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## FCC PART 15 SUBPART C TEST REPORT

### FCC PART 15.247

Report Reference No.....: **CTL1210111195-WB**

Compiled by

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Date of issue.....: Nov. 15, 2012

**Representative Laboratory Name.:** **Shenzhen CTL Electromagnetic Technology Co., Ltd.**

Address.....: Zone B, 4/F, Block 20, Guangqian Industrial Park, Longzhu Road, Nanshan, Shenzhen 518055 China.

**Test Firm.....:** **Bontek Compliance Testing Laboratory Ltd**

Address.....: 1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China

**Applicant's name.....:** **New Telecom Holdings Limited**

Address.....: 2/F, Eton Tower, 8 Hysan Avenue, Causeway, Hong Kong.

#### Test specification:

Standard.....: FCC Part 15.247: Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System

Master TRF.....: Dated 2011-01

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**Test item description.....:** **Tablet**

**FCC ID.....:** **PE4YEKA97TABN**

Trade Mark.....: 3Q

Model/Type reference.....: QS9719D

Operation Frequency.....: From 2400MHz to 2483.5MHz

Modulation.....: GFSK,  $\pi/4$ -DQPSK, 8-DPSK

Antenna Type.....: Internal

Result.....: **Positive**

**T E S T   R E P O R T**

|                          |                         |                                |
|--------------------------|-------------------------|--------------------------------|
| <b>Test Report No. :</b> | <b>CTL1210111195-WB</b> | Nov. 15, 2012<br>Date of issue |
|--------------------------|-------------------------|--------------------------------|

Equipment under Test : Tablet

Model /Type : QS9719D

Listed Models : /

**Applicant** : **New Telecom Holdings Limited**

Address : 2/F, Eton Tower, 8 Hysan Avenue, Causeway, Hong Kong.

**Manufacturer** : **New Telecom Holdings Limited**

Address : 2/F, Eton Tower, 8 Hysan Avenue, Causeway, Hong Kong.

|  |                 |
|--|-----------------|
| <b>Test Result</b> according to the standards on page 4: | <b>Positive</b> |
|--|-----------------|

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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## **1. TEST STANDARDS**

The tests were performed according to following standards:

**FCC Rules Part 15.247:** Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.

**ANSI C63.10-2009:** American National Standard for Testing Unlicensed Wireless Devices

**FCC Public Notice DA 00-705:** Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

**ANSI C63.4-2003**

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The public notice DA 00-705 for frequency hopping spread spectrum systems shall be performed also.

## 2. SUMMARY

### 2.1. General Remarks

|                                |   |                |
|--------------------------------|---|----------------|
| Date of receipt of test sample | : | Sept. 18, 2012 |
|                                |   |                |
| Testing commenced on           | : | Sept. 19, 2012 |
|                                |   |                |
| Testing concluded on           | : | Sept. 29, 2012 |

### 2.2. Equipment Under Test

#### Power supply system utilised

|                      |   |   |                                   |
|----------------------|---|---|-----------------------------------|
| Power supply voltage | : | <input checked="" type="radio"/> 120V / 60 Hz                     | <input type="radio"/> 115V / 60Hz |
|                      |   | <input type="radio"/> 12 V DC                                     | <input type="radio"/> 24 V DC     |
|                      |   | <input checked="" type="radio"/> Other (specified in blank below) |                                   |

DC 3.7V from battery

### 2.3. Short description of the Equipment under Test (EUT)

2.4GHz Tablet PC (QS9719D )

For more details, refer to the user's manual of the EUT.

Serial number: Prototype

### 2.4. EUT operation mode

The EUT has been tested under typical operating condition. The Applicant provides communication tools software to control the EUT for staying in continuous transmitting and receiving mode for testing. There are 79 channels of EUT, and the test carried out at the lowest channel, middle channel and highest channel .

|                  |                              |
|------------------|------------------------------|
| Frequency Range: | 2400-2483.5MHz               |
| Channel number:  | 79 channels                  |
| Modulation type: | GFSK, $\pi$ /4-DQPSK, 8-DPSK |
| Antenna:         | PCB Antenna                  |

| Test Channel   | Test Frequency |
|----------------|----------------|
| Low Channel    | 2402 MHz       |
| Middle Channel | 2441 MHz       |
| High Channel   | 2480 MHz       |

## 2.5. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

- - supplied by the manufacturer
- - supplied by the lab

|   |             |                |                  |
|---|-------------|----------------|------------------|
| ● | Notebook PC | Manufacturer : | SONY Corporation |
|   |             | Model No. :    | PCG-41216W       |

## 2.6. Configuration of Tested System

Fig. 2-1 Configuration of Tested System

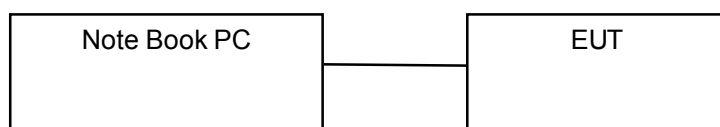


Table 2-1 Equipment Used in Tested System

| No. | Product     | Manufacturer     | Model No.  | Serial No.       | FCC ID |
|-----|-------------|------------------|------------|------------------|--------|
| 1   | Notebook PC | SONY Corporation | PCG-41216W | 27548966 7000262 | -----  |

## 2.7. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for **FCC ID: PE4YEKA97TABN** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

## 2.8. Modifications

No modifications were implemented to meet testing criteria.

## 2.9. NOTE

- The EUT is a Bluetooth Standard type device, The functions of the EUT listed as below:

|             | Test Standards                        | Reference Report |
|-------------|---------------------------------------|------------------|
| Radio       | FCC Part 15 Subpart C (Section15.247) | CTL1210111195-WB |
| RF Exposure | FCC Per 47 CFR 2.1093                 | CTL1210111195-WB |

- The frequency bands used in this EUT are listed as follows:

| Frequency Band(MHz) | 2400-2483.5 | 5150-5350 | 5470-5725 | 5725-5850 |
|---------------------|-------------|-----------|-----------|-----------|
| Bluetooth           | √           | —         | —         | —         |

- The EUT provides one completed transmitter and receiver.

| Modulation Mode | TX Function |
|-----------------|-------------|
| Bluetooth       | 1TX         |

## 2.10. Frequency Hopping System Requirements

### Standard Applicable

According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

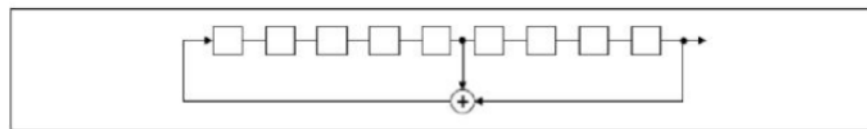
### EUT Pseudorandom Frequency Hopping Sequence

The pseudorandom sequence may be generated in a nine-stage shift register whose 5<sup>th</sup> and 9<sup>th</sup> stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONES; i.e. the shift register is initialized with nine ones.

Number of shift register stages: 9

Length of pseudo-random sequence:  $2^9 - 1 = 511$  bits

Longest sequence of zeros: 8 (non-inverted signal)



*Linear Feedback Shift Register for Generation of the PRBS sequence*

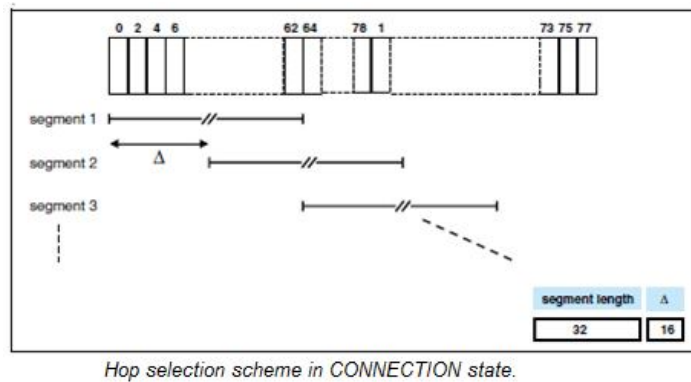
The frequencies allocated for the Bluetooth Module is  $F(\text{MHz}) = 2402 + 1 \cdot n$  ( $0 \leq n \leq 78$ ). The lowest, middle, highest channel numbers of the Bluetooth Module used and tested in this report are separately 0 (2402MHz), 39 (2441MHz) and 78 (2480MHz).

Each frequency used equally on the average by each transmitter.

The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

The selection scheme chooses a segment of 32 hop frequencies spanning about 64 MHz and visits these hops in a pseudo-random order. Next, a different 32-hop segment is chosen, etc. In the page, master page response, slave page response, page scan, inquiry, inquiry response and inquiry scan hopping sequences, the same 32-hop segment is used all the time (the segment is selected by the address; different devices will have different paging segments).

When the basic channel hopping sequence is selected, the output constitutes a pseudo-random sequence that slides through the 79 hops.



Channels list:

| Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
|---------|-----------------|---------|-----------------|---------|-----------------|
| 00      | 2402            | 27      | 2429            | 54      | 2456            |
| 01      | 2403            | 28      | 2430            | 55      | 2457            |
| 02      | 2404            | 29      | 2431            | 56      | 2458            |
| 03      | 2405            | 30      | 2432            | 57      | 2459            |
| 04      | 2406            | 31      | 2433            | 58      | 2460            |
| 05      | 2407            | 32      | 2434            | 59      | 2461            |
| 06      | 2408            | 33      | 2435            | 60      | 2462            |
| 07      | 2409            | 34      | 2436            | 61      | 2463            |
| 08      | 2410            | 35      | 2437            | 62      | 2464            |
| 09      | 2411            | 36      | 2438            | 63      | 2465            |
| 10      | 2412            | 37      | 2439            | 64      | 2466            |
| 11      | 2413            | 38      | 2440            | 65      | 2467            |
| 12      | 2414            | 39      | 2441            | 66      | 2468            |
| 13      | 2415            | 40      | 2442            | 67      | 2469            |
| 14      | 2416            | 41      | 2443            | 68      | 2470            |
| 15      | 2417            | 42      | 2444            | 69      | 2471            |
| 16      | 2418            | 43      | 2445            | 70      | 2472            |
| 17      | 2419            | 44      | 2446            | 71      | 2473            |
| 18      | 2420            | 45      | 2447            | 72      | 2474            |
| 19      | 2421            | 46      | 2448            | 73      | 2475            |
| 20      | 2422            | 47      | 2449            | 74      | 2476            |
| 21      | 2423            | 48      | 2450            | 75      | 2477            |
| 22      | 2424            | 49      | 2451            | 76      | 2478            |
| 23      | 2425            | 50      | 2452            | 77      | 2479            |
| 24      | 2426            | 51      | 2453            | 78      | 2480            |
| 25      | 2427            | 52      | 2454            |         |                 |
| 26      | 2428            | 53      | 2455            |         |                 |

The pseudorandom frequency hopping sequence sample:

42,41,66,4,78,59,55,48,54,46,52,78,41,26,24,34,39,32,51,18,25,9,12,73,70,58,54,6,66,4,32,67,60,16,3,78,78,76,47,45,47,49,14,34, etc.

### **Frequency Hopping System**

This transmitter device is frequency hopping device, and complies with FCC part 15.247 rule.

This device uses Bluetooth radio which operates in 2400-2483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 channels (1 MHz separation; from 2402 to 2480 MHz) in the range 2,400-2,483.5 MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock.



Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH-enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.

This device was tested with an bluetooth system receiver to check that the device maintained hopping synchronization, and the device complied with these requirements for DA 00-705 and FCC Part 15.247 rule.

## 2.11. Mode of Operation

CTL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

| Test Mode                                      |
|--|
| Mode 1: Transmitter-1Mbps(GFSK_DH5) DH5        |
| Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5) 2DH5 |
| Mode 3: Transmitter-3Mbps(8DPSK_DH5) 3DH5      |

### **3. TEST ENVIRONMENT**

#### **3.1. Address of the test laboratory**

Bontek Compliance Testing Laboratory Ltd  
1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

#### **3.2. Test Facility**

The test facility is recognized, certified, or accredited by the following organizations:

##### **IC Registration No.: 7631A**

The 3m alternate test site of Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7631A on March, 2011.

##### **FCC-Registration No.: 338263**

Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 338263, March 24, 2008.

#### **3.3. Environmental conditions**

During the measurement the environmental conditions were within the listed ranges:

|                       |                     |
|-----------------------|---------------------|
| Temperature:          | <u>15-35 ° C</u>    |
| Humidity:             | <u>30-60 %</u>      |
| Atmospheric pressure: | <u>950-1050mbar</u> |

#### **3.4. Statement of the measurement uncertainty**

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Bontek Compliance Testing Laboratory Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Bontek laboratory is reported:

| <b>Test</b>           | <b>Range</b> | <b>Measurement Uncertainty</b> | <b>Notes</b> |
|-----------------------|--------------|--------------------------------|--------------|
| Radiated Emission     | 30~1000MHz   | 4.10dB                         | (1)          |
| Radiated Emission     | Above 1GHz   | 4.32dB                         | (1)          |
| Conducted Disturbance | 0.15~30MHz   | 3.20dB                         | (1)          |

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

**3.5. Test Description**

| <b>FCC PART 15 Subpart C</b>    |                             |      |
|---------------------------------|-----------------------------|------|
| FCC Part 15.207                 | AC Power Conducted Emission | PASS |
| FCC Part 15.247(a)              | 20dB Bandwidth              | PASS |
| FCC Part 15.247(d)              | Spurious Emission           | PASS |
| FCC Part 15.247(b)              | Maximum Peak Output Power   | PASS |
| FCC Part 15.109/ 15.205/ 15.209 | Radiated Emissions          | PASS |
| FCC Part 15.247(d)              | Band Edge                   | PASS |
| FCC Part 15.247(a)(1)           | Frequency Separation        | PASS |
| FCC Part 15.247(a)(1)(iii)      | Number of hopping frequency | PASS |
| FCC Part 15.247(a)(1)(iii)      | Time of Occupancy           | PASS |
| FCC Part 15.203/15.247 (b)      | Antenna Requirement         | PASS |

Remark: The measurement uncertainty is not included in the test result.

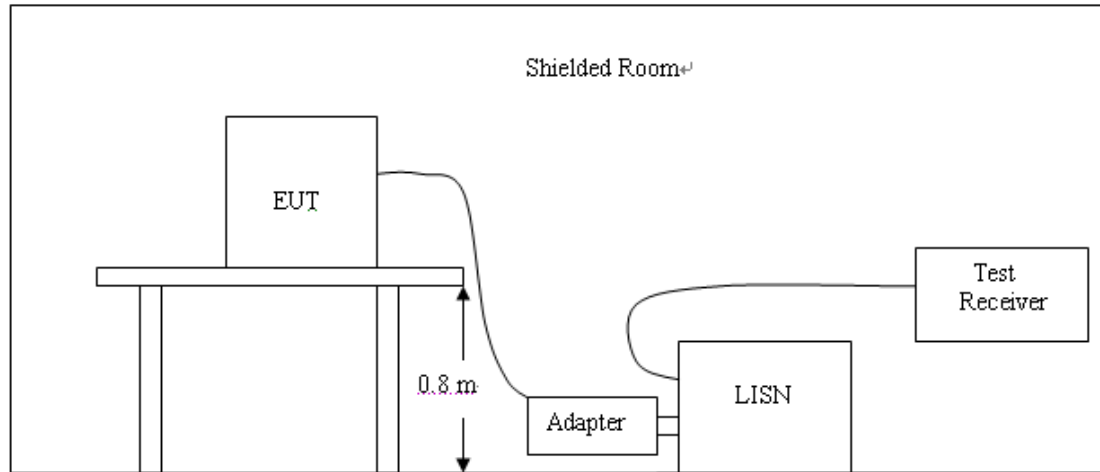
### 3.6. Equipments Used during the Test

| Item | Test Equipment              | Manufacturer    | Model No.             | Last Cal.  | Due. Date  |
|------|-----------------------------|-----------------|-----------------------|------------|------------|
| 1    | EMI Test Receiver           | ROHDE & SCHWARZ | ESCI                  | 2012/04/14 | 2013/04/13 |
| 2    | Radio Communication Tester  | ROHDE & SCHWARZ | CMU200                | 2012/04/14 | 2013/04/13 |
| 3    | Dual Directional Coupler    | Agilent         | 778D                  | 2012/04/14 | 2013/04/13 |
| 4    | 10dB attenuator             | SCHWARZBECK     | MTAIMP-136            | 2012/04/14 | 2013/04/13 |
| 5    | Tunable Bandreject filter   | K&L             | 3TNF-800              | 2012/04/14 | 2013/04/13 |
| 6    | Tunable Bandreject filter   | K&L             | 5TNF-1700             | 2012/04/14 | 2013/04/13 |
| 7    | High-Pass Filter            | K&L             | 9SH10-2700/X12750-O/O | 2012/04/14 | 2013/04/13 |
| 8    | High-Pass Filter            | K&L             | 41H10-1375/U12750-O/O | 2012/04/14 | 2013/04/13 |
| 9    | Coaxial Cable               | Huber+Suhner    | AC4-RF-H              | 2012/04/14 | 2013/04/13 |
| 10   | AC Power Supply             | IDRC            | CF-500TP              | 2012/04/14 | 2013/04/13 |
| 11   | DC Power Supply             | IDRC            | CD-035-020PR          | 2012/04/14 | 2013/04/13 |
| 12   | RF Current Probe            | FCC             | F-33-4                | 2012/04/14 | 2013/04/13 |
| 13   | Temperature /Humidity Meter | zhicheng        | ZC1-2                 | 2012/04/14 | 2013/04/13 |
| 14   | MICROWAVE AMPLIFIER         | HP              | 8349B                 | 2012/04/14 | 2013/04/13 |
| 15   | Amplifier                   | HP              | 8447D                 | 2012/04/14 | 2013/04/13 |
| 16   | SIGNAL GENERATOR            | HP              | 8647A                 | 2012/04/14 | 2013/04/13 |
| 17   | Log Periodic Antenna        | ELECTRO-METRICS | EM-6950               | 2012/04/14 | 2013/04/13 |
| 18   | Horn Antenna                | Schwarzbeck     | BBHA9120A             | 2012/04/14 | 2013/04/13 |
| 19   | EMI Test Receiver           | R&S             | ESPI                  | 2012/04/14 | 2013/04/13 |
| 20   | Loop Antenna                | ZHINAN          | ZN30900A              | 2012/04/14 | 2013/04/13 |
| 21   | Horn Antenna                | Schwarzbeck     | BBHA9120D             | 2012/04/14 | 2013/04/13 |
| 22   | Horn Antenna                | Schwarzbeck     | BBHA9170              | 2012/04/14 | 2013/04/13 |
| 23   | Spectrum Analyzer           | Agilent         | E4446A                | 2012/04/14 | 2013/04/13 |
| 24   | Wideband Peak Power Meter   | Anritsu         | ML2495A               | 2012/04/14 | 2013/04/13 |
| 25   | Power Sensor                | Anritsu         | MA2411B               | 2012/04/14 | 2013/04/13 |

## 4. TEST CONDITIONS AND RESULTS

### 4.1. AC Power Conducted Emission

#### TEST CONFIGURATION



#### TEST PROCEDURE

- 1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2009.
- 2 Support equipment, if needed, was placed as per ANSI C63.10-2009
- 3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2009
- 4 The EUT received DC5V power from the adapter, the adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5 All support equipments received AC power from a second LISN, if any.
- 6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
- 8 During the above scans, the emissions were maximized by cable manipulation.  
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

#### AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following :

| Frequency<br>(MHz) | Maximum RF Line Voltage (dBμV) |      |         |        |
|--------------------|--------------------------------|------|---------|--------|
|                    | CLASS A                        |      | CLASS B |        |
|                    | Q.P.                           | Ave. | Q.P.    | Ave.   |
| 0.15 - 0.50        | 79                             | 66   | 66-56*  | 56-46* |
| 0.50 - 5.00        | 73                             | 60   | 56      | 46     |
| 5.00 - 30.0        | 73                             | 60   | 60      | 50     |

\* Decreasing linearly with the logarithm of the frequency

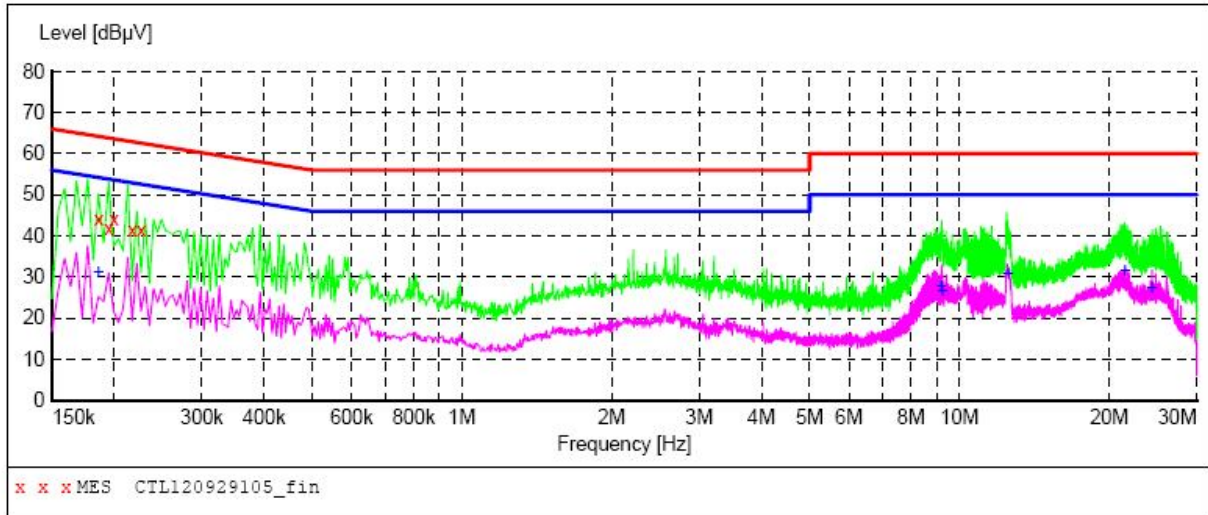
**TEST RESULTS**

The 1Mbps (GFSK Modulation) is the worst case as results in the report based on the Pre-test for all modulation models.

Mode 1:

**SCAN TABLE: "Voltage (9K-30M)FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL120929105\_fin"**

9/29/2012 1:40PM

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.186000         | 44.20         | 10.2         | 64            | 20.0         | QP       | L1   | GND |
| 0.195000         | 41.70         | 10.2         | 64            | 22.1         | QP       | L1   | GND |
| 0.199500         | 44.20         | 10.2         | 64            | 19.4         | QP       | L1   | GND |
| 0.217500         | 41.60         | 10.2         | 63            | 21.3         | QP       | L1   | GND |
| 0.226500         | 41.50         | 10.2         | 63            | 21.1         | QP       | L1   | GND |

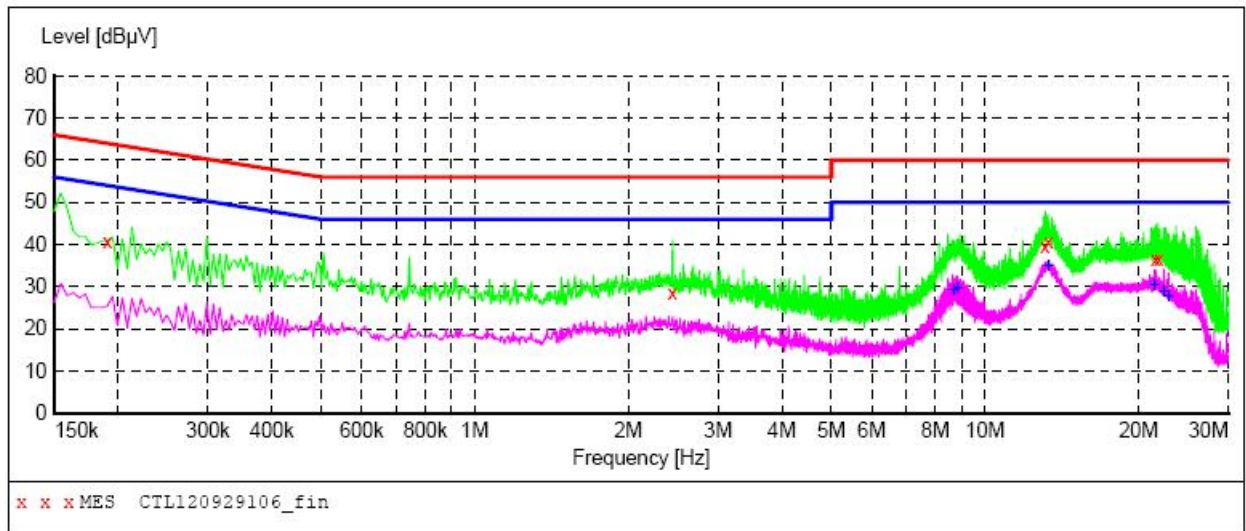
**MEASUREMENT RESULT: "CTL120929105\_fin2"**

9/29/2012 1:40PM

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.186000         | 31.40         | 10.2         | 54            | 22.8         | AV       | L1   | GND |
| 9.208500         | 28.00         | 10.6         | 50            | 22.0         | AV       | L1   | GND |
| 9.258000         | 26.60         | 10.6         | 50            | 23.4         | AV       | L1   | GND |
| 12.529500        | 30.90         | 10.6         | 50            | 19.1         | AV       | L1   | GND |
| 21.543000        | 31.70         | 11.0         | 50            | 18.3         | AV       | L1   | GND |
| 24.391500        | 27.30         | 11.1         | 50            | 22.7         | AV       | L1   | GND |

**SCAN TABLE: "Voltage (9K-30M)FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL120929106\_fin"**

9/29/2012 1:48PM

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.190500         | 40.70         | 10.2         | 64            | 23.3         | QP       | N    | GND |
| 2.440500         | 28.50         | 10.4         | 56            | 27.5         | QP       | N    | GND |
| 13.096500        | 39.70         | 10.6         | 60            | 20.3         | QP       | N    | GND |
| 13.321500        | 40.70         | 10.6         | 60            | 19.3         | QP       | N    | GND |
| 21.574500        | 36.40         | 11.0         | 60            | 23.6         | QP       | N    | GND |
| 21.907500        | 36.70         | 11.0         | 60            | 23.3         | QP       | N    | GND |

**MEASUREMENT RESULT: "CTL120929106\_fin2"**

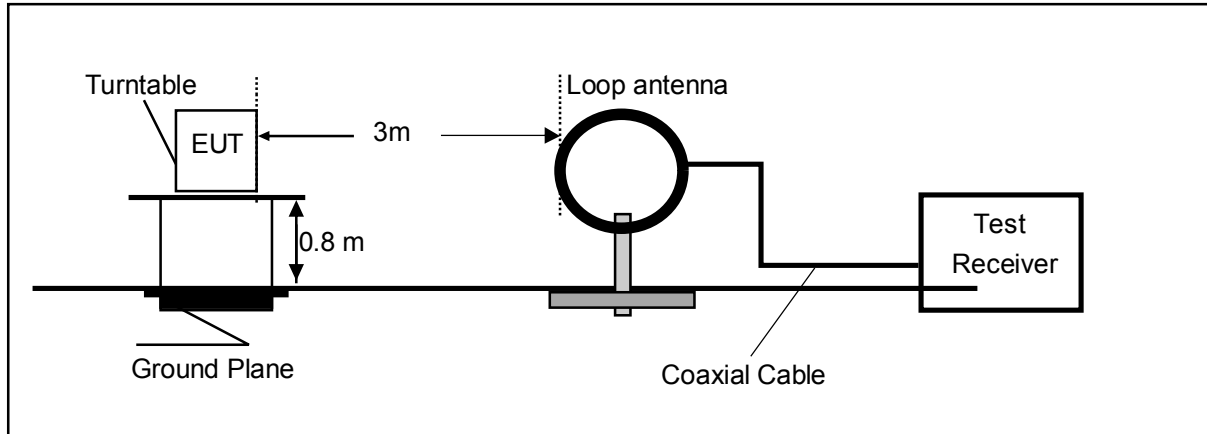
9/29/2012 1:48PM

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 8.686500         | 29.30         | 10.6         | 50            | 20.7         | AV       | N    | GND |
| 8.835000         | 29.70         | 10.6         | 50            | 20.3         | AV       | N    | GND |
| 13.339500        | 34.90         | 10.6         | 50            | 15.1         | AV       | N    | GND |
| 21.475500        | 30.50         | 11.0         | 50            | 19.5         | AV       | N    | GND |
| 22.443000        | 29.00         | 11.0         | 50            | 21.0         | AV       | N    | GND |
| 22.942500        | 27.90         | 11.1         | 50            | 22.1         | AV       | N    | GND |

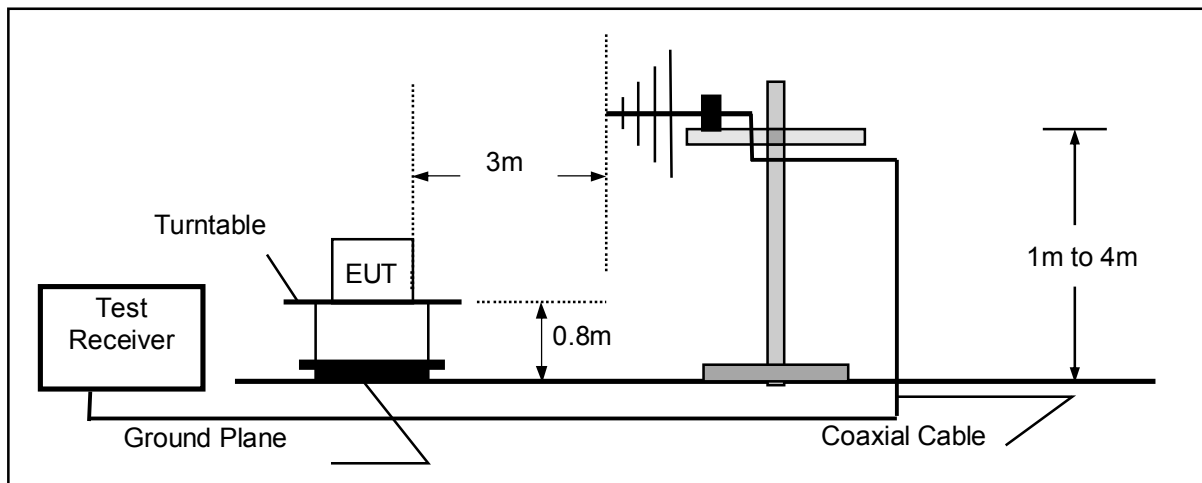
## 4.2. Radiated Emission

### TEST CONFIGURATION

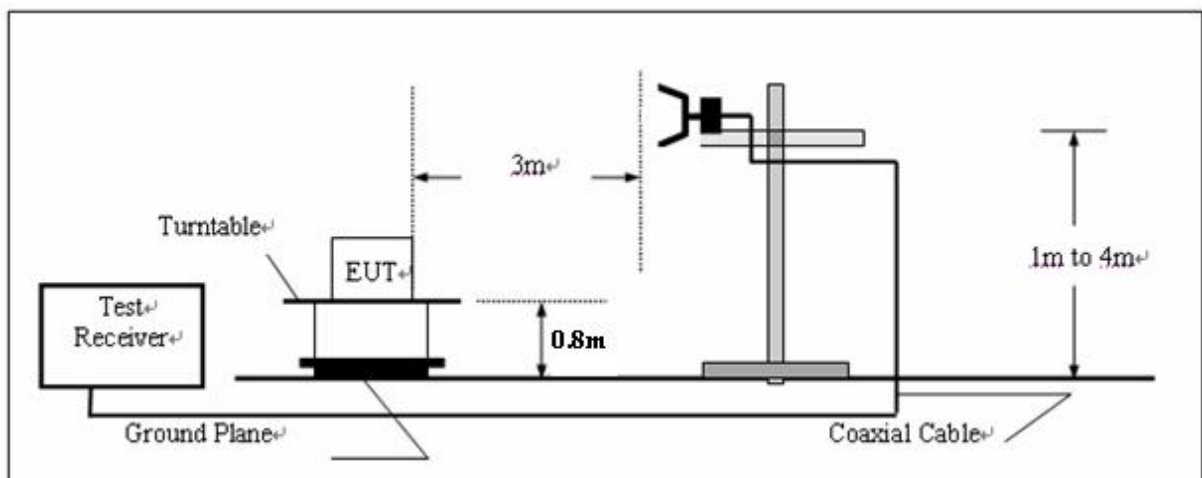
Radiated Emission Test Set-Up  
Frequency range 9KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz





## **TEST PROCEDURE**

- 1 The EUT was placed on a turn table which is 0.8m above ground plane.
- 2 Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0° to 360° to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. the fundamental frequency is 2400-2483.5MHz, So the radiation emissions frequency range were tested from 9KHz to 25GHz.

