

TEST REPORT

of

FCC Part 15 Subpart B&C §15.247 / RSS-210 Issue 7, RSS-Gen Issue 2
FCC ID/IC ID: SQMSQ-3500/ 6303A-SQ3500

Equipment Under Test : VoIP Phone

Model Name : SQ-3500 (the addition of model name : SQ-3300)

Serial No. : N/A

Applicant : UniData Communication Systems, INC.

Manufacturer : UniData Communication Systems, INC.

Date of Test(s) : 2009-10-01 ~ 2009-11-13

Date of Issue : 2009-12-10

In the configuration tested, the EUT complied with the standards specified above.

Tested By:



Date

2009-12-10

Grant Lee

Approved By



Date

2009-12-10

Charles Kim

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1. General information

1.1. Testing laboratory

SGS Testing Korea Co., Ltd.

- Wireless Div. 2FL, 18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea 435-040
- 705, Dongcheon-dong Suji-gu, Yongin-si, Gyeonggi-do, Korea.

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1.2 Details of applicant

Applicant : UniData Communication System, INC.
Address : 3F, BuLim-Bldg, 837-6, Bangbae 4-dong, Seocho-gu, Seoul-si, Korea
Contact Person : Byeong-Gil Park
Phone No. : +82 +2 3443 3390
Fax No. : -

1.3 Description of EUT

Kind of Product	VoIP Phone
Model Name	SQ-3500 (the addition of model name : SQ-3300)
Serial Number	N/A
Power Supply	DC 3.7 V
Frequency Range	2412 MHz ~ 2462 MHz (11b/g) 5745 MHz ~ 5825 MHz (11a) 5180 MHz ~ 5240 MHz (11a – Non DFS)
Modulation Technique	DSSS, OFDM
Number of Channels	11 channel(11b/g), 5 channel(11a), 4 channel(11a – Non DFS)
Operating Conditions	-20 ~ 60 °C
Antenna Type	Fixed type
Antenna Gain	2.85 dBi(11b/g), 1.78 dBi(11a), 1.85 dBi(11a – Non DFS)

1.4 Details of added model

Model	information
SQ-3500	Basic
SQ-3300	Only apply FCC It's the same as basic model, except for camera that is not existence.

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1.5. Description of test mode

IEEE 802.11 b mode:

We found out the test mode with the highest power level after we analyze all the data rates. So we choose 1 Mbps data rate (worst case) as a representative.

IEEE 802.11a/g mode:

We found out the test mode with the highest power level after we analyze all the data rates. So we choose 6 Mbps data rate (worst case) as a representative.

1.6. Test equipment list

Equipment	Manufacturer	Model	Cal Due.
Signal Generator	R&S	SMR40	Jan. 21, 2010
Spectrum Analyzer	Agilent	E4440A	Apr. 01, 2010
Spectrum Analyzer	R&S	FSP40	Sep. 25, 2010
High Pass Filter	Wainwright Instrument GmbH	WHK3.0/18G-11SS	Sep. 29, 2010
High Pass Filter	Wainwright Instrument GmbH	WHK6.0/18G-11SS	Sep. 29, 2010
Attenuator	Agilent	8494B	Apr. 01, 2010
DC Power Supply	Agilent	6674A	Apr. 02, 2010
Two-Lie V-network	R & S	ENV326	Jan. 01. 2010
Test Receiver	R & S	ESS	Jul. 03, 2010
Test Receiver	R & S	ESU26	Apr. 21, 2010
Preamplifier	H.P	8447F	Jul. 02, 2010
Preamplifier	H.P	8449B	Apr. 01, 2010
Bilog Antenna	VULB9163	SCHWARZBECK MESSELEKTRONIK	Jul. 22. 2010
Horn Antenna	Schwarzbeck	BBHA 9170	Jun. 16, 2010
Horn Antenna	R&S	HF906	Jan. 10, 2010
Anechoic Chamber	SY Corporation	L x W x H (6.5 m x 3.5 m x 3.5 m)	N.C.R.
Anechoic Chamber	SY Corporation	L x W x H (9.6 m x 6.4 m x 6.6 m)	Jan. 31, 2010

► Support equipment

Description	Manufacturer	Model	Serial Number
Notebook Computer	Sony Corporation	PCG-3AHP	28272287 7000053
Wireless Router	D-Link System	DIR-655	F3R3291000460

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1.7. Summary of test result

The EUT has been tested according to the following specifications:

Applied standard : FCC Part15 subpart B&C, RSS-210, RSS-Gen			
Standard section		Test Item	Result
15.207	RSS-Gen 7.2.2	Transmitter AC power line conducted emission	Complied
15.107	RSS-Gen 7.2.2	Receiver AC power line conducted emission	Complied
15.205(a) 15.209(a) 15.247(d)	A8.5	Transmitter radiated spurious emissions and Conducted spurious emission	Complied
15.109(a)	RSS-Gen 6	Receiver Radiated Spurious Emission	Complied
15.247(a)(2)	A8.2(a)	6 dB Bandwidth and 99 % BW	Complied
15.247(b)(3)	A8.4(4)	Maximum peak output power	Complied
15.247(e)	A8.2(b)	Power spectral density	Complied

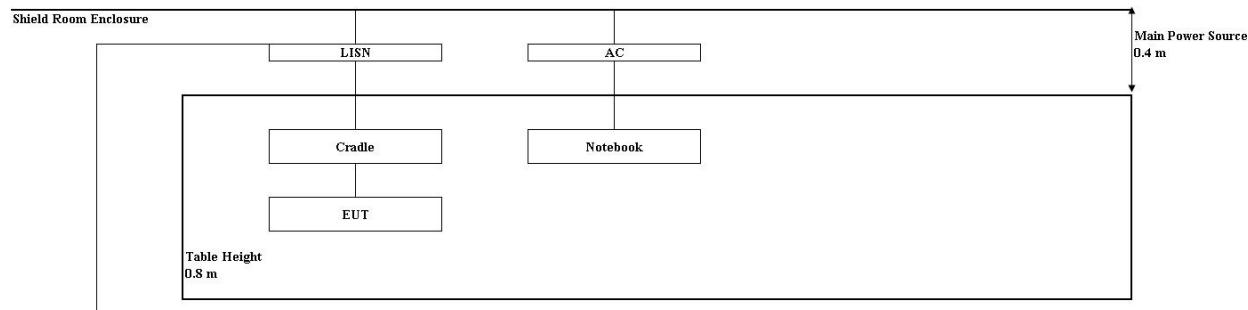
1.8. Test report revision

Revision	Report number	Description
0	F690501/RF-RTL003435	Initial
1	F690501/RF-RTL003435-1	Revise test setup for AC power line conducted emission

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2. Transmitter AC power line conducted emission

2.1. Test setup



2.2. Limit

According to §15.207(a) 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, as measured using a 50 uH/50 ohm line impedance stabilization network(LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 – 0.50	66-56*	56-46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Decreases with the logarithm of the frequency.

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2.3. Test procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

1. The test procedure is performed in a $6.5\text{ m} \times 3.6\text{ m} \times 3.6\text{ m}$ (L×W×H) shielded room. The EUT along with its peripherals were placed on a $1.0\text{ m(W)} \times 1.5\text{ m(L)}$ and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

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2.4. Test result (Worst case configuration _IEEE 802.11b& Cradle included)

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Ambient temperature : 22 °C
Relative humidity : 49 % R.H.
Frequency range : 0.15 MHz – 30 MHz
Measured Bandwidth : 9 kHz

Freq. (MHz)	Level (dBuV)		Line	Limit (dBuV)		Margin (dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.17	37.10	22.30	H	64.96	54.96	27.86	32.66
0.20	36.00	21.70	H	63.61	53.61	27.61	31.91
0.27	37.50	25.40	H	61.12	51.12	23.62	25.72
0.40	33.90	24.00	H	57.85	47.85	23.95	23.85
0.47	35.10	24.70	H	56.51	46.51	21.41	21.81
4.34	30.10	21.80	H	56.00	46.00	25.90	24.20
0.16	39.50	23.10	N	65.46	55.46	25.96	32.36
0.20	33.50	17.90	N	63.61	53.61	30.11	35.71
0.27	35.90	22.30	N	61.12	51.12	25.22	28.82
0.34	36.70	26.40	N	59.20	49.20	22.50	22.80
1.29	26.90	18.80	N	56.00	46.00	29.10	27.20
1.70	27.30	19.50	N	56.00	46.00	28.70	26.50

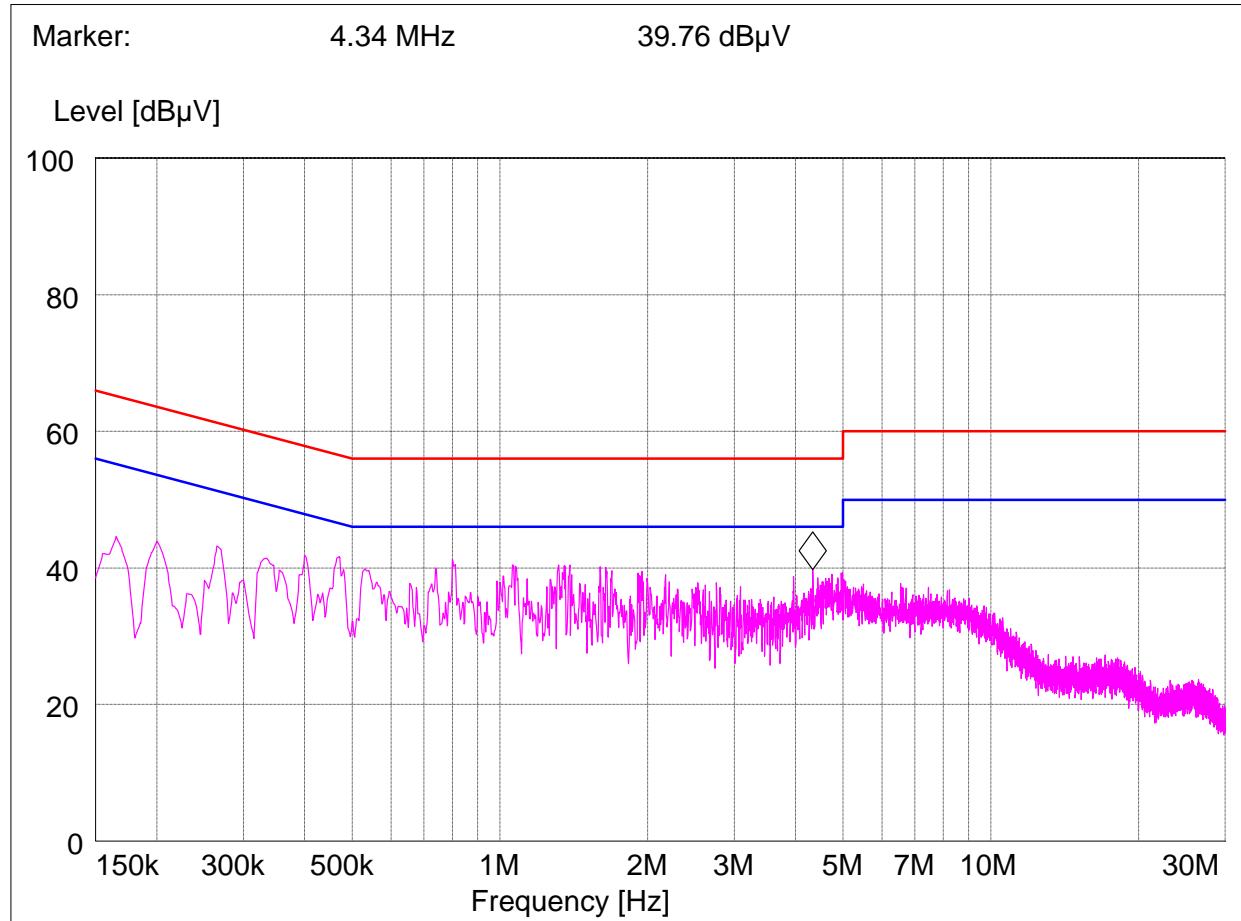
■ Note

Line (H) : Hot

Line (N) : Neutral

Plot of conducted power line

Test mode: (Hot)



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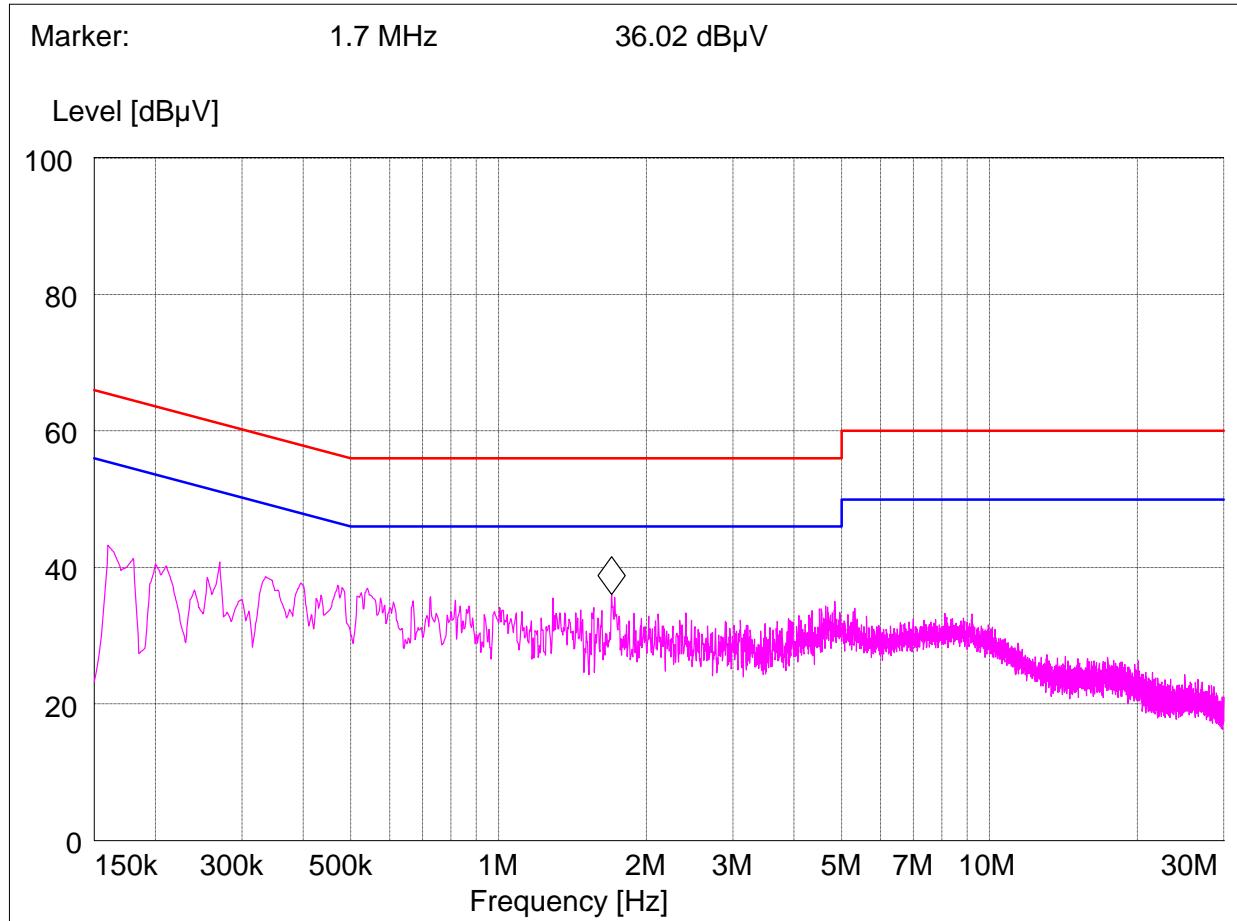
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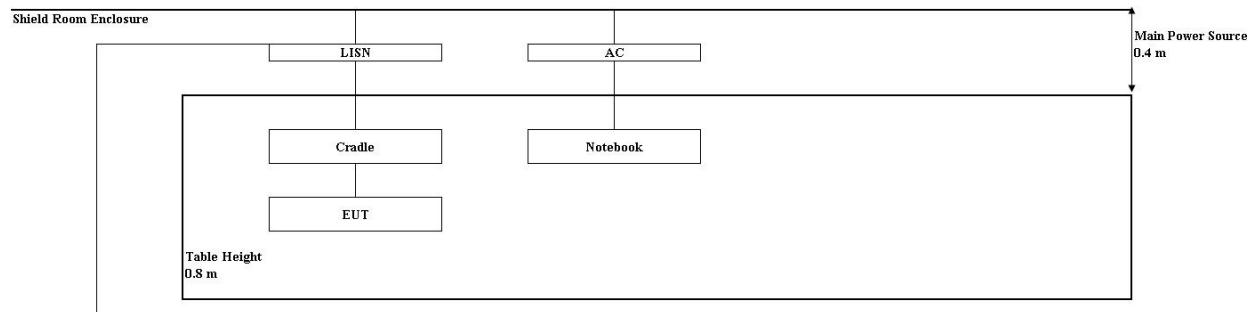
Test mode: (Neutral)



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3. Receiver AC power line conducted emission

3.1. Test setup



3.2. Limit

According to §15.107(a) Except for Class A digital devices, for equipment 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, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency of Emission (MHz)	Conducted limit (dB μ V)	
	Quasi-peak	Average
0.15 – 0.50	66-56*	56-46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Decreases with the logarithm of the frequency.

