

# TEST REPORT

of

## FCC PART 15 SUBPART E

New Application;  Class I PC;  Class II PC  
Full Modular Approval

**Product :** 5G +2.4G 2T/2R WLAN FMC  
**Brand:** Nane  
**Model:** Detail please refer to page 6  
**Model Difference:** Market Segmentation  
**FCC ID:** O7N-CWFB211-XXX  
it identifies a single equipment "X" is letter of the alphabet  
**FCC Rule Part:** §15.407  
**Applicant:** ChipSiP Technology CO., Ltd.  
**Address:** 8F.-1, No.186, Jian 1st Rd., Zhonghe Dist., New Taipei City 235, Taiwan

### Test Performed by:

#### International Standards Laboratory

<Lung-Tan LAB>

\*Site Registration No.

BSMI: SL2-IN-E-0013; MRA TW1036; TAF: 0997; IC: IC4067B-3;

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Report No.: **ISL-13LR006FE**

Issue Date : **2013/02/21**

Test results given in this report apply only to the specific sample(s) tested and are traceable to national or international standard through calibration of the equipment and evaluating measurement uncertainty herein.

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### VERIFICATION OF COMPLIANCE

**Applicant:** ChipSiP Technology CO., Ltd.  
**Product Description:** 5G +2.4G 2T/2R WLAN FMC  
**Brand Name:** Nane  
**Model No.:** Detail please refer to page 6  
**Model Difference:** Market segmentation  
**FCC ID:** O7N-CWFB211-XXX, it identifies a single equipment  
"X" is letter of the alphabet  
**FCC Rule Part:** §15.407  
**Date of test:** 2013/01/07 ~ 2013/01/19  
**Date of EUT Received:** 2013/01/07

**We hereby certify that:**

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

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**Approved By:** Vincent Su **Date:** 2013/02/21  
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## Version

| Version No. | Date       | Description                  |
|-------------|------------|------------------------------|
| 00          | 2013/02/21 | Initial creation of document |
|             |            |                              |
|             |            |                              |

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## 1. GENERAL INFORMATION

### 1.1. Product Description

General:

|                  |                         |             |             |             |
|------------------|-------------------------|-------------|-------------|-------------|
| Product Name     | 5G +2.4G 2T/2R WLAN FMC |             |             |             |
| Brand Name       | Nane                    |             |             |             |
| Model Name       | CWFB210                 |             | CWFB211-D00 |             |
|                  | CWFB210-T01             | CWFB210-R01 | CWFB211-D01 | CWFB212-L01 |
|                  | CWFB210-T02             | CWFB210-R02 | CWFB211-D02 | CWFB212-L02 |
|                  | CWFB210-T03             | CWFB210-R03 | CWFB211-D03 | CWFB212-L03 |
|                  | CWFB210-T04             | CWFB210-R04 | CWFB211-D04 | CWFB212-L04 |
|                  | CWFB210-T05             | CWFB210-R05 | CWFB211-D05 | CWFB212-L05 |
|                  | CWFB210-T06             | CWFB210-R06 | CWFB211-D06 | CWFB212-L06 |
|                  | CWFB210-T07             | CWFB210-R07 | CWFB211-D07 | CWFB212-L07 |
|                  | CWFB210-T08             | CWFB210-R08 | CWFB211-D08 | CWFB212-L08 |
|                  | CWFB210-T09             | CWFB210-R09 | CWFB211-D09 | CWFB212-L09 |
|                  | CWFB210-T10             | CWFB210-R10 | CWFB211-D10 | CWFB212-L10 |
| Model Difference | Market segmentation     |             |             |             |
| Power Supply     | 3.7Vdc                  |             |             |             |

WLAN: 2X2 MIMO

| Wi-Fi            | Frequency Range (MHz)    | Channels  | Peak Rated Power | Modulation Technology |  |
|------------------|--------------------------|---|------------------|-----------------------|--|
| 802.11b          | 2412 – 2462(DTS)         | 11  | 19.52dBm         | DSSS                  |  |
| 802.11g          | 2412 – 2462(DTS)         | 11  | 23.87dBm         | DSSS, OFDM            |  |
| 802.11n          | HT20<br>2412 – 2462(DTS) | 11  | 23.77dBm         | OFDM                  |  |
|                  | HT40<br>2422 – 2452(DTS) | 7   | 23.71dBm         |                       |  |
| 802.11a          | 5180 – 5240(NII)         | 4   | 9.19dBm          | OFDM                  |  |
|                  | 5745 – 5825(DTS)         | 5   | 23.88dBm         |                       |  |
| 802.11n          | HT20<br>5180 – 5240(NII) | 4   | 8.65dBm          | OFDM                  |  |
|                  | HT20<br>5745 – 5825(DTS) | 5   | 24.81dBm         |                       |  |
|                  | HT40<br>5190 – 5230(NII) | 2   | 10.93dBm         |                       |  |
|                  | HT40<br>5755 – 5795(DTS) | 2   | 24.60dBm         |                       |  |
| Modulation type  |                          | CCK, DQPSK, DBPSK for DSSS<br>64QAM, 16QAM, QPSK, BPSK for OFDM |                  |                       |  |
| Transition Rate: |                          | Upto 300Mbps  |                  |                       |  |

Antenna Designation:

|         | Manufacturer                      | Model No.            | Connector Type     | Type            | Gain (2.4GHz) | Gain (5GHz) |
|---------|-----------------------------------|----------------------|--------------------|-----------------|---------------|-------------|
| Ant 1   | Airwave Technologies INC.         | EDA-8709-25GR2-A4-RM | Revise SMA, unique | Dipole Ant      | 2 dBi         | 2 dBi       |
| Ant 2   | ARISTRITTLE                       | RFA-25-C2S1-70-90    | unique             | Dipole Ant      | 2 dBi         | 2 dBi       |
| Ant 3   | Tranwo technology corp.           | SD001-201003-A101    | Revise SMA, unique | Dipole Ant      | 2dBi          | 2 dBi       |
| Ant 3-1 | Tranwo technology corp.           | RFA-05-2-L14M3-B70-1 | Revise SMA, unique | Dipole Ant      | 2dBi          | 2 dBi       |
| Ant 3-2 | Tranwo technology corp.           | 202-000442-00        | unique             | Patch Ant       | 0 dBi         | -1 dBi      |
| Ant 3-3 | Tranwo technology corp.           | 202-000441-00        | unique             | Patch Ant       | 0.5 dBi       | -0.5 dBi    |
| Ant 4   | UDM Group Technology Co., Ltd     | 26-52-01800G         | unique             | PCB Ant (Green) | 2.5 dBi       | 4 dBi       |
| Ant 5   | Unictron Technologies Corporation | H2P566WKBA0100       | unique             | PCB Ant (Blue)  | 2.3 dBi       | 4dBi        |

The EUT is compliance with IEEE 802.11 a/b/g/n Standard.  
This report applies for frequency bands 5150 MHz– 5250 MHz

### **1.2. Related Submittal(s) / Grant (s)**

This submittal(s) (test report) is intended for FCC ID: NM8DGH100 filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules. The composite system (digital device) is compliance with Subpart B is authorized under a DoC procedure.

### **1.3. Test Methodology**

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003). Radiated testing was performed at an antenna to EUT distance 3 meters.

KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

### **1.4. Test Facility**

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-4.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

### **1.5. Special Accessories**

Not available for this EUT intended for grant.

### **1.6. Equipment Modifications**

Not available for this EUT intended for grant.



## **2. SYSTEM TEST CONFIGURATION**

### **2.1. EUT Configuration**

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

### **2.2. EUT Exercise**

The EUT (Transmitter) was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

### **2.3. Test Procedure**

#### **2.3.1 Conducted Emissions**

The EUT is placed on a turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4-2003, conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and Average detector mode.

#### **2.3.2 Radiated Emissions**

The EUT is placed on a turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m 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 max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes and measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made “while keeping the antenna in the ‘cone of radiation’ from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response.” Is still within the 3Db illumination BW of the measurement antenna. According to the requirements in Section 8 and 13 and Subclause 8.3.1.2 of ANSI C63.4-2003.

## 2.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System



Table 1-1 Equipment Used in Tested System

| Item | Equipment | Mfr/Brand | Model/<br>Type No. | Series No. | Data Cable | Power Cord |
|------|-----------|-----------|--------------------|------------|------------|------------|
| 1    | Notebook  | IBM       | X40                | N/A        | Shield     | Non-shield |
| 2    | Kit       | N/A       | N/A                | N/A        | Shield     | Non-shield |

### 3. SUMMARY OF TEST RESULT

| FCC Rules    | Description Of Test                            | Result    |
|--------------|--|-----------|
| §15.207      | AC Power Line Conducted Emission               | Compliant |
| §15.407(a)   | 26 dB Emission Bandwidth                       | Compliant |
| §15.407(a)   | Peak Output Power Measurement                  | Compliant |
| §15.407(a)   | Peak Power Spectral Density Measurement        | Compliant |
| 15.407(a)(6) | Peak Excursion Measurement                     | Compliant |
| §15.407(b)   | Undesirable Emission – Conducted Measurement   | Compliant |
| §15.407(b)   | Undesirable Emission – Radiated Measurement    | Compliant |
| §15.407©     | Transmission in case of Absence of Information | Compliant |
| §15.407(g)   | Frequency Stability                            | Compliant |
| §15.407(a)   | Antenna Requirement                            | Compliant |
| §15.407(d)   | TPC and DFS Measurement                        | Compliant |
| MPE          | Maximum Permissible Exposure                   | Compliant |

### 4. DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting mode is programmed.

a mode: 5150MHz-5250MHz: Channel lowest (5180MHz)、 Mid (5220MHz) and Highest (5240MHz) with 6Mbps data rate are chosen for full testing.

n HT 20 mode: 5150MHz-5250MHz: Channel lowest (5180MHz)、 Mid (5220MHz) and Highest (5240MHz) with 6.5Mbps data rate are chosen for full testing

n HT 40 mode: 5150MHz-5250MHz: Channel lowest (5190MHz) and Highest (5230MHz) with 13.5Mbps data rate are chosen for full testing

The worst case 802.11 n HT40 (5GHz) with antenna 4 was reported for Radiated Emission.

## 5. AC POWER LINE CONDUCTED EMISSION TEST

### 5.1. Standard Applicable

According to §15.207, frequency range within 150 KHz to 30 MHz shall not exceed the Limit table as below.

| Frequency range<br>MHz | Limits<br>dB(uV) |          |
|------------------------|------------------|----------|
|                        | 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       |

Note

- 1.The lower limit shall apply at the transition frequencies
- 2.The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### 5.2. Measurement Equipment Used:

| Conducted Emission Test Site |                 |                      |                |            |            |
|------------------------------|-----------------|----------------------|----------------|------------|------------|
| EQUIPMENT TYPE               | MFR             | MODEL NUMBER         | SERIAL NUMBER  | LAST CAL.  | CAL DUE.   |
| Conduction 03 -1 Cable       | WOKEN           | CFD 300-NL           | Conduction 0-1 | 06/28/2012 | 06/28/2013 |
| EMI Receiver 12              | ROHDE & SCHWARZ | ESCI                 | 100804         | 07/13/2012 | 07/13/2013 |
| LISN 07                      | FCC Inc.        | FCC-LISN-50-100-4-02 | 07040          | 07/13/2012 | 07/13/2013 |
| LISN 08                      | FCC             | FCC-LISN50-25-2-01   | 07039          | 07/13/2012 | 07/13/2013 |

### 5.3. EUT Setup:

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-2003.
2. The AC/DC Power adaptor of EUT was plug-in LISN. The EUT was placed flushed with the rear of the table.
3. The LISN was connected with 120Vac/60Hz power source.

#### **5.4. Measurement 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.

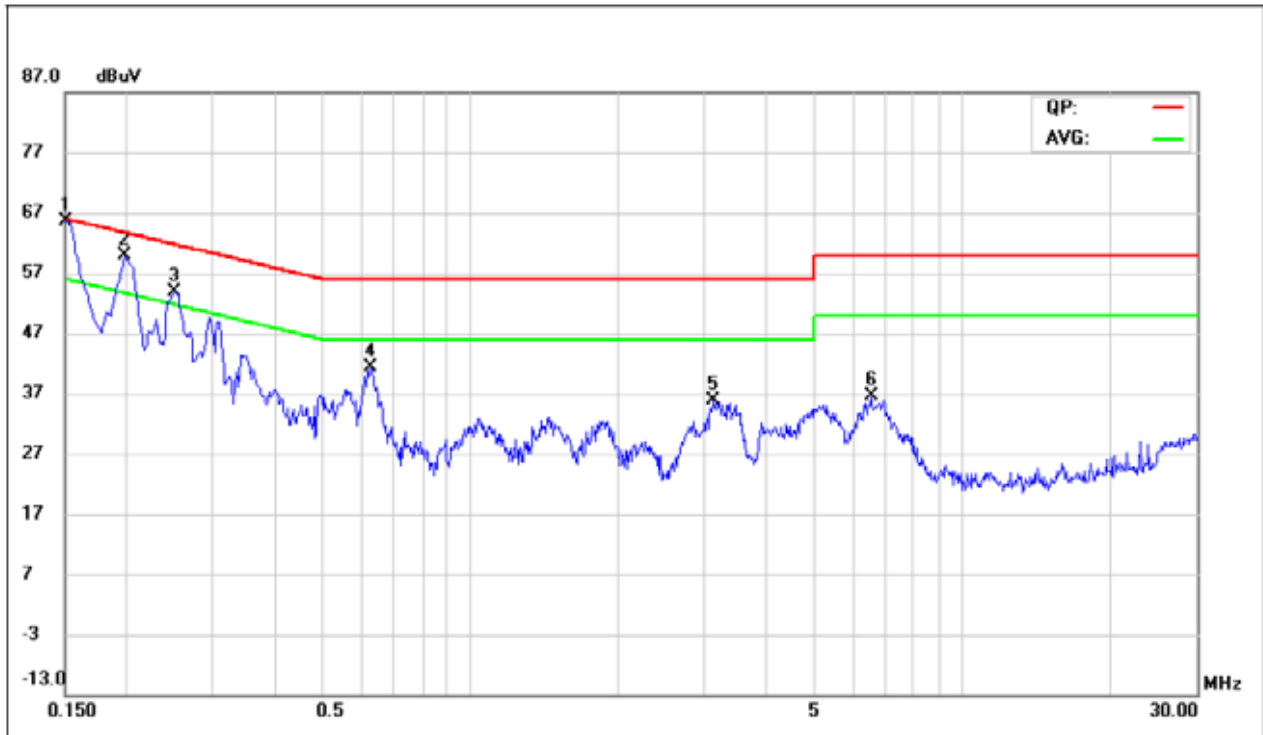
#### **5.5. Measurement Result:**

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.

Note: Refer to next page for measurement data and plots.

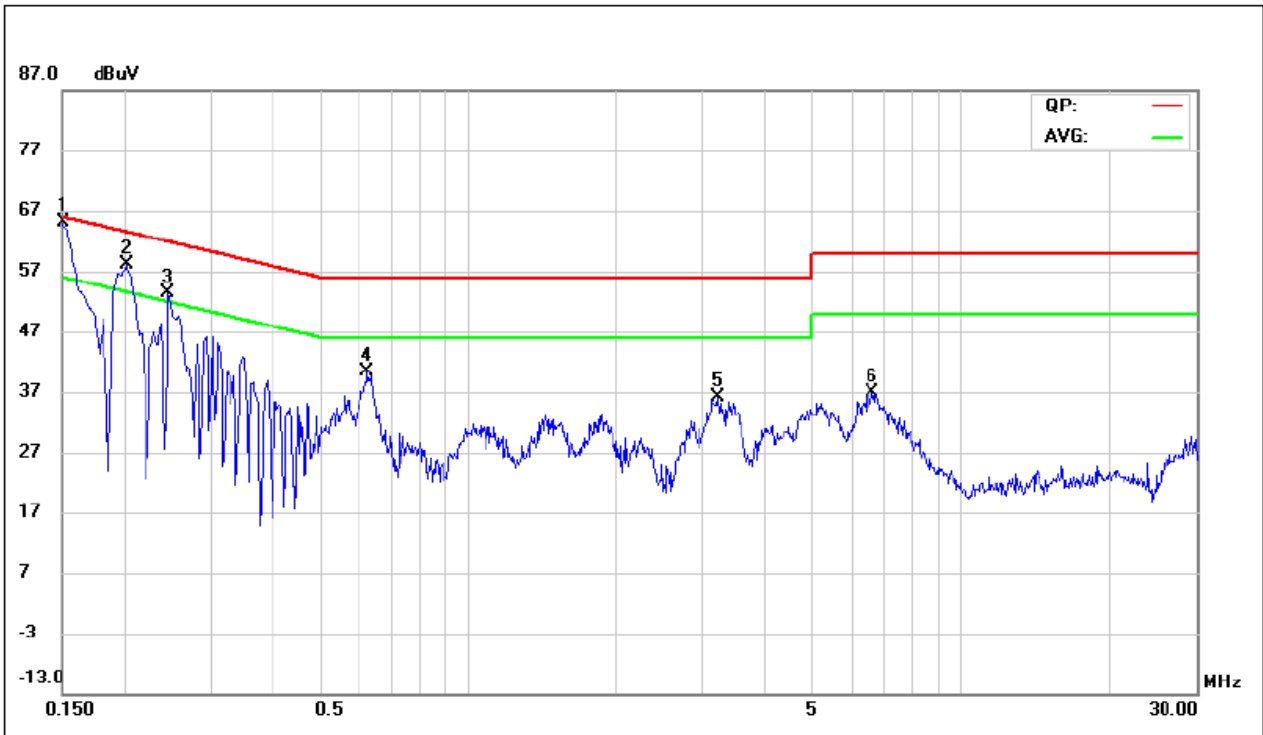
### AC POWER LINE CONDUCTED EMISSION TEST DATA

|                 |                |            |            |
|-----------------|----------------|------------|------------|
| Operation Mode: | Operation Mode | Test Date: | 2013/01/17 |
| Test By:        | Dino           |            |            |



|            |                            |           |                        |
|------------|----------------------------|-----------|------------------------|
| Site:      | Conduction 04              | Phase: L1 | Temperature(°C):26(°C) |
| Condition: | CISPR13 Class B Conduction |           | Humidity:54%           |
|            |                            | Power:    | AC 120V/60Hz           |

| No. | Frequency)<br>(MHz) | reading(dBuV) |       |       | Factor(dB)<br>(dB) | Measurement(dBuV) |       |       | limit(dBuV) |       | margin(dB) |        | Comment |
|-----|---------------------|---------------|-------|-------|--------------------|-------------------|-------|-------|-------------|-------|------------|--------|---------|
|     |                     | Peak          | QP    | AVG   |                    | Peak              | QP    | AVG   | P/Q         | AVG   | P/Q        | AVG    |         |
| 1   | 0.1516              | 56.77         | 53.97 | 39.66 | 9.58               | 66.35             | 63.55 | 49.24 | 65.91       | 55.91 | -2.36      | -6.67  |         |
| 2   | 0.1980              | 50.23         | 47.29 | 33.14 | 9.59               | 59.82             | 56.88 | 42.73 | 63.69       | 53.69 | -6.81      | -10.96 |         |
| 3   | 0.2500              | 45.13         | 41.78 | 29.18 | 9.59               | 54.72             | 51.37 | 38.77 | 61.76       | 51.76 | -10.39     | -12.99 |         |
| 4   | 0.6300              | 33.00         | 28.97 | 23.35 | 9.60               | 42.60             | 38.57 | 32.95 | 56.00       | 46.00 | -17.43     | -13.05 |         |
| 5   | 3.1260              | 25.97         | 21.27 | 15.36 | 9.60               | 35.57             | 30.87 | 24.96 | 56.00       | 46.00 | -25.13     | -21.04 |         |
| 6   | 6.5500              | 26.69         | 22.23 | 16.64 | 9.63               | 36.32             | 31.86 | 26.27 | 60.00       | 50.00 | -28.14     | -23.73 |         |



|            |                            |          |                        |
|------------|----------------------------|----------|------------------------|
| Site:      | Conduction 04              | Phase: N | Temperature(°C):26(°C) |
| Condition: | CISPR13 Class B Conduction |          | Humidity:54%           |
| Company:   | 景鉅                         | Power:   | AC 120V/60Hz           |

| No. | Frequency)<br>(MHz) | reading(dBuV) |       |       | Factor(dB)<br>(dB) | Measurement(dBuV) |       |       | limit(dBuV) |       | margin(dB) |        | Comment |
|-----|---------------------|---------------|-------|-------|--------------------|-------------------|-------|-------|-------------|-------|------------|--------|---------|
|     |                     | Peak          | QP    | AVG   |                    | Peak              | QP    | AVG   | P/Q         | AVG   | P/Q        | AVG    |         |
| 1   | 0.1500              | 31.43         | 23.72 | 19.59 | 9.59               | 41.02             | 33.31 | 29.18 | 66.00       | 56.00 | -32.69     | -26.82 |         |
| 2   | 0.2020              | 49.00         | 46.13 | 30.70 | 9.59               | 58.59             | 55.72 | 40.29 | 63.53       | 53.53 | -7.81      | -13.24 |         |
| 3   | 0.2460              | 43.95         | 39.26 | 24.10 | 9.59               | 53.54             | 48.85 | 33.69 | 61.89       | 51.89 | -13.04     | -18.20 |         |
| 4   | 0.6260              | 31.51         | 27.80 | 22.10 | 9.60               | 41.11             | 37.40 | 31.70 | 56.00       | 46.00 | -18.60     | -14.30 |         |
| 5   | 3.2100              | 27.08         | 22.14 | 15.91 | 9.60               | 36.68             | 31.74 | 25.51 | 56.00       | 46.00 | -24.26     | -20.49 |         |
| 6   | 6.6100              | 28.52         | 22.46 | 16.76 | 9.63               | 38.15             | 32.09 | 26.39 | 60.00       | 50.00 | -27.91     | -23.61 |         |

## 6. PEAK OUTPUT POWER MEASUREMENT

### 6.1 Standard Applicable

According to §15.407(a)

1. For the band 5.15-5.25 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 50 mW (17dBm) or 4 dBm + 10log B.
2. For the band 5.25-5.35 GHz and 5.47-5.725GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 250 mW (24dBm) or 11 dBm + 10log B.
3. For the band 5.725-5.825 GHz, the maximum conducted power over the frequency of operation shall not exceed the lesser of 1W (30dBm) or 17 dBm + 10log B.

### 6.2 Measurement Procedure

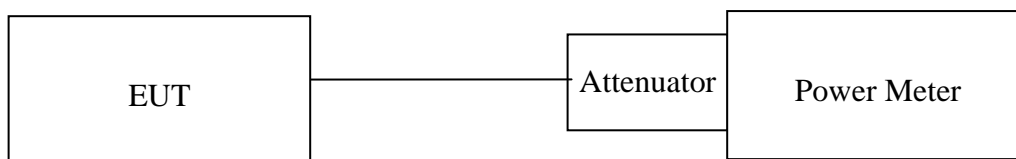
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power meter
3. Record the max. reading.
4. Repeat above procedures until all frequency measured were complete.

Refer to section C4 of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

### 6.3 Measurement Equipment Used:

| Conducted Emission Test Site |         |              |               |            |            |
|------------------------------|---------|--------------|---------------|------------|------------|
| EQUIPMENT TYPE               | MFR     | MODEL NUMBER | SERIAL NUMBER | LAST CAL.  | CAL DUE.   |
| Power Meter 05               | Anritsu | ML2495A      | 1116010       | 04/17/2012 | 04/16/2013 |
| Power Sensor 05              | Anritsu | MA2411B      | 34NKF50       | 04/16/2012 | 04/15/2013 |
| Temperature Chamber          | KSON    | THS-B4H100   | 2287          | 03/03/2012 | 03/02/2013 |
| DC Power supply              | ABM     | 51850        | N/A           | 06/17/2012 | 06/16/2013 |
| AC Power supply              | EXTECH  | CFC105W      | NA            | 12/19/2012 | 12/18/2013 |
| Splitter                     | MCLI    | PS4-199      | 12465         | 07/18/2012 | 07/17/2013 |
| Spectrum analyzer            | Agilent | N9030A       | MY51360021    | 03/11/2012 | 03/10/2013 |

### 6.4 Measurement Equipment Used:





**6.5 Measurement Result**

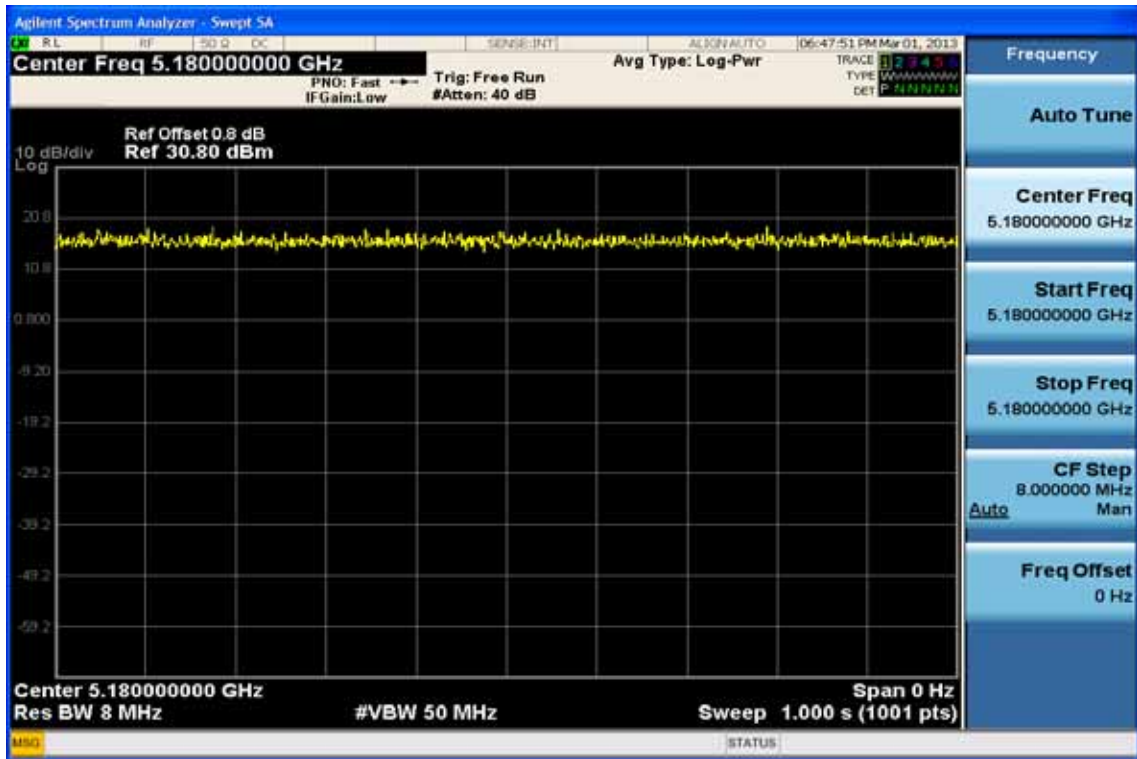
| Mode    | Freq(MHz) | channel | Peak power (dBm) | limit(dBm) | result |
|---------|-----------|---------|------------------|------------|--------|
| 802.11a | 5180      | 36      | 9.19             | 16.98      | pass   |
|         | 5200      | 40      | 8.67             | 16.98      | pass   |
|         | 5220      | 44      | 8.89             | 16.98      | pass   |
|         | 5240      | 48      | 8.76             | 16.98      | pass   |

**2\*2 MIMO**

| Mode   | Freq(MHz) | channel | Output Chain (dBm) |         | Combine Peak Output Power (dBm) | Limit(dBm) | Result |
|--------|-----------|---------|--------------------|---------|---------------------------------|------------|--------|
|        |           |         | Chain A            | chain B |                                 |            |        |
| N HT20 | 5180      | 36      | 5.21               | 6.03    | 8.65                            | 16.98      | Pass   |
|        | 5200      | 40      | 5.52               | 5.05    | 8.30                            | 16.98      | Pass   |
|        | 5220      | 44      | 5.61               | 5.45    | 8.54                            | 16.98      | Pass   |
|        | 5240      | 48      | 5.63               | 4.82    | 8.25                            | 16.98      | Pass   |

| Mode   | Freq(MHz) | channel | Output Chain (dBm) |         | Combine Peak Output Power (dBm) | Limit(dBm) | Result |
|--------|-----------|---------|--------------------|---------|---------------------------------|------------|--------|
|        |           |         | Chain A            | chain B |                                 |            |        |
| N HT40 | 5190      | 38      | 8.02               | 7.81    | 10.93                           | 16.98      | Pass   |
|        | 5230      | 46      | 7.59               | 7.33    | 10.47                           | 16.98      | Pass   |

100% Duty Cycle



## **7. 26dB EMISSION BANDWIDTH MEASUREMENT**

### **7.1 Standard Applicable**

According to §15.407(a). No Limit required.

