

# RF TEST REPORT

Test item : Bluetooth remote controller  
Model No. : M4-Media  
Order No. : 1111-01456  
Date of receipt : 2011-10-31  
Test duration : 2011-11-02 ~ 2011-11-10  
Date of issue : 2011-11-10  
Use of report : FCC & IC Original Grant

Applicant : LG Electronics USA.  
1000 Sylvan Avenue Englewood Cliffs, New Jersey, United States

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

Test specification : FCC Part 15.247 Subpart C  
RSS-210, RSS-Gen

Test environment : See appended test report

Test result : ☒ Pass ☐ Fail

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

Tested by:

Engineer  
S.K.Ryu

Witnessed by:

N/A

Reviewed by:

Technical Director  
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# 1. Equipment information

## 1.1 Equipment description

|                          |                                                       |
|--------------------------|-------------------------------------------------------|
| FCC Equipment Class      | Part 15 Spread Spectrum Transmitter(DSS)              |
| FCC ID                   | BEJ9QK-M4MEDIA                                        |
| IC ID                    | 2703H-M4MEDIA                                         |
| Equipment type           | Bluetooth remote controller                           |
| Equipment model name     | M4-Media                                              |
| Equipment add model name | N/A                                                   |
| Equipment serial no.     | Identical prototype                                   |
| Frequency band           | 2402 ~ 2480 MHz                                       |
| Spread Spectrum          | Frequency Hopping                                     |
| Modulation type          | GFSK, $\pi/4$ -DQPSK, 8DPSK                           |
| Transmission rate        | 1Mbps, 2Mbps, 3Mbps                                   |
| Channel Spacing          | 1.0 MHz                                               |
| Power                    | DC 3.0 V                                              |
| Antenna type             | Internal Type: Chip Antenna (Max. Peak Gain:1.99 dBi) |

## 1.2 Ancillary equipment

| Equipment | Model No. | Serial No. | Manufacturer | Note |
|-----------|-----------|------------|--------------|------|
| -         | -         | -          | -            | -    |
| -         | -         | -          | -            | -    |

## 2. Information about test items

### 2.1 Test mode & EUT Position

This device was tested in maximum duty mode at maximum power of hopping enable / disable mode.

|                    |       |
|--------------------|-------|
| <b>Test Case 1</b> | 1Mbps |
| <b>Test Case 2</b> | 2Mbps |
| <b>Test Case 3</b> | 3Mbps |

EUT position: refer to Test photo file.

### 2.2 Auxiliary equipment

| Equipment | Model No. | Serial No.      | Manufacturer | Note    |
|-----------|-----------|-----------------|--------------|---------|
| Notebook  | X51RL     | 85N0AS318314227 | ASUS         | FCC DoC |
| -         | -         | -               | -            | -       |

### 2.3 Tested frequency

- Hopping Function: Enable

|                     | TX Frequency (MHz) | RX Frequency (MHz) |
|---------------------|--------------------|--------------------|
| <b>Hopping Band</b> | 2402 ~ 2480        | 2402 ~ 2480        |

- Hopping Function: Disable

|                        | TX Frequency (MHz) | RX Frequency (MHz) |
|------------------------|--------------------|--------------------|
| <b>Lowest Channel</b>  | 2402               | 2402               |
| <b>Middle Channel</b>  | 2441               | 2441               |
| <b>Highest Channel</b> | 2480               | 2480               |

### 2.4 Tested environment

|                                  |                  |
|----------------------------------|------------------|
| <b>Temperature</b>               | : 22 ~ 25 °C     |
| <b>Relative humidity content</b> | : 38 ~ 45 % R.H. |
| <b>Details of power supply</b>   | : DC 3.0 V       |

### 2.5 EMI Suppression Device(s)/Modifications

EMI suppression device(s) added and/or modifications made during testing

→ None

### 3. Test Report

#### 3.1 Summary of tests

| FCC Part<br>RSS-210 & GEN                                                                                                                                                                                                                                                    | Parameter                     | Limit<br>(Using in 2400 ~ 2483.5MHz)                                                                              | Test<br>Condition | Status<br>(note 1) |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------|--------------------|
| I. Transmit mode (Tx)                                                                                                                                                                                                                                                        |                               |                                                                                                                   |                   |                    |
| 15.247(a)<br>RSS-210(A8.1)                                                                                                                                                                                                                                                   | Carrier Frequency Separation  | >= 20dB BW or >= Two-Thirds of the 20dB BW                                                                        | Conducted         | C                  |
|                                                                                                                                                                                                                                                                              | Number of Hopping Frequencies | >= 15 hops                                                                                                        |                   | C                  |
|                                                                                                                                                                                                                                                                              | 20 dB Bandwidth               | None                                                                                                              |                   | C                  |
|                                                                                                                                                                                                                                                                              | Dwell Time                    | =< 0.4 seconds                                                                                                    |                   | C                  |
| 15.247(b)<br>RSS-210(A8.4)                                                                                                                                                                                                                                                   | Transmitter Output Power      | =< 1Watt , if CHs >= 75 Others<br>=<0.125W                                                                        |                   | C                  |
| 15.247(d)<br>RSS-210(A8.5)                                                                                                                                                                                                                                                   | Band-edge /Conducted          | The radiated emission to any 100 kHz of outband shall be at least 20dB below the highest inband spectral density. |                   | C                  |
|                                                                                                                                                                                                                                                                              | Conducted Spurious Emissions  |                                                                                                                   |                   | C                  |
| 15.205,15.209<br>RSS-210(A8.5)                                                                                                                                                                                                                                               | Radiated Emissions            | FCC 15.209                                                                                                        | Radiated          | C<br>Note 2        |
| 15.207<br>RSS-Gen(7.2.4)                                                                                                                                                                                                                                                     | AC Conducted Emissions        | FCC 15.207                                                                                                        | AC Line Conducted | NA<br>Note 3       |
| RSS Gen Issue 3                                                                                                                                                                                                                                                              | Occupied Bandwidth (99%)      | RSS-Gen(4.6.1)                                                                                                    | Conducted         | C                  |
| 15.203<br>RSS-Gen(7.1.2)                                                                                                                                                                                                                                                     | Antenna Requirements          | FCC 15.203                                                                                                        | -                 | C                  |
| II. Receive mode (Rx)                                                                                                                                                                                                                                                        |                               |                                                                                                                   |                   |                    |
| RSS-Gen(7.2.4)                                                                                                                                                                                                                                                               | AC Conducted Emissions        | RSS-Gen(7.2.4 Table 4)                                                                                            | Line Conducted    | NA<br>Note 3       |
| RSS-Gen(6)                                                                                                                                                                                                                                                                   | Receiver Spurious Emissions   | RSS-Gen(6 Table 2)                                                                                                | Radiated          | C<br>Note 2        |
| Note 1: C=Comply    NC=Not Comply    NT=Not Tested    NA=Not Applicable<br>Note 2: This test item was performed in each axis. And the worst case data were reported.<br>Note 3: This test is not applicable.    Because the power of this device is supplied from batteries. |                               |                                                                                                                   |                   |                    |

The sample was tested according to the following specification:  
ANSI C-63.4-2003, DA00-705, RSS-Gen Issue 3

## 3.2 Transmitter requirements

### 3.2.1 Carrier Frequency Separation

#### - Procedure:

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

The spectrum analyzer is set to:

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

RBW = 1% of the span

Sweep = auto

VBW =  $\geq$  RBW

Detector function = peak

Trace = max hold

#### - Measurement Data: **Comply**

| Hopping Mode | Test Mode   | Peak of center channel (MHz) | Peak of adjacent Channel (MHz) | Test Result (MHz) |
|--------------|-------------|------------------------------|--------------------------------|-------------------|
| Enable       | Test Case 1 | 2440.004                     | 2441.009                       | 1.005             |
|              | Test Case 2 | 2439.992                     | 2440.994                       | 1.002             |
|              | Test Case 3 | 2440.007                     | 2441.012                       | 1.005             |

Note 1: See next pages for actual measured spectrum plots.

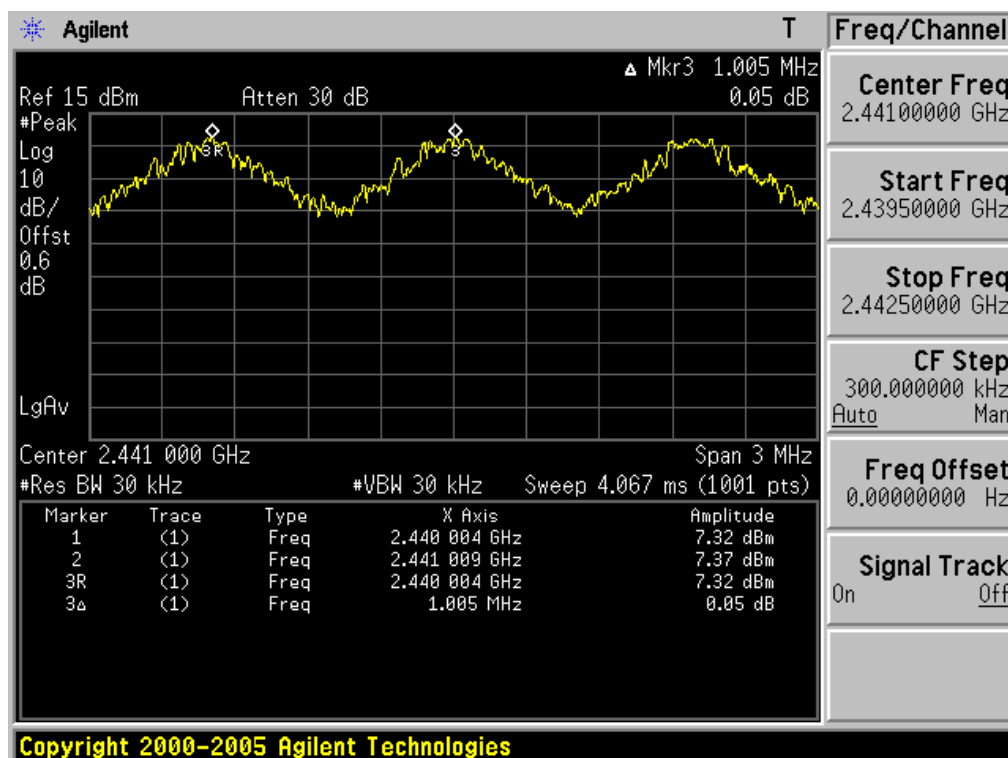
#### - Minimum Standard:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW

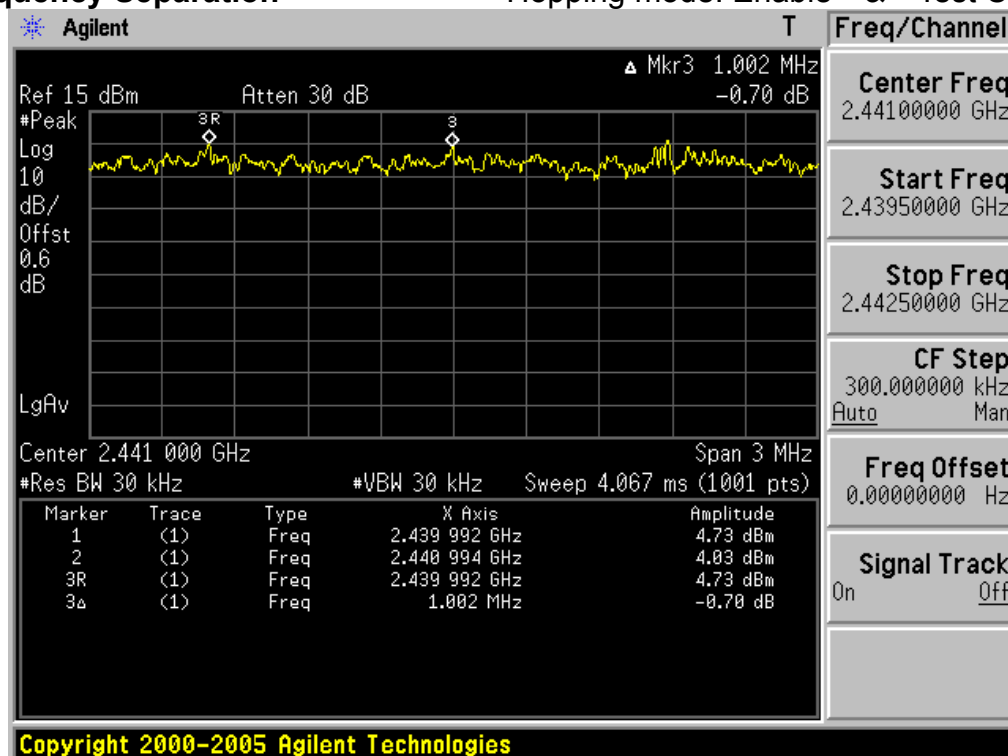
## Carrier Frequency Separation

Hopping mode: Enable &amp; Test Case 1



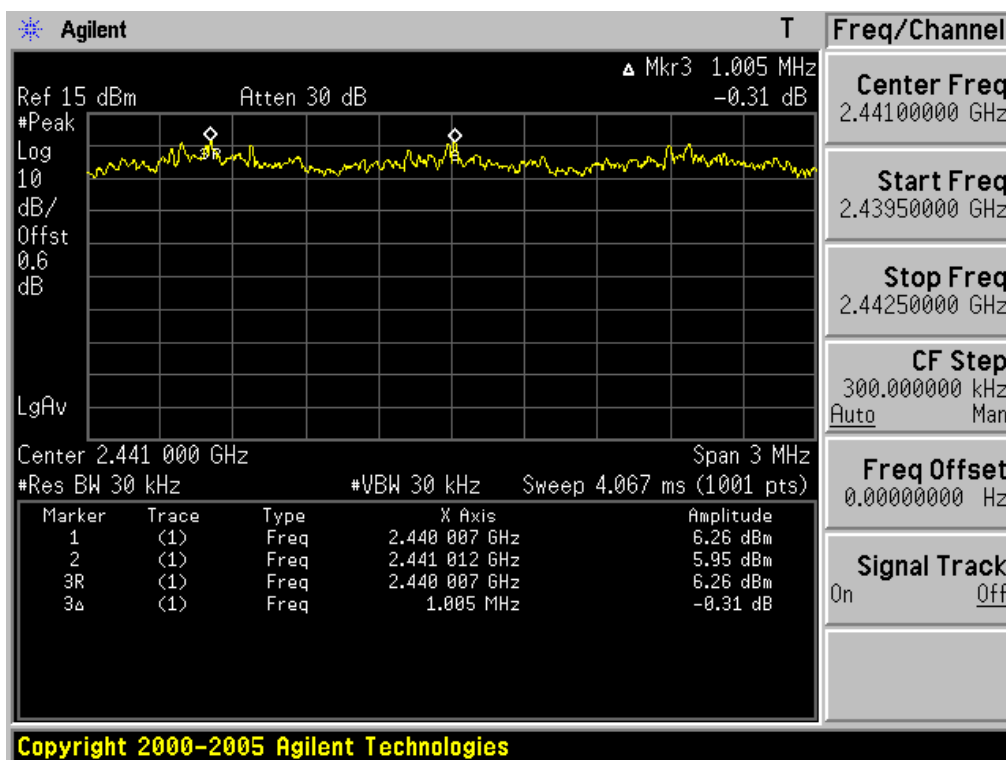
## Carrier Frequency Separation

Hopping mode: Enable &amp; Test Case 2



## Carrier Frequency Separation

Hopping mode: Enable &amp; Test Case 3



### 3.2.2 Number of Hopping Frequencies

#### - Procedure:

The number of hopping frequencies was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

To get higher resolution, four frequency ranges within the 2400 ~ 2483.5 MHz FH band were examined.

The spectrum analyzer is set to:

Span = 25MHz      Plot 1: Start Frequency = 2389.5MHz, Stop Frequency = 2414.5 MHz

Plot 2: Start Frequency = 2414.5MHz, Stop Frequency = 2439.5 MHz

Plot 3: Start Frequency = 2439.5MHz, Stop Frequency = 2464.5 MHz

Plot 4: Start Frequency = 2464.5MHz, Stop Frequency = 2489.5 MHz

RBW = 1% of the span or more

Sweep = auto

VBW =  $\geq$  RBW

Detector function = peak

Trace = max hold

#### - Measurement Data: **Comply**

| Hopping mode | Test mode   | Test Result<br>(Total Hops) |
|--------------|-------------|-----------------------------|
| Enable       | Test Case 1 | 79                          |
|              | Test Case 2 | 79                          |
|              | Test Case 3 | 79                          |

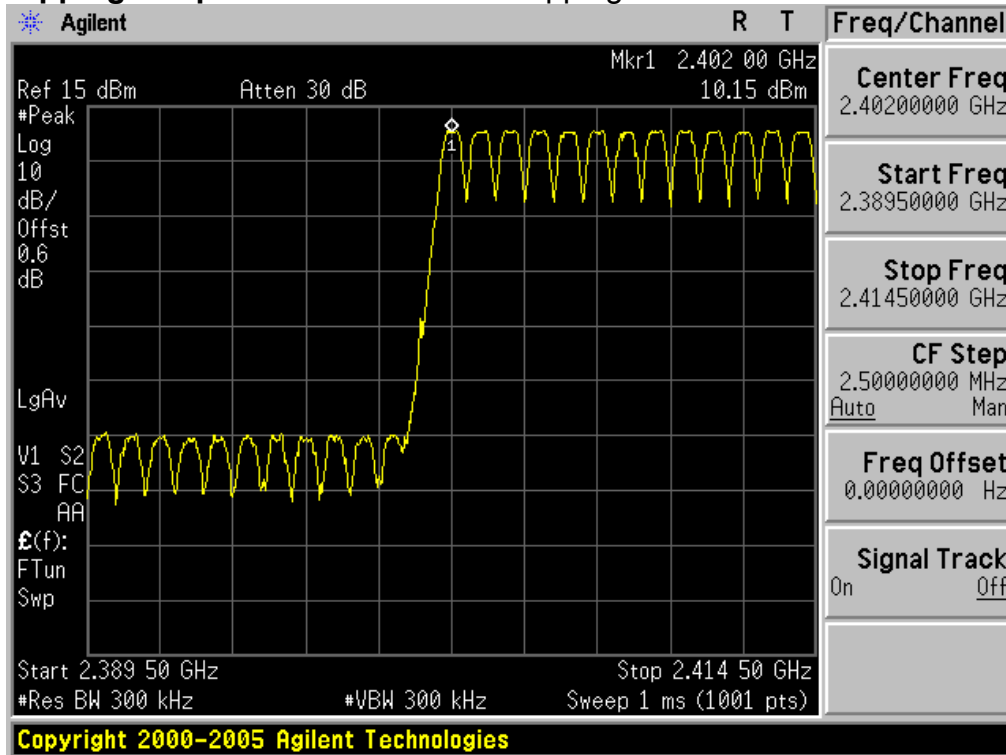
Note 1: See next pages for actual measured spectrum plots.

