# 7.2. CHANNEL TESTS FOR THE 5725 TO 5850 MHz BAND

## 7.2.1. 6 dB BANDWIDTH

**LIMIT**

§15.247 (a) (2) For direct sequence systems, the minimum 6 dB bandwidth shall be at least 500 kHz.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

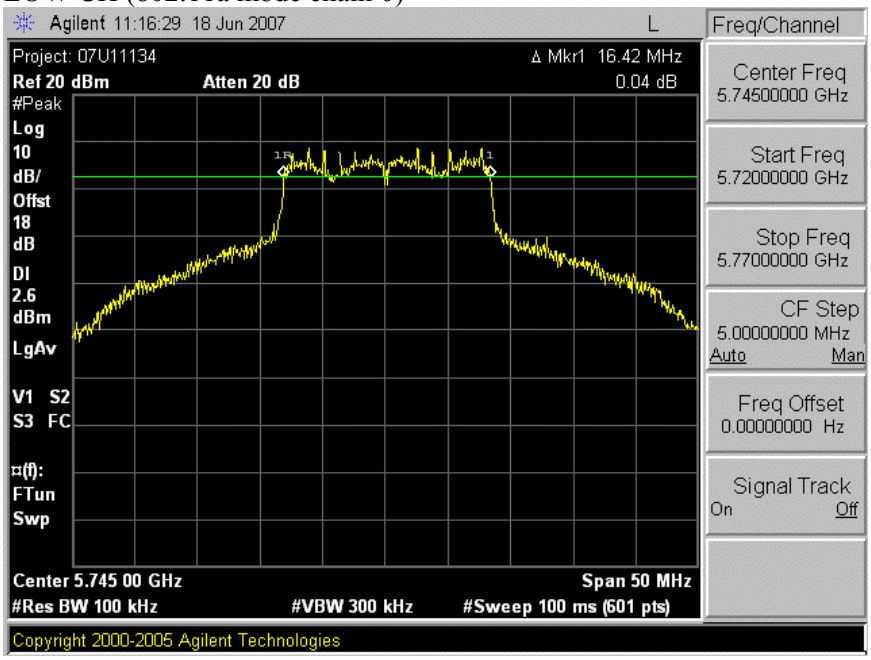
**RESULTS**

No non-compliance noted:

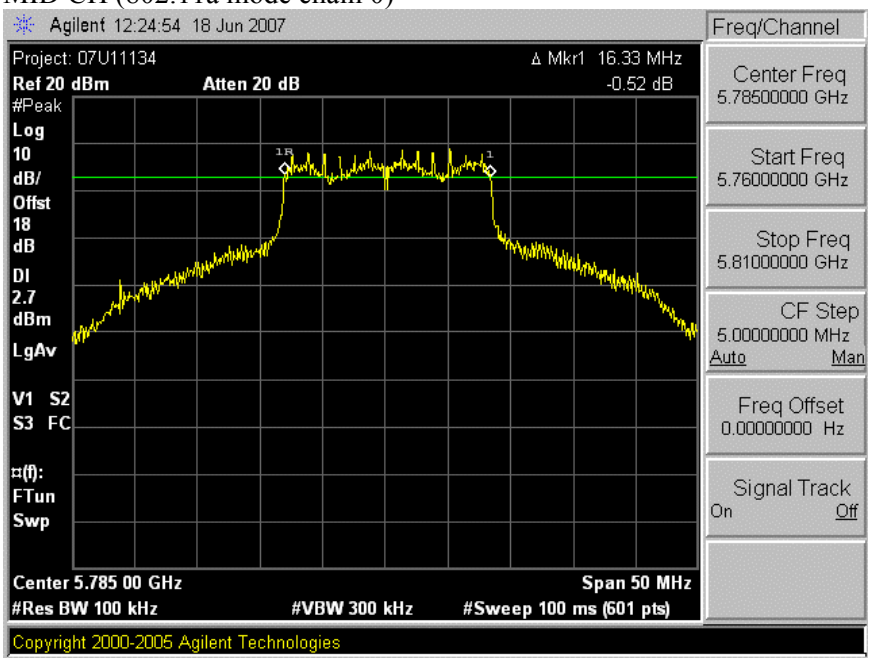
| Mode Channel | Frequency (MHz) | 6 dB BW Chain 0 (kHz) | 6 dB BW Chain 1 (kHz) | Minimum Limit (kHz) | Minimum Margin (kHz) |
|---|---|---|---|---|---|
| 802.11a Mode | | | | | |
| Low | 5745 | 16420 | 16420 | 500 | 15920 |
| Mid | 5785 | 16330 | 16420 | 500 | 15830 |
| High | 5825 | 16330 | 16420 | 500 | 15830 |
| 802.11n HT20 Mode | | | | | |
| Low | 5745 | 17580 | 17670 | 500 | 17080 |
| Mid | 5785 | 17500 | 17420 | 500 | 16920 |
| High | 5825 | 17750 | 17330 | 500 | 16830 |
| 802.11n HT40 Mode | | | | | |
| Low | 5755 | 35500 | 35500 | 500 | 35000 |
| Mid | 5795 | 35500 | 35500 | 500 | 35000 |
| High | 5815 | 35500 | 35500 | 500 | 35000 |

**(802.11a MODE CHAIN 0)**

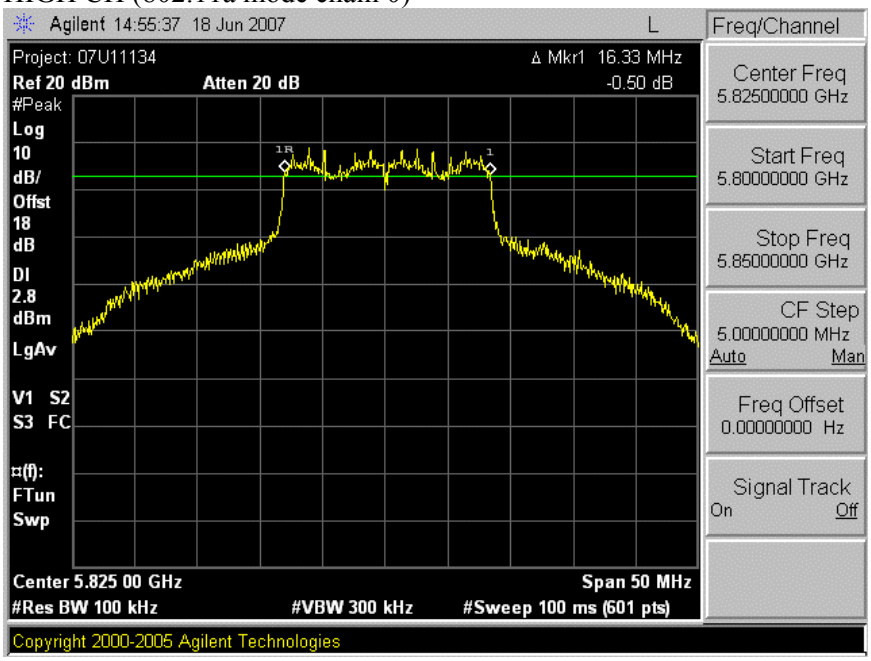
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

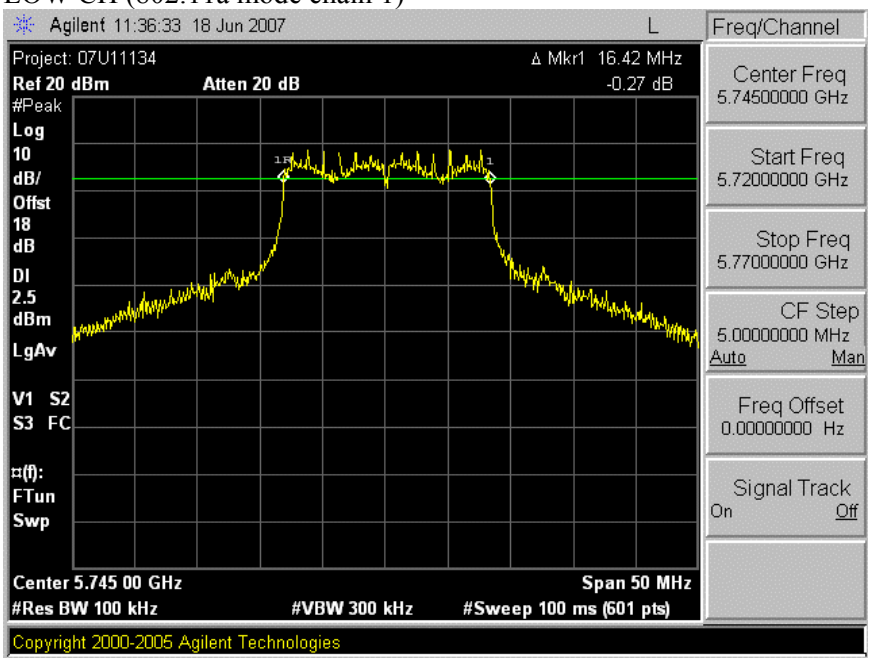


HIGH CH (802.11a mode chain 0)

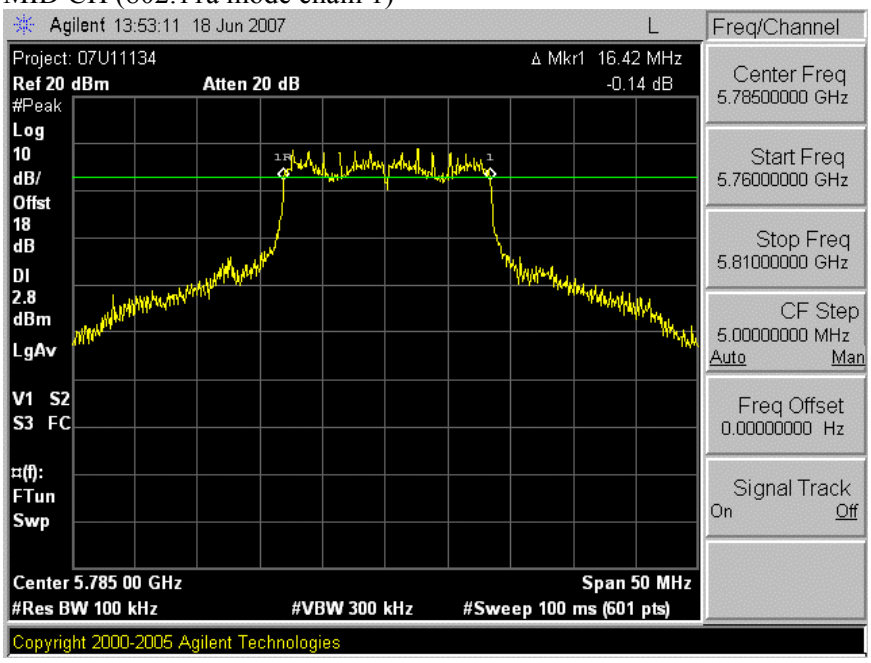


**(802.11a MODE CHAIN 1)**

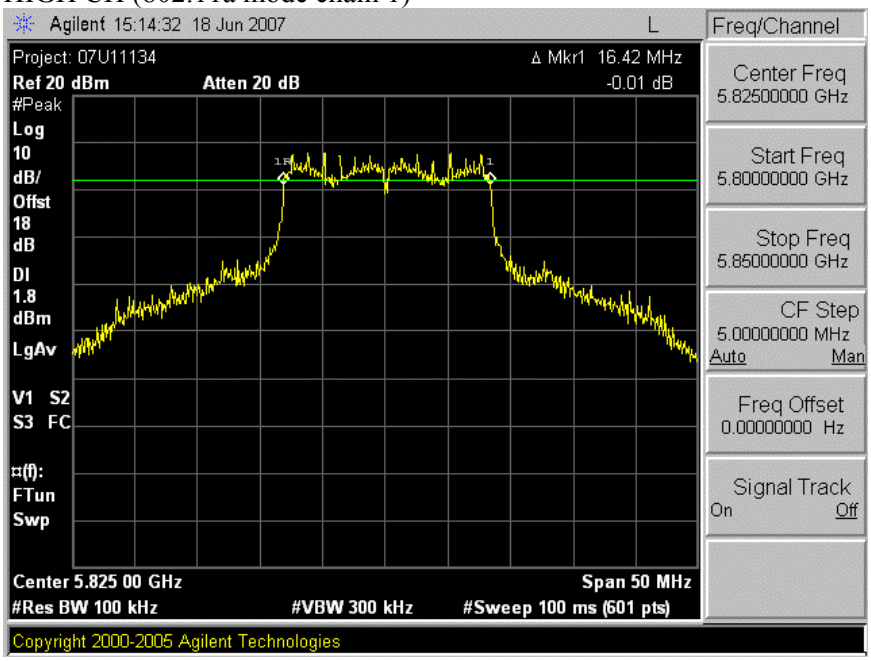
LOW CH (802.11a mode chain 1)



MID CH (802.11a mode chain 1)

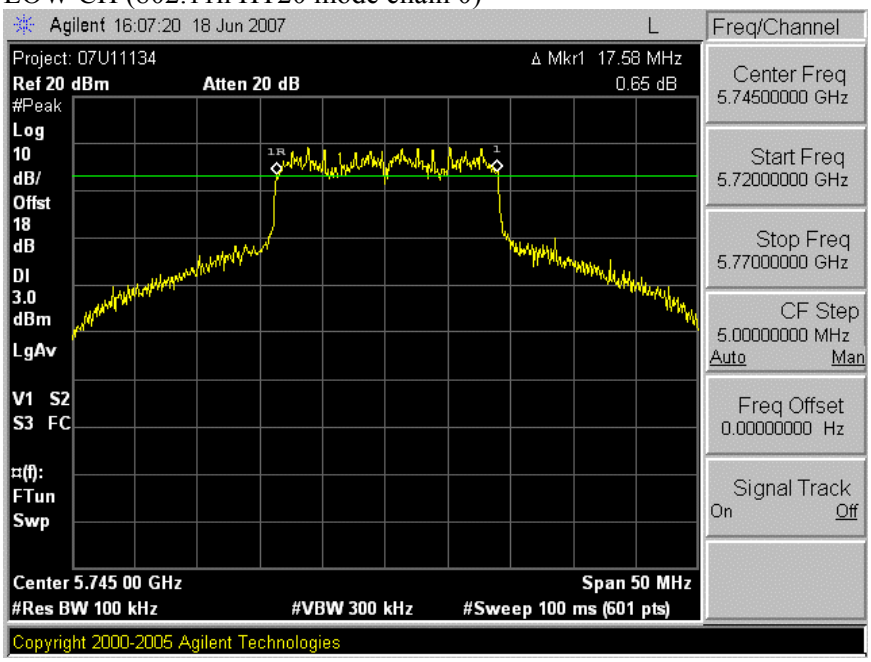


HIGH CH (802.11a mode chain 1)

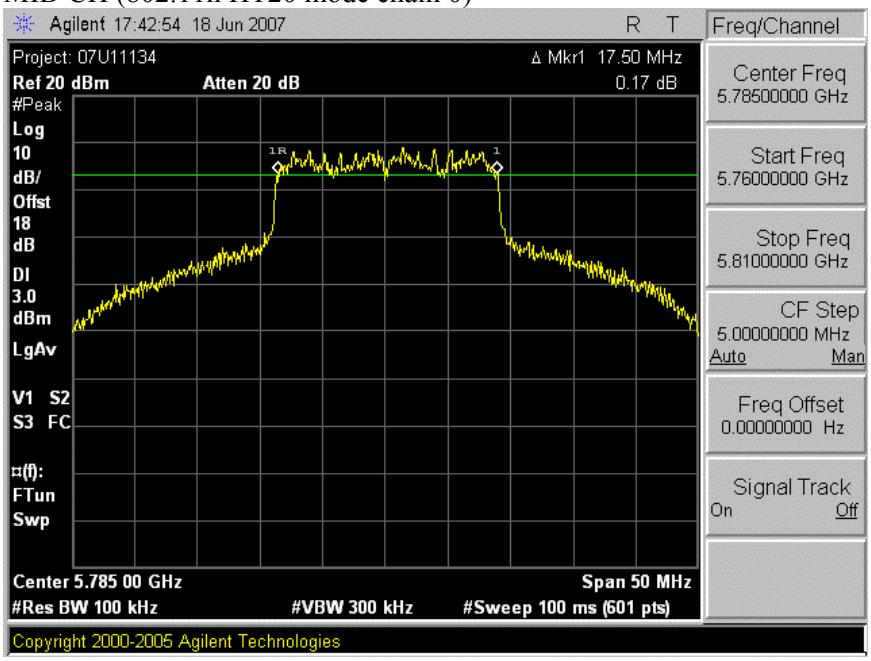


**(802.11n HT20 MODE CHAIN 0)**

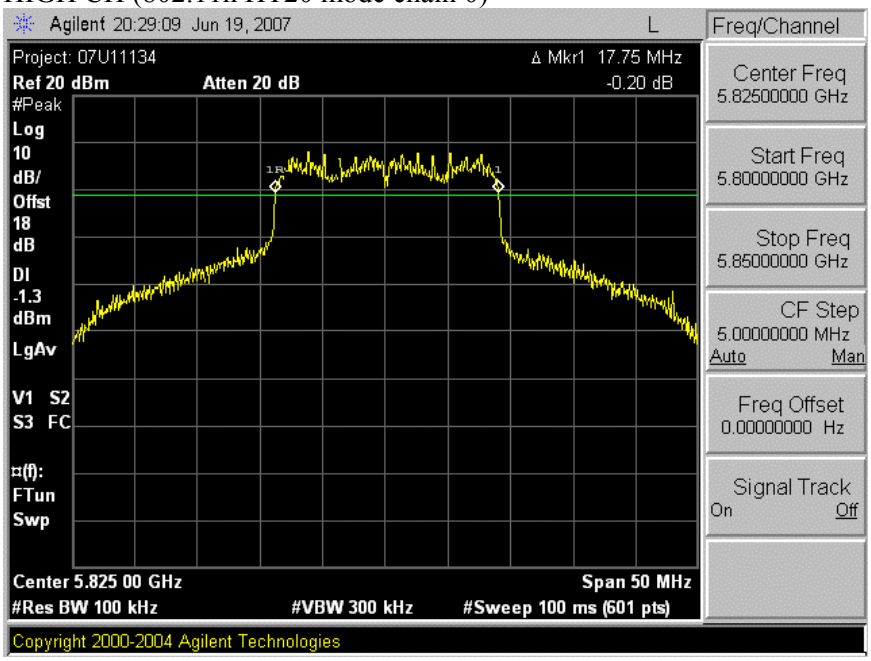
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

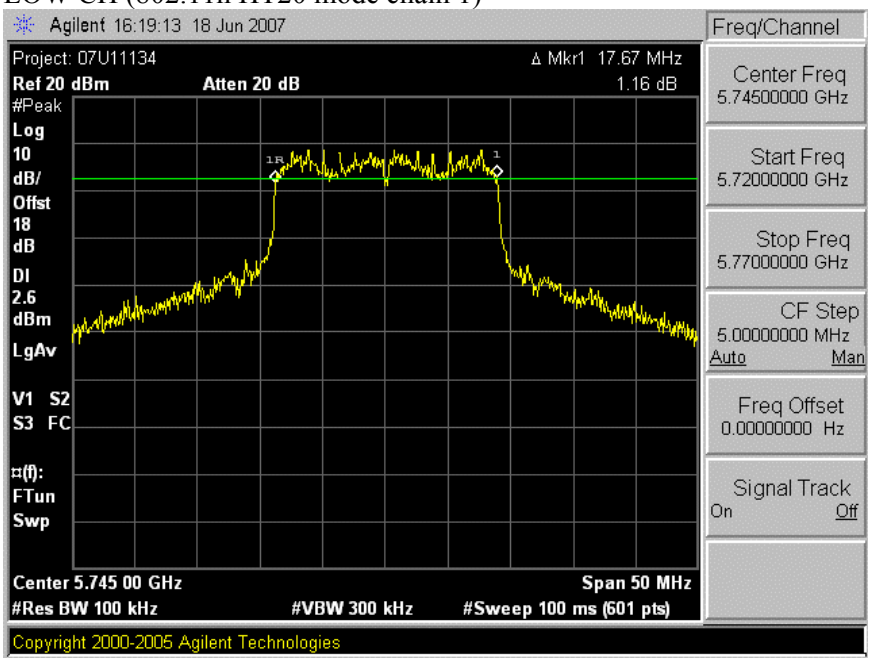


HIGH CH (802.11n HT20 mode chain 0)

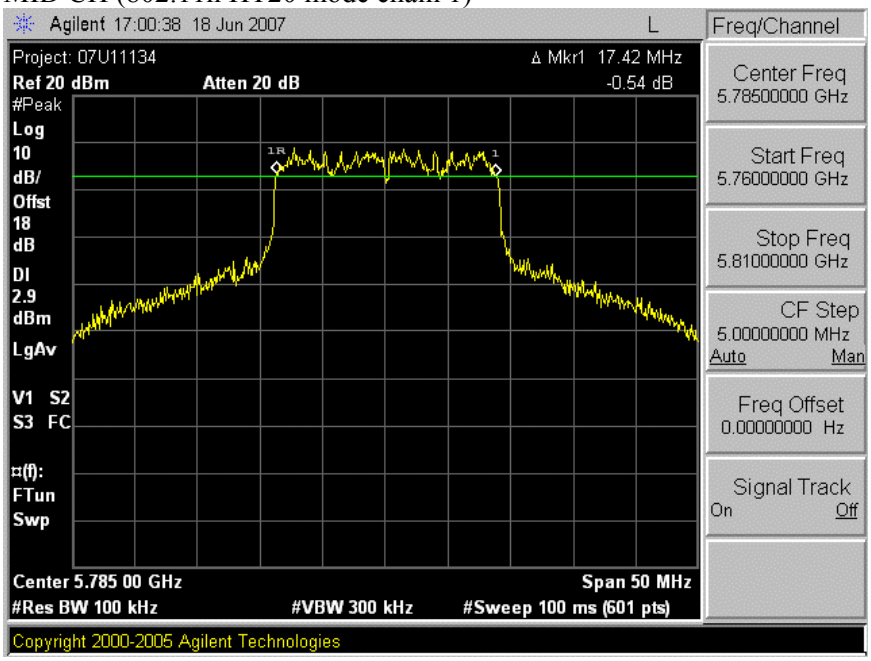


**(802.11 HT20 MODE CHAIN 1)**

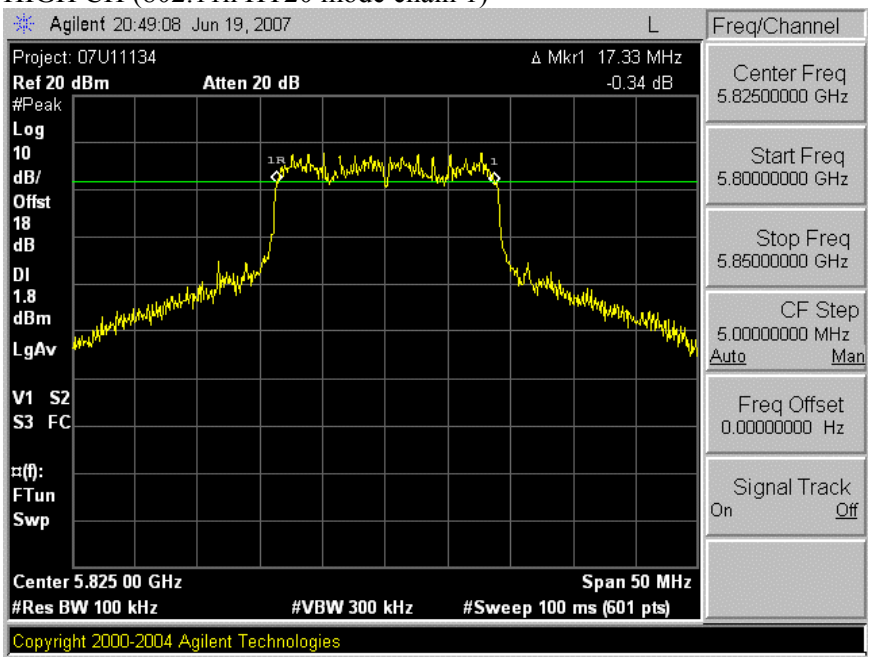
LOW CH (802.11n HT20 mode chain 1)



MID CH (802.11n HT20 mode chain 1)

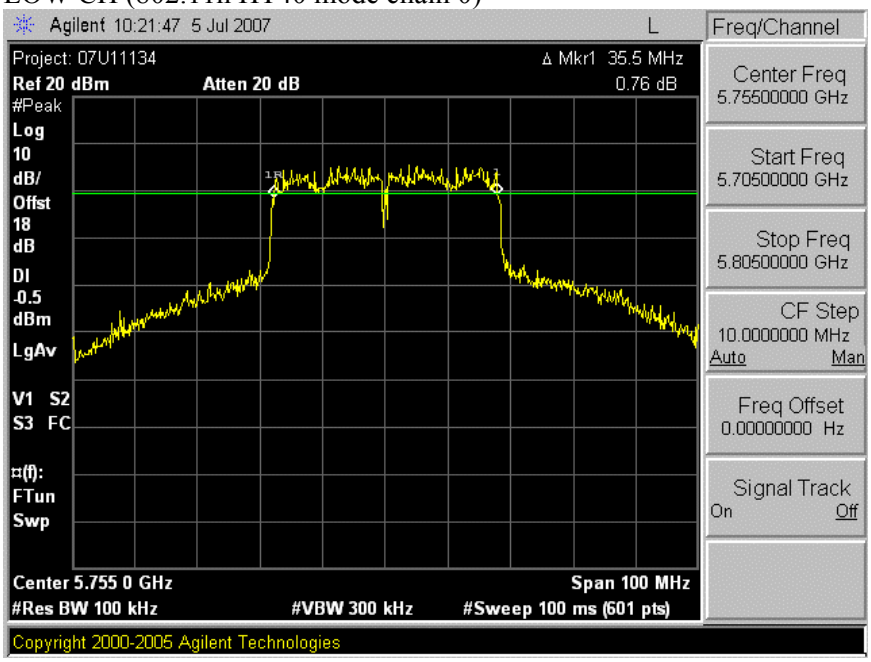


HIGH CH (802.11n HT20 mode chain 1)

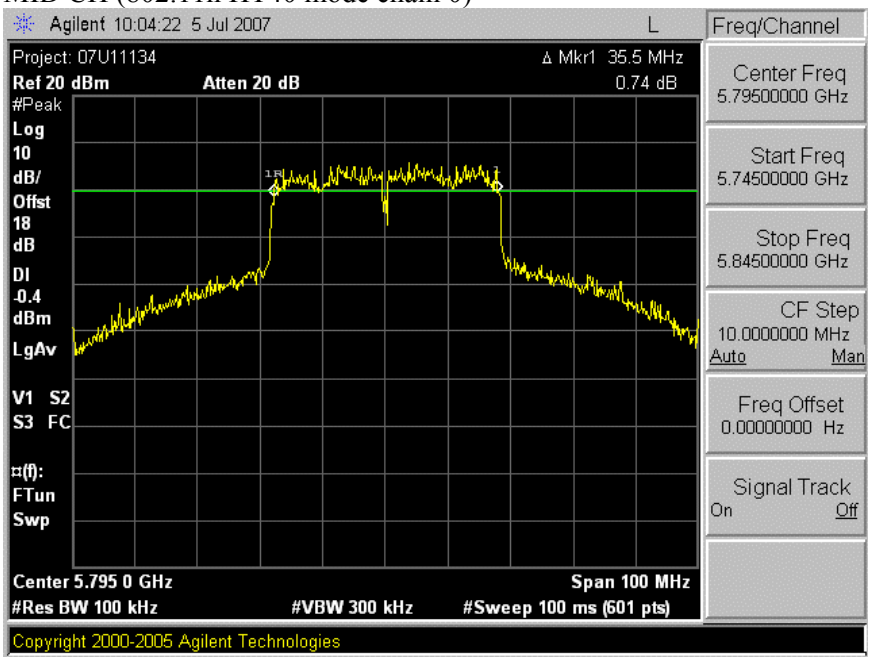


**(802.11 HT40 MODE CHAIN 0)**

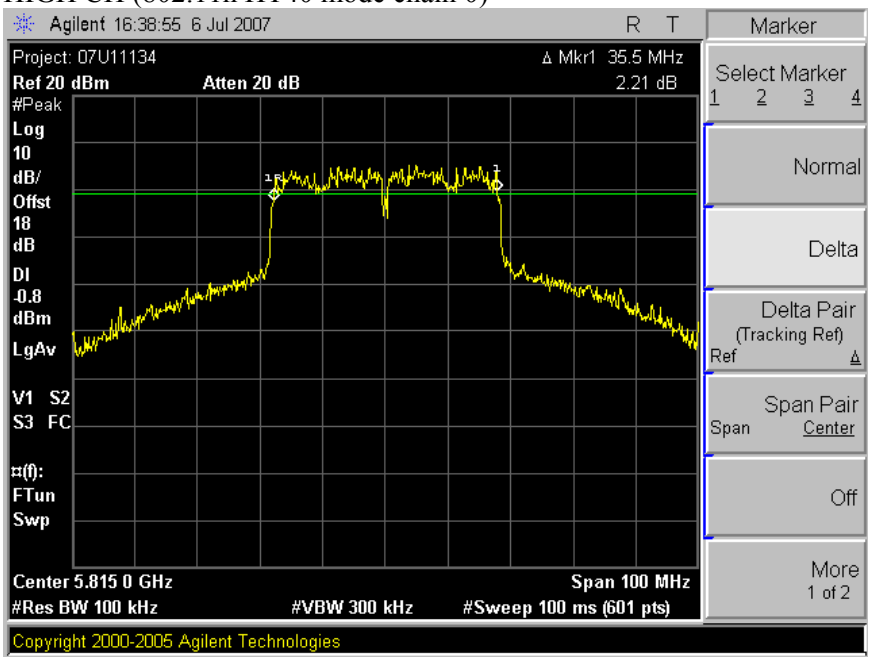
LOW CH (802.11n HT40 mode chain 0)



MID CH (802.11n HT40 mode chain 0)

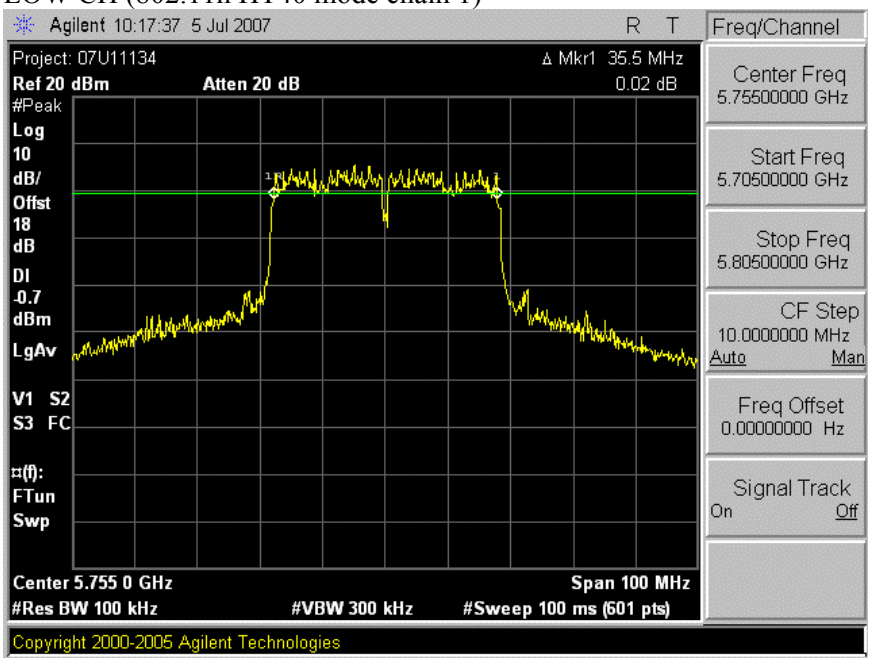


HIGH CH (802.11n HT40 mode chain 0)

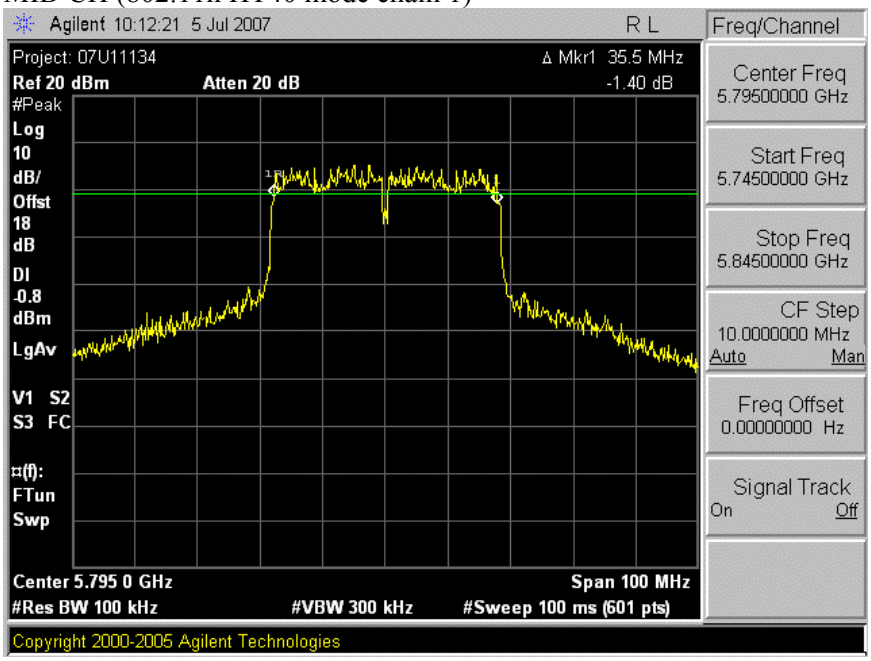


**(802.11 HT40 MODE CHAIN 1)**

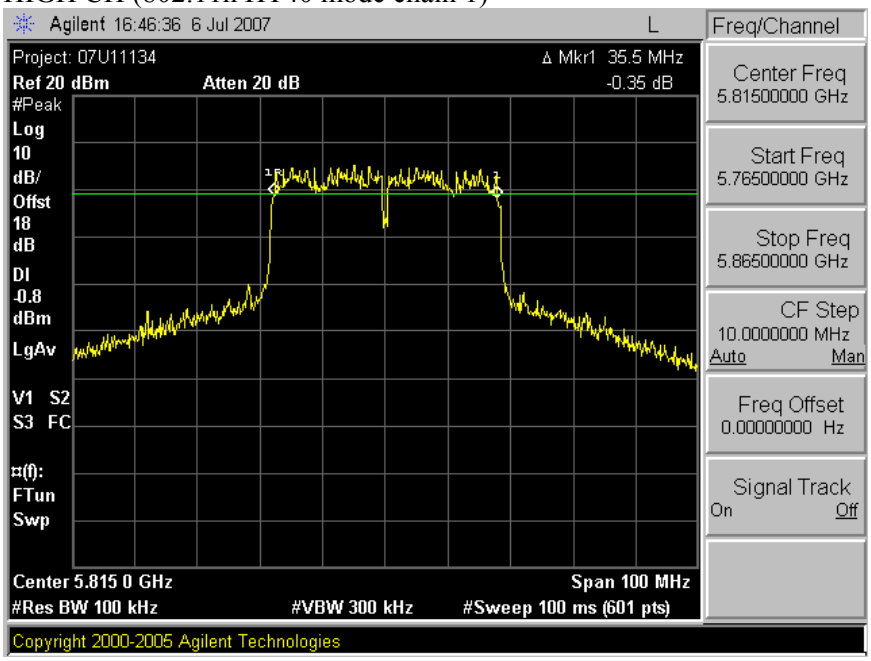
LOW CH (802.11n HT40 mode chain 1)



