

# RF TEST REPORT

Test item : Cellular/PCS GSM/GPRS/EDGE Phone with Bluetooth, WLAN and NFC  
Model No. : LG-E974, E974, LGE974  
Order No. : DEMC1208-01562  
Date of receipt : 2012-08-22  
Test duration : 2012-09-03 ~ 2012-09-17  
Date of issue : 2012-10-02  
Use of report : FCC Original Grant

Applicant : LG Electronics MobileComm U.S.A., Inc.  
1000 Sylvan Avenue, Englewood Cliffs NJ 07632

Test laboratory : Digital EMC Co., Ltd.  
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification : FCC Part 15 Subpart C 247  
ANSI C63.4-2003, KDB558074

Test environment : See appended test report

Test result : ☒ Pass ☐ Fail

The test results presented in this test report are limited only to the sample supplied by applicant and the use of this test report is inhibited other than its purpose. This test report shall not be reproduced except in full, without the written approval of DIGITAL EMC CO., LTD.

Tested by:



Engineer  
J.J.Lee

Witnessed by:

N/A

Reviewed by:



Technical Director  
Harvey Sung

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## 1. GENERAL INFORMATION

**Applicant** : LG Electronics MobileComm U.S.A., Inc.  
**Address** : 1000 Sylvan Avenue, Englewood Cliffs NJ 07632  
**FCC ID** : ZNFE974  
**EUT** : Cellular/PCS GSM/GPRS/EDGE Phone with Bluetooth, WLAN and NFC  
**Model** : LG-E974  
**Additional Model(s)** : E974, LGE974  
**Data of Test** : 2012-09-03 ~ 2012-09-17  
**Contact person** : Cheol Goo Lee

## 2. EUT DESCRIPTION

|                              |                                                                                                                                                                                              |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product</b>               | Cellular/PCS GSM/GPRS/EDGE Phone with Bluetooth, WLAN and NFC                                                                                                                                |
| <b>Model Name</b>            | LG-E974, E974, LGE974<br>※ 3 models are same mechanical, electrical and functional.<br>※ The only difference is the model name, which are changed for marketing purpose.                     |
| <b>Power Supply</b>          | DC 3.8V                                                                                                                                                                                      |
| <b>Frequency Range</b>       | 2.4GHz Band<br>▪ 802.11b/g/n(20MHz): 2412 ~ 2462 MHz<br>5GHz Band<br>▪ 802.11a/n(20MHz): 5745~5825 MHz<br>▪ 802.11n(40MHz): 5755~5795 MHz                                                    |
| <b>Max. RF Output Power</b>  | 2.4GHz Band<br>▪ 802.11b: 17.74 dBm<br>▪ 802.11g: 14.87 dBm<br>▪ 802.11n (HT20): 13.63 dBm<br>5GHz Band<br>▪ 802.11a: 15.37 dBm<br>▪ 802.11n (HT20): 13.43 dBm<br>▪ 802.11n (HT40): 9.51 dBm |
| <b>Modulation Type</b>       | 802.11b: DSSS/CCK<br>802.11a/g/n: OFDM                                                                                                                                                       |
| <b>Antenna Specification</b> | Internal Antenna (1TX 1RX)<br>▪ 2.4GHz Band Max. peak gain : -0.76dBi<br>▪ 5.7GHz Band Max. peak gain : -1.19dBi                                                                             |

**3. SUMMARY OF TESTS**

| FCC Part Section(s)                                                                                                                                                                                       | RSS Section(s)  | Parameter                                                                     | Limit                  | Test Condition    | Status Note 1            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------|------------------------|-------------------|--------------------------|
| <b>I. Transmitter Mode (TX)</b>                                                                                                                                                                           |                 |                                                                               |                        |                   |                          |
| 15.247(a)                                                                                                                                                                                                 | RSS-210 [A8.2]  | 6 dB Bandwidth                                                                | > 500 kHz              | Conducted         | <b>C</b>                 |
| 15.247(b)                                                                                                                                                                                                 | RSS-210 [A8.4]  | Transmitter Output Power                                                      | < 1Watt                |                   | <b>C</b>                 |
| 15.247(c)                                                                                                                                                                                                 | RSS-210 [A8.5]  | Out of Band Emissions / Band Edge                                             | 20dBc in any 100kHz BW |                   | <b>C</b>                 |
| 15.247(d)                                                                                                                                                                                                 | RSS-210 [A8.2]  | Transmitter Power Spectral Density                                            | < 8dBm / 3kHz          |                   | <b>C</b>                 |
| -                                                                                                                                                                                                         | RSS Gen Issue 3 | Occupied Bandwidth (99%)                                                      | RSS-Gen(4.6.1)         |                   | <b>NA</b>                |
| 15.205<br>15.209                                                                                                                                                                                          | RSS-210 [A8.5]  | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | < FCC 15.209 limits    | Radiated          | <b>C</b><br><b>Note2</b> |
| 15.207                                                                                                                                                                                                    | RSS-Gen [7.2.4] | AC Conducted Emissions                                                        | < FCC 15.207 limits    | AC Line Conducted | <b>C</b>                 |
| 15.203                                                                                                                                                                                                    | RSS-Gen [7.1.2] | Antenna Requirements                                                          | FCC 15.203             | -                 | <b>C</b>                 |
| <p>Note 1: <b>C</b>=Comply    <b>NC</b>=Not Comply    <b>NT</b>=Not Tested    <b>NA</b>=Not Applicable</p> <p>Note 2: This test item was performed in each axis and the worst case data was reported.</p> |                 |                                                                               |                        |                   |                          |

## 4. TEST METHODOLOGY

The measurement procedure described in the American National Standard for Methods of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz(ANSI C63.4-2003) and KDB558074

### 4.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

### 4.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

### 4.3 GENERAL TEST PROCEDURES

#### Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version :2003) Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

#### Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3 m away from the receiving antenna, which varied from 1 m to 4 m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the highest emission, the relative positions of the EUT were rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4. (Version: 2003)

### 4.4 DESCRIPTION OF TEST MODES

The EUT has been tested with several operating conditions for maximizing the emission characteristics. A test program is used to control the EUT for staying in continuous transmitting mode.

## 5. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipments, which is traceable to recognized national standards.

## 6. FACILITIES AND ACCREDITATIONS

### 6.1 FACILITIES

The open area test site(OATS) or semi anechoic chamber and conducted measurement facility used to collect the radiated and conducted test data are located at the 683-3, Yubang-Dong, Yongin-Si, Gyunggi-Do, 449-080, South Korea. The site is constructed in conformance with the requirements.

- Semi anechoic chamber registration Number : 678747

### 6.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, bi-conical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and peak, quasi-peak detectors are used to perform radiated measurements. Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers. Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

## 7. ANTENNA REQUIREMENTS

### According to FCC 47 CFR §15.203 & RSS-Gen [7.1.2]:

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section."

\* The internal antenna of this E.U.T is uniquely attached on the main PCB using specially spring contactors.

\* Therefore this E.U.T Complies with the requirement of §15.203

## 8. TEST RESULT

### 8.1 6dB Bandwidth

#### Test Requirements and limit, §15.247(a) & RSS-210 [A8.2]

The bandwidth at 6dB down from the highest in-band spectral density is measured with a spectrum analyzer connected to the receive antenna while the EUT is operating in transmission mode at the appropriate frequencies.

**The minimum permissible 6dB bandwidth is 500 kHz.**

#### ■ TEST CONFIGURATION

Refer to the APPENDIX I.

#### ■ TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer and used following test procedure of KDB558074.

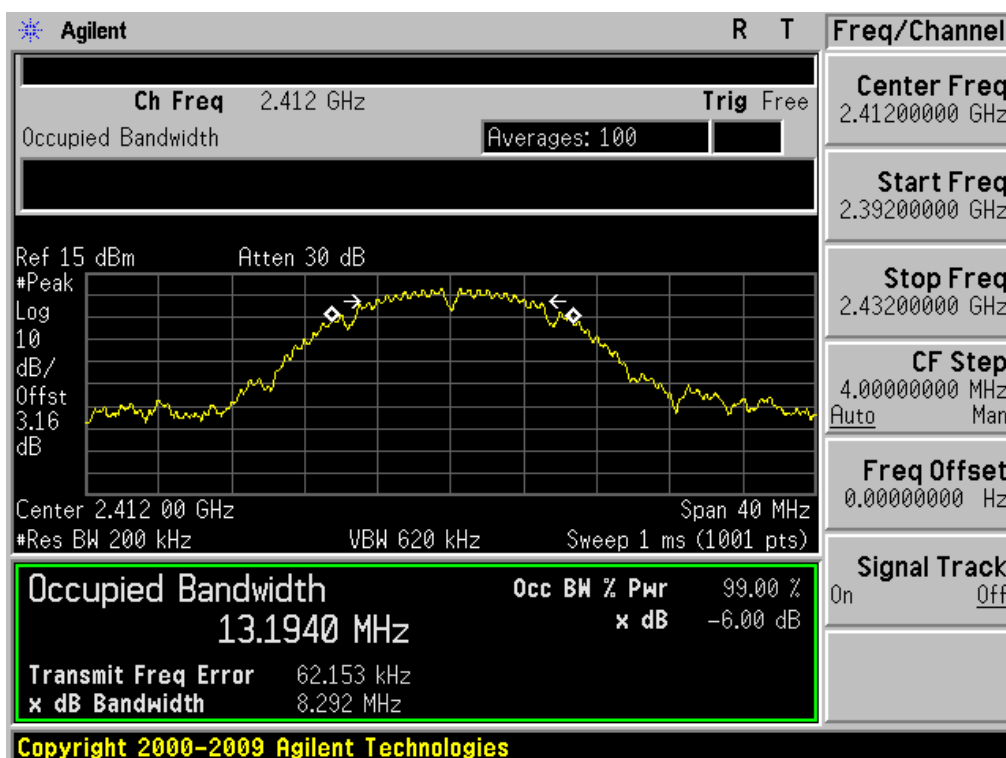
1. Set resolution bandwidth (RBW) = 1-5 % of the emission bandwidth (EBW).
2. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.  
(**RBW:200KHz/VBW:620KHz** for **EBW < 20 MHz** , **RBW:390KHz/VBW:1.2MHz** for **20 MHz < EBW < 40 MHz**)
3. Detector = **Peak**.
4. Trace mode = **max hold**.
5. Sweep = **auto couple**.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. Compare the resultant bandwidth with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is 1-5 %.

#### ■ TEST RESULTS: **Comply**

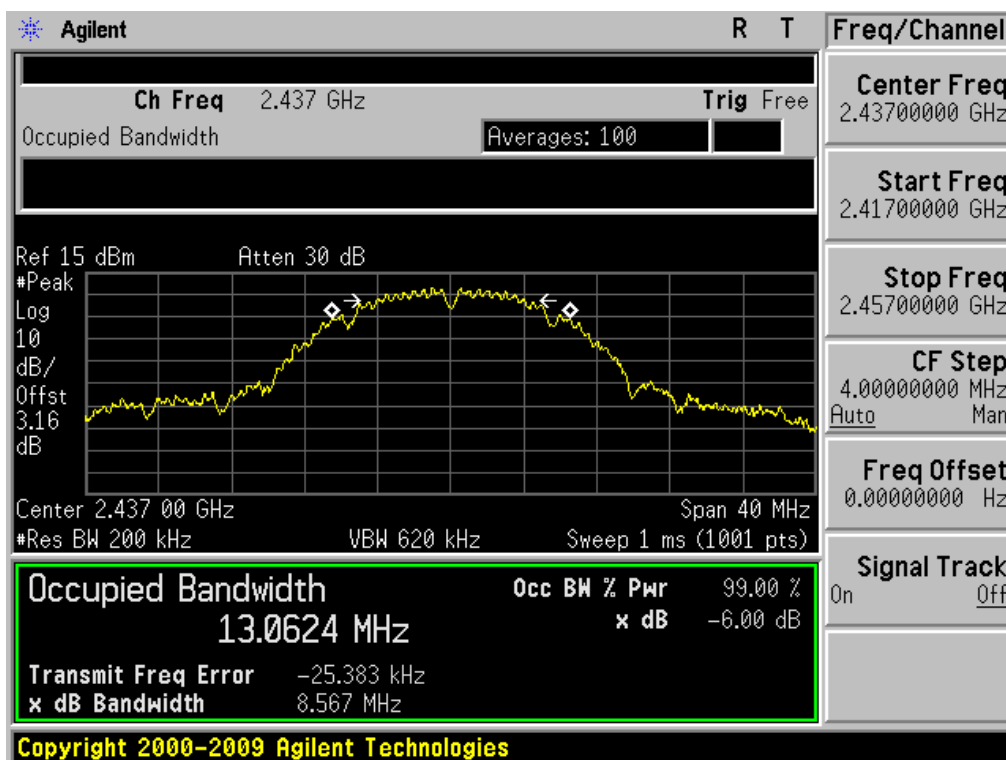
| Test Mode          | Data Rate | Frequency [MHz] | Test Results [MHz] |
|--------------------|-----------|-----------------|--------------------|
| 802.11b            | 1Mbps     | 2412            | 8.292              |
|                    |           | 2437            | 8.567              |
|                    |           | 2462            | 7.995              |
| 802.11g            | 6Mbps     | 2412            | 16.363             |
|                    |           | 2437            | 16.478             |
|                    |           | 2462            | 16.372             |
| 802.11n<br>(20MHz) | MCS0      | 2412            | 17.711             |
|                    |           | 2437            | 17.691             |
|                    |           | 2462            | 17.670             |
| 802.11a            | 6Mbps     | 5745            | 16.453             |
|                    |           | 5785            | 16.450             |
|                    |           | 5825            | 16.499             |
| 802.11n<br>(20MHz) | MCS0      | 5745            | 17.698             |
|                    |           | 5785            | 17.679             |
|                    |           | 5825            | 17.693             |
| 802.11n<br>(40MHz) | MCS0      | 5755            | 36.038             |
|                    |           | 5795            | 36.089             |

