

Test Report No:  
2460131R-RFUSV01S-A

## Test Result for Inspection (Class II Permissive Change)

|                                 |                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------|
| Product Name                    | UHF RFID RAIN MODULE                                                                                       |
| Brand Name                      | TSC                                                                                                        |
| Model No.                       | M7E-MEGA                                                                                                   |
| FCC ID                          | VTV-M7EMEGA                                                                                                |
| Applicant's Name / Address      | TSC Auto ID Technology Co., Ltd.<br>No. 35, Sec. 2, Ligong 1st Rd., Wujie Town, I Lan Hsien 268,<br>Taiwan |
| Manufacturer's Name             | JADAK, a business unit of Novanta Corporation                                                              |
| Test Method Requested, Standard | FCC CFR Title 47 Part 15 Subpart C Section 15.247<br>ANSI C63.10-2013                                      |
| Verdict Summary                 | IN COMPLIANCE                                                                                              |
| Documented by Genie Chang       |                         |
| Tested by Ivan Chuang           |                         |
| Approved by Alan Chen           |                         |
| Date of Receipt                 | 2024/06/05                                                                                                 |
| Date of Issue                   | 2024/06/28                                                                                                 |
| Report Version                  | V1.0                                                                                                       |

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## Competences and Guarantees

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DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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## General Conditions

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1. The test results relate only to the samples tested.
2. The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.
3. This report must not be used to claim product endorsement by TAF or any agency of the government.
4. The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.
5. Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Revision History

| Version | Description             | Issued Date |
|---------|-------------------------|-------------|
| V1.0    | Initial issue of report | 2024/06/28  |

Permissive Change

| Report No.          | Version | Description                                                                                                                                                                                                                                                            | Issued Date |
|---------------------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| BLYK08-U13          | Rev A   | Original application.                                                                                                                                                                                                                                                  | 2023/12/18  |
| 2460131R-RFUSV01S-A | V1.0    | This is to request a Class II permissive change.<br>The major change filed under this application is:<br>Change #1: Three new antennas have been added;<br>the antenna types are different, and the antenna<br>gains are lower than those in the original application. | 2024/06/28  |

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## Summary of Test Result

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| Report Clause | Test Items                       | Result (PASS/FAIL) | Remark |
|---------------|----------------------------------|--------------------|--------|
| 3             | AC Power Line Conducted Emission | PASS               | -      |
| 4             | Maximum Conducted Output Power   | PASS               | -      |
| 5             | Radiated Emission                | PASS               | -      |

| Comments and Explanations                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification. |

## 1. General Information

### 1.1. EUT Description

|                     |                         |
|---------------------|-------------------------|
| Frequency Range     | 902 ~ 928 MHz           |
| Operation Frequency | 902.75 MHz ~ 927.25 MHz |
| Channel Number      | 50 Channels             |
| Type of Modulation  | PR-ASK (FHSS)           |

| Antenna Information |            |                           |      |                    |
|---------------------|------------|---------------------------|------|--------------------|
| Item.               | Brand Name | Model No.                 | Type | Antenna Gain (dBi) |
| 1                   | TSC        | RFID PCB antenna 1 (ANT0) | PCB  | 1.68               |
|                     |            | RFID PCB antenna 1 (ANT1) |      |                    |
| 2                   | TSC        | RFID PCB antenna 2 (ANT0) | PCB  | -5.48              |
|                     |            | RFID PCB antenna 2 (ANT1) |      |                    |
| 3                   | TSC        | RFID PCB antenna 3 (ANT0) | PCB  | 0.2                |
|                     |            | RFID PCB antenna 3 (ANT1) |      |                    |

Note:

1. The above EUT information is declared by the manufacturer.
2. The antenna of EUT conforms to FCC 15.203.

#### For PR-ASK (FHSS) Mode: (1TX, 1RX)

Both ANT0 and ANT1 can be used as transmitting/receiving antennas (diversity).