### **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       |  |

For example

| Frequency (MHz) | FS (dBμV/m) | RA (dBμV/m) | AF (dB) | CL (dB) | AG (dB) | Transd (dB) |
|-----------------|-------------|-------------|---------|---------|---------|-------------|
| 300.00          | 40          | 58.1        | 12.2    | 1.6     | 31.90   | -18.1       |

$$\text{Transd} = \text{AF} + \text{CL} - \text{AG}$$

### **RADIATION LIMIT**

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

| Frequency (MHz) | Distance (Meters) | Radiated (dBμV/m) | Radiated (μV/m) |
|-----------------|-------------------|-------------------|-----------------|
| 30-88           | 3                 | 40.0              | 100             |
| 88-216          | 3                 | 43.5              | 150             |
| 216-960         | 3                 | 46.0              | 200             |
| Above 960       | 3                 | 54.0              | 500             |

## **TEST RESULTS**

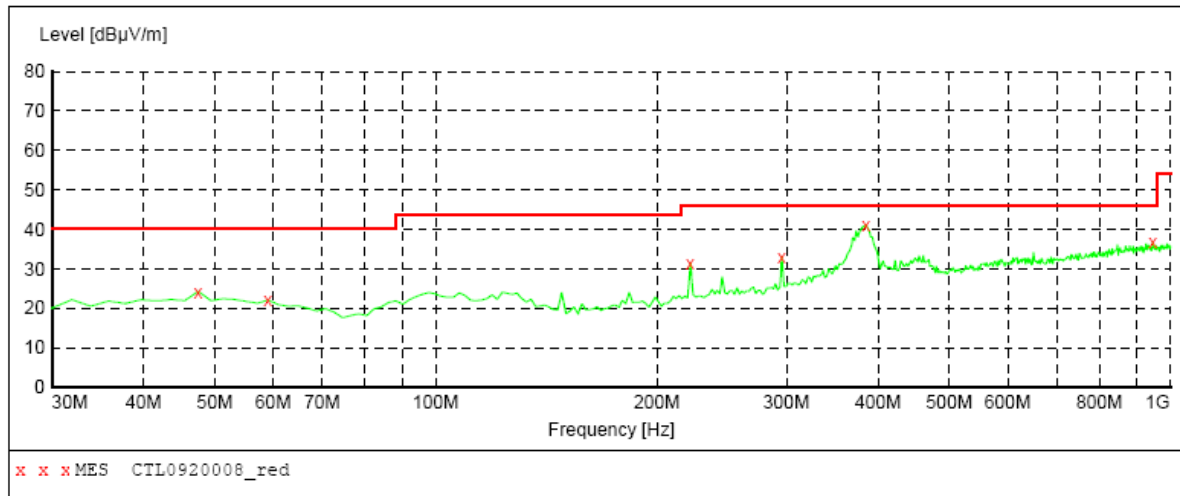
See next pages.

The 1Mbps (GFSK Modulation) is the worst case as results in the report based on the Pre-test for all modulation models.

Mode 1:

***SWEEP TABLE: "test (30M-1G)"***

|                    |           |                |        |         |              |
|--------------------|-----------|----------------|--------|---------|--------------|
| Short Description: |           | Field Strength |        |         |              |
| Start              | Stop      | Detector       | Meas.  | IF      | Transducer   |
| Frequency          | Frequency |                | Time   | Bandw.  |              |
| 30.0 MHz           | 1.0 GHz   | MaxPeak        | 5.0 ms | 100 kHz | VULB9163 NEW |

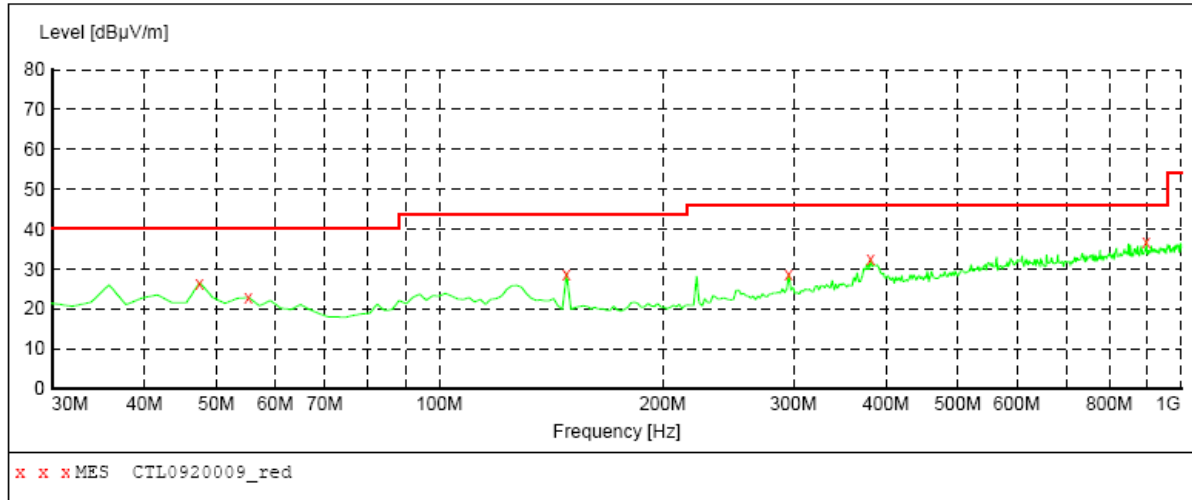
***MEASUREMENT RESULT: "CTL0920008\_red"***

9/20/2012 17:22

| Frequency<br>MHz | Level<br>dBμV/m | Transd<br>dB | Limit<br>dBμV/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------|--------------|-----------------|--------------|------|--------------|----------------|--------------|
| 47.460000        | 24.20           | 15.8         | 40.0            | 15.8         | ---  | 100.0        | 0.00           | HORIZONTAL   |
| 59.100000        | 22.00           | 14.6         | 40.0            | 18.0         | ---  | 100.0        | 0.00           | HORIZONTAL   |
| 222.060000       | 31.50           | 15.5         | 46.0            | 14.5         | ---  | 100.0        | 0.00           | HORIZONTAL   |
| 295.780000       | 33.10           | 18.6         | 46.0            | 12.9         | ---  | 100.0        | 0.00           | HORIZONTAL   |
| 385.020000       | 41.10           | 21.1         | 46.0            | 4.9          | ---  | 100.0        | 0.00           | HORIZONTAL   |
| 945.680000       | 36.80           | 29.5         | 46.0            | 9.2          | ---  | 100.0        | 0.00           | HORIZONTAL   |

***SWEEP TABLE: "test (30M-1G)"***

| Short Description: |           | Field Strength |            |           |              |
|--------------------|-----------|----------------|------------|-----------|--------------|
| Start              | Stop      | Detector       | Meas. Time | IF Bandw. | Transducer   |
| Frequency          | Frequency |                |            |           |              |
| 30.0 MHz           | 1.0 GHz   | MaxPeak        | 5.0 ms     | 100 kHz   | VULB9163 NEW |

***MEASUREMENT RESULT: "CTL0920009\_red"***

9/20/2012 17:24

| Frequency<br>MHz | Level<br>dBμV/m | Transd<br>dB | Limit<br>dBμV/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------|--------------|-----------------|--------------|------|--------------|----------------|--------------|
| 47.460000        | 26.50           | 15.8         | 40.0            | 13.5         | ---  | 100.0        | 0.00           | VERTICAL     |
| 55.220000        | 22.80           | 15.6         | 40.0            | 17.2         | ---  | 100.0        | 0.00           | VERTICAL     |
| 148.340000       | 28.90           | 12.3         | 43.5            | 14.6         | ---  | 100.0        | 0.00           | VERTICAL     |
| 295.780000       | 28.70           | 18.6         | 46.0            | 17.3         | ---  | 100.0        | 0.00           | VERTICAL     |
| 381.140000       | 32.40           | 20.9         | 46.0            | 13.6         | ---  | 100.0        | 0.00           | VERTICAL     |
| 897.180000       | 37.00           | 29.2         | 46.0            | 9.0          | ---  | 100.0        | 0.00           | VERTICAL     |

**Remark:**

- (1) Measuring frequencies from 9 KHz to the 1GHz, Loop Antenna used below 30MHz. See Section 3.6 table item 20. Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Datas of measurement 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. The test results from 9KHz to 25MHz are not reported because the emissions levels that are 20dB below the official limit.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz. Below 30MHz was 10KHz.

**Above 1G**

The frequency spectrum above 1 GHz for Transmitter was investigated. All emission not reported are much lower than the prescribed limits. Set the RBW=1MHz,VBW=3MHz for Peak Detector while the RBW=1MHz,VBW=10Hz for Average Detector,Readings are both peak and average values. The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

**Low channel****ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|--------------------|----------------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 1   | *2402.00        | 92.15                   | PK |                |             | 1.00               | 178                  | 95.55            | 28.3                  | 4.90              | 36.6               | -3.40                    |
| 1   | *2402.00        | 85.21                   | AV |                |             | 1.00               | 178                  | 88.61            | 28.3                  | 4.90              | 36.6               | -3.40                    |
| 2   | 4804.00         | 48.24                   | PK | 74.00          | 25.76       | 1.00               | 152                  | 45.04            | 32.7                  | 7.00              | 36.5               | 3.20                     |
| 2   | 4804.00         | --                      | AV | 54.00          | --          | 1.00               | 152                  | --               | 32.7                  | 7.00              | 36.5               | 3.20                     |
| 3   | 7206.00         | 49.15                   | PK | 74.00          | 24.85       | 1.00               | 98                   | 39.75            | 35.8                  | 8.90              | 35.3               | 9.40                     |
| 3   | 7206.00         | --                      | AV | 54.00          | --          | 1.00               | 98                   | --               | 35.8                  | 8.90              | 35.3               | 9.40                     |
| 4   | 10243.21        | 50.55                   | PK | 74.00          | 23.45       | 1.00               | 322                  | 33.95            | 38.0                  | 11.30             | 32.7               | 16.6                     |
| 4   | 10243.21        | --                      | AV | 54.00          | --          | 1.00               | 322                  | --               | 38.0                  | 11.30             | 32.7               | 16.6                     |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|--------------------|----------------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 1   | *2402.00        | 92.52                   | PK |                |             | 1.00               | 145                  | 95.9             | 28.3                  | 4.90              | 36.6               | -3.40                    |
| 1   | *2402.00        | 86.47                   | AV |                |             | 1.00               | 145                  | 89.8             | 28.3                  | 4.90              | 36.6               | -3.40                    |
| 2   | 4804.00         | 47.58                   | PK | 74.00          | 26.42       | 1.00               | 256                  | 44.3             | 32.7                  | 7.00              | 36.5               | 3.20                     |
| 2   | 4804.00         | --                      | AV | 54.00          | --          | 1.00               | 256                  | --               | 32.7                  | 7.00              | 36.5               | 3.20                     |
| 3   | 7206.00         | 49.55                   | PK | 74.00          | 24.45       | 1.00               | 327                  | 40.1             | 35.8                  | 8.90              | 35.3               | 9.40                     |
| 3   | 7206.00         | --                      | AV | 54.00          | --          | 1.00               | 327                  | --               | 35.8                  | 8.90              | 35.3               | 9.40                     |
| 4   | 10423.45        | 50.14                   | PK | 74.00          | 23.86       | 1.00               | 85                   | 33.5             | 38.0                  | 11.30             | 32.7               | 16.6                     |
| 4   | 10423.45        | --                      | AV | 54.00          | --          | 1.00               | 85                   | --               | 38.0                  | 11.30             | 32.7               | 16.6                     |

**Middle channel****ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

| No. | Frequency (MHz) | Emission Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
|-----|-----------------|-------------------------|----|----------------|-------------|--------------------|----------------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 1   | *2441.00        | 90.25                   | PK |                |             | 1.00               | 322                  | 93.45            | 28.3                  | 5.10              | 36.6               | -3.20                    |
| 1   | *2441.00        | 83.25                   | AV |                |             | 1.00               | 322                  | 86.45            | 28.3                  | 5.10              | 36.6               | -3.20                    |
| 2   | 4882.00         | 47.58                   | PK | 74.00          | 26.42       | 1.00               | 141                  | 44.18            | 32.3                  | 7.60              | 36.5               | 3.40                     |
| 2   | 4882.00         | --                      | AV | 54.00          | --          | 1.00               | 141                  | --               | 32.3                  | 7.60              | 36.5               | 3.40                     |
| 3   | 7323.00         | 50.52                   | PK | 74.00          | 23.48       | 1.00               | 258                  | 41.12            | 36.1                  | 8.60              | 35.3               | 9.40                     |
| 3   | 7323.00         | --                      | AV | 54.00          | --          | 1.00               | 258                  | --               | 36.1                  | 8.60              | 35.3               | 9.40                     |
| 4   | 10536.45        | 51.58                   | PK | 74.00          | 22.42       | 1.00               | 36                   | 34.98            | 38.0                  | 11.30             | 32.7               | 16.6                     |
| 4   | 10536.45        | --                      | AV | 54.00          | --          | 1.00               | 36                   | --               | 38.0                  | 11.30             | 32.7               | 16.6                     |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

| No. | Frequency (MHz) | Emssion Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
|-----|-----------------|------------------------|----|----------------|-------------|--------------------|----------------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 1   | *2441.00        | 91.12                  | PK |                |             | 1.00               | 179                  | 94.32            | 28.3                  | 5.10              | 36.6               | -3.20                    |
| 1   | *2441.00        | 83.41                  | AV |                |             | 1.00               | 179                  | 86.61            | 28.3                  | 5.10              | 36.6               | -3.20                    |
| 2   | 4882.00         | 48.52                  | PK | 74.00          | 25.48       | 1.00               | 146                  | 45.12            | 32.3                  | 7.60              | 36.5               | 3.40                     |
| 2   | 4882.00         | --                     | AV | 54.00          | --          | 1.00               | 146                  | --               | 32.3                  | 7.60              | 36.5               | 3.40                     |
| 3   | 7323.00         | 50.54                  | PK | 74.00          | 23.46       | 1.00               | 210                  | 41.14            | 36.1                  | 8.60              | 35.3               | 9.40                     |
| 3   | 7323.00         | --                     | AV | 54.00          | --          | 1.00               | 210                  | --               | 36.1                  | 8.60              | 35.3               | 9.40                     |
| 4   | 10632.54        | 52.45                  | PK | 74.00          | 21.55       | 1.00               | 265                  | 35.85            | 38.0                  | 11.30             | 32.7               | 16.6                     |
| 4   | 10632.54        | --                     | AV | 54.00          | --          | 1.00               | 265                  | --               | 38.0                  | 11.30             | 32.7               | 16.6                     |

**High channel****ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

| No. | Frequency (MHz) | Emssion Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
|-----|-----------------|------------------------|----|----------------|-------------|--------------------|----------------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 1   | *2480.00        | 88.33                  | PK |                |             | 1.00               | 320                  | 91.63            | 28.2                  | 5.10              | 36.6               | -3.30                    |
| 1   | *2480.00        | 80.10                  | AV |                |             | 1.00               | 320                  | 83.40            | 28.2                  | 5.10              | 36.6               | -3.30                    |
| 2   | 4960.00         | 48.52                  | PK | 74.00          | 25.48       | 1.00               | 141                  | 44.72            | 33.0                  | 7.00              | 36.2               | 3.80                     |
| 2   | 4960.00         | --                     | AV | 54.00          | --          | 1.00               | 141                  | --               | 33.0                  | 7.00              | 36.2               | 3.80                     |
| 3   | 7340.00         | 50.21                  | PK | 74.00          | 23.79       | 1.00               | 256                  | 40.81            | 36.2                  | 8.50              | 35.3               | 9.40                     |
| 3   | 7340.00         | --                     | AV | 54.00          | --          | 1.00               | 256                  | --               | 36.2                  | 8.50              | 35.3               | 9.40                     |
| 4   | 10535.10        | 52.41                  | PK | 74.00          | 21.59       | 1.00               | 87                   | 35.81            | 38.0                  | 11.30             | 32.7               | 16.6                     |
| 4   | 10535.10        | --                     | AV | 54.00          | --          | 1.00               | 87                   | --               | 38.0                  | 11.30             | 32.7               | 16.6                     |

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

| No. | Frequency (MHz) | Emssion Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
|-----|-----------------|------------------------|----|----------------|-------------|--------------------|----------------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 1   | *2480.00        | 89.14                  | PK |                |             | 1.00               | 48                   | 92.4             | 28.2                  | 5.10              | 36.6               | -3.30                    |
| 1   | *2480.00        | 81.87                  | AV |                |             | 1.00               | 48                   | 85.1             | 28.2                  | 5.10              | 36.6               | -3.30                    |
| 2   | 4960.00         | 49.52                  | PK | 74.00          | 24.48       | 1.00               | 252                  | 45.7             | 36.2                  | 8.50              | 35.3               | 3.80                     |
| 2   | 4960.00         | --                     | AV | 54.00          | --          | 1.00               | 252                  | --               | 36.2                  | 8.50              | 35.3               | 3.80                     |
| 3   | 7340.00         | 50.22                  | PK | 74.00          | 23.78       | 1.00               | 32                   | 40.8             | 37.4                  | 10.10             | 34.8               | 9.40                     |
| 3   | 7340.00         | --                     | AV | 54.00          | --          | 1.00               | 32                   | --               | 37.4                  | 10.10             | 34.8               | 9.40                     |
| 4   | 10361.45        | 52.81                  | PK | 74.00          | 21.19       | 1.00               | 144                  | 36.2             | 38.0                  | 11.30             | 32.7               | 16.6                     |
| 4   | 10361.45        | --                     | AV | 54.00          | --          | 1.00               | 144                  | --               | 38.0                  | 11.30             | 32.7               | 16.6                     |

**Suprious emission in restricted band**

| No. | Frequency (MHz) | Emssion Level (dBuV/m) |    | Limit (dBuV/m) | Margin (dB) | Antenna Height (m) | Table Angle (Degree) | Raw Value (dBuV) | Antenna Factor (dB/m) | Cable Factor (dB) | Pre-amplifier (dB) | Correction Factor (dB/m) |
|-----|-----------------|------------------------|----|----------------|-------------|--------------------|----------------------|------------------|-----------------------|-------------------|--------------------|--------------------------|
| 1   | 2390.00         | 52.44                  | PK | 74.00          | 21.56       | 1.00 H             | 154                  | 55.84            | 28.3                  | 4.90              | 36.6               | -3.40                    |
| 1   | 2390.00         | --                     | AV | 54.00          | --          | 1.00 H             | 154                  | --               | 28.3                  | 4.90              | 36.6               | -3.40                    |
| 2   | 2390.00         | 52.78                  | PK | 74.00          | 21.22       | 1.00 V             | 355                  | 56.18            | 28.3                  | 4.90              | 36.6               | -3.40                    |
| 2   | 2390.00         | --                     | AV | 54.00          | --          | 1.00 V             | 355                  | --               | 28.3                  | 4.90              | 36.6               | -3.40                    |
| 3   | 2483.5          | 57.85                  | PK | 74.00          | 16.15       | 1.00 H             | 102                  | 61.15            | 28.2                  | 5.10              | 36.6               | -3.30                    |
| 3   | 2483.5          | 47.61                  | AV | 54.00          | 6.39        | 1.00 H             | 102                  | 50.91            | 28.2                  | 5.10              | 36.6               | -3.30                    |
| 4   | 2483.5          | 58.25                  | PK | 74.00          | 15.75       | 1.00 V             | 90                   | 61.55            | 28.2                  | 5.10              | 36.6               | -3.30                    |
| 4   | 2483.5          | 49.21                  | AV | 54.00          | 4.79        | 1.00 V             | 90                   | 52.51            | 28.2                  | 5.10              | 36.6               | -3.30                    |

### 4.3. Maximum Peak Output Power

#### TEST CONFIGURATION



#### TEST PROCEDURE

According to ANSI C63.10: 2009.

Use the following spectrum analyzer settings:

Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured.

VBW  $\geq$  RBW, Sweep = auto, Detector function = peak, Trace = max hold

Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (don't forget added the external attenuation and cable loss).

#### LIMIT

The Maximum Peak Output Power Measurement limit is 30dBm.

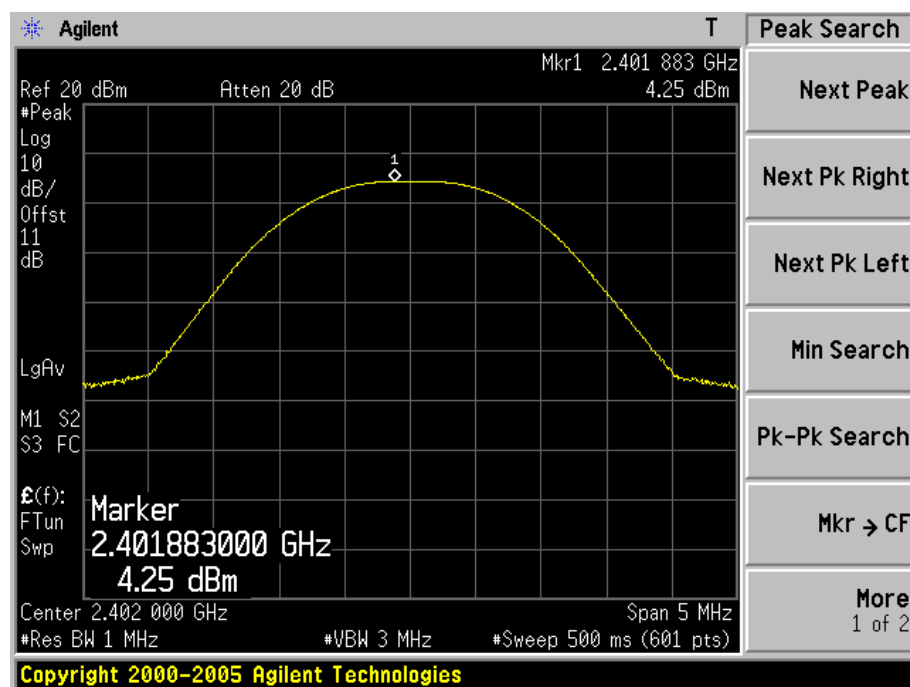
#### TEST RESULTS

DH5 Mode:

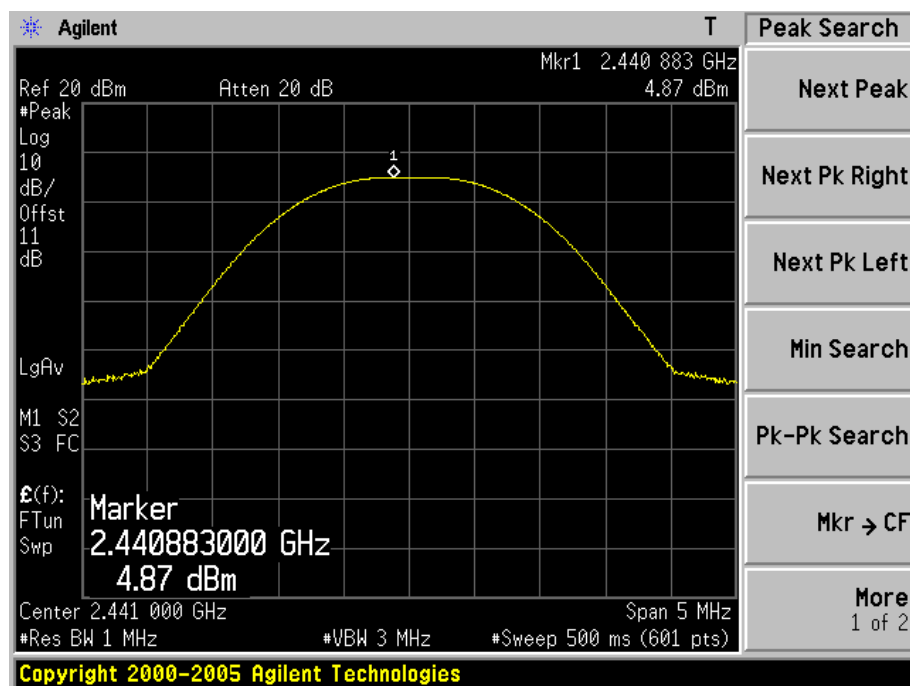
| Channel Frequency (MHz) | Peak Power Output (dBm) | Peak Power Limit (dBm) | Pass / Fail |
|-------------------------|-------------------------|------------------------|-------------|
| 2402                    | 4.25                    | 30                     | PASS        |
| 2441                    | 4.87                    | 30                     | PASS        |
| 2480                    | 5.23                    | 30                     | PASS        |

Note: The test results including the cable loss.

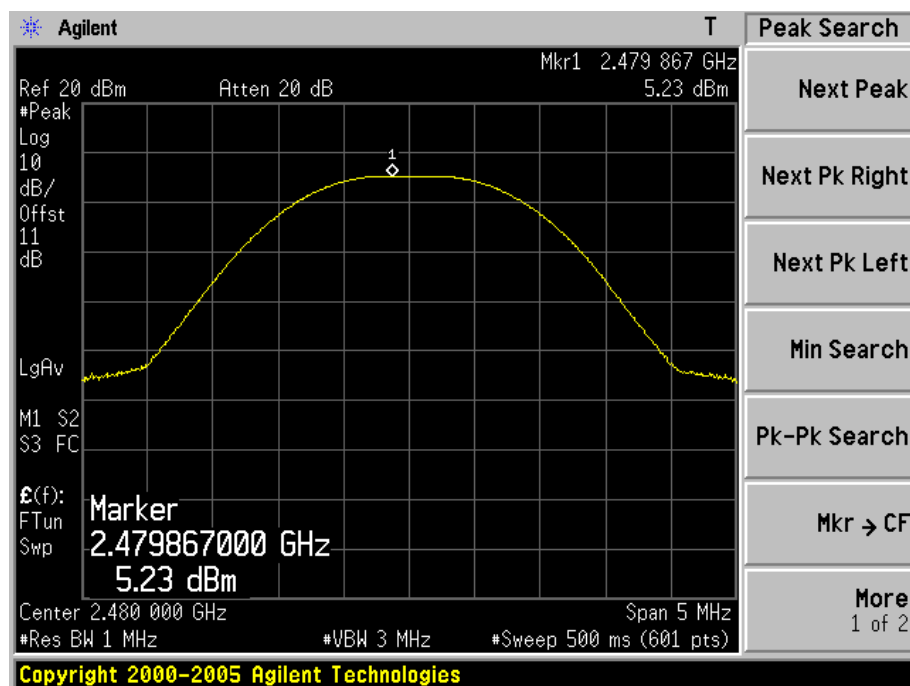
#### Low channel



## Middle channel



## High channel

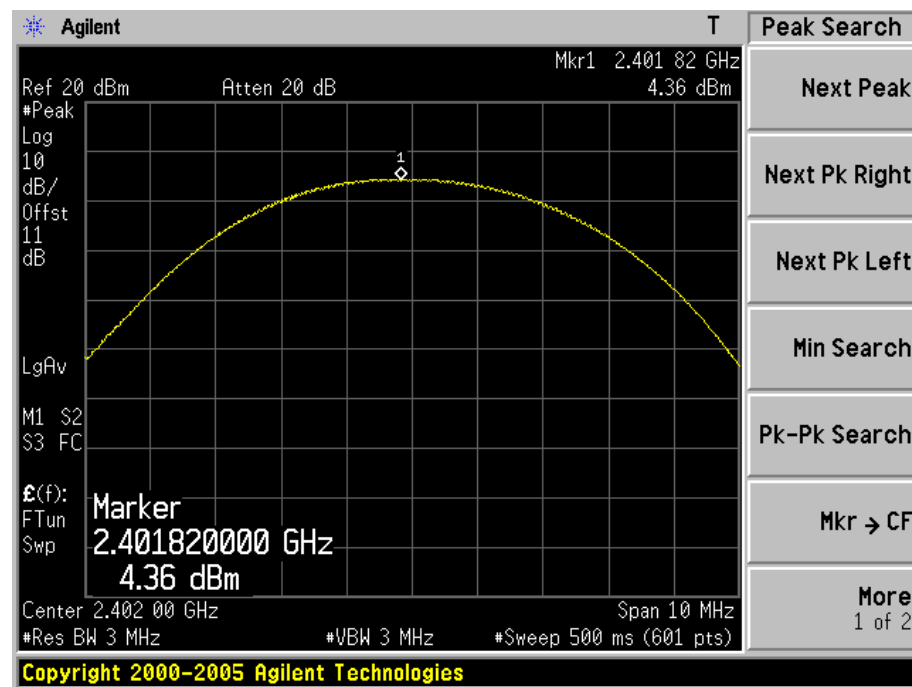


## 2DH5 Mode:

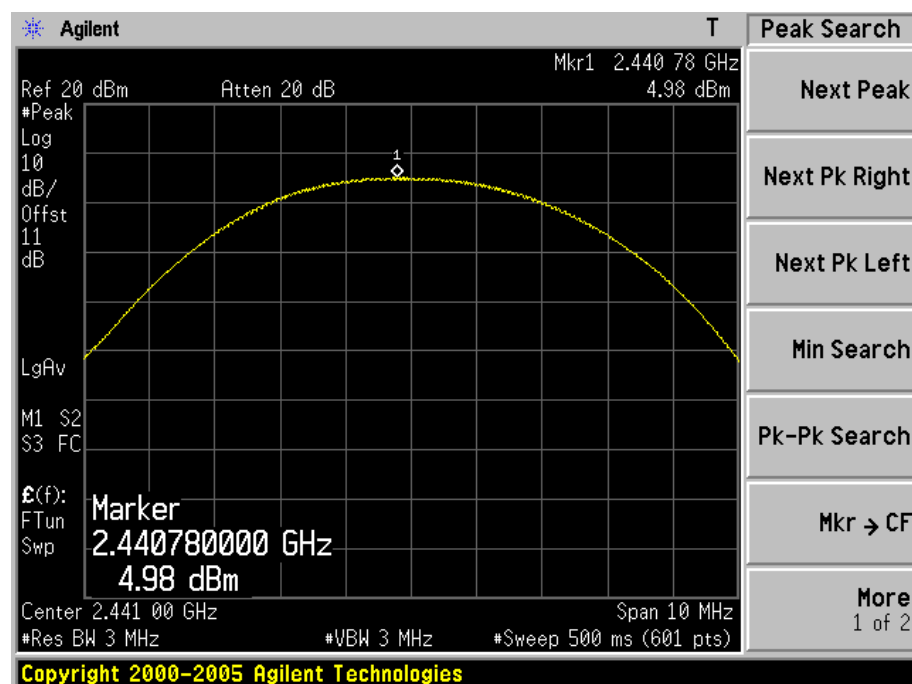
| Channel Frequency (MHz) | Peak Power Output (dBm) | Peak Power Limit (dBm) | Pass / Fail |
|-------------------------|-------------------------|------------------------|-------------|
| 2402                    | 4.36                    | 30                     | PASS        |
| 2441                    | 4.98                    | 30                     | PASS        |
| 2480                    | 5.05                    | 30                     | PASS        |

Note: The test results including the cable lose.

