## 7.8 POWERLINE CONDUCTED EMISSIONS

### LIMIT

According to §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 Range (MHz) | Limits (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56* | 56 to 46* |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

** Decreases with the logarithm of the frequency.*

### TEST CONFIGURATION

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

## TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

### Test Data

| | | | |
|---|---|---|---|
| **Operation Mode:** | Normal Link | **Test Date:** | August 12, 2009 |
| **Temperature:** | 22°C | **Tested by:** | Snake Shan |
| **Humidity:** | 45 % RH | | |

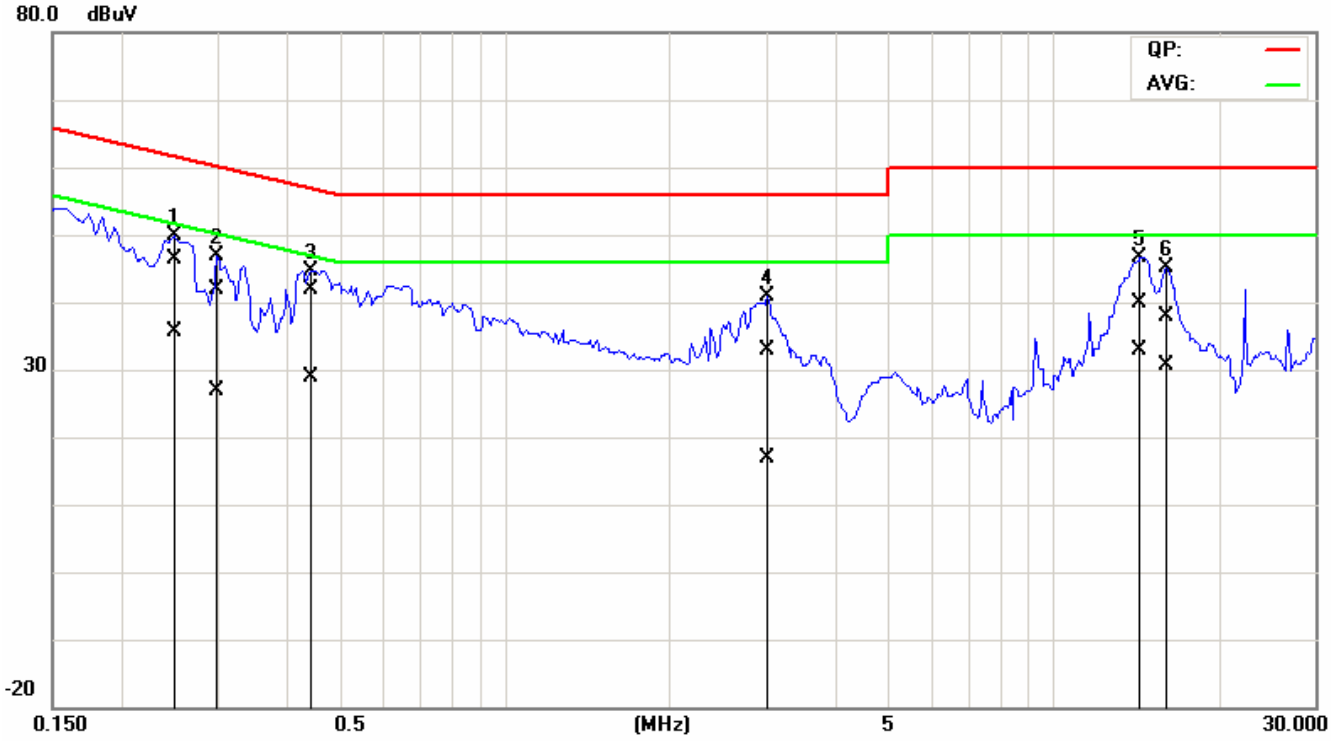
| Freq. (MHz) | QP Reading (dBuV) | AV Reading (dBuV) | Corr. factor (dB) | QP Result (dBuV) | AV Result (dBuV) | QP Limit (dBuV) | AV Limit (dBuV) | QP Margin (dB) | AV Margin (dB) | Note |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.2500 | 46.22 | 35.52 | 0.08 | 46.30 | 35.60 | 61.76 | 51.76 | -15.46 | -16.16 | L1 |
| 0.3000 | 41.92 | 26.92 | 0.08 | 42.00 | 27.00 | 60.24 | 50.24 | -18.24 | -23.24 | L1 |
| 0.4450 | 41.93 | 28.73 | 0.07 | 42.00 | 28.80 | 56.97 | 46.97 | -14.97 | -18.17 | L1 |
| 3.0200 | 32.74 | 16.74 | 0.06 | 32.80 | 16.80 | 56.00 | 46.00 | -23.20 | -29.20 | L1 |
| 14.4400 | 39.70 | 32.50 | 0.30 | 40.00 | 32.80 | 60.00 | 50.00 | -20.00 | -17.20 | L1 |
| 16.0550 | 37.56 | 30.26 | 0.34 | 37.90 | 30.60 | 60.00 | 50.00 | -22.10 | -19.40 | L1 |
| | | | | | | | | | | |
| 0.2400 | 36.10 | 27.40 | 0.10 | 36.20 | 27.50 | 62.10 | 52.10 | -25.90 | -24.60 | L2 |
| 0.3500 | 41.51 | 30.11 | 0.09 | 41.60 | 30.20 | 58.96 | 48.96 | -17.36 | -18.76 | L2 |
| 0.4500 | 41.22 | 30.02 | 0.08 | 41.30 | 30.10 | 56.88 | 46.88 | -15.58 | -16.78 | L2 |
| 2.7200 | 40.52 | 35.62 | 0.08 | 40.60 | 35.70 | 56.00 | 46.00 | -15.40 | -10.30 | L2 |
| 4.1100 | 38.31 | 34.71 | 0.09 | 38.40 | 34.80 | 56.00 | 46.00 | -17.60 | -11.20 | L2 |
| 14.0100 | 30.60 | 25.10 | 0.20 | 30.80 | 25.30 | 60.00 | 50.00 | -29.20 | -24.70 | L2 |

***Remark:***

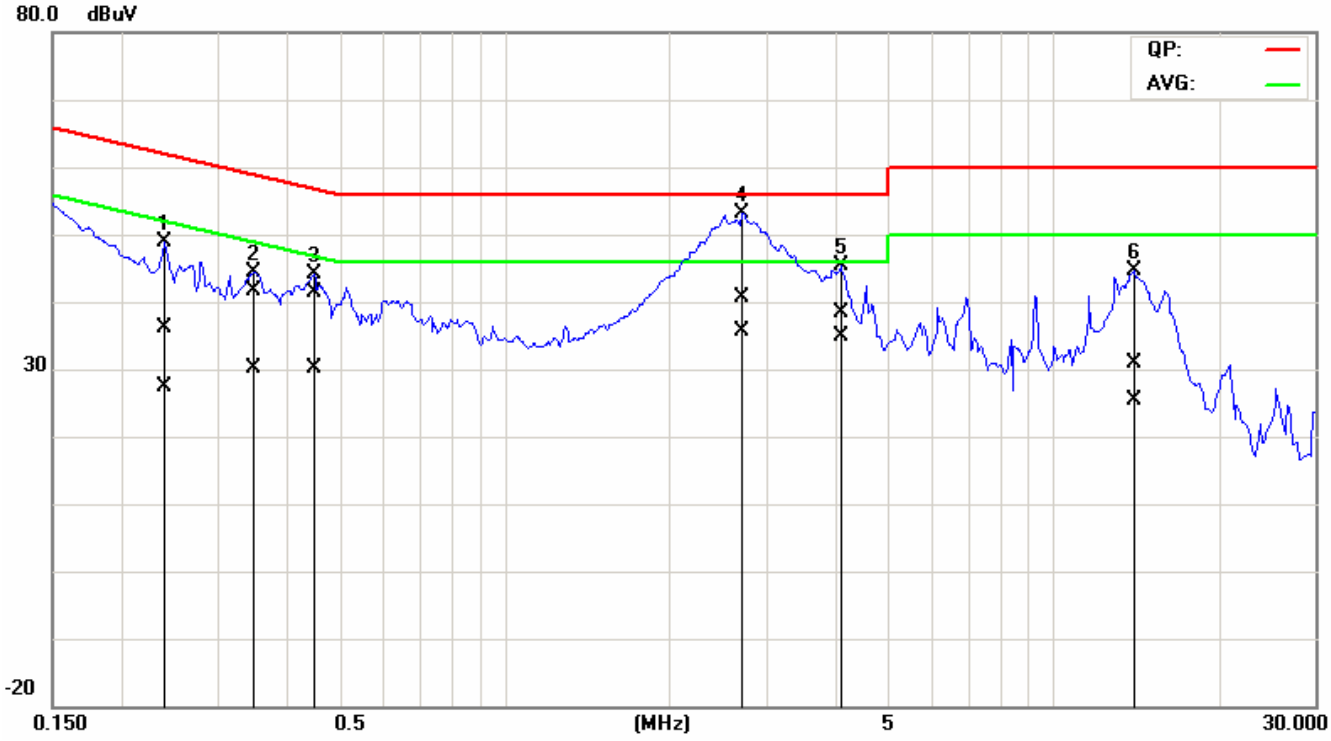
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-peak detector and average detector.*
3. *The IF bandwidth of SPA between 0.15MHz to 30MHz was 10kHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9kHz;*
4. *L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)*

## Test Plots

### *Conducted emissions (Line 1)*




### *Conducted emissions (Line 2)*

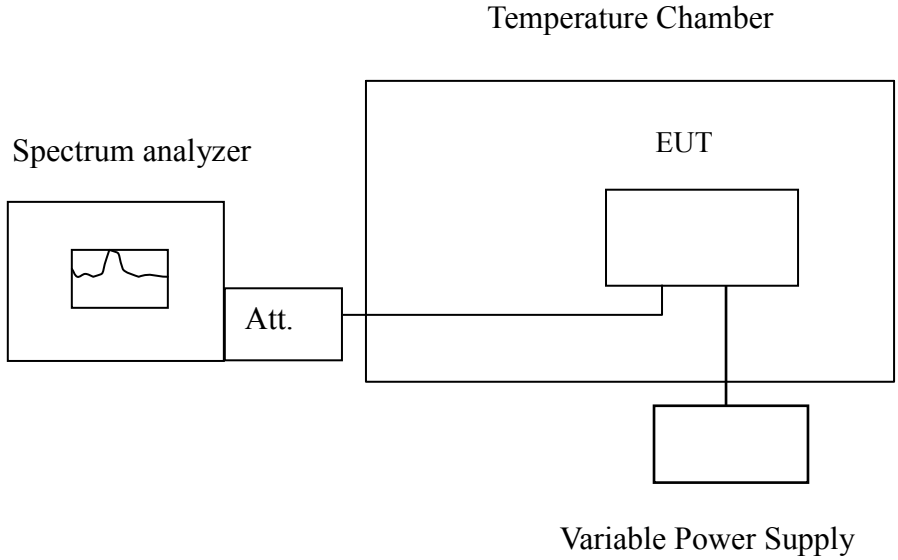


## 7.9 FREQUENCY STABILITY

## LIMIT

According to §15.407(g), manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

**Test Configuration**




***Remark:*** *Measurement setup for testing on Antenna connector*

## TEST PROCEDURE

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT 20°C operating frequency as reference frequency. Turn EUT off and set the chamber temperature to –20°C. After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of +50°C reached.

## TEST RESULTS

*No non-compliance noted.*

**IEEE 802.11a mode / 5180 ~ 5240 MHz:**

**CH Low**

| Operating Frequency: 5180 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5179.975875 | 5150~5250 | Pass |
| 40 | 110 | 5179.998644 | 5150~5250 | Pass |
| 30 | 110 | 5179.979915 | 5150~5250 | Pass |
| 20 | 110 | 5180.012962 | 5150~5250 | Pass |
| 10 | 110 | 5179.978052 | 5150~5250 | Pass |
| 0 | 110 | 5179.977908 | 5150~5250 | Pass |
| -10 | 110 | 5179.976475 | 5150~5250 | Pass |
| -20 | 110 | 5179.976402 | 5150~5250 | Pass |

| Operating Frequency: 5180 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5180.014568 | 5150~5250 | Pass |
| | 110 | 5180.992546 | 5150~5250 | Pass |
| | 121 | 5180.012541 | 5150~5250 | Pass |

## CH High

| Operating Frequency: 5240 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5240.01783 | 5150~5250 | Pass |
| 40 | 110 | 5240.003515 | 5150~5250 | Pass |
| 30 | 110 | 5239.975228 | 5150~5250 | Pass |
| 20 | 110 | 5239.971916 | 5150~5250 | Pass |
| 10 | 110 | 5239.982783 | 5150~5250 | Pass |
| 0 | 110 | 5240.01198 | 5150~5250 | Pass |
| -10 | 110 | 5239.982295 | 5150~5250 | Pass |
| -20 | 110 | 5240.018034 | 5150~5250 | Pass |

| Operating Frequency: 5240 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5239.970927 | 5150~5250 | Pass |
| | 110 | 5240.010849 | 5150~5250 | Pass |
| | 121 | 5239.993418 | 5150~5250 | Pass |

**draft 802.11n Standard-20 MHz Channel mode / 5180 ~ 5240 MHz:**

**CH Low**

| Operating Frequency: 5180 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5179.987343 | 5150~5250 | Pass |
| 40 | 110 | 5180.009917 | 5150~5250 | Pass |
| 30 | 110 | 5180.016139 | 5150~5250 | Pass |
| 20 | 110 | 5179.970030 | 5150~5250 | Pass |
| 10 | 110 | 5179.971913 | 5150~5250 | Pass |
| 0 | 110 | 5180.005286 | 5150~5250 | Pass |
| -10 | 110 | 5179.980006 | 5150~5250 | Pass |
| -20 | 110 | 5179.975572 | 5150~5250 | Pass |

| Operating Frequency: 5180 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5179.98622 | 5150~5250 | Pass |
| | 110 | 5180.001988 | 5150~5250 | Pass |
| | 121 | 5180.020881 | 5150~5250 | Pass |

## CH High

| Operating Frequency: 5240 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5239.981357 | 5150~5250 | Pass |
| 40 | 110 | 5239.988391 | 5150~5250 | Pass |
| 30 | 110 | 5240.01178 | 5150~5250 | Pass |
| 20 | 110 | 5239.99979 | 5150~5250 | Pass |
| 10 | 110 | 5240.015184 | 5150~5250 | Pass |
| 0 | 110 | 5239.980359 | 5150~5250 | Pass |
| -10 | 110 | 5239.972683 | 5150~5250 | Pass |
| -20 | 110 | 5239.972669 | 5150~5250 | Pass |

| Operating Frequency: 5240 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5239.985442 | 5150~5250 | Pass |
| | 110 | 5240.013046 | 5150~5250 | Pass |
| | 121 | 5239.989045 | 5150~5250 | Pass |

**draft 802.11n Wide-40 MHz Channel mode / 5190 ~ 5230 MHz:**

**CH Low**

| Operating Frequency: 5190 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5190.007532 | 5150~5250 | Pass |
| 40 | 110 | 5189.993879 | 5150~5250 | Pass |
| 30 | 110 | 5189.996338 | 5150~5250 | Pass |
| 20 | 110 | 5189.978665 | 5150~5250 | Pass |
| 10 | 110 | 5190.014444 | 5150~5250 | Pass |
| 0 | 110 | 5189.999037 | 5150~5250 | Pass |
| -10 | 110 | 5190.00754 | 5150~5250 | Pass |
| -20 | 110 | 5190.040021 | 5150~5250 | Pass |

| Operating Frequency: 5190 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5189.981156 | 5150~5250 | Pass |
| | 110 | 5189.977959 | 5150~5250 | Pass |
| | 121 | 5190.014796 | 5150~5250 | Pass |

## CH High

| Operating Frequency: 5230 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5230.010821 | 5150~5250 | Pass |
| 40 | 110 | 5230.018353 | 5150~5250 | Pass |
| 30 | 110 | 5229.978671 | 5150~5250 | Pass |
| 20 | 110 | 5229.987683 | 5150~5250 | Pass |
| 10 | 110 | 5229.993339 | 5150~5250 | Pass |
| 0 | 110 | 5229.995798 | 5150~5250 | Pass |
| -10 | 110 | 5229.972939 | 5150~5250 | Pass |
| -20 | 110 | 5230.005714 | 5150~5250 | Pass |

| Operating Frequency: 5230 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5230.011257 | 5150~5250 | Pass |
| | 110 | 5230.0186 | 5150~5250 | Pass |
| | 121 | 5229.996678 | 5150~5250 | Pass |