| Working Frequency of Each Channel |                 |         |                 |         |                 |         |                 |
|-----------------------------------|-----------------|---------|-----------------|---------|-----------------|---------|-----------------|
| Channel                           | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) | Channel | Frequency (MHz) |
| 902750                            | 902.75          | 909250  | 909.25          | 915750  | 915.75          | 922250  | 922.25          |
| 903250                            | 903.25          | 909750  | 909.75          | 916250  | 916.25          | 922750  | 922.75          |
| 903750                            | 903.75          | 910250  | 910.25          | 916750  | 916.75          | 923250  | 923.25          |
| 904250                            | 904.25          | 910750  | 910.75          | 917250  | 917.25          | 923750  | 923.75          |
| 904750                            | 904.75          | 911250  | 911.25          | 917750  | 917.75          | 924250  | 924.25          |
| 905250                            | 905.25          | 911750  | 911.75          | 918250  | 918.25          | 924750  | 924.75          |
| 905750                            | 905.75          | 912250  | 912.25          | 918750  | 918.75          | 925250  | 925.25          |
| 906250                            | 906.25          | 912750  | 912.75          | 919250  | 919.25          | 925750  | 925.75          |
| 906750                            | 906.75          | 913250  | 913.25          | 919750  | 919.75          | 926250  | 926.25          |
| 907250                            | 907.25          | 913750  | 913.75          | 920250  | 920.25          | 926750  | 926.75          |
| 907750                            | 907.75          | 914250  | 914.25          | 920750  | 920.75          | 927250  | 927.25          |
| 908250                            | 908.25          | 914750  | 914.75          | 921250  | 921.25          | --      | --              |
| 908750                            | 908.75          | 915250  | 915.25          | 921750  | 921.75          | --      | --              |

## 1.2. EUT Information

|                |                   |
|----------------|-------------------|
| EUT Power Type | From Test Fixture |
|----------------|-------------------|

## 1.3. Testing Location Information

|        |                                                       |
|--------|-------------------------------------------------------|
| USA    | FCC Designation Number: TW0033                        |
| Canada | CAB Identifier Number: TW3023 / Company Number: 26930 |

|                  |                         |
|------------------|-------------------------|
| Site Description | Accredited by TAF       |
|                  | Accredited Number: 3023 |

|                    |                                                                             |
|--------------------|-----------------------------------------------------------------------------|
| Test Laboratory    | DEKRA Testing and Certification Co., Ltd.                                   |
|                    | Linkou Laboratory                                                           |
| Address            | No.5-22, Ruishukeng Linkou District, New Taipei City, 24451, Taiwan, R.O.C. |
| Performed Location | No. 26, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan, R.O.C.   |
| Phone Number       | +886-3-275-7255                                                             |
| Fax Number         | +886-3-327-8031                                                             |

Ambient conditions in the laboratory:

| Performed Item                   | Items            | Required | Actual  | Test Date             |
|----------------------------------|------------------|----------|---------|-----------------------|
| AC Power Line Conducted Emission | Temperature (°C) | 10~40 °C | 22.6 °C | 2024/06/20            |
|                                  | Humidity (%RH)   | 10~90 %  | 58.2 %  |                       |
| Radiated Emission                | Temperature (°C) | 10~40 °C | 24.8 °C | 2024/06/18~2024/06/19 |
|                                  | Humidity (%RH)   | 10~90 %  | 64.0 %  |                       |
| RF Conducted Emission            | Temperature (°C) | 10~40 °C | 25.2 °C | 2024/06/18            |
|                                  | Humidity (%RH)   | 10~90 %  | 54.6 %  |                       |

#### 1.4. Measurement Uncertainty

Uncertainties have been calculated according to the DEKRA internal document.

The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of  $k=2$ , providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

| Test Item                        | Uncertainty                                                                                                               |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| AC Power Line Conducted Emission | $\pm 3.50$ dB                                                                                                             |
| Maximum Conducted Output Power   | Spectrum Analyzer: $\pm 2.13$ dB<br>Power Meter: $\pm 1.07$ dB                                                            |
| Radiated Emission                | 9 kHz~30 MHz: $\pm 3.30$ dB<br>30 MHz~1 GHz: $\pm 4.79$ dB<br>1 GHz~18 GHz: $\pm 4.17$ dB<br>18 GHz~40 GHz: $\pm 3.32$ dB |
| Duty Cycle                       | $\pm 0.51$ %                                                                                                              |

## 1.5. List of Test Equipment

### For Conduction Measurements / HY-SR01

|   | Equipment          | Manufacturer | Model No. | Serial No. | Cal. Date  | Due Date   |
|---|--------------------|--------------|-----------|------------|------------|------------|
| V | EMI Test Receiver  | R&S          | ESR7      | 102254     | 2023/12/07 | 2024/12/06 |
| V | Two-Line V-Network | R&S          | ENV216    | 101306     | 2024/04/01 | 2025/03/31 |
| V | Two-Line V-Network | R&S          | ENV216    | 101307     | 2023/08/17 | 2024/08/16 |
| V | Coaxial Cable      | SUHNER       | RG400_BNC | RF001      | 2024/01/10 | 2025/01/09 |

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "V" are used to measure the final test results.
3. Test Software Version: e3 230303 dekra V9.

