

Test Report

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RF test report

110112-AU01+W01



Audio GmbH

RF Module

SeDMP3



The test result refers exclusively
to the model tested.

This report must not be copied without
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Revision: 1.1



DGA-PL-224/95-03 / BNetzA-CAB-02/21-02/2

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Accreditation:



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Valid until 21.12.2014

CAB (EMC) registration number: BNetzA-CAB-02/21-02/3
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Test Firm Type "2.948 listed": Valid until 27.06.2014
Test Firm Type "accredited": Valid until 19.06.2013
MRA US-EU, FCC designation number: DE0010

Test Laboratory:

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1 Test regulations

CFR 47 Part 2: 01-2010	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)
CFR 47 Part 15: 01-2010	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)
ANSI C63.4: September 2009	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

1.1 Summary of test results

Standard	Test result
FCC CFR 47 Part 15	Passed



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2 Equipment under Test (EUT)

Product type: WLAN audio module
Model Name: SeDMP3
Manufacturer: Audio GmbH
Serial number: Prototype
Board revision: 3.1
FCC ID: ZUCSEDMP3
Application freq. band: 2400 MHz - 2483.5 MHz
Operating frequency: 2.412 GHz - 2.462 GHz
Number of RF-channels: 11
Modulation: DSSS for IEEE 802.11b
OFDM for IEEE 802.11g/n
Data Rate (Mbps) IEEE 802.11b (1 / 2 / 5.5 / 11)
IEEE 802.11g (6 / 9 / 12 / 18 / 24 / 36 / 48 / 54)
IEEE 802.11n (72.2 / 65 / 58.5 / 57.8 / 52 / 43.3 / 39 / 28.9 / 26 / 21.7 / 19.5 / 14.4 / 13 / 7.2 / 6.5)
Antenna type: Dipole antenna
 detachable not detachable
with U.FL-R-SMT connector
Power supply: DC powered
nominal: 5.0 V
Temperature range: 0°C to +70°C

2.1 List of antennas

For detailed information see antenna specification.

Manufacturer	Model	Gain
Cortec Technology	R-AN240-5701RS	≤2.0 dBi
Songtak Technology Co., Ltd.	SMA Swivel,2.4Ghz	≤2.0 dBi



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2.2 Photo documentation

For photos taken during testing, see annex A.
For internal photos of the EUT, see annex B.

2.3 Short description of the EUT

Wireless module to stream audio data over RLAN.

2.4 Operation mode

Preliminary tests were performed in different configuration modes to find the worst emission. The following description is relevant for the test modes used in this test report.

The EUT was tested in the following operation modes:

- Connect EUT to 5 V DC.
- Connect via serial adapter to EUT.
- Start terminal program to connect to command interface of the EUT.
- Use the following commands to set the different operation modes:
 - o Initialize test mode: `unitest init`
 - o 802.11b (DSSS): `unitest tx [1 | 6 | 11] 11 1000 1 same | channels`
 - o 802.11g (OFDM): `unitest tx [1 | 6 | 11] 54 100 1 same | channels`
 - o 802.11n (OFDM): `unitest tx [1 | 6 | 11] 65 100 1 same | channels`

2.5 Configuration

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

Device	Model:	S/N
WLAN audio module	SeDMP3 v3.1	Prototype
DC power supply	Statron	0702007

Used cables

Numbers:	Description: (type / lengths / remarks)	Serial No
1	Adapter cable U.FL-R-SMT to SMA, 20 cm	N/A
1	HF cable 04	E00434
2	Power supply cables, 1.2 m	N/A



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3 AC power line conducted emissions

according to CFR 47 Part 15, section 15.207

3.1 Test location

Description	Manufacturer	Inventory No.
Shielded chamber	Siemens - Matsushita	E00107

3.2 Test instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESCS 30	Rohde & Schwarz	E00003
<input type="checkbox"/>	ESCI	Rohde & Schwarz	E00001
<input checked="" type="checkbox"/>	ESH3 Z2	Rohde & Schwarz	E00028
<input checked="" type="checkbox"/>	ESH 2-Z5	Rohde & Schwarz	E00004
<input checked="" type="checkbox"/>	ESH 2-Z5	Rohde & Schwarz	E00005

3.3 Limits

Frequency [MHz]	Quasi-peak [dB μ V]	Average [dB μ V]
0.15 – 0.5	66 - 56	56 – 46
0.5 – 5.0	56	46
5 – 30	60	50

3.4 Test procedure

1. The tests of conducted emission were carried out in a shielded room using a line impedance stabilization network (LISN) 50 μ H/50 Ohms and an EMI test receiver.
2. The EMI test receiver was connected to the LISN and set to a measurement bandwidth of 9 kHz in the frequency range from 0.15 MHz to 30 MHz.
3. The EUT was placed on a wooden table and connected to the LISN.
4. To accelerate the measurement the detector of the EMI test receiver was set to peak and the whole frequency range from 0.15 MHz to 30 MHz were scanned.
5. After that all peaks values with fewer margins than 10 dB to quasi-peak limit or exceeding the limit were marked and re-measured with quasi-peak detector.
6. If after that all values are under the average limit no addition measurement is necessary. In case there are still values between quasi-peak and average limit than these values were re-measured again with an average detector.
7. These measurements were done on all current carrying conductors.



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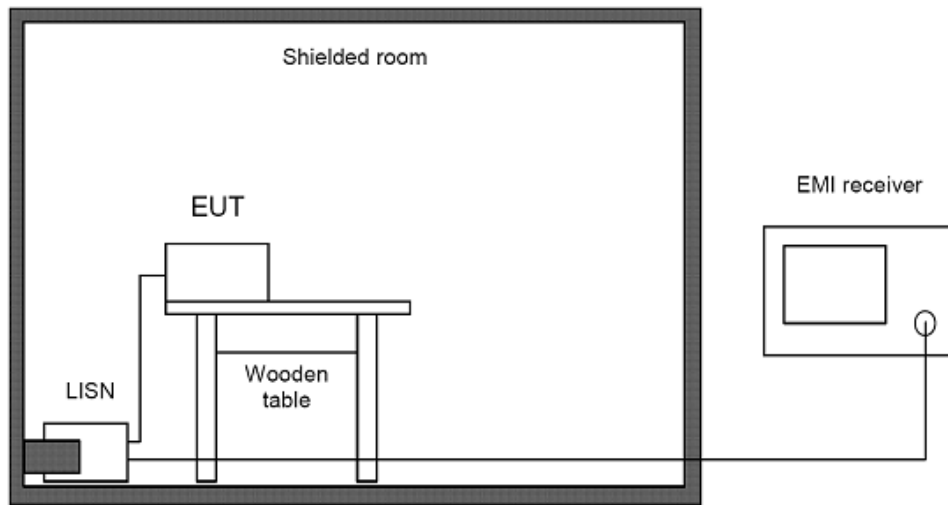
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According to ANSI C63.4, section 13.1.3.1 testing of intentional radiators with detachable antennas shall be done with a dummy load otherwise the tests should be done with connected antenna and if adjustable fully extended.

3.5 Test setup

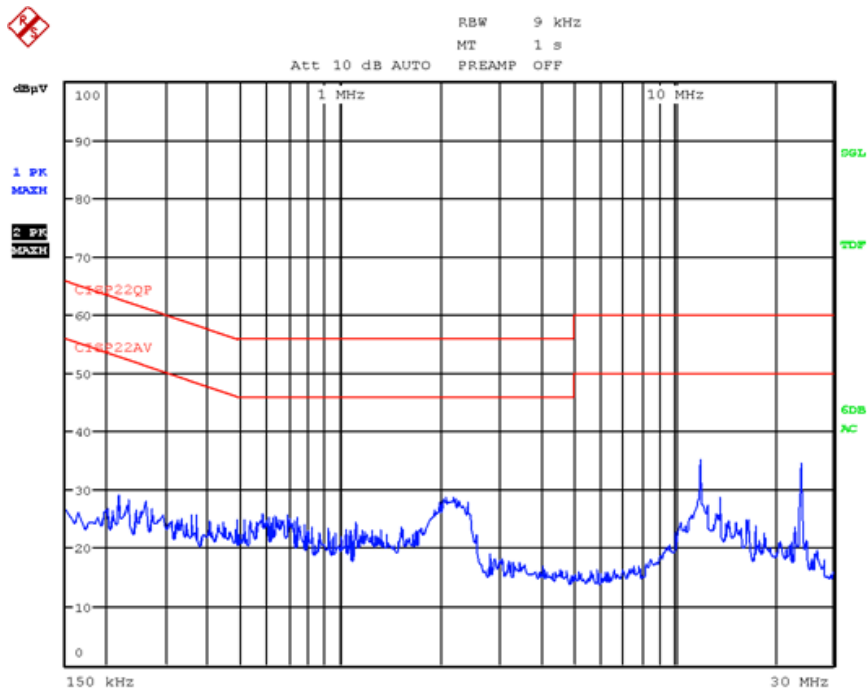


Picture 1: Outline of conducted emission test setup

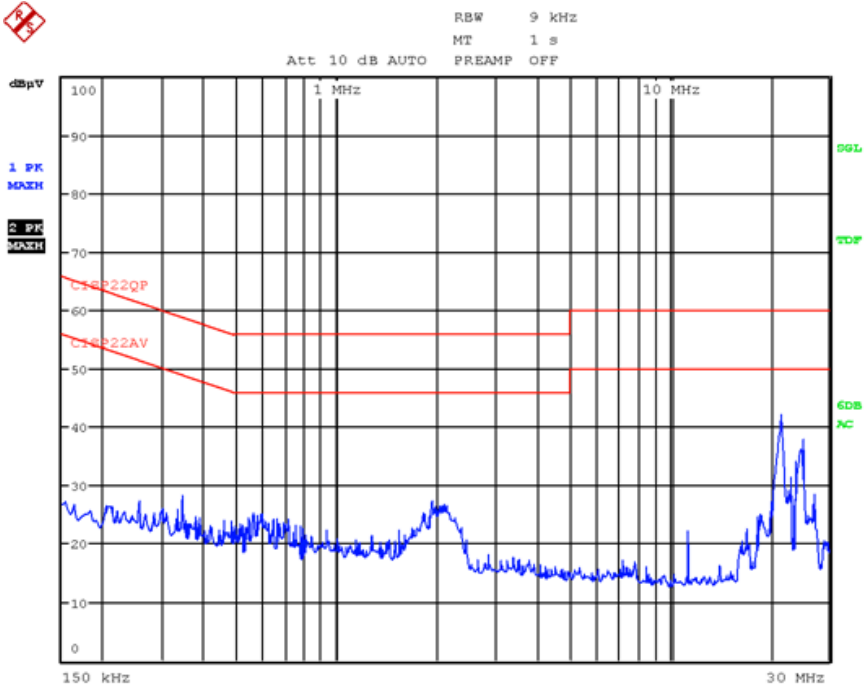
Comments: All peripheral devices were additionally decoupled by means of a line stabilization network.
The peak values are all below the average limit. Thus it can be supposed that the limit of average emissions is kept in all cases.

3.6 Test results

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-09-26



Picture 2: Conducted emission on mains, neutral (Chart)



Picture 3: Conducted emission on mains, phase 1 (chart)



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5 Maximum conducted output power

according to CFR 47 Part 15, section 15.247(b)

5.1 Test location

- Conducted measurement
- Scan with peak detector in 3 m CDC
- CISPR measurement with quasi peak detector on 10m open area test site.
- Measurement with peak detector on 3m open area test site

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site	EMV TESTHAUS GmbH	E00354

5.2 Test instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/>	ESU	Rohde & Schwarz	W00002
<input type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011

5.3 Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands is 1 Watt (30dBm).

Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level.

The conducted output power limit is based on the use of antennas with directional gains that do not exceed 6 dBi. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

5.4 Test procedure and instrument settings

Parameter	Setting
Attenuation	Auto
Span	Encompass the entire emissions bandwidth (EBW) of the signal



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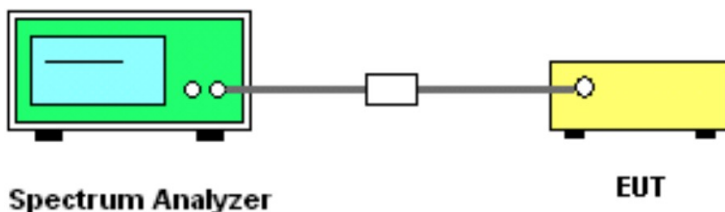
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RBW	1 MHz
VBW	≥ RBW
Detector	Peak
Trace	Max Hold
Sweep time	Auto

1. The test is performed in accordance with FCC Public Notice KBD 558074
2. The transmitter output (antenna port) was connected to the spectrum analyzer.
3. The unit was operated in continuous transmit mode.
4. Set the detector to peak, max hold.
5. After the trace has stabilized set the trace to VIEW mode.
6. Use marker function to set the marker to peak and record the value.

5.5 Test setup



Picture 6: Test setup for conducted output power measurement

5.6 Test deviation

There is no deviation with the original standard.

5.7 EUT operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.8 Test results (DSSS, 802.11b)

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-07-28

Channel	Frequency (GHz)	Conducted power (dBm)	Limit (dBm)	Result
1	2.412	8.89	30	PASS
6	2.437	9.01	30	PASS
11	2.462	9.21	30	PASS



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5.9 Test results (OFDM, 802.11g)

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-07-28

Channel	Frequency (GHz)	Conducted power (dBm)	Limit (dBm)	Result
1	2.412	2.04	30	PASS
6	2.437	2.61	30	PASS
11	2.462	2.67	30	PASS

5.10 Test results (OFDM, 802.11n)

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-07-28

Channel	Frequency (GHz)	Conducted power (dBm)	Limit (dBm)	Result
1	2.412	1.50	30	PASS
6	2.437	2.05	30	PASS
11	2.462	2.61	30	PASS



6 Power spectral density measurement

according to CFR 47 Part 15 section 15.247(e)

6.1 Test location

- Conducted measurement
- Scan with peak detector in 3 m CDC
- CISPR measurement with quasi peak detector on 10m open area test site.
- Measurement with peak detector on 3m open area test site

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site	EMV TESTHAUS GmbH	E00354

6.2 Test instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011

6.3 Limits

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. The same method of determining the conducted output power shall be used to determine the power spectral density.

6.4 Test procedure and instrument settings

Parameter	Setting
Attenuation	Auto
Span	1.2 MHz
RBW	3 kHz
VBW	30 kHz
Detector	Peak
Trace	Max Hold
Sweep time	400 s

1. The test is performed in accordance with FCC Public Notice KBD 558074



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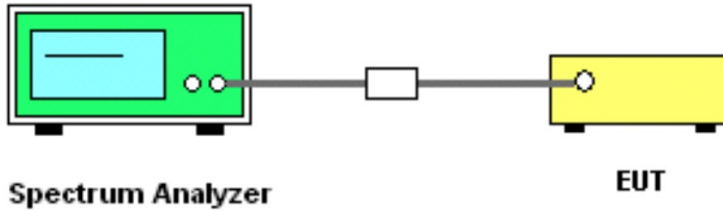
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2. The transmitter output (antenna port) was connected to the spectrum analyser.
3. The unit was operated in continuous transmit mode with modulation.
4. Set the detector to peak, max hold.
5. Mark the frequency with maximum peak power as the center of the display of the spectrum.
6. Set the span to 1.2 MHz and the sweep time to 400s.
7. After the trace has stabilized set the trace to VIEW mode.
8. Use marker function to set the marker to peak and record the value.

6.5 Test setup



Picture 7: Test setup for power spectral density measurement

6.6 Test Deviation

There is no deviation with the original standard.

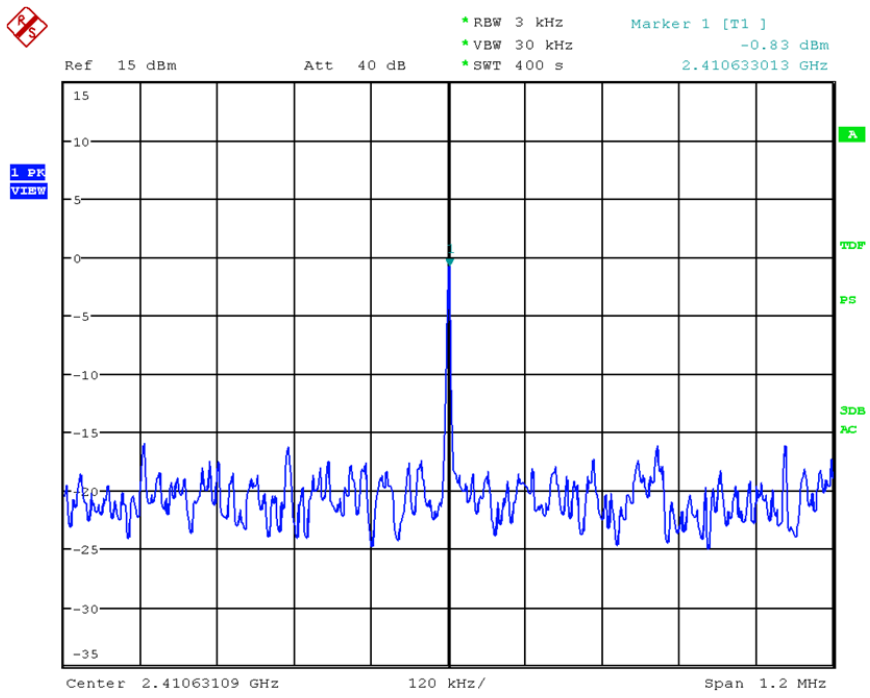
6.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

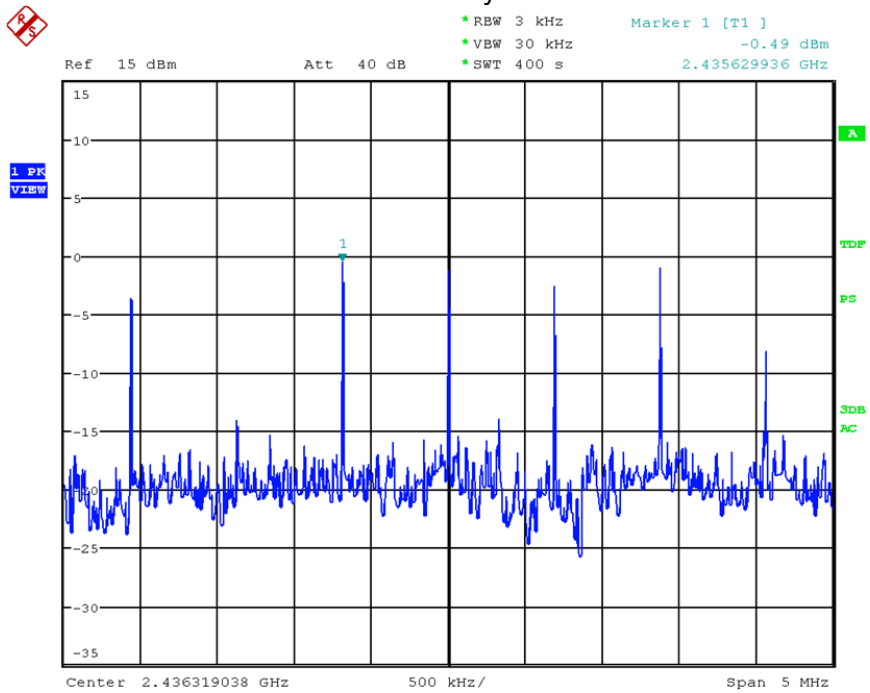
6.8 Test results (DSSS, 802.11b)

