

# RF TEST REPORT



Report No.: FCC\_IC\_RF\_SL18100302-ZBR-057-ZQ630-Collocation\_Rev1.0

Supersede Report No.: FCC\_IC\_RF\_SL18100302-ZBR-057-ZQ630-Collocation

|                                                     |   |                                                                                  |
|-----------------------------------------------------|---|----------------------------------------------------------------------------------|
| Applicant                                           | : | Zebra Technologies Corporation                                                   |
| Host Product Name                                   | : | Thermal Label Printer                                                            |
| Module Model No. (AC Radio)                         | : | WYSBHVXGXG                                                                       |
| Module Model No. (UHF RFID)                         | : | M6E-NANO                                                                         |
| Host Model No.                                      | : | ZQ630                                                                            |
| Test Standard                                       | : | 47 CFR 15.247<br>RSS247 Issue 2, 2017                                            |
| Test Method                                         | : | ANSI C63.10: 2013<br>RSS Gen Iss 4: Nov 2014<br>558074 D01 DTS Meas Guidance v04 |
| FCC ID (AC Radio)                                   | : | I28MD-FXLAN11AC                                                                  |
| IC (AC Radio)                                       | : | 3798B-FXLAN11AC                                                                  |
| FCC ID (UHF RFID Module)                            | : | 128-M6ENANO                                                                      |
| IC (UHF RFID Module)                                | : | 3798B-M6ENANO                                                                    |
| Dates of test                                       | : | 11/28/2018 -11/30/2018                                                           |
| Issue Date                                          | : | 02/06/2019                                                                       |
| Test Result                                         | : | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail           |
| Equipment complied with the specification [X]       |   |                                                                                  |
| Equipment did not comply with the specification [ ] |   |                                                                                  |

This Test Report is Issued Under the Authority of:

|                                                                                     |                                                                                      |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
|  |  |
| <b>Cipher</b>                                                                       | <b>Chen Ge</b>                                                                       |
| Test Engineer                                                                       | Engineer Reviewer                                                                    |

Issued By:  
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| Country/Region | Accreditation Body     | Scope                             |
|----------------|------------------------|-----------------------------------|
| USA            | FCC, A2LA              | EMC, RF/Wireless, Telecom         |
| Canada         | IC, A2LA, NIST         | EMC, RF/Wireless, Telecom         |
| Taiwan         | BSMI, NCC, NIST        | EMC, RF, Telecom, Safety          |
| Hong Kong      | OFTA, NIST             | RF/Wireless, Telecom              |
| Australia      | NATA, NIST             | EMC, RF, Telecom, Safety          |
| Korea          | KCC/RRR, NIST          | EMI, EMS, RF, Telecom, Safety     |
| Japan          | VCCI, JATE, TELEC, RFT | EMI, RF/Wireless, Telecom         |
| Mexico         | NOM, COFETEL, Caniety  | Safety, EMC, RF/Wireless, Telecom |
| Europe         | A2LA, NIST             | EMC, RF, Telecom, Safety          |
| Israel         | MOC, NIST              | EMC, RF, Telecom, Safety          |

### Accreditations for Product Certifications

| Country   | Accreditation Body | Scope                                 |
|-----------|--------------------|---------------------------------------|
| USA       | FCC TCB, NIST      | EMC, RF, Telecom                      |
| Canada    | IC FCB, NIST       | EMC, RF, Telecom                      |
| Singapore | iDA, NIST          | EMC, RF, Telecom                      |
| EU        | NB                 | EMC & Radio Equipment Directive (RED) |
| Japan     | MIC (RCB 208)      | RF, Telecom                           |
| Hong Kong | OFTA (US002)       | RF, Telecom                           |

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## 1 Report Revision History

| Report No.                                            | Report Version | Description                        | Issue Date |
|-------------------------------------------------------|----------------|------------------------------------|------------|
| FCC_IC_RF_SL18100302-ZBR-057-ZQ630-Collocation        | None           | Original                           | 01/29/2019 |
| FCC_IC_RF_SL18100302-ZBR-057-ZQ630-Collocation_Rev1.0 | Rev1.0         | Updated as per reviewer's comments | 02/06/2019 |
|                                                       |                |                                    |            |
|                                                       |                |                                    |            |
|                                                       |                |                                    |            |

## 2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Zebra Technologies Corporation  
Host Product: Thermal Label Printer  
Host Model No.: ZQ630

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1<sup>st</sup> page.