### For Conducted Measurements / HY-SR02

|   | Equipment             | Manufacturer | Model No. | Serial No. | Cal. Date  | Due Date   |
|---|-----------------------|--------------|-----------|------------|------------|------------|
| V | Spectrum Analyzer     | R&S          | FSV30     | 103466     | 2024/01/05 | 2025/01/04 |
| V | Spectrum Analyzer     | KEYSIGHT     | N9010A    | MY53470892 | 2023/11/09 | 2024/11/08 |
| V | Peak Power Analyzer   | KEYSIGHT     | 8990B     | MY51000539 | 2024/05/07 | 2025/05/06 |
| V | Wideband Power Sensor | KEYSIGHT     | N1923A    | MY59240002 | 2024/05/08 | 2025/05/07 |
| V | Wideband Power Sensor | KEYSIGHT     | N1923A    | MY59240003 | 2024/05/08 | 2025/05/07 |

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "V" are used to measure the final test results.
3. Test Software Version: RF Conducted Test Tools R3 V3.0.1.14.

### For Radiated Measurements /HY-CB03

|   | Equipment         | Manufacturer  | Model No.         | Serial No.   | Cal. Date  | Due Date   |
|---|-------------------|---------------|-------------------|--------------|------------|------------|
| V | Loop Antenna      | TESEQ         | HLA6121           | 49611        | 2024/02/23 | 2025/02/22 |
| V | Bi-Log Antenna    | SCHWARZBECK   | VULB9168          | 9168-0675    | 2023/08/09 | 2025/08/08 |
|   | Horn Antenna      | Com-Power     | AH-840            | 101101       | 2023/12/04 | 2025/12/03 |
| V | Horn Antenna      | RF SPIN       | DRH18-E           | 210507A18ES  | 2024/05/15 | 2025/05/14 |
| V | Pre-Amplifier     | SGH           | SGH0301-9         | 20211007-11  | 2024/01/10 | 2025/01/09 |
| V | Pre-Amplifier     | SGH           | PRAMP118          | 20200701     | 2024/01/10 | 2025/01/09 |
|   | Pre-Amplifier     | EMCI          | EMC05820SE        | 980310       | 2024/01/10 | 2025/01/09 |
|   | Pre-Amplifier     | EMCI          | EMC184045SE       | 980369       | 2024/01/10 | 2025/01/09 |
|   | Coaxial Cable     | EMCI          | EMC102-KM-KM-600  | 1160314      | 2024/01/10 | 2025/01/09 |
|   | Coaxial Cable     | EMCI          | EMC102-KM-KM-7000 | 170242       | 2024/01/10 | 2025/01/09 |
| V | Filter            | MICRO TRONICS | HPM50115          | G069         | 2024/01/05 | 2025/01/04 |
| V | EMI Test Receiver | R&S           | ESR3              | 102793       | 2023/12/11 | 2024/12/10 |
| V | Spectrum Analyzer | R&S           | FSV3044           | 101114       | 2024/02/21 | 2025/02/20 |
| V | Coaxial Cable     | SGH           | SGH18             | 2021005-1    | 2024/01/10 | 2025/01/09 |
| V | Coaxial Cable     | SGH           | SGH18             | 202108-4     | 2024/01/10 | 2025/01/09 |
| V | Coaxial Cable     | SGH           | HA800             | GD20110223-1 | 2024/01/10 | 2025/01/09 |
| V | Coaxial Cable     | SGH           | HA800             | GD20110222-3 | 2024/01/10 | 2025/01/09 |

Note:

1. Bi-Log Antenna and Horn Antenna(AH-840) is calibrated every two years, the other equipments are calibrated every one year.
2. The test instruments marked with "V" are used to measure the final test results.
3. Test Software Version: e3 230303 dekra V9.

