

# FC

## Test Report

|              |                    |
|--------------|--------------------|
| Product Name | Bluetooth Handfree |
| Model No.    | Kii 101            |
| FCC ID.      | VSPMQ-BT-HFKII     |

|           |  |
|-----------|--|
| Applicant | MarcusQ Technology Inc.,Co.  |
| Address   | 1F, No.1, Alley 3, Lane 60, Sec. 3, Minquan E. Rd., Taipei,<br>104, Taiwan |

|                 |                    |
|-----------------|--------------------|
| Date of Receipt | Nov. 07, 2007      |
| Issued Date     | Dec. 19, 2007      |
| Report No.      | 07B147R-RFUSP06V01 |

The Test Results relate only to the samples tested.

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# Test Report Certification

Issued Date: Dec. 19, 2007

Report No.: 07B147R-RFUSP06V01



|                     |   |
|---------------------|---|
| Product Name        | Bluetooth Handfree  |
| Applicant           | MarcusQ Technology Inc.,Co.   |
| Address             | 1F, No.1, Alley 3, Lane 60, Sec. 3, Minquan E. Rd., Taipei, 104, Taiwan |
| Manufacturer        | MarcusQ Technology Inc.,Co.   |
| Model No.           | Kii 101   |
| FCC ID.             | VSPMQ-BT-HFKII  |
| Rated Voltage       | AC 120V/60Hz  |
| Working Voltage     | DC 5V(Via USB)  |
| Trade Name          | MarcusQ   |
| Applicable Standard | FCC CFR Title 47 Part 15 Subpart C: 2006<br>ANSI C63.4: 2003            |
| Test Result         | Complied  |



The Test Results relate only to the samples tested.

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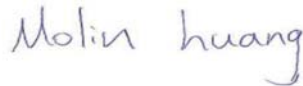
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Documented By :



( Engineering Adm. Specialist /  
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Tested By :



( Engineer / Molin Huang )



Approved By :



( Deputy Manager / Vincent Lin )

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

## 1. GENERAL INFORMATION

### 1.1. EUT Description

|                    |                                   |
|--------------------|-----------------------------------|
| Product Name       | Bluetooth Handfree                |
| Trade Name         | MarcusQ                           |
| FCC ID.            | VSPMQ-BT-HFKII                    |
| Model No.          | Kii 101                           |
| Frequency Range    | 2402 – 2480MHz                    |
| Channel Number     | 79                                |
| Type of Modulation | FHSS                              |
| Antenna Interface  | Soldered on PCB                   |
| Channel Control    | Auto                              |
| Antenna Gain       | Refer to the table “Antenna List” |
| USB Cable          | Non-Shielded, 1.0m                |

#### Antenna List

| No. | Manufacturer | Part No.        | Peak Gain        |
|-----|--------------|-----------------|------------------|
| 1   | WALSIN       | RFANT5220110A1T | 2dBi for 2.4 GHz |

#### Frequency of Each Channel:

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

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

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. The transmitter is presented with a continuous data stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its 79 channels and over the minimum number of hopping channels (75 channels).

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

Note:

1. This device is a Bluetooth Handfree with a built-in 2.4GHz Bluetooth transceiver.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

## 1.2. Operational Description

The EUT is a Bluetooth Handfree with a built-in 2.4GHz Bluetooth transceiver. The number of the channels is 79 in 2402-2480MHz. The device adapts the frequency hopping spread spectrum modulation. The antenna is connector-type and provides diversity function to improve the receiving function.

This device provides wireless technology that revolutionizes personal connectivity. It is the solution for the seamless integration of Bluetooth technology into personal computer enabling short-range wireless connections between desktop/laptop computers, Bluetooth-enabled peripherals, and portable handheld devices.

|           |                     |
|-----------|---------------------|
| Test Mode | Mode 1: Transmitter |
|-----------|---------------------|

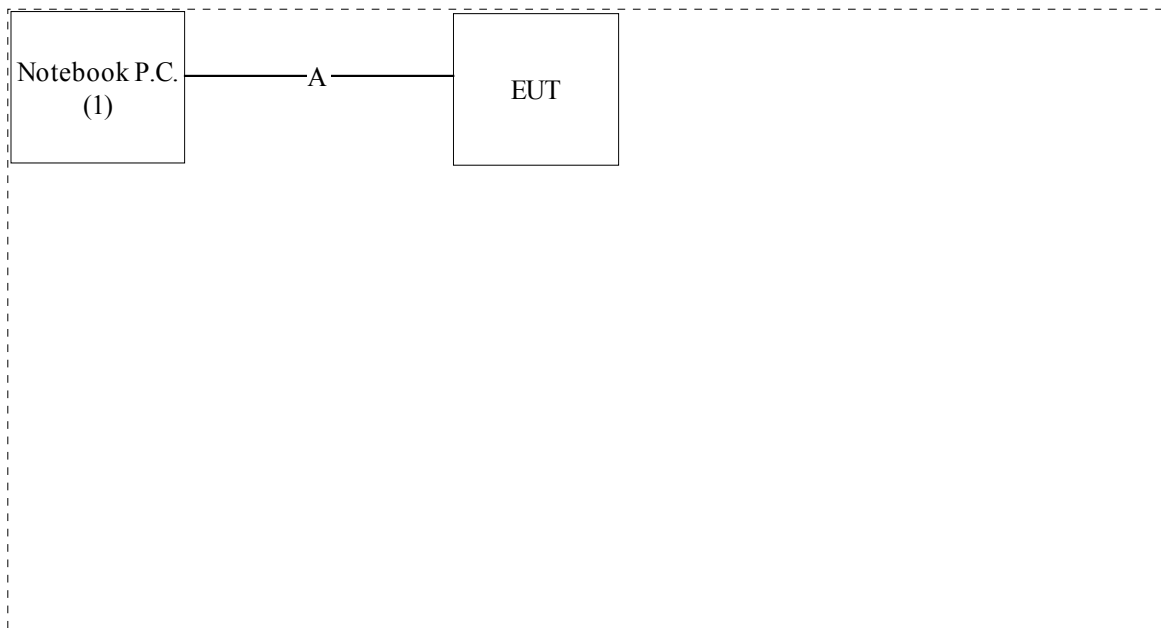
### 1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

|     | Product       | Manufacturer | Model No. | Serial No. | Power Cord |
|-----|---------------|--------------|-----------|------------|------------|
| (1) | Notebook P.C. | ASUS         | L4000L    | N/A        | N/A        |

|     | Signal Cable Type | Signal cable Description |
|-----|-------------------|--------------------------|
| (1) | USB Cable         | Shielded, 1.0m           |

### 1.4. Configuration of Tested System



### 1.5. EUT Exercise Software

- 1 Setup the EUT and simulators as shown on 1.4.
- 2 Turn on the power of all equipment.
- 3 Messages will be transmitted and received through EUT.
- 4 Test is based on the mandatory continuous transmitter.
- 5 Repeat the above procedure (3) to (4).



## 1.6. Test Facility

Ambient conditions in the laboratory:

| Items                      | Required (IEC 68-1) | Actual   |
|----------------------------|---------------------|----------|
| Temperature (°C)           | 15-35               | 20-35    |
| Humidity (%RH)             | 25-75               | 30-65    |
| Barometric pressure (mbar) | 860-1060            | 950-1000 |

Site Description: File on  
Federal Communications Commission  
FCC Engineering Laboratory  
7435 Oakland Mills Road  
Columbia, MD 21046  
Reference 31040/SIT1300F2



Accreditation on NVLAP  
NVLAP Lab Code: 200533-0



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FCC Accreditation Number: TW1014



## 2. Conducted Emission

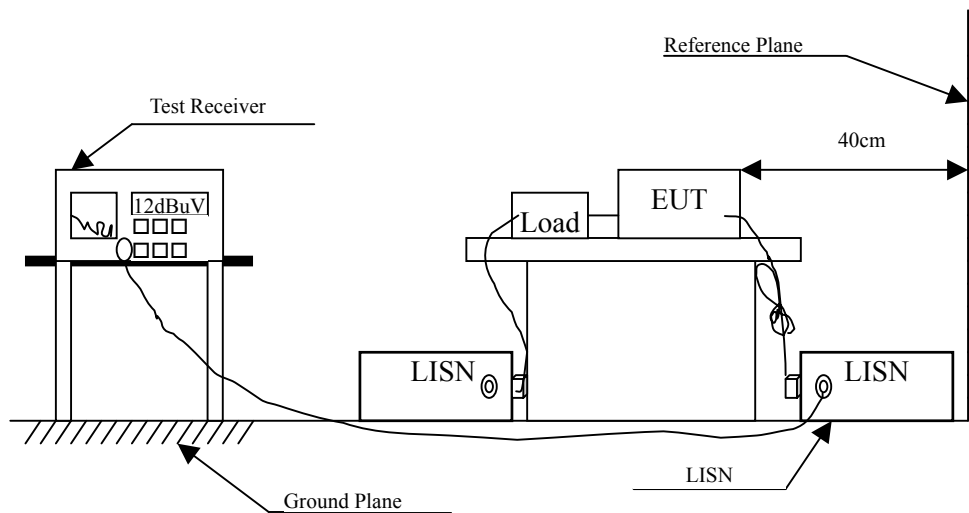
### 2.1. Test Equipment

The following test equipment are used during the conducted emission test:

| Item | Instrument         | Manufacturer | Type No./Serial No | Last Cal. | Remark      |
|------|--------------------|--------------|--------------------|-----------|-------------|
| 1    | Test Receiver      | R & S        | ESCS 30/825442/17  | May, 2007 |             |
| 2    | L.I.S.N.           | R & S        | ESH3-Z5/825016/6   | May, 2007 | EUT         |
| 3    | L.I.S.N.           | Kyoritsu     | KNW-407/8-1420-3   | May, 2007 | Peripherals |
| 4    | Pulse Limiter      | R & S        | ESH3-Z2            | May, 2007 |             |
| 5    | No.1 Shielded Room |              |                    | N/A       |             |

Note: All instruments are calibrated every one year.

### 2.2. Test Setup



### 2.3. Limits

| FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit |        |       |
|---|--------|-------|
| Frequency<br>MHz                                    | Limits |       |
|   | QP     | AV    |
| 0.15 - 0.50   | 66-56  | 56-46 |
| 0.50-5.0  | 56     | 46    |
| 5.0 - 30  | 60     | 50    |

Remarks: In the above table, the tighter limit applies at the band edges.

