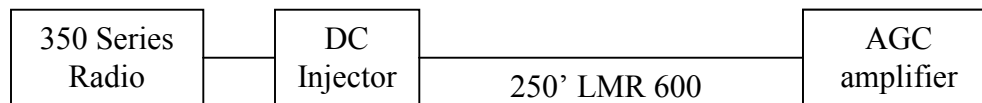


## ADDITIONAL INFORMATION FOR AGC AMPLIFIER

The AGC amplifier has been investigated for maximum gain conditions. The minimum gain condition has been investigated and considered as the worst case for the previous data. The amplifier has been tested as shown below.



## 1 JUSTIFICATION

Because of the linear relationship between the field strength and the intensity of the current for the same frequency and azimuth, to show compliance for the maximum amplifier gain, most of the conducted measurements were performed for the critical aspect of the testing.

- Band edge: a table was provided to show that the conducted average measurement is lower at the band edge (and the delta between the carrier and the maximum spurious in the restricted band) for the maximum amplifier gain compared to the minimum amplifier gain. Due to the relationship between the intensity of the current and the field strength for the same frequencies (2390MHz, 2483.5MHz), the radiated measurement performed for the report for the minimal amplifier gain, the unit was considered compliant at the band edge
- Radiated spurious emission: the conducted spurious at the port was compared to the measurement performed for the minimal amplifier gain. The unit was found compliant for the radiated testing for the minimal amplifier gain with all types of antennas. Meanwhile the conducted measurement was for all harmonics and spurious for the maximum amplifier gain compared to the minimum amplifier gain. In conclusion, the unit was considered compliant for the radiated spurious due the inherent characteristics of the antenna listed above. To show that the unit is compliant, the unit was tested with the highest antenna gain antenna of all families' type. The results are listed Section 5 of this appendix.

## 2 POWER OUTPUT

### 2.1 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 power at the port was find lower compare to the minimum amplifier gain measurement .

### 2.2 TEST EQUIPMENT USED FOR TESTING

**TABLE 1-1: RADIATED RF OUTPUT – EIRP TEST EQUIPMENT**

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

## 2.3 POWER OUTPUT TEST DATA

**TABLE 1-2: POWER OUTPUT TEST DATA**

**Operating Frequency (MHz):** 2422, 2437 & 2452  
**Channel:** 3, 6 & 9

**TABLE 1-3: POWER OUTPUT TEST DATA**

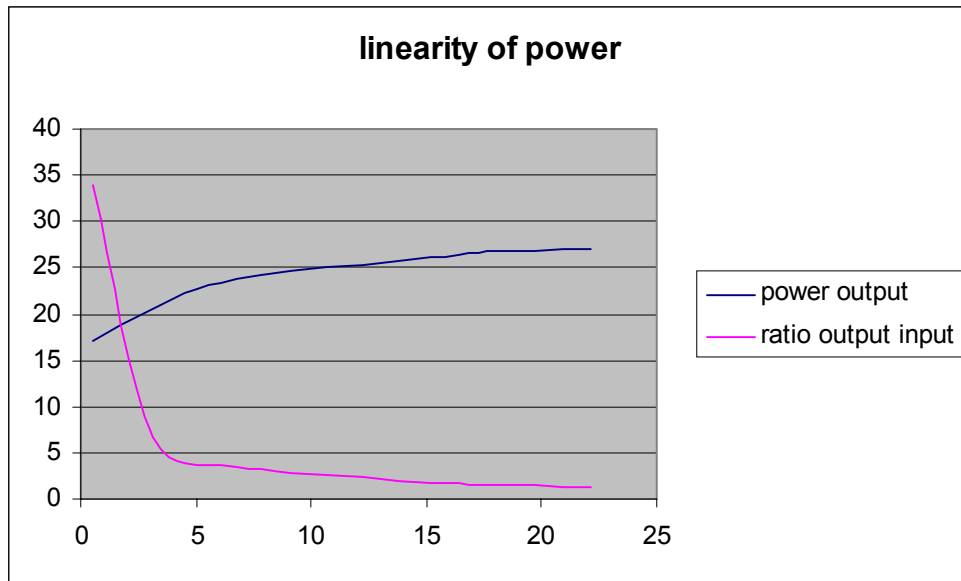
CHANNEL	POWER CONDUCTED OUTPUT (dBm)
3	17.0
6	16.5
9	16.2

\*Measurement accuracy is +/- 1.5 dB

## 2.4 POWER OUTPUT OF THE AMPLIFIER

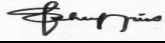
To verify the characteristic of the amplifier the unit has been tested with different cable lengths between the DC Injector and the input of the amplifier. The unit was not capable amplifying a signal lower than 3.6 dBm as reported in the table below.

POWER AT INPUT (dBm)	POWER AT OUTPUT (dBm)	RATIO OUTPUT/INPUT
0.5	17.0	34.0
3.1	20.5	6.6
6.8	23.7	3.5
17.3	26.5	1.5
17.8	26.8	1.5
22.1	27.0	1.2



**TEST PERSONNEL:**

---

Franck Schuppius Test Technician/Engineer	 Signature	09/12/02 Date Of Test
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### 3 COMPLIANCE WITH THE RESTRICTED BAND EDGE - §15.205

#### 3.1 TEST PROCEDURE

Compliance with the band edges for the high gain of the amplifier was performed by comparing the absolute value at the band edge, and the delta between the carrier and the highest point in the restricted band, with the low gain of the amplifier.

#### 3.2 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

Operating Frequency (MHz): 2422-2452  
 Channel: 3 & 9  
 Distance (m): 3  
 Limit (dBuV/m): 54

**TABLE 3-1: RESTRICTED BAND EDGE TEST DATA FOR LOW GAIN OF AMPLIFIER**

Channel Set to	Frequency tested (MHz)	Detector	Field Strength Level
3	2390.0	Absolute measurement	-40.5dBm
3	2390.0	Delta measurement	51.1dB
9	2483.5	Absolute measurement	-41.6dBm
9	2483.5	Delta measurement	50.4 dB