## Low channel

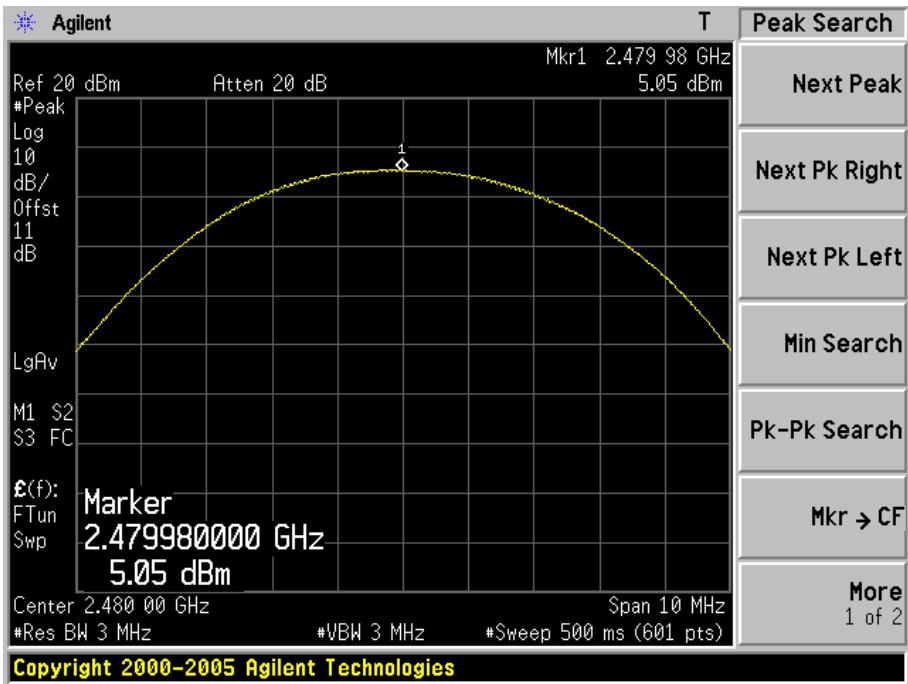


## Middle channel





High channel

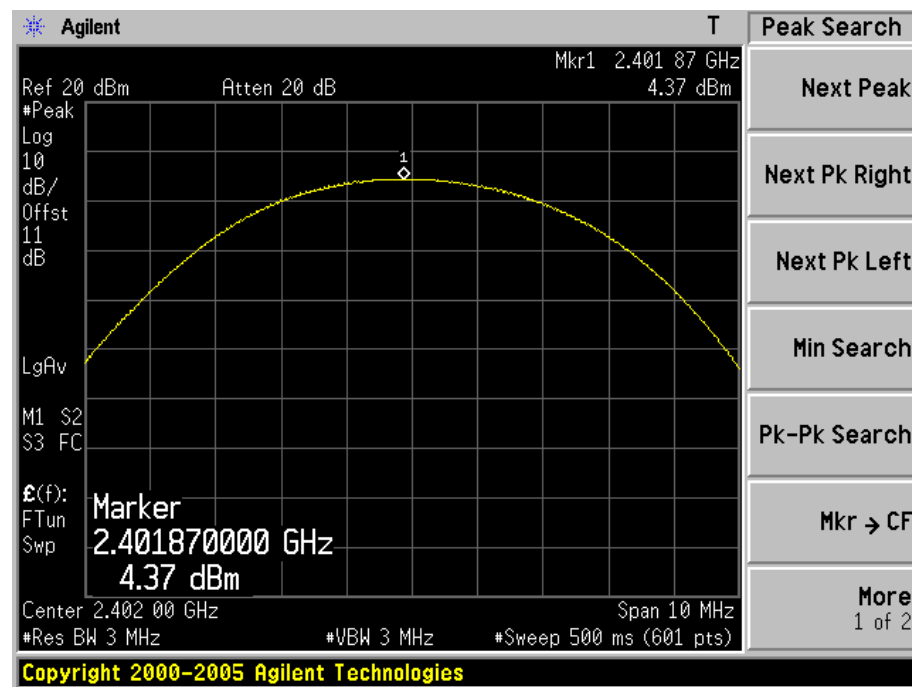


## 3DH5 Mode:

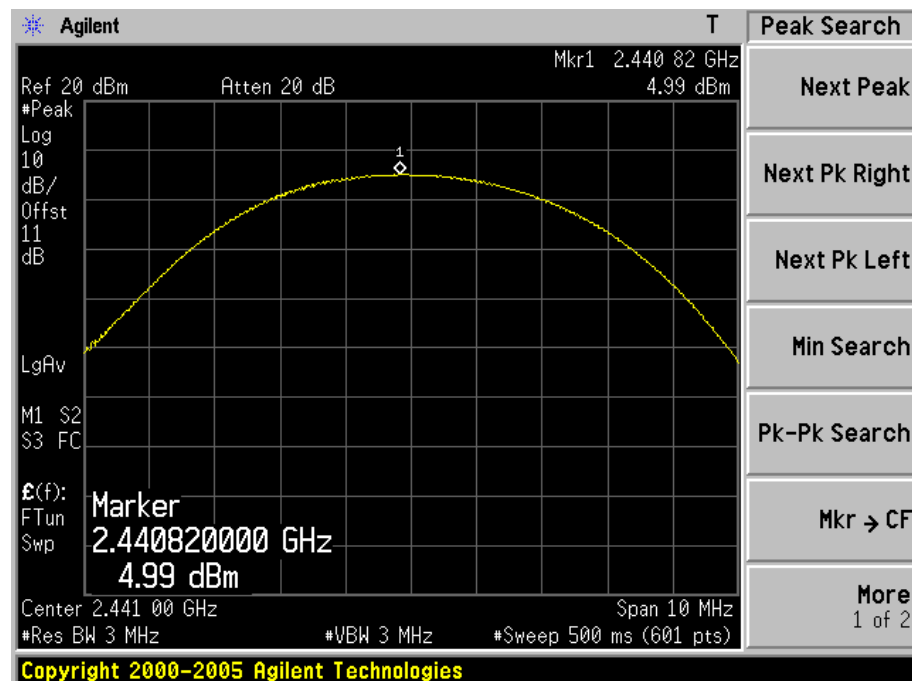
| Channel Frequency (MHz) | Peak Power Output (dBm) | Peak Power Limit (dBm) | Pass / Fail |
|-------------------------|-------------------------|------------------------|-------------|
| 2402                    | 4.37                    | 30                     | PASS        |
| 2441                    | 4.99                    | 30                     | PASS        |
| 2480                    | 5.32                    | 30                     | PASS        |

Note: The test results including the cable lose.

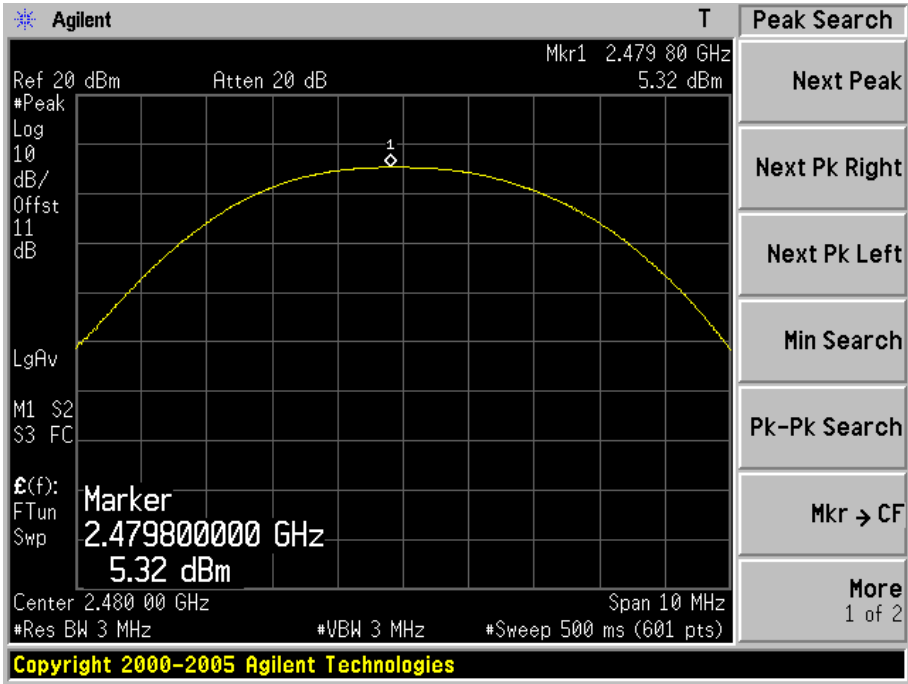
## Low channel



## Middle channel



High channel



#### 4.4. 20dB Bandwidth

##### TEST CONFIGURATION



##### TEST PROCEDURE

According to ANSI C63.10: 2009.

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel

RBW  $\geq$  1% of the 20dB bandwidth, VBW  $\geq$  RBW, Sweep = auto, Detector function = peak, Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize.

Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

##### LIMIT

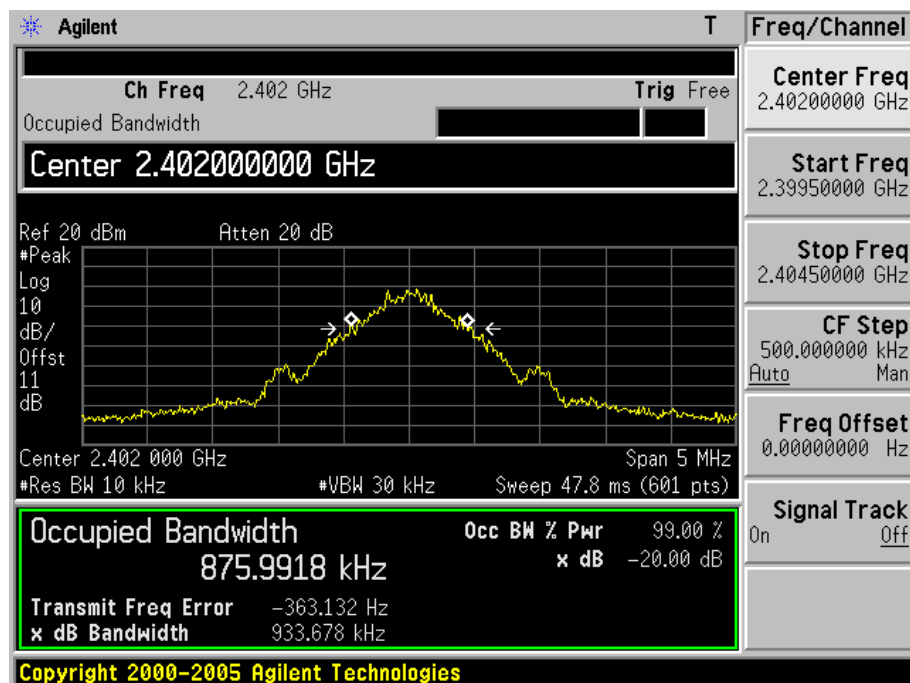
For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

##### TEST RESULTS

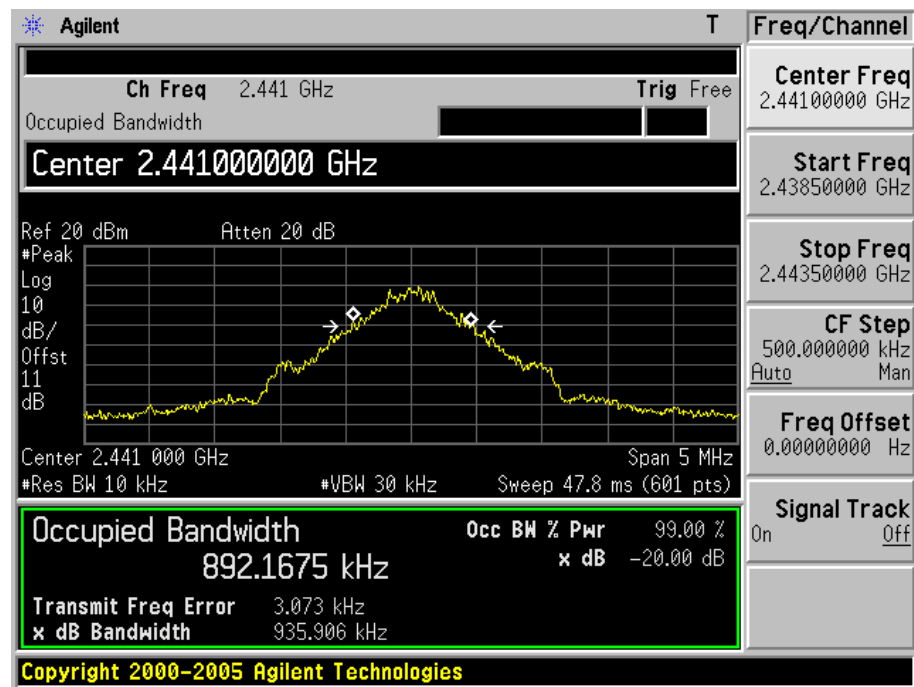
DH5 Mode:

| CHANNEL<br>FREQUENCY<br>(MHz) | 20dB BANDWIDTH<br>(MHz) | LIMIT<br>(MHz) | PASS/FAIL |
|-------------------------------|-------------------------|----------------|-----------|
| 2402                          | 0.934                   | /              | PASS      |
| 2441                          | 0.936                   | /              | PASS      |
| 2480                          | 0.935                   | /              | PASS      |

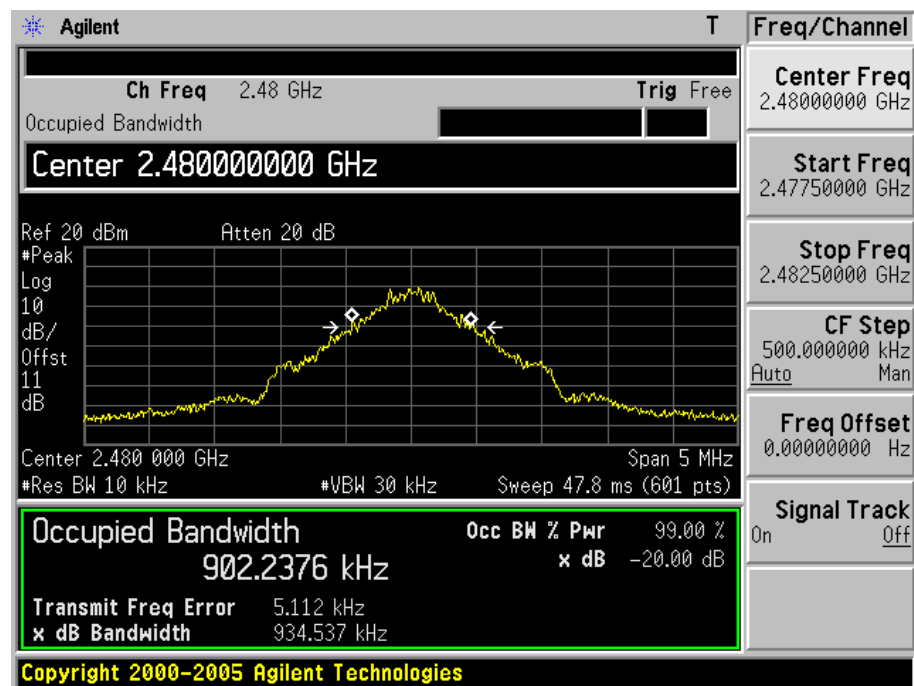
##### Low Channel



## Middle Channel



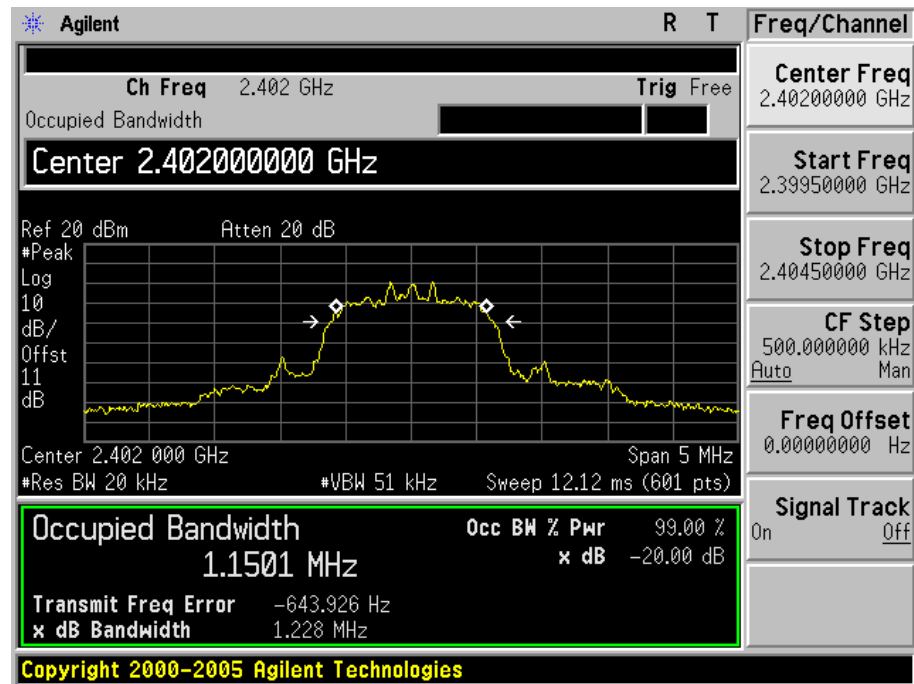
## High Channel



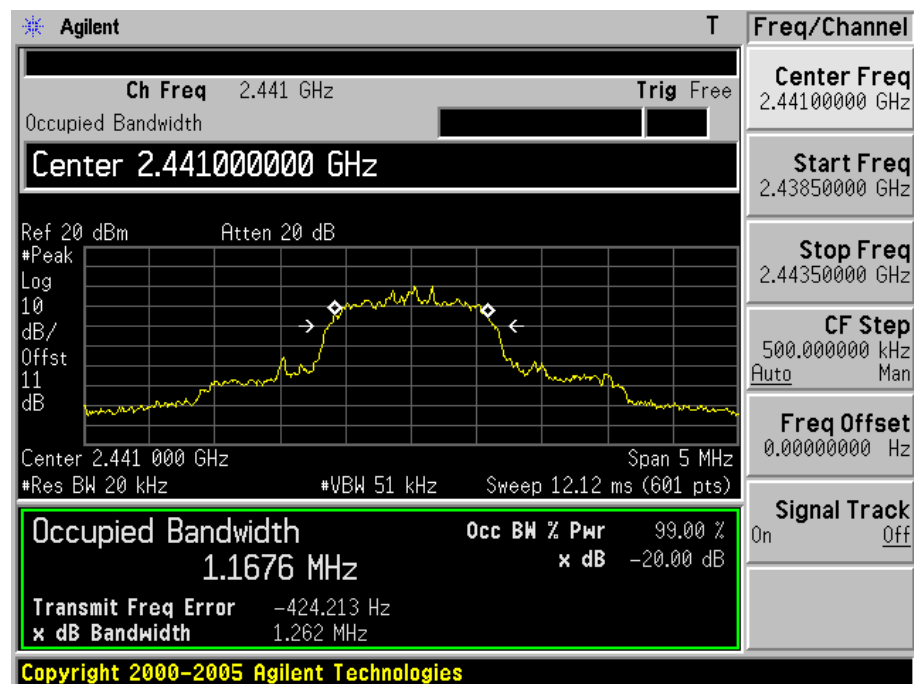
2DH5 Mode:

| CHANNEL<br>FREQUENCY<br>(MHz) | 20dB BANDWIDTH<br>(MHz) | LIMIT<br>(MHz) | PASS/FAIL |
|-------------------------------|-------------------------|----------------|-----------|
| 2402                          | 1.228                   | /              | PASS      |
| 2441                          | 1.262                   | /              | PASS      |
| 2480                          | 1.233                   | /              | PASS      |

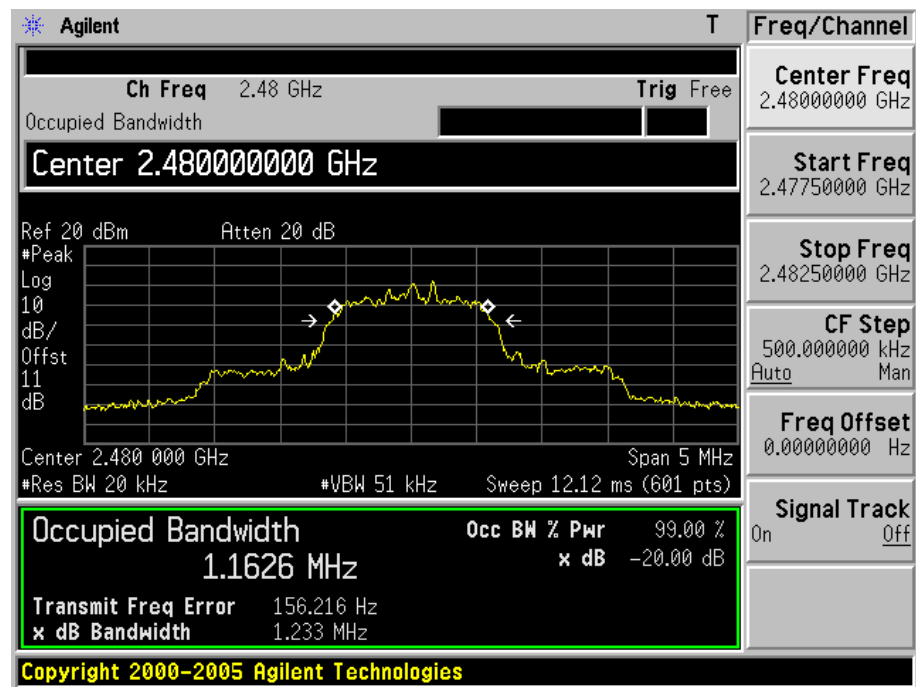
## Low Channel



## Middle Channel



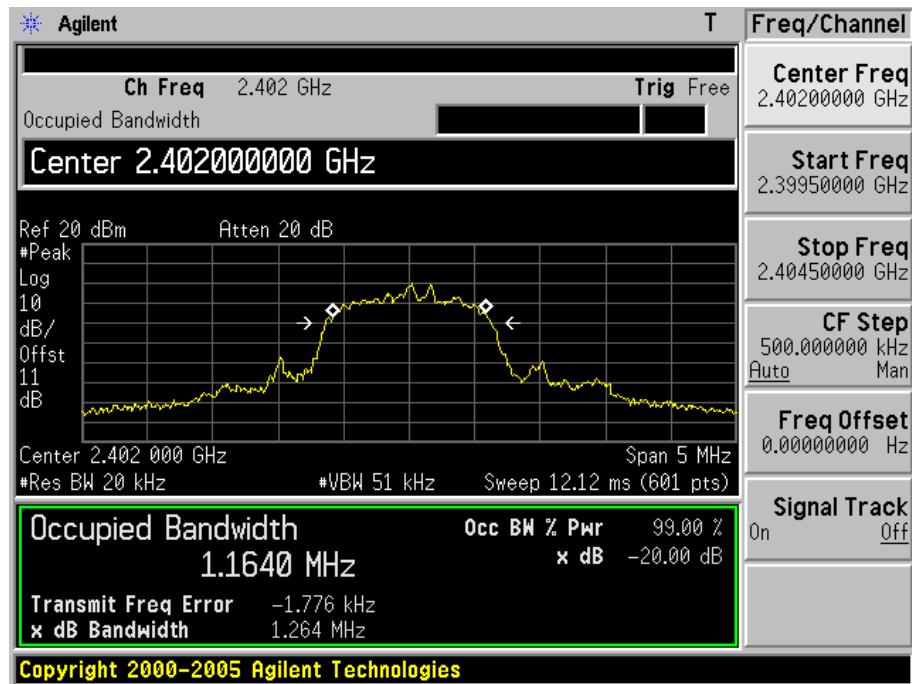
## High Channel



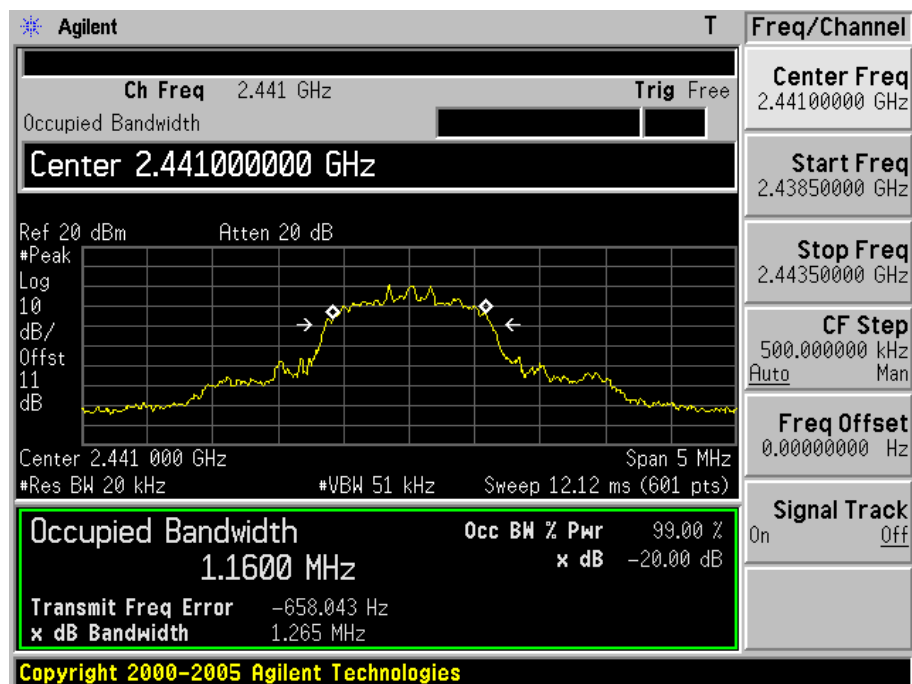
## 3DH5 Mode:

| CHANNEL<br>FREQUENCY<br>(MHz) | 20dB BANDWIDTH<br>(MHz) | LIMIT<br>(MHz) | PASS/FAIL |
|-------------------------------|-------------------------|----------------|-----------|
| 2402                          | 1.264                   | /              | PASS      |
| 2441                          | 1.265                   | /              | PASS      |
| 2480                          | 1.268                   | /              | PASS      |

## Low Channel

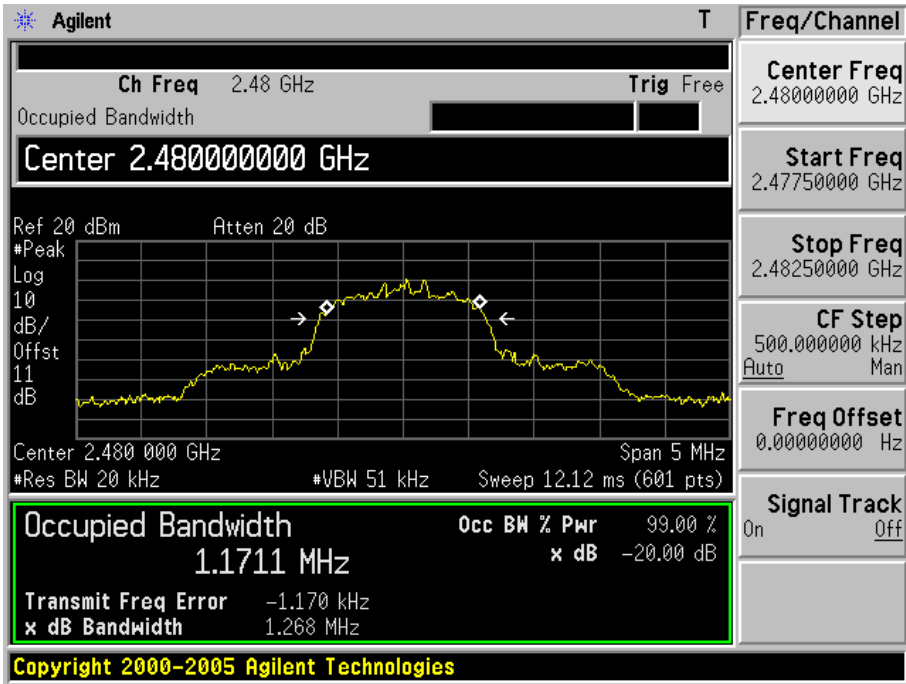


## Middle Channel





High Channel



## 4.5. Band Edge

### Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

### TEST PROCEDURE

According to ANSI C63.10: 2009.

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation.

RBW  $\geq$  1% of the span

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. The marker-delta value now displayed must comply with the limit specified in this Section.

Now, using the same instrument settings, enable the hopping function of the EUT. Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

### TEST RESULTS

**Spurious emission in restricted band please see page 18**

See next pages.

