# FCC PART 15.247

# EMI MEASUREMENT AND TEST REPORT

For

## Cheung Hung Electronics Ltd.

Unit 4, 15/F, North Point Asia-pac Centre, No.28 A Java Road, North Point, Hong Kong

**FCC ID: TWXCH-W808**

| **This Report Concerns:** | **Equipment Type:** |
|---|---|
| ☒ Original Report | 2.4GHz Cordless phone |

| | |
|---|---|
| **Test Engineer:** | Oscar Au |
| **Report No.:** | R0511174 |
| **Report Date:** | 2006-1-6 |
| **Reviewed By:** | Snell Leong |
| **Prepared By:** | Bay Area Compliance Laboratory Corporation (BACL)<br>230 Commercial Street<br>Sunnyvale, CA 94085<br>Tel: (408) 732-9162<br>Fax: (408) 732 9164 |

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# GENERAL INFORMATION

**Product Description for Equipment Under Test (EUT)**

The *Cheung Hung Electronics Ltd.'s* product, *FCC ID: TWXCH-W808*, Model: *CH-W808* or the "EUT" as referred to this report is a 2.4GHz Cordless phone. The base part of the EUT measures approximately 170mmL x 90mmW x 90mmH and the handset part of the EUT measures approximately 170mmL x 45mmW x 30mmH.

** The test data gathered are from typical production sample, serial number: 001 provided by the manufacturer.*

**Objective**

This type approval report is prepared on behalf of *Cheung Hung Electronics Ltd.* in accordance with Part 2, Subpart J, Part 15, Subparts A , B and C of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for Output Power, Antenna Requirements, Dwell Time, Number of Hopping number, Channel Separation , 100 kHz Bandwidth of Band Edges Measurement, Spurious Emission, Conducted and Spurious Radiated Emission.

**Related Submittal(s)/Grant(s)**

No Related Submittals.

**Test Methodology**

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.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

**Test Facility**

The Open Area Test site used by BACL to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA with registration number: 90464.

Test site at BACL has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

# SYSTEM TEST CONFIGURATION

### Justification

The host system was configured for testing according to ANSI C63.4-2003.

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

### EUT Exercise Software

Engineering software for RF testing

### Special Accessories

As shown in following test block diagram, all interface cables used for compliance testing are shielded.

### Schematics / Block Diagram

Please refer to Appendix A.

### Equipment Modifications

No modifications were made to the EUT.

### Local Support Equipment

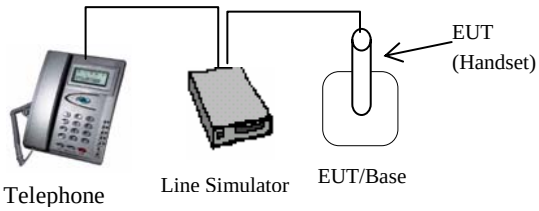
| Manufacturer | Description | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| Southern Telecom | Telephone | None | None | None |
| Teltone Corp | Phone Simulator | TLS-3B-01 | 80071 | None |

### Host PC Power Supply and Line Filters

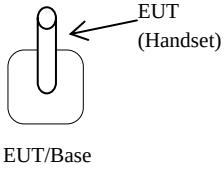
| Manufacturer | Description | Model | Serial Number | FCC ID |
|---|---|---|---|---|
| Cheung Hung Electronics | AC Adaptor | N/A | N/A | None |

**Configuration of Test System**

Conducted Emission

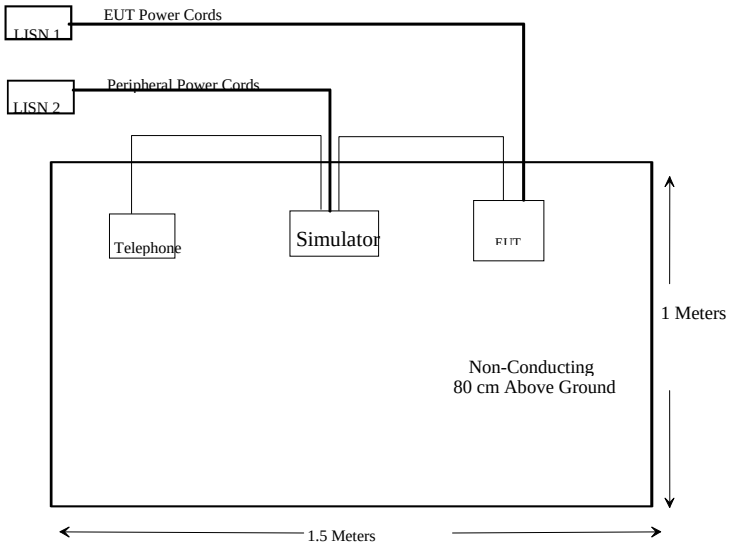



Radiated Emission

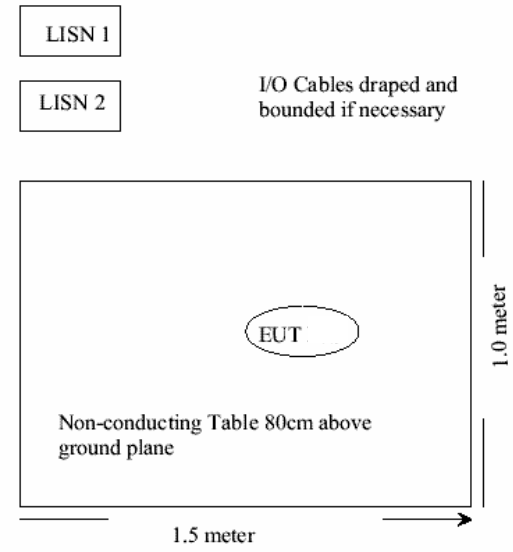



**Test Setup Block Diagram**

Conducted Emission




Radiated Emission



# SUMMARY OF TEST RESULTS

| FCC RULES | DESCRIPTION OF TEST | RESULT |
|---|---|---|
| §15.203 | Antenna Requirement | Compliant |
| § 15.205 | Restricted Bands | Compliant |
| §15.207 (a) | Conducted Emission | Compliant |
| §15.209 | Radiated Emission | Compliant* |
| §15.247 (a) (1) | Hopping Channel Separation | Compliant |
| §15.247 (a) (1) | Channel Bandwidth | Compliant |
| §15.247 (a) (1) (iii) | Number of Hopping Frequencies Used | Compliant |
| §15.247 (a) (1) (iii) | Dwell Time of Each Frequency within 37.2 Second Period of time (0.4 x Number of Channel) | Compliant |
| §15.247 (b) (1) | Maximum Peak Output Power | Compliant |
| § 15.247 (e)(i) § 2.1093 | RF Safety Requirements | Compliant |
| § 15.247 (d) | 100 kHz Bandwidth of Frequency Band Edge | Compliant |
| § 2.1051 | Spurious Emission at Antenna Port | Compliant |

* test data are within the measurement uncertainty

# §15.203 - ANTENNA REQUIREMENT

**Standard Applicable**

According to § 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 § 15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The antenna for this device is an integral antenna with gain of 0 dBi.

# §15.207 (a)- CONDUCTED EMISSION

**Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are receiver, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ±2.4 dB.

**Test Setup**

The measurement was performed at shield room, using the same setup per ANSI C63.4 – 2003 measurement procedure. The specification used was FCC Class B limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The EUT was connected with LISN-1.

**Receiver Setup**

The EMI receiver was set to investigate the spectrum from 150 kHz to 30MHz.

**Test Equipment List and Details**

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Rohde & Schewarz | Artificial-Mains Network | ESH2-Z5 | 871884/039 | 8/16/2005 |
| Rohde & Schewarz | EMI Test Receiver | ESCS30 | 100176 | 9/15/2005 |
| Fluke | Calibrated Voltmeter | 189 | 18485-38 | 12/29/2005 |

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

**Test Procedure**

During the conducted emission test, the power cord of the EUT was connected to the mains outlet of the LISN-1.

Maximizing procedures were performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with an "QP". Average readings are distinguished with an "Ave".

**Environmental Conditions**

| | |
|---|---|
| Temperature: | 15° C |
| Relative Humidity: | 45% |
| ATM Pressure: | 1009 mbar |

**The testing was performed by Oscar Au on 2005-12-09.*

**Summary of Test Results**

According to the recorded data in following table, the EUT complied with the FCC Conducted limit for a Class B device, with the *worst* margin reading of:

**-11.7 dB** at **0.325 MHz** in the **Neutral** conductor

**Conducted Emissions Test Data**

| LINE CONDUCTED EMISSIONS | | | | FCC CLASS B | |
|---|---|---|---|---|---|
| Frequency MHz | Amplitude dBμV | Detector Qp/Ave/Peak | Phase Line/Neutral | Limit dBμV | Margin dB |
| 0.325 | 37.9 | Ave | Neutral | 49.58 | -11.7 |
| 0.240 | 39.4 | Ave | Neutral | 52.10 | -12.7 |
| 0.160 | 40.4 | Ave | Neutral | 55.46 | -15.1 |
| 0.240 | 44.4 | QP | Neutral | 62.10 | -17.7 |
| 0.325 | 38.8 | QP | Neutral | 59.58 | -20.8 |
| 1.130 | 23.1 | Ave | Line | 46.00 | -22.9 |
| 0.160 | 42.3 | QP | Neutral | 65.46 | -23.2 |
| 24.000 | 20.3 | Ave | Line | 50.00 | -29.7 |
| 0.160 | 25.2 | Ave | Line | 55.46 | -30.3 |
| 1.130 | 24.4 | QP | Line | 56.00 | -31.6 |
| 24.000 | 23.4 | QP | Line | 60.00 | -36.6 |
| 0.160 | 27.4 | QP | Line | 65.46 | -38.1 |

**Plot of Conducted Emissions Test Data**

Plot(s) of Conducted Emissions Test Data is presented in the following page as reference.

Bay Area Compliance Laboratory Corp 09. Dec 05 16:39

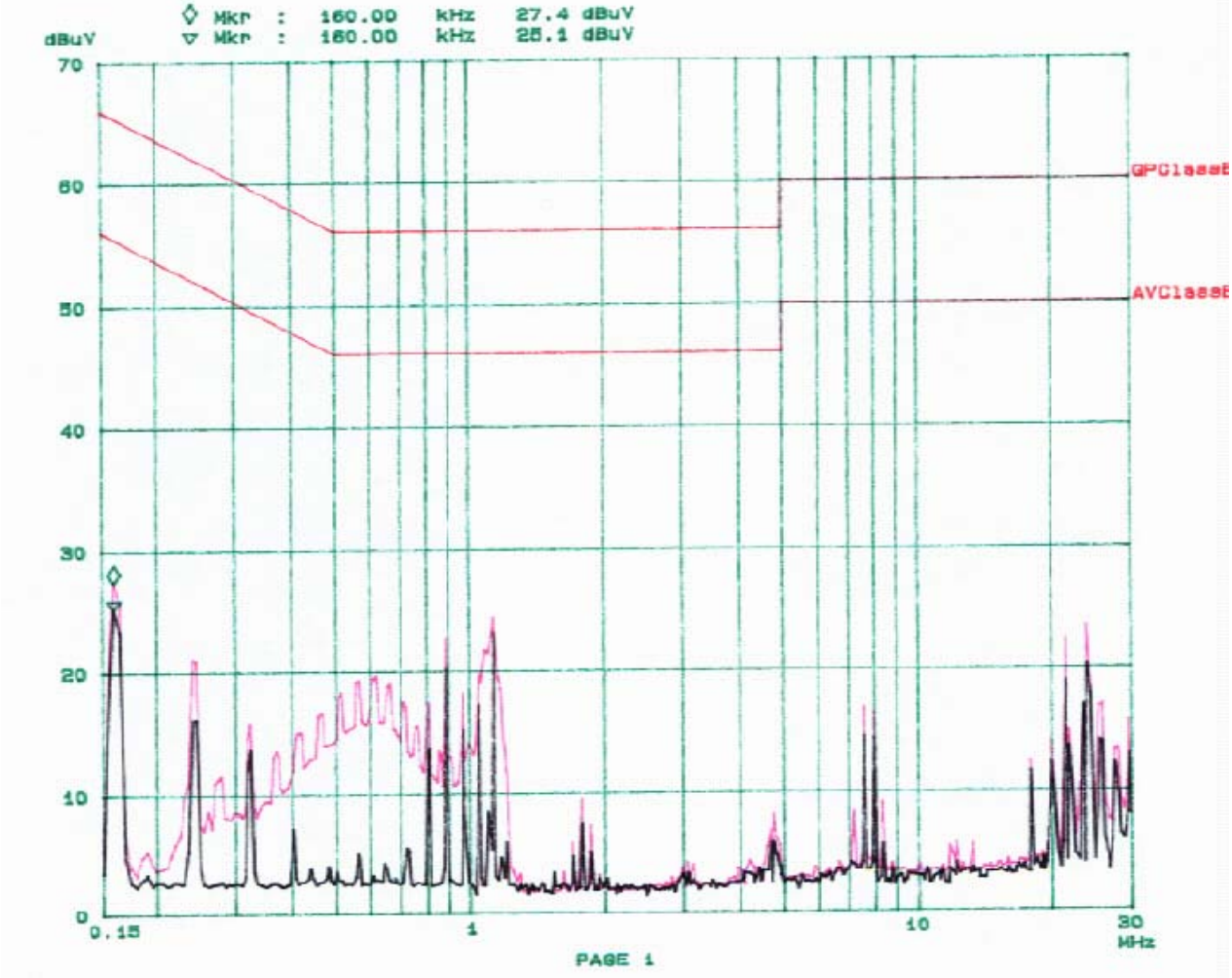
Class B

EUT: 2.4GHz digital cordless phone (CH-W808)
Manuf: Cheung Hung Electronics
Op Cond: Normal
Operator: Oscar
Comment: L
120VAC

12/09/05

Scan Settings (3 Ranges)

| Frequencies | | | Receiver Settings | | | | |
|---|---|---|---|---|---|---|---|
| Start | Stop | Step | IF BW | Detector | M-Time | Atten | Preamp |
| 150k | 1M | 5K | 9k | QP+AV | 20ms | 15dBLN | OFF |
| 1M | 5M | 10k | 9k | QP+AV | 1ms | 15dBLN | OFF |
| 5M | 30M | 100k | 9k | QP+AV | 1ms | 15dBLN | OFF |



Bay Area Compliance Laboratory Corp 09. Dec 05 17:13

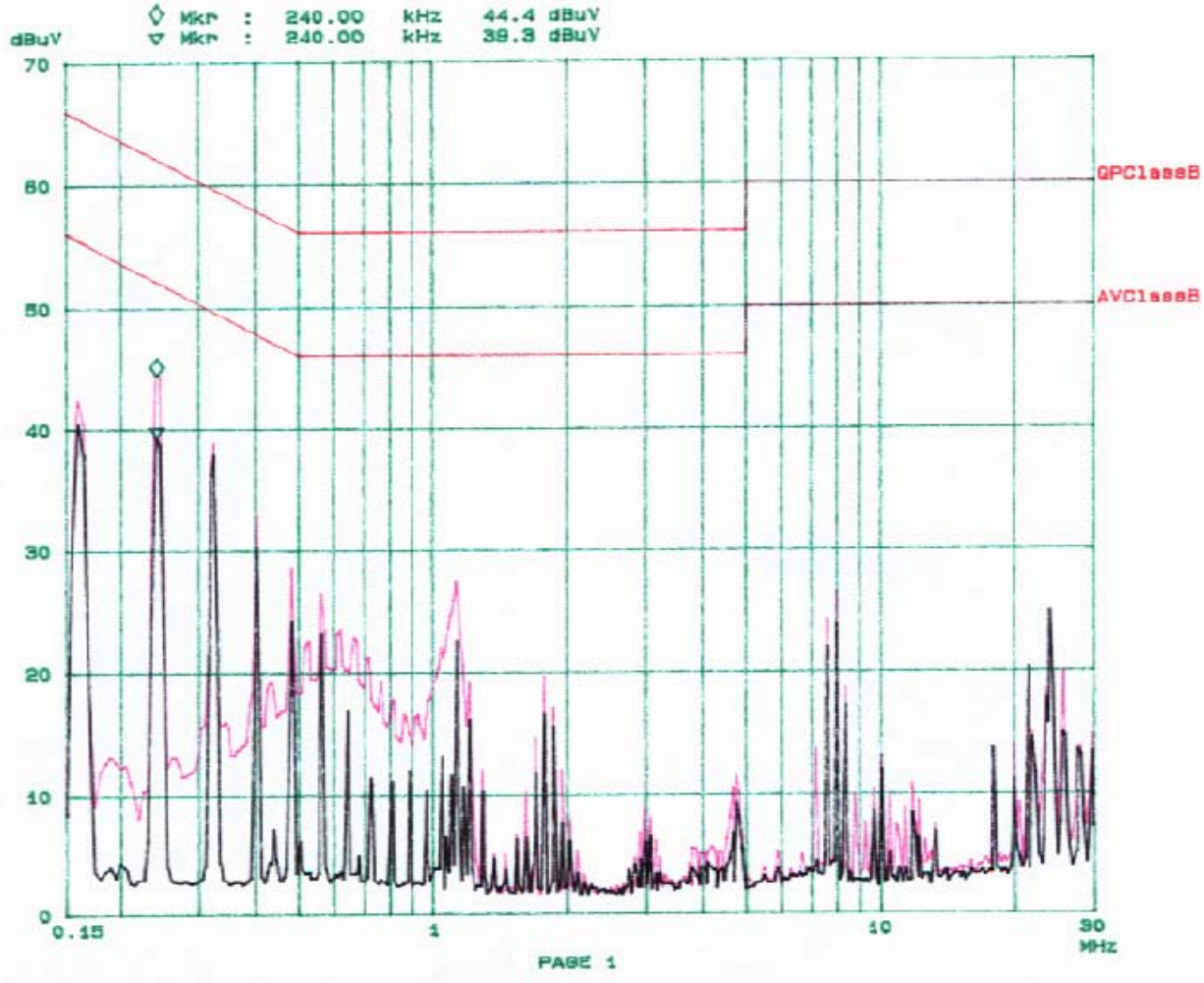
Class B

EUT: 2.4GHz digital cordless phone (CH-W808)
Manuf: Cheung Hung Electronics
Op Cond: Normal
Operator: Oscar
Comment: N
120VAC

12/09/05

Scan Settings (3 Ranges)

| Frequencies | | | Receiver Settings | | | | |
|---|---|---|---|---|---|---|---|
| Start | Stop | Step | IF BW | Detector | M-Time | Atten | Preamp |
| 150k | 1M | 5k | 9k | QP+AV | 20ms | 15dBLN | OFF |
| 1M | 5M | 10k | 9k | QP+AV | 1ms | 15dBLN | OFF |
| 5M | 30M | 100k | 9k | QP+AV | 1ms | 15dBLN | OFF |

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# §15.205 & §15.209 - RADIATED EMISSION

**Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

**Test Setup**

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with ANSI C63.4-2003. The specification used was the FCC 15 Subpart C limits.

**Spectrum Analyzer Setup**

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 25GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

| ***Frequency Range*** | ***RBW*** | ***Video B/W*** |
|---|---|---|
| Below 30MHz | 10kHz | 10kHz |
| 30 – 1000MHz | 100kHz | 100kHz |
| Above 1000MHz | 1MHz | 1MHz |

**Test Equipment List and Details**

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Amplifer, Pre | 8447D | 2944A10198 | 8/17/2005 |
| Agilent | Amplifier, Pre | 8449B | 3147A00400 | 10/05/2005 |
| Sunol Science Corp | Combination Antenna | JB1 Antenna | A013105 | 2/11/2005 |
| Rohde & Schewarz | EMI Test Receiver | ESCI 1166.595 0K03 | 100044 | 11/29/2005 |
| Sunol Science Corp | System Controller | SC99V | 122303-1 | N/R |
| Agilent | Amplifer, Pre | 8449B | 3008A01988 | 8/10/2005 |
| Sunol Science Corp | Horn Antenna | SAS-200/571 | 261 | 4/20/2005 |

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

**Test Procedure**

For the radiated emissions test, the EUT, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings performed only when an emission was found to be marginal (within -4 dBμV of specification limits), and are distinguished with a "**Qp**" in the data table.

**Corrected Amplitude & Margin Calculation**

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit.
The equation for margin calculation is as follows:

Margin = Corr. Ampl. - FCC 15.247 Limit

**Environmental Conditions**

| | |
|---|---|
| Temperature: | 15° C |
| Relative Humidity: | 45% |
| ATM Pressure: | 1009 mbar |

***The testing was performed by Oscar Au on 2005-12-18.***

**Summary of Test Results**

According to the data hereinafter, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209 and 15.247, and had the worst margin of:

**For Handset of EUT (TX Spurious Emission):**

**-11.5 dB** at **7203.0000 MHz** in the **Vertical** polarization, Low Channel

**-10.7 dB** at **7323.0000 MHz** in the **Horizontal** polarization, Middle Channel

**-8.2 dB** at **7446.0000MHz** in the **Vertical** polarization, High Channel

For Base of EUT:

**-7.7 dB** at **7203.0000MHz** in the **Vertical** *polarization*, Low Channel

**-5.4 dB** at **7323.0000MHz** in the Vertical polarization, Middle Channel

**-4.2 dB** at **7446.0000 MHz** in the **Vertical** polarization, High Channel

**For Handset of EUT(RX Spurious Emission):**

**-7.5 dB** at **538.30 MHz** in the **Horizontal** polarization, Unintentional Emission

For Base of EUT:

**-14.2dB** at **113.40MHz** in the **Horizontal** polarization, Unintentional Emission

**TX Radiated Emission Test Result**

For Handset of EUT ( TX Spurious Emission)

Low Channel, 1-25GHz

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | CORRECTED AMPLITUDE | FCC 15 SUBPART C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Meter Reading | Angle | Height | Polar | Antenna Loss | Cable Loss | Amp. | Corr. Ampl. | Limit | Margin | PK/AV/QP |
| MHz | dBμV | Degree | Meter | H/ V | dB | dB | dB | dBμV/m | dBμV/m | dB | |
| 2401.0000 | 117.8 | 90 | 2.5 | v | 28.7 | 2.0 | 35.8 | 112.6 | | | Fund/Peak |
| 2401.0000 | 122.6 | 0 | 2.0 | h | 28.7 | 2.0 | 35.8 | 117.4 | | | Fund/Peak |
| 2401.0000 | 65.5 | 90 | 2.5 | v | 28.7 | 2.0 | 35.8 | 60.3 | | | Ave |
| 2401.0000 | 66.8 | 0 | 2.0 | h | 28.7 | 2.0 | 35.8 | 61.6 | | | Ave |
| 7203.0000 | 36.2 | 270 | 1.5 | v | 36.7 | 4.3 | 34.7 | 42.5 | 54 | -11.5 | Ave |
| 7203.0000 | 36.0 | 60 | 2.0 | h | 36.7 | 4.3 | 34.7 | 42.3 | 54 | -11.7 | Ave |
| 7203.0000 | 54.6 | 270 | 1.5 | v | 36.7 | 4.3 | 34.7 | 60.9 | 74 | -13.1 | Peak |
| 7203.0000 | 53.3 | 60 | 2.0 | h | 36.7 | 4.3 | 34.7 | 59.6 | 74 | -14.4 | Peak |
| 4802.0000 | 58.0 | 90 | 1.5 | v | 32.5 | 3.1 | 34.8 | 58.8 | 74 | -15.2 | Peak |
| 4802.0000 | 57.4 | 340 | 1.8 | h | 32.5 | 3.1 | 34.8 | 58.2 | 74 | -15.8 | Peak |
| 4802.0000 | 34.7 | 90 | 1.5 | v | 32.5 | 3.1 | 34.8 | 35.5 | 54 | -18.5 | Ave |
| 4802.0000 | 34.5 | 340 | 1.8 | h | 32.5 | 3.1 | 34.8 | 35.3 | 54 | -18.7 | Ave |

Middle Channel, 1-25GHz

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | CORRECTED AMPLITUDE | FCC 15 SUBPART C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Meter Reading | Angle | Height | Polar | Antenna Loss | Cable Loss | Amp. | Corr. Ampl. | Limit | Margin | PK/AV/QP |
| MHz | dBμV | Degree | Meter | H/ V | dB | dB | dB | dBμV/m | dBμV/m | dB | |
| 2441.0000 | 119.3 | 270 | 1.0 | v | 28.7 | 2.0 | 35.8 | 114.1 | | | Fund/Peak |
| 2441.0000 | 121.6 | 180 | 3.0 | h | 28.7 | 2.0 | 35.8 | 116.4 | | | Fund/Peak |
| 2441.0000 | 64.8 | 270 | 1.0 | v | 28.7 | 2.0 | 35.8 | 59.6 | | | Ave |
| 2441.0000 | 67.1 | 180 | 3.0 | h | 28.7 | 2.0 | 35.8 | 61.9 | | | Ave |
| 7323.0000 | 37.0 | 90 | 1.8 | h | 36.7 | 4.3 | 34.7 | 43.3 | 54 | -10.7 | Ave |
| 7323.0000 | 36.9 | 180 | 2.0 | v | 36.7 | 4.3 | 34.7 | 43.2 | 54 | -10.8 | Ave |
| 7323.0000 | 55.5 | 90 | 1.8 | h | 36.7 | 4.3 | 34.7 | 61.8 | 74 | -12.2 | Peak |
| 7323.0000 | 52.6 | 180 | 2.0 | v | 36.7 | 4.3 | 34.7 | 58.9 | 74 | -15.1 | Peak |
| 4882.0000 | 57.3 | 270 | 2.0 | h | 32.5 | 3.1 | 34.8 | 58.1 | 74 | -15.9 | Peak |
| 4882.0000 | 35.3 | 270 | 2.0 | h | 32.5 | 3.1 | 34.8 | 36.1 | 54 | -17.9 | Ave |
| 4882.0000 | 34.8 | 90 | 2.0 | v | 32.5 | 3.1 | 34.8 | 35.6 | 54 | -18.4 | Ave |
| 4882.0000 | 53.8 | 90 | 2.0 | v | 32.5 | 3.1 | 34.8 | 54.6 | 74 | -19.4 | Peak |

High Channel, 1-25GHz

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | CORRECTED AMPLITUDE | FCC 15 SUBPART C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Meter Reading | Angle | Height | Polar | Antenna Loss | Cable Loss | Amp. | Corr. Ampl. | Limit | Margin | PK/AV/QP |
| MHz | dBμV | Degree | Meter | H/ V | dB | dB | dB | dBμV/m | dBμV/m | dB | |
| 2482.0000 | 115.3 | 300 | 1.5 | v | 28.7 | 2.0 | 35.8 | 110.1 | | | Fund/Peak |
| 2482.0000 | 121.3 | 180 | 1.5 | h | 28.7 | 2.0 | 35.8 | 116.1 | | | Fund/Peak |
| 2482.0000 | 67.1 | 300 | 1.5 | v | 28.7 | 2.0 | 35.8 | 61.9 | | | Ave |
| 2482.0000 | 67.6 | 180 | 1.5 | h | 28.7 | 2.0 | 35.8 | 62.4 | | | Ave |
| 7446.0000 | 59.5 | 90 | 2.0 | v | 36.7 | 4.3 | 34.7 | 65.8 | 74 | -8.2 | Peak |
| 7446.0000 | 38.0 | 90 | 2.0 | v | 36.7 | 4.3 | 34.7 | 44.3 | 54 | -9.7 | Ave |
| 7446.0000 | 37.3 | 200 | 1.5 | h | 36.7 | 4.3 | 34.7 | 43.6 | 54 | -10.4 | Ave |
| 7446.0000 | 57.0 | 200 | 1.5 | h | 36.7 | 4.3 | 34.7 | 63.3 | 74 | -10.7 | Peak |
| 4964.0000 | 59.8 | 0 | 1.5 | h | 32.5 | 3.1 | 34.8 | 60.6 | 74 | -13.4 | Peak |
| 4964.0000 | 56.2 | 270 | 1.8 | v | 32.5 | 3.1 | 34.8 | 57.0 | 74 | -17.0 | Peak |
| 4964.0000 | 36.0 | 0 | 1.5 | h | 32.5 | 3.1 | 34.8 | 36.8 | 54 | -17.2 | Ave |
| 4964.0000 | 35.5 | 270 | 1.8 | v | 32.5 | 3.1 | 34.8 | 36.3 | 54 | -17.7 | Ave |

