

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |     <p>CERTIFICATE 2518.08</p> <p>MS ISO/IEC 17025<br/>TESTING<br/>SAMM NO. 0825</p> |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <p><b>MOTOROLA PENANG ADV. COMM. LABORATORY</b><br/><b>Motorola Solutions Malaysia Sdn. Bhd.</b><br/><b>Plot 2A Medan Bayan Lepas,</b><br/><b>Mukim 12, S.W.D. 11900 Bayan Lepas,</b><br/><b>Penang, Malaysia.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <p><b>FCC / ISED TEST REPORT</b><br/><b>Report Revision : Rev.A</b></p>                                                                                                                                                                                                                                                                                                                                                         |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <table><tr><td><b>Date/s Tested</b></td><td>: 18-Sep-2020 - 04-Nov-2020</td></tr><tr><td><b>Report Issue Date</b></td><td>: 05-Nov-2020</td></tr><tr><td><b>Manufacturer/Location</b></td><td>: Motorola Solutions Malaysia Sdn Bhd<br/>Plot 2A, Medan Bayan Lepas, Mukim 12 SWD,<br/>11900 Bayan Lepas, Penang, Malaysia</td></tr><tr><td><b>Requestor</b></td><td>: NUR AYUNI BINTI ALBAKRI</td></tr><tr><td><b>Product Type</b></td><td>: Mobile</td></tr><tr><td><b>Product Version (PMN)</b></td><td>: XPR 5550e</td></tr><tr><td><b>Model Number (HVIN)</b></td><td>: AAM28JNN9RA1AN (PMUD2566C)(IC MODEL:<br/>PMUD2566CBMNAA)</td></tr><tr><td><b>Frequency Band</b></td><td>: 2.402 - 2.480 GHz</td></tr><tr><td><b>Max RF Output Power</b></td><td>: 3.98 mWatts</td></tr><tr><td><b>Applicant Name</b></td><td>: Motorola Solutions Inc</td></tr><tr><td><b>Applicant Address</b></td><td>: 8000 West Sunrise Boulevard,<br/>Fort Lauderdale, Florida 33322</td></tr><tr><td><b>FCC Registrations</b></td><td>: 461337</td></tr><tr><td><b>ISED Registrations</b></td><td>: MY0001</td></tr><tr><td><b>Firmware Version (FVIN)</b></td><td>: D02.20.02.0111</td></tr></table> <p><b>The equipment was tested accordance to the requirement listed below:</b></p> <table><tr><td><b>(2.4GHz BT LE )</b><br/><b>47 CFR Part 15C</b><br/><b>ISED RSS 247 Issue 2</b></td><td><b>PASS</b></td></tr></table>  |                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Date/s Tested</b> | : 18-Sep-2020 - 04-Nov-2020 | <b>Report Issue Date</b> | : 05-Nov-2020 | <b>Manufacturer/Location</b> | : Motorola Solutions Malaysia Sdn Bhd<br>Plot 2A, Medan Bayan Lepas, Mukim 12 SWD,<br>11900 Bayan Lepas, Penang, Malaysia | <b>Requestor</b> | : NUR AYUNI BINTI ALBAKRI | <b>Product Type</b> | : Mobile | <b>Product Version (PMN)</b> | : XPR 5550e | <b>Model Number (HVIN)</b> | : AAM28JNN9RA1AN (PMUD2566C)(IC MODEL:<br>PMUD2566CBMNAA) | <b>Frequency Band</b> | : 2.402 - 2.480 GHz | <b>Max RF Output Power</b> | : 3.98 mWatts | <b>Applicant Name</b> | : Motorola Solutions Inc | <b>Applicant Address</b> | : 8000 West Sunrise Boulevard,<br>Fort Lauderdale, Florida 33322 | <b>FCC Registrations</b> | : 461337 | <b>ISED Registrations</b> | : MY0001 | <b>Firmware Version (FVIN)</b> | : D02.20.02.0111 | <b>(2.4GHz BT LE )</b><br><b>47 CFR Part 15C</b><br><b>ISED RSS 247 Issue 2</b> | <b>PASS</b> |
| <b>Date/s Tested</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | : 18-Sep-2020 - 04-Nov-2020                                                                                                                                                                                                                                                                                                                                                                                                     |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Report Issue Date</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | : 05-Nov-2020                                                                                                                                                                                                                                                                                                                                                                                                                   |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Manufacturer/Location</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | : Motorola Solutions Malaysia Sdn Bhd<br>Plot 2A, Medan Bayan Lepas, Mukim 12 SWD,<br>11900 Bayan Lepas, Penang, Malaysia                                                                                                                                                                                                                                                                                                       |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Requestor</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | : NUR AYUNI BINTI ALBAKRI                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Product Type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | : Mobile                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Product Version (PMN)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | : XPR 5550e                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Model Number (HVIN)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | : AAM28JNN9RA1AN (PMUD2566C)(IC MODEL:<br>PMUD2566CBMNAA)                                                                                                                                                                                                                                                                                                                                                                       |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Frequency Band</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | : 2.402 - 2.480 GHz                                                                                                                                                                                                                                                                                                                                                                                                             |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Max RF Output Power</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | : 3.98 mWatts                                                                                                                                                                                                                                                                                                                                                                                                                   |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Applicant Name</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | : Motorola Solutions Inc                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Applicant Address</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | : 8000 West Sunrise Boulevard,<br>Fort Lauderdale, Florida 33322                                                                                                                                                                                                                                                                                                                                                                |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>FCC Registrations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | : 461337                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>ISED Registrations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | : MY0001                                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>Firmware Version (FVIN)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | : D02.20.02.0111                                                                                                                                                                                                                                                                                                                                                                                                                |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <b>(2.4GHz BT LE )</b><br><b>47 CFR Part 15C</b><br><b>ISED RSS 247 Issue 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>PASS</b>                                                                                                                                                                                                                                                                                                                                                                                                                     |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <p>This report shall not be reproduced without written approval from an officially designated representative of the Motorola Penang Adv. Comm. Laboratory. The results and statements contained in this report pertain only to the device(s) evaluated.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                 |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |
| <p>Prepared By:</p>  <hr/> <p><b>GAN BOON TEONG</b><br/><b>Test Personnel</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>Approved Signatory:</p> <hr/> <p><b>VINCENT FOONG CHUEN KIT</b><br/><b>Responsible Engineer</b></p>                                                                                                                                                                                                                                                                                                                          |                      |                             |                          |               |                              |                                                                                                                           |                  |                           |                     |          |                              |             |                            |                                                           |                       |                     |                            |               |                       |                          |                          |                                                                  |                          |          |                           |          |                                |                  |                                                                                 |             |

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### REVISION HISTORY

| Revision History | Description    | Date        | Originator     |
|------------------|----------------|-------------|----------------|
| Rev. A           | Initial Report | 04-Nov-2020 | Gan Boon Teong |

## 1.0 General Information

### EUT Description:

|                           |                                     |
|---------------------------|-------------------------------------|
| <b>Technologies</b>       | 2.4GHz BT LE                        |
| <b>TX Frequency range</b> | 2402MHz – 2480MHz                   |
| <b>Modulation Type</b>    | GFSK                                |
| <b>Connector type</b>     | PROGRAMMING, TEST & ALIGNMENT CABLE |
| <b>Antenna type</b>       | INVERTED FANTENNA                   |

The EUT contains following accessory devices and data cable:

| Item                                                          | Brand    | Model or P/N     |
|---------------------------------------------------------------|----------|------------------|
| IMPRES 4-WAY NAVIGATION KEYPAD MICROPHONE WITH ENHANCED AUDIO | MOTOROLA | RMN5127C-C1      |
| POWER CABLE TO BATTERY, 6M (20 FT.), 20 AMP (1- 45W)          | MOTOROLA | 13921-HKN4192B-1 |

Channel number and frequency information:

40 channels are provided to this EUT:

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

### General Description of Applied Standards

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

**FCC 47 CFR Part 15 Subpart C**  
**KDB 558074 D01 15.247 Meas Guidance v05**  
**ANSI C63.10-2013**

### Deviation from standard

Not applicable as no deviation from standard test method

### Modifications to EUT

A pigtail was soldered out of the board to enable conducted measurements. Radiated measurements were done with the unit unmodified.