MID CH (802.11n HT40 mode chain 1)



HIGH CH (802.11n HT40 mode chain 1)



### 7.2.2. 99% BANDWIDTH

**LIMIT**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

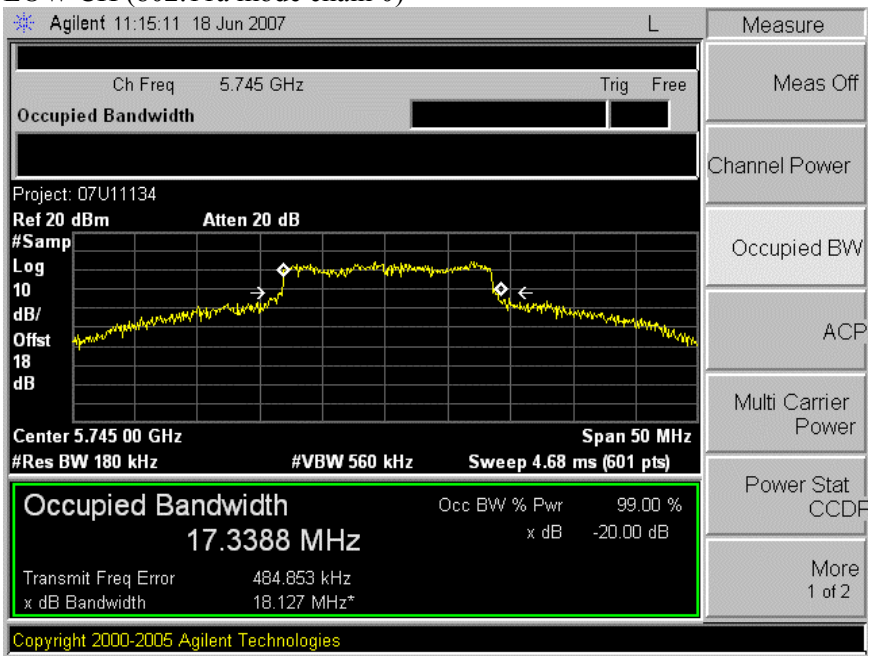
**RESULTS**

No non-compliance noted:

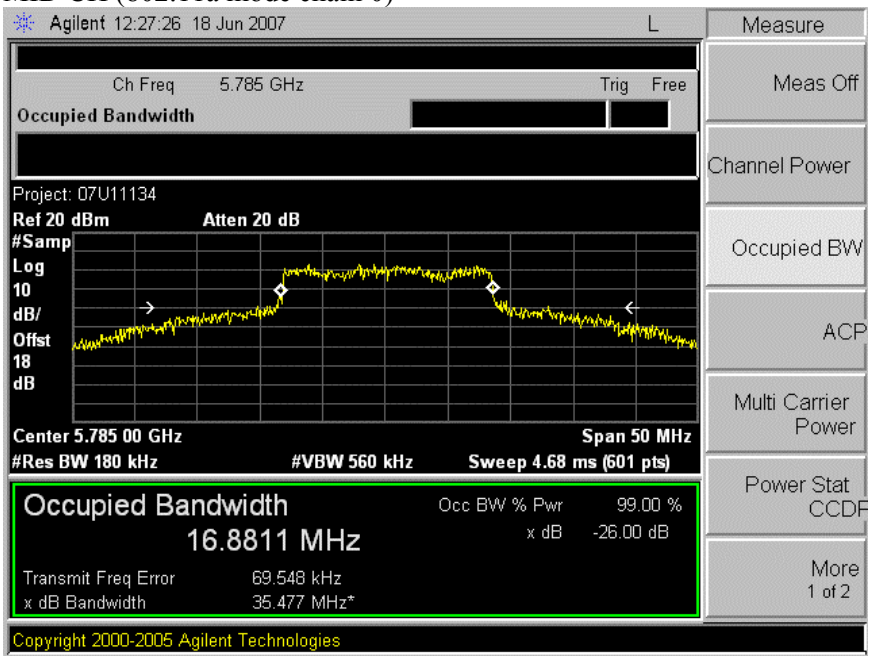
| Mode Channel | Frequency (MHz) | 99% BW Chain 0 (MHz) | 99% BW Chain 1 (MHz) |
|---|---|---|---|
| 802.11a Mode | | | |
| Low | 5745 | 17.339 | 16.408 |
| Mid | 5785 | 16.881 | 16.488 |
| High | 5825 | 16.746 | 16.454 |
| 802.11n HT20 Mode | | | |
| Low | 5745 | 17.858 | 17.252 |
| Mid | 5785 | 17.821 | 17.508 |
| High | 5825 | 17.829 | 17.561 |
| 802.11n HT40 Mode | | | |
| Low | 5755 | 35.777 | 35.921 |
| Mid | 5795 | 35.782 | 35.512 |
| High | 5815 | 35.803 | 35.849 |

**(802.11a MODE CHAIN 0)**

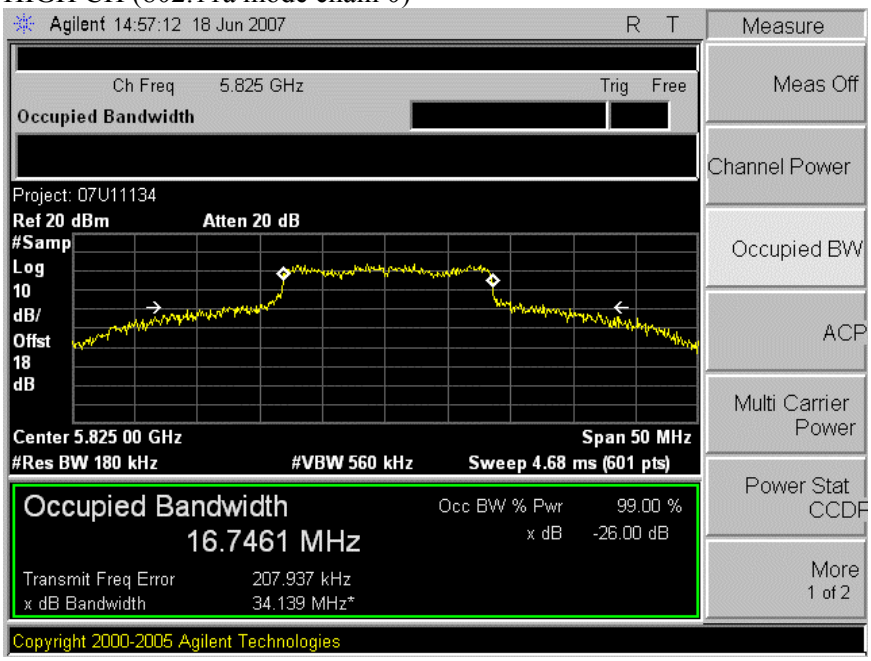
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

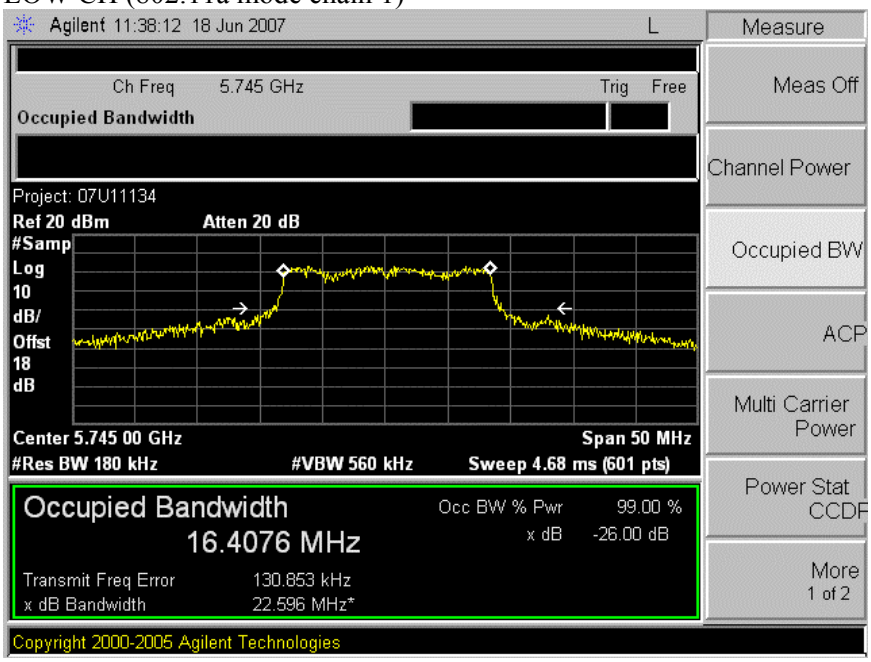


HIGH CH (802.11a mode chain 0)

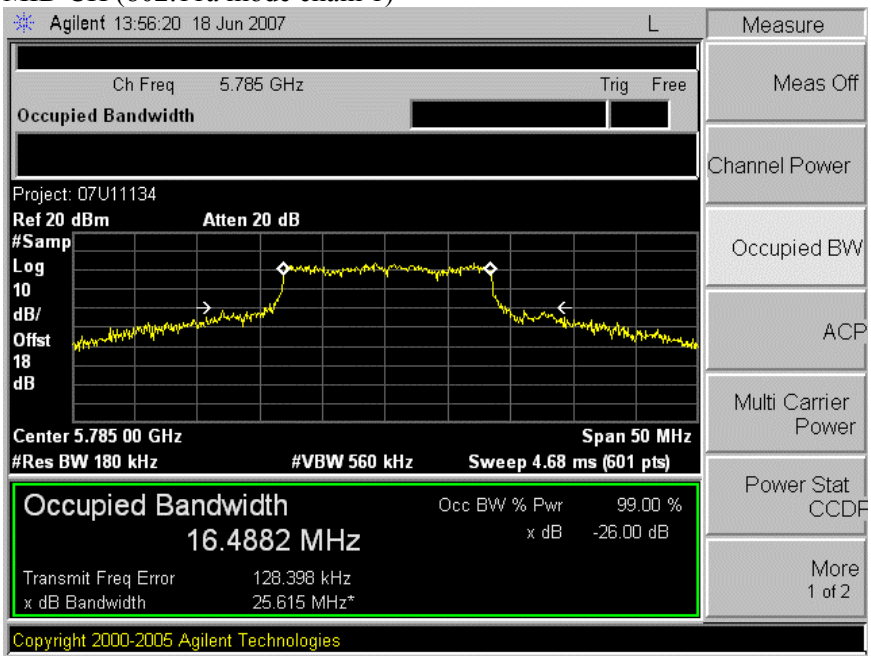


**(802.11a MODE CHAIN 1)**

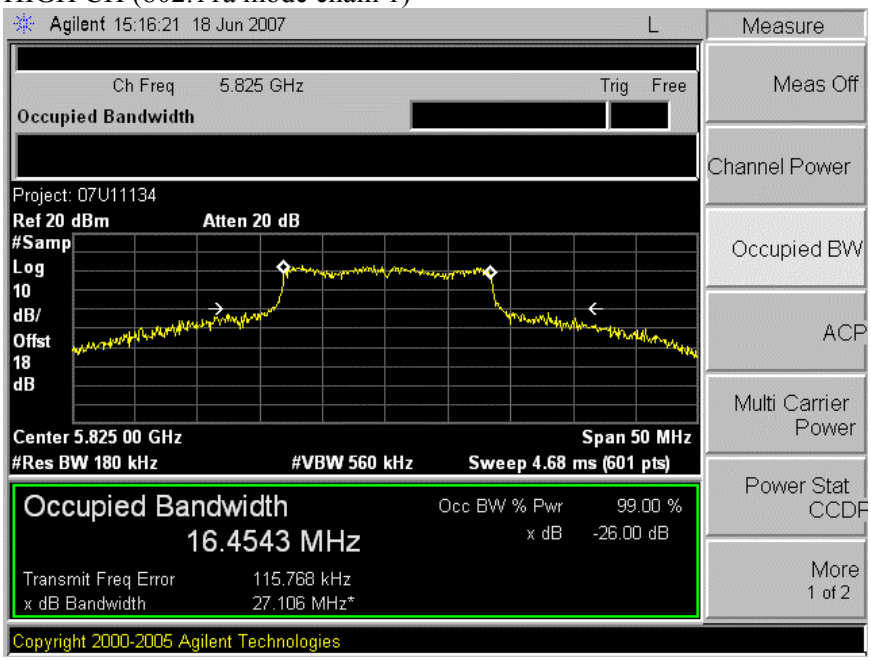
LOW CH (802.11a mode chain 1)



MID CH (802.11a mode chain 1)

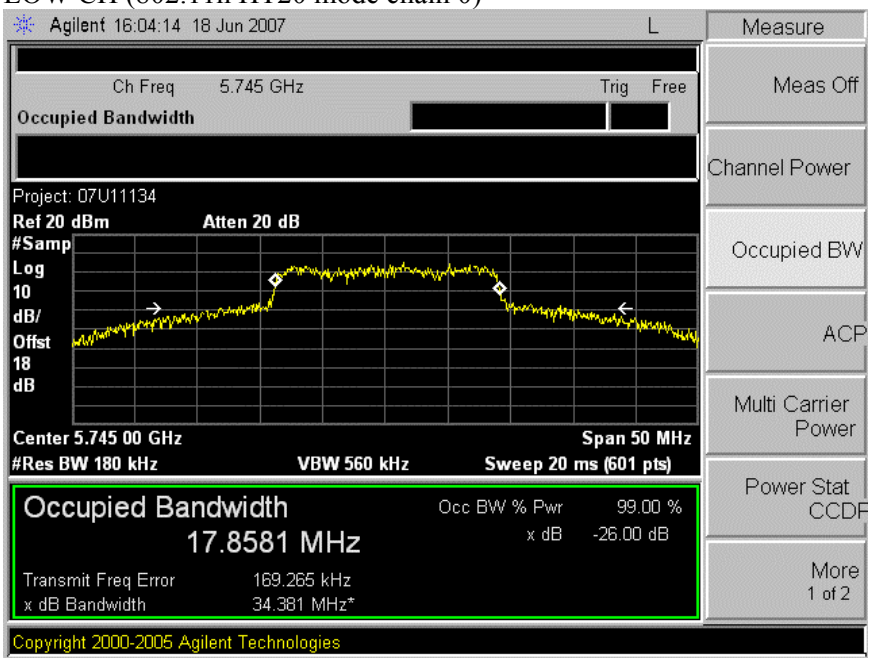


HIGH CH (802.11a mode chain 1)

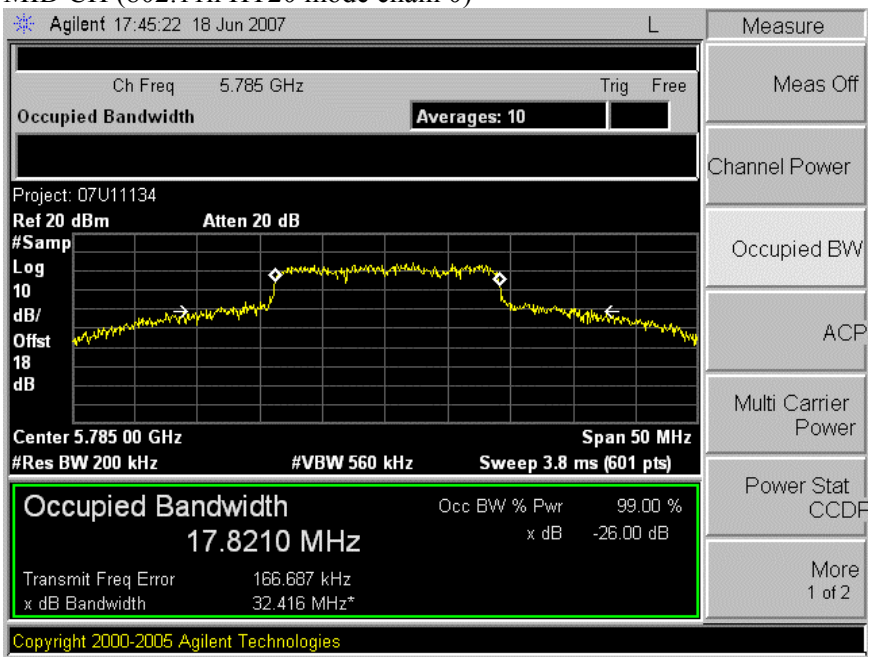


**(802.11n HT20 MODE CHAIN 0)**

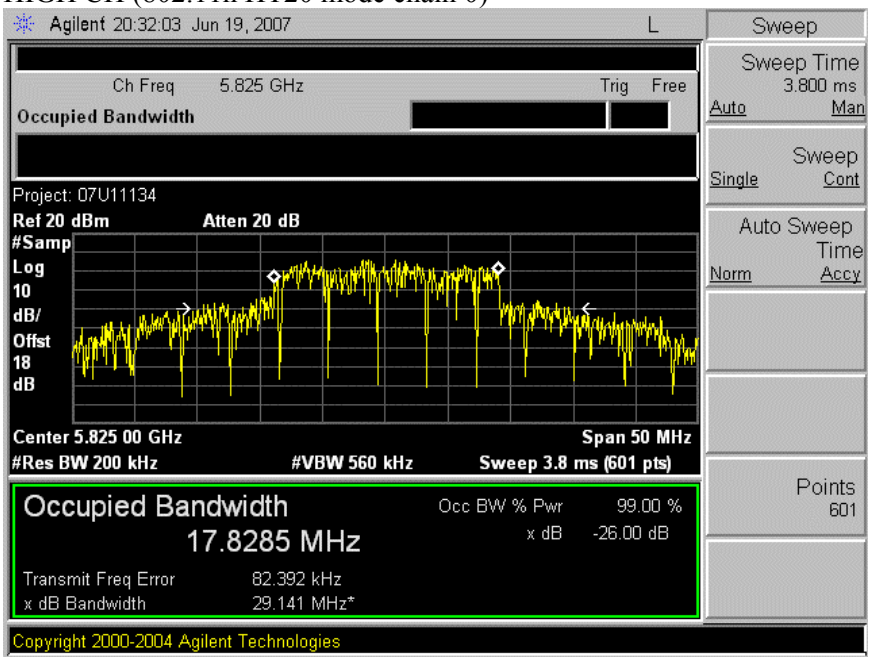
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

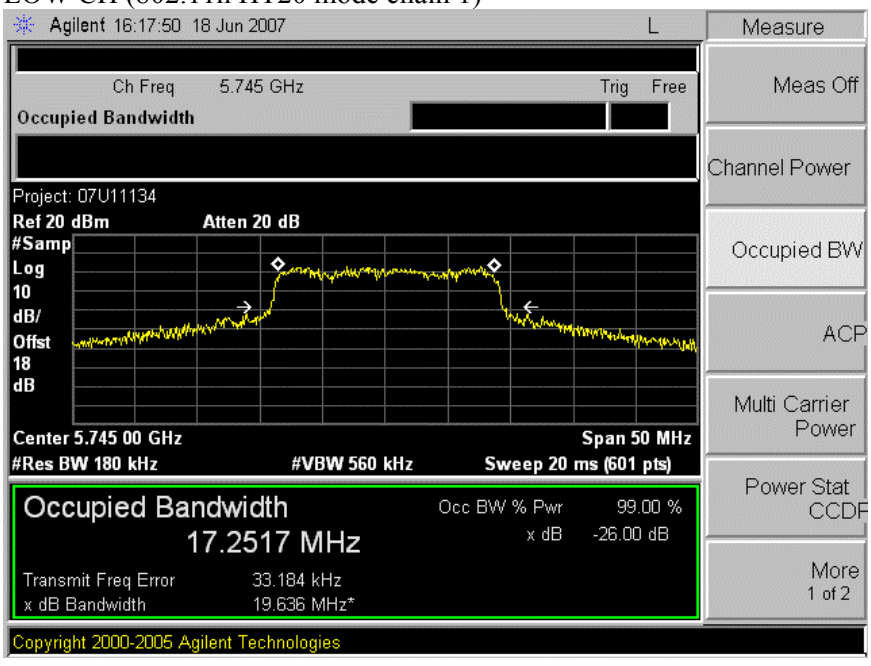


HIGH CH (802.11n HT20 mode chain 0)

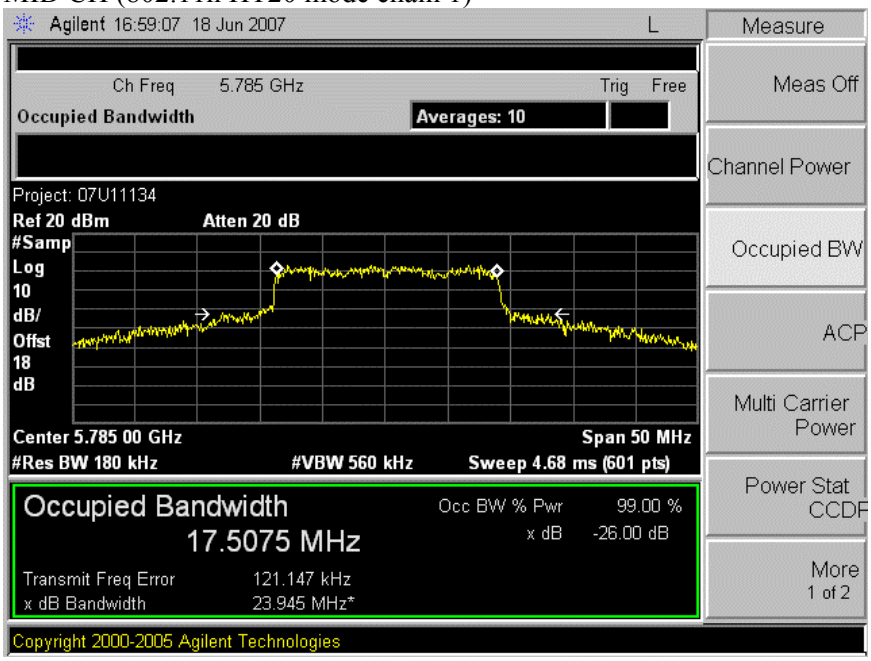


**(802.11 HT20 MODE CHAIN 1)**

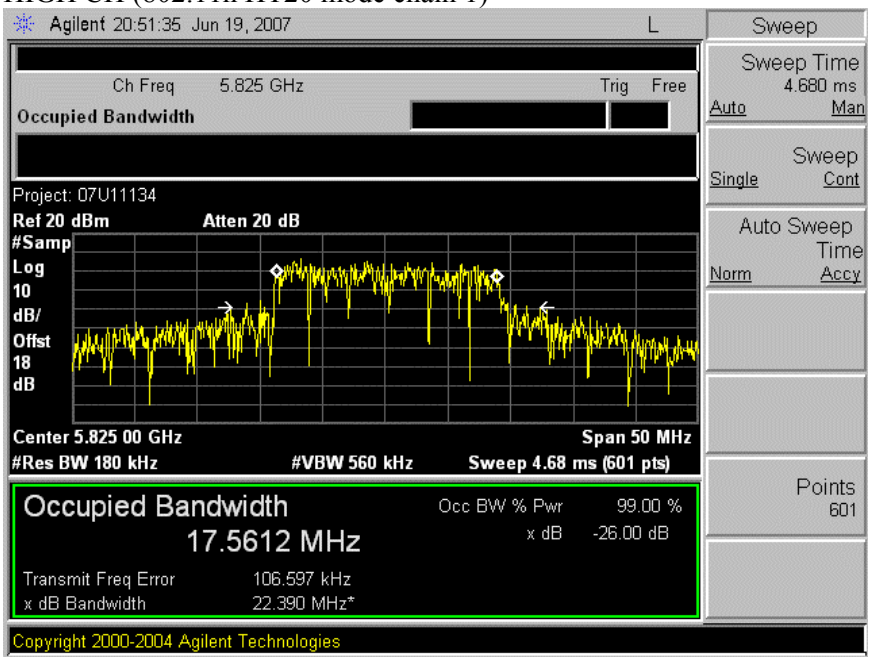
LOW CH (802.11n HT20 mode chain 1)



MID CH (802.11n HT20 mode chain 1)

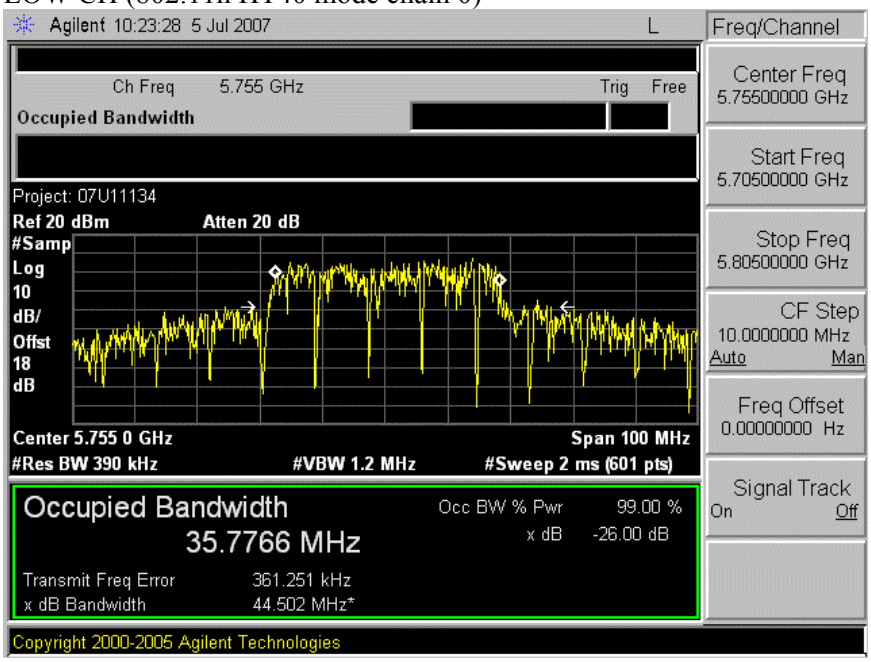


HIGH CH (802.11n HT20 mode chain 1)

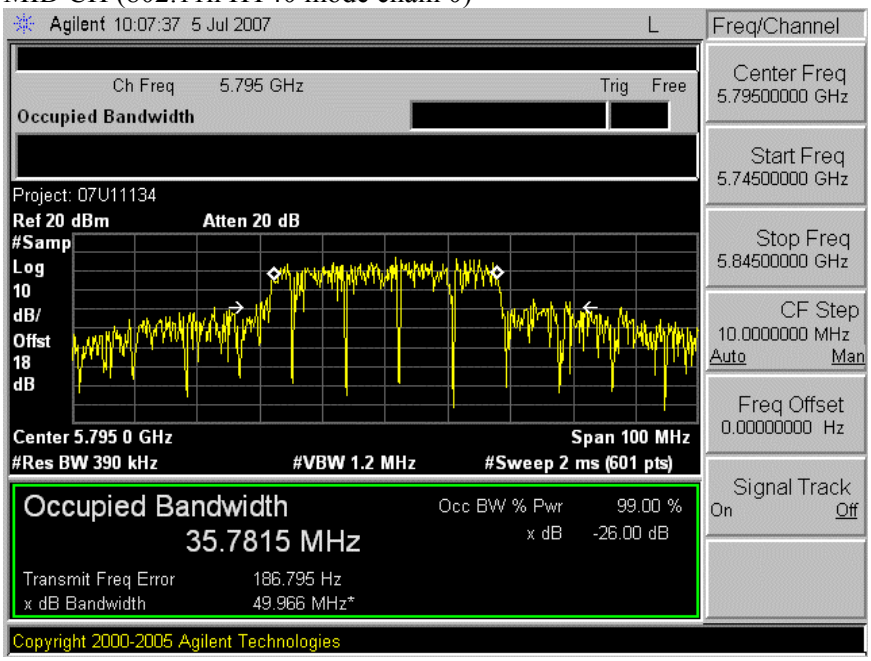


**(802.11 HT40 MODE CHAIN 0)**

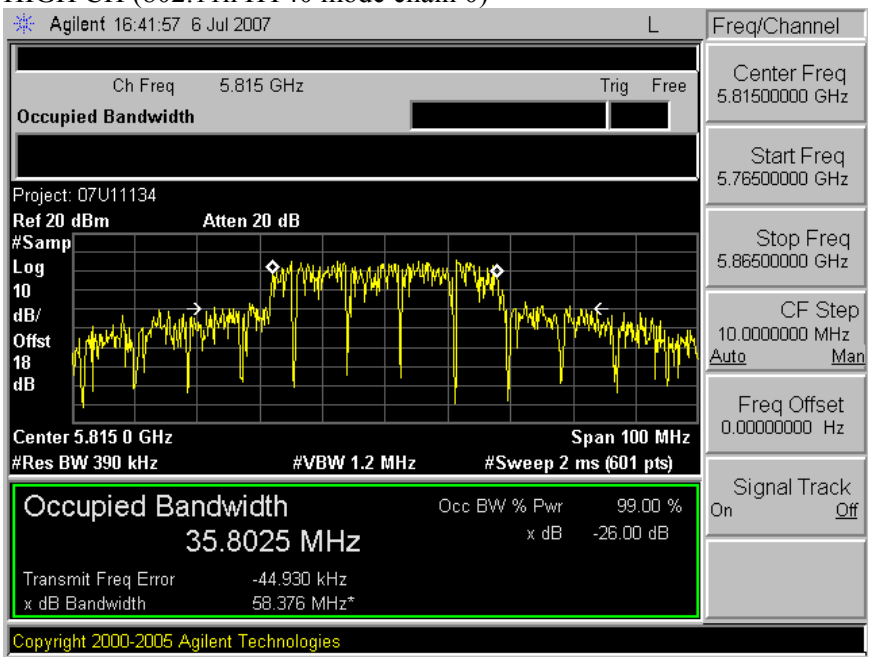
LOW CH (802.11n HT40 mode chain 0)



MID CH (802.11n HT40 mode chain 0)

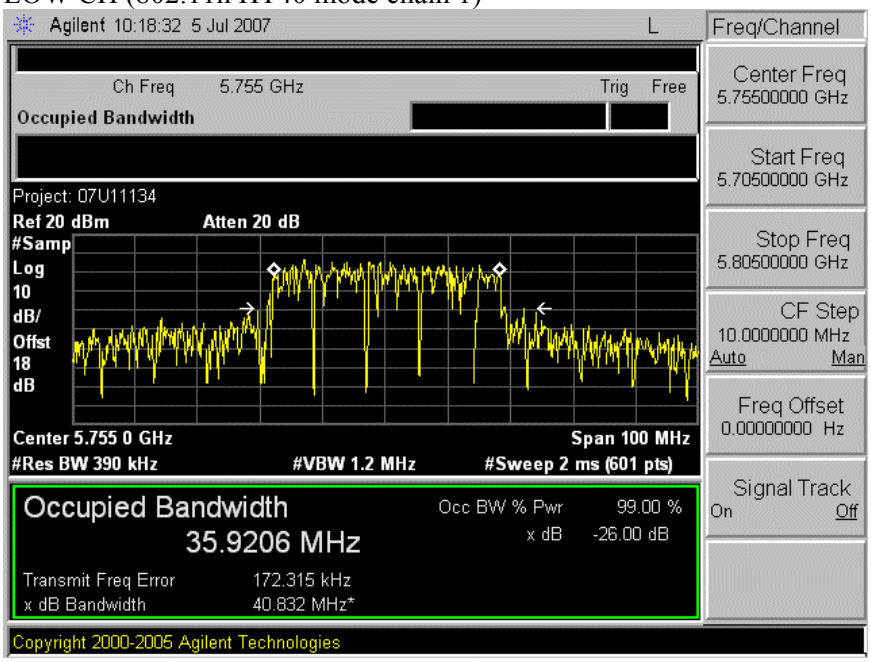


HIGH CH (802.11n HT40 mode chain 0)

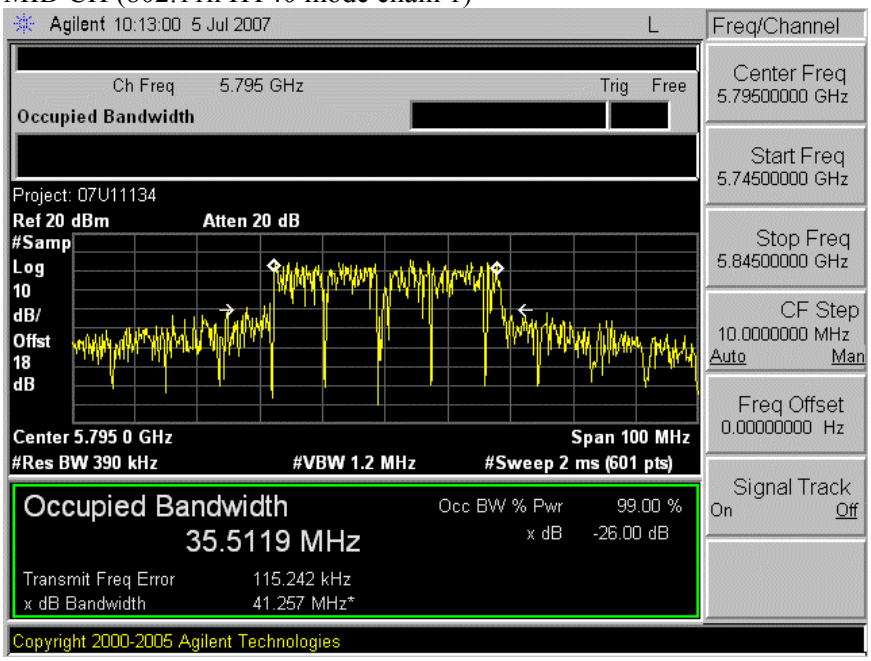


**(802.11 HT40 MODE CHAIN 1)**

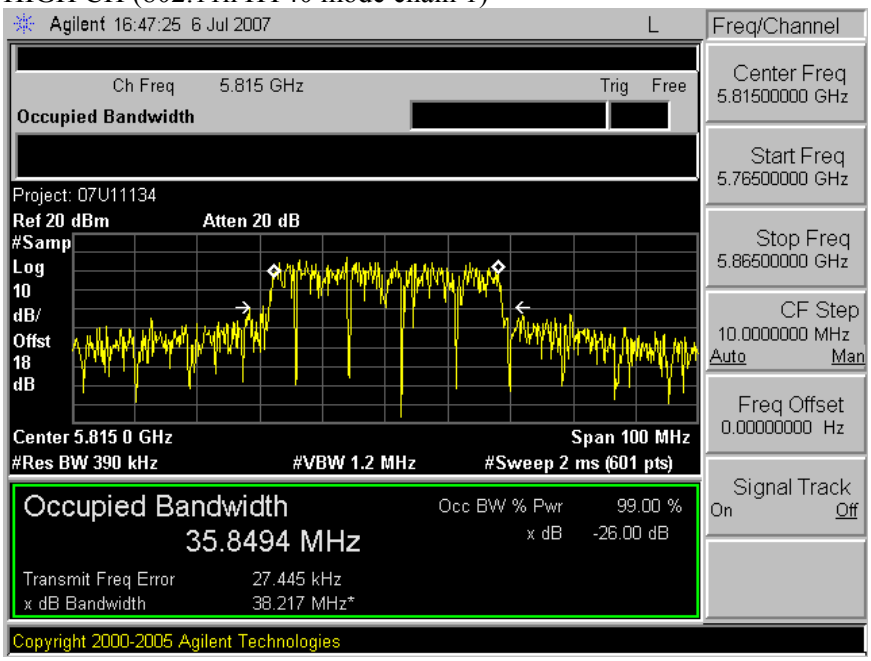
LOW CH (802.11n HT40 mode chain 1)



MID CH (802.11n HT40 mode chain 1)



HIGH CH (802.11n HT40 mode chain 1)



## 7.2.3. PEAK OUTPUT POWER

**LIMIT**

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz , and 5725-5850 MHz bands: 1 watt.

