# Certificate of Test

August 2006

## TAIWAN SEMICONDUCTOR CO., LTD

Product Type : Bluetooth Module

Model Number : BT-23, BT-234

Test Report Number : 0608074 Rev. 1

Date of Test : August 16, 2006- August 21, 2006

This Product was tested to the following standards at the laboratory of Global EMC Standard Tech. Corp., and found Compliance.

Standards:

FCC Part 15 Subpart C Paragraph 15.247

ANSI C63.4: 2003

http://www.gestek.com.tw

Mille

**Sharon Chang, President** 

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**Date: August 22, 2006** 















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Test Report
Application for
Certification
On Behalf Of

# **TAIWAN SEMICONDUCTOR CO., LTD**

## **EUT:**

**Bluetooth Module** 

**Model Number:** 

BT-23, BT-234

FCC ID: UES2006001 Prepared for:

TAIWAN SEMICONDUCTOR CO., LTD 11F, NO. 205, SEC. 3, BEISHIN RD., SHINDIAN CITY, TAIPEI, TAIWAN 231, R.O.C.

Report By :Global EMC Standard Tech. Corp.
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# TABLE OF CONTENTS

|              | DESCRIPTION  | PAGE                                    |
|--------------|--|---|
| 1.           | CERTIFICATION  | 3                                       |
| 2.           | GENERAL INFORMATION  | 4                                       |
| 2.1          | PRODUCTION DESCRIPTION   | 4                                       |
| 2.2          | OPERATIONAL DESCRIPTION  | 5                                       |
| 2.3          |  | 5                                       |
| 2.4          | SUMMARY OF TEST PROCEDURE AND TEST RESULTS                     |   |
| 2.5<br>2.6   | CONFIGURATION OF THE TESTED SYSTEMTEST FACILITY                |   |
| 2.7          |  |   |
| 2.8          | EUT OPERATING CONDITIONS                                       |   |
| 3.           | CONDUCTION EMISSION DATA                                       | 11                                      |
| 3.1          | TEST EQUIPMENTS  | 11                                      |
| 3.2          |  |   |
| 3.3          | CONDUCTED EMISSION LIMIT                                       |   |
| 3.4<br>3.5   | OPERATING CONDITION OF EUT<br>EUT CONFIGURATION ON MEASUREMENT |   |
| 3.6          |  |   |
| 3.7          | CONDUCTED EMISSIONS MEASUREMENT RESULTS                        |   |
| 4.           | RADIATION EMISSION DATA  |   |
| 4.1          | TEST EQUIPMENT   |   |
| 4.2          |  | 15                                      |
| 4.3          | RADIATED EMISSION LIMIT  |   |
| 4.4          | EUT CONFIGURATION<br>OPERATING CONDITION OF EUT                |   |
| 4.5<br>4.6   |  |   |
| 4.7          |  |   |
| 5.           | PEAK POWER OUTPUT  |   |
| 5.1          | TEST EQUIPMENT   | 22                                      |
| 5.2          | BLOCK DIAGRAM OF TEST SETUP                                    | 22                                      |
| 5.3          |  |   |
| 5.4          |  |   |
| 6.           | BAND EDGE  |   |
| 6.1<br>6.2   | TEST EQUIPMENTBLOCK DIAGRAM OF TEST SETUP                      |   |
| 6.2<br>6.3   |  |   |
| 6.4          |  |   |
| 6.5          | OPERATING CONDITION OF EUT                                     | 26                                      |
| 6.6          |  |   |
| 7.           | OCCUPIED BANDWIDTH   |   |
| 7.1          | TEST EQUIPMENT   | 33                                      |
| 7.2          |  |   |
| 7.3<br>7.4   | LIMIT TEST RESULT  |   |
| 8.           | CHANNEL SEPARATION   |   |
| 8.1          | TEST EQUIPMENT   |   |
| 8.2          |  | 36                                      |
| 8.3          | LIMIT  | • |
| 8.4          | TEST RESULT  | 37                                      |
| 9.           | DWELL TIME   | 39                                      |
| 9.1          | TEST EQUIPMENT   |   |
| 9.2          |  | • |
| 9.3<br>9.4   | LIMIT<br>TEST RESULT   |   |
| 10.          | HOPPING CHANNEL  |   |
|              |  |   |
| 10.1<br>10.2 |  |   |
| 10.2         |  |   |
| 10.4         | 4 TEST RELULT  | 47                                      |
| 11.          | PHOTOGRAPHS FOR TEST   | 48                                      |
| 11.1         |  |   |
| 11.2         |  |   |
| 12.          | PHOTOGRAPHS FOR PRODUCT  |   |
| 13.          | EMI REDUCTION METHOD DURING COMPLIANCE TESTING                 | 60                                      |

## 1. CERTIFICATION

Applicant: TAIWAN SEMICONDUCTOR CO., LTD

Applicant Address : 11F, NO. 205, SEC. 3, BEISHIN RD., SHINDIAN CITY, TAIPEI,

**TAIWAN 231, R.O.C.** 

EUT Description : Bluetooth Module Model Number : BT-23, BT-234

Serial Number : N/A
Brade Name : TSC

FCC ID : UES2006001 Tested Power Supply : 120V/60Hz

Manufacturer : TAIWAN SEMICONDUCTOR CO., LTD

Manufacturer Address : 11F, NO. 205, SEC. 3, BEISHIN RD., SHINDIAN CITY, TAIPEI,

**TAIWAN 231, R.O.C.** 

## **MEASUREMENT PROCEDURES USED:**

☑ CFR 47, Part 15 Radio Frequency Device Subpart C Intentional Radiators :2005

☑ ANSI C63.4 Methods of Measurements of Radio-Noise Emissions from Low- Voltage

Electrical and Electronic Equipment in the range of 9kHz To 40GHz.

2003

THE MEASUREMENT SHOWN IN THE ATTACHMENT WAS MADE IN ACCORDANCE WITH THE PROCEDURES INDICATED, AND THE MAXIMUM ENERGY EMITTED BY THE EQUIPMENT WAS FOUND TO BE WITHIN THE ABOVE LIMITS APPLICABLE.

Sample Received Date : <u>August 16, 2006</u> Final Test Date : <u>August 21, 2006</u>

In order to ensure the quality and accuracy of this document, the contents have been thoroughly reviewed by the following qualified personnel from GesTek Lab.

**Documented By:** 

Rini Chen / adm. Dept. Supervisor

Technical Reviewed By:

Approved By:

Tested Bv :

Shine Chang / eng. Dept. Supervisor

Tonny Lin General Manager

This test data shown below is traceable to National or international standard such as NIST/USA, etc. The laboratory's NVLAP accreditation in no way constitutes or implies product certification, approval, or endorsement by NVLAP or the United States government.

## 2. GENERAL INFORMATION

## 2.1 PRODUCTION DESCRIPTION

Product Name : Bluetooth Module

Model Number : BT-23, BT-234

Serial Number : N/A
Brade Name : TSC

FCC ID : UES2006001

Modulation Type : FHSS
Antenna Gain : 0dBi

Antenna Type : Ceramic

Type of Antenna joint Soldered on PCB

Frequencg Range : 2402MHz to 2480MHz

**Channel Number** 79 Channel **Data Rate** 115200bps

Channel Control Control by Software

Working Voltage : DC +5V

Frequency of Each Channel:

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

#### Note:

- 1. This device is a 2.4GHz RS232 interface Bluetooth module transceiver, and certification modular approval of permissive change(Class II Change).
- 2. This report is transmitter.
- 3. Test of channel was included the lowest, middle and highest frequency in highest data rate and to perform the test, then record on this report.
- 4. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
- 5. The device is a transceiver equipement to accordance with Part 15 regulations. The function receiving was under Declaration of Conformity and record of measurment in test report that the report number is 0608074FCC DOC.
- 6. The EUT has two model numbers, because of the requirement of marketing.

#### 2.2 OPERATIONAL DESCRIPTION

The Transmitter of EUT is RS232 interface Bluetooth Module and powered by host equipment. This device have one ceramic antenna soldered on PCB. The other instruction, please look at user manual.

This device is certified modular approval. It is powered by DC power supply in testing and connected to notebook by RS232 cable. The notebook run "CSR BuleTest" test softwave to control channels of device.

This is FHSS modulation. The equipment enables high-speed access without wires to network assets. This adapter uses the Bluetooth protocol to enable wireless communications between the host computer and other computers, in the same way the computer would use an Ethernet adapter.

## 2.3 TEST MODES & EUT COMPONENTS DESCRIPTION

| EUT: Bluetooth Module, M/N: BT-23, BT-234                         |               |  |  |  |  |
|---|---------------|--|--|--|--|
| The EUT tested with Notebook PC. (DELL, M/N: Latitude D600 PPO5L) |               |  |  |  |  |
|   | Mode 1        |  |  |  |  |
| Test Mode Transmit  |               |  |  |  |  |
| Power Cord  | <b>d</b> 1.0m |  |  |  |  |

## 2.4 SUMMARY OF TEST PROCEDURE AND TEST RESULTS

| Test Item           | Applied Standard Section                              | Test Resut                   |
|---------------------|---|------------------------------|
| Conduction Emission | 15.207, ANSI C63.4 Section 7                          | Pass (refer to section 3.7)  |
| Radistion Emission  | 15.209,15.247(d) ANSI C63.4 Section 8,13<br>& Annex I | Pass (refer to section 4.7)  |
| Peak Power Output   | 15.247(b), ANSI C63.4 Section 13 & Annex              | Pass (refer to section 5.4)  |
| Band Edge           | 15.247(d) , ANSI C63.4 Section 13 & Annex I           | Pass (refer to section 6.6)  |
| Occupied Bandwidth  | 15.247(a) , ANSI C63.4 Section 13 & Annex I           | Pass (refer to section 7.4)  |
| Channel Separation  | 15.247(a) , ANSI C63.4 Section 13 & Annex I           | Pass (refer to section 8.4)  |
| Dwell Time          | 15.247(a) , ANSI C63.4 Section 13 & Annex I           | Pass (refer to section 9.4)  |
| Hopping Channel     | 15.247(b) , ANSI C63.4 Section 13 & Annex I           | Pass (refer to section 10.4) |

## 2.5 CONFIGURATION OF THE TESTED SYSTEM

The FCC IDs/Types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards, which have grants) are:

(including inserted cards, which have grants) are:

| Device                                  | No.                | which have grants) are:  Configuration  |  |  |  |  |
|---|--------------------|---|--|--|--|--|
|   |                    | Manufacturer  | : COMPAQ   |  |  |  |
|   |                    |   | : PE1143-41  |  |  |  |
|   |                    |   | : N/A  |  |  |  |
| 21" COLOR                               | M01-060            |   | : R31708   |  |  |  |
| Monitor                                 | 11101 000          |   | : N/A  |  |  |  |
|   |                    | Data Cable  | : Shielded, detachable, 1.5m, VGA Cable  |  |  |  |
|   |                    |   | : 3Pin, Shielded, Detachable, 1.5m   |  |  |  |
|   |                    |   | : Hewlett Packard  |  |  |  |
|   |                    | Model Number  | : 2225C  |  |  |  |
|   |                    | Serial Number   | : 2548S40842   |  |  |  |
| Printer                                 | P01-018            | BSMI ID   | : 3892A957   |  |  |  |
|   |                    | FCC ID  | : BS46XU2225C  |  |  |  |
|   |                    | Data Cable  | : Shielded, Detachable, 1.2m, Parallel Cable   |  |  |  |
|   |                    | Power Cord  | : Non-Shielded, Detachable, 1.8m   |  |  |  |
|   |                    | Manufacturer  | : TERASYS  |  |  |  |
|   |                    | Model Number  | : F12-UF   |  |  |  |
|   |                    | Serial Number   | : A0100215-34P0030   |  |  |  |
| External USB 2.0                        | 1102.054           | BSMI ID   | : 4912A002   |  |  |  |
| Hard Disk                               | U02-051            |   | : Shielded, detachable, 1.5m   |  |  |  |
|   |                    | AC Power Adaptor  | : YHI M/N:YS-1015-U12A BSMI ID:4872A185  |  |  |  |
|   |                    |   | Input:AC IN:100V 50/60Hz 35VA  |  |  |  |
|   |                    |   | Output: DC +12V ,1.25A   |  |  |  |
|   |                    |   | : TERASYS  |  |  |  |
|   |                    |   | : F12-UF   |  |  |  |
|   | 2.0<br>U02-052     |   | : A0100215-34P0030   |  |  |  |
| External USB 2.0                        |                    |   | : 4912A002   |  |  |  |
| Hard Disk                               |                    |   | : Shielded, detachable, 1.5m   |  |  |  |
|   |                    | AC Power Adaptor  | : YHI M/N:YS-1015-U12A BSMI ID:4872A185  |  |  |  |
|   |                    |   | Input:AC IN:100V 50/60Hz 35VA  |  |  |  |
|   |                    |   | Output: DC +12V ,1.25A   |  |  |  |
|   |                    |   | : TOKYO  |  |  |  |
|   |                    | Model Number  | : SX-M1  |  |  |  |
|   |                    | O and all MI and and  | N1/A   |  |  |  |
| Headset &                               | E01-081            |   | : N/A  |  |  |  |
| Headset &<br>Earphone                   | E01-081            | Data Cable  | : Non-Shielded, Undetachable, 1.8 m  |  |  |  |
|   | E01-081            | Data Cable<br>Power Cord  | : Non-Shielded, Undetachable, 1.8 m<br>: N/A   |  |  |  |
|   | E01-081            | Data Cable<br>Power Cord<br>Purchase Date   | : Non-Shielded, Undetachable, 1.8 m<br>: N/A<br>: 2/22/1999  |  |  |  |
|   | E01-081            | Data Cable Power Cord Purchase Date Manufacturer                                    | : Non-Shielded, Undetachable, 1.8 m<br>: N/A<br>: 2/22/1999<br>: SONY CORPORATION  |  |  |  |
|   | E01-081            | Data Cable Power Cord Purchase Date Manufacturer Model Number                       | : Non-Shielded, Undetachable, 1.8 m<br>: N/A<br>: 2/22/1999<br>: SONY CORPORATION<br>: DCR-TRV230  |  |  |  |
| Earphone                                | E01-081            | Data Cable Power Cord Purchase Date Manufacturer Model Number Serial Number         | : Non-Shielded, Undetachable, 1.8 m<br>: N/A<br>: 2/22/1999<br>: SONY CORPORATION<br>: DCR-TRV230<br>: 380291  |  |  |  |
| Earphone  Digital Video                 |                    | Data Cable Power Cord Purchase Date Manufacturer Model Number Serial Number BSMI ID | : Non-Shielded, Undetachable, 1.8 m<br>: N/A<br>: 2/22/1999<br>: SONY CORPORATION<br>: DCR-TRV230<br>: 380291<br>: N/A   |  |  |  |
| Earphone  Digital Video Camera Recorder | E01-081<br>V01-005 | Data Cable Power Cord Purchase Date Manufacturer Model Number Serial Number BSMI ID | : Non-Shielded, Undetachable, 1.8 m<br>: N/A<br>: 2/22/1999<br>: SONY CORPORATION<br>: DCR-TRV230<br>: 380291<br>: N/A<br>: M/N:AC-L10B, S/N:60308774  |  |  |  |
| Earphone  Digital Video                 |                    | Data Cable Power Cord Purchase Date Manufacturer Model Number Serial Number BSMI ID | : Non-Shielded, Undetachable, 1.8 m<br>: N/A<br>: 2/22/1999<br>: SONY CORPORATION<br>: DCR-TRV230<br>: 380291<br>: N/A<br>: M/N:AC-L10B, S/N:60308774<br>Input:AC IN:100-240V 50/60Hz 23W                        |  |  |  |
| Earphone  Digital Video Camera Recorder |                    | Data Cable Power Cord Purchase Date Manufacturer Model Number Serial Number BSMI ID | : Non-Shielded, Undetachable, 1.8 m<br>: N/A<br>: 2/22/1999<br>: SONY CORPORATION<br>: DCR-TRV230<br>: 380291<br>: N/A<br>: M/N:AC-L10B, S/N:60308774<br>Input:AC IN:100-240V 50/60Hz 23W<br>Output:DC 8.4V/1.5A |  |  |  |

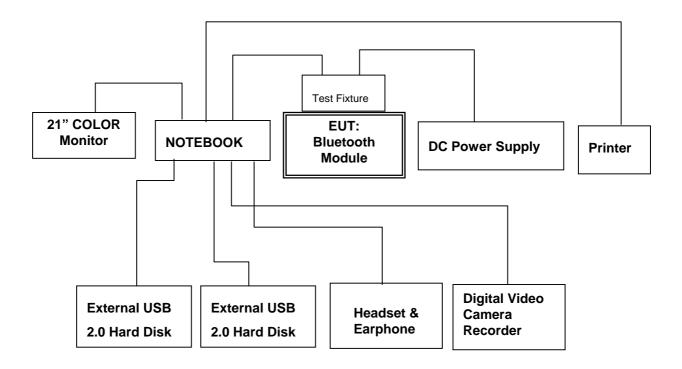
| Device          | No. | Configuration   |   |  |
|-----------------|-----|---|---|--|
| NOTEBOOK        | No. | Model Number BSMI ID Serial Number C.P.U DDR F.D.D H.D.D.  CD-ROM BATTERY MODULE AC ADAPTOR | Configuration  : Latitude D600 PPO5L  : R33002  : 11444680576  : Intel Pentium M 1.4G HZ  : PC2100 256MB  : N/A  : Manufacturer : HITACHI 20.G  M/N: IC25N020ATMR04-0,  S/N:MRG157K1GJP9JH  BSMI ID:D33082  : Manufacturer :DELL  M/N:6T980-A01  : Manufacturer :DELL Li-ion  M/N:6Y270  RATING:14.8V 220mAh  : Manufacturer :DELL  M/N: PA-1650-05D  S/N:CN-05U092-71615-41K-58C3  INPUT:AC 100-240 V~1.5A 50-60HZ |  |
|                 |     | Manufacturer  | Shielded, Undetachable, 2.5m : Agilent  |  |
| DC Power Supply |     | Model Number  | : E3617A  |  |

## 2.6 TEST FACILITY

Ambient conditions in the laboratory:

| ITEMS                       | REQIORED  |  |  |  |
|-----------------------------|---|--|--|--|
| TEMPERATURE (°C)            | 15-35   |  |  |  |
| HUMIDITY (%RH)              | 30-60   |  |  |  |
| BAROMETRIC PRESSURE (mbar)  | 860-1060  |  |  |  |
| FCC SITE DESCRIPTION        | Aug. 10, 1995 /Aug. 25, 1998 File on                    |  |  |  |
|                             | FCC Engineering Laboratory                              |  |  |  |
|                             | Federal Communication Commission                        |  |  |  |
|                             | 7435 Oakland Mills Road                                 |  |  |  |
|                             | Columbia, MD 21046                                      |  |  |  |
|                             | Reference 31040/SIT1300F2                               |  |  |  |
| NVLAP LAB. CODE             | 200085-0  |  |  |  |
|                             | United Stated Department of commerce                    |  |  |  |
|                             | National Institute of Standards and Technology          |  |  |  |
|                             | National Voluntary Laboratory Accreditation Program     |  |  |  |
|                             | Accreditation on NVLAP effective through Sep. 30,2006   |  |  |  |
|                             | For CISPR 22, FCC Method and AS/NZS CISPR 22            |  |  |  |
|                             | Measurement.  |  |  |  |
| Chinese National Laboratory | Recognized by the Council of Chinese National           |  |  |  |
| Accreditation Certificate   | Laboratory Accreditation and confirmed to meet the      |  |  |  |
| R.O.C.                      | requirements of ISO/IEC 17025 also has been             |  |  |  |
|                             | registered for fifteen items, and meet the requirements |  |  |  |
|                             | of the Article 4 of Measures Governing the Recognition  |  |  |  |
|                             | both Approval of Designated Laboratory for              |  |  |  |
|                             | Commodities Inspection and has been registered for      |  |  |  |
|                             | four items within the field of Electrical Testing.      |  |  |  |
|                             | Registration No.: 1082                                  |  |  |  |
|                             | Registration on CNLA effective through April 30, 2006.  |  |  |  |

# 2.7 TEST SETUP BLOCK DIAGRAM OF CONNECTIONS BETWEEN EUT AND SIMULATORS



## 2.8 EUT OPERATING CONDITIONS

The EUT exercise program used during conducted testing was designed to exercise the EUT in a manner similar to a typical use. The exercise sequence is listed as below:

- 1. Setup the EUT and simulators as shown on section 2.7.
- 2. Turn on the power of all equipments.
- 3. Run test softwave and confirm transmit mode of EUT.
- 4. Choose frequency required of standard and start testing.
- 5. Repeat the above steps.

## 3. CONDUCTION EMISSION DATA

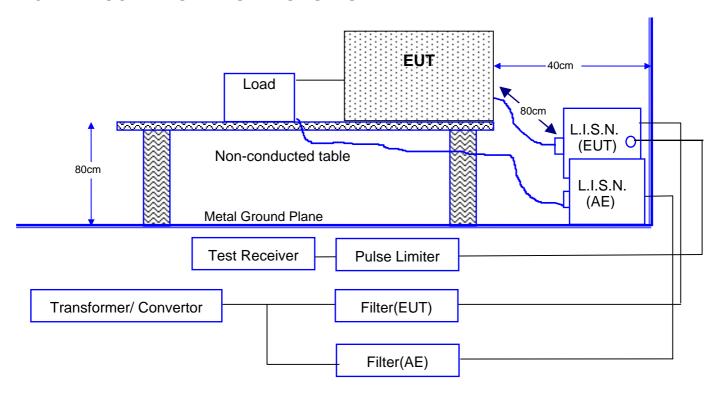
## 3.1 TEST EQUIPMENTS

The following test equipment are used during the conducted power line tests:

| Item | Instrument        | Manufacturer    | Model     | Serial No.    | Last Cal. |
|------|-------------------|-----------------|-----------|---------------|-----------|
| 1    | Test Receiver     | R&S             | ESCS30    | 825022/003    | 06/08/06  |
| 2    | LISN              | ROLF HEINE      | NNB-2/16Z | 99042         | 12/20/05  |
| 3    | Pulse Limiter     | Rohde & Schwarz | ESH3-Z2   | 357.8810.52   | 08/03/06  |
| 4    | RF CABLE          | GesTek          | N/A       | GTK-E-A152-01 | 12/20/05  |
| 5    | 50 Ohm Terminator | GesTek          | N/A       | GTK-E-A124-01 | 10/07/05  |
| 6    | Shielded Room     | GesTek          | N/A       | B5            | N/A       |

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

## 3.2 BLOCK DIAGRAM OF TEST SETUP



Note: This is a reprehensive setup diagram for Table-top EUT.

For Floor-standing EUT, the table will be removed with all others setup condition remain the same.

## 3.3 CONDUCTED EMISSION LIMIT

**⋉FCC 15.207** 

| Frequency    | Maximum RF Line Voltage dB(μV) |          |  |  |  |
|--------------|--------------------------------|----------|--|--|--|
| MHz          | QUASI-PEAK                     | AVERAGE  |  |  |  |
| 0.15 to 0.50 | 66 to 56                       | 56 to 46 |  |  |  |
| 0.50 to 5.0  | 56                             | 46       |  |  |  |
| 5.0 to 30    | 60                             | 50       |  |  |  |

Remarks: In the Above Table, the tighter limit applies at the band edges.

