



# FCC Part 15C Test Report

## FCC ID: 2BFKI-905ML

Applicant: Zhongshan Haohan Hardware Technology Co.,Ltd.

Address: Floor 4,Tuofeng Street 2,Yumin seven Cun, Dongsheng Town, Zhongshan City,Guangdong, China

Manufacturer: Zhongshan Haohan Hardware Technology Co.,Ltd.

Address: Floor 4,Tuofeng Street 2,Yumin seven Cun, Dongsheng Town, Zhongshan City,Guangdong, China

EUT: digital deadbolt lock

Trade Mark: N/A

Model Number: 905ML/904ML/906ML/907ML

Date of Receipt: Mar. 27, 2025

Test Date: Mar. 28, 2025~Apr. 03, 2025

Date of Report: Apr. 03, 2025

Prepared By: Shenzhen DL Testing Technology Co., Ltd.

Address: 101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China

Applicable Standards: FCC PART 15 C 15.247  
ANSI C63.10:2013

Test Result: Pass

Report Number: DLE-250403004R

Prepared (Test Engineer): Ken Tan

Reviewer (Supervisor): Jack Bu

Approved (Manager): Jade Yang



*This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Shenzhen DL Testing Technology Co., Ltd.*



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## 1. SUMMARY OF TEST RESULTS

Test procedures according to the technical standards:

| FCC Part15 (15.247) , Subpart C |                                  |          |        |
|---------------------------------|----------------------------------|----------|--------|
| Standard Section                | Test Item                        | Judgment | Remark |
| FCC part 15.203/15.247 (c)      | Antenna requirement              | PASS     |        |
| FCC part 15.207                 | AC Power Line Conducted Emission | N/A      |        |
| FCC part 15.247 (b)(3)          | Conducted Peak Output Power      | PASS     |        |
| FCC part 15.247 (a)(2)          | -6dB Bandwidth                   | PASS     |        |
| FCC part 15.247 (e)             | Power Spectral Density           | PASS     |        |
| FCC part 15.247(d)              | Band Edge                        | PASS     |        |
| FCC part 15.205/15.209          | Spurious Emission                | PASS     |        |

### NOTE:

(1)" N/A" denotes test is not applicable in this Test Report.

|                                    |                                                                                                                                             |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Test Lab:                          | Shenzhen DL Testing Technology Co., Ltd.                                                                                                    |
| Address:                           | 101-201, Building C, Shuanghuan, No.8, Baoqing Road, Baolong Industrial Zone, Baolong Street, Longgang District, Shenzhen, Guangdong, China |
| FCC Test Firm Registration Number: | 854456                                                                                                                                      |
| Designation Number:                | CN1307                                                                                                                                      |
| IC Registered No.:                 | 27485                                                                                                                                       |
| CAB ID.:                           | CN0118                                                                                                                                      |



### 1.1 MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement  $y \pm U$ , where expanded uncertainty  $U$  is based on a standard uncertainty multiplied by a coverage factor of  $k=2$  providing a level of confidence of approximately **95 %**.

| No. | Item                                              | Uncertainty |
|-----|---------------------------------------------------|-------------|
| 1   | 3m chamber Radiated spurious emission(9KHz-30MHz) | U=4.5dB     |
| 2   | 3m chamber Radiated spurious emission(30MHz-1GHz) | U=4.8dB     |
| 3   | 3m chamber Radiated spurious emission(1GHz-6GHz)  | U=4.9dB     |
| 4   | 3m chamber Radiated spurious emission(6GHz-40GHz) | U=5.0dB     |
| 5   | Conducted disturbance                             | U=3.2dB     |
| 6   | RF Band Edge                                      | U=1.68dB    |
| 7   | RF power conducted                                | U=1.86dB    |
| 8   | RF conducted Spurious Emission                    | U=2.2dB     |
| 9   | RF Occupied Bandwidth                             | U=1.8dB     |
| 10  | RF Power Spectral Density                         | U=1.75dB    |
| 11  | humidity uncertainty                              | U=5.3%      |
| 12  | Temperature uncertainty                           | U=0.59°C    |



## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

|                        |                                                                                                                                                                                                                       |
|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Name:          | digital deadbolt lock                                                                                                                                                                                                 |
| Trademark              | N/A                                                                                                                                                                                                                   |
| Model No.:             | 905ML/904ML/906ML/907ML                                                                                                                                                                                               |
| Model Difference       | All the models are electrical identical including the same software parameter and hardware design, same mechanical structure and design, the only difference is the model named and the shape of the unlocking shell. |
| BT Version:            | 5.0                                                                                                                                                                                                                   |
| Operation Frequency:   | 2402~2480MHz                                                                                                                                                                                                          |
| Channel numbers:       | 40 Channels                                                                                                                                                                                                           |
| Channel separation:    | 1M                                                                                                                                                                                                                    |
| Modulation technology: | GFSK                                                                                                                                                                                                                  |
| Antenna Type:          | PCB antenna                                                                                                                                                                                                           |
| Antenna gain:          | 0dBi                                                                                                                                                                                                                  |
| Power supply:          | DC 6V from battery or DC 5V from adapter                                                                                                                                                                              |

Note:

- 1.For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.
- 2.The EUT's all information provided by client.

#### 2. Channel List

| Operation Frequency each of channel |           |         |           |         |           |         |           |
|-------------------------------------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency | Channel | Frequency | Channel | Frequency |
| 1                                   | 2402 MHz  | 11      | 2422 MHz  | 21      | 2442 MHz  | 31      | 2462 MHz  |
| 2                                   | 2404 MHz  | 12      | 2424 MHz  | 22      | 2444 MHz  | 32      | 2464 MHz  |
| 3                                   | 2406 MHz  | 13      | 2426 MHz  | 23      | 2446 MHz  | 33      | 2466 MHz  |
| 4                                   | 2408 MHz  | 14      | 2428 MHz  | 24      | 2448 MHz  | 34      | 2468 MHz  |
| 5                                   | 2410 MHz  | 15      | 2430 MHz  | 25      | 2450 MHz  | 35      | 2470 MHz  |
| 6                                   | 2412 MHz  | 16      | 2432 MHz  | 26      | 2452 MHz  | 36      | 2472 MHz  |
| 7                                   | 2414 MHz  | 17      | 2434 MHz  | 27      | 2454 MHz  | 37      | 2474 MHz  |
| 8                                   | 2416 MHz  | 18      | 2436 MHz  | 28      | 2456 MHz  | 38      | 2476 MHz  |
| 9                                   | 2418 MHz  | 19      | 2438 MHz  | 29      | 2458 MHz  | 39      | 2478 MHz  |
| 10                                  | 2420 MHz  | 20      | 2440 MHz  | 30      | 2460 MHz  | 40      | 2480 MHz  |