### 2.4. Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

### 2.5. Uncertainty

± 2.26 dB

## 2.6. Test Result of Conducted Emission

Product : Bluetooth Handfree  
 Test Item : Conducted Emission Test  
 Power Line : Line 1  
 Test Mode : Mode 1: Transmitter

| Frequency<br>MHz  | Correct<br>Factor<br>dB | Reading<br>Level<br>dBuV | Measurement<br>Level<br>dBuV | Margin<br>dB | Limit<br>dBuV |
|-------------------|-------------------------|--------------------------|------------------------------|--------------|---------------|
| <b>Line 1</b>     |                         |                          |                              |              |               |
| <b>Quasi-Peak</b> |                         |                          |                              |              |               |
| 0.201             | 0.643                   | 42.570                   | 43.213                       | -21.330      | 64.543        |
| 0.529             | 0.300                   | 31.660                   | 31.960                       | -24.040      | 56.000        |
| 0.923             | 0.310                   | 29.910                   | 30.220                       | -25.780      | 56.000        |
| 2.181             | 0.350                   | 30.760                   | 31.110                       | -24.890      | 56.000        |
| 3.041             | 0.370                   | 32.900                   | 33.270                       | -22.730      | 56.000        |
| 5.685             | 0.454                   | 33.640                   | 34.094                       | -25.906      | 60.000        |
| <b>Average</b>    |                         |                          |                              |              |               |
| 0.201             | 0.643                   | 36.260                   | 36.903                       | -17.640      | 54.543        |
| 0.529             | 0.300                   | 28.180                   | 28.480                       | -17.520      | 46.000        |
| 0.923             | 0.310                   | 28.570                   | 28.880                       | -17.120      | 46.000        |
| 2.181             | 0.350                   | 28.570                   | 28.920                       | -17.080      | 46.000        |
| 3.041             | 0.370                   | 30.180                   | 30.550                       | -15.450      | 46.000        |
| 5.685             | 0.454                   | 31.600                   | 32.054                       | -17.946      | 50.000        |

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : Bluetooth Handfree  
 Test Item : Conducted Emission Test  
 Power Line : Line 2  
 Test Mode : Mode 1: Transmitter

| Frequency         | Correct | Reading | Measurement | Margin  | Limit  |
|-------------------|---------|---------|-------------|---------|--------|
| MHz               | Factor  | Level   | Level       |         |        |
|                   | dB      | dBuV    | dBuV        | dB      | dBuV   |
| <b>Line 2</b>     |         |         |             |         |        |
| <b>Quasi-Peak</b> |         |         |             |         |        |
| 0.197             | 0.300   | 44.960  | 45.260      | -19.397 | 64.657 |
| 0.396             | 0.310   | 36.230  | 36.540      | -22.431 | 58.971 |
| 0.728             | 0.314   | 35.250  | 35.564      | -20.436 | 56.000 |
| 2.248             | 0.350   | 29.920  | 30.270      | -25.730 | 56.000 |
| 2.841             | 0.370   | 30.480  | 30.850      | -25.150 | 56.000 |
| 5.615             | 0.430   | 33.520  | 33.950      | -26.050 | 60.000 |
| <b>Average</b>    |         |         |             |         |        |
| 0.197             | 0.300   | 35.630  | 35.930      | -18.727 | 54.657 |
| 0.396             | 0.310   | 35.440  | 35.750      | -13.221 | 48.971 |
| 0.728             | 0.314   | 33.060  | 33.374      | -12.626 | 46.000 |
| 2.248             | 0.350   | 28.270  | 28.620      | -17.380 | 46.000 |
| 2.841             | 0.370   | 28.570  | 28.940      | -17.060 | 46.000 |
| 5.615             | 0.430   | 30.920  | 31.350      | -18.650 | 50.000 |

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

### 3. Peak Power Output

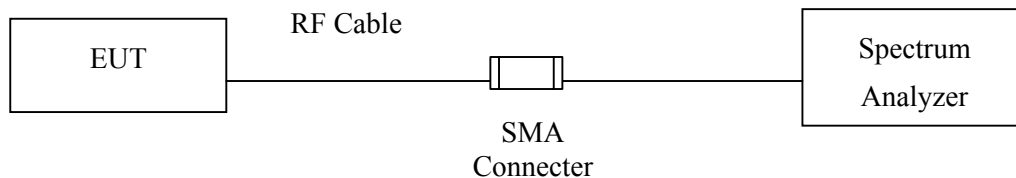
#### 3.1. Test Equipment

The following test equipments are used during the radiated emission tests:

|   | Equipment    | Manufacturer | Model No./Serial No. | Last Cal. |
|---|--------------|--------------|----------------------|-----------|
| X | Power Meter  | Anritsu      | ML2495A/6K00003357   | May, 2007 |
| X | Power Sensor | Anritsu      | MA2491A/034457       | May, 2007 |

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by “X” are used to measure the final test results.

#### 3.2. Test Setup



#### 3.3. Limit

The maximum peak power shall be less 1Watt.

#### 3.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

#### 3.5. Uncertainty

± 1.27 dB

### 3.6. Test Result of Peak Power Output

Product : Bluetooth Handfree  
Test Item : Peak Power Output  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmitter

| Channel No. | Frequency (MHz) | Measurement | Required Limit | Result |
|-------------|-----------------|-------------|----------------|--------|
| Channel 00  | 2402.00         | -3.12dBm    | 1 Watt= 30 dBm | Pass   |
| Channel 39  | 2441.00         | -2.48dBm    | 1 Watt= 30 dBm | Pass   |
| Channel 78  | 2480.00         | -1.57dBm    | 1 Watt= 30 dBm | Pass   |

## 4. Radiated Emission

### 4.1. Test Equipment

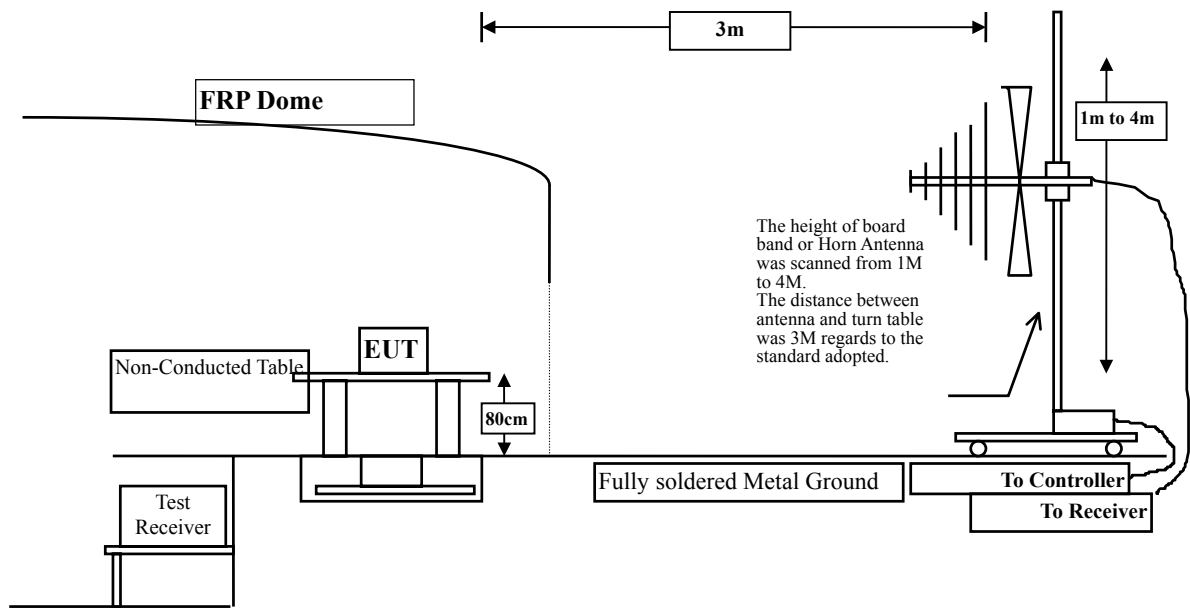
The following test equipments are used during the radiated emission test:

| Test Site                                    | Equipment         | Manufacturer | Model No./Serial No.   | Last Cal.  |
|--|-------------------|--------------|------------------------|------------|
| <input type="checkbox"/> Site # 1            | Test Receiver     | R & S        | ESVS 10 / 834468/003   | May, 2007  |
|  | Spectrum Analyzer | Advantest    | R3162/ 00803480        | May, 2007  |
|  | Pre-Amplifier     | Advantest    | BB525C/ 3307A01812     | May, 2007  |
|  | Bilog Antenna     | SCHAFFNER    | CBL6112B / 2697        | Sep., 2007 |
| <input type="checkbox"/> Site # 2            | Test Receiver     | R & S        | ESCS 30 / 836858 / 022 | May, 2007  |
|  | Spectrum Analyzer | Advantest    | R3162 / 100803466      | May, 2007  |
|  | Pre-Amplifier     | Advantest    | BB525C/3307A01814      | May, 2007  |
|  | Bilog Antenna     | SCHAFFNER    | CBL6112B / 2705        | May, 2007  |
|  | Horn Antenna      | ETS          | 3115 / 0005-6160       | Sep., 2007 |
|  | Pre-Amplifier     | QTK          | QTK-AMP-01/ 0001       | May, 2007  |
| <input checked="" type="checkbox"/> Site # 3 | Test Receiver     | R & S        | ESI 26 / 838786 / 004  | May, 2007  |
|  | Spectrum Analyzer | Agilent      | E4407B / US39440758    | May, 2007  |
|  | Bilog Antenna     | SCHAFFNER    | CBL6112B / 2697        | May, 2007  |
|  | Horn Antenna      | Schwarzbeck  | BBHA9120D / 305, 306   | July, 2007 |
|  | Horn Antenna      | Schwarzbeck  | BBHA9170 / 208, 209    | July, 2007 |
|  | Pre-Amplifier     | QTK          | QTK-AMP-01 / 0001      | July, 2007 |
|  | Pre-Amplifier     | QTK          | QTK-AMP-03 / 0003      | May, 2007  |
|  | Pre-Amplifier     | HP           | 8449B / 3008A01123     | July, 2007 |

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by "X" are used to measure the final test results.



## 4.2. Test Setup



## 4.3. Limits

### ➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

| FCC Part 15 Subpart C Paragraph 15.209 Limits |          |           |
|---|----------|-----------|
| Frequency MHz                                 | uV/m @3m | dBuV/m@3m |
| 30-88   | 100      | 40        |
| 88-216  | 150      | 43.5      |
| 216-960                                       | 200      | 46        |
| Above 960                                     | 500      | 54        |

- Remarks:
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
  2. In the Above Table, the tighter limit applies at the band edges.
  3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

#### 4.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

The additional latch filter below 1GHz was used to measure the level of harmonics radiated emission during field strength of harmonics measurement.

