

8. Power Output - §15.247(b)

8.1. POWER OUTPUT TEST PROCEDURE

The peak conducted output power of the EUT was measured using an Agilent 4416A EPM-P Series Power Meter with an E9323A Peak and Average Power Sensor. All the WLAN Circuit Modulated Output Signals were tested with a combiner calibrated for Channels 1, 6 and 11 as well as without a combiner i.e. each of the 16 antenna feed point individually measured and arithmetically combined for the total final power. The highest, medium and lowest power were derived from these measurements as WLAN Circuit Modulated Output Signals 13, 4 and 8 respectively at 1 MBPS, 2 MBPS and 11 MBPS including the 3 highest WLAN Circuit Modulated Output Signals power namely 13, 1 and 6. The aforementioned output represents the worst-case configuration. The measurement data can be found in the Appendix B.

Note the measurement listed in the report with the power meter and sensor was verified using the Substitution Power Measurement Method with a signal generator, power meter, diode detector, and an oscilloscope.

During testing, the unit was set for typical operational mode i.e. 7 degree set point starting from bore-sight (WLAN 13) direction from each WLAN circuit covering the 100 degree radiation angle, i.e. +/-50 degree angle. The arithmetic linear sum of all the ports for the WLANs other than WLAN 13 would be different from the measurement using the combiner due to the destructive effect of the field at the port of the combiner. The test equipment used for testing is listed in the table 8.3-1.

8.2. JUSTIFICATION OF RESULTS

EQUAL POWER BEAM FORMER

The plot below shows the pattern of an equal power 16 port beam-forming network with equal phasing to all antennas. The equal phase example generates a beam of RF energy that radiates line-of-sight from the surface of the antenna. This is called the bore-sight beam.

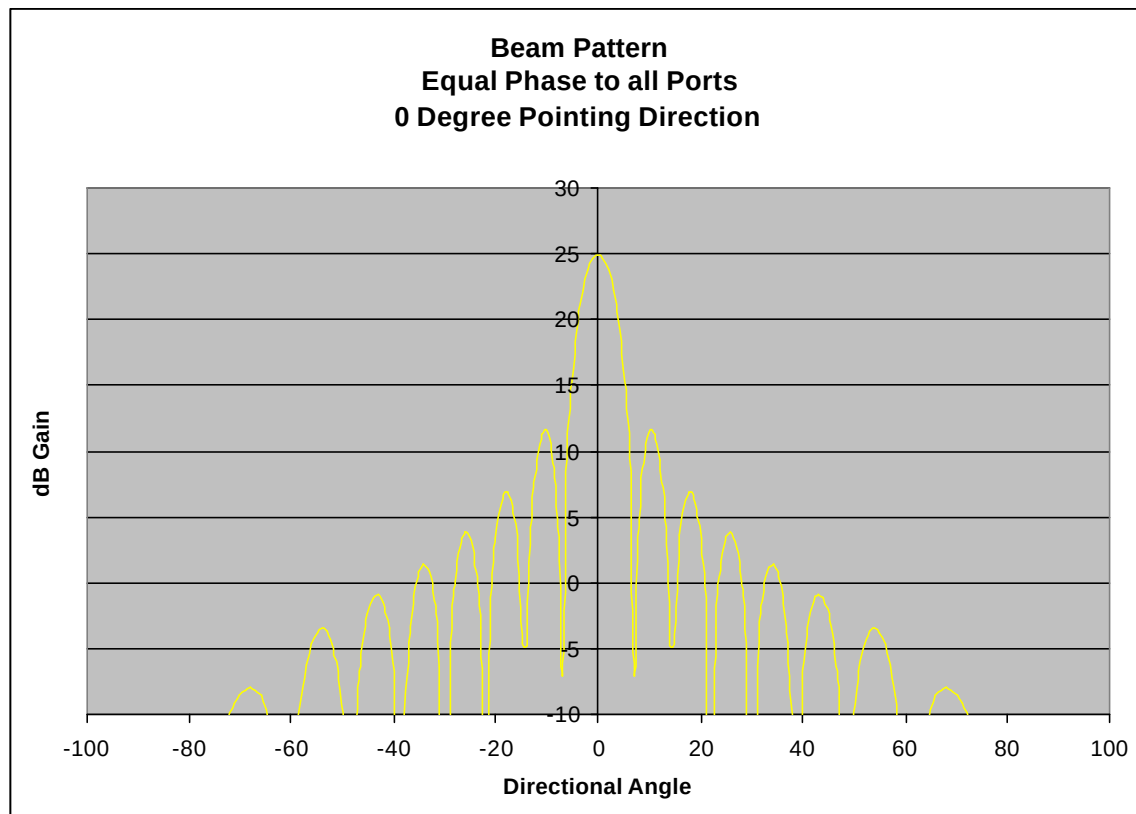
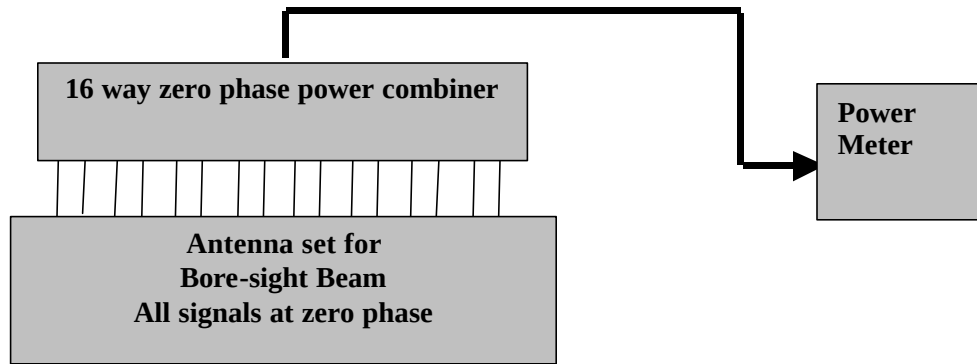


DIAGRAM 1: BEAM PATTERN EQUAL PHASE 0 DEGREE DIRECTION

Power measurements made with an equal phase power combiner yield a true representation of the total radiated power because the bore-sight beam requires all signals to be summed in space with equal phase. Note that there are nulls in the antenna pattern.



Peak power at bore-sight direction	Zero degrees (normal to antenna surface)
Phase relationship:	Equal phases to all signals
Nulls at:	7, 14, 21, 30 etc. degrees

The nulls represent zero power transmitted at these directions. This means that the signals emanating from all 16 antennas cancel in space along the directions of 7, 14, 21, 30 etc. degrees from the bore-sight direction.

DIRECTIONS OTHER THAN BORE-SIGHT

The diagram below shows the pattern for a beam with maximum signal strength in a direction 14 degrees away from bore-sight. The phase for each of the 16 signals increases by 45 degrees per port as one measure from left to right. Note that there is a null at the bore-sight or 0 degree direction. The null indicates that the signals from all of the 16 antennas cancel to zero in a direction normal to the antenna.

A power meter connected to a zero phase power combiner as show in the diagram above would ideally measure no power since the zero phase combining is the equivalent of a bore sight power measurement.

Peak power direction	14 degrees (relative to a normal antenna surface)
Phase relationship:	45 degrees per port phase slope
Nulls at:	-7, 0, 7, 21, 30, degrees

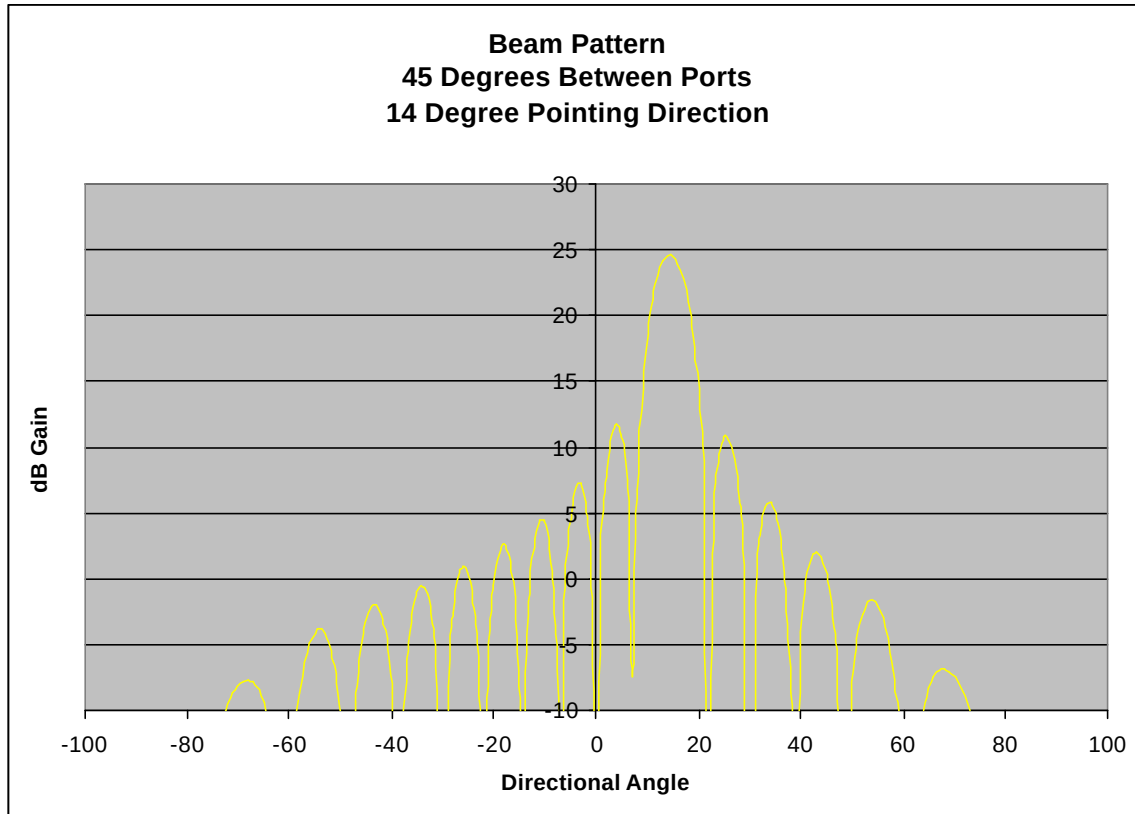


DIAGRAM 2: BEAM PATTERN EQUAL PHASE 14 DEGREE DIRECTION

BEAM-FORMER IMPERFECTIONS

The diagrams and discussion above assumes that the beam-former, the power amplifiers, and all associated circuitry have perfect magnitude and phase. Real parts have both gain and phase fluctuations limiting the depth of the nulls and the accuracy of the peaks. The measurement data in Appendix TBD reflects the aforementioned anomalies.

8.3. TEST EQUIPMENT USED FOR TESTING

TABLE 8.3-1: TEST EQUIPMENT USED FOR TESTING RADIATED RF OUTPUT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DATE
901186	Agilent Technologies	E9323A (50MHz-6GHz)	Peak & Average Power Sensor	US40410380	07/19/03
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573	07/19/03
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz – 22 GHz)	3138A07771	05/10/03

8.4. POWER OUTPUT TEST DATA - WLAN 13

TABLE 8.4-1: POWER OUTPUT TEST DATA WLAN 13

Operating Frequency (MHz): 2412, 2437 & 2462
Channels: 1, 6 & 11
Measured Conducted Power. (dBm): See below

DATA RATE (MBPS)	POWER CONDUCTED OUTPUT (DBM)		
	CH 1 COMBINER/(SUM 16 PORTS)	CH 6 COMBINER/(SUM 16 PORTS)	CH 11 COMBINER/(SUM 16 PORTS)
1	19.4 (20.6)	19.6 (20.6)	18.7 (19.7)
2	19.6 (20.7)	19.7 (20.7)	18.7 (19.8)
11	19.4 (20.7)	19.6 (20.7)	18.7 (19.8)

MEASUREMENT ACCURACY IS +/- 1.5 DB

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

8.5. POWER OUTPUT TEST DATA - WLAN 1

TABLE 8.5-1: POWER OUTPUT TEST DATA WLAN 1

Operating Frequency (MHz): 2412, 2437 & 2462
Channel: 1, 6 & 11
Measured Conducted Power (dBm): See below

DATA RATE (MBPS)	POWER CONDUCTED OUTPUT (DBM)		
	CH 1 COMBINER/(SUM 16 PORTS)	CH 6 COMBINER/(SUM 16 PORTS)	CH 11 COMBINER/(SUM 16 PORTS)
1	7.35(17.7)	7.95(17.4)	7.05(16.3)
2	6.15 (17.9)	6.78(17.6)	5.89 (16.1)
11	6.14 (18.0)	6.79 (17.7)	5.85 (16.2)

MEASUREMENT ACCURACY IS +/- 1.5 DB

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

8.6. POWER OUTPUT TEST DATA - WLAN 6

TABLE 8.6-1: POWER OUTPUT TEST DATA WLAN 6

Operating Frequency (MHz): 2412, 2437 & 2462
Channel: 1, 6 & 11
Measured Conducted Power (dBm): See below

DATA RATE (MBPS)	POWER CONDUCTED OUTPUT (DBM)		
	CH 1 COMBINER/(SUM 16 PORTS)	CH 6 COMBINER/(SUM 16 PORTS)	CH 11 COMBINER/(SUM 16 PORTS)
1	8.35 (18.9)	4.8 (18.6)	4.84 (17.3)
2	5.01(19.1)	3.36(18.7)	3.47 (17.5)
11	5.03 (19.0)	3.38 (18.6)	3.48 (17.5)

MEASUREMENT ACCURACY IS +/- 1.5 DB

8.7. POWER OUTPUT TEST DATA- WLAN 4

TABLE 8.7-1: POWER OUTPUT TEST DATA WLAN 4

Operating Frequency (MHz): 2412, 2437 & 2462

Channel: 1, 6 & 11

Measured Conducted Power (dBm): See below

DATA RATE (MBPS)	POWER CONDUCTED OUTPUT (DBM)		
	CH 1 COMBINER/(SUM 16 PORTS)	CH 6 COMBINER/(SUM 16 PORTS)	CH 11 COMBINER/(SUM 16 PORTS)
1	1.65(19.5)	-0.15(19.3)	-6.15(18.2)
2	2.82(19.6)	0.68(19.4)	-6.05(18.3)
11	2.8(19.6)	0.85(19.4)	-6.05(18.3)

MEASUREMENT ACCURACY IS +/- 1.5 DB

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

8.8. POWER OUTPUT TEST DATA - WLAN 8

TABLE 8.8-1: POWER OUTPUT TEST DATA WLAN 8

Operating Frequency (MHz): 2412, 2437 & 2462
Channel: 1, 6 & 11
Measured Conducted Power (dBm): See below

DATA RATE (Mbps)	POWER CONDUCTED OUTPUT (DBM)		
	CH 1 COMBINER/(SUM 16 PORTS)	CH 6 COMBINER/(SUM 16 PORTS)	CH 11 COMBINER/(SUM 16 PORTS)
1	-13.75 (14.8)	-11.55 (15.5)	-10.45(15.2)
2	-15.15 (14.9)	-12.85 (15.6)	-12.15 (15.4)
11	-15.25 (14.8)	-12.9 (15.5)	-12.05 (15.4)

MEASUREMENT ACCURACY IS +/- 1.5 DB

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

8.9. POWER OUTPUT TEST DATA - WLAN 10

TABLE 8.9-1: POWER OUTPUT TEST DATA WLAN 10

Operating Frequency (MHz): 2412, 2437 & 2462
Channel: 1, 6 & 11
Measured Conducted Power (dBm): See below

DATA RATE Mbps	POWER CONDUCTED OUTPUT (DBM)		
	CH 1 COMBINER/(SUM 16 PORTS)	CH 6 COMBINER/(SUM 16 PORTS)	CH 11 COMBINER/(SUM 16 PORTS)
1	-8.55 (16.7)	-11.35 (16.8)	-8.35(15.9)
2	-8.75(16.7)	-11.15(16.9)	-8.75(16.0)
11	-8.35(16.7)	-11.35 (16.9)	-8.75(15.9)

MEASUREMENT ACCURACY IS +/- 1.5 DB

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

9. Antenna Conducted Spurious Emissions - §15.247(c)

9.1. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES

Antenna conducted spurious emissions per FCC 15.247(c) were measured from the EUT antenna port using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The modulated carrier was identified at 2.412 GHz for Channel 1, 2.437 GHz for Channel 6, and 2.462 GHz for Channel 11. No other harmonics or spurs were found within 20 dB of the carrier level, and from 9 kHz to the carrier's 10th harmonic. The EUT was tested in its typical configuration from 9 kHz to the 10th harmonic of the carrier at the following:

Highest, Medium, and Lowest WLAN Circuit Modulated Output Signal:

WLAN 13 on Channels 1, 6 and 11 for the modulation rates 1, 2 and 11 Mbps
WLAN 4 on Channels 1, 6 and 11 for the modulation rates 1, 2 and 11 Mbps
WLAN 8 on Channels 1, 6 and 11 for the modulation rates 1, 2 and 11 Mbps

The following worst cases, those with the highest power output, were also tested:

Three Simultaneous Highest Power WLAN Circuits Modulated Output Signal:

WLAN 13 on Channel 1, WLAN 1 on Channel 6, and WLAN 6 on Channel 11 for modulation rates 1, 2 and 11 Mbps
WLAN 1 on Channel 1, WLAN 13 on Channel 6, and WLAN 6 on Channel 11 for modulation rates 1, 2 and 11 Mbps
WLAN 6 on Channel 1, WLAN 13 on Channel 6, and WLAN 1 on Channel 11 for modulation rates 1, 2 and 11 Mbps

Test results for antenna conducted spurious noise are listed in the table below.

