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FCC Test Report

Company:	Williams Enterprises 1714 Hwy. 14 West Carmi, IL 62821
Contact:	David Camp
Product:	Watchfire Remote Video Web Server
FCC ID:	WK2-WFV100
Test Report No:	R121808-01
APPROVED BY:	Nic Johnson Test Engineer
DATE:	17 March 2009
Total Pages:	46

ACCREDITED
Test Laboratory Certificate 1953.01

1.0 Summary of test results

1.1 Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARDS: FCC Part 15, Subpart C			
Standard Section	**Test Type and Limit**	**Result**	**Remark**
15.203	Unique Antenna Requirement	Pass	EUT uses reverse polarity SMA connector.
15.107	Conducted Emissions	Pass	Meets the requirement of the limit.
15.109	Radiated Emissions	Pass	Meets the requirement of the limit.
15.247(a)(2)	Minimum Bandwidth, Limit: min. 500kHz	Pass	Meets the requirement of the limit.
15.247(b)	Maximum Peak Output Power, Limit: Max. 23.9dBm	Pass	Meets the requirement of the limit.
15.247(e)	Power Spectral Density, Limit: Max. 8dBm	Pass	Meets the requirement of the limit.
15.247(d)	Band Edge Measurement, Limit: 20dB less than the peak value of fundamental frequency	Pass	Meets the requirement of the limit.

1.2 Test Methods

1.2.1 Conducted AC Emissions

The EUT was powered by 120VAC/60Hz with a 50Ω load on the antenna port. Compliance to 47 CFR Part 15.207 was tested in accordance with the methods of ANSI/IEEE C63.4: 2003. Measurements were made on both conductors.

1.2.2 Radiated Emissions

Compliance to 47 CFR Parts 15.209 and 15.247 was tested in accordance with the methods of ANSI/IEEE C63.4: 2003. Several configurations were examined and the results presented represent a worst-case scenario. The EUT was placed on a wooden table approximately 80cm high and centered on a 4m diameter turntable. The table was rotated to find the angles of maximum emissions and the receiving antenna was moved from 1m to 4m in both vertical and horizontal positions. All measurements were taken at a distance of 3m from the EUT for Part 15.209 intentional radiator measurements.

2.0 Description

2.1 Equipment under test

EUT Received Date: 22 December 2008
EUT Tested Dates: February 11, March 15, 16, 17, 2009

PRODUCT	Watchfire Remote Video Web Server
MODULATION TYPE	OFDM, DSSS, DBPSK, DQPSK, CCK
DATA RATE	OFDM: 54Mb/s DSSS: 11Mb/s
RADIO TECHNOLOGY	802.11b, 802.11g
FREQUENCY RANGE	2.412-2.462GHz
NUMBER OF CHANNELS	11
MAX OUTPUT POWER	21.57dBm (143.55mW)
EUT CLASSIFICATION	A (For industrial and commercial use only)

NOTE:
1. For more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2.2 Laboratory description

All testing was performed at the NCEE Lincoln facility, which is a FCC and IC registered lab. This site has been fully described in previously submitted reports. Laboratory environmental conditions varied slightly throughout the tests:

Relative humidity of 45 ± 4%
Temperature of 20 ± 3° Celsius

2.3 Description of test modes

The EUT was tested at the frequencies below:

Channel	Frequency GHz	Test Mode
1	2.412	802.11b
6	2.437	802.11b
11	2.462	802.11b
1	2.412	802.11g
6	2.437	802.11g
11	2.462	802.11g

2.4 Applied standards

The EUT uses digital modulation and operates between 2.412GHz – 2.462GHz . According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247) using ANSI/IEEE C63.4: 2003
FCC Part 15, Subpart C (15.209) using ANSI/IEEE C63.4: 2003
KDB Publication No. 558074: 2005

All test items have been performed and recorded as per the above standards.

2.5 Description of support units

None

2.6 Configuration of system under test

This EUT was set to transmit in a worse-case scenario with modulation on. The software allowed the selection of the channel and modulation type. The EUT was tested with the video camera supplied by the manufacturer.

The EUT used a 12V, 3A power supply from DVE, model number DSA-0421S-12 2 36.

3.0 Test equipment used

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE
Rohde & Schwarz Test Receiver	ESIB26	100037	19 Aug 2008
EMCO Biconilog Antenna	3142B	1654	6 Feb 2009
EMCO Horn Antenna	3115	6415	6 Feb 2009
EMCO Horn Antenna**	3116	2576	6 Jun 2008
Rohde & Schwarz LISN	ESH3-Z5	836679/010	12 Jun 2008
Hewlett Packard Power Meter	4378	100307	20 Jan 2009
Hewlett Packard Power Sensor	8481A	2702A63981	20 Jan 2009
Rohde & Schwarz Preamp*	TS-PR18	082001/003	6 Dec 2008
Trilithic High Pass Filter*	6HC330	23042	6 Dec 2008

*Used for radiated measurements above 3GHz
**Used for radiated measurements above 18GHz

4.0 Detailed results

4.1 Unique antenna requirement

4.1.1 Standard applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

4.1.2 Antenna description

The equipment uses a reverse polarity SMA connector so commercially available antennas are not compatible.

4.2 Radiated emissions

4.2.1 Limits for radiated emissions measurements

Emissions radiated outside of the specified bands shall be applied to the limits in part 15.109 for the unintentional radiator functionality of the EUT as followed:

15.109 Class A Limits

Frequency of emission (MHz)	Field strength (microvolts/meter)
30-88	90
88-216	150
216-960	210
Above 960	300

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 * log * Emission level (μV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20dB under any condition of modulation.

4.2.2 Test procedures

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground plane in a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. For measurements above 1GHz, the antenna was placed 3m away from the EUT.

c. The antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.

2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for peak and average detectors at frequencies above 1GHz.

4.2.3 Deviations from test standard

No deviation.

4.2.4 Test setup

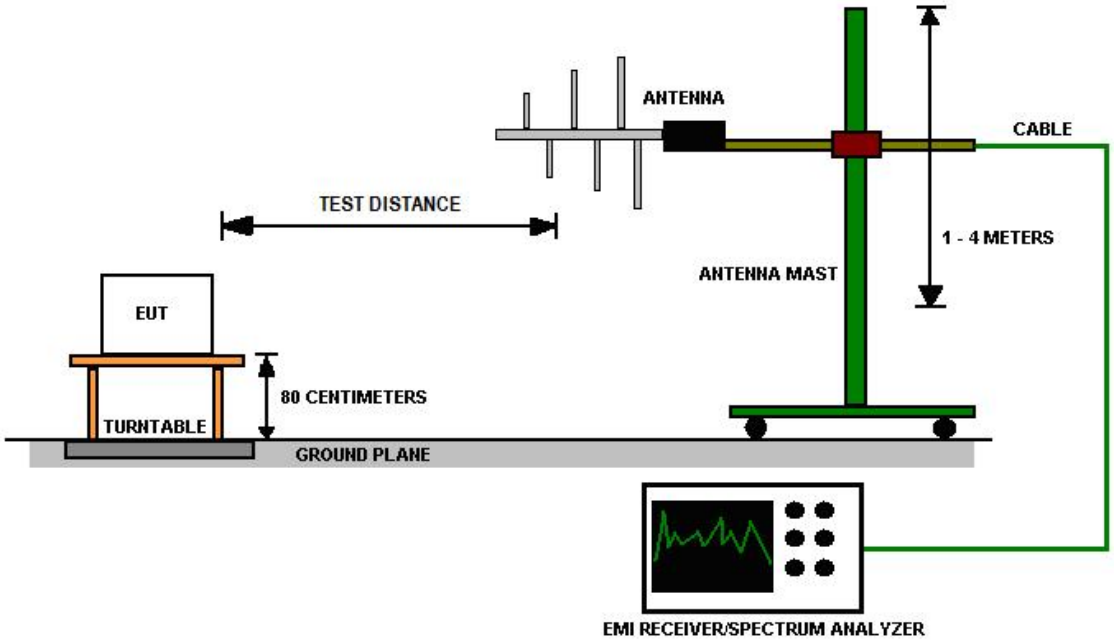


Figure 1 - Radiated Emissions Test Setup

For the actual test configuration, please refer to Appendix A for photographs of the test configuration.

4.2.5 EUT operating conditions

This EUT was set to transmit in a worse-case scenario with modulation on. The software allowed the selection of the channel and modulation type. The EUT was tested with a camera and all cables populated.

4.2.6 Test results

EUT	Watchfire Remote Video Web Server	MODE	Continuous transmit
INPUT POWER	120VAC/60Hz	FREQUENCY RANGE	30MHz – 25GHz
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

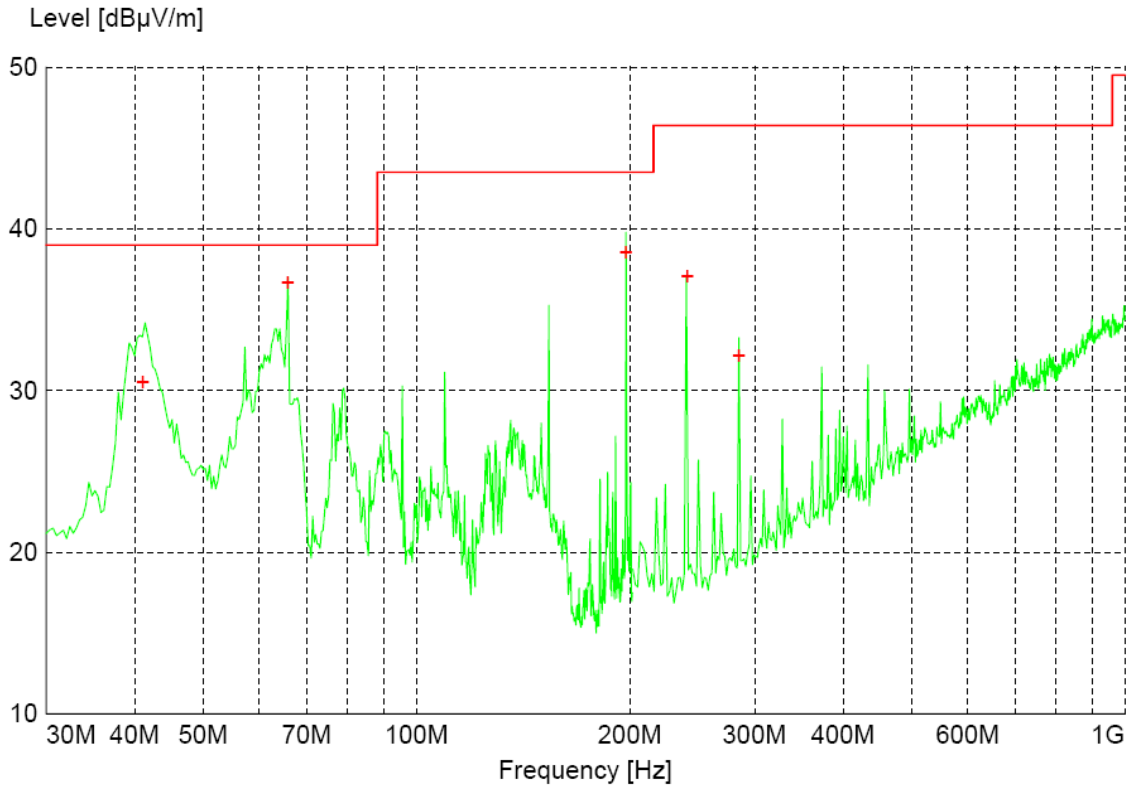


Figure 2 - Radiated Emissions Plot, Channel 1, 802.11b

Channel 1, 802.11b Quasi-peak Data

Frequency	Level	Limit	Margin	Height	Angle	Pol.
MHz	dBµV/m	dBµV/m	dB	cm	deg.	
41.1	30.51	39.0	8.5	103	0	VERT
65.82	36.66	39.0	2.3	187	180	VERT
197.4	38.54	43.5	5.0	98	331	VERT
241.3	37.05	46.4	9.4	103	189	VERT
285.16	32.13	46.4	14.3	100	91	VERT