## 3 Customer information

|                      |                                          |
|----------------------|------------------------------------------|
| Applicant Name       | Zebra Technologies Corp.                 |
| Applicant Address    | 3 Overlook Point, Lincolnshire, IL 60069 |
| Manufacturer Name    | Zebra Technologies Corp.                 |
| Manufacturer Address | 3 Overlook Point, Lincolnshire, IL 60069 |

## 4 Test site information

|                      |                                             |
|----------------------|---------------------------------------------|
| Lab performing tests | SIEMIC Laboratories                         |
| Lab Address          | 775 Montague Expressway, Milpitas, CA 95035 |
| FCC Test Site No.    | 540430                                      |
| IC Test Site No.     | 4842D-2                                     |
| VCCI Test Site No.   | A0133                                       |

## 5 Modification

| Index | Item | Description | Note |
|-------|------|-------------|------|
| -     | -    | -           | -    |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |
|       |      |             |      |

## 6 EUT Information

### 6.1 EUT Description

|                           |                       |
|---------------------------|-----------------------|
| Host Product Name         | Thermal Label Printer |
| Host Model No.            | ZQ630                 |
| Trade Name                | Zebra                 |
| Serial No.                | N/A                   |
| Input Power               | 100-240VAC,50/60Hz    |
| Power Adapter Manu/Model  | FSP025-DYAA3          |
| Power Adapter SN          | N/A                   |
| Product Hardware version  | N/A                   |
| Product Software version  | N/A                   |
| Radio Hardware version    | N/A                   |
| Radio Software version    | N/A                   |
| Date of EUT received      | 11/28/2018            |
| Equipment Class/ Category | DTS,UNII,RFID         |
| Port/Connectors           | USB                   |
| Remark                    | NONE                  |

### 6.2 Spec for Radio

#### UHF RFID:

| Radio Type              | UHF RFID                                           |
|-------------------------|----------------------------------------------------|
| Radio Module            | M6E-NANO                                           |
| Operating Frequency     | 902-928 MHz                                        |
| Modulation              | ASK                                                |
| Radio type              | RFID                                               |
| Number of Channels      | 50                                                 |
| Antenna Type            | Loop/Coil                                          |
| Antenna Gain            | -28 dBi                                            |
| Maximum conducted power | 21.68 dBm<br>See FCC_IC_RF_SL18100302-ZBR-057 pg21 |
| Maximum EIRP            | -8.32 dBm                                          |

#### BLE:

| Radio Type              | Bluetooth                                                  |
|-------------------------|------------------------------------------------------------|
| Radio Module            | WYSBHVXGXG                                                 |
| Operating Frequency     | 2402MHz-2480MHz                                            |
| Modulation              | GFSK (LE)                                                  |
| Channel Spacing         | 2MHz (LE)                                                  |
| Antenna Type            | Patch Antenna                                              |
| Antenna Gain            | 3.66dBi (for 2.4GHz)                                       |
| Antenna Connector Type  | U.FL connector                                             |
| Maximum conducted power | 8.43 dBm<br>See FCC_RF_SL15072901-ZBR-024_DTS_Rev.2.0 pg28 |
| Maximum EIRP            | 12.09 dBm                                                  |

**BT:**

| Radio Type              | Bluetooth (Ver4.0+EDR)                                      |
|-------------------------|-------------------------------------------------------------|
| Rdaio Module            | WYSBHVXGXG                                                  |
| Operating Frequency     | 2402MHz-2480MHz                                             |
| Modulation              | FHSS (BDR, EDR)                                             |
| Channel Spacing         | 1MHz (BDR, EDR)                                             |
| Antenna Type            | Patch Antenna                                               |
| Antenna Gain            | 3.66 dBi                                                    |
| Antenna Connector Type  | U.FL connector                                              |
| Maximum conducted power | 10.27 dBm<br>See FCC_RF_SL15072901-ZBR-024_DSS Rev.3.0 pg28 |
| Maximum EIRP            | 13.93 dBm                                                   |

**2.4 GHz**

| Radio Type              | 802.11b                                                              | 802.11g                             | 802.11n-20M                     | 802.11n-40M                     |
|-------------------------|----------------------------------------------------------------------|-------------------------------------|---------------------------------|---------------------------------|
| Rdaio Module            | WYSBHVXGXG                                                           |                                     |                                 |                                 |
| Operating Frequency     | 2412-2462MHz                                                         | 2412-2462MHz                        | 2412-2462MHz                    | 2422-2452MHz                    |
| Modulation              | DSSS<br>(CCK, DQPSK, DBPSK)                                          | OFDM-CCK (BPSK, QPSK, 16QAM, 64QAM) | OFDM (BPSK, QPSK, 16QAM, 64QAM) | OFDM (BPSK, QPSK, 16QAM, 64QAM) |
| Channel Spacing         | 5MHz                                                                 | 5MHz                                | 5MHz                            | 5MHz                            |
| Number of Channels      | 11                                                                   | 11                                  | 11                              | 7                               |
| Antenna Type            | Patch Antenna                                                        |                                     |                                 |                                 |
| Antenna Gain (Peak)     | 2.4GHz: 3.66 dBi                                                     |                                     |                                 |                                 |
| Antenna Connector Type  | U.FL connector                                                       |                                     |                                 |                                 |
| Note                    | -                                                                    |                                     |                                 |                                 |
| Maximum conducted power | 16.77 dBm<br>See FCC_IC_RF_SL15072901-ZBR-024_DTS_2.4G Rev. 2.0 pg26 |                                     |                                 |                                 |
| Maximum EIRP            | 20.43 dBm                                                            |                                     |                                 |                                 |

