



Shenzhen CTL Testing Technology Co., Ltd.  
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# TEST REPORT

ETSI EN 301 489-1 V2.1.1 (2017-02)& ETSI EN 301 489-17 V3.1.1 (2017-02)

Report Reference No. ....: CTL1911053101-WE

Compiled by:  
( position+printed name+signature)

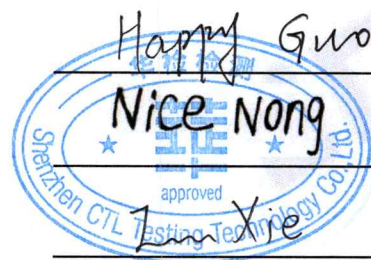
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Ivan Xie  
(Manager)



Product Name.....: Smart watch

Model/Type reference .....: SN58-H

List Model(s).....: SN58

Trade Mark .....: N/A

Applicant's name .....: Decade Smart Technology Co., Ltd

Address of applicant .....: 3F, Building 5th, Haomai Hi-Tech Technology Park, Huating Road,  
Dalang Zone, Longhua District, Shenzhen, China

Test Firm .....: Shenzhen CTL Testing Technology Co., Ltd.

Address of Test Firm .....: Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road,  
Nanshan District, Shenzhen, China 518055

Test specification.....:

Standard.....: ETSI EN 301 489-1 V2.1.1 (2017-02))  
ETSI EN 301 489-17 V3.1.1 (2017-02)

TRF Originator .....: Shenzhen CTL Testing Technology Co., Ltd.

Master TRF .....: Dated 2011-01

Date of receipt of test item .....: Nov. 21, 2019

Date of sampling .....: Nov. 21, 2019

Date of Test Date .....: Nov. 25, 2019–Dec. 05, 2019

Data of Issue.....: Dec. 10, 2019

Result.....: Pass

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# TEST REPORT

|                          |                         |               |
|--------------------------|-------------------------|---------------|
| <b>Test Report No. :</b> | <b>CTL1911053101-WE</b> | Dec. 10, 2019 |
|                          |                         | Date of issue |

Equipment under Test : Smart watch

Model /Type : SN58-H

Listed Models : SN58

**Applicant** : **Decade Smart Technology Co., Ltd**

Address : 3F, Building 5th, Haomai Hi-Tech Technology Park,  
Huating Road, Dalang Zone, Longhua District, Shenzhen,  
China

**Manufacturer** : **Decade Smart Technology Co., Ltd**

Address : 3F, Building 5th, Haomai Hi-Tech Technology Park,  
Huating Road, Dalang Zone, Longhua District, Shenzhen,  
China

|                    |               |
|--------------------|---------------|
| <b>Test result</b> | <b>Pass *</b> |
|--------------------|---------------|

\* In the configuration tested, the EUT complied with the standards specified page 5.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

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# 1 TEST SUMMARY

## 1.1 Test Standards

The tests were performed according to following standards:

**ETSI EN 301 489-1 V2.1.1 (2017-02)** —ElectroMagnetic Compatibility (EMC)

standard for radio equipment and services; Part 1: Common technical requirements; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU and the essential requirements of article 6 of Directive 2014/30/EU

**ETSI EN 301 489-17 V3.1.1 (2017-02)** —ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard covering the essential requirements of article 3.1(b) of Directive 2014/53/EU

## 1.2 Test Description

| ETSI EN 301 489-1/ Requirements              |                                    |      |
|--|------------------------------------|------|
| Conducted Emission( AC Mains)                | ETSI EN301 489-1 V2.1.1 Clause 7.1 | PASS |
| Radiated Emission                            | ETSI EN301 489-1 V2.1.1 Clause 7.1 | PASS |
| Conducted Emission( Telecommunication Ports) | ETSI EN301 489-1 V2.1.1 Clause 7.1 | N/A  |
| Harmonic Current Emissions                   | ETSI EN301 489-1 V2.1.1 Clause 7.1 | N/A  |
| Voltage Fluctuations and Flicker             | ETSI EN301 489-1 V2.1.1 Clause 7.1 | N/A  |
| Electrostatic Discharge                      | ETSI EN301 489-1 V2.1.1 Clause 7.2 | PASS |
| RF Electromagnetic Field                     | ETSI EN301 489-1 V2.1.1 Clause 7.2 | PASS |
| Fast Transients Common Mode                  | ETSI EN301 489-1 V2.1.1 Clause 7.2 | N/A  |
| Surges                                       | ETSI EN301 489-1 V2.1.1 Clause 7.2 | N/A  |
| RF Common Mode 0,15 MHz to 80 MHz            | ETSI EN301 489-1 V2.1.1 Clause 7.2 | N/A  |
| Transients and Surges                        | ETSI EN301 489-1 V2.1.1 Clause 7.2 | N/A  |
| Voltage Dips and Interruptions               | ETSI EN301 489-1 V2.1.1 Clause 7.2 | N/A  |

## 1.3 Test Facility

### 1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

### 1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

#### CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2005 General Requirements) for the Competence of Testing and Calibration Laboratories.

