

5 RADIATED EMISSION LIMITS RECEIVER/DIGITAL INTERFACE - §15.209

5.1 RADIATED EMISSION LIMITS TEST PROCEDURE

Radiated Spurious Emissions applies to harmonics and spurious emissions that fall in the restricted and non-restricted bands. The restricted bands are listed in Part 15.205. The maximum permitted average field strength for the restricted band is listed in Part 15.209. The IF, LO and up to the 2nd LO were investigated and tested. Channels 1, 6, and 11 were tested and investigated in the transmitting and receiving mode between 10kHz and 1GHz. The worst -case channel 11 in both modes is presented in the table below.

5.2 RADIATED EMISSION LIMITS TEST DATA

TABLE 5-1: RADIATED EMISSIONS TRANSMITTING CH 11

Temperature: 43°F Humidity: 51%									
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
132.000	Qp	V	180	1.0	41.4	-15.5	25.9	43.5	-17.6
176.000	Qp	V	145	1.0	42.7	-17.5	25.2	43.5	-18.3
220.000	Qp	V	0	1.0	46.1	-17.5	28.6	46.0	-17.4
396.000	Qp	V	90	1.0	36.2	-11.1	25.1	46.0	-20.9
528.000	Qp	V	145	1.0	35.3	-7.9	27.4	46.0	-18.6
723.231	Qp	V	1	1.0	72.4	-4.6	67.8	46.0	21.8
924.000	Qp	V	225	1.0	35.8	-3.7	32.1	46.0	-13.9

QP: RES. =100 kHz, VID= 100 kHz

TABLE 5-2: RADIATED EMISSIONS RECEIVING CH 11

Temperature: 43°F Humidity: 51%									
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
87.976	Qp	V	145	1.2	42.7	-20.8	21.9	40.0	-18.1
219.992	Qp	V	175	1.2	43.9	-17.5	26.4	46.0	-19.6
263.990	Qp	V	180	1.2	38.8	-14.5	24.3	46.0	-21.7
395.990	Qp	V	180	1.0	34.6	-11.1	23.5	46.0	-22.5
439.990	Qp	V	320	1.2	33.0	-9.4	23.6	46.0	-22.4
527.990	Qp	V	145	1.0	34.9	-7.9	27.0	46.0	-19.0
1187.990	Av	V	0	1.5	31.9	-1.2	30.7	54.0	-23.3

QP: RES. =100 kHz, VID= 100 kHz

TEST PERSONNEL:

Franck Schuppis
 Test Technician/Engineer


 Signature

4/06/2002
 Date Of Test

6 RADIATED EMISSION LIMITS RADIATED HARMONICS - §15.247

6.1 RADIATED EMISSION LIMITS TEST PROCEDURE

Radiated Spurious Emissions applies to harmonics and spurious emissions that fall in the restricted and non-restricted bands. The restricted bands are listed in Part 15.205. The maximum permitted average field strength for the restricted band is listed in Part 15.209. The EUT was tested in the X-Y, X-Z and Y-Z orthogonal plane.

Operating Frequency (MHz): 2412
 Channel: 1
 Measured Cond. Pwr. (dBm): 15.4
 Measured EIRP (dBm): 18.4
 Antenna: Patch antenna

TABLE 6-1: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 1)

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
2412.000	Av	V	10	1.0	95.5	11	106.5	Fundamental
2412.000	Pk	V	10	1.0	103.3	11	114.3	Fundamental
4075.971	Av	V	10	1.0	<20 dB			54.0
4824.000	Av	V	10	1.0	<20 dB			54.0
7236.000	Av	V	20	1.0	<20 dB			54.0
9648.000	Av	V	20	1.0	<20 dB			54.0
12060.000	Av	V	10	1.0	<20 dB			54.0
14472.000	Av	V	10	1.0	<20 dB			54.0
16884.000	Av	V	10	1.0	<20 dB			54.0
19296.000	Av	V	10	1.0	<20 dB			54.0
21708.000	Av	V	10	1.0	<20 dB			54.0
24120.000	Av	V	10	1.0	<20 dB			54.0

PEAK: RES. =1 MHz, VID= 1MHz; AVERAGE: RES. =1 MHz, VID= 10Hz; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppis
 Test Technician/Engineer


 Signature

4/06/2002
 Date Of Test

Operating Frequency (MHz): 2437
 Channel: 6
 Measured Cond. Pwr. (dBm): 16.1

Measured EIRP (dBm): 19.7
 Antenna: Patch antenna

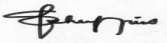
TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 6)