## 2.0 Summary of Test Results

| FCC Clause                 | ISED Clause     | Test Item                                 | Result | Remark                                                       | Serial number tested   | Tested by              |
|----------------------------|-----------------|-------------------------------------------|--------|--------------------------------------------------------------|------------------------|------------------------|
| 15.247 (a)(2)              | RSS 247 5.2 (a) | DTS & 99% Channel Bandwidth               | Pass   | Highest 99% OCB: BT 4.0 - 1.061 MHz (1M06F1D)                | 511TWP5900             | Gan                    |
| 15.247 (b)(3)              | RSS 247 5.4 (d) | Conducted RF Output Power (Average)       | Pass   | Highest output power: 5.934dBm (3.92 mW)                     | 511TWP5900             | Gan                    |
| 15.247(e)                  | RSS 247 5.2 (b) | Maximum Peak Power Spectral Density       | NA     | References data from FCC ID AZ492FT7138 / ISED 109U-92FT7138 | 511TWP7148             | NA                     |
| 15.247 (d)                 | RSS-247 5.5     | Band-Edge Conducted Spurious Emission     | NA     | References data from FCC ID AZ492FT7138 / ISED 109U-92FT7138 | 511TWP7148             | NA                     |
| 15.247 (b)                 | RSS-247 5.5     | Conducted Spurious Emission               | NA     | References data from FCC ID AZ492FT7138 / ISED 109U-92FT7138 | 511TWP7148             | NA                     |
| 15.205, 15.209, 15.247 (d) | RSS247 5.5      | Radiated Emission within Restricted Bands | Pass   | Worst case emission: 71.72dBuV/m                             | 511TWP7151, 511TWP5907 | Nazrin &Qawiman &Fendi |
| 15.207                     | RSS-Gen 8.8     | AC Power Line Conducted Spurious Emission | NA     | Device does not operate on AC                                | NA                     | NA                     |
| 15.203                     | -               | Antenna Requirement                       | NA     | Internal antenna is not accessible to the end-user           | NA                     | NA                     |

**\*NOTE: The BT LE chipset is identical to FCC ID AZ492FT7138 / ISED 109U-92FT7138. The rest of conducted measurements are by similarity. Only worst case configuration of radiated emission based on FCC ID AZ492FT7138 / ISED 109U-92FT7138 is tested. As per KDB 484596 D01v01, the applicant takes full responsibility that data referenced represents compliance to the relevant rules for this current FCC ID.**

## 3.0. Measurement Uncertainty

| Measurement                               | Frequency        | Expended Uncertainty (k=1.96) (±dB) |
|-------------------------------------------|------------------|-------------------------------------|
| AC Power Line Conducted Spurious Emission | 150KHz ~ 30MHz   | 3.43                                |
| Radiated Emissions up to 1 GHz            | 30MHz ~ 200MHz   | 4.25                                |
|                                           | 200MHz ~ 1000MHz | 4.25                                |
| Radiated Emissions above 1 GHz            | 1GHz ~ 18GHz     | 4.96                                |
|                                           | 18GHz ~ 25GHz    | 4.96                                |
| Conducted Spurious Emissions              | 9kHz ~ 12.75GHz  | 2.82                                |

## 4.0 Equipment List

### Bluetooth ATE # 1 (SW Version: Ate Main\_3.1.10\_R2)

| Description         | Model         | Serial Number | Calibration Date | Calibration Due Date |
|---------------------|---------------|---------------|------------------|----------------------|
| SPECTRUM ANALYZER   | FSEK30        | 838495/014    | 19-Jan-20        | 19-Jan-21            |
| POWER SUPPLY        | 6652A         | 3541A02565    | 26-Jun-20        | 26-Jun-21            |
| SPECTRUM ANALYZER   | E4445A        | MY45301089    | 07-Sep-20        | 07-Sep-21            |
| CHAMBER             | SH-641        | 92002639      | 9-Dec-19         | 9-Dec-20             |
| N to N RF Cable # 1 | SF126/11N/11N | NA            | NA               | NA                   |

### Radiated Emission Station (SW Version: EMC FCC RE v1.6.2)

| Description               | Model                     | Serial Number | Calibration Date | Calibration Due Date |
|---------------------------|---------------------------|---------------|------------------|----------------------|
| DRG HORN FREQ.            | SAS-571                   | 720           | 21-Mar-19        | 21-Mar-21            |
| DRG HORN FREQ.            | SAS-571                   | 1143          | 14-Feb-19        | 14-Feb-21            |
| POWER SUPPLY              | 6032A                     | 2615A01178    | 21-May-20        | 21-May-21            |
| SIGNAL GENERATOR          | SMB 100A                  | 181117        | 8-Nov-18         | 8-Nov-21             |
| EMI TEST RECEIVER         | ESW44                     | 101750        | 24-Jul-19        | 24-Nov-20            |
| EMI TEST RECEIVER         | ESIB26                    | 100017        | 19-Jul-19        | 19-Nov-20            |
| 5m SEMI-ANECHOIC CHAMBER  | S800-HX                   | J2308         | Not Required     | Not Required         |
| BILOG ANTENNA             | CBL6112B                  | 2964          | 23-Apr-19        | 23-Apr-21            |
| BILOG ANTENNA             | CBL6112B                  | 2950          | 8-Jul-19         | 8-Jul-21             |
| DATA LOGGER               | SDL500                    | A.016776      | 4-Jun-20         | 4-Jun-21             |
| SYSTEM CONTROLLER         | SC104V                    | 050806-1      | Not Required     | Not Required         |
| TURNTABLE FLUSH MOUNT 2M  | FM2011                    | NA            | Not Required     | Not Required         |
| ANTENNA POSITIONING TOWER | TLT2                      | NA            | Not Required     | Not Required         |
| BROAD-BAND HORN ANTENNA   | BBHA9170                  | BBHA9170255   | 27-Jan-20        | 27-Jan-21            |
| 18 - 40GHz PREAMPLIFIER   | MITEQ Hi GAIN<br>SUCOFLEX | 001           | Not Required     | Not Required         |
| PREAMPLIFIER              | PAM-0118                  | 269           | 24-May-19        | 24-May-22            |
| LOOP ANTENNA              | 6502                      | 00203479      | 21-Jan-20        | 21-Jan-21            |

## 5.0 Test Mode Applicability and Test Channel Detail

### Radiated Emission Test (Above 1GHz)

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

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

| EUT Configure Mode | Available Channel | Tested Channel | Modulation Type | Environmental Conditions |
|--------------------|-------------------|----------------|-----------------|--------------------------|
| Test Mode          | 0 to 39           | 0,19,39        | GFSK            | 23.3°C,<br>69.6%RH       |

### Radiated Emission Test (Below 1GHz)

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

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

| EUT Configure Mode | Available Channel | Tested Channel | Modulation Type | Environmental Conditions |
|--------------------|-------------------|----------------|-----------------|--------------------------|
| Test Mode          | 0 to 39           | 0,19,39        | GFSK            | 23.3°C,<br>69.6%RH       |