**IEEE 802.11a mode / 5260 ~ 5320 MHz:**

**CH Low**

| Operating Frequency: 5260 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5319.983693 | 5250~5350 | Pass |
| 40 | 110 | 5319.972788 | 5250~5350 | Pass |
| 30 | 110 | 5319.975018 | 5250~5350 | Pass |
| 20 | 110 | 5320.003647 | 5250~5350 | Pass |
| 10 | 110 | 5319.997425 | 5250~5350 | Pass |
| 0 | 110 | 5319.986038 | 5250~5350 | Pass |
| -10 | 110 | 5320.004851 | 5250~5350 | Pass |
| -20 | 110 | 5320.021159 | 5250~5350 | Pass |

| Operating Frequency: 5260 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5319.970284 | 5250~5350 | Pass |
| | 110 | 5319.973723 | 5250~5350 | Pass |
| | 121 | 5319.983908 | 5250~5350 | Pass |

## CH High

| Operating Frequency: 5320 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5259.996324 | 5250~5350 | Pass |
| 40 | 110 | 5259.993671 | 5250~5350 | Pass |
| 30 | 110 | 5259.998248 | 5250~5350 | Pass |
| 20 | 110 | 5260.017187 | 5250~5350 | Pass |
| 10 | 110 | 5259.973008 | 5250~5350 | Pass |
| 0 | 110 | 5260.009234 | 5250~5350 | Pass |
| -10 | 110 | 5259.988082 | 5250~5350 | Pass |
| -20 | 110 | 5259.983203 | 5250~5350 | Pass |

| Operating Frequency: 5320 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5260.02003 | 5250~5350 | Pass |
| | 110 | 5259.990493 | 5250~5350 | Pass |
| | 121 | 5259.996358 | 5250~5350 | Pass |

**draft 802.11n Standard-20 MHz Channel mode / 5260 ~ 5320 MHz:**

**CH Low**

| Operating Frequency: 5260 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5260.007791 | 5250~5350 | Pass |
| 40 | 110 | 5259.99925 | 5250~5350 | Pass |
| 30 | 110 | 5260.008902 | 5250~5350 | Pass |
| 20 | 110 | 5259.994455 | 5250~5350 | Pass |
| 10 | 110 | 5260.002366 | 5250~5350 | Pass |
| 0 | 110 | 5259.98981 | 5250~5350 | Pass |
| -10 | 110 | 5259.973893 | 5250~5350 | Pass |
| -20 | 110 | 5259.983203 | 5250~5350 | Pass |

| Operating Frequency: 5260 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5259.981283 | 5250~5350 | Pass |
| | 110 | 5260.018517 | 5250~5350 | Pass |
| | 121 | 5260.0206 | 5250~5350 | Pass |

## CH High

| Operating Frequency: 5320 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5319.988721 | 5250~5350 | Pass |
| 40 | 110 | 5319.985775 | 5250~5350 | Pass |
| 30 | 110 | 5319.97212 | 5250~5350 | Pass |
| 20 | 110 | 5319.9965 | 5250~5350 | Pass |
| 10 | 110 | 5319.983262 | 5250~5350 | Pass |
| 0 | 110 | 5319.974482 | 5250~5350 | Pass |
| -10 | 110 | 5319.993597 | 5250~5350 | Pass |
| -20 | 110 | 5320.021159 | 5250~5350 | Pass |

| Operating Frequency: 5320 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5319.991957 | 5250~5350 | Pass |
| | 110 | 5319.997831 | 5250~5350 | Pass |
| | 121 | 5320.00406 | 5250~5350 | Pass |

**draft 802.11n Wide-40 MHz Channel mode / 5270 ~ 5310 MHz:**

**CH Low**

| Operating Frequency: 5270 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5270.002433 | 5250~5350 | Pass |
| 40 | 110 | 5270.010073 | 5250~5350 | Pass |
| 30 | 110 | 5270.014416 | 5250~5350 | Pass |
| 20 | 110 | 5269.985032 | 5250~5350 | Pass |
| 10 | 110 | 5269.975556 | 5250~5350 | Pass |
| 0 | 110 | 5269.971269 | 5250~5350 | Pass |
| -10 | 110 | 5270.006109 | 5250~5350 | Pass |
| -20 | 110 | 5270.003432 | 5250~5350 | Pass |

| Operating Frequency: 5270 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5269.98435 | 5250~5350 | Pass |
| | 110 | 5269.997547 | 5250~5350 | Pass |
| | 121 | 5270.015547 | 5250~5350 | Pass |

## CH High

| Operating Frequency: 5310 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5310.004656 | 5250~5350 | Pass |
| 40 | 110 | 5310.00501 | 5250~5350 | Pass |
| 30 | 110 | 5310.016531 | 5250~5350 | Pass |
| 20 | 110 | 5309.996415 | 5250~5350 | Pass |
| 10 | 110 | 5310.020282 | 5250~5350 | Pass |
| 0 | 110 | 5310.014675 | 5250~5350 | Pass |
| -10 | 110 | 5309.976998 | 5250~5350 | Pass |
| -20 | 110 | 5310.012673 | 5250~5350 | Pass |

| Operating Frequency: 5310 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5309.983184 | 5250~5350 | Pass |
| | 110 | 5309.978225 | 5250~5350 | Pass |
| | 121 | 5309.97571 | 5250~5350 | Pass |

**IEEE 802.11a mode / 5500 ~ 5700 MHz:**

**CH Low**

| Operating Frequency: 5500 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5499.980445 | 5470~5725 | Pass |
| 40 | 110 | 5500.000654 | 5470~5725 | Pass |
| 30 | 110 | 5499.977697 | 5470~5725 | Pass |
| 20 | 110 | 5499.998892 | 5470~5725 | Pass |
| 10 | 110 | 5500.011572 | 5470~5725 | Pass |
| 0 | 110 | 5499.999836 | 5470~5725 | Pass |
| -10 | 110 | 5500.004253 | 5470~5725 | Pass |
| -20 | 110 | 5499.980256 | 5470~5725 | Pass |

| Operating Frequency: 5500 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5500.015647 | 5470~5725 | Pass |
| | 110 | 5499.990669 | 5470~5725 | Pass |
| | 121 | 5499.993054 | 5470~5725 | Pass |

## CH High

| Operating Frequency: 5700 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5699.999747 | 5470~5725 | Pass |
| 40 | 110 | 5699.996596 | 5470~5725 | Pass |
| 30 | 110 | 5700.005053 | 5470~5725 | Pass |
| 20 | 110 | 5699.987183 | 5470~5725 | Pass |
| 10 | 110 | 5699.981218 | 5470~5725 | Pass |
| 0 | 110 | 5699.993848 | 5470~5725 | Pass |
| -10 | 110 | 5700.001877 | 5470~5725 | Pass |
| -20 | 110 | 5700.006082 | 5470~5725 | Pass |

| Operating Frequency: 5700 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5699.970578 | 5470~5725 | Pass |
| | 110 | 5700.005187 | 5470~5725 | Pass |
| | 121 | 5700.013111 | 5470~5725 | Pass |

**draft 802.11n Standard-20 MHz Channel mode / 5500 ~ 5700 MHz:**

**CH Low**

| Operating Frequency: 5500 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5500.017116 | 5470~5725 | Pass |
| 40 | 110 | 5500.004002 | 5470~5725 | Pass |
| 30 | 110 | 5500.016687 | 5470~5725 | Pass |
| 20 | 110 | 5499.996755 | 5470~5725 | Pass |
| 10 | 110 | 5499.990142 | 5470~5725 | Pass |
| 0 | 110 | 5500.01764 | 5470~5725 | Pass |
| -10 | 110 | 5499.978811 | 5470~5725 | Pass |
| -20 | 110 | 5499.972116 | 5470~5725 | Pass |

| Operating Frequency: 5500 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5499.99859 | 5470~5725 | Pass |
| | 110 | 5500.014809 | 5470~5725 | Pass |
| | 121 | 5500.018813 | 5470~5725 | Pass |

## CH High

| Operating Frequency: 5700 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5700.018739 | 5470~5725 | Pass |
| 40 | 110 | 5700.011001 | 5470~5725 | Pass |
| 30 | 110 | 5700.001431 | 5470~5725 | Pass |
| 20 | 110 | 5700.008957 | 5470~5725 | Pass |
| 10 | 110 | 5699.970189 | 5470~5725 | Pass |
| 0 | 110 | 5700.003111 | 5470~5725 | Pass |
| -10 | 110 | 5699.990515 | 5470~5725 | Pass |
| -20 | 110 | 5700.010583 | 5470~5725 | Pass |

| Operating Frequency: 5700 MHz, | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5699.998679 | 5470~5725 | Pass |
| | 110 | 5700.01005 | 5470~5725 | Pass |
| | 121 | 5699.998442 | 5470~5725 | Pass |

**draft 802.11n Wide-40 MHz Channel mode / 5510 ~ 5670 MHz:**

**CH Low**

| Operating Frequency: 5510 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | **Voltage (V)** | **Measured Frequency (MHz)** | **Limit Range** | **Test Result** |
| 50 | 110 | 5510.004645 | 5470~5725 | Pass |
| 40 | 110 | 5509.995129 | 5470~5725 | Pass |
| 30 | 110 | 5509.979244 | 5470~5725 | Pass |
| 20 | 110 | 5509.99253 | 5470~5725 | Pass |
| 10 | 110 | 5510.009729 | 5470~5725 | Pass |
| 0 | 110 | 5510.010642 | 5470~5725 | Pass |
| -10 | 110 | 5509.998802 | 5470~5725 | Pass |
| -20 | 110 | 5509.99564 | 5470~5725 | Pass |

| Operating Frequency: 5510 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | **Voltage (V)** | **Measured Frequency (MHz)** | **Limit Range** | **Test Result** |
| 20 | 99 | 5509.98777 | 5470~5725 | Pass |
| | 110 | 5510.006905 | 5470~5725 | Pass |
| | 121 | 5509.970039 | 5470~5725 | Pass |

## CH High

| Operating Frequency: 5670 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 50 | 110 | 5670.01359 | 5470~5725 | Pass |
| 40 | 110 | 5669.978388 | 5470~5725 | Pass |
| 30 | 110 | 5669.995117 | 5470~5725 | Pass |
| 20 | 110 | 5670.016717 | 5470~5725 | Pass |
| 10 | 110 | 5669.985822 | 5470~5725 | Pass |
| 0 | 110 | 5669.973827 | 5470~5725 | Pass |
| -10 | 110 | 5669.984424 | 5470~5725 | Pass |
| -20 | 110 | 5670.009767 | 5470~5725 | Pass |

| Operating Frequency: 5670 MHz | | | | |
|---|---|---|---|---|
| Environment Temperature (°C) | Voltage (V) | Measured Frequency (MHz) | Limit Range | Test Result |
| 20 | 99 | 5670.002578 | 5470~5725 | Pass |
| | 110 | 5670.006361 | 5470~5725 | Pass |
| | 121 | 5669.982082 | 5470~5725 | Pass |

## 7.10 DYNAMIC FREQUENCY SELECTION

## LIMIT

According to §15.407 (h) and FCC 06-96 appendix "compliance measurement procedures for unlicensed-national information infrastructure devices operating in the 5250-5350 MHz and 5470-5725 MHz bands incorporating dynamic frequency selection".

**Table 1: Applicability of DFS requirements prior to use of a channel**

| Requirement | Operational Mode | | |
|---|---|---|---|
| | Master | Client (without radar detection) | Client(with radar detection) |
| Non-Occupancy Period | Yes | Yes | Yes |
| DFS Detection Threshold | Yes | Not required | Yes |
| Channel Availability Check Time | Yes | Not required | Not required |
| Uniform Spreading | Yes | Not required | Not required |

**Table 2: Applicability of DFS requirements during normal operation**

| Requirement | Operational Mode | | |
|---|---|---|---|
| | Master | Client (without radar detection) | Client(with radar detection) |
| DFS Detection Threshold | Yes | Not required | Yes |
| Channel Closing Transmission Time | Yes | Yes | Yes |
| Channel Move Time | Yes | Yes | Yes |

**Table 3: Interference Threshold values, Master or Client incorporating In-Service**

| Maximum Transmit Power | Value (see note) |
|---|---|
| >=200 Milliwatt | -64 dBm |
| < 200 Milliwatt | -62 dBm |

Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna.
Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.

**Table 4: DFS Response requirement values**

| Parameter | Value |
|---|---|
| Non-occupancy period | 30 minutes |
| Channel Availability Check Time | 60 seconds |
| Channel Move Time | 10 seconds |
| Channel Closing Transmission Time | 200 milliseconds + approx. 60 milliseconds over remaining 10 second period |

The instant that the Channel Move Time and the Channel Closing Transmission Time begins is as follows:

- For the Short pulse radar Test Signals this instant is the end of the Burst.
- For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated.
- For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission.

The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate channel changes (an aggregate of approximately 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.

**Table 5 – Short Pulse Radar Test Waveforms**

| Radar Type | Pulse Width (Microseconds) | PRI (Microseconds) | Pulses | Minimum Percentage of Successful Detection | Minimum Trials |
|---|---|---|---|---|---|
| 1 | 1 | 1428 | 18 | 60% | 30 |
| 2 | 1-5 | 150-230 | 23-29 | 60% | 30 |
| 3 | 6-10 | 200-500 | 16-18 | 60% | 30 |
| 4 | 11-20 | 200-500 | 12-16 | 60% | 30 |
| Aggregate (Radar Types 1-4) | | | | 80% | 120 |

**Table 6 – Long Pulse Radar Test Signal**

| Radar Waveform | Bursts | Pulses per Burst | Pulse Width (µsec) | Chirp Width (µsec) | PRI (µsec) | Minimum Percentage of Successful Detection | Minimum Trials |
|---|---|---|---|---|---|---|---|
| 5 | 8-20 | 1-3 | 50-100 | 5-20 | 1000-2000 | 80% | 30 |

**Table 7 – Frequency Hopping Radar Test Signal**

| Radar Waveform | Pulse Width (µsec) | PRI (µsec) | Burst Length (ms) | Pulses Per Hop | Hopping Rate (kHz) | Minimum Percentage of Successful Detection | Minimum Trials |
|---|---|---|---|---|---|---|---|
| 6 | 1 | 333 | 300 | 9 | 0.33 | 70% | 30 |

# DESCRIPTION OF EUT

## Overview Of EUT With Respect To §15.407 (H) Requirements

The EUT operates over the 5250-5350 & 5500-5700 MHz range as a Client Device that does not have radar detection capability.

The antenna assembly utilized with the EUT has a gain of 3.53 dBi.

The highest power level is 18.47 dBm EIRP in the 5500 ~ 5700MHz band.

The EUT uses two transmitter connected to two 50-ohm coaxial antenna ports via a diversity switch. Two antenna port is connected to the test system since the EUT has two antenna.

The Slave device associated with the EUT during these tests does not have radar detection capability.

WLAN traffic is generated by streaming the video file TestFile.mp2 "6 ½ Magic Hours" from the Master to the Slave in full motion video mode using the media player with the V2.61 Codec package.

TPC is not required since the maximum EIRP is less than 500 mW (27 dBm).

The EUT utilizes the 802.11a architecture, with a nominal channel bandwidth of 20 MHz.

The Master Device is a Cisco Aironet 802.11a/b/g Access Point, FCC ID: LDK102056.

The rated output power of the Master unit is < 23dBm (EIRP). Therefore the required interference threshold level is -62 dBm. After correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is –62 + 5 = -57dBm.

The calibrated conducted DFS Detection Threshold level is set to -62 dBm. The tested level is lower than the required level hence it provides margin to the limit.

## Manufacturer's Statement Regarding Uniform Channel Spreading

The end product implements an automatic channel selection feature at startup such that operation commences on channels distributed across the entire set of allowed 5GHz channels. This feature will ensure uniform spreading is achieved while avoiding non-allowed channels due to prior radar events.

# TEST AND MEASUREMENT SYSTEM

## System Overview

The measurement system is based on a conducted test method.