The bandwidth below 1GHz setting on the field strength meter is 120 kHz, above 1GHz are 1 MHz.

The frequency range from 30MHz to 10th harmonics is checked.

#### 4.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

#### 4.6. Test Result of Radiated Emission

Product : Bluetooth Handfree  
Test Item : Harmonic Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmitter (2402MHz)

| Frequency             | Correct | Reading | Measurement | Margin  | Limit  |
|-----------------------|---------|---------|-------------|---------|--------|
| MHz                   | Factor  | Level   | Level       |         |        |
|                       | dB      | dBuV    | dBuV/m      | dB      | dBuV/m |
| <b>Horizontal</b>     |         |         |             |         |        |
| <b>Peak Detector:</b> |         |         |             |         |        |
| 4804.000              | 3.663   | 55.110  | 58.773      | -15.227 | 74.000 |
| 7206.000              | 9.357   | 34.740  | 44.096      | -29.904 | 74.000 |
| 9608.000              | 11.842  | 33.910  | 45.752      | -28.248 | 74.000 |
| <b>Average</b>        |         |         |             |         |        |
| <b>Detector:</b>      |         |         |             |         |        |
| 4804.000              | 3.663   | 32.000  | 35.663      | -18.337 | 54.000 |
| <b>Vertical</b>       |         |         |             |         |        |
| <b>Peak Detector:</b> |         |         |             |         |        |
| 4804.000              | 3.663   | 53.050  | 56.713      | -17.287 | 74.000 |
| 7206.000              | 9.357   | 34.820  | 44.176      | -29.824 | 74.000 |
| 9608.000              | 11.842  | 34.520  | 46.362      | -27.638 | 74.000 |
| <b>Average</b>        |         |         |             |         |        |
| <b>Detector:</b>      |         |         |             |         |        |
| 4804.000              | 3.663   | 28.500  | 32.163      | -21.837 | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz °
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:10Hz; Span:20MHz °
4. Emission Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Bluetooth Handfree  
 Test Item : Harmonic Radiated Emission  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (2441MHz)

| Frequency             | Correct | Reading | Measurement | Margin  | Limit  |
|-----------------------|---------|---------|-------------|---------|--------|
| MHz                   | Factor  | Level   | Level       |         |        |
|                       | dB      | dBuV    | dBuV/m      | dB      | dBuV/m |
| <b>Horizontal</b>     |         |         |             |         |        |
| <b>Peak Detector:</b> |         |         |             |         |        |
| 4882.000              | 3.921   | 54.620  | 58.541      | -15.459 | 74.000 |
| 7323.000              | 9.657   | 34.040  | 43.697      | -30.303 | 74.000 |
| 9764.000              | 11.798  | 34.700  | 46.498      | -27.502 | 74.000 |
| <b>Average</b>        |         |         |             |         |        |
| <b>Detector:</b>      |         |         |             |         |        |
| 4882.000              | 3.921   | 33.100  | 37.021      | -16.979 | 54.000 |
| <b>Vertical</b>       |         |         |             |         |        |
| <b>Peak Detector:</b> |         |         |             |         |        |
| 4882.000              | 3.921   | 54.170  | 58.091      | -15.909 | 74.000 |
| 7323.000              | 9.657   | 33.480  | 43.137      | -30.863 | 74.000 |
| 9764.000              | 11.798  | 35.040  | 46.838      | -27.162 | 74.000 |
| <b>Average</b>        |         |         |             |         |        |
| <b>Detector:</b>      |         |         |             |         |        |
| 4882.000              | 3.921   | 30.250  | 34.171      | -19.829 | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz °
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:10Hz; Span:20MHz °
4. Emission Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Bluetooth Handfree  
 Test Item : Harmonic Radiated Emission  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (2480MHz)

| Frequency             | Correct | Reading | Measurement | Margin  | Limit  |
|-----------------------|---------|---------|-------------|---------|--------|
| MHz                   | Factor  | Level   | Level       |         |        |
|                       | dB      | dBuV    | dBuV/m      | dB      | dBuV/m |
| <b>Horizontal</b>     |         |         |             |         |        |
| <b>Peak Detector:</b> |         |         |             |         |        |
| 4960.000              | 4.197   | 53.440  | 57.636      | -16.364 | 74.000 |
| 7440.000              | 9.951   | 32.450  | 42.401      | -31.599 | 74.000 |
| 9920.000              | 11.856  | 33.840  | 45.696      | -28.304 | 74.000 |
| <b>Average</b>        |         |         |             |         |        |
| <b>Detector:</b>      |         |         |             |         |        |
| 4960.000              | 4.197   | 31.740  | 35.936      | -18.064 | 54.000 |
| <b>Vertical</b>       |         |         |             |         |        |
| <b>Peak Detector:</b> |         |         |             |         |        |
| 4960.000              | 4.197   | 52.990  | 57.186      | -16.814 | 74.000 |
| 7440.000              | 9.951   | 32.490  | 42.441      | -31.559 | 74.000 |
| 9920.000              | 11.856  | 34.090  | 45.946      | -28.054 | 74.000 |
| <b>Average</b>        |         |         |             |         |        |
| <b>Detector:</b>      |         |         |             |         |        |
| 4960.000              | 4.197   | 30.258  | 34.454      | -19.546 | 54.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz °
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:10Hz; Span:20MHz °
4. Emission Level = Reading Level + Correct Factor.
5. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product : Bluetooth Handfree  
 Test Item : General Radiated Emission  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (2441MHz)

| Frequency         | Correct | Reading | Measurement | Margin  | Limit  |
|-------------------|---------|---------|-------------|---------|--------|
| MHz               | Factor  | Level   | Level       |         |        |
|                   | dB      | dBuV    | dBuV/m      | dB      | dBuV/m |
| <b>Horizontal</b> |         |         |             |         |        |
| 191.020           | 7.955   | 24.912  | 32.867      | -10.633 | 43.500 |
| 299.660           | 12.528  | 23.034  | 35.562      | -10.438 | 46.000 |
| 534.400           | 16.722  | 15.736  | 32.458      | -13.542 | 46.000 |
| 602.300           | 17.862  | 16.221  | 34.083      | -11.917 | 46.000 |
| 792.420           | 19.541  | 14.579  | 34.120      | -11.880 | 46.000 |
| 912.700           | 19.550  | 10.893  | 30.443      | -15.557 | 46.000 |
| <b>Vertical</b>   |         |         |             |         |        |
| 159.980           | 8.680   | 20.669  | 29.349      | -14.151 | 43.500 |
| 299.660           | 12.145  | 13.592  | 25.737      | -20.263 | 46.000 |
| 460.680           | 16.446  | 12.404  | 28.850      | -17.150 | 46.000 |
| 528.589           | 16.927  | 12.925  | 29.852      | -16.148 | 46.000 |
| 672.140           | 17.577  | 8.273   | 25.850      | -20.150 | 46.000 |
| 802.120           | 19.160  | 13.800  | 32.960      | -13.040 | 46.000 |

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. “ ” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The radiated emissions below 1GHz of the lowest, middle, highest frequency are pretested. Only the worst case is shown on the report.

## 5. Band Edge

### 5.1. Test Equipment

The following test equipments are used during the band edge tests:

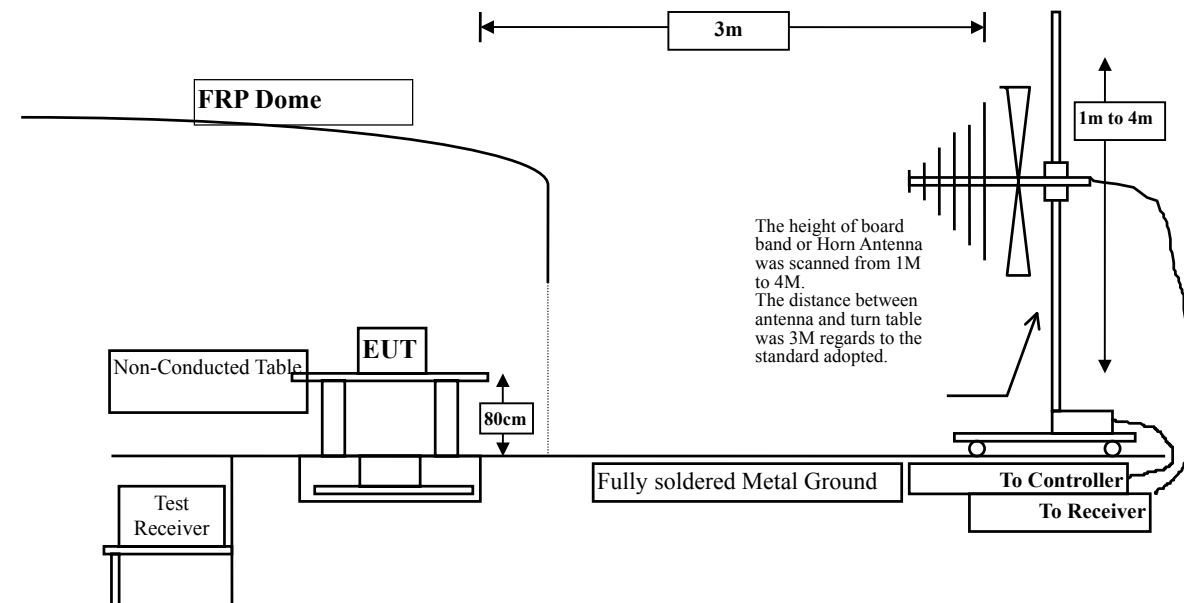
|   | Equipment         | Manufacturer | Model No./Serial No.  | Last Cal.  |
|---|-------------------|--------------|-----------------------|------------|
| X | Test Receiver     | R & S        | ESI 26 / 838786 / 004 | May, 2007  |
| X | Spectrum Analyzer | Agilent      | E4407B / US39440758   | May, 2007  |
| X | Bilog Antenna     | SCHAFFNER    | CBL6112B / 2697       | May, 2007  |
| X | Horn Antenna      | Schwarzbeck  | BBHA9120D / 305, 306  | July, 2007 |
| X | Horn Antenna      | Schwarzbeck  | BBHA9170 / 208, 209   | July, 2007 |
| X | Pre-Amplifier     | QTK          | QTK-AMP-01 / 0001     | July, 2007 |
| X | Pre-Amplifier     | QTK          | QTK-AMP-03 / 0003     | May, 2007  |
| X | Pre-Amplifier     | HP           | 8449B / 3008A01123    | July, 2007 |

Test Site Site 3

- Note:
1. All equipments are calibrated every one year.
  2. The test instruments marked by "X" are used to measure the final test results.