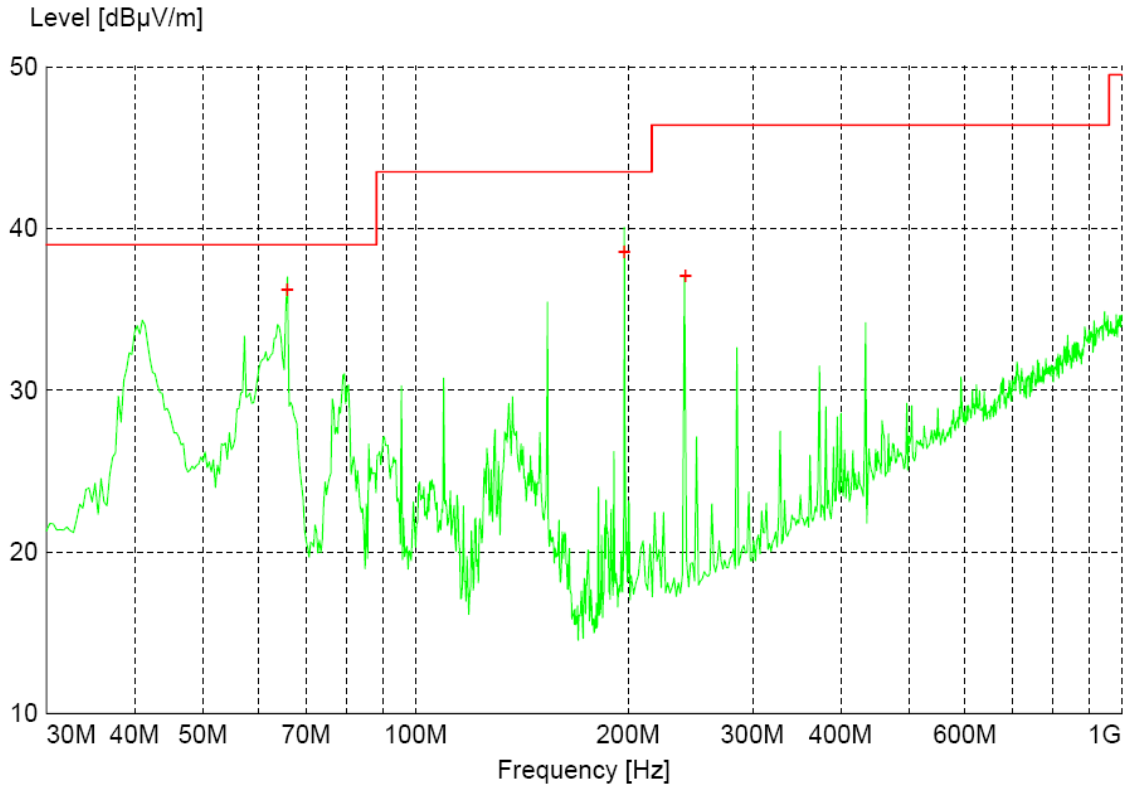


Figure 3 - Radiated Emissions Plot, Channel 6, 802.11b

Channel 6, 802.11b Quasi-peak Data

Frequency	Level	Limit	Margin	Height	Angle	Pol.
MHz	dBµV/m	dBµV/m	dB	cm	deg.	
65.82	38.52	39	2.8	257	68	VERT
197.4	38.52	43.5	5.0	100	341	VERT
241.3	37.09	46.4	9.3	102	204	VERT

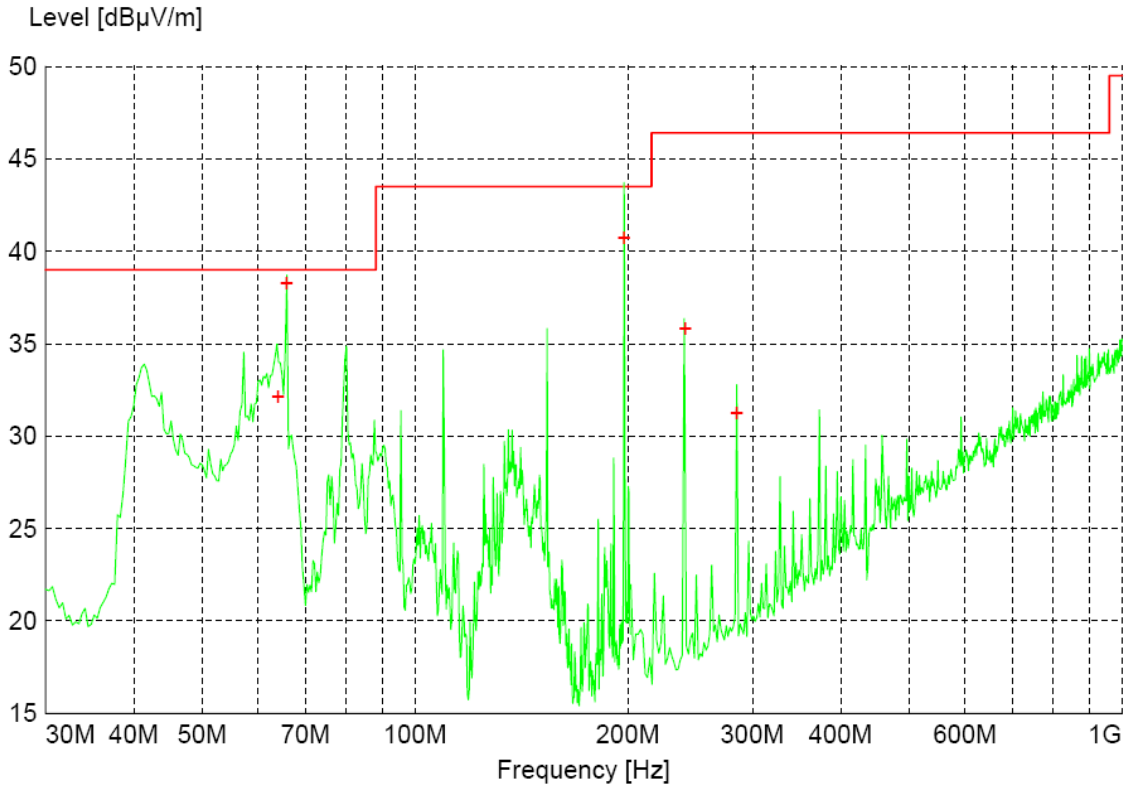


Figure 4 - Radiated Emissions Plot, Channel 11, 802.11b

Channel 11, 802.11b Quasi-peak Data

Frequency	Level	Limit	Margin	Height	Angle	Pol.
MHz	dBµV/m	dBµV/m	dB	cm	deg.	
64.02	32.13	39.0	6.9	240	317	VERT
65.82	38.24	39.0	0.7	260	107	VERT
197.46	40.73	43.5	2.8	99	151	VERT
241.3	35.81	46.4	10.6	103	223	VERT
285.16	31.24	46.4	15.2	100	360	VERT

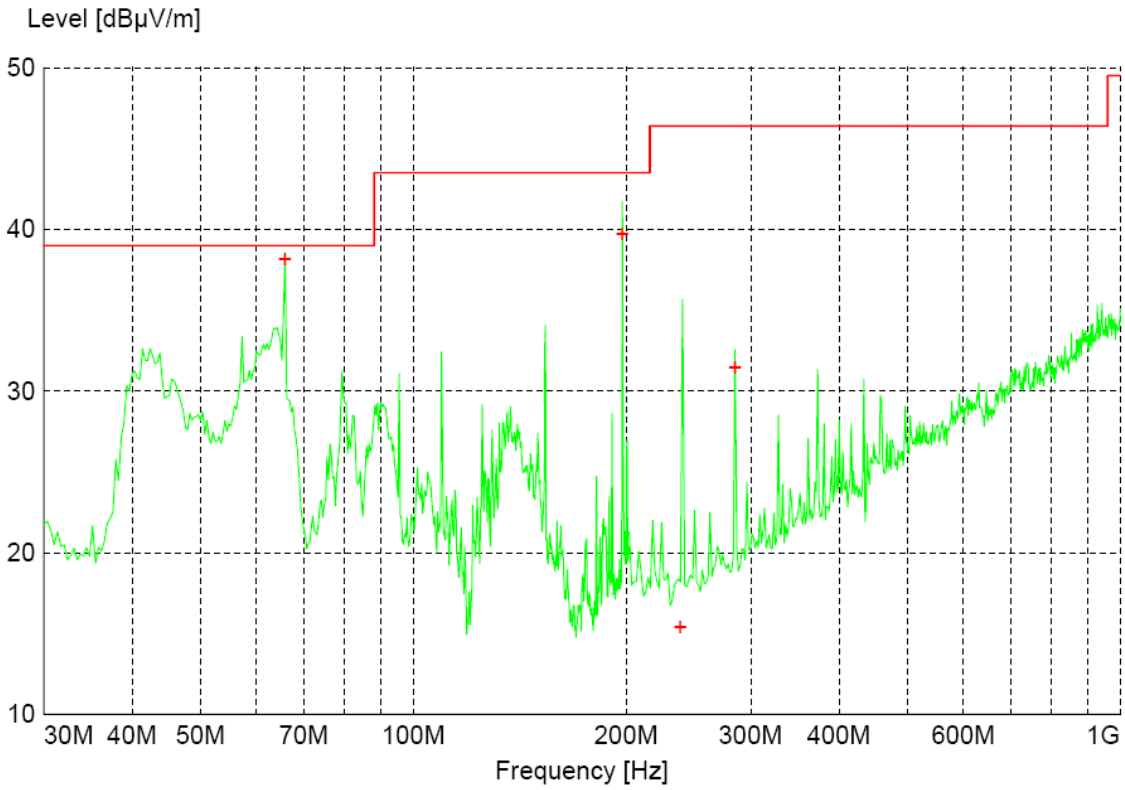


Figure 5 - Radiated Emissions Plot, Channel 1, 802.11g

Channel 1, 802.11g Quasi-peak Data

Frequency	Level	Limit	Margin	Height	Angle	Pol.
MHz	dBµV/m	dBµV/m	dB	cm	deg.	
65.82	38.12	39	0.9	260	150	VERT
197.4	39.74	43.5	3.8	100	156	VERT
238.6	15.36	46.4	31.0	301	243	HORI
285.16	31.43	46.4	15.0	100	0	VERT