§15.247 (b) (4) (i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer and the analyzer's internal channel power integration function is used to integrate the power over a bandwidth greater than or equal to the 99% bandwidth.

Each chain is measured separately and the total power is calculated using:

Total Power = 10 log (10^ (Chain 0 Power / 10) + 10^ (Chain 1 Power / 10))

**RESULTS**

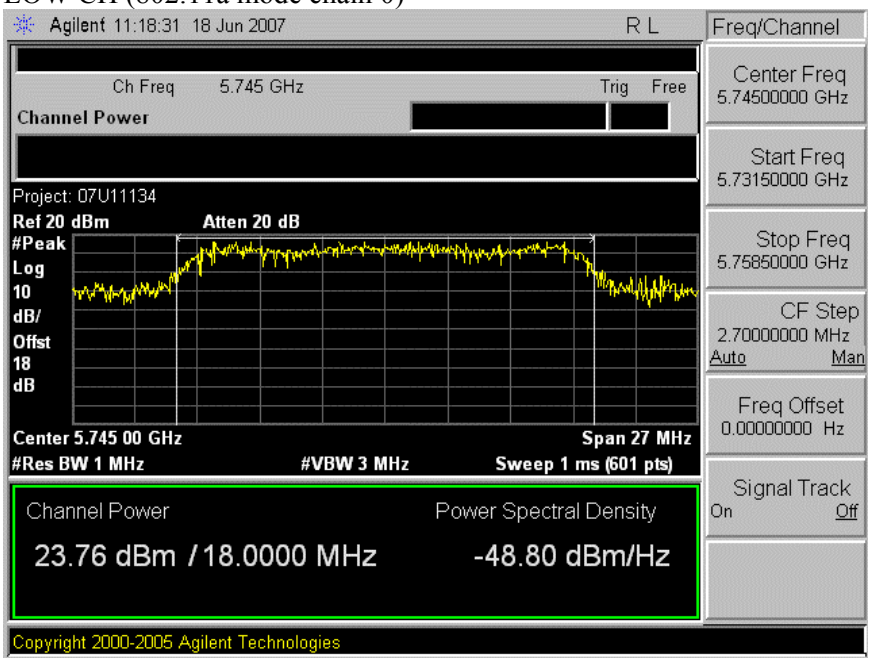
No non-compliance noted:

| | |
|---|---|
| **Fixed Limit (dBm)** | 17 |
| **Antenna Gain (dBi)** | 3 |
| **10 Log (# Tx Chains)** | 3.01 |
| **Effective Legacy Gain** | 6.01 |

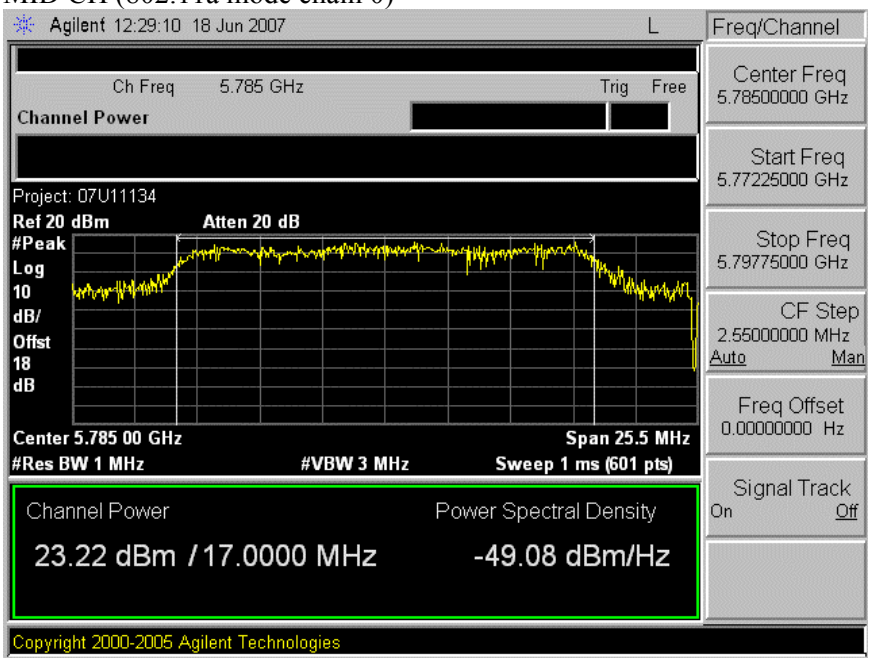
| Mode Channel | Frequency (MHz) | Max Power Chain 0 (dBm) | Max Power Chain 1 (dBm) | Max Power Total (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| 802.11a Mode | | | | | | |
| Low | 5745 | 23.76 | 23.32 | 26.56 | 29.99 | -3.43 |
| Mid | 5785 | 23.22 | 23.39 | 26.32 | 29.99 | -3.67 |
| High | 5825 | 23.31 | 22.72 | 26.04 | 29.99 | -3.95 |
| 802.11n HT20 Mode | | | | | | |
| Low | 5745 | 23.89 | 22.98 | 26.47 | 30.00 | -3.53 |
| Mid | 5785 | 23.36 | 23.16 | 26.27 | 30.00 | -3.73 |
| High | 5825 | 22.54 | 22.23 | 25.40 | 30.00 | -4.60 |
| 802.11n HT40 Mode | | | | | | |
| Low | 5755 | 22.72 | 22.20 | 25.48 | 30.00 | -4.52 |
| Mid | 5795 | 22.70 | 22.18 | 25.46 | 30.00 | -4.54 |
| High | 5815 | 22.69 | 22.15 | 25.44 | 30.00 | -4.56 |

**(802.11a MODE CHAIN 0)**

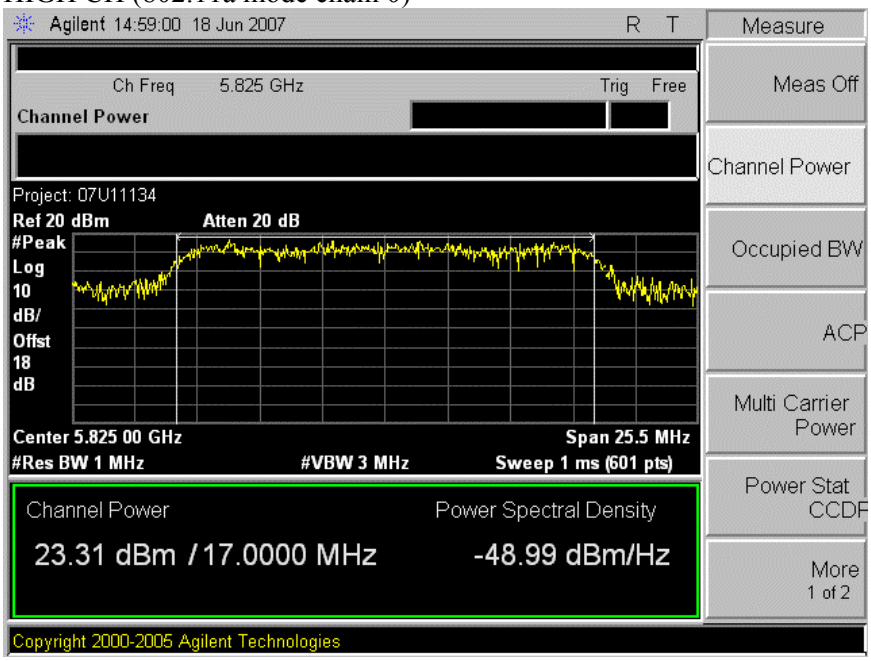
LOW CH (802.11a mode chain 0)



MID CH (802.11a mode chain 0)

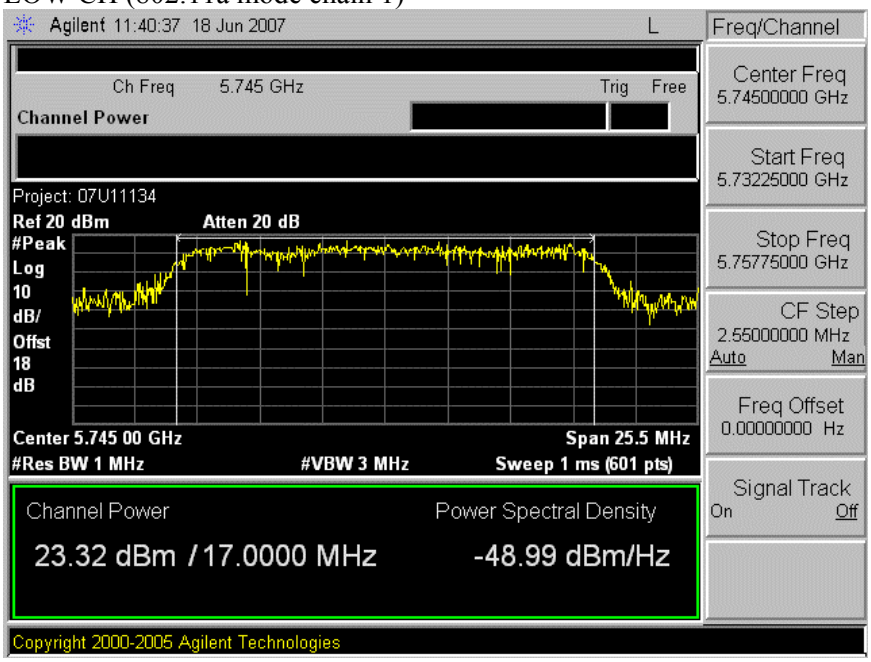


HIGH CH (802.11a mode chain 0)

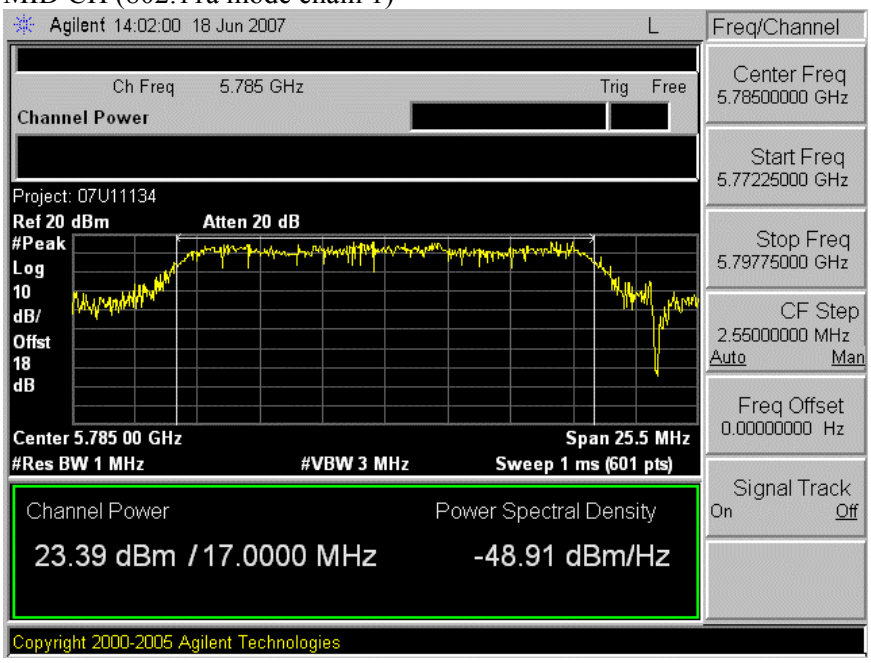


**(802.11a MODE CHAIN 1)**

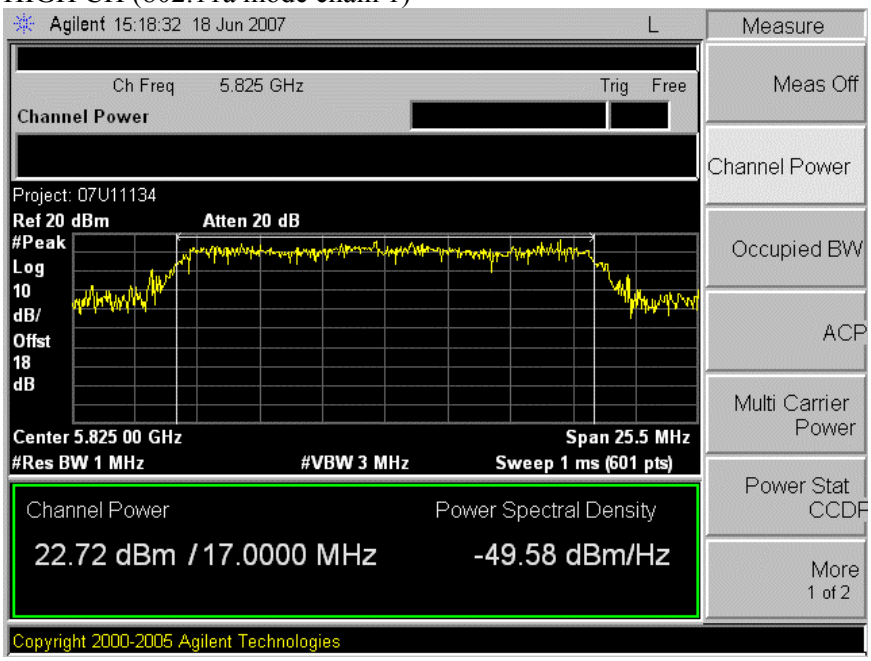
LOW CH (802.11a mode chain 1)



MID CH (802.11a mode chain 1)

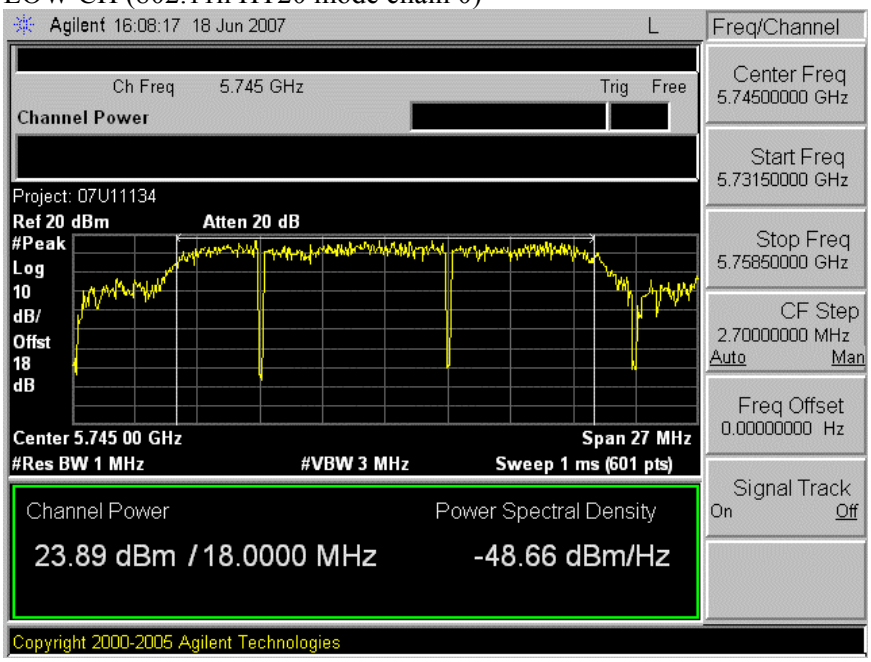


HIGH CH (802.11a mode chain 1)

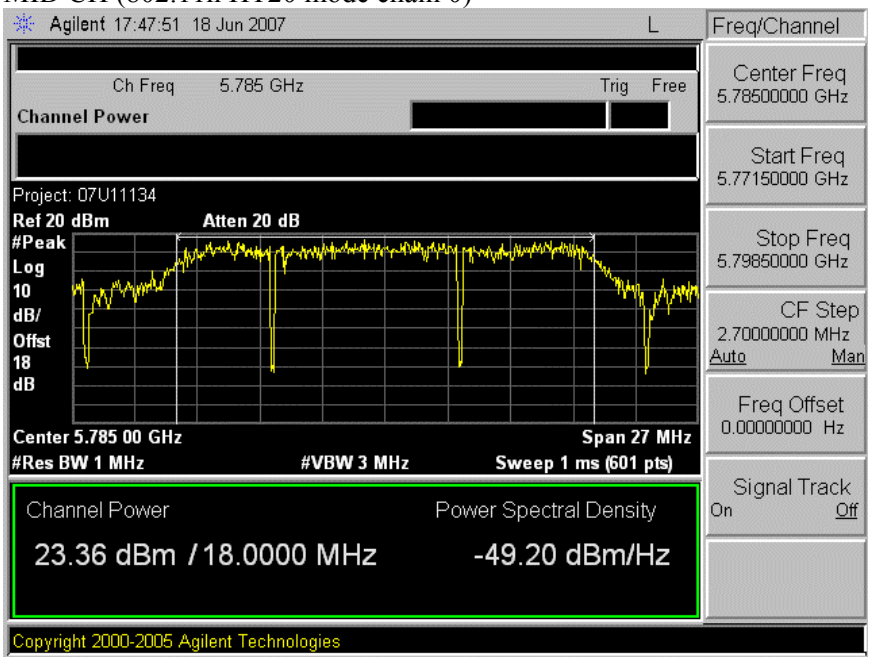


**(802.11n HT20 MODE CHAIN 0)**

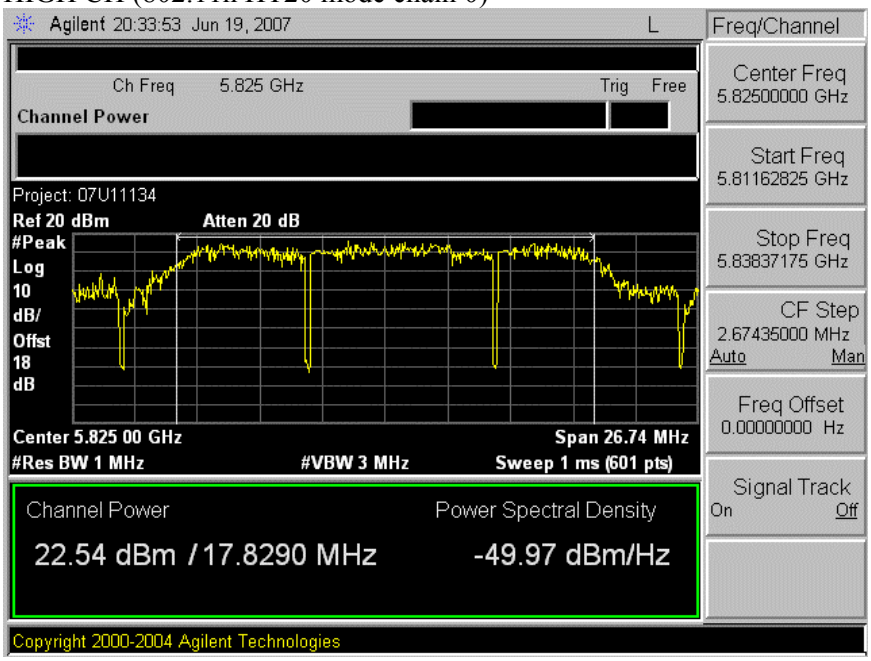
LOW CH (802.11n HT20 mode chain 0)



MID CH (802.11n HT20 mode chain 0)

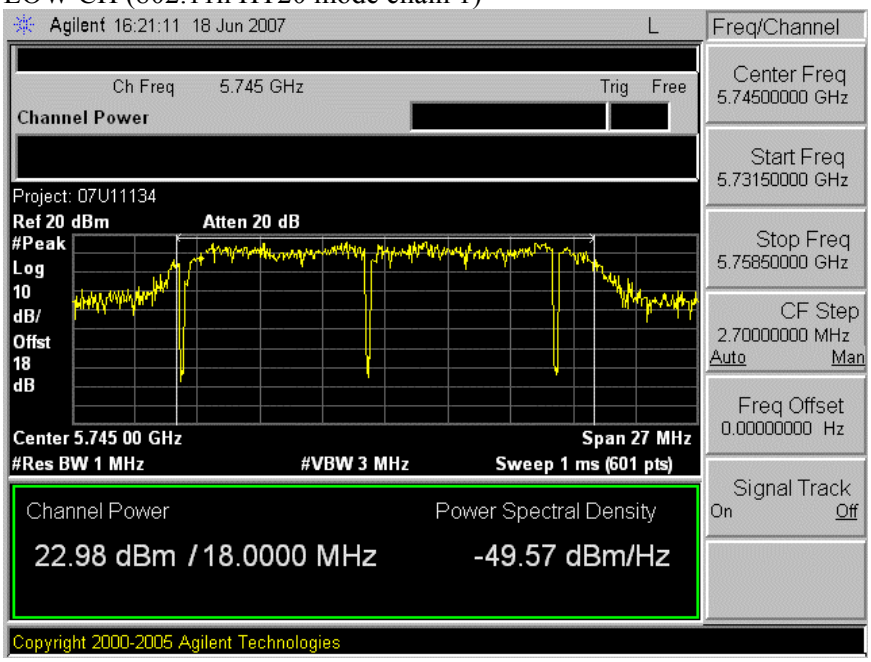


HIGH CH (802.11n HT20 mode chain 0)

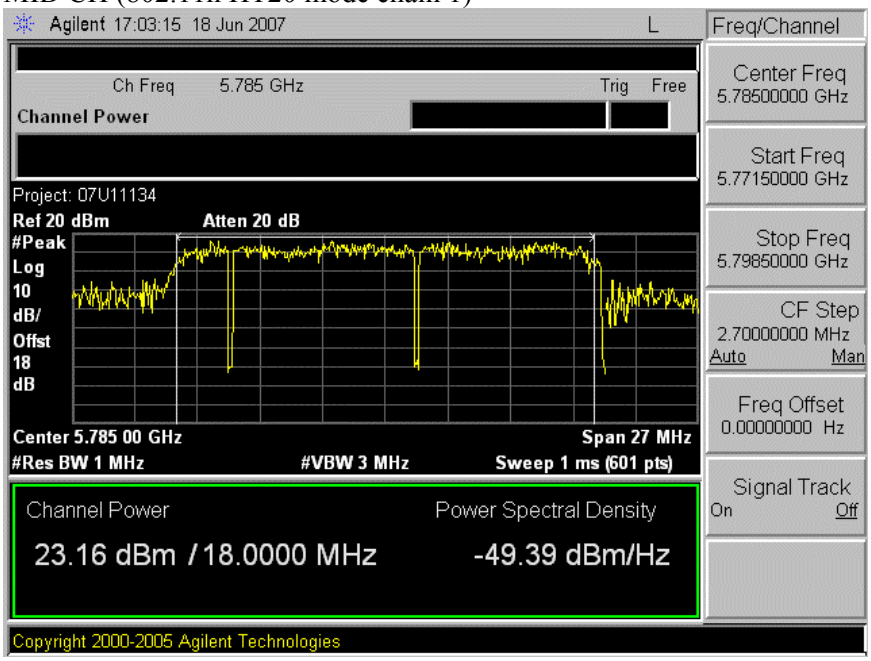


**(802.11 HT20 MODE CHAIN 1)**

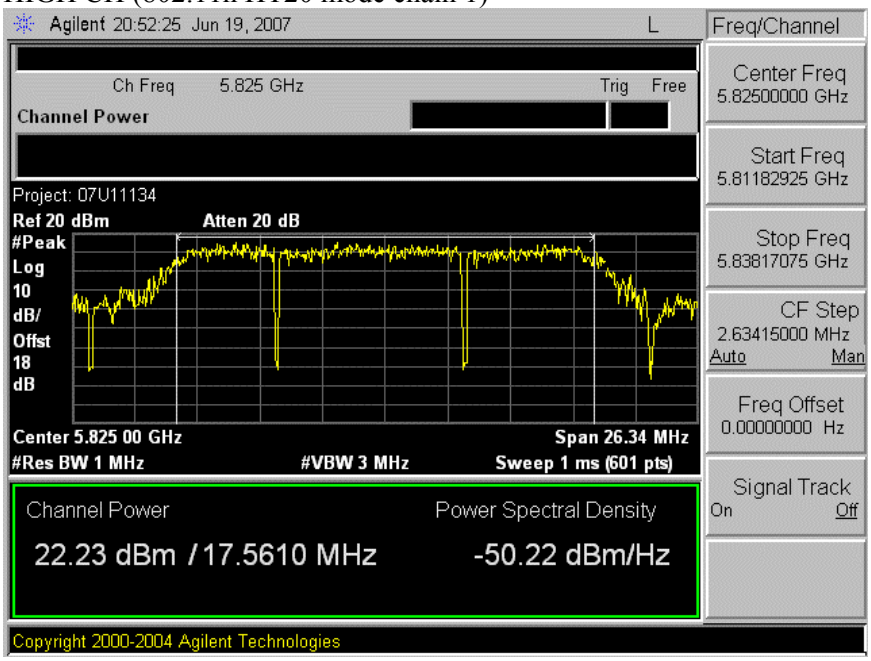
LOW CH (802.11n HT20 mode chain 1)



MID CH (802.11n HT20 mode chain 1)

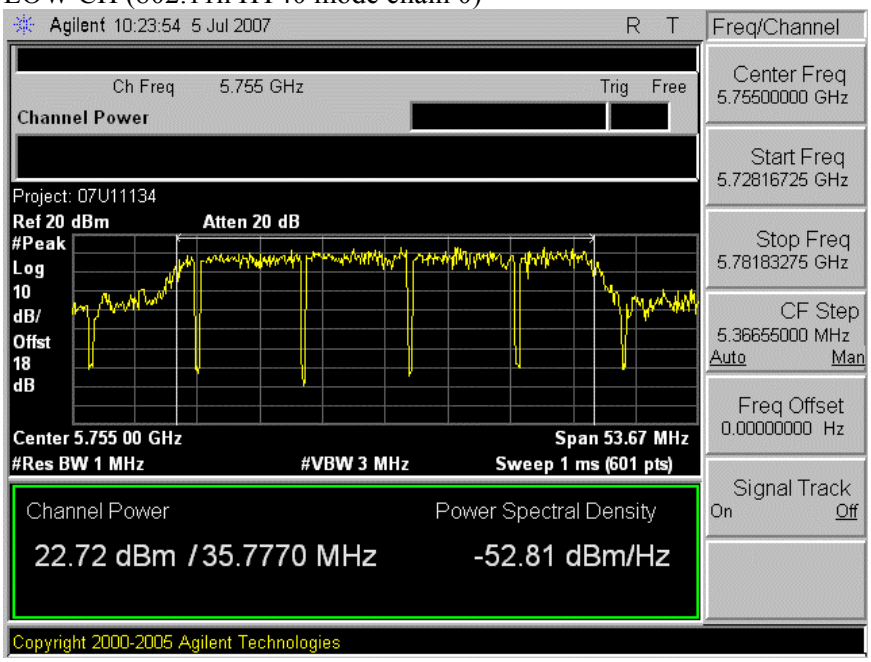


HIGH CH (802.11n HT20 mode chain 1)

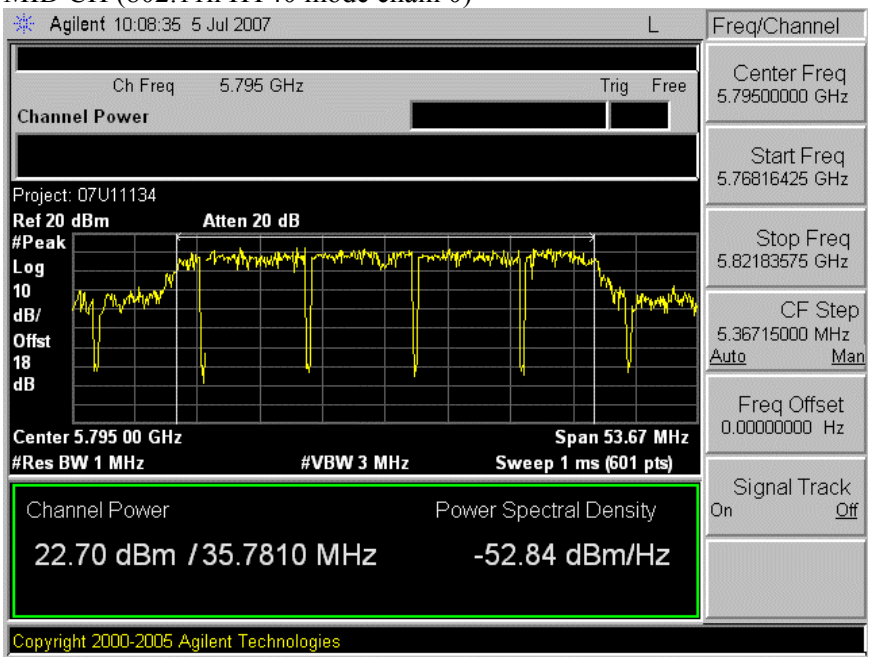


**(802.11 HT40 MODE CHAIN 0)**

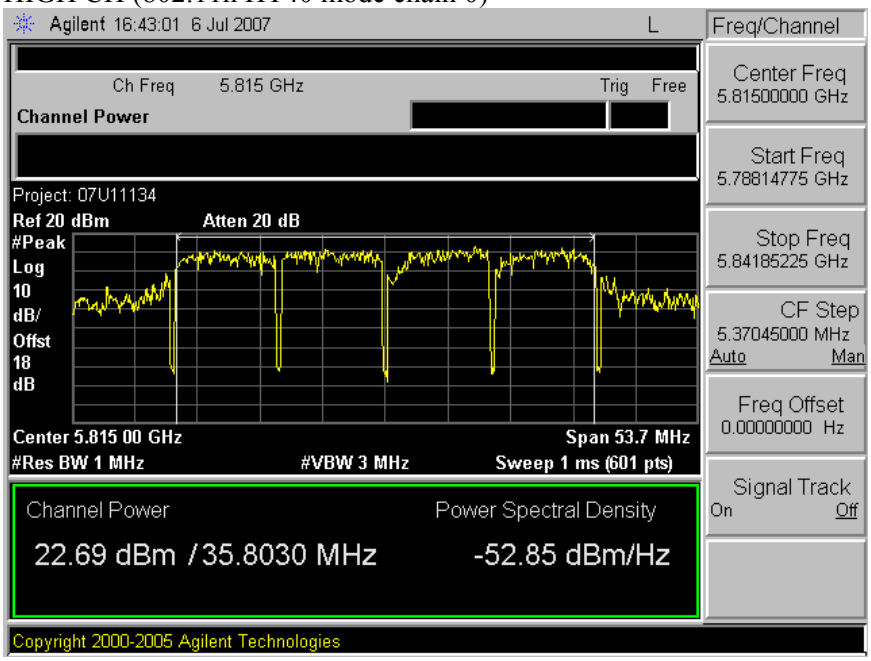
LOW CH (802.11n HT40 mode chain 0)



MID CH (802.11n HT40 mode chain 0)