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3.3. Test procedures

Same as clause 2.3.

3.4. Test result (Worst case configuration _IEEE 802.11b & Cradle included)

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Ambient temperature : 22 °C
Relative humidity : 49 % R.H.

Frequency range : 0.15 MHz – 30 MHz
Measured Bandwidth : 9 kHz

Freq. (MHz)	Level (dBuV)		Line	Limit (dBuV)		Margin (dB)	
	Q-Peak	Average		Q-Peak	Average	Q-Peak	Average
0.19	43.50	30.00	H	64.04	54.04	20.54	24.04
0.37	39.00	26.50	H	58.50	48.50	19.50	22.00
0.38	39.30	27.90	H	58.28	48.28	18.98	20.38
0.53	35.60	24.00	H	56.00	46.00	20.40	22.00
0.74	36.30	25.50	H	56.00	46.00	19.70	20.50
4.87	34.10	27.00	H	56.00	46.00	21.90	19.00
0.18	41.10	27.30	N	64.49	54.49	23.39	27.19
0.32	36.20	20.70	N	59.71	49.71	23.51	29.01
0.55	32.40	22.30	N	56.00	46.00	23.60	23.70
0.78	29.80	20.10	N	56.00	46.00	26.20	25.90
1.07	29.70	20.50	N	56.00	46.00	26.30	25.50
4.72	28.70	22.40	N	56.00	46.00	27.30	23.60

Note

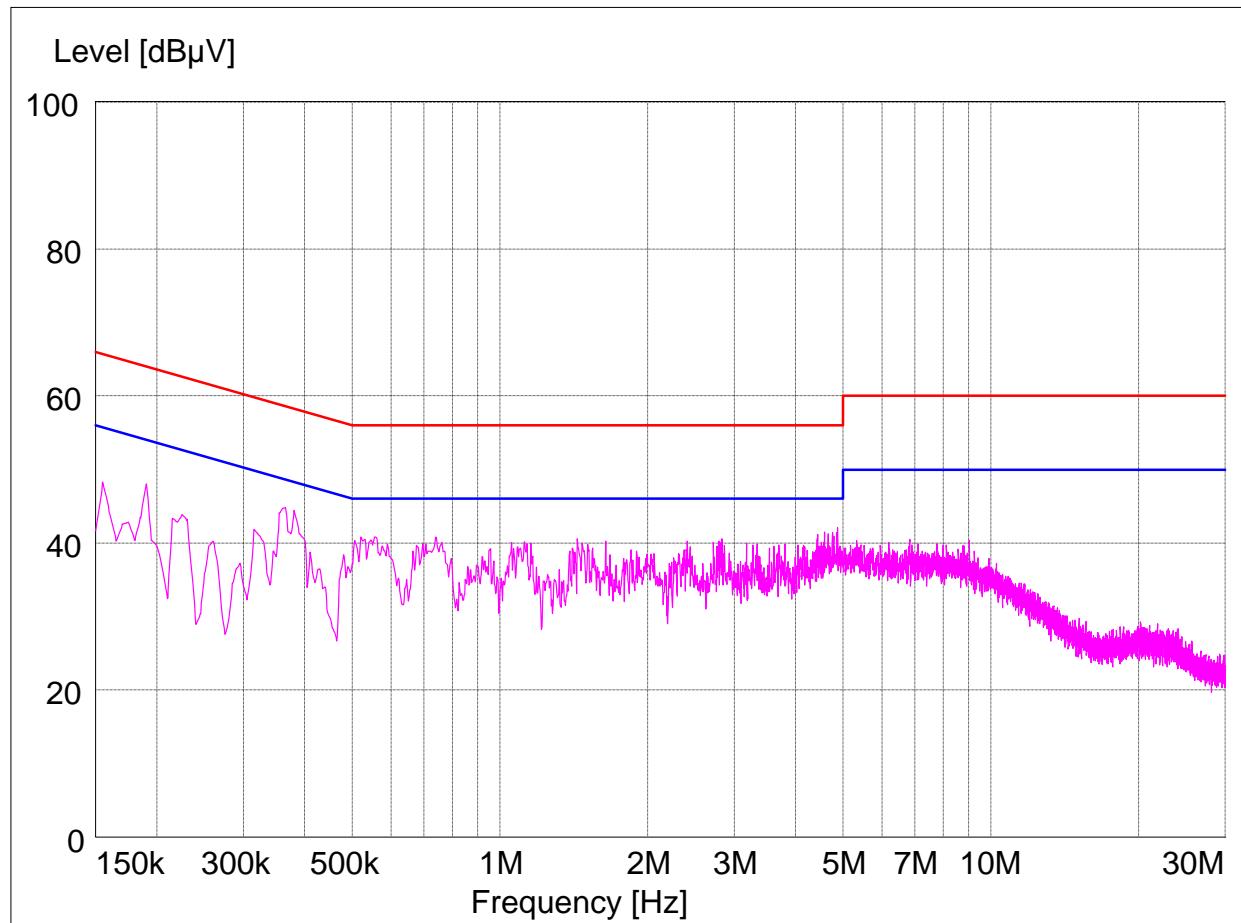
Line (H) : Hot

Line (N) : Neutral

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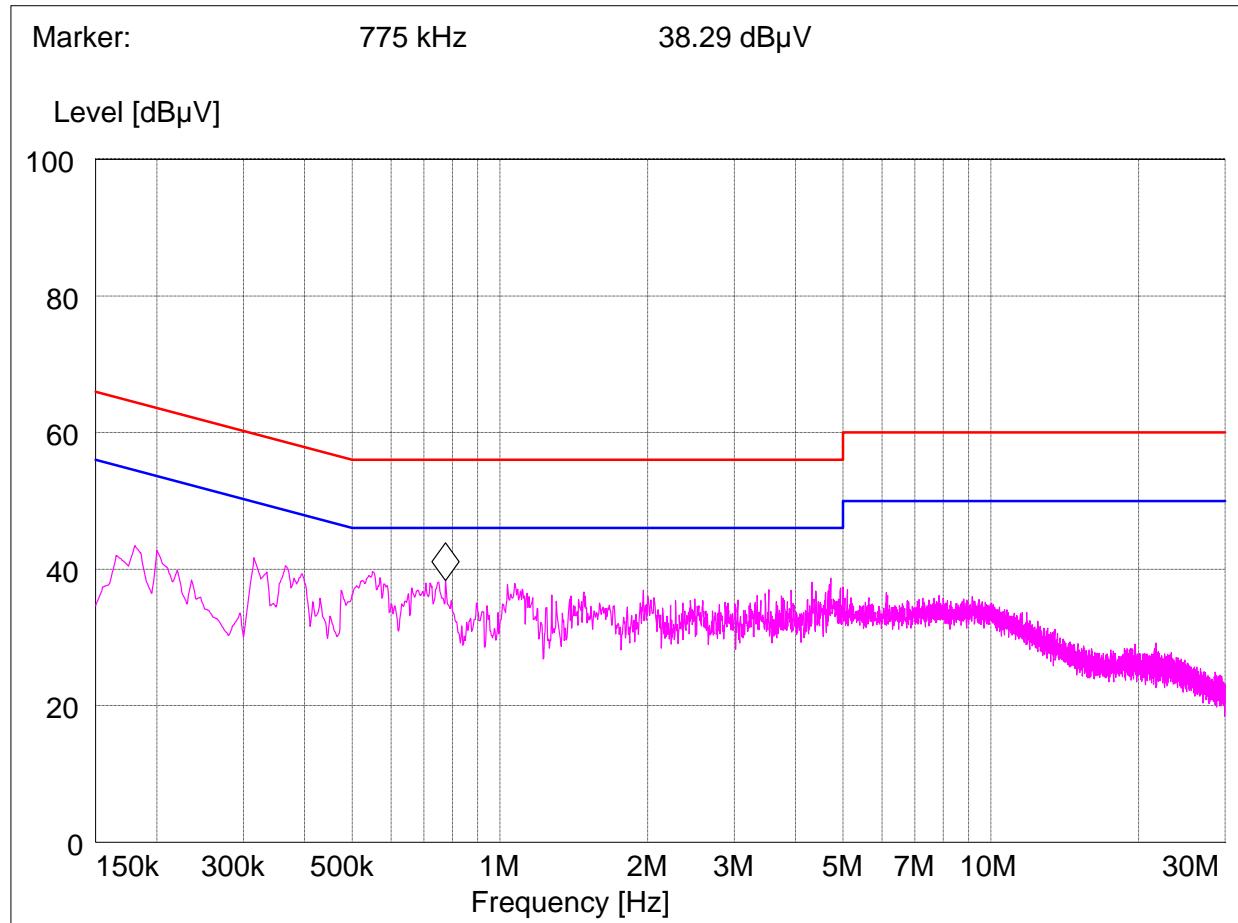
Plot of conducted power line

Test mode : (Hot)



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Test mode : (Neutral)



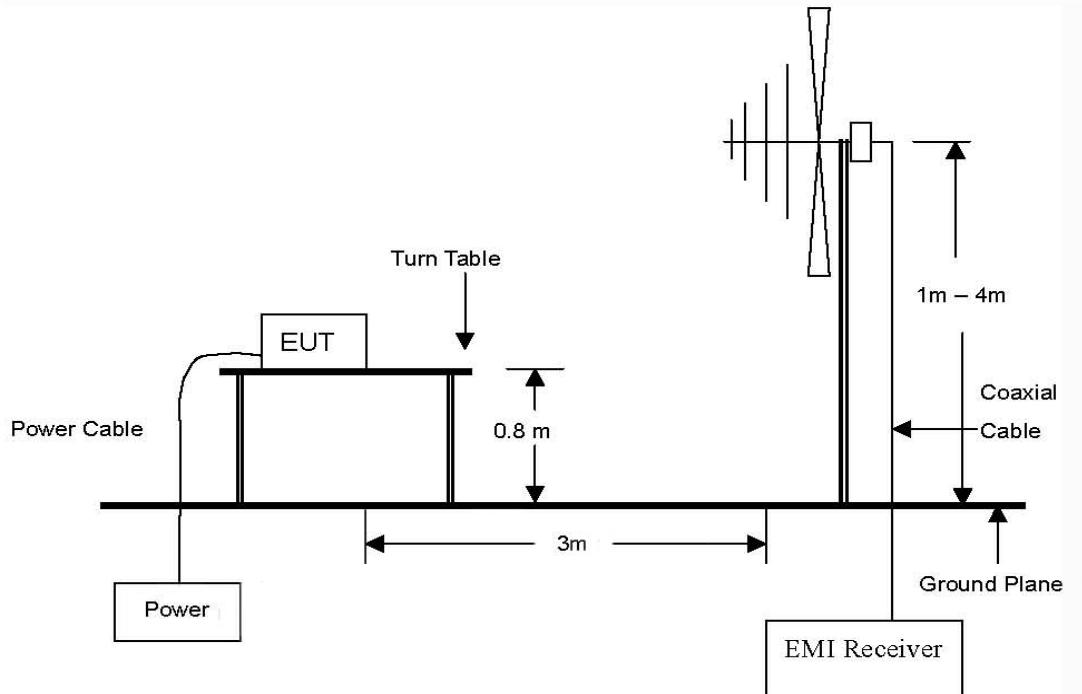
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4. Transmitter radiated spurious emissions and conducted spurious emission

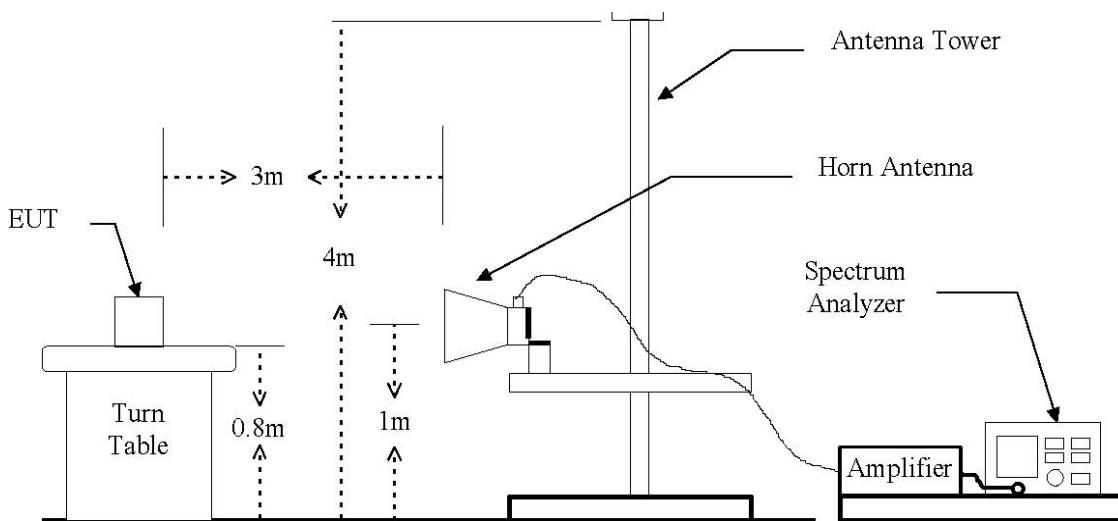
4.1. Test setup

4.1.1. Transmitter radiated spurious emissions

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz Emissions.

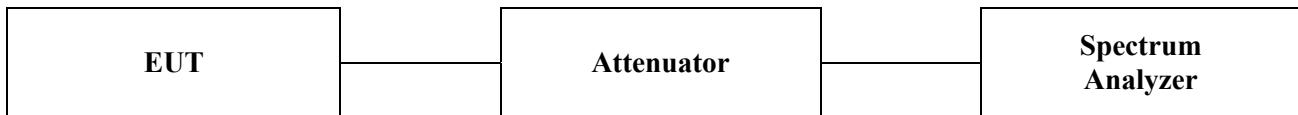


The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to 24 GHz Emissions.



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4.1.2. Conducted spurious emissions



4.2. Limit

According to §15.247(d), 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, based on either an RF conducted or a radiated measurement , provided the transmitter demonstrates compliance with the peak conducted power limits. 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 section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.209(a) (see section §15.205(c))

According to § 15.109(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values :

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
30 - 88	3	40.0	100
88 – 216	3	43.5	150
216 – 960	3	46.0	200
Above 960	3	54.0	500

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4.3. Test procedures

Radiated emissions from the EUT were measured according to the dictates of ANSI C63.4:2003

4.3.1. Test procedures for radiated spurious emissions

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 3 meter away from the interference-receiving antenna.
3. The antenna is 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 set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10 dB 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 in a data sheet.