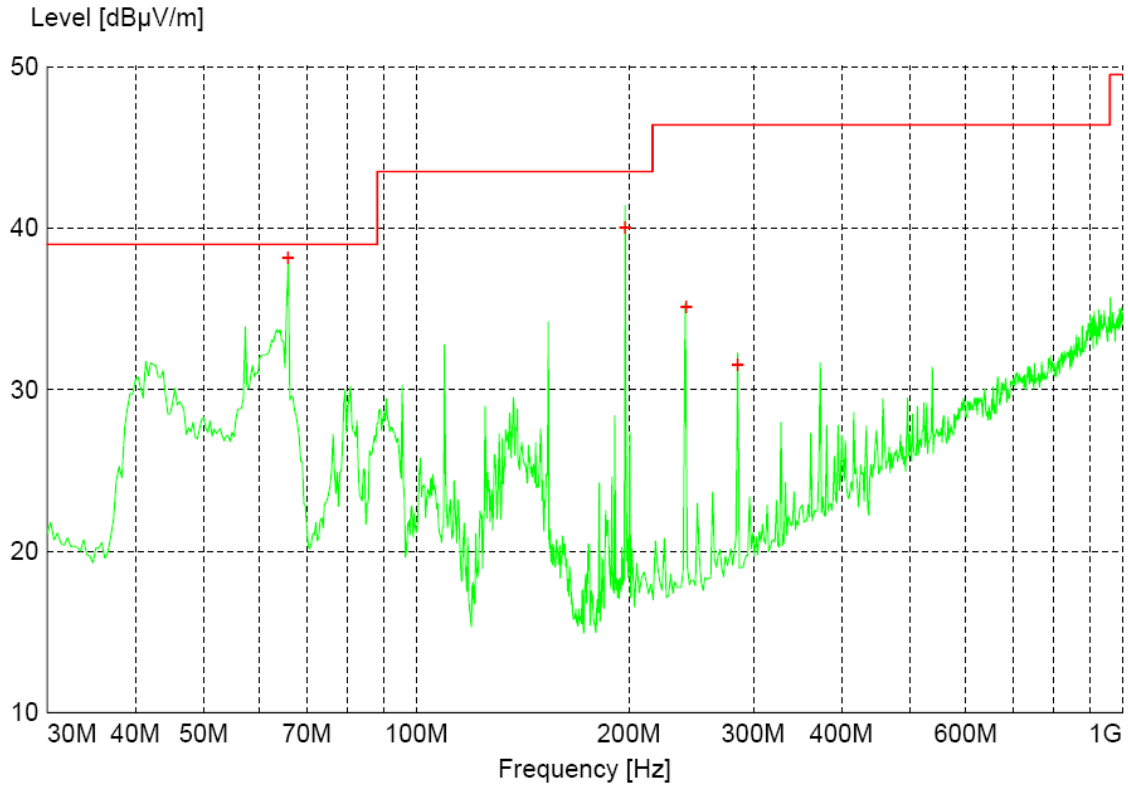


Figure 6 - Radiated Emissions Plot, Channel 6, 802.11g

Channel 6, 802.11g Quasi-peak Data

Frequency	Level	Limit	Margin	Height	Angle	Pol.
MHz	dBµV/m	dBµV/m	dB	cm	deg.	
65.82	38.18	39.0	0.8	260	101	VERT
197.4	40.00	43.5	3.5	100	145	VERT
241.3	35.12	46.4	11.3	103	224	VERT
285.16	31.50	46.4	14.9	100	0	VERT

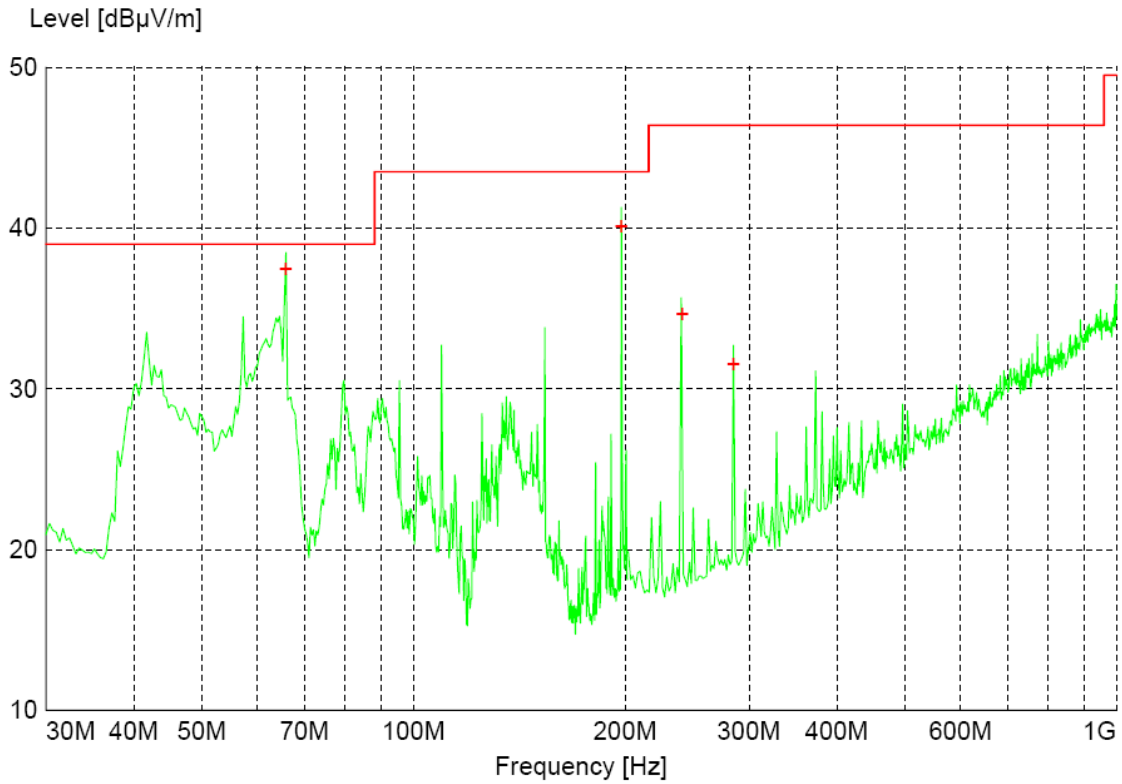


Figure 7 - Radiated Emissions Plot, Channel 11, 802.11g

Channel 11, 802.11g Quasi-peak Data

Frequency	Level	Limit	Margin	Height	Angle	Pol.
MHz	dBµV/m	dBµV/m	dB	cm	deg.	
65.82	37.45	39.0	1.6	243	106	VERT
197.4	40.08	43.5	3.4	98	155	VERT
241.3	34.63	46.4	11.8	103	214	VERT
285.16	31.49	46.4	14.9	100	0	VERT

Peak and Average Measurements above 1GHz:

Channel 1, 802.11b

Frequency	Level	Limit	Margin	Height	Angle	Pol.	Detector
MHz	dBµV/m	dBµV/m	dB	cm	deg.		
4803.00	25.69	59.50	33.80	190	356	VERT	Average
9653.50	35.43	59.50	24.10	156	203	VERT	Average
14419.50	40.54	59.50	19.00	399	45	VERT	Average
2413.50	108.64	NA	NA	394	358	VERT	Peak
4803.00	39.71	79.50	19.80	190	356	VERT	Peak
9653.50	52.11	79.50	7.40	156	203	VERT	Peak
14419.50	54.18	79.50	5.30	399	45	VERT	Peak

Channel 6, 802.11b

Frequency	Level	Limit	Margin	Height	Angle	Pol.	Detector
MHz	dBµV/m	dBµV/m	dB	cm	deg.		
4765.00	25.83	59.50	33.70	150	272	VERT	Average
7317.50	33.29	59.50	26.20	166	184	VERT	Average
9748.00	34.84	59.50	24.70	349	274	VERT	Average
12165.00	37.54	59.50	22.00	213	92	VERT	Average
2441.00	114.22	NA	NA	203	79	VERT	Peak
4765.00	39.57	79.50	19.90	150	272	VERT	Peak
7317.50	46.22	79.50	13.30	166	184	VERT	Peak
9748.00	48.78	79.50	10.70	349	274	VERT	Peak
12165.00	52.19	79.50	7.30	213	92	VERT	Peak

Channel 11, 802.11b

Frequency	Level	Limit	Margin	Height	Angle	Pol.	Detector
MHz	dBµV/m	dBµV/m	dB	cm	deg.		
4912.00	25.46	59.50	34.00	156	211	VERT	Average
7329.00	33.39	59.50	26.10	100	56	VERT	Average
9815.50	34.96	59.50	24.50	350	73	VERT	Average
12212.50	37.67	59.50	21.80	256	54	VERT	Average
2460.00	114.77	NA	NA	166	83	VERT	Peak
4912.00	38.74	79.50	20.80	156	211	VERT	Peak
7329.00	47.17	79.50	12.30	100	56	VERT	Peak
9815.50	48.60	79.50	10.90	350	73	VERT	Peak
12212.50	50.92	79.50	8.60	256	54	VERT	Peak

Channel 1, 802.11g

Frequency	Level	Limit	Margin	Height	Angle	Pol.	Detector
MHz	dBµV/m	dBµV/m	dB	cm	deg.		
4815.50	25.50	59.50	34.00	150	359	VERT	Average
7235.00	32.73	59.50	26.80	150	118	VERT	Average
9646.00	35.36	59.50	24.10	249	334	VERT	Average
12052.50	37.89	59.50	21.60	193	246	VERT	Average
2415.50	107.42	NA	NA	166	149	VERT	Peak
4815.50	39.09	79.50	20.50	150	359	VERT	Peak
7235.00	46.75	79.50	12.70	150	118	VERT	Peak
9646.00	50.17	79.50	9.30	249	334	VERT	Peak
12052.50	51.39	79.50	8.10	193	246	VERT	Peak

