


**SK TECH CO., LTD.**

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## Certificate of Compliance

|                             |  |                         |              |
|-----------------------------|--|-------------------------|--------------|
| <b>Test Report No.:</b>     | SKTTRT-041202-008  |                         |              |
| <b>NVLAP CODE:</b>          | 200220-0   |                         |              |
| <b>Applicant:</b>           | HASSNET Inc  |                         |              |
| <b>Applicant Address:</b>   | #716. Kumgang Hightech Valley Bldg. 133 Sangdaewon Jungwon Sungnam Kyunggi 462-120 Korea |                         |              |
| <b>Device Under Test:</b>   | Bluetooth Headset  |                         |              |
| <b>FCC ID:</b>              | QWGBHE10   | <b>Model No.:</b>       | BHE10        |
| <b>Receipt No.:</b>         | SKTEU04-0758   | <b>Date of receipt:</b> | NOV 24, 2004 |
| <b>Date of Issue:</b>       | DEC 2, 2004  |                         |              |
| <b>Location of Testing:</b> | SK TECH CO., LTD.<br>820-2, Wolmoon-Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea         |                         |              |
| <b>Test Procedure:</b>      | ANSI C63.4 / 2003  |                         |              |
| <b>Test Specification:</b>  | 47CFR, Part 15 Subpart C   |                         |              |
| <b>Equipment Class:</b>     | DSS - Part 15 Spread Spectrum Transmitter  |                         |              |
| <b>Test Result:</b>         | The above-mentioned device has been tested and passed.                                   |                         |              |

Tested &amp; Reported by: Chang-Min, Moon

Approved by: Jae-Kyung, Bae

DEC 2, 2004

DEC 2, 2004

Signature

Date

Signature

Date

|                       |  |
|-----------------------|--|
| <b>Other Aspects:</b> |  |
| <b>Abbreviations:</b> | • OK, Pass = passed • Fail = failed • N/A = not applicable |

- This test report is not permitted to copy partly without our permission.
- This test result is dependent on only equipment to be used.
- This test result is based on a single evaluation of one sample of the above mentioned.
- This test report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government.
- We certify that this test report has been based on the measurement standards that is traceable to the national or International standards.

NVLAP Lab. Code: 200220-0



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## 1. GENERAL

These tests were performed using the test procedure outlined in ANSI C63.4, 2003 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.247 for Spread Spectrum Transmitter. The EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards.

We attest to the accuracy of data. All measurements reported herein were performed by SK Tech Co., Ltd. and were made under Chief Engineer's supervision.

We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

## 2. TEST SITE

SK TECH Co., Ltd.

### 2.1 Location

820-2, Wolmoon Ri, Wabu-Up, Namyangju-Si, Kyunggi-Do, Korea

This test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.

This laboratory is accredited by NVLAP for NVLAP Lab. Code: 200220-0 and DATech for DAR-Registration No.: TTI-P-G155/97-10



## 2.2 List of Test and Measurement Instruments

| Description                  | Manufacturer    | Model #       | Serial #    |                                     |
|------------------------------|-----------------|---------------|-------------|-------------------------------------|
| Spectrum Analyzer            | Agilent         | E4405B        | US40520856  | <input checked="" type="checkbox"/> |
| EMC Spectrum Analyzer        | Agilent         | E7405A        | US40240203  | <input checked="" type="checkbox"/> |
| EMI Test Receiver            | Rohde&Schwarz   | ESVS10        | 825120/013  | <input checked="" type="checkbox"/> |
| EMI Test Receiver            | Rohde&Schwarz   | ESVS10        | 834468/008  | <input checked="" type="checkbox"/> |
| EMI Test Receiver            | Rohde&Schwarz   | ESHS10        | 825120/013  | <input checked="" type="checkbox"/> |
| EMI Test Receiver            | Rohde&Schwarz   | ESHS10        | 834468/008  | <input checked="" type="checkbox"/> |
| Artificial Mains Network     | Rohde&Schwarz   | ESH3-Z5       | 836679/018  | <input checked="" type="checkbox"/> |
| Pre-amplifier                | HP              | 8447F         | 3113A05153  | <input checked="" type="checkbox"/> |
| Pre-amplifier                | HP              | 8349B         | 2644A03250  | <input checked="" type="checkbox"/> |
| Power Meter                  | Agilent         | E4418B        | 3318A13916  |                                     |
| Power Sensor                 | HP              | 8485A         | 3318A13916  |                                     |
| VHF Precision Dipole Antenna | Schwarzbeck     | VHAP          | 1014        |                                     |
| VHF Precision Dipole Antenna | Schwarzbeck     | VHAP          | 1015        |                                     |
| UHF Precision Dipole Antenna | Schwarzbeck     | UHAP          | 989         |                                     |
| UHF Precision Dipole Antenna | Schwarzbeck     | UHAP          | 990         |                                     |
| Loop Antenna                 | Schwarzbeck     | HFH2-Z2       | 863048/019  |                                     |
| TRILOG Broadband Antenna     | Schwarzbeck     | VULB9160      | 3141        | <input checked="" type="checkbox"/> |
| Biconical Antenna            | Schwarzbeck     | VHA9103       | 2265        | <input checked="" type="checkbox"/> |
| Log-Periodic Antenna         | Schwarzbeck     | UHALP9107     | 1819        | <input checked="" type="checkbox"/> |
| Horn Antenna                 | AH Systems      | SAS-200/571   | 304         | <input checked="" type="checkbox"/> |
| Horn Antenna                 | Electro Metrics | EM-6961       | 6297        |                                     |
| Horn Antenna                 | Electro Metrics | EM-6961       | 6298        |                                     |
| Vector Signal Generator      | Agilent         | E4438C        | MY42080359  |                                     |
| Signal Generator             | HP              | 8349B         | 2644A03250  |                                     |
| DC Power Supply              | HP              | 6634A         | 2926A-01078 | <input checked="" type="checkbox"/> |
| DC Power Supply              | HP              | 6268B         | 2542A-07856 |                                     |
| Digital Multimeter           | HP              | HP3458A       | 2328A14389  | <input checked="" type="checkbox"/> |
| PCS Interface                | HP              | 83236B        | 3711J00881  |                                     |
| CDMA Mobile Test Set         | HP              | 8924C         | US35360253  |                                     |
| Hygro/Thermo Graph           | SATO            | PC-5000TRH-II | -           | <input checked="" type="checkbox"/> |
| Temperature/Humidity Chamber | All Three       | ATH-50M       | 20030425    |                                     |

## 2.3 Test Date

Date of Application : NOV 24, 2004

Date of Test : NOV 25, 2004 ~ DEC 1, 2004

## 2.4 Test Environment

See each test item's description.



### 3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

The product specification described herein was obtained from the product data sheet or user's manual.

#### 3.1 Rating and Physical Characteristics

|                           |   |
|---------------------------|---|
| Type / Model No.          | Bluetooth Headset / BHE10   |
| Power source              | Lithium Ion Battery (DC 3.7V)   |
| Local Oscillator or X-Tal | X-Tal: 13 MHz   |
| Transmit Frequency        | 2402 ~ 2480 MHz (1MHz, 79 channels)   |
| Antenna Type              | SMD Chip antenna (50Ω, -1.3dBi)   |
| Type of Modulation        | FHSS (GFSK)   |
| RF Output power           | < 4dBm  |
| External Ports            | <ul style="list-style-type: none"> <li>- Battery Rechargeable AC Adapter Jack**</li> <li>1)AC adapter manufactured by Seorim Elecom Co., Ltd.<br/>Model No.: SR0510SV<br/>AC Input: 100-240V, 50-60Hz, DC output: 5.0V, 1.0A</li> <li>2)AC adapter manufactured by Wang Huei Company Limited. (Alternate)<br/>Model No.: YFAR23073001<br/>AC Input: 100-240V, 50-60Hz, DC output: 5.0V, 1.0A</li> <li>3)AC adapter manufactured by Kuantech Co., Ltd. (Alternate)<br/>Model No.: KSAFB0500100W1EU<br/>AC Input: 100-240V, 50-60Hz, DC output: 5.0V, 1.0A</li> <li>4)AC adapter manufactured by Jenlin Electronics Co., Ltd. (Alternate)<br/>Model No.: TA-11E<br/>AC Input: 100-240V, 50-60Hz, DC output: 5.2V, 0.6A</li> </ul> |

\*\*Rechargeable AC Adapter of the EUT is used by Multi-Models.

Please refer to the Conducted Emissions Test (Page 37 ~49).

#### 3.2 Equipment Modifications

None.

#### 3.3 Submitted Documents

Block diagram

Schematic diagram

Antenna Specification

Part List

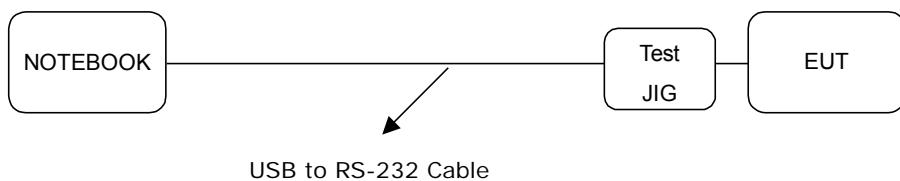
User manual



## 4. MEASUREMENT CONDITIONS

### 4.1 Description of test configuration

The measurements were taken in continuous transmitting mode using Special Test Program provided by the applicant for controlling the EUT via RS-232 Port so that the operating frequency of the EUT could be changed with the frequency hopping turned off.



### 4.2 List of Peripherals

| Equipment Type | Manufacture | Model     | Cable Description                   |
|----------------|-------------|-----------|-------------------------------------|
| Notebook       | Trigem      | Dreambook | 1.8m, Shielded, USB to RS-232 Cable |

### 4.3 Uncertainty

| Measurement Item     | Combined Standard Uncertainty<br>$U_c$ | Expanded Uncertainty<br>$U = KU_c (K = 2)$ |
|----------------------|--|--|
| Conducted RF power   | $\pm 1.49$ dB                          | $\pm 2.98$ dB                              |
| Radiated disturbance | $\pm 2.37$ dB                          | $\pm 4.74$ dB                              |



## 5. TEST AND MEASUREMENTS

### Summary of Test Results

| Requirement  | CFR 47 Section                  | Report Section | Test Result |
|--|---------------------------------|----------------|-------------|
| Antenna Requirement                                | 15.203, 15.247(b)(4)            | 5.1            | PASS        |
| Maximum Peak Output Power                          | 15.247(b)(1), (4)               | 5.2            | PASS        |
| Carrier Frequency Separation                       | 15.247(a)(1)                    | 5.3            | PASS        |
| 20dB Channel Bandwidth                             | 15.247(a)(1)                    | 5.4            | PASS        |
| Number of Hopping Channels                         | 15.247(a)(iii), 15.247(b)(1)    | 5.5            | PASS        |
| Time of Occupancy (Dwell Time)                     | 15.247(a)(iii)                  | 5.6            | PASS        |
| Spurious Emission, Band Edge, and Restricted bands | 15.247(d), 15.205(a), 15.209(a) | 5.7            | PASS        |
| Peak Power Spectral Density                        | 15.247(e)                       | 5.8            | PASS        |
| Conducted Emissions                                | 15.207(a)                       | 5.9            | PASS        |
| RF Exposure  | 15.247(i), 1.1307(b)(1)         | 5.10           | PASS        |

### 5.1 ANTENNA REQUIREMENT

#### 5.1.1 Regulation

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### 5.1.2 Result:

**PASS**

The transmitter has an integral SMD Chip Antenna. The directional gain of the antenna is typically -1.3dBi.



## 5.2 MAXIMUM PEAK OUTPUT POWER

### 5.2.1 Regulation

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.

According to §15.247(b)(4), the conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### 5.2.2 Test Procedure

1. Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via RS232 Port(Test Jig) and make sure the spectrum analyzer is operated in its linear range.
4. Set the spectrum analyzer to MAX HOLD mode with RBW = 3 MHz.
5. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
6. Repeat above procedures until all frequencies measured were complete.

### 5.2.3 Test Results:

**PASS**

**Table 1: Measured values of the Maximum Peak Output Power (Conducted)**

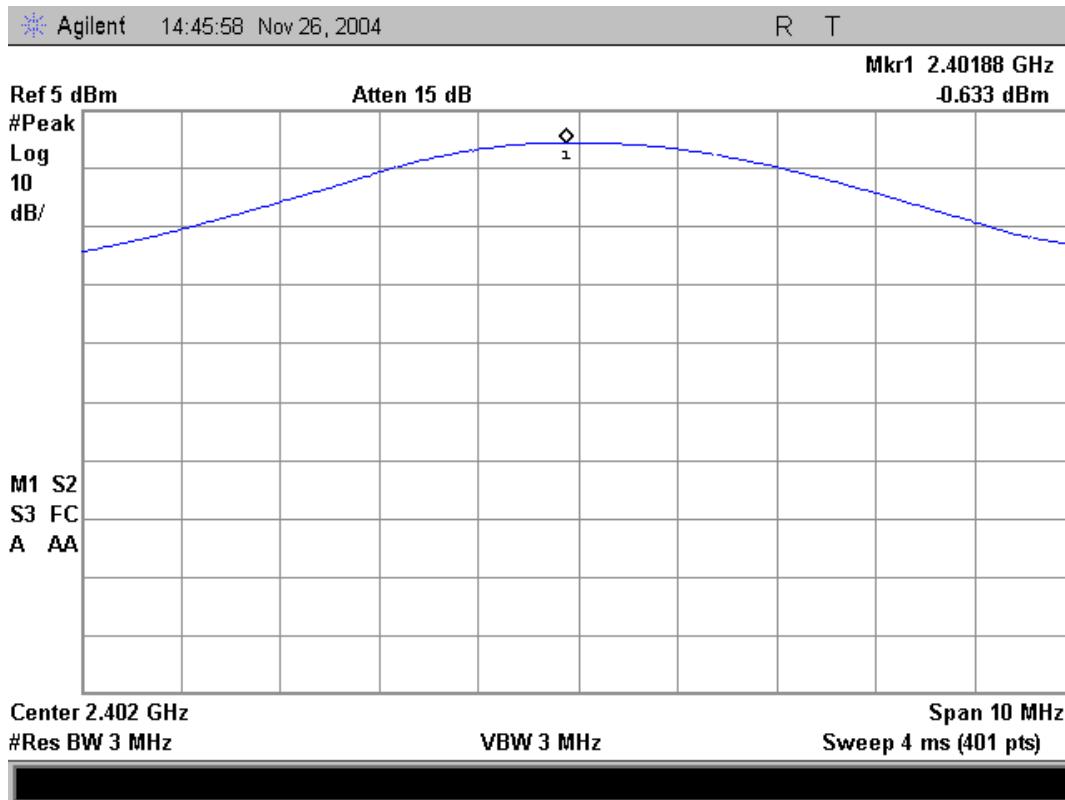
| Operating Frequency | Resolution Bandwidth | Reading    | Cable Loss | Actual               | Limit |
|---------------------|----------------------|------------|------------|----------------------|-------|
| 2402 MHz            | 3 MHz                | -0.633 dBm | 0.1 dB     | -0.533 dBm (0.88 mW) | 1 W   |
| 2441 MHz            | 3 MHz                | -0.005 dBm | 0.1 dB     | 0.095 dBm (1.02 mW)  | 1 W   |
| 2480 MHz            | 3 MHz                | -0.594 dBm | 0.1 dB     | -0.494 dBm (0.89 mW) | 1 W   |

Actual = Reading + Cable Loss

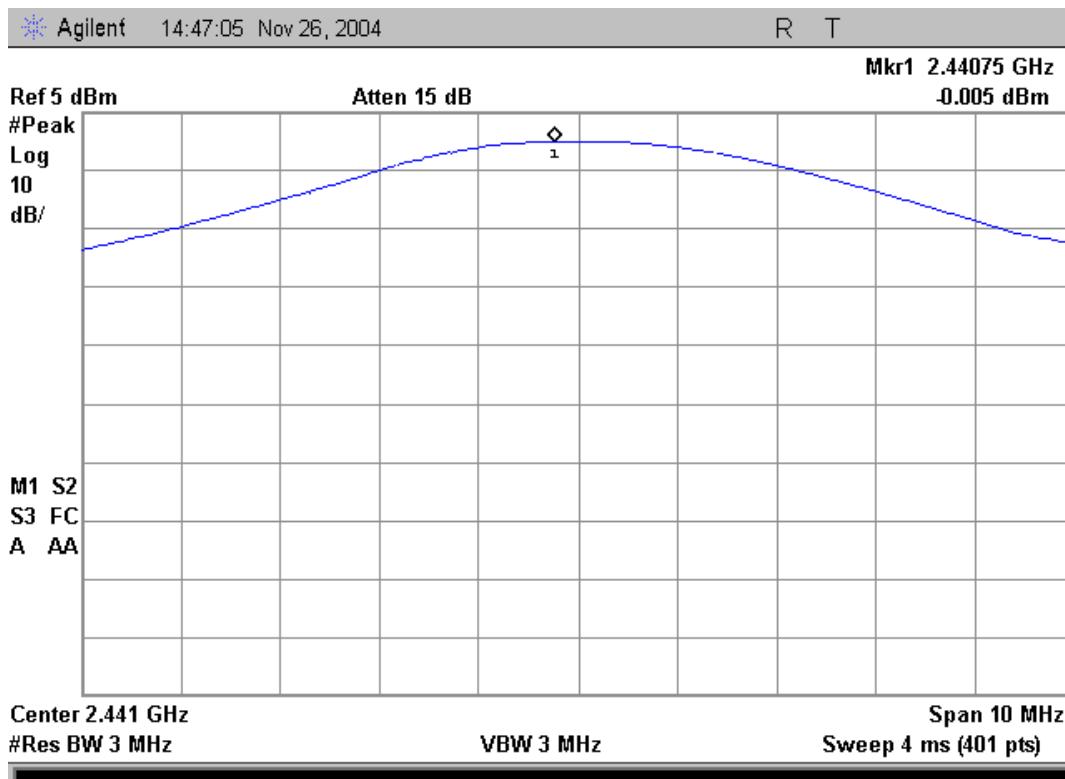

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**Figure 1. Plot of the Maximum Peak Output Power (Conducted)**  
**Lowest Channel (operating at 2402 MHz)**

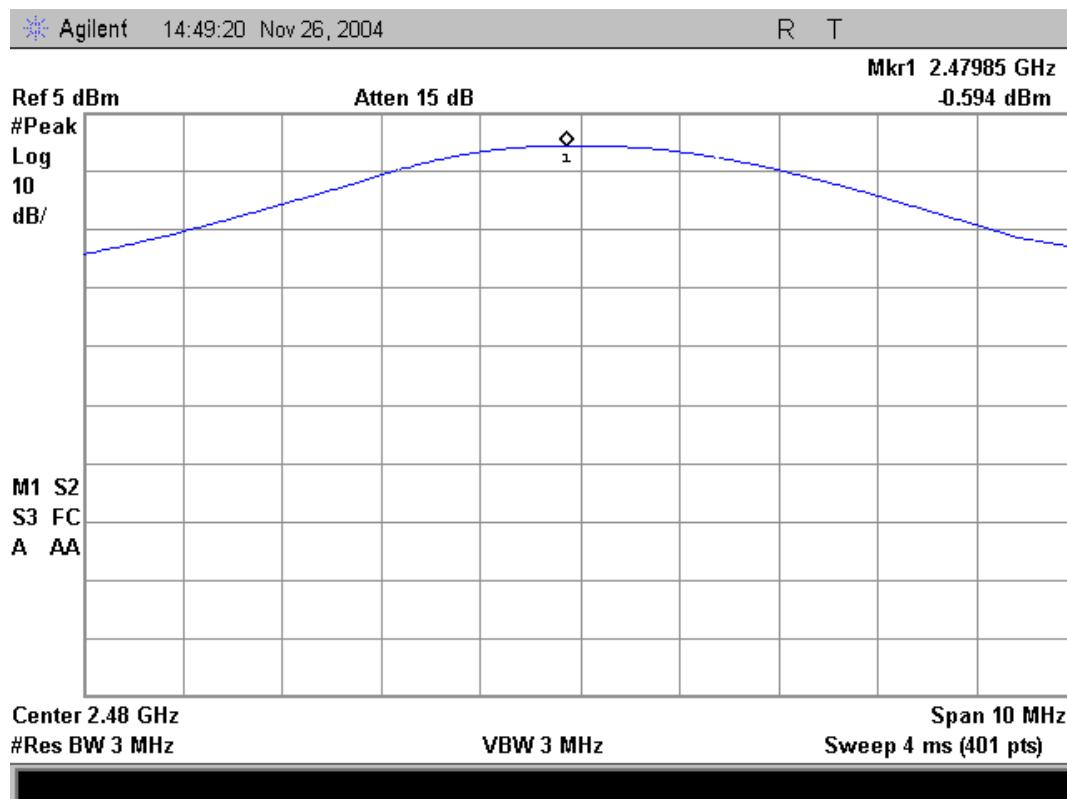


**Middle Channel (operating at 2441 MHz)**



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**Highest Channel (operating at 2480 MHz)**



## 5.3 CARRIER FREQUENCY SEPARATION

### 5.3.1 Regulation

According to §15.247(a)(1), 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.