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
2437.000	Av	V	20	1.2	95.5	11	106.5	Fundamental
2437.000	Pk	V	20	1.2	102.7	11	113.7	Fundamental
4125.960	Av	V	20	1.0	<20 dB			54.0
4874.000	Av	V	20	1.0	<20 dB			54.0
7311.000	Av	V	10	1.2	<20 dB			54.0
9748.000	Av	V	10	1.2	<20 dB			54.0
12185.000	Av	V	10	1.0	<20 dB			54.0
14622.000	Av	V	10	1.0	<20 dB			54.0
17059.000	Av	V	10	1.0	<20 dB			54.0
19496.000	Av	V	10	1.0	<20 dB			54.0
21933.000	Av	V	10	1.0	<20 dB			54.0
24370.000	Av	V	10	1.0	<20 dB			54.0
4125.960	Av	V	10	1.0	<20 dB			54.0

AVERAGE: RES. =1 MHz, VID= 10Hz; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppius
 Test Technician/Engineer


 Signature

4/06/2002
 Date Of Test

Operating Frequency (MHz): 2462
 Channel: 11
 Measured Cond. Pwr. (dBm): 16.6

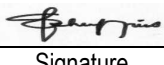
Measured EIRP (dBm): 20.6
 Antenna: Patch antenna

TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 11)

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
2462.000	Av	V	20	1.3	94.8	11	105.8	Fundamental
2462.000	Pk	V	20	1.3	101.5	11	112.5	Fundamental
4125.960	Av	V	20	1.2	<20 dB			54.0
4924.000	Av	V	20	1.2	<20 dB			54.0
7386.000	Av	V	10	1.2	<20 dB			54.0
9848.000	Av	V	10	1.0	<20 dB			54.0
12310.000	Av	V	10	1.0	<20 dB			54.0
14772.000	Av	V	10	1.2	<20 dB			54.0
17234.000	Av	V	10	1.0	<20 dB			54.0
19696.000	Av	V	10	1.0	<20 dB			54.0
22158.000	Av	V	10	1.0	<20 dB			54.0
24620.000	Av	V	10	1.0	<20 dB			54.0

AVERAGE: RES. =1 MHz, VID= 10Hz; NF = NOISE FLOOR; <20dB= 20dB BELOW THE LIMIT

TEST PERSONNEL:

Franck Schuppis Test Technician/Engineer	 Signature	4/06/2002 Date Of Test
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6.2 TEST EQUIPMENT USED FOR TESTING

TABLE 6-4: RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771
900772	EMCO	3161-02	Horn ANTENNA (2-4 GHz)	900772
900321	EMCO	3161-03	Horn Antennas (4-8,2GHz)	9508-1020
900323	EMCO	3160-7	Horn Antennas (8,2-12,4 GHz)	9605-1054
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051
900723	Miteq	NA	AMP 100MHz-26GHz	NA
900791	Schaffner - Chase	CBL6112	Antenna (25 MHz - 2 GHz)	2099

7 MODULATED BANDWIDTH - §15.247(A)(2)

7.1 MODULATED BANDWIDTH TEST PROCEDURE

The minimum 6 dB bandwidth per FCC 15.247 (a)(2) was measured using a 50 ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 300 kHz. The minimum 6 dB modulated bandwidths are the following:

7.2 TEST EQUIPMENT USED FOR TESTING

TABLE 7-1: TEST EQUIPMENT USED FOR TESTING (MODULATED BANDWIDTH)

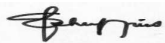
RTL Asset #	Manufacturer	Model	Part Type	Serial Number
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771