**For Base of EUT (TX Spurious Emission)**

Low Channel, 1-25GHz

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | CORRECTED AMPLITUDE | FCC 15 SUBPART C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Meter Reading | Angle | Height | Polar | Antenna Loss | Cable Loss | Amp. | Corr. Ampl. | Limit | Margin | PK/AV/QP |
| MHz | dBμV | Degree | Meter | H/ V | dB | dB | dB | dBμV/m | dBμV/m | dB | |
| 2401.0000 | 124.3 | 90 | 2.0 | v | 28.7 | 2.0 | 35.8 | 119.1 | | | Fund/Peak |
| 2401.0000 | 114.7 | 180 | 1.5 | h | 28.7 | 2.0 | 35.8 | 109.5 | | | Fund/Peak |
| 2401.0000 | 68.8 | 90 | 2.0 | v | 28.7 | 2.0 | 35.8 | 63.6 | | | Ave |
| 2401.0000 | 57.4 | 180 | 1.5 | h | 28.7 | 2.0 | 35.8 | 52.2 | | | Ave |
| 7203.0000 | 60.0 | 90 | 1.5 | v | 36.7 | 4.3 | 34.7 | 66.3 | 74 | -7.7 | Peak |
| 3102.0000 | 69.0 | 180 | 1.8 | v | 29.8 | 2.5 | 35.2 | 66.2 | 74 | -7.8 | Peak |
| 7203.0000 | 58.2 | 180 | 2.0 | h | 36.7 | 4.3 | 34.7 | 64.5 | 74 | -9.5 | Peak |
| 3102.0000 | 66.5 | 90 | 1.5 | h | 29.8 | 2.5 | 35.2 | 63.7 | 74 | -10.3 | Peak |
| 3601.0000 | 65.3 | 180 | 1.8 | v | 30.0 | 2.7 | 34.8 | 63.2 | 74 | -10.8 | Peak |
| 7203.0000 | 36.8 | 90 | 1.5 | v | 36.7 | 4.3 | 34.7 | 43.1 | 54 | -10.9 | Ave |
| 7203.0000 | 36.5 | 180 | 2.0 | h | 36.7 | 4.3 | 34.7 | 42.8 | 54 | -11.2 | Ave |
| 4802.0000 | 35.8 | 270 | 2.4 | v | 32.5 | 3.1 | 34.8 | 36.6 | 54 | -17.4 | Ave |
| 4802.0000 | 54.4 | 180 | 1.5 | v | 32.5 | 3.1 | 34.8 | 55.2 | 74 | -18.8 | Peak |
| 4802.0000 | 34.2 | 180 | 2.3 | h | 32.5 | 3.1 | 34.8 | 35.0 | 54 | -19.0 | Ave |
| 3291.0000 | 56.8 | 160 | 2.0 | v | 29.8 | 2.5 | 35.2 | 54.0 | 74 | -20.0 | Peak |
| 3601.0000 | 36.0 | 180 | 1.8 | v | 30.0 | 2.7 | 34.8 | 33.9 | 54 | -20.1 | Ave |
| 3601.0000 | 55.6 | 30 | 2.2 | h | 30.0 | 2.7 | 34.8 | 53.5 | 74 | -20.5 | Peak |
| 3102.0000 | 36.2 | 180 | 1.8 | v | 29.8 | 2.5 | 35.2 | 33.4 | 54 | -20.6 | Ave |
| 3291.0000 | 35.5 | 160 | 2.0 | v | 29.8 | 2.5 | 35.2 | 32.7 | 54 | -21.3 | Ave |
| 3102.0000 | 35.5 | 90 | 1.5 | h | 29.8 | 2.5 | 35.2 | 32.7 | 54 | -21.3 | Ave |
| 3291.0000 | 55.2 | 180 | 2.5 | h | 29.8 | 2.5 | 35.2 | 52.4 | 74 | -21.6 | Peak |
| 3291.0000 | 35.2 | 180 | 2.5 | h | 29.8 | 2.5 | 35.2 | 32.4 | 54 | -21.6 | Ave |
| 4802.0000 | 50.3 | 180 | 2.3 | h | 32.5 | 3.1 | 34.8 | 51.1 | 74 | -22.9 | Peak |
| 3601.0000 | 33.1 | 30 | 2.2 | h | 30.0 | 2.7 | 34.8 | 31.0 | 54 | -23.0 | Ave |

Middle Channel, 1-25GHz

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | CORRECTED AMPLITUDE | FCC 15 SUBPART C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Meter Reading | Angle | Height | Polar | Antenna Loss | Cable Loss | Amp. | Corr. Ampl. | Limit | Margin | PK/AV/QP |
| MHz | dBμV | Degree | Meter | H/ V | dB | dB | dB | dBμV/m | dBμV/m | dB | |
| 2441.0000 | 119.1 | 90 | 1.0 | v | 28.7 | 2.0 | 35.8 | 113.9 | | | Fund/Peak |
| 2441.0000 | 124.8 | 180 | 1.2 | h | 28.7 | 2.0 | 35.8 | 119.6 | | | Fund/Peak |
| 2441.0000 | 66.7 | 90 | 1.2 | v | 28.7 | 2.0 | 35.8 | 61.5 | | | Ave |
| 2441.0000 | 67.3 | 180 | 1.2 | h | 28.7 | 2.0 | 35.8 | 62.1 | | | Ave |
| 7323.0000 | 62.3 | 90 | 1.5 | v | 36.7 | 4.3 | 34.7 | 68.6 | 74 | -5.4 | Peak |
| 3142.0000 | 69.0 | 180 | 1.8 | v | 29.8 | 2.5 | 35.2 | 66.2 | 74 | -7.8 | Peak |
| 7323.0000 | 59.7 | 180 | 2.0 | h | 36.7 | 4.3 | 34.7 | 66.0 | 74 | -8.0 | Peak |
| 3318.0000 | 68.0 | 180 | 2.5 | v | 29.8 | 2.5 | 35.2 | 65.2 | 74 | -8.8 | Peak |
| 7323.0000 | 37.3 | 90 | 1.5 | v | 36.7 | 4.3 | 34.7 | 43.6 | 54 | -10.4 | Ave |
| 7323.0000 | 37.1 | 180 | 2.0 | h | 36.7 | 4.3 | 34.7 | 43.4 | 54 | -10.6 | Ave |
| 3318.0000 | 62.7 | 60 | 1.8 | h | 29.8 | 2.5 | 35.2 | 59.9 | 74 | -14.1 | Peak |
| 3142.0000 | 59.9 | 90 | 1.5 | h | 29.8 | 2.5 | 35.2 | 57.1 | 74 | -16.9 | Peak |
| 4882.0000 | 34.8 | 270 | 1.8 | v | 32.5 | 3.1 | 34.8 | 35.6 | 54 | -18.4 | Ave |
| 4882.0000 | 34.3 | 180 | 1.5 | h | 32.5 | 3.1 | 34.8 | 35.1 | 54 | -18.9 | Ave |
| 3318.0000 | 37.3 | 180 | 2.5 | v | 29.8 | 2.5 | 35.2 | 34.5 | 54 | -19.5 | Ave |
| 4882.0000 | 53.1 | 270 | 1.8 | v | 32.5 | 3.1 | 34.8 | 53.9 | 74 | -20.1 | Peak |
| 3142.0000 | 36.2 | 180 | 1.8 | v | 29.8 | 2.5 | 35.2 | 33.4 | 54 | -20.6 | Ave |
| 3318.0000 | 35.5 | 60 | 1.8 | h | 29.8 | 2.5 | 35.2 | 32.7 | 54 | -21.3 | Ave |
| 3142.0000 | 34.5 | 90 | 1.5 | h | 29.8 | 2.5 | 35.2 | 31.7 | 54 | -22.3 | Ave |
| 4882.0000 | 50.1 | 180 | 1.5 | h | 32.5 | 3.1 | 34.8 | 50.9 | 74 | -23.1 | Peak |

High Channel, 1-25GHz

| INDICATED | | TABLE | ANTENNA | | CORRECTION FACTOR | | | CORRECTED AMPLITUDE | FCC 15 SUBPART C | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Meter Reading | Angle | Height | Polar | Antenna Loss | Cable Loss | Amp. | Corr. Ampl. | Limit | Margin | PK/AV/QP |
| MHz | dBμV | Degree | Meter | H/ V | dB | dB | dB | dBμV/m | dBμV/m | dB | |
| 2482.0000 | 122.9 | 160 | 2.0 | v | 28.7 | 2.0 | 35.8 | 117.7 | | | Fund/Peak |
| 2482.0000 | 117.1 | 200 | 1.2 | h | 28.7 | 2.0 | 35.8 | 111.9 | | | Fund/Peak |
| 2482.0000 | 67.2 | 160 | 2.0 | v | 28.7 | 2.0 | 35.8 | 62.0 | | | Ave |
| 2482.0000 | 66.8 | 200 | 1.2 | h | 28.7 | 2.0 | 35.8 | 61.6 | | | Ave |
| 7446.0000 | 63.5 | 300 | 2.0 | v | 36.7 | 4.3 | 34.7 | 69.8 | 74 | -4.2 | Peak |
| 3724.0000 | 70.7 | 160 | 2.0 | v | 30.0 | 2.7 | 34.8 | 68.6 | 74 | -5.4 | Peak |
| 7446.0000 | 60.8 | 180 | 2.0 | h | 36.7 | 4.3 | 34.7 | 67.1 | 74 | -6.9 | Peak |
| 3359.0000 | 68.8 | 180 | 2.0 | v | 29.8 | 2.5 | 35.2 | 66.0 | 74 | -8.0 | Peak |
| 7446.0000 | 38.5 | 300 | 2.0 | v | 36.7 | 4.3 | 34.7 | 44.8 | 54 | -9.2 | Ave |
| 7446.0000 | 37.9 | 180 | 2.0 | h | 36.7 | 4.3 | 34.7 | 44.2 | 54 | -9.8 | Ave |
| 3182.0000 | 65.6 | 180 | 1.8 | v | 29.8 | 2.5 | 35.2 | 62.8 | 74 | -11.2 | Peak |
| 3182.0000 | 62.4 | 160 | 2.0 | h | 29.8 | 2.5 | 35.2 | 59.6 | 74 | -14.4 | Peak |
| 3724.0000 | 61.5 | 180 | 2.0 | h | 30.0 | 2.7 | 34.8 | 59.4 | 74 | -14.6 | Peak |
| 4964.0000 | 55.8 | 200 | 1.8 | v | 32.5 | 3.1 | 34.8 | 56.6 | 74 | -17.4 | Peak |
| 4964.0000 | 35.2 | 200 | 2.0 | v | 32.5 | 3.1 | 34.8 | 36.0 | 54 | -18.0 | Ave |
| 4964.0000 | 34.7 | 30 | 2.1 | h | 32.5 | 3.1 | 34.8 | 35.5 | 54 | -18.5 | Ave |
| 3724.0000 | 37.2 | 160 | 2.0 | v | 30.0 | 2.7 | 34.8 | 35.1 | 54 | -18.9 | Ave |
| 3359.0000 | 57.6 | 180 | 2.0 | h | 29.8 | 2.5 | 35.2 | 54.8 | 74 | -19.2 | Peak |
| 3724.0000 | 36.2 | 180 | 2.0 | h | 30.0 | 2.7 | 34.8 | 34.1 | 54 | -19.9 | Ave |
| 3182.0000 | 36.3 | 180 | 1.8 | v | 29.8 | 2.5 | 35.2 | 33.5 | 54 | -20.5 | Ave |
| 3359.0000 | 35.8 | 180 | 2.0 | v | 29.8 | 2.5 | 35.2 | 33.0 | 54 | -21.0 | Ave |
| 3182.0000 | 35.8 | 160 | 2.0 | h | 29.8 | 2.5 | 35.2 | 33.0 | 54 | -21.0 | Ave |
| 3359.0000 | 34.2 | 180 | 2.0 | h | 29.8 | 2.5 | 35.2 | 31.4 | 54 | -22.6 | Ave |
| 4964.0000 | 49.9 | 30 | 2.0 | h | 32.5 | 3.1 | 34.8 | 50.7 | 74 | -23.3 | Peak |

***30MHz – 1GHz ( RX Spurious Emission)***

For Handset of EUT

| Indicated | | | Table | Antenna | | Correction Factor | | | FCC 15 Subpart B | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Ampl. | Direction | Height | Polar | Antenna | Cable Loss | Amp. | Corr. Ampl. | Limit | Margin |
| MHz | dBμV/m | Degree | Meter | H/V | dB | dB | dB | dBμV/m | dBμV/m | dB |
| 538.30 | 46.5 | 200 | 2.5 | H | 18.6 | 1.7 | 28.3 | 38.5 | 46 | -7.5 |
| 496.60 | 45.9 | 180 | 1.5 | H | 17.9 | 1.6 | 28.5 | 36.9 | 46 | -9.1 |
| 538.30 | 43.4 | 160 | 1.0 | V | 18.6 | 1.7 | 28.3 | 35.4 | 46 | -10.6 |
| 496.60 | 44.3 | 200 | 1.5 | V | 17.9 | 1.6 | 28.5 | 35.3 | 46 | -10.7 |
| 516.90 | 43.5 | 260 | 2.0 | H | 18.5 | 1.7 | 28.5 | 35.2 | 46 | -10.8 |
| 516.90 | 41.2 | 180 | 1.5 | V | 18.5 | 1.7 | 28.5 | 32.9 | 46 | -13.1 |
| 340.40 | 40.2 | 180 | 2.5 | H | 15.4 | 1.3 | 27.3 | 29.6 | 46 | -16.4 |
| 351.10 | 40.6 | 180 | 3.0 | H | 14.9 | 1.3 | 27.3 | 29.5 | 46 | -16.5 |
| 330.70 | 38.7 | 60 | 2.5 | H | 15.4 | 1.3 | 27.4 | 28.0 | 46 | -18.0 |
| 58.90 | 39.0 | 30 | 1.5 | V | 10.3 | 0.6 | 28.4 | 21.5 | 40 | -18.5 |
| 352.30 | 38.5 | 200 | 1.0 | V | 14.9 | 1.3 | 27.3 | 27.4 | 46 | -18.6 |

For Base of EUT

| Indicated | | | Table | Antenna | | Correction Factor | | | FCC 15 Subpart B | |
|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | Ampl. | Direction | Height | Polar | Antenna | Cable Loss | Amp. | Corr. Ampl. | Limit | Margin |
| MHz | dBμV/m | Degree | Meter | H/V | dB | dB | dB | dBμV/m | dBμV/m | dB |
| 113.40 | 45.1 | 180 | 3.0 | H | 11.7 | 0.8 | 28.3 | 29.3 | 43.5 | -14.2 |
| 175.50 | 41.5 | 180 | 2.5 | H | 13.4 | 1.0 | 27.7 | 28.2 | 43.5 | -15.3 |
| 466.63 | 39.7 | 180 | 1.5 | H | 17.1 | 1.6 | 28.3 | 30.1 | 46 | -15.9 |
| 82.80 | 41.3 | 200 | 2.0 | H | 9.6 | 0.7 | 28.5 | 23.1 | 40 | -16.9 |
| 113.40 | 42.2 | 100 | 1.5 | V | 11.7 | 0.8 | 28.3 | 26.4 | 43.5 | -17.1 |
| 82.80 | 40.5 | 300 | 1.0 | V | 9.6 | 0.7 | 28.5 | 22.3 | 40 | -17.7 |
| 175.50 | 38.9 | 200 | 1.0 | V | 13.4 | 1.0 | 27.7 | 25.6 | 43.5 | -17.9 |
| 466.63 | 36.8 | 240 | 1.0 | V | 17.1 | 1.6 | 28.3 | 27.2 | 46 | -18.8 |
| 134.40 | 38.4 | 60 | 1.5 | V | 12.6 | 0.8 | 28.1 | 23.8 | 43.5 | -19.8 |

AVG = average

# §15.247 (a) (1) - HOPPING CHANNEL SEPARATION

### Standard Applicable

According to §15.247(a)(1), frequency hopping system 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. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies.

### Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on a bench without connection to measurement instrument Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the Max-Hold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function, and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

### Test Equipment

| Manufacturer | Description | Model No. | Serial No. | Calibration Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2005 |

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### Environmental Conditions

| | |
|---|---|
| Temperature: | 15° C |
| Relative Humidity: | 46% |
| ATM Pressure: | 1009 mbar |

**The testing was performed by Oscar Au on 2005-12-18.*

**Measurement Results**

For Handset of EUT

| Channel | Frequency MHz | Channel Separation (MHz) |
|---|---|---|
| Low | 2401 | 0.865 |
| Mid | 2441 | 0.865 |
| High | 2482 | 0.865 |

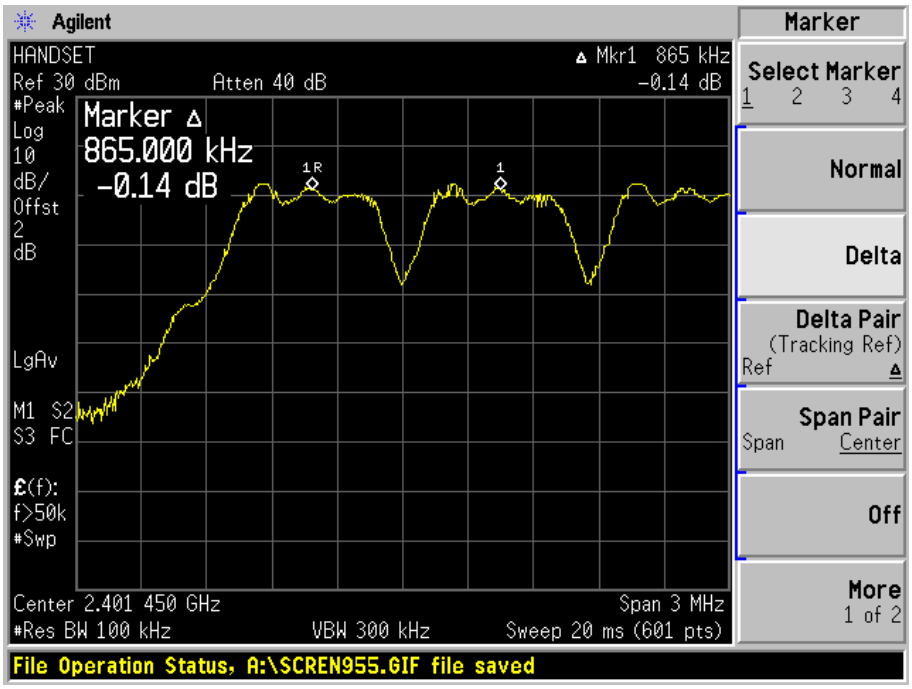
For Base of EUT

| Channel | Frequency MHz | Channel Separation (MHz) |
|---|---|---|
| Low | 2401 | 0.862 |
| Mid | 2441 | 0.88 |
| High | 2482 | 0.88 |

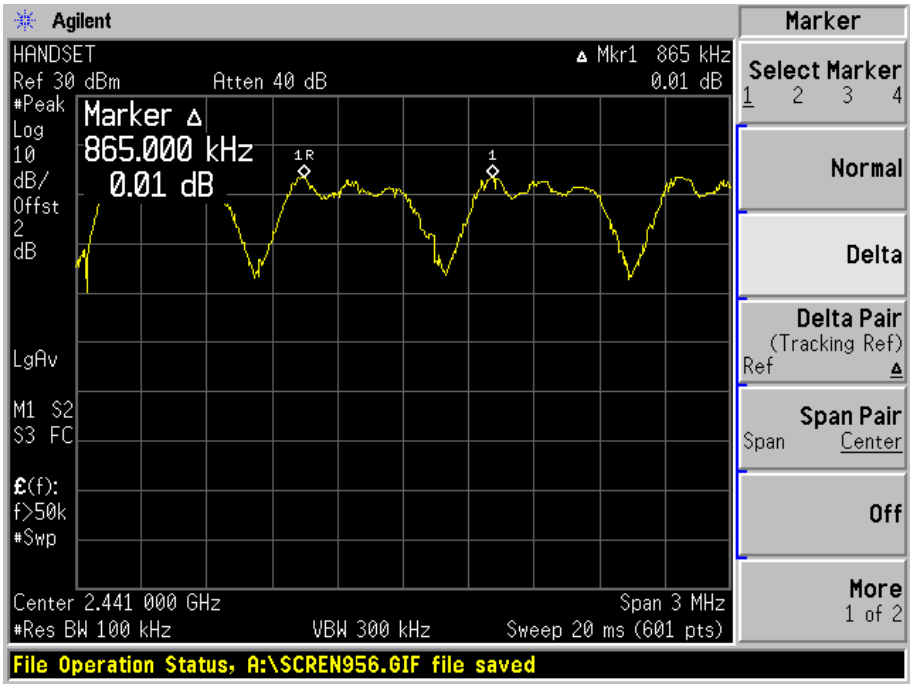
**Plots of Hopping Channel Separation**

Please refer to the following plots.

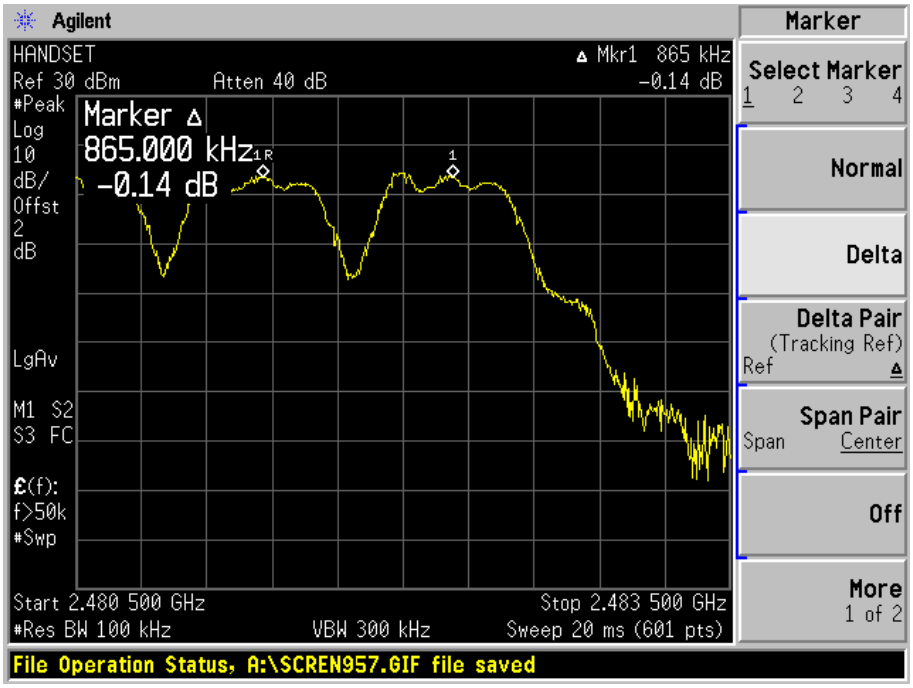
Handset of EUT, Low Channel



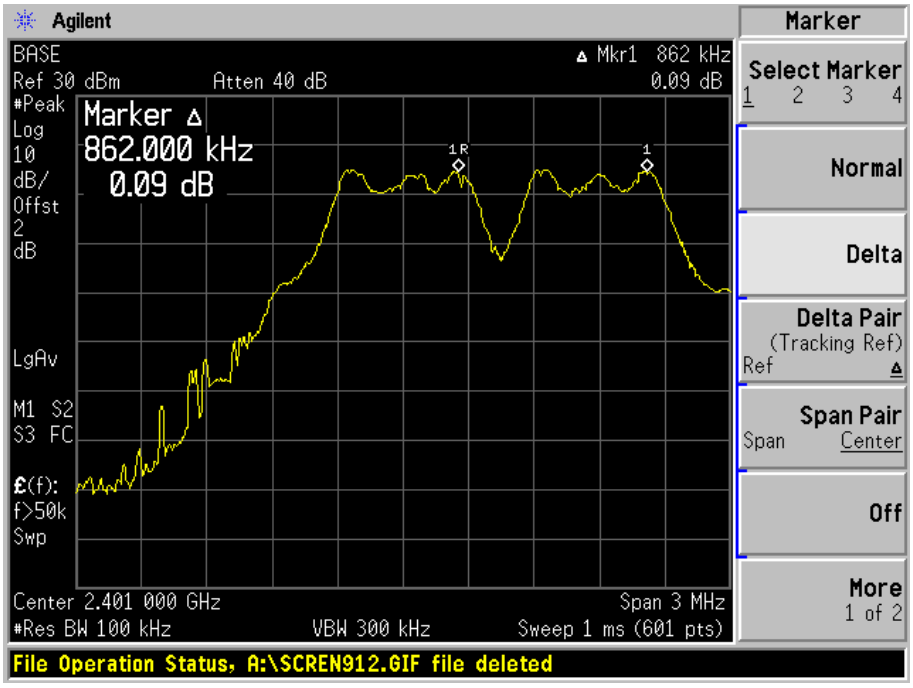

Handset of EUT, Middle Channel



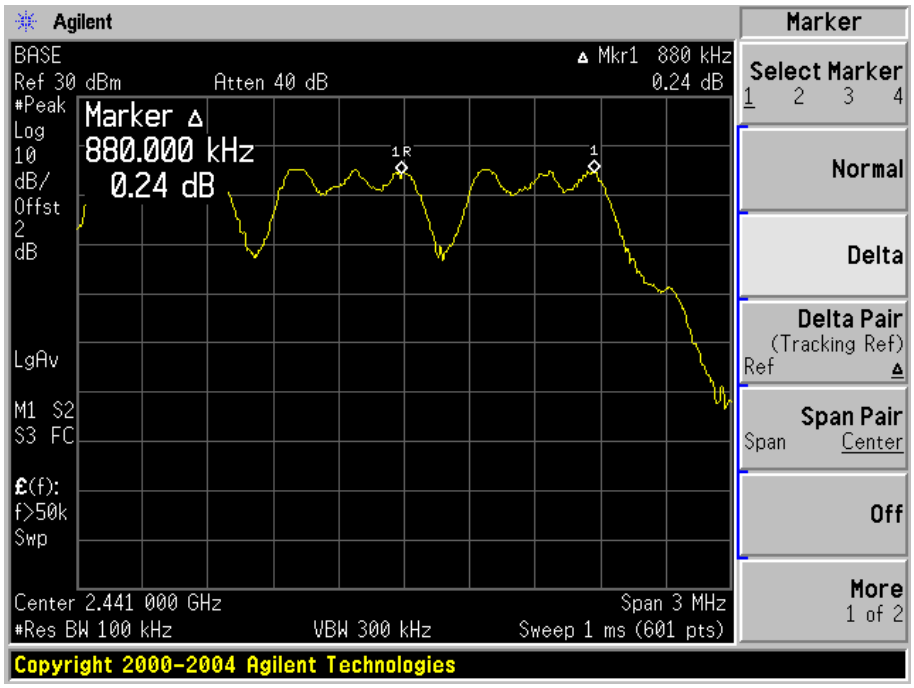
Handset of EUT, High Channel



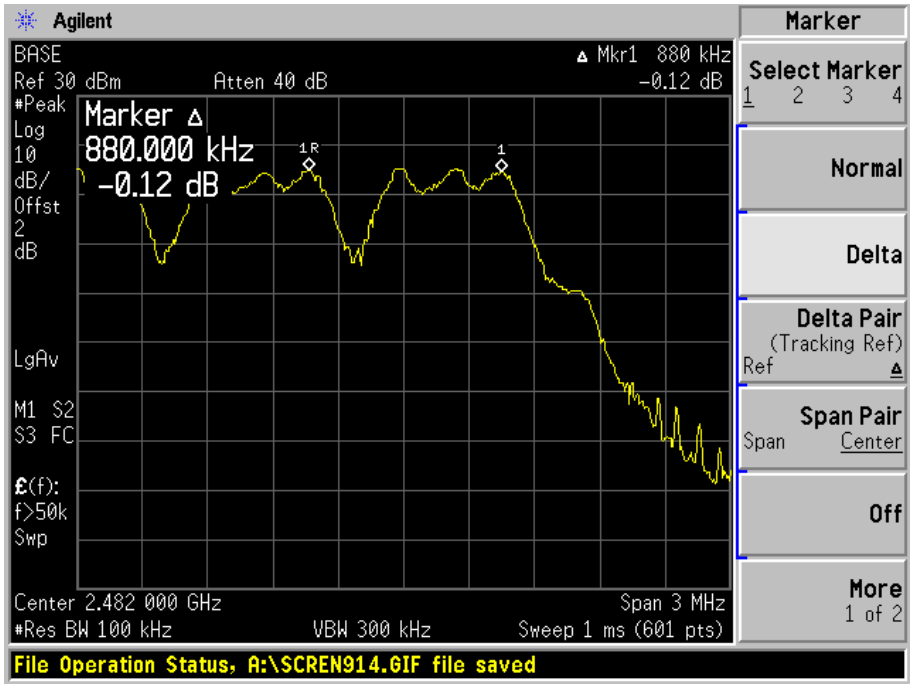

Base of EUT, Low Channel



Base of EUT, Middle Channel




Base of EUT, High Channel



# §15.247(a)(1) – 20 dB BANDWIDTH

### Standard Applicable

According to §15.247(a)(l), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

### Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### Equipment Lists

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2005 |

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### Measurement Result

#### Environmental Conditions

| | |
|---|---|
| Temperature: | 15° C |
| Relative Humidity: | 46% |
| ATM Pressure: | 1009 mbar |

