

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                               |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
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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/>Motorola Solutions Malaysia Sdn Bhd,<br/>Plot 2A, Medan Bayan Lepas,<br/>Mukim 12 S.W.D, 11900 Bayan Lepas,<br/>Penang, Malaysia.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p><b>FCC / ISED TEST REPORT</b><br/><b>Report Revision : Rev.B</b></p>                                                                                                                                                                                                                                                                                                                                                       |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <table><tr><td><b>Date/s Tested</b></td><td>: 10-August-2020 - 27-August-2020</td></tr><tr><td><b>Manufacturer/Location</b></td><td>: Motorola Solutions Malaysia Sdn Bhd</td></tr><tr><td><b>Manufacturer Address</b></td><td>: Plot 2A, Medan Bayan lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia</td></tr><tr><td><b>Requestor</b></td><td>: SIEW KHENG TAN</td></tr><tr><td><b>Product Type</b></td><td>: Portable</td></tr><tr><td><b>Product Version (PMN)</b></td><td>: P2B</td></tr><tr><td><b>Model Number (HVIN)</b></td><td>: AAH90ZDU9RH1AN</td></tr><tr><td><b>Frequency Band</b></td><td>: Refer to section 1.4</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, 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>: 109AK</td></tr><tr><td><b>Firmware Version (FVIN)</b></td><td>: I02.21.01.0029 (BP), D00.00.65 (AP)</td></tr></table> <div></div> <p><b>The equipment was tested accordance to the requirement listed below:</b></p> <table><tr><td><b>(LTE Band 14)</b><br/><b>FCC 47 CFR Part 2 / 90</b><br/><b>ISED RSS GEN / 140</b></td><td><b>PASS</b></td></tr></table> |                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Date/s Tested</b> | : 10-August-2020 - 27-August-2020 | <b>Manufacturer/Location</b> | : Motorola Solutions Malaysia Sdn Bhd | <b>Manufacturer Address</b> | : Plot 2A, Medan Bayan lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia | <b>Requestor</b> | : SIEW KHENG TAN | <b>Product Type</b> | : Portable | <b>Product Version (PMN)</b> | : P2B | <b>Model Number (HVIN)</b> | : AAH90ZDU9RH1AN | <b>Frequency Band</b> | : Refer to section 1.4 | <b>Applicant Name</b> | : Motorola Solutions Inc | <b>Applicant Address</b> | : 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322. | <b>FCC Registrations</b> | : 461337 | <b>ISED Registrations</b> | : 109AK | <b>Firmware Version (FVIN)</b> | : I02.21.01.0029 (BP), D00.00.65 (AP) | <b>(LTE Band 14)</b><br><b>FCC 47 CFR Part 2 / 90</b><br><b>ISED RSS GEN / 140</b> | <b>PASS</b> |
| <b>Date/s Tested</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | : 10-August-2020 - 27-August-2020                                                                                                                                                                                                                                                                                                                                                                                             |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>Manufacturer/Location</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | : Motorola Solutions Malaysia Sdn Bhd                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>Manufacturer Address</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | : Plot 2A, Medan Bayan lepas, Mukim 12, S.W.D. 11900 Bayan Lepas, Penang, Malaysia                                                                                                                                                                                                                                                                                                                                            |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>Requestor</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | : SIEW KHENG TAN                                                                                                                                                                                                                                                                                                                                                                                                              |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>Product Type</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | : Portable                                                                                                                                                                                                                                                                                                                                                                                                                    |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>Product Version (PMN)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | : P2B                                                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>Model Number (HVIN)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | : AAH90ZDU9RH1AN                                                                                                                                                                                                                                                                                                                                                                                                              |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>Frequency Band</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | : Refer to section 1.4                                                                                                                                                                                                                                                                                                                                                                                                        |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>Applicant Name</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | : Motorola Solutions Inc                                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>Applicant Address</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | : 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322.                                                                                                                                                                                                                                                                                                                                                                |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>FCC Registrations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | : 461337                                                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>ISED Registrations</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | : 109AK                                                                                                                                                                                                                                                                                                                                                                                                                       |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>Firmware Version (FVIN)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | : I02.21.01.0029 (BP), D00.00.65 (AP)                                                                                                                                                                                                                                                                                                                                                                                         |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |
| <b>(LTE Band 14)</b><br><b>FCC 47 CFR Part 2 / 90</b><br><b>ISED RSS GEN / 140</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><br><br><hr/> <p><b>Lim Khay Kwang</b><br/><b>Technician</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>Approve Signatory:</p><br><br><hr/> <p><b>Ho Sze Khian</b><br/><b>Technical Manager</b></p>                                                                                                                                                                                                                                                                                                                                |                      |                                   |                              |                                       |                             |                                                                                    |                  |                  |                     |            |                              |       |                            |                  |                       |                        |                       |                          |                          |                                                                |                          |          |                           |         |                                |                                       |                                                                                    |             |

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## REVISION HISTORY

| Revision History | Description                           | Date             | Originator     |
|------------------|---------------------------------------|------------------|----------------|
| Rev A            | Initial Report                        | 9-September-2020 | Lim Khay Kwang |
| Rev B            | Update 1.3. General Information Table | 11-November-2020 | Lim Khay Kwang |

### 1.0. Summary of Test Results

| FCC Clause          | ISED Clause                 | Test Item                             | Result         | Remark                         | Serial Number Tested |
|---------------------|-----------------------------|---------------------------------------|----------------|--------------------------------|----------------------|
| 2.1046              | RSS-140 3.1                 | Conducted RF Output Power             | Pass           | Meet the requirement of limit. | 734TWP0386           |
| 2.1046              | RSS 140 4.3                 | Peak-to-Average Power Ratio           | Pass           | Meet the requirement of limit. | 734TWP0386           |
| 2.1049<br>90.209(7) | RSS-Gen 6.7                 | Occupied Bandwidth (26dBc, 99%)       | Pass           | Meet the requirement of limit. | 734TWP0386           |
| 2.1055<br>90.213    | RSS-140 4.2                 | Frequency Stability                   | Pass           | Meet the requirement of limit. | 734TWP0386           |
| 2.1051<br>90.691    | RSS-Gen 6.13<br>RSS-140 4.4 | Band Edge Conducted Spurious Emission | Pass           | Meet the requirement of limit. | 734TWP0386           |
| 2.1051              | RSS-Gen 6.13<br>RSS-140 4.4 | Conducted Spurious Emissions          | Pass           | Meet the requirement of limit. | 734TWP0386           |
| 2.1051              | RSS-140 4.4                 | Radiated Spurious Emission            | Not Performed. | Not Performed.                 | 734TWP0308           |
| 90.635(b)           | RSS-140 4.3                 | Effective Radiated Power (ERP)        | Not Performed. | Not Performed.                 | Not Performed        |
| 90.543(f)           | RSS – 140<br>4.4(b)         | GNSS (EIRP for 1599 – 1610MHz)        | Pass           | Meet the requirement of limit  | 734TWP0308           |