Channel 6, 802.11g

Frequency	Level	Limit	Margin	Height	Angle	Pol.	Detector
MHz	dBµV/m	dBµV/m	dB	cm	deg.		
4871	25.89	59.5	33.6	394	208	VERT	Average
7312	33.12	59.5	26.4	150	95	VERT	Average
9745	34.71	59.5	24.8	269	247	VERT	Average
12173	37.53	59.5	22	150	338	VERT	Average
2439	114.08	NA	NA	200	285	VERT	Peak
4871	39.01	79.5	40.49	394	208	VERT	Peak
7312	46.57	79.5	32.93	150	95	VERT	Peak
9745	51.64	79.5	27.86	269	247	VERT	Peak
12173	51	79.5	28.5	150	338	VERT	Peak

Channel 11, 802.11g

Frequency	Level	Limit	Margin	Height	Angle	Pol.	Detector
MHz	dBµV/m	dBµV/m	dB	cm	deg.		
4909.50	25.89	59.50	33.60	399	160	VERT	Average
7401.50	33.74	59.50	25.80	150	317	VERT	Average
9839.50	35.25	59.50	24.30	150	4	VERT	Average
12301.50	38.65	59.50	20.80	115	236	VERT	Average
2464.50	112.75	NA	NA	179	151	VERT	Peak
4909.50	39.12	79.50	20.40	399	160	VERT	Peak
7401.50	47.15	79.50	12.30	150	317	VERT	Peak
9839.50	49.00	79.50	10.50	150	4	VERT	Peak
12301.50	51.94	79.50	7.60	115	236	VERT	Peak

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. Radiated limits do not apply from 2400.0 GHz to 2483.5 GHz and measurements are listed for reference only.

4.3 Bandwidth

4.3.1 Limits of bandwidth measurements

The 6dB bandwidth of the signal must be greater than 0.50MHz.

4.3.2 Test procedures

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 10 MHz VBW. The 6 dB bandwidth is defined as the bandwidth of which is higher than peak power minus 6dB.

4.3.3 Deviations from test standard

No deviation.

4.3.4 Test setup

4.3.5 EUT operating conditions

This EUT was set to transmit in a worse-case scenario with modulation on. The software allowed the selection of the channel and modulation type.

4.3.6 Test results

EUT	Watchfire Remote Video Web Server	MODE	Continuous transmit
INPUT POWER	120VAC/60Hz	FREQUENCY RANGE	2.412GHz – 2.462GHz,
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BW (MHz)	20dB Limit Min (kHz)	RESULT
1, 802.11b	2.412	10.82	500.00	PASS
6, 802.11b	2.437	10.65	500.00	PASS
11, 802.11b	2.462	10.75	500.00	PASS
1, 802.11g	2.412	11.13	500.00	PASS
6, 802.11g	2.437	13.53	500.00	PASS
11, 802.11g	2.462	10.39	500.00	PASS