9.2. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 13 CHANNEL 1 AT 1 MBPS

Operating Frequency (MHz): 2412
Channel: 1
WLAN On: 13
Peak (dBm): 4.5
Limit (dBm): -15.5

TABLE 9.2-1: WLAN 13 CHANNEL 1 AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
8.16	-68.9	0.2	0.0	-69.1	-15.5	-53.6
459.40	-66.4	0.3	0.5	-67.2	-15.5	-51.7
2040.45	-68.4	3.1	2.4	-73.9	-15.5	-58.4
4826.97	-55.8	4.7	5.0	-65.5	-15.5	-50.0
7234.83	-55.8	6.5	5.3	-67.6	-15.5	-52.1
8567.54	-69.8	7.2	17.4	-94.4	-15.5	-78.9

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Client: Vivato, Inc.
Report number: 2003034
Standards: FCC 15.247 & IC RSS-210
FCC ID: QLNVLJ24WFSW
Model Name: 2.4 GHz Wi-Fi Switch

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

9.3. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 13 CHANNEL 1 AT 2 MBPS

Operating Frequency (MHz): 2412
Channel: 1
WLAN On: 13
Peak (dBm): 4.2
Limit (dBm): -15.8

TABLE 9.3-1: WLAN 13 CHANNEL 1 AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
8.10	-67.5	0.3	0.0	-67.8	-15.8	-52.0
11.20	-68.4	0.2	0.0	-68.6	-15.8	-52.8
457.20	-71.1	0.7	0.5	-72.3	-15.8	-56.5
2042.70	-68.2	3.1	2.4	-73.7	-15.8	-57.9
4829.74	-60.3	4.7	5.0	-70.0	-15.8	-54.2
7237.23	-59.5	6.5	5.3	-71.3	-15.8	-55.5

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

9.4. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 13 CHANNEL 1 AT 11 MBPS

Operating Frequency (MHz): 2412
Channel: 1
WLAN On: 13
Peak (dBm): 4.4
Limit (dBm): -15.6

TABLE 9.4-1: WLAN 13 CHANNEL 1 AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
11.14	-69.4	0.2	0.0	-69.6	-15.6	-54.0
2042.70	-70.1	3.1	2.4	-75.6	-15.6	-60.0
4826.97	-64.3	4.7	5.0	-74.0	-15.6	-58.4
7247.45	-62.4	6.5	5.3	-74.2	-15.6	-58.6

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

9.5. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 13 CHANNEL 6 AT 1 MBPS

Operating Frequency (MHz): 2437
Channel: 6
WLAN On: 13
Peak (dBm): 4.4
Limit (dBm): -15.6

TABLE 9.5-1: WLAN 13 CHANNEL 6 AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
11.01	-75.9	0.2	0.0	-76.1	-15.6	-60.5
14.07	-85.7	0.2	0.0	-85.9	-15.6	-70.3
2066.67	-70.1	3.1	2.4	-75.6	-15.6	-60.0
4856.82	-76.2	6.2	1.1	-83.5	-15.6	-67.9

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

9.6. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 13 CHANNEL 6 AT 2 MBPS

Operating Frequency (MHz): 2437
Channel: 6
WLAN On: 13
Peak (dBm): 4.2
Limit (dBm): -15.8

TABLE 9.6-1: WLAN 13 CHANNEL 6 AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
8.18	-80.0	0.3	0.0	-80.3	-15.8	-64.5
11.04	-77.0	0.2	0.0	-77.2	-15.8	-61.4
2070.45	-70.1	3.1	2.4	-75.6	-15.8	-59.8
4880.68	-78.3	4.7	1.1	-84.1	-15.8	-68.3
5755.68	-78.7	5.3	0.6	-84.6	-15.8	-68.8
7306.82	-71.9	6.5	3.3	-81.7	-15.8	-65.9
7437.50	-71.2	6.6	3.4	-81.2	-15.8	-65.4

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

9.7. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 13 CHANNEL 6 AT 11 MBPS

Operating Frequency (MHz): 2437
Channel: 6
WLAN On: 13
Peak (dBm): 4.5
Limit (dBm): -15.5

TABLE 9.7-1: WLAN 13 CHANNEL 6 AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
11.15	-77.8	0.3	0.0	-78.1	-15.5	-62.6
2065.91	-70.3	3.1	2.4	-75.8	-15.5	-60.3
2486.36	-71.6	3.4	10.5	-85.5	-15.5	-70.0
5755.68	-78.4	5.3	0.6	-84.3	-15.5	-68.8

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

9.8. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 13 CHANNEL 11 AT 1 MBPS

Operating Frequency (MHz): 2462

Channel: 11

WLAN On: 13

Peak (dBm): 3.4

Limit (dBm): -16.6

TABLE 9.8-1: WLAN 13 CHANNEL 11 AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2094.25	-74.6	3.1	3.4	-81.1	-16.6	-64.5
4921.84	-57.2	4.8	2.2	-64.2	-16.6	-47.6
5756.32	-79.4	5.3	0.7	-85.4	-16.6	-68.8
7413.79	-65.4	6.6	3.4	-75.4	-16.6	-58.8

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

9.9. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 13 CHANNEL 11 AT 2 MBPS

Operating Frequency (MHz): 2462
Channel: 11
WLAN On: 13
Peak (dBm): 3.9
Limit (dBm): -16.1

TABLE 9.9-1: WLAN 13 CHANNEL 6 AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
249.40	-83.1	0.2	0.0	-83.3	-16.1	-67.2
2093.18	-73.6	3.1	3.3	-80.0	-16.1	-63.9
4925.00	-55.6	4.8	2.2	-62.6	-16.1	-46.5
5771.59	-79.2	5.3	0.7	-85.2	-16.1	-69.1
7402.27	-69.1	6.6	3.4	-79.1	-16.1	-63.0

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.10. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 13
CHANNEL 11 AT 11 MBPS**

Operating Frequency (MHz): 2462
Channel: 11
WLAN On: 13
Peak (dBm): 3.8
Limit (dBm): -16.2

TABLE 9.10-1: WLAN 13 CHANNEL 11 AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2093.18	-74.1	3.1	3.3	-80.5	-16.2	-64.3
4920.45	-67.3	4.8	2.3	-74.4	-16.2	-58.2
5760.23	-80.1	5.3	0.8	-86.2	-16.2	-70.0
7376.14	-71.1	6.6	3.5	-81.2	-16.2	-65.0
2093.18	-74.1	3.1	3.3	-80.5	-16.2	-64.3
4920.45	-67.3	4.8	2.3	-74.4	-16.2	-58.2

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.11. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 4
 CHANNEL 1 AT 1 MBPS**

Operating Frequency (MHz): 2412

Channel: 1

WLAN On: 4

Peak (dBm): -15.1

Limit (dBm): -35.5

TABLE 9.11-1: WLAN 4 CHANNEL 1 AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2042.70	-67.5	3.1	2.4	-73.0	-35.1	-37.9
4823.93	-77.5	4.7	5.0	-87.2	-35.1	-52.1
5761.85	-79.6	5.3	0.6	-85.5	-35.1	-50.4

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

**9.12. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 4
CHANNEL 1 AT 2 MBPS**

Operating Frequency (MHz): 2412

Channel: 1

WLAN On: 4

Peak (dBm): -15.9

Limit (dBm): -35.9

TABLE 9.12-1: WLAN 4 CHANNEL 1 AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
8.15	-82.9	0.6	0.0	-83.5	-35.9	-47.6
2040.63	-68.3	3.1	2.4	-73.8	-35.9	-37.9
4824.40	-79.2	6.2	5.0	-90.4	-35.9	-54.5
5751.69	-77.7	5.3	0.6	-83.6	-35.9	-47.7

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.13. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 4
CHANNEL 1 AT 11 MBPS**

Operating Frequency (MHz): 2412

Channel: 1

WLAN On: 4

Peak (dBm): -16.4

Limit (dBm): -36.4

TABLE 9.13-1: WLAN 4 CHANNEL 1 AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2038.37	-67.9	3.1	2.4	-73.4	-36.4	-37.0
4826.19	-82.4	6.2	5.0	-93.6	-36.4	-57.2
5744.92	-77.9	5.3	0.6	-83.8	-36.4	-47.4

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.14. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 4
CHANNEL 6 AT 1 MBPS**

Operating Frequency (MHz): 2437

Channel: 6

WLAN On: 4

Peak (dBm): -18.1

Limit (dBm): -38.1

TABLE 9.14-1: WLAN 4 CHANNEL 6 AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2068.18	-69.7	3.1	2.4	-75.2	-38.1	-37.1
4875.00	-78.3	4.8	1.1	-84.2	-38.1	-46.1
5747.73	-78.0	5.3	0.6	-83.9	-38.1	-45.8

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.15. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 4
CHANNEL 6 AT 2 MBPS**

Operating Frequency (MHz): 2437
Channel: 6
WLAN On: 4
Peak (dBm): -17.3
Limit (dBm): -37.3

TABLE 9.15-1: WLAN 4 CHANNEL 6 AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2068.18	-68.6	3.1	2.4	-74.1	-37.3	-36.8
4868.97	-79.1	6.3	1.1	-86.5	-37.3	-49.2
5761.36	-77.4	5.1	0.6	-83.1	-37.3	-45.8
7681.82	-70.4	6.7	3.4	-80.5	-37.3	-43.2

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

**9.16. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 4
CHANNEL 6 AT 11 MBPS**

Operating Frequency (MHz): 2437
Channel: 6
WLAN On: 13
Peak (dBm): -17.3
Limit (dBm): -37.3

TABLE 9.16-1: WLAN 4 CHANNEL 6 AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2068.18	-68.6	3.1	2.4	-74.1	-37.3	-36.8
4868.97	-79.1	6.3	1.1	-86.5	-37.3	-49.2

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.17. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 4
CHANNEL 11 AT 1 MBPS**

Operating Frequency (MHz): 2462

Channel: 11

WLAN On: 4

Peak (dBm): -26.5

Limit (dBm): -46.5

TABLE 9.17-1: WLAN 4 CHANNEL 11 AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2093.18	-75.1	3.1	2.3	-80.5	-46.5	-34.0
5762.07	-79.4	5.3	5.5	-90.2	-46.5	-43.7

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.18. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 4
CHANNEL 11 AT 2 MBPS**

Operating Frequency (MHz): 2462
Channel: 11
WLAN On: 4
Peak (dBm): -26.9
Limit (dBm): -46.9

TABLE 9.18-1: WLAN 4 CHANNEL 11 AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2089.66	-76.7	3.1	2.4	-82.2	-46.9	-35.30
5770.11	-79.4	5.3	5.5	-90.2	-46.9	-43.30

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.19. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 4
CHANNEL 11 AT 11 MBPS**

Operating Frequency (MHz): 2462
Channel: 11
WLAN On: 4
Peak (dBm): -25.4
Limit (dBm): -45.4

TABLE 9.19-1: WLAN 4 CHANNEL 11 AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2093.18	-76.3	3.1	2.3	-81.7	-45.4	-36.30
5761.36	-80.1	5.3	5.6	-91.0	-45.4	-45.60

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.20. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 8
CHANNEL 1 AT 1 MBPS**

Operating Frequency (MHz): 2412

Channel: 1

WLAN On: 8

Peak (dBm): 4.5

Limit (dBm): -48.0

TABLE 9.20-1: WLAN 8 CHANNEL 1 AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2043.48	-71.3	3.1	2.4	-76.8	-48.0	-28.80
5760.18	-75.6	5.3	0.6	-81.5	-48.0	-33.50

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.21. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 8
CHANNEL 1 AT 2 MBPS**

Operating Frequency (MHz): 2412
Channel: 1
WLAN On: 8
Peak (dBm): -28.2
Limit (dBm): -48.2

TABLE 9.21-1: WLAN 8 CHANNEL 1 AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
11.02	-98.9	0.2	0.0	-99.1	-48.2	-50.90
2041.38	-70.5	3.1	2.4	-76.0	-48.2	-27.80
5746.59	-78.6	5.3	0.6	-84.5	-48.2	-36.30

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

**9.22. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 8
CHANNEL 1 AT 11 MBPS**

Operating Frequency (MHz): 2412

Channel: 1

WLAN On: 8

Peak (dBm): -29.7

Limit (dBm): -49.7

TABLE 9.22-1: WLAN 8 CHANNEL 1 AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
136.90	-82.4	0.7	0.2	-83.3	-49.7	-33.60
2041.38	-71.7	3.1	2.4	-77.2	-49.7	-27.50
5753.41	-78.4	5.5	0.6	-84.5	-49.7	-34.80
6118.18	-79.4	4.6	3.8	-87.8	-49.7	-38.10

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.23. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 8
 CHANNEL 6 AT 1 MBPS**

Operating Frequency (MHz): 2437
 Channel: 6
 WLAN On: 8
 Peak (dBm): -24.9
 Limit (dBm): -44.9

TABLE 9.23-1: WLAN 8 CHANNEL 6 AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2065.91	-72.2	3.1	2.4	-77.7	-44.9	-32.80
5750.00	-76.8	5.3	0.6	-82.7	-44.9	-37.80

TEST PERSONNEL:

Rachid Sehb
 Test Technician/Engineer


 Signature

03/28/2003
 Date Of Test

**9.24. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 8
 CHANNEL 6 AT 2 MBPS**

Operating Frequency (MHz): 2437
 Channel: 6
 WLAN On: 8
 Peak (dBm): -25.4
 Limit (dBm): -45.4

TABLE 9.24-1: WLAN 8 CHANNEL 6 AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2065.91	-71.9	3.1	2.4	-77.4	-45.4	-32.00
5763.64	-78.3	5.4	1.1	-84.8	-45.4	-39.40

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

**9.25. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 8
CHANNEL 6 AT 11 MBPS**

Operating Frequency (MHz): 2437
Channel: 6
WLAN On: 8
Peak (dBm): -23.6
Limit (dBm): -43.6

TABLE 9.25-1: WLAN 8 CHANNEL 6 AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2065.61	-74.1	3.1	2.4	-79.6	-43.6	-36.00
5783.94	-78.9	5.3	1.3	-85.5	-43.6	-41.90

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.26. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 8
CHANNEL 11 AT 1 MBPS**

Operating Frequency (MHz): 2462

Channel: 11

WLAN On: 8

Peak (dBm): 22.6

Limit (dBm): -42.6

TABLE 9.26-1: WLAN 8 CHANNEL 11 AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2091.53	-75.6	3.1	3.0	-81.7	-42.6	-39.10
5763.16	-78.2	5.3	5.4	-88.9	-42.6	-46.30

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.27. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 8
CHANNEL 11 AT 2 MBPS**

Operating Frequency (MHz): 2462

Channel: 11

WLAN On: 8

Peak (dBm): -23.4

Limit (dBm): -43.4

TABLE 9.27-1: WLAN 8 CHANNEL 6 AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2095.45	-76.9	3.1	3.0	-83.0	-43.4	-39.60
5767.05	-79.2	6.7	5.4	-91.3	-43.4	-47.90

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.28. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 8
CHANNEL 11 AT 11 MBPS**

Operating Frequency (MHz): 2462

Channel: 11

WLAN On: 8

Peak (dBm): -21.2

Limit (dBm): -41.2

TABLE 9.28-1: WLAN 8 CHANNEL 11 AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
319.90	-77.3	0.7	0.0	-78.0	-41.2	-36.80
2090.91	-76.3	3.1	2.4	-81.8	-41.2	-40.60
5767.05	-80.4	5.3	5.4	-91.1	-41.2	-49.90

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.29. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA - WLAN 13, 1
AND 6 ON CHANNEL 1, 6 AND 11 AT 1 MBPS**

Operating Frequency (MHz): 2412, 2437, 2462
WLAN On (Channel) 13 (1), 1 (6), 6 (13)
Minimum Peak (dBm): -8.6
Minimum Limit (dBm): -28.6

TABLE 9.29-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
456.60	-69.7	0.5	4.9	-64.3	-28.6	-35.6
2040.91	-69.8	3.1	1.8	-64.9	-28.6	-36.2
4823.86	-72.1	4.7	28.0	-39.4	-28.6	-10.7
4769.32	-72.5	4.7	28.0	-39.8	-28.6	-11.1

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

**9.30. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WLAN 13, 1
 AND 6 ON CHANNEL 1, 6 AND 11 AT 2 MBPS**

Operating Frequency (MHz): 2412, 2437, 2462
WLAN On (Channel) 13 (1), 1 (6), 6 (13)
Minimum Peak (dBm): -21.7
Minimum Limit (dBm): -31.7

TABLE 9.30-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
453.30	-73.7	0.5	4.9	-68.3	-31.7	-36.6
2043.18	-70.6	3.1	1.8	-65.7	-31.7	-34.0
2088.64	-70.7	3.2	3.6	-63.9	-31.7	-32.2
4825.29	-70.8	4.8	28.0	-38.0	-31.7	-6.3

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

**9.31. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 13, 1
AND 6 ON CHANNEL 1, 6 AND 11 AT 11 MBPS**

Operating Frequency (MHz): 2412, 2437, 2462
Channel: 1
WLAN On (Channel) 13 (1), 1 (6), 6 (13)
Peak (dBm): -11.3
Limit (dBm): -31.3

