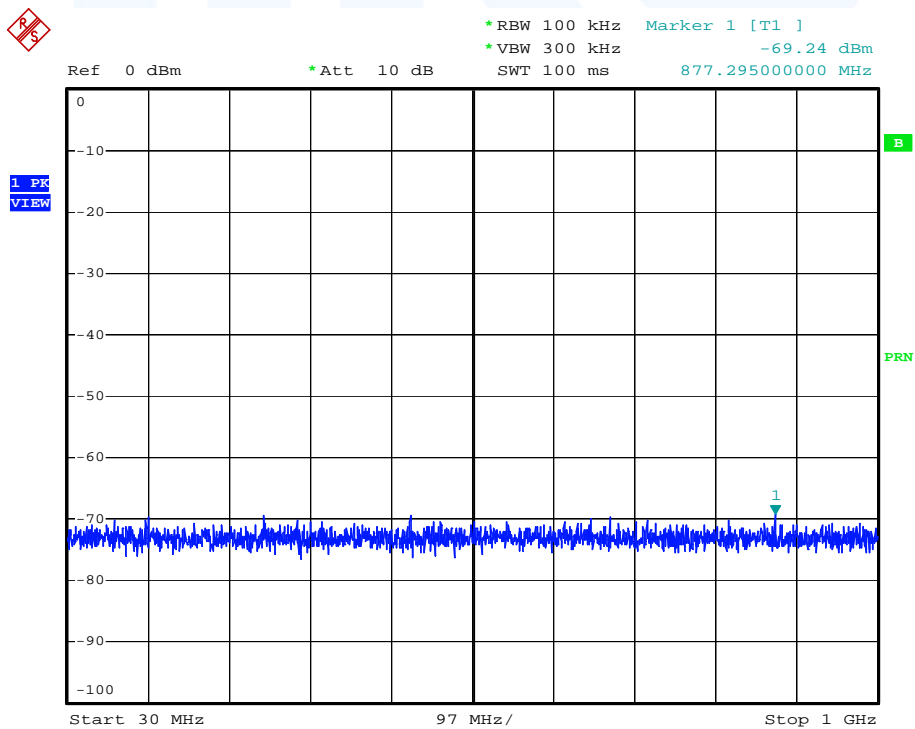
Comment: H42, Power set 30, NC, Ch1b

FCC ID: T4YH42TBTWMGBS

Conducted spurious emissions from 3 GHz to 30 GHz (worst case)