### Power Line Conducted Emission Test

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

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

| EUT Configure Mode | Available Channel | Tested Channel | Modulation Type | Environmental Conditions |
|--------------------|-------------------|----------------|-----------------|--------------------------|
| Application Mode   | 0 to 39           | AUTO           | AUTO            | NA                       |

### Antenna Port Conducted Measurement:

☒ This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

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

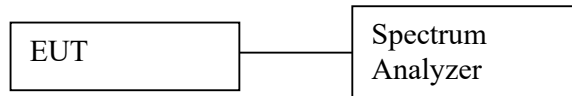
☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT Configure Mode | Available Channel | Tested Channel | Modulation Type | Environmental Conditions |
|--------------------|-------------------|----------------|-----------------|--------------------------|
| Test Mode          | 0 to 39           | 0,19,39        | GFSK            | 25°C, 54.8%RH            |

## 6.0 Transmitter Test Parameters

### 6.1 6dB Channel Bandwidth

#### 6.1.1 Test Setup



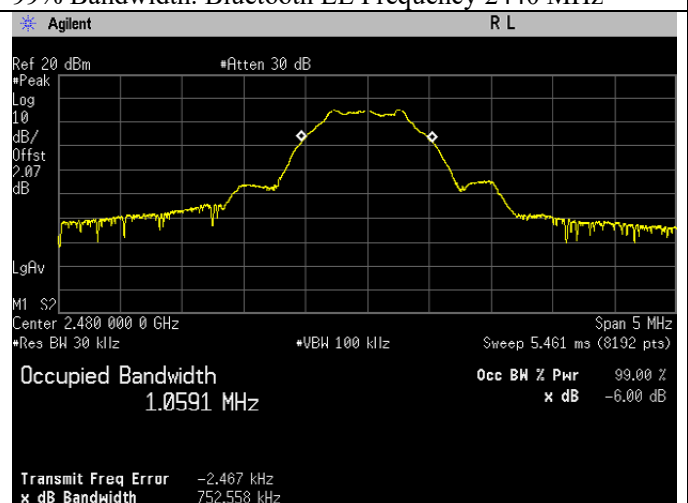
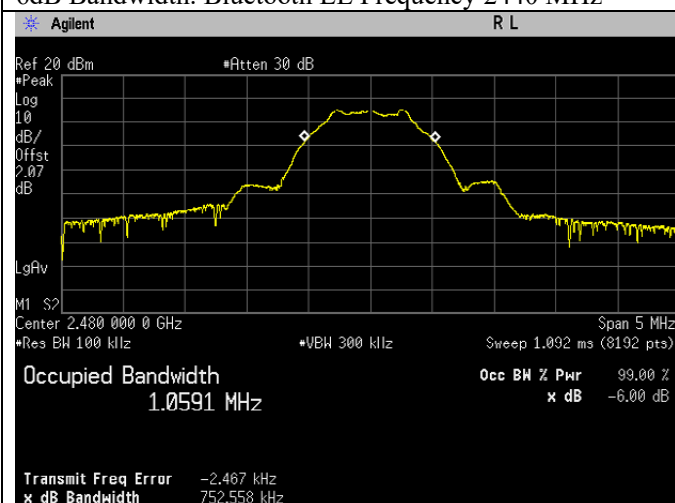
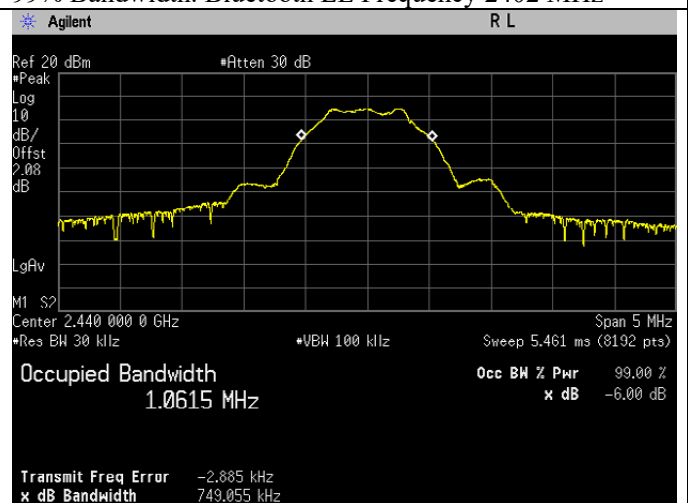
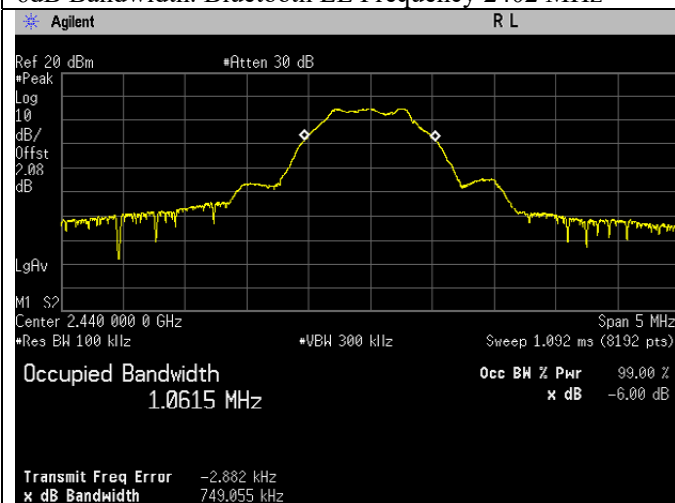
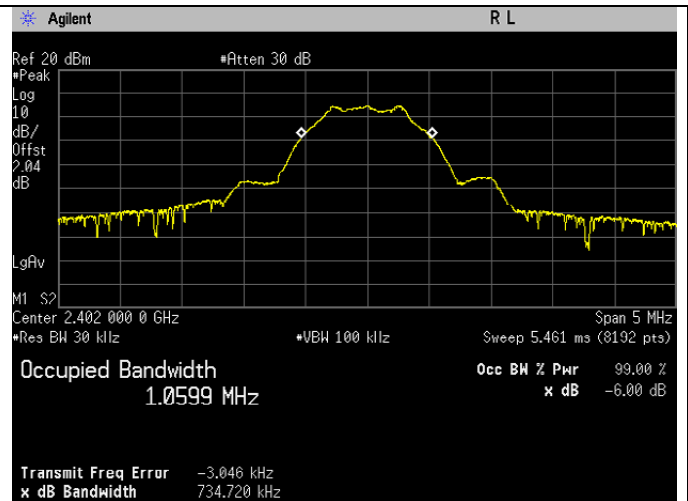
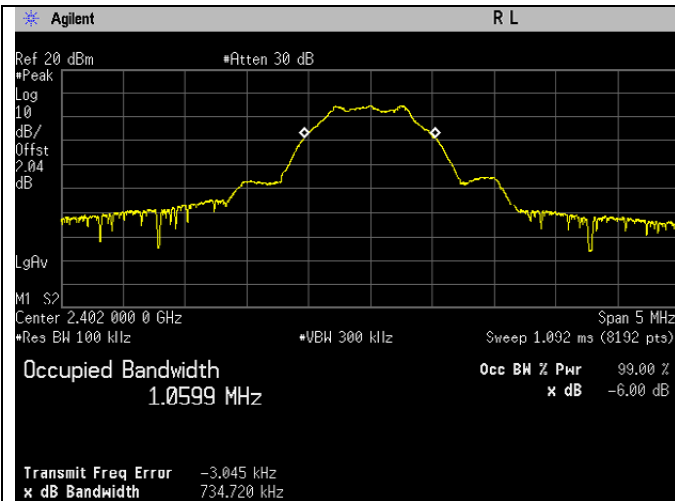
- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- 4) Setting of Spectrum analyzer :
  - a. RBW = 100 kHz
  - b. VBW = 300 kHz
  - c. Detector mode = Peak
  - d. Trace = Max hold
  - e. Sweep = auto
- 5) Measure the freq different of two frequencies that were attenuated 6dB from peak of the emission & record the frequency difference as the emission bandwidth.

#### 6.1.2 Test Limits:

|                                  |
|----------------------------------|
| <b>Normal Condition (25 ° C)</b> |
| <b>≥500 kHz</b>                  |

#### 6.1.3 Test Data:

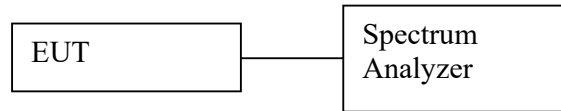
| Test Conditions |                 | Test Frequency | Results             |                     |        |
|-----------------|-----------------|----------------|---------------------|---------------------|--------|
| Standard        | Modulation Type | Tx (MHz)       | 6dB Bandwidth (MHz) | 99% Bandwidth (MHz) | Status |
| Bluetooth L.E   | GFSK            | 2402           | 0.735               | 1.060               | Pass   |
| Bluetooth L.E   | GFSK            | 2440           | 0.749               | 1.061               | Pass   |
| Bluetooth L.E   | GFSK            | 2480           | 0.753               | 1.059               | Pass   |





## 6.2 Conducted RF Output Power

### 6.2.1 Test Setup



- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Measure the duty cycle of transmitter output signal.
- 4) Setting of Spectrum analyzer :
  - a. Set the RBW = 30 kHz.
  - b. Set the VBW  $\geq [3 \times \text{RBW}]$ .
  - c. Set the span  $\geq [1.5 \times \text{OBW bandwidth}]$ .
  - d. Detector = average.
  - e. Sweep time = auto couple.
  - f. Trace mode = free run.
  - g. Allow trace to fully stabilize.
- 5) Add in duty cycle correction into final test result.
- 6) Duty cycle correction is calculated as below:
$$10 \log (1/x)$$

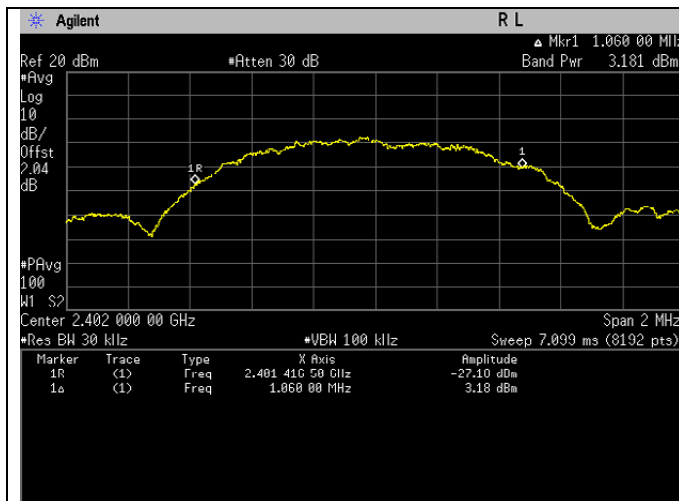
### 6.2.2 Test Limits:

|                                       |
|---------------------------------------|
| Normal Condition (25 ° C)             |
| $\leq 1 \text{ Watt}(30 \text{ dBm})$ |

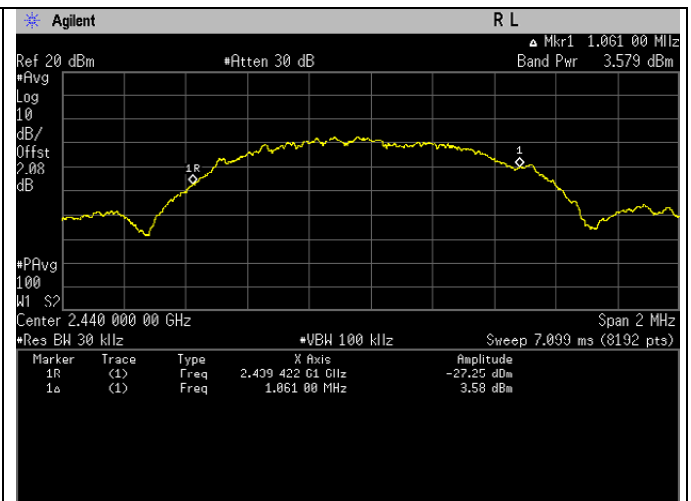
### 6.2.3 Test Data:

Output power = Band Power + Duty Cycle factor  
=Band Power + 2.114dBm

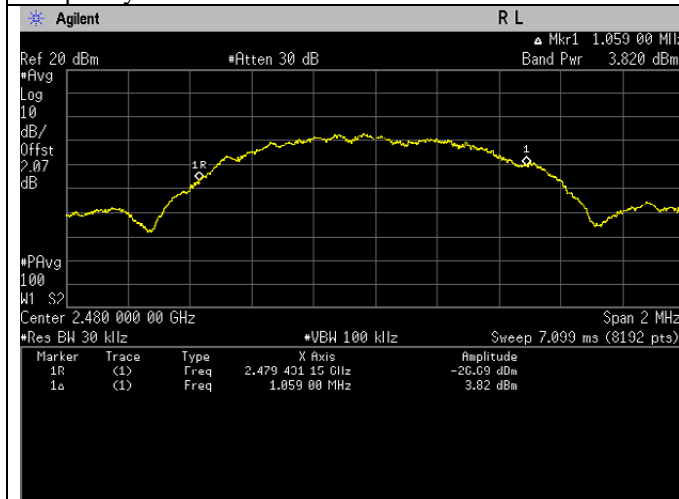
| Test Conditions |                 |          | Test Frequency     | Results |
|-----------------|-----------------|----------|--------------------|---------|
| Standard        | Modulation Type | Tx (MHz) | Output Power (dBm) | Status  |
| Bluetooth L.E   | GFSK            | 2402     | 5.295              | Pass    |
| Bluetooth L.E   | GFSK            | 2440     | 5.693              | Pass    |
| Bluetooth L.E   | GFSK            | 2480     | 5.934              | Pass    |



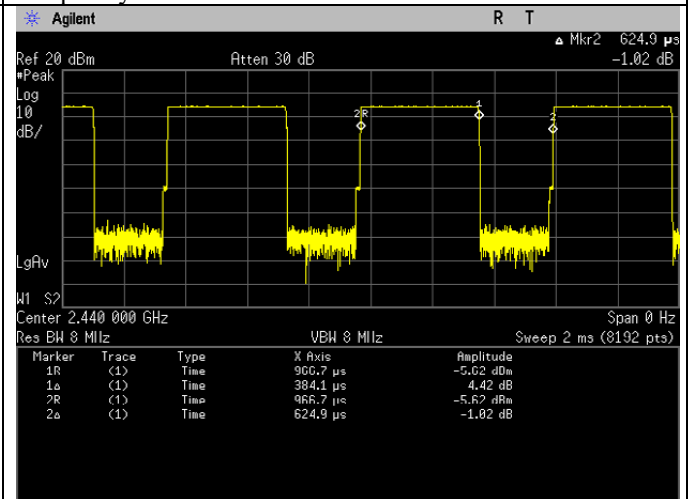
Frequency 2402 MHz



Frequency 2440 MHz



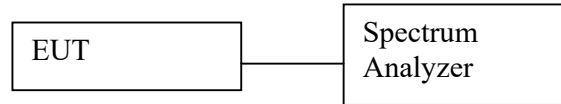
Frequency 2480 MHz



Duty Cycle

## 6.3 Maximum Peak Power Spectral Density

### 6.3.1 Test Setup



#### Maximum Peak

- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- 4) Setting of Spectrum analyzer :
  - a. Set analyzer center frequency to DTS channel center frequency.
  - b. Set the span to 1.5 times the DTS bandwidth.
  - c. Set the RBW to 3 kHz.
  - d. Set the VBW  $\geq [3 \times \text{RBW}]$ .
  - e. Detector = peak.
  - f. Sweep time = auto couple.
  - g. Trace mode = max hold.
  - h. Allow trace to fully stabilize.
  - i. Use the peak marker function to determine the maximum amplitude level within the RBW.
  - j. If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

### 6.3.2 Test Limits:

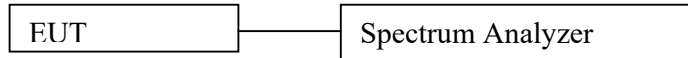
|                           |
|---------------------------|
| Normal Condition (25 ° C) |
| $\leq 8 \text{ dBm/3kHz}$ |
|                           |

### 6.3.3 Test Result

N/A

## 6.4 Conducted Spurious Emission

### 6.4.1 Test Setup



- 1) Check and ensure the spectrum analyzer well calibrate.
- 2) Turn on the DUT and set DUT to transmit maximum power.
- 3) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- 4) Setting of Spectrum analyzer :
  - a. RBW = 100 kHz
  - b. VBW = 300 kHz
  - c. Detector mode = Peak
  - d. Trace = Max Hold
  - e. Sweep = auto
- 5) Use the peak marker function to measure highest emission and scan up to 10<sup>th</sup> harmonic.

### 6.4.2 Test Limits:

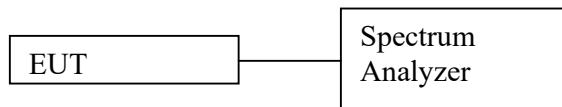
|                                                        |
|--------------------------------------------------------|
| <b>Normal Condition (25 ° C)</b>                       |
| <b>Shall be at least 30 dB below peak (max) power.</b> |

### 6.4.3 Test Result

N/A

## 6.5 Band edge Conducted Spurious Emission

### 6.5.1 Test Setup



- a) Check and ensure the spectrum analyzer well calibrate.
- b) Turn on the DUT and set DUT to transmit maximum power.
- c) Connect DUT's antenna terminal to spectrum analyzer with a low loss cable.
- d) Setting of Spectrum analyzer :
  - a. RBW = 100 kHz
  - b. VBW = 300 kHz
  - c. Detector mode = Peak
  - d. Trace = Max Hold
  - e. Sweep = auto
- e) Use the peak marker function to measure highest emission.

### 6.5.2 Test Limits:

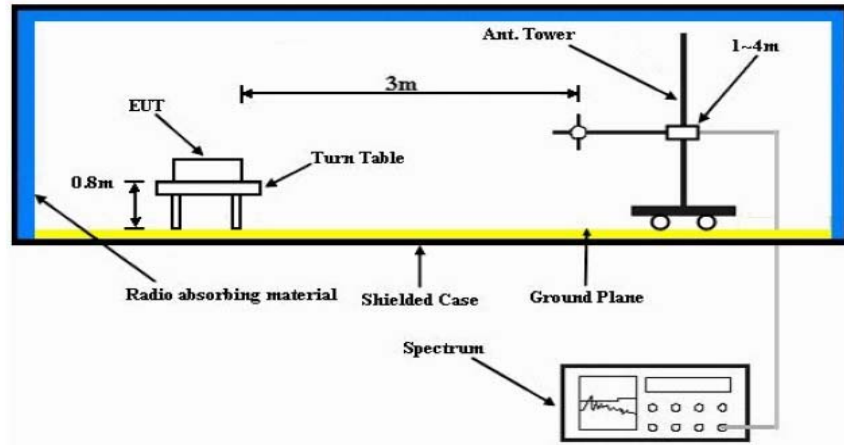
|                                                        |
|--------------------------------------------------------|
| <b>Normal Condition (25 ° C)</b>                       |
| <b>Shall be at least 30 dB below peak (max) power.</b> |

### 6.5.3 Test Result

N/A

## 6.6 Radiated Emission within Restricted Bands

### 6.6.1 Test Setup



- The EUT is placed on the top of a rotating table 0.8m (<1GHz) or 1.5m (>1GHz) above the ground at a 3m semi-anechoic chamber. The table is rotated 360 degrees to determine the position of the highest radiation.
- The EUT is set 3m away from the interference-receiving antenna, which is mounted on the top of a variable-height antenna tower.
- The antenna is Bilog/Horn antenna depend on which frequency range uses, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT is arranged to its worst case and then the antenna is tuned to heights from 1m to 4m and the rotatable table is turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system is set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode is fall within the range of 10dB from the limit specified, the emissions would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. Otherwise, the testing could be stopped and the peak values of the EUT would be reported.

#### NOTE:

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

### 6.6.2 Test Limits:

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

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

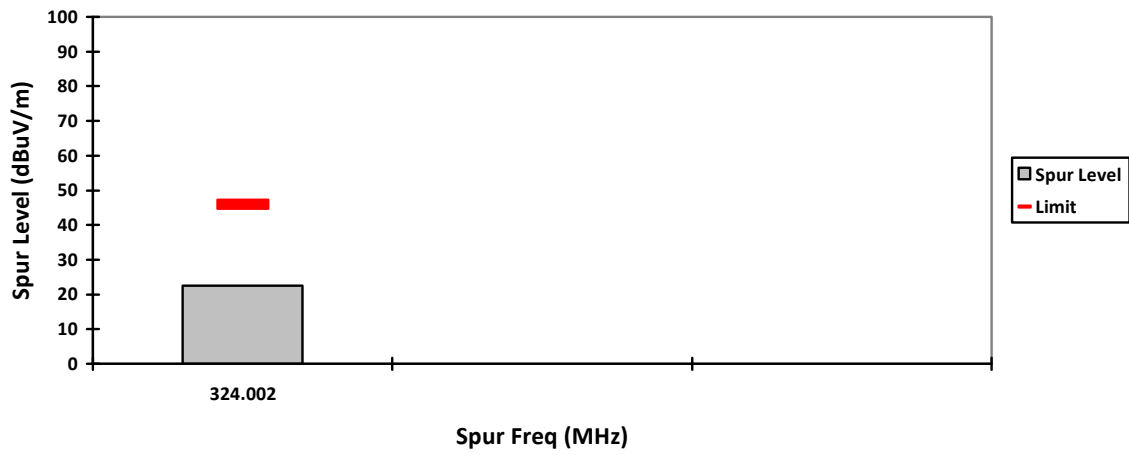
**NOTE:**

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

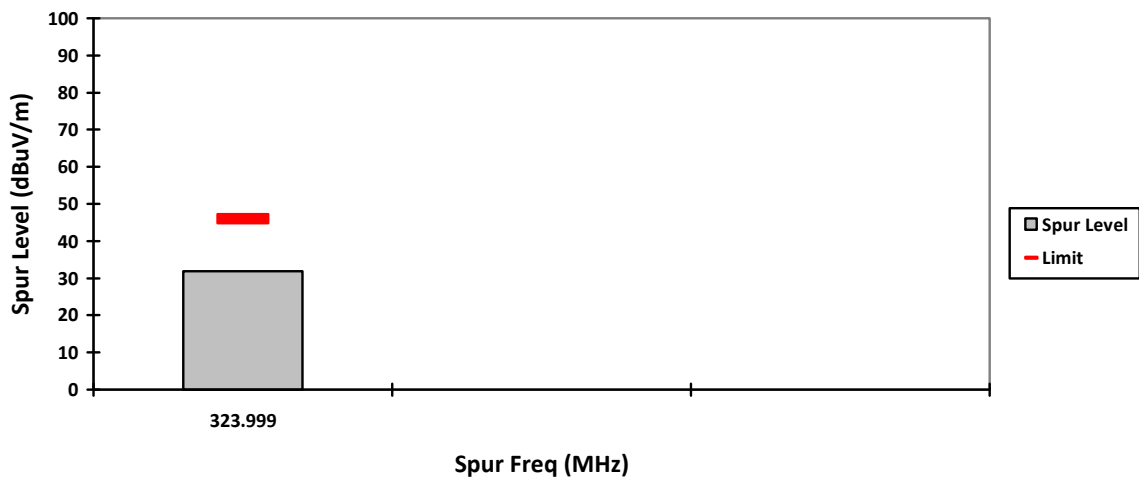




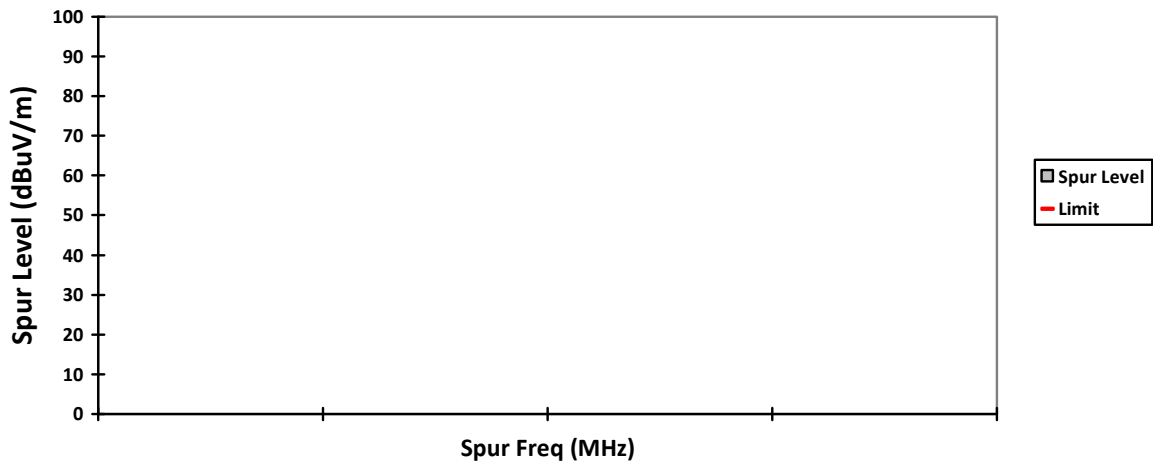
VERTICAL, QPK



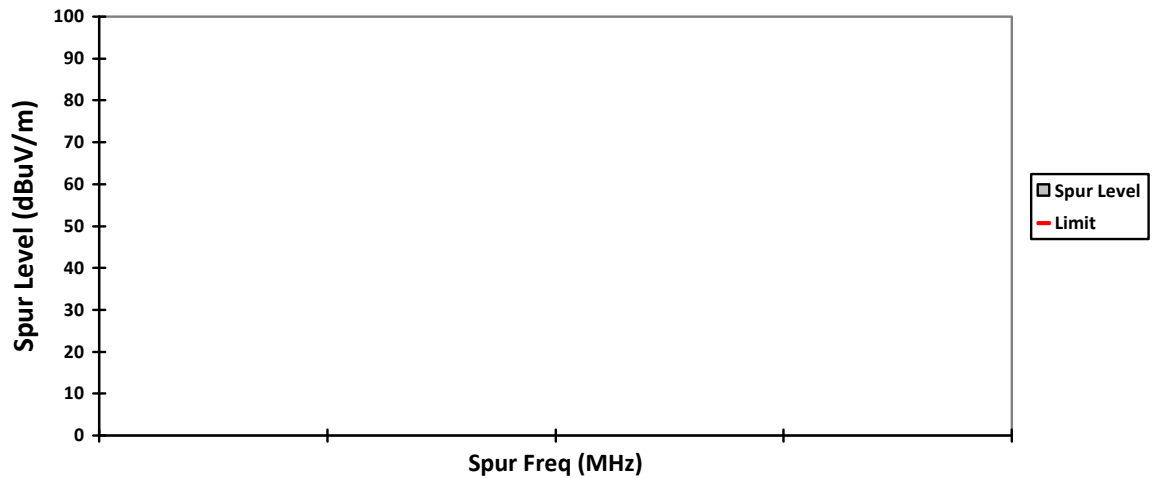
HORIZONTAL, QPK



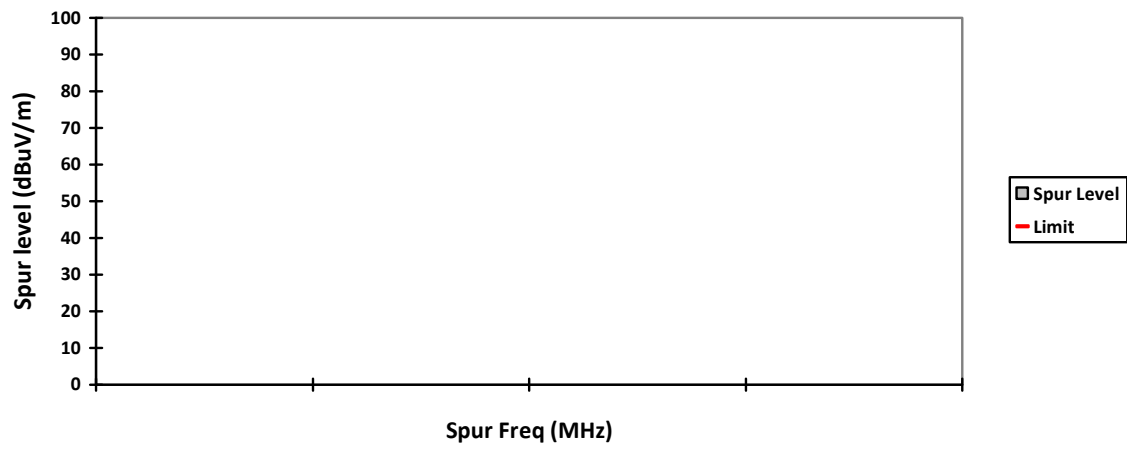
VERTICAL, PK



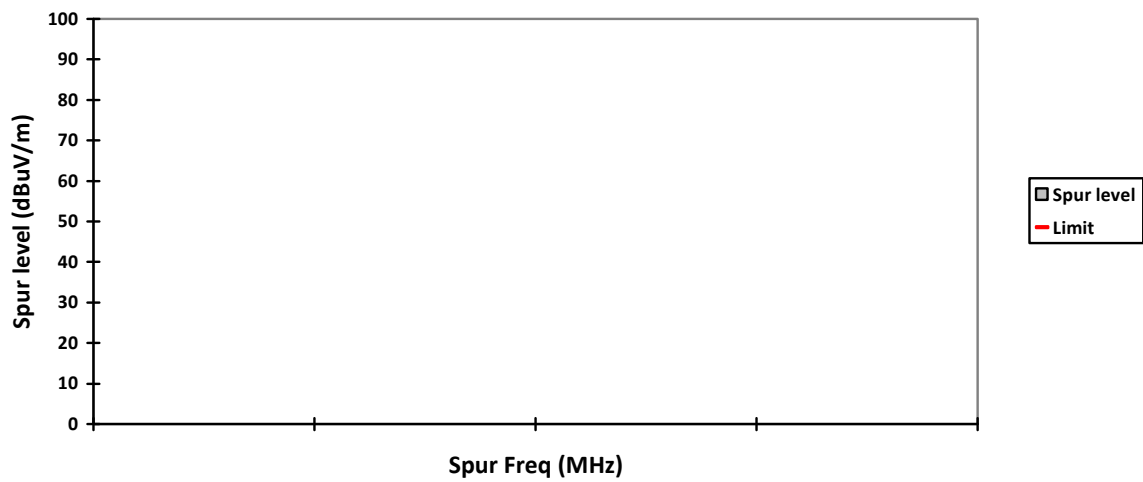
HORIZONTAL, PK