#### - Minimum Standard:

At least 15 hops

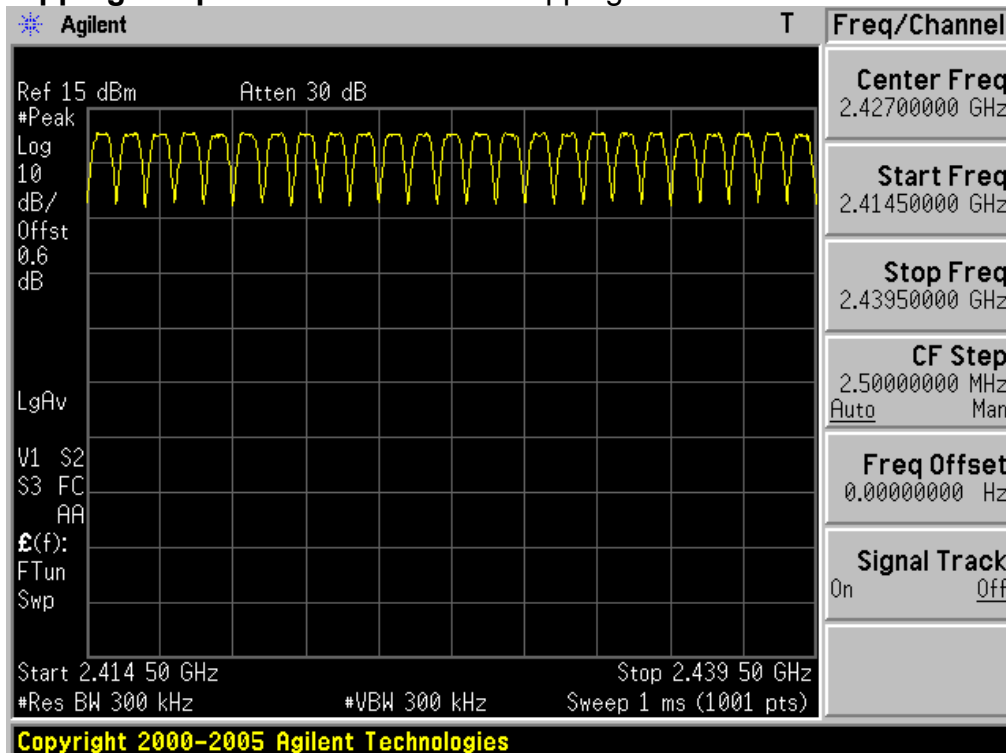
## Number of Hopping Frequencies 1

Hopping mode: Enable &amp; Test Case 1



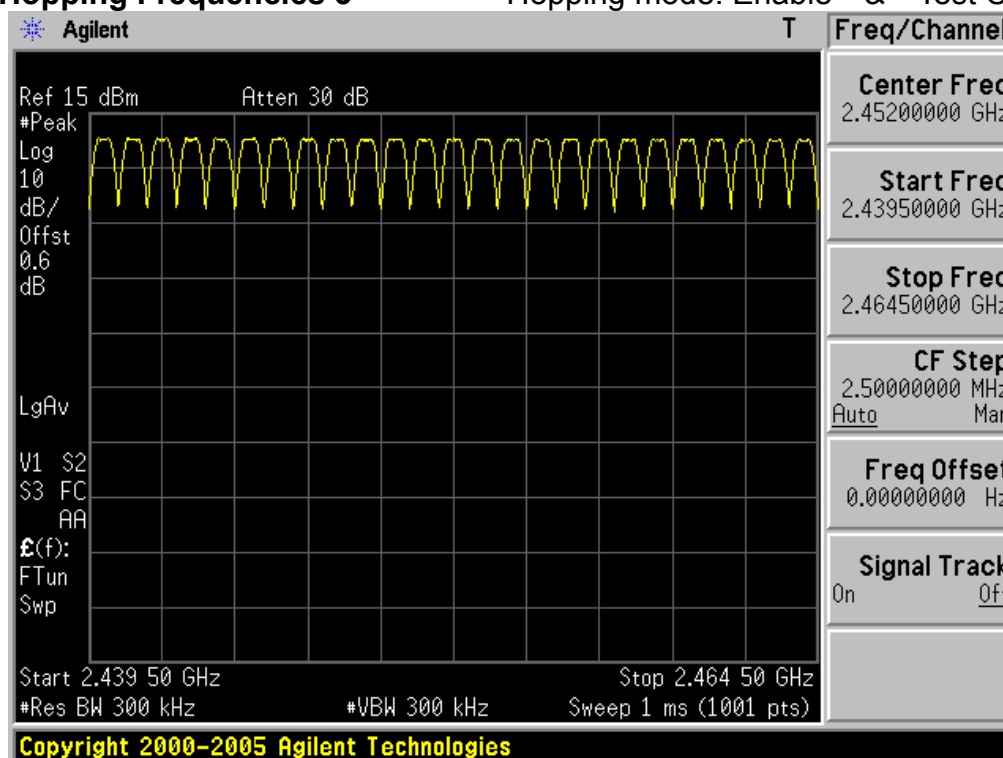
## Number of Hopping Frequencies 2

Hopping mode: Enable &amp; Test Case 1



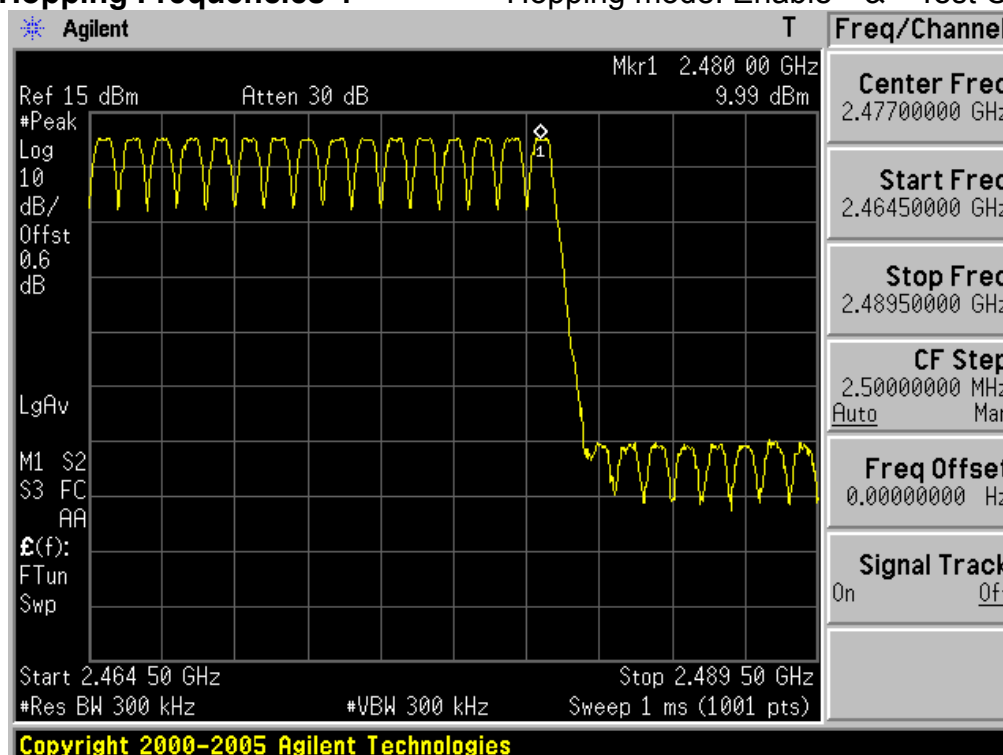
## Number of Hopping Frequencies 3

Hopping mode: Enable &amp; Test Case 1



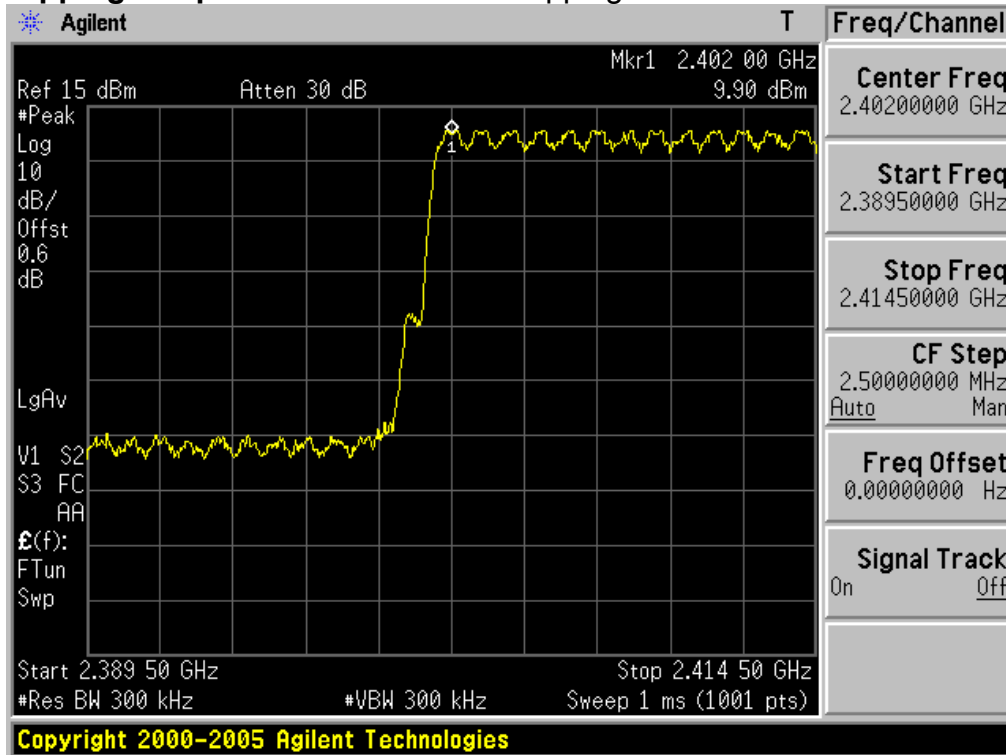
## Number of Hopping Frequencies 4

Hopping mode: Enable &amp; Test Case 1



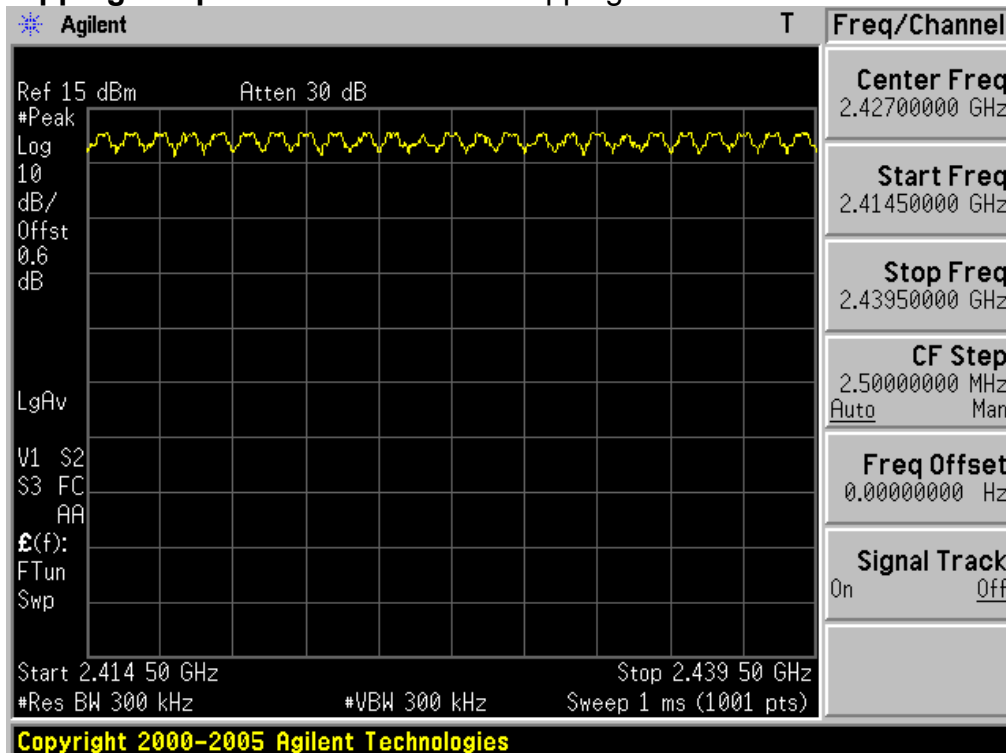
## Number of Hopping Frequencies 1

Hopping mode: Enable &amp; Test Case 2



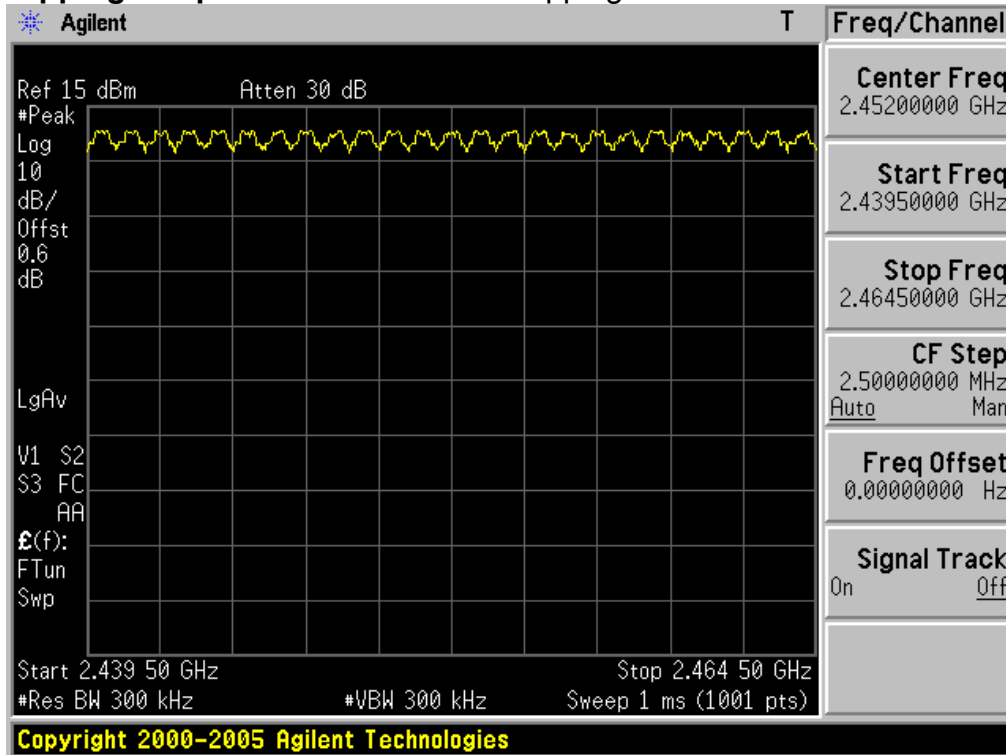
## Number of Hopping Frequencies 2

Hopping mode: Enable &amp; Test Case 2



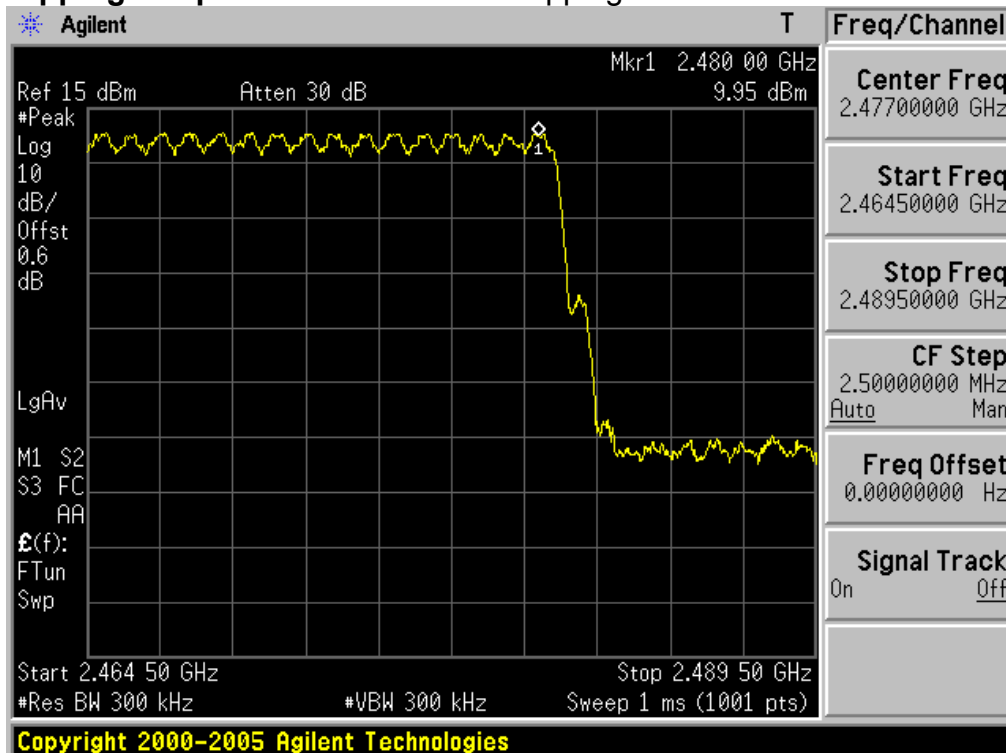
## Number of Hopping Frequencies 3

Hopping mode: Enable &amp; Test Case 2



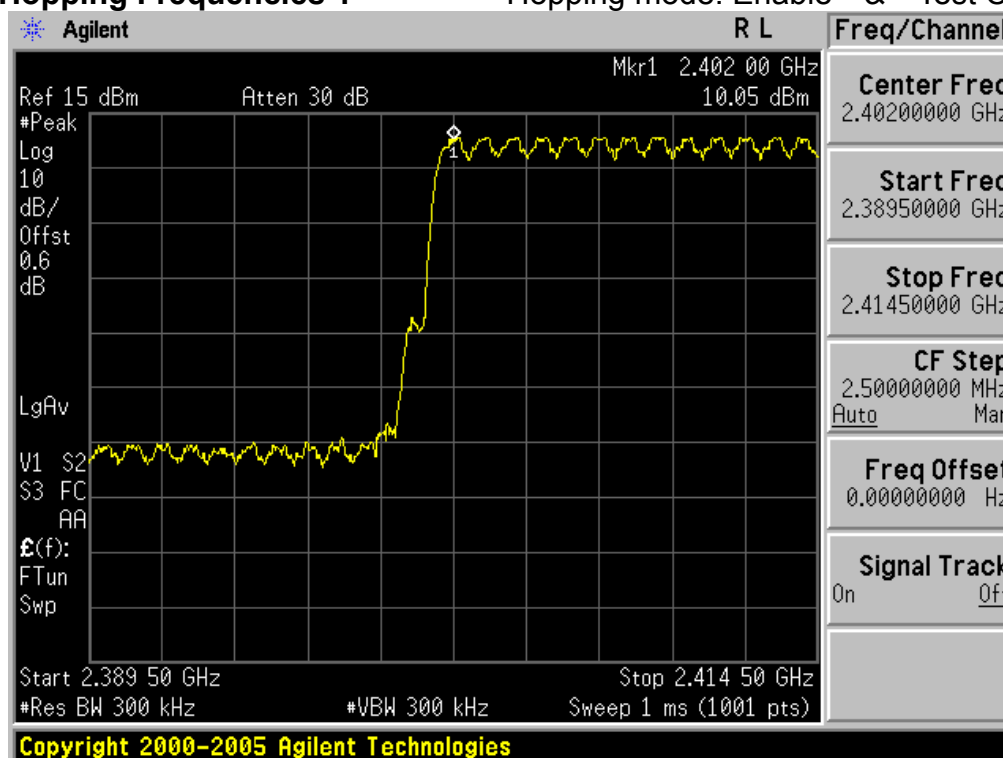
## Number of Hopping Frequencies 4

Hopping mode: Enable &amp; Test Case 2



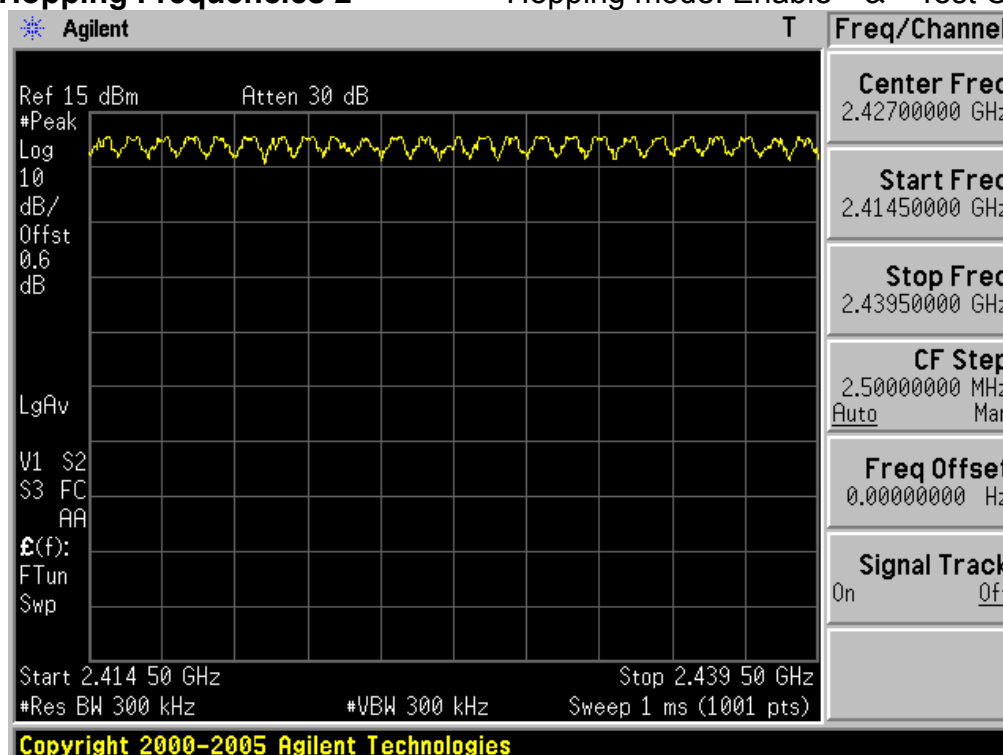
## Number of Hopping Frequencies 1

Hopping mode: Enable &amp; Test Case 3



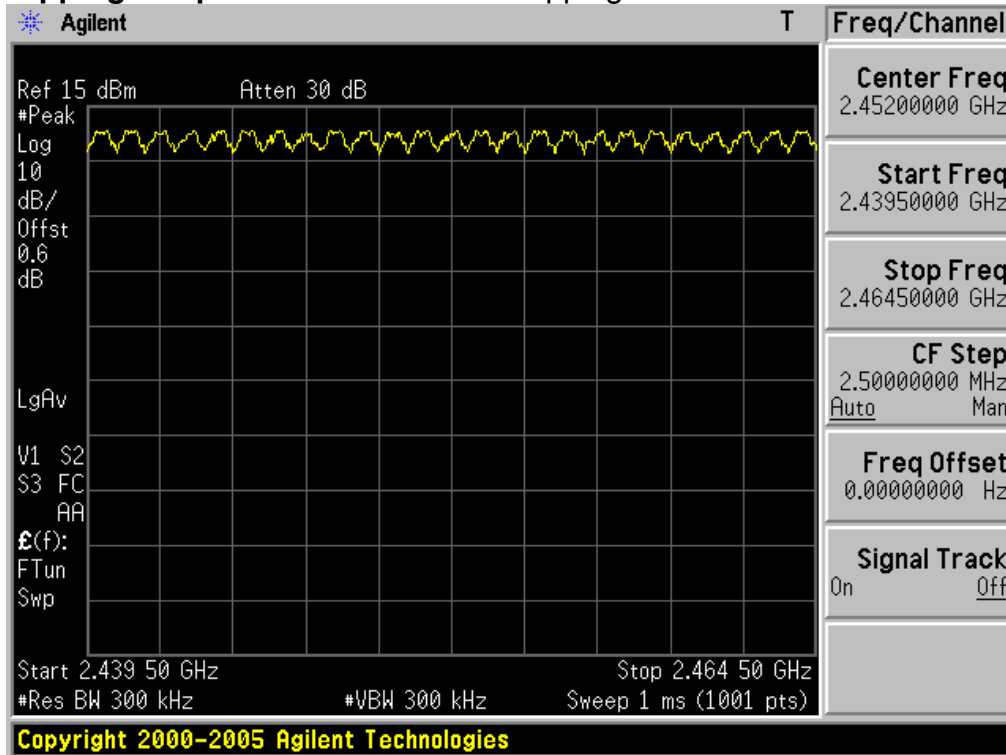
## Number of Hopping Frequencies 2

Hopping mode: Enable &amp; Test Case 3



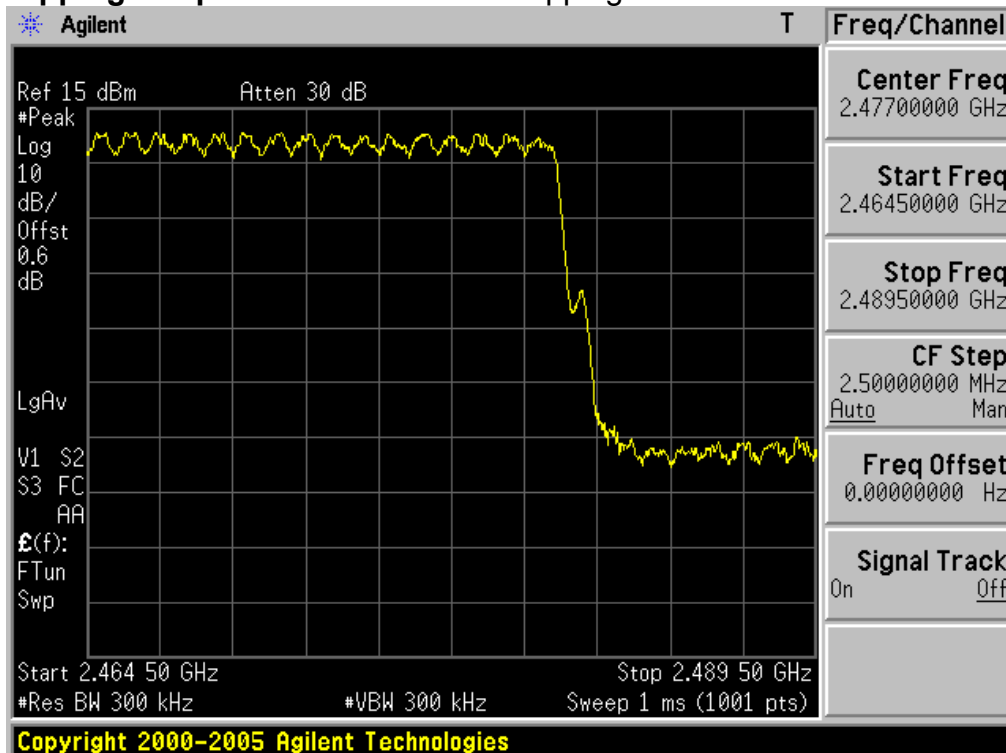
## Number of Hopping Frequencies 3

Hopping mode: Enable &amp; Test Case 3



## Number of Hopping Frequencies 4

Hopping mode: Enable &amp; Test Case 3



### 3.2.3 20 dB Bandwidth & Occupied Bandwidth(99%)

#### - Procedure:

The bandwidth at 20 dB below the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20dB 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.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest Frequencies

Span = approximately 2 or 3 times of the 20 dB bandwidth

RBW = 1% of the 20dB bandwidth or more

Sweep = auto

VBW =  $\geq$  RBW

Detector function = peak

Trace = max hold

#### - Measurement Data: **Comply**

| Hopping mode | Test mode   | Tested Channel | Test Results(MHz) |                         |
|--------------|-------------|----------------|-------------------|-------------------------|
|              |             |                | 20dB Bandwidth    | Occupied Bandwidth(99%) |
| Disable      | Test Case 1 | Lowest         | 0.946             | 0.872                   |
|              |             | Middle         | 0.927             | 0.871                   |
|              |             | Highest        | 0.928             | 0.865                   |
|              | Test Case 2 | Lowest         | 1.290             | 1.167                   |
|              |             | Middle         | 1.309             | 1.173                   |
|              |             | Highest        | 1.311             | 1.177                   |
|              | Test Case 3 | Lowest         | 1.263             | 1.173                   |
|              |             | Middle         | 1.262             | 1.178                   |
|              |             | Highest        | 1.267             | 1.185                   |

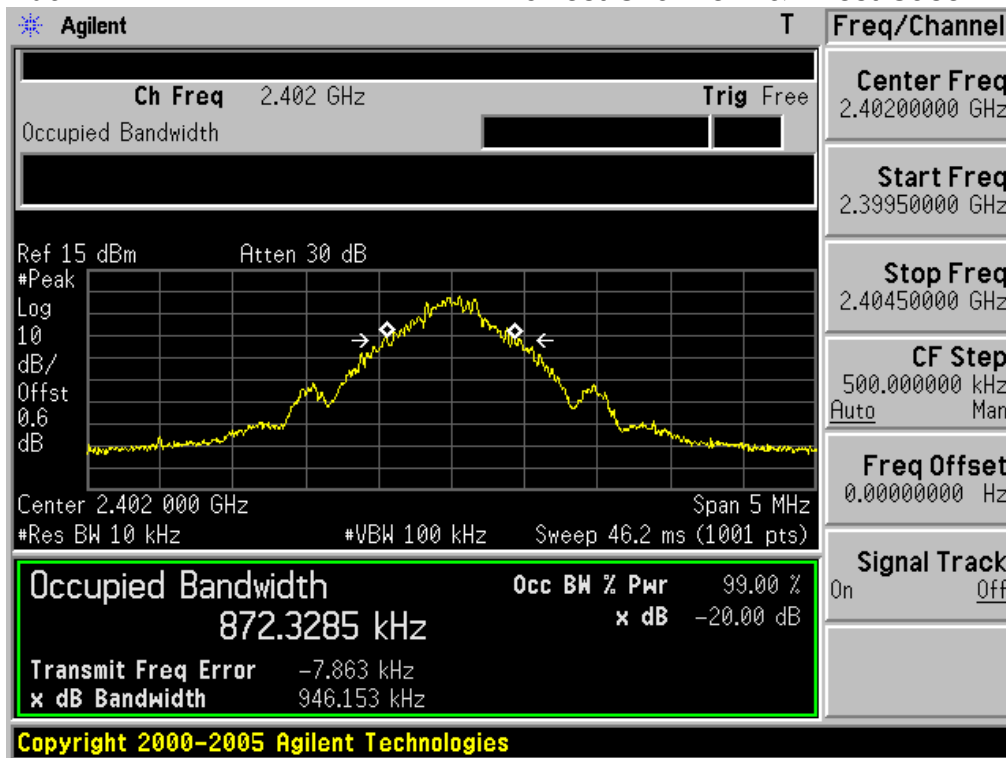
Note 1: See next pages for actual measured spectrum plots.