***The testing was performed by Oscar Au on 2005-12-18.***

**Test Result**

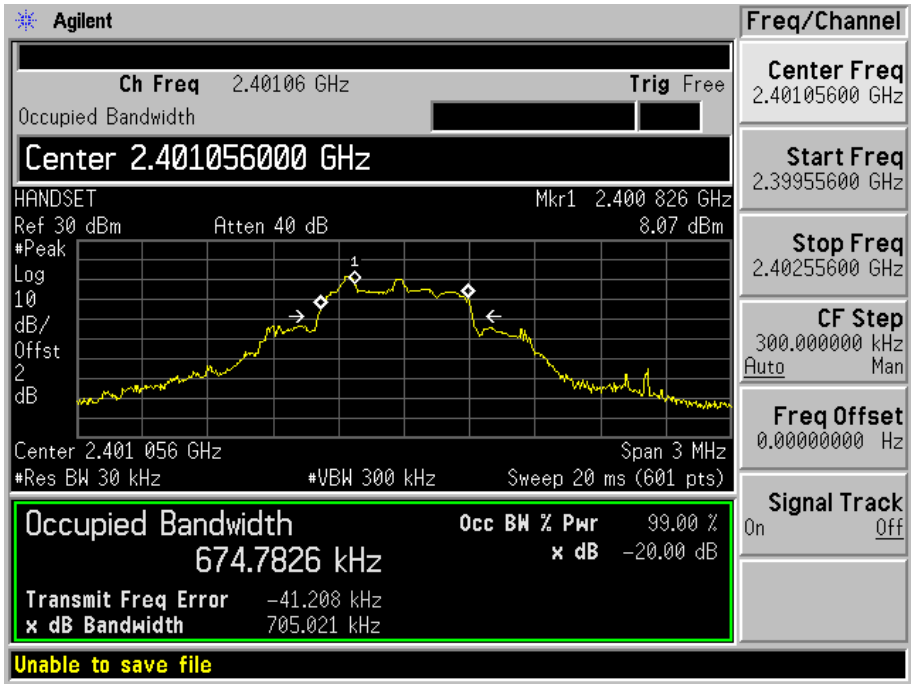
For Handset of EUT

| Channel | Frequency MHz | Channel Bandwidth (KHz) | Limit (KHz) | Result |
|---|---|---|---|---|
| Low | 2401 | 705.02 | <865 | Pass |
| Mid | 2441 | 690.05 | <865 | Pass |
| High | 2482 | 697.6 | <865 | Pass |

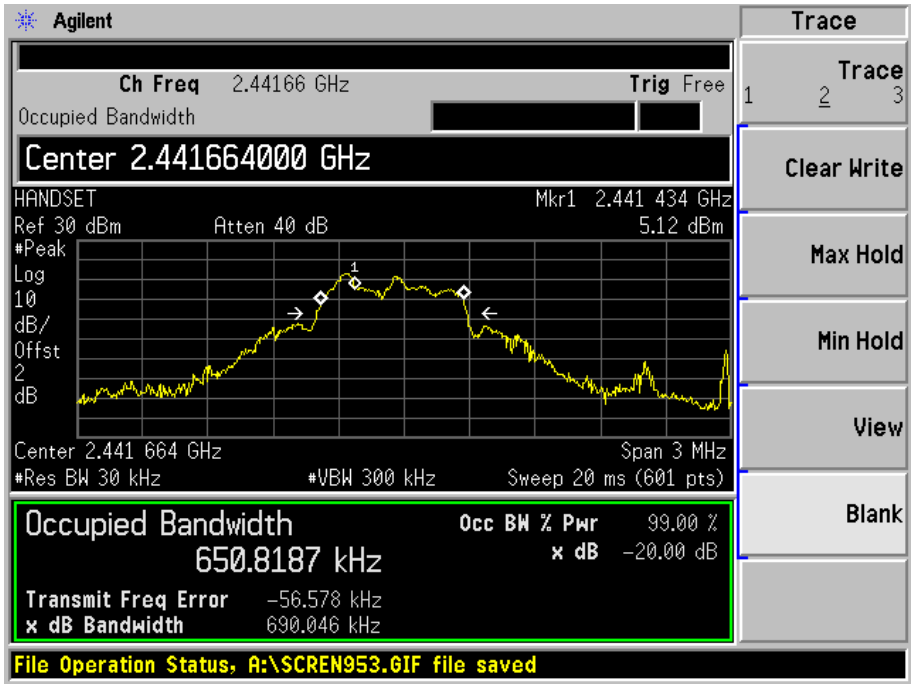
For Base of EUT

| Channel | Frequency MHz | Channel Bandwidth (KHz) | Limit (KHz) | Result |
|---|---|---|---|---|
| Low | 2401 | 682.75 | <862 | Pass |
| Mid | 2441 | 679.22 | <880 | Pass |
| High | 2482 | 693.14 | <880 | Pass |

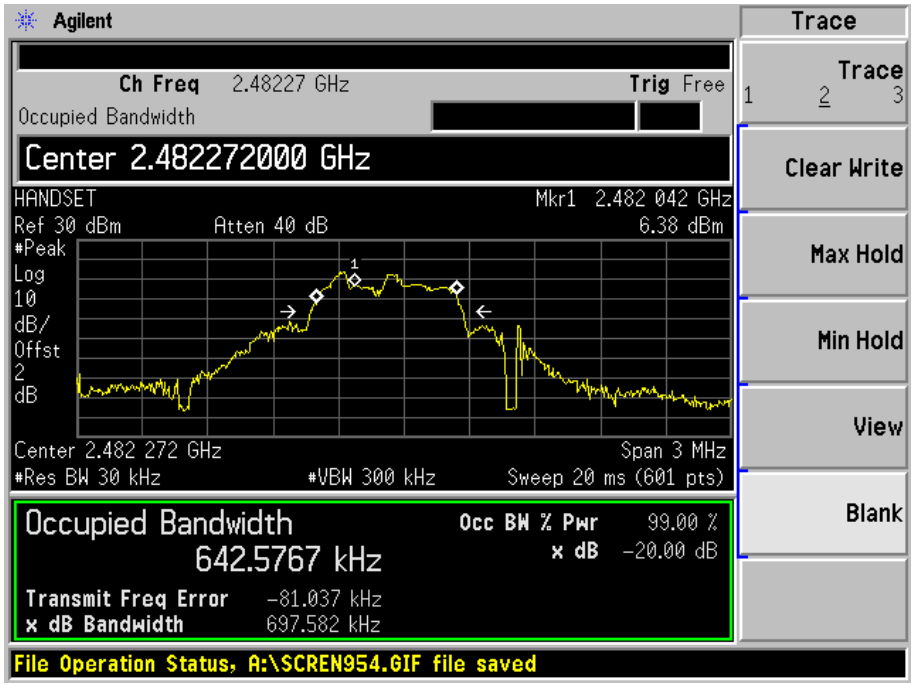
Handset of EUT, Low Channel



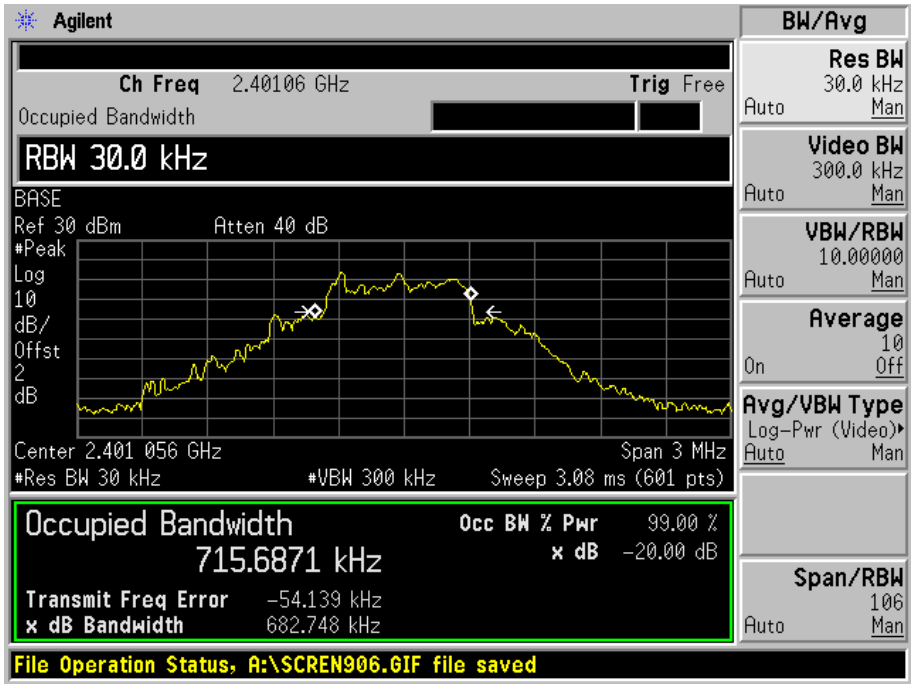

Handset of EUT, Mid. Channel



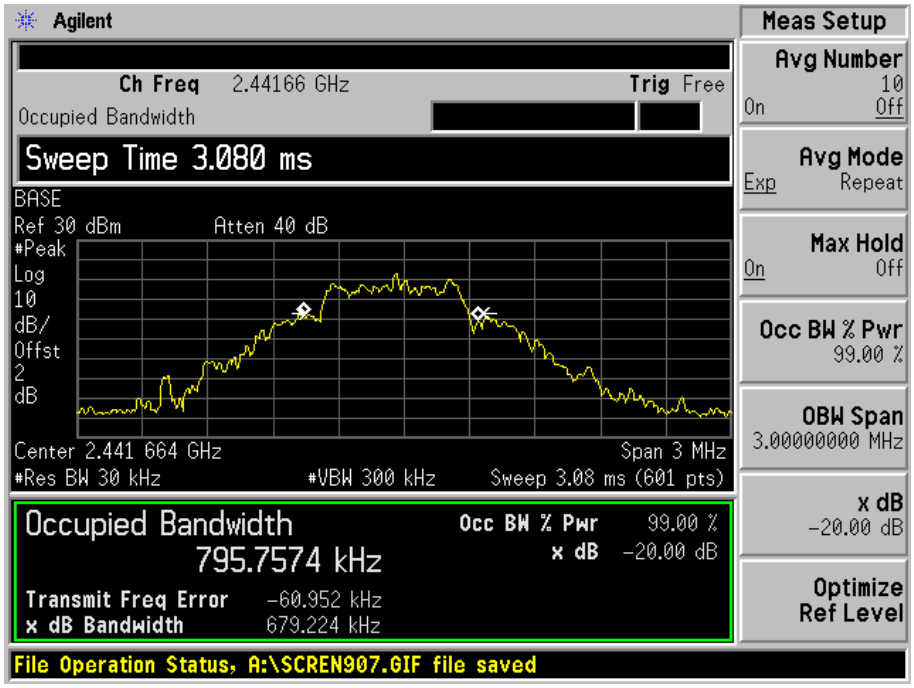
Handset of EUT, High Channel



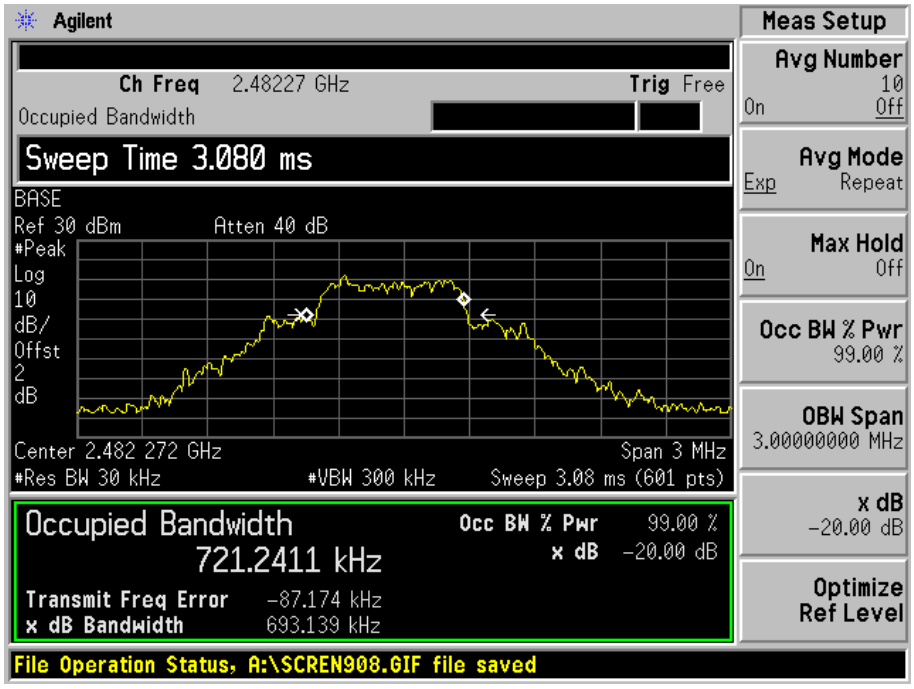
Base of EUT, Low Channel




Base of EUT, Mid. Channel



Base of EUT, High Channel



# §15.247 (a) (1) (iii) - NUMBER OF HOPPING FREQUENCY USED

**Standard Applicable**

According to §15.247(a)(1)(iii), frequency-hopping systems operating in the 2400-2483.5Mhz band shall use at least 15 hopping frequencies.

**Measurement Procedure**

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the bench without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set the SA on Max-Hold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4. Set the SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

**Test Equipment**

| Manufacturer | Description | Model No. | Serial No. | Calibration Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2005 |

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

**Environmental Conditions**

| | |
|---|---|
| Temperature: | 15° C |
| Relative Humidity: | 46% |
| ATM Pressure: | 1009 mbar |

**The testing was performed by Oscar Au on 2005-12-18.*

**Measurement Results**

For Handset of EUT

| Measurement | Standard | Result |
|---|---|---|
| 93 | >15 | Compliant |

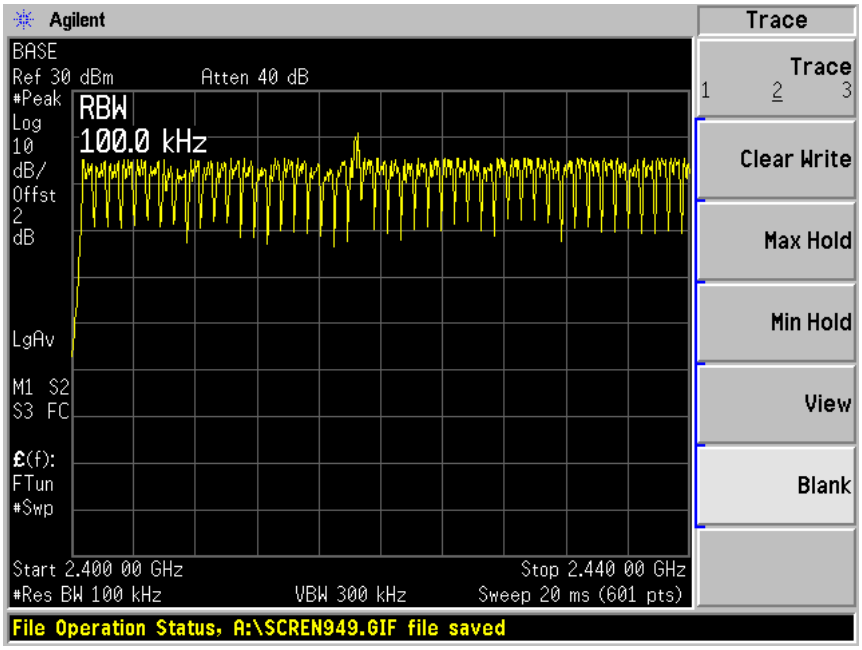
For Base of EUT

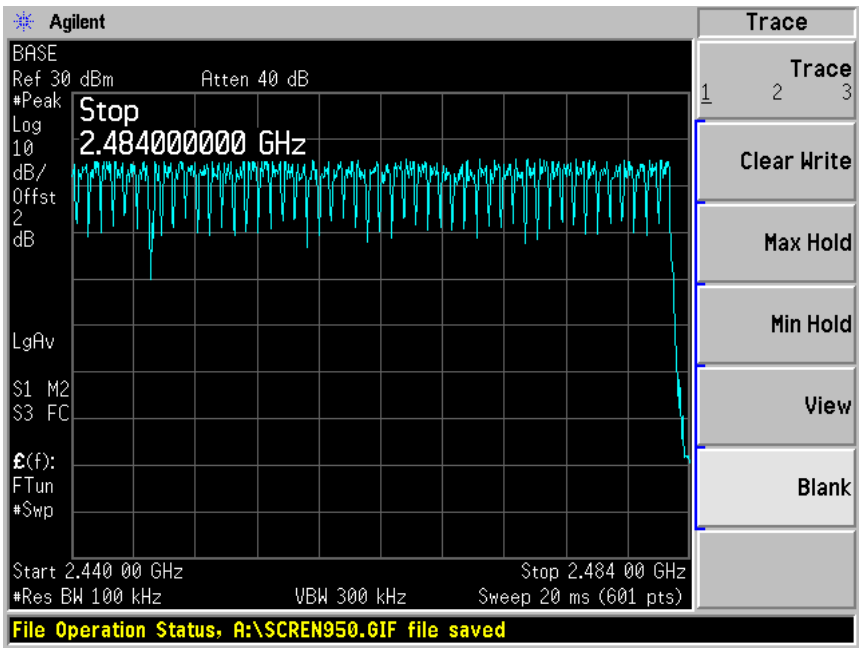
| Measurement | Standard | Result |
|---|---|---|
| 93 | >15 | Compliant |

**Plots of Number of Hopping Frequency**

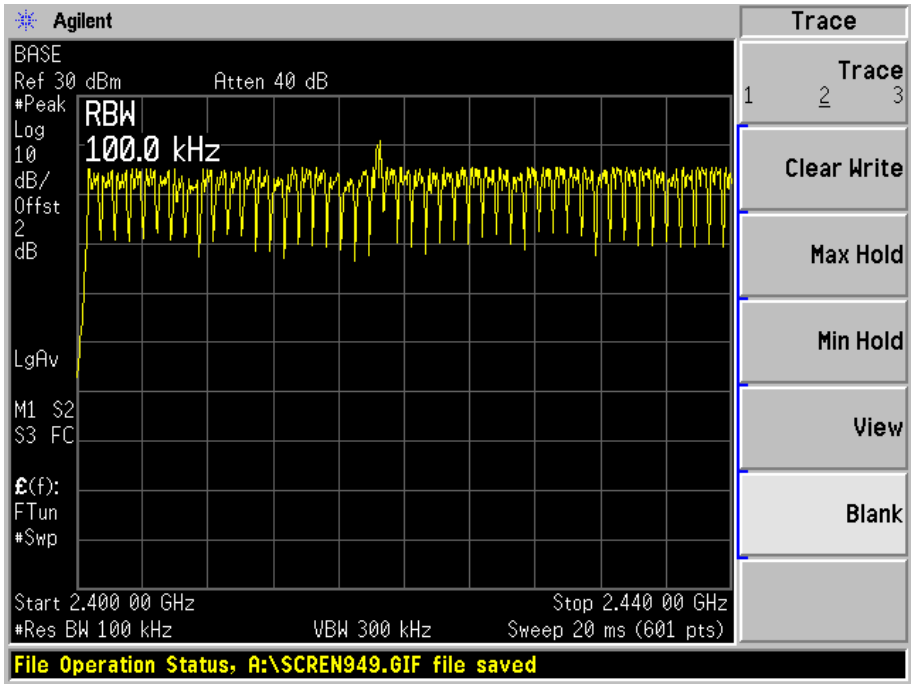
Please refer to the attached plots.

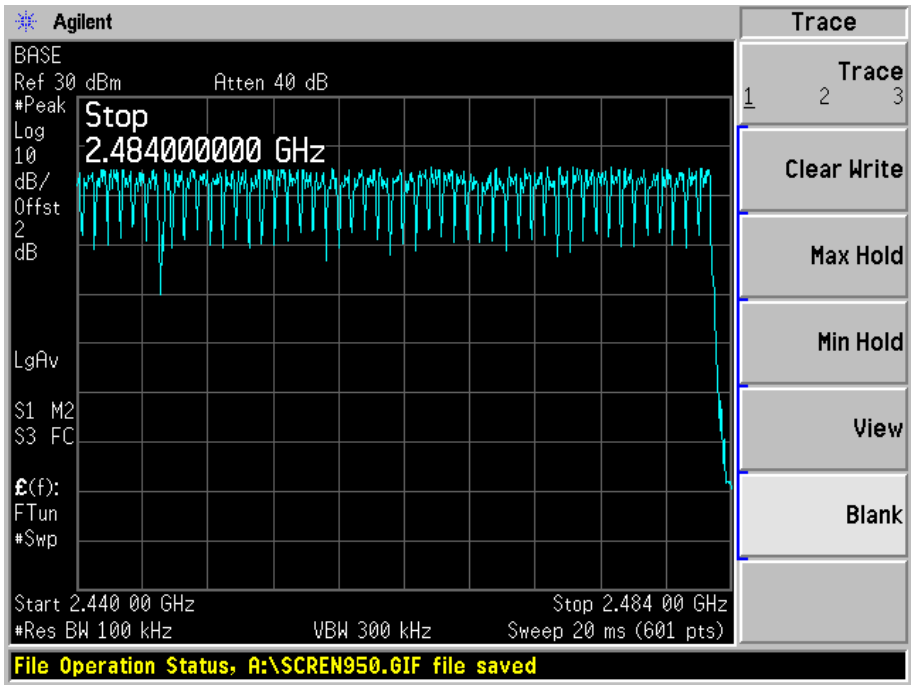
Handset of EUT



Base of EUT


Agilent
Trace
BASE
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
2
dB
RBW
100.0 kHz
LgAv
M1 S2
S3 FC
£(f):
FTun
#Swp
Start 2.400 00 GHz
Stop 2.440 00 GHz
#Res BW 100 kHz
VBW 300 kHz
Sweep 20 ms (601 pts)
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
File Operation Status, A:\SCREN949.GIF file saved


Agilent
Trace
BASE
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
2
dB
Stop
2.484000000 GHz
LgAv
S1 M2
S3 FC
£(f):
FTun
#Swp
Start 2.440 00 GHz
Stop 2.484 00 GHz
#Res BW 100 kHz
VBW 300 kHz
Sweep 20 ms (601 pts)
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
File Operation Status, A:\SCREN950.GIF file saved

# §15.247 (a) (1) (iii) - DWELL TIME

### Standard Applicable

According to §15.247 (a)(1)(iii), the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

### Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.