■ **RESULT PLOTS****6 dB Bandwidth**

Test Mode: 802.11b &amp; 1Mbps &amp; 2412MHz

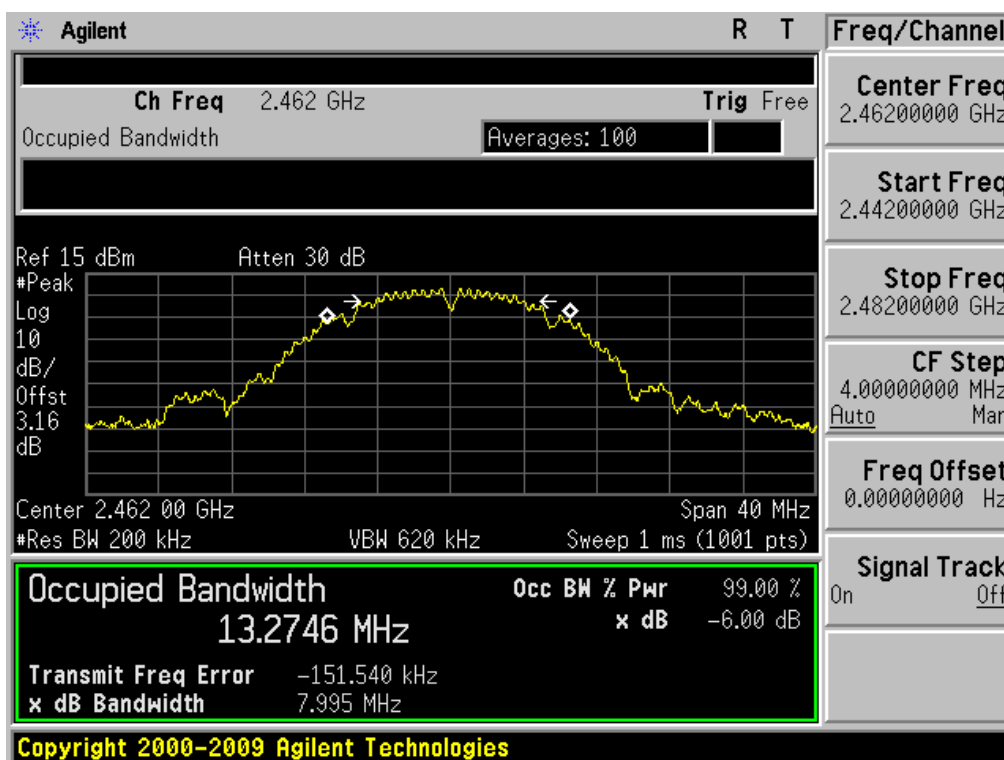
**6 dB Bandwidth**

Test Mode: 802.11b &amp; 1Mbps &amp; 2437MHz



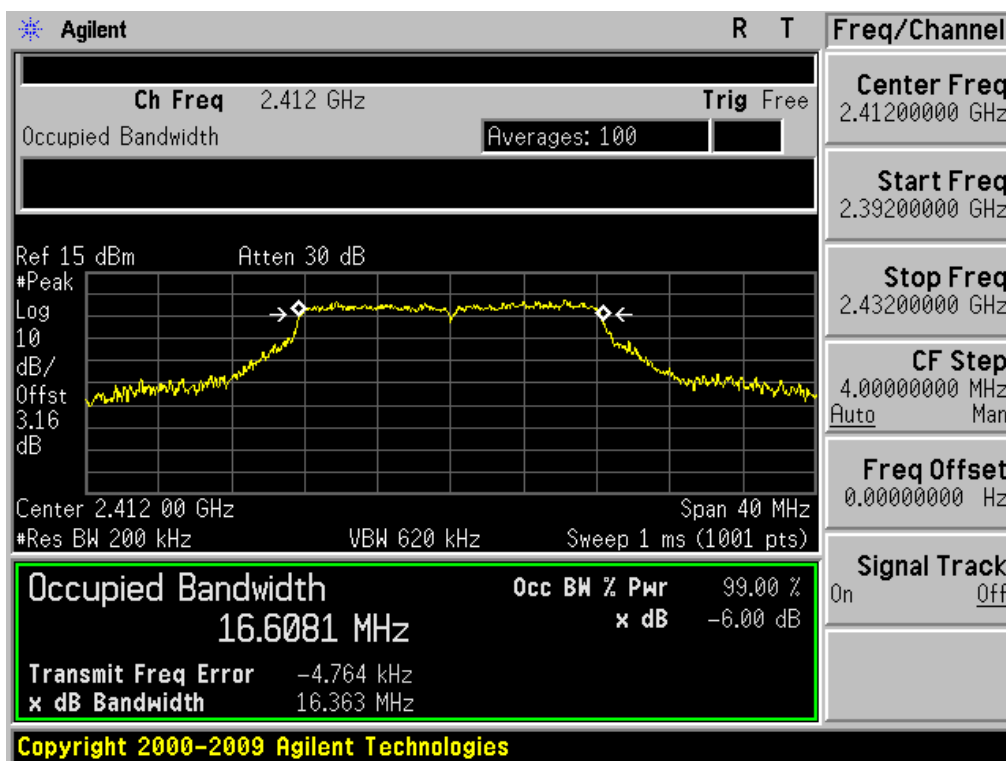
# 6 dB Bandwidth

Test Mode: 802.11b & 1Mbps & 2462MHz



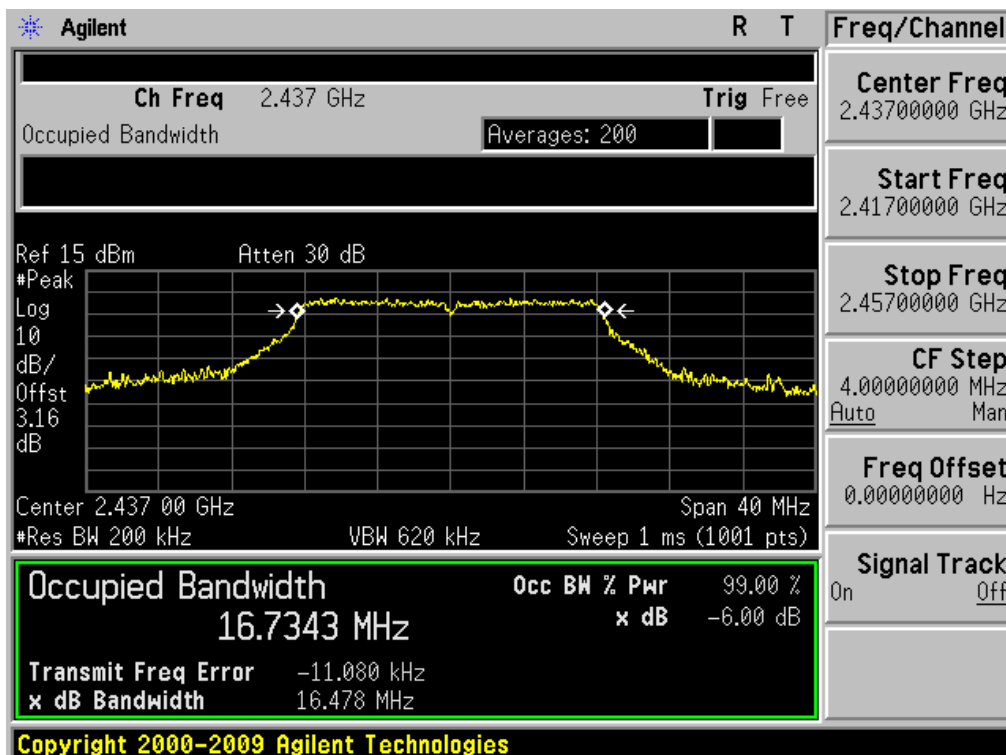
## 6 dB Bandwidth

Test Mode: 802.11g &amp; 6Mbps &amp; 2412MHz



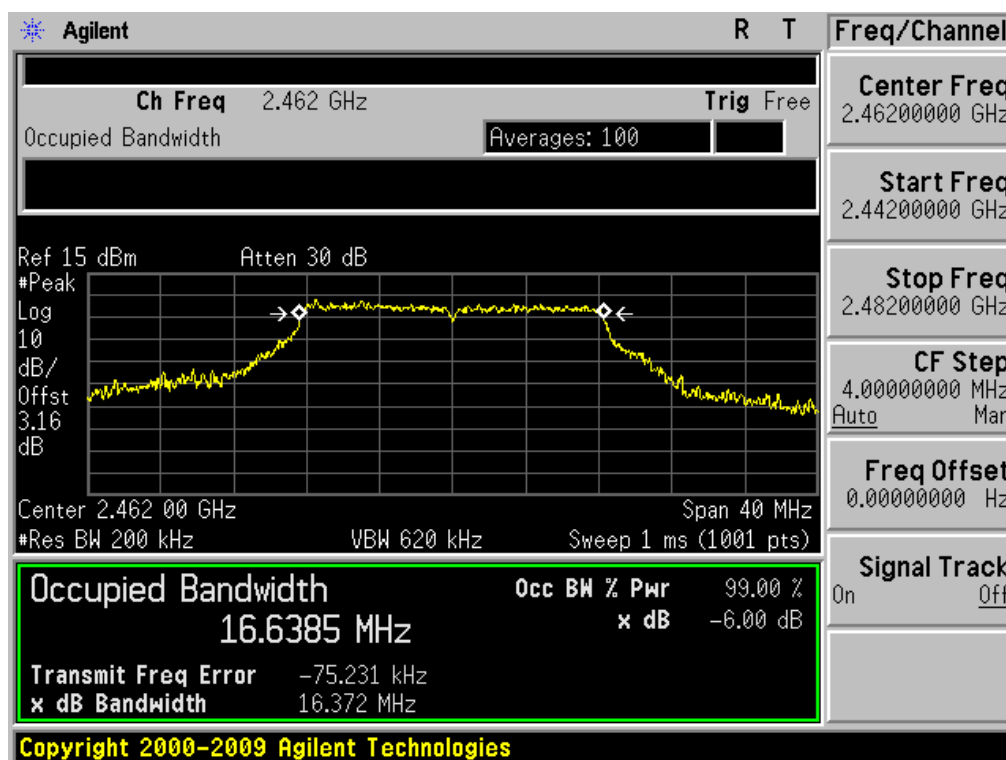
## 6 dB Bandwidth

Test Mode: 802.11g &amp; 6Mbps &amp; 2437MHz



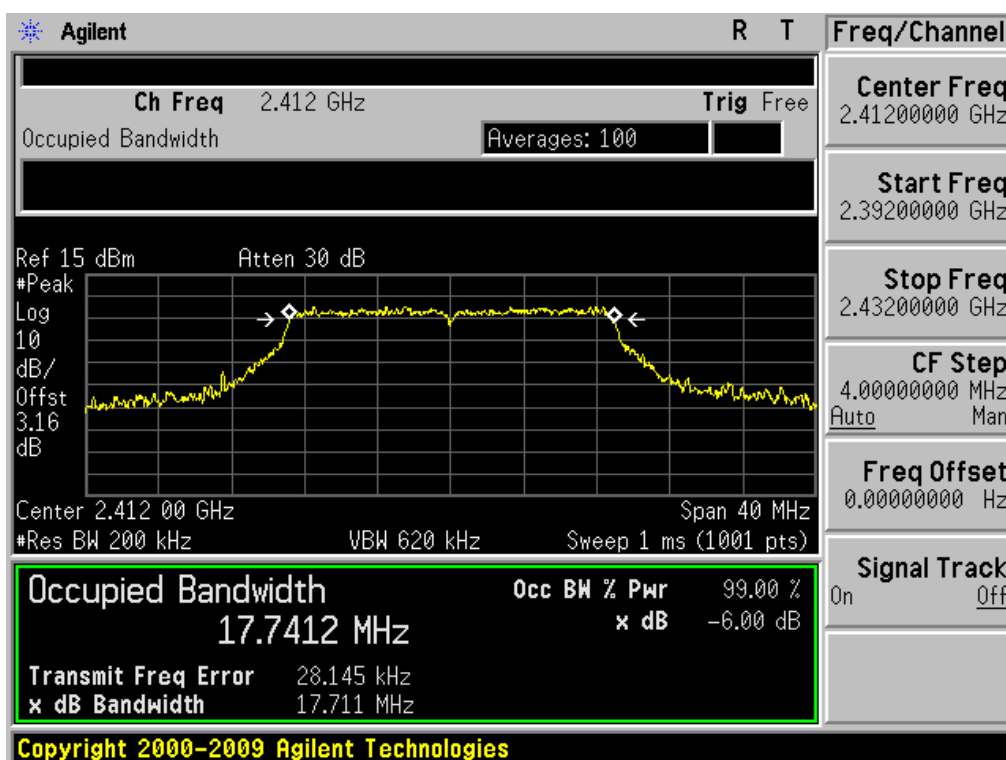
# 6 dB Bandwidth

Test Mode: 802.11g & 6Mbps & 2462MHz

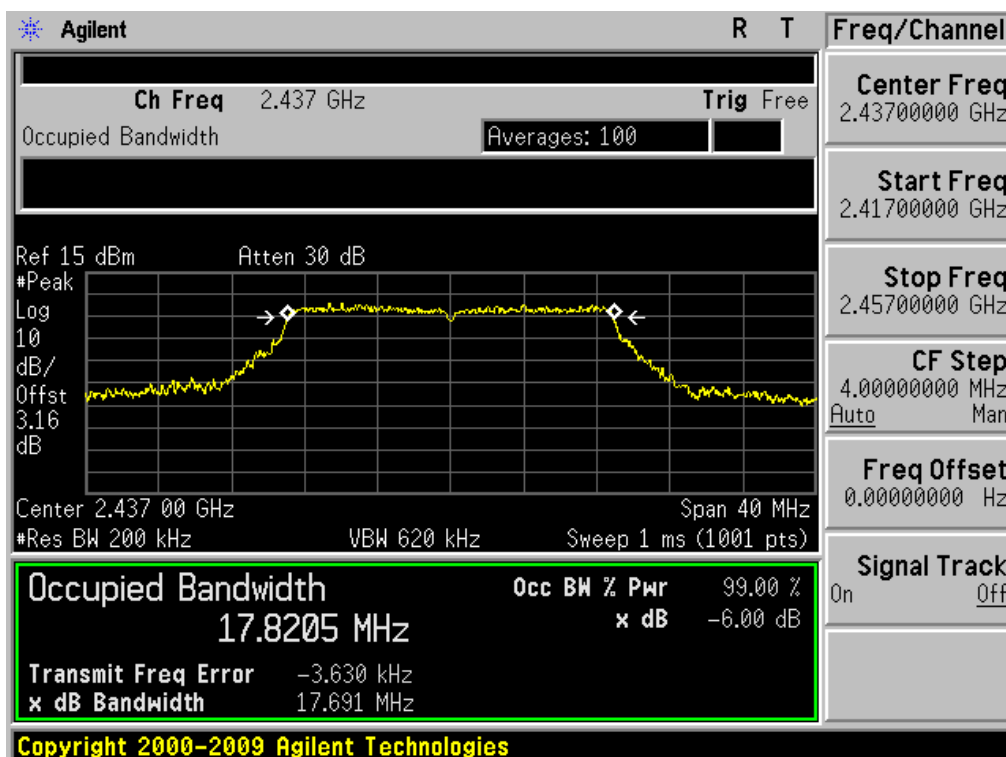


**6 dB Bandwidth**

Test Mode: 802.11n &amp; MCS0 &amp; 2412MHz

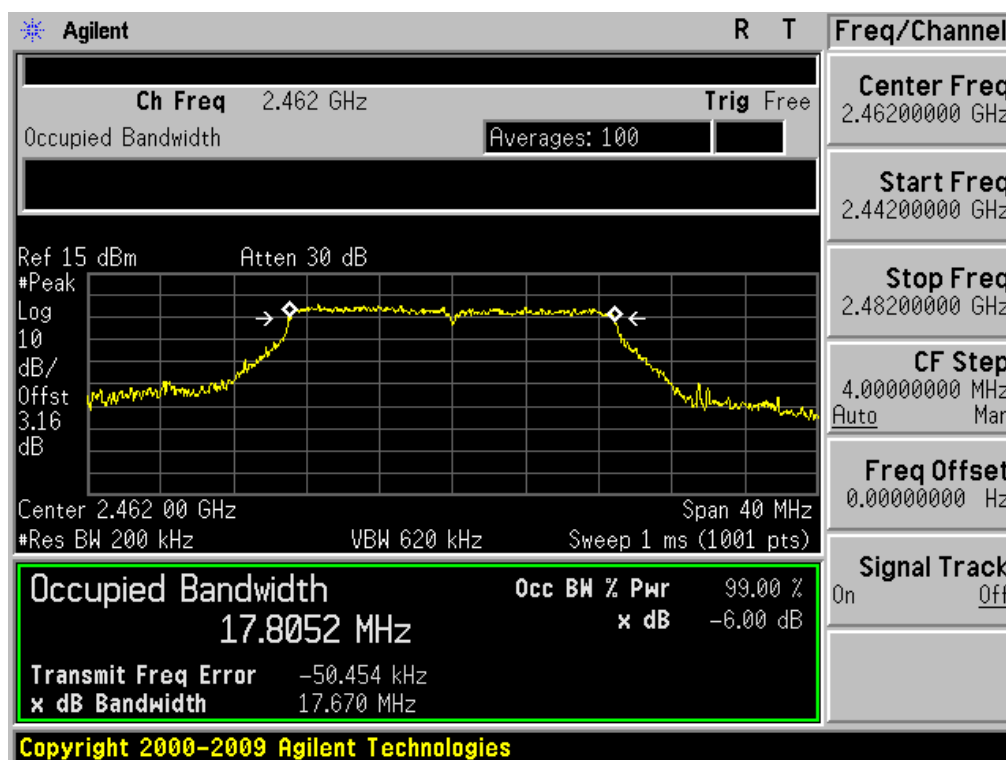
**6 dB Bandwidth**

Test Mode: 802.11n &amp; MCS0 &amp; 2437MHz



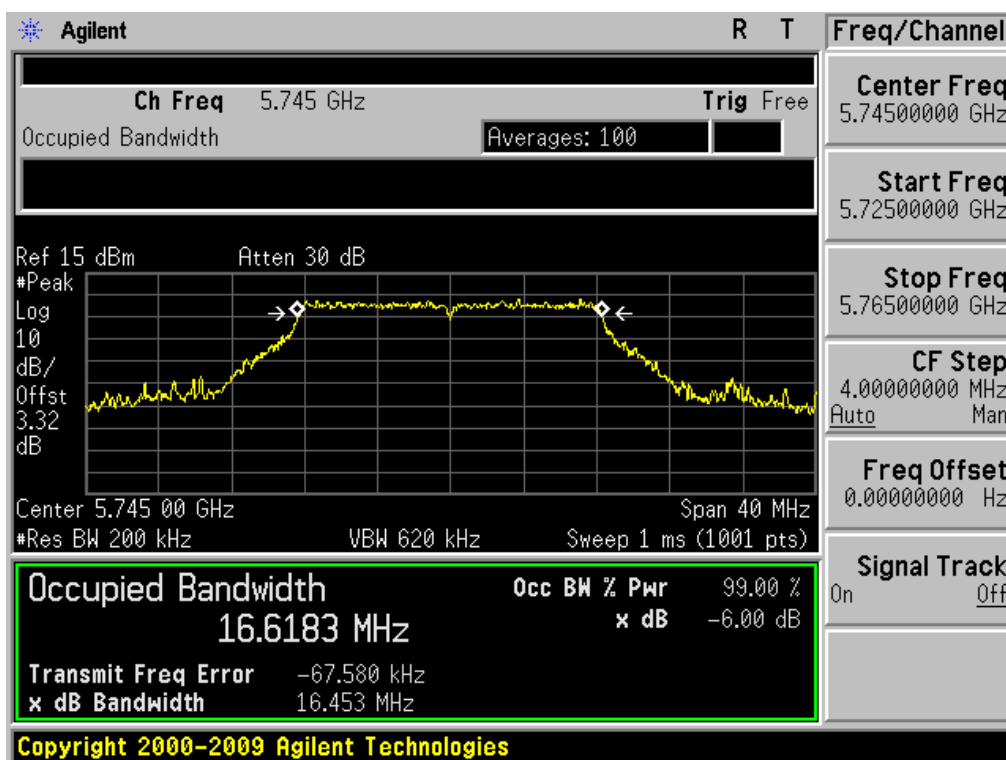
# 6 dB Bandwidth

Test Mode: 802.11n & MCS0 & 2462MHz

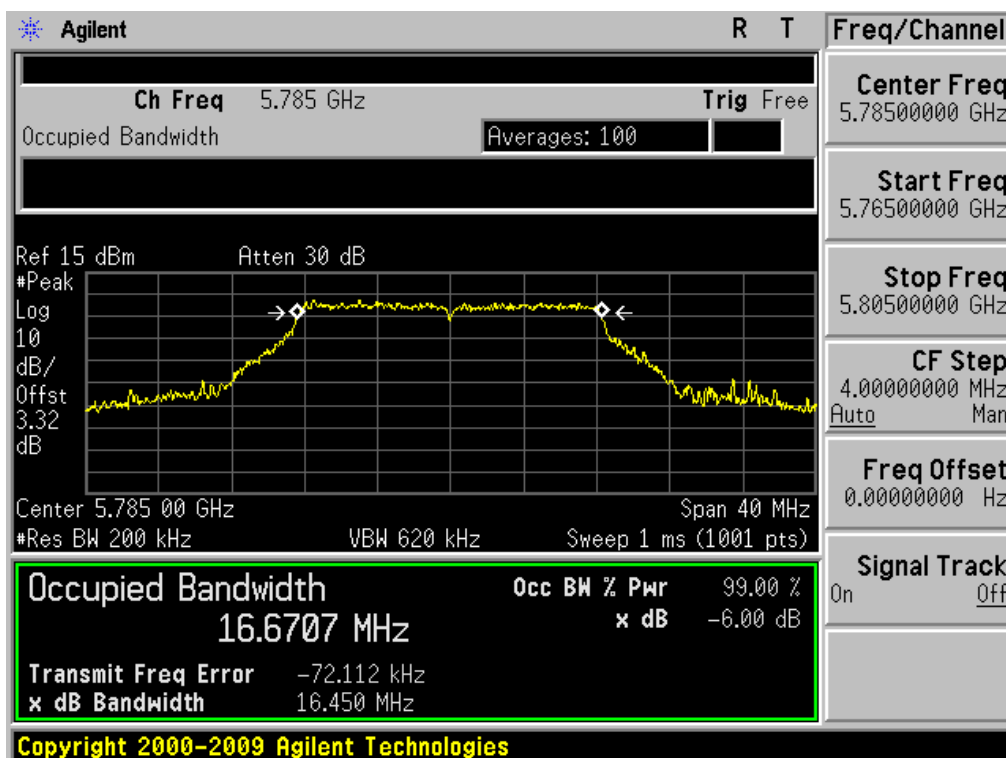


**6 dB Bandwidth**

Test Mode: 802.11a &amp; 6Mbps &amp; 5745MHz

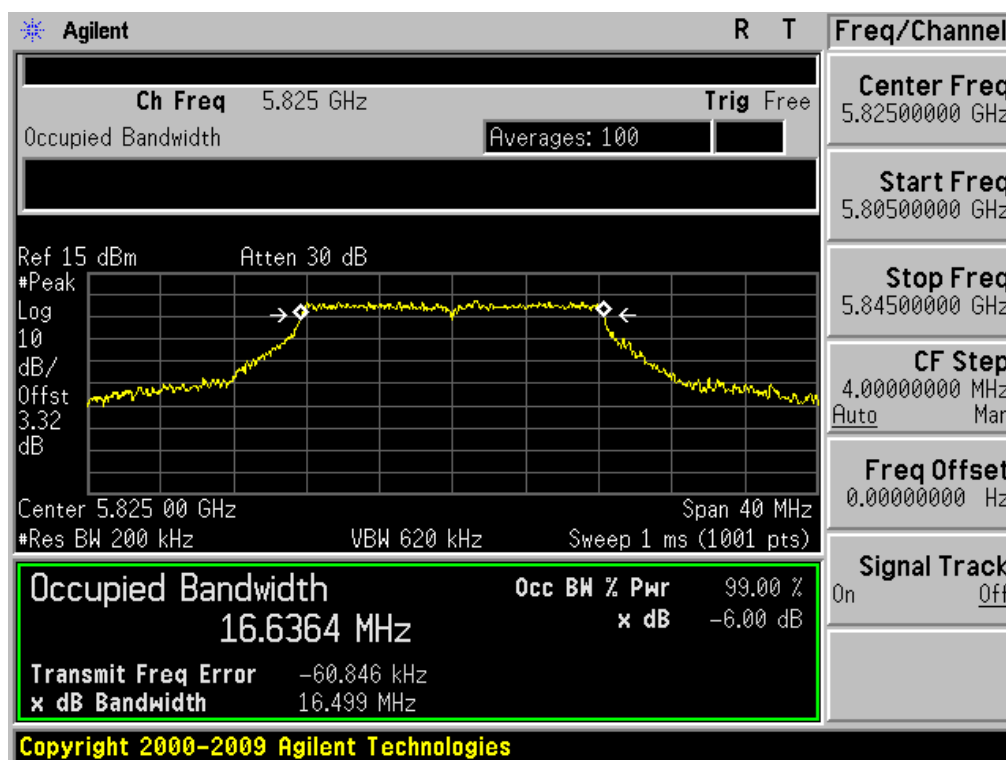
**6 dB Bandwidth**

Test Mode: 802.11a &amp; 6Mbps &amp; 5785MHz



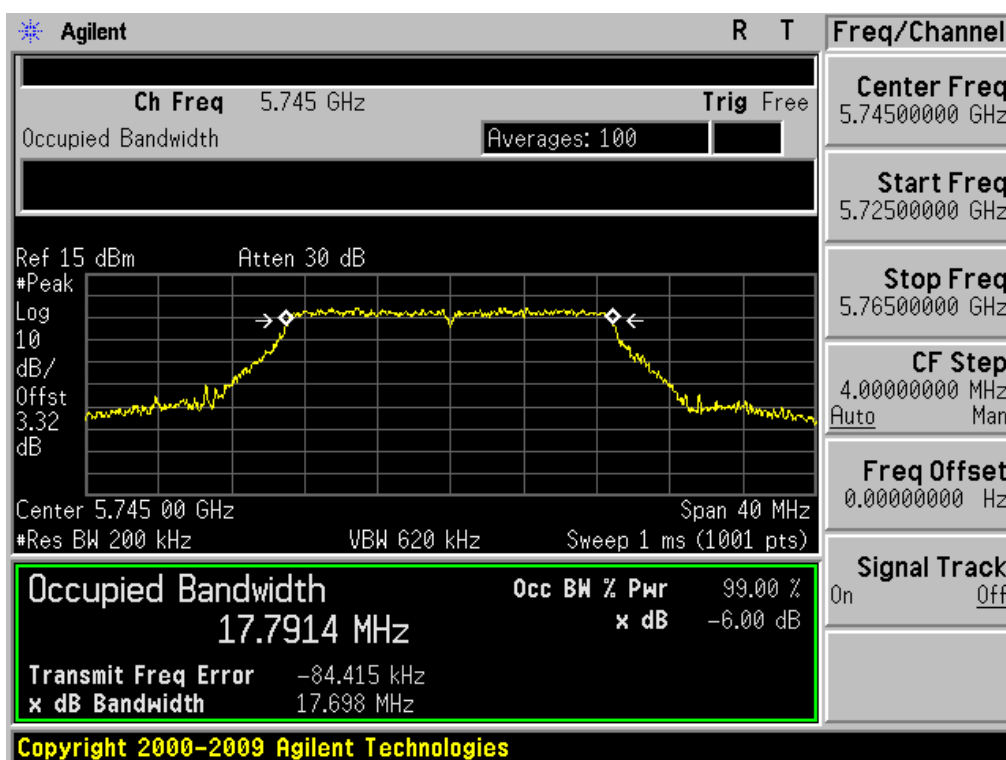
# 6 dB Bandwidth

Test Mode: 802.11a & 6Mbps & 5825MHz

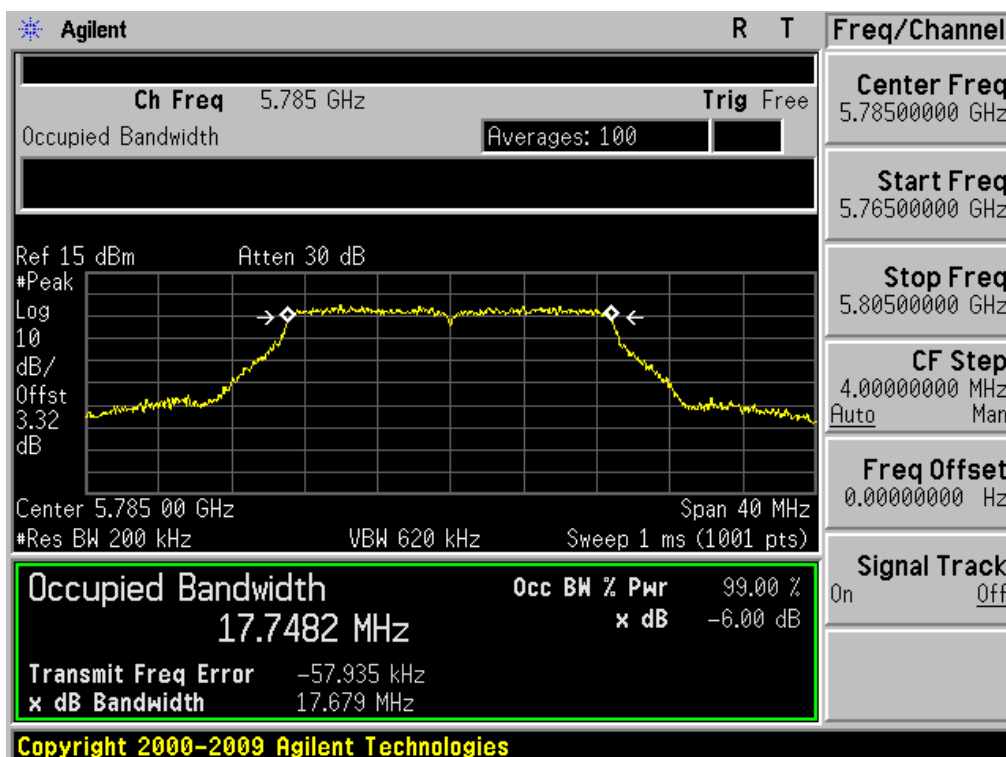


**6 dB Bandwidth**

Test Mode: 802.11n HT20 &amp; MCS0 &amp; 5745MHz

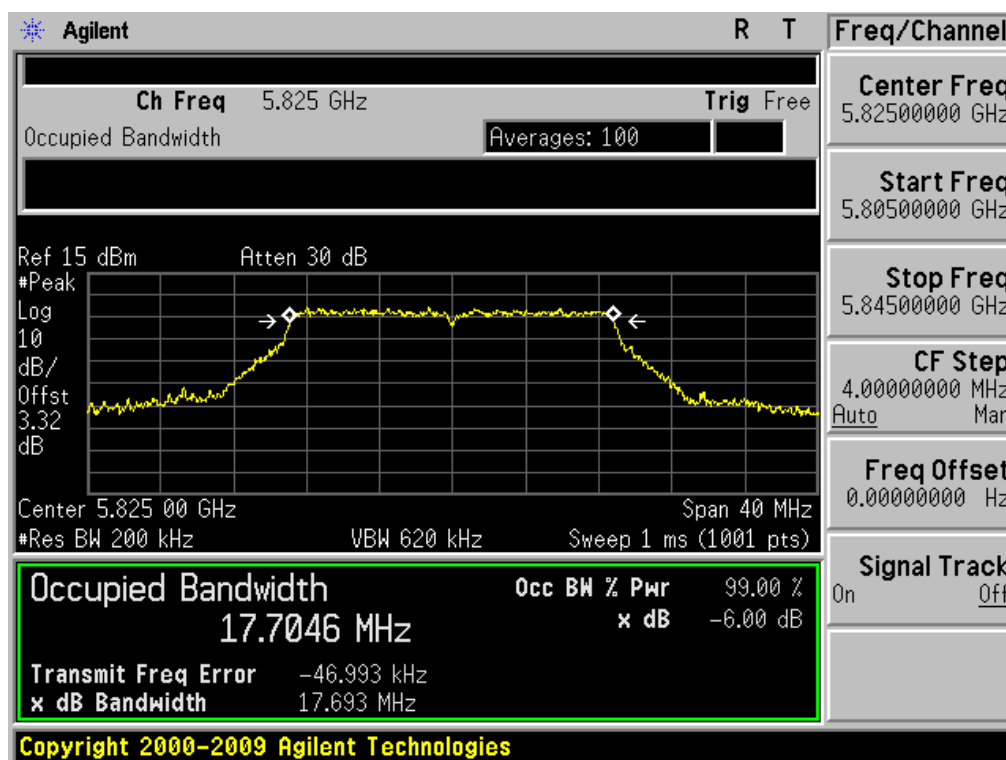
**6 dB Bandwidth**

Test Mode: 802.11n HT20 &amp; MCS0 &amp; 5785MHz



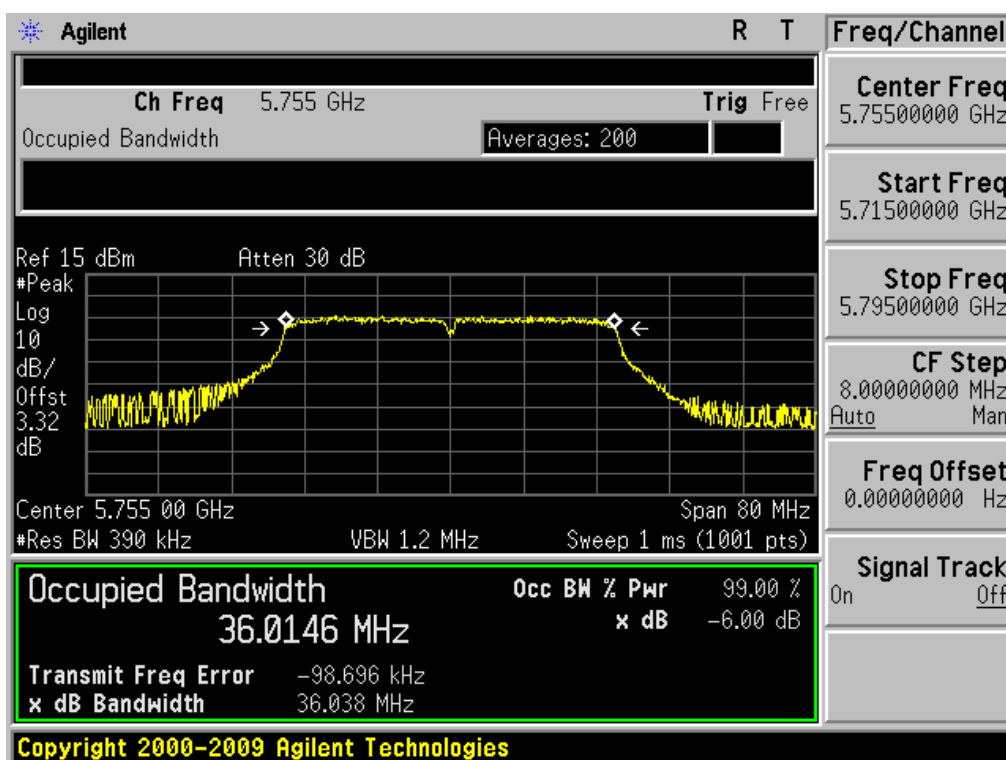
# 6 dB Bandwidth

Test Mode: 802.11n HT20 & MCS0 & 5825MHz

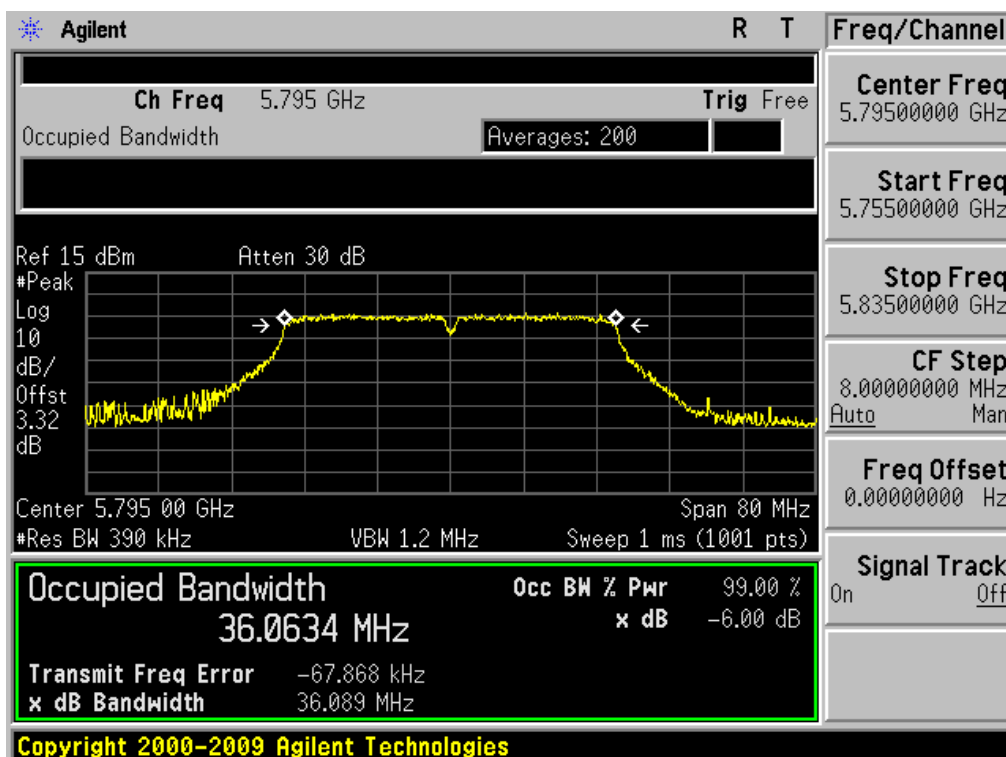


**6 dB Bandwidth**

Test Mode: 802.11n HT40 &amp; MCS0 &amp; 5755MHz

**6 dB Bandwidth**

Test Mode: 802.11n HT40 &amp; MCS0 &amp; 5795MHz



## 8.2 Maximum Peak Conducted Output Power

### Test Requirements and limit, §15.247(b) & RSS-210 [A8.4]

A transmitter antenna terminal of EUT is connected to the input of a spectrum analyzer.

Measurement is made while the EUT is operating in transmission mode at the appropriate frequencies.

**The maximum permissible conducted output power is 1 Watt.**

#### ■ TEST CONFIGURATION

Refer to the APPENDIX I.

#### ■ TEST PROCEDURE :

Maximum Peak Conducted Output Power is measured using **the Measurement Procedure PK2 of KDB558074**.

1. Set the **RBW = 1 MHz**.
2. Set the **VBW = 3 MHz**.
3. Set the span to a value that is **5-30 %** greater than the EBW.
4. Detector = **peak**.
5. Sweep time = **auto couple**.
6. Trace mode = **max hold**.
7. Allow trace to fully stabilize.
8. Use the spectrum analyzer's integrated band power measurement function with band limits set equal to the EBW band edges (for some analyzers, this may require a manual override to ensure use of peak detector). If the spectrum analyzer does not have a band power function, sum the spectrum levels (in linear power units) at 1 MHz intervals extending across the EBW of the spectrum.

**Note:** Tests were performed all possible data rates and the worst case data were reported.

■ **TEST RESULTS : Comply**

- Measurement Data: **Comply**

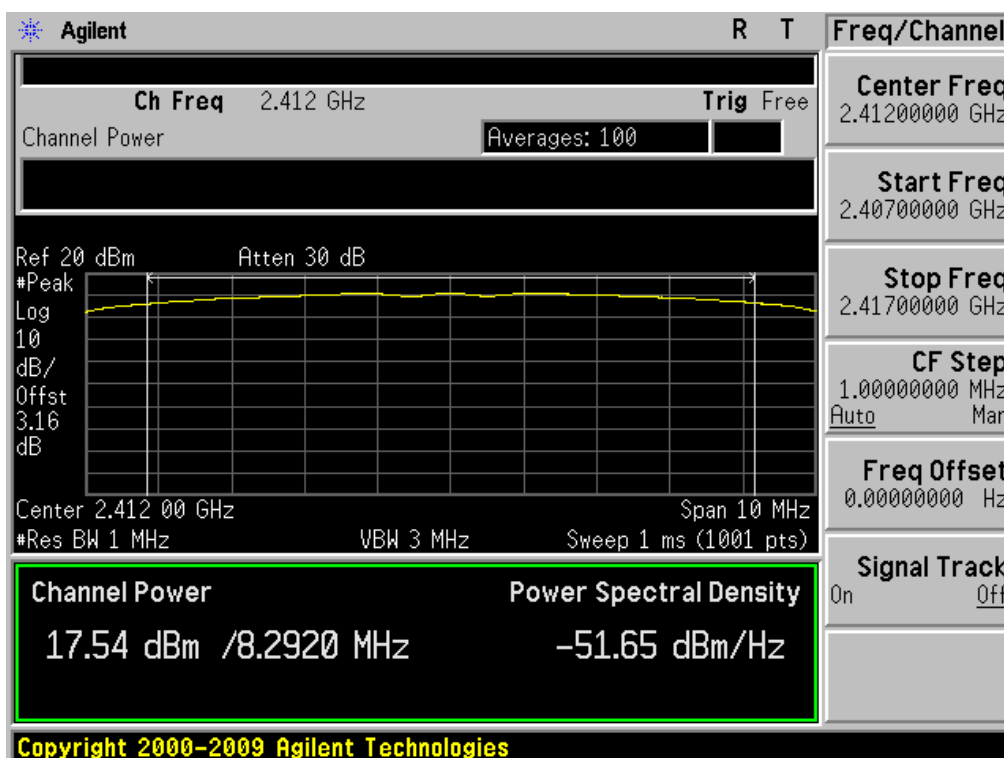
- Summary of Test Results

| Mode         | Channel | Frequency<br>[MHz] | Test Result  |              |
|--------------|---------|--------------------|--------------|--------------|
|              |         |                    | [dBm]        | [W]          |
| 802.11b      | 1       | 2412               | 17.54        | 0.057        |
|              | 6       | 2437               | <b>17.74</b> | <b>0.059</b> |
|              | 11      | 2462               | 17.33        | 0.054        |
| 802.11g      | 1       | 2412               | <b>14.87</b> | <b>0.031</b> |
|              | 6       | 2437               | 14.55        | 0.029        |
|              | 11      | 2462               | 14.32        | 0.027        |
| 802.11n HT20 | 1       | 2412               | 13.44        | 0.022        |
|              | 6       | 2437               | 13.13        | 0.021        |
|              | 11      | 2462               | <b>13.63</b> | <b>0.023</b> |
| 802.11a      | 149     | 5745               | <b>15.37</b> | <b>0.034</b> |
|              | 157     | 5785               | 14.78        | 0.030        |
|              | 165     | 5825               | 15.24        | 0.033        |
| 802.11n HT20 | 149     | 5745               | <b>13.43</b> | <b>0.022</b> |
|              | 157     | 5785               | 12.72        | 0.019        |
|              | 165     | 5825               | 12.36        | 0.017        |
| 802.11n HT40 | 151     | 5755               | 9.27         | 0.008        |
|              | 159     | 5795               | <b>9.51</b>  | <b>0.009</b> |

## RESULT PLOTS

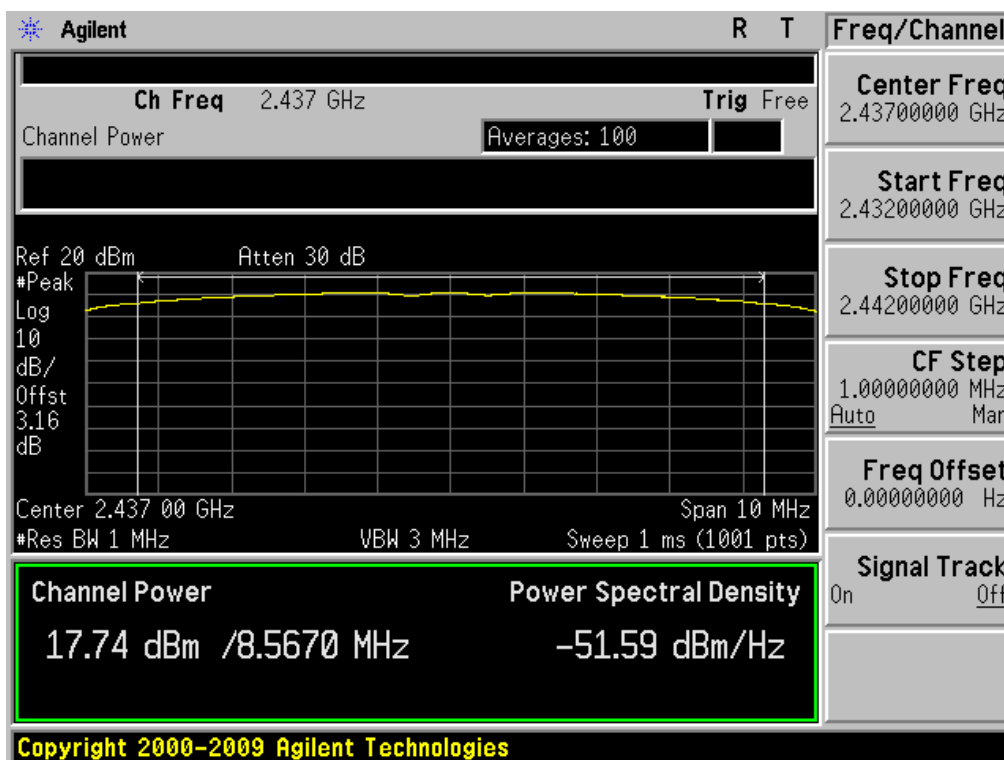
### Peak Output Power

Test Mode: 802.11b & 1Mbps & 2412MHz



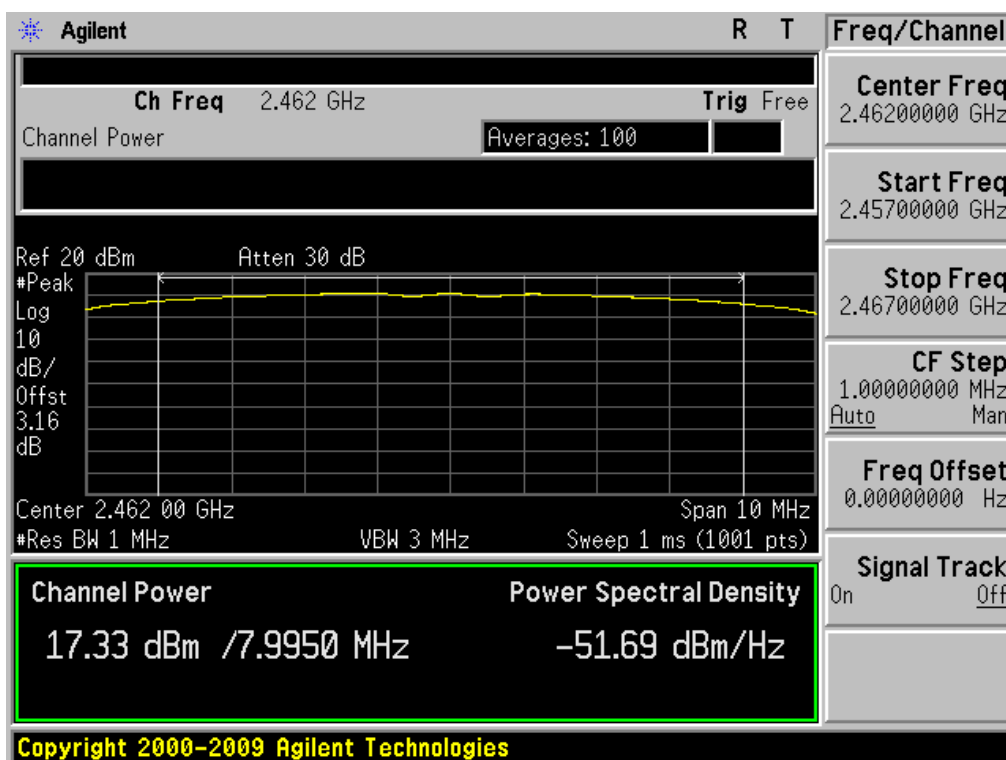
### Peak Output Power

Test Mode: 802.11b & 1Mbps & 2437MHz



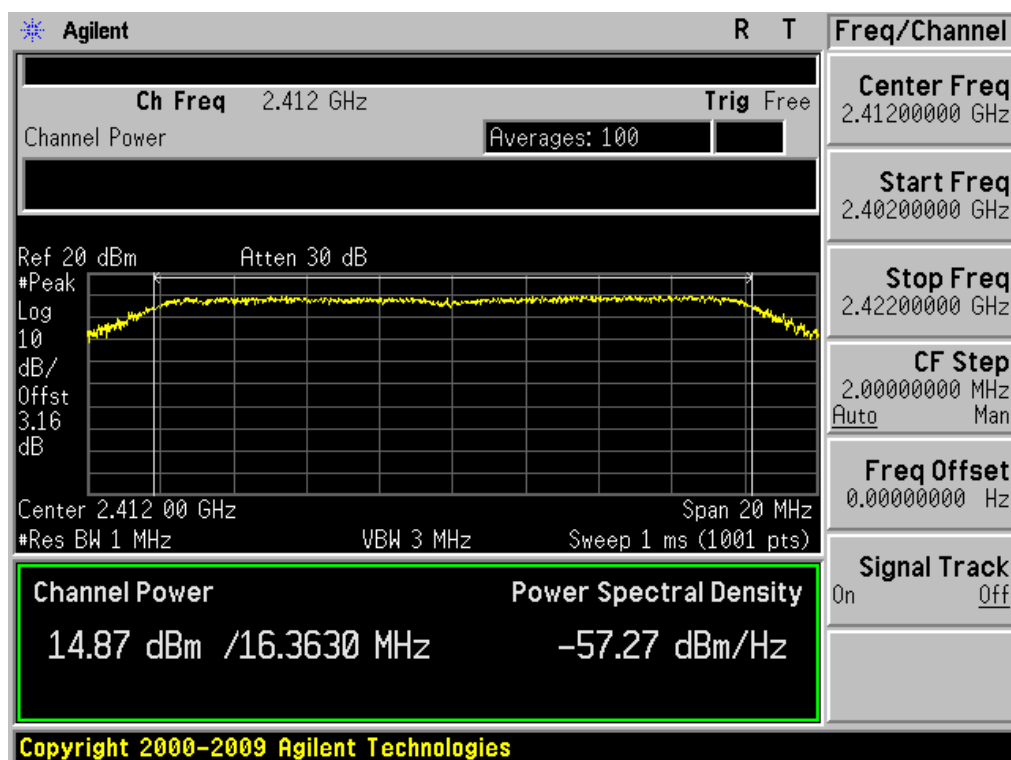
**Peak Output Power**

Test Mode: 802.11b &amp; 1Mbps &amp; 2462MHz

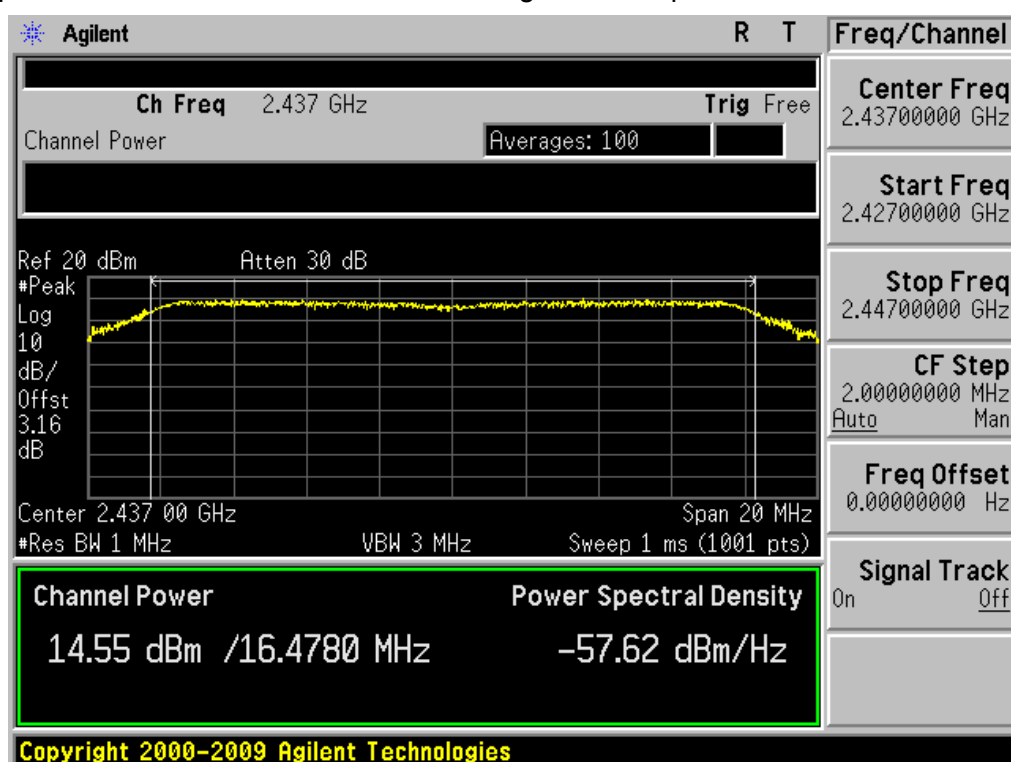


**Peak Output Power**

Test Mode: 802.11g &amp; 6Mbps &amp; 2412MHz

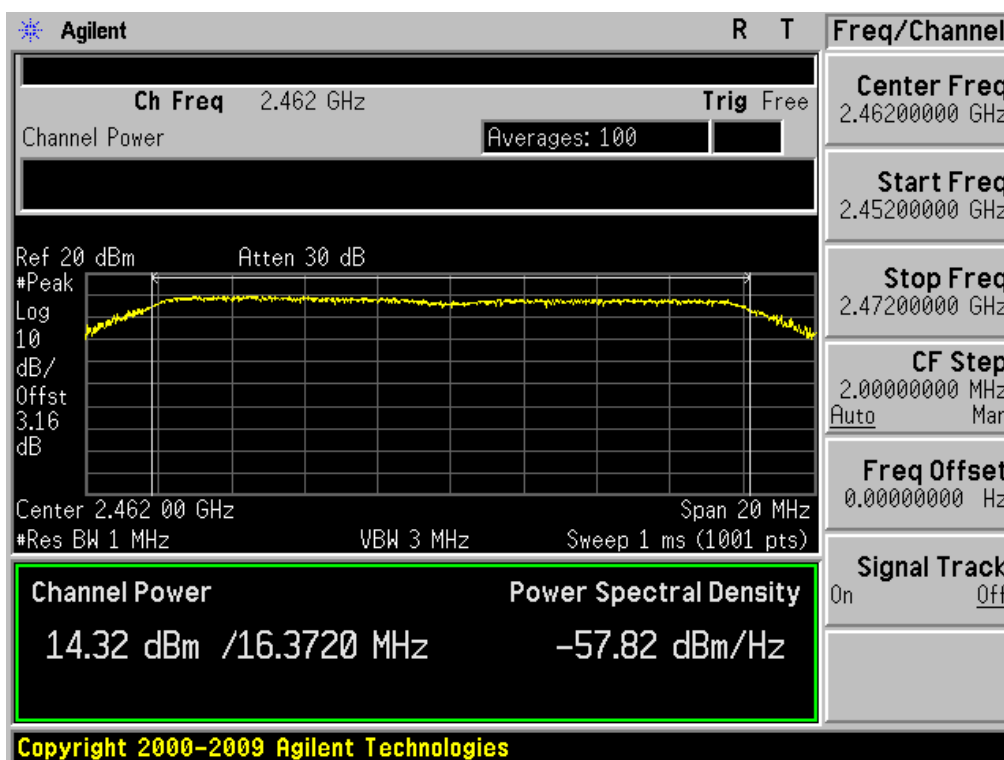
**Peak Output Power**

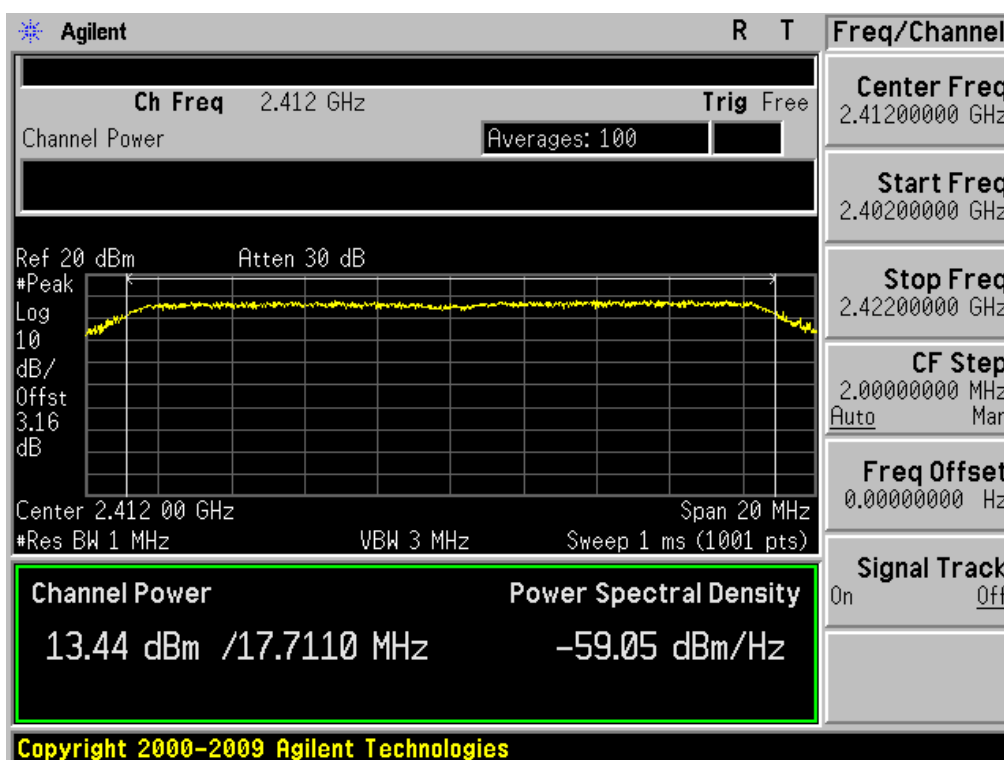
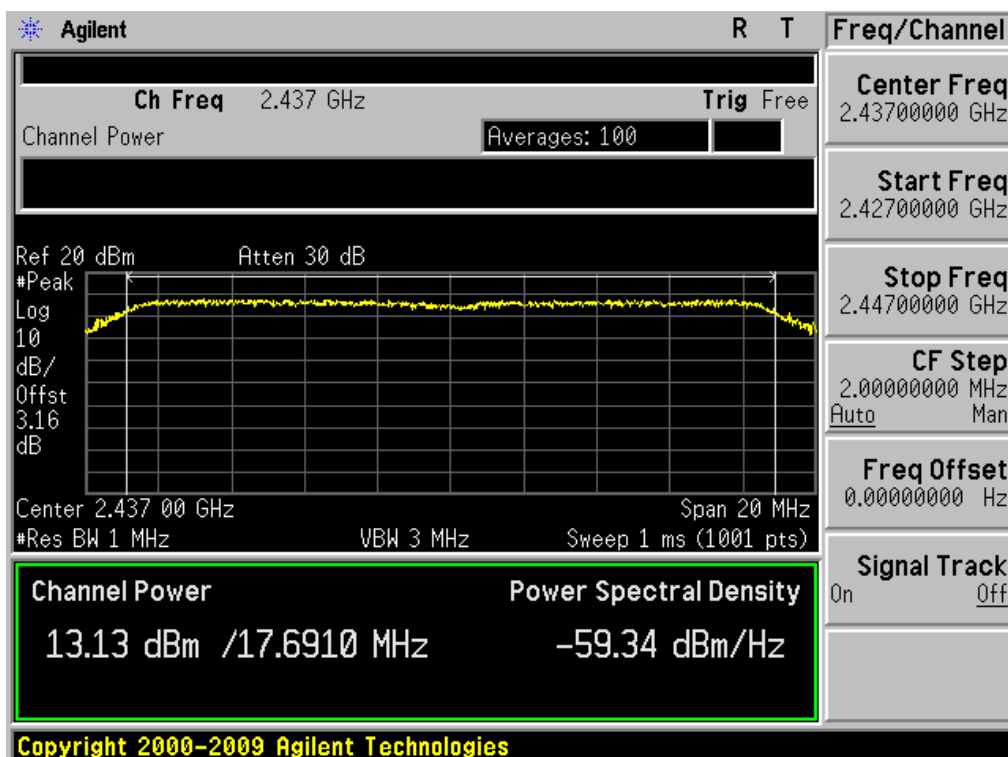
Test Mode: 802.11g &amp; 6Mbps &amp; 2437MHz



# Peak Output Power

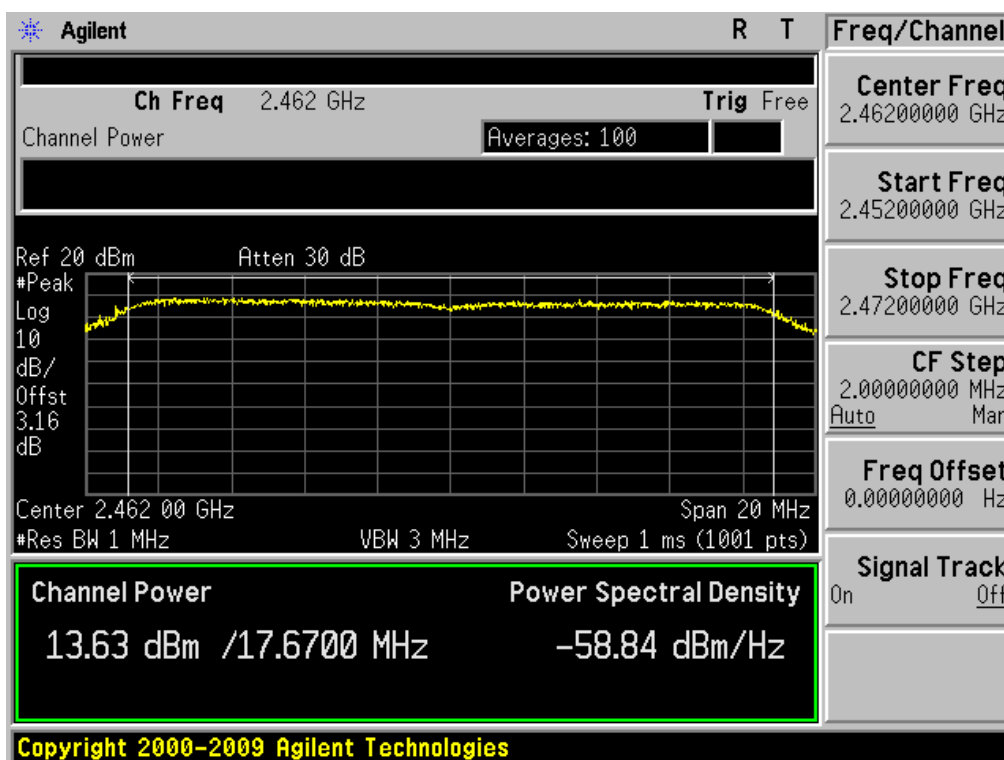
Test Mode: 802.11g & 6Mbps & 2462MHz



**Peak Output Power**      Test Mode: 802.11n HT20 & MCS0 & 2412MHz**Peak Output Power**      Test Mode: 802.11n HT20 & MCS0 & 2437MHz

