

# ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW-POWER, NON-LICENSED TRANSMITTER

Test Report No. : OT-193-RWD-056

AGR No. : A18DA-151R

Applicant : LG Electronics USA

Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 07632

Manufacturer : LG Electronics Inc.

Address : 222 LG-ro, Jinwi-Myeon, Pyeongtaek -Si, Gyeonggi-Do, 451-713, Korea

Type of Equipment : Car Navigation

FCC ID. : BEJ-MIB3OI

Model Name : MIB3 OI

Serial number : N/A

Total page of Report : 13 pages (including this page)

Date of Incoming : January 11, 2019

Date of issue : March 26, 2019

## SUMMARY

The equipment complies with the regulation; **FCC PART 15 SUBPART C Section 15.247**

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

Reviewed by:



Yu-Seog Sim / Assistant Manager  
ONETECH Corp.

Approved by:



Jae-Ho Lee / Chief Engineer  
ONETECH Corp.

## CONTENTS

### PAGE

|                                                                                |           |
|--------------------------------------------------------------------------------|-----------|
| <b>1. VERIFICATION OF COMPLIANCE .....</b>                                     | <b>4</b>  |
| <b>2. GENERAL INFORMATION.....</b>                                             | <b>5</b>  |
| <b>2.1 PRODUCT DESCRIPTION.....</b>                                            | <b>5</b>  |
| <b>2.2 ALTERNATIVE TYPE(S)/MODEL(S); ALSO COVERED BY THIS TEST REPORT.....</b> | <b>7</b>  |
| <b>3. EUT MODIFICATIONS.....</b>                                               | <b>8</b>  |
| <b>4. MAXIMUM PERMISSIBLE EXPOSURE.....</b>                                    | <b>9</b>  |
| <b>4.1 RF EXPOSURE CALCULATION .....</b>                                       | <b>9</b>  |
| <b>4.2 EUT DESCRIPTION.....</b>                                                | <b>10</b> |
| <b>5. CALCULATED MPE SAFE DISTANCE .....</b>                                   | <b>11</b> |
| <b>5.1 TEST DATA (2.4 GHz BAND) .....</b>                                      | <b>11</b> |
| <b>5.2 TEST DATA (5 GHz BAND).....</b>                                         | <b>12</b> |
| <b>5.3 CALCULATION RESULT OF MAXIMUM CONDUCTED POWER .....</b>                 | <b>13</b> |

### REVISION HISTORY

| Issued Report No. | Issued Date    | Revisions     | Effect Section |
|-------------------|----------------|---------------|----------------|
| OT-193-RWD-056    | March 26, 2019 | Initial Issue | All            |

### DOCUMENT HISTORY

| Revision No. | Issued Date    | Revisions                       | Effect Section |
|--------------|----------------|---------------------------------|----------------|
| Original     | April 28, 2017 | Initial Issue                   | -              |
| Rev. 01      | May 30, 2019   | 4. MAXIMUM PERMISSIBLE EXPOSURE | -              |

## 1. VERIFICATION OF COMPLIANCE

Applicant : LG Electronics USA  
Address : 1000 Sylvan Avenue, Englewood Cliffs, New Jersey, United States, 07632  
Contact Person : Kyung-Su Han / Director  
Telephone No. : (201) 266-2215  
FCC ID : BEJ-MIB3OI  
Model Name : MIB3 OI  
Brand Name : LG, Volkswagen, Seat  
Serial Number : N/A  
Date : March 26, 2019

|                                                         |                                                                                                                  |
|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| EQUIPMENT CLASS                                         | DTS – DIGITAL TRNSMISSION SYSTEM<br>NII – Unlicensed National Information Infrastructure(UNII)                   |
| E.U.T. DESCRIPTION                                      | Car Navigation                                                                                                   |
| THIS REPORT CONCERNS                                    | Original Grant                                                                                                   |
| MEASUREMENT PROCEDURES                                  | ANSI C63.10: 2013                                                                                                |
| TYPE OF EQUIPMENT TESTED                                | Pre-Production                                                                                                   |
| KIND OF EQUIPMENT<br>AUTHORIZATION REQUESTED            | Certification                                                                                                    |
| EQUIPMENT WILL BE OPERATED<br>UNDER FCC RULES PART(S)   | FCC PART 15 SUBPART C Section 15.247<br>FCC PART 15 SUBPART E Section 15.407<br>KDB 558074 D01 DTS Meas Guidance |
| Modifications on the Equipment to Achieve<br>Compliance | None                                                                                                             |
| Final Test was Conducted On                             | 3 m, Semi Anechoic Chamber                                                                                       |