Temperature:	23°C	Humidity:	41%
Tested by:	M. Janker	Test date:	2011-09-26

Channel	Frequency (GHz)	Spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Result
1	2.412	-0.83	8.0	PASS
6	2.437	-0.49	8.0	PASS
11	2.462	-7.76	8.0	PASS



Picture 8: Power Density IEEE 802.11b channel 1

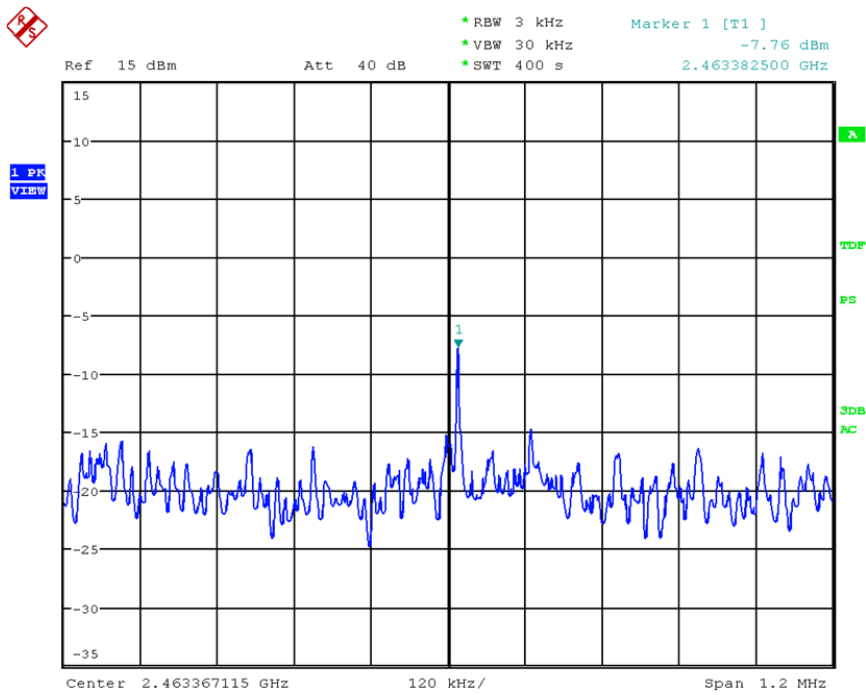


Picture 9: Power Density IEEE 802.11b channel 6



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Picture 10: Power Density IEEE 802.11b channel 11

6.9 Test results (OFDM, 802.11g)

Temperature:	23°C	Humidity:	41%
Tested by:	M. Janker	Test date:	2011-09-26

Channel	Frequency (GHz)	Spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Result
1	2.412	-10.55	8.0	PASS
6	2.437	-9.86	8.0	PASS
11	2.462	-9.39	8.0	PASS



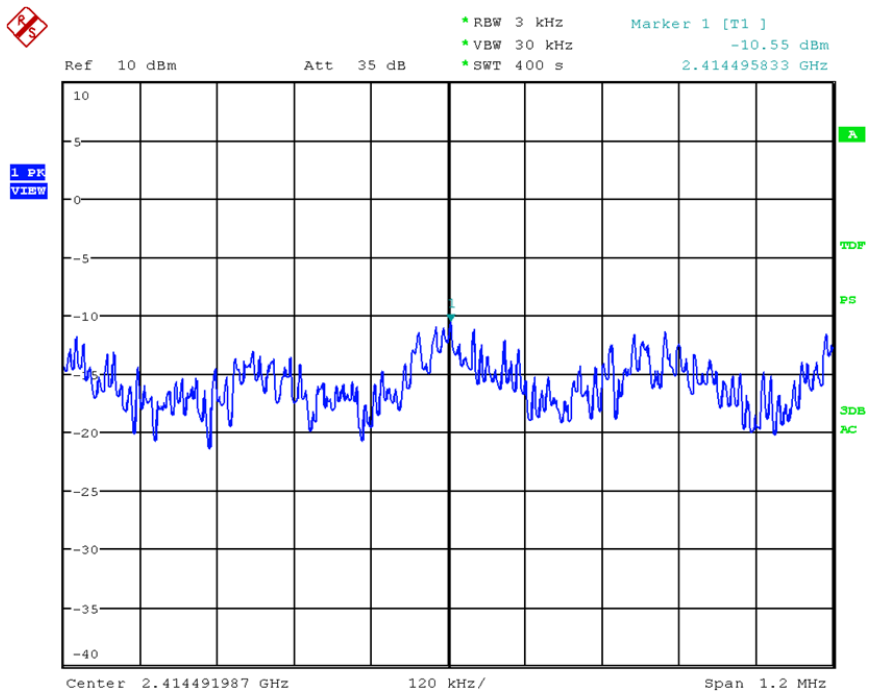
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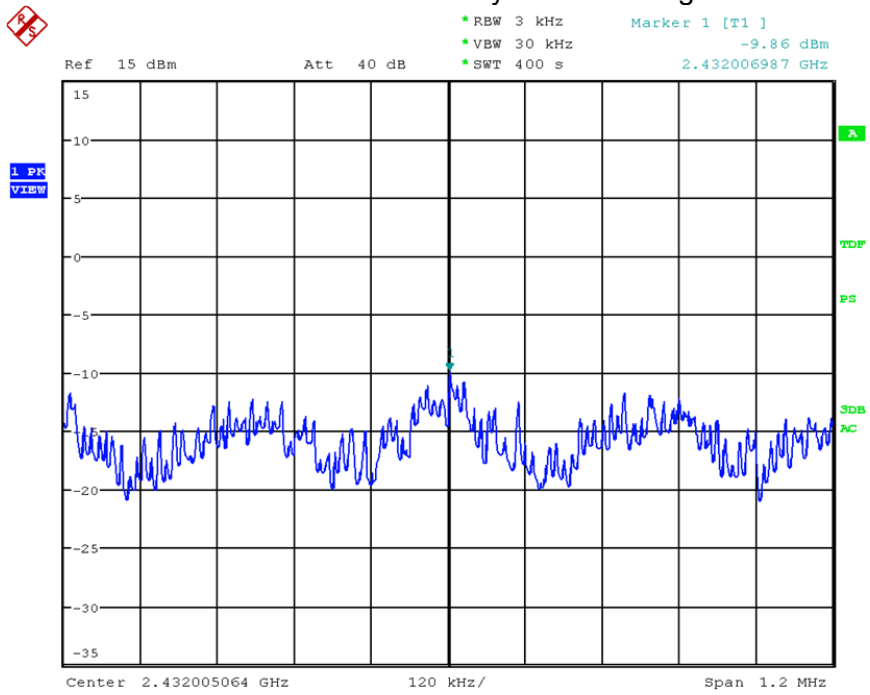
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Picture 11: Power Density IEEE 802.11g channel 1

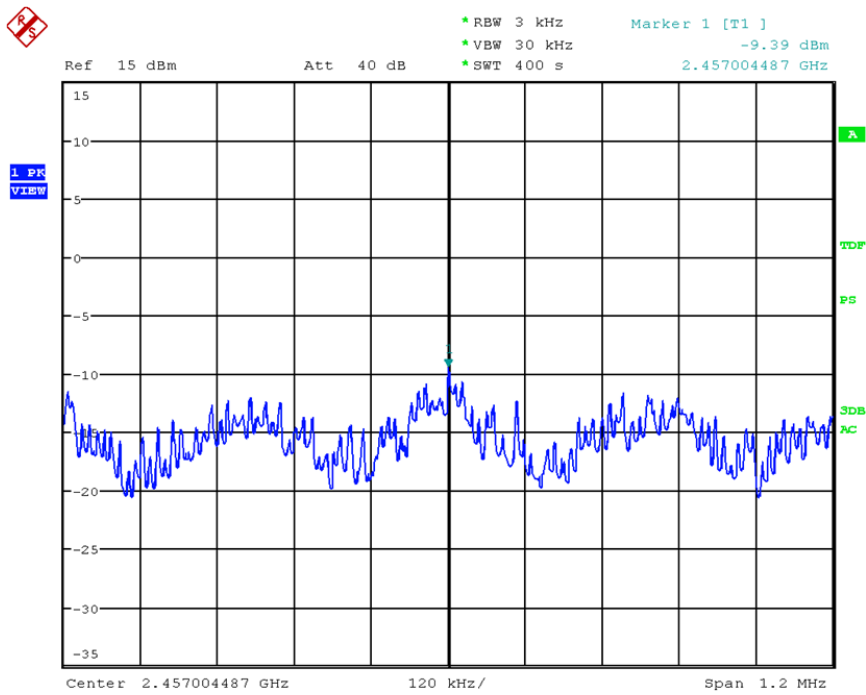


Picture 12: Power Density IEEE 802.11g channel 6



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Picture 13: Power Density IEEE 802.11g channel 11

6.10 Test results (OFDM, 802.11n)

Temperature:	23°C	Humidity:	41%
Tested by:	M. Janker	Test date:	2011-09-26

Channel	Frequency (GHz)	Spectral density (dBm/3kHz)	Limit (dBm/3kHz)	Result
1	2.412	-10.89	8.0	PASS
6	2.437	-10.88	8.0	PASS
11	2.462	-10.74	8.0	PASS



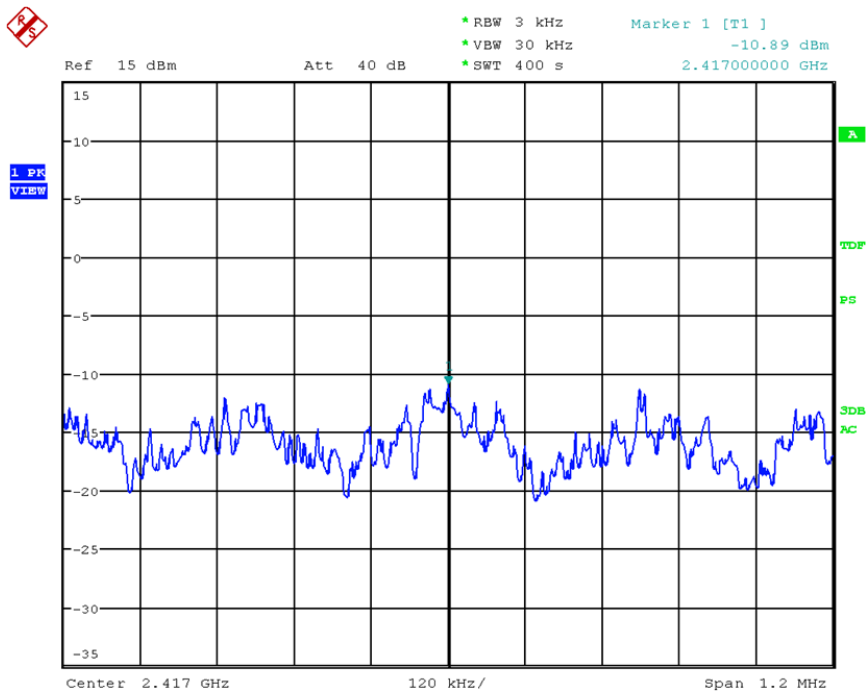
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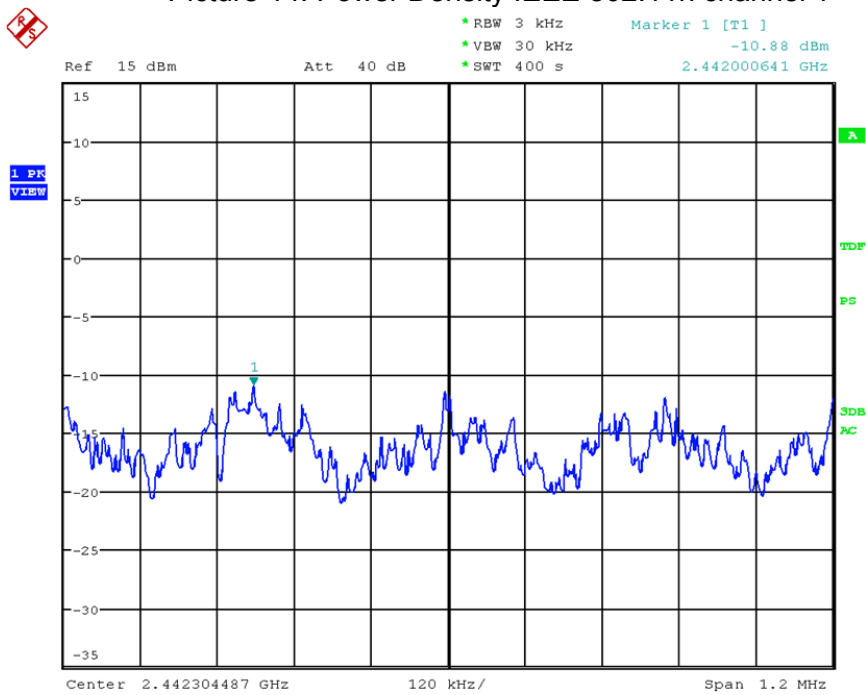
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Picture 14: Power Density IEEE 802.11n channel 1



Picture 15: Power Density IEEE 802.11n channel 6

7 6dB spectrum bandwidth measurement

according to CFR 47 Part 15 section 2.247(a)(2)

7.1 Test location

- Conducted measurement
- Scan with peak detector in 3 m CDC
- CISPR measurement with quasi peak detector on 10m open area test site.
- Measurement with peak detector on 3m open area test site

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open area test site	EMV TESTHAUS GmbH	E00354

7.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011

7.3 Limits

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

7.4 Test procedure and instrument settings

Parameter	Setting
Attenuation	Auto
Span	≥ RBW
RBW	100 kHz
VBW	≥ RBW
Detector	Peak
Trace	Max Hold
Sweep time	Auto



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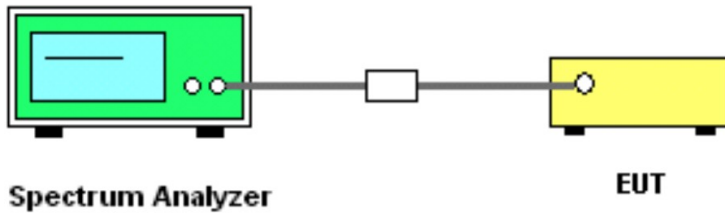
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1. The test is performed in accordance with FCC Public Notice KBD 558074.
2. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
3. The unit was operated in continuous transmit mode with modulation.
4. Set the detector to peak, max hold.
5. After the trace has stabilized set the trace to VIEW mode.
6. Use marker function to set the marker to peak and set the delta marker to 6 dB below the carrier.
7. Measure the bandwidth of the signal as the lower and upper limit of the intersection of the trace with the delta marker.

7.5 Test setup



Picture 17: Test setup for 6dB spectrum bandwidth measurement

7.6 Test deviation

There is no deviation with the original standard.

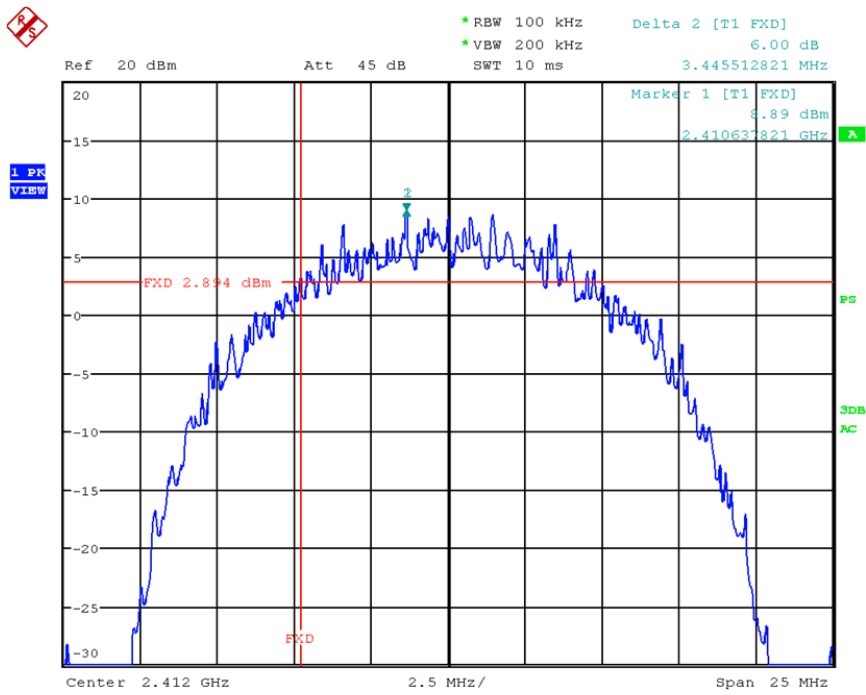
7.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

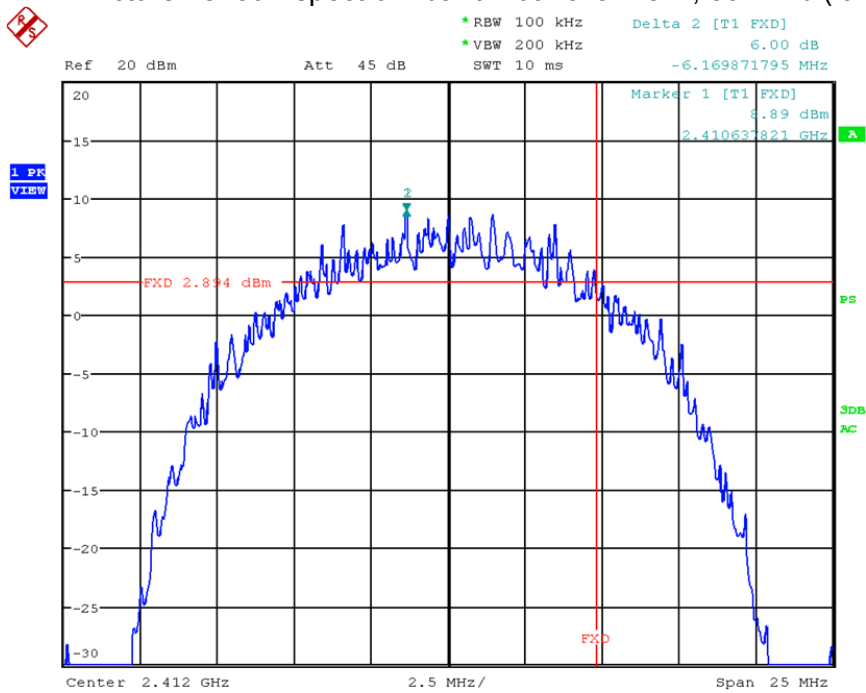
7.8 Test results (DSSS, 802.11b)