### Test Equipment

| Manufacturer | Description | Model No. | Serial No. | Calibration Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2005 |

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### Environmental Conditions

| | |
|---|---|
| Temperature: | 15° C |
| Relative Humidity: | 46% |
| ATM Pressure: | 1009 mbar |

**The testing was performed by Oscar Au on 2005-12-18.*

### Measurement Results

For Handset of EUT

| Channel | Frequency MHz | Pulse Wide uSec | Occupied time per 1 Sec | Dwell Time Sec | Limit Sec |
|---|---|---|---|---|---|
| Low | 2401 | 788.7 | 38 | 0.030 | 0.4 |
| Mid | 2441 | 788.7 | 38 | 0.030 | 0.4 |
| High | 2482 | 788.7 | 38 | 0.030 | 0.4 |

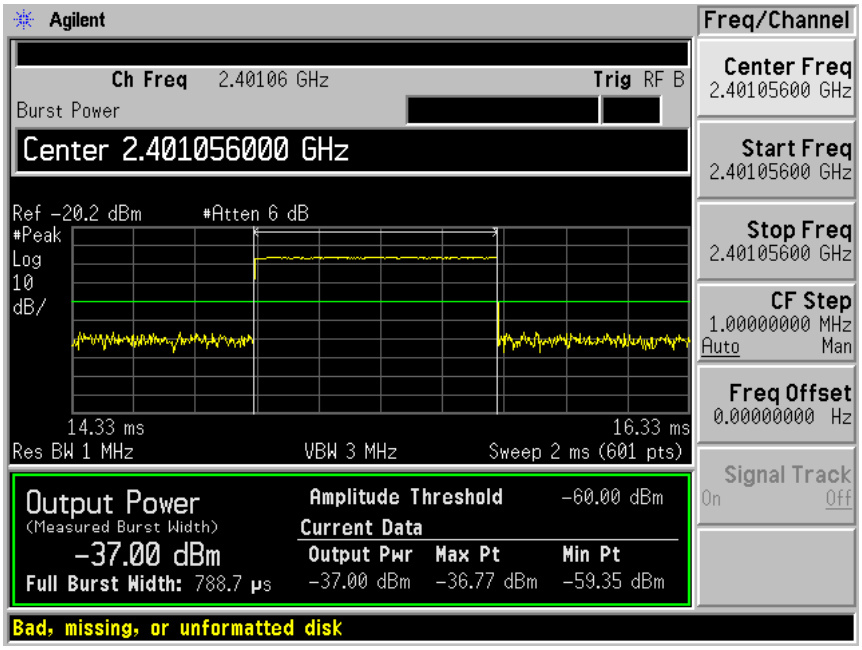
For Base of EUT

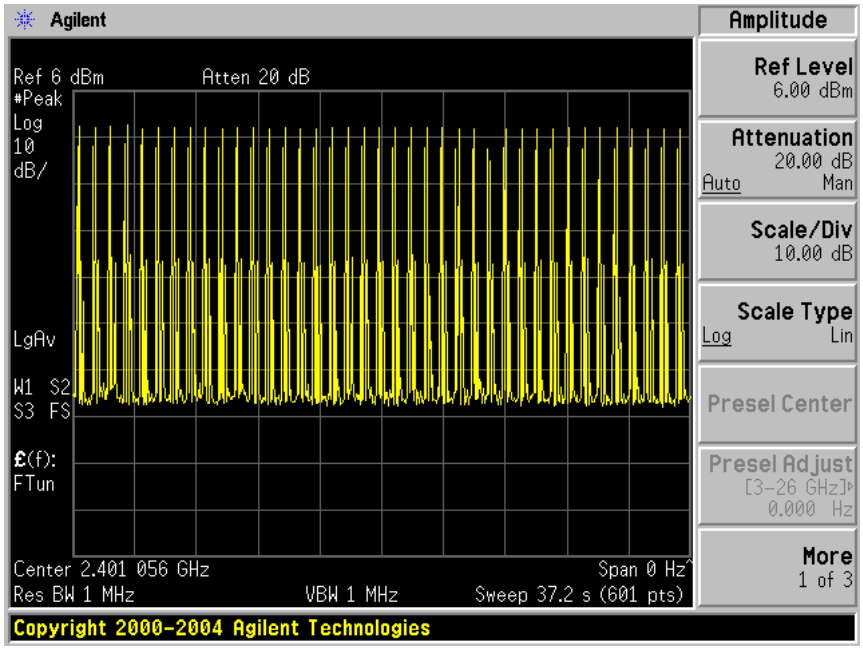
| Channel | Frequency MHz | Pulse Wide uSec | Occupied time per 1 Sec | Dwell Time Sec | Limit Sec |
|---|---|---|---|---|---|
| Low | 2401 | 213 | 44.64 | 0.009 | 0.4 |
| Mid | 2441 | 214 | 44.64 | 0.009 | 0.4 |
| High | 2482 | 213 | 44.64 | 0.009 | 0.4 |

**Plots of Dwell Time**

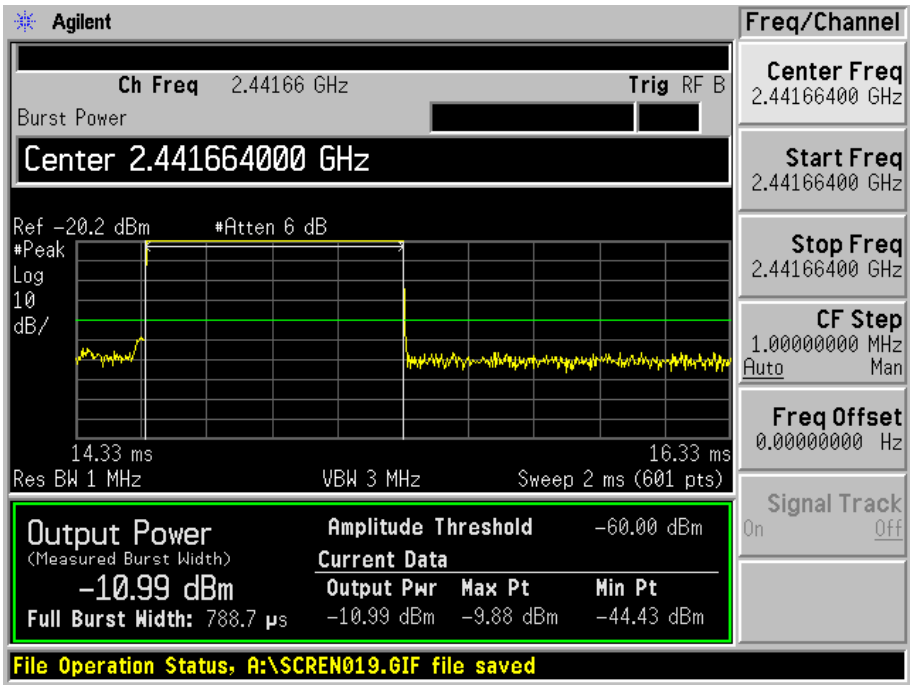
Please refer the following plots.

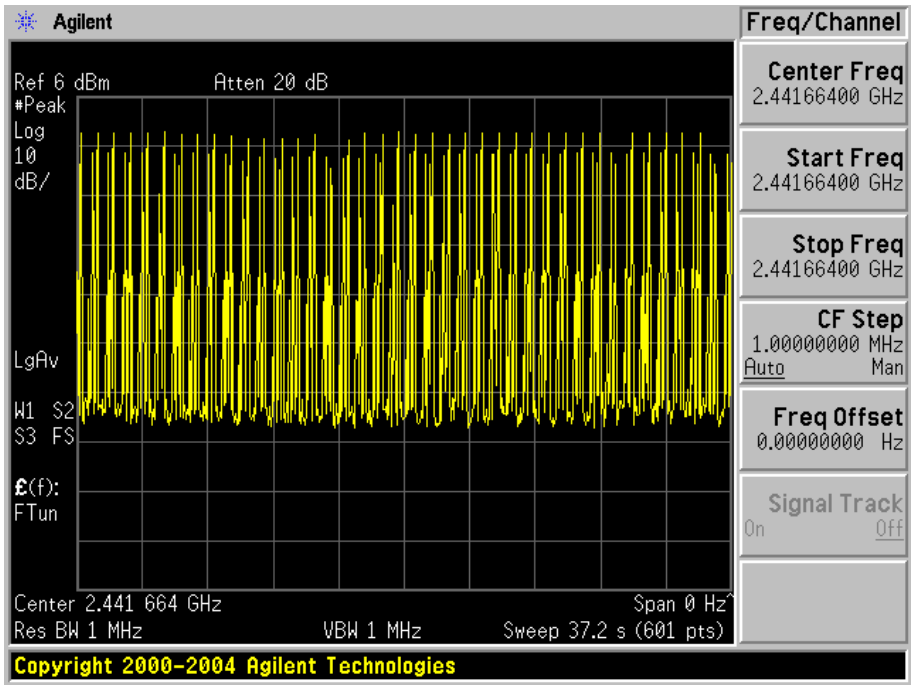
Handset of EUT, Low Channel



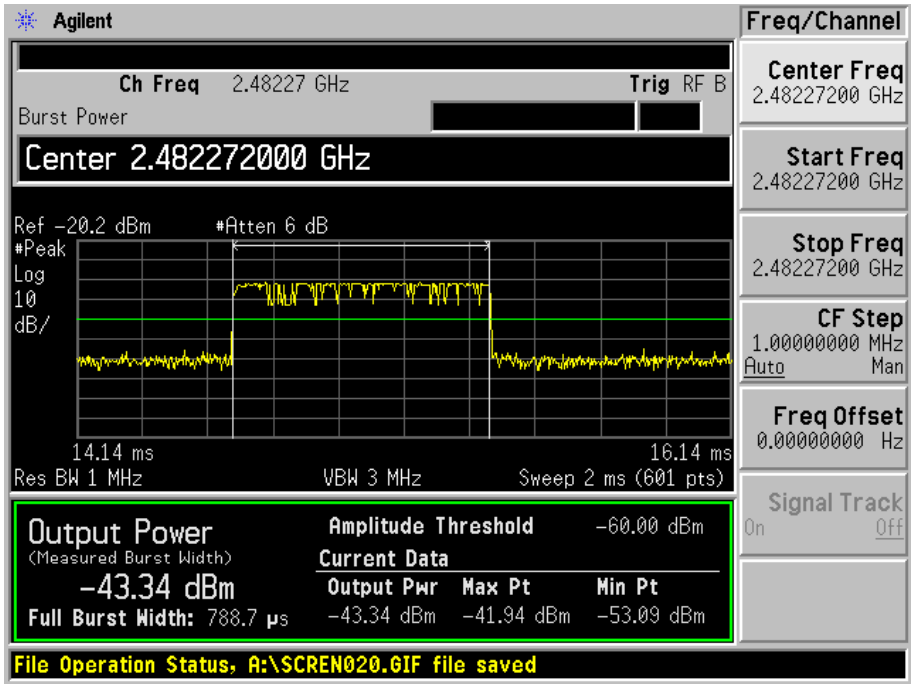



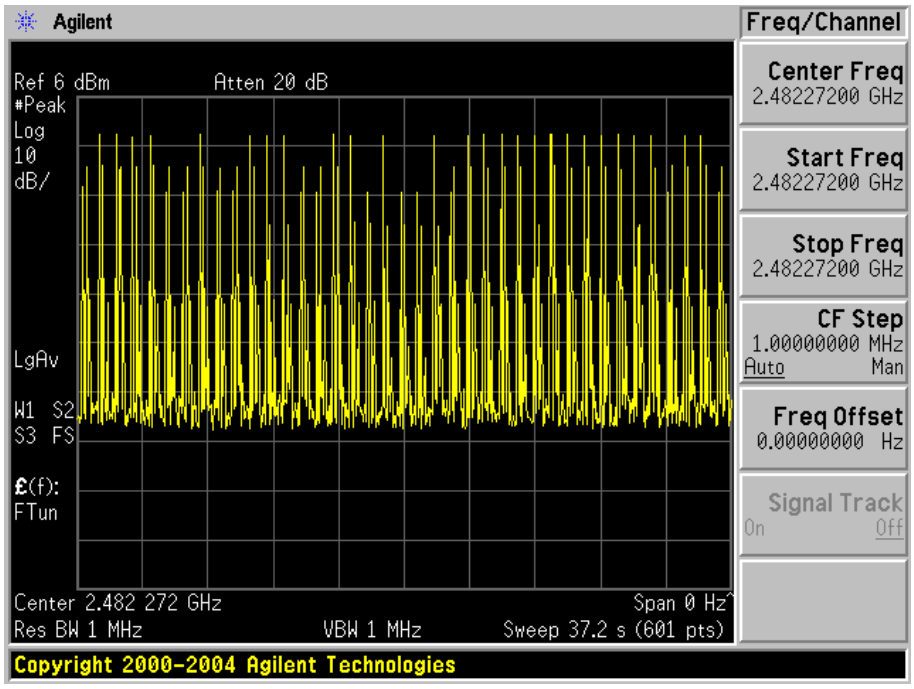
Handset of EUT, Middle Channel



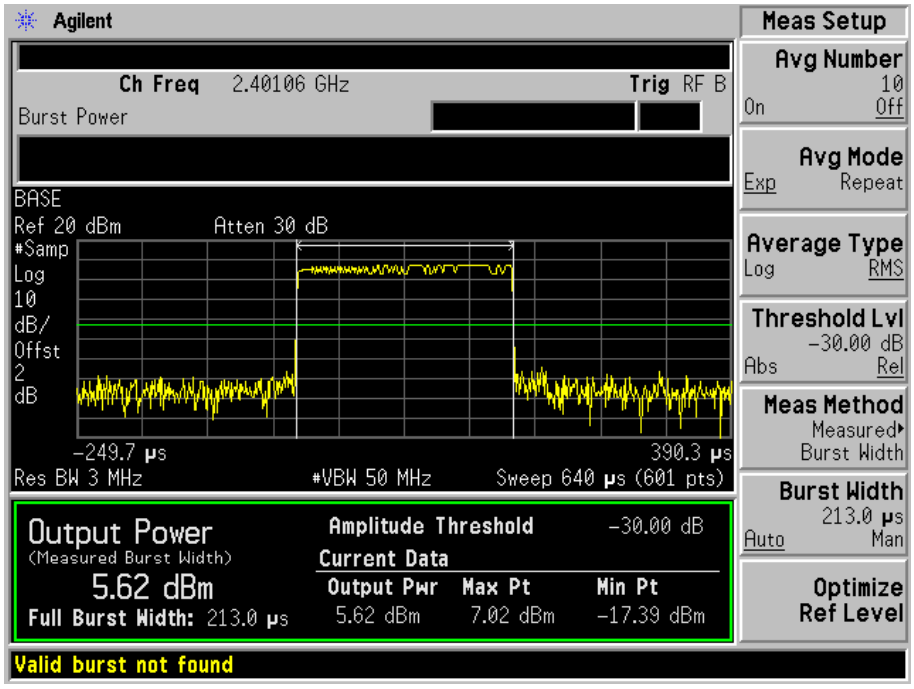



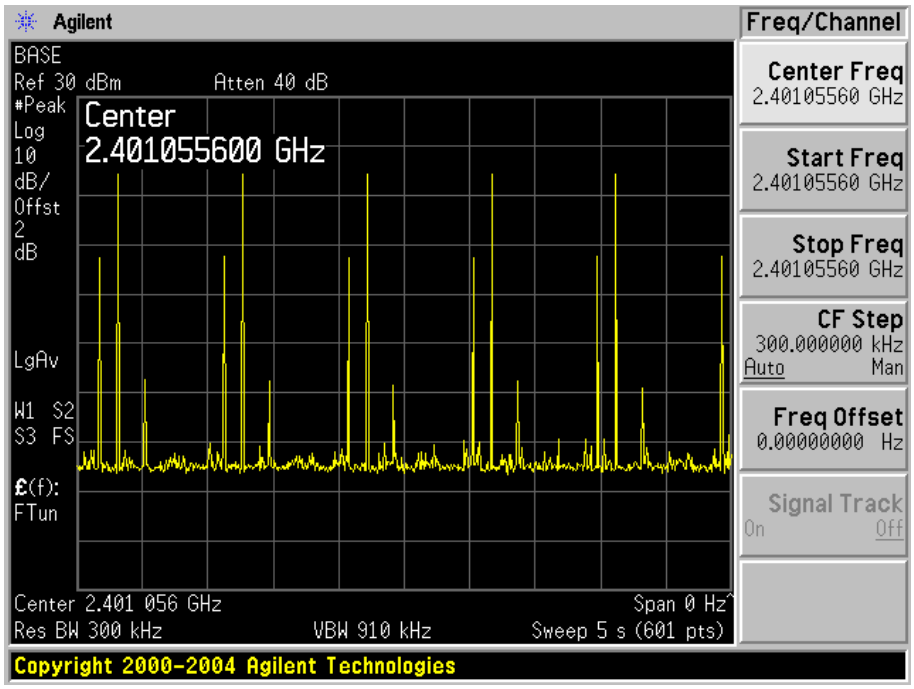
Handset of EUT, High Channel



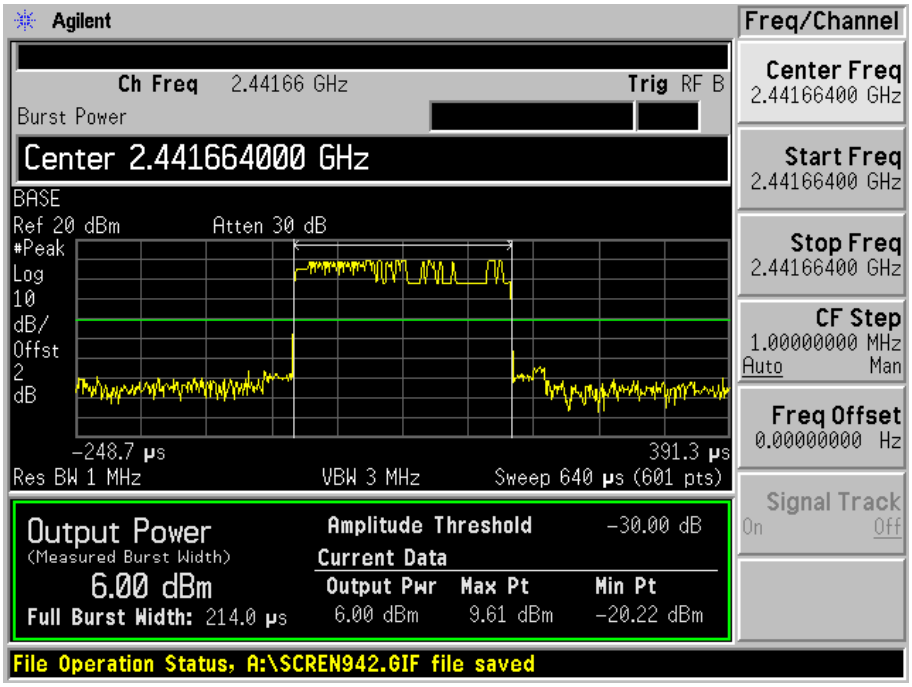



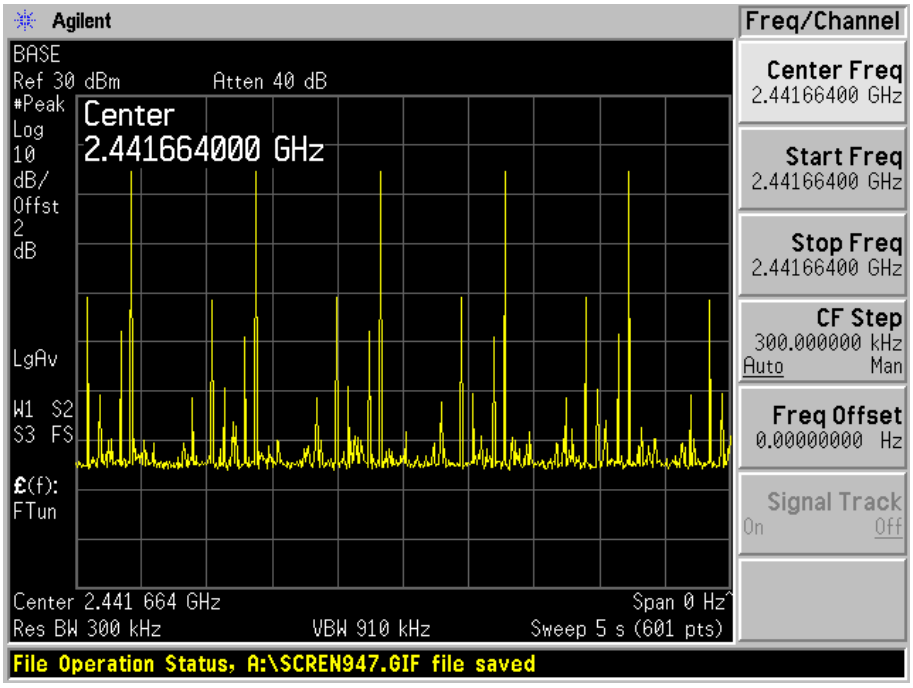
Base of EUT, Low Channel



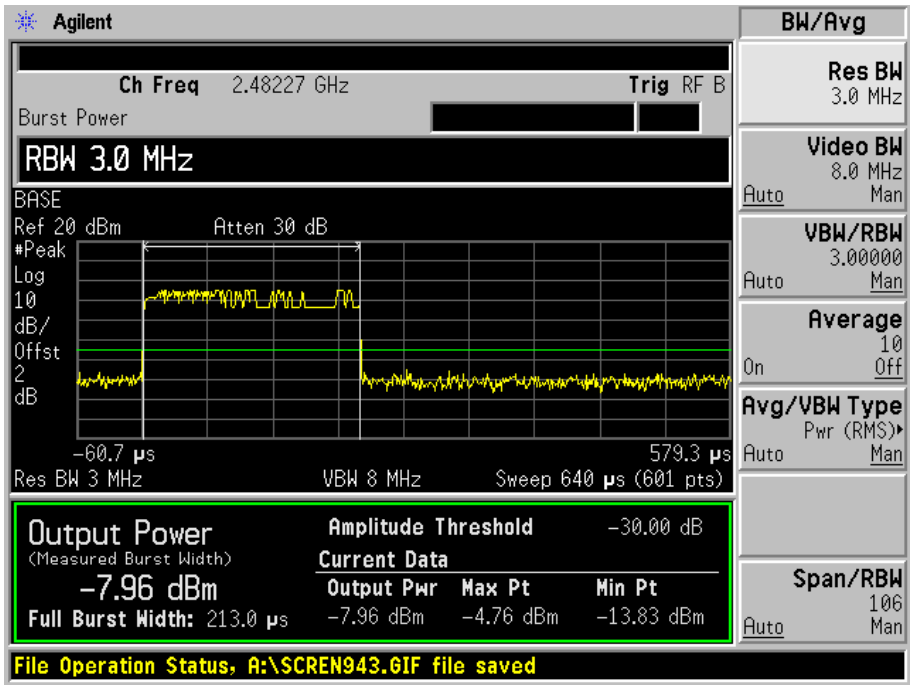



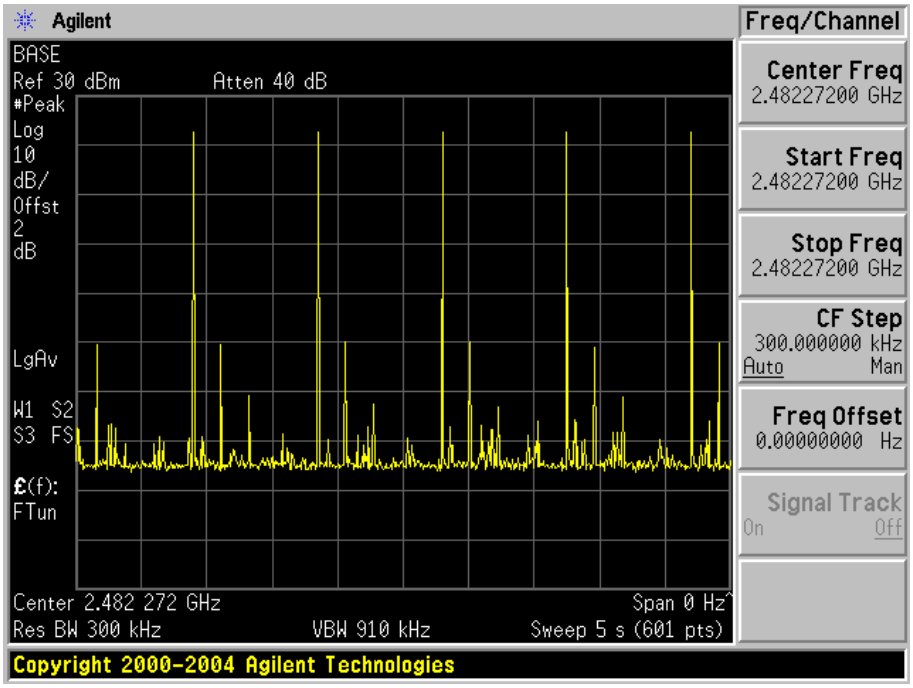
Base of EUT, Middle Channel



Base of EUT, High Channel



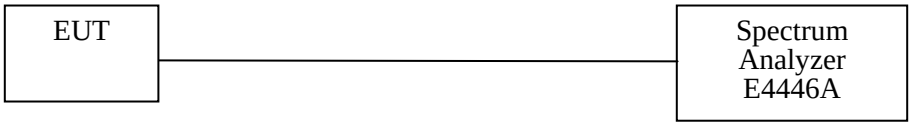
# §15.247(b)(1) - PEAK OUTPUT POWER MEASUREMENT

**Standard Applicable**

According to §15.247(b) (1), 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.

**Measurement Procedure**

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.