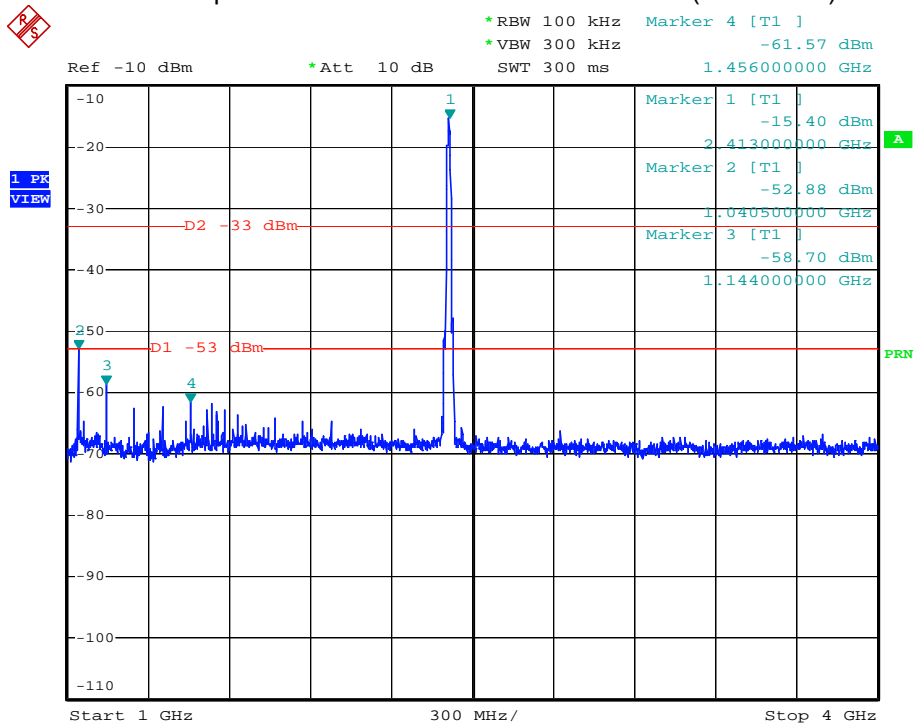


Radiated spurious emissions from 30 MHz to 1000 MHz (worst case)



FCC ID: T4YH42TBTWMGBS

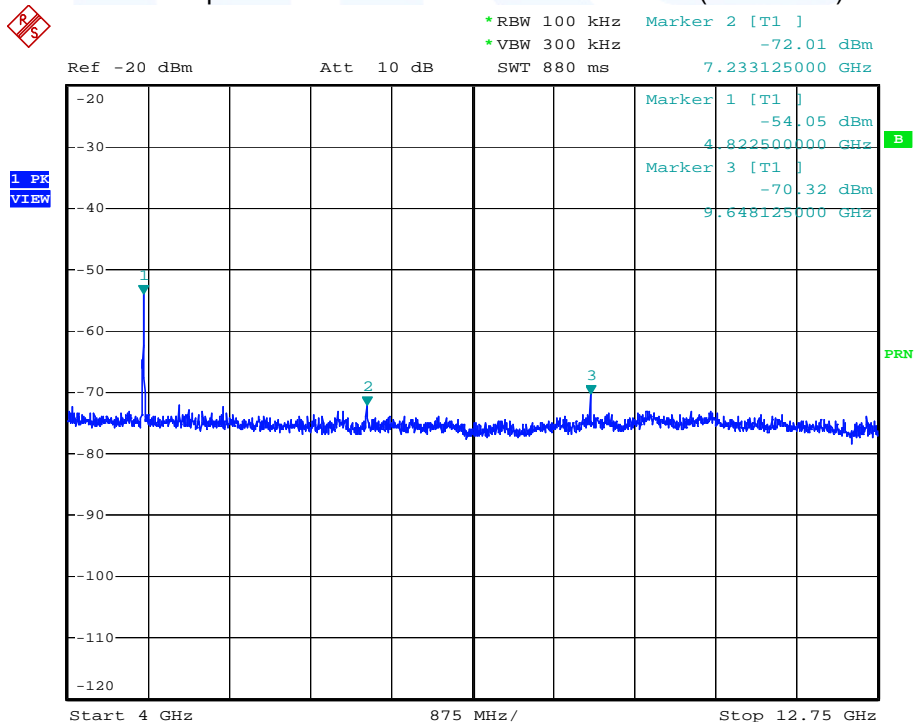
Radiated spurious emissions from 1 GHz to 4 GHz (worst case)



Comment: H42, CH1b, NC, Power set 30, 50 OHM, hor

Remark: The large peak in the diagram is the output of the WLAN-Transmitter in the permitted operating band.