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 19:43

Limit: FCC\_Part15.209\_RE(3m)

Margin: 0

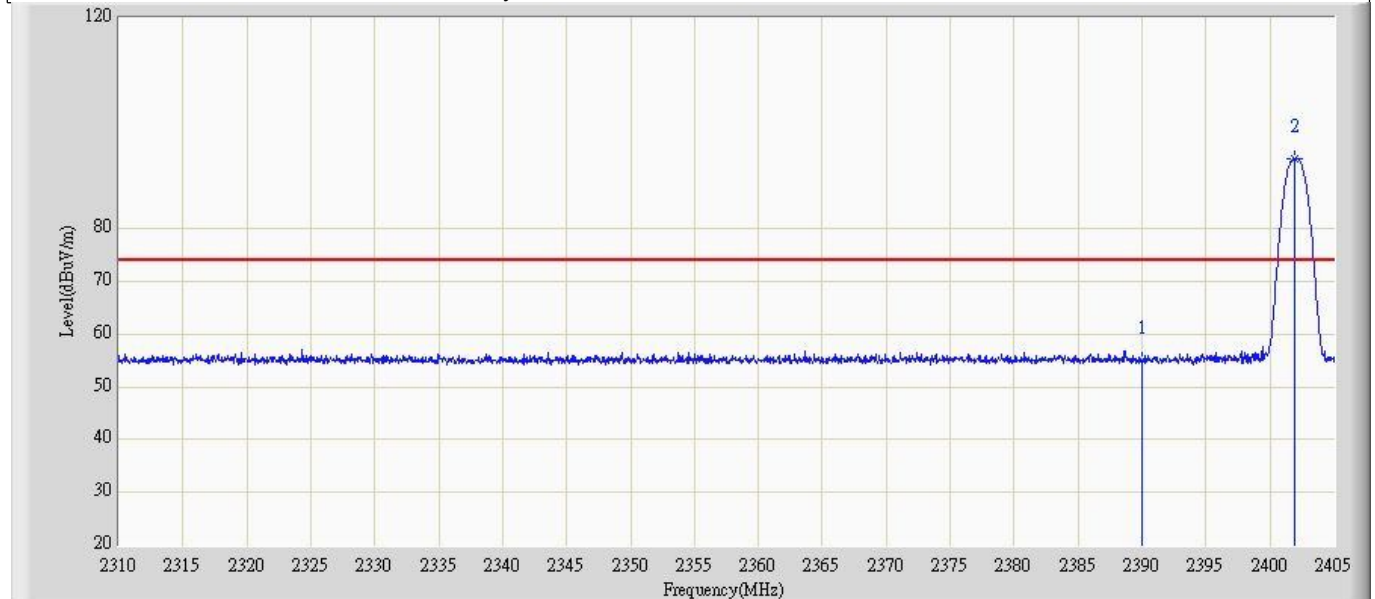
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode1: Transmit at channel 2402MHz by DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 55.019                 | 23.931               | -18.981         | 74.000         | 31.088      | PK   |
| 2  | *    | 2401.960        | 93.251                 | 62.094               | N/A             | N/A            | 31.157      | PK   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 20:01

Limit: FCC\_Part15.209\_RE(3m)

Margin: 0

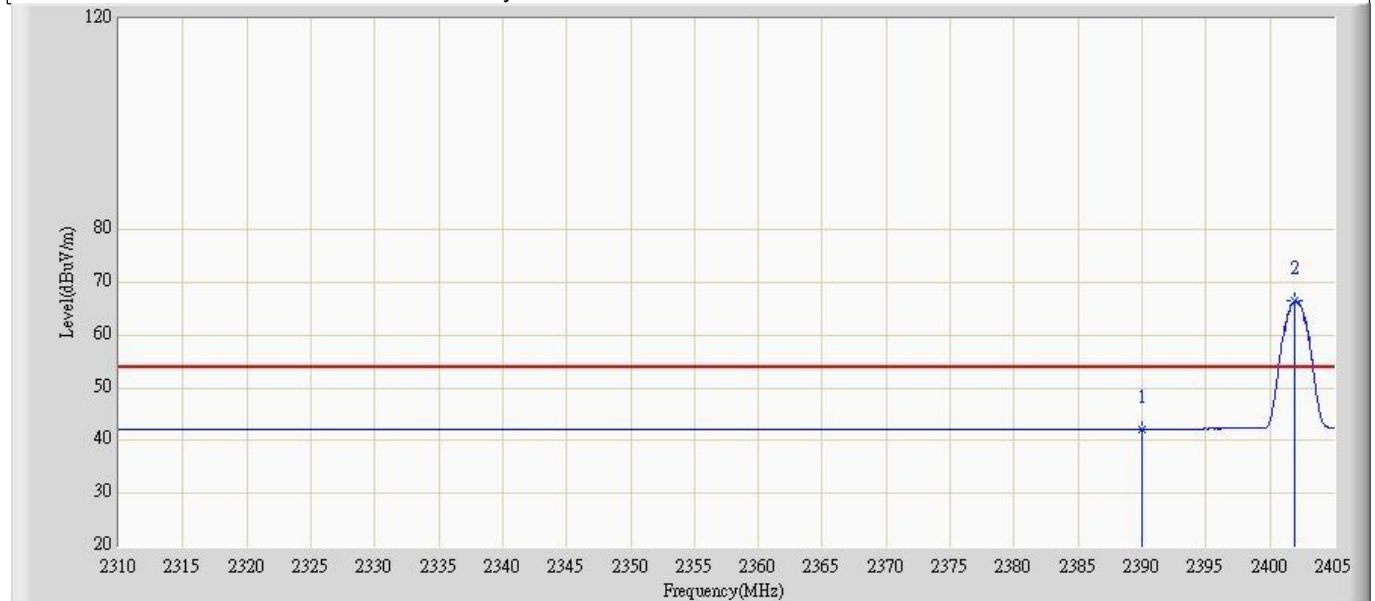
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode1: Transmit at channel 2402MHz by DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 42.208                 | 11.120               | -11.792         | 54.000         | 31.088      | AV   |
| 2  | *    | 2401.960        | 66.468                 | 35.311               | N/A             | N/A            | 31.157      | AV   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 20:04

Limit: FCC Part15.209 RE(3m)

Margin: 0

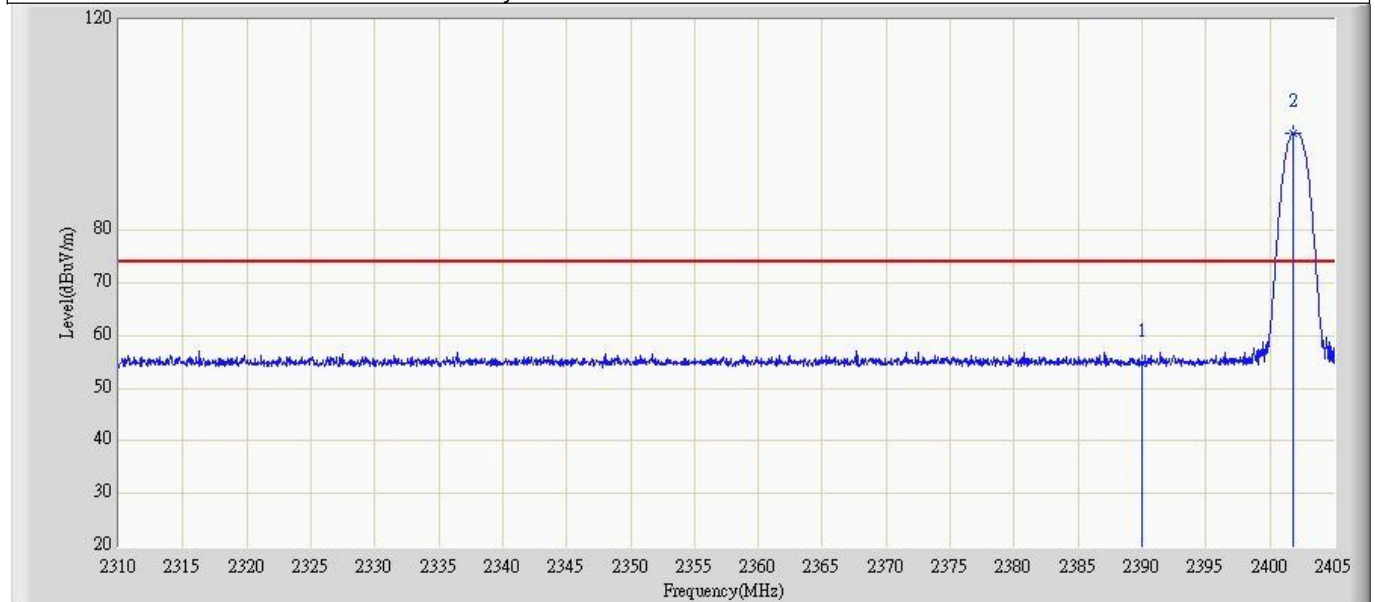
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Vertical

EUT: Tablet

Power: By battery

Note: Mode1: Transmit at channel 2402MHz by DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 54.698                 | 23.610               | -19.302         | 74.000         | 31.088      | PK   |
| 2  | *    | 2401.817        | 98.444                 | 67.288               | N/A             | N/A            | 31.156      | PK   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 20:06

Limit: FCC Part15.209 RE(3m)

Margin: 0

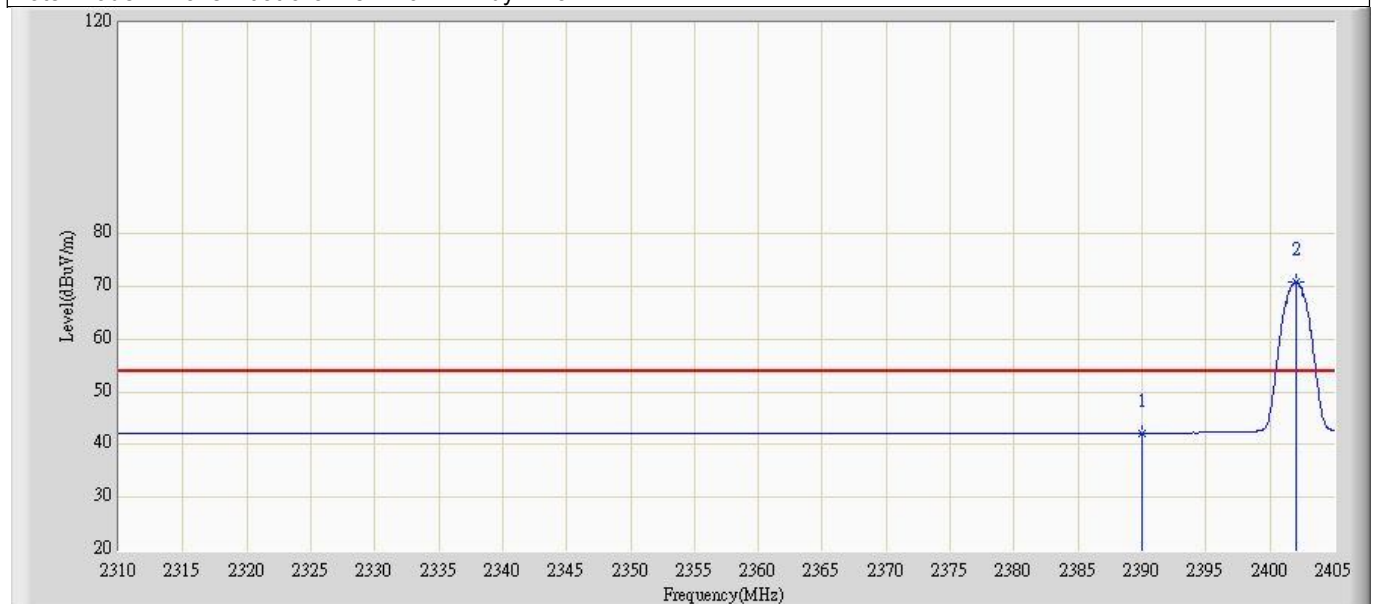
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Vertical

EUT: Tablet

Power: By battery

Note: Mode1: Transmit at channel 2402MHz by DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 42.240                 | 11.152               | -11.760         | 54.000         | 31.088      | AV   |
| 2  | *    | 2402.008        | 70.813                 | 39.655               | N/A             | N/A            | 31.158      | AV   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 20:08

Limit: FCC\_Part15.209\_RE(3m)

Margin: 0

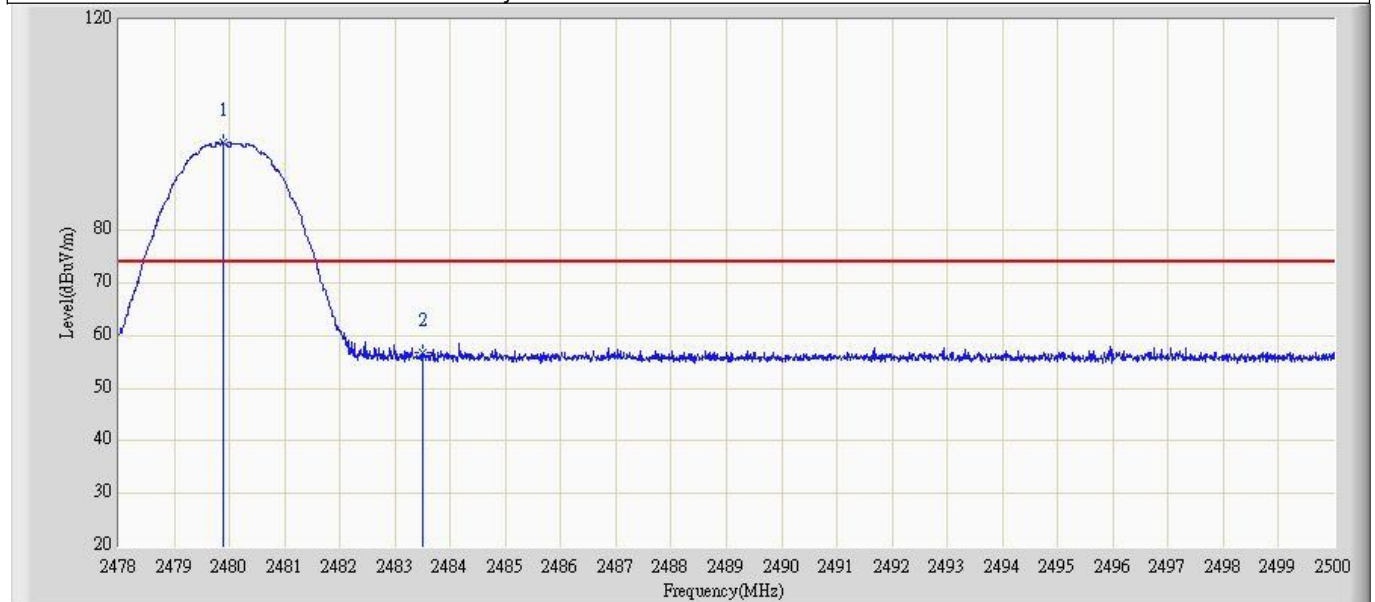
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode1: Transmit at channel 2480MHz by DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2479.881        | 96.597                 | 64.987               | N/A             | N/A            | 31.610      | PK   |
| 2  |      | 2483.500        | 56.759                 | 25.146               | -17.241         | 74.000         | 31.613      | PK   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 20:18

Limit: FCC\_Part15.209\_RE(3m)

Margin: 0

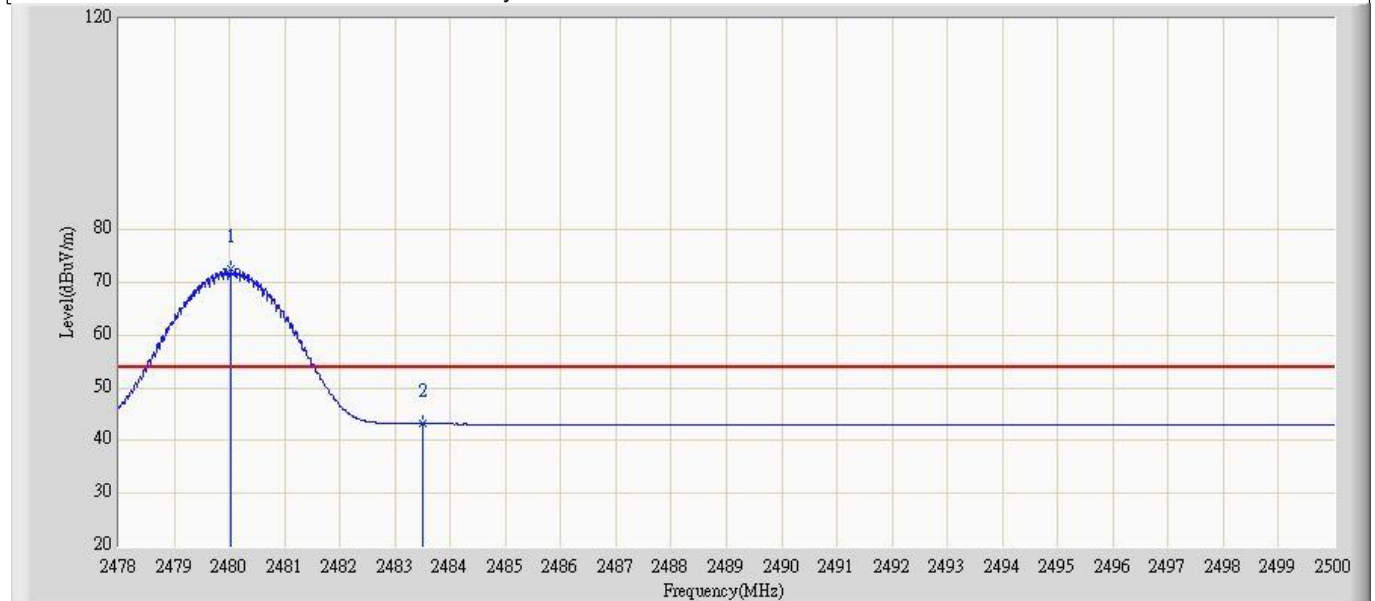
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode1: Transmit at channel 2480MHz by DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2480.013        | 72.465                 | 40.855               | N/A             | N/A            | 31.610      | AV   |
| 2  |      | 2483.500        | 43.155                 | 11.542               | -10.845         | 54.000         | 31.613      | AV   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 20:20

Limit: FCC\_Part15.209\_RE(3m)

Margin: 0

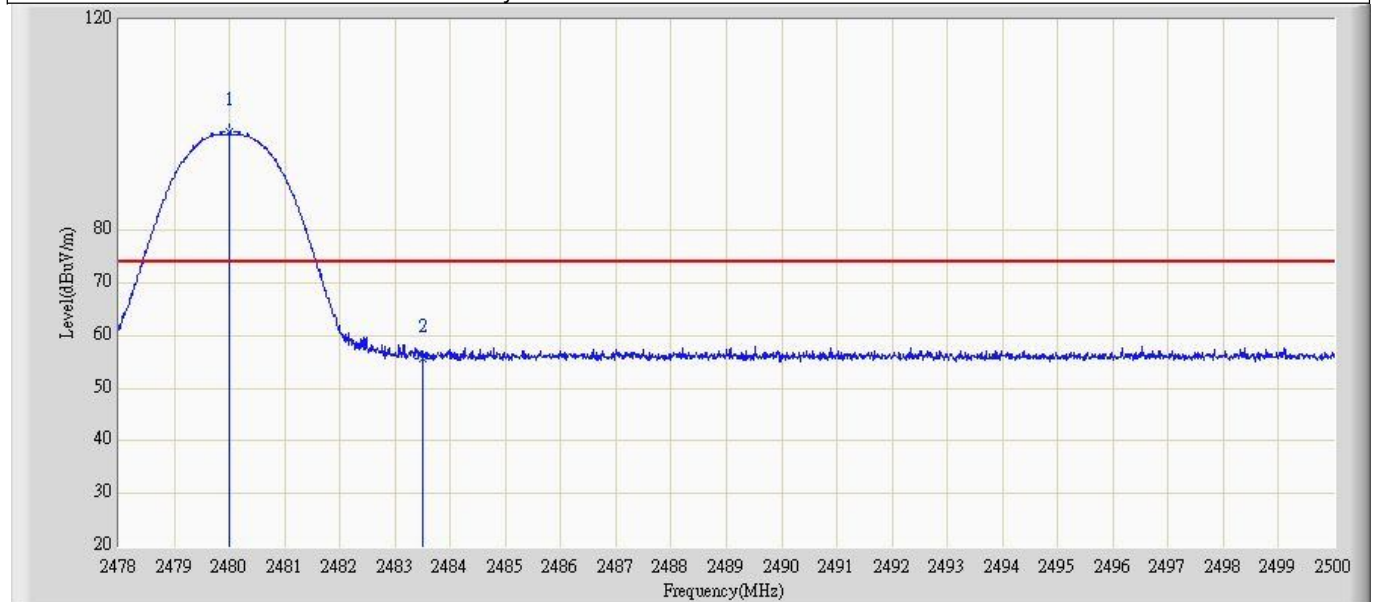
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Vertical

EUT: Tablet

Power: By battery

Note: Mode1: Transmit at channel 2480MHz by DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2480.002        | 98.662                 | 67.052               | N/A             | N/A            | 31.610      | PK   |
| 2  |      | 2483.500        | 55.706                 | 24.093               | -18.294         | 74.000         | 31.613      | PK   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 20:22

Limit: FCC\_Part15.209\_RE(3m)

Margin: 0

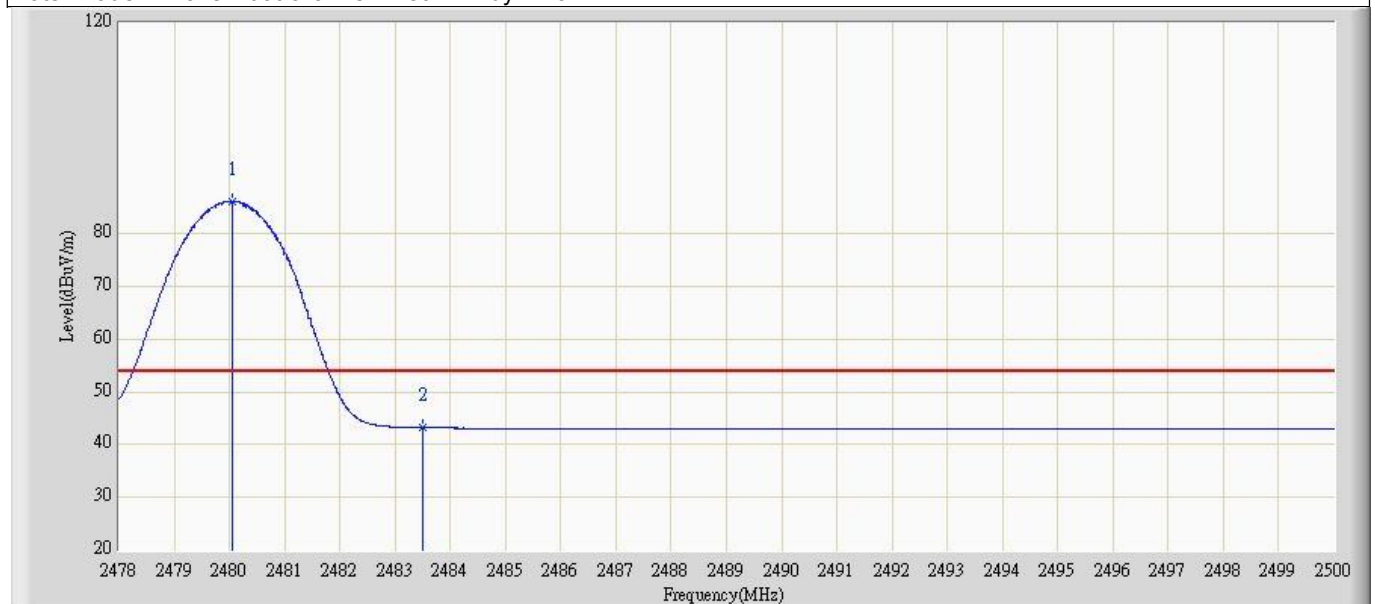
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Vertical

EUT: Tablet

Power: By battery

Note: Mode1: Transmit at channel 2480MHz by DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2480.057        | 86.052                 | 54.442               | N/A             | N/A            | 31.610      | AV   |
| 2  |      | 2483.500        | 43.207                 | 11.594               | -10.793         | 54.000         | 31.613      | AV   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 20:23

Limit: FCC Part15.209 RE(3m)

Margin: 0

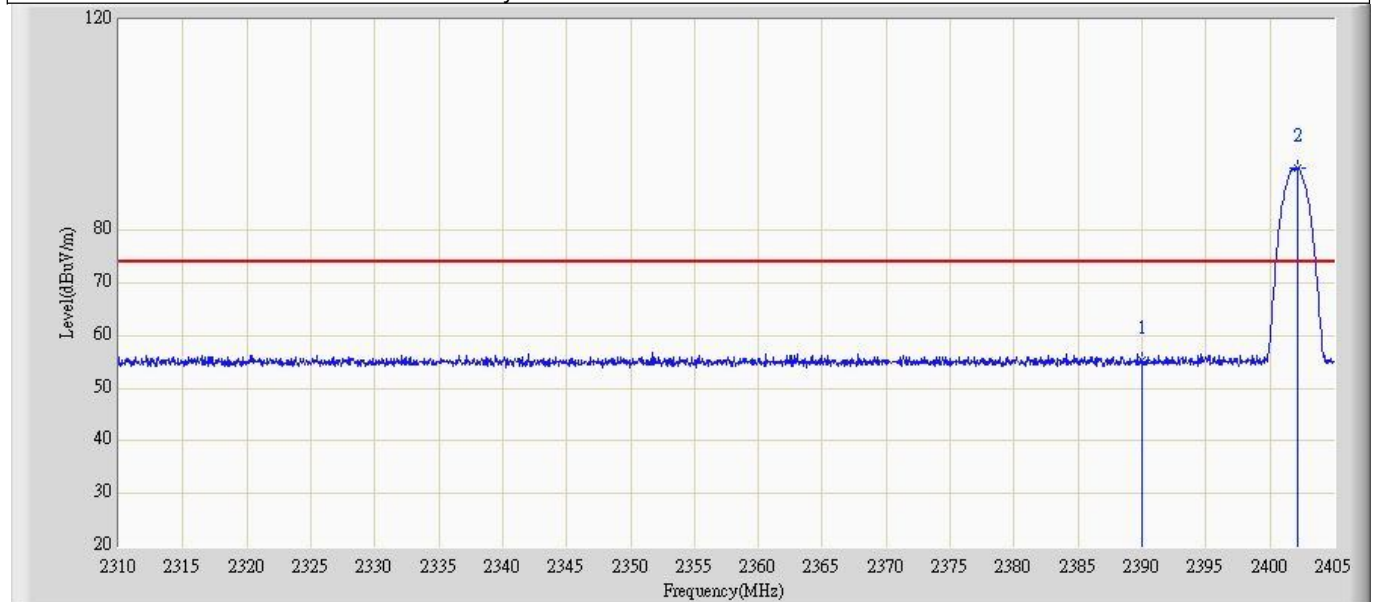
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode2: Transmit at channel 2402MHz by 2DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 55.248                 | 24.160               | -18.752         | 74.000         | 31.088      | PK   |
| 2  | *    | 2402.150        | 91.924                 | 60.765               | N/A             | N/A            | 31.158      | PK   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:18

Limit: FCC Part15.209 RE(3m)

Margin: 0

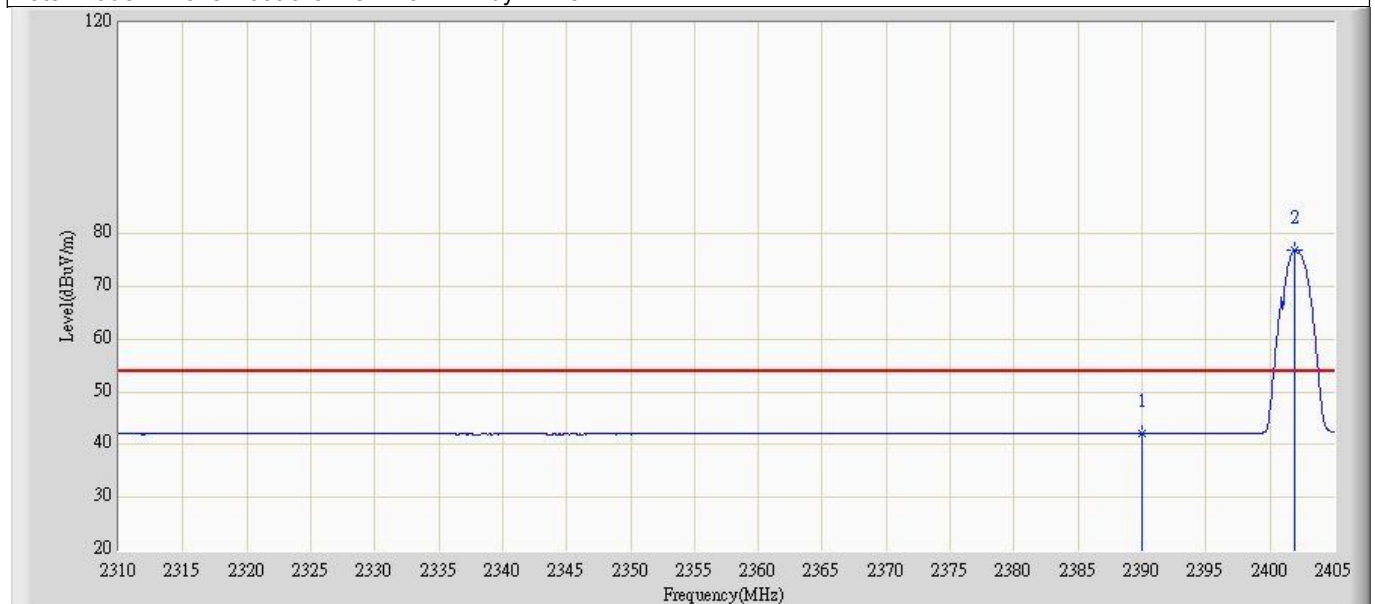
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode2: Transmit at channel 2402MHz by 2DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 42.068                 | 10.980               | -11.932         | 54.000         | 31.088      | AV   |
| 2  | *    | 2401.960        | 77.033                 | 45.876               | N/A             | N/A            | 31.157      | AV   |



Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:19

Limit: FCC Part15.209 RE(3m)

Margin: 0

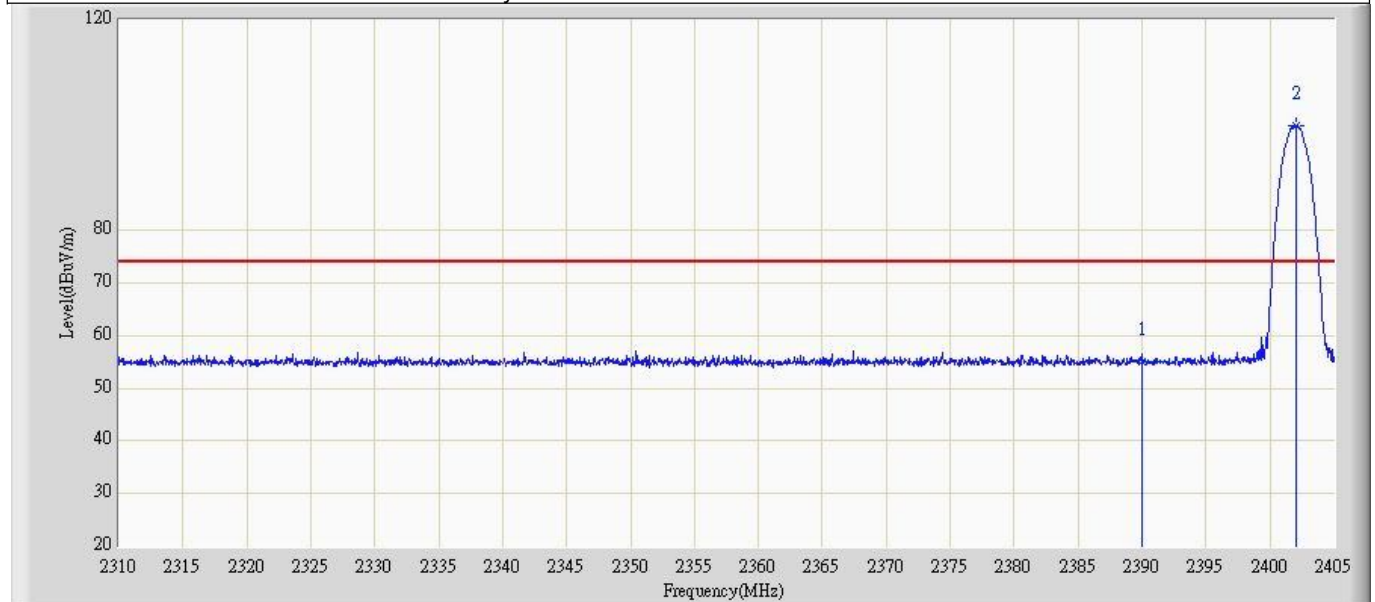
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Vertical

EUT: Tablet

Power: By battery

Note: Mode2: Transmit at channel 2402MHz by 2DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 55.173                 | 24.085               | -18.827         | 74.000         | 31.088      | PK   |
| 2  | *    | 2402.103        | 99.809                 | 68.651               | N/A             | N/A            | 31.158      | PK   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:21

Limit: FCC Part15.209 RE(3m)

Margin: 0

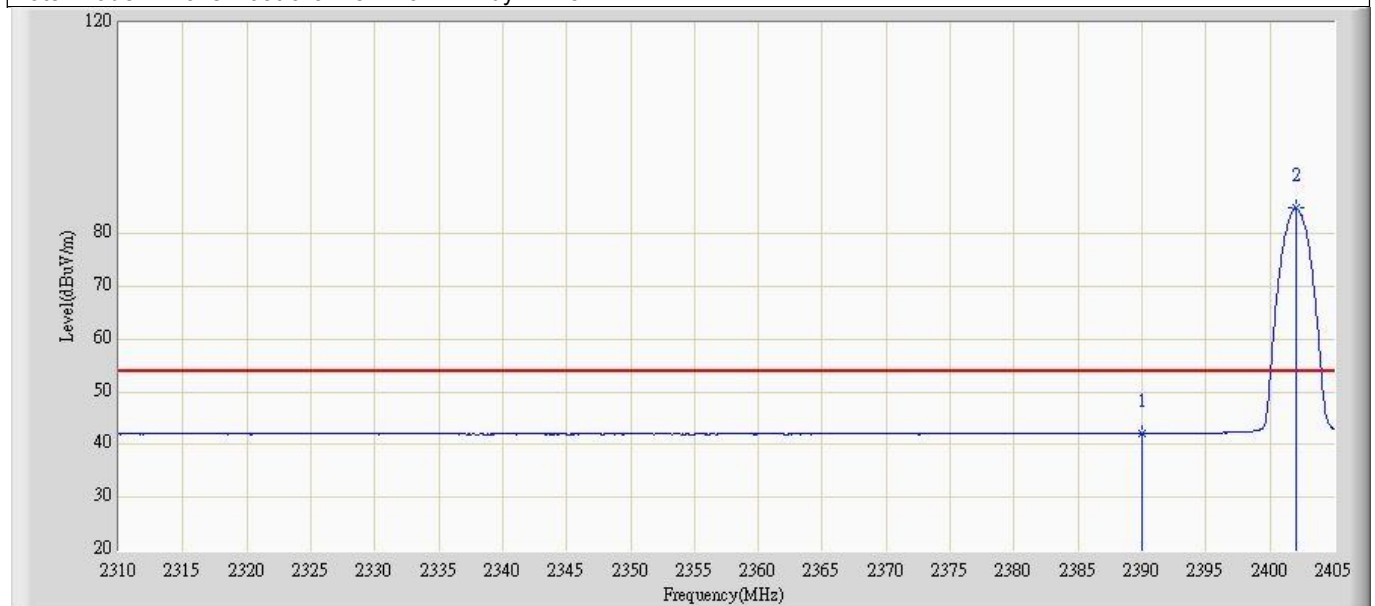
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Vertical