### 5.2. Test Setup

#### RF Radiated Measurement:



### 5.3. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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. 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)).

### 5.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of The bandwidth below 1GHz setting on the field strength meter is 120 kHz, above 1GHz are 1 MHz.

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 5.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz



## 5.6. Test Result of Band Edge

Product : Bluetooth Handfree  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (2402MHz)

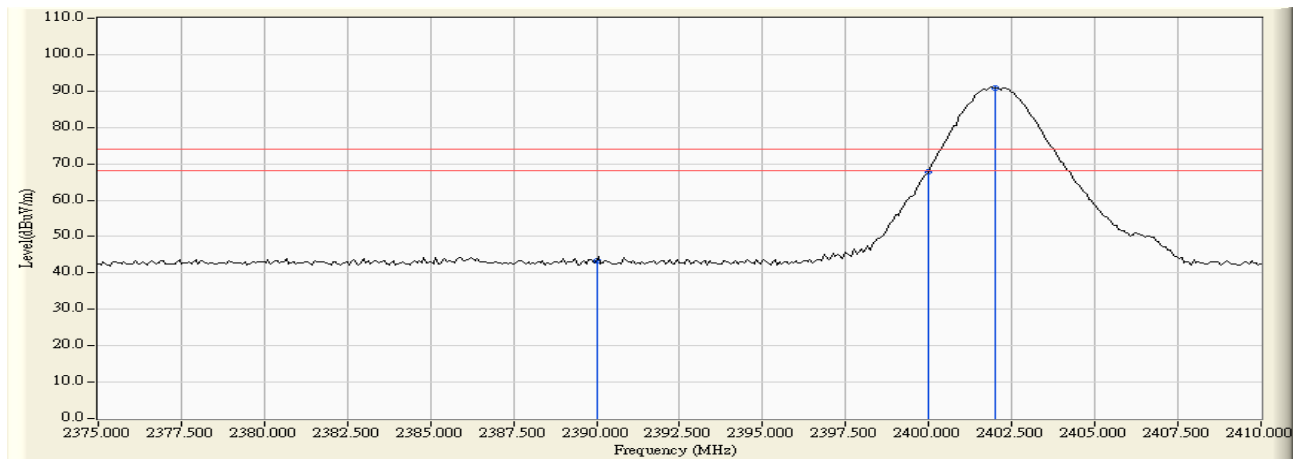
### RF Radiated Measurement:

| Channel No. | Frequency (MHz) | Required Limit (dBc) | Result |
|-------------|-----------------|----------------------|--------|
| 00          | <2400           | >20                  | Pass   |

### RF Radiated Measurement (Horizontal):

| Channel   | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Emission Level (dBuV/m) | Peak Limit (dBuV/m) | Average Limit (dBuV/m) | Result |
|-----------|-----------------|---------------------|----------------------|-------------------------|---------------------|------------------------|--------|
| 00 (Peak) | 2390.000        | -2.378              | 45.835               | 43.458                  | 74.00               | 54.00                  | Pass   |
| 00 (Peak) | 2400.000        | -2.328              | 70.119               | 67.791                  | 74.00               | 54.00                  | Pass   |
| 00 (Peak) | 2402.015        | -2.318              | 93.189               | 90.871                  | 74.00               | 54.00                  | Pass   |

Figure Channel 00: (Horizontal) (Peak)



Note:

RBW=1MHz, VBW=1MHz, Sweep Time=500ms.

Product : Bluetooth Handfree  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (2402MHz)

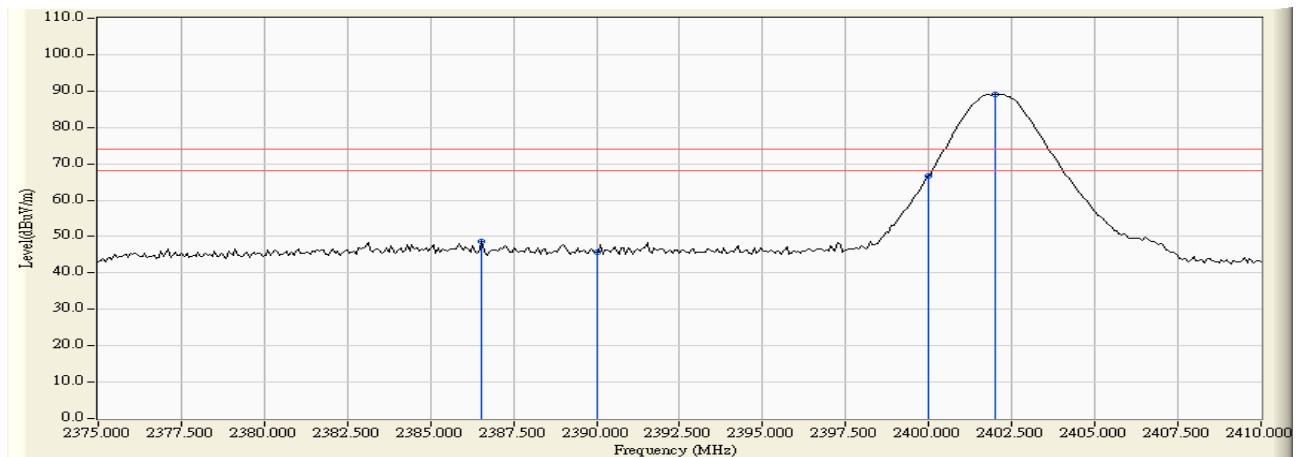
**RF Radiated Measurement:**

| Channel No. | Frequency (MHz) | Required Limit (dBc) | Result |
|-------------|-----------------|----------------------|--------|
| 00          | <2400           | >20                  | Pass   |

**RF Radiated Measurement (Vertical):**

| Channel   | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Emission Level (dBuV/m) | Peak Limit (dBuV/m) | Average Limit (dBuV/m) | Result |
|-----------|-----------------|---------------------|----------------------|-------------------------|---------------------|------------------------|--------|
| 00 (Peak) | 2386.550        | -2.394              | 51.132               | 48.738                  | 74.00               | 54.00                  | Pass   |
| 00 (Peak) | 2390.000        | -2.378              | 48.130               | 45.753                  | 74.00               | 54.00                  | Pass   |
| 00 (Peak) | 2400.000        | -2.328              | 69.015               | 66.687                  | 74.00               | 54.00                  | Pass   |
| 00 (Peak) | 2402.019        | -2.318              | 91.445               | 89.127                  | 74.00               | 54.00                  | Pass   |

**Figure Channel 00: (Vertical) (Peak)**



Note:

RBW=1MHz, VBW=1MHz, Sweep Time=500ms.

Product : Bluetooth Handfree  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (2480MHz)

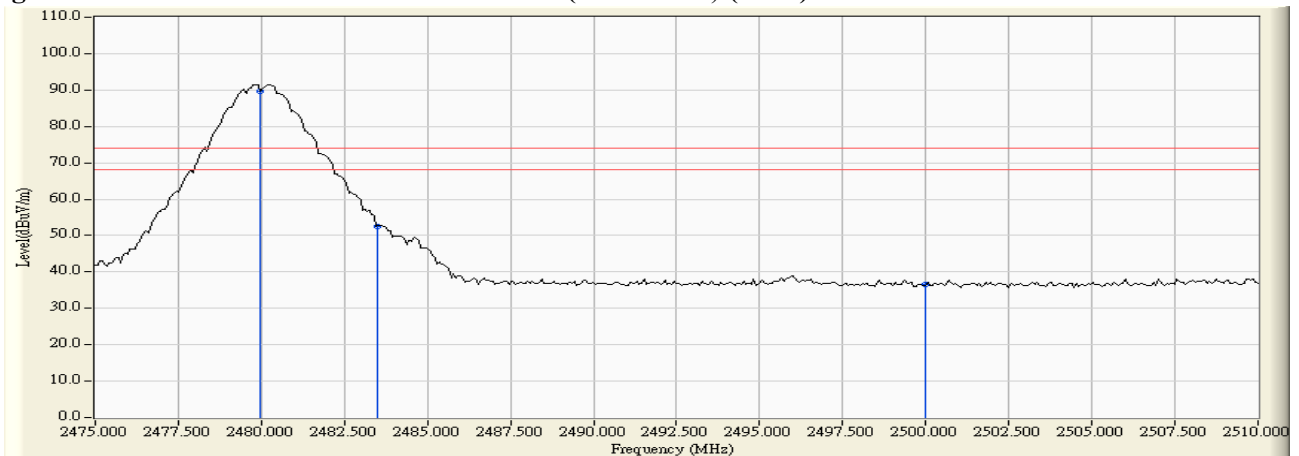
**RF Radiated Measurement:**

| Channel No. | Frequency (MHz) | Required Limit (dBc) | Result |
|-------------|-----------------|----------------------|--------|
| 78          | >2483.5         | >20                  | Pass   |