7.3 MODULATED BANDWIDTH TEST DATA

TABLE 7-2: MINIMUM 6 DB MODULATED BANDWIDTHS

CHANNEL	6 dB BANDWIDTH (MHz)
1	10.32
6	10.32
11	10.42

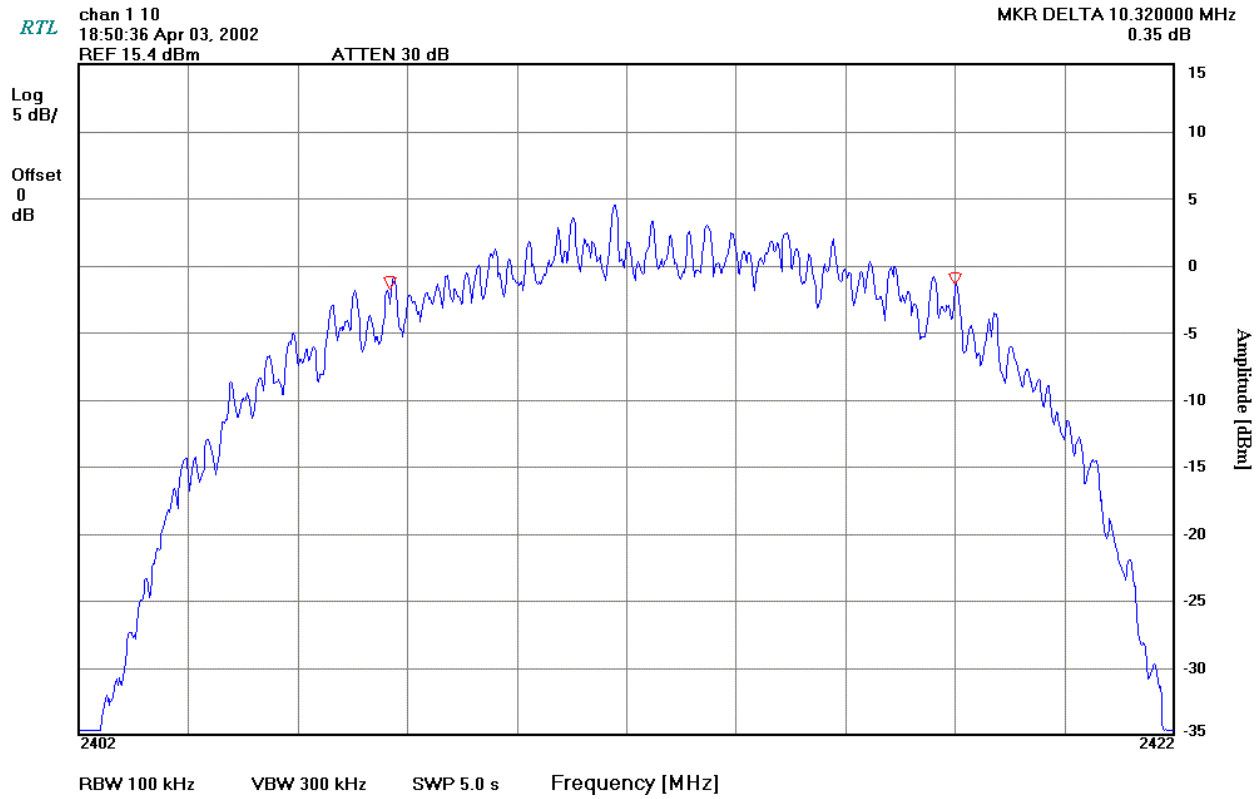
TEST PERSONNEL:

Franck Schuppis Test Technician/Engineer	 Signature	4/03/2002 Date Of Test
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7.4 MODULATED BANDWIDTH PLOTS

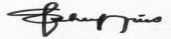
Channel Number: 1
Frequency (MHz): 2412
Resolution Bandwidth: 100kHz
Video Bandwidth: 300kHz
Sweep Time: 1.0s

PLOT 7-1: MODULATED BANDWIDTH CHANNEL 1



TEST PERSONNEL:

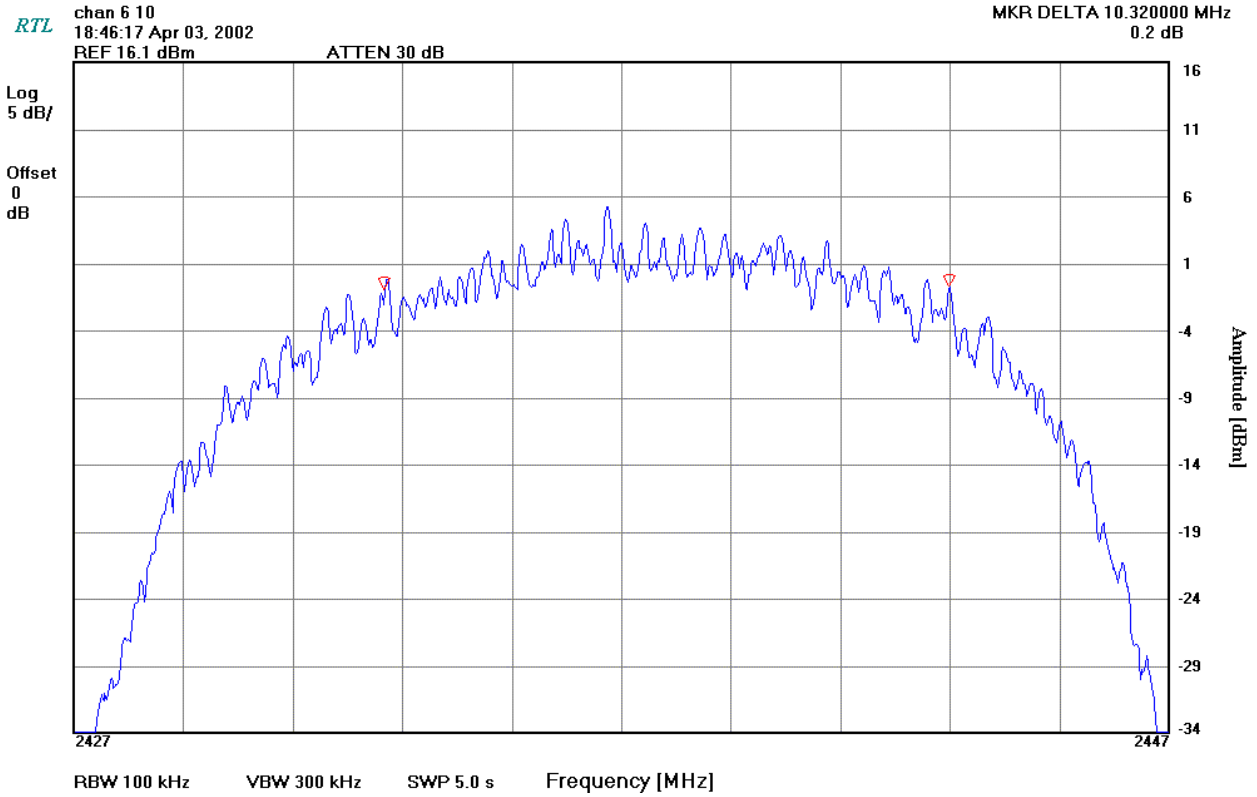
Franck Schuppis
Test Technician/Engineer