## 2. Test Configuration of EUT

### 2.1. Test Condition

| EUT Operational Condition |                       |
|---------------------------|-----------------------|
| Testing Voltage           | DC 5V by Test Fixture |

### 2.2. Test Frequency Mode

|                       |                                          |
|-----------------------|------------------------------------------|
| Test Software Version | Universal Reader Assistant / Version 6.1 |
|-----------------------|------------------------------------------|

#### ANT0

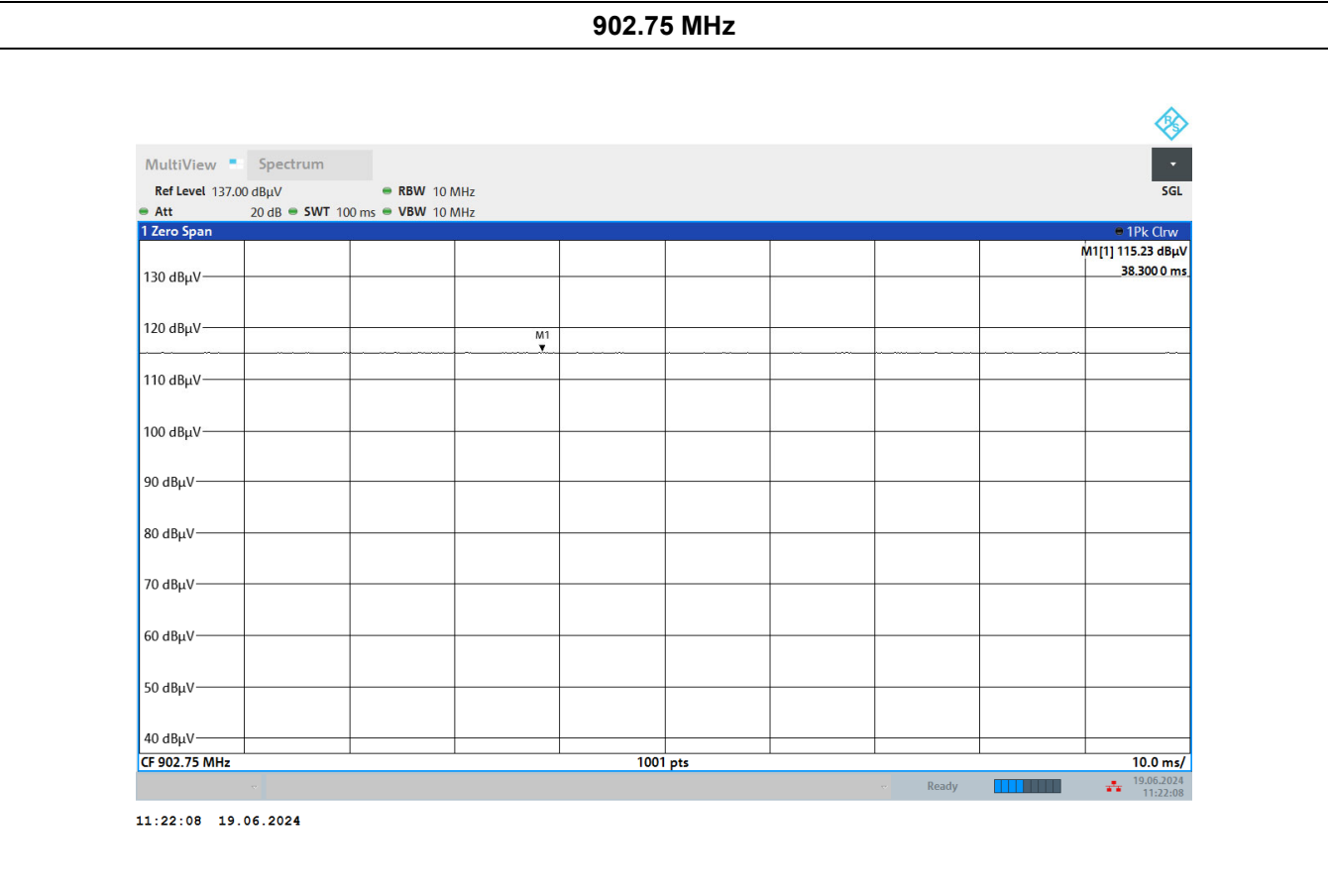
| Modulation | Frequency (MHz) | Power Setting |
|------------|-----------------|---------------|
| PR-ASK     | 902.75          | N/A           |
|            | 914.75          | N/A           |
|            | 927.25          | N/A           |

#### ANT1

| Modulation | Frequency (MHz) | Power Setting |
|------------|-----------------|---------------|
| PR-ASK     | 902.75          | N/A           |
|            | 914.75          | N/A           |
|            | 927.25          | N/A           |