The short pulse and long pulse signal generating system utilizes the NTIA software. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

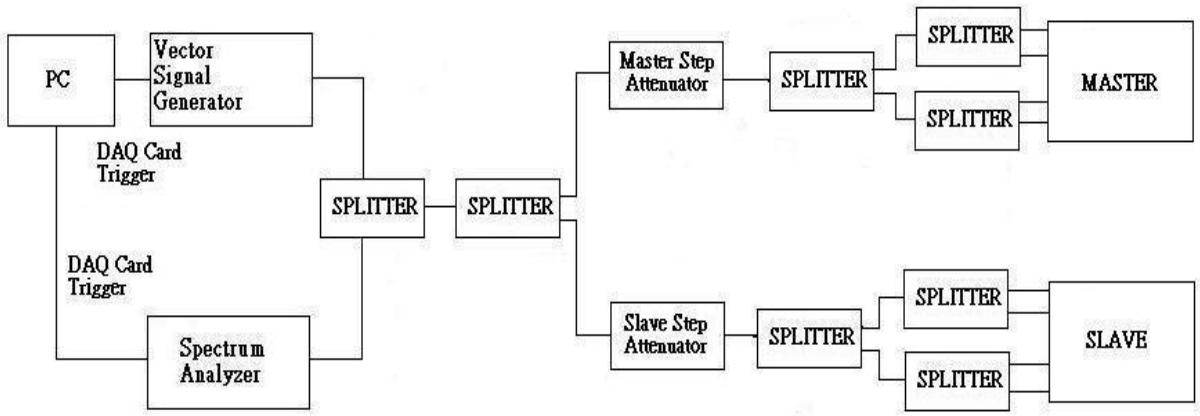
The short pulse types 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Frequency Hopping Radar Waveform Generating Subsystem of FCC 06-96 APPENDIX. The frequency of the signal generator is incremented in 1 MHz steps from FL to FH for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer set to display 8001 bins on the horizontal axis. The time-domain resolution is 2 msec / bin with a 16 second sweep time, meeting the 10 second short pulse reporting criteria. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold. The time-domain resolution is 3 msec / bin with a 24 second sweep time, meeting the 22 second long pulse reporting criteria and allowing a minimum of 10 seconds after the end of the long pulse waveform.

Should multiple RF ports be utilized for the Master and/or Slave devices (for example, for diversity or MIMO implementations), 50 ohm termination would be removed from the splitter so that connection can be established between splitter and the Master and/or Slave devices.

## Conducted Method System Block Diagram



**System Calibration**

Connect the spectrum analyzer to the test system in place of the master device. Set the signal generator to CW mode. Adjust the amplitude of the signal generator to yield a measured level of –62 dBm on the spectrum analyzer.

Without changing any of the instrument settings, reconnect the spectrum analyzer to the Common port of the Spectrum Analyzer Combiner/Divider and connect a 50 ohm load to the Master Device port of the test system.

Measure the amplitude and calculate the difference from –62 dBm. Adjust the Reference Level Offset of the spectrum analyzer to this difference. Confirm that the signal is displayed at –62 dBm. Readjust the RBW and VBW to 3 MHz, set the span to 10 MHz, and confirm that the signal is still displayed at –62 dBm.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –62 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

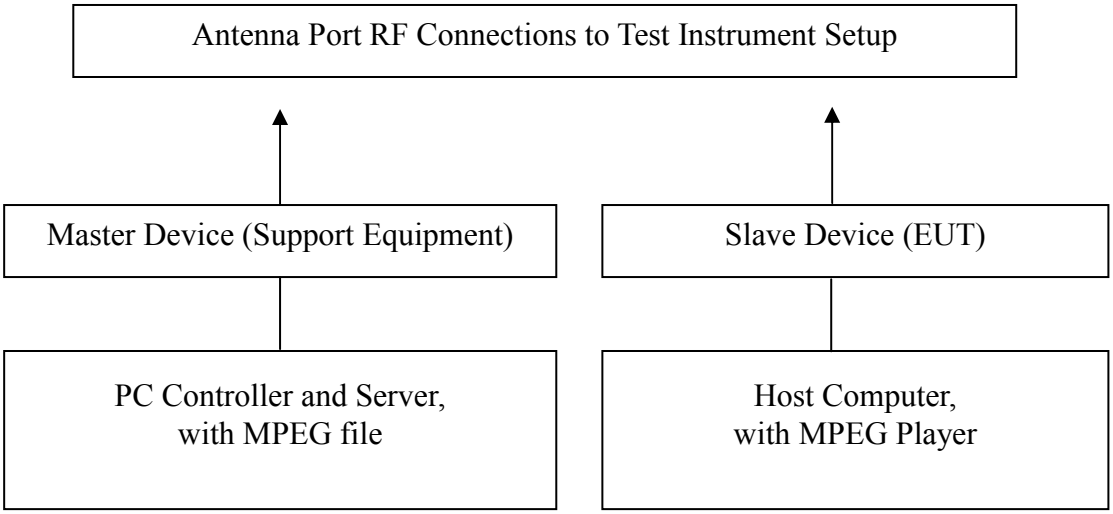
Set the signal generator to produce a radar waveform, trigger a burst manually and measure the level on the spectrum analyzer. Readjust the amplitude of the signal generator as required so that the peak level of the waveform is at a displayed level equal to the required or desired interference detection threshold. Separate signal generator amplitude settings are determined as required for each radar type.

**Adjustment Of Displayed Traffic Level**

Establish a link between the Master and Slave, adjusting the Link Step Attenuator as needed to provide a suitable received level at the Master and Slave devices. Stream the video test file to generate WLAN traffic. Confirm that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold. Confirm that the displayed traffic is from the Master Device. For Master Device testing confirm that the displayed traffic does not include Slave Device traffic. For Slave Device testing confirm that the displayed traffic does not include Master Device traffic.

If a different setting of the Master Step Attenuator is required to meet the above conditions, perform a new System Calibration for the new Master Step Attenuator setting.