#### - Minimum Standard:

None

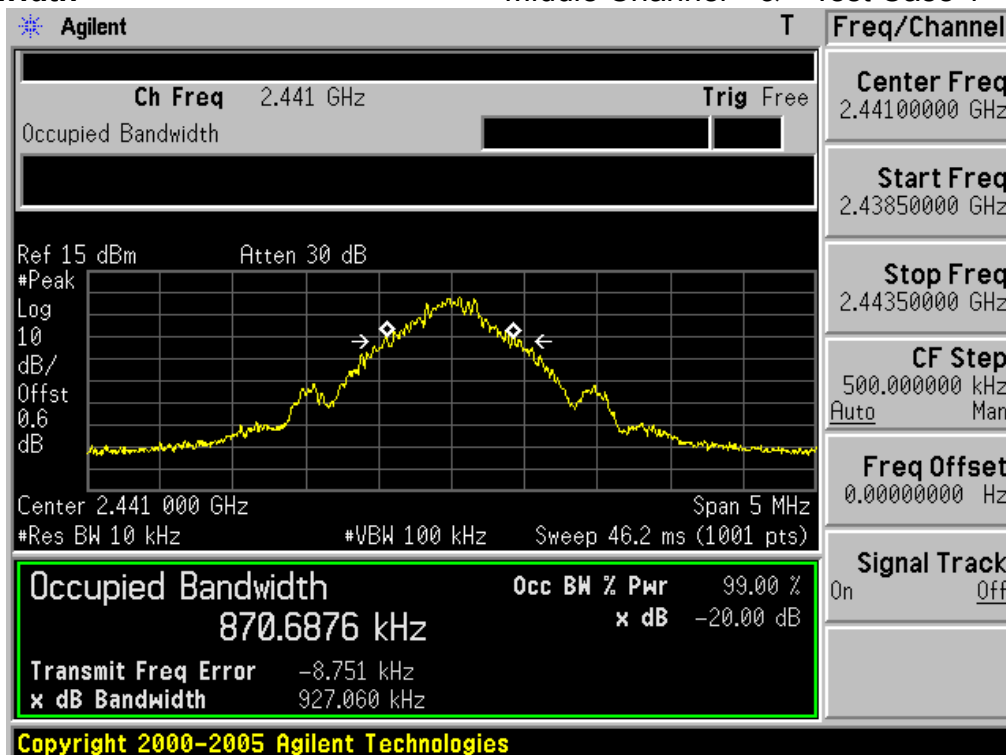
## 20dB Bandwidth

## Lowest Channel &amp; Test Case 1



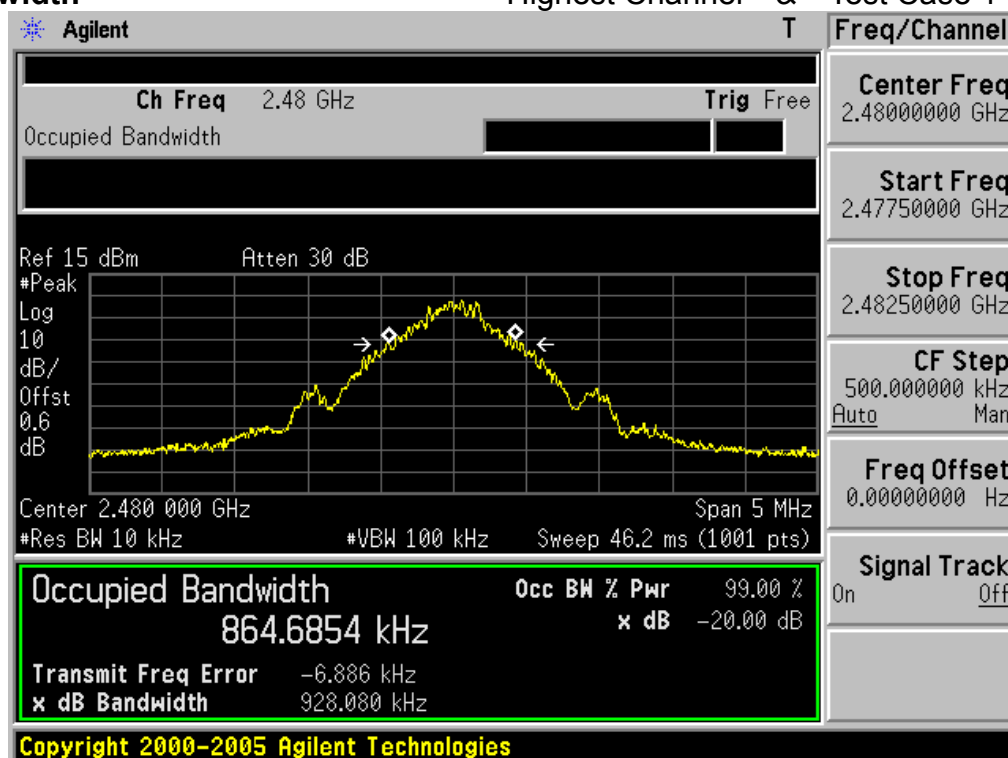
## 20dB Bandwidth

## Middle Channel &amp; Test Case 1



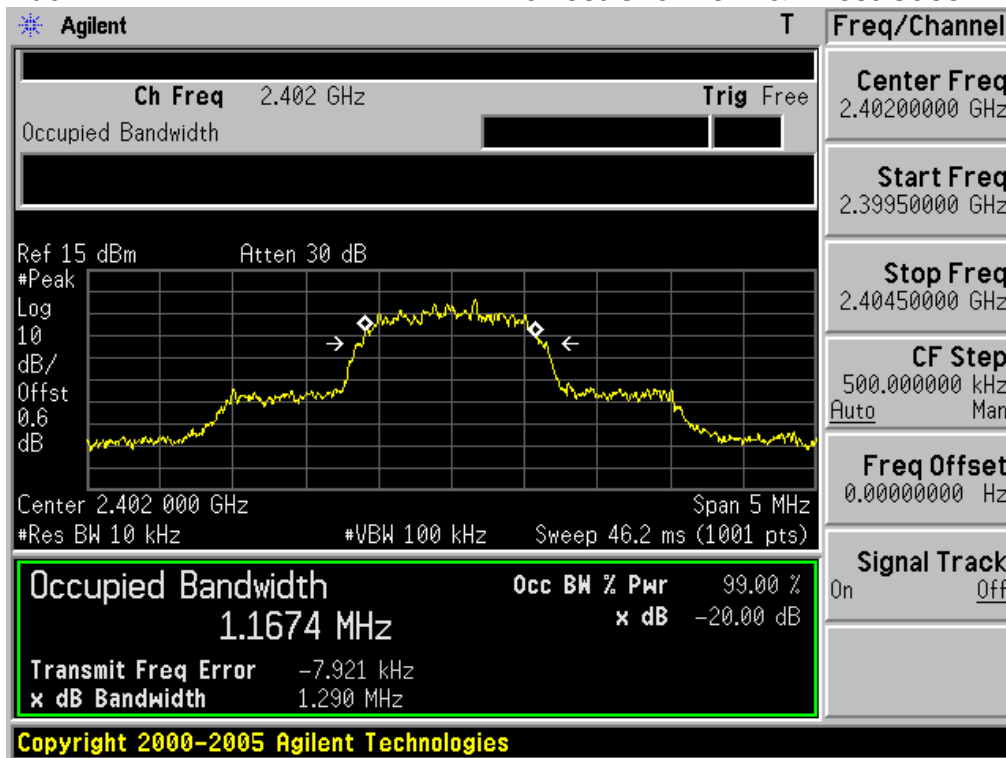
## 20dB Bandwidth

Highest Channel &amp; Test Case 1



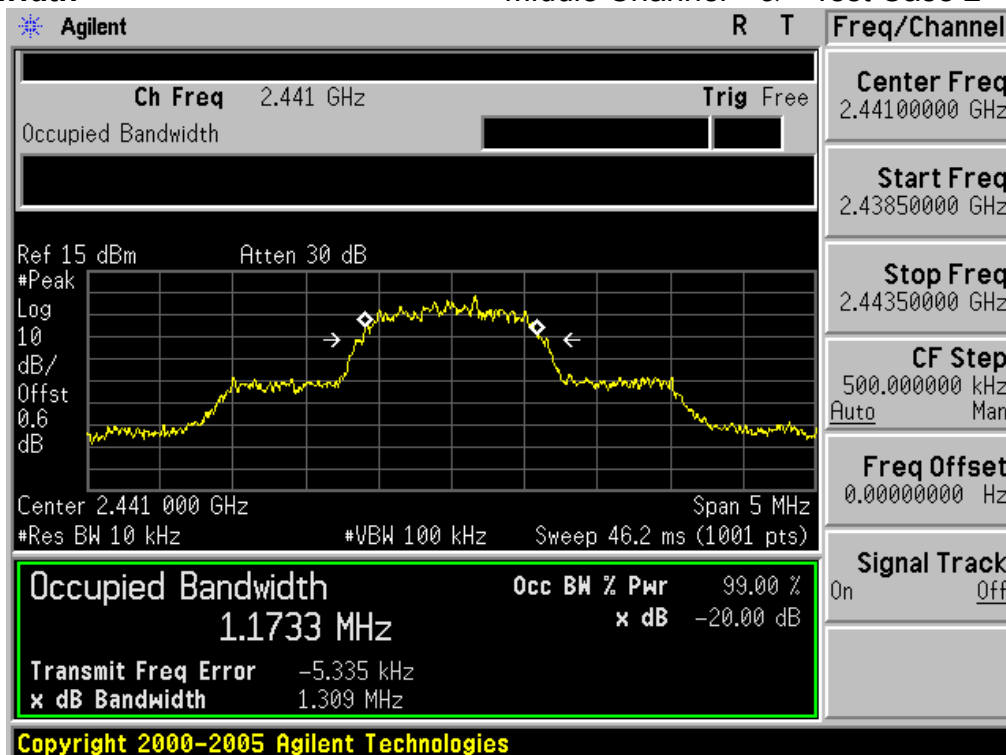
## 20dB Bandwidth

## Lowest Channel &amp; Test Case 2



## 20dB Bandwidth

## Middle Channel &amp; Test Case 2



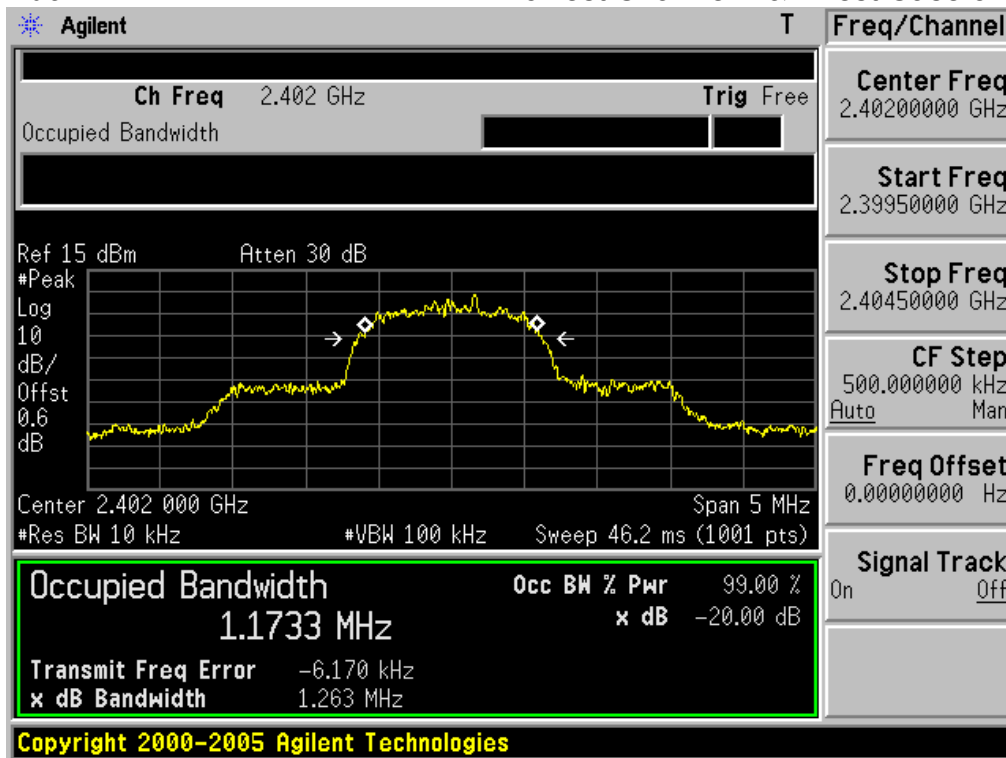
## 20dB Bandwidth

Highest Channel &amp; Test Case 2



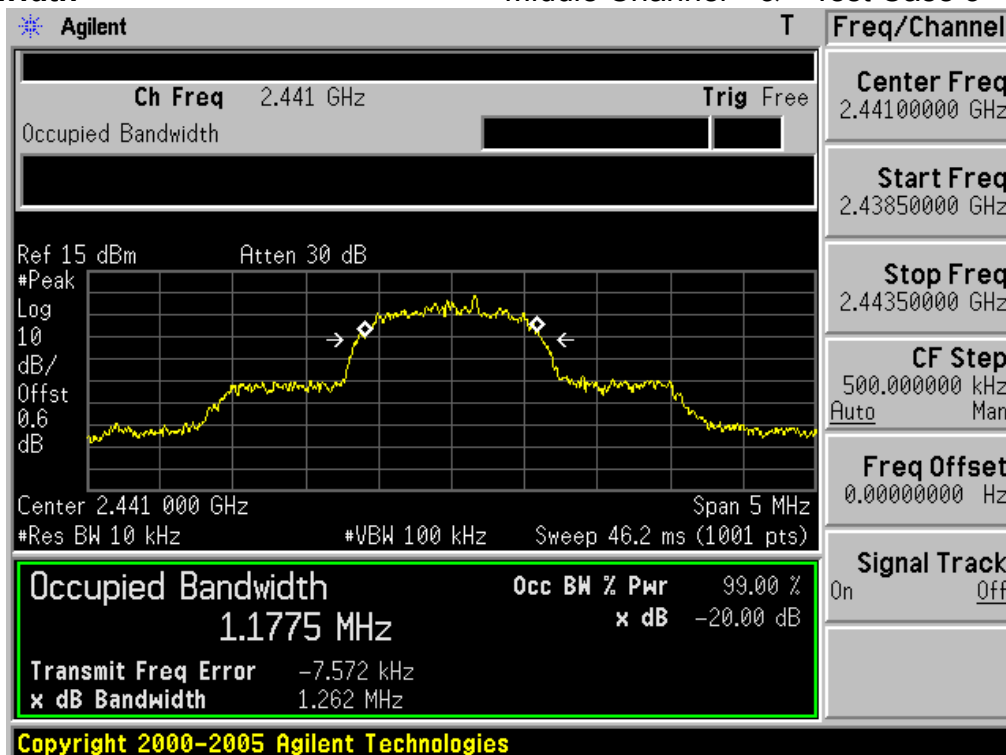
## 20dB Bandwidth

## Lowest Channel &amp; Test Case 3



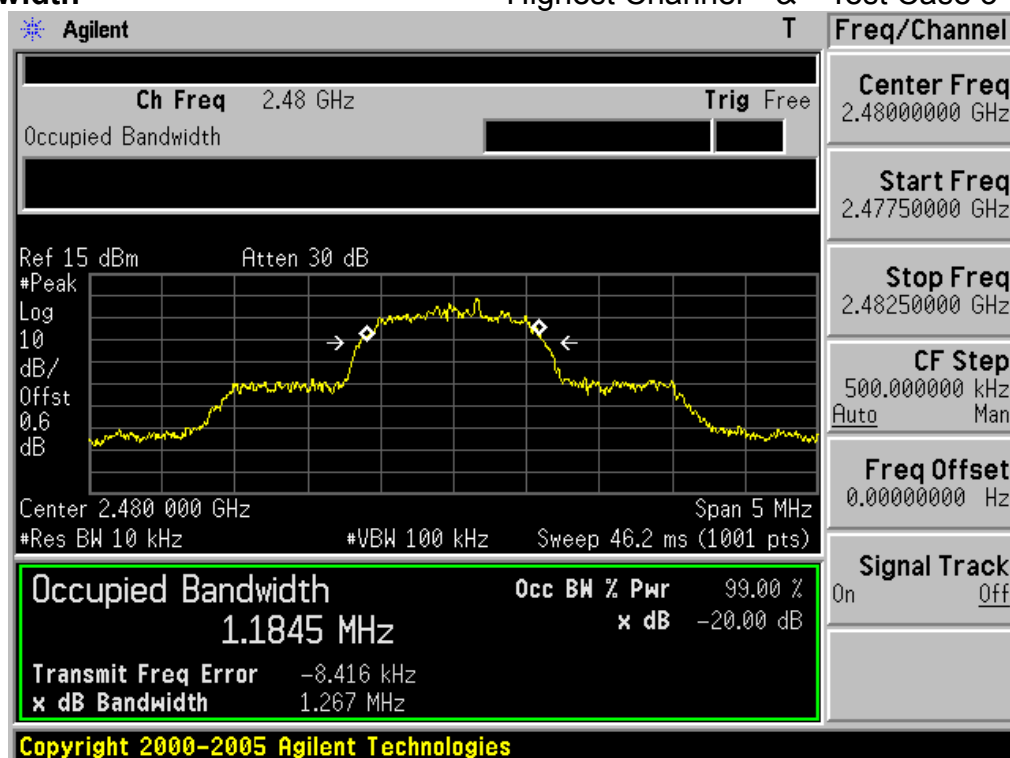
## 20dB Bandwidth

## Middle Channel &amp; Test Case 3



## 20dB Bandwidth

Highest Channel &amp; Test Case 3



### 3.2.4 Time of Occupancy (Dwell Time)

#### - Procedure:

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to:

Center frequency = 2441 MHz

RBW = 1 MHz

Trace = max hold

Span = zero

VBW =  $\geq$  RBW

Detector function = peak

#### - Measurement Data: **Comply**

| Hopping mode | Test mode   | Packet Type | Burst On Time (ms) | Period (ms) | Number of hopping Channels | Test Result (s) |
|--------------|-------------|-------------|--------------------|-------------|----------------------------|-----------------|
| Enable       | Test Case 1 | DH 1        | 0.453              | 1.248       | 79                         | 0.145           |
|              |             | DH 3        | 1.715              | 2.500       |                            | 0.274           |
|              |             | DH 5        | 2.970              | 3.750       |                            | 0.317           |
|              | Test Case 2 | 2 DH 1      | 0.459              | 1.251       | 79                         | 0.147           |
|              |             | 2 DH 3      | 1.715              | 2.500       |                            | 0.274           |
|              |             | 2 DH 5      | 2.970              | 3.750       |                            | 0.317           |
|              | Test Case 3 | 3 DH 1      | 0.456              | 1.248       | 79                         | 0.146           |
|              |             | 3 DH 3      | 1.715              | 2.500       |                            | 0.274           |
|              |             | 3 DH 5      | 2.970              | 3.750       |                            | 0.317           |

Note 1: Each new transmission event begins on the next channel in the hopping sequence after the final channel used in the previous transmission event.

DWELL TIME =  $(0.4 \times \text{Number of hopping Channels}) \times \text{Burst On time} / (\text{period} \times \text{Number of hopping Channels})$

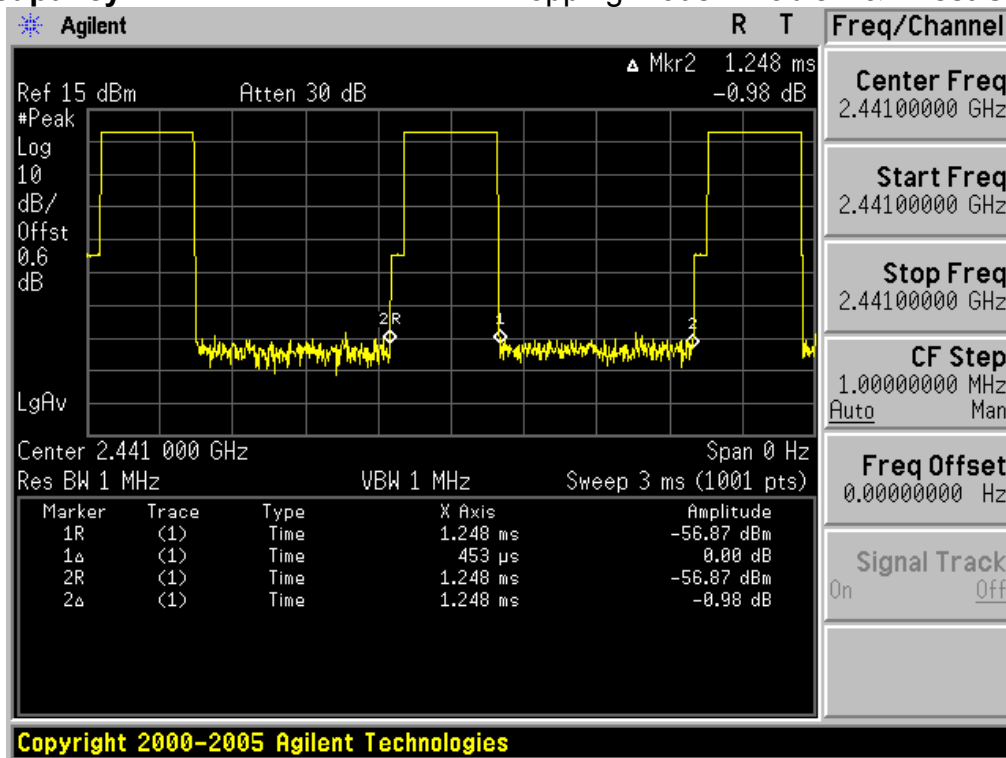
Note 2: See next pages for actual measured spectrum plots.

#### - Minimum Standard:

|                             |
|-----------------------------|
| No greater than 0.4 seconds |
|-----------------------------|

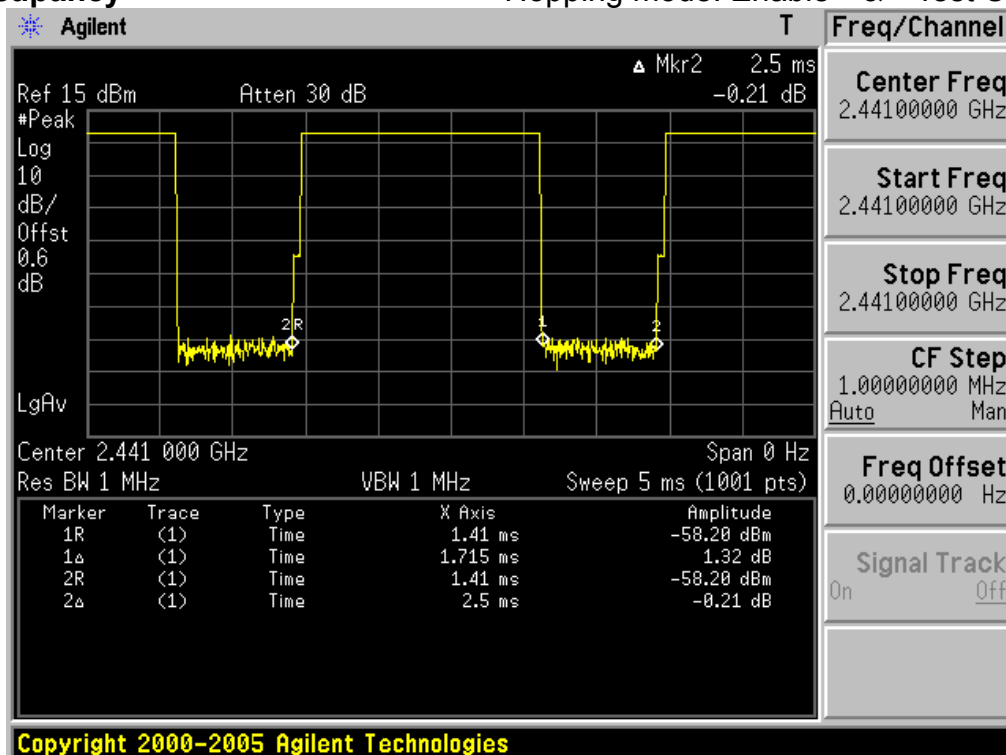
## Time of Occupancy

Hopping mode: Enable &amp; Test Case 1(DH1)



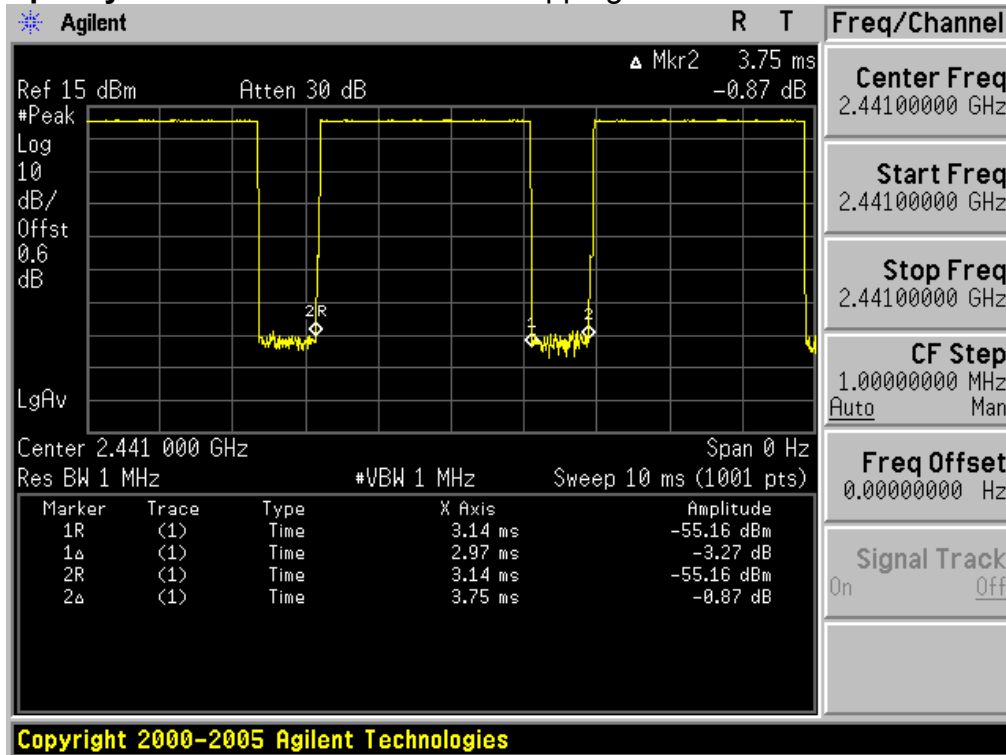
## Time of Occupancy

Hopping mode: Enable &amp; Test Case 1(DH3)



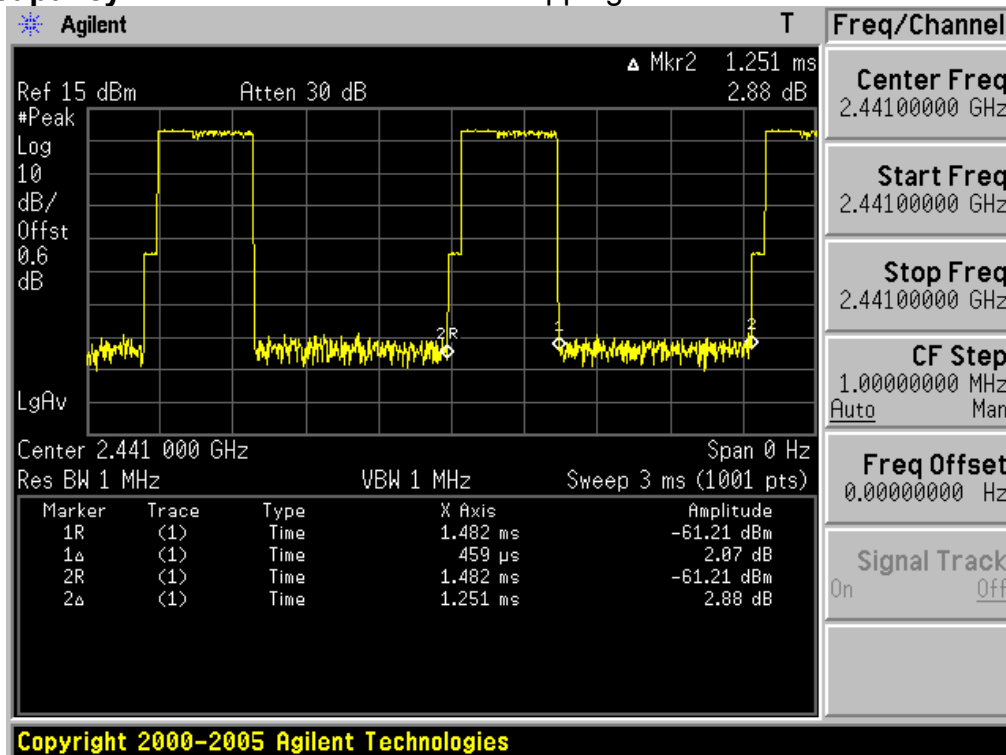
## Time of Occupancy

Hopping mode: Enable &amp; Test Case 1(DH5)



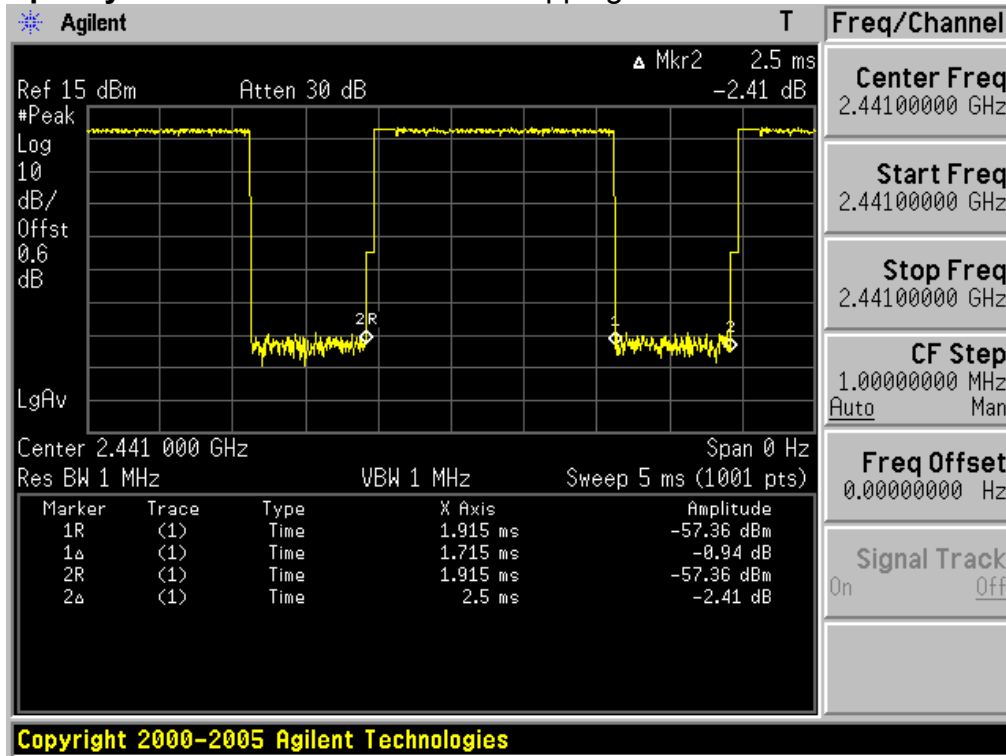
## Time of Occupancy

Hopping mode: Enable &amp; Test Case 2(DH1)



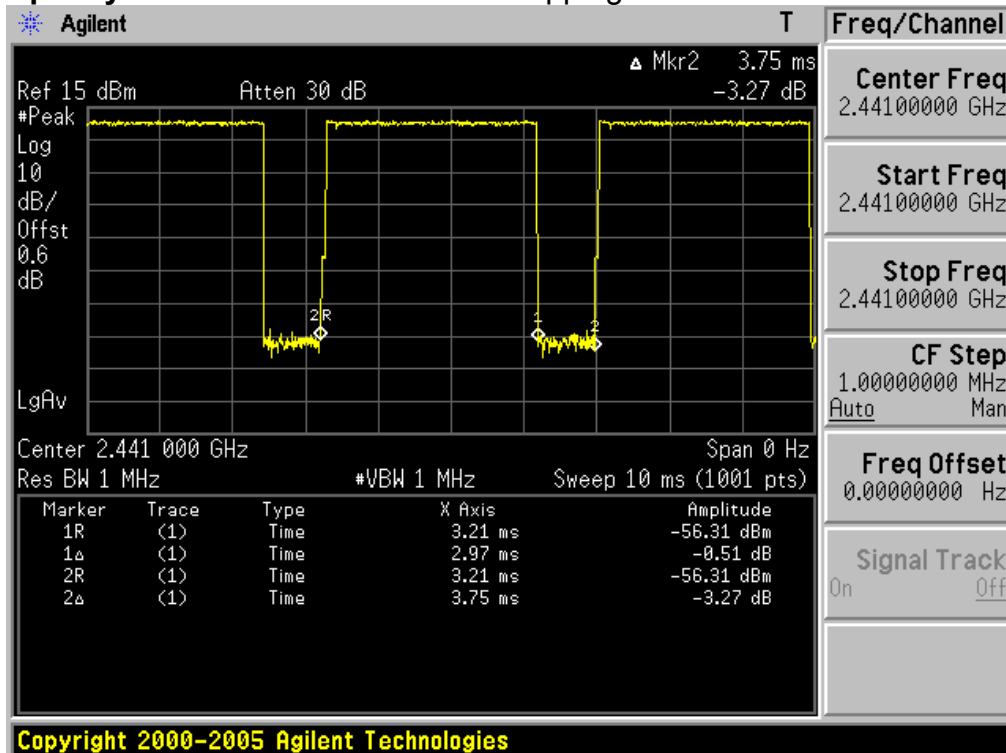
## Time of Occupancy

Hopping mode: Enable &amp; Test Case 2(DH3)



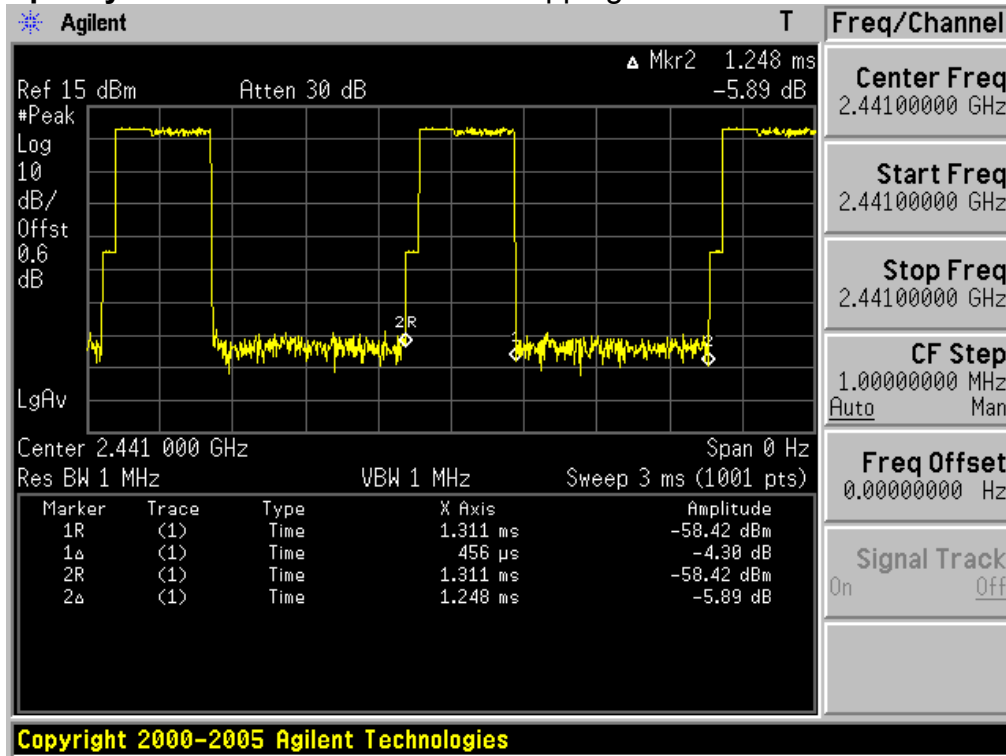
## Time of Occupancy

Hopping mode: Enable &amp; Test Case 2(DH5)