Signature

4/03/2002
Date Of Test

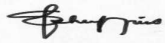
Channel Number: 6
Frequency (MHz): 2437
Resolution Bandwidth: 100kHz
Video Bandwidth: 300kHz
Sweep Time: 1.0s

PLOT 7-2: MODULATED BANDWIDTH CHANNEL 6



TEST PERSONNEL:

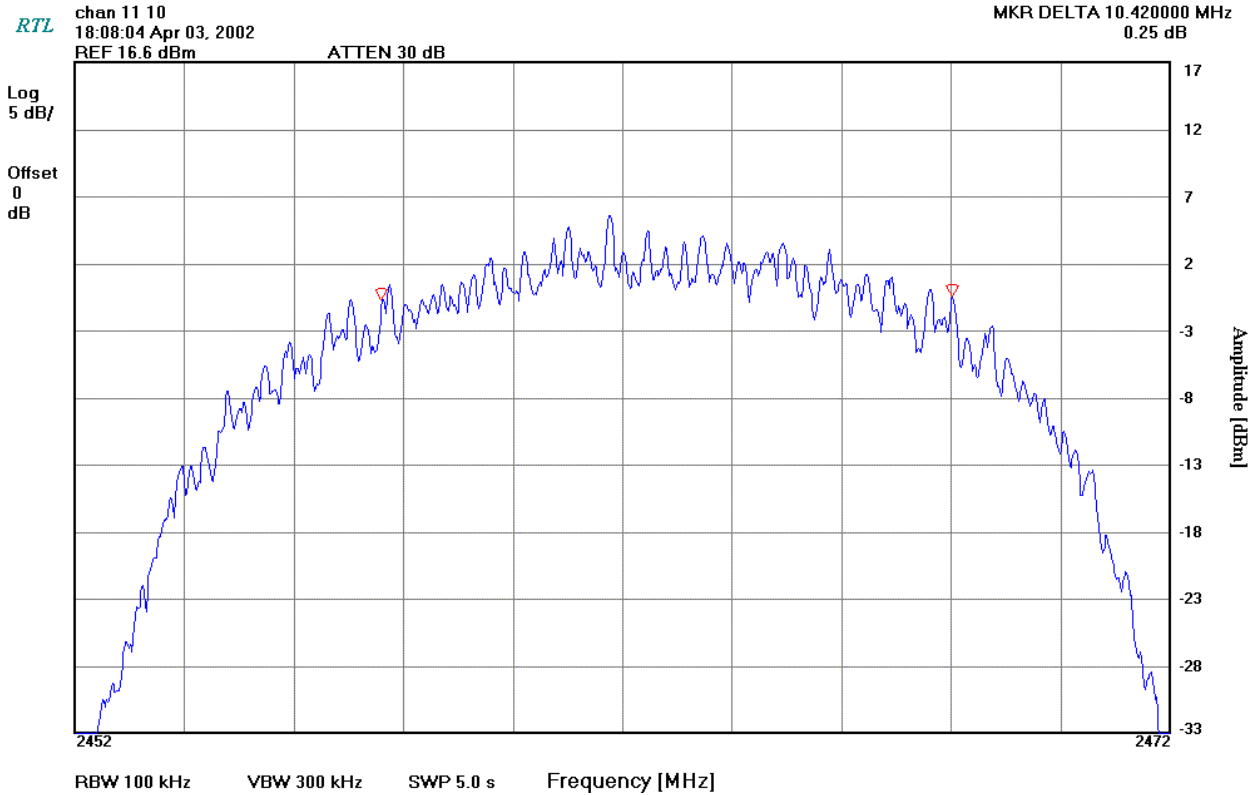
Franck Schuppis
Test Technician/Engineer