2.3. Duty Cycle

| Modulation | On Times<br>(ms) | On+Off Times<br>(ms) | Duty Cycle<br>(%) | Duty Factor<br>(dB) | VBW<br>(Hz) |
|------------|------------------|----------------------|-------------------|---------------------|-------------|
| PR-ASK     | --               | --                   | 100%              | 0                   | 10          |



## 2.4. Measurement Configuration

|           |        |          |
|-----------|--------|----------|
| Test Mode | Mode 1 | Transmit |
|-----------|--------|----------|

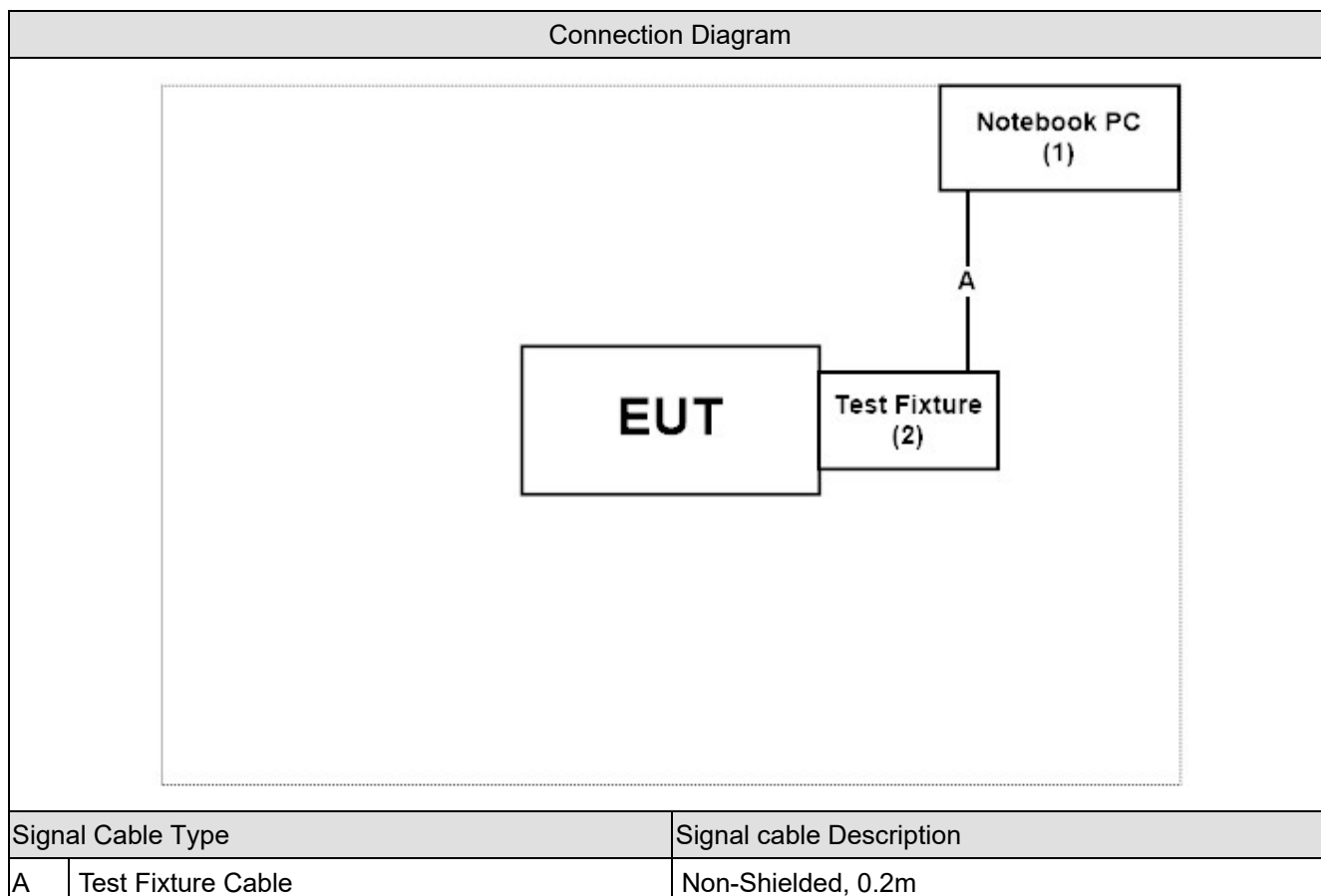
Note:

1. Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
2. For radiated emission below 1 GHz and AC power line conducted emission have performed all modes of operation were investigated and the worst-case emissions are reported.
3. The spectrum plot against conducted item only shows the worst case.