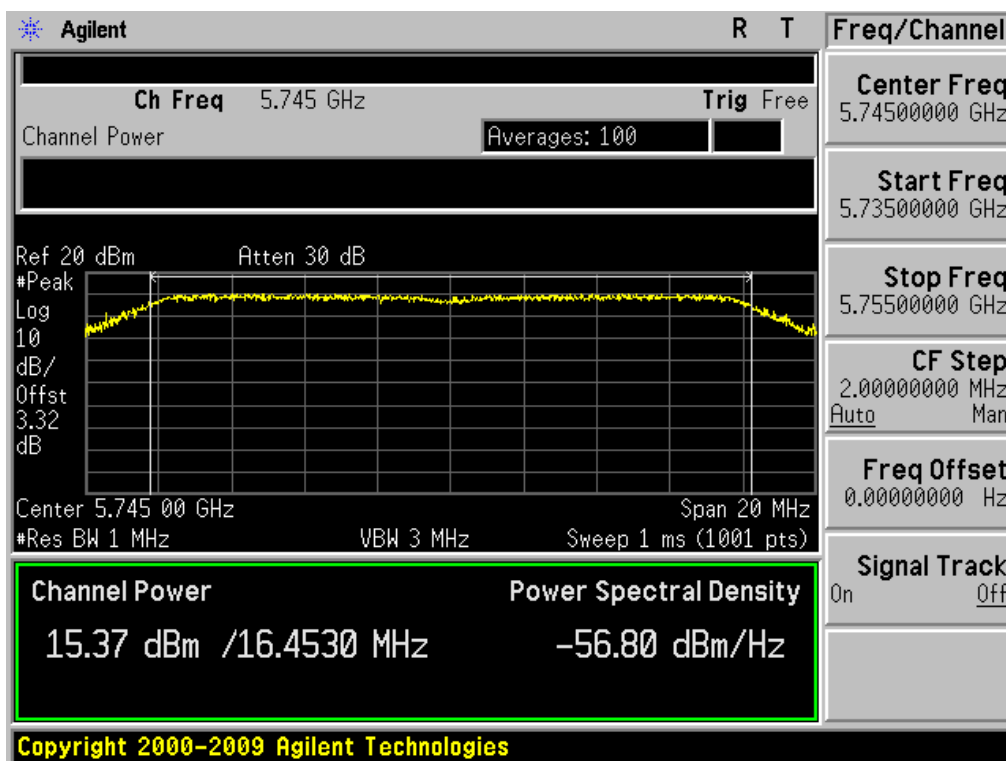
# Peak Output Power

Test Mode: 802.11n HT20 & MCS0 & 2462MHz

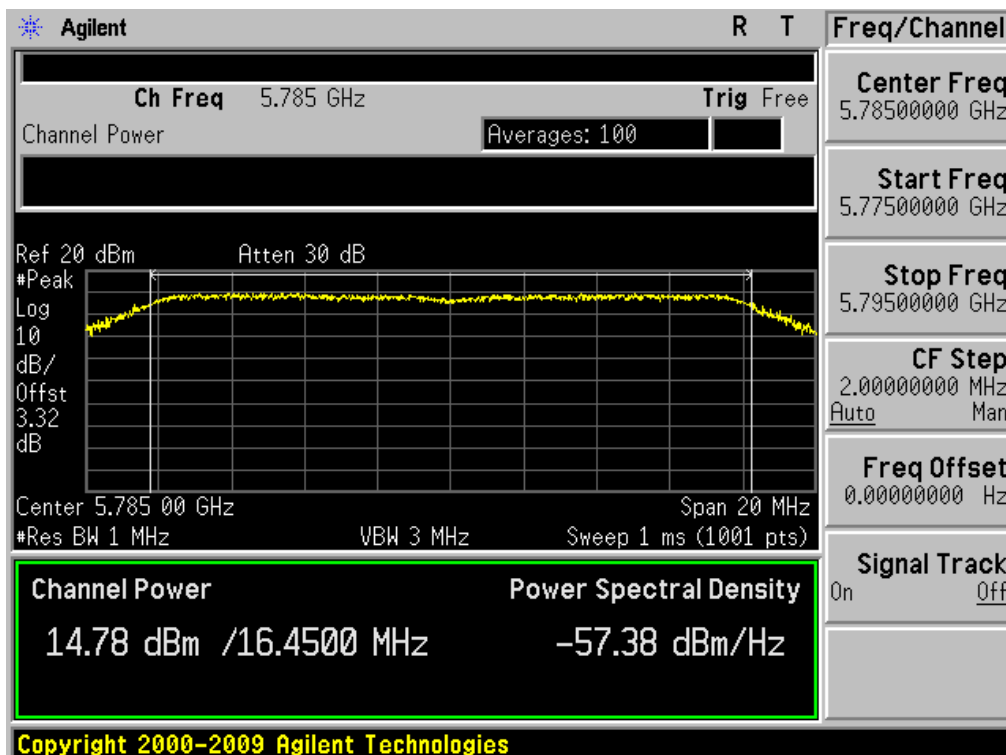


**Peak Output Power**

Test Mode: 802.11a &amp; 6Mbps &amp; 5745MHz

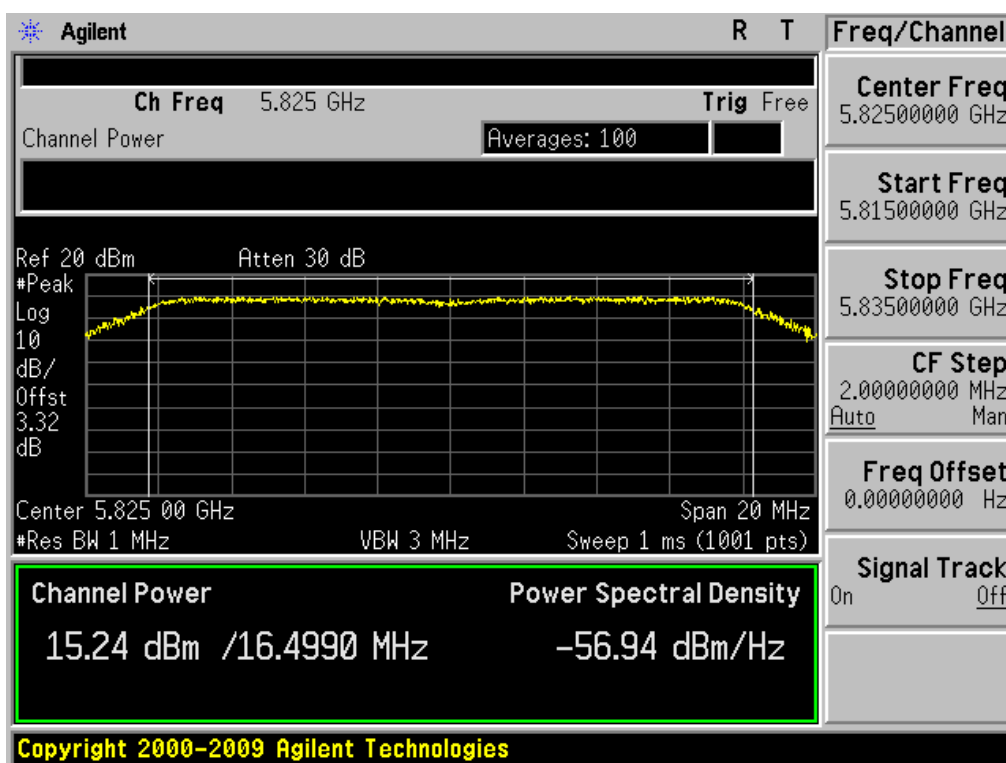
**Peak Output Power**

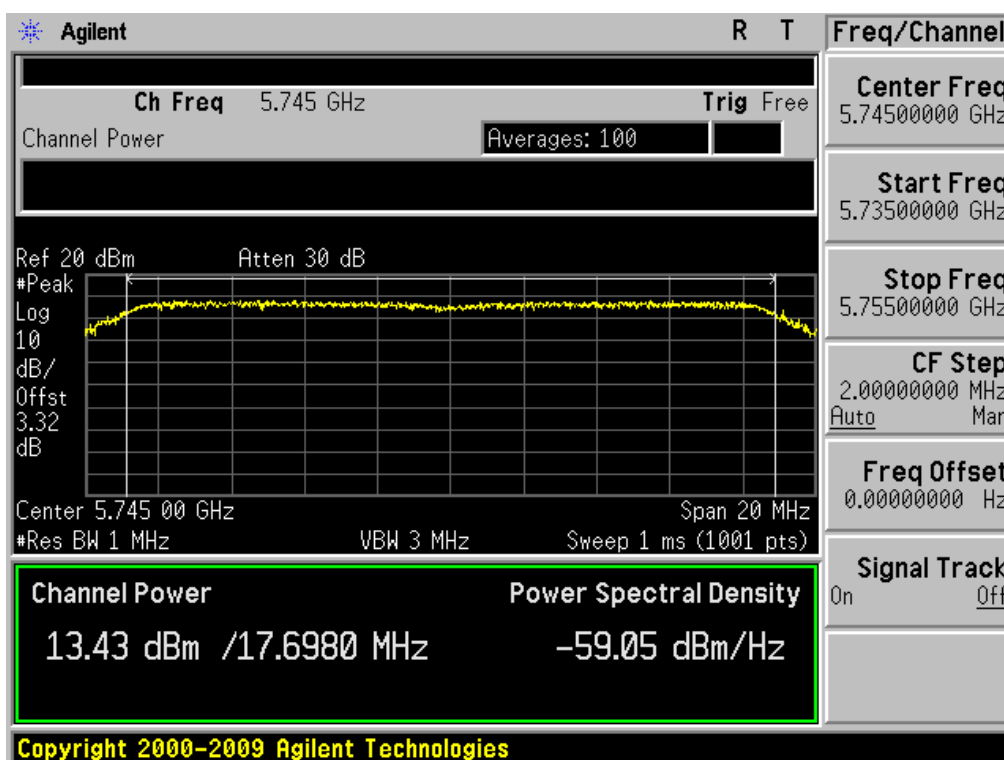
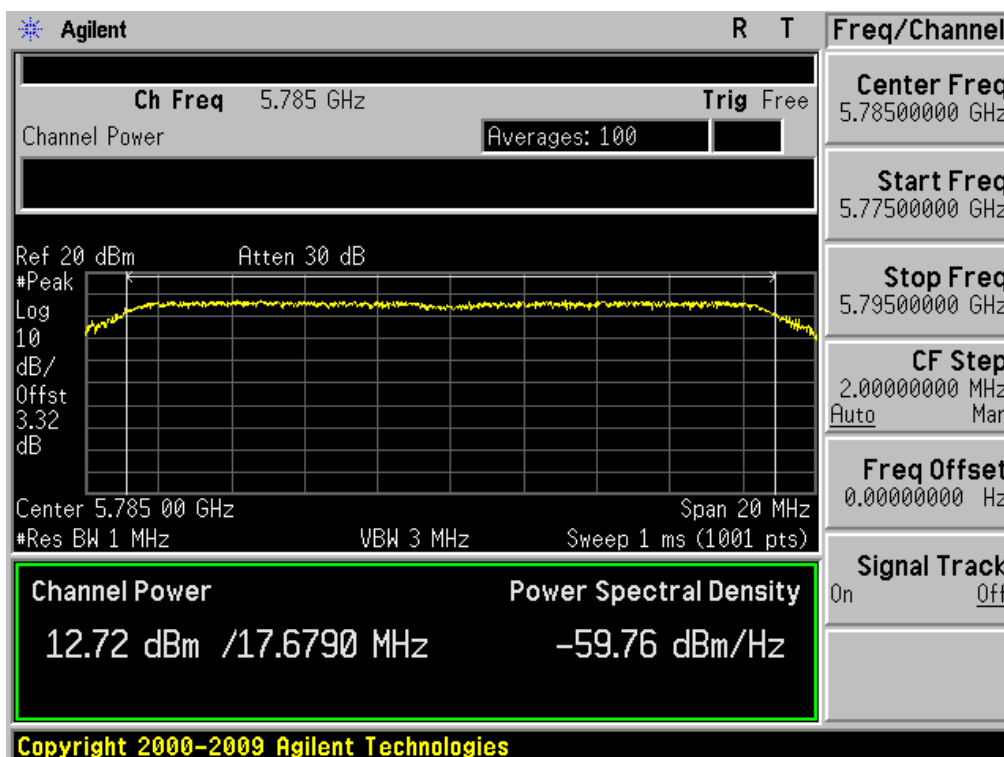
Test Mode: 802.11a &amp; 6Mbps &amp; 5785MHz



**Peak Output Power**

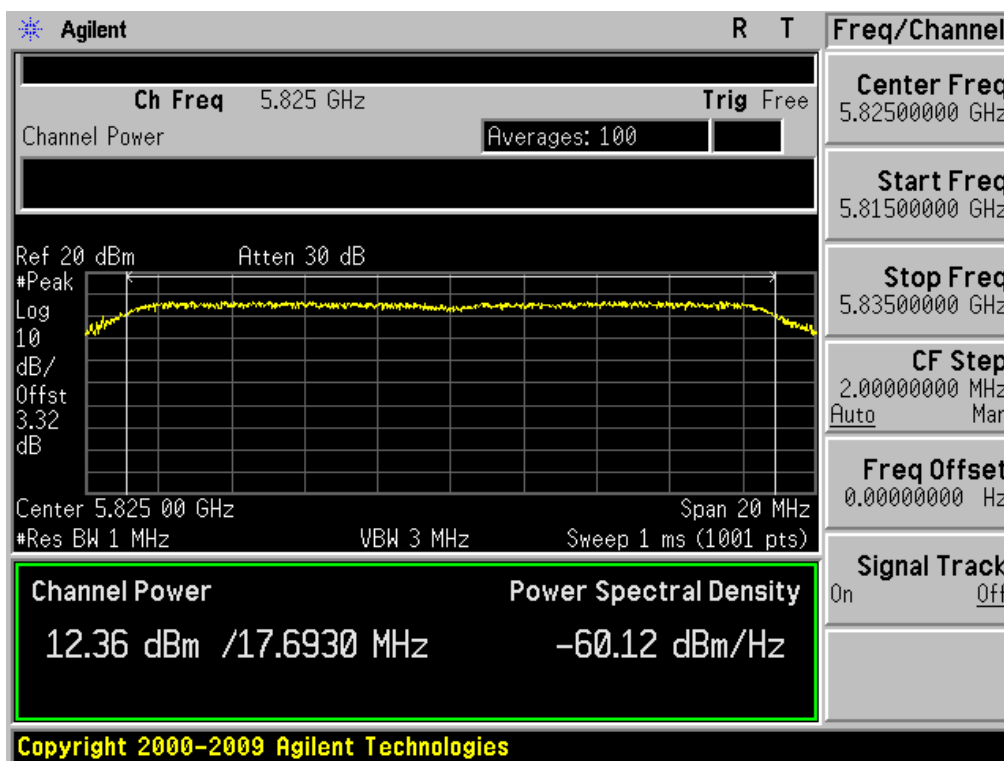
Test Mode: 802.11a &amp; 6Mbps &amp; 5825MHz

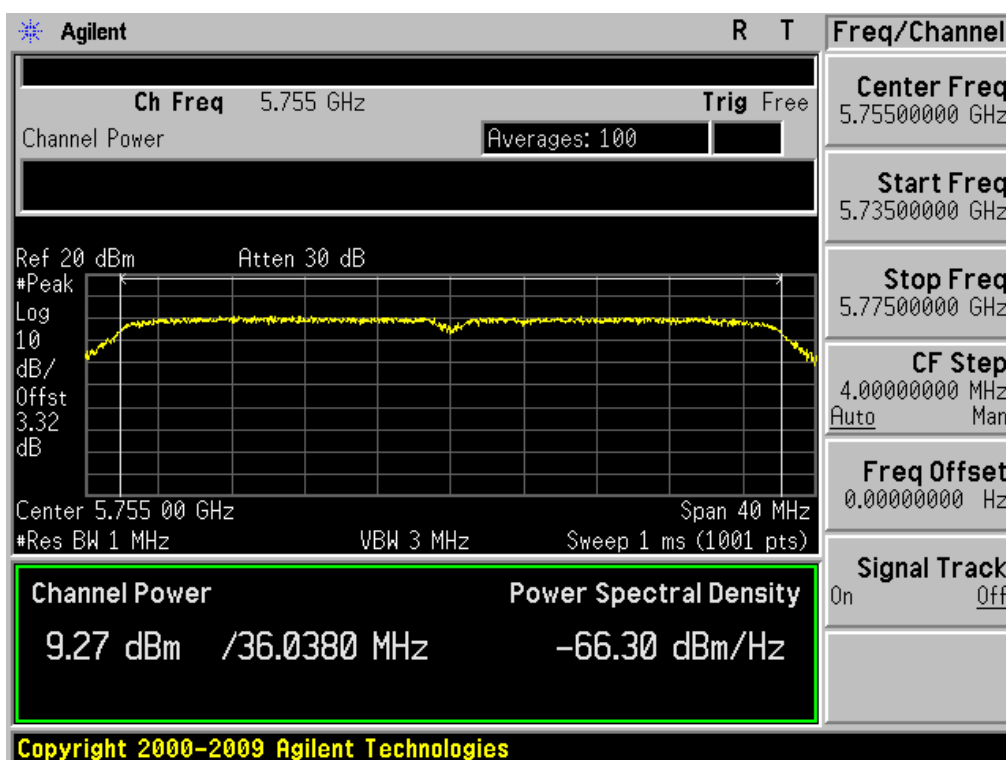
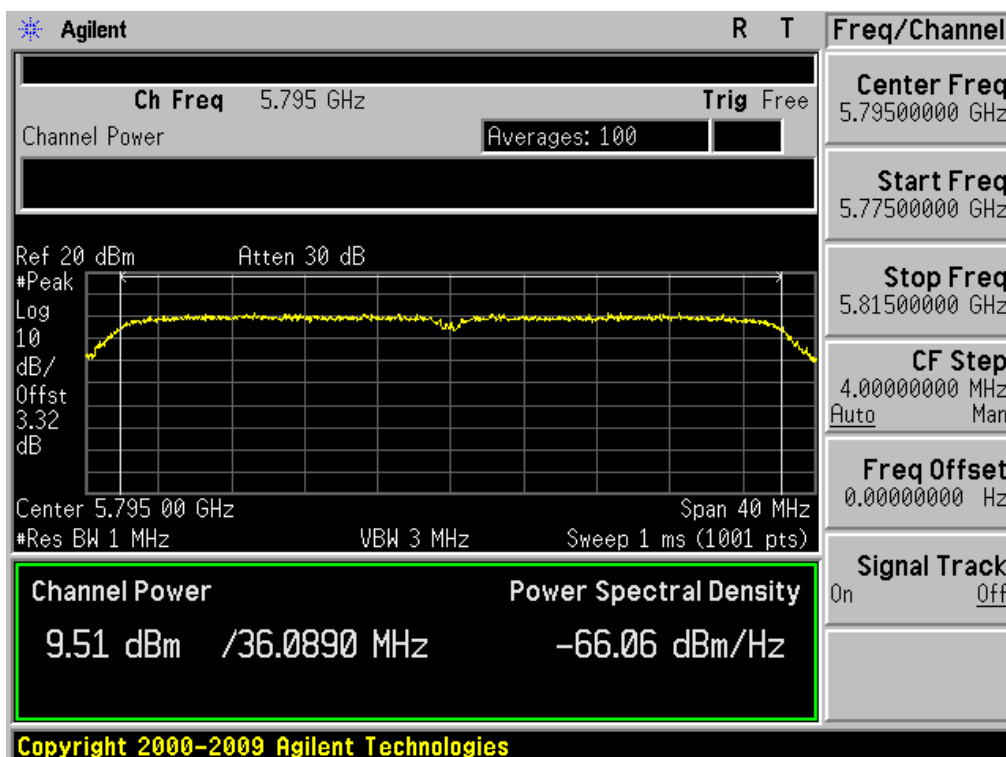


**Peak Output Power**      Test Mode: 802.11n HT20 & MCS0 & 5745MHz**Peak Output Power**      Test Mode: 802.11n HT20 & MCS0 & 5785MHz

# Peak Output Power

Test Mode: 802.11n HT20 & MCS0 & 5825MHz



**Peak Output Power**      Test Mode: 802.11n HT40 & MCS0 & 5755MHz**Peak Output Power**      Test Mode: 802.11n HT40 & MCS0 & 5795MHz

### 8.3 Maximum Power Spectral Density

#### Test requirements and limit, §15.247(e) & RSS-210 [A8.2]

The peak power density is measured with a spectrum analyzer connected to the antenna terminal while the EUT is operating in transmission mode at the appropriate frequencies.

**Minimum Standard –specifies a conducted power spectral density (PSD) limit of 8 dBm in any 3 kHz band segment within the fundamental EBW during any time interval of continuous transmission.**

#### ■ TEST CONFIGURATION

Refer to the APPENDIX I.

#### ■ TEST PROCEDURE:

The Measurement Procedure **PKPSD of KDB558074** is used.

1. Set the **RBW = 100 kHz**.
2. Set the **VBW ≥ 300 kHz**.
3. Set the span to **5-30 %** greater than the EBW.
4. Detector = **peak**.
5. Sweep time = **auto couple**.
6. Trace mode = **max hold**.
7. Allow trace to fully stabilize.
8. Use the **peak marker function** to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
9. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where **BWCF =  $10\log(3\text{ kHz}/100\text{ kHz}) = -15.2\text{ dB}$** .
10. The resulting peak PSD level must be  $\leq 8\text{ dBm}$ .

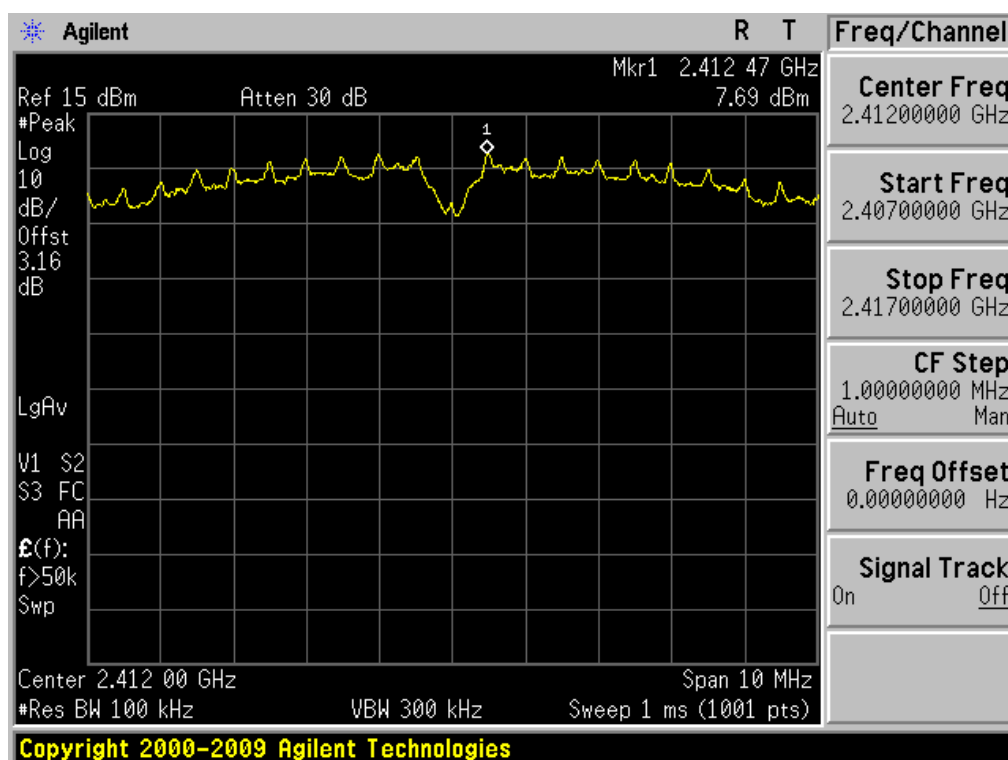
#### ■ TEST RESULTS: **Comply**

| Test Mode    | Data Rate | Frequency [MHz] | S/A Reading [dBm] | B.W.C.F [dB] | PKPSD [dBm]  |
|--------------|-----------|-----------------|-------------------|--------------|--------------|
| 802.11b      | 1Mbps     | 2412            | 7.69              | -15.20       | <b>-7.51</b> |
|              |           | 2437            | 7.23              | -15.20       | -7.97        |
|              |           | 2462            | 7.63              | -15.20       | -7.57        |
| 802.11g      | 6Mbps     | 2412            | 1.29              | -15.20       | -13.91       |
|              |           | 2437            | 1.77              | -15.20       | -13.43       |
|              |           | 2462            | 2.13              | -15.20       | -13.07       |
| 802.11n HT20 | MCS0      | 2412            | 0.47              | -15.20       | -14.73       |
|              |           | 2437            | 0.54              | -15.20       | -14.66       |
|              |           | 2462            | 1.32              | -15.20       | -13.88       |
| 802.11a      | 6Mbps     | 5745            | 2.17              | -15.20       | -13.03       |
|              |           | 5785            | 1.52              | -15.20       | -13.68       |
|              |           | 5825            | 1.30              | -15.20       | -13.90       |
| 802.11n HT20 | MCS0      | 5745            | 0.22              | -15.20       | -14.98       |
|              |           | 5785            | -0.35             | -15.20       | -15.55       |
|              |           | 5825            | -0.90             | -15.20       | -16.10       |
| 802.11n HT40 | MCS0      | 5755            | -6.58             | -15.20       | -21.78       |
|              |           | 5795            | -6.26             | -15.20       | -21.46       |