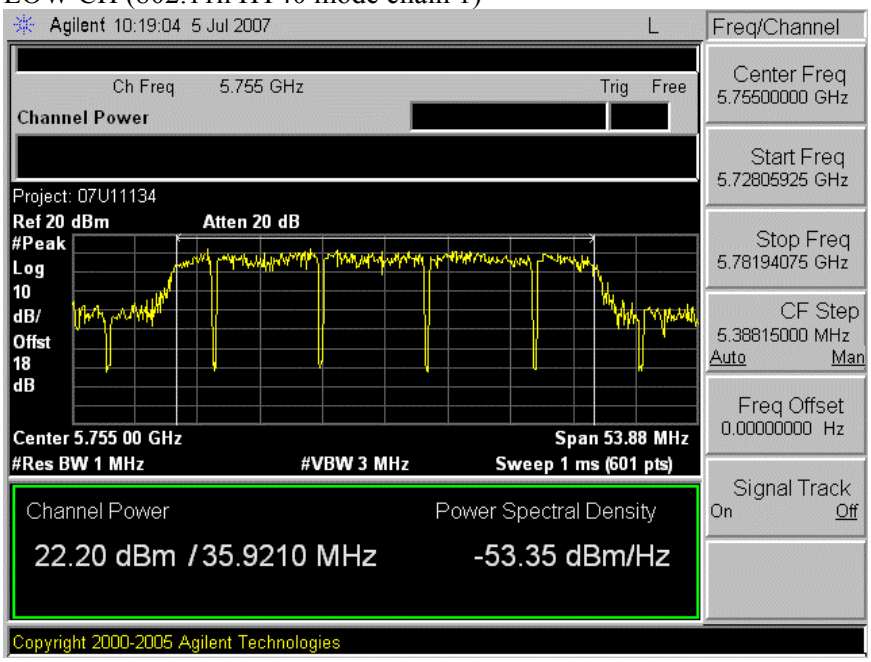


HIGH CH (802.11n HT40 mode chain 0)

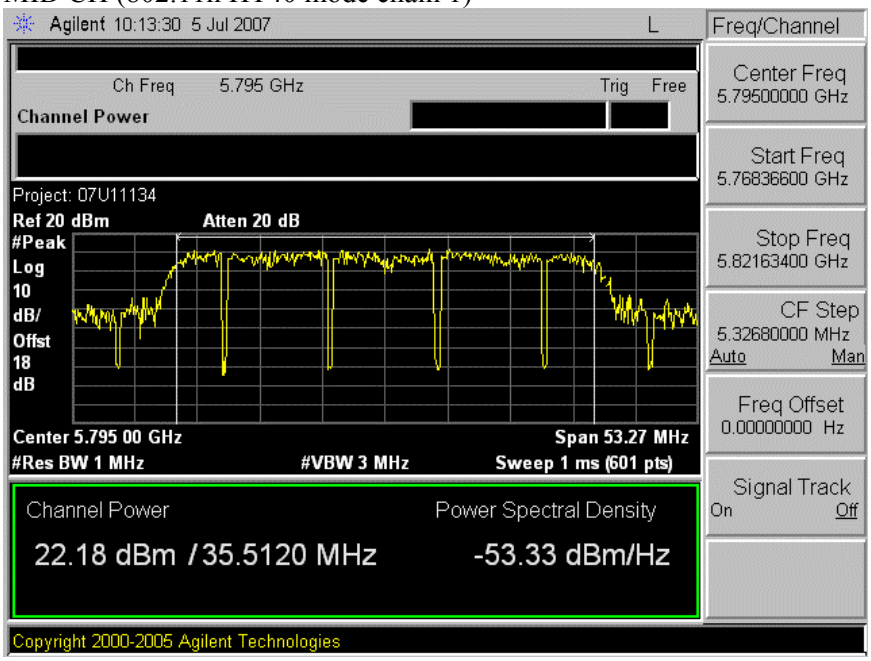


**(802.11 HT40 MODE CHAIN 1)**

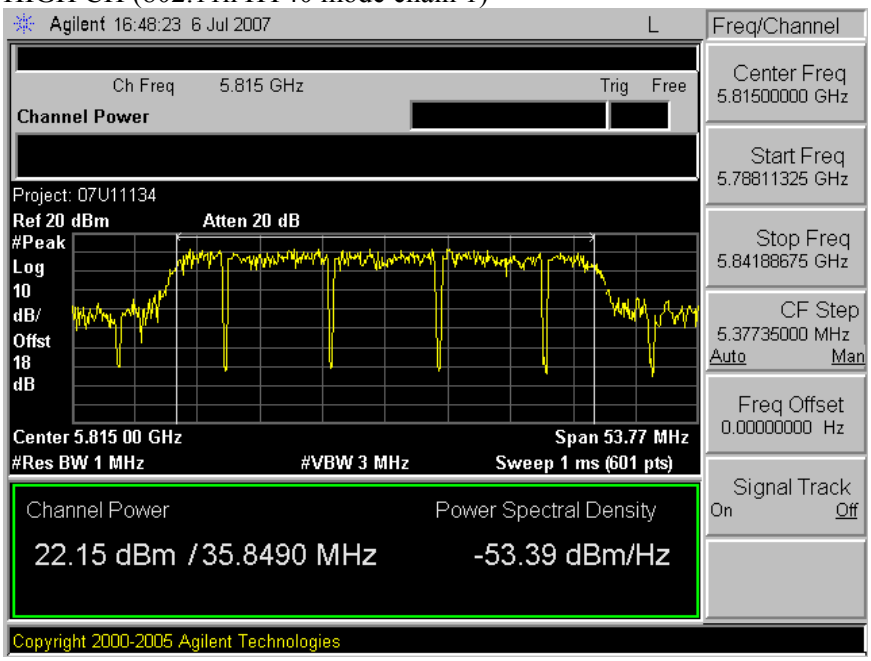
LOW CH (802.11n HT40 mode chain 1)



MID CH (802.11n HT40 mode chain 1)



HIGH CH (802.11n HT40 mode chain 1)



## 7.2.4. AVERAGE POWER

**AVERAGE POWER LIMIT**

None; for reporting purposes only.

**TEST PROCEDURE**

The transmitter output is connected to a power meter.

Each chain is measured separately and the total power is calculated using:

Total Power = 10 log (10^ (Chain 0 Power / 10) + 10^ (Chain 1 Power / 10))

## RESULTS

No non-compliance noted:

The cable assembly insertion loss of 18 dB (including 10 dB pad and 8 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

| Mode Channel | Frequency (MHz) | Average Power Chain 0 (dBm) | Average Power Chain 1 (dBm) | Average Power Total (dBm) |
|---|---|---|---|---|
| 802.11a Mode | | | | |
| Low | 5745 | 18.1 | 17.3 | 20.7 |
| Mid | 5785 | 18.0 | 17.4 | 20.8 |
| High | 5825 | 17.8 | 17.6 | 20.7 |
| 802.11n HT20 Mode | | | | |
| Low | 5745 | 18.0 | 17.2 | 20.6 |
| Mid | 5785 | 17.9 | 17.4 | 20.7 |
| High | 5825 | 18.8 | 18.6 | 21.7 |
| 802.11n HT40 Mode | | | | |
| Low | 5755 | 18.4 | 17.7 | 21.1 |
| Mid | 5795 | 18.4 | 17.8 | 21.1 |
| High | 5815 | 18.4 | 17.8 | 21.1 |

## 7.2.5. MAXIMUM PERMISSIBLE EXPOSURE

**LIMITS**

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| (A) Limits for Occupational/Controlled Exposures | | | | |
| 0.3–3.0 | 614 | 1.63 | *(100) | 6 |
| 3.0–30 | 1842/f | 4.89/f | *($900/f^2$) | 6 |
| 30–300 | 61.4 | 0.163 | 1.0 | 6 |
| 300–1500 | | | f/300 | 6 |
| 1500–100,000 | | | 5 | 6 |
| (B) Limits for General Population/Uncontrolled Exposure | | | | |
| 0.3–1.34 | 614 | 1.63 | *(100) | 30 |
| 1.34–30 | 824/f | 2.19/f | *($180/f^2$) | 30 |

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| 30–300 | 27.5 | 0.073 | 0.2 | 30 |
| 300–1500 | | | f/1500 | 30 |
| 1500–100,000 | | | 1.0 | 30 |

f = frequency in MHz
* = Plane-wave equivalent power density
NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

## CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations and rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$ Equation (1)

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Equation (1) and the measured peak power is used to calculate the MPE distance.

## LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2 in the 5.8 GHz band

## RESULTS

No non-compliance noted:

**802.11a Legacy Mode**

| Mode | MPE Distance (cm) | Output Power (dBm) | Antenna Gain (dBi) | Power Density (mW/cm^2) |
|---|---|---|---|---|
| 802.11a, 5GHz Band | 20.0 | 26.56 | 3.00 | 0.18 |

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

## 7.2.6. PEAK POWER SPECTRAL DENSITY

**LIMIT**

§15.247 (d) For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer, the maximum level in a 3 kHz bandwidth is measured with the spectrum analyzer using RBW = 3 kHz and VBW > 3 kHz, sweep time = span / 3 kHz, and video averaging is turned off. The PPSD is the highest level found across the emission in any 3 kHz band.

Each chain is measured separately and the total PPSD is calculated using:

Total PPSD = 10 log (10^ (Chain 0 PPSD / 10) + 10^ (Chain 2 PPSD / 10))

## RESULTS

No non-compliance noted:

Based on the previous preliminary scan of single channel vs. combiner, combined PPSD has the worse condition over all.

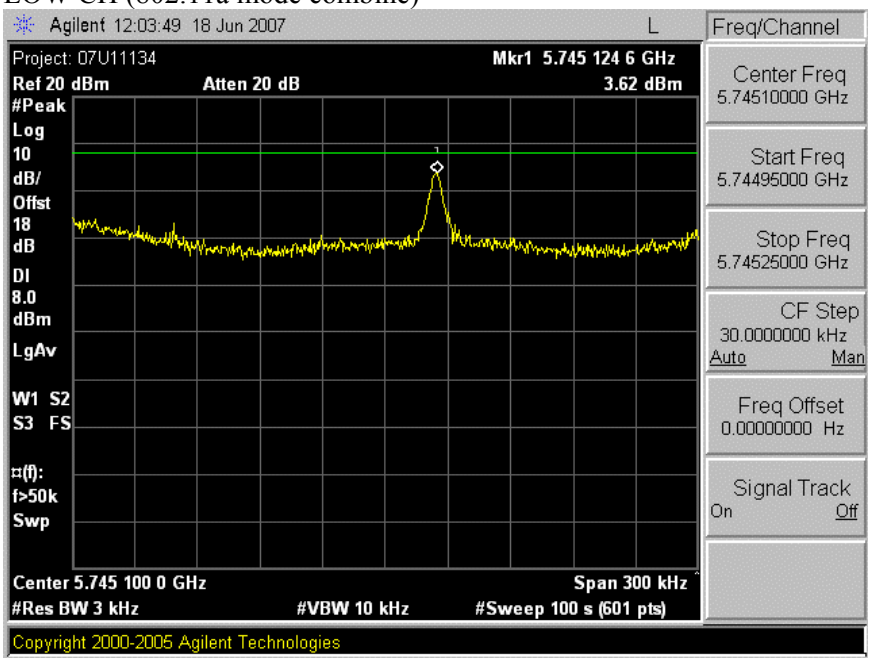
## RESULTS WITH COMBINER

No non-compliance noted:

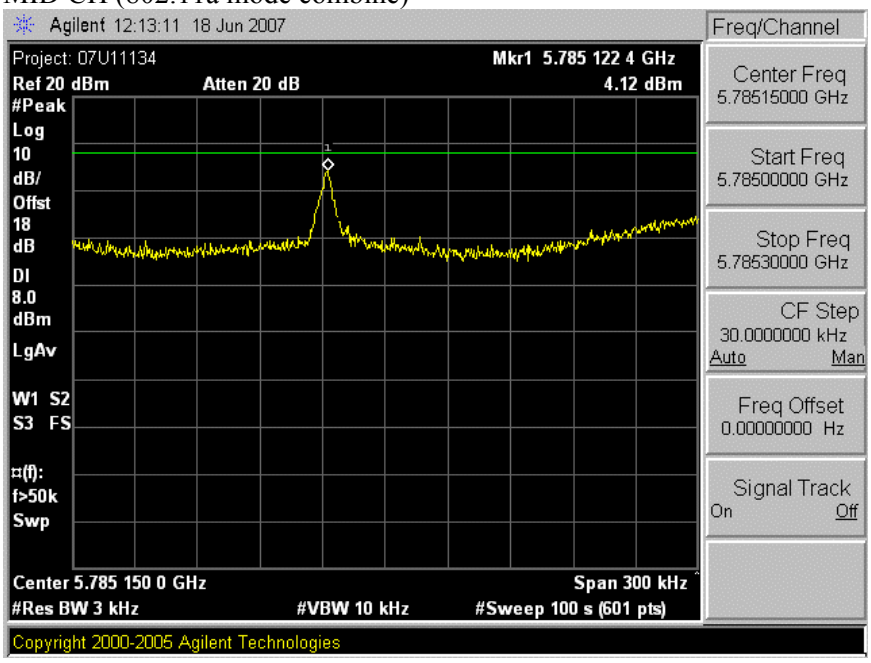
| Mode Channel | Frequency (MHz) | PPSD Using Combiner (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| 802.11a Mode | | | | |
| Low | 5745 | 3.62 | 8 | -4.38 |
| Mid | 5785 | 4.12 | 8 | -3.88 |
| High | 5825 | 3.34 | 8 | -4.66 |
| 802.11n HT20 Mode | | | | |
| Low | 5745 | 3.65 | 8 | -4.35 |
| Mid | 5785 | 0.35 | 8 | -7.65 |
| High | 5825 | 2.13 | 8 | -5.87 |
| 802.11n HT40 Mode | | | | |
| Low | 5755 | -1.34 | 8 | -9.34 |
| Mid | 5795 | -3.36 | 8 | -11.36 |
| High | 5815 | -2.32 | 8 | -10.32 |

**(802.11a MODE COMBINE)**

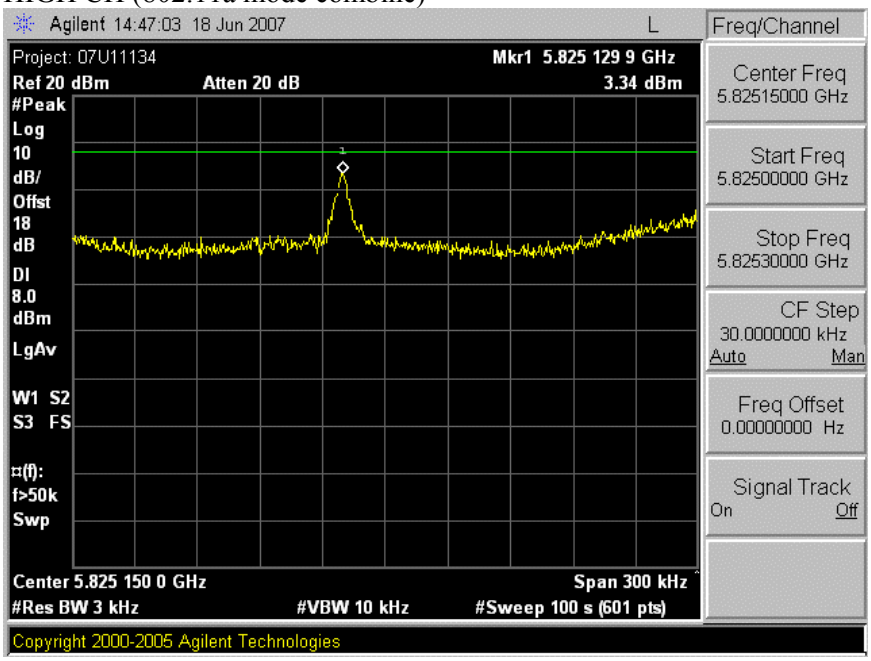
LOW CH (802.11a mode combine)



MID CH (802.11a mode combine)

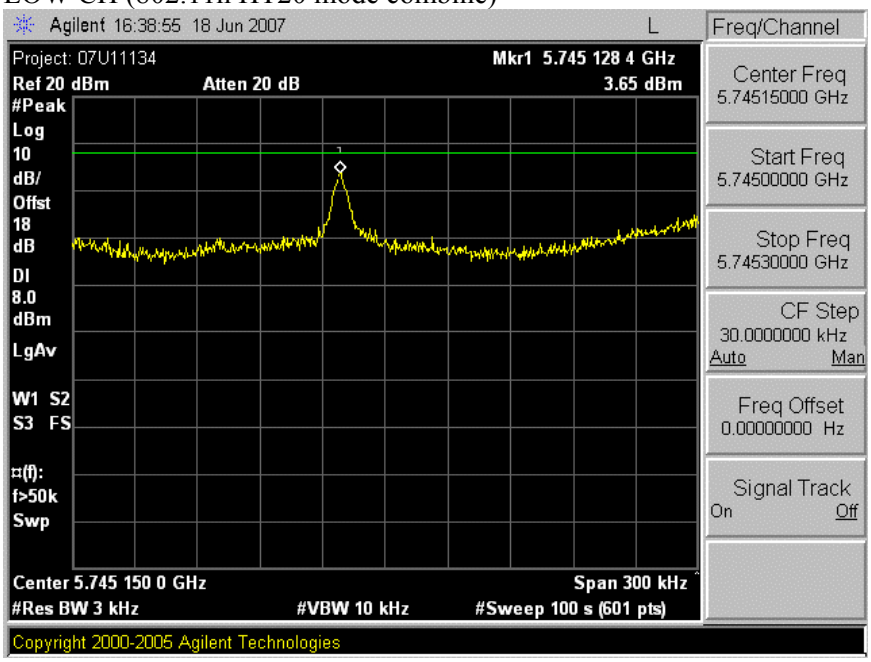


HIGH CH (802.11a mode combine)

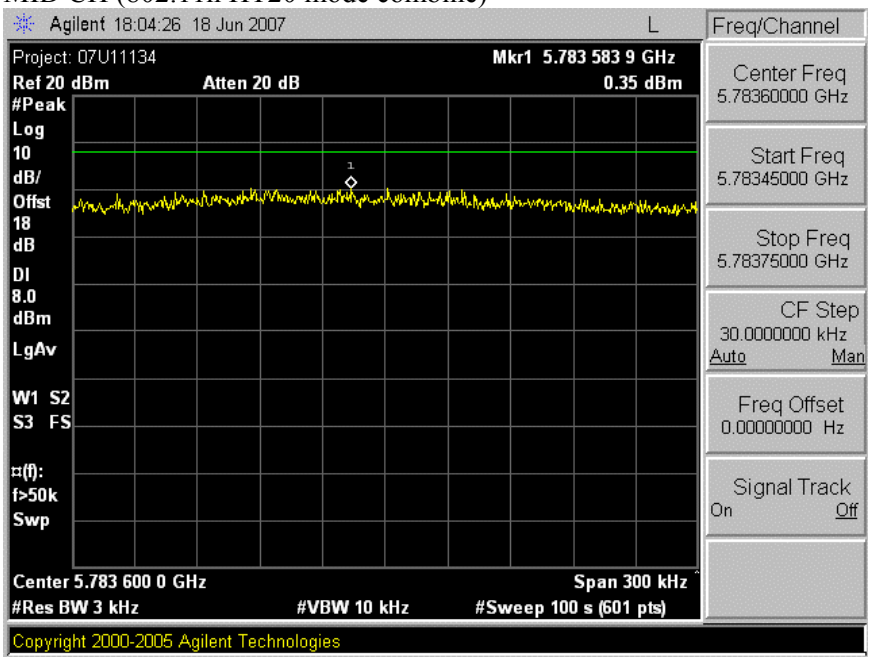


**(802.11n HT20 MODE COMBINE)**

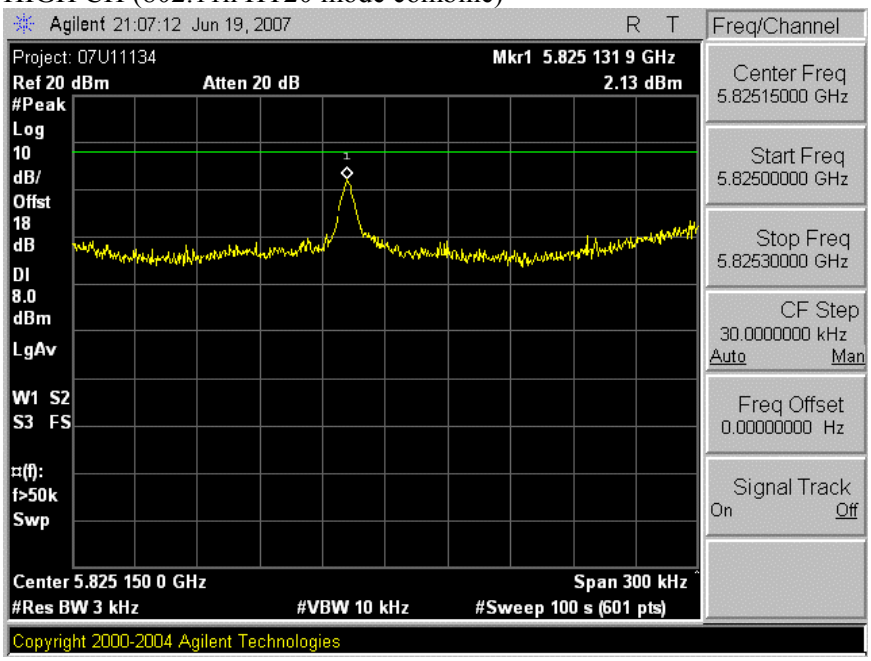
LOW CH (802.11n HT20 mode combine)



MID CH (802.11n HT20 mode combine)

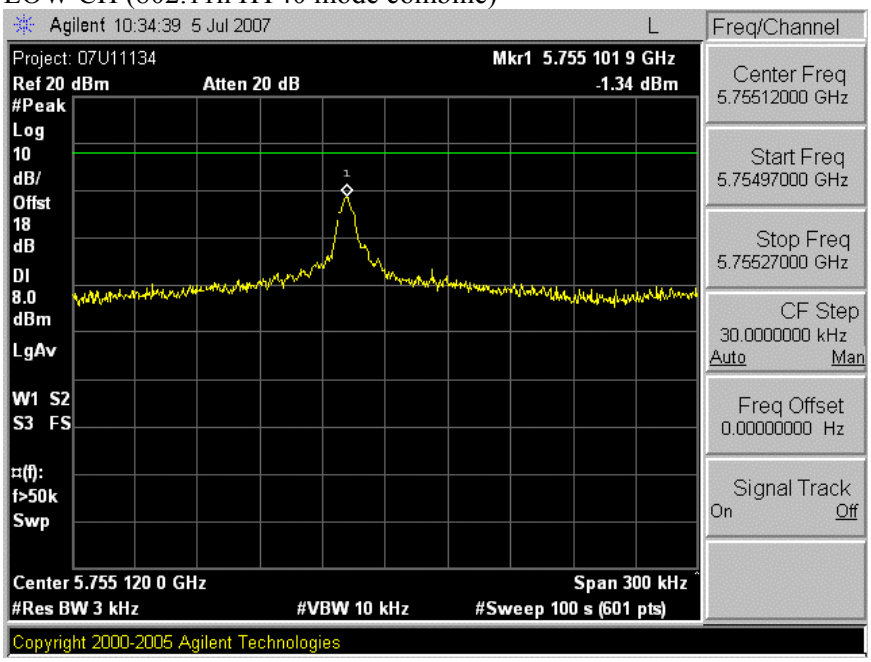


HIGH CH (802.11n HT20 mode combine)

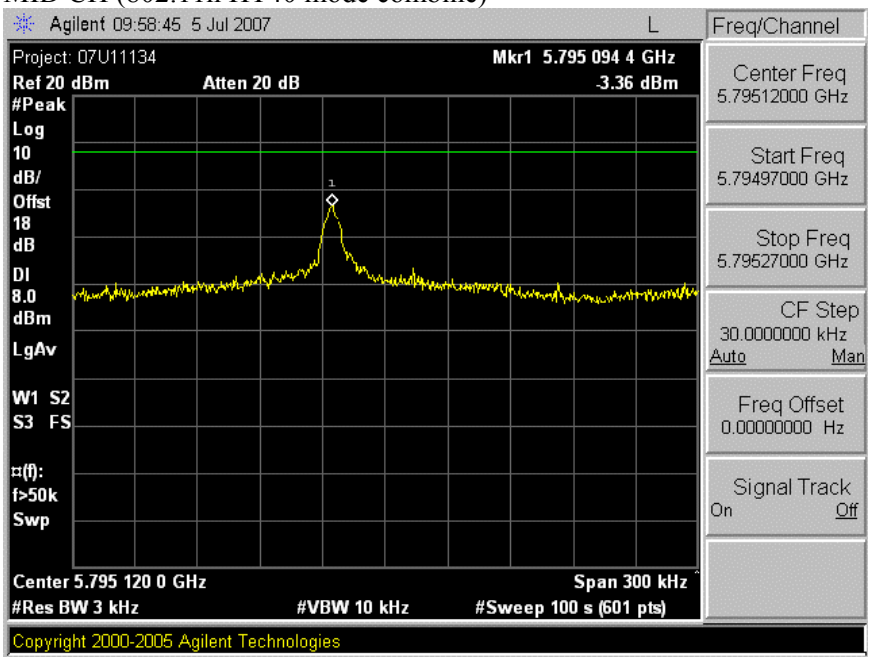


**(802.11 HT40 MODE COMBINE)**

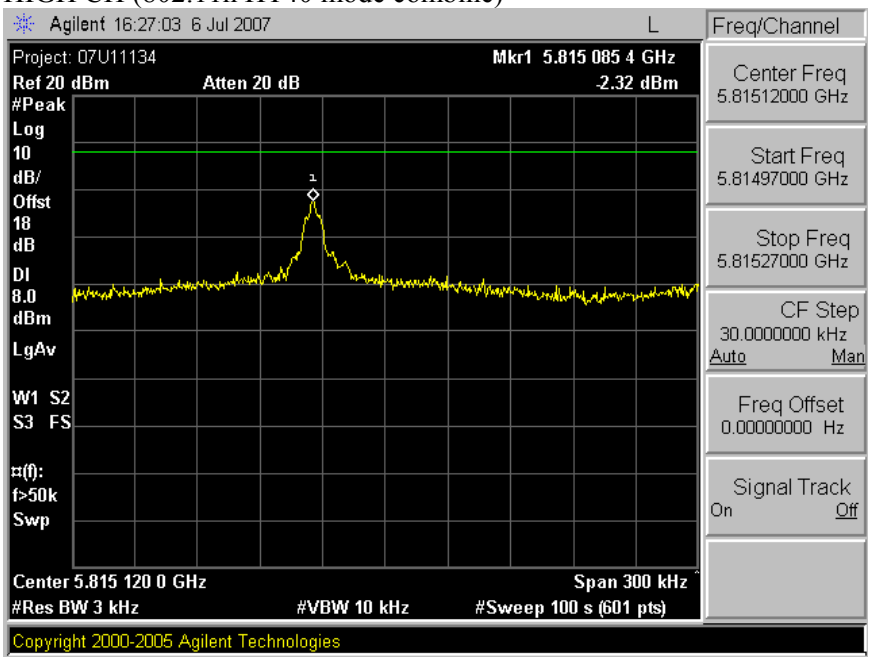
LOW CH (802.11n HT40 mode combine)



MID CH (802.11n HT40 mode combine)



HIGH CH (802.11n HT40 mode combine)



## 7.2.7. CONDUCTED SPURIOUS EMISSIONS

**LIMITS**

§15.247 (c) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions, which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

**TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

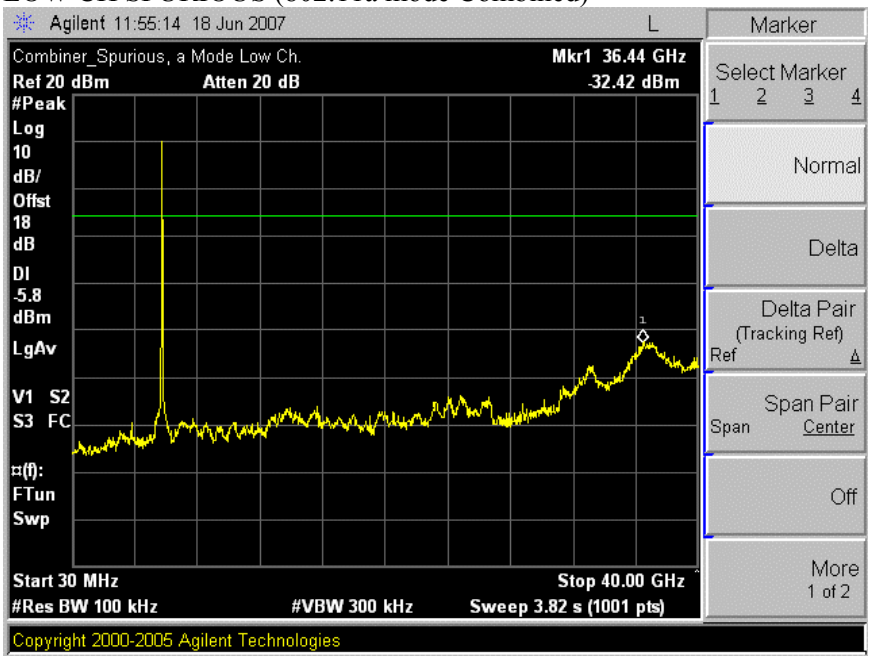
**RESULTS**

No non-compliance noted:

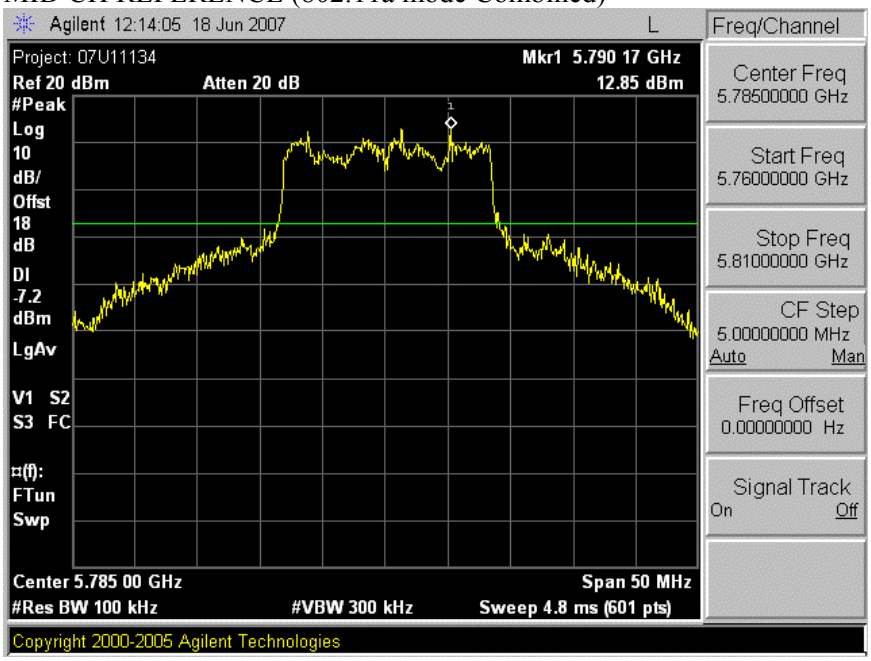
## COMBINED SPURIOUS EMISSIONS (802.11a MODE)

LOW CH BANDEDGE (802.11a mode Combined)

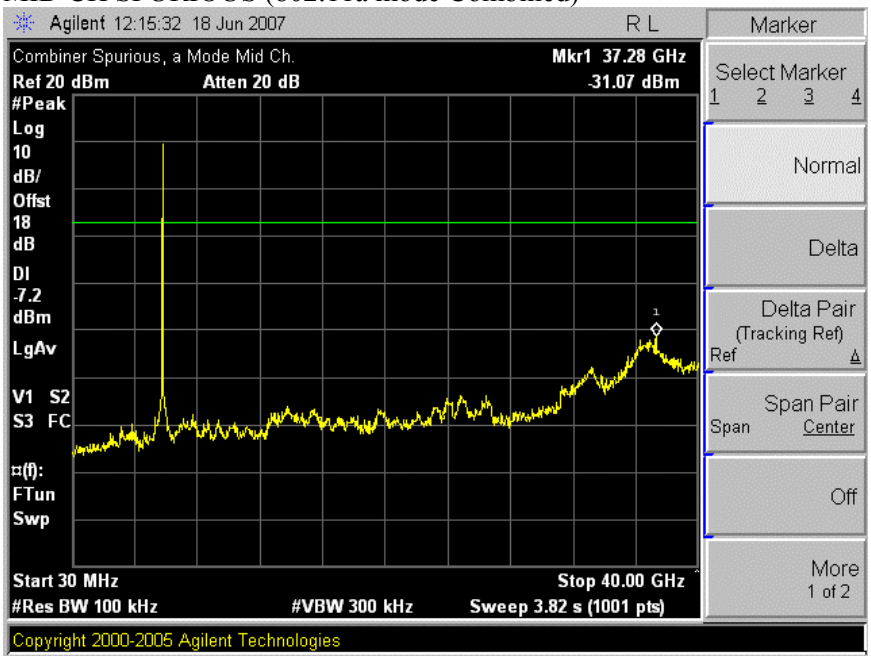
LOW CH SPURIOUS (802.11a mode Combined)



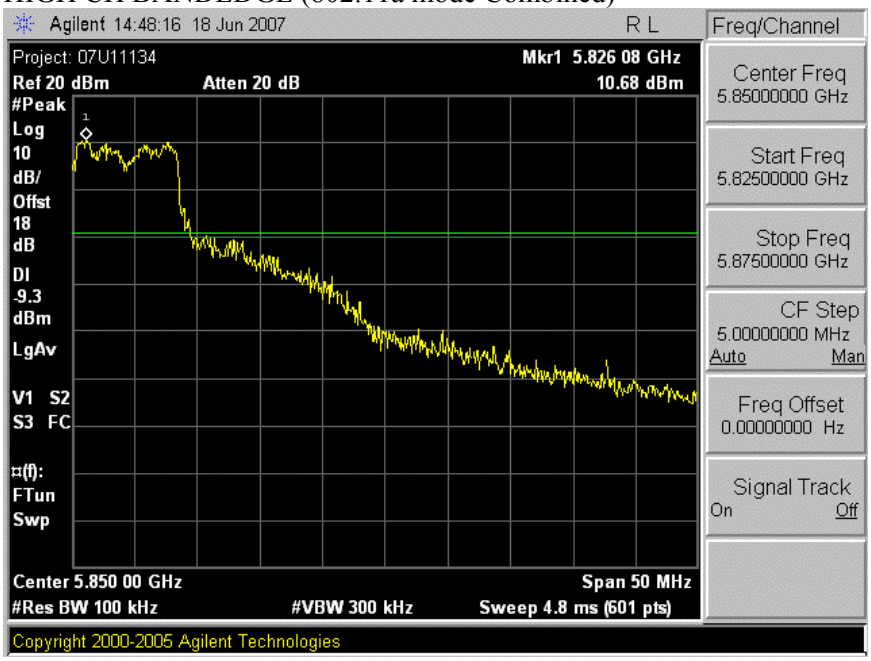
MID CH REFERENCE (802.11a mode Combined)