**RF Radiated Measurement (Horizontal):**

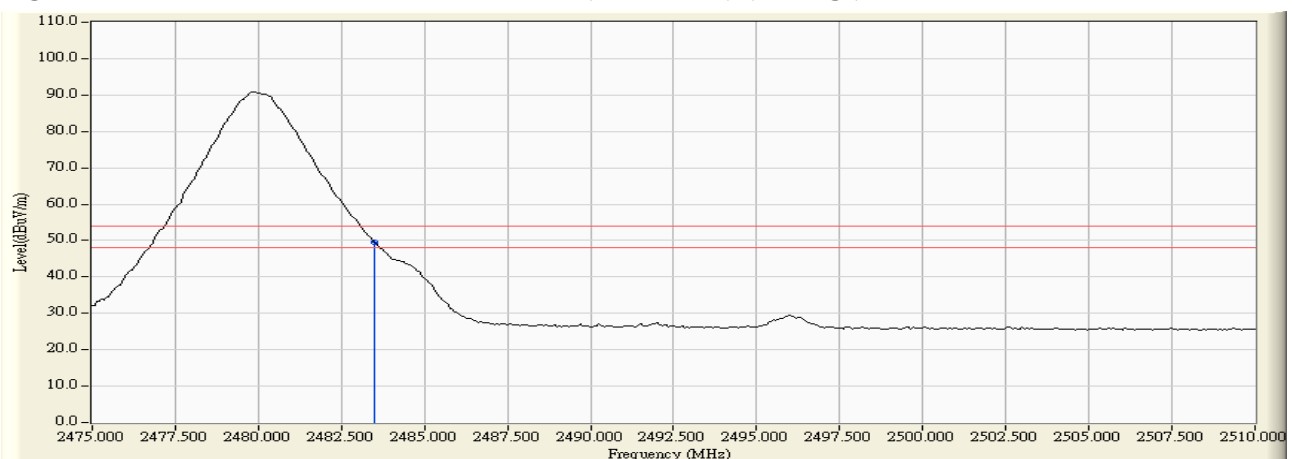
| Channel     | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Emission Level (dBuV/m) | Peak Limit (dBuV/m) | Average Limit (dBuV/m) | Result |
|-------------|-----------------|---------------------|----------------------|-------------------------|---------------------|------------------------|--------|
| 78(Peak)    | 2479.970        | -1.952              | 91.690               | 89.738                  | 74.00               | 54.00                  | Pass   |
| 78(Peak)    | 2483.500        | -1.937              | 54.502               | 52.565                  | 74.00               | 54.00                  | Pass   |
| 78(Peak)    | 2500.000        | -1.886              | 38.322               | 36.436                  | 74.00               | 54.00                  | Pass   |
| 78(Average) | 2483.500        | -1.937              | 51.572               | 49.635                  | 74.00               | 54.00                  | Pass   |

**Figure Channel 78: (Horizontal) (Peak)**



Note: RBW=1MHz, VBW=1MHz, Sweep=500ms

**Figure Channel 78: (Horizontal) (Average)**



Note:

RBW=1MHz, VBW=300Hz, Sweep Time=500ms.

Product : Bluetooth Handfree  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (2480MHz)

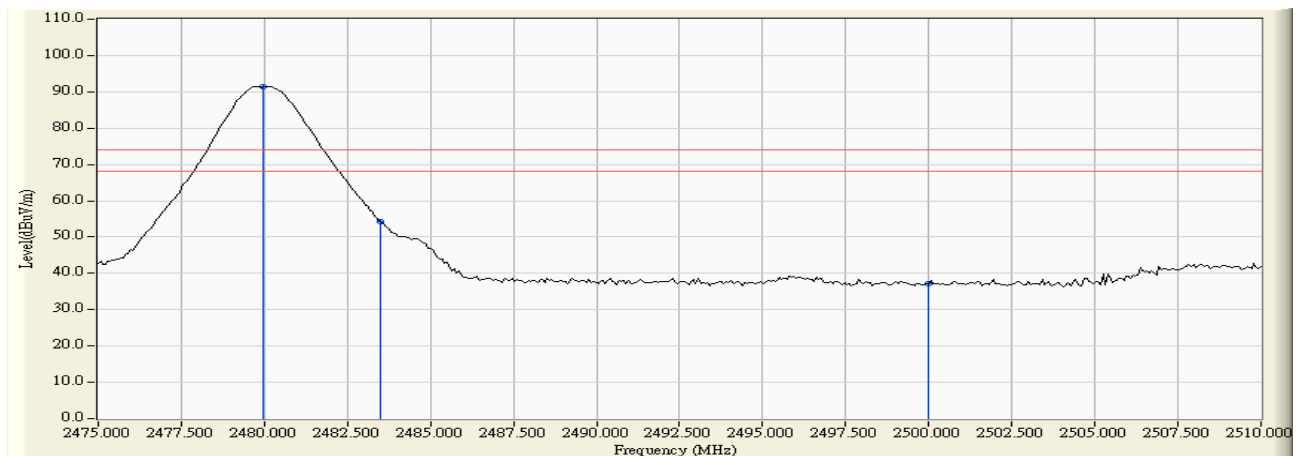
**RF Radiated Measurement:**

| Channel No. | Frequency (MHz) | Required Limit (dBc) | Result |
|-------------|-----------------|----------------------|--------|
| 78          | >2483.5         | >20                  | Pass   |

**RF Radiated Measurement (Vertical):**

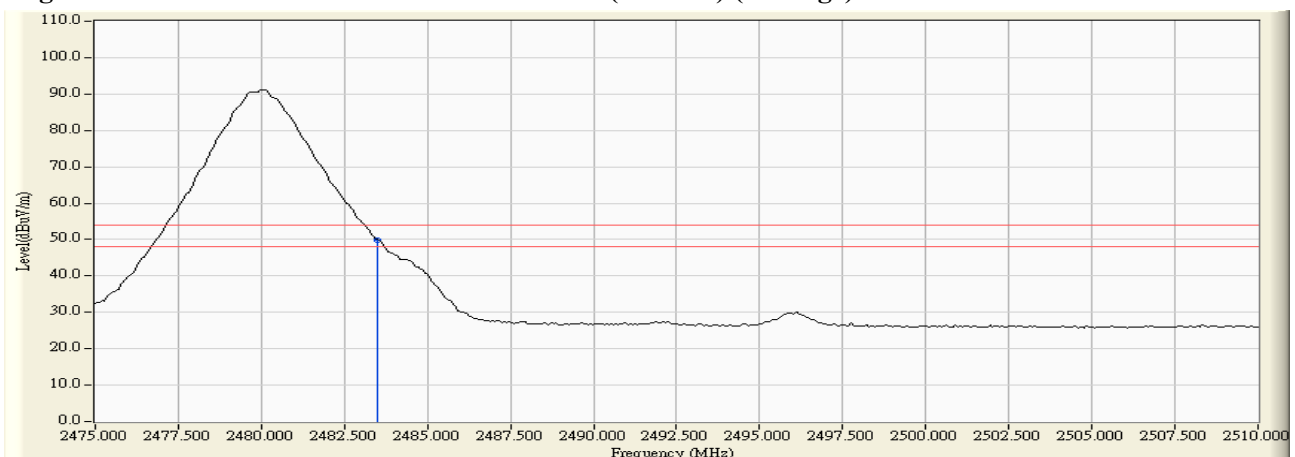
| Channel     | Frequency (MHz) | Correct Factor (dB) | Reading Level (dBuV) | Emission Level (dBuV/m) | Peak Limit (dBuV/m) | Average Limit (dBuV/m) | Result |
|-------------|-----------------|---------------------|----------------------|-------------------------|---------------------|------------------------|--------|
| 78(Peak)    | 2479.980        | -1.952              | 93.395               | 91.443                  | 74.00               | 54.00                  | Pass   |
| 78(Peak)    | 2483.500        | -1.937              | 56.236               | 54.299                  | 74.00               | 54.00                  | Pass   |
| 78(Peak)    | 2500.000        | -1.886              | 38.990               | 37.104                  | 74.00               | 54.00                  | Pass   |
| 78(Average) | 2483.500        | -1.937              | 51.868               | 49.931                  | 74.00               | 54.00                  | Pass   |

**Figure Channel 78: (Vertical) (Peak)**



Note: RBW=1MHz, VBW=1MHz, Sweep Time=500ms.

**Figure Channel 78: (Vertical) (Average)**



Note:

RBW=1MHz, VBW=300Hz, Sweep Time=500ms.

Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

## 6. Channel Number

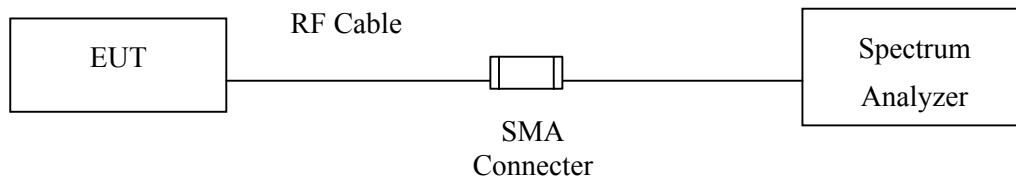
### 6.1. Test Equipment

The following test equipments are used during the radiated emission tests:

|   | Equipment         | Manufacturer | Model No./Serial No. | Last Cal. |
|---|-------------------|--------------|----------------------|-----------|
| X | Spectrum Analyzer | Agilent      | E4407B / US39440758  | May, 2007 |

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by "X" are used to measure the final test results.

### 6.2. Test Setup



### 6.3. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

### 6.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 6.5. Uncertainty

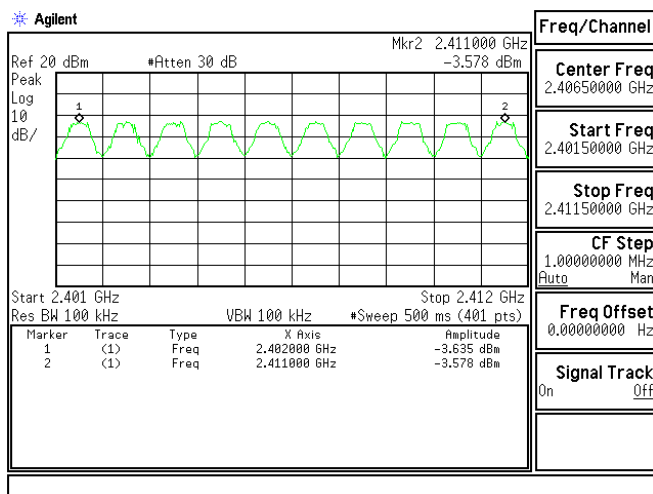
N/A

## 6.6. Test Result of Channel Number

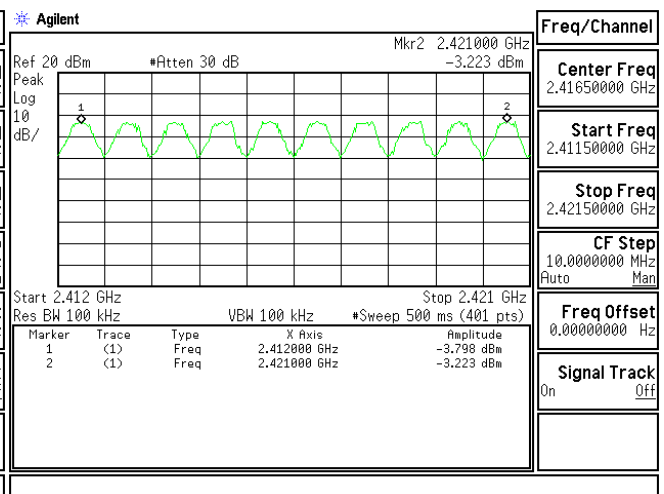
Product : Bluetooth Handfree  
 Test Item : Channel Number  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter

| Frequency Range<br>(MHz) | Measurement<br>(Hopping Channel) | Required Limit<br>(Hopping Channel) | Result |
|--------------------------|----------------------------------|-------------------------------------|--------|
| 2402 ~ 2480              | 79                               | >75                                 | Pass   |