## ■ RESULT PLOTS

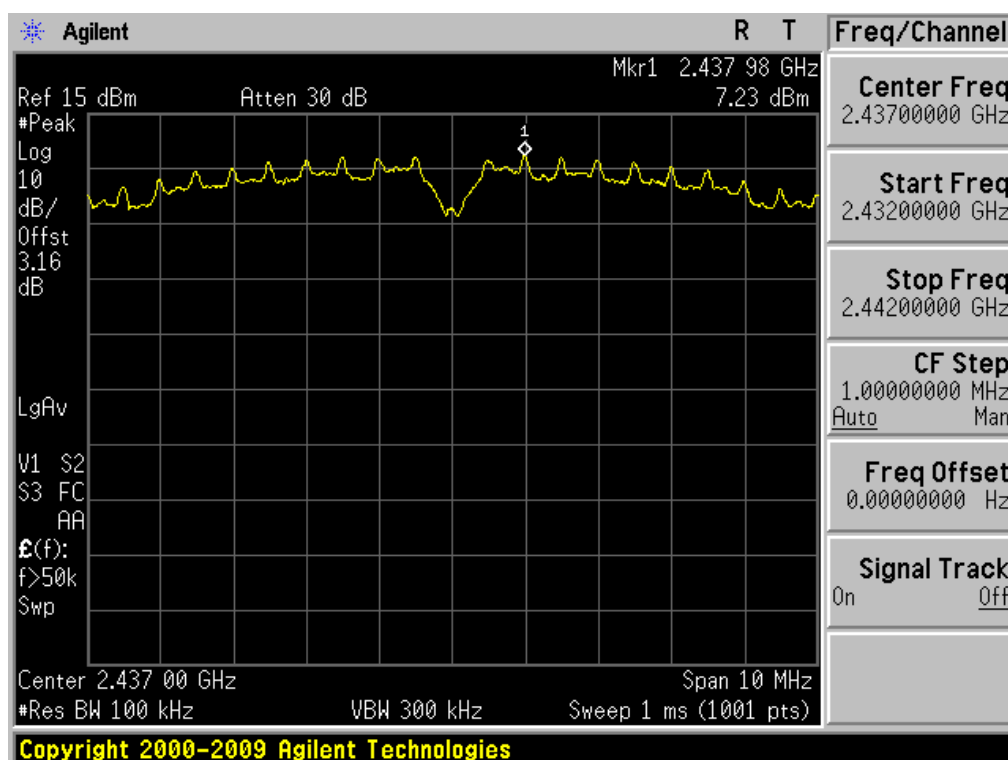
## Maximum PKPSD

Test Mode: 802.11b &amp; 1Mbps &amp; 2412MHz



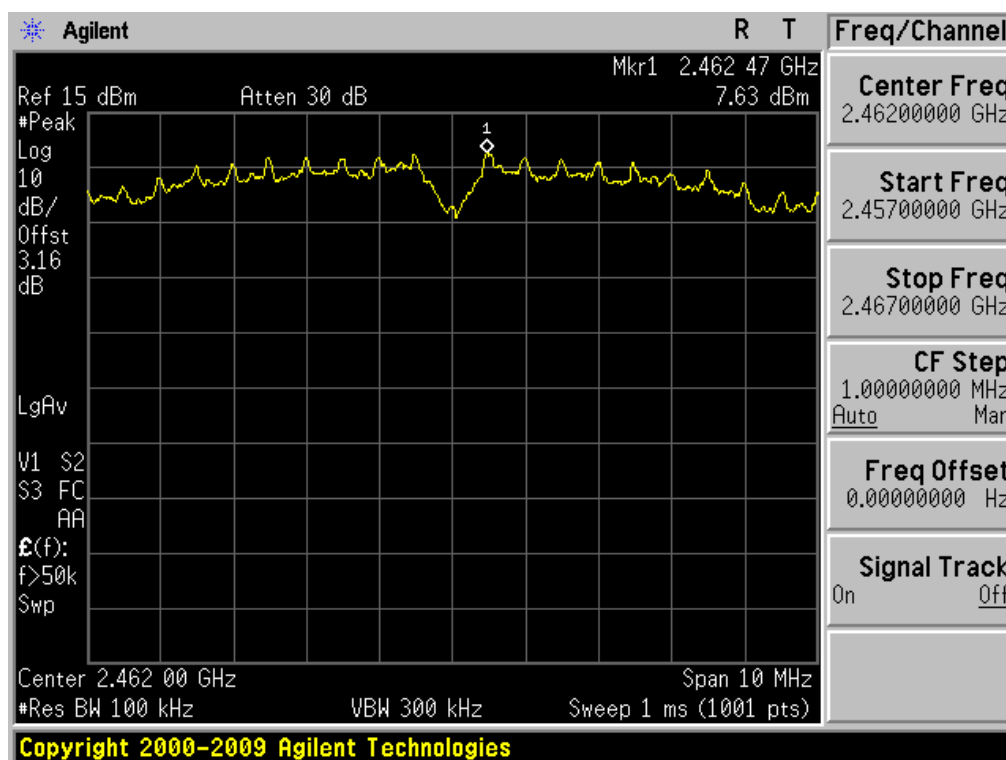
## Maximum PKPSD

Test Mode: 802.11b &amp; 1Mbps &amp; 2437MHz



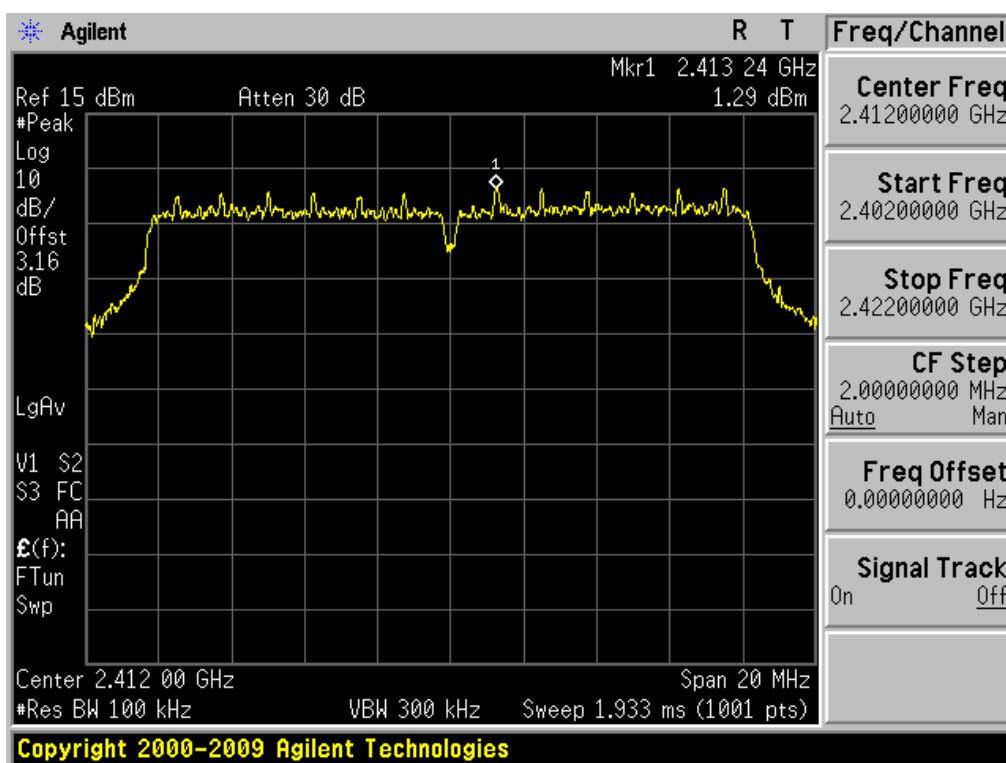
**Maximum PKPSD**

Test Mode: 802.11b & 1Mbps & 2462MHz



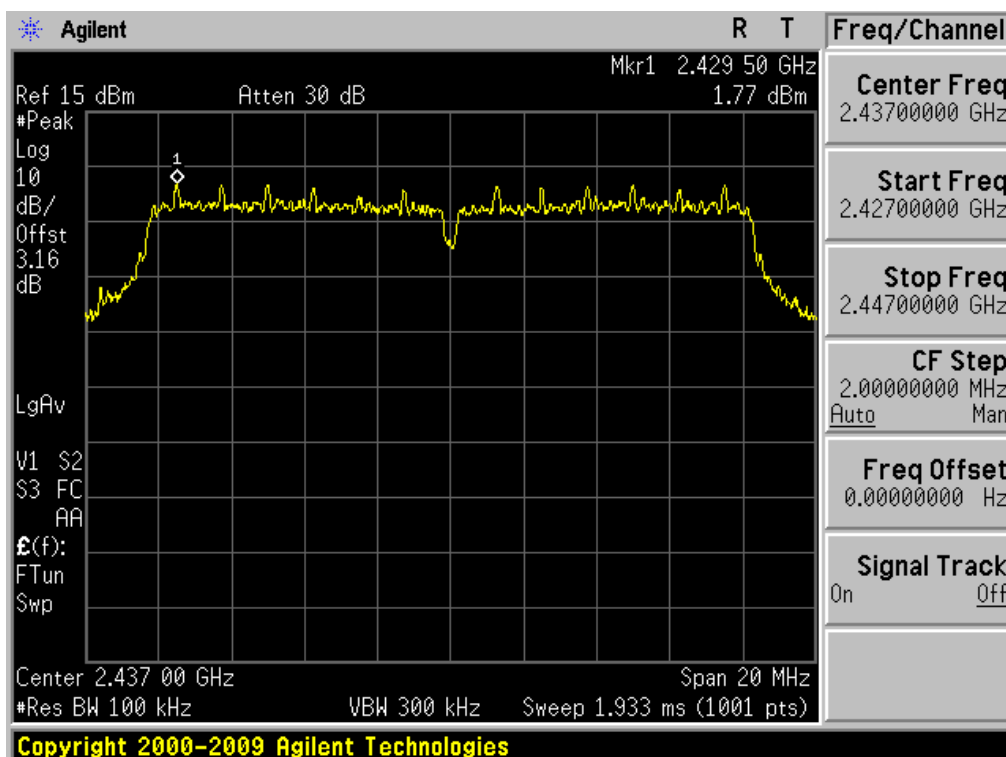
## Maximum PKPSD

Test Mode: 802.11g &amp; 6Mbps &amp; 2412MHz



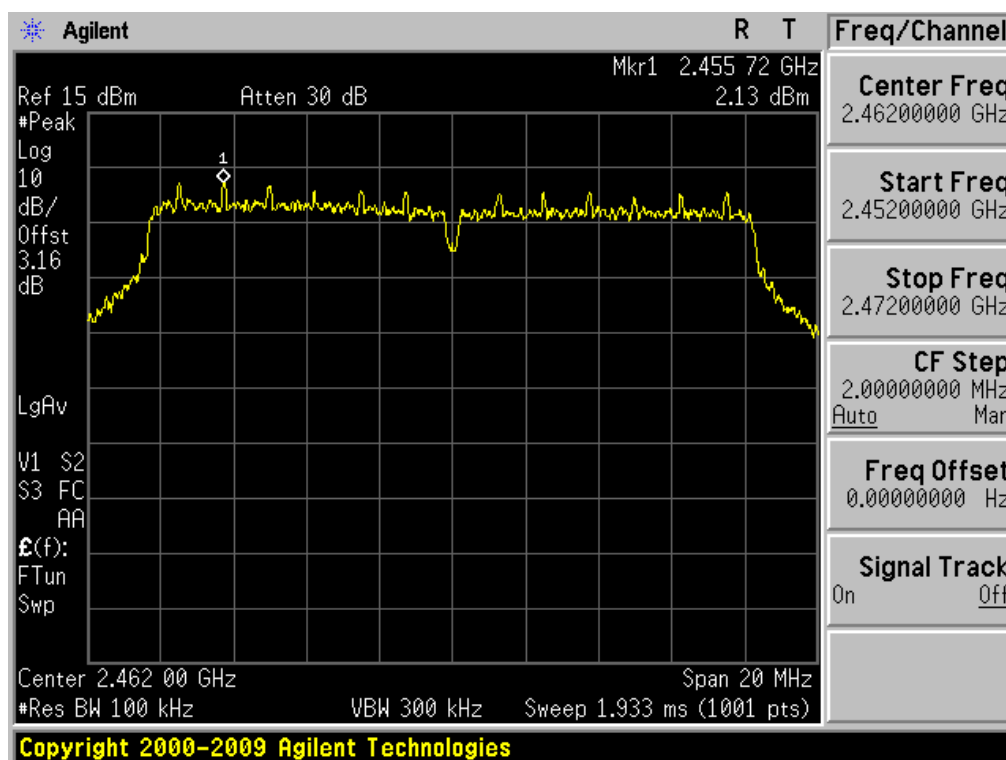
## Maximum PKPSD

Test Mode: 802.11g &amp; 6Mbps &amp; 2437MHz



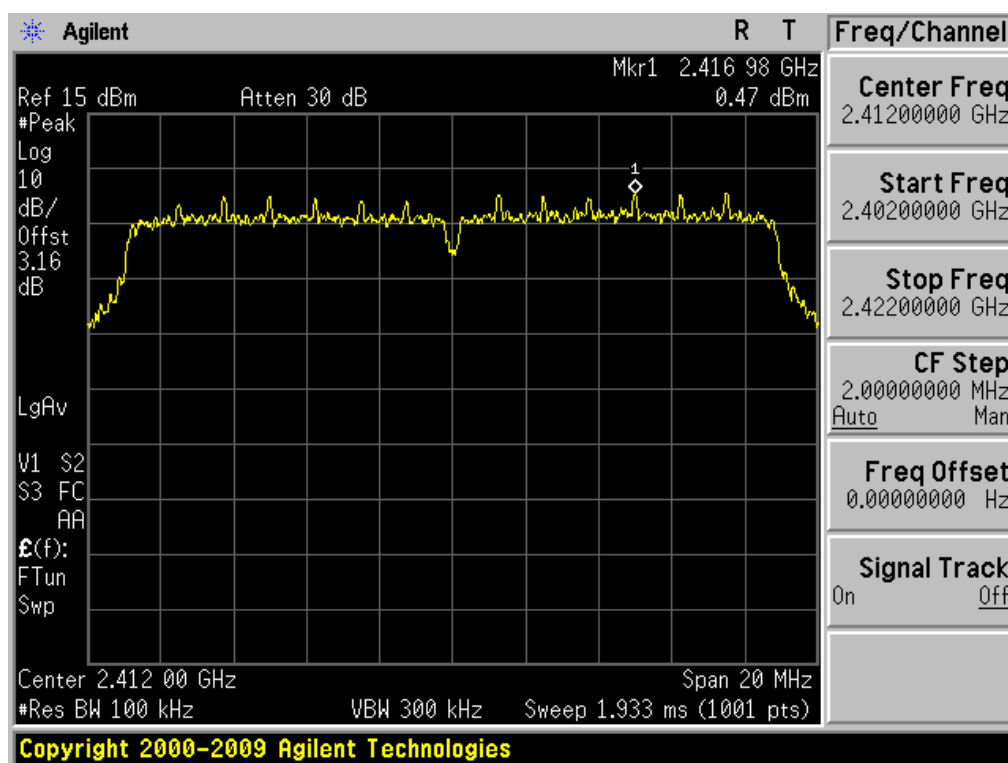
**Maximum PKPSD**

Test Mode: 802.11g & 6Mbps & 2462MHz



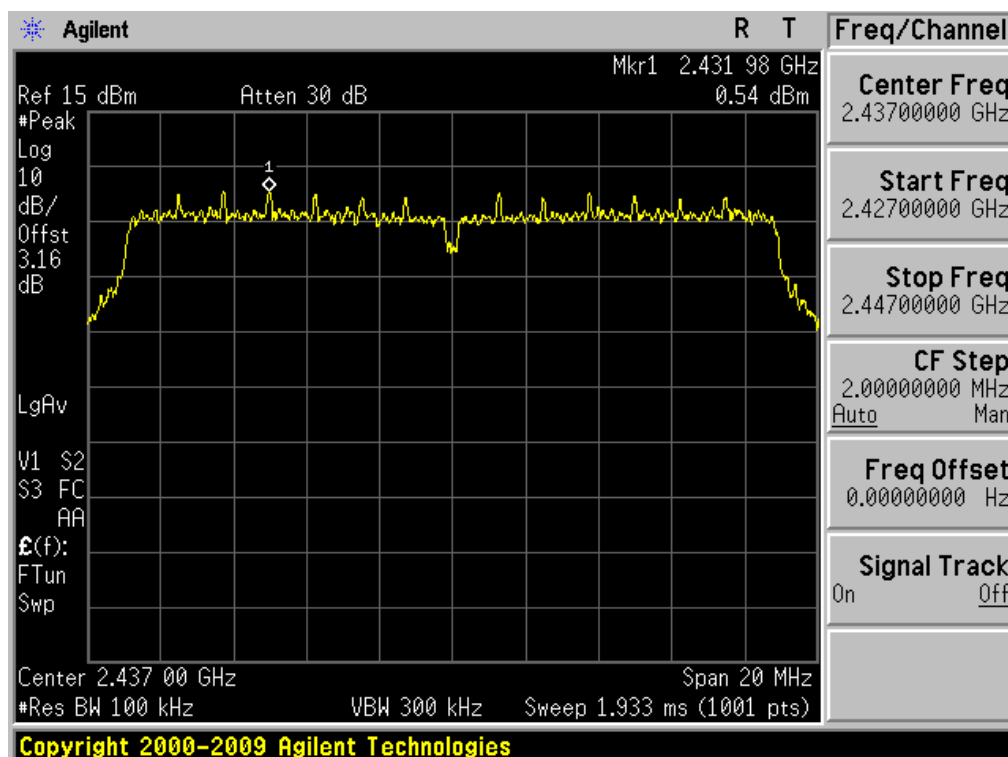
## Maximum PKPSD

Test Mode: 802.11n(HT20) &amp; MCS0 &amp; 2412MHz



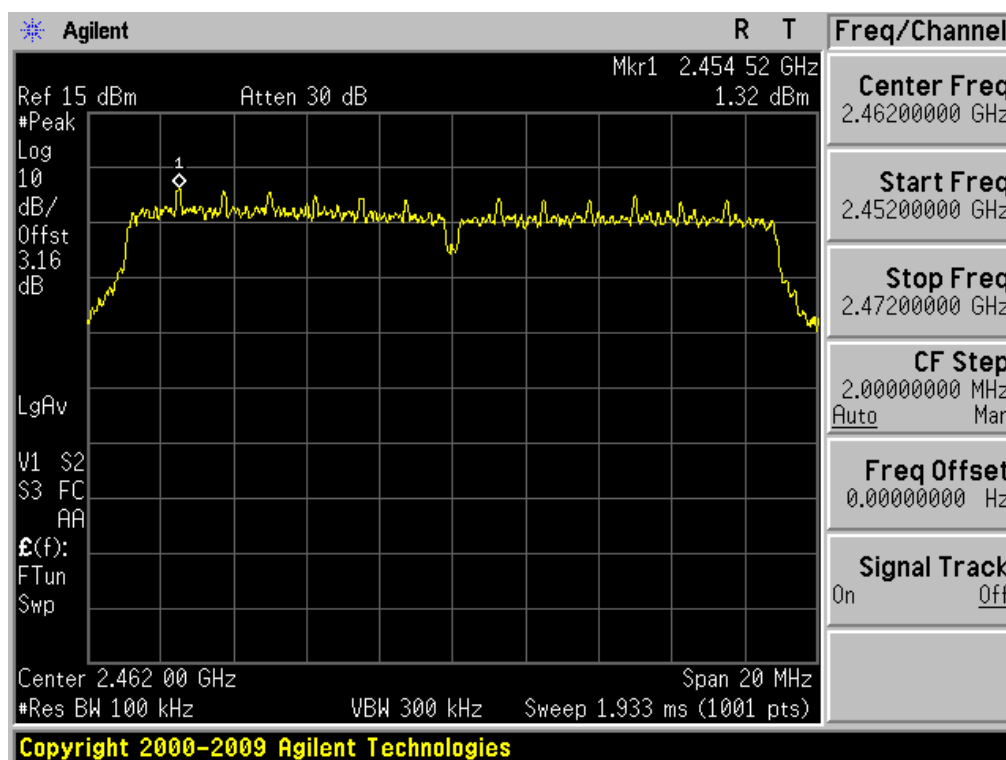
## Maximum PKPSD

Test Mode: 802.11n(HT20) &amp; MCS0 &amp; 2437MHz



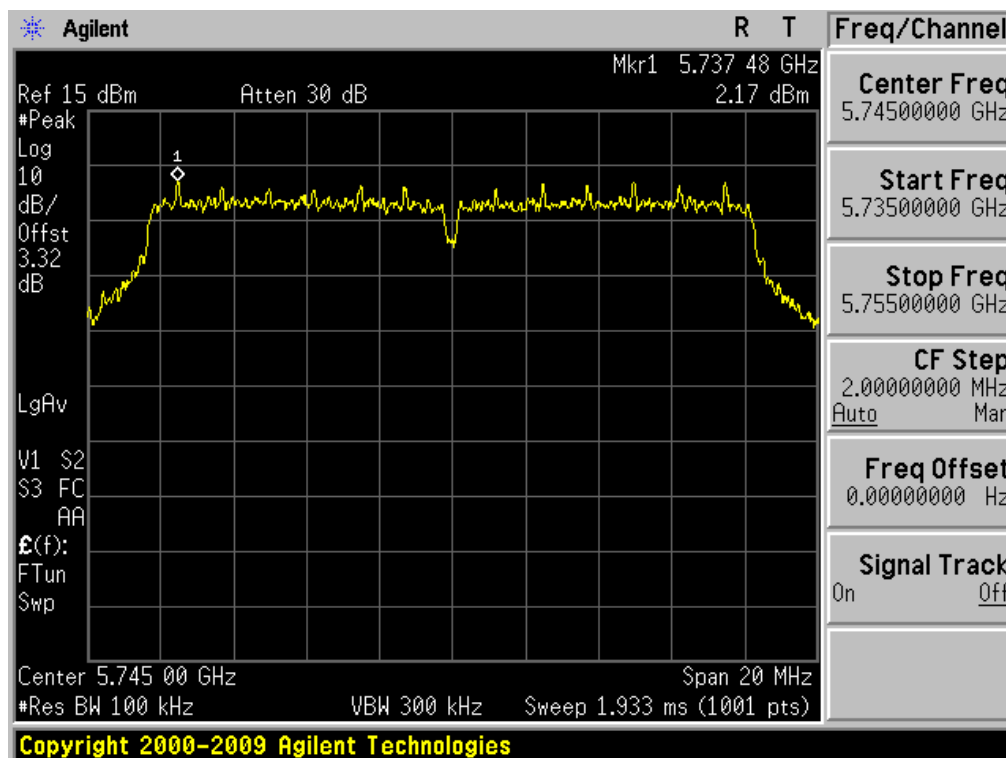
**Maximum PKPSD**

Test Mode: 802.11n(HT20) & MCS0 & 2462MHz



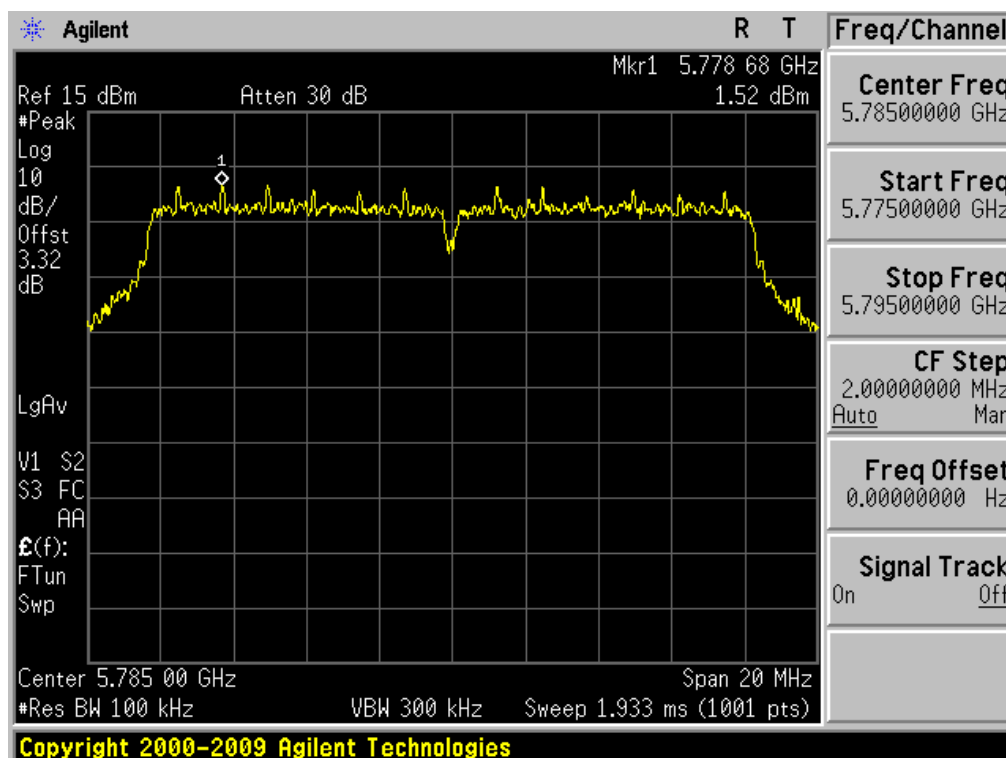
# Maximum PKPSD

Test Mode: 802.11a & 6Mbps & 5745MHz



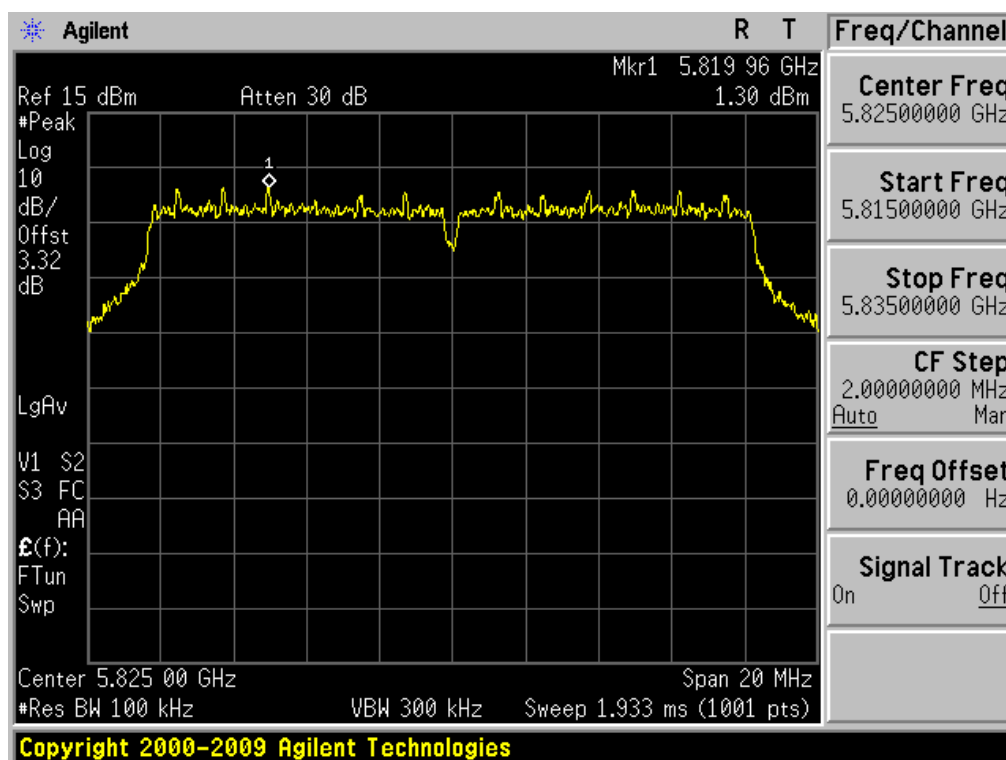
# Maximum PKPSD

Test Mode: 802.11a & 6Mbps & 5785MHz



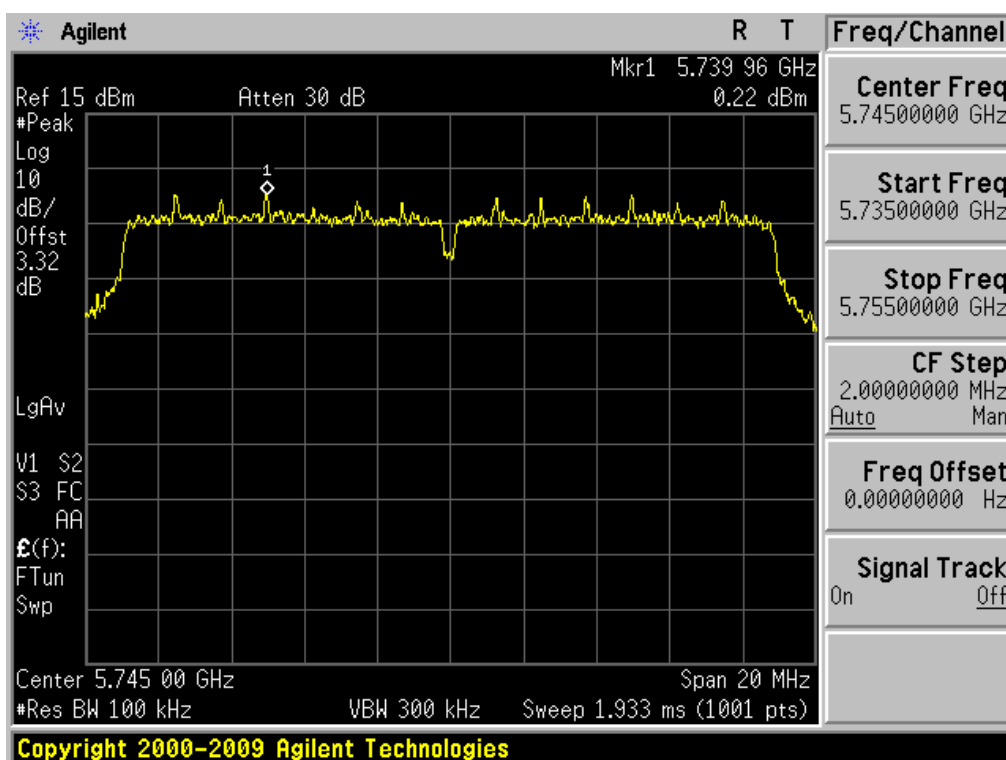
**Maximum PKPSD**

Test Mode: 802.11a & 6Mbps & 5825MHz



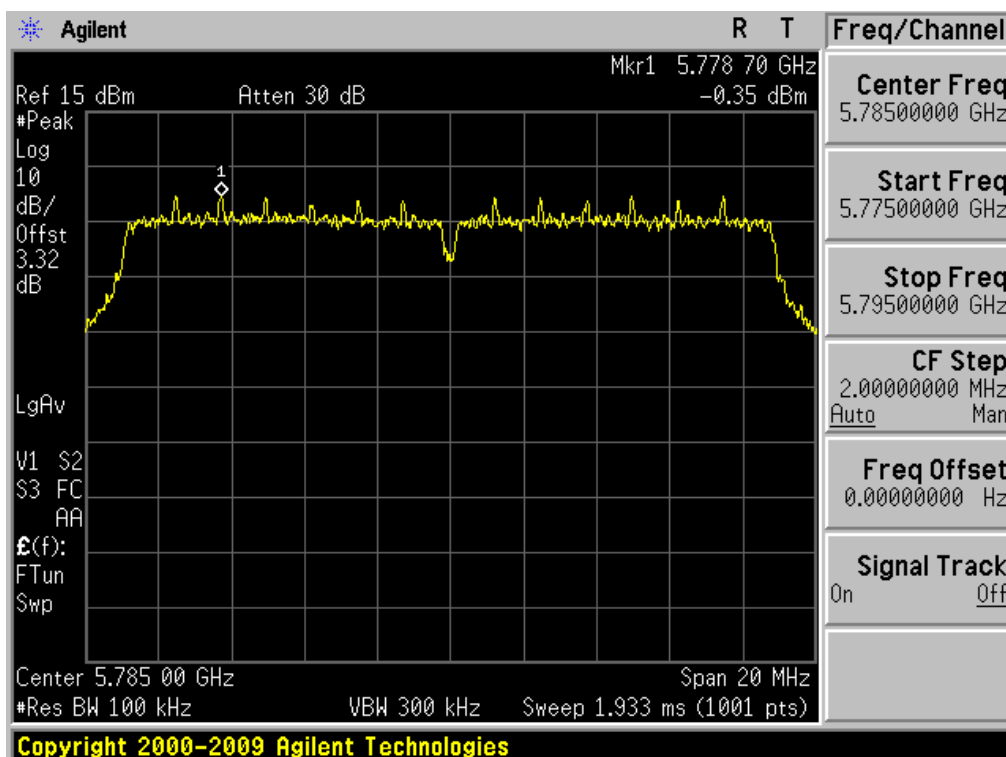
## Maximum PKPSD

Test Mode: 802.11n(HT20) &amp; MCS0 &amp; 5745MHz



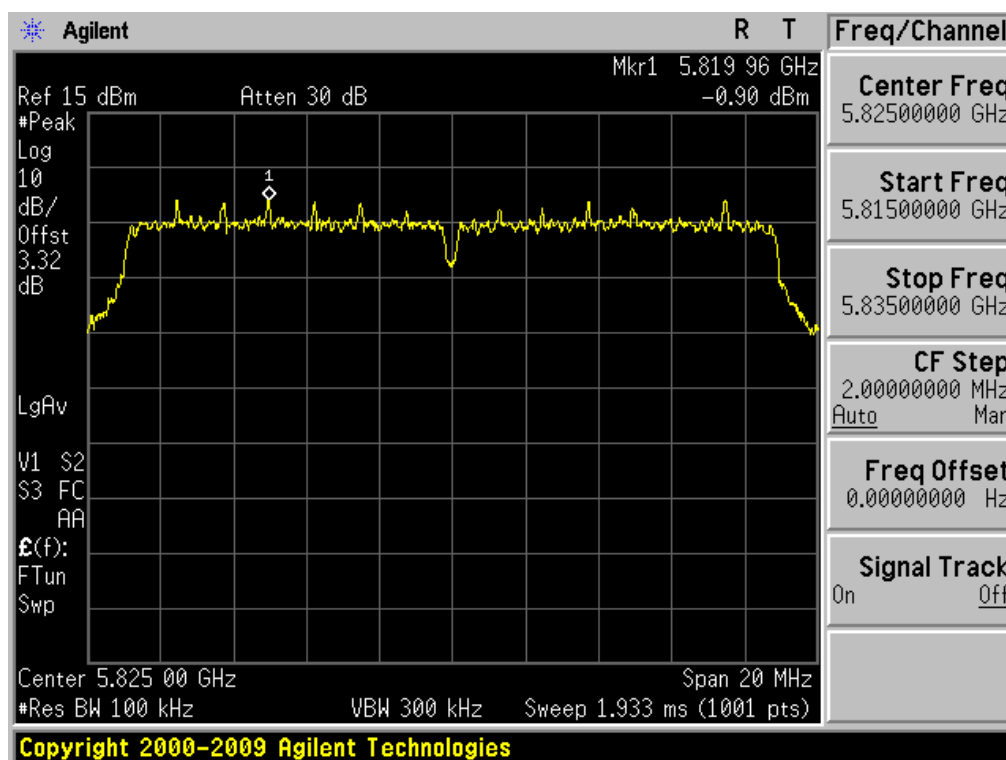
## Maximum PKPSD

Test Mode: 802.11n(HT20) &amp; MCS0 &amp; 5785MHz



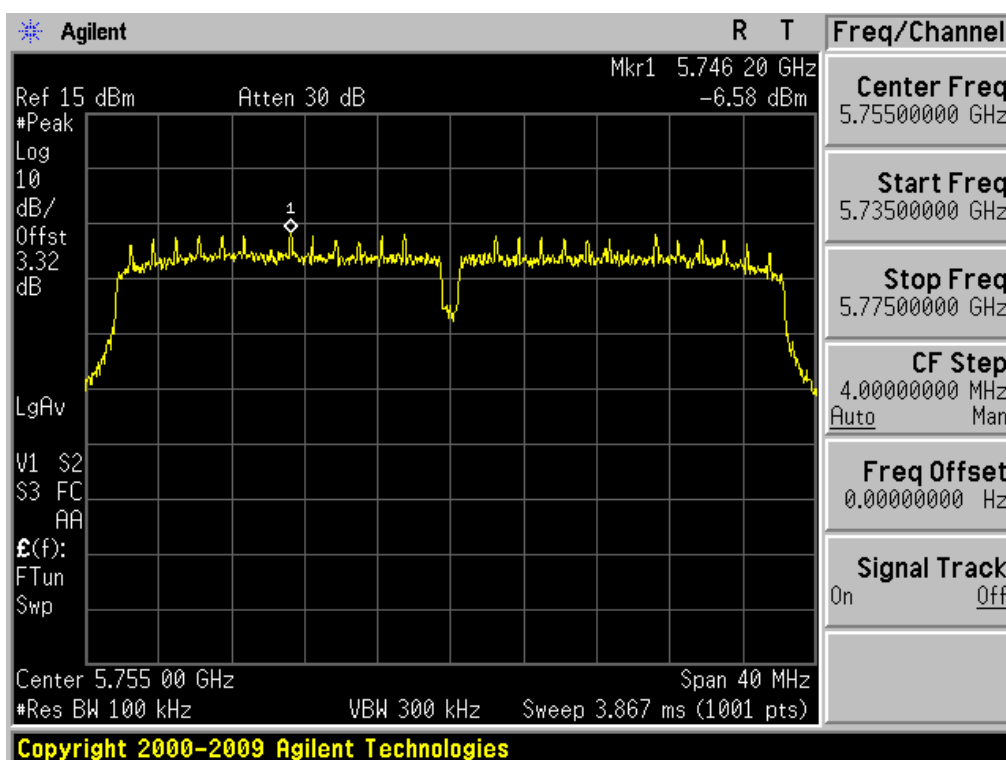
**Maximum PKPSD**

Test Mode: 802.11n(HT20) & MCS0 & 5825MHz

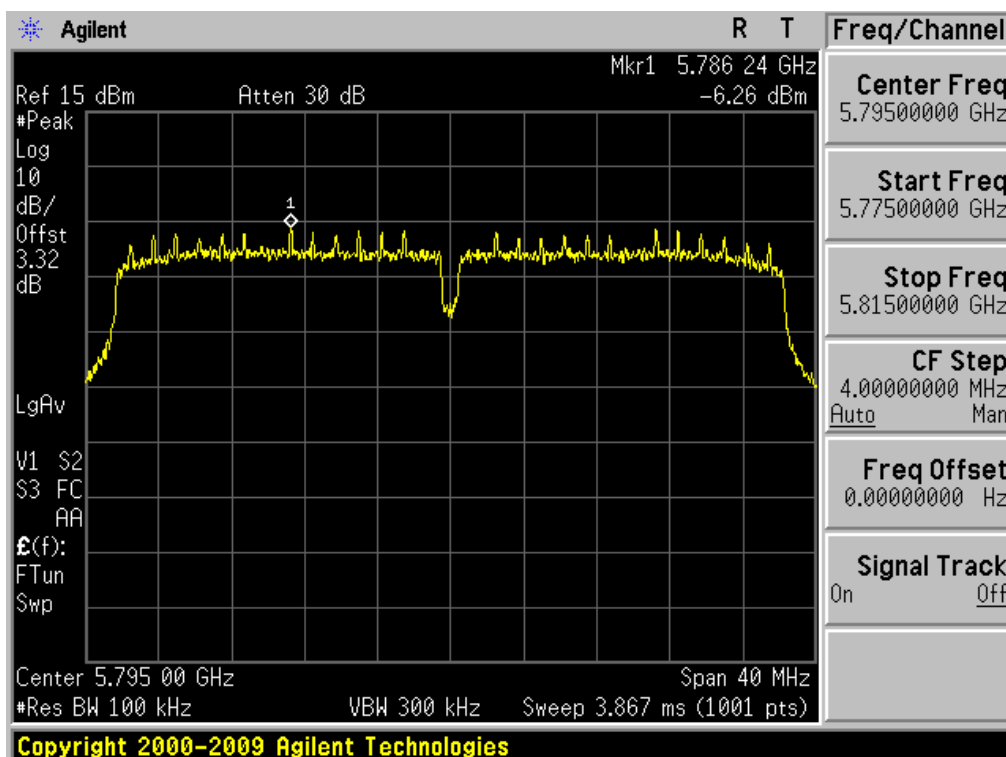


**Maximum PKPSD**

Test Mode: 802.11n(HT40) &amp; MCS0 &amp; 5755MHz

**Maximum PKPSD**

Test Mode: 802.11n(HT40) &amp; MCS0 &amp; 5795MHz



## 8.4 Out of Band Emissions at the Band Edge/ Conducted Spurious Emissions

### Test requirements and limit, §15.247(d)

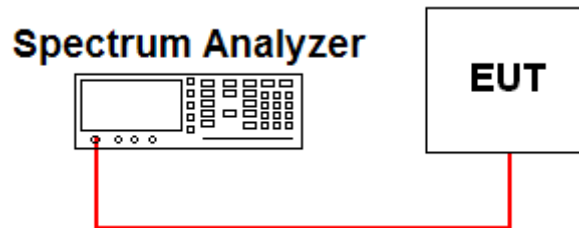
§15.247(d) specifies that in any 100 kHz bandwidth outside of the authorized frequency band, the power shall be attenuated according to the following conditions:

If **the peak output power procedure** is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the peak conducted output power measured within any 100 kHz outside the authorized frequency band shall be attenuated **by at least 20 dB** relative to the maximum measured in-band peak PSD level.

If the average output power procedure is used to measure the fundamental emission power to demonstrate compliance to **15.247(b)(3)** requirements, then the power in any 100 kHz outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum measured inband average PSD level.

In either case, attenuation to levels below the general emission limits specified in **§15.209(a)** is not required.

### ■ TEST CONFIGURATION



### ■ TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer.

#### - Measurement Procedure 1 – Reference Level

1. Set the **RBW = 100 kHz**.
2. Set the **VBW ≥ 300 kHz**.
3. Set the span to **5-30 %** greater than the EBW.
4. Detector = **peak**.
5. Sweep time = **auto couple**.
6. Trace mode = **max hold**.
7. Allow trace to fully stabilize.
8. Use the **peak marker function** to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

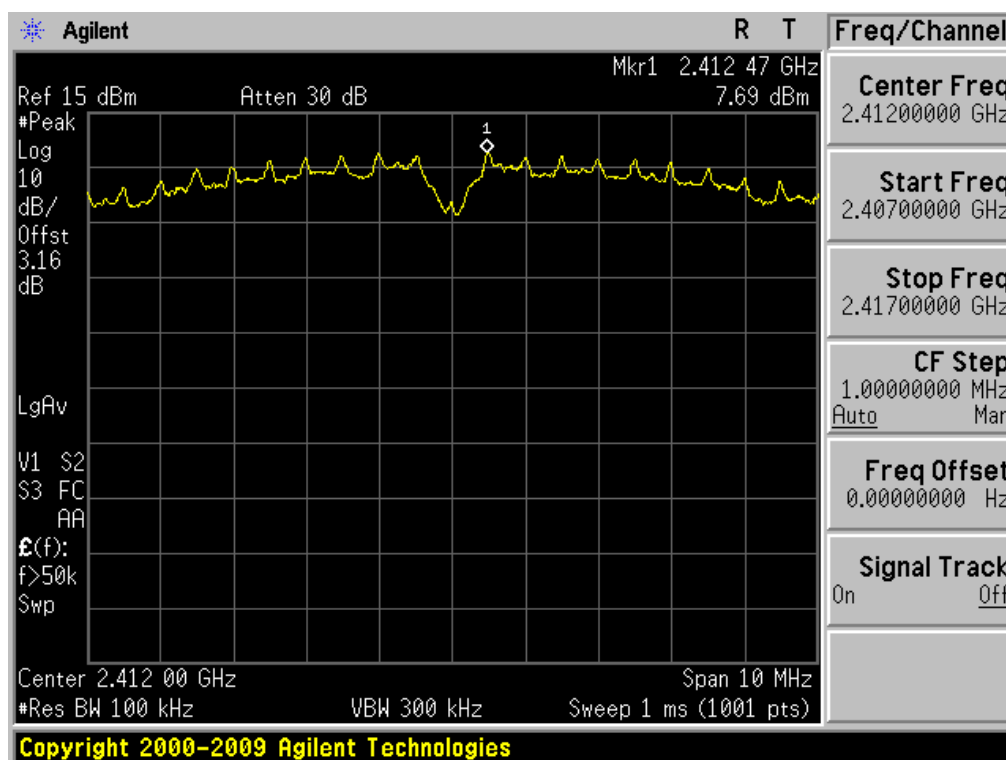
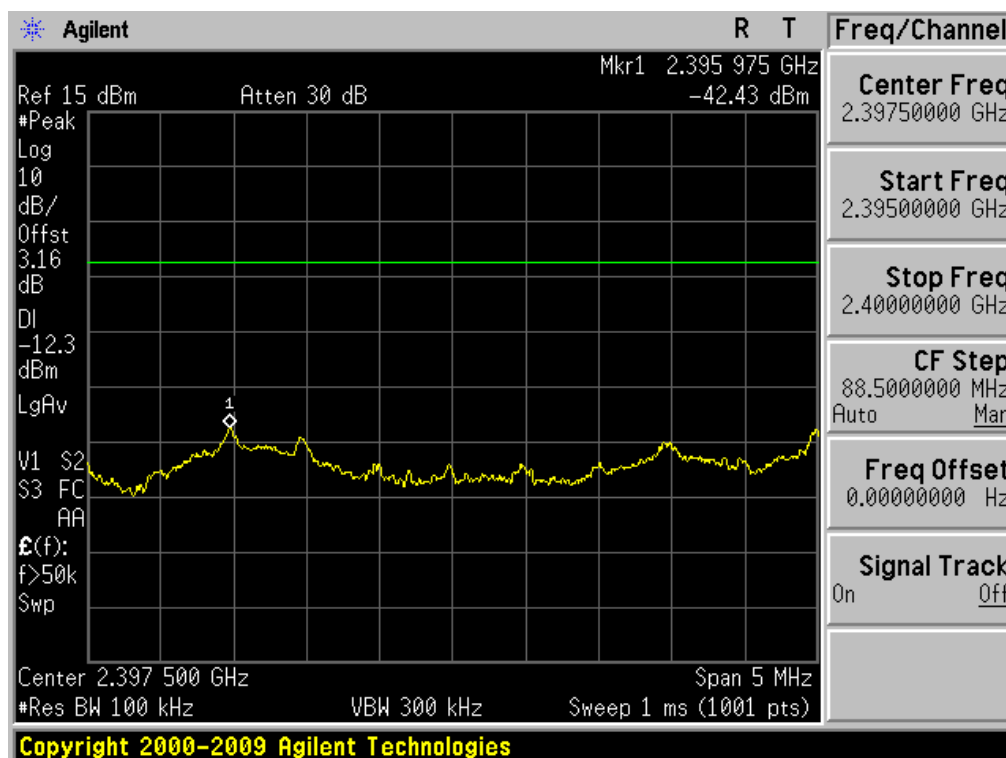
Next, **determine the power** in 100 kHz band segments outside of the authorized frequency band using the following measurement:

#### - Measurement Procedure 2 - Unwanted Emissions

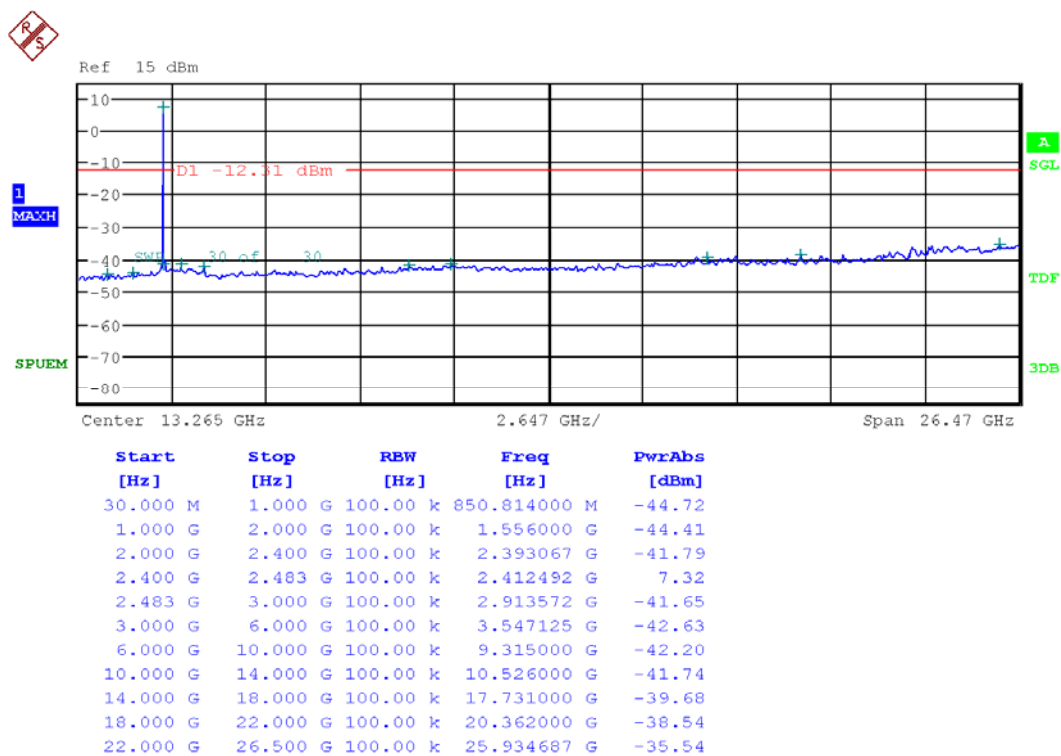
1. Set **RBW = 100 kHz**.
2. Set **VBW ≥ 300 kHz**.
3. Set **span to encompass the spectrum** to be examined.
4. Detector = **peak**.
5. Trace Mode = **max hold**.
6. Sweep = **auto couple**.
7. Allow the trace to stabilize (this may take some time, depending on the extent of the span).