EUT: Tablet

Power: By battery

Note: Mode2: Transmit at channel 2402MHz by 2DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 42.093                 | 11.005               | -11.907         | 54.000         | 31.088      | AV   |
| 2  | *    | 2402.103        | 84.849                 | 53.691               | N/A             | N/A            | 31.158      | AV   |



Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:23

Limit: FCC Part15.209 RE(3m)

Margin: 0

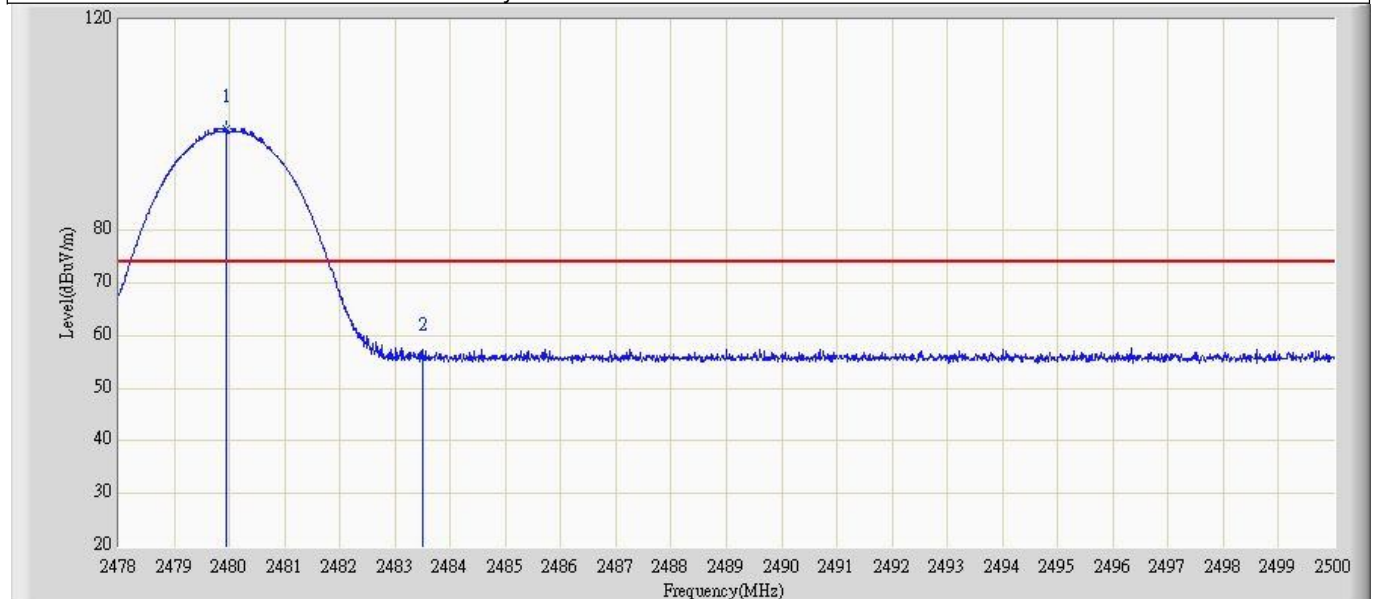
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode2: Transmit at channel 2480MHz by 2DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2479.947        | 99.439                 | 67.829               | N/A             | N/A            | 31.610      | PK   |
| 2  |      | 2483.500        | 56.014                 | 24.401               | -17.986         | 74.000         | 31.613      | PK   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:38

Limit: FCC Part15.209 RE(3m)

Margin: 0

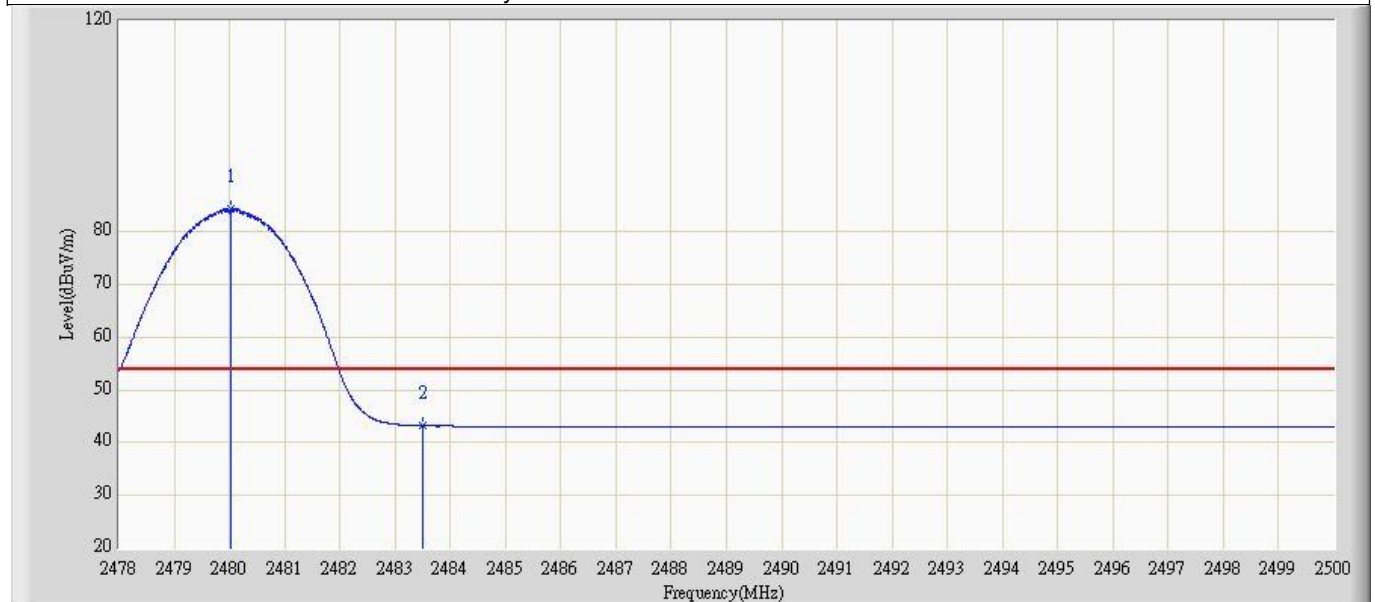
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

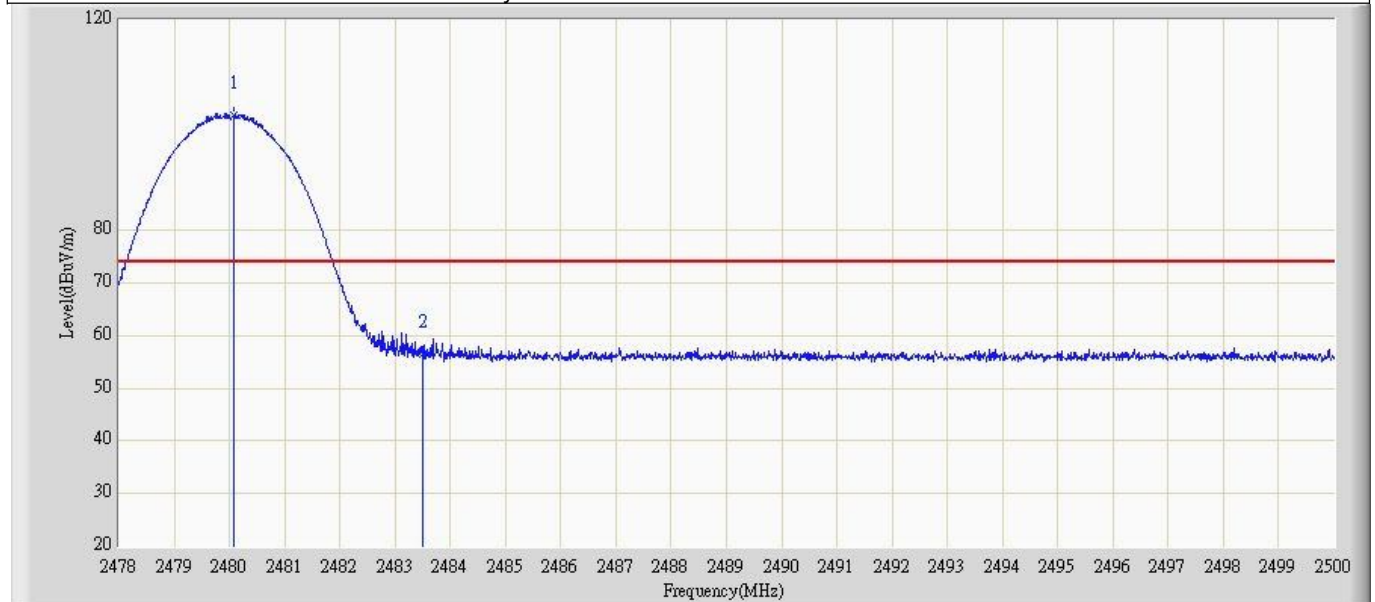
Power: By battery

Note: Mode2: Transmit at channel 2480MHz by 2DH5



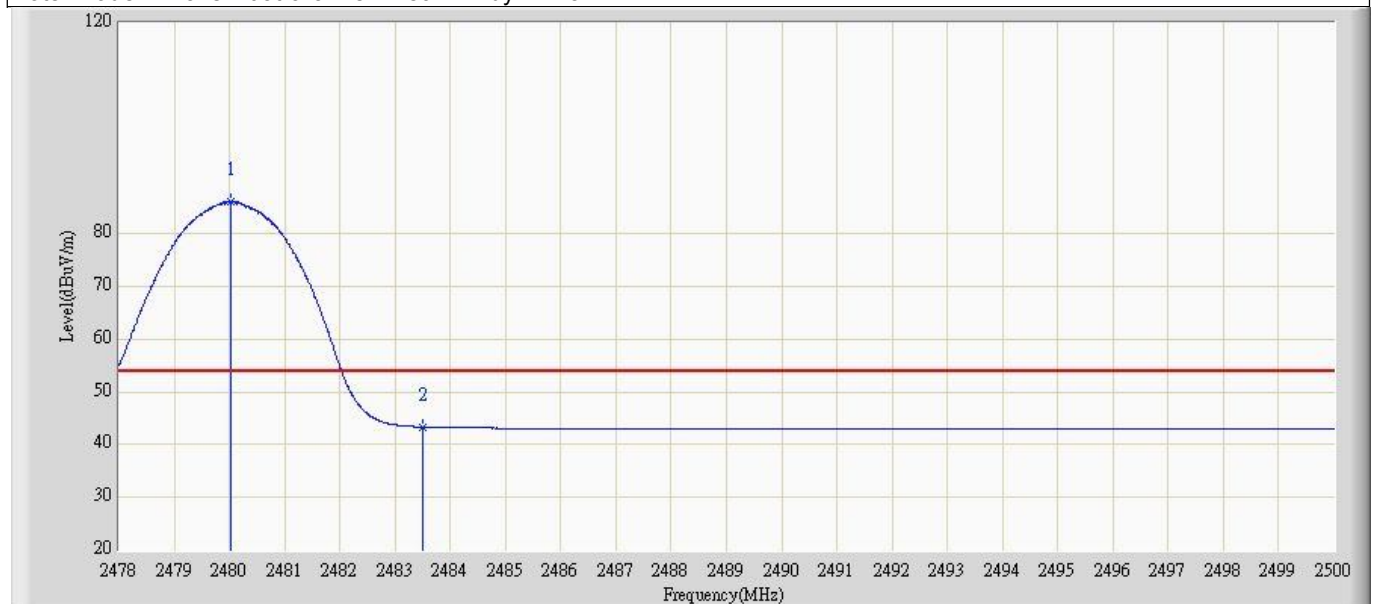
| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2480.024        | 84.262                 | 52.652               | N/A             | N/A            | 31.610      | AV   |
| 2  |      | 2483.500        | 43.187                 | 11.573               | -10.813         | 54.000         | 31.613      | AV   |

|  |                          |
|--|--------------------------|
| Engineer: Brgant                                 |                          |
| Site: AC5  | Time: 2012/09/26 - 21:38 |
| Limit: FCC_Part15.209_RE(3m)                     | Margin: 0                |
| Probe: BBHA 9120D_499(1-18GHz)                   | Polarity: Vertical       |
| EUT: Tablet                                      | Power: By battery        |
| Note: Mode2: Transmit at channel 2480MHz by 2DH5 |                          |



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2480.090        | 102.032                | 70.422               | N/A             | N/A            | 31.610      | PK   |
| 2  |      | 2483.500        | 56.373                 | 24.760               | -17.627         | 74.000         | 31.613      | PK   |

|  |                          |
|--|--------------------------|
| Engineer: Brgant                                 |                          |
| Site: AC5  | Time: 2012/09/26 - 21:42 |
| Limit: FCC_Part15.209_RE(3m)                     | Margin: 0                |
| Probe: BBHA 9120D_499(1-18GHz)                   | Polarity: Vertical       |
| EUT: Tablet                                      | Power: By battery        |
| Note: Mode2: Transmit at channel 2480MHz by 2DH5 |                          |



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2480.024        | 85.996                 | 54.386               | N/A             | N/A            | 31.610      | AV   |
| 2  |      | 2483.500        | 43.343                 | 11.730               | -10.657         | 54.000         | 31.613      | AV   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:43

Limit: FCC Part15.209 RE(3m)

Margin: 0

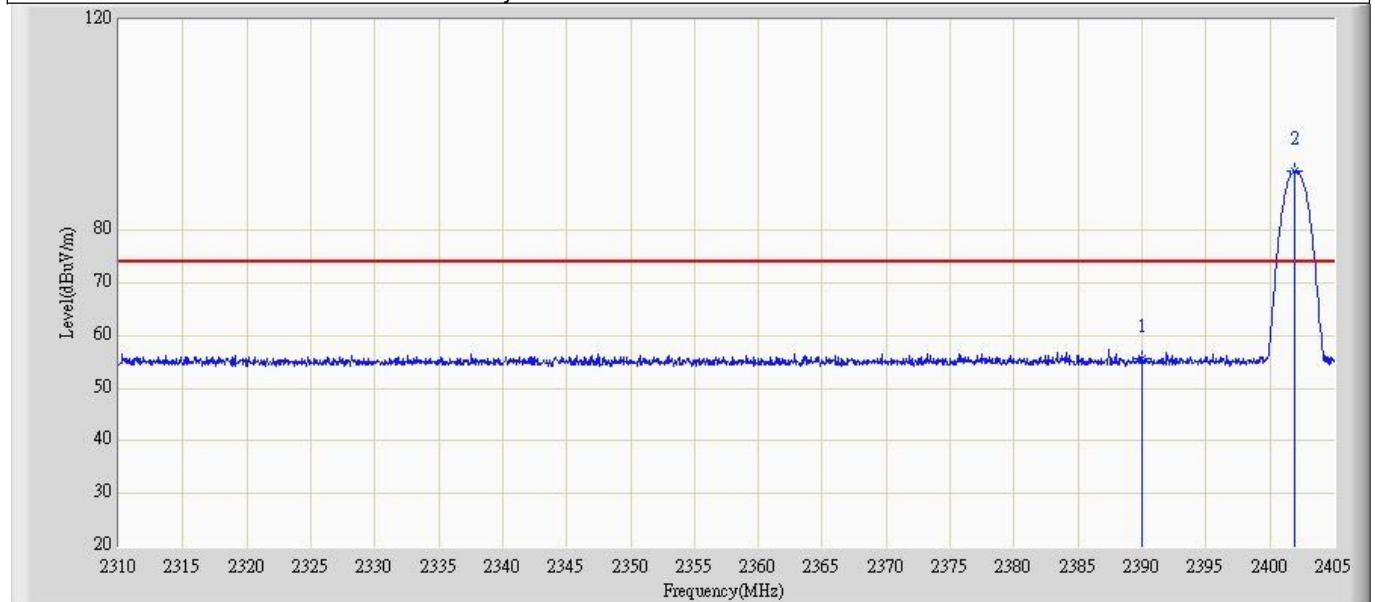
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode3: Transmit at channel 2402MHz by 3DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 55.600                 | 24.512               | -18.400         | 74.000         | 31.088      | PK   |
| 2  | *    | 2401.960        | 91.320                 | 60.163               | N/A             | N/A            | 31.157      | PK   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:47

Limit: FCC Part15.209 RE(3m)

Margin: 0

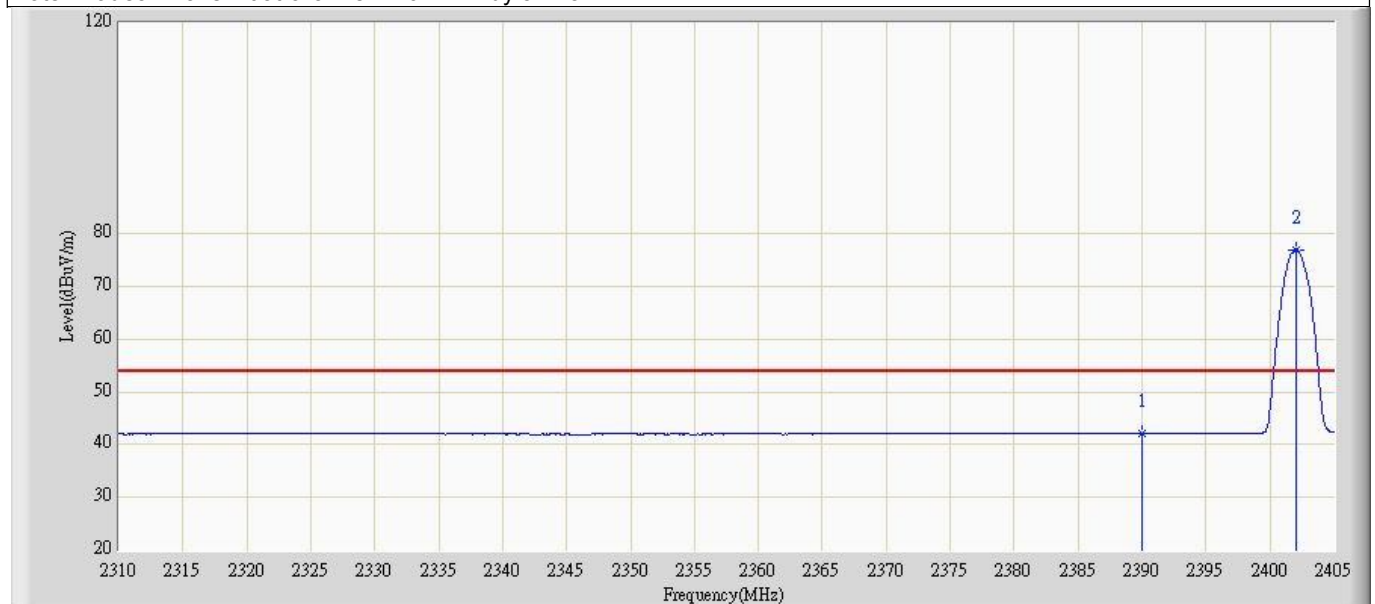
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode3: Transmit at channel 2402MHz by 3DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 42.026                 | 10.938               | -11.974         | 54.000         | 31.088      | AV   |
| 2  | *    | 2402.103        | 77.026                 | 45.868               | N/A             | N/A            | 31.158      | AV   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:47

Limit: FCC Part15.209 RE(3m)

Margin: 0

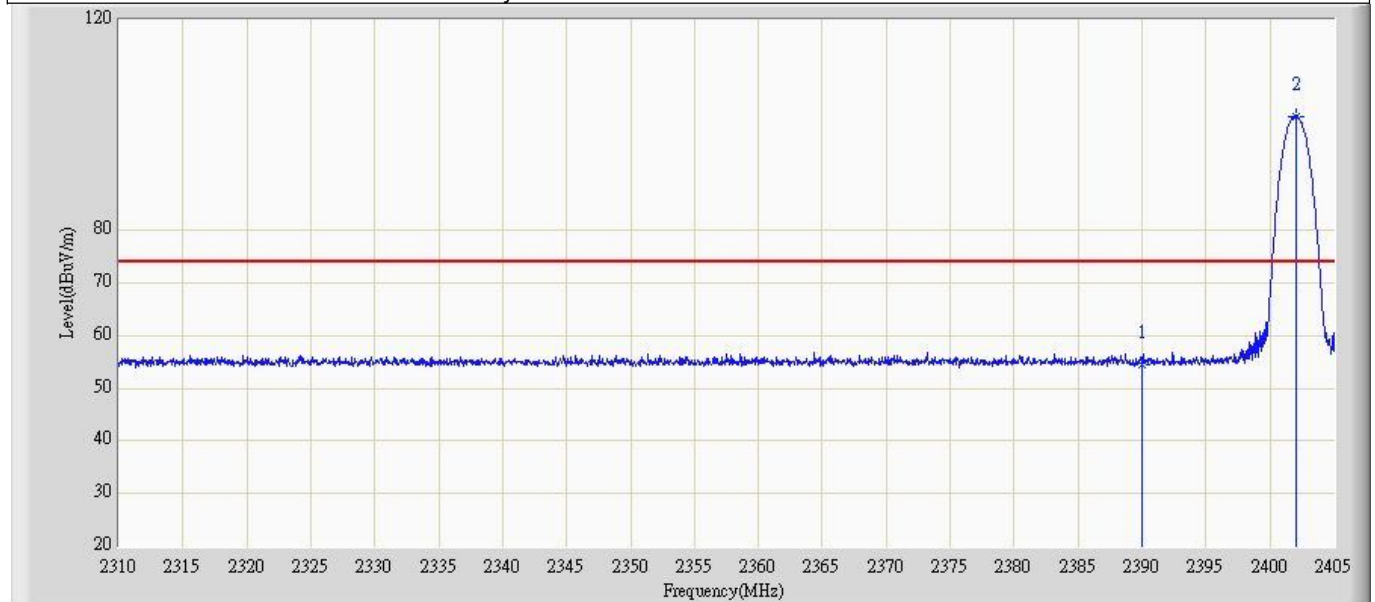
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Vertical

EUT: Tablet

Power: By battery

Note: Mode3: Transmit at channel 2402MHz by 3DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 54.558                 | 23.470               | -19.442         | 74.000         | 31.088      | PK   |
| 2  | *    | 2402.103        | 101.588                | 70.430               | N/A             | N/A            | 31.158      | PK   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:49

Limit: FCC Part15.209 RE(3m)

Margin: 0

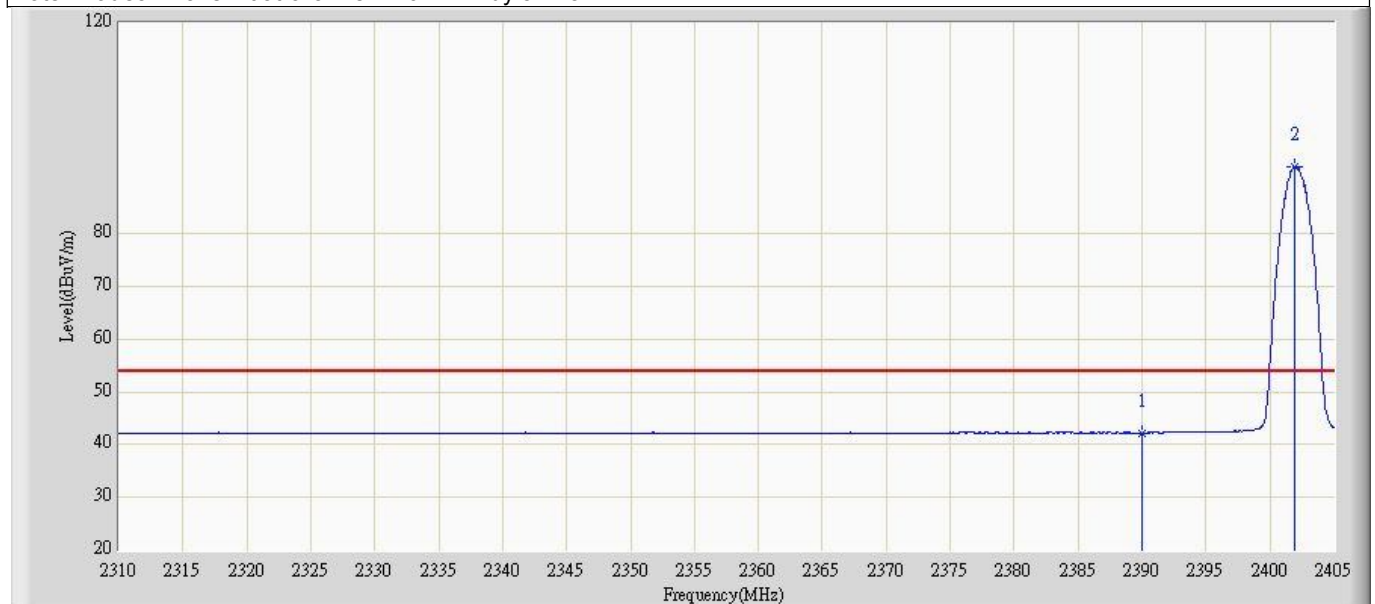
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Vertical

EUT: Tablet

Power: By battery

Note: Mode3: Transmit at channel 2402MHz by 3DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  |      | 2390.000        | 42.195                 | 11.107               | -11.805         | 54.000         | 31.088      | AV   |
| 2  | *    | 2401.960        | 92.834                 | 61.677               | N/A             | N/A            | 31.157      | AV   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:50

Limit: FCC Part15.209 RE(3m)

Margin: 0

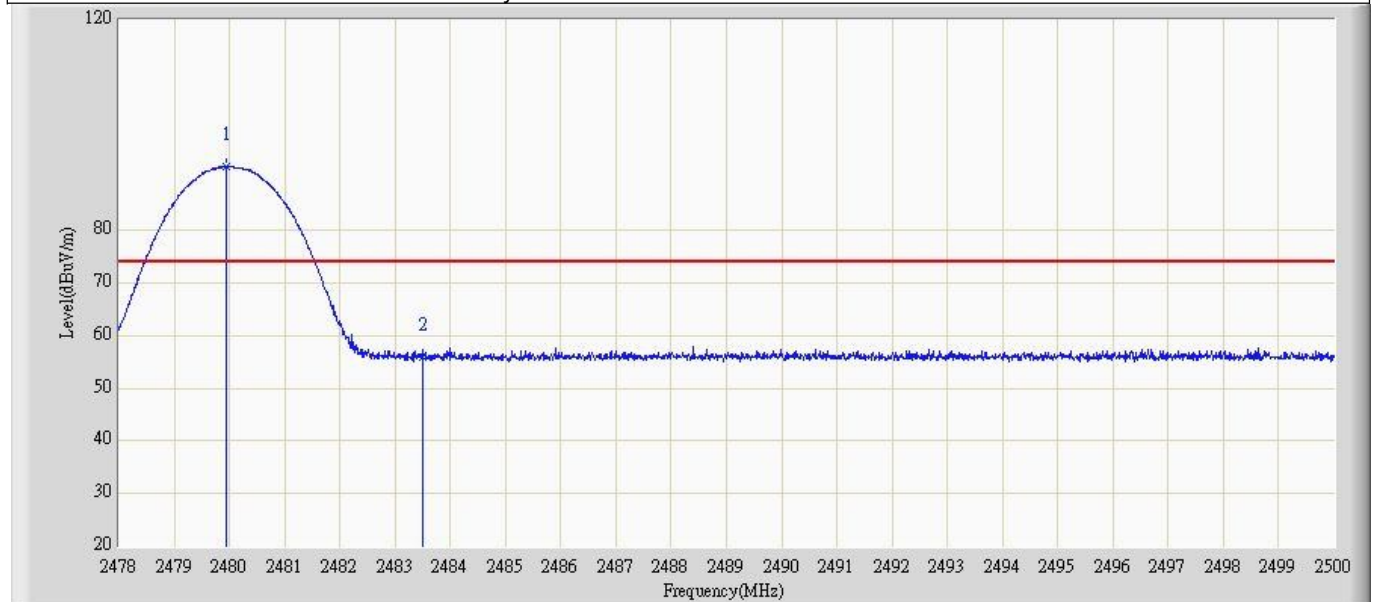
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode3: Transmit at channel 2480MHz by 3DH5



Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:54

Limit: FCC Part15.209 RE(3m)

Margin: 0

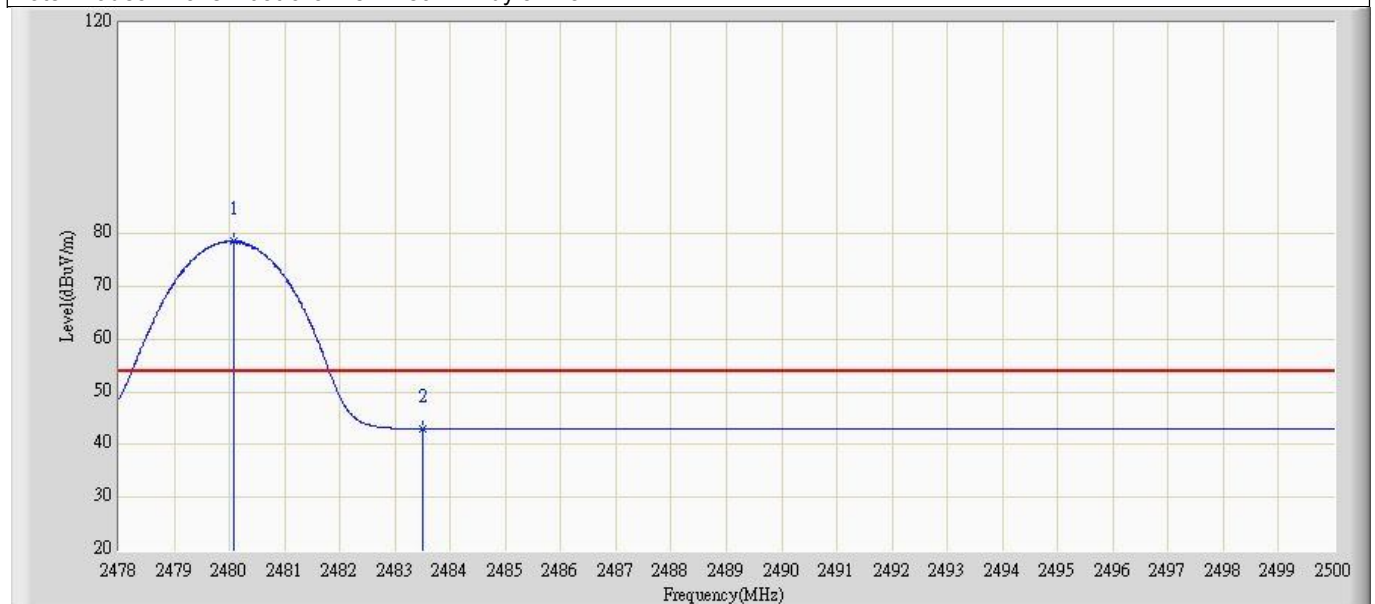
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Horizontal

EUT: Tablet

Power: By battery

Note: Mode3: Transmit at channel 2480MHz by 3DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2480.068        | 78.588                 | 46.978               | N/A             | N/A            | 31.610      | AV   |
| 2  |      | 2483.500        | 42.950                 | 11.336               | -11.050         | 54.000         | 31.613      | AV   |



Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:54

Limit: FCC\_Part15.209\_RE(3m)

Margin: 0

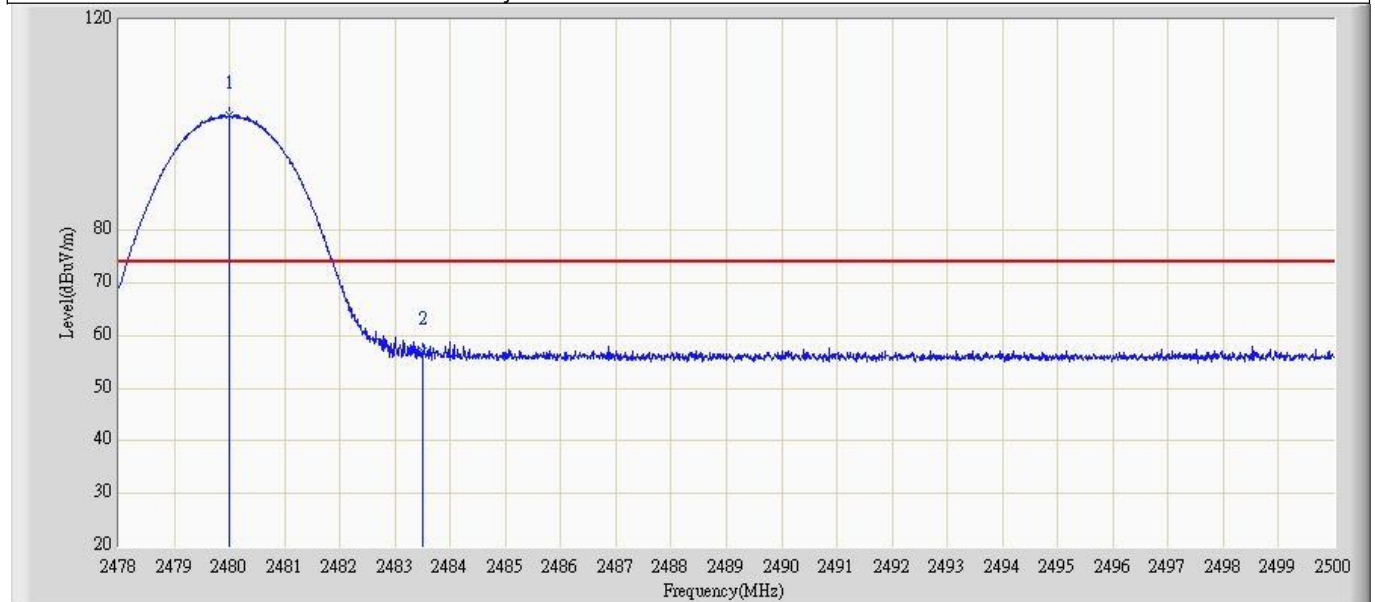
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Vertical

EUT: Tablet

Power: By battery

Note: Mode3: Transmit at channel 2480MHz by 3DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2479.991        | 101.914                | 70.304               | N/A             | N/A            | 31.610      | PK   |
| 2  |      | 2483.500        | 57.044                 | 25.431               | -16.956         | 74.000         | 31.613      | PK   |

Engineer: Brgant

Site: AC5

Time: 2012/09/26 - 21:57

Limit: FCC\_Part15.209\_RE(3m)

Margin: 0

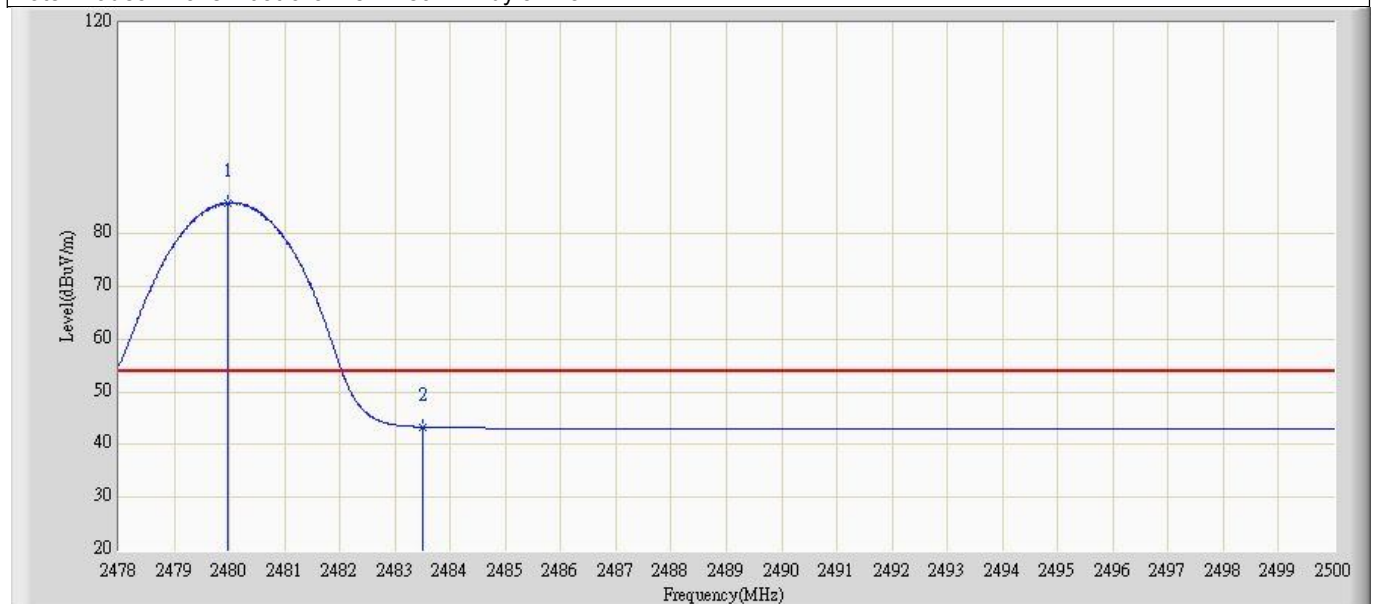
Probe: BBHA 9120D\_499(1-18GHz)

Polarity: Vertical

EUT: Tablet

Power: By battery

Note: Mode3: Transmit at channel 2480MHz by 3DH5



| No | Mark | Frequency (MHz) | Measure Level (dBuV/m) | Reading Level (dBuV) | Over Limit (dB) | Limit (dBuV/m) | Factor (dB) | Type |
|----|------|-----------------|------------------------|----------------------|-----------------|----------------|-------------|------|
| 1  | *    | 2479.980        | 85.915                 | 54.305               | N/A             | N/A            | 31.610      | AV   |
| 2  |      | 2483.500        | 43.354                 | 11.741               | -10.646         | 54.000         | 31.613      | AV   |

## 4.6. Frequency Separation

### TEST CONFIGURATION



### TEST PROCEDURE

According to ANSI C63.10: 2009.

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span

Video (or Average) Bandwidth VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

### LIMIT

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the  $2/3 \times 20\text{dB}$  bandwidth of the hopping channel, whichever is greater.

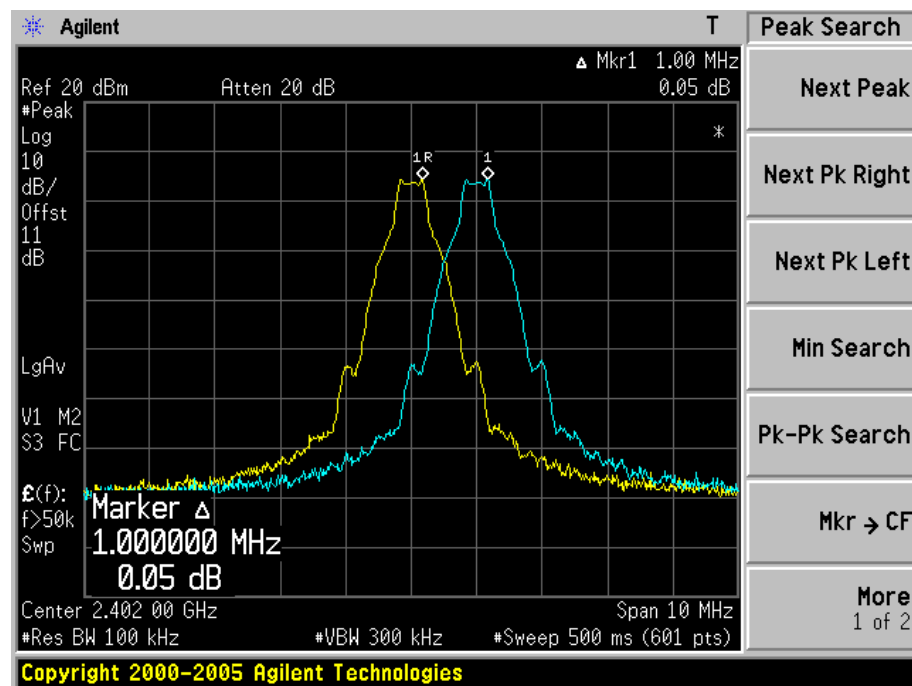
### TEST RESULTS

#### DH5 Mode:

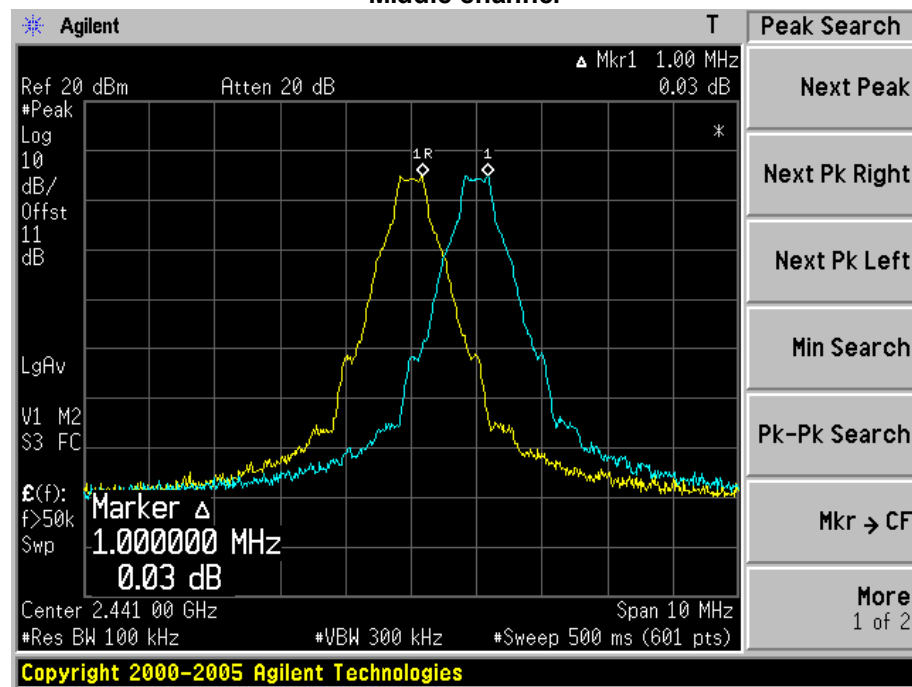
| Channel           | Channel Frequency (MHz) | Channel Separation (MHz) | Limit (MHz)   | Result |
|-------------------|-------------------------|--------------------------|---|--------|
| Low Channel       | 2402                    | 1.000                    | 25KHz or $2/3 \times 20\text{dB}$ bandwidth(0.567MHz) | Pass   |
| Adjacency Channel | 2403                    |                          |   |        |
| Mid Channel       | 2441                    | 1.000                    | 25KHz or $2/3 \times 20\text{dB}$ bandwidth(0.566MHz) | Pass   |
| Adjacency Channel | 2442                    |                          |   |        |
| High Channel      | 2480                    | 1.000                    | 25KHz or $2/3 \times 20\text{dB}$ bandwidth(0.578MHz) | Pass   |
| Adjacency Channel | 2479                    |                          |   |        |

Photos of Frequency separation Measurement

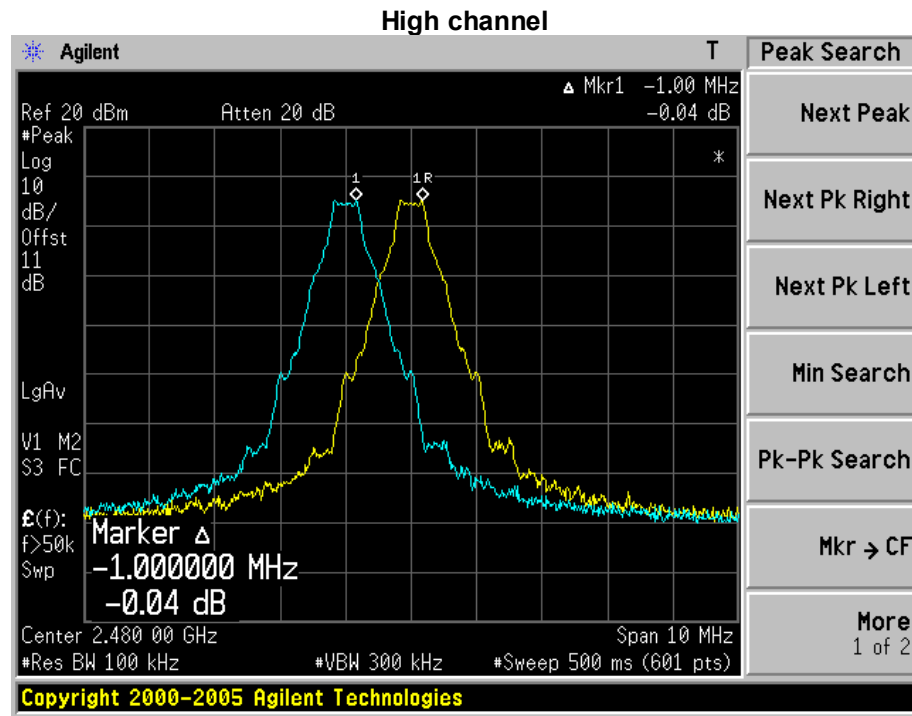
## Low channel



## Middle channel



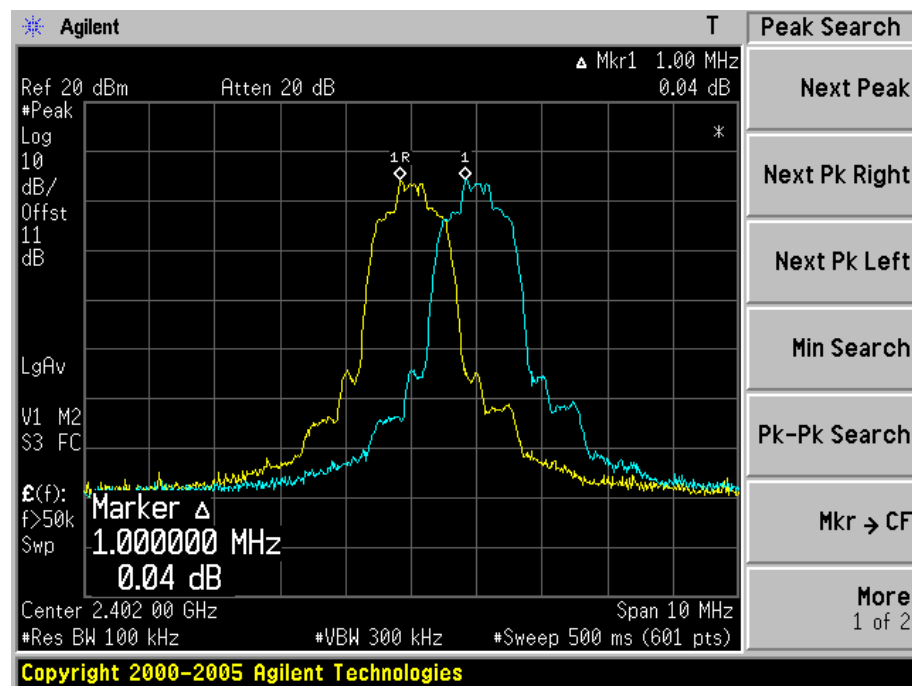


**2DH5 Mode:**

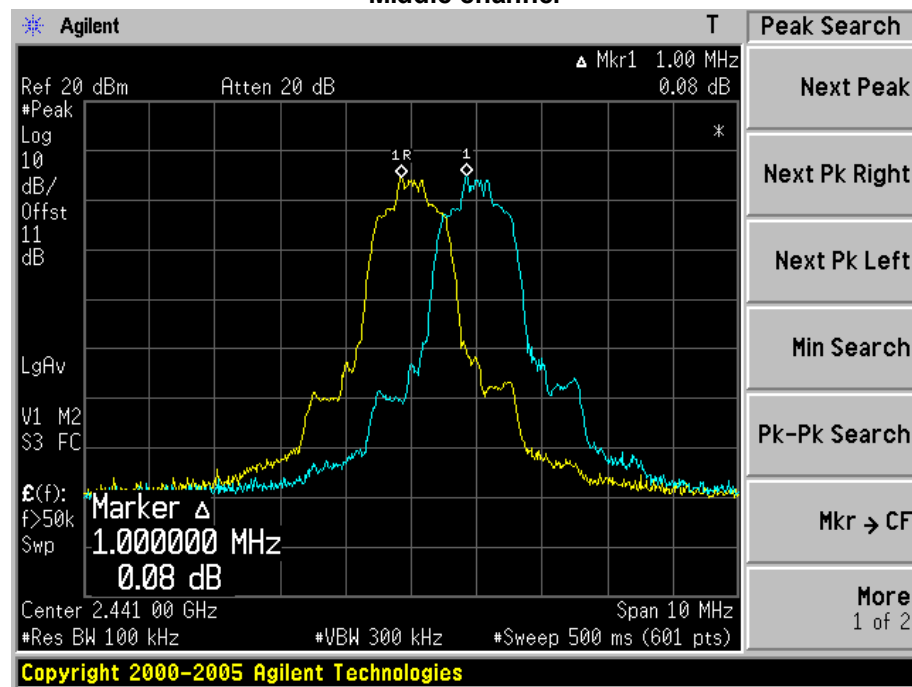
| Channel           | Channel Frequency (MHz) | Channel Separation (MHz) | Limit (MHz)                           | Result |
|-------------------|-------------------------|--------------------------|---------------------------------------|--------|
| Low Channel       | 2402                    | 1.000                    | 25KHz or 2/3*20dB bandwidth(0.567MHz) | Pass   |
| Adjacency Channel | 2403                    |                          |                                       |        |
| Mid Channel       | 2441                    | 1.000                    | 25KHz or 2/3*20dB bandwidth(0.566MHz) | Pass   |
| Adjacency Channel | 2442                    |                          |                                       |        |
| High Channel      | 2480                    | 1.000                    | 25KHz or 2/3*20dB bandwidth(0.578MHz) | Pass   |
| Adjacency Channel | 2479                    |                          |                                       |        |

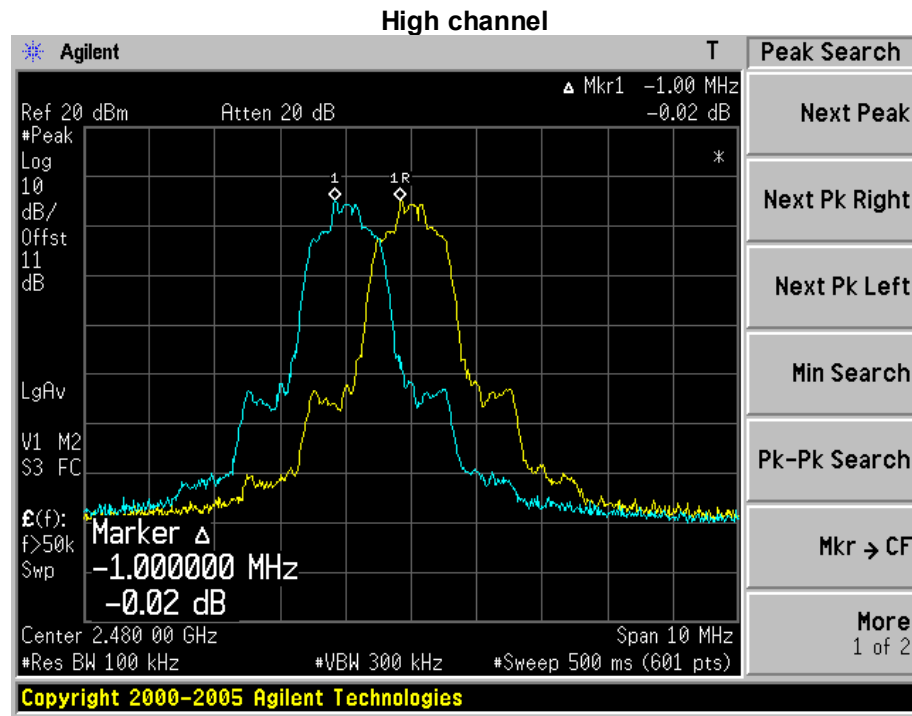
Photos of Frequency separation Measurement

## Low channel



## Middle channel

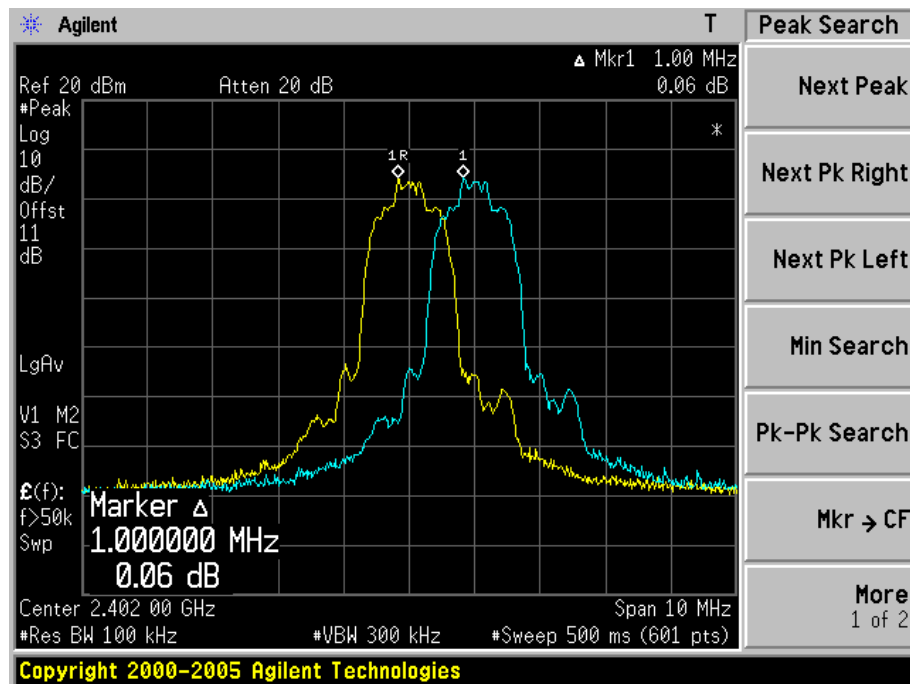


**3DH5 Mode:**

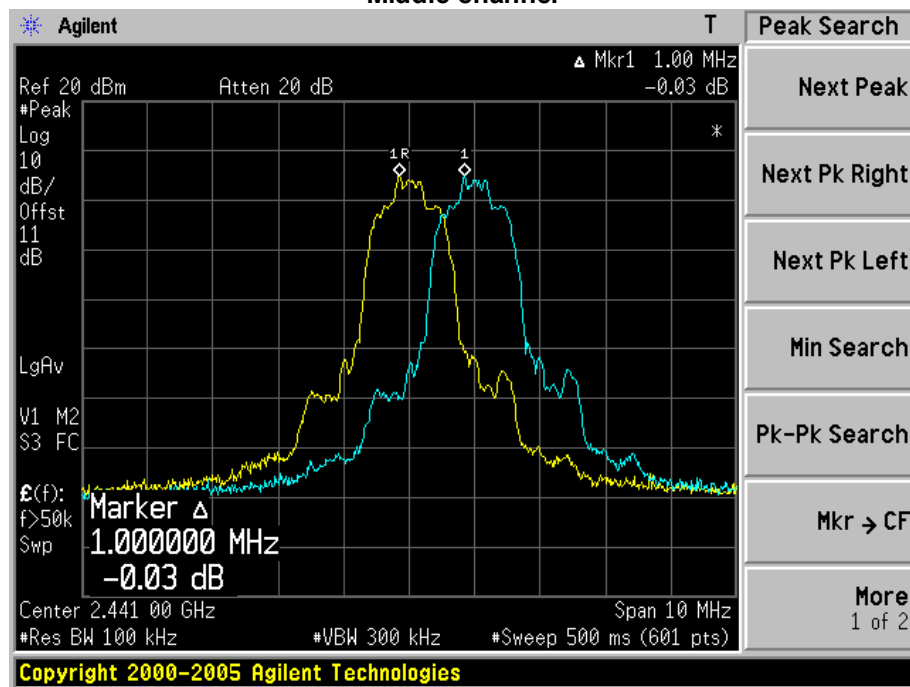
| Channel           | Channel Frequency (MHz) | Channel Separation (MHz) | Limit (MHz)                           | Result |
|-------------------|-------------------------|--------------------------|---------------------------------------|--------|
| Low Channel       | 2402                    | 1.000                    | 25KHz or 2/3*20dB bandwidth(0.567MHz) | Pass   |
| Adjacency Channel | 2403                    |                          |                                       |        |
| Mid Channel       | 2441                    | 1.000                    | 25KHz or 2/3*20dB bandwidth(0.566MHz) | Pass   |
| Adjacency Channel | 2442                    |                          |                                       |        |
| High Channel      | 2480                    | 1.000                    | 25KHz or 2/3*20dB bandwidth(0.578MHz) | Pass   |
| Adjacency Channel | 2479                    |                          |                                       |        |

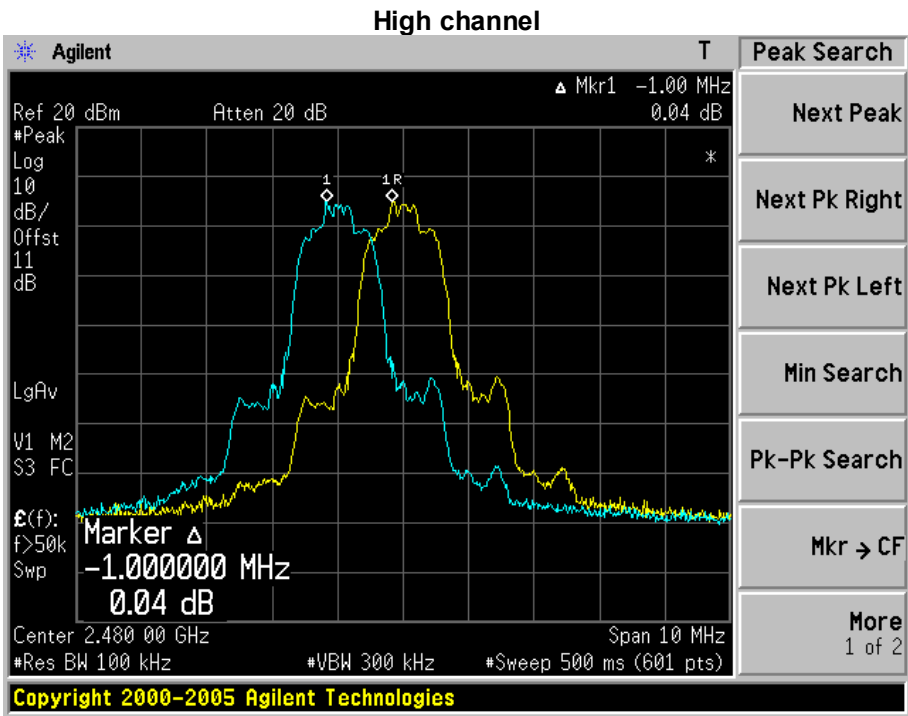
Photos of Frequency separation Measurement

## Low channel



## Middle channel





#### 4.7. Number of hopping frequency

##### TEST CONFIGURATION



##### TEST PROCEDURE

According to ANSI C63.10: 2009.

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW  $\geq$  1% of the span

VBW  $\geq$  RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. It may prove necessary to bread the span up to sections, in order to clearly show all of the hopping frequencies.