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

## 2. GENERAL INFORMATION

### 2.1 Product Description

The LG Electronics USA, Model MIB3 OI (referred to as the EUT in this report) is a Car Navigation. Product specification information described herein was obtained from product data sheet or user's manual.

| DEVICE TYPE                | Car Navigation       |                                                                                           |                                            |                                                                                                                                    |
|----------------------------|----------------------|-------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| FREQUENCY RANGE            | Bluetooth            | 2 402 MHz ~ 2 480 MHz                                                                     |                                            |                                                                                                                                    |
|                            | WLAN<br>2.4 GHz Band | 2 412 MHz ~ 2 462 MHz (802.11b/g/n(HT20))                                                 |                                            |                                                                                                                                    |
|                            | WLAN<br>5 GHz Band   | 5 150 MHz ~<br>5 250 MHz Band                                                             | 5 180 MHz ~ 5 240 MHz (802.11a/n/ac(HT20)) |                                                                                                                                    |
|                            |                      |                                                                                           | 5 190 MHz ~ 5 230 MHz (802.11n/ac(HT40))   |                                                                                                                                    |
|                            |                      |                                                                                           | 5 210 MHz (802.11ac(VHT80))                |                                                                                                                                    |
|                            |                      | 5 725 MHz ~<br>5 850 MHz Band                                                             | 5 745 MHz ~ 5 825 MHz (802.11a/n/ac(HT20)) |                                                                                                                                    |
|                            |                      |                                                                                           | 5 755 MHz ~ 5 795 MHz (802.11n/ac(HT40))   |                                                                                                                                    |
|                            |                      |                                                                                           | 5 775 MHz (802.11ac(VHT80))                |                                                                                                                                    |
| MAX. RF<br>OUTPUT<br>POWER | Bluetooth            | 1 Mbps                                                                                    | -1.40 dBm                                  |                                                                                                                                    |
|                            |                      | 2 Mbps                                                                                    | -0.61 dBm                                  |                                                                                                                                    |
|                            |                      | 3 Mbps                                                                                    | -0.07 dBm                                  |                                                                                                                                    |
|                            | WLAN<br>2.4 GHz Band | Wi-Fi 802.11b (15.43 dBm)<br>Wi-Fi 802.11g (17.26 dBm)<br>Wi-Fi 802.11n(HT20) (15.97 dBm) |                                            |                                                                                                                                    |
|                            | WLAN<br>5 GHz Band   | 5 150 MHz ~<br>5 250 MHz Band                                                             | Antenna 0                                  | Wi-Fi 802.11a (10.49 dBm)<br>Wi-Fi 802.11n(HT20) (10.44 dBm)<br>Wi-Fi 802.11n(HT40) (8.21 dBm)<br>Wi-Fi 802.11ac(VHT80) (7.34 dBm) |
|                            |                      |                                                                                           | Antenna 1                                  | Wi-Fi 802.11a (10.15 dBm)<br>Wi-Fi 802.11n(HT20) (10.07 dBm)<br>Wi-Fi 802.11n(HT40) (8.35 dBm)<br>Wi-Fi 802.11ac(VHT80) (7.68 dBm) |
|                            |                      |                                                                                           | Multiple transmit                          | Wi-Fi 802.11n(HT20) (13.24 dBm)<br>Wi-Fi 802.11n(HT40) (11.29 dBm)<br>Wi-Fi 802.11ac(VHT80) (10.52 dBm)                            |