### 5 GHz:

| Radio Type              | 802.11a                                                          | 802.11n-20M                                                  | 802.11n-40M                                                  | 802.11ac-80M                                    |
|-------------------------|------------------------------------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------|-------------------------------------------------|
| Rdaio Module            | WYSBHVXGX                                                        |                                                              |                                                              |                                                 |
| Operating Frequency     | 5180-5240MHz<br>5260-5320MHz<br>5500-5700MHz<br>5745-5825MHz     | 5180-5240MHz<br>5260-5320MHz<br>5500-5700MHz<br>5745-5825MHz | 5190-5230MHz<br>5270-5310MHz<br>5510-5670MHz<br>5755-5795MHz | 5210MHz, 5290MHz<br>5530MHz, 5690MHz<br>5775MHz |
| Modulation              | OFDM (BPSK, QPSK, 16QAM, 64QAM)                                  | OFDM (BPSK, QPSK, 16QAM, 64QAM)                              | OFDM (BPSK, QPSK, 16QAM, 64QAM)                              | OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)         |
| Channel Spacing         | 20MHz                                                            | 20MHz                                                        | 40MHz                                                        | 80MHz                                           |
| Number of Channels      | 24                                                               | 24                                                           | 11                                                           | 5                                               |
| Antenna Type            | Patch Antenna                                                    |                                                              |                                                              |                                                 |
| Antenna Gain (Peak)     | 3.19dBi (5GHz)                                                   |                                                              |                                                              |                                                 |
| Antenna Connector Type  | U.FL connector                                                   |                                                              |                                                              |                                                 |
| Note                    | -                                                                |                                                              |                                                              |                                                 |
| Maximum conducted power | 13.95 dBm<br>See FCC_RF_SL15072901-ZBR-024_UNII_5G Rev. 2.0 pg29 |                                                              |                                                              |                                                 |
| Maximum EIRP            | 17.14 dBm                                                        |                                                              |                                                              |                                                 |

## 7 Supporting Equipment/Software and cabling Description

### 7.1 Supporting Equipment

| Item | Supporting Equipment Description | Model          | Serial Number | Manufacturer | Note |
|------|----------------------------------|----------------|---------------|--------------|------|
| 1    | Laptop                           | LATITUDE E5410 | N/A           | Dell         | -    |
|      |                                  |                |               |              |      |

### 7.2 Cabling Description

| Name | Connection Start |          | Connection Stop |          | Length / shielding Info |           | Note       |
|------|------------------|----------|-----------------|----------|-------------------------|-----------|------------|
|      | From             | I/O Port | To              | I/O Port | Length (m)              | Shielding |            |
| USB  | USB              | EUT      | USB             | Laptop   | USB                     | 2         | Unshielded |
|      |                  |          |                 |          |                         |           |            |

### 7.3 Test Software Description

| Test Item  | Software      | Description                                                |
|------------|---------------|------------------------------------------------------------|
| RF Testing | Zebra Toolbox | Set the EUT to transmit continuously in diferent test mode |
|            |               |                                                            |
|            |               |                                                            |

## 8 Test Summary

| Test Item                    | Test standard |              | Test Method/Procedure |                                      | Pass / Fail                               |
|------------------------------|---------------|--------------|-----------------------|--------------------------------------|-------------------------------------------|
| Antenna Requirement          | FCC           | 15.203       | FCC                   | ANSI C63.10 – 2013                   | <input checked="" type="checkbox"/> Pass  |
|                              | IC            | -            | IC                    | 558074 D01 DTS Meas. Guidance v03r02 | <input type="checkbox"/> N/A              |
| Restricted Band of Operation | FCC           | 15.205       | FCC                   | ANSI C63.10:2013                     | <input checked="" type="checkbox"/> Pass  |
|                              | IC            | RSS Gen 8.10 | IC                    | 558074 D01 DTS Meas Guidance v04     | <input type="checkbox"/> N/A              |
| AC Conducted Emissions       | FCC           | 15.207(a)    | FCC                   | ANSI C63.10:2013                     | <input checked="" type="checkbox"/> Pass* |
|                              | IC            | RSS Gen 8.8  | IC                    | RSS Gen Issue 4: 2014                | <input type="checkbox"/> N/A              |