Note

1. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 GHz.*
2. *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1MHz for Peak detection and frequency above 1 GHz.*
3. *The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1 GHz.*

4.3.2. Test procedures for conducted spurious emissions

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=100 kHz, VBW=100 kHz.

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4.4. Test result

Ambient temperature : 22 °C

Relative humidity : 49 % R.H.

4.4.1. Spurious radiated emission for below 1GHz (Worst case configuration_ IEEE 802.11b)

The frequency spectrum from 30 MHz to 1000 MHz was investigated. All emissions are not reported much lower than the prescribed limits. All reading values are quasi-peak values.

Radiated emissions			Ant	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect mode	Pol.	AF (dB/m)	Amp gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
398.980	29.18	Q.P.	H	13.30	-25.56	16.92	46.00	29.08
664.940	41.14	Q.P.	H	18.10	-25.59	33.65	46.00	12.35
766.633	30.10	Q.P.	H	19.46	-25.20	24.36	46.00	21.64
797.915	33.86	Q.P.	H	19.59	-25.05	28.40	46.00	17.60
Above 800.00	Not Detected							

Remark:

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. All spurious emission at low, middle and high channel are almost the same below 1 GHz, so the spurious emission test result of the low channel was chosen as representative in final test.
3. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made an instrument Using peak/quasi-peak detector mode.
4. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes. The worst case is XZ.

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4.4.2. Spurious radiated emission for above 1 GHz

IEEE 802.11b

A. Low Channel (2412 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2390.00*	45.45	P	H	28.05	-31.28	42.22	74.00	31.78
2390.00*	32.40	Av	H	28.05	-31.28	29.17	54.00	24.83
2390.00*	45.10	P	V	28.05	-31.28	41.87	74.00	32.13
2390.00*	32.43	Av	V	28.05	-31.28	29.20	54.00	24.80
4824.35	45.63	P	H	33.01	-28.47	50.17	74.00	23.83
4824.35	32.46	Av	H	33.01	-28.47	37.00	54.00	17.00
Above 4900.00	Not Detected							

B. Middle Channel (2437 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.99	45.86	P	H	33.15	-28.42	50.59	74.00	23.41
4874.99	33.07	Av	H	33.15	-28.42	37.80	54.00	16.20
Above 4900.00	Not Detected							

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C. High Channel (2462 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.50*	46.11	P	H	28.18	-31.20	43.09	74.00	30.91
2483.50*	33.50	Av	H	28.18	-31.20	30.48	54.00	23.52
2483.50*	47.52	P	V	28.18	-31.20	44.50	74.00	29.50
2483.50*	33.47	Av	V	28.18	-31.20	30.45	54.00	23.55
4924.41	47.04	P	H	33.29	-28.37	51.96	74.00	22.04
4924.41	33.71	Av	H	33.29	-28.37	38.63	54.00	15.37
Above 5000.00	Not Detected							

Remarks

1. “*” means the restricted band.
2. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using peak/average detector mode.
4. Average test would be performed if the peak result were greater than the average limit.
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes. The worst case is XZ.

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IEEE 802.11g

A. Low Channel (2412 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2390.00*	48.27	P	H	28.05	-31.28	45.04	74.00	28.96
2390.00*	34.89	Av	H	28.05	-31.28	31.66	54.00	22.34
2390.00*	53.62	P	V	28.05	-31.28	50.39	74.00	23.61
2390.00*	38.77	Av	V	28.05	-31.28	35.54	54.00	18.46
4824.35	46.12	P	H	33.01	-28.47	50.66	74.00	23.34
4824.35	33.24	Av	H	33.01	-28.47	37.78	54.00	16.22
Above 4900.00	Not Detected							

B. Middle Channel (2437 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4874.99	47.22	P	H	33.15	-28.42	51.95	74.00	22.05
4874.99	35.62	Av	H	33.15	-28.42	40.35	54.00	13.65
Above 4900.00	Not Detected							

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C. High Channel (2462 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.50*	46.30	P	H	28.18	-31.20	43.28	54.00	10.72
2483.50*	33.25	Av	H	28.18	-31.20	30.23	54.00	23.77
2483.50*	47.26	P	V	28.18	-31.20	44.24	54.00	9.76
2483.50*	33.31	Av	V	28.18	-31.20	30.29	54.00	23.71
4924.41	48.22	P	H	33.29	-28.37	53.14	74.00	20.86
4924.41	35.11	Av	H	33.29	-28.37	40.03	54.00	13.97
Above 5000.00	Not Detected							

■ Remarks

1. “*” means the restricted band.
2. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using peak/average detector mode.
4. Average test would be performed if the peak result were greater than the average limit.
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes. The worst case is XZ.

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IEEE 802.11a

A. Low Channel (5745 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5745.00*	52.91	P	H	34.29	9.39	96.59	-	-
5745.00*	41.10	Av	H	34.29	9.39	84.78	-	-
5745.00*	66.68	P	V	34.29	9.39	110.36	-	-
5745.00*	54.42	Av	V	34.29	9.39	98.10	-	-
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11490.00	47.13	P	V	38.30	-21.58	63.85	74.00	10.15
11490.00	33.70	Av	V	38.30	-21.58	50.42	54.00	3.58
Above 11500.00	Not Detected							

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

B. Middle Channel (5785 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5785.00*	55.05	P	H	34.34	9.44	98.83	-	-
5785.00*	41.12	Av	H	34.34	9.44	84.90	-	-
5785.00*	66.83	P	V	34.34	9.44	110.61	-	-
5785.00*	53.96	Av	V	34.34	9.44	97.74	-	-
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11570.00	47.45	P	V	38.31	-21.52	64.24	74.00	9.76
11570.00	33.57	Av	V	38.31	-21.52	50.36	54.00	3.64
Above 11600.00	Not Detected							

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C. High Channel (5825 MHz)

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
5825.00*	53.74	P	H	34.39	9.49	97.62	-	-
5825.00*	42.24	Av	H	34.39	9.49	86.12	-	-
5825.00*	68.03	P	V	34.39	9.49	111.91	-	-
5825.00*	55.95	Av	V	34.39	9.49	99.83	-	-
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
11650.00	47.09	P	V	38.33	-21.46	63.96	74.00	10.04
11650.00	33.06	Av	V	38.33	-21.46	49.93	54.00	4.07
Above 11700.00	Not Detected							

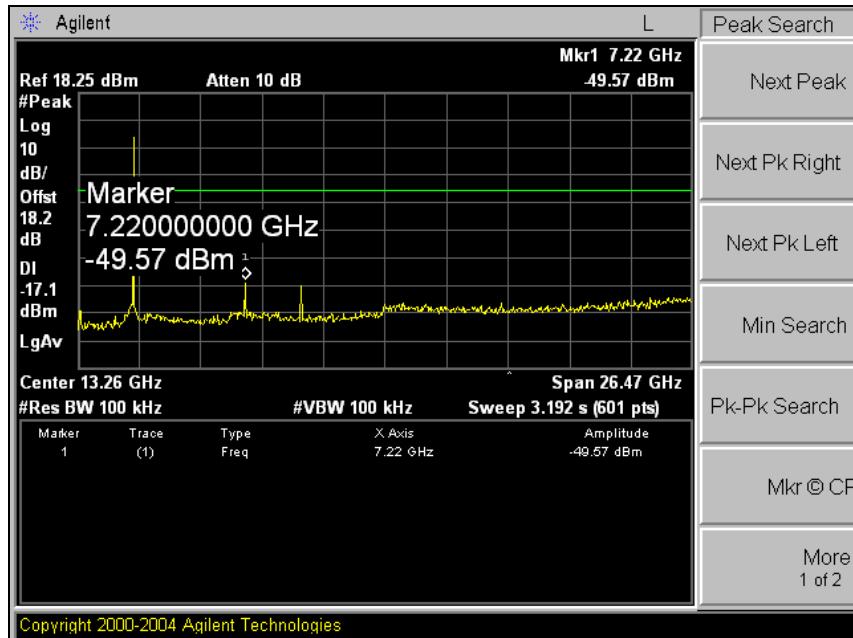
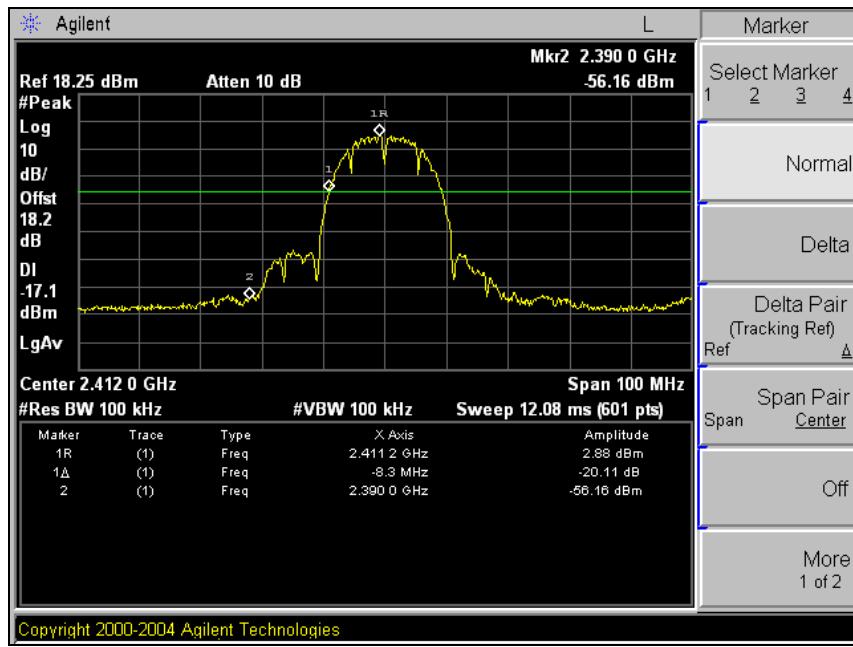
■ Remarks

1. “*” means fundamental frequency.
2. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental Frequency.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using peak/average detector mode.
4. Average test would be performed if the peak result were greater than the average limit.
5. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes. The worst case is XZ.

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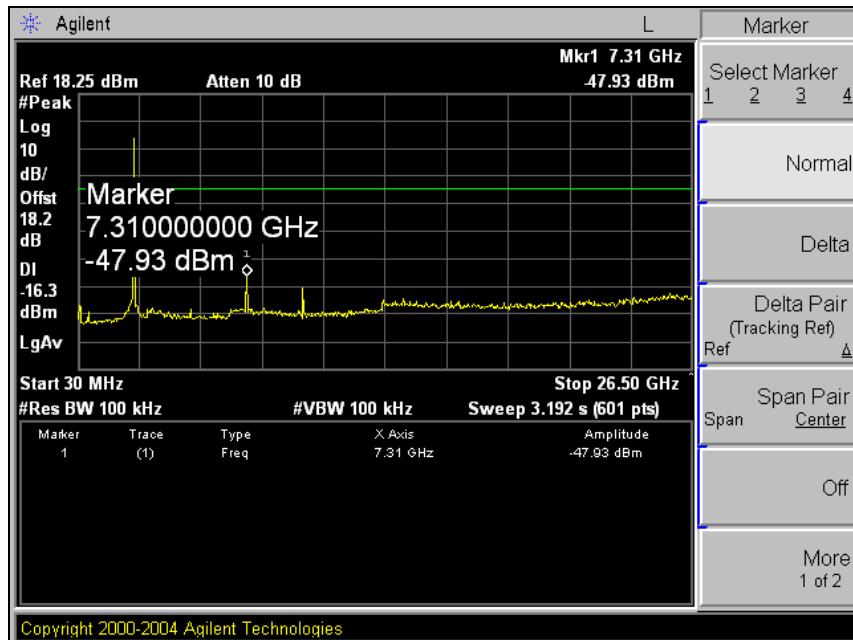
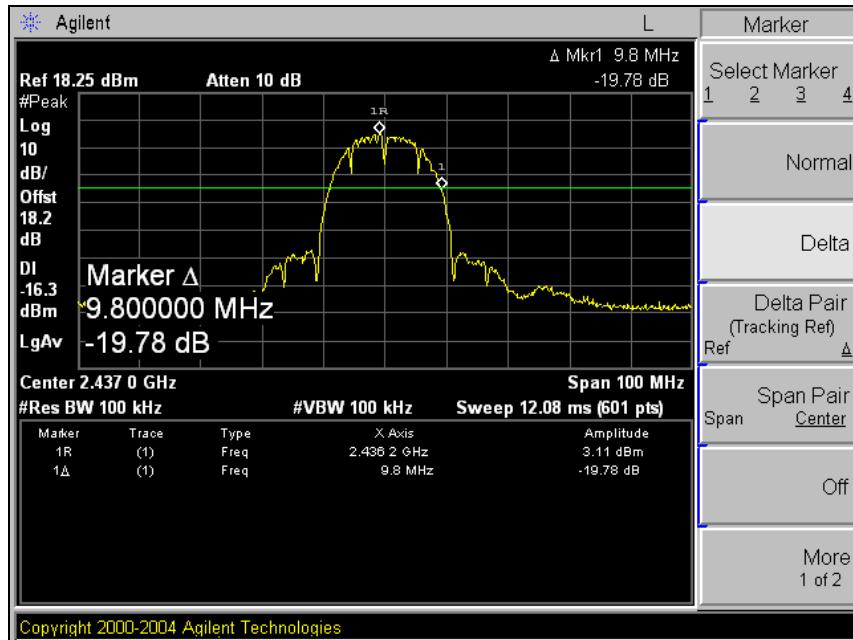
4.4.3. Spurious RF Conducted Emissions: Plot of Spurious RF Conducted Emission**IEEE 802.11b**

Low Channel



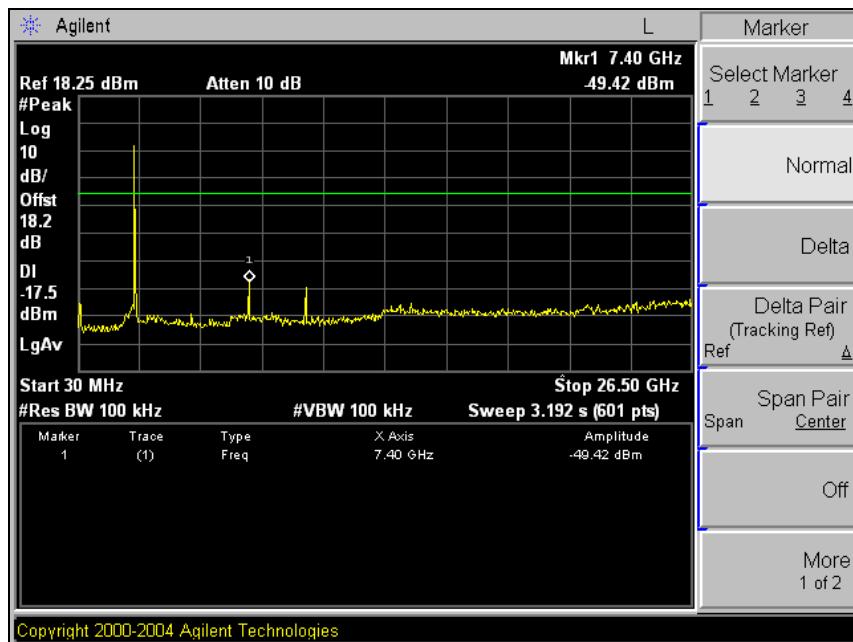
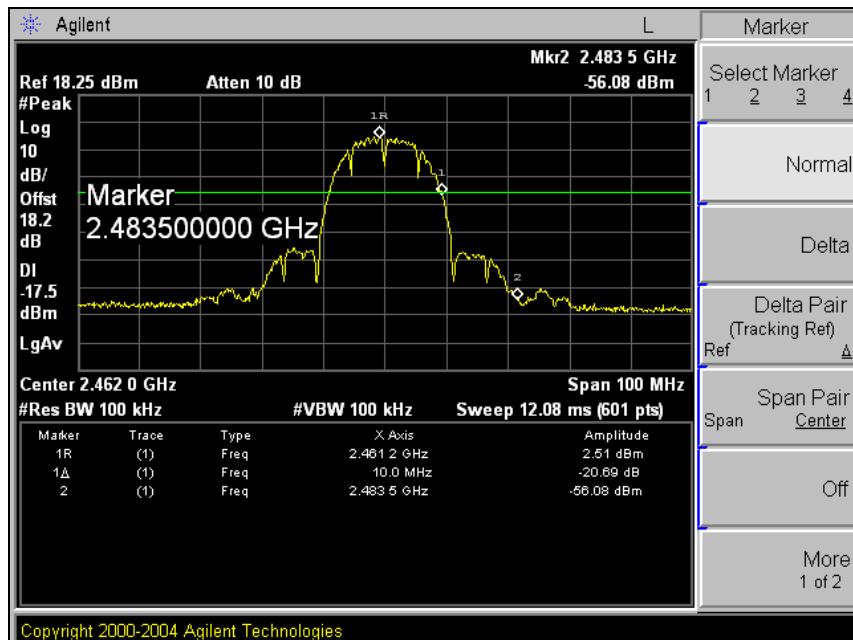
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Middle Channel