### 5.3.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via RS232 Port(Test Jig), and then set the spectrum analyzer to MAX HOLD mode.
4. Measure the separation between the peaks of the adjacent channels using the marker-delta function.
5. Repeat above procedures until all frequencies measured were complete.

### 5.3.3 Test Results:

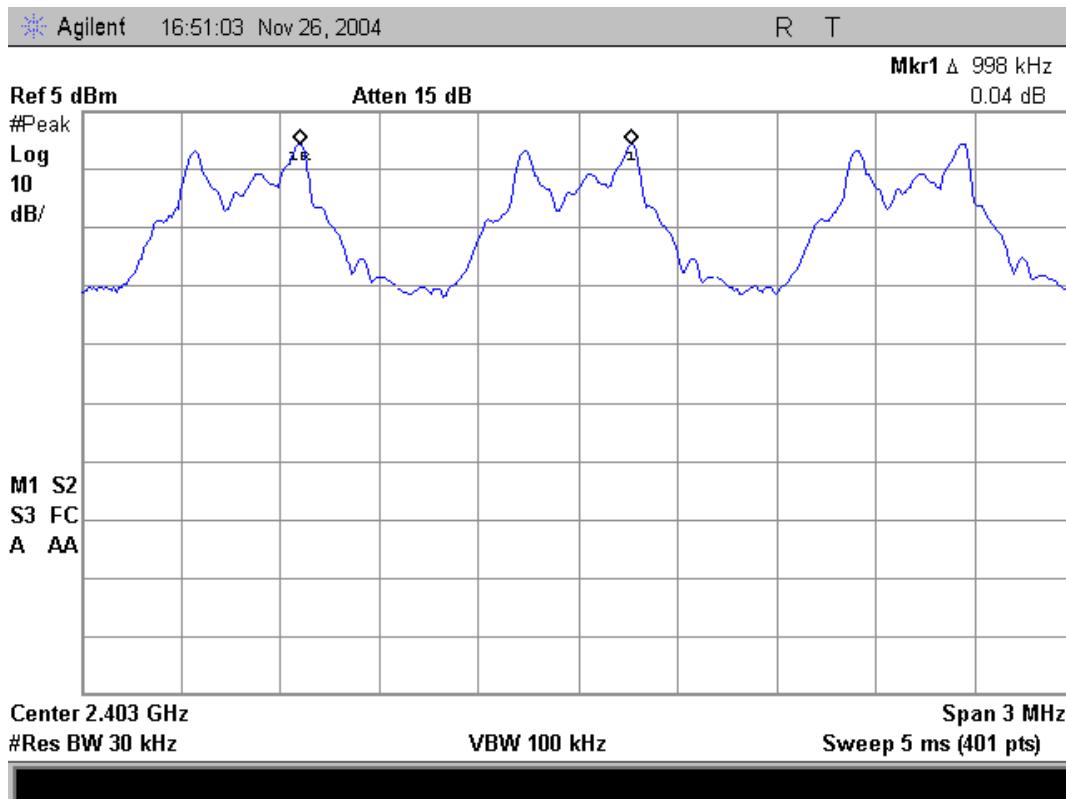
**PASS****Table 2: Measured values of the Carrier Frequency Separation (Conducted)**

| Operating frequency | Carrier frequency separation | Limit                       |
|---------------------|------------------------------|-----------------------------|
| 2402 MHz            | 998 kHz                      | ≥ 25 kHz or 20 dB bandwidth |
| 2441 MHz            | 998 kHz                      | ≥ 25 kHz or 20 dB bandwidth |
| 2480 MHz            | 998 kHz                      | ≥ 25 kHz or 20 dB bandwidth |

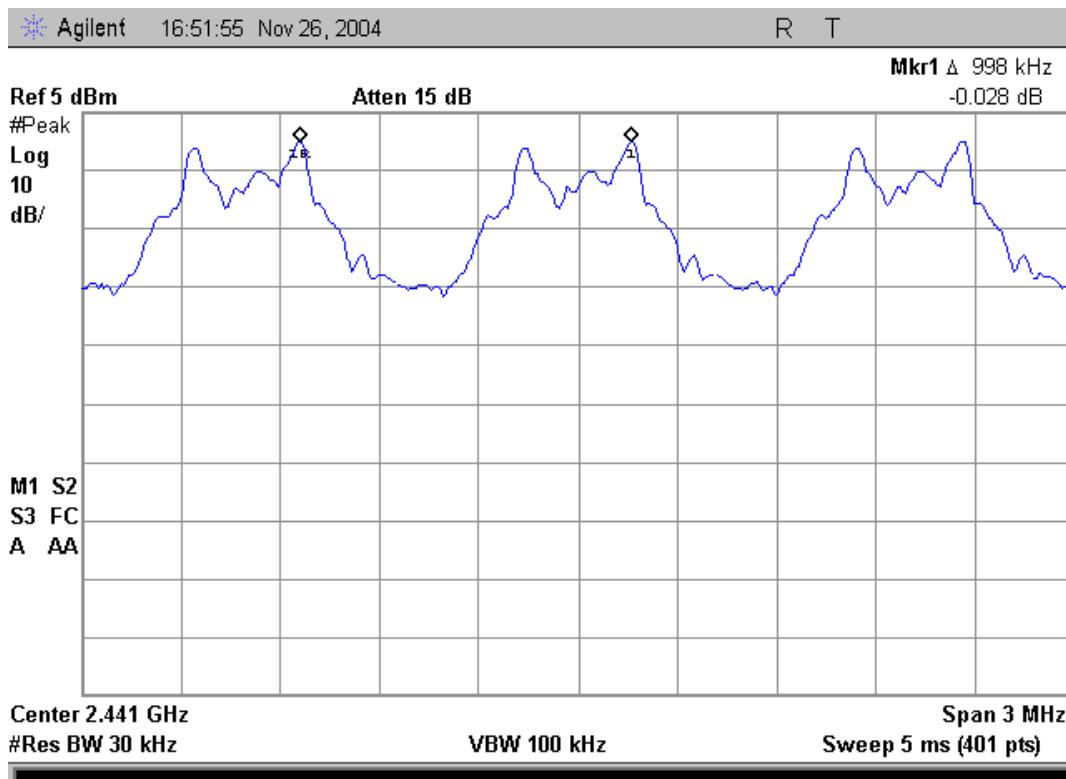
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**Figure 2. Plot of the Carrier Frequency Separation (Conducted)**  
**Lowest Channel (operating at 2402 MHz)**

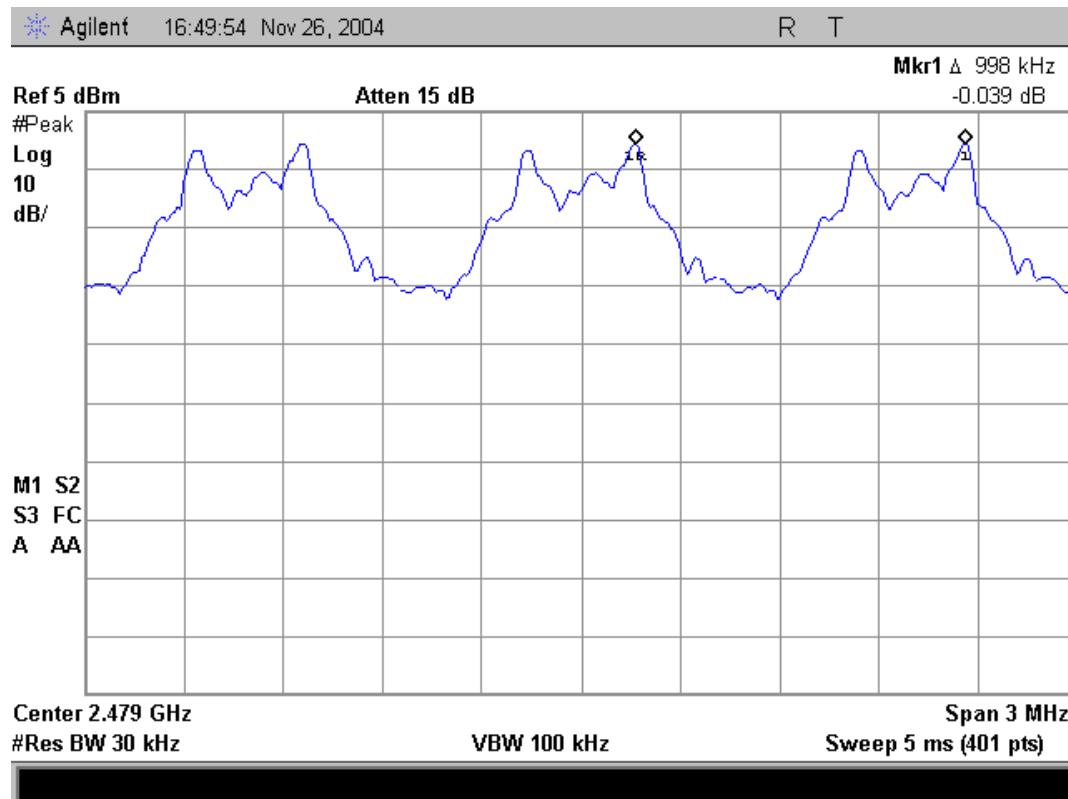


**Middle Channel (operating at 2441 MHz)**



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**Highest Channel (operating at 2480 MHz)**



## 5.4 20dB CHANNEL BANDWIDTH

### 5.4.1 Regulation

According to §15.247(a)(1), 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.

### 5.4.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via RS232 Port(Test Jig) and make sure the spectrum analyzer is operated in its linear range.
4. Set the spectrum analyzer to MAX HOLD mode and then set a reference level on it equal to the highest peak value.
5. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
6. Repeat above procedures until all frequencies measured were complete.

### 5.4.3 Test Results:

**PASS**

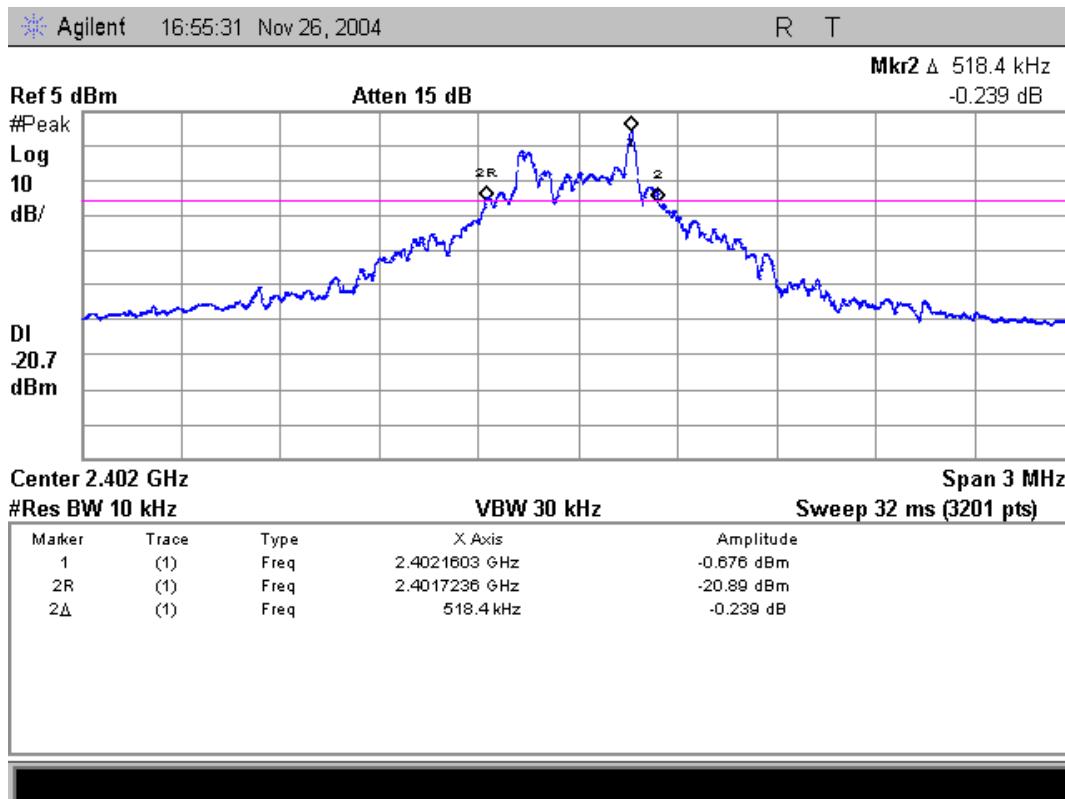
**Table 3: Measured values of the 20dB Channel Bandwidth (Conducted)**

| Operating frequency | 20dB Channel bandwidth | Limit   |
|---------------------|------------------------|---------|
| 2402 MHz            | 518.4 kHz              | < 1 MHz |
| 2441 MHz            | 521.3 kHz              | < 1 MHz |
| 2480 MHz            | 521.3 kHz              | < 1 MHz |

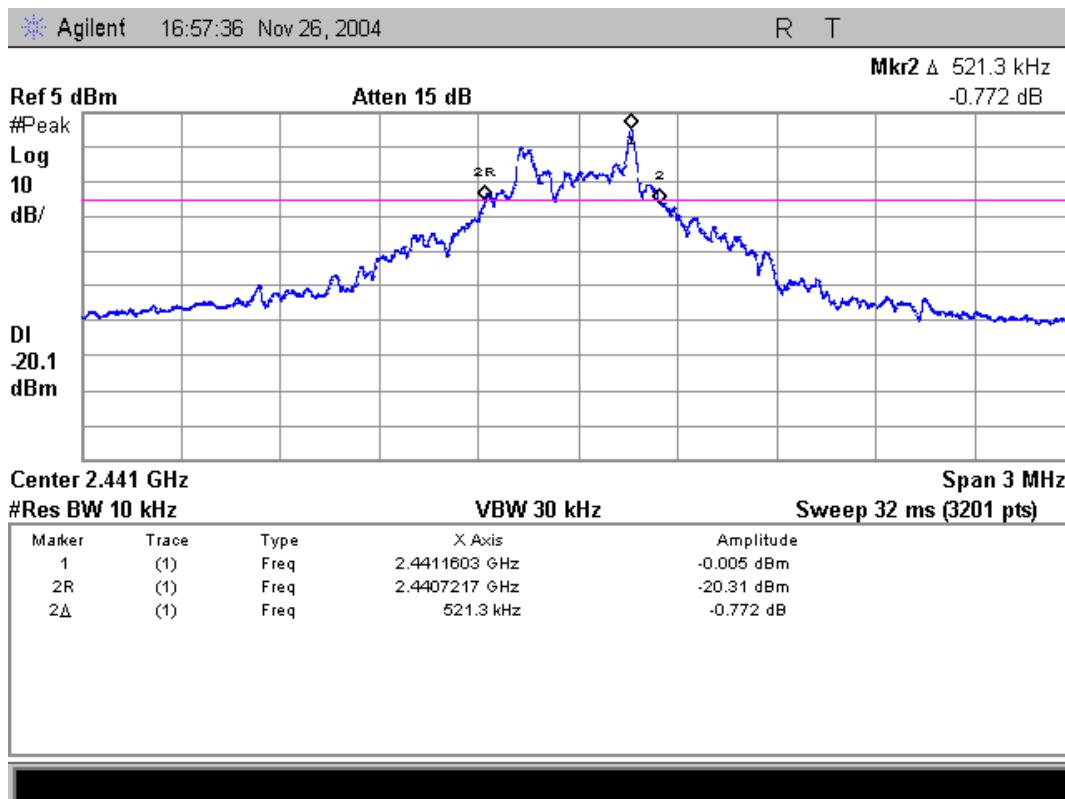

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**Figure 3. Plot of the 20dB Channel Bandwidth (Conducted)**  
**Lowest Channel (operating at 2402 MHz)**

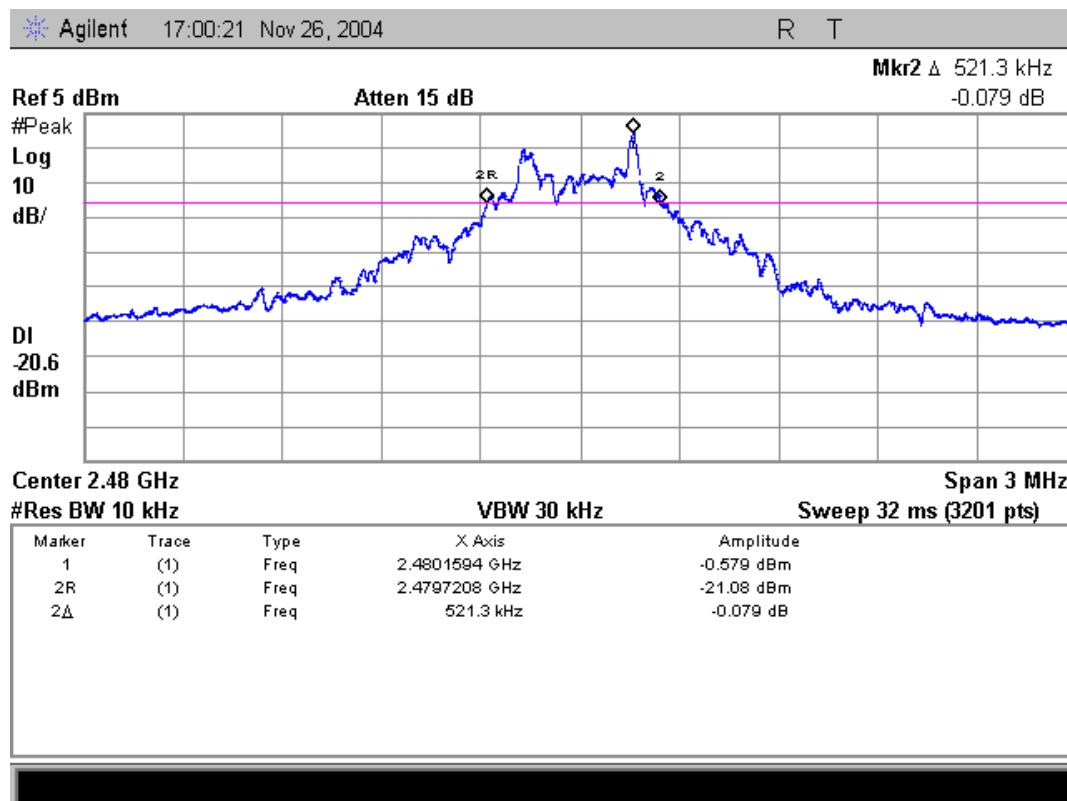


**Middle Channel (operating at 2441 MHz)**



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**Highest Channel (operating at 2480 MHz)**



## 5.5 NUMBER OF HOPPING CHANNELS

### 5.5.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

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.