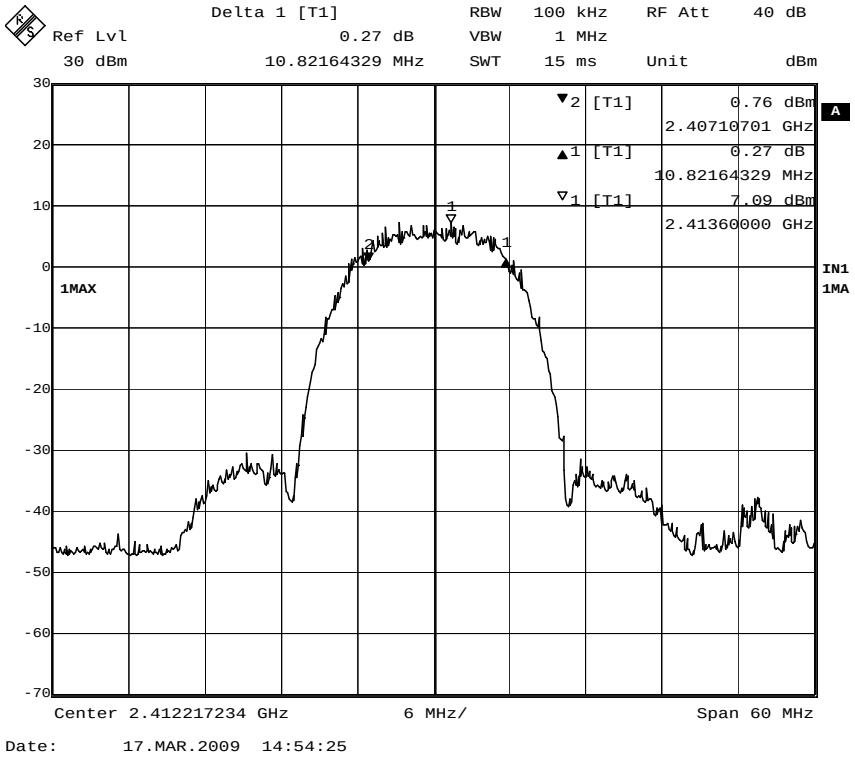


Figure 8 - 6dB Bandwidth, Channel 1, 802.11b

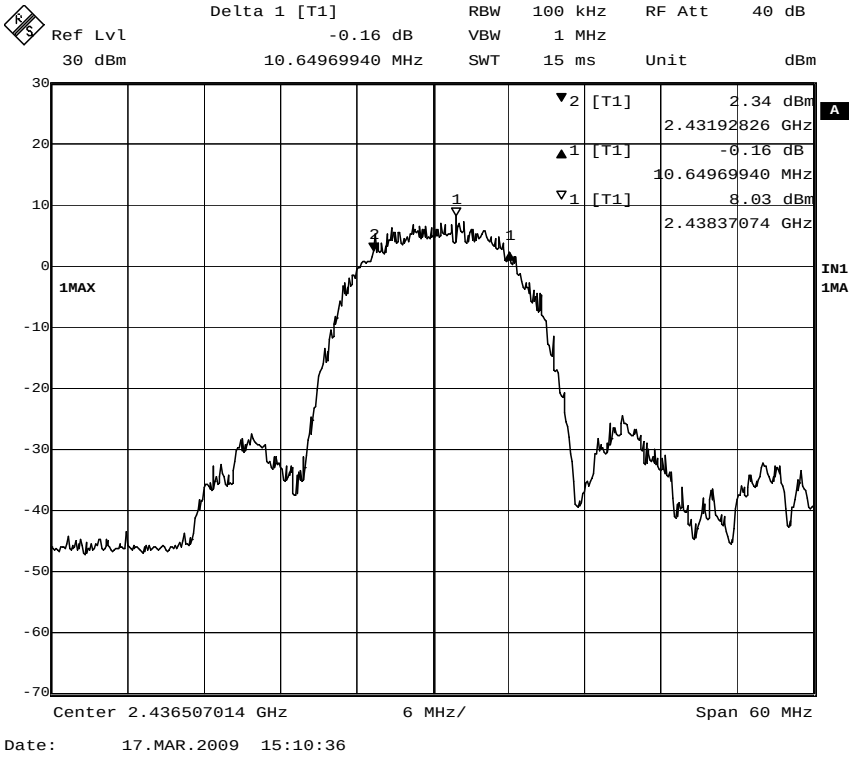


Figure 9 - 6dB Bandwidth, Channel 6, 802.11b

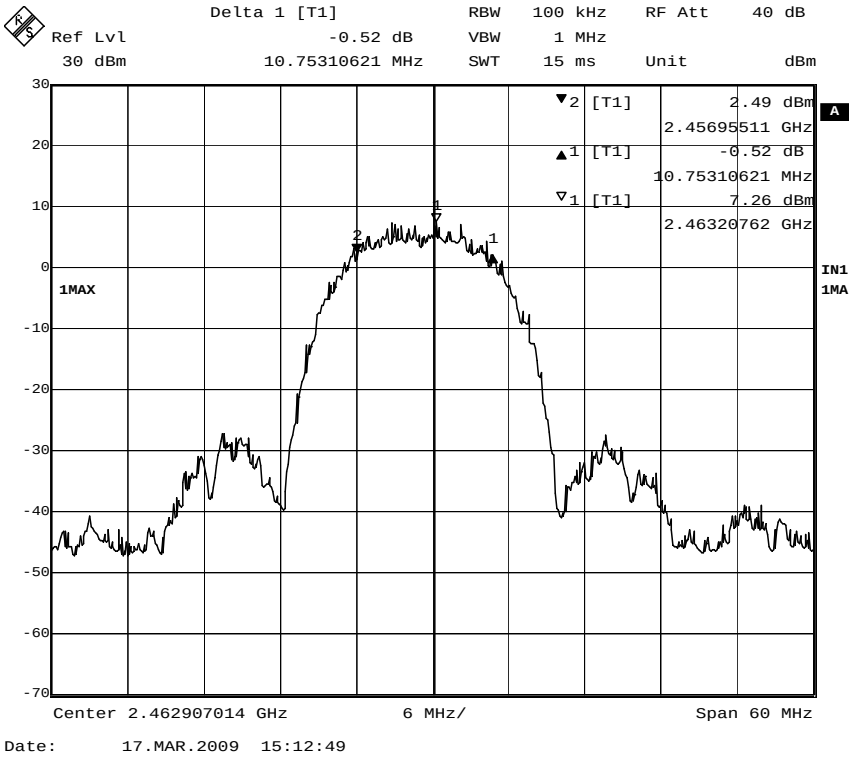


Figure 10 - 6dB Bandwidth, Channel 6, 802.11b

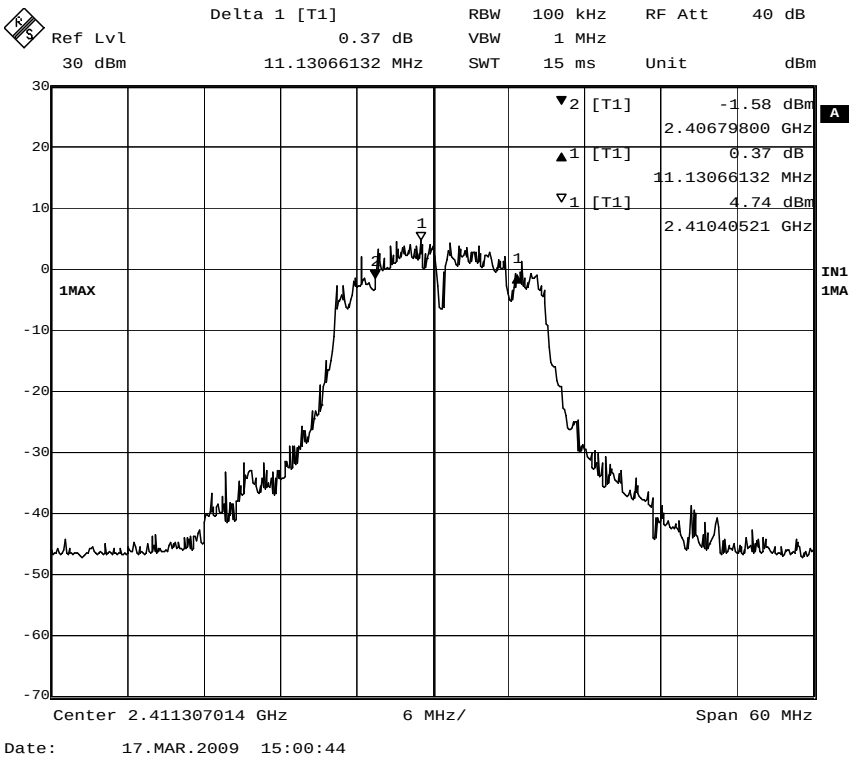


Figure 11 - 6dB Bandwidth, Channel 1, 802.11g

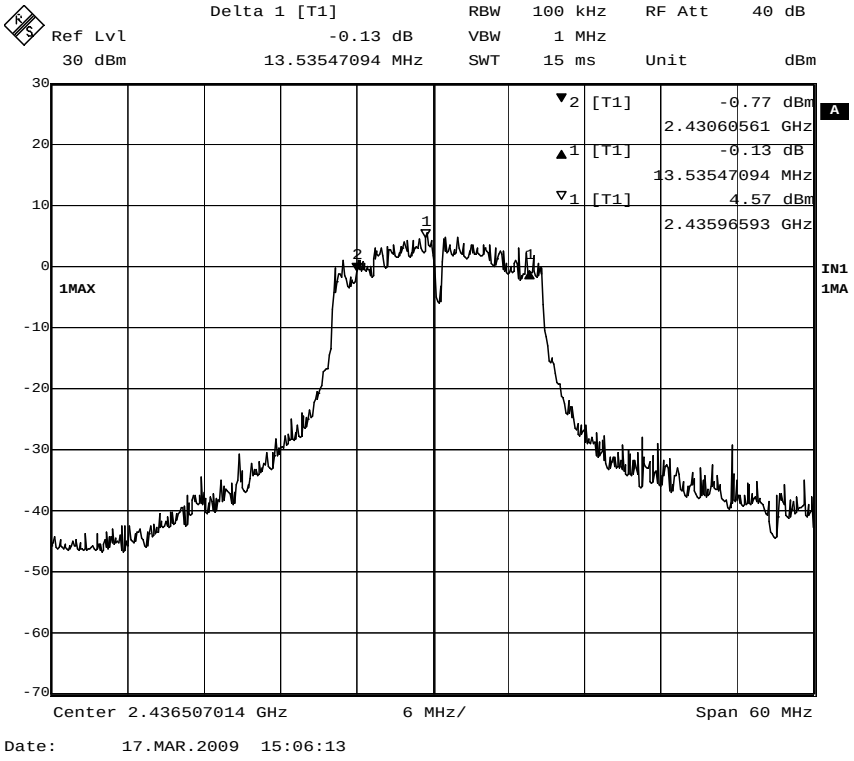


Figure 12 - 6dB Bandwidth, Channel 6, 802.11g

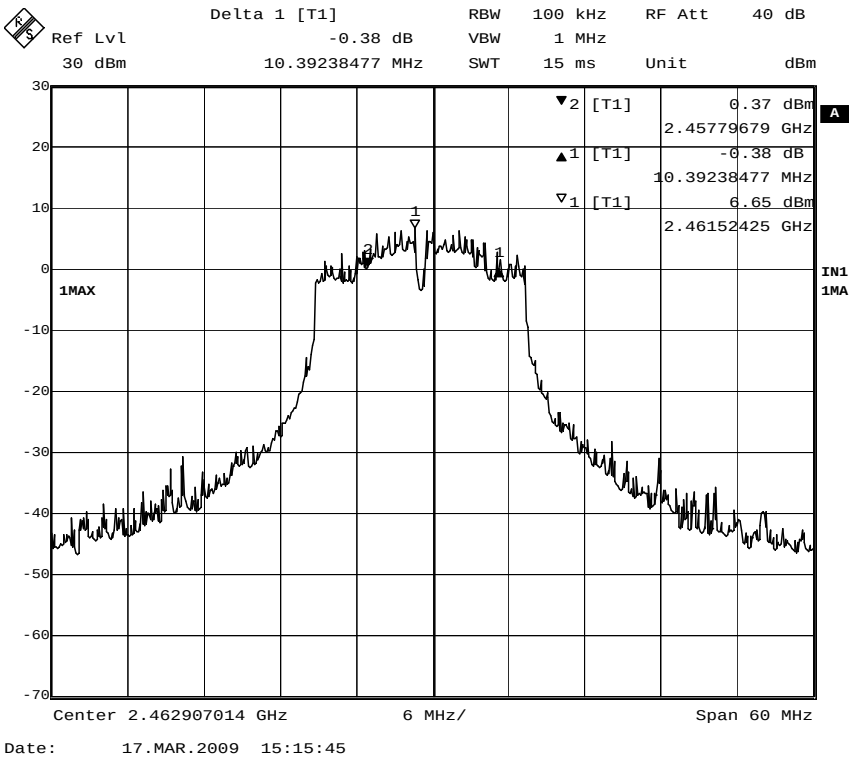


Figure 13 - 6dB Bandwidth, Channel 11, 802.11g

4.4 Maximum peak output power

4.4.1 Limits of power measurements

The maximum peak output power allowed is 30dBm (1000mW).

4.4.2 Test procedures

1. The EUT was connected to the power sensor directly with a low-loss shielded coaxial cable.

4.4.3 Deviations from test standard

No deviation.

4.4.4 Test setup

The RF output of the EUT was connected to a diode power sensor and power meter through a 10dB attenuator. All measurements shown are corrected for this attenuation.

4.4.5 EUT operating conditions

This EUT was set to transmit in a worse-case scenario with modulation on. The software allowed the selection of the channel and modulation type.

4.4.6 Test results

EUT	Watchfire Remote Video Web Server	MODE	Continuous transmit
INPUT POWER	120VAC/60Hz	FREQUENCY RANGE	2.412 - 2.462GHz
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

Maximum peak output power

CHANNEL	Operating Mode	CHANNEL FREQUENCY (GHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)	RESULT
1	802.11b	2.412	17.71	30	PASS
6	802.11b	2.437	21.57	30	PASS
11	802.11b	2.462	20.73	30	PASS
1	802.11g	2.412	19.08	30	PASS
6	802.11g	2.437	16.38	30	PASS
11	802.11g	2.462	20.01	30	PASS

REMARKS:

4.5 Bandedges

4.5.1 Limits of bandedge measurements

For emissions outside of the allowed band of operation the emission level needs to be 20dB under the maximum fundamental field strength. However, if the emissions fall within one of the restricted bands from 15.205 the field strength levels need to be under that of the limits in 15.209.

4.5.2 Test procedures

The antenna output of the EUT was connected directly to the spectrum analyzer using a low-loss shielded coaxial cable. The span was adjusted as to show the edge of the allowed band and the highest emissions. The delta between the two was recorded. Measurements were made at the exact band edge frequency and within 1MHz from the bandedge frequency and the highest measurements was recorded.

4.5.3 Deviations from test standard

No deviation.

4.5.4 Test setup

See Section 4.4

4.5.5 EUT operating conditions

The EUT was powered by 5VDC from an AC-DC power converter, which was powered by 120VAC/60Hz from the AC mains. The EUT was tested while connected to a Dell D60 Latitude laptop PC via USB.

4.5.6 Test results

EUT	Watchfire Remote Video Web Server	MODE	Continuous transmit
INPUT POWER	120VAC/60Hz	FREQUENCY RANGE	2.412GHz – 2.462GHz
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

Highest Out of Band Emissions

CHANNEL	Highest in band level dBm	Delta dB	Delta Limit dB	Result
1, 802.11b (2.412GHz)	7.80	30.81	20.00	PASS
11, 802.11b (2.462GHz)	8.01	43.49	20.00	PASS
1, 802.11g (2.412GHz)	6.38	27.48	20.00	PASS
11, 802.11g(2.462GHz)	7.38	35.98	20.00	PASS

NOTE:
EUT was tested as described in section 4.2. All measurements above were taken from section 4.2. The highest out of band measurement was maximized in a 5MHz frequency band, so the frequency may be slightly within the frequency band, but represents a worse-case scenario for all out of band measurements. The plots on the following page shows the peak measurements in green and quasi-peak in red.