TABLE 9.31-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
2041.38	-70.2	3.1	1.9	-65.2	-31.3	-33.9
2089.66	-69.6	3.8	3.6	-62.2	-31.3	-30.9
5844.83	-72.3	5.3	12.0	-55.0	-31.3	-23.7

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

**9.32. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 1, 13
AND 6 ON CHANNEL 1, 6 AND 11 AT 1 MBPS**

Operating Frequency (MHz): 2412, 2437, 2462
WLAN On (Channel) 1 (1), 13 (6), 6 (13)
Minimum Peak (dBm): -10.8
Minimum Limit (dBm): -30.8

TABLE 9.32-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
11.04	-64.1	0.2	0.3	-63.6	-30.8	-32.8
479.70	-61.5	0.5	4.9	-56.1	-30.8	-25.3
1697.73	-67.7	2.3	4.2	-61.2	-30.8	-30.4
2093.18	-69.5	3.1	3.5	-62.9	-30.8	-32.1
4869.32	-70.0	4.7	24.5	-40.8	-30.8	-10.0
7159.09	-65.4	6.5	15.1	-43.8	-30.8	-13.0

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

**9.33. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WLAN 1, 13
AND 6 ON CHANNEL 1, 6 AND 11 AT 2 MBPS**

Operating Frequency (MHz): 2412, 2437, 2462
WLAN On (Channel) 1 (1), 13 (6), 6 (13)
Minimum Peak (dBm): -12.0
Minimum Limit (dBm): -32.0

TABLE 9.33-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
71.30	-80.7	0.2	0.3	-80.2	-32.0	-48.2
2041.38	-70.5	3.1	1.8	-65.6	-32.0	-33.6
5746.59	-78.6	5.3	16.2	-57.1	-32.0	-25.1

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

**9.34. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 1, 13
AND 6 ON CHANNEL 1, 6 AND 11 AT 11 MBPS**

Operating Frequency (MHz): 2412, 2437, 2462
WLAN On (Channel) 1 (1),13 (6), 6 (13)
Peak (dBm): -19.2
Limit (dBm): -39.2

TABLE 9.34-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
11.04	-64.7	0.2	0.3	-64.2	-39.2	-25.0
479.70	-72.7	0.5	4.9	-67.3	-39.2	-28.1
1697.73	-70.7	2.3	4.2	-64.2	-39.2	-25.0
2043.18	-70.9	3.1	1.8	-66.0	-39.2	-26.8
2093.18	-70.4	3.1	3.6	-63.7	-39.2	-24.5
4272.73	-71.0	4.8	21.0	-45.2	-39.2	-6.0

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

**9.35. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 6, 13
AND 1 ON CHANNEL 1, 6 AND 11 AT 1 MBPS**

Operating Frequency (MHz): 2412, 2437, 2462
WLAN On (Channel) 6 (1), 13 (6), 1 (13)
Minimum Peak (dBm): -9.8
Minimum Limit (dBm): -29.2

TABLE 9.35-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS AT 1 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
11.11	-64.4	0.2	0.3	-63.9	-29.2	-34.7
479.70	-62.7	0.5	4.9	-57.3	-29.2	-28.1
1697.73	-69.7	2.3	3.3	-64.1	-29.2	-34.9
2043.18	-67.4	3.1	1.8	-62.5	-29.2	-33.3
4868.18	-67.1	4.7	25.0	-37.4	-29.2	-8.2

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.36. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA WLAN 6, 13
AND 1 ON CHANNEL 1, 6 AND 11 AT 2 MBPS**

Operating Frequency (MHz): 2412, 2437, 2462
WLAN On (Channel) 6 (1), 13 (6), 1 (11)
Minimum Peak (dBm): -10.0
Minimum Limit (dBm): -30.0

TABLE 9.36-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS AT 2 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
11.05	-63.2	0.2	0.3	-62.7	-30.0	-32.7
478.20	-66.4	0.5	4.9	-61.0	-30.0	-31.0
1696.55	-71.6	2.3	3.3	-66.0	-30.0	-36.0
2041.38	-69.1	3.1	1.8	-64.2	-30.0	-34.2
4872.73	-72.1	4.8	22.0	-45.3	-30.0	-15.3

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/28/2003
Date Of Test

**9.37. ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA, WLAN 1, 13
AND 6 ON CHANNEL 1, 6 AND 11 AT 11 MBPS**

Operating Frequency (MHz): 2412, 2437, 2462
WLAN On (Channel) 6 (1), 13 (6), 1 (11)
Peak (dBm): -10.4
Limit (dBm): -30.4

TABLE 9.37-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS AT 11 MBPS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Splitter Insertion Loss (dB)	Corrected Measured Level (dBm)	Limit (dBm)	Margin (dB)
11.08	-64.1	0.2	0.3	-63.6	-30.4	-33.2
479.70	-71.6	0.5	4.9	-66.2	-30.4	-35.8
2045.45	-69.8	3.1	1.8	-64.9	-30.4	-34.5
4582.76	-72.6	4.8	24.0	-43.8	-30.4	-13.4

TEST PERSONNEL:

Rachid Sehb		03/28/2003
Test Technician/Engineer	Signature	Date Of Test

10. Power Spectral Density - §15.247(d)

10.1. POWER SPECTRAL DENSITY TEST PROCEDURE

The power spectral density per FCC 15.247(d) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 3 kHz, the video bandwidth set at 30 kHz, and the sweep time set at 1000 seconds. The spectral lines were resolved for the WLAN circuit modulated Output Signal configuration below respectively. These levels are well below the +8 dBm limit.

Highest, Medium, and Lowest WLAN Circuit Modulated Output Signal:

WLAN 13 on Channels 1, 6 and 11 for the modulation rates 1, 2 and 11 Mbps

WLAN 4 on Channels 1, 6 and 11 for the modulation rates 1, 2 and 11 Mbps

WLAN 8 on Channels 1, 6 and 11 for the modulation rates 1, 2 and 11 Mbps

The following below configuration was not tested since the EUT restricts overlapping channels. The test data if tested would be the same as the result of the aforementioned configuration above.

Three Simultaneous Highest Power WLAN Circuits Modulated Output Signal:

WLAN 13 on Channel 1, WLAN 1 on Channel 6, and WLAN 6 on Channel 11 for modulation rates 1, 2 and 11 Mbps

WLAN 1 on Channel 1, WLAN 13 on Channel 6, and WLAN 6 on Channel 11 for modulation rates 1, 2 and 11 Mbps

WLAN 6 on Channel 1, WLAN 13 on Channel 6, and WLAN 1 on Channel 11 for modulation rates 1, 2 and 11 Mbps

The test equipment used for this testing is listed in the table below.

10.2. TEST EQUIPMENT USED FOR TESTING

TABLE 10.2-1: TEST EQUIPMENT USED FOR TESTING POWER SPECTRAL DENSITY

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER	CALIBRATION DATE
900931	Hewlett Packard	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771	03/15/04

10.3. POWER SPECTRAL DENSITY TEST DATA WLAN 13

Operating Frequency (MHz): 2412, 2437 & 2462

Channel: 1, 6 & 11

Limit (dBm): 8

TABLE 10.3-1: POWER SPECTRAL DENSITY TEST DATA

CHANNEL	POWER SPECTRAL DENSITY LIMIT = +8DBM		
	1 MBPS	2 MBPS	11 MBPS
1	2.70	2.50	1.70
6	2.87	3.03	2.03
11	1.03	1.53	0.70

Rhein Tech Laboratories
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Client: Vivato, Inc.
Report number: 2003034
Standards: FCC 15.247 & IC RSS-210
FCC ID: QLNVLJ24WFSW
Model Name: 2.4 GHz Wi-Fi Switch

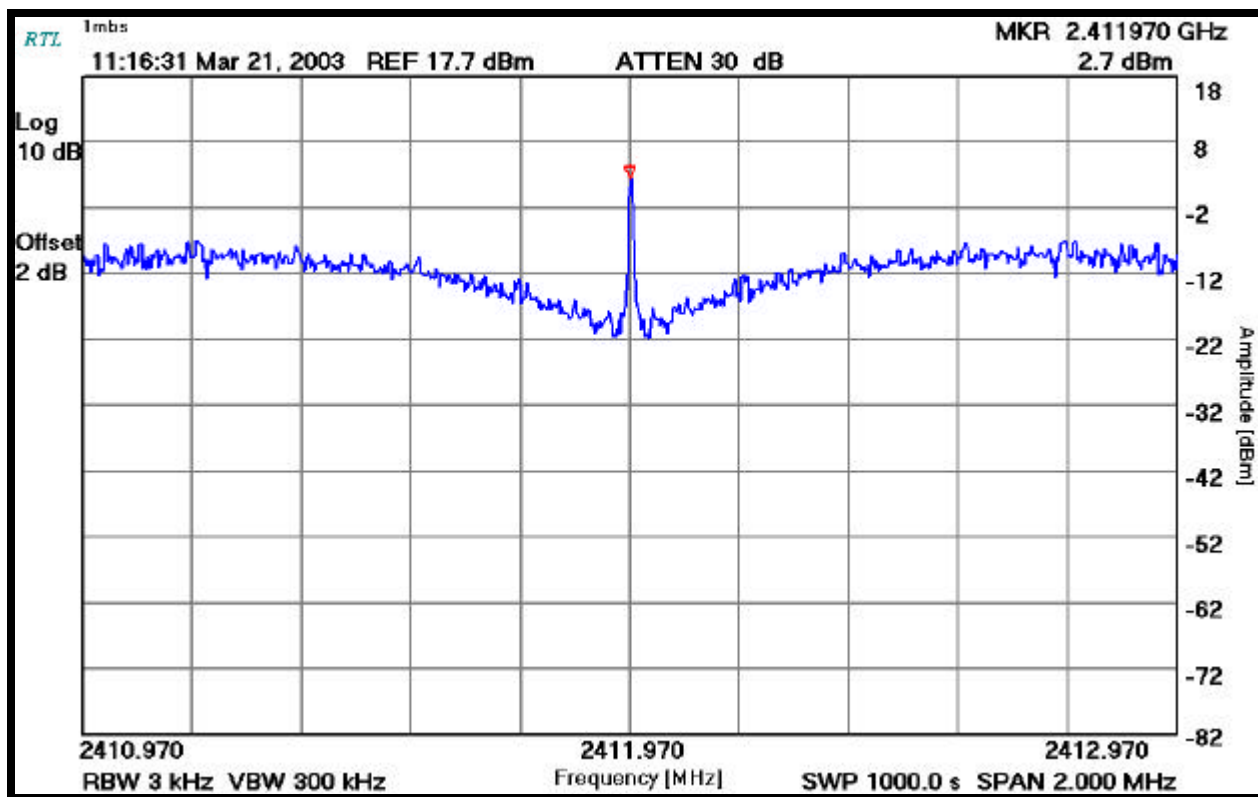
TEST PERSONNEL:

Rachid Sehb		03/24/2003
Test Technician/Engineer	Signature	Date Of Test

10.4. POWER SPECTAL DENSITY TEST PLOTS WLAN 13

Operating Frequency (MHz): 2412
WLAN On: 13
Channel: 1
Data Rate: 1
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.4-1: POWER SPECTRAL DENSITY: CHANNEL 1 AT 1 MBPS



TEST PERSONNEL:

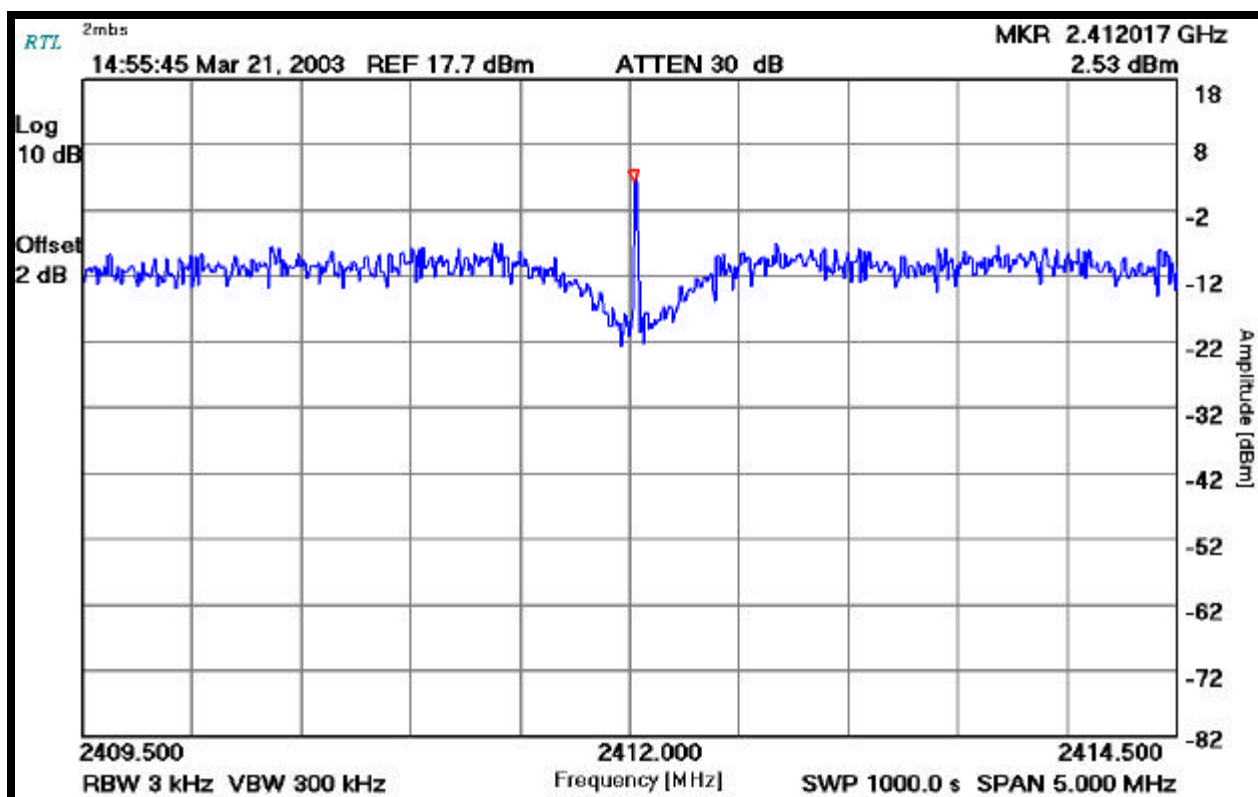
Rachid Sehb
Test Technician/Engineer

See
Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2412
WLAN On: 13
Channel: 1
Data Rate: 2
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.4-2: POWER SPECTRAL DENSITY: CHANNEL 1 AT 2 MBPS



TEST PERSONNEL:

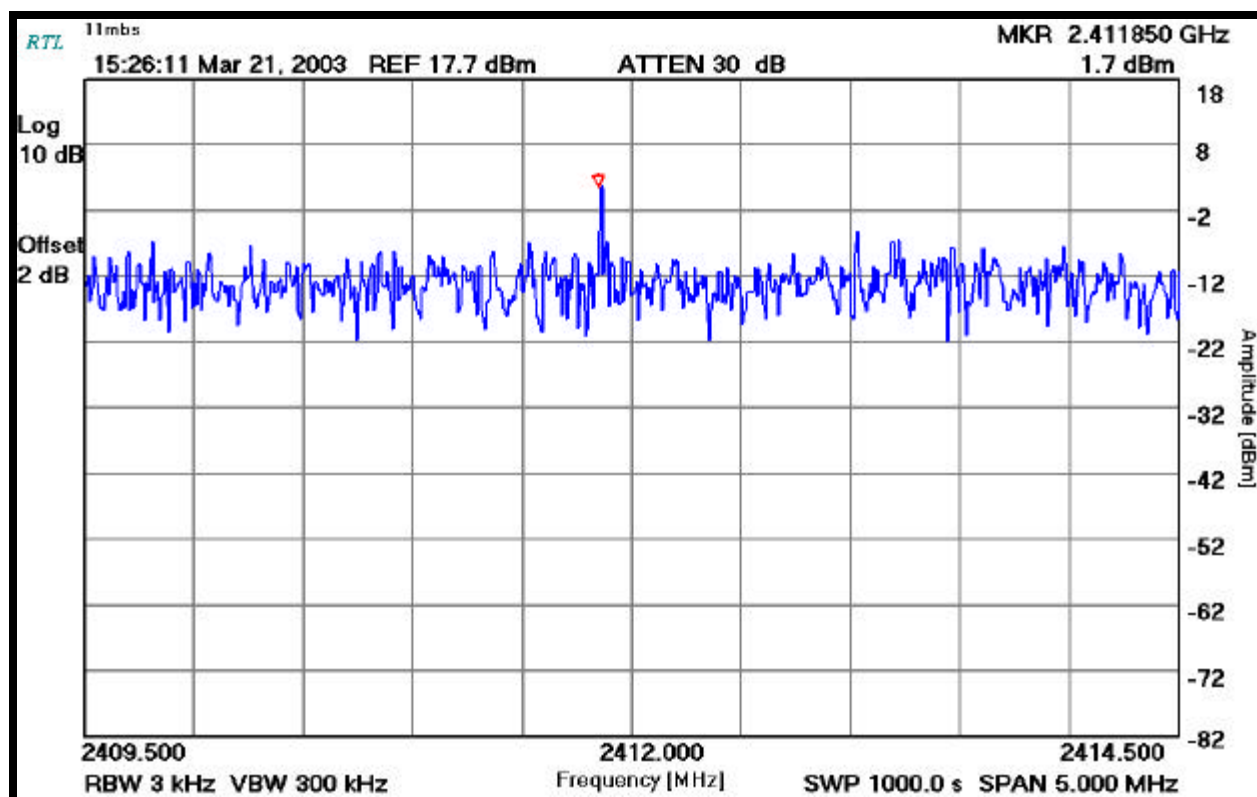
Rachid Sehb
Test Technician/Engineer


Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2412
WLAN On: 13
Channel: 1
Data Rate: 11
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.4-3: POWER SPECTRAL DENSITY: CHANNEL 1 AT 11 MBPS