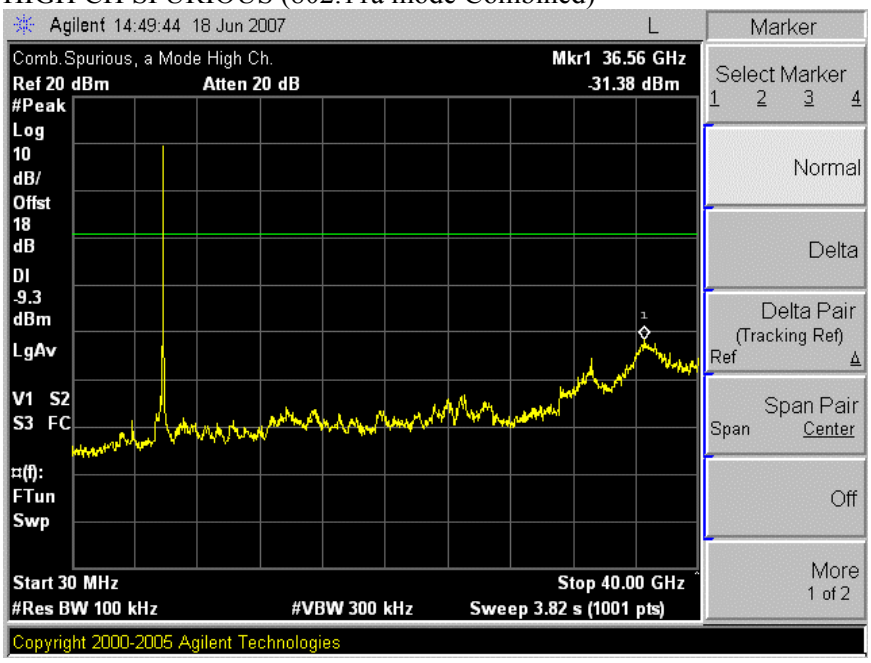
MID CH SPURIOUS (802.11a mode Combined)



HIGH CH BANDEDGE (802.11a mode Combined)

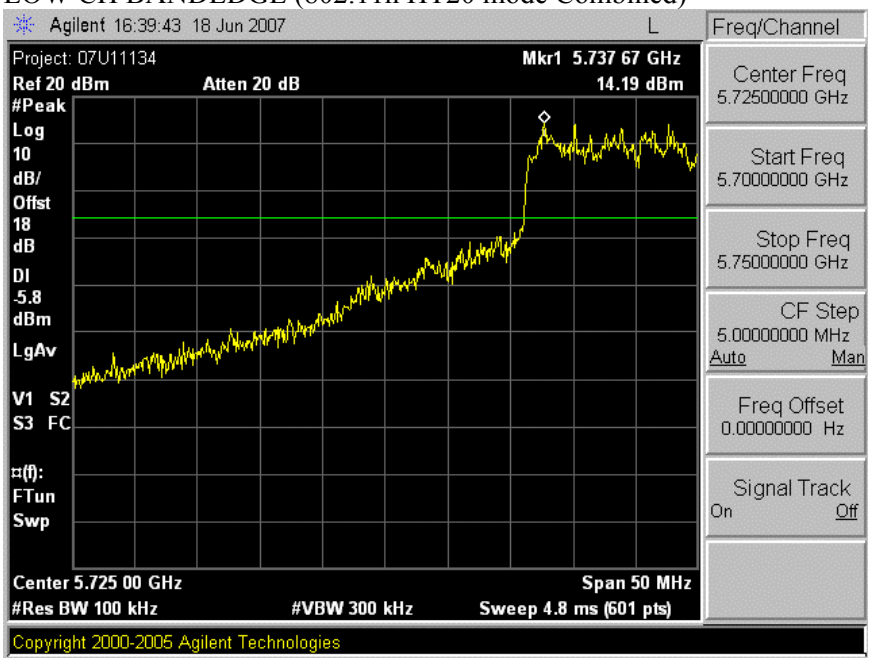


HIGH CH SPURIOUS (802.11a mode Combined)

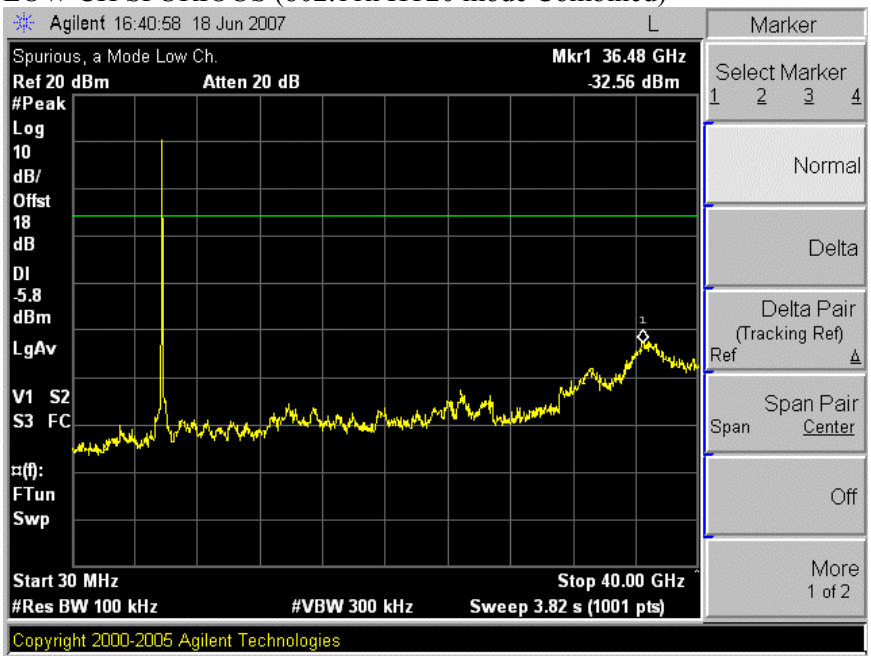


## COMBINED SPURIOUS EMISSIONS (802.11n HT20 MODE)

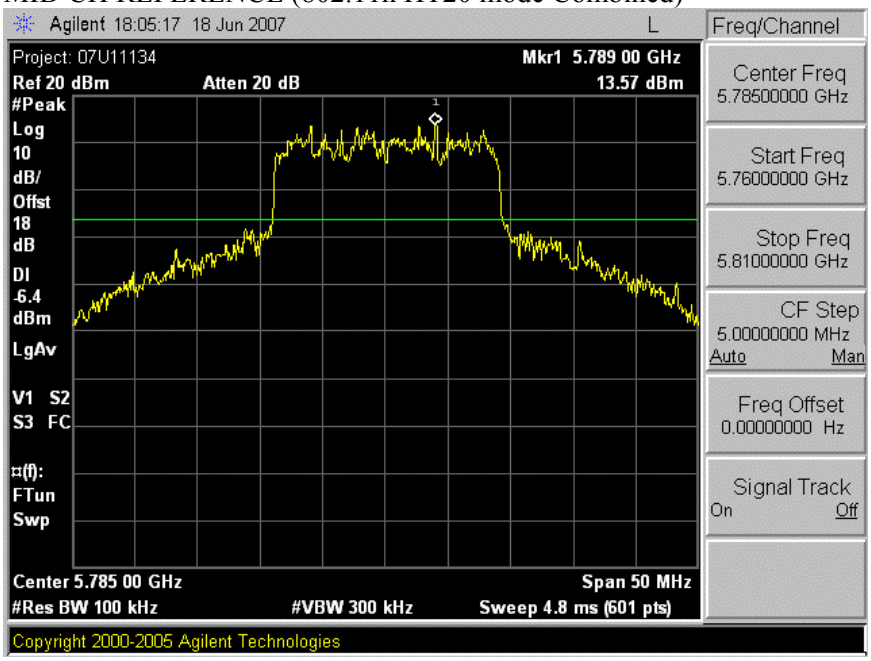
LOW CH BANDEDGE (802.11n HT20 mode Combined)



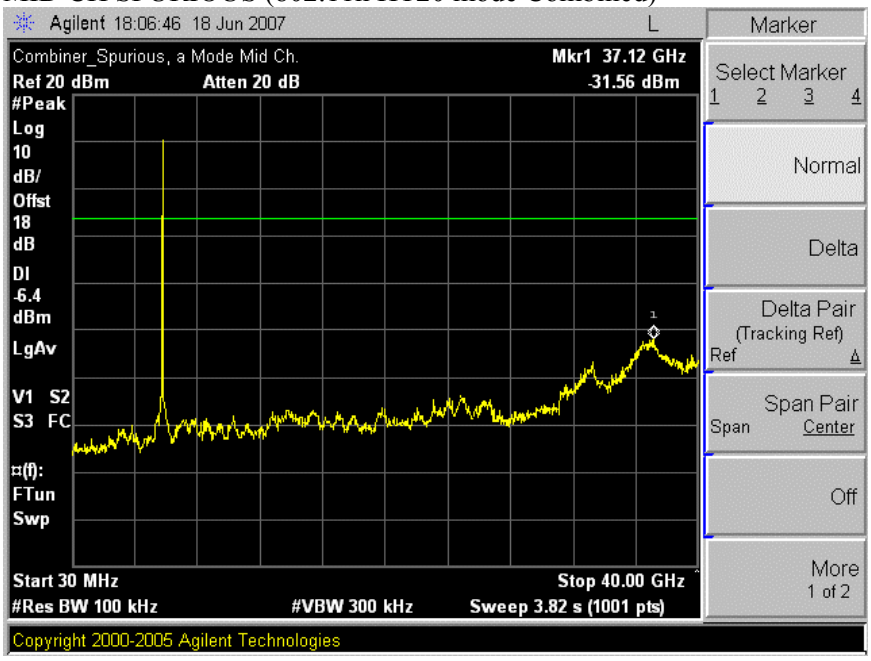
LOW CH SPURIOUS (802.11n HT20 mode Combined)



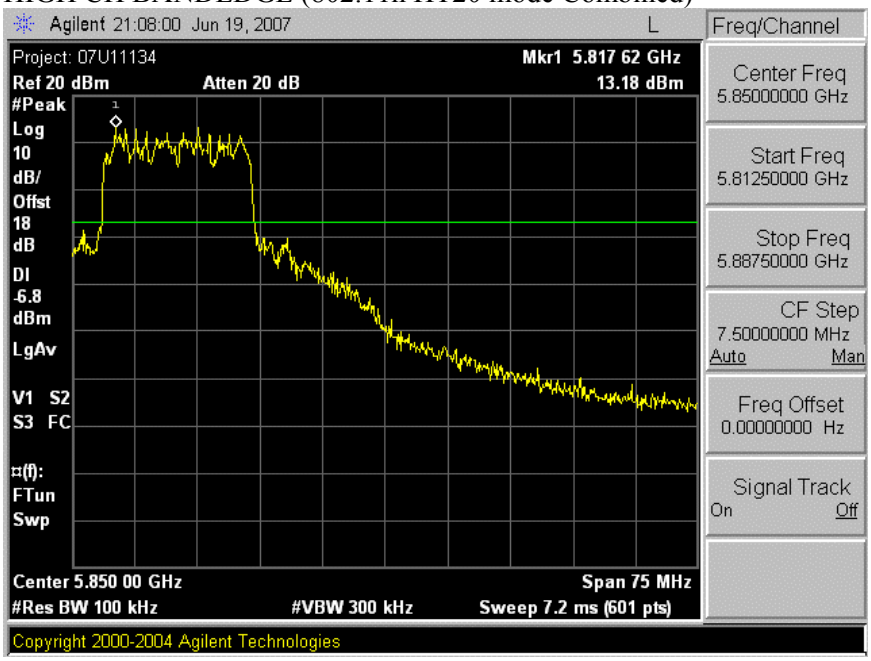
MID CH REFERENCE (802.11n HT20 mode Combined)



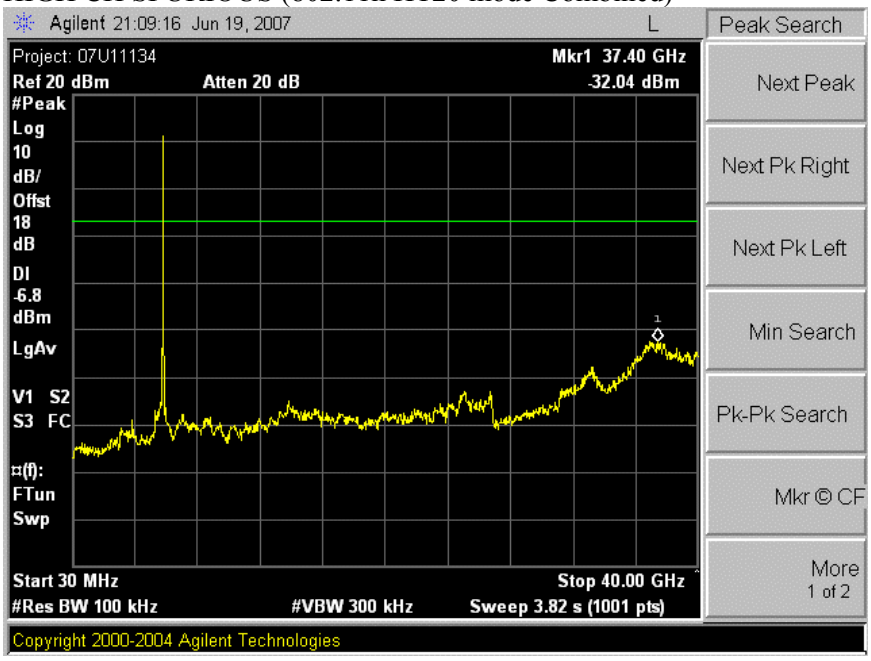
MID CH SPURIOUS (802.11n HT20 mode Combined)



HIGH CH BANDEDGE (802.11n HT20 mode Combined)

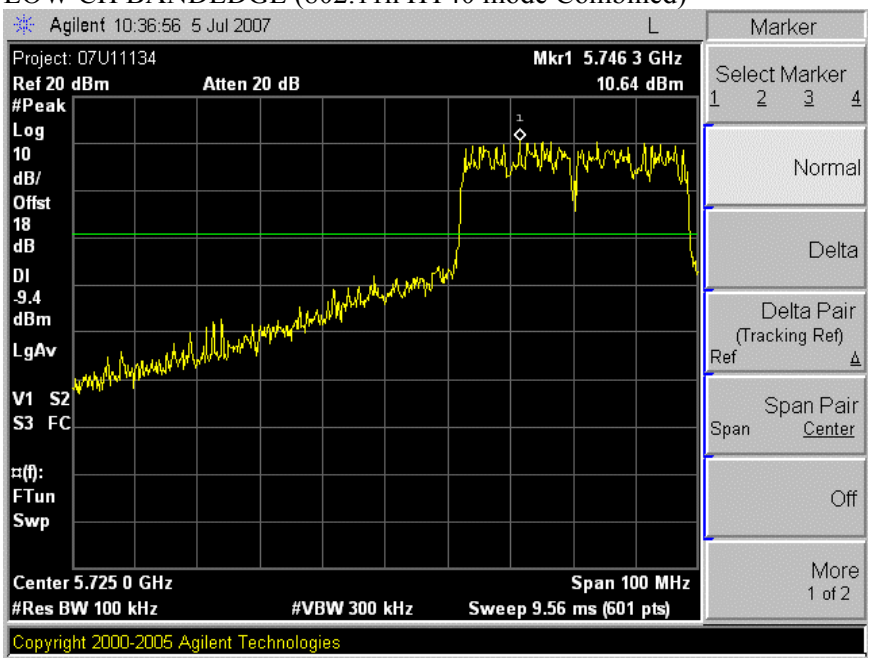


HIGH CH SPURIOUS (802.11n HT20 mode Combined)

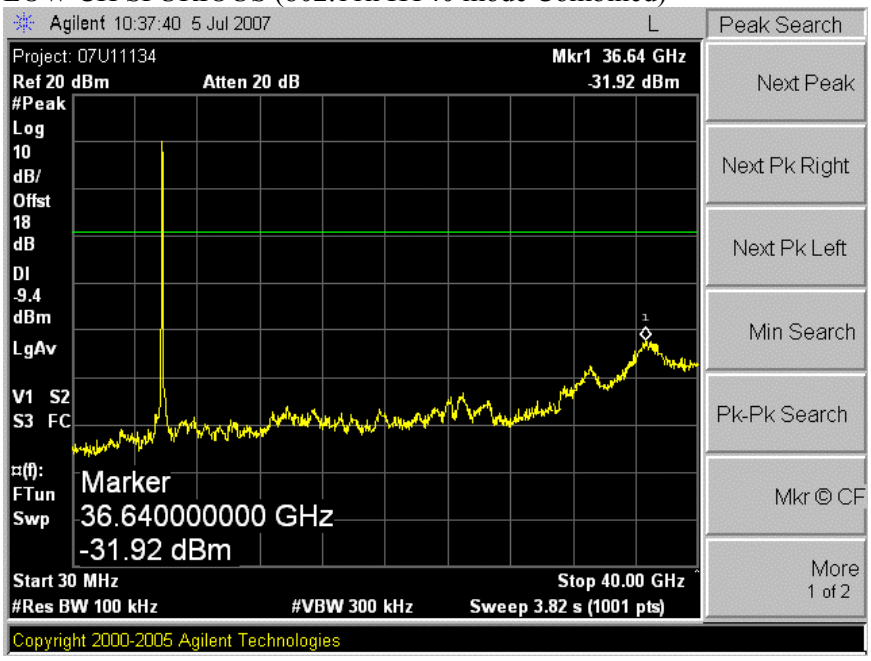


## COMBINED SPURIOUS EMISSIONS (802.11 HT40 MODE)

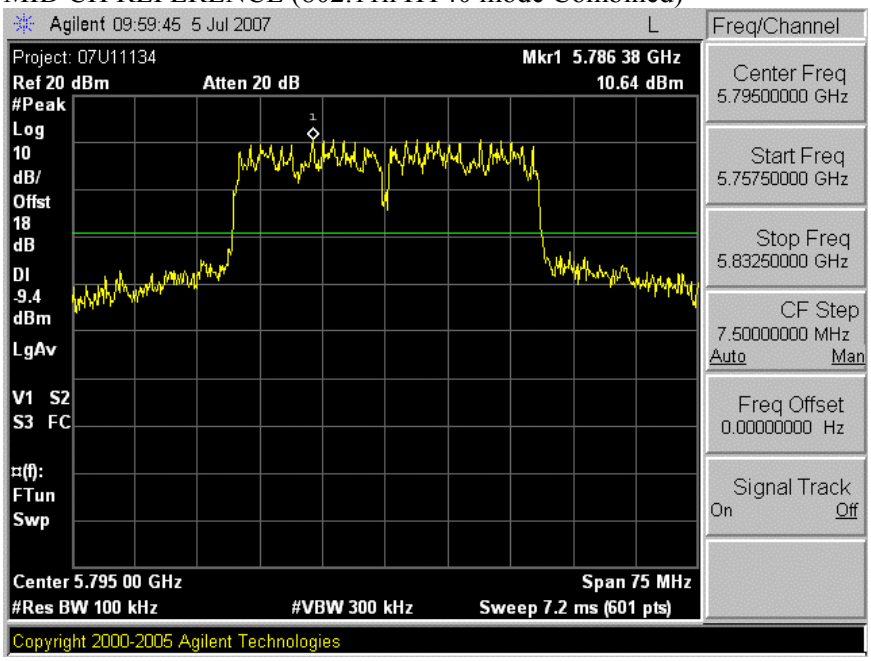
LOW CH BANDEDGE (802.11n HT40 mode Combined)



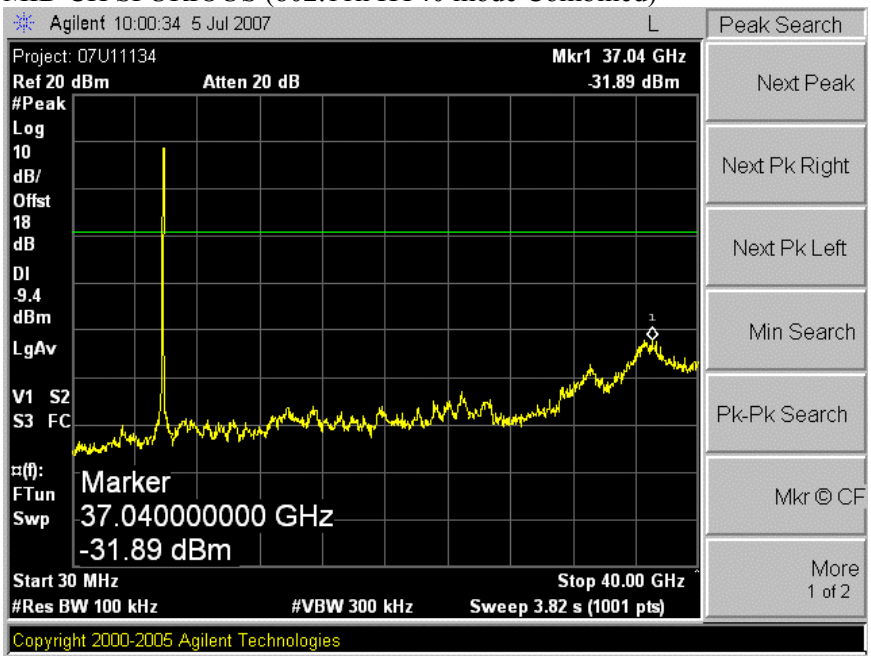
LOW CH SPURIOUS (802.11n HT40 mode Combined)



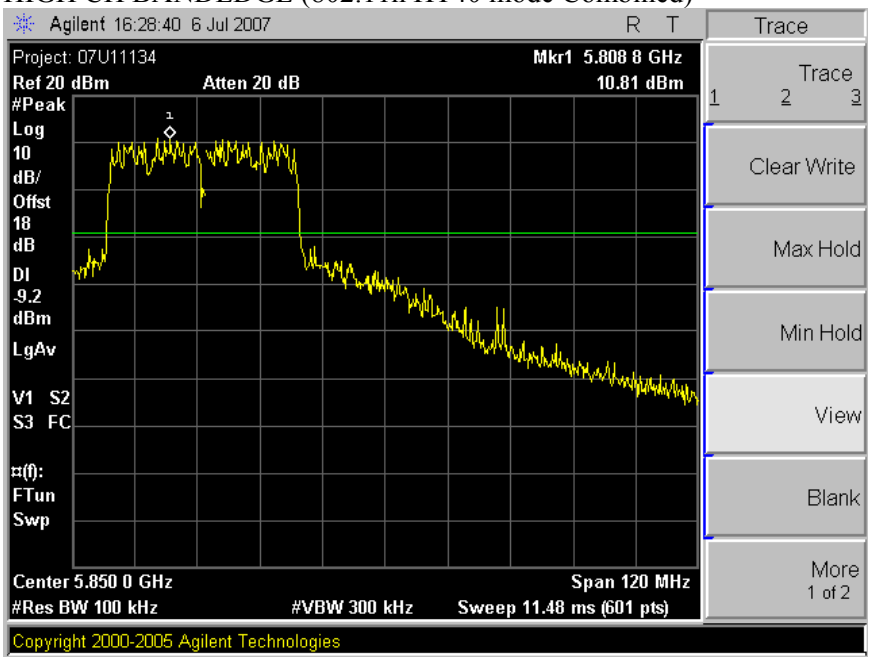
MID CH REFERENCE (802.11n HT40 mode Combined)



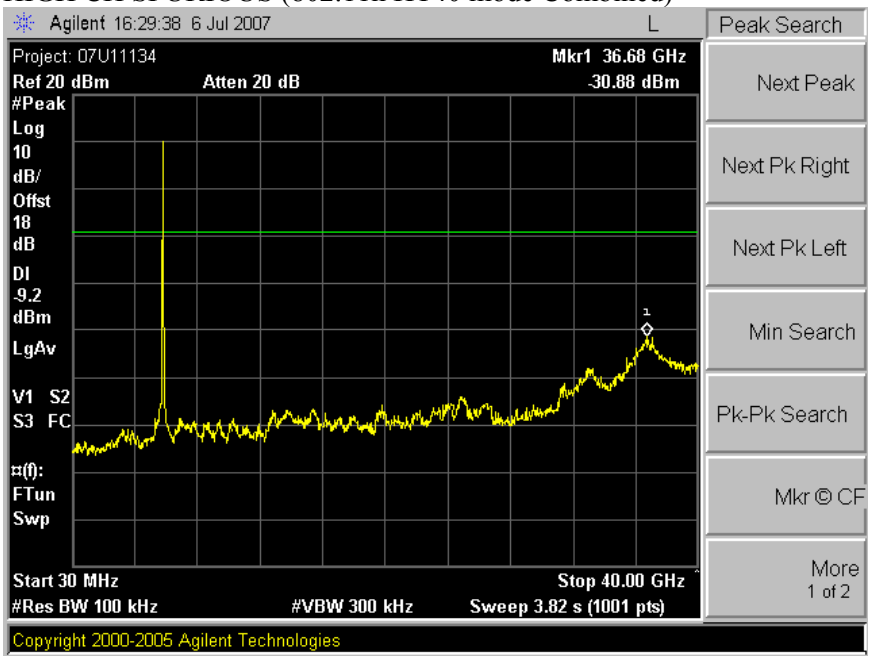
MID CH SPURIOUS (802.11n HT40 mode Combined)



HIGH CH BANDEDGE (802.11n HT40 mode Combined)



HIGH CH SPURIOUS (802.11n HT40 mode Combined)



# 7.3. RADIATED EMISSIONS

## 7.3.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

**LIMITS**

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| [1]0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2655 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | ([2]) |
| 13.36 - 13.41 | | | |

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (microvolts/meter) | Measurement Distance (meters) |
|---|---|---|
| 30 - 88 | 100 ** | 3 |
| 88 - 216 | 150 ** | 3 |
| 216 - 960 | 200 ** | 3 |
| Above 960 | 500 | 3 |

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

## TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

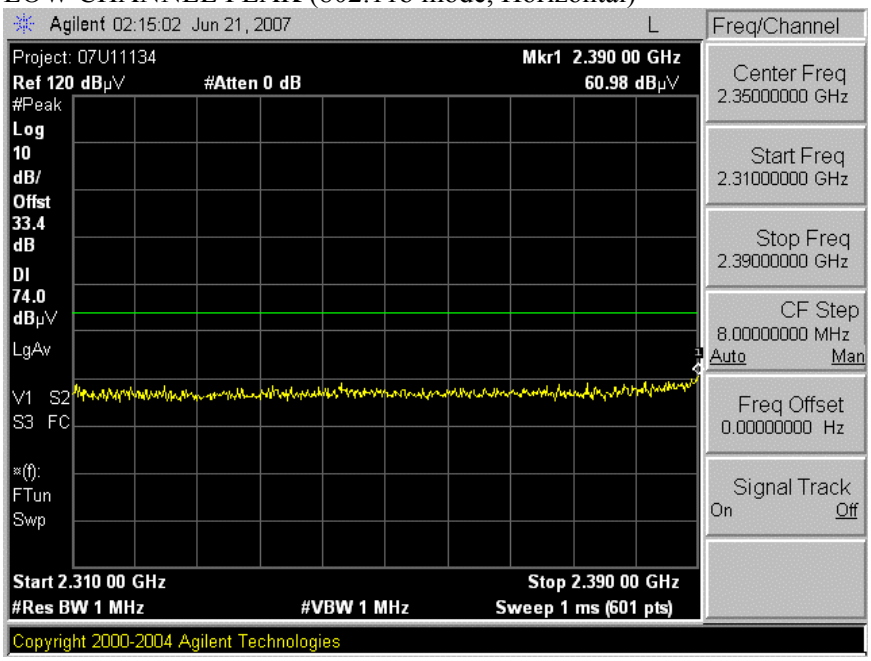
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each 5 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

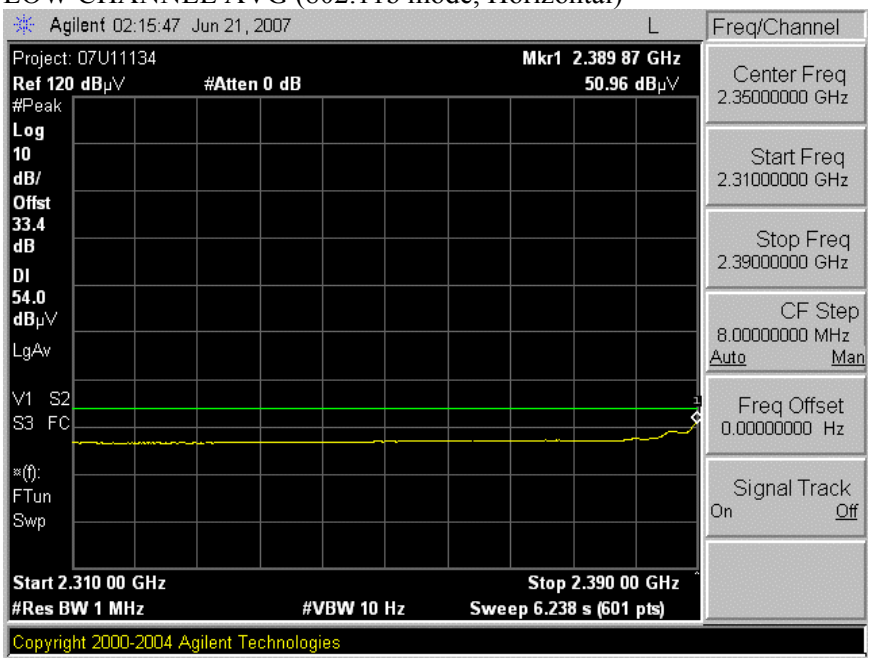
## 7.3.2. TRANSMITTER ABOVE 1 GHz FOR 2400 TO 2483.5 MHz BAND

**RESTRICTED BANDEDGE (802.11b MODE, LOW CHANNEL)**

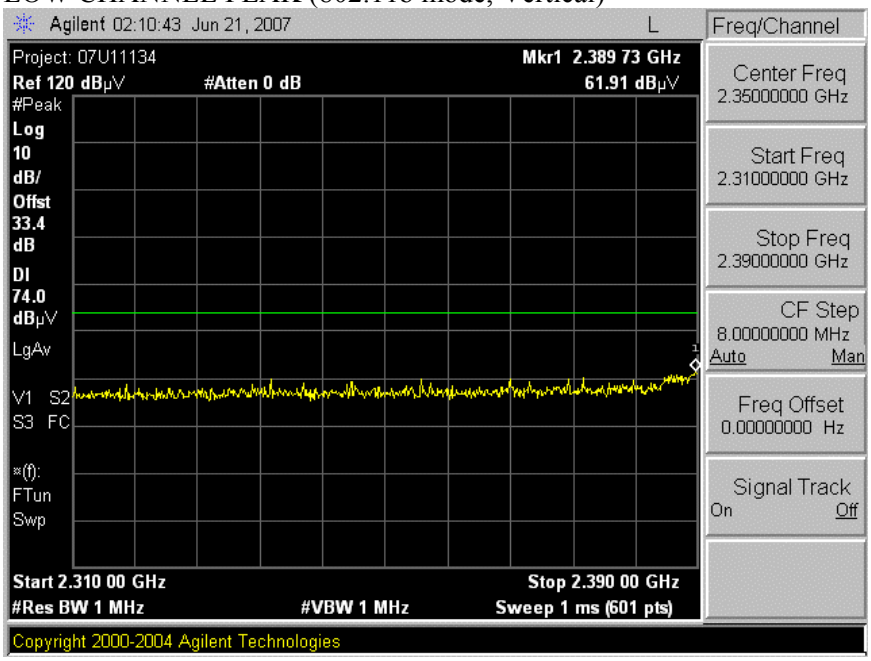
LOW CHANNEL PEAK (802.11b mode, Horizontal)



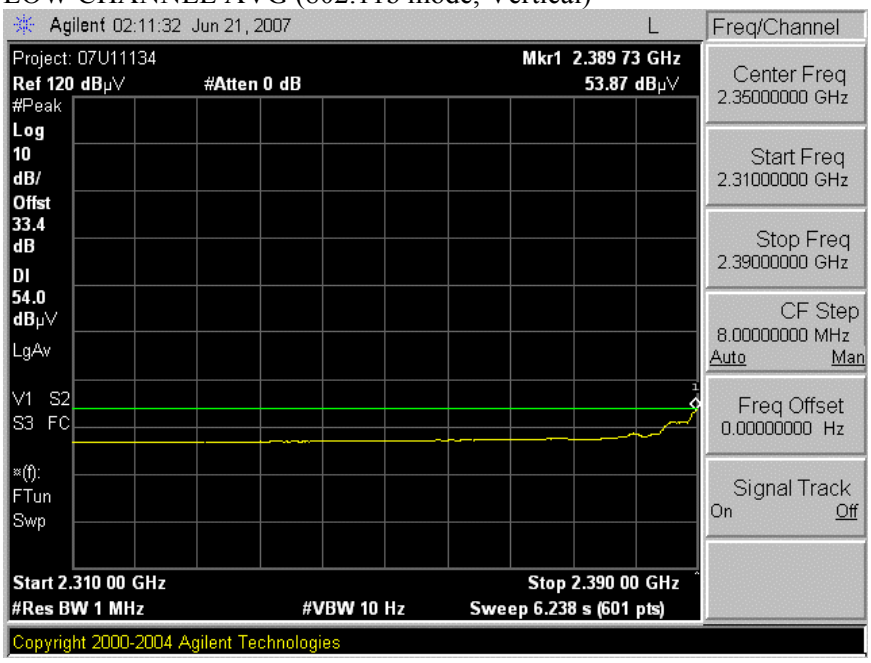
LOW CHANNEL AVG (802.11b mode, Horizontal)



LOW CHANNEL PEAK (802.11b mode, Vertical)