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-07-28

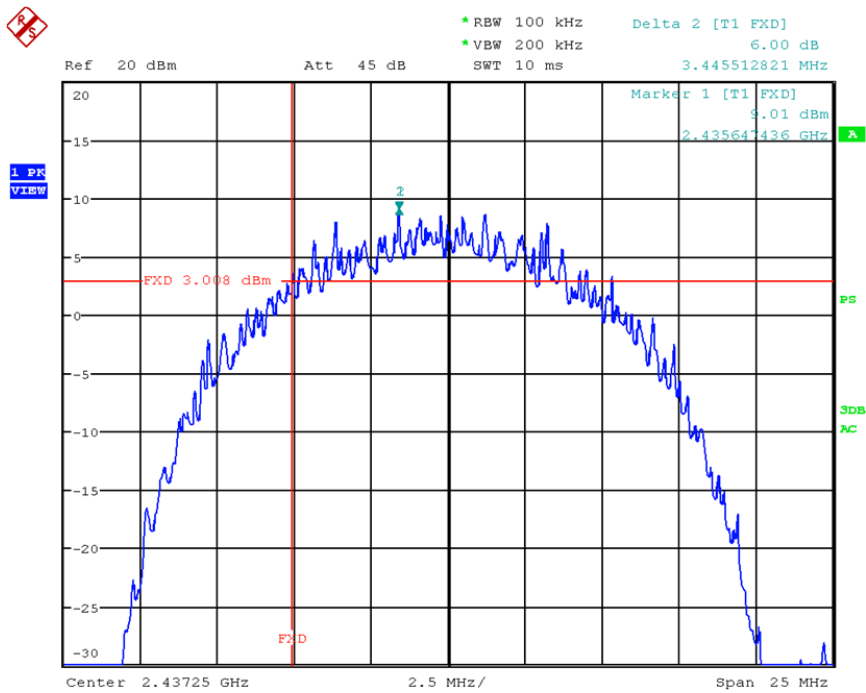
Channel	Frequency (GHz)	6 dB bandwidth (MHz)	Min. limit (kHz)	Result
1	2.412	9.6154	500	PASS
6	2.437	10.3766	500	PASS
11	2.462	9.5753	500	PASS



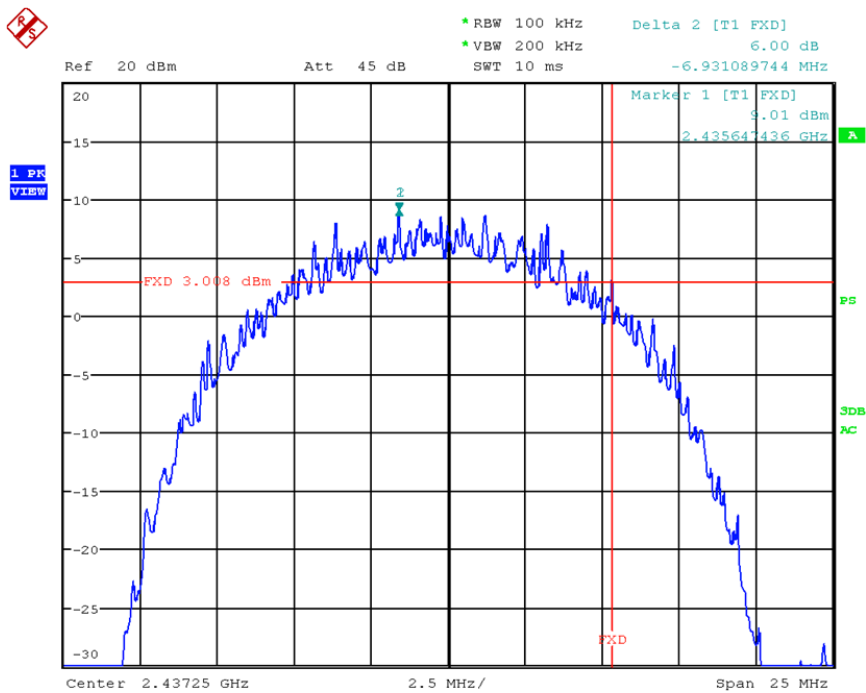
Picture 18: 6dB spectrum bandwidth channel 1, 802.11b (lower)



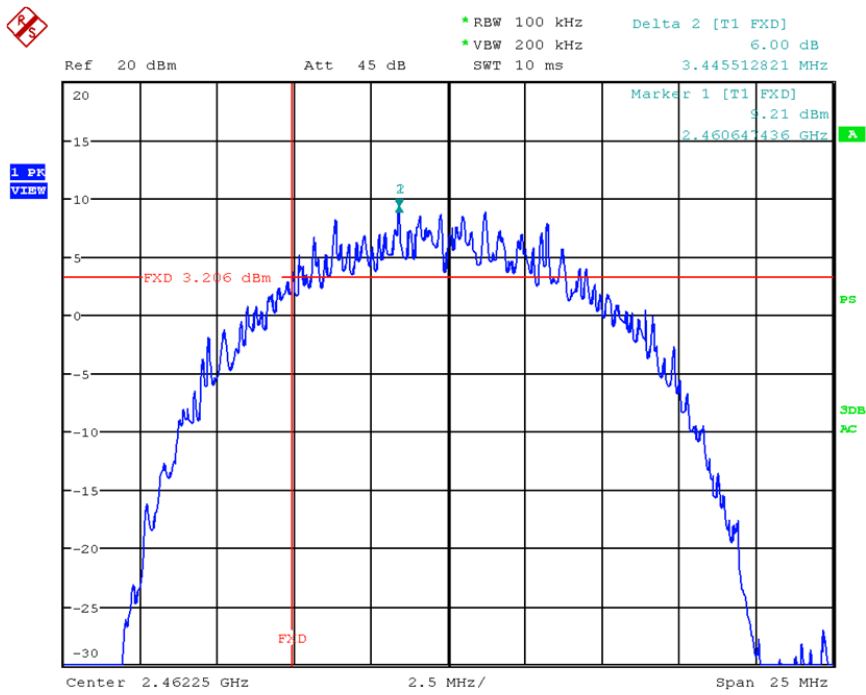
Picture 19: 6dB spectrum bandwidth channel 1, 802.11b (upper)



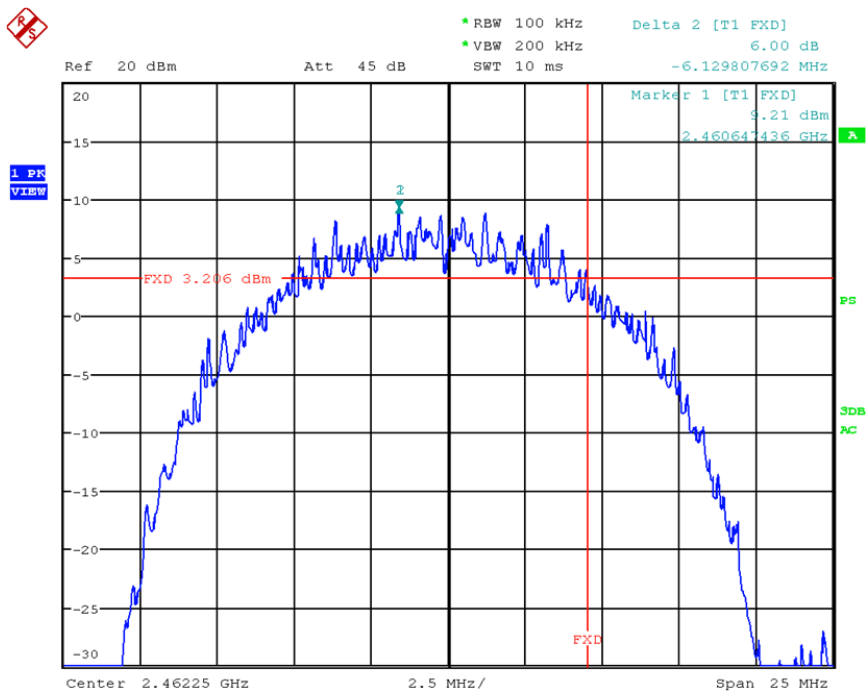
Picture 20: 6dB spectrum bandwidth channel 6, 802.11b (lower)



Picture 21: 6dB spectrum bandwidth channel 6, 802.11b (upper)



Picture 22: 6dB spectrum bandwidth channel 11, 802.11b (lower)

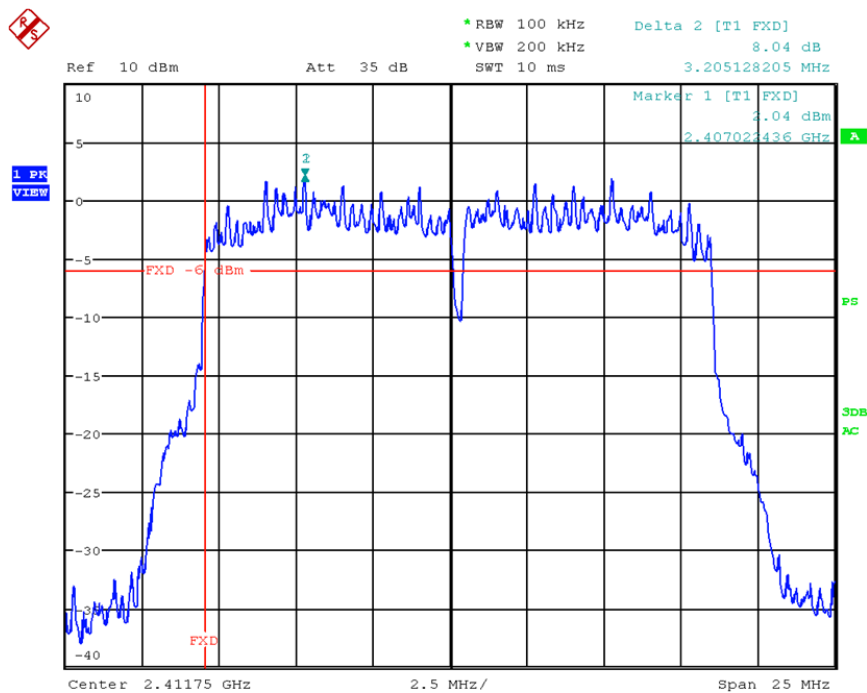


Picture 23: 6dB spectrum bandwidth channel 11, 802.11b (upper)

7.9 Test results (OFDM, 802.11g)

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-07-28

Channel	Frequency (GHz)	6 dB bandwidth (MHz)	Min. limit (kHz)	Result
1	2.412	16.426	500	PASS
6	2.437	16.426	500	PASS
11	2.462	16.426	500	PASS



Picture 24: 6dB spectrum bandwidth channel 1, 802.11g (lower)



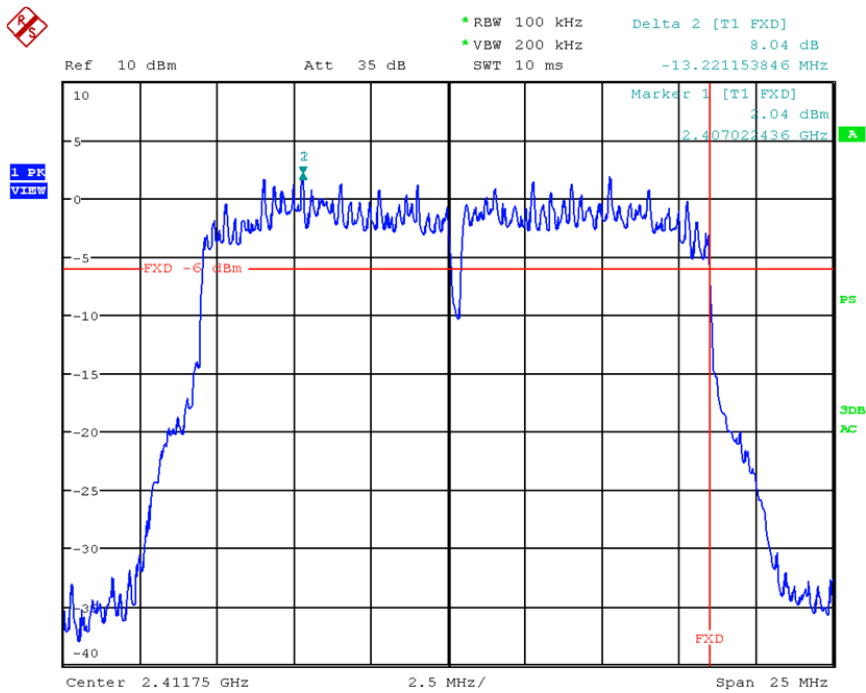
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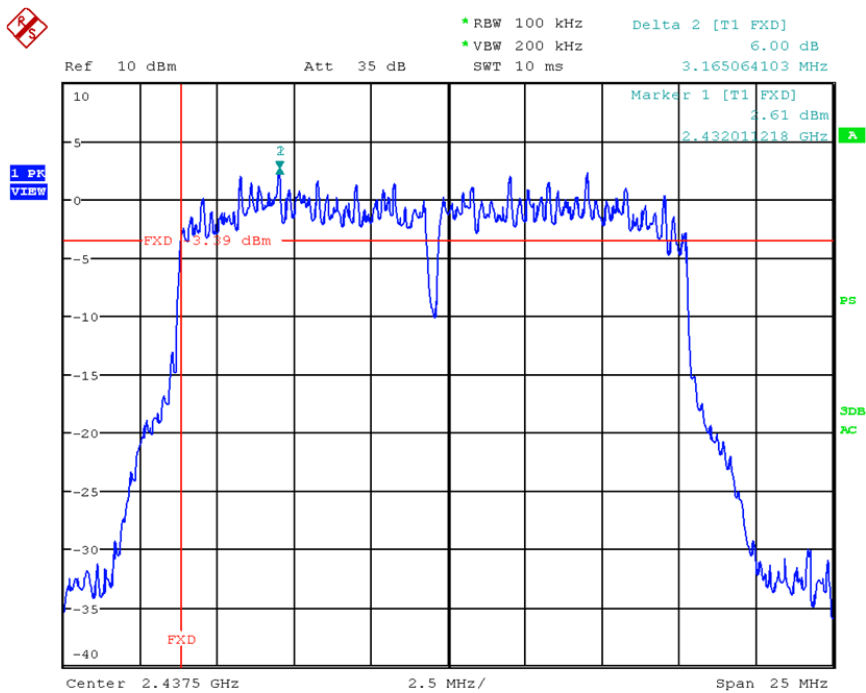
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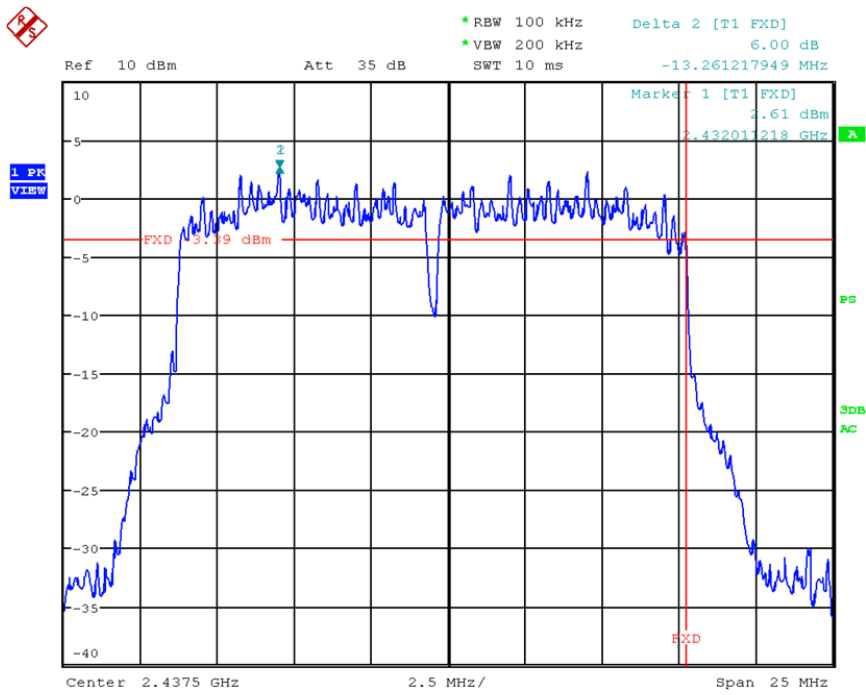
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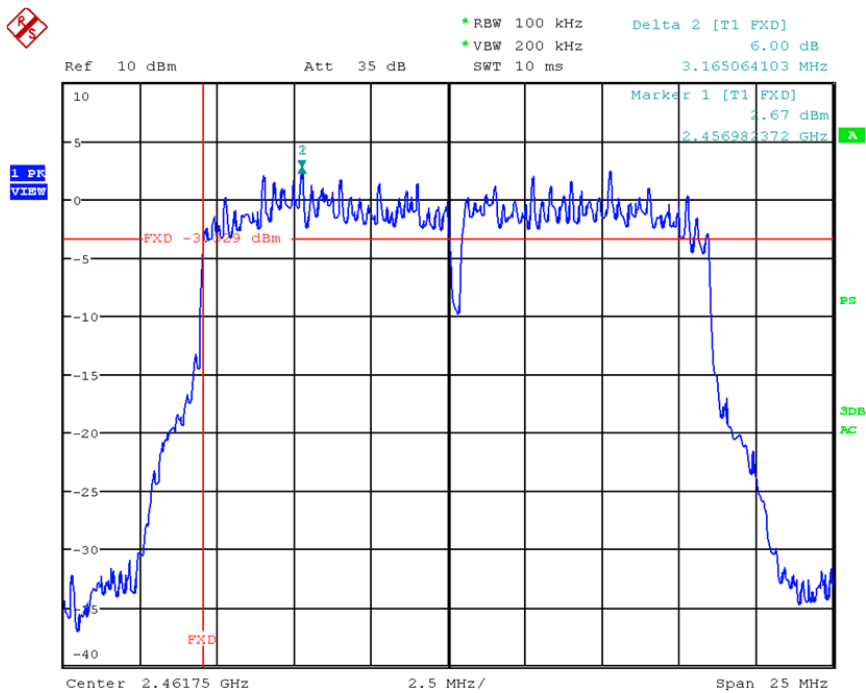
Picture 25: 6dB spectrum bandwidth channel 1, 802.11g (upper)



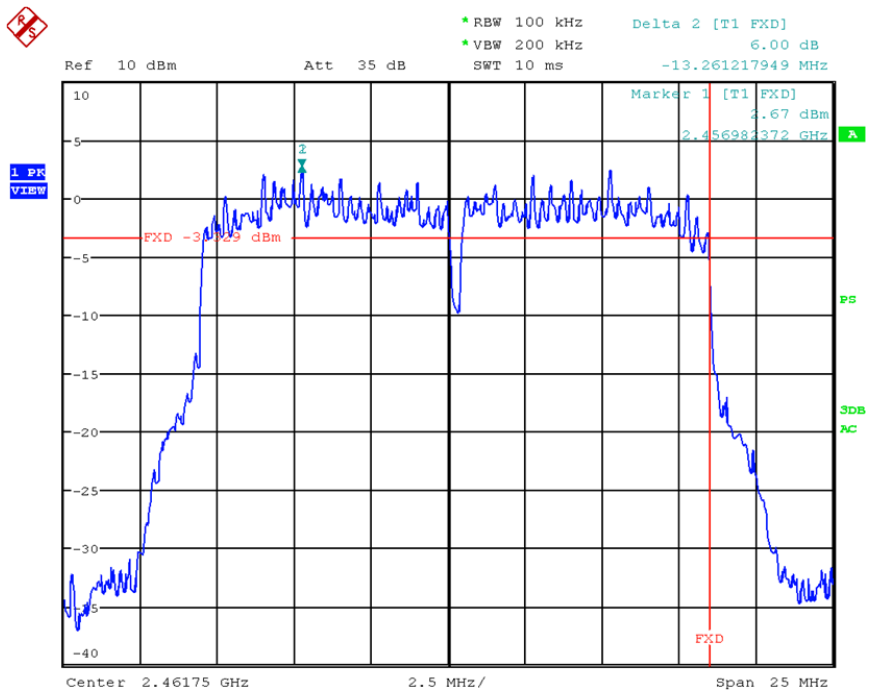
Picture 26: 6dB spectrum bandwidth channel 6, 802.11g (lower)