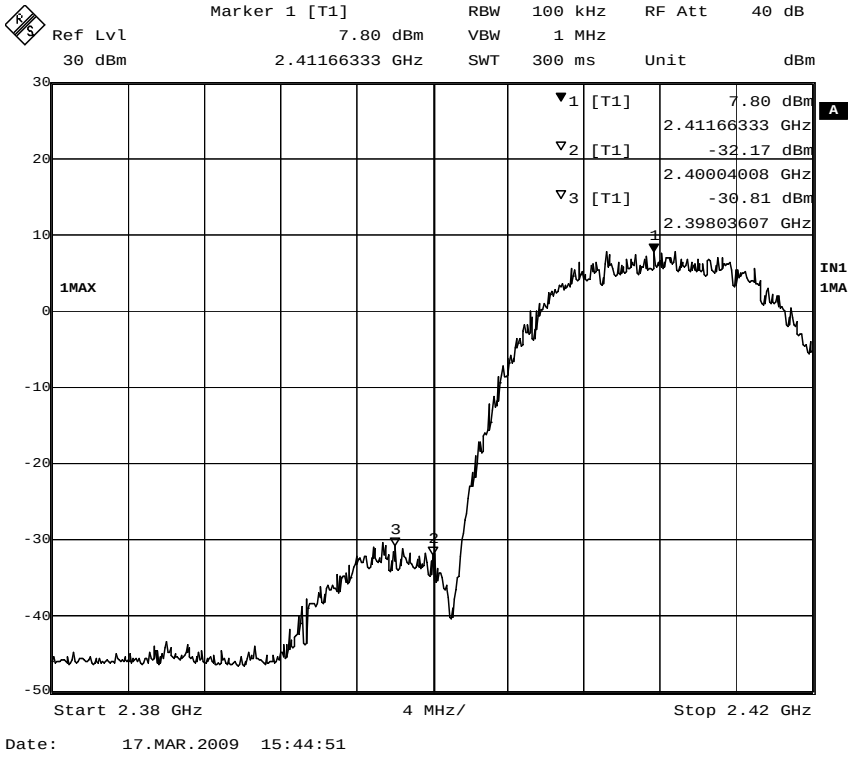


Figure 14 - Bandedge Measurements, Channel 1, 802.11b

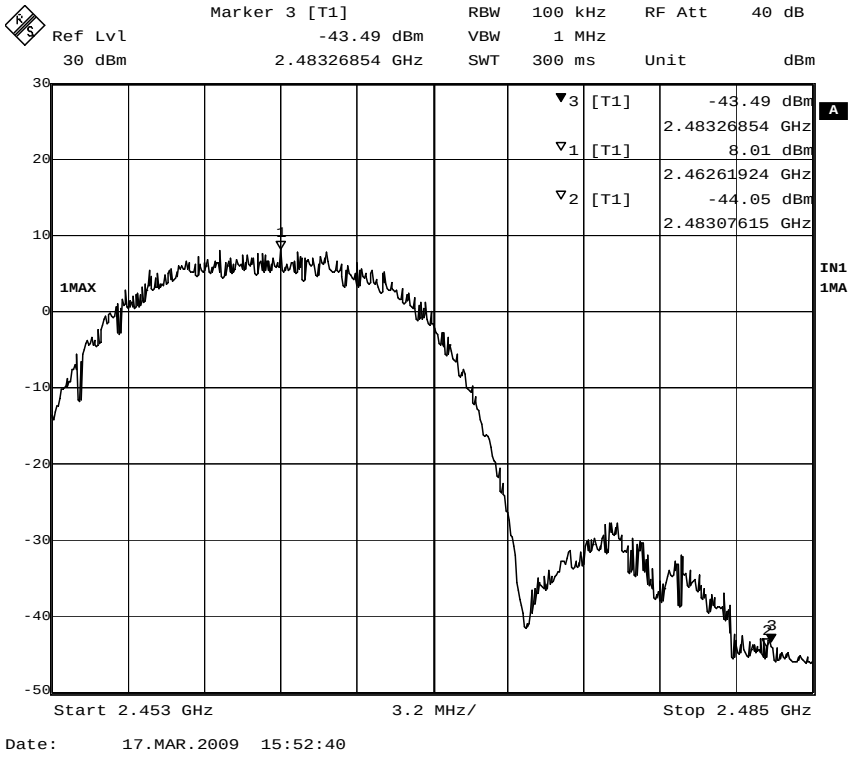


Figure 15 - Bandedge Measurements, Channel 11, 802.11b

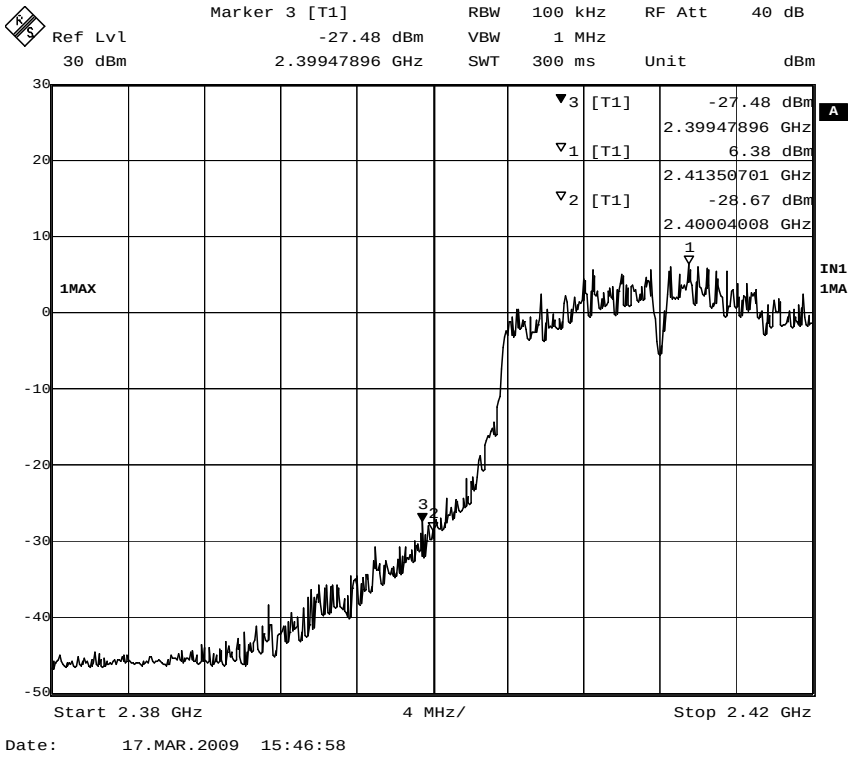


Figure 16 - Bandedge Measurements, Channel 11, 802.11g

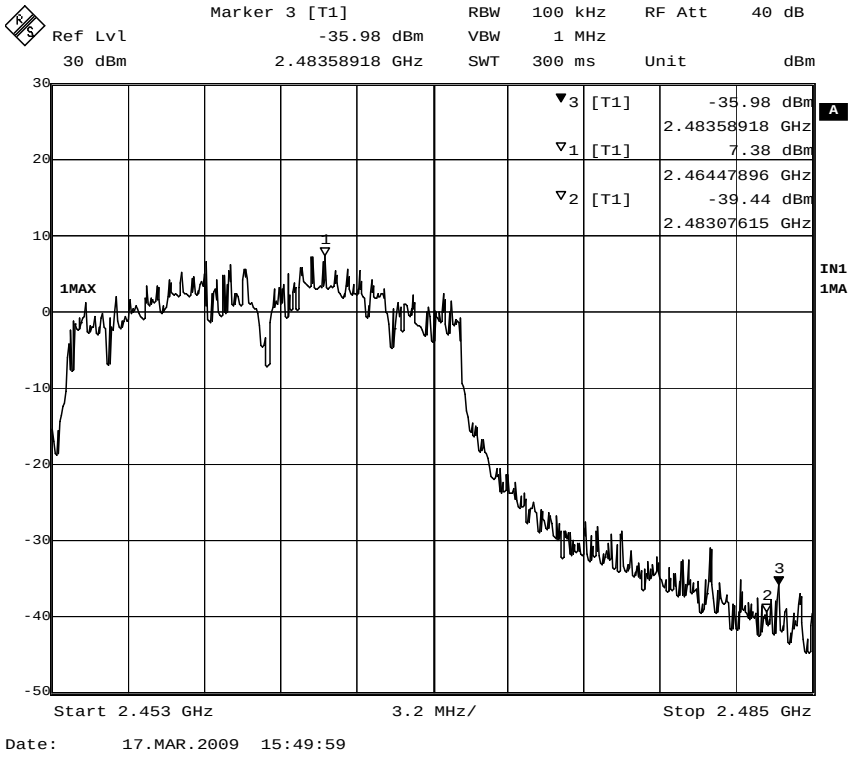


Figure 17 - Bandedge Measurements, Channel 11, 802.11g

4.6 Power Spectral Density

4.6.1 Power spectral density measurements

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.

4.6.2 Test procedures

The antenna output of the EUT was connected directly to the spectrum analyzer using a low-loss shielded coaxial cable. The spectrum analyzer was set to 3 kHz RBW and 30 kHz VBW, the sweep time was 500s. The power spectral density was measured and recorded at the frequency with the highest emission. The sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

4.6.3 Deviations from test standard

No deviation.

4.6.4 Test setup

See section 4.3

4.6.5 EUT operating conditions

The EUT was powered by 120VAC/60Hz from the AC mains supply and set to transmit continuously on the lowest frequency channel, highest frequency channel and one in the middle of its operating range.

EUT	Watchfire Remote Video Web Server	MODE	Continuous transmit
INPUT POWER	120VAC/60Hz	FREQUENCY RANGE	2.412 - 2.462GHz
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

Power Spectral Density

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN # KHz BW (dBm)	MAXIMUM POWER LIMIT (dBm)	RESULT
1b	2.412	-6.88	8.00	PASS
6b	2.437	-8.02	8.00	PASS
11b	2.462	-7.39	8.00	PASS
1g	2.412	-7.91	8.00	PASS
6g	2.437	-9.80	8.00	PASS
11g	2.462	-8.96	8.00	PASS