### **7.2 Measurement Procedure**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW=300KHz, VBW =1MHz, Span= 50MHz, Sweep=auto
4. Mark the peak frequency and -26dB (upper and lower) frequency.
5. Repeat above procedures until all frequency measured were complete.

**Refer to section D of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02**

### **7.3 Measurement Equipment Used:**

Refer to section 6.3 for details.

### **7.4 Test Set-up:**

Refer to section 6.4 for details.

## 7.5 Measurement Result

### 802.11a Mode

| <b>Frequency<br/>(MHz)</b> | <b>26dB Bandwidth<br/>(MHz)</b> | <b>10 Log (B)<br/>(dB)</b> |
|----------------------------|---------------------------------|----------------------------|
| 5180                       | 21.220                          | 13.27                      |
| 5220                       | 21.820                          | 13.39                      |
| 5240                       | 21.280                          | 13.28                      |

### 802.11n HT20 Mode

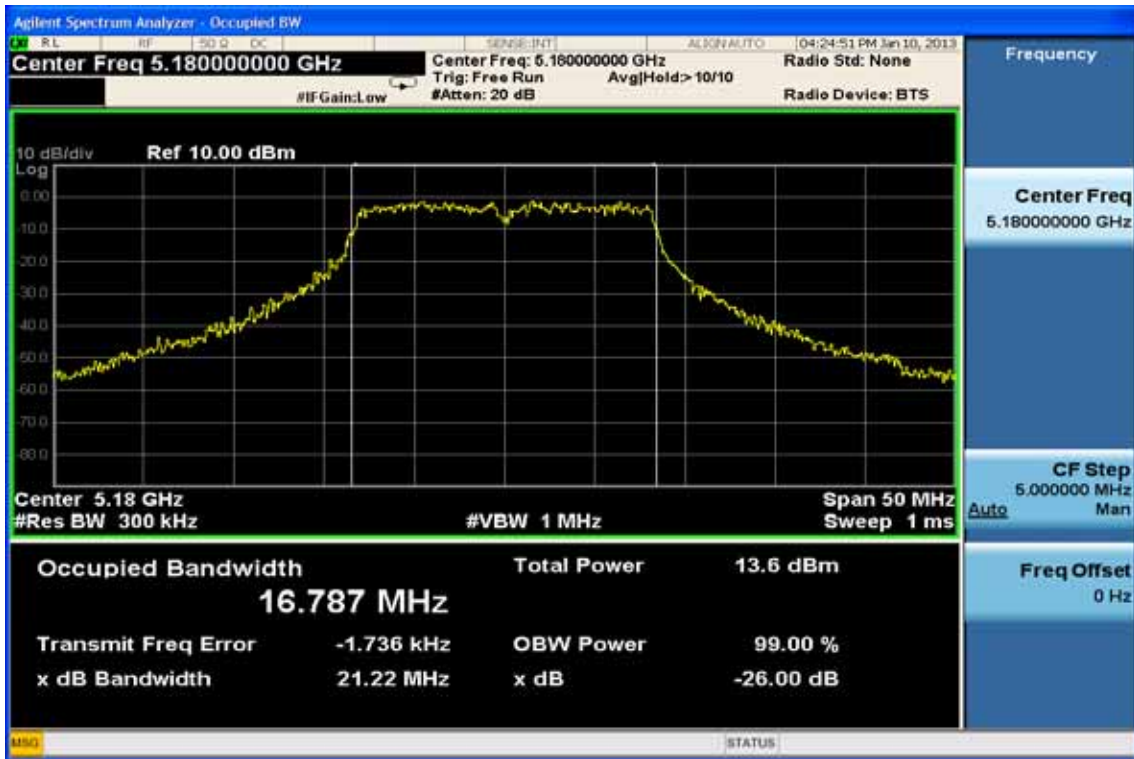
| <b>Frequency<br/>(MHz)</b> | <b>26dB Bandwidth<br/>(MHz)</b> | <b>10 Log (B)<br/>(dB)</b> |
|----------------------------|---------------------------------|----------------------------|
| 5180                       | 21.520                          | 13.33                      |
| 5220                       | 21.520                          | 13.33                      |
| 5240                       | 21.640                          | 13.35                      |

### 802.11n HT40 Mode

| <b>Frequency<br/>(MHz)</b> | <b>26dB Bandwidth<br/>(MHz)</b> | <b>10 Log (B)<br/>(dB)</b> |
|----------------------------|---------------------------------|----------------------------|
| 5190                       | 39.370                          | 15.95                      |
| 5270                       | 39.480                          | 15.96                      |

### 802.11a

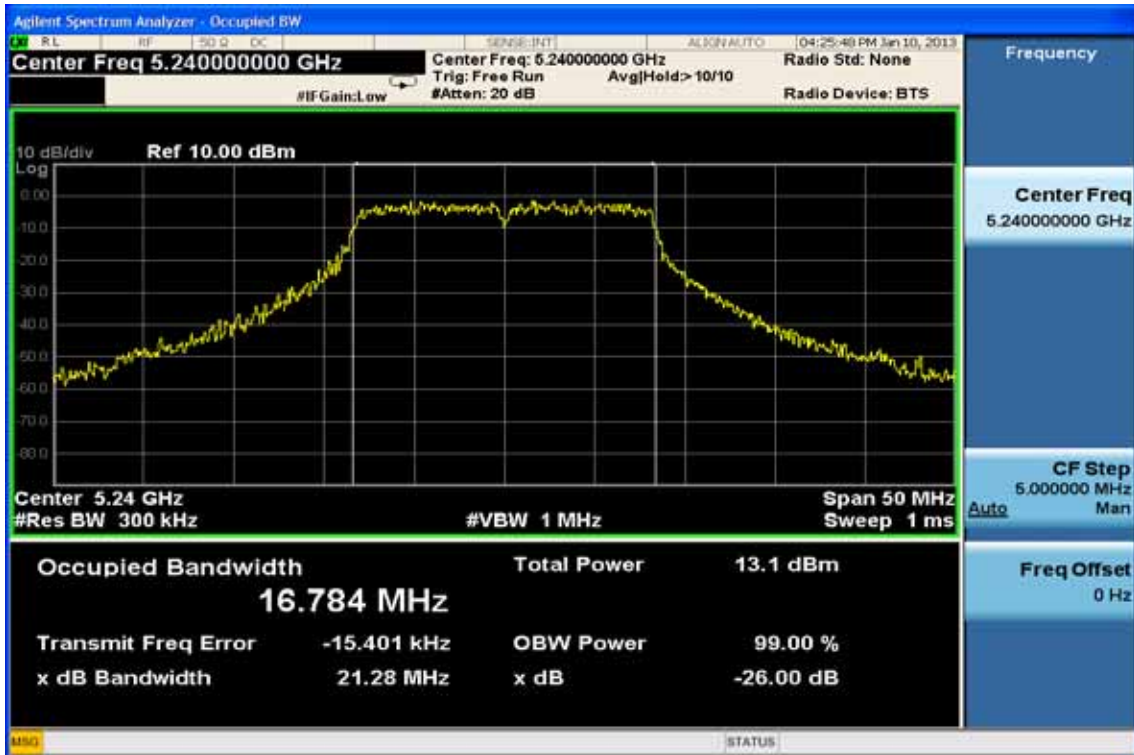
#### 26dB Band Width Test Data CH-Low



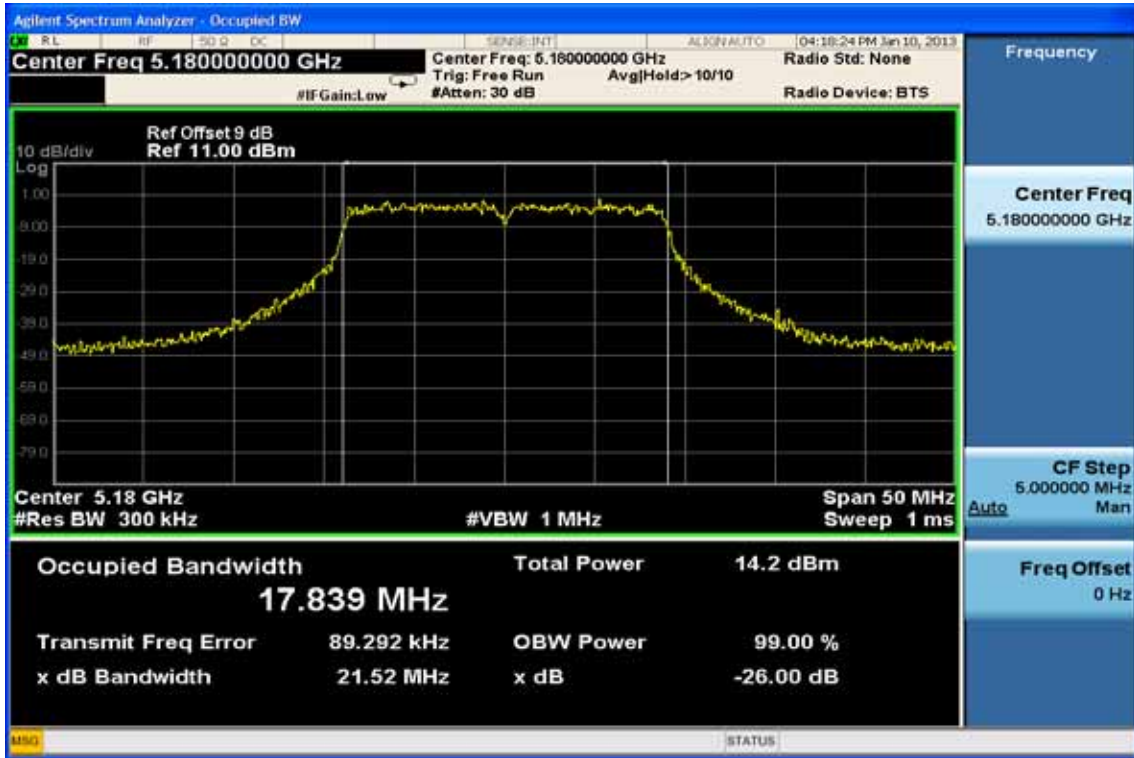
#### 26dB Band Width Test Data CH-Mid



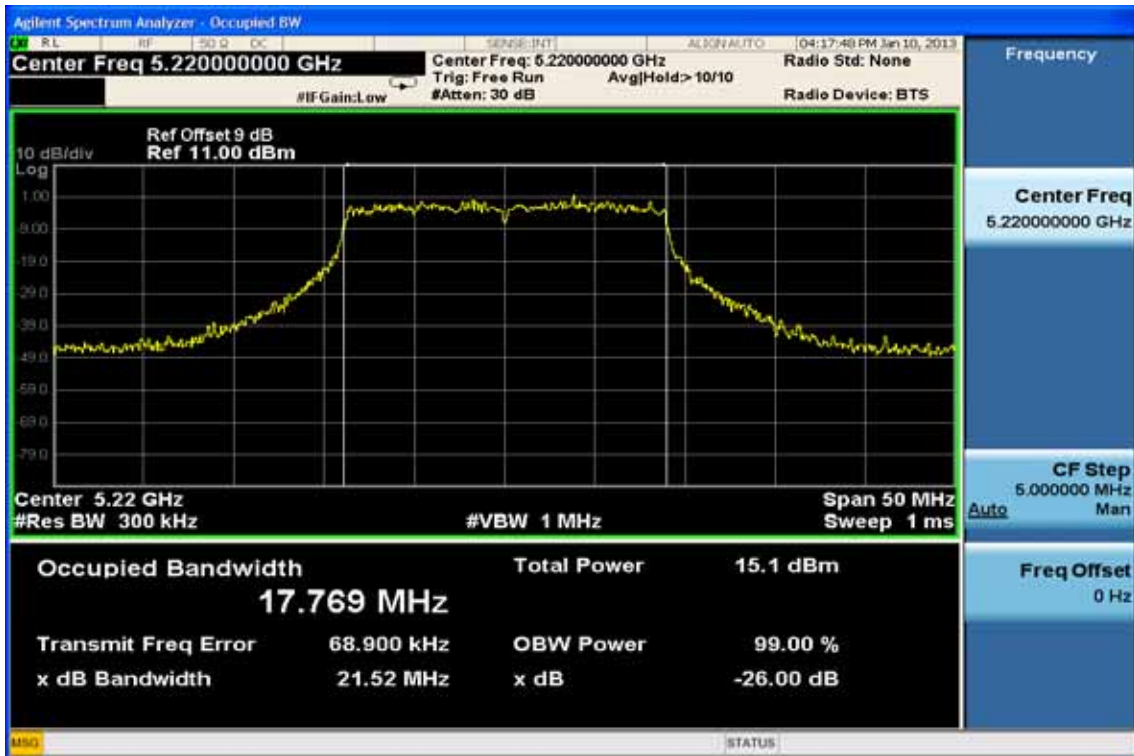
### 26dB Band Width Test Data CH-High



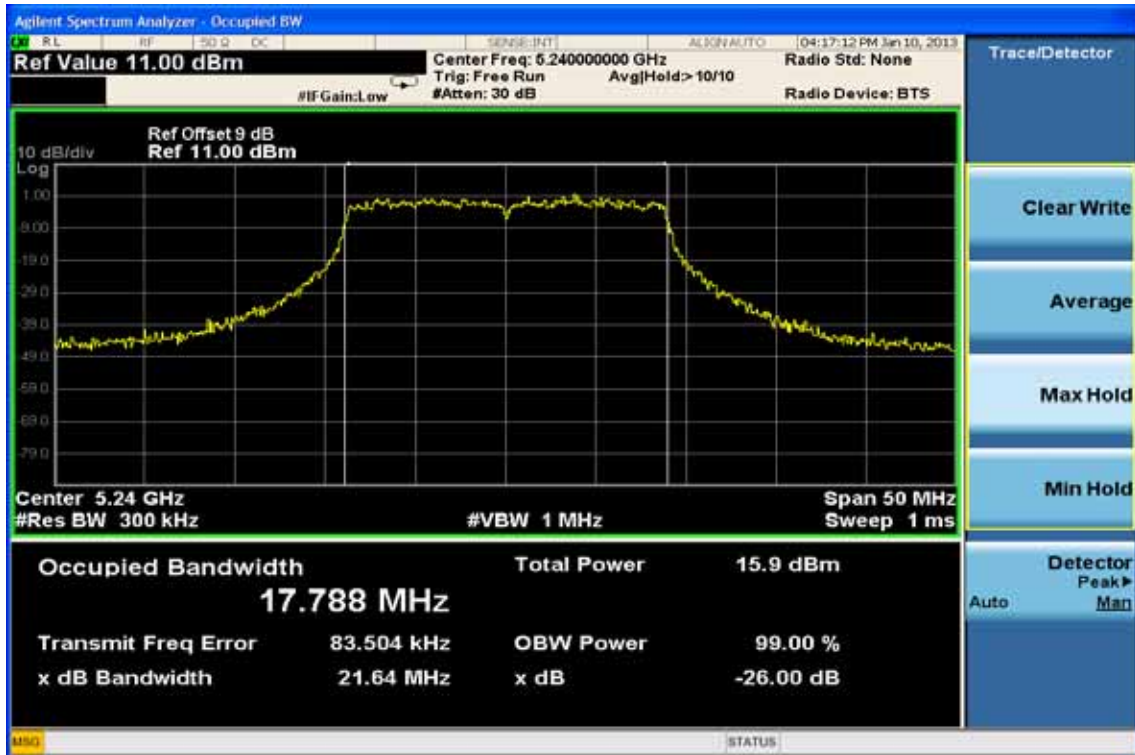
**802.11n HT20  
26dB Band Width Test Data CH-Low**



**26dB Band Width Test Data CH-Mid**



### 26dB Band Width Test Data CH-High





### 802.11n HT40 26dB Band Width Test Data CH-Low



### 26dB Band Width Test Data CH-High



## **8. PEAK POWER SPECTRAL DENSITY**

### **8.1 Standard Applicable**

According to §15.407(a)

1. For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4 dBm in any 1-MHz band.
2. For the band 5.25-5.35 GHz and 5.47-5.725GHz, the peak power spectral density shall not exceed 11 dBm in any 1-MHz band.
3. For the band 5.725-5.825 GHz, the peak power spectral density shall not exceed 17 dBm in any 1-MHz band.

### **8.2 Measurement Procedure**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.
3. Set RBW=1MHz,VBW=3MHz, Span=50MHz (Base Mode), Sweep time = Auto, traces 100 sweeps of video averaging.
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

**Refer to section E of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02**

### **8.3 Measurement Equipment Used:**

Refer to section 6.3 for details.

### **8.4 Test Set-up:**

Refer to section 6.4 for details.

### 8.5 Measurement Result

#### 802.11a Mode

| Frequency MHz | RF Power Density Reading (dBm) | Cable loss (dB) | Maximum Limit (dBm) |
|---------------|--------------------------------|-----------------|---------------------|
| 5180          | 3.717                          | 0.00            | 4                   |
| 5220          | 3.781                          | 0.00            | 4                   |
| 5240          | 3.679                          | 0.00            | 4                   |

#### 802.11n HT20

| Frequency MHz | Chain A RF Power Density Reading (dBm) | Chain A RF Power Density Reading (dBm) | Cable loss (dB) | RF Power Density Level (dBm) | Maximum Limit (dBm) |
|---------------|--|--|-----------------|------------------------------|---------------------|
| 5180          | 0.652                                  | 0.721                                  | 0.00            | 3.697                        | 4                   |
| 5220          | 0.434                                  | 0.931                                  | 0.00            | 3.700                        | 4                   |
| 5240          | 0.638                                  | 0.980                                  | 0.00            | 3.823                        | 4                   |

#### 802.11n HT40 Mode

| Frequency MHz | Chain A RF Power Density Reading (dBm) | Chain B RF Power Density Reading (dBm) | Cable loss (dB) | RF Power Density Level (dBm) | Maximum Limit (dBm) |
|---------------|--|--|-----------------|------------------------------|---------------------|
| 5190          | 0.480                                  | 0.997                                  | 0.00            | 3.756                        | 4                   |
| 5270          | 0.694                                  | 0.899                                  | 0.00            | 3.808                        | 4                   |



### Peak Power Spectral Density Data Plot (CH High)



**802.11n HT20 (Antenna A Port)  
Power Spectral Density Test Plot (CH-Low)**



**Power Spectral Density Test Plot (CH-Mid)**





### 802.11n HT20 for 5GHz (Antenna B Port) Power Spectral Density Test Plot (CH-Low)



### Power Spectral Density Test Plot (CH-Mid)







### 802.11n HT40 (Antenna A Port) Power Spectral Density Test Plot (CH-Low)



### Power Spectral Density Test Plot (CH-High)



**802.11n HT40 for 5GHz (Antenna B Port)  
Power Spectral Density Test Plot (CH-Low)**



**Power Spectral Density Test Plot (CH-High)**



## 9. PEAK EXCURSION MEASUREMENT

### 9.1 Standard Applicable

15.407(a)(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### 9.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
3. Trace A, Set RBW=1MHz, VBW = 3MHz, Span = 26dBc, Max. hold.
4. Trace B, Set RBW=1MHz, VBW = 30KHz, Span = 26dBc, Max. hold..
5. Delta Mark trace A center frequency and trace B center frequency.
6. Repeat above procedures until all frequency measured were complete.

**Refer to section F of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02**

### 9.3 Measurement Equipment Used:

Refer to section 6.3 for details.

### 9.4 Test Set-up:

Refer to section 6.4 for details.

## 9.5 Test Results:

### 802.11a Mode

| Frequency<br>(MHz) | peak excursion<br>(dB) | Limit | Margin |
|--------------------|------------------------|-------|--------|
|                    |                        | (dB)  | (dB)   |
| 5180               | 6.683                  | 13.00 | -6.32  |
| 5220               | 6.809                  | 13.00 | -6.19  |
| 5240               | 6.860                  | 13.00 | -6.14  |

### 802.11n HT20 Mode

| Frequency<br>(MHz) | peak excursion<br>(dB) | Limit | Margin |
|--------------------|------------------------|-------|--------|
|                    |                        | (dB)  | (dB)   |
| 5180               | 6.181                  | 13.00 | -6.82  |
| 5220               | 6.606                  | 13.00 | -6.39  |
| 5240               | 6.899                  | 13.00 | -6.10  |

### 802.11n HT40 Mode

| Frequency<br>(MHz) | peak excursion<br>(dB) | Limit | Margin |
|--------------------|------------------------|-------|--------|
|                    |                        | (dB)  | (dB)   |
| 5190               | 6.240                  | 13.00 | -6.76  |
| 5230               | 6.299                  | 13.00 | -6.70  |

802.11a mode

Peak Excursion Data Plot (CH Low)



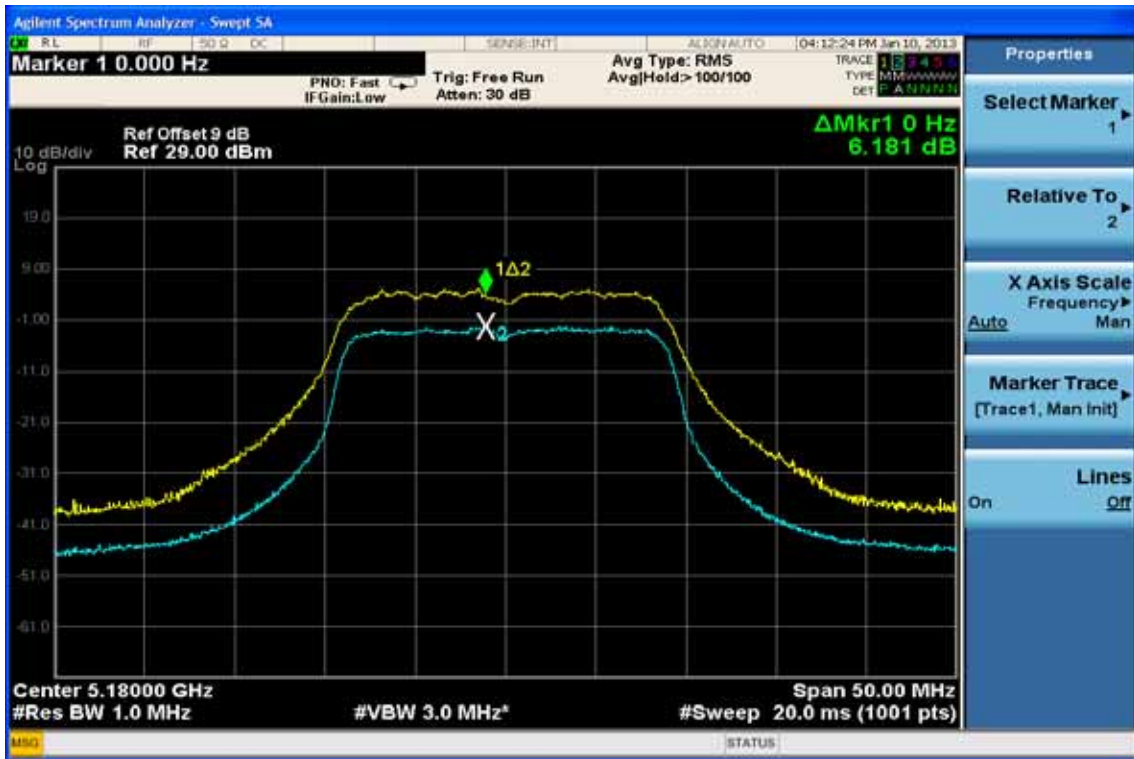
Peak Excursion Data Plot (CH Mid)



### Peak Excursion Data Plot (CH High)



### 802.11n HT20 Mode Peak Excursion Data Plot (CH Low)



### Peak Excursion Data Plot (CH Mid)







### 802.11n HT40 Mode Peak Excursion Data Plot (CH Low)



### Peak Excursion Data Plot (CH High)



## 10. UNDESIRABLE EMISSION - CONDUCTED MEASUREMENT

### 10.1 Standard Applicable

According to §15.407(b),

(b) Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.
- (3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.
- (5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.
- (7) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

## 10.2 Measurement Procedure

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to spectrum.
3. Set Spectrum RBW=1MHz, VBW = 1MHz for peak measurement and 10Hz for average measurement.
4. Set Spectrum at lower/upper band edge and the restricted band adjacent to the lower/upper edge of the authorized band, with the transmitter set to the lowest/highest channel.
5. Set Spectrum over the 30MHz to 40GHz range with the transmitter set to the lowest, middle, and highest channels.