## 3.4 OPERATING CONDITION OF EUT

Same as section 2.7.

#### 3.5 EUT CONFIGURATION ON MEASUREMENT

The equipments that are listed 3.1 are installed on Conducted Power Line Test to meet the Commission requirement and operating in a manner, which tends to maximize its emission characteristics in a normal application.

The device under test, installed in a representative system as described in section 3.2, was placed on a non-conductive table whose total height equal to 80cm. Powered from one L.I.S.N. which signal output to receiver, and the other peripherals was powered from another L.I.S.N. which signal output was terminated by  $50\Omega$ .

## 3.6 CONDUCTED EMISSION DATA

The measurement range of conducted emission, which is from <u>0.15 MHz to 30 MHz</u>, was investigated. All readings are quasi-peak and average values with a resolution Bandwidth of 9 KHz. The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range for all the test modes. Then the worst modes were reported the following data pages.

#### **CONDUCTED EMISSIONS MEASUREMENT RESULTS** 3.7

| Date of Test | Augsut 21, 2006   | Temperature | 24   |
|--------------|-------------------|-------------|------|
| EUT          | Bluetooth Module  | Humidity    | 53 % |
| Test Mode    | TX Mode (Hopping) |             |      |

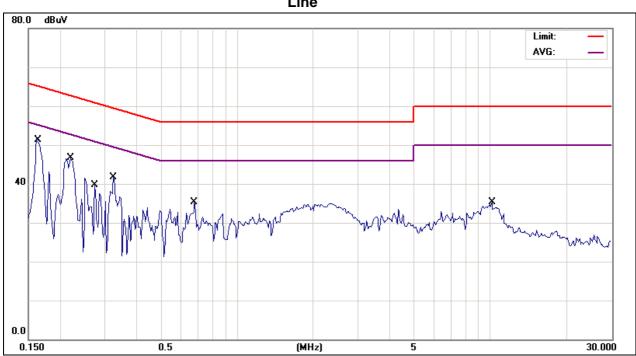
## Line

| No. | Frequency | Reading Level | Factor | Measurement | Limit | Over Limit | Detector |
|-----|-----------|---------------|--------|-------------|-------|------------|----------|
|     | MHz       | dΒμV          | dB     | dΒμV        | dΒμV  | dB         | 20100101 |
| 1   | 0.1644    | 37.10         | 10.02  | 47.12       | 65.24 | -18.12     | QP       |
| 2   | 0.1644    | 23.53         | 10.02  | 33.55       | 55.24 | -21.69     | AVG      |
| 3   | 0.2194    | 34.52         | 10.03  | 44.55       | 62.84 | -18.29     | QP       |
| 4   | 0.2194    | 20.25         | 10.03  | 30.28       | 52.84 | -22.56     | AVG      |
| 5   | 0.2722    | 24.62         | 10.03  | 34.65       | 61.05 | -26.40     | QP       |
| 6   | 0.2722    | 24.62         | 10.03  | 34.65       | 61.05 | -26.40     | QP       |
| 7   | 0.2722    | 9.48          | 10.03  | 19.51       | 51.05 | -31.54     | AVG      |
| 8   | 0.3261    | 27.54         | 10.04  | 37.58       | 59.55 | -21.97     | QP       |
| 9   | 0.3261    | 22.41         | 10.04  | 32.45       | 49.55 | -17.10     | AVG      |
| 10  | 0.6846    | 18.14         | 10.02  | 28.16       | 56.00 | -27.84     | QP       |
| 11  | 0.6846    | 13.89         | 10.02  | 23.91       | 46.00 | -22.09     | AVG      |
| 12  | 10.1793   | 12.74         | 10.22  | 22.96       | 50.00 | -27.04     | AVG      |

#### Remarks:

- 1 All readings are Quasi-peak and Average values.
- 2 " means that this data is the worse case emission level.

## Line



| Date of Test | August 21, 2006   | Temperature | 24   |
|--------------|-------------------|-------------|------|
| EUT          | Bluetooth Module  | Humidity    | 53 % |
| Test Mode    | TX Mode (Hopping) |             |      |

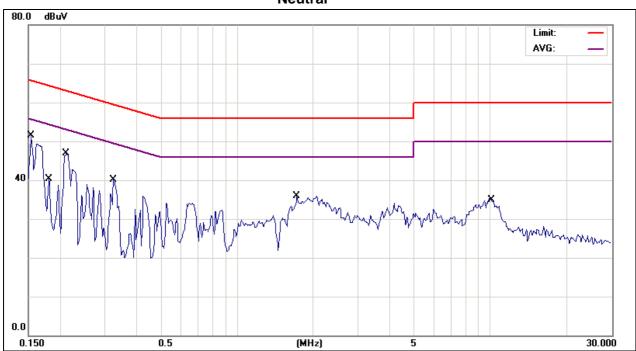
#### Neutral

| No.  | Frequency | Reading Level | Factor | Measurement | Limit | Over Limit | Detector |
|------|-----------|---------------|--------|-------------|-------|------------|----------|
| 140. | MHz       | dΒμV          | dB     | dΒμV        | dΒμV  | dB         | Detector |
| 1    | 0.1546    | 36.88         | 10.07  | 46.95       | 65.75 | -18.80     | QP       |
| 2    | 0.1546    | 17.28         | 10.07  | 27.35       | 55.75 | -28.40     | AVG      |
| 3    | 0.1782    | 29.58         | 10.04  | 39.62       | 64.57 | -24.95     | QP       |
| 4    | 0.1782    | 12.14         | 10.04  | 22.18       | 54.57 | -32.39     | AVG      |
| 5    | 0.2113    | 35.28         | 10.03  | 45.31       | 63.15 | -17.84     | QP       |
| 6    | 0.2113    | 22.41         | 10.03  | 32.44       | 53.15 | -20.71     | AVG      |
| 7    | 0.3271    | 28.98         | 10.04  | 39.02       | 59.52 | -20.50     | QP       |
| 8    | 0.3271    | 23.68         | 10.04  | 33.72       | 49.52 | -15.80     | AVG      |
| 9    | 1.7320    | 19.66         | 9.96   | 29.62       | 56.00 | -26.38     | QP       |
| 10   | 1.7320    | 8.94          | 9.96   | 18.90       | 46.00 | -27.10     | AVG      |
| 11   | 10.2150   | 18.72         | 10.33  | 29.05       | 60.00 | -30.95     | QP       |
| 12   | 10.2150   | 12.68         | 10.33  | 23.01       | 50.00 | -26.99     | AVG      |

#### Remarks:

- 1 All readings are Quasi-peak and Average values.
- 2 " means that this data is the worse case emission level.

## **Neutral**



## 4. RADIATION EMISSION DATA

## 4.1 TEST EQUIPMENT

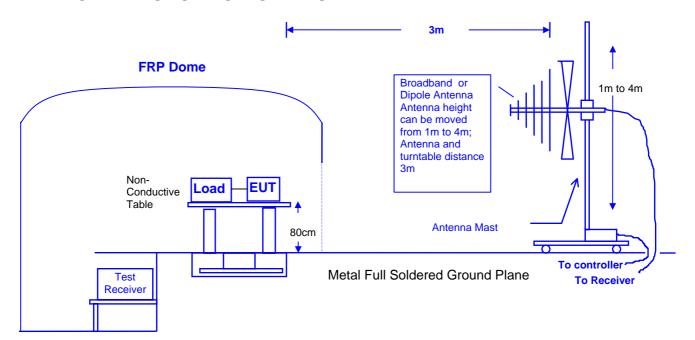
The following test equipments are used during the radiated emission tests:

Radiated test was performed on: ☐Site #1 ☐Site #2 ☐Site #3 ☐Site #4

| Item | Instrument            | Manufacturer    | Model     | Serial No.    | Last Cal. |
|------|-----------------------|-----------------|-----------|---------------|-----------|
| 1    | Test Receiver         | R&S             | ESCS30    | 825022/003    | 06/08/06  |
| 2    | Spectrum Analyzer     | R&S             | FSP40     | 100061        | 04/03/06  |
| 3    | Spectrum Analyzer     | HP              | E4407B    | 39240339      | 07/26/06  |
| 4    | Power Meter           | Rohde & Schwarz | NRVS      | 100666        | 04/07/06  |
| 5    | Peak Power Sensor     | Rohde & Schwarz | NRV-Z32   | 8360191058    | 04/07/06  |
| 6    | Pre-Amplifier         | HP              | 8449B     | 3008A01263    | 04/06/06  |
| 7    | BILOG ANTENNA         | SCHAFFNER       | CBL6112B  | 2620          | 11/26/05  |
| 8    | Horn Antenna          | Electro-Metrics | EM-6961   | 103318        | 01/26/06  |
| 9    | Horn Antenna          | Schwarzbeck     | BBHA 9120 | D243          | 12/21/05  |
| 10   | RF Cable              | GesTek          | N/A       | GTK-E-A151-01 | 02/06/06  |
| 11   | Open Site             | GesTek          | N/A       | A1            | 11/25/05  |
| 12   | Test Program Software | GesTek          | N/A       | GTK-E-S001-01 | N/A       |

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

## 4.2 OPEN TEST SITE SETUP DIAGRAM



## 4.3 RADIATED EMISSION LIMIT

#### **⋉FCC Class C Limit at 3m**

| Frequency  | Distance | Field S | trength |
|------------|----------|---------|---------|
| MHz        | Meter    | μV/M    | dBμV/M  |
| 30 to 88   | 3        | 100     | 40.0    |
| 88 to 216  | 3        | 150     | 43.5    |
| 216 to 960 | 3        | 200     | 46.0    |
| Above 960  | 3        | 500     | 54.0    |

Note: The frequencies above 1000MHz, as measured using instrumentation with a peak detector function was corresponding to 20dB above the maximum permitted average limit.

#### 4.4 EUT CONFIGURATION

The equipment which is listed 4.1 are installed on Radiated Emission Test to meet the Commission requirement and operating in a manner which tends to maximize its emission characteristics in a normal application.

The device under test, installed in a representative system as described in section 4.2, was placed on a non-conductive table whose total height equaled 80 cm. This table can be rotated 360 degree. The measurement antenna was mounted to a non-conductive mast capable of moving the antenna vertically. Antenna height was varied from 1 meter to 4 meters and the system under test was rotated from 0 degree through 360 degrees relative to the antenna position and polarization (Horizontal and Vertical). Also the I/O cable position was investigated to find the maximum emission condition.

## 4.5 OPERATING CONDITION OF EUT

Same as section 2.7.

#### 4.6 RADIATED EMISSION DATA

The measurement range of radiated emission, which is from 30 MHz to 10th Harminics, was investigated. All readings below 1GHz are quasi-peak values with a resolution bandwidth of 120 KHz. Above 1GHz are peak and avg. values with a resolution bandwidth of 1MHz. The initial step in collecting radiated emission data is a spectrum analyzer peak scans of the measurement range for all the test modes and then use test receiver for final measurement. Then the worst modes were reported the following data pages.