**Test Setup**




## TEST RESULTS

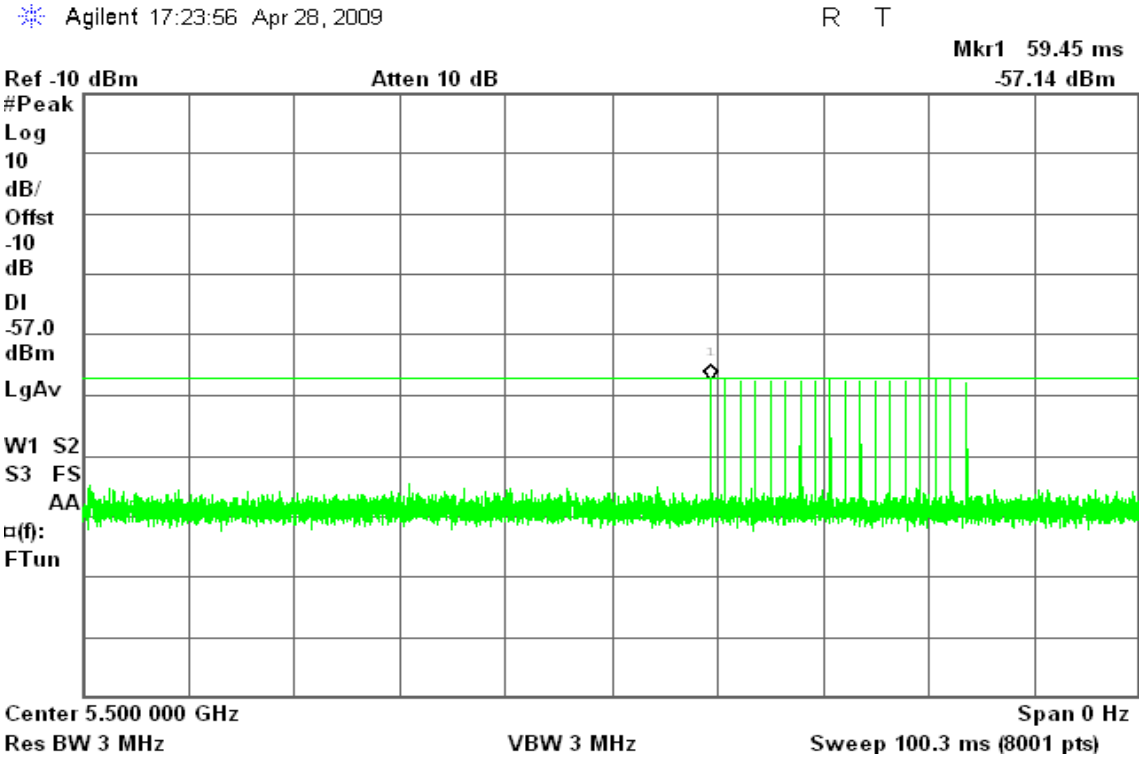
*No non-compliance noted*

## Test Plot

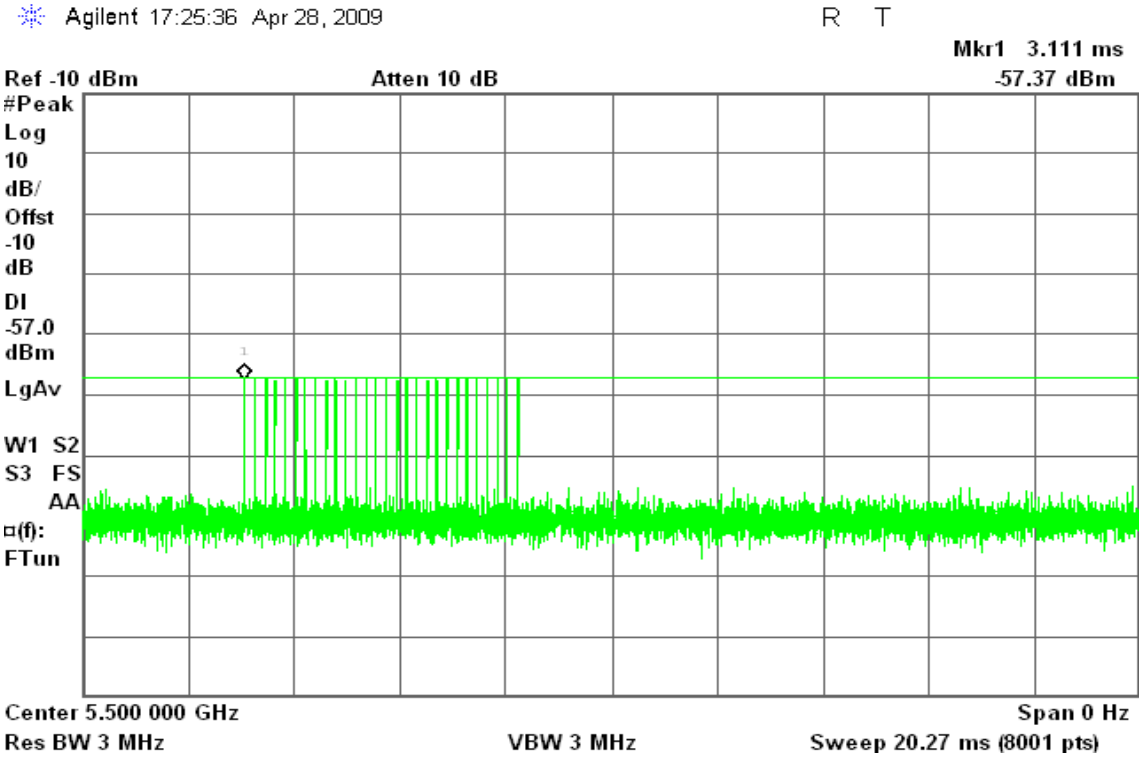
**PLOTS OF RADAR WAVEFORMS**

**draft 802.11n Standard-20 MHz mode**

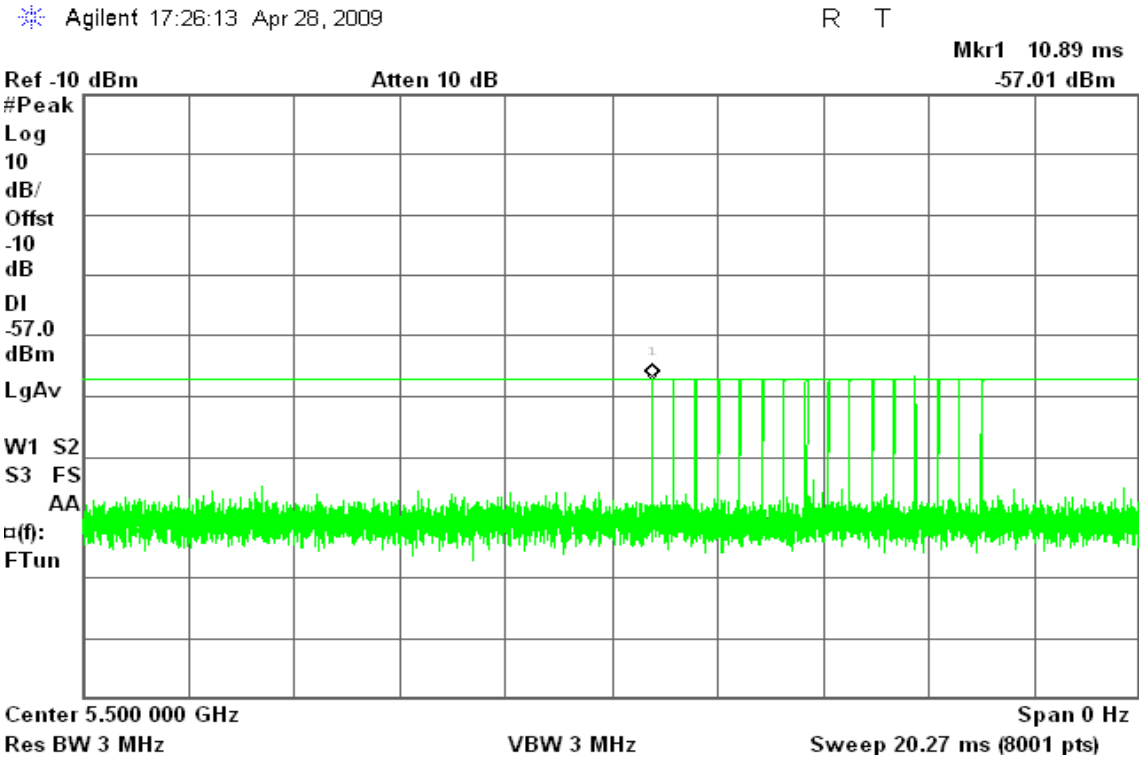
**Sample of Short Pulse Radar Type 1**



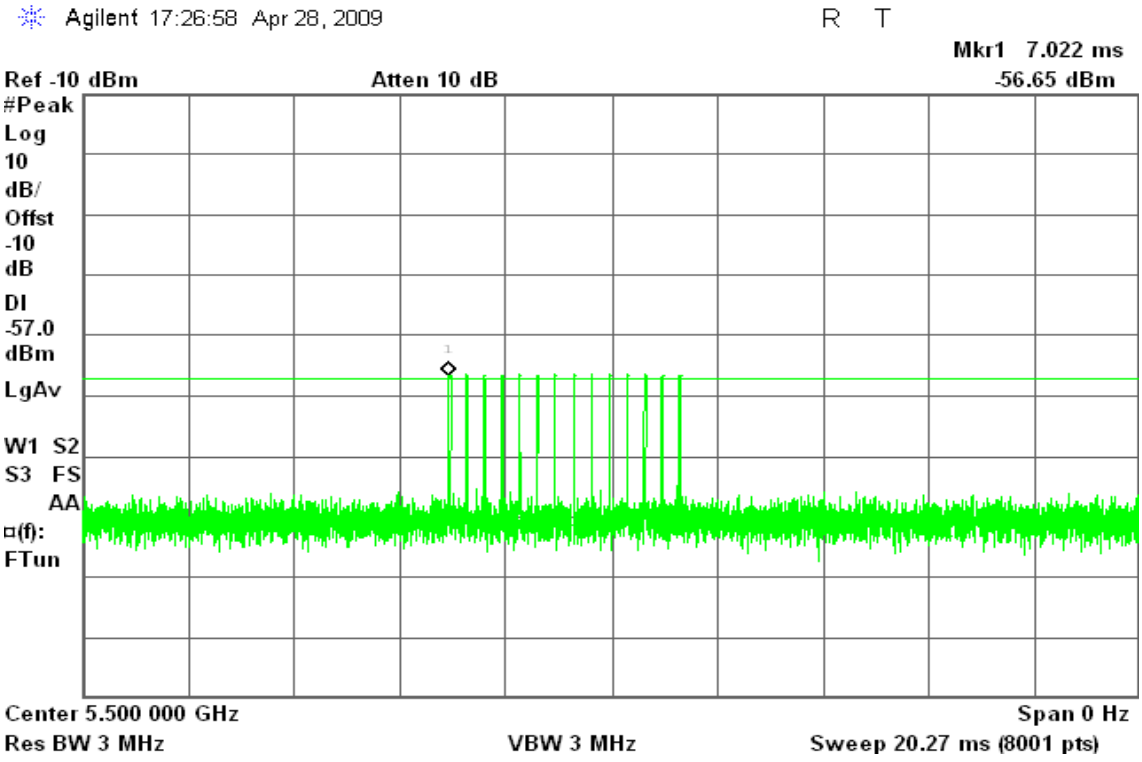

**Sample of Short Pulse Radar Type 2**



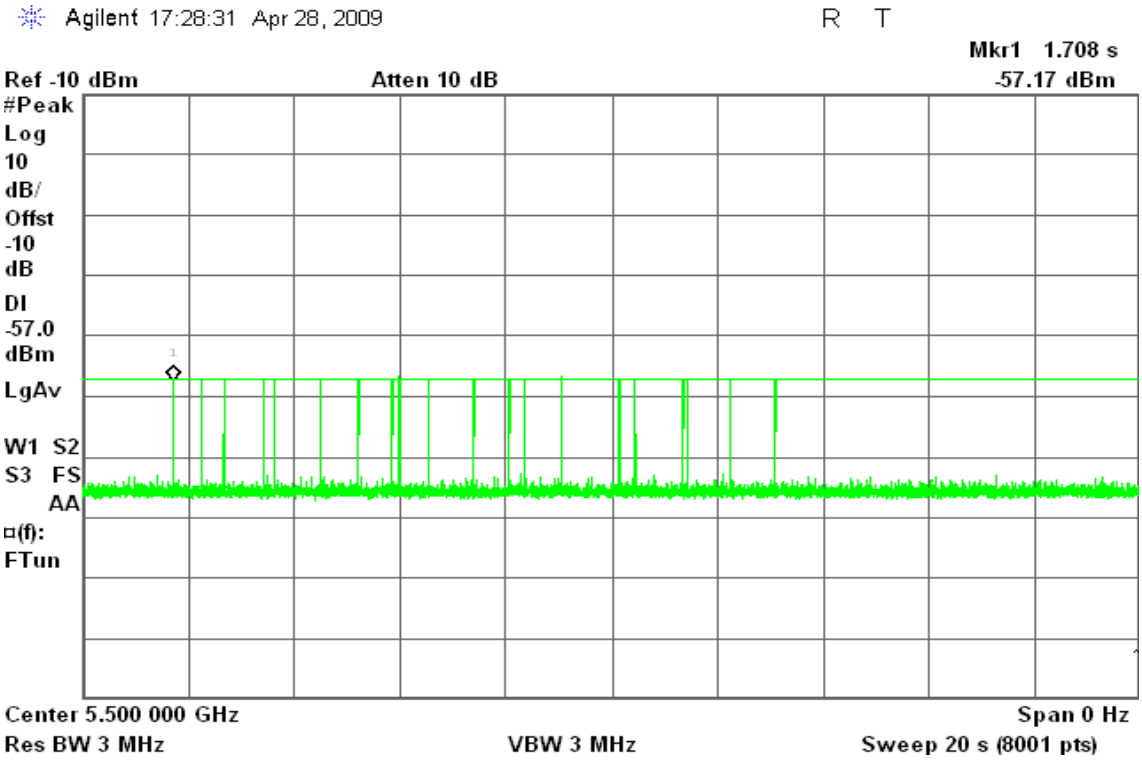
## Sample of Short Pulse Radar Type 3



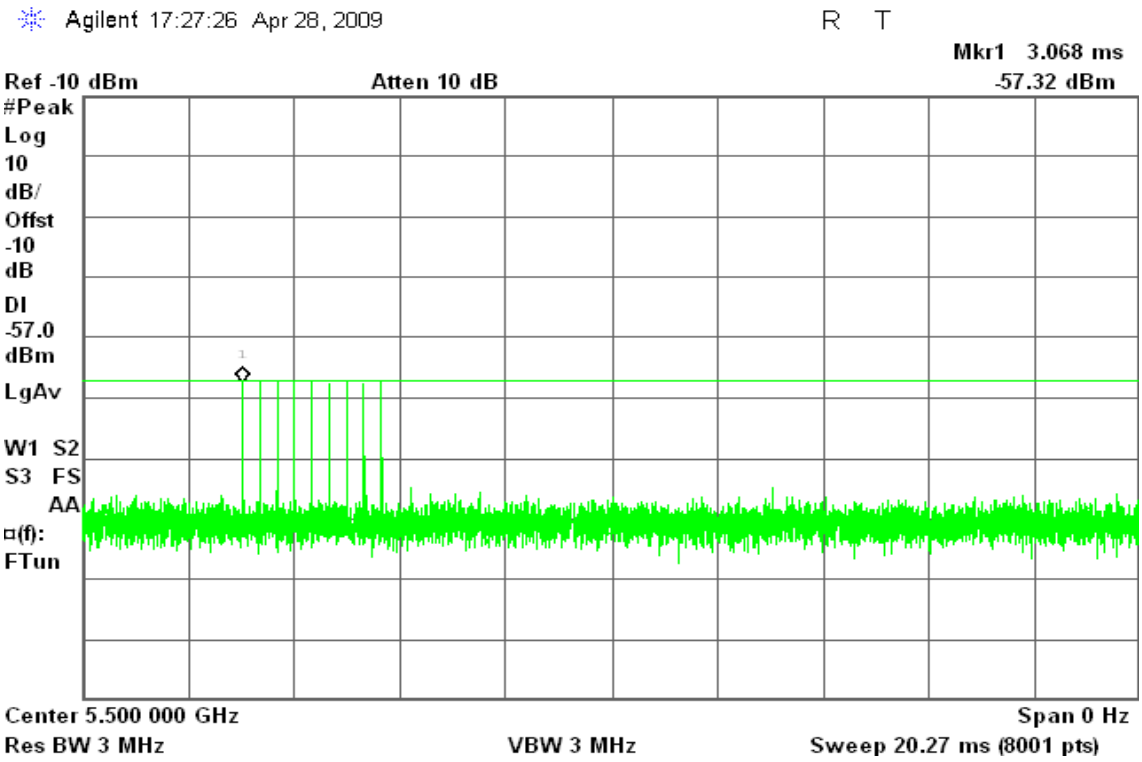

## Sample of Short Pulse Radar Type 4



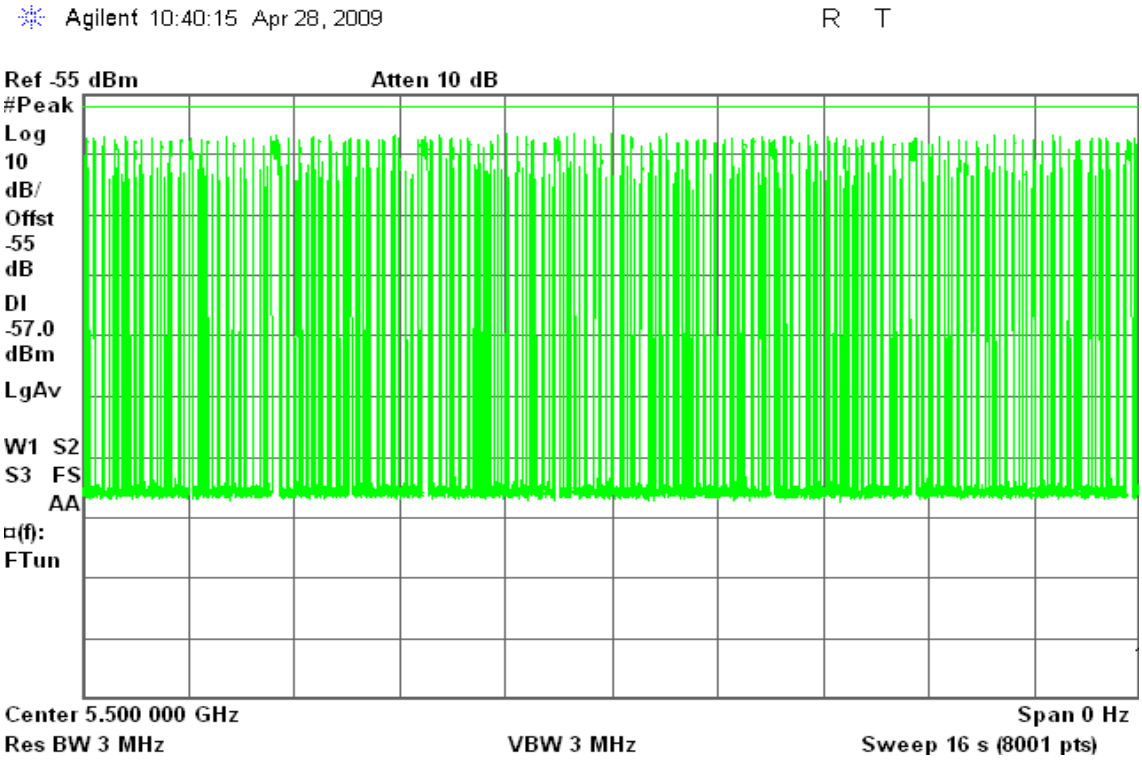
## Sample of Long Pulse Radar Type 5




## Sample of Frequency Hopping Radar Type 6

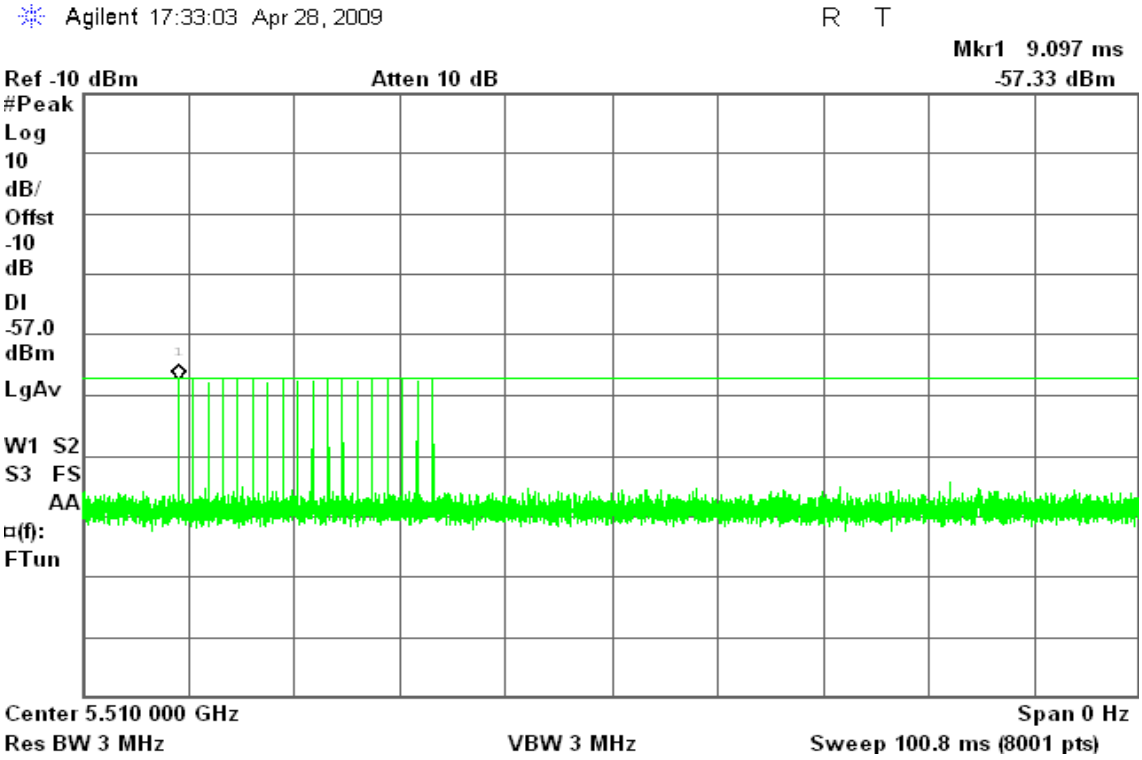


## Plot of WLAN Traffic from Slave

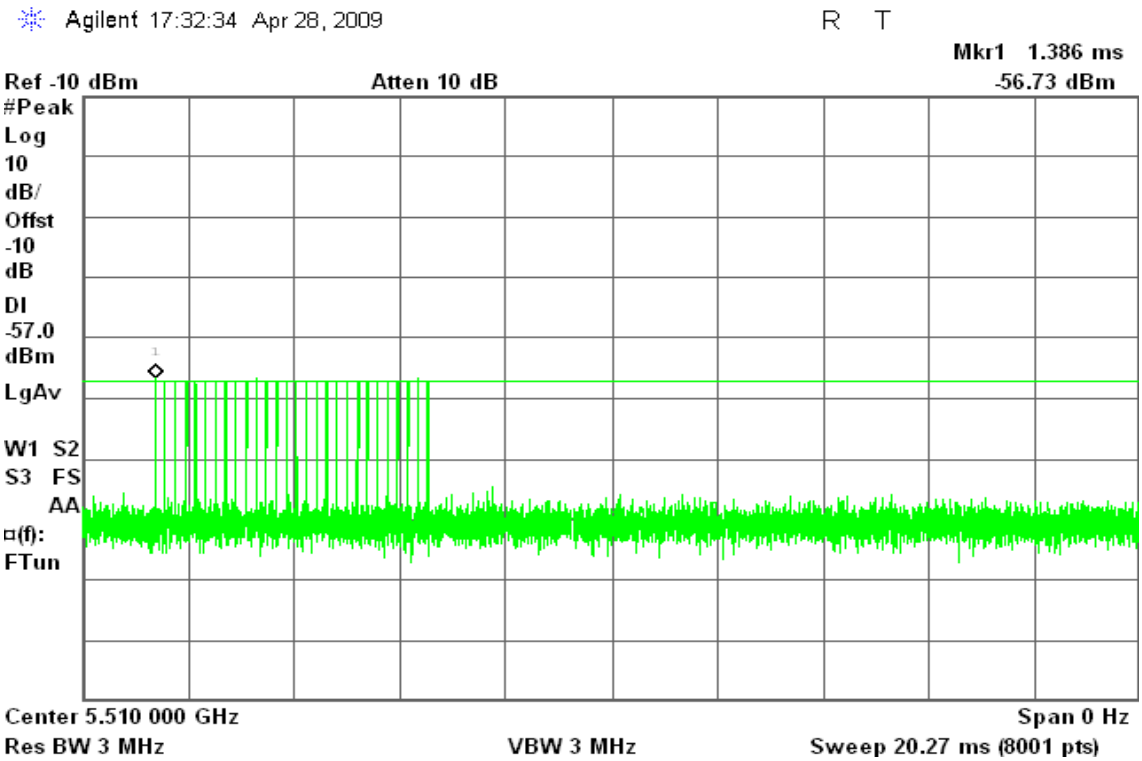


## draft 802.11n Wide-40 MHz mode

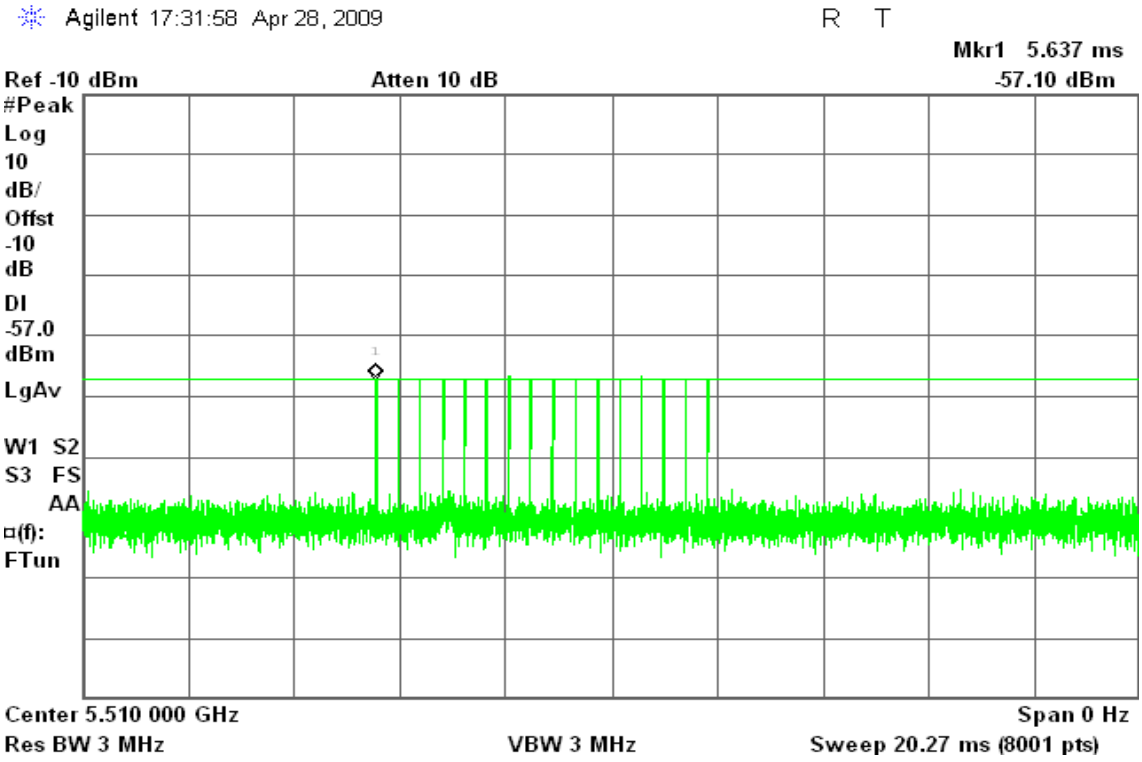
### Sample of Short Pulse Radar Type 1



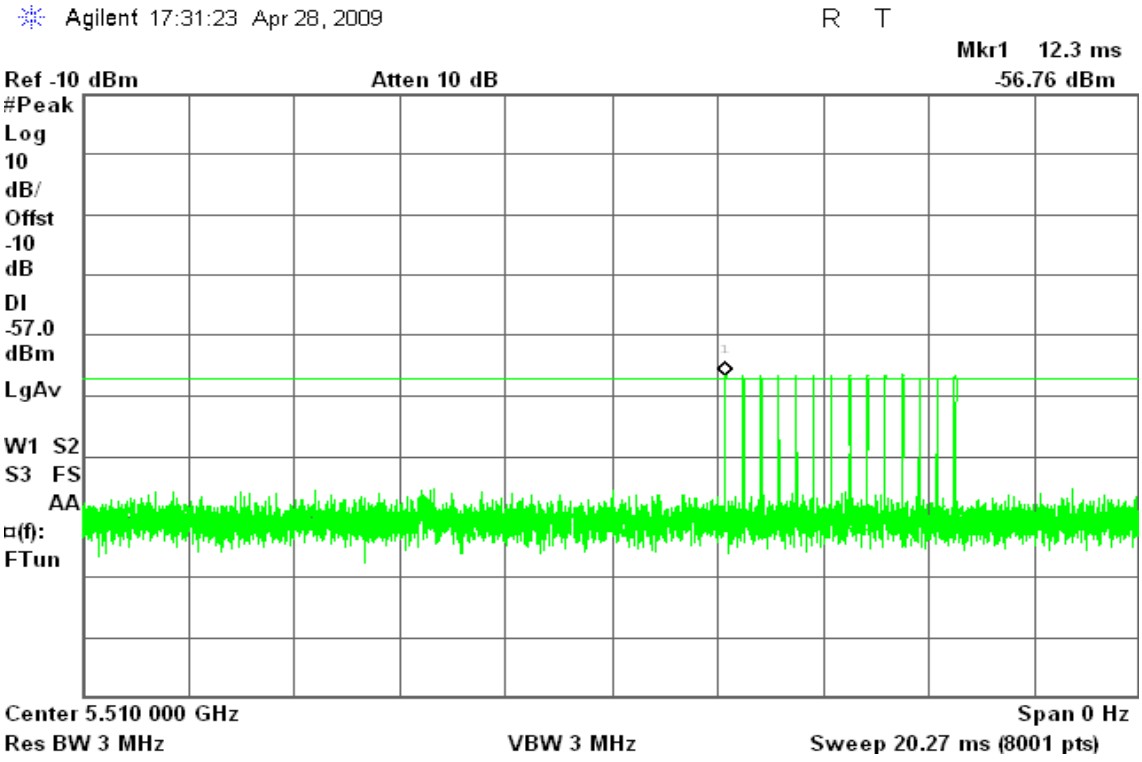

