

FCC ID: UTQ-W2400B

EMI -- TEST REPORT

Test Report No. :

T31905-01-00AA

September 04, 2007

Date of issue

Type / Model Name : 47BAXSB28AM3

Product Description : Industrial cordless assembly Tool with WLAN data transmission

Applicant : Cooper Power Tools GmbH & Co. OHG

Address : Industriestr. 1
73463 Westhausen

Manufacturer : Cooper Power Tools GmbH & Co. OHG

Address : Industriestr. 1
73463 Westhausen

Licence holder : Cooper Power Tools GmbH & Co. OHG

Address : Industriestr. 1
73463 Westhausen

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 C - Intentional Radiators (May 04, 2007)

Part 15, Subpart C, Section 15.35(c)	Correction for Pulse Operation (Duty Cycle)
Part 15, Subpart C, Section 15.207(a)	AC Line conducted emissions
Part 15, Subpart C, Section 15.209(a)	Radiated emissions, general requirements
Part 15, Subpart C, Section 15.247(c)	Radiated emissions, outside the used frequency band
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 15.247(1)(iii)	Bandwidth requirement
Part 15, Subpart C, Section 15.247(b)(1)	Maximum Peak output Power of intentional radiator

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (May 04, 2007)

Part 15, Subpart B, Section 15.107(a)	AC Line conducted emissions
Part 15, Subpart B, Section 15.109(a)	Radiated emissions, general requirements

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2 SUMMARY

GENERAL REMARKS:

The frequency range was scanned from 30 MHz to 25 GHz. All emissions not reported in this test report were more than 10 dB below the specified limit.

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 : September 03, 2007
Testing concluded on : September 03, 2007

Checked by:

Tested by:

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

Anton Altmann
Dipl.-Ing.(FH)

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3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT

Industrial cordless assembly Tool with WLAN data transmission

External Photo



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Industrial cordless assembly Tool with WLAN data transmission

External Photo
Antenna



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Industrial cordless assembly Tool with WLAN data transmission

External Photo



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Industrial cordless assembly Tool with WLAN data transmission

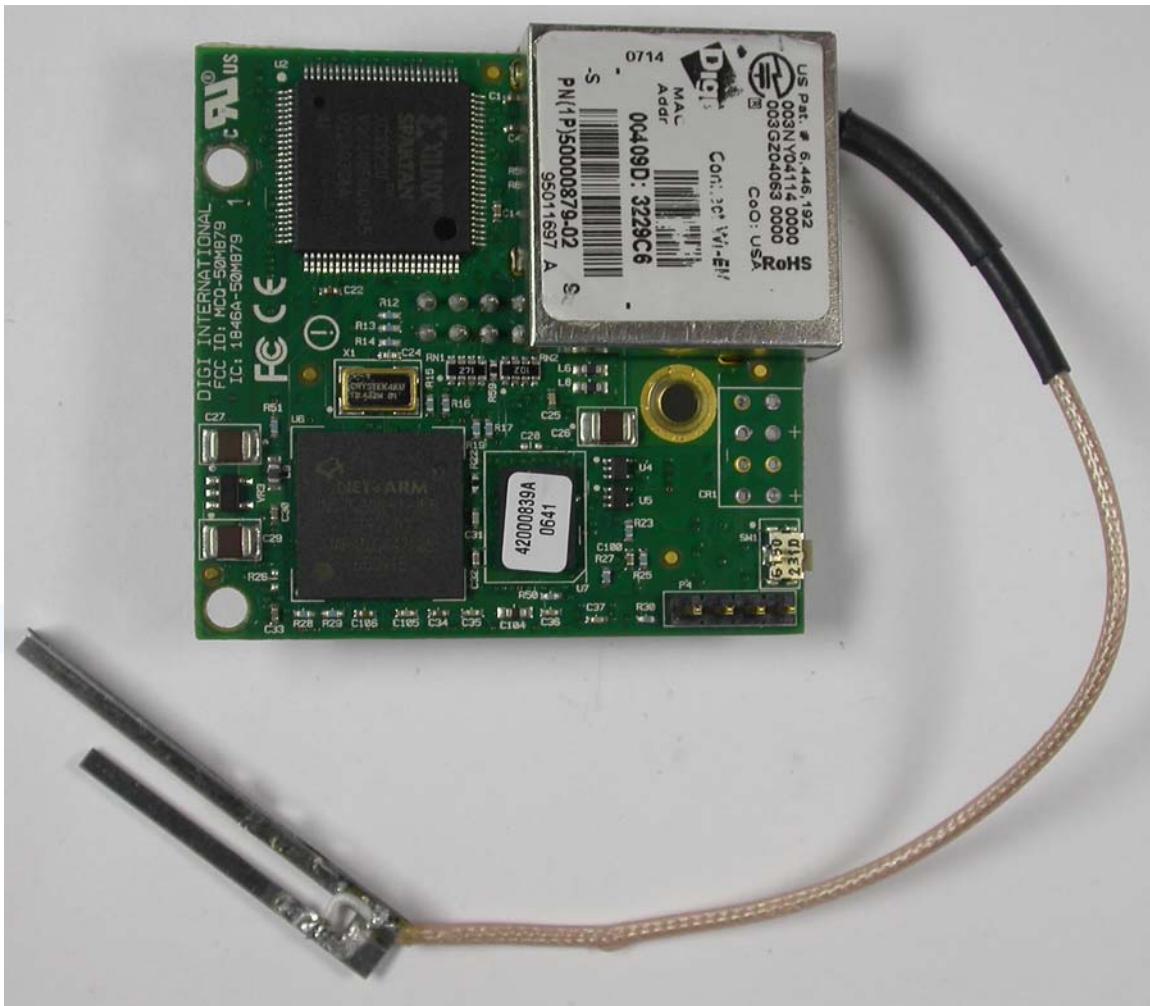
Internal Photo
Open view



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Industrial cordless assembly Tool with WLAN data transmission

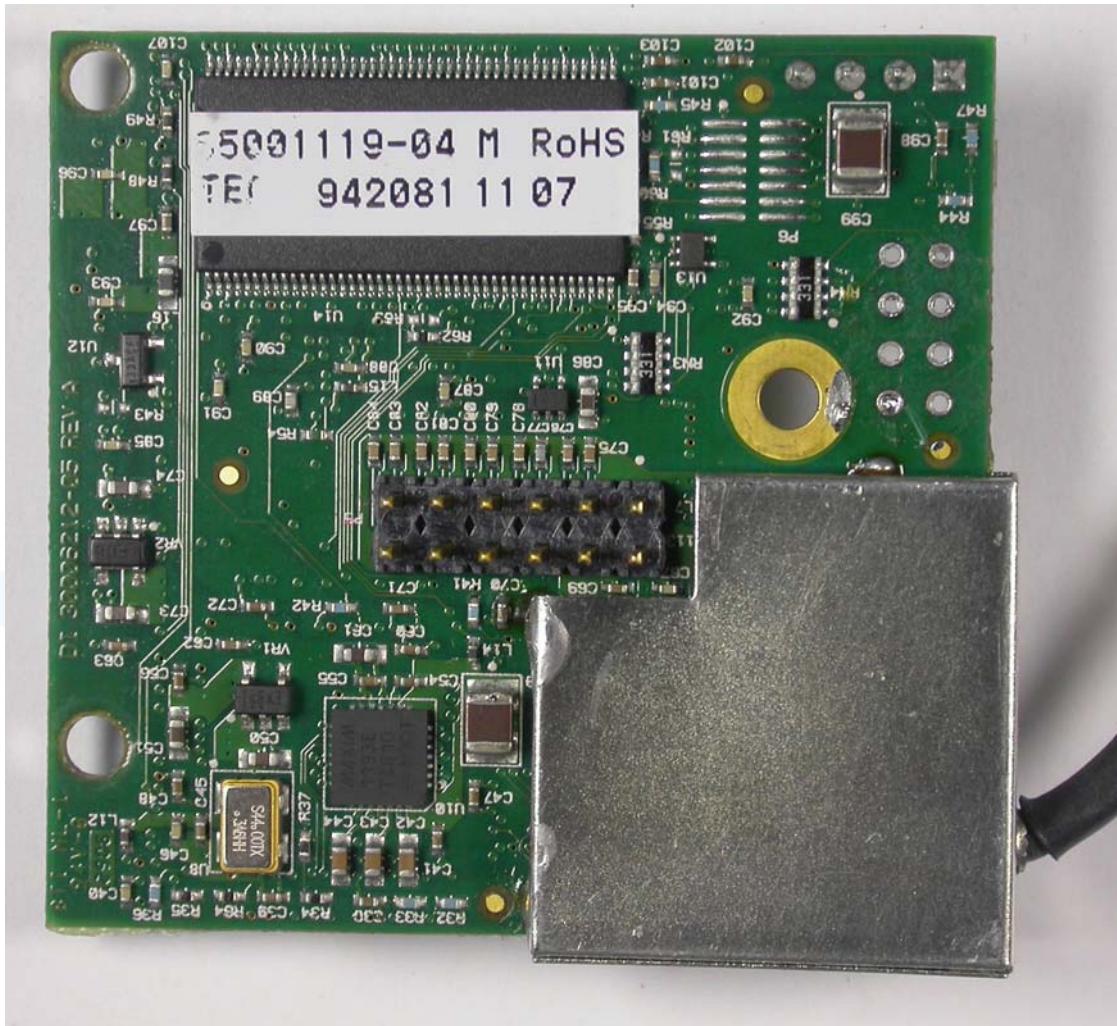
Internal Photo
WLAN module and antenna with shielding



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Industrial cordless assembly Tool with WLAN data transmission