|                                                       |                        |                               |                                                                            |                   |                                                                                                                                    |  |
|-------------------------------------------------------|------------------------|-------------------------------|----------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------|--|
| MAX. RF<br>OUTPUT<br>POWER                            | WLAN<br>5 GHz Band     | 5 725 MHz ~<br>5 850 MHz Band |                                                                            | Antenna 0         | Wi-Fi 802.11a (9.37 dBm)<br>Wi-Fi 802.11n(HT20) (9.39 dBm)<br>Wi-Fi 802.11n(HT40) (7.29 dBm)<br>Wi-Fi 802.11ac(VHT80) (6.34 dBm)   |  |
|                                                       |                        |                               |                                                                            | Antenna 1         | Wi-Fi 802.11a (10.42 dBm)<br>Wi-Fi 802.11n(HT20) (10.52 dBm)<br>Wi-Fi 802.11n(HT40) (8.49 dBm)<br>Wi-Fi 802.11ac(VHT80) (7.74 dBm) |  |
|                                                       |                        |                               |                                                                            | Multiple transmit | Wi-Fi 802.11n(HT20) (12.84 dBm)<br>Wi-Fi 802.11n(HT40) (10.94 dBm)<br>Wi-Fi 802.11ac(VHT80) (10.11 dBm)                            |  |
| MODULATION<br>TYPE                                    | Bluetooth              |                               | GFSK for 1 Mbps, $\pi/4$ -DQPSK for 2 Mbps, 8-DPSK for 3 Mbps              |                   |                                                                                                                                    |  |
|                                                       | WLAN<br>2.4 GHz Band   |                               | DSSS Modulation(DBPSK/DQPSK/CCK)<br>OFDM Modulation(BPSK/QPSK/16QAM/64QAM) |                   |                                                                                                                                    |  |
|                                                       | WLAN<br>5 GHz Band     |                               | OFDM Modulation(BPSK/QPSK/16QAM/64QAM)                                     |                   |                                                                                                                                    |  |
| ANTENNA TYPE                                          | Bluetooth              |                               | PCB Antenna                                                                |                   |                                                                                                                                    |  |
|                                                       | WLAN (2.4GHz Band)     |                               | Chip Antenna                                                               |                   |                                                                                                                                    |  |
|                                                       | WLAN (5GHz Band)       | Antenna 0                     | PCB Antenna                                                                |                   |                                                                                                                                    |  |
|                                                       |                        | Antenna 1                     | Chip Antenna                                                               |                   |                                                                                                                                    |  |
| ANTENNA GAIN                                          | Bluetooth              |                               | 2.5 dBi                                                                    |                   |                                                                                                                                    |  |
|                                                       | WLAN<br>2.4 GHz Band   |                               | 3.8 dBi                                                                    |                   |                                                                                                                                    |  |
|                                                       | WLAN<br>5 GHz Band     | 5 150 MHz ~<br>5 250 MHz      | ANT0                                                                       | 3.8 dBi           |                                                                                                                                    |  |
|                                                       |                        |                               | ANT1                                                                       | 1.6 dBi           |                                                                                                                                    |  |
|                                                       |                        | 5 725 MHz ~<br>5 850 MHz      | ANT0                                                                       | 5.5 dBi           |                                                                                                                                    |  |
|                                                       |                        |                               | ANT1                                                                       | 2.4 dBi           |                                                                                                                                    |  |
|                                                       | 5 GHz Band (ANT 0 + 1) | 5 150 MHz ~<br>5 250 MHz      | 5.78 dBi                                                                   |                   |                                                                                                                                    |  |
|                                                       |                        | 5 725 MHz ~<br>5 850 MHz      | 7.10 dBi                                                                   |                   |                                                                                                                                    |  |
| List of each Osc. or crystal<br>Freq.(Freq. >= 1 MHz) |                        |                               | 31.25 MHz, 28.63636 MHz                                                    |                   |                                                                                                                                    |  |
| RATED SUPPLY VOLTAGE                                  |                        |                               | DC 12.0 V                                                                  |                   |                                                                                                                                    |  |

- Directional Gain Calculations

$$\text{Directional gain} = 10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N_{\text{ANT}}] \text{ dBi}$$

## 2.2 Alternative type(s)/model(s); also covered by this test report.

-. The following lists consist of the added config and their differences.:

| Brand                    | Model   | Config      | Feature |       |     |     |     |                     |          | Tested                              |
|--------------------------|---------|-------------|---------|-------|-----|-----|-----|---------------------|----------|-------------------------------------|
|                          |         |             | BT      | Wi-Fi | RVC | DAB | Amp | Tuner Configuration | Platform |                                     |
| LG<br>Volkswagen<br>Seat | MIB3 OI | L91VW3-N200 | O       | O     | O   | O   | 4CH | Mercury,Merlin      | MQB      | <input checked="" type="checkbox"/> |
|                          |         | L91VW3-N20A | O       | O     | O   | O   | 4CH | Titan,Merlin        | MQB      | <input type="checkbox"/>            |
|                          |         | L91VW3-N320 | O       | O     | O   | X   | 4CH | Mercury,Merlin      | MQB      | <input type="checkbox"/>            |
|                          |         | L91VW3-N160 | O       | O     | O   | O   | 4CH | Mercury,Merlin      | MQB      | <input type="checkbox"/>            |
|                          |         | L91VW3-N16A | O       | O     | O   | O   | 4CH | Titan,Merlin        | MQB      | <input type="checkbox"/>            |
|                          |         | L91VW3-N740 | O       | O     | O   | X   | 4CH | Titan,Merlin        | MQB      | <input type="checkbox"/>            |
|                          |         | L91VW3-N760 | O       | O     | O   | X   | 4CH | Mercury,Merlin      | MQB      | <input type="checkbox"/>            |
|                          |         | L92VW3-N200 | O       | O     | X   | O   | 4CH | Mercury,Titan       | MQB37    | <input type="checkbox"/>            |
|                          |         | L92VW3-N20A | O       | O     | X   | O   | 4CH | Mercury,Titan       | MQB37    | <input type="checkbox"/>            |
|                          |         | L92VW3-N320 | O       | O     | X   | X   | 4CH | Titan,Merlin        | MQB37    | <input type="checkbox"/>            |
|                          |         | L92VW3-N160 | O       | O     | X   | O   | 4CH | Mercury,Titan       | MQB37    | <input type="checkbox"/>            |
|                          |         | L92VW3-N16A | O       | O     | X   | O   | 4CH | Mercury,Titan       | MQB37    | <input type="checkbox"/>            |
|                          |         | L92VW3-N740 | O       | O     | X   | X   | 4CH | Titan,Merlin        | MQB37    | <input type="checkbox"/>            |
|                          |         | L92VW3-N760 | O       | O     | X   | X   | 4CH | Titan,Merlin        | MQB37    | <input type="checkbox"/>            |
|                          |         | L91SE3-N200 | O       | O     | O   | O   | 4CH | Mercury,Merlin      | MQB      | <input type="checkbox"/>            |
|                          |         | L91SE3-N20A | O       | O     | O   | O   | 4CH | Mercury,Merlin      | MQB      | <input type="checkbox"/>            |
|                          |         | L91SE3-N320 | O       | O     | O   | X   | 4CH | Titan,Merlin        | MQB      | <input type="checkbox"/>            |
|                          |         | L91SE3-N620 | O       | O     | O   | O   | 4CH | Mercury,Merlin      | MQB      | <input type="checkbox"/>            |
|                          |         | L91SE3-N62A | O       | O     | O   | O   | 4CH | Mercury,Merlin      | MQB      | <input type="checkbox"/>            |
|                          |         | L91SE3-N670 | O       | O     | O   | X   | 4CH | Titan,Merlin        | MQB      | <input type="checkbox"/>            |
|                          |         | L91SE3-N680 | O       | O     | O   | X   | 4CH | Titan,Merlin        | MQB      | <input type="checkbox"/>            |
|                          |         | L92SE3-N620 | O       | O     | X   | O   | 4CH | Mercury,Titan       | MQB37    | <input type="checkbox"/>            |
|                          |         | L92SE3-N62A | O       | O     | X   | O   | 4CH | Mercury,Titan       | MQB37    | <input type="checkbox"/>            |
|                          |         | L92SE3-N670 | O       | O     | X   | X   | 4CH | Titan,Merlin        | MQB37    | <input type="checkbox"/>            |
|                          |         | L92SE3-N680 | O       | O     | X   | X   | 4CH | Titan,Merlin        | MQB37    | <input type="checkbox"/>            |

Note: 1. Applicants must delegate only the models with all features applied to be tested, Therefore, this test report only guarantees the unit tested.

2. The Applicant/manufacture is responsible for the compliance of all configs.

### 3. EUT MODIFICATIONS

-. None

## 4. MAXIMUM PERMISSIBLE EXPOSURE

### 4.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment are  $f/1500 \text{ mW/cm}^2$  for the frequency range between 300 MHz and 1 500 MHz and  $1.0 \text{ mW/cm}^2$  for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a  $1 \text{ mW/cm}^2$  exposure is calculated as follows:

$$E = \sqrt{(30 * P * G) / d}, \text{ and } S = E^2 / Z = E^2 / 377, \text{ because } 1 \text{ mW/cm}^2 = 10 \text{ W/m}^2$$