### Sample of Short Pulse Radar Type 2



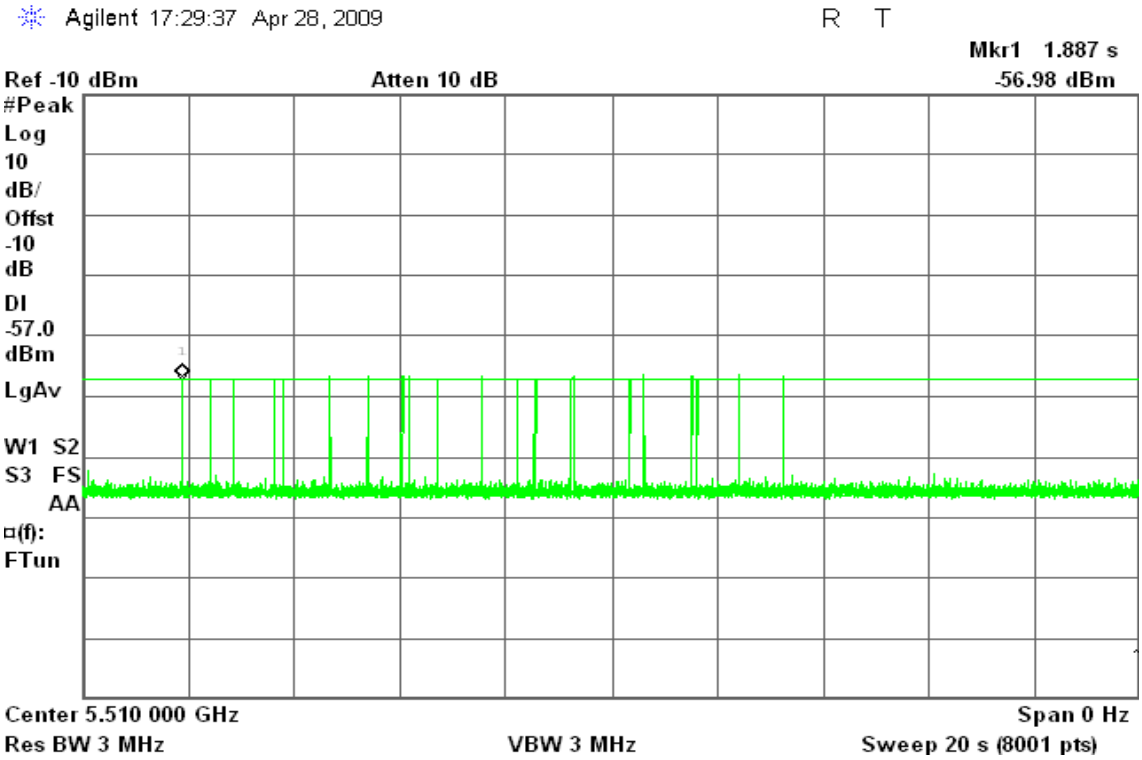
## Sample of Short Pulse Radar Type 3



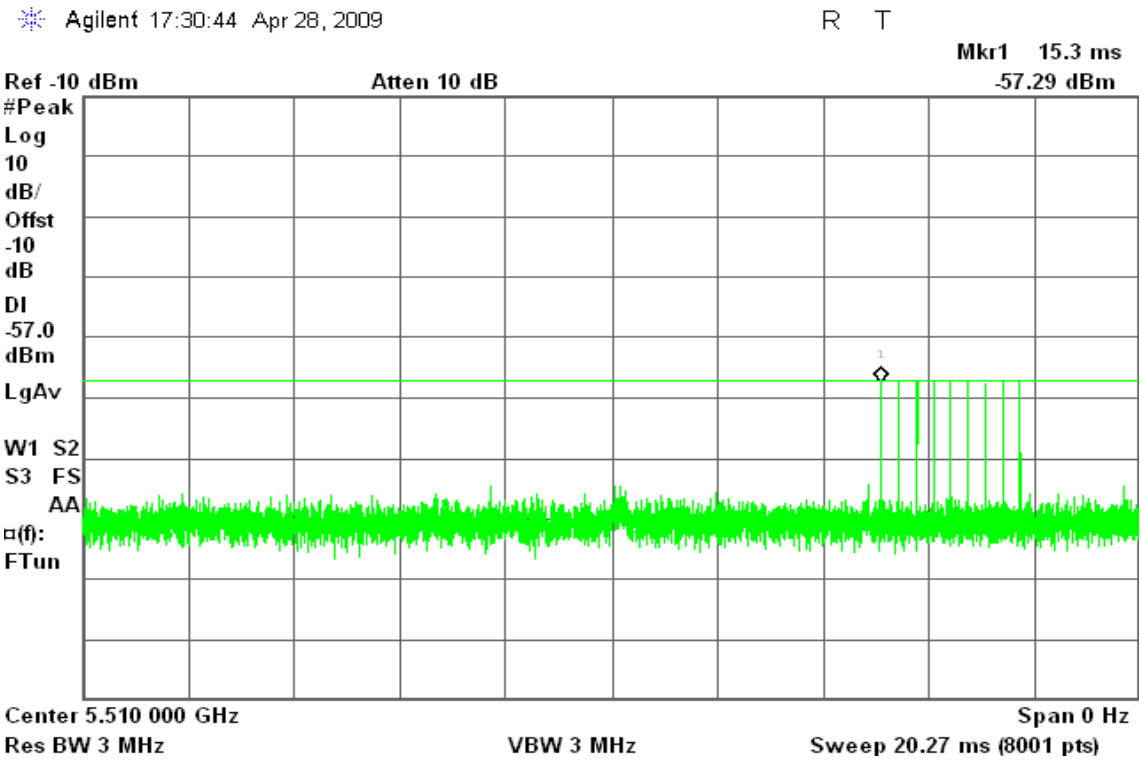

## Sample of Short Pulse Radar Type 4



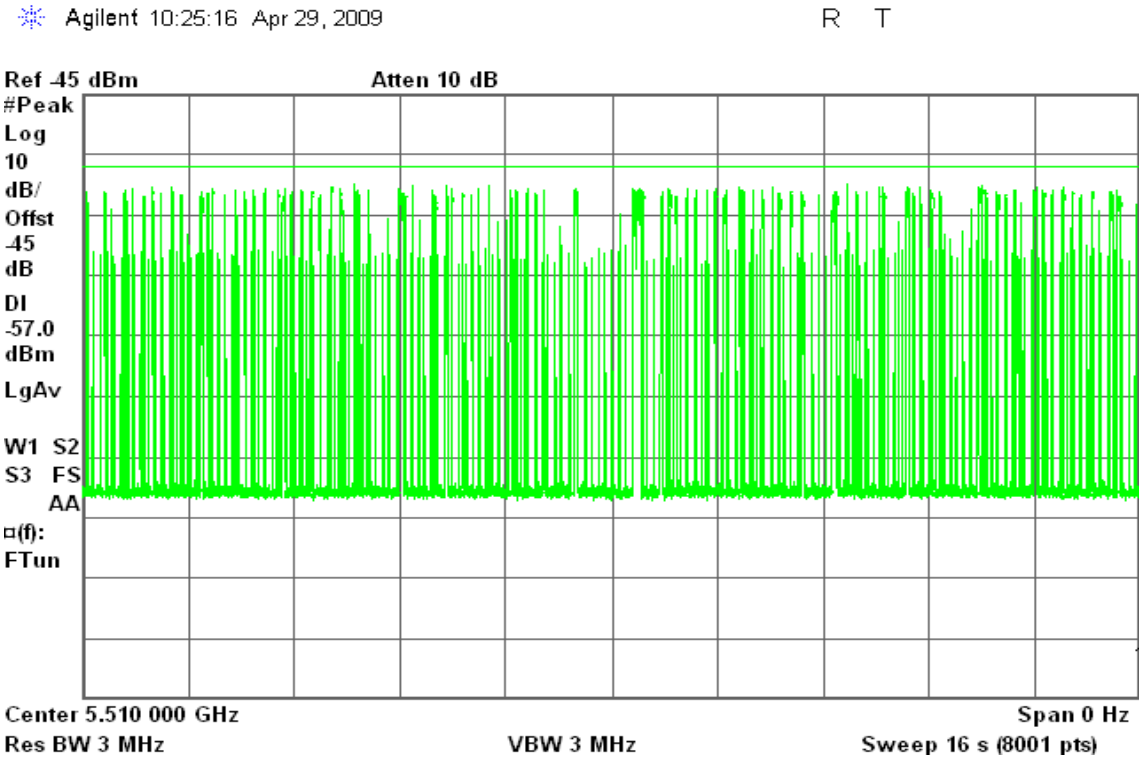
## Sample of Long Pulse Radar Type 5




## Sample of Frequency Hopping Radar Type 6



## Plot of WLAN Traffic from Slave



# TEST CHANNEL AND METHOD

All tests were performed at a channel center frequency of 5500 MHz utilizing a conducted test method.

## CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME

### GENERAL REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =

(Number of analyzer bins showing transmission) * (dwell time per bin)

The observation period over which the aggregate time is calculated

Begins at (Reference Marker + 200 msec) and

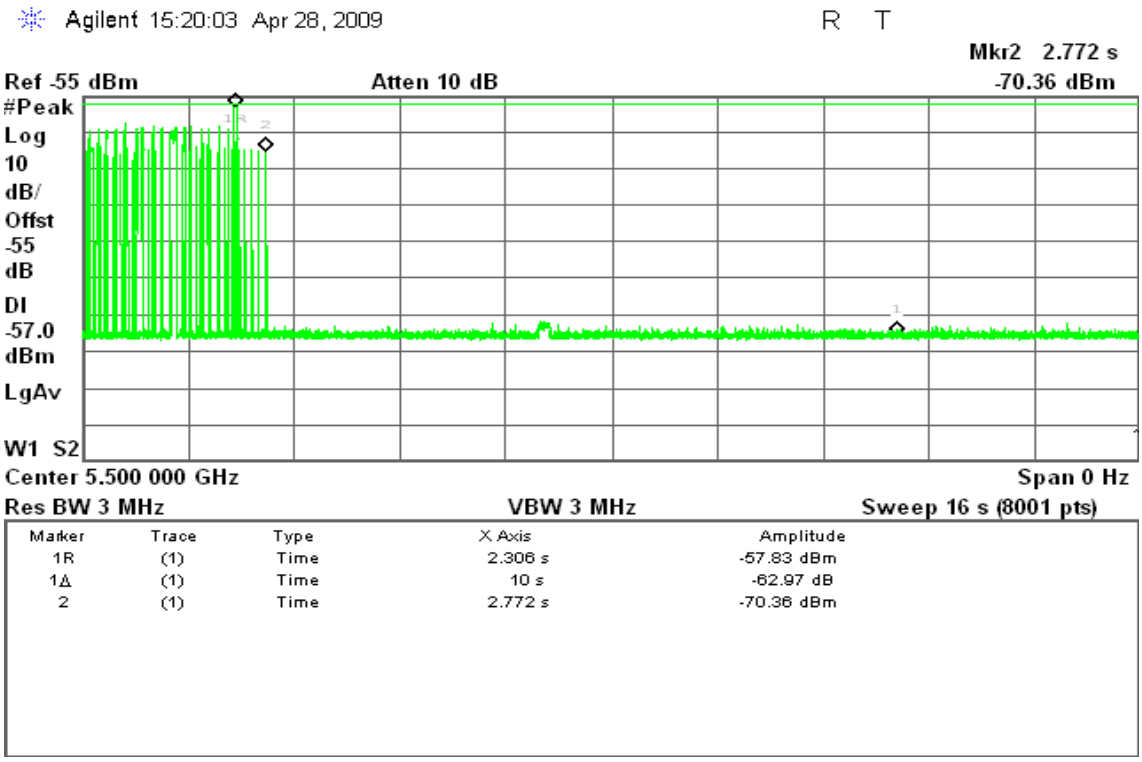
Ends no earlier than (Reference Marker + 10 sec).