**TABLE 3-2: RESTRICTED BAND EDGE TEST DATA FOR HIGH GAIN OF AMPLIFIER**

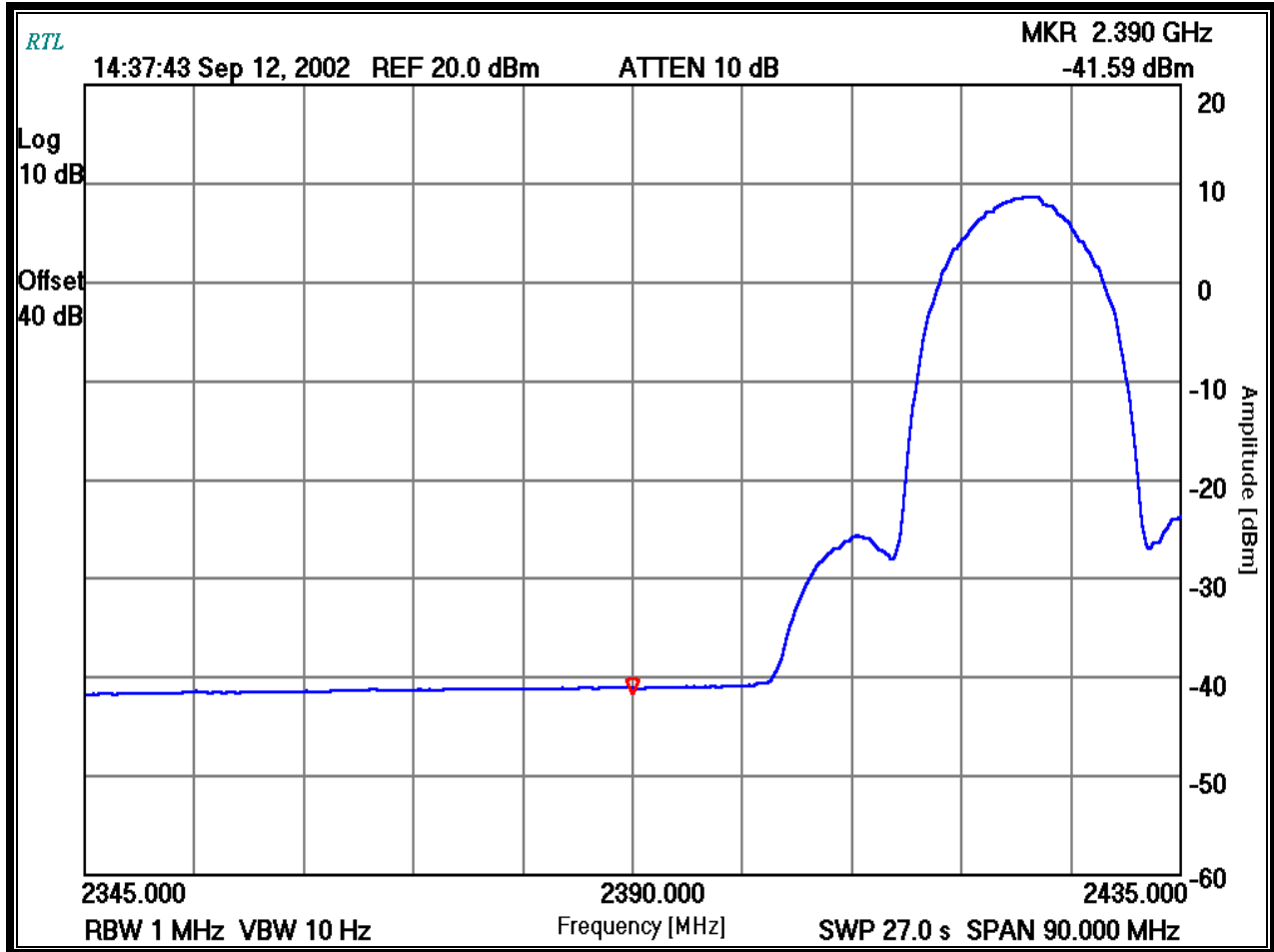
Channel Set to	Frequency tested (MHz)	Detector	Field Strength Level
3	2390.0	Absolute measurement	-41.5 dBm
3	2390.0	Delta measurement	49.7 dB
9	2483.5	Absolute measurement	41.7dBm
9	2483.5	Delta measurement	49.9 dB

**TEST PERSONNEL:**

Franck Schuppius Test Technician/Engineer	 Signature	09/12/02 Date Of Test
--	--	--------------------------

Channel Number: 3  
Frequency (MHz): 2422  
Resolution Bandwidth (MHz): 1  
Video Bandwidth (Hz): 10

**PLOT 3-1: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 3 HIGH GAIN**



**TEST PERSONNEL:**

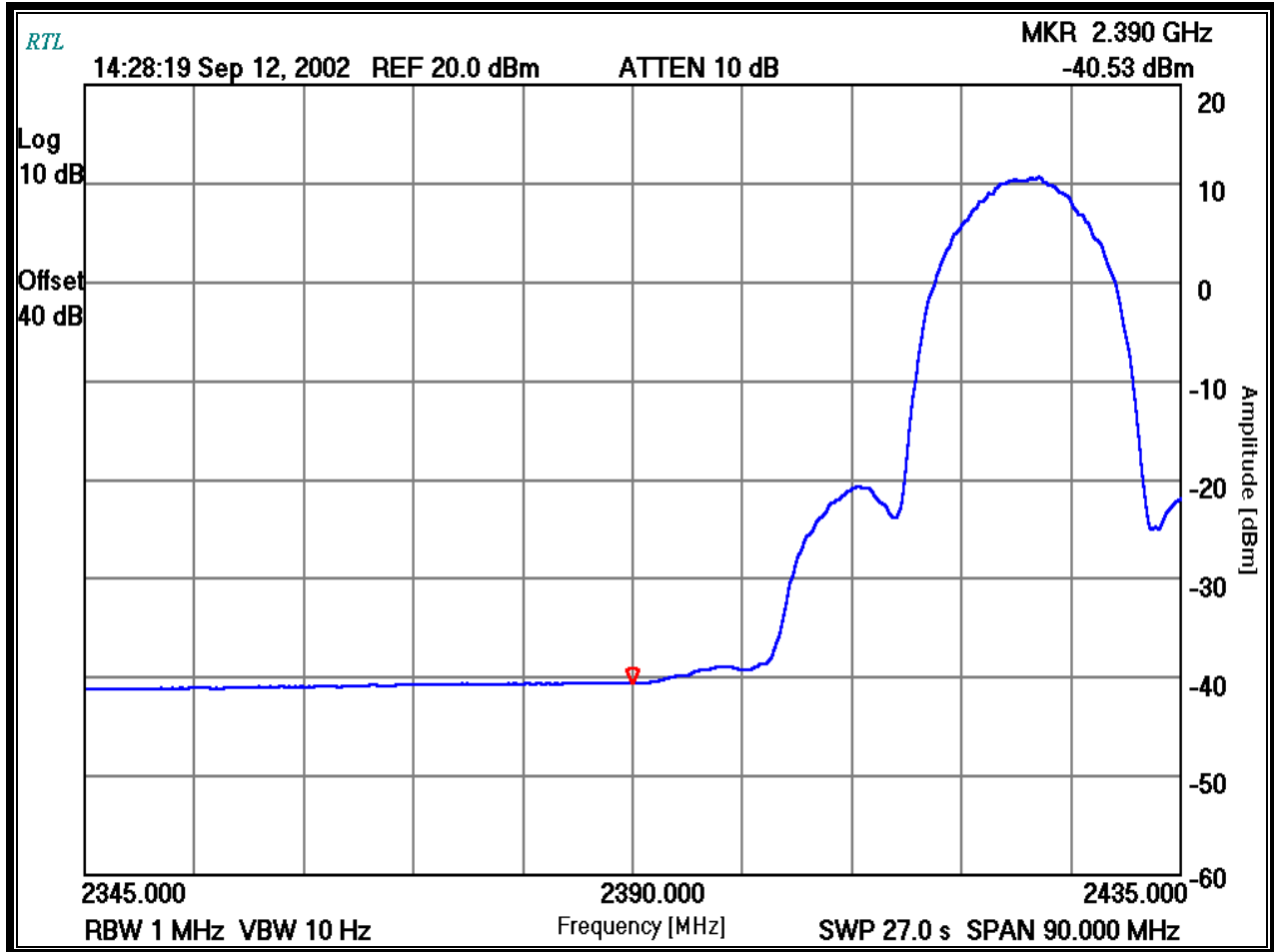
Franck Schuppis  
Test Technician/Engineer

  
Signature

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Date Of Test

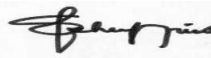
Channel Number: 3  
Frequency (MHz): 2422  
Resolution Bandwidth (MHz): 1  
Video Bandwidth (Hz): 10