## 2.5. Tested System Details

| No. | Equipment    | Brand Name | Model No.     | Serial No. | Power Cord |
|-----|--------------|------------|---------------|------------|------------|
| 1   | Notebook PC  | DELL       | Latitude 5501 | 4H94P13    | N/A        |
| 2   | Test Fixture | TSC        | CP2102        | N/A        | N/A        |

## 2.6. Configuration of Tested System

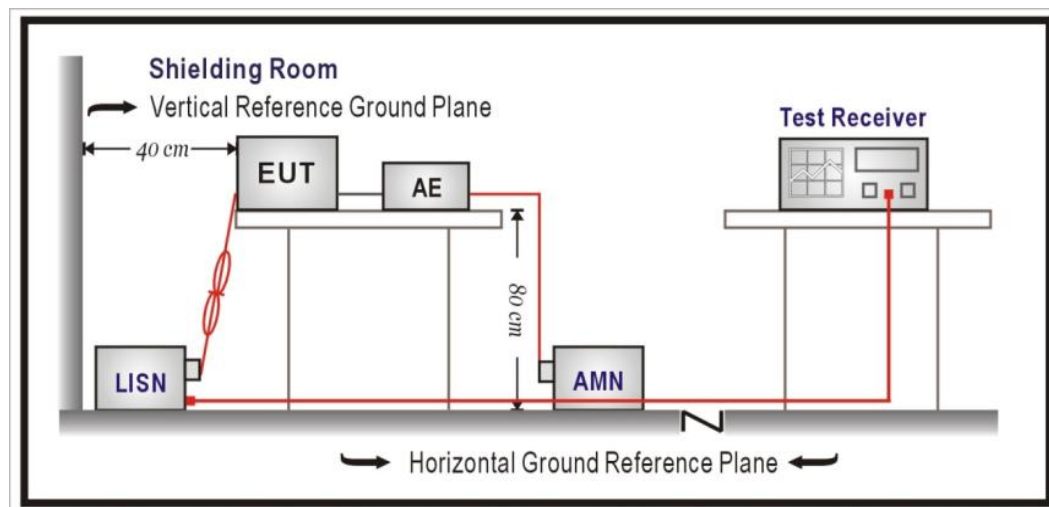


## 2.7. EUT Operating Procedures

|   |                                                                                 |
|---|---------------------------------------------------------------------------------|
| 1 | Setup the EUT as shown in Section 2.6.                                          |
| 2 | Execute software “Universal Reader Assistant / Version 6.1” on the Notebook PC. |
| 3 | Configure the test mode and the test channel.                                   |
| 4 | Verify that the EUT works properly.                                             |

### 3. AC Power Line Conducted Emission

#### 3.1. Test Setup



#### 3.2. Test Limit

| Frequency (MHz) | QP (dBuV) | AV (dBuV) |
|-----------------|-----------|-----------|
| 0.15 - 0.50     | 66 - 56   | 56 - 46   |
| 0.50 - 5.0      | 56        | 46        |
| 5.0 - 30        | 60        | 50        |

Remarks: In the above table, the tighter limit applies at the band edges.

#### 3.3. Test Procedure

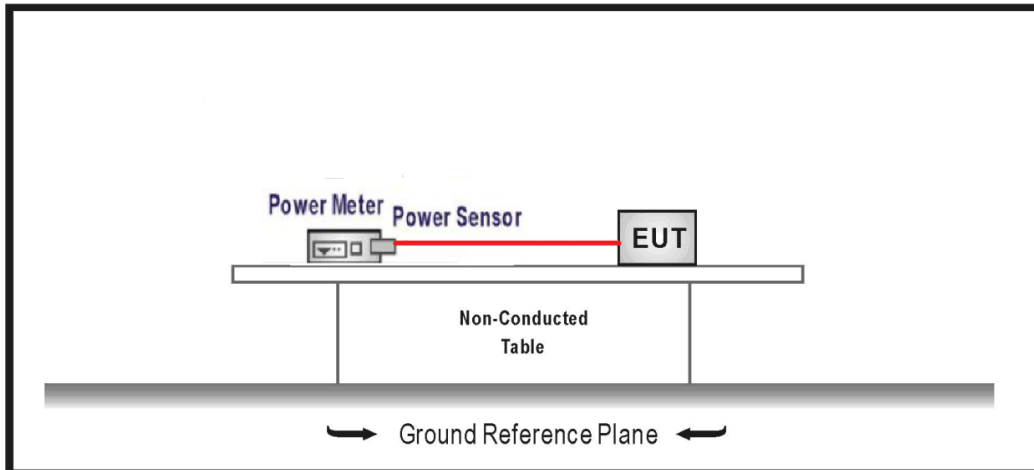
The EUT was setup according to ANSI C63.10: 2013 for AC Power Line Conducted Emissions.

