Registration No. DAT-P-207/05

FCC ID: U9AIM154-6WLAN-V1

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

- FCC Part 15.247 -

Test Report No. :	**T32985-02-00AA**	07. April 2009 Date of issue

Type / Model Name : Connection Unit IM 154-6 PN HF IWLAN

Product Description : Network WLAN Client

Applicant **:** Siemens AG

Address : Werner-von-Siemens-Str. 50

92224 Amberg

Manufacturer **:** Siemens AG, Industry Sector, I IA AS EWA

Address : Werner-von-Siemens-Str. 50

92224 Amberg

Licence holder **:** Siemens AG, Industry Sector, I IA AS RD ST TT

Address : Werner-von-Siemens-Str. 50

92224 Amberg

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

Deutscher Akkreditierungs Rat

DAT-P-207/05-00

mikes-testingpartners gmbh
Ohmstrasse 2-4 · 94342 Strasskirchen
Tel.:+49(0)9424-94810 · Fax:+49(0)9424-9481240

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

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

Part 15, Subpart C, Section 15.35(c)	Measurement detector functions and bandwidths
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 15.207(a)	AC Line conducted emissions
Part 15, Subpart C, Section 15.209(a)	Radiated emissions, general requirements
Part 15, Subpart C, Section 15.247	Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October, 2008)

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

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.

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

2 SUMMARY

GENERAL REMARKS:

The EuT consists of 1 WLAN client module.
It has no radar Interference Detection function
Actual firmware of CM module: T 0.0.13 ART 16.11.2007
Actual firmware of IM module: R 10.10.0

Available Features:

The WLAN client module is compatible with 802.11a, 802.11b, 802.11g technology. It is able to operate in the 2.4 GHz and 5 GHz frequency band.

- 802.11a Mode 5.15 GHz – 5.25 GHz and 5.725 GHz – 5.850 GHz
- 802.11b/g Mode 2400 – 2483.5 MHz

The module uses DSSS or OFDM modulation and is cabable to provide following data rates:

- 802.11b Mode 11, 5.5, 2, 1 Mbps, auto-fallback
- 802.11g Mode 54, 48, 36, 24, 18, 12, 9, 6 Mbps, auto-fallback
- 802.11a 54, 48, 36, 24, 18, 12, 9, 6 Mbps, auto-fallback

There are three different external antennas provided. The following table shows the WEB-power settings depending on the transmitting channel, antenna type and WLAN technology.

Channel/ Frequency	Antenna Type	Antenna Gain	WEB Power settings (∆dB)	ART Power settings (dBm)
802.11b	ANT IM154-6 IWLAN	2 dBi	0	19
	ANT792-4DN	4 dBi	0	19
	ANT792-6MN	6 dBi	0	19
802.11g Ch 1/ Ch 11	ANT IM154-6 IWLAN	2 dBi	-6	16
	ANT792-4DN	4 dBi	-6	16
	ANT792-6MN	6 dBi	-6	16
802.11g Ch 2 to Ch 10	ANT IM154-6 IWLAN	2 dBi	0	20
	ANT792-4DN	4 dBi	0	20
	ANT792-6MN	6 dBi	0	20
802.11a	ANT IM154-6 IWLAN	2 dBi	0	19
	ANT793-4MN	5 dBi	0	19
	ANT793-6MN	5 dBi	0	19

Note: The WEB-power settings are related to the measured ART-power settings (worst case conditions).

Note: The tests have been carried out in the following frequency bands:
2400 MHz to 2483.5 MHz and
5725 MHz to 5850 MHz.

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

As worst case the following data rates are used:

- **802.11b: 11 Mbits**
- **802.11g: 6 Mbits**
- **802.11a: 6 Mbits**

The EuT has been adjusted to transmit data during the tests with a duty cycle (X) of about X=1.

Eleven channels are provided to this EuT in 802.11b/g mode:

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

Five channels are provided to this EuT in 802.11a mode:

802.11a mode:

Channel	Frequency
149	5745 MHz
153	5765 MHz
157	5785 MHz
161	5805 MHz
165	5825 MHz

Following channels were selected for the final test as listed below:

Technology	Available Channel	Tested Channel	Modulation	Modulation Type	Data Rate (MBps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	11
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	6

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 : 25. February 2009

Testing concluded on : 17. March 2009

Checked by:

Klaus Gegenfurtner
Ich bestätige die Richtigkeit und Integrität dieses Dokuments
2009.06.16 13:41:30 +02'00'

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

Tested by:

Anton Altmann
Ich bin der Verfasser dieses Dokuments
2009.06.16 13:30:29 +02'00'

Anton Altmann
Dipl.-Ing.(FH)

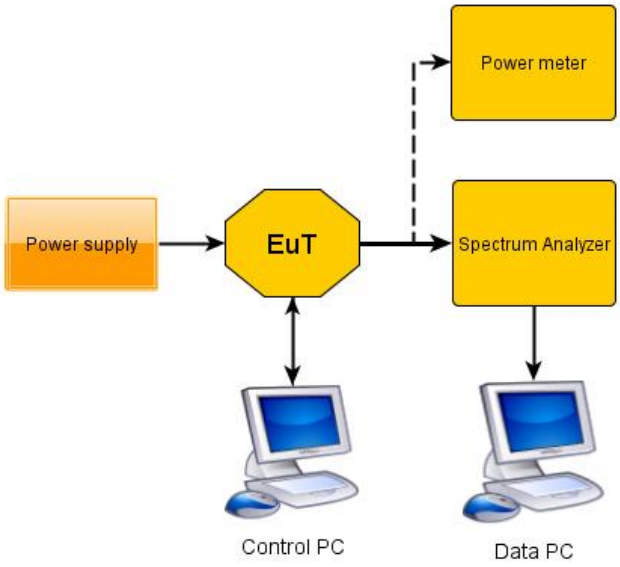
3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT – Detailed photos see Attachment A

3.2 Power supply system utilised

Power supply voltage : 10 V DC

3.3 Test setup



3.4 Short description of the Equipment under Test (EuT)

The new interface module is integrated in the communication network as an IWLAN client via an IWLAN access point, such as the Scalance W access point from Siemens. The module works according to the WLAN standards IEEE 802.11 a/b/g/h and therefore operates in the 2.4 and 5 GHz frequency bands. The interface module wirelessly integrates the distributed I/O system into the automation network. It is designed for harsh industrial environments with a high degree of protection (IP65/66/67) and conceived for use directly on the machine. For this purpose, the new 154-6 PN HF IWLAN interface module was developed for the Simatic ET 200pro system.

Number of tested samples: 1
Serial number: Prototype

EuT operation mode:

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

- Continuous transmit 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:

-	Test board (ART Interface)	Model :	RF-PCB, V1.0
-	Network cable RJ45	Model :	Standard
-	Power cable	Model :	AC/DC Power supply
-		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 /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.

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."

5 TEST CONDITIONS AND RESULTS

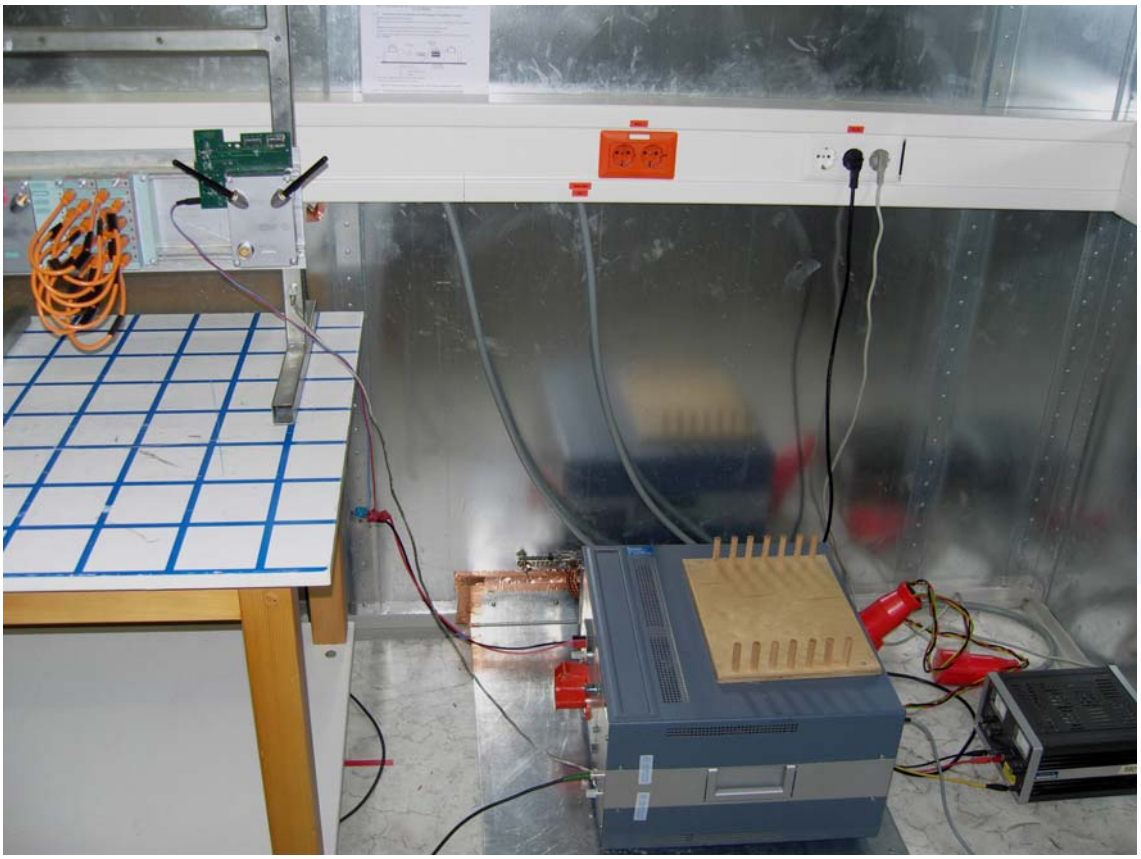
5.1 Conducted emissions

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 Subpart 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.
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 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.

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 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.

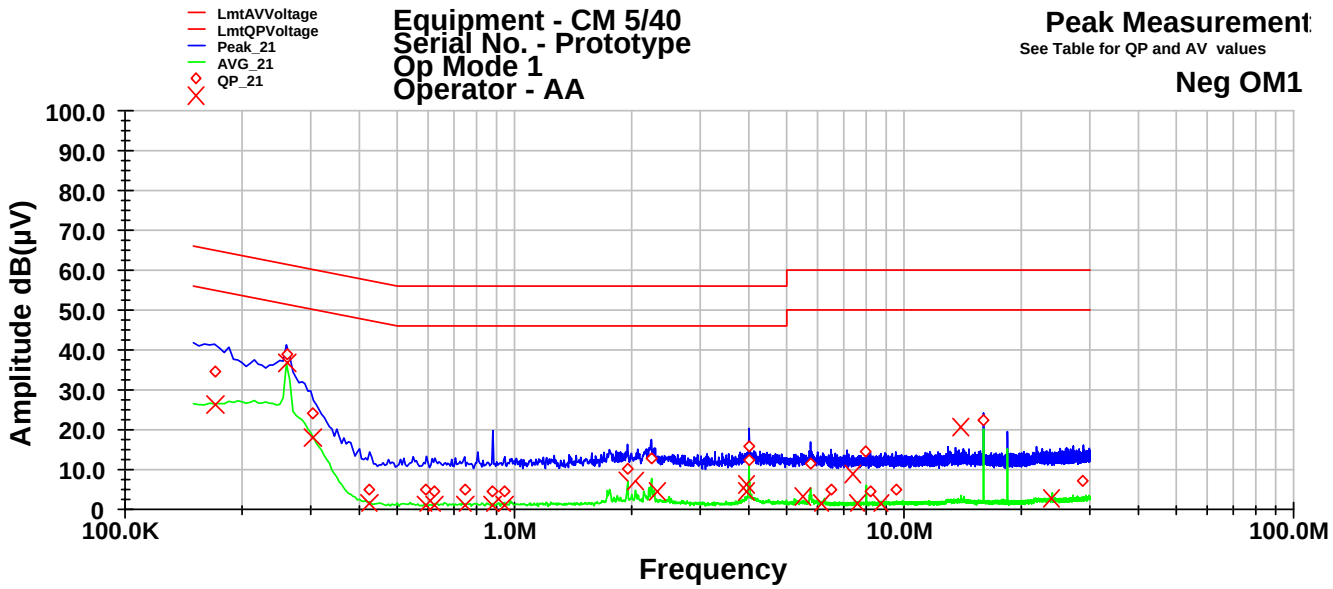
To convert between dBμV and μV, the following conversions apply:

dBμV = 20(log μV)
μV = Inverse log(dBμV/20)

The requirements are **FULFILLED.**

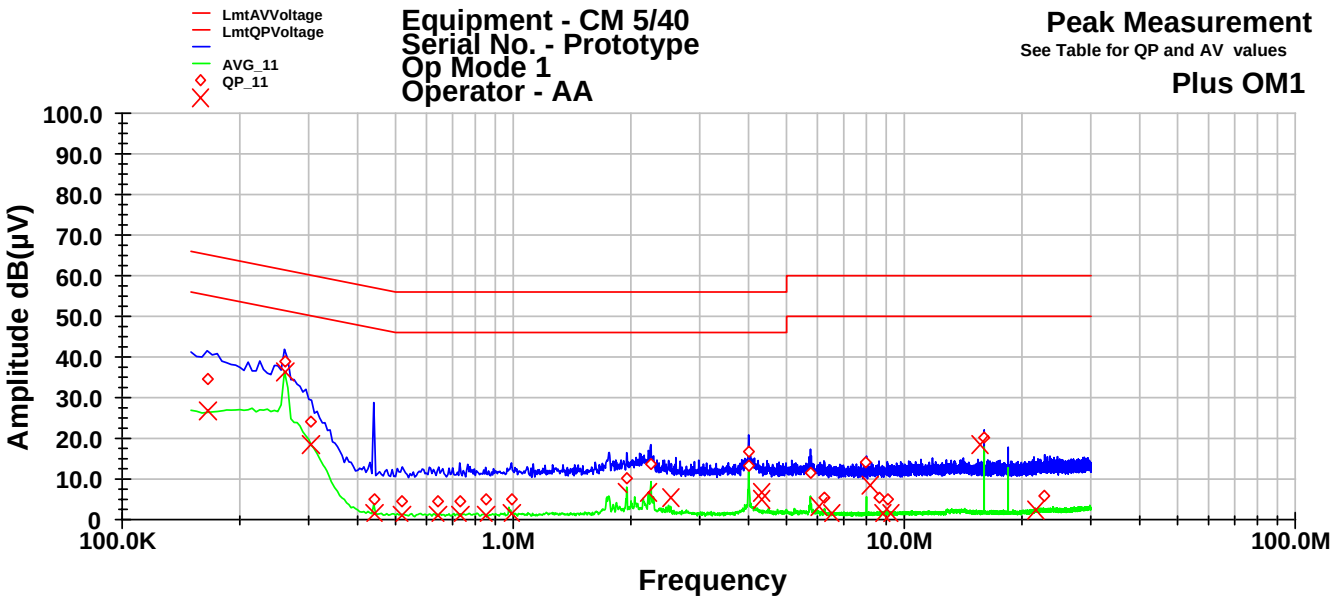
Remarks: For detailed results please refer to the following plots.