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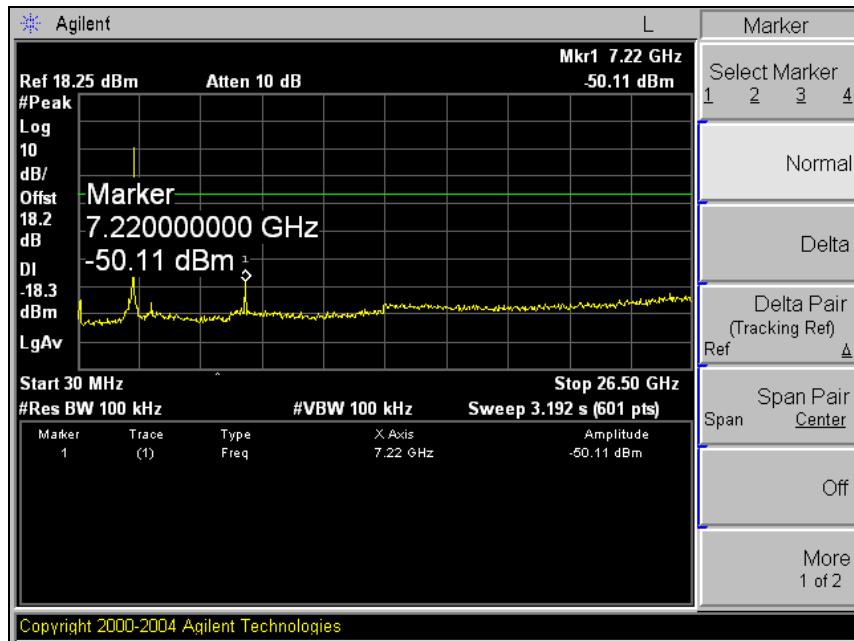
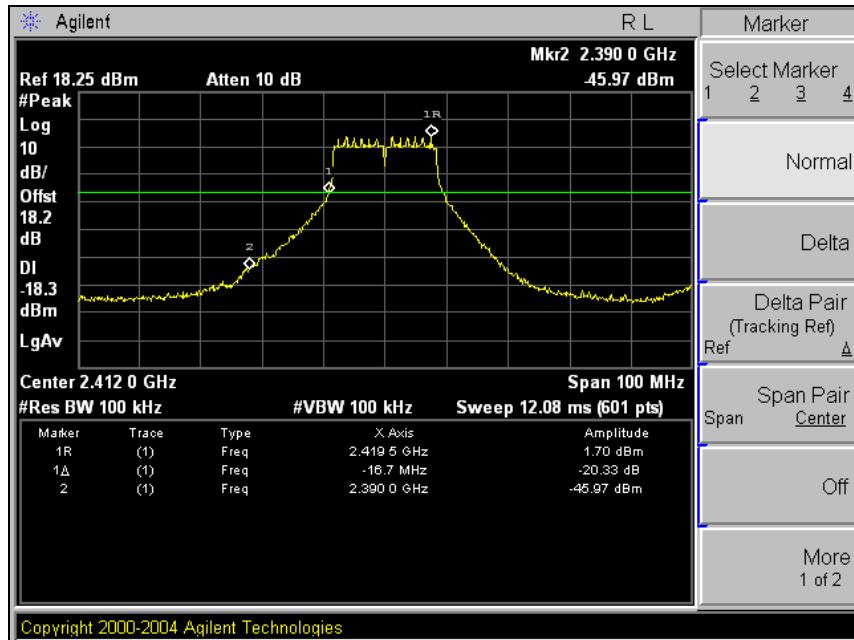
High Channel



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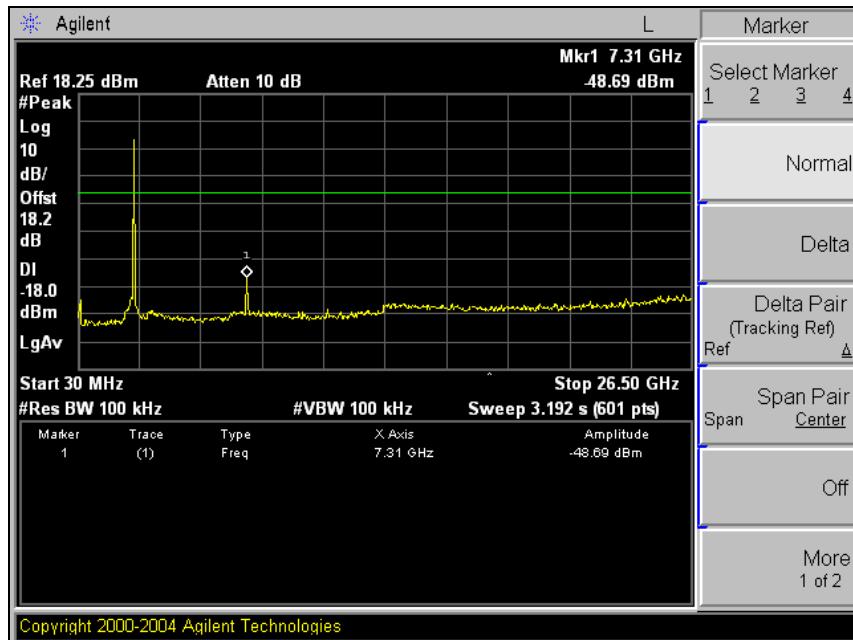
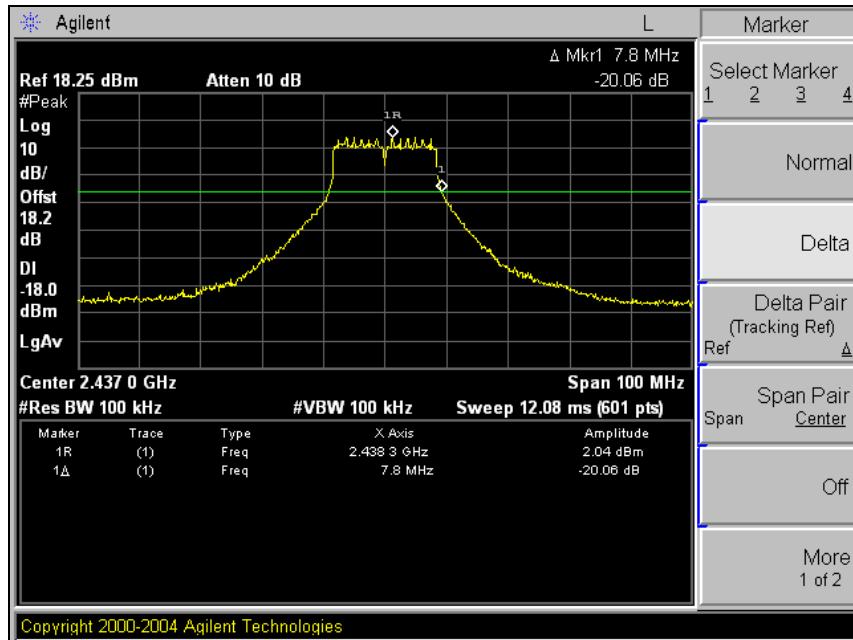
IEEE 802.11g

Low Channel



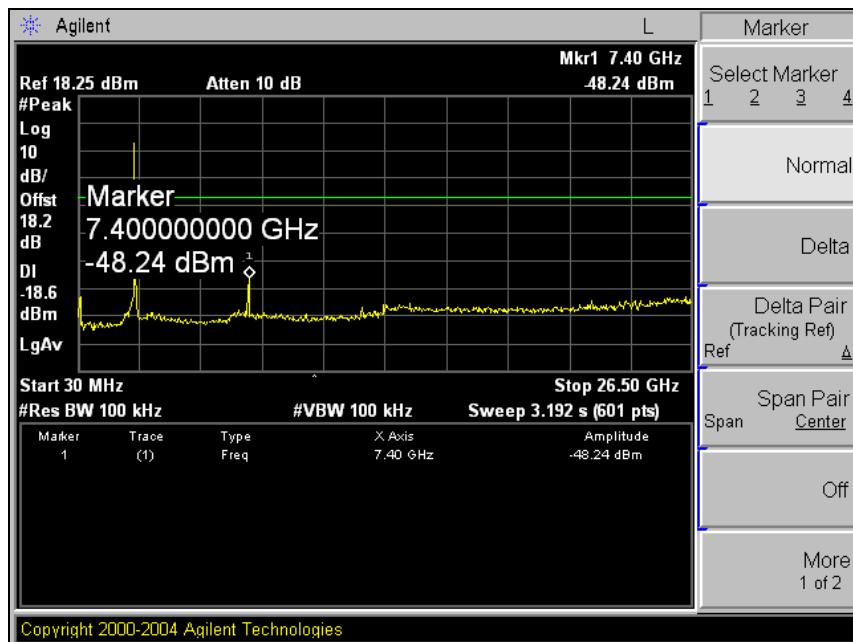
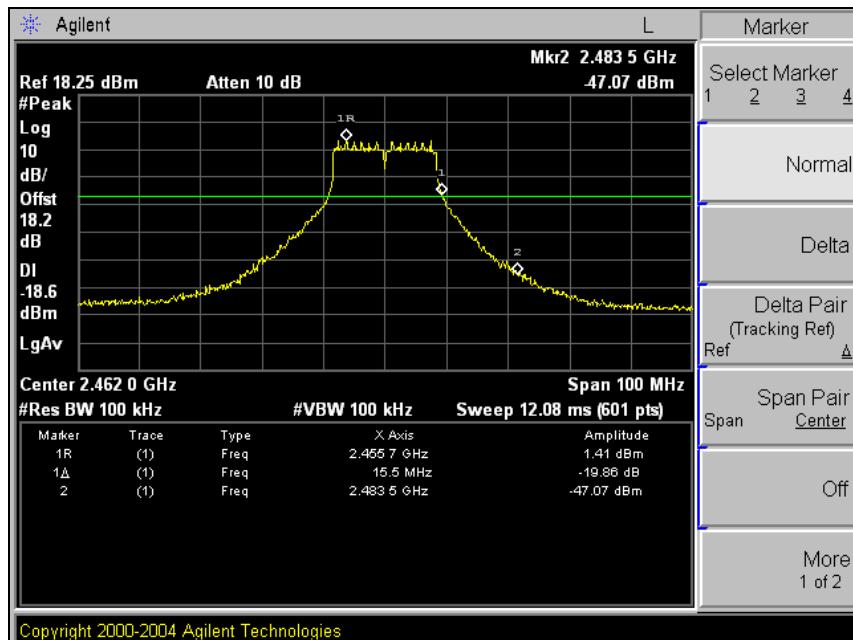
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Middle Channel



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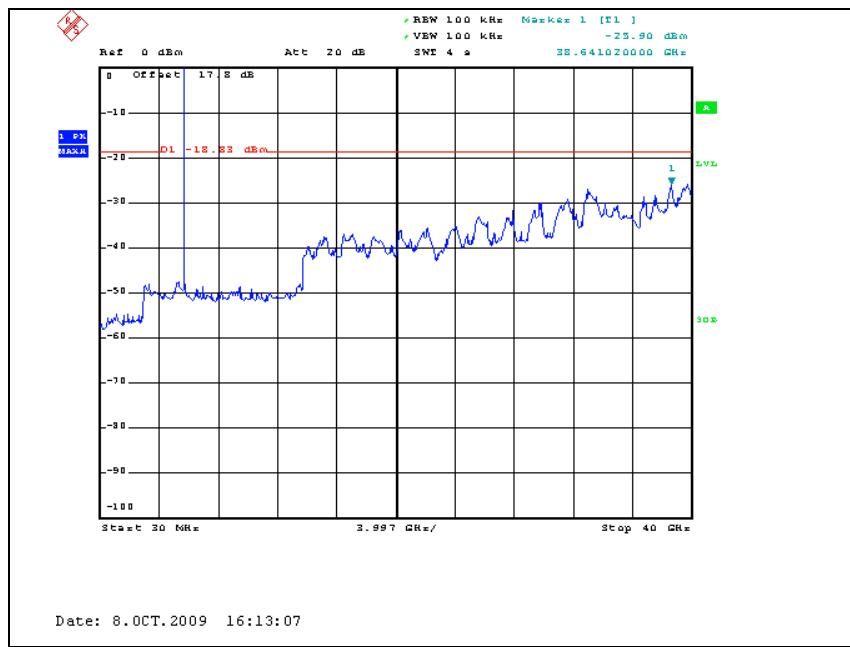
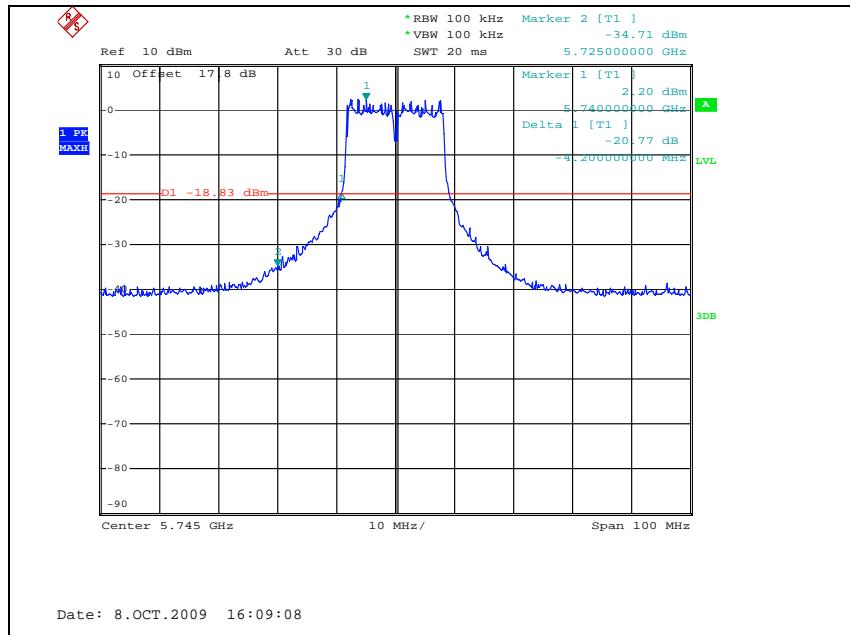
High Channel