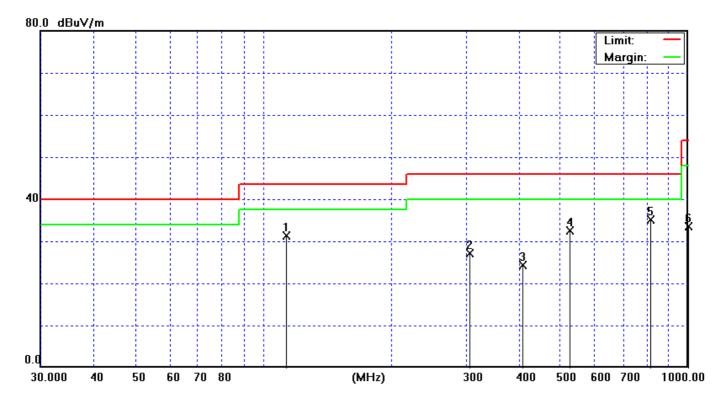
## 4.7 RADIATED EMISSIONS MEASUREMENT RESULTS

| Date of Test     | August 16, 2006         | Temperature     | 26 deg/C   |
|------------------|-------------------------|-----------------|------------|
| EUT              | Bluetooth Module        | Humidity        | 55 %RH     |
| Working Cond.    | TX Mode (Hopping)       |                 |            |
| Antenna distance | 3m at <b>Horizontal</b> | Frequency Range | 30-1000MHz |

| Na  | Frequency | Reading Level | Factor | Measurement | Limit  | Over Limit | Detector |
|-----|-----------|---------------|--------|-------------|--------|------------|----------|
| No. | MHz       | dBuV          | dB     | dBuV/m      | dBuV/m | dB         | Detector |
| 1   | 113.0100  | 43.80         | -12.56 | 31.24       | 43.50  | -12.26     | QP       |
| 2   | 305.4800  | 34.80         | -7.73  | 27.07       | 46.00  | -18.93     | QP       |
| 3   | 405.6800  | 30.40         | -6.16  | 24.24       | 46.00  | -21.76     | QP       |
| 4   | 527.1300  | 36.14         | -3.64  | 32.50       | 46.00  | -13.50     | QP       |
| 5   | 810.8100  | 34.59         | 0.43   | 35.02       | 46.00  | -10.98     | QP       |
| 6   | 999.8400  | 29.71         | 3.80   | 33.51       | 54.00  | -20.49     | QP       |

## Remarks:

- 1. All Readings below 1GHz are Quasi-Peak.
- 2. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
- 3. Over Limit (Margin Value)=Measurement level-Limit value.
- 4. The " "means this data is worst-case Measurement level.

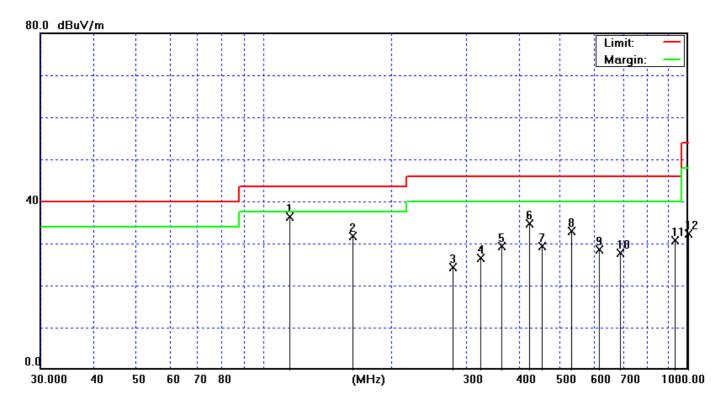


| Date of Test     | August 16, 2006   | Temperature     | 26 deg/C   |
|------------------|-------------------|-----------------|------------|
| EUT              | Bluetooth Module  | Humidity        | 55 %RH     |
| Working Cond.    | TX Mode (Hopping) |                 |            |
| Antenna distance | 3m at Vertical    | Frequency Range | 30-1000MHz |

| Na  | Frequency | Reading Level | Factor | Measurement | Limit  | Over Limit | Dotootor |
|-----|-----------|---------------|--------|-------------|--------|------------|----------|
| No. | MHz       | dBuV          | dB     | dBuV/m      | dBuV/m | dB         | Detector |
| 1   | 115.0000  | 48.70         | -12.35 | 36.35       | 43.50  | -7.15      | QP       |
| 2   | 162.0750  | 45.60         | -13.97 | 31.63       | 43.50  | -11.87     | QP       |
| 3   | 278.5400  | 33.20         | -8.87  | 24.33       | 46.00  | -21.67     | QP       |
| 4   | 325.0000  | 33.90         | -7.43  | 26.47       | 46.00  | -19.53     | QP       |
| 5   | 361.8880  | 36.25         | -6.87  | 29.38       | 46.00  | -16.62     | QP       |
| 6   | 423.4380  | 40.39         | -5.78  | 34.61       | 46.00  | -11.39     | QP       |
| 7   | 453.7100  | 34.40         | -5.13  | 29.27       | 46.00  | -16.73     | QP       |
| 8   | 527.3900  | 36.60         | -3.64  | 32.96       | 46.00  | -13.04     | QP       |
| 9   | 615.3900  | 30.60         | -2.16  | 28.44       | 46.00  | -17.56     | QP       |
| 10  | 687.2475  | 29.10         | -1.43  | 27.67       | 46.00  | -18.33     | QP       |
| 11  | 931.1600  | 28.00         | 2.72   | 30.72       | 46.00  | -15.28     | QP       |
| 12  | 999.9700  | 28.60         | 3.80   | 32.40       | 54.00  | -21.60     | QP       |

#### Remarks:

- 1. All Readings below 1GHz are Quasi-Peak.
- 2. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
- 3. Over Limit (Margin Value)=Measurement level-Limit value.
- 4. The " "means this data is worst-case Measurement level.



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| Date of Test     | August 16, 2006   | Temperature     | 25.6 deg/C |
|------------------|-------------------|-----------------|------------|
| EUT              | Bluetooth Module  | Humidity        | 63 %RH     |
| Working Cond.    | TX Mode (2402MHz) |                 |            |
| Antenna distance | 3m                | Frequency Range | Above 1GHz |

#### **Horizontal**

| No. | Frequency<br>MHz | Reading Level dBuV | Factor<br>dB | Measurement<br>dBuV/m | Limit<br>dBuV/m | Over Limit<br>dB | Detector |
|-----|------------------|--------------------|--------------|-----------------------|-----------------|------------------|----------|
| 1   | 4804.0300        | 44.10              | 1.46         | 45.56                 | 74.00           | -28.44           | peak     |
| 2   | 7206.0300        | 42.96              | 9.04         | < 52.00               | 74.00           | -22.00           | peak     |
| 3   | 9608.0300        | 43.26              | 6.55         | < 49.81               | 74.00           | -24.19           | peak     |

## **Vertical**

| No. | Frequency<br>MHz | Reading Level dBuV | Factor<br>dB | Measurement<br>dBuV/m | Limit<br>dBuV/m | Over Limit<br>dB | Detector |
|-----|------------------|--------------------|--------------|-----------------------|-----------------|------------------|----------|
| 1   | 4804.0300        | 43.19              | 1.45         | 44.64                 | 74.00           | -29.36           | peak     |
| 2   | 7206.0300        | 42.88              | 8.73         | 51.61                 | 74.00           | -22.39           | peak     |
| 3   | 9608.0300        | 44.68              | 10.17        | < 54.85               | 74.00           | -19.15           | peak     |
| 4   | 9608.0300        | 31.55              | 10.17        | < 41.72               | 54.00           | -12.28           | AVG      |

#### Remark

- 1. All Readings above 1GHz are peak or average detector.
- Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
   Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ, Span=20MHz.
- 4. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
- 5. Factor= Antenna Factor + Cable Loss Amplifier Factor
- 6. Over Limit (Margin Value)=Measurement level-Limit value.
- 7. The " " means this data is worst-case Measurement level.
- 8. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.

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| Date of Test     | August 16, 2006   | Temperature     | 25.6 deg/C |
|------------------|-------------------|-----------------|------------|
| EUT              | Bluetooth Module  | Humidity        | 63 %RH     |
| Working Cond.    | TX Mode (2441MHz) |                 |            |
| Antenna distance | 3m                | Frequency Range | Above 1GHz |

#### **Horizontal**

| No. | Frequency<br>MHz | Reading Level<br>dBuV | Factor<br>dB | Measurement<br>dBuV/m | Limit<br>dBuV/m | Over Limit<br>dB | Detector |
|-----|------------------|-----------------------|--------------|-----------------------|-----------------|------------------|----------|
| 1   | 4882.0300        | 44.03                 | 1.41         | 45.44                 | 74.00           | -28.56           | peak     |
| 2   | 7323.0300        | 42.86                 | 9.24         | < 52.10               | 74.00           | -21.90           | peak     |
| 3   | 9764.0300        | 43.77                 | 6.86         | < 50.63               | 74.00           | -23.37           | peak     |

#### **Vertical**

| No. | Frequency<br>MHz | Reading Level<br>dBuV | Factor<br>dB | Measurement<br>dBuV/m | Limit<br>dBuV/m | Over Limit<br>dB | Detector |
|-----|------------------|-----------------------|--------------|-----------------------|-----------------|------------------|----------|
| 1   | 4882.0300        | 44.30                 | 2.06         | 46.36                 | 74.00           | -27.64           | peak     |
| 2   | 7323.0300        | 42.98                 | 8.56         | < 51.54               | 74.00           | -22.46           | peak     |
| 3   | 9764.0300        | 42.95                 | 9.80         | < 52.75               | 74.00           | -21.25           | peak     |

#### Remark

- 1. All Readings above 1GHz are peak or average detector.
- Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ, Span=20MHz.
- 4. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
- 5. Factor= Antenna Factor + Cable Loss Amplifier Factor
- 6. Over Limit (Margin Value)=Measurement level-Limit value.
- 7. The " "means this data is worst-case Measurement level.
- 8. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.

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| Date of Test     | August 16, 2006   | Temperature     | 25.6 deg/C |
|------------------|-------------------|-----------------|------------|
| EUT              | Bluetooth Module  | Humidity        | 63 %RH     |
| Working Cond.    | TX Mode (2480MHz) |                 |            |
| Antenna distance | 3m                | Frequency Range | Above 1GHz |

#### **Horizontal**

| No. | Frequency<br>MHz | Reading Level dBuV | Factor<br>dB | Measurement<br>dBuV/m | Limit<br>dBuV/m | Over Limit<br>dB | Detector |
|-----|------------------|--------------------|--------------|-----------------------|-----------------|------------------|----------|
| 1   | 4960.2500        | 44.52              | 1.34         | 45.86                 | 74.00           | -28.14           | peak     |
| 2   | 7440.2500        | 42.38              | 8.78         | < 51.16               | 74.00           | -22.84           | peak     |
| 3   | 9920.2500        | 43.97              | 4.61         | < 48.58               | 74.00           | -25.42           | peak     |

## **Vertical**

| No. | Frequency<br>MHz | Reading Level<br>dBuV | Factor<br>dB | Measurement<br>dBuV/m | Limit<br>dBuV/m | Over Limit<br>dB | Detector |
|-----|------------------|-----------------------|--------------|-----------------------|-----------------|------------------|----------|
| 1   | 4959.7800        | 44.35                 | 2.64         | 46.99                 | 74.00           | -27.01           | peak     |
| 2   | 7439.7800        | 43.70                 | 8.36         | 52.06                 | 74.00           | -21.94           | peak     |
| 3   | 9919.7800        | 44.55                 | 9.78         | < 54.33               | 74.00           | -19.67           | peak     |
| 4   | 9919.7800        | 32.46                 | 9.78         | < 42.24               | 54.00           | -11.76           | AVG      |

#### Remark

- 1. All Readings above 1GHz are peak or average detector.
- Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ, Span=100MHz.
   Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ, Span=20MHz.
- 4. Emission Level= Reading + Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
- 5. Factor= Antenna Factor + Cable Loss Amplifier Factor
- 6. Over Limit (Margin Value)=Measurement level-Limit value.
- 7. The " " means this data is worst-case Measurement level.
- 8. The average measurement was not performed when the peak measured data under the limit of average detection. If the average value is measured, peak measurement should also be supplied.