Conducted emissions at negative power line



Frequency	QP Level	QP Margin	QP Limit	AV Level	AV Margin	AV Limit
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB
0.17	34.5	-30.5	65.0	26.4	-28.6	55.0
0.26	39.0	-22.4	61.4	36.7	-14.8	51.4
0.305	23.9	-36.2	60.1	17.9	-32.2	50.1
0.425	5.1	-52.3	57.3	1.6	-45.7	47.3
0.595	4.8	-51.2	56.0	1.2	-44.8	46.0
0.625	4.5	-51.5	56.0	1.2	-44.8	46.0
0.745	4.8	-51.3	56.0	1.2	-44.8	46.0
0.88	4.3	-51.7	56.0	1.2	-44.8	46.0
0.945	4.5	-51.5	56.0	1.2	-44.8	46.0
1.955	10.3	-45.7	56.0	7.0	-39.0	46.0
2.25	12.7	-43.3	56.0	4.6	-41.4	46.0
4	15.8	-40.2	56.0	6.4	-39.5	46.0
4.005	12.5	-43.5	56.0	4.4	-41.6	46.0
5.755	11.4	-48.6	60.0	3.3	-46.7	50.0
6.495	4.9	-55.1	60.0	1.4	-48.7	50.0
8	14.6	-45.4	60.0	8.9	-41.1	50.0
8.195	4.7	-55.3	60.0	1.5	-48.5	50.0
9.53	5.1	-54.9	60.0	1.6	-48.4	50.0
16	22.6	-37.4	60.0	20.7	-29.3	50.0
28.85	6.9	-53.1	60.0	2.7	-47.3	50.0

Conducted emissions at positive power line



Frequency	QP Level	QP Margin	QP Limit	AV Level	AV Margin	AV Limit
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB
0.165	34.7	-30.5	65.2	26.7	-28.5	55.2
0.26	38.9	-22.6	61.4	36.4	-15.1	51.4
0.305	24.2	-35.9	60.1	18.3	-31.8	50.1
0.44	4.9	-52.1	57.1	1.4	-45.6	47.1
0.52	4.7	-51.3	56.0	1.2	-44.8	46.0
0.645	4.7	-51.3	56.0	1.2	-44.8	46.0
0.73	4.6	-51.4	56.0	1.2	-44.8	46.0
0.85	4.9	-51.1	56.0	1.2	-44.8	46.0
0.99	5.0	-51.0	56.0	1.4	-44.6	46.0
1.95	10.0	-46.0	56.0	6.6	-39.4	46.0
2.25	13.8	-42.2	56.0	5.2	-40.8	46.0
4	16.7	-39.3	56.0	6.9	-39.1	46.0
4.005	13.2	-42.8	56.0	4.7	-41.3	46.0
5.755	11.5	-48.5	60.0	3.3	-46.7	50.0
6.23	5.2	-54.8	60.0	1.5	-48.5	50.0
8	14.1	-45.9	60.0	8.3	-41.7	50.0
8.615	5.3	-54.8	60.0	1.6	-48.4	50.0
9.045	5.1	-54.9	60.0	1.5	-48.5	50.0
16	20.4	-39.6	60.0	18.4	-31.6	50.0
22.85	5.9	-54.1	60.0	2.4	-47.6	50.0

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

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 was 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 measurement has been carried out using a spectrum analyzer with the following settings:
RBW=100 kHz
VBW=300 kHz
PEAK Detector
The table below shows the settings 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

Technology 802.11b

Channel number	Fundamental Frequency (MHz)	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)
1	2412	11.6	0.5
6	2437	11.0	0.5
11	2462	12.4	0.5

Technology 802.11g

Channel number	Fundamental Frequency (MHz)	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)
1	2412	16.4	0.5
6	2437	16.4	0.5
11	2462	16.4	0.5

Technology 802.11a

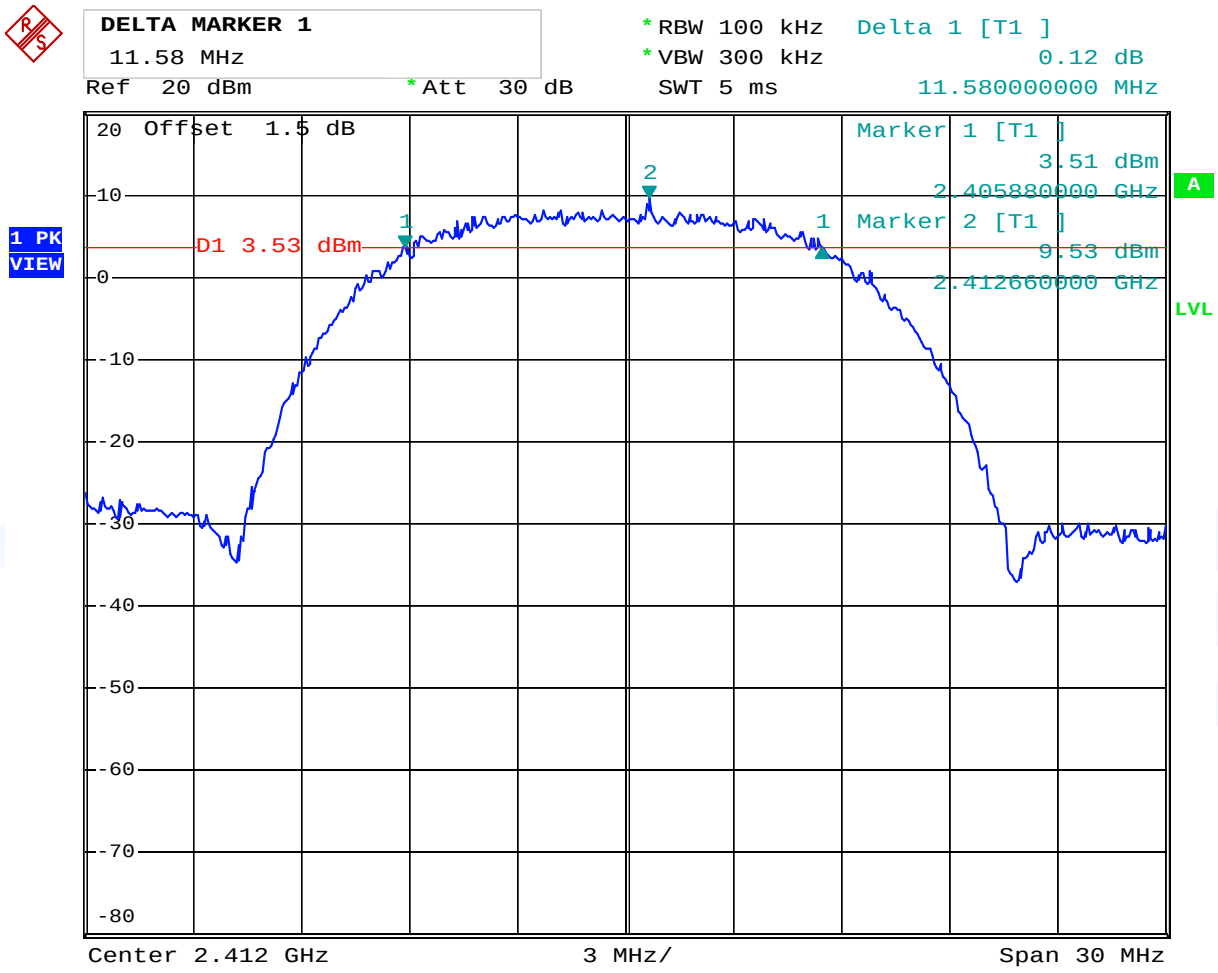
Channel number	Fundamental Frequency (MHz)	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)
149	5745	16.4	0.5
157	5785	16.4	0.5
165	5825	16.4	0.5

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

5.2.6 Test protocol

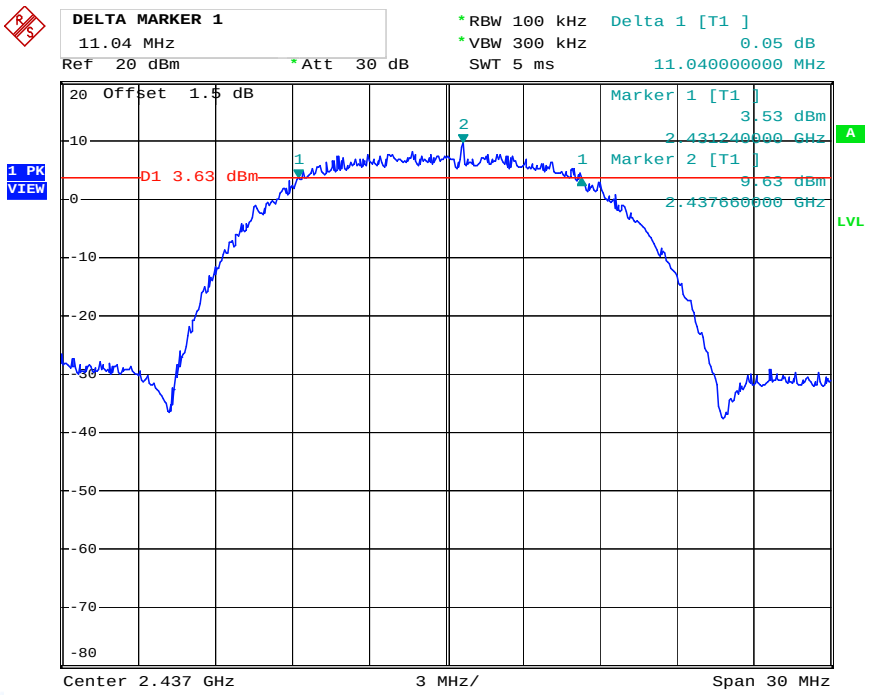
6dB Bandwidth Measurement plots

802.11b, Channel 1 (2412 MHz)



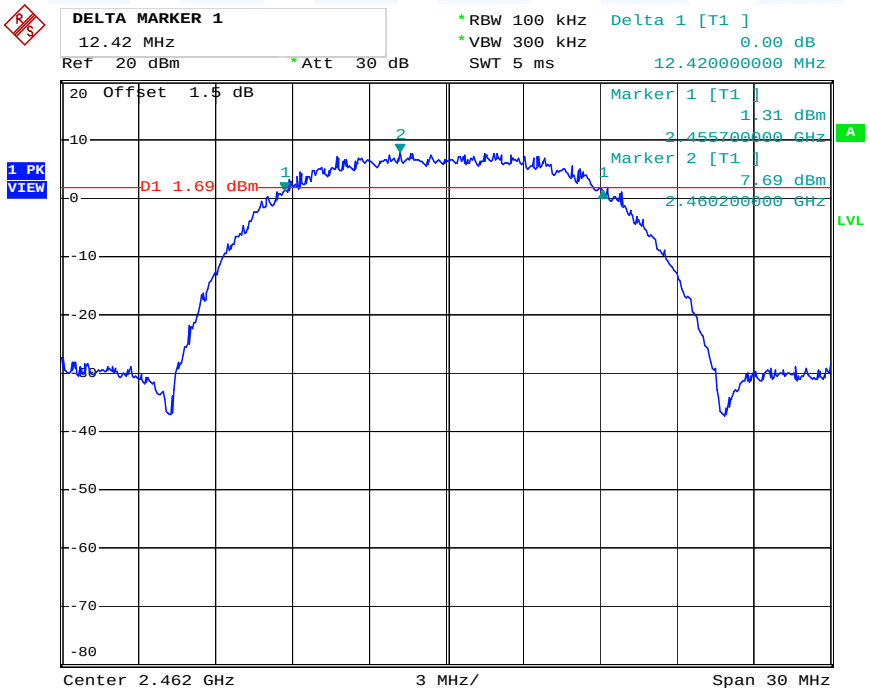
Date: 16.MAR.2009 09:42:27

802.11b, Channel 6 (2437 MHz)



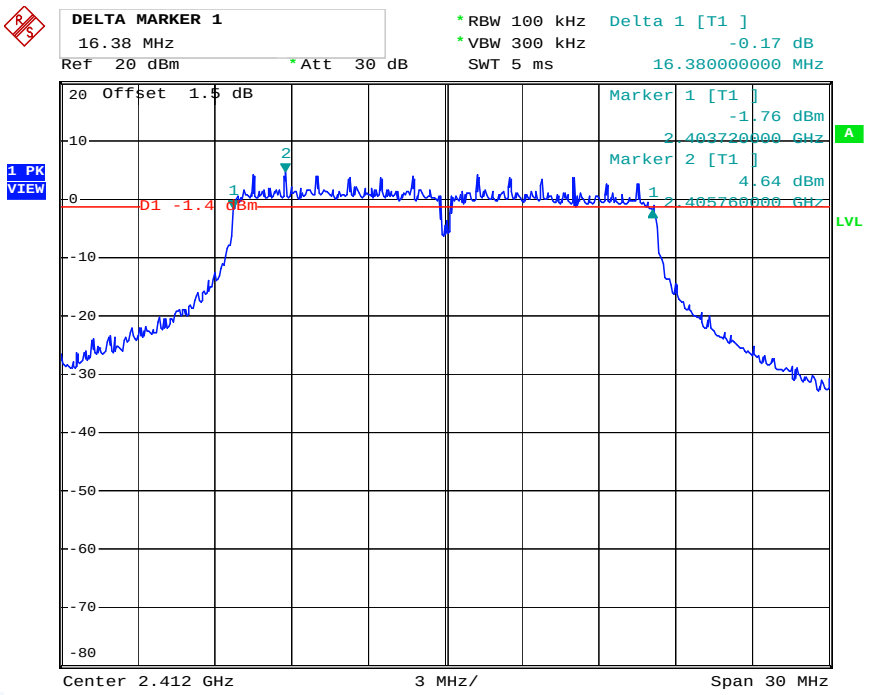
Date: 16.MAR.2009 09:49:15

802.11b, Channel 11 (2462 MHz)



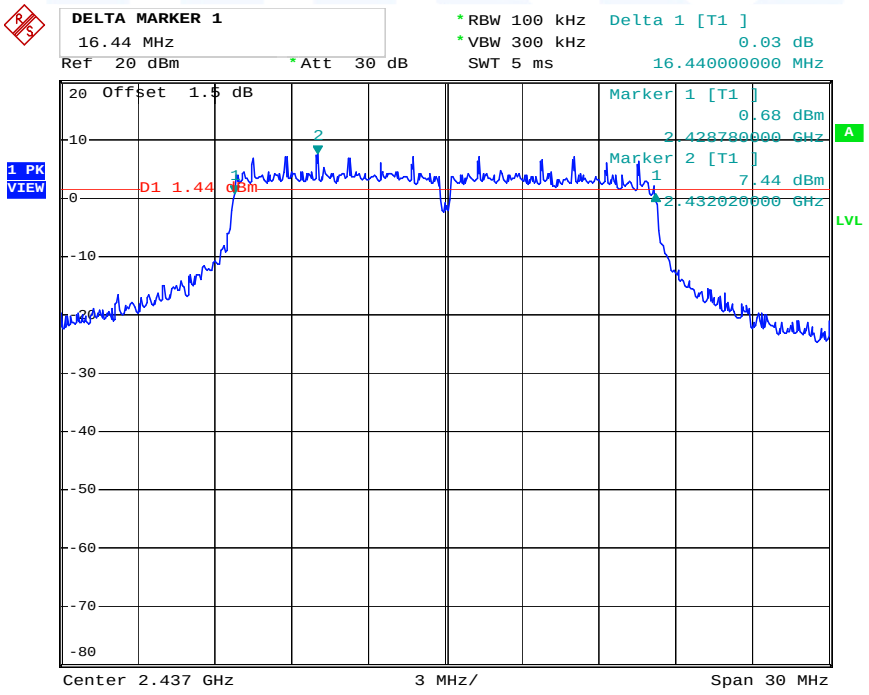
Date: 16.MAR.2009 09:51:14

802.11g, Channel 1 (2412 MHz)



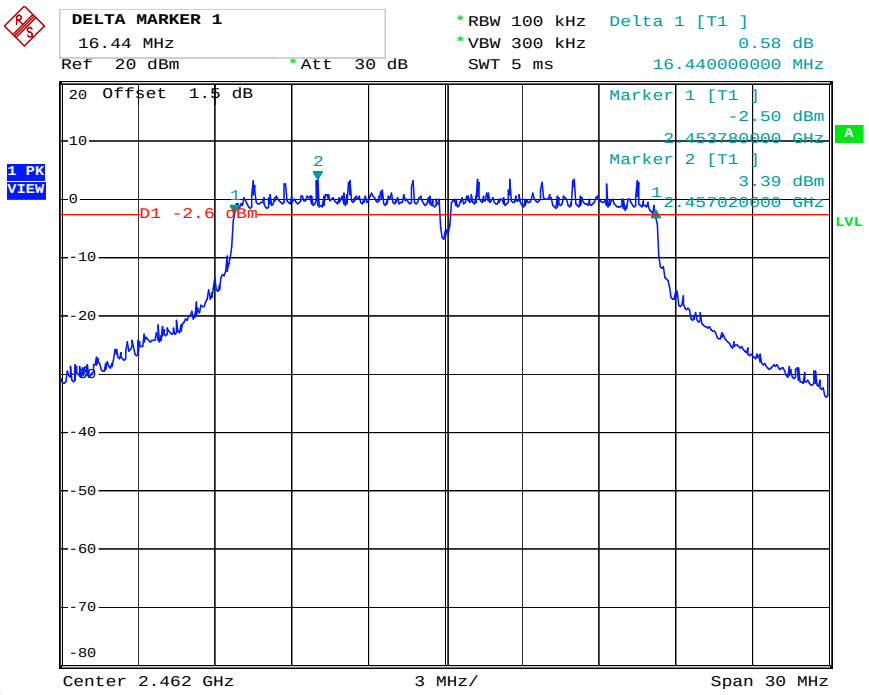
Date: 16.MAR.2009 09:59:20

802.11g, Channel 6 (2437 MHz)