### DTS Band Requirement

| Test Item                                 | Test standard                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                | Test Method/Procedure |                                                      | Pass / Fail                                                              |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------------|------------------------------------------------------|--------------------------------------------------------------------------|
| 99% Occupied Bandwidth                    | -                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -              | -                     | -                                                    | <input checked="" type="checkbox"/> Pass*                                |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RSS Gen 6.6    | IC                    | RSS Gen Issue 4: 2014                                | <input type="checkbox"/> N/A                                             |
| 6dB Bandwidth                             | FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15.247(a)(2)   | FCC                   | 558074 D01 DTS Meas Guidance v04                     | <input checked="" type="checkbox"/> Pass*                                |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RSS247 (5.2.1) | IC                    |                                                      | <input type="checkbox"/> N/A                                             |
| Band Edge and Radiated Spurious Emissions | FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15.247(d)      | FCC                   | ANSI C63.10:2013<br>558074 D01 DTS Meas Guidance v04 | <input checked="" type="checkbox"/> Pass                                 |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RSS247 (5.5)   | IC                    |                                                      | <input type="checkbox"/> N/A                                             |
| Output Power                              | FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15.247(b)      | FCC                   | 558074 D01 DTS Meas Guidance v04                     | <input checked="" type="checkbox"/> Pass *                               |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RSS247 (5.4.4) | IC                    |                                                      | <input type="checkbox"/> N/A                                             |
| Receiver Spurious Emissions               | IC                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RSS Gen (4.8)  | IC                    | RSS Gen Issue 4: 2014                                | <input type="checkbox"/> Pass<br><input checked="" type="checkbox"/> N/A |
| Antenna Gain > 6 dBi                      | FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15.247(e)      | FCC                   | -                                                    | <input type="checkbox"/> Pass                                            |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | -              | IC                    | -                                                    | <input checked="" type="checkbox"/> N/A                                  |
| Power Spectral Density                    | FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15.247(e)      | FCC                   | 558074 D01 DTS Meas Guidance v04                     | <input checked="" type="checkbox"/> Pass*                                |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RSS247 (5.2.2) | IC                    |                                                      | <input type="checkbox"/> N/A                                             |
| RF Exposure requirement                   | FCC                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 15.247(i)      | FCC                   | -                                                    | <input type="checkbox"/> Pass                                            |
|                                           | IC                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | RSS Gen(5.5)   | IC                    | RSS Gen Issue 4: 2014                                | <input checked="" type="checkbox"/> N/A                                  |
| Remark                                    | <ol style="list-style-type: none"> <li>All measurement uncertainties do not take into consideration for all presented test results.</li> <li>The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual.</li> <li>Pass* : Please refer to FCC_IC_RF_SL15072901-ZBR-024 and FCC_IC_RF_SL18100302-ZBR-057 test report.</li> </ol> |                |                       |                                                      |                                                                          |

## 9 Measurement Uncertainty

### 9.1 Conducted Emissions

The test is to measure the conducted emissions to the mains port of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the LISN
- Uncertainty of cables
- Uncertainty due to the mismatches
- Etc, see the below table for details

| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Receiver Reading                  | 0.12       | Rectangular              | 1.732    | 1                       | 0.069284             |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.105                |
| Filter Insertion Loss             | 0.25       | Normal                   | 2        | 1                       | 0.125                |
| LISN Insertion Loss               | 0.40       | Normal                   | 2        | 1                       | 0.20                 |
| Receiver CW accuracy              | 0.5        | Rectangular              | 1.732    | 1                       | 0.2886836            |
| Pulse Amplitude Response          | 1.5        | Rectangular              | 1.732    | 1                       | 0.86605081           |
| PRF Response                      | 1.5        | Rectangular              | 1.732    | 1                       | 0.86605081           |
| Mismatch LISN - Receiver          | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| LISN Impedance                    | 2.5        | Triangular               | 2.449    | 1                       | 1.0208248            |
| Combined Standard Uncertainty     |            |                          |          |                         | 1.928133             |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>3.856266</b>      |

The total derived measurement uncertainty is +/- 3.86 dB.

### 9.2 Radiated Emissions (30MHz to 1GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Receiver Reading                  | 0.12       | Rectangular              | 1.732    | 1                       | 0.069284             |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.105                |
| Filter Insertion Loss             | 0.25       | Normal                   | 2        | 1                       | 0.125                |
| Antenna Factor                    | 0.65       | Normal                   | 2        | 1                       | 0.325                |
| Receiver CW accuracy              | 0.5        | Rectangular              | 1.732    | 1                       | 0.2886836            |
| Pulse Amplitude Response          | 1.5        | Rectangular              | 1.732    | 1                       | 0.86605081           |
| PRF Response                      | 1.5        | Rectangular              | 1.732    | 1                       | 0.86605081           |
| Mismatch Filter - Receiver        | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| NSA Calibration                   | 4.0        | U-Shape                  | 1.414    | 1                       | 2.8288543            |
| Combined Standard Uncertainty     |            |                          |          |                         | 3.0059131            |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>6.0118262</b>     |

The total derived measurement uncertainty is +/- 6.00 dB.