## 2.2 DESCRIPTION OF TEST MODES

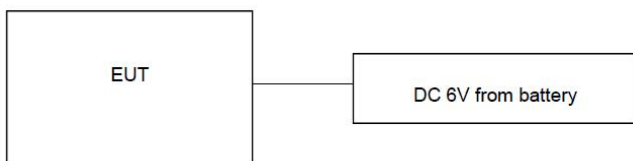
To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

| Pretest Mode                  | Description  |
|-------------------------------|--------------|
| Mode 1                        | CH01         |
| Mode 2                        | CH20         |
| Mode 3                        | CH40         |
| Mode 4                        | Working Mode |
| <b>For Conducted Emission</b> |              |
| Final Test Mode               | Description  |
| Mode 4                        | Working Mode |
| <b>For Radiated Emission</b>  |              |
| Final Test Mode               | Description  |
| Mode 1                        | CH01         |
| Mode 2                        | CH20         |
| Mode 3                        | CH40         |

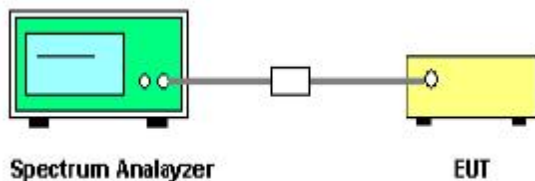
Note: 1. The measurements are performed at the highest, middle, lowest available channels.

## 2.3 BLOCK DIGRAM SHOWING THE CONFIGURATION OF SYSTEM TESTED

### Radiated Emission



### Conducted Spurious





## 2.4 DESCRIPTION OF SUPPORT UNITS(CONDUCTED MODE)

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| Item | Equipment             | Model/Type No. | Series No. | Note |
|------|-----------------------|----------------|------------|------|
| E-1  | digital deadbolt lock | 905ML          | N/A        | EUT  |
| A-1  | Battery               | GP             | LR6        | AE   |

| Item | Shielded Type | Ferrite Core | Length | Note |
|------|---------------|--------------|--------|------|
|      |               |              |        |      |

Note:

- (1) For detachable type I/O cable should be specified the length in cm in 『Length』 column.

## 2.5 TABLE OF PARAMETERS OF TEST SOFTWARE SETTING

During testing, channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the end product.

| Test software             | BLE Test Tool |         |          |
|---------------------------|---------------|---------|----------|
| Frequency                 | 2402 MHz      | 2440MHz | 2480 MHz |
| Power Setting of Software | Default       | Default | Default  |





## 2.6 EQUIPMENTS LIST FOR ALL TEST ITEMS

Radiation test, Band-edge test and 6db bandwidth test equipment

| Item | Equipment                        | Manufacturer    | Type No.  | Serial No. | Last calibration | Calibrated until |
|------|----------------------------------|-----------------|-----------|------------|------------------|------------------|
| 1    | Spectrum Analyzer (9kHz-26.5GHz) | Agilent         | E4408B    | MY50140780 | Nov. 01, 2024    | Oct. 31, 2025    |
| 2    | Test Receiver (9kHz-7GHz)        | R&S             | ESRP7     | 101393     | Nov. 01, 2024    | Oct. 31, 2025    |
| 3    | Bilog Antenna (30MHz-1GHz)       | R&S             | VULB9162  | 00306      | Nov. 01, 2024    | Oct. 31, 2025    |
| 4    | Horn Antenna (1GHz-18GHz)        | Schwarzbeck     | BBHA9120D | 02139      | Nov. 01, 2024    | Oct. 31, 2025    |
| 5    | Horn Antenna (18GHz-40GHz)       | A.H. Systems    | SAS-574   | 588        | Nov. 01, 2024    | Oct. 31, 2025    |
| 6    | Amplifier (9KHz-6GHz)            | Schwarzbeck     | BBV9743B  | 00153      | Nov. 01, 2024    | Oct. 31, 2025    |
| 7    | Amplifier (1GHz-18GHz)           | EMEC            | EM01G8GA  | 00270      | Nov. 01, 2024    | Oct. 31, 2025    |
| 8    | Amplifier (18GHz-40GHz)          | Quanjuda        | DLE-161   | 97         | Nov. 01, 2024    | Oct. 31, 2025    |
| 9    | Loop Antenna (9KHz-30MHz)        | Schwarzbeck     | FMZB1519B | 00014      | Nov. 01, 2024    | Oct. 31, 2025    |
| 10   | RF cables1 (9kHz-1GHz)           | ChengYu         | 966       | 004        | Nov. 01, 2024    | Oct. 31, 2025    |
| 11   | RF cables2 (1GHz-40GHz)          | ChengYu         | 966       | 003        | Nov. 01, 2024    | Oct. 31, 2025    |
| 12   | Antenna connector                | Florida RF Labs | N/A       | RF 01#     | Nov. 01, 2024    | Oct. 31, 2025    |
| 13   | Power probe                      | KEYSIGHT        | U2021XA   | MY55210018 | Nov. 01, 2024    | Oct. 31, 2025    |
| 14   | Signal Analyzer 9kHz-26.5GHz     | Agilent         | N9020A    | MY55370280 | Nov. 01, 2024    | Oct. 31, 2025    |
| 15   | Test Receiver 20kHz-40GHz        | R&S             | ESU 40    | 100376     | Nov. 01, 2024    | Oct. 31, 2025    |
| 16   | D.C. Power Supply                | LongWei         | PS-305D   | 010964729  | Nov. 01, 2024    | Oct. 31, 2025    |

Conduction Test equipment

| Item | Equipment         | Manufacturer | Type No. | Serial No. | Last calibration | Calibrated until |
|------|-------------------|--------------|----------|------------|------------------|------------------|
| 1    | 843 Shielded Room | ChengYu      | 843 Room | 843        | Nov. 01, 2024    | Oct. 31, 2025    |
| 2    | EMI Receiver      | R&S          | ESR      | 101421     | Nov. 01, 2024    | Oct. 31, 2025    |
| 3    | LISN              | R&S          | ENV216   | 102417     | Nov. 01, 2024    | Oct. 31, 2025    |
| 4    | 843 Cable 1#      | ChengYu      | CE Cable | 001        | Nov. 01, 2024    | Oct. 31, 2025    |

Other

| Item | Name                         | Manufacturer | Model   | Software version |
|------|------------------------------|--------------|---------|------------------|
| 1    | EMC Conduction Test System   | FALA         | EZ_EMCC | EMC-CON 3A1.1    |
| 2    | EMC radiation test system    | FALA         | EZ_EMCC | FA-03A2          |
| 3    | RF test system               | MAIWEI       | MTS8310 | 2.0.0.0          |
| 4    | RF communication test system | MAIWEI       | MTS8200 | 2.0.0.0          |



### 3. EMC EMISSION TEST

#### 3.1 CONDUCTED EMISSION MEASUREMENT

##### 3.1.1 POWER LINE CONDUCTED EMISSION Limits (Frequency Range 150KHz-30MHz)

| FREQUENCY (MHz) | Limit (dBuV) |           | Standard |
|-----------------|--------------|-----------|----------|
|                 | Quasi-peak   | Average   |          |
| 0.15 -0.5       | 66 - 56 *    | 56 - 46 * | FCC      |
| 0.50 -5.0       | 56.00        | 46.00     | FCC      |
| 5.0 -30.0       | 60.00        | 50.00     | FCC      |