Picture 27: 6dB spectrum bandwidth channel 6, 802.11g (upper)



Picture 28: 6dB spectrum bandwidth channel 11, 802.11g (lower)

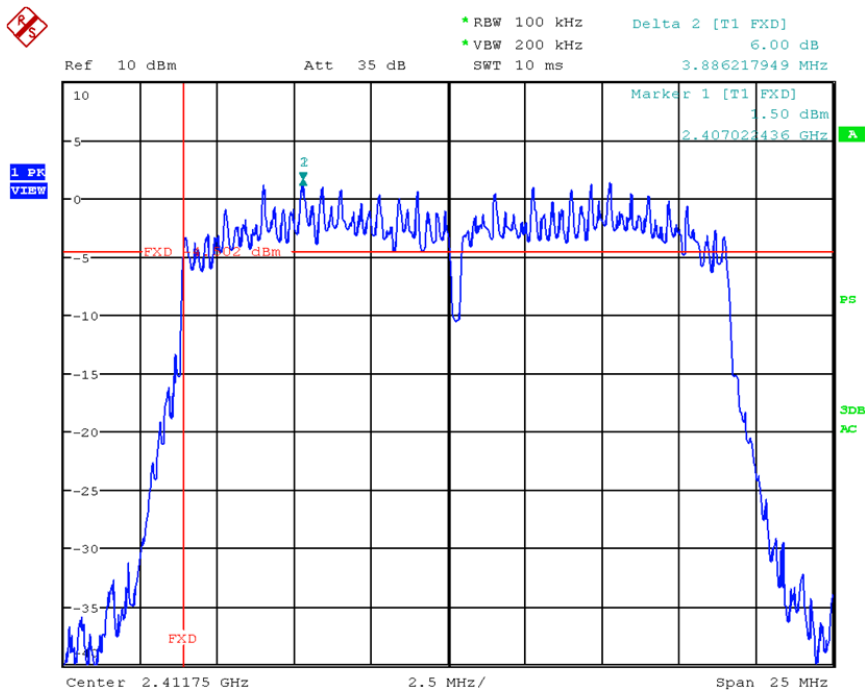


Picture 29: 6dB spectrum bandwidth channel 11, 802.11g (upper)

7.10 Test results (OFDM, 802.11n)

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-07-28

Channel	Frequency (GHz)	6 dB bandwidth (MHz)	Min. limit (kHz)	Result
1	2.412	17.6682	500	PASS
6	2.437	17.6682	500	PASS
11	2.462	17.6682	500	PASS



Picture 30: 6dB spectrum bandwidth channel 1, 802.11n (lower)



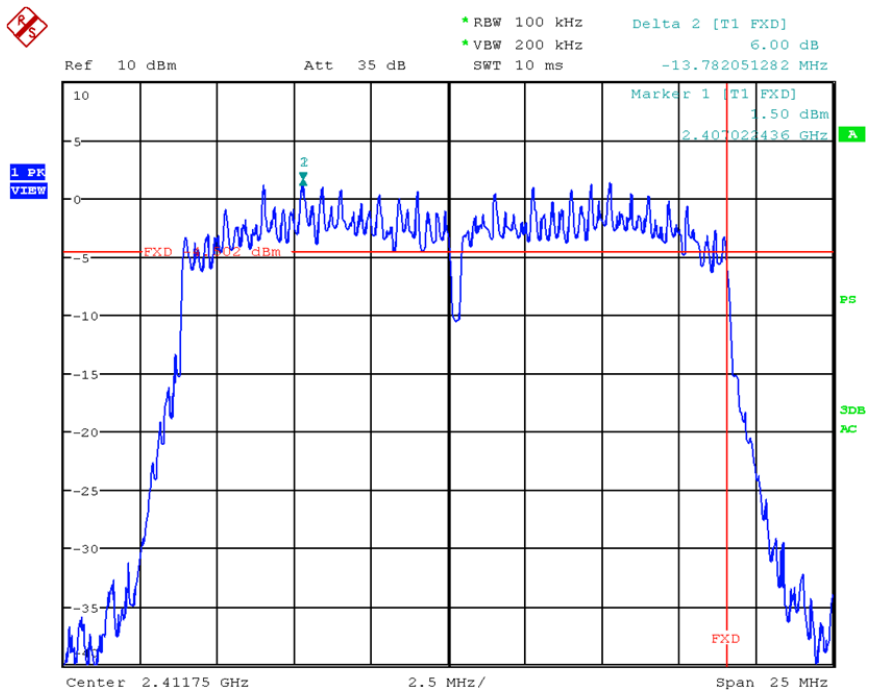
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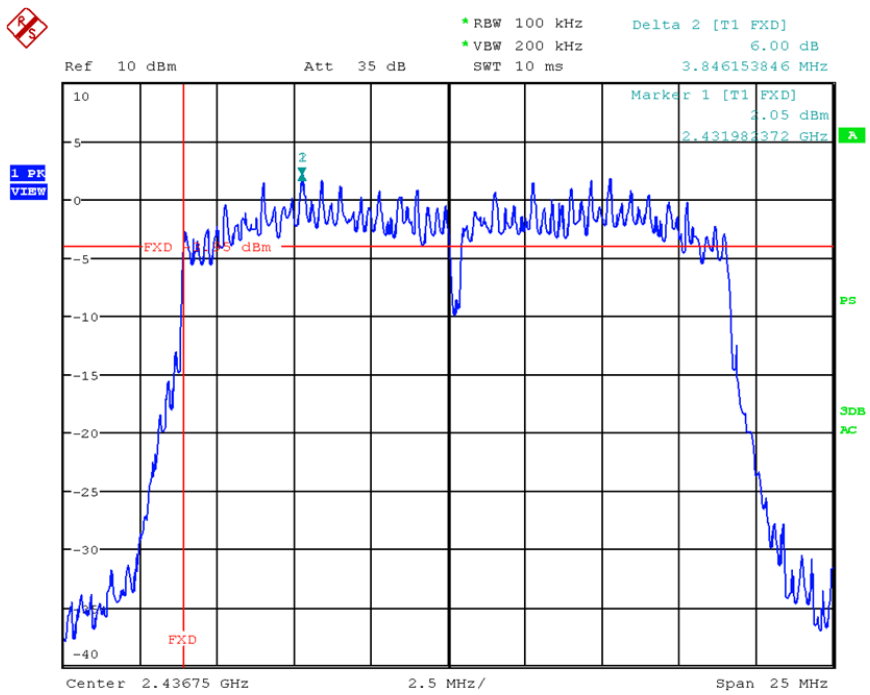
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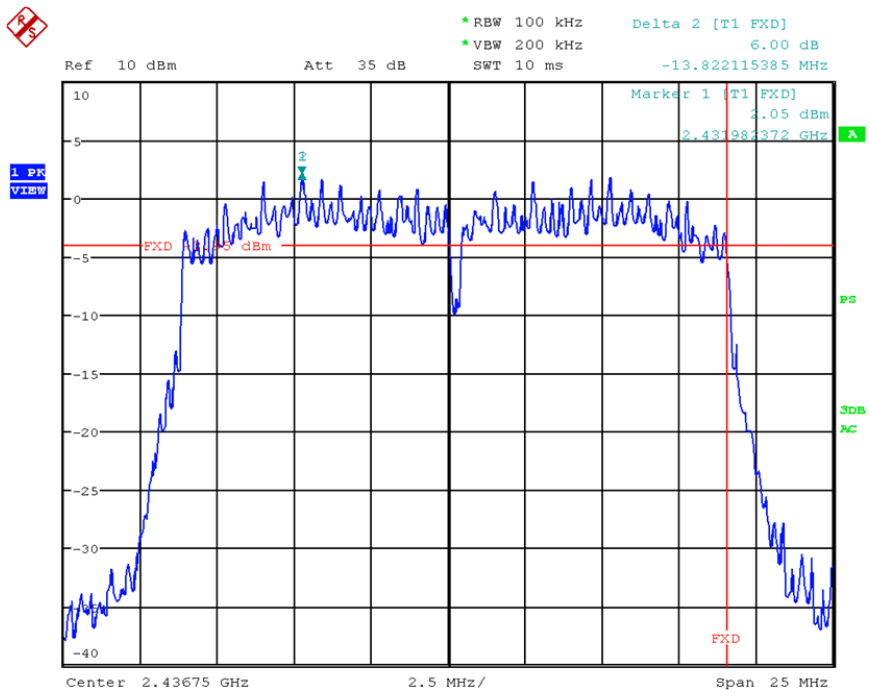
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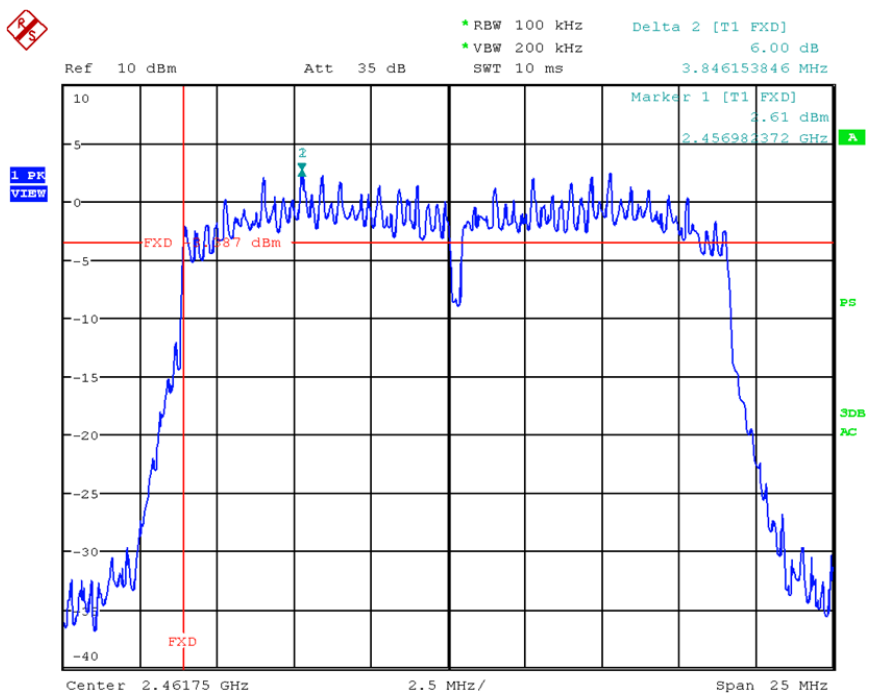
Picture 31: 6dB spectrum bandwidth channel 1, 802.11n (upper)



Picture 32: 6dB spectrum bandwidth channel 6, 802.11n (lower)



Picture 33: 6dB spectrum bandwidth channel 6, 802.11n (upper)

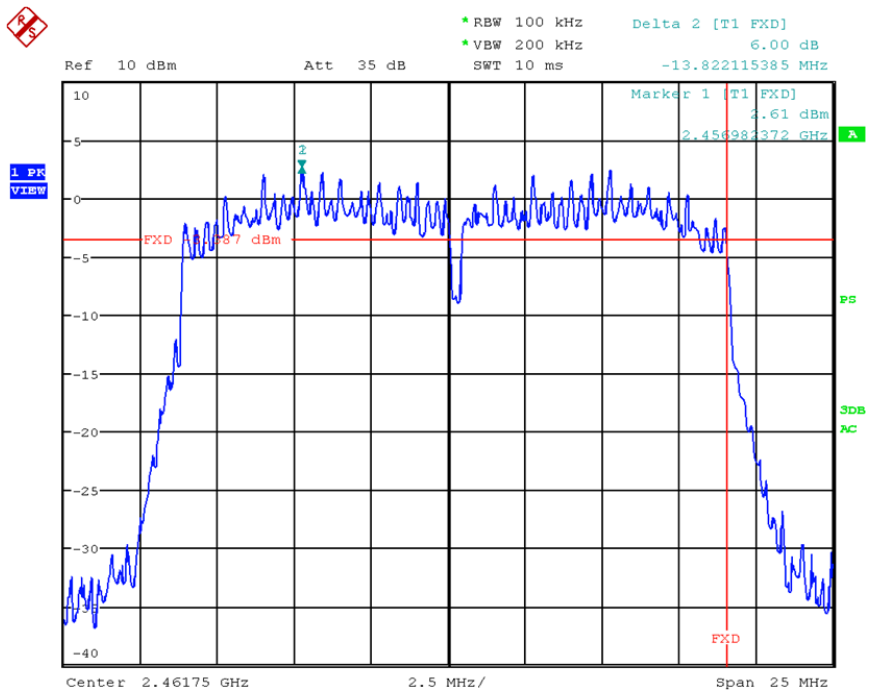


Picture 34: 6dB spectrum bandwidth channel 11, 802.11n (lower)



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Picture 35: 6dB spectrum bandwidth channel 11, 802.11n (upper)

8 Radiated emission measurement (<1 GHz)

according to CFR 47 Part 15, section 15.205(a), 15.209(a), 15.247(d)

8.1 Test Location

- Scan with peak detector in 3 m CDC.
- Final CISPR measurement with quasi peak detector on 3 m open area test site.

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open site area	EMV TESTHAUS GmbH	E00354

8.2 Test instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input checked="" type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input checked="" type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input checked="" type="checkbox"/>	Feedline OATS	Huber & Suhner	200024

8.3 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the 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.

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency [MHz]	Field strength Fs [$\mu\text{V}/\text{m}$]	Field strength [dB $\mu\text{V}/\text{m}$]	Measurement distance d [m]
0.009 – 0.490	266.6 – 4.9	48.5 – 13.8	300
0.490 – 1.705	48.98 – 14.08	33.8 – 22.97	30
1.705 – 30.0	30	29.54	30
30 – 88	100	40	3
88 – 216	150	43.5	3



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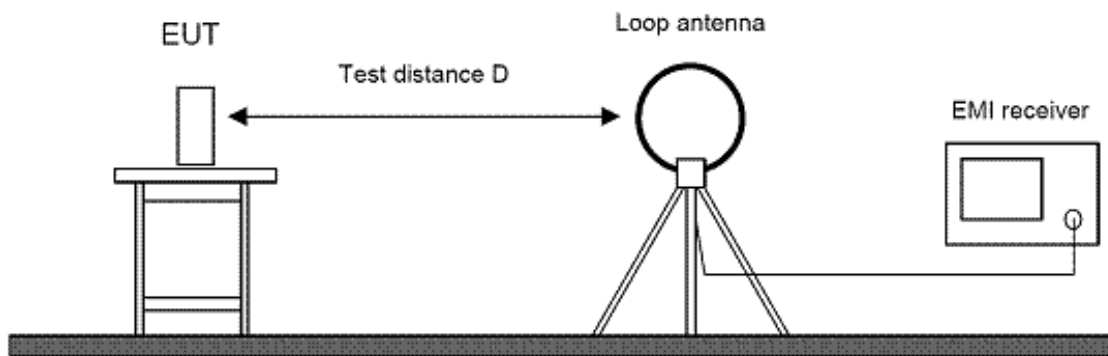
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216 - 960	200	46	3
Above 960	500	54	3

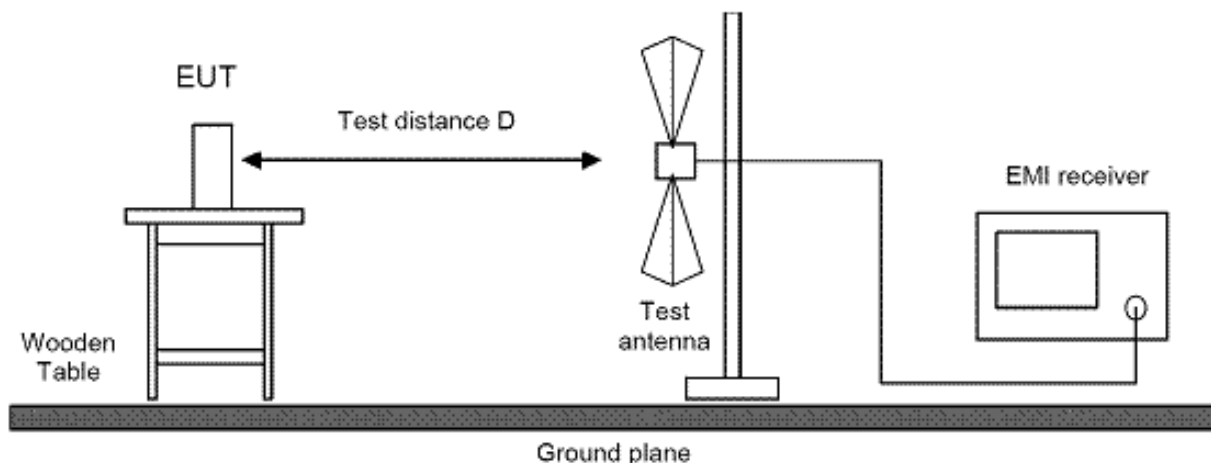
8.4 Test procedure

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The receiving antenna was placed 3 meters from the turntable. The test setup was placed inside a compact diagnostic chamber.
2. Power on the EUT and all peripherals.
3. The broadband antenna was set to vertical polarization.
4. The EMI receiver performed a scan from 30MHz to 1000MHz with the detector set to peak and the measurement bandwidth to 120 kHz.
5. The turn table was rotated to 6 different positions ($360^\circ / 6$) and the antenna polarization was changed to horizontal.
6. Repeat the test procedure at step 4 and 5.
7. The test setup was then placed in an OATS at 3 m distance and all peak values over or with less distance to limit then 6dB were marked and re-measured with a quasi-peak detector.
8. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
9. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization. The highest value was recorded.
10. For emissions below 30MHz, measurements were done with a loop antenna. The recorded data were measured in QP mode off he receiver. The antenna height was not changed during this test.

8.5 Test setup



Picture 36: Test setup for radiated emission measurement (< 30 MHz)



Picture 37: Test setup for radiated emission measurement (< 1 GHz)

8.6 Test deviation

There is no deviation with the original standard.