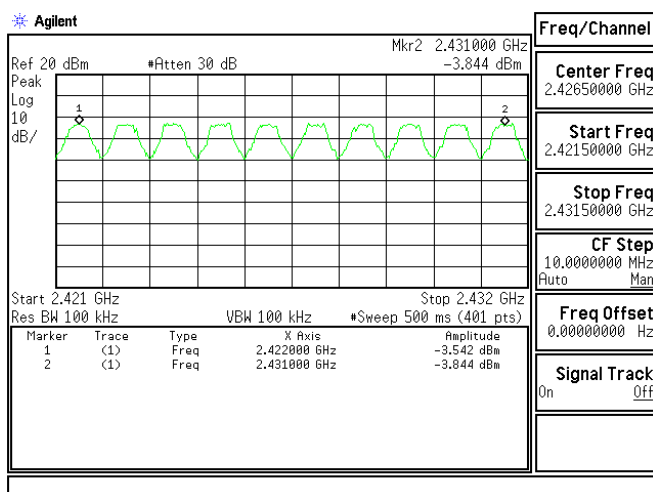
### 2402-2411MHz



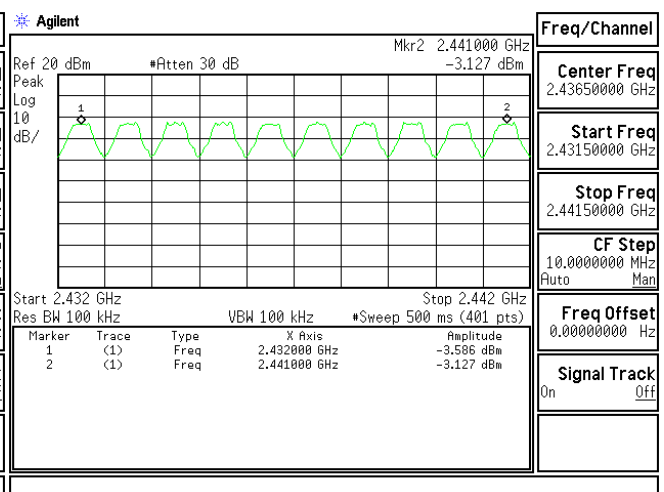
### 2412-2421MHz



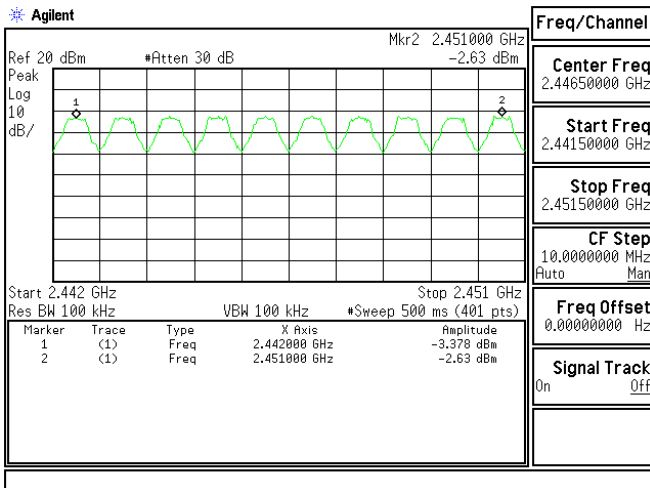
### 2422-2431MHz



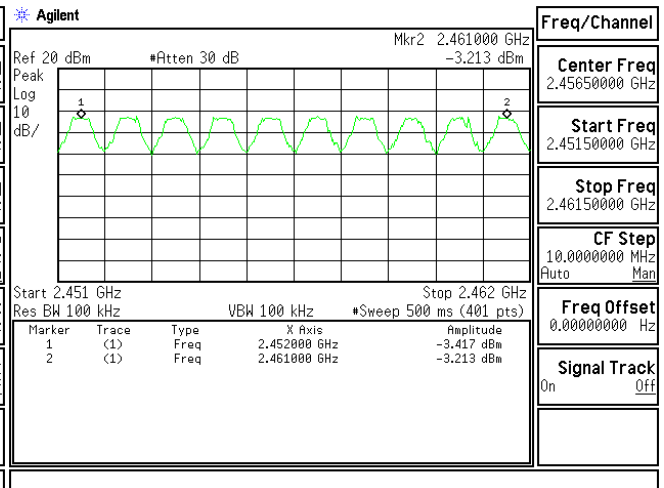
### 2432-2441MHz



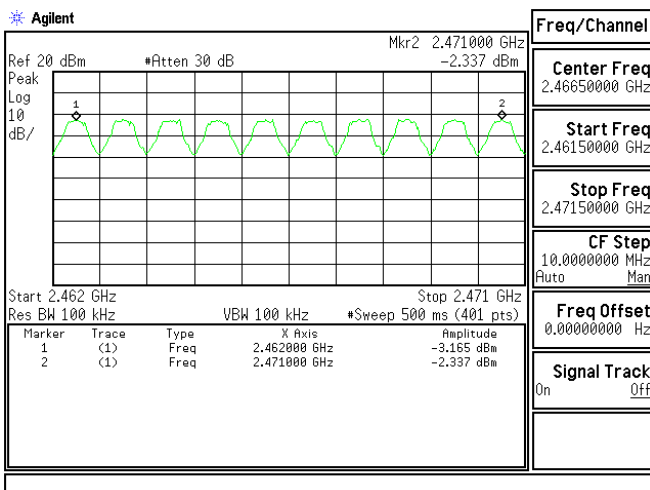
### 2442-2451MHz



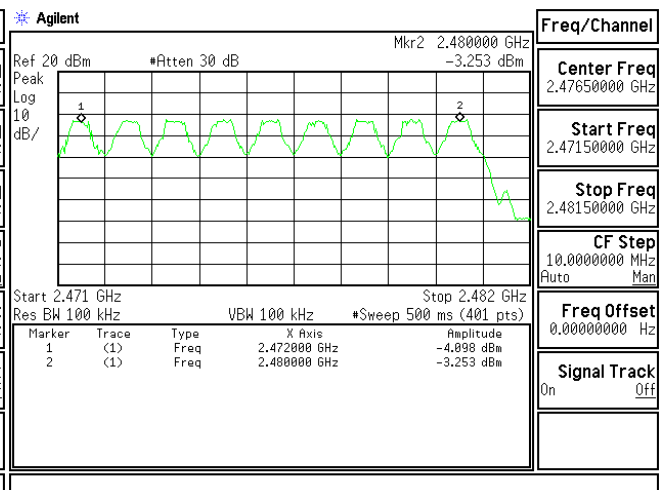
### 2452-2461MHz



### 2462-2471MHz



### 2472-2480MHz



## 7. Channel Separation

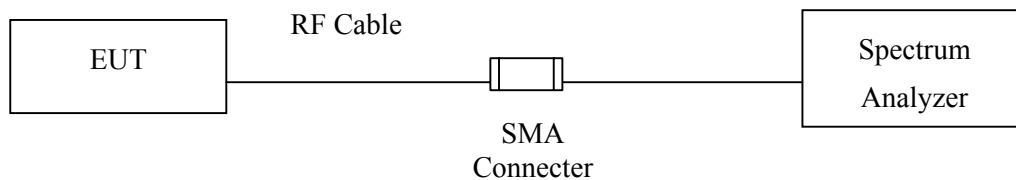
### 7.1. Test Equipment

The following test equipments are used during the radiated emission tests:

|   | Equipment         | Manufacturer | Model No./Serial No. | Last Cal. |
|---|-------------------|--------------|----------------------|-----------|
| X | Spectrum Analyzer | Agilent      | E4407B / US39440758  | May, 2007 |

Note: 1. All equipments are calibrated every one year.  
2. The test instruments mark by “X” are used to measure the final test results.

### 7.2. Test Setup



### 7.3. Limit

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.

### 7.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 7.5. Uncertainty

$\pm 150\text{Hz}$

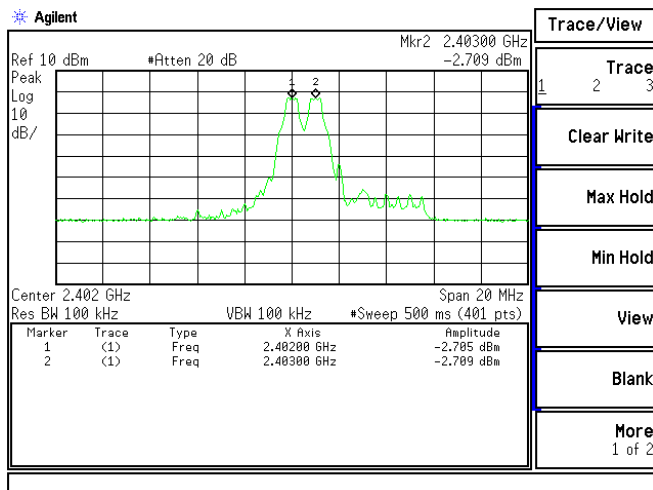


## 7.6. Test Result of Channel Separation

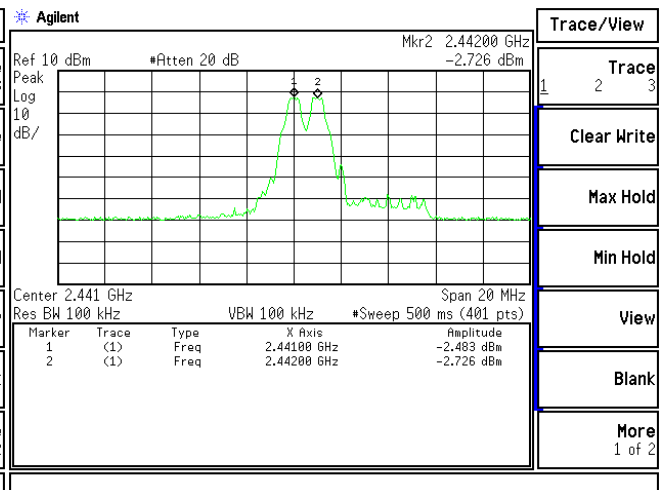
Product : Bluetooth Handfree  
 Test Item : Channel Separation  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter

| Frequency (MHz) | Measurement Level (MHz) | Required Limit            | Result |
|-----------------|-------------------------|---------------------------|--------|
| 2402            | 1.00                    | >25 kHz or 2/3 * 20 dB BW | Pass   |
| 2441            | 1.00                    | >25 kHz or 2/3 * 20 dB BW | Pass   |
| 2480            | 1.00                    | >25 kHz or 2/3 * 20 dB BW | Pass   |