Note:

- (1) The tighter limit applies at the band edges.
- (2) The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver

| Receiver Parameters | Setting  |
|---------------------|----------|
| Attenuation         | 10 dB    |
| Start Frequency     | 0.15 MHz |
| Stop Frequency      | 30 MHz   |
| IF Bandwidth        | 9 kHz    |

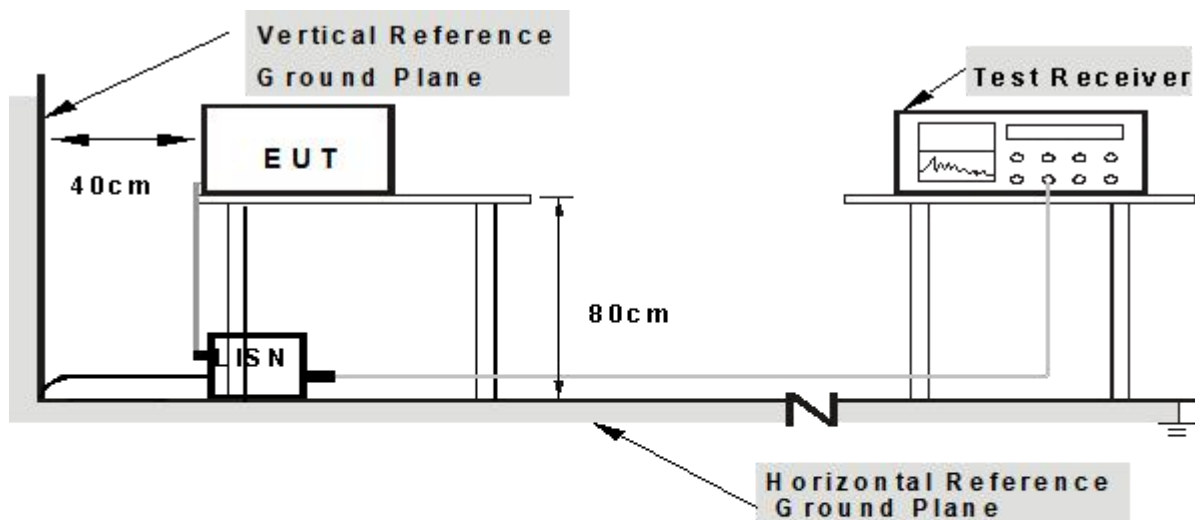
##### 3.1.2 TEST PROCEDURE

- a. The EUT was placed 0.8 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- c. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- d. LISN at least 80 cm from nearest part of EUT chassis.
- e. For the actual test configuration, please refer to the related Item –EUT Test Photos.

##### 3.1.3 DEVIATION FROM TEST STANDARD

No deviation

### 3.1.4 TEST SETUP



**Note: 1. Support units were connected to second LISN.**

**2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes**

### 3.1.5 EUT OPERATING CONDITIONS

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to Charging during test. This operating condition was tested and used to collect the included data.

We pretest AC 120V and AC 230V, the worst voltage was AC 120V and the data recording in the report.

### 3.1.6 TEST RESULT

N/A

EUT powered by cell batteries



### 3.2 RADIATED EMISSION MEASUREMENT

#### 3.2.1 RADIATED EMISSION LIMITS (Frequency Range 9kHz-1000MHz)

In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

| Frequencies<br>(MHz) | Field Strength<br>(micorvolts/meter) | Measurement Distance<br>(meters) |
|----------------------|--------------------------------------|----------------------------------|
| 0.009~0.490          | 2400/F(KHz)                          | 300                              |
| 0.490~1.705          | 24000/F(KHz)                         | 30                               |
| 1.705~30.0           | 30                                   | 30                               |
| 30~88                | 100                                  | 3                                |
| 88~216               | 150                                  | 3                                |
| 216~960              | 200                                  | 3                                |
| Above 960            | 500                                  | 3                                |

#### LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| FREQUENCY (MHz) | Limit (dBuV/m) (at 3M) |         |
|-----------------|------------------------|---------|
|                 | PEAK                   | AVERAGE |
| Above 1000      | 74                     | 54      |

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Receiver setup:

| Frequency    | Detector   | RBW    | VBW    | Value      |
|--------------|------------|--------|--------|------------|
| 9KHz-150KHz  | Quasi-peak | 200Hz  | 600Hz  | Quasi-peak |
| 150KHz-30MHz | Quasi-peak | 9KHz   | 30KHz  | Quasi-peak |
| 30MHz-1GHz   | Quasi-peak | 100KHz | 300KHz | Quasi-peak |
| Above 1GHz   | Peak       | 1MHz   | 3MHz   | Peak       |
|              | Peak       | 1MHz   | 10Hz   | Average    |

### 3.2.2 TEST PROCEDURE

- A. The measuring distance of at 3 m shall be used for measurements at frequency up to 25GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- B. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-chamber test. The table was rotated 360 degrees to determine the position of the highest radiation.
- C. The height of the equipment or of the substitution antenna shall be 0.8m; above 1GHz, the height was 1.5m, the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- D. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured.
- E. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
- F. For the actual test configuration, please refer to the related Item –EUT Test Photos.

G. For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response.

The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

Note:

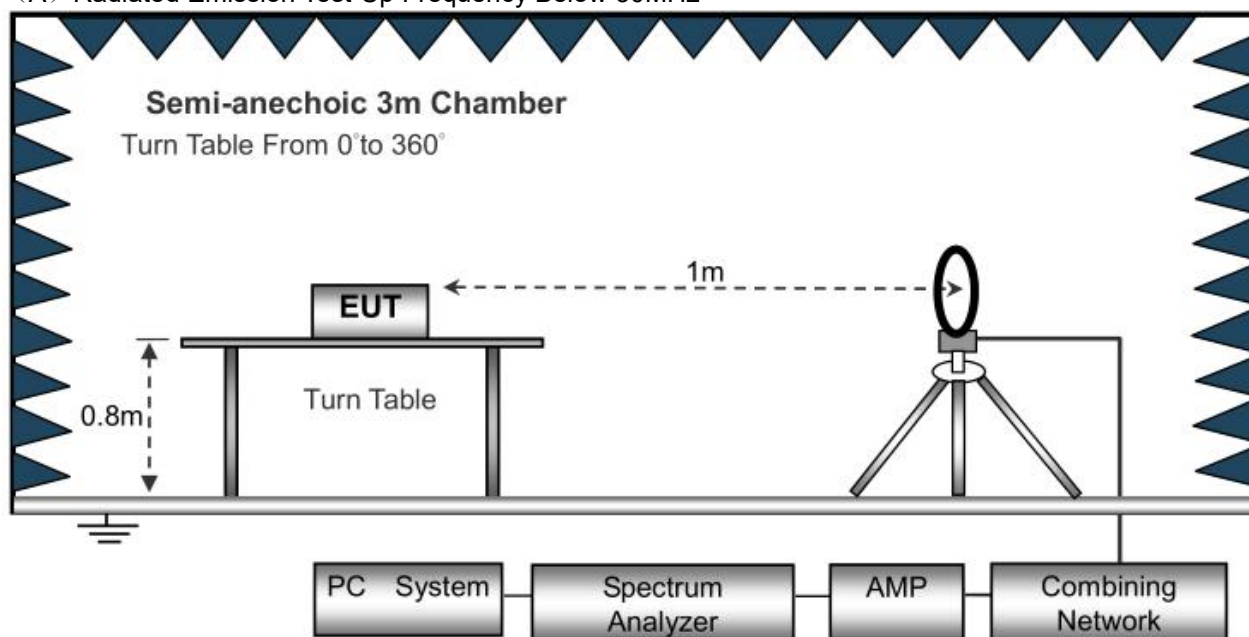
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