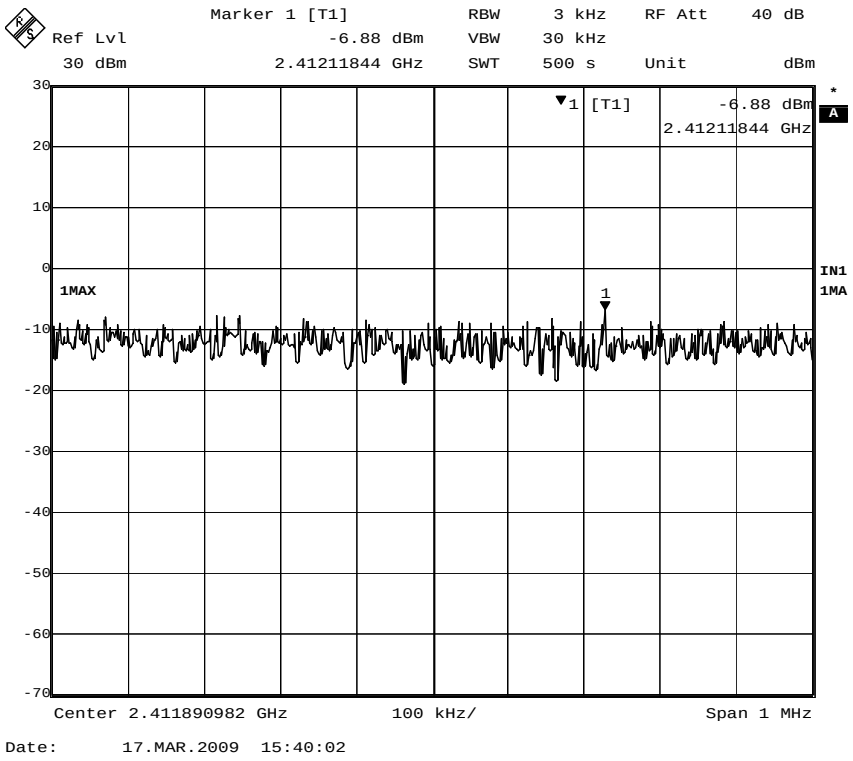


Figure 18 - PSD, Channel 1, 802.11b

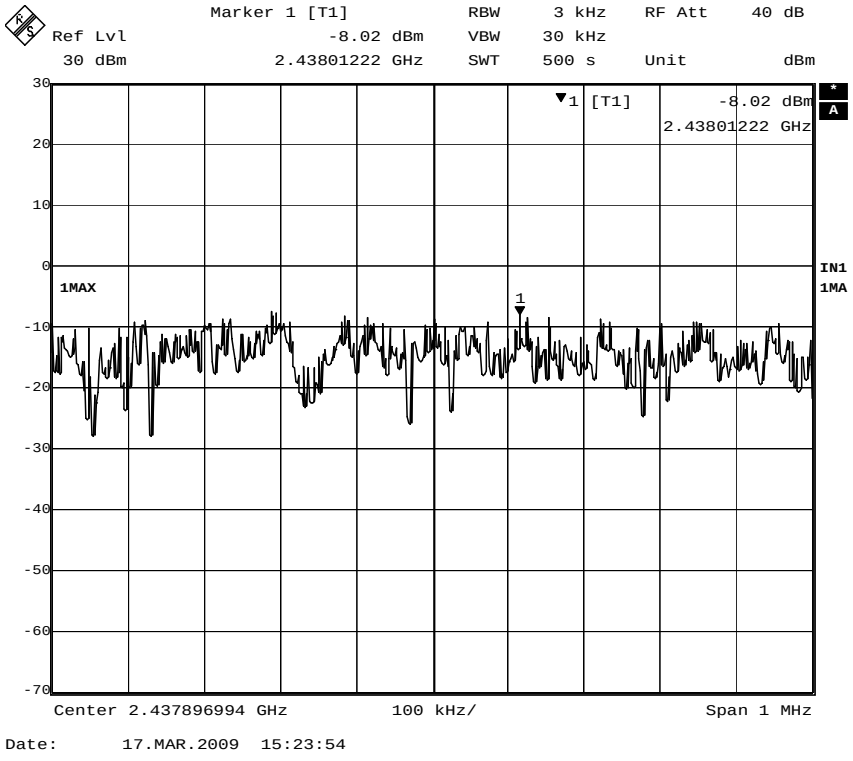


Figure 19 - PSD, Channel 6, 802.11b

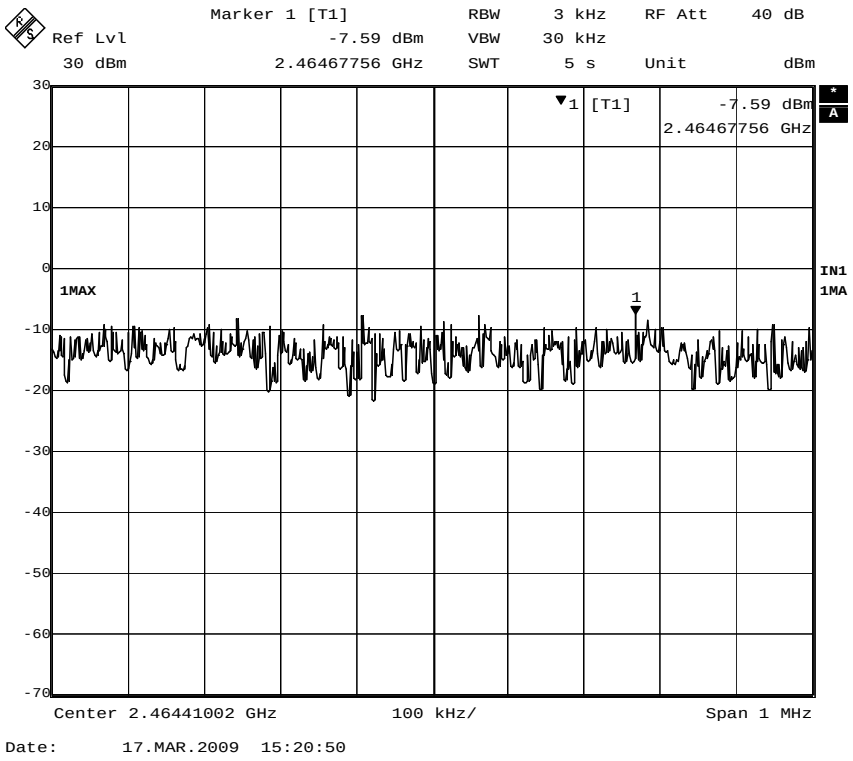


Figure 20 - PSD, Channel 11, 802.11b

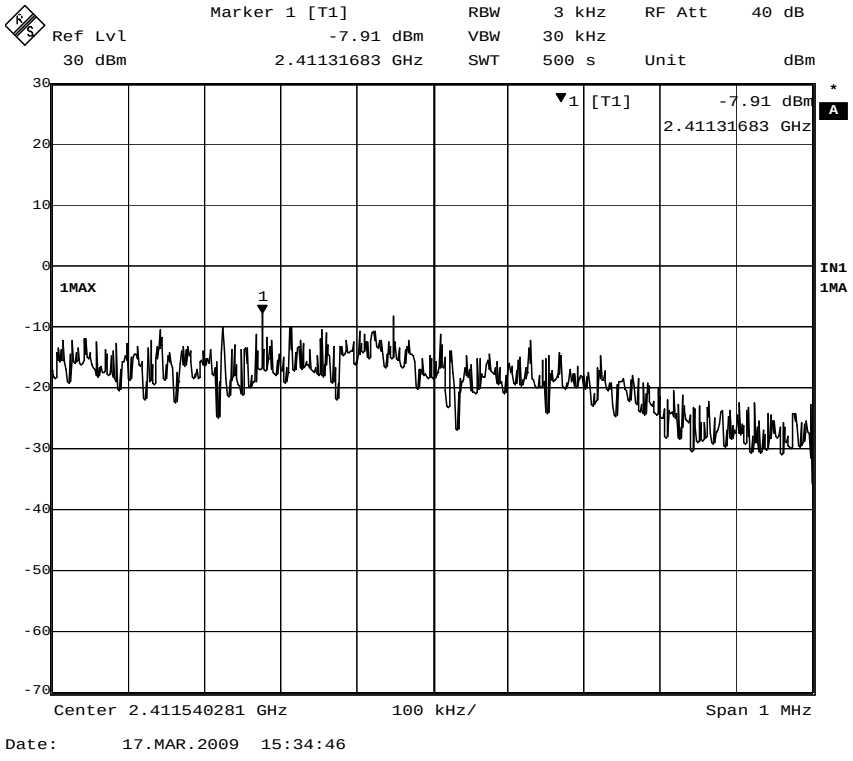


Figure 21 - PSD, Channel 1, 802.11g

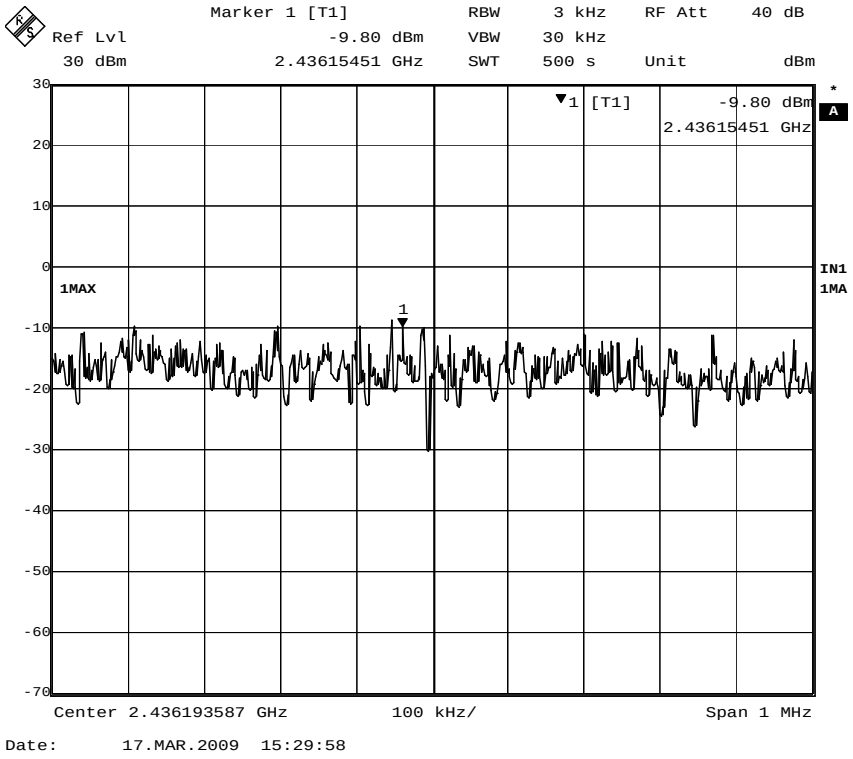


Figure 22 - PSD, Channel 6, 802.11g

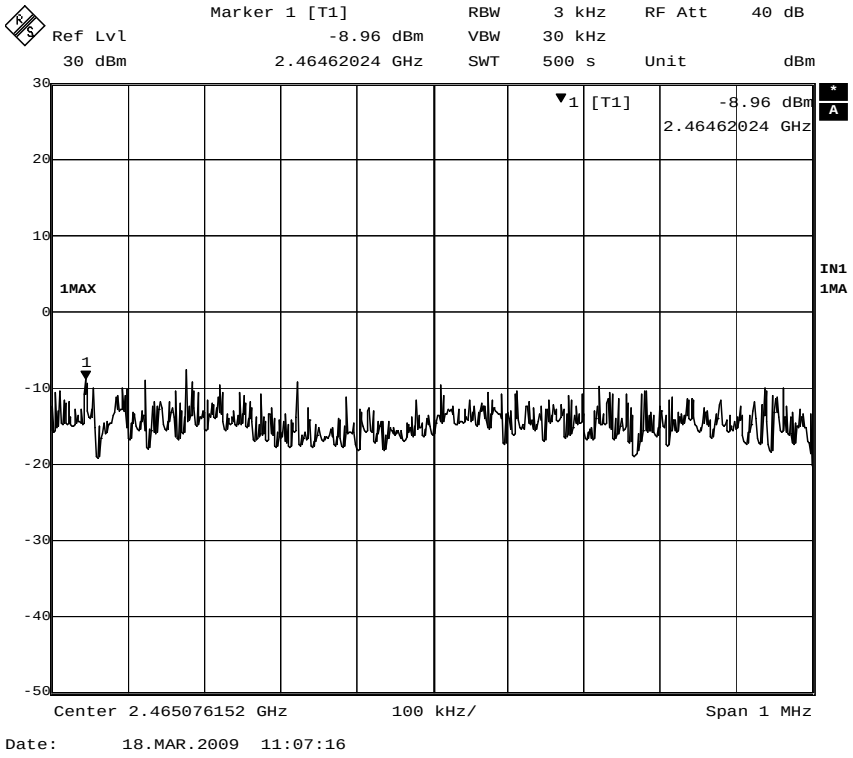


Figure 23 - PSD, Channel 11, 802.11g

4.7 Conducted AC Mains Emissions

4.7.1 Limits for conducted emissions measurements

Part 15.107 Class A Limits

Frequency of emission (MHz)	Conducted limit (microvolts)
0.45 to 1.705	1000
1.705 to 30.0	3000

NOTE: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
3. All emanations from a class A digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.7.2 Test Procedures

a. The EUT was placed 0.8m above a ground reference plane and 0.4 meters from the conducting wall of a shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provides 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference as well as the ground.

c. The frequency range from 150 kHz to 30 MHz was searched.

