

## **FCC 15.247& RSS-247 2.4GHz Test Report**

**for**

**LG Electronics Inc.**

**222, LG-ro Jinwi-myeon, Pyeongtaek-Si, Gyeonggi-Do,  
451-713, Korea**

**Product Name : Notebook Computer**  
**Model Name : (1)14Z90N (2)14ZB90N (3)14ZD90N  
(4)14ZG90N (5)14ZC90N**  
**Brand : LG**  
**FCC ID : BEJNT-14Z90N**  
**IC : 2703H-14Z90N**

**Prepared by: : AUDIX Technology Corporation,  
EMC Department**



The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

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## TEST REPORT CERTIFICATION

Applicant : LG Electronics Inc.  
Manufacturer : LG Electronics Inc.  
Factory #1 : LG Electronics Nanjing New Technology Co., Ltd.  
Factory #2 : SEO HEUNG ELECTRONICS CO LTD  
EUT Description  
(1) Product : Notebook Computer  
(2) Model : (1)14Z90N (2)14ZB90N (3)14ZD90N (4)14ZG90N (5)14ZC90N  
(3) Brand : LG  
(4) Power Supply: DC 19V, 2.53A

### Applicable Standards:

47CFR FCC Part 15 Subpart C  
RSS-Gen (Issue 5), April 2018  
RSS-247 (Issue 2), February 2017  
ANSI C63.10:2013

**Audix Technology Corp.** tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

**Audix Technology Corp.** does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

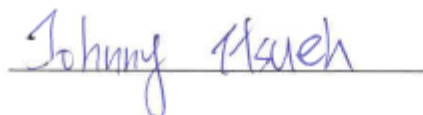
Date of Report: 2019. 10. 23

Reviewed by:



(Sabrina Wang/Administrator)

Approved by:



(Johnny Hsueh/Section Manager)



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## 1. REVISION RECORD OF TEST REPORT

| Edition No | Issued Date  | Revision Summary | Report Number |
|------------|--------------|------------------|---------------|
| 0          | 2019. 10. 23 | Original Report  | EM-F190363    |

## 2. SUMMARY OF TEST RESULTS

| Rule                                                                                                                                                                                                                                                                                                                                                       |                              | Description                                             | Data Reused                     | Results           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------|---------------------------------|-------------------|
| FCC                                                                                                                                                                                                                                                                                                                                                        | IC                           |                                                         |                                 |                   |
| 15.207                                                                                                                                                                                                                                                                                                                                                     | RSS-Gen §8.8                 | Conducted Emission                                      | No                              | <b>PASS</b>       |
| 15.247(d)/<br>15.205                                                                                                                                                                                                                                                                                                                                       | RSS-Gen §8.9<br>RSS-247 §5.5 | Radiated Band Edge and<br>Radiated Spurious Emission    | No                              | <b>PASS</b>       |
| 15.247(a)(2)                                                                                                                                                                                                                                                                                                                                               | RSS-247 §5.2(1)              | 6dB/Occupied Bandwidth                                  | Yes                             | <b>PASS</b>       |
| 15.247(b)(3)                                                                                                                                                                                                                                                                                                                                               | RSS-247 §5.4(4)              | Maximum Peak Output Power                               | SPOT<br>CHECK <sup>Note 2</sup> | <b>PASS</b>       |
| 15.247(d)                                                                                                                                                                                                                                                                                                                                                  | RSS-247 §5.5                 | Conducted Band Edges and<br>Conducted Spurious Emission | Yes                             | <b>PASS</b>       |
| 15.247 (e)                                                                                                                                                                                                                                                                                                                                                 | RSS-247 §5.2(2)              | Peak Power Spectral Density                             | Yes                             | <b>PASS</b>       |
| 15.203                                                                                                                                                                                                                                                                                                                                                     | RSS-Gen §8.3                 | Antenna Requirement                                     | ---                             | <b>Compliance</b> |
| <p>Note: 1. The uncertainties value is not used in determining the result.</p> <p>2. This device embedded with same radio transmitter with FCC ID: BEJNT-15Z90N, IC: 2703H-15Z90N. According to KDB 484596 D01, we did spot check for output power and all output power values keep identical thus we reuse all results except to E.I.R.P. test items.</p> |                              |                                                         |                                 |                   |

### 3. GENERAL INFORMATION

#### 3.1. Description of Application

|              |                                                                                                                                 |
|--------------|---------------------------------------------------------------------------------------------------------------------------------|
| Applicant    | LG Electronics Inc.<br>222, LG-roJinwi-myeon, Pyeongtaek-Si, Gyeonggi-Do, 451-713, Korea                                        |
| Manufacturer | LG Electronics Inc.<br>222, LG-roJinwi-myeon, Pyeongtaek-Si, Gyeonggi-Do, 451-713, Korea                                        |
| Factory #1   | LG Electronics Nanjing New Technology Co., Ltd.<br>No.346, Yaoxin Road, Economic & Technical Development Zone, Nanjing, China.  |
| Factory #2   | SEO HEUNG ELECTRONICS CO LTD<br>55 Asan valley Seo-ro, Dunpo-myeon, Asan-si, Chungcheongnam-do, 31409 Korea                     |
| Product      | Notebook Computer<br>The product has two colors (Dark Silver and White).                                                        |
| Model        | (1)14Z90N (2)14ZB90N (3)14ZD90N (4)14ZG90N (5)14ZC90N<br>The difference between all models is different in the sales customers. |
| Brand        | LG                                                                                                                              |

### 3.2. Description of EUT

| Test Model                                | 14Z90N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|--|---------|------|---------|------|--------------|------|--------------|------|---------------|------|---------------|------|--------|------|------------|--|---------|------|-------------------------------------------|------|-------------------------------------------|------|------------------------------|------|--------------------------------|------|
| Serial Number                             | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| Power Rating                              | DC 19V, 2.53A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| Software Version                          | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| RF Features                               | WLAN: 802.11 a/b/g/n/ac/ax<br>Bluetooth: BT and BLE (BT 5.0)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| Transmit Type                             | <table><thead><tr><th colspan="2">2.4 GHz</th></tr></thead><tbody><tr><td>802.11b</td><td>1T1R</td></tr><tr><td>802.11g</td><td>1T1R</td></tr><tr><td>802.11n-HT20</td><td>2T2R</td></tr><tr><td>802.11n-HT40</td><td>2T2R</td></tr><tr><td>802.11ax-HE20</td><td>2T2R</td></tr><tr><td>802.11ax-HE40</td><td>2T2R</td></tr><tr><td>BT/BLE</td><td>1T1R</td></tr></tbody></table><br><table><thead><tr><th colspan="2">UNII Bands</th></tr></thead><tbody><tr><td>802.11a</td><td>1T1R</td></tr><tr><td>802.11n-HT20/802.11ac-VHT20/802.11ax-HE20</td><td>2T2R</td></tr><tr><td>802.11n-HT40/802.11ac-VHT40/802.11ax-HE40</td><td>2T2R</td></tr><tr><td>802.11ac-VHT80/802.11ax-HE80</td><td>2T2R</td></tr><tr><td>802.11ac-VHT160/802.11ax-HE160</td><td>2T2R</td></tr></tbody></table> | 2.4 GHz |  | 802.11b | 1T1R | 802.11g | 1T1R | 802.11n-HT20 | 2T2R | 802.11n-HT40 | 2T2R | 802.11ax-HE20 | 2T2R | 802.11ax-HE40 | 2T2R | BT/BLE | 1T1R | UNII Bands |  | 802.11a | 1T1R | 802.11n-HT20/802.11ac-VHT20/802.11ax-HE20 | 2T2R | 802.11n-HT40/802.11ac-VHT40/802.11ax-HE40 | 2T2R | 802.11ac-VHT80/802.11ax-HE80 | 2T2R | 802.11ac-VHT160/802.11ax-HE160 | 2T2R |
| 2.4 GHz                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11b                                   | 1T1R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11g                                   | 1T1R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11n-HT20                              | 2T2R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11n-HT40                              | 2T2R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11ax-HE20                             | 2T2R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11ax-HE40                             | 2T2R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| BT/BLE                                    | 1T1R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| UNII Bands                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11a                                   | 1T1R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11n-HT20/802.11ac-VHT20/802.11ax-HE20 | 2T2R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11n-HT40/802.11ac-VHT40/802.11ax-HE40 | 2T2R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11ac-VHT80/802.11ax-HE80              | 2T2R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| 802.11ac-VHT160/802.11ax-HE160            | 2T2R                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| Sample Status                             | Mass production                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| Date of Receipt                           | 2019. 09. 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| Date of Test                              | 2019. 09. 18 ~ 10. 02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| Interface Ports of EUT                    | <ul style="list-style-type: none"><li>• One Micro SD Card Slot</li><li>• One Earphone Port</li><li>• Two USB 3.0 Ports</li><li>• One USB Type C Port</li><li>• One HDMI Port</li><li>• One DC Input Port</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |
| Accessories Supplied                      | <ul style="list-style-type: none"><li>• AC Adapter</li><li>• LAN Gender</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |         |  |         |      |         |      |              |      |              |      |               |      |               |      |        |      |            |  |         |      |                                           |      |                                           |      |                              |      |                                |      |

### 3.3. Antenna Information

| 2.4G Antenna |                            |              |              |                 |                |
|--------------|----------------------------|--------------|--------------|-----------------|----------------|
| No.          | Antenna Part Number        | Manufacture  | Antenna Type | Frequency (MHz) | Max Gain (dBi) |
| 1.           | WA-P-LBLB-04-069<br>(Main) | INPAQ        | Mono-pole    | 2400            | 3.28           |
|              |                            |              |              | 2410            | 2.63           |
|              |                            |              |              | 2420            | 2.69           |
|              |                            |              |              | 2430            | 2.74           |
|              |                            |              |              | 2440            | 2.96           |
|              |                            |              |              | 2450            | 3.36           |
|              |                            |              |              | 2460            | 3.70           |
|              |                            |              |              | 2470            | 4.12           |
|              |                            |              |              | 2480            | <b>4.29</b>    |
|              |                            |              |              | 2490            | 4.28           |
|              |                            |              |              | 2500            | 4.26           |
| 2.           | WA-P-LBLB-04-069<br>(AUX)  | INPAQ        | Mono-pole    | 2400            | 4.52           |
|              |                            |              |              | 2410            | 3.99           |
|              |                            |              |              | 2420            | 4.14           |
|              |                            |              |              | 2430            | 4.55           |
|              |                            |              |              | 2440            | 4.78           |
|              |                            |              |              | 2450            | 5.06           |
|              |                            |              |              | 2460            | 5.23           |
|              |                            |              |              | 2470            | <b>5.32</b>    |
|              |                            |              |              | 2480            | 5.13           |
|              |                            |              |              | 2490            | 4.87           |
|              |                            |              |              | 2500            | 4.70           |
| 3.           | L1LRF002-CS-H<br>(Main)    | LUXSHARE-ICT | Mono-pole    | 2400            | 4.9            |
|              |                            |              |              | 2450            | <b>4.9</b>     |
|              |                            |              |              | 2500            | 3.9            |
| 4.           | L1LRF002-CS-H<br>(AUX)     | LUXSHARE-ICT | Mono-pole    | 2400            | 3.9            |
|              |                            |              |              | 2450            | <b>4.2</b>     |
|              |                            |              |              | 2500            | 4.0            |

| 5G Antenna |                            |             |              |                 |                |
|------------|----------------------------|-------------|--------------|-----------------|----------------|
| No.        | Antenna Part Number        | Manufacture | Antenna Type | Frequency (MHz) | Max Gain (dBi) |
| 1.         | WA-P-LBLB-04-069<br>(Main) | INPAQ       | Mono-pole    | 5100            | 2.48           |
|            |                            |             |              | 5150            | 2.17           |
|            |                            |             |              | 5200            | 1.71           |
|            |                            |             |              | 5250            | 2.69           |
|            |                            |             |              | 5300            | 3.06           |
|            |                            |             |              | 5350            | 4.42           |
|            |                            |             |              | 5400            | 3.73           |
|            |                            |             |              | 5450            | 3.84           |
|            |                            |             |              | 5500            | 3.73           |
|            |                            |             |              | 5550            | 3.17           |
|            |                            |             |              | 5600            | 3.06           |
|            |                            |             |              | 5650            | 3.96           |
|            |                            |             |              | 5700            | 3.69           |
|            |                            |             |              | 5750            | 4.77           |
|            |                            |             |              | 5800            | <b>4.86</b>    |
| 2.         | WA-P-LBLB-04-069<br>(AUX)  | INPAQ       | Mono-pole    | 5100            | 4.89           |
|            |                            |             |              | 5150            | <b>5.28</b>    |
|            |                            |             |              | 5200            | 4.96           |
|            |                            |             |              | 5250            | 4.08           |
|            |                            |             |              | 5300            | 3.88           |
|            |                            |             |              | 5350            | 4.04           |
|            |                            |             |              | 5400            | 3.69           |
|            |                            |             |              | 5450            | 3.68           |
|            |                            |             |              | 5500            | 4.12           |
|            |                            |             |              | 5550            | 4.59           |
|            |                            |             |              | 5600            | 4.18           |
|            |                            |             |              | 5650            | 3.30           |
|            |                            |             |              | 5700            | 2.56           |
|            |                            |             |              | 5750            | 1.65           |
|            |                            |             |              | 5800            | 1.31           |

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| 5G Antenna |                         |              |              |                 |                |
|------------|-------------------------|--------------|--------------|-----------------|----------------|
| No.        | Antenna Part Number     | Manufacture  | Antenna Type | Frequency (MHz) | Max Gain (dBi) |
| 3.         | L1LRF002-CS-H<br>(Main) | LUXSHARE-ICT | Mono-pole    | 5150            | <b>4.1</b>     |
|            |                         |              |              | 5250            | 3.3            |
|            |                         |              |              | 5350            | 3.8            |
|            |                         |              |              | 5470            | 3.0            |
|            |                         |              |              | 5600            | 3.2            |
|            |                         |              |              | 5725            | 3.6            |
|            |                         |              |              | 5785            | 3.1            |
|            |                         |              |              | 5800            | 3.9            |
|            |                         |              |              | 5850            | 3.8            |
| 4.         | L1LRF002-CS-H<br>(AUX)  | LUXSHARE-ICT | Mono-pole    | 5150            | 3.6            |
|            |                         |              |              | 5250            | 2.9            |
|            |                         |              |              | 5350            | 3.4            |
|            |                         |              |              | 5470            | 3.2            |
|            |                         |              |              | 5600            | 3.4            |
|            |                         |              |              | 5725            | <b>3.7</b>     |
|            |                         |              |              | 5785            | 3.0            |
|            |                         |              |              | 5800            | 3.4            |
|            |                         |              |              | 5850            | 2.7            |

### 3.4. EUT Specifications Assessed in Current Report

| Mode          | Fundamental Range (MHz) | Channel Number | Modulation                                       | Data Rate (Mbps) |
|---------------|-------------------------|----------------|--------------------------------------------------|------------------|
| 802.11b       | 2412-2472               | 13             | DSSS (DBPSK/DQPSK/CCK)                           | Up to 11         |
| 802.11g       |                         | 13             | OFDM (BPSK/QPSK/16QAM/64QAM)                     | Up to 54         |
| 802.11n-HT20  |                         |                |                                                  | Up to 144.4      |
| 802.11n-HT40  | 2422-2462               | 9              | OFDM (BPSK/QPSK/16QAM/64QAM)                     | Up to 300        |
| 802.11ax-HE20 | 2412-2472               | 13             | OFDMA (BPSK/ QPSK/ 16QAM/ 64QAM/ 256QAM/1024QAM) | Up to 144.4      |
| 802.11ax-HE40 | 2422-2462               | 9              |                                                  | Up to 300        |
| BLE           | 2402-2480               | 40             | GFSK (1M, 2M, PHY Coded S8, PHY Coded S2)        | 2                |

| Channel List              |                 |                      |                 |
|---------------------------|-----------------|----------------------|-----------------|
| 802.11 b/g/n-HT20/ax-HE20 |                 | 802.11n-HT40/ax-HE40 |                 |
| Channel Number            | Frequency (MHz) | Channel Number       | Frequency (MHz) |
| 1                         | 2412            | 3                    | 2422            |
| 2                         | 2417            | 4                    | 2427            |
| 3                         | 2422            | 5                    | 2432            |
| 4                         | 2427            | 6                    | 2437            |
| 5                         | 2432            | 7                    | 2442            |
| 6                         | 2437            | 8                    | 2447            |
| 7                         | 2442            | 9                    | 2452            |
| 8                         | 2447            | 10                   | 2457            |
| 9                         | 2452            | 11                   | 2462            |
| 10                        | 2457            | ---                  |                 |
| 11                        | 2462            |                      |                 |
| 12                        | 2467            |                      |                 |
| 13                        | 2472            |                      |                 |

| Channel List   |                 |                |                 |                |                 |                |                 |
|----------------|-----------------|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| BLE            |                 |                |                 |                |                 |                |                 |
| Channel Number | Frequency (MHz) | Channel Number | Frequency (MHz) | Channel Number | Frequency (MHz) | Channel Number | Frequency (MHz) |
| 37             | 2402            | 09             | 2422            | 18             | 2442            | 28             | 2462            |
| 00             | 2404            | 10             | 2424            | 19             | 2444            | 29             | 2464            |
| 01             | 2406            | 38             | 2426            | 20             | 2446            | 30             | 2466            |
| 02             | 2408            | 11             | 2428            | 21             | 2448            | 31             | 2468            |
| 03             | 2410            | 12             | 2430            | 22             | 2450            | 32             | 2470            |
| 04             | 2412            | 13             | 2432            | 23             | 2452            | 33             | 2472            |
| 05             | 2414            | 14             | 2434            | 24             | 2454            | 34             | 2474            |
| 06             | 2416            | 15             | 2436            | 25             | 2456            | 35             | 2476            |
| 07             | 2418            | 16             | 2438            | 26             | 2458            | 36             | 2478            |
| 08             | 2420            | 17             | 2440            | 27             | 2460            | 39             | 2480            |

| RMS Output Power (dBm) |         |         |              |               |              |               |
|------------------------|---------|---------|--------------|---------------|--------------|---------------|
| Channel                | 802.11b | 802.11g | 802.11n-HT20 | 802.11ax-HE20 | 802.11n-HT40 | 802.11ax-HE40 |
| 1                      | 19.35   | 16.91   | 17.13        | 17.03         | ---          | ---           |
| 2                      | 19.96   | 17.94   | 18.43        | 18.26         |              |               |
| 3                      | 20.01   | 18.02   | 18.38        | 18.28         | 16.83        | 16.69         |
| 4                      | 19.98   | 17.99   | 18.41        | 18.31         | 15.78        | 15.56         |
| 5                      | 19.99   | 17.92   | 18.43        | 18.34         | 15.83        | 15.64         |
| 6                      | 20.1    | 18.06   | 18.48        | 18.35         | 15.74        | 15.52         |
| 7                      | 20.04   | 19.74   | 20.15        | 20.05         | 17.63        | 17.46         |
| 8                      | 20.00   | 18.24   | 18.68        | 18.54         | 17.77        | 17.58         |
| 9                      | 19.98   | 18.18   | 18.64        | 18.52         | 16.19        | 15.99         |
| 10                     | 20.02   | 18.21   | 18.60        | 18.49         | 12.49        | 12.27         |
| 11                     | 19.08   | 17.47   | 17.74        | 17.64         | 4.01         | 3.63          |
| 12                     | 18.18   | 14.79   | 14.91        | 14.80         | ---          | ---           |
| 13                     | 13.08   | 1.52    | 2.58         | 2.5           |              |               |

### 3.5. Descriptions of Key Components

#### 3.5.1. For the All Component Lists

| Item                          | Supplier          | Model / Type                           | Character                                                                                                 |
|-------------------------------|-------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------|
| System                        | Microsoft         | Win10 Home                             | ---                                                                                                       |
|                               |                   | Win10 Pro                              | ---                                                                                                       |
| Main Board                    | LG                | 1XZ90N MAIN B/D PCB                    | Manufacturer:<br>#1 Hannstar Board Tech (Jiang Yin) Corp., Ltd.<br>#2 Elec & Eltek Company (MCO) Limited. |
| WLAN SUB Board                | LG                | 14Z90N WLAN SUB B/D                    | Manufacturer:<br>#1 Hannstar Board Tech (Jiang Yin) Corp., Ltd.<br>#2 Elec & Eltek Company (MCO) Limited. |
| CPU<br>(Socket: FCBGA1526)    | Intel             | i7-1065G7                              | 1.3GHz, up to 3.9GHz                                                                                      |
|                               | Intel             | i5-1035G7                              | 1.2GHz, up to 3.7GHz                                                                                      |
| 14" LCD Panel                 | LG Display        | LP140WFA-SPY1                          | Resolution: 1920X1080, 60Hz<br>FHD IPS (Normal Non touch)                                                 |
| Storage (SSD)<br>(Max. 2 pcs) | Samsung           | MZ-VLB5120<br>(P/N MZVLB512HAJQ-00000) | 512GB (M.2)                                                                                               |
|                               |                   | MZ-VLB2560<br>(P/N MZVLB256HAHQ-00000) | 256GB (M.2)                                                                                               |
| Memory (RAM)                  | Samsung           | ---                                    | 8GB DDR4 3200MHz SODIMM (on Card)                                                                         |
|                               | SK Hynix          | ---                                    | 8GB DDR4 3200MHz SODIMM (on Card)                                                                         |
|                               | Samsung           | ---                                    | 8GB DDR4 (On Board)                                                                                       |
| Battery Pack                  | LG                | LBS1224E                               | DC 7.7V, 72Wh, Typ 9450mAh                                                                                |
| WLAN Combo Card               | Intel             | AX201D2W                               | WLAN and BT, 2x2 CNVi1216<br>FCC ID: PD9AX201NG<br>IC: 1000M-AX201NG<br>NCC ID: CCAH18LP3410T5            |
| WLAN Combo Antenna            | LG (INPAQ)        | WA-P-LBLB-04-069                       | PCB, Mono-pole Type<br>Main: Black, Aux: Gray                                                             |
|                               | LG (LUXSHARE-ICT) | L1LRF002-CS-H                          | PCB, Mono-pole Type<br>Main: Black, Aux: Gray                                                             |
| Keyboard                      | TIC               | KT01-18B8                              | P/N: KT01-18B8BS03USRA000 (White KBD)                                                                     |
|                               |                   | KT01-18B8                              | P/N: KT01-18B8AS03USRA000 (Black KBD)                                                                     |
|                               | LITE ON           | SN3871BL                               | P/N: SG-91030-XUA (White KBD)                                                                             |
|                               |                   | SN3871BL                               | P/N: SG-91020-XUA (Black KBD)                                                                             |
| Web Camera                    | Chicony           | CKFIH2821005290LH                      | With two microphones                                                                                      |
|                               |                   | CKFIH28-121005290LH                    | With one microphone                                                                                       |
|                               | Luxvisions        | 7BF109N2DC                             | With two microphones                                                                                      |
|                               |                   | 7BF109N2C                              | With one microphone                                                                                       |

| Item                          | Supplier                                                                                                                                             | Model / Type         | Character                                              |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------|
| LAN Gender<br>(Type C to LAN) | SUZHOU MEC<br>ELECTRONICS                                                                                                                            | 80-5946-200          | (White) 10/100/1000 Megabit Ethernet                   |
|                               |                                                                                                                                                      | 80-5946-210          | (Black) 10/100/1000 Megabit Ethernet                   |
|                               | Type C to LAN: Shielded, Undetached, 0.13m                                                                                                           |                      |                                                        |
|                               | SUZHOU MEC<br>ELECTRONICS                                                                                                                            | 80-5946-111          | (White) 10/100Megabit Ethernet                         |
|                               |                                                                                                                                                      | 80-5946-101          | (Black) 10/100 Megabit Ethernet                        |
|                               | Type C to LAN: Shielded, Undetached, 0.12m                                                                                                           |                      |                                                        |
|                               | ARIN TECH CO.<br>LTD                                                                                                                                 | GD-08MF-36-WH-LP10   | (White) 10/100Megabit Ethernet                         |
|                               |                                                                                                                                                      | GD-08MF-36-BK-LP11   | (Black) 10/100 Megabit Ethernet                        |
|                               | Type C to LAN: Shielded, Undetached, 0.12m                                                                                                           |                      |                                                        |
| AC Adapter (48W)              | LG (HONOR)                                                                                                                                           | ADS-48MS-19-2 19048E | I/P: AC 100-240V, 50-60Hz, 1.5A,<br>O/P: DC 19V, 2.53A |
|                               | DC Power Cord: Non-Shielded, Undetached, 1.5m                                                                                                        |                      |                                                        |
|                               | AC Power Cord: Non-Shielded, Detached, 1.0m (2C) (For Other Countries)<br>AC Power Cord: Non-Shielded, Detached, 1.55m (2C) (For US, Canada, Mexico) |                      |                                                        |

Remark: For more detailed features description, please refer to the manufacturer's specifications or the user manual.

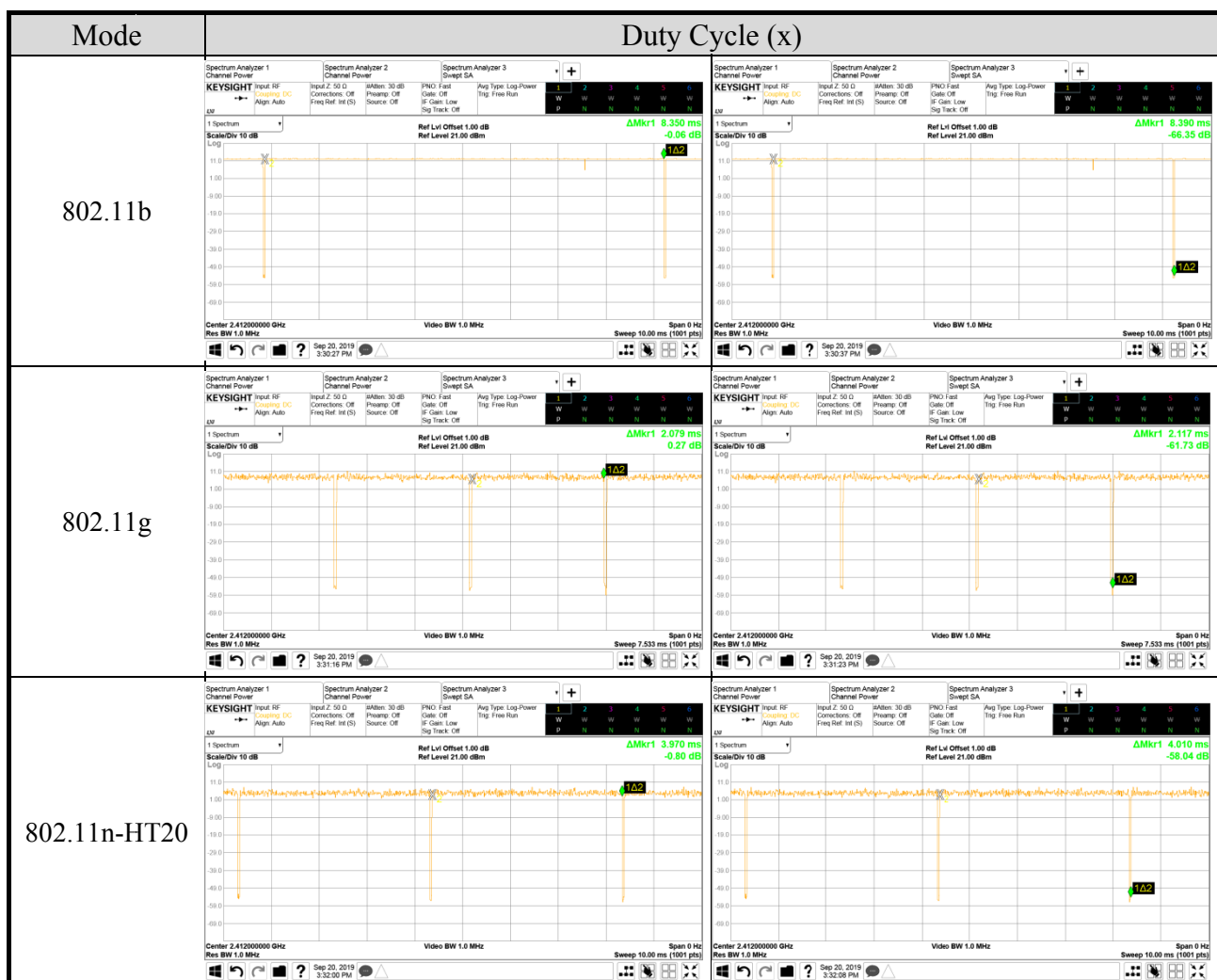
### 3.5.2. The EUT collocates with following worst components, which are used to establish a basic configuration of system during test:

| SKU                           |                    |                                             | #1 | #2 |
|-------------------------------|--------------------|---------------------------------------------|----|----|
| Main Board                    |                    | LG, 1XZ90N Main B/D PCB                     | V  | V  |
| SUB Board                     |                    | LG, 14Z90N WLAN SUB B/D                     | V  | V  |
| CPU                           |                    | i7-1065G7                                   | V  |    |
|                               |                    | i5-1035G7                                   |    | V  |
| 14” LCD Panel                 |                    | LG Display, LP140WFA-SPY1                   | V  | V  |
| Storage (SSD)<br>(Max. 2 pcs) |                    | Samsung, 512GB NVMe                         | V  | V  |
|                               |                    | Samsung, 512GB NVMe                         | V  | V  |
| Memory (RAM)                  |                    | SK Hynix, 8GB (On Card)                     | V  | V  |
|                               |                    | Samsung, 8GB (On Board)                     | V  | V  |
| Battery Pack                  |                    | LG, LBS1224E                                | V  | V  |
| WLAN Combo Card               |                    | Intel, AX201D2W                             | V  | V  |
| WLAN Combo Antenna            |                    | LG (INPAQ), WA-P-LBLB-04-069                | V  |    |
|                               |                    | LG (LUXSHARE-ICT), L1LRF002-CS-H            |    | V  |
| Keyboard                      |                    | TIC, KT01-18B8 (White)                      | V  | V  |
| Web Camera                    |                    | Chicony, CKFIH2821005290LH                  | V  | V  |
| AC Adapter                    |                    | LG (HONOR), ADS-48MS-19-2 19048E            | V  | V  |
| Type C                        | Link to LAN Gender | SUZHOU MEC ELECTRONICS, 80-5946-200 (White) | V  | V  |

### 3.6. Test Configuration

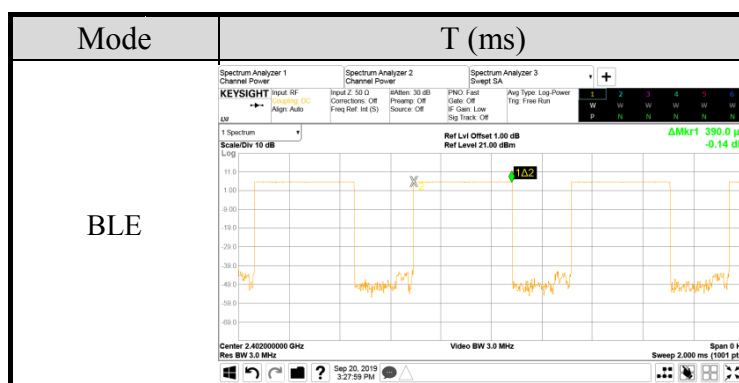
| Mode          | Duty Cycle (x) | T (ms) | Duty Cycle Factor (dB) |
|---------------|----------------|--------|------------------------|
| 802.11b       | 1.00           | 8.35   | N/A                    |
| 802.11g       | 0.98           | 2.079  | N/A                    |
| 802.11n-HT20  | 0.99           | 3.97   | N/A                    |
| 802.11n-HT40  | 0.99           | 3.96   | N/A                    |
| 802.11ax-HE20 | 0.99           | 3.95   | N/A                    |
| 802.11ax-HE40 | 0.98           | 3.93   | N/A                    |
| BLE           | ---            | 0.390  | ---                    |

Note: When duty cycle is less than 98% (0.98) that duty cycle factor  $10\log(1/x)$  is needed to add in conducted test items measured in average detector.



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New Taipei City 244, Taiwan

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**Fax: +886 2 26099303**



| AC Conduction |                  |
|---------------|------------------|
| SKU #1        | Normal operation |
| SKU #2        | Normal operation |

| SKU | Item               |                                                     | Mode          | Data Rate | Test Channel    |
|-----|--------------------|-----------------------------------------------------|---------------|-----------|-----------------|
| #2  | Radiated Test Case | Radiated Band Edge <sup>Note1</sup>                 | 802.11b       | 1Mbps     | 1/2/10/11/12/13 |
|     |                    |                                                     | 802.11g       | 6Mbps     | 1/2/10/11/12/13 |
|     |                    |                                                     | 802.11n-HT20  | MCS8      | 1/2/10/11/12/13 |
|     |                    |                                                     | 802.11n-HT40  | MCS8      | 3/4/8/9/10/11   |
|     |                    |                                                     | BLE           | 1Mbps     | 37/39           |
|     |                    | Radiated Spurious Emission <sup>Note1 &amp; 2</sup> | 802.11b       | 1Mbps     | 7               |
|     |                    |                                                     | 802.11g       | 6Mbps     | 7               |
|     |                    |                                                     | 802.11n-HT20  | MCS8      | 7               |
|     |                    |                                                     | 802.11n-HT40  | MCS8      | 8               |
|     |                    |                                                     | 802.11ax-HE20 | HE0       | 7               |
|     |                    |                                                     | 802.11ax-HE40 | HE0       | 7               |
|     |                    |                                                     | BLE           | 1Mbps     | 37/17/39        |
|     |                    |                                                     |               |           |                 |
| #1  | Radiated Test Case | Radiated Spurious Emission <sup>Note1</sup>         | 802.11n-HT20  | MCS8      | 7               |

| SKU | Item               |                                     | Mode          | Data Rate | RU Configuration | Test Channel |
|-----|--------------------|-------------------------------------|---------------|-----------|------------------|--------------|
| #2  | Radiated Test Case | Radiated Band Edge <sup>Note1</sup> | 802.11ax-HE20 | HE0       | 26/0             | 1            |
|     |                    |                                     |               |           | 52/37            |              |
|     |                    |                                     |               |           | 106/53           |              |
|     |                    |                                     | 802.11ax-HE20 | HE0       | 26/8             | 13           |
|     |                    |                                     |               |           | 52/40            |              |
|     |                    |                                     |               |           | 106/54           |              |
|     |                    |                                     | 802.11ax-HE40 | HE0       | 242/61           | 3            |
|     |                    |                                     |               | HE0       | 242/62           | 11           |

| SKU | Item                |                             | Mode          | Data Rate    | Test Channel      |
|-----|---------------------|-----------------------------|---------------|--------------|-------------------|
| #1  | Conducted Test Case | 6dB/Occupied Bandwidth      | 802.11b       | 1Mbps        | 1/7/11/13         |
|     |                     |                             | 802.11g       | 6Mbps        | 1/7/11/13         |
|     |                     |                             | 802.11n-HT20  | MCS8         | 1/7/11/13         |
|     |                     |                             | 802.11n-HT40  | MCS8         | 3/7/9/11          |
|     |                     |                             | 802.11ax-HE20 | HE0          | 1/7/11/13         |
|     |                     |                             | 802.11ax-HE40 | HE0          | 3/7/9/11          |
|     |                     |                             | BLE           | 1Mbps        | 37/17/39          |
|     |                     | Peak Output Power           | 802.11b       | 1Mbps        | 1/2/7/10/11/12/13 |
|     |                     |                             | 802.11g       | 6Mbps        | 1/2/7/10/11/12/13 |
|     |                     |                             | 802.11n-HT20  | MCS8         | 1/2/7/10/11/12/13 |
|     |                     |                             | 802.11n-HT40  | MCS8         | 3/4/7/8/9/10/11   |
|     |                     |                             | 802.11ax-HE20 | HE0          | 1/2/7/10/11/12/13 |
|     |                     |                             | 802.11ax-HE40 | HE0          | 3/4/7/8/9/10/11   |
|     |                     |                             | BLE           | 1Mbps        | 37/17/39          |
|     |                     |                             |               | 2Mbps        | 37/17/39          |
|     |                     |                             |               | PHY Coded S2 | 37/17/39          |
|     |                     |                             |               | PHY Coded S8 | 37/17/39          |
|     |                     | Band Edge                   | 802.11b       | 1Mbps        | 1/11/13           |
|     |                     |                             | 802.11g       | 6Mbps        | 1/11/13           |
|     |                     |                             | 802.11n-HT20  | MCS8         | 1/11/13           |
|     |                     |                             | 802.11n-HT40  | MCS8         | 3/9/11            |
|     |                     |                             | 802.11ax-HE20 | HE0          | 1/11/13           |
|     |                     |                             | 802.11ax-HE40 | HE0          | 3/9/11            |
|     |                     |                             | BLE           | 1Mbps        | 37/39             |
|     |                     | Spurious Emission           | 802.11b       | 1Mbps        | 1/7/11/13         |
|     |                     |                             | 802.11g       | 6Mbps        | 1/7/11/13         |
|     |                     |                             | 802.11n-HT20  | MCS8         | 1/7/11/13         |
|     |                     |                             | 802.11n-HT40  | MCS8         | 3/7/9/11          |
|     |                     |                             | 802.11ax-HE20 | HE0          | 1/7/11/13         |
|     |                     |                             | 802.11ax-HE40 | HE0          | 3/7/9/11          |
|     |                     |                             | BLE           | 1Mbps        | 37/17/39          |
|     |                     | Peak Power Spectral Density | 802.11b       | 1Mbps        | 1/7/11/13         |
|     |                     |                             | 802.11g       | 6Mbps        | 1/7/11/13         |
|     |                     |                             | 802.11n-HT20  | MCS8         | 1/7/11/13         |
|     |                     |                             | 802.11n-HT40  | MCS8         | 3/7/9/11          |
|     |                     |                             | 802.11ax-HE20 | HE0          | 1/7/11/13         |
|     |                     |                             | 802.11ax-HE40 | HE0          | 3/7/9/11          |
|     |                     |                             | BLE           | 1Mbps        | 37/17/39          |

| SKU | Item                |                             | Mode          | Data Rate | RU Configuration | Test Channel |
|-----|---------------------|-----------------------------|---------------|-----------|------------------|--------------|
| #1  | Conducted Test Case | 6dB/Occupied Bandwidth      | 802.11ax-HE20 | HE0       | 26/0             | 1            |
|     |                     |                             |               |           | 52/37            |              |
|     |                     |                             |               |           | 106/53           |              |
|     |                     |                             | 802.11ax-HE40 | HE0       | 26/8             | 13           |
|     |                     |                             |               |           | 52/40            |              |
|     |                     |                             |               |           | 106/54           |              |
|     |                     | Peak Output Power           | 802.11ax-HE20 | HE0       | 242/61           | 3            |
|     |                     |                             |               |           | 242/62           | 11           |
|     |                     |                             |               |           |                  |              |
|     |                     |                             | 802.11ax-HE40 | HE0       | 26/0             | 1            |
|     |                     |                             |               |           | 52/37            |              |
|     |                     |                             |               |           | 106/53           |              |
|     |                     | Peak Power Spectral Density | 802.11ax-HE20 | HE0       | 26/8             | 13           |
|     |                     |                             |               |           | 52/40            |              |
|     |                     |                             |               |           | 106/5            |              |
|     |                     |                             | 802.11ax-HE40 | HE0       | 242/61           | 3            |
|     |                     |                             |               |           | 242/62           | 11           |
|     |                     |                             |               |           |                  |              |

Note 1: ☐ Mobile Device

☒ Portable Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: ☒ Lie ☐ Side ☐ Stand

Note 2: Low, mid, and high channels were measured, only the worst channel of each modulation was presented in this report.

Note 3: Both of the antennas are the same type, and we presented the worst case in the report. The max-gain condition with SISO (main port) and MIMO is SKU #2. The MIMO is uncorrelated and supported SDM mode only.

Note 4: The modulation and bandwidth are similar for 802.11n mode for HT20/HT40 and 802.11ac mode for VHT20/VHT40, therefore investigated worst case to representative mode in the test report.

Note 5: The data rates were selected based on preliminary testing that identified those rate as the worst case for output power.

### 3.7. Tested Supporting System List

#### 3.7.1. Support Peripheral Unit

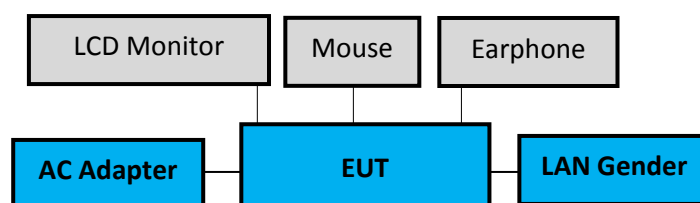
| No. | Product     | Brand | Model No.  | Serial No. | Approval   |
|-----|-------------|-------|------------|------------|------------|
| 1.  | LCD Monitor | LG    | 22LK330-DB | N/A        | N/A        |
| 2.  | USB Mouse   | acer  | MOBVUO     | N/A        | FCC By DoC |
| 3.  | Earphone    | APPLE | N/A        | N/A        | N/A        |

#### 3.7.2. Cable Lists

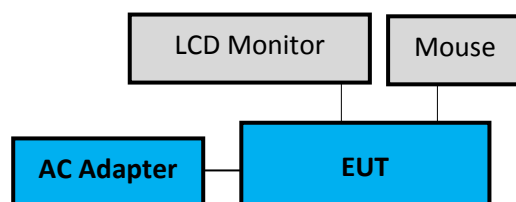
| No. | Cable Description Of The Above Support Units                                          |
|-----|---------------------------------------------------------------------------------------|
| 1.  | HDMI Cable: Shielded, Detachable, 1.8m<br>AC Power Cord: Unshielded, Detachable, 1.8m |
| 2.  | USB Cable: Unshielded, Undetachable, 1.8m                                             |
| 3.  | Earphone Cable: Unshielded, Undetachable, 0.9m                                        |

### 3.8. Setup Configuration

#### 3.8.1. EUT Configuration for Power Line & Radiated Emission



#### 3.8.2. EUT Configuration for RF Conducted Test Items



### 3.9. Operating Condition of EUT

Test program “DRTU” is used for enabling EUT BT or WLAN function under continues transmitting and choosing data rate/ channel.

[Chain 0 is aux port (A Button in DRTU) Chain 1 is main port (B Button in DRTU)].

### 3.10. Description of Test Facility

|                   |                                                                                                                                                                                                                                             |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Name of Test Firm | Audix Technology Corporation / EMC Department<br>No. 53-11, Dingfu, Linkou Dist., New Taipei City 244, Taiwan<br>Tel: +886-2-26092133<br>Fax: +886-2-26099303<br>Website : www.audixtech.com<br>Contact e-mail: attemc_report@audixtech.com |
| Accreditations    | The laboratory is accredited by following organizations under ISO/IEC 17025:2017<br>(1) NVLAP(USA)<br>NVLAP Lab Code 200077-0<br>(2) TAF(Taiwan)<br>No. 1724                                                                                |
| Test Facilities   | FCC OET Designation Number under APEC MRA by NCC is : TW1724<br>ISED CAB Identifier Number under APEC TEL MRA by NCC is TW1724<br>(1) No.8 Shielded Room<br>(2) No.1 3m Semi Anechoic Chamber<br>(3) Fully Anechoic Chamber                 |

### 3.11.Measurement Uncertainty

| Test Items/Facilities |                               | Frequency Range                | Uncertainty |
|-----------------------|-------------------------------|--------------------------------|-------------|
| Conduction Test       |                               | 150kHz~30MHz                   | ±3.50dB     |
| Radiation Test        | No.1 3m Semi Anechoic Chamber | 30MHz-200MHz, 3m, Horizontal   | ±3.9dB      |
|                       |                               | 200MHz-1000MHz, 3m, Horizontal | ±4.3dB      |
|                       |                               | 30MHz-200MHz, 3m, Vertical     | ±4.5dB      |
|                       |                               | 200MHz-1000MHz, 3m, Vertical   | ±4.1dB      |
|                       |                               | 1GHz-6GHz, 3m                  | ±5.1dB      |
|                       |                               | 6GHz-18GHz, 3m                 | ±5.5dB      |
|                       | No.3 3m Semi Anechoic Chamber | 30MHz-200MHz, 3m, Horizontal   | ±4.7dB      |
|                       |                               | 200MHz-1000MHz, 3m, Horizontal | ±4.5dB      |
|                       |                               | 30MHz-200MHz, 3m, Vertical     | ±4.3dB      |
|                       |                               | 200MHz-1000MHz, 3m, Vertical   | ±4.1dB      |
|                       | No.4 3m Semi Anechoic Chamber | 30MHz-200MHz, 3m, Horizontal   | ±4.1dB      |
|                       |                               | 200MHz-1000MHz, 3m, Horizontal | ±4.4dB      |
|                       |                               | 30MHz-200MHz, 3m, Vertical     | ±4.2dB      |
|                       |                               | 200MHz-1000MHz, 3m, Vertical   | ±5.0dB      |
|                       |                               | 1GHz-6GHz, 3m                  | ±4.4dB      |
|                       |                               | 6GHz-18GHz, 3m                 | ±4.1dB      |
|                       | No.5 3m Semi Anechoic Chamber | 30MHz-200MHz, 3m, Horizontal   | ±4.0dB      |
|                       |                               | 200MHz-1000MHz, 3m, Horizontal | ±4.0dB      |
|                       |                               | 30MHz-200MHz, 3m, Vertical     | ±4.2dB      |
|                       |                               | 200MHz-1000MHz, 3m, Vertical   | ±4.4dB      |
|                       |                               | 1GHz-6GHz, 3m                  | ±4.3dB      |
|                       |                               | 6GHz-18GHz, 3m                 | ±4.6dB      |
|                       | Fully Anechoic Chamber        | 30MHz~1000MHz                  | ±4.7dB      |
|                       |                               | 1GHz~18GHz                     | ±5.3dB      |

Remark : Uncertainty =  $ku_c(y)$

| Test Item                      | Uncertainty |
|--------------------------------|-------------|
| 6dB Bandwidth                  | ± 0.05kHz   |
| Maximum peak output power      | ± 0.33dB    |
| Power spectral density         | ± 0.13dB    |
| Conducted Emission Limitations | ± 0.13dB    |

## 4. MEASUREMENT EQUIPMENT LIST

### 4.1. Conducted Emission Measurement

| Item | Type                       | Manufacturer | Model No. | Serial No. | Cal. Date    | Cal. Interval |
|------|----------------------------|--------------|-----------|------------|--------------|---------------|
| 1.   | Test Receiver              | R&S          | ESR3      | 101774     | 2019. 01. 23 | 1 Year        |
| 2.   | A.M.N.                     | R&S          | ENV4200   | 100169     | 2018. 11. 04 | 1 Year        |
| 3.   | L.I.S.N.                   | Kyoritsu     | KNW-407   | 8-855-9    | 2018. 12. 19 | 1 Year        |
| 4.   | Pulse Limiter              | R&S          | ESH3-Z2   | 100354     | 2019. 01. 12 | 1 Year        |
| 5.   | Digital Thermo-Hygro Meter | iMax         | HTC-1     | No.8 S/R   | 2019. 04. 20 | 1 Year        |
| 6.   | Test Software              | Audix        | e3        | V6.120619c | N.C.R.       | N.C.R.        |

### 4.2. Radiated Emission Measurement

| Item | Type                         | Manufacturer | Model No.                        | Serial No.     | Cal. Date    | Cal. Interval |
|------|------------------------------|--------------|----------------------------------|----------------|--------------|---------------|
| 1.   | Spectrum Analyzer            | Agilent      | N9010A-526                       | MY53400071     | 2019. 09. 11 | 1 Year        |
| 2.   | Spectrum Analyzer            | Agilent      | N9030A-526                       | MY53310269     | 2019. 01. 30 | 1 Year        |
| 3.   | Test Receiver                | R & S        | ESCS30                           | 100338         | 2019. 06. 12 | 1 Year        |
| 4.   | Amplifier                    | HP           | 8447D                            | 2944A06305     | 2019. 01. 30 | 1 Year        |
| 5.   | Amplifier                    | HP           | 8449B                            | 3008A02678     | 2019. 03. 07 | 1 Year        |
| 6.   | Amplifier                    | Keysight     | 83051A                           | MY53010042     | 2019. 08. 08 | 1 Year        |
| 7.   | Bilog Antenna                | TESEQ        | CBL6112D                         | 33821          | 2019. 01. 19 | 1 Year        |
| 8.   | Loop Antenna                 | R&S          | HFH2-Z2                          | 891847/27      | 2017.12. 18  | 2 Years       |
| 9.   | Double-Ridged Waveguide Horn | ETS-Lindgren | 3117                             | 00135902       | 2019. 03. 13 | 1 Year        |
| 10.  | Horn Antenna                 | COM-POWER    | AH-840                           | 101092         | 2019. 05. 14 | 1 Year        |
| 11.  | 2.4GHz Notch Filter          | K&L          | 7NSL10-244<br>1.5/E130.5-O<br>/O | 1              | 2019. 07. 23 | 1 Year        |
| 12.  | 3GHz Notch Filter            | Microwave    | H3G018G1                         | 484796         | 2019. 08. 21 | 1 Year        |
| 13.  | Coaxial Cable                | MIYAZAKI     | 5D2W                             | RE-11          | 2019. 02. 01 | 1 Year        |
| 14.  | Coaxial Cable                | HUBER+SUHNER | SUCOFLEX<br>104                  | RF<br>CABLE-01 | 2019. 09. 20 | 1 Year        |
| 15.  | Coaxial Cable                | HUBER+SUHNER | SUCOFLEX<br>102                  | MY1493/2       | 2019. 09. 20 | 1 Year        |
| 16.  | Digital Thermo-Hygro Meter   | iMax         | HTC-1                            | No.1 3m A/C    | 2019. 04. 20 | 1 Year        |
| 17.  | Digital Thermo-Hygro Meter   | EVERY DAY    | E-512                            | RF-02          | 2019. 04. 20 | 1 Year        |
| 18.  | Test Software                | Audix        | e3                               | V6.120619c     | N.C.R.       | N.C.R.        |
| 19.  | Test Software                | Audix        | e3                               | V6.110601      | N.C.R.       | N.C.R.        |

### 4.3. RF Conducted Measurement

| Item | Type                       | Manufacturer                 | Model No.  | Serial No. | Cal. Date    | Cal. Interval |
|------|----------------------------|------------------------------|------------|------------|--------------|---------------|
| 1.   | Spectrum Analyzer          | Keysight                     | N9010B-544 | MY55460198 | 2019. 05. 06 | 1 Year        |
| 2.   | Power Meter                | Anritsu                      | ML2495A    | 1145008    | 2018. 11. 07 | 1 Year        |
| 3.   | Power Sensor               | Anritsu                      | MA2411B    | 1126096    | 2018. 11. 07 | 1 Year        |
| 4.   | Digital Thermo-Hygro Meter | Shenzhen Datronn Electronics | KT-905     | RF         | 2019. 04. 20 | 1 Year        |

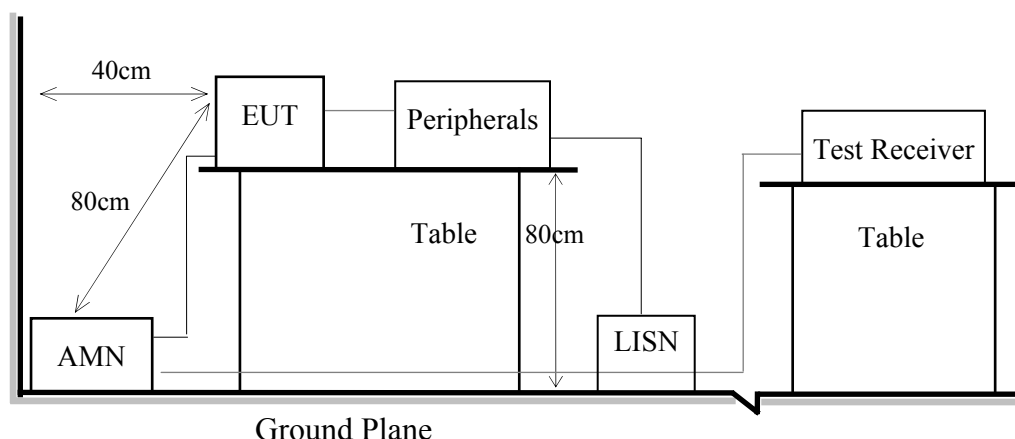
## 5. CONDUCTED EMISSION

### 5.1. Block Diagram of Test Setup

#### 5.1.1. Block Diagram of EUT

Indicated as section 3.8

#### 5.1.2. Shielded Room Setup Diagram



### 5.2. Conducted Emission Limit

| Frequency       | Conducted Limit    |                    |
|-----------------|--------------------|--------------------|
|                 | Quasi-Peak Level   | Average Level      |
| 150kHz ~ 500kHz | 66 ~ 56 dB $\mu$ V | 56 ~ 46 dB $\mu$ V |
| 500kHz ~ 5MHz   | 56 dB $\mu$ V      | 46 dB $\mu$ V      |
| 5MHz ~ 30MHz    | 60 dB $\mu$ V      | 50 dB $\mu$ V      |

Remark1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.

2.: The lower limit applies to the band edges.

### 5.3. Test Procedure

- 5.3.1. To set up the EUT as indicated in ANSI C 63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.
- 5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).
- 5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.)
- 5.3.4. Checking frequency range from 150kHz to 30 MHz and record the emission which does not have 20 dB below limit.

### 5.4. Test Results

Please refer to Appendix A.

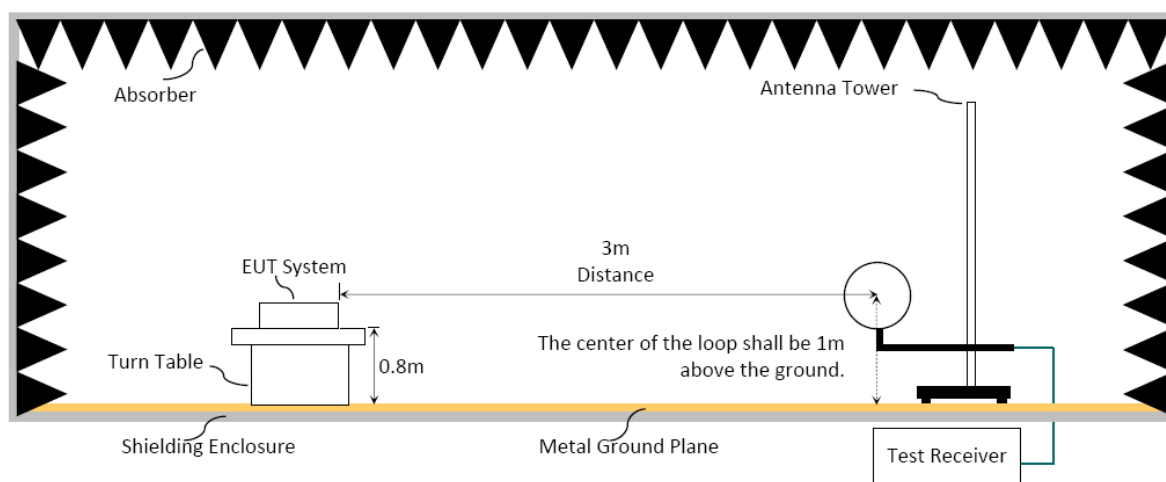
## 6. RADIATED EMISSION

### 6.1. Block Diagram of Test Setup

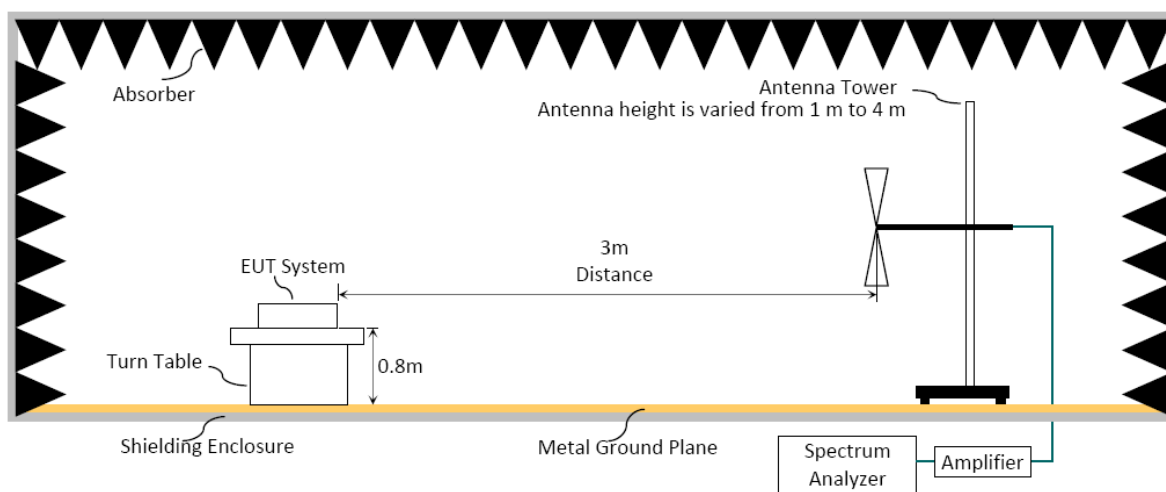
#### 6.1.1. Block Diagram of EUT

Indicated as section 3.8

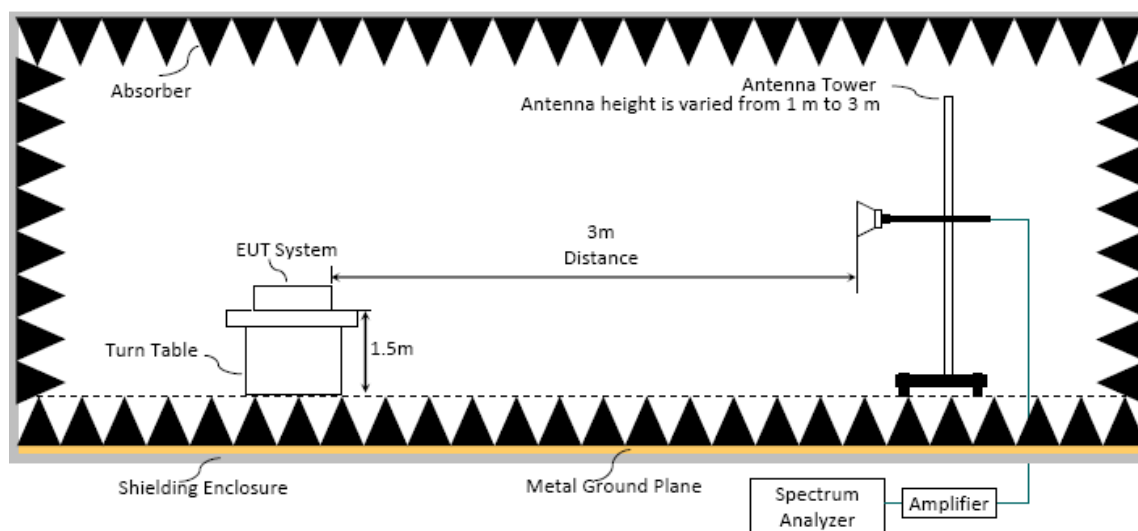
#### 6.1.2. Setup Diagram for 9kHz-30MHz



#### 6.1.3. Setup Diagram for 30-1000MHz



#### 6.1.4. Setup Diagram for above 1GHz



## 6.2. Radiated Emission Limits

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified as below.

| Frequency (MHz) | Distance(m) | Limits                                      |             |
|-----------------|-------------|---------------------------------------------|-------------|
|                 |             | dBμV/m                                      | μV/m        |
| 0.009 - 0.490   | 300         | 67.6-20 log f(kHz)                          | 2400/f kHz  |
| 0.490 - 1.705   | 30          | 87.6-20 log f(kHz)                          | 24000/f kHz |
| 1.705 - 30      | 30          | 29.5                                        | 30          |
| 30 - 88         | 3           | 40.0                                        | 100         |
| 88- 216         | 3           | 43.5                                        | 150         |
| 216- 960        | 3           | 46.0                                        | 200         |
| Above 960       | 3           | 54.0                                        | 500         |
| Above 1000      | 3           | 74.0 dBμV/m (Peak)<br>54.0 dBμV/m (Average) |             |

Remark : (1)  $\text{dB}\mu\text{V/m} = 20 \log (\mu\text{V/m})$

- (2) The tighter limit applies to the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) Fundamental and emission fall within operation band are exempted from this section.
- (5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

### 6.3. Test Procedure

#### Frequency Range 9kHz~30MHz:

The EUT setup on the turntable which has 0.8 m height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

- (1) RBW = 9kHz with peak and average detector.
- (2) Detector: average and peak (9kHz-490kHz)  
Q.P. (490kHz-30MHz)

#### Frequency Range 30MHz ~ 25GHz:

The EUT setup on the turn table which has 80 cm (for 30-1000 MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m (for 30-1000MHz) or antenna varied from 1 m to 3 m (for above 1GHz) to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

#### Frequency below 1GHz:

Spectrum Analyzer is used for pre-testing with following setting:

- (1) RBW = 120KHz
- (2) VBW  $\geq 3 \times$  RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.

Note 1: When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. for final measurement.

Note 2: When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds.

#### Frequency above 1GHz to 10th harmonic(up to 25 GHz):

##### Peak Detector:

- (1) RBW = 1MHz
- (2) VBW  $\geq 3 \times$  RBW.
- (3) Detector = Peak.
- (4) Sweep time = auto.
- (5) Trace mode = max hold.
- (6) Allow sweeps to continue until the trace stabilizes.

Note: When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

**Average Detector:****■ Option 1:**

(1) RBW = 1MHz

(2) VBW  $\geq 1/T$ .

| Modulation Type | T (ms) | 1/T (kHz) | VBW Setting(Hz) |
|-----------------|--------|-----------|-----------------|
| BLE             | 0.90   | 1.111111  | 10Hz            |
| 802.11b         | 8.35   | 0.119760  | 10Hz            |
| 802.11g         | 2.079  | 0.481000  | 10Hz            |
| 802.11n-HT20    | 3.97   | 0.251889  | 10Hz            |
| 802.11n-HT40    | 3.96   | 0.252525  | 10Hz            |
| 802.11ax-HE20   | 3.95   | 0.253165  | 10Hz            |
| 802.11ax-HE40   | 3.93   | 0.254453  | 10Hz            |

N/A: 1/T is not implemented when duty cycle presented in section 3.6 is  $\geq 98\%$ .

(1) Detector = Peak.

(2) Sweep time = auto.

(3) Trace mode = max hold.

(4) Allow sweeps to continue until the trace stabilizes.

**□ Option 2:**

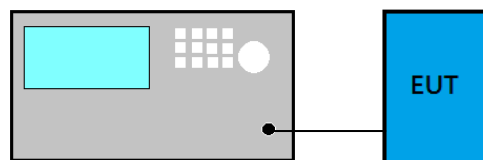
Average Emission Level = Peak Emission Level + D.C.C.F.

**6.4. Measurement Result Explanation****■** Peak Emission Level = Antenna Factor + Cable Loss + Meter Reading (including Preamp factor if test used)**■** Average Emission Level = Antenna Factor + Cable Loss + Meter Reading (including Preamp factor if test used)**□** Average Emission Level = Peak Emission Level + DCCFDuty Cycle Correction Factor (DCCF) =  $20\log(TX_{on}/TX_{on+off})$  presented in section 3.6**□** ERP = Peak Emission Level - 95.2dB - 2.14dB**6.5. Test Results**

Please refer to Appendix A.

## 7. 6dB/OCCUPIED BANDWIDTH

### 7.1. Block Diagram of Test Setup



### 7.2. Specification Limits

The minimum 6dB bandwidth shall be at least 500kHz.

### 7.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

- (1) Set RBW = 100 kHz.
- (2) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x to -6dB or 99% power to record the final bandwidth.

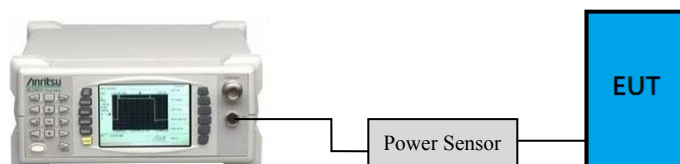
### 7.4. Test Results

Please refer to Appendix A

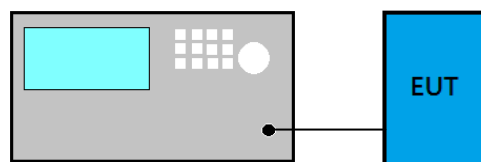
## 8. MAXIMUM PEAK OUTPUT POWER

### 8.1. Block Diagram of Test Setup

- For WLAN Function



- For BLE Function



### 8.2. Specification Limits

The Limits of maximum Peak Output Power for digital modulation in 2400 - 2483.5MHz is : 1Watt. (30dBm), and E.I.R.P.: 4Watt (36dBm)

### 8.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

**■ PKPM1 Peak power meter method:**

EUT is connected to power sensor and record the maximum output power.

**■ Maximum peak conducted output power method:**

- (1) Set the RBW  $\geq$  DTS bandwidth
- (2) Set VBW  $\geq 3 \times$  RBW
- (3) Set span  $\geq 3 \times$  RBW.
- (4) Sweep time = auto couple
- (5) Detector = peak.
- (6) Trace mode = max hold.
- (7) Allow trace to fully stabilize.
- (8) Use peak marker function to determine the peak amplitude level.

**■ Method AVGPM (Measurement using an RF average power meter):**

EUT is connected to power sensor and record the maximum average output power and duty cycle factor is added when duty cycle presented in section 3.6 is  $< 98\%$ .

**□ Method AVGSA-2 (Spectrum channel power)**

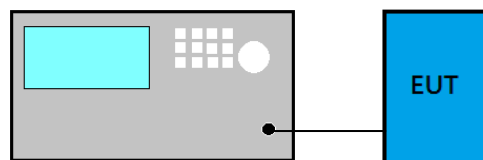
- (1) Set span to at least 1.5 times the OBW
- (2) Set RBW = 1 -5% of OBW
- (3) Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- (4) Detector = RMS.
- (5) Trace mode = trace average at least 100 traces
- (6) Sweep = auto couple.
- (7) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges.
- (8) Duty cycle factor is added when duty cycle presented in section 3.6 is  $< 98\%$ .

### 8.4. Test Results

Please refer to Appendix A

## 9. EMISSION LIMITATIONS

### 9.1. Block Diagram of Test Setup



### 9.2. Specification Limits

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, that the required attenuation shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in Section 15.209(a)/RSS-Gen Section 8.9 table 4 is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a)/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified in Section 15.209(a)/RSS-Gen Section 8.9 table 4 (See Section 15.205(c)).

### 9.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

#### ■ Reference Level

- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: 100 kHz.
- (4) Set the VBW  $\geq 3 \times$  RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize to find the max PSD as reference level.

#### ■ Emission Level Measurement

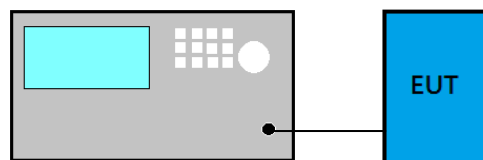
- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to: 100 kHz.
- (4) Set the VBW  $\geq 3 \times$  RBW.
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize to find the max level.

### 9.4. Test Results

Please refer to Appendix A

## 10. POWER SPECTRAL DENSITY

### 10.1. Block Diagram of Test Setup



### 10.2. Specification Limits

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band.

### 10.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

#### ■ Method PKPSD (peak PSD)

- (1) Set analyzer center frequency to DTS channel center frequency.
- (2) Set the span to 1.5 times the DTS bandwidth.
- (3) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- (4) Set the VBW  $\geq 3 \times \text{RBW}$ .
- (5) Detector = peak.
- (6) Sweep time = auto couple.
- (7) Trace mode = max hold.
- (8) Allow trace to fully stabilize.
- (9) Use the peak marker function to determine the maximum amplitude level.
- (10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

#### □ Method AVGPSD-2

- (1) Using peak PSD procedure step 1 to step 4.
- (2) Detector = RMS detector
- (3) Sweep time = auto couple
- (4) Trace mode = trace averaging over a minimum of 100 traces
- (5) Use the peak marker function to determine the maximum amplitude level.
- (6) Duty cycle factor is added when duty cycle presented in section 3.7 < 98%.
- (7) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 10.4. Test Results

Please refer to Appendix A



## 11.DEVIATION TO TEST SPECIFICATIONS

【NONE】



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# APPDNDIX A

## TEST DATA AND PLOTS

(Model: 14Z90N)



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# APPDNDIX B

## TEST PHOTOGRAPHS

(Model: 14Z90N)