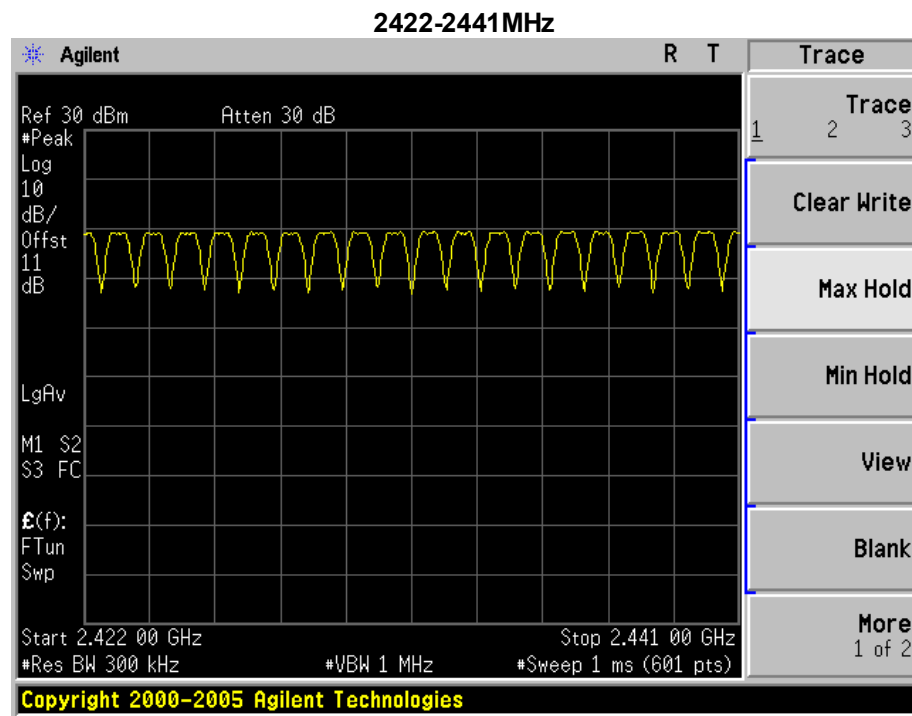
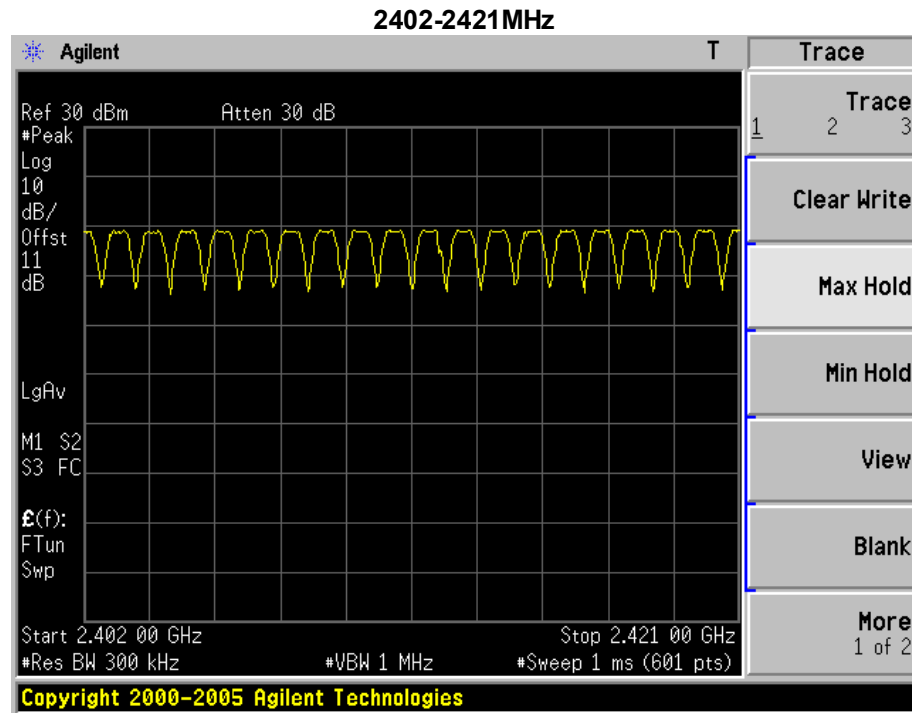
##### LIMIT

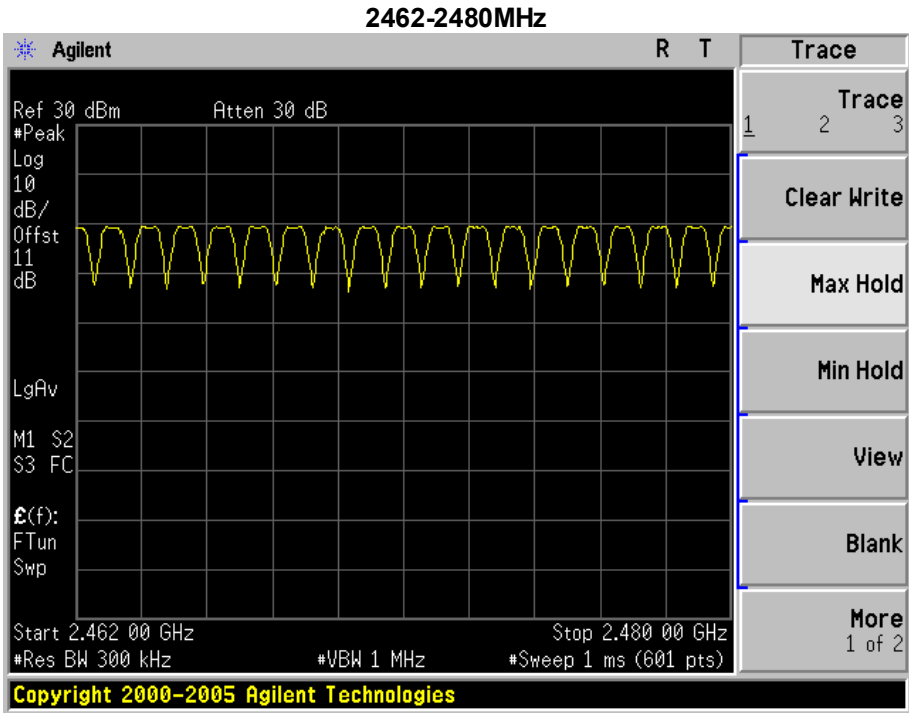
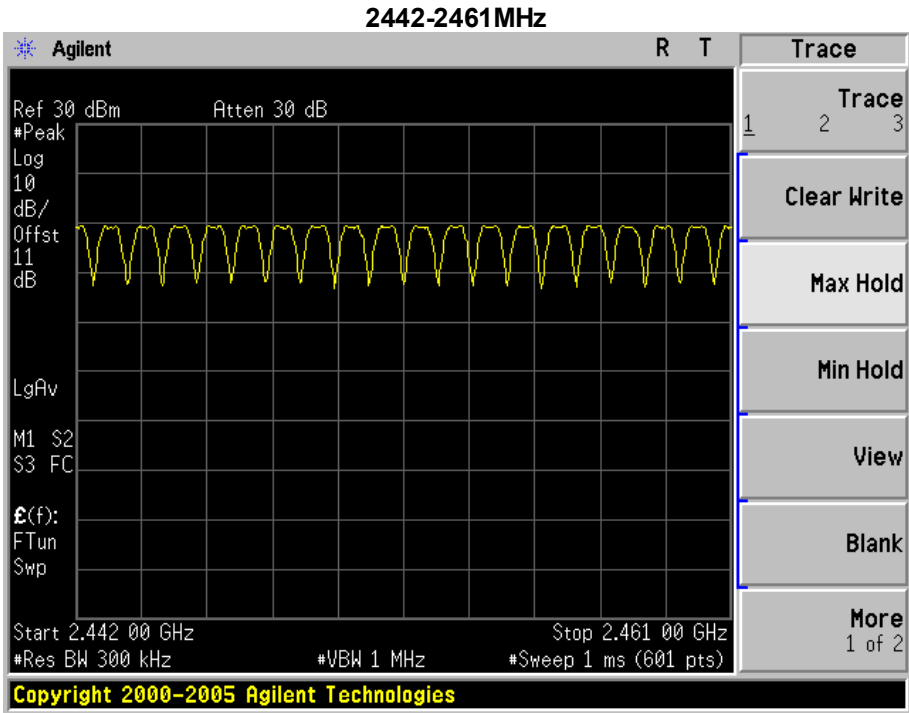
Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

##### TEST RESULTS

DH5 Mode:

| Hopping Channel Frequency Range (MHz) | Number of Hopping Channel | Limit     |
|---------------------------------------|---------------------------|-----------|
| 2400-2483.5                           | 79                        | $\geq 15$ |

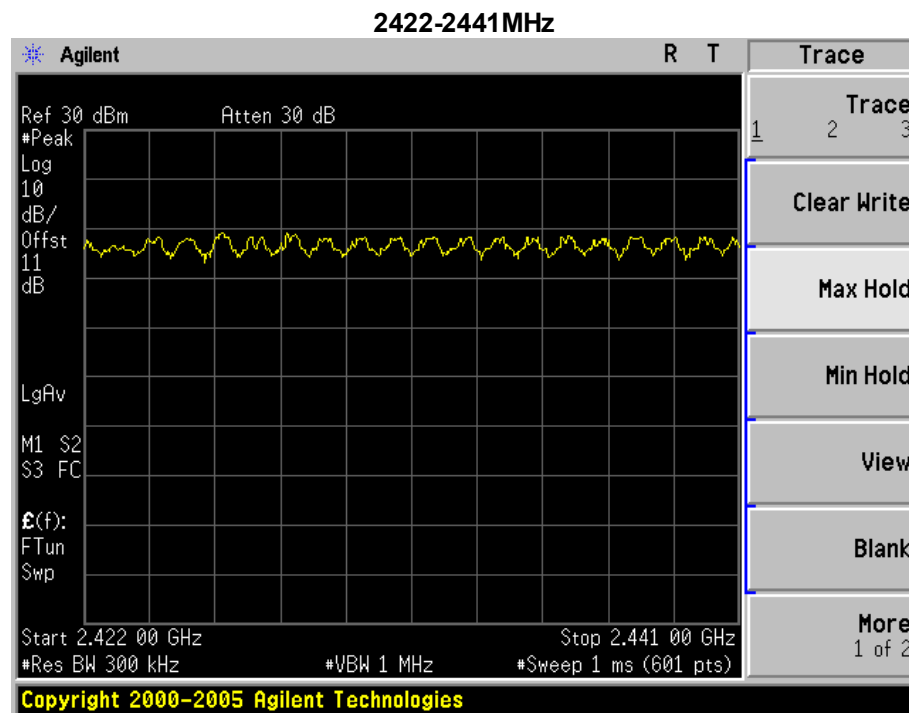
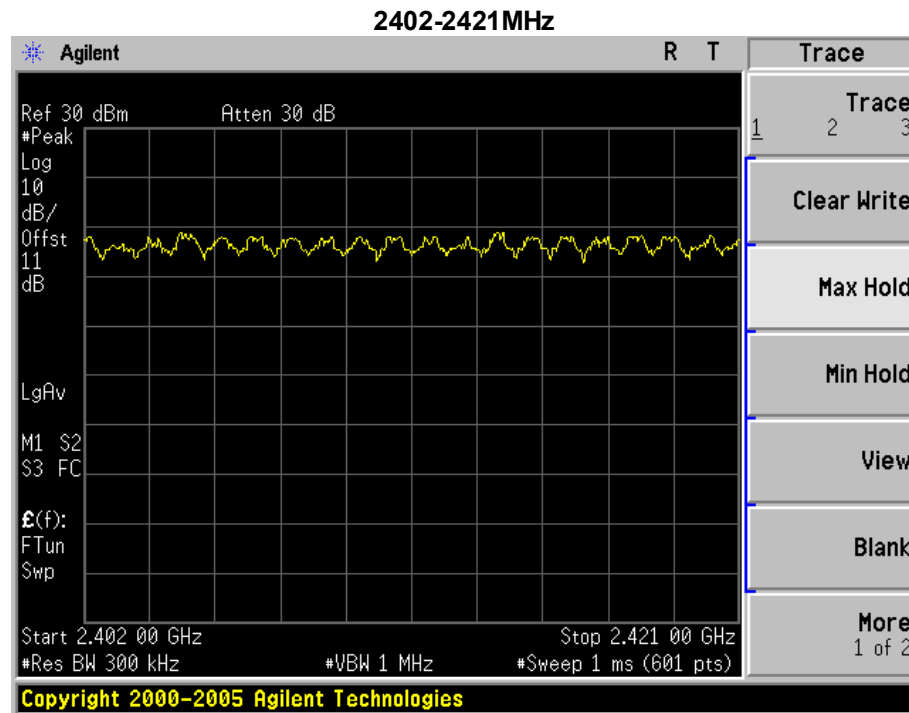
Photos of Number of hopping channel Measurement

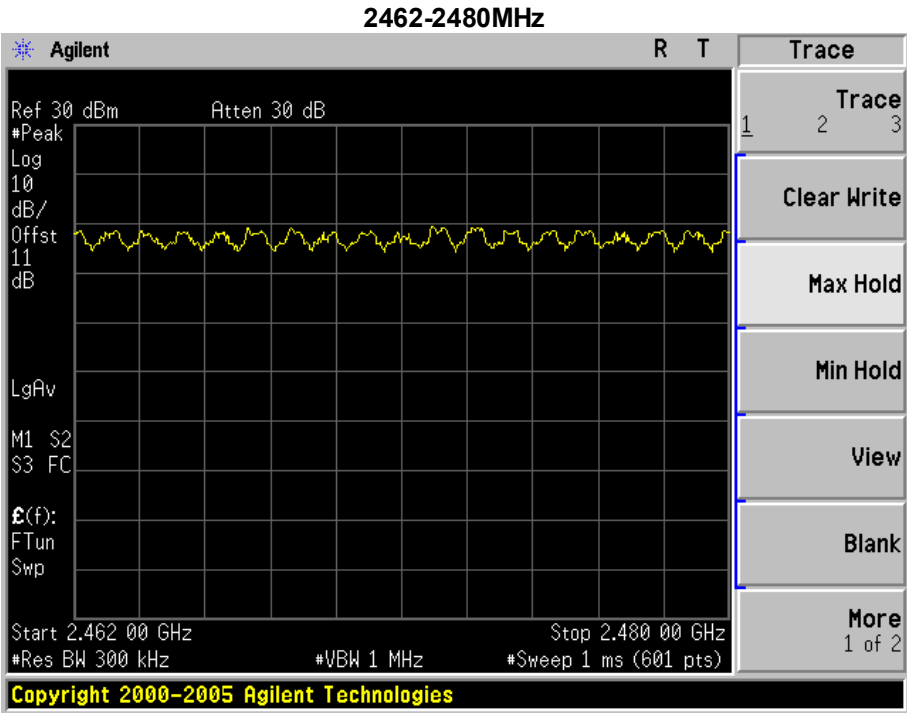
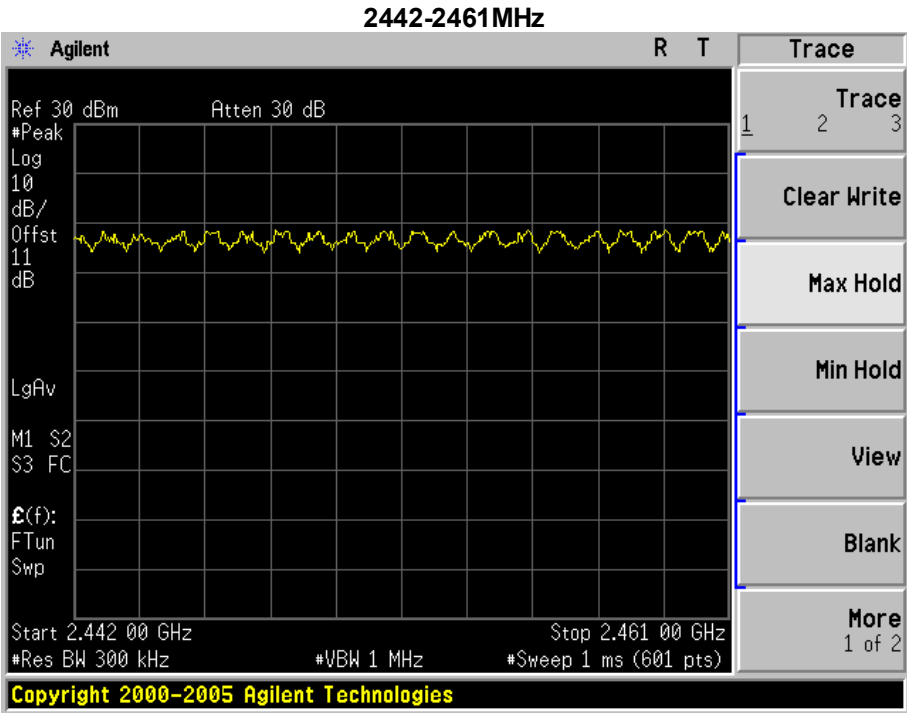




## 2DH5 Mode:

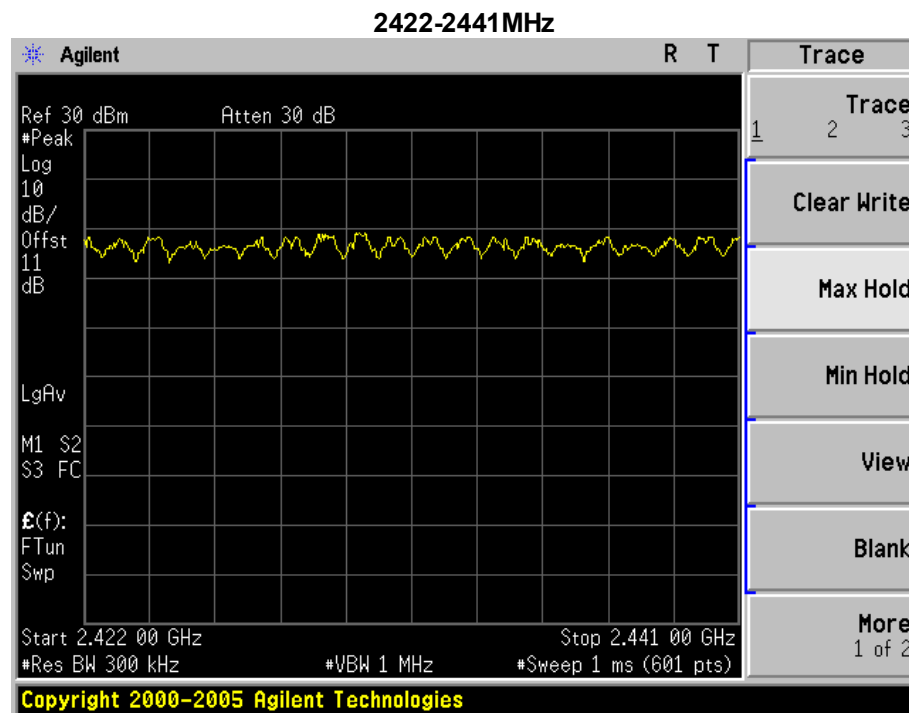
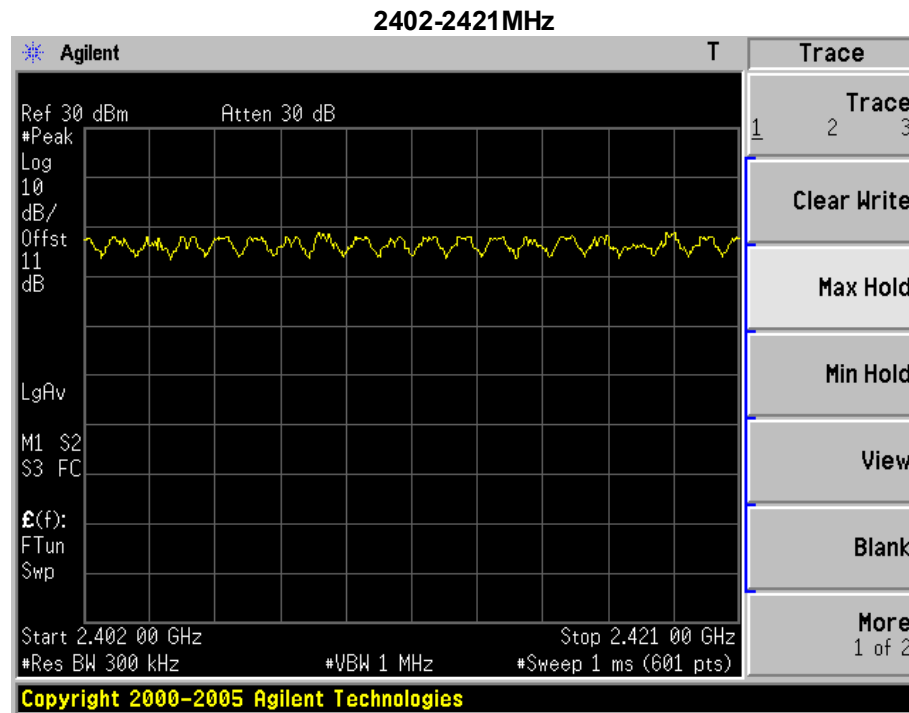
| Hopping Channel Frequency Range (MHz) | Number of Hopping Channel | Limit |
|---------------------------------------|---------------------------|-------|
| 2400-2483.5                           | 79                        | ≥15   |

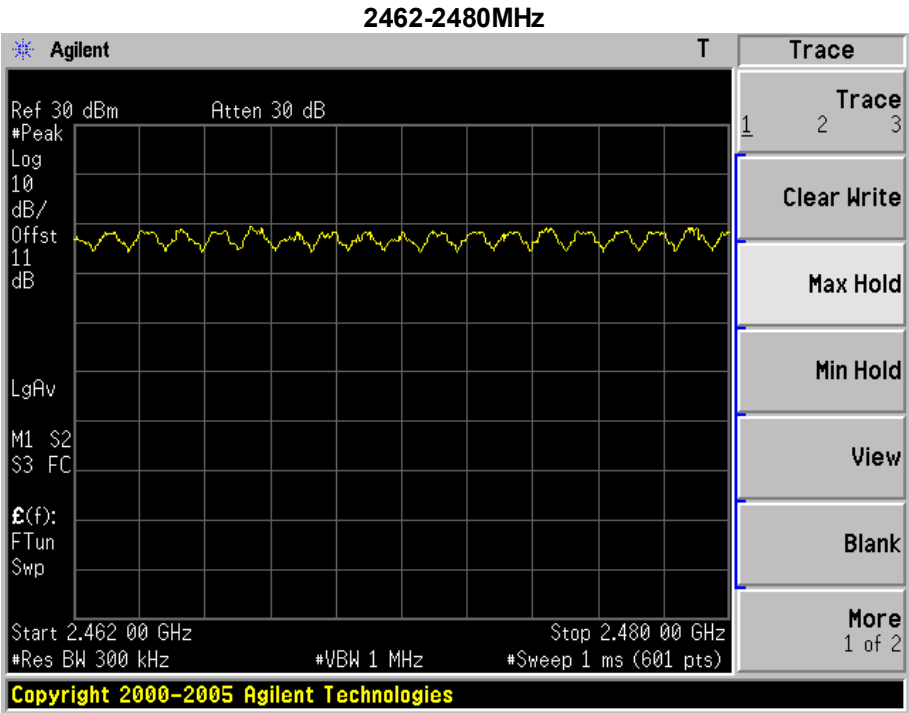
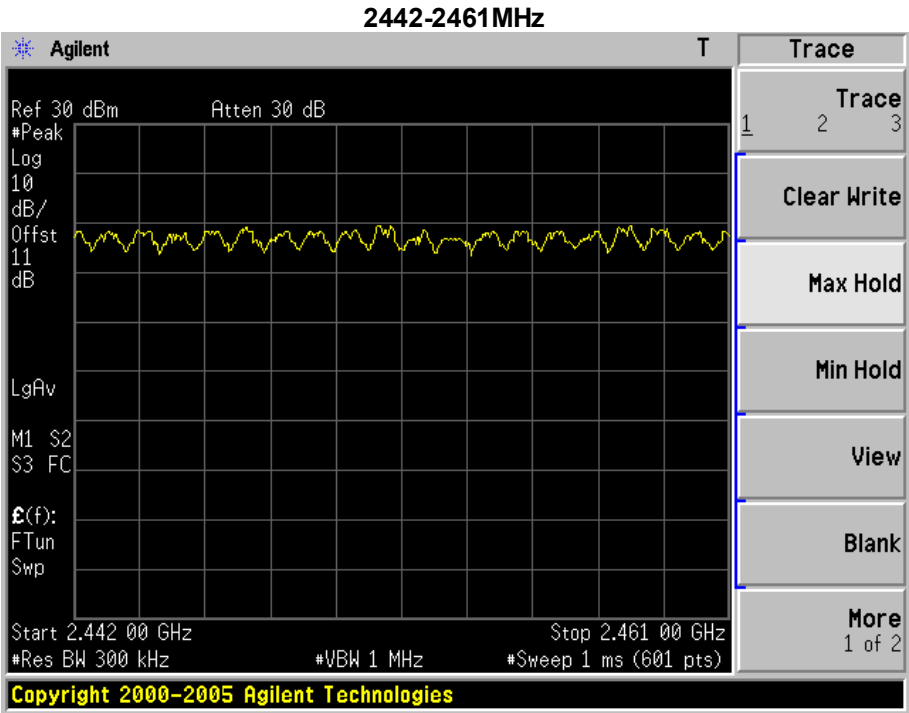
Photos of Number of hopping channel Measurement



## 3DH5 Mode:

| Hopping Channel Frequency Range (MHz) | Number of Hopping Channel | Limit |
|---------------------------------------|---------------------------|-------|
| 2400-2483.5                           | 79                        | ≥15   |

Photos of Number of hopping channel Measurement



#### 4.8. Time Of Occupancy(Dwell Time)

##### TEST CONFIGURATION



##### TEST PROCEDURE

According to ANSI C63.10: 2009.

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW = 1MHz

VBW  $\geq$  RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

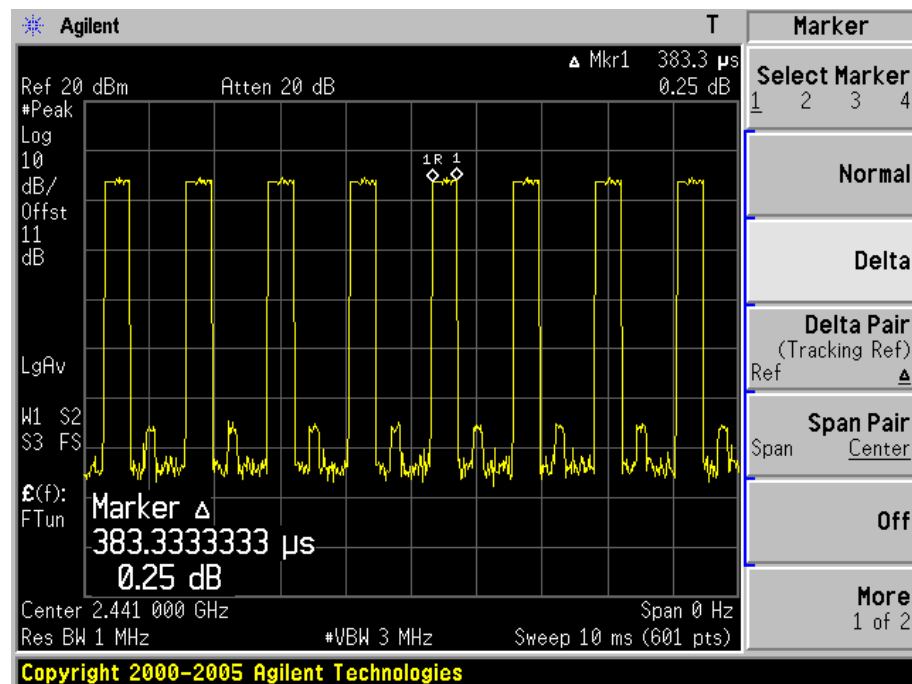
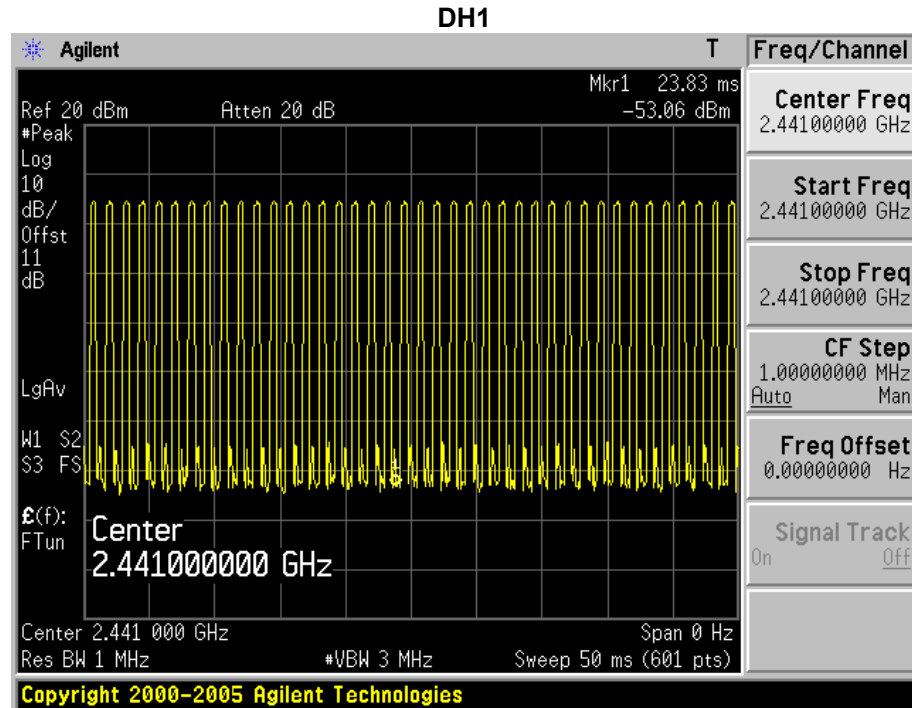
If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

##### LIMIT

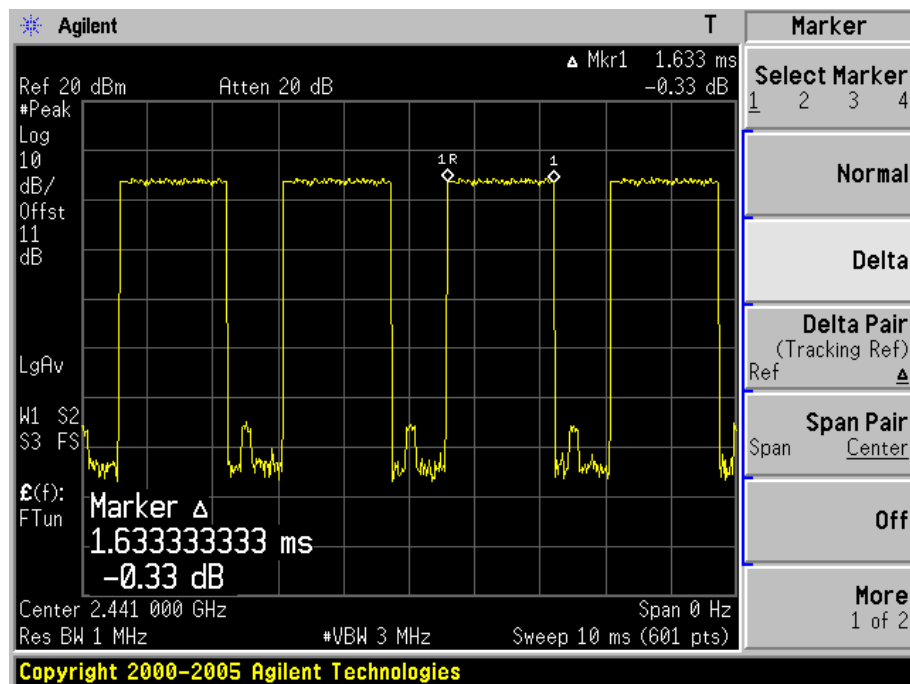
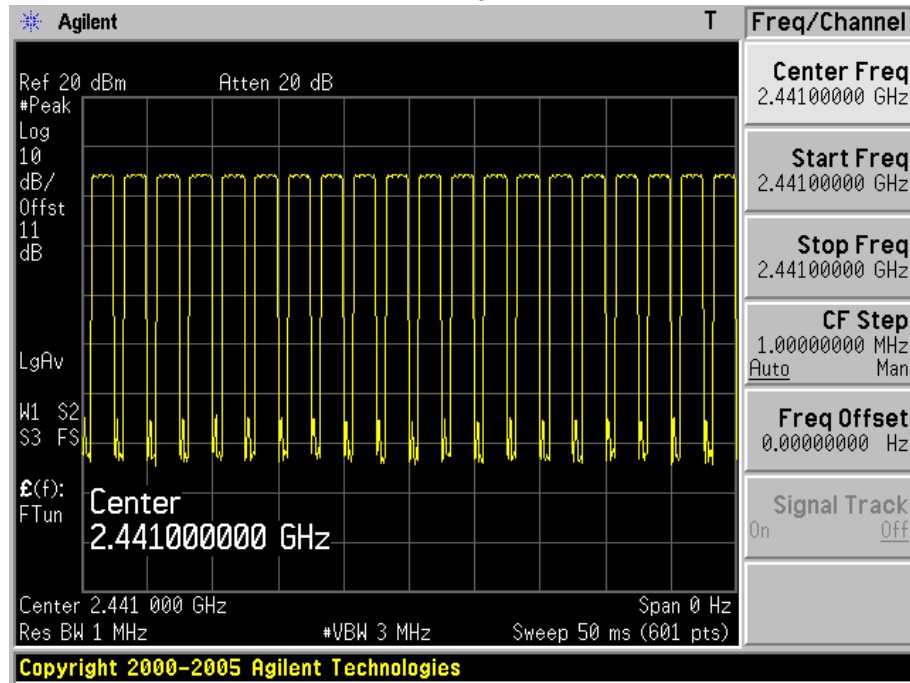
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a pe-riod of 0.4 seconds multiplied by the number of hopping channels employed.