### 9.3 Radiated Emissions (1GHz to 40GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- VSWR Calibration
- Etc., details see the below table

| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Receiver Reading                  | 0.12       | Rectangular              | 1.732    | 1                       | 0.0692840            |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.1050000            |
| Filter Insertion Loss             | 0.25       | Normal                   | 2        | 1                       | 0.1250000            |
| Antenna Factor                    | 0.65       | Normal                   | 2        | 1                       | 0.3250000            |
| Receiver CW accuracy              | 0.5        | Rectangular              | 1.732    | 1                       | 0.2886836            |
| Pulse Amplitude Response          | 1.5        | Rectangular              | 1.732    | 1                       | 0.8660508            |
| PRF Response                      | 1.5        | Rectangular              | 1.732    | 1                       | 0.8660508            |
| Mismatch Filter - Receiver        | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| VSWR Calibration                  | 2.0        | U-Shape                  | 1.414    | 1                       | 1.4144272            |
| Combined Standard Uncertainty     |            |                          |          |                         | 4.2363               |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>8.4726</b>        |

The total derived measurement uncertainty is +/- 8.47 dB.

### 9.4 RF conducted measurement

The test is to measure the RF output power from the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the Reference Level Uncertainty
- Uncertainty of variable attenuators
- Uncertainty of cables
- Uncertainty due to the mismatches

| Source of Uncertainty             | Value (dB) | Probability Distribution | Division | Sensitivity Coefficient | Expanded Uncertainty |
|-----------------------------------|------------|--------------------------|----------|-------------------------|----------------------|
| Reference Level                   | 0.12       | Rectangular              | 1.732    | 1                       | 0.069284             |
| Cable Insertion Loss              | 0.21       | Normal                   | 2        | 1                       | 0.105                |
| Attenuator                        | 0.25       | Normal                   | 2        | 1                       | 0.125                |
| Mismatch                          | 0.25       | U-Shape                  | 1.414    | 1                       | 0.1768033            |
| Combined Standard Uncertainty     |            |                          |          |                         | 0.476087             |
| <b>Expanded Uncertainty (K=2)</b> |            |                          |          |                         | <b>0.952174</b>      |

The total derived measurement uncertainty is +/- 0.95 dB.

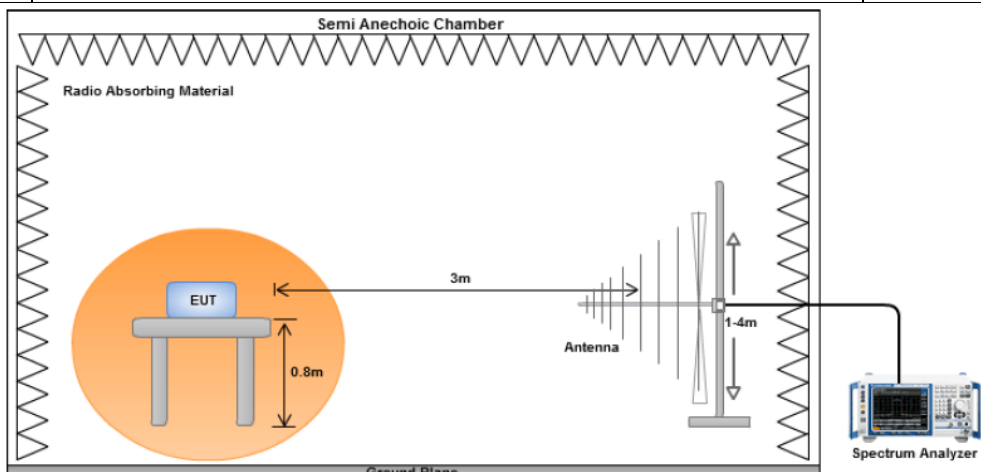
## 10 Measurements, Examination and Derived Results

### 10.1 Antenna Requirement

| Spec    | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Applicable                          |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| §15.203 | <p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.</p> <p>Antenna requirement must meet at least one of the following:</p> <ul style="list-style-type: none"> <li>a) Antenna must be permanently attached to the device.</li> <li>b) The antenna must use a unique type of connector to attach to the device.</li> <li>c) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.</li> </ul> | <input checked="" type="checkbox"/> |
| Remark  | The device has a unique coupling connector attached to the device, RP-SMA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| Result  | <input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                     |

## 10.2 Radiated Spurious Emissions below 1GHz

### Requirement(s):

| Spec                            | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Applicable            |                       |         |     |          |     |         |     |           |     |                                                |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|---------|-----|----------|-----|---------|-----|-----------|-----|------------------------------------------------|
| 47CFR§15.247(d)<br>RSS247 (5.5) | a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges</p> <table><thead><tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr></thead><tbody><tr><td>30 – 88</td><td>100</td></tr><tr><td>88 – 216</td><td>150</td></tr><tr><td>216 960</td><td>200</td></tr><tr><td>Above 960</td><td>500</td></tr></tbody></table> | Frequency range (MHz) | Field Strength (uV/m) | 30 – 88 | 100 | 88 – 216 | 150 | 216 960 | 200 | Above 960 | 500 | <div><input checked="" type="checkbox"/></div> |
| Frequency range (MHz)           | Field Strength (uV/m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| 30 – 88                         | 100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| 88 – 216                        | 150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| 216 960                         | 200                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| Above 960                       | 500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| Test Setup                      | <div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| Procedure                       | <div><div><div>1.</div><div>2.</div><div>3.</div><div>4.</div></div><div><p>The EUT was switched on and allowed to warm up to its normal operating condition.</p><p>The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:</p><div><div>a.</div><div>b.</div><div>c.</div></div><p>Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</p><p>The EUT was then rotated to the direction that gave the maximum emission.</p><p>Finally, the antenna height was adjusted to the height that gave the maximum emission.</p><p>A Quasi-peak measurement was then made for that frequency point.</p><p>Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</p></div></div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| Remark                          | The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |
| Result                          | <div><div><input checked="" type="checkbox"/> Pass</div><div><input type="checkbox"/> Fail</div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                       |                       |         |     |          |     |         |     |           |     |                                                |