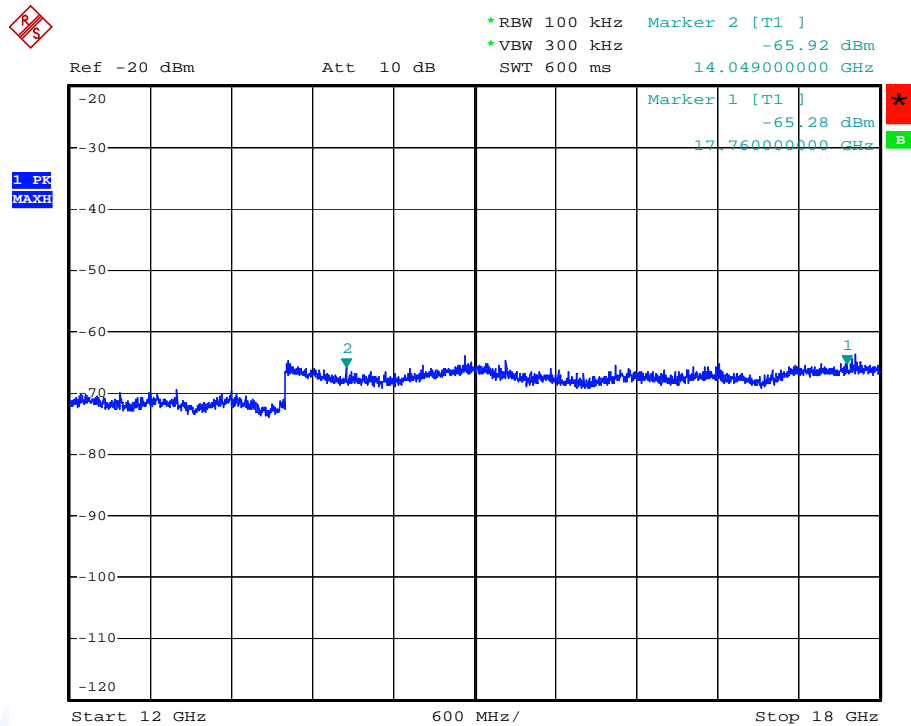
Radiated spurious emissions from 4 GHz to 12 GHz (worst case)



Comment: H42, CH1b, NC, Power set 30, 50 OHM, vert

FCC ID: T4YH42TBTWMGBS

Radiated spurious emissions from 12 GHz to 18 GHz (worst case)



Comment: H42, CH1b, NC, Power set 30, 50 OHM, hor

Remark: No emission could be detected in the range up to 25 GHz. All peak emissions were below the limits of Section 15.209(a).

FCC ID: T4YH42TBTWMGBS

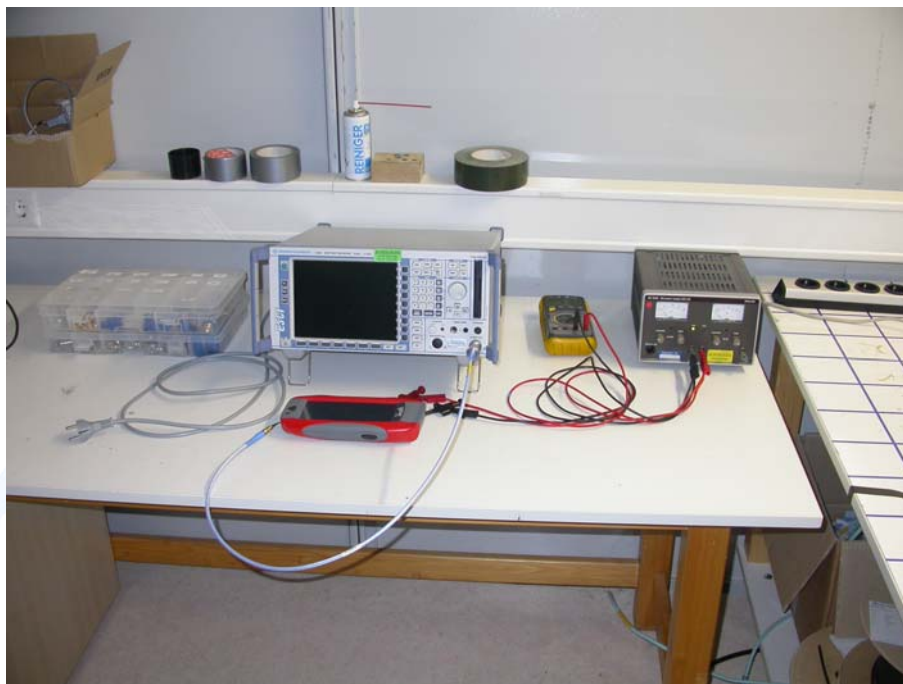
5.5 Power spectral density

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



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 EUT was connected to the spectrum analyser with a suitable attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyser, set sweep time equal to span/3 kHz. The power spectral density was measured using the analyser function "Channel Power" in dBm/Hz. The result is calculated by adding 35 dB (10log3000 Hz/Hz) as bandwidth correction factor to the analyser reading.