### 3.2.3 DEVIATION FROM TEST STANDARD

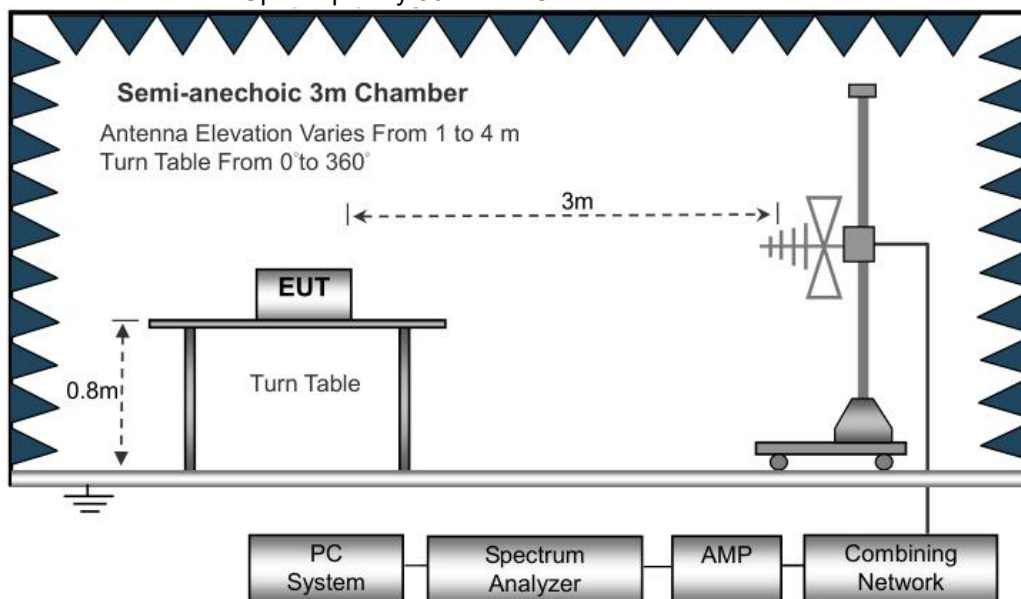
No deviation

### 3.2.4 TEST SETUP

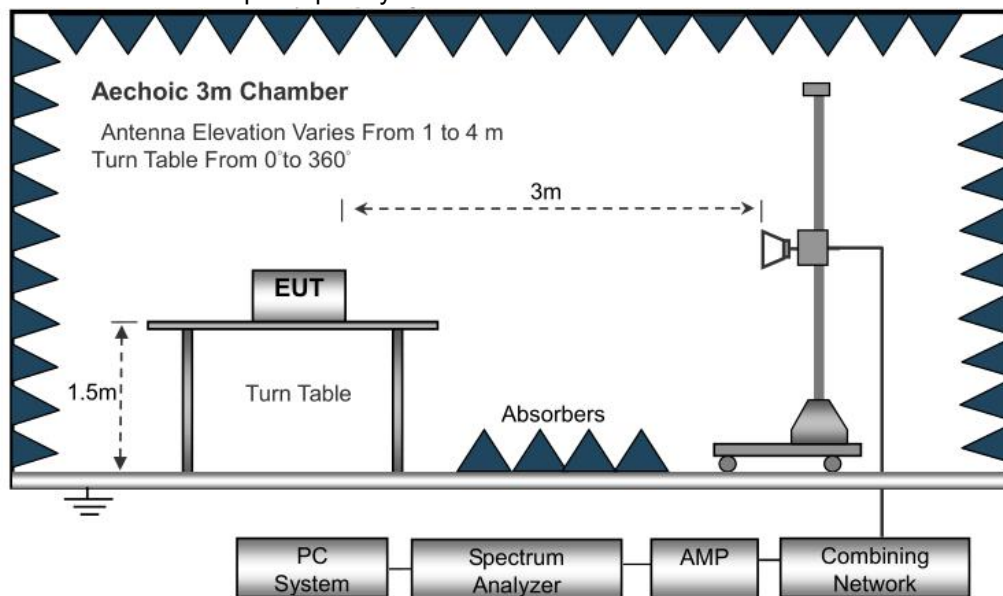
(A) Radiated Emission Test-Up Frequency Below 30MHz