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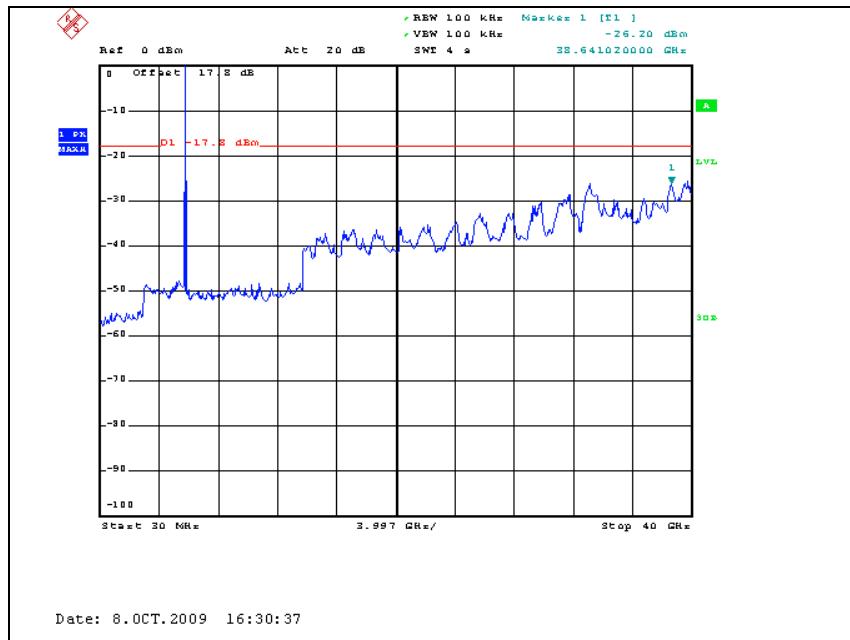
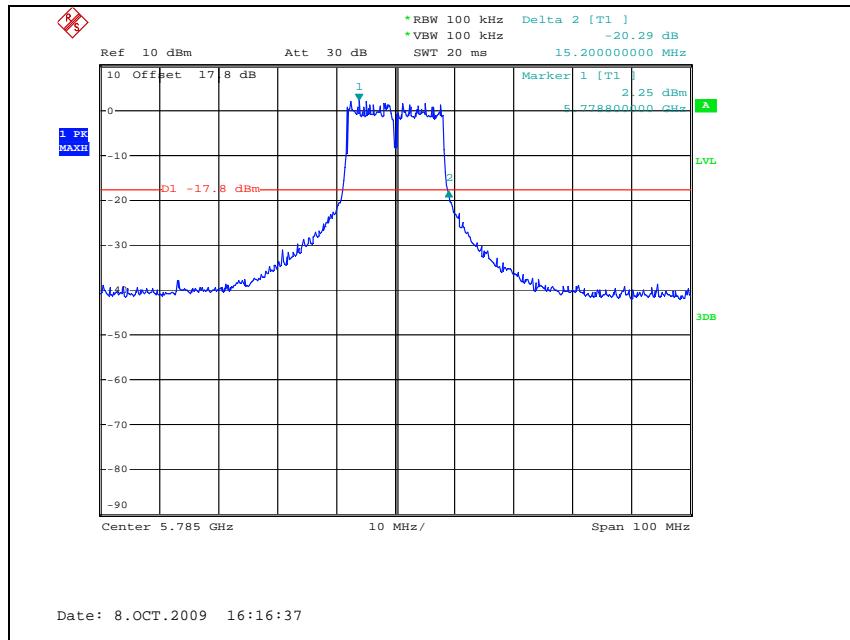
IEEE 802.11a

Low Channel



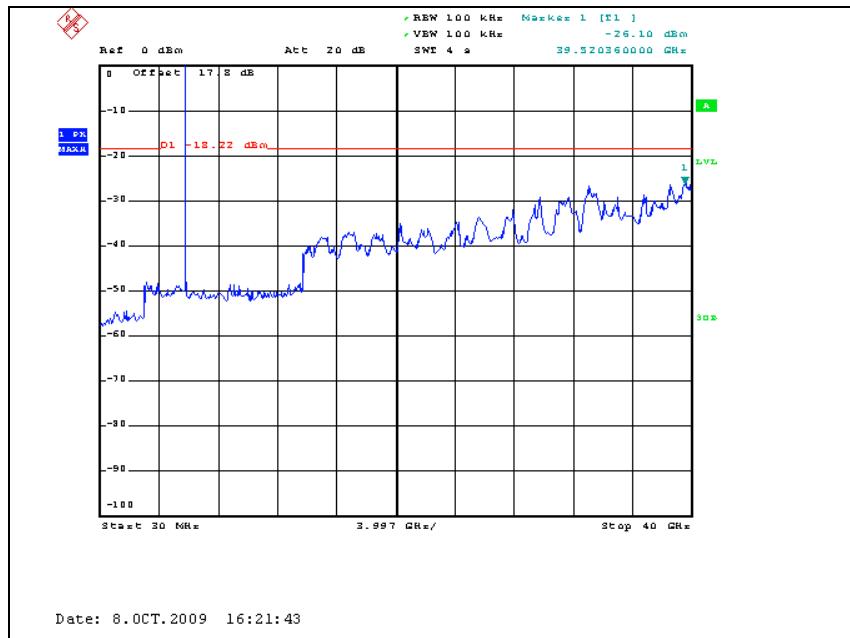
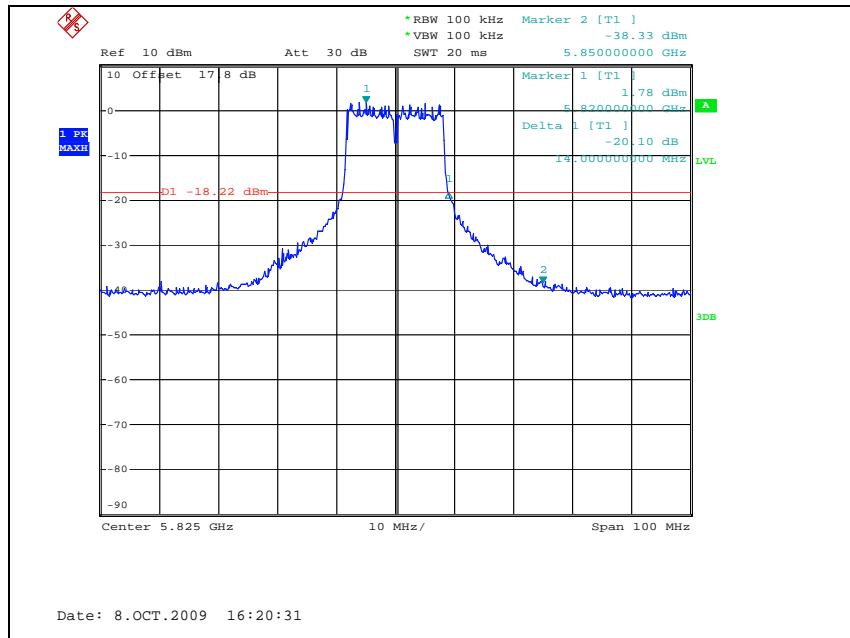
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Middle Channel



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High Channel



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5. Receiver radiated spurious emissions

5.1. Test setup

Same as clause 4.1.

5.1.1. Receiver radiated spurious emissions

Same as clause 4.1.1.

5.2. Limit

According to §15.109(a), Except for Class A digital devices, the field strength of radiated emission from unintentional radiator at a distance of 3 m shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dB μ V/m)	Radiated (μ V/m)
30 - 88	3	40.0	100
88 - 216	3	43.5	150
216 - 960	3	46.0	200
Above 960	3	54.0	500

5.3. Test procedures

Same as clause 4.3.

5.3.1. Test procedures for radiated spurious emissions

Same as clause 4.3.1.

5.4. Test result

Ambient temperature : 22 °C
Relative humidity : 49 % R.H.

5.4.1. Spurious radiated emission (Worst case configuration_ IEEE 802.11b)

All emissions are not reported much lower than the prescribed limits. All reading values are quasi-peak values.

Radiated Emissions			Ant	Correction Factors		Total	Limit	
Frequency (MHz)	Reading (dBuV)	Detect Mode	Pol.	AF (dB/m)	Amp Gain+CL (dB)	Actual (dBuV/m)	Limit (dBuV/m)	Margin (dB)
398.980	30.08	Q.P.	H	13.30	-25.56	17.82	46.00	28.18
664.940	42.34	Q.P.	H	18.10	-25.59	34.85	46.00	11.15
766.633	31.18	Q.P.	H	19.46	-25.20	25.44	46.00	20.56
797.915	34.15	Q.P.	H	19.59	-25.05	28.69	46.00	17.31
Above 800.00	Not Detected							

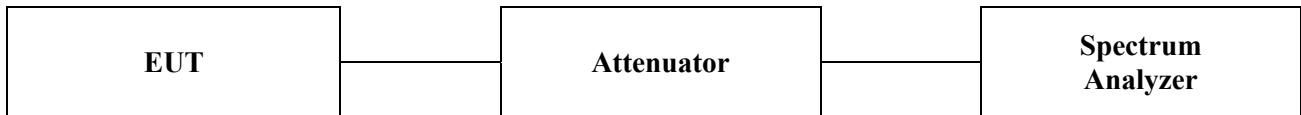
■ Remark:

1. All spurious emission at low, middle and high channel are almost the same below 1 GHz, so the spurious emission test result of the low channel was chosen as representative in final test.
2. “*” means the restricted band.
3. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

6. 6 dB Bandwidth measurement and 99 % BW

6.1. Test setup



6.2. Limit

According to §15.247(a)(2), systems using digital modulation techniques may operate in the 902 ~928 MHz, 2400 ~ 2483.5 MHz, and 5725 ~ 5825 MHz bands. The minimum of 6 dB Bandwidth shall be at least 500 kHz

6.3. Test procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as;
2 GHz: RBW = 100 kHz, VBW = 100 kHz, Span = 100 MHz, Sweep = auto.
5 GHz: RBW = 1 MHz, VBW = 3 MHz, Span = 100 MHz, Sweep = auto.
4. Mark the peak frequency and -6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

6.4. Test result

Ambient temperature : 22 °C
Relative humidity : 49 % R.H.

IEEE 802.11b

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)
2412	12.66	15.74
2437	12.53	15.81
2462	12.71	15.79

IEEE 802.11g

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)
2412	16.60	16.65
2437	16.57	16.64
2462	16.58	16.65

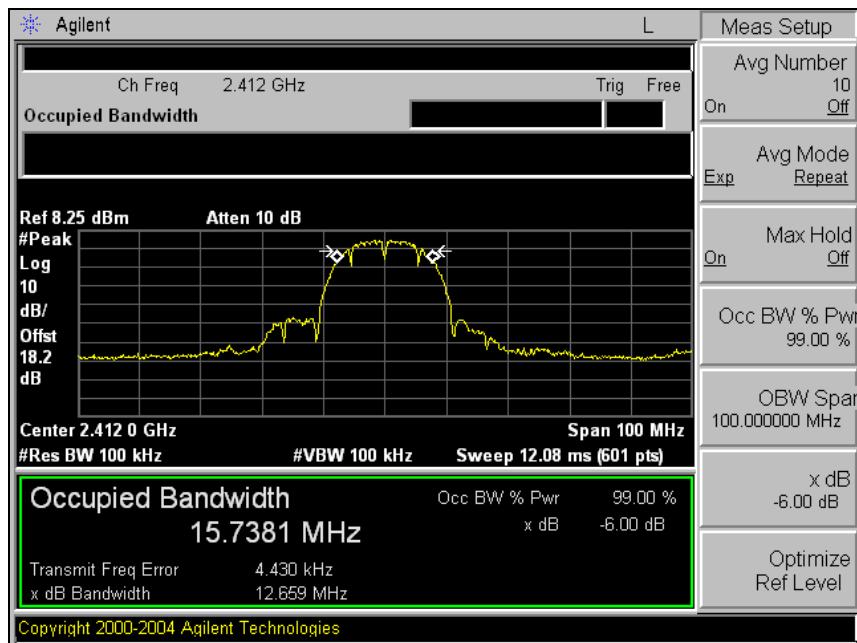
IEEE 802.11a

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)
5745	16.72	18.54
5785	16.67	18.54
5825	16.68	18.52

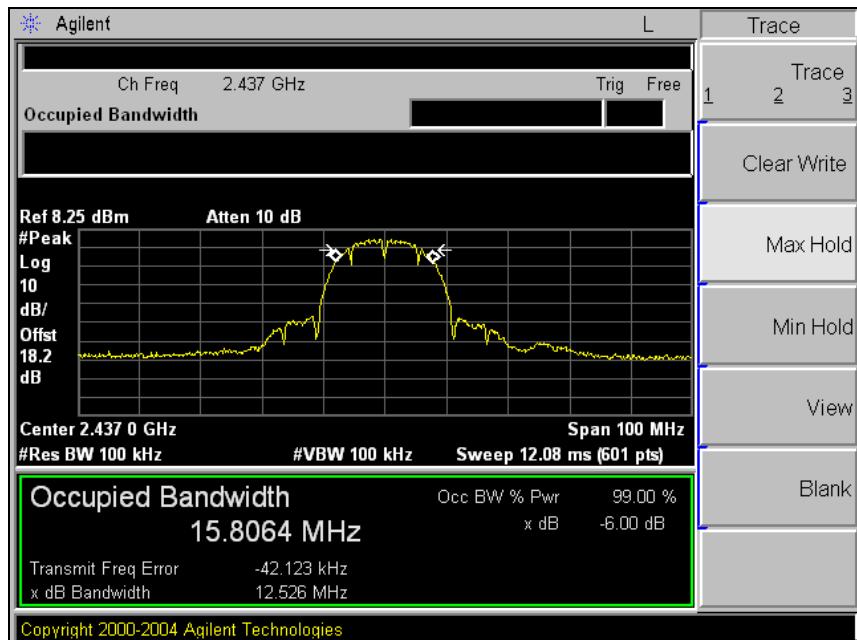
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IEEE 802.11b

Low channel

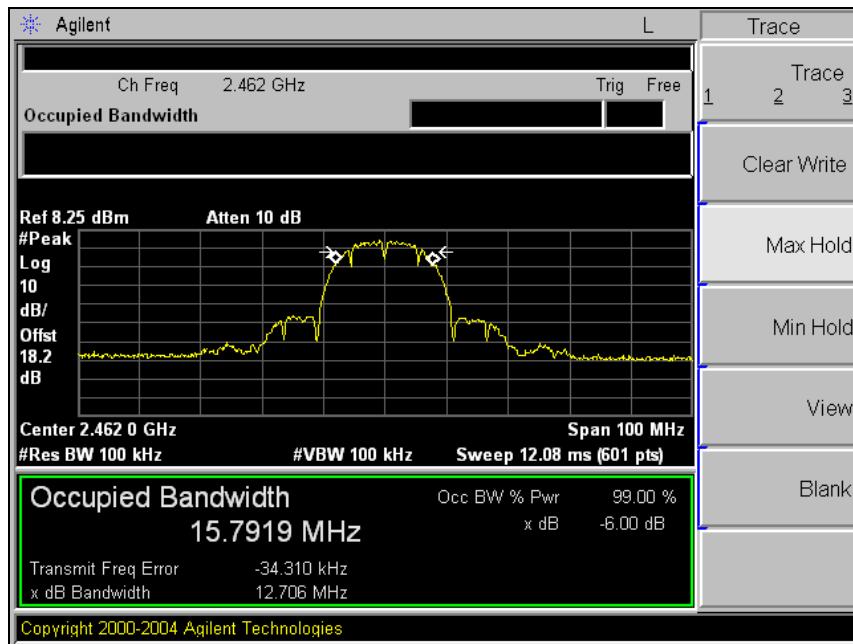


Middle channel



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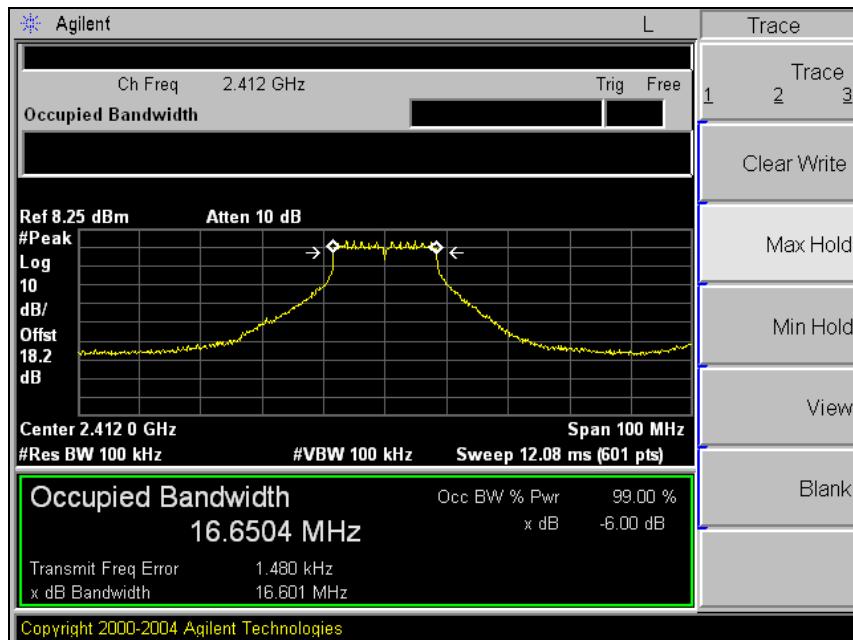
High channel