**Equipment Lists**

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2005 |

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

**Measurement Result**

**Environmental Conditions**

| | |
|---|---|
| Temperature: | 15° C |
| Relative Humidity: | 46% |
| ATM Pressure: | 1009 mbar |

***The testing was performed by Oscar Au on 2005-12-18.***

**Output Power**

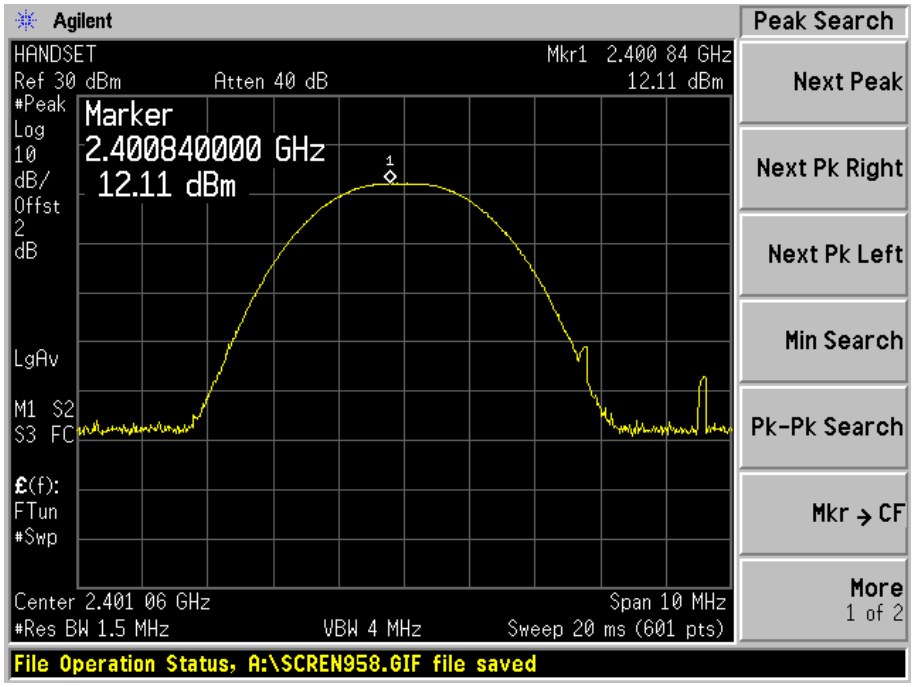
For Handset of EUT

| Channel | Frequency MHz | Max Peak Output Power (dBm) | (mW) | Limit (mW) | Result |
|---|---|---|---|---|---|
| Low | 2401 | 12.11 | 16.26 | 1000 | Pass |
| Mid | 2441 | 13.42 | 21.98 | 1000 | Pass |
| High | 2482 | 14.42 | 27.67 | 1000 | Pass |

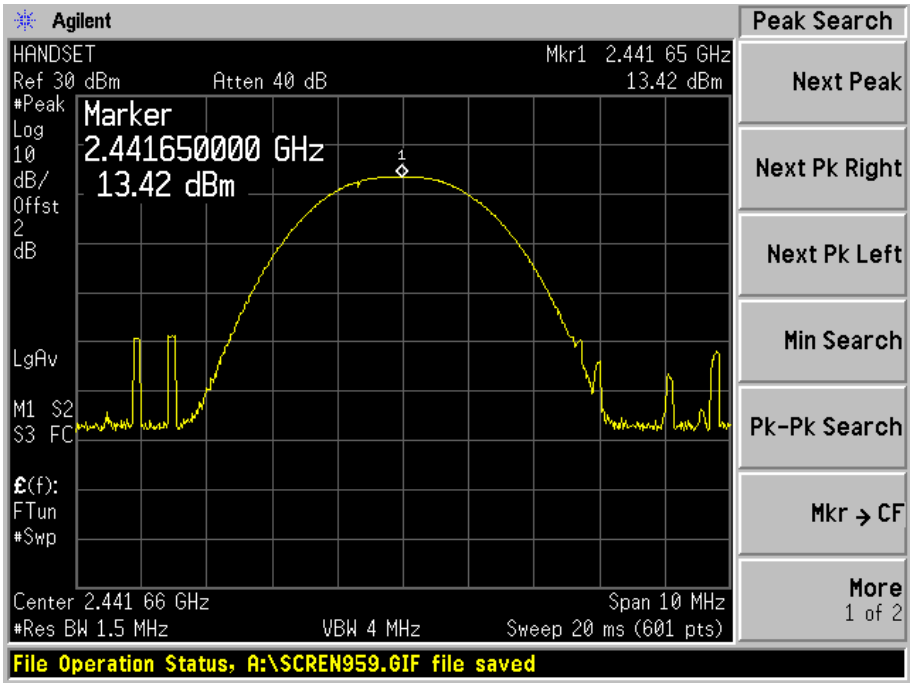
For Base of EUT

| Channel | Frequency MHz | Max Peak Output Power (dBm) | (mW) | Limit (mW) | Result |
|---|---|---|---|---|---|
| Low | 2401 | 15.12 | 32.51 | 1000 | Pass |
| Mid | 2441 | 15.31 | 33.96 | 1000 | Pass |
| High | 2482 | 15.36 | 34.36 | 1000 | Pass |

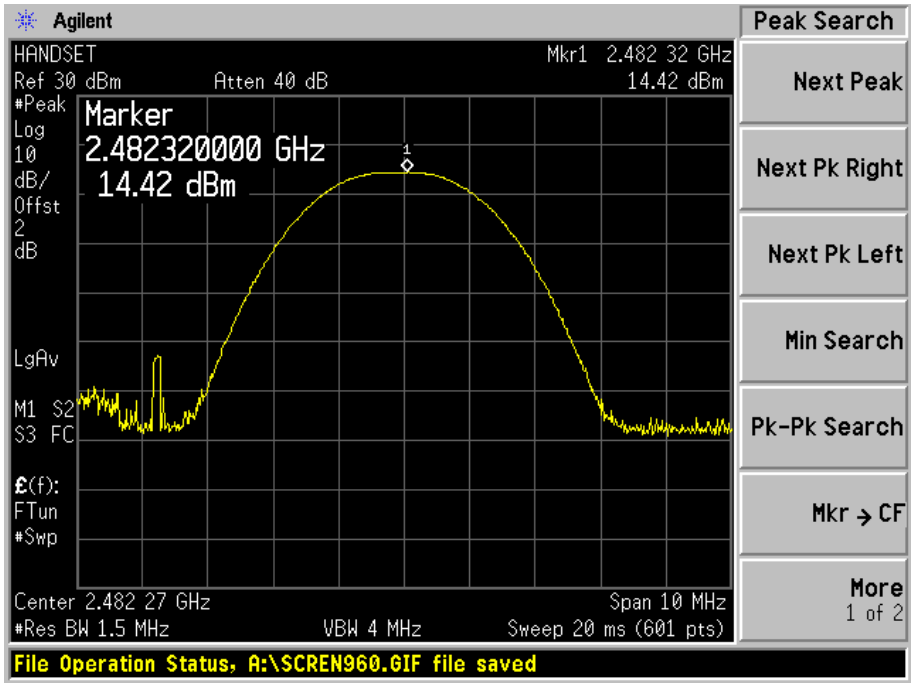
Handset of EUT, Low Channel



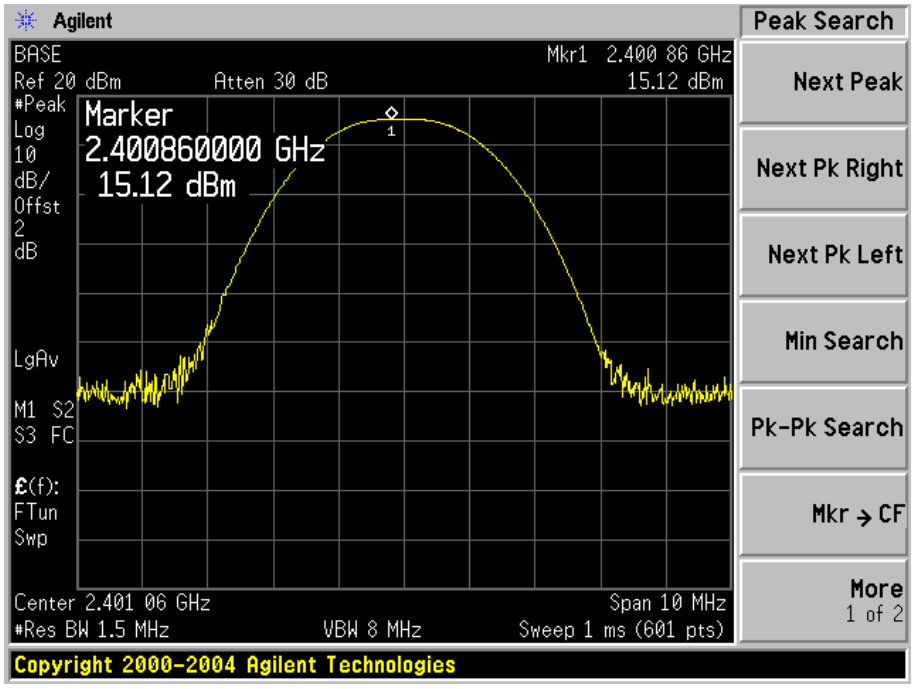

Handset of EUT, Mid. Channel



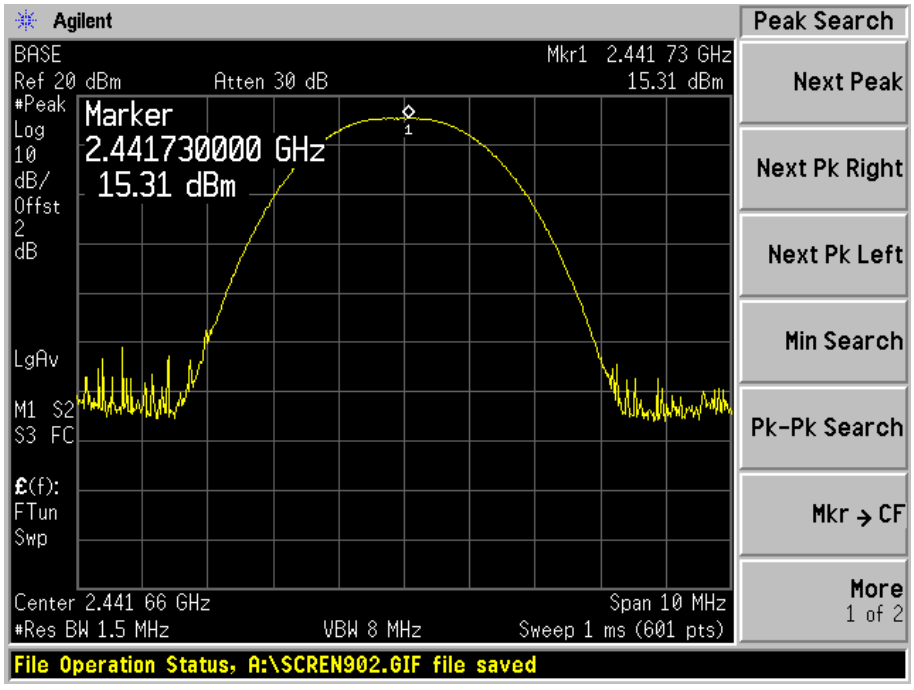
Handset of EUT, High Channel



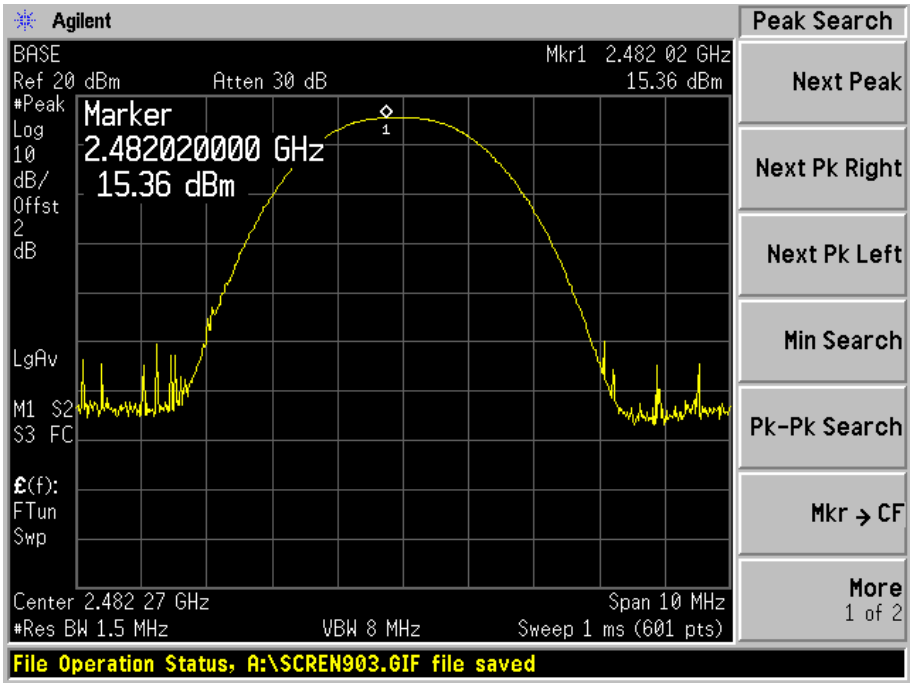
Base of EUT, Low Channel




Base of EUT, Middle Channel



Base of EUT, High Channel



# §15.247 (e)(i) - RF EXPOSURE

According to §15.247(b)(5) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

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

f = frequency in MHz
* = Plane-wave equivalent power density

**MPE Prediction**

Predication of MPE limit at a given distance

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

$S = PG/4\pi R^2$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Base:

Maximum peak output power at antenna input terminal: 15.36 (dBm)
Maximum peak output power at antenna input terminal: 34.36 (mW)
Prediction distance: 20 (cm)
Predication frequency: 2400 (MHz)
Antenna Gain (typical): 0 (dBi)
Maximum antenna gain: 1 (numeric)
Power density at predication frequency at 20 cm: 0.0068(mW/cm^2)
MPE limit for uncontrolled exposure at prediction frequency: 1.0 (mW/cm^2)

**Test Result**

The predicted power density level at 20 cm is 0.006 mW/cm^2. This is below the uncontrolled exposure limit of 1mW/cm^2 at 2400 MHz. The EUT is used at least 20cm away from user's body. It is determined as mobile equipment.

## TCB Exclusions List For Portable Device

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

| Exposure category | low threshold | high threshold |
|---|---|---|
| general population | $(60/f_{GHz})$ mW, $d < 2.5$ cm<br>$(120/f_{GHz})$ mW, $d \geq 2.5$ cm | $(900/f_{GHz})$ mW, $d < 20$ cm |
| occupational | $(375/f_{GHz})$ mW, $d < 2.5$ cm<br>$(900/f_{GHz})$ mW, $d \geq 2.5$ cm | $(2250/f_{GHz})$ mW, $d < 20$ cm |

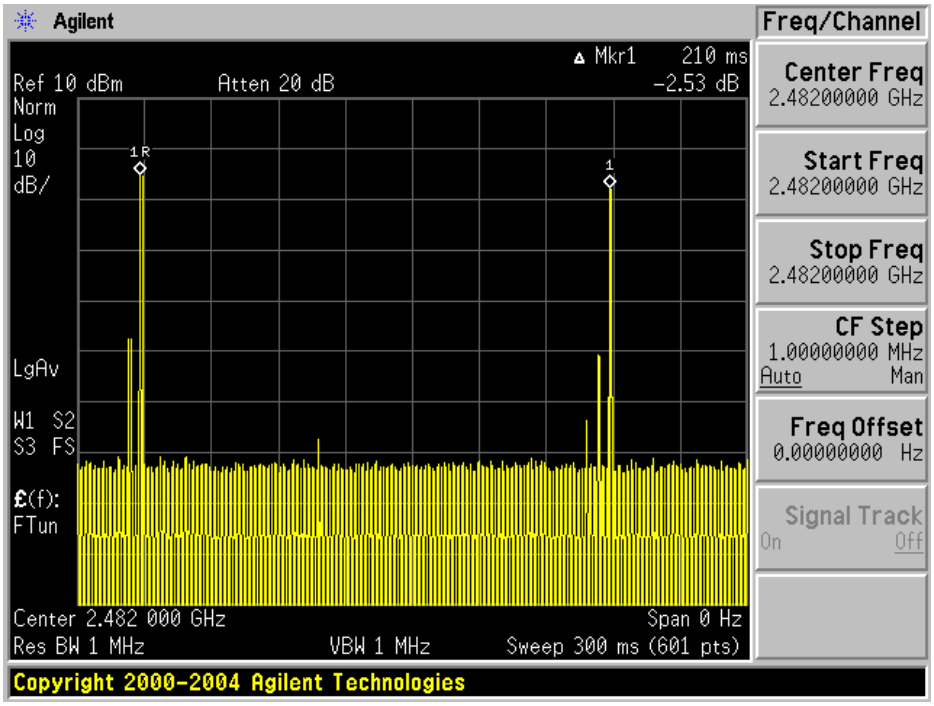
For 2.4Ghz device, Low Threshold = 25 mW, High Threshold = 375mW

Duty cycle = On time / period

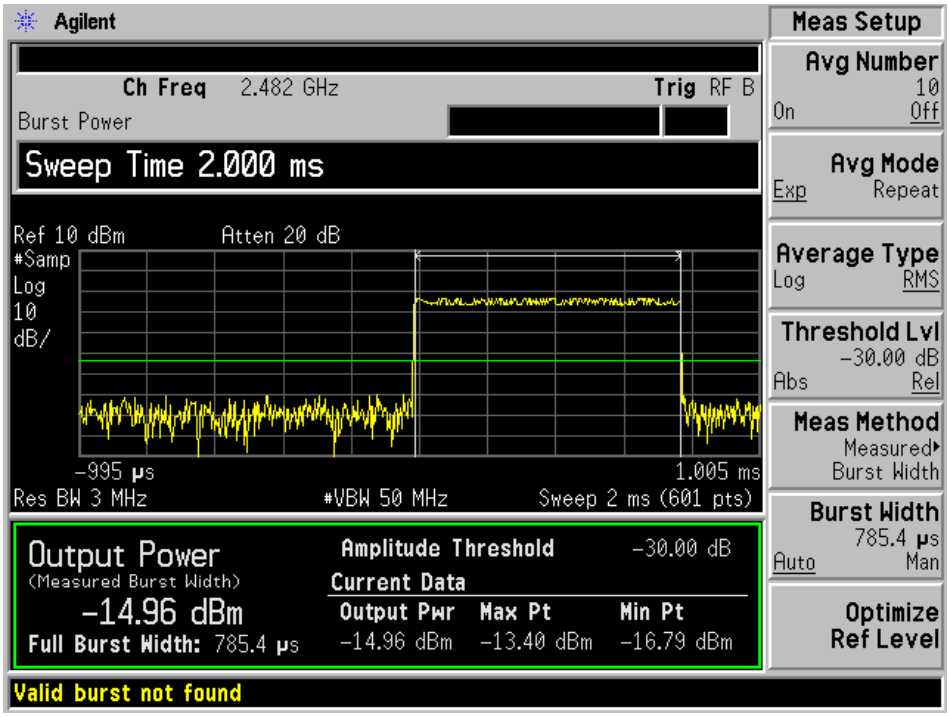
= 785.4 uS / 210 mS
= 0.00374 sec

EUT Average output power = Peak power * Duty Cycle = 27.67 * 0.00374 = 0.1035 mW.

Therefore, EUT is not subject to any SAR evaluation.




Plot showing period between each On time




Plot showing On time duration

# §15.247(d) - 100 KHZ BANDWIDTH OF BAND EDGES

### Standard Applicable

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)).

### Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

### Equipment Lists

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2005 |

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

### Measurement Result

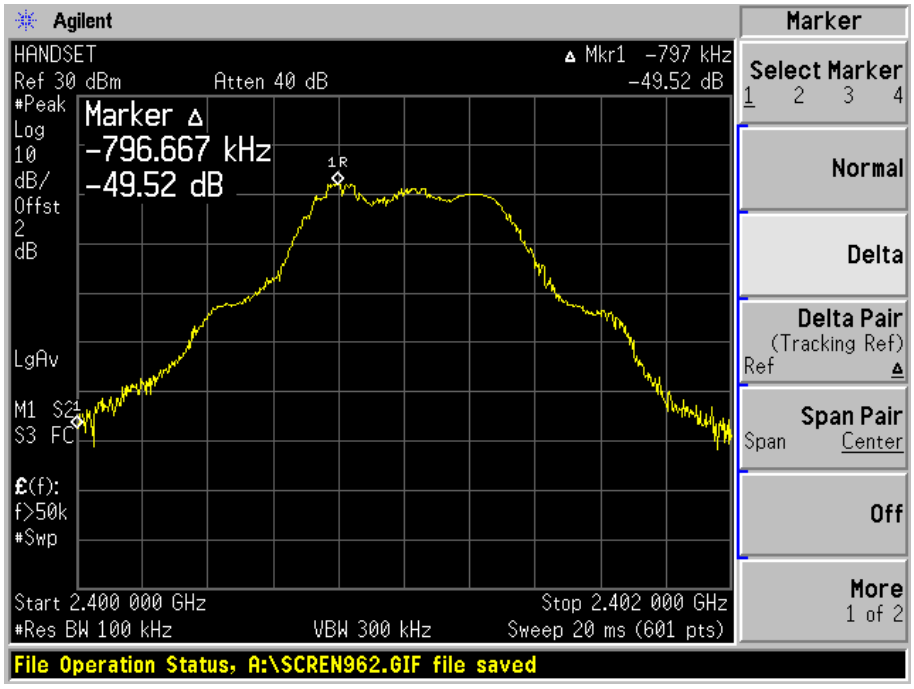
#### Environmental Conditions

| | |
|---|---|
| Temperature: | 15° C |
| Relative Humidity: | 46% |
| ATM Pressure: | 1009 mbar |

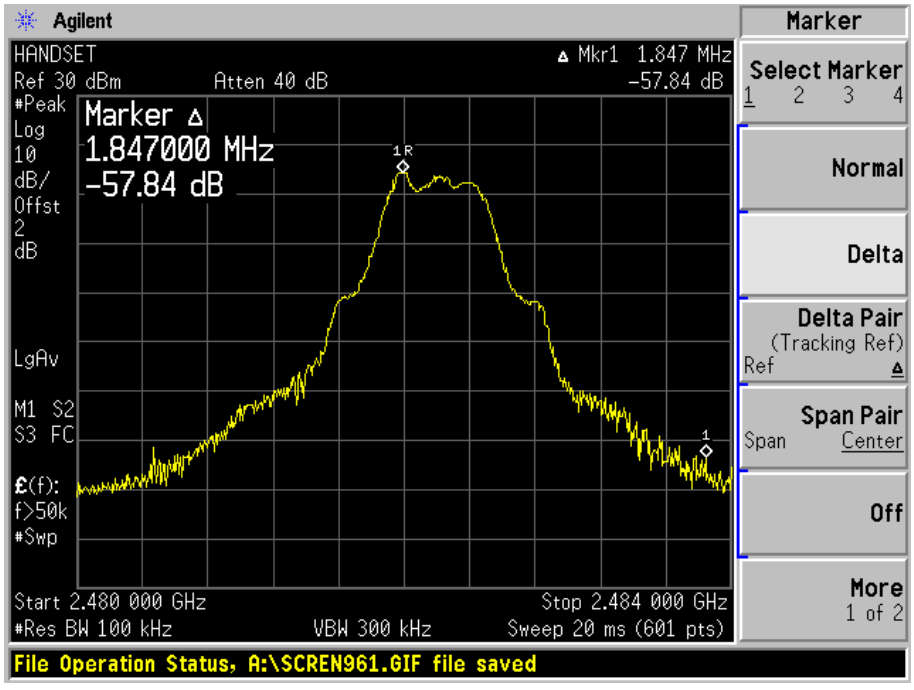
***The testing was performed by Oscar Au on 2005-12-18.***

Please refer to following pages for plots of band edge.

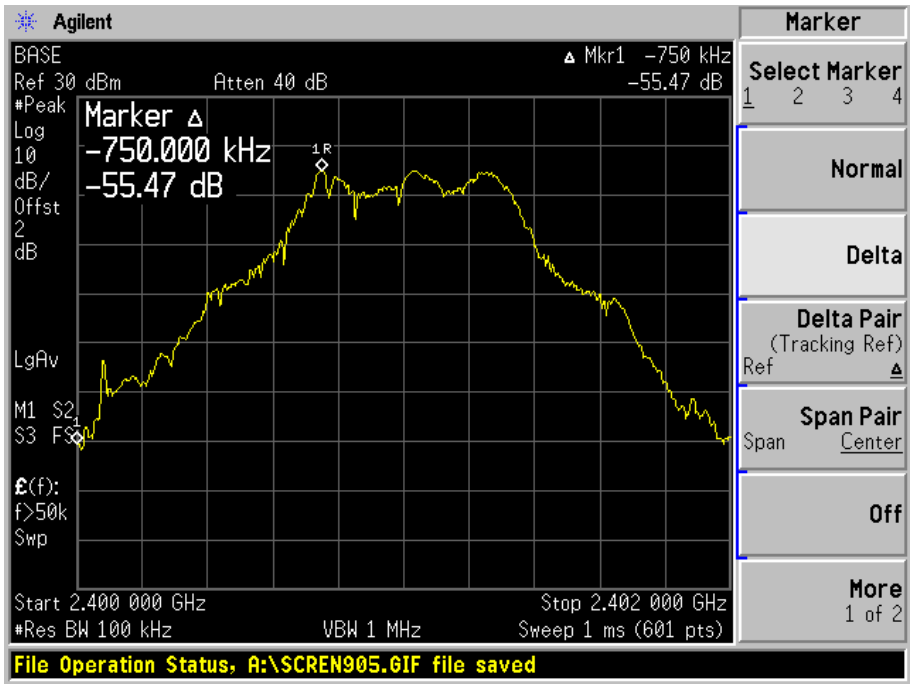
Handset of EUT, Low Channel



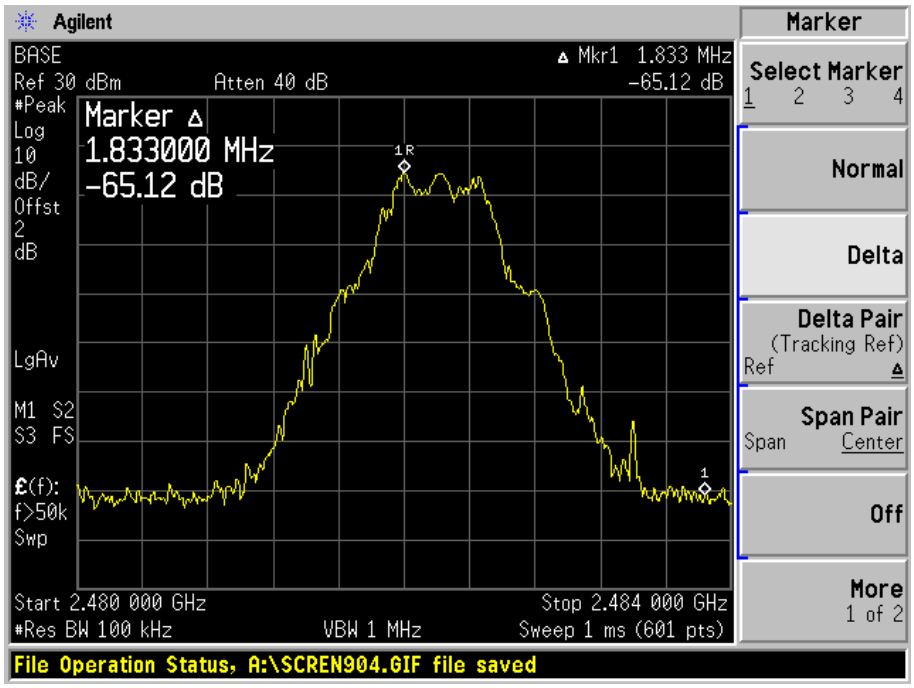

Handset of EUT, High Channel



Base of EUT, Low Channel




Base of EUT, High Channel



# §2.1051 - SPURIOUS EMISSION AT ANTENNA PORT

**Standard Applicable**

According to §15.209 (f) and §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit.

**Measurement Procedure**

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Position the EUT on a bench without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.

3. Set the SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.

4. Set the SA on View mode and then plot the result on SA screen.

5. Repeat above procedures until all frequencies measured were complete.

**Equipment Lists**

| Manufacturer | Description | Model | Serial Number | Cal. Date |
|---|---|---|---|---|
| Agilent | Analyzer, Spectrum | E4446A | US44300386 | 11/10/2005 |

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

**Measurement Result**

Please refer to following pages for plots of spurious emission.