**Refer to section E of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02**

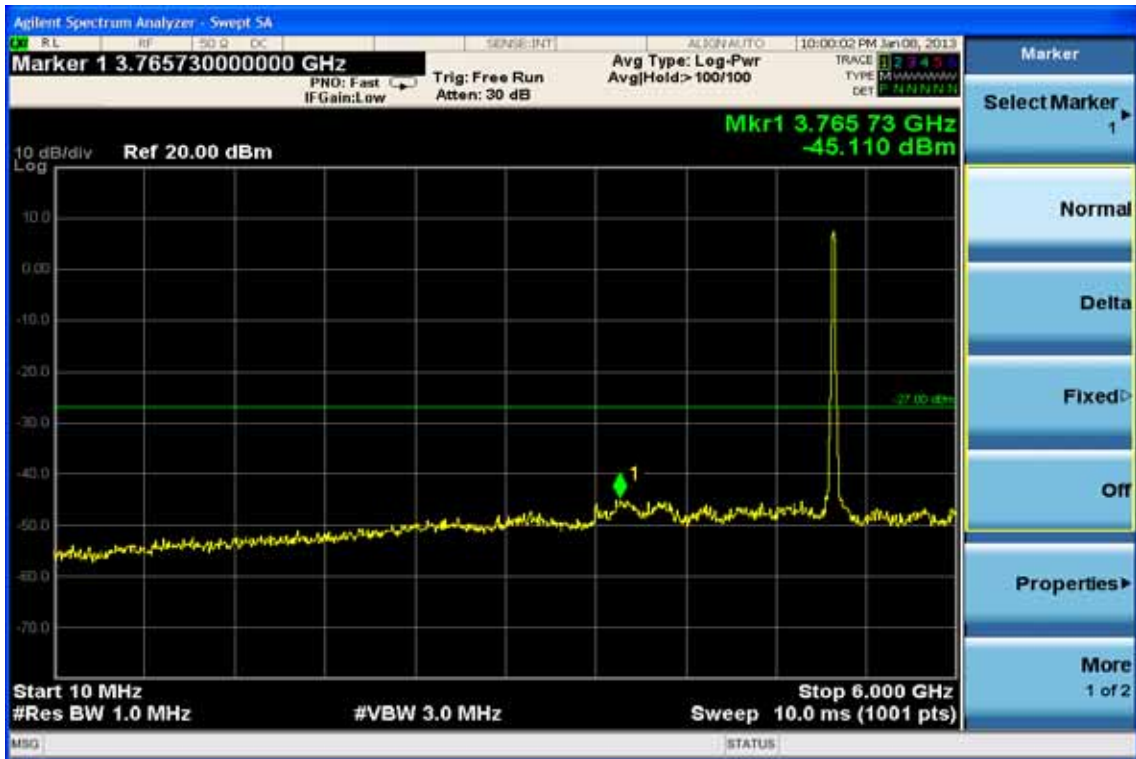
Conducted RF measurements of the transmitter output were made at the band edges and the adjacent restricted bands.

Also, conducted RF measurements of the transmitter output over the 30 MHz to 40 GHz band were made in order to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

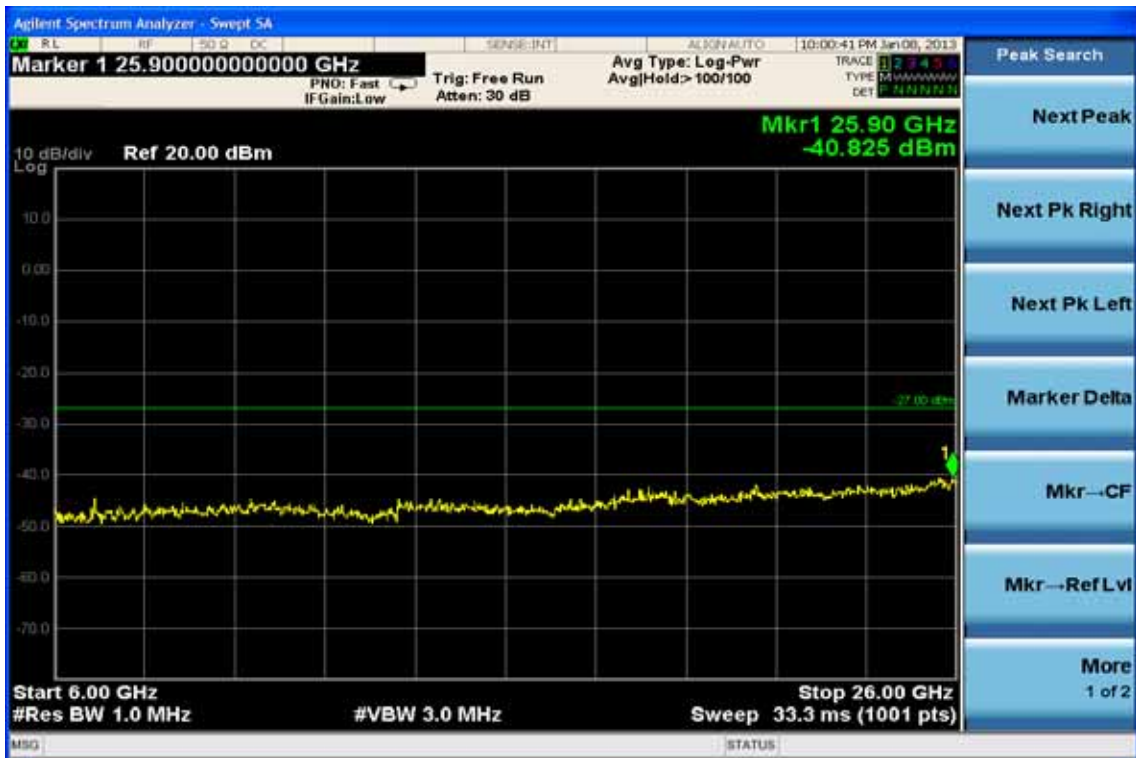
## 10.3 Measurement Equipment Used:

Refer to section 6.3 for details.