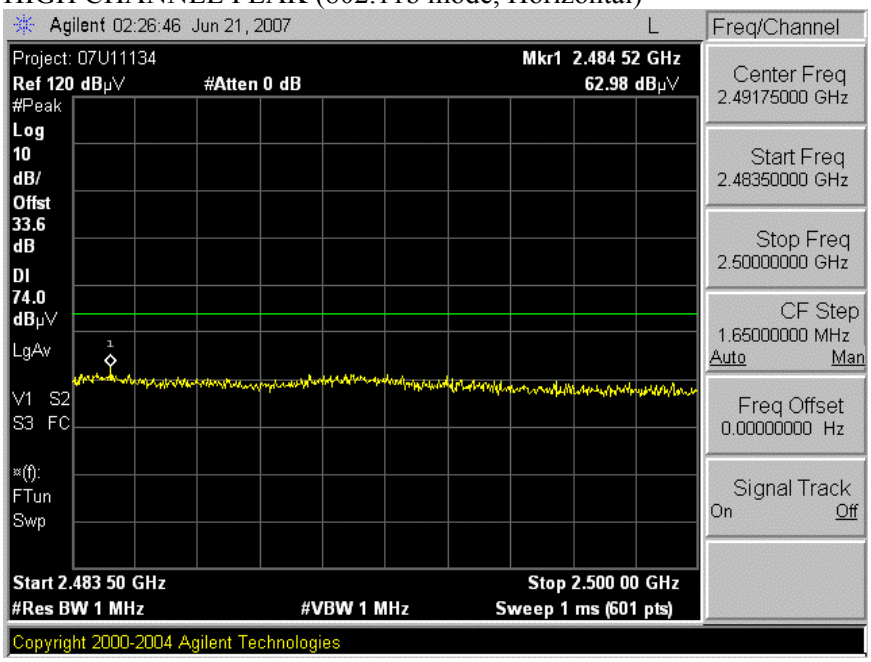


LOW CHANNEL AVG (802.11b mode, Vertical)

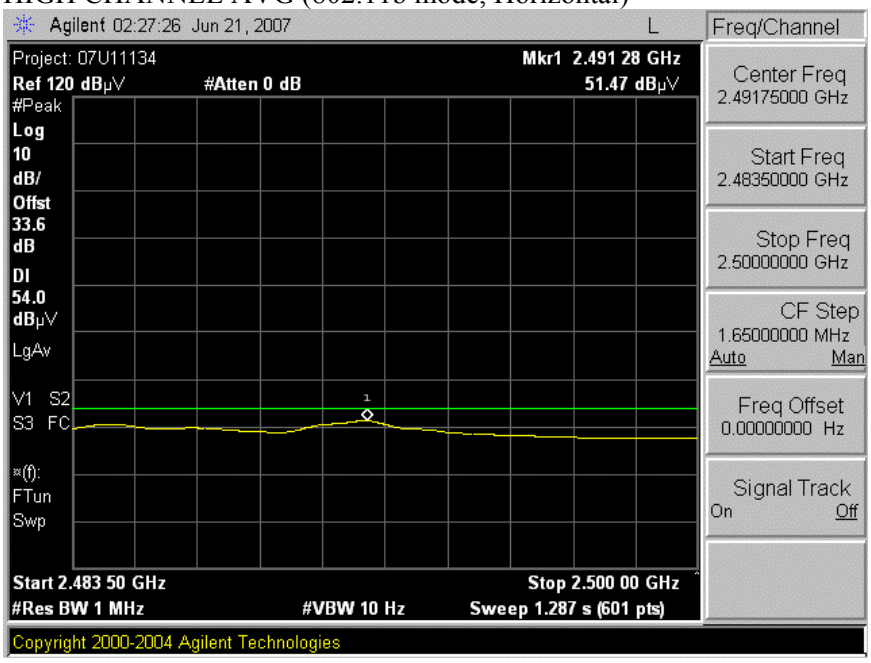


## RESTRICTED BANDEDGE (802.11b MODE, HIGH CHANNEL)

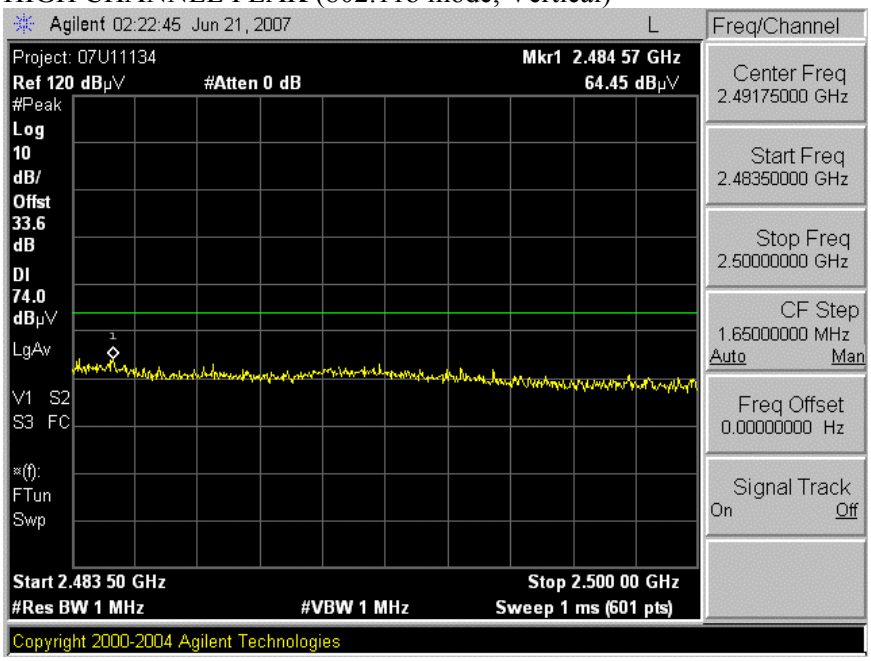
HIGH CHANNEL PEAK (802.11b mode, Horizontal)



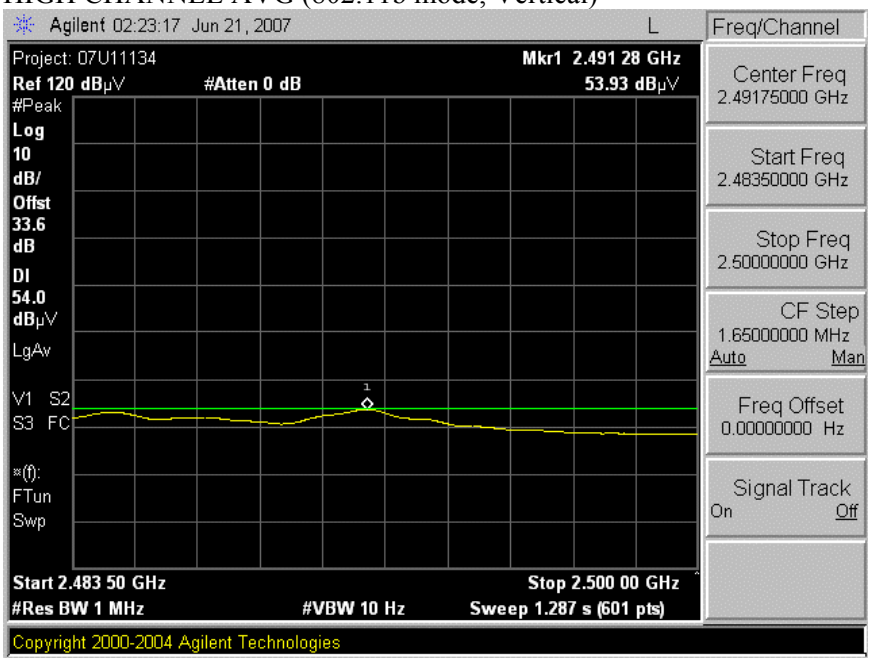
HIGH CHANNEL AVG (802.11b mode, Horizontal)



HIGH CHANNEL PEAK (802.11b mode, Vertical)



HIGH CHANNEL AVG (802.11b mode, Vertical)



## HARMONICS AND SPURIOUS EMISSIONS (802.11b MODE)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Qualcomm
Project #: 07U11134
Date: 6/21/2007
Test Engineer: William Zhuang
Configuration: EUT with Laptop
Mode: Transmit, b Mode

Test Equipment:

| Horn 1-18GHz | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz | Limit |
|---|---|---|---|---|
| T60; S/N: 2238 @3m | T145 Agilent 3008A005 | | | FCC 15.209 |

Hi Frequency Cables

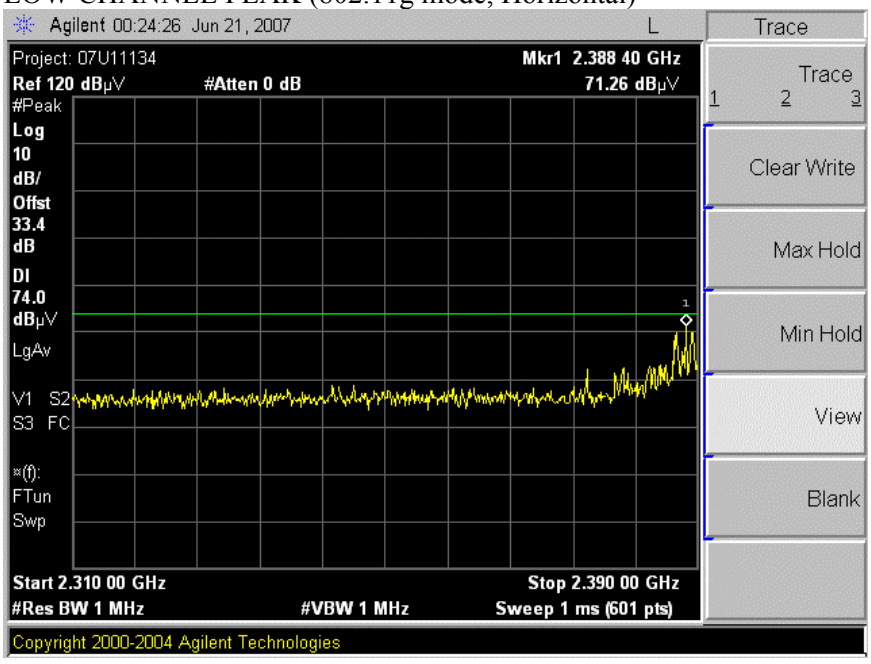
| 2 foot cable | 3 foot cable | 12 foot cable | HPF | Reject Filter |
|---|---|---|---|---|
| | | Gordon 203134001 | HPF_4.0GHz | |

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

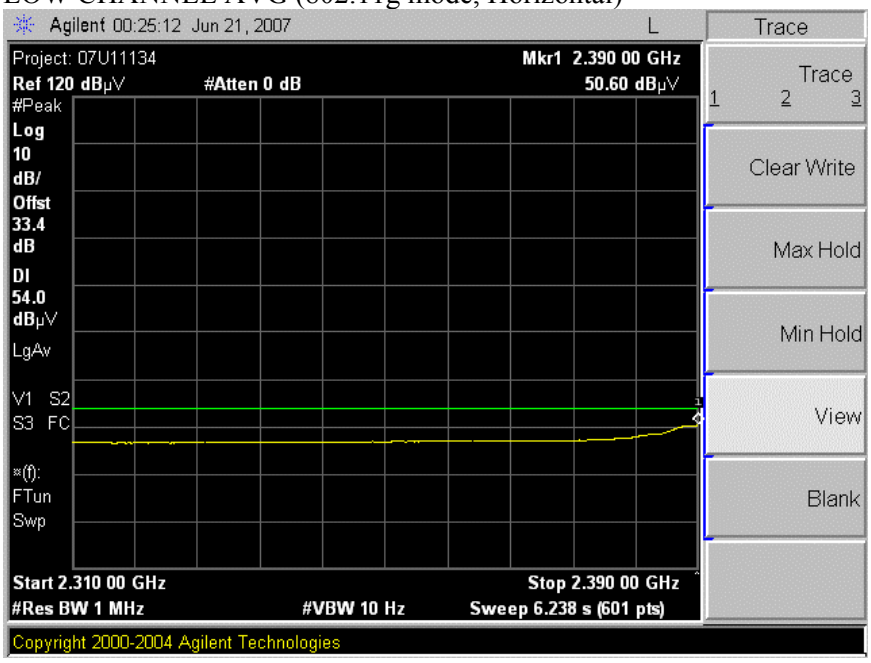
| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Low Ch. 2412MHz | | | | | | | | | | | | | | | |
| 4.824 | 3.0 | 43.0 | 37.1 | 33.0 | 6.9 | -34.8 | 0.0 | 0.6 | 48.6 | 42.7 | 74 | 54 | -25.4 | -11.3 | V |
| 7.236 | 3.0 | 43.7 | 37.2 | 35.4 | 8.4 | -34.7 | 0.0 | 0.6 | 53.5 | 46.9 | 74 | 54 | -20.5 | -7.1 | V |
| 9.648 | 3.0 | 39.9 | 33.7 | 37.1 | 9.7 | -35.0 | 0.0 | 0.8 | 52.5 | 46.4 | 74 | 54 | -21.5 | -7.6 | V |
| 4.824 | 3.0 | 41.2 | 31.3 | 33.0 | 6.9 | -34.8 | 0.0 | 0.6 | 46.8 | 36.9 | 74 | 54 | -27.2 | -17.1 | H |
| 7.236 | 3.0 | 40.1 | 28.5 | 35.4 | 8.4 | -34.7 | 0.0 | 0.6 | 49.9 | 38.3 | 74 | 54 | -24.1 | -15.7 | H |
| 9.648 | 3.0 | 37.3 | 24.2 | 37.1 | 9.7 | -35.0 | 0.0 | 0.8 | 50.0 | 36.8 | 74 | 54 | -24.0 | -17.2 | H |
| Mid Ch. 2437MHz | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 43.1 | 37.2 | 33.1 | 6.9 | -34.9 | 0.0 | 0.6 | 48.8 | 43.0 | 74 | 54 | -25.2 | -11.0 | V |
| 7.311 | 3.0 | 43.4 | 36.2 | 35.5 | 8.4 | -34.7 | 0.0 | 0.6 | 53.3 | 46.0 | 74 | 54 | -20.7 | -8.0 | V |
| 9.748 | 3.0 | 40.8 | 35.6 | 37.2 | 9.8 | -35.0 | 0.0 | 0.8 | 53.6 | 48.4 | 74 | 54 | -20.4 | -5.6 | V |
| 4.874 | 3.0 | 40.6 | 31.5 | 33.1 | 6.9 | -34.9 | 0.0 | 0.6 | 46.4 | 37.2 | 74 | 54 | -27.6 | -16.8 | H |
| 7.311 | 3.0 | 39.6 | 29.9 | 35.5 | 8.4 | -34.7 | 0.0 | 0.6 | 49.4 | 39.8 | 74 | 54 | -24.6 | -14.2 | H |
| 9.748 | 3.0 | 38.5 | 25.3 | 37.2 | 9.8 | -35.0 | 0.0 | 0.8 | 51.3 | 38.1 | 74 | 54 | -22.7 | -15.9 | H |
| High Ch. 2462MHz | | | | | | | | | | | | | | | |
| 4.924 | 3.0 | 44.7 | 40.6 | 33.1 | 7.0 | -34.9 | 0.0 | 0.6 | 50.6 | 46.4 | 74 | 54 | -23.4 | -7.6 | V |
| 7.386 | 3.0 | 41.8 | 32.4 | 35.6 | 8.4 | -34.6 | 0.0 | 0.6 | 51.8 | 42.4 | 74 | 54 | -22.2 | -11.6 | V |
| 9.848 | 3.0 | 40.6 | 35.2 | 37.3 | 9.9 | -35.1 | 0.0 | 0.8 | 53.6 | 48.2 | 74 | 54 | -20.4 | -5.8 | V |
| 4.924 | 3.0 | 40.5 | 31.6 | 33.1 | 7.0 | -34.9 | 0.0 | 0.6 | 46.3 | 37.5 | 74 | 54 | -27.7 | -16.5 | H |
| 7.386 | 3.0 | 40.1 | 30.3 | 35.6 | 8.4 | -34.6 | 0.0 | 0.6 | 50.1 | 40.4 | 74 | 54 | -23.9 | -13.6 | H |
| 9.848 | 3.0 | 38.5 | 24.9 | 37.3 | 9.9 | -35.1 | 0.0 | 0.8 | 51.4 | 37.9 | 74 | 54 | -22.6 | -16.1 | H |

## RESTRICTED BANDEDGE (802.11g MODE, LOW CHANNEL)

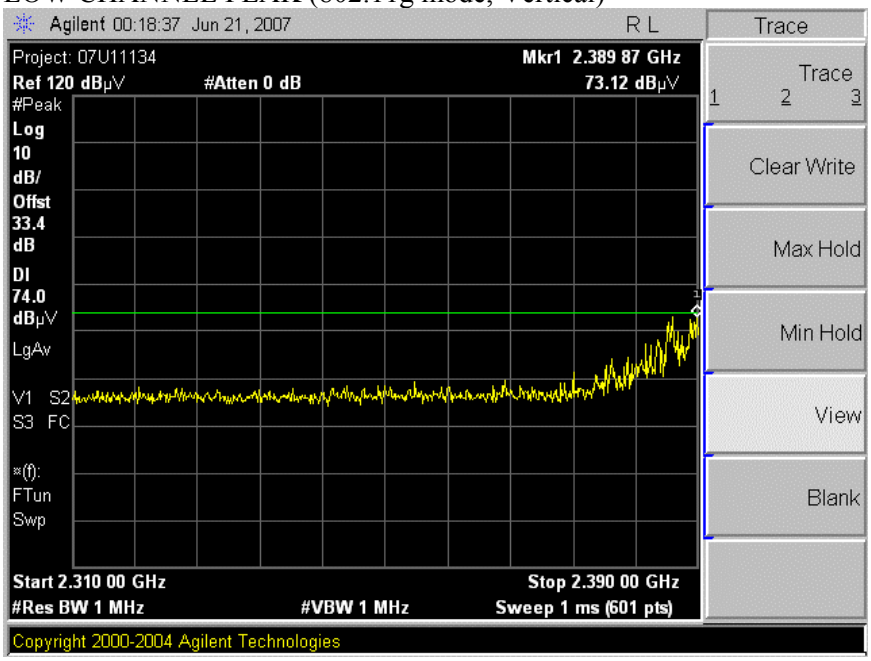
LOW CHANNEL PEAK (802.11g mode, Horizontal)



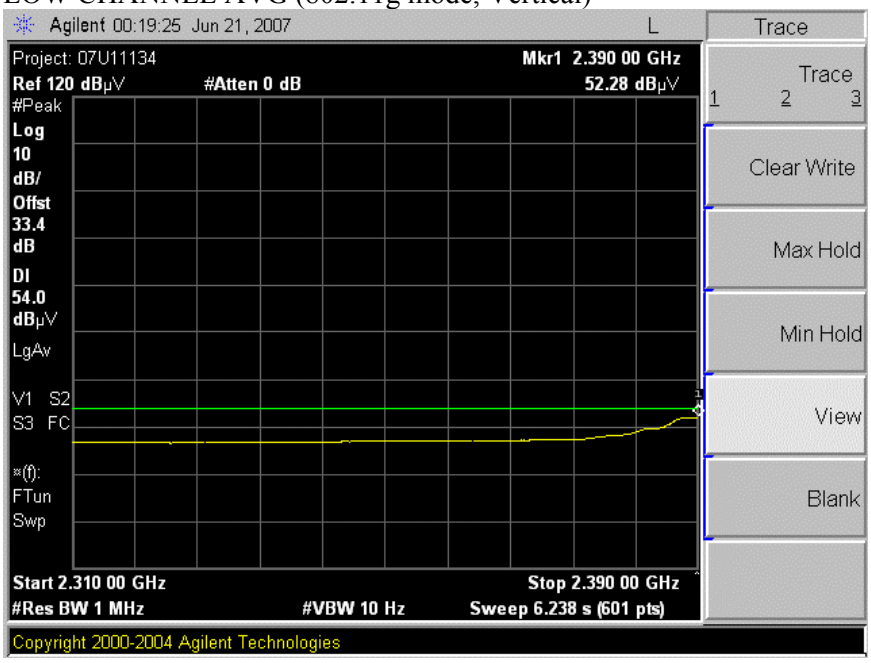
LOW CHANNEL AVG (802.11g mode, Horizontal)



LOW CHANNEL PEAK (802.11g mode, Vertical)

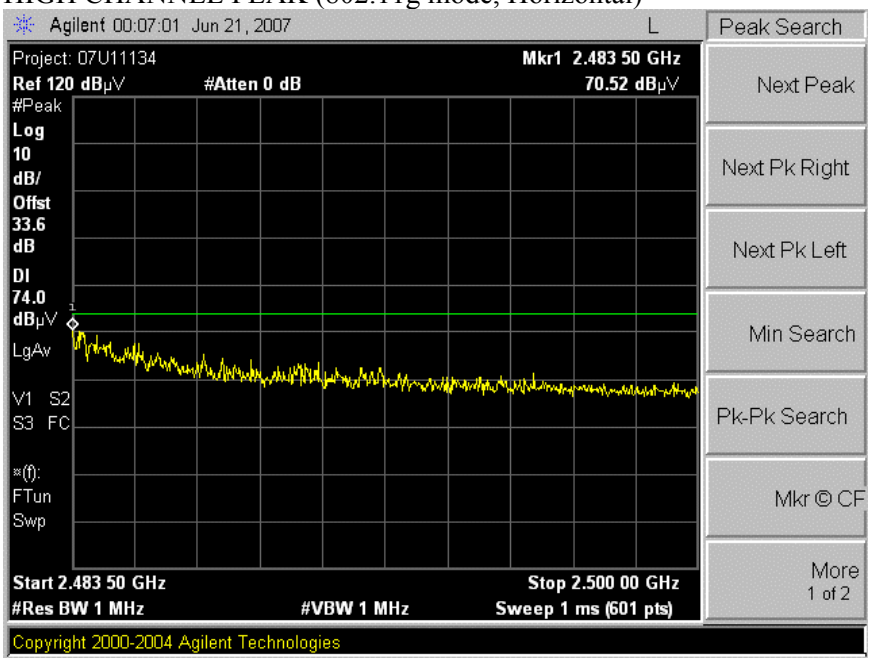


LOW CHANNEL AVG (802.11g mode, Vertical)

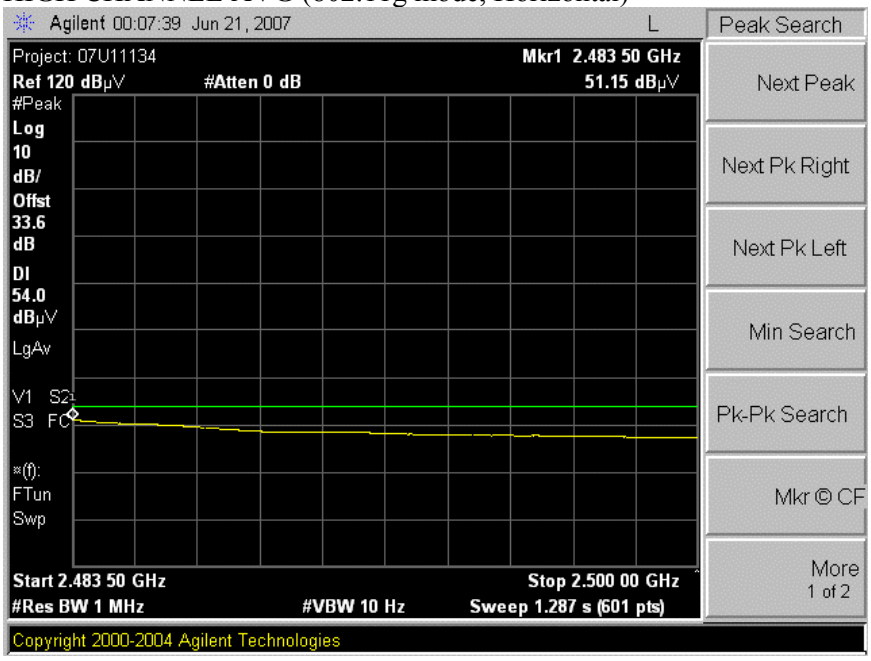


## RESTRICTED BANDEDGE (802.11g MODE, HIGH CHANNEL)

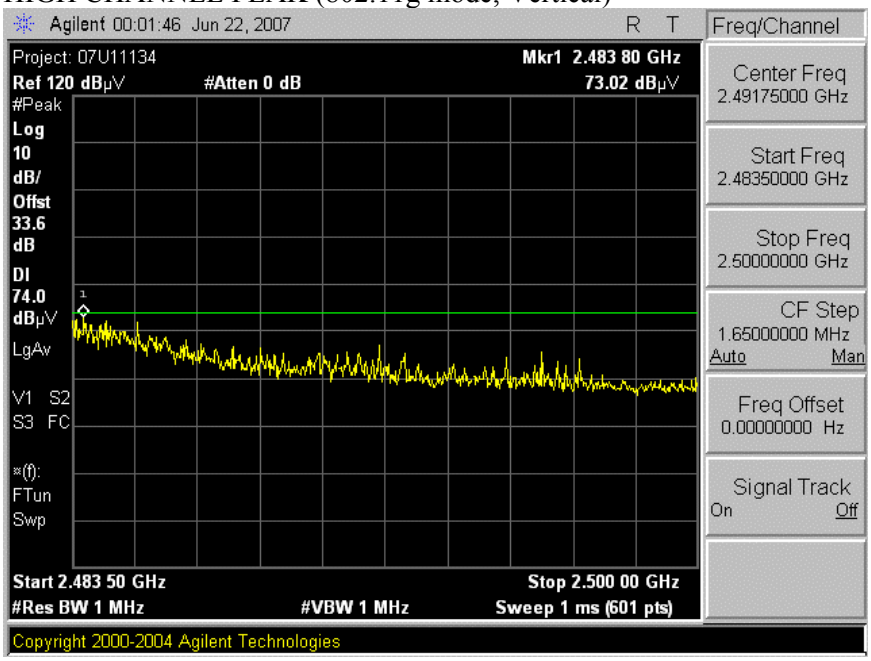
HIGH CHANNEL PEAK (802.11g mode, Horizontal)



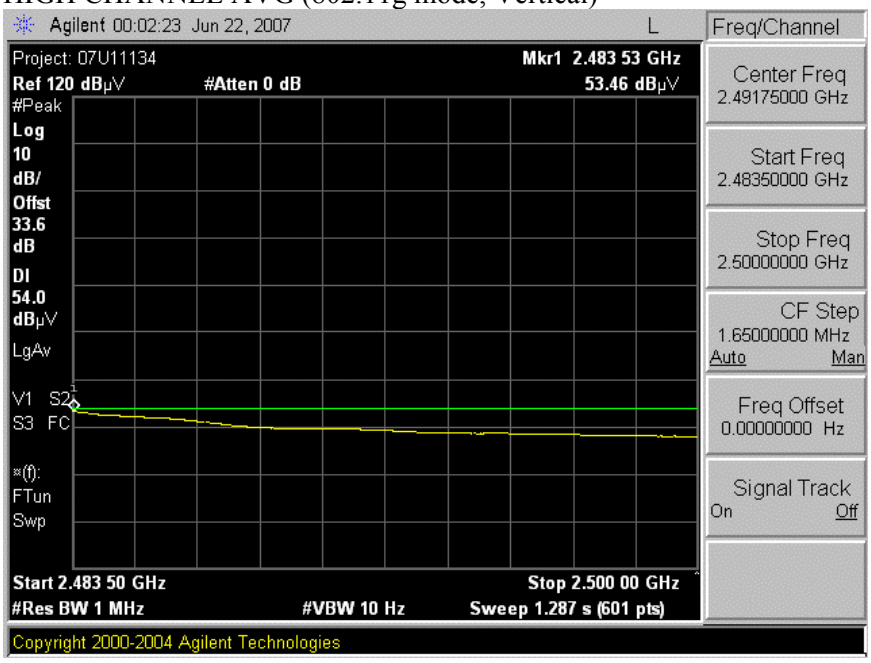
HIGH CHANNEL AVG (802.11g mode, Horizontal)



HIGH CHANNEL PEAK (802.11g mode, Vertical)



HIGH CHANNEL AVG (802.11g mode, Vertical)



## HARMONICS AND SPURIOUS EMISSIONS (802.11g MODE)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Qualcomm
Project #: 07U11134
Date: 6/21/2007
Test Engineer: William Zhuang
Configuration: EUT with Laptop
Mode: Transmit, g Legacy Mode

Test Equipment:

| Horn 1-18GHz | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz | Limit |
|---|---|---|---|---|
| T60; S/N: 2238 @3m | T145 Agilent 3008A005 | | | FCC 15.209 |

Hi Frequency Cables

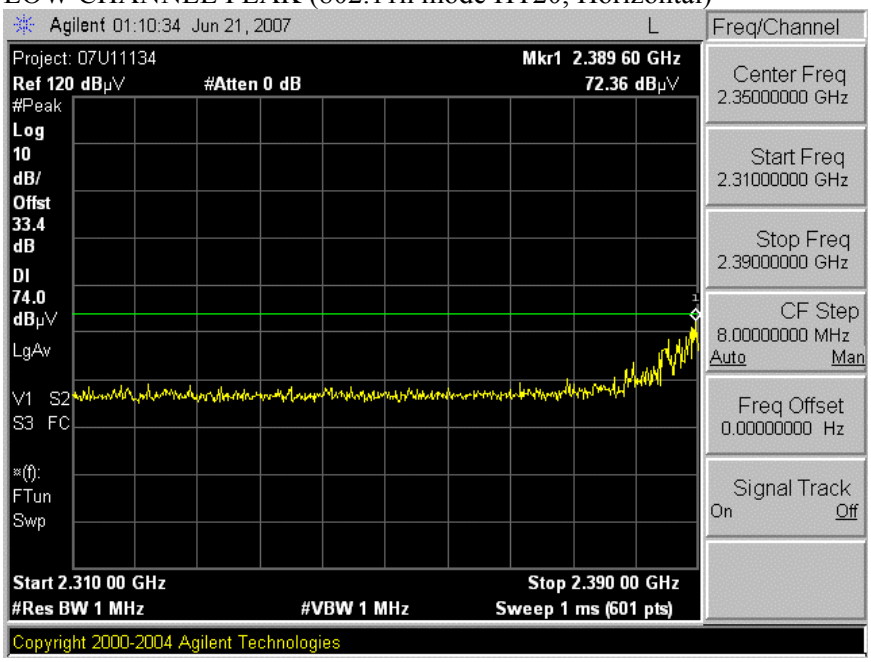
| 2 foot cable | 3 foot cable | 12 foot cable | HPF | Reject Filter |
|---|---|---|---|---|
| | | Gordon 203134001 | HPF_4.0GHz | |

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

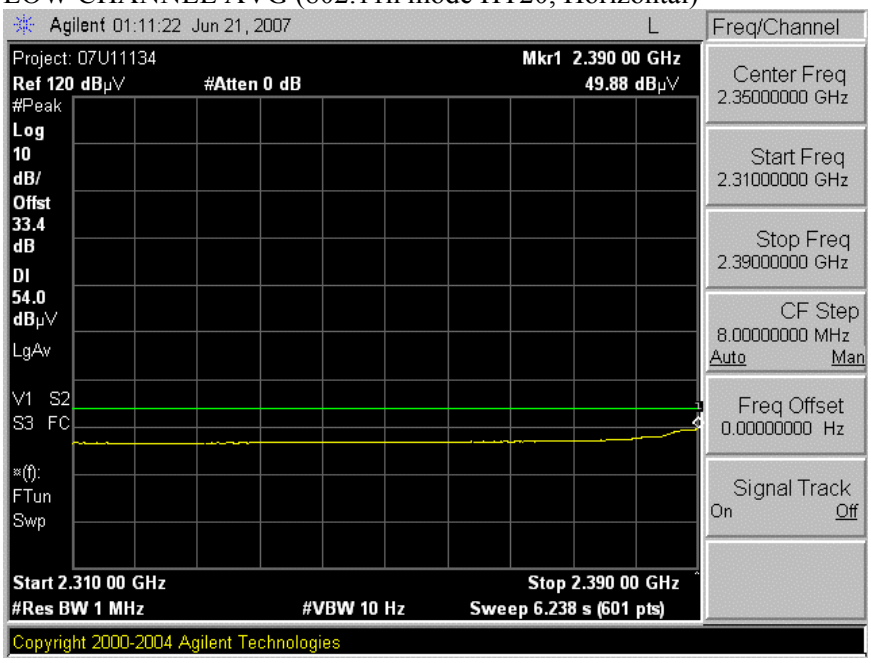
| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Low Ch. 2412MHz | | | | | | | | | | | | | | | |
| 4.824 | 3.0 | 39.8 | 27.6 | 33.0 | 6.9 | -34.8 | 0.0 | 0.6 | 45.4 | 33.3 | 74 | 54 | -28.6 | -20.7 | V |
| 7.236 | 3.0 | 41.4 | 27.9 | 35.4 | 8.4 | -34.7 | 0.0 | 0.6 | 51.2 | 37.7 | 74 | 54 | -22.8 | -16.3 | V |
| 4.824 | 3.0 | 40.5 | 26.0 | 33.0 | 6.9 | -34.8 | 0.0 | 0.6 | 46.1 | 31.7 | 74 | 54 | -27.9 | -22.3 | H |
| 7.236 | 3.0 | 38.3 | 25.5 | 35.4 | 8.4 | -34.7 | 0.0 | 0.6 | 48.1 | 35.2 | 74 | 54 | -25.9 | -18.8 | H |
| Mid Ch. 2437MHz | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 40.7 | 27.0 | 33.1 | 6.9 | -34.9 | 0.0 | 0.6 | 46.4 | 32.8 | 74 | 54 | -27.6 | -21.2 | V |
| 7.311 | 3.0 | 42.8 | 30.8 | 35.5 | 8.4 | -34.7 | 0.0 | 0.6 | 52.7 | 40.7 | 74 | 54 | -21.3 | -13.3 | V |
| 9.748 | 3.0 | 37.5 | 25.0 | 37.2 | 9.8 | -35.0 | 0.0 | 0.8 | 50.3 | 37.8 | 74 | 54 | -23.7 | -16.2 | V |
| 4.874 | 3.0 | 38.8 | 25.9 | 33.1 | 6.9 | -34.9 | 0.0 | 0.6 | 44.6 | 31.6 | 74 | 54 | -29.4 | -22.4 | H |
| 7.311 | 3.0 | 38.3 | 25.5 | 35.5 | 8.4 | -34.7 | 0.0 | 0.6 | 48.1 | 35.4 | 74 | 54 | -25.9 | -18.6 | H |
| 9.748 | 3.0 | 36.7 | 23.8 | 37.2 | 9.8 | -35.0 | 0.0 | 0.8 | 49.5 | 36.6 | 74 | 54 | -24.5 | -17.4 | H |
| High Ch. 2462MHz | | | | | | | | | | | | | | | |
| 4.924 | 3.0 | 39.1 | 25.5 | 33.1 | 7.0 | -34.9 | 0.0 | 0.6 | 44.9 | 31.4 | 74 | 54 | -29.1 | -22.6 | V |
| 7.386 | 3.0 | 39.1 | 26.0 | 35.6 | 8.4 | -34.6 | 0.0 | 0.6 | 49.1 | 36.0 | 74 | 54 | -24.9 | -18.0 | V |
| 4.924 | 3.0 | 38.8 | 25.4 | 33.1 | 7.0 | -34.9 | 0.0 | 0.6 | 44.7 | 31.3 | 74 | 54 | -29.3 | -22.7 | H |
| 7.386 | 3.0 | 38.7 | 25.2 | 35.6 | 8.4 | -34.6 | 0.0 | 0.6 | 48.7 | 35.2 | 74 | 54 | -25.3 | -18.8 | H |