## 5. PEAK POWER OUTPUT

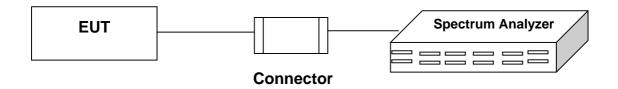
## 5.1 TEST EQUIPMENT

The following test equipments are used during the Conduct tests:

| Item | Instrument        | Manufacturer    | Model  | Serial No. | Last Cal. |
|------|-------------------|-----------------|--------|------------|-----------|
| 1    | Spectrum Analyzer | Rohde & Schwarz | FSP40  | 100061     | 04/03/06  |
| 2    | Spectrum Analyzer | HP              | E4407B | 39240339   | 07/26/06  |

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

## 5.2 BLOCK DIAGRAM OF TEST SETUP



## 5.3 PEAK POWER OUTPUT LIMIT

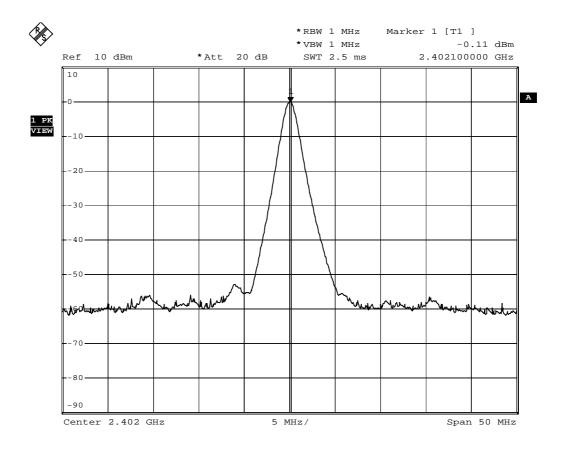
The maximum peak power shall be less 1 Watt.

## 5.4 TEST RESULT

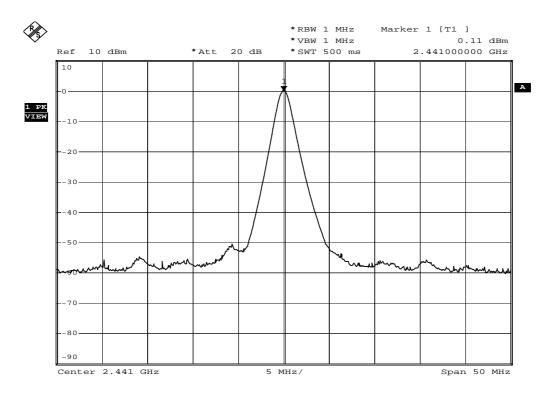
| Date of Test | August 17, 2006  | Temperature | 26 deg/C |
|--------------|------------------|-------------|----------|
| EUT          | Bluetooth Module | Humidity    | 40 %RH   |
| Test Mode    | TX Mode          | Data Rate   | DH5      |

| Channel No. | Frequency<br>(MHz) | Measurement<br>(dBm) | Required Limit | Result |
|-------------|--------------------|----------------------|----------------|--------|
| 0           | 2402               | 0.39                 | 1W(30dBm)      | Pass   |
| 39          | 2441               | 0.61                 | 1W(30dBm)      | Pass   |
| 78          | 2480               | 1.11                 | 1W(30dBm)      | Pass   |

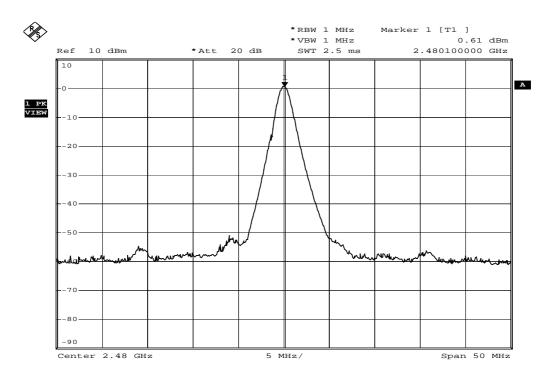
Cable Loss = 0.5dB



Date: 17.AUG.2006 14:04:53



Date: 17.AUG.2006 16:49:39



Date: 17.AUG.2006 14:02:38

## 6. BAND EDGE

## 6.1 TEST EQUIPMENT

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

Radiated test was performed on: 

Site #1 

Site #2 

Site #3 

Site #4

| Item | Instrument        | Manufacturer    | Model     | Serial No.    | Last Cal. |
|------|-------------------|-----------------|-----------|---------------|-----------|
| 1    | Test Receiver     | Rohde & Schwarz | ESVS30    | 829007/014    | 01/19/06  |
| 2    | Spectrum Analyzer | Rohde & Schwarz | FSP40     | 100061        | 04/03/06  |
| 3    | Spectrum Analyzer | HP              | E4407B    | 39240339      | 07/26/06  |
| 4    | Power Meter       | Rohde & Schwarz | NRVS      | 100666        | 04/07/06  |
| 5    | Peak Power Sensor | Rohde & Schwarz | NRV-Z32   | 8360191058    | 04/07/06  |
| 6    | Pre-Amplifier     | HP              | 8449B     | 3008A01263    | 04/06/06  |
| 7    | BILOG ANTENNA     | SCHAFFNER       | CBL6112B  | 2620          | 11/26/05  |
| 8    | Horn Antenna      | Electro-Metrics | EM-6961   | 103318        | 01/26/06  |
| 9    | Horn Antenna      | Schwarzbeck     | BBHA 9120 | D243          | 12/21/05  |
| 10   | RF Cable          | GesTek          | N/A       | GTK-E-A151-01 | 02/26/06  |
| 11   | Open Site         | GesTek          | N/A       | A1            | 11/25/05  |

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

#### 6.2 BLOCK DIAGRAM OF TEST SETUP

#### **RF Radiated Measurement:**

Refer to Section 4.2

#### **RF Couductive Measurement:**

Refer to Section 5.2

#### 6.3 BAND EDGE LIMIT

In any 100KHz 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 100KHz 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)).

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## 6.4 EUT CONFIGURATION

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 interface cables must be manipulated according to ANSI C63.4:2000 on radiated measurement.

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

#### 6.5 OPERATING CONDITION OF EUT

Same as section 2.7.

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#### 6.6 **TEST RELULT**

| Date of Test     | Augsut 17, 2006  | Temperature | 25 deg/C |
|------------------|------------------|-------------|----------|
| EUT              | Bluetooth Module | Humidity    | 40 %RH   |
| Working Cond.    | TX Mode          |             |          |
| Antenna distance | 3m at Horizontal | Test Band   | Lower    |

## **Radiation Emission of Fundamental**

## **Peak**

| Frequency | Reading Level | <b>Correction Factor</b> | <b>Emission Level</b> |
|-----------|---------------|--------------------------|-----------------------|
| [MHz]     | [dB(uV)]      | [dB/m]                   | [dB(uV/m)]            |
| 2401.98   | 60.46         | 31.49                    | 91.95                 |

## Average

| Frequency<br>[MHz] | Reading Level<br>[dB(uV)] | Correction Factor [dB/m] | Emission Level [dB(uV/m)] |
|--------------------|---------------------------|--------------------------|---------------------------|
| 2402.01            | 59.81                     | 31.49                    | 91.30                     |

#### Remark:

- All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
- Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ
- Emission Level= Reading + Correction Factor (Could have ±0.01 tolerance due to computer automatically round off calculation).
- Correction Factor = Antenna Factor + Cable Loss Amplifier Factor

#### **TEST Result**

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (62.48)dB delta between carry power and maximum emission in restrict band 2376.01 MHz. The plot for average is appear (63.02)dB delta between carry power and maximum emission in restrict band (2376.01)MHz. The above tables are list of fundamental emission test result.

Therefore, peak field strength of  $\underline{2376.01}$  MHz is  $\underline{91.95}$  dBuV/m  $-\underline{62.48}$  dB =  $\underline{29.47}$  dBuV/m which is under 74dBuV/m.

Average field strength of 2376.01 MHz is 91.30 dBuV/m - 63.02 dB = 28.28 dBuV/m which is under 54dBuV/m

| Date of Test     | August 17, 2006  | Temperature | 25 deg/C |
|------------------|------------------|-------------|----------|
| EUT              | Bluetooth Module | Humidity    | 40 %RH   |
| Working Cond.    | TX Mode          |             |          |
| Antenna distance | 3m at Vertical   | Test Band   | Lower    |

## **Radiation Emission of Fundamental**

#### **Peak**

| Frequency | •        | Correction Factor | Emission Level |
|-----------|----------|-------------------|----------------|
| [MHz]     | [dB(uV)] | [dB/m]            | [dB(uV/m)]     |
| 2401.98   | 57.33    | 24.6              | 81.93          |

## **Average**

| Frequency<br>[MHz] | Reading Level<br>[dB(uV)] | Correction Factor [dB/m] | Emission Level [dB(uV/m)] |
|--------------------|---------------------------|--------------------------|---------------------------|
| 2402               | 56.54                     | 24.6                     | 81.14                     |

#### Remark:

- 1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.

- Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ.

  Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ

  Emission Level= Reading + Correction Factor (Could have ±0.01 tolerance due to computer automatically round off calculation)
- 5. Correction Factor = Antenna Factor + Cable Loss Amplifier Factor

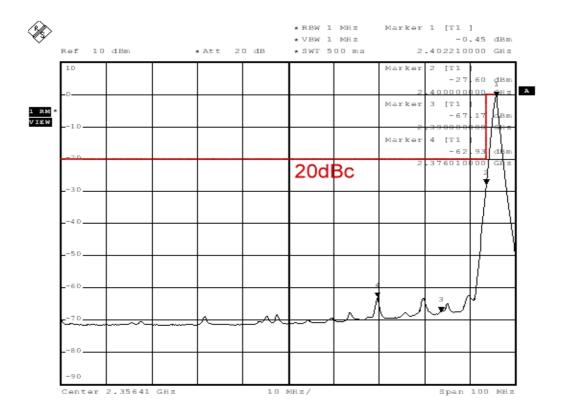
## **TEST Result**

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (62.48)dB delta between carry power and maximum emission in restrict band 2376.01 MHz. The plot for average is appear (63.02)dB delta between carry power and maximum emission in restrict band (2376.01)MHz.

The above tables are list of fundamental emission test result.

Therefore, peak field strength of  $\underline{2376.01}$  MHz is  $\underline{81.93}$  dBuV/m –  $\underline{62.48}$  dB =  $\underline{19.45}$  dBuV/m which is under 74dBuV/m.

Average field strength of 2376.01 MHz is 81.14 dBuV/m - 63.02 dB = 18.12 dBuV/m which is under 54dBuV/m



Date: 18.AUG.2006 15:28:52



Date: 18.AUG.2006 15:31:35

| GESTEK Lab   | Report #: 0608074 ID Rev . 1            |
|--|---|
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| Date of Test     | August 17, 2006  | Temperature | 25 deg/C |
|------------------|------------------|-------------|----------|
| EUT              | Bluetooth Module | Humidity    | 40 %RH   |
| Working Cond.    | TX Mode          |             |          |
| Antenna distance | 3m at Horizontal | Test Band   | Higher   |

## **Radiation Emission of Fundamental**

## **Peak**

| Frequency | Reading Level | <b>Correction Factor</b> | <b>Emission Level</b> |
|-----------|---------------|--------------------------|-----------------------|
| [MHz]     | [dB(uV)]      | [dB/m]                   | [dB(uV/m)]            |
| 2480.03   | 57.70         | 31.32                    | 89.02                 |

## **Average**

| Frequency<br>[MHz] | Reading Level<br>[dB(uV)] | Correction Factor [dB/m] | Emission Level [dB(uV/m)] |
|--------------------|---------------------------|--------------------------|---------------------------|
| 2480.01            | 56.63                     | 31.32                    | 87.95                     |

#### Remark:

- 1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
- Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ
- Emission Level= Reading + Correction Factor (Could have ±0.01 tolerance due to computer automatically round off calculation)
- 5. Correction Factor= Antenna Factor + Cable Loss Amplifier Factor

## **TEST Result**

The band edge emission plot on next page are Peak and Average. The polt for peak is appear (42.62)dB delta between carry power and maximum emission in restrict band 2483.5 MHz. The plot for average is appear (42.43)dB delta between carry power and maximum emission in restrict band (2483.5)MHz.