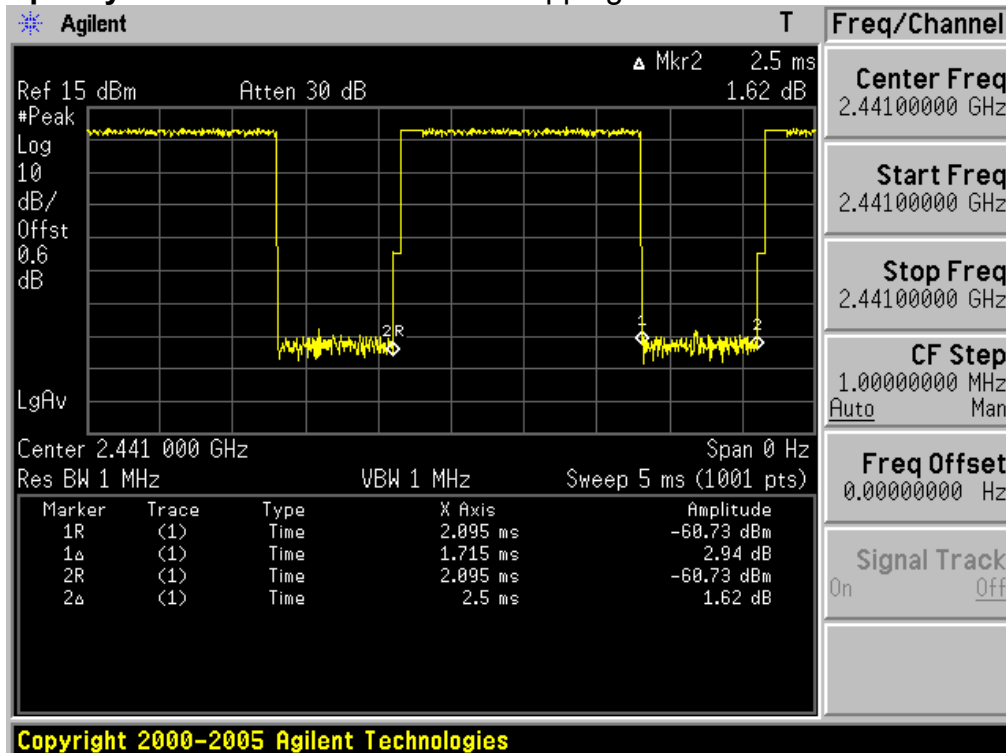
## Time of Occupancy

Hopping mode: Enable &amp; Test Case 3(DH1)



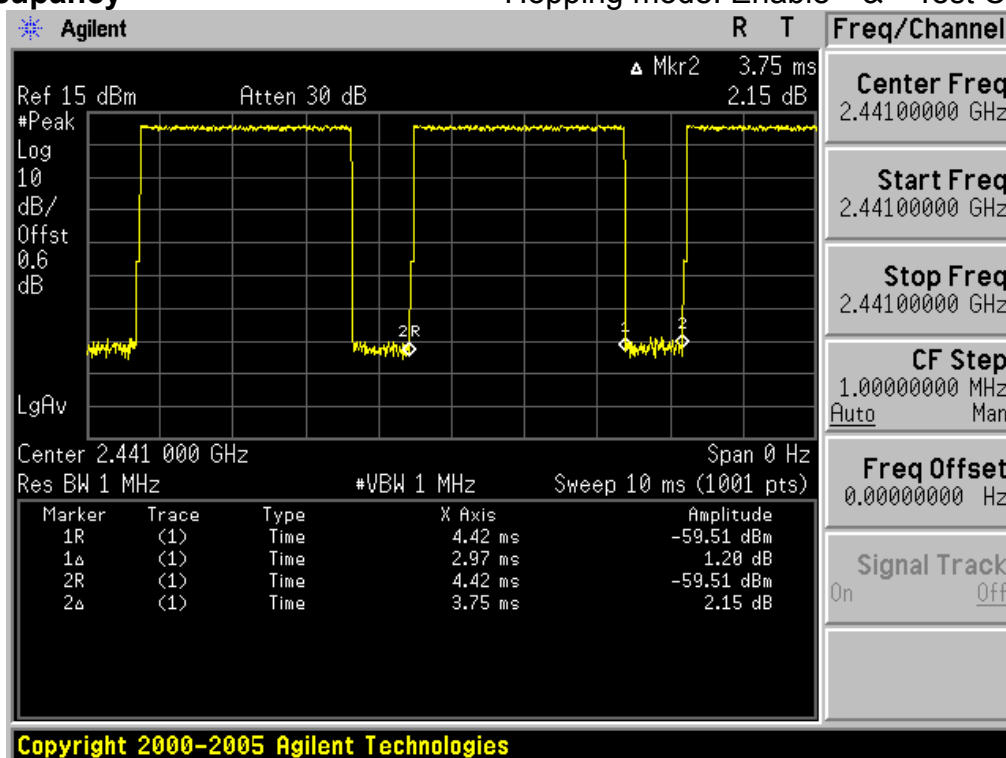
## Time of Occupancy

Hopping mode: Enable &amp; Test Case 3(DH3)



## Time of Occupancy

Hopping mode: Enable &amp; Test Case 3(DH5)



### 3.2.5 Peak Output Power

#### - Procedure:

The peak output power was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest Frequencies

Span = approximately 10 times of the 20 dB bandwidth

RBW = greater than the 20dB bandwidth of the emission being measured

VBW =  $\geq$  RBW

Detector function = peak

Trace = max hold

Sweep = auto

#### - Measurement Data: **Comply**

| Hopping mode | Test mode   | Tested Channel | Test Results |              |
|--------------|-------------|----------------|--------------|--------------|
|              |             |                | dBm          | mW           |
| Disable      | Test Case 1 | Lowest         | 8.48         | 7.047        |
|              |             | Middle         | <b>8.67</b>  | <b>7.362</b> |
|              |             | Highest        | 8.61         | 7.261        |
|              | Test Case 2 | Lowest         | 9.26         | 8.433        |
|              |             | Middle         | <b>9.45</b>  | <b>8.810</b> |
|              |             | Highest        | 9.37         | 8.650        |
|              | Test Case 3 | Lowest         | 9.65         | 9.226        |
|              |             | Middle         | <b>9.73</b>  | <b>9.397</b> |
|              |             | Highest        | 9.68         | 9.290        |

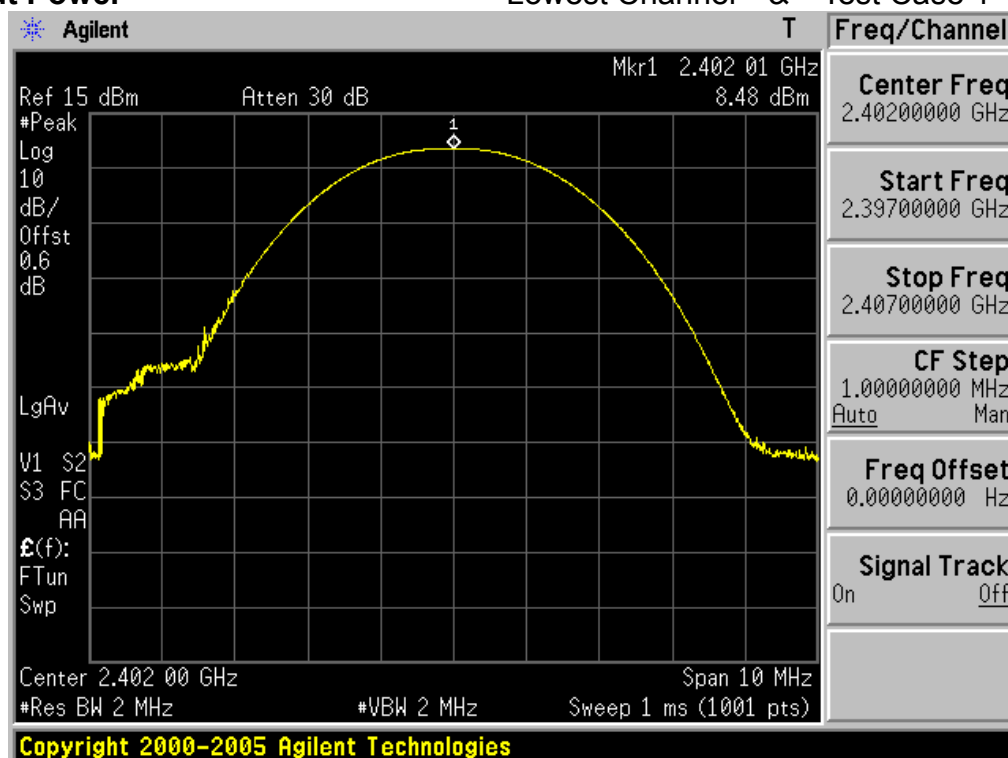
Note 1: See next pages for actual measured spectrum plots.

#### - Minimum Standard:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: **1 Watt**. For all other frequency hopping systems in the 2400-2483.5 MHz band: **0.125 Watts**

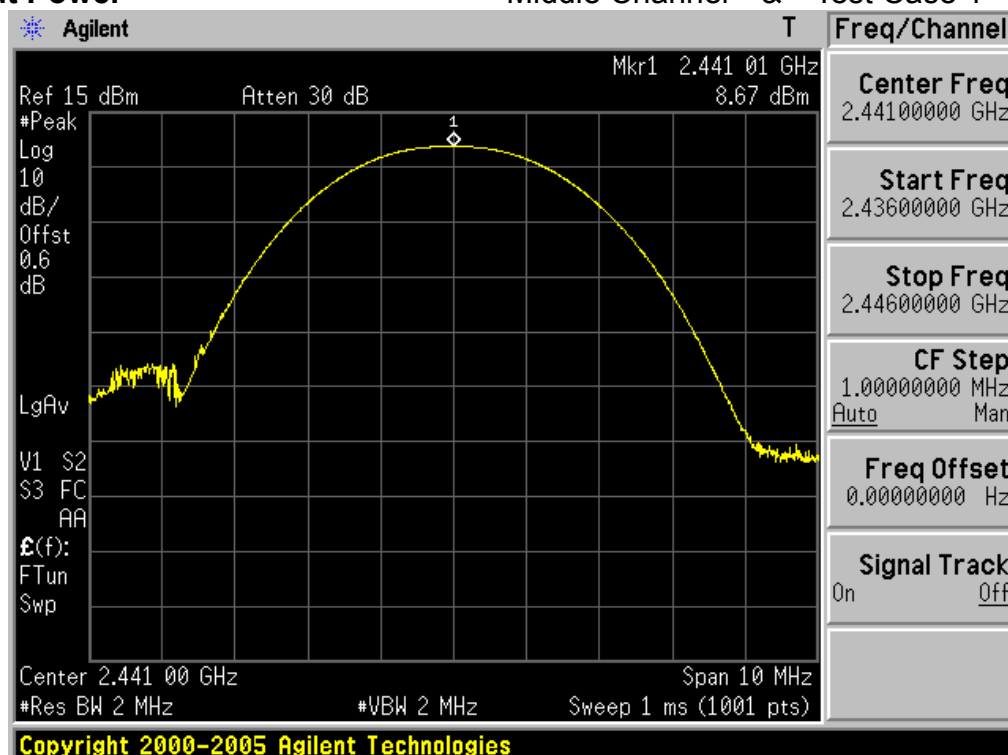
## Peak Output Power

Lowest Channel &amp; Test Case 1



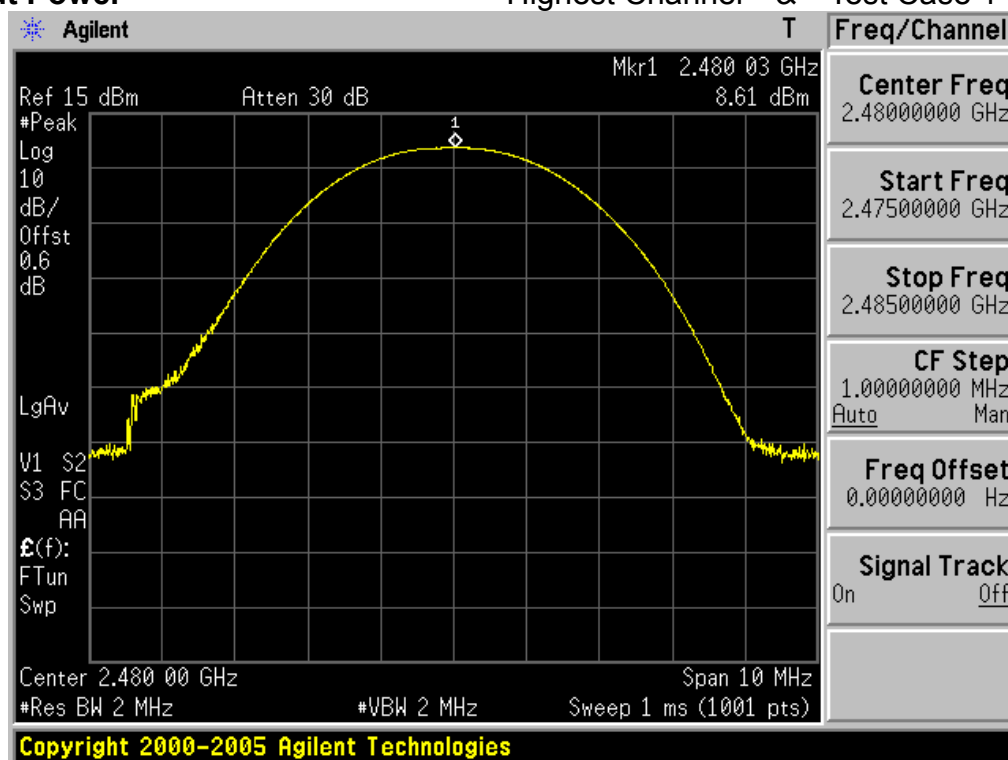
## Peak Output Power

Middle Channel &amp; Test Case 1



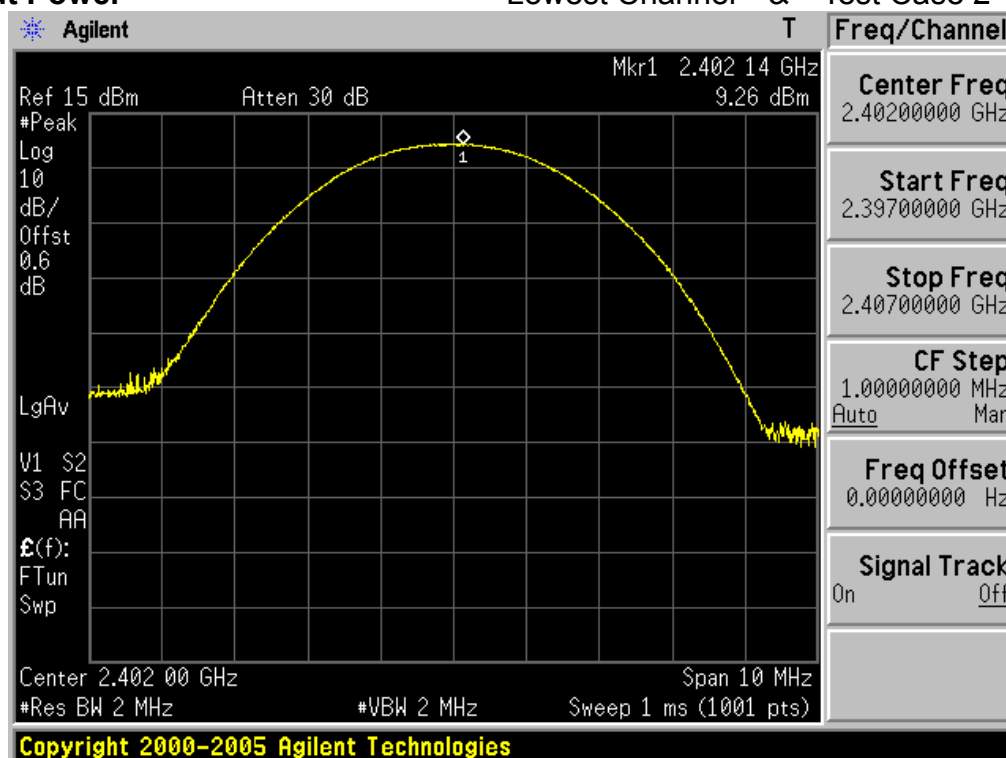
## Peak Output Power

Highest Channel &amp; Test Case 1



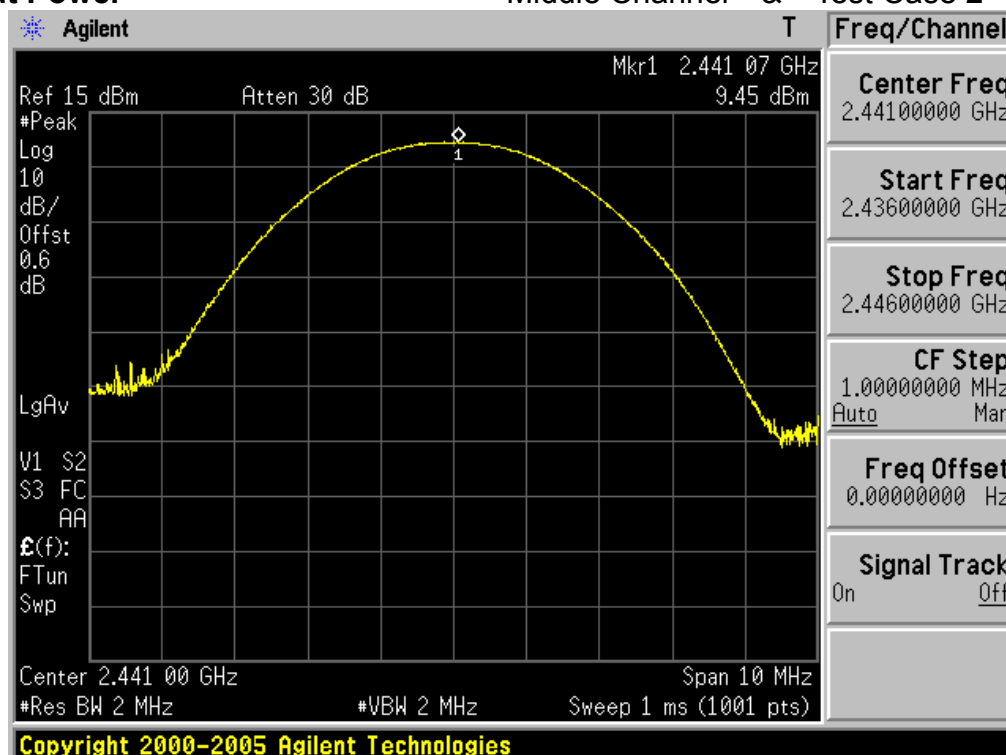
## Peak Output Power

Lowest Channel &amp; Test Case 2



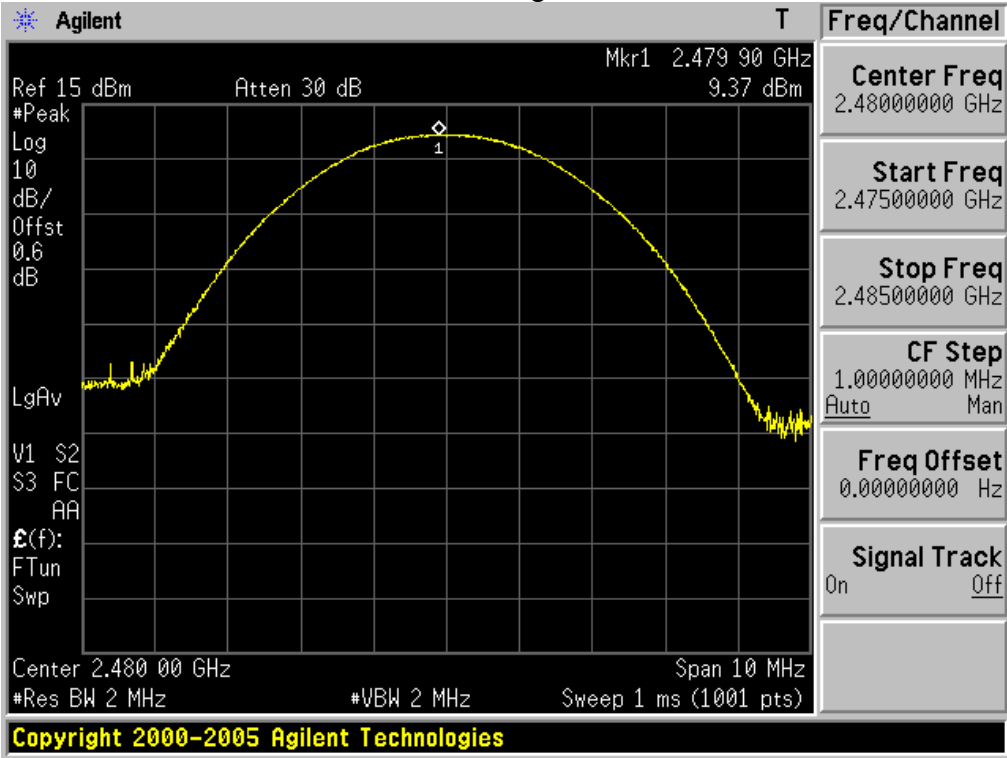
## Peak Output Power

Middle Channel &amp; Test Case 2



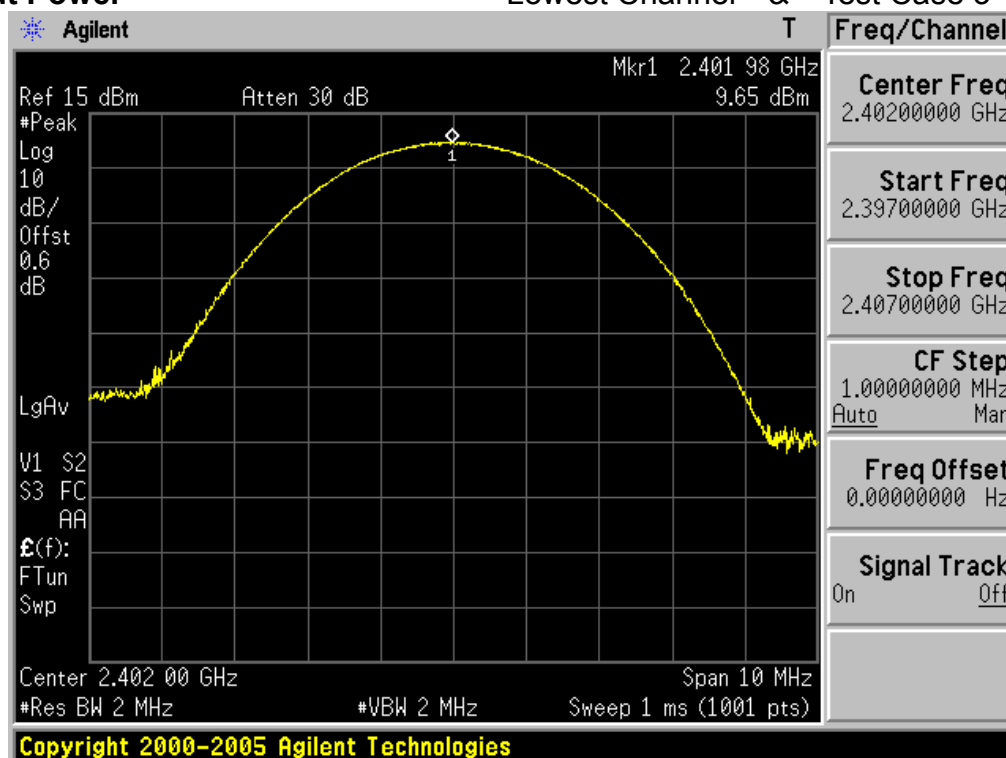
Peak Output Power

Highest Channel & Test Case 2



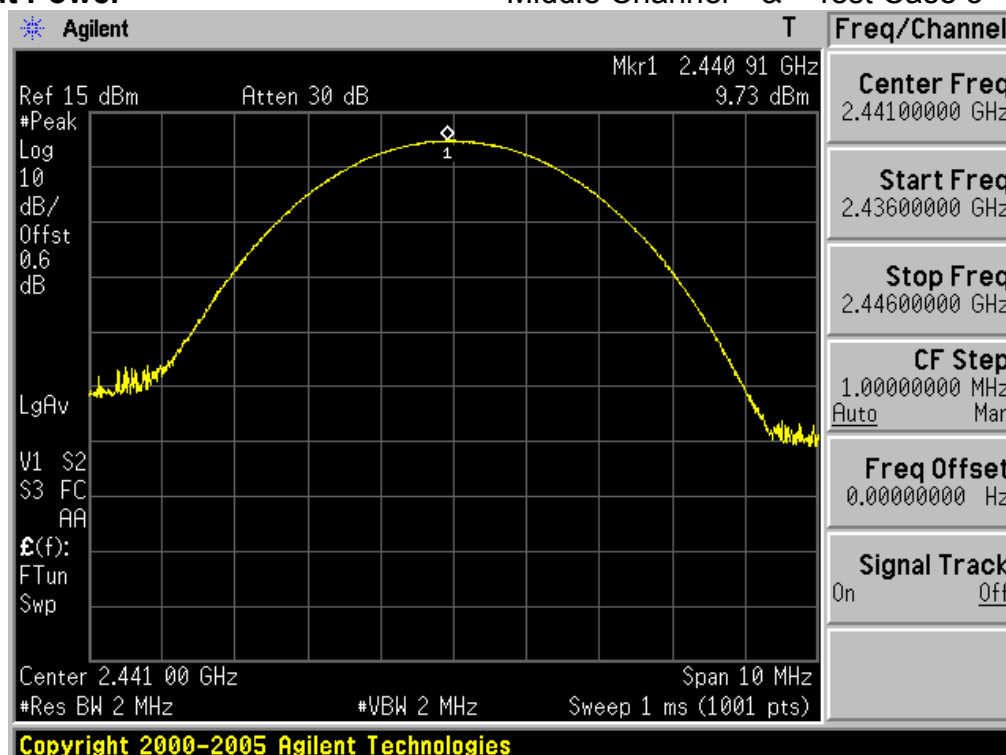
## Peak Output Power

Lowest Channel &amp; Test Case 3



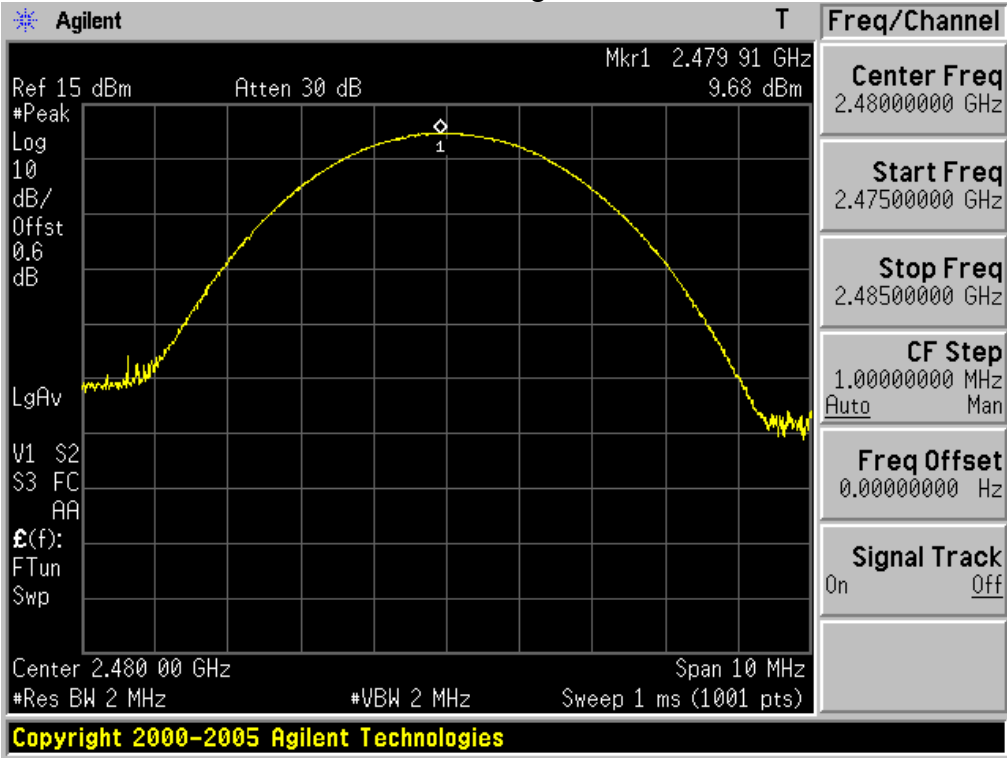
## Peak Output Power

Middle Channel &amp; Test Case 3



Peak Output Power

Highest Channel & Test Case 3



### 3.2.6 Conducted Spurious Emissions

#### - Procedure:

The bandwidth at 20dB down from the highest inband spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.