## RESTRICTED BANDEDGE (802.11n MODE HT20, LOW CHANNEL)

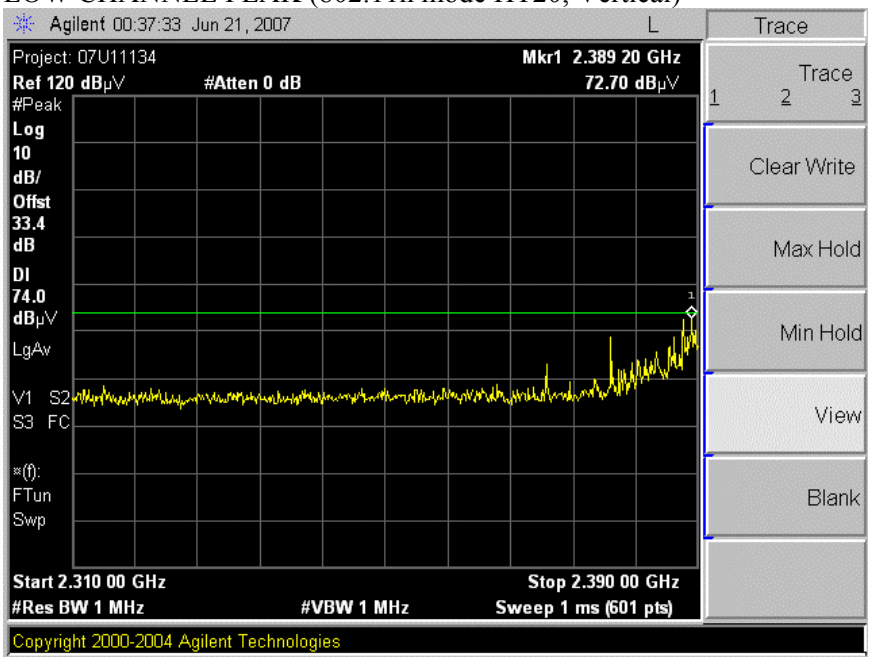
LOW CHANNEL PEAK (802.11n mode HT20, Horizontal)



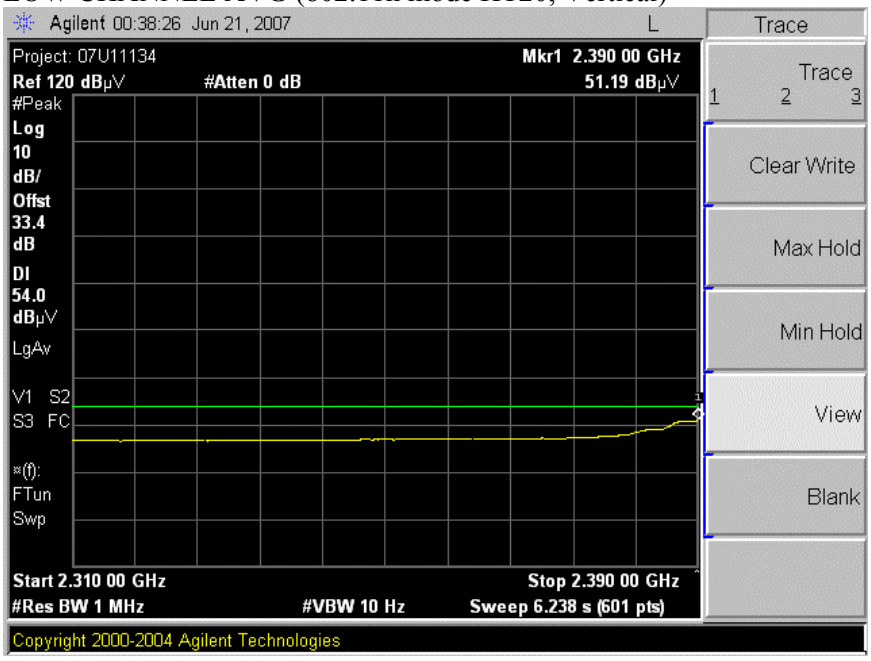
LOW CHANNEL AVG (802.11n mode HT20, Horizontal)



LOW CHANNEL PEAK (802.11n mode HT20, Vertical)

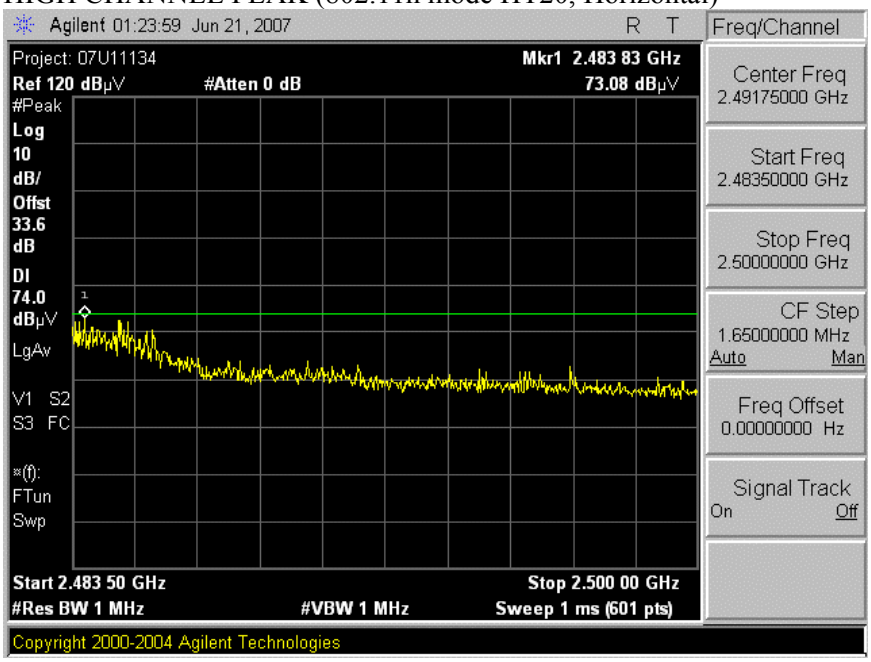


LOW CHANNEL AVG (802.11n mode HT20, Vertical)

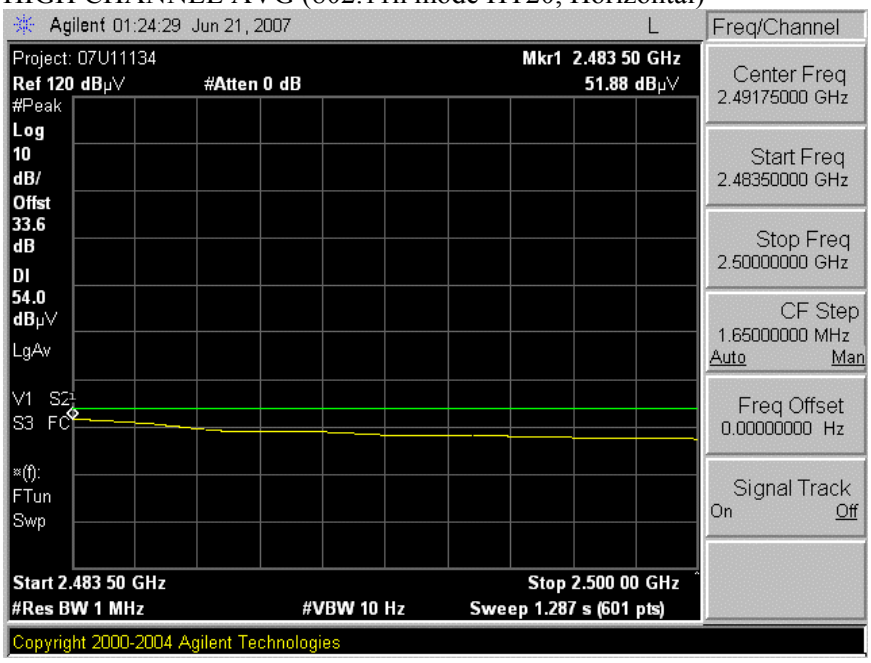


## RESTRICTED BANDEDGE (802.11n MODE HT20, HIGH CHANNEL)

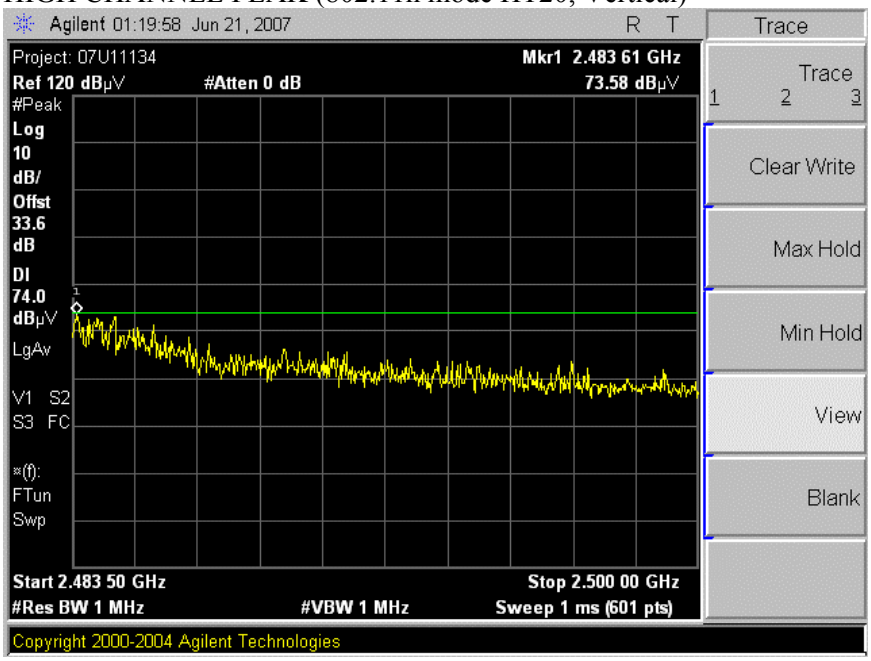
HIGH CHANNEL PEAK (802.11n mode HT20, Horizontal)



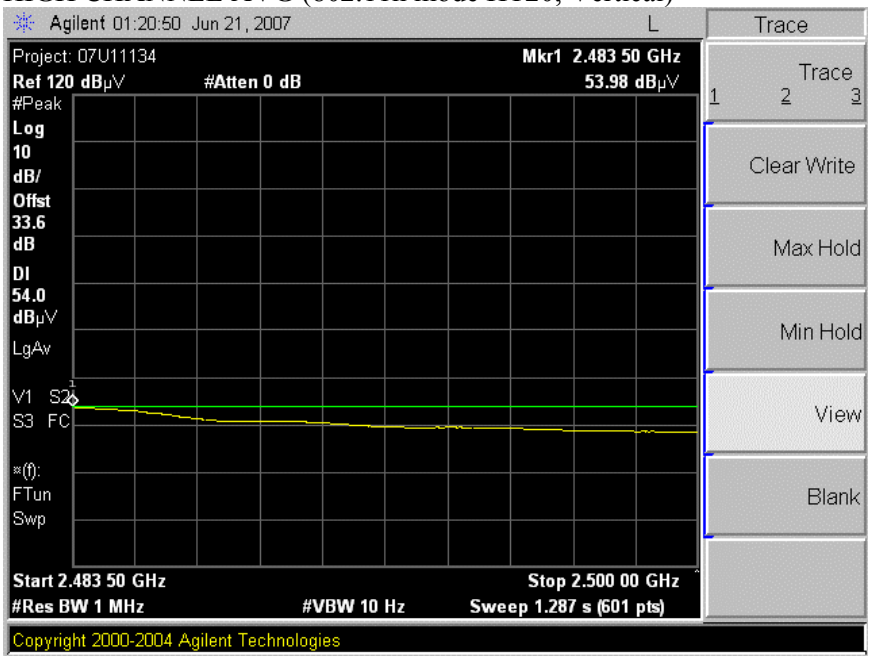
HIGH CHANNEL AVG (802.11n mode HT20, Horizontal)



HIGH CHANNEL PEAK (802.11n mode HT20, Vertical)



HIGH CHANNEL AVG (802.11n mode HT20, Vertical)



## HARMONICS AND SPURIOUS EMISSIONS (802.11n MODE HT20)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Qualcomm
Project #: 07U11134
Date: 6/21/2007
Test Engineer: William Zhuang
Configuration: EUT with Laptop
Mode: Transmit, g HT20 Mode

Test Equipment:

| Horn 1-18GHz | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz | Limit |
|---|---|---|---|---|
| T60; S/N: 2238 @3m | T145 Agilent 3008A005 | | | FCC 15.209 |

Hi Frequency Cables

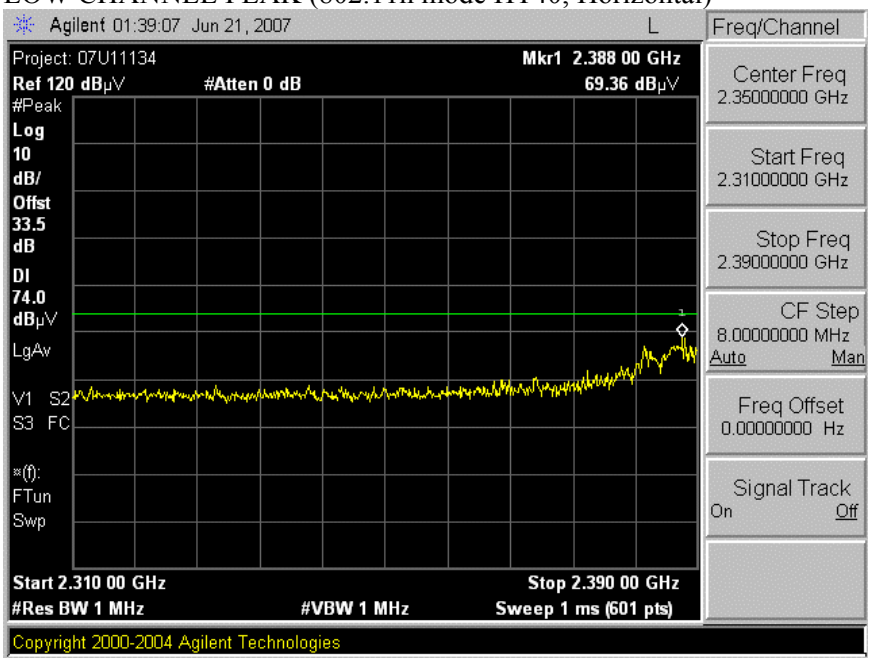
| 2 foot cable | 3 foot cable | 12 foot cable | HPF | Reject Filter |
|---|---|---|---|---|
| | | Gordon 203134001 | HPF_4.0GHz | |

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

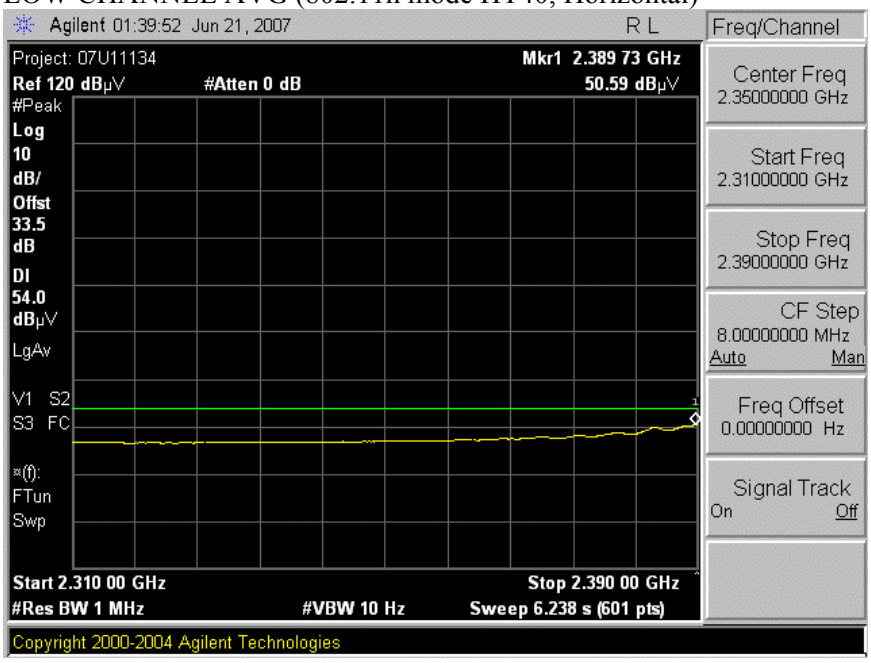
| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Low Ch. 2412MHz | | | | | | | | | | | | | | | |
| 4.824 | 3.0 | 38.2 | 26.6 | 33.0 | 6.9 | -34.8 | 0.0 | 0.6 | 43.9 | 32.2 | 74 | 54 | -30.1 | -21.8 | V |
| 7.236 | 3.0 | 39.2 | 26.4 | 35.4 | 8.4 | -34.7 | 0.0 | 0.6 | 48.9 | 36.1 | 74 | 54 | -25.1 | -17.9 | V |
| 4.824 | 3.0 | 38.7 | 26.2 | 33.0 | 6.9 | -34.8 | 0.0 | 0.6 | 44.3 | 31.8 | 74 | 54 | -29.7 | -22.2 | H |
| 7.236 | 3.0 | 38.0 | 25.2 | 35.4 | 8.4 | -34.7 | 0.0 | 0.6 | 47.7 | 34.9 | 74 | 54 | -26.3 | -19.1 | H |
| Mid Ch. 2437MHz | | | | | | | | | | | | | | | |
| 4.874 | 3.0 | 39.7 | 27.9 | 33.1 | 6.9 | -34.9 | 0.0 | 0.6 | 45.5 | 33.7 | 74 | 54 | -28.5 | -20.3 | V |
| 7.311 | 3.0 | 40.2 | 27.7 | 35.5 | 8.4 | -34.7 | 0.0 | 0.6 | 50.1 | 37.6 | 74 | 54 | -23.9 | -16.4 | V |
| 9.748 | 3.0 | 37.4 | 25.0 | 37.2 | 9.8 | -35.0 | 0.0 | 0.8 | 50.2 | 37.8 | 74 | 54 | -23.8 | -16.2 | V |
| 4.874 | 3.0 | 38.8 | 25.8 | 33.1 | 6.9 | -34.9 | 0.0 | 0.6 | 44.5 | 31.5 | 74 | 54 | -29.5 | -22.5 | H |
| 7.311 | 3.0 | 39.2 | 26.9 | 35.5 | 8.4 | -34.7 | 0.0 | 0.6 | 49.0 | 36.8 | 74 | 54 | -25.0 | -17.2 | H |
| 9.748 | 3.0 | 36.4 | 24.2 | 37.2 | 9.8 | -35.0 | 0.0 | 0.8 | 49.2 | 37.0 | 74 | 54 | -24.8 | -17.0 | H |
| High Ch. 2462MHz | | | | | | | | | | | | | | | |
| 4.924 | 3.0 | 38.7 | 26.3 | 33.1 | 7.0 | -34.9 | 0.0 | 0.6 | 44.5 | 32.1 | 74 | 54 | -29.5 | -21.9 | V |
| 7.386 | 3.0 | 37.9 | 25.1 | 35.6 | 8.4 | -34.6 | 0.0 | 0.6 | 47.9 | 35.2 | 74 | 54 | -26.1 | -18.8 | V |
| 4.924 | 3.0 | 38.5 | 25.4 | 33.1 | 7.0 | -34.9 | 0.0 | 0.6 | 44.3 | 31.3 | 74 | 54 | -29.7 | -22.7 | H |
| 7.386 | 3.0 | 38.6 | 25.7 | 35.6 | 8.4 | -34.6 | 0.0 | 0.6 | 48.6 | 35.7 | 74 | 54 | -25.4 | -18.3 | H |

## RESTRICTED BANDEDGE (802.11n MODE HT40, LOW CHANNEL)

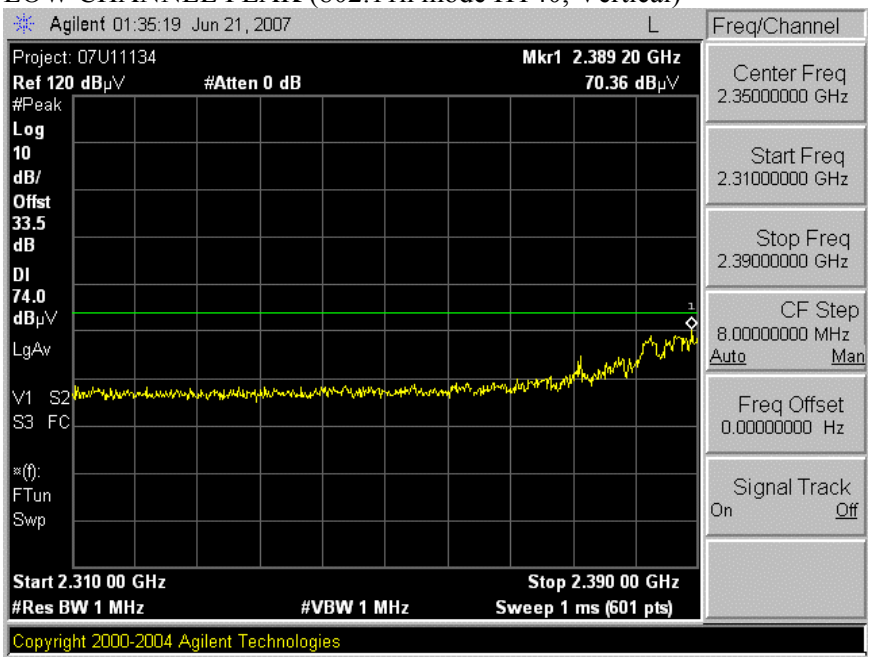
LOW CHANNEL PEAK (802.11n mode HT40, Horizontal)



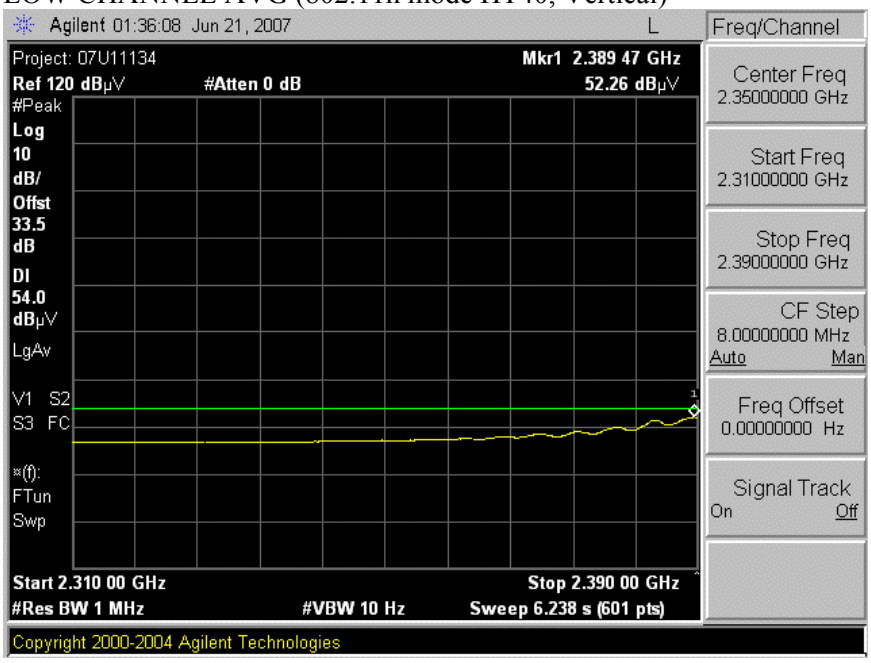
LOW CHANNEL AVG (802.11n mode HT40, Horizontal)



LOW CHANNEL PEAK (802.11n mode HT40, Vertical)

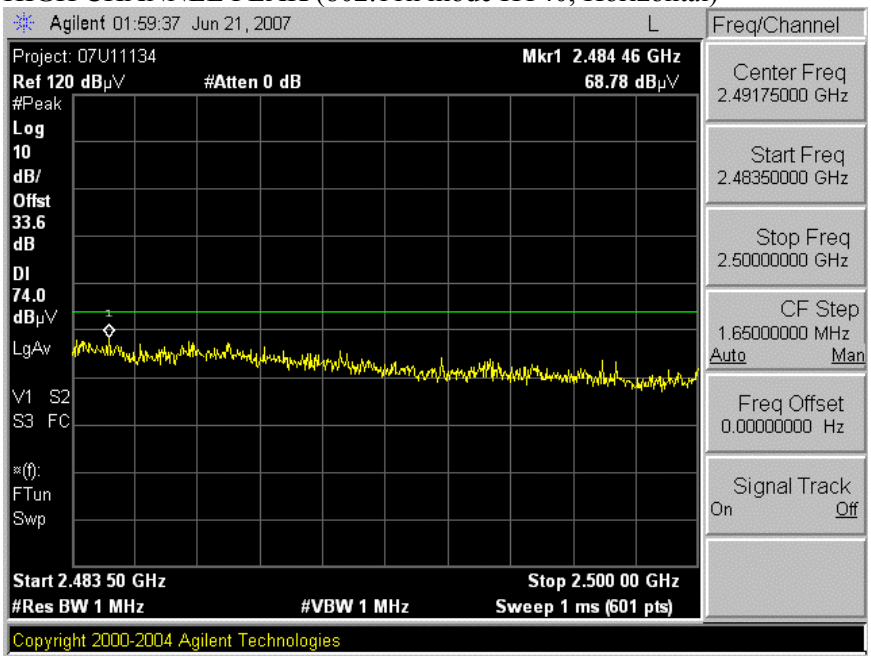


LOW CHANNEL AVG (802.11n mode HT40, Vertical)

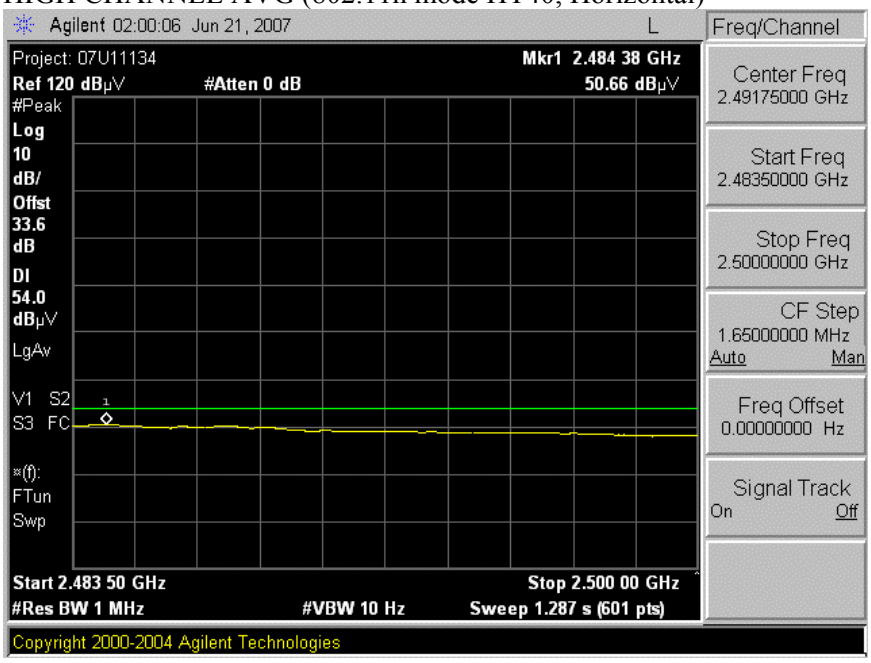


## RESTRICTED BANDEDGE (802.11n MODE HT40, HIGH CHANNEL)

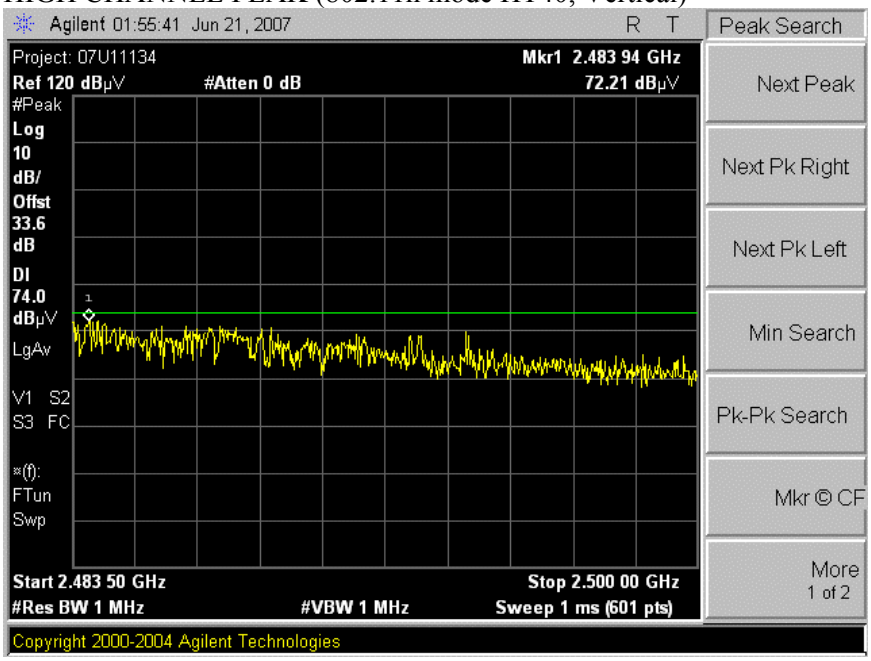
HIGH CHANNEL PEAK (802.11n mode HT40, Horizontal)



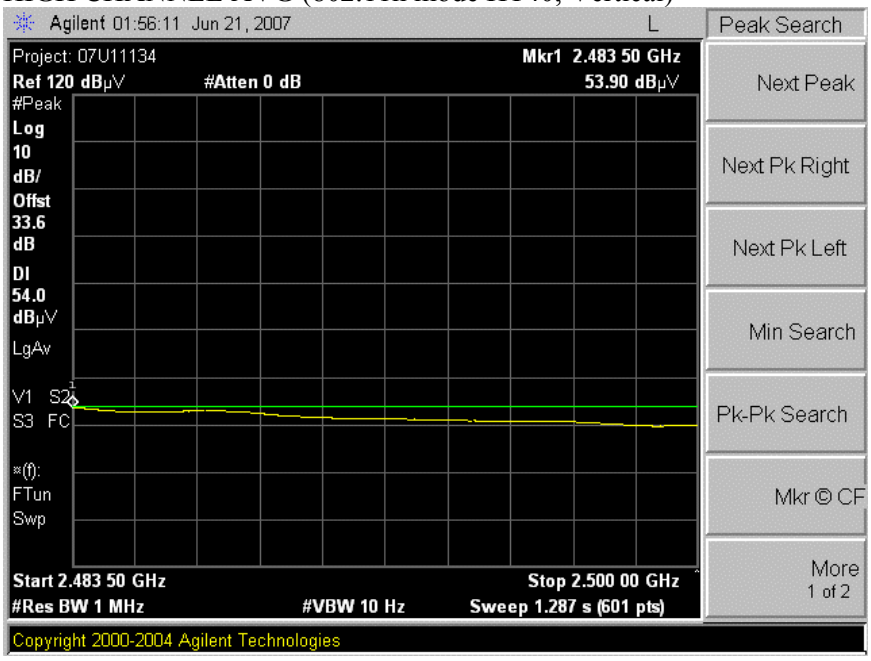
HIGH CHANNEL AVG (802.11n mode HT40, Horizontal)



HIGH CHANNEL PEAK (802.11n mode HT40, Vertical)



HIGH CHANNEL AVG (802.11n mode HT40, Vertical)



## HARMONICS AND SPURIOUS EMISSIONS (802.11n MODE HT40)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Qualcomm
Project #: 07U11134
Date: 6/22/2007
Test Engineer: William Zhuang
Configuration: EUT with Laptop
Mode: Transmit, g HT40 Mode

Test Equipment:

| Horn 1-18GHz | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz | Limit |
|---|---|---|---|---|
| T60; S/N: 2238 @3m | T145 Agilent 3008A005 | | | FCC 15.209 |

Hi Frequency Cables

| 2 foot cable | 3 foot cable | 12 foot cable | HPF | Reject Filter |
|---|---|---|---|---|
| | | Gordon 203134001 | HPF_4.0GHz | |