**PLOT 3-2: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 3 LOW GAIN**



**TEST PERSONNEL:**

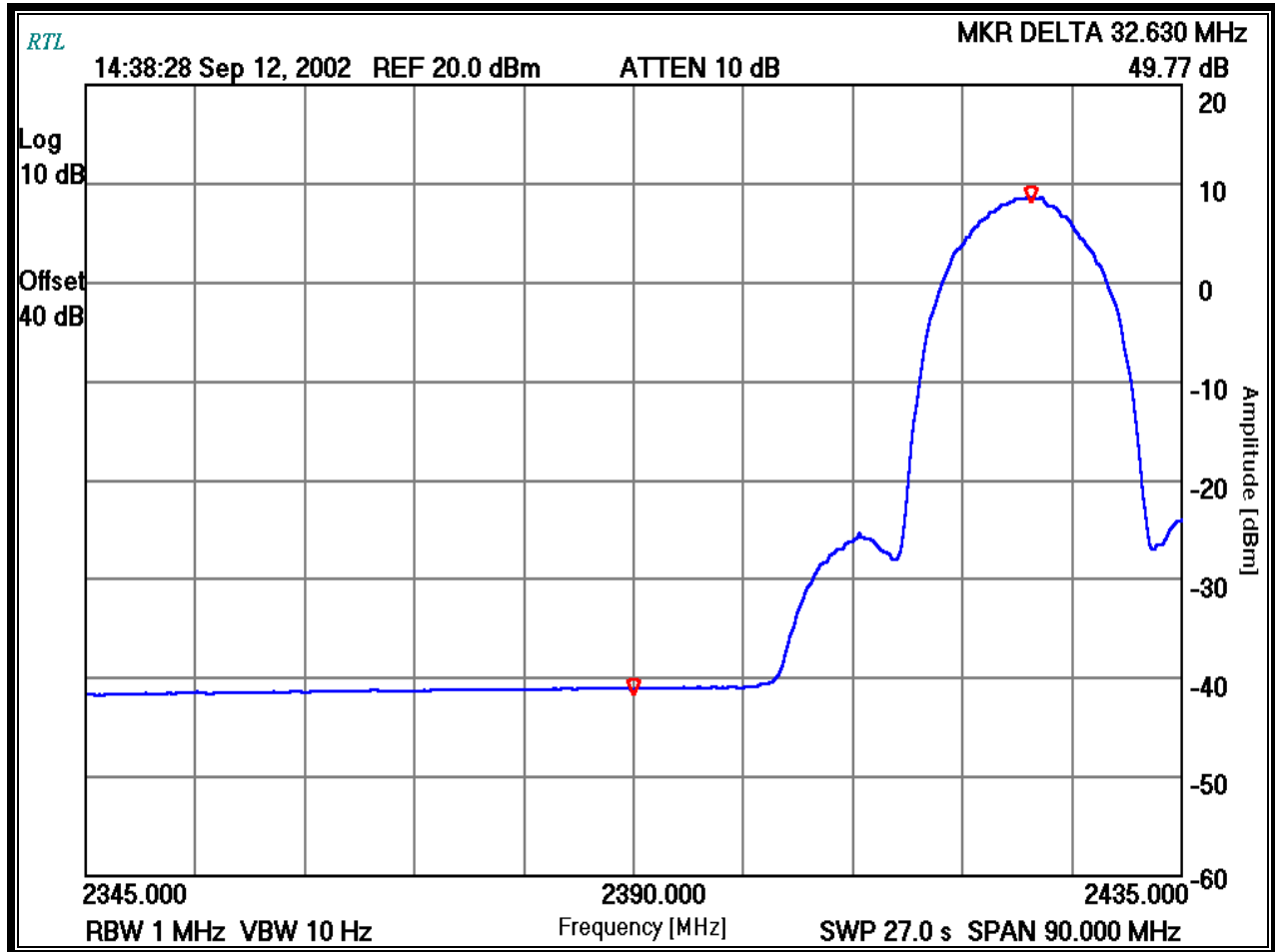
Franck Schuppius  
Test Technician/Engineer

  
Signature

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Date Of Test

Channel Number: 3  
Frequency (MHz): 2422  
Resolution Bandwidth (MHz): 1  
Video Bandwidth (Hz): 10

**PLOT 3-3: BAND EDGE: DELTA MEASUREMENT FOR CHANNEL 3 HIGH GAIN**



**TEST PERSONNEL:**

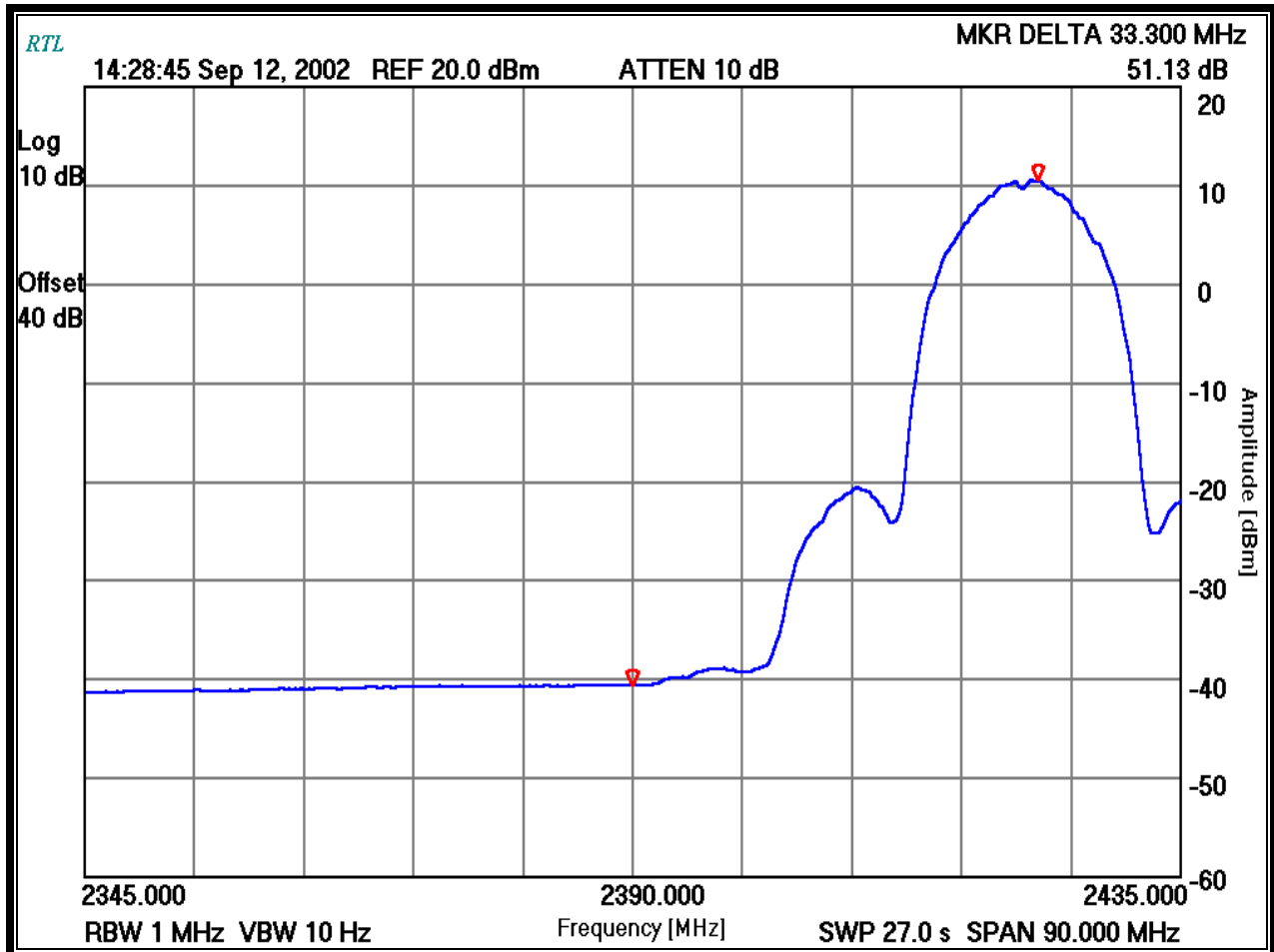
Franck Schuppis  
Test Technician/Engineer

  
Signature

09/12/02  
Date Of Test


Channel Number: 3  
Frequency (MHz): 2422  
Resolution Bandwidth (MHz): 1  
Video Bandwidth (Hz): 10