After the trace being stable, Use the marker-to-peak function to measure 20 dB down both sides of the intentional emission.

For Band-edge testing the spectrum analyzer is set to:

Tested frequency = the highest and the lowest Frequencies

Center frequency = 2400MHz, 2483.5MHz

Span = 10MHz

Detector function = peak

RBW = 1% of the span

VBW =  $\geq$  RBW

Trace = max hold

Sweep = auto

For spurious testing the spectrum analyzer is set to:

Tested frequency = the highest, middle and the lowest Frequencies

RBW = 100 kHz

VBW =  $\geq$  RBW

Detector function = peak

Sweep = auto

Trace = max hold

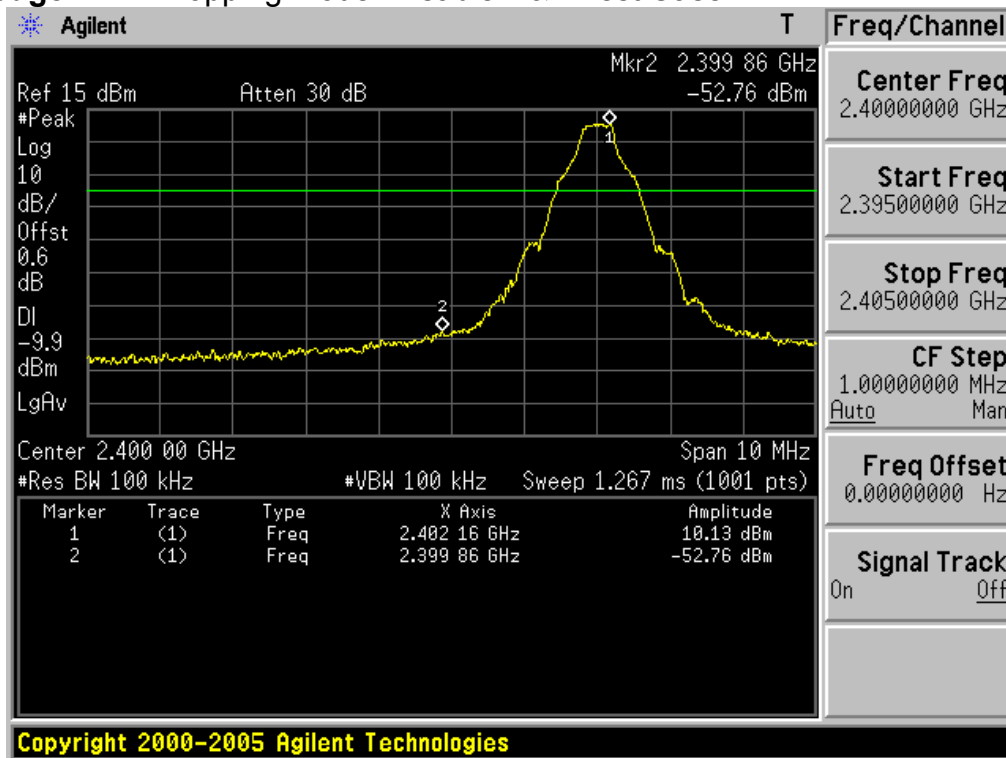
#### - Measurement Data: **Comply**

Note 1: See next pages for actual measured spectrum plots.

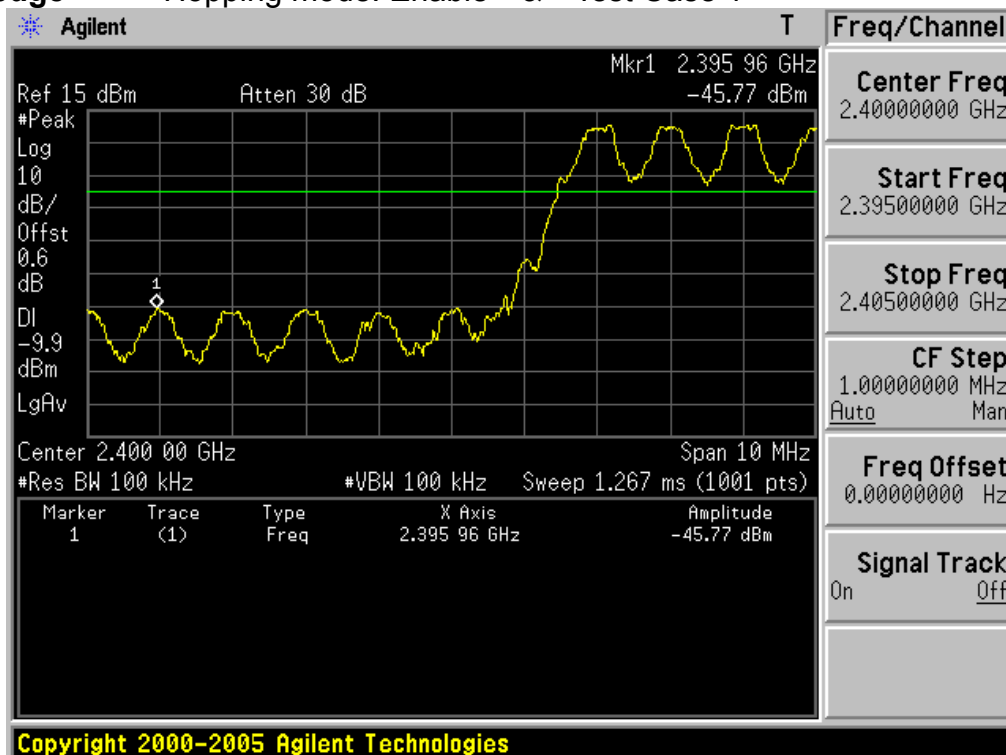
#### - Minimum Standard:

|                   |          |
|-------------------|----------|
| Minimum Standard: | > 20 dBc |
|-------------------|----------|

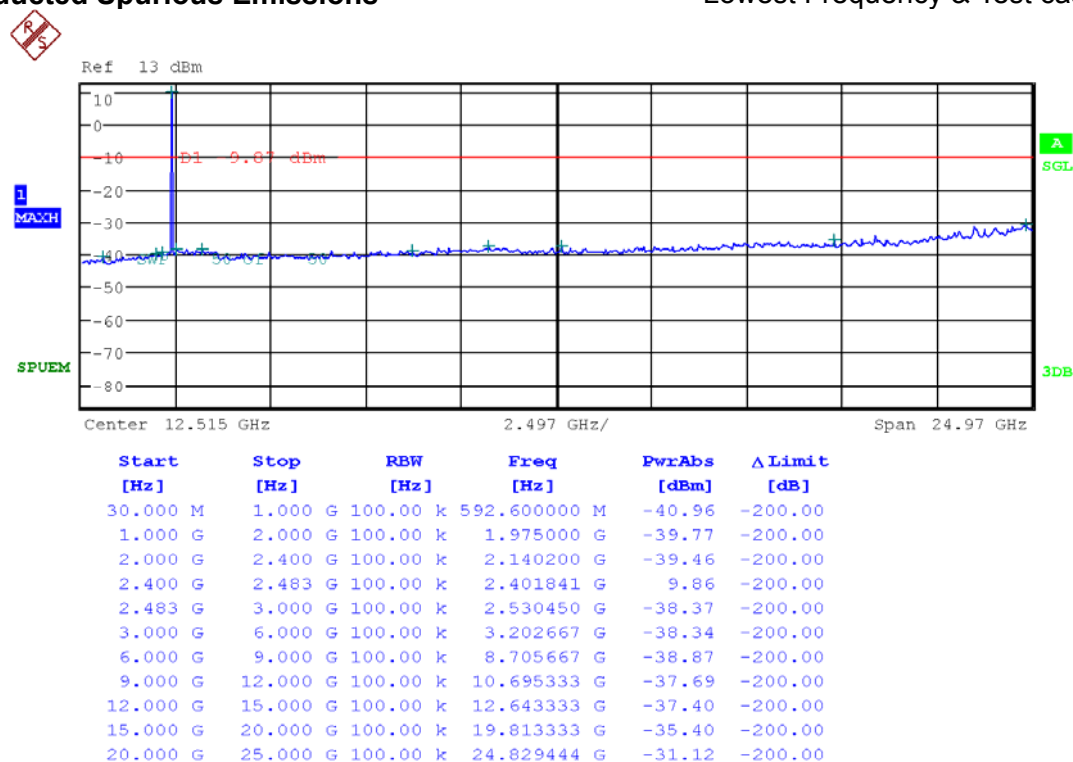
# Low Band-edge Hopping mode: Disable & Test Case 1