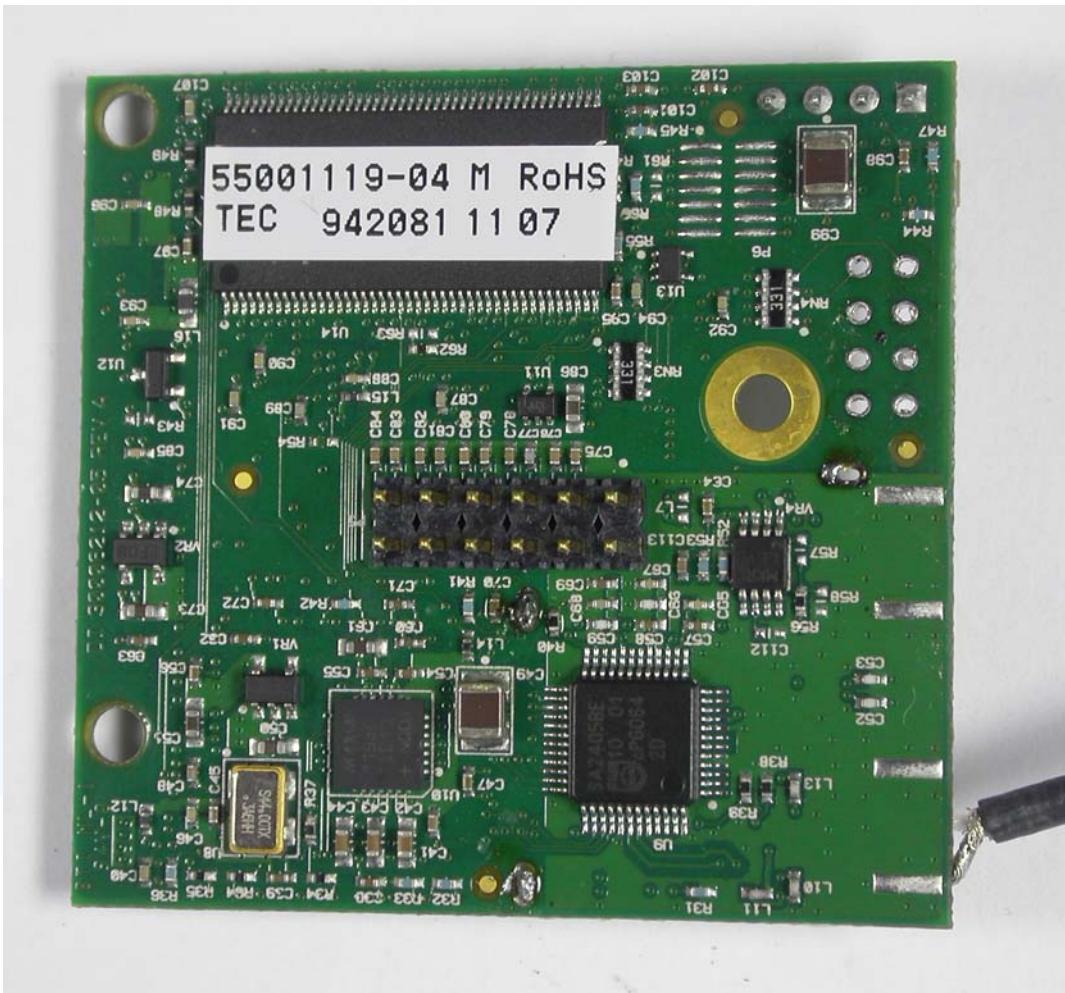
Internal Photo
WLAN module with shielding



FCC ID: UTQ-W2400B

Industrial cordless assembly Tool with WLAN data transmission

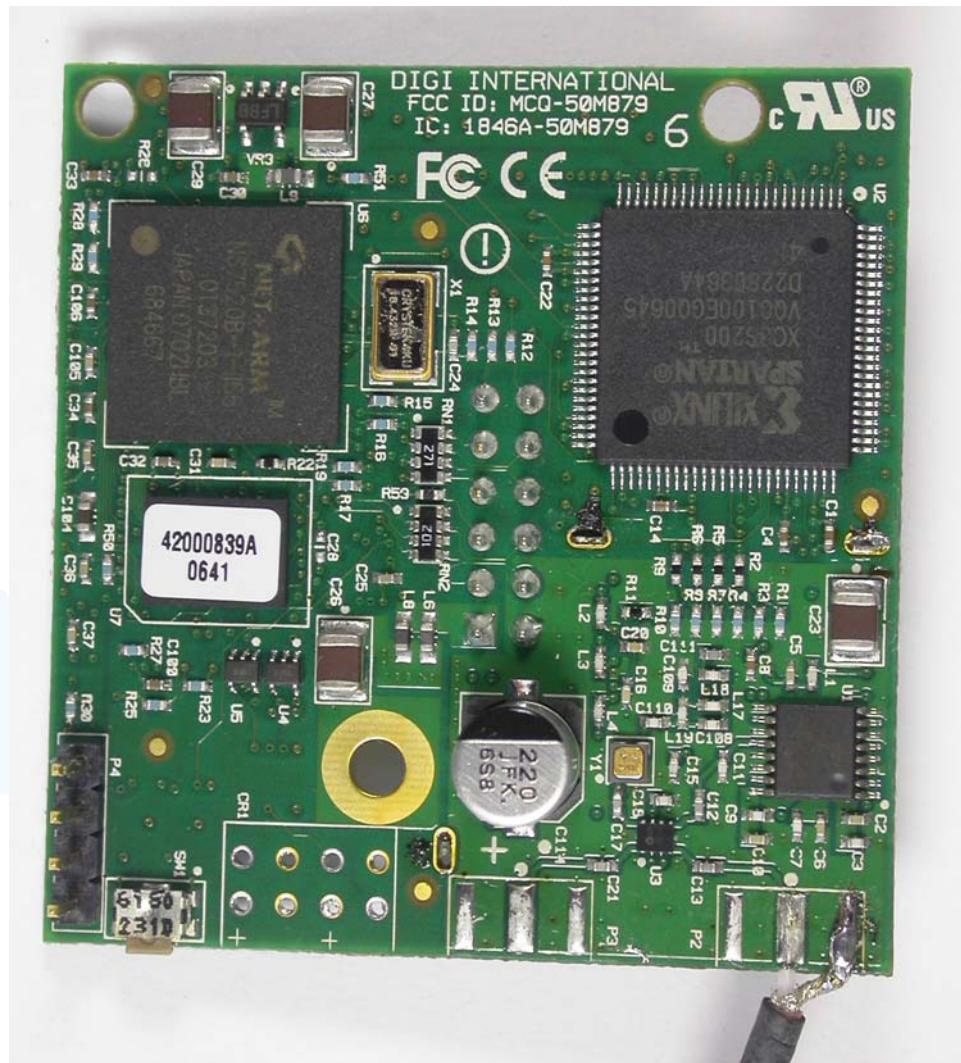
Internal Photo
WLAN module without shielding



FCC ID: UTQ-W2400B

Industrial cordless assembly Tool with WLAN data transmission

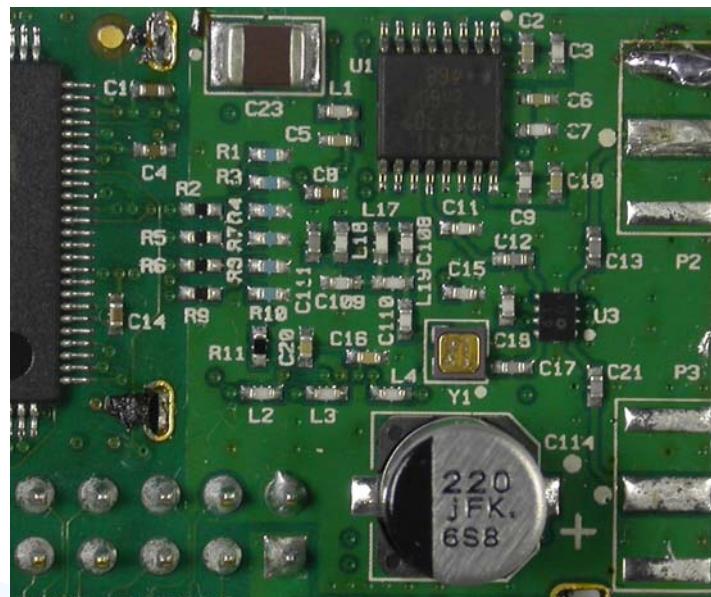
Internal Photo
WLAN module without shielding



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Industrial cordless assembly Tool with WLAN data transmission

Internal Photo
Detail of WLAN module



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3.2 Power supply system utilised

Power supply voltage : 26 V / DC

3.3 Short description of the Equipment under Test (EuT)

The cordless Tools of series 47BAX... with WLAN data transmission are used in the automotive industry for fastening and releasing threaded fasteners.

The WLAN data transmission is used for data communication between a controller and the Tool. Before start of a fastening cycle the WLAN data transmission is used in order to define the set points, like turn off torque, on the Tool. If all values are defined the worker could start the fastening cycle. After a fastening cycle is complete the WLAN data transmission is used in order transmit the reached final values, like peak torque and turned angle, back to the controller. These values usually used on the controller for documentation of the production process.

Number of tested samples: 1
Serial number: 659617

EuT operation mode:

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

- TX, CW 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:

- Model : _____

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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 /11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. 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.

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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 in International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

In compliance with 47 CFR Part 15 Subpart A Section 15.38 testing for FCC compliance may be done following the ANSI C63.4-2003 procedures and using the CISPR 22 Limits.

4.4.1.2 Measurement Error

The data and results referenced in this document are true and accurate. The reader is cautioned that there is some measurement variability due to the tolerances of the test equipment that can contribute to a nominal product measurement uncertainty. The measurement uncertainty was calculated for all measurements listed in this test report according to NIS 81/5.1994 "The treatment of uncertainty in EMC measurements" and is documented in the mikes-testingpartners gmbh quality system according to DIN EN ISO/IEC 17025. Furthermore, component differences and manufacturing process variability of production units similar to that tested may result in additional product uncertainty. 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 device.

4.4.1.3 Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.2 DETAILS OF TEST PROCEDURES

4.4.2.1 General Standard Information

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4-2003 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

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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

5.1.2 Photo documentation of the test set-up

5.1.3 Description of Measurement

The final level, expressed in $\text{dB}\mu\text{V}$, 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 $\text{dB}\mu\text{V}$ and μV , the following conversions apply:

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

$$\mu\text{V} = \text{Inverse log}(\text{dB}\mu\text{V}/20)$$

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 $50\Omega/50 \mu\text{H}$ (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters 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.

5.1.4 Test result

Remarks: The test is not applicable because the EuT is battery powered.

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5.2 6 dB 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



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5.2.3 Applicable standard

According to FCC Part 15 Subpart 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 band width 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 by a specified ratio of -6 dB. The reference level is the level of the highest amplitude signal observed from 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.

The resolution bandwidth of measuring instrument was set to a value as shown in the following table below according to ANSI C63.4-2003.

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

5.2.5 Test result

Channel number	Fundamental Frequency [MHz]	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)
1	2412	7,6	0,5
6	2437	7,8	0,5
11	2462	7,6	0,5

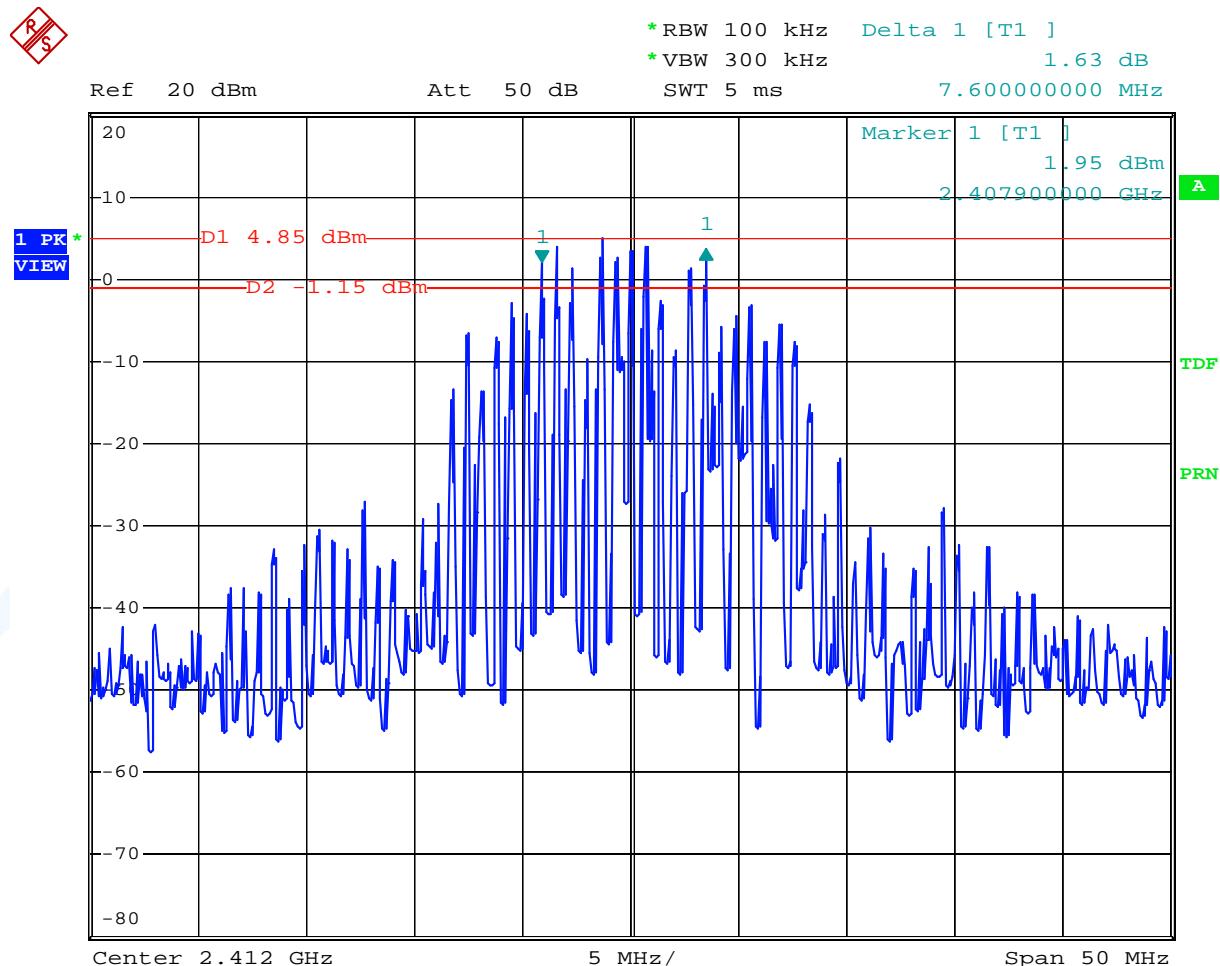
Remarks: For detailed test result please refer to following test protocol.

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5.2.6 Test protocol

6dB Bandwidth Measurement

Channel 1 (2412 MHz)

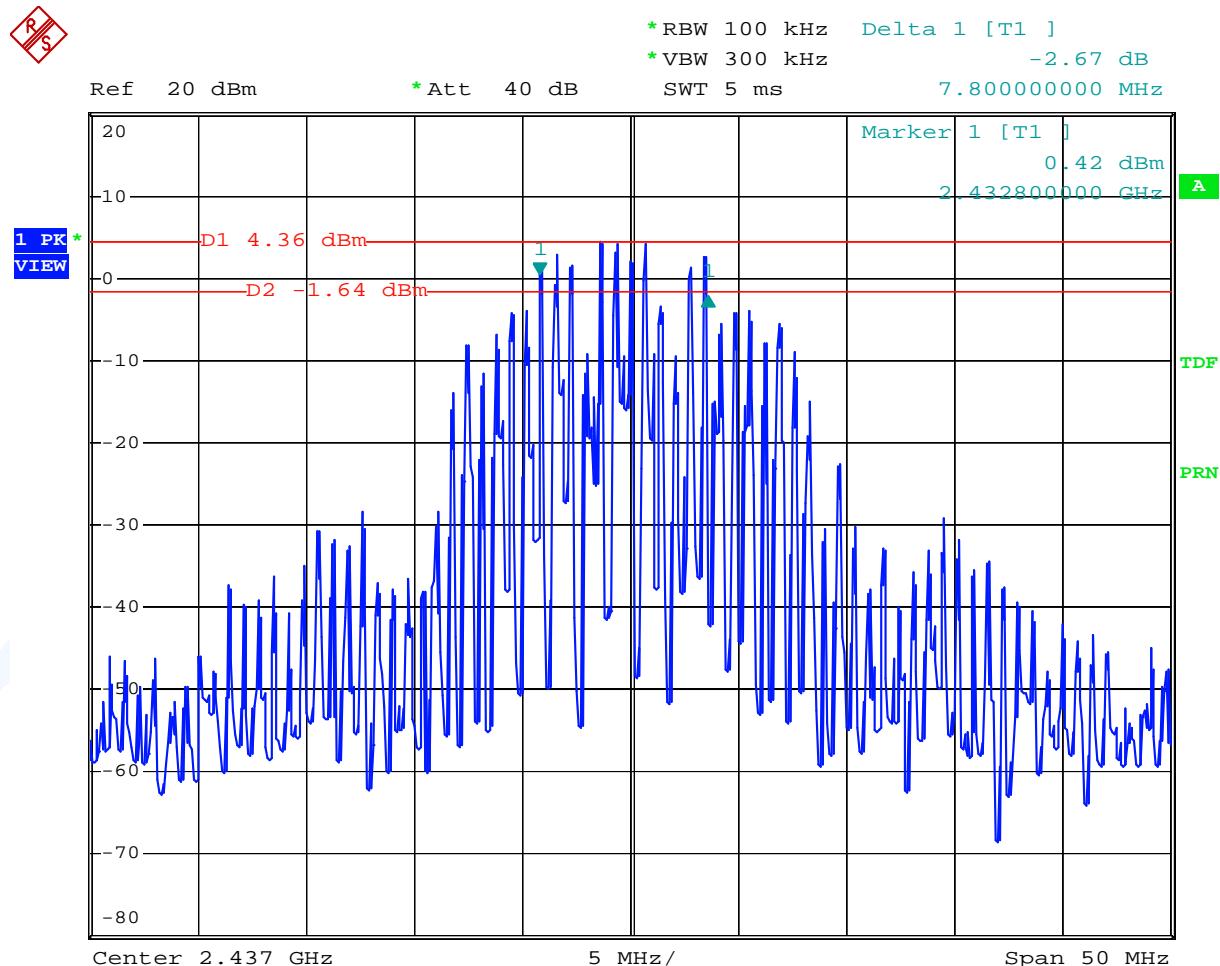


Date: 3.SEP.2007 14:04:16

FCC ID: UTQ-W2400B

6dB Bandwidth Measurement

Channel 6 (2437 MHz)

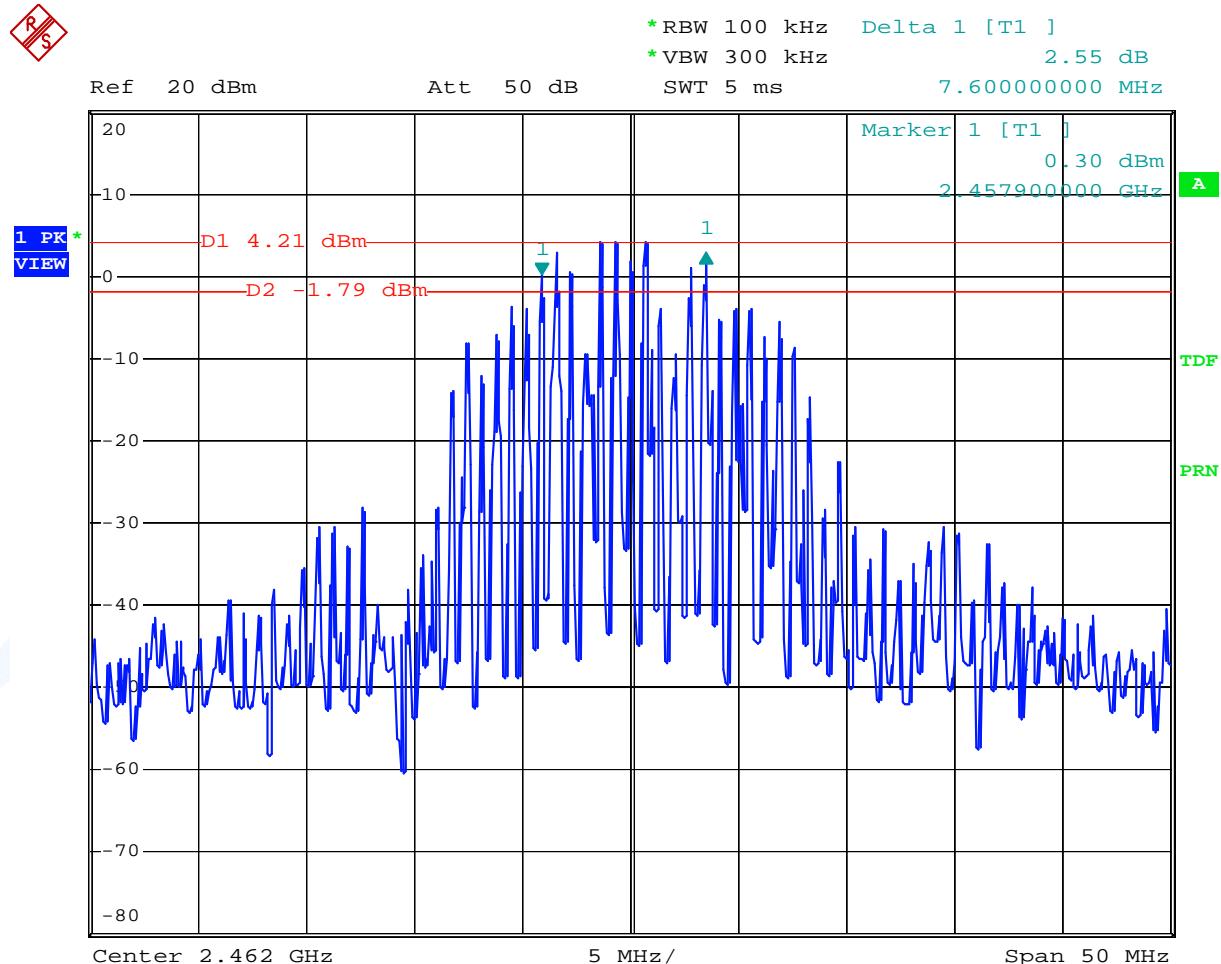


Date: 3.SEP.2007 14:46:45

FCC ID: UTQ-W2400B

6dB Bandwidth Measurement

Channel 11 (2462 MHz)



Date: 3.SEP.2007 15:48:02

FCC ID: UTQ-W2400B

5.3 Maximum Conducted Output Power

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

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 Subpart 15.247 (b): For systems using digital modulation in the 2400-2483,5 MHz band, the maximum peak output power of the transmitter shall not exceed 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.3.4 Description of Measurement

The transmitter output was connected to the spectrum analyzer through an attenuator. The center frequency of the spectrum analyzer is set to the fundamental frequency using 1 MHz RBW and 300 kHz VBW. The span of the spectrum analyzer should be larger than the Emission Band Width (EBW). To get the total power of the occupied band width the function "Channel Power Measurement" of the analyzer has been used. The channel band width has been set to EBW. With Peak detector and Power Mode Max Hold the result is the summed maximum output power of the EBW.

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5.3.5 Test result

Technology 802.11 b, data rate 11 Mbit/s

Channel	Frequency [MHz]	Peak Power Output (dBm)	Correction [dB]	Corr. Peak Power Output (dBm)	Peak Power Limit (dBm)	Delta [dB]
1	2412	13.8	0.5	14.3	30	-15.7
6	2437	13.4	0.5	13.9	30	-16.1
11	2462	13.4	0.5	13.9	30	-16.1

Remarks: Where Correction means attenuation of cable loss of 0.5 dB.

Peak Power Limit according to FCC Subpart 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: This test has been performed conducted at antenna jack on WLAN module.

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5.4 Radiated emissions 30 MHz – 40 GHz

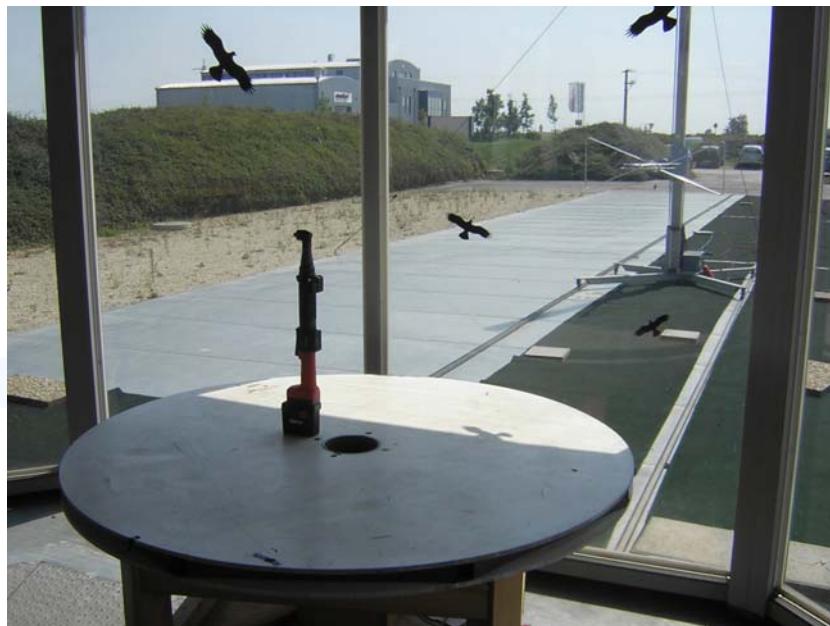
For test instruments and accessories used see section 6 Part **SER 2** and **SER 3**.

5.4.1 Description of the test location

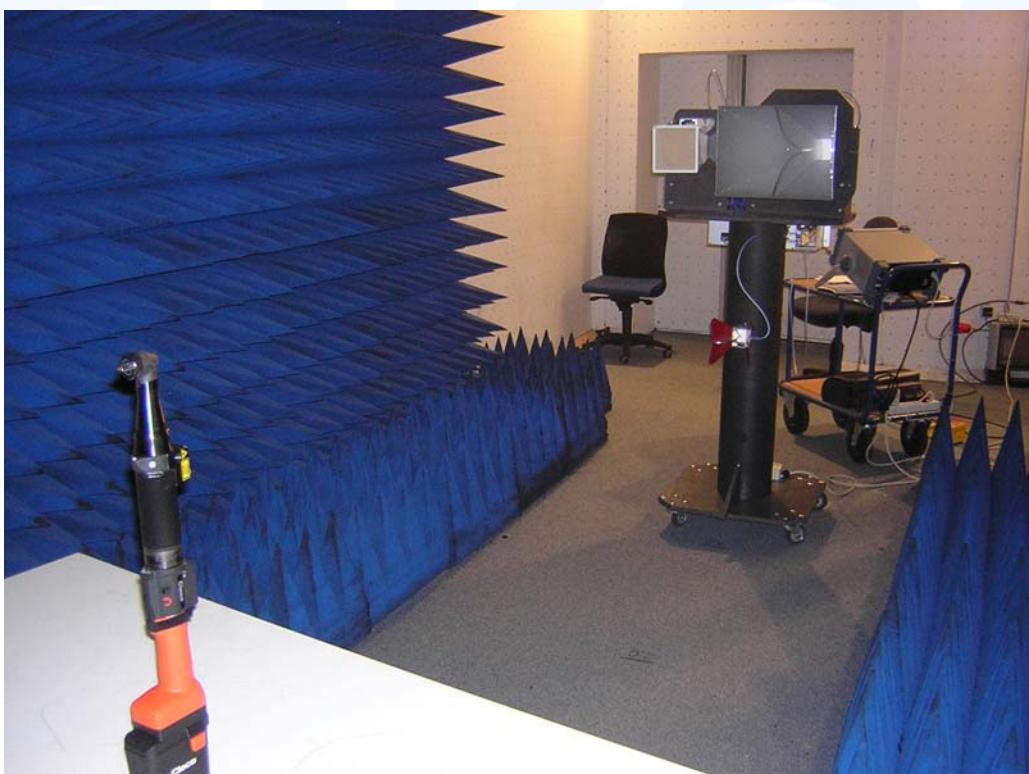
Test location: OATS1
Anechoic Chamber A2

Test distance: 3 metres

5.4.2 Photo documentation of the test set-up



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5.4.3 Applicable standard

According to FCC Part 15 Subpart 15.247 (d): In any 100 kHz bandwidth outside the frequency band 2400 – 2483.50 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 a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required.

In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limit specified in §15.209(a) (see §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 linearly polarized antennas. The measurements are made with 120 kHz/6 dB bandwidth and quasi-peak detection. The EuT is placed on a 1.0 X 1.5 meter non-conducting table 80 centimetres above the ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003.

The antenna was positioned 3 meters horizontally from the EuT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarization's and the EuT are rotated 360 degrees.

The final level, expressed in dB μ V/m, is arrived by taking the reading from the EMI receiver (Level dB μ V) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver, where the correction factors are stored. This result then has the FCC or CISPR limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets at page.

The radiated emissions from the EuT are measured in the frequency range of 1 GHz to maximum frequency as specified in section 15.33, using a Spectrum Analyzer and appropriate linearly polarized antennas. The EuT is placed on a 1.0 X 1.5 meter non-conducting table 80 centimetres above the ground plane. The set up of the EuT will be in accordance to ANSI C63.4-2003. The antenna was positioned 3 m horizontally from the EuT.

Measurement are made in both the horizontal and vertical planes of polarization in a fully anechoic room using a spectrum analyzer with the detector function set to peak, RBW 1 MHz and VBW set to 3 MHz for any spurious emission or modulation product that falls in **Restricted bands** as defined in Section 15.205.

All tests are performed at a test-distance of 3 meters. During the tests the EUT measurement scans are made with both horizontal and vertical antenna polarization's and the EuT are rotated 360 degrees.

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5.4.5 Test result

Technology 802.11 b, data rate 11 Mbit/s

Testresult in detail: (<1GHz)

Field strength of fundamental wave as reference for radiated emissions: 107.6 dB μ V/m

Frequency [MHz]	Restricted Band	Reading Level QP [dB μ V]	Reading Level AV [dB μ V]	Reading Level PK [dB μ V]	Bandwidth [kHz]	Correct. factor [dB]	Corrected Level QP [dB μ V/m]	Corrected Level AV [dB μ V/m]	Corrected Level PK [dB μ V/m]	Limit [dB μ V/m]		Margin [dB]
										PK	QP	
30-1000					120					< 30	87,6	
30-88	■				120		< 30				40	> 10,0
88-216	■				120		< 30				43,5	> 13,5
216-960	■				120		< 30				46	> 16,0
960-1000	■				120		< 30				54	> 24,0

Field strength of fundamental wave as reference for radiated emissions: 106.7 dB μ V/m

Frequency [MHz]	Restricted Band	Reading Level QP [dB μ V]	Reading Level AV [dB μ V]	Reading Level PK [dB μ V]	Bandwidth [kHz]	Correct. factor [dB]	Corrected Level QP [dB μ V/m]	Corrected Level AV [dB μ V/m]	Corrected Level PK [dB μ V/m]	Limit [dB μ V/m]		Margin [dB]
										PK	QP	
30-1000					120					< 30	86,7	
30-88	■				120		< 30				40	> 10,0
88-216	■				120		< 30				43,5	> 13,5
216-960	■				120		< 30				46	> 16,0
960-1000	■				120		< 30				54	> 24,0

Field strength of fundamental wave as reference for radiated emissions: 105.5 dB μ V/m

Frequency [MHz]	Restricted Band	Reading Level QP [dB μ V]	Reading Level AV [dB μ V]	Reading Level PK [dB μ V]	Bandwidth [kHz]	Correct. factor [dB]	Corrected Level QP [dB μ V/m]	Corrected Level AV [dB μ V/m]	Corrected Level PK [dB μ V/m]	Limit [dB μ V/m]		Margin [dB]
										PK	QP	
30-1000					120					< 30	85,5	
30-88	■				120		< 30				40	> 10,0
88-216	■				120		< 30				43,5	> 13,5
216-960	■				120		< 30				46	> 16,0
960-1000	■				120		< 30				54	> 24,0

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Testresult in detail:(>1GHz)

Remarks: Only spurious emissions falling in restricted bands have been measured radiated. All other spurious emissions have been measured conducted according to 15.247 (d).

*) Average values were measured with spectrum analyzer by taking the following Settings

RBW: 1 MHz

VBW: 10 Hz

Sweep: Auto

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

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (meters)
	(μ V/m)	dB (μ V/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 §15.209

MHz	MHz	GHz
25.5 – 25.67	960 – 1240	4.5 – 5.15
37.5 – 38.25	1300 – 1427	5.35 – 5.46
73 – 74.6	1435 – 1626.5	7.25 – 7.75
74.8 – 75.2	1645.5 – 1646.5	8.025 – 8.5
108 – 121.94	1660 – 1710	9.0 – 9.2
123 – 138	1718.8 – 1722.2	9.3 – 9.5
149.9 – 150.05	2200 – 2300	10.6 – 12.7
156.52475 – 156.52525	2310 – 2390	13.25 – 13.4
156.7 – 156.9	2483.5 – 2500	14.47 – 14.5
162.0125 – 167.17	2655 – 2900	15.35 – 16.2
167.72 – 173.2	3260 – 3267	17.7 – 21.4
240 – 285	3332 – 3339	22.01 – 23.12
322 – 335.4	3345.8 – 3358	23.6 – 24.0
399.9 – 410	3600 – 4400	31.2 – 31.8
608 – 614		36.43 – 36.5

The requirements are **FULFILLED**.

Remarks: During the test, the Eut was set into normal modulation mode as intended for use.
The measurement has been performed up to the 10th harmonic (25000 MHz).

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5.5 Band edge measurement

For test instruments and accessories used see section 6 Part **SEC2** and **SEC3**.

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up



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5.5.3 Applicable standard

According to FCC Part 15 Subpart 15.247 (d): In any 100 kHz bandwidth outside the frequency band 2400 – 2483.50 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 a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required.

5.5.4 Description of Measurement

A Spectrum analyzer is connected to the output of the transmitter via a high pass filter while EuT was operating in transmit mode using the assigned frequency. Band edge measurements near of the fundamental frequency have been performed without high pass filter.

Analyzer Settings:

- Detector: Max Hold
- RBW: 100 kHz
- VBW: 300 kHz
- Detector function: Peak

5.5.5 Test result

Technology 802.11 b, data rate 11 Mbit/s

Channel 1: 2412 MHz

Frequency [MHz]	Peak Power Output as reference [dBm]	Emission Out of band [dBm]	Result of Band edge [dBc]	Band edge LIMIT [dBc]
7240	14,3	-64,2	78,5	≥ 20
9664	14,3	-52,7	67,0	≥ 20

Channel 6: 2437 MHz

Frequency [MHz]	Peak Power Output as reference [dBm]	Emission Out of band [dBm]	Result of Band edge [dBc]	Band edge LIMIT [dBc]
9760	13,9	-52,5	66,4	≥ 20

Channel 11: 2462 MHz

Frequency [MHz]	Peak Power Output as reference [dBm]	Emission Out of band [dBm]	Result of Band edge [dBc]	Band edge LIMIT [dBc]
9856	13,9	-53,0	66,9	≥ 20

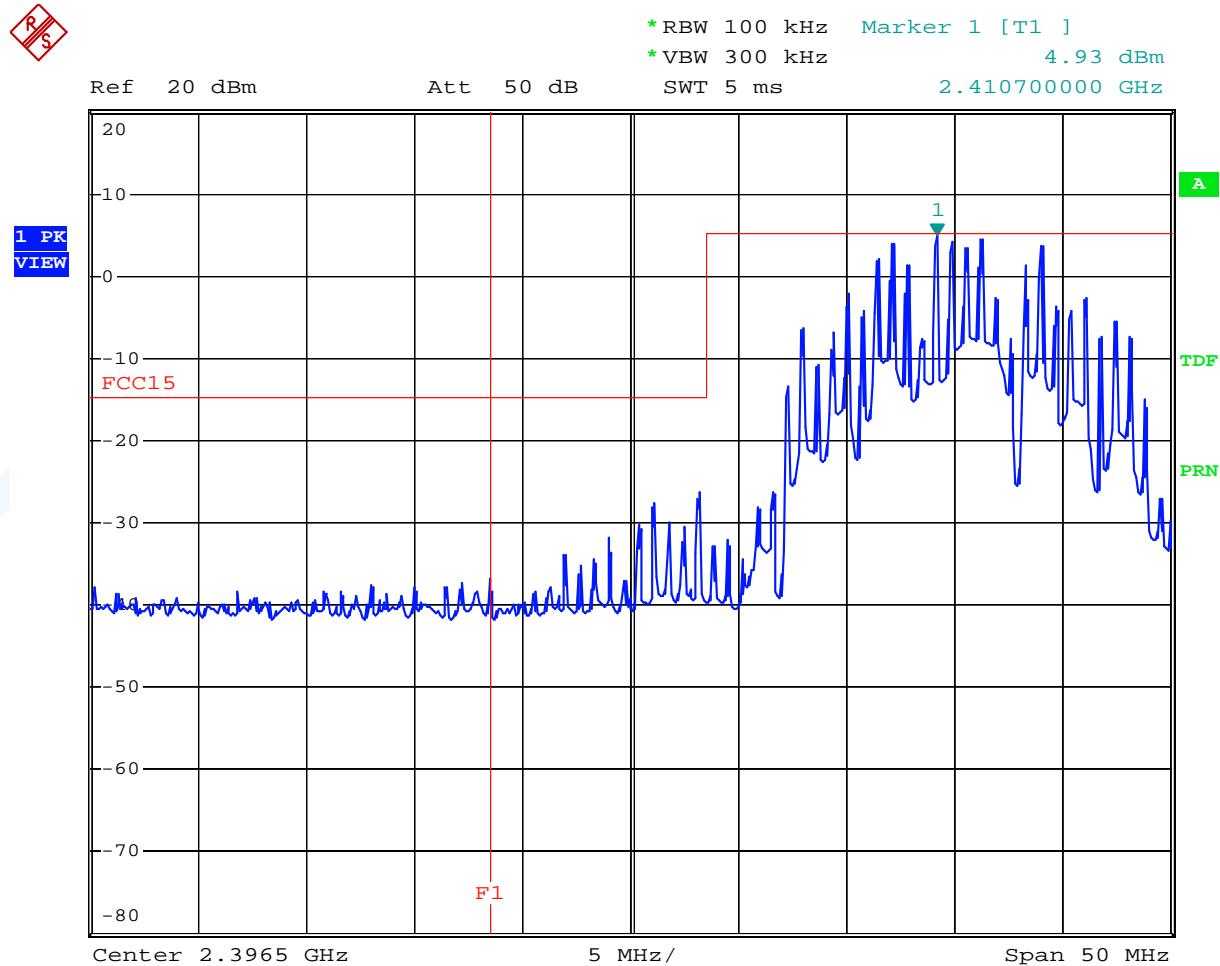
The requirements are **FULFILLED**.

Remarks: Only spurious emissions falling not in restricted bands have been measured (assessed) conducted.
The measurement was performed up to the 10th harmonic (25000 MHz).
For detailed test results please refer to following test protocol.

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5.5.6 Test protocol

**Band edge
Lower Channel
2412 MHz**

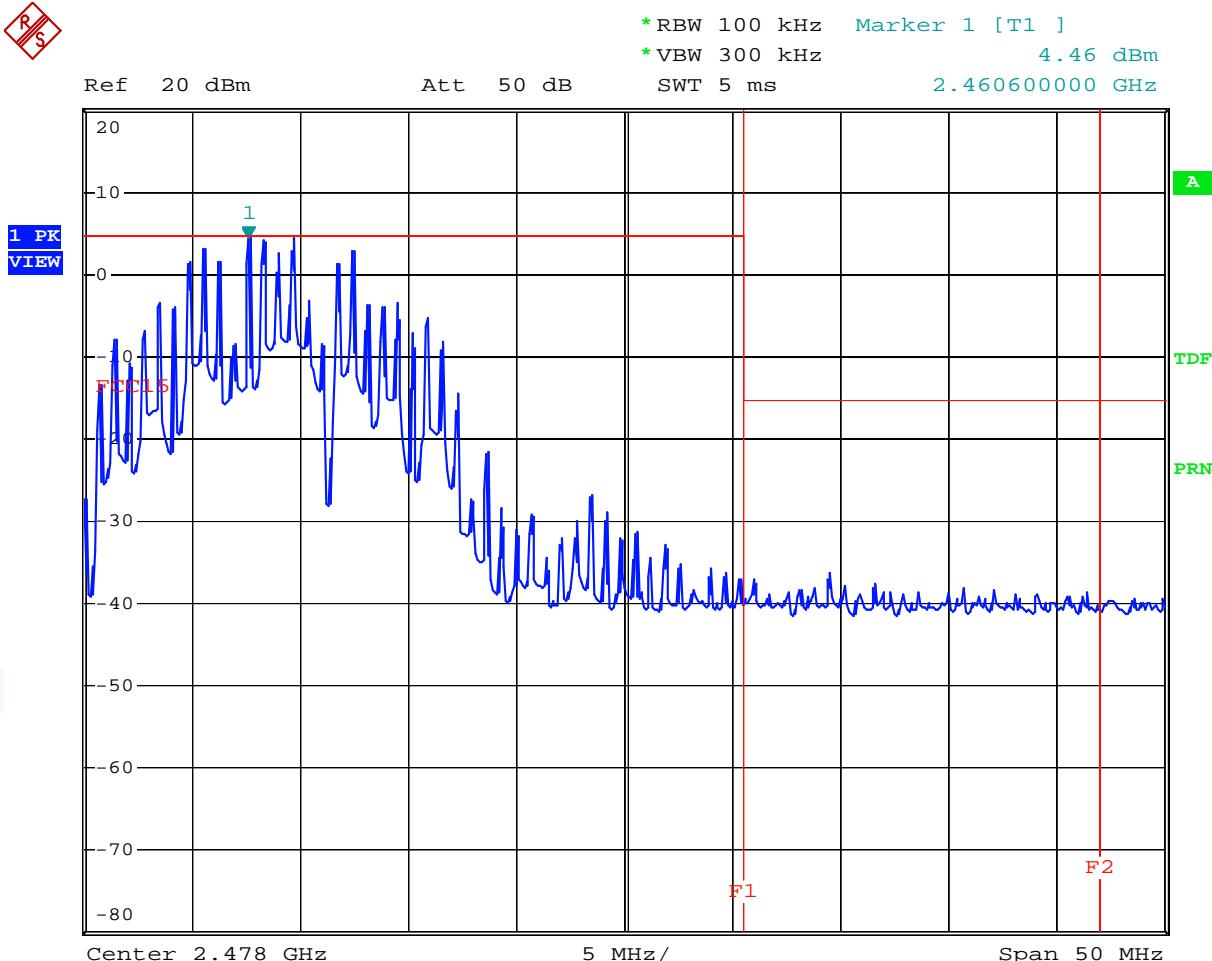


Date: 3.SEP.2007 14:11:00

FCC ID: UTQ-W2400B

**Band edge
Higher Channel
2462 MHz**

R
S

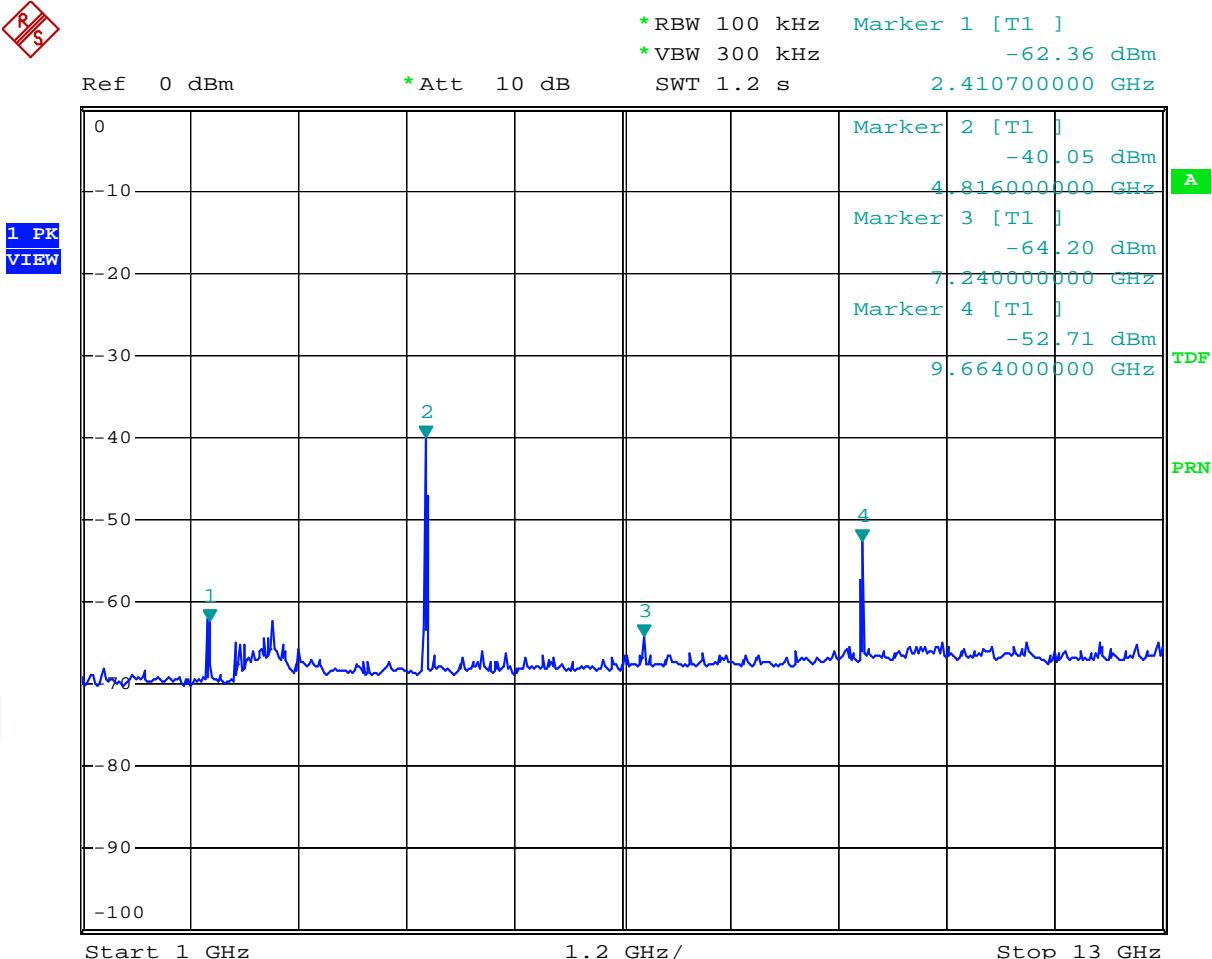


Date: 3.SEP.2007 15:53:32

FCC ID: UTQ-W2400B

Conducted spurious emissions of
Channel 1

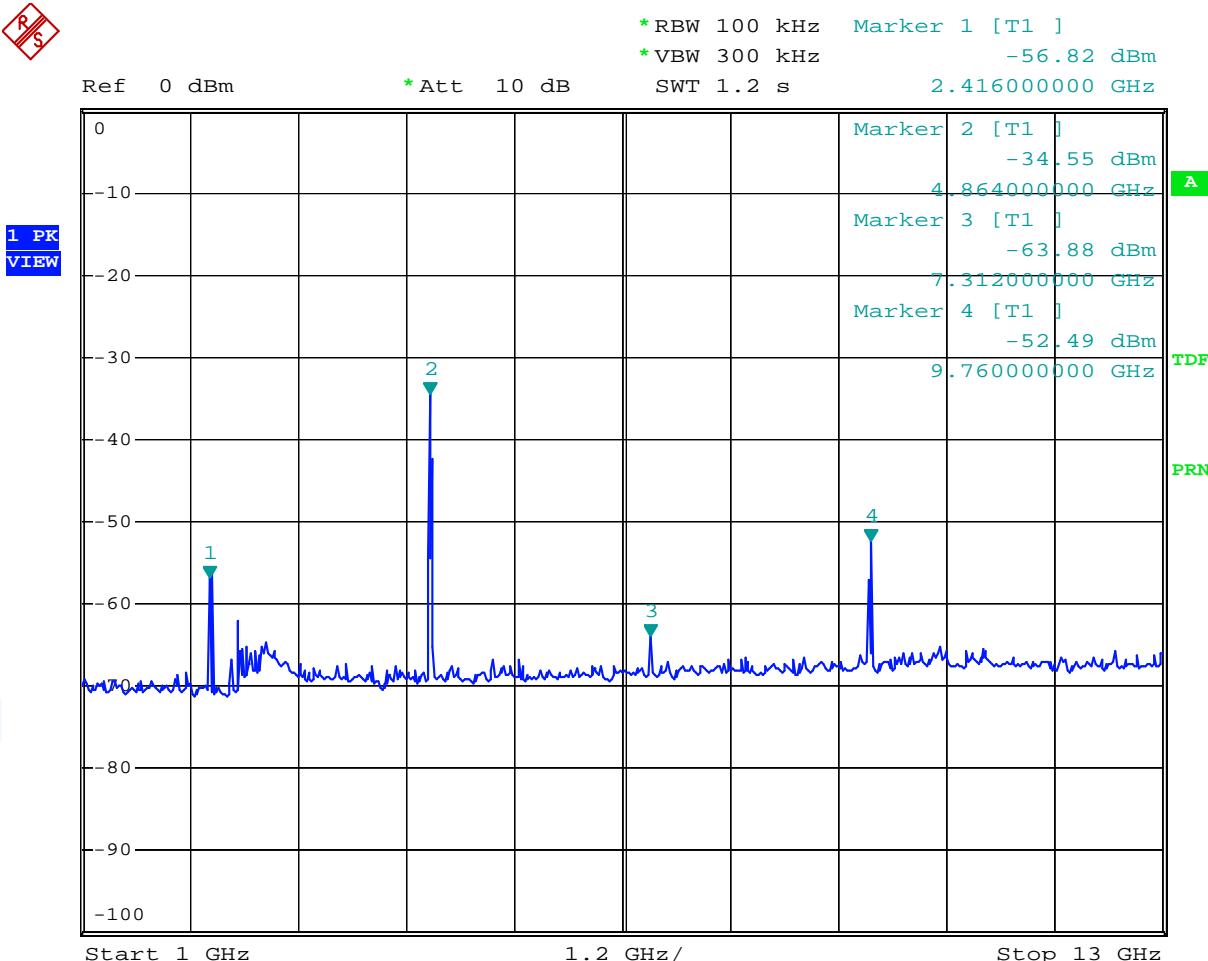
RS



Date: 3.SEP.2007 14:22:13

FCC ID: UTQ-W2400B

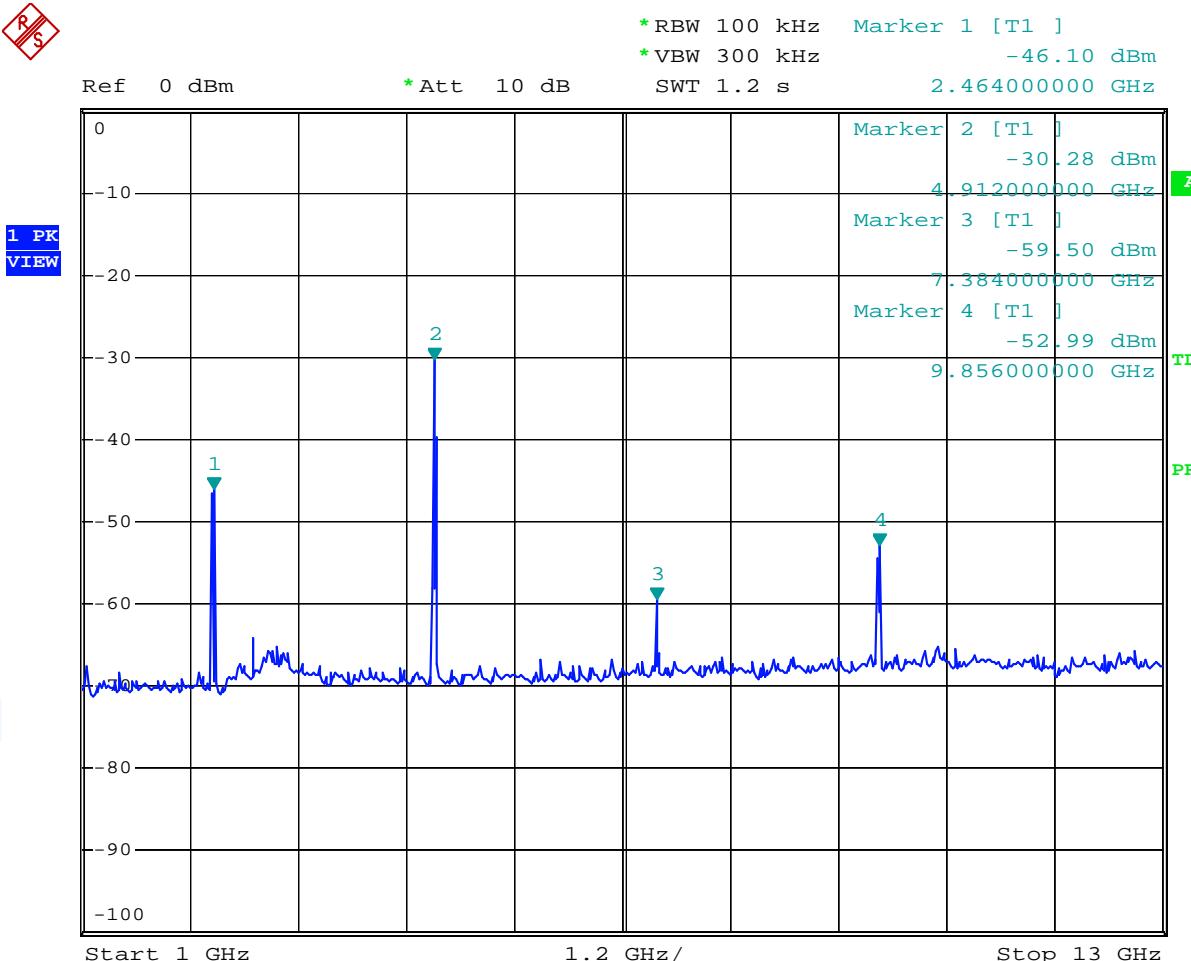
Conducted spurious emissions of
Channel 6



Date: 3.SEP.2007 15:05:23

FCC ID: UTQ-W2400B

Conducted spurious emissions of
Channel 11



Date: 3.SEP.2007 15:25:56

FCC ID: UTQ-W2400B

5.6 Power Spectral Density

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

5.6.1 Description of the test location

Test location: Area 4

5.6.2 Photo documentation of the test set-up



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5.6.3 Applicable standard

According to FCC Part 15 Subpart 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.

5.6.4 Description of Measurement

The EuT was connected to the spectrum analyzer with a suitable attenuator. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3 kHz RBW and 30 kHz VBW, set sweep time equal to span/3 kHz. The power spectral density was measured using the analyzer function of measuring the power/Hz. The result is calculated by addition of 35 dB (10 log 3000 Hz/Hz) to the readings.

Settings on the spectrum analyzer:

RBW: 3 kHz

VBW: 30 kHz

Sweep: auto

Detector function: Peak

5.6.5 Test result

Technology 802.11 b, data rate 11 Mbit/s

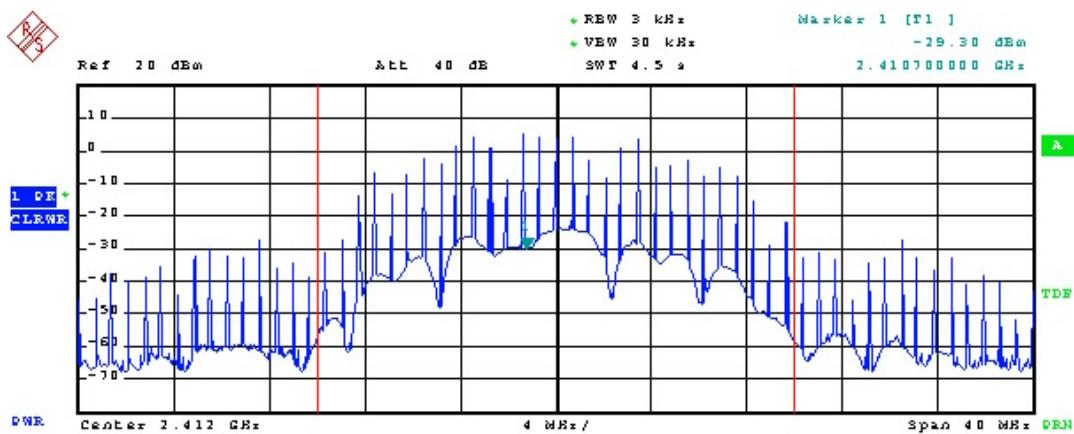
Channel	Fundamental Frequency [MHz]	Reading [dBm/Hz]	Correction to 3 kHz [dB]	Power Spectral Density Result [dBm]	Limit [dBm]
1	2412	-45,17	35	-10,17	8
6	2437	-46,69	35	-11,69	8
11	2462	-46,72	35	-11,72	8

The requirements are **FULFILLED**.

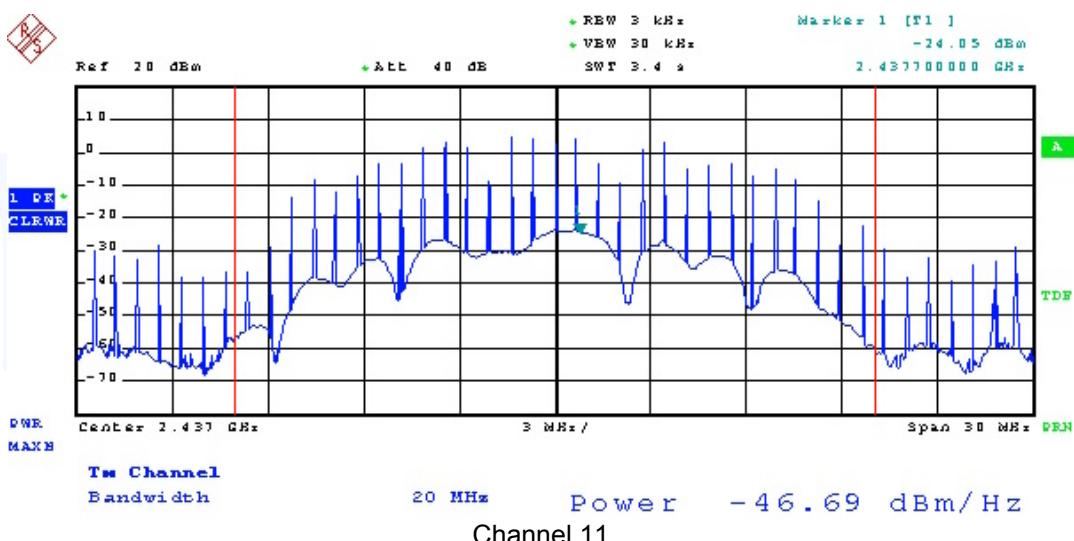
Remarks: For detailed test results please refer to following test protocol.

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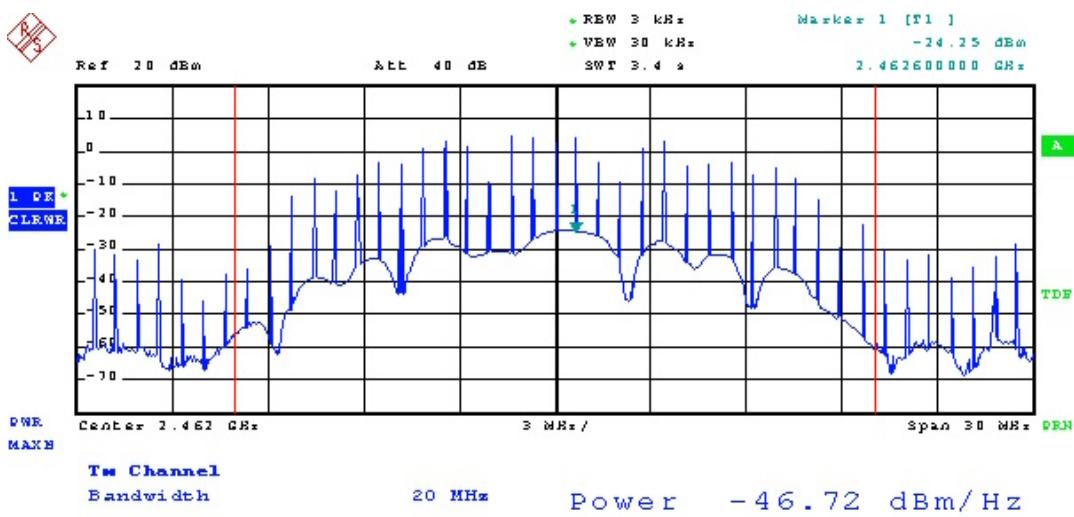
Channel 1



Channel 6



Channel 11



FCC ID: UTQ-W2400B

5.7 Antenna application

5.7.1 Antenna requirements

The EuT's antenna is met the requirement of FCC part 15C section 15.203 and 15.204.

FCC part 15C section 15.247 requirement:

Systems operating in the 2400-2483,5 MHz band that are used exclusively for fixed, point to point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dbi.

5.7.2 Result

The EUT used a dipole antenna and is internal connected via RF cable to the WLAN module. The max. antenna gain is 1,5 dBi and meets the requirement.

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5.8 Receiver radiated emissions 30 MHz - 40 GHz

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

5.8.1 Description of the test location

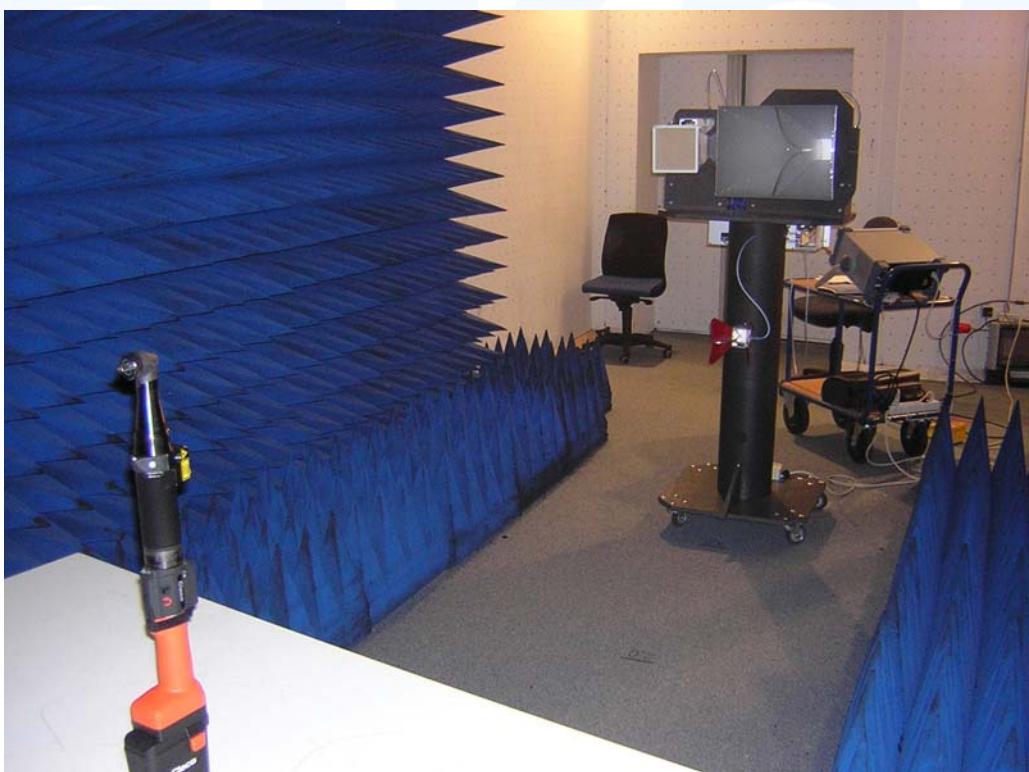
Test location: OATS1
Anechoic Chamber A2

Test distance: 3 metres

5.8.2 Photo documentation of the test set-up



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FCC ID: UTQ-W2400B

5.8.3 Applicable standard

The field strength of radiated emissions from unintentional radiators shall not exceed the values given in FCC Part 15 Subpart 15.109 (a).

5.8.4 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 linearly polarized antennas. The measurements are made with 120 kHz/6 dB bandwidth and quasi-peak detection. The EuT is placed on a 1.0 X 1.5 meter non-conducting table 80 centimetres above the ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003.

The antenna was positioned 3 meters horizontally from the EuT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarization's and the EuT are rotated 360 degrees.

The final level, expressed in dB μ V/m, is arrived by taking the reading from the EMI receiver (Level dB μ V) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver, where the correction factors are stored. This result then has the FCC or CISPR limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets at page.

The radiated emissions from the EuT are measured in the frequency range of 1 GHz to maximum frequency as specified in section 15.33, using a Spectrum Analyzer and appropriate linearly polarized antennas. The EuT is placed on a 1.0 X 1.5 meter non-conducting table 80 centimetres above the ground plane. The set up of the EuT will be in accordance to ANSI C63.4-2003. The antenna was positioned 3 m horizontally from the EuT.

Measurement are made in both the horizontal and vertical planes of polarization in a fully anechoic room using a spectrum analyzer with the detector function set to peak, RBW 1 MHz and VBW set to 3 MHz for any spurious emission or modulation product that falls in **Restricted bands** as defined in Section 15.205.

All tests are performed at a test-distance of 3 meters. During the tests the EUT measurement scans are made with both horizontal and vertical antenna polarization's and the EuT are rotated 360 degrees.

Analyzer Settings (EMI receiver) for spurious emissions which fall not in Restricted Band:

- Detector: Max hold
- RBW: 100 kHz for $f \geq 1\text{GHz}$, 120 kHz for $f \leq 1\text{GHz}$
- VBW: \geq RBW
- Sweep Time: Coupled
- Detector function: Peak

Analyzer Settings (EMI receiver) for spurious emissions which fall in Restricted Band:

- Detector: Max hold
- RBW: 1 MHz for $f \geq 1\text{GHz}$, 120 kHz for $f \leq 1\text{GHz}$
- VBW: \geq RBW
- Sweep Time: Coupled
- Detector function: Peak for $f \geq 1\text{GHz}$, Quasi Peak for $f \leq 1\text{GHz}$

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5.8.5 Test result

Testresult in detail: (<1GHz)

Frequency [MHz]	Readin g Level QP [dB μ V]	Reading Level AV [dB μ V]	Reading Level PK [dB μ V]	Bandwidth [kHz]	Correct. factor [dB]	Corrected Level QP [dB μ V/m]	Corrected Level AV [dB μ V/m]	[Corrected Level PK [dB μ V/m]	Limit [dB μ V/m]			Delta [dB]
									QP	AV	PK	
30-1000				120		< 30						

Channel 6 (2437 MHz)												
Frequency [MHz]	Readin g Level QP [dB μ V]	Reading Level AV [dB μ V]	Reading Level PK [dB μ V]	Bandwidth [kHz]	Correct. factor [dB]	Corrected Level QP [dB μ V/m]	Corrected Level AV [dB μ V/m]	[Corrected Level PK [dB μ V/m]	Limit [dB μ V/m]			Delta [dB]
									QP	AV	PK	
30-1000				120		< 30						

Channel 11 (2462 MHz)												
Frequency [MHz]	Readin g Level QP [dB μ V]	Reading Level AV [dB μ V]	Reading Level PK [dB μ V]	Bandwidth [kHz]	Correct. factor [dB]	Corrected Level QP [dB μ V/m]	Corrected Level AV [dB μ V/m]	[Corrected Level PK [dB μ V/m]	Limit [dB μ V/m]			Delta [dB]
									QP	AV	PK	
30-1000				120		< 30						

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Test result >1GHz

Channel 1 (2412 MHz)									
Frequency [MHz]	Reading Level PK [dB μ V]	Reading Level AV [dB μ V] *)	Band-width [kHz]	Correct. Factor [dB]	Corrected Level PK [dB μ V/m]	Corrected Level AV [dB μ V/m]	Limit PK [dB μ V/m]	Limit AV [dB μ V/m]	Delta [dB]
1000-13000			1000		< 50				

Channel 6 (2437 MHz)									
Frequency [MHz]	Reading Level PK [dB μ V]	Reading Level AV [dB μ V] *)	Band-width [kHz]	Correct. Factor [dB]	Corrected Level PK [dB μ V/m]	Corrected Level AV [dB μ V/m]	Limit PK [dB μ V/m]	Limit AV [dB μ V/m]	Delta [dB]
1000-13000			1000		< 50				

Channel 11 (2462 MHz)									
Frequency [MHz]	Reading Level PK [dB μ V]	Reading Level AV [dB μ V] *)	Band-width [kHz]	Correct. Factor [dB]	Corrected Level PK [dB μ V/m]	Corrected Level AV [dB μ V/m]	Limit PK [dB μ V/m]	Limit AV [dB μ V/m]	Delta [dB]
1000-13000			1000		< 50				

Limit according to FCC Subpart 15.109(a)

Frequency of emission [MHz]	Field strength Limits [μ V/m]	Field strength Limits [dB μ V/m]
0,009-0,490	2400/F(kHz)	
0,490-1,705	24000/F(kHz)	
1,705-30	30	
30-88	100	40
88-216	150	44
216-960	200	46
Above 960	500	54

The requirements are **FULFILLED**.

Remarks: During the test, the Eut was set into continuous receiving mode.

The measurement was performed up to the 5th harmonic (13000 MHz).

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6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

Test ID	Model / Type	Kind of Equipment	Manufacturer	Equipment No.
CPC 3	FSP 30 THS730A	Spectrum Analyzer Handheld Scope	Rohde & Schwarz München Tektronix GmbH	02-02/11-05-001 02-02/13-05-001
MB	FSP 30 THS730A	Spectrum Analyzer Handheld Scope	Rohde & Schwarz München Tektronix GmbH	02-02/11-05-001 02-02/13-05-001
SEC 1-3	FSP 30 THS730A	Spectrum Analyzer Handheld Scope	Rohde & Schwarz München Tektronix GmbH	02-02/11-05-001 02-02/13-05-001
SER 2	ESVS 30 VULB 9168 S10162-B/+11N-50-10-5/+1 KK-EF393-21N-16 NW-2000-NB	EMI Test Receiver Trilog-Broadband Anten RF Cable 33m RF Cable 20m RF Cable	Rohde & Schwarz München Schwarzbeck Mess-Elektron Huber + Suhner Huber + Suhner Huber + Suhner	02-02/03-05-006 02-02/24-05-005 02-02/50-05-031 02-02/50-05-033 02-02/50-05-113
SER 3	FSP 30 AFS4-01000400-10-10P-4 AMF-4F-04001200-15-10P AFS5-12001800-18-10P-6 BBHA 9120 E 251 WBH218H N Sucoflex N-2000-SMA Sucoflex N-2000-SMA	Spectrum Analyzer RF Amplifier 1-4 GHz RF Amplifier 4-12 GHz RF Amplifier 12-18 GHz Broad-Band Horn Anten Horn Antenna 2-18 GHz RF Cable RF Cable	Rohde & Schwarz München PARZICH GMBH PARZICH GMBH PARZICH GMBH Schwarzbeck Mess-Elektron Q-par Angus Ltd novotronik Signalverarbeit novotronik Signalverarbeit	02-02/11-05-001 02-02/17-05-003 02-02/17-05-004 02-02/17-06-002 02-02/24-05-006 02-02/24-05-007 02-02/50-05-075 02-02/50-05-088

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Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
02-02/11-05-001	12/06/2007	12/06/2006		
02-02/13-05-001	09/03/2008	09/03/2007		
02-02/11-05-001	12/06/2007	12/06/2006		
02-02/13-05-001	09/03/2008	09/03/2007		
02-02/11-05-001	12/06/2007	12/06/2006		
02-02/13-05-001	09/03/2008	09/03/2007		
02-02/03-05-006	07/24/2008	07/24/2007		
02-02/24-05-005	04/15/2008	04/15/2005	05/09/2007	05/09/2006
02-02/50-05-031				
02-02/50-05-033				
02-02/50-05-113				
02-02/11-05-001	12/06/2007	12/06/2006		
02-02/17-05-003				
02-02/17-05-004				
02-02/17-06-002				
02-02/24-05-006	04/15/2008	04/15/2005	10/23/2007	04/23/2007
02-02/24-05-007			10/23/2007	04/23/2007
02-02/50-05-075				
02-02/50-05-088				