Spectrum analyser settings:

RBW	3 kHz	VBW	30 kHz
Detector	max. PEAK	Sweep time	5 s
Channel bandwidth	20 MHz, 40 MHz for turbo channels, adjacent channel band with ditto.		

FCC ID: T4YH42TBTWMGBS

5.5.5 Test result

WLAN Standard 802.11b

Channel	Frequency (MHz)	Reading (dBm/Hz)	Correction to 3 kHz (dB)	PSD (dBm)	Limit (dBm)
1	2412	-46.8	35	-11.8	8
6	2437	-47.8	35	-12.8	8
11	2462	-47.6	35	-12.6	8

WLAN Standard 802.11g

Channel	Frequency (MHz)	Reading (dBm/Hz)	Correction to 3 kHz (dB)	PSD (dBm)	Limit (dBm)
1	2412	-53.4	35	-18.4	8
6	2437	-53.6	35	-18.6	8
11	2462	-53.5	35	-18.5	8

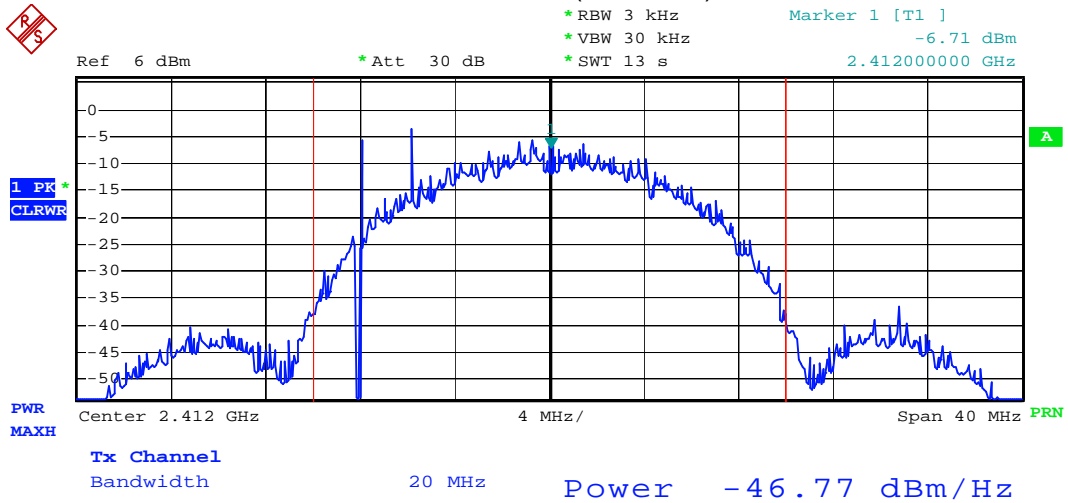
The requirements are **FULFILLED**.