■ **RESULT PLOTS**

802.11b &amp; 1Mbps &amp; 2412MHz

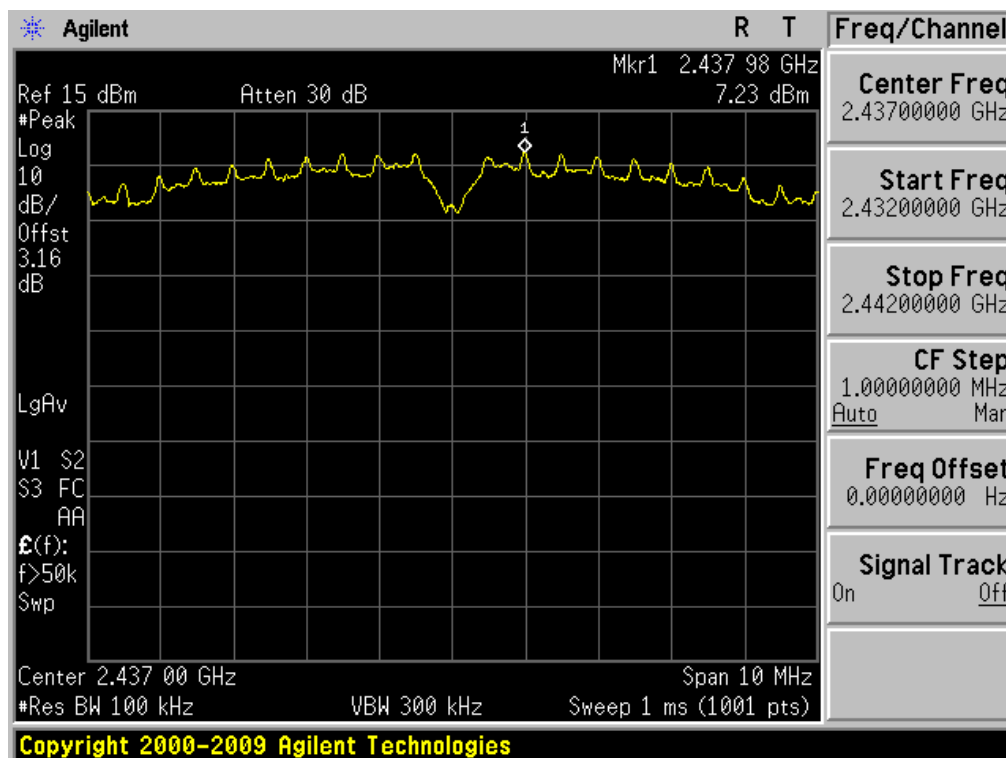
**Reference****Low Band-edge**

## Conducted Spurious Emissions

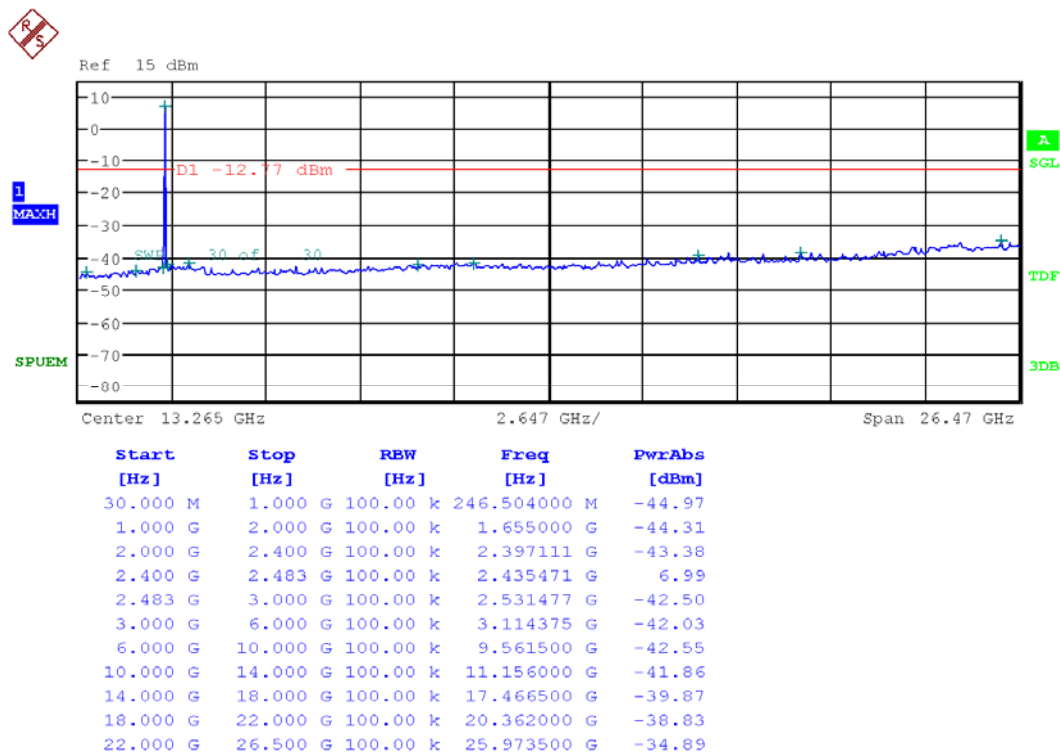


802.11b & 1Mbps & 2437MHz

### Reference

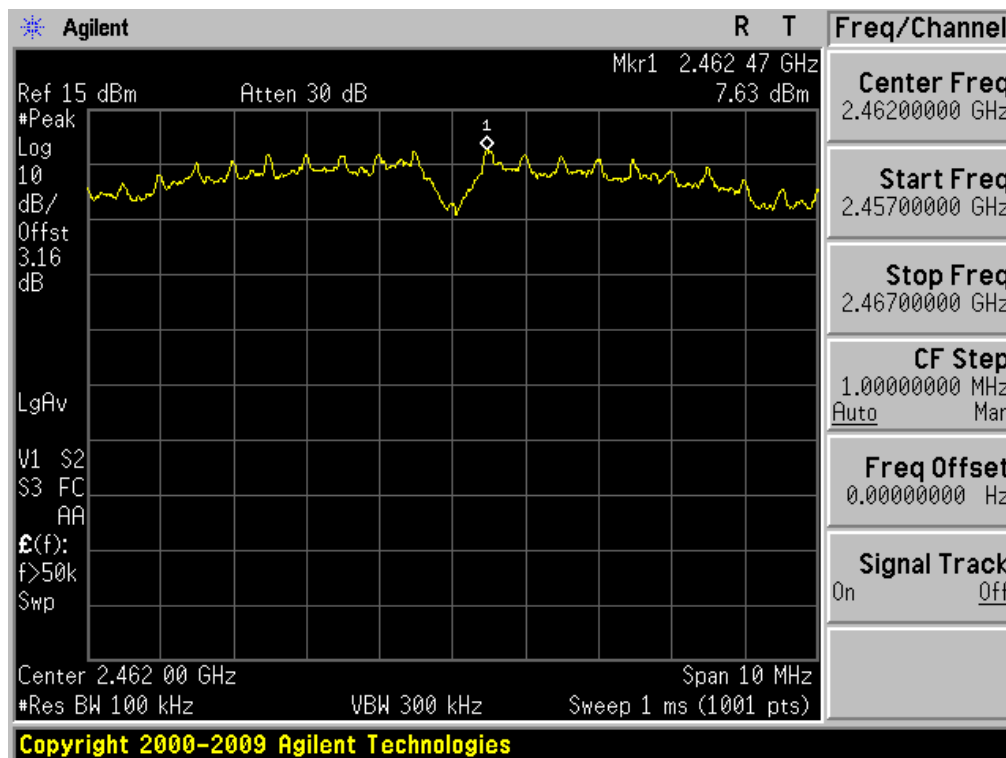


### Conducted Spurious Emissions

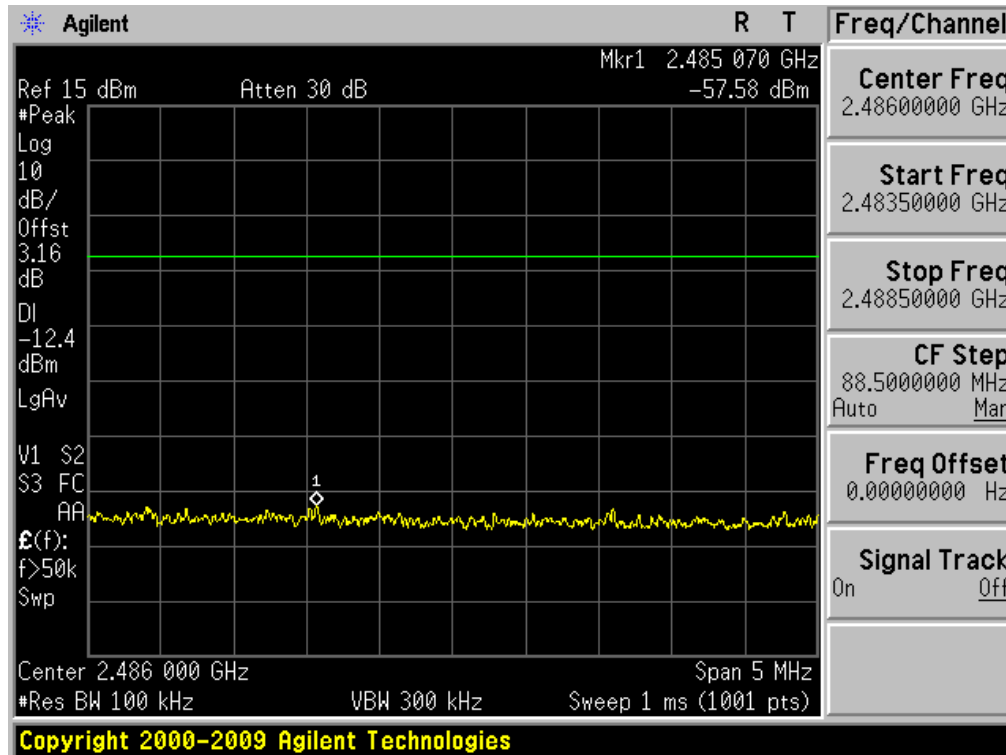


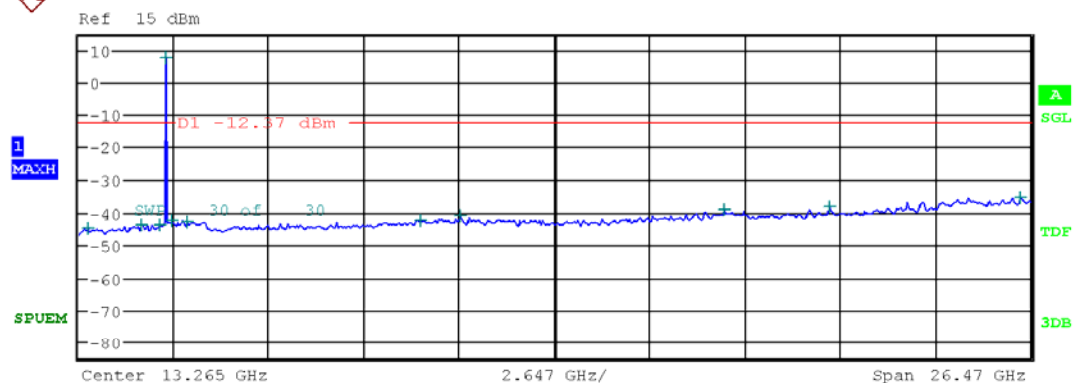
802.11b & 1Mbps & 2462MHz

### Reference



### High Band-edge

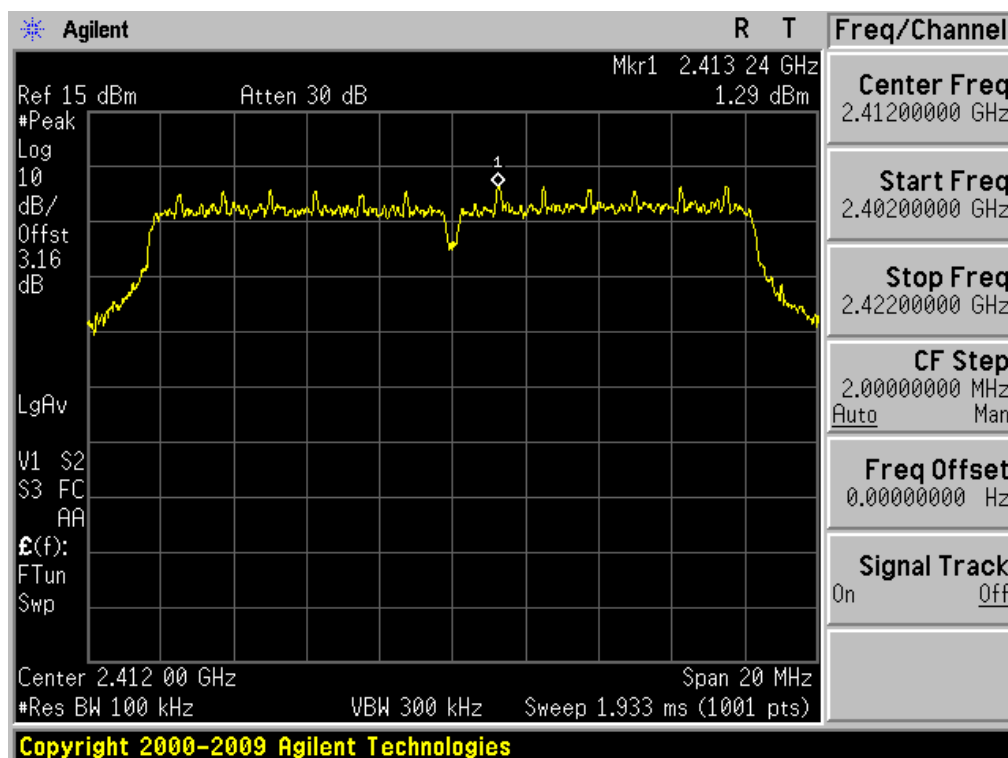




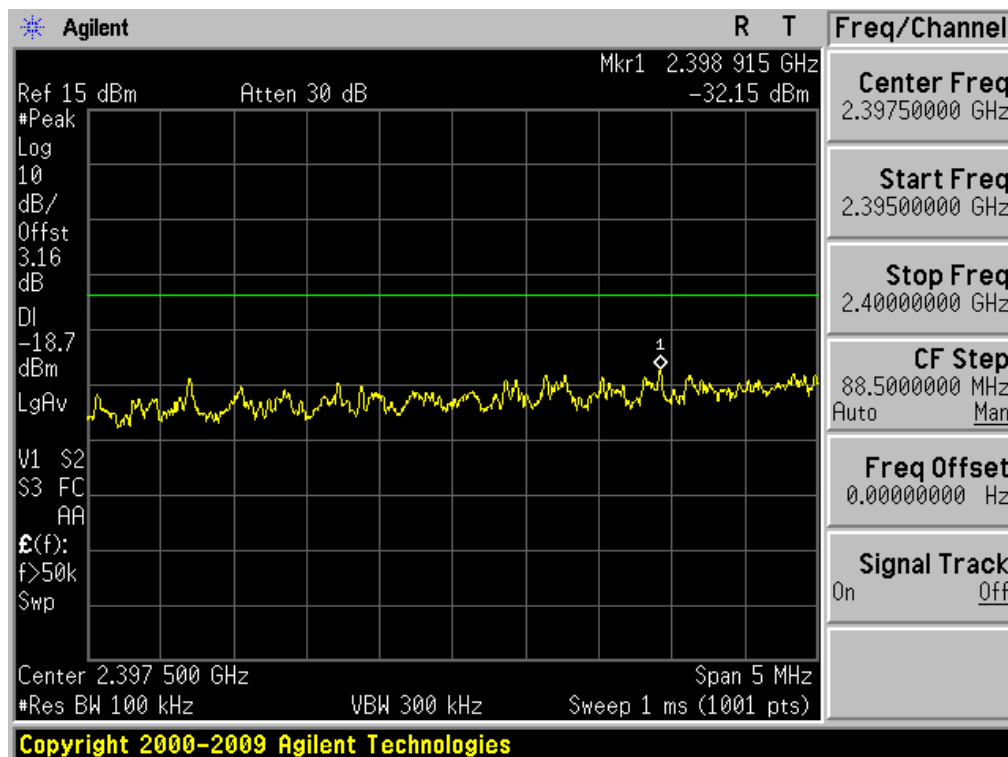
| Start<br>[Hz] | Stop<br>[Hz] | RBW<br>[Hz] | Freq<br>[Hz] | PwrAbs<br>[dBm] |
|---------------|--------------|-------------|--------------|-----------------|
| 30.000 M      | 1.000 G      | 100.00 k    | 266.874000 M | -44.67          |
| 1.000 G       | 2.000 G      | 100.00 k    | 1.757000 G   | -43.85          |
| 2.000 G       | 2.400 G      | 100.00 k    | 2.258533 G   | -43.75          |
| 2.400 G       | 2.483 G      | 100.00 k    | 2.460972 G   | 7.73            |
| 2.483 G       | 3.000 G      | 100.00 k    | 2.616814 G   | -42.38          |
| 3.000 G       | 6.000 G      | 100.00 k    | 3.022875 G   | -42.80          |
| 6.000 G       | 10.000 G     | 100.00 k    | 9.537000 G   | -42.32          |
| 10.000 G      | 14.000 G     | 100.00 k    | 10.652000 G  | -40.99          |
| 14.000 G      | 18.000 G     | 100.00 k    | 17.985500 G  | -39.05          |
| 18.000 G      | 22.000 G     | 100.00 k    | 20.894500 G  | -38.47          |
| 22.000 G      | 26.500 G     | 100.00 k    | 26.205250 G  | -35.33          |