# Low Band-edge Hopping mode: Enable & Test Case 1

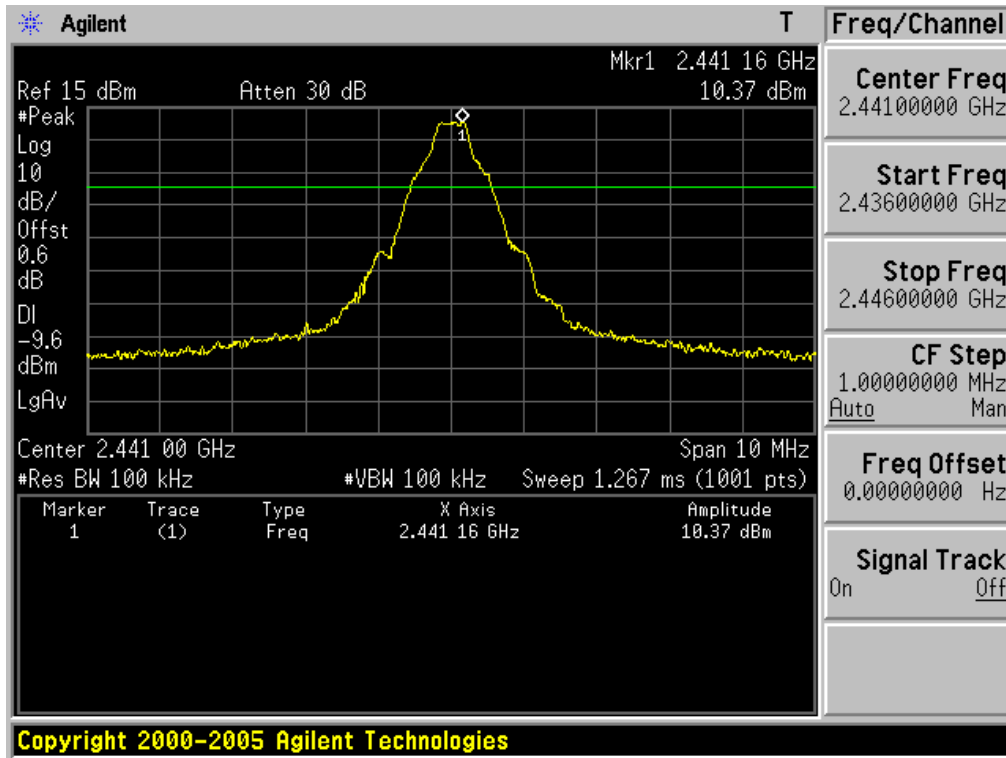


### Lowest Frequency & Test case 1



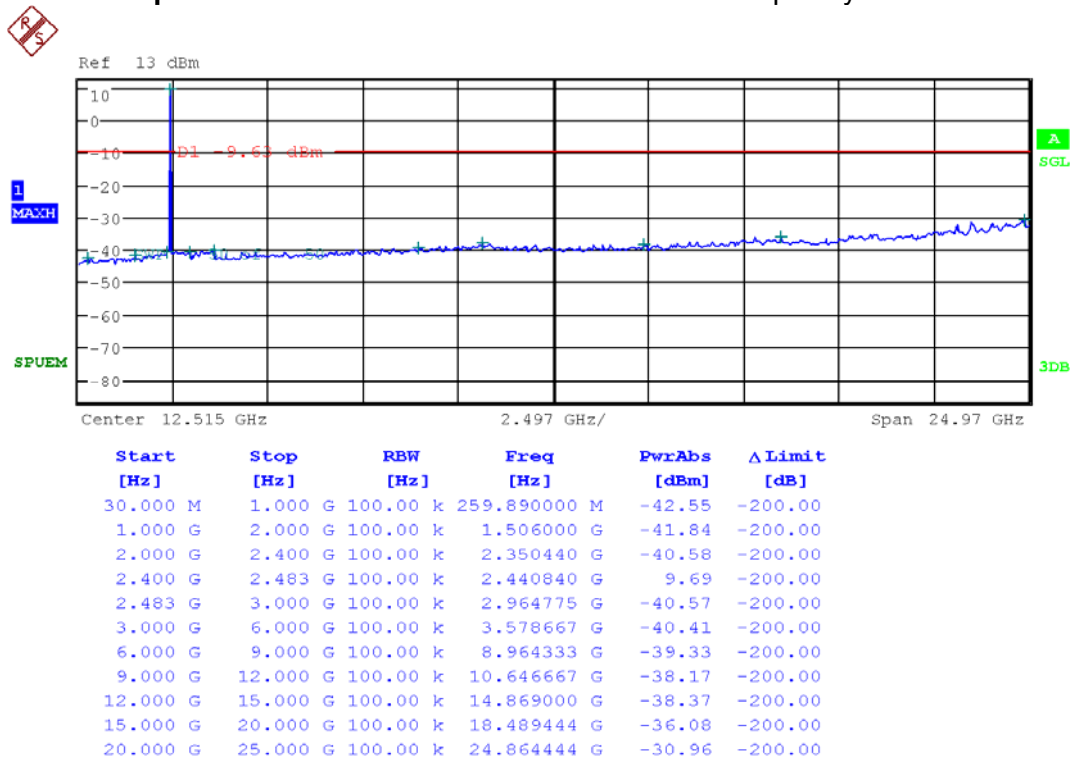
## Reference for limit

## Middle Frequency &amp; Test case 1

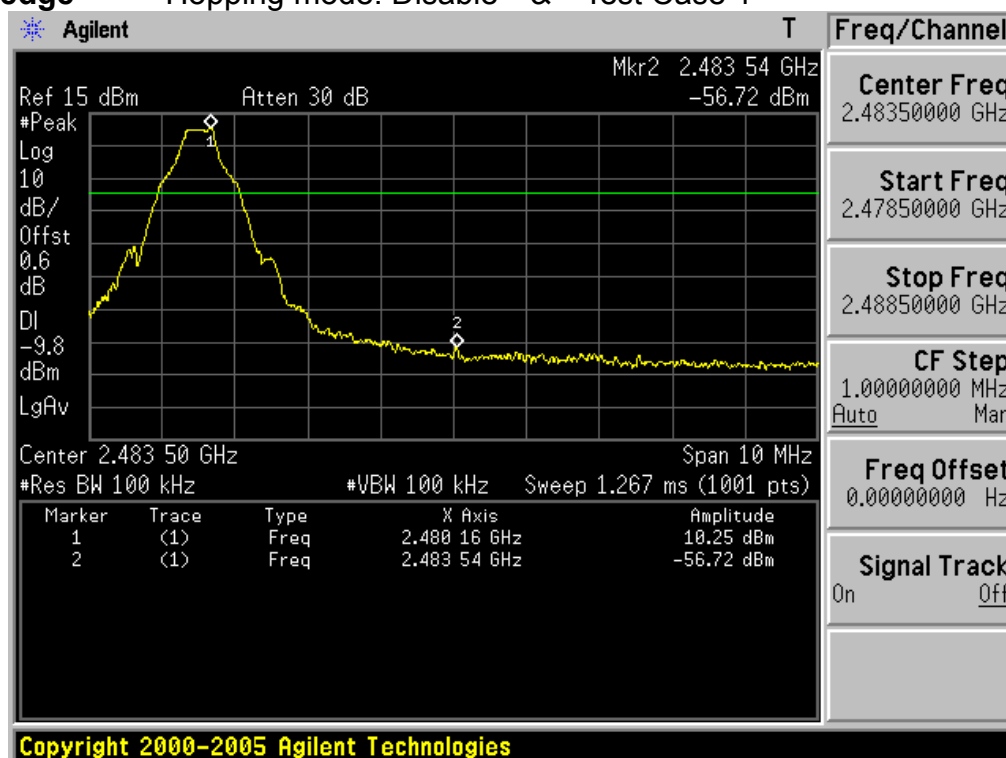


## Conducted Spurious Emissions

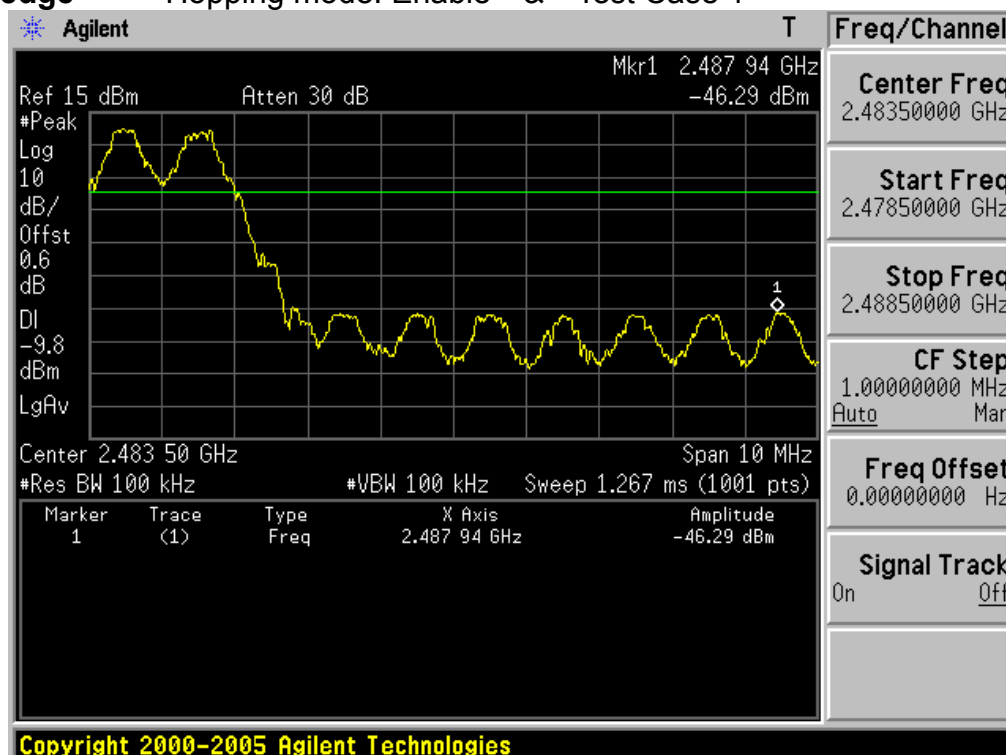
## Middle Frequency &amp; Test case 1



# High Band-edge Hopping mode: Disable & Test Case 1

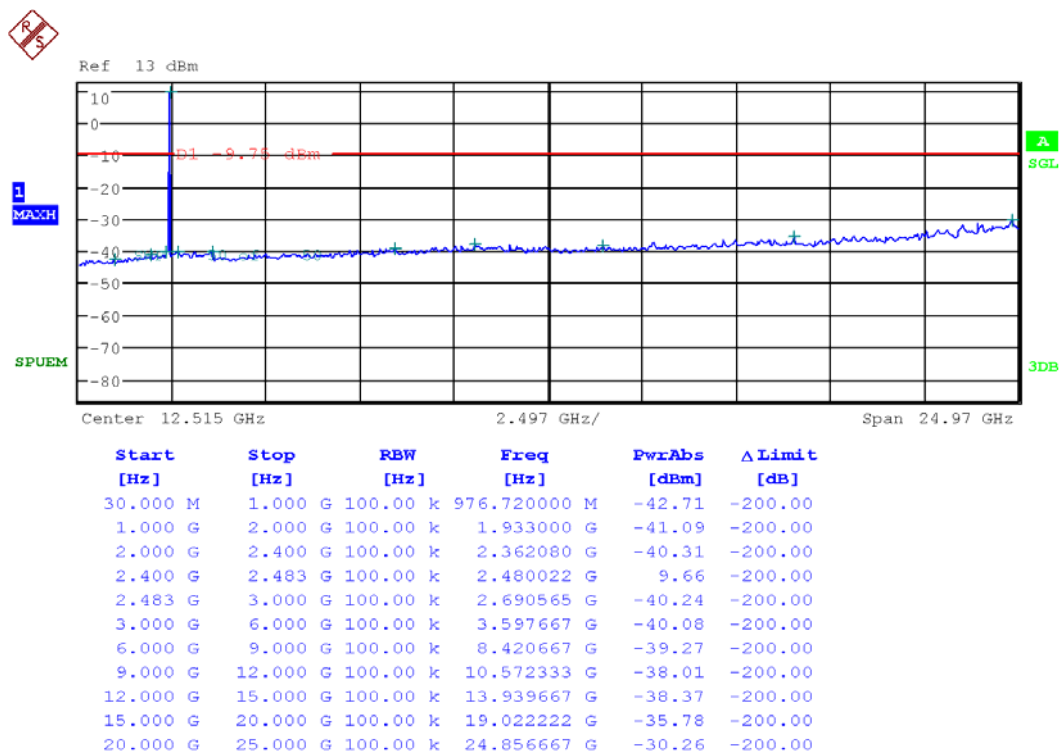


# High Band-edge Hopping mode: Enable & Test Case 1

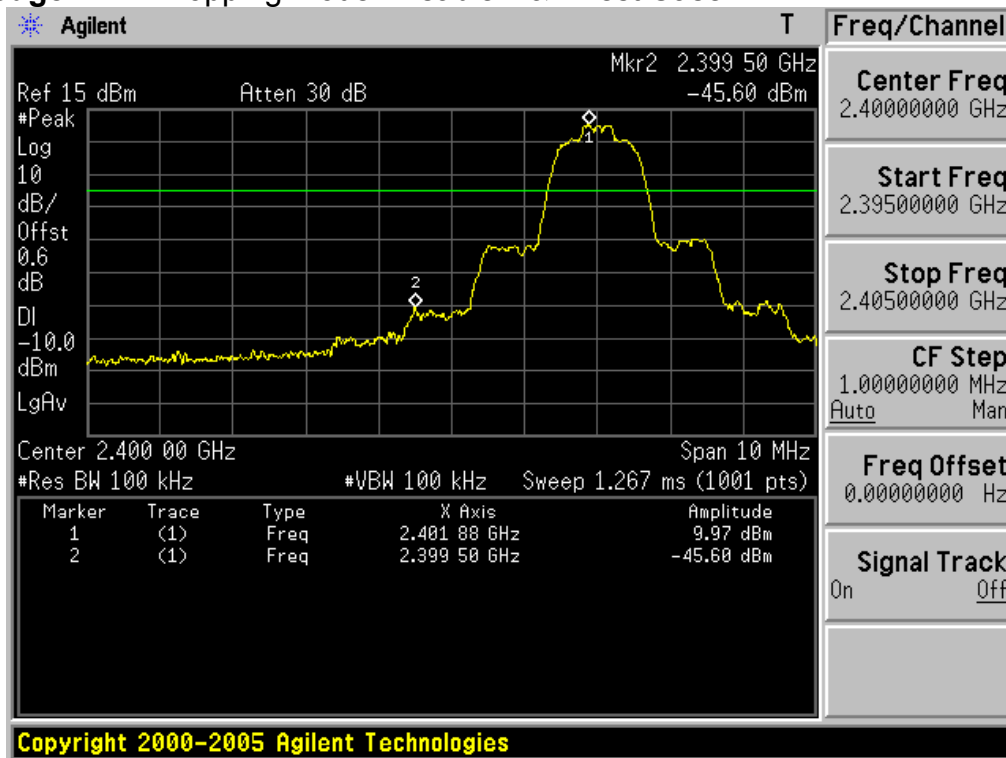


## Conducted Spurious Emissions

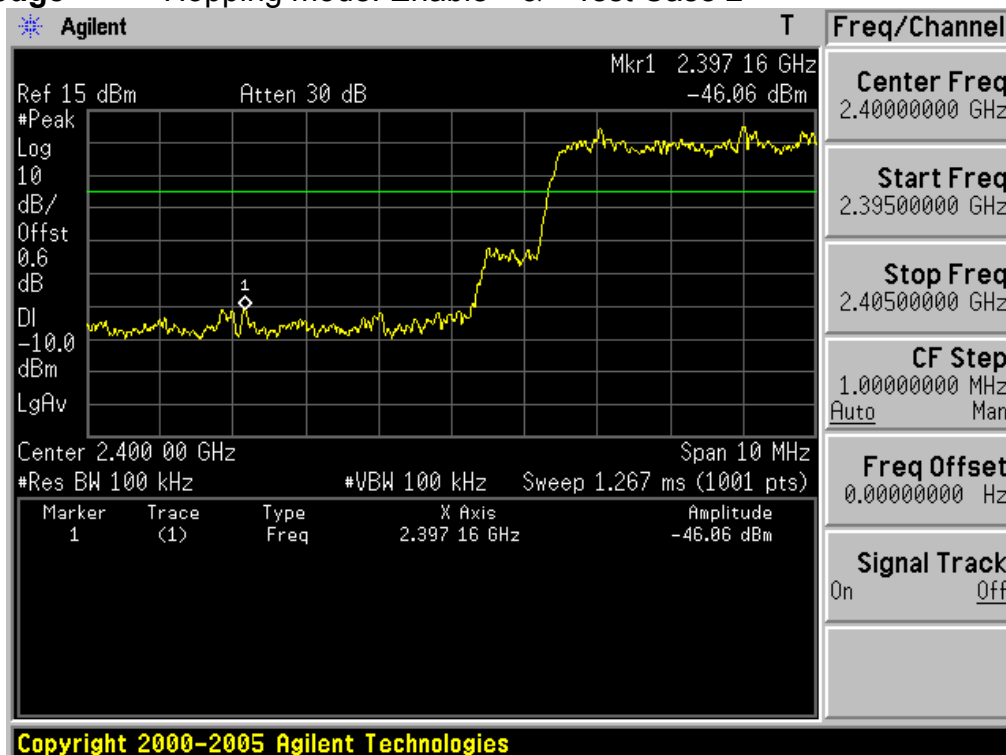
## Highest Frequency &amp; Test case 1



# Low Band-edge Hopping mode: Disable & Test Case 2

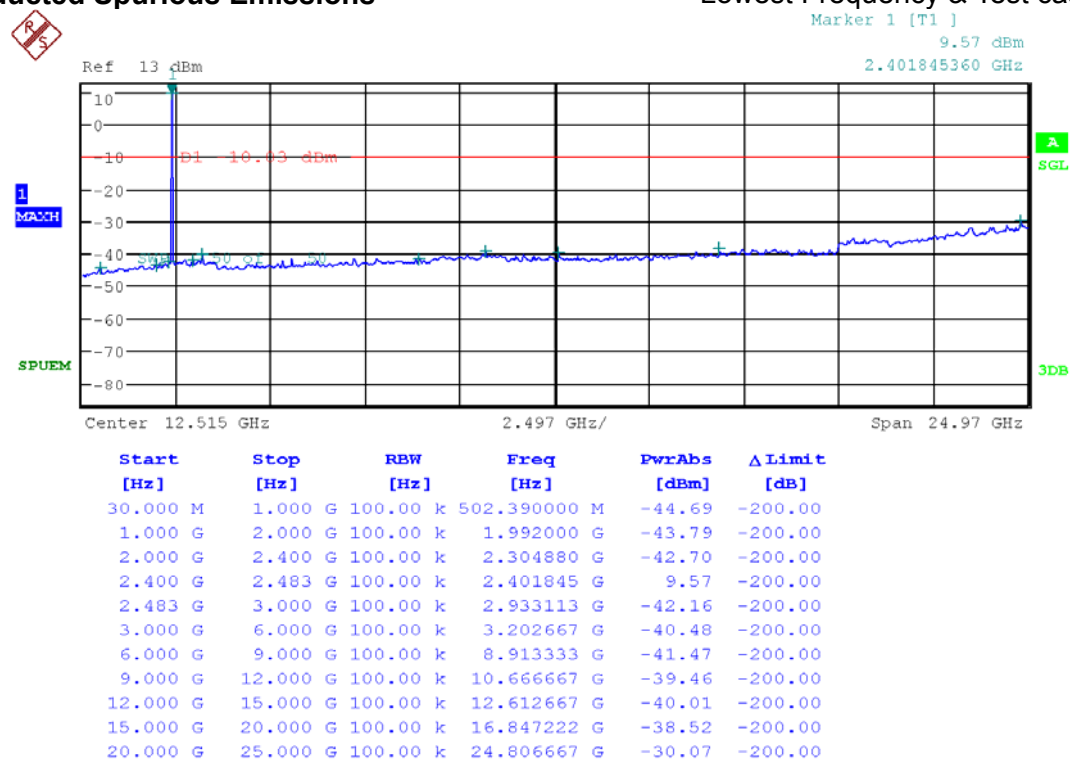


# Low Band-edge Hopping mode: Enable & Test Case 2



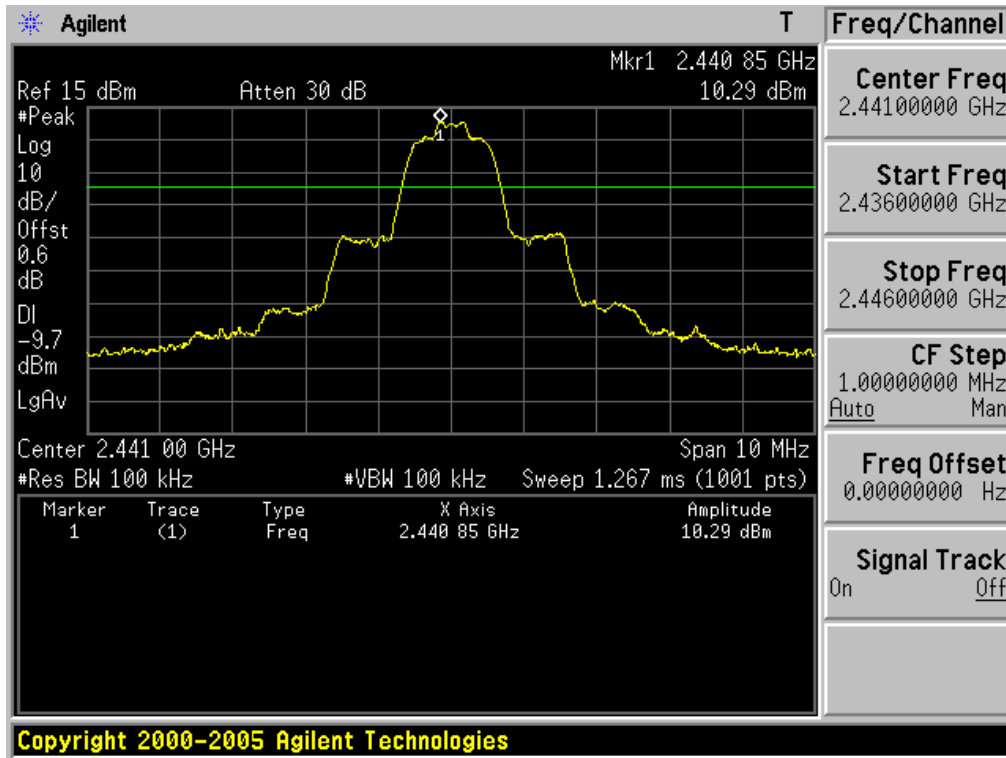
## Conducted Spurious Emissions

## Lowest Frequency &amp; Test case 2



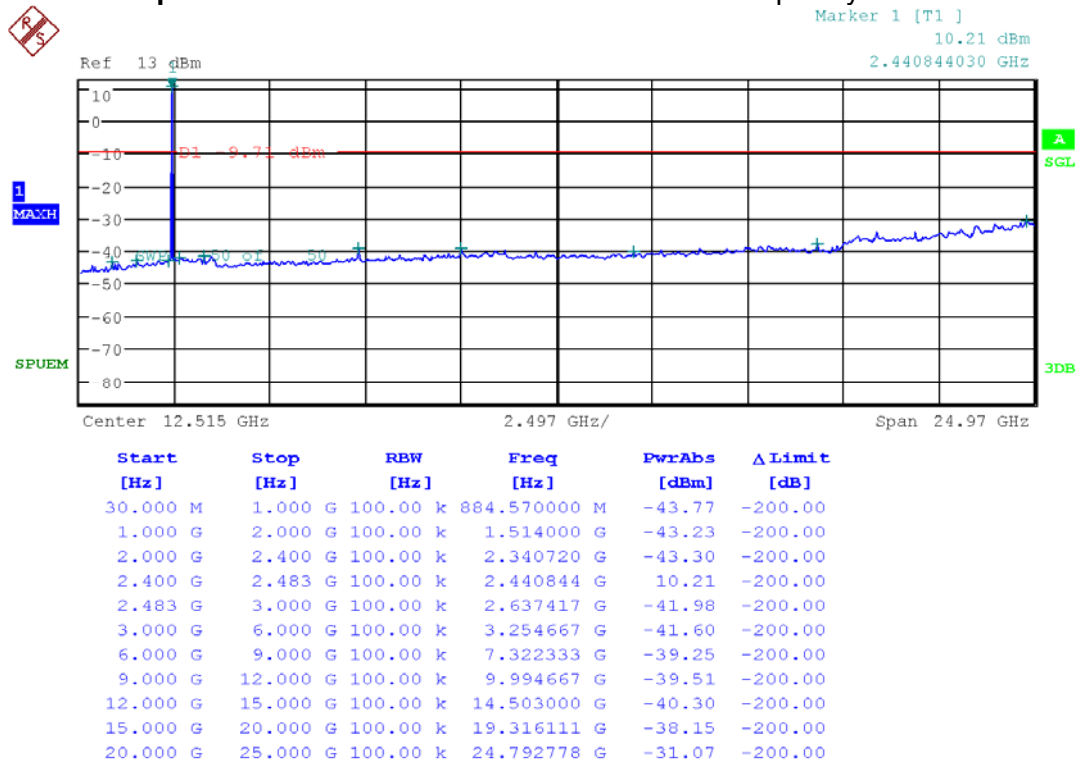
## Reference for limit

## Middle Frequency &amp; Test case 2

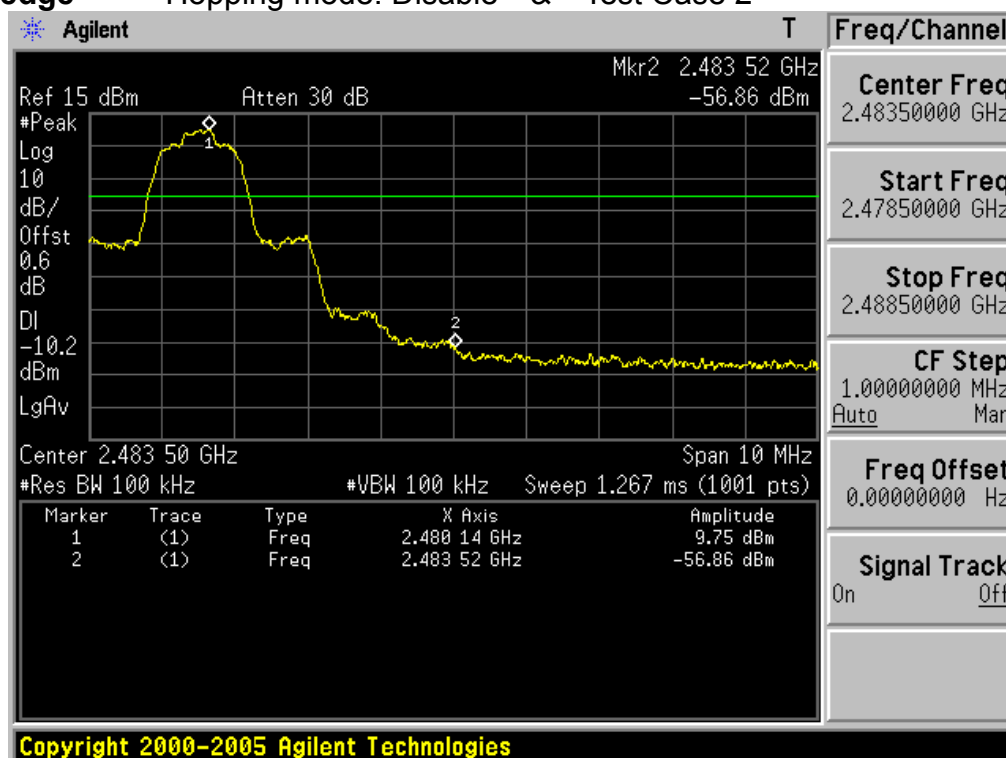


## Conducted Spurious Emissions

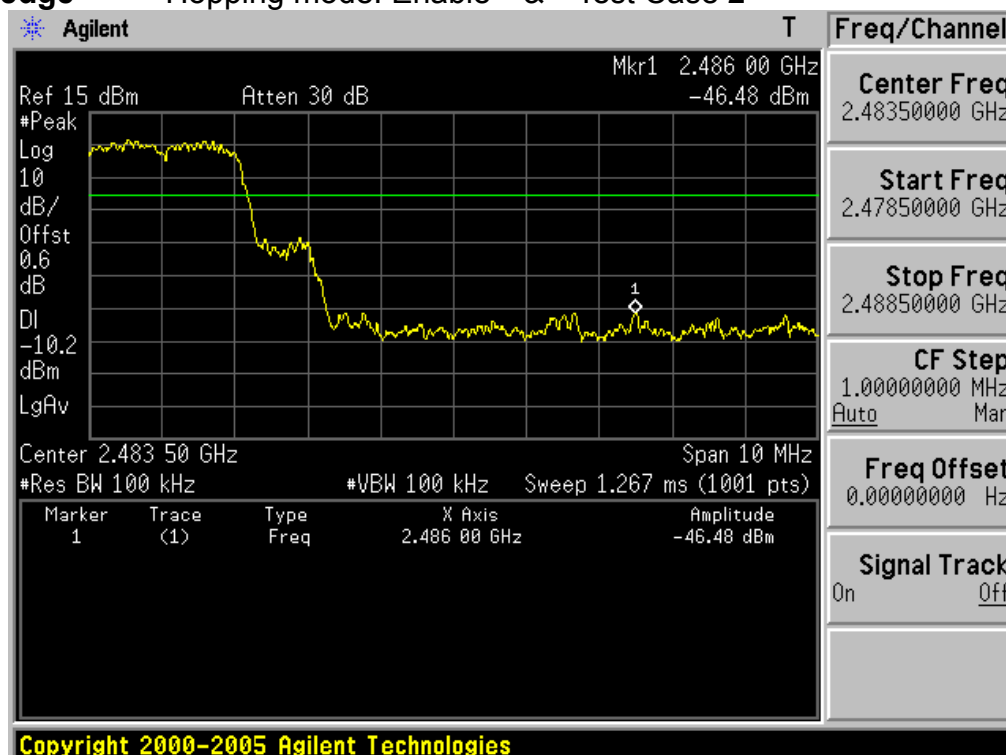
## Middle Frequency &amp; Test case 2



# High Band-edge Hopping mode: Disable & Test Case 2

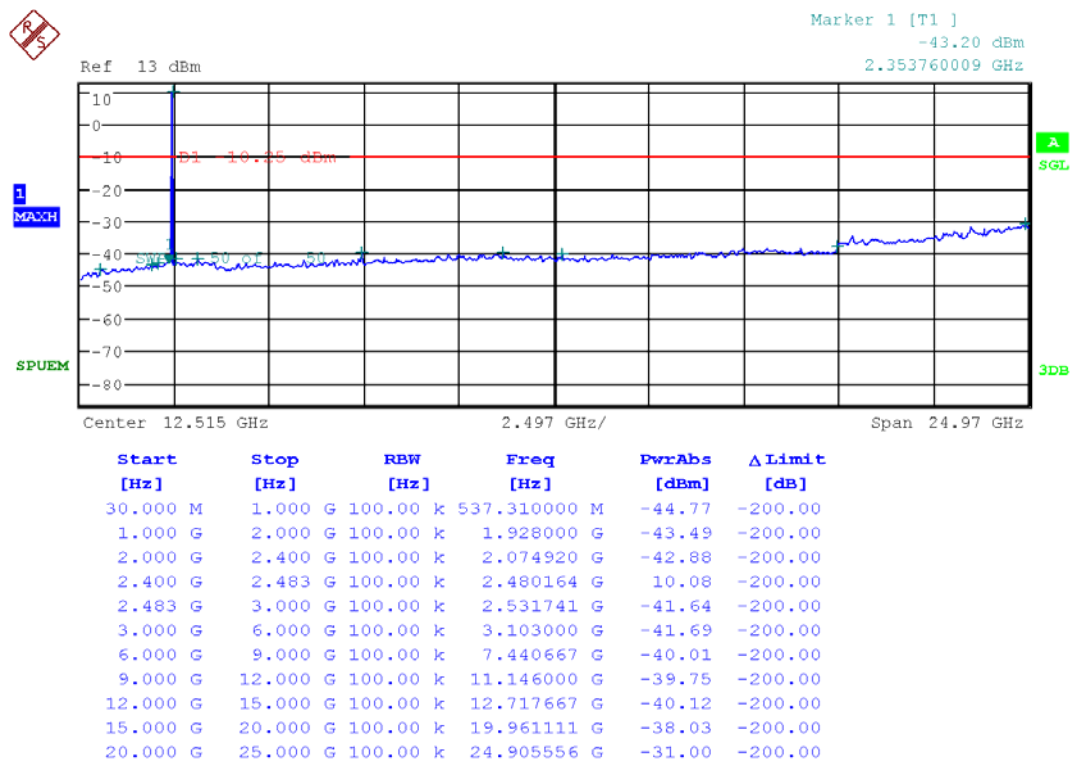


# High Band-edge Hopping mode: Enable & Test Case 2

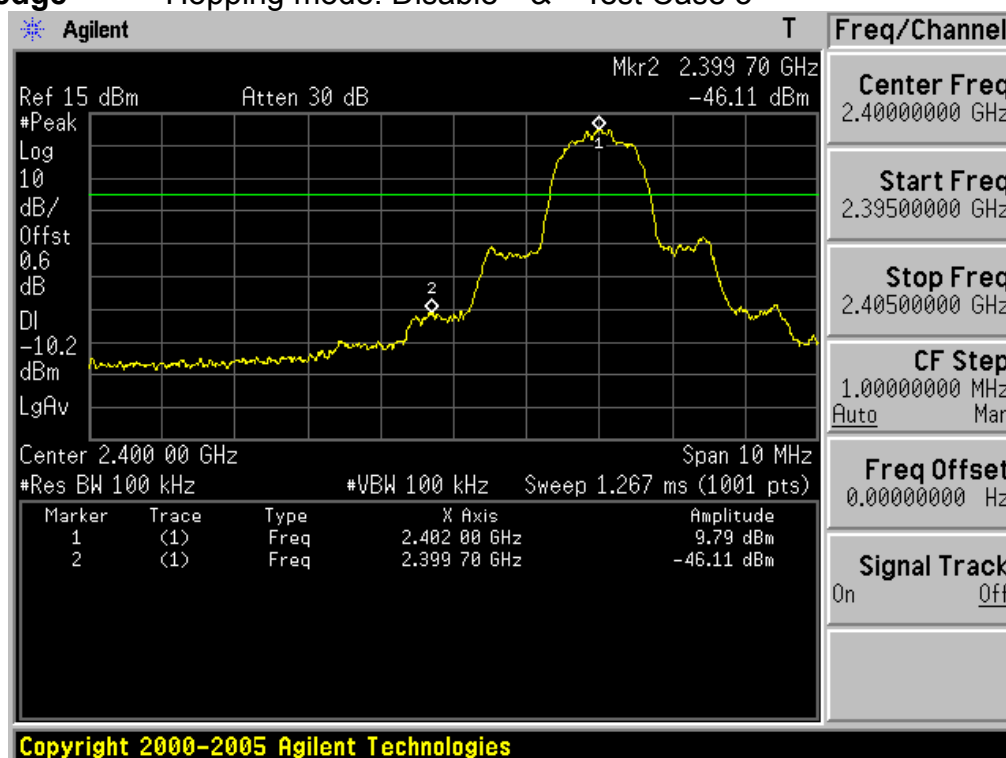


## Conducted Spurious Emissions

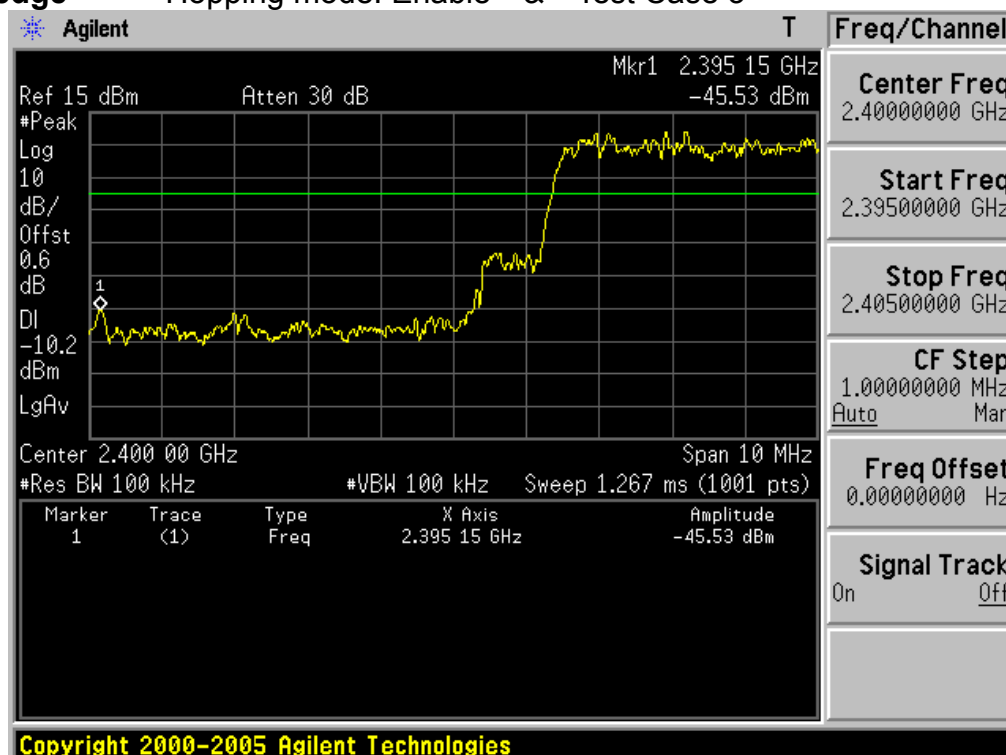
## Highest Frequency &amp; Test case 2



# Low Band-edge Hopping mode: Disable & Test Case 3



# Low Band-edge Hopping mode: Enable & Test Case 3



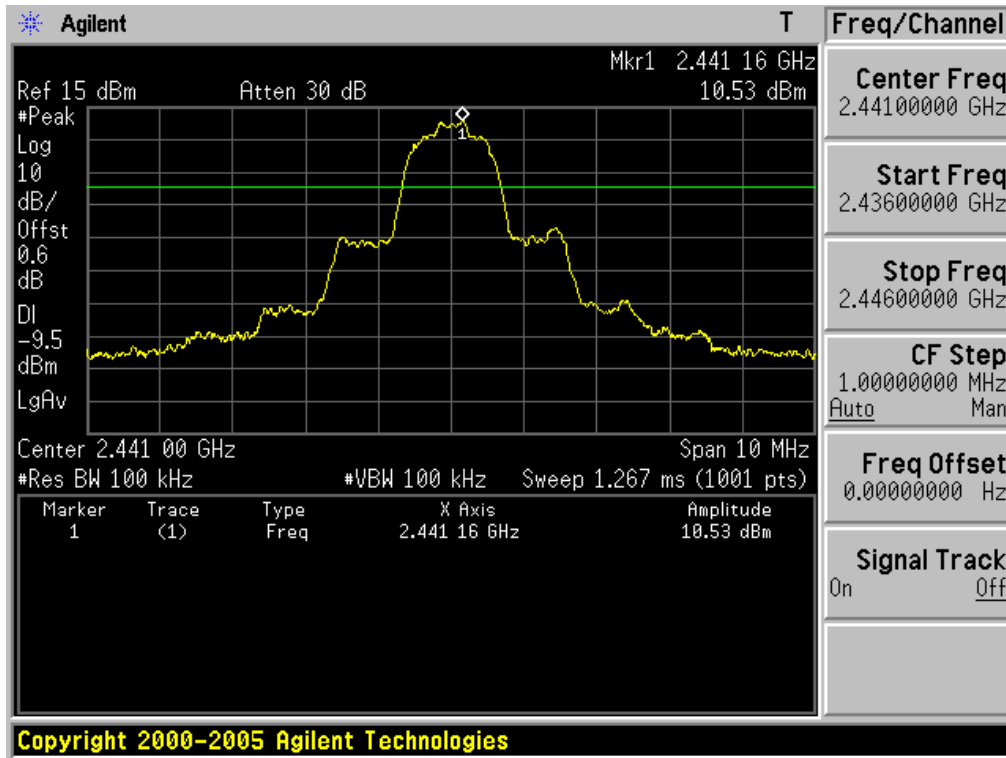
### Lowest Frequency & Test case 3



| Start<br>[Hz] | Stop<br>[Hz] | RBW<br>[Hz] | Freq<br>[Hz] | PwrAbs<br>[dBm] | Δ Limit<br>[dB] |
|---------------|--------------|-------------|--------------|-----------------|-----------------|
| 30.000 M      | 1.000 G      | 100.00 k    | 987.390000 M | -44.19          | -200.00         |
| 1.000 G       | 2.000 G      | 100.00 k    | 1.853000 G   | -43.83          | -200.00         |
| 2.000 G       | 2.400 G      | 100.00 k    | 2.390000 G   | -42.79          | -200.00         |
| 2.400 G       | 2.483 G      | 100.00 k    | 2.402150 G   | 9.87            | -200.00         |
| 2.483 G       | 3.000 G      | 100.00 k    | 2.798358 G   | -42.00          | -200.00         |
| 3.000 G       | 6.000 G      | 100.00 k    | 3.202667 G   | -41.38          | -200.00         |
| 6.000 G       | 9.000 G      | 100.00 k    | 7.206667 G   | -38.68          | -200.00         |
| 9.000 G       | 12.000 G     | 100.00 k    | 10.629000 G  | -40.09          | -200.00         |
| 12.000 G      | 15.000 G     | 100.00 k    | 14.568333 G  | -40.55          | -200.00         |
| 15.000 G      | 20.000 G     | 100.00 k    | 18.403889 G  | -38.35          | -200.00         |
| 20.000 G      | 25.000 G     | 100.00 k    | 24.698333 G  | -30.73          | -200.00         |