PLOT 3-4: BAND EDGE: DELTA MEASUREMENT FOR CHANNEL 3 LOW GAIN



TEST PERSONNEL:

Franck Schuppius  
Test Technician/Engineer

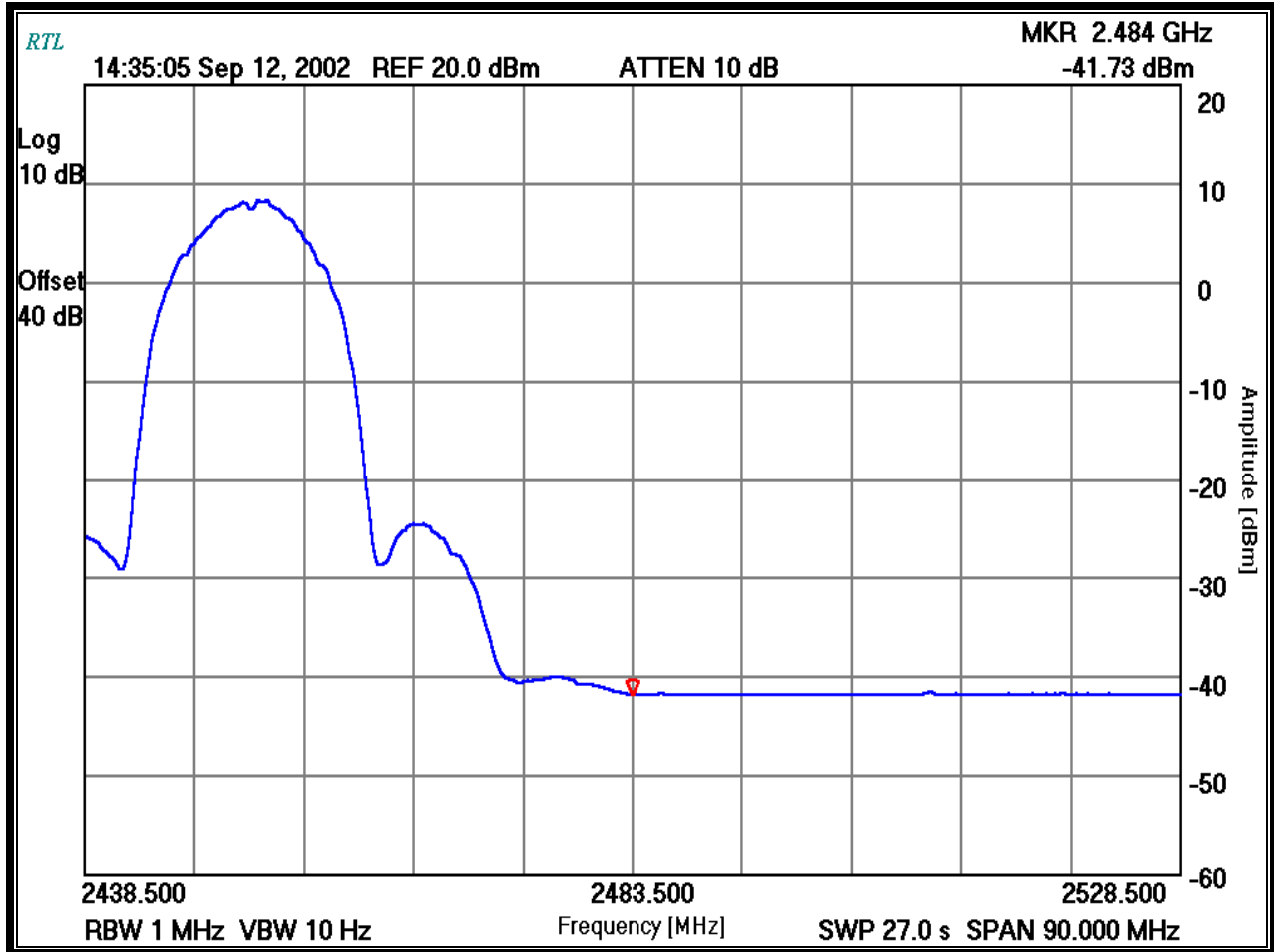
  
Signature

09/12/02  
Date Of Test



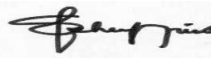
Channel Number: 9  
Frequency (MHz): 2452  
Resolution Bandwidth (MHz): 1  
Video Bandwidth (Hz): 10

**PLOT 3-5: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 9 HIGH GAIN**



**TEST PERSONNEL:**

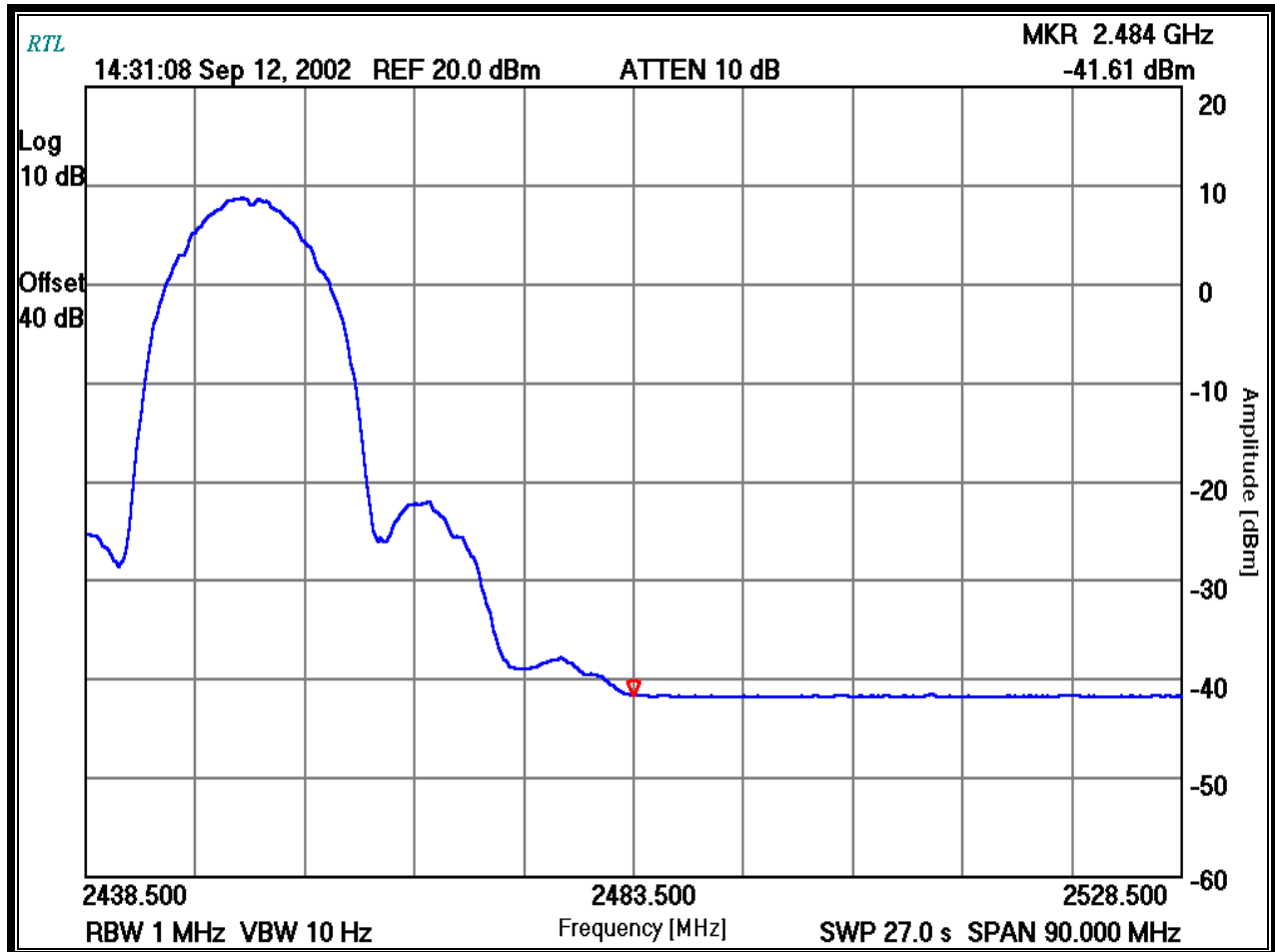
Franck Schuppis  
Test Technician/Engineer

  
Signature

09/12/02  
Date Of Test

Channel Number: 9  
Frequency (MHz): 2452  
Resolution Bandwidth (MHz): 1  
Video Bandwidth (Hz): 10

**PLOT 3-6: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 9 LOW GAIN**



**TEST PERSONNEL:**

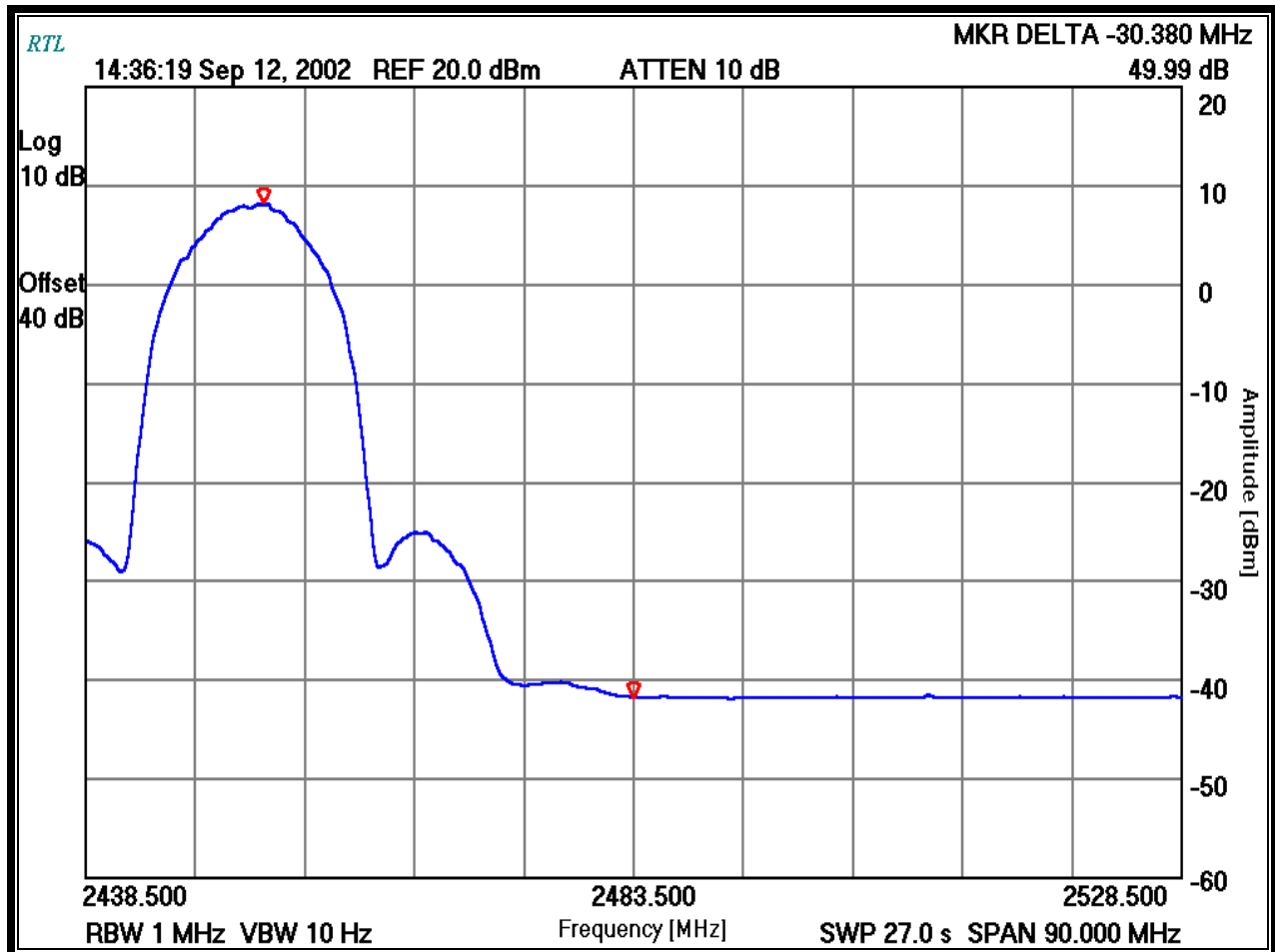
Franck Schuppius  
Test Technician/Engineer

  
Signature

09/12/02  
Date Of Test

Channel Number: 9  
Frequency (MHz): 2452  
Resolution Bandwidth (MHz): 1  
Video Bandwidth (Hz): 10

**PLOT 3-7: BAND EDGE: DELTA MEASUREMENT FOR CHANNEL 9 HIGH GAIN**



**TEST PERSONNEL:**

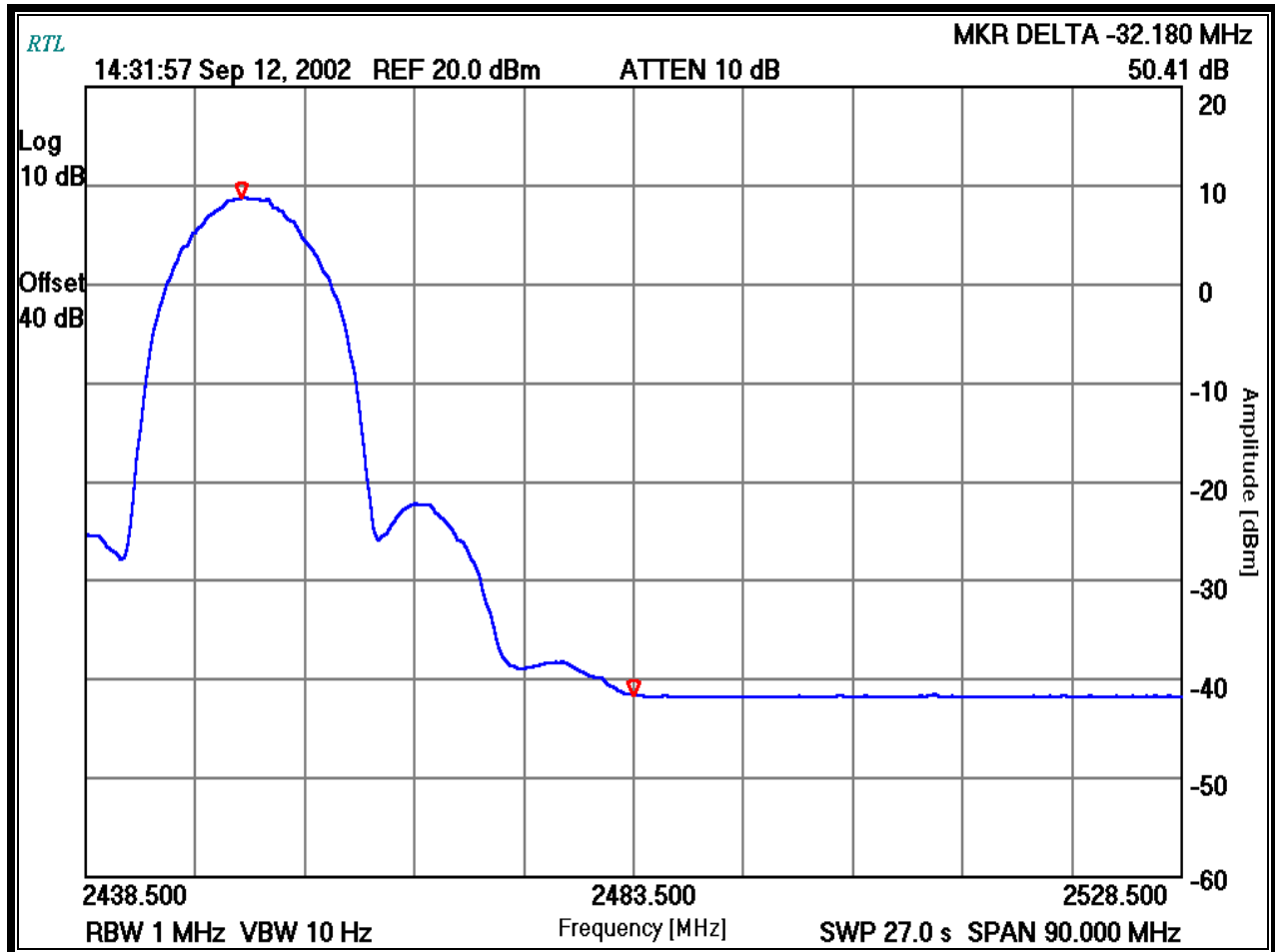
Franck Schuppius  
Test Technician/Engineer

  
Signature

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Date Of Test

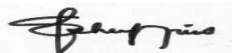
Channel Number: 9  
Frequency (MHz): 2452  
Resolution Bandwidth (MHz): 1  
Video Bandwidth (Hz): 10

**PLOT 3-8: BAND EDGE: DELTA MEASUREMENT FOR CHANNEL 9 LOW GAIN**



**TEST PERSONNEL:**

Franck Schuppius  
Test Technician/Engineer

  
Signature

09/12/02  
Date Of Test

## 4 ANTENNA CONDUCTED SPURIOUS EMISSIONS - §15.247(C)

### 4.1 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 2.422 GHz for Channel 3, 2.437 GHz for Channel 6 and 2.452 GHz for Channel 9. No other harmonics or spurs were found within 20 dB of the carrier level, and from 9kHz to the carriers 10<sup>th</sup> harmonic. See the antenna conducted spurious noise table below. Channels 3, 6, and 9 were investigated and tested.

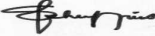
### 4.2 ANTENNA CONDUCTED SPURIOUS EMISSIONS TEST DATA

Operating Frequency (MHz): 2422  
 Channel: 3  
 Peak@100KHz(dBm): 10.5  
 Limit (dBm): -9.5

TABLE 4-1: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 3

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Measured Level (dBm)	Margin (dB)
4844	-33.3	2.2	-31.1	41.6
7266	-53	1.5	-51.5	62.0
9688	-72.1	6.8	-65.3	75.8
12110	-73.8	7.8	-66.0	76.5

#### TEST PERSONNEL:

Franck Schuppius Test Technician/Engineer	 Signature	09/05/2002 Date Of Test
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Rhein Tech Laboratories  
360 Herndon Parkway  
Suite 1400  
Herndon, VA 20170  
<http://www.rheintech.com>

Report number: 2002124  
FCC: Part 15.247  
Industry Canada: RSS-210  
FCC ID: MFMSAMP24S  
M/N: Extended Amplified  
WLAN System (1W)


**Operating Frequency (MHz):** 2437  
**Channel:** 6  
**Peak@100KHz(dBm):** 10.3  
**Limit (dBm):** -9.7

**TABLE 4-2: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 6**

Frequency (MHz)	Measured Level (dBm)	Notch Filter Insertion Loss (dB)	Corrected Measured Level (dBm)	Margin (dB)
4874	-51.4	1.8	-49.6	59.9
7311	-47.5	4.2	-43.3	53.6
9748	-64.3	3.5	-60.8	71.1
12185	-69.5	9.8	-59.7	70.0
14622	-58.3	7.8	-50.5	60.8
17059	-57.6	8.8	-48.8	59.1

**TEST PERSONNEL:**

---

Franck Schuppius Test Technician/Engineer	 Signature	09/05/2002 Date Of Test
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360 Herndon Parkway  
Suite 1400  
Herndon, VA 20170  
<http://www.rheintech.com>

Report number: 2002124  
FCC: Part 15.247  
Industry Canada: RSS-210  
FCC ID: MFMSAMP24S  
M/N: Extended Amplified  
WLAN System (1W)

**Operating Frequency (MHz):** 2452  
**Channel:** 9  
**Peak@100KHz(dBm):** 9.9  
**Limit (dBm):** -10.1

**TABLE 4-3: ANTENNA CONDUCTED SPURIOUS EMISSIONS CHANNEL 9**

<b>Frequency (MHz)</b>	<b>Measured Level (dBm)</b>	<b>Notch Filter Insertion Loss (dB)</b>	<b>Corrected Measured Level (dBm)</b>	<b>Margin (dB)</b>
4927.74	-54.6	1.5	-53.1	63.0
7388.55	-66.3	4.5	-61.8	71.7
9848.08	-71.4	8.8	-62.6	72.5
12312.95	-72.1	12.0	-60.1	70.0

**TEST PERSONNEL:**

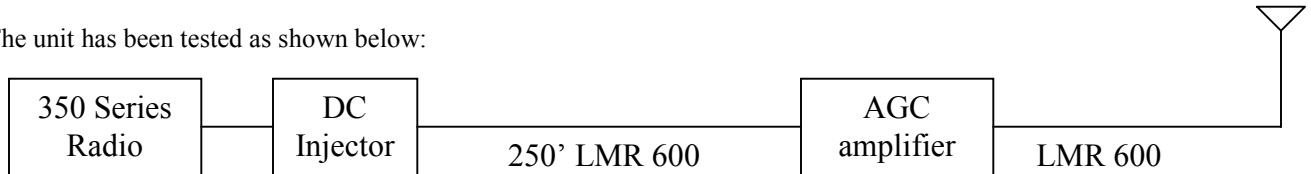
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Franck Schuppius Test Technician/Engineer	 Signature	09/05/2002 Date Of Test
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## 5 RADIATED EMISSION LIMITS RADIATED HARMONICS - §15.247

### 5.1 RADIATED EMISSION LIMITS TEST PROCEDURE

The unit has been tested as shown below:



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 planes. The three channels have been investigated; only the worst-case channel is listed below for the highest antenna gain for all the family types.

The minimal cable length that could be used for each antenna is listed in Table 2-1. This is the length of cable that was used for the maximum amplification of the AGC.

Operating Frequency (MHz): 2422  
 Channel: 3  
 Antenna: ANT-RFLCTR-24

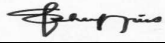
**TABLE 5-1: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 3) (ANT-RFLCTR-24)**

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)
4844.00	Av	V	10	1.1	32.1	13.3	45.4	54.0
4844.00	Pk	V	10	1.1	45.4	13.3	58.7	

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

09/26/02  
 Date Of Test



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

Report number: 2002124  
FCC: Part 15.247  
Industry Canada: RSS-210  
FCC ID: MFMSAMP24S  
M/N: Extended Amplified  
WLAN System (1W)

Operating Frequency (MHz): 2422  
Channel: 3  
Antenna: ANT-OMN-12

**TABLE 5-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 3) (ANT-OMN-12)**

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)
4844	Av	V	145	1.1	32.8	13.3	46.1	54
4844	Pk	V	145	1.1	45.2	13.3	58.5	

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

**TEST PERSONNEL:**

---

Franck Schuppius Test Technician/Engineer	 Signature	09/26/02 Date Of Test
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 360 Herndon Parkway  
 Suite 1400  
 Herndon, VA 20170  
<http://www.rheintech.com>

Report number: 2002124  
 FCC: Part 15.247  
 Industry Canada: RSS-210  
 FCC ID: MFMSAMP24S  
 M/N: Extended Amplified  
 WLAN System (1W)

**Operating Frequency (MHz):** 2422  
**Channel:** 3  
**Antenna:** ANT-PATCH-19

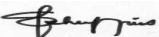
**TABLE 5-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 3) (ANT-P-19)**

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)
4844	Av	V	0	1.1	32.7	13.3	46.0	54
4844	Pk	V	0	1.1	43.0	13.3	56.3	

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

**TEST PERSONNEL:**

---

Franck Schuppius Test Technician/Engineer	 Signature	09/26/02 Date Of Test
--	--	--------------------------

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

Report number: 2002124  
FCC: Part 15.247  
Industry Canada: RSS-210  
FCC ID: MFMSAMP24S  
M/N: Extended Amplified  
WLAN System (1W)

Operating Frequency (MHz): 2422  
Channel: 3  
Antenna: ANT-D2421

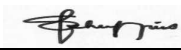
**TABLE 5-4: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 3) (ANT-D2421)**

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)
4844	Av	V	0	1.4	30.0	13.3	43.3	54
4844	Pk	V	0	1.4	41.2	13.3	54.5	

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

**TEST PERSONNEL:**

---

Franck Schuppius Test Technician/Engineer	 Signature	09/26/02 Date Of Test
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## 6 POWER SPECTRAL DENSITY - §15.247(D)

### 6.1 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. . The spectral lines were resolved for the modulated carriers at 2.422GHz, 2.437GHz, and 2.452GHz respectively. These levels are well below the +8 dBm limit. See the power spectral density test data and plots.

### 6.2 TEST EQUIPMENT USED FOR TESTING

**TABLE 6-1: POWER SPECTRAL DENSITY TEST EQUIPMENT**

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

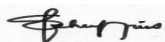
### 6.3 POWER SPECTRAL DENSITY TEST DATA

Operating Frequency (MHz): 2422, 2437 & 2452  
 Channel: 3, 6 & 9  
 Limit (dBm): 8

**TABLE 6-2: POWER SPECTRAL DENSITY DATA**

CHANNEL	500mW-POWER SPECTRAL DENSITY LIMIT = +8dBm
3	-1.5
6	-1.8
9	-2.1

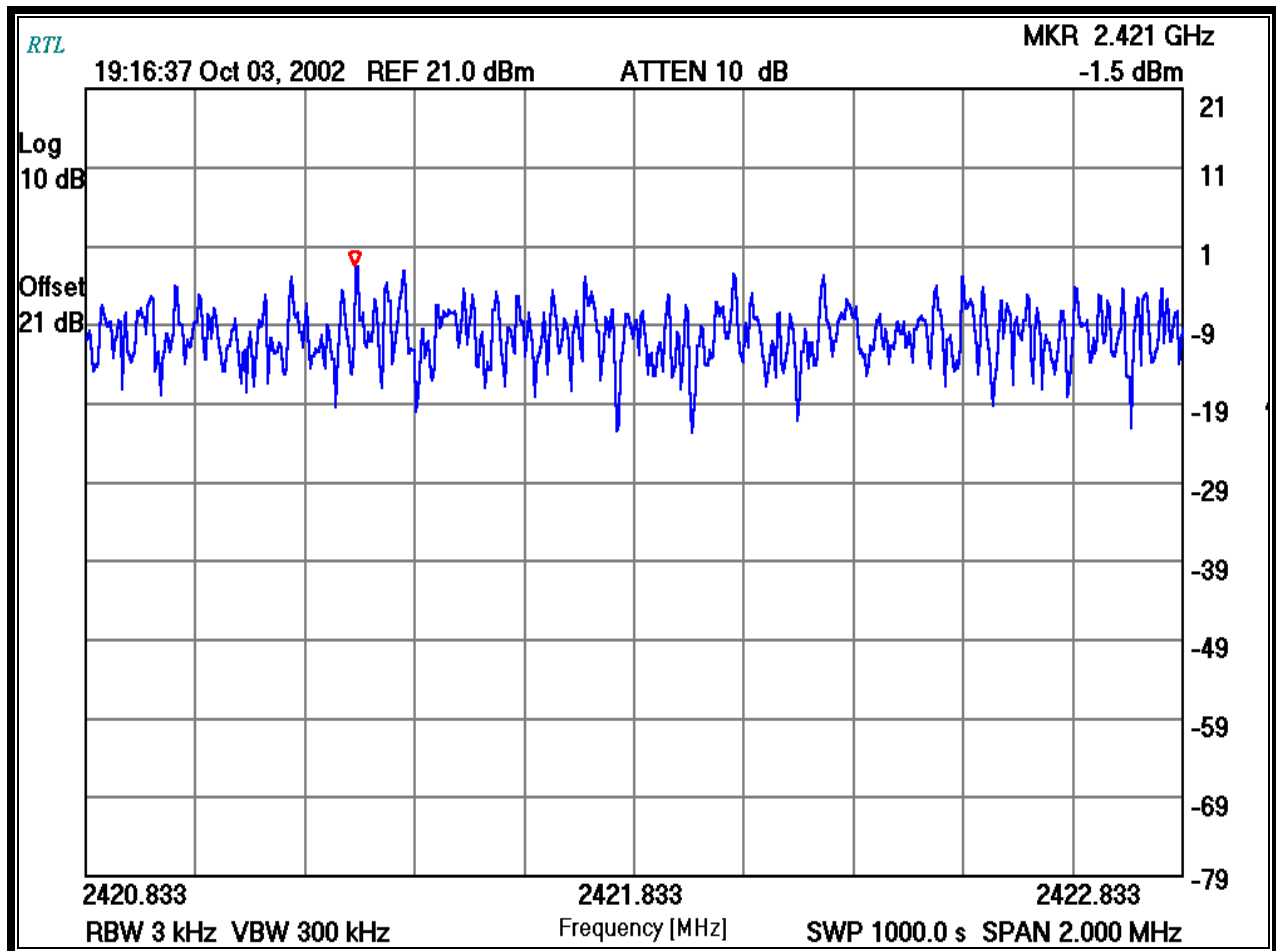
#### TEST PERSONNEL:

Franck Schuppius Test Technician/Engineer	 Signature	10/03/02 Date Of Test
--	--	--------------------------

## 6.4 POWER SPECTRAL DENSITY PLOTS

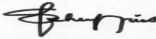
Operating Frequency (MHz): 2422  
Channel: 3  
Bandwidth Resolution (kHz): 3  
Bandwidth Video (kHz): 300  
Sweep Time (s): 1000.0

PLOT 6-1: POWER SPECTRAL DENSITY: CHANNEL 3



TEST PERSONNEL:

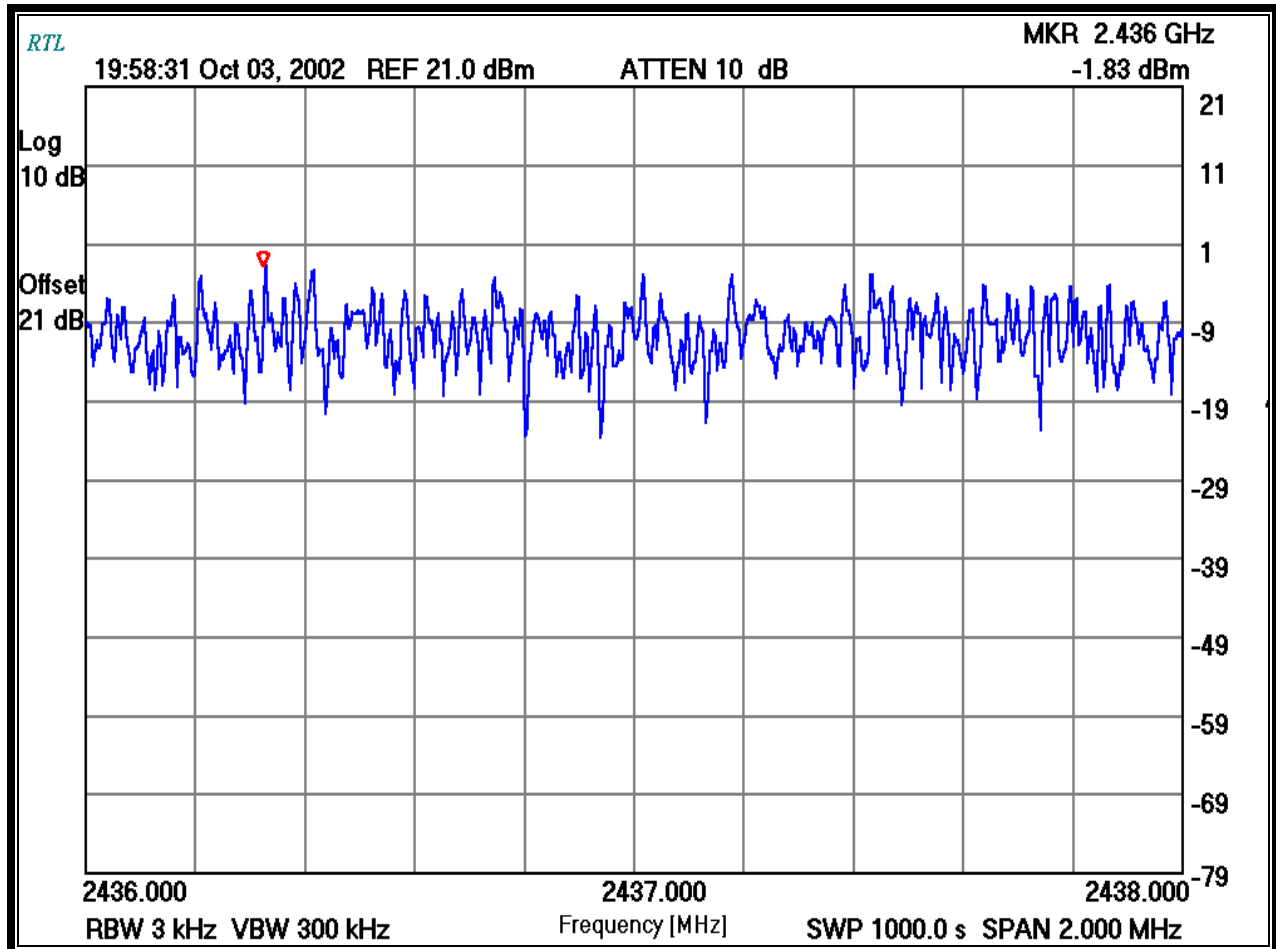
Franck Schuppis  
Test Technician/Engineer

  
Signature

10/03/02  
Date Of Test

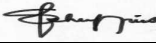
Operating Frequency (MHz): 2437  
Channel: 6  
Bandwidth Resolution (kHz): 3  
Bandwidth Video (kHz): 300  
Sweep Time (s): 1000.0

PLOT 6-2: POWER SPECTRAL DENSITY: CHANNEL 6



TEST PERSONNEL:

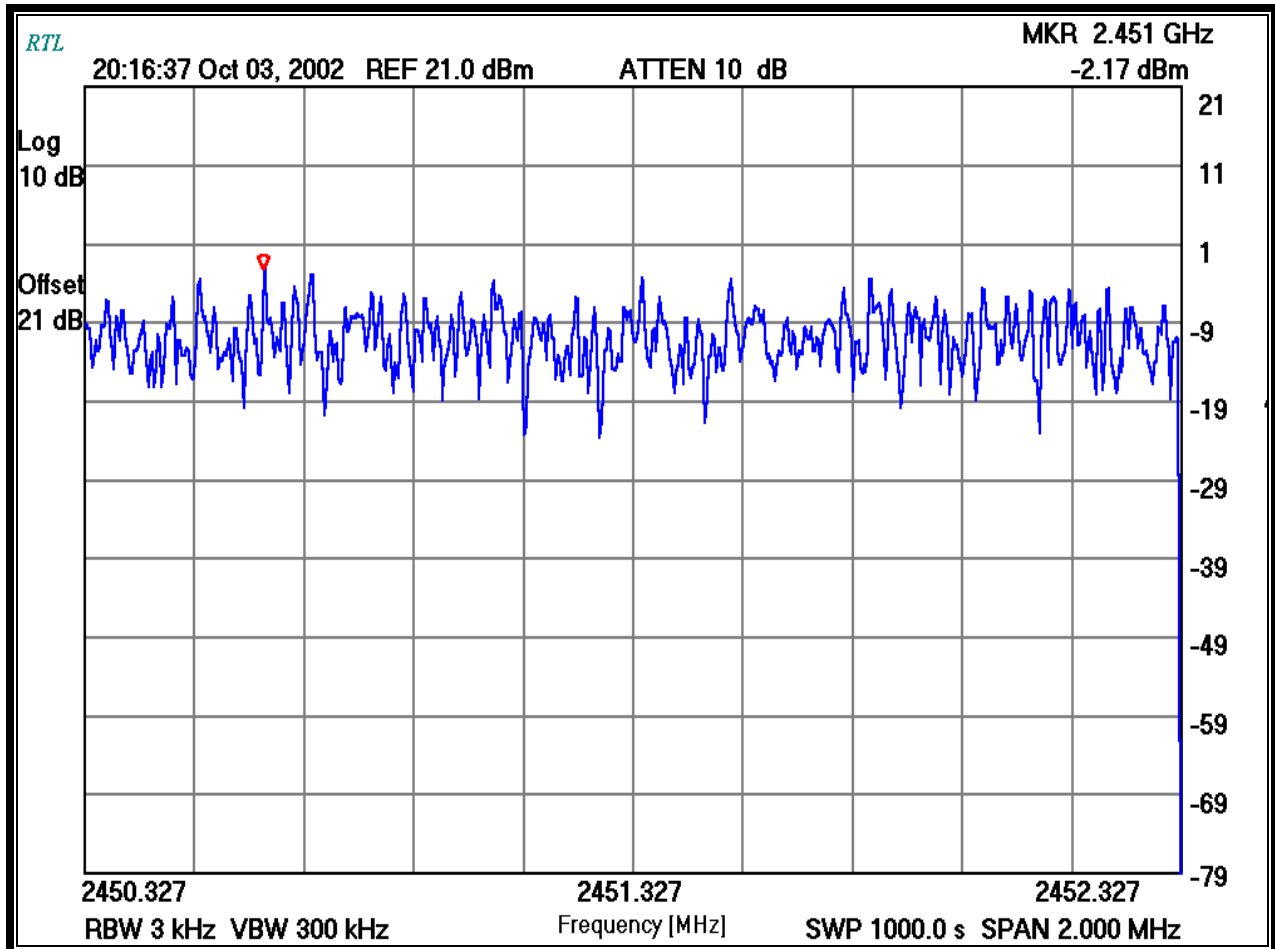
Franck Schuppius  
Test Technician/Engineer

  
Signature

10/03/02  
Date Of Test

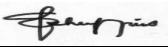
Operating Frequency (MHz): 2452  
Channel: 9  
Bandwidth Resolution (kHz): 3  
Bandwidth Video (kHz): 300  
Sweep Time (s): 1000.0

**PLOT 6-3: POWER SPECTRAL DENSITY: CHANNEL 9**



**TEST PERSONNEL:**

Franck Schuppis  
Test Technician/Engineer

  
Signature

10/03/02  
Date Of Test