802.11g &amp; 6Mbps &amp; 2412MHz

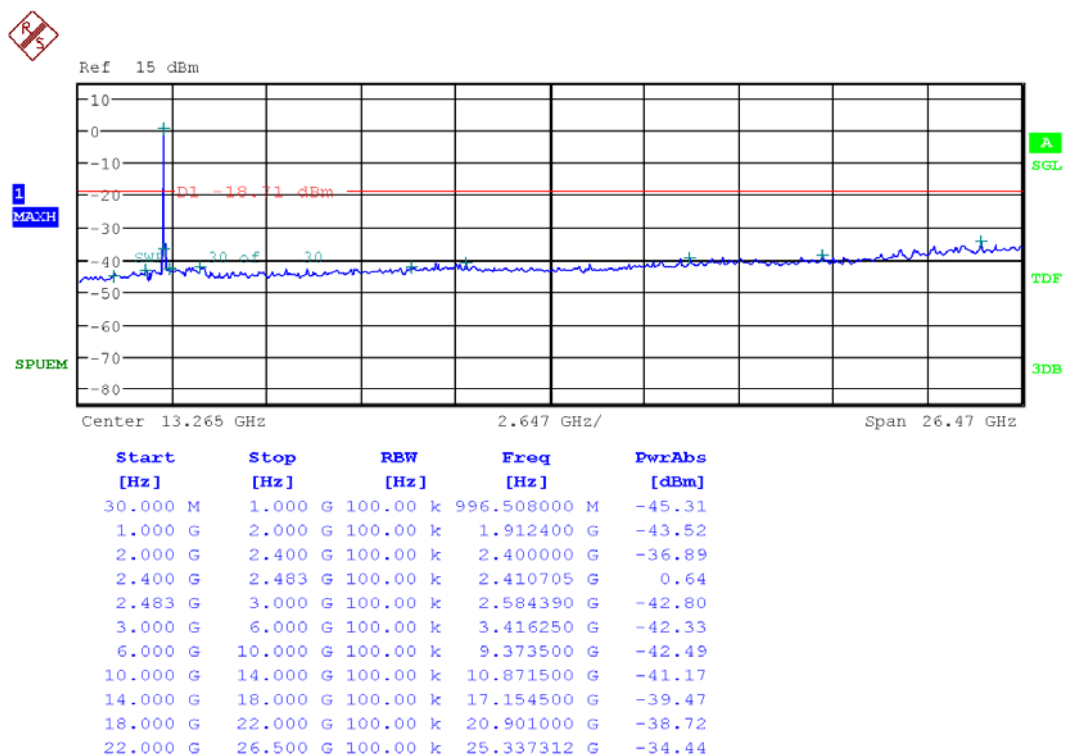
## Reference



## Low Band-edge

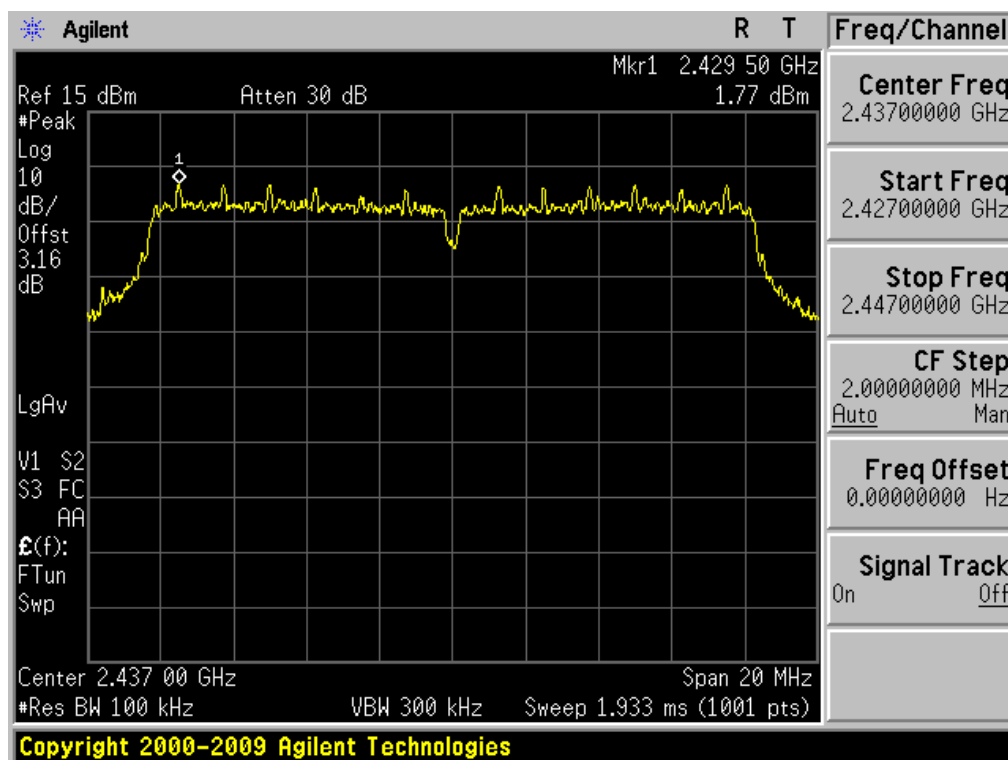


# Conducted Spurious Emissions

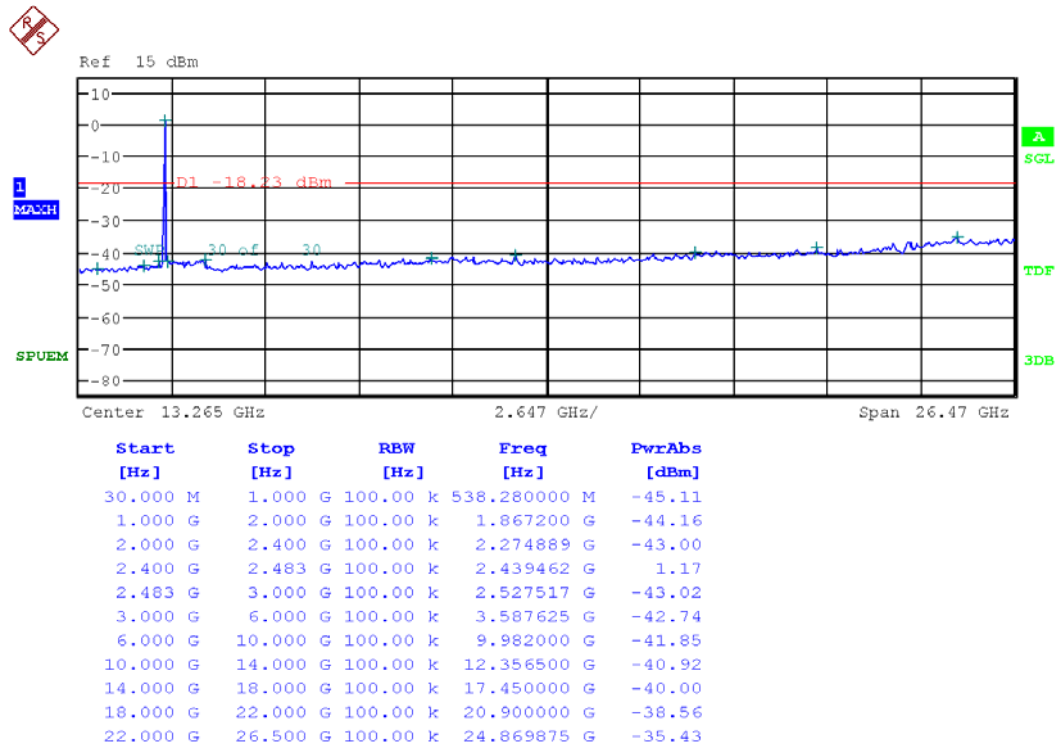


802.11g &amp; 6Mbps &amp; 2437MHz

## Reference

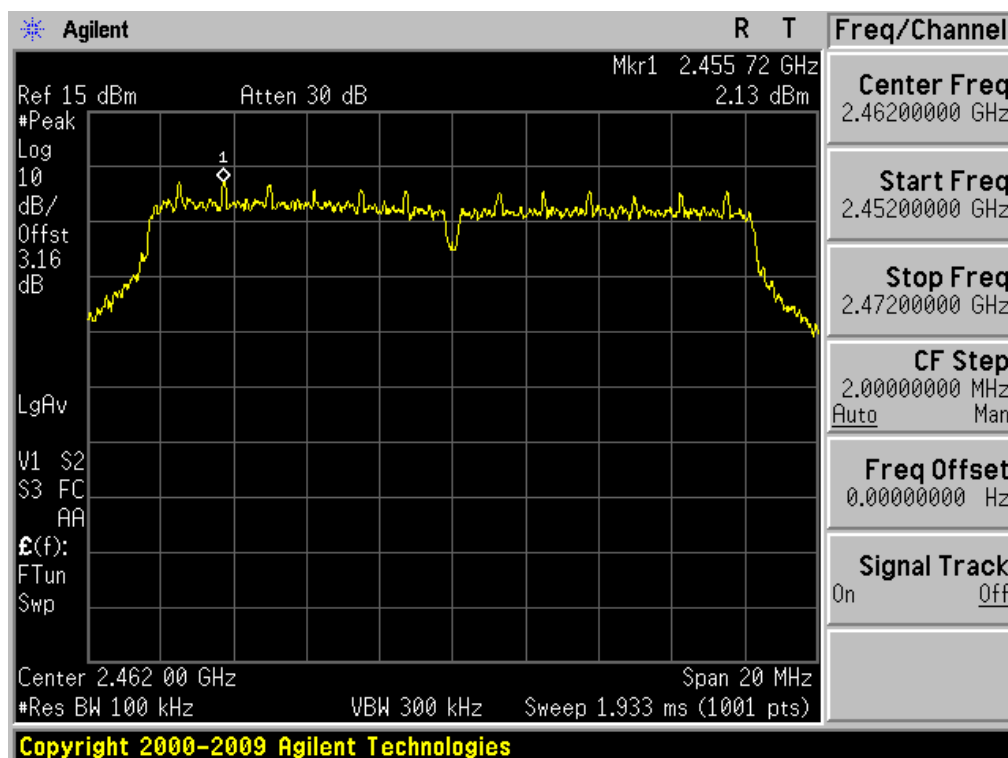


## Conducted Spurious Emissions

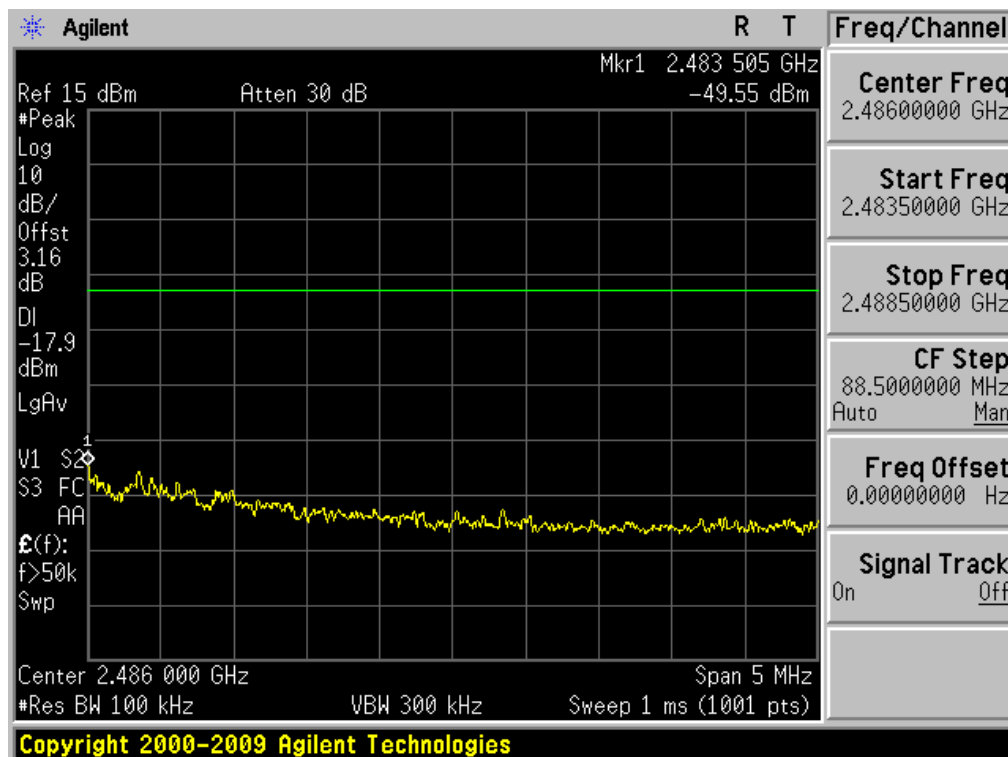


802.11g &amp; 6Mbps &amp; 2462MHz

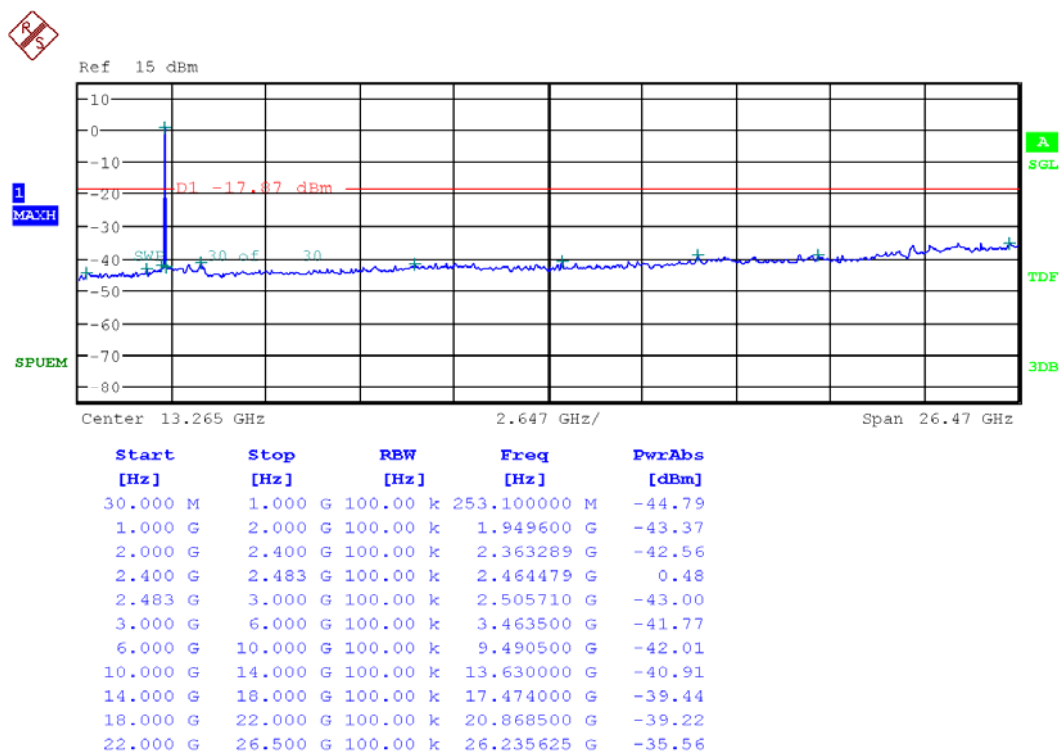
## Reference



## High Band-edge

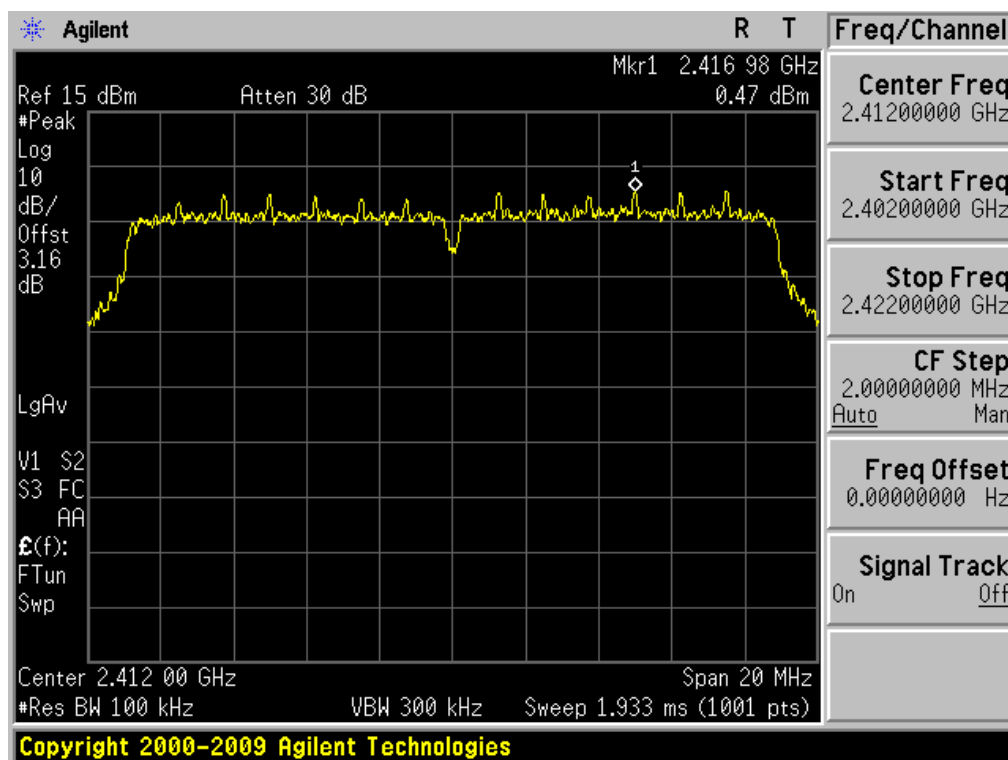


# Conducted Spurious Emissions

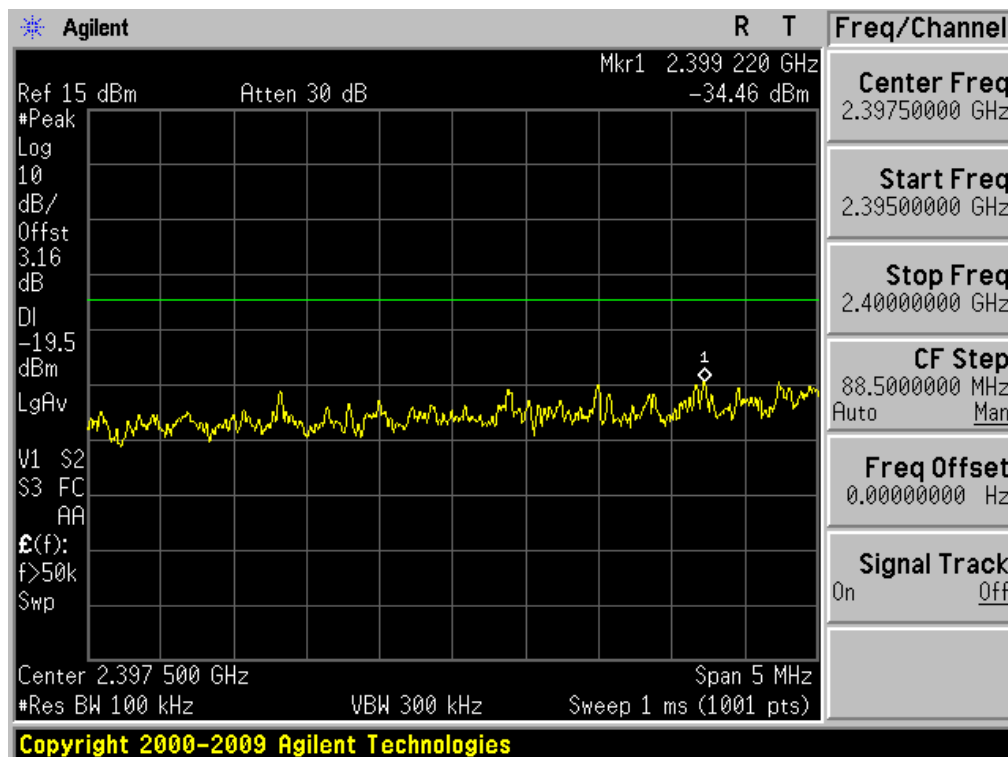


802.11n(HT20) &amp; MCS0 &amp; 2412MHz

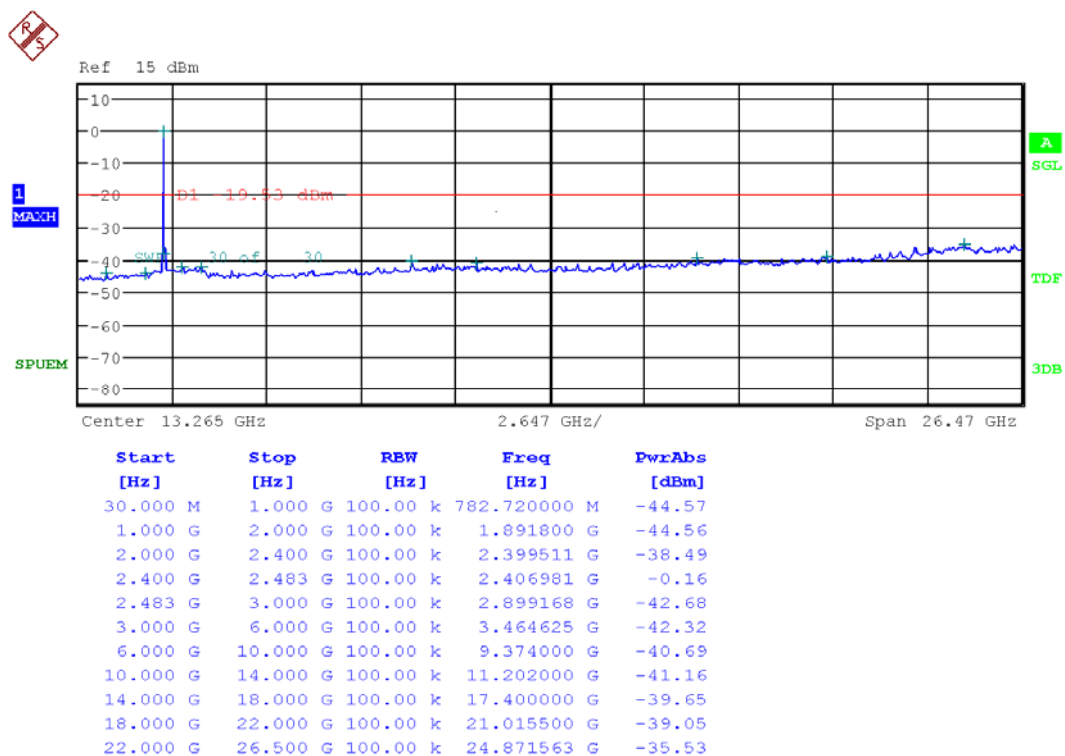
## Reference



## Low Band-edge

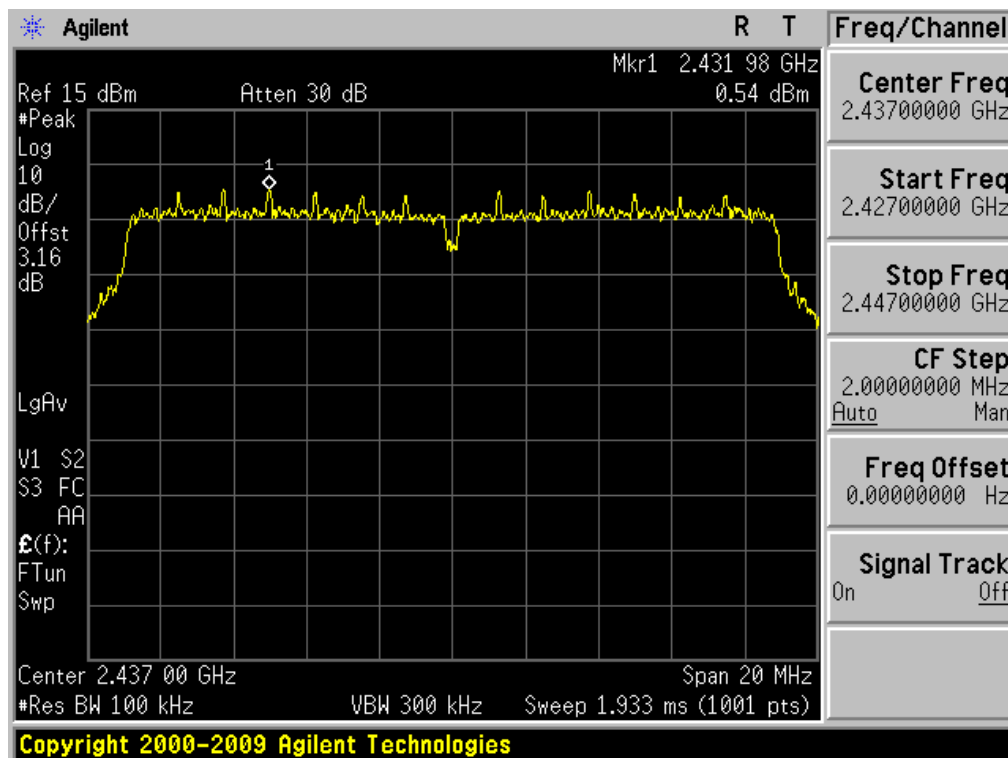


# Conducted Spurious Emissions

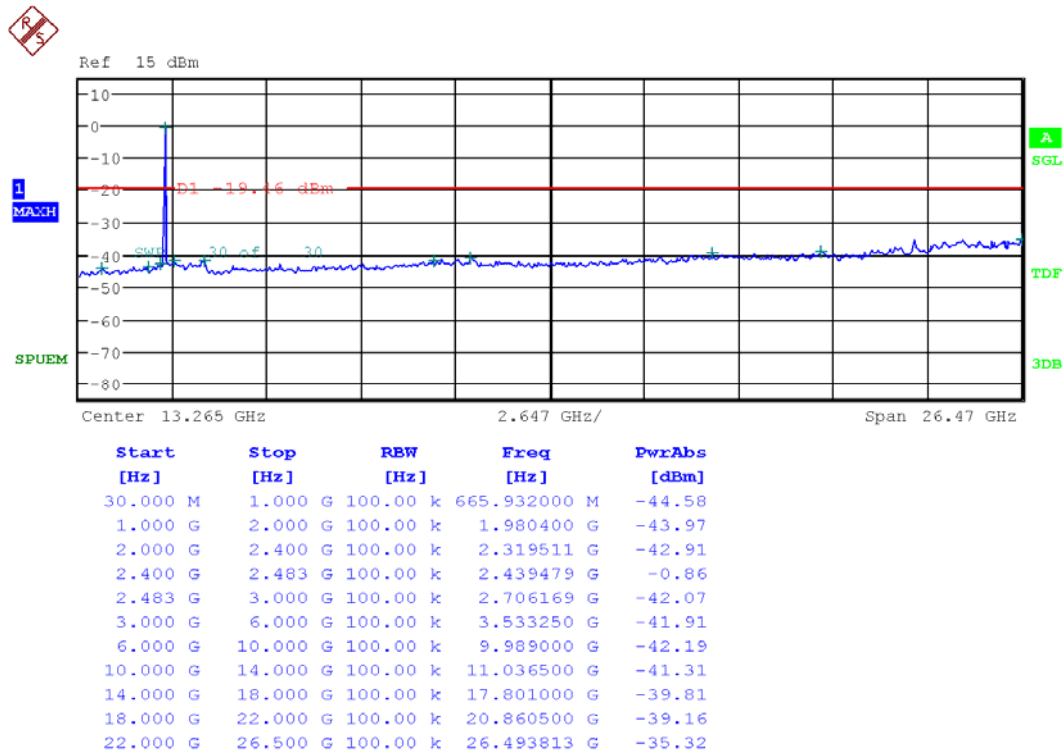


802.11n(HT20) &amp; MCS0 &amp; 2437MHz

## Reference

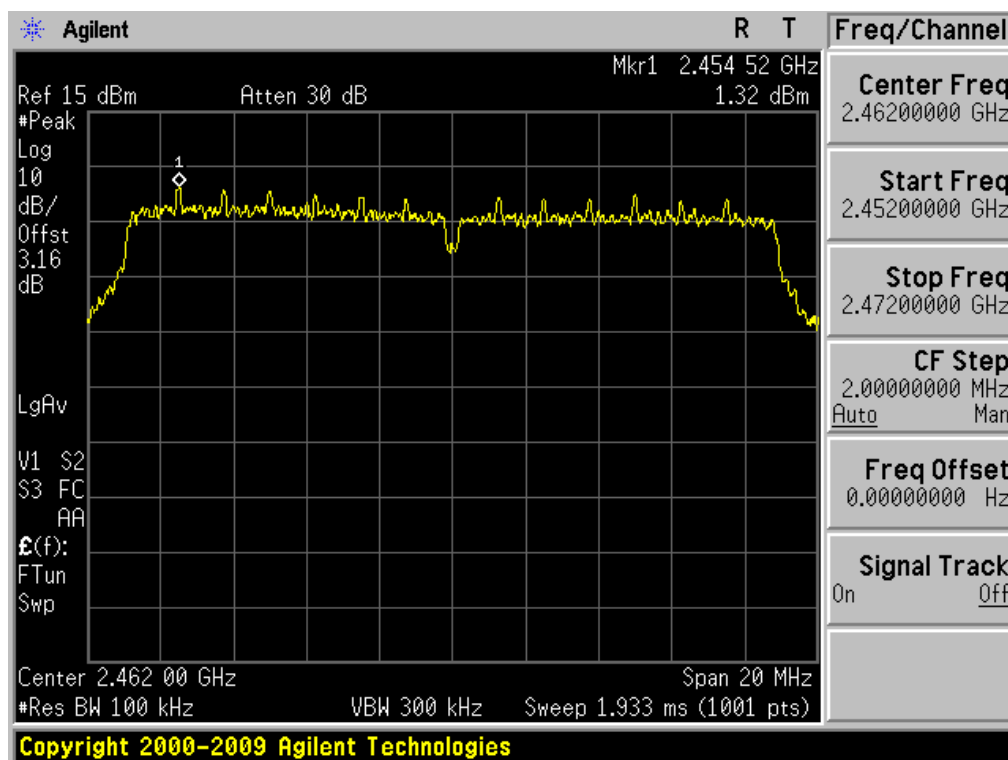


## Conducted Spurious Emissions

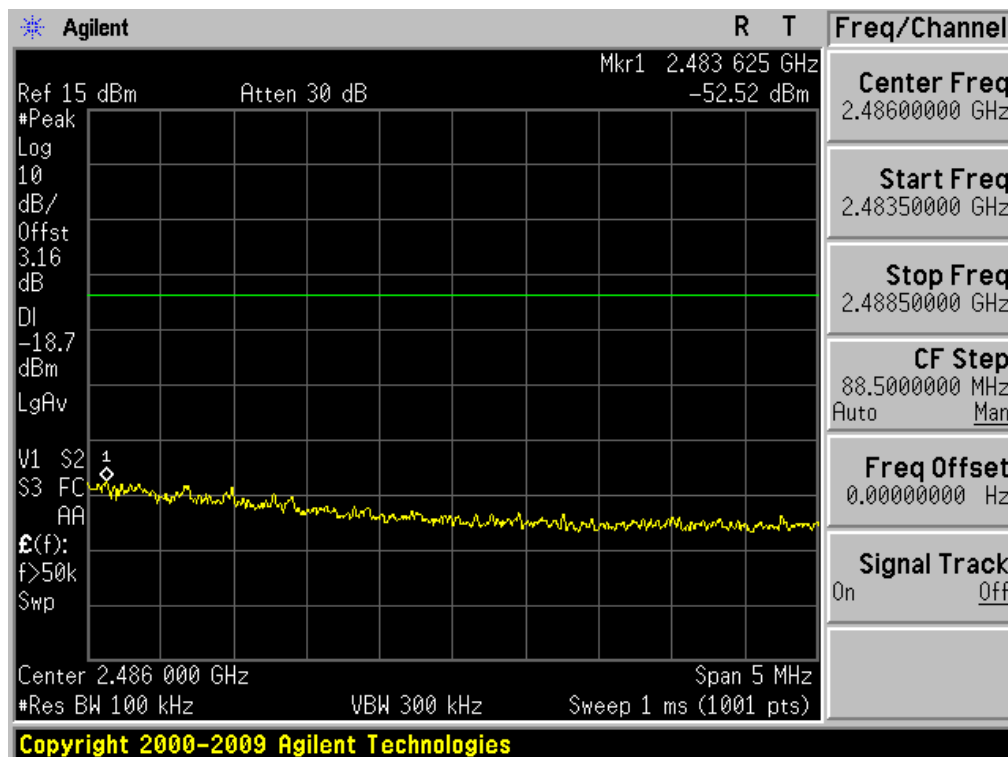


802.11n(HT20) &amp; MCS0 &amp; 2462MHz

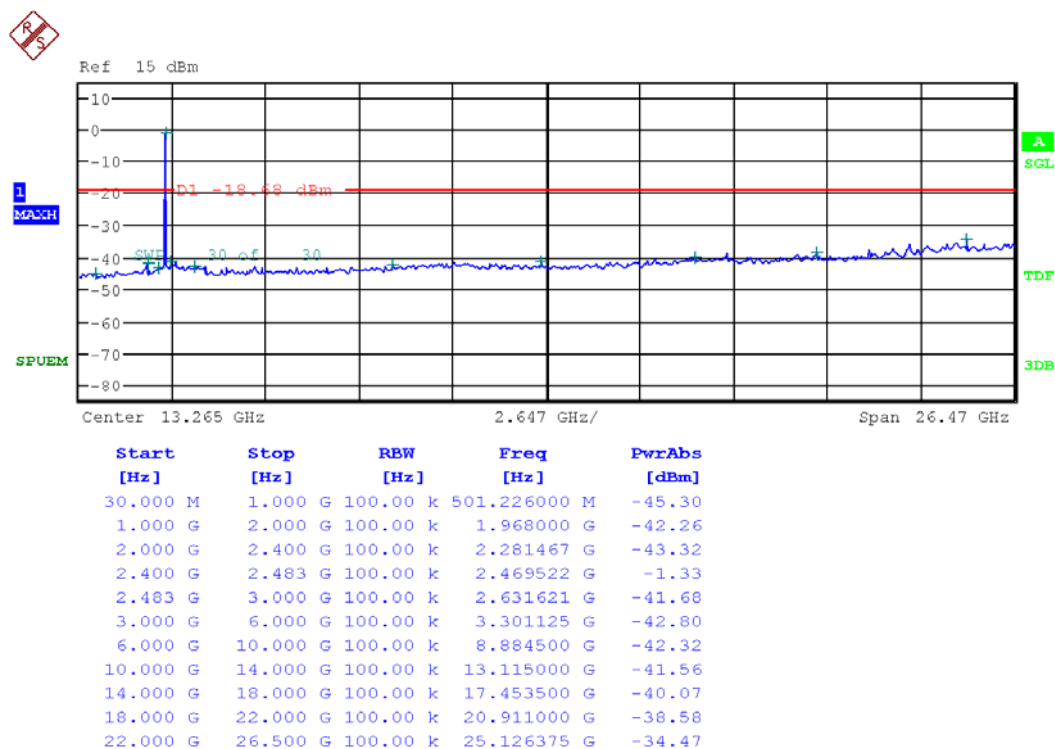
## Reference



## High Band-edge

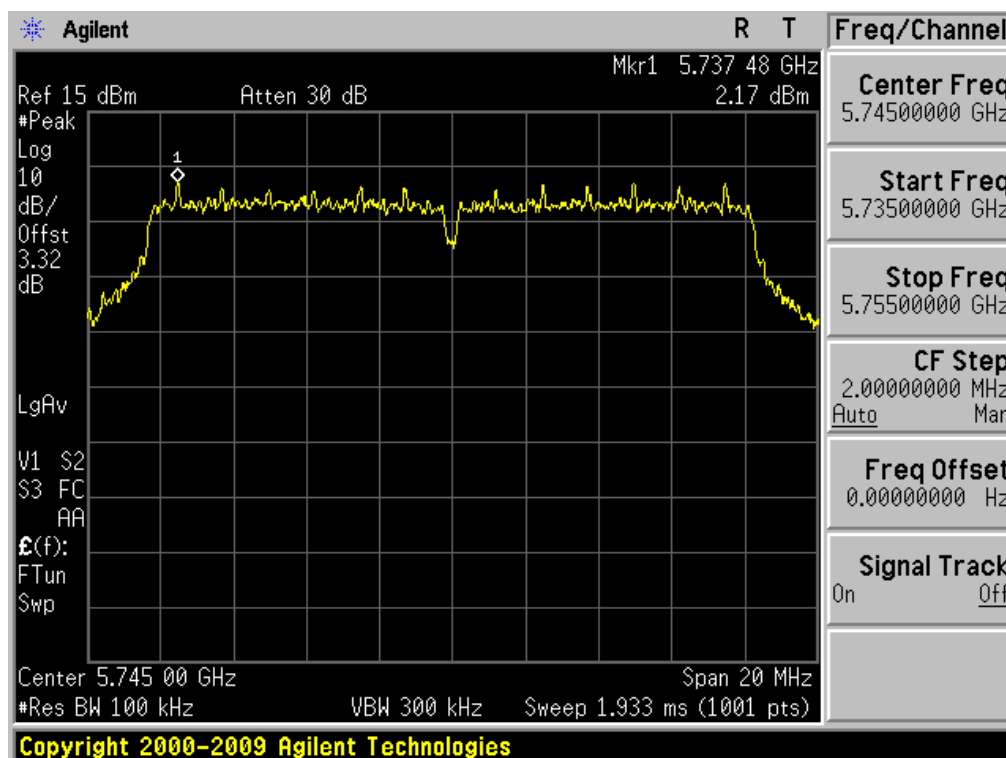


# Conducted Spurious Emissions

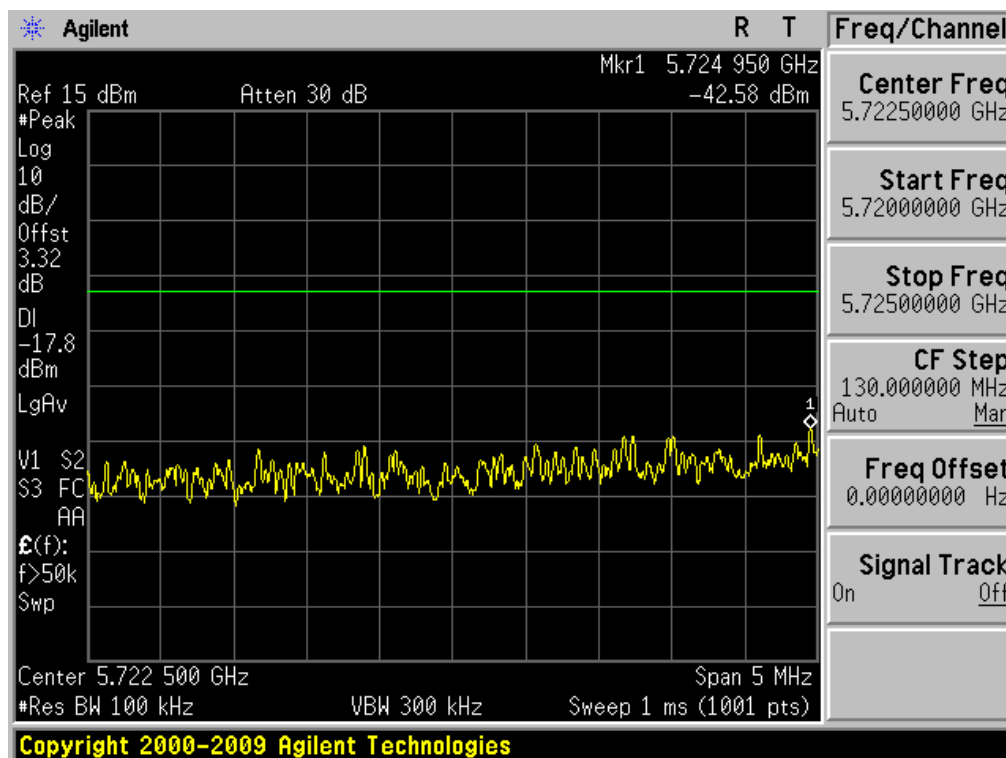


802.11a &amp; 6Mbps &amp; 5745MHz

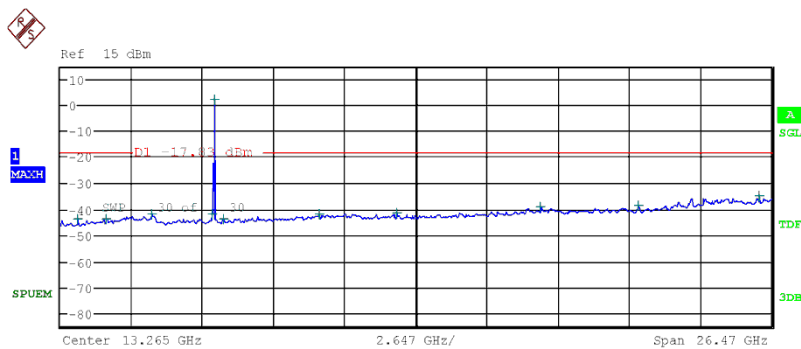
## Reference



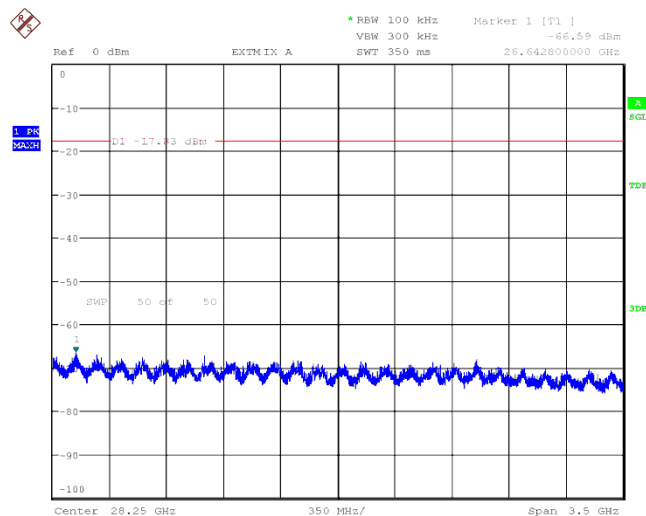
## Low Band-edge



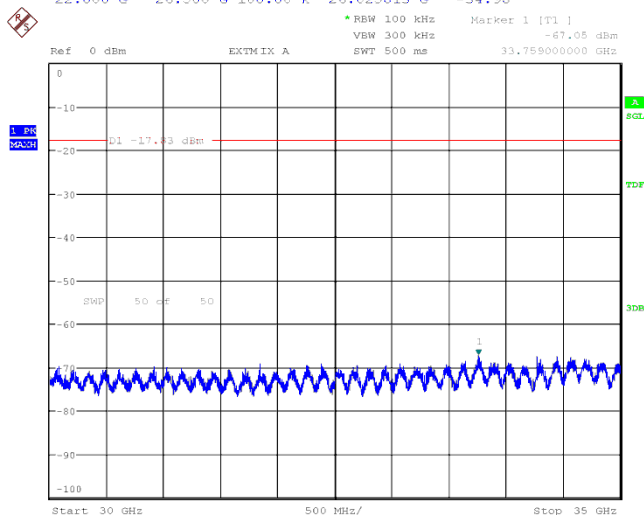
# Conducted Spurious Emissions



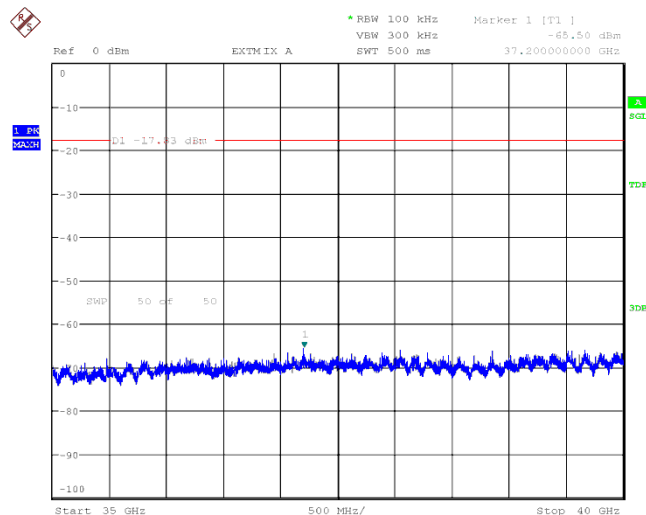
| Start [Hz] | Stop [Hz] | RBW [Hz] | Freq [Hz]    | PwrAbs [dBm] |
|------------|-----------|----------|--------------|--------------|
| 30.000 M   | 1.000 G   | 100.00 k | 664.574000 M | -44.07       |
| 1.000 G    | 2.000 G   | 100.00 k | 1.723600 G   | -43.80       |
| 2.000 G    | 5.000 G   | 100.00 k | 3.423750 G   | -42.10       |
| 5.000 G    | 5.725 G   | 100.00 k | 5.691892 G   | -41.98       |
| 5.725 G    | 5.850 G   | 100.00 k | 5.752450 G   | 1.94         |
| 5.850 G    | 6.500 G   | 100.00 k | 6.097072 G   | -43.76       |
| 6.500 G    | 10.000 G  | 100.00 k | 9.640812 G   | -42.05       |
| 10.000 G   | 14.000 G  | 100.00 k | 12.544500 G  | -41.80       |
| 14.000 G   | 18.000 G  | 100.00 k | 17.909500 G  | -39.08       |
| 18.000 G   | 22.000 G  | 100.00 k | 21.534500 G  | -38.65       |
| 22.000 G   | 26.500 G  | 100.00 k | 26.025812 G  | -34.98       |



Date: 15.SEP.2012 08:21:58



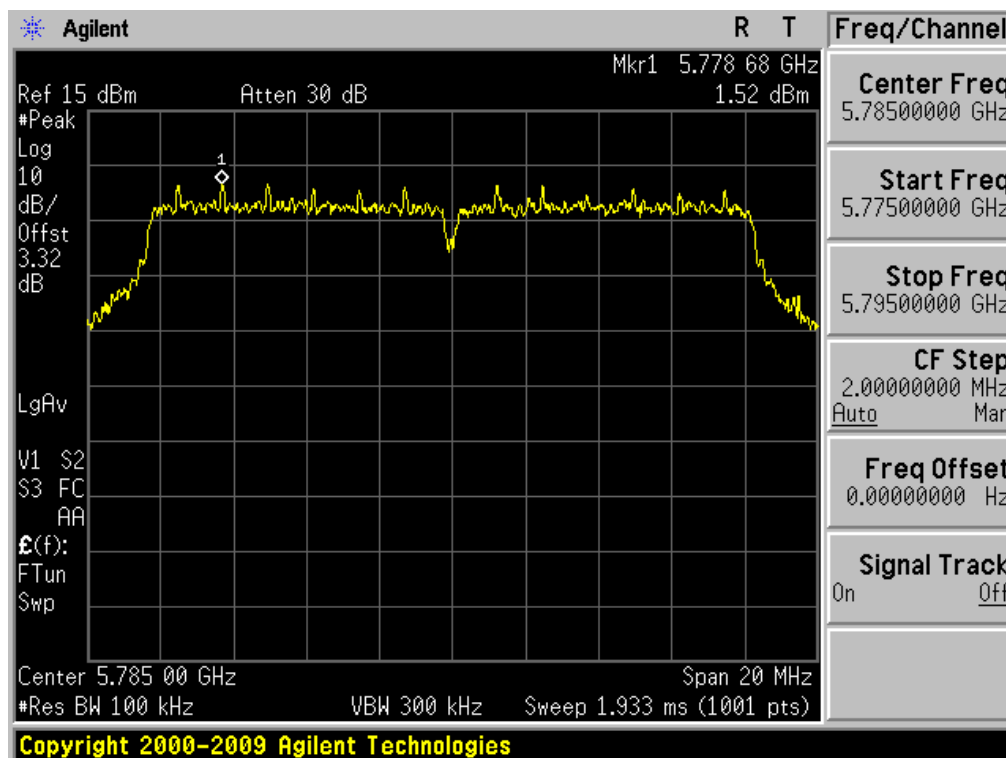
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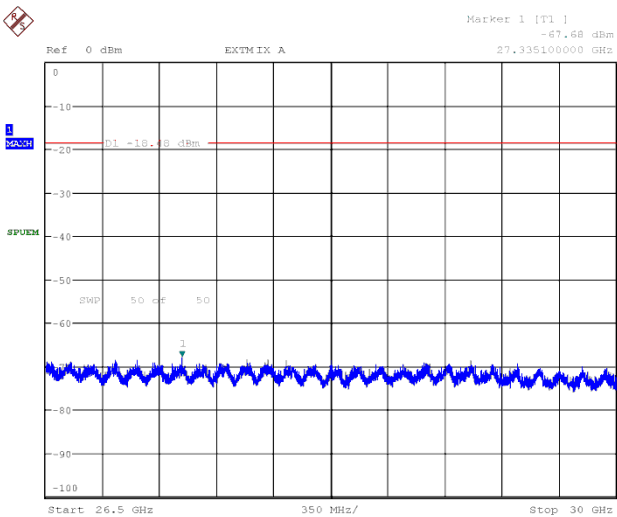
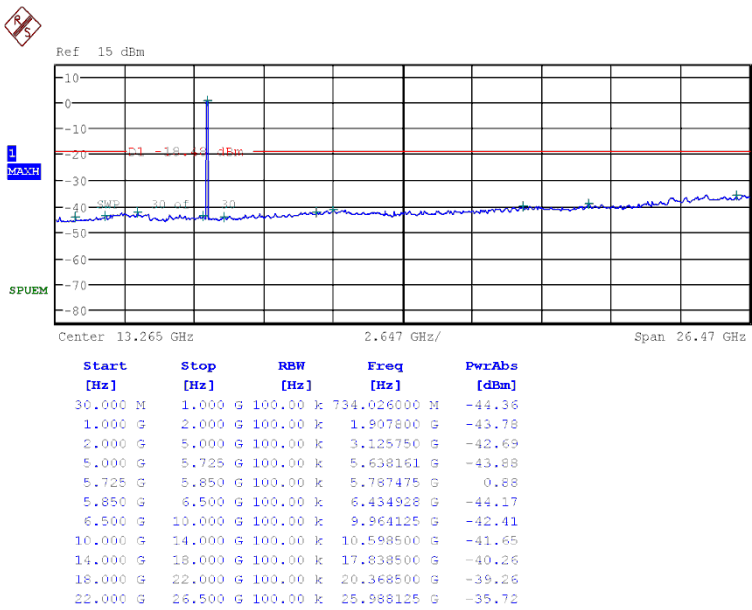
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802.11a & 6Mbps & 5785MHz

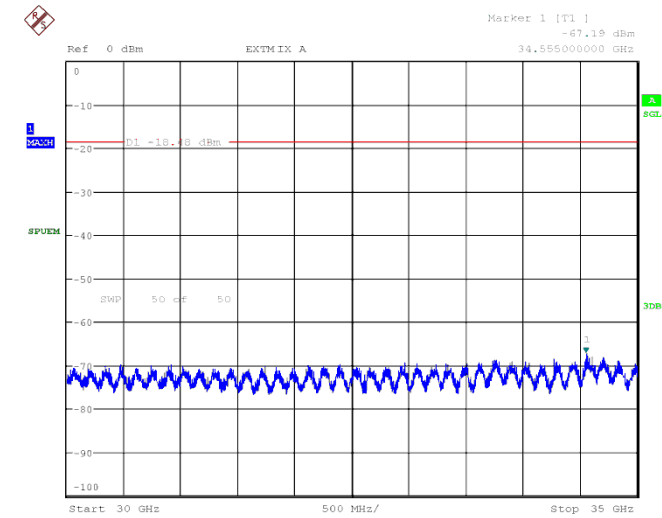
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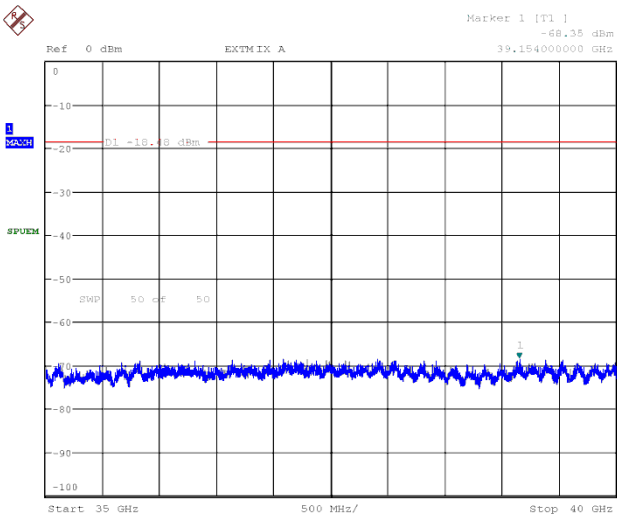
Conducted Spurious Emissions



Date: 15.SEP.2012 08:41:00



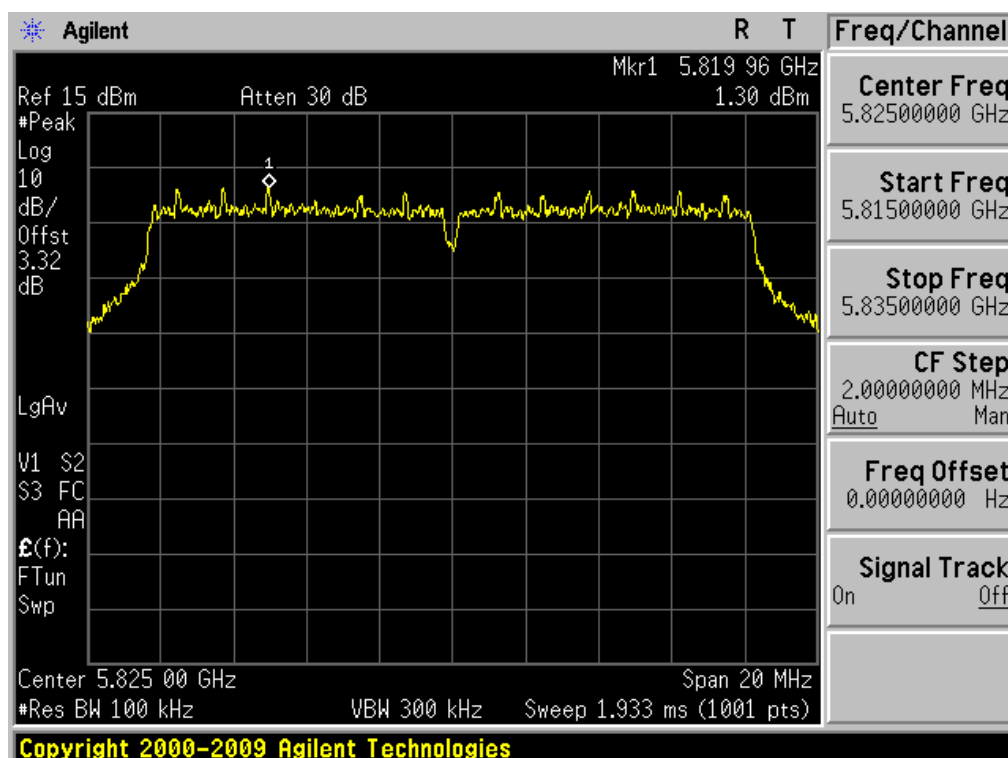
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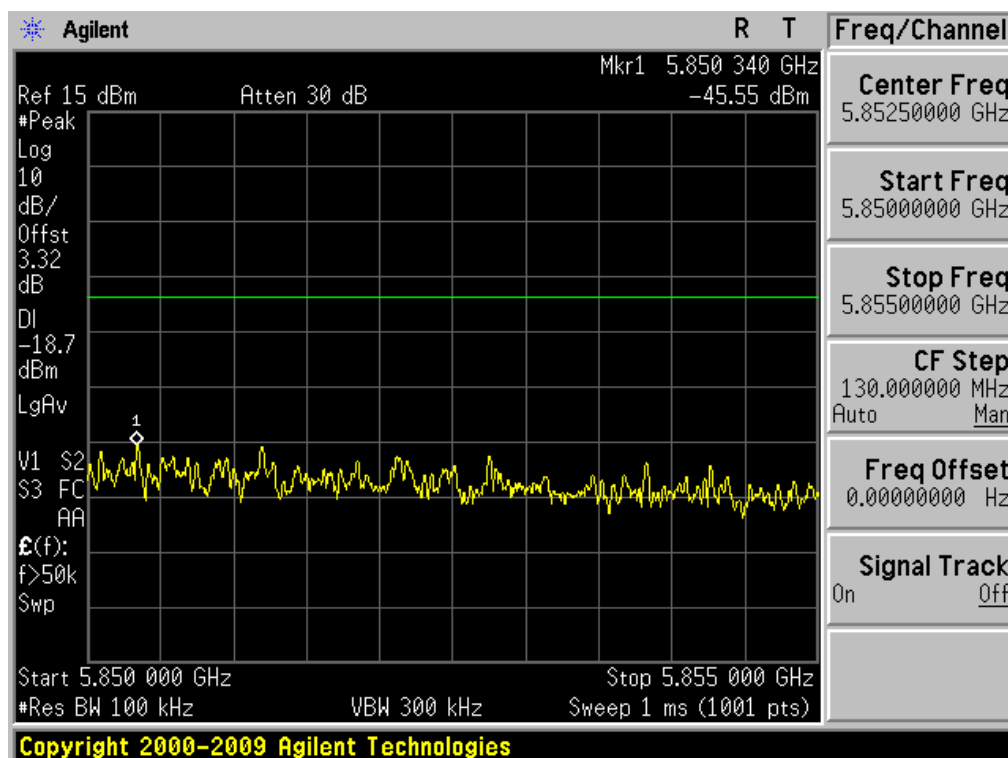
Date: 15.SEP.2012 08:50:35

802.11a &amp; 6Mbps &amp; 5825MHz

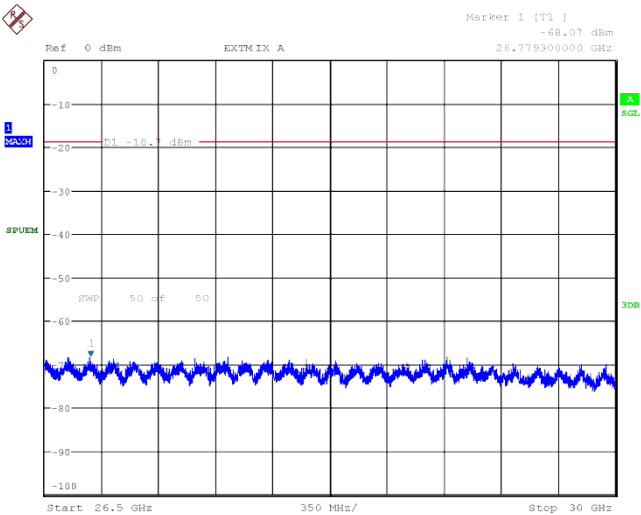
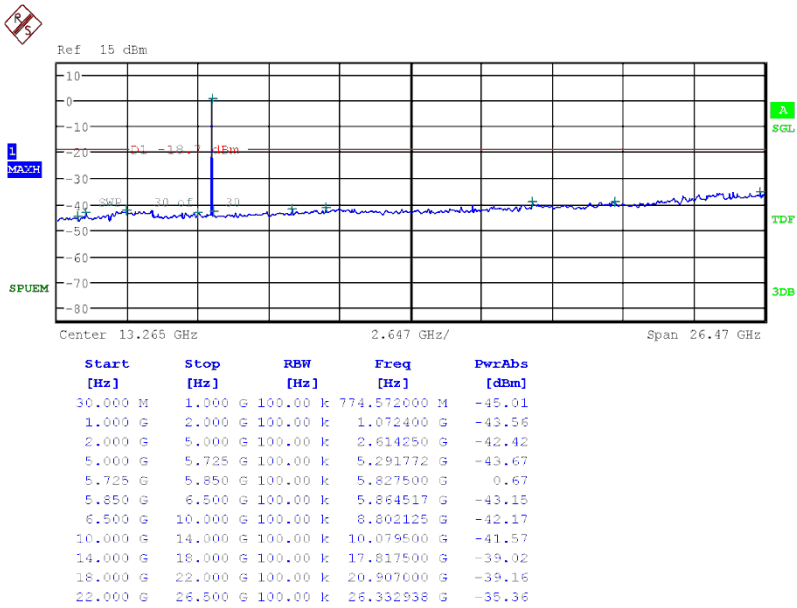
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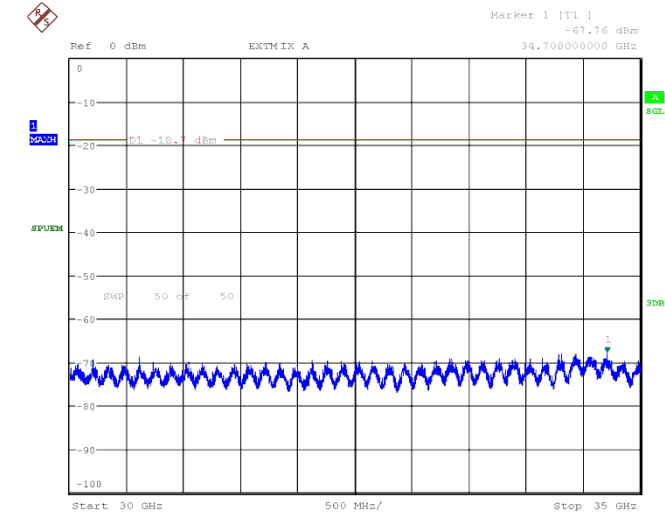
## High Band-edge