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

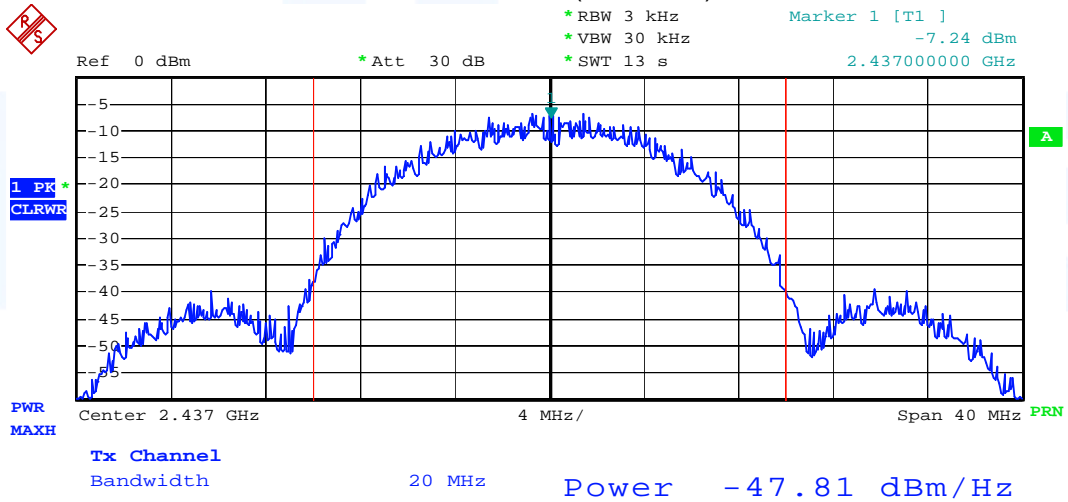
FCC ID: T4YH42TBTWMGBS

Power spectral density plots

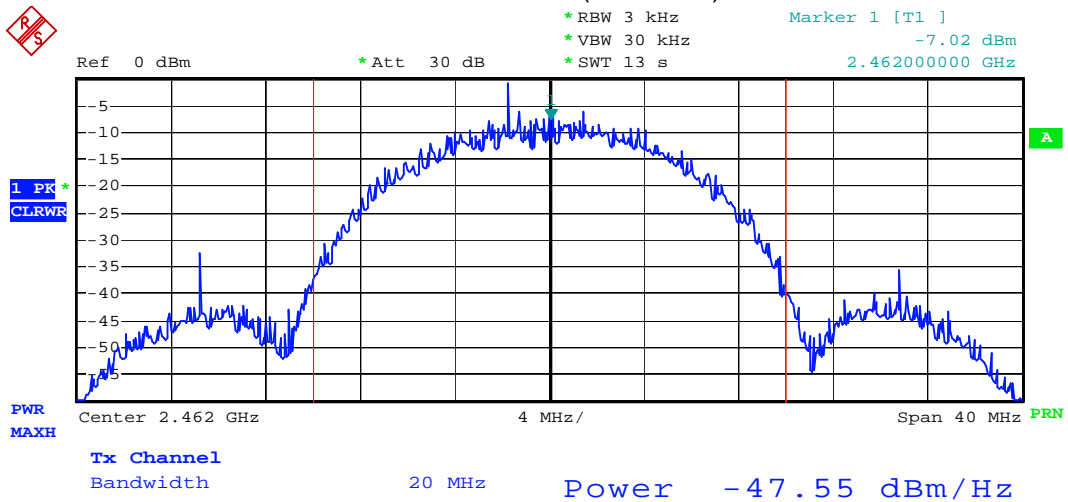
802.11b Channel 1 (2412 MHz)