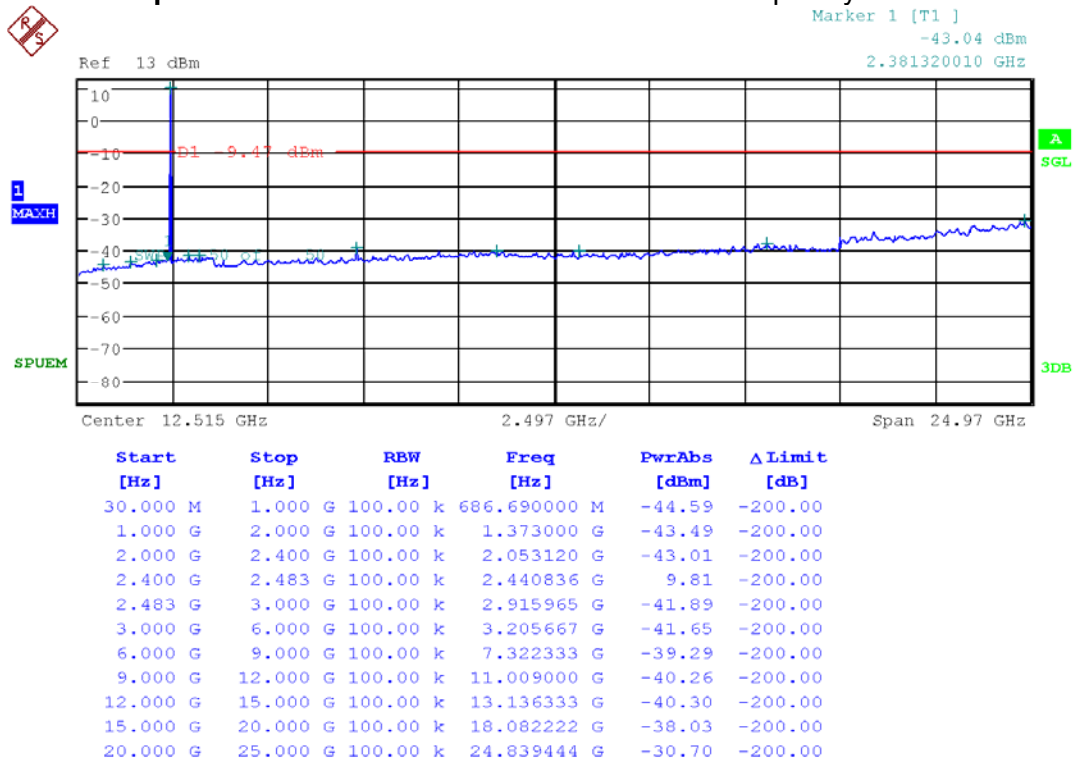
## Reference for limit

## Middle Frequency &amp; Test case 3

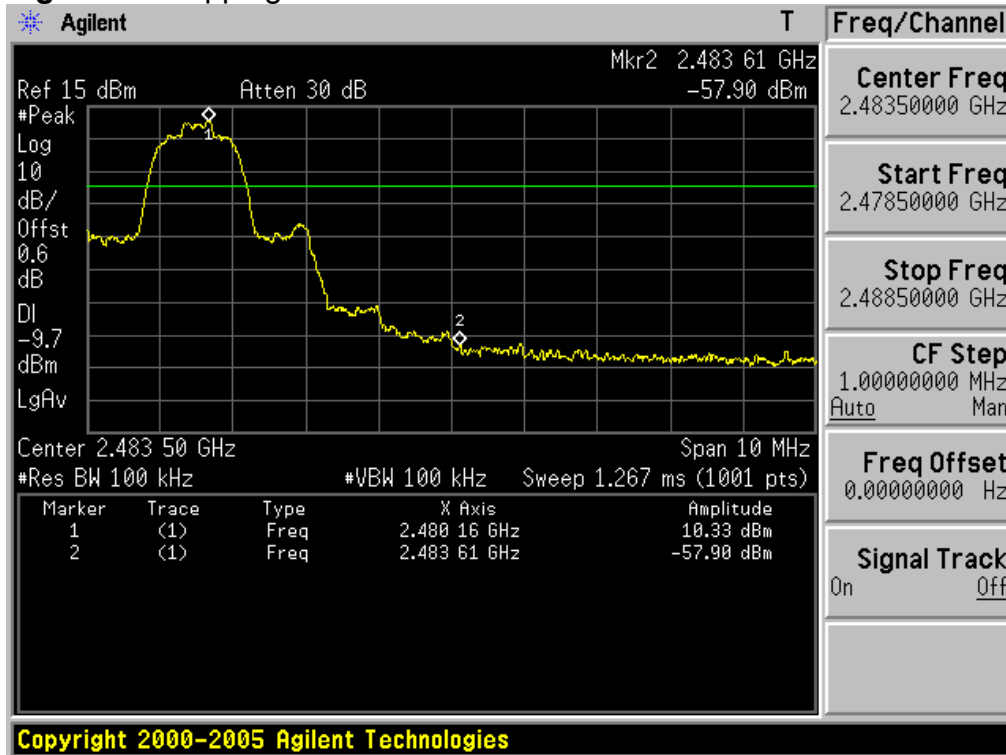


## Conducted Spurious Emissions

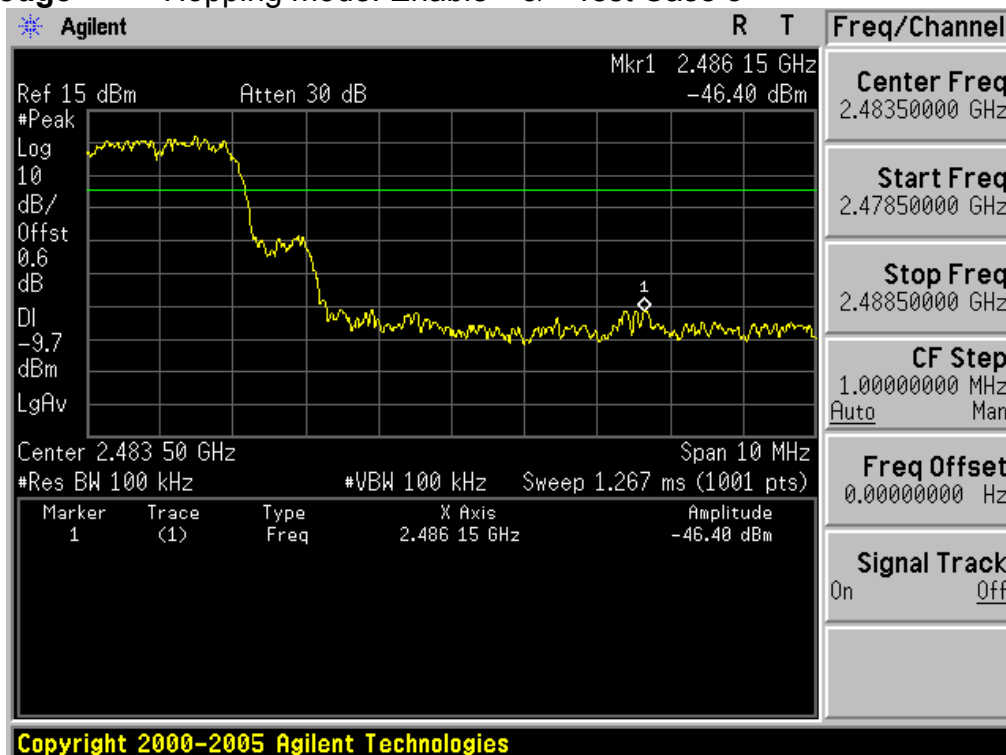
## Middle Frequency &amp; Test case 3



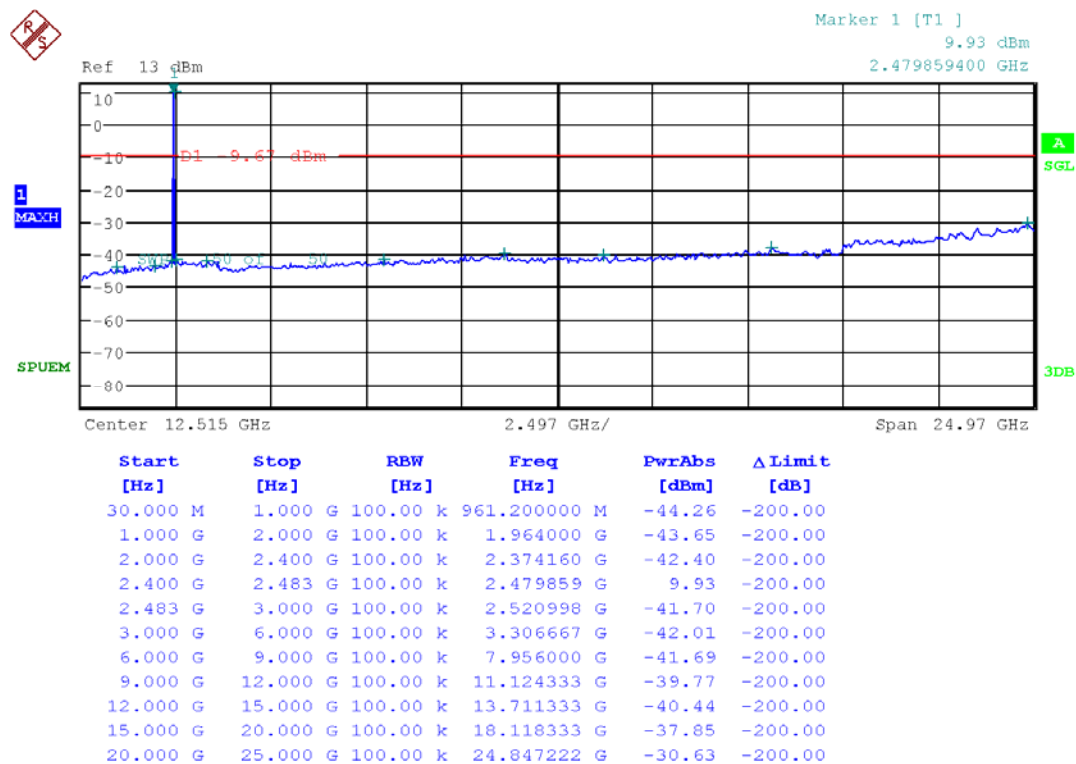
## High Band-edge Hopping mode: Disable & Test Case 3



## High Band-edge Hopping mode: Enable & Test Case 3



### Highest Frequency & Test case 3



### 3.2.7 Radiated Spurious Emissions

#### - Procedure:

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The spectrum analyzer is set to:

Tested frequency = Low, Middle, High Frequencies

Frequency Range = 30 MHz ~ 10th harmonic.

RBW and VBW = 1. Frequency range: 30MHz ~ 1GHz  
RBW = 120KHz / VBW =  $\geq$  RBW  
2. Frequency range: 1GHz ~ 10<sup>th</sup> harmonics  
Peak mode: RBW = 1MHz / VBW =  $\geq$  RBW  
Average mode: RBW = 1MHz / VBW = 10Hz

Detector function = Peak

Sweep = auto

Trace = max hold

#### - Measurement Data: **Comply**

Note 1: See next pages for actual measured spectrum plots and data.

#### - Minimum Standard:

##### • FCC Part 15.209(a) and (b)

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

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

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

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

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

## 30MHz ~ 25GHz Radiated Spurious Emissions & Test Case 1

### ▪ Lowest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2390.000    | H       | Z axis                      | PK            | 53.15          | -3.75      | 49.40           | 74.00          | 24.60       |
| 2390.000    | H       | Z axis                      | AV            | 44.50          | -3.75      | 40.75           | 54.00          | 13.25       |
| 4804.120    | H       | Y axis                      | PK            | 55.38          | -24.65*    | 30.73           | 74.00          | 43.27       |
| 4803.997    | H       | Y axis                      | AV            | 47.47          | -24.65*    | 22.82           | 54.00          | 31.18       |

### ▪ Middle Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 4882.309    | V       | Z axis                      | PK            | 56.75          | -25.68*    | 31.07           | 74.00          | 42.93       |
| 4882.048    | V       | Z axis                      | AV            | 49.15          | -25.68*    | 23.47           | 54.00          | 30.53       |

### ▪ Highest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2483.550    | V       | X axis                      | PK            | 56.53          | -3.75      | 52.78           | 74.00          | 21.22       |
| 2492.027    | V       | X axis                      | AV            | 46.32          | -3.75      | 42.57           | 54.00          | 11.43       |
| 4959.808    | H       | Y axis                      | PK            | 56.10          | -24.20*    | 31.90           | 74.00          | 42.10       |
| 4960.033    | H       | Y axis                      | AV            | 48.26          | -24.20*    | 24.06           | 54.00          | 29.94       |

### Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions on above table.
2. " \* ": The duty correction factor was calculated in the results.
3. Sample Calculation.  

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

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,  
D.C.F = Duty Correction Factor =  $20\log(2.97/100) = -30.54$

## 30MHz ~ 25GHz Radiated Spurious Emissions & Test Case 2

### ▪ Lowest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2389.680    | H       | Z axis                      | PK            | 52.25          | -3.75      | 48.50           | 74.00          | 25.50       |
| 2390.000    | H       | Z axis                      | AV            | 43.04          | -3.75      | 39.29           | 54.00          | 14.71       |
| 4804.303    | H       | Y axis                      | PK            | 54.40          | -24.65*    | 29.75           | 74.00          | 44.25       |
| 4804.024    | H       | Y axis                      | AV            | 43.60          | -24.65*    | 18.95           | 54.00          | 35.05       |

### ▪ Middle Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 4882.302    | V       | Z axis                      | PK            | 56.48          | -25.68*    | 30.80           | 74.00          | 43.20       |
| 4882.011    | V       | Z axis                      | AV            | 45.84          | -25.68*    | 20.16           | 54.00          | 33.84       |

### ▪ Highest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2483.520    | V       | X axis                      | PK            | 56.42          | -3.75      | 52.67           | 74.00          | 21.33       |
| 2491.948    | V       | X axis                      | AV            | 44.69          | -3.75      | 40.94           | 54.00          | 13.06       |
| 4959.901    | H       | Y axis                      | PK            | 55.27          | -24.20*    | 31.07           | 74.00          | 42.93       |
| 4960.035    | H       | Y axis                      | AV            | 45.51          | -24.20*    | 21.31           | 54.00          | 32.69       |

#### Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions on above table.
2. " \* ": The duty correction factor was calculated in the results.
3. Sample Calculation.  

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

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,  
D.C.F = Duty Correction Factor =  $20\log(2.97/100) = -30.54$

### 30MHz ~ 25GHz Radiated Spurious Emissions & Test Case 3

#### ▪ Lowest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2390.530    | H       | Z axis                      | PK            | 53.74          | -3.75      | 49.99           | 74.00          | 24.01       |
| 2389.920    | H       | Z axis                      | AV            | 43.03          | -3.75      | 39.28           | 54.00          | 14.72       |
| 4804.039    | H       | Y axis                      | PK            | 54.51          | -24.65*    | 29.86           | 74.00          | 44.14       |
| 4803.980    | H       | Y axis                      | AV            | 43.63          | -24.65*    | 18.98           | 54.00          | 35.02       |

#### ▪ Middle Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 4881.510    | V       | Z axis                      | PK            | 56.64          | -25.68*    | 30.96           | 74.00          | 43.04       |
| 4882.016    | V       | Z axis                      | AV            | 45.94          | -25.68*    | 20.26           | 54.00          | 33.74       |

#### ▪ Highest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2483.764    | V       | X axis                      | PK            | 55.81          | -3.75      | 52.06           | 74.00          | 21.94       |
| 2492.064    | V       | X axis                      | AV            | 44.65          | -3.75      | 40.90           | 54.00          | 13.10       |
| 4959.702    | H       | Y axis                      | PK            | 55.31          | -24.20*    | 31.11           | 74.00          | 42.89       |
| 4960.040    | H       | Y axis                      | AV            | 45.47          | -24.20*    | 21.27           | 54.00          | 32.73       |

#### Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions on above table.
2. " \* ": The duty correction factor was calculated in the results.
3. Sample Calculation.  
 $\text{Margin} = \text{Limit} - \text{Result}$      /      $\text{Result} = \text{Reading} + \text{T.F}$      /      $\text{T.F} = \text{AF} + \text{CL} - \text{AG} + \text{DCF}$   
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,  
 D.C.F = Duty Correction Factor =  $20\log(2.97/100) = -30.54$

### 3.2.8 AC Line Conducted Emissions

#### - Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak and average detector mode with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

#### - Measurement Data: **N/A**

Note 1: This test is not applicable. Because the power of this device is supplied from batteries.

#### - Minimum Standard: FCC Part 15.207(a)/EN 55022

| Frequency Range<br>(MHz) | Conducted Limit (dBuV) |            |
|--------------------------|------------------------|------------|
|                          | Quasi-Peak             | Average    |
| 0.15 ~ 0.5               | 66 to 56 *             | 56 to 46 * |
| 0.5 ~ 5                  | 56                     | 46         |
| 5 ~ 30                   | 60                     | 50         |

\* Decreases with the logarithm of the frequency

### 3.2.9 Antenna Requirements

**- Procedure:**

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

**- Conclusion: Comply**

→ This module uses a Chip antenna. The antenna is permanently attached by soldering.  
(Refer to Internal photo file.)

**- Minimum Standard:**

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

### 3.2.10 Occupied Bandwidth (99%)

**- Procedure: (RSS-Gen Issue 3)**

- The 99% power bandwidth was measured with a calibrated spectrum analyzer.
- Spectrum analyzer plots are included on the following pages.

**- Measurement Data: Comply**

| Test Mode   | Tested Channel | Test Results (MHz) |
|-------------|----------------|--------------------|
| Test Case 1 | Lowest         | 0.877              |
|             | Middle         | 0.879              |
|             | Highest        | 0.877              |
| Test Case 2 | Lowest         | 1.170              |
|             | Middle         | 1.168              |
|             | Highest        | 1.169              |
| Test Case 3 | Lowest         | 1.161              |
|             | Middle         | 1.164              |
|             | Highest        | 1.171              |

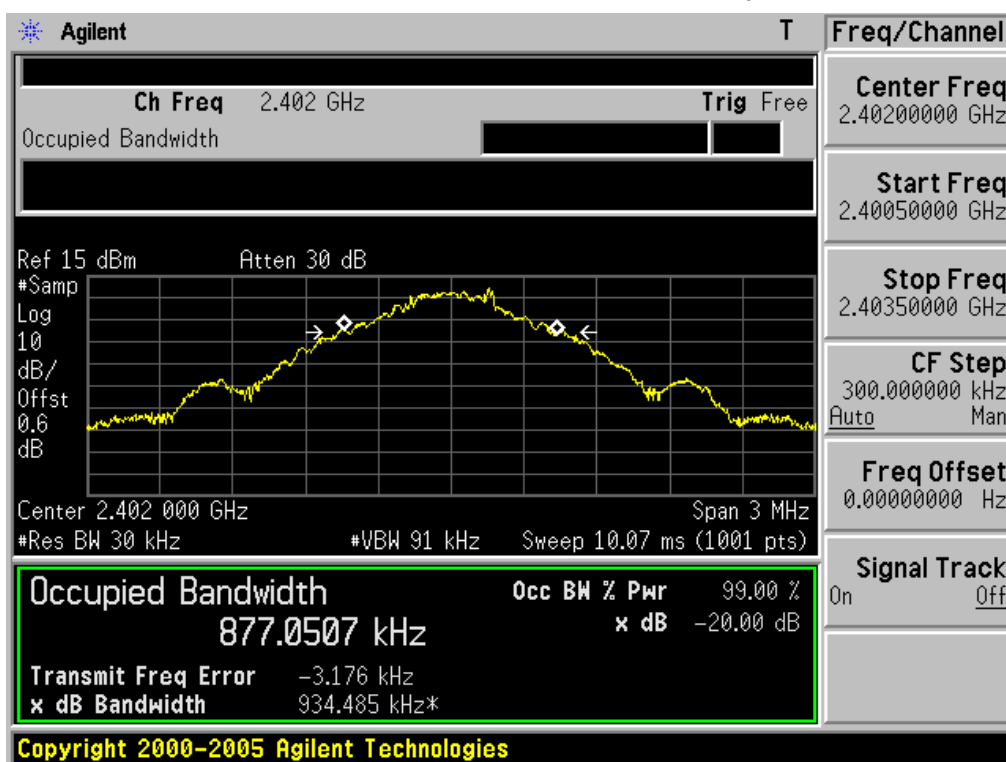
Note 1: See next pages for actual measured spectrum plots.

**- Minimum Standard:**

N/A

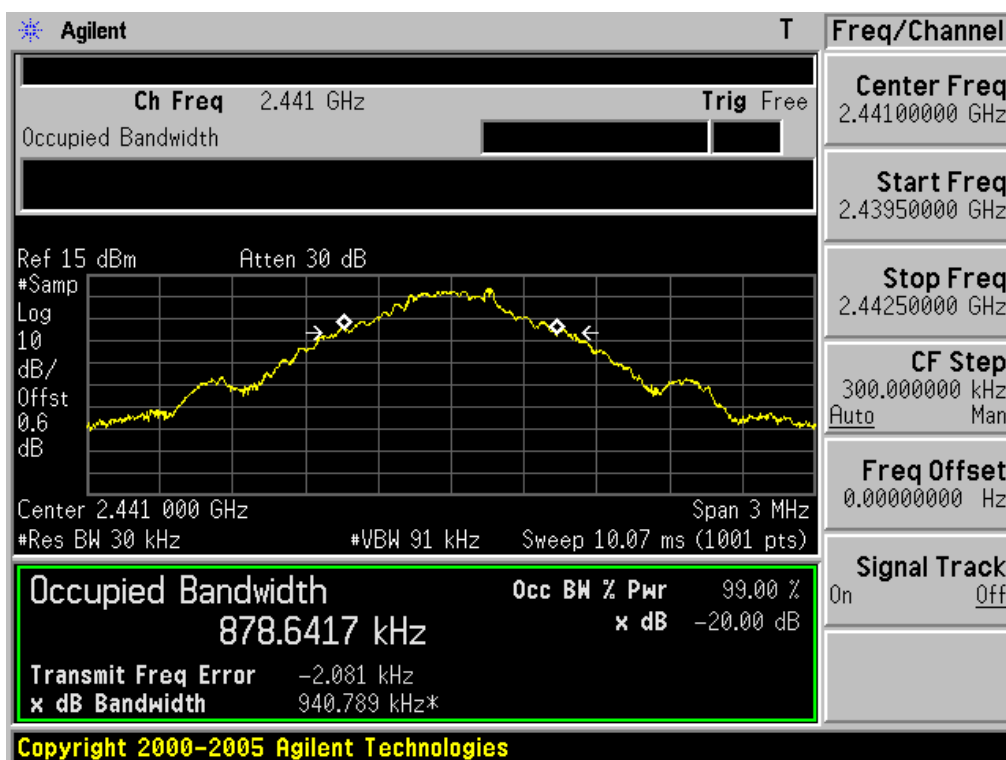
## Occupied Bandwidth (99%)

## Lowest Frequency &amp; Test Case 1



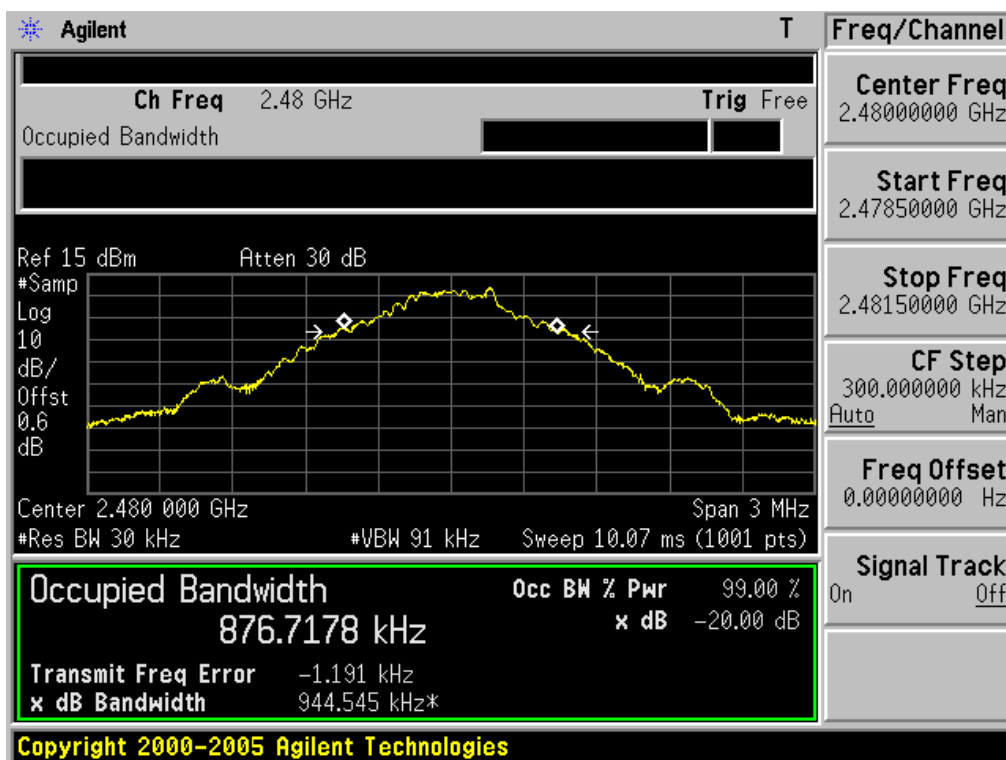
## Occupied Bandwidth (99%)

## Middle Frequency &amp; Test Case 1



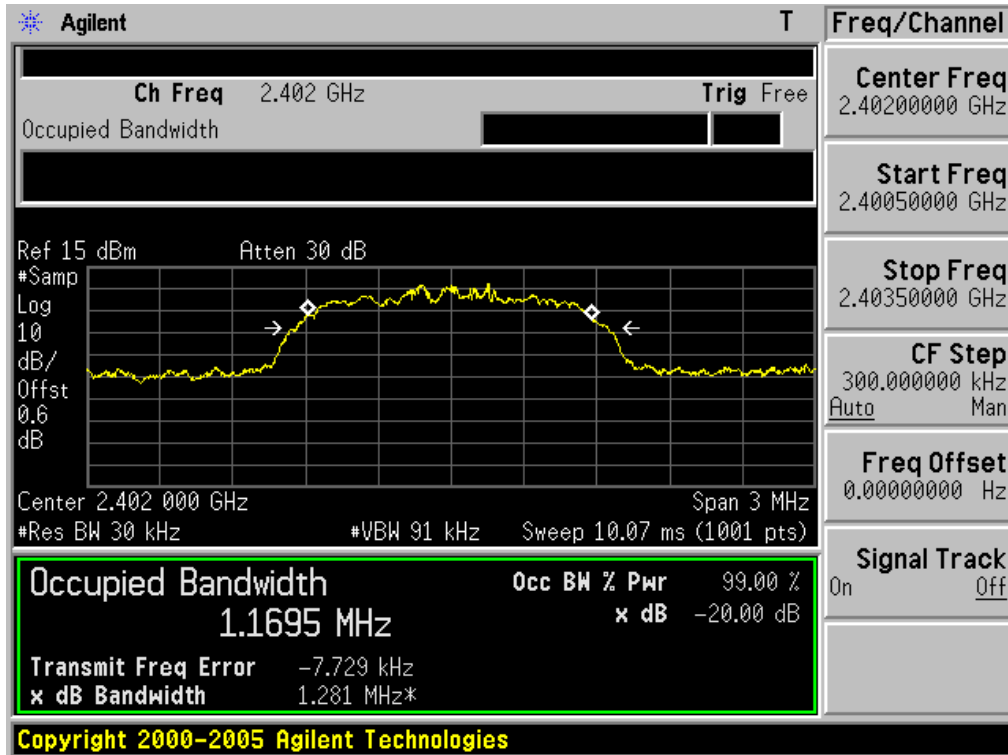
## Occupied Bandwidth (99%)

## Highest Frequency &amp; Test Case 1



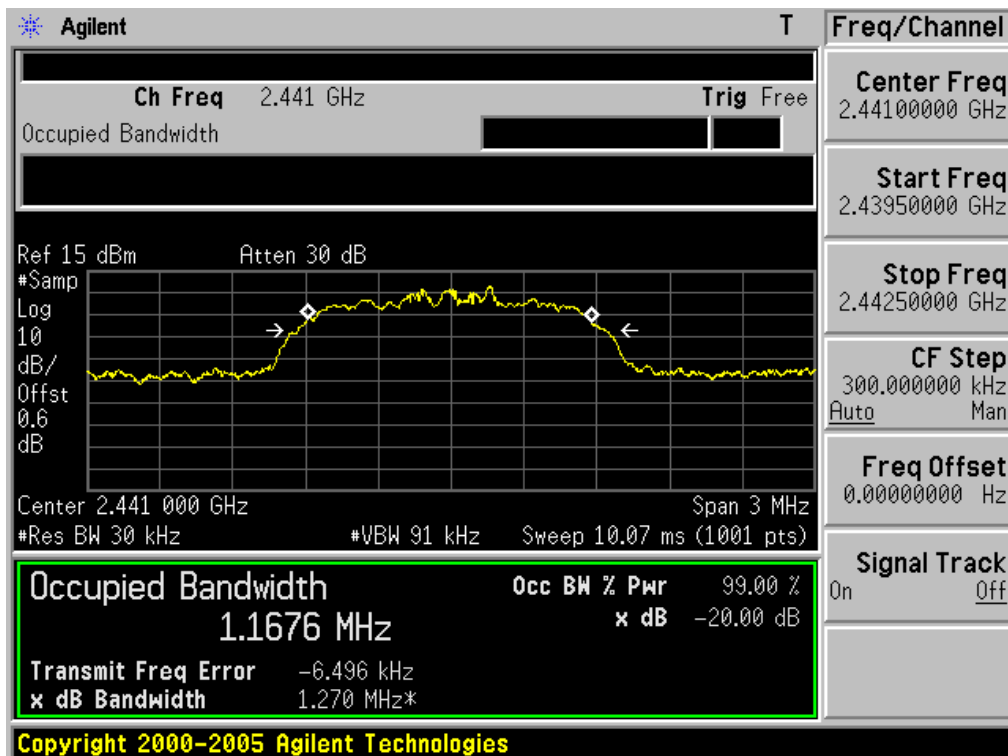
## Occupied Bandwidth (99%)

## Lowest Frequency &amp; Test Case 2



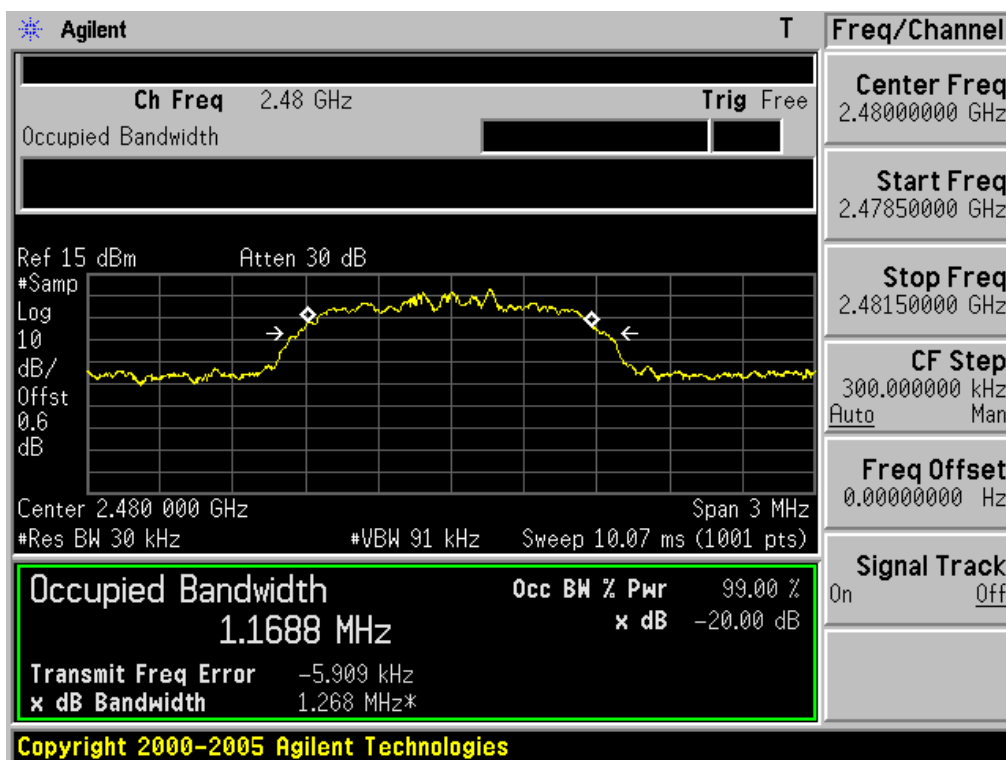
## Occupied Bandwidth (99%)