Where

$S$  = Power density in  $\text{mW/cm}^2$ ,  $Z$  = Impedance of free space,  $377 \Omega$

$E$  = Electric field strength in  $\text{V/m}$ ,  $G$  = Numeric antenna gain, and  $d$  = distance in meter

Combining equations and rearranging the terms to express the distance as a function of the remaining variable

$$d = \sqrt{(30 * P * G) / (377 * 10 S)}$$

Changing to units of mW and cm, using  $P (\text{mW}) = P (\text{W}) / 1 000$ ,  $d (\text{cm}) = 0.01 * d (\text{m})$

$$d = 0.282 * \sqrt{(P * G) / S}$$

Where

$d$  = distance in cm,  $P$  = Power in mW,  $G$  = Numeric antenna gain, and  $S$  = Power density in  $\text{mW/cm}^2$

## 4.2 EUT Description

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Kind of EUT                 | Car Navigation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Operating Frequency Band    | <input type="checkbox"/> Wireless Microphone: 494.000 MHz ~ 501.000 MHz<br>and 498.200 MHz ~ 505.200 MHz<br><input checked="" type="checkbox"/> WLAN: 2 412 MHz ~ 2 462 MHz<br><input type="checkbox"/> WLAN: 2 422 MHz ~ 2 452 MHz<br><input checked="" type="checkbox"/> WLAN: 5 180 MHz ~ 5 240 MHz<br><input checked="" type="checkbox"/> WLAN: 5 190 MHz ~ 5 230 MHz<br><input checked="" type="checkbox"/> WLAN: 5 210 MHz<br><input checked="" type="checkbox"/> WLAN: 5 745 MHz ~ 5 825 MHz<br><input checked="" type="checkbox"/> WLAN: 5 755 MHz ~ 5 795 MHz<br><input checked="" type="checkbox"/> WLAN: 5 775 MHz<br><input checked="" type="checkbox"/> FHSS: 2 402 MHz ~ 2 480 MHz<br><input type="checkbox"/> GFSK Modulation: 2403 MHz , 2443 MHz , 2478 MHz |
| Device Category             | <input type="checkbox"/> Portable (< 20 cm separation)<br><input checked="" type="checkbox"/> Mobile (> 20 cm separation)<br><input type="checkbox"/> Others                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Exposure Evaluation Applied | <input checked="" type="checkbox"/> MPE<br><input type="checkbox"/> SAR<br><input type="checkbox"/> N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## 5. Calculated MPE Safe Distance

### 5.1 Test data (2.4 GHz Band)

According to above equation, the following result was obtained.

| Operating Freq. Band | Operating Mode | Target Power W/tolerance | Max tune up power |       | Antenna Gain |        | Safe Distance (cm) | Power Density (mW/cm <sup>2</sup> ) @ 20 cm Separation | Limit (mW/cm <sup>2</sup> ) |
|----------------------|----------------|--------------------------|-------------------|-------|--------------|--------|--------------------|--------------------------------------------------------|-----------------------------|
|                      |                | (dBm)                    | (dBm)             | (mW)  | Log          | Linear |                    |                                                        |                             |
| 2 400 ~ 2 483.5      | 802.11b        | 14.93 ± 0.5              | 15.43             | 34.91 | 3.8          | 2.399  | 2.87               | 0.016 7                                                | 1.00                        |
| 2 400 ~ 2 483.5      | 802.11g        | 16.76 ± 0.5              | 17.26             | 53.21 | 3.8          | 2.399  | 3.19               | 0.025 4                                                | 1.00                        |
| 2 400 ~ 2 483.5      | 802.11n(HT20)  | 15.47 ± 0.5              | 15.97             | 39.54 | 3.8          | 2.399  | 2.75               | 0.018 9                                                | 1.00                        |

According to above table, for 2 400 ~ 2 483.5 MHz Band, safe distance,

$$D = 0.282 * \sqrt{(34.91 * 2.399)/1.00} = 2.87 \text{ cm}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 34.91 * 2.399 / (4 * 3.14 * 20^2) = 0.016 7$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna



Tested by: Ha-Ram Lee / Assistant Manager

## 5.2 Test data (5 GHz Band)

According to above equation, the following result was obtained.

| Operating Freq. Band | Operating Mode  | Target Power W/tolerance | Max tune up power |       | Antenna Gain |        | Safe Distance (cm) | Power Density (mW/cm <sup>2</sup> ) @ 20 cm Separation | Limit (mW/cm <sup>2</sup> ) |
|----------------------|-----------------|--------------------------|-------------------|-------|--------------|--------|--------------------|--------------------------------------------------------|-----------------------------|
|                      |                 | (dBm)                    | (dBm)             | (mW)  | Log          | Linear |                    |                                                        |                             |
| 5 150 ~ 5 250        | 802.11a         | 9.99 ± 0.5               | 10.49             | 11.19 | 3.80         | 2.399  | 1.46               | 0.005 3                                                | 1.00                        |
| 5 150 ~ 5 250        | 802.11n(HT20)   | 12.74 ± 0.5              | 13.24             | 21.09 | 5.78         | 3.784  | 2.52               | 0.015 9                                                | 1.00                        |
| 5 150 ~ 5 250        | 802.11n(HT40)   | 10.79 ± 0.5              | 11.29             | 13.46 | 5.78         | 3.784  | 2017               | 0.010 1                                                | 1.00                        |
| 5 150 ~ 5 250        | 802.11ac(VHT80) | 10.02 ± 0.5              | 10.52             | 11.27 | 5.78         | 3.784  | 1.84               | 0.008 5                                                | 1.00                        |
| 5 725 ~5 850         | 802.11a         | 9.92 ± 0.5               | 10.42             | 11.02 | 2.40         | 1.738  | 1.23               | 0. 003 8                                               | 1.00                        |
| 5 725 ~5 850         | 802.11n(HT20)   | 12.34 ± 0.5              | 12.84             | 19.23 | 7.10         | 5.129  | 2.80               | 0.019 6                                                | 1.00                        |
| 5 725 ~5 850         | 802.11n(HT40)   | 10.44 ± 0.5              | 10.94             | 12.42 | 7.10         | 5.129  | 2.25               | 0.012 7                                                | 1.00                        |
| 5 725 ~5 850         | 802.11ac(VHT80) | 9.61 ± 0.5               | 10.11             | 10.26 | 7.10         | 5.129  | 2.05               | 0.010 5                                                | 1.00                        |

According to above table, for 5 150 ~ 5 250 MHz Band, safe distance,

$$D = 0.282 * \sqrt{(11.19 * 2.399)/1.00} = 1.46 \text{ cm}$$

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 11.19 * 2.399 / (4 * 3.14 * 20^2) = 0.005 3$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna



**Tested by: Ha-Ram Lee / Assistant Manager**

### 5.3 Calculation Result Of Maximum Conducted Power

| Operating Freq. Band | Operating Mode | Target Power W/tolerance | Max tune up power |       | Antenna Gain |        | Safe Distance (cm) | Power Density (mW/cm <sup>2</sup> ) @ 20 cm Separation | Limit (mW/cm <sup>2</sup> ) |
|----------------------|----------------|--------------------------|-------------------|-------|--------------|--------|--------------------|--------------------------------------------------------|-----------------------------|
|                      |                | (dBm)                    | (dBm)             | (mW)  | Log          | Linear |                    |                                                        |                             |
| 2.4G WLAN            | 802.11g        | 16.76 ± 0.5              | 17.26             | 53.21 | 3.80         | 2.399  | 3.19               | 0.025 4                                                | 1.00                        |
| BT                   | 3 Mbps         | -0.57 ± 0.5              | -0.07             | 0.98  | 2.5          | 1.778  | 0.37               | 0.000 348                                              | 1.00                        |
| 5 150 ~ 5 250        | 802.11n(HT20)  | 12.74 ± 0.5              | 13.24             | 21.09 | 5.78         | 3.784  | 2.52               | 0.015 9                                                | 1.00                        |
| 5 725 ~5 850         | 802.11n(HT20)  | 12.34 ± 0.5              | 12.84             | 19.23 | 7.10         | 5.129  | 2.80               | 0.019 6                                                | 1.00                        |

- Bluetooth transmit simultaneously with 2.4 GHz and 5 GHz WiFi.

2.4 GHz band + Bluetooth + 5 GHz band =

$(0.025\ 4 / 1) + (0.000\ 348 / 1) + (0.015\ 9 / 1) + (0.019\ 6 / 1) = 0.061\ 248$

- Therefore the maximum calculations of above situations are less than the “1” limit.



**Tested by: Ha-Ram Lee / Assistant Manager**