#### A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

#### IC Registration No.: 9618B

#### CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B on Jan. 22, 2019.

#### FCC-Registration No.: 399832

#### Designation No.: CN1216

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832, December 08, 2017.

## 1.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16 - 4

“Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system according to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

| Test               | Range      | Measurement Uncertainty | Notes |
|--------------------|------------|-------------------------|-------|
| Radiated Emission  | 30~1000MHz | ±3.53dB                 | (1)   |
| Radiated Emission  | 1~12.75GHz | ±4.32dB                 | (1)   |
| Conducted Emission | 0.15~30MHz | ±2.66dB                 | (1)   |

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



#### Harmonic Current Emission

The measurement uncertainty is evaluated as  $\pm 1.2 \%$ .

#### Voltage Fluctuations and Flicker

The measurement uncertainty is evaluated as  $\pm 1.5 \%$ .

#### Electrostatic Discharge

As what is concluded in the document from Note1 of clause 7.6.3 of ISO/IEC 17025: 2017, the requirements for measurement uncertainty in ESD testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant ESD standards. The immunity test signal from the ESD system meet the required specifications in IEC 61000-4-2 through the calibration report with the calibrated uncertainty for the waveform of voltage and timing as being 1.63% and 2.76%.

#### RF Electromagnetic Field

As what is concluded in the document from Note1 of clause 7.6.3 of ISO/IEC 17025: 2017, the requirements for measurement uncertainty in RS testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant RS standards. The immunity test signal from the RS system meet the required specifications in IEC 61000-4-3 through the calibration for the uniform field strength and monitoring for the test level with the uncertainty evaluation report for the electrical field strength as being 2.72 dB.

#### Fast Transients Common Mode

As what is concluded in the document from Note1 of clause 7.6.3 of ISO/IEC 17025: 2017, the requirements for measurement uncertainty in EFT/Burst testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant EFT/Burst standards. The immunity test signal from the EFT/Burst system meet the required specifications in IEC 61000-4-4 through the calibration report with the calibrated uncertainty for the waveform of voltage. Frequency and timing as being 1.63% and 2.76%.

#### Surges

As what is concluded in the document from Note1 of clause 7.6.3 of ISO/IEC 17025: 2017, the requirements for measurement uncertainty in Surge testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant Surge standards. The immunity test signal from the Surge system meet the required specifications in IEC 61000-4-5 through the calibration report with the calibrated uncertainty for the waveform of voltage and timing as being 1.63% and 2.76%.

#### RF Common Mode

As what is concluded in the document from Note1 of clause 7.6.3 of ISO/IEC 17025: 2017, the requirements for measurement uncertainty in CS testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant CS standards. The immunity test signal from the CS system meet the required specifications in IEC 61000-4-6 through the calibration for unmodulated signal and monitoring for the test level with the uncertainty evaluation report for the injected modulated signal level through CDN and EM Clamp/Direct Injection as being 3.72 dB and 2.78 dB.

#### Voltage Dips and Interruption

As what is concluded in the document from Note1 of clause 7.6.3 of ISO/IEC 17025: 2017, the requirements for measurement uncertainty in DIP testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant DIP standards. The immunity test signal from the DIP system meet the required specifications in IEC 61000-4-11 through the calibration report with the calibrated uncertainty for the waveform of voltage and timing as being 1.63% and 2.76%.

#### Transients and Surges

As what is concluded in the document from Note1 of clause 7.6.3 of ISO/IEC 17025: 2017, the requirements for measurement uncertainty in Transients and Surges testing are deemed to have been satisfied, and the testing is reported in accordance with the relevant DIP standards. The immunity test signal from the Transients and Surges system meet the required specifications in ISO 7637-2 through the calibration report with the calibrated uncertainty for the waveform of voltage and timing as being 1.60% and 2.60%.

## 2 GENERAL INFORMATION

### 2.1 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

|                     |            |
|---------------------|------------|
| Normal Temperature: | 15°C -35°C |
| Relative Humidity   | 35%-55 %   |
| Air Pressure        | 101KPa     |

### 2.2 General Description of EUT

|                       |                                |
|-----------------------|--------------------------------|
| Product Name:         | Smart watch                    |
| Model/Type reference: | SN58-H                         |
| Power supply:         | DC 3.7V from battery           |
| <b>BLE:</b>           |                                |
| Supported type:       | Supported Bluetooth low Energy |
| Modulation:           | GFSK                           |
| Operation frequency:  | 2402MHz to 2480MHz             |
| Channel number:       | 40                             |
| Channel separation:   | 2 MHz                          |
| Antenna type:         | Monopole Antenna               |
| Antenna gain:         | 0dBi                           |

Note: For more detailed features description, please refer to the manufacturer's specifications or the User's Manual.

### 2.3 Description of Test Modes

The EUT was tested under typical operating condition. The applicant provides drivers to make it work in general use, and software can obtain data from it to see if it works intended during testing.