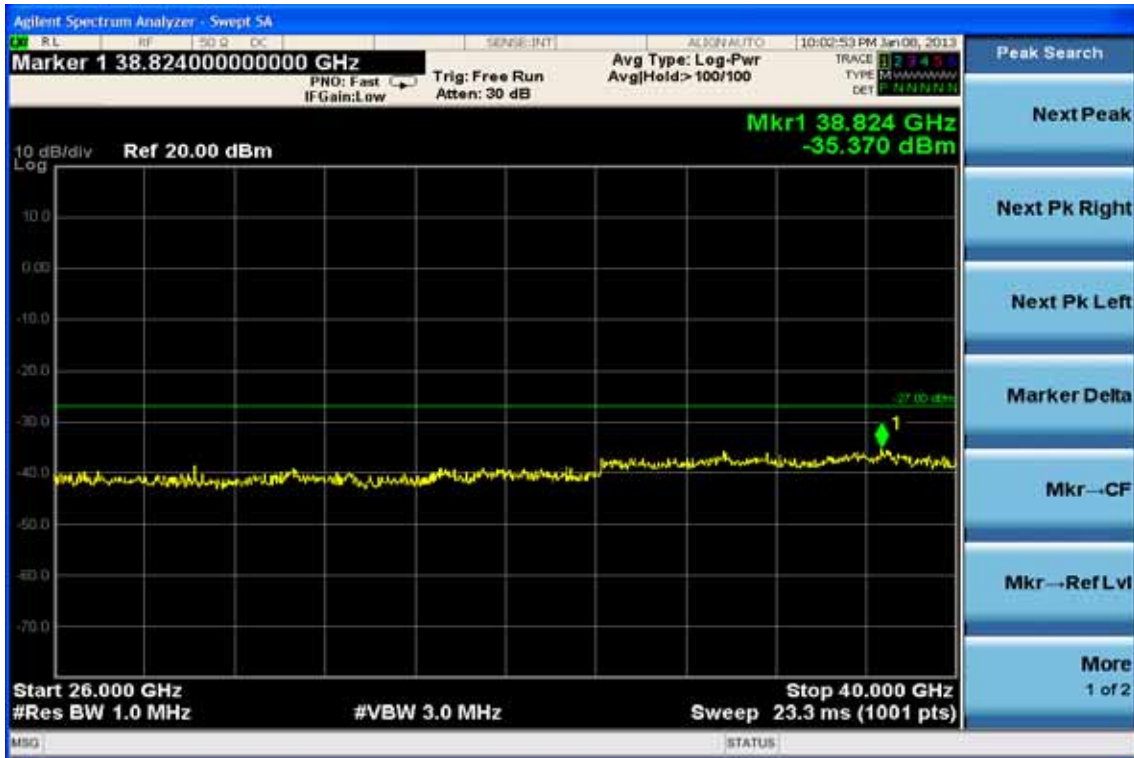
802.11a mode  
Ch Low 30MHz – 6GHz



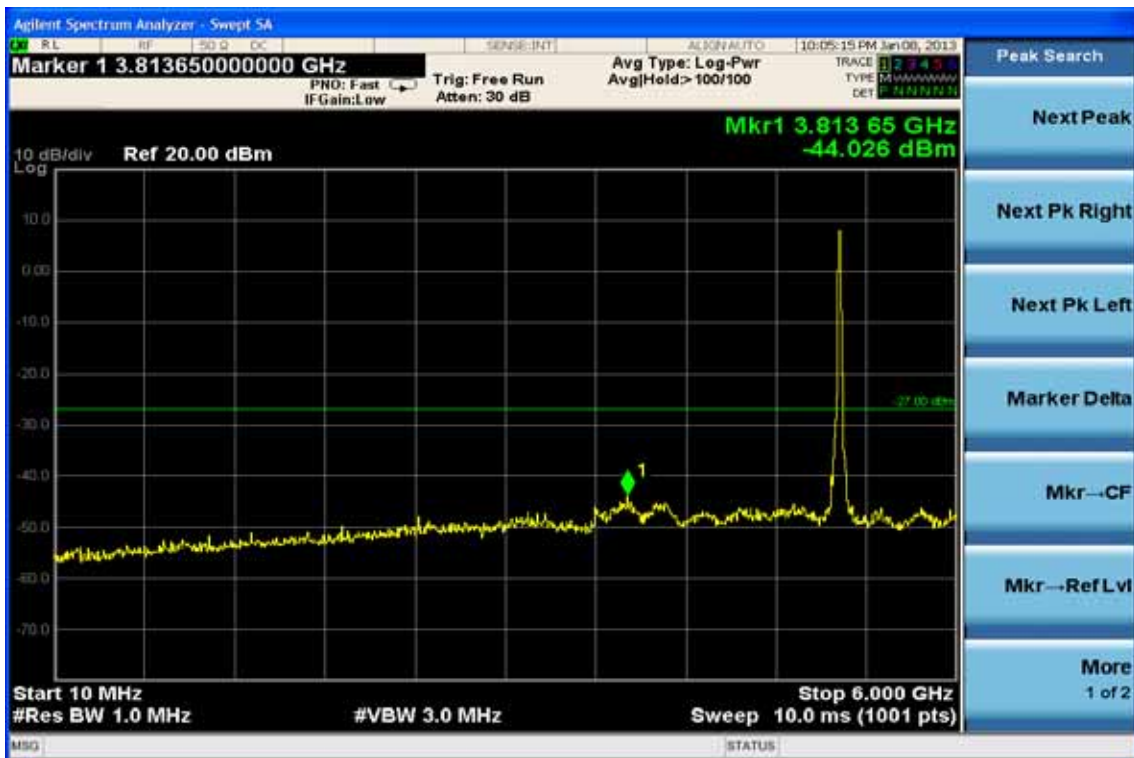
Ch Low 6GHz – 18GHz



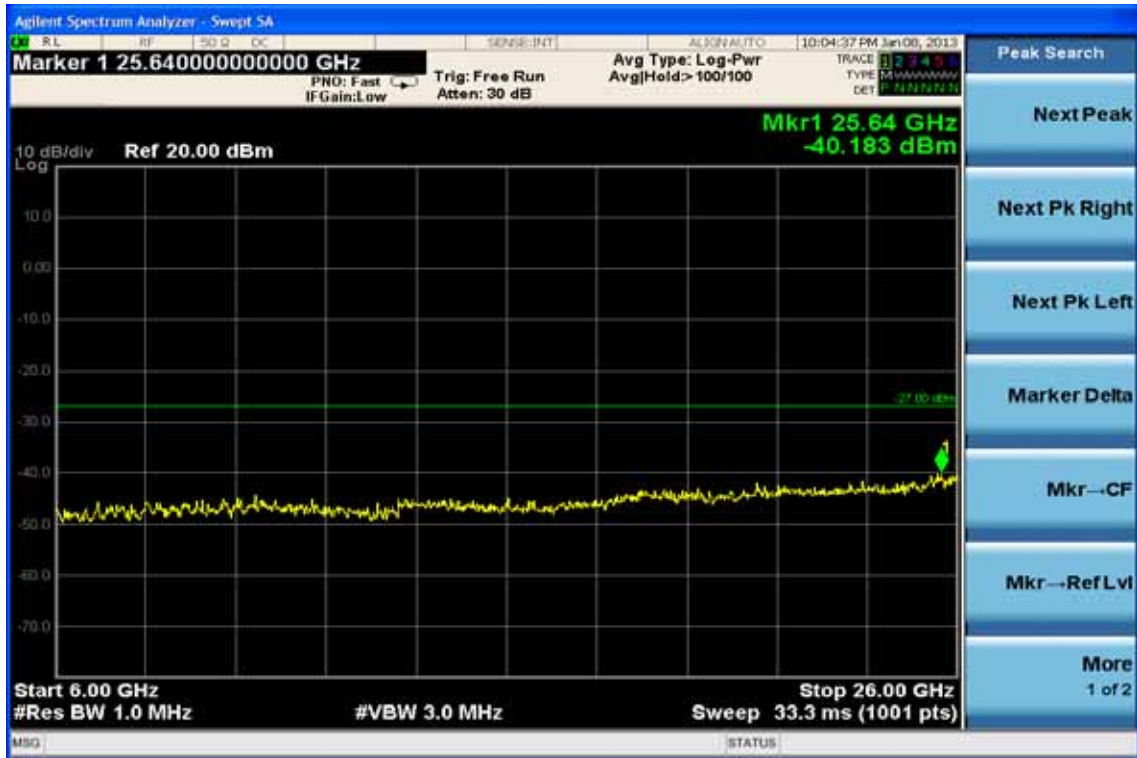
### Ch Low 18GHz – 40GHz



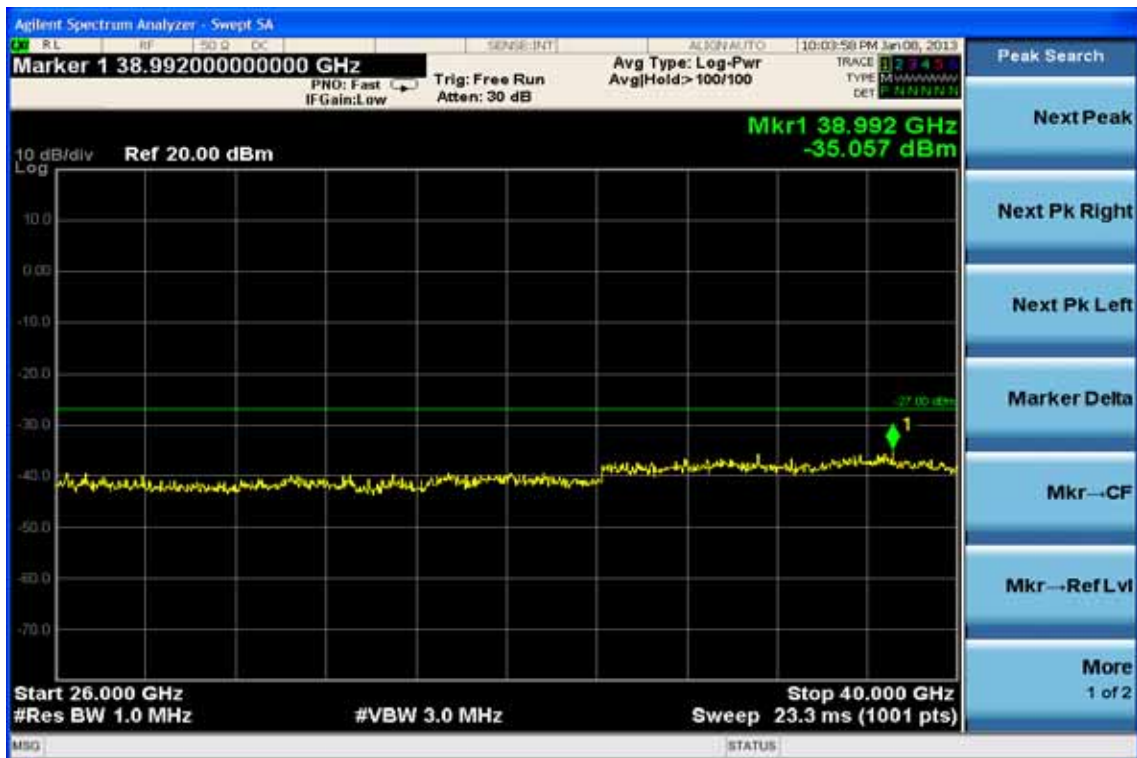
### Ch Mid 30MHz – 6GHz



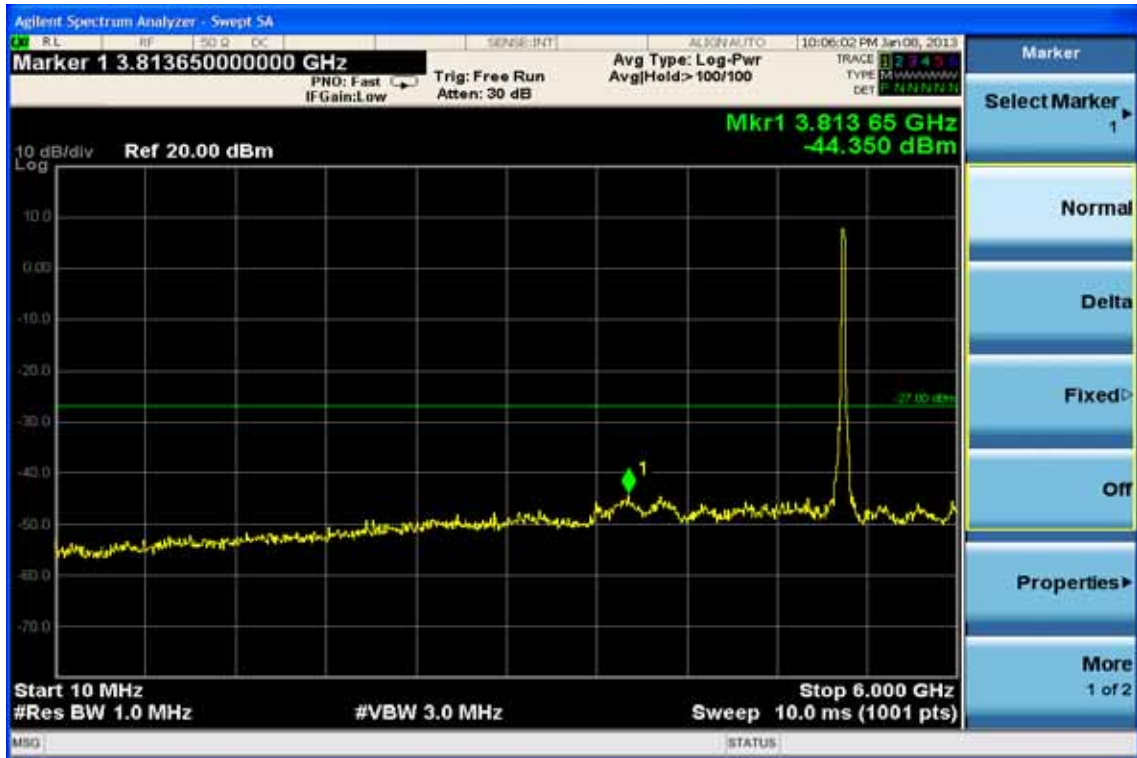
### Ch Mid 6GHz – 18GHz



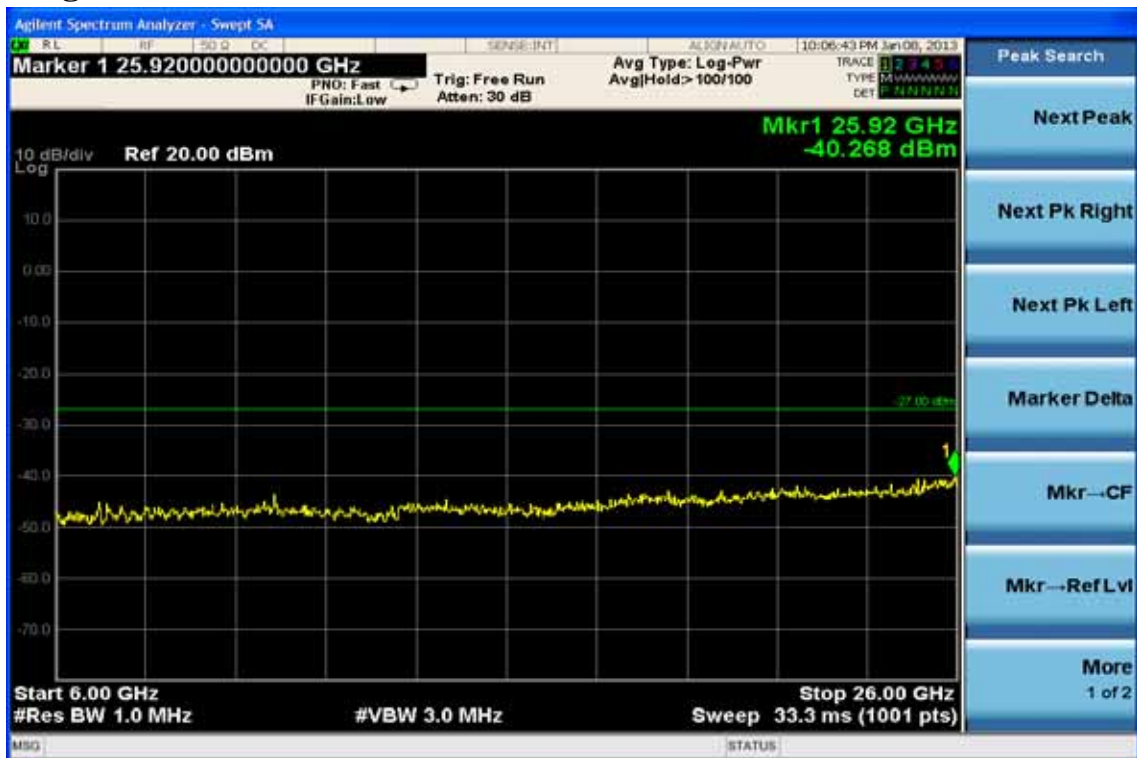
### Ch Mid 18GHz – 40GHz



### Ch High 30MHz – 6GHz

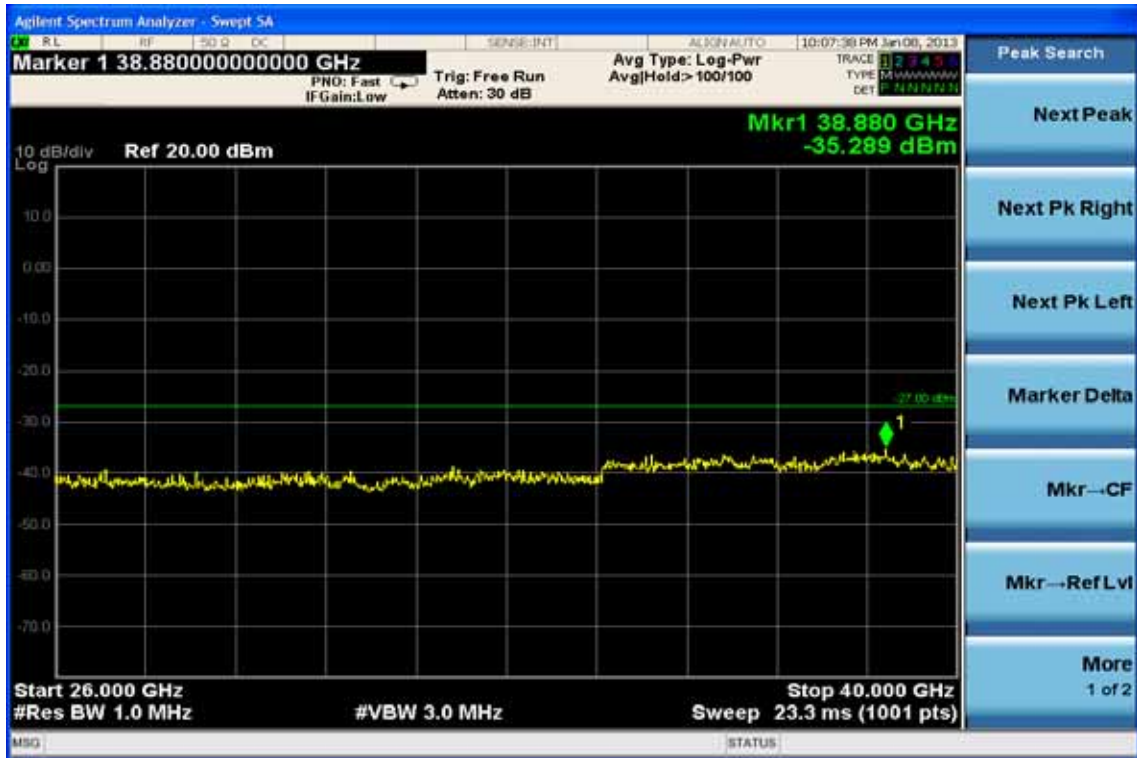


### Ch High 6GHz – 18GHz

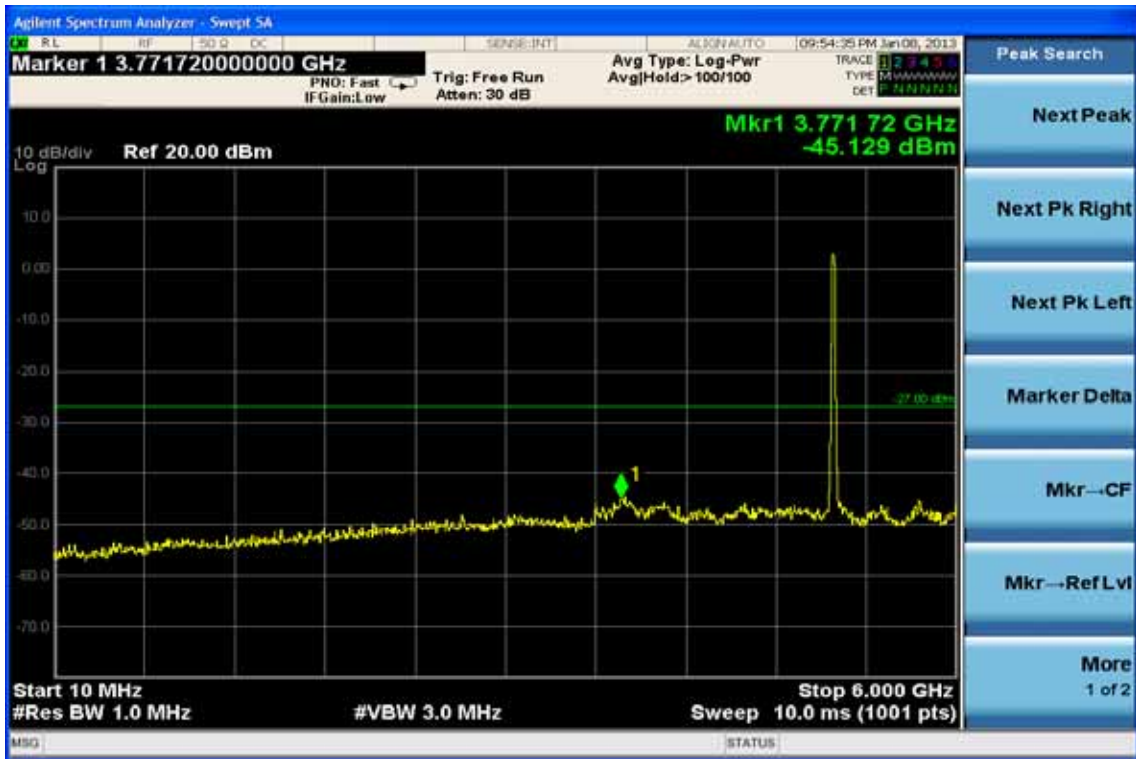




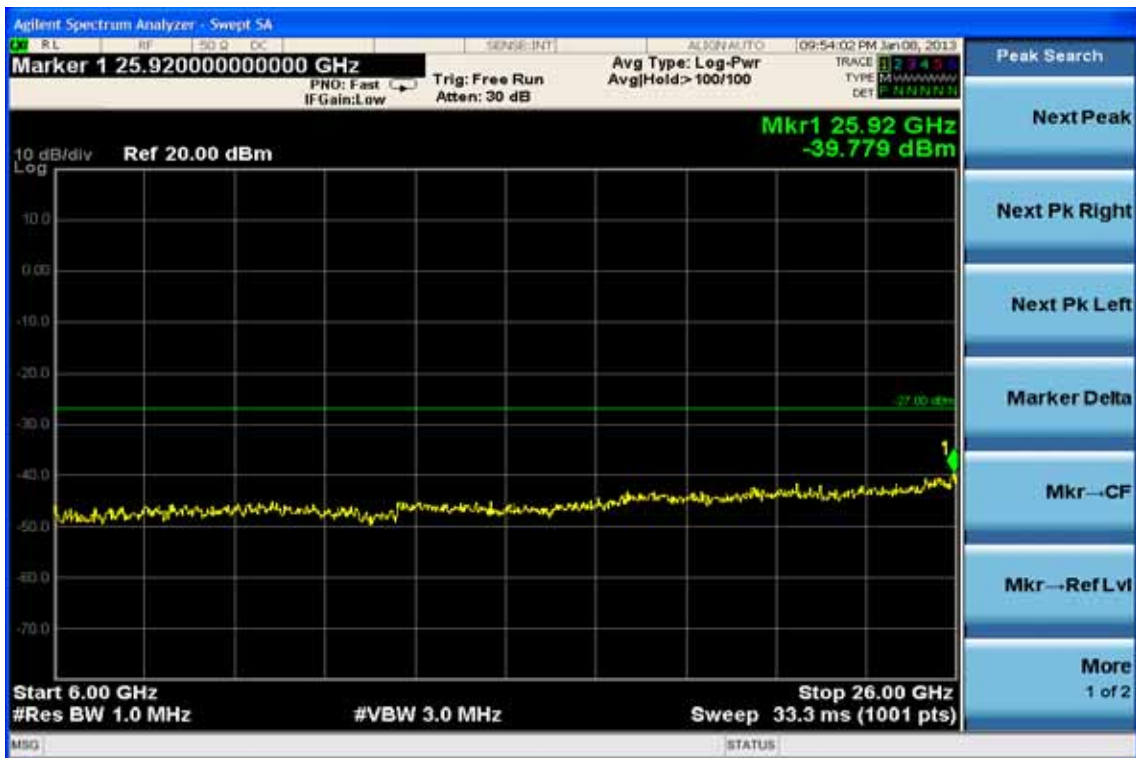
### Ch High 18GHz – 40GHz



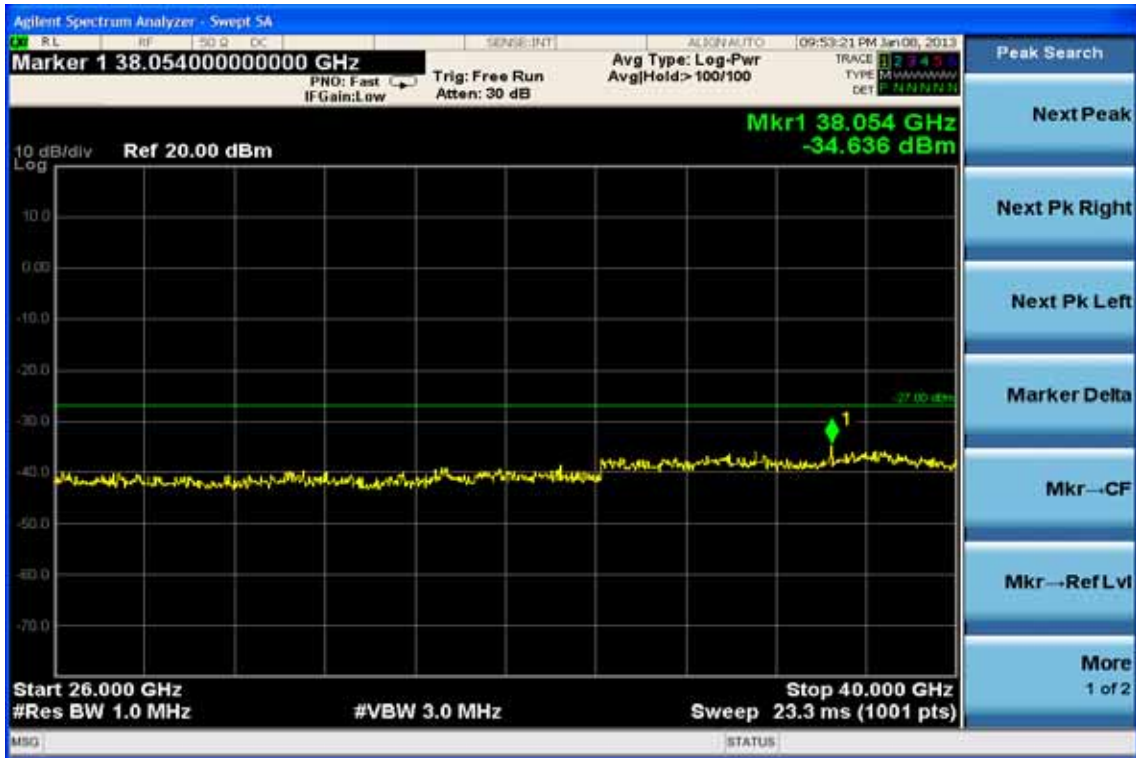
**802.11n HT20 Mode (Antenna A Port)**  
**Ch Low 30MHz – 6GHz**