4.7.3 Deviation from the test standard

No deviation

4.7.4 Test setup

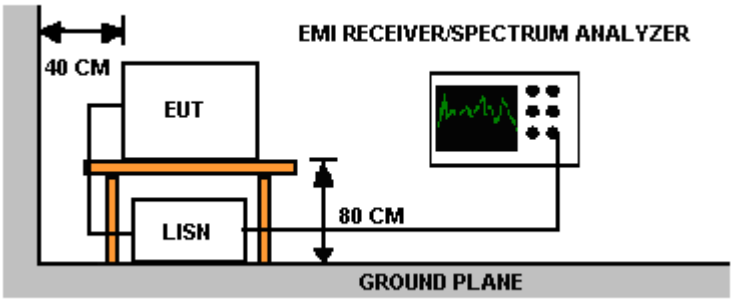


Figure 24 - Conducted Emissions Test Setup

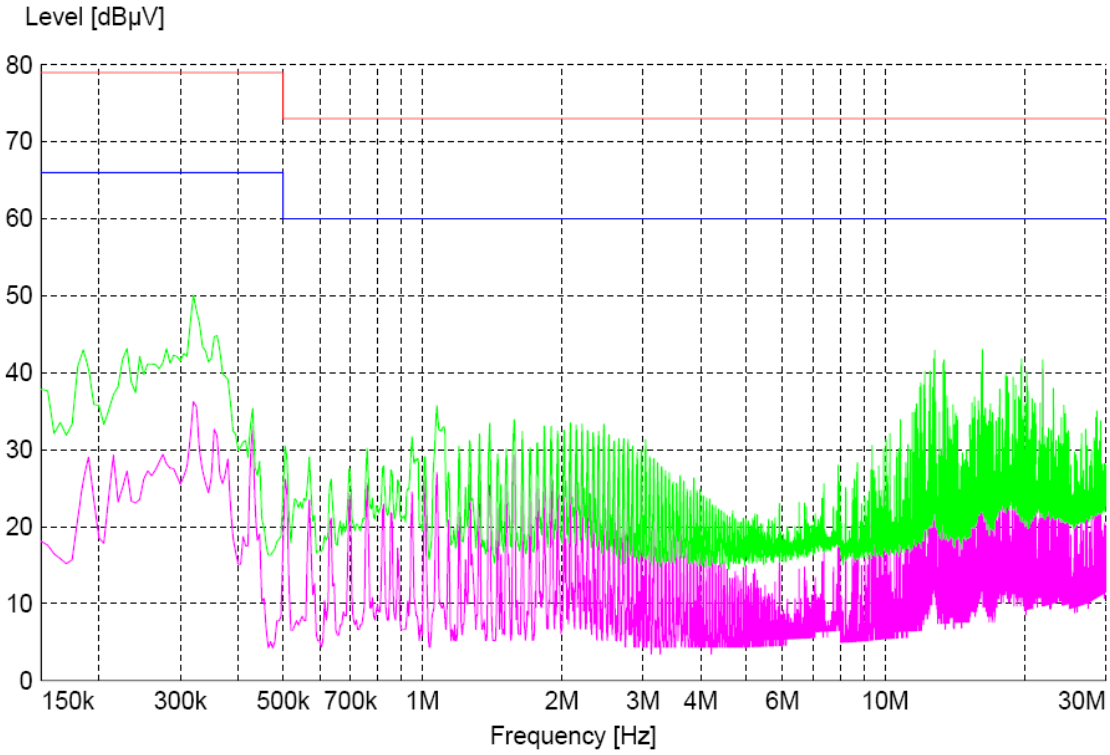
For actual test configuration, see photographs in Appendix A

4.7.5 EUT operating conditions

This EUT was set to transmit in a worse-case scenario with modulation on. The software allowed the selection of the channel and modulation type. The EUT was tested with a camera and all cables populated.

4.3.6 Test Results

EUT	Watchfire Remote Video Web Server	MODE	Continuous transmit, Channel 1, 802.11b
INPUT POWER	120VAC/60Hz	FREQUENCY RANGE	150kHz – 30MHz
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson



REMARKS:
1. Q.P. and AV. are abbreviations for quasi-peak and average respectively.
2. Average measurements are in violet and corresponding limit is blue
3. Peak measurements are in green and corresponding limit is red.

Appendix A: Test Photos

Figure 25 - Radiated Emissions Test Setup

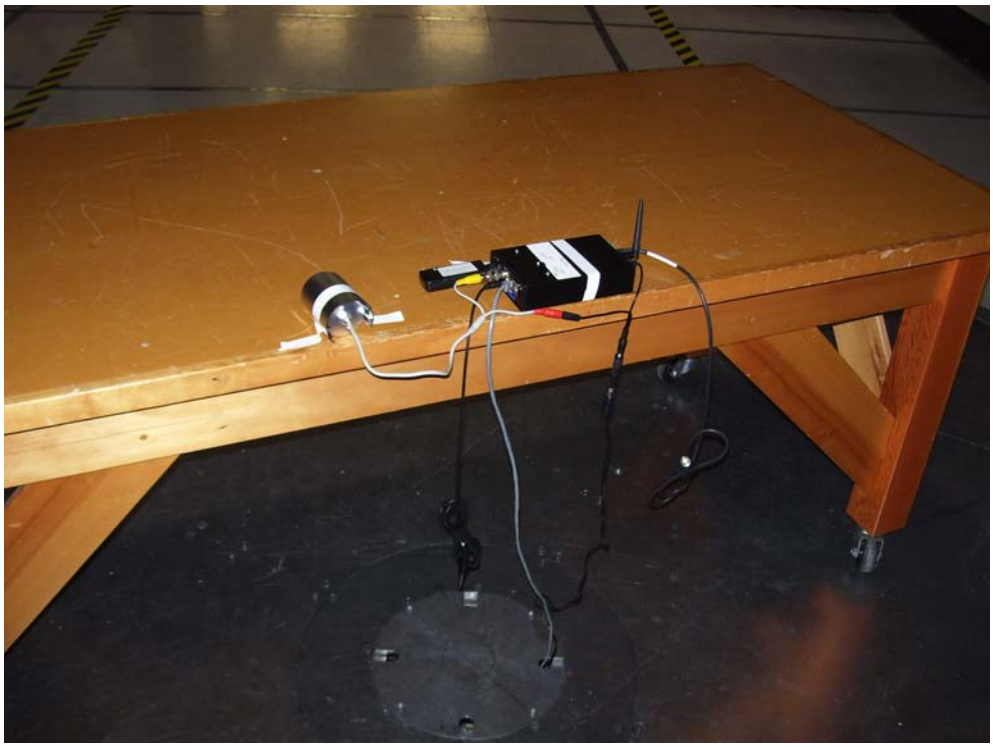


Figure 26 - Radiated Emissions Test Setup

Figure 27 - Conducted Emissions Test Setup

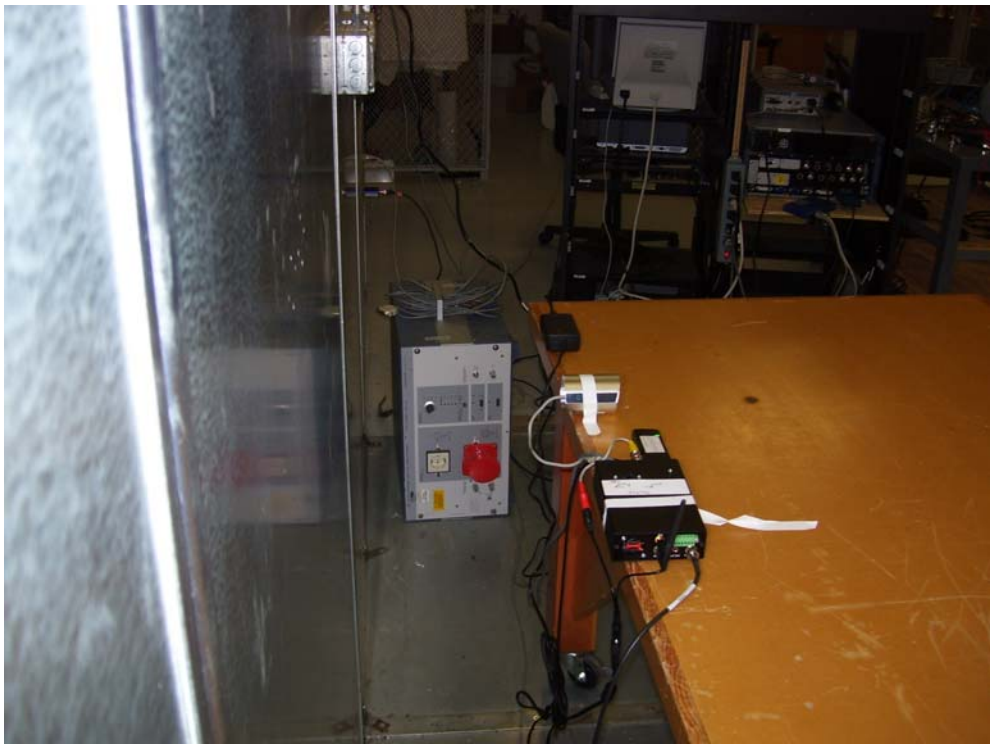


Figure 28 - Conducted Emissions Test Setup

Appendix B: Sample Calculation

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:
FS = RA + AF – (-CF + AG) + AV

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

AG = Amplifier Gain

AV = Averaging Factor (if applicable)

Assume a receiver reading of 55 dBμV is obtained. The Antenna Factor of 12 and a Cable Factor of 1.1 is added. The Amplifier Gain of 20 dB is subtracted, giving a field strength of 48.1 dBμV/m.

FS = 55 + 12 – (-1.1 + 20) + 0 = 48.1 dBμV/m

The 48.1 dBμV/m value can be mathematically converted to its corresponding level in μV/m.

Level in μV/m = Common Antilogarithm [(48.1 dBμV/m)/20]= 254.1 μV/m

AV is calculated by the taking the 20*log(T_{on}/100) where T_{on} is the maximum transmission time in any 100ms window.

Table of Figures

Figure **Page Number**