The above tables are list of fundamental emission test result.

Therefore, peak field strength of  $\underline{2483.5}$  MHz is  $\underline{89.02}$  dBuV/m  $-\underline{42.62}$  dB =  $\underline{46.4}$  dBuV/m which is under 74dBuV/m.

Average field strength of  $\underline{2483.5}$  MHz is  $\underline{87.95}$  dBuV/m  $-\underline{42.43}$  dB =  $\underline{45.52}$  dBuV/m which is under 54dBuV/m

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| Date of Test     | August 17, 2006  | Temperature | 25 deg/C |
|------------------|------------------|-------------|----------|
| EUT              | Bluetooth Module | Humidity    | 40 %RH   |
| Working Cond.    | TX Mode          |             |          |
| Antenna distance | 3m at Vertical   | Test Band   | Higher   |

## **Radiation Emission of Fundamental**

## **Peak**

| Frequency<br>[MHz] | Reading Level<br>[dB(uV)] | Correction Factor [dB/m] | Emission Level [dB(uV/m)] |
|--------------------|---------------------------|--------------------------|---------------------------|
| 2480.03            | 56.20                     | 23.33                    | 79.53                     |

## **Average**

| Frequency<br>[MHz] | Reading Level<br>[dB(uV)] | Correction Factor [dB/m] | Emission Level [dB(uV/m)] |
|--------------------|---------------------------|--------------------------|---------------------------|
| 2480.030           | 55.38                     | 23.33                    | 78.68                     |

#### Remark:

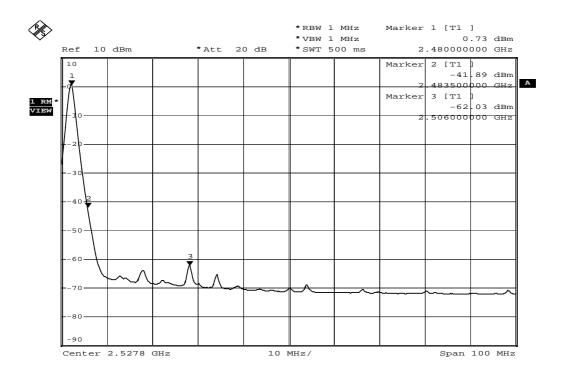
- 1. All Readings below 1GHz are Quasi-Peak and above 1GHz are peak or average.
- Spectrum Analizyer Setting(Peak Detector): RBW=1MHz, VBW=1MHZ. Spectrum Analizyer Setting(AVG Detector): RBW=1MHz, VBW=10HZ
- Emission Level= Reading + Correction Factor (Could have ±0.01 tolerance due to computer automatically round off calculation)
- 5. Correction Factor= Antenna Factor + Cable Loss Amplifier Factor

## **TEST Result**

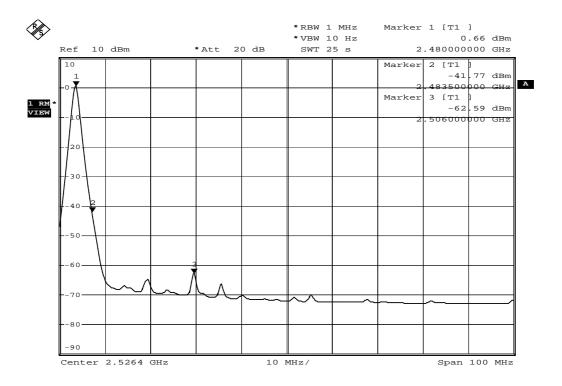
The band edge emission plot on next page are Peak and Average. The polt for peak is appear (42.62)dB delta between carry power and maximum emission in restrict band 2483.5 MHz. The plot for average is appear (42.43)dB delta between carry power and maximum emission in restrict band (2483.5)MHz. The above tables are list of fundamental emission test result.

Therefore, peak field strength of  $\underline{2483.5}$  MHz is  $\underline{79.53}$  dBuV/m -  $\underline{42.62}$  dB =  $\underline{36.91}$  dBuV/m which is under 74dBuV/m.

Average field strength of 2483.5 MHz is 78.68 dBuV/m – 42.43 dB = 36.25 dBuV/m which is under 54dBuV/m



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Date: 18.AUG.2006 15:37:47

## 7. OCCUPIED BANDWIDTH

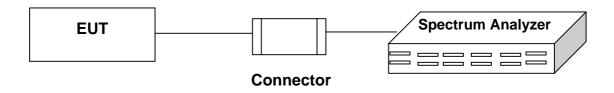
## 7.1 TEST EQUIPMENT

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

| Item | Instrument        | Manufacturer    | Model  | Serial No. | Last Cal. |
|------|-------------------|-----------------|--------|------------|-----------|
| 1    | Spectrum Analyzer | Rohde & Schwarz | FSP40  | 100061     | 04/03/06  |
| 2    | Spectrum Analyzer | HP              | E4407B | 39240339   | 07/26/06  |

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

## 7.2 BLOCK DIAGRAM OF TEST SETUP



#### **7.3 LIMIT**

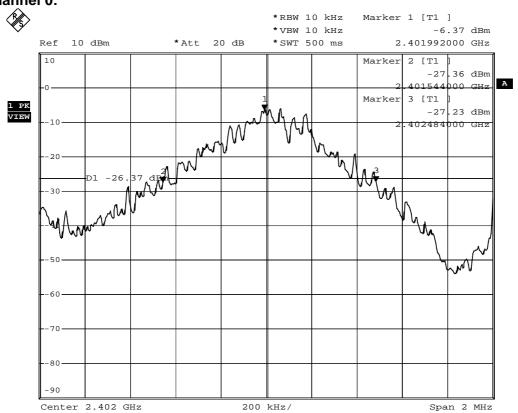
The maximum 20 dB bandwidth shall be muasurement.

## 7.4 TEST RESULT

| Date of Test  | August 17, 2006  | Temperature | 25 deg/C |
|---------------|------------------|-------------|----------|
| EUT           | Bluetooth Module | Humidity    | 40 %RH   |
| Working Cond. | TX Mode          |             |          |

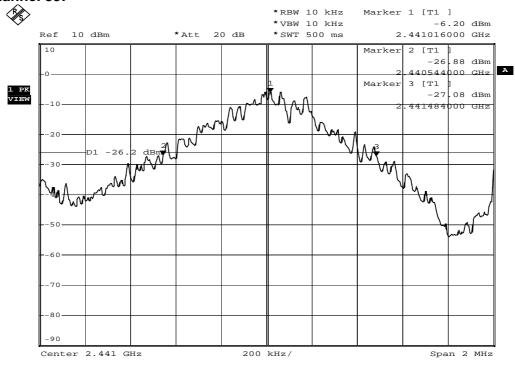
| Channel No. | Frequency | 20dB Bandwidth |
|-------------|-----------|----------------|
|             | (MHz)     | (MHz)          |
| 0           | 2402      | 0.94           |
| 39          | 2441      | 0.94           |
| 78          | 2480      | 0.944          |

## Figure Channel 0:



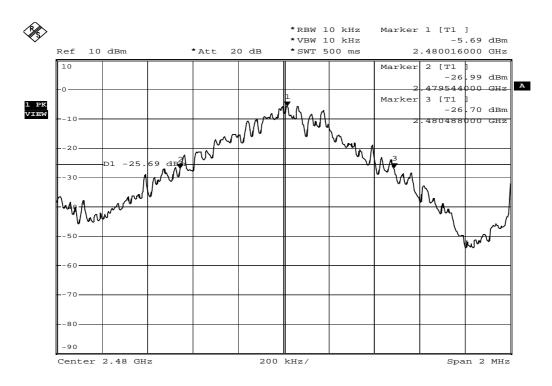
Date: 17.AUG.2006 15:23:42

## Figure Channel 39:



Date: 17.AUG.2006 15:19:07

## Figure Channel 78:



Date: 17.AUG.2006 15:14:13

#### 8. CHANNEL SEPARATION

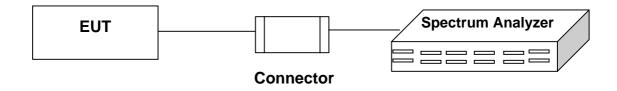
#### 8.1 TEST EQUIPMENT

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

| Item | Instrument        | Manufacturer    | Model  | Serial No. | Last Cal. |
|------|-------------------|-----------------|--------|------------|-----------|
| 1    | Spectrum Analyzer | Rohde & Schwarz | FSP40  | 100061     | 04/03/06  |
| 2    | Spectrum Analyzer | HP              | E4407B | 39240339   | 07/26/06  |

Note: All measurement critical items of test instrumentation were within their calibration period of 1 year.

#### 8.2 BLOCK DIAGRAM OF TEST SETUP



#### **8.3 LIMIT**

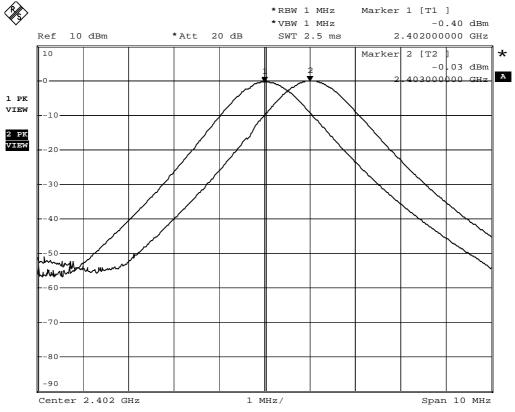
Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 20dB bandwidth of hopping channel, whichever is grester.