### 5.5.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set the hopping function enabled by controlling it via RS232 Port(Test Jig).
4. Set the spectrum analyzer MAX HOLD and record the number of hopping channels.

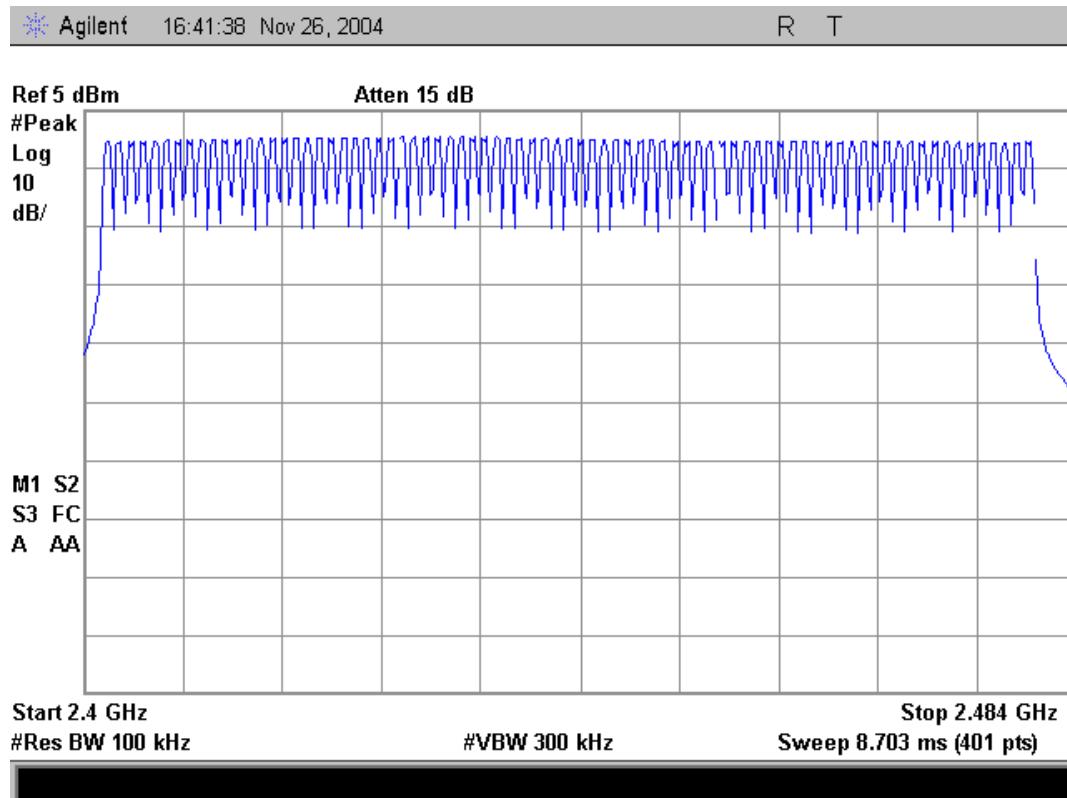
### 5.5.3 Test Results:

**PASS****Table 4: Measured values of the Number of Hopping Channels (Conducted)**

| Operating frequency | Number of hopping channels | Limit |
|---------------------|----------------------------|-------|
| 2402 - 2480 MHz     | 79                         | ≥ 15  |

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**Figure 4. Plot of the Number of Hopping Channels (Conducted)**



## 5.6 TIME OF OCCUPANCY (DWELL TIME)

### 5.6.1 Regulation

According to §15.247(a)(1)(iii), frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

### 5.6.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via RS232 Port(Test Jig).
4. Set the spectrum analyzer to ZERO SAPN centered on the hopping channel with RBW = 1MHz, and then measure the dwell time using the marker-delta function.
5. Repeat above procedures until all frequencies measured were complete.
6. Repeat this test for different modes of operation (e.g., data rate, modulation format, etc.), if applicable.

### 5.6.3 Test Results:

**PASS**

**Table 5: Measured values of the Time of Occupancy (Conducted)**

| Operating frequency | Reading   | Hopping rate | Number of Channels | Actual     | Limit       |
|---------------------|-----------|--------------|--------------------|------------|-------------|
| 2402 MHz            | 0.3796 ms | 800 hops/s   | 79                 | 121.472 ms | 0.4 seconds |
| 2441 MHz            | 0.3803 ms | 800 hops/s   | 79                 | 121.696 ms | 0.4 seconds |
| 2480 MHz            | 0.3803 ms | 800 hops/s   | 79                 | 121.696 ms | 0.4 seconds |

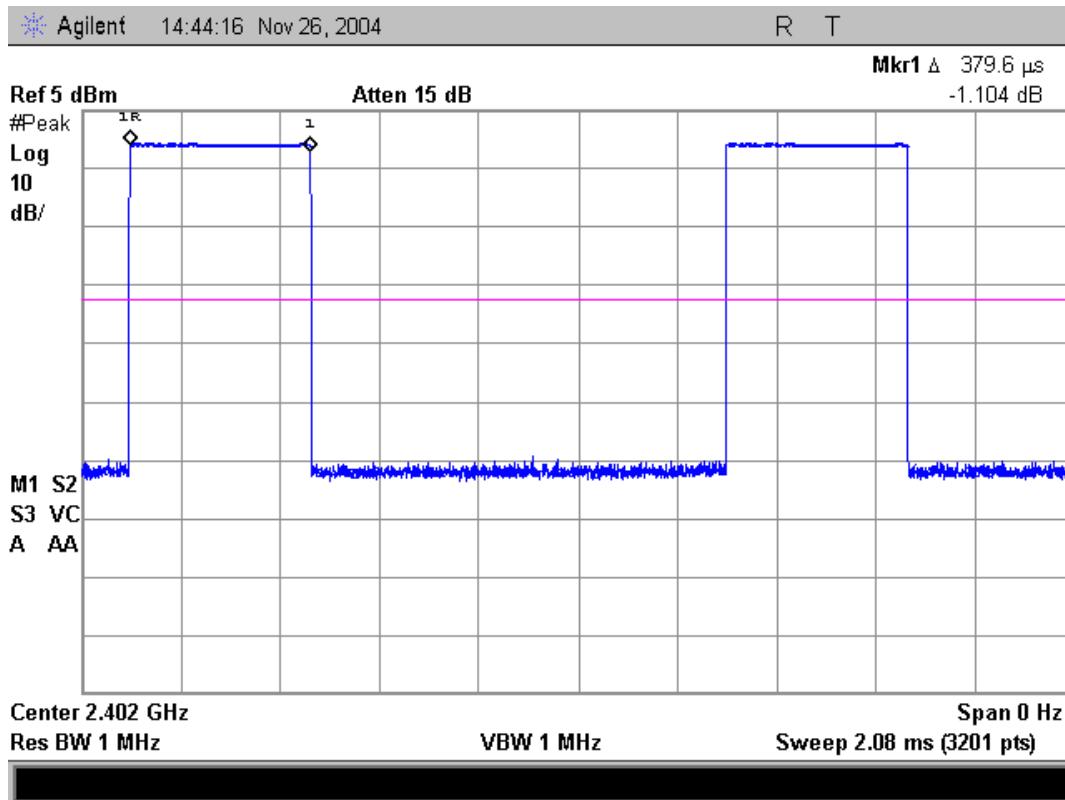
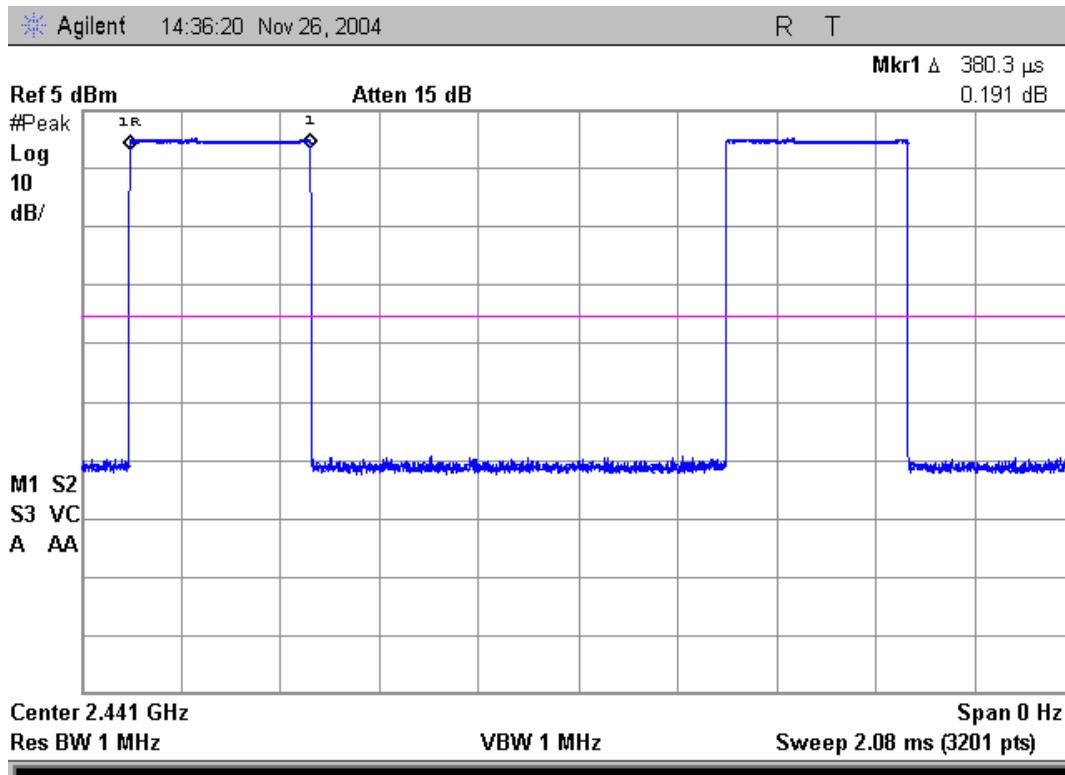
**Actual = Reading × (Hopping rate / Number of channels) × Test period**

**Test period = 0.4 [seconds / channel] × 79 [channel] = 31.6 [seconds]**

NOTE: The EUT makes worst case 1600 hops per second or 1 time slot has a length of 625µs with 79 channels. A DH1 Packet needs 1 time slot for transmitting and 1 time slot for receiving. Then the EUT makes worst case 800 hops per second with 79 channels.

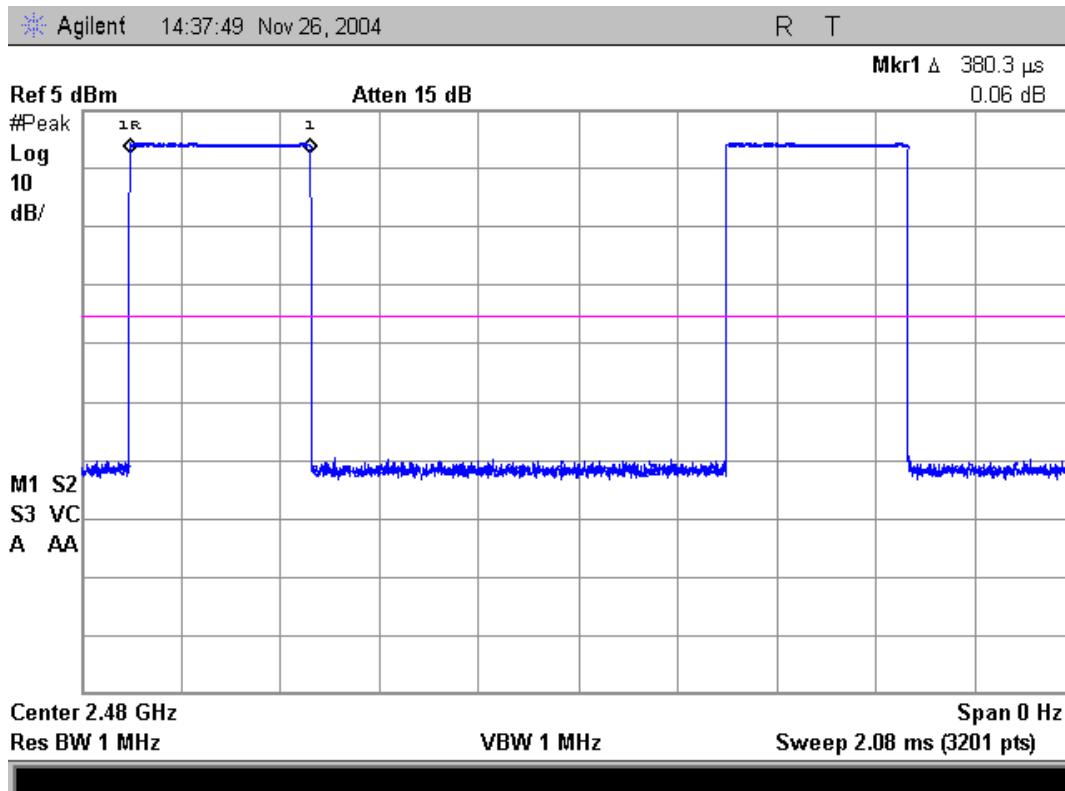

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**Figure 5. Plot of the Time of Occupancy (Conducted)**
**Lowest Channel (operating at 2402 MHz)**

**Middle Channel (operating at 2441 MHz)**


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**Highest Channel (operating at 2480 MHz)**



## 5.7 SPURIOUS EMISSIONS, BAND EDGE, AND RESTRICTED BANDS

### 5.7.1 Regulation

According to §15.24(d), 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 Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

| Frequency (MHz) | Field strength ( $\mu$ V/m @ 3m) | Field strength (dB $\mu$ V/m @ 3m) |
|-----------------|----------------------------------|------------------------------------|
| 30–88           | 100                              | 40.0                               |
| 88–216          | 150                              | 43.5                               |
| 216–960         | 200                              | 46.0                               |
| Above 960       | 500                              | 54.0                               |

According to §15.109(a), for an unintentional device, except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the above table.

\*\* The emission limits shown in the above table are based on measurement instrumentation employing a CISPR quasi-peak detector and above 1000 MHz are based on the average value of measured emissions.

### 5.7.2 Test Procedure

#### 1) Spurious RF Conducted Emissions:

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via RS232 Port(Test Jig) and make sure the spectrum analyzer is operated in its linear range.
4. Set the spectrum analyzer to MAX HOLD mode with RBW = 100kHz, VBW = 100kHz and wide SPAN enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.



5. Set the marker on the peak of any spurious emission, and then measure the peak level of the emissions marked, using the spectrum analyzer with RBW = 100kHz, VBW = 100kHz, and SPAN = 100MHz.
6. Repeat above procedures until all frequencies measured were complete.

**2) Spurious Radiated Emissions:**

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 meters.
2. The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360°.
3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 30 to 1000 MHz using the TRILOG broadband antenna, and from 1000 MHz to 18000 MHz using the horn antenna.
4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.
5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.
6. The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT.



## 5.7.3 Test Results:

PASS

Table 6: Measured values of the RF antenna port emissions (Conducted)

| Frequency [MHz]                                | Reading [dBm] | Cable Loss [dB] | Actual [dBm] | Limit [dBm] | Margin [dB] |
|--|---------------|-----------------|--------------|-------------|-------------|
| <b>Lowest Channel (operating at 2402 MHz)</b>  |               |                 |              |             |             |
| 2402.00  | -0.89         | 0.1             | -0.79        | -           | -           |
| 2390.00  | -54.12        | 0.1             | -54.02       | -20.79      | 33.23       |
| 2399.80  | -40.04        | 0.1             | -39.94       | -20.79      | 19.15       |
| 2506.11  | -56.70        | 0.1             | -56.60       | -20.79      | 35.81       |
| 2532.20  | -55.99        | 0.1             | -55.89       | -20.79      | 35.10       |
| 2558.05  | -58.33        | 0.1             | -58.23       | -20.79      | 37.44       |
| 2571.20  | -58.63        | 0.1             | -58.53       | -20.79      | 37.74       |
| 2675.27  | -60.31        | 0.1             | -60.21       | -20.79      | 39.42       |
| 7206.47  | -52.14        | 0.3             | -51.84       | -20.79      | 31.05       |
|  |               |                 |              |             |             |
|  |               |                 |              |             |             |
|  |               |                 |              |             |             |
| <b>Middle Channel (operating at 2441 MHz)</b>  |               |                 |              |             |             |
| 2441.00  | -0.83         | 0.1             | -0.73        | -           | -           |
| 2389.18  | -58.42        | 0.1             | -58.32       | -20.73      | 37.59       |
| 2493.19  | -54.20        | 0.1             | -54.10       | -20.73      | 33.37       |
| 2545.20  | -57.76        | 0.1             | -57.66       | -20.73      | 36.93       |
| 2571.20  | -56.33        | 0.1             | -56.23       | -20.73      | 35.50       |
| 2597.20  | -58.43        | 0.1             | -58.33       | -20.73      | 37.60       |
| 2675.20  | -60.33        | 0.1             | -60.23       | -20.73      | 39.50       |
| 7323.50  | -53.33        | 0.3             | -53.23       | -20.73      | 32.50       |
|  |               |                 |              |             |             |
|  |               |                 |              |             |             |
|  |               |                 |              |             |             |
| <b>Highest Channel (operating at 2480 MHz)</b> |               |                 |              |             |             |
| 2480.00  | -0.88         | 0.1             | -0.78        | -           | -           |
| 2376.20  | -58.38        | 0.1             | -58.28       | -20.78      | 37.50       |
| 2483.60  | -46.13        | 0.1             | -46.03       | -20.78      | 25.25       |
| 2492.82  | -52.00        | 0.1             | -51.90       | -20.78      | 31.12       |
| 2519.20  | -58.10        | 0.1             | -58.00       | -20.78      | 37.22       |
| 2532.20  | -55.46        | 0.1             | -55.36       | -20.78      | 34.58       |
| 2584.25  | -58.34        | 0.1             | -58.24       | -20.78      | 37.46       |
| 2610.20  | -56.38        | 0.1             | -56.28       | -20.78      | 35.50       |
| 2636.20  | -58.76        | 0.1             | -58.66       | -20.78      | 37.88       |
| 4960.00  | -60.45        | 0.2             | -60.25       | -20.78      | 39.47       |
| 7440.50  | -55.75        | 0.3             | -55.45       | -20.78      | 34.67       |

Actual = Reading + Cable Loss

NOTE: All the Reading values were taken using Spectrum Analyzer with RBW=100 kHz, VBW=100 kHz, and SPAN=100 MHz



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**Table 7: Measured values of the Field strength of spurious emission (Radiated)**

Margin (dB) = Limit - Actual

[Actual = Reading - Amp Gain + AF + CL]