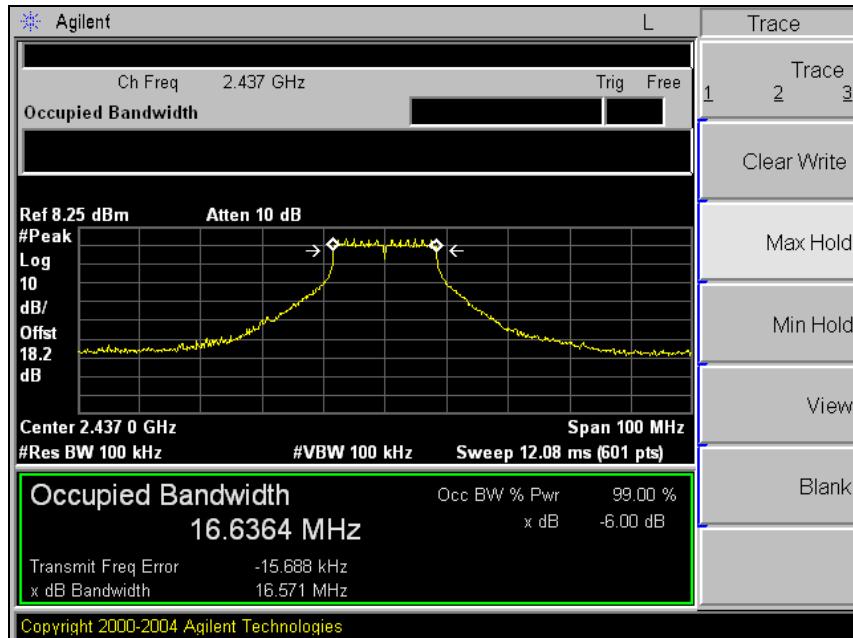
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IEEE 802.11g

Low channel

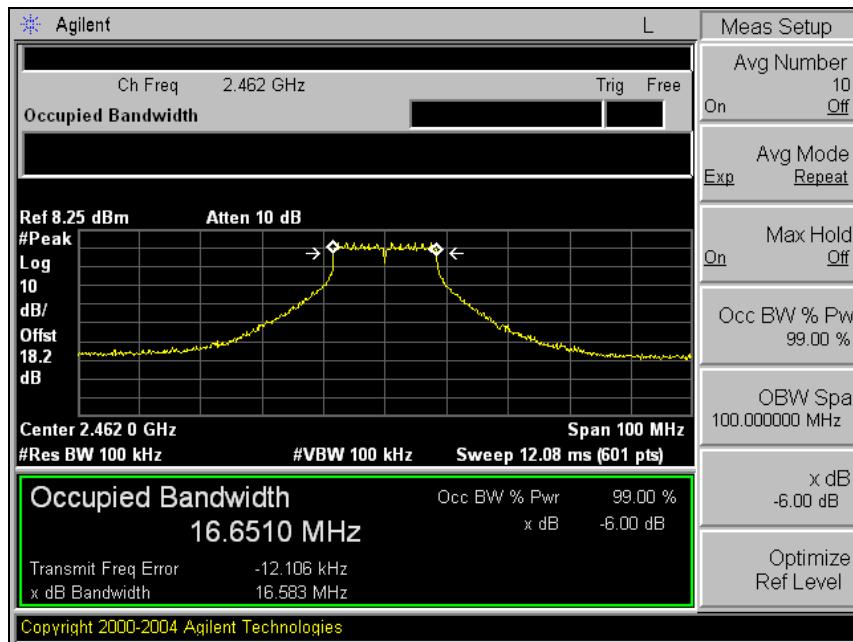


Middle channel



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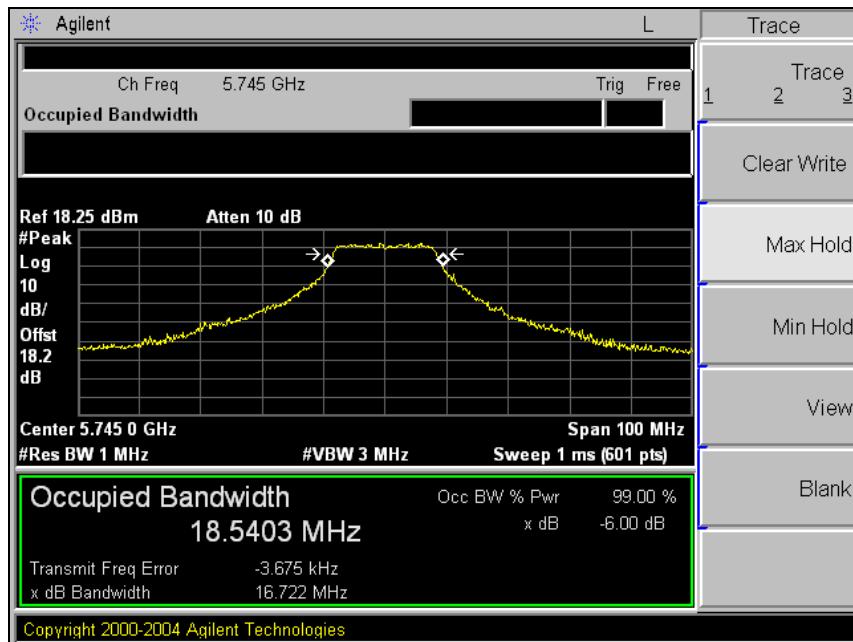
High channel



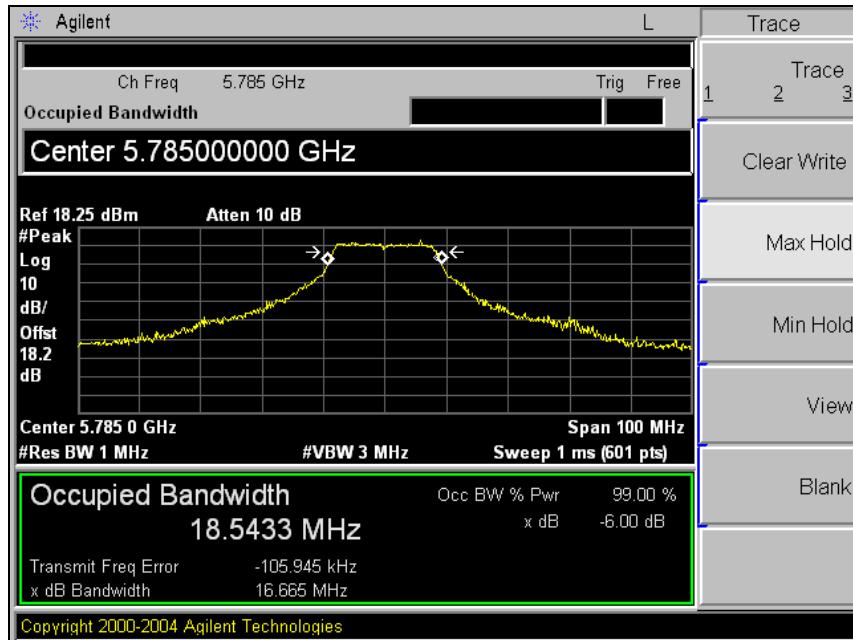
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IEEE 802.11a

Low channel

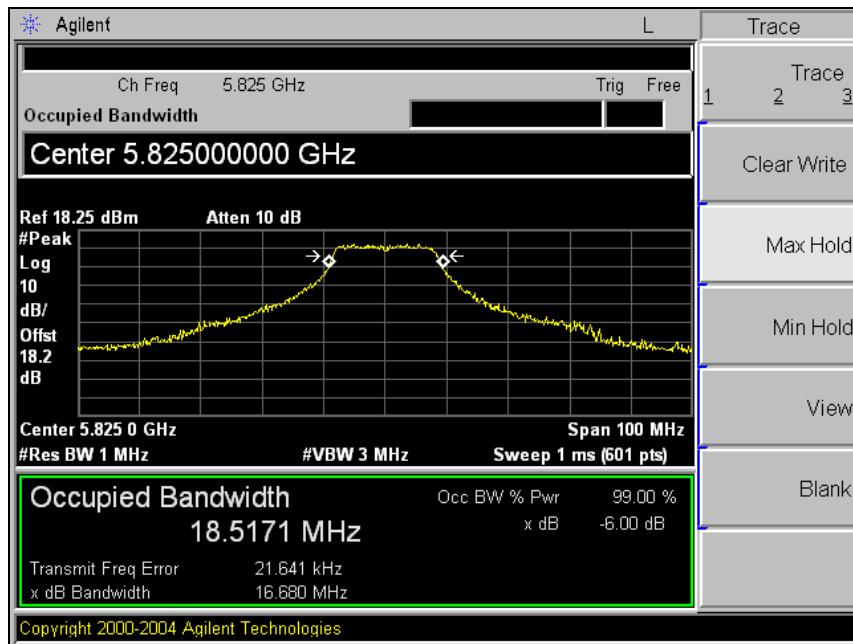


Middle channel



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High channel



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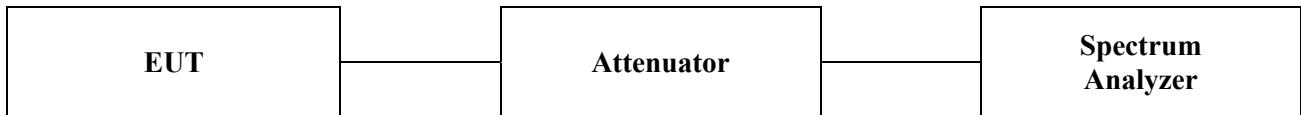
18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea, 435-040

Tel. +82 31 428 5700 / Fax. +82 31 427 2371

www.electrolab.kr.sgs.com

7. Maximum peak output power measurement

7.1. Test setup



7.2. Limit

According to §15.247(b)(3), for systems using digital modulation in the 902 ~ 928 MHz, 2400 ~2483.5 MHz, and 5725 ~ 5850 MHz band: 1 Watt. As an alternative to a peak power measurement, compliance with the one watt limit can be based on a measurement of the maximum conducted output power. 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 antenna elements. The average must not include any intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4), the conducted output power limit specified in paragraph(b) of this section is based on the use of antenna with directional gains that do not exceed 6 dBi. Except as shown in paragraph(c) of this section, if transmitting antenna of directional gain greater than 6 dBi are used, the conducted output power from the 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.

7.3. Test procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the Spectrum analyzer as RBW = 1 MHz, VBW = 3 MHz, Span = Auto, Channel BW = 99%.

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This test report cannot be reproduced, except in full, without prior written permission of the Company.

7.4. Test result

Ambient temperature : 22 °C
Relative humidity : 49 % R.H.

IEEE 802.11b

Frequency (MHz)	Output power (dBm)	Limit (dBm)	Margin (dB)
2412	16.69	30	13.31
2437	16.76		13.24
2462	16.30		13.70

IEEE 802.11g

Frequency (MHz)	Output power (dBm)	Peak Power Limit (dBm)	Margin (dB)
2412	17.26	30	12.74
2437	16.29		13.71
2462	16.42		13.58

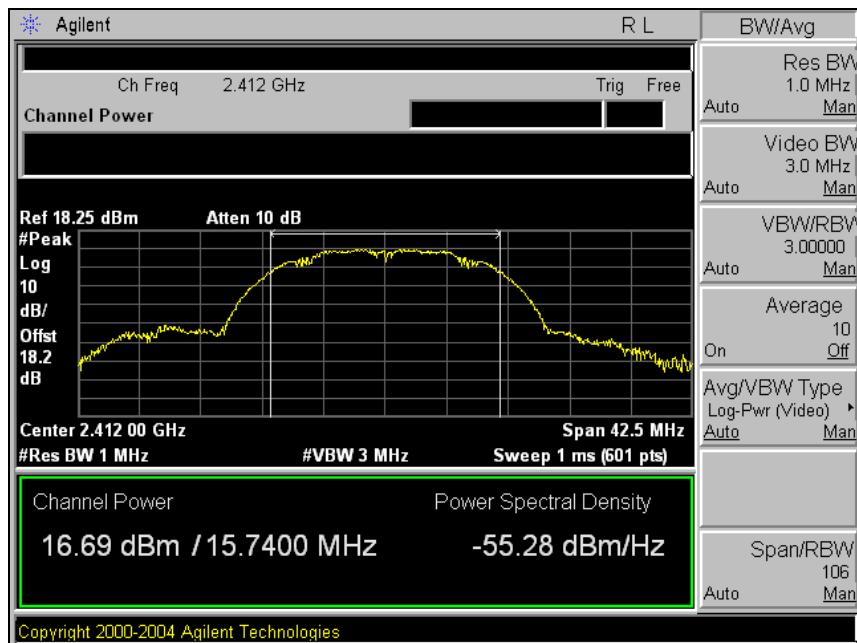
IEEE 802.11a

Frequency (MHz)	Output power (dBm)	Limit (dBm)	Margin (dB)
5745	16.51	30	13.49
5785	16.10		13.90
5825	15.85		14.15

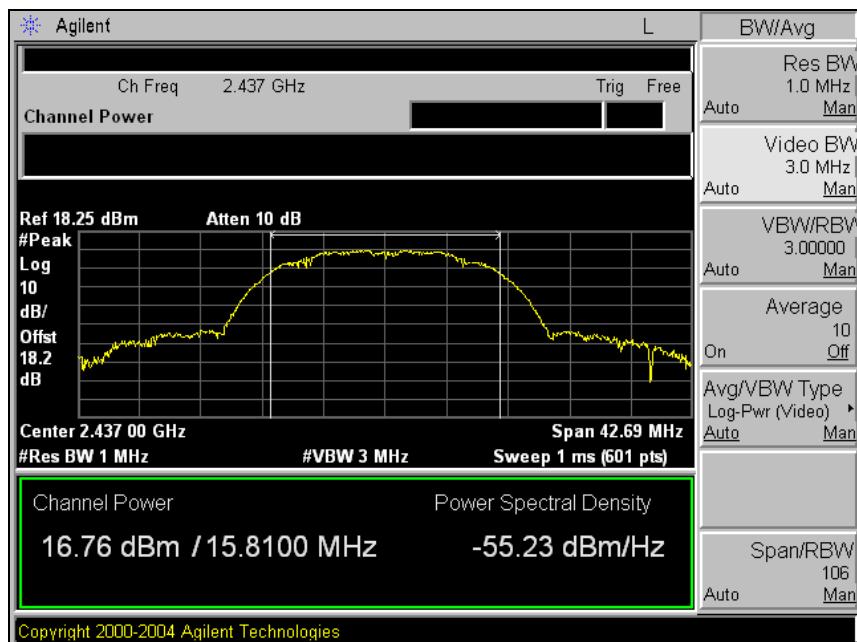
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IEEE 802.11b