8.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

8.8 Test results

Radiated Emission Measurement 9 kHz – 30 MHz

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-07-28

Frequency (MHz)	Reading (dBµV/m)	Detector	Recalculation factor (dB/decade)	Field strength (dBµV/m)	Limit (dBµV/m)	Margin	Result
-	-	-	-	-	-	-	See Note

Note: Amplitudes of spurious emissions that are attenuated more than 20 dB below the permissible limit are not reported.

$$\text{extrapolation factor} = 40 \cdot \log \left(\frac{\text{specified distance}}{\text{test distance}} \right)$$

$$\text{limit line} = \text{specific limits (dBµV)} + \text{distance extrapolation factor}$$



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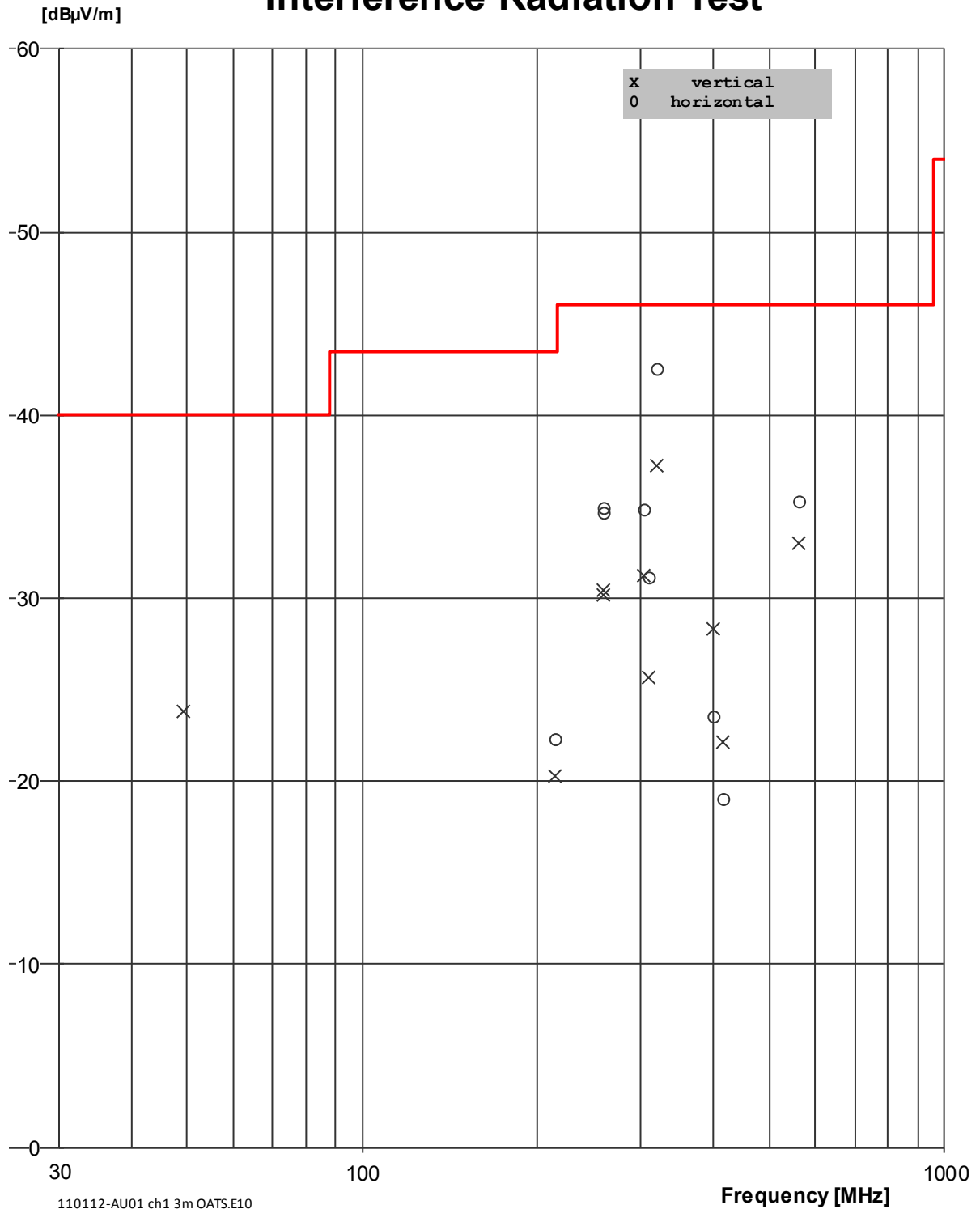
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Interference Radiation Test



Picture 39: Radiated emission 30 MHz – 1000MHz (802.11b, Channel 1)



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Freq. [MHz]	U_Rec [dB μ V/m]	Limit [dB μ V/m]	Corr. [dB]	U_Ant. [dB μ V]	delta_U [dB]	Turn- table	Antenna	Pol.	Remark
49,15	23,8	40,0	14,0	9,8	16,2	82°	100 cm	V	110112-AU01_ch1_3m_OATS.E10
214,51	22,3	43,5	12,6	9,8	21,2	189°	250 cm	H	
214,51	20,3	43,5	12,6	7,8	23,2	311°	100 cm	V	
259,66	34,7	46,0	14,0	20,7	11,4	44°	250 cm	H	
259,66	30,2	46,0	14,0	16,3	15,8	135°	100 cm	V	
259,68	35,0	46,0	14,0	21,0	11,0	29°	250 cm	H	
259,68	30,4	46,0	14,0	16,5	15,6	114°	100 cm	V	
304,84	34,9	46,0	15,0	19,9	11,1	246°	250 cm	H	
304,84	31,2	46,0	15,0	16,2	14,8	163°	100 cm	V	
309,92	31,2	46,0	15,2	16,0	14,9	219°	250 cm	H	
309,92	25,6	46,0	15,2	10,5	20,4	158°	100 cm	V	
320,00	42,5	46,0	15,4	27,1	3,5	235°	250 cm	H	
320,00	37,3	46,0	15,4	21,8	8,8	182°	100 cm	V	
399,96	23,5	46,0	17,1	6,4	22,5	49°	250 cm	H	
399,96	28,3	46,0	17,1	11,2	17,7	134°	100 cm	V	
416,00	19,1	46,0	17,3	1,7	26,9	53°	250 cm	H	
416,00	22,1	46,0	17,3	4,8	23,9	194°	100 cm	V	
560,00	35,3	46,0	20,2	15,0	10,7	234°	250 cm	H	
560,00	33,0	46,0	20,2	12,8	13,0	179°	100 cm	V	

Picture 40: Radiated emission 30 MHz – 1000MHz (Table, 802.11b, channel 1)



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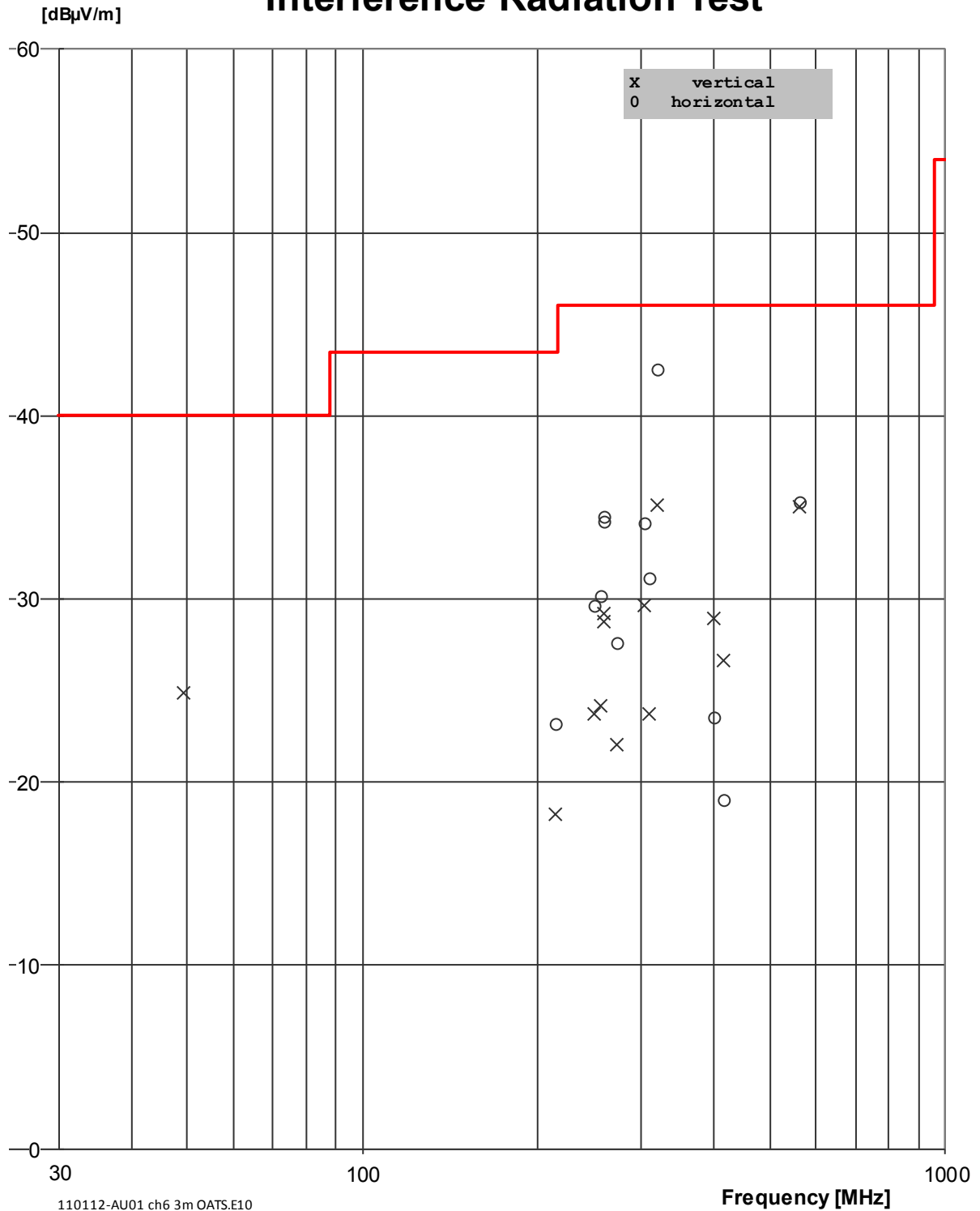
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Interference Radiation Test



Picture 41: Radiated emission 30 MHz – 1000MHz (802.11b, Channel 6)

Interference Radiation Test

Freq. [MHz]	U_Rec [dB μ V/m]	Limit [dB μ V/m]	Corr. [dB]	U_Ant. [dB μ V]	delta_U [dB]	Turn- table	Antenna	Pol.	Remark
49,15	24,9	40,0	14,0	10,9	15,1	52°	100 cm	V	110112-AU01_ch6_3m_OATS.E10
214,51	23,2	43,5	12,6	10,7	20,3	358°	250 cm	H	
214,51	18,2	43,5	12,6	5,7	25,3	279°	100 cm	V	
250,00	29,6	46,0	13,7	15,9	16,4	18°	250 cm	H	
250,00	23,8	46,0	13,7	10,1	22,2	121°	100 cm	V	
256,06	30,1	46,0	13,9	16,3	15,9	198°	250 cm	H	
256,06	24,1	46,0	13,9	10,3	21,9	174°	100 cm	V	
259,66	34,3	46,0	14,0	20,3	11,7	210°	250 cm	H	
259,66	28,8	46,0	14,0	14,8	17,2	110°	100 cm	V	
259,68	34,5	46,0	14,0	20,6	11,5	194°	250 cm	H	
259,68	29,2	46,0	14,0	15,2	16,8	133°	100 cm	V	
271,96	27,6	46,0	14,2	13,4	18,4	204°	250 cm	H	
271,96	22,1	46,0	14,2	7,8	23,9	243°	100 cm	V	
304,84	34,1	46,0	15,0	19,1	11,9	203°	250 cm	H	
304,84	29,7	46,0	15,0	14,7	16,3	166°	100 cm	V	
309,92	31,2	46,0	15,2	16,0	14,9	219°	250 cm	H	
309,92	23,7	46,0	15,2	8,6	22,3	154°	100 cm	V	
320,00	42,5	46,0	15,4	27,1	3,5	235°	250 cm	H	
320,00	35,2	46,0	15,4	19,7	10,9	198°	100 cm	V	
399,96	23,5	46,0	17,1	6,4	22,5	49°	250 cm	H	
399,96	28,9	46,0	17,1	11,8	17,1	118°	100 cm	V	
416,00	19,1	46,0	17,3	1,7	26,9	53°	250 cm	H	
416,00	26,7	46,0	17,3	9,3	19,3	122°	100 cm	V	
560,00	35,3	46,0	20,2	15,0	10,7	234°	250 cm	H	
560,00	35,1	46,0	20,2	14,8	10,9	121°	100 cm	V	

Picture 42: Radiated emission 30 MHz – 1000MHz (Table, 802.11b, channel 6)



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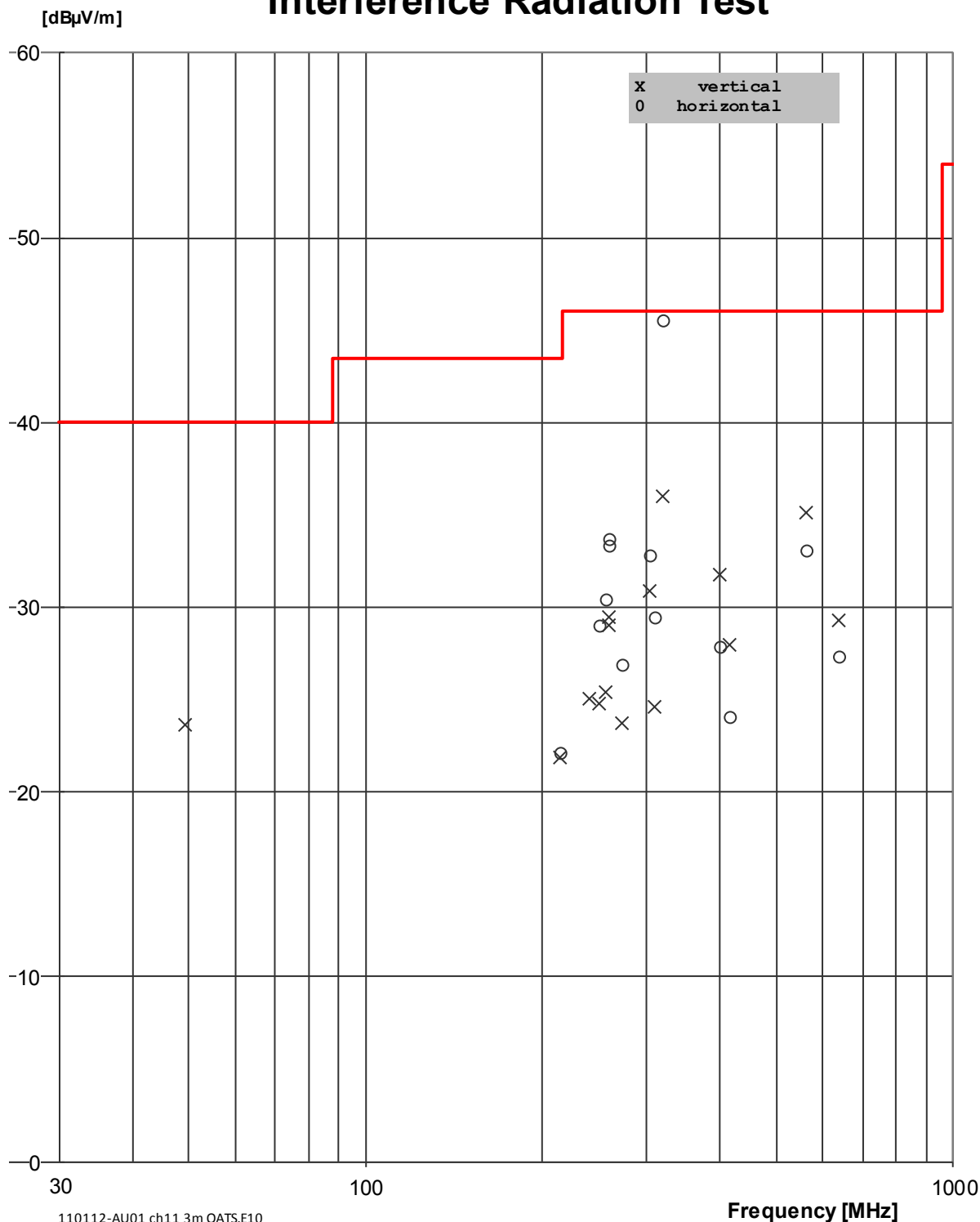
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Interference Radiation Test



Picture 43: Radiated emission 30 MHz – 1000MHz (802.11b, Channel 11)

Interference Radiation Test

Freq. [MHz]	U_Rec [dB μ V/m]	Limit [dB μ V/m]	Corr. [dB]	U_Ant. [dB μ V]	delta_U [dB]	Turn- table	Antenna	Pol.	Remark
49,15	23,6	40,0	14,0	9,6	16,4	105°	100 cm	V	110112-AU01_ch11_3m.OATS.F10
214,51	22,2	43,5	12,6	9,6	21,4	360°	250 cm	H	
214,51	21,8	43,5	12,6	9,3	21,7	129°	100 cm	V	
240,00	25,0	46,0	13,4	11,6	21,0	115°	106 cm	V	
250,00	29,1	46,0	13,7	15,4	17,0	7°	250 cm	H	
250,00	24,8	46,0	13,7	11,1	21,2	220°	100 cm	V	
256,06	30,5	46,0	13,9	16,6	15,5	9°	250 cm	H	
256,06	25,4	46,0	13,9	11,6	20,6	118°	100 cm	V	
259,66	33,4	46,0	14,0	19,5	12,6	17°	250 cm	H	
259,66	29,1	46,0	14,0	15,1	17,0	132°	100 cm	V	
259,68	33,7	46,0	14,0	19,8	12,3	9°	250 cm	H	
259,68	29,5	46,0	14,0	15,5	16,5	122°	100 cm	V	
271,96	26,9	46,0	14,2	12,7	19,1	186°	250 cm	H	
271,96	23,7	46,0	14,2	9,5	22,3	133°	100 cm	V	
304,84	32,8	46,0	15,0	17,8	13,2	174°	250 cm	H	
304,84	30,9	46,0	15,0	15,9	15,1	146°	100 cm	V	
309,92	29,5	46,0	15,2	14,4	16,5	222°	250 cm	H	
309,92	24,6	46,0	15,2	9,4	21,4	174°	100 cm	V	
320,00	45,5	46,0	15,4	30,1	0,5	202°	108 cm	H	
320,00	36,0	46,0	15,4	20,6	10,0	158°	100 cm	V	
399,96	27,9	46,0	17,1	10,8	18,1	69°	250 cm	H	
399,96	31,8	46,0	17,1	14,7	14,3	134°	100 cm	V	
416,00	24,1	46,0	17,3	6,7	21,9	14°	250 cm	H	
416,00	28,0	46,0	17,3	10,7	18,0	259°	100 cm	V	
560,00	33,1	46,0	20,2	12,9	12,9	243°	250 cm	H	
560,00	35,1	46,0	20,2	14,9	10,9	105°	100 cm	V	
640,00	27,3	46,0	21,4	6,0	18,7	354°	250 cm	H	
640,00	29,3	46,0	21,4	8,0	16,7	226°	106 cm	V	

Picture 44: Radiated emission 30 MHz – 1000MHz (Table, 802.11b, channel 11)