### 1.1. Measurement Uncertainty

| Measurement                    | Frequency        | Expended Uncertainty (k=1.96) (±dB) |
|--------------------------------|------------------|-------------------------------------|
| Radiated Emissions up to 1 GHz | 30MHz ~ 200MHz   | 5.01                                |
|                                | 200MHz ~ 1000MHz | 5.01                                |
| Radiated Emissions above 1 GHz | 1GHz ~ 18GHz     | 5.01                                |
|                                | 18GHz ~ 25GHz    | 5.01                                |

### 1.2. Equipment List

| Description                                                                | Model  | Serial Number | Calibration Date | Calibration Due Date |
|----------------------------------------------------------------------------|--------|---------------|------------------|----------------------|
| Broadband ATE 1 (RF Conducted Tests); Test Software Version: CMWRun v1.8.9 |        |               |                  |                      |
| SIGNAL ANALYZER                                                            | FSV40  | 101431        | 16-Jul-19        | 16-Jul-21            |
| CHAMBER                                                                    | SH-641 | 92003150      | 25-Sep-19        | 25-Sep-20            |

|                                                                                      |                        |             |              |              |
|--------------------------------------------------------------------------------------|------------------------|-------------|--------------|--------------|
| WIDEBAND RADIO COMMUNICATION TESTER                                                  | CMW500                 | 154550      | 23-Jul-19    | 23-Jul-21    |
| POWER SUPPLY                                                                         | 6652A                  | 3117A00162  | 16-Mar-20    | 16-Mar-21    |
| Radiated Spurious Emission (EMC Chamber 1); Test Software Version: EMC_FCC_RE_v1.6.2 |                        |             |              |              |
| 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-Sep-20    |
| EMI TEST RECEIVER                                                                    | ESIB26                 | 100017      | 19-Jul-19    | 19-Sep-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 Sucoflex | 001         | Not Required | Not Required |
| PREAMPLIFIER                                                                         | PAM-0118               | 269         | 24-May-19    | 24-May-22    |
| LOOP ANTENNA                                                                         | 6502                   | 00208416    | 5-Sep-19     | 5-Sep-20     |

### 1.3. General Information

#### General Description of EUT

|                     |                                     |                                     |                     |         |
|---------------------|-------------------------------------|-------------------------------------|---------------------|---------|
| Product             | MACKENZIE UHF NAG MODEL             |                                     |                     |         |
| Brand               | Motorola Solutions                  |                                     |                     |         |
| Test Model          | AAH90ZDU9RH1AN                      |                                     |                     |         |
| Power Supply Rating | 7.5Vdc                              |                                     |                     |         |
| Mode of operation   | LTE Band 14                         |                                     |                     |         |
| Modulation Type     | QPSK, 16QAM                         |                                     |                     |         |
| Operating Frequency | LTE Band 14                         | Channel Bandwidth 5MHz              | 790.5MHz~795.5MHz   |         |
|                     |                                     | Channel Bandwidth 10MHz             | 793.0MHz            |         |
| Max. ERP Power      | LTE Band 14<br>QPSK                 | Channel Bandwidth 5MHz              | 22.764dBm (0.1890W) |         |
|                     |                                     | Channel Bandwidth 10MHz             | 22.674dBm (0.1851W) |         |
|                     | LTE Band 14<br>16QAM                | Channel Bandwidth 5MHz              | 21.887dBm (0.1544W) |         |
|                     |                                     | Channel Bandwidth 10MHz             | 21.815dBm (0.1519W) |         |
| Emission Designator | LTE Band 14                         |                                     | QPSK                | 16QAM   |
|                     |                                     | Channel Bandwidth 5MHz              | 4M47G7D             | 4M48D7W |
|                     |                                     | Channel Bandwidth 10MHz             | 8M91G7D             | 8M93D7W |
| Antenna Type        | LTE Band 14                         | LTE LOW BAND MAIN ANTENNA (1.15dBi) |                     |         |
| SW Version          | I02.21.01.0029 (BP), D00.00.65 (AP) |                                     |                     |         |
| HW Version          | P2B                                 |                                     |                     |         |

Note:

1. The EUT contains following accessory devices and data cable.

| Item   | Brand    | Model or P/N | Specification                                            |
|--------|----------|--------------|----------------------------------------------------------|
| Li-Ion | MOTOROLA | PMNN4804A    | BATTERY PACK,BATTERY PACK,IMPRES GEN2, LIION,IP68, 2820T |

### Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

The following support units or accessories were used to form a representative test configuration during the tests.

| NO. | Product                             | Brand | Model No. | Serial No. | FCC ID |
|-----|-------------------------------------|-------|-----------|------------|--------|
| 1   | Wideband Radio Communication Tester | R&S   | CMW500    | 154550     | NA     |

| NO. | Signal Cable Description of The above Support Units |
|-----|-----------------------------------------------------|
| 1   | NA                                                  |

Note:

1. All power cords of the above support units are non-shielded.
2. Item 1 acted as a communication partner to transfer data.

### EUT Operating Conditions

The EUT makes a call to the communication simulator. The communication simulator station system controlled a EUT to export maximum output power under transmission mode and specific channel frequency.

### General Description of Applied Standards

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

**FCC 47 CFR Part 2**

**FCC 47 CFR Part 90**

**KDB 971168 D01 Power Meas License Digital Systems v03r01**

**ANSI C63.26**

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

### 1.4. Channel number and frequency info

| Band        | Bandwidth supported | Available Channel Number | Test Channel Number |             |              | Test Channel Frequency (MHz) |             |              |
|-------------|---------------------|--------------------------|---------------------|-------------|--------------|------------------------------|-------------|--------------|
|             |                     |                          | Low Channel         | Mid Channel | High Channel | Low Channel                  | Mid Channel | High Channel |
| LTE Band 14 | 5 MHz               | 23305 ~ 23355            | 23305               | 23330       | 23355        | 790.5                        | 793.0       | 795.5        |
|             | 10 MHz              | 23330                    | -                   | 23330       | -            | -                            | 793.0       | -            |

## 1.5. Test Mode Applicability and Tested Channel Detail

### LTE Band 14

| Test Item                             | Available Channel | Tested Channel      | Channel Bandwidth | Uplink Modulation | Mode                                                             |
|---------------------------------------|-------------------|---------------------|-------------------|-------------------|------------------------------------------------------------------|
| Conducted RF Output Power             | 23305~ 23355      | 23305, 23330, 23355 | 5 MHz             | QPSK, 16QAM       | As per table 1.6.3                                               |
|                                       | 23330             | 23330               | 10 MHz            |                   |                                                                  |
| Peak to Average Power Ratio           | 23305~ 23355      | 23305, 23330, 23355 | 5 MHz             | QPSK, 16QAM       | 25 RB / 0 RB Offset                                              |
|                                       | 23330             | 23330               | 10 MHz            |                   | 50 RB / 0 RB Offset                                              |
| Occupied Bandwidth                    | 23305~ 23355      | 23305, 23330, 23355 | 5 MHz             | QPSK, 16QAM       | 25 RB / 0 RB Offset                                              |
|                                       | 23330             | 23330               | 10 MHz            |                   | 50 RB / 0 RB Offset                                              |
| Frequency Stability                   | 23305~ 23355      | 23305, 23355        | 5 MHz             | QPSK              | 25 RB / 0 RB Offset                                              |
|                                       | 23330             | 23330               | 10 MHz            |                   | 50 RB / 0 RB Offset                                              |
| Band Edge Conducted Spurious Emission | 23305~ 23355      | 23305, 23355        | 5 MHz             | QPSK, 16QAM       | 1 RB / 0 RB Offset<br>1 RB / 24 RB Offset<br>25 RB / 0 RB Offset |
|                                       | 23330             | 23330               | 10 MHz            |                   | 1 RB / 0 RB Offset<br>1 RB / 49 RB Offset<br>50 RB / 0 RB Offset |
| Conducted Spurious Emission           | 23305~ 23355      | 23305, 23330, 23355 | 5 MHz             | QPSK              | 1 RB / 13 RB Offset                                              |
|                                       | 23330             | 23330               | 10 MHz            |                   | 1 RB / 49 RB Offset                                              |
| Radiated Spurious Emission            | 23305~ 23355      | 23305               | 5 MHz             | QPSK              | 1 RB / 24 RB Offset                                              |
|                                       |                   | 23330               |                   |                   | 1 RB / 24 RB Offset                                              |
|                                       |                   | 23355               |                   |                   | 1 RB / 13 RB Offset                                              |
| GNSS (EIRP for 1599 – 1610MHz)        | 23305~ 23355      | 23305               | 5 MHz             | QPSK              | 1 RB / 24 RB Offset                                              |
|                                       |                   | 23330               |                   |                   | 1 RB / 24 RB Offset                                              |
|                                       |                   | 23355               |                   |                   | 1 RB / 13 RB Offset                                              |
| Effective Radiated Power (ERP)        | 23305~ 23355      | 23305, 23330, 23355 | 5 MHz             | QPSK, 16QAM       | As per table 1.6.4                                               |
|                                       | 23330             | 23330               | 10 MHz            |                   |                                                                  |

#### NOTE:

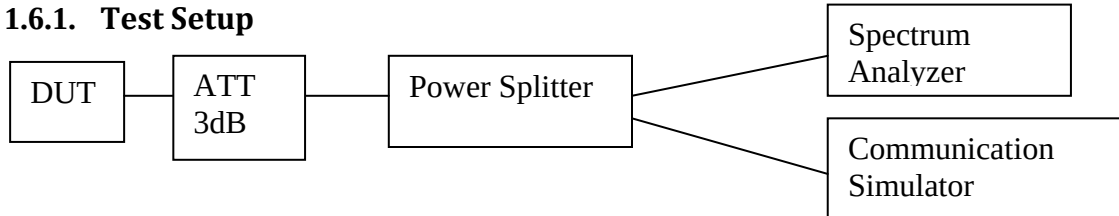
1. The Conducted RF Output Power for QPSK and 16QAM, measured value of QPSK mode is higher than 16QAM mode. Therefore, only Conducted Spurious Emission, Radiated Emission and GNSS (EIRP for 1599 – 1610MHz) had been tested under QPSK modes.
2. Band Edge was performed with 1 and full Resource Block at the lowest and highest operating frequency band.
3. The Equivalent Isotropically Radiated Power (EIRP) was calculated from Conducted RF Output Power results in QPSK and 16QAM modulation.
4. Peak to Average and Occupied Bandwidth were performed with full Resource Block which is the worst case.
5. Frequency stability was performed with full Resource Block in QPSK modulation.

**Test Condition:**

| Test Item                             | Environmental Conditions | Input Power | Tested By    |
|---------------------------------------|--------------------------|-------------|--------------|
| Conducted RF Output Power             | 25°C, 50% RH             | 7.5V DC     | Khay Kwang   |
| Peak-to-Average Power Ratio           | 25°C, 50% RH             | 7.5V DC     | Khay Kwang   |
| Occupied Bandwidth                    | 25°C, 50% RH             | 7.5V DC     | Khay Kwang   |
| Frequency Stability                   | 25°C, 50% RH             | 7.5V DC     | Khay Kwang   |
| Band Edge Conducted Spurious Emission | 25°C, 50% RH             | 7.5V DC     | Khay Kwang   |
| Conducted Spurious Emission           | 25°C, 50% RH             | 7.5V DC     | Khay Kwang   |
| Radiated Spurious Emission            | 25°C, 63.7% RH           | 7.5V DC     | Nazrin&Fendi |
| Effective Radiated Power (ERP)        | 25°C, 63.7% RH           | 7.5V DC     | Khay Kwang   |

## 1.6. Conducted RF Output Power

### 1.6.1. Test Setup



1. The DUT transmitter output port was connected to communication simulator with above setup.
2. Path loss for the measurement included.
3. Set DUT to transmit maximum power through communication simulator
4. All the measurement were done at low, mid, high channel for each band and different modulation.
5. Record the average power into the test report.

### 1.6.2. Test Limits

FCC: Portable stations (hand-held devices) transmitting in the 758-768 MHz band and the 788-798 MHz band are limited to 3 watts ERP.

### 1.6.3. Conducted RF Output Power – LTE Band 14 (788-798MHz)

| Conducted Output Power (dBm) |         |           |                 |          |           |                  |          |           |
|------------------------------|---------|-----------|-----------------|----------|-----------|------------------|----------|-----------|
| LTE Band/BW                  | RB Size | RB Offset | QPSK Modulation |          |           | 16QAM Modulation |          |           |
|                              |         |           | Low CH          | Mid CH   | High CH   | Low CH           | Mid CH   | High CH   |
|                              |         |           | 23305           | 23330    | 23355     | 23305            | 23330    | 23355     |
|                              |         |           | 790.5MHz        | 793.0MHz | 795.5 MHz | 790.5 MHz        | 793.0MHz | 795.5 MHz |
| Band 14 / 5MHz               | 1       | 0         | 23.482          | 23.572   | 23.673    | 22.774           | 22.721   | 22.723    |
|                              | 1       | 13        | 23.597          | 23.706   | 23.764    | 22.887           | 22.813   | 22.794    |
|                              | 1       | 24        | 23.635          | 23.717   | 23.725    | 22.88            | 22.852   | 22.756    |
|                              | 12      | 0         | 22.539          | 22.697   | 22.749    | 21.621           | 21.672   | 21.791    |
|                              | 12      | 6         | 22.536          | 22.709   | 22.755    | 21.611           | 21.693   | 21.804    |
|                              | 12      | 13        | 22.651          | 22.68    | 22.78     | 21.678           | 21.666   | 21.855    |
|                              | 25      | 0         | 22.545          | 22.695   | 22.74     | 21.61            | 21.772   | 21.797    |



| Conducted Output Power (dBm) |         |           |                 |          |         |                  |          |         |
|------------------------------|---------|-----------|-----------------|----------|---------|------------------|----------|---------|
| LTE Band/BW                  | RB Size | RB Offset | QPSK Modulation |          |         | 16QAM Modulation |          |         |
|                              |         |           | Low CH          | Mid CH   | High CH | Low CH           | Mid CH   | High CH |
|                              |         |           |                 | 23330    |         |                  | 23330    |         |
|                              |         |           |                 | 793.0MHz |         |                  | 793.0MHz |         |
| Band 14 / 10MHz              | 1       | 0         |                 | 23.488   |         |                  | 22.638   |         |
|                              | 1       | 25        |                 | 23.64    |         |                  | 22.779   |         |
|                              | 1       | 49        |                 | 23.674   |         |                  | 22.815   |         |
|                              | 25      | 0         |                 | 22.731   |         |                  | 21.86    |         |
|                              | 25      | 13        |                 | 22.736   |         |                  | 21.862   |         |
|                              | 25      | 25        |                 | 22.692   |         |                  | 21.823   |         |
|                              | 50      | 0         |                 | 22.719   |         |                  | 21.746   |         |

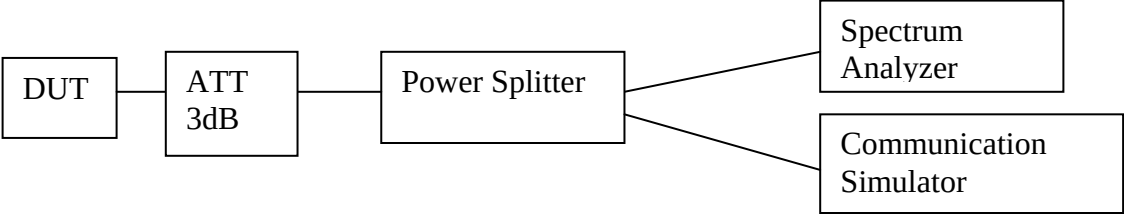
#### 1.6.4. Effective Radiated Power (ERP) - LTE Band 14 (788-798MHz)

| Effective Radiated Power (dBm) |         |           |                 |          |           |                  |          |           |
|--------------------------------|---------|-----------|-----------------|----------|-----------|------------------|----------|-----------|
| LTE Band/BW                    | RB Size | RB Offset | QPSK Modulation |          |           | 16QAM Modulation |          |           |
|                                |         |           | Low CH          | Mid CH   | High CH   | Low CH           | Mid CH   | High CH   |
|                                |         |           | 23305           | 23330    | 23355     | 23305            | 23330    | 23355     |
|                                |         |           | 790.5MHz        | 793.0MHz | 795.5 MHz | 790.5 MHz        | 793.0MHz | 795.5 MHz |
| Band 14 / 5MHz                 | 1       | 0         | 22.482          | 22.572   | 22.673    | 21.774           | 21.721   | 21.723    |
|                                | 1       | 13        | 22.597          | 22.706   | 22.764    | 21.887           | 21.813   | 21.794    |
|                                | 1       | 24        | 22.635          | 22.717   | 22.725    | 21.88            | 21.852   | 21.756    |
|                                | 12      | 0         | 21.539          | 21.697   | 21.749    | 20.621           | 20.672   | 20.791    |
|                                | 12      | 6         | 21.536          | 21.709   | 21.755    | 20.611           | 20.693   | 20.804    |
|                                | 12      | 13        | 21.651          | 21.68    | 21.78     | 20.678           | 20.666   | 20.855    |
|                                | 25      | 0         | 21.545          | 21.695   | 21.74     | 20.61            | 20.772   | 20.797    |

| Effective Radiated Power (dBm) |         |           |                 |          |         |                  |          |         |
|--------------------------------|---------|-----------|-----------------|----------|---------|------------------|----------|---------|
| LTE Band/BW                    | RB Size | RB Offset | QPSK Modulation |          |         | 16QAM Modulation |          |         |
|                                |         |           | Low CH          | Mid CH   | High CH | Low CH           | Mid CH   | High CH |
|                                |         |           |                 | 23330    |         |                  | 23330    |         |
|                                |         |           |                 | 793.0MHz |         |                  | 793.0MHz |         |
| Band 14 / 10MHz                | 1       | 0         |                 | 22.488   |         |                  | 21.638   |         |
|                                | 1       | 25        |                 | 22.64    |         |                  | 21.779   |         |
|                                | 1       | 49        |                 | 22.674   |         |                  | 21.815   |         |
|                                | 25      | 0         |                 | 21.731   |         |                  | 20.86    |         |
|                                | 25      | 13        |                 | 21.736   |         |                  | 20.862   |         |
|                                | 25      | 25        |                 | 21.692   |         |                  | 20.823   |         |
|                                | 50      | 0         |                 | 21.719   |         |                  | 20.746   |         |

1.7. Peak-to-Average Power Ratio

1.7.1. Test Setup



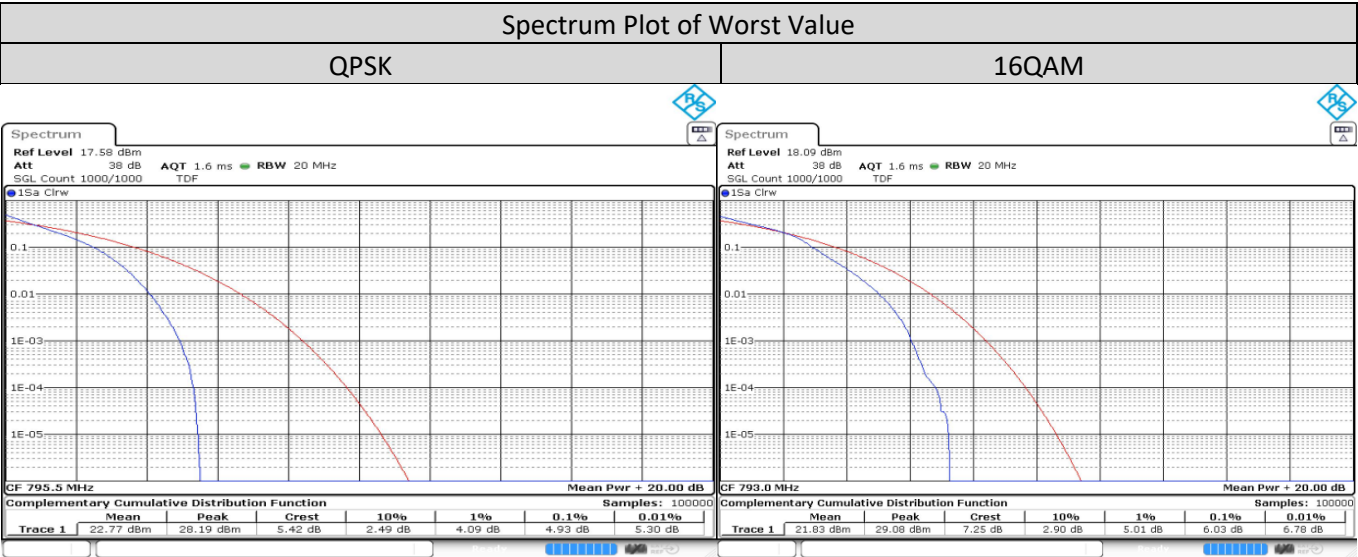
- 1) The DUT transmitter output port was connected to communication simulator with above setup.
- 2) Path loss for the measurement included.
- 3) Set DUT to transmit maximum power through communication simulator
- 4) Set the CCDF (Complementary Cumulative Distribution Function) option in the spectrum analyzer.
- 5) Spectrum Analyzer setting, RBW = 20MHz.
- 6) Recorded the maximum PAR level associated with a probability of 0.1% as Peak to Average Ratio.
- 7) All the measurements were done at low, mid, high channel for each band and different modulation.

1.7.2. Test Limit

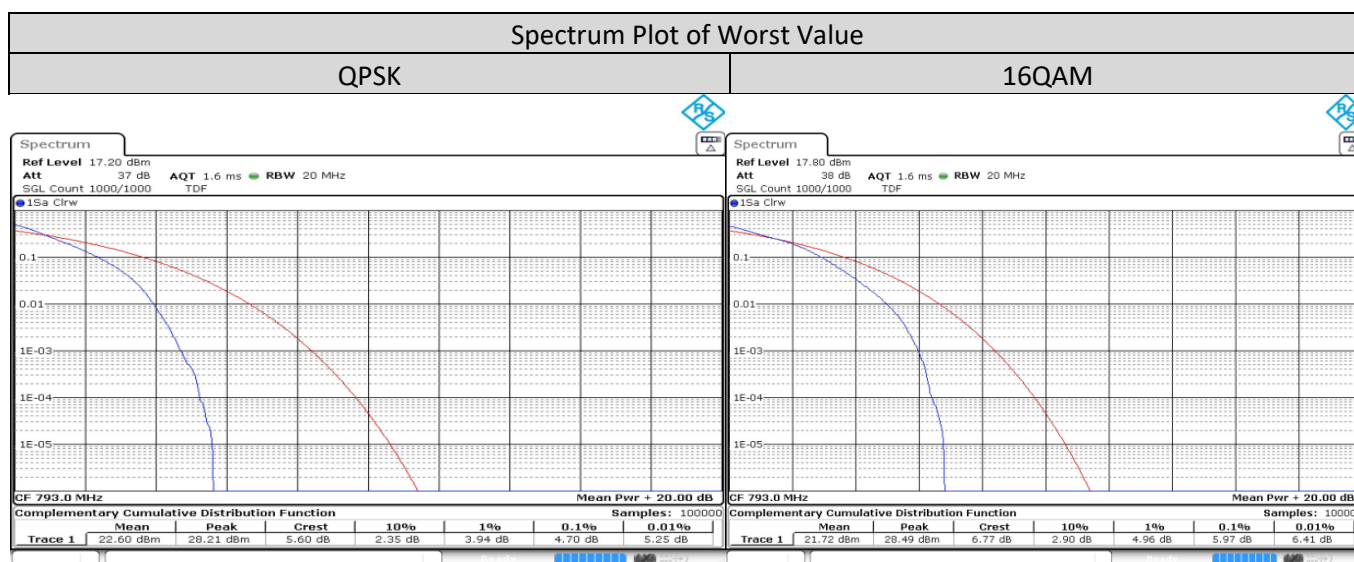
The peak-to-average ratio (PAR) of the transmission may not exceed 13 dB

1.7.3. Peak To Average Power Ratio - LTE Band 14 (788-798MHz)

| LTE Band/<br>BW/<br>RB Size/<br>RB Offset | Channel<br>Number | Tx Frequency<br>(MHz) | Peak To Average (dB) |                  |
|-------------------------------------------|-------------------|-----------------------|----------------------|------------------|
|                                           |                   |                       | QPSK Modulation      | 16QAM Modulation |
| Band 14 /<br>5MHz/25/0                    | Low CH 23305      | 790.5 MHz             | 4.812                | 6                |
|                                           | Mid CH 23330      | 793 MHz               | 4.899                | 6.029            |
|                                           | High CH 23355     | 795.5 MHz             | 4.928                | 6                |

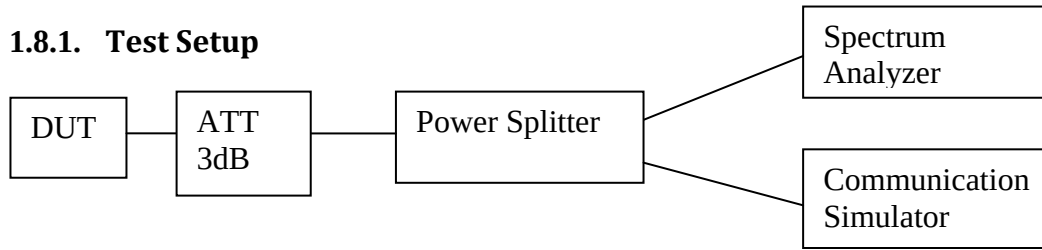


| LTE Band/<br>BW/<br>RB Size/<br>RB Offset | Channel<br>Number | Tx Frequency<br>(MHz) | Peak To Average (dB) |                  |
|-------------------------------------------|-------------------|-----------------------|----------------------|------------------|
|                                           |                   |                       | QPSK Modulation      | 16QAM Modulation |
| <b>Band 14 /<br/>10 MHz/50/0</b>          | Low CH            |                       |                      |                  |
|                                           | Mid CH 23330      | 793 MHz               | 4.696                | 5.971            |
|                                           | High CH           |                       |                      |                  |



## 1.8. Occupied Bandwidth

### 1.8.1. Test Setup



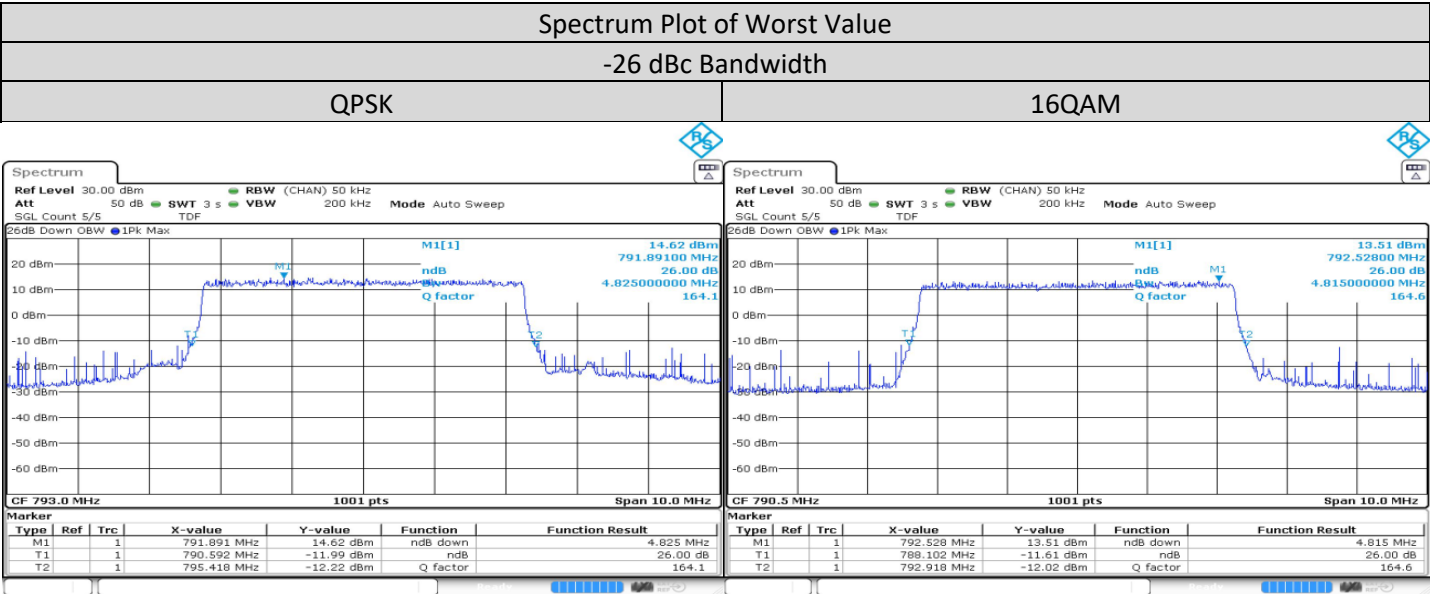
- 1) The DUT transmitter output port was connected to communication simulator with above setup.
- 2) Path loss for the measurement included.
- 3) For LTE measurement, set DUT to transmit maximum power & full RB size through communication simulator.
- 4) For LTE measurement, set DUT to transmit maximum power through communication simulator.
- 5) Spectrum Analyzer setting, RBW is 1% of OBW and VBW is 3 times of RBW.
- 6) Measure & record -26dBc and 99% occupied bandwidth (BW).
- 7) All the measurement was done at low, mid, high channel for each band and different modulation.

### 1.8.2. Test Limit

For measurement 99% of occupied bandwidth that is required by FCC 2.1049.

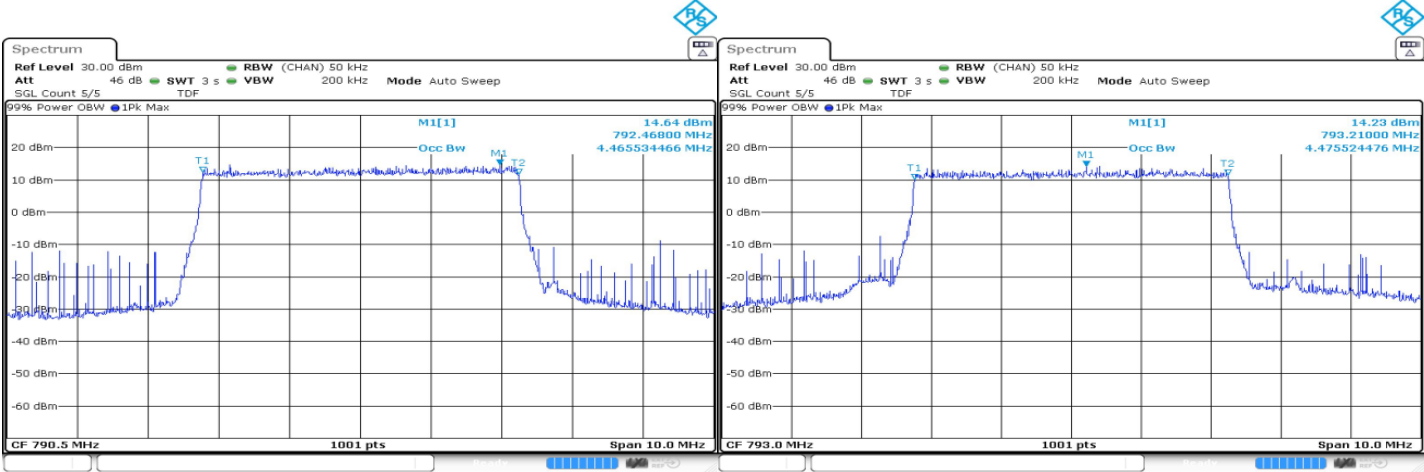
1.8.3. Occupied Bandwidth - LTE Band 14 (788-798MHz)

| LTE Band/<br>BW/<br>RB Size/<br>RB Offset | Channel Number | Tx Frequency<br>(MHz) | -26 dBc Bandwidth (MHz) |                  |
|-------------------------------------------|----------------|-----------------------|-------------------------|------------------|
|                                           |                |                       | QPSK Modulation         | 16QAM Modulation |
| Band 14 /<br>5MHz/25/0                    | Low CH 23305   | 790.5 MHz             | 4.805                   | 4.815            |
|                                           | Mid CH 23330   | 793 MHz               | 4.825                   | 4.805            |
|                                           | High CH 23355  | 795.5 MHz             | 4.815                   | 4.775            |



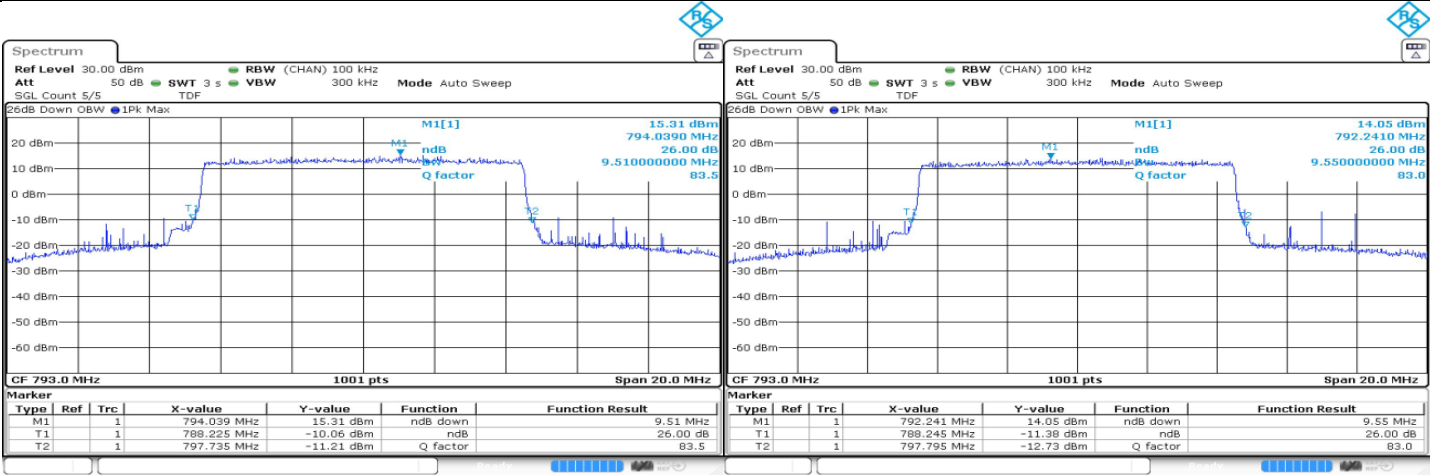
| LTE Band/<br>BW        | Channel Number | Tx Frequency<br>(MHz) | 99% Occupied Bandwidth (MHz) |                  |
|------------------------|----------------|-----------------------|------------------------------|------------------|
|                        |                |                       | QPSK Modulation              | 16QAM Modulation |
| Band 14 /<br>5MHz/25/0 | Low CH 23305   | 790.5 MHz             | 4.466                        | 4.466            |
|                        | Mid CH 23330   | 793 MHz               | 4.456                        | 4.476            |
|                        | High CH 23355  | 795.5 MHz             | 4.466                        | 4.456            |

| Spectrum Plot of Worst Value |       |
|------------------------------|-------|
| 99% Occupied Bandwidth       |       |
| QPSK                         | 16QAM |



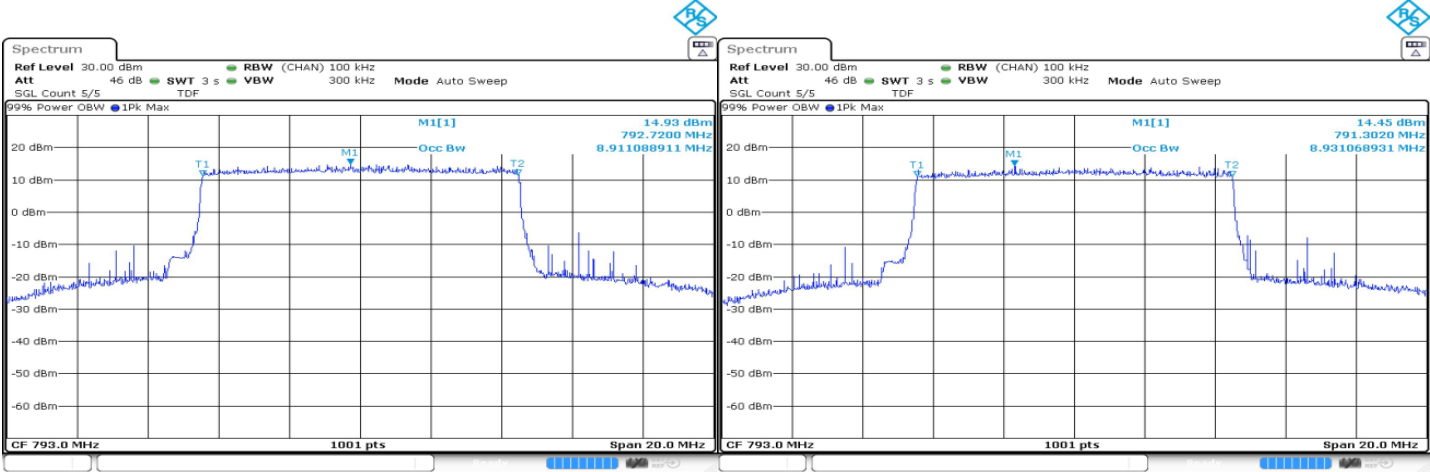
| LTE Band/<br>BW/<br>RB Size/<br>RB Offset | Channel Number | Tx Frequency<br>(MHz) | -26 dBc Bandwidth (MHz) |                  |
|-------------------------------------------|----------------|-----------------------|-------------------------|------------------|
|                                           |                |                       | QPSK Modulation         | 16QAM Modulation |
| Band 14 /<br>10MHz/50/0                   | Low CH         |                       |                         |                  |
|                                           | Mid CH 23330   | 793 MHz               | 9.51                    | 9.55             |
|                                           | High CH        |                       |                         |                  |

| Spectrum Plot of Worst Value |       |
|------------------------------|-------|
| -26 dBc Bandwidth            |       |
| QPSK                         | 16QAM |



| LTE Band/<br>BW         | Channel Number | Tx Frequency<br>(MHz) | 99% Occupied Bandwidth (MHz) |                  |
|-------------------------|----------------|-----------------------|------------------------------|------------------|
|                         |                |                       | QPSK Modulation              | 16QAM Modulation |
| Band 14 /<br>10MHz/50/0 | Low CH         |                       |                              |                  |
|                         | Mid CH 23330   | 793 MHz               | 8.911                        | 8.931            |
|                         | High CH        |                       |                              |                  |

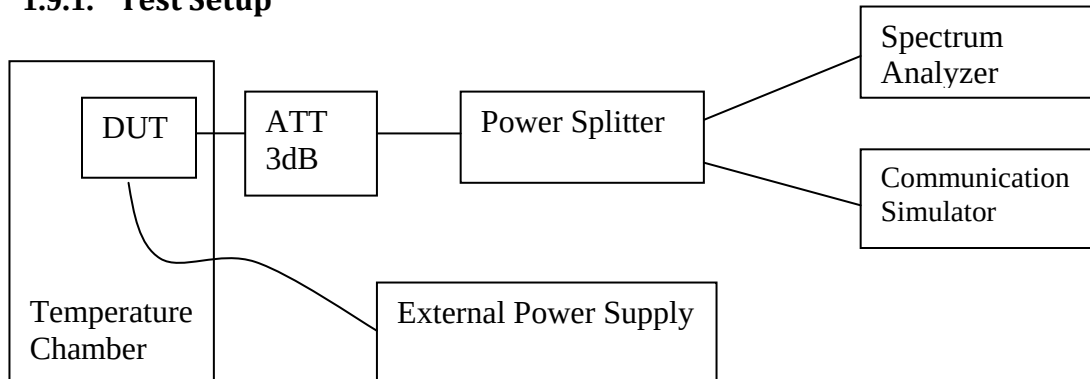
| Spectrum Plot of Worst Value |       |
|------------------------------|-------|
| 99% Occupied Bandwidth       |       |
| QPSK                         | 16QAM |