VERTICAL, AV



HORIZONTAL, AV

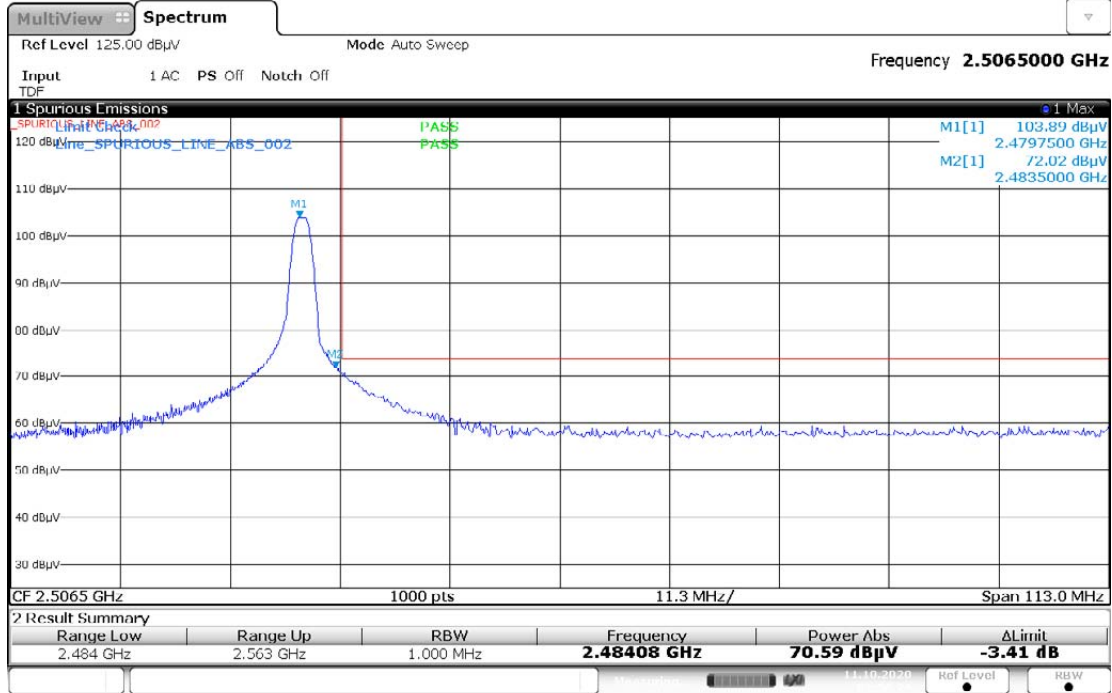


### Restricted Band Edge (High Channel) tabular data

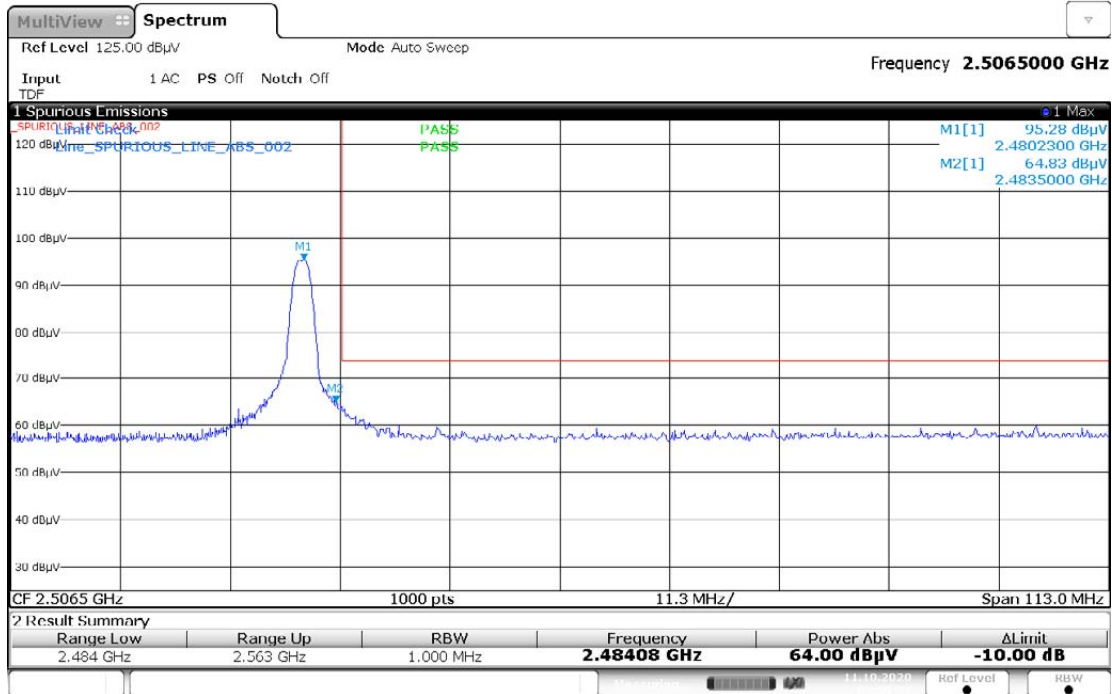
|                         |                 |             |
|-------------------------|-----------------|-------------|
| Remarks:<br>Pass Result | Marginal Result | Fail Result |
|-------------------------|-----------------|-------------|

**Humidity (%): 69.3**  
**Test Date: Sun, 11 Oct, 2020**

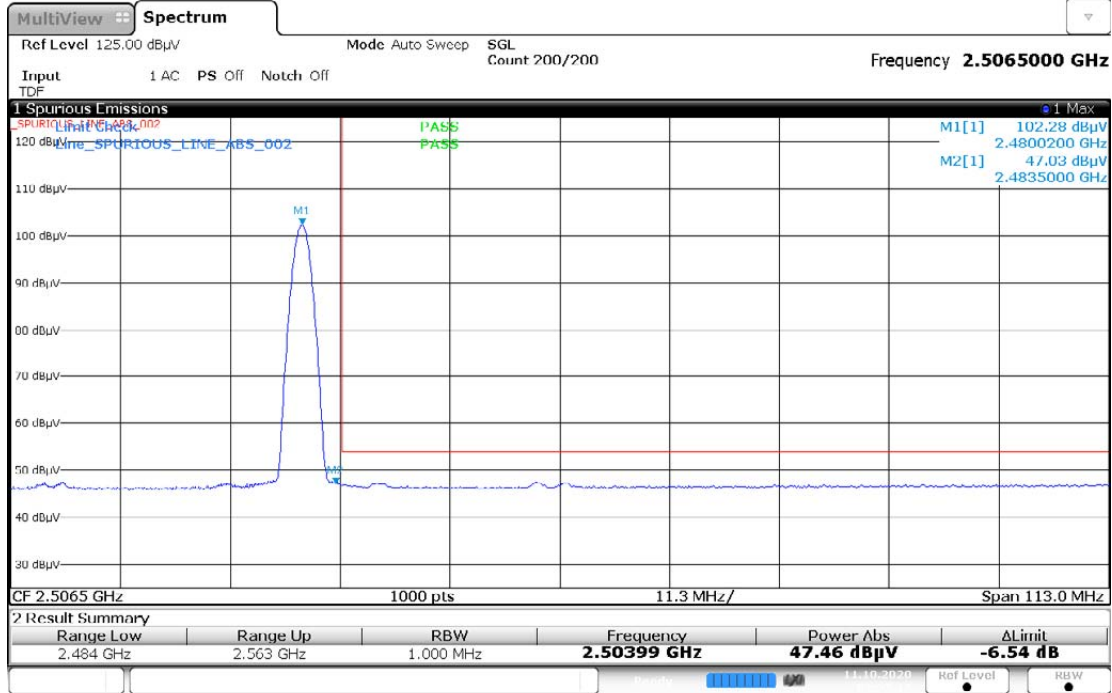
Restricted Band Edge (High Channel, Vertical, Peak) graphical screen shot