Low channel

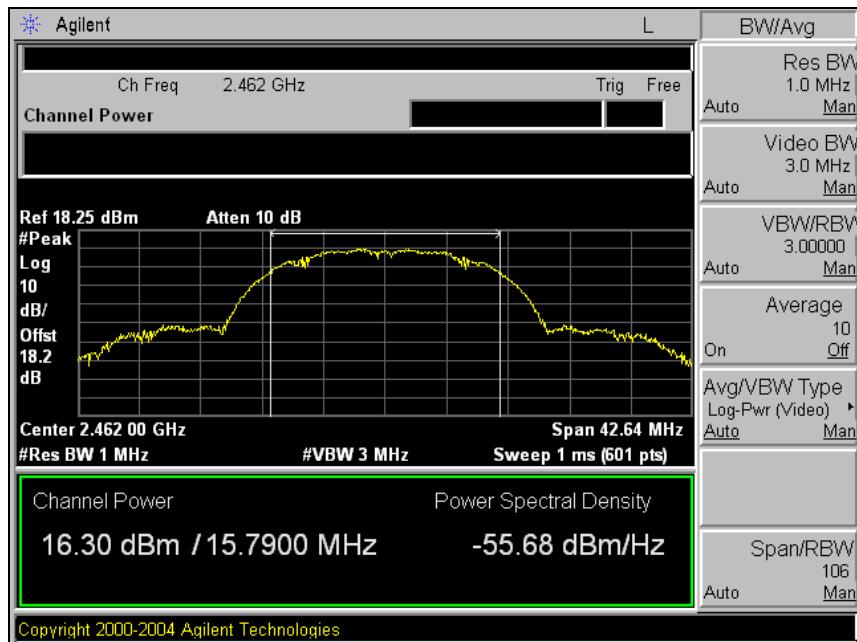


Middle channel



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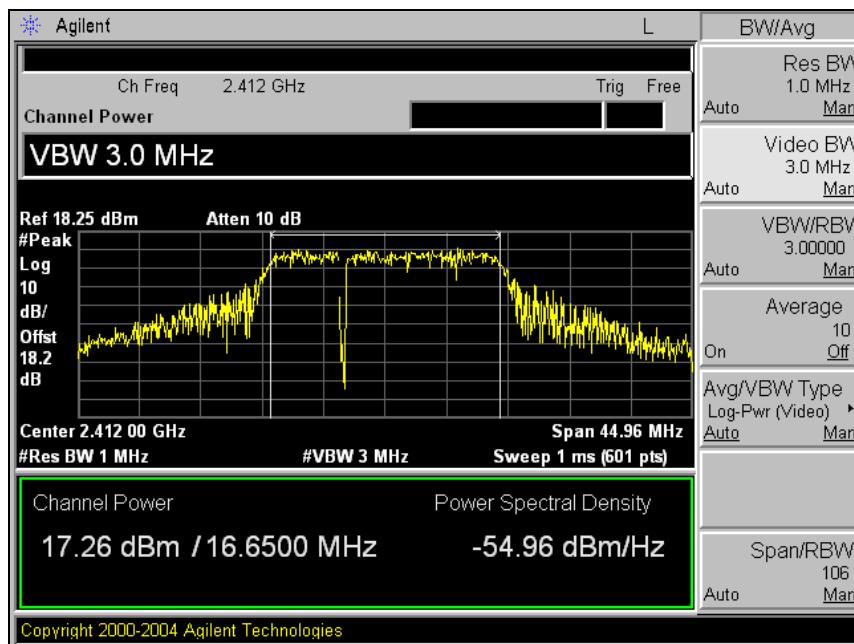
High channel



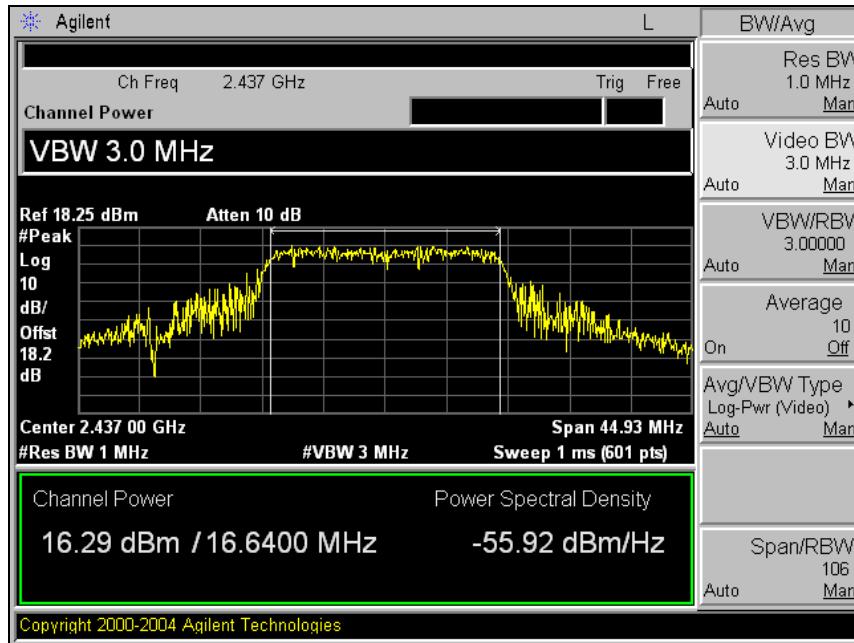
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IEEE 802.11g

Low channel

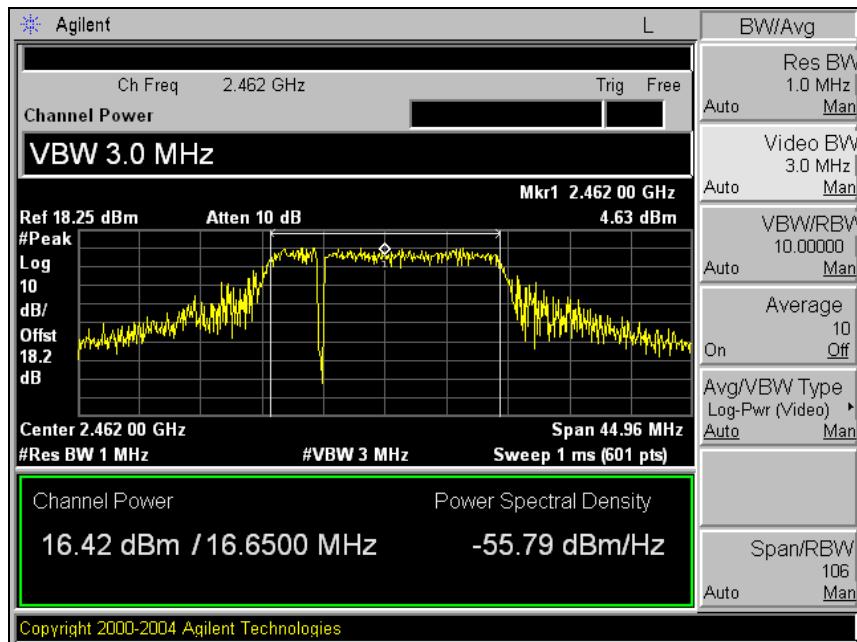


Middle channel



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High channel



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SGS Testing Korea Co., Ltd.

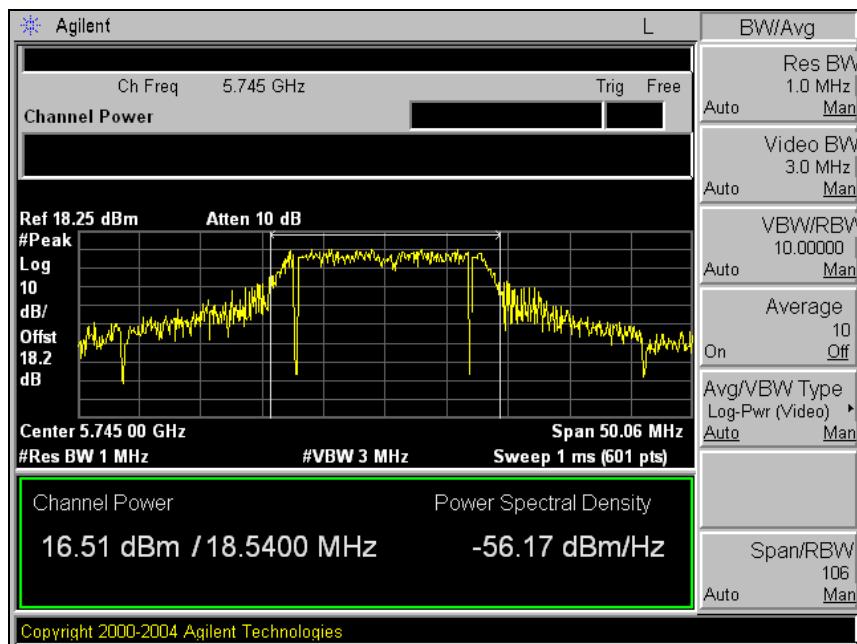
18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea, 435-040

Tel. +82 31 428 5700 / Fax. +82 31 427 2371

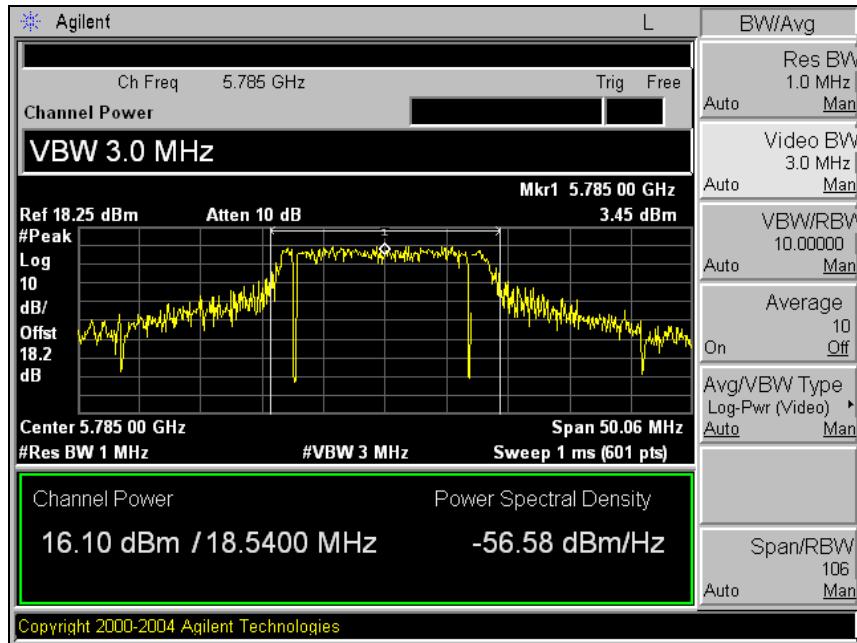
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IEEE 802.11a

Low channel

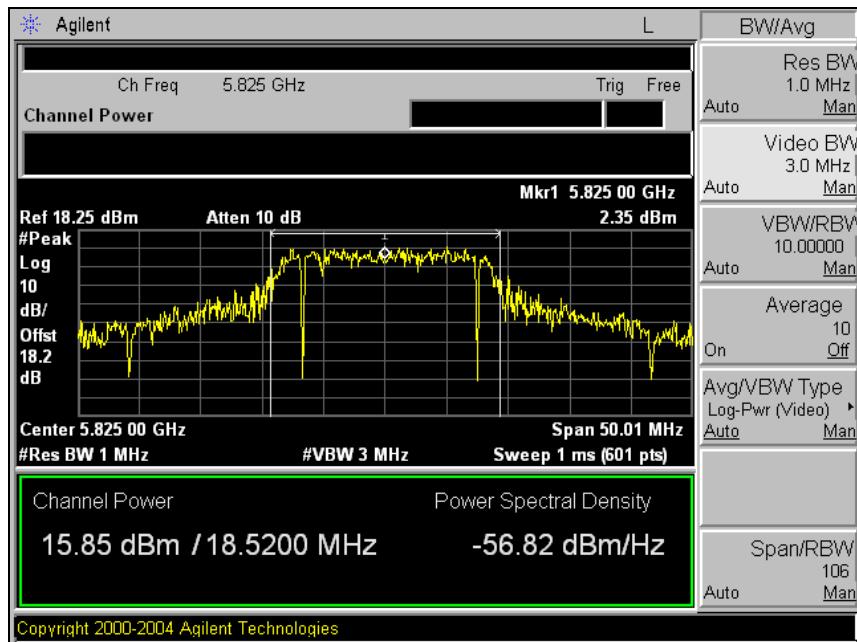


Middle channel



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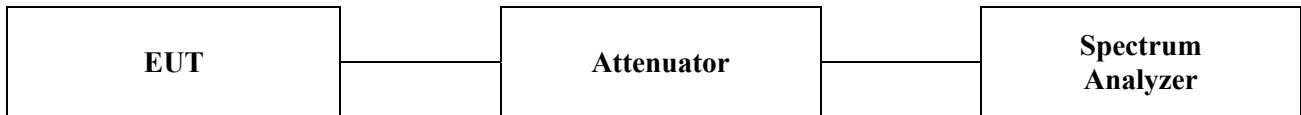
High channel



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8. Power spectral density measurement

8.1. Test setup



8.2. Limit

According to §15.247(e), For digitally modulated system, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band 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

6.3. Test procedure

1. Place the EUT on the table and set it in transmitting mode

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

2. Set the spectrum analyzer as RBW = 3 kHz, VBW = 10 kHz, Span = 300 kHz, Sweep = 100 s
3. Record the max reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

8.4. Test result

Ambient temperature : 22 °C
Relative humidity : 49 % R.H.