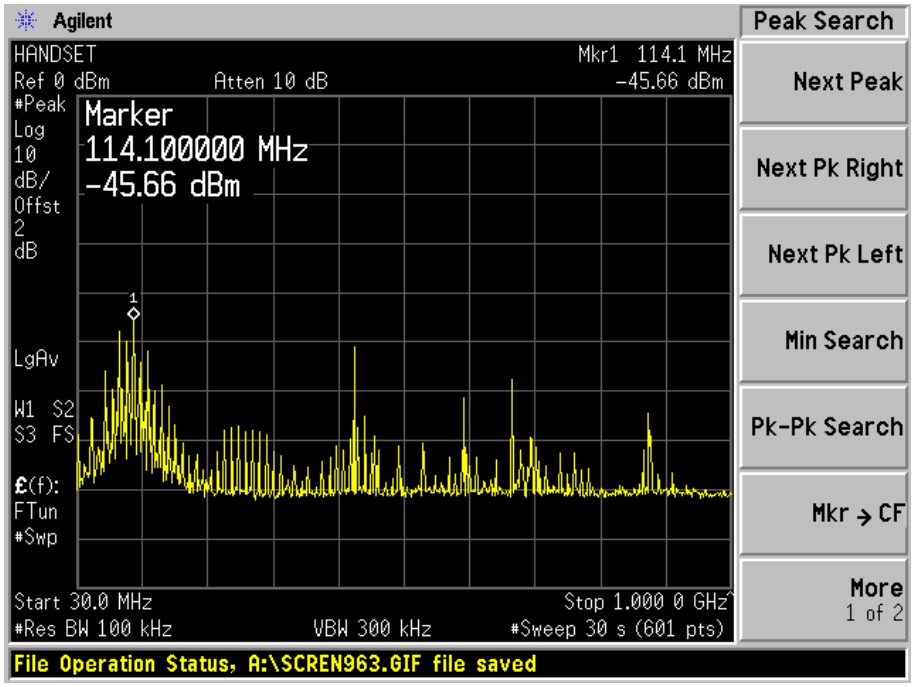
**Environmental Conditions**

| | |
|---|---|
| Temperature: | 15° C |
| Relative Humidity: | 45% |
| ATM Pressure: | 1009 mbar |

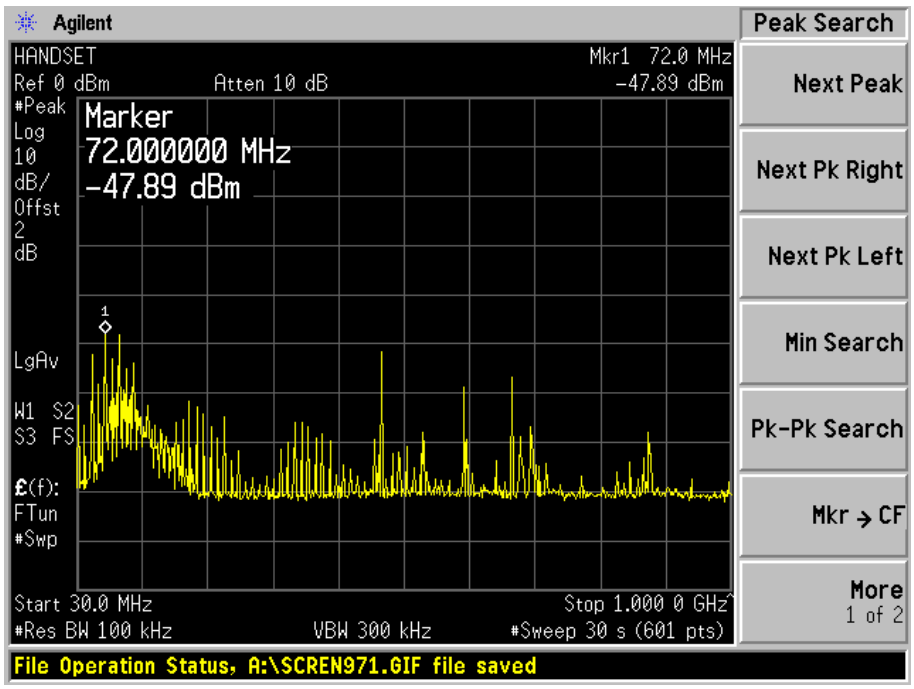
***The testing was performed by Oscar Au on 2005-12-18.***