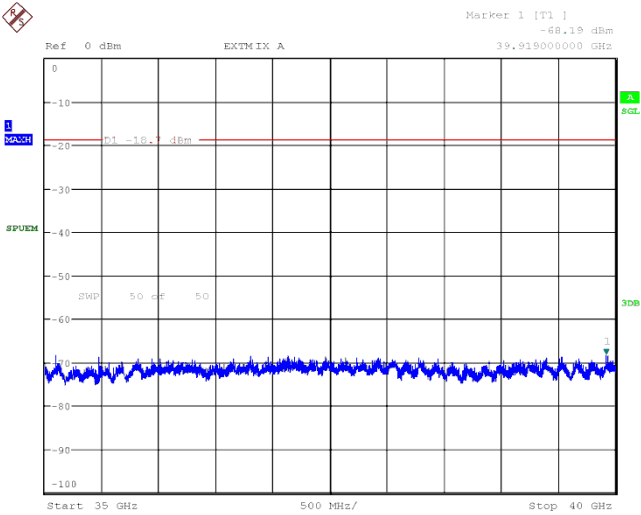
Conducted Spurious Emissions



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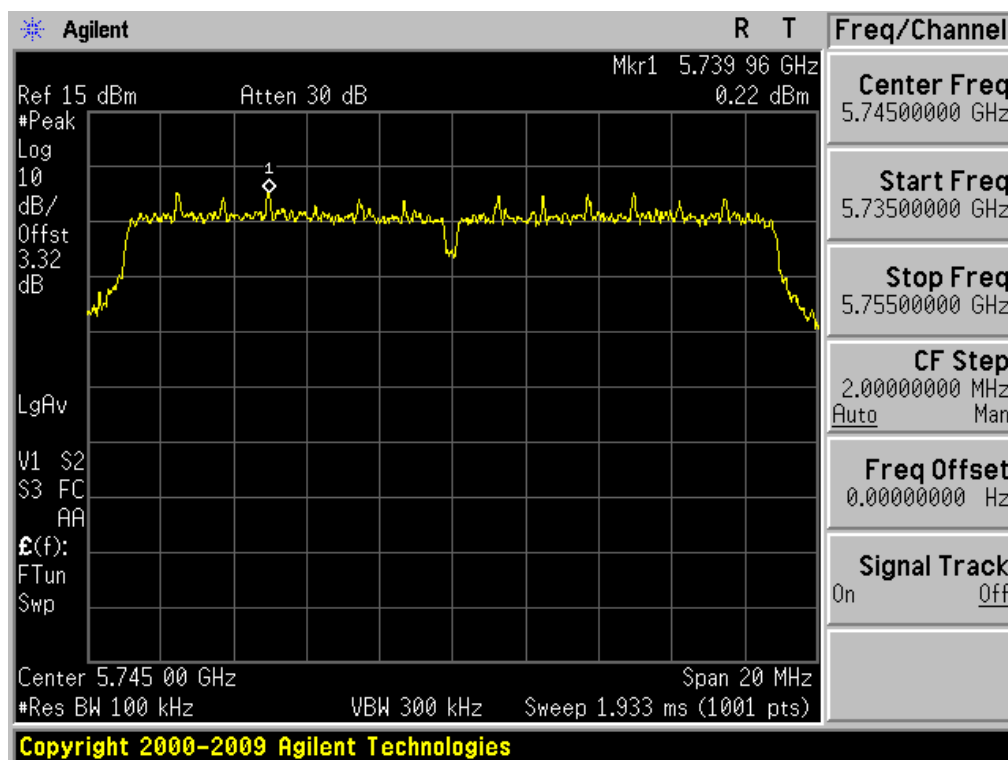
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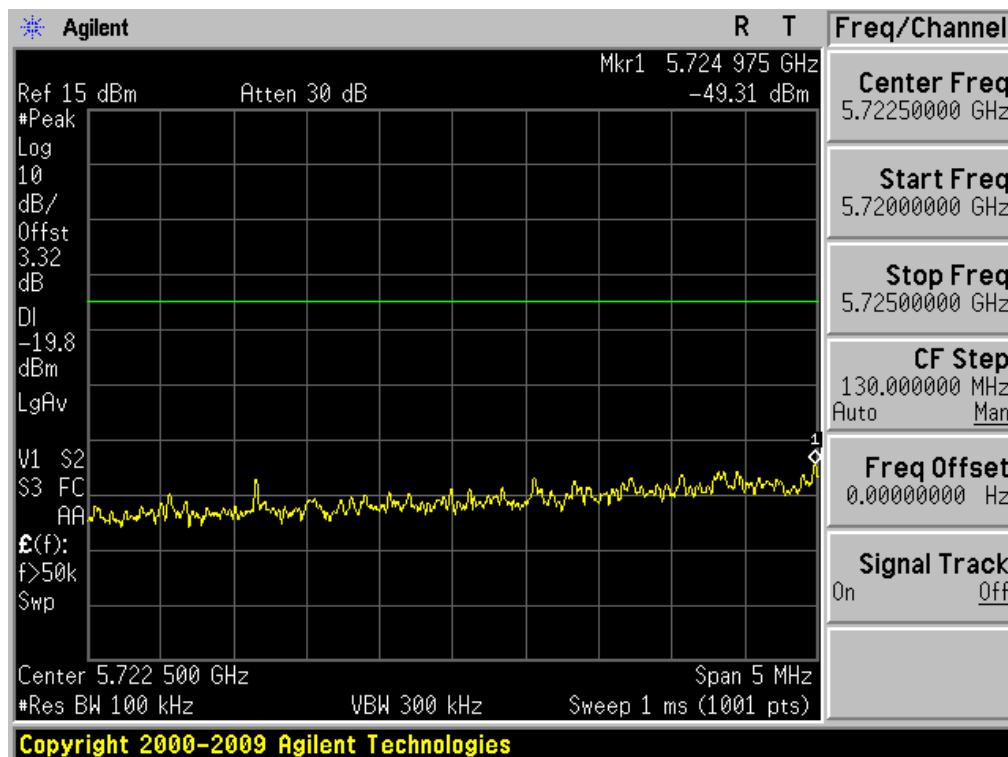
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802.11n(HT20) &amp; MCS0 &amp; 5745MHz

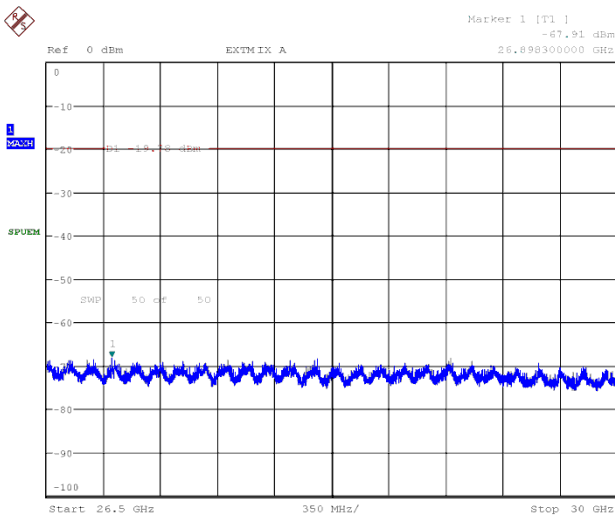
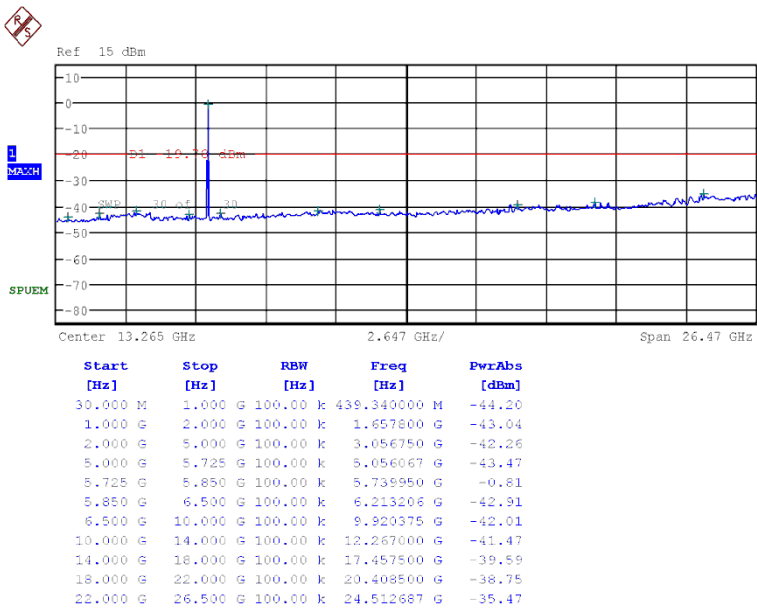
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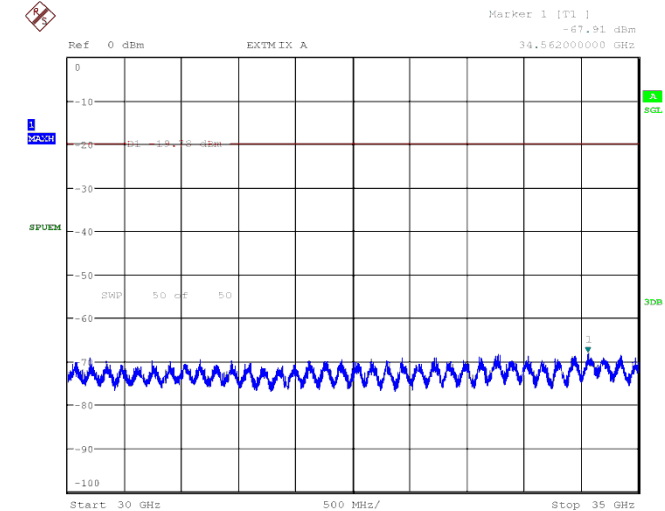
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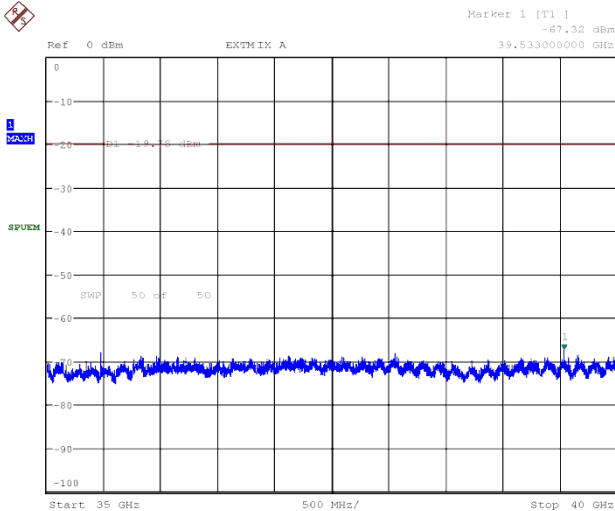
Conducted Spurious Emissions



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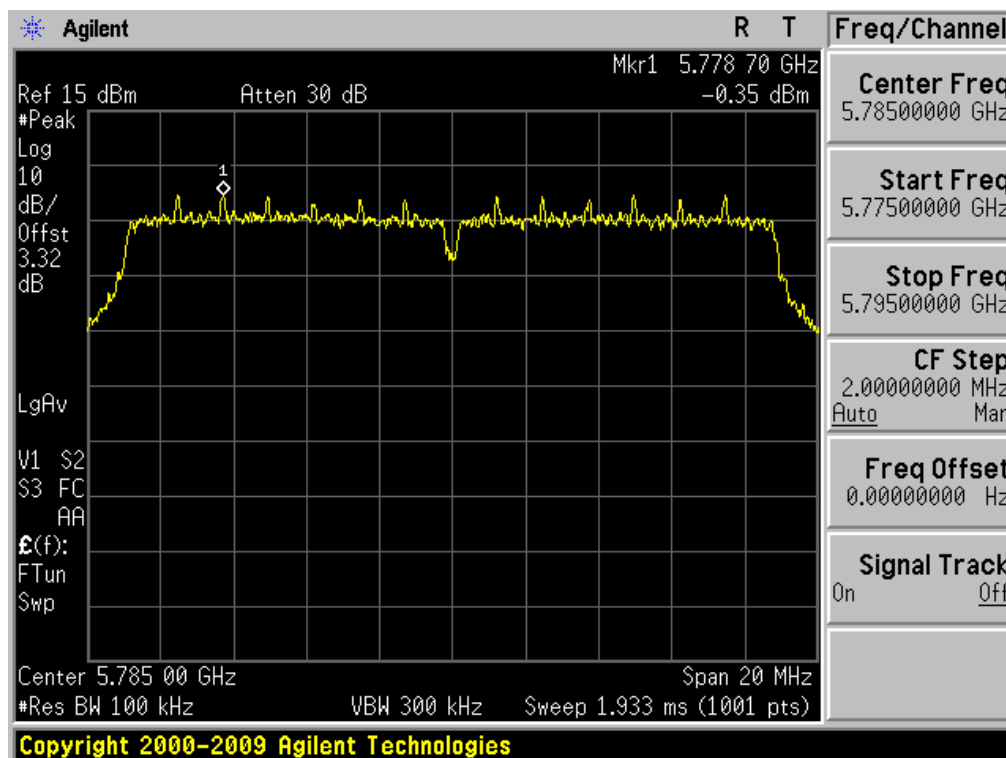
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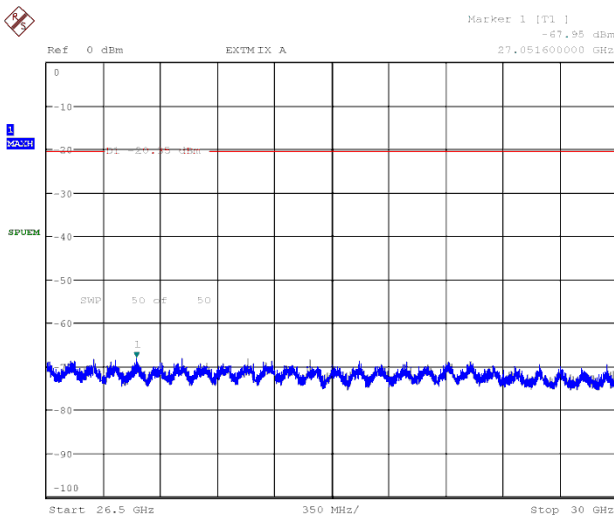
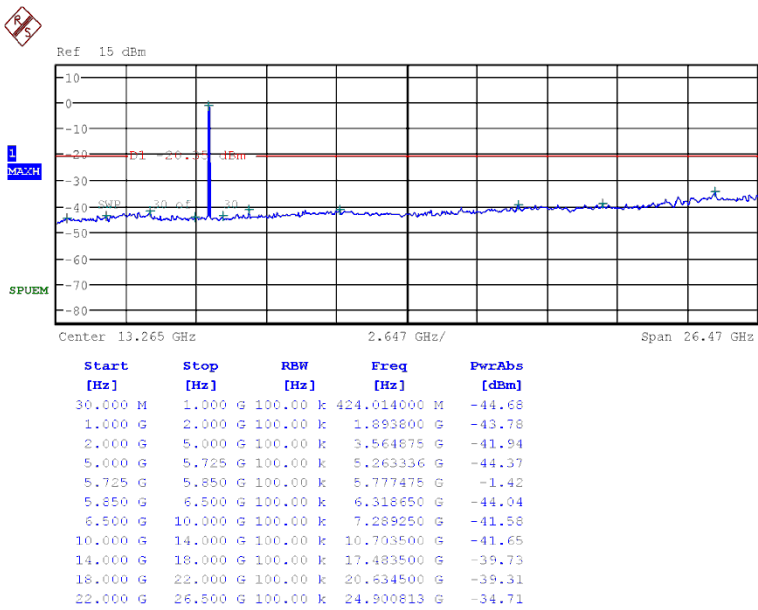
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802.11n(HT20) & MCS0 & 5785MHz

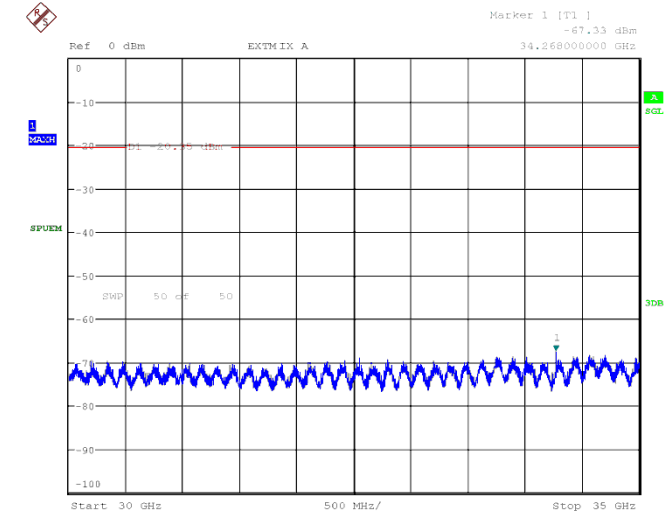
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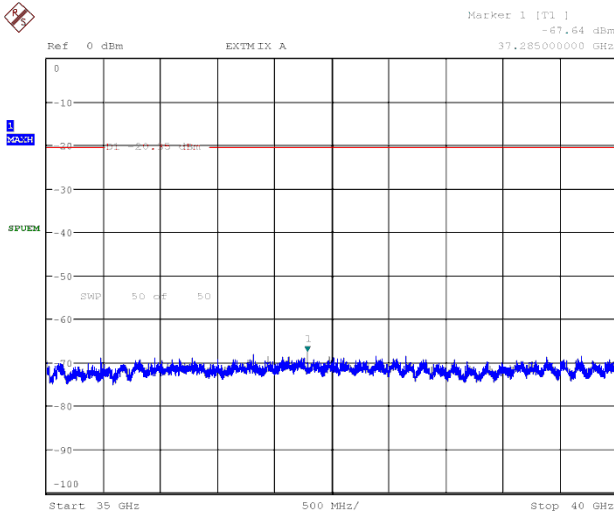
Conducted Spurious Emissions



Date: 15.SEP.2012 09:10:52



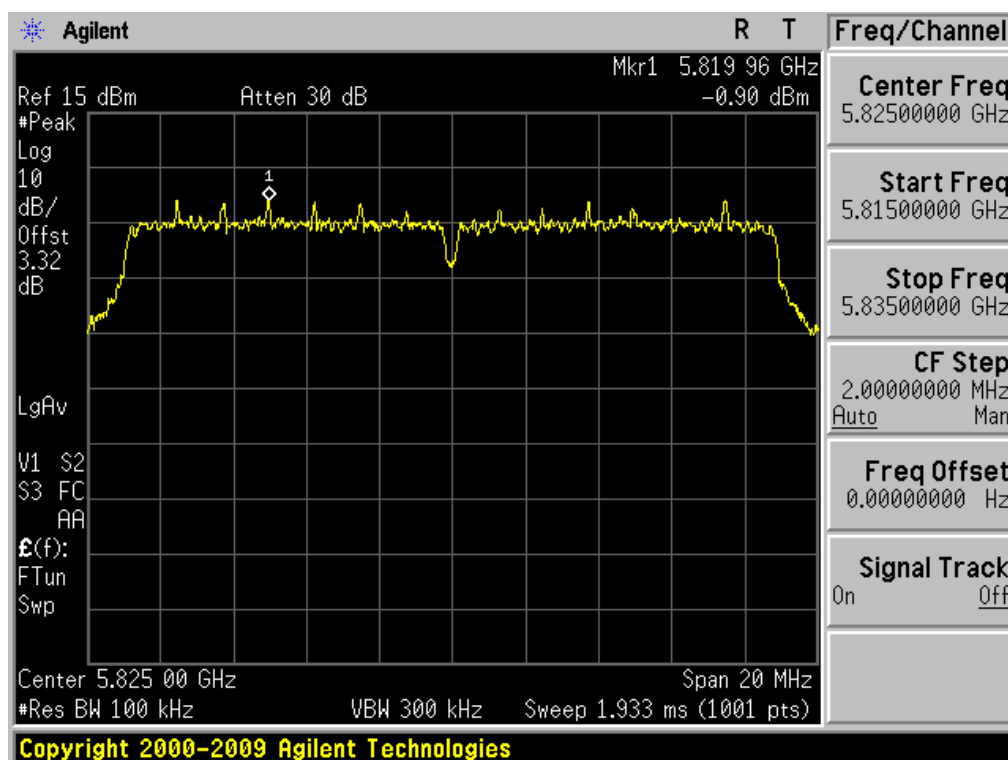
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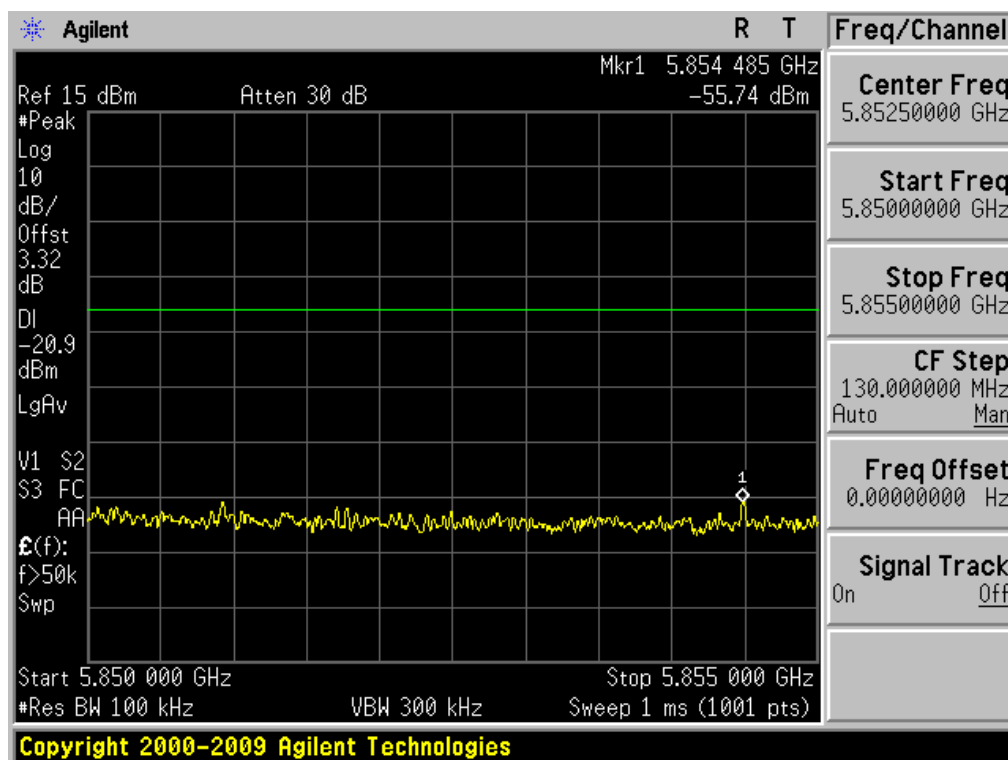
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802.11n(HT20) &amp; MCS0 &amp; 5825MHz

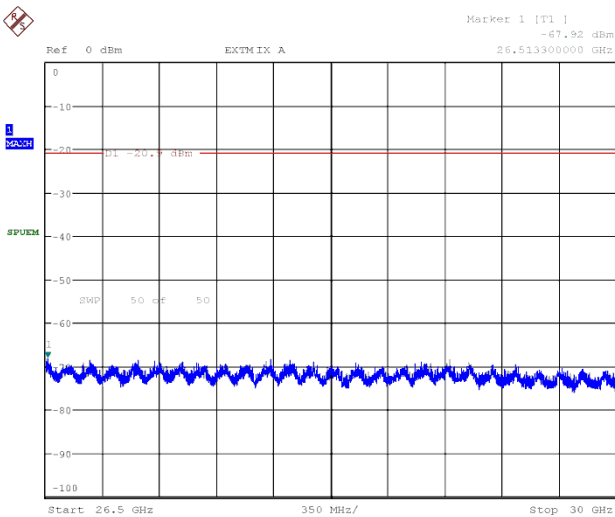
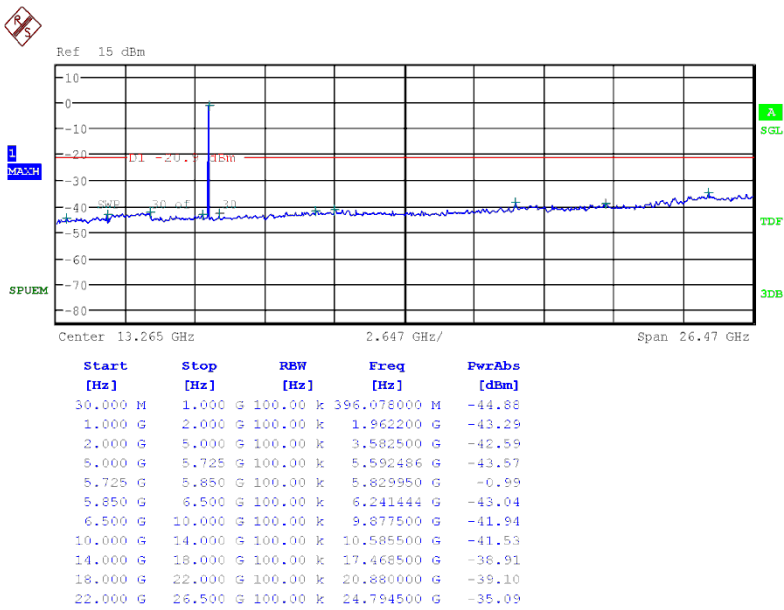
## Reference



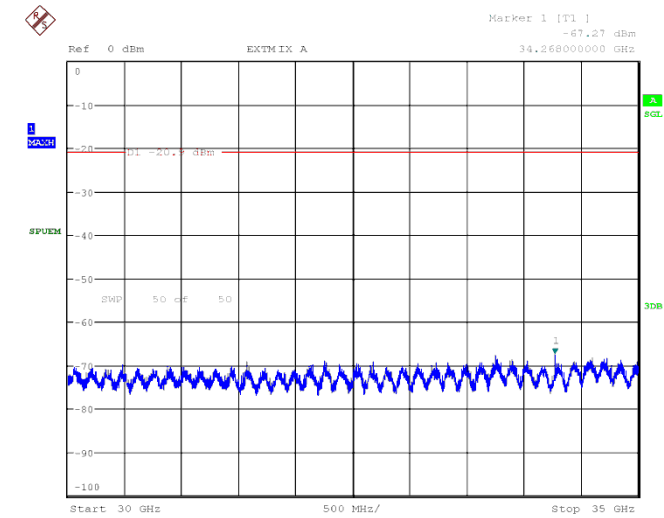
## High Band-edge



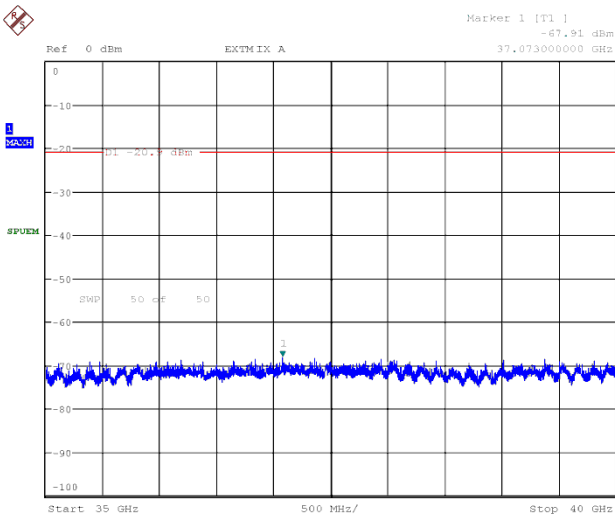
Conducted Spurious Emissions



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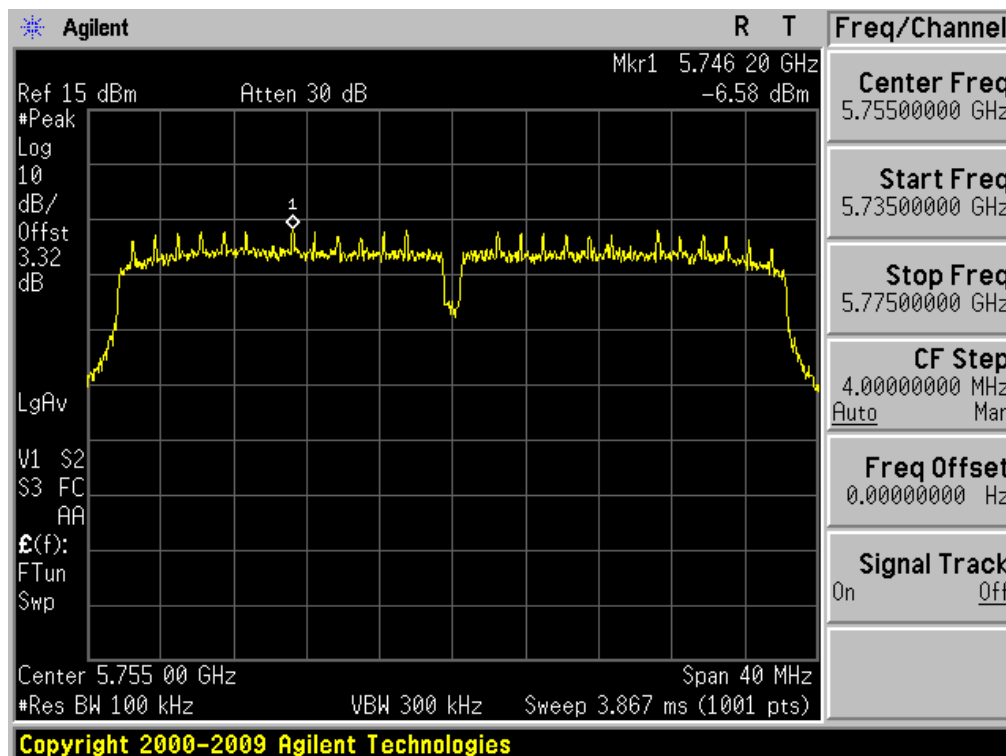
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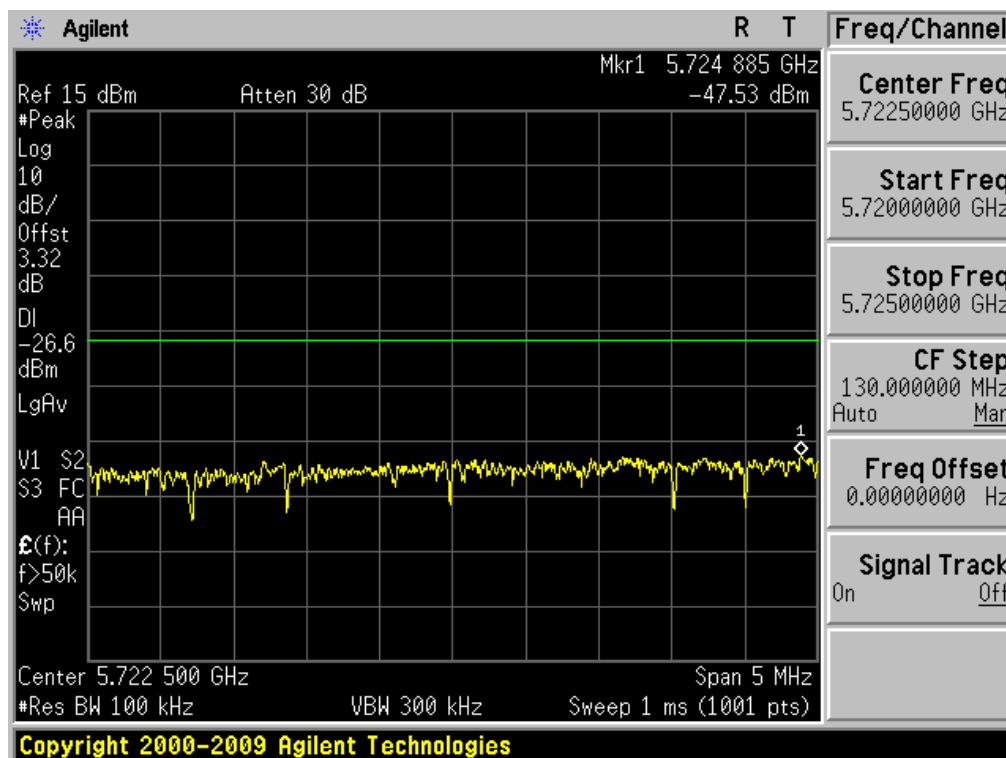
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802.11n(HT40) &amp; MCS0 &amp; 5755MHz

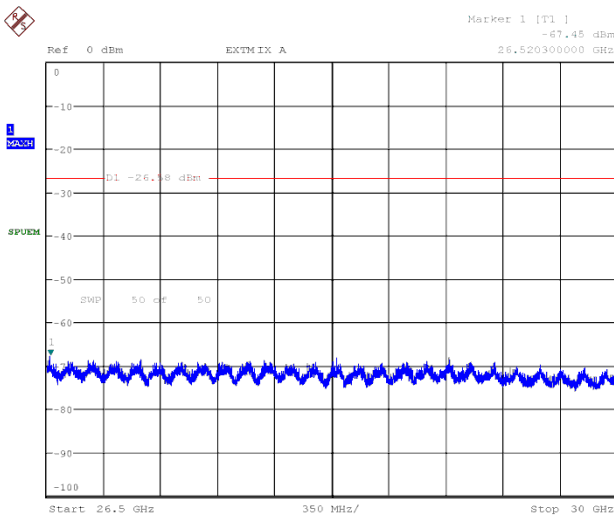
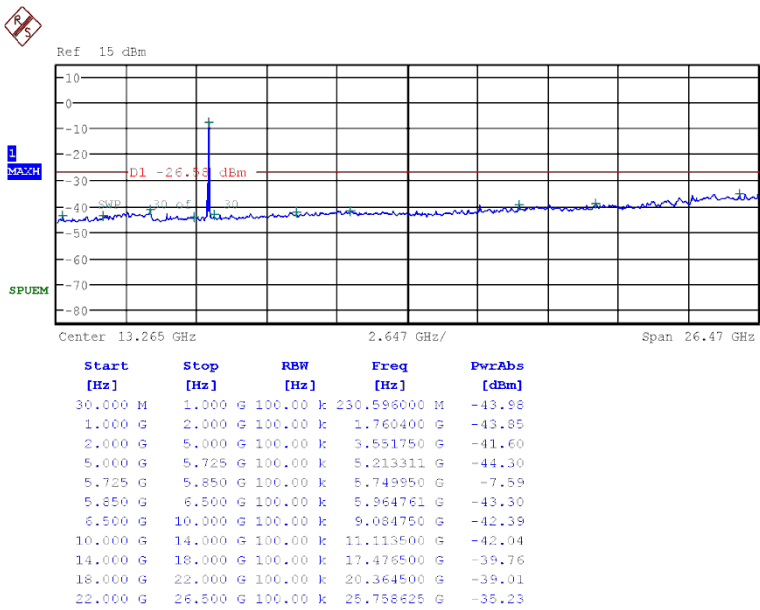
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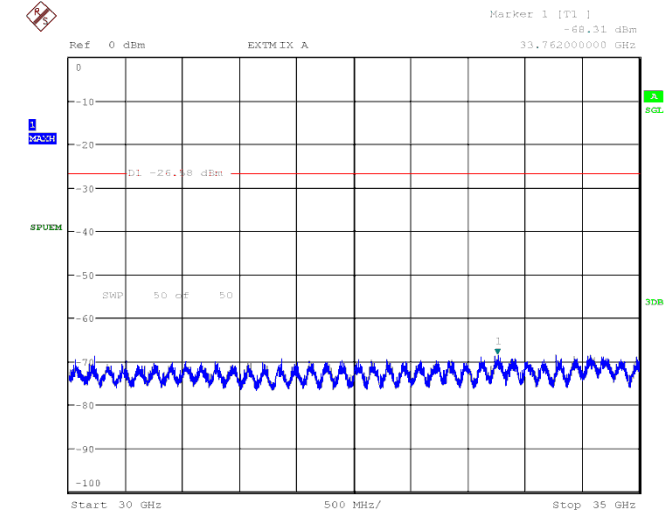
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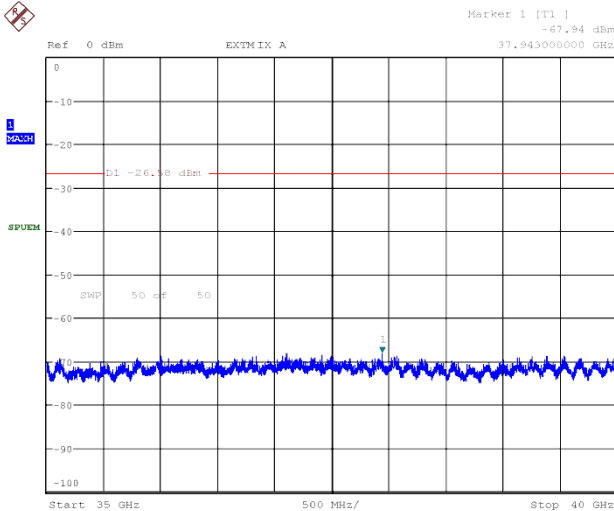
Conducted Spurious Emissions



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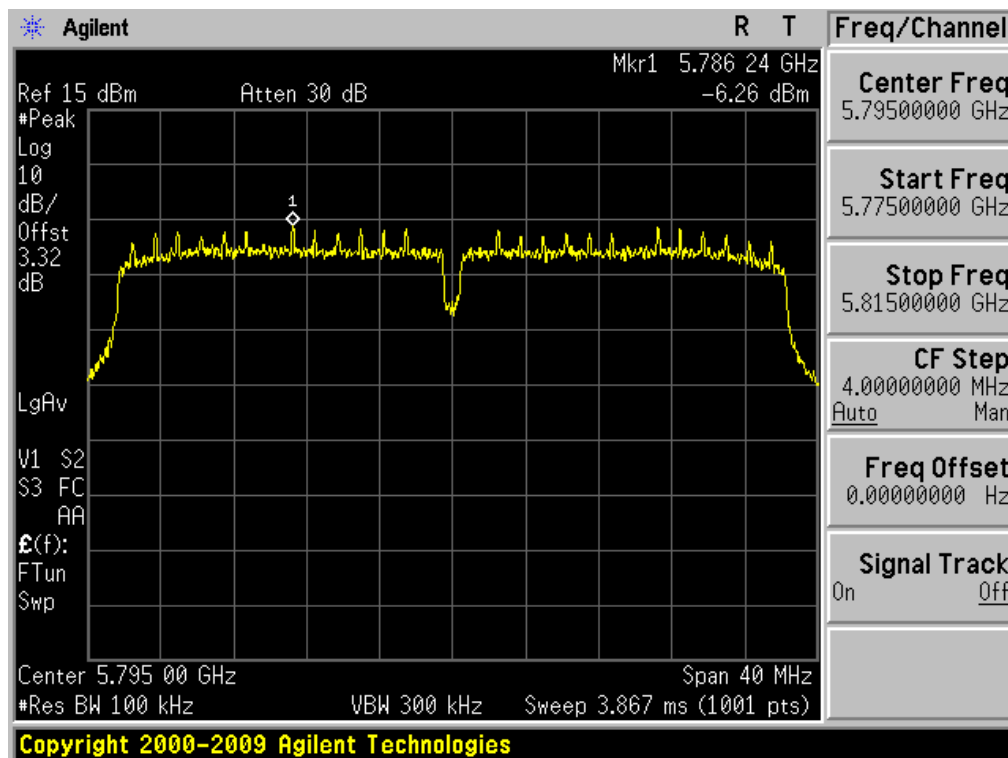
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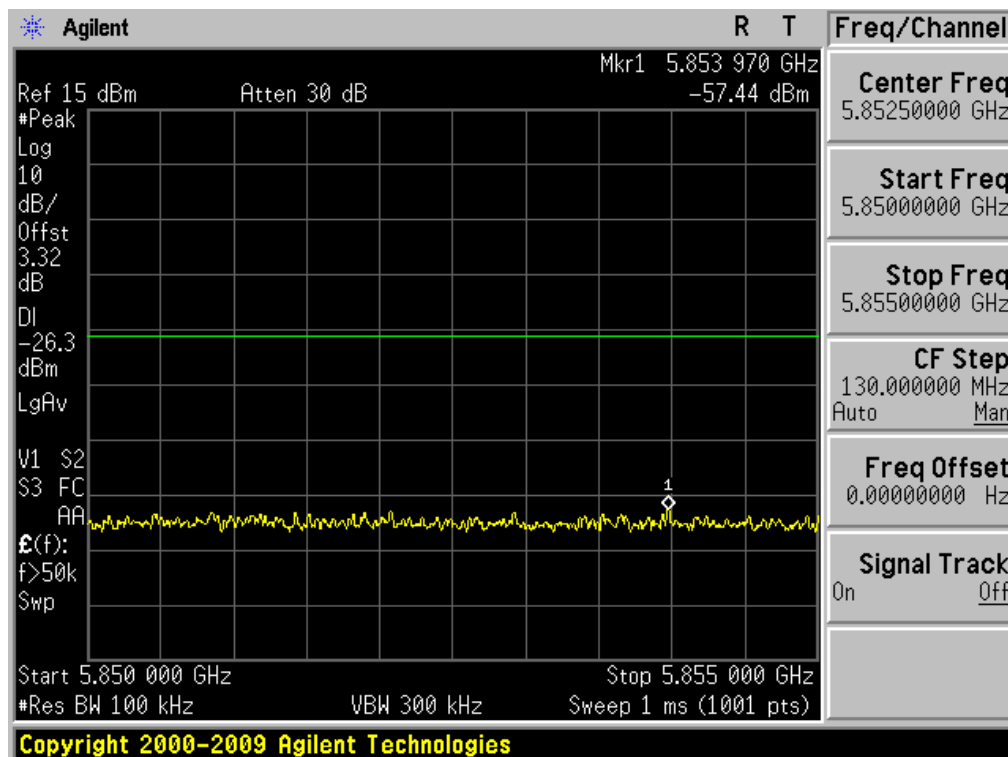
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802.11n(HT40) &amp; MCS0 &amp; 5795MHz