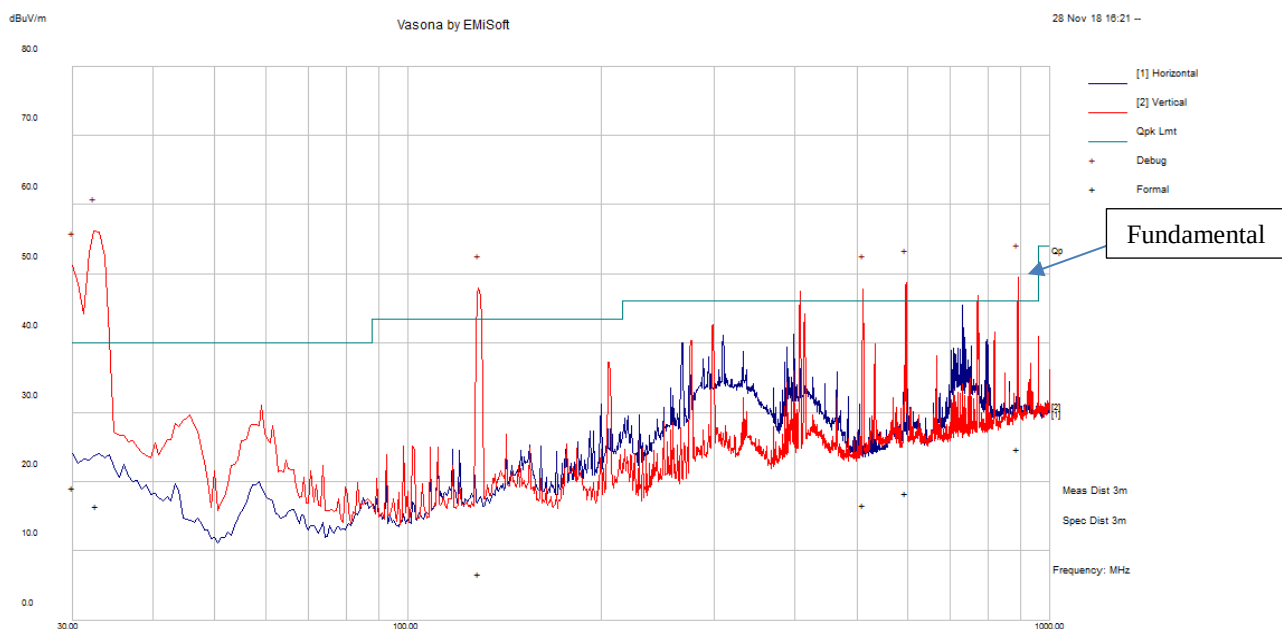
**Test Data**    ☒ Yes (See below)      ☐ N/A

**Test Plot**    ☒ Yes (See below)      ☐ N/A

**Test was done by Cipher at 10m chamber.**

## Radiated Emission Test Results (Below 1GHz)

|                           |                         |      |        |      |
|---------------------------|-------------------------|------|--------|------|
| Test specification        | Below 1GHz              |      | Result | Pass |
| Environmental Conditions: | Temp (°C):              | 20   |        |      |
|                           | Humidity (%)            | 38   |        |      |
|                           | Atmospheric (mbar):     | 1019 |        |      |
| Mains Power:              | 120VAC,60Hz             |      |        |      |
| Tested by:                | Cipher                  |      |        |      |
| Test Date:                | 11/29/2018              |      |        |      |
| Remarks:                  | RFID+Bluetooth+802.11ac |      |        |      |