### (B) Radiated Emission Test-Up Frequency 30MHz~1GHz



### (C) Radiated Emission Test-Up Frequency Above 1GHz



### 3.2.5 EUT OPERATING CONDITIONS

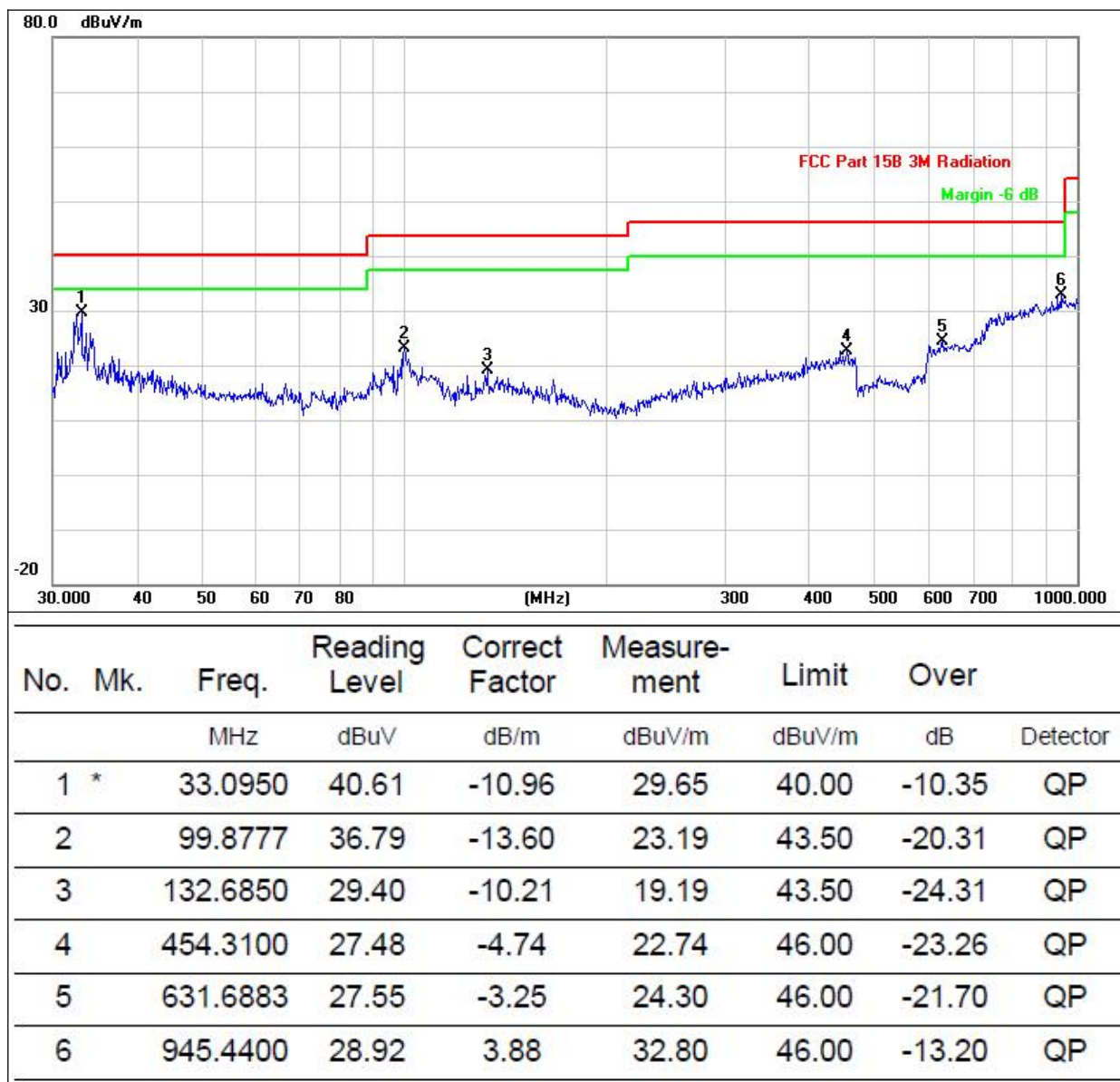
The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

### 3.2.6 TEST RESULTS (BETWEEN 9KHZ – 30 MHZ)

The emission from 9 kHz to 30MHz was pre-tested and found the result was 20dB lower than the limit, and according to 15.31(o) & RSS-Gen 6.13, the test result no need to reported.

**3.2.7 TEST RESULTS (BETWEEN 30MHZ – 1GHZ)**

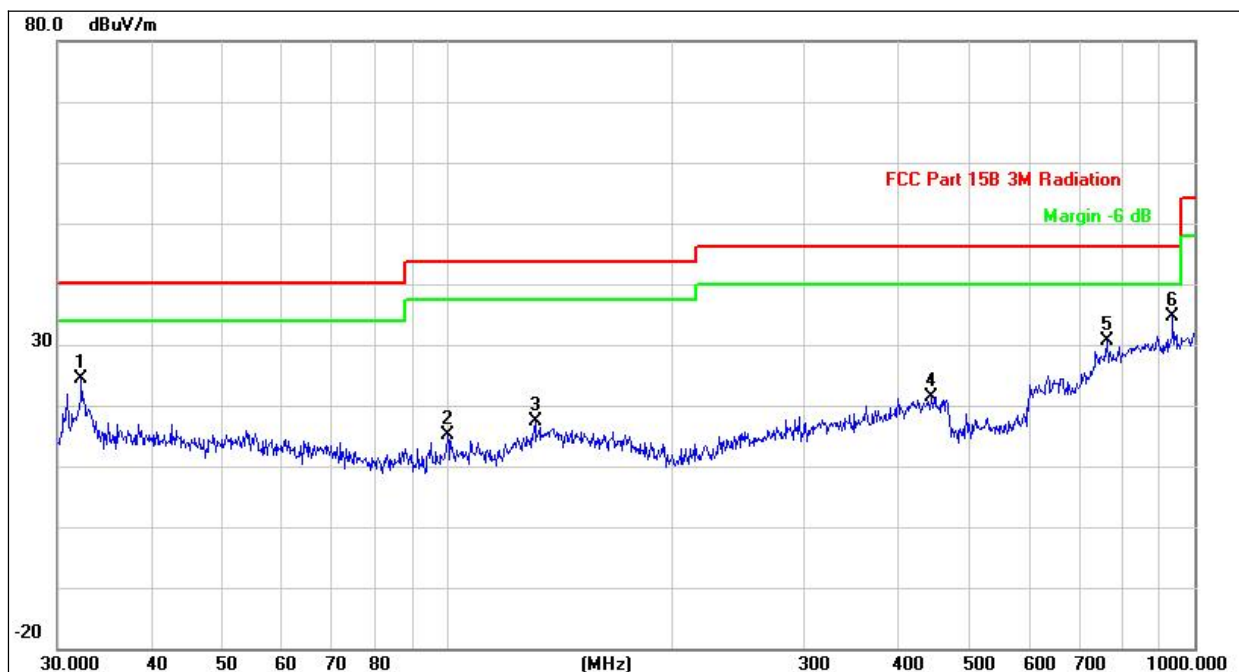
|               |         |                    |          |
|---------------|---------|--------------------|----------|
| Temperature:  | 26°C    | Relative Humidity: | 54%      |
| Pressure:     | 101 kPa | Polarization:      | Vertical |
| Test Voltage: | DC 6V   |                    |          |







|               |        |                    |            |
|---------------|--------|--------------------|------------|
| Temperature:  | 26°C   | Relative Humidity: | 54%        |
| Pressure:     | 101kPa | Polarization:      | Horizontal |
| Test Voltage: | DC 6V  |                    |            |



| No. | Mk. | Freq.    | Reading Level | Correct Factor | Measurement | Limit  | Over   |          |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------|
|     |     | MHz      | dBuV          | dB/m           | dBuV/m      | dBuV/m | dB     | Detector |
| 1   |     | 32.2925  | 35.23         | -10.97         | 24.26       | 40.00  | -15.74 | QP       |
| 2   |     | 99.8777  | 28.73         | -13.60         | 15.13       | 43.50  | -28.37 | QP       |
| 3   |     | 130.8370 | 27.78         | -10.41         | 17.37       | 43.50  | -26.13 | QP       |
| 4   |     | 444.8514 | 26.29         | -4.87          | 21.42       | 46.00  | -24.58 | QP       |
| 5   |     | 763.3757 | 28.92         | 1.61           | 30.53       | 46.00  | -15.47 | QP       |
| 6   | *   | 935.5463 | 30.94         | 3.66           | 34.60       | 46.00  | -11.40 | QP       |

## Remarks:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. The emission levels of other frequencies are very lower than the limit and not show in test report.
3. The test data shows only the worst case GFSK 2402 MHz mode