## draft 802.11n Standard-20 MHz Channel mode

## Type 1 Channel Move Time Results

*No non-compliance noted.*

| Channel Move Time (s) | Limit (s) |
|---|---|
| 2.772 | 10 |

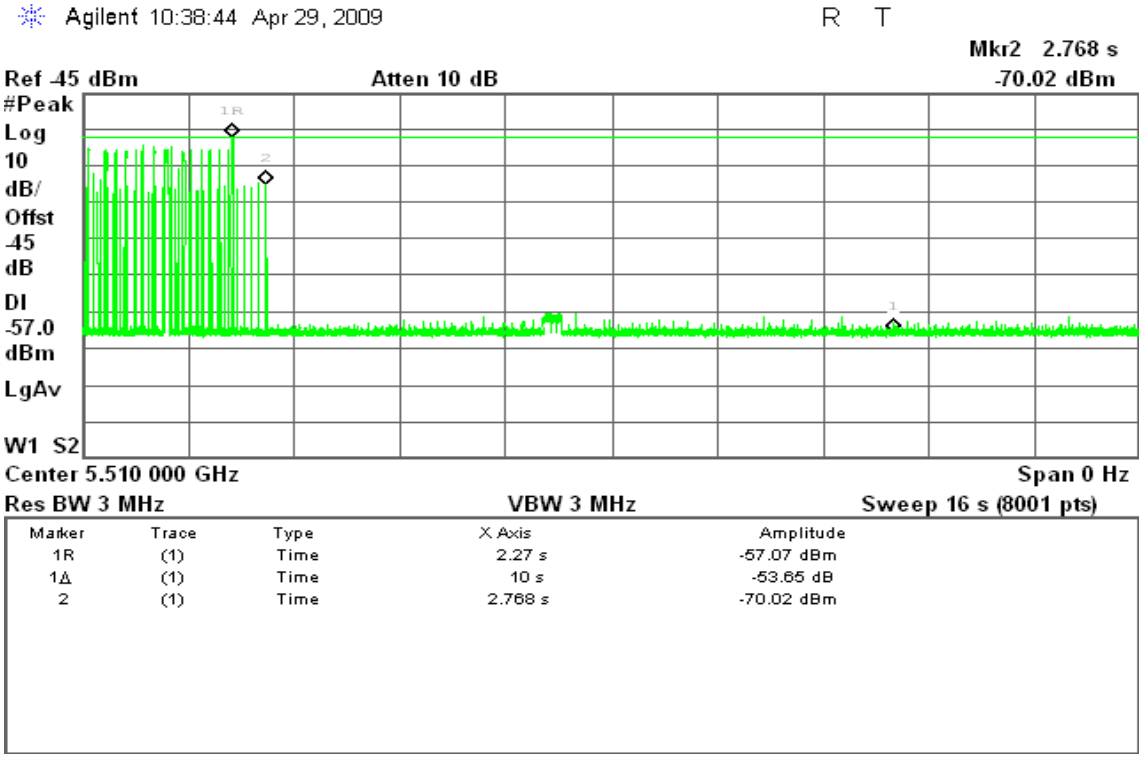


## draft 802.11n Wide-40 MHz Channel mode

## Type 1 Channel Move Time Results

*No non-compliance noted.*

| Channel Move Time (s) | Limit (s) |
|---|---|
| 2.768 | 10 |

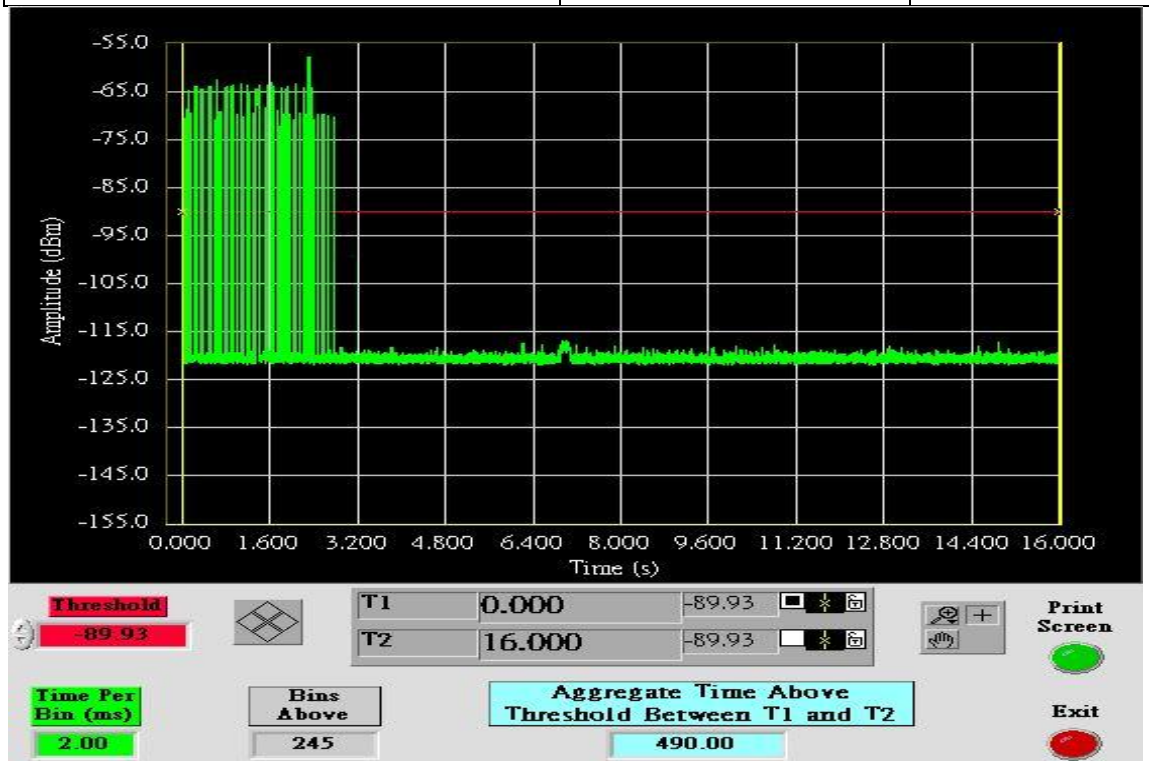


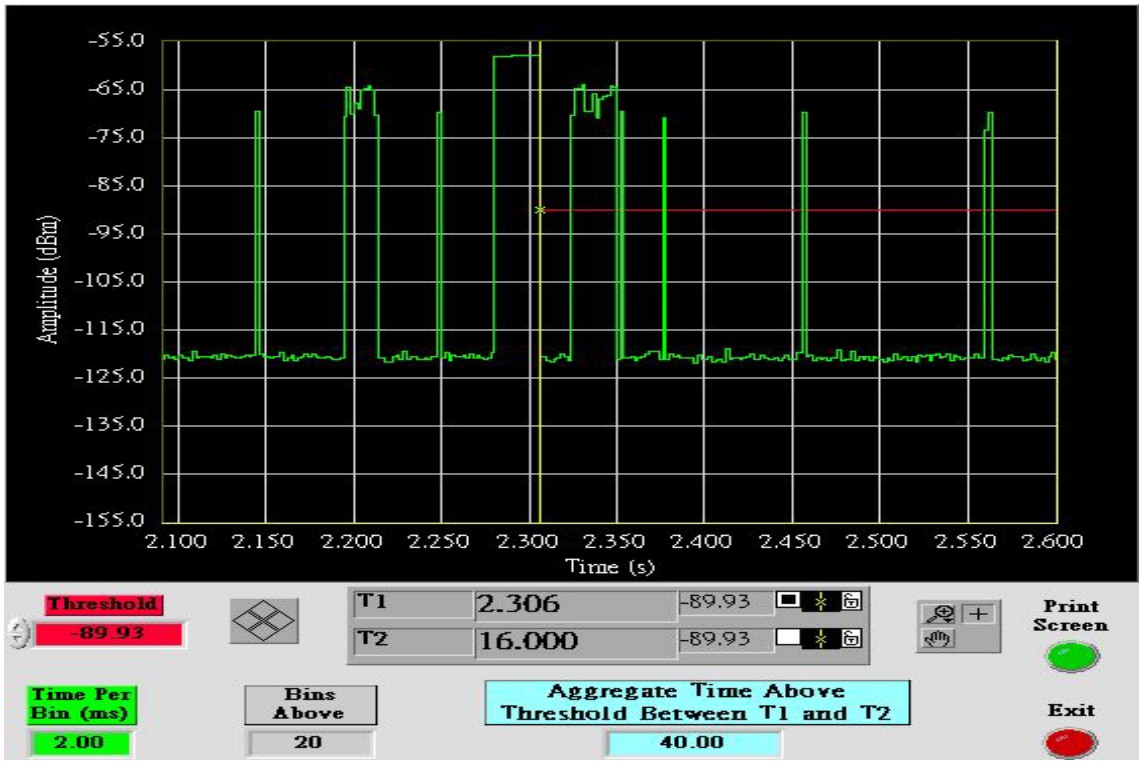
## draft 802.11n Standard-20 MHz Channel mode

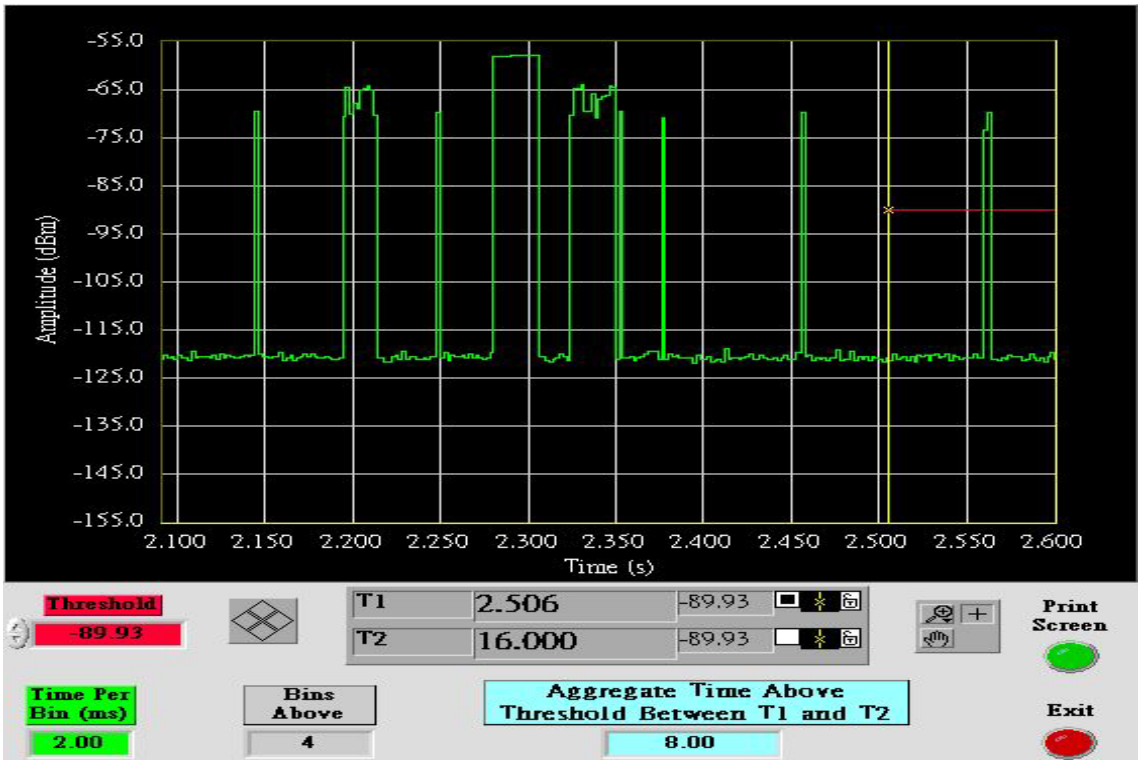
## Type 1 Channel Closing Transmission Time Results

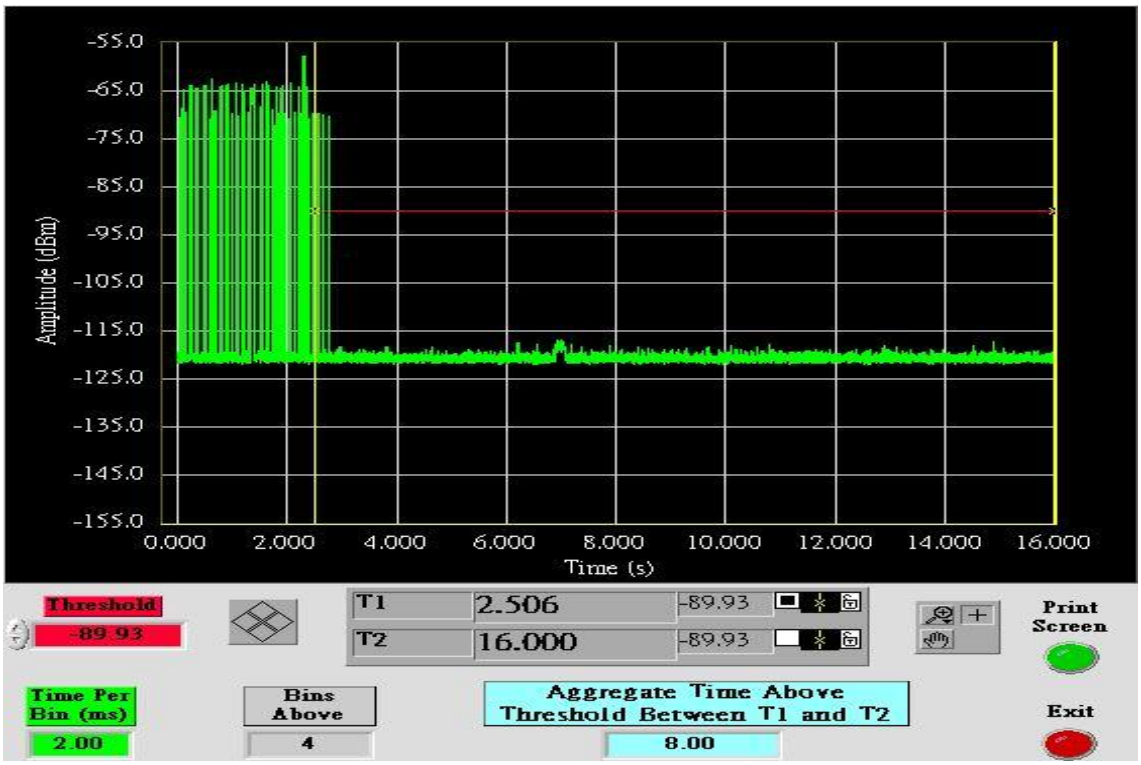
*No non-compliance noted.*

| Aggregate Transmission Time (ms) | Limit (ms) | Margin (ms) |
|---|---|---|
| 8 | 60 | -52 |




-55.0
-65.0
-75.0
-85.0
-95.0
-105.0
-115.0
-125.0
-135.0
-145.0
-155.0
Amplitude (dBm)
2.100 2.150 2.200 2.250 2.300 2.350 2.400 2.450 2.500 2.550 2.600
Time (s)
Threshold
-89.93
T1 2.506 -89.93
T2 16.000 -89.93
Print Screen
Time Per Bin (ms)
2.00
Bins Above
4
Aggregate Time Above Threshold Between T1 and T2
8.00
Exit