Signature

4/03/2002
Date Of Test

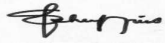
Channel Number: 11
Frequency (MHz): 2462
Resolution Bandwidth: 100kHz
Video Bandwidth: 300kHz
Sweep Time: 1.0s

PLOT 7-3: MODULATED BANDWIDTH CHANNEL 11



TEST PERSONNEL:

Franck Schuppis
Test Technician/Engineer


Signature

4/03/2002
Date Of Test

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. The EIRP measurement was performed as a radiated test using the substitution method

8.2 TEST EQUIPMENT USED FOR TESTING

TABLE 8-1: TEST EQUIPMENT USED FOR TESTING (RADIATED RF OUTPUT – EIRP)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number
901186	Agilent Technologies	E9323A (50MHz-6GHz)	Peak & Avg. Power Sensor	US40410380
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771
900772	EMCO	3161-02	Horn ANTENNA (2-4 GHz)	900772
900723	Miteq	NA	AMP 100MHz-26GHz	NA
900814	Electro-Metrics	RGA-60	Double Ridges Guide Antenna (1-18 GHz)	2310

8.3 POWER OUTPUT TEST DATA

TABLE 8-2: POWER OUTPUT TEST DATA

Operating Frequency (MHz): 2412MHz, 2437MHz, 2462MHz
 Channel: 1, 6 & 11
 Measured Cond. Pwr. (dBm): 15.4, 16.1 & 16.6
 Measured EIRP (dBm): 18.4, 19.7 & 20.6
 Modulation bandwidth: 10.3MHz
 Antenna: Patch Antenna

TABLE 8-3: POWER OUTPUT TEST DATA

CHANNEL	EIRP (dBm)*	POWER CONDUCTED OUTPUT (dBm)
1	18.4	15.4
6	19.7	16.1
11	20.6	16.6

*Measurement accuracy is +/- 1.5 dB

TEST PERSONNEL:

Franck Schuppis Test Technician/Engineer	 Signature	4/04/2002 Date Of Test
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9 ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C)

9.1 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST PROCEDURES

Antenna spurious emission per FCC 15.247(c) was 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 2.410GHz for Channel 1, 2.437GHz for Channel 6 and 2.463GHz for Channel 11. No other harmonics or spurs were found within 20 dB of the carrier level, and from 9kHz to the carriers 10th harmonic. See antenna conducted spurious noise table. Channels 1, 6, and 11 were investigated and tested.

9.2 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA

Operating Frequency (MHz): 2412
 Channel: 1
 Measured Cond. Pwr. (dBm): 15.4
 Measured EIRP (dBm): 18.4
 Limit: -4.6 dBm

TABLE 9-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Measured Level (dBc)	Margin (dB)
4075.971	-51.7	1.4	65.7	-70.3
4824.000	-58.3	2.3	71.4	-76.0
7236.000	-53.7	2.4	66.7	-71.3
9648.000	-54.1	9.3	60.2	-64.8
12060.000	-53.8	6.7	62.5	-67.1
14472.000	-49.6	6.5	58.5	-63.1
16884.000	-48.7	8.8	55.3	-59.9
19296.000	-44.4	8.8	51.0	-55.6
21708.000	-45.4	8.4	52.4	-57.0
24120.000	-45.1	8.3	52.2	-56.8

TEST PERSONNEL:

Franck Schuppis
 Test Technician/Engineer


 Signature

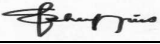
5/16/2002
 Date Of Test

Operating Frequency (MHz): 2437
 Channel: 6
 Measured Cond. Pwr. (dBm): 16.1
 Measured EIRP (dBm): 19.7
 Limit: -3.9 dBm

TABLE 9-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Measured Level (dBc)	Margin (dB)
4125.960	-51.7	1.5	66.3	-70.2
4874.000	-58.8	2.3	72.6	-76.5
7311.000	-52.1	2.5	65.7	-69.6
9748.000	-54.3	10.1	60.3	-64.2
12185.000	-54.4	7.0	63.5	-67.4
14622.000	-51.4	6.5	61.0	-64.9
17059.000	-50.8	8.7	58.2	-62.1
19496.000	-46.3	8.8	53.6	-57.5
21933.000	-46.4	8.3	54.2	-58.1
24370.000	-46.4	8.3	54.2	-58.1

TEST PERSONNEL:

Franck Schuppis		5/16/2002
Test Technician/Engineer	Signature	Date Of Test

Operating Frequency (MHz): 2462
 Channel: 11
 Measured Cond. Pwr. (dBm): 16.6
 Measured EIRP (dBm): 20.6
 Limit: -3.4 dBm