## 1GHz~25GHz

| Polar<br>(H/V)      | Frequency | Meter<br>Reading | Pre-ampli<br>fier | Cable<br>Loss | Antenna<br>Factor | Emission<br>Level | Limits   | Margin | Detector<br>Type |
|---------------------|-----------|------------------|-------------------|---------------|-------------------|-------------------|----------|--------|------------------|
|                     | (MHz)     | (dBuV)           | (dB)              | (dB)          | (dB)              | (dBuV/m)          | (dBuV/m) | (dB)   |                  |
| Low Channel:2402MHz |           |                  |                   |               |                   |                   |          |        |                  |
| V                   | 4804.00   | 48.54            | 30.55             | 5.77          | 24.66             | 48.42             | 74.00    | -25.58 | Pk               |
| V                   | 4804.00   | 41.63            | 30.55             | 5.77          | 24.66             | 41.51             | 54.00    | -12.49 | AV               |
| V                   | 7206.00   | 51.53            | 30.33             | 6.32          | 24.55             | 52.07             | 74.00    | -21.93 | Pk               |
| V                   | 7206.00   | 41.18            | 30.33             | 6.32          | 24.55             | 41.72             | 54.00    | -12.28 | AV               |
| V                   | 9608.00   | 50.41            | 30.85             | 7.45          | 24.69             | 51.7              | 74.00    | -22.30 | Pk               |
| V                   | 9608.00   | 40.85            | 30.85             | 7.45          | 24.69             | 42.14             | 54.00    | -11.86 | AV               |
| V                   | 12010.00  | 49.48            | 31.02             | 8.99          | 25.57             | 53.02             | 74.00    | -20.98 | Pk               |
| V                   | 12010.00  | 41.29            | 31.02             | 8.99          | 25.57             | 44.83             | 54.00    | -9.17  | AV               |
| H                   | 4804.00   | 49.03            | 30.55             | 5.77          | 24.66             | 48.91             | 74.00    | -25.09 | Pk               |
| H                   | 4804.00   | 41.41            | 30.55             | 5.77          | 24.66             | 41.29             | 54.00    | -12.71 | AV               |
| H                   | 7206.00   | 52.11            | 30.33             | 6.32          | 24.55             | 52.65             | 74.00    | -21.35 | Pk               |
| H                   | 7206.00   | 41.77            | 30.33             | 6.32          | 24.55             | 42.31             | 54.00    | -11.69 | AV               |
| H                   | 9608.00   | 49.88            | 30.85             | 7.45          | 24.69             | 51.17             | 74.00    | -22.83 | Pk               |
| H                   | 9608.00   | 41.74            | 30.85             | 7.45          | 24.69             | 43.03             | 54.00    | -10.97 | AV               |
| H                   | 12010.00  | 50.73            | 31.02             | 8.99          | 25.57             | 54.27             | 74.00    | -19.73 | Pk               |
| H                   | 12010.00  | 41.11            | 31.02             | 8.99          | 25.57             | 44.65             | 54.00    | -9.35  | AV               |

| Polar<br>(H/V)         | Frequency | Meter<br>Reading | Pre-ampli<br>fier | Cable<br>Loss | Antenna<br>Factor | Emission<br>Level | Limits   | Margin | Detector<br>Type |
|------------------------|-----------|------------------|-------------------|---------------|-------------------|-------------------|----------|--------|------------------|
|                        | (MHz)     | (dBuV)           | (dB)              | (dB)          | (dB)              | (dBuV/m)          | (dBuV/m) | (dB)   |                  |
| Middle Channel:2440MHz |           |                  |                   |               |                   |                   |          |        |                  |
| V                      | 4880.00   | 51.06            | 30.55             | 5.77          | 24.66             | 50.94             | 74.00    | -23.06 | Pk               |
| V                      | 4880.00   | 41.03            | 30.55             | 5.77          | 24.66             | 40.91             | 54.00    | -13.09 | AV               |
| V                      | 7320.00   | 49.6             | 30.33             | 6.32          | 24.55             | 50.14             | 74.00    | -23.86 | Pk               |
| V                      | 7320.00   | 41.74            | 30.33             | 6.32          | 24.55             | 42.28             | 54.00    | -11.72 | AV               |
| V                      | 9760.00   | 52.58            | 30.85             | 7.45          | 24.69             | 53.87             | 74.00    | -20.13 | Pk               |
| V                      | 9760.00   | 41.32            | 30.85             | 7.45          | 24.69             | 42.61             | 54.00    | -11.39 | AV               |
| V                      | 12200.00  | 49.31            | 31.02             | 8.99          | 25.57             | 52.85             | 74.00    | -21.15 | Pk               |
| V                      | 12200.00  | 41.08            | 31.02             | 8.99          | 25.57             | 44.62             | 54.00    | -9.38  | AV               |
| H                      | 4880.00   | 48.66            | 30.55             | 5.77          | 24.66             | 48.54             | 74.00    | -25.46 | Pk               |
| H                      | 4880.00   | 40.83            | 30.55             | 5.77          | 24.66             | 40.71             | 54.00    | -13.29 | AV               |
| H                      | 7320.00   | 47.86            | 30.33             | 6.32          | 24.55             | 48.4              | 74.00    | -25.60 | Pk               |
| H                      | 7320.00   | 41.47            | 30.33             | 6.32          | 24.55             | 42.01             | 54.00    | -11.99 | AV               |
| H                      | 9760.00   | 50.5             | 30.85             | 7.45          | 24.69             | 51.79             | 74.00    | -22.21 | Pk               |
| H                      | 9760.00   | 41.77            | 30.85             | 7.45          | 24.69             | 43.06             | 54.00    | -10.94 | AV               |
| H                      | 12200.00  | 47.82            | 31.02             | 8.99          | 25.57             | 51.36             | 74.00    | -22.64 | Pk               |
| H                      | 12200.00  | 41.14            | 31.02             | 8.99          | 25.57             | 44.68             | 54.00    | -9.32  | AV               |