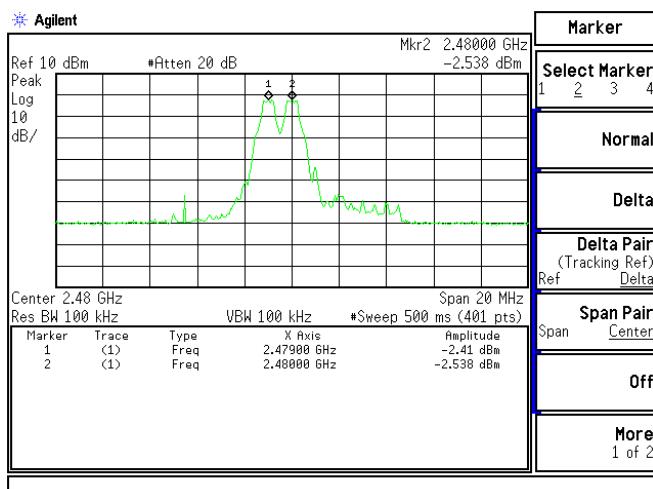
Channel 00 2402MHz



Channel 39 2441MHz



Channel 78 2480 MHz



## 8. Dwell Time

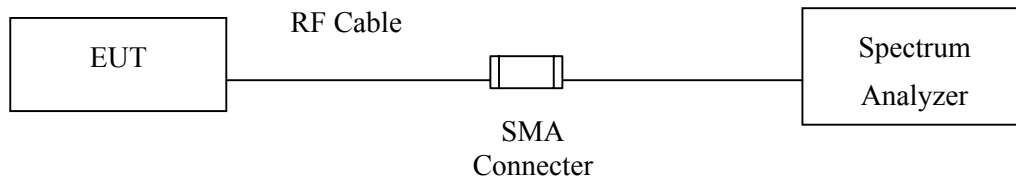
### 8.1. Test Equipment

The following test equipments are used during the radiated emission tests:

|   | Equipment         | Manufacturer | Model No./Serial No. | Last Cal. |
|---|-------------------|--------------|----------------------|-----------|
| X | Spectrum Analyzer | Agilent      | E4407B / US39440758  | May, 2007 |

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by “X” are used to measure the final test results.

### 8.2. Test Setup



### 8.3. Limit

The dwell time shall be the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

### 8.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 8.5. Uncertainty

± 25msec

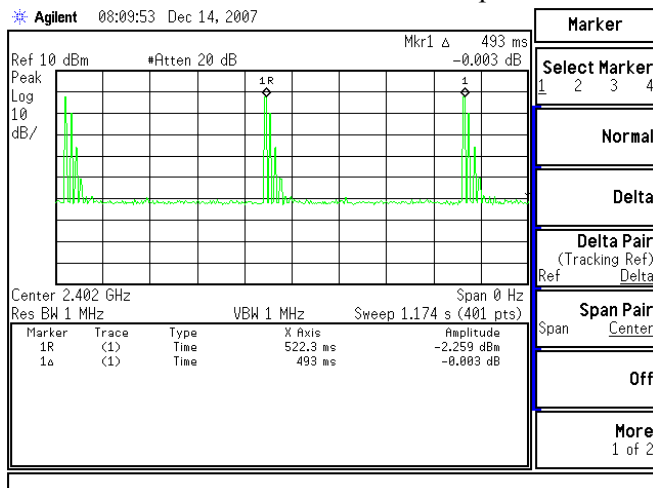
## 8.6. Test Result of Dwell Time

Product : Bluetooth Handfree  
 Test Item : Dwell Time  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Channel 00,39,78 –DH5)

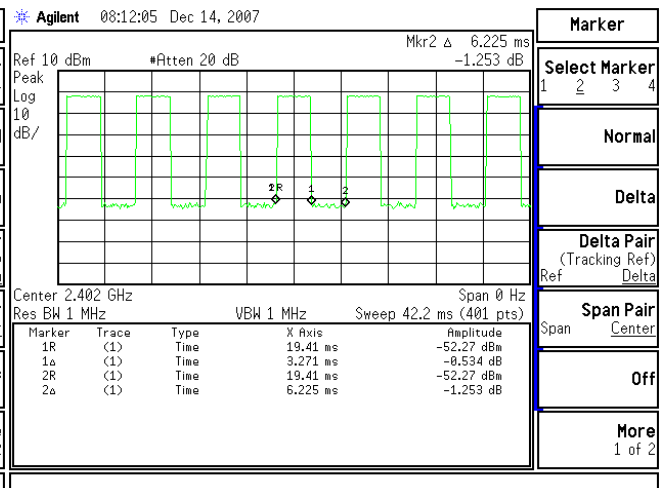
| Channel No. | Frequency (MHz) | Time Interval between hops (ms) | Transmission Time (us) | Dwell Time (ms) | Limit (ms) | Result |
|-------------|-----------------|---------------------------------|------------------------|-----------------|------------|--------|
| 00          | 2402            | 493                             | 3271                   | 209.6624746     | 400        | Pass   |
| 39          | 2441            | 493                             | 3482                   | 223.1870183     | 400        | Pass   |
| 78          | 2480            | 493                             | 3376                   | 216.3926978     | 400        | Pass   |

Note: Dwell Time = 79 \* 400 / Time Interval Between Hops \* Transmission Time / 1000

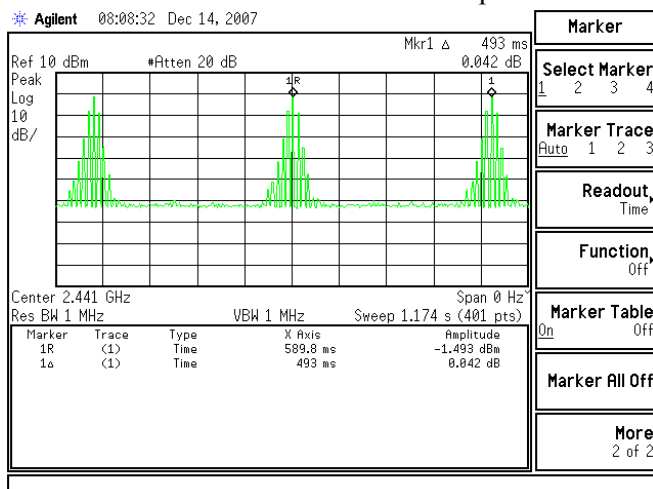
### CH 2402MHz Time Interval between hops



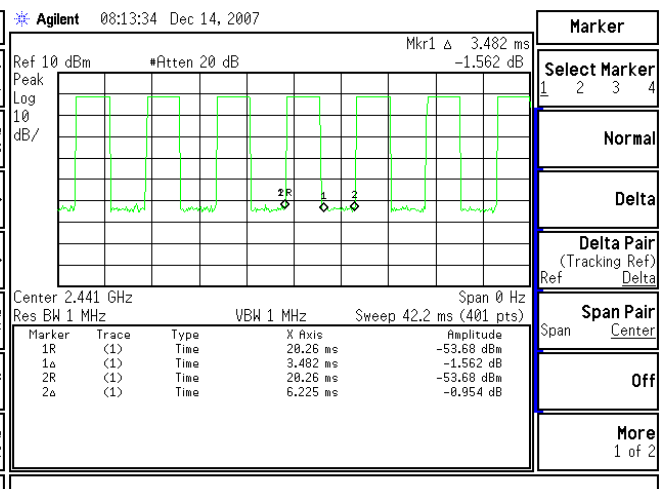
### Transmission Time



### CH 2441MHz Time Interval between hops

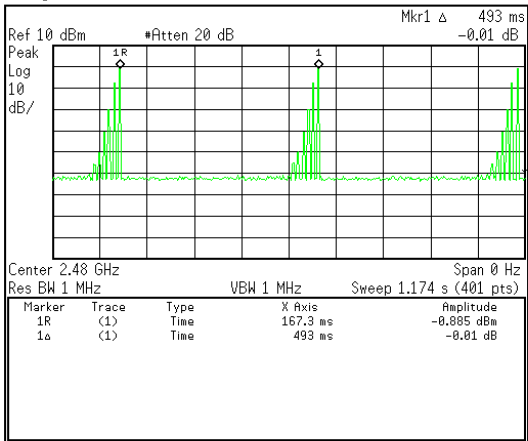


### Transmission Time



## CH 2480MHz Time Interval between hops

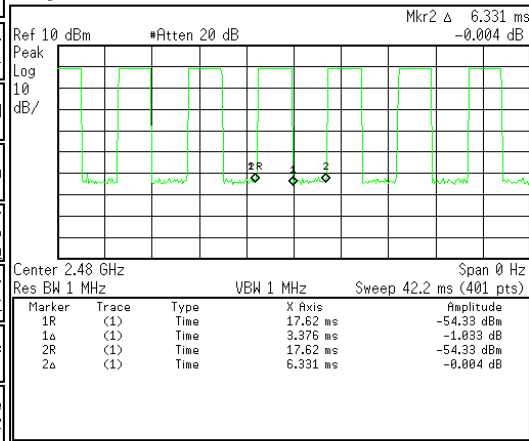
Agilent 08:10:42 Dec 14, 2007



| Marker                    |   |   |   |
|---------------------------|---|---|---|
| Select Marker             | 1 | 2 | 3 |
| Normal                    |   |   |   |
| Delta                     |   |   |   |
| Delta Pair (Tracking Ref) |   |   |   |
| Ref                       |   |   |   |
| Span Pair                 |   |   |   |
| Span                      |   |   |   |
| Off                       |   |   |   |
| More                      |   |   |   |
| 1 of 2                    |   |   |   |

## Transmission Time

Agilent 08:14:24 Dec 14, 2007



| Marker                    |   |   |   |
|---------------------------|---|---|---|
| Select Marker             | 1 | 2 | 3 |
| Normal                    |   |   |   |
| Delta                     |   |   |   |
| Delta Pair (Tracking Ref) |   |   |   |
| Ref                       |   |   |   |
| Span Pair                 |   |   |   |
| Span                      |   |   |   |
| Off                       |   |   |   |
| More                      |   |   |   |
| 1 of 2                    |   |   |   |

Note:

The dwell times of the packet type DH5 are tested.