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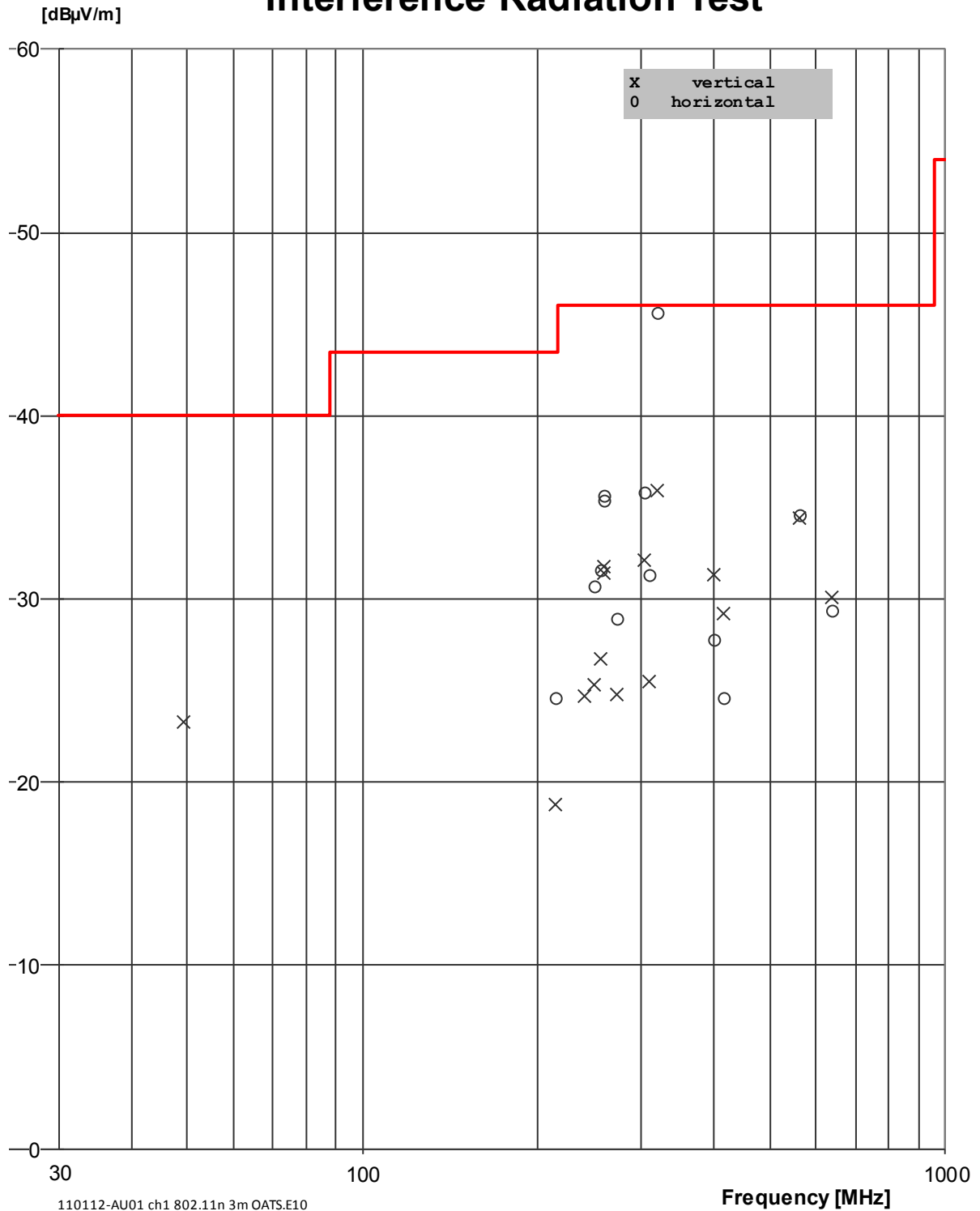
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Interference Radiation Test



Picture 45: Radiated emission 30 MHz – 1000MHz (802.11g/n, Channel 1)

Interference Radiation Test

Freq. [MHz]	U_Rec [dBµV/m]	Limit [dBµV/m]	Corr. [dB]	U_Ant. [dBµV]	delta_U [dB]	Turn- table	Antenna	Pol.	Remark
49,15	23,3	40,0	14,0	9,3	16,7	346°	100 cm	V	110112-AU01.ch1.802.11n.3m OATS.E10
214,51	24,6	43,5	12,6	12,0	18,9	14°	250 cm	H	
214,51	18,8	43,5	12,6	6,2	24,7	105°	100 cm	V	
240,00	24,7	46,0	13,4	11,3	21,3	152°	106 cm	V	
250,00	30,7	46,0	13,7	17,0	15,3	6°	250 cm	H	
250,00	25,4	46,0	13,7	11,7	20,7	127°	100 cm	V	
256,06	31,6	46,0	13,9	17,7	14,4	8°	250 cm	H	
256,06	26,8	46,0	13,9	12,9	19,2	135°	100 cm	V	
259,66	35,4	46,0	14,0	21,5	10,6	0°	250 cm	H	
259,66	31,4	46,0	14,0	17,5	14,6	120°	100 cm	V	
259,68	35,7	46,0	14,0	21,7	10,3	16°	250 cm	H	
259,68	31,8	46,0	14,0	17,9	14,2	178°	100 cm	V	
271,96	28,9	46,0	14,2	14,7	17,1	156°	250 cm	H	
271,96	24,8	46,0	14,2	10,6	21,2	125°	100 cm	V	
304,84	35,8	46,0	15,0	20,8	10,2	206°	250 cm	H	
304,84	32,2	46,0	15,0	17,1	13,8	158°	100 cm	V	
309,92	31,4	46,0	15,2	16,2	14,7	198°	250 cm	H	
309,92	25,5	46,0	15,2	10,4	20,5	150°	100 cm	V	
320,00	45,7	46,0	15,4	30,3	0,3	14°	108 cm	H	
320,00	35,9	46,0	15,4	20,5	10,1	166°	100 cm	V	
399,96	27,8	46,0	17,1	10,7	18,2	57°	250 cm	H	
399,96	31,4	46,0	17,1	14,3	14,7	126°	100 cm	V	
416,00	24,6	46,0	17,3	7,2	21,4	359°	250 cm	H	
416,00	29,2	46,0	17,3	11,9	16,8	251°	100 cm	V	
560,00	34,6	46,0	20,2	14,3	11,4	49°	250 cm	H	
560,00	34,4	46,0	20,2	14,2	11,6	142°	100 cm	V	
640,00	29,4	46,0	21,4	8,1	16,6	303°	250 cm	H	
640,00	30,1	46,0	21,4	8,8	15,9	38°	106 cm	V	

Picture 46: Radiated emission 30 MHz – 1000MHz (Table, 802.11g/n, channel 1)



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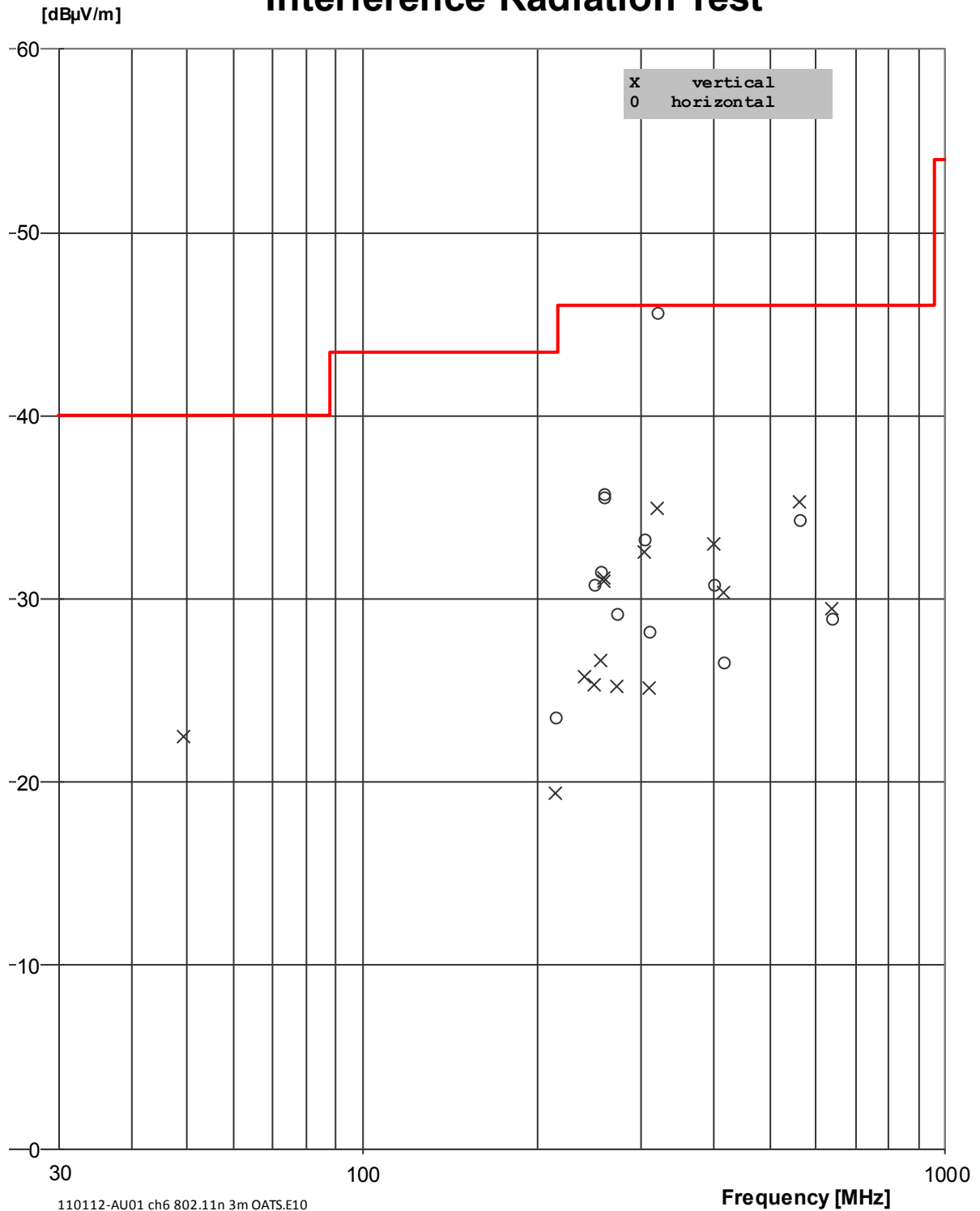
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Interference Radiation Test



Picture 47: Radiated emission 30 MHz – 1000MHz (802.11g/n, Channel 6)

Interference Radiation Test

Freq. [MHz]	U_Rec [dB μ V/m]	Limit [dB μ V/m]	Corr. [dB]	U_Ant. [dB μ V]	delta_U [dB]	Turn- table	Antenna	Pol.	Remark
49,15	22,5	40,0	14,0	8,5	17,5	359°	100 cm	V	110112-AU01.ch6.802.11n.3m OATS.E10
214,51	23,5	43,5	12,6	11,0	20,0	8°	250 cm	H	
214,51	19,4	43,5	12,6	6,9	24,1	275°	100 cm	V	
240,00	25,7	46,0	13,4	12,3	20,3	44°	106 cm	V	
250,00	30,8	46,0	13,7	17,1	15,2	4°	250 cm	H	
250,00	25,3	46,0	13,7	11,6	20,7	136°	100 cm	V	
256,06	31,5	46,0	13,9	17,7	14,5	1°	250 cm	H	
256,06	26,7	46,0	13,9	12,8	19,4	125°	100 cm	V	
259,66	35,5	46,0	14,0	21,6	10,5	11°	250 cm	H	
259,66	31,0	46,0	14,0	17,0	15,0	135°	100 cm	V	
259,68	35,8	46,0	14,0	21,8	10,2	0°	250 cm	H	
259,68	31,2	46,0	14,0	17,2	14,8	114°	100 cm	V	
271,96	29,2	46,0	14,2	15,0	16,8	190°	250 cm	H	
271,96	25,2	46,0	14,2	11,0	20,8	130°	100 cm	V	
304,84	33,3	46,0	15,0	18,3	12,7	182°	250 cm	H	
304,84	32,6	46,0	15,0	17,5	13,4	146°	100 cm	V	
309,92	28,3	46,0	15,2	13,1	17,7	218°	250 cm	H	
309,92	25,1	46,0	15,2	10,0	20,9	158°	100 cm	V	
320,00	45,7	46,0	15,4	30,2	0,4	359°	108 cm	H	
320,00	34,9	46,0	15,4	19,5	11,1	150°	100 cm	V	
399,96	30,8	46,0	17,1	13,7	15,2	59°	250 cm	H	
399,96	33,0	46,0	17,1	15,9	13,0	122°	100 cm	V	
416,00	26,6	46,0	17,3	9,2	19,5	198°	250 cm	H	
416,00	30,4	46,0	17,3	13,0	15,6	248°	100 cm	V	
560,00	34,3	46,0	20,2	14,1	11,7	8°	250 cm	H	
560,00	35,3	46,0	20,2	15,1	10,7	96°	100 cm	V	
640,00	29,0	46,0	21,4	7,6	17,0	351°	250 cm	H	
640,00	29,5	46,0	21,4	8,1	16,5	124°	106 cm	V	

Picture 48: Radiated emission 30 MHz – 1000MHz (Table, 802.11g/n, channel 6)



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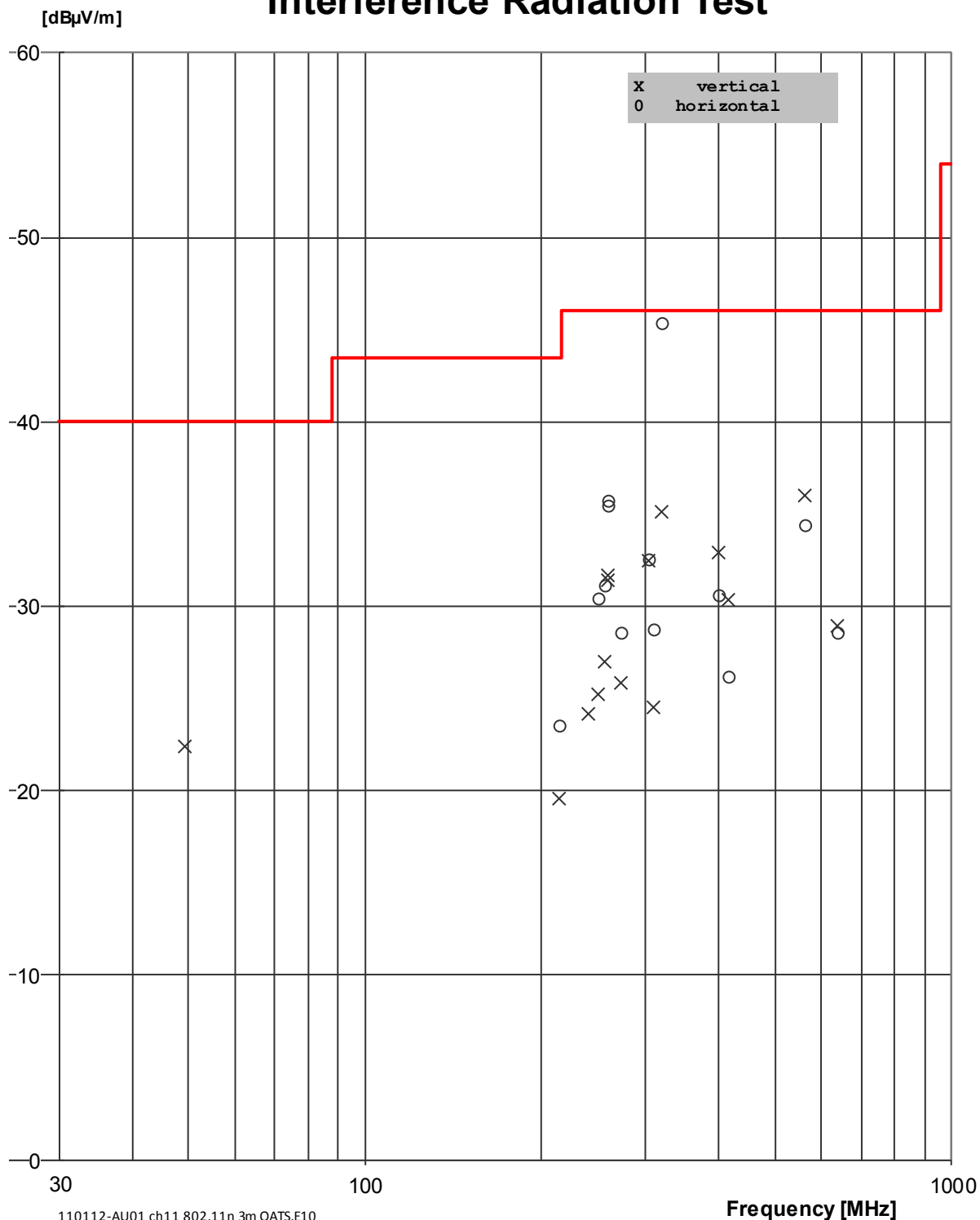
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Interference Radiation Test



Picture 49: Radiated emission 30 MHz – 1000MHz (802.11g/n , Channel 11)

Interference Radiation Test

Freq. [MHz]	U_Rec [dB μ V/m]	Limit [dB μ V/m]	Corr. [dB]	U_Ant. [dB μ V]	delta_U [dB]	Turn- table	Antenna	Pol.	Remark
49,15	22,4	40,0	14,0	8,4	17,6	34°	100 cm	V	110112-AU01_ch11_802.11n_3m OATS.E10
214,51	23,6	43,5	12,6	11,0	20,0	8°	250 cm	H	
214,51	19,6	43,5	12,6	7,1	23,9	271°	100 cm	V	
240,00	24,2	46,0	13,4	10,8	21,8	48°	106 cm	V	
250,00	30,4	46,0	13,7	16,7	15,6	11°	250 cm	H	
250,00	25,2	46,0	13,7	11,5	20,8	176°	100 cm	V	
256,06	31,1	46,0	13,9	17,3	14,9	0°	250 cm	H	
256,06	27,0	46,0	13,9	13,1	19,0	121°	100 cm	V	
259,66	35,5	46,0	14,0	21,5	10,5	14°	250 cm	H	
259,66	31,4	46,0	14,0	17,5	14,6	134°	100 cm	V	
259,68	35,7	46,0	14,0	21,8	10,3	0°	250 cm	H	
259,68	31,7	46,0	14,0	17,8	14,3	121°	100 cm	V	
271,96	28,6	46,0	14,2	14,4	17,4	210°	250 cm	H	
271,96	25,9	46,0	14,2	11,6	20,1	134°	100 cm	V	
304,84	32,5	46,0	15,0	17,5	13,5	202°	250 cm	H	
304,84	32,5	46,0	15,0	17,5	13,5	149°	100 cm	V	
309,92	28,8	46,0	15,2	13,6	17,2	219°	250 cm	H	
309,92	24,6	46,0	15,2	9,4	21,4	182°	100 cm	V	
320,00	45,4	46,0	15,4	30,0	0,6	360°	108 cm	H	
320,00	35,1	46,0	15,4	19,7	10,9	149°	100 cm	V	
399,96	30,6	46,0	17,1	13,5	15,4	83°	250 cm	H	
399,96	32,9	46,0	17,1	15,8	13,1	119°	100 cm	V	
416,00	26,2	46,0	17,3	8,9	19,8	360°	250 cm	H	
416,00	30,4	46,0	17,3	13,1	15,6	251°	100 cm	V	
560,00	34,4	46,0	20,2	14,2	11,6	29°	250 cm	H	
560,00	36,0	46,0	20,2	15,8	10,0	97°	100 cm	V	
640,00	28,6	46,0	21,4	7,3	17,4	354°	250 cm	H	
640,00	28,9	46,0	21,4	7,6	17,1	213°	106 cm	V	

Picture 50: Radiated emission 30 MHz – 1000MHz (Table, 802.11g/n, channel 11)



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Receive Mode

Temperature:	23°C	Humidity:	40%
Tested by:	M. Janker	Test date:	2011-07-28

Note: No significant emissions were detected in receive mode!