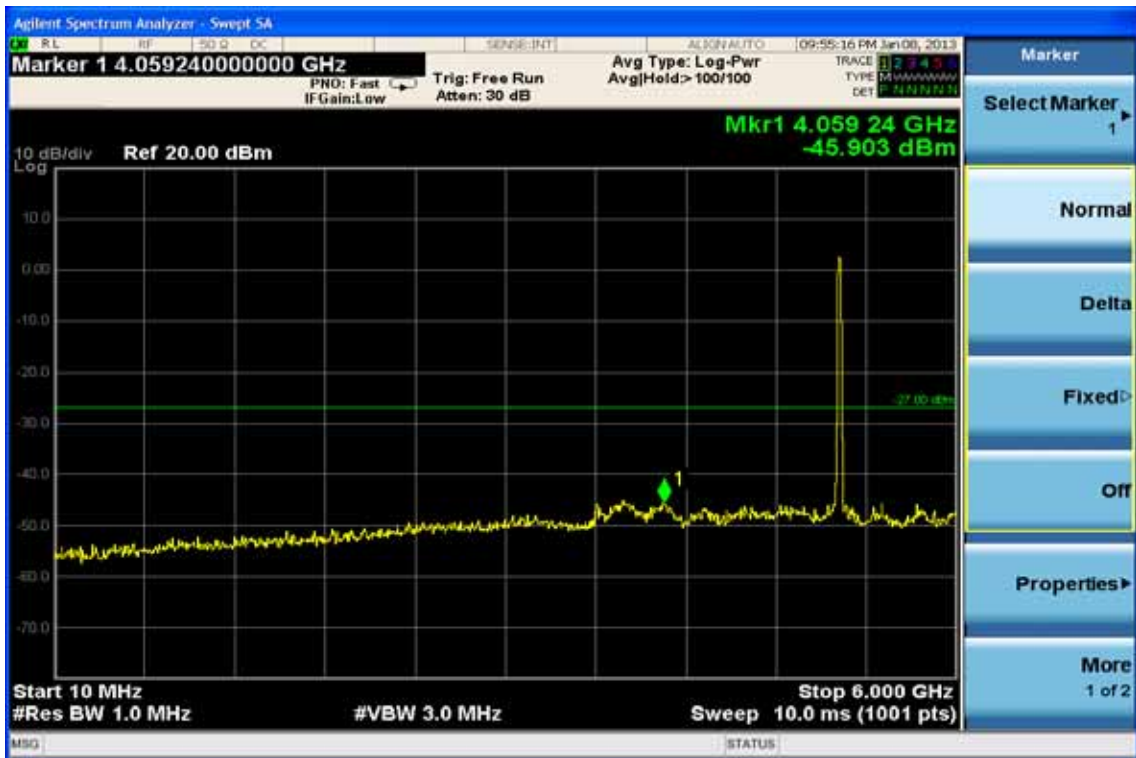
**Ch Low 6GHz – 18GHz**



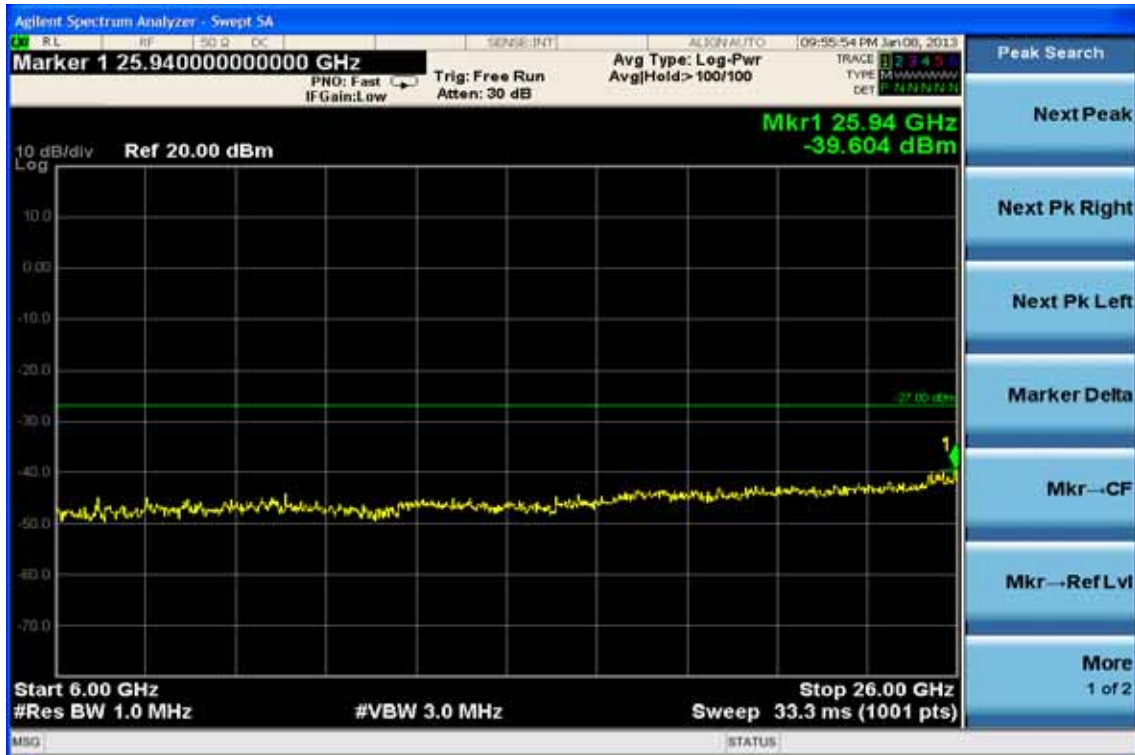
Ch Low 18GHz – 40GHz



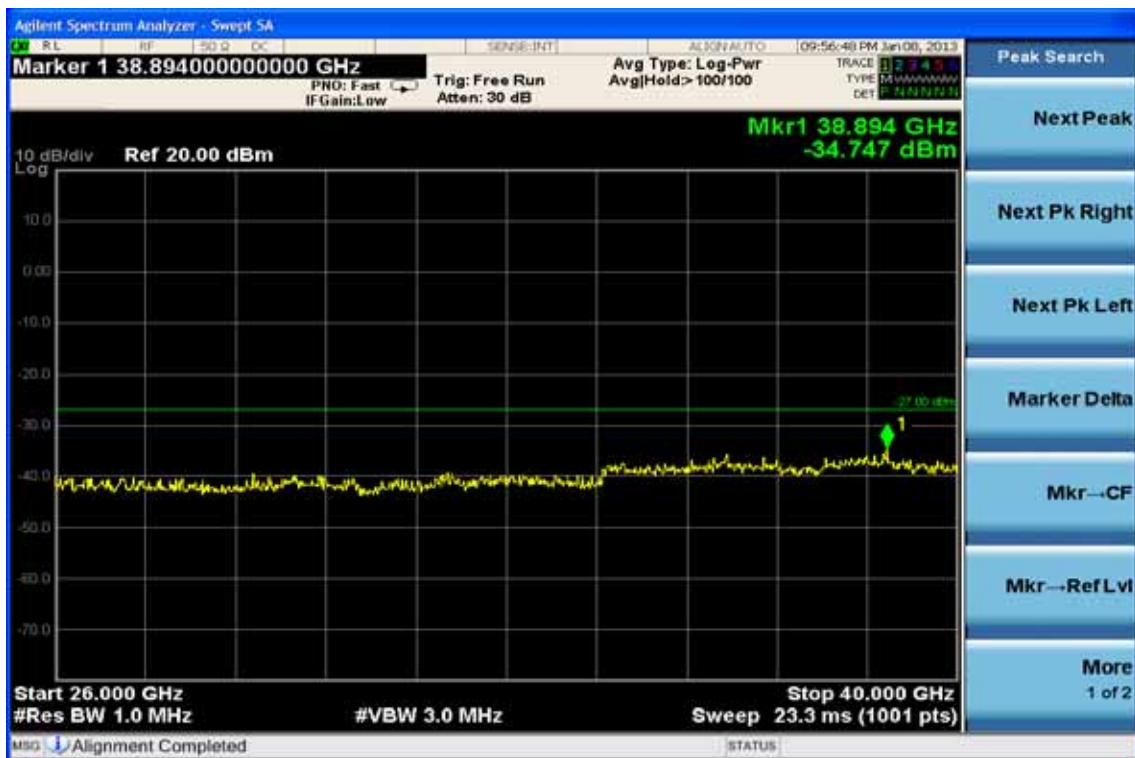
Ch Mid 30MHz – 6GHz



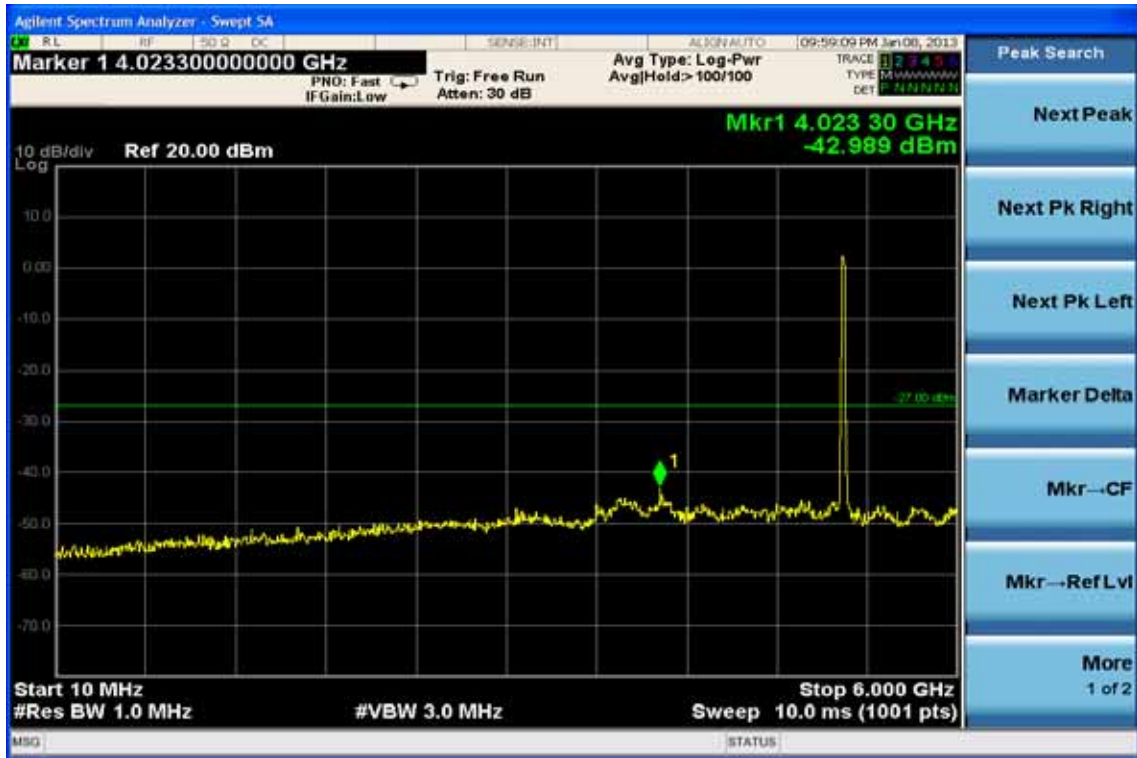
### Ch Mid 6GHz – 18GHz



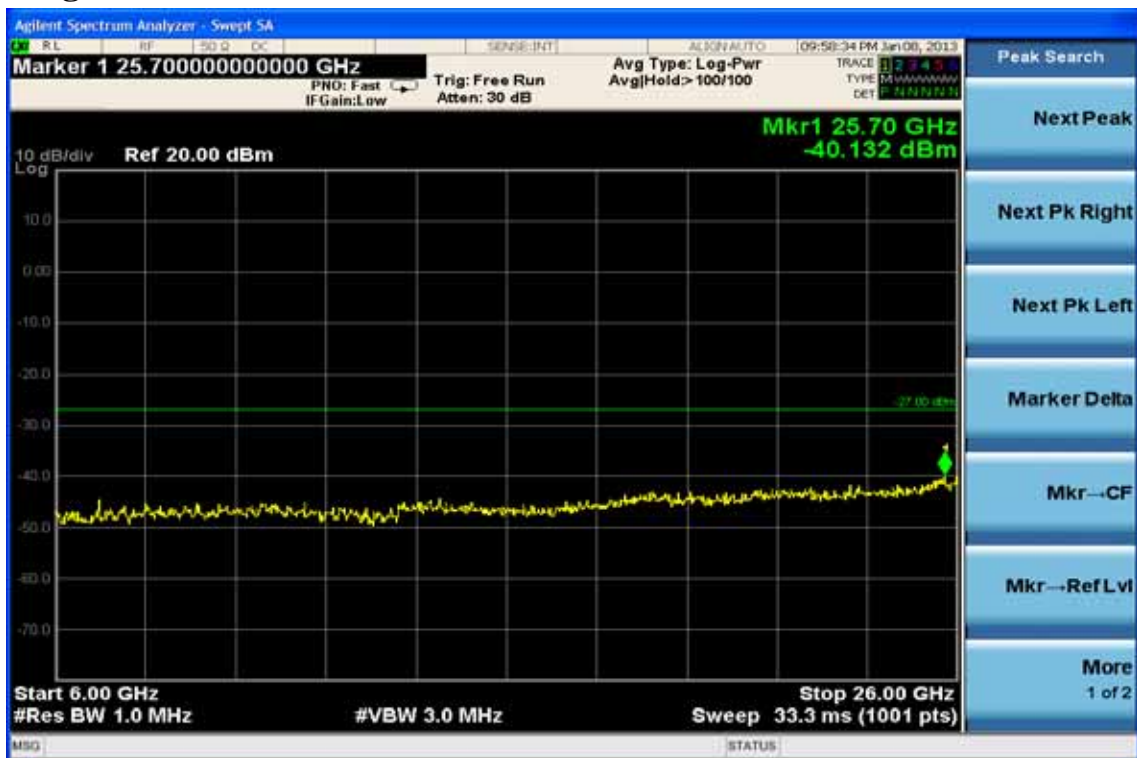
### Ch Mid 18GHz – 40GHz



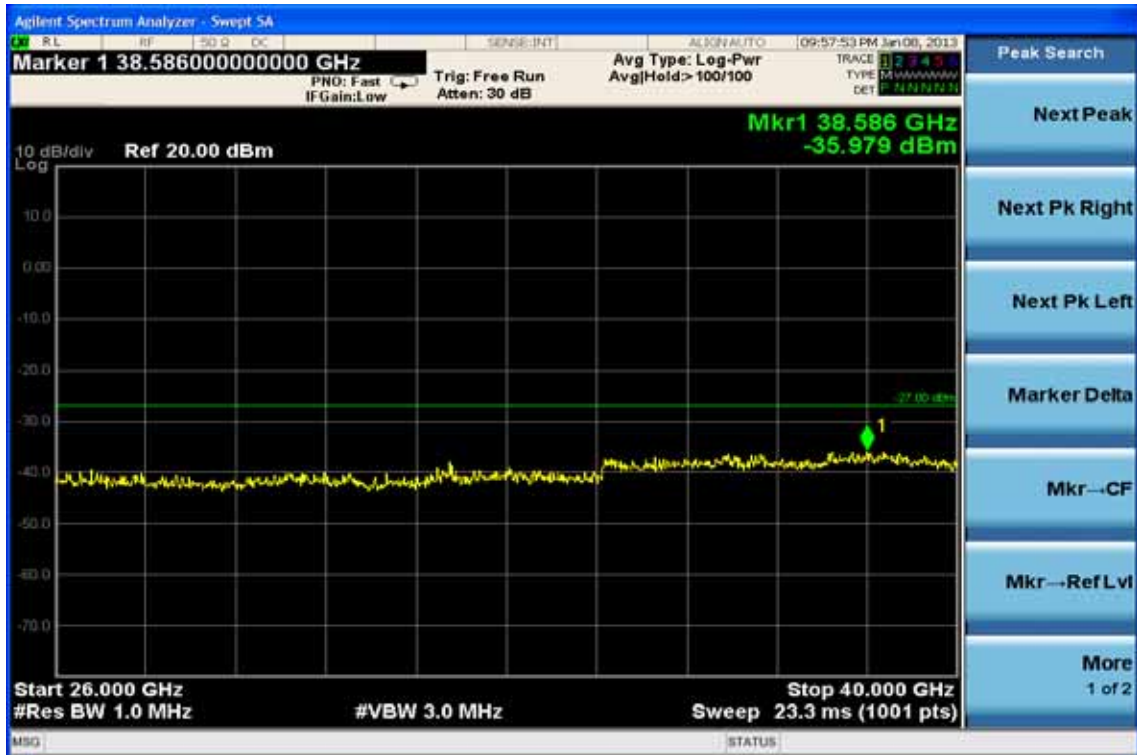
### Ch High 30MHz – 6GHz



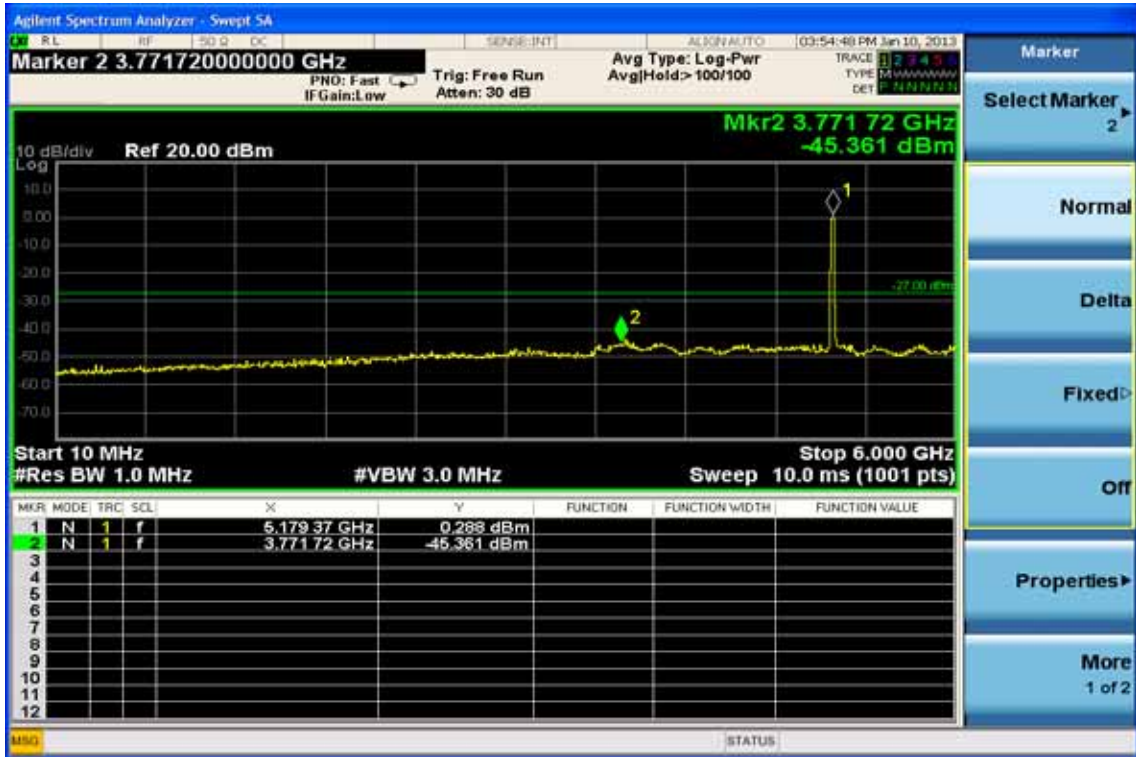
### Ch High 6GHz – 18GHz



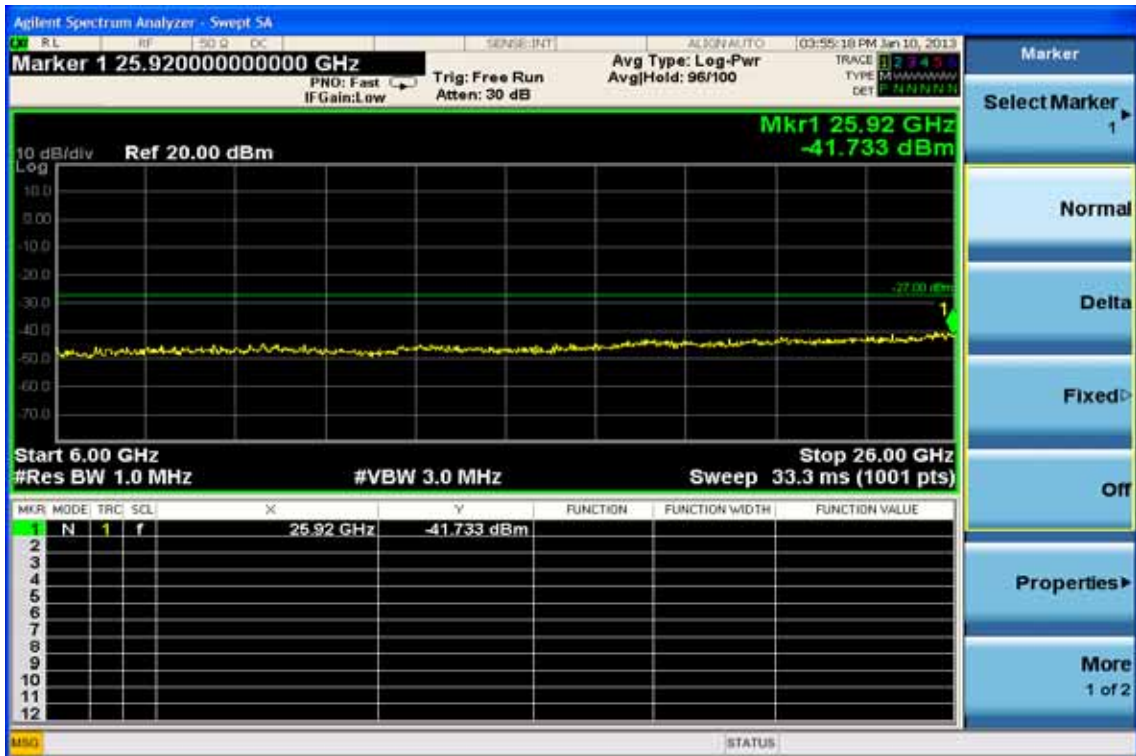
### Ch High 18GHz – 40GHz



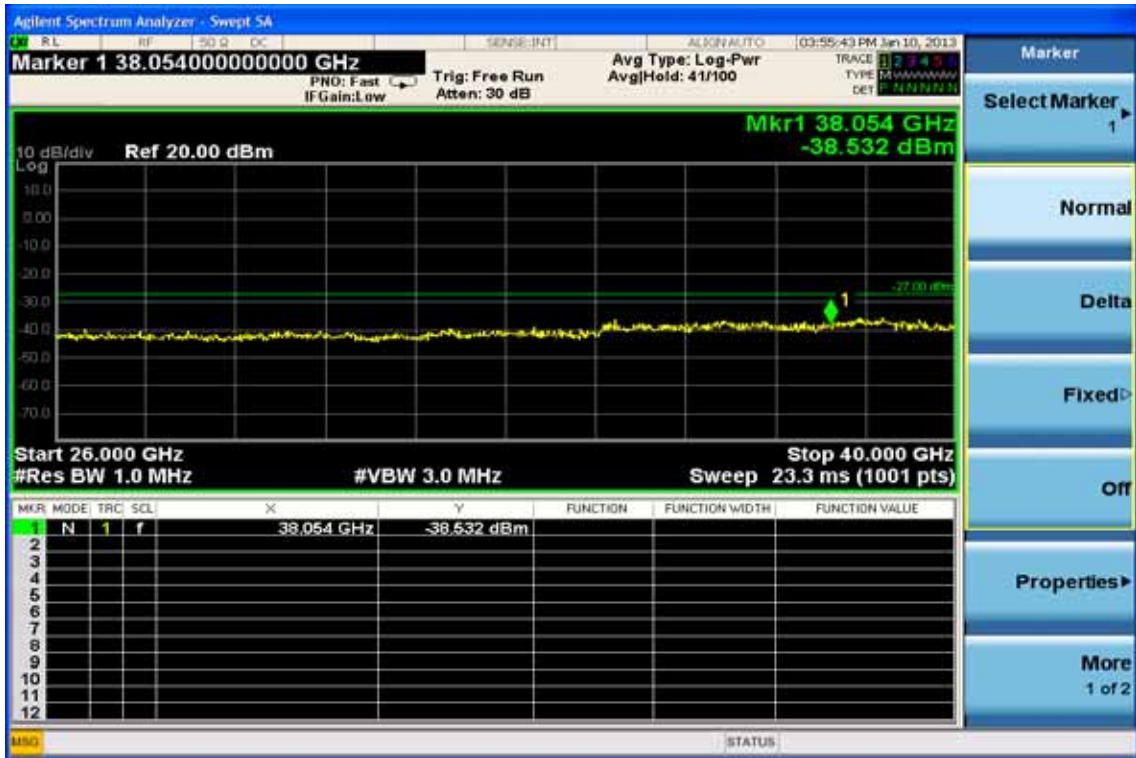
### 802.11n HT20 Mode (Antenna B Port) Ch Low 30MHz – 6GHz