## 9. Occupied Bandwidth

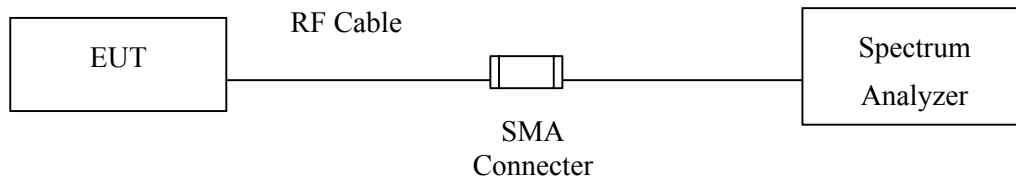
### 9.1. Test Equipment

The following test equipments are used during the radiated emission tests:

|   | Equipment         | Manufacturer | Model No./Serial No. | Last Cal. |
|---|-------------------|--------------|----------------------|-----------|
| X | Spectrum Analyzer | Agilent      | E4407B / US39440758  | May, 2007 |

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by “X” are used to measure the final test results.

### 9.2. Test Setup



### 9.3. Limits

N/A

### 9.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 9.5. Uncertainty

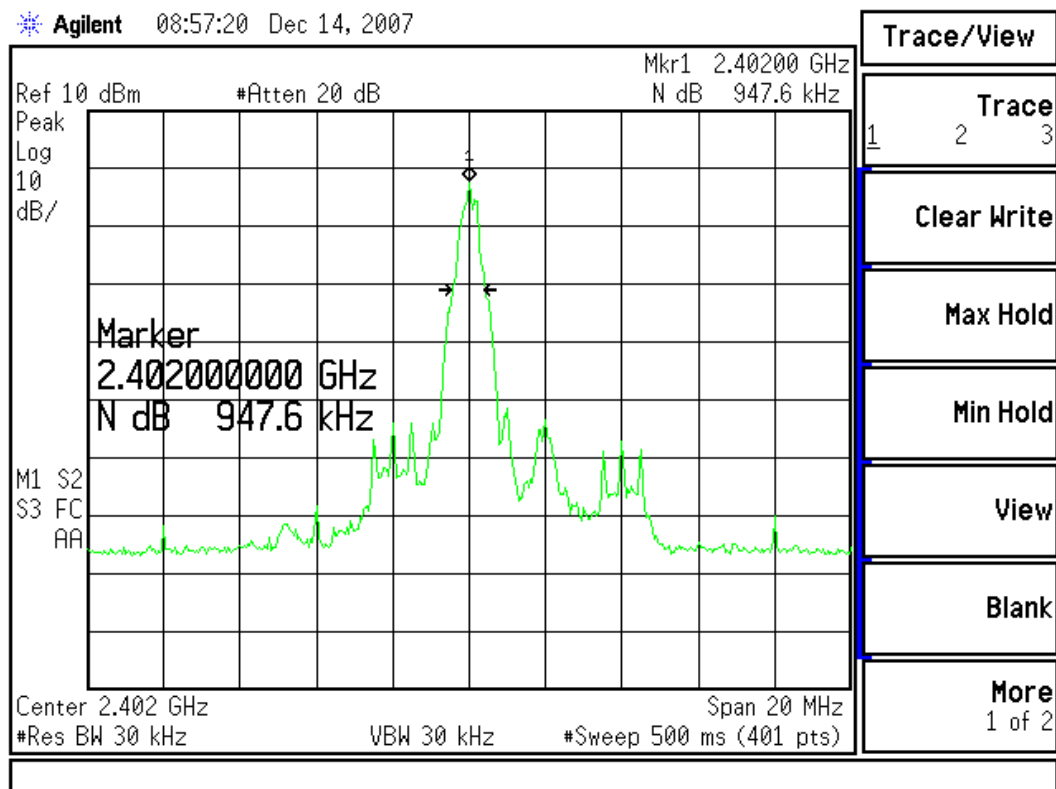
$\pm 150\text{Hz}$

## 9.6. Test Result of Occupied Bandwidth

Product : Bluetooth Handfree  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (2402MHz)

| Channel No. | Frequency (MHz) | Measurement Level (kHz) | Required Limit (kHz) | Result |
|-------------|-----------------|-------------------------|----------------------|--------|
| 00          | 2402            | 947.6                   | --                   | NA     |

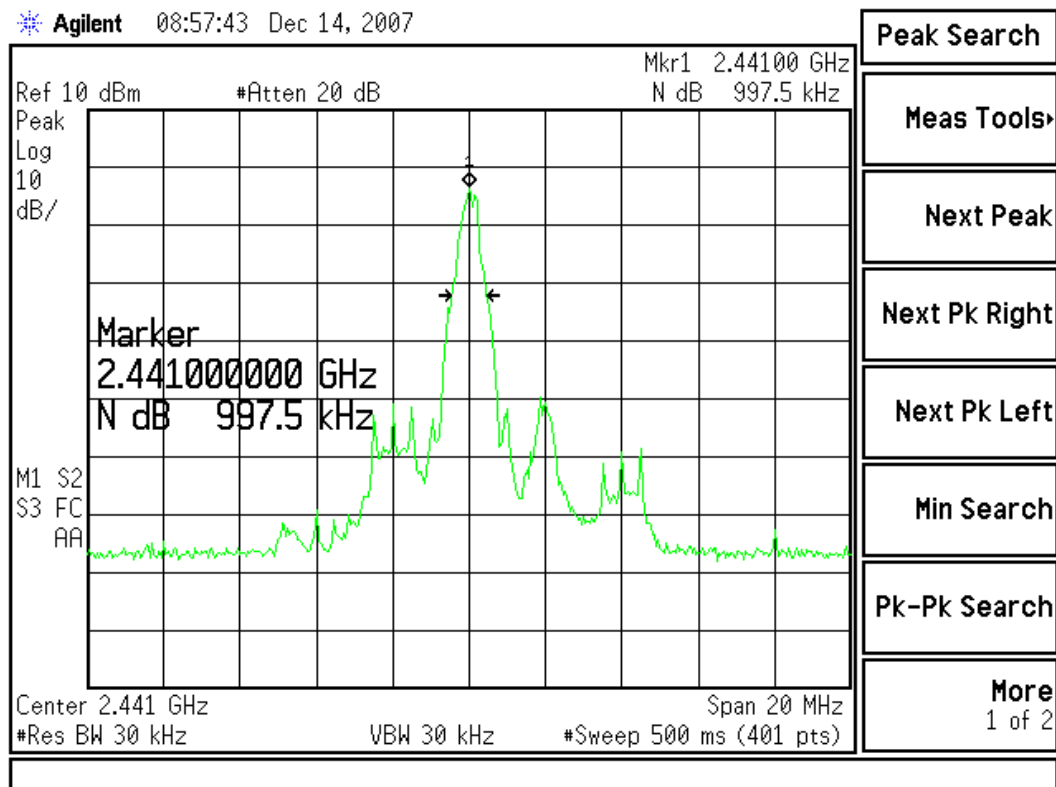
Figure Channel 00:



Product : Bluetooth Handfree  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (2441MHz)

| Channel No. | Frequency (MHz) | Measurement Level (kHz) | Required Limit (kHz) | Result |
|-------------|-----------------|-------------------------|----------------------|--------|
| 39          | 2441            | 997.5                   | --                   | NA     |

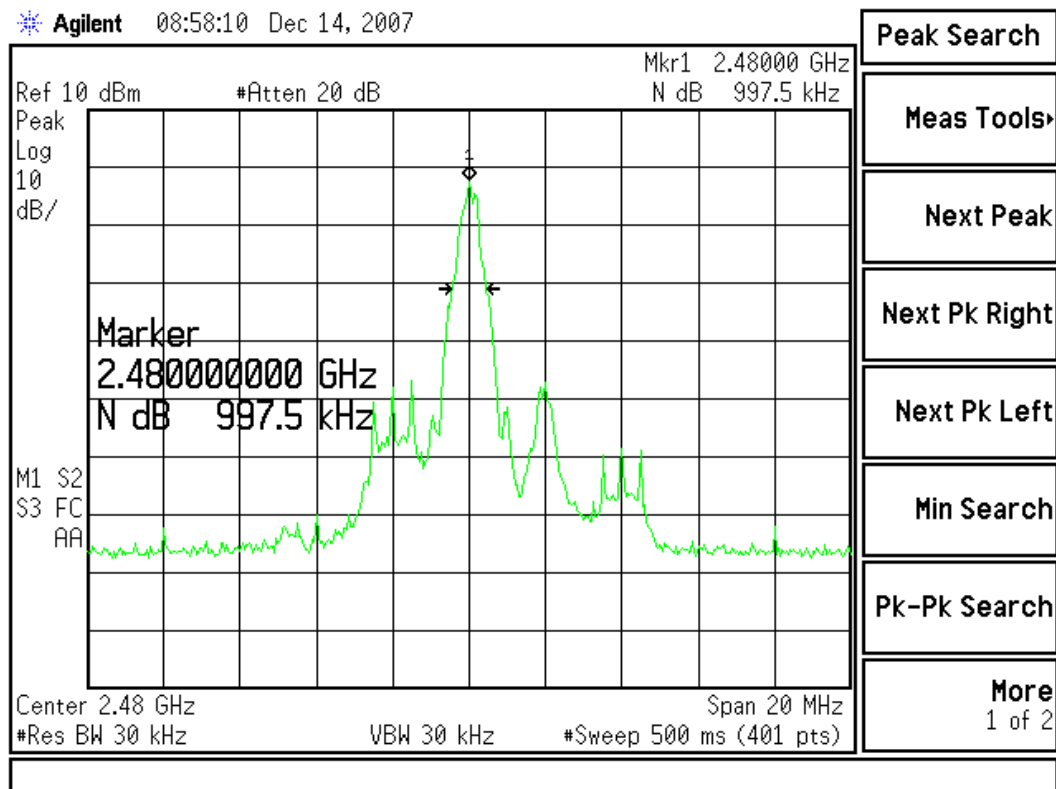
**Figure Channel 39:**



Product : Bluetooth Handfree  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (2480MHz)

| Channel No. | Frequency (MHz) | Measurement Level (kHz) | Required Limit (kHz) | Result |
|-------------|-----------------|-------------------------|----------------------|--------|
| 78          | 2480            | 997.5                   | --                   | NA     |

Figure Channel 78:





## **10. EMI Reduction Method During Compliance Testing**

No modification was made during testing.