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9 Radiated emission measurement (>1 GHz)

according to CFR 47 Part 15, section 15.205(a), 15.209(a), 15.247(d)

9.1 Test location

- Scan with peak detector in 3 m anechoic chamber
- Final measurement with average and max peak detector.

Description	Manufacturer	Inventory No.
Anechoic chamber	EMV TESTHAUS GmbH	E00100

9.2 Test instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESU26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/>	AMF-5D-00501800-28-13P	Parzich	W00089
<input type="checkbox"/>	AMF-6F-16002650-25-10P	Parzich	W00090
<input checked="" type="checkbox"/>	BBHA 9170	Schwarzbeck	W00054
<input type="checkbox"/>	BBHA 9170	Schwarzbeck	W00055
<input checked="" type="checkbox"/>	COSB 4-1-26	Conformitas	W00091

9.3 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.



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Frequency [MHz]	Field strength Fs [$\mu\text{V/m}$]	Field strength [$\text{dB}\mu\text{V/m}$]	Measurement distance d [m]
30 – 88	100	40	3
88 – 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

9.4 Test procedure

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The receiving antenna was placed 3 meters from the turntable. The test setup was placed inside a fully anechoic chamber.
2. Power on the EUT and all peripherals.
3. The broadband antenna was set to vertical polarization.
4. The EMI receiver performed a scan from 1000 MHz to 10th harmonic of the fundamental frequency with the detector set to peak and the measurement bandwidth set to 1 MHz (VBW \geq 1 MHz). The trace data was recorded with the receiver Max Hold function.
5. The turn table was rotated in intervals of 15°.
6. After a full 360°-turn the antenna polarization was changed to horizontal and the test was repeated at step 4 and 5.
7. If the emission level of the EUT measured in peak mode was attenuated more than 3 dB below the average limit, then testing will be stopped and the peak values of the EUT will be reported. Otherwise the emissions will be measured in average mode and reported.
8. After the scan suspicious frequencies were selected and the RBW was set to 1 MHz and the VBW was set to 10Hz and the detector was changed to average reading.
9. The receiving antenna was set to vertical polarization.
10. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
11. The receiving antenna was then set to horizontal polarization and the measurement was repeated at step 9.
12. The highest recorded level was noted.

Above 16 GHz the test antenna was set to a distance of 1.5 m. An extrapolation factor was added to the spectrum analyzer to extrapolate the emission to the specified distance.

$$\text{Extrapolation factor} = 20 \cdot \log\left(\frac{3m}{1.5m}\right)$$

Limit line = specific limit + extrapolation factor



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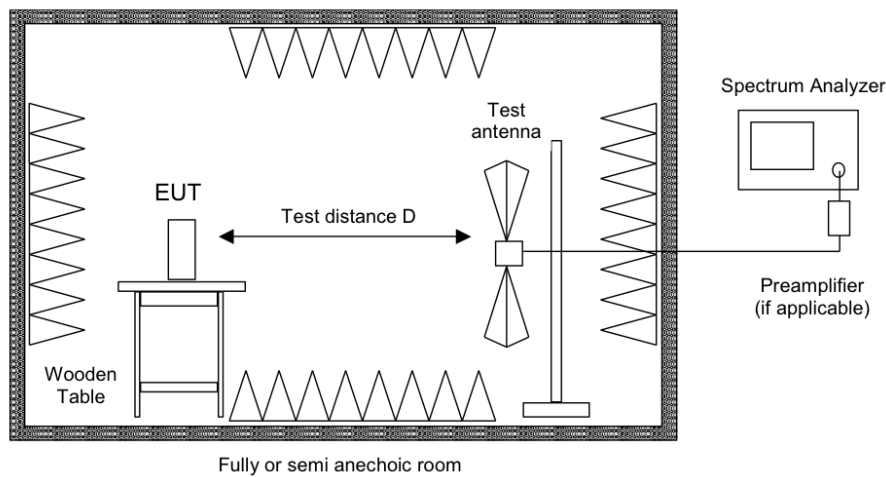
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9.5 Test setup



Picture 53: Test setup for radiated emission measurement (> 1 GHz)

9.6 Test deviation

There is no deviation with the original standard.

9.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

9.8 Test results 802.11b

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-09-26

Channel 1

Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
7.2308	46.69	PK	53.98	-7.29	PASS
9.6394	44.11	PK	53.98	-9.87	PASS
14.9673	46.20	PK	53.98	-7.78	PASS
19.2885	42.62	PK	53.98	-11.36	PASS

Channel 6

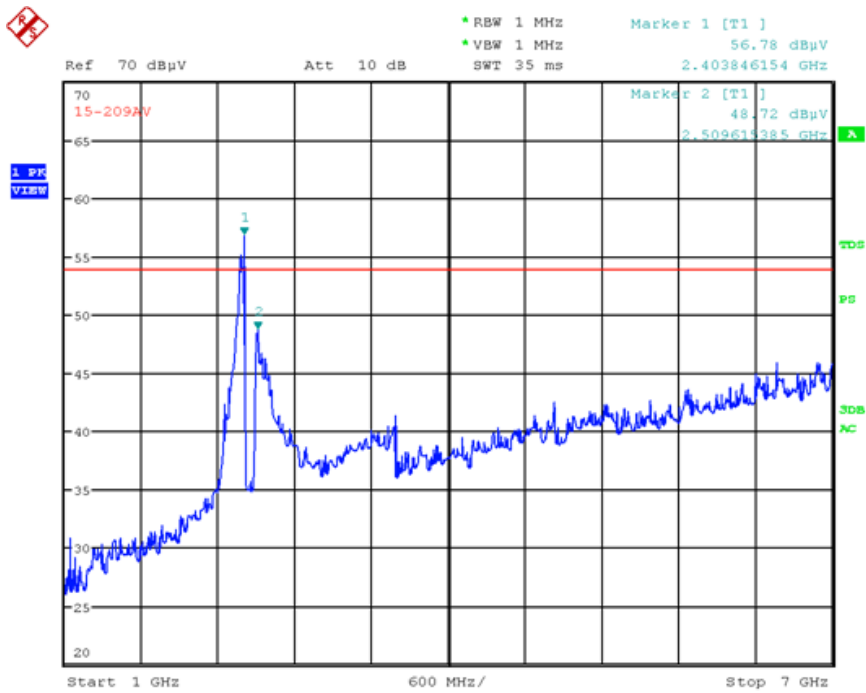
Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
See Note					

Channel 11

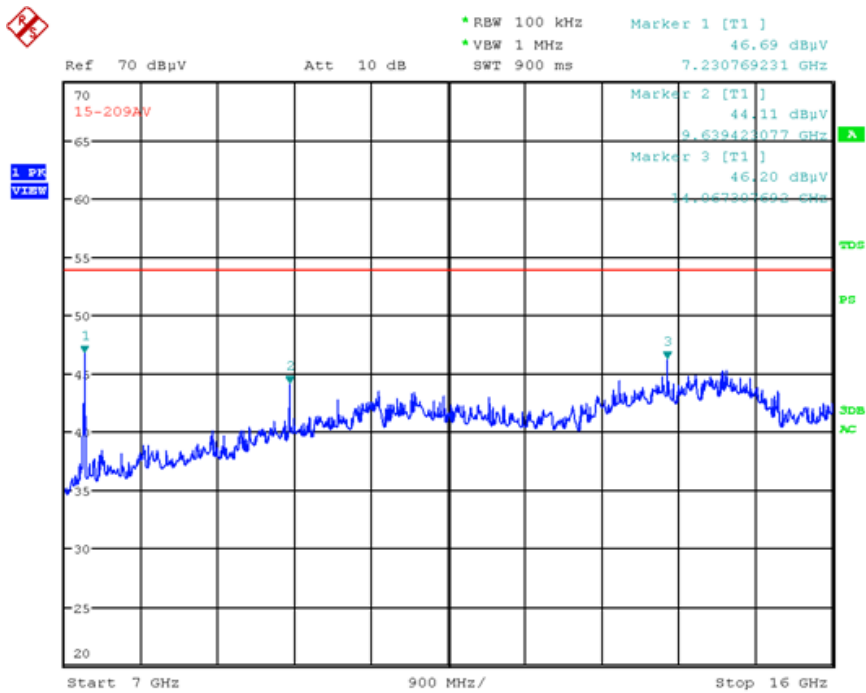
Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
See Note					

Note: All spurious/harmonics emissions that are attenuated to noise floor of the spectrum analyzer or 20dB below the specific limit are not reported. The emissions at band edges are documented separately.

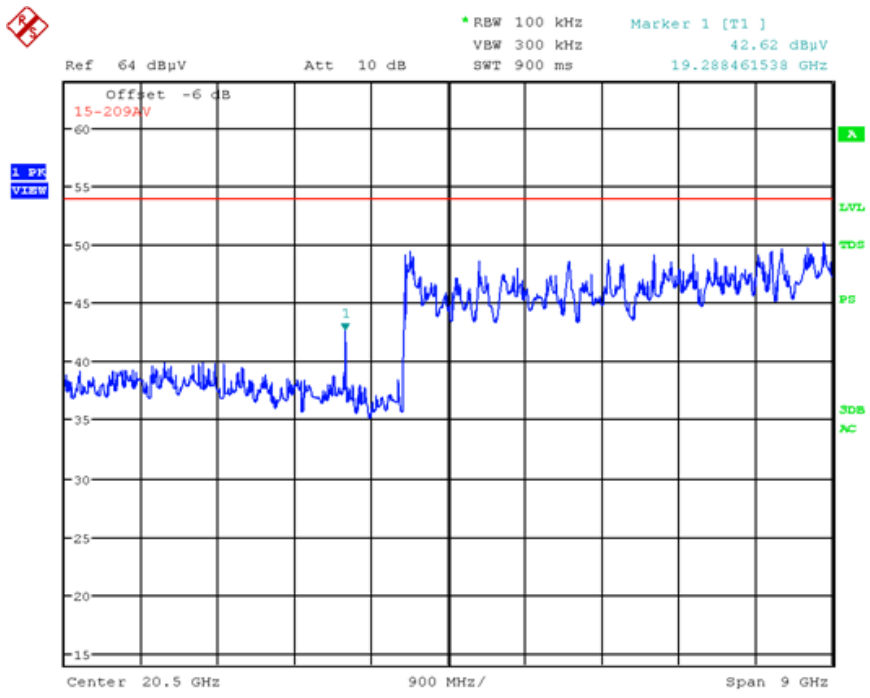




Picture 54: Spurious emissions channel 1, 1 GHz-7 GHz (Overview scan)



Picture 55: Spurious emissions channel 1, 7 GHz-16 GHz (overview scan)



Picture 56: Spurious emissions channel 1, 16 GHz-25 GHz (overview scan)



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9.9 Test results 802.11g

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-09-26

Channel 1

Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
7.2308	46.08	PK	53.98	-7.9	PASS

Channel 6

Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
See Note					

Channel 11

Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
See Note					

Note: All spurious/harmonics emissions that are attenuated to noise floor of the spectrum analyzer or 20dB below the specific limit are not reported. The emissions at band edges are documented separately.



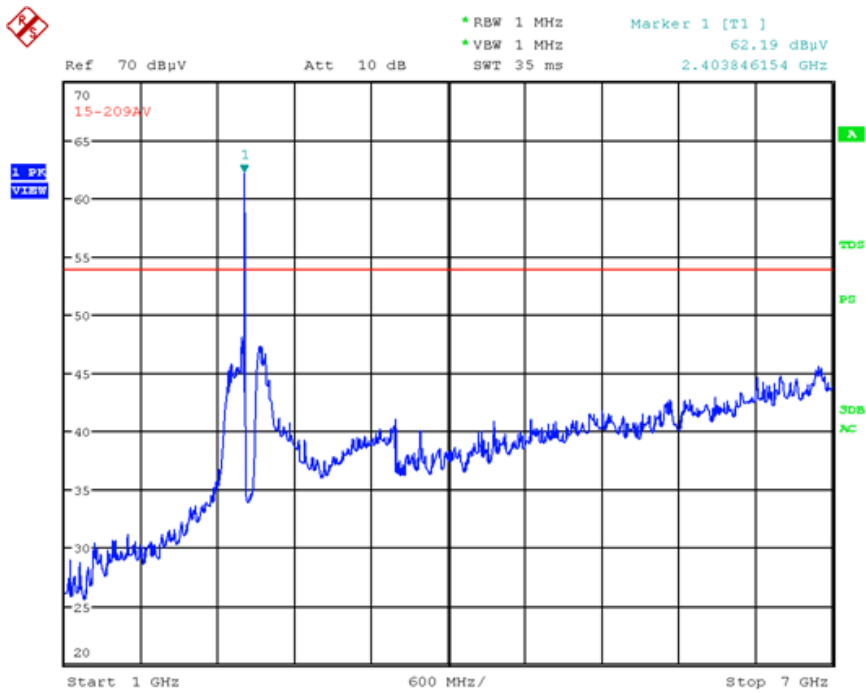
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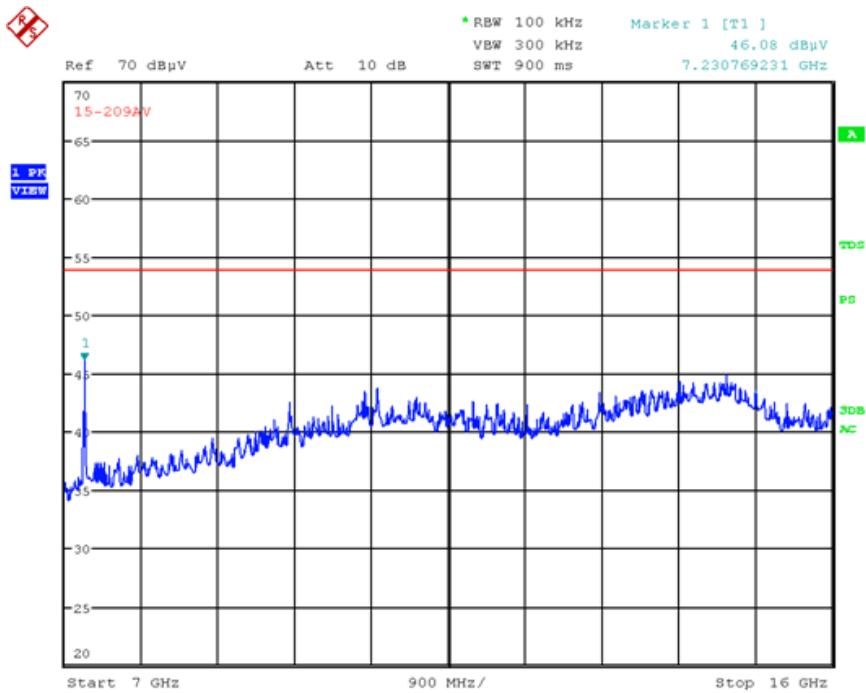
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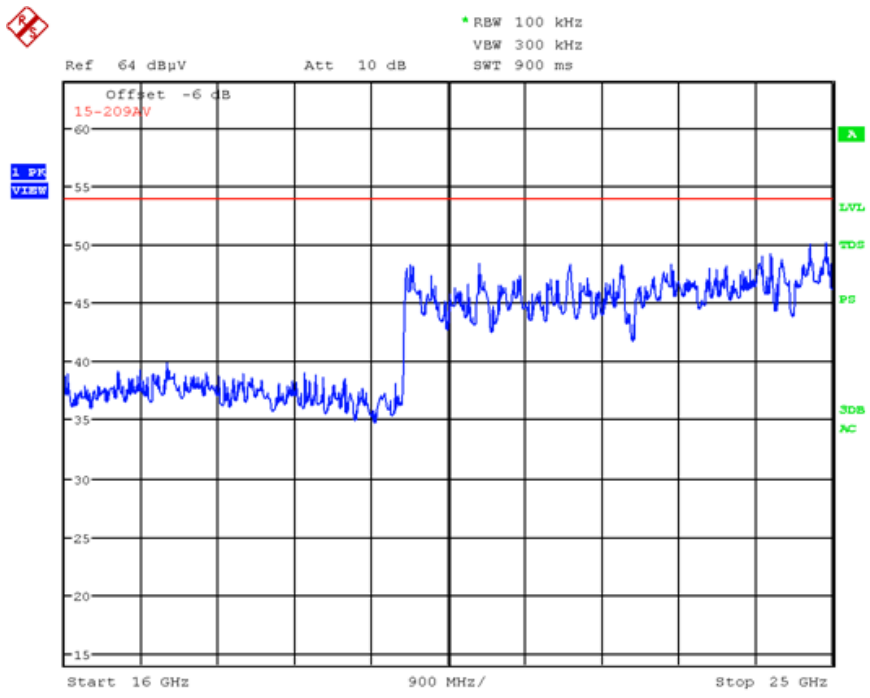
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Picture 57: Spurious emissions channel 1, 1 GHz-7 GHz (overview scan)



Picture 58: Spurious emissions channel 1, 7 GHz-16 GHz (overview scan)



Picture 59: Spurious emissions channel 1, 16 GHz-25 GHz (overview scan)



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9.10 Test results 802.11n

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-09-26

Channel 1

Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
7.2308	44.45	PK	53.98	-9.53	PASS

Channel 6

Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
See Note					

Channel 11

Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
19.6923	42.53	PK	53.98	-11.45	PASS

Note: All spurious/harmonics emissions that are attenuated to noise floor of the spectrum analyzer or 20dB below the specific limit are not reported. The emissions at band edges are documented separately.