TABLE 9-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Measured Level (dBc)	Margin (dB)
4125.960	-51.6	1.6	66.6	-70.0
4924.000	-58.4	2.4	72.6	-76.0
7386.000	-52.3	2.5	66.4	-69.8
9848.000	-54.1	10.2	60.5	-63.9
12310.000	-54.3	7.1	63.8	-67.2
14772.000	-51.5	6.6	61.5	-64.9
17234.000	-50.6	8.5	58.7	-62.1
19696.000	-46.5	9.0	54.1	-57.5
22158.000	-46.5	8.4	54.7	-58.1
24620.000	-46.5	8.3	54.8	-58.2

TEST PERSONNEL:

Franck Schuppius		5/16/2002
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 3kHz, the video bandwidth set at 30kHz, and the sweep time set at 1000 second. Since the EUT has an integral antenna, the test was performed as a radiated testing. The 6 dB value on the bandwidth plots were corrected using the site correction factor (i.e. cable loss, amplifier gain, and antenna factor) and the path loss at 3 meter distance; and referenced to the EIRP value measured in section 7 of this report. The spectral lines were resolved for the modulated carriers at 2.412GHz, 2.437GHz, and 2.463GHz respectively. These levels are well below the +8 dBm limit. See power spectral density table and plots.

10.2 TEST EQUIPMENT USED FOR TESTING

TABLE 10-1: TEST EQUIPMENT USED FOR TESTING (POWER SPECTRAL DENSITY)

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771

10.3 POWER SPECTRAL DENSITY TEST DATA

Operating Frequency (MHz): 2412MHz, 2437MHz & 2462
 Channel: 1, 6 & 11
 Measured Cond. Pwr. (dBm):
 Modulation Bandwidth: 10.3 MHz
 Limit: 8dBm

TABLE 10-2: POWER SPECTRAL DENSITY

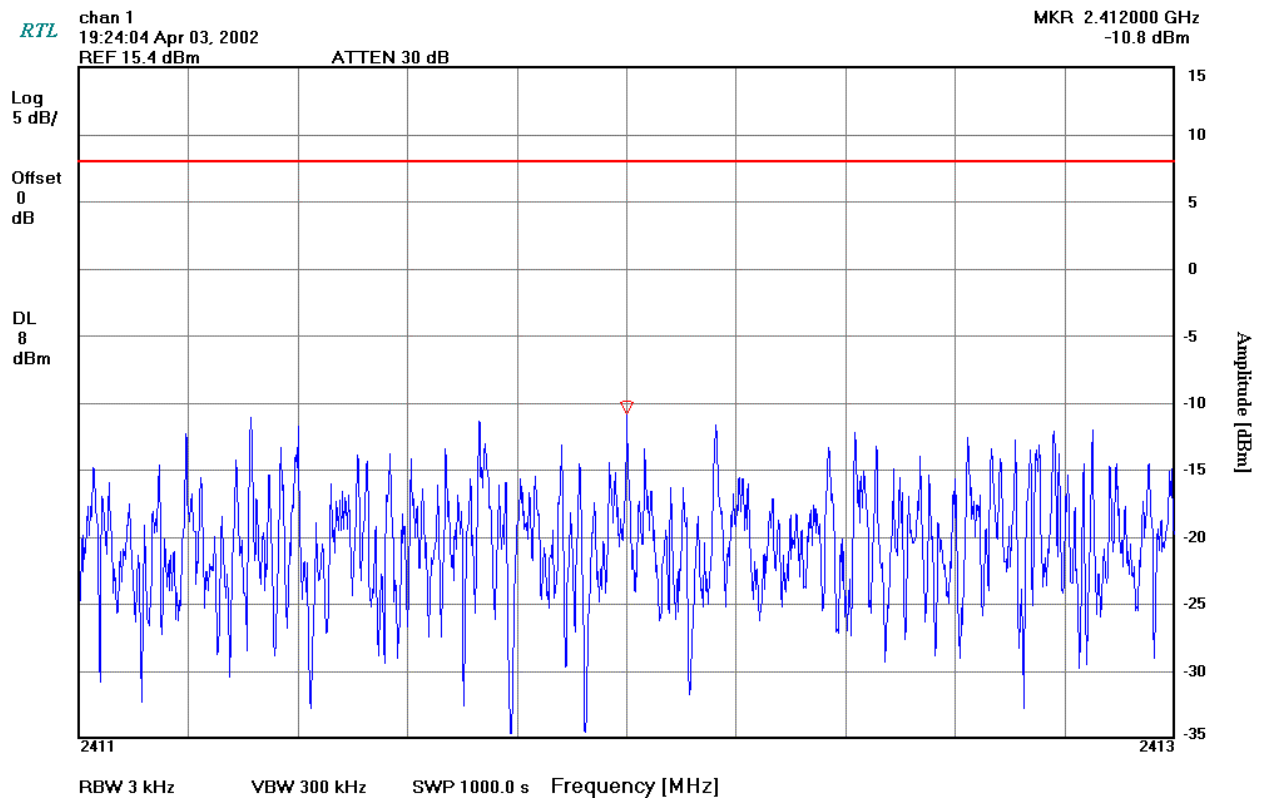
CHANNEL	POWER SPECTRAL DENSITY LIMIT = +8dBm
1	-10.8
6	-9.9
11	-9.5