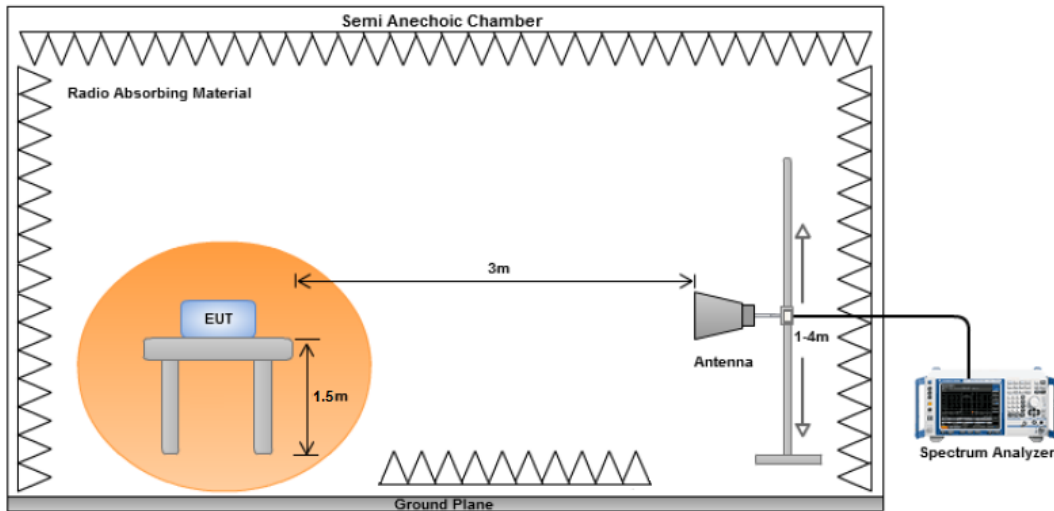
### 30MHz – 1000MHz at 3 meters

| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 32.67         | 20.04    | 11.15      | -14.56 | 16.63        | Quasi Max        | V   | 189    | 20      | 40           | -23.37    | Pass       |
| 30.00         | 20.20    | 11.12      | -12.08 | 19.23        | Quasi Max        | V   | 133    | 154     | 40           | -20.77    | Pass       |
| 128.87        | 17.34    | 12.16      | -22.73 | 6.78         | Quasi Max        | V   | 138    | 357     | 43.5         | -36.73    | Pass       |
| 891.65        | 22.51    | 15.95      | -13.6  | 24.86        | Quasi Max        | V   | 129    | 286     | 46           | -21.14    | Pass       |
| 597.07        | 20.50    | 14.70      | -16.75 | 18.46        | Quasi Max        | V   | 266    | 102     | 46           | -27.54    | Pass       |
| 511.51        | 20.34    | 14.29      | -17.92 | 16.71        | Quasi Max        | V   | 300    | 212     | 46           | -29.29    | Pass       |

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

### 10.3 Radiated Spurious Emissions between 1GHz – 25GHz

#### Requirement(s):

| Spec                             | Item                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Applicable                          |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| 47CFR§15.247(d),<br>RSS247(A8.5) | a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required<br><br><input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down | <input checked="" type="checkbox"/> |
|                                  | b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | or restricted band, emission must also comply with the radiated emission limits specified in 15.209                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <input checked="" type="checkbox"/> |
| Test Setup                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| Procedure                        | <ol style="list-style-type: none"> <li>The EUT was switched on and allowed to warm up to its normal operating condition.</li> <li>The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner: <ol style="list-style-type: none"> <li>Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.</li> <li>The EUT was then rotated to the direction that gave the maximum emission.</li> <li>Finally, the antenna height was adjusted to the height that gave the maximum emission.</li> </ol> </li> <li>An average measurement was then made for that frequency point.</li> <li>Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| Remark                           | Both horizontal and vertical polarities were investigated. The results show only the worst case.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |
| Result                           | <input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                     |

Test Data    ☒ Yes (See below)    ☐ N/A

Test Plot    ☐ Yes (See below)    ☒ N/A

Test was done by Cipher at 10m chamber.

## Radiated Emission Test Results (Above 1GHz)

### RFID+Bluetooth+802.11ac

| Frequency MHz | Raw dBuV | Cable Loss | AF dB  | Level dBuV/m | Measurement Type | Pol | Hgt cm | Azt Deg | Limit dBuV/m | Margin dB | Pass /Fail |
|---------------|----------|------------|--------|--------------|------------------|-----|--------|---------|--------------|-----------|------------|
| 7134.28       | 50.59    | 5.11       | -7.7   | 48           | Peak Max         | V   | 350    | 100     | 74           | -26       | Pass       |
| 11127.98      | 41.95    | 6.08       | -3.11  | 44.92        | Peak Max         | H   | 105    | 22      | 74           | -29.08    | Pass       |
| 4822.28       | 48.93    | 4.12       | -10.92 | 42.13        | Peak Max         | H   | 303    | 93      | 74           | -31.87    | Pass       |
| 7134.28       | 35.79    | 5.11       | -7.7   | 33.2         | Average Max      | V   | 350    | 100     | 54           | -20.8     | Pass       |
| 11127.98      | 29.46    | 6.08       | -3.11  | 32.43        | Average Max      | H   | 105    | 22      | 54           | -21.57    | Pass       |
| 4822.28       | 36.25    | 4.12       | -10.92 | 29.45        | Average Max      | H   | 303    | 93      | 54           | -24.55    | Pass       |