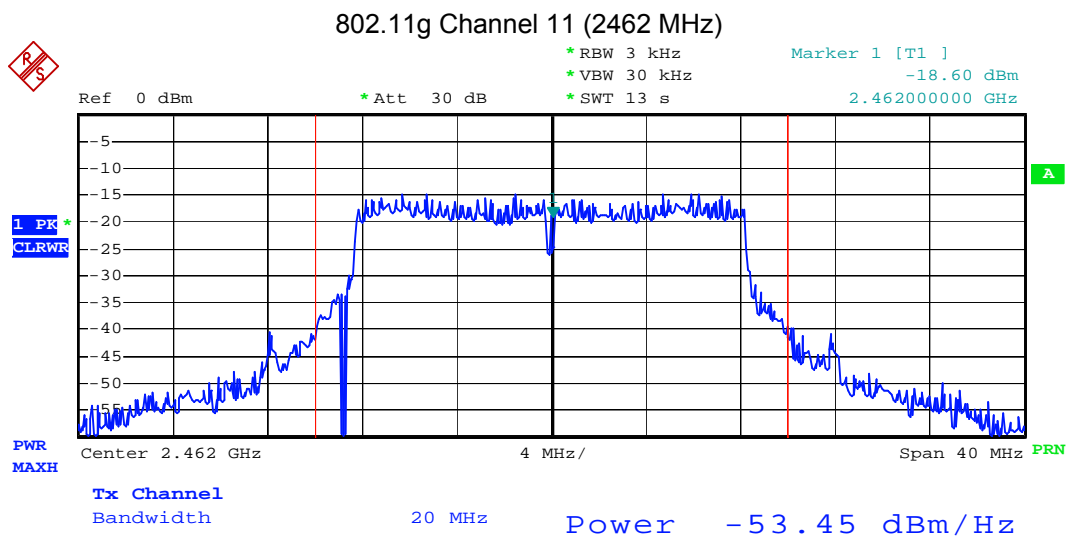
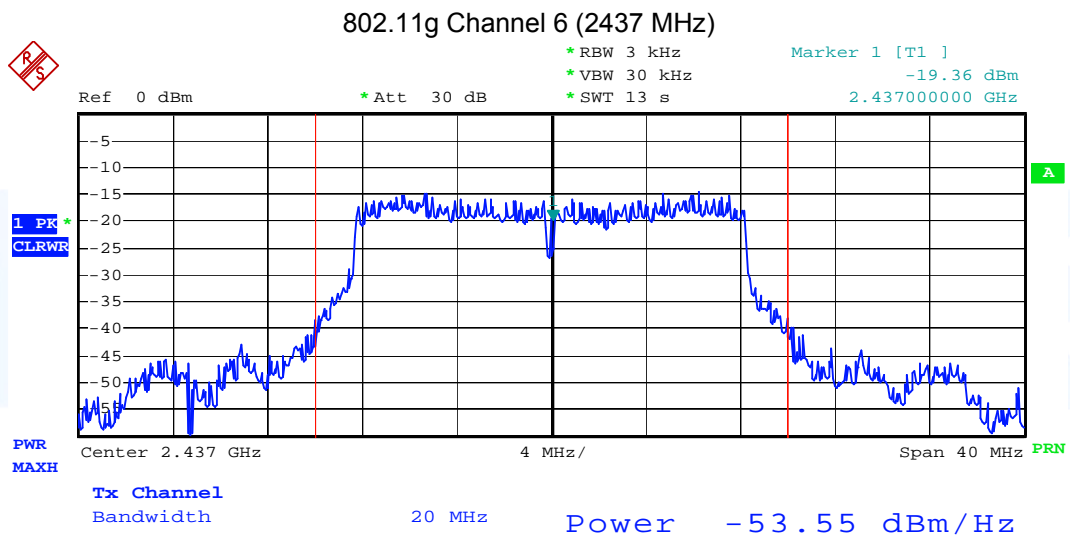
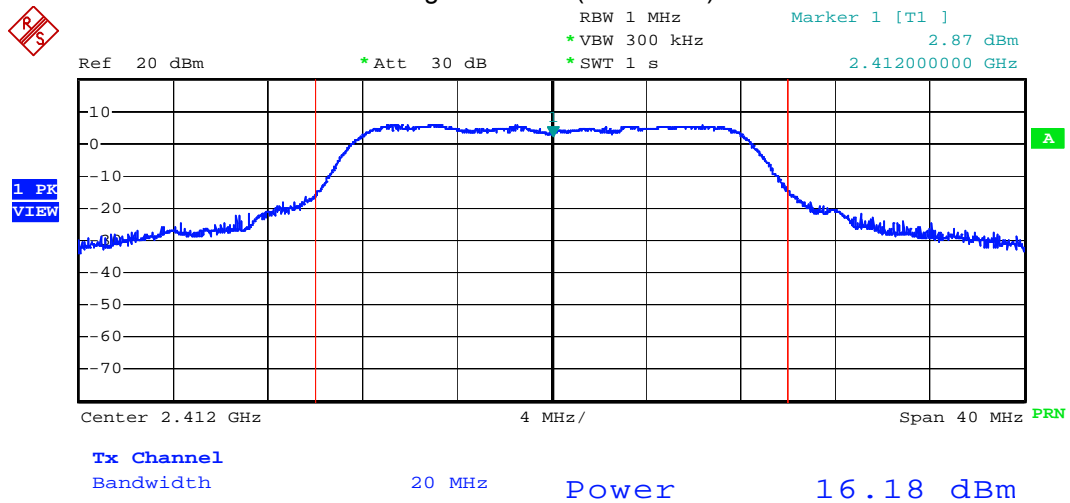
802.11b Channel 6 (2437 MHz)