TEST PERSONNEL:

Franck Schuppius Test Technician/Engineer	 Signature	4/04/2002 Date Of Test
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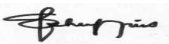
Operating Frequency (MHz): 2412
Channel: 1
Measured Cond. Pwr. (dBm): 15.4
Measured EIRP (dBm): 18.4
Bandwidth Resolution: 3kHz
Bandwidth Video: 300kHz
Sweep Time: 1000.0s

PLOT 10-1: POWER SPECTRAL DENSITY: CHANNEL 1



TEST PERSONNEL:

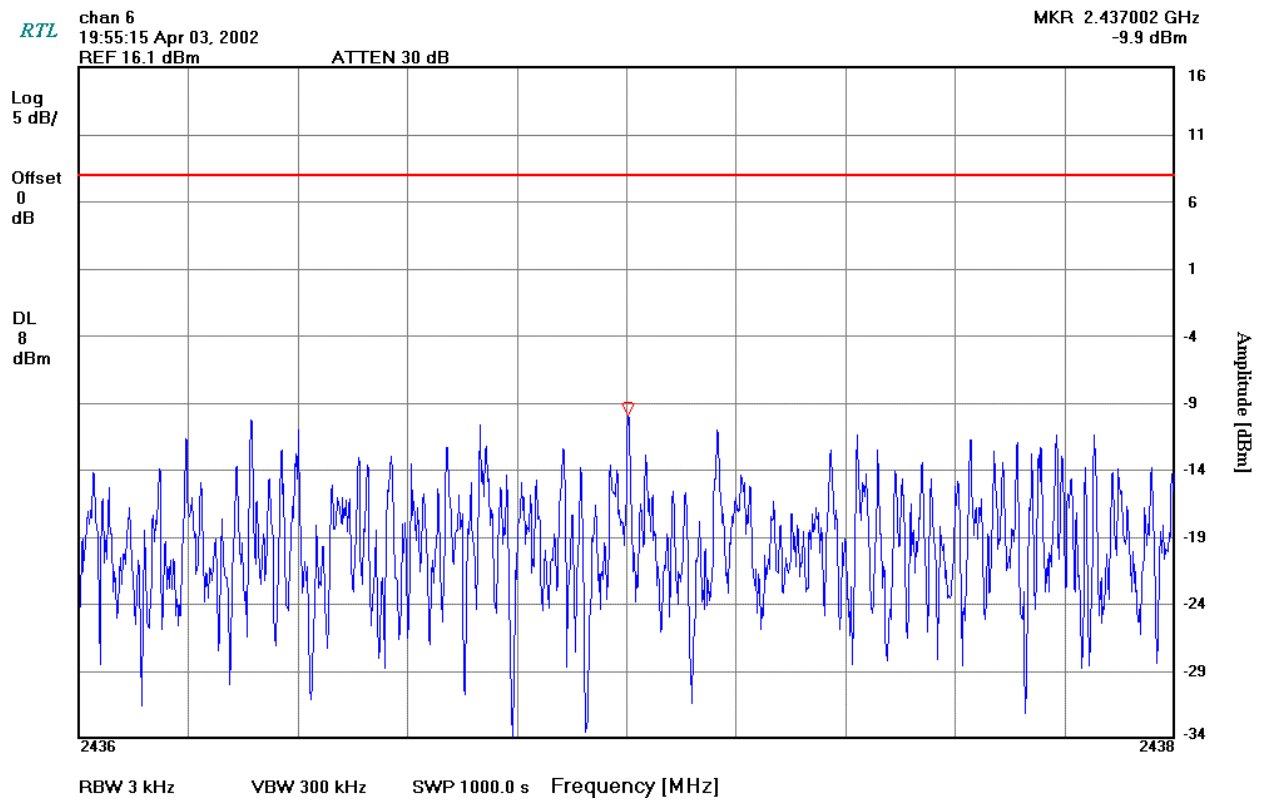
Franck Schuppis
Test Technician/Engineer