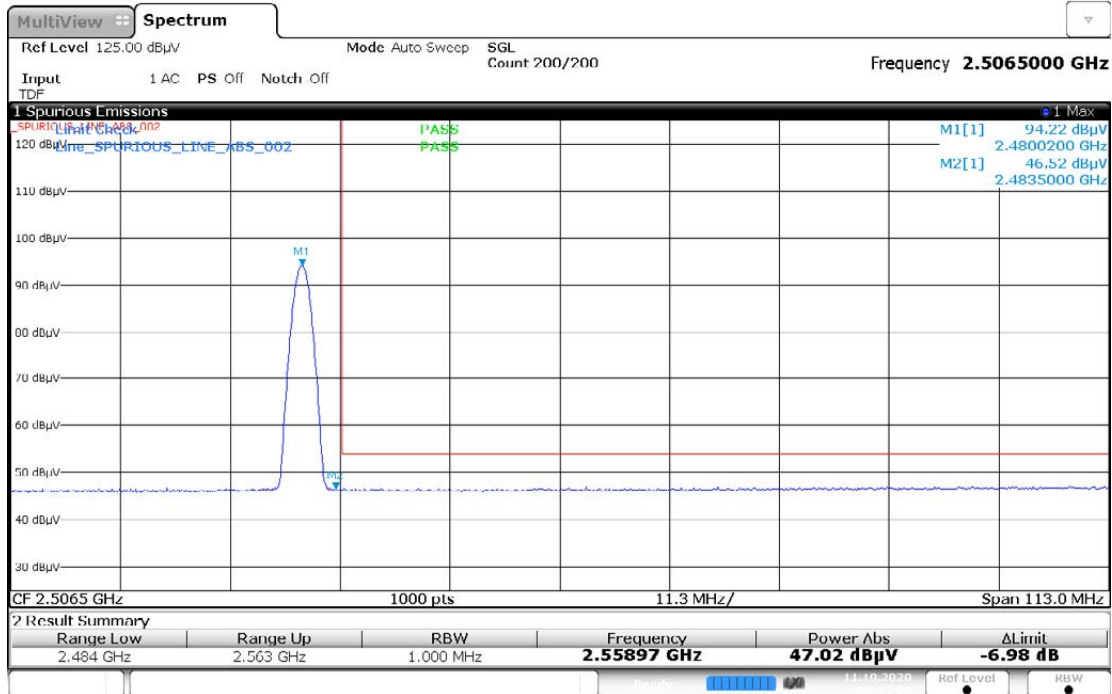
Restricted Band Edge (High Channel, Horizontal, Peak) graphical screen shot



Restricted Band Edge (High Channel, Vertical, Average) graphical screen shot

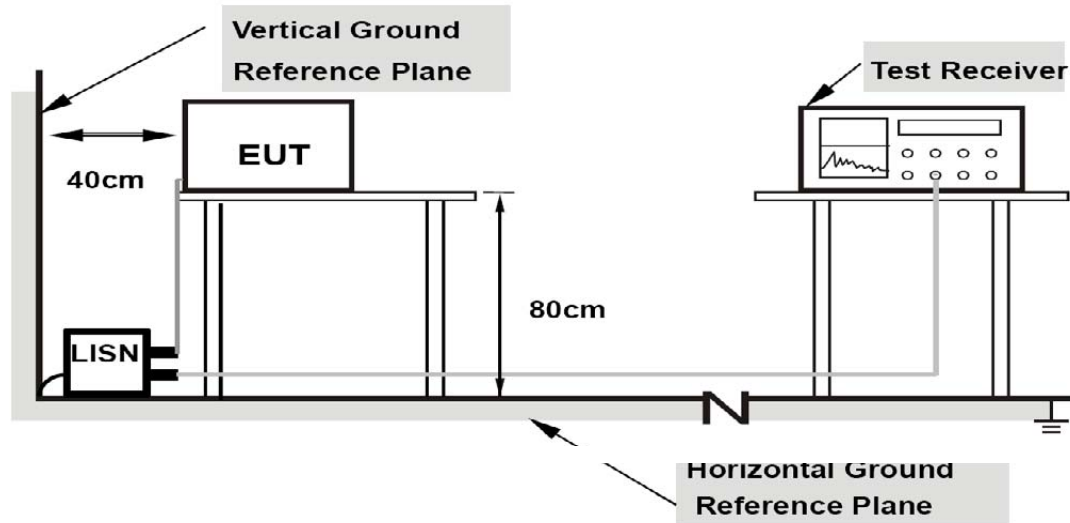


Restricted Band Edge (High Channel, Horizontal, Average) graphical screen shot



## 6.7 AC Powerline Conducted Emission

### 6.7.1 Test Setup



- 1) Tests were conducted for both Receive and Transmit Mode of the EUT.
- 2) The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50uH of coupling impedance for the measuring instrument.
- 3) Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 4) The frequency range from 150 kHz to 30MHz was measured.

### 6.7.2 Test Limits:

For AC Power Line Conducted Test Limit can be Class A or B depends on product classification.

Limits for conducted disturbance at the mains ports  
of class A ITE

| Frequency range<br>MHz                                        | Limits<br>dB(μV) |         |
|---------------------------------------------------------------|------------------|---------|
|                                                               | Quasi-peak       | Average |
| 0,15 to 0,50                                                  | 79               | 66      |
| 0,50 to 30                                                    | 73               | 60      |
| NOTE The lower limit shall apply at the transition frequency. |                  |         |

Table 1: Limits for Conducted Disturbance at the Mains Ports of Class A ITE.

**Limits for conducted disturbance at the mains ports  
of class B ITE**

| Frequency range<br>MHz                                                                                                                                                          | Limits<br>dB( $\mu$ V) |          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------|
|                                                                                                                                                                                 | Quasi-peak             | Average  |
| 0,15 to 0,50                                                                                                                                                                    | 66 to 56               | 56 to 46 |
| 0,50 to 5                                                                                                                                                                       | 56                     | 46       |
| 5 to 30                                                                                                                                                                         | 60                     | 50       |
| NOTE 1 The lower limit shall apply at the transition frequencies.<br>NOTE 2 The limit decreases linearly with the logarithm of the frequency in the range 0,15 MHz to 0,50 MHz. |                        |          |

**Table 2: Limits for Conducted Disturbance at the Mains Ports of Class B ITE**

### 6.7.3 Test Result

Not Applicable. Testing is not required, radio shall turn off during charging mode.

**END OF TEST REPORT**