# 8.4 TEST RESULT

| Date of Test  | August 17, 2006  | Temperature | 25 deg/C |
|---------------|------------------|-------------|----------|
| EUT           | Bluetooth Module | Humidity    | 40 %RH   |
| Working Cond. | TX Mode          |             |          |

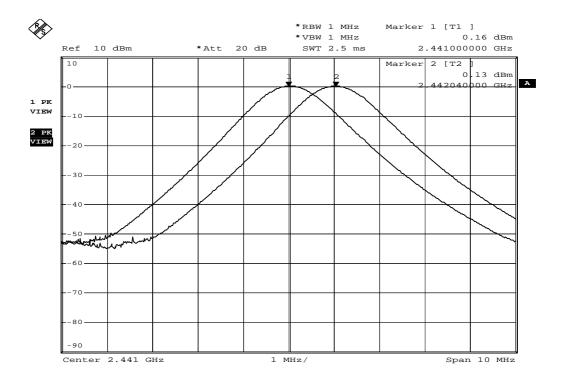
| Test Channel No. | Channel Separated (kHz) | Limit<br>(kHz) | Limit of 20dB<br>Bandwidth<br>(kHz) | Result |
|------------------|-------------------------|----------------|-------------------------------------|--------|
| 0                | 1000                    | > 25           | > 940                               | Pass   |
| 39               | 1040                    | > 25           | > 940                               | Pass   |
| 78               | 980                     | > 25           | > 944                               | Pass   |

# Figure Channel 0:



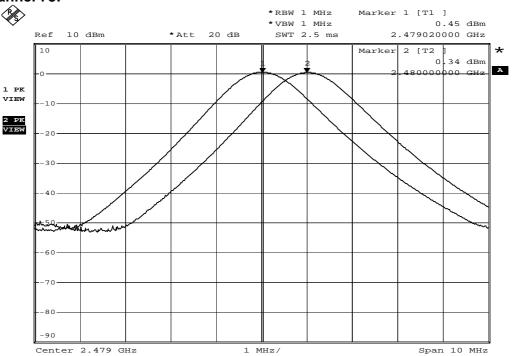
Date: 17.AUG.2006 13:58:15

#### Figure Channel 39:



Date: 17.AUG.2006 13:51:43

# Figure Channel 78:



Date: 17.AUG.2006 16:55:35

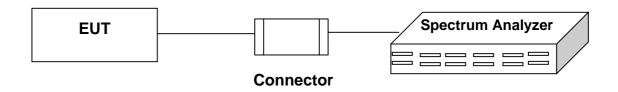
### 9. DWELL TIME

### 9.1 TEST EQUIPMENT

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

| Item | Instrument        | Manufacturer    | Model  | Serial No. | Last Cal. |
|------|-------------------|-----------------|--------|------------|-----------|
| 1    | Spectrum Analyzer | Rohde & Schwarz | FSP40  | 100061     | 04/03/06  |
| 2    | Spectrum Analyzer | HP              | E4407B | 39240339   | 07/26/06  |

#### 9.2 BLOCK DIAGRAM OF TEST SETUP



#### **9.3 LIMIT**

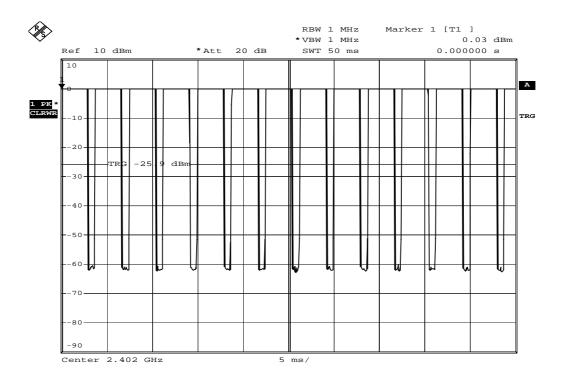
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by number of hopping channels employed.

# 9.4 TEST RESULT

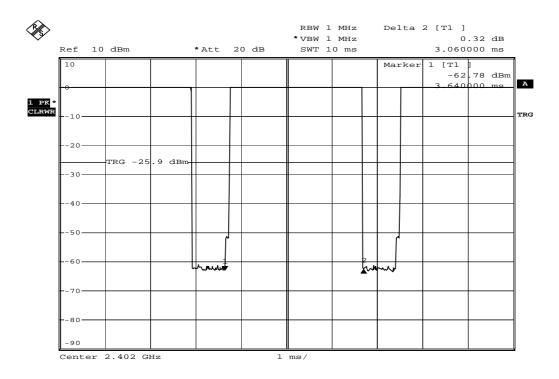
| Date of Test  | August 17, 2006  | Temperature | 25 deg/C |
|---------------|------------------|-------------|----------|
| EUT           | Bluetooth Module | Humidity    | 40 %RH   |
| Working Cond. | TX Mode(2402MHz) |             |          |

| Measurement Level (sec)                      | Required Limit (sec) | Result |
|--|----------------------|--------|
| Period = 0.4 (sec) * 79 (number of channel)  |                      |        |
| = 31.6 (sec)                                 |                      |        |
| Hop rate = 14 / 50 (ms) = 280 / sec          |                      |        |
| Time slot length = 3.06 (ms) = 0.00306 (sec) | < 0.4                | Pass   |
| Dwell Time = 0.00306 * ( 280 / 79) * 31.6    |                      |        |
| = 0.343 (sec)                                |                      |        |

Note: Dwell time = time slot length \* hop rate / number of hopping channels \* period



Date: 17.AUG.2006 15:38:41

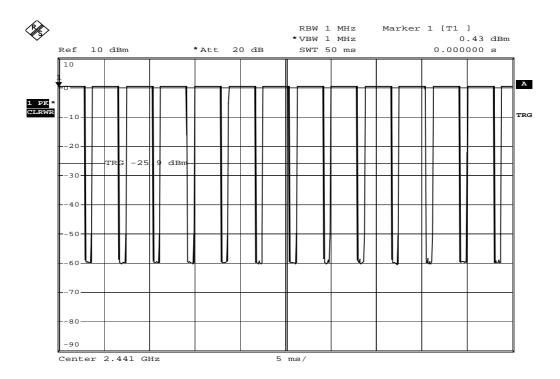


Date: 17.AUG.2006 15:44:06

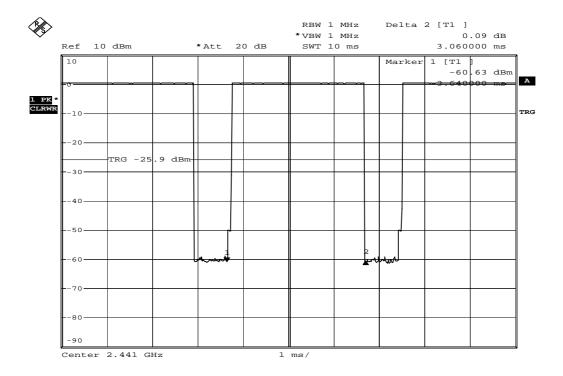
| Date of Test  | August 17, 2006       | Temperature | 25 deg/C |
|---------------|-----------------------|-------------|----------|
| EUT           | Bluetooth Module      | Humidity    | 40 %RH   |
| Working Cond. | TX Mode (2441MHz)-DH5 |             |          |

| Measurement Level (sec)                      | Required Limit (sec) | Result |
|--|----------------------|--------|
| Period = 0.4 (sec) * 79 (number of channel)  |                      |        |
| = 31.6 (sec)                                 |                      |        |
| Hop rate = 14 / 50 (ms) = 280 / sec          |                      |        |
| Time slot length = 3.06 (ms) = 0.00306 (sec) | < 0.4                | Pass   |
| Dwell Time = 0.00306 * ( 280 / 79) * 31.6    |                      |        |
| = 0.343 (sec)                                |                      |        |

Note: Dwell time = time slot length \* hop rate / number of hopping channels \* period



Date: 17.AUG.2006 15:46:56

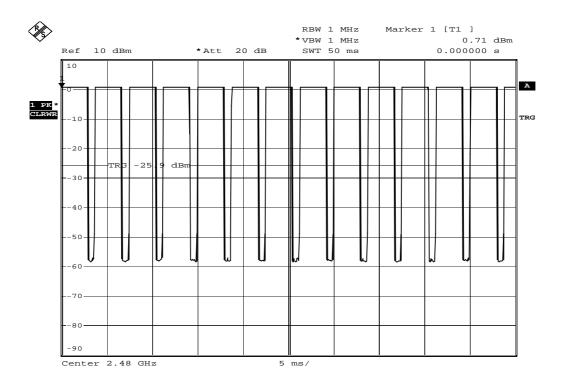


Date: 17.AUG.2006 15:45:23

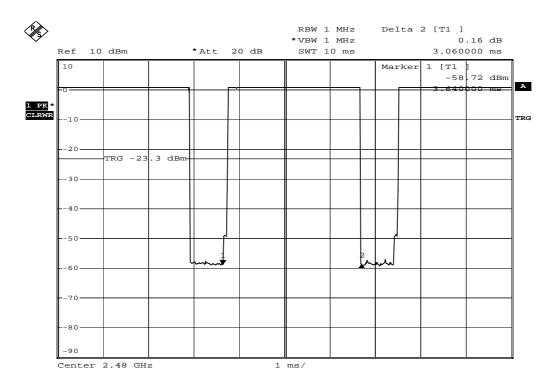
| Date of Test  | August 17, 2006       | Temperature | 25 deg/C |
|---------------|-----------------------|-------------|----------|
| EUT           | Bluetooth Module      | Humidity    | 40 %RH   |
| Working Cond. | TX Mode (2480MHz)-DH5 |             |          |

| Measurement Level (sec)                      | Required Limit (sec) | Result |
|--|----------------------|--------|
| Period = 0.4 (sec) * 79 (number of channel)  |                      |        |
| = 31.6 (sec)                                 |                      |        |
| Hop rate = 14 / 50 (ms) = 280 / sec          |                      |        |
| Time slot length = 3.06 (ms) = 0.00306 (sec) | < 0.4                | Pass   |
| Dwell Time = 0.00306 * ( 280 / 79) * 31.6    |                      |        |
| = 0.343 (sec)                                |                      |        |

Note: Dwell time = time slot length \* hop rate / number of hopping channels \* period



Date: 17.AUG.2006 15:47:44



Date: 17.AUG.2006 15:49:03

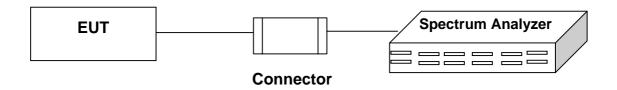
### 10. HOPPING CHANNEL

#### **10.1 TEST EQUIPMENT**

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

| Item | Instrument        | Manufacturer    | Model  | Serial No. | Last Cal. |
|------|-------------------|-----------------|--------|------------|-----------|
| 1    | Spectrum Analyzer | Rohde & Schwarz | FSP40  | 100061     | 04/03/06  |
| 2    | Spectrum Analyzer | HP              | E4407B | 39240339   | 07/26/06  |

#### 10.2 BLOCK DIAGRAM OF TEST SETUP



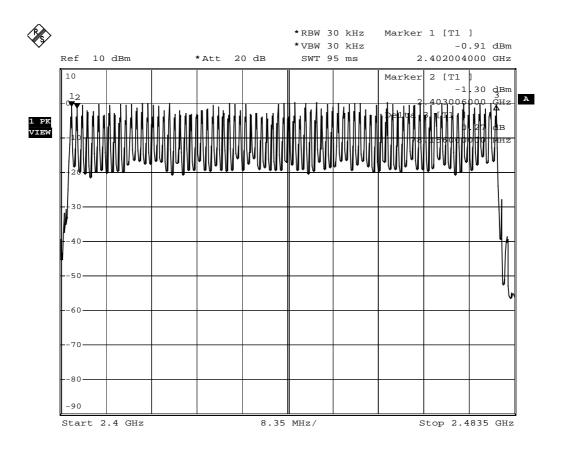
#### **10.3 LIMIT**

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

# **10.4 TEST RELULT**

| Date of Test  | August 17, 2006   | Temperature | 26 deg/C |
|---------------|-------------------|-------------|----------|
| EUT           | Bluetooth Module  | Humidity    | 52 %RH   |
| Working Cond. | TX Mode (Hopping) |             |          |