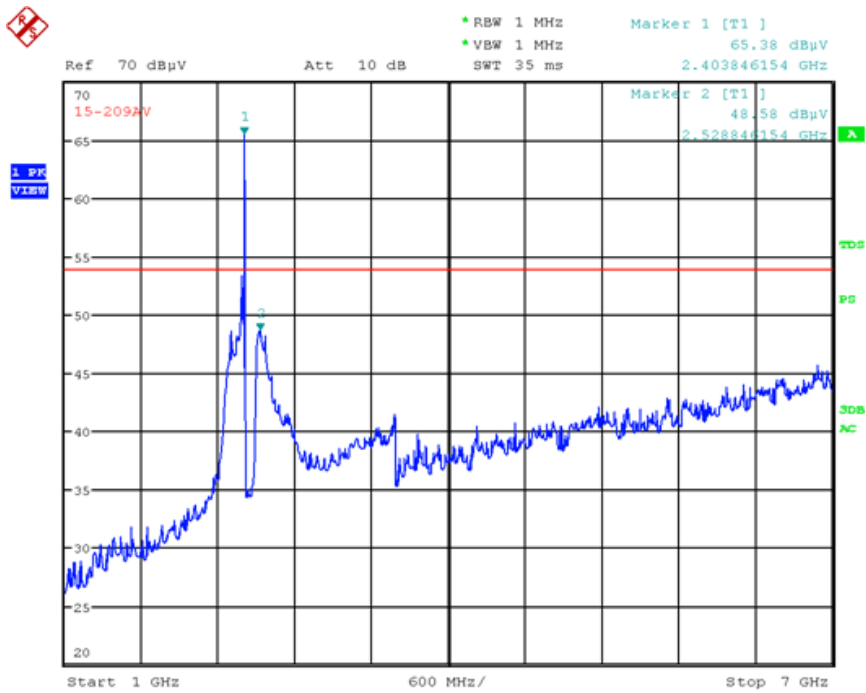


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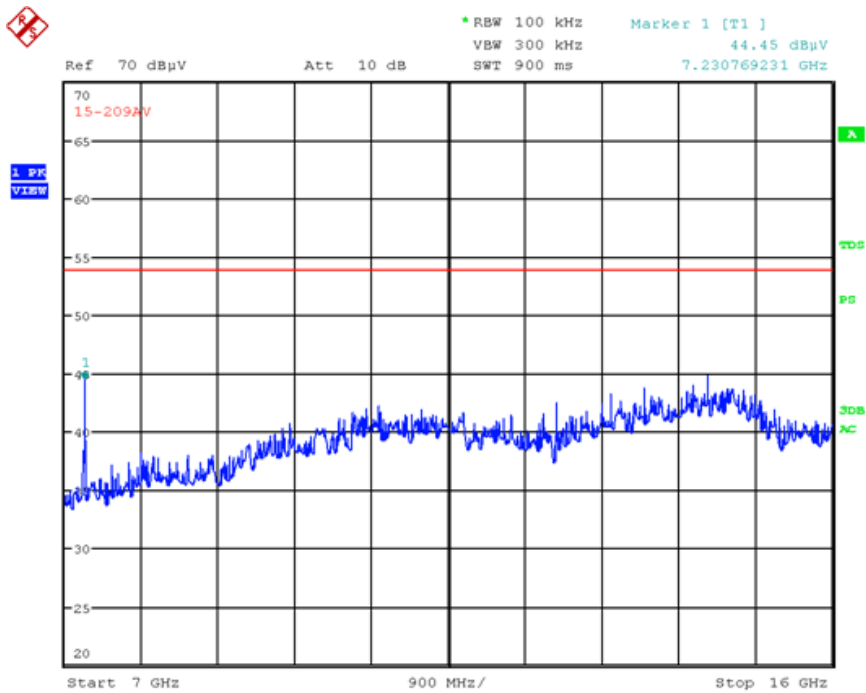
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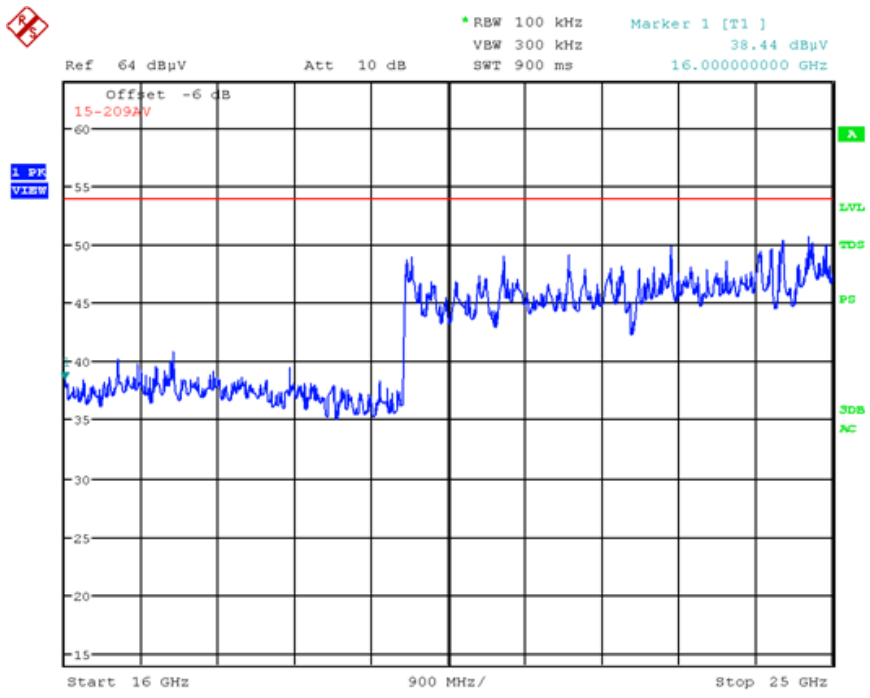
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Picture 60: Spurious emissions channel 1, 1 GHz-7 GHz (overview scan)



Picture 61: Spurious emissions channel 1, 7 GHz-16 GHz (overview scan)



Picture 62: Spurious emissions channel 1, 16 GHz-25 GHz (overview scan)



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10 Band edge measurement

according to CFR 47 Part 15, section 15.205(a), 15.209(a), 15.247(d)

10.1 Test location

- Scan with peak detector in 3 m anechoic chamber
- Final measurement with average and max peak detector.

Description	Manufacturer	Inventory No.
Anechoic chamber	EMV TESTHAUS GmbH	E00100

10.2 Test instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESU26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/>	AMF-5D-00501800-28-13P	Parzich	W00089
<input type="checkbox"/>	AMF-6F-16002650-25-10P	Parzich	W00090
<input checked="" type="checkbox"/>	BBHA 9170	Schwarzbeck	W00054
<input type="checkbox"/>	BBHA 9170	Schwarzbeck	W00055
<input checked="" type="checkbox"/>	COSB 4-1-26	Conformitas	W00091

10.3 Limits

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the 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. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

10.4 Test procedure

1. The test procedure is the same as in 9.4. The investigated frequency range is limited to 100 MHz around band edge emissions.



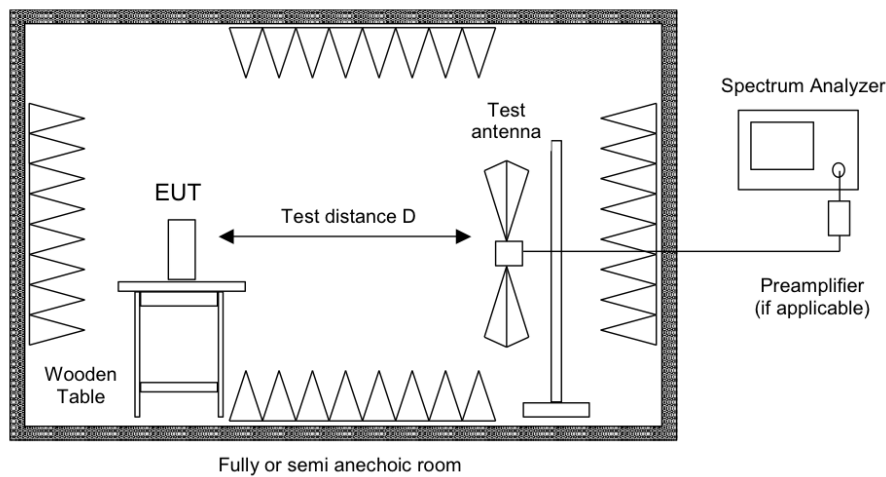
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10.5 Test setup



Picture 63: Test setup for radiated emission measurement (> 1 GHz)

10.6 Test deviation

There is no deviation with the original standard.

10.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

10.8 Test results 802.11b

Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-09-26

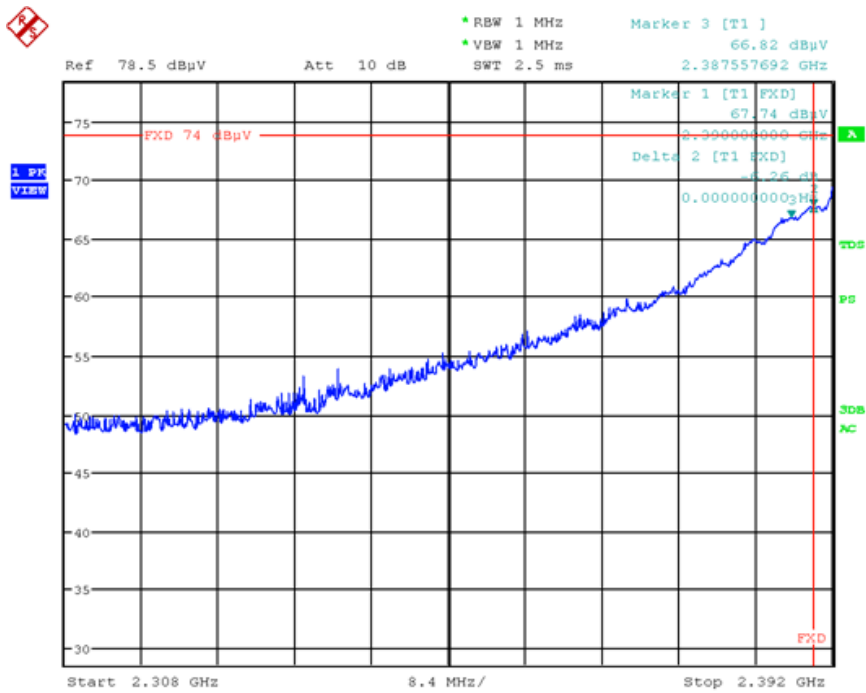
Channel 1

Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
2.3876	66.82	PK	73.98	-7.16	PASS
2.3876	47.21	AV	53.98	-6.77	PASS
2.3900	67.74	PK	73.98	-6.24	PASS
2.3900	45.66	AV	53.98	-8.32	PASS

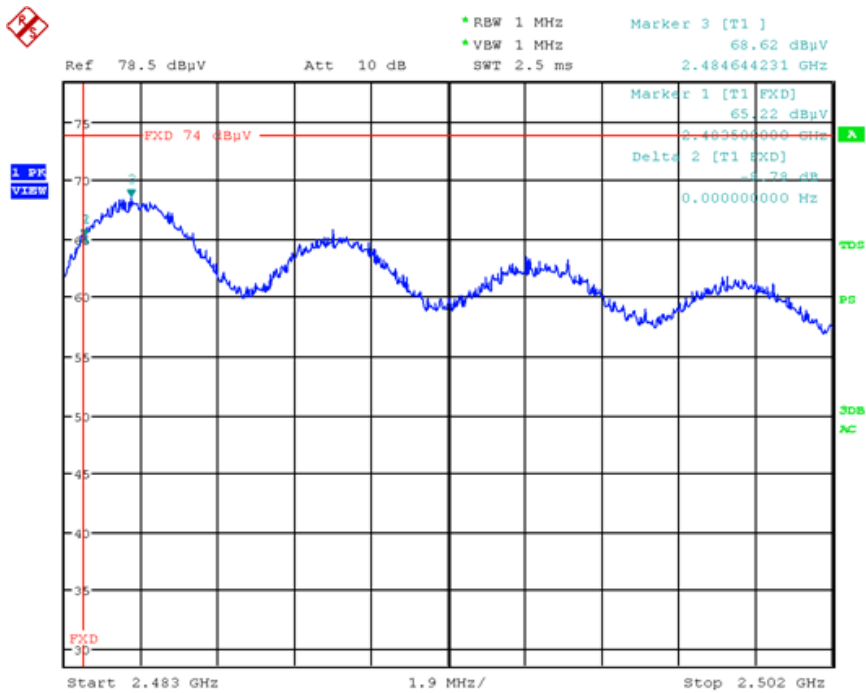
Channel 11

Frequency (GHz)	Reading (dB μ V/m)	Detector	Limit (dB μ V/m)	Margin	Result
2.4835	65.22	PK	73.98	-8.76	PASS
2.4835	47.94	AV	53.98	-6.04	PASS
2.4846	68.62	PK	73.98	-5.36	PASS
2.4846	46.22	AV	53.98	-7.76	PASS





Picture 64: Low band edge 802.11b, channel 1



Picture 65: High band edge 802.11b, channel 11

10.9 Test results 802.11g/n

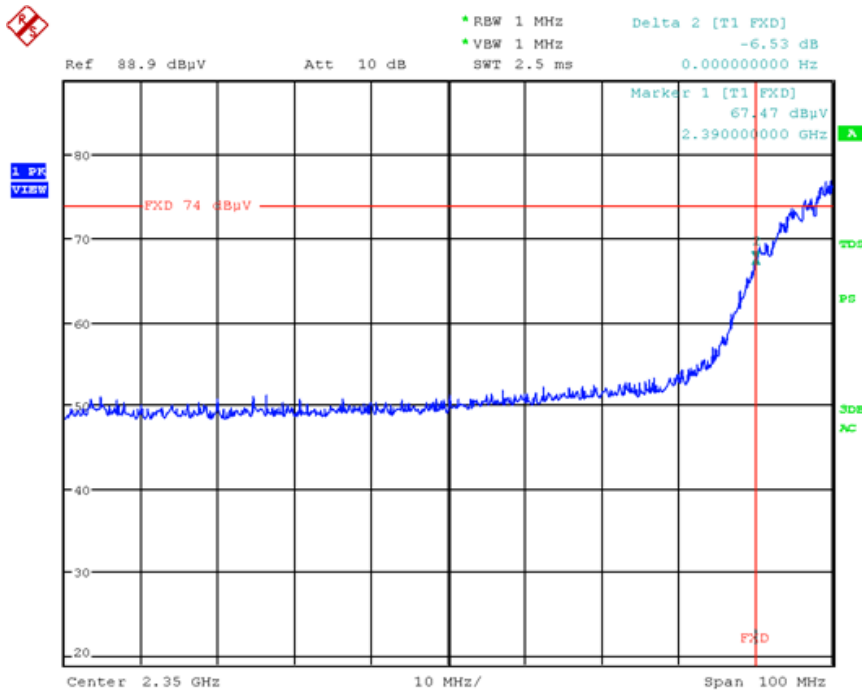
Temperature:	22°C	Humidity:	44%
Tested by:	M. Janker	Test date:	2011-09-26

Channel 1

Frequency (GHz)	Reading (dBµV/m)	Detector	Limit (dBµV/m)	Margin	Result
2.3900	67.47	PK	73.98	-6.51	PASS
2.3900	47.03	AV	53.98	-6.95	PASS

Channel 11

Frequency (GHz)	Reading (dBµV/m)	Detector	Limit (dBµV/m)	Margin	Result
2.4835	72.33	PK	73.98	-1.65	PASS
2.4835	52.86	AV	53.98	-1.12	PASS



Picture 66: Low band edge 802.11g/n, channel 1



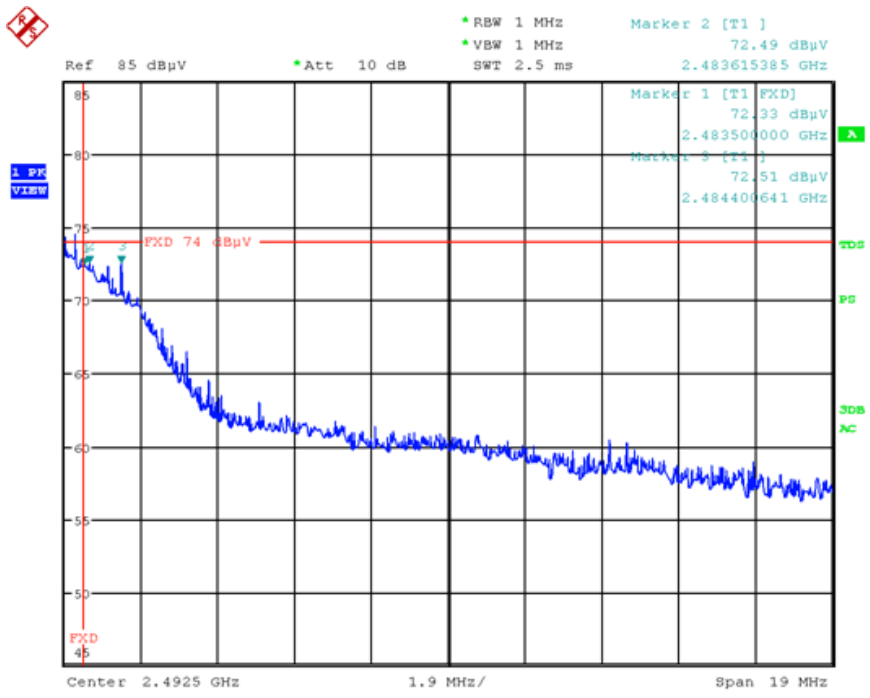
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 Germany
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Picture 67: High band edge 802.11g/n, channel 11



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12 Equipment calibration status

Inventory Number	Model Number	Manufacturer	Last calibration	Next calibration	Cycle of calibration
W00002	ESU26	Rohde & Schwarz	Sep 2009	Sep 2011	2 Years
E00001	ESCI	Rohde & Schwarz	July 2011	Sep 2011	2 Years
E00003	ESCS 30	Rohde & Schwarz	Oct 2010	Oct 2012	1 Year
E00004	ESH 2-Z5	Rohde & Schwarz	Jan 2011	Jan 2013	2 Years
E00005	ESH 2-Z5	Rohde & Schwarz	Sep 2009	Sep 2011	2 Years
E00060	HFH2-Z2	Rohde & Schwarz	Oct 2008	Oct 2011	4 Years*
E00011	VULB 9160	Schwarzbeck	Sep 2009	Sep. 2011	2 Years
E00012	VULB 9163	Schwarzbeck	Mar 2011	Mar 2012	1 Years
C00015	VC ³ 4034	Vötsch	Aug 2010	Aug 2014	4 Years*

Table 1: Equipment Calibration status

* Equipment is not used often and the maintenance and calibration interval of these equipment is subject to special precautions of the quality management.



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13 Measurement uncertainty

Description	Max. deviation	k=
Conducted emission AMN (9kHz to 30 MHz)	± 4,0 dB	2
Radiated emission open field (30 MHz to 1 GHz)	± 4,5 dB	2
Radiated emission absorber chamber (> 1000 MHz)	± 5,4 dB	2

Table 2: Measurement uncertainty

Comment: The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k. If k=2 the value of the measurements lies within the assigned range of values with a probability of 95 %.



14 Summary

The EMC Regulations according to the marked specifications are

KEPT

The EUT does fulfill the general approval requirements mentioned.

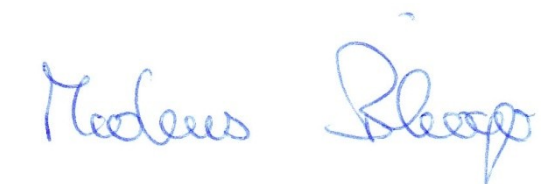
NOT KEPT

The EUT does not fulfill the general approval requirements mentioned.

Place, Date: Straubing, September 29, 2011



Marco Janker
Test engineer
EMV **TESTHAUS** GmbH



Markus Biberger
Technical executive
EMV **TESTHAUS** GmbH