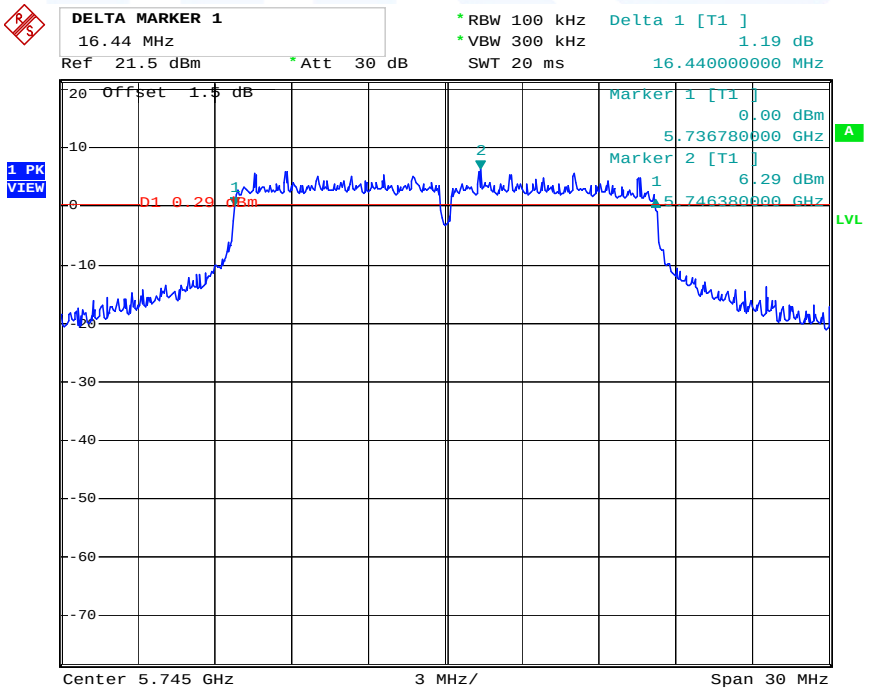
Date: 16.MAR.2009 09:56:14

802.11g, Channel 11 (2462 MHz)



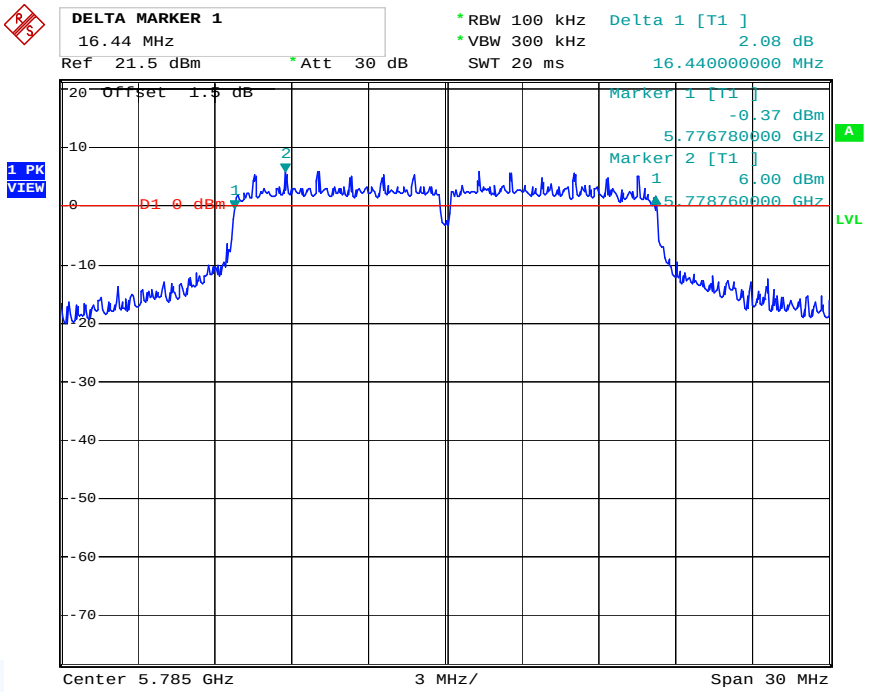
Date: 16.MAR.2009 09:53:58

802.11a, Channel 149 (5745 MHz)



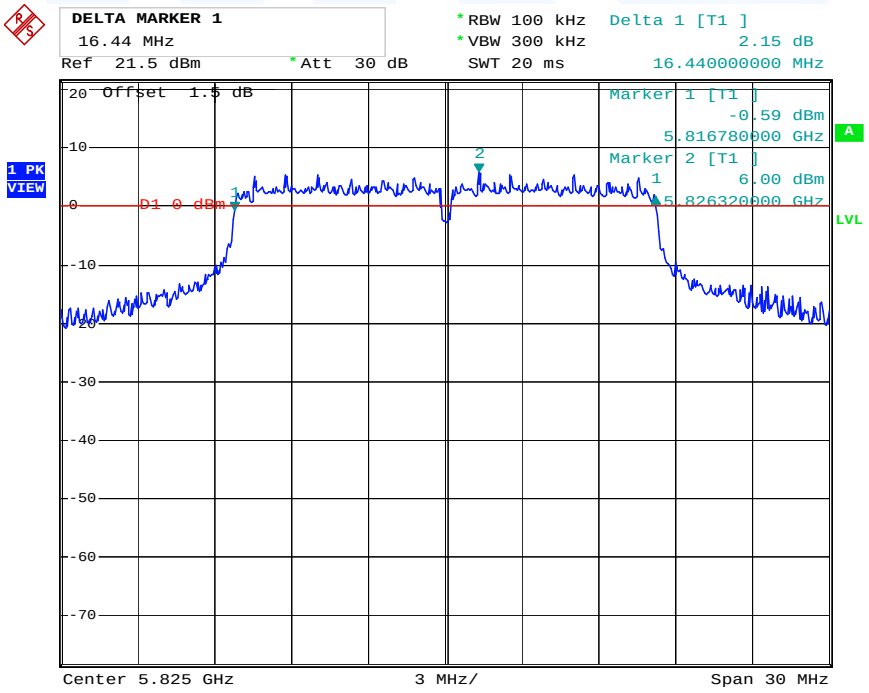
Date: 16.MAR.2009 08:54:00

802.11a, Channel 157 (5785 MHz)



Date: 16.MAR.2009 08:56:16

802.11a, Channel 165 (5825 MHz)



Date: 16.MAR.2009 08:58:11

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 and 5725 – 5850 MHz bands, 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 ananlyzer 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 AV detector and Power Mode Max Hold the result is the summed maximum output power of the EBW.

5.3.5 Test result

Technology 802.11b

Channel	Frequency (MHz)	ART settings (dBm)	Measured Power (dBm)	Correction (dB)	Corr. Peak Power Output (dBm)	Peak Power Limit (dBm)	Delta (dB)
1	2412	19	7.0	11.0	18.0	30	-12.0
6	2437	19	7.4	11.0	18.4	30	-11.6
11	2462	19	6.7	11.0	17.7	30	-12.3

Remarks: Where Correction means fixed attenuation of 10 dB and cable loss of 1.0 dB.

Technology 802.11g

Channel	Frequency (MHz)	ART settings (dBm)	Measured Power (dBm)	Correction (dB)	Corr. Peak Power Output (dBm)	Peak Power Limit (dBm)	Delta (dB)
1	2412	16	3.9	11.0	14.9	30	-15.1
6	2437	20	7.0	11.0	18.0	30	-12.0
11	2462	16	3.1	11.0	14.1	30	-15.9

Remarks: Where Correction means fixed attenuation of 10 dB and cable loss of 1.0 dB.

Technology 802.11a

Channel	Frequency (MHz)	ART settings (dBm)	Measured Power (dBm)	Correction (dB)	Corr. Peak Power Output (dBm)	Peak Power Limit (dBm)	Delta (dB)
149	5745	19	5.6	12.0	17.6	30	-12.4
157	5785	19	4.6	12.0	16.6	30	-13.4
165	5825	19	5.1	12.0	17.1	30	-12.9

Remarks: Where Correction means fixed attenuation of 10 dB and cable loss of 2.0 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.

5.4 Spurious emissions

For test instruments and accessories used see section 6 Part **SEC1-3, SER 1, 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

Anechoic chamber

Open area test site

5.4.3 Applicable standard

According to FCC Part 15 Subpart 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 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 9 kHz 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 dBµV/m, is arrived by taking the reading from the EMI receiver (Level dBµV) 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.

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.

Average values were measured with spectrum analyzer by taking the following Settings
RBW: 1 MHz
VBW: 10 Hz
Sweep: Auto

5.4.5 Test result

5.4.5.1 RF antenna conducted test

Technology 802.11b

	Ch 1 (2412 MHz), 18.0 dBm			Ch 6 (2437 MHz), 18.4 dBm			Ch 11 (2462 MHz), 17.7 dBm	
Frequency (MHz)	Peak Power (dBm)	Limit (-20 dB) (dBm)		Peak Power (dBm)	Limit (-20 dB) (dBm)		Peak Power (dBm)	Limit (-20 dB) (dBm)
9 kHz-30	<-65	-2.0		<-65	-1.6		<-65	-2.3
30-1000	<-65	-2.0		<-65	-1.6		<-65	-2.3
1-30 GHz	<-30	-2.0		<-30	-1.6		<-30	-2.3

Technology 802.11g

	Ch 1 (2412 MHz), 14.9 dBm			Ch 6 (2437 MHz), 18.0 dBm			Ch 11 (2462 MHz), 14.1 dBm	
Frequency (MHz)	Peak Power (dBm)	Limit (-20 dB) (dBm)		Peak Power (dBm)	Limit (-20 dB) (dBm)		Peak Power (dBm)	Limit (-20 dB) (dBm)
9 kHz-30	<-65	-5.1		<-65	-2.0		<-65	-5.9
30-1000	<-65	-5.1		<-65	-2.0		<-65	-5.9
1-30 GHz	<-30	-5.1		<-30	-2.0		<-30	-5.9

Technology 802.11a

	Ch 149 (5745 MHz), 17.6 dBm			Ch 157 (5785 MHz), 16.6 dBm			Ch 165 (5825 MHz), 17.1 dBm	
Frequency (MHz)	Peak Power (dBm)	Limit (-20 dB) (dBm)		Peak Power (dBm)	Limit (-20 dB) (dBm)		Peak Power (dBm)	Limit (-20 dB) (dBm)
9 kHz-30	<-65	-2.4		<-65	-3.4		<-65	-2.9
30-1000	<-65	-2.4		<-65	-3.4		<-65	-2.9
1-30 GHz	<-30	-2.4		<-30	-3.4		<-30	-2.9

Remarks: All spurious emissions falling in restricted bands have been measured radiated.

For detailed test results please refer to test protocols below.

5.4.5.2 Radiated emission test

Technology 802.11b
Worst case: Max power of 19 dBm with antenna ANT792-6MN (6 dBi) respectively ANT792-4DN (4 dBi).
The maximum values resulted by ANT792-6MN have been used for declaration of compliance.

Channel 1 (2412 MHz)
Nearest restricted bands: 2200-2300 MHz and 2310-2390 MHz

Spurious Frequency	Antenna gain	WEB Power Setting	ART setting	Peak		Average	
	(dBi)	(ΔdB)	(dBm)	Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
2218	6	0	19	59.1	74	37.0	54
2387	6	0	19	73.1	74	51.2	54
2492	6	0	19	65.0	74	45.7	54

Channel 6 (2437 MHz)

Spurious Frequency	Antenna gain	WEB Power Setting	ART setting	Peak		Average	
	(dBi)	(ΔdB)	(dBm)	Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
---	6	0	19	---	74	---	54

Note: No radiated spurious emissions in restricted bands near band edges!

Channel 11 (2462 MHz)
Nearest restricted band: 2483.5-2500 MHz

Spurious Frequency	Antenna gain	WEB Power Setting	ART setting	Peak		Average	
	(dBi)	(ΔdB)	(dBm)	Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
2378	6	0	19	67.0	74	45.5	54
2484	6	0	19	65.2	74	52.3	54
2486	6	0	19	70.7	74	53.1	54
2493	6	0	19	68.0	74	52.8	54

Remarks: All other emissions falling in restricted bands are at least 20 dB below the appropriate limit (see table below).

Technology 802.11g

Channel 1 (2412 MHz)
Nearest restricted bands: 2200-2300 MHz and 2310-2390 MHz

Spurious Frequency	Antenna gain (dBi)	WEB Power Setting (∆dB)	ART setting (dBm)	Peak		Average	
				Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
2390	6	-6	16	68.2	74	52.7	54
2492	6	-6	16	61.4	74	38.1	54
2504	6	-6	16	58.5	74	37.5	54

Channel 6 (2437 MHz)

Spurious Frequency	Antenna gain (dBi)	WEB Power Setting (∆dB)	ART setting (dBm)	Peak		Average	
				Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
---	6	0	20	---	74	---	54

Note: No radiated spurious emissions in restricted bands near band edges!

Channel 11 (2462 MHz)
Nearest restricted band: 2483.5-2500 MHz

Spurious Frequency	Antenna gain (dBi)	WEB Power Setting (∆dB)	ART setting (dBm)	Peak		Average	
				Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
2299	6	-6	16	60.0	74	46.8	54
2484	6	-6	16	65.6	74	50.1	54
2854	6	-6	16	52.5	74	38.9	54

Remarks: All other emissions falling in restricted bands are at least 20 dB below the appropriate limit (see table below).

Technology 802.11a

Worst case: Max power of 19 dBm with antenna ANT793-6MN (5 dBi) respectively ANT793-4MN (5 dBi). The maximum values resulted by ANT793-6MN have been used for declaration of compliance.

Channel 149 (5745 MHz)
Nearest restricted band: 5350-5460 MHz

Spurious Frequency	Antenna gain (dBi)	WEB Power Setting (∆dB)	ART setting (dBm)	Peak		Average	
				Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
---	5	0	19	---	74	---	54

Note: No radiated spurious emissions in restricted bands near band edges!

Channel 157 (5785 MHz)

Spurious Frequency	Antenna gain (dBi)	WEB Power Setting (∆dB)	ART setting (dBm)	Peak		Average	
				Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
---	5	0	19	---	74	---	54

Note: No radiated spurious emissions in restricted bands near band edges!

Channel 165 (5825 MHz)
Nearest restricted band: 7250-7750 MHz

Spurious Frequency	Antenna gain (dBi)	WEB Power Setting (∆dB)	ART setting (dBm)	Peak		Average	
				Value (dBµV/m)	Limit (dBµV/m)	Value (dBµV/m)	Limit (dBµV/m)
---	5	0	19	---	74	---	54

Note: No radiated spurious emissions in restricted bands near band edges!

The power settings are controlled by firmware and are defined for each antenna type.

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)
	(µV/m)	dB (µV/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: Only spurious emissions falling not in restricted bands have been measured (assessed) conducted.

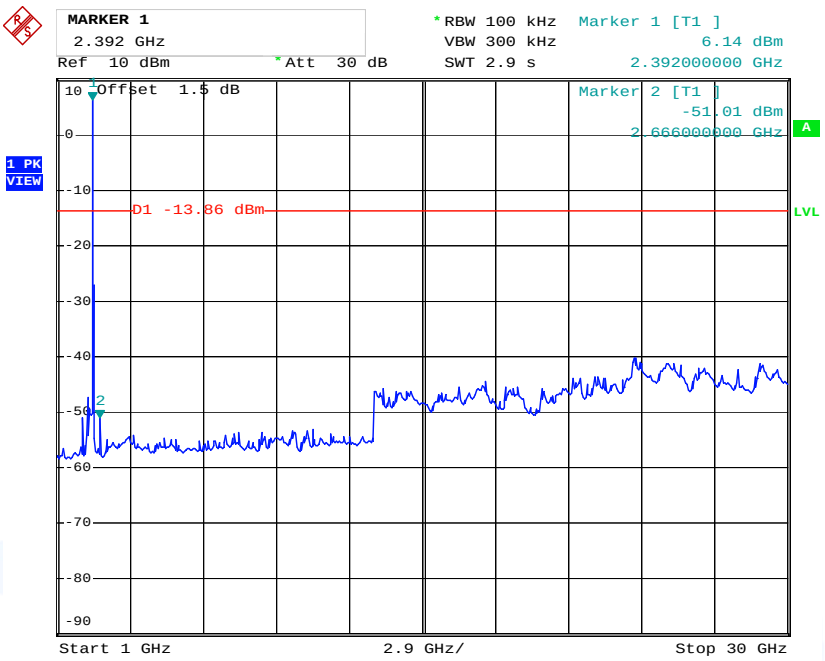
The measurement was performed up to the 10th harmonic.

For detailed test results please refer to following test protocols.