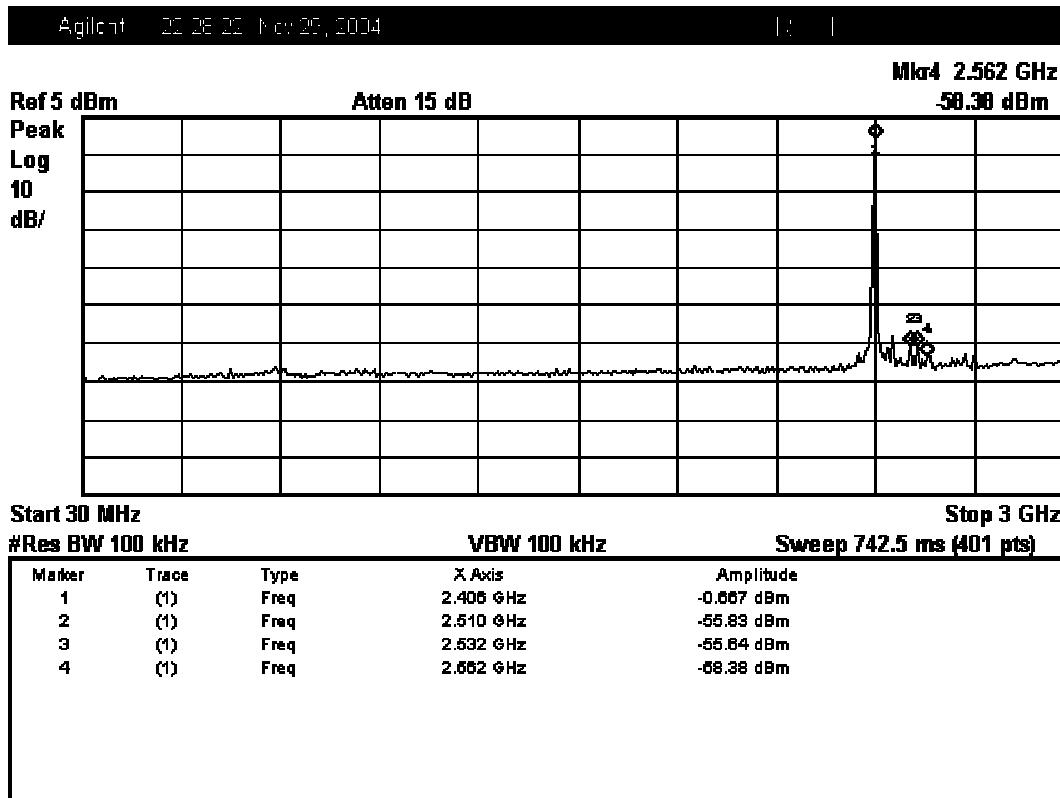
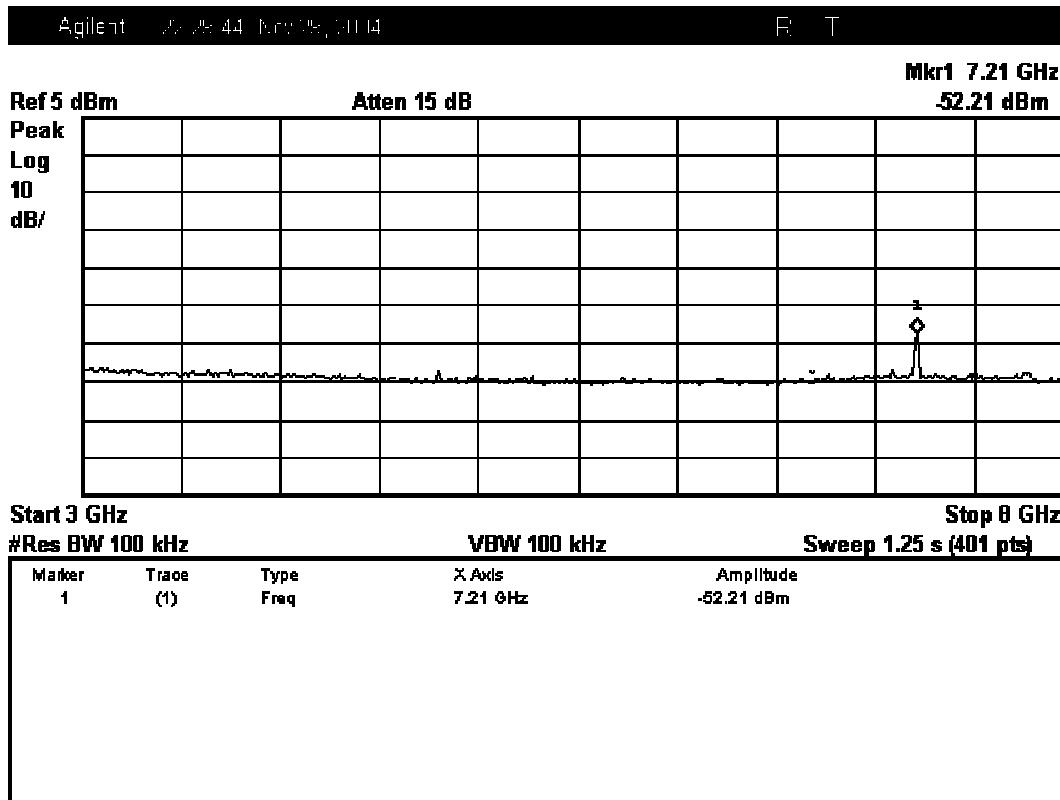
1. H = Horizontal, V = Vertical Polarization

## 2. AF/CI = Antenna Factor and Cable Loss

NOTE: The spectrum was scanned from 30 MHz to 18 GHz. All emissions not reported were more than 20 dB below the specified limit or in the noise floor. The measured data in the above table include the spurious radiated emissions that do not fall in the restricted bands.

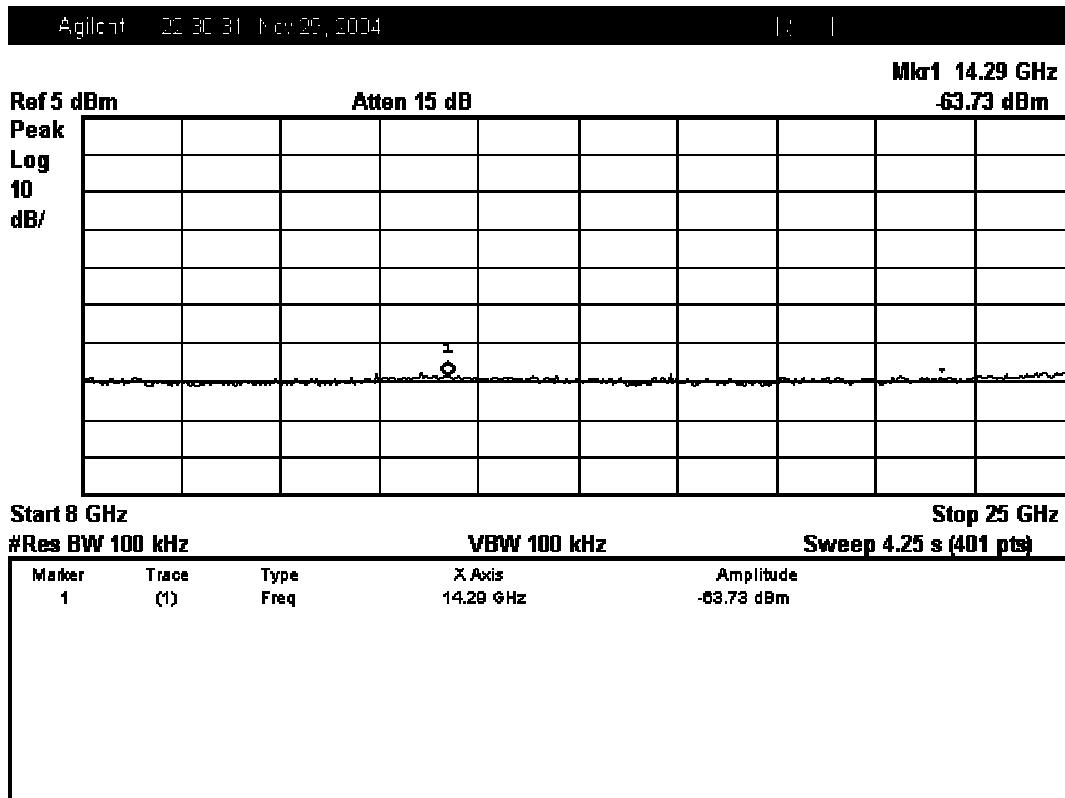
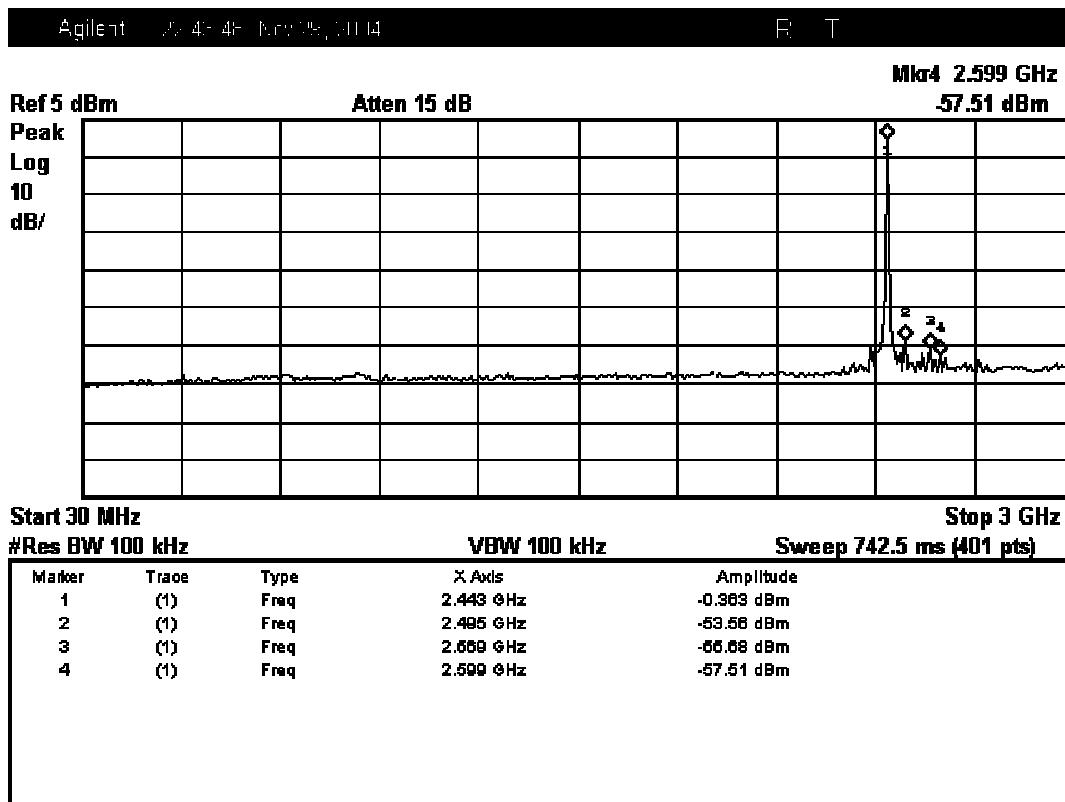

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**Figure 6. Plot of the RF antenna port emissions (Conducted)**
**Lowest Channel (operating at 2402 MHz): 30MHz ~ 3GHz**

**Lowest Channel (operating at 2402 MHz): 3GHz ~ 8GHz**


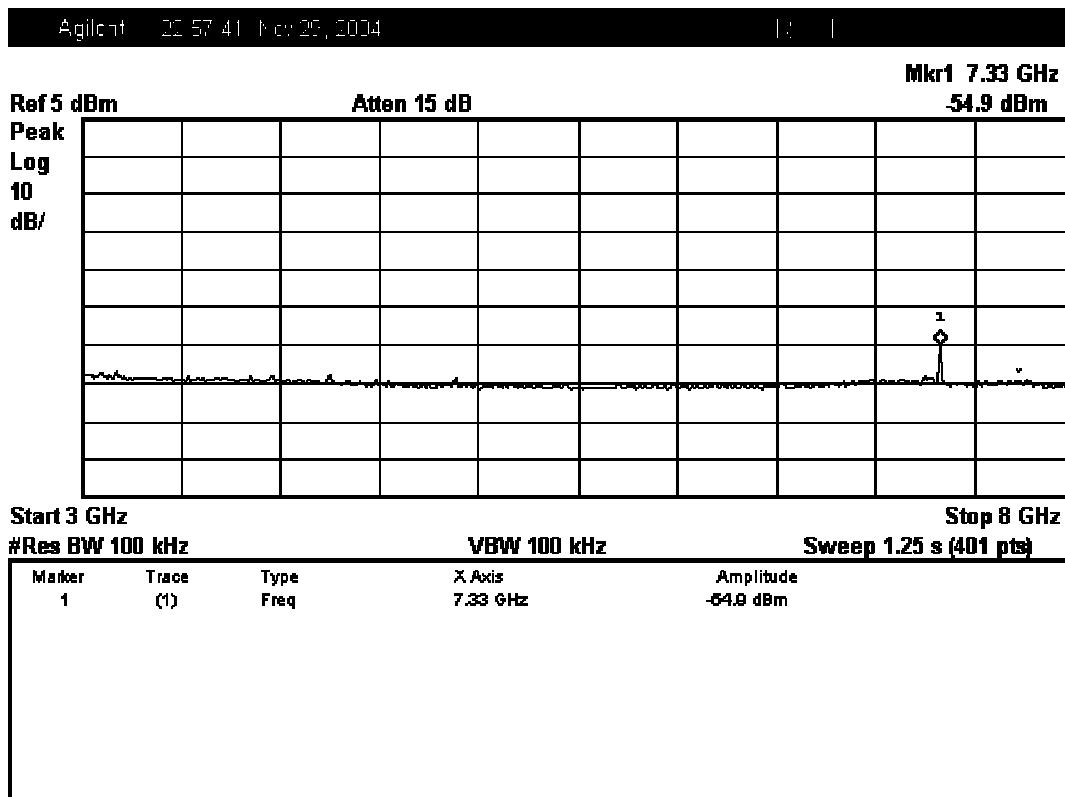
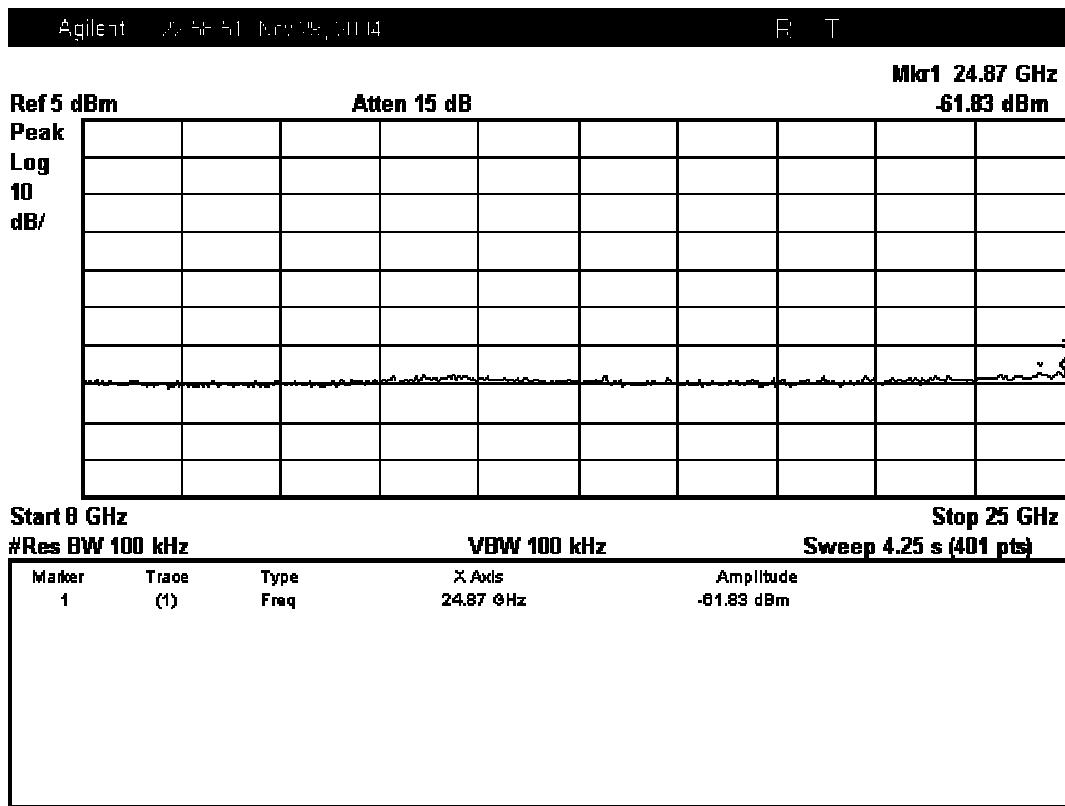

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**Lowest Channel (operating at 2402 MHz): 8GHz ~ 25GHz**