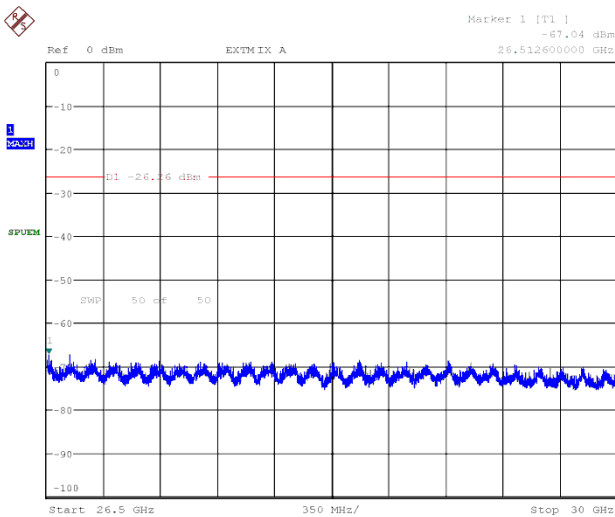
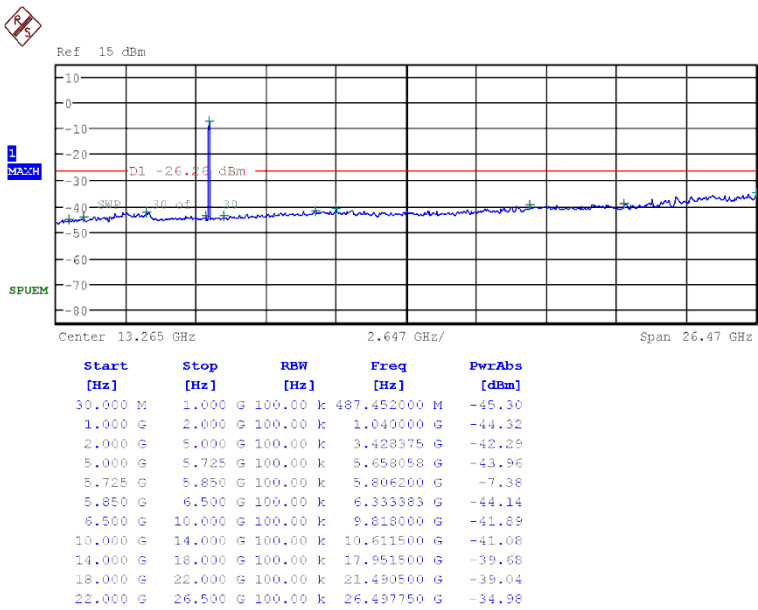
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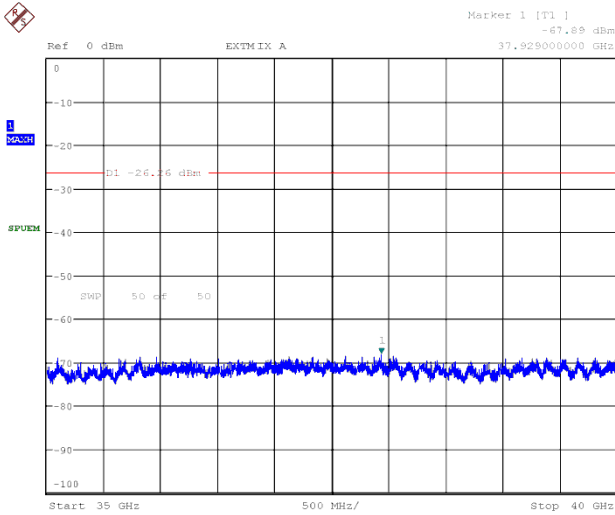
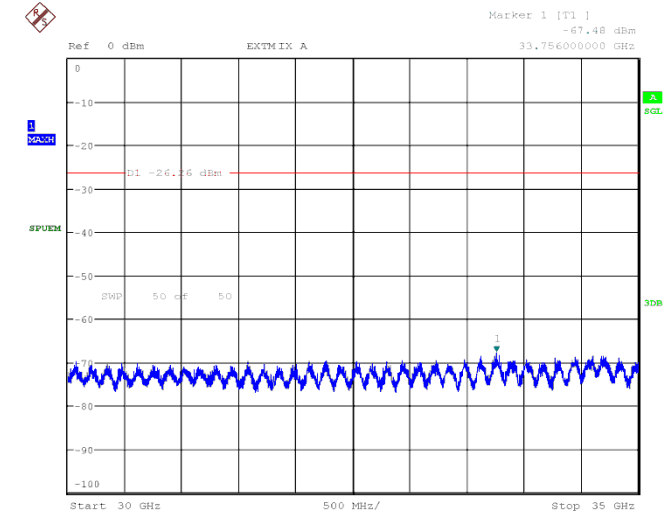
## High Band-edge



Conducted Spurious Emissions



Date: 15.SEP.2012 09:32:48



Date: 15.SEP.2012 09:40:23

## 8.5 Radiated Spurious Emissions

### Test Requirements and limit, §15.247(d), §15.205, §15.209 & RSS-210 [A8.5], RSS-Gen [7.2.2]

In any 100kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) and (b), then the 15.209(a) limit in the table below has to be followed

#### ▪ FCC Part 15.209(a) and (b)

| Frequency (MHz) | Limit (uV/m) @ 3m |
|-----------------|-------------------|
| 30 ~ 88         | 100 **            |
| 88 ~ 216        | 150 **            |
| 216 ~ 960       | 200 **            |
| Above 960       | 500               |

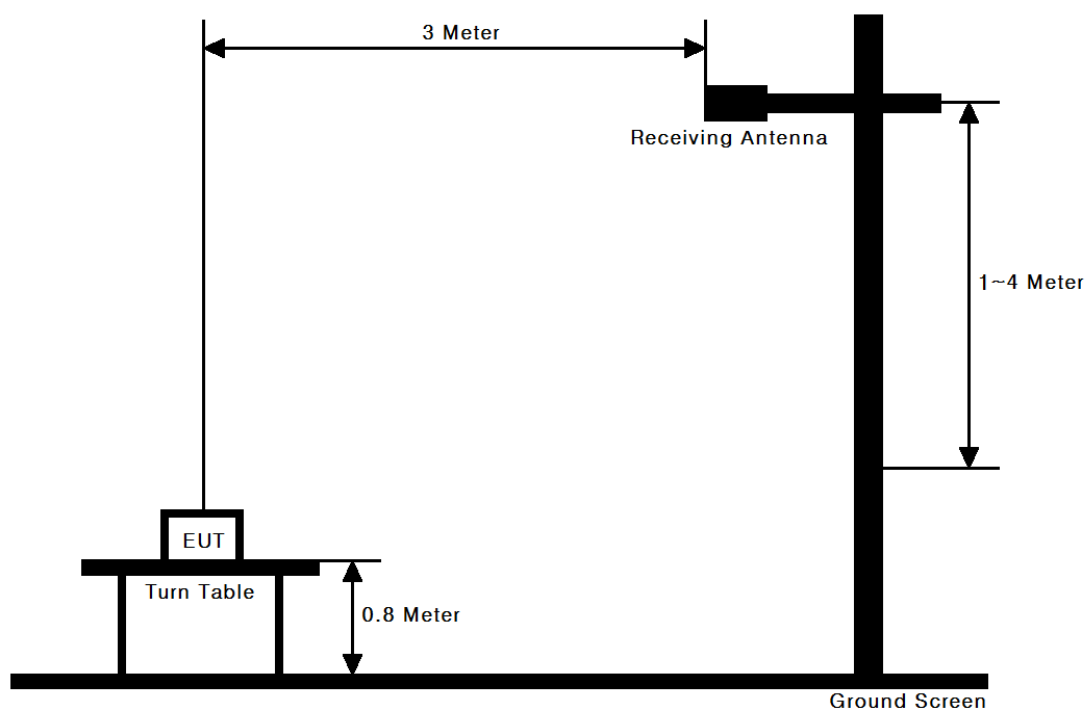
\*\* Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88MHz, 174-216MHz or 470-806MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

#### ▪ FCC Part 15.205 (a): Only spurious emissions are permitted in any of the frequency bands listed below:

| MHz               | MHz               | MHz               | MHz             | GHz          | GHz           |
|-------------------|-------------------|-------------------|-----------------|--------------|---------------|
| 0.009 ~ 0.110     | 8.41425 ~ 8.41475 | 108 ~ 121.94      | 1300 ~ 1427     | 3600 ~ 4400  | 14.47 ~ 14.5  |
| 0.495 ~ 0.505     | 12.29 ~ 12.293    | 123 ~ 138         | 1435 ~ 1626.5   | 4.5 ~ 5.15   | 15.35 ~ 16.2  |
| 2.1735 ~ 2.1905   | 12.51975 ~        | 149.9 ~ 150.05    | 1645.5 ~ 1646.5 | 5.35 ~ 5.46  | 17.7 ~ 21.4   |
| 4.125 ~ 4.128     | 12.52025          | 156.52475 ~       | 1660 ~ 1710     | 7.25 ~ 7.75  | 22.01 ~ 23.12 |
| 4.17725 ~ 4.17775 | 12.57675 ~        | 156.52525         | 1718.8 ~ 1722.2 | 8.025 ~ 8.5  | 23.6 ~ 24.0   |
| 4.20725 ~ 4.20775 | 12.57725          | 156.7 ~ 156.9     | 2200 ~ 2300     | 9.0 ~ 9.2    | 31.2 ~ 31.8   |
| 6.215 ~ 6.218     | 13.36 ~ 13.41     | 162.0125 ~ 167.17 | 2310 ~ 2390     | 9.3 ~ 9.5    | 36.43 ~ 36.5  |
| 6.26775 ~ 6.26825 | 16.42 ~ 16.423    | 167.72 ~ 173.2    | 2483.5 ~ 2500   | 10.6 ~ 12.7  | Above 38.6    |
| 6.31175 ~ 6.31225 | 16.69475 ~        | 240 ~ 285         | 2655 ~ 2900     | 13.25 ~ 13.4 |               |
| 8.291 ~ 8.294     | 16.69525          | 322 ~ 335.4       | 3260 ~ 3267     |              |               |
| 8.362 ~ 8.366     | 16.80425 ~        | 399.90 ~ 410      | 3332 ~ 3339     |              |               |
| 8.37625 ~ 8.38675 | 16.80475          | 608 ~ 614         | 3345.8 ~ 3358   |              |               |
|                   | 25.5 ~ 25.67      | 960 ~ 1240        |                 |              |               |
|                   | 37.5 ~ 38.25      |                   |                 |              |               |
|                   | 73 ~ 74.6         |                   |                 |              |               |
|                   | 74.8 ~ 75.2       |                   |                 |              |               |

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

## Test Configuration



## TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8 m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3 m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

### Note : Measurement Instrument Setting for Radiated Emission Measurements.

#### 1. Frequency Range Below 1 GHz

RBW = 100 or 120 KHz, VBW = 3 x RBW , Detector = Peak or Quasi Peak

#### 2. Frequency Range > 1 GHz

##### Peak Measurement

RBW = 1 MHz , VBW = 3 MHz, Detector = Peak

##### Average Measurement

RBW = 1 MHz , VBW = 10 Hz, Detector = Peak

**30MHz ~ 25GHz Data(802.11b & 1Mbps)**▪ **Lowest Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2382.55         | H       | Z                   | PK            | 54.67          | -4.73      | 49.94           | 74.00          | 24.06       |
| 2389.85         | H       | Z                   | AV            | 42.20          | -4.73      | 37.47           | 54.00          | 16.53       |
| 4823.98         | H       | Z                   | PK            | 45.11          | 2.23       | 47.34           | 74.00          | 26.66       |
| 4824.01         | H       | Z                   | AV            | 36.04          | 2.23       | 38.27           | 54.00          | 15.73       |

▪ **Middle Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 4874.34         | H       | Z                   | PK            | 44.62          | 2.92       | 47.54           | 74.00          | 26.46       |
| 4874.01         | H       | Z                   | AV            | 34.11          | 2.92       | 37.03           | 54.00          | 16.97       |

▪ **Highest Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2483.56         | H       | Z                   | PK            | 56.36          | -4.59      | 51.77           | 74.00          | 22.23       |
| 2483.50         | H       | Z                   | AV            | 43.06          | -4.59      | 38.47           | 54.00          | 15.53       |
| 4924.04         | H       | Z                   | PK            | 45.21          | 2.67       | 47.88           | 74.00          | 26.12       |
| 4924.04         | H       | Z                   | AV            | 34.23          | 2.67       | 36.90           | 54.00          | 17.10       |

**Note.**

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

**30MHz ~ 25GHz Data(802.11g & 6Mbps)**▪ **Lowest Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2389.55         | H       | Z                   | PK            | 59.51          | -4.73      | 54.78           | 74.00          | 19.22       |
| 2390.00         | H       | Z                   | AV            | 43.67          | -4.73      | 38.94           | 54.00          | 15.06       |
| 4823.06         | H       | X                   | PK            | 43.85          | 2.23       | 46.08           | 74.00          | 27.92       |
| 4825.46         | H       | X                   | AV            | 32.29          | 2.23       | 34.52           | 54.00          | 19.48       |

▪ **Middle Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 4875.24         | H       | X                   | PK            | 43.34          | 2.92       | 46.26           | 74.00          | 27.74       |
| 4876.64         | H       | X                   | AV            | 31.70          | 2.92       | 34.62           | 54.00          | 19.38       |

▪ **Highest Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2483.54         | H       | Z                   | PK            | 61.31          | -4.59      | 56.72           | 74.00          | 17.28       |
| 2483.51         | H       | Z                   | AV            | 44.75          | -4.59      | 40.16           | 54.00          | 13.84       |
| 4925.78         | H       | X                   | PK            | 44.50          | 2.67       | 47.17           | 74.00          | 26.83       |
| 4924.96         | H       | X                   | AV            | 32.61          | 2.67       | 35.28           | 54.00          | 18.72       |

**Note.**

1. No other spurious and harmonic emissions were found greater than listed emissions on above table..
2. Above listed point data is the worst case data.
3. Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

**30MHz ~ 25GHz Data(802.11n HT20 & MCS0)**▪ **Lowest Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2389.67         | H       | Z                   | PK            | 60.32          | -4.73      | 55.59           | 74.00          | 18.41       |
| 2390.00         | H       | Z                   | AV            | 43.08          | -4.73      | 38.35           | 54.00          | 15.65       |
| 4824.89         | H       | X                   | PK            | 44.28          | 2.23       | 46.51           | 74.00          | 27.49       |
| 4825.21         | H       | X                   | AV            | 32.20          | 2.23       | 34.43           | 54.00          | 19.57       |

▪ **Middle Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 4873.58         | H       | X                   | PK            | 43.12          | 2.92       | 46.04           | 74.00          | 27.96       |
| 4872.27         | H       | X                   | AV            | 31.92          | 2.92       | 34.84           | 54.00          | 19.16       |

▪ **Highest Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2483.61         | H       | Z                   | PK            | 61.47          | -4.59      | 56.88           | 74.00          | 17.12       |
| 2483.50         | H       | Z                   | AV            | 43.95          | -4.59      | 39.36           | 54.00          | 14.64       |
| 4926.76         | H       | X                   | PK            | 44.19          | 2.67       | 46.86           | 74.00          | 27.14       |
| 4925.28         | H       | X                   | AV            | 32.59          | 2.67       | 35.26           | 54.00          | 18.74       |

**Note.**

1. No other spurious and harmonic emissions were found greater than listed emissions on above table..
2. Above listed point data is the worst case data.
3. Sample Calculation.

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain

**30MHz ~ 40GHz Data(802.11a & 6Mbps)**

## ▪ Lowest Channel

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Distance Correction Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|---------------------------------|-----------------|----------------|-------------|
| 11489.84        | H       | Z                   | PK            | 40.88          | 14.75      | -6.02                           | 49.61           | 74.00          | 24.39       |
| 11489.96        | H       | Z                   | AV            | 31.31          | 14.75      | -6.02                           | 40.04           | 54.00          | 13.96       |

## ▪ Middle Channel

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Distance Correction Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|---------------------------------|-----------------|----------------|-------------|
| 11569.76        | H       | Z                   | PK            | 41.81          | 15.32      | -6.02                           | 51.11           | 74.00          | 22.89       |
| 11569.94        | H       | Z                   | AV            | 32.53          | 15.32      | -6.02                           | 41.83           | 54.00          | 12.17       |

## ▪ Highest Channel

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Distance Correction Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|---------------------------------|-----------------|----------------|-------------|
| 11650.10        | H       | Z                   | PK            | 42.46          | 15.27      | -6.02                           | 51.71           | 74.00          | 22.29       |
| 11649.96        | H       | Z                   | AV            | 32.73          | 15.27      | -6.02                           | 41.98           | 54.00          | 12.02       |

**Note.**

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.  

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain
4. Measurement Distance above 10 GHz = 1.5 m. So Distance Correction Factor :  $-6.02\text{dB} = 20 \cdot \log(1.5\text{m}/3\text{m})$

**30MHz ~ 40GHz Data(802.11n HT20 & MCS0)**

## ▪ Lowest Channel

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Distance Correction Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|---------------------------------|-----------------|----------------|-------------|
| 11489.90        | H       | Z                   | PK            | 41.06          | 14.75      | -6.02                           | 49.79           | 74.00          | 24.21       |
| 11489.98        | H       | Z                   | AV            | 31.45          | 14.75      | -6.02                           | 40.18           | 54.00          | 13.82       |

## ▪ Middle Channel

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Distance Correction Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|---------------------------------|-----------------|----------------|-------------|
| 11570.22        | H       | Z                   | PK            | 41.55          | 15.32      | -6.02                           | 50.85           | 74.00          | 23.15       |
| 11569.96        | H       | Z                   | AV            | 32.38          | 15.32      | -6.02                           | 41.68           | 54.00          | 12.32       |

## ▪ Highest Channel

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Distance Correction Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|---------------------------------|-----------------|----------------|-------------|
| 11649.95        | H       | Z                   | PK            | 41.05          | 15.27      | -6.02                           | 50.30           | 74.00          | 23.70       |
| 11649.96        | H       | Z                   | AV            | 32.72          | 15.27      | -6.02                           | 41.97           | 54.00          | 12.03       |

**Note.**

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.  

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} \quad / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain
4. Measurement Distance above 10 GHz = 1.5 m. So Distance Correction Factor :  $-6.02\text{dB} = 20 \cdot \log(1.5\text{m}/3\text{m})$

**30MHz ~ 40GHz Data(802.11n HT40 & MCS0)**▪ **Lowest Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Distance Correction Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|---------------------------------|-----------------|----------------|-------------|
| 11509.66        | H       | Z                   | PK            | 41.00          | 14.75      | -6.02                           | 49.73           | 74.00          | 24.27       |
| 11510.26        | H       | Z                   | AV            | 30.96          | 14.75      | -6.02                           | 39.69           | 54.00          | 14.31       |

▪ **Highest Channel**

| Frequency (MHz) | ANT Pol | EUT Position (Axis) | Detector Mode | Reading (dBuV) | T.F (dB/m) | Distance Correction Factor (dB) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-----------------|---------|---------------------|---------------|----------------|------------|---------------------------------|-----------------|----------------|-------------|
| 11590.22        | H       | Z                   | PK            | 41.24          | 15.27      | -6.02                           | 50.49           | 74.00          | 23.51       |
| 11589.96        | H       | Z                   | AV            | 31.85          | 15.27      | -6.02                           | 41.10           | 54.00          | 12.90       |

**Note.**

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.
2. Above listed point data is the worst case data.
3. Sample Calculation.  

$$\text{Margin} = \text{Limit} - \text{Result} \quad / \quad \text{Result} = \text{Reading} + \text{T.F} / \quad \text{T.F} = \text{AF} + \text{CL} - \text{AG}$$

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain
4. Measurement Distance above 10 GHz = 1.5 m. So Distance Correction Factor :  $-6.02\text{dB} = 20 \cdot \log(1.5\text{m}/3\text{m})$

## 8.6 Power-line Conducted Emissions

### Test Requirements and limit, §15.207 & RSS-Gen [7.2.2]

For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (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

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### Test Configuration

See test photographs for the actual connections between EUT and support equipment.

### TEST PROCEDURE

1. The EUT is placed on a wooden table 80 cm above the reference ground plane.
2. The EUT is connected via LISN to the test power supply.
3. The measurement results are obtained as described below:
4. Detectors – Quasi Peak and Average Detector.

## ■ RESULT PLOTS

## AC Line Conducted Emissions (Graph)

Test Mode: 802.11n HT20 (2.4GHz Band)



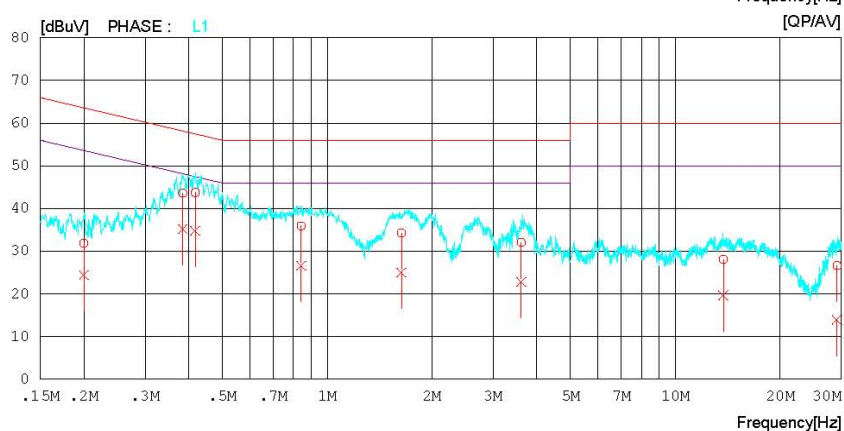
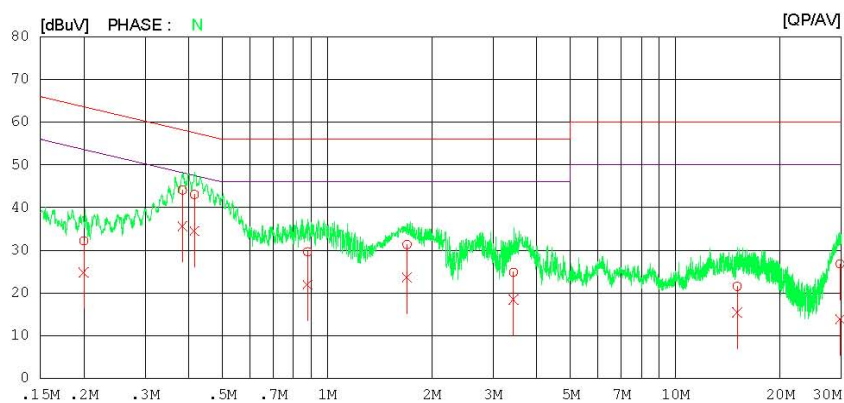
## Results of Conducted Emission

Digital EMC  
Date : 2012-09-06

Model No. : LG-E974  
Type :  
Serial No. : Identical prototype  
Test Condition : WLAN

Reference No. :  
Power Supply : 120 V 60 Hz  
Temp/Humid. : 24 °C 50 % R.H.  
Operator : J.J.LEE

Memo : 2.4GHz

LIMIT : CISPR22\_B QP  
CISPR22\_B AV

**AC Line Conducted Emissions (List)**

Test Mode: 802.11n HT20 (2.4GHz Band)

**Results of Conducted Emission**Digital EMC  
Date : 2012-09-06

|                |                       |               |                   |
|----------------|-----------------------|---------------|-------------------|
| Model No.      | : LG-E974             | Reference No. | :                 |
| Type           | :                     | Power Supply  | : 120 V 60 Hz     |
| Serial No.     | : Identical prototype | Temp/Humi.    | : 24 °C 50 % R.H. |
| Test Condition | : WLAN                | Operator      | : J.J.LEE         |

Memo : 2.4GHz

LIMIT : CISPR22\_B QP  
CISPR22\_B AV

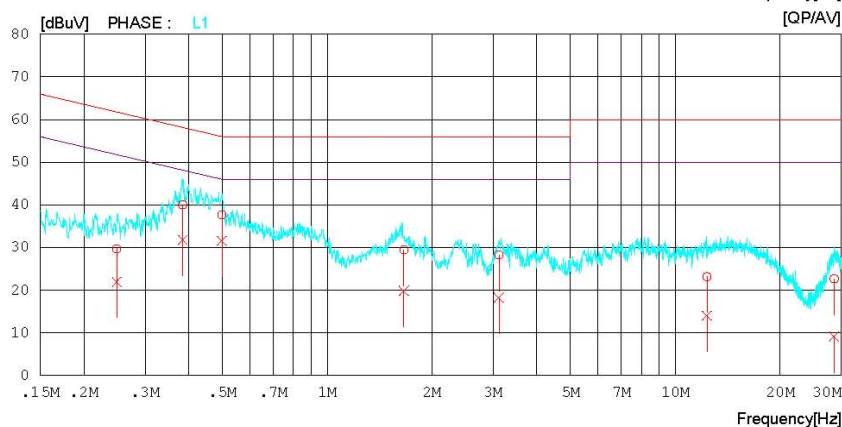
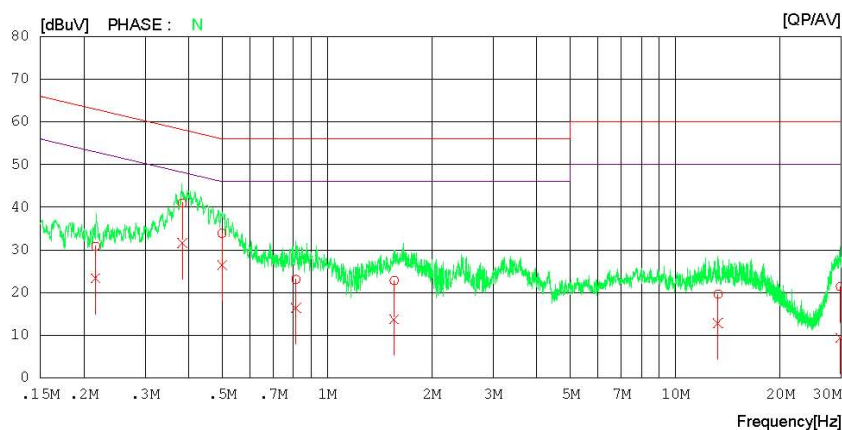
| NO | FREQ<br>[MHz] | READING      |              | C.FACTOR<br>[dB] | RESULT       |              | LIMIT        |              | MARGIN       |              | PHASE |
|----|---------------|--------------|--------------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------|
|    |               | QP<br>[dBuV] | AV<br>[dBuV] |                  | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] |       |
| 1  | 0.19990       | 32.0         | 24.6         | 0.2              | 32.2         | 24.8         | 63.6         | 53.6         | 31.4         | 28.8         | N     |
| 2  | 0.38416       | 43.8         | 35.3         | 0.3              | 44.1         | 35.6         | 58.2         | 48.2         | 14.1         | 12.6         | N     |
| 3  | 0.41559       | 42.7         | 34.2         | 0.3              | 43.0         | 34.5         | 57.5         | 47.5         | 14.5         | 13.0         | N     |
| 4  | 0.87898       | 29.3         | 21.6         | 0.3              | 29.6         | 21.9         | 56.0         | 46.0         | 26.4         | 24.1         | N     |
| 5  | 1.69650       | 31.0         | 23.3         | 0.3              | 31.3         | 23.6         | 56.0         | 46.0         | 24.7         | 22.4         | N     |
| 6  | 3.43050       | 24.4         | 18.0         | 0.4              | 24.8         | 18.4         | 56.0         | 46.0         | 31.2         | 27.6         | N     |
| 7  | 15.06250      | 20.6         | 14.5         | 0.9              | 21.5         | 15.4         | 60.0         | 50.0         | 38.5         | 34.6         | N     |
| 8  | 29.76550      | 25.5         | 12.6         | 1.3              | 26.8         | 13.9         | 60.0         | 50.0         | 33.2         | 36.1         | N     |
| 9  | 0.20013       | 31.7         | 24.2         | 0.2              | 31.9         | 24.4         | 63.6         | 53.6         | 31.7         | 29.2         | L1    |
| 10 | 0.38481       | 43.3         | 34.9         | 0.3              | 43.6         | 35.2         | 58.2         | 48.2         | 14.6         | 13.0         | L1    |
| 11 | 0.41784       | 43.5         | 34.5         | 0.3              | 43.8         | 34.8         | 57.5         | 47.5         | 13.7         | 12.7         | L1    |
| 12 | 0.84168       | 35.6         | 26.4         | 0.3              | 35.9         | 26.7         | 56.0         | 46.0         | 20.1         | 19.3         | L1    |
| 13 | 1.63450       | 34.0         | 24.7         | 0.3              | 34.3         | 25.0         | 56.0         | 46.0         | 21.7         | 21.0         | L1    |
| 14 | 3.60950       | 31.7         | 22.4         | 0.4              | 32.1         | 22.8         | 56.0         | 46.0         | 23.9         | 23.2         | L1    |
| 15 | 13.74450      | 27.2         | 18.8         | 0.9              | 28.1         | 19.7         | 60.0         | 50.0         | 31.9         | 30.3         | L1    |
| 16 | 29.14850      | 25.4         | 12.7         | 1.3              | 26.7         | 14.0         | 60.0         | 50.0         | 33.3         | 36.0         | L1    |

**AC Line Conducted Emissions (Graph)**

Test Mode: 802.11a (5.7GHz Band)

**Results of Conducted Emission**Digital EMC  
Date : 2012-09-06Model No. : LG-E974  
Type :  
Serial No. : Identical prototype  
Test Condition : WLANReference No. :  
Power Supply : 120 V 60 Hz  
Temp/Humi. : 24 °C 50 % R.H.  
Operator : J.J.LEE

Memo : 5.7GHz

LIMIT : CISPR22\_B QP  
CISPR22\_B AV

**AC Line Conducted Emissions (List)**

Test Mode: 802.11a (5.7GHz Band)

**Results of Conducted Emission**Digital EMC  
Date : 2012-09-06Model No. : LG-E974  
Type :  
Serial No. : Identical prototype  
Test Condition : WLANReference No. :  
Power Supply : 120 V 60 Hz  
Temp/Humi. : 24 °C 50 % R.H.  
Operator : J.J.LEE

Memo : 5.7GHz

LIMIT : CISPR22\_B QP  
CISPR22\_B AV

| NO | FREQ<br>[MHz] | READING      |              | C.FACTOR<br>[dB] | RESULT       |              | LIMIT        |              | MARGIN       |              | PHASE |
|----|---------------|--------------|--------------|------------------|--------------|--------------|--------------|--------------|--------------|--------------|-------|
|    |               | QP<br>[dBuV] | AV<br>[dBuV] |                  | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] | QP<br>[dBuV] | AV<br>[dBuV] |       |
| 1  | 0.21624       | 30.6         | 23.2         | 0.2              | 30.8         | 23.4         | 63.0         | 53.0         | 32.2         | 29.6         | N     |
| 2  | 0.38358       | 40.7         | 31.3         | 0.3              | 41.0         | 31.6         | 58.2         | 48.2         | 17.2         | 16.6         | N     |
| 3  | 0.49918       | 33.7         | 26.2         | 0.2              | 33.9         | 26.4         | 56.0         | 46.0         | 22.1         | 19.6         | N     |
| 4  | 0.81383       | 22.8         | 16.1         | 0.3              | 23.1         | 16.4         | 56.0         | 46.0         | 32.9         | 29.6         | N     |
| 5  | 1.55800       | 22.5         | 13.4         | 0.3              | 22.8         | 13.7         | 56.0         | 46.0         | 33.2         | 32.3         | N     |
| 6  | 13.26750      | 18.7         | 11.9         | 0.9              | 19.6         | 12.8         | 60.0         | 50.0         | 40.4         | 37.2         | N     |
| 7  | 29.81100      | 20.1         | 8.0          | 1.3              | 21.4         | 9.3          | 60.0         | 50.0         | 38.6         | 40.7         | N     |
| 8  | 0.24878       | 29.5         | 21.8         | 0.2              | 29.7         | 22.0         | 61.8         | 51.8         | 32.1         | 29.8         | L1    |
| 9  | 0.38475       | 39.7         | 31.5         | 0.3              | 40.0         | 31.8         | 58.2         | 48.2         | 18.2         | 16.4         | L1    |
| 10 | 0.49861       | 37.5         | 31.4         | 0.2              | 37.7         | 31.6         | 56.0         | 46.0         | 18.3         | 14.4         | L1    |
| 11 | 1.66150       | 29.1         | 19.6         | 0.3              | 29.4         | 19.9         | 56.0         | 46.0         | 26.6         | 26.1         | L1    |
| 12 | 3.11400       | 27.9         | 17.9         | 0.4              | 28.3         | 18.3         | 56.0         | 46.0         | 27.7         | 27.7         | L1    |
| 13 | 12.33550      | 22.4         | 13.2         | 0.8              | 23.2         | 14.0         | 60.0         | 50.0         | 36.8         | 36.0         | L1    |
| 14 | 28.61600      | 21.4         | 7.9          | 1.3              | 22.7         | 9.2          | 60.0         | 50.0         | 37.3         | 40.8         | L1    |

## 8.7 Occupied Bandwidth

### Test Requirements, RSS-Gen [4.6.1]

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

#### ■ TEST CONFIGURATION

Refer to the APPENDIX I.

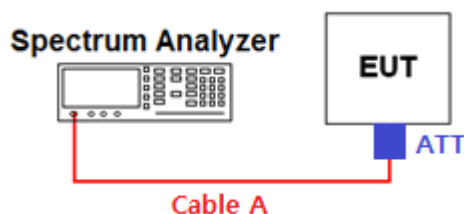
#### ■ TEST PROCEDURE

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual.

#### ■ TEST RESULTS: **N/A**

**9. LIST OF TEST EQUIPMENT**

| Type                      | Manufacturer  | Model    | Cal.Date<br>(yy/mm/dd) | Next.Cal.Date<br>(yy/mm/dd) | S/N                    |
|---------------------------|---------------|----------|------------------------|-----------------------------|------------------------|
| Spectrum Analyzer         | Agilent       | E4440A   | 11/10/11               | 12/10/11                    | US45303022             |
| Spectrum Analyzer         | Agilent       | E4440A   | 11/09/30               | 12/09/30                    | MY45304199             |
| Spectrum Analyzer         | Rohde Schwarz | FSQ26    | 12/01/09               | 13/01/09                    | 200445                 |
| Harmonic Mixer            | OML           | M28HWD   | 12/02/06               | 13/02/06                    | Ka100224-1             |
| Digital Multimeter        | H.P           | 34401A   | 12/03/05               | 13/03/05                    | 3146A13475, US36122178 |
| Spectrum Analyzer         | Agilent       | N9020A   | 12/01/09               | 13/01/09                    | MY49100833             |
| Signal Generator          | Rohde Schwarz | SMR20    | 12/03/05               | 13/03/05                    | 101251                 |
| Vector Signal Generator   | Rohde Schwarz | SMJ100A  | 12/01/09               | 13/01/09                    | 100148                 |
| Thermo hygrometer         | BODYCOM       | BJ5478   | 12/01/13               | 13/01/13                    | 090205-2               |
| DC Power Supply           | HP            | 6622A    | 12/03/05               | 13/03/05                    | 3448A03760             |
| High-pass filter          | Wainwright    | WHNX3.0  | 11/09/30               | 12/09/30                    | 9                      |
| High-Pass Filter          | Wainwright    | WHKX8.5  | 11/09/30               | 12/09/30                    | 1                      |
| BILOG ANTENNA             | SCHAFFNER     | CBL6112D | 10/12/21               | 12/12/21                    | 22609V                 |
| HORN ANT                  | ETS           | 3115     | 12/02/20               | 14/02/20                    | 6419                   |
| HORN ANT                  | A.H.Systems   | SAS-574  | 11/03/25               | 13/03/25                    | 154                    |
| Attenuator (3dB)          | WEINSCHEL     | 56-3     | 11/09/30               | 12/09/30                    | Y2342                  |
| Amplifier (22dB)          | H.P           | 8447E    | 12/01/09               | 13/01/09                    | 2945A02865             |
| Amplifier (30dB)          | Agilent       | 8449B    | 12/03/05               | 13/03/05                    | 3008A01590             |
| EMI TEST RECEIVER         | R&S           | ESU      | 12/03/05               | 13/03/05                    | 100014                 |
| EMI TEST RECEIVER         | R&S           | ESCI     | 12/03/06               | 13/03/06                    | 100364                 |
| CVCF                      | NF Electronic | 4420     | 12/03/06               | 13/03/06                    | 304935/337980          |
| LISN                      | R&S           | ESH2-Z5  | 11/09/30               | 12/09/30                    | 828739/006             |
| RFI/Field intensity Meter | KYORITSU      | KNM-2402 | 12/07/02               | 13/07/02                    | 4N-170-3               |

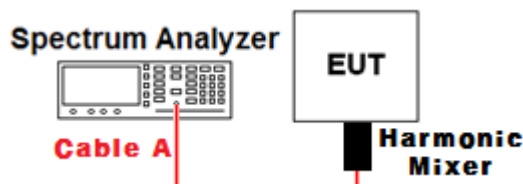
**APPENDIX I****Conducted Test set up Diagram & Path loss Information**▪ **Conducted Measurement(30MHz ~ 26.5GHz)****Path loss value information**

| Frequency (GHz) | Path Loss (dB) | Frequency (GHz) | Path Loss (dB) |
|-----------------|----------------|-----------------|----------------|
| 0.03            | 2.95           | 10              | 3.77           |
| 1               | 3.02           | 15              | 4.28           |
| 2.412 ~ 2.462   | 3.16           | 20              | 4.51           |
| 5               | 3.22           | 26.5            | 4.78           |
| 5.745 ~ 5.825   | 3.32           | -               | -              |

Note. 1: The path loss from EUT to Spectrum analyzer was measured and used for test.

Path loss (=S/A's offset value) = Cable A + ATT (Attenuator, Applied only when it was used externally)

Note. 2: For conducted spurious emissions, the path loss values were saved as the transducer factor on the spurious measurement function of the spectrum analyzer and the transducer factor of tested frequency is calculated and corrected automatically by the spectrum analyzer's measurement function.

▪ **Conducted Measurement(26.5GHz ~ 40.0GHz)****Path loss value information**

| Frequency (GHz) | Path Loss (dB) | Frequency (GHz) | Path Loss (dB) |
|-----------------|----------------|-----------------|----------------|
| 26.5            | 21.42          | 35.0            | 20.91          |
| 30.0            | 20.06          | 40.0            | 23.03          |

Note. 1: For conducted spurious emissions between 25.6 GHz and 40 GHz, the external harmonic mixer was used and above correction factors were saved as the transducer factor on the S/A and it was corrected automatically by the S/A's function.