## 1.9. Frequency Stability

### 1.9.1. Test Setup



- 1) The DUT is placed in the temperature chamber and DUT is power up by external power supply to control the DC input voltage.
- 2) The temperature chamber could control the temperature and humidity and external power supply could control the test voltage range from minimum to maximum operating voltage.
- 3) Measured frequency error from the communication simulator by vary below step :
  - i. Vary temperature of the temperature chamber from -30 ~ 50 deg C (10 deg C / Step) and set external supply voltage constant at nominal voltage.
  - ii. Vary external supply voltage from minimum to maximum operation voltage support by DUT and set temperature chamber constant at room temp.
- 4) All the measurement was done at mid channel for each band.

### 1.9.2. Test Limit

As per manufacturer declared product operating at -20 to 60 deg C with spec of +/- 0.1ppm.

### 1.9.3. Frequency Stability - LTE Band 14 (788-798MHz)

| Band           | Temp<br>( Deg C) | Frequency Error VS Temperature |                       |                 |                       |
|----------------|------------------|--------------------------------|-----------------------|-----------------|-----------------------|
|                |                  | Channel Bandwidth: 5 MHz       |                       |                 |                       |
|                |                  | Low Channel                    |                       | High Channel    |                       |
|                |                  | 790.5MHz                       |                       | 795.5MHz        |                       |
| LTE<br>Band 14 |                  | Frequency (MHz)                | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
|                | 60               | 790.500006                     | 0.008071              | 795.500011      | 0.013235              |
|                | 50               | 790.499995                     | -0.006678             | 795.500008      | 0.009585              |
|                | 40               | 790.500009                     | 0.011129              | 795.500007      | 0.009315              |
|                | 30               | 790.500004                     | 0.004759              | 795.500001      | 0.01203               |
|                | 20               | 790.500007                     | 0.008614              | 795.500001      | 0.012462              |
|                | 10               | 790.500005                     | 0.006768              | 795.500007      | 0.009333              |
|                | 0                | 790.500008                     | 0.009682              | 795.500006      | 0.007661              |
|                | -10              | 790.500007                     | 0.009193              | 795.500006      | 0.007804              |
|                | -20              | 790.500006                     | 0.00798               | 795.500011      | 0.014278              |

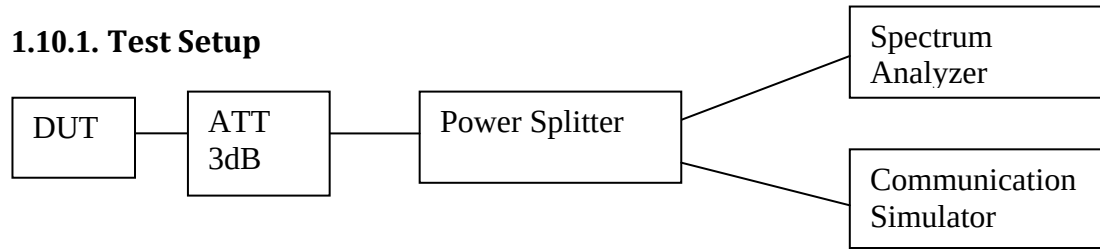
| Band           | Voltage (V) | Frequency Error VS Voltage |                       |                 |                       |
|----------------|-------------|----------------------------|-----------------------|-----------------|-----------------------|
|                |             | Channel Bandwidth: 5 MHz   |                       |                 |                       |
|                |             | Low Channel                |                       | High Channel    |                       |
|                |             | 790.5MHz                   |                       | 795.5MHz        |                       |
| LTE<br>Band 14 |             | Frequency (MHz)            | Frequency Error (ppm) | Frequency (MHz) | Frequency Error (ppm) |
|                | 9V          | 790.499994                 | -0.00713              | 795.50001       | 0.012462              |
|                | 7.5V        | 790.500008                 | 0.009844              | 795.500008      | 0.01025               |
|                | 6V          | 790.500005                 | 0.006641              | 795.500008      | 0.01034               |

| Band           | Temp ( Deg C) | Frequency Error VS Temperature |                       |
|----------------|---------------|--------------------------------|-----------------------|
|                |               | Channel Bandwidth: 10 MHz      |                       |
|                |               | Mid Channel                    |                       |
|                |               | 793MHz                         |                       |
| LTE<br>Band 14 |               | Frequency (MHz)                | Frequency Error (ppm) |
|                | 60            | 792.999992                     | -0.010409             |
|                | 50            | 792.999992                     | -0.009759             |
|                | 40            | 792.999992                     | -0.009705             |
|                | 30            | 792.999991                     | -0.01104              |
|                | 20            | 792.999992                     | -0.009489             |
|                | 10            | 792.999993                     | -0.008623             |
|                | 0             | 792.999993                     | -0.009398             |
|                | -10           | 792.999994                     | -0.007685             |
|                | -20           | 792.999993                     | -0.009272             |

| Band           | Voltage (V) | Frequency Error VS Voltage |                       |
|----------------|-------------|----------------------------|-----------------------|
|                |             | Channel Bandwidth: 10 MHz  |                       |
|                |             | Mid Channel                |                       |
|                |             | 793MHz                     |                       |
| LTE<br>Band 14 |             | Frequency (MHz)            | Frequency Error (ppm) |
|                | 9V          | 792.999993                 | -0.008623             |
|                | 7.5V        | 792.999992                 | -0.010336             |
|                | 6V          | 792.999994                 | -0.008136             |

## 1.10. Band Edge/Emission Mask Conducted Spurious Emission

### 1.10.1. Test Setup



- 1) The DUT transmitter output port was connected to communication simulator with above setup.
- 2) Path loss for the measurement included.
- 3) Set DUT to transmit maximum power through communication simulator.
- 4) The band edges of lowest and highest channels with the highest RF powers were measured.
- 5) The center frequency of spectrum is the band edge frequency, RBW is 1~3% of OBW and VBW is 3 times of RBW.
- 6) Record the maximum trace plot into the test report.

### 1.10.2. Test Limit

(b) *Emission Mask B.* For transmitters that are equipped with an audio low-pass filter, the power of any emission must be attenuated below the unmodulated carrier power (P) as follows:

- (1) On any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth: At least 25 dB.
- (2) On any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth: At least 35 dB.
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least  $43 + 10 \log (P)$  dB.

### 1.10.3. Band Edge/Emission Mask Conducted Spurious Emission - LTE Band 14 (788-798MHz)

#### Emission Mask Conducted Spurious Emission