5.4.5.3 Test protocols

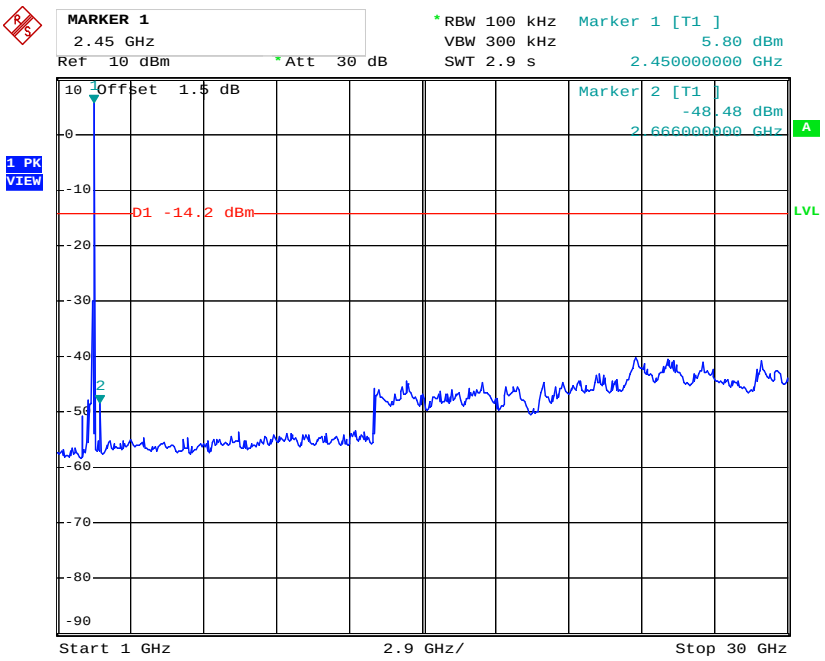
Plots of spurious emissions (conducted) out of operating frequency bands (-20 dBc)

Lower Channel 802.11b (2412 MHz)



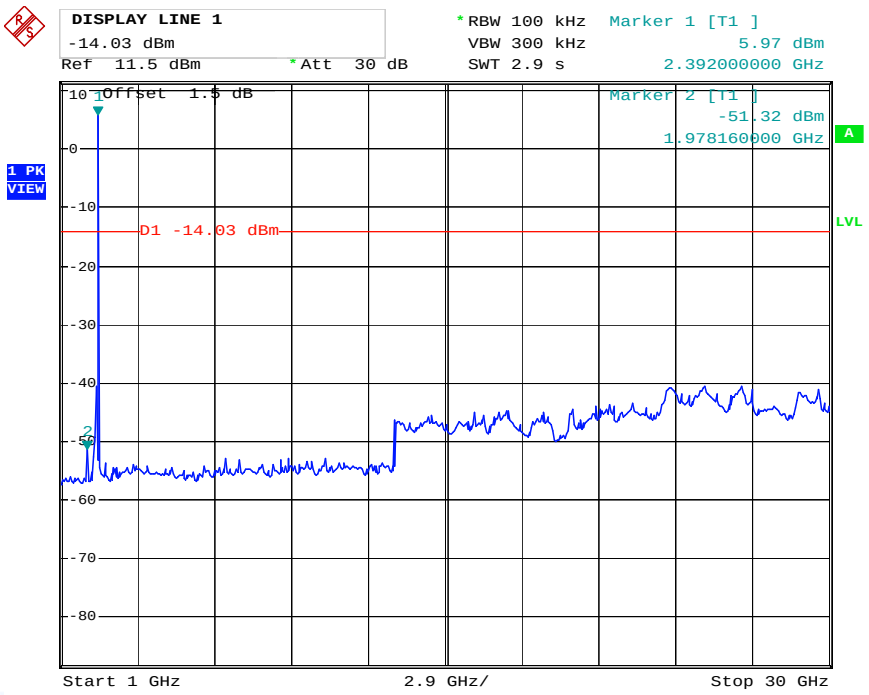
Date: 16.MAR.2009 10:50:14

Higher Channel 802.11b (2462 MHz)



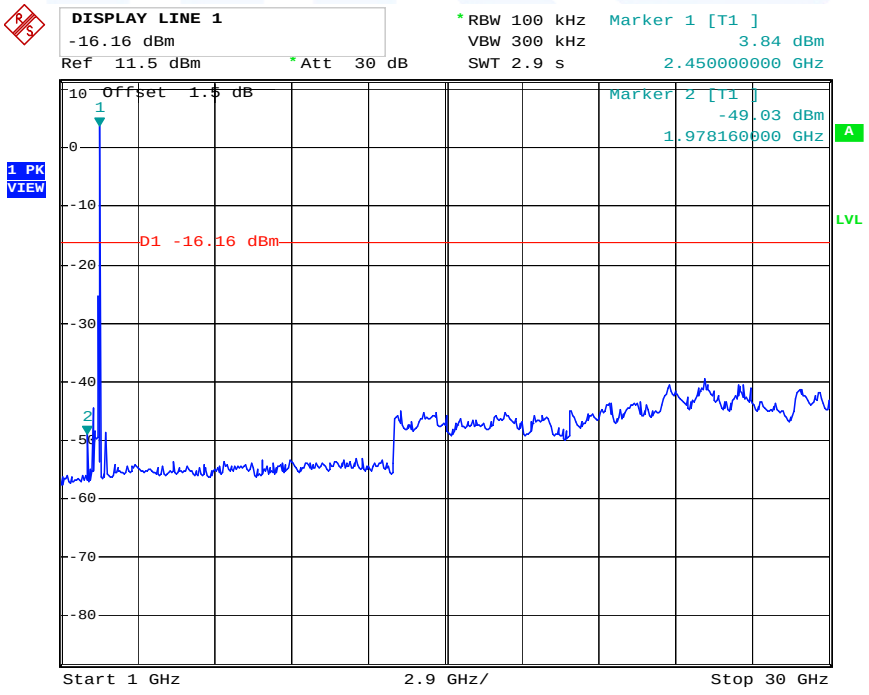
Date: 16.MAR.2009 10:48:57

Lower Channel 802.11g (2412 MHz)



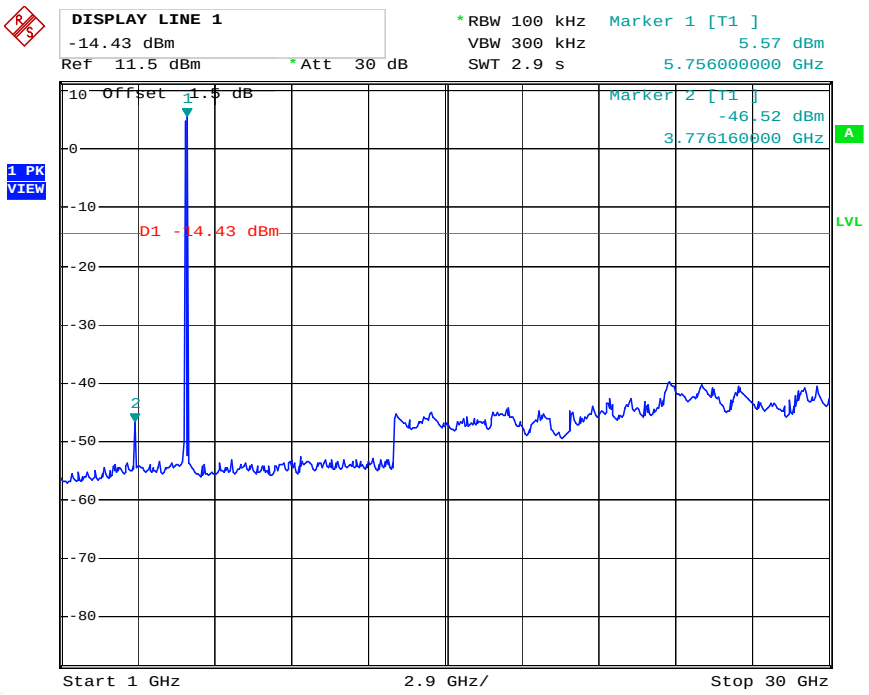
Date: 16.MAR.2009 10:41:11

Higher Channel 802.11g (2462 MHz)



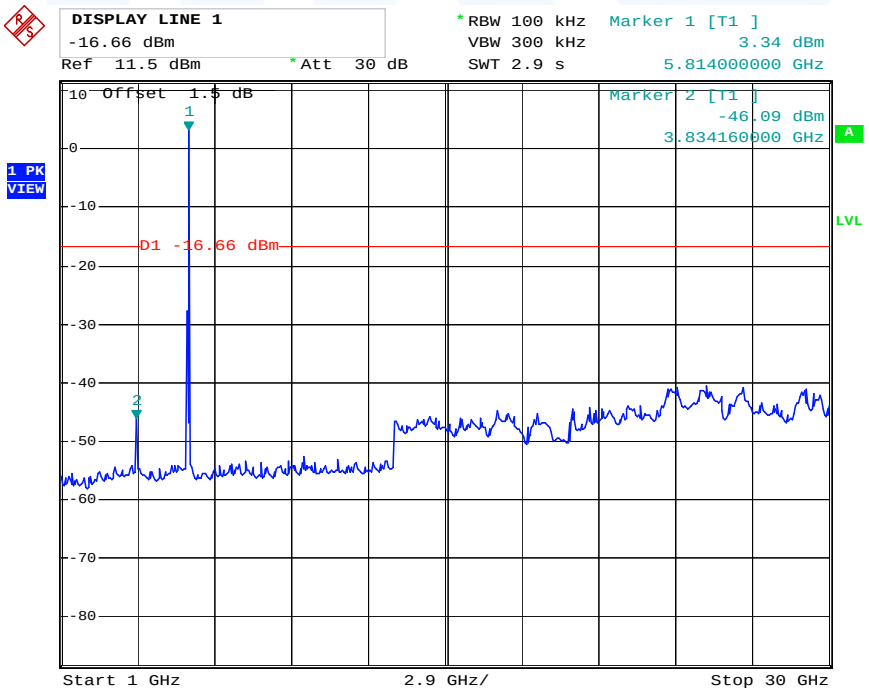
Date: 16.MAR.2009 10:44:53

Lower Channel 802.11a (5745 MHz)



Date: 16.MAR.2009 10:35:12

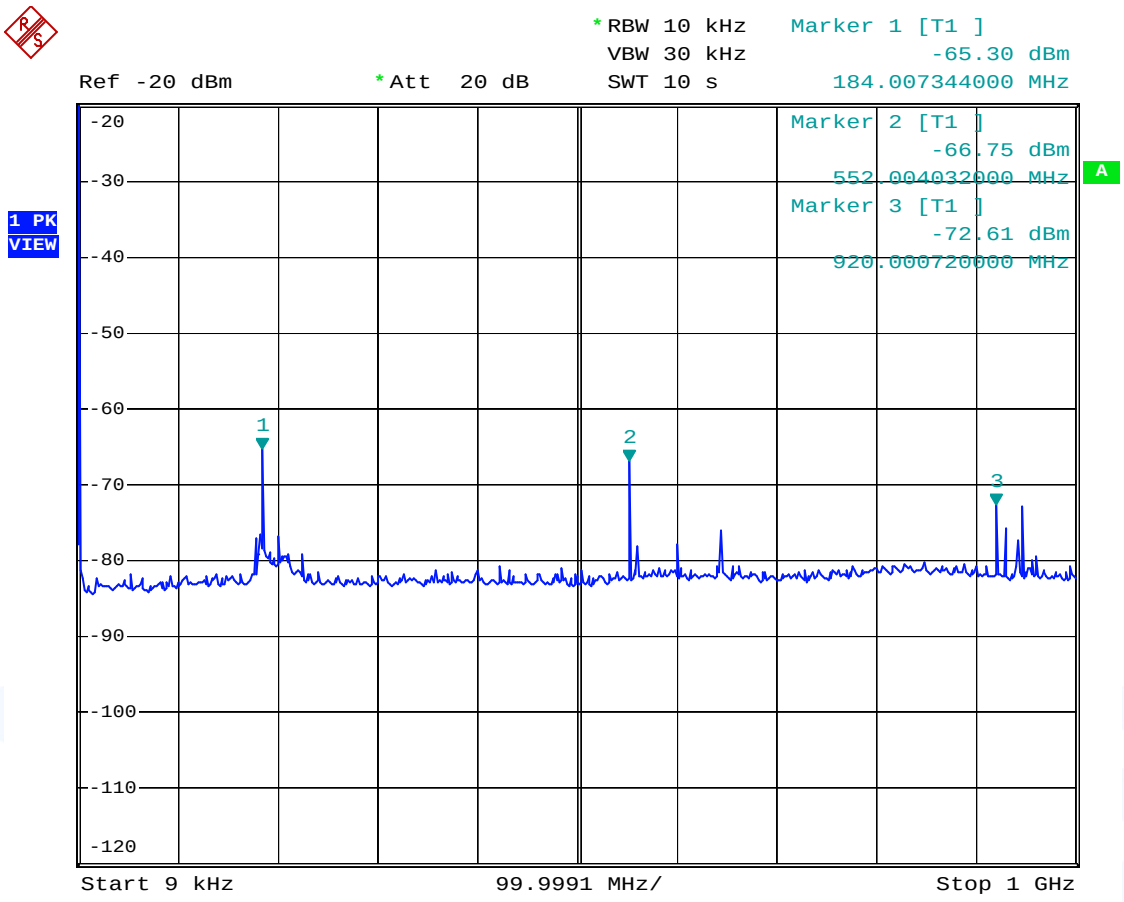
Higher Channel 802.11a (5825 MHz)



Date: 16.MAR.2009 10:39:14

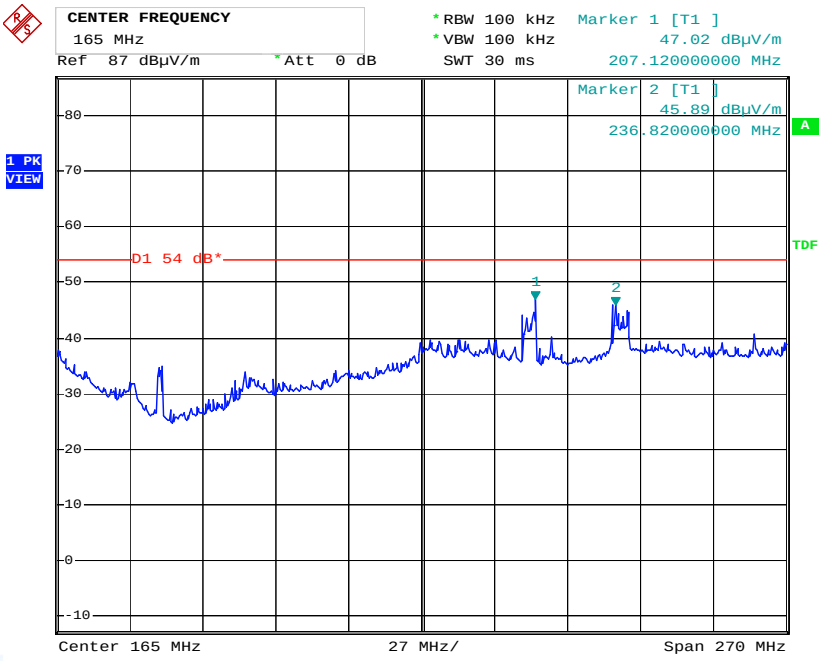
mikes-testingpartners gmbh
Ohmstrasse 2-4 · 94342 Strasskirchen
Tel.:+49(0)9424-94810 · Fax:+49(0)9424-9481240

Conducted spurious emissions from 9 kHz to 1 GHz



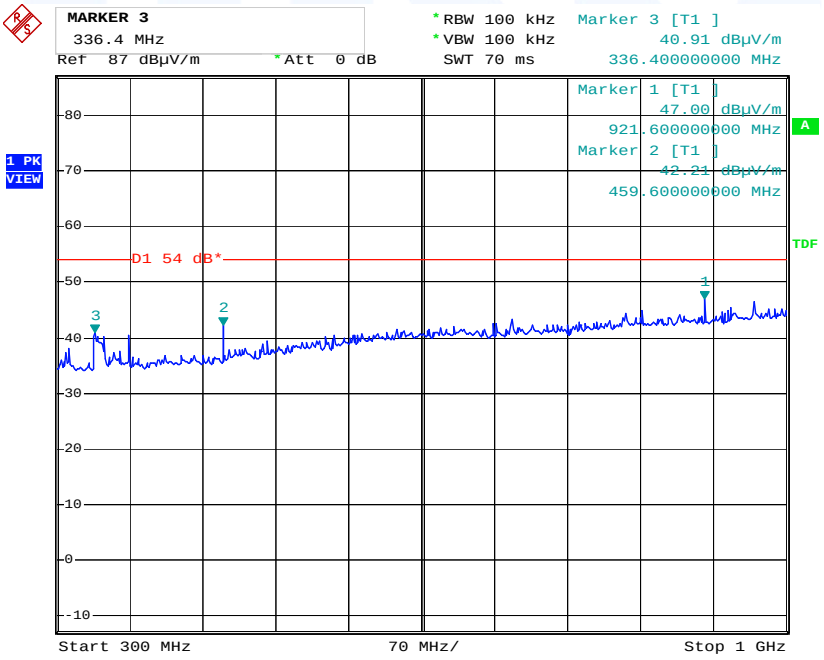
Date: 1.APR.2009 11:36:11

Radiated spurious emissions from 30 MHz to 300 MHz



Date: 9.MAR.2009 11:52:37

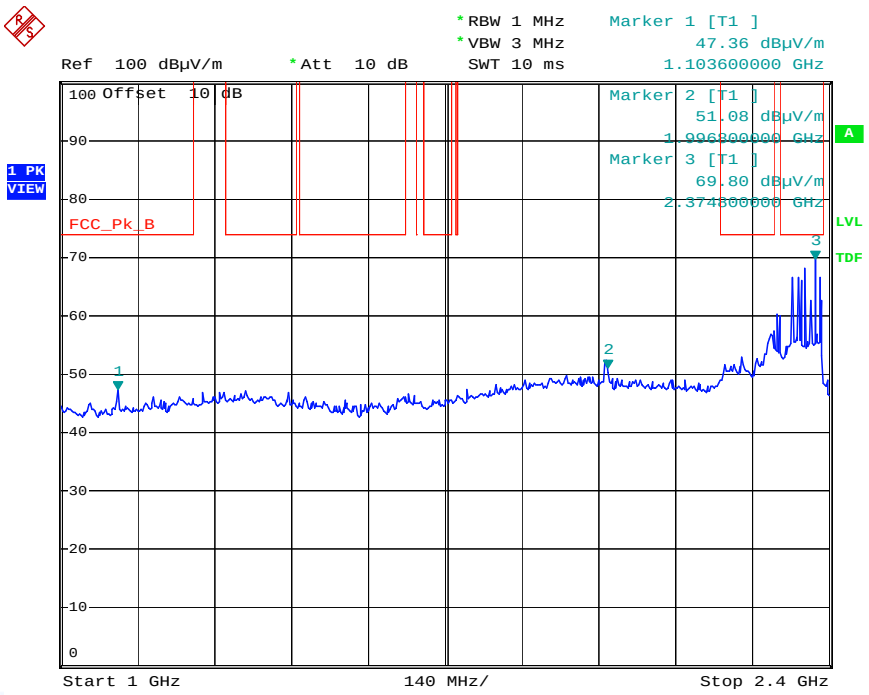
Radiated spurious emissions from 300 MHz to 1000 MHz