## Annex A. TEST INSTRUMENT

| Instrument                  | Model      | Serial #    | Cal Date   | Cal Cycle | Cal Due    | In use                              |
|-----------------------------|------------|-------------|------------|-----------|------------|-------------------------------------|
| <b>Radiated Emissions</b>   |            |             |            |           |            |                                     |
| EMI Test Receiver           | ESIB 40    | 100179      | 06/08/2018 | 1 Year    | 06/08/2019 | <input checked="" type="checkbox"/> |
| Bi-Log antenna (30MHz~2GHz) | JB1        | A030702     | 03/09/2018 | 2 Year    | 03/09/2020 | <input checked="" type="checkbox"/> |
| Horn Antenna (1-18GHz)      | 3115       | 10SL0059    | 01/26/2018 | 2 Year    | 01/26/2020 | <input checked="" type="checkbox"/> |
| Horn Antenna (18-40 GHz)    | AH-840     | 101013      | 08/28/2018 | 1 Year    | 08/28/2019 | <input checked="" type="checkbox"/> |
| Tuned Dipole Antenna Set    | AD-100     | 40133:40149 | 03/08/2018 | 1 Year    | 03/08/2019 | <input checked="" type="checkbox"/> |
| Pre-Amplifier               | LPA-6-30   | 11140711    | 02/08/2018 | 1 Year    | 02/10/2019 | <input checked="" type="checkbox"/> |
| Pre-Amplifier (1-26.5GHz)   | 8449B      | 3008A00715  | 03/30/2018 | 1 Year    | 03/30/2019 | <input checked="" type="checkbox"/> |
| Agilent Signal Generator    | MXG N5182A | MY47071065  | 04/06/2018 | 1 Year    | 04/06/2019 | <input checked="" type="checkbox"/> |

## Annex B. SIEMIC Accreditation

| Accreditations                          | Document                                                                            | Scope / Remark                                                                                                                                                            |
|-----------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ISO 17025 (A2LA)                        |    | Please see the documents for the detailed scope                                                                                                                           |
| ISO Guide 65 (A2LA)                     |    | Please see the documents for the detailed scope                                                                                                                           |
| TCB Designation                         |                                                                                     | <a href="#">A1</a> , <a href="#">A2</a> , <a href="#">A3</a> , <a href="#">A4</a> , <a href="#">B1</a> , <a href="#">B2</a> , <a href="#">B3</a> , <a href="#">B4</a> , C |
| FCC DoC Accreditation                   |    | FCC Declaration of Conformity Accreditation                                                                                                                               |
| FCC Site Registration                   |    | 3 meter site                                                                                                                                                              |
| FCC Site Registration                   |    | 10 meter site                                                                                                                                                             |
| IC Site Registration                    |    | 3 meter site                                                                                                                                                              |
| IC Site Registration                    |    | 10 meter site                                                                                                                                                             |
| EU NB                                   |    | <b>Radio &amp; Telecommunications Terminal Equipment:</b><br>EN45001 – EN ISO/IEC 17025                                                                                   |
|                                         |  | <b>Electromagnetic Compatibility:</b><br>EN45001 – EN ISO/IEC 17025                                                                                                       |
| Singapore iDA<br>CB(Certification Body) |  | <a href="#">Phase I</a> , <a href="#">Phase II</a>                                                                                                                        |
| Vietnam MIC<br>CAB Accreditation        |  | Please see the document for the detailed scope                                                                                                                            |
| Hong Kong OFCA                          |  | <b>(Phase II)</b> OFCA Foreign Certification Body for Radio and Telecom                                                                                                   |
|                                         |  | <b>(Phase I)</b> Conformity Assessment Body for Radio and Telecom                                                                                                         |
| Industry Canada CAB                     |  | <b>Radio:</b> Scope A – All Radio Standard Specification in Category I                                                                                                    |
|                                         |  | <b>Telecom:</b> CS-03 Part I, II, V, VI, VII, VIII                                                                                                                        |

|                                                    |                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Japan Recognized Certification<br>Body Designation |    | <p><b>Radio:</b> A1. Terminal equipment for purpose of calling</p> <p><b>Telecom:</b> B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Korea CAB Accreditation                            |    | <p><b>EMI:</b> KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI<br/>KN22: Test Method for EMI</p> <p><b>EMS:</b> KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS<br/>KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS</p> <p><b>Radio:</b> RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68</p> <p><b>Telecom:</b> President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4</p> |
| Taiwan NCC CAB Recognition                         |    | LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Taiwan BSMI CAB Recognition                        |  | CNS 13438                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Japan VCCI                                         |  | <p>R-3083: Radiation 3 meter site</p> <p>C-3421: Main Ports Conducted Interference Measurement</p> <p>T-1597: Telecommunication Ports Conducted Interference Measurement</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Australia CAB Recognition                          |  | <p><b>EMC:</b> AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4</p> <p><b>Radio communications:</b> AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771</p> <p><b>Telecommunications:</b> AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06, AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1</p>                                                                                                             |
| Australia NATA Recognition                         |  | AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016, AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |