



A D T

# FCC TEST REPORT (BLUETOOTH/DTS)

**REPORT NO.:** RF140313E05C-2

**MODEL NO.:** QCNFA34AC

**FCC ID:** PPD-QCNFA34AC

**RECEIVED:** Aug. 07, 2014

**TESTED:** Aug. 18 to 27, 2014

**ISSUED:** Sep. 12, 2014

**APPLICANT:** Qualcomm Atheros, Inc.

**ADDRESS:** 1700 Technology Drive, San Jose, CA 95110

**ISSUED BY:** Bureau Veritas Consumer Products Services (H.K.)  
Ltd., Taoyuan Branch Hsin Chu Laboratory

**LAB ADDRESS:** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen,  
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan,  
R.O.C.

**TEST LOCATION (1):** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen,  
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan,  
Taiwan, R.O.C.

**TEST LOCATION (2):** No.49, Ln. 206, Wende Rd., Shangshan Tsuen,  
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan,  
Taiwan, R.O.C.

This report should not be used by the client to claim  
product certification, approval, or endorsement by  
TAF or any government agencies.



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification



## TABLE OF CONTENTS

|   |    |
|---|----|
| RELEASE CONTROL RECORD .....  | 4  |
| 1 CERTIFICATION .....   | 5  |
| 2 SUMMARY OF TEST RESULTS .....                                     | 6  |
| 2.1 MEASUREMENT UNCERTAINTY .....                                   | 7  |
| 3 GENERAL INFORMATION .....   | 8  |
| 3.1 GENERAL DESCRIPTION OF EUT (BLUETOOTH/DTS).....                 | 8  |
| 3.2 DESCRIPTION OF ANTENNA.....                                     | 10 |
| 3.3 DESCRIPTION OF TEST MODES .....                                 | 11 |
| 3.4 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL: .....        | 12 |
| 3.5 DUTY CYCLE OF TEST SIGNAL .....                                 | 16 |
| 3.6 GENERAL DESCRIPTION OF APPLIED STANDARDS .....                  | 17 |
| 3.7 DESCRIPTION OF SUPPORT UNITS .....                              | 18 |
| 3.8 CONFIGURATION OF SYSTEM UNDER TEST .....                        | 18 |
| 4 TEST PROCEDURES AND RESULTS (BT-EDR) .....                        | 19 |
| 4.1 MAXIMUM PEAK OUTPUT POWER.....                                  | 19 |
| 4.1.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT .....         | 19 |
| 4.1.2 INSTRUMENTS .....   | 19 |
| 4.1.3 TEST PROCEDURES.....  | 19 |
| 4.1.4 DEVIATION FROM TEST STANDARD .....                            | 19 |
| 4.1.5 TEST SETUP .....  | 20 |
| 4.1.6 EUT OPERATING CONDITION .....                                 | 20 |
| 4.1.7 TEST RESULTS .....  | 21 |
| 4.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT .....                | 23 |
| 4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT .....    | 23 |
| 4.2.2 TEST INSTRUMENTS .....  | 24 |
| 4.2.3 TEST PROCEDURES.....  | 26 |
| 4.2.4 DEVIATION FROM TEST STANDARD .....                            | 26 |
| 4.2.5 TEST SETUP .....  | 27 |
| 4.2.6 EUT OPERATING CONDITIONS.....                                 | 28 |
| 4.2.7 TEST RESULTS .....  | 29 |
| 5 TEST TYPES AND RESULTS (BT-LE) .....                              | 36 |
| 5.1 CONDUCTED OUTPUT POWER MEASUREMENT .....                        | 36 |
| 5.1.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT .....              | 36 |
| 5.1.2 INSTRUMENTS .....   | 36 |
| 5.1.3 TEST PROCEDURES.....  | 36 |
| 5.1.4 DEVIATION FROM TEST STANDARD .....                            | 36 |
| 5.1.5 TEST SETUP .....  | 37 |
| 5.1.6 EUT OPERATING CONDITIONS.....                                 | 37 |
| 5.1.7 TEST RESULTS .....  | 38 |
| 5.2 UNWANTED EMISSION MEASUREMENT (RADIATED VERSUS CONDUCTED) ..... | 39 |
| 5.2.1 LIMITS OF UNWANTED EMISSION MEASUREMENT .....                 | 39 |
| 5.2.2 TEST INSTRUMENTS .....  | 40 |
| 5.2.3 TEST PROCEDURES.....  | 42 |



A D T

|       |   |    |
|-------|---|----|
| 5.2.4 | DEVIATION FROM TEST STANDARD .....  | 42 |
| 5.2.5 | TEST SETUP .....  | 43 |
| 5.2.6 | EUT OPERATING CONDITIONS.....   | 44 |
| 5.2.7 | TEST RESULTS .....  | 45 |
| 6     | PHOTOGRAPHS OF THE TEST CONFIGURATION .....   | 50 |
| 7     | INFORMATION ON THE TESTING LABORATORIES .....   | 51 |
| 8     | APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB..... | 52 |



A D T

## RELEASE CONTROL RECORD

| ISSUE NO.      | REASON FOR CHANGE | DATE ISSUED   |
|----------------|-------------------|---------------|
| RF140313E05C-2 | Original release  | Sep. 12, 2014 |



A D T

## 1 CERTIFICATION

**PRODUCT :** 802.11 a/b/g/n/ac+ BT 4.1 M.2 Type Card  
**BRAND NAME :** Qualcomm Atheros  
**MODEL NO. :** QCNFA34AC  
**TEST SAMPLE :** R&D SAMPLE  
**APPLICANT :** Qualcomm Atheros, Inc.  
**TESTED DATE :** Aug. 18 to 27, 2014  
**STANDARDS :** **FCC Part 15, Subpart C (Section 15.247)**  
ANSI C63.10-2009

The above equipment (Model: QCNFA34AC) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**PREPARED BY :**  , **DATE:** Sep. 12, 2014  
( Lori Chung, Specialist )

**APPROVED BY :**  , **DATE:** Sep. 12, 2014  
( May Chen, Manager )



## 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

### For BT-EDR mode:

| APPLIED STANDARD: FCC Part 15, Subpart C |  |        |   |
|--|--|--------|---|
| STANDARD SECTION                         | TEST TYPE AND LIMIT                        | RESULT | REMARK  |
| 15.247(b)                                | Maximum Peak Output Power                  | PASS   | Meet the requirement of limit.  |
| 15.247(d)                                | Radiated Emissions & Band Edge Measurement | PASS   | Meet the requirement of limit. Minimum passing margin is -5.5dB at 906.64MHz. |
| 15.203                                   | Antenna Requirement                        | PASS   | Antenna connector is IPEX not a standard connector.                           |

NOTE: Frequency Hopping System operating in 2400-2483.5MHz band and the output power less than 125mW. The hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of the 20dB bandwidth of hopping channel whichever is greater.

### For BT-LE mode:

| APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247) |  |        |  |
|---|--|--------|--|
| STANDARD SECTION  | TEST TYPE AND LIMIT                        | RESULT | REMARK   |
| 15.247(d)<br>15.209                                       | Radiated Emissions & Band Edge Measurement | PASS   | Meet the requirement of limit. Minimum passing margin is -5.5dB at 906.62MHz |
| 15.247(b)   | Conducted Output power                     | PASS   | Meet the requirement of limit.   |
| 15.203  | Antenna Requirement                        | PASS   | Antenna connector is IPEX not a standard connector.                          |

NOTE: This report is prepared for FCC class II permissive change. Only radiated emission and Transmit Power were presented in this test report.

## 2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of  $k=2$ .

| Measurement                       | Value   |
|-----------------------------------|---------|
| Radiated emissions (30MHz-1GHz)   | 5.37 dB |
| Radiated emissions (1GHz -6GHz)   | 3.72 dB |
| Radiated emissions (6GHz -18GHz)  | 4.00 dB |
| Radiated emissions (18GHz -40GHz) | 4.11 dB |

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT (BLUETOOTH/DTS)

|                              |  |
|------------------------------|--|
| <b>PRODUCT</b>               | 802.11 a/b/g/n/ac+ BT 4.1 M.2 Type Card  |
| <b>MODEL NO.</b>             | QCNFA34AC  |
| <b>POWER SUPPLY</b>          | DC 3.3V from host equipment  |
| <b>MODULATION TYPE</b>       | GFSK, $\pi/4$ -DQPSK, 8DPSK for FHSS<br>16QAM, QPSK, BPSK for OFDM<br>GFSK for DTS       |
| <b>MODULATION TECHNOLOGY</b> | FHSS, OFDM, DTS  |
| <b>DATE RATE</b>             | Up to 3Mbps for BT-EDR mode<br>Up to 24Mbps for BT-HS mode<br>Up to 1Mbps for BT-LE mode |
| <b>FREQUENCY RANGE</b>       | BT-EDR, BT-LE mode: 2402MHz ~ 2480MHz<br>BT-HS mode: 2412MHz ~ 2462MHz                   |
| <b>NUMBER OF CHANNEL</b>     | BT-EDR mode: 79<br>BT-HS mode: 11<br>BT-LE mode: 40                                      |
| <b>MAX. OUTPUT POWER</b>     | BT-EDR mode: 14.388 mW<br>BT-LE mode: 2.018 mW   |
| <b>ANTENNA TYPE</b>          | See item 3.2   |
| <b>ANTENNA CONNECTOR</b>     | See item 3.2   |
| <b>DATA CABLE</b>            | NA   |
| <b>I/O PORTS</b>             | NA   |
| <b>ASSOCIATED DEVICES</b>    | NA   |



# NOTE:

1. This report is prepared for FCC class II permissive change. The difference compared with the Report No.: RF140313E05-2 design is as the following:
  - ◆ Change Diplexier (this component will impact all the WLAN/BT Tx patch).
2. According to above conditions, only radiated emission / conducted output power need to be performed. And all data was verified to meet the requirements.
3. There are Bluetooth technology and WLAN technology used for the EUT.
4. The Bluetooth supports version 4.1.
5. The EUT is a combo module, therefore the WLAN OFDM will be cover BT OFDM (low power) scenario.

6. The modular has two variant designs as following table:

| Variant No. | Description                          |
|-------------|--------------------------------------|
| SKU #1      | NFA344: This SKU supports 2T2R MIMO. |
| SKU #2      | NFA345: This SKU supports 1T2R.      |

7. WLAN/BT coexistence mode:

## ◆ NFA344:

2TX 5GHz WLAN (Main + Aux) + BT (Main) concurrent.  
2TX 2.4GHz WLAN+ BT timely shared at Main antenna.

## ◆ NFA345:

1TX 2.4GHz WLAN+ BT timely shared at Main antenna.  
1TX 5GHz WLAN+ BT concurrent

8. The emission of the simultaneous operation (WiFi <5GHz> & Bluetooth) have been evaluated and no non-compliance found. The detail combinations of transmitters / frequencies / modes as below table

| Mode                       | Available Channel | Tested Channel | Modulation Technology |
|----------------------------|-------------------|----------------|-----------------------|
| 5 GHz<br>(802.11ac(VHT20)) | 149 to 165        | 157            | OFDM                  |
| +<br>Bluetooth (GFSK)      | 0 to 78           | 78             | FHSS                  |

9. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.



### 3.2 DESCRIPTION OF ANTENNA

The antenna provided to the EUT, please refer to the following table:

| Brand | Model        | Antenna Type | 2.4G Gain with cable loss (dBi) | 5G Gain with cable loss (dBi)                  | 2.4G Cable Loss (dBi) | 5G Cable Loss (dBi)                           | Connector Type | Cable Length (mm) |
|-------|--------------|--------------|---------------------------------|--|-----------------------|---|----------------|-------------------|
| WNC   | 81.EBJ15.005 | PIFA         | 3.62                            | Band 1&2: 3.08<br>Band 3: 4.76<br>Band 4: 4.76 | 1.15                  | Band1&2: 1.70<br>Band 3: 1.74<br>Band 4: 1.79 | IPEX           | 300               |

- Note: 1. Above antenna gains of antenna are Total (H+V).  
2. All of antenna can be application for WLAN and Bluetooth.

### 3.3 DESCRIPTION OF TEST MODES

79 channels are provided for BT-EDR mode

| Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 0       | 2402        | 20      | 2422        | 40      | 2442        | 60      | 2462        |
| 1       | 2403        | 21      | 2423        | 41      | 2443        | 61      | 2463        |
| 2       | 2404        | 22      | 2424        | 42      | 2444        | 62      | 2464        |
| 3       | 2405        | 23      | 2425        | 43      | 2445        | 63      | 2465        |
| 4       | 2406        | 24      | 2426        | 44      | 2446        | 64      | 2466        |
| 5       | 2407        | 25      | 2427        | 45      | 2447        | 65      | 2467        |
| 6       | 2408        | 26      | 2428        | 46      | 2448        | 66      | 2468        |
| 7       | 2409        | 27      | 2429        | 47      | 2449        | 67      | 2469        |
| 8       | 2410        | 28      | 2430        | 48      | 2450        | 68      | 2470        |
| 9       | 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        |         |             |

40 channels are provided for BT-LE mode:

| CHANNEL | FREQ. (MHZ) | CHANNEL | FREQ. (MHZ) | CHANNEL | FREQ. (MHZ) | CHANNEL | FREQ. (MHZ) |
|---------|-------------|---------|-------------|---------|-------------|---------|-------------|
| 0       | 2402        | 10      | 2422        | 20      | 2442        | 30      | 2462        |
| 1       | 2404        | 11      | 2424        | 21      | 2444        | 31      | 2464        |
| 2       | 2406        | 12      | 2426        | 22      | 2446        | 32      | 2466        |
| 3       | 2408        | 13      | 2428        | 23      | 2448        | 33      | 2468        |
| 4       | 2410        | 14      | 2430        | 24      | 2450        | 34      | 2470        |
| 5       | 2412        | 15      | 2432        | 25      | 2452        | 35      | 2472        |
| 6       | 2414        | 16      | 2434        | 26      | 2454        | 36      | 2474        |
| 7       | 2416        | 17      | 2436        | 27      | 2456        | 37      | 2476        |
| 8       | 2418        | 18      | 2438        | 28      | 2458        | 38      | 2478        |
| 9       | 2420        | 19      | 2440        | 29      | 2460        | 39      | 2480        |



### 3.4 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:

#### For BT-EDR mode:

| EUT<br>CONFIGURE<br>MODE | APPLICABLE TO |         |      | DESCRIPTION    |
|--------------------------|---------------|---------|------|----------------|
|                          | RE < 1G       | RE ≥ 1G | APCM |                |
| 1                        | √             | √       | √    | SKU #1(NFA344) |

Where RE < 1G: Radiated Emission below 1GHz RE ≥ 1G: Radiated Emission above 1GHz

APCM: Antenna Port Conducted Measurement

Note 1. In original, the EUT's antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

#### RADIATED EMISSION TEST (BELOW 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

- ☒ Following channel(s) was (were) selected for the final test as listed below.

| Available Channel | Tested Channel | Modulation Technology | Modulation Type | Packet Type |
|-------------------|----------------|-----------------------|-----------------|-------------|
| 0 to 78           | 78             | FHSS                  | GFSK            | DH5         |

#### RADIATED EMISSION TEST (ABOVE 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

- ☒ Following channel(s) was (were) selected for the final test as listed below.

| Available Channel | Tested Channel | Modulation Technology | Modulation Type | Packet Type |
|-------------------|----------------|-----------------------|-----------------|-------------|
| 0 to 78           | 0, 39, 78      | FHSS                  | GFSK            | DH5         |
| 0 to 78           | 0, 39, 78      | FHSS                  | 8DPSK           | 3DH5        |

**ANTENNA PORT CONDUCTED MEASUREMENT:**

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| Available Channel | Tested Channel | Modulation Technology | Modulation Type | Packet Type |
|-------------------|----------------|-----------------------|-----------------|-------------|
| 0 to 78           | 0, 39, 78      | FHSS                  | GFSK            | DH5         |
| 0 to 78           | 0, 39, 78      | FHSS                  | 8DPSK           | 3DH5        |

**TEST CONDITION:**

| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER (SYSTEM) | TESTED BY  |
|---------------|--------------------------|----------------------|------------|
| RE<1G         | 23deg. C, 69%RH          | 120Vac, 60Hz         | Gary Cheng |
| RE≥1G         | 25deg. C, 70%RH          | 120Vac, 60Hz         | Tim Ho     |
| APCM          | 25deg. C, 60%RH          | 120Vac, 60Hz         | James Chan |

# For BT-LE mode:

| EUT<br>CONFIGURE<br>MODE | APPLICABLE TO |         |      | DESCRIPTION    |
|--------------------------|---------------|---------|------|----------------|
|                          | UE < 1G       | UE ≥ 1G | APCM |                |
| 1                        | √             | √       | √    | SKU #1(NFA344) |

Where **RE < 1G**: Radiated Emission below 1GHz **RE ≥ 1G**: Radiated Emission above 1GHz

**APCM**: Antenna Port Conducted Measurement

Note 1. The EUT's antenna had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **X-plane**.

## RADIATED EMISSION TEST (BELOW 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE  | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE | DATA RATE (Mbps) |
|-------|-------------------|----------------|-----------------|------------------|
| BT-LE | 0 to 39           | 39             | GFSK            | 1                |

## RADIATED EMISSION TEST (ABOVE 1 GHz):

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE  | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE | DATA RATE (Mbps) |
|-------|-------------------|----------------|-----------------|------------------|
| BT-LE | 0 to 39           | 0, 19, 39      | GFSK            | 1                |

## ANTENNA PORT CONDUCTED MEASUREMENT:

- ☒ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- ☒ Following channel(s) was (were) selected for the final test as listed below.

| MODE  | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE | DATA RATE (Mbps) |
|-------|-------------------|----------------|-----------------|------------------|
| BT-LE | 0 to 39           | 0, 19, 39      | GFSK            | 1                |



A D T

**TEST CONDITION:**

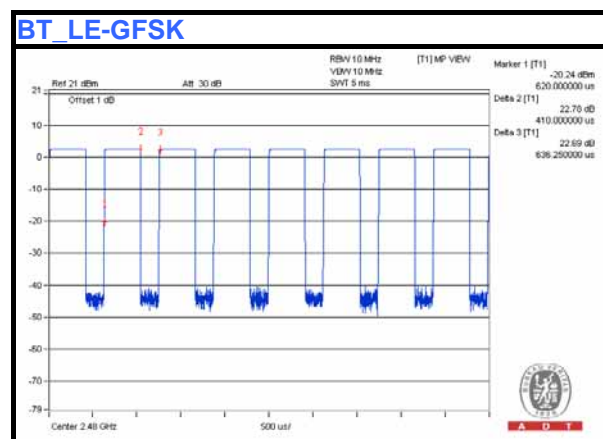
| APPLICABLE TO | ENVIRONMENTAL CONDITIONS | INPUT POWER (SYSTEM) | TESTED BY  |
|---------------|--------------------------|----------------------|------------|
| RE<1G         | 23deg. C, 69%RH          | 120Vac, 60Hz         | Gary Cheng |
| RE≥1G         | 25deg. C, 70%RH          | 120Vac, 60Hz         | Tim Ho     |
| APCM          | 25deg. C, 60%RH          | 120Vac, 60Hz         | James Chan |

### 3.5 DUTY CYCLE OF TEST SIGNAL

#### For BT\_LE-GFSK

Duty cycle of test signal is < 98%.

Duty cycle =  $0.41 \text{ ms} / 0.63625 \text{ ms} = 0.644$





### **3.6 GENERAL DESCRIPTION OF APPLIED STANDARDS**

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC Part 15, Subpart C (15.247)**

**558074 D01 DTS Meas Guidance v03r02**

**ANSI C63.10-2009**

All test items have been performed and recorded as per the above standards.



### 3.7 DESCRIPTION OF SUPPORT UNITS

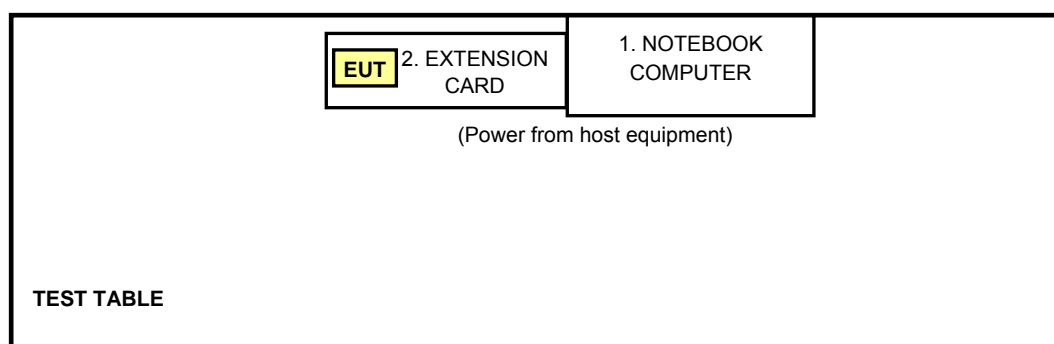
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| No. | Product           | Brand            | Model No.  | Serial No. | FCC ID  |
|-----|-------------------|------------------|------------|------------|---------|
| 1   | NOTEBOOK COMPUTER | DELL             | E6420      | H62T3R1    | FCC DoC |
| 2   | EXTENSION CARD    | Qualcomm Atheros | HPCBM194-0 | NA         | NA      |

| No. | Signal cable description |
|-----|--------------------------|
| 1   | NA                       |
| 2   | NA                       |

Note: The power cords of the above support units were unshielded (1.8m).

### 3.8 CONFIGURATION OF SYSTEM UNDER TEST



## 4 TEST PROCEDURES AND RESULTS (BT-EDR)

### 4.1 MAXIMUM PEAK OUTPUT POWER

#### 4.1.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Maximum Peak Output Power Limit is 125mW.

#### 4.1.2 INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|----------------------------|-----------|------------|-----------------|------------------|
| SPECTRUM ANALYZER R&S      | FSV 40    | 100964     | July 05, 2014   | July 04, 2015    |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. Tested date : Aug. 25, 2014

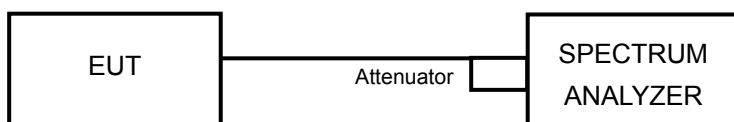
#### 4.1.3 TEST PROCEDURES

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. The center frequency of the spectrum analyzer is set to the fundamental frequency and using 3MHz RBW and 10 MHz VBW.
- d. Measure the captured power within the band and recording the plot.
- e. Repeat above procedures until all frequencies required were complete.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.5 TEST SETUP



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

#### 4.1.6 EUT OPERATING CONDITION

The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.



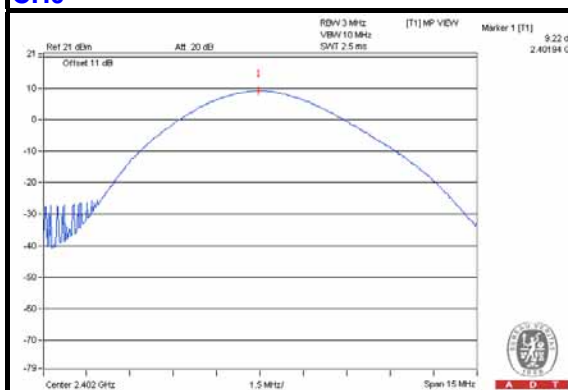
A D T

## 4.1.7 TEST RESULTS

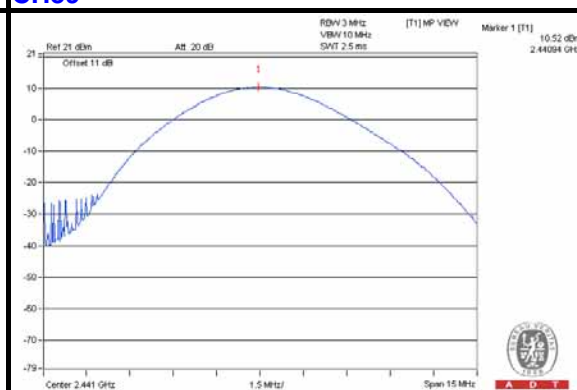
| CHANNEL | FREQUENCY (MHz) | OUTPUT POWER (mW) |        | OUTPUT POWER (dBm) |       | POWER LIMIT (mW) | PASS / FAIL |
|---------|-----------------|-------------------|--------|--------------------|-------|------------------|-------------|
|         |                 | GFSK              | 8DPSK  | GFSK               | 8DPSK |                  |             |
| 0       | 2402            | 8.356             | 12.274 | 9.22               | 10.89 | 125              | PASS        |
| 39      | 2441            | 11.272            | 13.274 | 10.52              | 11.23 | 125              | PASS        |
| 78      | 2480            | 12.106            | 14.388 | 10.83              | 11.58 | 125              | PASS        |

### For GFSK

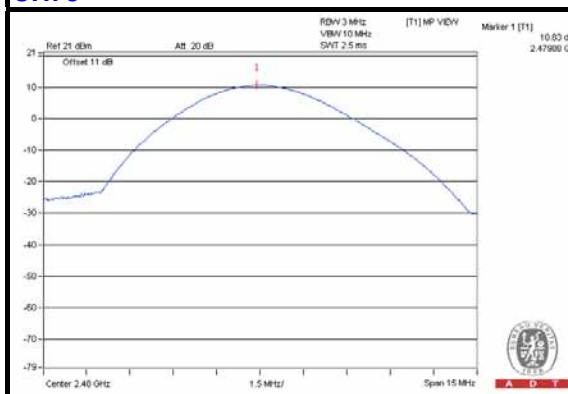
#### CH0



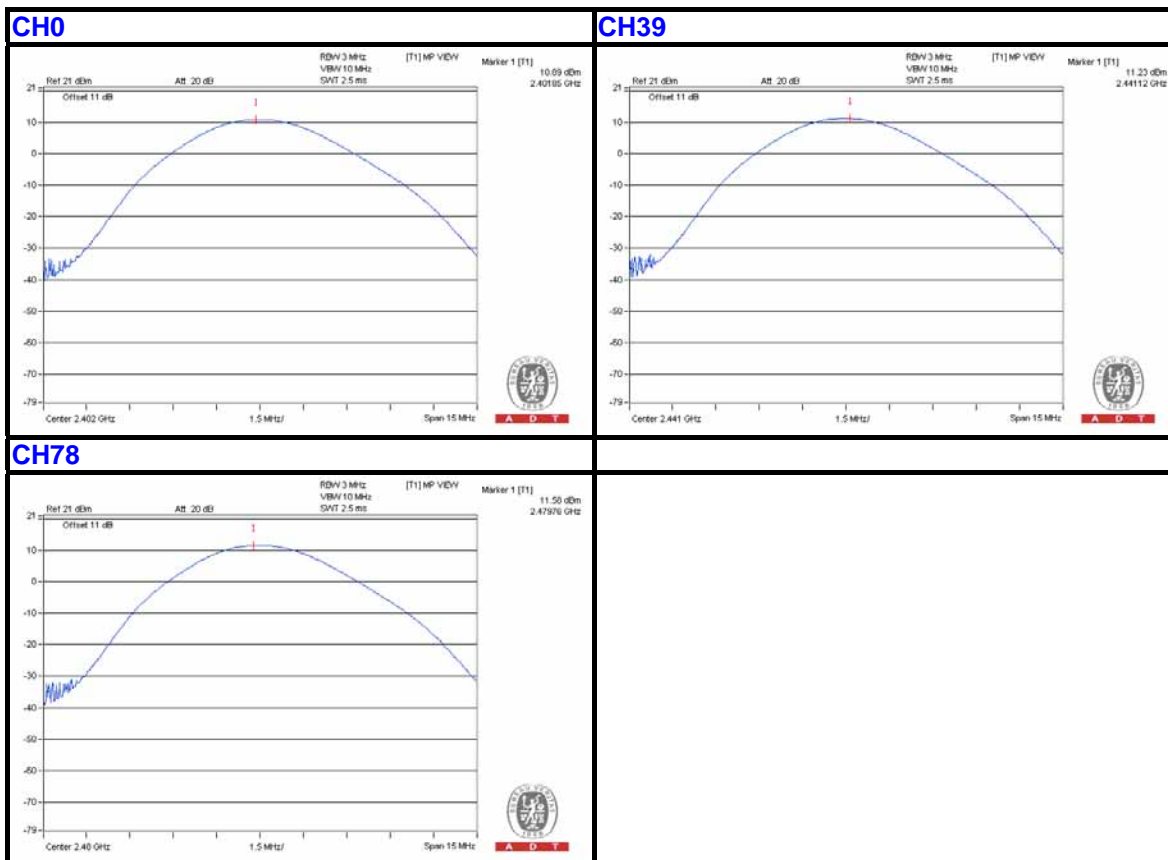
#### CH39



#### CH78



# For 8DPSK



## 4.2 RADIATED EMISSION AND BANDEGE MEASUREMENT

### 4.2.1 LIMITS OF RADIATED EMISSION AND BANDEGE MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

| FREQUENCIES (MHz) | FIELD STRENGTH (microvolts/meter) | MEASUREMENT DISTANCE (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009 ~ 0.490     | 2400/F(kHz)                       | 300                           |
| 0.490 ~ 1.705     | 24000/F(kHz)                      | 30                            |
| 1.705 ~ 30.0      | 30                                | 30                            |
| 30 ~ 88           | 100                               | 3                             |
| 88 ~ 216          | 150                               | 3                             |
| 216 ~ 960         | 200                               | 3                             |
| Above 960         | 500                               | 3                             |

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



A D T

## 4.2.2 TEST INSTRUMENTS

### For Below 1GHz test:

| DESCRIPTION & MANUFACTURER              | MODEL NO.                | SERIAL NO.                          | CALIBRATED DATE | CALIBRATED UNTIL |
|---|--------------------------|-------------------------------------|-----------------|------------------|
| MXE EMI Receiver<br>Agilent             | N9038A                   | MY51210105                          | July 21, 2014   | July 20, 2015    |
| Pre-Amplifier<br>Mini-Circuits          | ZFL-1000VH2<br>B         | AMP-ZFL-03                          | Nov. 13, 2013   | Nov. 12, 2014    |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168                | 9168-360                            | Feb. 26, 2014   | Feb. 25, 2015    |
| RF Cable                                | NA                       | CHGCAB_001                          | Oct. 05, 2013   | Oct. 04, 2014    |
| Spectrum Analyzer<br>R&S                | FSV40                    | 100964                              | July 05, 2014   | July 04, 2015    |
| Horn_Antenna<br>AISI                    | AIH.8018                 | 0000320091110                       | Nov. 18, 2013   | Nov. 17, 2014    |
| Pre-Amplifier<br>Agilent                | 8449B                    | 3008A02578                          | June 24, 2014   | June 23, 2015    |
| RF Cable                                | NA                       | RF104-201<br>RF104-203<br>RF104-204 | Dec. 12, 2013   | Dec. 11, 2014    |
| Spectrum Analyzer<br>Agilent            | E4446A                   | MY48250253                          | Aug. 28, 2013   | Aug. 27, 2014    |
| Pre-Amplifier<br>SPACEK LABS            | SLKKa-48-6               | 9K16                                | Nov. 13, 2013   | Nov. 12, 2014    |
| Horn_Antenna<br>SCHWARZBECK             | BBHA 9170                | 9170-424                            | Oct. 08, 2013   | Oct. 07, 2014    |
| Software                                | ADT_Radiated<br>_V8.7.07 | NA                                  | NA              | NA               |
| Antenna Tower & Turn Table<br>CT        | NA                       | NA                                  | NA              | NA               |

### Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.
7. Tested Date: Aug. 19, 2014





A D T

**For Above 1GHz test:**

| DESCRIPTION & MANUFACTURER              | MODEL NO.                | SERIAL NO.                          | CALIBRATED DATE | CALIBRATED UNTIL |
|---|--------------------------|-------------------------------------|-----------------|------------------|
| MXE EMI Receiver<br>Agilent             | N9038A                   | MY50010156                          | Aug. 11, 2014   | Aug. 10, 2015    |
| Pre-Amplifier<br>Mini-Circuits          | ZFL-1000VH2<br>B         | AMP-ZFL-04                          | Nov. 13, 2013   | Nov. 12, 2014    |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168                | 9168-361                            | Feb. 27, 2014   | Feb. 26, 2015    |
| RF Cable                                | NA                       | CHHCAB_001                          | Oct. 06, 2013   | Oct. 05, 2014    |
| Spectrum Analyzer<br>R&S                | FSV40                    | 100964                              | July 05, 2014   | July 04, 2015    |
| Horn_Antenna<br>AISI                    | AIH.8018                 | 0000220091110                       | Dec. 06, 2013   | Dec. 05, 2014    |
| Pre-Amplifier<br>Agilent                | 8449B                    | 3008A01923                          | Oct. 29, 2013   | Oct. 28, 2014    |
| RF Cable                                | NA                       | RF104-205<br>RF104-207<br>RF104-202 | Dec. 12, 2013   | Dec. 11, 2014    |
| Spectrum Analyzer<br>Agilent            | E4446A                   | MY48250253                          | Aug. 28, 2013   | Aug. 27, 2014    |
| Pre-Amplifier<br>SPACEK LABS            | SLKKa-48-6               | 9K16                                | Nov. 13, 2013   | Nov. 12, 2014    |
| Horn_Antenna<br>SCHWARZBECK             | BBHA 9170                | 9170-424                            | Oct. 08, 2013   | Oct. 07, 2014    |
| Software                                | ADT_Radiated<br>_V8.7.07 | NA                                  | NA              | NA               |
| Antenna Tower & Turn Table<br>CT        | NA                       | NA                                  | NA              | NA               |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Tested Date: Aug. 18, 2014

#### 4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

**NOTE:**

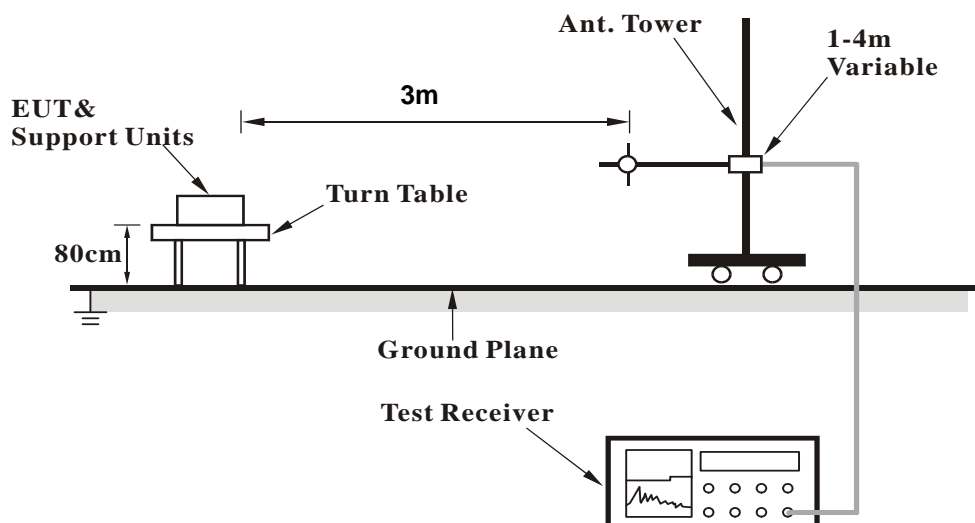
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 1MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 DEVIATION FROM TEST STANDARD

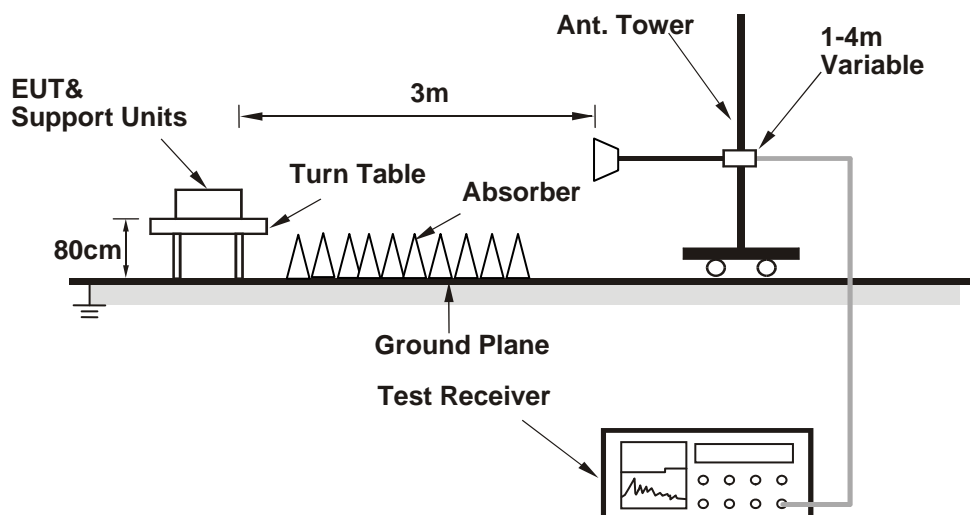
No deviation

## 4.2.5 TEST SETUP

### <Frequency Range below 1GHz>



### <Frequency Range above 1GHz>



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### 4.2.6 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program “QCRT Version3.0.29.0” to enable EUT under transmission/receiving condition continuously at specific channel frequency.



A D T

## 4.2.7 TEST RESULTS

### BELOW 1GHz WORST-CASE DATA

#### BT\_GFSK

|                 |               |                      |                 |
|-----------------|---------------|----------------------|-----------------|
| CHANNEL         | TX Channel 78 | DETECTOR<br>FUNCTION | Quasi-Peak (QP) |
| FREQUENCY RANGE | Below 1GHz    |                      |                 |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | 54.12          | 25.5 QP                       | 40.0              | -14.5          | 2.00 H                   | 93                         | 39.07                  | -13.55                         |
| 2   | 166.06         | 35.2 QP                       | 43.5              | -8.3           | 2.00 H                   | 118                        | 48.71                  | -13.49                         |
| 3   | 233.20         | 38.3 QP                       | 46.0              | -7.7           | 1.00 H                   | 11                         | 53.76                  | -15.46                         |
| 4   | 428.38         | 33.6 QP                       | 46.0              | -12.5          | 2.00 H                   | 66                         | 42.30                  | -8.75                          |
| 5   | 666.45         | 31.7 QP                       | 46.0              | -14.3          | 1.00 H                   | 42                         | 35.69                  | -3.99                          |
| 6   | 770.72         | 33.6 QP                       | 46.0              | -12.4          | 2.00 H                   | 107                        | 35.25                  | -1.63                          |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | 49.50          | 22.9 QP                       | 40.0              | -17.1          | 1.00 V                   | 32                         | 36.44                  | -13.52                         |
| 2   | 166.58         | 24.4 QP                       | 43.5              | -19.1          | 2.00 V                   | 202                        | 37.92                  | -13.52                         |
| 3   | 311.74         | 26.4 QP                       | 46.0              | -19.6          | 1.50 V                   | 181                        | 38.40                  | -11.98                         |
| 4   | 428.32         | 26.7 QP                       | 46.0              | -19.3          | 2.00 V                   | 133                        | 35.46                  | -8.75                          |
| 5   | 663.85         | 32.2 QP                       | 46.0              | -13.8          | 1.50 V                   | 130                        | 36.25                  | -4.03                          |
| 6   | 906.64         | 40.5 QP                       | 46.0              | -5.5           | 1.50 V                   | 116                        | 40.31                  | 0.23                           |

#### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



A D T

## ABOVE 1GHz DATA

## BT\_GFSK

|                 |              |                      |           |
|-----------------|--------------|----------------------|-----------|
| CHANNEL         | TX Channel 0 | DETECTOR<br>FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      |           |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | 2390.00        | 46.1 PK                       | 74.0              | -27.9          | 1.58 H                   | 227                        | 51.70                  | -5.60                          |
| 2   | 2390.00        | 16.0 AV                       | 54.0              | -38.0          | 1.58 H                   | 227                        | 21.60                  | -5.60                          |
| 3   | *2402.00       | 97.8 PK                       |                   |                | 1.58 H                   | 227                        | 103.39                 | -5.59                          |
| 4   | *2402.00       | 67.7 AV                       |                   |                | 1.58 H                   | 227                        | 73.29                  | -5.59                          |
| 5   | 4804.00        | 48.3 PK                       | 74.0              | -25.7          | 1.04 H                   | 156                        | 44.41                  | 3.89                           |
| 6   | 4804.00        | 18.2 AV                       | 54.0              | -35.8          | 1.04 H                   | 156                        | 14.31                  | 3.89                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | 2390.00        | 46.3 PK                       | 74.0              | -27.7          | 1.08 V                   | 278                        | 51.90                  | -5.60                          |
| 2   | 2390.00        | 16.2 AV                       | 54.0              | -37.8          | 1.08 V                   | 278                        | 21.80                  | -5.60                          |
| 3   | *2402.00       | 104.7 PK                      |                   |                | 1.08 V                   | 278                        | 110.29                 | -5.59                          |
| 4   | *2402.00       | 74.6 AV                       |                   |                | 1.08 V                   | 278                        | 80.19                  | -5.59                          |
| 5   | 4804.00        | 49.1 PK                       | 74.0              | -24.9          | 1.14 V                   | 178                        | 45.21                  | 3.89                           |
| 6   | 4804.00        | 19.0 AV                       | 54.0              | -35.0          | 1.14 V                   | 178                        | 15.11                  | 3.89                           |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1 \text{ dB}$
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .



A D T

|                 |               |                      |           |
|-----------------|---------------|----------------------|-----------|
| CHANNEL         | TX Channel 39 | DETECTOR<br>FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz  |                      |           |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2441.00       | 97.8 PK                       |                   |                | 1.61 H                   | 231                        | 103.20                 | -5.40                          |
| 2   | *2441.00       | 67.7 AV                       |                   |                | 1.61 H                   | 231                        | 73.10                  | -5.40                          |
| 3   | 4882.00        | 48.5 PK                       | 74.0              | -25.5          | 1.03 H                   | 166                        | 44.70                  | 3.80                           |
| 4   | 4882.00        | 18.4 AV                       | 54.0              | -35.6          | 1.03 H                   | 166                        | 14.60                  | 3.80                           |
| 5   | 7323.00        | 53.4 PK                       | 74.0              | -20.6          | 1.02 H                   | 327                        | 45.12                  | 8.28                           |
| 6   | 7323.00        | 23.3 AV                       | 54.0              | -30.7          | 1.02 H                   | 327                        | 15.02                  | 8.28                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2441.00       | 104.8 PK                      |                   |                | 1.12 V                   | 274                        | 110.20                 | -5.40                          |
| 2   | *2441.00       | 74.7 AV                       |                   |                | 1.12 V                   | 274                        | 80.10                  | -5.40                          |
| 3   | 4882.00        | 48.7 PK                       | 74.0              | -25.3          | 1.09 V                   | 180                        | 44.90                  | 3.80                           |
| 4   | 4882.00        | 18.6 AV                       | 54.0              | -35.4          | 1.09 V                   | 180                        | 14.80                  | 3.80                           |
| 5   | 7323.00        | 51.9 PK                       | 74.0              | -22.1          | 1.01 V                   | 160                        | 43.62                  | 8.28                           |
| 6   | 7323.00        | 21.8 AV                       | 54.0              | -32.2          | 1.01 V                   | 160                        | 13.52                  | 8.28                           |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1$  dB
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .



A D T

|                 |               |                      |           |
|-----------------|---------------|----------------------|-----------|
| CHANNEL         | TX Channel 78 | DETECTOR<br>FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz  |                      |           |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2480.00       | 97.8 PK                       |                   |                | 1.15 H                   | 66                         | 103.03                 | -5.23                          |
| 2   | *2480.00       | 67.7 AV                       |                   |                | 1.15 H                   | 66                         | 72.93                  | -5.23                          |
| 3   | 2483.50        | 49.9 PK                       | 74.0              | -24.1          | 1.15 H                   | 66                         | 55.10                  | -5.20                          |
| 4   | 2483.50        | 19.8 AV                       | 54.0              | -34.2          | 1.15 H                   | 66                         | 25.00                  | -5.20                          |
| 5   | 4960.00        | 48.1 PK                       | 74.0              | -25.9          | 1.00 H                   | 161                        | 44.27                  | 3.83                           |
| 6   | 4960.00        | 18.0 AV                       | 54.0              | -36.0          | 1.00 H                   | 161                        | 14.17                  | 3.83                           |
| 7   | 7440.00        | 53.4 PK                       | 74.0              | -20.6          | 1.00 H                   | 319                        | 44.72                  | 8.68                           |
| 8   | 7440.00        | 23.3 AV                       | 54.0              | -30.7          | 1.00 H                   | 319                        | 14.62                  | 8.68                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2480.00       | 104.2 PK                      |                   |                | 1.06 V                   | 306                        | 109.43                 | -5.23                          |
| 2   | *2480.00       | 74.1 AV                       |                   |                | 1.06 V                   | 306                        | 79.33                  | -5.23                          |
| 3   | 2483.50        | 52.3 PK                       | 74.0              | -21.7          | 1.06 V                   | 306                        | 57.50                  | -5.20                          |
| 4   | 2483.50        | 22.2 AV                       | 54.0              | -31.8          | 1.06 V                   | 306                        | 27.40                  | -5.20                          |
| 5   | 4960.00        | 49.2 PK                       | 74.0              | -24.8          | 1.10 V                   | 193                        | 45.37                  | 3.83                           |
| 6   | 4960.00        | 19.1 AV                       | 54.0              | -34.9          | 1.10 V                   | 193                        | 15.27                  | 3.83                           |
| 7   | 7440.00        | 52.3 PK                       | 74.0              | -21.7          | 1.00 V                   | 171                        | 43.62                  | 8.68                           |
| 8   | 7440.00        | 22.2 AV                       | 54.0              | -31.8          | 1.00 V                   | 171                        | 13.52                  | 8.68                           |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1 \text{ dB}$
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .





A D T

## BT\_8DPSK

|                 |              |                      |           |
|-----------------|--------------|----------------------|-----------|
| CHANNEL         | TX Channel 0 | DETECTOR<br>FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      |           |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | 2390.00        | 46.6 PK                       | 74.0              | -27.4          | 1.19 H                   | 76                         | 52.20                  | -5.60                          |
| 2   | 2390.00        | 16.5 AV                       | 54.0              | -37.5          | 1.19 H                   | 76                         | 22.10                  | -5.60                          |
| 3   | *2402.00       | 98.2 PK                       |                   |                | 1.19 H                   | 76                         | 103.79                 | -5.59                          |
| 4   | *2402.00       | 68.1 AV                       |                   |                | 1.19 H                   | 76                         | 73.69                  | -5.59                          |
| 5   | 4804.00        | 47.8 PK                       | 74.0              | -26.2          | 1.01 H                   | 159                        | 43.91                  | 3.89                           |
| 6   | 4804.00        | 17.7 AV                       | 54.0              | -36.3          | 1.01 H                   | 159                        | 13.81                  | 3.89                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | 2390.00        | 47.1 PK                       | 74.0              | -26.9          | 1.09 V                   | 316                        | 52.70                  | -5.60                          |
| 2   | 2390.00        | 17.0 AV                       | 54.0              | -37.0          | 1.09 V                   | 316                        | 22.60                  | -5.60                          |
| 3   | *2402.00       | 104.6 PK                      |                   |                | 1.09 V                   | 316                        | 110.19                 | -5.59                          |
| 4   | *2402.00       | 74.5 AV                       |                   |                | 1.09 V                   | 316                        | 80.09                  | -5.59                          |
| 5   | 4804.00        | 48.9 PK                       | 74.0              | -25.1          | 1.05 V                   | 198                        | 45.01                  | 3.89                           |
| 6   | 4804.00        | 18.8 AV                       | 54.0              | -35.2          | 1.05 V                   | 198                        | 14.91                  | 3.89                           |

## REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1 \text{ dB}$
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .



A D T

|                 |               |                      |           |
|-----------------|---------------|----------------------|-----------|
| CHANNEL         | TX Channel 39 | DETECTOR<br>FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz  |                      |           |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2441.00       | 97.2 PK                       |                   |                | 1.18 H                   | 72                         | 102.60                 | -5.40                          |
| 2   | *2441.00       | 67.1 AV                       |                   |                | 1.18 H                   | 72                         | 72.50                  | -5.40                          |
| 3   | 4882.00        | 48.5 PK                       | 74.0              | -25.5          | 1.05 H                   | 156                        | 44.70                  | 3.80                           |
| 4   | 4882.00        | 18.4 AV                       | 54.0              | -35.6          | 1.05 H                   | 156                        | 14.60                  | 3.80                           |
| 5   | 7323.00        | 53.0 PK                       | 74.0              | -21.0          | 1.00 H                   | 314                        | 44.72                  | 8.28                           |
| 6   | 7323.00        | 22.9 AV                       | 54.0              | -31.1          | 1.00 H                   | 314                        | 14.62                  | 8.28                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2441.00       | 104.5 PK                      |                   |                | 1.04 V                   | 294                        | 109.90                 | -5.40                          |
| 2   | *2441.00       | 74.4 AV                       |                   |                | 1.04 V                   | 294                        | 79.80                  | -5.40                          |
| 3   | 4882.00        | 49.1 PK                       | 74.0              | -24.9          | 1.09 V                   | 183                        | 45.30                  | 3.80                           |
| 4   | 4882.00        | 19.0 AV                       | 54.0              | -35.0          | 1.09 V                   | 183                        | 15.20                  | 3.80                           |
| 5   | 7323.00        | 52.2 PK                       | 74.0              | -21.8          | 1.07 V                   | 187                        | 43.92                  | 8.28                           |
| 6   | 7323.00        | 22.1 AV                       | 54.0              | -31.9          | 1.07 V                   | 187                        | 13.82                  | 8.28                           |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1 \text{ dB}$
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .



A D T

|                 |               |                      |           |
|-----------------|---------------|----------------------|-----------|
| CHANNEL         | TX Channel 78 | DETECTOR<br>FUNCTION | Peak (PK) |
| FREQUENCY RANGE | 1GHz ~ 25GHz  |                      |           |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2480.00       | 97.6 PK                       |                   |                | 1.14 H                   | 66                         | 102.83                 | -5.23                          |
| 2   | *2480.00       | 67.5 AV                       |                   |                | 1.14 H                   | 66                         | 72.73                  | -5.23                          |
| 3   | 2483.50        | 49.1 PK                       | 74.0              | -24.9          | 1.14 H                   | 66                         | 54.30                  | -5.20                          |
| 4   | 2483.50        | 19.0 AV                       | 54.0              | -35.0          | 1.14 H                   | 66                         | 24.20                  | -5.20                          |
| 5   | 4960.00        | 48.4 PK                       | 74.0              | -25.6          | 1.01 H                   | 164                        | 44.57                  | 3.83                           |
| 6   | 4960.00        | 18.3 AV                       | 54.0              | -35.7          | 1.01 H                   | 164                        | 14.47                  | 3.83                           |
| 7   | 7440.00        | 53.0 PK                       | 74.0              | -21.0          | 1.05 H                   | 319                        | 44.32                  | 8.68                           |
| 8   | 7440.00        | 22.9 AV                       | 54.0              | -31.1          | 1.05 H                   | 319                        | 14.22                  | 8.68                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2480.00       | 104.9 PK                      |                   |                | 1.05 V                   | 304                        | 110.13                 | -5.23                          |
| 2   | *2480.00       | 74.8 AV                       |                   |                | 1.05 V                   | 304                        | 80.03                  | -5.23                          |
| 3   | 2483.50        | 55.9 PK                       | 74.0              | -18.1          | 1.05 V                   | 304                        | 61.10                  | -5.20                          |
| 4   | 2483.50        | 25.8 AV                       | 54.0              | -28.2          | 1.05 V                   | 304                        | 31.00                  | -5.20                          |
| 5   | 4960.00        | 49.1 PK                       | 74.0              | -24.9          | 1.09 V                   | 180                        | 45.27                  | 3.83                           |
| 6   | 4960.00        | 19.0 AV                       | 54.0              | -35.0          | 1.09 V                   | 180                        | 15.17                  | 3.83                           |
| 7   | 7440.00        | 51.9 PK                       | 74.0              | -22.1          | 1.00 V                   | 163                        | 43.22                  | 8.68                           |
| 8   | 7440.00        | 21.8 AV                       | 54.0              | -32.2          | 1.00 V                   | 163                        | 13.12                  | 8.68                           |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.
6. The DH5 packet was the worse case duty cycle for a transmit dwell time on a channel, based upon bluetooth theory the transmitter is on 0.625 \* 5 per 296.25 ms per channel. Therefore, the duty cycle correlation factor be equal to:  $20\log(3.125 / 100) = -30.1 \text{ dB}$
7. Average value = peak reading +  $20\log(\text{duty cycle})$ .

## 5 TEST TYPES AND RESULTS (BT-LE)

### 5.1 CONDUCTED OUTPUT POWER MEASUREMENT

#### 5.1.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

For systems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm)

#### 5.1.2 INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED DATE | CALIBRATED UNTIL |
|----------------------------|-----------|------------|-----------------|------------------|
| Power Meter<br>Anritsu     | ML2495A   | 1014008    | Apr. 30, 2014   | Apr. 29, 2015    |
| Power Sensor<br>Anritsu    | MA2411B   | 0917122    | Apr. 30, 2014   | Apr. 29, 2015    |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. Tested date :Aug. 27, 2014

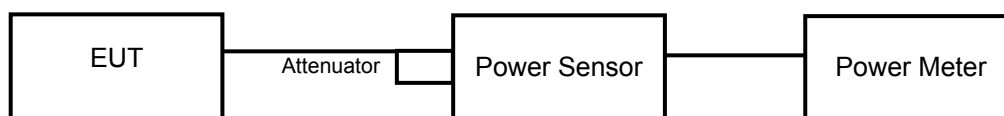
#### 5.1.3 TEST PROCEDURES

The peak / average power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak / average power sensor. Record the peak power level.

#### 5.1.4 DEVIATION FROM TEST STANDARD

No deviation

### 5.1.5 TEST SETUP



### 5.1.6 EUT OPERATING CONDITIONS

The software (QCRT Version:3.0.29.0) provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.



## 5.1.7 TEST RESULTS

### FOR PEAK POWER BT\_LE-GFSK

| CHANNEL | FREQUENCY (MHz) | PEAK POWER (mW) | PEAK POWER (dBm) | LIMIT (dBm) | PASS/FAIL |
|---------|-----------------|-----------------|------------------|-------------|-----------|
| 0       | 2402            | 1.663           | 2.21             | 30          | PASS      |
| 19      | 2440            | 1.901           | 2.79             | 30          | PASS      |
| 39      | 2480            | 2.018           | 3.05             | 30          | PASS      |

### FOR AVERAGE POWER BT\_LE-GFSK

| CHANNEL | FREQUENCY (MHz) | AVERAGE POWER (mW) | AVERAGE POWER (dBm) |
|---------|-----------------|--------------------|---------------------|
| 0       | 2402            | 1.390              | 1.43                |
| 19      | 2440            | 1.626              | 2.11                |
| 39      | 2480            | 1.750              | 2.43                |

## 5.2 UNWANTED EMISSION MEASUREMENT (RADIATED VERSUS CONDUCTED)

### 5.2.1 LIMITS OF UNWANTED EMISSION MEASUREMENT

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

| Frequencies (MHz) | Field strength (microvolts/meter) | Measurement distance (meters) |
|-------------------|-----------------------------------|-------------------------------|
| 0.009-0.490       | 2400/F(kHz)                       | 300                           |
| 0.490-1.705       | 24000/F(kHz)                      | 30                            |
| 1.705-30.0        | 30                                | 30                            |
| 30-88             | 100                               | 3                             |
| 88-216            | 150                               | 3                             |
| 216-960           | 200                               | 3                             |
| Above 960         | 500                               | 3                             |

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.



A D T

## 5.2.2 TEST INSTRUMENTS

### For Below 1GHz test:

| DESCRIPTION & MANUFACTURER              | MODEL NO.                | SERIAL NO.                          | CALIBRATED DATE | CALIBRATED UNTIL |
|---|--------------------------|-------------------------------------|-----------------|------------------|
| MXE EMI Receiver<br>Agilent             | N9038A                   | MY51210105                          | July 21, 2014   | July 20, 2015    |
| Pre-Amplifier<br>Mini-Circuits          | ZFL-1000VH2<br>B         | AMP-ZFL-03                          | Nov. 13, 2013   | Nov. 12, 2014    |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168                | 9168-360                            | Feb. 26, 2014   | Feb. 25, 2015    |
| RF Cable                                | NA                       | CHGCAB_001                          | Oct. 05, 2013   | Oct. 04, 2014    |
| Spectrum Analyzer<br>R&S                | FSV40                    | 100964                              | July 05, 2014   | July 04, 2015    |
| Horn_Antenna<br>AISI                    | AIH.8018                 | 0000320091110                       | Nov. 18, 2013   | Nov. 17, 2014    |
| Pre-Amplifier<br>Agilent                | 8449B                    | 3008A02578                          | June 24, 2014   | June 23, 2015    |
| RF Cable                                | NA                       | RF104-201<br>RF104-203<br>RF104-204 | Dec. 12, 2013   | Dec. 11, 2014    |
| Spectrum Analyzer<br>Agilent            | E4446A                   | MY48250253                          | Aug. 28, 2013   | Aug. 27, 2014    |
| Pre-Amplifier<br>SPACEK LABS            | SLKKa-48-6               | 9K16                                | Nov. 13, 2013   | Nov. 12, 2014    |
| Horn_Antenna<br>SCHWARZBECK             | BBHA 9170                | 9170-424                            | Oct. 08, 2013   | Oct. 07, 2014    |
| Software                                | ADT_Radiated<br>_V8.7.07 | NA                                  | NA              | NA               |
| Antenna Tower & Turn Table<br>CT        | NA                       | NA                                  | NA              | NA               |

### Note:

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
- 3 The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
- 5 The VCCI Site Registration No. is G-137.
- 6 The CANADA Site Registration No. is IC 7450H-2.
- 7 Tested Date: Aug. 19, 2014





A D T

**For Above 1GHz test:**

| DESCRIPTION & MANUFACTURER              | MODEL NO.                | SERIAL NO.                          | CALIBRATED DATE | CALIBRATED UNTIL |
|---|--------------------------|-------------------------------------|-----------------|------------------|
| MXE EMI Receiver<br>Agilent             | N9038A                   | MY50010156                          | Aug. 11, 2014   | Aug. 10, 2015    |
| Pre-Amplifier<br>Mini-Circuits          | ZFL-1000VH2<br>B         | AMP-ZFL-04                          | Nov. 13, 2013   | Nov. 12, 2014    |
| Trilog Broadband Antenna<br>SCHWARZBECK | VULB 9168                | 9168-361                            | Feb. 27, 2014   | Feb. 26, 2015    |
| RF Cable                                | NA                       | CHHCAB_001                          | Oct. 06, 2013   | Oct. 05, 2014    |
| Spectrum Analyzer<br>R&S                | FSV40                    | 100964                              | July 05, 2014   | July 04, 2015    |
| Horn_Antenna<br>AISI                    | AIH.8018                 | 0000220091110                       | Dec. 06, 2013   | Dec. 05, 2014    |
| Pre-Amplifier<br>Agilent                | 8449B                    | 3008A01923                          | Oct. 29, 2013   | Oct. 28, 2014    |
| RF Cable                                | NA                       | RF104-205<br>RF104-207<br>RF104-202 | Dec. 12, 2013   | Dec. 11, 2014    |
| Spectrum Analyzer<br>Agilent            | E4446A                   | MY48250253                          | Aug. 28, 2013   | Aug. 27, 2014    |
| Pre-Amplifier<br>SPACEK LABS            | SLKKa-48-6               | 9K16                                | Nov. 13, 2013   | Nov. 12, 2014    |
| Horn_Antenna<br>SCHWARZBECK             | BBHA 9170                | 9170-424                            | Oct. 08, 2013   | Oct. 07, 2014    |
| Software                                | ADT_Radiated<br>_V8.7.07 | NA                                  | NA              | NA               |
| Antenna Tower & Turn Table<br>CT        | NA                       | NA                                  | NA              | NA               |

**Note:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Tested Date: Aug. 18, 2014

### 5.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz.

**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 1MHz for Peak detection at frequency above 1GHz.
3. All modes of operation were investigated and the worst-case emissions are reported.

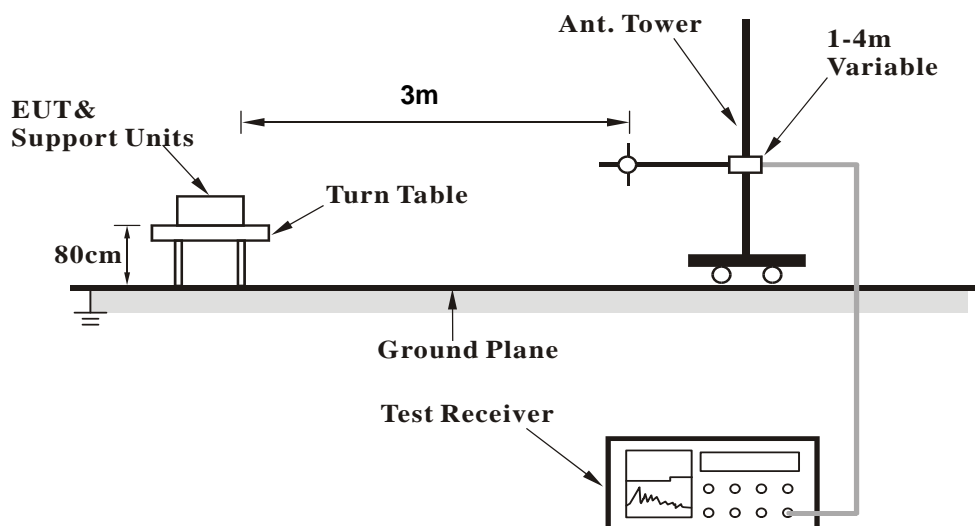
### 5.2.4 DEVIATION FROM TEST STANDARD

No deviation

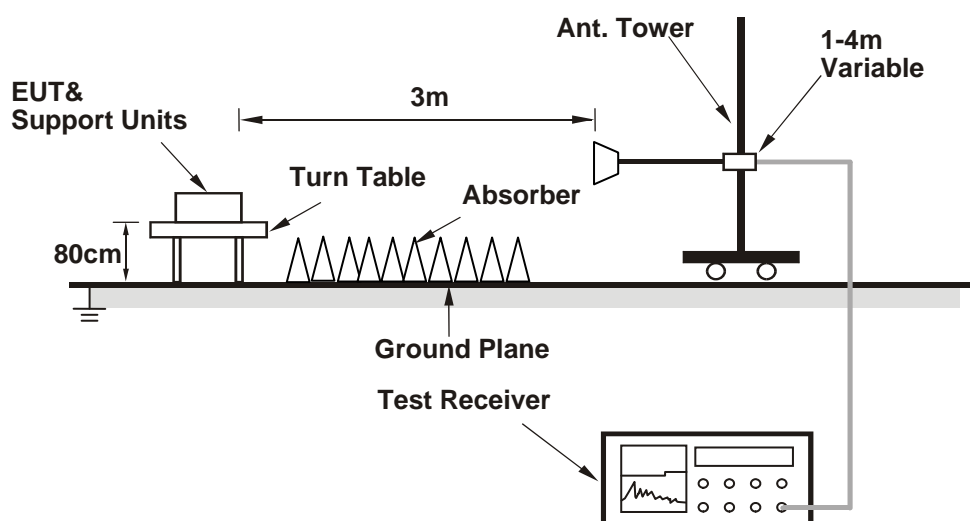
## 5.2.5 TEST SETUP

For radiated configuration:

<Frequency Range below 1GHz>



<Frequency Range above 1GHz>



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

### 5.2.6 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program “QCRT Version:3.0.29.0” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

## 5.2.7 TEST RESULTS

| Radiated versus Conducted Measurement   |  |
|---|--|
| <input type="checkbox"/> Conducted measurement  | <input checked="" type="checkbox"/> Radiated measurement |
| <p><u>For Radiated measurement:</u></p> <p>The level of unwanted emissions was measured when radiated by the cabinet or structure of the equipment with the antenna connector(s) terminated by a specified load (cabinet radiation)</p> <p><u>For Conducted measurement:</u></p> <p>The level of unwanted emissions was measured as their power in a specified load (conducted spurious emissions).</p> |  |



A D T

**BELOW 1GHz WORST-CASE DATA****BT\_LE-GFSK**

|                        |              |                              |                 |
|------------------------|--------------|------------------------------|-----------------|
| <b>CHANNEL</b>         | TX Channel 0 | <b>DETECTOR<br/>FUNCTION</b> | Quasi-Peak (QP) |
| <b>FREQUENCY RANGE</b> | Below 1GHz   |                              |                 |

| <b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b> |                        |  |                           |                        |                                   |                                     |                                 |   |
|--|------------------------|--|---------------------------|------------------------|-----------------------------------|-------------------------------------|---------------------------------|---|
| <b>NO.</b>   | <b>FREQ.<br/>(MHz)</b> | <b>EMISSION<br/>LEVEL<br/>(dBuV/m)</b> | <b>LIMIT<br/>(dBuV/m)</b> | <b>MARGIN<br/>(dB)</b> | <b>ANTENNA<br/>HEIGHT<br/>(m)</b> | <b>TABLE<br/>ANGLE<br/>(Degree)</b> | <b>RAW<br/>VALUE<br/>(dBuV)</b> | <b>CORRECTION<br/>FACTOR<br/>(dB/m)</b> |
| 1  | 54.10                  | 25.6 QP                                | 40.0                      | -14.4                  | 2.00 H                            | 93                                  | 39.17                           | -13.55                                  |
| 2  | 166.06                 | 35.0 QP                                | 43.5                      | -8.5                   | 2.00 H                            | 118                                 | 48.51                           | -13.49                                  |
| 3  | 233.21                 | 38.3 QP                                | 46.0                      | -7.7                   | 1.00 H                            | 11                                  | 53.78                           | -15.46                                  |
| 4  | 428.38                 | 33.7 QP                                | 46.0                      | -12.3                  | 2.00 H                            | 66                                  | 42.41                           | -8.75                                   |
| 5  | 666.48                 | 31.9 QP                                | 46.0                      | -14.2                  | 1.00 H                            | 42                                  | 35.84                           | -3.99                                   |
| 6  | 770.72                 | 33.6 QP                                | 46.0                      | -12.4                  | 2.00 H                            | 107                                 | 35.25                           | -1.63                                   |
| <b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b>   |                        |  |                           |                        |                                   |                                     |                                 |   |
| <b>NO.</b>   | <b>FREQ.<br/>(MHz)</b> | <b>EMISSION<br/>LEVEL<br/>(dBuV/m)</b> | <b>LIMIT<br/>(dBuV/m)</b> | <b>MARGIN<br/>(dB)</b> | <b>ANTENNA<br/>HEIGHT<br/>(m)</b> | <b>TABLE<br/>ANGLE<br/>(Degree)</b> | <b>RAW<br/>VALUE<br/>(dBuV)</b> | <b>CORRECTION<br/>FACTOR<br/>(dB/m)</b> |
| 1  | 49.56                  | 22.9 QP                                | 40.0                      | -17.1                  | 1.00 V                            | 32                                  | 36.43                           | -13.53                                  |
| 2  | 166.58                 | 24.4 QP                                | 43.5                      | -19.1                  | 2.00 V                            | 202                                 | 37.92                           | -13.52                                  |
| 3  | 311.75                 | 26.5 QP                                | 46.0                      | -19.5                  | 1.50 V                            | 181                                 | 38.45                           | -11.98                                  |
| 4  | 428.32                 | 26.7 QP                                | 46.0                      | -19.3                  | 2.00 V                            | 133                                 | 35.46                           | -8.75                                   |
| 5  | 663.85                 | 32.3 QP                                | 46.0                      | -13.7                  | 1.50 V                            | 130                                 | 36.35                           | -4.03                                   |
| 6  | 906.62                 | 40.5 QP                                | 46.0                      | -5.5                   | 1.50 V                            | 116                                 | 40.23                           | 0.23                                    |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value



A D T

Radiated test was done with antenna

## ABOVE 1GHz DATA

### BT\_LE-GFSK

|                 |              |                      |              |
|-----------------|--------------|----------------------|--------------|
| CHANNEL         | TX Channel 0 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz |                      | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | 2390.00        | 46.8 PK                       | 74.0              | -27.2          | 1.05 H                   | 315                        | 52.40                  | -5.60                          |
| 2   | 2390.00        | 32.3 AV                       | 54.0              | -21.7          | 1.05 H                   | 315                        | 37.90                  | -5.60                          |
| 3   | *2402.00       | 91.0 PK                       |                   |                | 1.05 H                   | 315                        | 96.59                  | -5.59                          |
| 4   | *2402.00       | 80.5 AV                       |                   |                | 1.05 H                   | 315                        | 86.09                  | -5.59                          |
| 5   | 4804.00        | 48.7 PK                       | 74.0              | -25.3          | 1.00 H                   | 234                        | 44.81                  | 3.89                           |
| 6   | 4804.00        | 35.6 AV                       | 54.0              | -18.4          | 1.00 H                   | 234                        | 31.71                  | 3.89                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | 2390.00        | 48.6 PK                       | 74.0              | -25.4          | 1.06 V                   | 269                        | 54.20                  | -5.60                          |
| 2   | 2390.00        | 33.1 AV                       | 54.0              | -20.9          | 1.06 V                   | 269                        | 38.70                  | -5.60                          |
| 3   | *2402.00       | 95.8 PK                       |                   |                | 1.06 V                   | 269                        | 101.39                 | -5.59                          |
| 4   | *2402.00       | 84.5 AV                       |                   |                | 1.06 V                   | 269                        | 90.09                  | -5.59                          |
| 5   | 4804.00        | 47.6 PK                       | 74.0              | -26.4          | 1.55 V                   | 197                        | 43.71                  | 3.89                           |
| 6   | 4804.00        | 36.7 AV                       | 54.0              | -17.3          | 1.55 V                   | 197                        | 32.81                  | 3.89                           |

### REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.



A D T

|                 |               |                      |              |
|-----------------|---------------|----------------------|--------------|
| CHANNEL         | TX Channel 19 | DETECTOR<br>FUNCTION | Peak (PK)    |
| FREQUENCY RANGE | 1GHz ~ 25GHz  |                      | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2440.00       | 90.1 PK                       |                   |                | 1.05 H                   | 300                        | 95.51                  | -5.41                          |
| 2   | *2440.00       | 79.7 AV                       |                   |                | 1.05 H                   | 300                        | 85.11                  | -5.41                          |
| 3   | 4880.00        | 49.4 PK                       | 74.0              | -24.6          | 1.03 H                   | 254                        | 45.60                  | 3.80                           |
| 4   | 4880.00        | 35.9 AV                       | 54.0              | -18.1          | 1.03 H                   | 254                        | 32.10                  | 3.80                           |
| 5   | 7320.00        | 52.9 PK                       | 74.0              | -21.1          | 1.10 H                   | 233                        | 44.63                  | 8.27                           |
| 6   | 7320.00        | 40.0 AV                       | 54.0              | -14.0          | 1.10 H                   | 233                        | 31.73                  | 8.27                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2440.00       | 95.9 PK                       |                   |                | 1.02 V                   | 262                        | 101.31                 | -5.41                          |
| 2   | *2440.00       | 84.3 AV                       |                   |                | 1.02 V                   | 262                        | 89.71                  | -5.41                          |
| 3   | 4880.00        | 47.6 PK                       | 74.0              | -26.4          | 1.48 V                   | 221                        | 43.80                  | 3.80                           |
| 4   | 4880.00        | 36.5 AV                       | 54.0              | -17.5          | 1.48 V                   | 221                        | 32.70                  | 3.80                           |
| 5   | 7320.00        | 51.5 PK                       | 74.0              | -22.5          | 1.00 V                   | 345                        | 43.23                  | 8.27                           |
| 6   | 7320.00        | 38.7 AV                       | 54.0              | -15.3          | 1.00 V                   | 345                        | 30.43                  | 8.27                           |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.





A D T

|                        |               |                              |              |
|------------------------|---------------|------------------------------|--------------|
| <b>CHANNEL</b>         | TX Channel 39 | <b>DETECTOR<br/>FUNCTION</b> | Peak (PK)    |
| <b>FREQUENCY RANGE</b> | 1GHz ~ 25GHz  |                              | Average (AV) |

| ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M |                |                               |                   |                |                          |                            |                        |                                |
|---|----------------|-------------------------------|-------------------|----------------|--------------------------|----------------------------|------------------------|--------------------------------|
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2480.00       | 90.6 PK                       |                   |                | 1.04 H                   | 315                        | 95.83                  | -5.23                          |
| 2   | *2480.00       | 80.2 AV                       |                   |                | 1.04 H                   | 315                        | 85.43                  | -5.23                          |
| 3   | 2483.50        | 47.2 PK                       | 74.0              | -26.8          | 1.04 H                   | 315                        | 52.40                  | -5.20                          |
| 4   | 2483.50        | 33.0 AV                       | 54.0              | -21.0          | 1.04 H                   | 315                        | 38.20                  | -5.20                          |
| 5   | 4960.00        | 49.3 PK                       | 74.0              | -24.7          | 1.03 H                   | 241                        | 45.47                  | 3.83                           |
| 6   | 4960.00        | 36.0 AV                       | 54.0              | -18.0          | 1.03 H                   | 241                        | 32.17                  | 3.83                           |
| 7   | 7440.00        | 53.0 PK                       | 74.0              | -21.0          | 1.04 H                   | 239                        | 44.32                  | 8.68                           |
| 8   | 7440.00        | 39.9 AV                       | 54.0              | -14.1          | 1.04 H                   | 239                        | 31.22                  | 8.68                           |
| ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M   |                |                               |                   |                |                          |                            |                        |                                |
| NO.   | FREQ.<br>(MHz) | EMISSION<br>LEVEL<br>(dBuV/m) | LIMIT<br>(dBuV/m) | MARGIN<br>(dB) | ANTENNA<br>HEIGHT<br>(m) | TABLE<br>ANGLE<br>(Degree) | RAW<br>VALUE<br>(dBuV) | CORRECTION<br>FACTOR<br>(dB/m) |
| 1   | *2480.00       | 96.1 PK                       |                   |                | 1.06 V                   | 272                        | 101.33                 | -5.23                          |
| 2   | *2480.00       | 84.5 AV                       |                   |                | 1.06 V                   | 272                        | 89.73                  | -5.23                          |
| 3   | 2483.50        | 49.9 PK                       | 74.0              | -24.1          | 1.06 V                   | 272                        | 55.10                  | -5.20                          |
| 4   | 2483.50        | 34.0 AV                       | 54.0              | -20.0          | 1.06 V                   | 272                        | 39.20                  | -5.20                          |
| 5   | 4960.00        | 47.8 PK                       | 74.0              | -26.2          | 1.54 V                   | 206                        | 43.97                  | 3.83                           |
| 6   | 4960.00        | 36.8 AV                       | 54.0              | -17.2          | 1.54 V                   | 206                        | 32.97                  | 3.83                           |
| 7   | 7440.00        | 52.0 PK                       | 74.0              | -22.0          | 1.02 V                   | 343                        | 43.32                  | 8.68                           |
| 8   | 7440.00        | 39.2 AV                       | 54.0              | -14.8          | 1.02 V                   | 343                        | 30.52                  | 8.68                           |

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

## 6 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the attached file (Test Setup Photo).

## 7 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

**Linko EMC/RF Lab:**

Tel: 886-2-26052180

Fax: 886-2-26052943

**Hsin Chu EMC/RF Lab:**

Tel: 886-3-5935343

Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety/Telecom Lab:**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://www.bureauveritas-adt.com)

The address and road map of all our labs can be found in our web site also.

## **8 APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No modifications were made to the EUT by the lab during the test.

**--- END ---**