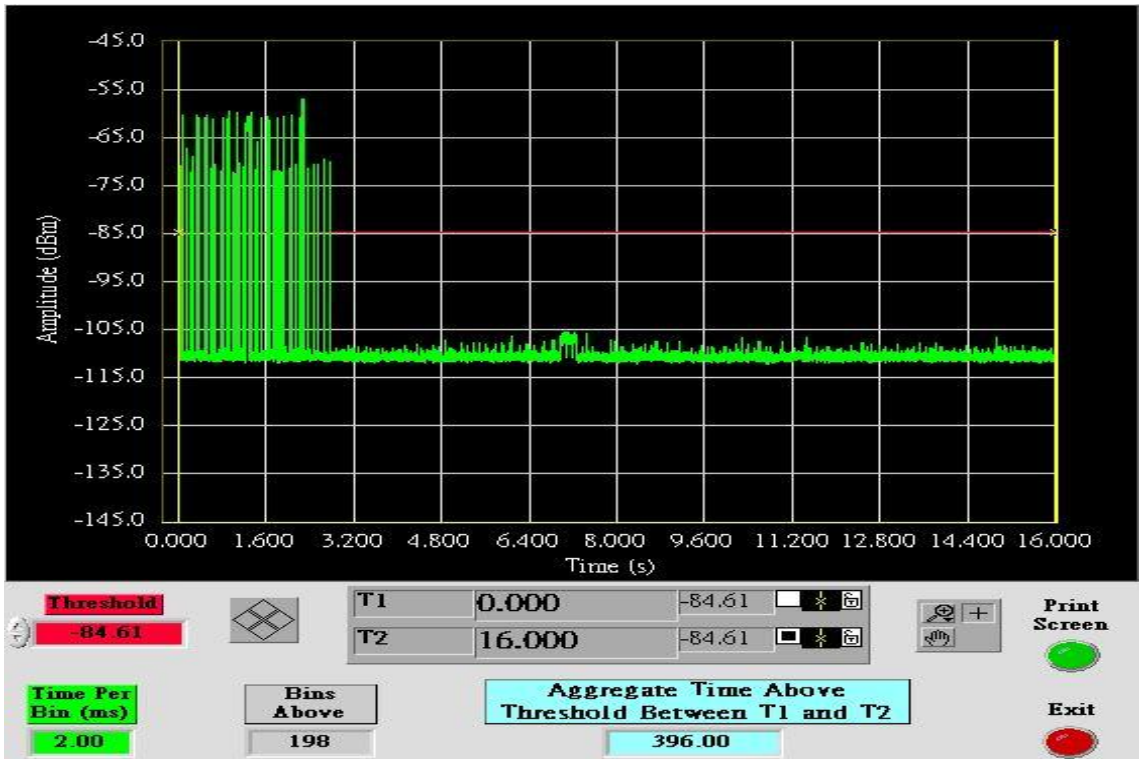

-55.0
-65.0
-75.0
-85.0
-95.0
-105.0
-115.0
-125.0
-135.0
-145.0
-155.0
Amplitude (dBm)
0.000 2.000 4.000 6.000 8.000 10.000 12.000 14.000 16.000
Time (s)
Threshold
-89.93
T1 2.506 -89.93
T2 16.000 -89.93
Print Screen
Time Per Bin (ms)
2.00
Bins Above
4
Aggregate Time Above Threshold Between T1 and T2
8.00
Exit

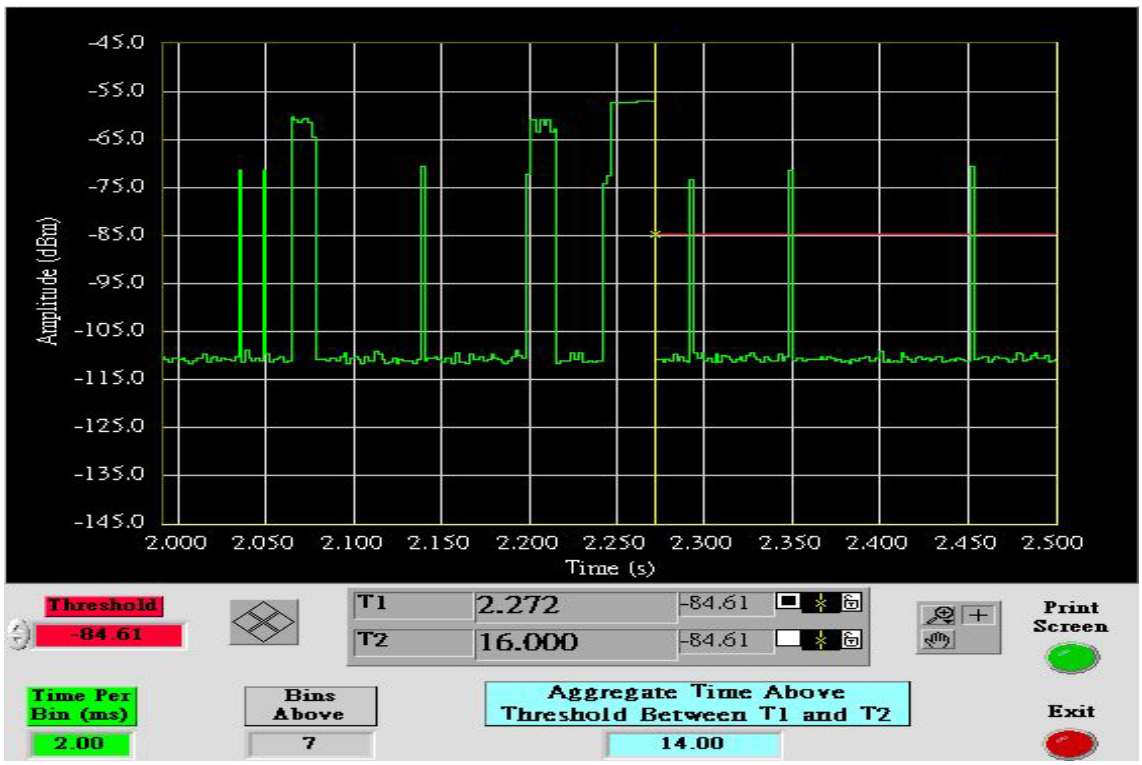
## draft 802.11n Wide-40 MHz Channel mode

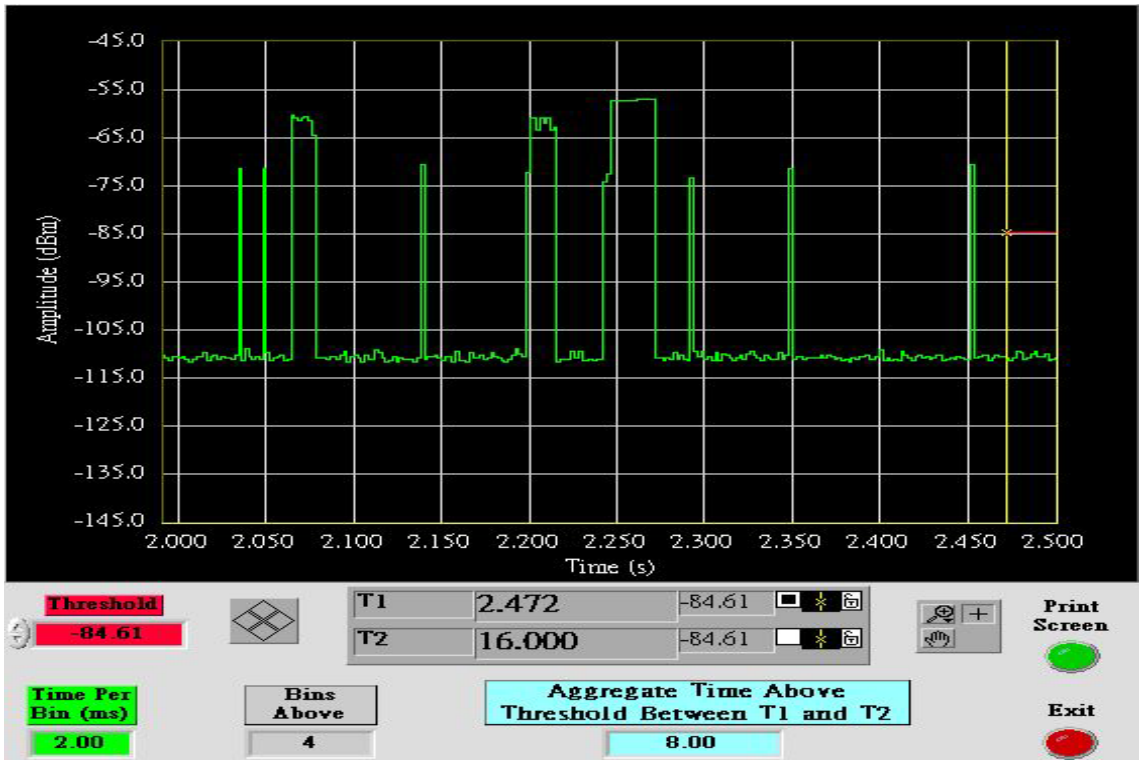
## Type 1 Channel Closing Transmission Time Results

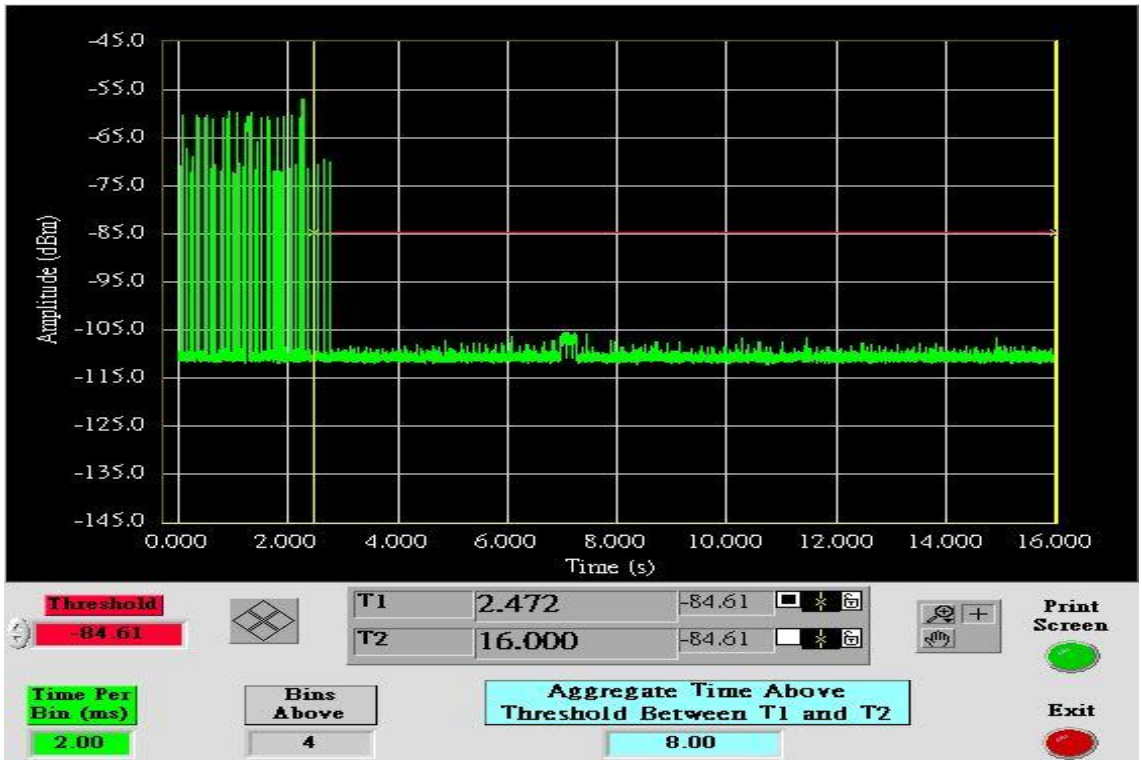
*No non-compliance noted.*

| Aggregate Transmission Time (ms) | Limit (ms) | Margin (ms) |
|---|---|---|
| 8 | 60 | -52 |



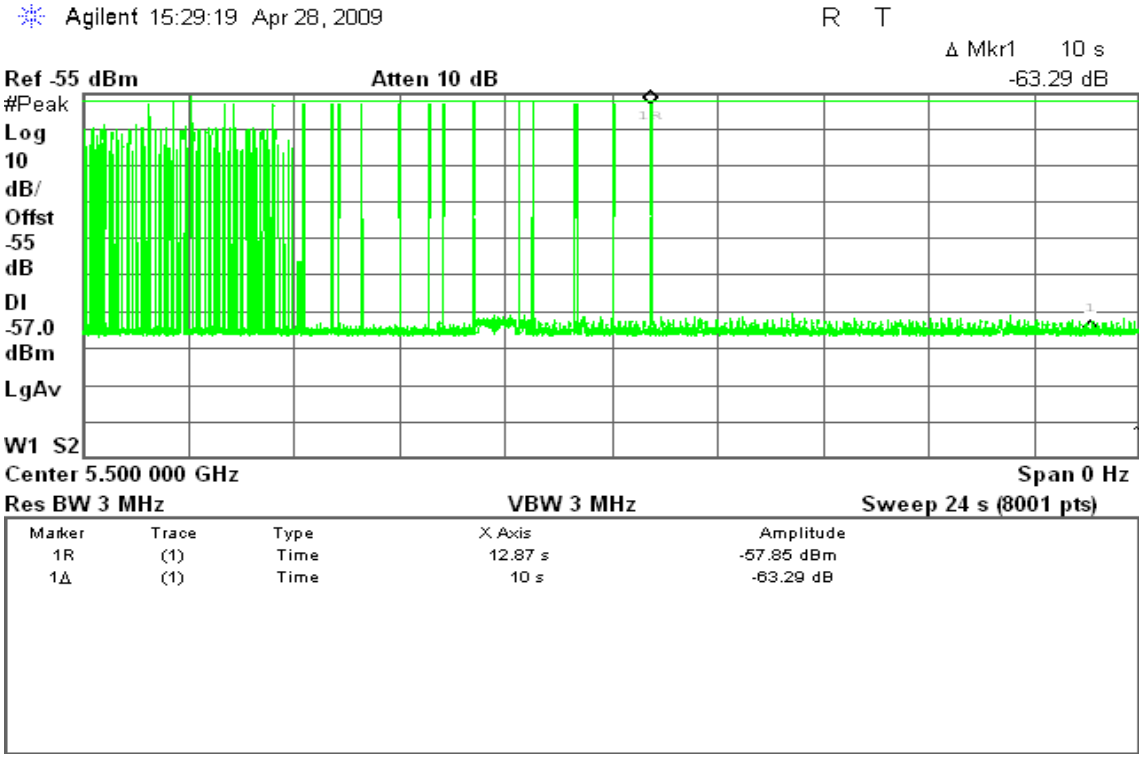

-45.0
-55.0
-65.0
-75.0
-85.0
-95.0
-105.0
-115.0
-125.0
-135.0
-145.0
Amplitude (dBm)
2.000 2.050 2.100 2.150 2.200 2.250 2.300 2.350 2.400 2.450 2.500
Time (s)
Threshold
-84.61
T1 2.472 -84.61
T2 16.000 -84.61
Print Screen
Time Per Bin (ms)
2.00
Bins Above
4
Aggregate Time Above Threshold Between T1 and T2
8.00
Exit


-45.0
-55.0
-65.0
-75.0
-85.0
-95.0
-105.0
-115.0
-125.0
-135.0
-145.0
Amplitude (dBm)
0.000 2.000 4.000 6.000 8.000 10.000 12.000 14.000 16.000
Time (s)
Threshold
-84.61
T1 2.472 -84.61
T2 16.000 -84.61
Print Screen
Time Per Bin (ms)
2.00
Bins Above
4
Aggregate Time Above Threshold Between T1 and T2
8.00
Exit

**draft 802.11n Standard-20 MHz Channel mode**

**Type 5 Channel Move Time Results**

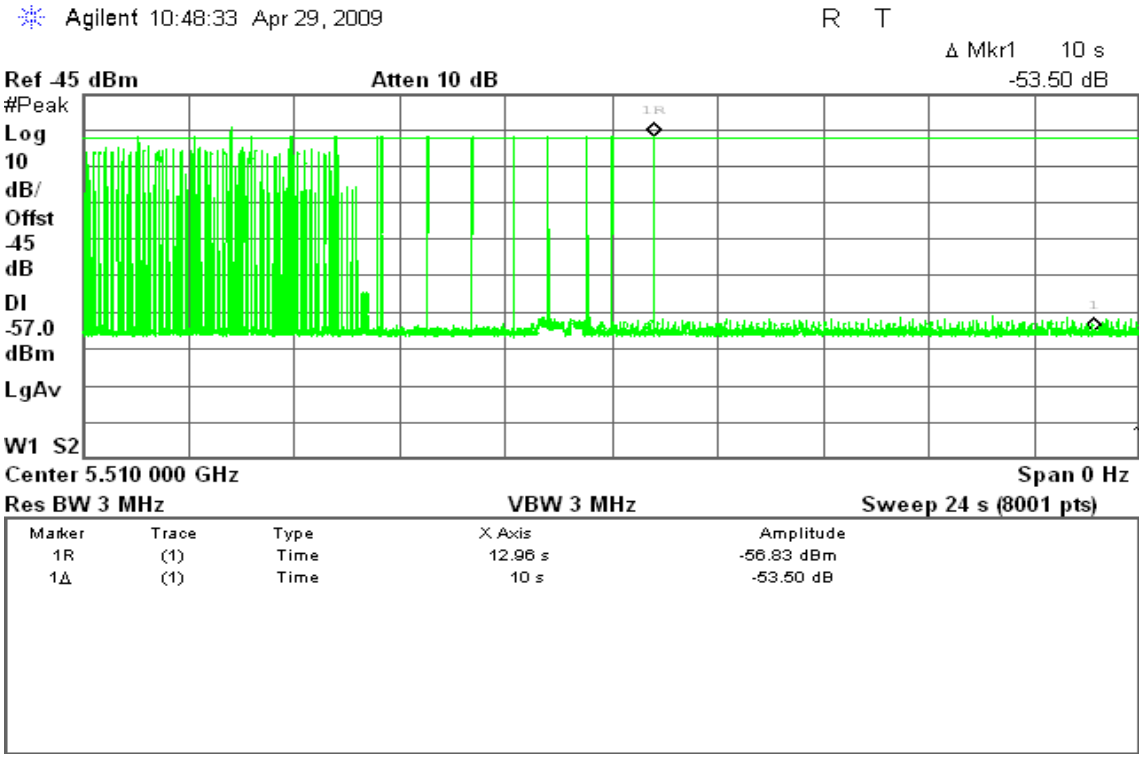
No non-compliance noted: The traffic ceases prior to the end of the radar waveform, therefore it also ceases prior to 10 seconds after the end of the radar waveform.



**draft 802.11n Wide-40 MHz Channel mode**

**Type 5 Channel Move Time Results**

No non-compliance noted: The traffic ceases prior to the end of the radar waveform, therefore it also ceases prior to 10 seconds after the end of the radar waveform.



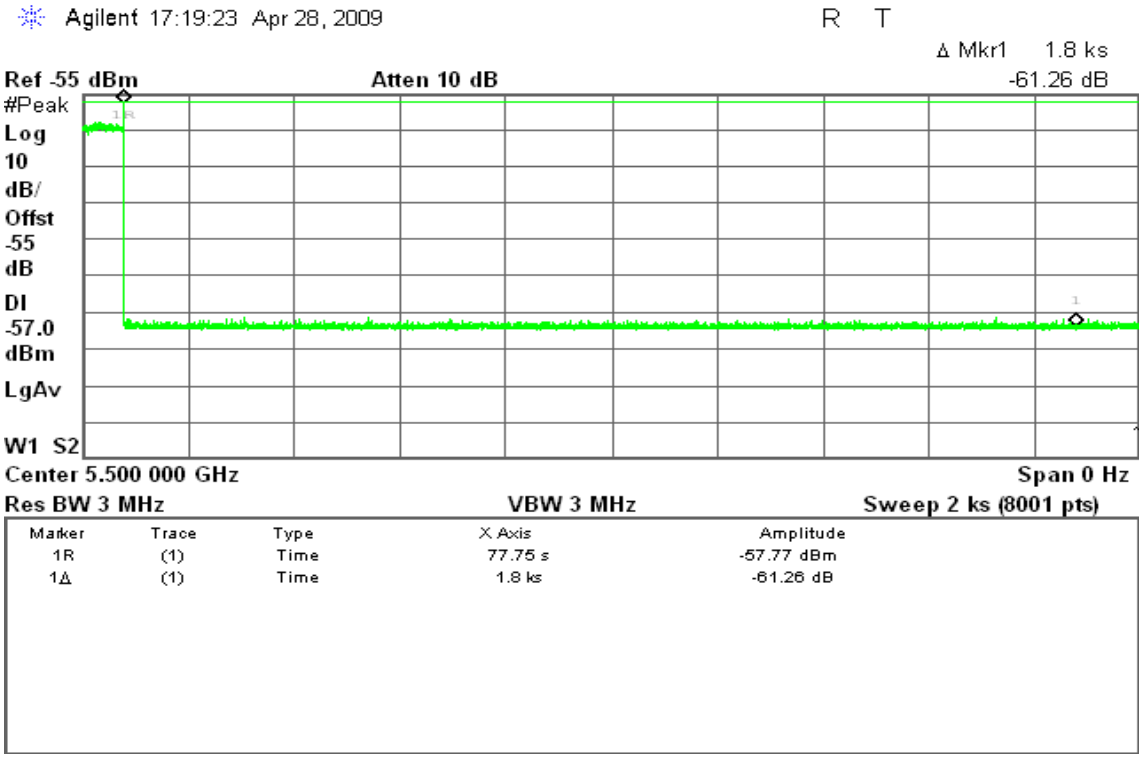
# NON-OCCUPANCY PERIOD

## draft 802.11n Wide-20 MHz mode

### Type 1 Non-Occupancy Period Test Results

*No non-compliance noted.*

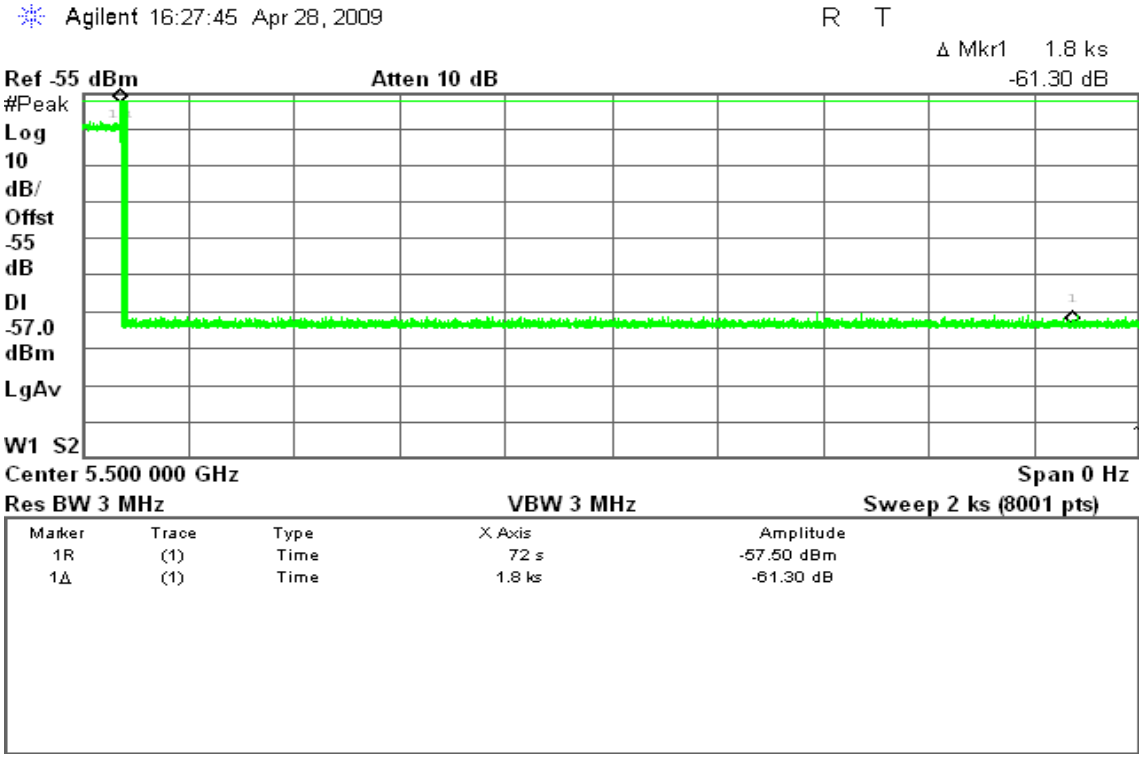
No EUT transmissions were observed on the test channel during the 30 minute observation time.



## Type 5 Non-Occupancy Period Test Results

*No non-compliance noted.*

No EUT transmissions were observed on the test channel during the 30 minute observation time.

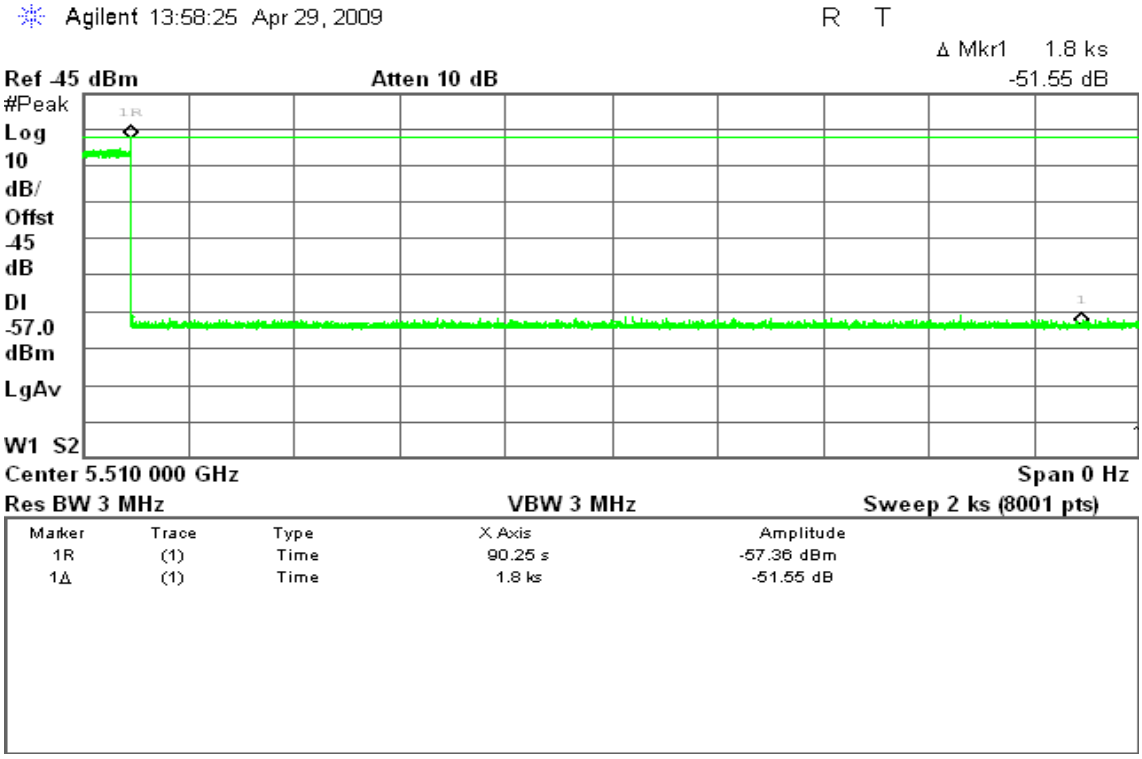


## draft 802.11n Wide-40 MHz mode

## Type 1 Non-Occupancy Period Test Results

*No non-compliance noted.*

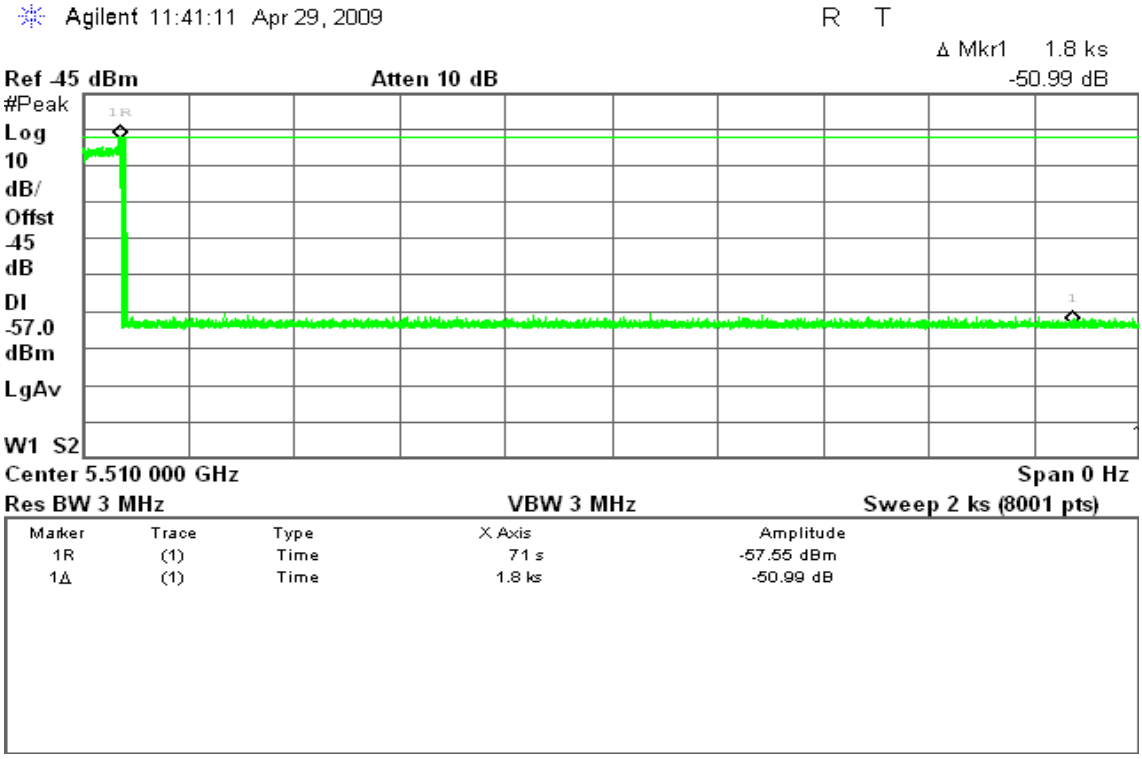
No EUT transmissions were observed on the test channel during the 30 minute observation time.



## Type 5 Non-Occupancy Period Test Results

*No non-compliance noted.*

No EUT transmissions were observed on the test channel during the 30 minute observation time.



# APPENDIX I
# RADIO FREQUENCY EXPOSURE

## LIMIT

According to §15.407(f), U-NII devices are subject to the radio frequency radiation exposure requirements specified in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

## EUT Specification

| | |
|---|---|
| **EUT** | 7" UMPC |
| **Frequency band (Operating)** | ☐ WLAN: 2.412GHz ~ 2.462GHz<br>☒ WLAN: 5.15GHz ~ 5.35GHz<br>☒ WLAN: 5.5GHz ~ 5.7GHz<br>☐ WLAN: 5.725GHz ~ 5.850GHz<br>☐ Bluetooth: 2.402 GHz ~ 2.482 GHz<br>☐ Others: _____ |
| **Device category** | ☒ Portable (<20cm separation)<br>☐ Mobile (>20cm separation)<br>☐ Others: _____ |
| **Exposure classification** | General Population/Uncontrolled exposure *(S=1mW/cm$^2$)* |
| **Antenna diversity** | ☒ Single antenna<br>☐ Multiple antennas<br>☐ Tx diversity<br>☐ Rx diversity<br>☐ Tx/Rx diversity |
| **Max. output power** | IEEE 802.11a mode / 5180 ~ 5240MHz: 14.27 dBm (26.73mW)<br>draft 802.11n Standard-20 MHz Channel mode / 5180 ~ 5240MHz: 14.16 dBm (26.06mW)<br>draft 802.11n Wide-40 MHz Channel mode / 5190 ~ 5230MHz: 13.62 dBm (23.016mW)<br>IEEE 802.11a mode / 5260 ~ 5320MHz: 14.50 dBm (28.18mW)<br>draft 802.11n Standard-20 MHz Channel mode / 5260 ~ 5320MHz: 14.42 dBm (27.66mW)<br>draft 802.11n Wide-40 MHz Channel mode / 5270 ~ 5310MHz: 14.33 dBm (27.10mW)<br>IEEE 802.11a mode / 5500 ~ 5700MHz: 14.94 dBm (31.18mW)<br>draft 802.11n Standard-20 MHz Channel mode / 5500 ~ 5700MHz: 14.58 dBm (28.706mW)<br>draft 802.11n Wide-40 MHz Channel mode / 5510 ~ 5670MHz: 14.62 dBm (28.97mW) |
| **Antenna gain (Max)** | IEEE 802.11a: 3.53 dBi (Numeric gain: 2.25) |
| **Evaluation applied** | ☐ MPE Evaluation<br>☒ SAR Evaluation*<br>☐ N/A |

***Remark:***
1. *The maximum output power is 14.94dBm (31.18mW) at 5600MHz (with 2.25 numeric antenna gain.)*
2. *For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm$^2$ even if the calculation indicates that the power density would be larger.*

## TEST RESULTS

*No non-compliance noted.*
***Remark:*** *Please refer to the separated SAR report.*

## MPE

*No non-compliance noted.*