##### TEST RESULTS

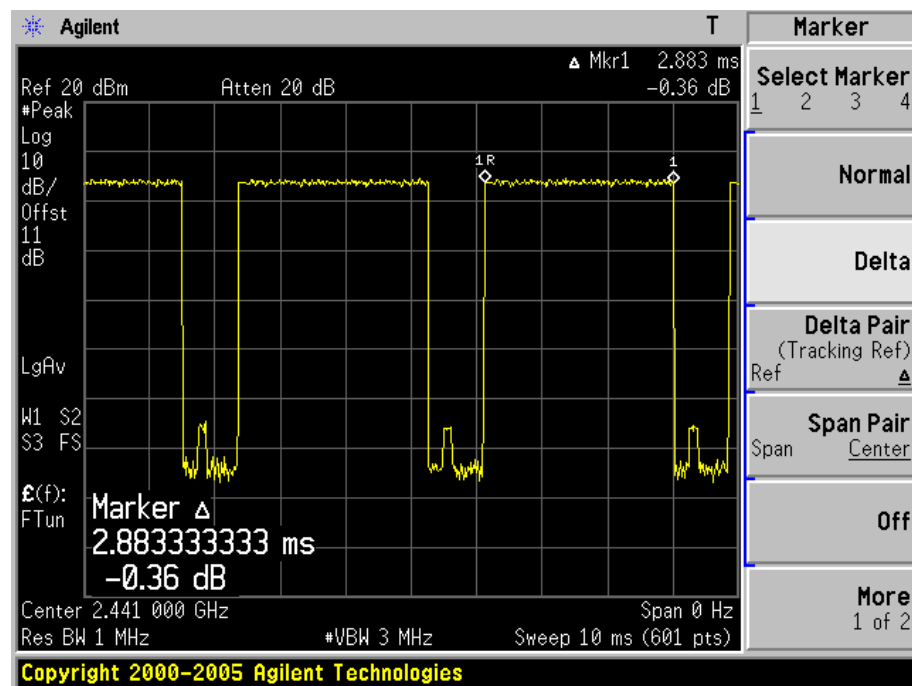
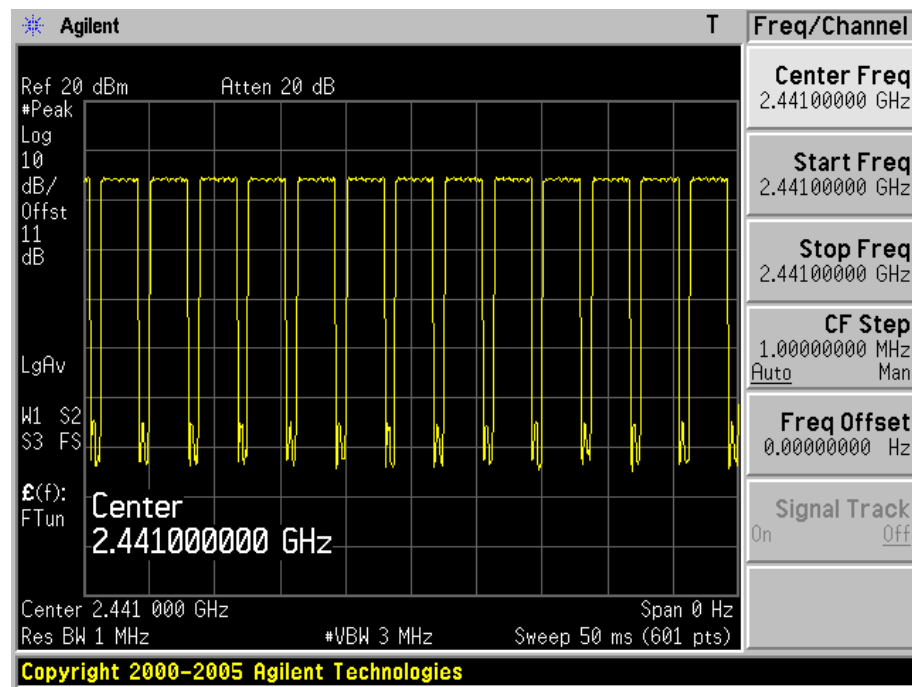
| Rate  | Mode  | Pulse Width (ms) | Dwell Time (S) | Limit (S) | Result |
|-------|---|------------------|----------------|-----------|--------|
| 3Mbps | DH1   | 0.383            | 0.123          | 0.4       | Pass   |
|       | DH3   | 1.633            | 0.261          | 0.4       | Pass   |
|       | DH5   | 2.883            | 0.308          | 0.4       | Pass   |
|       | <b>Note:</b><br>DH1: Dwell time=Pulse time (ms) $\times$ (1600 $\div$ 2 $\div$ 79) $\times$ 31.6 Second<br>DH3: Dwell time=Pulse time (ms) $\times$ (1600 $\div$ 4 $\div$ 79) $\times$ 31.6 Second<br>DH5: Dwell time=Pulse time (ms) $\times$ (1600 $\div$ 6 $\div$ 79) $\times$ 31.6 Second |                  |                |           |        |

Photos of Dwell Time Measurement:

## DH3



## DH5





## 4.9. Spurious RF Conducted Emissions

### TEST CONFIGURATION



### TEST PROCEDURE

According to ANSI C63.10: 2009.

The EUT must have its hopping function enabled.

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100KHz, VBW  $\geq$  RBW, Sweep = auto, Detector function = peak, Trace = max hold

Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded. The level displayed must comply with the limit specified in this section.

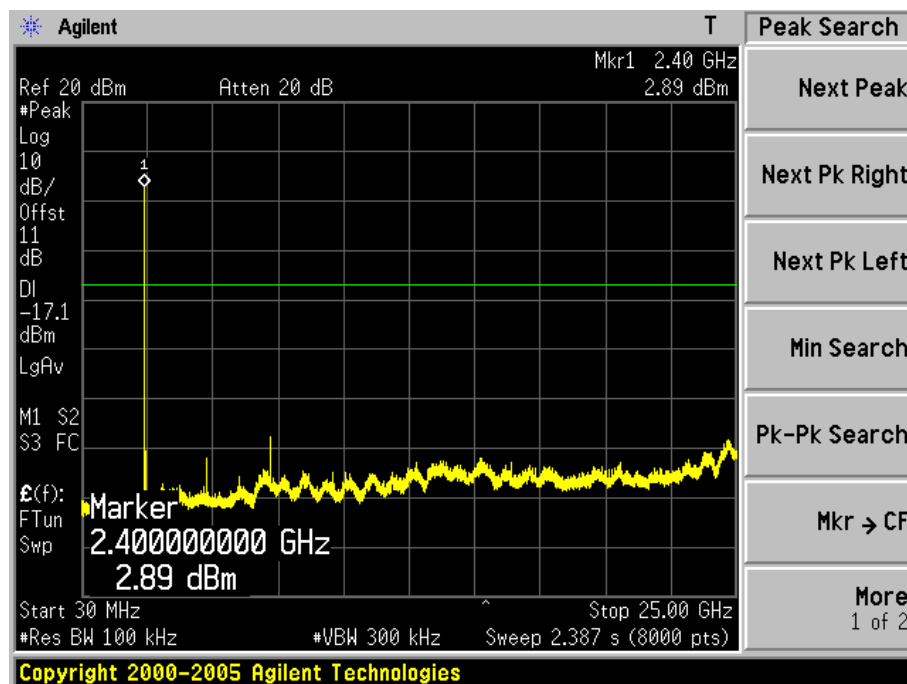
### LIMIT

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) of FCC part 15 is not required.

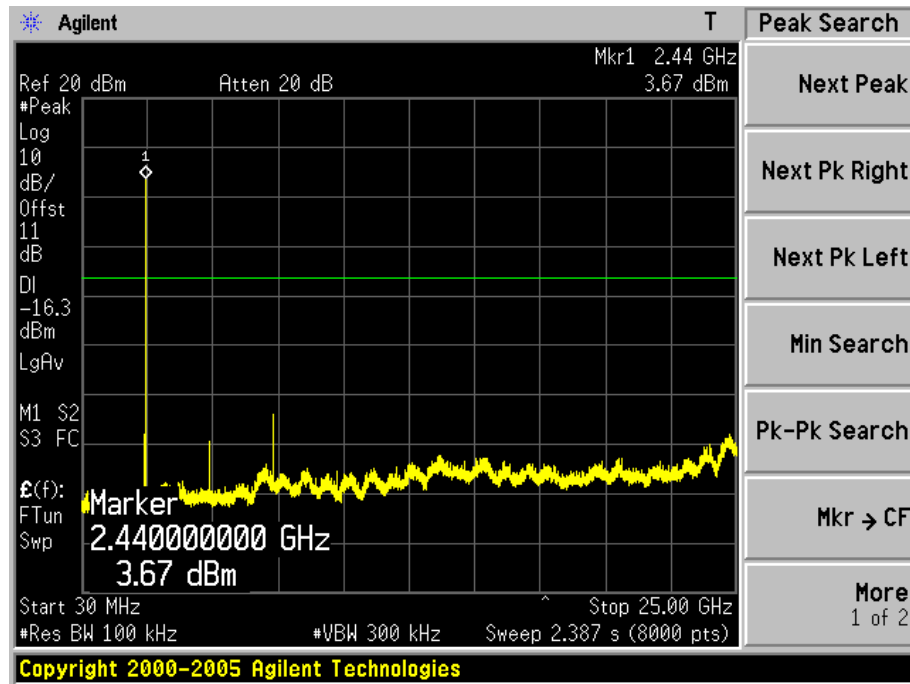
### TEST RESULT

DH5 Mode:

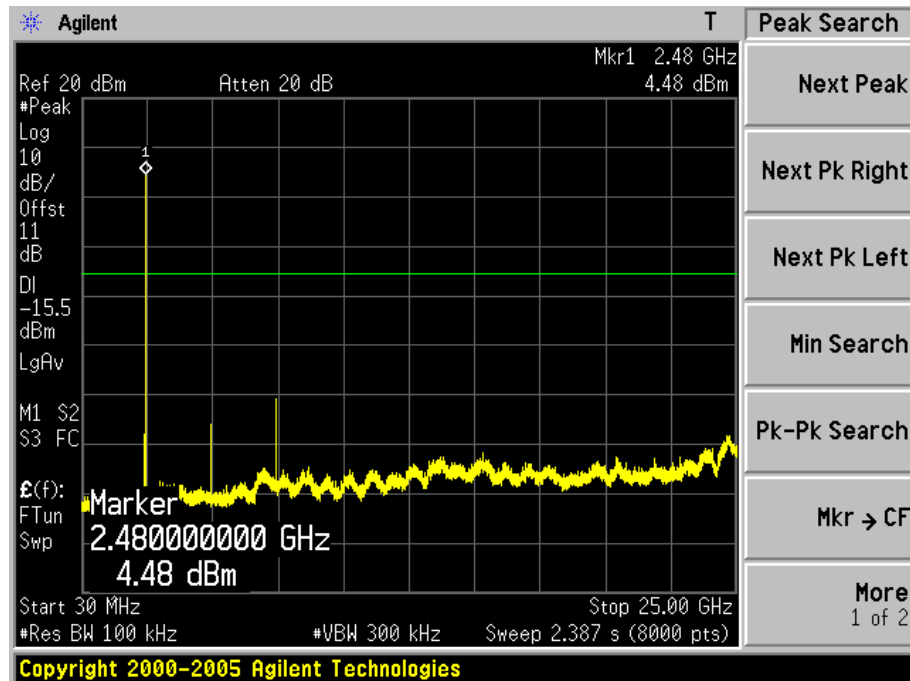
#### Low Channel



## Middle Channel

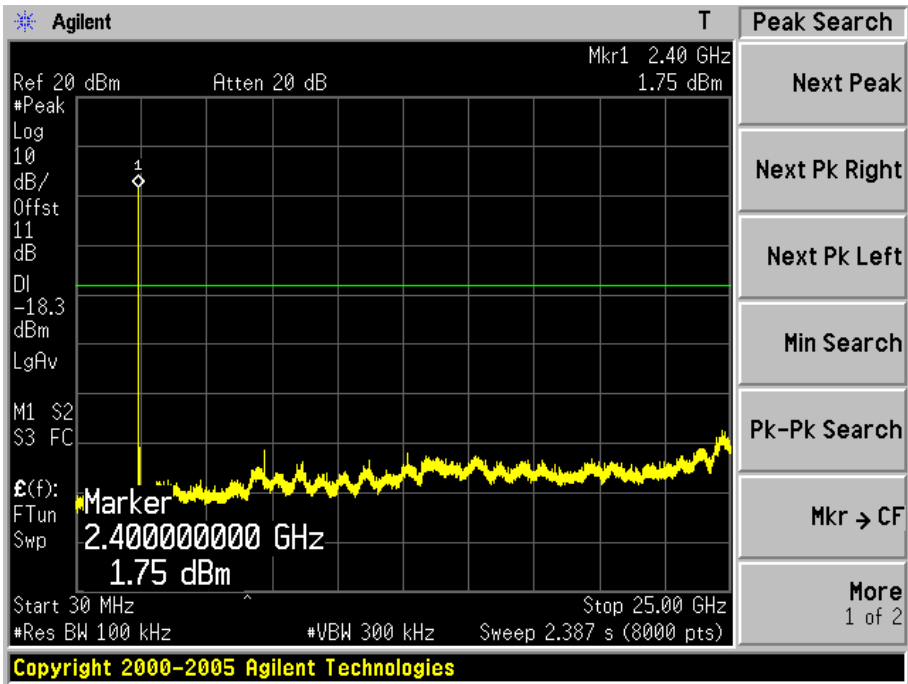


## High Channel

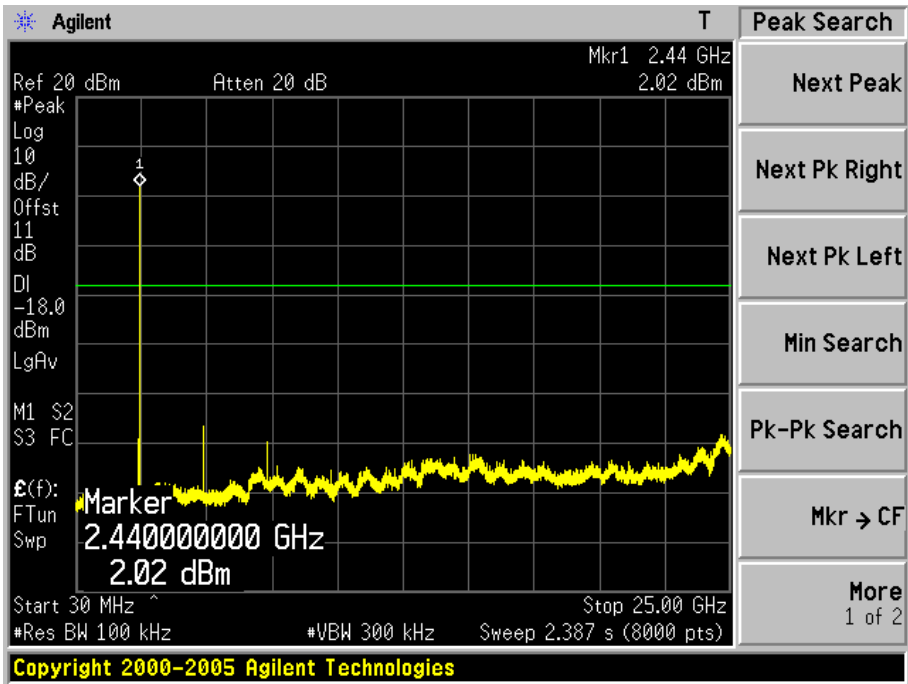


2DH5 Mode:

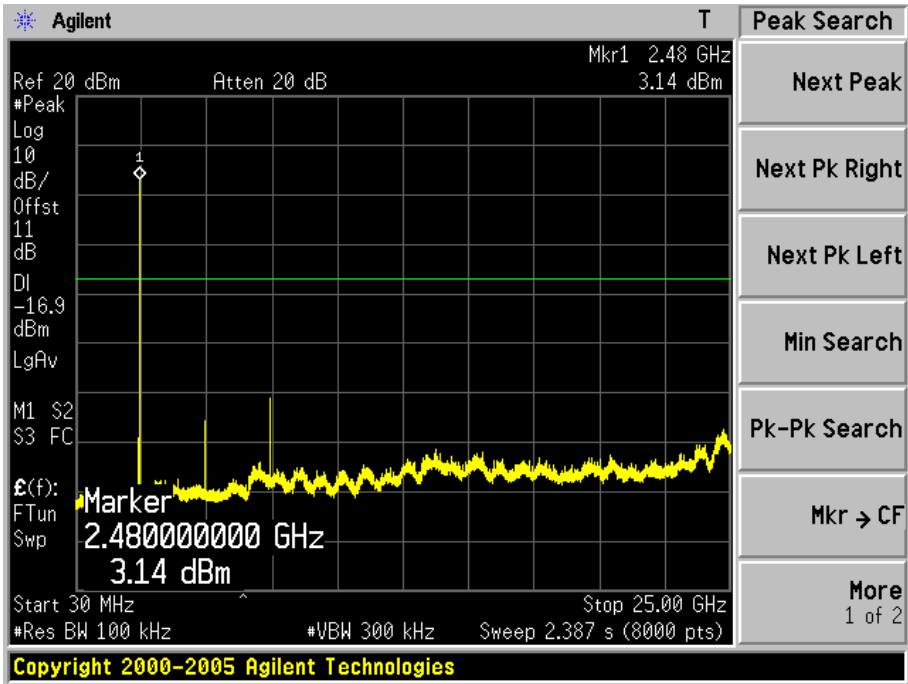
Low Channel



Middle Channel

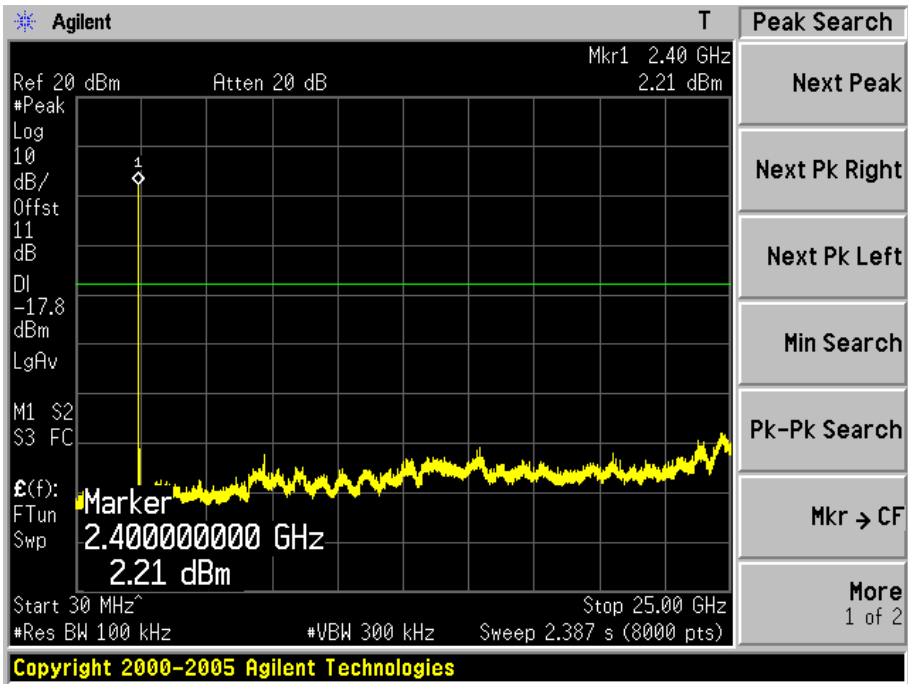


High Channel

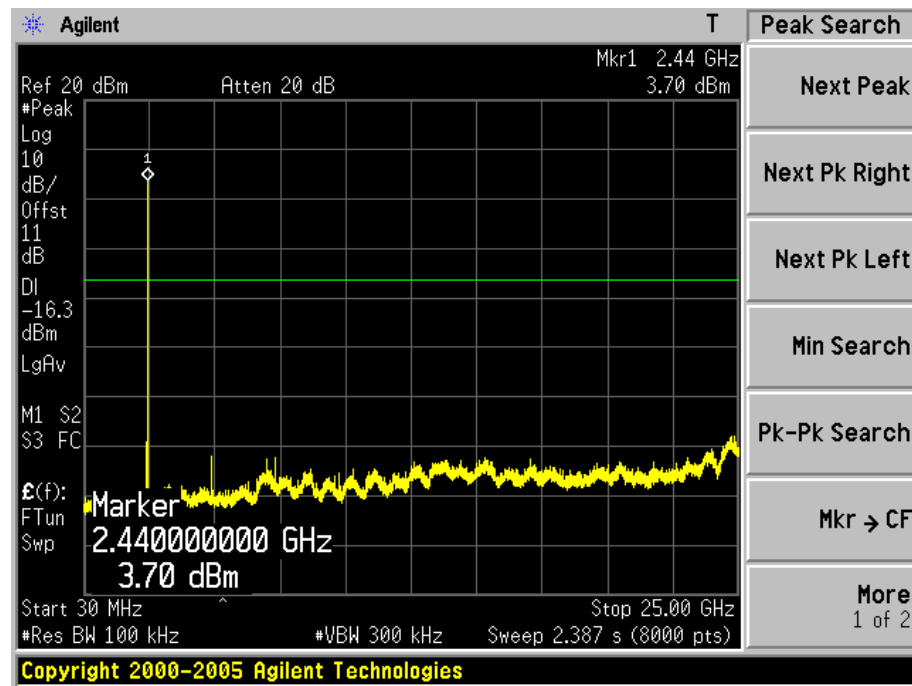


3DH5 Mode;

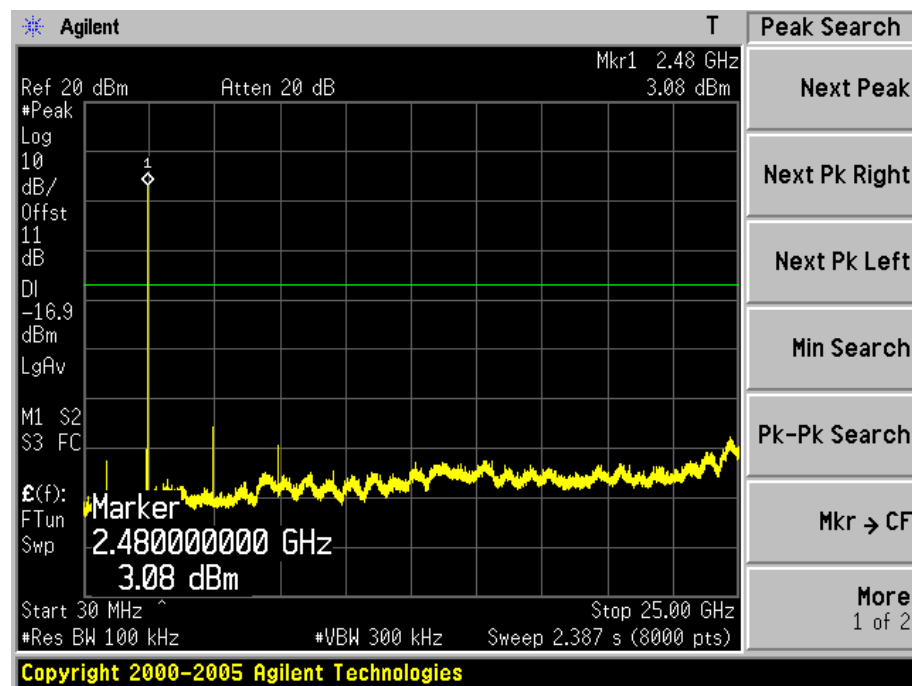
Low Channel



## Middle Channel



## High Channel



## 4.10. Antenna Requirement

### Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

**Refer to statement below for compliance.**

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### Antenna Connected Construction

The antenna used in this product is a PCB Antenna, The directional gains of antenna used for transmitting is -2.0 dBi.

#### 4.11. RF Exposure

##### **STANDARD APPLICABLE**

According to § 1.1307 (b)(1), system 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 device with bluetooth function.

##### **MEASUREMENT RESULTS**

This is a bluetooth function and the Max peak output power is 5.32dBm (3.4 mW) lower than low threshold 60/fGHz mW (24.19 mW),  $d < 2.5\text{cm}$  in general population category.

The SAR measurement is not necessary.

## 5. Test Setup Photos of the EUT

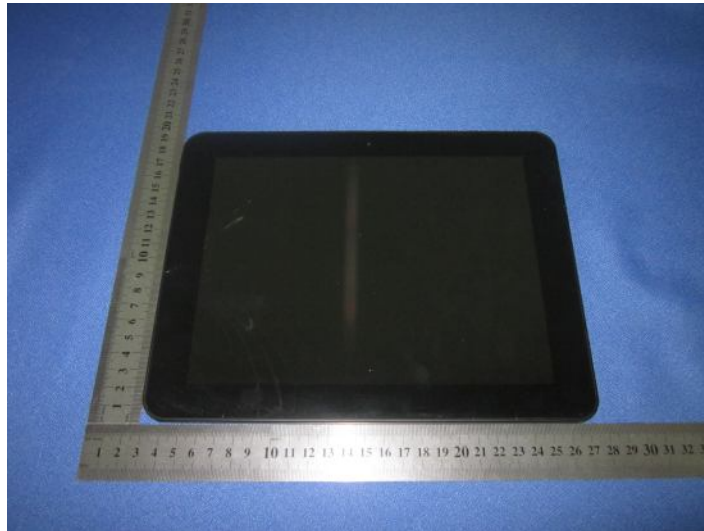






## 6. External and Internal Photos of the EUT

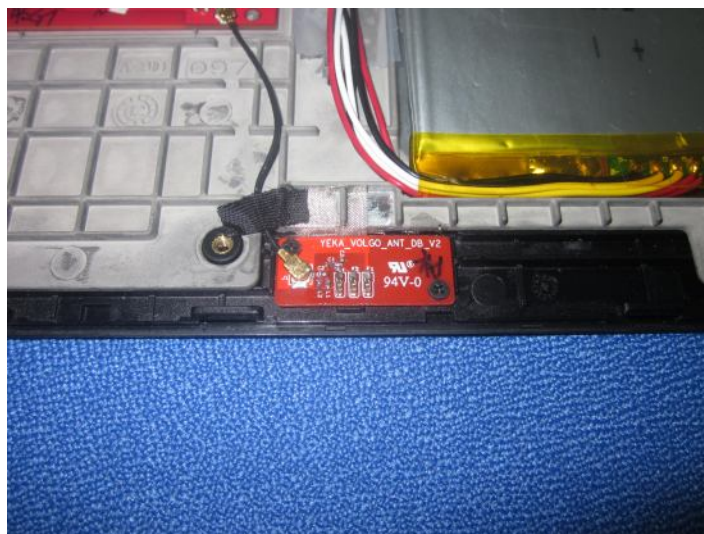
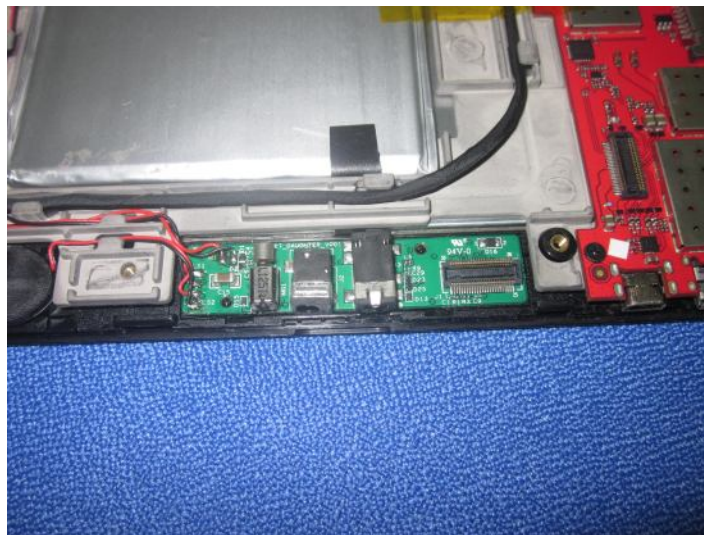
### External Photos of EUT

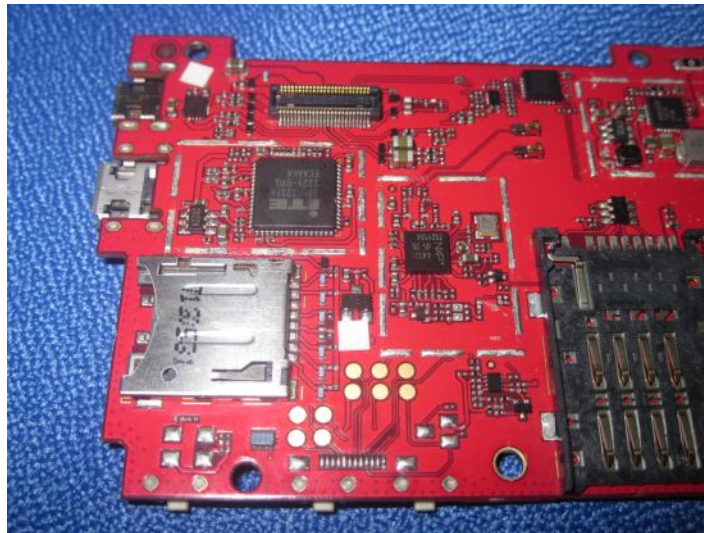
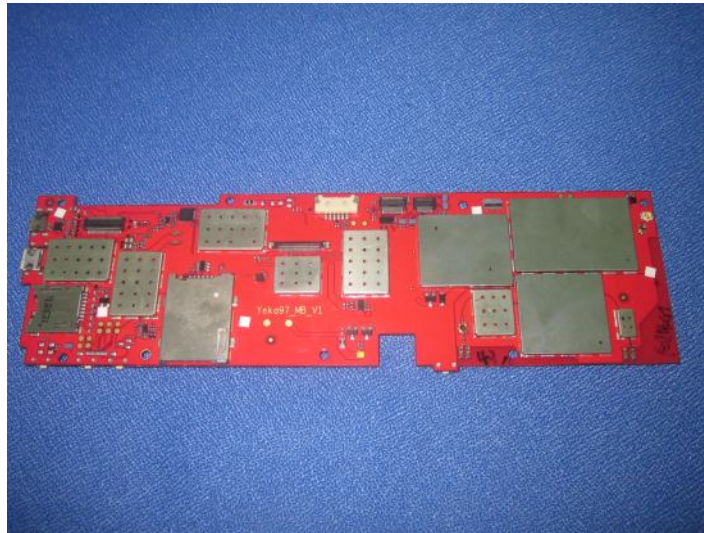




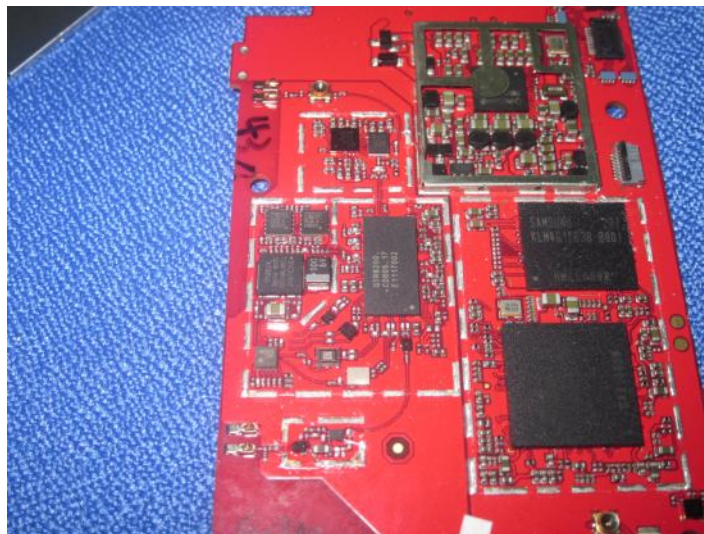
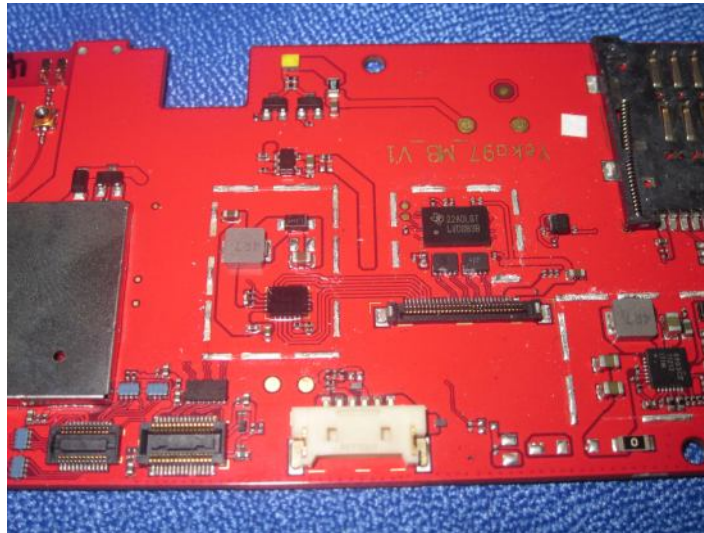
Internal Photos of EUT













.....End of Report.....