TEST PERSONNEL:

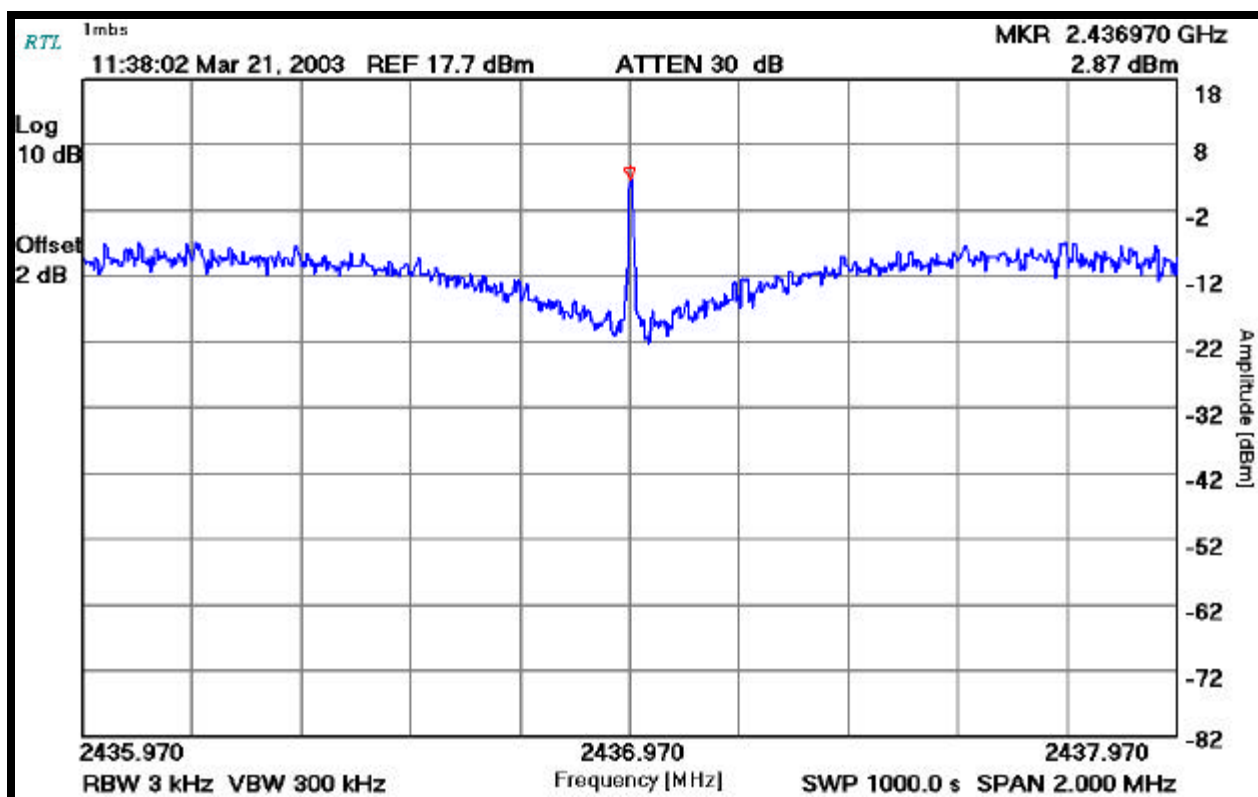
Rachid Sehb
Test Technician/Engineer


Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2437
WLAN On: 13
Channel: 6
Data Rate: 1
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.4-4: POWER SPECTRAL DENSITY: CHANNEL 6 AT 1 MBPS



TEST PERSONNEL:

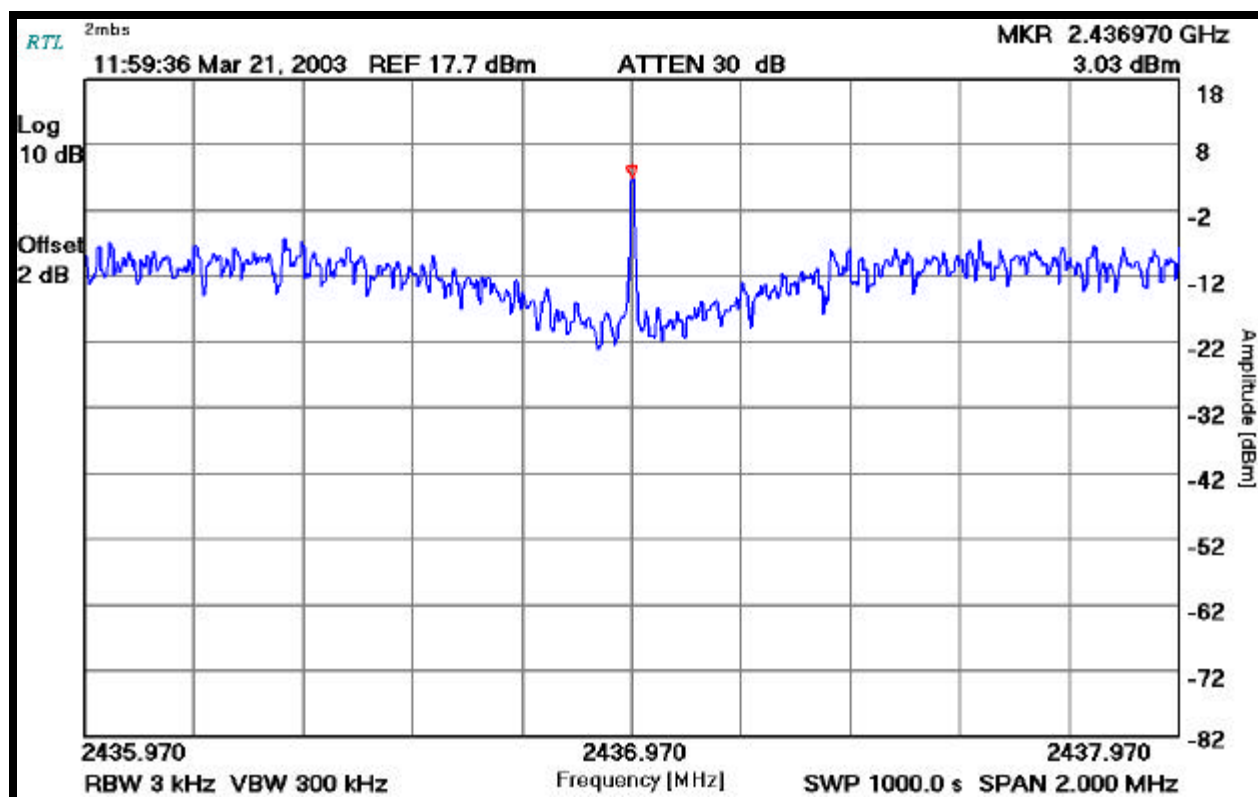
Rachid Sehb
Test Technician/Engineer

See
Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2437
WLAN On: 13
Channel: 6
Data Rate: 2
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.4-5: POWER SPECTRAL DENSITY: CHANNEL 6 AT 2 MBPS



TEST PERSONNEL:

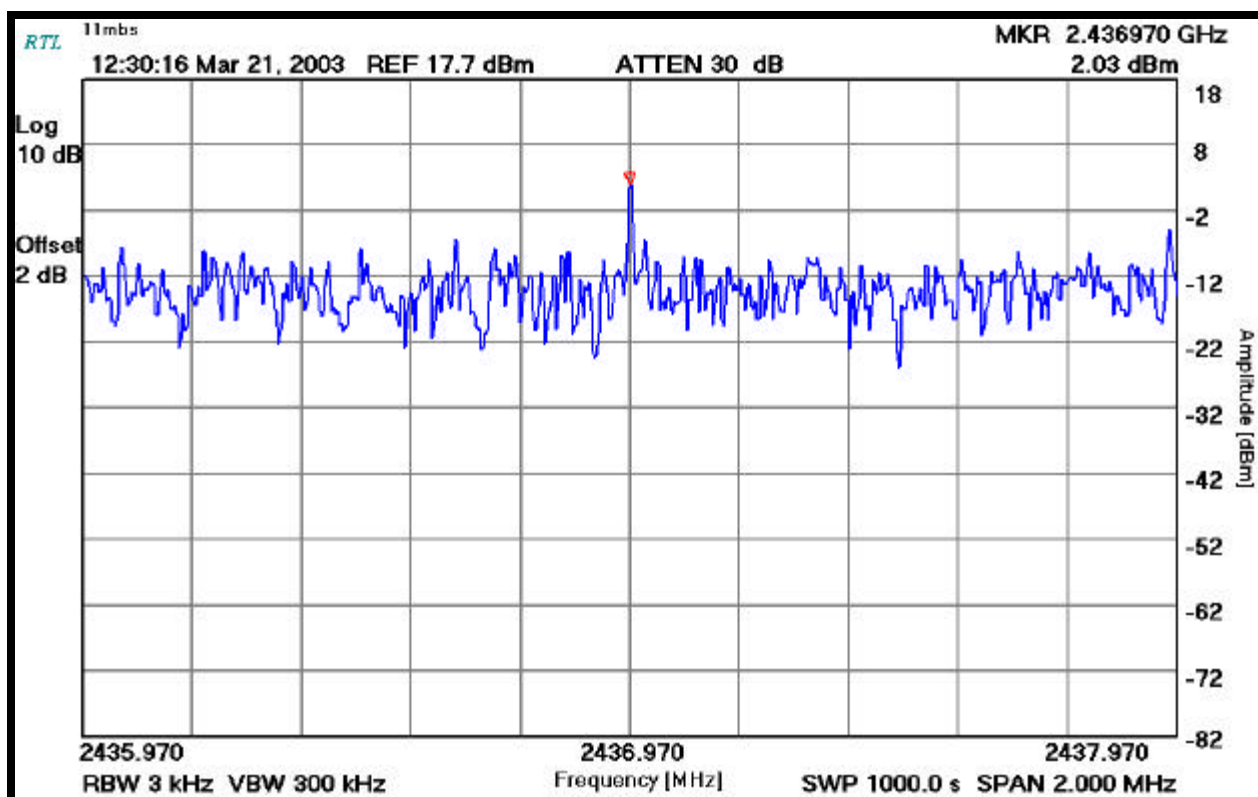
Rachid Sehb
Test Technician/Engineer


Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2437
 WLAN On: 13
 Channel: 6
 Data Rate: 11
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 300
 Sweep Time (s): 1000.0

PLOT 10.4-6: POWER SPECTRAL DENSITY: CHANNEL 6 AT 11 MBPS



TEST PERSONNEL:

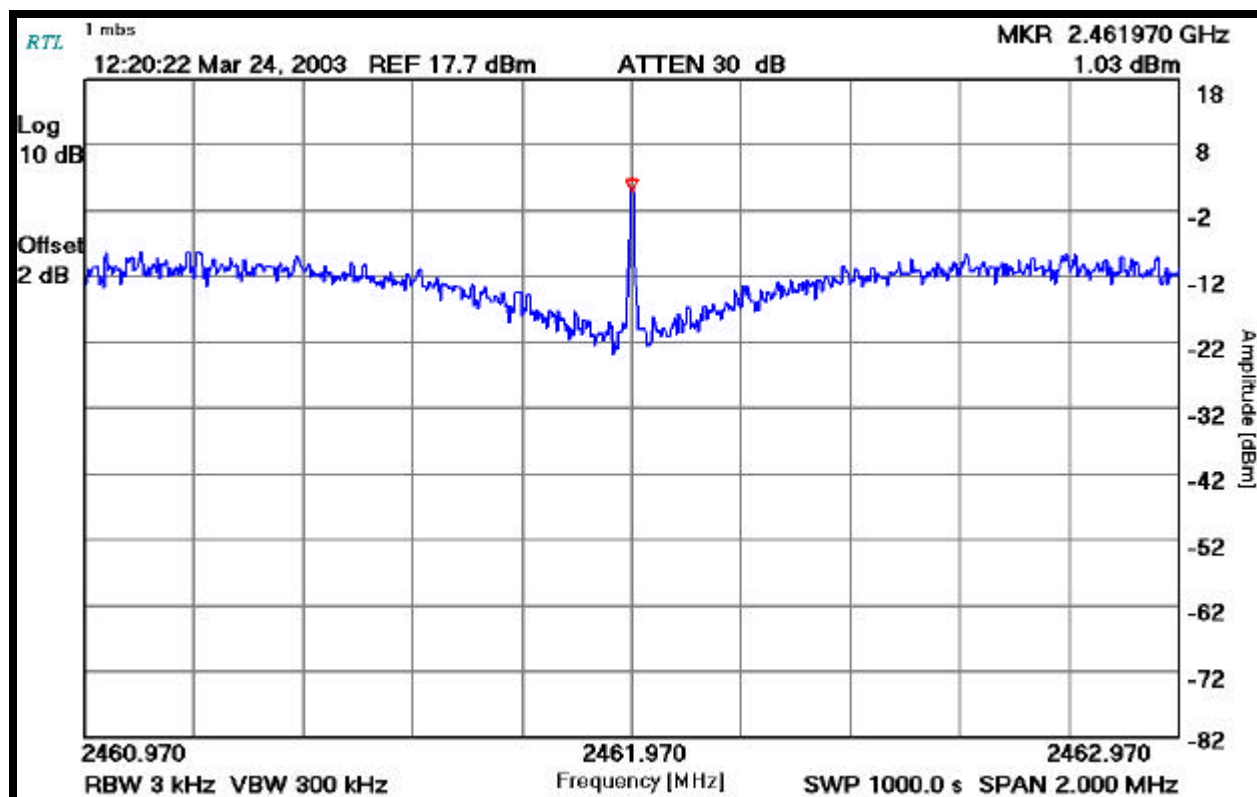
Rachid Sehb
 Test Technician/Engineer


 Signature

03/21/2003
 Date Of Test

Operating Frequency (MHz): 2462
WLAN On: 13
Channel: 11
Data Rate: 1
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.4-7: POWER SPECTRAL DENSITY: CHANNEL 11 AT 1 MBPS



TEST PERSONNEL:

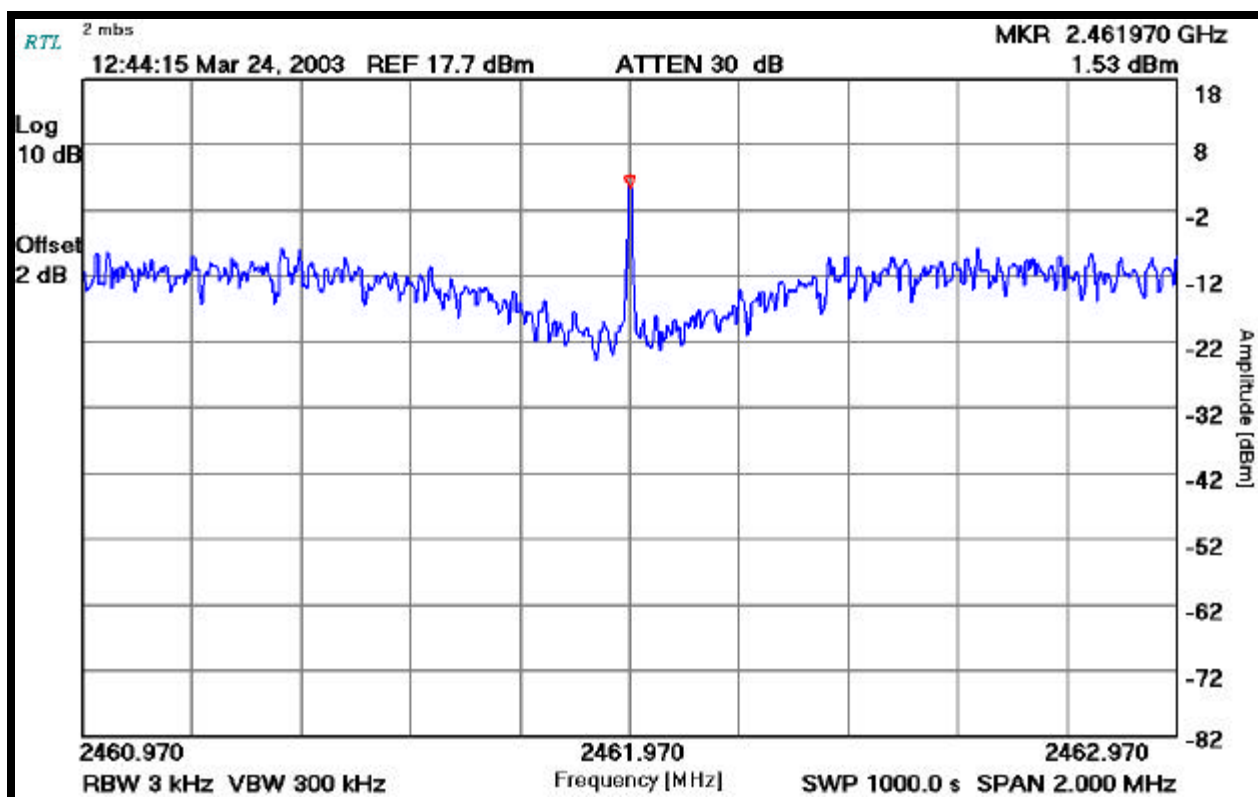
Rachid Sehb
Test Technician/Engineer


Signature

03/24/2003
Date Of Test

Operating Frequency (MHz): 2462
 WLAN On: 13
 Channel: 11
 Data Rate: 2
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 300
 Sweep Time (s): 1000.0