*For Handset of EUT*

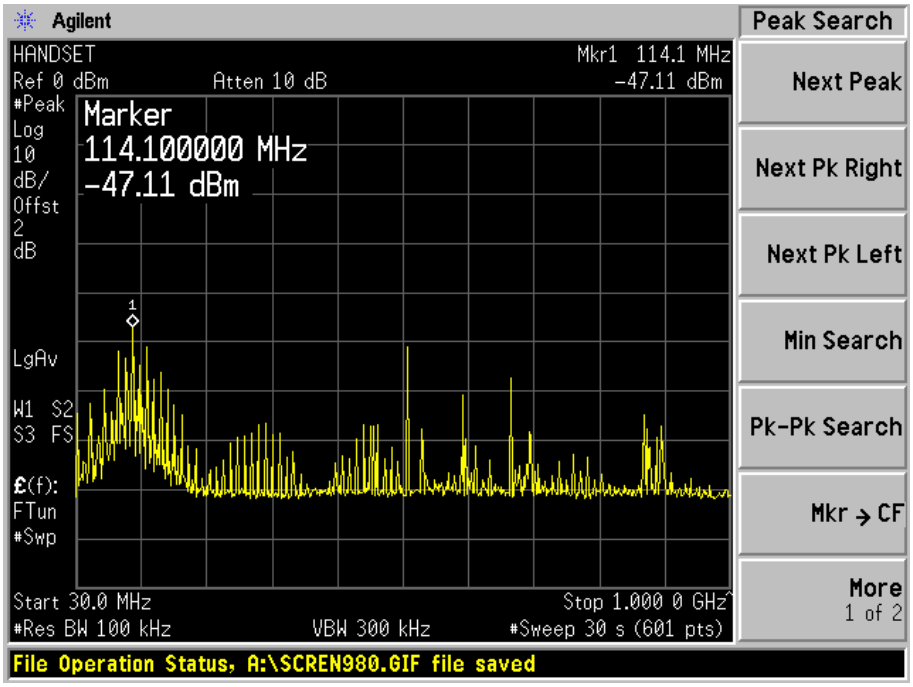
*30 MHz-1000MHz, Low Channel*



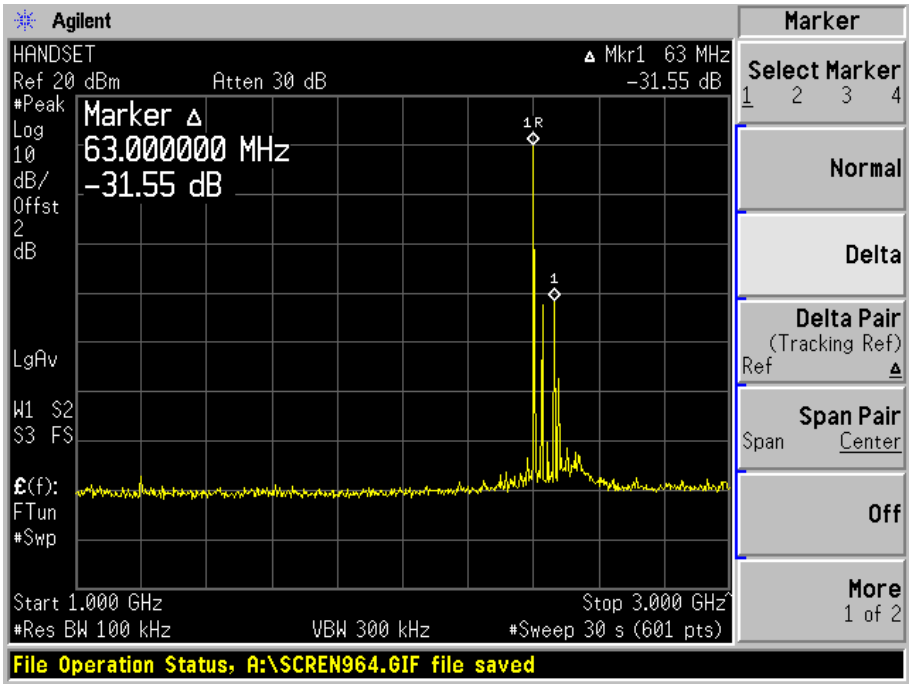

*30 MHz- 1000MHz, Middle Channel*



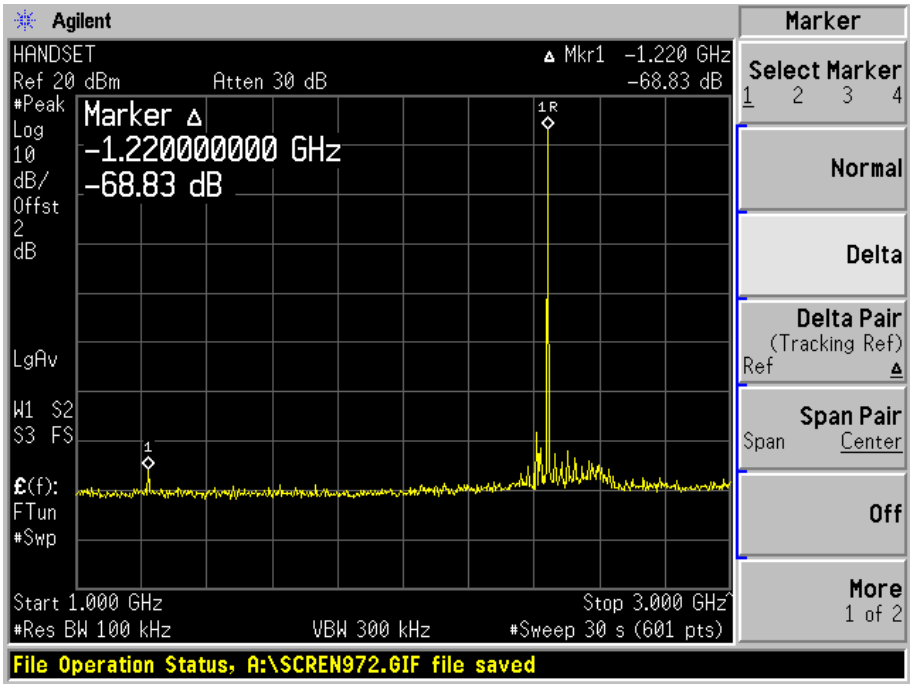
*30 MHz- 1000MHz, High Channel*



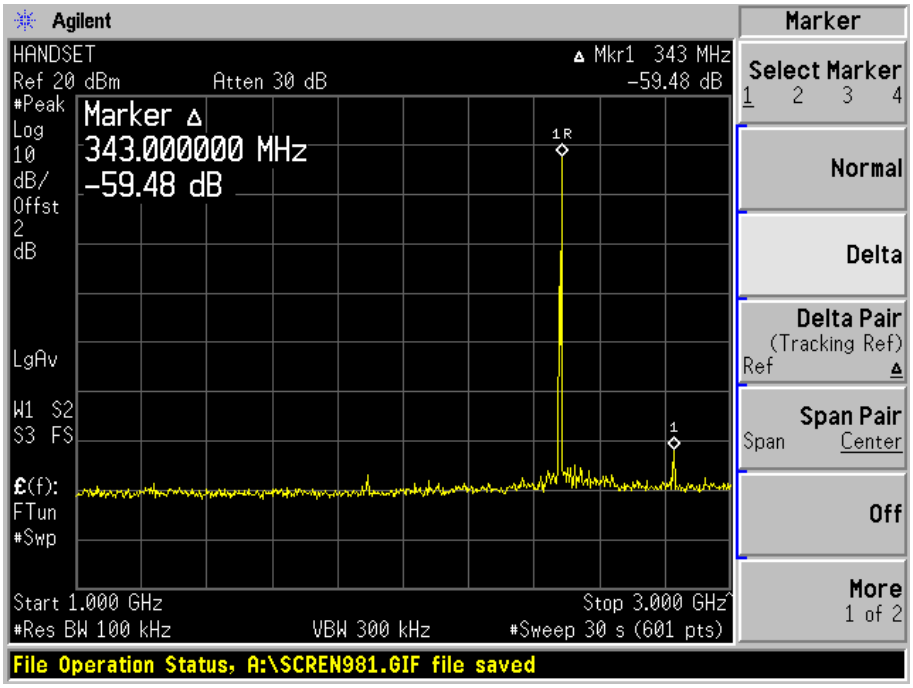

*1GHz-3GHz, Low Channel*



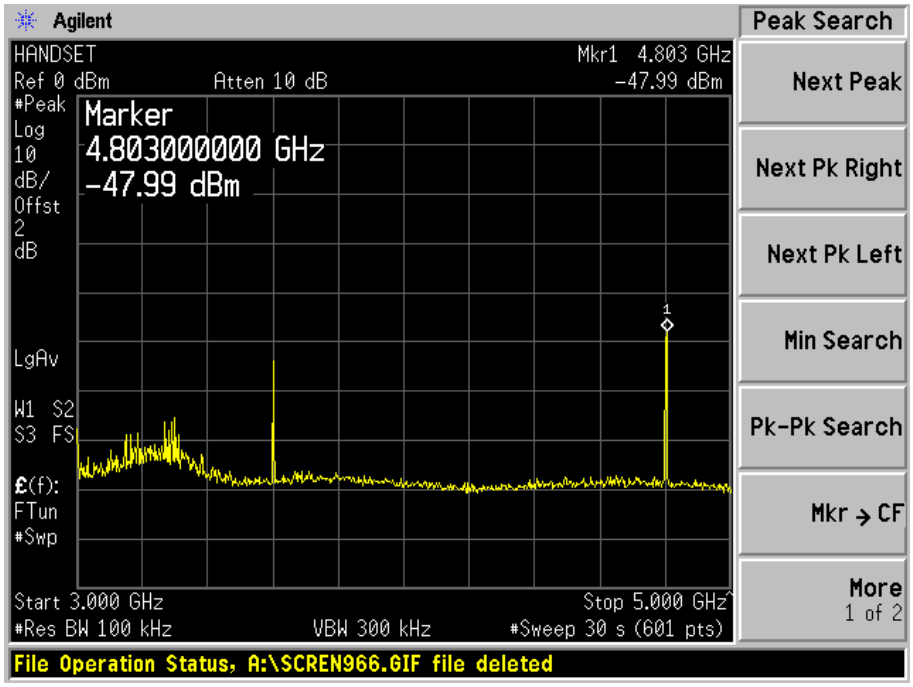
*1GHz-3GHz, Middle Channel*



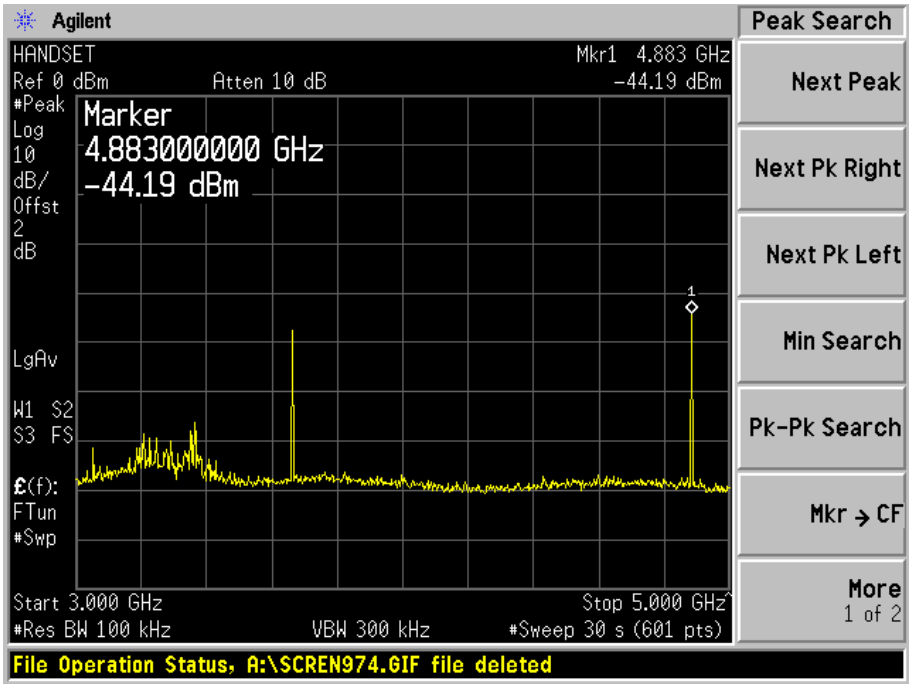

*1GHz-3GHz, High Channel*



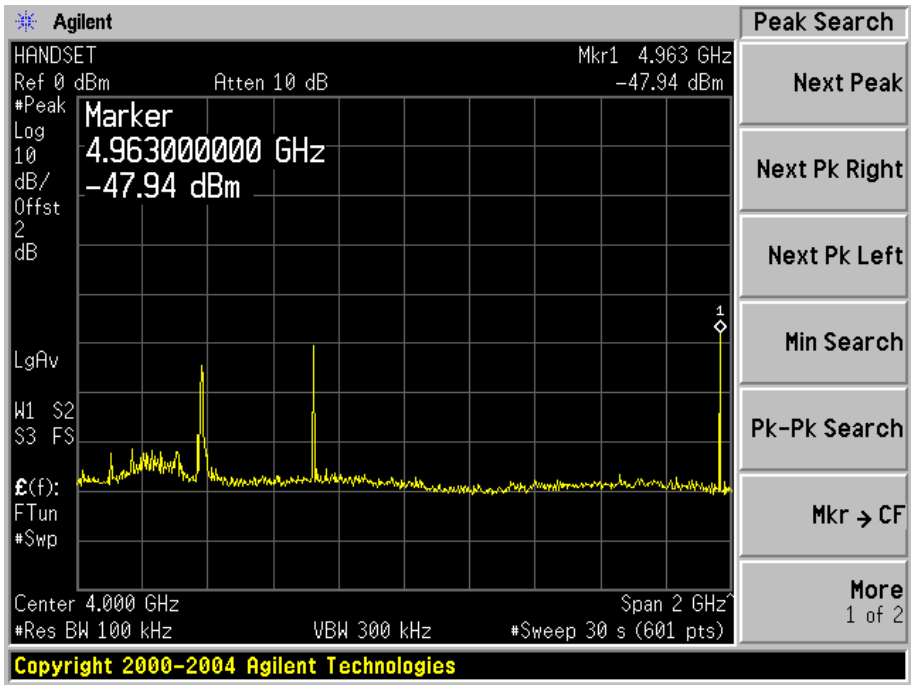
*3GHz-5GHz, Low Channel*



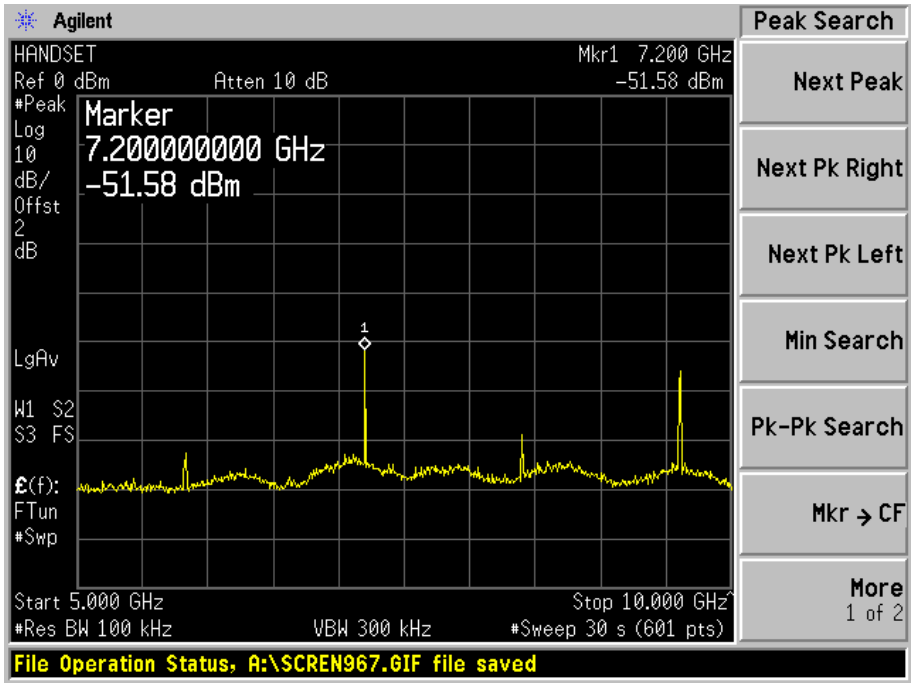

*3GHz-5GHz, Middle Channel*



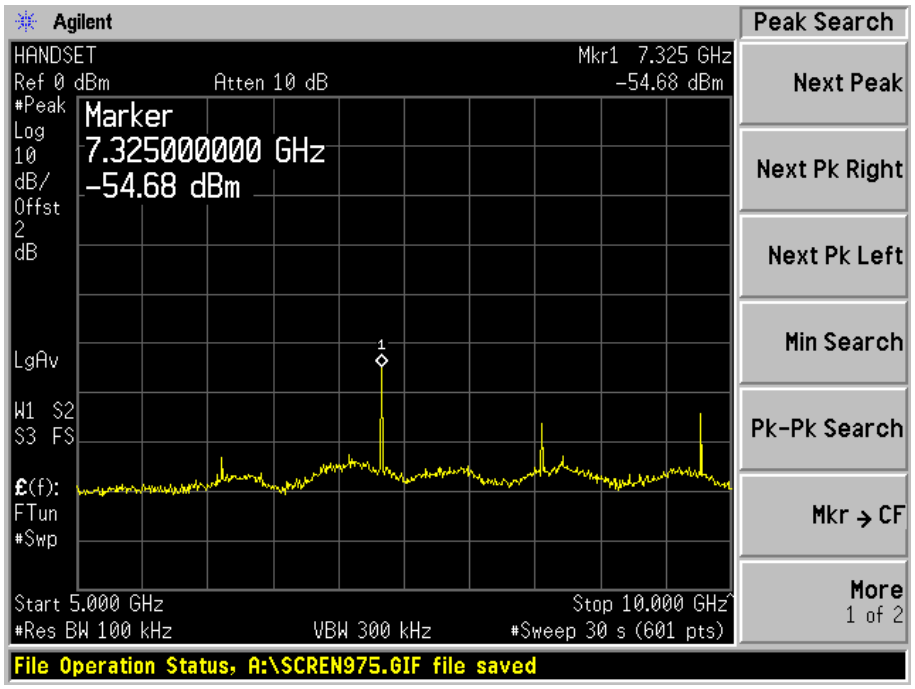
*3GHz-5GHz, High Channel*



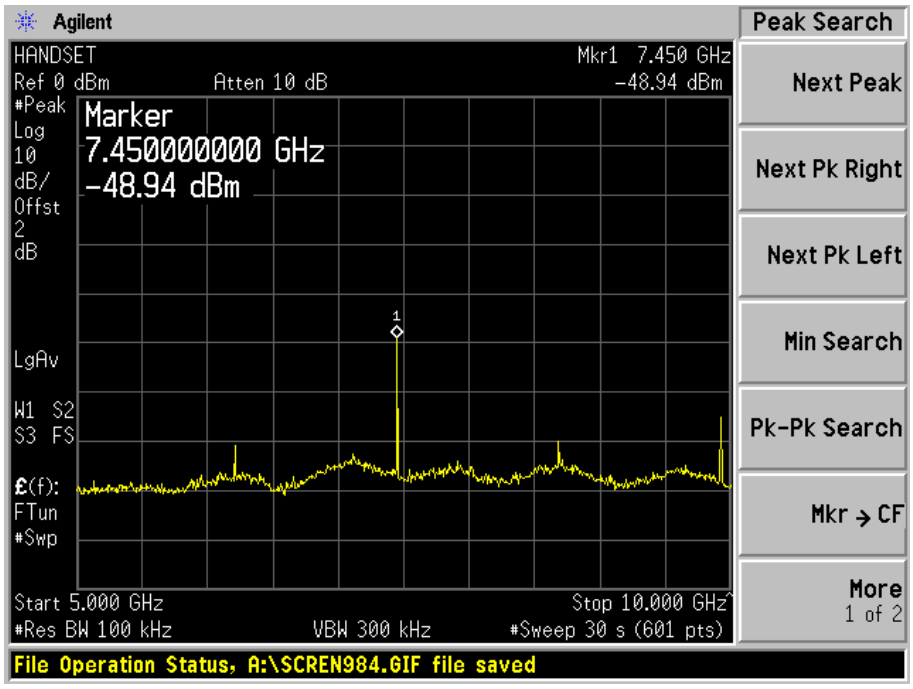

*5GHz-10GHz, Low Channel*



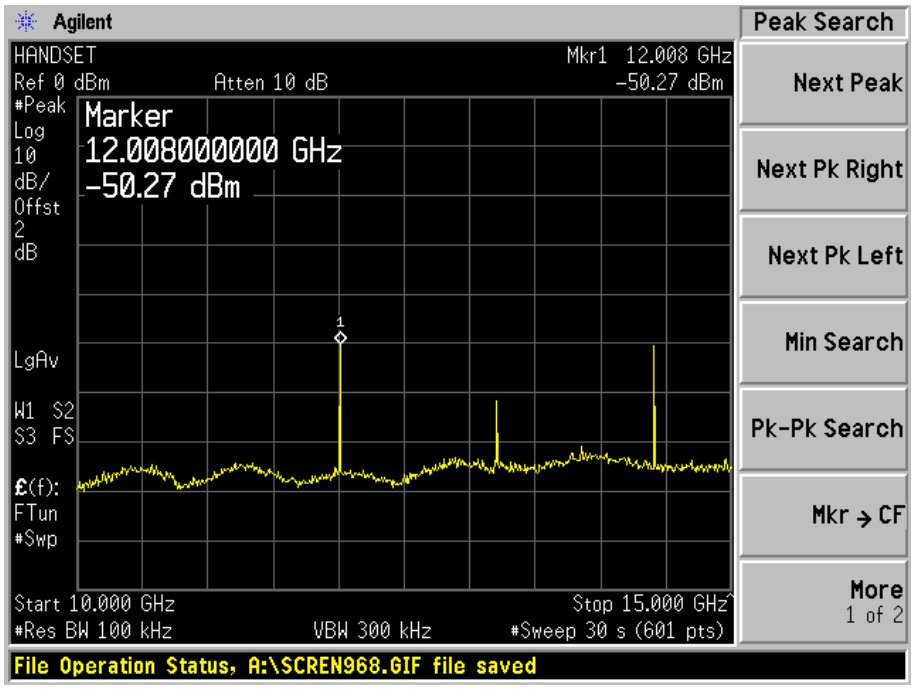
*5GHz-10GHz, Middle Channel*



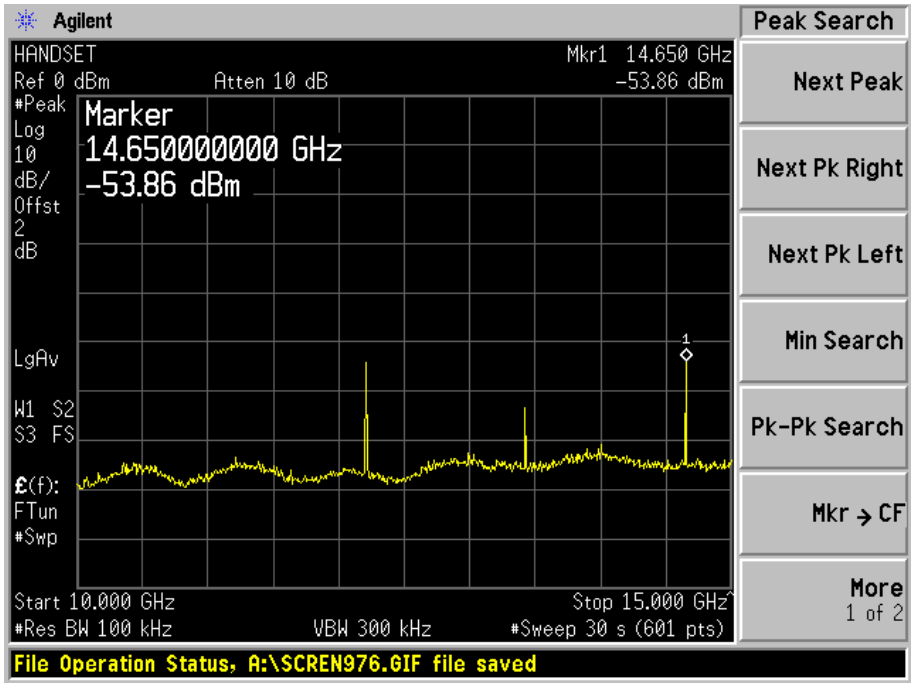

*5GHz-10GHz, High Channel*



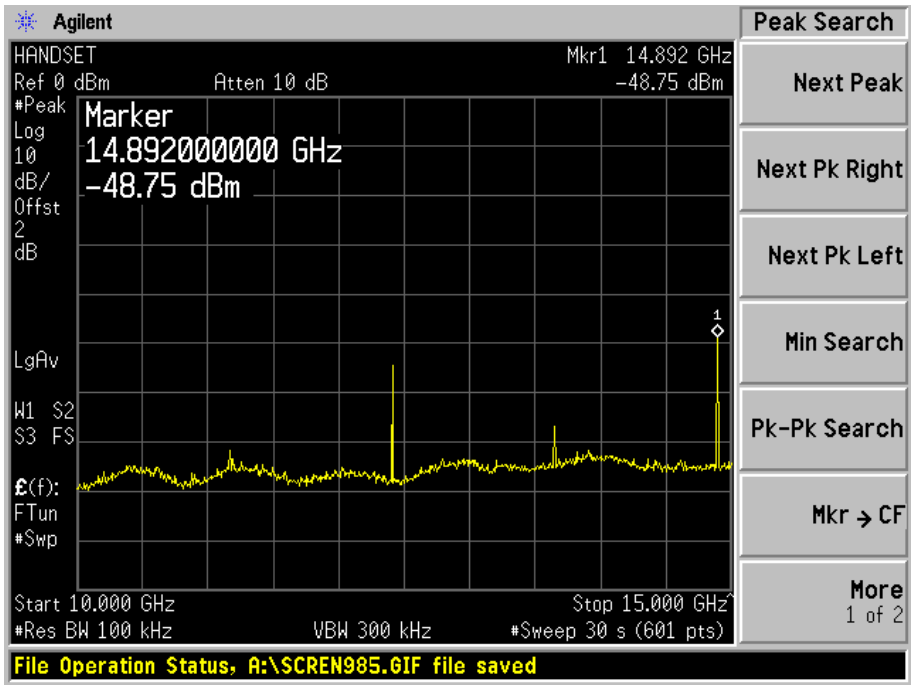
*10 GHz -15GHz, Low Channel*



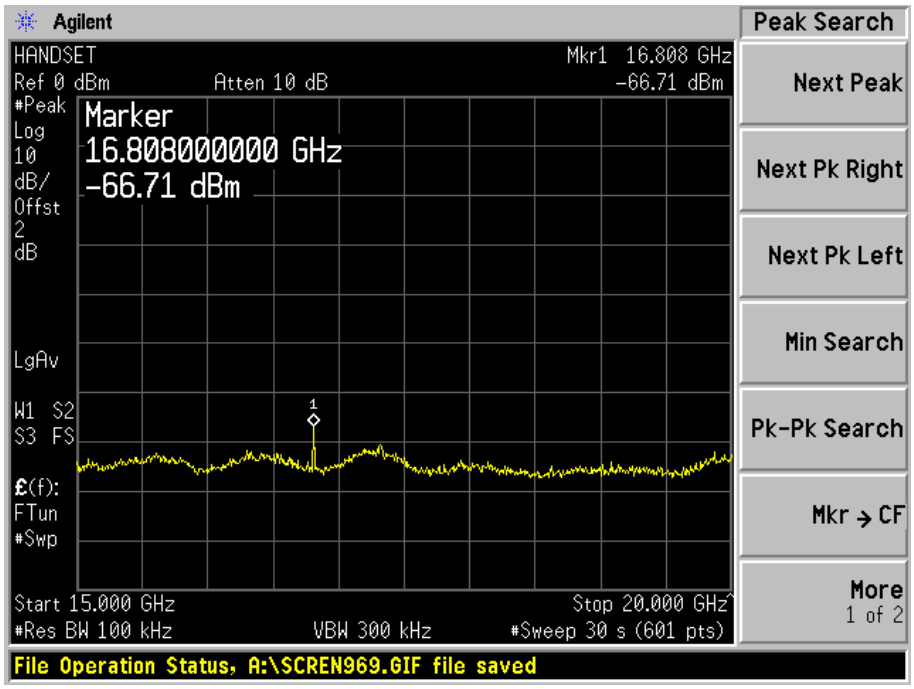

*10 GHz -15GHz, Middle Channel*



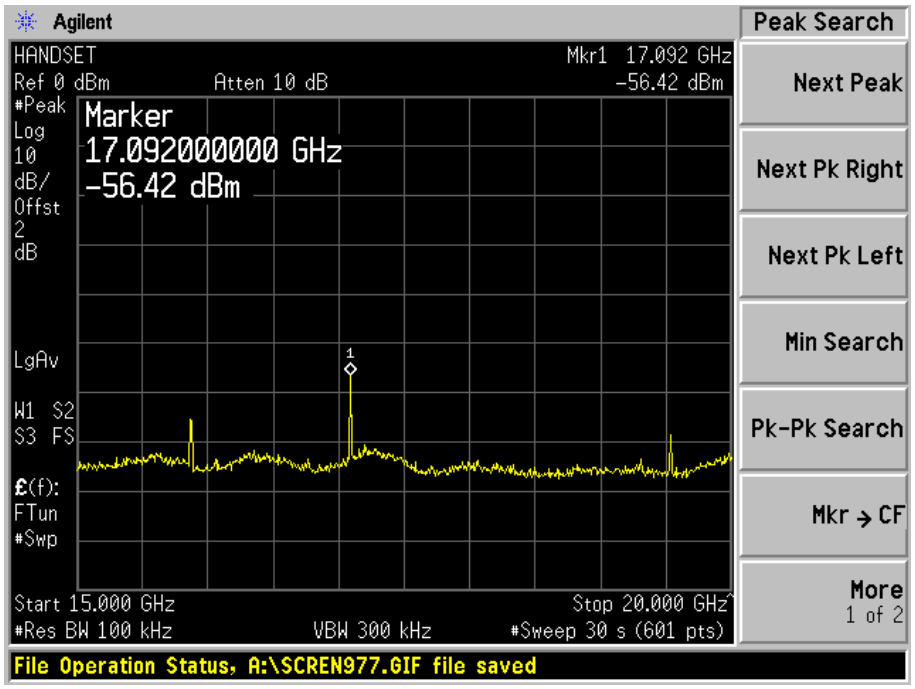
*10 GHz -15GHz, High Channel*



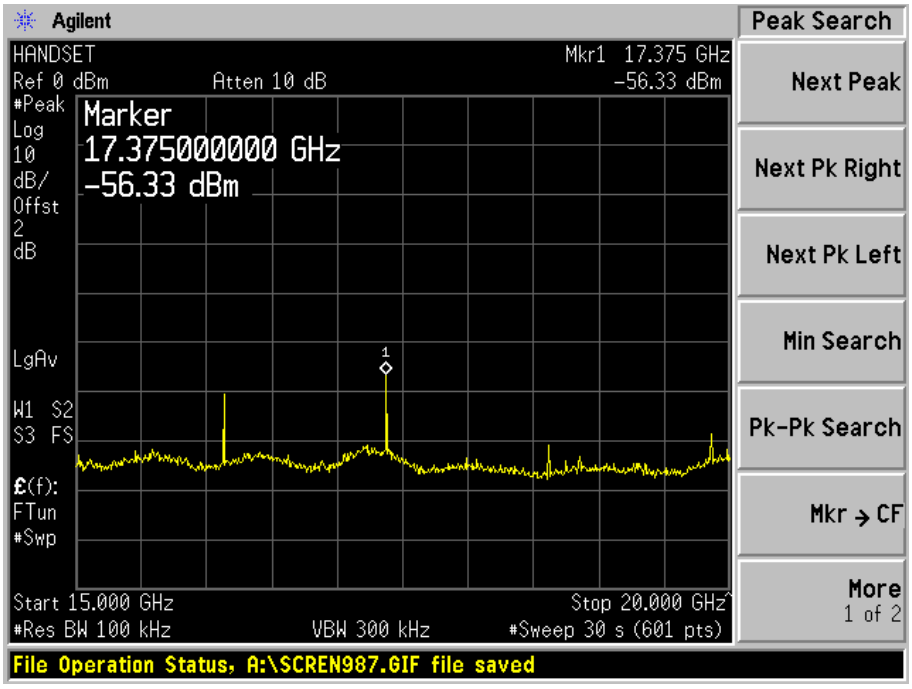

*15 GHz -20GHz, Low Channel*



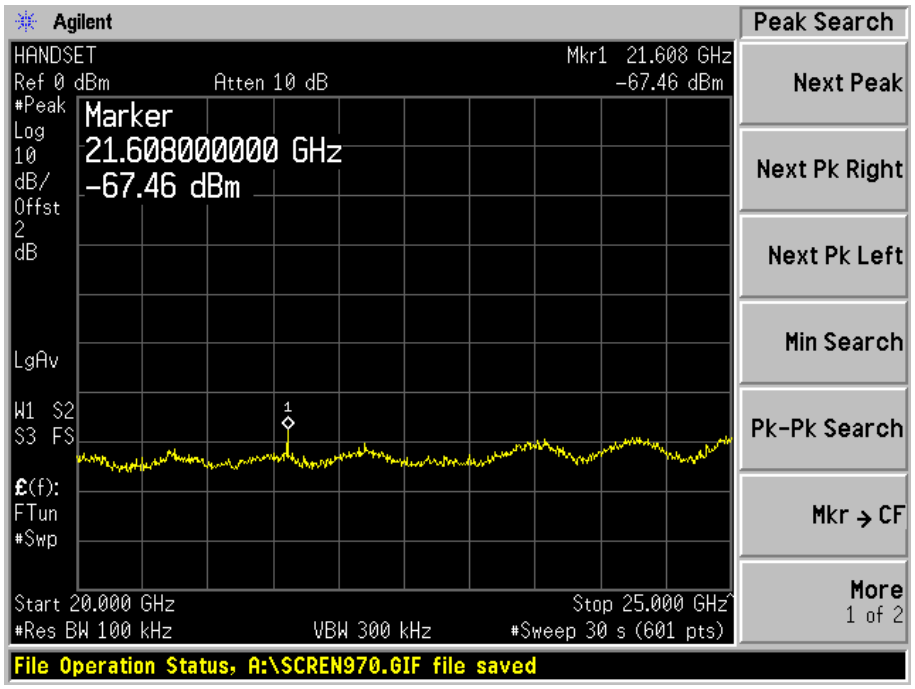
*15 GHz -20GHz,Middle Channel*



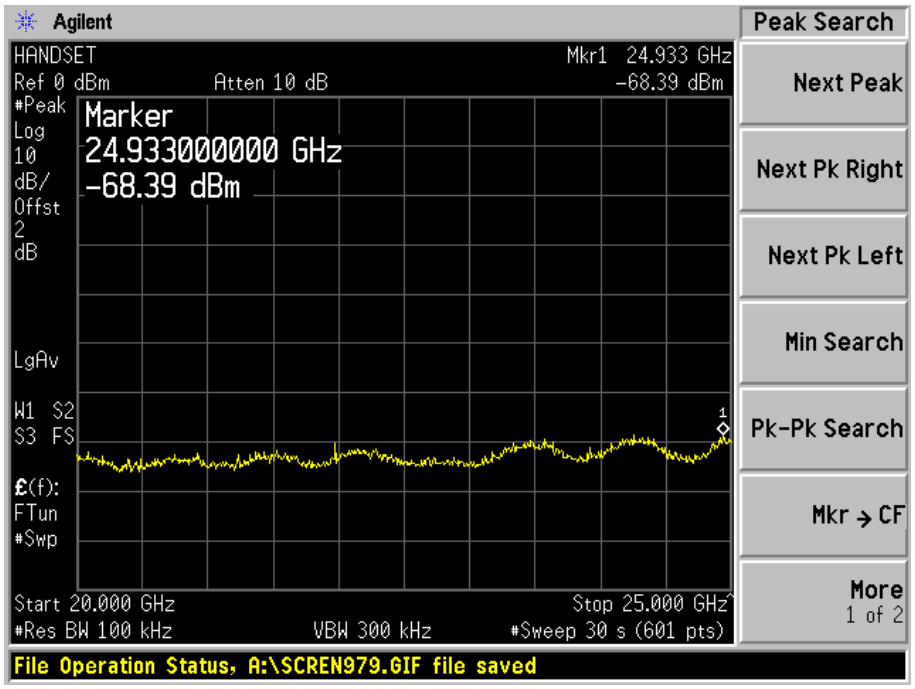

*15 GHz -20GHz,High Channel*



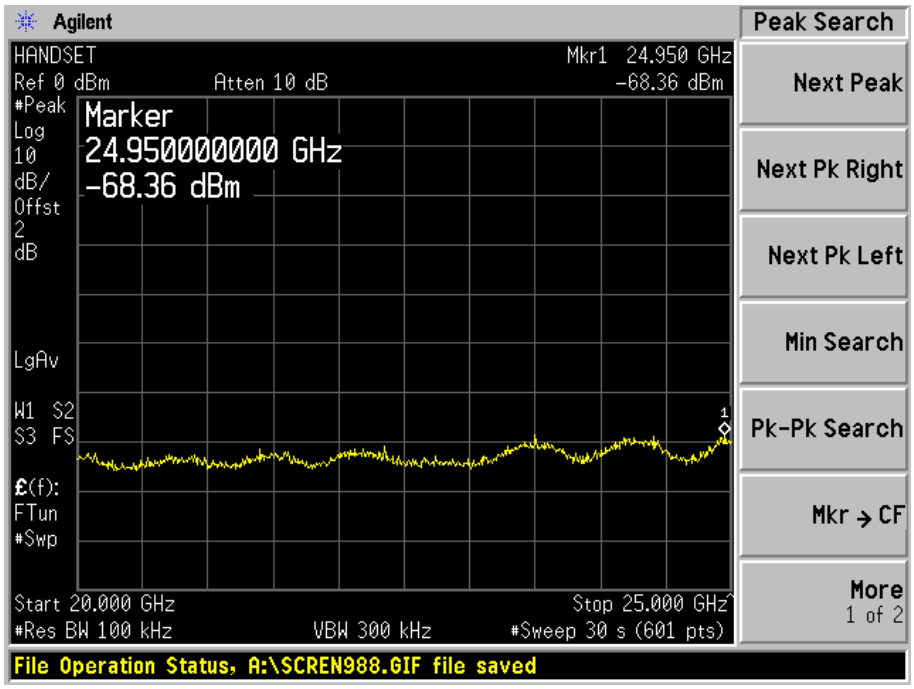
*20 GHz -25GHz,Low Channel*




*20 GHz -25GHz,Middle Channel*

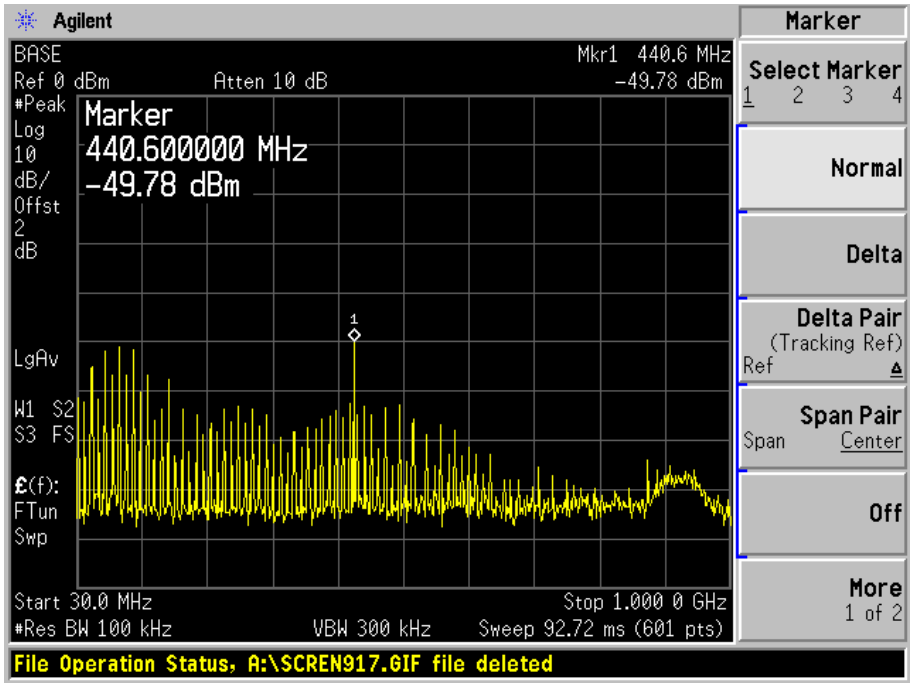


*20 GHz -25GHz,High Channel*