## Middle Frequency &amp; Test Case 2



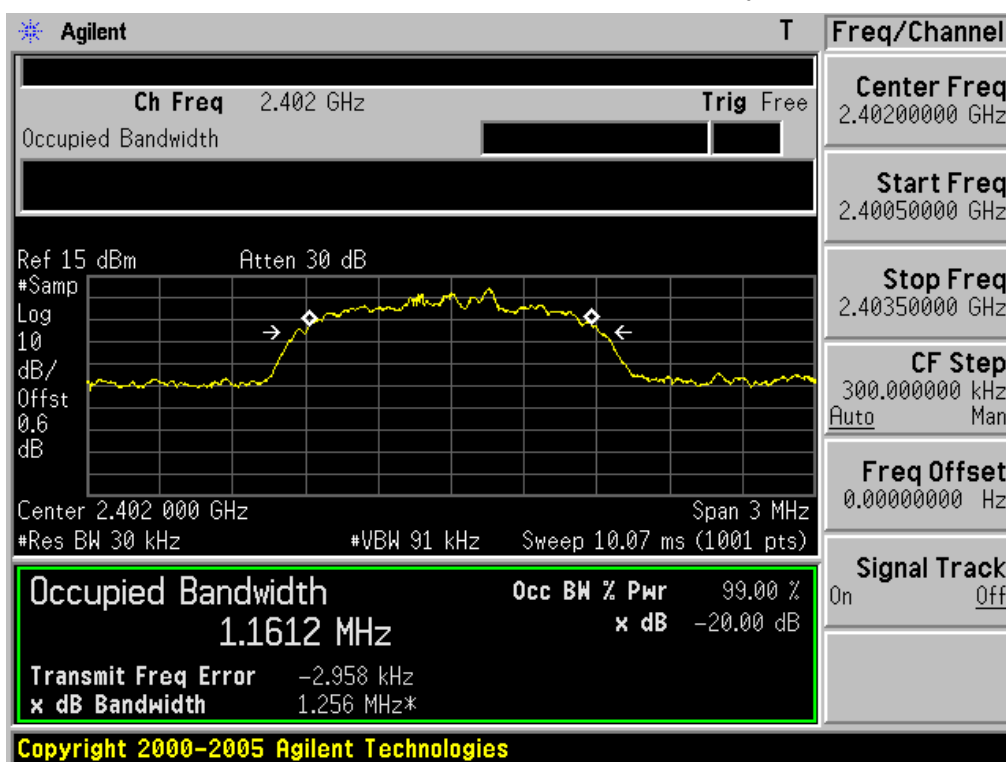
## Occupied Bandwidth (99%)

## Highest Frequency &amp; Test Case 2



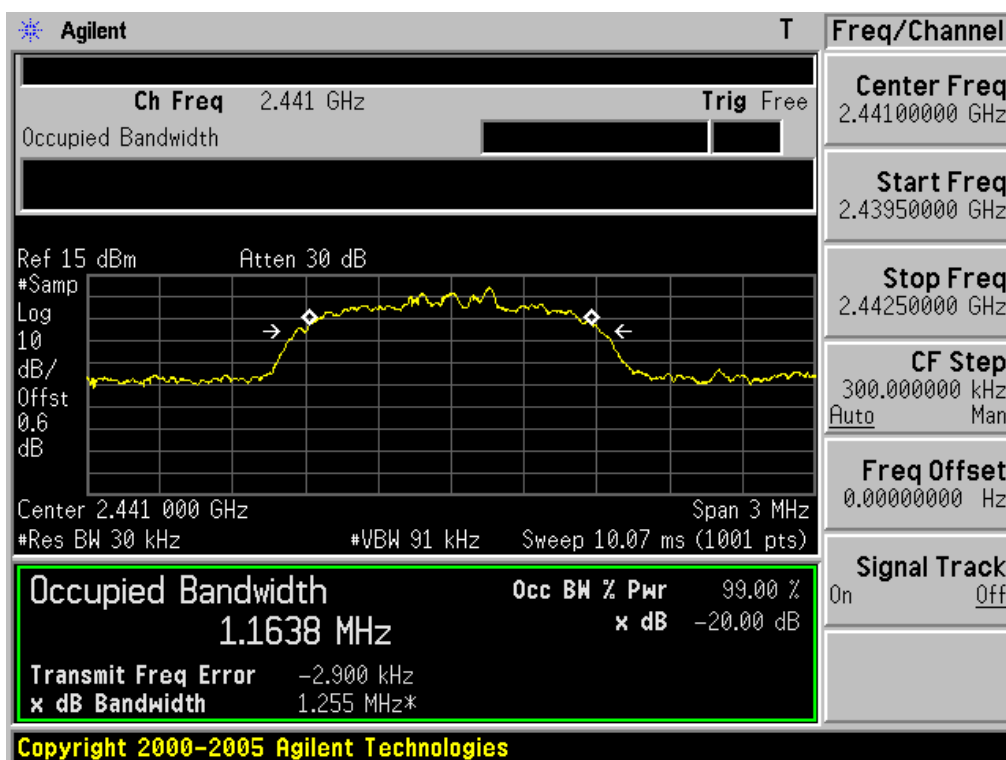
## Occupied Bandwidth (99%)

## Lowest Frequency &amp; Test Case 3



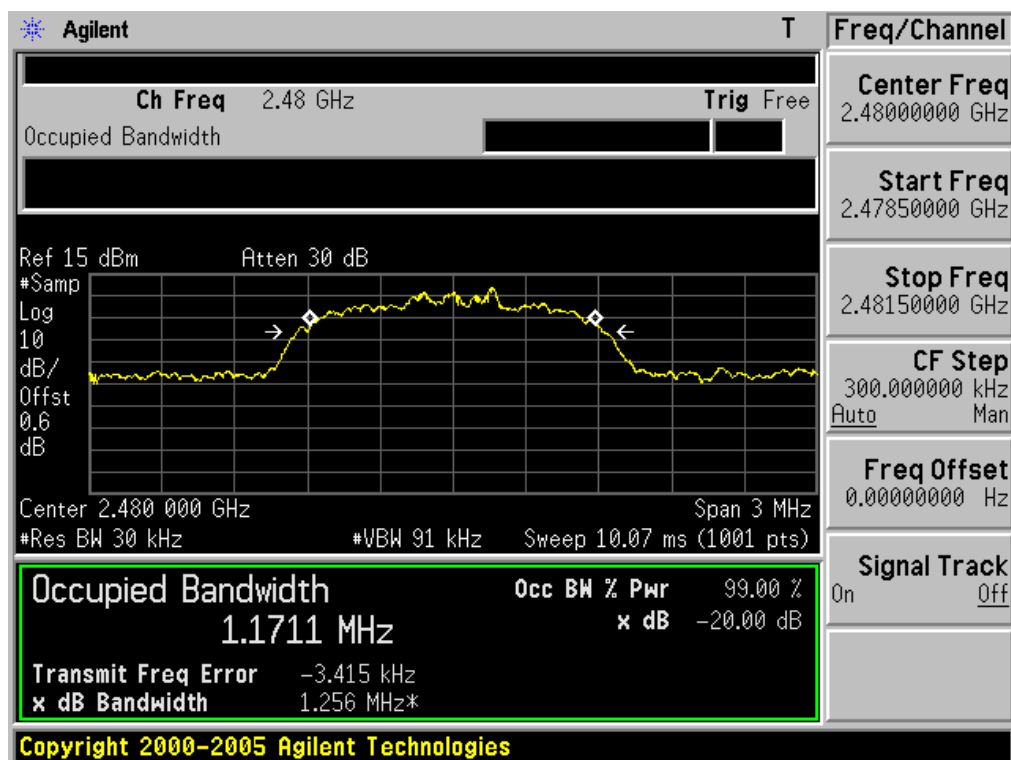
## Occupied Bandwidth (99%)

## Middle Frequency &amp; Test Case 3



## Occupied Bandwidth (99%)

## Highest Frequency &amp; Test Case 3



### 3.3 Receiver requirements

#### 3.3.1 AC Conducted Emissions (Receiver Mode)

**- Procedure:**

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its receiving function. Emissions closest to the limit are measured in the quasi-peak mode (QP) and average mode (AV) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

**- Measurement Data: N/A**

**Note 1:** This test is not applicable. Because the power of this device is supplied from batteries.

**- Minimum Standard: FCC Part 15.207(a)/EN 55022**

| Frequency Range (MHz) | Conducted Limit (dBuV) |            |
|-----------------------|------------------------|------------|
|                       | Quasi-Peak             | Average    |
| 0.15 ~ 0.5            | 66 to 56 *             | 56 to 46 * |
| 0.5 ~ 5               | 56                     | 46         |
| 5 ~ 30                | 60                     | 50         |

\* Decreases with the logarithm of the frequency

### 3.3.2 Out of Band Emissions – Radiated (Receiver Mode)

#### - Procedure:

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in a OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The spectrum analyzer is set to:

Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic.

RBW = 120 kHz ( 30MHz ~ 1 GHz)

= 1 MHz (1 GHz ~ 10<sup>th</sup> harmonic )

Trace = max hold

Sweep = auto

VBW = 10Hz (Average), VBW ≥ RBW (Peak)

Detector function = peak

#### - Measurement Data: **Comply** (Refer to the Next page)

Note 1: See next pages for actual measured spectrum plots and data.

Note 2: This test item was performed in each axis. and the worst case data were reported.

#### - Minimum Standard: FCC Part 15.109(a)

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

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

## 30MHz ~ 25GHz Radiated Spurious Emissions & Test Case 1

### ▪ Lowest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2125.000    | V       | X axis                      | PK            | 55.10          | -9.10      | 46.00           | 74.00          | 28.00       |
| 2126.408    | V       | X axis                      | AV            | 41.30          | -9.10      | 32.20           | 54.00          | 21.80       |

### ▪ Middle Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2125.000    | V       | X axis                      | PK            | 55.50          | -9.10      | 46.40           | 74.00          | 27.60       |
| 2126.845    | V       | X axis                      | AV            | 42.20          | -9.10      | 33.10           | 54.00          | 20.90       |

### ▪ Highest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2125.000    | V       | X axis                      | PK            | 54.90          | -9.10      | 45.80           | 74.00          | 28.20       |
| 2127.451    | V       | X axis                      | AV            | 43.40          | -9.10      | 34.30           | 54.00          | 19.70       |

### Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions on above table.
2. Sample Calculation.

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

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

## 30MHz ~ 25GHz Radiated Spurious Emissions & Test Case 2

### ▪ Lowest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2125.000    | V       | X axis                      | PK            | 54.20          | -9.10      | 45.10           | 74.00          | 28.90       |
| 2126.583    | V       | X axis                      | AV            | 43.50          | -9.10      | 34.40           | 54.00          | 19.60       |

### ▪ Middle Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2125.000    | V       | X axis                      | PK            | 55.50          | -9.10      | 46.40           | 74.00          | 27.60       |
| 2127.843    | V       | X axis                      | AV            | 41.10          | -9.00      | 32.10           | 54.00          | 21.90       |

### ▪ Highest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2125.000    | V       | X axis                      | PK            | 55.30          | -9.10      | 46.20           | 74.00          | 27.80       |
| 2126.432    | V       | X axis                      | AV            | 40.90          | -9.10      | 31.80           | 54.00          | 22.20       |

### Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions on above table.
2. Sample Calculation.  
 $\text{Margin} = \text{Limit} - \text{Result}$      /      $\text{Result} = \text{Reading} + \text{T.F}$      /      $\text{T.F} = \text{AF} + \text{CL} - \text{AG}$   
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

### 30MHz ~ 25GHz Radiated Spurious Emissions & Test Case 3

#### ▪ Lowest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2125.000    | V       | X axis                      | PK            | 55.60          | -9.10      | 46.50           | 74.00          | 27.50       |
| 2126.459    | V       | X axis                      | AV            | 41.40          | -9.10      | 32.30           | 54.00          | 21.70       |

#### ▪ Middle Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2125.000    | V       | X axis                      | PK            | 56.60          | -9.10      | 47.50           | 74.00          | 26.50       |
| 2128.583    | V       | X axis                      | AV            | 40.60          | -9.10      | 31.50           | 54.00          | 22.50       |

#### ▪ Highest Channel

| Freq. (MHz) | ANT Pol | The worst case EUT Position | Detector Mode | Reading (dBuV) | T.F (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) |
|-------------|---------|-----------------------------|---------------|----------------|------------|-----------------|----------------|-------------|
| 2125.000    | V       | X axis                      | PK            | 53.50          | -9.10      | 44.40           | 74.00          | 29.60       |
| 2126.402    | V       | X axis                      | AV            | 41.40          | -9.10      | 32.30           | 54.00          | 21.70       |

#### Note.

1. No other spurious and harmonic emissions were reported greater than listed emissions on above table.
2. Sample Calculation.  
 $\text{Margin} = \text{Limit} - \text{Result}$      /      $\text{Result} = \text{Reading} + \text{T.F}$      /      $\text{T.F} = \text{AF} + \text{CL} - \text{AG}$   
 Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain,

# **APPENDIX I**

## **TEST EQUIPMENT FOR TESTS**

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment.

|                                     | Type                                    | Manufacturer              | Model         | Cal.Date<br>(yy/mm/dd) | Next.Cal.Date<br>(yy/mm/dd) | S/N                    |
|-------------------------------------|-----------------------------------------|---------------------------|---------------|------------------------|-----------------------------|------------------------|
| <input checked="" type="checkbox"/> | Spectrum Analyzer                       | Agilent                   | E4440A        | 11/09/30               | 12/09/30                    | MY45304199             |
| <input checked="" type="checkbox"/> | Spectrum Analyzer                       | Rohde Schwarz             | FSQ26         | 11/01/11               | 12/01/11                    | 200445                 |
| <input type="checkbox"/>            | Spectrum analyzer                       | Agilent                   | E4404B        | 11/03/08               | 12/03/08                    | US41061134             |
| <input type="checkbox"/>            | Spectrum Analyzer(RE)                   | H.P                       | 8563E         | 11/10/04               | 12/10/04                    | 3551A04634             |
| <input type="checkbox"/>            | MXA Signal Analyzer                     | Agilent Technologies, Inc | N9020A        | 11/01/07               | 12/01/07                    | MY49100833             |
| <input type="checkbox"/>            | Power Meter                             | H.P                       | EPM-442A      | 11/07/01               | 12/07/01                    | GB37170413             |
| <input type="checkbox"/>            | Power Sensor                            | H.P                       | 8481A         | 11/07/01               | 12/07/01                    | 3318A96332             |
| <input type="checkbox"/>            | Wideband Power Sensor                   | Rohde Schwarz             | NRP-Z81       | 11/06/04/              | 12/06/04                    | 1137.9009.02-101001    |
| <input type="checkbox"/>            | Power Divider                           | Agilent                   | 11636B        | 11/09/30               | 12/09/30                    | 56471                  |
| <input type="checkbox"/>            | 4-Way Power Divider                     | ET Industries             | D-0526-4      | 10/12/24               | 11/12/24                    | 210195001              |
| <input type="checkbox"/>            | Power Splitter                          | Anritsu                   | K241B         | 11/09/30               | 12/09/30                    | 020611                 |
| <input type="checkbox"/>            | Power Splitter                          | Anritsu                   | K241B         | 11/07/01               | 12/07/01                    | 017060                 |
| <input type="checkbox"/>            | Power Splitters & Dividers              | Aeroflex/Weinschel        | 1594          | 11/02/21               | 12/02/21                    | 1177                   |
| <input type="checkbox"/>            | Frequency Counter                       | H.P                       | 5342A         | 11/07/01               | 12/07/01                    | 2119A04450             |
| <input type="checkbox"/>            | TEMP & HUMIDITY Chamber                 | JISCO                     | KR-100/J-RHC2 | 11/09/30               | 12/09/30                    | 30604493/021031        |
| <input checked="" type="checkbox"/> | Digital Multimeter                      | H.P                       | 34401A        | 11/03/07               | 12/03/07                    | 3146A13475, US36122178 |
| <input type="checkbox"/>            | Multifunction Synthesizer               | HP                        | 8904A         | 11/10/06               | 12/10/06                    | 3633A08404             |
| <input checked="" type="checkbox"/> | Signal Generator                        | Rohde Schwarz             | SMR20         | 11/03/08               | 12/03/08                    | 101251                 |
| <input type="checkbox"/>            | Signal Generator                        | H.P                       | ESG-3000A     | 11/07/01               | 12/07/01                    | US37230529             |
| <input checked="" type="checkbox"/> | Vector Signal Generator                 | Rohde Schwarz             | SMJ100A       | 11/01/11               | 12/01/11                    | 100148                 |
| <input type="checkbox"/>            | Vector Signal Generator                 | Rohde Schwarz             | SMBV100A      | 11/01/11               | 12/01/11                    | 255571                 |
| <input type="checkbox"/>            | Audio Analyzer                          | H.P                       | 8903B         | 11/07/02               | 12/07/02                    | 3011A09448             |
| <input type="checkbox"/>            | Modulation Analyzer                     | H.P                       | 8901B         | 11/07/01               | 12/07/01                    | 3028A03029             |
| <input type="checkbox"/>            | 8960 Series 10 Wireless Comms. Test Set | Agilent                   | E5515C        | 11/03/07               | 12/03/07                    | GB43461134             |
| <input type="checkbox"/>            | Universal Radio communication Tester    | Rohde Schwarz             | CMU200        | 11/03/07               | 12/03/07                    | 106760                 |
| <input type="checkbox"/>            | Bluetooth Tester                        | TESCOM                    | TC-3000B      | 11/07/01               | 12/07/01                    | 3000B000268            |
| <input type="checkbox"/>            | Thermo hygrometer                       | BODYCOM                   | BJ5478        | 11/01/13               | 12/01/13                    | 090205-3               |
| <input checked="" type="checkbox"/> | Thermo hygrometer                       | BODYCOM                   | BJ5478        | 11/01/13               | 12/01/13                    | 090205-2               |
| <input type="checkbox"/>            | Thermo hygrometer                       | BODYCOM                   | BJ5478        | 11/01/13               | 12/01/13                    | 090205-4               |
| <input type="checkbox"/>            | AC Power supply                         | DAEKWANG                  | 5KVA          | 11/03/08               | 12/03/08                    | 20060321-1             |
| <input checked="" type="checkbox"/> | DC Power Supply                         | HP                        | 6622A         | 11/03/07               | 12/03/07                    | 3448A03760             |
| <input type="checkbox"/>            | DC Power Supply                         | HP                        | 6633A         | 11/03/07               | 12/03/07                    | 3524A06634             |
| <input type="checkbox"/>            | DC Power Supply                         | Protek                    | PWS-3010D     | 11/09/30               | 12/09/30                    | 4072702                |
| <input type="checkbox"/>            | DC Power Supply                         | SM techno                 | SDP30-5D      | 11/05/20               | 12/05/20                    | 305DKA013              |
| <input type="checkbox"/>            | BAND Reject Filter                      | Microwave Circuits        | N0308372      | 11/09/30               | 12/09/30                    | 3125-01DC0352          |
| <input type="checkbox"/>            | BAND Reject Filter                      | Wainwright                | WRCG1750      | 11/09/30               | 12/09/30                    | 2                      |
| <input type="checkbox"/>            | High-Pass Filter                        | ANRITSU                   | MP526D        | 11/09/30               | 12/09/30                    | M27756                 |

|                                     | Type                         | Manufacturer   | Model                              | Cal.Date<br>(yy/mm/dd) | Next.Cal.Date<br>(yy/mm/dd) | S/N        |
|-------------------------------------|------------------------------|----------------|------------------------------------|------------------------|-----------------------------|------------|
| <input type="checkbox"/>            | High-pass filter             | Wainwright     | WHNX2.1                            | 11/09/30               | 12/09/30                    | 1          |
| <input checked="" type="checkbox"/> | High-pass filter             | Wainwright     | WHNX3.0                            | 11/09/30               | 12/09/30                    | 9          |
| <input type="checkbox"/>            | High-pass filter             | Wainwright     | WHNX5.0                            | 11/09/19               | 12/09/19                    | 8          |
| <input type="checkbox"/>            | High-Pass Filter             | Wainwright     | WHKX8.5                            | 11/09/19               | 12/09/19                    | 1          |
| <input type="checkbox"/>            | High-Pass Filter             | Wainwright     | WHKX1.0                            | 11/09/30               | 12/09/30                    | 9          |
| <input type="checkbox"/>            | Tunable Notch Filter         | Wainwright     | WRCT800.0<br>/960.0-0.2/40-8SSK    | N/A                    | N/A                         | 32         |
| <input type="checkbox"/>            | Tunable Notch Filter         | Wainwright     | WRCD1700.0<br>/2000.0-0.2/40-10SSK | N/A                    | N/A                         | 53         |
| <input type="checkbox"/>            | Tunable Notch Filter         | Wainwright     | WRCT1900.0/<br>2200.0-5/40-10SSK   | N/A                    | N/A                         | 30         |
| <input type="checkbox"/>            | HORN ANT                     | ETS            | 3115                               | 11/09/06               | 12/09/06                    | 21097      |
| <input checked="" type="checkbox"/> | HORN ANT                     | ETS            | 3115                               | 11/03/22               | 12/03/22                    | 6419       |
| <input checked="" type="checkbox"/> | HORN ANT                     | A.H.Systems    | SAS-574                            | 11/03/25               | 13/03/25                    | 154        |
| <input type="checkbox"/>            | HORN ANT                     | A.H.Systems    | SAS-574                            | 11/03/25               | 13/03/25                    | 155        |
| <input type="checkbox"/>            | HORN ANT                     | SCHWARZBECK    | BBHA9120A                          | 10/04/13               | 12/04/13                    | 322        |
| <input type="checkbox"/>            | Dipole Antenna               | Schwarzbeck    | VHA9103                            | 11/11/22               | 12/11/22                    | 2116       |
| <input type="checkbox"/>            | Dipole Antenna               | Schwarzbeck    | VHA9103                            | 11/11/22               | 12/11/22                    | 2117       |
| <input type="checkbox"/>            | Dipole Antenna               | Schwarzbeck    | UHA9105                            | 11/11/22               | 12/11/22                    | 2261       |
| <input type="checkbox"/>            | Dipole Antenna               | Schwarzbeck    | UHA9105                            | 11/11/22               | 12/11/22                    | 2262       |
| <input type="checkbox"/>            | LOOP Antenna                 | ETS            | 6502                               | 10/10/29               | 12/10/29                    | 3471       |
| <input type="checkbox"/>            | Coaxial Fixed Attenuators    | Agilent        | 8491B                              | 11/07/02               | 12/07/02                    | MY39260700 |
| <input type="checkbox"/>            | Attenuator (3dB)             | WEINSCHHEL     | 56-3                               | 11/09/30               | 12/09/30                    | Y2342      |
| <input type="checkbox"/>            | Attenuator (3dB)             | WEINSCHHEL     | 56-3                               | 11/09/30               | 12/09/30                    | Y2370      |
| <input type="checkbox"/>            | Attenuator (10dB)            | WEINSCHHEL     | 23-10-34                           | 11/09/30               | 12/09/30                    | BP4386     |
| <input type="checkbox"/>            | Attenuator (10dB)            | WEINSCHHEL     | 23-10-34                           | 11/01/11               | 12/01/11                    | BP4387     |
| <input type="checkbox"/>            | Attenuator (10dB)            | WEINSCHHEL     | 86-10-11                           | 11/09/30               | 12/09/30                    | 446        |
| <input type="checkbox"/>            | Attenuator (10dB)            | WEINSCHHEL     | 86-10-11                           | 11/09/30               | 12/09/30                    | 408        |
| <input type="checkbox"/>            | Attenuator (20dB)            | WEINSCHHEL     | 86-20-11                           | 11/09/30               | 12/09/30                    | 432        |
| <input type="checkbox"/>            | Attenuator (30dB)            | JFW            | 50FH-030-300                       | 11/03/07               | 12/03/07                    | 060320-1   |
| <input type="checkbox"/>            | Attenuator (40dB)            | WEINSCHHEL     | 57-40-33                           | 11/09/30               | 12/09/30                    | NN837      |
| <input type="checkbox"/>            | Termination                  | H.P            | HP-909D                            | 11/07/02               | 12/07/02                    | 02750      |
| <input type="checkbox"/>            | Termination                  | H.P            | HP-909D                            | 11/07/02               | 12/07/02                    | 02702      |
| <input type="checkbox"/>            | Type N<br>Coaxial CIRCULATOR | NOVA MICROWAVE | 0088CAN                            | 11/07/01               | 12/07/01                    | 788        |
| <input type="checkbox"/>            | Type N<br>Coaxial CIRCULATOR | NOVA MICROWAVE | 0185CAN                            | 11/07/01               | 12/07/01                    | 790        |
| <input type="checkbox"/>            | Amplifier (30dB)             | Agilent        | 8449B                              | 11/03/07               | 12/03/07                    | 3008A01590 |
| <input checked="" type="checkbox"/> | Amplifier (30dB)             | H.P            | 8449B                              | 11/03/07               | 12/03/07                    | 3008A00370 |
| <input type="checkbox"/>            | Amplifier                    | EMPOWER        | BBS3Q7ELU                          | 11/09/30               | 12/09/30                    | 1020       |
| <input type="checkbox"/>            | RF Power Amplifier           | OPHIRRF        | 5069F                              | 11/07/01               | 12/07/01                    | 1006       |
| <input checked="" type="checkbox"/> | EMI TEST RECEIVER            | R&S            | ESU                                | 11/01/20               | 12/01/20                    | 100014     |

|                                     | Type                                | Manufacturer  | Model            | Cal.Date<br>(yy/mm/dd) | Next.Cal.Date<br>(yy/mm/dd) | S/N           |
|-------------------------------------|-------------------------------------|---------------|------------------|------------------------|-----------------------------|---------------|
| <input checked="" type="checkbox"/> | BILOG ANTENNA                       | SCHAFFNER     | CBL6112B         | 10/07/14               | 12/07/14                    | 2737          |
| <input checked="" type="checkbox"/> | Amplifier (22dB)                    | H.P           | 8447E            | 11/01/11               | 12/01/11                    | 2945A02865    |
| <input type="checkbox"/>            | EMI TEST RECEIVER                   | R&S           | ESCI             | 11/03/08               | 12/03/08                    | 100364        |
| <input type="checkbox"/>            | BICONICAL ANT.                      | Schwarzbeck   | VHA 9103         | 10/11/29               | 12/11/29                    | 91032789      |
| <input type="checkbox"/>            | LOG-PERIODIC ANT.                   | Schwarzbeck   | UHALP9108A1      | 10/11/29               | 12/11/29                    | 1098          |
| <input type="checkbox"/>            | BICONICAL ANT.                      | Schwarzbeck   | VHA 9103         | 10/12/21               | 12/12/21                    | 91031946      |
| <input type="checkbox"/>            | LOG-PERIODIC ANT.                   | Schwarzbeck   | UHALP9108A1      | 10/07/07               | 12/07/07                    | 0590          |
| <input type="checkbox"/>            | Low Noise Pre Amplifier             | TSJ           | MLA-100K01-B01-2 | 11/03/07               | 12/03/07                    | 1252741       |
| <input type="checkbox"/>            | Low Noise Pre Amplifier             | TSJ           | MLA-00108-B02-36 | 11/01/11               | 12/01/11                    | 1518831       |
| <input type="checkbox"/>            | Amplifier (25dB)                    | Agilent       | 8447D            | 11/03/07               | 12/03/07                    | 2944A10144    |
| <input type="checkbox"/>            | Amplifier (25dB)                    | Agilent       | 8447D            | 11/07/01               | 12/07/01                    | 2648A04922    |
| <input type="checkbox"/>            | Spectrum Analyzer(CE)               | H.P           | 8591E            | 11/03/07               | 12/03/07                    | 3649A05889    |
| <input type="checkbox"/>            | LISN                                | Kyoritsu      | KNW-407          | 11/01/11               | 12/01/11                    | 8-317-8       |
| <input type="checkbox"/>            | LISN                                | Kyoritsu      | KNW-242          | 11/07/02               | 12/07/02                    | 8-654-15      |
| <input type="checkbox"/>            | CVCF                                | NF Electronic | 4420             | 11/03/08               | 12/03/08                    | 304935/337980 |
| <input type="checkbox"/>            | 50 ohm Terminator                   | HME           | CT-01            | 11/01/11               | 12/01/11                    | N/A           |
| <input type="checkbox"/>            | RFI/FIELD Intensity Meter           | Kyoritsu      | KNM-2402         | 11/07/02               | 12/07/02                    | 4N-170-3      |
| <input type="checkbox"/>            | Wideband Radio Communication Tester | R&S           | CMW500           | 11/09/30               | 12/09/30                    | 100989        |