| Polar<br>(H/V)       | Frequency | Meter<br>Reading | Pre-ampli<br>fier | Cable<br>Loss | Antenna<br>Factor | Emission<br>Level | Limits   | Margin | Detector<br>Type |
|----------------------|-----------|------------------|-------------------|---------------|-------------------|-------------------|----------|--------|------------------|
|                      | (MHz)     | (dBuV)           | (dB)              | (dB)          | (dB)              | (dBuV/m)          | (dBuV/m) | (dB)   |                  |
| High Channel:2480MHz |           |                  |                   |               |                   |                   |          |        |                  |
| V                    | 4960.00   | 49.95            | 30.55             | 5.77          | 24.66             | 49.83             | 74.00    | -24.17 | Pk               |
| V                    | 4960.00   | 41.96            | 30.55             | 5.77          | 24.66             | 41.84             | 54.00    | -12.16 | AV               |
| V                    | 7440.00   | 50.92            | 30.33             | 6.32          | 24.55             | 51.46             | 74.00    | -22.54 | Pk               |
| V                    | 7440.00   | 41.49            | 30.33             | 6.32          | 24.55             | 42.03             | 54.00    | -11.97 | AV               |
| V                    | 9920.00   | 52.46            | 30.85             | 7.45          | 24.69             | 53.75             | 74.00    | -20.25 | Pk               |
| V                    | 9920.00   | 41.16            | 30.85             | 7.45          | 24.69             | 42.45             | 54.00    | -11.55 | AV               |
| V                    | 12400.00  | 48.03            | 31.02             | 8.99          | 25.57             | 51.57             | 74.00    | -22.43 | Pk               |
| V                    | 12400.00  | 41.32            | 31.02             | 8.99          | 25.57             | 44.86             | 54.00    | -9.14  | AV               |
| H                    | 4960.00   | 51.44            | 30.55             | 5.77          | 24.66             | 51.32             | 74.00    | -22.68 | Pk               |
| H                    | 4960.00   | 40.85            | 30.55             | 5.77          | 24.66             | 40.73             | 54.00    | -13.27 | AV               |
| H                    | 7440.00   | 50.14            | 30.33             | 6.32          | 24.55             | 50.68             | 74.00    | -23.32 | Pk               |
| H                    | 7440.00   | 41.25            | 30.33             | 6.32          | 24.55             | 41.79             | 54.00    | -12.21 | AV               |
| H                    | 9920.00   | 51.48            | 30.85             | 7.45          | 24.69             | 52.77             | 74.00    | -21.23 | Pk               |
| H                    | 9920.00   | 41.64            | 30.85             | 7.45          | 24.69             | 42.93             | 54.00    | -11.07 | AV               |
| H                    | 12400.00  | 51.05            | 31.02             | 8.99          | 25.57             | 54.59             | 74.00    | -19.41 | Pk               |
| H                    | 12400.00  | 41.78            | 31.02             | 8.99          | 25.57             | 45.32             | 54.00    | -8.68  | AV               |

## Remark:

1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier,

Margin= Emission Level - Limit

2. If peak below the average limit, the average emission was no test.

3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.



### 3.3 RADIATED BAND EMISSION MEASUREMENT

#### 3.3.1 TEST REQUIREMENT:

FCC Part15 C Section 15.209 and 15.205

LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

| FREQUENCY (MHz) | Limit (dBuV/m) (at 3M) |         |
|-----------------|------------------------|---------|
|                 | PEAK                   | AVERAGE |
| Above 1000      | 74                     | 54      |

Notes:

- (1) The limit for radiated test was performed according to FCC PART 15C.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

Receiver setup:

| Frequency     | Detector | RBW  | VBW  | Value   |
|---------------|----------|------|------|---------|
| Above<br>1GHz | Peak     | 1MHz | 3MHz | Peak    |
|               | Average  | 1MHz | 3MHz | Average |

Test Frequency Range: All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.

#### 3.3.2 TEST PROCEDURE

Above 1GHz test procedure as below:

- a. 1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- g. Test the EUT in the lowest channel,the Highest channel

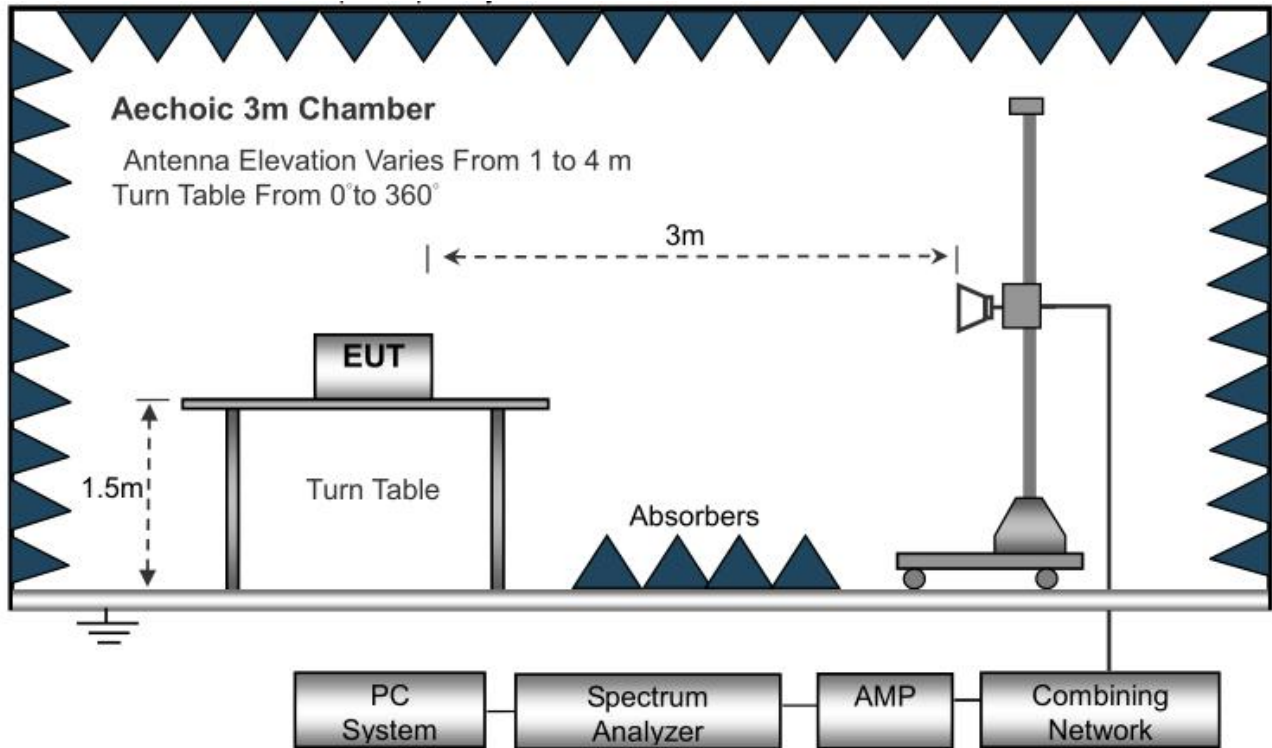
Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported

#### 3.3.1 DEVIATION FROM TEST STANDARD

No deviation

### 3.3.4 TEST SETUP



### 3.3.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

**3.3.6 TEST RESULT**

GFSK

| Polar (H/V)                                                                                                                | Frequency (MHz) | Meter Reading (dBuV) | Pre-amplifier (dB) | Cable Loss (dB) | Antenna Factor (dB/m) | Emission level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Detector Type |
|----------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|--------------------|-----------------|-----------------------|-------------------------|----------------|-------------|---------------|
| Low Channel: 2402MHz                                                                                                       |                 |                      |                    |                 |                       |                         |                |             |               |
| H                                                                                                                          | 2390.00         | 53.22                | 30.55              | 5.77            | 24.66                 | 53.1                    | 74.00          | -20.9       | PK            |
| H                                                                                                                          | 2390.00         | 42.19                | 30.55              | 5.77            | 24.66                 | 42.07                   | 54.00          | -11.93      | AV            |
| H                                                                                                                          | 2400.00         | 50.37                | 30.33              | 6.32            | 24.55                 | 50.91                   | 74.00          | -23.09      | PK            |
| H                                                                                                                          | 2400.00         | 42.03                | 30.33              | 6.32            | 24.55                 | 42.57                   | 54.00          | -11.43      | AV            |
| V                                                                                                                          | 2390.00         | 51.11                | 30.85              | 7.45            | 24.69                 | 52.4                    | 74.00          | -21.6       | PK            |
| V                                                                                                                          | 2390.00         | 41.97                | 30.85              | 7.45            | 24.69                 | 43.26                   | 54.00          | -10.74      | AV            |
| V                                                                                                                          | 2400.00         | 50.29                | 31.02              | 8.99            | 25.57                 | 53.83                   | 74.00          | -20.17      | PK            |
| V                                                                                                                          | 2400.00         | 41.64                | 31.02              | 8.99            | 25.57                 | 45.18                   | 54.00          | -8.82       | AV            |
| High Channel: 2480MHz                                                                                                      |                 |                      |                    |                 |                       |                         |                |             |               |
| H                                                                                                                          | 2483.50         | 52.91                | 30.22              | 4.85            | 23.98                 | 51.52                   | 74.00          | -22.48      | PK            |
| H                                                                                                                          | 2483.50         | 43.36                | 30.22              | 4.85            | 23.98                 | 41.97                   | 54.00          | -12.03      | AV            |
| H                                                                                                                          | 2500.00         | 52.24                | 30.22              | 4.85            | 23.98                 | 50.85                   | 74.00          | -23.15      | PK            |
| H                                                                                                                          | 2500.00         | 42.77                | 30.22              | 4.85            | 23.98                 | 41.38                   | 54.00          | -12.62      | AV            |
| V                                                                                                                          | 2483.50         | 52.83                | 30.22              | 4.85            | 23.98                 | 51.44                   | 74.00          | -22.56      | PK            |
| V                                                                                                                          | 2483.50         | 43.27                | 30.22              | 4.85            | 23.98                 | 41.88                   | 54.00          | -12.12      | AV            |
| V                                                                                                                          | 2500.00         | 52.34                | 30.22              | 4.85            | 23.98                 | 50.95                   | 74.00          | -23.05      | PK            |
| V                                                                                                                          | 2500.00         | 42.53                | 30.22              | 4.85            | 23.98                 | 41.14                   | 54.00          | -12.86      | AV            |
| Remark:<br>1. Emission Level = Meter Reading + Antenna Factor + Cable Loss – Pre-amplifier, Margin= Emission Level - Limit |                 |                      |                    |                 |                       |                         |                |             |               |



#### 4. POWER SPECTRAL DENSITY TEST

##### 4.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C |                        |           |                       |        |
|---------------------------------|------------------------|-----------|-----------------------|--------|
| Section                         | Test Item              | Limit     | Frequency Range (MHz) | Result |
| 15.247                          | Power Spectral Density | 8dBm/3kHz | 2400-2483.5           | PASS   |

##### 4.1.1 TEST PROCEDURE

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

##### 4.1.2 DEVIATION FROM STANDARD

No deviation.

##### 4.1.3 TEST SETUP



##### 4.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.3 Unless otherwise a special operating condition is specified in the follows during the testing.

##### 4.1.5 TEST RESULTS

Measurement Data : The detailed test data see Appendix I



## 5. -6 DB BANDWIDTH

|                   |                                          |
|-------------------|------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (a)(2)       |
| Test Method:      | KDB558074 D0115.247 Meas Guidance v05r02 |

### 5.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C |           |                                         |                       |        |
|---------------------------------|-----------|-----------------------------------------|-----------------------|--------|
| Section                         | Test Item | Limit                                   | Frequency Range (MHz) | Result |
| 15.247(a)(2)                    | Bandwidth | $\geq 500\text{KHz}$<br>(6dB bandwidth) | 2400-2483.5           | PASS   |

#### 5.1.1 TEST PROCEDURE

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3 \times \text{RBW}$ .
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

#### 5.1.2 DEVIATION FROM STANDARD

No deviation.

#### 5.1.3 TEST SETUP



#### 5.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

#### 5.1.5 TEST RESULT

Measurement Data : The detailed test data see Appendix I



## 6. PEAK OUTPUT POWER TEST

|                   |                                          |
|-------------------|------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (b)(3)       |
| Test Method:      | KDB558074 D0115.247 Meas Guidance v05r02 |

### 6.1 APPLIED PROCEDURES / LIMIT

| FCC Part15 (15.247) , Subpart C |                   |                 |                       |        |
|---------------------------------|-------------------|-----------------|-----------------------|--------|
| Section                         | Test Item         | Limit           | Frequency Range (MHz) | Result |
| 15.247(b)(3)                    | Peak Output Power | 1 watt or 30dBm | 2400-2483.5           | PASS   |

- a) Set the RBW  $\geq$  DTS bandwidth.
- b) Set VBW  $\geq$  [3  $\times$  RBW].
- c) Set span  $\geq$  [3  $\times$  RBW].
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

#### 6.1.1 TEST SETUP



#### 6.1.2 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

#### 6.1.3 TEST RESULT

Measurement Data : The detailed test data see Appendix I





## 7. CONDUCTED BAND EDGE AND SPURIOUS EMISSION

|                   |                                                      |
|-------------------|------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.247 (d)                      |
| Test Method:      | KDB558074 D0115.247 Meas Guidance v05r02 and RSS-Gen |

### 7.1 APPLICABLE STANDARD

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

#### 7.1.1 TEST PROCEDURE

Using the following spectrum analyzer setting:

- A) Set the RBW = 100KHz.
- B) Set the VBW = 300KHz.
- C) Sweep time = auto couple.
- D) Detector function = peak.
- E) Trace mode = max hold.
- F) Allow trace to fully stabilize.

#### 7.1.2 DEVIATION FROM STANDARD

No deviation.

#### 7.1.3 TEST SETUP



#### 7.1.4 EUT OPERATION CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

#### 7.1.5 TEST RESULTS

Measurement Data : The detailed test data see Appendix I



## 8. ANTENNA REQUIREMENT

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Standard requirement:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | FCC Part15 C Section 15.203 /247(c) |
| <p>15.203 requirement:<br/>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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> <p>15.247(c) (1)(i) requirement:<br/>(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.</p> |                                     |
| EUT Antenna:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                     |
| The antenna is PCB antenna, the best case gain of the antennas is 0dBi, reference to the Appendix -EUT PHOTO Internal Photos for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                     |



## 9. TEST SETUP PHOTO

Reference to the appendix Test Setup Photo for details.

## 10. EUT CONSTRUCTIONAL DETAILS

Reference to the appendix External Photos & Internal Photos for details.

\*\*\*\*\* END OF REPORT \*\*\*\*\*