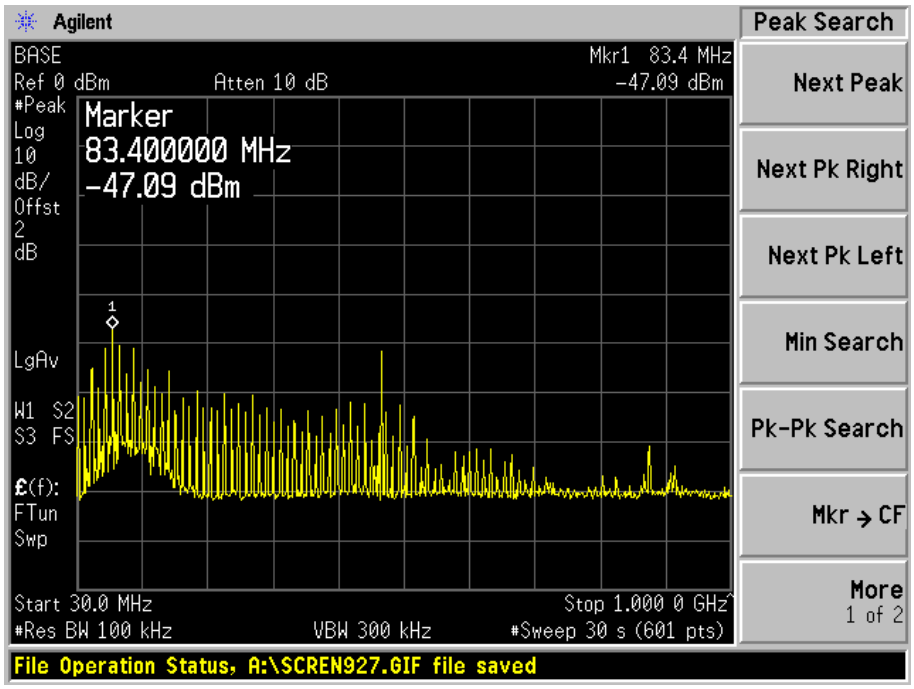


*For Base of EUT*

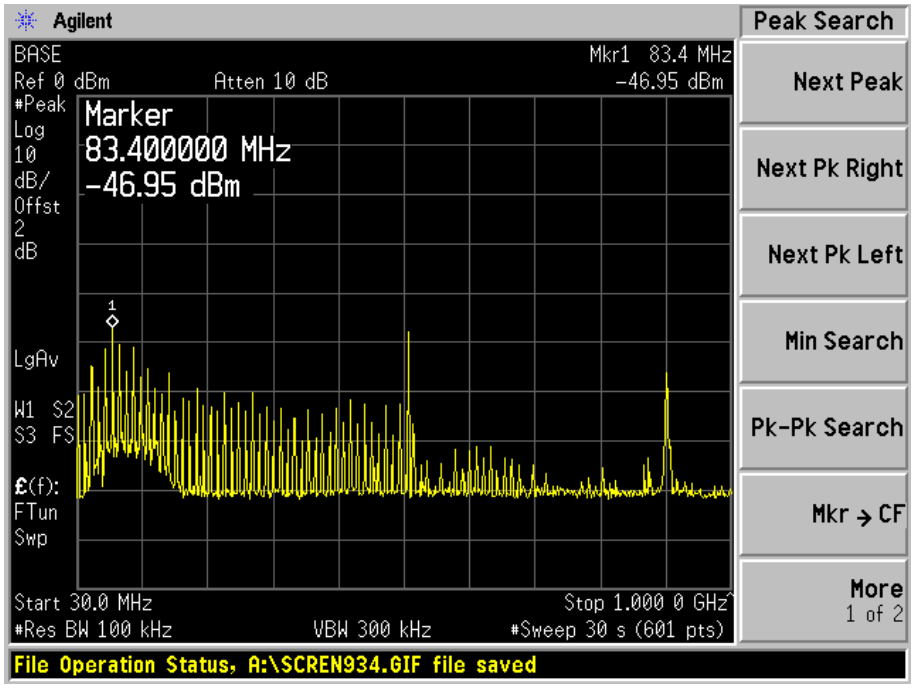
*30 MHz- 1000MHz, Low Channel*



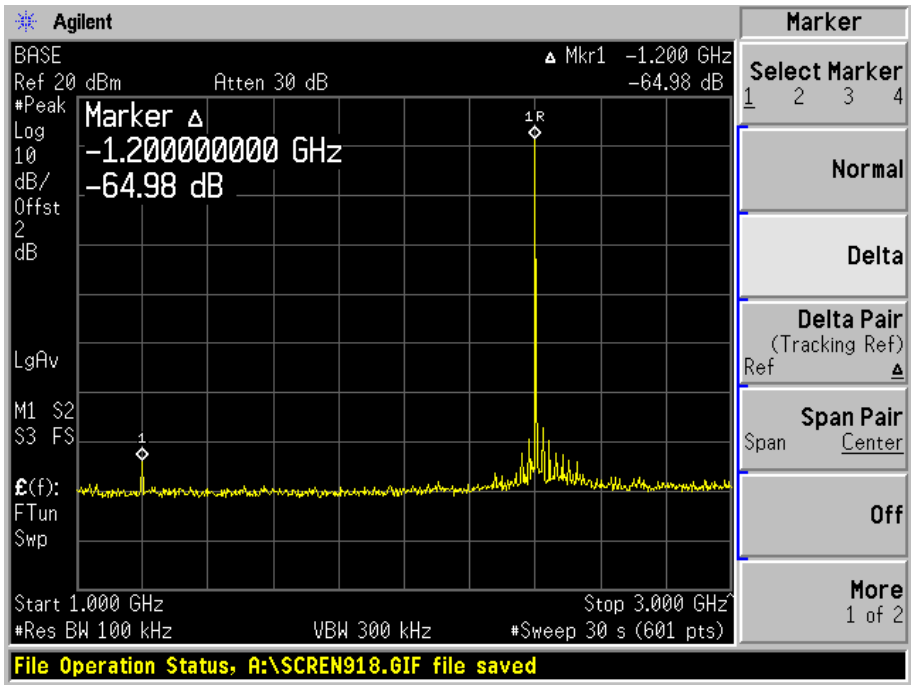

*30 MHz- 1000MHz, Middle Channel*



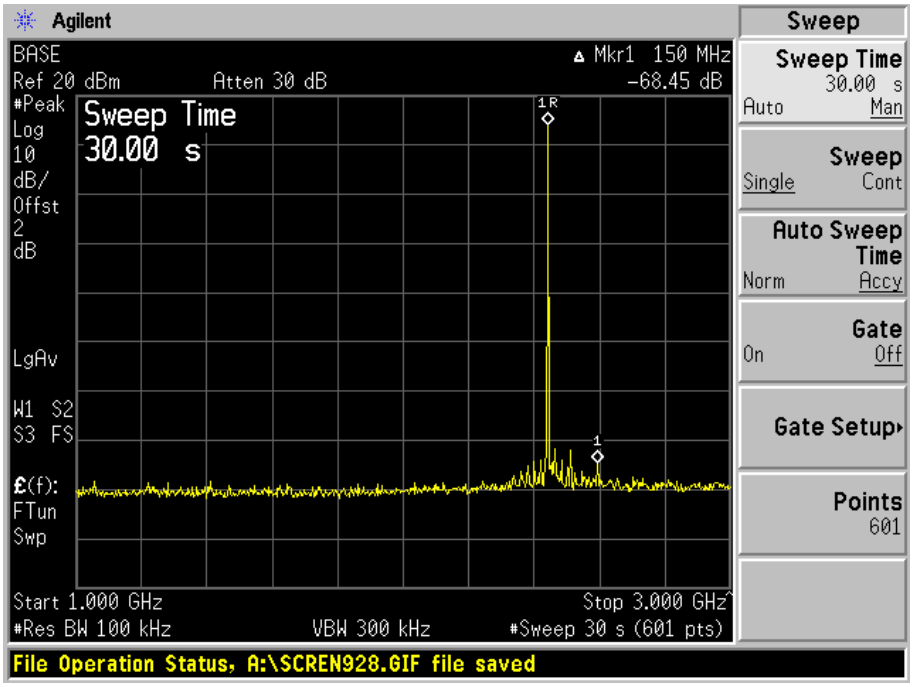
*30 MHz- 1000MHz, High Channel*



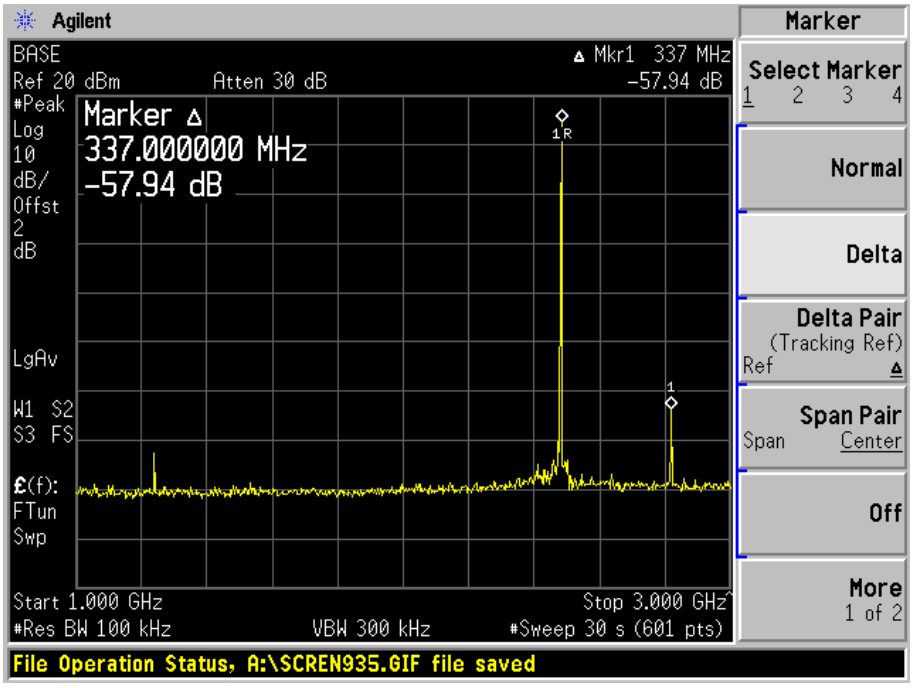

*1 GHz- 3GHz, Low Channel*



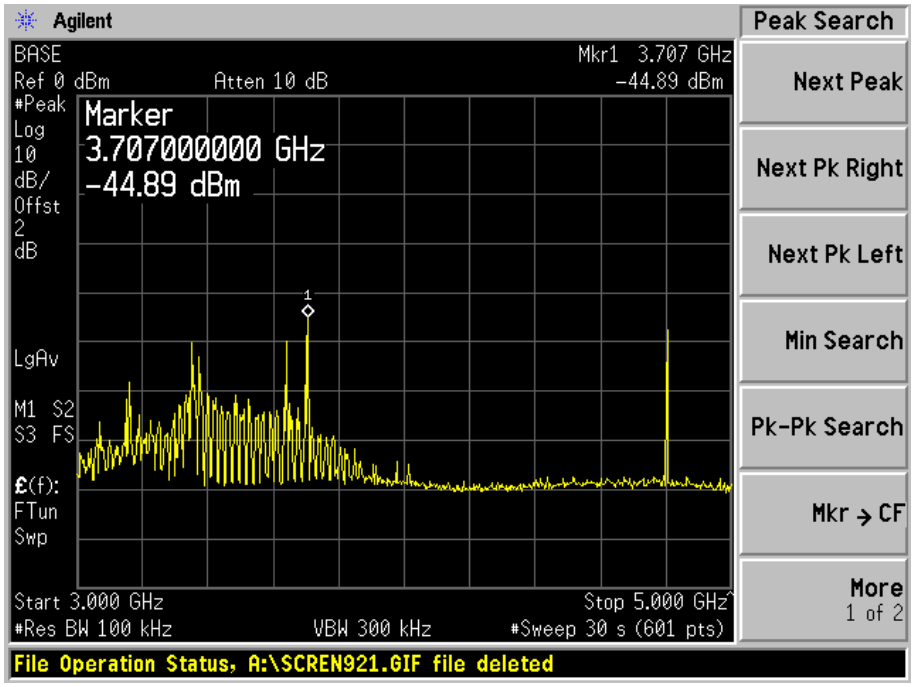
*1 GHz- 3GHz, Middle Channel*



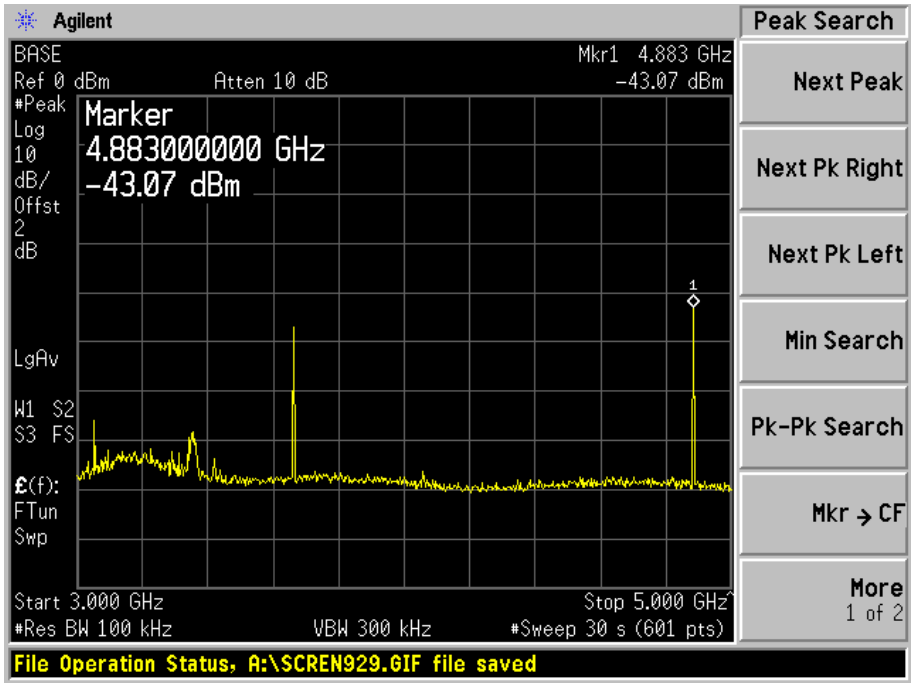

*1 GHz- 3GHz, High Channel*



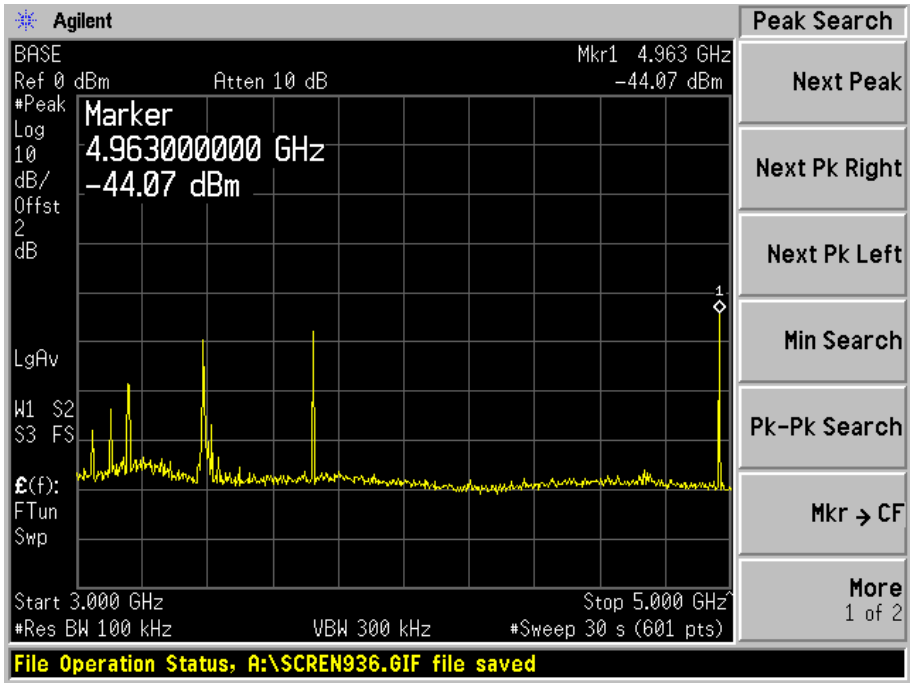
*3 GHz- 5GHz, Low Channel*



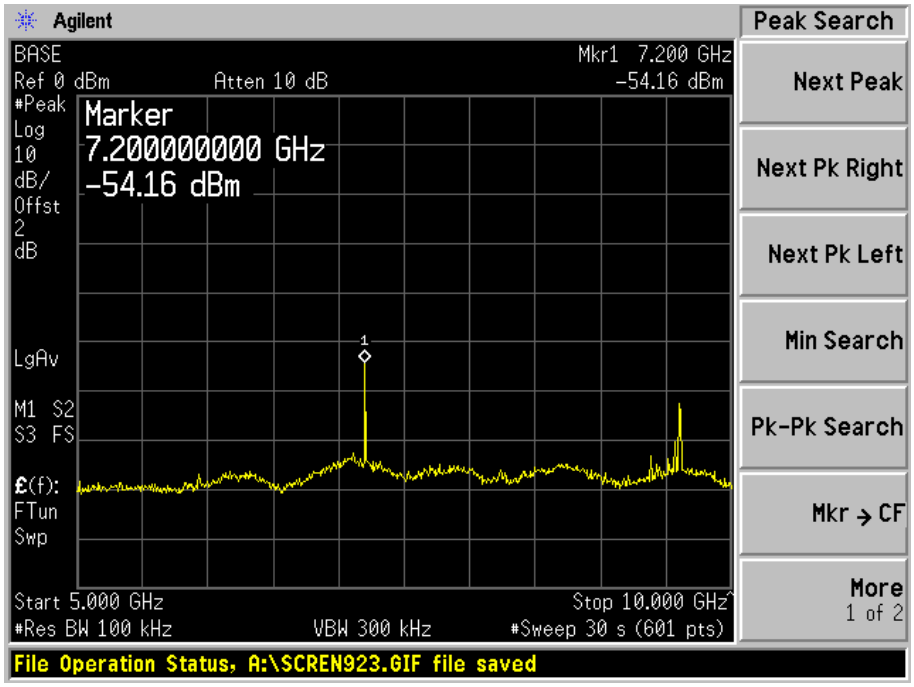

*3 GHz- 5GHz, Middle Channel*



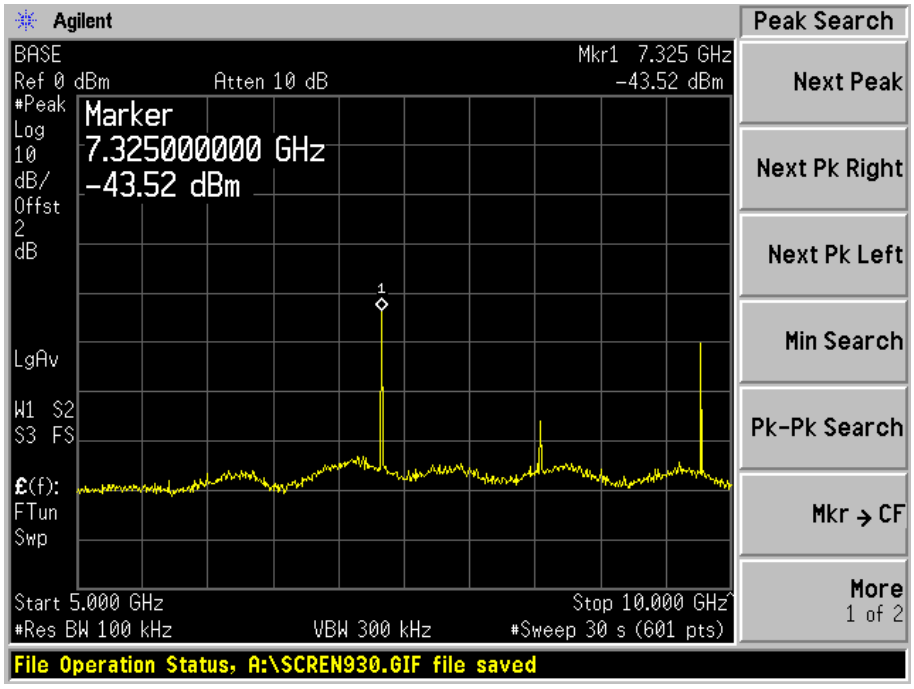
*3 GHz- 5GHz, High Channel*



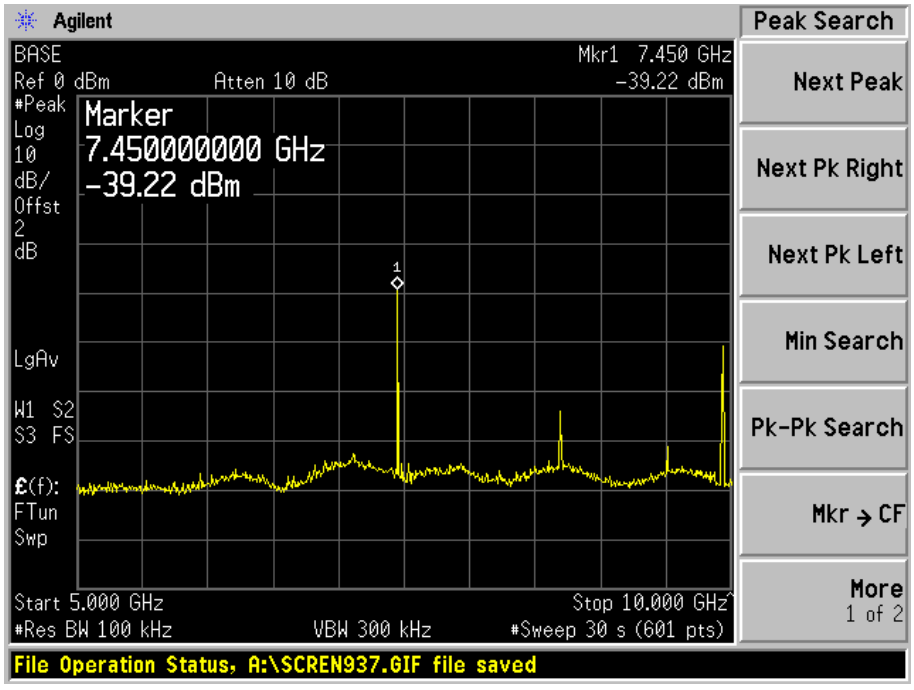

*5 GHz- 10 GHz, Low Channel*



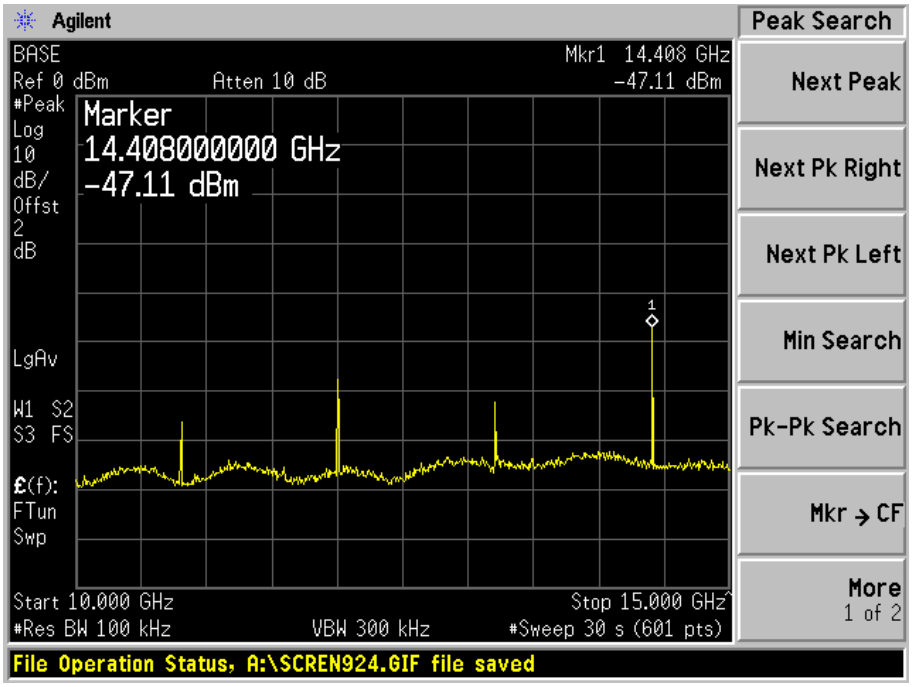
*5 GHz- 10 GHz, Middle Channel*



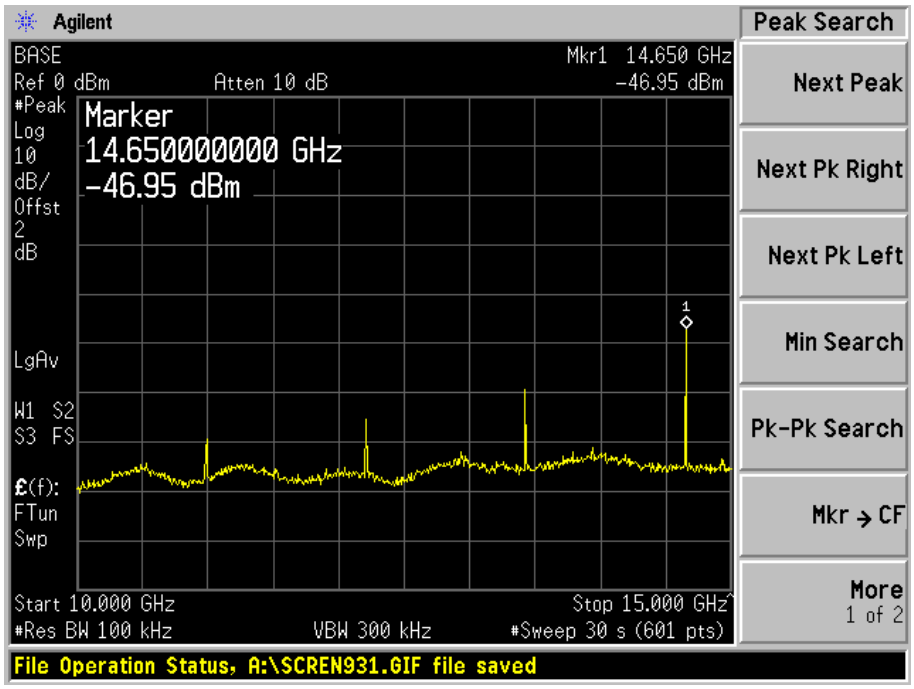

*5 GHz- 10 GHz, High Channel*



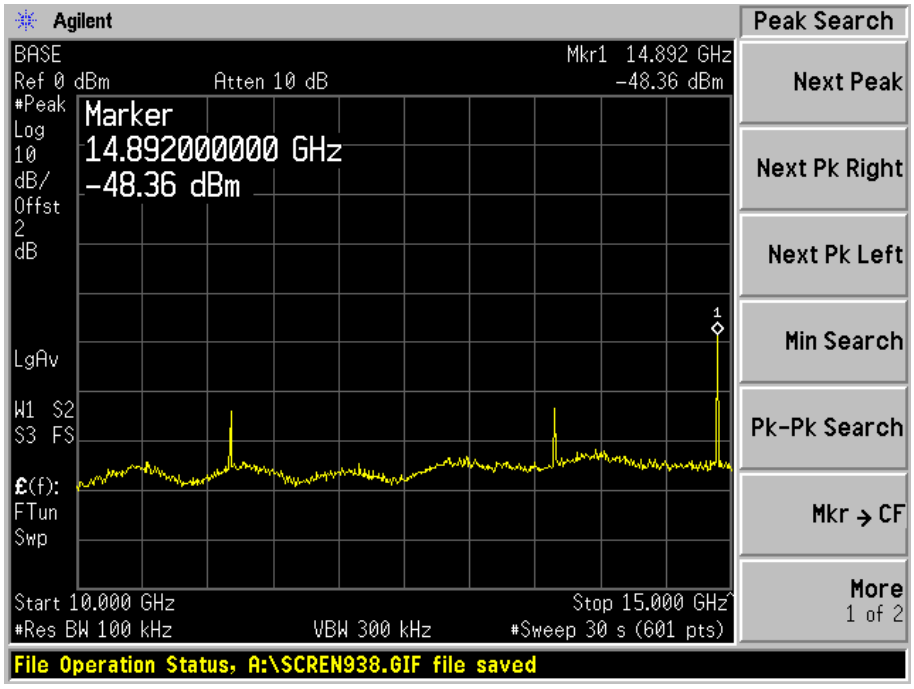
*10 GHz- 15 GHz, Low Channel*



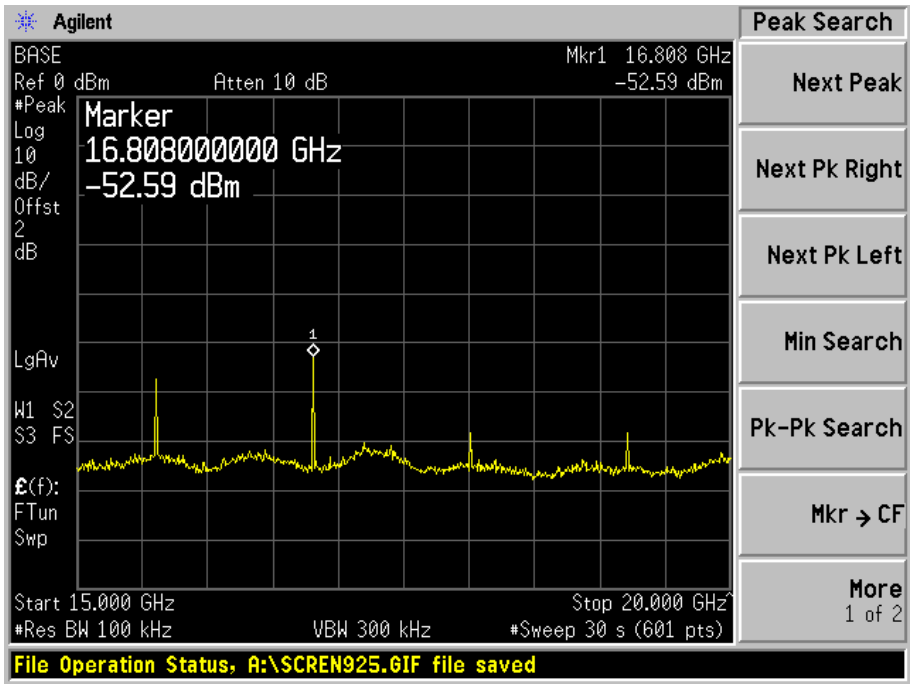

*10 GHz- 15 GHz, Middle Channel*



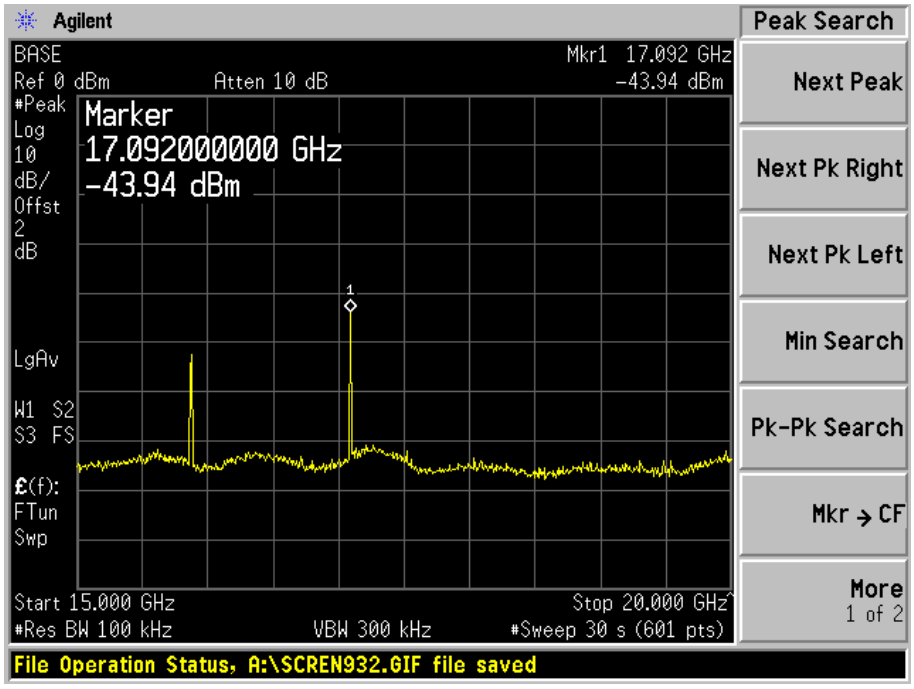
*10 GHz- 15 GHz, High Channel*



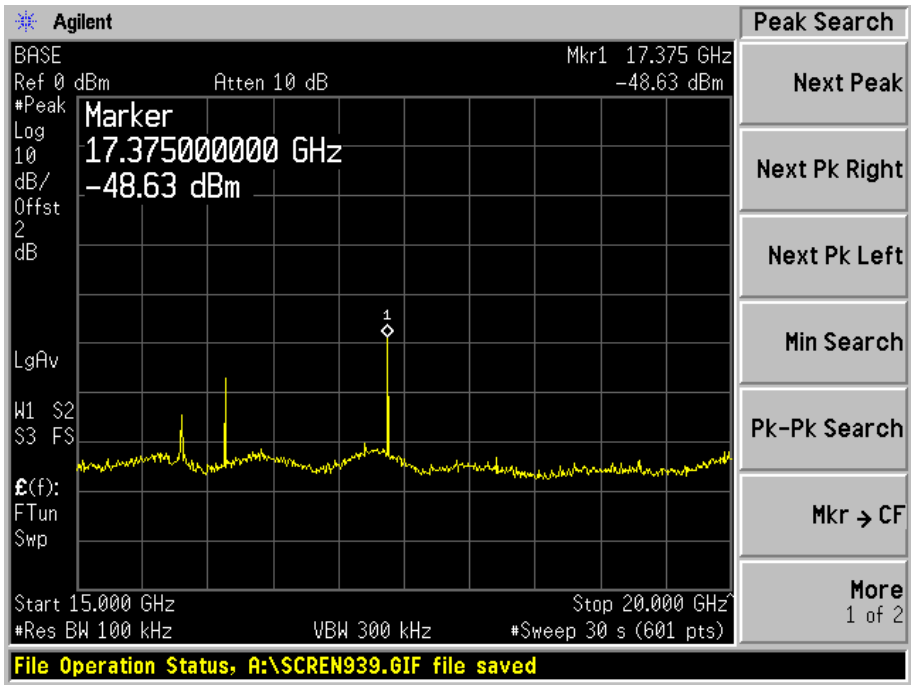

*15 GHz- 20 GHz, Low Channel*



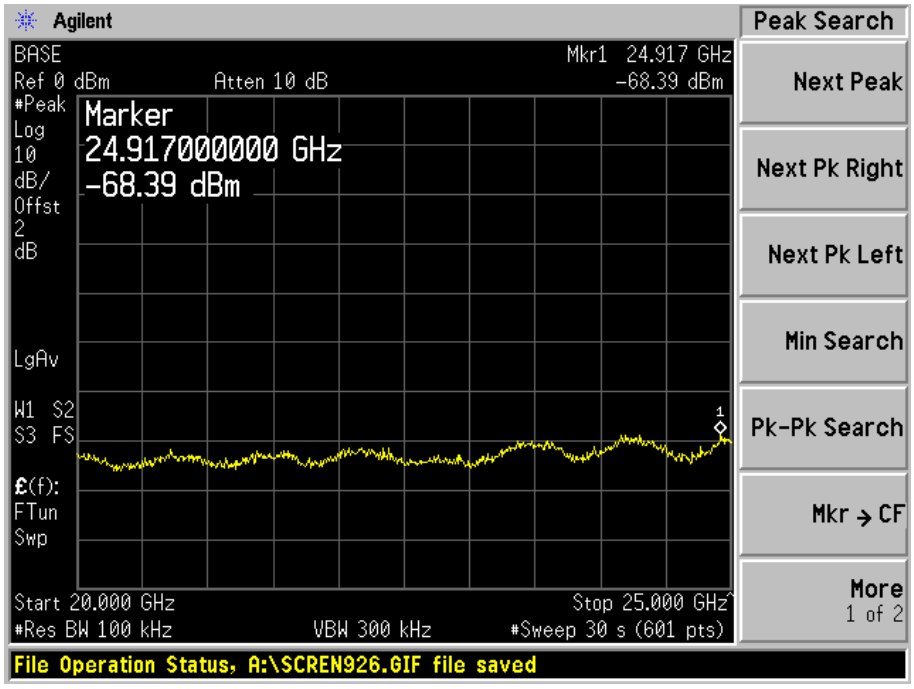
*15 GHz- 20 GHz, Middle Channel*



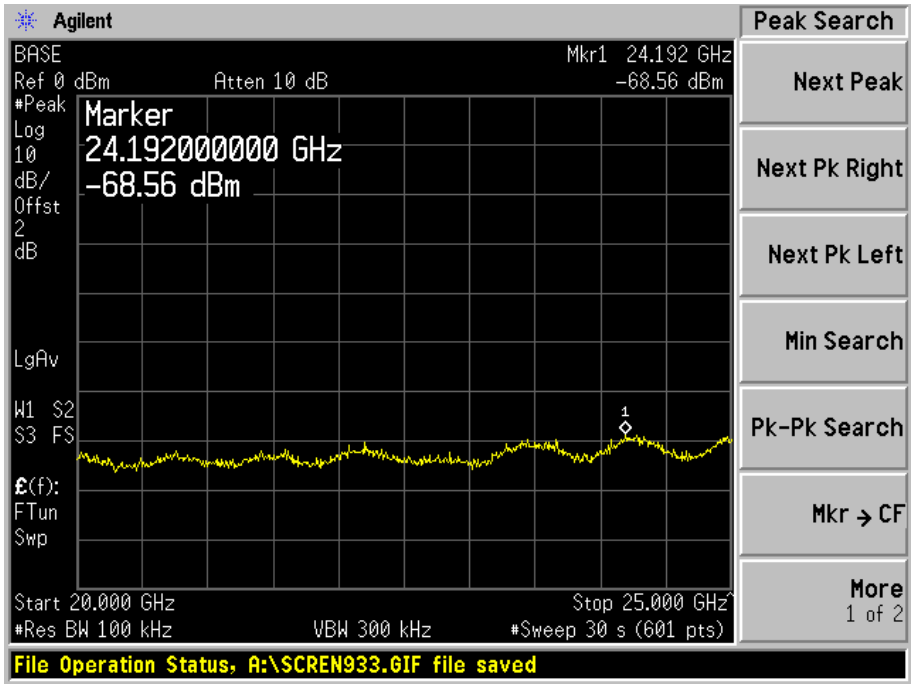

*15 GHz- 20 GHz, High Channel*



*20 GHz- 25 GHz, Low Channel*




*20 GHz- 25 GHz, Middle Channel*



*20 GHz- 25 GHz, High Channel*