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



Date: 17.AUG.2006 12:06:57

# 11. PHOTOGRAPHS FOR TEST

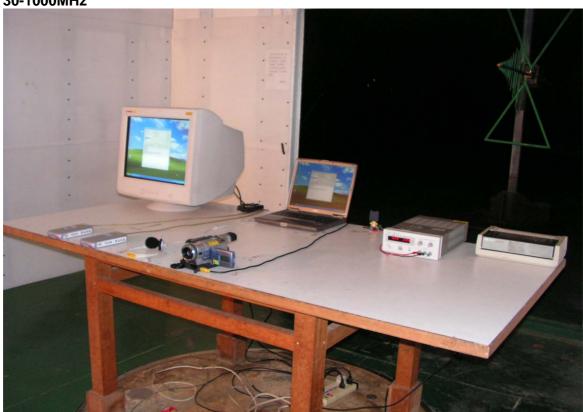
# 11.1 TEST PHOTOGRAPHS FOR CONDUCTION

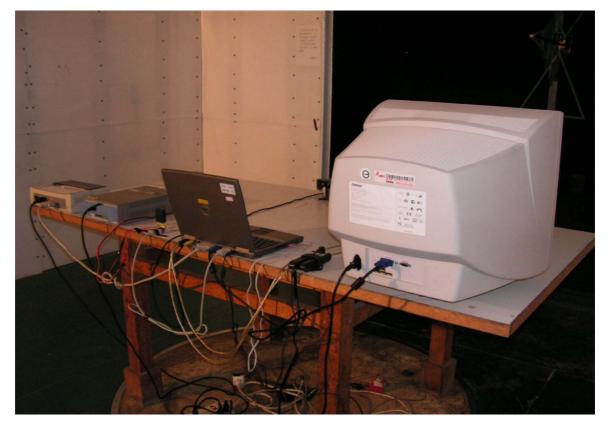




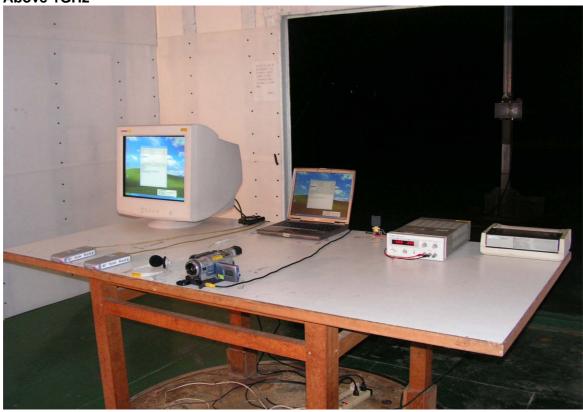
# 11.2 TEST PHOTOGRAPHS FOR RADIATION

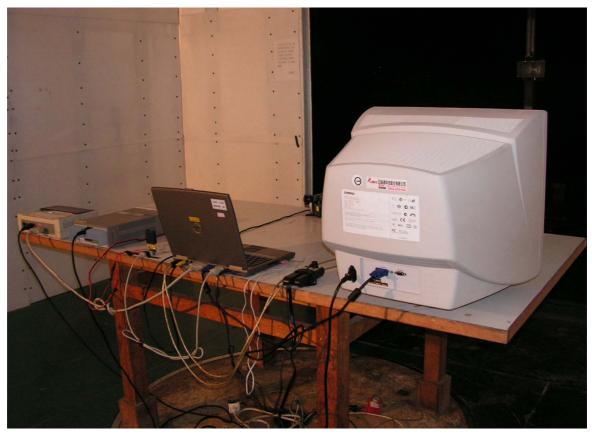
#### 30-1000MHz





**Above 1GHz** 





#### PHOTOGRAPHS FOR PRODUCT **12.**





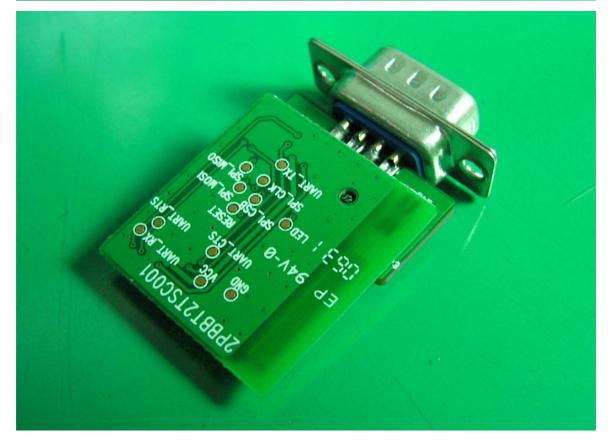
3. Inner



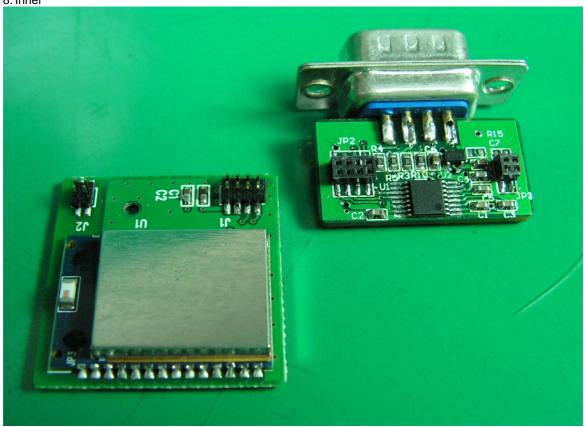


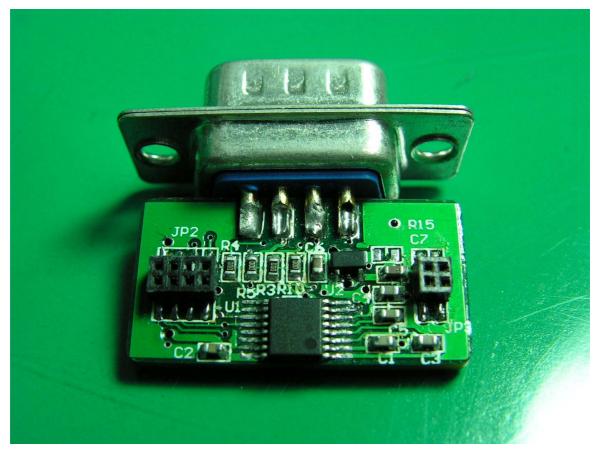
5. Inner



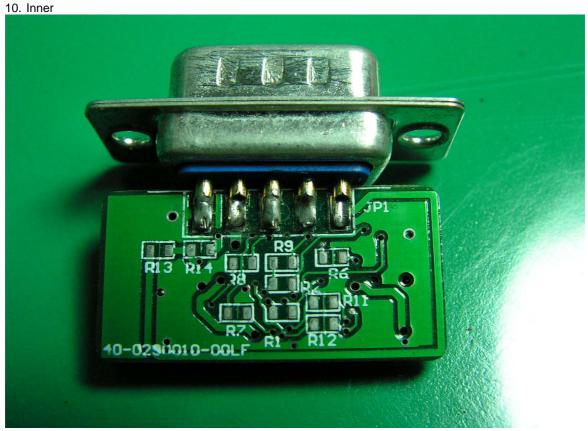


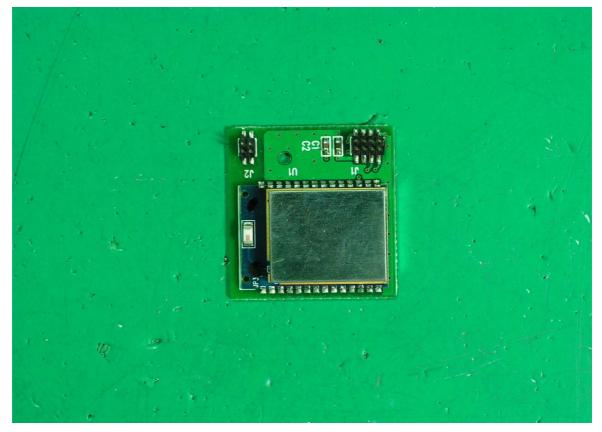
7. Inner 8. Inner



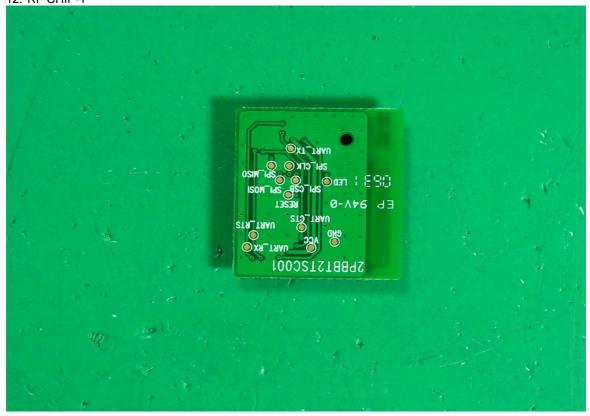


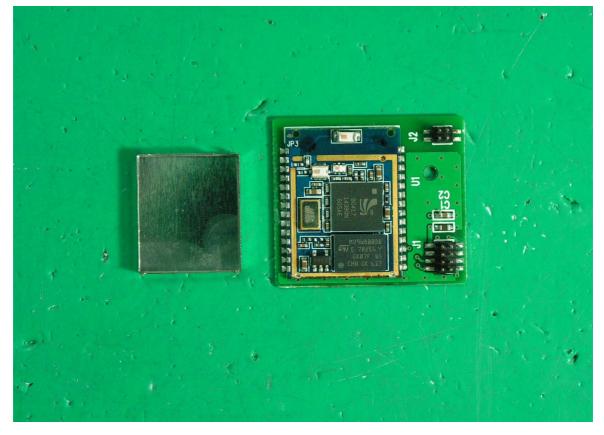
9. Inner



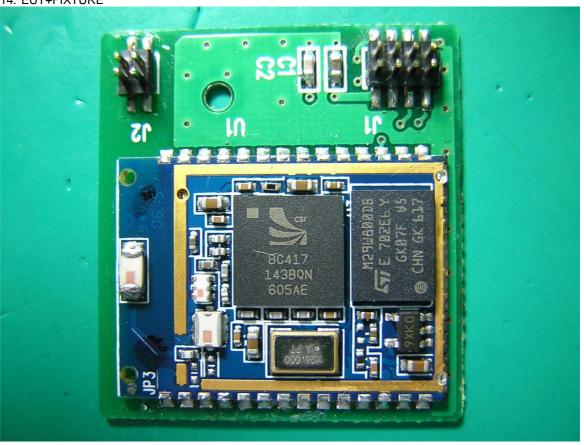


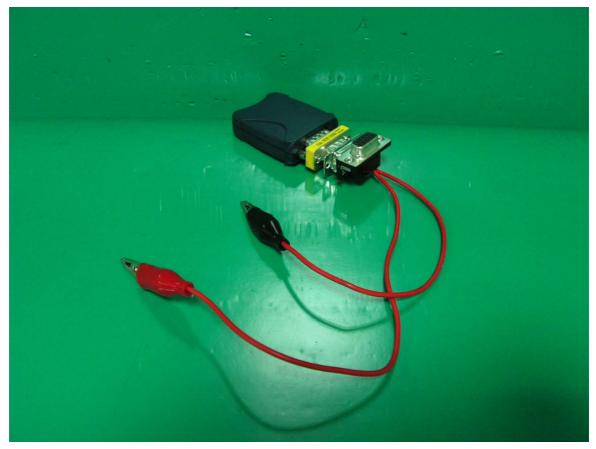
11. Inner12. RF CHIP-1





13. RF CHIP-2 14. EUT+FIXTURE



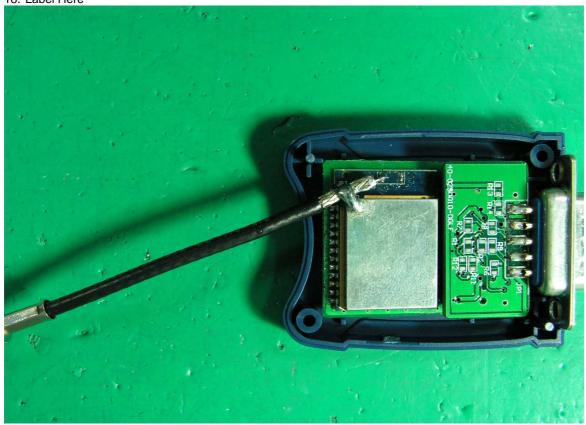


15. FIXTURE 16. FIXTURE





- 17. Coductive Measurement Position
- 18. Label Here





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# 13. EMI REDUCTION METHOD DURING COMPLIANCE TESTING

No modification was made during testing.

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# Appendix A Circuit (Block) Diagram

(Shall be added by Applicant)

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# Appendix B User Manual

(Shall be added by Applicant)