**Middle Channel (operating at 2441 MHz): 30MHz ~ 3GHz**


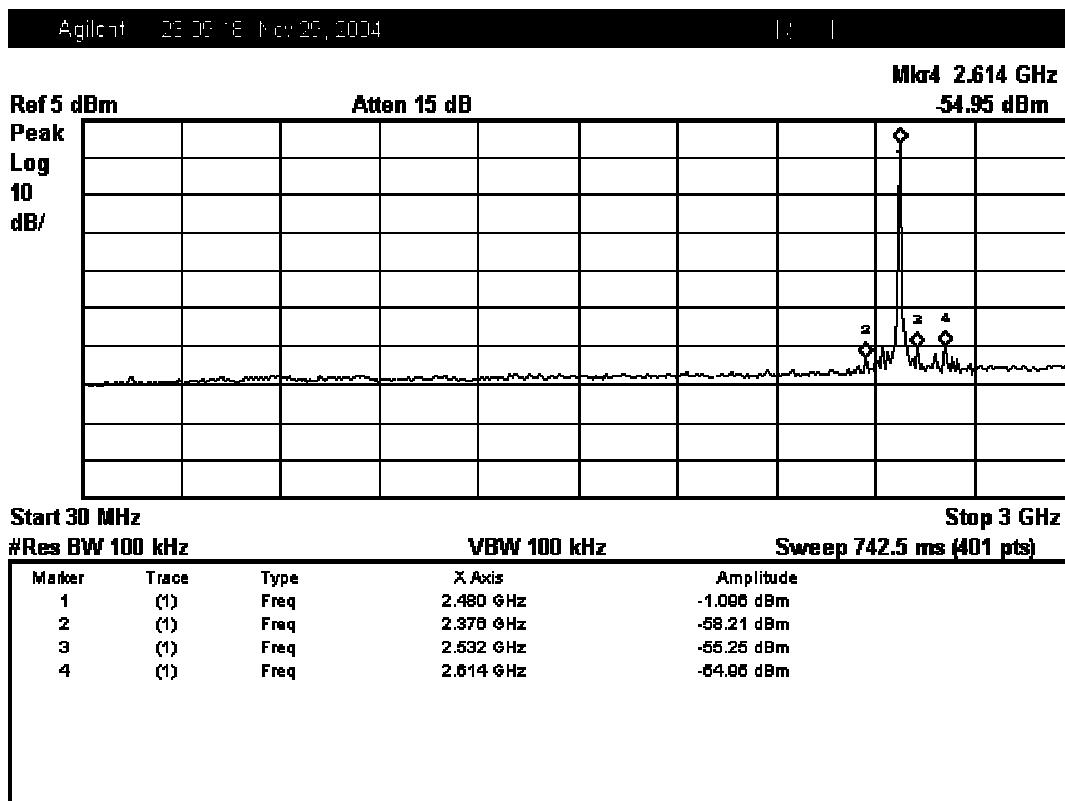
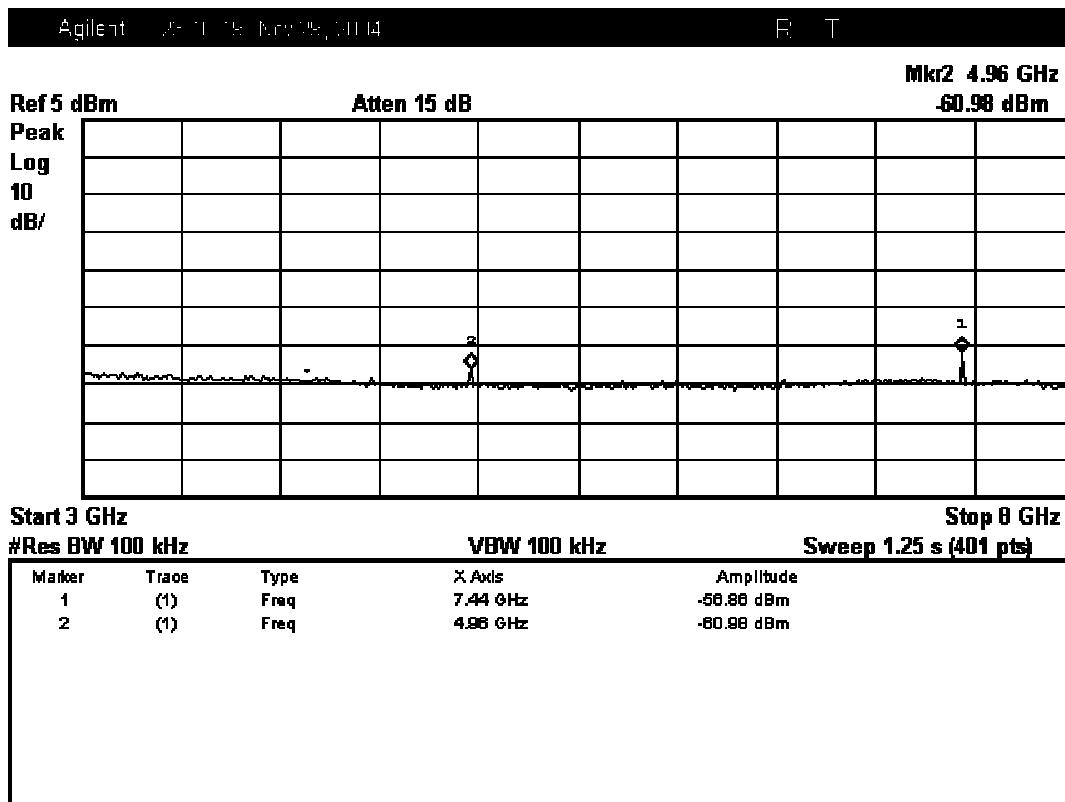

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**Middle Channel (operating at 2441 MHz): 3GHz ~ 8GHz**

**Middle Channel (operating at 2441 MHz): 8GHz ~ 25GHz**


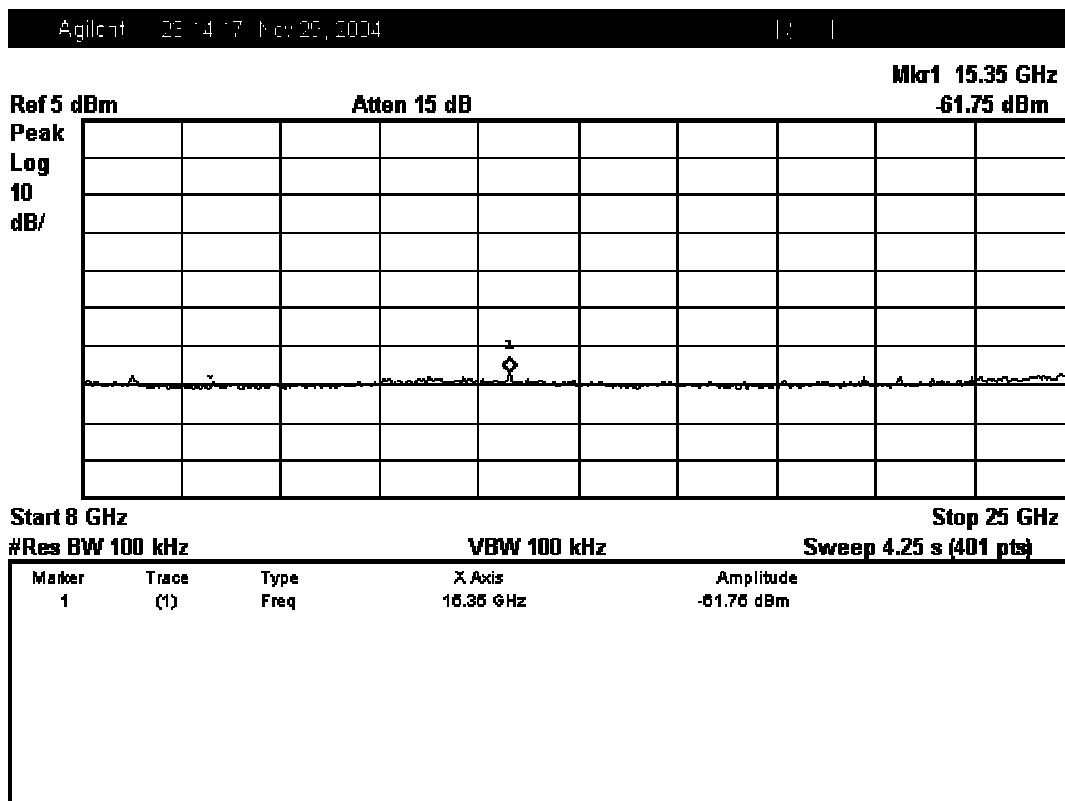

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**Highest Channel (operating at 2480 MHz): 30MHz ~ 3GHz**

**Highest Channel (operating at 2480 MHz): 3GHz ~ 8GHz**


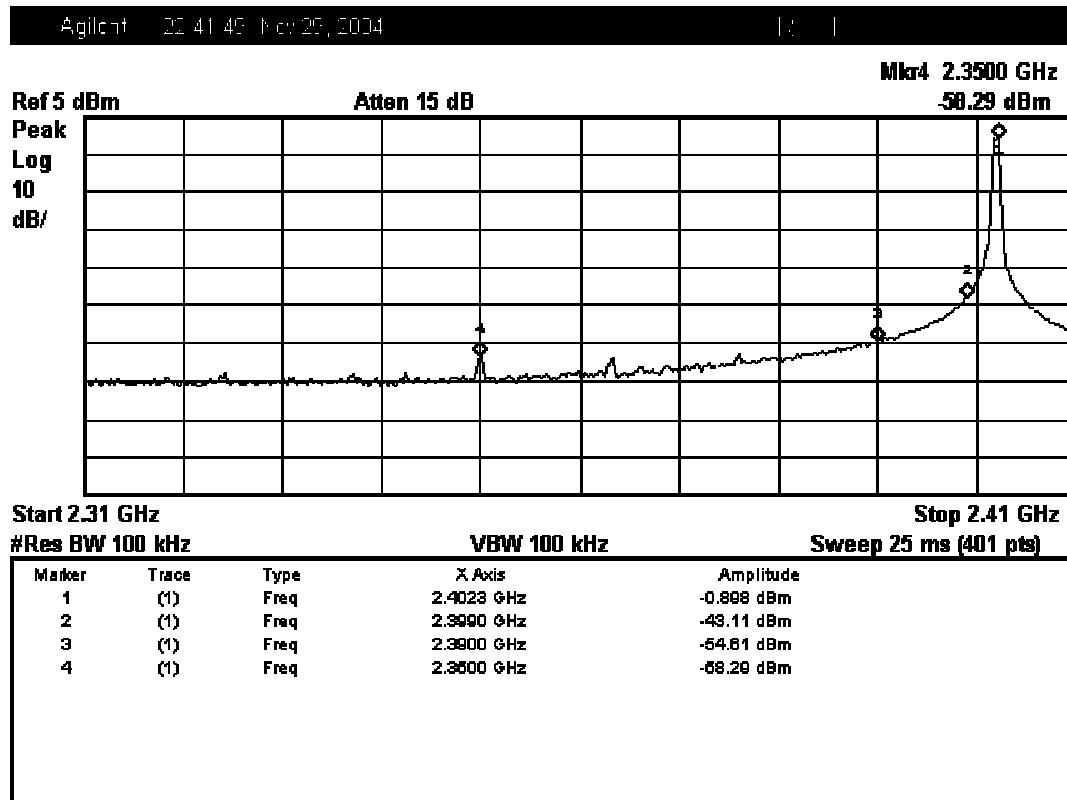
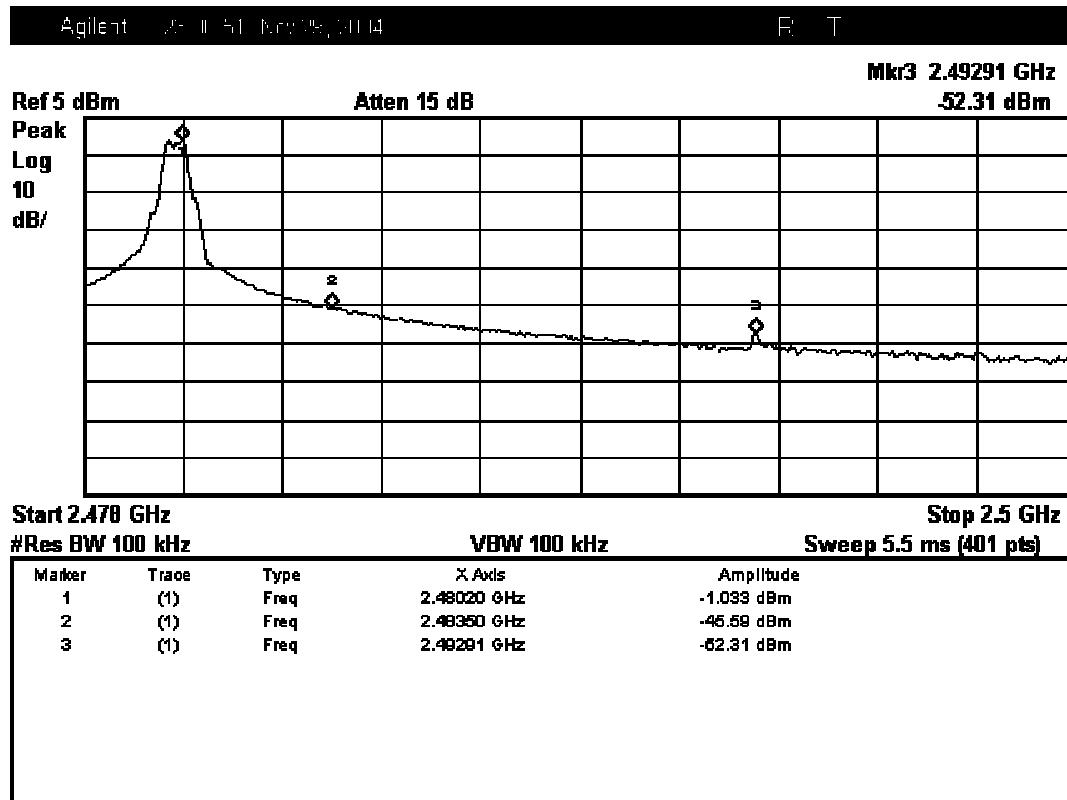
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**Highest Channel (operating at 2480 MHz): 8GHz ~ 25GHz**

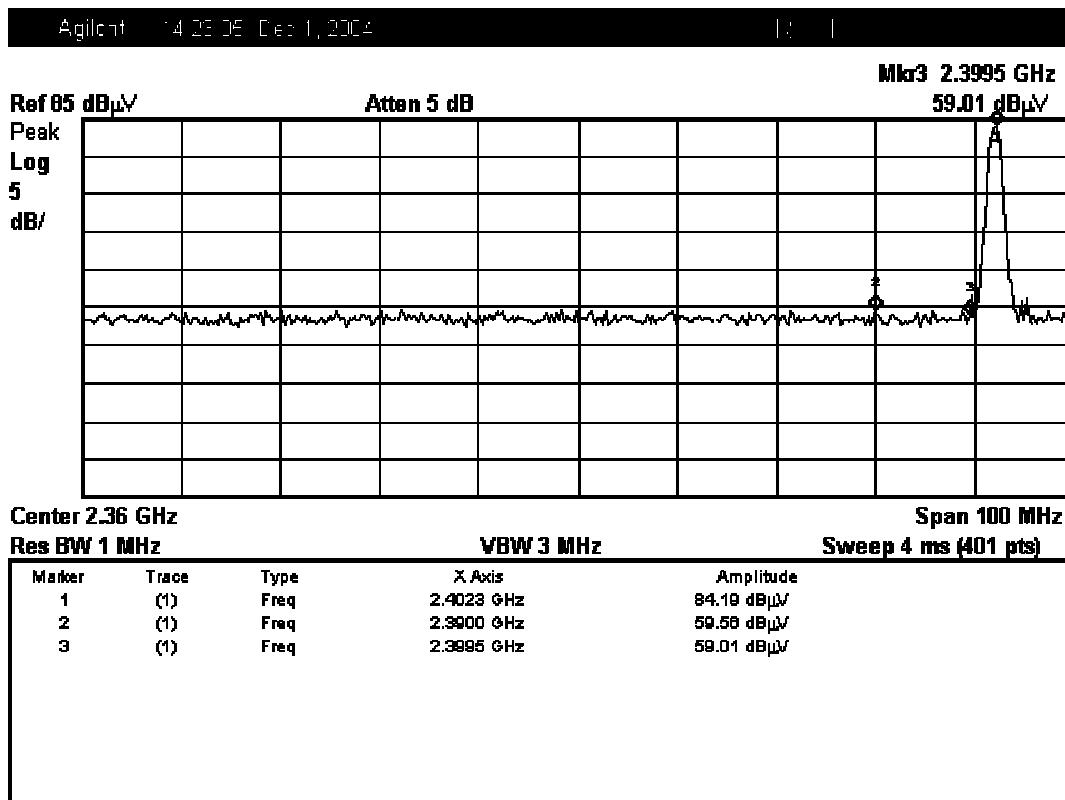
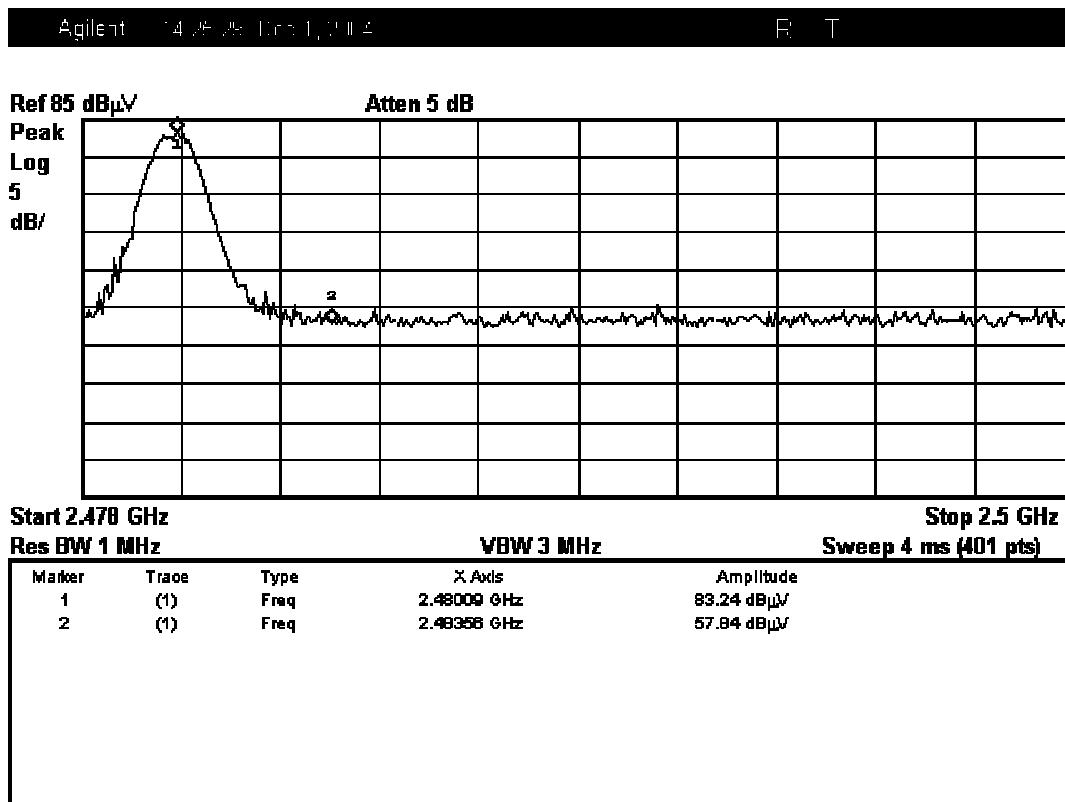

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**Figure 7. Plot of the Band Edge (Conducted)**
**Lowest Channel (operating at 2402 MHz): 2310 ~ 2390 MHz**

**Highest Channel (operating at 2480 MHz): 2483.5 ~ 2500MHz**



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**Figure 8. Plot of the Band Edge (Radiated)**
**Lowest Channel (operating at 2402 MHz): 2310 ~ 2390 MHz**

**Highest Channel (operating at 2480 MHz): 2483.5 ~ 2500MHz**




## 5.8 PEAK POWER SPECTRAL DENSITY

### 5.8.1 Regulation

According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

### 5.8.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Connect the antenna port of the EUT to RF input on the spectrum analyzer via a low loss cable.
3. Turn on the EUT and set it to any one measured frequency within its operating range by controlling it via RS232 Port(Test Jig) and make sure the spectrum analyzer is operated in its linear range.
4. Set the spectrum analyzer to MAX HOLD mode with RBW = 3kHz.
5. Measure the highest amplitude appearing on spectral display and record the level to calculate results.
6. Repeat above procedures until all frequencies measured were complete.