PLOT 10.4-8: POWER SPECTRAL DENSITY: CHANNEL 11 AT 2 MBPS



TEST PERSONNEL:

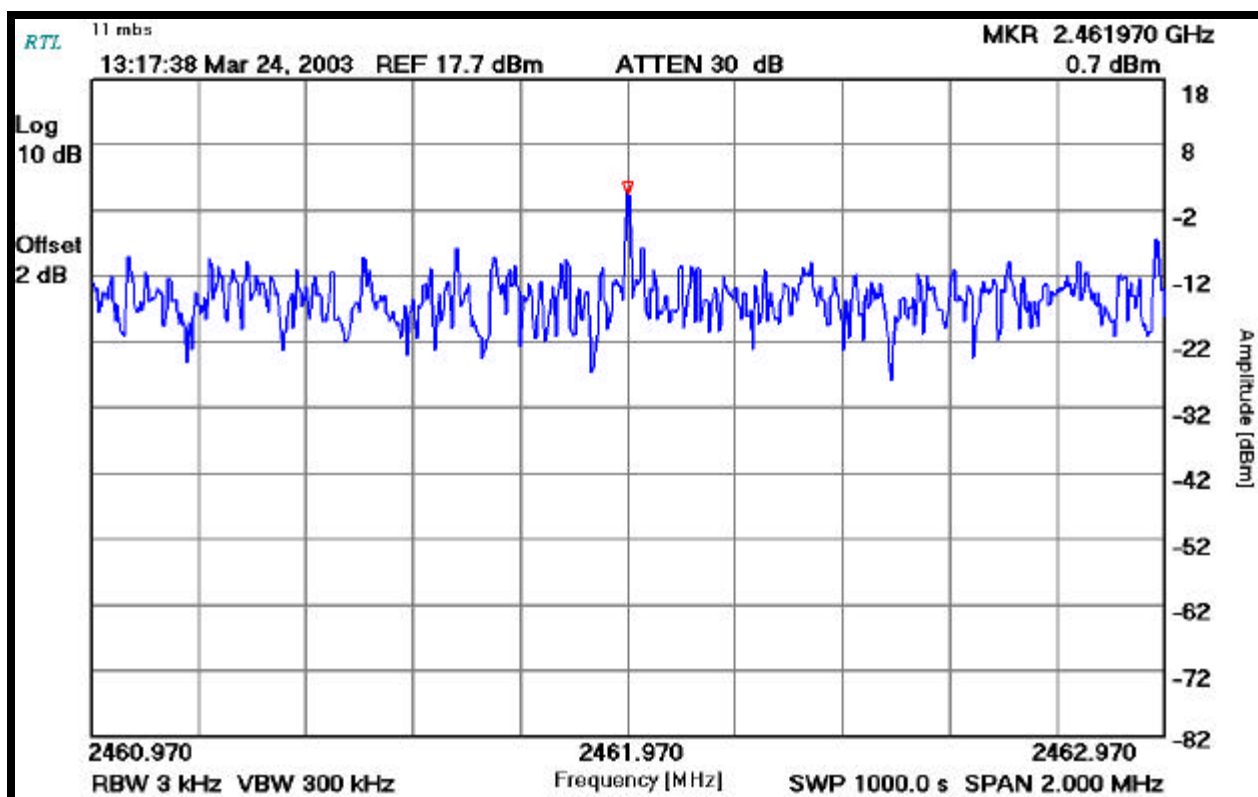
Rachid Sehb
 Test Technician/Engineer

See
 Signature

03/24/2003
 Date Of Test

Operating Frequency (MHz): 2462
WLAN On: 13
Channel: 11
Data Rate: 11
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.4-9: POWER SPECTRAL DENSITY: CHANNEL 11 AT 11 MBPS



TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/24/2003
Date Of Test

10.5. POWER SPECTRAL DENSITY TEST DATA FOR WLAN 8

Operating Frequency (MHz): 2412, 2437 & 2462
Channel: 1, 6 & 11
Limit (dBm): 8

TABLE 10.5-1: POWER SPECTRAL DENSITY TEST DATA

Channel	Power Spectral Density Limit = +8dBm		
	1MBPS	2MBPS	11MBPS
1	-30.67	-30.50	-32.00
6	-25.67	-25.67	-26.50
11	-32.00	-24.10	-25.17

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer

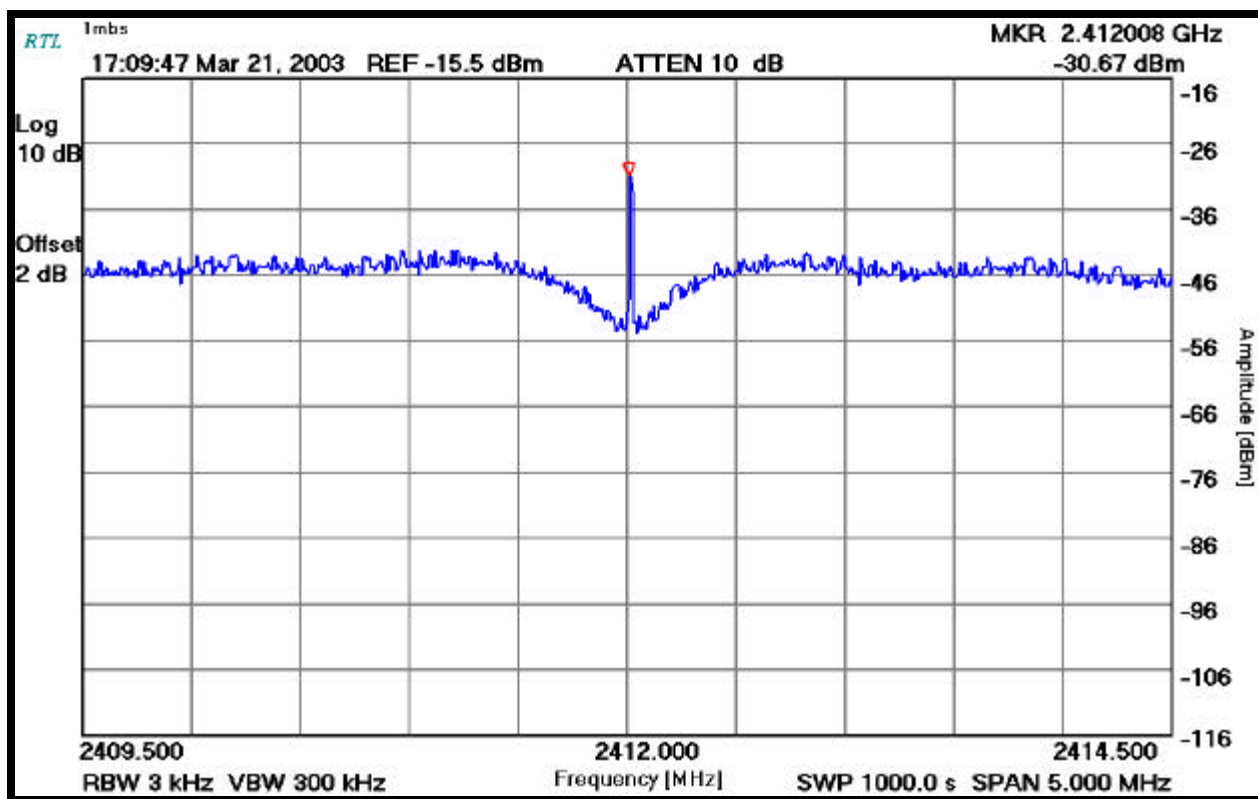

Signature

03/21/2003
Date Of Test

10.6. POWER SPECTAL DENSITY TEST PLOTS WLAN 8

Operating Frequency (MHz): 2412
WLAN On: 8
Channel: 1
Data Rate: 1
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.6-1: POWER SPECTRAL DENSITY: CHANNEL 1 AT 1 MBPS



TEST PERSONNEL:

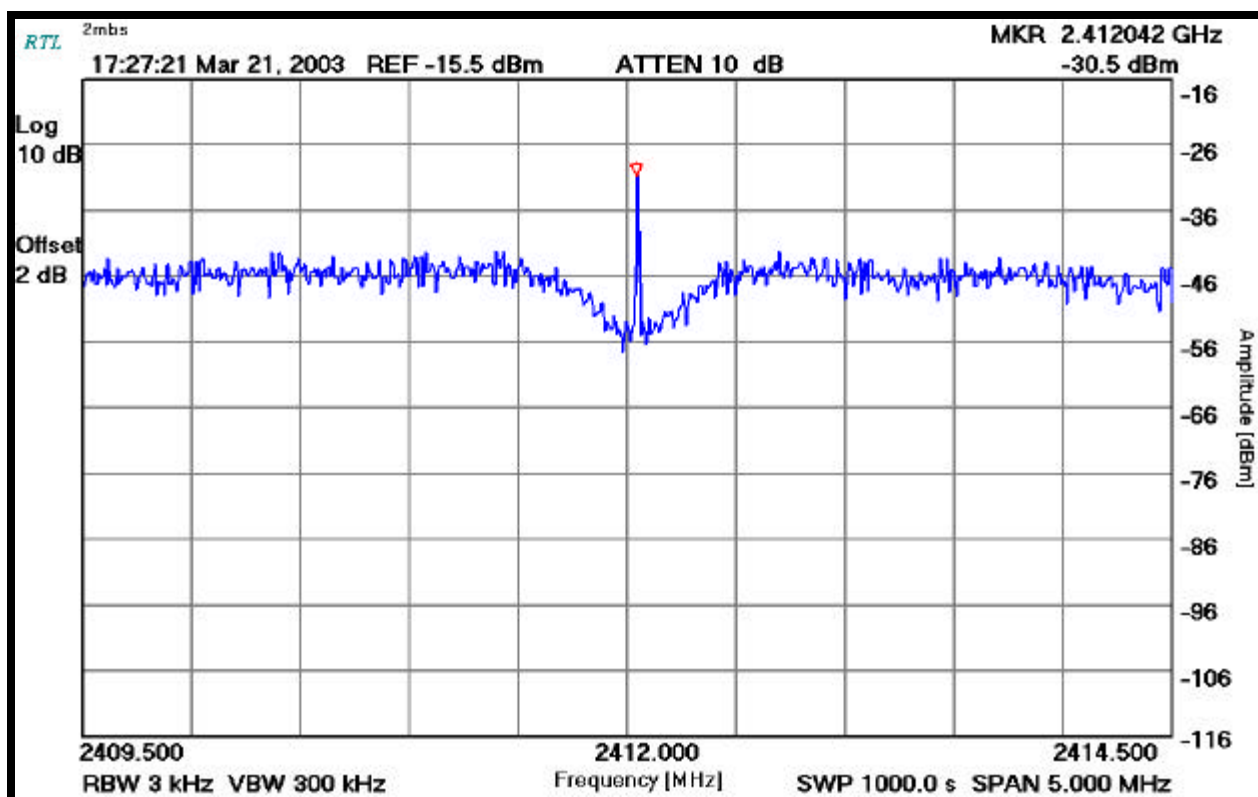
Rachid Sehb
Test Technician/Engineer


Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2412
WLAN On: 8
Channel: 1
Data Rate: 2
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.6-2: POWER SPECTRAL DENSITY: CHANNEL 1 AT 2 MBPS



TEST PERSONNEL:

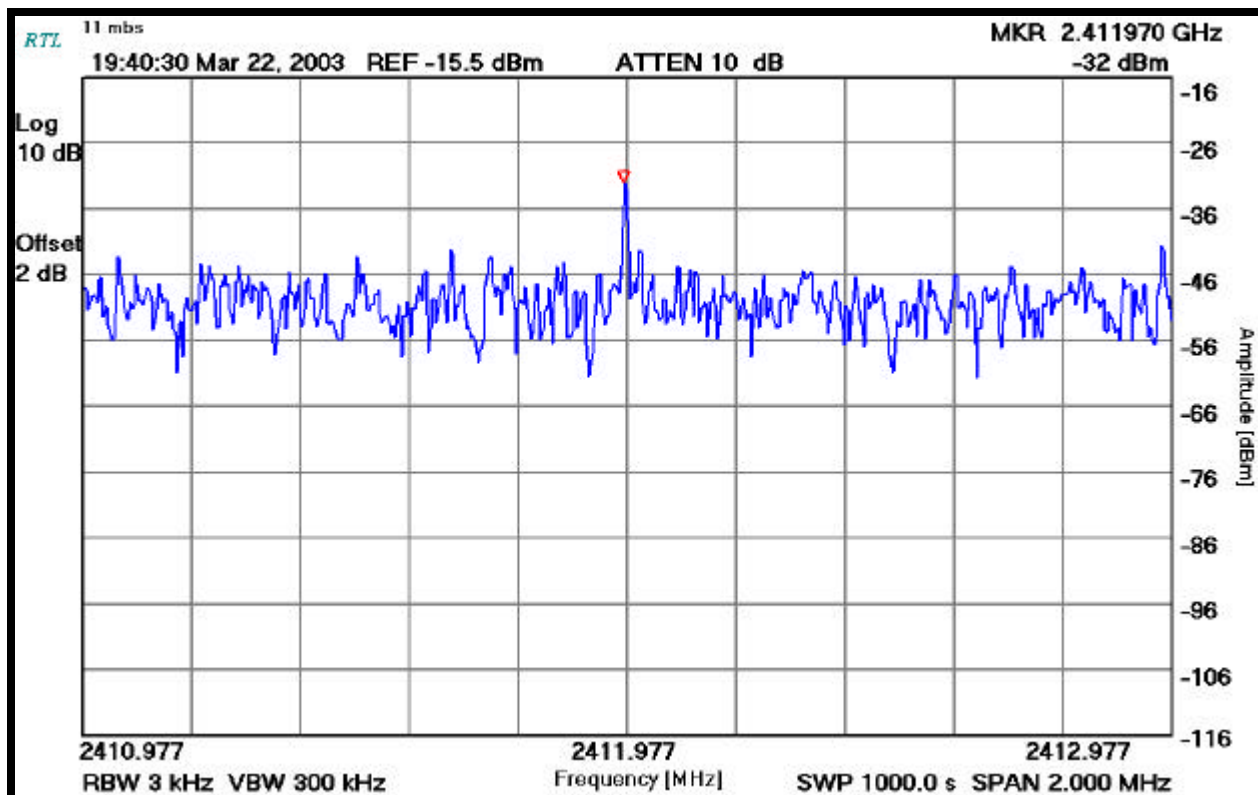
Rachid Sehb
Test Technician/Engineer


Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2412
 WLAN On: 8
 Channel: 1
 Data Rate: 11
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 300
 Sweep Time (s): 1000.0

PLOT 10.6-3: POWER SPECTRAL DENSITY: CHANNEL 1 AT 11 MBPS

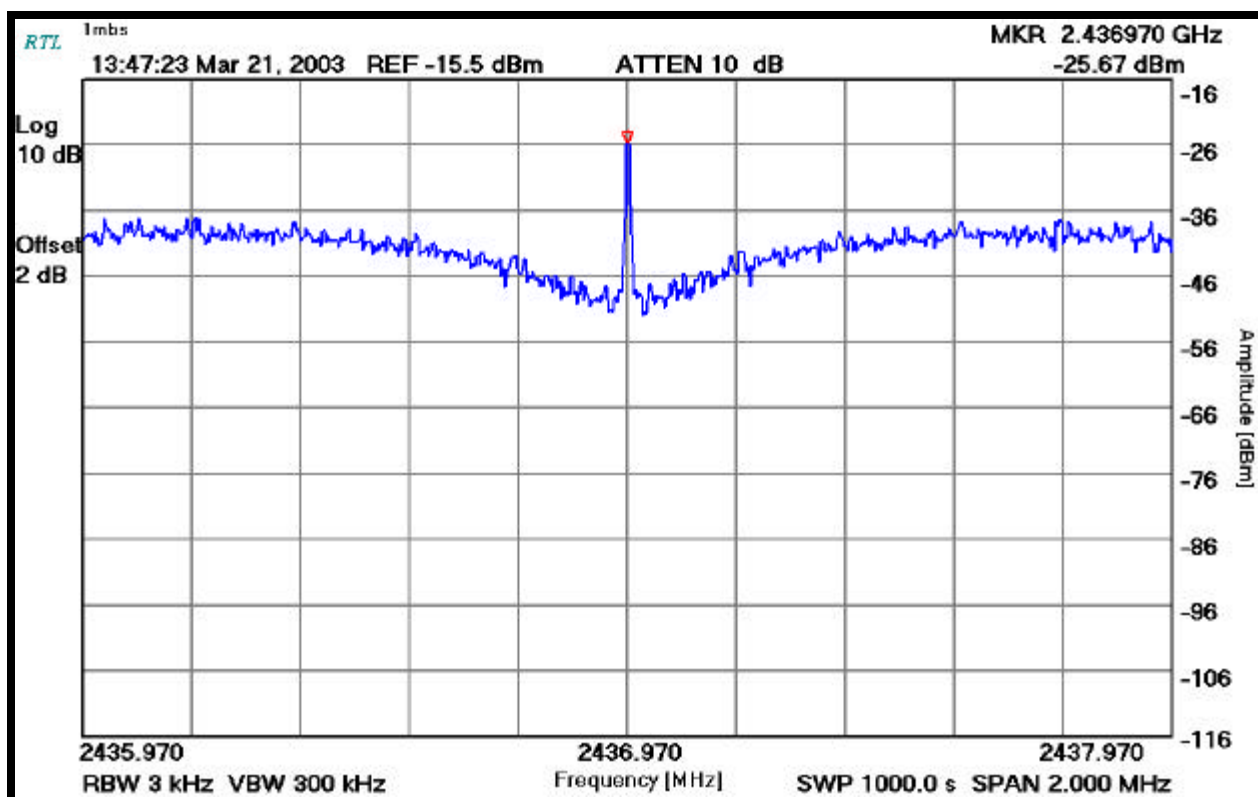


TEST PERSONNEL:

Rachid Sehb		03/22/2003
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz): 2437
WLAN On: 8
Channel: 6
Data Rate: 1
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.6-4: POWER SPECTRAL DENSITY: CHANNEL 6 AT 1 MBPS



TEST PERSONNEL:

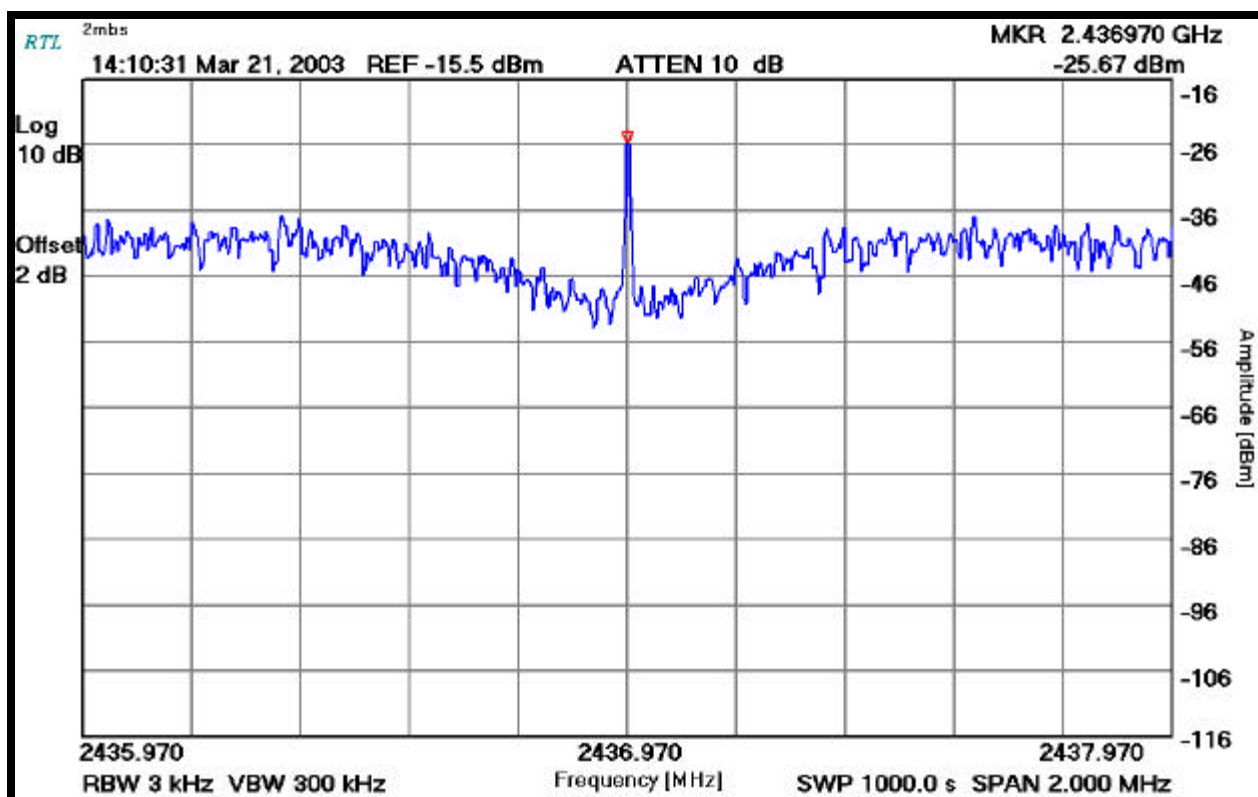
Rachid Sehb
Test Technician/Engineer


Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2437
WLAN On: 8
Channel: 6
Data Rate: 2
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.6-5: POWER SPECTRAL DENSITY: CHANNEL 6 AT 2 MBPS



TEST PERSONNEL:

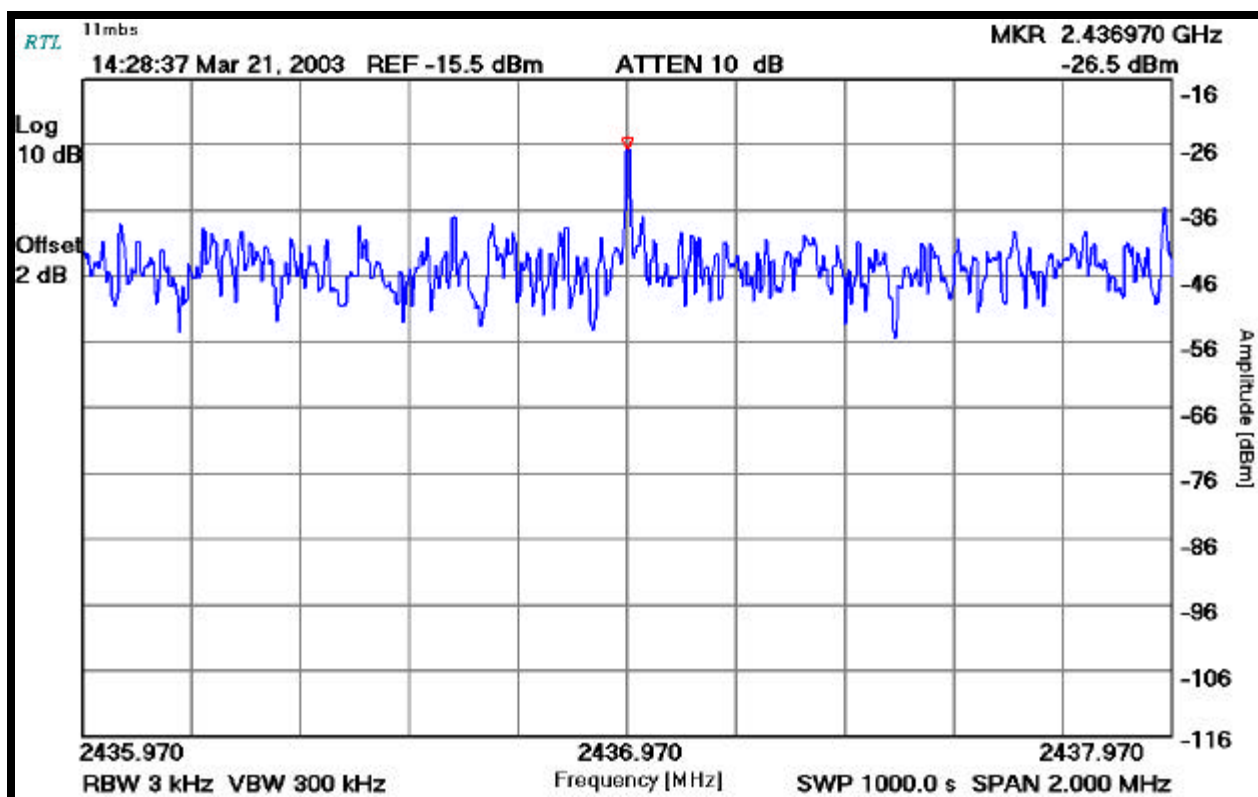
Rachid Sehb
Test Technician/Engineer

See
Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2437
 WLAN On: 8
 Channel: 6
 Data Rate: 11
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 300
 Sweep Time (s): 1000.0

PLOT 10.6-6: POWER SPECTRAL DENSITY: CHANNEL 6 AT 11 MBPS

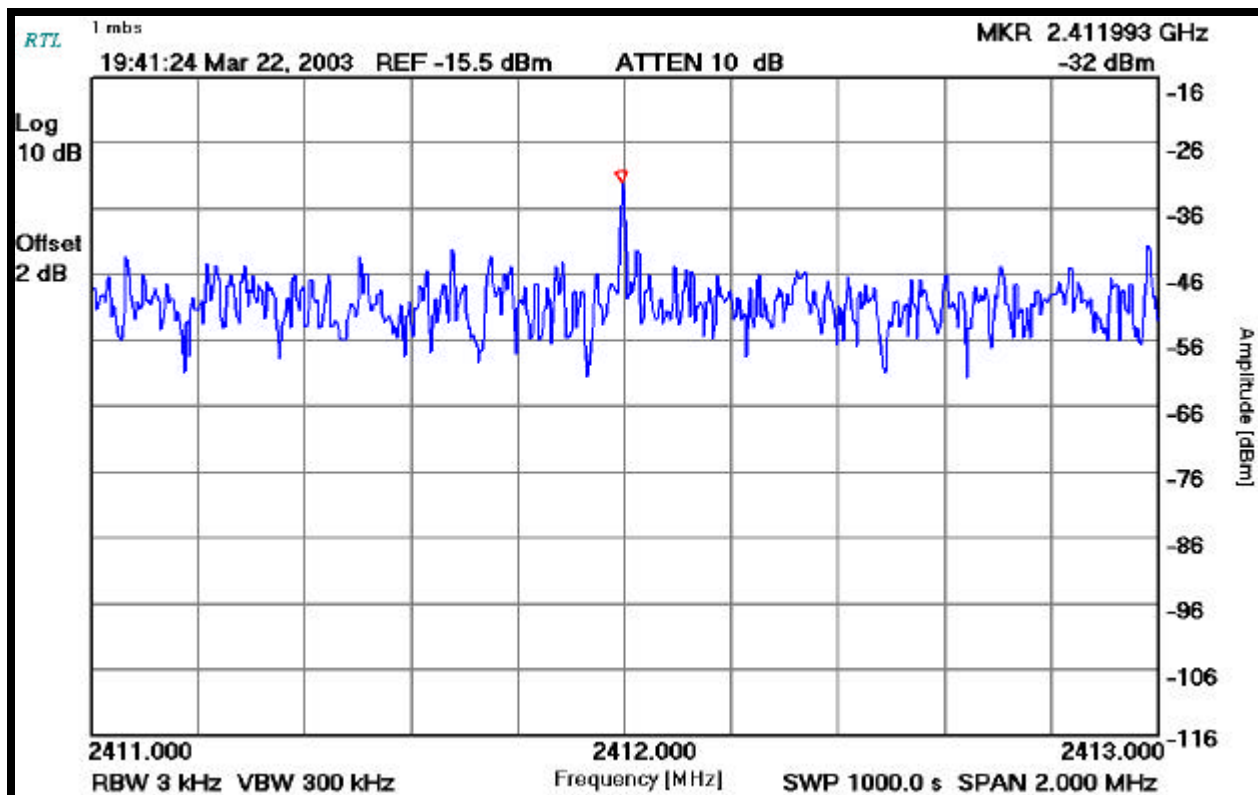


TEST PERSONNEL:

Rachid Sehb		03/21/2003
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz): 2462
WLAN On: 8
Channel: 11
Data Rate: 1
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.6-7: POWER SPECTRAL DENSITY: CHANNEL 11 AT 1 MBPS



TEST PERSONNEL:

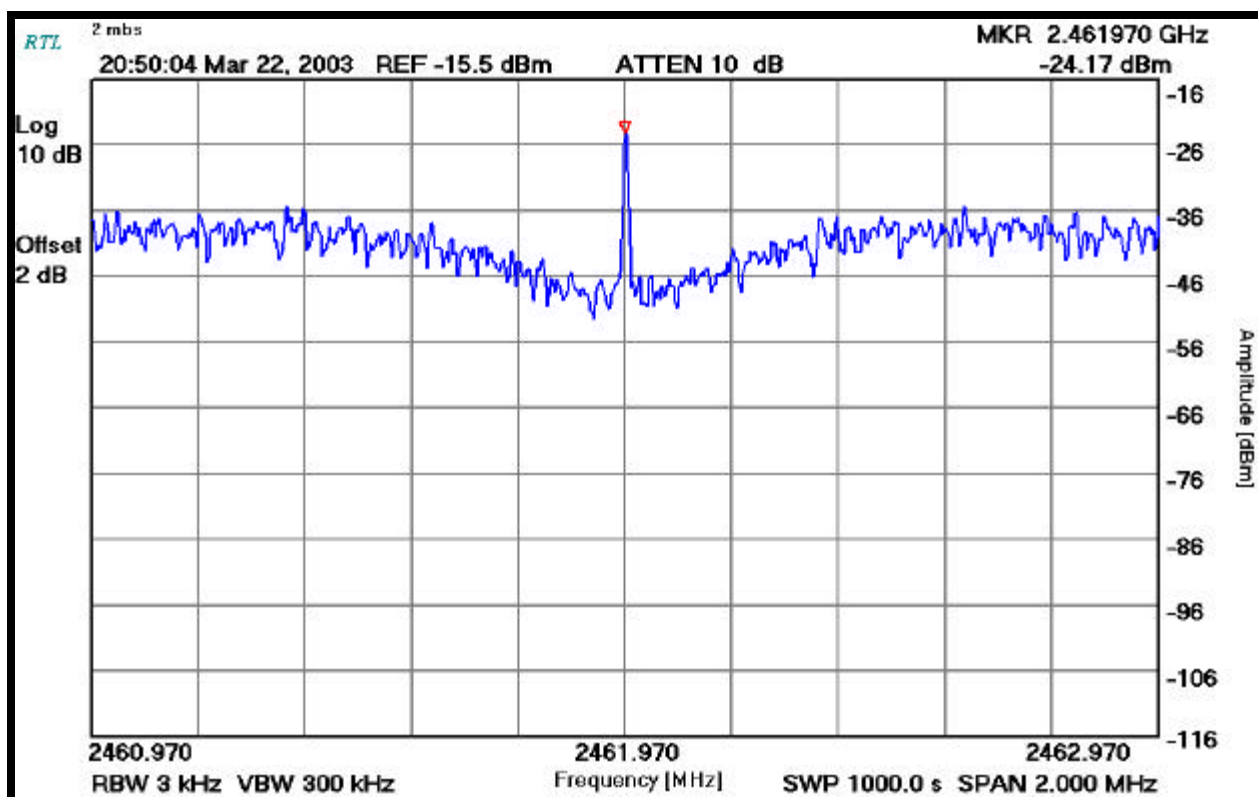
Rachid Sehb
Test Technician/Engineer

Sehb
Signature

03/22/2003
Date Of Test

Operating Frequency (MHz): 2462
WLAN On: 8
Channel: 11
Data Rate: 2
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.6-8: POWER SPECTRAL DENSITY: CHANNEL 11 AT 2 MBPS



TEST PERSONNEL:

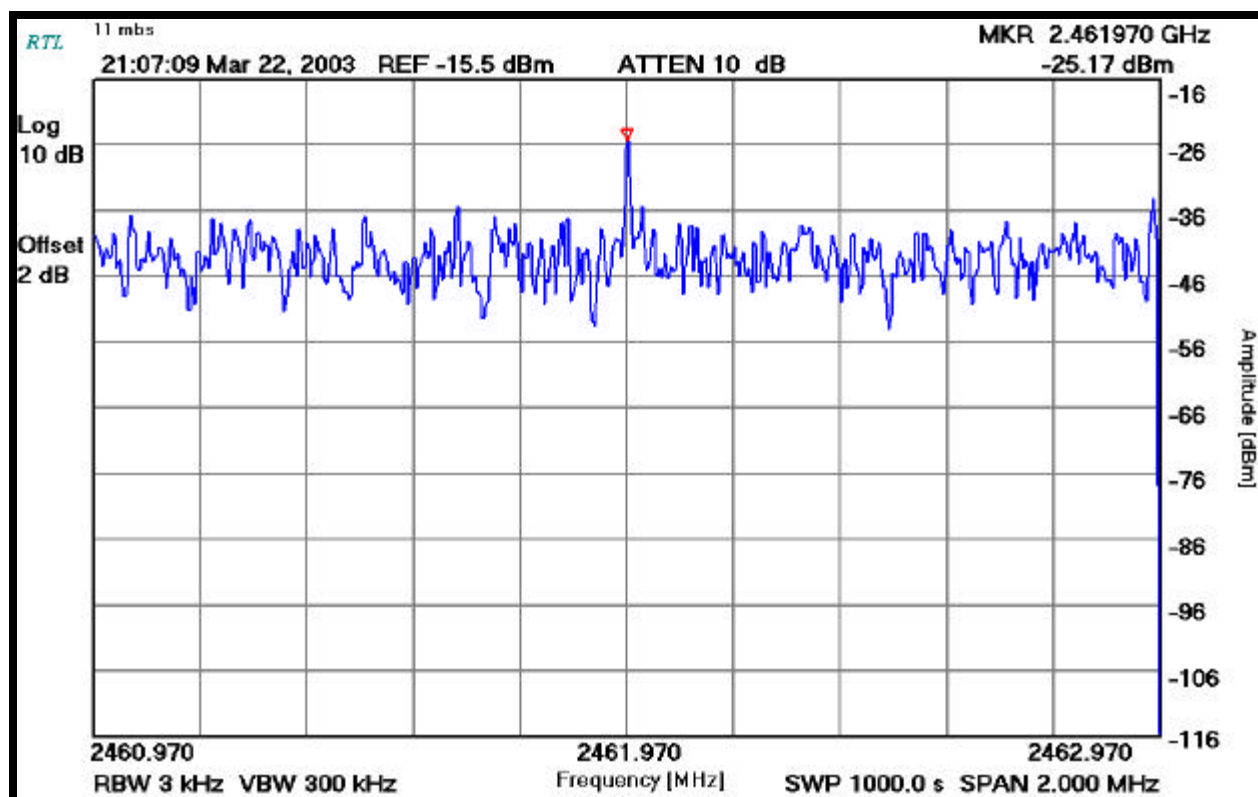
Rachid Sehb
Test Technician/Engineer

See
Signature

03/22/2003
Date Of Test

Operating Frequency (MHz): 2462
WLAN On: 8
Channel: 11
Data Rate: 11
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.6-9: POWER SPECTRAL DENSITY: CHANNEL 11 AT 11 MBPS



TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

03/22/2003
Date Of Test

10.7. POWER SPECTRAL DENSITY TEST DATA FOR WLAN 4

Operating Frequency (MHz): 2412, 2437 & 2462

Channel: 1, 6 & 11

Limit (dBm): 8

TABLE 10.7-1: POWER SPECTRAL DENSITY TEST DATA

CHANNEL	POWER SPECTRAL DENSITY LIMIT = +8DBM		
	1 MBPS	2 MBPS	11 MBPS
1	-15.27	-15.10	-15.10
6	-17.10	-16.90	-17.70
11	-23.77	-24.77	-24.77

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer



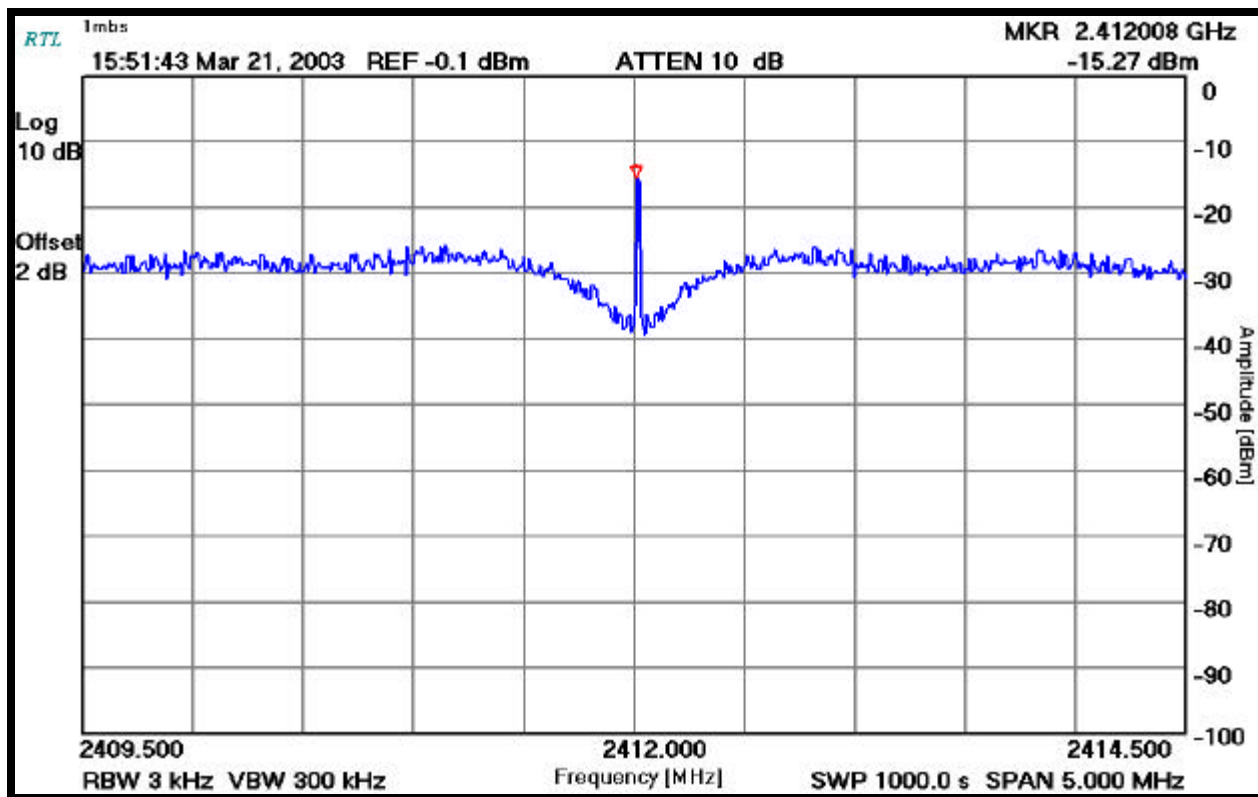
Signature

03/21/2003
Date Of Test

10.8. POWER SPECTAL DENSITY TEST PLOTS WLAN 4

Operating Frequency (MHz): 2412
WLAN On: 4
Channel: 1
Data Rate: 1
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.8-1: POWER SPECTRAL DENSITY: CHANNEL 1 AT 1 MBPS



TEST PERSONNEL:

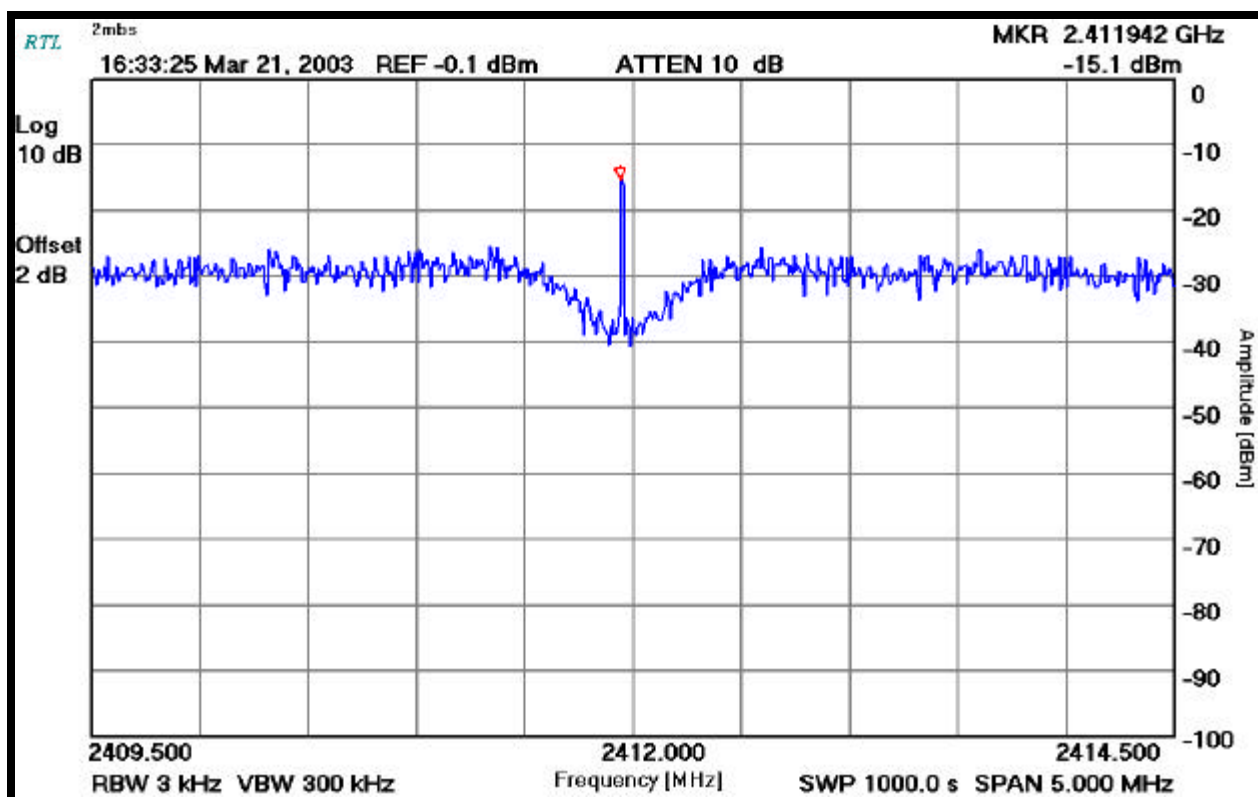
Rachid Sehb
Test Technician/Engineer


Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2412
 WLAN On: 4
 Channel: 1
 Data Rate: 2
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 300
 Sweep Time (s): 1000.0

PLOT 10.8-2: POWER SPECTRAL DENSITY: CHANNEL 1 AT 2 MBPS



TEST PERSONNEL:

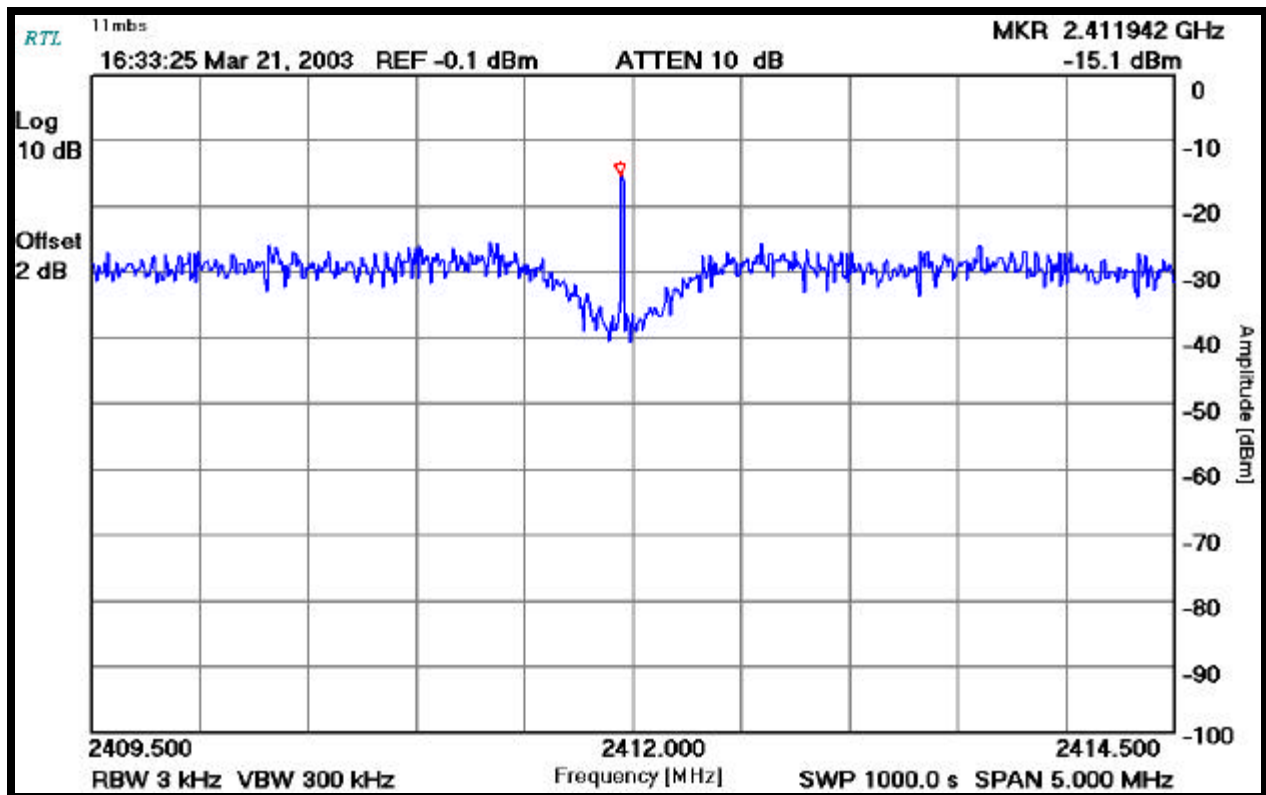
Rachid Sehb
 Test Technician/Engineer


 Signature

03/21/2003
 Date Of Test

Operating Frequency (MHz): 2412
 WLAN On: 4
 Channel: 1
 Data Rate: 11
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 300
 Sweep Time (s): 1000.0

PLOT 10.8-3: POWER SPECTRAL DENSITY: CHANNEL 1 AT 11 MBPS

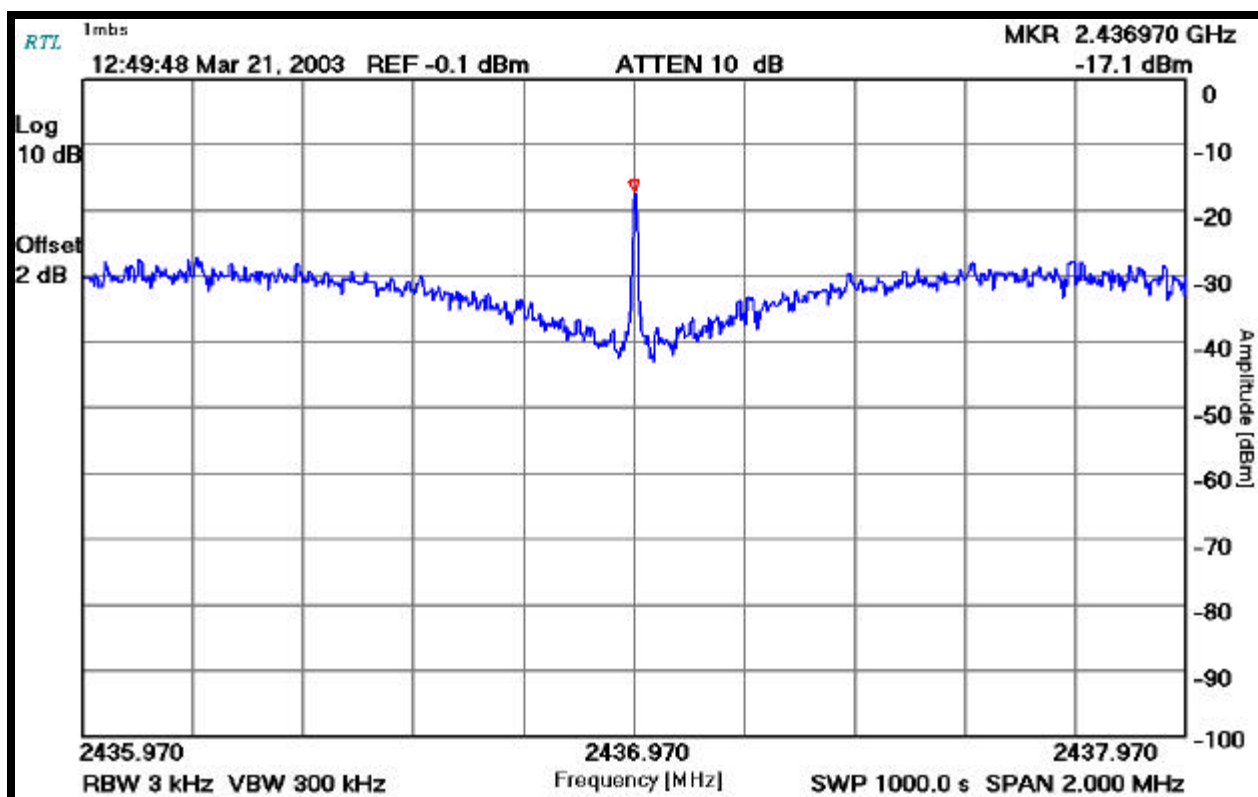


TEST PERSONNEL:

Rachid Sehb		03/21/2003
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz): 2437
WLAN On: 4
Channel: 6
Data Rate: 1
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.8-4: POWER SPECTRAL DENSITY: CHANNEL 6 AT 1 MBPS



TEST PERSONNEL:

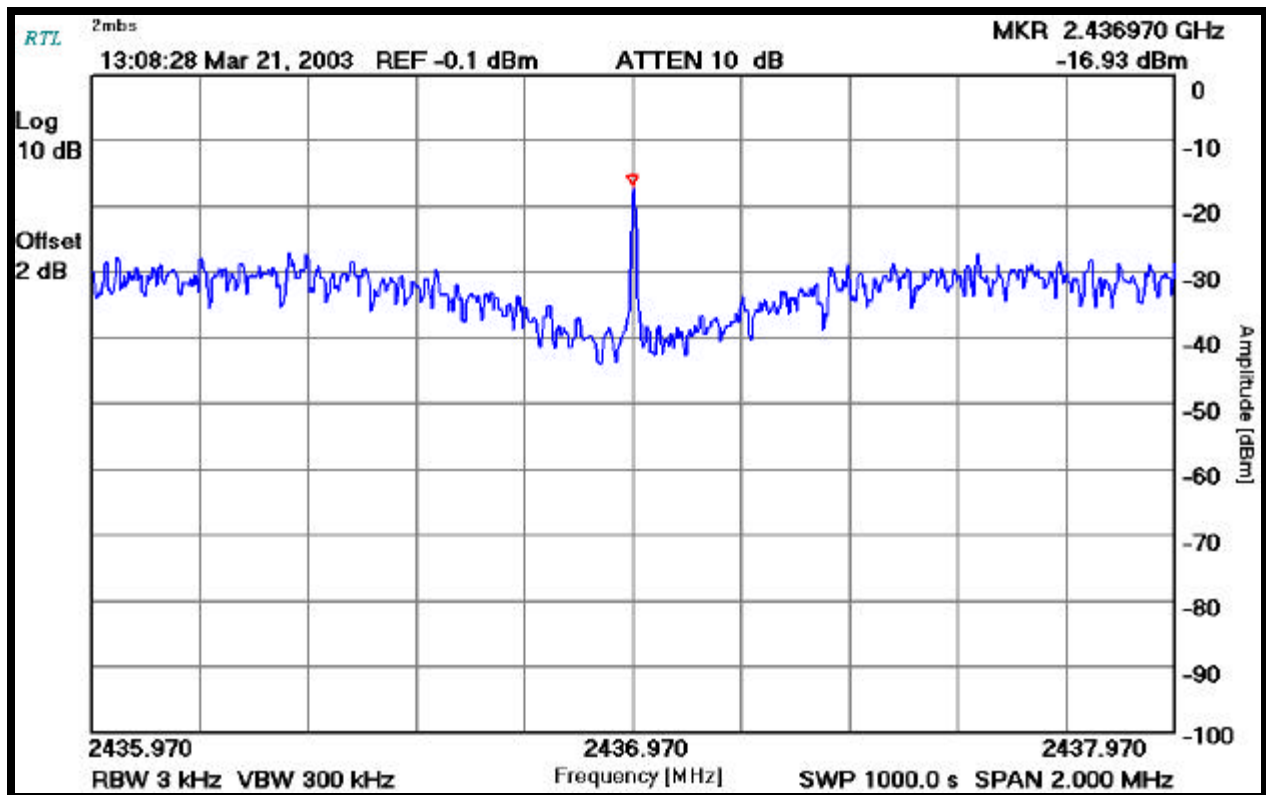
Rachid Sehb
Test Technician/Engineer

See
Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2437
WLAN On: 4
Channel: 6
Data Rate: 2
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.8-5: POWER SPECTRAL DENSITY: CHANNEL 6 AT 2 MBPS



TEST PERSONNEL:

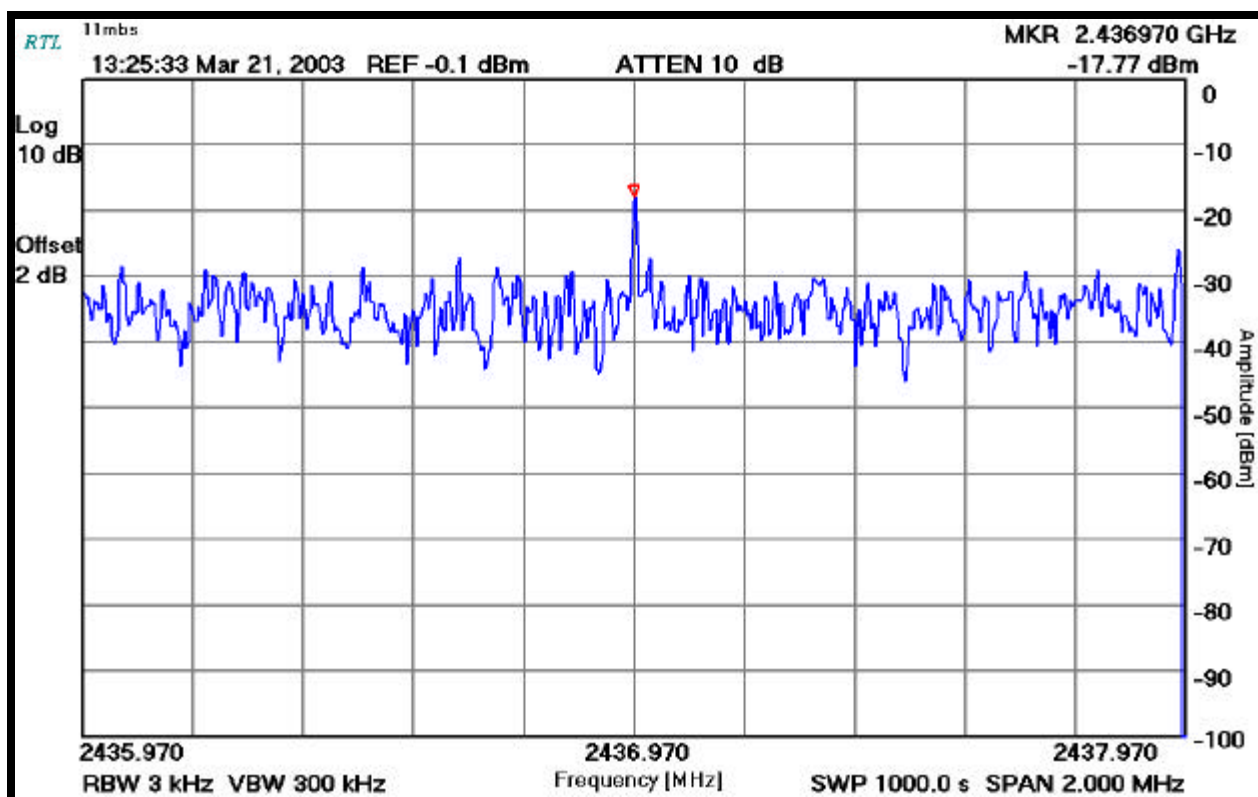
Rachid Sehb
Test Technician/Engineer


Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2437
WLAN On: 4
Channel: 6
Data Rate: 11
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.8-6: POWER SPECTRAL DENSITY: CHANNEL 6 AT 11 MBPS



TEST PERSONNEL:

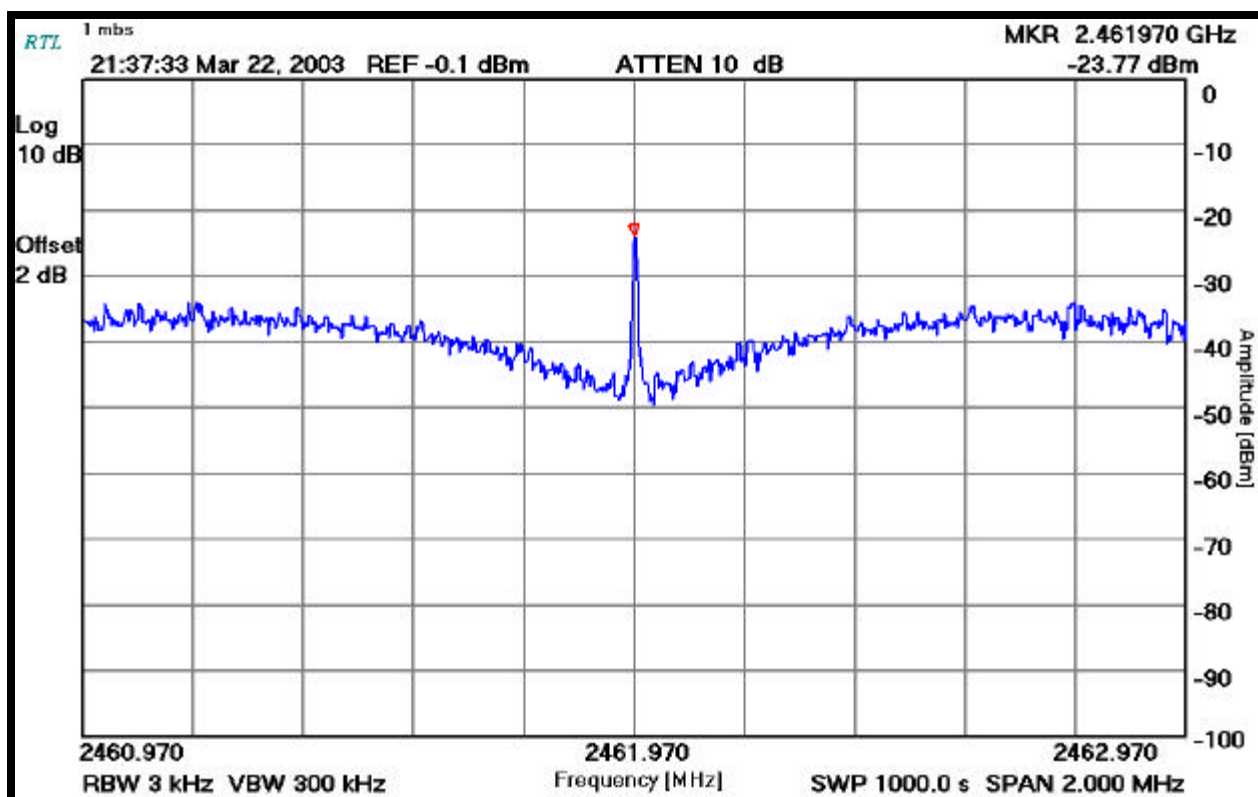
Rachid Sehb
Test Technician/Engineer

See
Signature

03/21/2003
Date Of Test

Operating Frequency (MHz): 2462
 WLAN On: 4
 Channel: 11
 Data Rate: 1
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 300
 Sweep Time (s): 1000.0

PLOT 10.8-7: POWER SPECTRAL DENSITY: CHANNEL 11 AT 1 MBPS



TEST PERSONNEL:

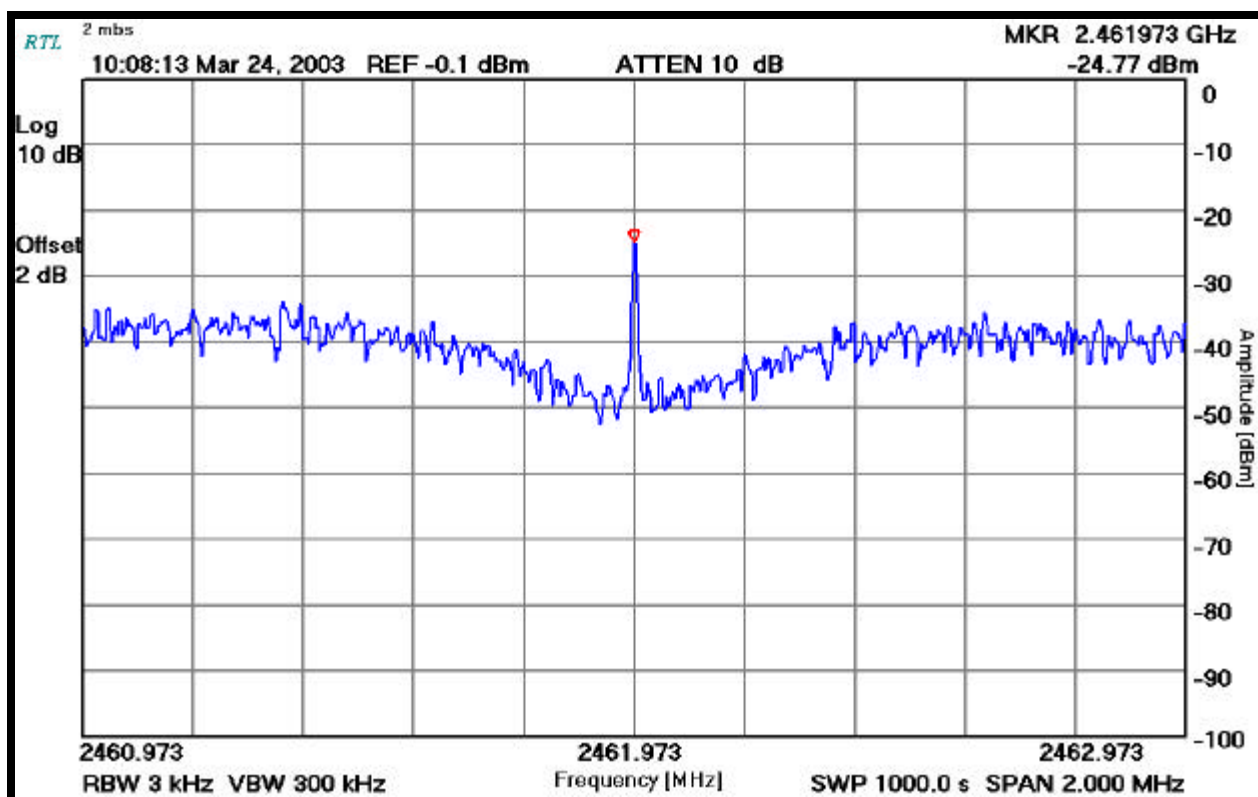
Rachid Sehb
 Test Technician/Engineer


 Signature

03/22/2003
 Date Of Test

Operating Frequency (MHz): 2462
 WLAN On: 4
 Channel: 11
 Data Rate: 2
 Bandwidth Resolution (kHz): 3
 Bandwidth Video (kHz): 300
 Sweep Time (s): 1000.0

PLOT 10.8-8: POWER SPECTRAL DENSITY: CHANNEL 11 AT 2 MBPS



TEST PERSONNEL:

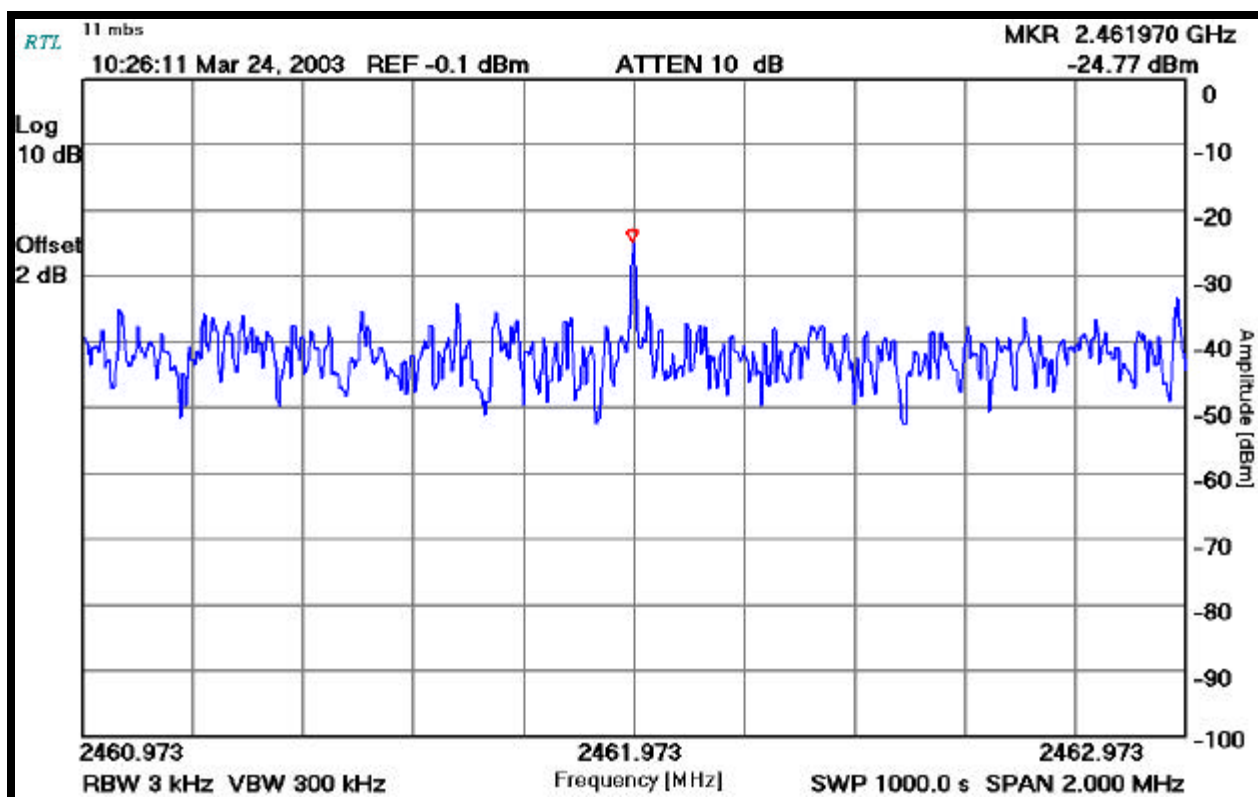
Rachid Sehb
 Test Technician/Engineer

See
 Signature

03/24/2003
 Date Of Test

Operating Frequency (MHz): 2462
WLAN On: 4
Channel: 11
Data Rate: 11
Bandwidth Resolution (kHz): 3
Bandwidth Video (kHz): 300
Sweep Time (s): 1000.0

PLOT 10.8-9: POWER SPECTRAL DENSITY: CHANNEL 11 AT 11 MBPS



TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer

See
Signature

03/24/2003
Date Of Test

Rhein Tech Laboratories
360 Herndon Parkway
Suite 1400
Herndon, VA 20170
<http://www.rheintech.com>

Client: Vivato, Inc.
Report number: 2003034
Standards: FCC 15.247 & IC RSS-210
FCC ID: QLNVLJ24WFSW
Model Name: 2.4 GHz Wi-Fi Switch

11. Conclusion

The data in this measurement report shows that the Vivato 2.4 GHz Wi-Fi Switch, FCC ID: QLNVLJ24WFSW, complies with all the requirements of Parts 2 and 15 of the FCC Rules and Industry Canada RSS-210.