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Low Ch. 2422MHz | | | | | | | | | | | | | | | |
| 4.844 | 3.0 | 39.2 | 26.4 | 33.0 | 6.9 | -34.8 | 0.0 | 0.6 | 44.9 | 32.1 | 74 | 54 | -29.1 | -21.9 | V |
| 7.266 | 3.0 | 40.0 | 26.2 | 35.4 | 8.4 | -34.7 | 0.0 | 0.6 | 49.8 | 36.0 | 74 | 54 | -24.2 | -18.0 | V |
| 4.844 | 3.0 | 39.2 | 25.6 | 33.0 | 6.9 | -34.8 | 0.0 | 0.6 | 44.9 | 31.3 | 74 | 54 | -29.1 | -22.7 | H |
| 7.266 | 3.0 | 38.4 | 25.0 | 35.4 | 8.4 | -34.7 | 0.0 | 0.6 | 48.2 | 34.8 | 74 | 54 | -25.8 | -19.2 | H |
| Mid Ch. 2447MHz | | | | | | | | | | | | | | | |
| 4.894 | 3.0 | 39.1 | 26.1 | 33.1 | 6.9 | -34.9 | 0.0 | 0.6 | 44.9 | 31.8 | 74 | 54 | -29.1 | -22.2 | V |
| 7.341 | 3.0 | 38.1 | 25.5 | 35.5 | 8.4 | -34.6 | 0.0 | 0.6 | 48.0 | 35.4 | 74 | 54 | -26.0 | -18.6 | V |
| 9.788 | 3.0 | 37.4 | 23.7 | 37.2 | 9.8 | -35.0 | 0.0 | 0.8 | 50.3 | 36.5 | 74 | 54 | -23.7 | -17.5 | V |
| 4.894 | 3.0 | 39.1 | 25.4 | 33.1 | 6.9 | -34.9 | 0.0 | 0.6 | 44.9 | 31.2 | 74 | 54 | -29.1 | -22.8 | H |
| 7.341 | 3.0 | 37.8 | 24.9 | 35.5 | 8.4 | -34.6 | 0.0 | 0.6 | 47.7 | 34.8 | 74 | 54 | -26.3 | -19.2 | H |
| 9.788 | 3.0 | 37.8 | 23.6 | 37.2 | 9.8 | -35.0 | 0.0 | 0.8 | 50.7 | 36.4 | 74 | 54 | -23.3 | -17.6 | H |
| High Ch. 2452MHz | | | | | | | | | | | | | | | |
| 4.904 | 3.0 | 39.2 | 25.3 | 33.1 | 7.0 | -34.9 | 0.0 | 0.6 | 45.0 | 31.1 | 74 | 54 | -29.0 | -22.9 | V |
| 7.356 | 3.0 | 38.2 | 24.8 | 35.5 | 8.4 | -34.6 | 0.0 | 0.6 | 48.2 | 34.7 | 74 | 54 | -25.8 | -19.3 | V |
| 4.904 | 3.0 | 38.9 | 25.2 | 33.1 | 7.0 | -34.9 | 0.0 | 0.6 | 44.7 | 30.9 | 74 | 54 | -29.3 | -23.1 | H |
| 7.356 | 3.0 | 38.6 | 24.7 | 35.5 | 8.4 | -34.6 | 0.0 | 0.6 | 48.5 | 34.7 | 74 | 54 | -25.5 | -19.3 | H |

## 7.3.3. TRANSMITTER ABOVE 1 GHz FOR 5725 TO 5850 MHz BAND

### HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Qualcomm
Project #: 07U11134
Date: 6/15/2007
Test Engineer: William Zhuang
Configuration: EUT with Laptop
Mode: Transmit, 5.8 GHz DTS

Test Equipment:

| Horn 1-18GHz | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz | Limit |
|---|---|---|---|---|
| T73; S/N: 6717 @3m | T145 Agilent 3008A005 | | | FCC 15.209 |

Hi Frequency Cables

| 2 foot cable | 3 foot cable | 12 foot cable | HPF | Reject Filter |
|---|---|---|---|---|
| | | Gordon 203134001 | HPF_7.6GHz | |

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Low Ch. 5745MHz | | | | | | | | | | | | | | | |
| 11.490 | 3.0 | 45.0 | 33.4 | 37.5 | 11.6 | -33.1 | 0.0 | 0.7 | 61.7 | 50.1 | 74 | 54 | -12.3 | -3.9 | V |
| 17.235 | 3.0 | 43.8 | 28.7 | 41.7 | 13.3 | -32.0 | 0.0 | 0.6 | 67.5 | 52.3 | 88 | 68 | -20.5 | -15.7 | V, Non Restricted Band |
| 11.490 | 3.0 | 45.1 | 32.7 | 37.5 | 11.6 | -33.1 | 0.0 | 0.7 | 61.7 | 49.4 | 74 | 54 | -12.3 | -4.6 | H |
| 17.235 | 3.0 | 43.6 | 29.4 | 41.7 | 13.3 | -32.0 | 0.0 | 0.6 | 67.3 | 53.1 | 88 | 68 | -20.7 | -14.9 | H, Non Restricted Band |
| Mid Ch. 5785MHz | | | | | | | | | | | | | | | |
| 11.570 | 3.0 | 46.1 | 33.1 | 37.5 | 11.7 | -33.0 | 0.0 | 0.7 | 63.0 | 50.0 | 74 | 54 | -11.0 | -4.0 | V |
| 17.355 | 3.0 | 45.5 | 32.1 | 42.2 | 13.3 | -32.0 | 0.0 | 0.6 | 69.6 | 56.3 | 88 | 68 | -18.4 | -11.7 | V, Non Restricted Band |
| 11.570 | 3.0 | 44.3 | 33.2 | 37.5 | 11.7 | -33.0 | 0.0 | 0.7 | 61.2 | 50.1 | 74 | 54 | -12.8 | -3.9 | H |
| 17.355 | 3.0 | 45.3 | 31.7 | 42.2 | 13.3 | -32.0 | 0.0 | 0.6 | 69.5 | 55.8 | 88 | 68 | -18.5 | -12.2 | H, Non Restricted Band |
| High Ch. 5825MHz | | | | | | | | | | | | | | | |
| 11.650 | 3.0 | 47.6 | 34.9 | 37.5 | 11.8 | -32.9 | 0.0 | 0.7 | 64.7 | 52.0 | 74 | 54 | -9.3 | -2.0 | V |
| 17.475 | 3.0 | 38.0 | 25.2 | 42.7 | 13.4 | -32.0 | 0.0 | 0.6 | 62.7 | 49.8 | 88 | 68 | -25.3 | -18.2 | V, Non Restricted Band |
| 11.650 | 3.0 | 46.1 | 32.6 | 37.5 | 11.8 | -32.9 | 0.0 | 0.7 | 63.2 | 49.7 | 74 | 54 | -10.8 | -4.3 | H |
| 17.475 | 3.0 | 35.8 | 23.6 | 42.7 | 13.4 | -32.0 | 0.0 | 0.6 | 60.5 | 48.3 | 88 | 68 | -27.5 | -19.7 | H, Non Restricted Band |

## HARMONICS AND SPURIOUS EMISSIONS (802.11n MODE HT20)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Qualcomm
Project #: 07U11134
Date: 6/15/2007
Test Engineer: William Zhuang
Configuration: EUT with Laptop
Mode: Transmit, 5.8 GHz DTS HT20

Test Equipment:

| Horn 1-18GHz | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz | Limit |
|---|---|---|---|---|
| T73; S/N: 6717 @3m | T145 Agilent 3008A005 | | | FCC 15.209 |

Hi Frequency Cables

| 2 foot cable | 3 foot cable | 12 foot cable | HPF | Reject Filter |
|---|---|---|---|---|
| | | Gordon 203134001 | HPF_7.6GHz | |

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Low Ch. 5745MHz | | | | | | | | | | | | | | | |
| 11.490 | 3.0 | 42.8 | 29.1 | 37.5 | 11.6 | -33.1 | 0.0 | 0.7 | 59.5 | 45.8 | 74 | 54 | -14.5 | -8.2 | V |
| 17.235 | 3.0 | 41.6 | 27.7 | 41.7 | 13.3 | -32.0 | 0.0 | 0.6 | 65.2 | 51.4 | 88 | 68 | -22.8 | -16.6 | V, Non Restricted Band |
| 11.490 | 3.0 | 42.0 | 31.0 | 37.5 | 11.6 | -33.1 | 0.0 | 0.7 | 58.7 | 47.7 | 74 | 54 | -15.3 | -6.3 | H |
| 17.235 | 3.0 | 45.0 | 31.7 | 41.7 | 13.3 | -32.0 | 0.0 | 0.6 | 68.7 | 55.4 | 88 | 68 | -19.3 | -12.6 | H, Non Restricted Band |
| Mid Ch. 5785MHz | | | | | | | | | | | | | | | |
| 11.570 | 3.0 | 43.4 | 31.0 | 37.5 | 11.7 | -33.0 | 0.0 | 0.7 | 60.3 | 47.9 | 74 | 54 | -13.7 | -6.1 | V |
| 17.355 | 3.0 | 40.6 | 27.1 | 42.2 | 13.3 | -32.0 | 0.0 | 0.6 | 64.8 | 51.3 | 88 | 68 | -23.2 | -16.7 | V, Non Restricted Band |
| 11.570 | 3.0 | 43.2 | 32.0 | 37.5 | 11.7 | -33.0 | 0.0 | 0.7 | 60.1 | 48.9 | 74 | 54 | -13.9 | -5.1 | H |
| 17.355 | 3.0 | 45.4 | 31.2 | 42.2 | 13.3 | -32.0 | 0.0 | 0.6 | 69.5 | 55.4 | 88 | 68 | -18.5 | -12.6 | H, Non Restricted Band |
| High Ch. 5825MHz | | | | | | | | | | | | | | | |
| 11.650 | 3.0 | 44.5 | 29.4 | 37.5 | 11.8 | -32.9 | 0.0 | 0.7 | 61.7 | 46.5 | 74 | 54 | -12.3 | -7.5 | V |
| 17.475 | 3.0 | 36.9 | 23.5 | 42.7 | 13.4 | -32.0 | 0.0 | 0.6 | 61.5 | 48.2 | 88 | 68 | -26.5 | -19.8 | V, Non Restricted Band |
| 11.650 | 3.0 | 44.1 | 32.8 | 37.5 | 11.8 | -32.9 | 0.0 | 0.7 | 61.2 | 49.9 | 74 | 54 | -12.8 | -4.1 | H |
| 17.475 | 3.0 | 36.3 | 24.0 | 42.7 | 13.4 | -32.0 | 0.0 | 0.6 | 60.9 | 48.7 | 88 | 68 | -27.1 | -19.3 | H, Non Restricted Band |

## HARMONICS AND SPURIOUS EMISSIONS (802.11n MODE HT40)

High Frequency Measurement
Compliance Certification Services, Morgan Hill Open Field Site

Company: Qualcomm
Project #: 07U11134
Date: 6/20/2007
Test Engineer: William Zhuang
Configuration: EUT with Laptop
Mode: Transmit, 5.8 GHz DTS HT40

Test Equipment:

| Horn 1-18GHz | Pre-amplifer 1-26GHz | Pre-amplifer 26-40GHz | Horn > 18GHz | Limit |
|---|---|---|---|---|
| T60; S/N: 2238 @3m | T145 Agilent 3008A005 | | | FCC 15.209 |

Hi Frequency Cables

| 2 foot cable | 3 foot cable | 12 foot cable | HPF | Reject Filter |
|---|---|---|---|---|
| | | Gordon 203134001 | HPF_7.6GHz | |

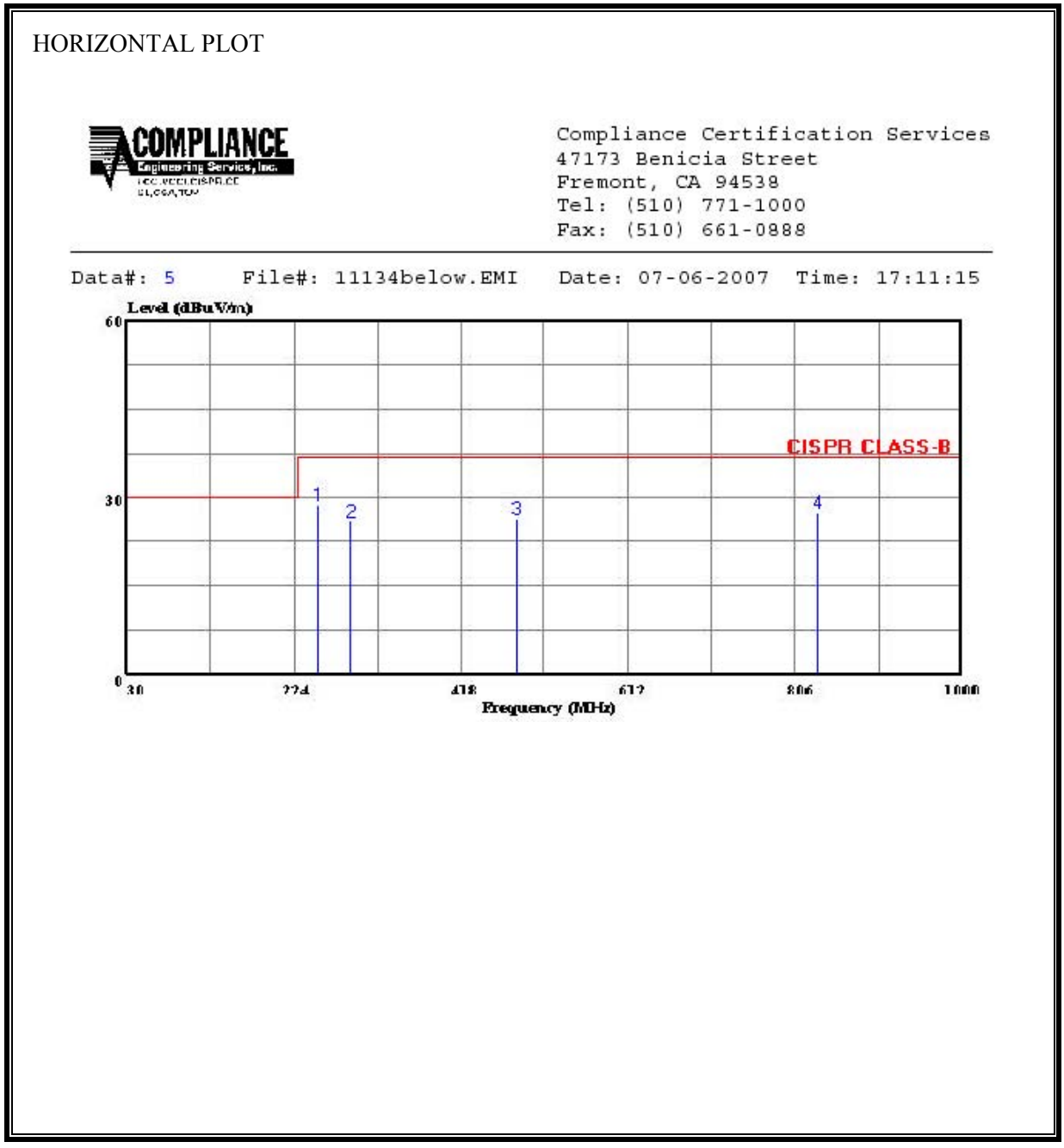
Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

| f GHz | Dist (m) | Read Pk dBuV | Read Avg. dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB | Notes (V/H) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Low Ch. 5755MHz | | | | | | | | | | | | | | | |
| 11.510 | 3.0 | 41.0 | 29.7 | 37.4 | 11.6 | -33.1 | 0.0 | 0.7 | 57.7 | 46.4 | 74 | 54 | -16.3 | -7.6 | V |
| 17.265 | 3.0 | 43.6 | 30.1 | 41.8 | 13.3 | -32.0 | 0.0 | 0.6 | 67.3 | 53.8 | 88 | 68 | -20.7 | -14.2 | V, Non Restricted Band |
| 11.510 | 3.0 | 41.8 | 28.7 | 41.8 | 13.3 | -32.0 | 0.0 | 0.6 | 65.5 | 52.4 | 74 | 54 | -8.5 | -1.6 | H |
| 17.265 | 3.0 | 40.6 | 27.6 | 41.8 | 13.3 | -32.0 | 0.0 | 0.6 | 64.3 | 51.3 | 88 | 68 | -23.7 | -16.7 | H, Non Restricted Band |
| Mid Ch. 5795MHz | | | | | | | | | | | | | | | |
| 11.590 | 3.0 | 42.6 | 29.9 | 37.4 | 11.7 | -33.0 | 0.0 | 0.7 | 59.4 | 46.8 | 74 | 54 | -14.6 | -7.2 | V |
| 17.385 | 3.0 | 41.4 | 28.3 | 42.2 | 13.3 | -32.0 | 0.0 | 0.6 | 65.6 | 52.5 | 88 | 68 | -22.4 | -15.5 | V, Non Restricted Band |
| 11.590 | 3.0 | 42.3 | 29.6 | 37.4 | 11.7 | -33.0 | 0.0 | 0.7 | 59.1 | 46.4 | 74 | 54 | -14.9 | -7.6 | H |
| 17.385 | 3.0 | 40.6 | 26.2 | 42.2 | 13.3 | -32.0 | 0.0 | 0.6 | 64.8 | 50.4 | 88 | 68 | -23.2 | -17.6 | H, Non Restricted Band |
| High Ch. 5815MHz | | | | | | | | | | | | | | | |
| 11.630 | 3.0 | 44.5 | 32.2 | 37.4 | 11.8 | -32.9 | 0.0 | 0.7 | 61.5 | 49.1 | 74 | 54 | -12.5 | -4.9 | V |
| 17.445 | 3.0 | 39.5 | 26.8 | 42.5 | 13.4 | -32.0 | 0.0 | 0.6 | 63.9 | 51.2 | 88 | 68 | -24.1 | -16.8 | V, Non Restricted Band |
| 11.630 | 3.0 | 41.6 | 29.9 | 37.4 | 11.8 | -32.9 | 0.0 | 0.7 | 58.6 | 46.8 | 74 | 54 | -15.4 | -7.2 | H |
| 17.445 | 3.0 | 40.4 | 26.7 | 42.5 | 13.4 | -32.0 | 0.0 | 0.6 | 64.9 | 51.1 | 88 | 68 | -23.1 | -16.9 | H, Non Restricted Band |

## 7.3.4. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

**SPURIOUS EMISSIONS 30 TO 1000 MHz (2.4GHZ WORST-CASE CONFIGURATION, HORIZONTAL)**

HORIZONTAL PLOT



HORIZONTAL DATA

Condition: CISPR CLASS-B HORIZONTAL
Test Operator:: Thanh Nguyen
Project #: : 07U11134
Company: : QualCom
Configuration:: EUT w/ Extender card, Laptop
Mode : : Tx 22dBm, b, low channel
Target: : CISPR22 Class B

Page: 1

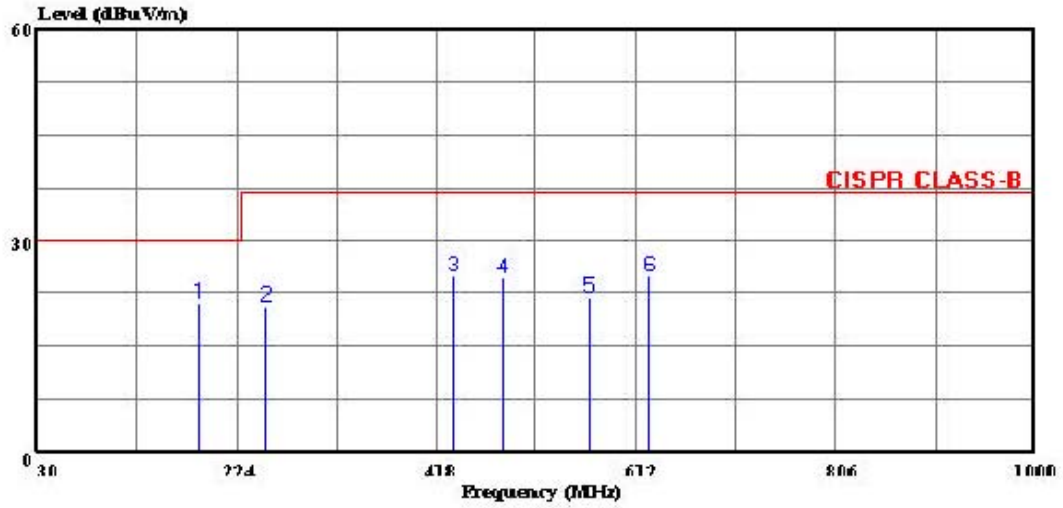
| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 1 | 252.130 | 14.98 | 13.94 | 28.92 | 37.00 | -8.08 | Peak |
| 2 | 288.990 | 10.46 | 15.42 | 25.88 | 37.00 | -11.12 | Peak |
| 3 | 482.990 | 6.34 | 20.10 | 26.44 | 37.00 | -10.56 | Peak |
| 4 | 832.190 | 2.23 | 25.31 | 27.54 | 37.00 | -9.46 | Peak |

**SPURIOUS EMISSIONS 30 TO 1000 MHz (2.4GHZ WORST-CASE CONFIGURATION, VERTICAL)**

VERTICAL PLOT

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 7 File#: 11134below.EMI Date: 07-06-2007 Time: 17:19:30



VERTICAL DATA

Condition: CISPR CLASS-B VERTICAL
Test Operator:: Thanh Nguyen
Project #: : 07U11134
Company: : QualCom
Configuration:: EUT w/ Extender card, Laptop
Mode : : Tx 22dBm, b, low channel
Target: : CISPR22 Class B

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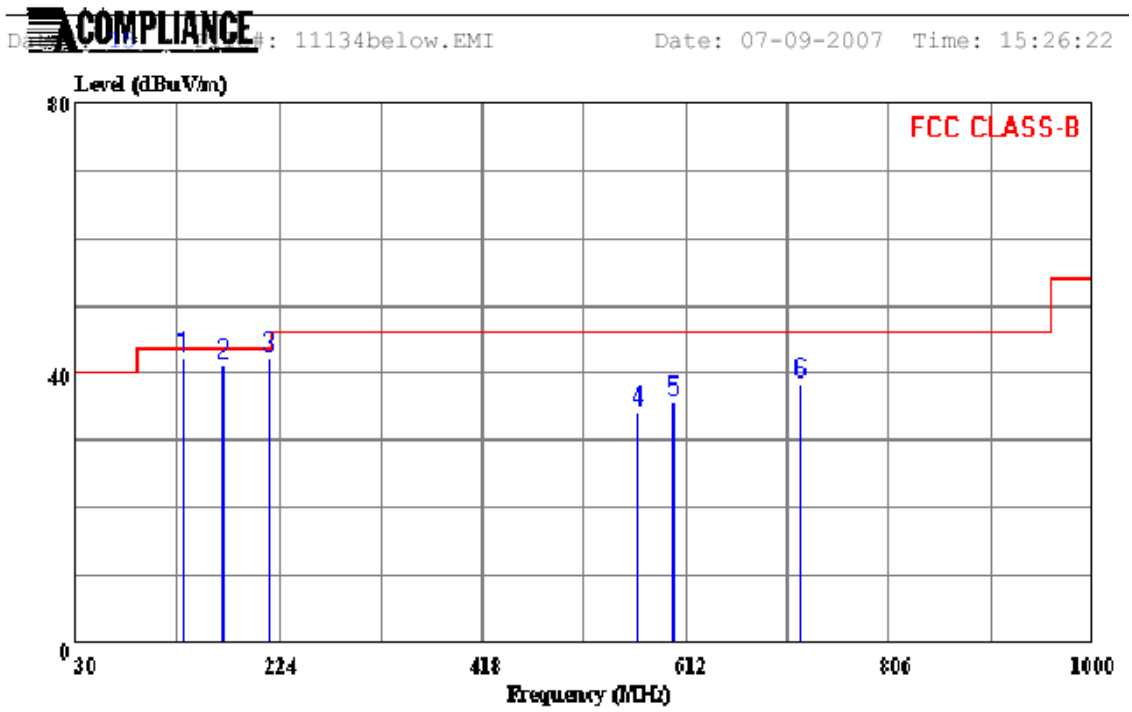
| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 1 | 187.140 | 7.67 | 13.30 | 20.97 | 30.00 | -9.03 | Peak |
| 2 | 252.130 | 6.52 | 13.94 | 20.46 | 37.00 | -16.54 | Peak |
| 3 | 434.490 | 5.91 | 19.01 | 24.92 | 37.00 | -12.08 | Peak |
| 4 | 482.990 | 4.53 | 20.10 | 24.63 | 37.00 | -12.37 | Peak |
| 5 | 566.410 | 0.38 | 21.48 | 21.85 | 37.00 | -15.15 | Peak |
| 6 | 625.580 | 2.53 | 22.36 | 24.89 | 37.00 | -12.11 | Peak |

## SPURIOUS EMISSIONS 30 TO 1000 MHz (5GHZ WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



HORIZONTAL DATA

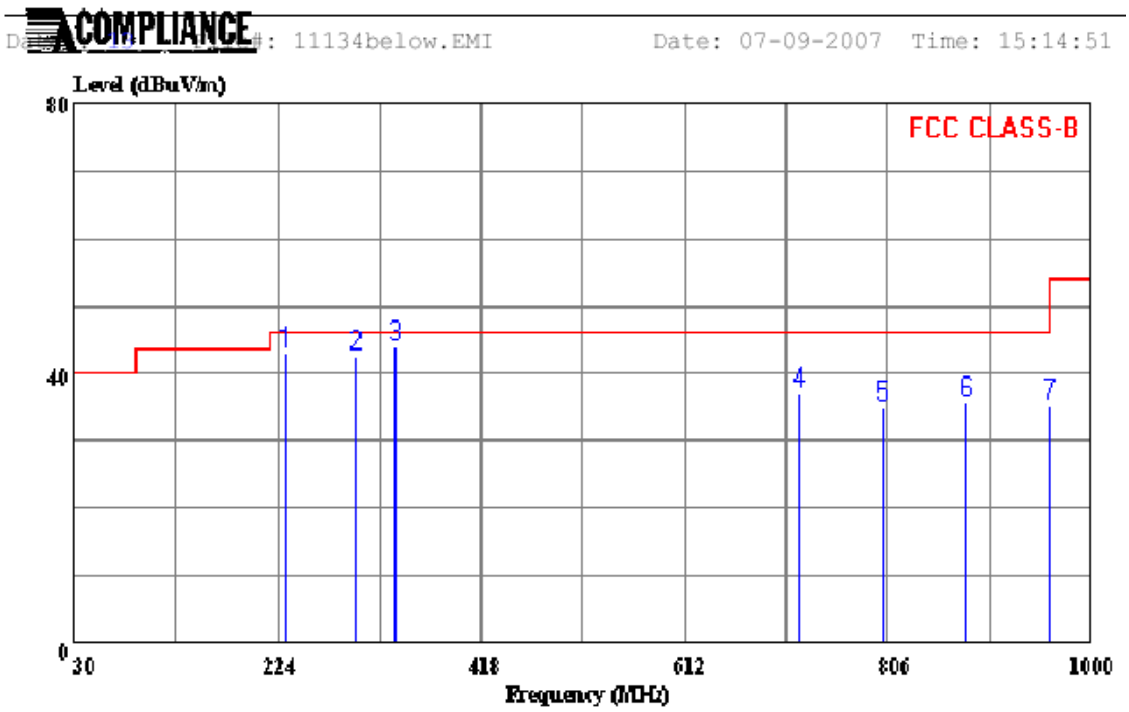
Condition: FCC CLASS-B HORIZONTAL
Test Operator:: William Zhuang
Project #: : 07U11134
Company: : QualCom
Configuration:: EUT off/ Extender card, Laptop
Mode : : Tx, 5 GHz worst case
Target: : CISPR22 Class B

Page: 1

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 1 | 131.850 | 58.90 | -16.63 | 42.27 | 43.50 | -1.23 | Peak |
| 2 | 170.650 | 59.20 | -18.14 | 41.06 | 43.50 | -2.44 | Peak |
| 3 | 213.330 | 61.20 | -18.83 | 42.37 | 43.50 | -1.13 | Peak |
| 4 | 566.410 | 44.60 | -10.35 | 34.25 | 46.00 | -11.75 | Peak |
| 5 | 600.360 | 45.40 | -9.84 | 35.56 | 46.00 | -10.44 | Peak |
| 6 | 720.640 | 46.60 | -8.19 | 38.41 | 46.00 | -7.59 | Peak |

**SPURIOUS EMISSIONS 30 TO 1000 MHz (5GHZ WORST-CASE CONFIGURATION, VERTICAL)**

VERTICAL PLOT



VERTICAL DATA

Condition: FCC CLASS-B VERTICAL
Test Operator:: William Zhuang
Project #: : 07U11134
Company: : QualCom
Configuration:: EUT off/ Extender card, Laptop
Mode : : Tx, 5 GHz worst case
Target: : CISPR22 Class B

Page: 1

| | Freq | Read Level | Factor | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | |
| 1 | 231.760 | 61.20 | -18.35 | 42.85 | 46.00 | -3.15 | Peak |
| 2 | 298.690 | 58.60 | -15.90 | 42.70 | 46.00 | -3.30 | Peak |
| 3 | 335.550 | 58.80 | -14.92 | 43.88 | 46.00 | -2.12 | Peak |
| 4 | 720.640 | 45.20 | -8.19 | 37.01 | 46.00 | -8.99 | Peak |
| 5 | 800.180 | 42.00 | -6.88 | 35.12 | 46.00 | -10.88 | Peak |
| 6 | 880.690 | 41.00 | -5.17 | 35.83 | 46.00 | -10.17 | Peak |
| 7 | 960.230 | 39.00 | -3.73 | 35.27 | 54.00 | -18.73 | Peak |

## 7.4. POWERLINE CONDUCTED EMISSIONS

**LIMIT**

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, 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 μH/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 boundary between the frequency ranges.

| Frequency of Emission (MHz) | Conducted Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15-0.5 | 66 to 56 * | 56 to 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |

* Decreases with the logarithm of the frequency.

**TEST PROCEDURE**

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

Line conducted data is recorded for both NEUTRAL and HOT lines.

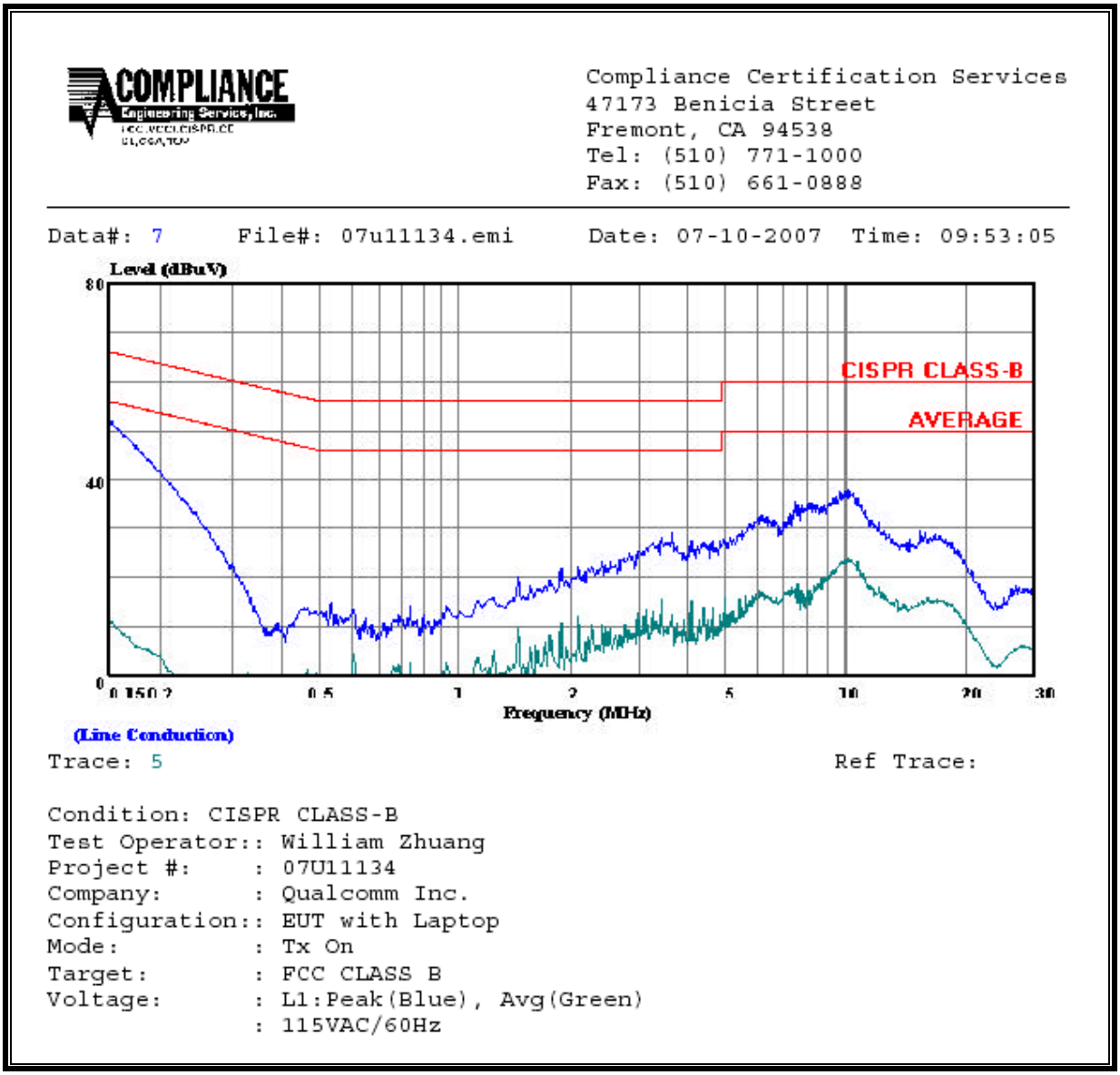
**RESULTS**

No non-compliance noted:

## 6 WORST EMISSIONS

| CONDUCTED EMISSIONS DATA (115VAC 60Hz) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Freq. | Reading | | | Closs | Limit | FCC_B | Margin | | Remark |
| (MHz) | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB) | QP | AV | QP (dB) | AV (dB) | L1 / L2 |
| 0.15 | 52.08 | -- | 11.40 | 0.00 | 65.94 | 55.94 | -13.86 | -44.54 | L1 |
| 7.57 | 35.54 | -- | 18.53 | 0.00 | 60.00 | 50.00 | -24.46 | -31.47 | L1 |
| 10.18 | 38.10 | -- | 23.81 | 0.00 | 60.00 | 50.00 | -21.90 | -26.19 | L1 |
| 0.15 | 63.12 | -- | 17.54 | 0.00 | 65.89 | 55.89 | -2.77 | -38.35 | L2 |
| 0.16 | 61.96 | -- | 17.61 | 0.00 | 65.62 | 55.62 | -3.66 | -38.01 | L2 |
| 9.91 | 37.32 | -- | 23.76 | 0.00 | 60.00 | 50.00 | -22.68 | -26.24 | L2 |
| 6 Worst Data | | | | | | | | | |

**LINE 1 RESULTS**



**LINE 2 RESULTS**