### 5.8.3 Test Results:

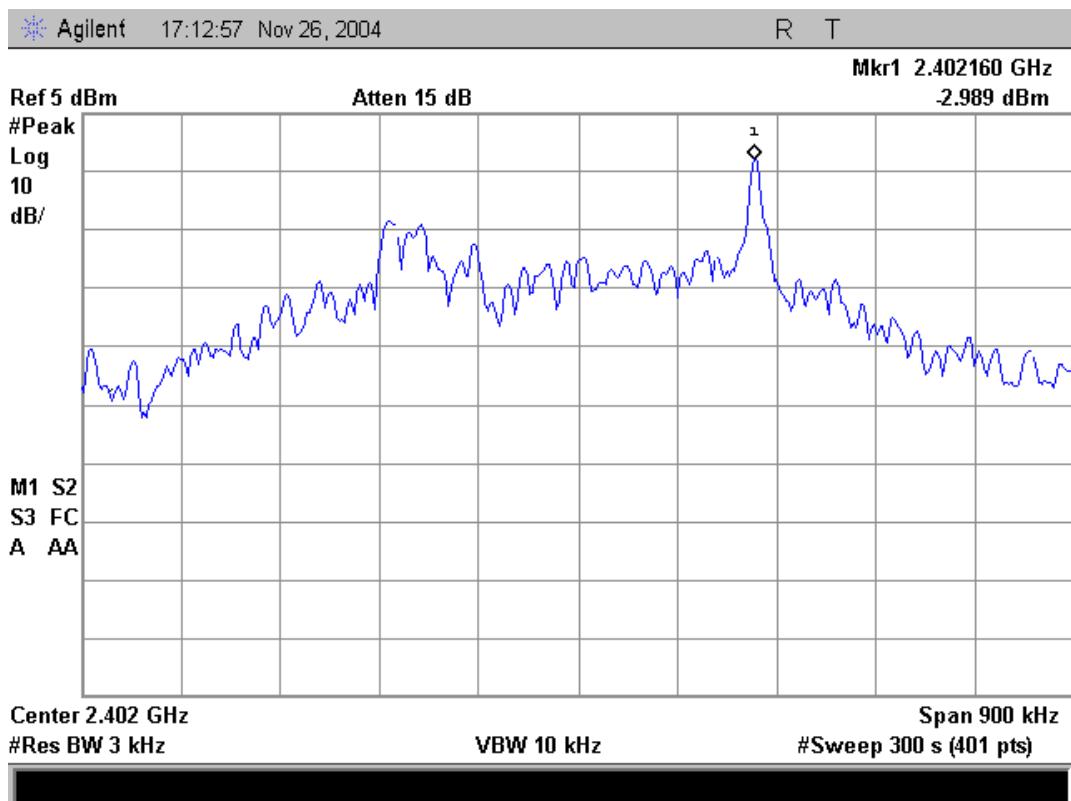
**PASS****Table 8: Measured values of the Peak Power Spectral Density (Conducted)**

| Operating frequency | Reading    | Cable Loss | Actual     | Limit   |
|---------------------|------------|------------|------------|---------|
| 2402 MHz            | -2.989 dBm | 0.1 dB     | -2.889 dBm | 8.0 dBm |
| 2441 MHz            | -2.288 dBm | 0.1 dB     | -2.188 dBm | 8.0 dBm |
| 2480 MHz            | -2.827 dBm | 0.1 dB     | -2.727 dBm | 8.0 dBm |

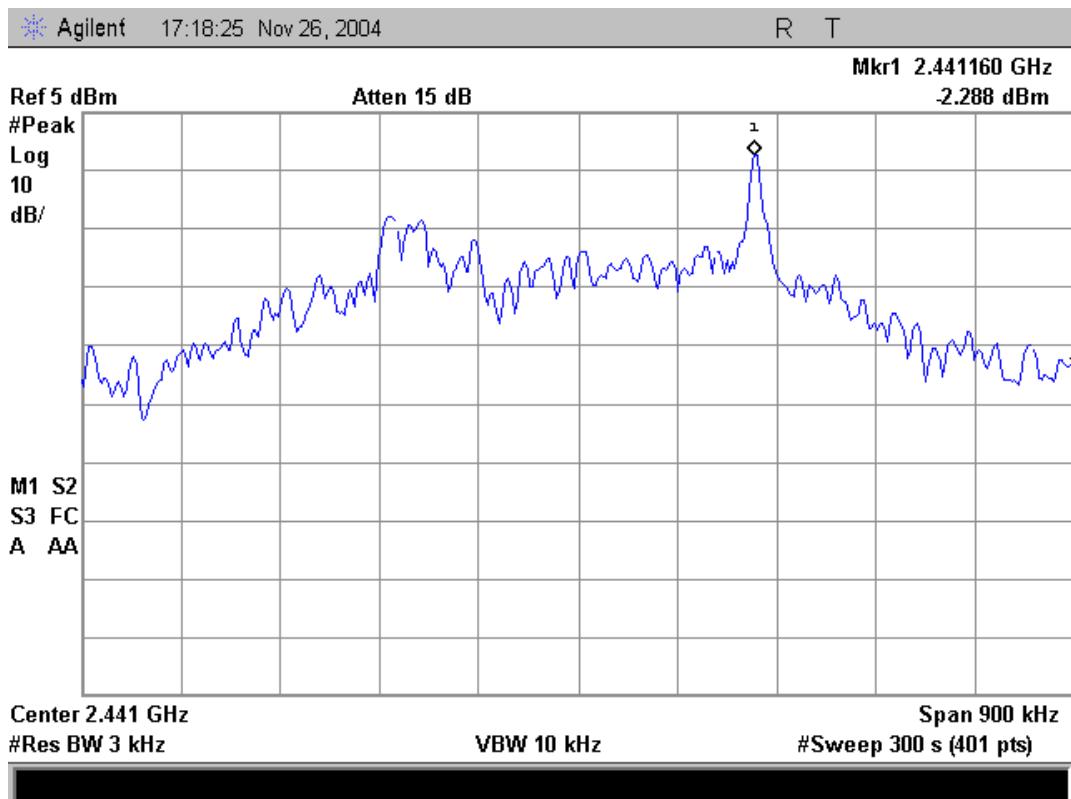
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**Figure 9. Plot of the Peak Power Spectral Density (Conducted)**  
**Lowest Channel (operating at 2402 MHz)**

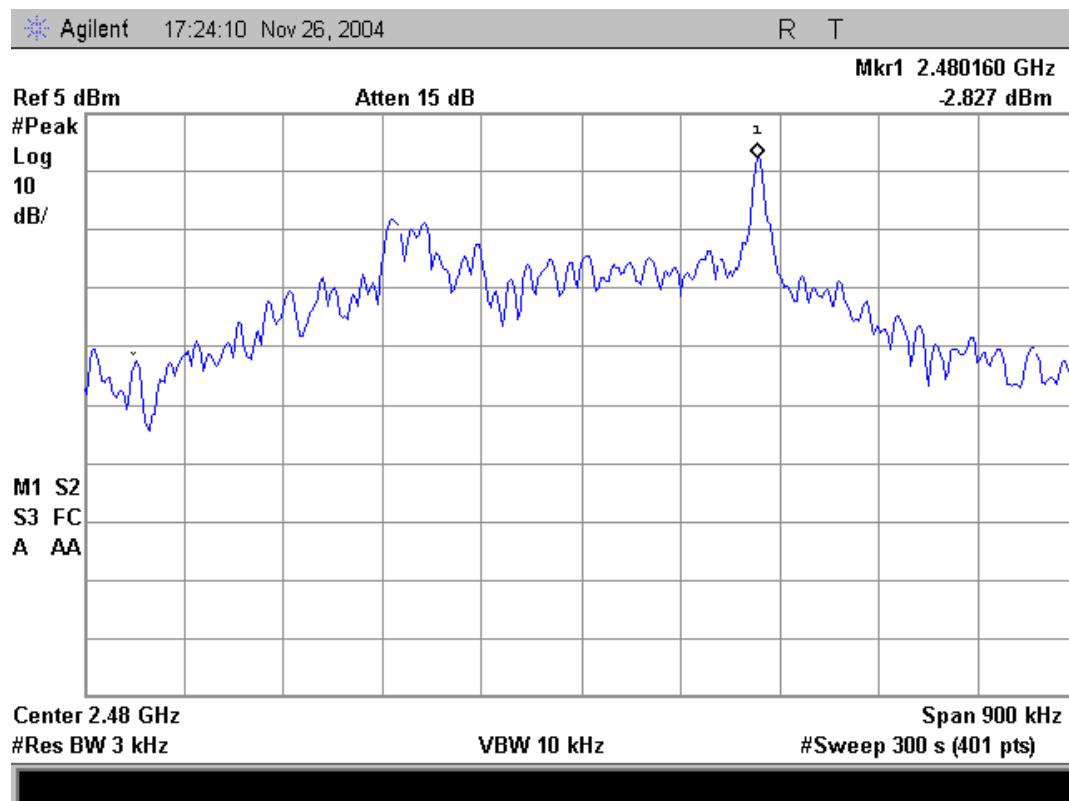


**Middle Channel (operating at 2441 MHz)**



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**Highest Channel (operating at 2480 MHz)**



## 5.9 CONDUCTED EMISSIONS

### 5.9.1 Regulation

According to §15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/50 $\Omega$  line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

| Frequency of emission (MHz) | Conducted limit (dB $\mu$ V) |            |
|-----------------------------|------------------------------|------------|
|                             | Qausi-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.

According to §15.107(a), for unintentional device, except for Class A digital devices, line conducted emission limits are the same as the above table.

### 5.9.2 Test Procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 cm in which is located 40 cm away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50 $\Omega$ /50 $\mu$ H LISN, which is an input transducer to a Spectrum Analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz.
5. The measurements were made with the detector set to PEAK amplitude within a bandwidth of 10 kHz or to QUASI-PEAK and AVERAGE within a bandwidth of 9 kHz. The EUT was in transmitting mode during the measurements.



## 5.9.3 Test Results:

PASS

## AC Adapter (Model No.: SR0510SV)

Table 9: Measured values of the Conducted Emissions

| Frequency<br>[MHz]  | Reading [dB $\mu$ V] |     | CF/CL<br>[dB] | Actual [dB $\mu$ V] |     | Limit [dB $\mu$ V] |     | Margin [dB] |     |
|---------------------|----------------------|-----|---------------|---------------------|-----|--------------------|-----|-------------|-----|
|                     | Qp                   | Ave |               | Qp                  | Ave | Qp                 | Ave | Qp          | Ave |
| <b>LINE – PE</b>    |                      |     |               |                     |     |                    |     |             |     |
| 0.18                | 29.73                | --- | 0.09/0.0      | 29.82               | --- | 64.49              | --- | 34.67       | --- |
| 0.29                | 34.53                | --- | 0.08/0.1      | 34.71               | --- | 60.52              | --- | 25.81       | --- |
| 0.41                | 34.11                | --- | 0.08/0.1      | 34.29               | --- | 57.65              | --- | 23.36       | --- |
| 0.89                | 25.63                | --- | 0.13/0.1      | 25.86               | --- | 56.00              | --- | 30.14       | --- |
| 1.0                 | 33.70                | --- | 0.1/0.1       | 33.90               | --- | 56.00              | --- | 22.10       | --- |
| 1.71                | 33.54                | --- | 0.1/0.1       | 33.74               | --- | 56.00              | --- | 22.26       | --- |
| 1.77                | 30.90                | --- | 0.1/0.1       | 31.10               | --- | 56.00              | --- | 24.90       | --- |
| 24.0                | 23.41                | --- | 0.81/0.6      | 24.82               | --- | 60.00              | --- | 35.18       | --- |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
| <b>NEUTRAL – PE</b> |                      |     |               |                     |     |                    |     |             |     |
| 0.29                | 36.43                | --- | 0.13/0.1      | 36.66               | --- | 60.52              | --- | 23.86       | --- |
| 0.41                | 35.82                | --- | 0.13/0.1      | 36.05               | --- | 57.65              | --- | 21.60       | --- |
| 1.06                | 35.19                | --- | 0.15/0.1      | 35.44               | --- | 56.00              | --- | 20.56       | --- |
| 1.59                | 35.86                | --- | 0.15/0.1      | 36.11               | --- | 56.00              | --- | 19.89       | --- |
| 1.65                | 36.04                | --- | 0.15/0.1      | 36.29               | --- | 56.00              | --- | 19.71       | --- |
| 17.0                | 26.10                | --- | 0.5/0.6       | 27.20               | --- | 60.00              | --- | 32.80       | --- |
| 24.0                | 26.01                | --- | 0.6/0.6       | 27.21               | --- | 60.00              | --- | 32.79       | --- |
|                     | ---                  |     |               | ---                 |     | ---                |     | ---         |     |
|                     | ---                  |     |               | ---                 |     | ---                |     | ---         |     |
|                     | ---                  |     |               | ---                 |     | ---                |     | ---         |     |
|                     |                      |     |               |                     |     |                    |     |             |     |

Margin (dB) = Limit – Actual

[Actual = Reading + CF + CL]

1. Remark “---” means the level is undetectable or the Quasi-peak value is lower than the limit of Average.
2. CF/CL = Correction Factor and Cable Loss
3. Qp = Quasi-peak, Ave = Average value

NOTE: The frequency range was scanned from 150 kHz to 30 MHz. All emissions not reported were more than 20 dB below the specified limit.


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**Figure 10: Plots of the Conducted Emissions**
**Line - PE**

with AC Adapter(Model No.:SR0510SV)

02 Dec 2004 18:50

**CONDUCTED DISTURBANCE**

EUT: EHE10

Manuf:

Op Cond:

Operator:

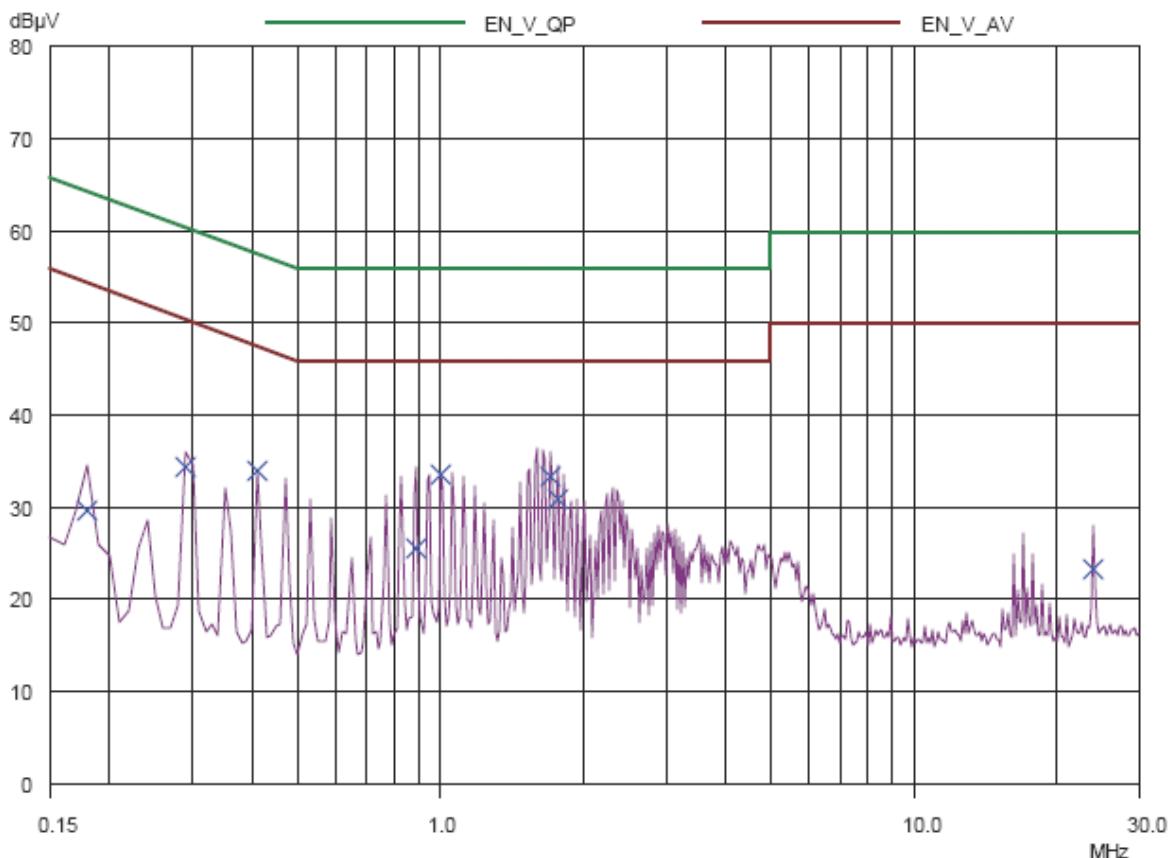
Test Spec:

Comment: LINE-PE

Result File: 5000\_I1.dat : New Measurement

| Scan Settings (1 Range) |       | Receiver Settings |       |          |         |       |        |       |
|-------------------------|-------|-------------------|-------|----------|---------|-------|--------|-------|
| Start                   | Stop  | Step              | IF BW | Detector | M-Time  | Atten | Preamp | OpRge |
| 150kHz                  | 30MHz | 10kHz             | 10kHz | PK       | 100msec | Auto  | OFF    | 60dB  |

Final Measurement:      Detector: X QP  
 Meas Time: 1sec  
 Peaks: 8  
 Acc Margin: 35 dB



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**Neutral - PE**

with AC Adapter(Model No.:SR0510SV)

02 Dec 2004 19:07

**CONDUCTED DISTURBANCE**

EUT: BHE10

Manuf:

Op Cond:

Operator:

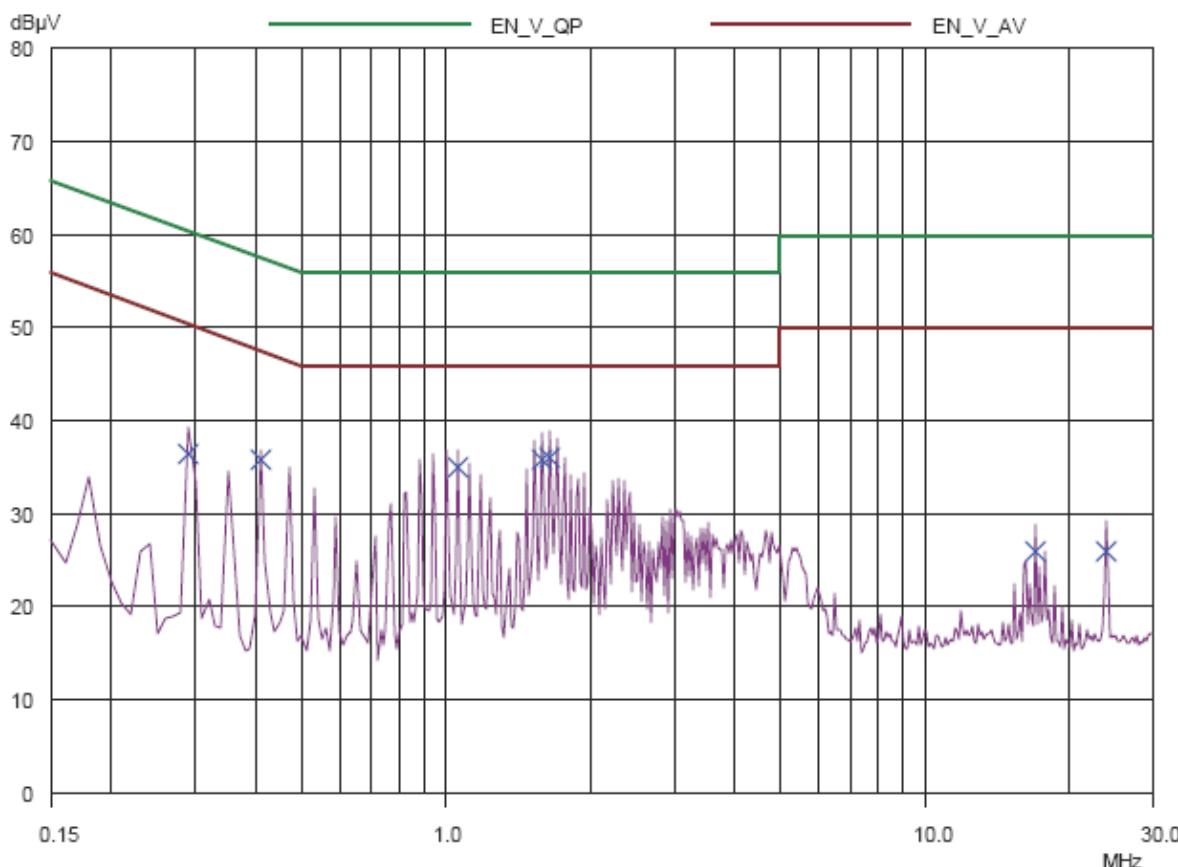
Test Spec:

Comment: NEUTRAL-PE

Result File: 5000\_I1.dat : New Measurement

| Scan Settings | (1 Range) | Frequencies |       |          |         | Receiver Settings |        |       |  |
|---------------|-----------|-------------|-------|----------|---------|-------------------|--------|-------|--|
| Start         | Stop      | Step        | IF BW | Detector | M-Time  | Atten             | Preamp | OpRge |  |
| 150kHz        | 30MHz     | 10kHz       | 10kHz | PK       | 100msec | Auto              | OFF    | 60dB  |  |

Final Measurement:      Detector: X QP  
                                  Meas Time: 1sec  
                                  Peaks: 8  
                                  Acc Margin: 35 dB




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**AC Adapter (Model No.: YFAR23073001)**
**Table 10: Measured values of the Conducted Emissions**

| Frequency<br>[MHz]  | Reading [dB $\mu$ V] |     | CF/CL<br>[dB] | Actual [dB $\mu$ V] |     | Limit [dB $\mu$ V] |     | Margin [dB] |     |
|---------------------|----------------------|-----|---------------|---------------------|-----|--------------------|-----|-------------|-----|
|                     | Qp                   | Ave |               | Qp                  | Ave | Qp                 | Ave | Qp          | Ave |
| <b>LINE – PE</b>    |                      |     |               |                     |     |                    |     |             |     |
| 0.25                | 38.07                | --- | 0.08//0.1     | 38.25               | --- | 61.76              | --- | 23.51       | --- |
| 0.38                | 23.43                | --- | 0.08/0.1      | 23.61               | --- | 58.28              | --- | 34.67       | --- |
| 0.50                | 26.90                | --- | 0.09/0.1      | 27.09               | --- | 56.00              | --- | 28.91       | --- |
| 0.75                | 18.63                | --- | 0.13/0.1      | 18.86               | --- | 56.00              | --- | 37.14       | --- |
| 1.00                | 19.29                | --- | 0.1/0.1       | 19.49               | --- | 56.00              | --- | 36.51       | --- |
| 1.25                | 12.26                | --- | 0.1/0.1       | 12.46               | --- | 56.00              | --- | 43.54       | --- |
| 24.0                | 29.33                | --- | 0.81/0.6      | 30.74               | --- | 60.00              | --- | 29.26       | --- |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
| <b>NEUTRAL – PE</b> |                      |     |               |                     |     |                    |     |             |     |
| 0.24                | 44.09                | --- | 0.13/0.1      | 44.35               | --- | 62.10              | --- | 17.75       | --- |
| 0.37                | 37.78                | --- | 0.13/0.1      | 38.04               | --- | 58.50              | --- | 20.46       | --- |
| 0.49                | 39.70                | --- | 0.13/0.1      | 39.93               | --- | 56.17              | --- | 16.24       | --- |
| 0.61                | 38.09                | --- | 0.15/0.1      | 38.34               | --- | 56.00              | --- | 17.66       | --- |
| 1.10                | 36.89                | --- | 0.15/0.1      | 37.14               | --- | 56.00              | --- | 18.86       | --- |
| 1.59                | 30.86                | --- | 0.15/0.1      | 31.11               | --- | 56.00              | --- | 24.89       | --- |
| 24.0                | 30.05                | --- | 0.6/0.6       | 31.25               | --- | 60.00              | --- | 28.75       | --- |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |

**Margin (dB) = Limit – Actual**
**[Actual = Reading + CF + CL]**

1. Remark “---” means the level is undetectable or the Quasi-peak value is lower than the limit of Average.
2. CF/CL = Correction Factor and Cable Loss
3. Qp = Quasi-peak, Ave = Average value

NOTE: The frequency range was scanned from 150 kHz to 30 MHz. All emissions not reported were more than 20 dB below the specified limit.


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**Figure 11: Plots of the Conducted Emissions**
**Line - PE**

with AC Adapter(Model No.:YFAR23073001)

02 Dec 2004 19:21

**CONDUCTED DISTURBANCE**

EUT: BHE10

Manuf:

Op Cond:

Operator:

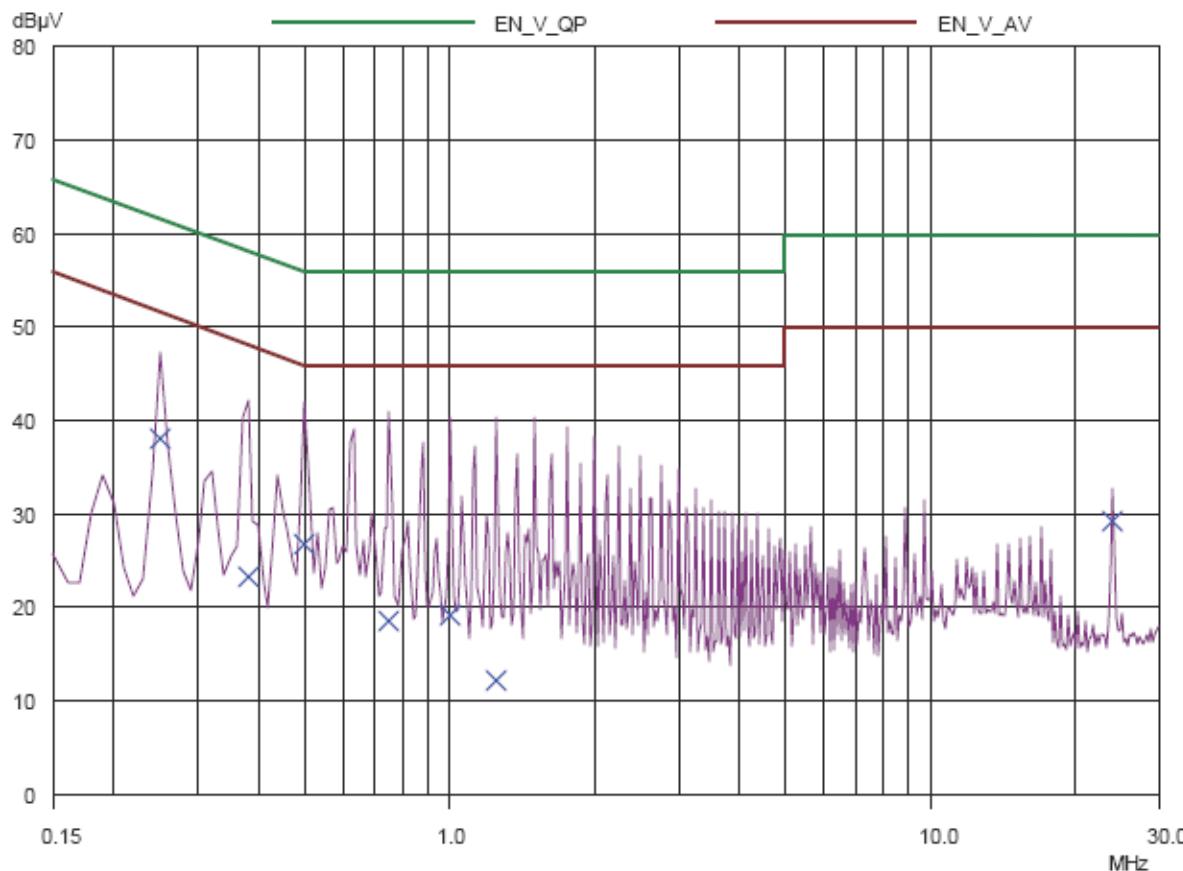
Test Spec:

Comment: LINE-PE

Result File: AD2\_L.dat : New Measurement

| Scan Settings | (1 Range)   |       |       |       | Receiver Settings |         |       |        |       |
|---------------|-------------|-------|-------|-------|-------------------|---------|-------|--------|-------|
|               | Frequencies |       | Step  | IF BW | Detector          | M-Time  | Atten | Preamp | OpRge |
| Start         | Start       | Stop  | Step  | IF BW | Detector          | M-Time  | Atten | Preamp | OpRge |
| 150kHz        | 150kHz      | 30MHz | 10kHz | 10kHz | PK                | 100msec | Auto  | OFF    | 60dB  |

Final Measurement:      Detector: X QP  
 Meas Time: 1sec  
 Peaks: 8  
 Acc Margin: 35 dB



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**Neutral - PE**

with AC Adapter(Model No.:YFAR23073001)

02 Dec 2004 19:33

**CONDUCTED DISTURBANCE**

EUT: BHE10

Manuf:

Op Cond:

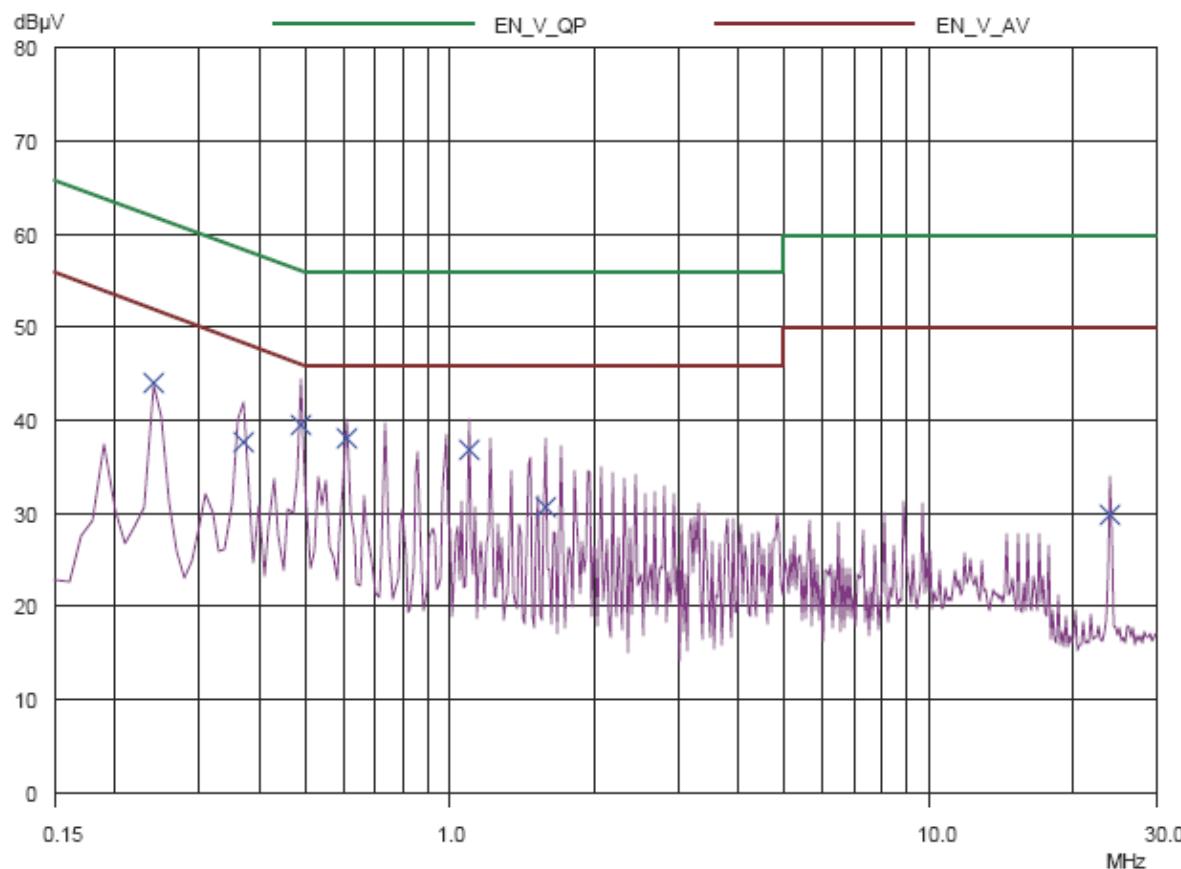
Operator:

Test Spec:

Comment: NEUTRAL-PE

Result File: ad2\_N.dat : New Measurement

| Scan Settings      | (1 Range)   |             |       | Receiver Settings |         |       |        |       |  |
|--------------------|-------------|-------------|-------|-------------------|---------|-------|--------|-------|--|
|                    | Frequencies |             |       | Detector          | M-Time  | Atten | Preamp | OpRge |  |
| Start              | Stop        | Step        | IF BW |                   |         |       |        |       |  |
| 150kHz             | 30MHz       | 10kHz       | 10kHz | PK                | 100msec | Auto  | OFF    | 60dB  |  |
| Final Measurement: |             | Detector:   | X QP  |                   |         |       |        |       |  |
|                    |             | Meas Time:  | 1sec  |                   |         |       |        |       |  |
|                    |             | Peaks:      | 8     |                   |         |       |        |       |  |
|                    |             | Acc Margin: | 35 dB |                   |         |       |        |       |  |




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**AC Adapter (Model No.: KSAFB0500100W1EU)**
**Table 11: Measured values of the Conducted Emissions**

| Frequency<br>[MHz]  | Reading [dB $\mu$ V] |     | CF/CL<br>[dB] | Actual [dB $\mu$ V] |     | Limit [dB $\mu$ V] |     | Margin [dB] |     |
|---------------------|----------------------|-----|---------------|---------------------|-----|--------------------|-----|-------------|-----|
|                     | Qp                   | Ave |               | Qp                  | Ave | Qp                 | Ave | Qp          | Ave |
| <b>LINE – PE</b>    |                      |     |               |                     |     |                    |     |             |     |
| 0.43                | 32.69                | --- | 0.08/0.1      | 32.87               | --- | 57.25              | --- | 24.38       | --- |
| 0.55                | 34.73                | --- | 0.09/0.1      | 34.92               | --- | 56.00              | --- | 21.08       | --- |
| 0.73                | 33.48                | --- | 0.13/0.1      | 33.71               | --- | 56.00              | --- | 22.29       | --- |
| 1.77                | 30.92                | --- | 0.1/0.1       | 31.12               | --- | 56.00              | --- | 24.88       | --- |
| 8.90                | 32.19                | --- | 0.26/0.5      | 32.95               | --- | 60.00              | --- | 27.05       | --- |
| 24.0                | 28.21                | --- | 0.81/0.6      | 29.62               | --- | 60.00              | --- | 30.38       | --- |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
| <b>NEUTRAL – PE</b> |                      |     |               |                     |     |                    |     |             |     |
| 0.37                | 35.91                | --- | 0.13/0.1      | 36.14               | --- | 58.50              | --- | 22.36       | --- |
| 0.61                | 34.78                | --- | 0.15/0.1      | 35.03               | --- | 56.00              | --- | 20.97       | --- |
| 0.73                | 34.47                | --- | 0.15/0.1      | 34.72               | --- | 56.00              | --- | 21.28       | --- |
| 1.89                | 29.69                | --- | 0.15/0.1      | 29.94               | --- | 56.00              | --- | 26.06       | --- |
| 8.90                | 33.10                | --- | 0.3/0.5       | 33.90               | --- | 60.00              | --- | 26.10       | --- |
| 24.0                | 28.25                | --- | 0.6/0.6       | 29.45               | --- | 60.00              | --- | 30.55       | --- |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |
|                     |                      |     |               |                     |     |                    |     |             |     |

**Margin (dB) = Limit – Actual**
**[Actual = Reading + CF + CL]**

1. Remark “---” means the level is undetectable or the Quasi-peak value is lower than the limit of Average.
2. CF/CL = Correction Factor and Cable Loss
3. Qp = Quasi-peak, Ave = Average value

NOTE: The frequency range was scanned from 150 kHz to 30 MHz. All emissions not reported were more than 20 dB below the specified limit.

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**Figure 12: Plots of the Conducted Emissions****Line - PE**

with AC Adapter(Model No.:KSAFB0500100W1EU)

02 Dec 2004 19:56

**CONDUCTED DISTURBANCE**

EUT: BHE10

Manuf:

Op Cond:

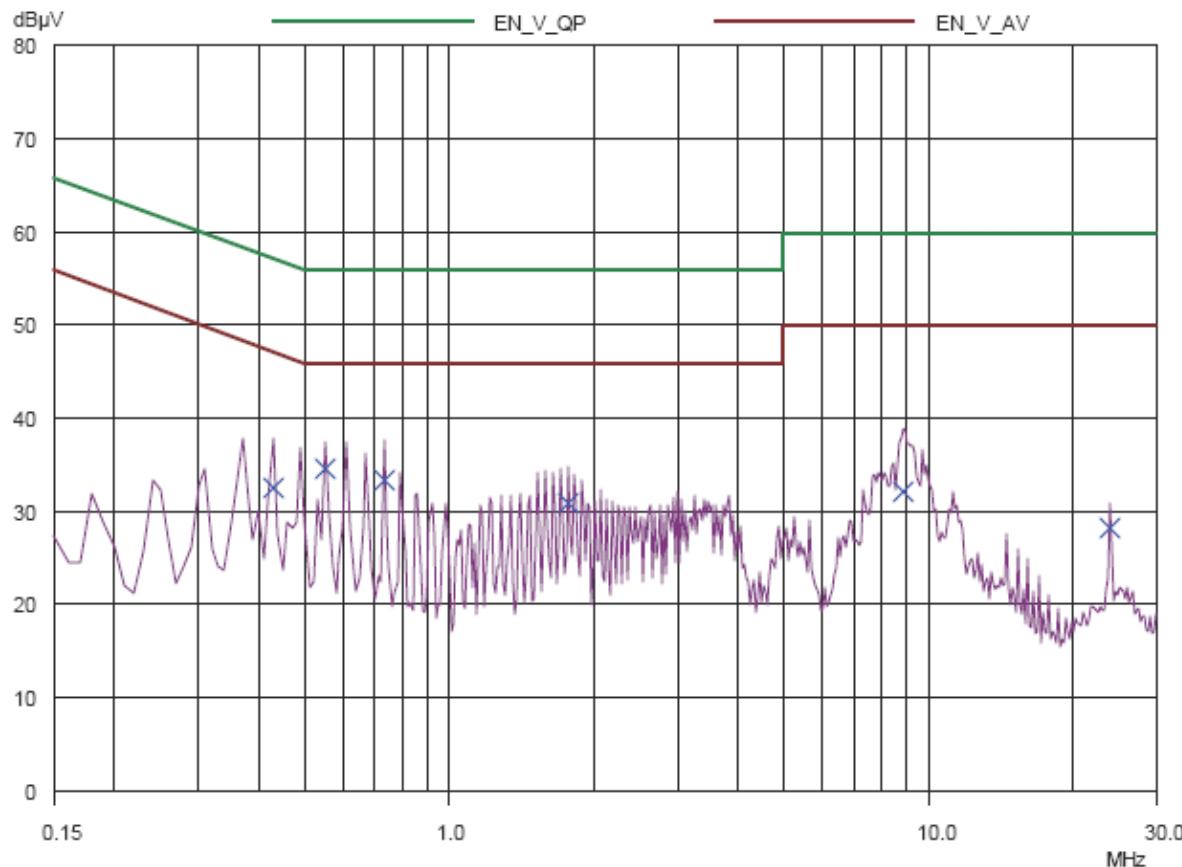
Operator:

Test Spec:

Comment: LINE-PE

Result File: ad3\_I.dat : New Measurement

| Scan Settings      |             | (1 Range) |       |          | Receiver Settings |       |        |       |  |
|--------------------|-------------|-----------|-------|----------|-------------------|-------|--------|-------|--|
| Start              | Stop        | Step      | IF BW | Detector | M-Time            | Atten | Preamp | OpRge |  |
| 150kHz             | 30MHz       | 10kHz     | 10kHz | PK       | 100msec           | Auto  | OFF    | 60dB  |  |
| Final Measurement: |             |           |       |          |                   |       |        |       |  |
|                    | Detector:   | X QP      |       |          |                   |       |        |       |  |
|                    | Meas Time:  | 1sec      |       |          |                   |       |        |       |  |
|                    | Peaks:      | 8         |       |          |                   |       |        |       |  |
|                    | Acc Margin: | 35 dB     |       |          |                   |       |        |       |  |





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## Neutral - PE

with AC Adapter(Model No.:KSAFB0500100W1EU)

02 Dec 2004 20:06

## CONDUCTED DISTURBANCE

EUT: BHE10

Manuf.:

## Op Con

**Operator:**

## Test Spec

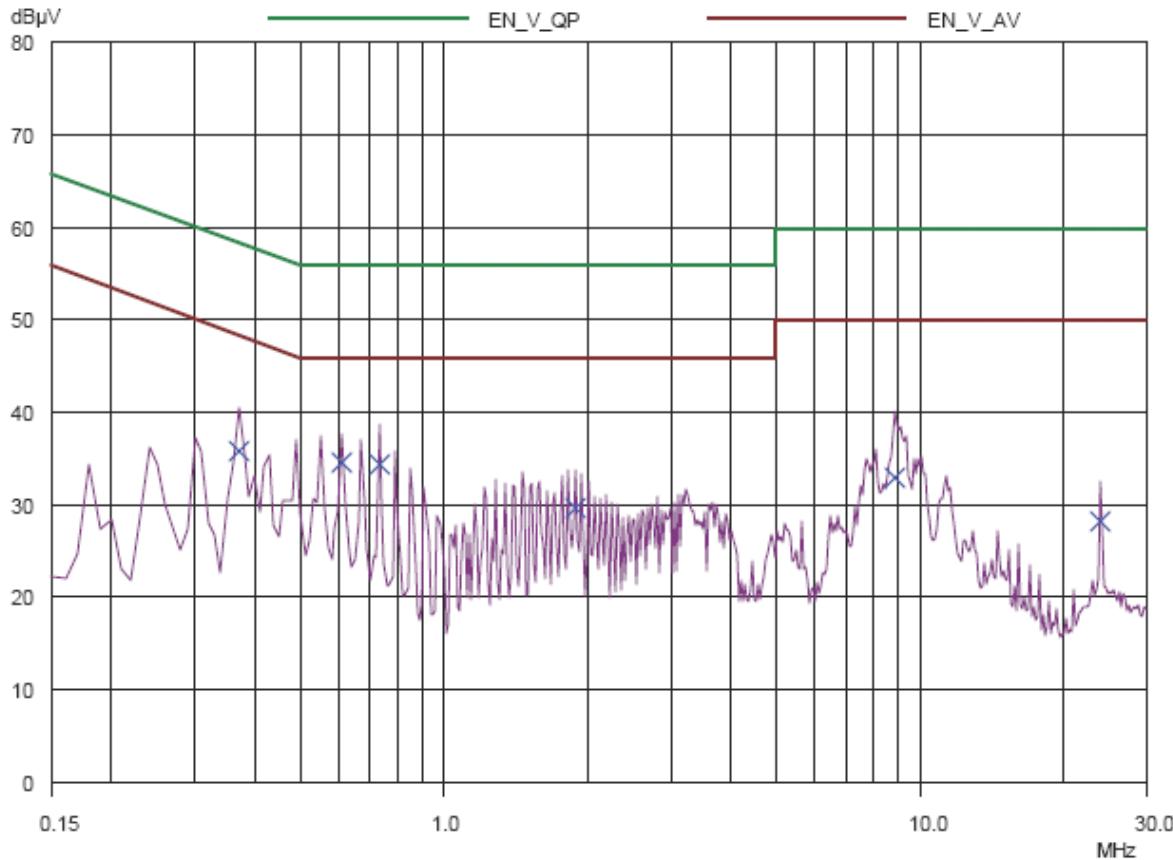
### Comment:

Result File: ad3\_N.dat : New Measurement

**Scan Settings (1 Range)**

| Start  | Stop  | Step  | IF BW | Detector | M-Time  | Atten | Preamp | OpRge |
|--------|-------|-------|-------|----------|---------|-------|--------|-------|
| 150kHz | 30MHz | 10kHz | 10kHz | PK       | 100msec | Auto  | OFF    | 60dB  |

Final Measurement: Detector: X QP  
Meas Time: 1sec  
Peaks: 8  
Acc Margin: 35 dB




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**AC Adapter (Model No.: TA-11E)**
**Table 12: Measured values of the Conducted Emissions**

| Frequency<br>[MHz]  | Reading [dB $\mu$ V] |     | CF/CL<br>[dB] | Actual [dB $\mu$ V] |     | Limit [dB $\mu$ V] |     | Margin [dB] |     |
|---------------------|----------------------|-----|---------------|---------------------|-----|--------------------|-----|-------------|-----|
|                     | Qp                   | Ave |               | Qp                  | Ave | Qp                 | Ave | Qp          | Ave |
| <b>LINE – PE</b>    |                      |     |               |                     |     |                    |     |             |     |
| 0.33                | 37.13                | --- | 0.08/0.1      | 37.31               | --- | 59.45              | --- | 22.14       | --- |
| 0.47                | 33.45                | --- | 0.08/0.1      | 33.63               | --- | 56.51              | --- | 22.88       | --- |
| 0.50                | 40.46                | --- | 0.09/0.1      | 40.65               | --- | 56.00              | --- | 15.35       | --- |
| 0.67                | 40.51                | --- | 0.09/0.1      | 40.70               | --- | 56.00              | --- | 15.30       | --- |
| 0.72                | 34.37                | --- | 0.13/0.1      | 34.60               | --- | 56.00              | --- | 21.40       | --- |
| 0.84                | 38.07                | --- | 0.13/0.1      | 38.30               | --- | 56.00              | --- | 17.70       | --- |
| 1.34                | 34.80                | --- | 0.1/0.1       | 35.00               | --- | 56.00              | --- | 21.00       | --- |
| 1.50                | 32.32                | --- | 0.1/0.1       | 32.52               | --- | 56.00              | --- | 23.48       | --- |
| 2.32                | 26.58                | --- | 0.13/0.3      | 27.01               | --- | 56.00              | --- | 28.99       | --- |
| 24.0                | 31.85                | --- | 0.81/0.6      | 33.26               | --- | 60.00              | --- | 26.74       | --- |
|                     |                      |     |               |                     |     |                    |     |             |     |
| <b>NEUTRAL – PE</b> |                      |     |               |                     |     |                    |     |             |     |
| 0.17                | 28.17                | --- | 0.13/0.0      | 28.30               | --- | 64.96              | --- | 36.66       | --- |
| 0.34                | 30.38                | --- | 0.13/0.1      | 30.61               | --- | 59.20              | --- | 28.59       | --- |
| 0.51                | 32.37                | --- | 0.15/0.1      | 32.62               | --- | 56.00              | --- | 23.38       | --- |
| 0.67                | 29.16                | --- | 0.15/0.1      | 29.41               | --- | 56.00              | --- | 26.59       | --- |
| 0.71                | 29.24                | --- | 0.15/0.1      | 29.49               | --- | 56.00              | --- | 26.51       | --- |
| 0.85                | 28.72                | --- | 0.15/0.1      | 28.97               | --- | 56.00              | --- | 27.03       | --- |
| 1.35                | 26.28                | --- | 0.15/0.1      | 26.53               | --- | 56.00              | --- | 29.47       | --- |
| 1.85                | 20.47                | --- | 0.15/0.1      | 20.72               | --- | 56.00              | --- | 35.28       | --- |
| 24.0                | 29.93                | --- | 0.6/0.6       | 31.13               | --- | 60.00              | --- | 28.87       | --- |
|                     |                      |     |               |                     |     |                    |     |             |     |

**Margin (dB) = Limit – Actual**
**[Actual = Reading + CF + CL]**

1. Remark “---” means the level is undetectable or the Quasi-peak value is lower than the limit of Average.
2. CF/CL = Correction Factor and Cable Loss
3. Qp = Quasi-peak, Ave = Average value

NOTE: The frequency range was scanned from 150 kHz to 30 MHz. All emissions not reported were more than 20 dB below the specified limit.

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**Figure 13: Plots of the Conducted Emissions****Line - PE**

with AC Adapter(Model No.:TA-11E)

02 Dec 2004 20:19

**CONDUCTED DISTURBANCE**

EUT: BHE10

Manuf:

Op Cond:

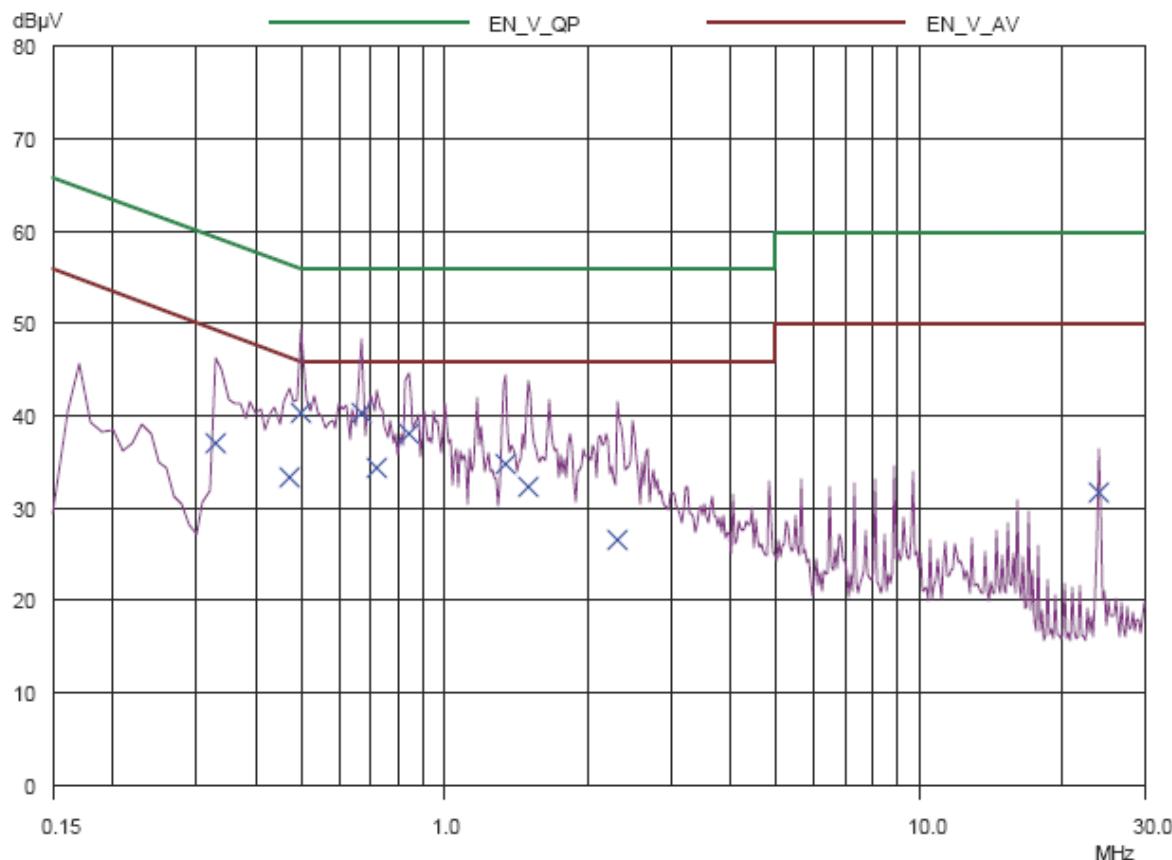
Operator:

Test Spec:

Comment: LINE-PE

Result File: ad4\_I.dat : New Measurement

| Scan Settings      | (1 Range)   |             |       |       | Receiver Settings |         |       |        |       |
|--------------------|-------------|-------------|-------|-------|-------------------|---------|-------|--------|-------|
|                    | Frequencies |             | Step  | IF BW | Detector          | M-Time  | Atten | Preamp | OpRge |
| Start              | Start       | Stop        | Step  | IF BW | Detector          | M-Time  | Atten | Preamp | OpRge |
| 150kHz             | 150kHz      | 30MHz       | 10kHz | 10kHz | PK                | 100msec | Auto  | OFF    | 60dB  |
| Final Measurement: |             | Detector:   | X QP  |       |                   |         |       |        |       |
|                    |             | Meas Time:  | 1sec  |       |                   |         |       |        |       |
|                    |             | Peaks:      | 8     |       |                   |         |       |        |       |
|                    |             | Acc Margin: | 35 dB |       |                   |         |       |        |       |



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**Neutral - PE**

with AC Adapter(Model No.:TA-11E)

02 Dec 2004 20:31

**CONDUCTED DISTURBANCE**

EUT: BHE10

Manuf:

Op Cond:

Operator:

Test Spec:

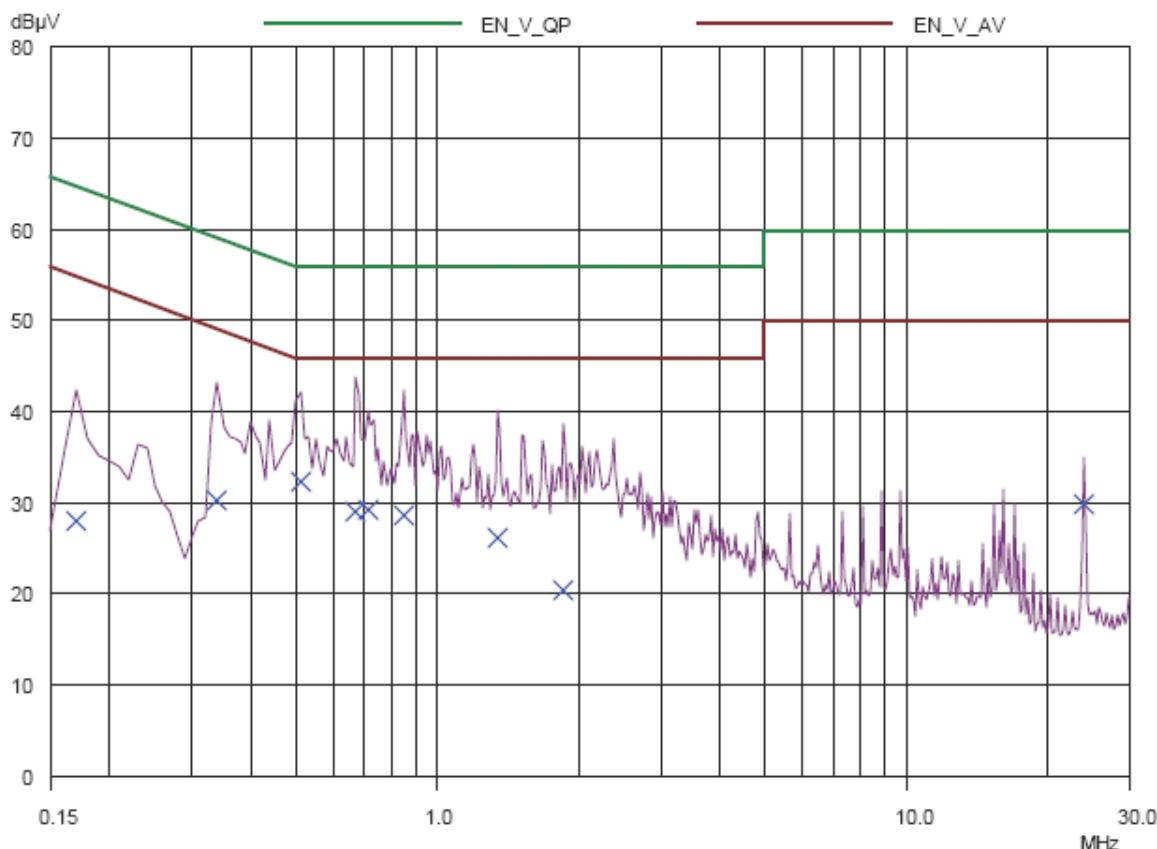
Comment: NEUTRAL-PE

Result File: ad4\_N.dat : New Measurement

Scan Settings (1 Range)

| Frequencies |       | Receiver Settings |       |          |         |       |        |       |
|-------------|-------|-------------------|-------|----------|---------|-------|--------|-------|
| Start       | Stop  | Step              | IF BW | Detector | M-Time  | Atten | Preamp | OpRge |
| 150kHz      | 30MHz | 10kHz             | 10kHz | PK       | 100msec | Auto  | OFF    | 60dB  |

Final Measurement:      Detector: X QP  
                                  Meas Time: 1sec  
                                  Peaks: 8  
                                  Acc Margin: 35 dB





## 5.10 RF Exposure

### 5.10.1 Regulation

According to §15.247(i), 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 levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this Chapter.

Limits for Maximum Permissive Exposure: According to §1.1310 and §2.1093, RF exposure is calculated.

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

f = frequency in MHz,

\* = Plane-wave equivalent power density

### MPE (Maximum Permissive Exposure) Prediction

Predication of MPE limit at a given distance: Equation from page 18 of OET Bulletin 65, Edition 97-01

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

S = power density [mW/cm<sup>2</sup>]

P = power input to antenna [mW]

$$(\Rightarrow R = \sqrt{PG/4\pi S})$$

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 [cm]

|   |   |
|---|---|
| EUT: Maximum peak output power = 0.095[dBm] (= 1.02 [mW]) & Antenna gain = -1.3[dBi](=0.74 numeric) |   |
| 100mW, at 20cm from an antenna 6[dBi]   | $S = PG/4\pi R^2 = 100 \times 3.98 / (4 \times \pi \times 400)$<br>$= 0.0792 \text{ [mW/cm}^2\text{]} < 1.0 \text{ [mW/cm}^2\text{]}$ |
| 1.1mW, at 20cm from the antenna -1.3[dBi]   | $S = PG/4\pi R^2 = 0.000162 \text{ [mW/cm}^2\text{]} < 1.0 \text{ [mW/cm}^2\text{]}$  |
| 1.1mW, at 1cm from the antenna -1.3[dBi]  | $S = PG/4\pi R^2 = 0.0648 \text{ [mW/cm}^2\text{]} < 1.0 \text{ [mW/cm}^2\text{]}$  |
| 1.1mW, at 0.3cm from the antenna -1.3[dBi]  | $S = PG/4\pi R^2 = 0.7200 \text{ [mW/cm}^2\text{]} < 1.0 \text{ [mW/cm}^2\text{]}$  |

NOTE: The antenna used for the EUT is an integral SMD chip antenna. The calculated values of MPE for the EUT show that MPE is safe beyond 0.3 cm from the antenna.

### 5.10.2 RF Exposure Compliance Issue

The EUT is categorically excluded from routine environmental because it operates at very low power level. The equipment is deemed to comply with the SAR or MPE limits without testing due to this very low power level. The maximum RF EIRP power output from the EUT is less than 1.1mW. If the entire RF power was absorbed by 1 gram of tissue (not possible considering typical RF circuits), the SAR limit of 1.6mW/g would still not be exceed. Therefore no warning labels, no RF exposure warnings in the manual or other protection measures are required for the EUT.