IEEE 802.11b

Frequency (MHz)	Final RF Power Level in 3 kHz BW (dBm)	Limit (dBm)	Margin (dB)
2412	-8.76	8	16.76
2437	-8.64		16.64
2462	-9.06		17.06

IEEE 802.11g

Frequency (MHz)	Final RF Power Level in 3 kHz BW (dBm)	Limit (dBm)	Margin (dB)
2412	-12.34	8	20.34
2437	-11.16		19.16
2462	-12.11		20.11

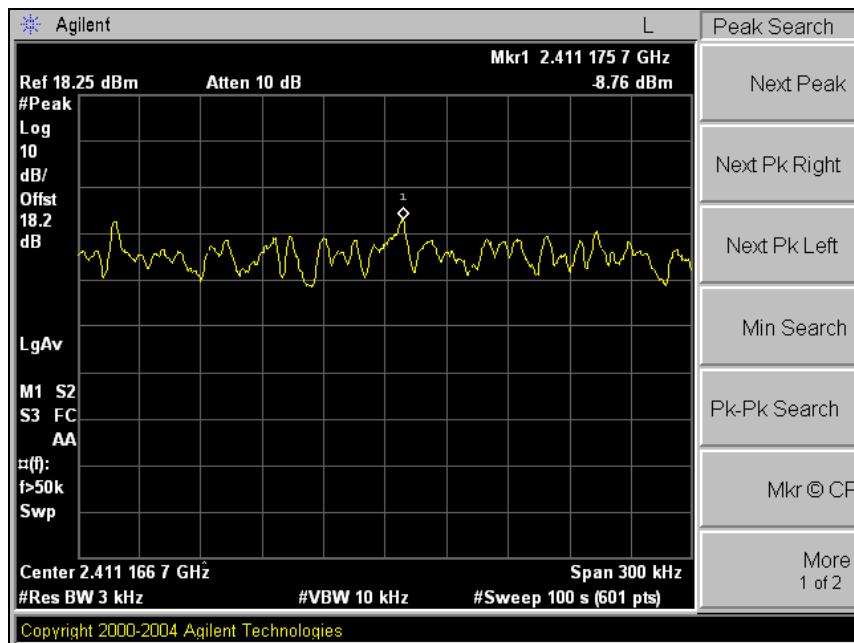
IEEE 802.11g

Frequency (MHz)	Final RF Power Level in 3 kHz BW (dBm)	Limit (dBm)	Margin (dB)
2412	-10.99	8	18.99
2437	-11.82		19.82
2462	-11.90		19.90

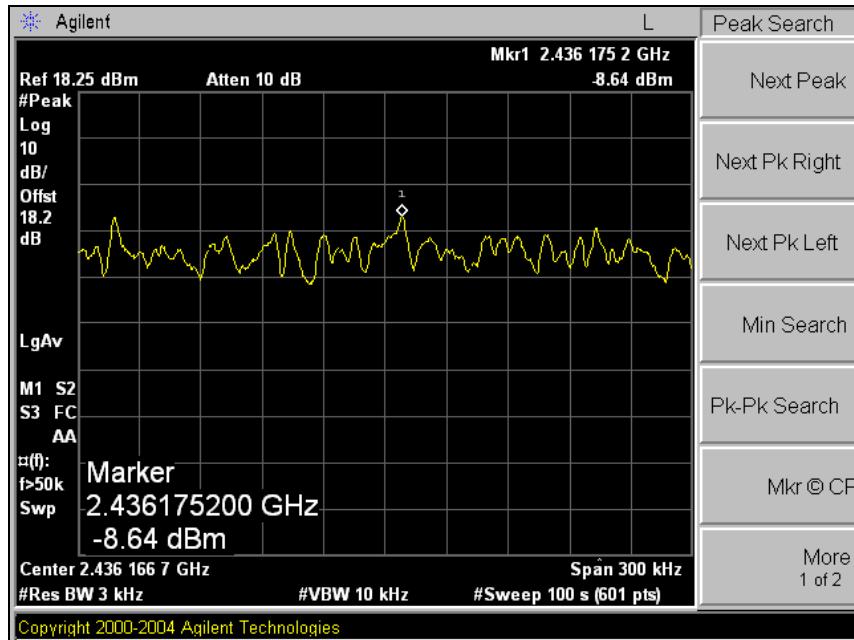
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IEEE 802.11b

Low channel

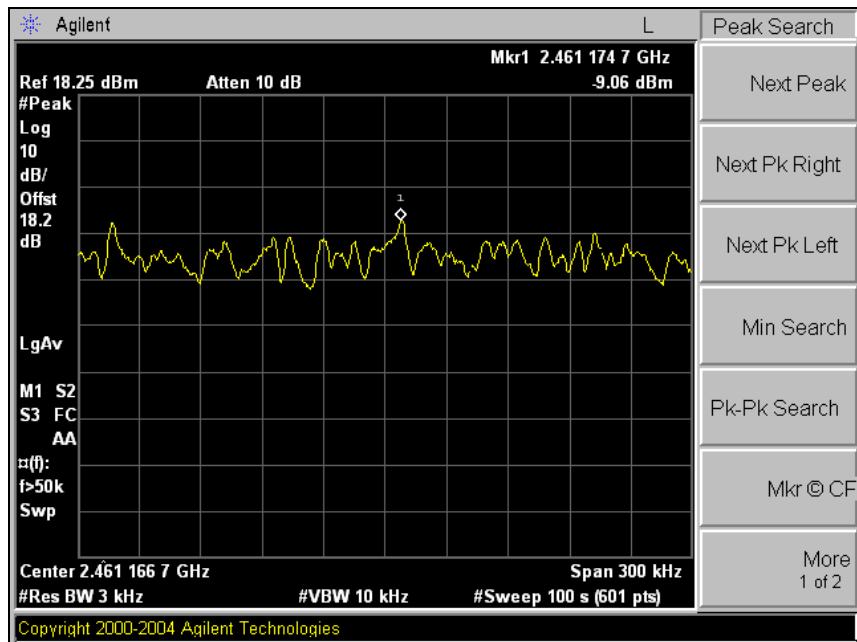


Middle channel



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High channel



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SGS Testing Korea Co., Ltd.

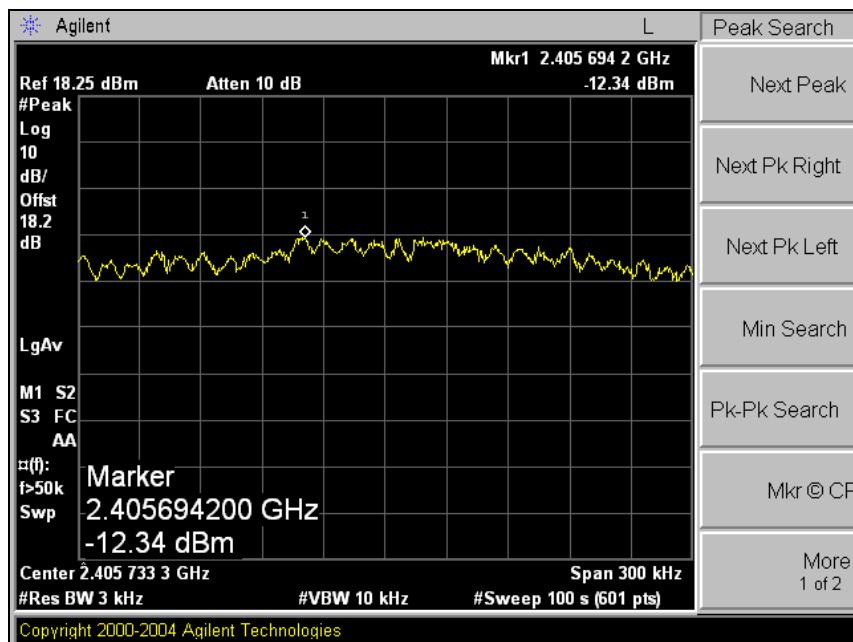
18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea, 435-040

Tel. +82 31 428 5700 / Fax. +82 31 427 2371

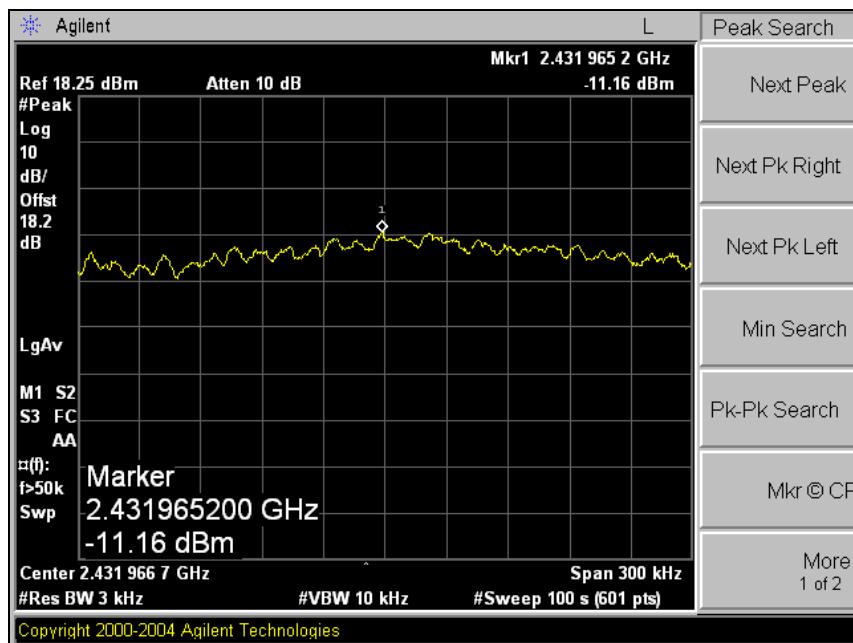
www.electrolab.kr.sgs.com

IEEE 802.11g

Low channel

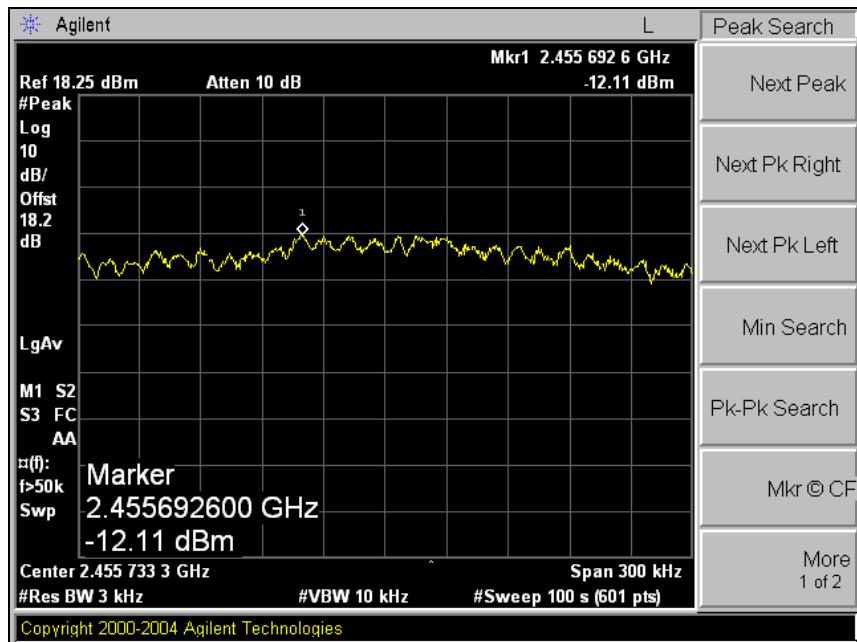


Middle channel



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High channel



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SGS Testing Korea Co., Ltd.

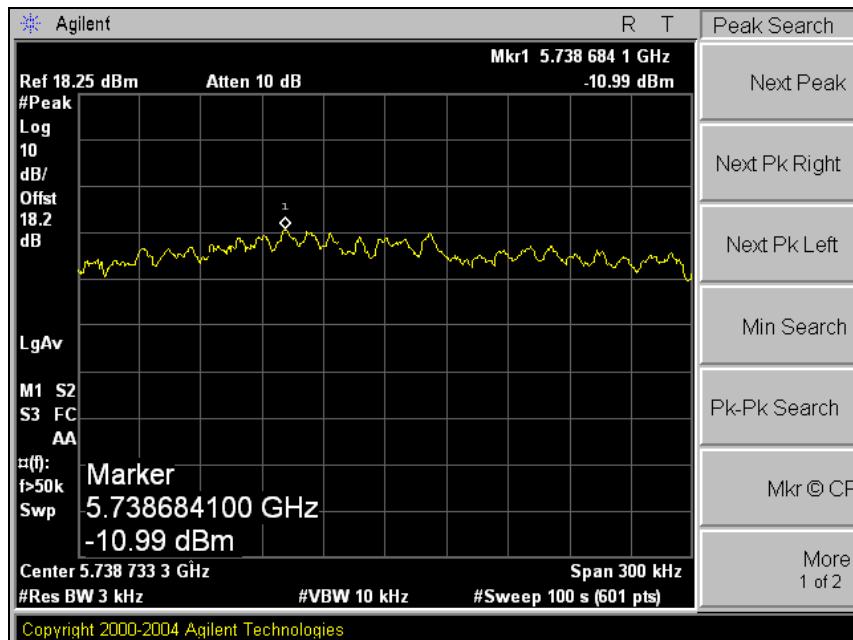
18-34, Sanbon-dong, Gunpo-si, Gyeonggi-do, Korea, 435-040

Tel. +82 31 428 5700 / Fax. +82 31 427 2371

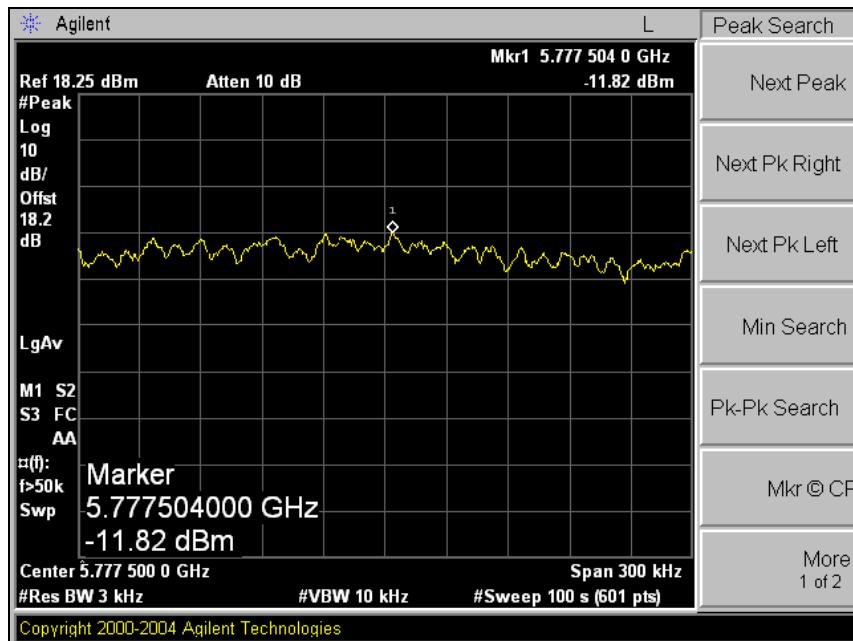
www.electrolab.kr.sgs.com

IEEE 802.11a

Low channel

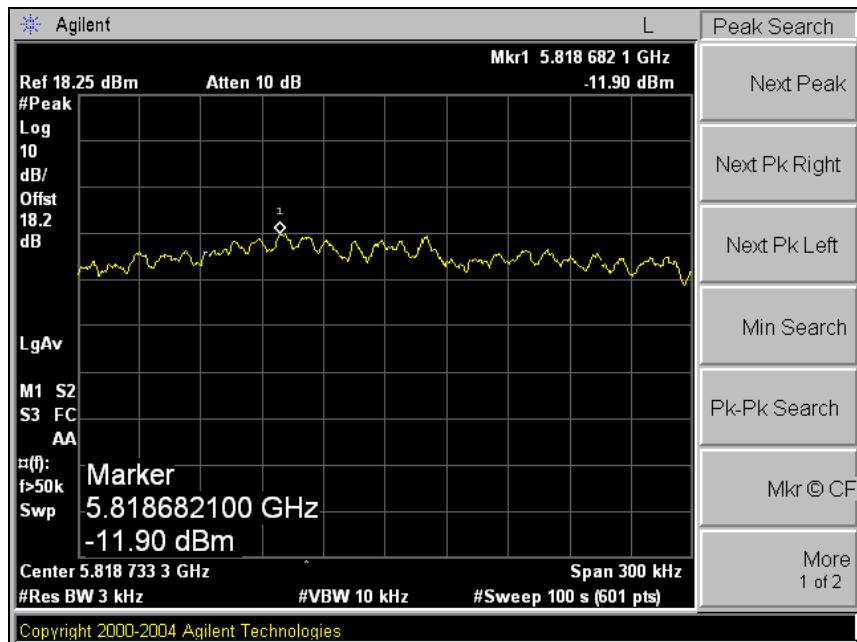


Middle channel



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High channel



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9. Antenna Requirement

9.1. 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. And according to FCC 47 CFR Section § 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the gain of the antenna exceeds 6 dBi.

7.2. Antenna Connected Construction

The antenna used of this product is inverter F type antenna.

The peak max gain of this antenna is 2.85 dBi(2.4 GHz) & 1.78 dBi(5.7 GHz)

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