802.11b Channel 11 (2462 MHz)



FCC ID: T4YH42TBTWMGBS



5.6 Co-location and co-transmission

This WLAN-Module is co-located to a GSM 1900 module and a BT-Module. These functions are designed to be “either” “or” in operation but the software permits to switch BT on while WLAN is connected to a net and GSM is running. A co-transmission of the WLAN-Module in the same frequency range 2400 – 2483.5 MHz is not possible because the BT device adopt the hopset to avoid hopping on occupied channels, according to Part C 15.247(h) and the GSM device is operation in the 1900 MHz band. The radiated direction of each of the transmitter is in case of co-transmission different. Each transmitter use an own build-in antenna are scattered in any direction and therefore is not awaited a boost of the radiated emissions. This could be verified via the measurement of the radiated peak output power while operating all transmitters. The peak hold function helped to display the different frequency ranges with the peak output power. In no range could be recognised an increase of the radiation in relation to the output power measured while only the appropriate transmitter was active.

5.7 Maximum permissible exposure (MPE)

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

5.7.1 Description of the test location

Test location: AREA4

5.7.2 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).

5.7.3 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.3 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/cm²)

P_{out} = output power to antenna (mW)

G = gain of antenna (linear scale)

r = distance between antenna and observation point (cm)

The EUT is according to FCC Rules 47CFR 2.1093(b) no portable device. The EUT is designed to be used that radiating structures are outside 20 cm of the body of the user (r=20 cm).

5.7.4 Test result

WLAN Standard 802.11b

Worst case: Internally antenna with an antenna gain of 2.7 dBi, Power setting: 30

Channel No.	Frequency (MHz)	Max conducted power		Antenna gain (dBi)	PD (mW/cm ²)	Limit of PD (mW/cm ²)
		(dBm)	(mW)			
1	2412	23.0	200	2.7	0.074	1.0
6	2437	23.1	204	2.7	0.075	1.0
11	2462	22.9	195	2.7	0.072	1.0

WLAN Standard 802.11g

Worst case: Internally antenna with an antenna gain of 2.7 dBi, Power setting: 30

Channel No.	Frequency (MHz)	Max conducted power		Antenna gain (dBi)	PD (mW/cm ²)	Limit of PD (mW/cm ²)
		(dBm)	(mW)			
1	2412	18.6	72	2.7	0.027	1.0
6	2437	18.5	71	2.7	0.026	1.0
11	2462	18.5	71	2.7	0.026	1.0

Limits for maximum permissible exposure (MPE)

Frequency (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:

5.8 Antenna application - Detailed photos see attachment A

5.8.1 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.

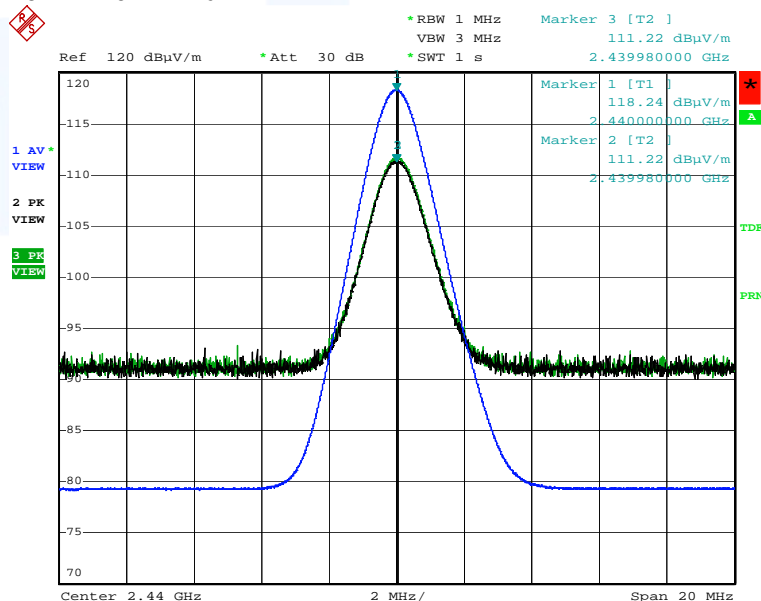
The EUT has a U-FL-Connector to conduct the integrated antenna.

5.8.2 Determination of the antenna gain

The antenna gain of the internal PCB-Antenna was measured according the substitution method using a RF generator at 2.44 GHz (-20 dBm) in a fully anechoic chamber. The gain of substitution antenna LOBB18 (24-05-026) is 9.7 dBi at 2.44 GHz. The maximum was found by rotating the table 360° in vertically and horizontally direction. The PCB-Antenna is connected via 5 cm coaxial cable soldered on one side and with a crimped U-FL-Connector for connection to the output of the WLAN-Module.

$$\Delta\text{Gain} = P_{\text{sub}} - P_{\text{ant}} = 118.24 - 111.22 = 7.02$$

$$\text{Gain}_{\text{ant}} = \text{Gain}_{\text{sub}} - \Delta\text{Gain} = 9.7 - 7.0 = 2.7 \text{ dBi}$$



Comment: H42, TR1 ref 9120vert, TR2 PCB vert, TR3 PCB hor.

5.8.3 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 6dBi.

The integrated antenna structure has 2.7 dBi Gain. It does not exceed the 6 dBi.

FCC ID: T4YH42TBTWMGBS

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.	Next Verif.
A 4	ESHS 30	02-02/03-05-002	05/06/2010	05/06/2009		
	NNLK 8129	02-02/20-05-001			12/30/2009	06/30/2009
	ESH 2 - Z 5	02-02/20-05-004	03/13/2011	03/13/2008	05/17/2010	11/17/2009
	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			04/06/2010	10/06/2009
CPC 3	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	PE1540	02-02/50-07-033				
MB	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	PE1540	02-02/50-07-033				
SEC 1-3	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	PE1540	02-02/50-07-033				
SER 2	ESVS 30	02-02/03-05-006	08/05/2010	08/05/2009		
	VULB 9168	02-02/24-05-005	05/06/2011	05/06/2008	04/08/2010	10/08/2009
	S10162-B	02-02/50-05-031				
	KK-EF393-21N-16	02-02/50-05-033				
	NW-2000-NB	02-02/50-05-113				
SER 3	FSP 30	02-02/11-05-001	04/20/2010	04/20/2009		
	AFS4-01000400-10-10P-4	02-02/17-05-003				
	AMF-4F-04001200-15-10P	02-02/17-05-004				
	AFS5-12001800-18-10P-6	02-02/17-06-002				
	3117	02-02/24-05-009	02/04/2010	02/04/2009		
	LOBB 18	02-02/24-05-026			07/09/2010	07/09/2009
	Sucoflex N-1600-SMA	02-02/50-05-073				
	Sucoflex N-2000-SMA	02-02/50-05-075				