Signature

4/03/2002
Date Of Test

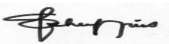
Operating Frequency (MHz): 2437
Channel: 6
Measured Cond. Pwr. (dBm): 16.1
Measured EIRP (dBm): 19.7
Bandwidth Resolution: 3kHz
Bandwidth Video: 300kHz
Sweep Time: 1500.0s

PLOT 10-2: POWER SPECTRAL DENSITY: CHANNEL 6



TEST PERSONNEL:

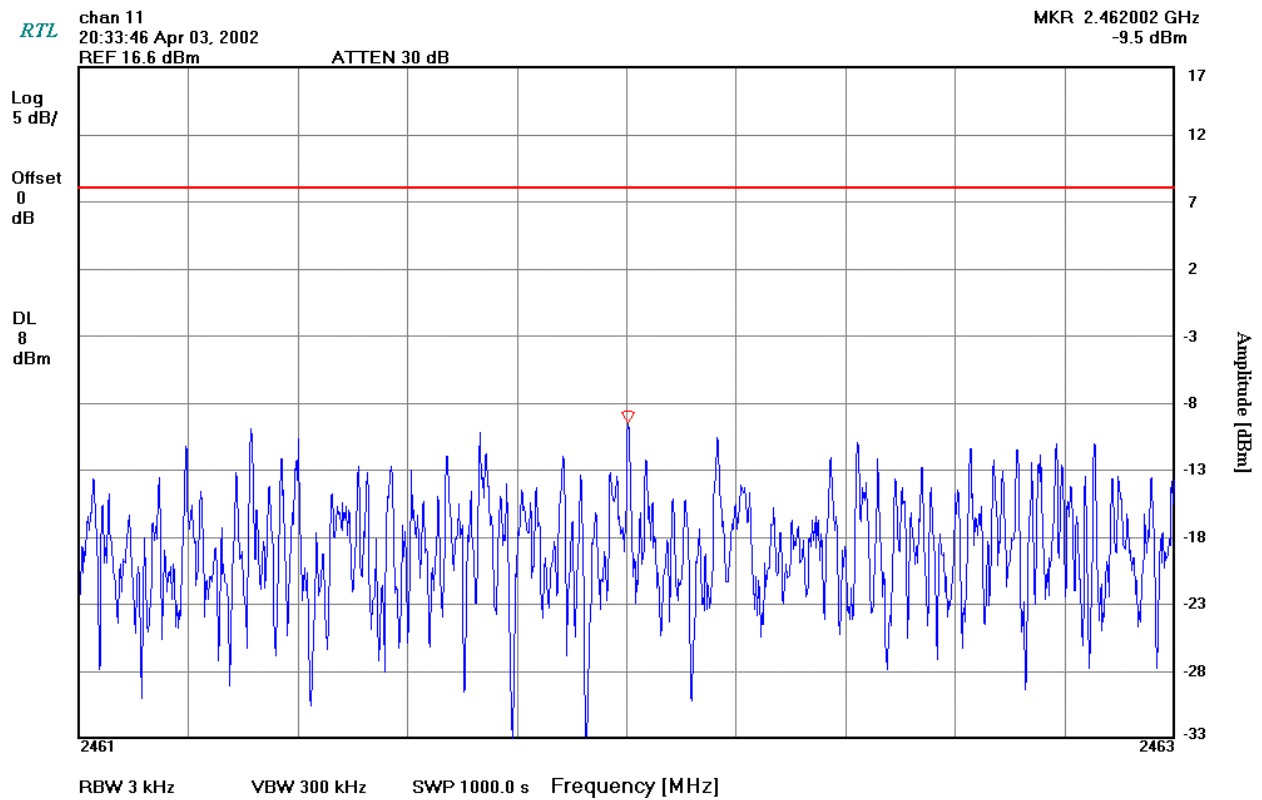
Franck Schuppis
Test Technician/Engineer


Signature

4/03/2002
Date Of Test

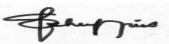
Operating Frequency (MHz): 2462
Channel: 11
Measured Cond. Pwr. (dBm): 16.6
Measured EIRP (dBm): 20.6
Bandwidth Resolution: 3kHz
Bandwidth Video: 300kHz
Sweep Time: 1000.0s

PLOT 10-3: POWER SPECTRAL DENSITY: CHANNEL 11



TEST PERSONNEL:

Franck Schuppis
Test Technician/Engineer


Signature

4/03/2002
Date Of Test

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

Report number 2002057
FCC Part 15.247
Industry Canada RSS-210
FCC ID E2X-SWL2200P
M/N SWL-2200P

11 CONCLUSION

The data in this measurement report shows that the **Samsung Electro-Mechanics Co., LTD, Model: SWL-2200P FCC ID: E2XSWL-2200P** complies with all the requirements of Parts 2 and 15 of the FCC Rules and Industry Canada RSS-210.