#### 3.4. Test Result of AC Power Line Conducted Emission

Refer as Appendix A

## 4. Maximum Conducted Output Power

### 4.1. Test Setup



### 4.2. Test Limit

For frequency hopping systems operating in the 902 ~ 928 MHz band:

1. Number of Hopping Frequencies  $\geq 50$ : 1 watt (30dBm)
2.  $50 >$  Number of Hopping Frequencies  $\geq 25$ : 0.25 watt (23.98dBm)

For frequency hopping systems operating in the 2400 ~ 2483.5 MHz band:

1. Number of Hopping Frequencies  $\geq 75$ : 1 watt (30dBm)
2.  $75 >$  Number of Hopping Frequencies  $\geq 15$ : 0.125 watts (20.97dBm)

For frequency hopping systems operating in the 5725 ~ 5850 MHz band:

Number of Hopping Frequencies  $\geq 75$ : 1 watt (30dBm)

### 4.3. Test Procedures

The EUT was setup according to ANSI C63.10: 2013 and tested according to FHSS test procedure of KDB 558074.

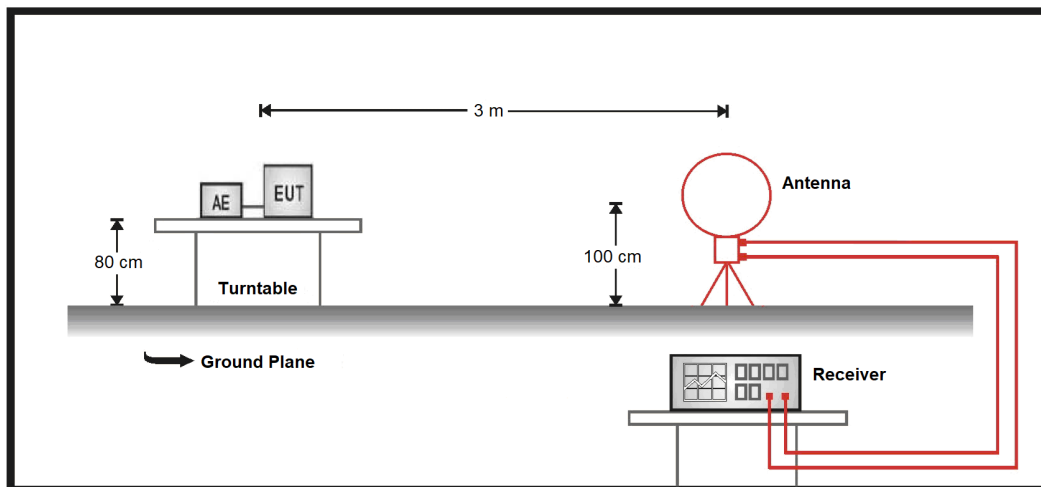
### 4.4. Test Result of Maximum Conducted Output Power