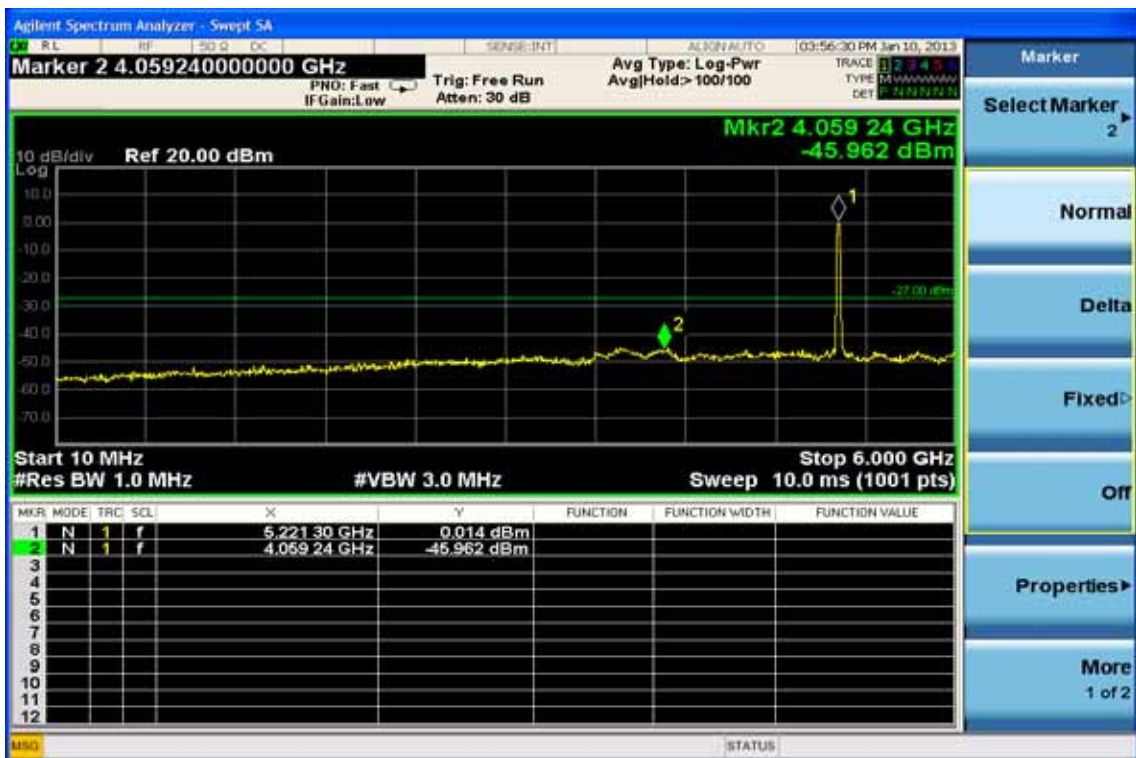
### Ch Low 6GHz – 18GHz



### Ch Low 18GHz – 40GHz

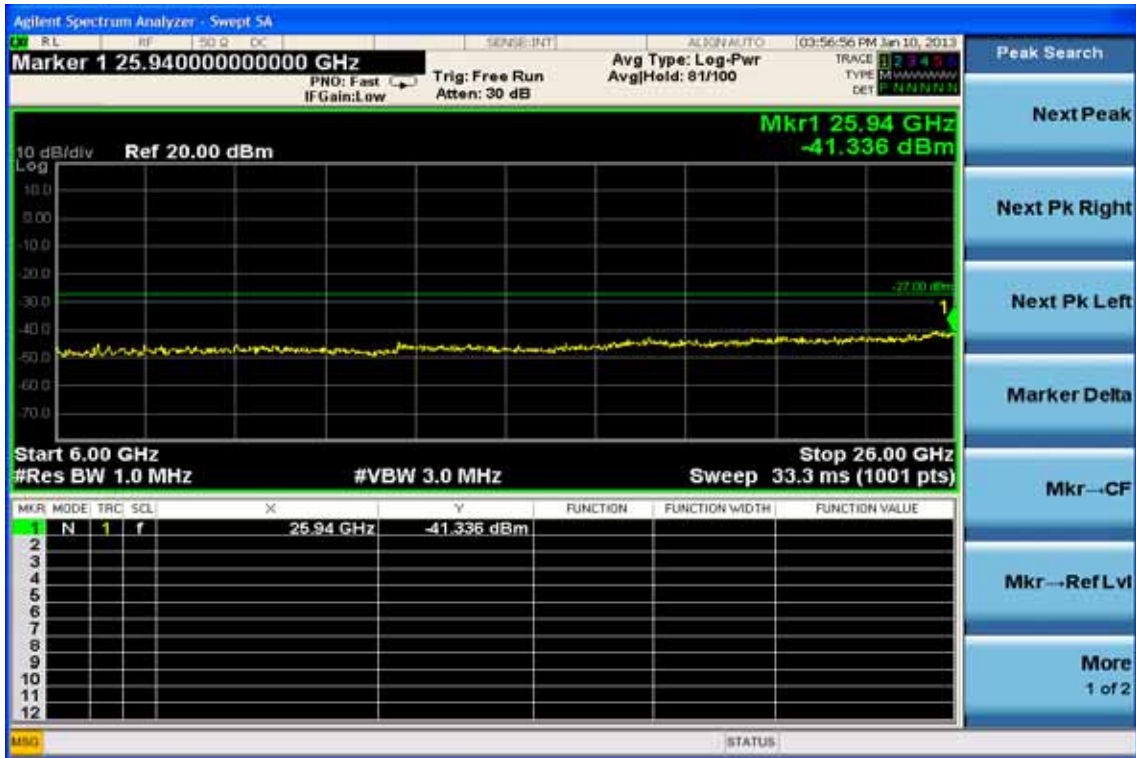


### Ch Mid 30MHz – 6GHz

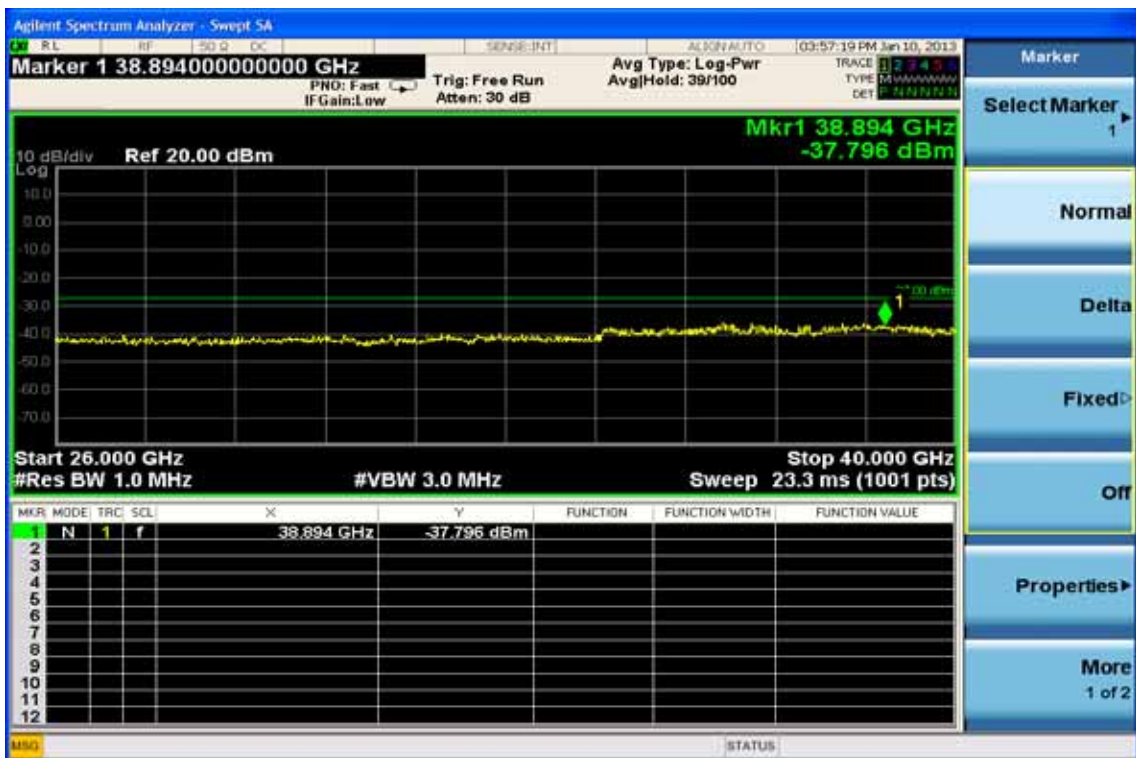




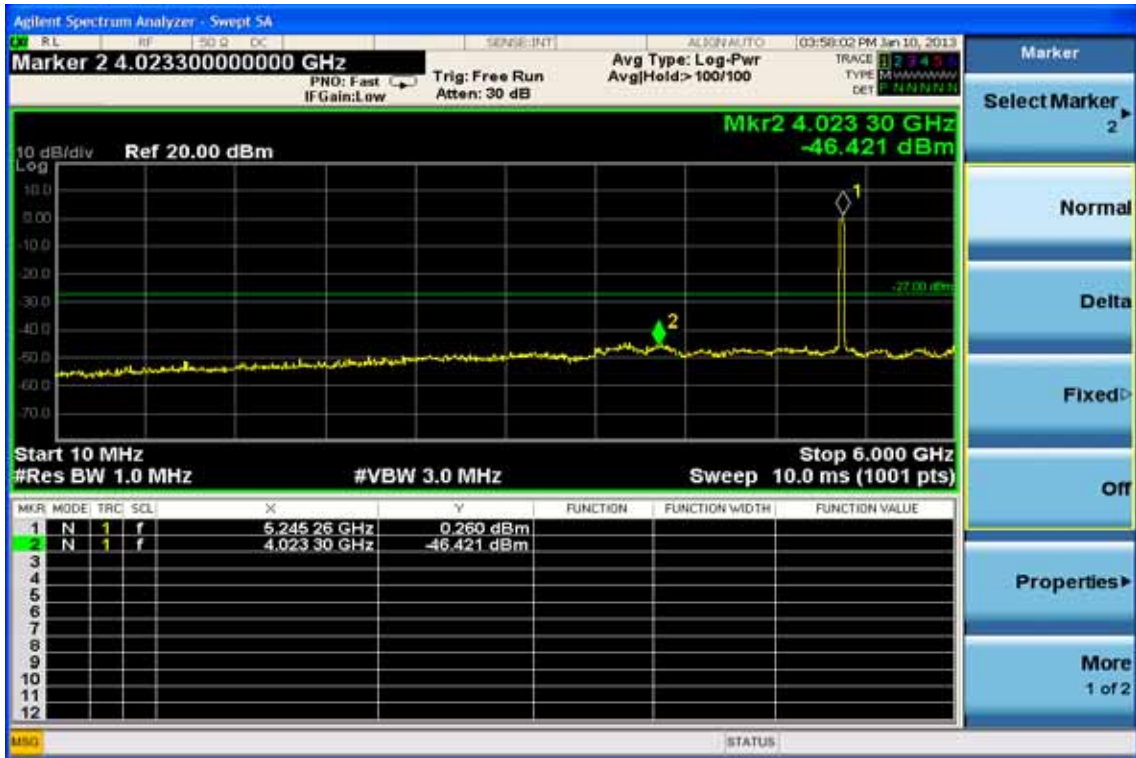
### Ch Mid 6GHz – 18GHz



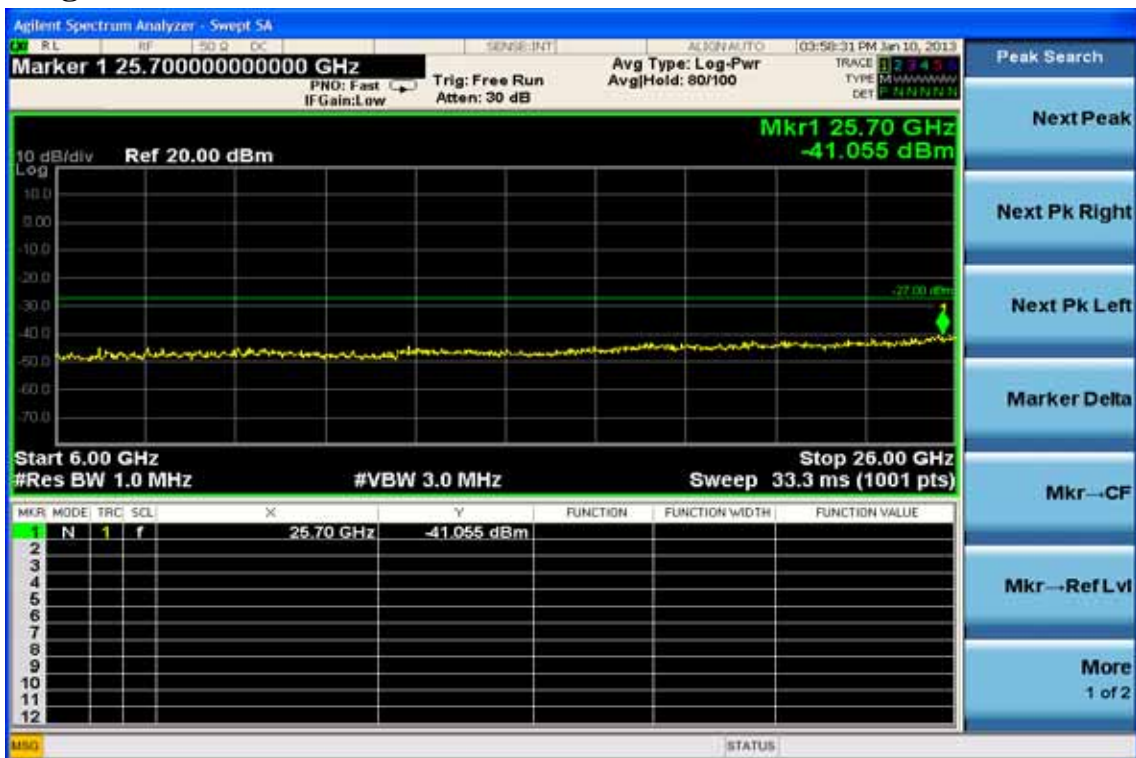
### Ch Mid 18GHz – 40GHz



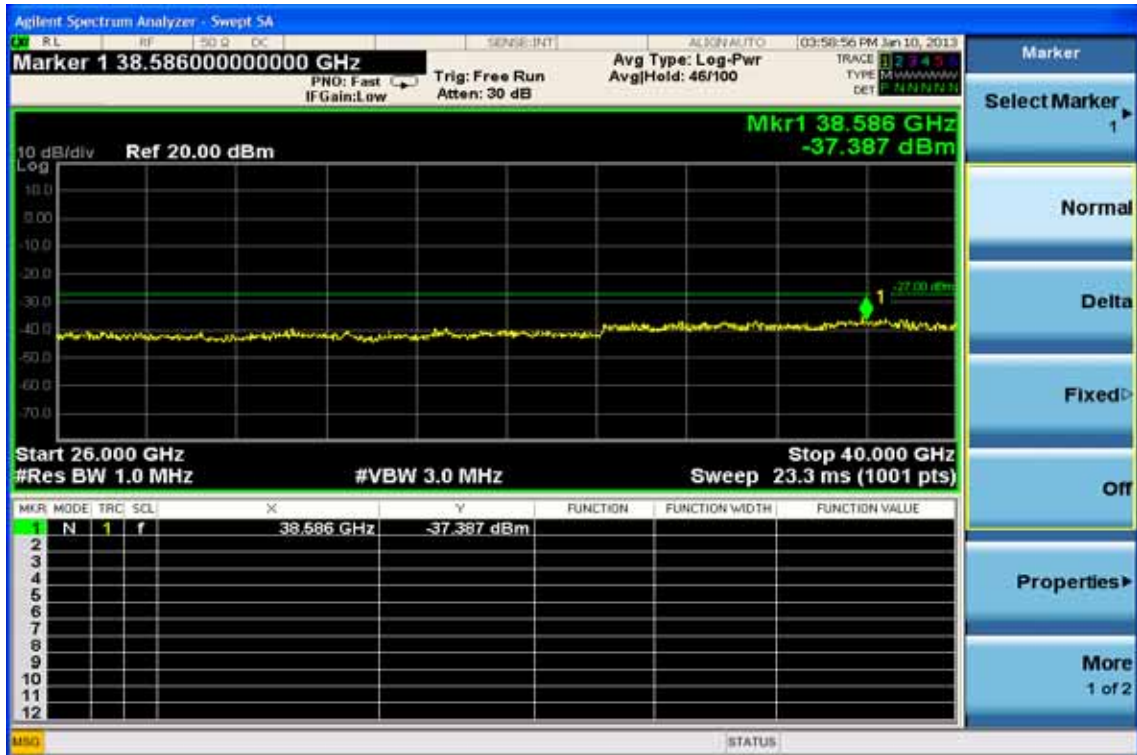
### Ch High 30MHz – 6GHz



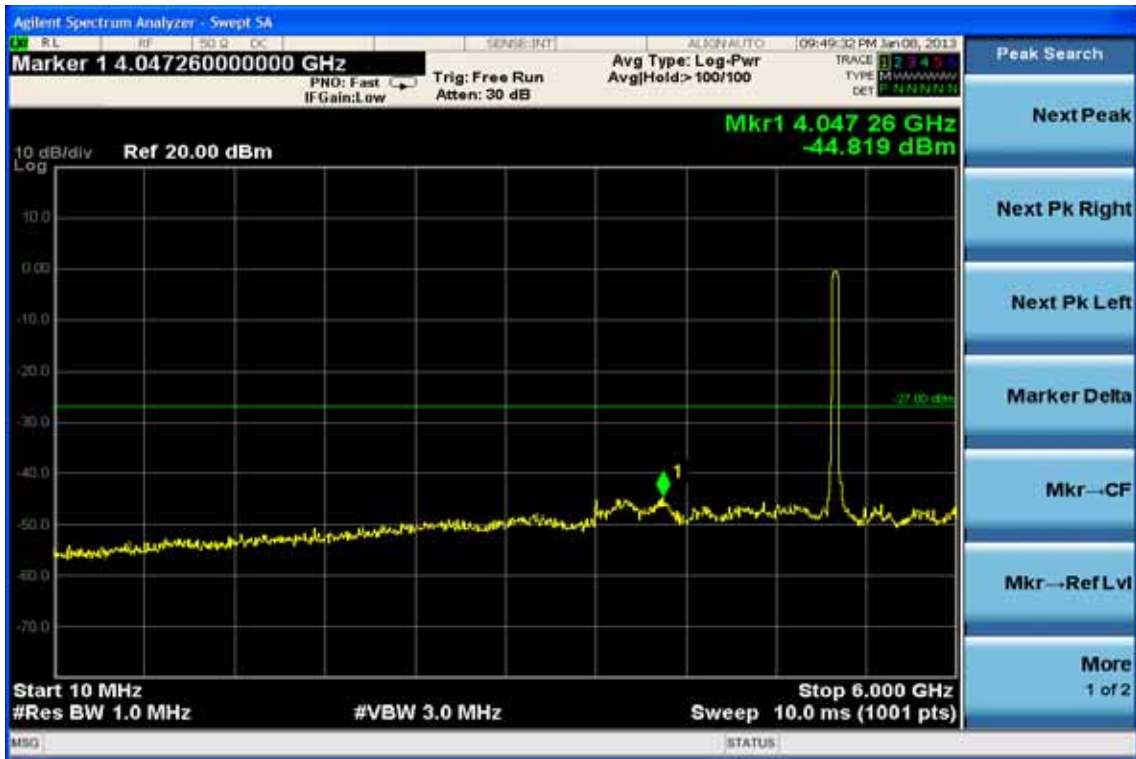
### Ch High 6GHz – 18GHz



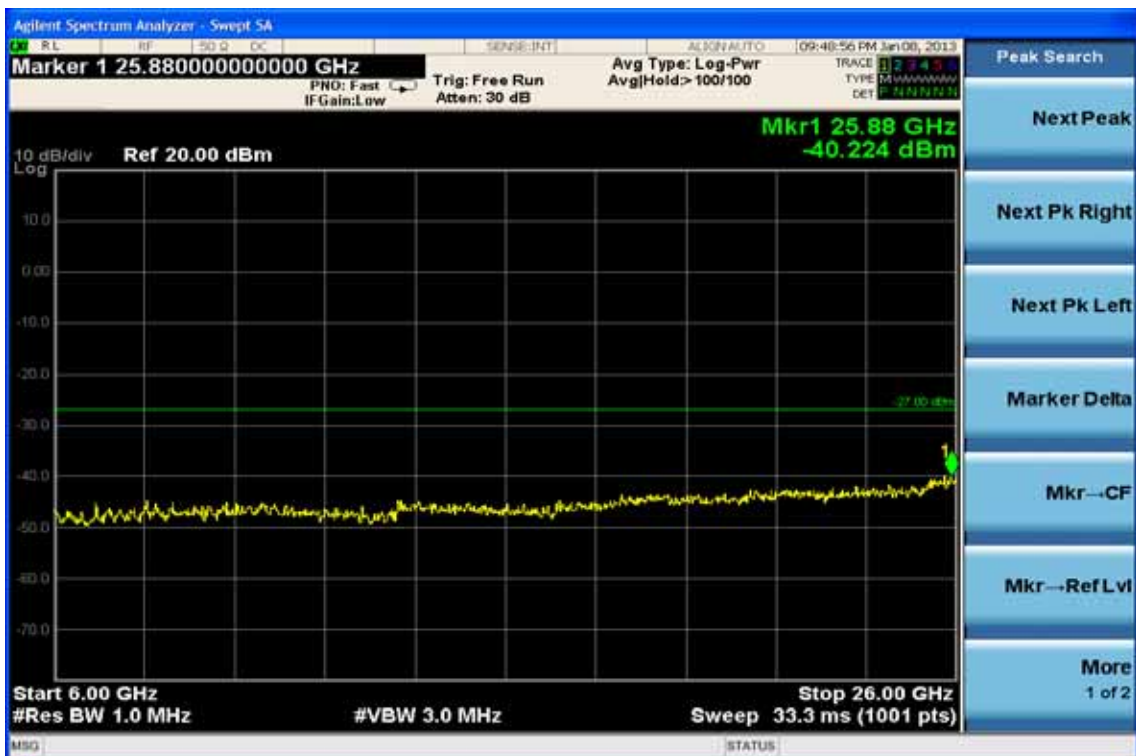
### Ch High 18GHz – 40GHz



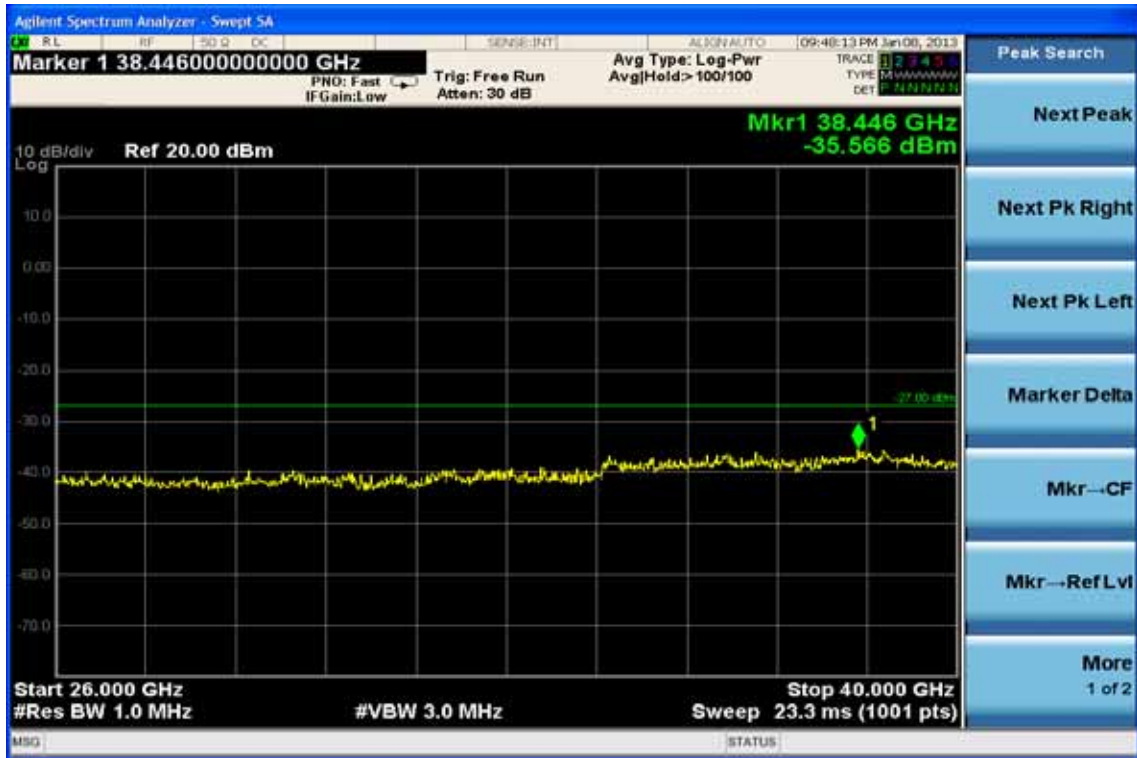
**802.11n HT40 Mode (Antenna A Port)**  
**Ch Low 30MHz – 6GHz**



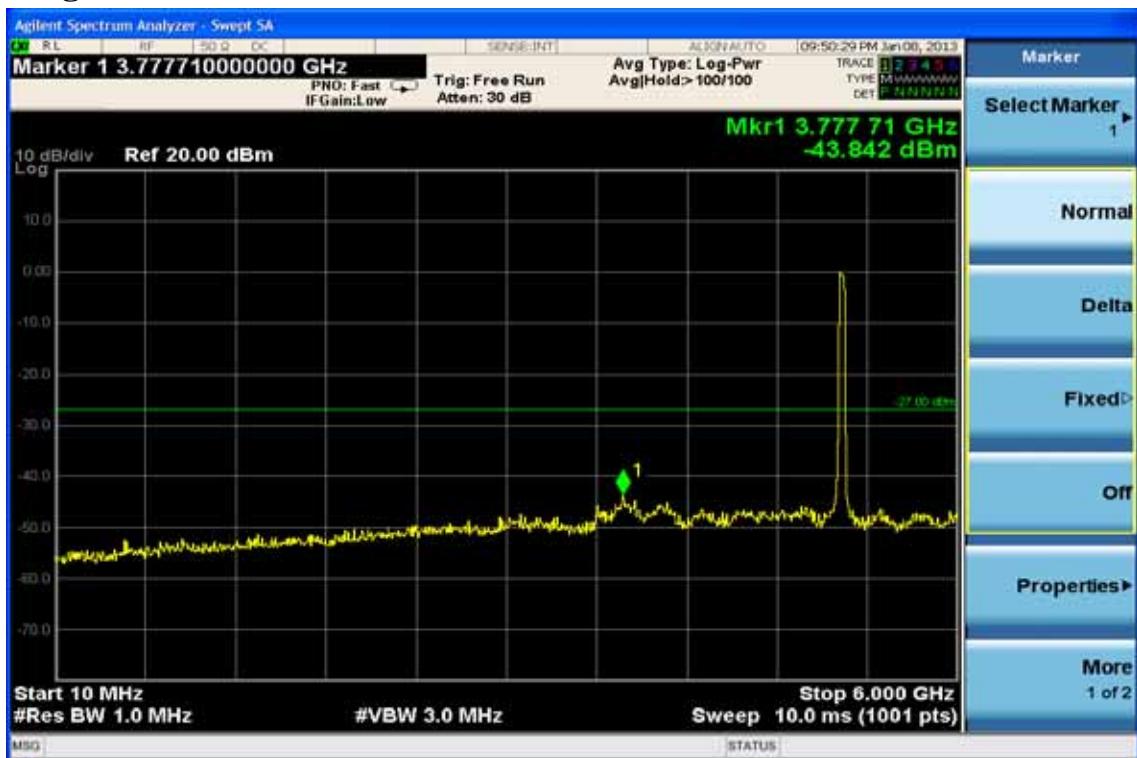
**Ch Low 6GHz – 18GHz**



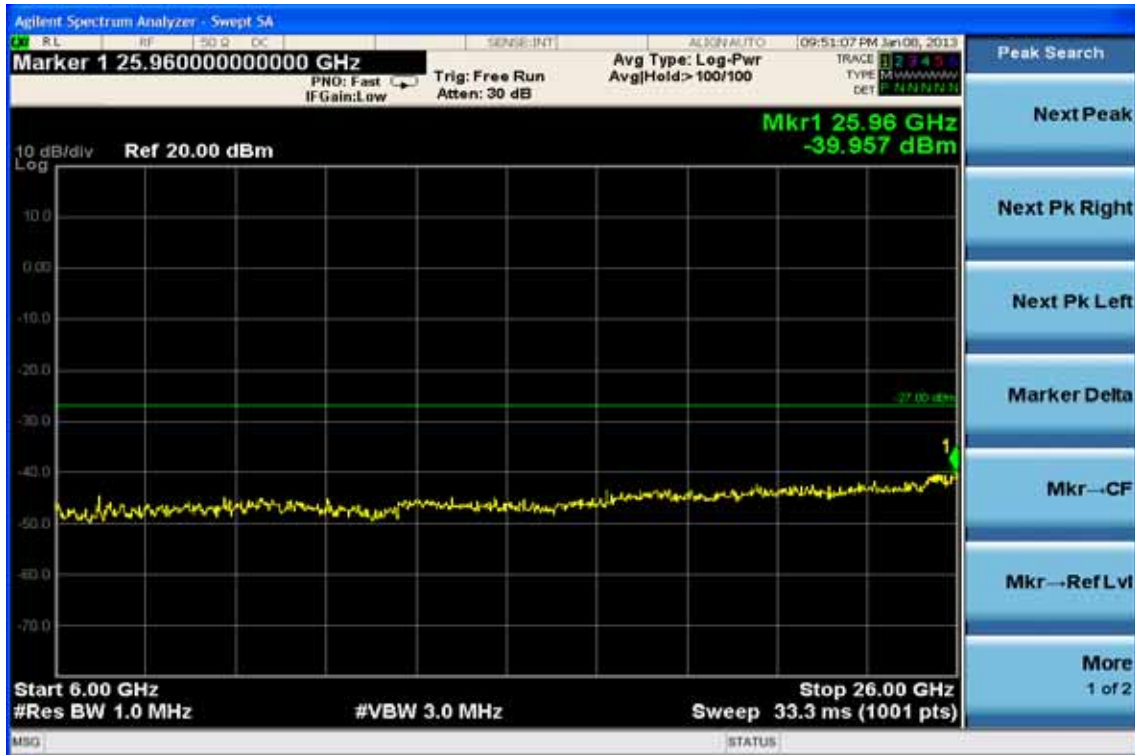
### Ch Low 18GHz – 40GHz



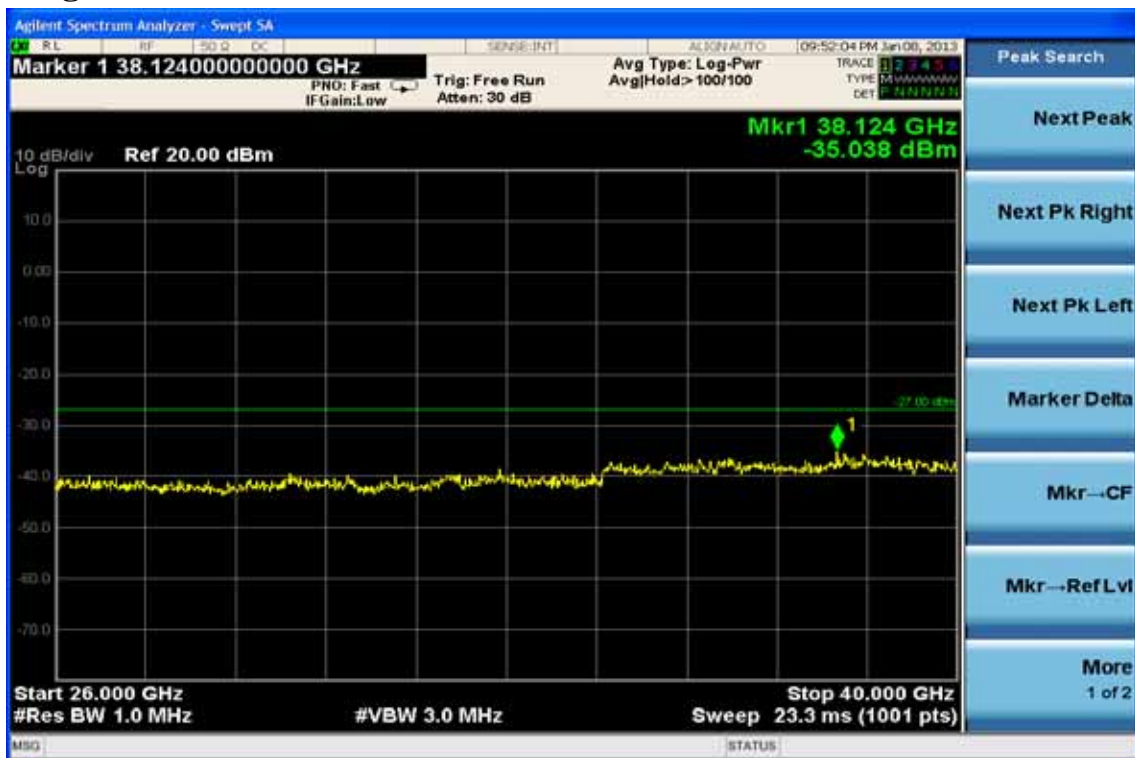
### Ch High 30MHz – 6GHz



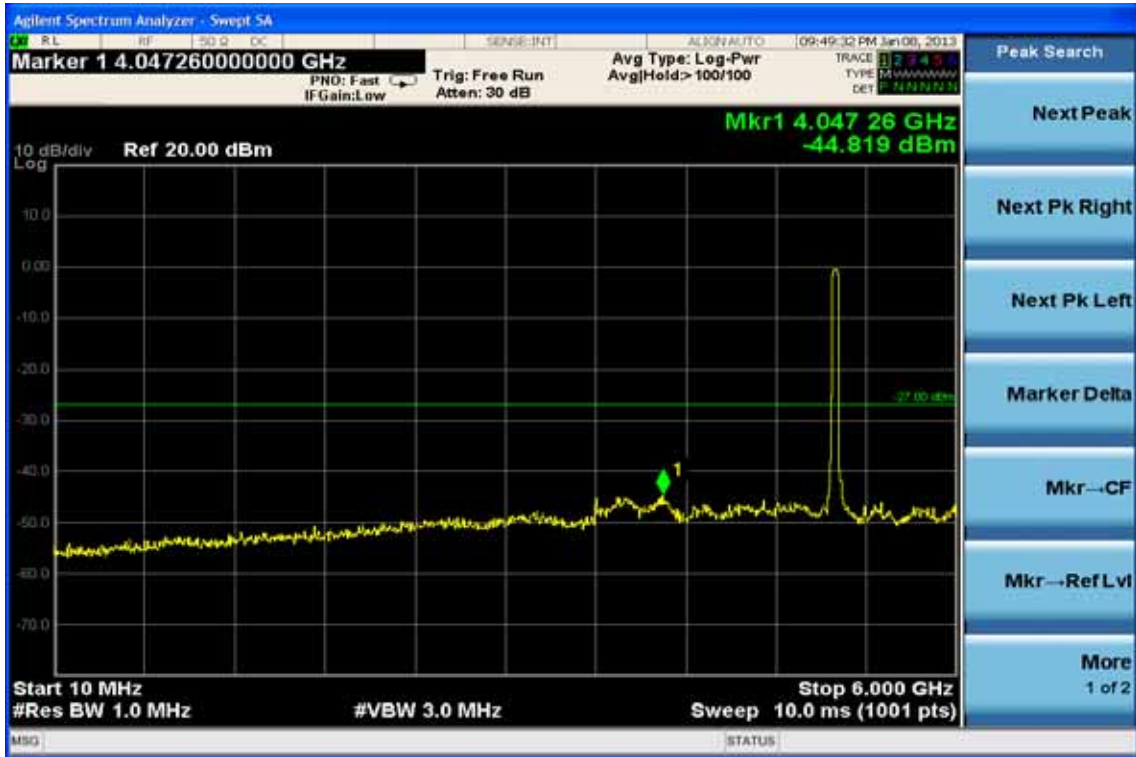
### Ch High 6GHz – 18GHz



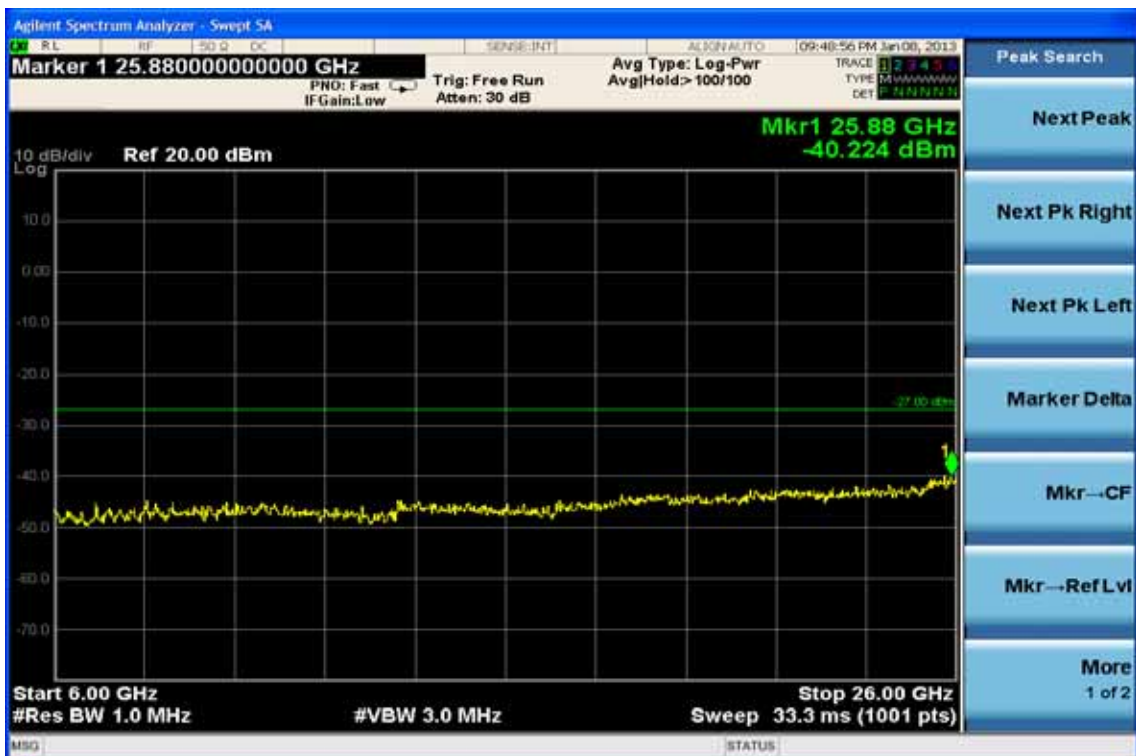
### Ch High 18GHz – 40GHz



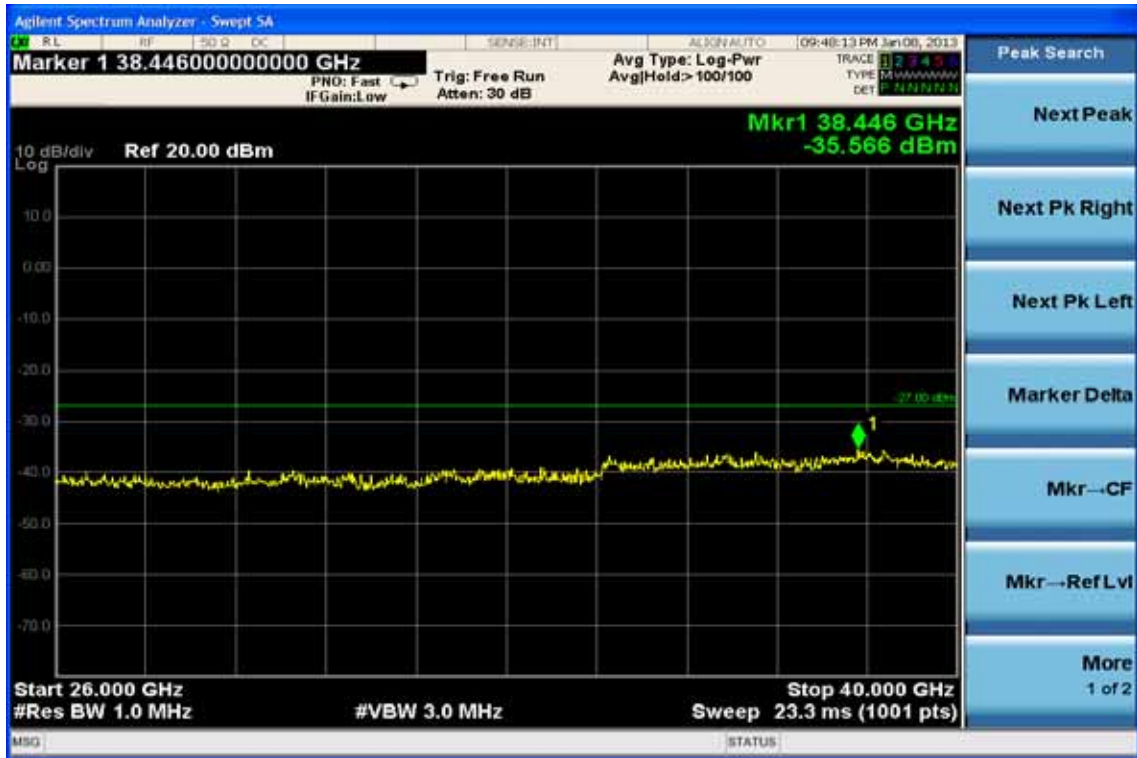
**802.11n HT40 Mode (Antenna B Port)**  
**Ch Low 30MHz – 6GHz**



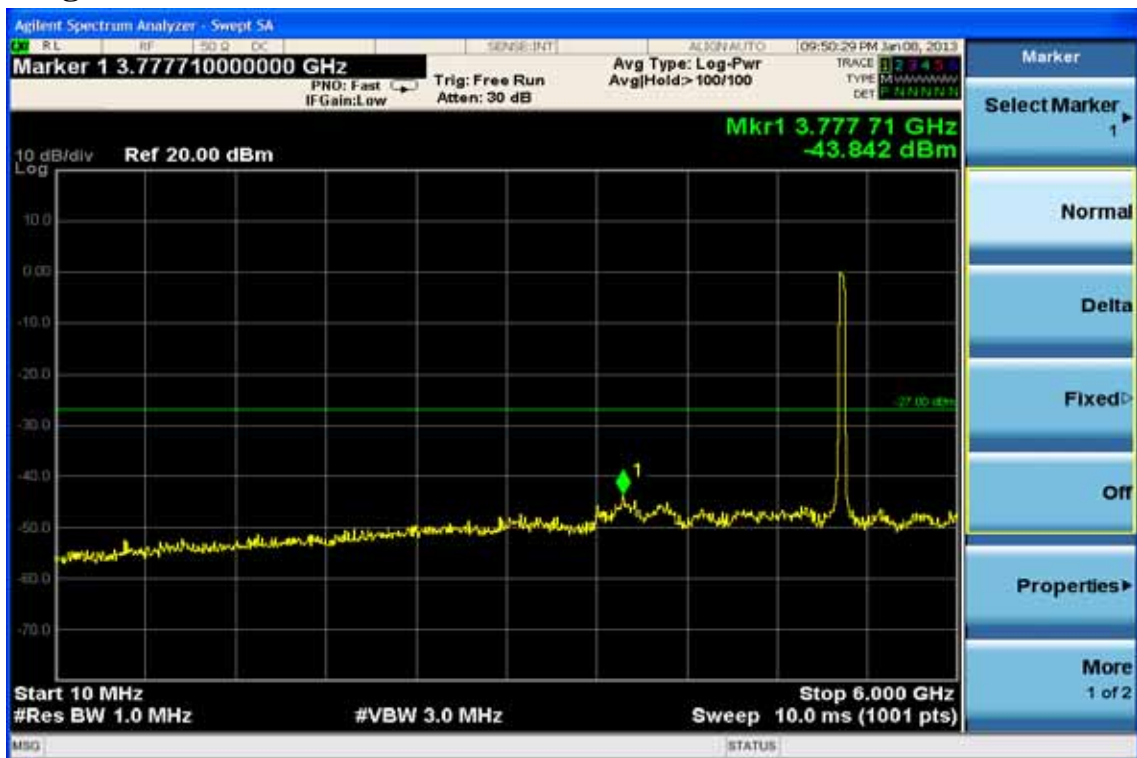
**Ch Low 6GHz – 18GHz**



### Ch Low 18GHz – 40GHz

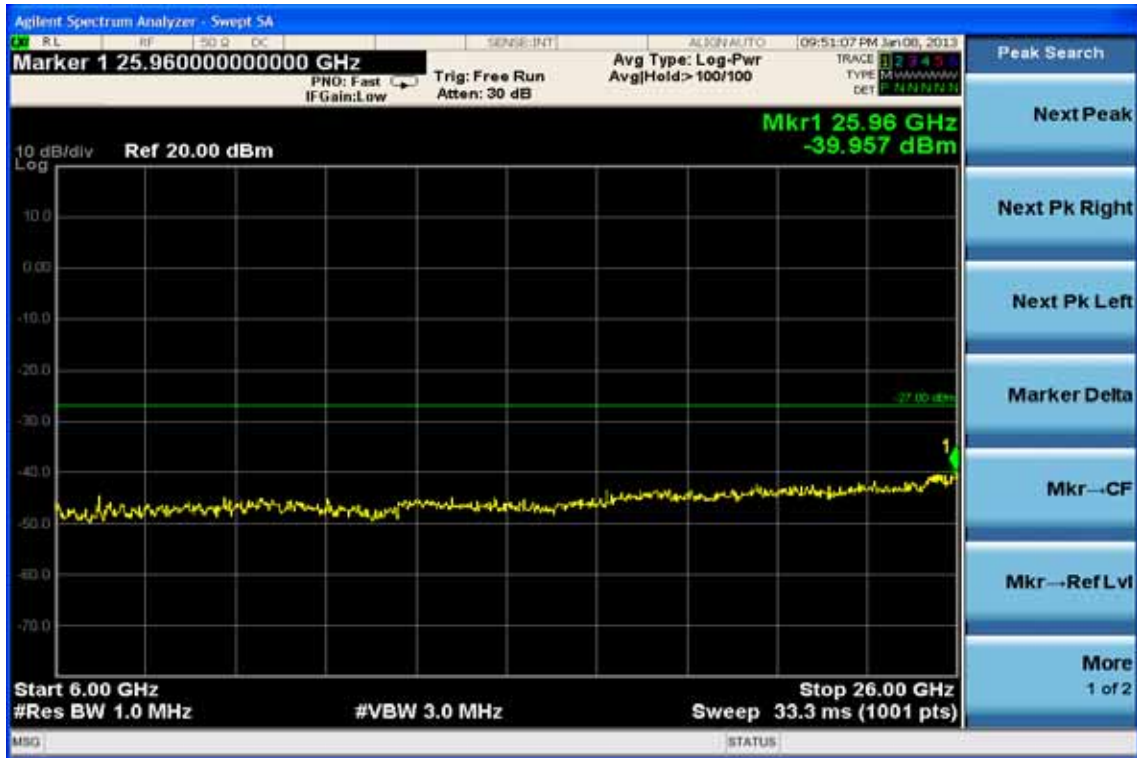


### Ch High 30MHz – 6GHz

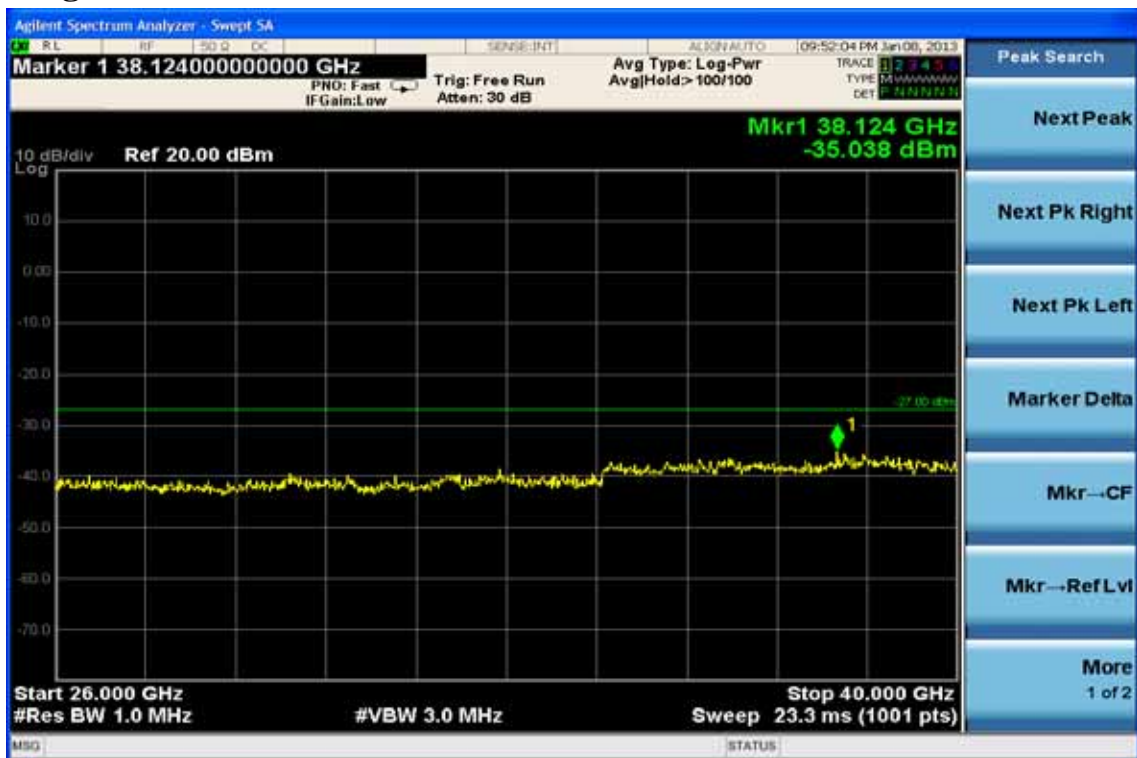




### Ch High 6GHz – 18GHz



### Ch High 18GHz – 40GHz



## 11. UNDESIRABLE EMISSION - RADICTED MEASUREMENT

### 11.1 Standard Applicable

According to §15.407(b),

(b) Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

- (1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz. Devices operating in the 5.25-5.35 GHz band that generate emissions in the 5.15-5.25 GHz band must meet all applicable technical requirements for operation in the 5.15-5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of -27 dBm/MHz in the 5.15-5.25 GHz band.
- (3) For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.
- (5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.
- (6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.
- (7) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.
- (8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

**§15.205- RESTRICTED BANDS OF OPERATIONS**

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

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

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

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

**§15.209- RADIATED EMISSION LIMITS: GENERAL REQUIREMENTS**

FCC PART 15.209

| MEASURING DISTANCE OF 3 METER |                                  |                            |
|-------------------------------|----------------------------------|----------------------------|
| FREQUENCY RANGE<br>(MHz)      | FIELD STRENGTH<br>(Microvolts/m) | FIELD STRENGTH<br>(dBuV/m) |
| 30-88                         | 100                              | 40                         |
| 88-216                        | 150                              | 43.5                       |
| 216-960                       | 200                              | 46                         |
| Above 960                     | 500                              | 54                         |

**11.2 EUT Setup**

1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4-1992.
2. The EUT was put in the front of the test table. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the monitor, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when necessary.
6. The host PC system was connected with 120Vac/60Hz power source.

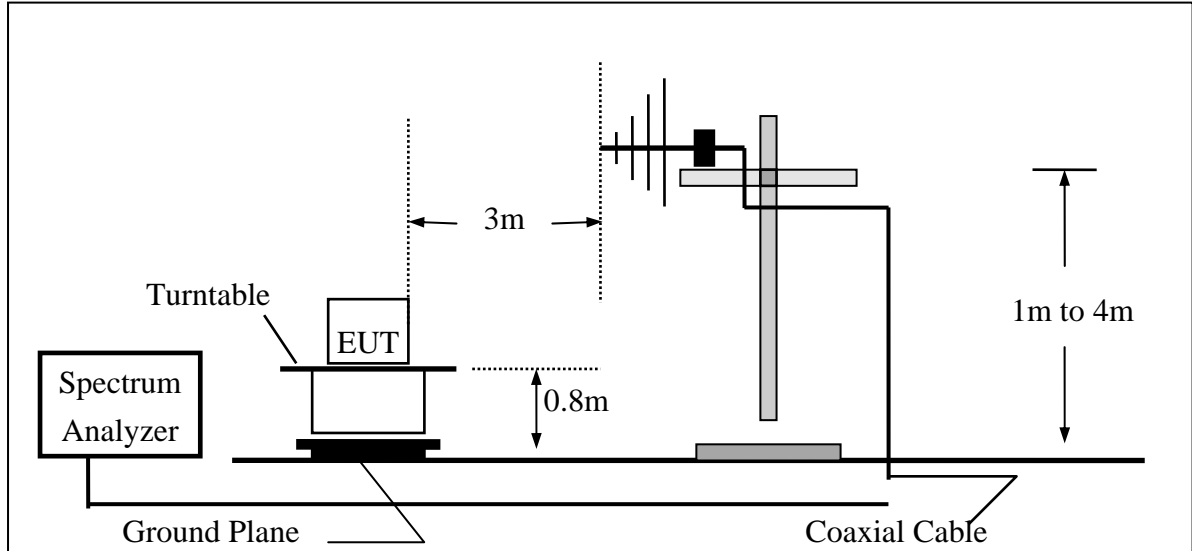
### 11.3 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna which 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 all frequency measured were complete.

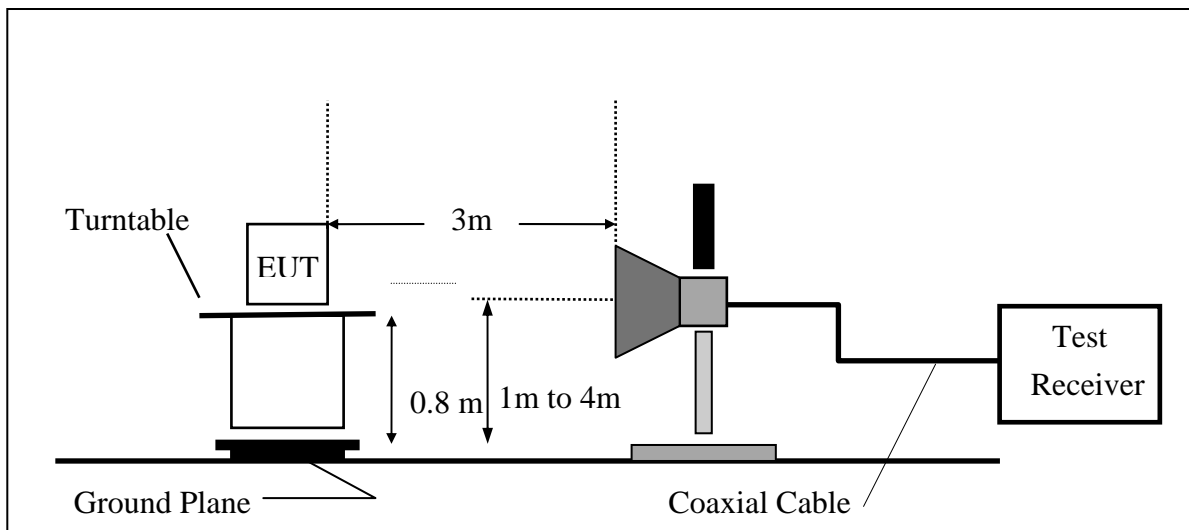
**Refer to section E of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02**

### 11.4 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



**11.5 Measurement Equipment Used:**

| <b>Chamber 14(966)</b>        |               |                          |                      |                  |                 |
|-------------------------------|---------------|--------------------------|----------------------|------------------|-----------------|
| <b>EQUIPMENT TYPE</b>         | <b>MFR</b>    | <b>MODEL NUMBER</b>      | <b>SERIAL NUMBER</b> | <b>LAST CAL.</b> | <b>CAL DUE.</b> |
| Spectrum Analyzer 21(26.5GHz) | Agilent       | N9010A                   | MY49060537           | 07/17/2012       | 07/16/2013      |
| Spectrum Analyzer 20(6.5GHz)  | Agilent       | E4443A                   | MY48250315           | 05/24/2012       | 05/23/2013      |
| Spectrum Analyzer 22(43GHz)   | R&S           | FSU43                    | 100143               | 04/25/2012       | 04/24/2013      |
| Dipole antenna                | SCHWARZBECK   | VHAP,30-300              | 919                  | 11/16/2011       | 11/15/2013      |
| Dipole antenna                | SCHWARZBECK   | UHAP,300-1000            | 1195                 | 10/25/2011       | 10/24/2013      |
| Loop Antenna9K-30M            | A.H.SYSTEM    | SAS-564                  | 294                  | 02/28/2011       | 02/27/2013      |
| Bilog Antenna30-1G            | Schaffner     | CBL 6111B                | 2756                 | 01/13/2013       | 01/12/2014      |
| Horn antenna1-18G             | COM-POWER     | AH118                    | 2011071401           | 03/01/2012       | 02/29/2013      |
| Horn antenna1-18G(06)         | EMCO          | 3117                     | 0006665              | 10/15/2012       | 10/14/2013      |
| Horn antenna26-40G(05)        | Com-power     | AH-640                   | 100A                 | 01/09/2013       | 01/08/2015      |
| Horn antenna18-26G(04)        | Com-power     | AH-826                   | 081001               | 05/04/2011       | 05/03/2013      |
| Preamplifier9-1000M           | HP            | 8447D                    | NA                   | 02/10/2012       | 02/09/2013      |
| Preamplifier1-18G             | MITEQ         | AFS44-00101800-25-10P-44 | 1329256              | 07/23/2012       | 07/22/2013      |
| Preamplifier1-26G             | EM            | EM01M26G                 | NA                   | 02/21/2012       | 02/20/2013      |
| Preamplifier26-40G            | MITEQ         | JS-26004000-27-5A        | 818471               | 05/21/2011       | 05/20/2013      |
| Cable1-18G                    | HUBER SUHNER  | Sucoflex 106             | NA                   | 02/10/2012       | 02/09/2013      |
| Cable UP to 1G                | HUBER SUHNER  | RG 214/U                 | NA                   | 10/08/2012       | 10/07/2013      |
| SUCOFLEX 1GHz~40GHz cable     | HUBER SUHNER  | Sucoflex 102             | 27963/2&37421/2      | 09/21/2011       | 09/20/2013      |
| Signal Generator              | R&S           | SMU200A                  | 102330               | 02/07/2012       | 02/06/2013      |
| Signal Generator              | Anritsu       | MG3692A                  | 20311                | 09/18/2012       | 09/17/2013      |
| 2.4G Filter                   | Micro-Tronics | Brm50702                 | 76                   | 12/27/2012       | 12/26/2013      |
| 5G Filter                     | Micro-Tronics | Brm50716                 | 005                  | 12/27/2012       | 12/26/2013      |

## 11.6 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

|       |                        |  |
|-------|------------------------|--|
| Where | FS = Field Strength    | CL = Cable Attenuation Factor (Cable Loss) |
|       | RA = Reading Amplitude | AG = Amplifier Gain                        |
|       | AF = Antenna Factor    |  |

## 11.7 Measurement Result

Refer to attach tabular data sheets.

### NOTE:

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 100kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.



**Radiated Spurious Emission Measurement Result (below 1GHz) (worst case)**

|                       |                        |           |            |
|-----------------------|------------------------|-----------|------------|
| Operation Mode        | 802.11n HT40 TX CH Low | Test Date | 2013/01/16 |
| Fundamental Frequency | 5190MHz                | Test By   | Dino       |
| Temperature           | 25                     | Pol       | Ver./Hor   |
| Humidity              | 65 %                   |           |            |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 120.21      | 51.60           | -15.34       | 36.26           | 43.50           | -7.24               | Peak   | VERTICAL   |
| 2  | 250.19      | 51.52           | -14.13       | 37.39           | 46.00           | -8.61               | Peak   | VERTICAL   |
| 3  | 312.27      | 54.52           | -12.17       | 42.35           | 46.00           | -3.65               | Peak   | VERTICAL   |
| 4  | 399.57      | 50.46           | -10.62       | 39.84           | 46.00           | -6.16               | Peak   | VERTICAL   |
| 5  | 468.44      | 49.18           | -9.32        | 39.86           | 46.00           | -6.14               | Peak   | VERTICAL   |
| 6  | 759.44      | 40.64           | -3.77        | 36.87           | 46.00           | -9.13               | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 120.21      | 55.36           | -15.34       | 40.02           | 43.50           | -3.48               | Peak   | HORIZONTAL |
| 2  | 199.75      | 53.89           | -16.48       | 37.41           | 43.50           | -6.09               | Peak   | HORIZONTAL |
| 3  | 312.27      | 52.33           | -12.17       | 40.16           | 46.00           | -5.84               | Peak   | HORIZONTAL |
| 4  | 350.10      | 52.57           | -11.54       | 41.03           | 46.00           | -4.97               | Peak   | HORIZONTAL |
| 5  | 468.44      | 50.16           | -9.32        | 40.84           | 46.00           | -5.16               | Peak   | HORIZONTAL |
| 6  | 749.74      | 36.18           | -3.86        | 32.32           | 46.00           | -13.68              | Peak   | HORIZONTAL |

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

**Radiated Spurious Emission Measurement Result (below 1GHz)**

|                       |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Operation Mode        | 802.11n HT40 TX CH High | Test Date | 2013/01/16 |
| Fundamental Frequency | 5230MHz                 | Test By   | Dino       |
| Temperature           | 25                      | Pol       | Ver./Hor   |
| Humidity              | 65 %                    |           |            |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 120.21      | 54.33           | -15.34       | 38.99           | 43.50           | -4.51               | Peak   | VERTICAL   |
| 2  | 250.19      | 50.57           | -14.13       | 36.44           | 46.00           | -9.56               | Peak   | VERTICAL   |
| 3  | 312.27      | 54.56           | -12.17       | 42.39           | 46.00           | -3.61               | Peak   | VERTICAL   |
| 4  | 375.32      | 52.30           | -10.88       | 41.42           | 46.00           | -4.58               | Peak   | VERTICAL   |
| 5  | 500.45      | 49.79           | -9.04        | 40.75           | 46.00           | -5.25               | Peak   | VERTICAL   |
| 6  | 755.56      | 41.69           | -3.81        | 37.88           | 46.00           | -8.12               | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 120.21      | 54.19           | -15.34       | 38.85           | 43.50           | -4.65               | Peak   | HORIZONTAL |
| 2  | 312.27      | 51.39           | -12.17       | 39.22           | 46.00           | -6.78               | Peak   | HORIZONTAL |
| 3  | 399.57      | 51.72           | -10.62       | 41.10           | 46.00           | -4.90               | Peak   | HORIZONTAL |
| 4  | 500.45      | 49.01           | -9.04        | 39.97           | 46.00           | -6.03               | Peak   | HORIZONTAL |
| 5  | 600.36      | 39.25           | -6.74        | 32.51           | 46.00           | -13.49              | Peak   | HORIZONTAL |
| 6  | 749.74      | 34.97           | -3.86        | 31.11           | 46.00           | -14.89              | Peak   | HORIZONTAL |

Remark:

- 1 No further spurious emissions detected from the lowest internal frequency and 30MHz.
- 2 Measuring frequencies from the lowest internal frequency to the 1GHz.
- 3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP
- 4 Measurement result within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

**Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)**

|                       |                        |           |            |
|-----------------------|------------------------|-----------|------------|
| Operation Mode        | 802.11n HT40 TX CH Low | Test Date | 2013/01/16 |
| Fundamental Frequency | 5190MHz                | Test By   | Dino       |
| Temperature           | 25                     | Humidity  | 60 %       |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 6537.00     | 35.13           | 3.02         | 38.15           | 74.00           | -35.85              | Peak   | VERTICAL   |
| 2  | 10380.00    | 27.72           | 7.01         | 34.73           | 74.00           | -39.27              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 6922.00     | 37.07           | 3.93         | 41.00           | 74.00           | -33.00              | Peak   | HORIZONTAL |
| 2  | 10380.00    | 28.67           | 7.01         | 35.68           | 74.00           | -38.32              | Peak   | HORIZONTAL |

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

**Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)**

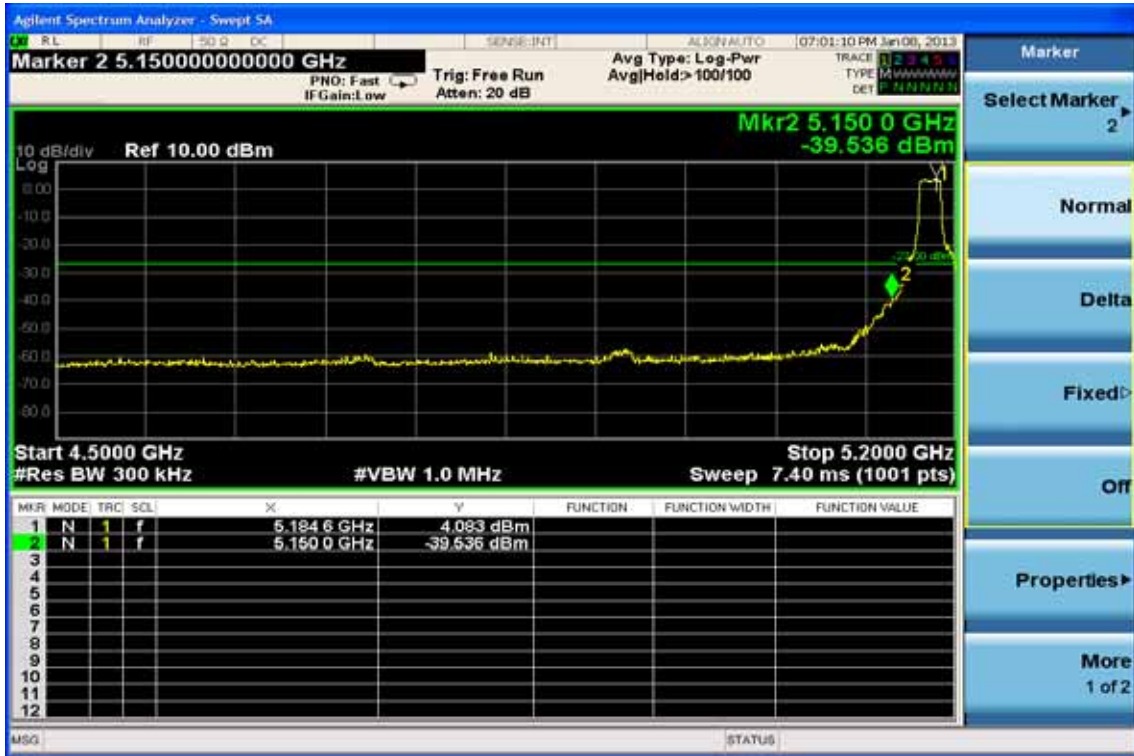
|                       |                         |           |            |
|-----------------------|-------------------------|-----------|------------|
| Operation Mode        | 802.11n HT40 TX CH High | Test Date | 2013/01/16 |
| Fundamental Frequency | 5230MHz                 | Test By   | Dino       |
| Temperature           | 25                      | Humidity  | 60 %       |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 7370.00     | 33.63           | 4.55         | 38.18           | 74.00           | -35.82              | Peak   | VERTICAL   |
| 2  | 10460.00    | 26.34           | 7.13         | 33.47           | 74.00           | -40.53              | Peak   | VERTICAL   |
|    |             |                 |              |                 |                 |                     |        |            |
| 1  | 6971.00     | 36.00           | 4.04         | 40.04           | 74.00           | -33.96              | Peak   | HORIZONTAL |
| 2  | 10460.00    | 27.79           | 7.13         | 34.92           | 74.00           | -39.08              | Peak   | HORIZONTAL |

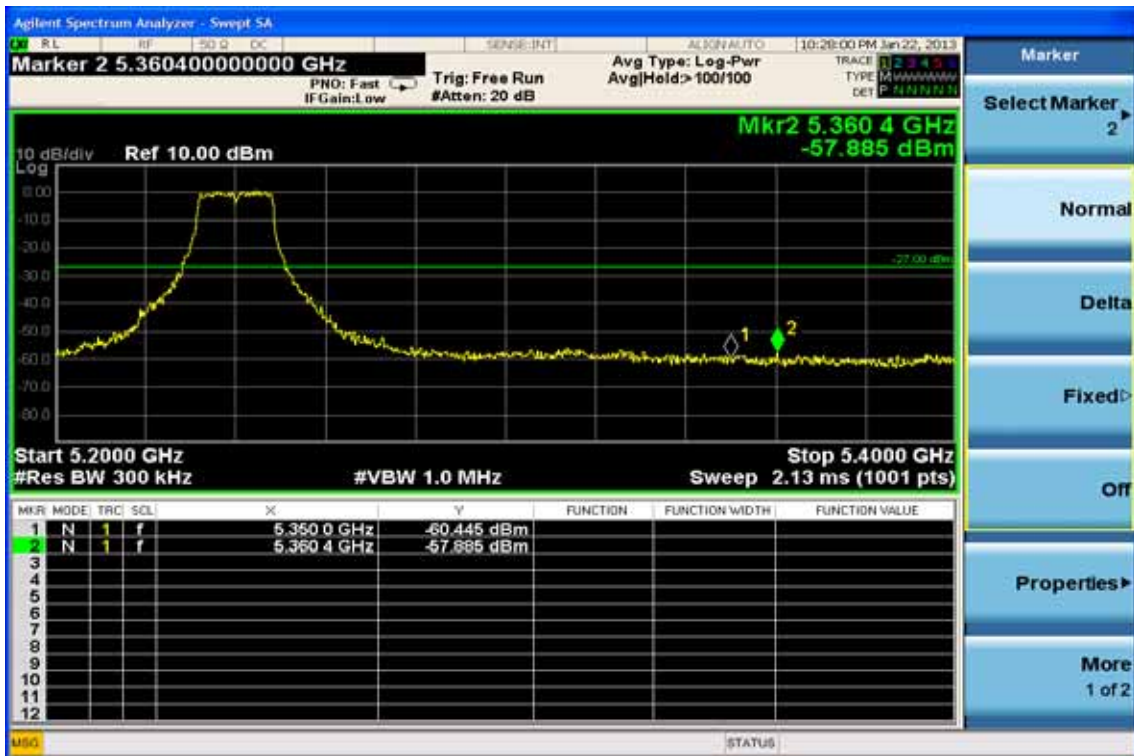
Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

### Band Edges test 802.11a mode CH-Low



### Band Edges Test Data CH-High



**Radiated Emission: 802.11a mode**

|                       |           |           |            |
|-----------------------|-----------|-----------|------------|
| Operation Mode        | TX CH Low | Test Date | 2013/01/16 |
| Fundamental Frequency | 5180 MHz  | Test By   | Dino       |
| Temperature           | 25        | Humidity  | 65 %       |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 5150.00     | 48.13           | -1.27        | 46.86           | 74.00           | -27.14              | Peak   | VERTICAL   |
| 1  | 5150.00     | 47.94           | -1.27        | 46.67           | 74.00           | -27.33              | Peak   | HORIZONTAL |

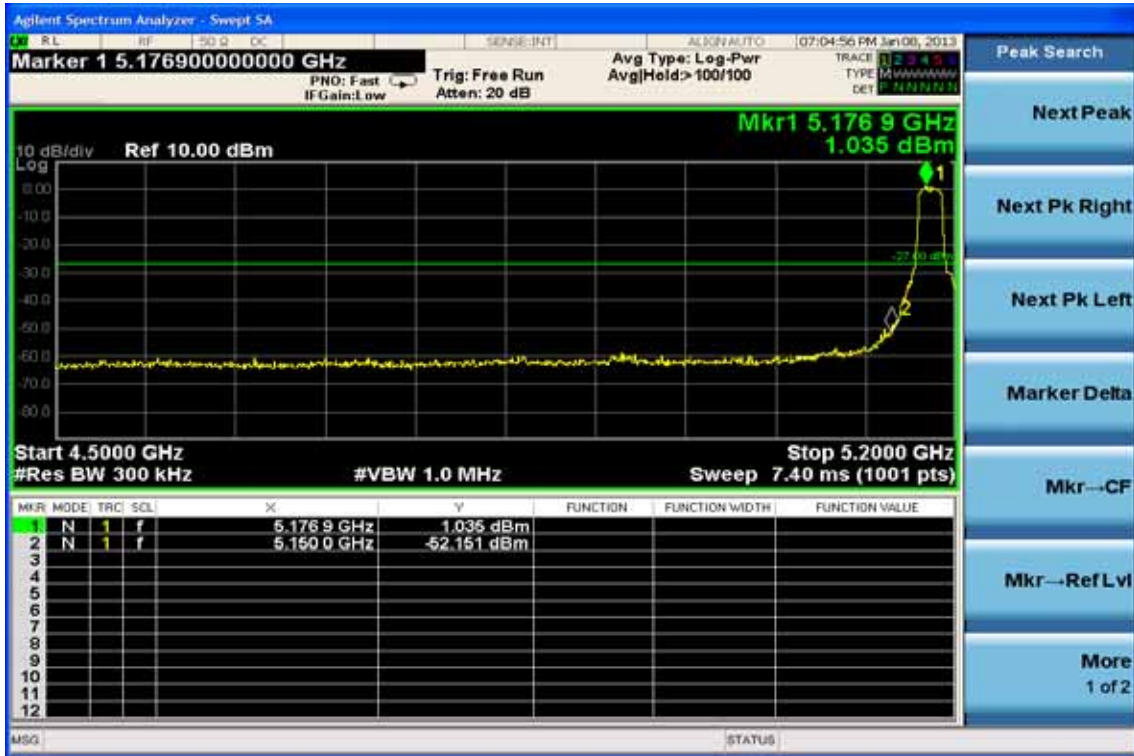
|                       |            |           |            |
|-----------------------|------------|-----------|------------|
| Operation Mode        | TX CH High | Test Date | 2013/01/16 |
| Fundamental Frequency | 5240MHz    | Test By   | Dino       |
| Temperature           | 25         | Humidity  | 65 %       |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 5350.00     | 47.60           | -0.75        | 46.85           | 74.00           | -27.15              | Peak   | VERTICAL   |
| 1  | 5350.00     | 46.18           | -0.75        | 45.43           | 74.00           | -28.57              | Peak   | HORIZONTAL |

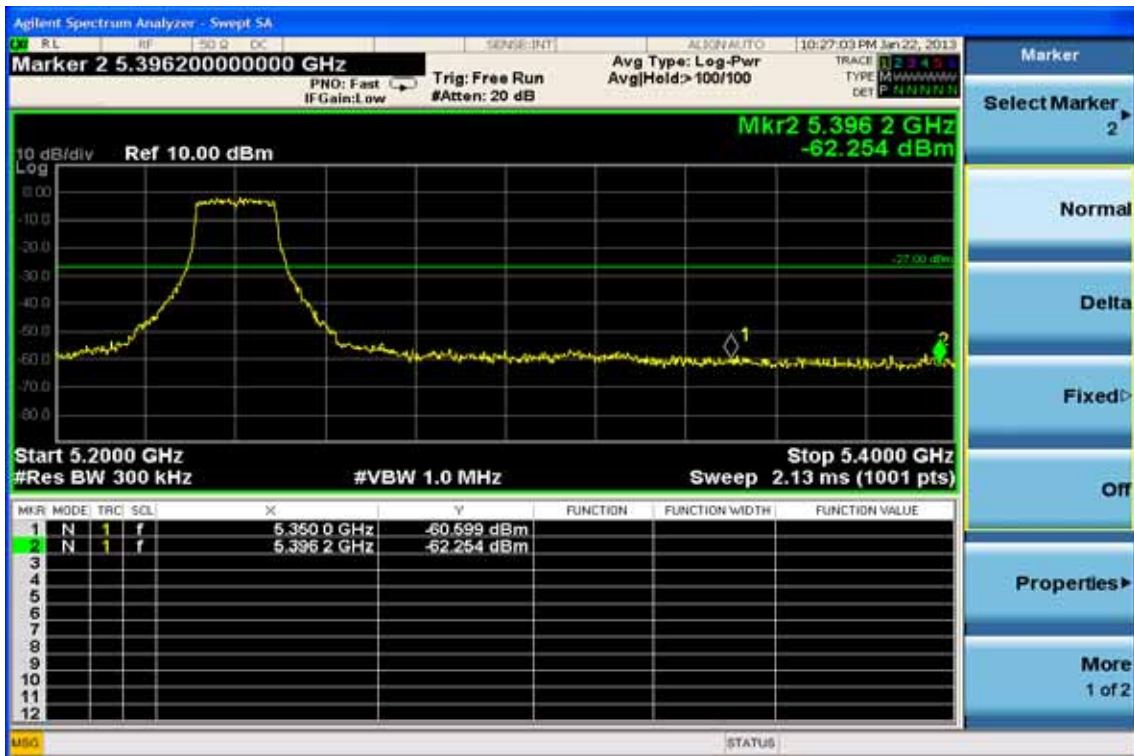
Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

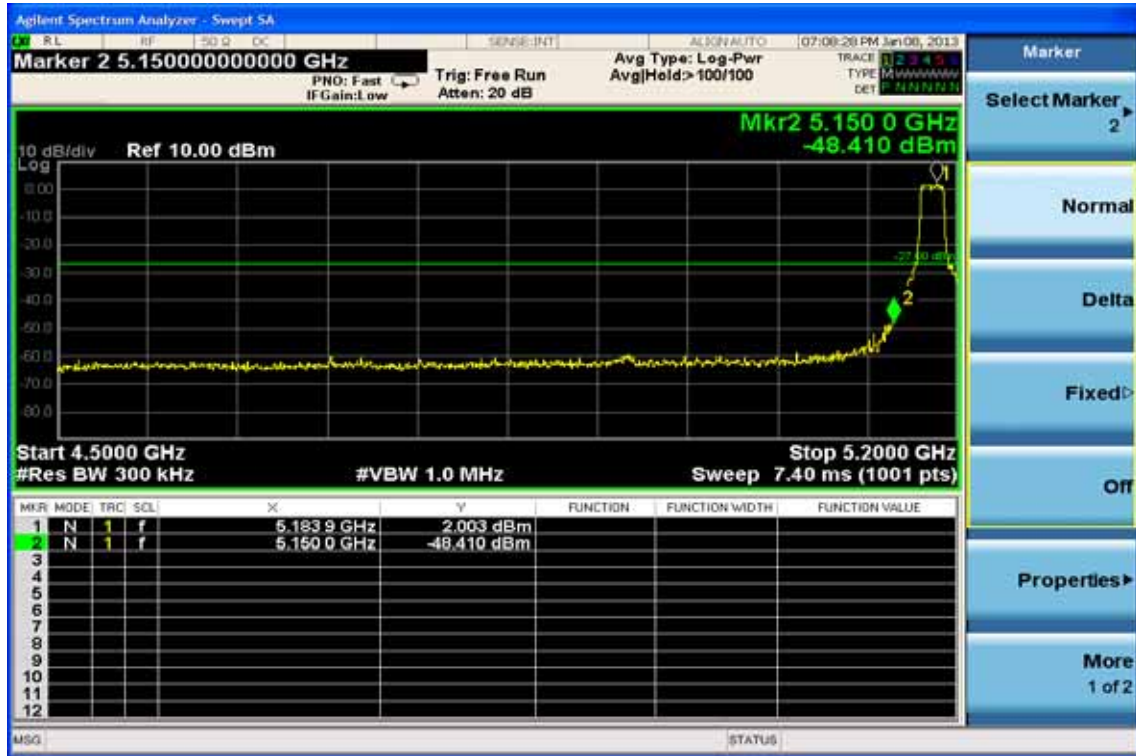
### 802.11n HT20 mode (Antenna A Port) Band Edges Test Data CH-Low



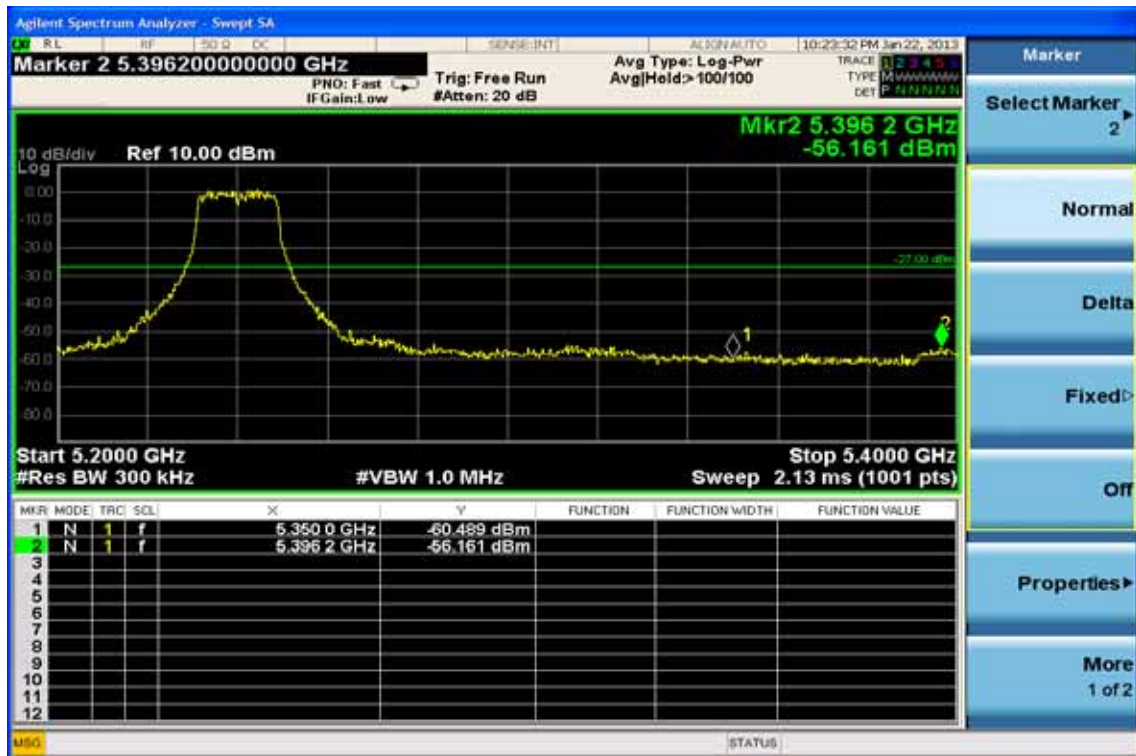
### Band Edges Test Data CH-High



### 802.11n HT20 mode (Antenna B Port) Band Edges Test Data CH-Low



### Band Edges Test Data CH-High





**Radiated Emission: 802.11n HT20 mode, Antenna A+B**

|                       |           |           |            |
|-----------------------|-----------|-----------|------------|
| Operation Mode        | TX CH Low | Test Date | 2013/01/16 |
| Fundamental Frequency | 5180 MHz  | Test By   | Dino       |
| Temperature           | 25        | Humidity  | 65 %       |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 5150.00     | 48.21           | -1.27        | 46.94           | 74.00           | -27.06              | Peak   | VERTICAL   |
| 1  | 5150.00     | 48.22           | -1.27        | 46.95           | 74.00           | -27.05              | Peak   | HORIZONTAL |

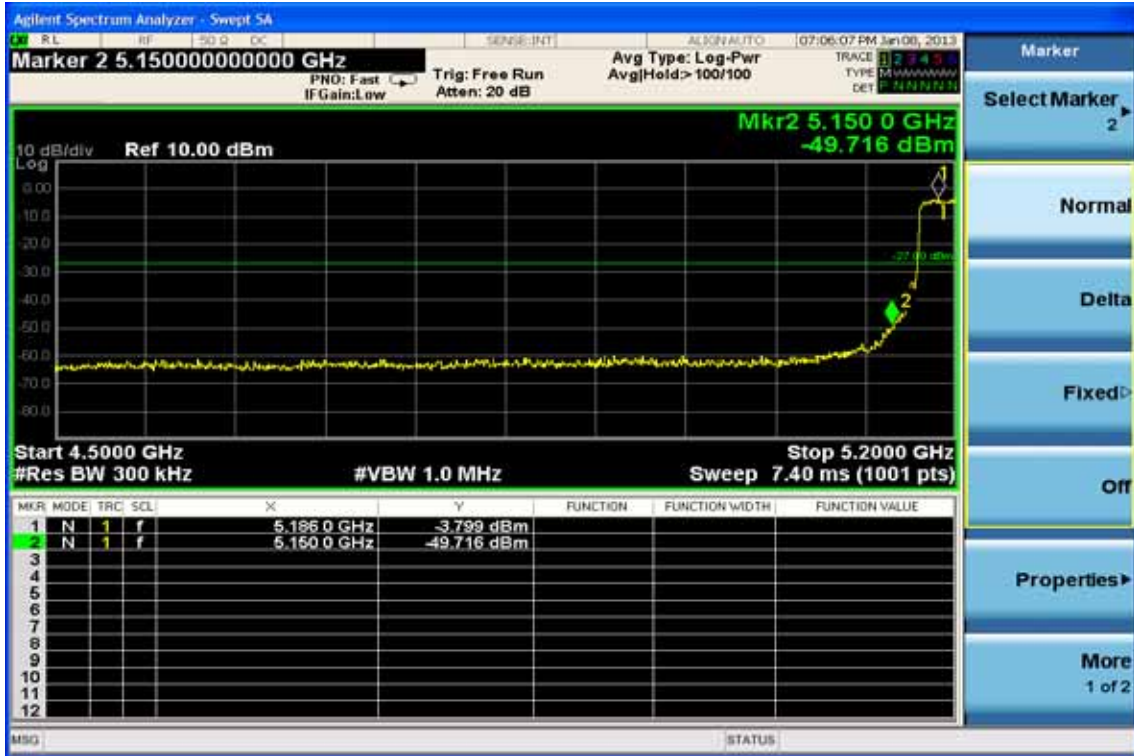
|                       |            |           |            |
|-----------------------|------------|-----------|------------|
| Operation Mode        | TX CH High | Test Date | 2013/01/16 |
| Fundamental Frequency | 5240MHz    | Test By   | Dino       |
| Temperature           | 25         | Humidity  | 65 %       |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 5350.00     | 46.99           | -0.75        | 46.24           | 74.00           | -27.76              | Peak   | VERTICAL   |
| 1  | 5350.00     | 46.49           | -0.75        | 45.74           | 74.00           | -28.26              | Peak   | HORIZONTAL |

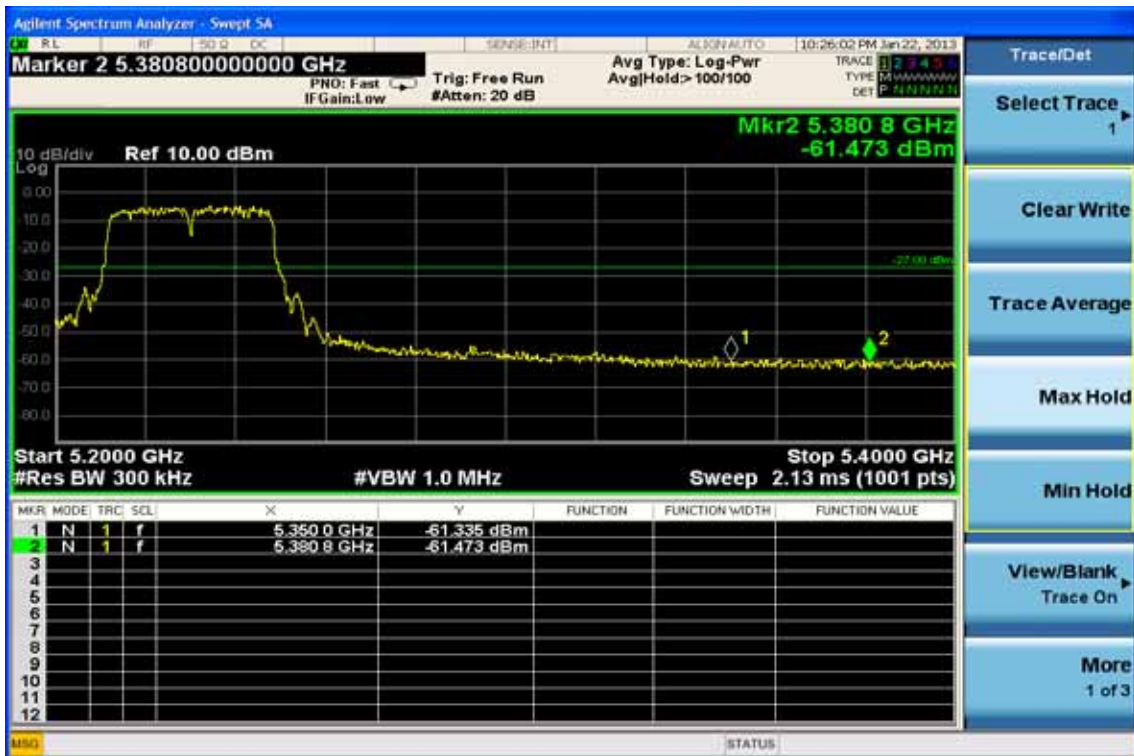
Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

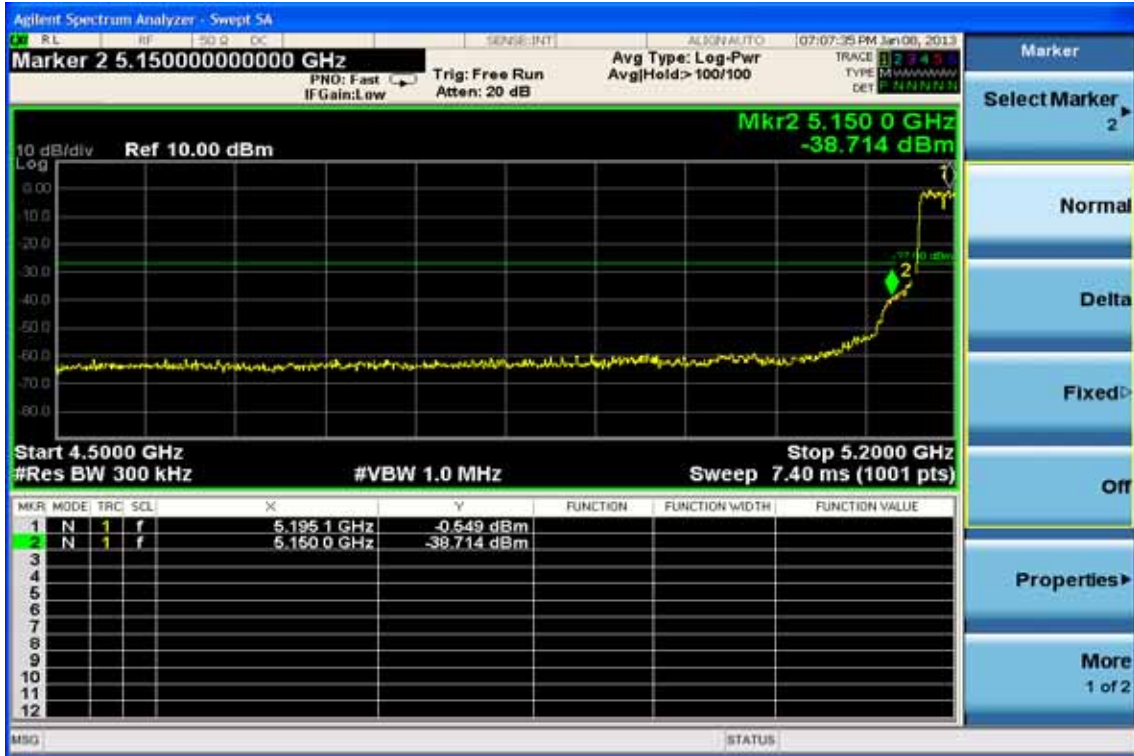
### 802.11n HT40 mode (Antenna A Port) Band Edges Test Data CH-Low



### Band Edges Test Data CH-High



### 802.11n HT40 mode (Antenna B Port) Band Edges Test Data CH-Low



### Band Edges Test Data CH-High



**Radiated Emission: 802.11n HT40 mode, Antenna A+B**

|                       |           |           |            |
|-----------------------|-----------|-----------|------------|
| Operation Mode        | TX CH Low | Test Date | 2013/01/16 |
| Fundamental Frequency | 5190 MHz  | Test By   | Dino       |
| Temperature           | 25        | Humidity  | 65 %       |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 5150.00     | 47.58           | -1.27        | 46.31           | 74.00           | -27.69              | Peak   | VERTICAL   |
| 1  | 5150.00     | 51.75           | -1.27        | 50.48           | 74.00           | -23.52              | Peak   | HORIZONTAL |

|                       |            |           |            |
|-----------------------|------------|-----------|------------|
| Operation Mode        | TX CH High | Test Date | 2013/01/16 |
| Fundamental Frequency | 5230MHz    | Test By   | Dino       |
| Temperature           | 25         | Humidity  | 65 %       |

| No | Freq<br>MHz | Reading<br>dBuV | Factor<br>dB | Level<br>dBuV/m | Limit<br>dBuV/m | Over<br>Limit<br>dB | Remark | Pol<br>V/H |
|----|-------------|-----------------|--------------|-----------------|-----------------|---------------------|--------|------------|
| 1  | 5350.00     | 46.84           | -0.75        | 46.09           | 74.00           | -27.91              | Peak   | VERTICAL   |
| 1  | 5350.00     | 47.90           | -0.75        | 47.15           | 74.00           | -26.85              | Peak   | HORIZONTAL |

Remark:

- 1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency
- 2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.
- 3 Measurement of data within this frequency range shown “ - ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.
- 5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

## **12. TRANSMISSION IN THE ABSENCE OF DATA**

### **12.1 Standard Applicable**

According to §15.407(c)

The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude the transmission of control or signalling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

### **12.2 Result:**

No non-compliance noted:

Refer to the theory of operation.

## 13. FREQUENCY STABILITY

### 13.1 Standard Applicable

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.

### 13.2 Result:

No non-compliance noted:

±20ppm ppm was defined in product specification.

## 14. ANTENNA REQUIREMENT

### 14.1 Standard Applicable

According to §15.203, Antenna requirement.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall 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 manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

### 14.2 Antenna Connected Construction

The directional gains of antenna used for transmitting please refer to below table, and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

Antenna Designation:

|         | Manufacturer                      | Model No.            | Connector Type     | Type            | Gain (2.4GHz) | Gain (5GHz) |
|---------|-----------------------------------|----------------------|--------------------|-----------------|---------------|-------------|
| Ant 1   | Airwave Technologies INC.         | EDA-8709-25GR2-A4-RM | Revise SMA, unique | Dipole Ant      | 2 dBi         | 2 dBi       |
| Ant 2   | ARISTRITL                         | RFA-25-C2S1-70-90    | unique             | Dipole Ant      | 2 dBi         | 2 dBi       |
| Ant 3   | Tranwo technology corp.           | SD001-201003-A101    | Revise SMA, unique | Dipole Ant      | 2dBi          | 2 dBi       |
| Ant 3-1 | Tranwo technology corp.           | RFA-05-2-L14M3-B70-1 | Revise SMA, unique | Dipole Ant      | 2dBi          | 2 dBi       |
| Ant 3-2 | Tranwo technology corp.           | 202-000442-00        | unique             | Patch Ant       | 0 dBi         | -1 dBi      |
| Ant 3-3 | Tranwo technology corp.           | 202-000441-00        | unique             | Patch Ant       | 0.5 dBi       | -0.5 dBi    |
| Ant 4   | UDM Group Technology Co., Ltd     | 26-52-01800G         | unique             | PCB Ant (Green) | 2.5 dBi       | 4 dBi       |
| Ant 5   | Unictron Technologies Corporation | H2P566WKBA0100       | unique             | PCB Ant (Blue)  | 2.3 dBi       | 4dBi        |

## 15. Maximum Permissible Exposure (MPE)

### 15.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission’s guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

| Frequency Range (MHz)                               | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Averaging Time (minute) |
|---|-------------------------------|-------------------------------|-------------------------------------|-------------------------|
| Limits for General Population/Uncontrolled Exposure |                               |                               |                                     |                         |
| 0.3-1.34  | 614                           | 1.63                          | *(100)                              | 30                      |
| 1.34-30   | 824/f                         | 2.19/f                        | *(180/f <sup>2</sup> )              | 30                      |
| 30-300  | 27.5                          | 0.073                         | 0.2                                 | 30                      |
| 300-1500  | /                             | /                             | F/1500                              | 30                      |
| 1500-15000  | /                             | /                             | 1.0                                 | 30                      |

F = frequency in MHz

\* = Plane-wave equipment power density



### 15.2 Maximum Permissible Exposure (MPE) Evaluation

#### MPE Prediction (802.11n HT40) (worst case)

Power measurement:

| Mode   | Freq(MHz) | channel | Output Chain (dBm) |         | Combine Peak Output Power (dBm) | Limit(dBm) | Result |
|--------|-----------|---------|--------------------|---------|---------------------------------|------------|--------|
|        |           |         | Chain A            | chain B |                                 |            |        |
| N HT40 | 5190      | 38      | 8.02               | 7.81    | 10.93                           | 16.98      | Pass   |
|        | 5230      | 46      | 7.59               | 7.33    | 10.47                           | 16.98      | Pass   |

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4 R^2}$$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

|  |             |                       |
|--|-------------|-----------------------|
| Maximum peak output power at antenna input terminal: | 10.93       | (dBm)                 |
| Maximum peak output power at antenna input terminal: | 12.38796587 | (mW)                  |
| Duty cycle:  | 100         | (%)                   |
| Maximum P <sub>av</sub> :                            | 12.38796587 | (mW)                  |
| Antenna gain (typical):                              | 4           | (dBi)                 |
| Maximum antenna gain:                                | 2.511886432 | (numeric)             |
| Prediction distance:                                 | 20          | (cm)                  |
| Prediction frequency:                                | 5190        | (MHz)                 |
| MPE limit for uncontrolled exposure at prediction    | 1           | (mW/cm <sup>2</sup> ) |
| Power density at predication frequency at 20 (cm)    | 0.0061937   | (mW/cm <sup>2</sup> ) |

#### Measurement Result

The predicted power density level at 20 cm is 0.00619 mW/cm<sup>2</sup>. This is below the uncontrolled exposure limit of 1 mW/cm<sup>2</sup> at 5190MHz.