Date: 9.MAR.2009 12:01:24

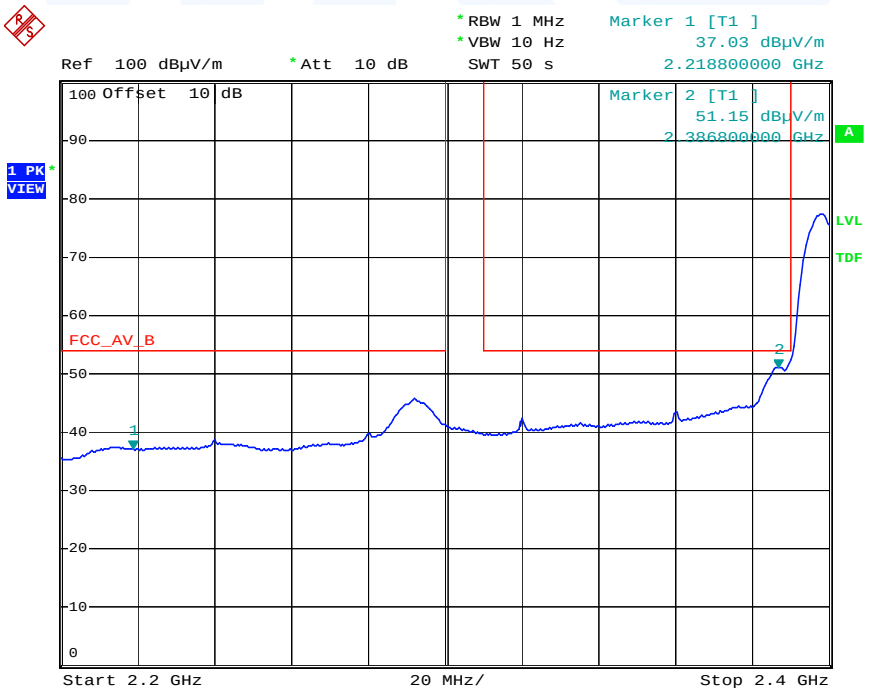
Notes: All peak emissions were below the limits of part 15.209.

Radiated spurious emissions from 1 GHz to 2.4 GHz
802.11b Ch 1 (2412 MHz)



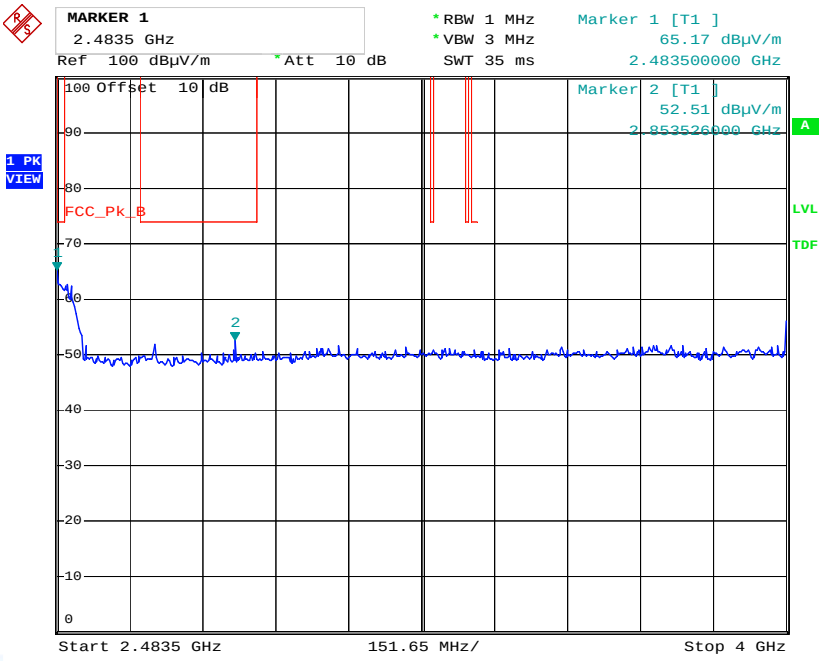
Date: 5.MAR.2009 14:51:07

Average-Plot



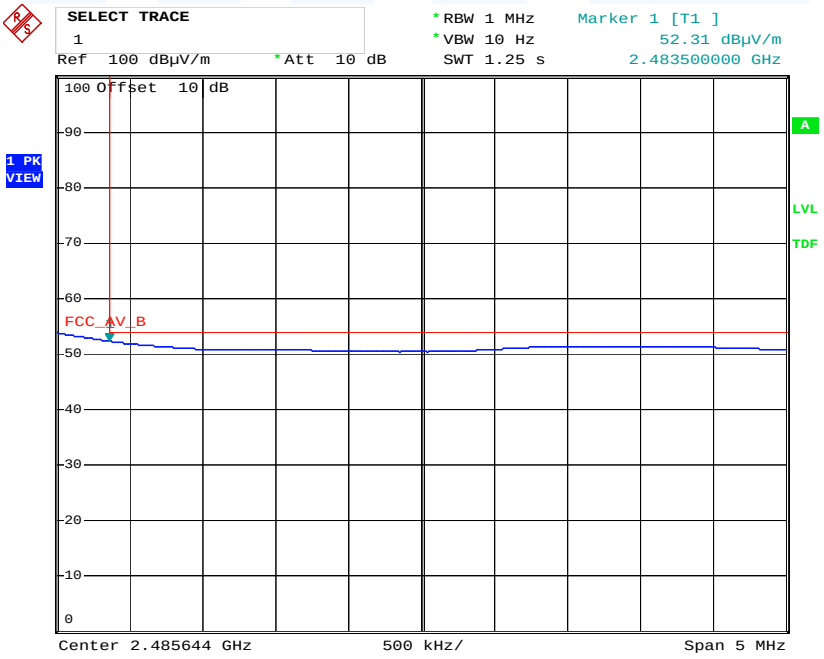
Date: 5.MAR.2009 14:40:17

Radiated spurious emissions from 2.4835 GHz to 4 GHz
802.11b Ch 11 (2462 MHz)



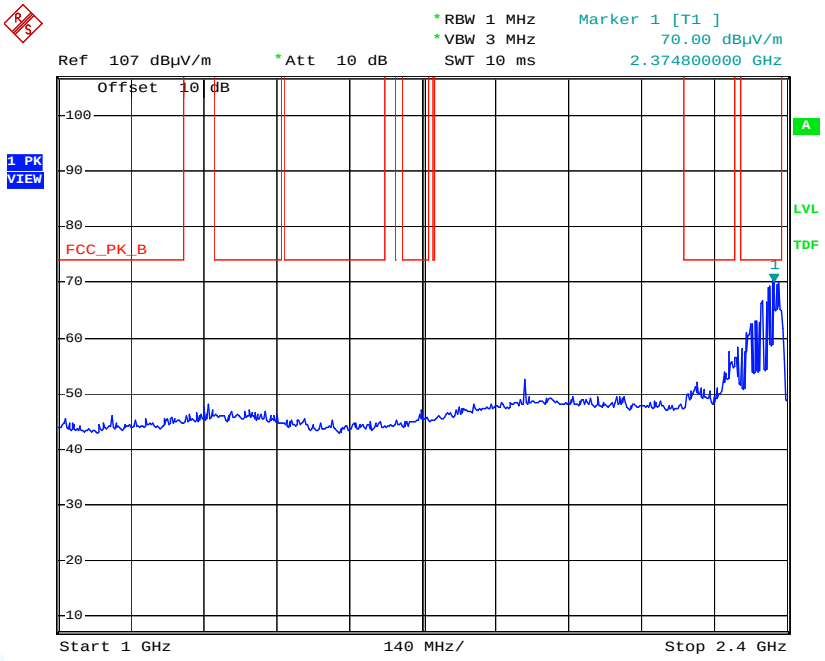
Date: 5.MAR.2009 15:15:50

Average-Plot



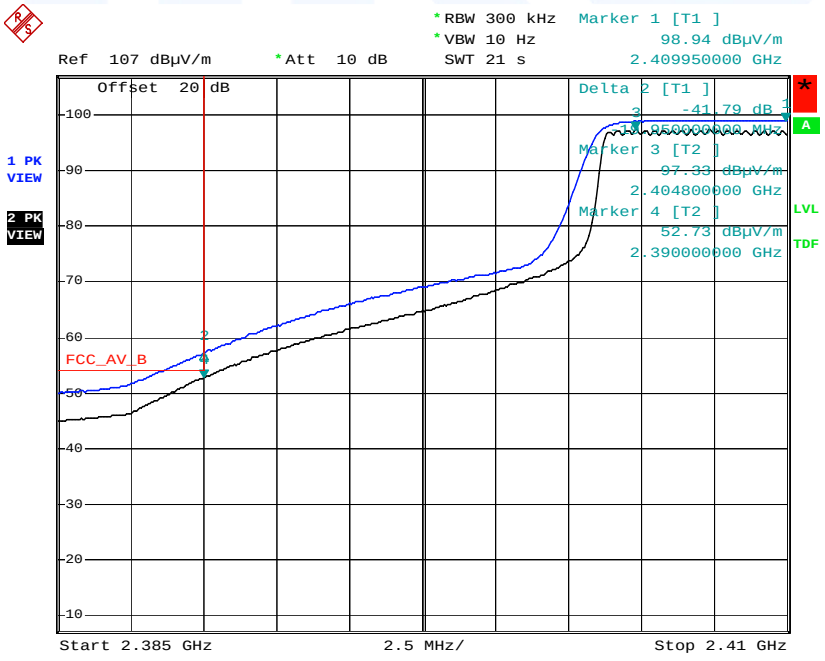
Date: 5.MAR.2009 15:26:40

Radiated spurious emissions from 1 GHz to 2.4 GHz
802.11g Ch 1 (2412 MHz)



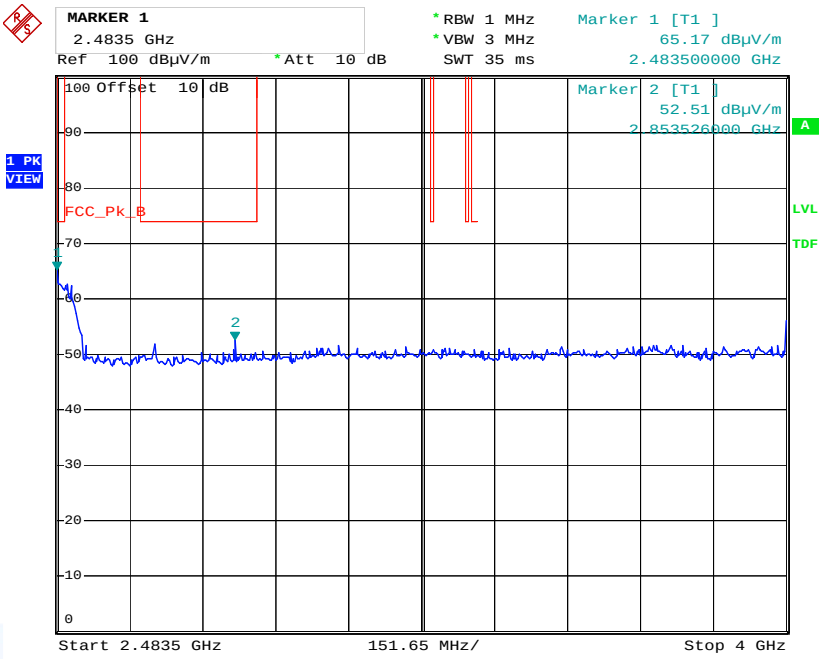
Date: 6.MAR.2009 11:24:58

Average-Plot



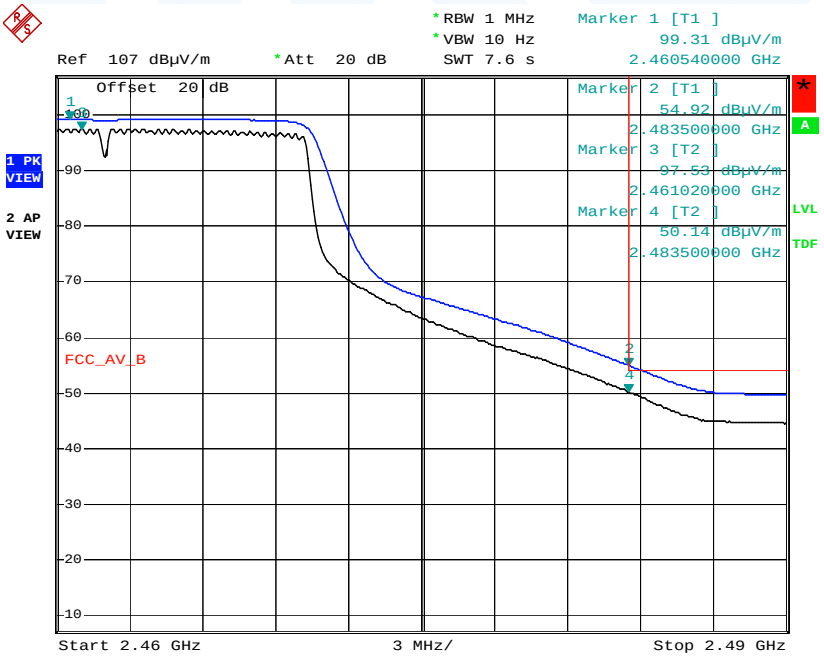
Date: 9.MAR.2009 10:41:26

Radiated spurious emissions from 2.4835 GHz to 4 GHz
802.11g Ch 11 (2462 MHz)