Refer as Appendix B

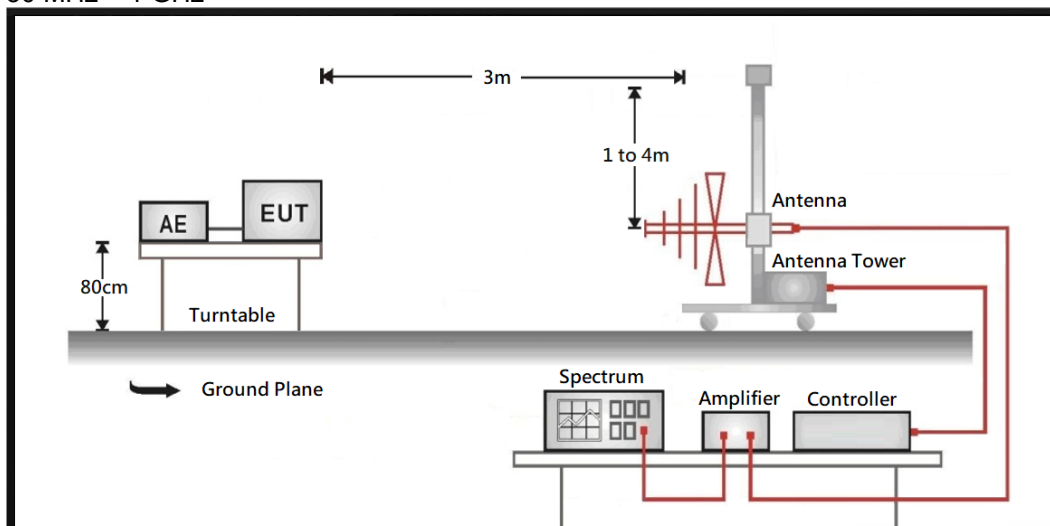
## 5. Radiated Emission

### 5.1. Test Setup

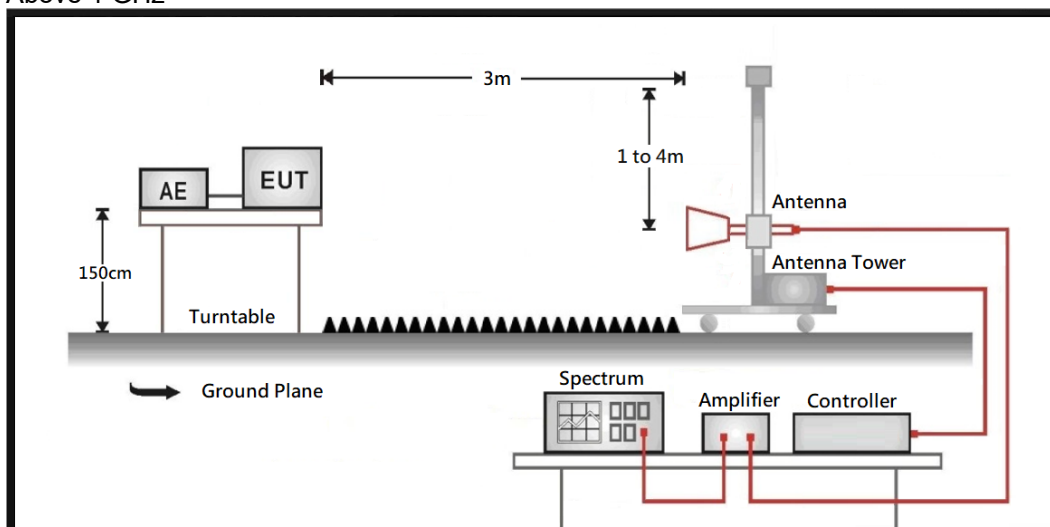
9 kHz ~ 30 MHz



30 MHz ~ 1 GHz



Above 1 GHz



## 5.2. Test Limit

| Frequency (MHz) | Field strength (uV/m) | Field strength (dBuV/m) | Measurement distance (m) |
|-----------------|-----------------------|-------------------------|--------------------------|
| 0.009 – 0.490   | 2400/F(kHz)           | 20 log (2400/F(kHz))    | 300                      |
| 0.490 – 1.705   | 24000/F(kHz)          | 20 log (24000/F(kHz))   | 30                       |
| 1.705 - 30      | 30                    | 29.5                    | 30                       |
| 30 - 88         | 100                   | 40                      | 3                        |
| 88 - 216        | 150                   | 43.5                    | 3                        |
| 216 - 960       | 200                   | 46                      | 3                        |
| Above 960       | 500                   | 54                      | 3                        |

Remarks:

1. Field strength (dBuV/m) = 20 log Field strength (uV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

## 5.3. Test Procedure

The EUT was setup according to ANSI C63.10: 2013 and tested according to FHSS test procedure of KDB 558074.

The EUT and its simulators are placed on a turn table which is 0.8 or 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level. Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

On any frequency or frequencies from 9 kHz (include The the lowest oscillator frequency generated within the device up to the 10th harmonic) to 1000 MHz, the limit shown are based on measuring equipment employing a quasi-peak detector function and on any frequency or frequencies above 1000 MHz the radiated limit shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurement are included emission measurement below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.

The bandwidth below 1 GHz setting on the field strength meter is 120 kHz and above 1 GHz is 1 MHz.

## 5.4. Test Result of Radiated Emission

Refer as Appendix C