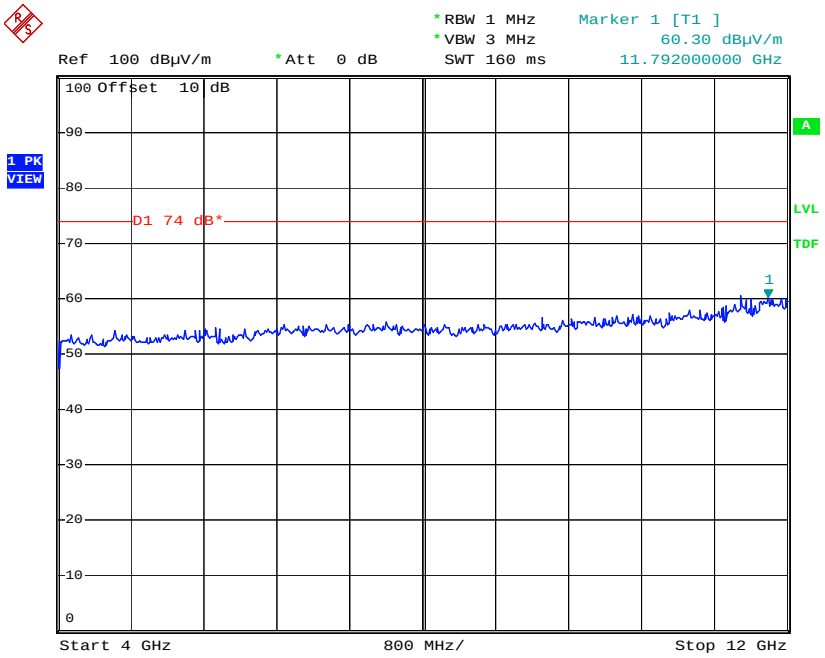


Date: 5.MAR.2009 15:15:50

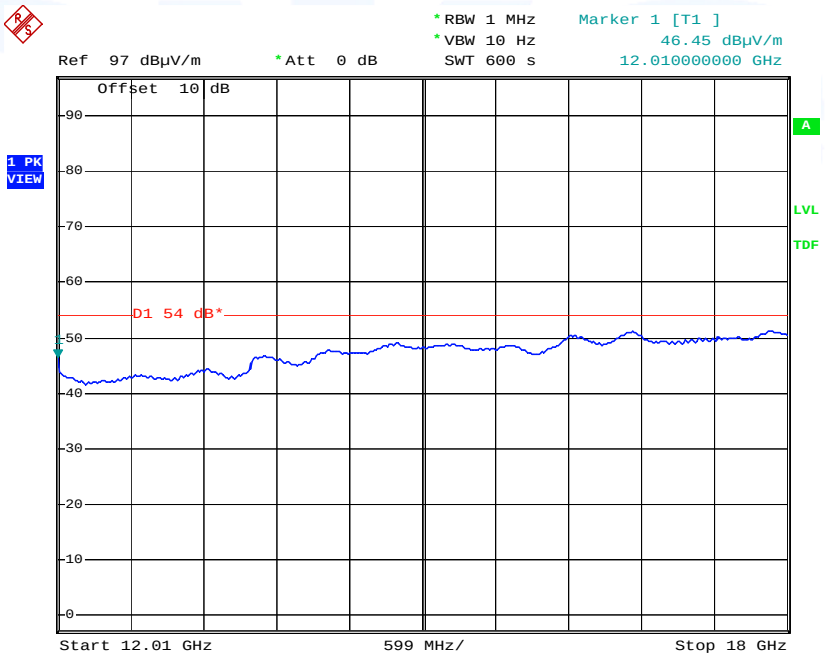
Average-Plot



Date: 9.MAR.2009 11:28:33

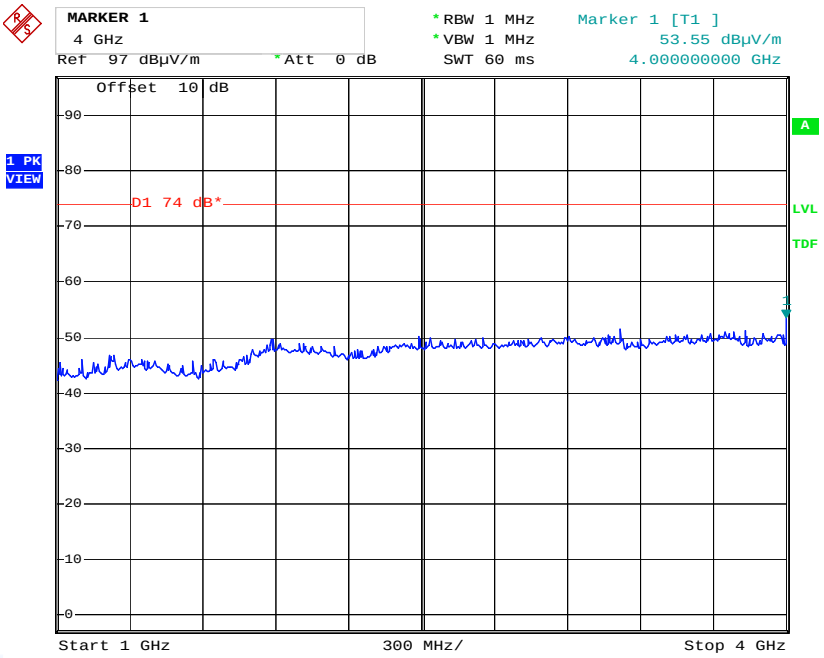


Date: 5.MAR.2009 14:54:22

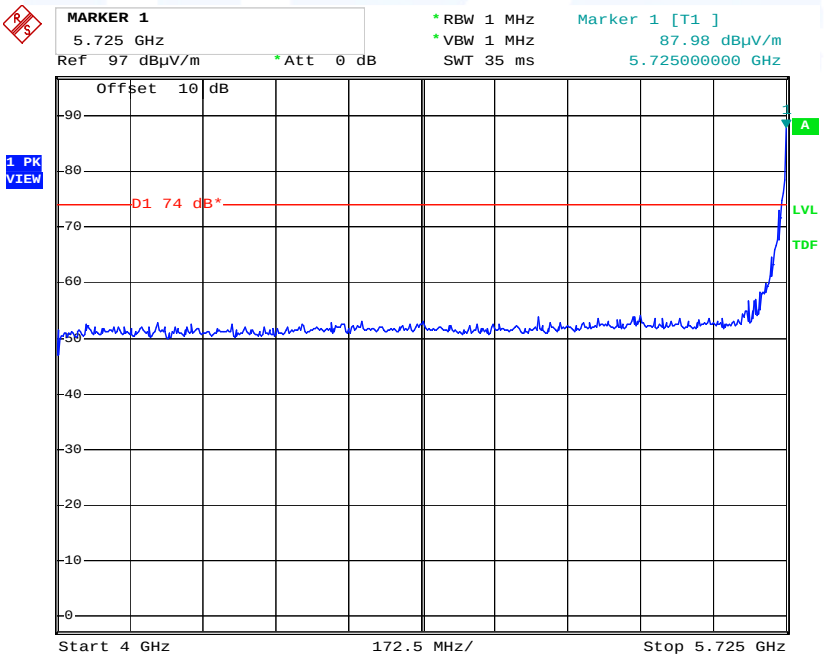


Date: 9.MAR.2009 11:03:29

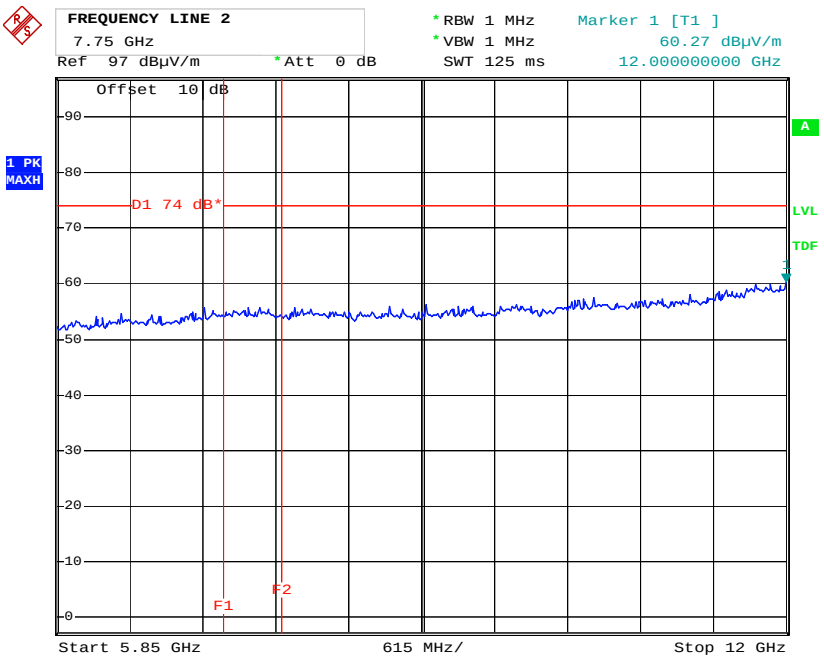
Radiated spurious emissions out of band 5725-5850 MHz
802.11a Ch 149 (5745 MHz)



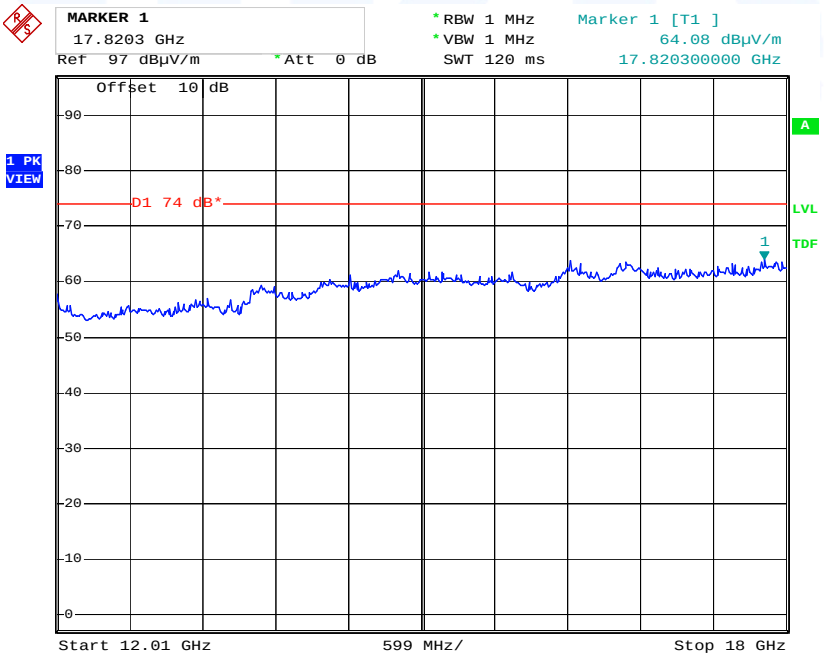
Date: 9.MAR.2009 16:13:38



Date: 9.MAR.2009 16:12:05

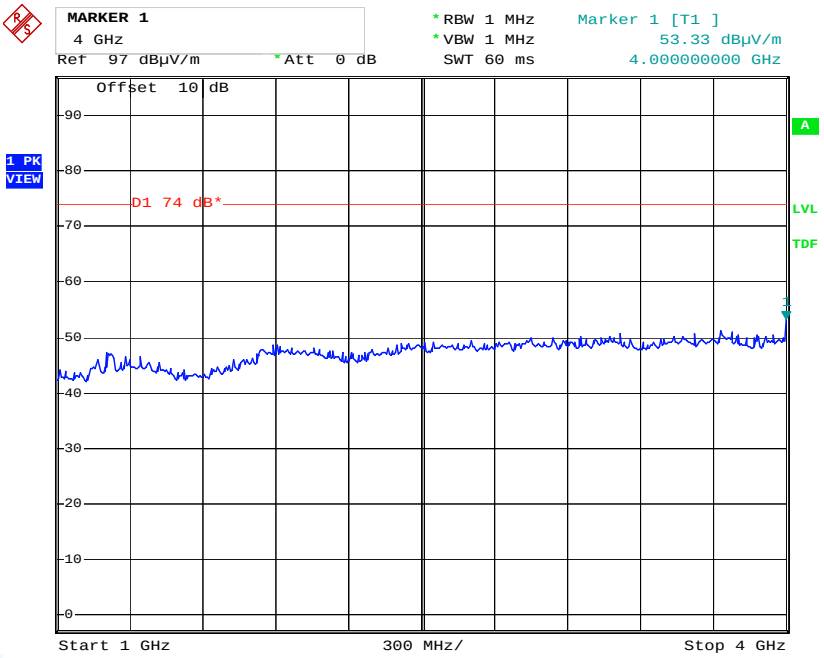


Date: 9.MAR.2009 15:38:34

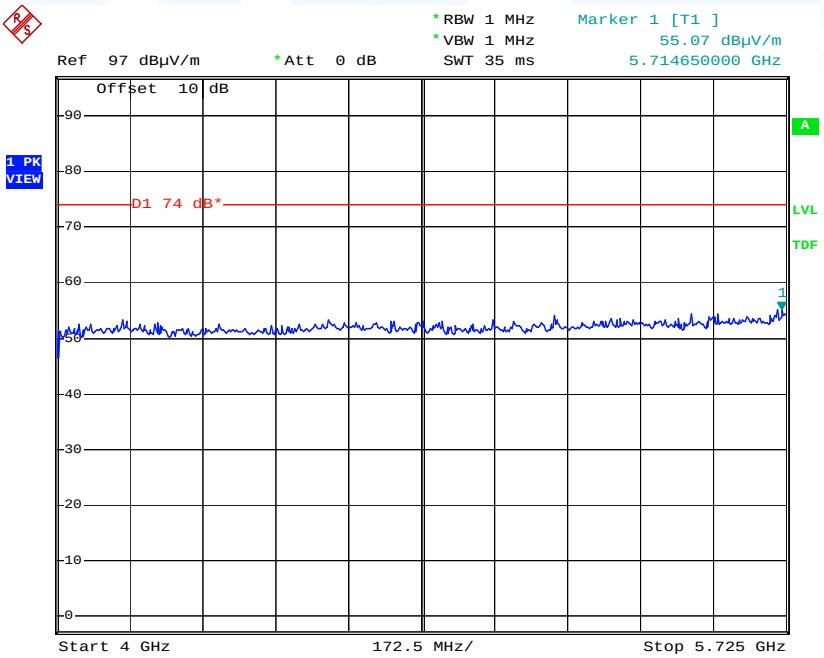


Date: 9.MAR.2009 15:40:15

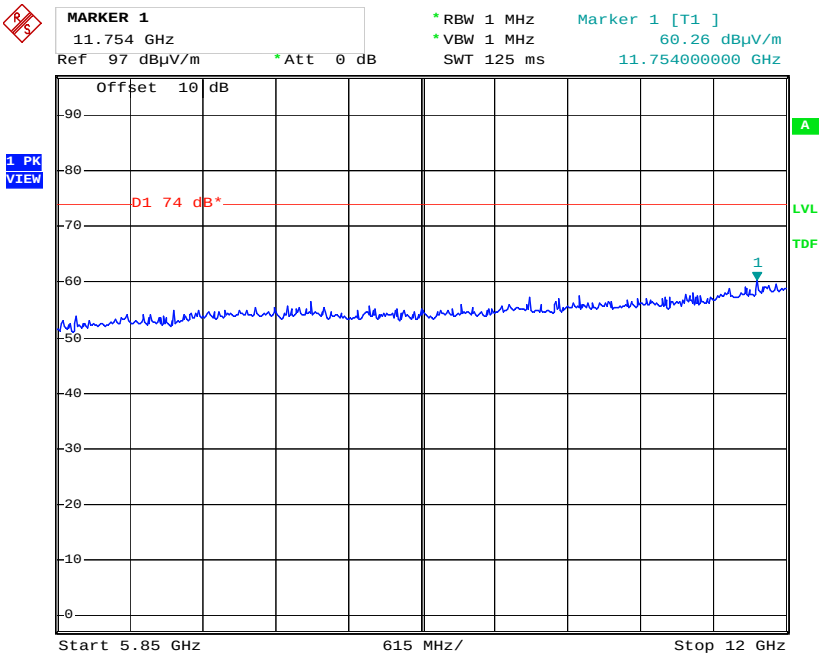
Radiated spurious emissions out of band 5725-5850 MHz
802.11a Ch 165 (5825 MHz)



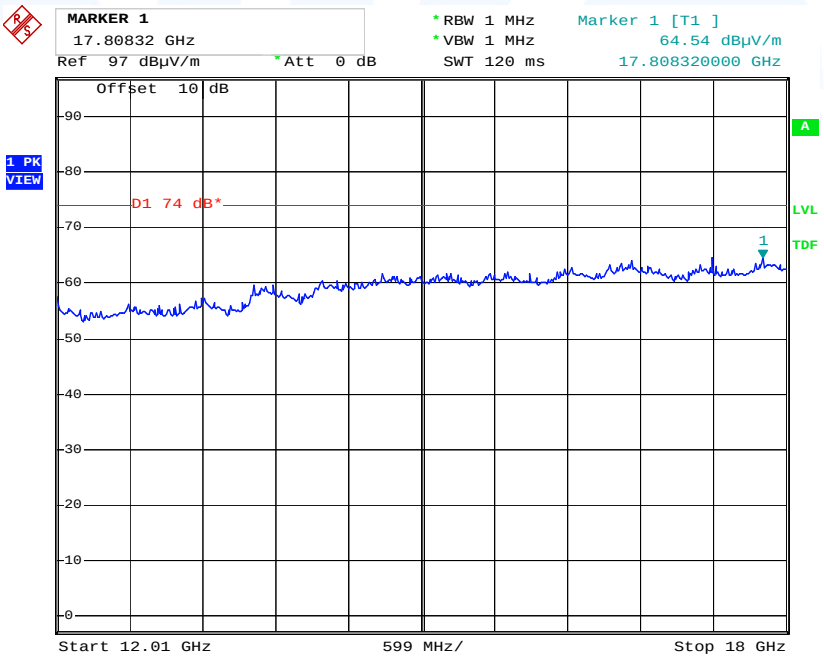
Date: 9.MAR.2009 16:06:10



Date: 9.MAR.2009 15:51:47

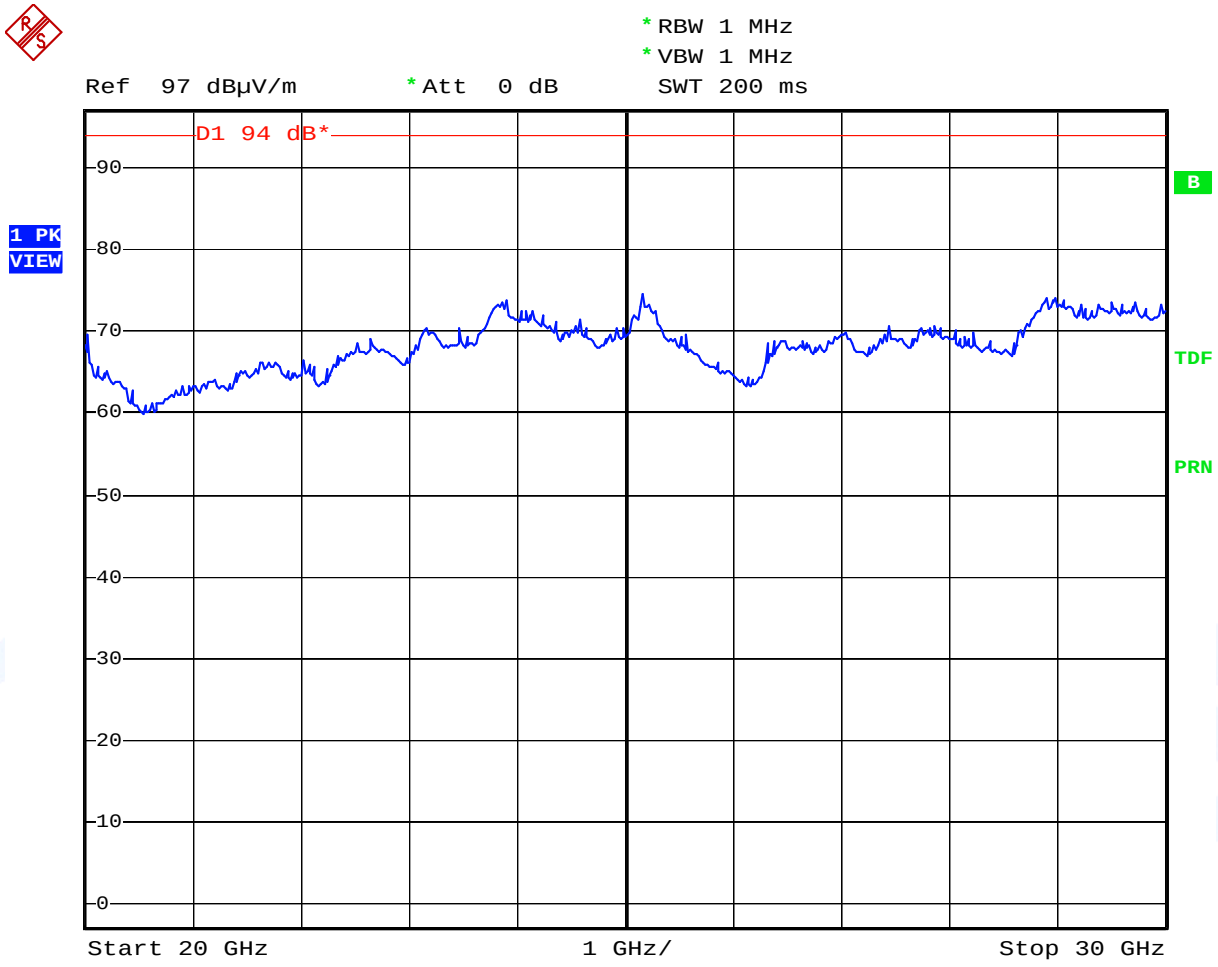


Date: 9.MAR.2009 15:47:46



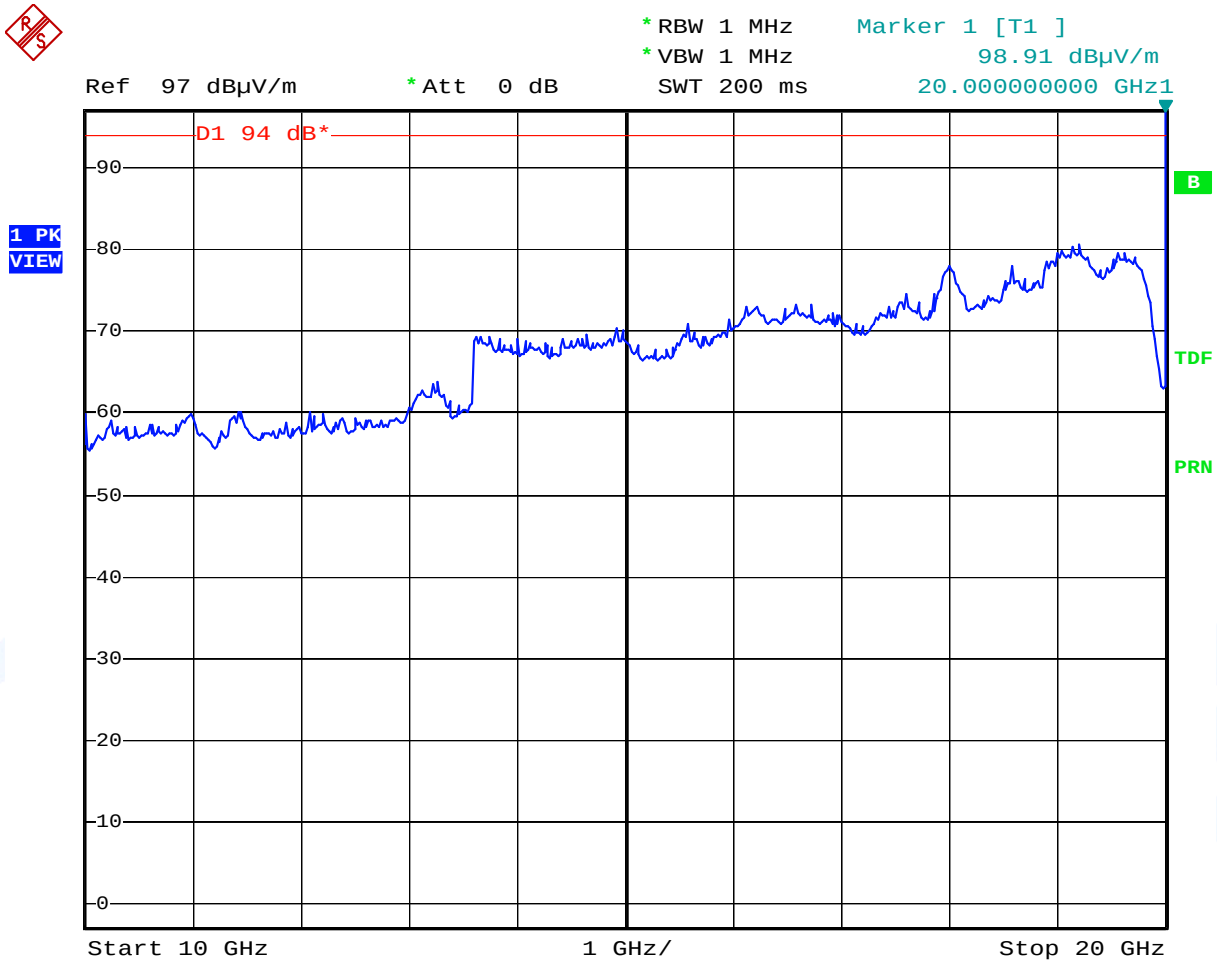
Date: 9.MAR.2009 15:49:02

Radiated spurious emissions from 20 GHz to 30 GHz
(worstcase)



Notes: All peak emissions were below the limits of part 15.209.
Measurementdistance: 0.3 m
Limit is extrapolated by 20 dB/decade

Radiated spurious emissions from 30 GHz to 40 GHz (worstcase)



Notes: All peak emissions were below the limits of part 15.209.
Measurementdistance: 0.3 m
Limit is extrapolated by 20 dB/decade
The measurement range from 30 – 40 GHz has been transposed by a mixer of 20 GHz to the analyzer range from 10 – 20 GHz.

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: Area 4

5.5.2 Photo documentation of the test set-up

5.5.3 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.

5.5.4 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
Detecter function: AV

5.5.5 Test result

Technology 802.11b

Channel	Fundamental Frequency (MHz)	Reading (dBm/Hz)	Correction to 3 kHz (dB)	PSD Result (dBm)	Limit (dBm)
1	2412	-55.4	35	-20.4	8
6	2437	-55.3	35	-20.3	8
11	2462	-55.4	35	-20.4	8

Technology 802.11g

Channel	Fundamental Frequency (MHz)	Reading (dBm/Hz)	Correction to 3 kHz (dB)	PSD Result (dBm)	Limit (dBm)
1	2412	-58.1	35	-23.1	8
6	2437	-55.2	35	-20.2	8
11	2462	-58.8	35	-23.8	8

Technology 802.11a

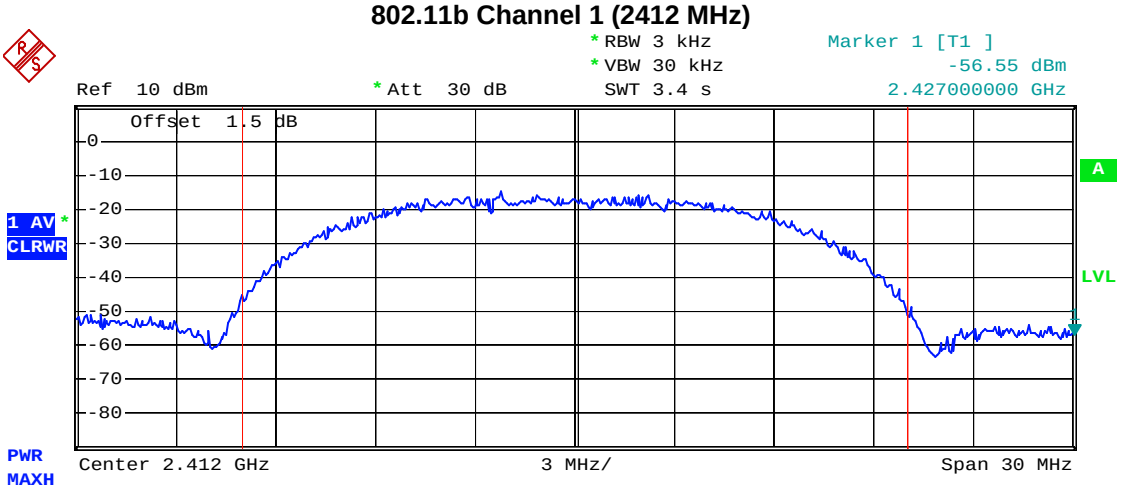
Channel	Fundamental Frequency (MHz)	Reading (dBm/Hz)	Correction to 3 kHz (dB)	PSD Result (dBm)	Limit (dBm)
149	5745	-55.6	35	-20.6	8
157	5785	-56.7	35	-21.7	8
165	5825	-56.1	35	-21.1	8

The requirements are **FULFILLED.**

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

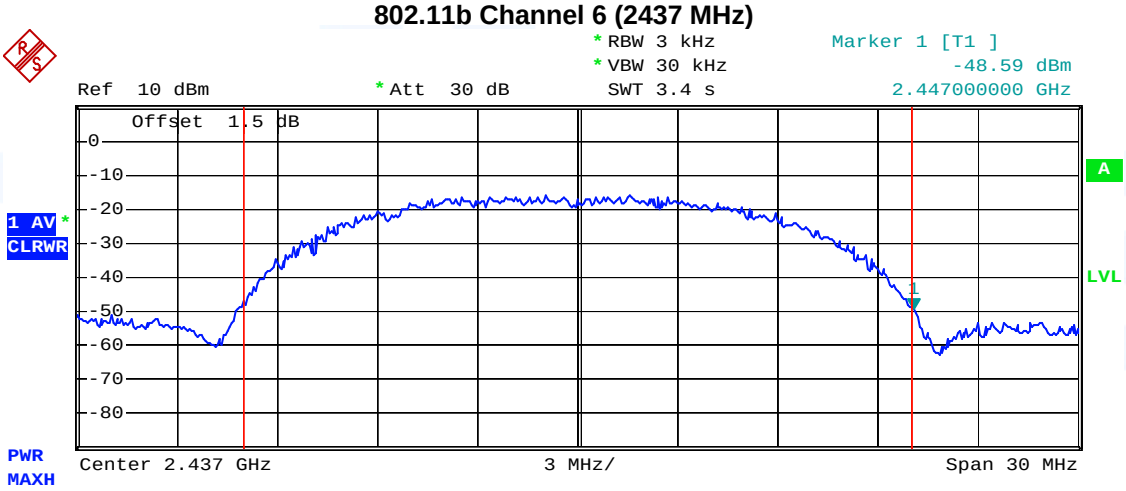
Power spectral density plots

802.11b Channel 1 (2412 MHz)



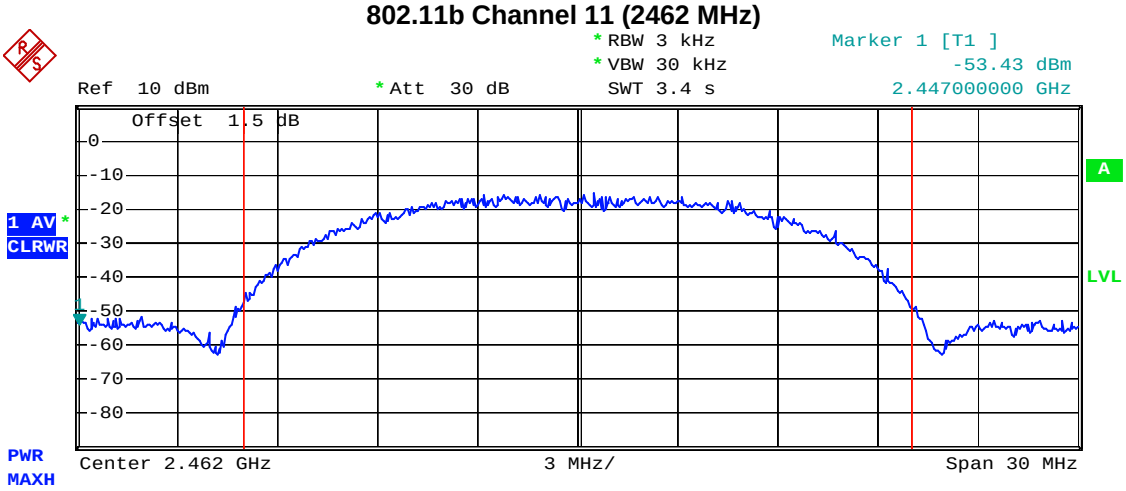
Tx Channel
Bandwidth 20 MHz **Power -55.43 dBm/Hz**

802.11b Channel 6 (2437 MHz)



Tx Channel
Bandwidth 20 MHz **Power -55.26 dBm/Hz**

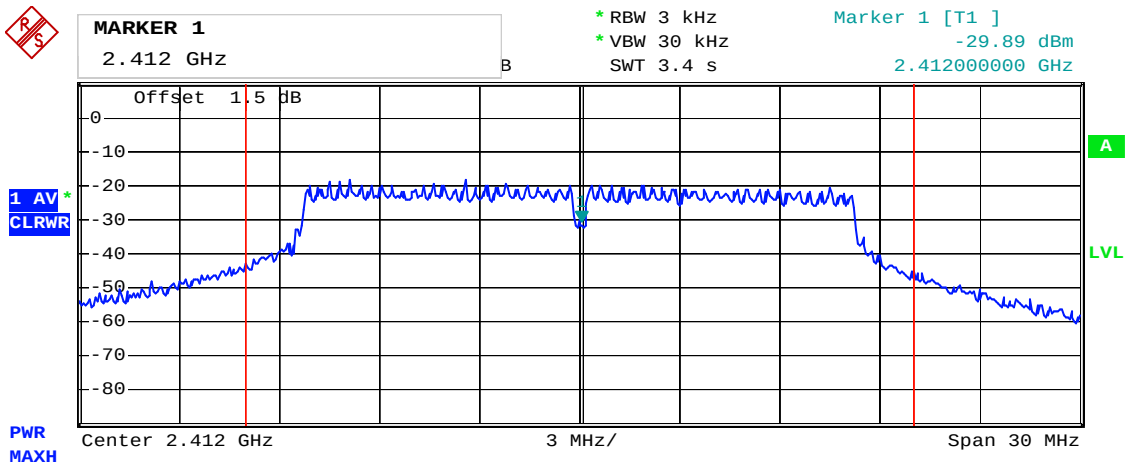
802.11b Channel 11 (2462 MHz)



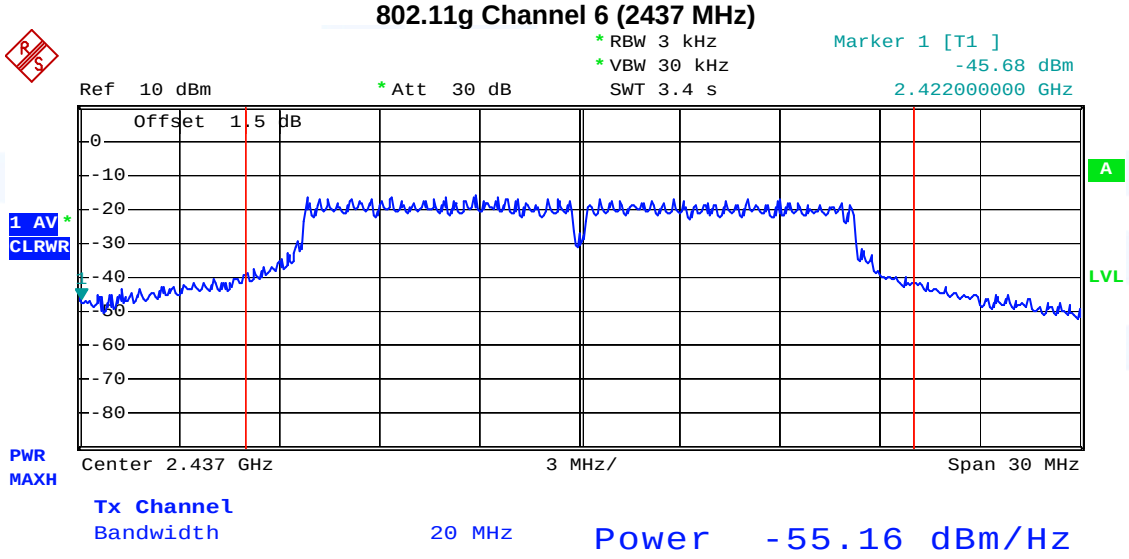
Tx Channel
Bandwidth 20 MHz **Power -55.44 dBm/Hz**

mikes-testingpartners gmbh
Ohmstrasse 2-4 · 94342 Strasskirchen
Tel.:+49(0)9424-94810 · Fax:+49(0)9424-9481240

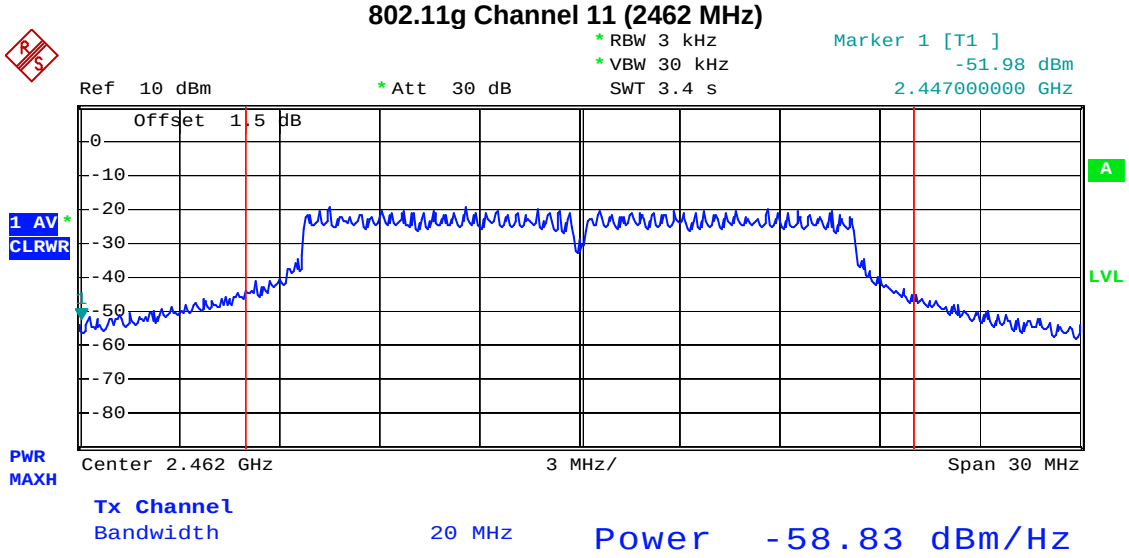
802.11g Channel 1 (2412 MHz)



802.11g Channel 6 (2437 MHz)

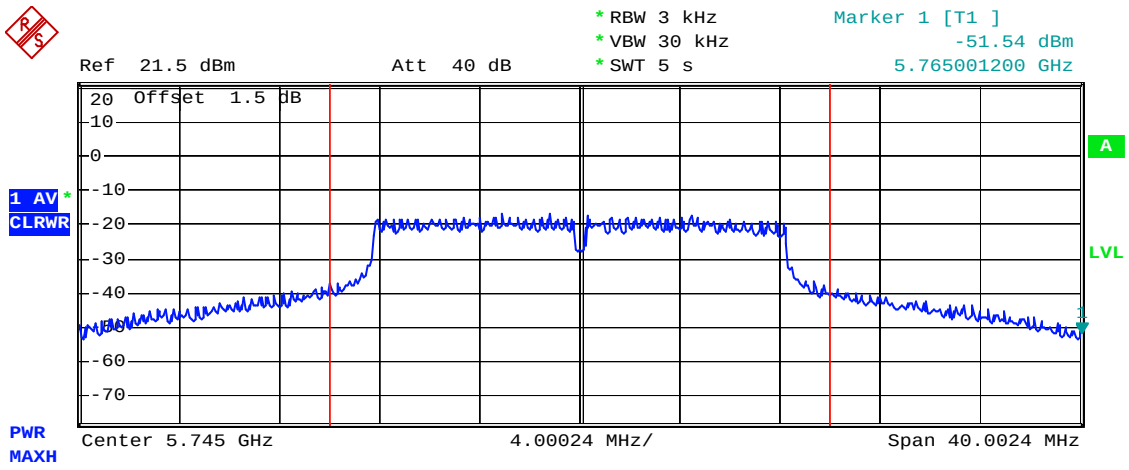


802.11g Channel 11 (2462 MHz)



mikes-testingpartners gmbh
Ohmstrasse 2-4 · 94342 Strasskirchen
Tel.:+49(0)9424-94810 · Fax:+49(0)9424-9481240

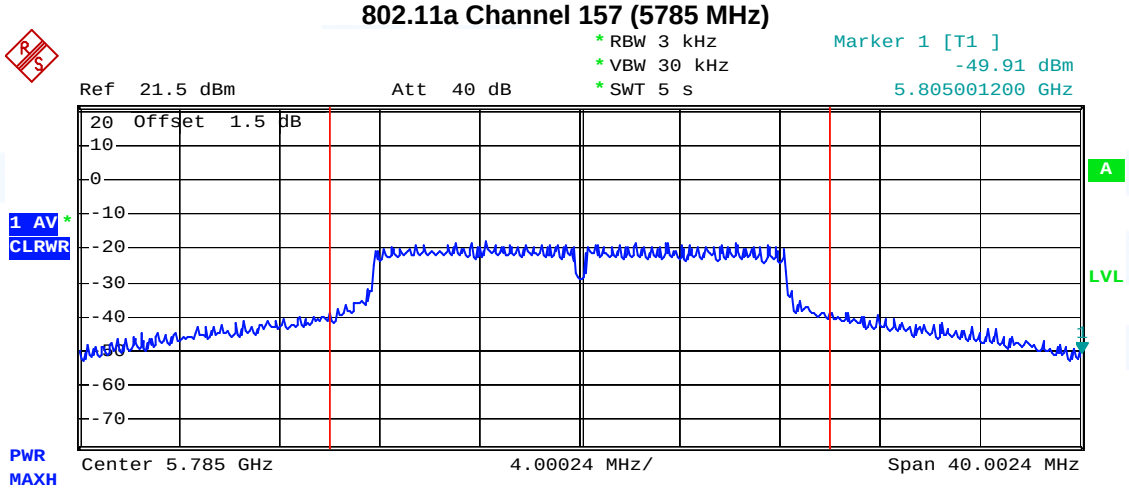
802.11a Channel 149 (5745 MHz)



Tx Channel
Bandwidth 20 MHz

Power -55.64 dBm/Hz

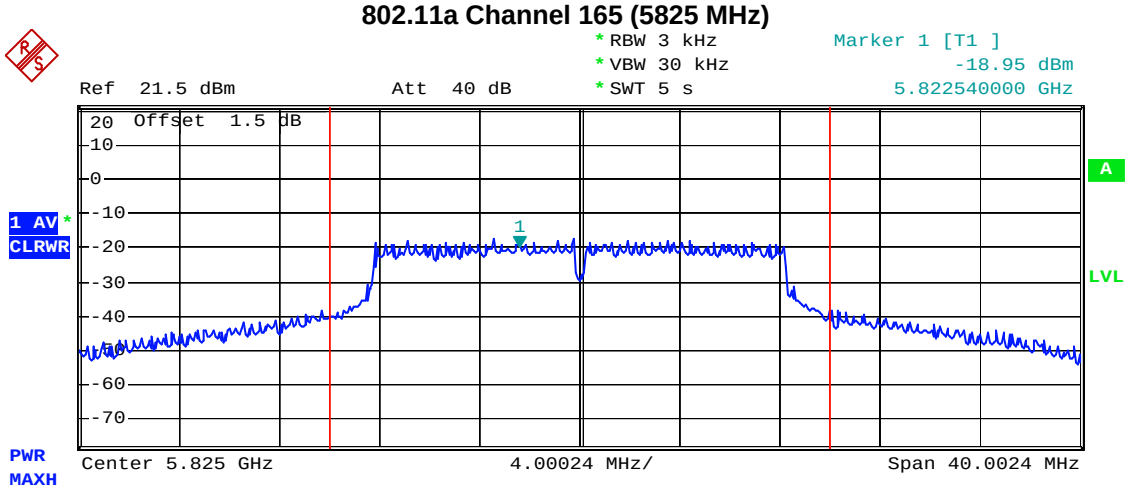
802.11a Channel 157 (5785 MHz)



Tx Channel
Bandwidth 20 MHz

Power -56.72 dBm/Hz

802.11a Channel 165 (5825 MHz)



Tx Channel
Bandwidth 20 MHz

Power -56.11 dBm/Hz

5.6 Maximum Permissible Exposure (MPE)

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

5.6.1 Description of the test location

Test location: OATS1

5.6.2 Applicable standard

According to FCC Part 15 Subpart 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 Commision's guidelines.
The test methods used comply with ANSI/IEEE C95.1-1992, "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 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in FCC 1.1307(b).

5.6.3 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, which is a far field assumption and the known maximum gain of the antenna, the maximum MPE at a defined distance away from the product, can be calculated.

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

where

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

5.6.4 Compliance regarding co-location and co-transmission

There is no co-location issue because the EuT consists of 1 module only.

5.6.5 Test result

Technology 802.11b

Worst case: Antenna ANT792-6MN with an antenna gain of 6 dBi

Channel No.	Frequency (MHz)	Max Power Output to Antenna (dBm)	(mW)	Antenna gain (dBi)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	18.0	63.1	6	0.050	1.0
6	2437	18.4	69.2	6	0.055	1.0
11	2462	17.7	58.9	6	0.047	1.0

Technology 802.11g

Worst case: Antenna ANT792-6MN with an antenna gain of 6 dBi

Channel No.	Frequency (MHz)	Max Power Output to Antenna (dBm)	(mW)	Antenna gain (dBi)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
1	2412	14.9	30.9	6	0.024	1.0
6	2437	18.0	63.1	6	0.050	1.0
11	2462	14.1	25.7	6	0.020	1.0

Technology 802.11a

Worst case: Antenna ANT793-6MN with an antenna gain of 5 dBi

Channel No.	Frequency (MHz)	Max Power Output to Antenna (dBm)	(mW)	Antenna gain (dBi)	Power Density (mW/cm^2)	Limit of Power Density (mW/cm^2)
149	5745	17.6	57.5	5	0.036	1.0
157	5785	16.6	45.7	5	0.029	1.0
165	5825	17.1	51.3	5	0.032	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)
(A) Limits for Occupational / Controlled Exposure				
0.3 – 3.0	614	1.63	100	6
3.0 – 30	1842/f	4.89/f	$900/f^2$	6
30 - 300	61.4	0.163	1.0	6
300-1500	---	---	f/300	6
1500-100000	---	---	5.0	6
(**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: _____

5.7 Antenna application

5.7.1 Applicable standard

According to FCC Part 15 Subpart 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.
All supplied antennas meet the requirements of part 15.203 and 15.204.
The antennas can be connected only by a cable equiped with a reverse SMA plug supplied by the manufacturer.

5.7.2 Antenna requirements

FCC part 15C section 15.247 (b) (4) requirements:
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 necessary reduction of the output power depends on the used type of antenna. The amount of the reduced output power is implemented in the firmware of the EuT and will be automaticly adjusted on the selected antenna.

5.8 Receiver Spurious Emissions

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

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

Anechoic chamber

Open area test site

5.8.3 Applicable standard

According to FCC Part 15 Subpart 15.109: Field strength of radiated emissions from unintentional radiators at 3 m.

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 dBµV/m, is arrived by taking the reading from the EMI receiver (Level dBµV) 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.

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.

Average values were measured with spectrum analyzer by taking the following Settings
RBW: 1 MHz
VBW: 10 Hz
Sweep: Auto

5.8.5 Test result

Frequency (MHz)	Detector	Analyzer reading hor (dBµV/m)	Analyzer reading vert (dBµV/m)	Correction (dB)	Result hor (dBµV/m)	Result vert (dBµV/m)	Limit (dBµV/m)	Delta (dB)
30-1000	Pk	<30	<30		---	---	---	---
	AV	---	---		---	---	---	---
1000-18000	Pk	<54	<54		---	---	74	---
	AV	---	---		---	---	54	---

Limit according to FCC Subpart 15.109(a)

Frequency of emission (MHz)	Field strength Limits (µV/m)	Field strength Limits (dBµV/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: The measurement was performed up to the 5th harmonic.

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.
A 4	ESHS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-002
	FSP 30	Spectrum Analyzer	Rohde & Schwarz München	02-02/11-05-001
	ESH 2 - Z 5	LISN	Rohde & Schwarz München	02-02/20-05-004
	N-4000-BNC	RF Cable	mikes-testingpartners gmbh	02-02/50-05-138
	N-1500-N	RF Cable	mikes-testingpartners gmbh	02-02/50-05-140
	ESH 3 - Z 2	Pulse Limiter	Rohde & Schwarz München	02-02/50-05-155
	PE1540	Power Supply	Phillips Fluke GmbH	02-02/50-07-031
CPC 3	FSP 30	Spectrum Analyzer	Rohde & Schwarz München	02-02/11-05-001
	THS730A	Handheld Scope	Tektronix GmbH	02-02/13-05-001
	PE1540	Power Supply	Phillips Fluke GmbH	02-02/50-07-031
MB	FSP 30	Spectrum Analyzer	Rohde & Schwarz München	02-02/11-05-001
	THS730A	Handheld Scope	Tektronix GmbH	02-02/13-05-001
	PE1540	Power Supply	Phillips Fluke GmbH	02-02/50-07-031
SEC 1-3	FSP 30	Spectrum Analyzer	Rohde & Schwarz München	02-02/11-05-001
	THS730A	Handheld Scope	Tektronix GmbH	02-02/13-05-001
	PE1540	Power Supply	Phillips Fluke GmbH	02-02/50-07-031
SER 1	FMZB 1516	Magnetic Field Antenna	Schwarzbeck Mess-Elektronik	01-02/24-01-018
	ESCS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-001
	PE1540	Power Supply	Phillips Fluke GmbH	02-02/50-07-031
SER 2	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006
	FSP 30	Spectrum Analyzer	Rohde & Schwarz München	02-02/11-05-001
	VULB 9168	Trilog Broad Band Antenna	Schwarzbeck Mess-Elektronik	02-02/24-05-005
	S10162-B	RF Cable 33 m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20 m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
	PE1540	Power Supply	Phillips Fluke GmbH	02-02/50-07-031
SER 3	FSP 30	Spectrum Analyzer	Rohde & Schwarz München	02-02/11-05-001
	AFS4-01000400-10-10P-4	RF Amplifier 1-4 GHz	PARZICH GMBH	02-02/17-05-003
	AMF-4F-04001200-15-10P	RF Amplifier 4-12 GHz	PARZICH GMBH	02-02/17-05-004
	AFS5-12001800-18-10P-6	RF Amplifier 12-18 GHz	PARZICH GMBH	02-02/17-06-002
	3117	Horn Antenna 1-18 GHz	EMCO Elektronik GmbH	02-02/24-05-009
	Sucoflex N-1600-SMA	RF Cable	novotronik Signalverarbeitung	02-02/50-05-073
	Sucoflex N-2000-SMA	RF Cable	novotronik Signalverarbeitung	02-02/50-05-075
	PE1540	Power Supply	Phillips Fluke GmbH	02-02/50-07-031

	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Last Verif.
A 4	02-02/03-05-002	04/30/2009	04/30/2008		
	02-02/11-05-001	04/08/2009	04/08/2008		
	02-02/20-05-004	03/13/2011	03/13/2008	04/08/2009	10/08/2008
	02-02/50-05-138				
	02-02/50-05-140				
	02-02/50-05-155	04/06/2009	10/06/2008		
	02-02/50-07-031				
CPC 3	02-02/11-05-001	04/08/2009	04/08/2008		
	02-02/13-05-001	09/10/2009	09/10/2008		
	02-02/50-07-031				
MB	02-02/11-05-001	04/08/2009	04/08/2008		
	02-02/13-05-001	09/10/2009	09/10/2008		
	02-02/50-07-031				
SEC 1-3	02-02/11-05-001	04/08/2009	04/08/2008		
	02-02/13-05-001	09/10/2009	09/10/2008		
	02-02/50-07-031				
SER 1	01-02/24-01-018	02/23/2010	02/23/2009		
	02-02/03-05-001	12/10/2009	12/10/2008		
	02-02/50-07-031				
SER 2	02-02/03-05-006	07/30/2009	07/30/2008		
	02-02/11-05-001	04/08/2009	04/08/2008		
	02-02/24-05-005	05/06/2011	05/06/2008	09/02/2009	03/02/2009
	02-02/50-05-031				
	02-02/50-05-033				
	02-02/50-05-113				
	02-02/50-07-031				
SER 3	02-02/11-05-001	04/08/2009	04/08/2008		
	02-02/17-05-003				
	02-02/17-05-004				
	02-02/17-06-002				
	02-02/24-05-009	02/04/2010	02/04/2009		
	02-02/50-05-073				
	02-02/50-05-075				
	02-02/50-07-031				