## 2.4 Equipments Used during the Test

| Radiated Emission(chamber 1) |                          |                      |             |              |            |            |
|------------------------------|--------------------------|----------------------|-------------|--------------|------------|------------|
| Item                         | Test Equipment           | Manufacturer         | Model No.   | Serial No.   | Last Cal.  | Cal.Due    |
| 1                            | ULTRA-BROA DBAND ANTENNA | Sunol Sciences Corp. | JB1 Antenna | A061713      | 2019/05/20 | 2020/05/19 |
| 2                            | EMI Test Receiver        | ROHDE & SCHWARZ      | ESCI        | 1166.5950.03 | 2019/05/20 | 2020/05/19 |
| 3                            | Horn Antenna             | Sunol Sciences Corp  | DRH-118     | A062013      | 2019/05/20 | 2020/05/19 |

| Conducted Emission |                   |                 |            |              |            |            |
|--------------------|-------------------|-----------------|------------|--------------|------------|------------|
| Item               | Test Equipment    | Manufacturer    | Model No.  | Serial No.   | Last Cal.  | Cal.Due    |
| 1                  | EMI Test Receiver | ROHDE & SCHWARZ | ESCI       | 1166.5950.03 | 2019/05/20 | 2020/05/19 |
| 2                  | LISN              | ROHDE & SCHWARZ | ESH2-Z5    | 860014/010   | 2019/05/20 | 2020/05/19 |
| 3                  | Limitator         | HP              | VTSD 9561f | N/A          | 2019/05/20 | 2020/05/19 |

| Harmonic Current/ Voltage Fluctuation and Flicker |                               |              |           |            |            |            |
|---|-------------------------------|--------------|-----------|------------|------------|------------|
| Item  | Test Equipment                | Manufacturer | Model No. | Serial No. | Last Cal.  | Cal.Due    |
| 1   | Purified Power Source         | MToni        | PHF 5010  | N/A        | 2019/05/20 | 2020/05/19 |
| 2   | Harmonic And Flicker Analyzer | Voltech      | PM6000    | N/A        | 2019/05/20 | 2020/05/19 |

| Electrostatic Discharge |                |              |           |            |            |            |
|-------------------------|----------------|--------------|-----------|------------|------------|------------|
| Item                    | Test Equipment | Manufacturer | Model No. | Serial No. | Last Cal.  | Cal.Due    |
| 1                       | ESD Simulator  | TESEQ AG     | NSG 437   | 1058       | 2019/05/20 | 2020/05/19 |

| Electrical Fast Transient/Surge/Dips |                         |              |           |            |            |            |
|--------------------------------------|-------------------------|--------------|-----------|------------|------------|------------|
| Item                                 | Test Equipment          | Manufacturer | Model No. | Serial No. | Last Cal.  | Cal.Due    |
| 1                                    | Ultra Compact Simulator | HAEFELY      | ECOMPACT4 | 174887     | 2019/05/20 | 2020/05/19 |

| Conducted Susceptibility ( CS ) : |                                    |              |            |            |            |            |
|-----------------------------------|------------------------------------|--------------|------------|------------|------------|------------|
| Item                              | Test Equipment                     | Manufacturer | Model No.  | Serial No. | Last Cal.  | Cal.Due    |
| 1                                 | Conducted Disturbances test system | SCHLODER     | CDG 6000   | N/A        | 2019/05/20 | 2020/05/19 |
| 2                                 | Amplifier                          | SCHLODER     | 4N100W-6DB | N/A        | 2019/05/20 | 2020/05/19 |
| 3                                 | EM CLAMP                           | LÜTHI        | EM101      | 335625     | 2019/05/20 | 2020/05/19 |

|   |     |          |           |                   |            |            |
|---|-----|----------|-----------|-------------------|------------|------------|
| 4 | CDN | SCHLODER | CDN M2+M3 | A2210225/<br>2013 | 2019/05/20 | 2020/05/19 |
|---|-----|----------|-----------|-------------------|------------|------------|

| Power Frequency Magnetic Field Susceptibility |                |                       |           |            |            |            |
|---|----------------|-----------------------|-----------|------------|------------|------------|
| Item  | Test Equipment | Manufacturer          | Model No. | Serial No. | Last Cal.  | Cal.Due    |
| 1   | MAGNETIC COIL  | HTEC Instruments Ltd. | HPFMF     | 154402     | 2019/05/20 | 2020/05/19 |

| RF Field Strength Susceptibility |                         |                 |                   |                |            |            |
|----------------------------------|-------------------------|-----------------|-------------------|----------------|------------|------------|
| Item                             | Test Equipment          | Manufacturer    | Model No.         | Serial No.     | Last Cal.  | Cal.Due    |
| 1                                | SIGNAL GENERATOR        | HEWLETT PACKARD | 8648C             | 3642U0176<br>5 | 2019/05/20 | 2020/05/19 |
| 2                                | Power Amplifier         | AR              | 150W1000<br>M3    | 309401         | 2019/05/20 | 2020/05/19 |
| 3                                | Power Meter             | Agilent         | E4419B            | GB4331787<br>7 | 2019/05/20 | 2020/05/19 |
| 4                                | Directional Coupler     | EMtrace         | DDC-0210-<br>150W | N/A            | 2019/05/20 | 2020/05/19 |
| 5                                | Test Antenna-<br>Bi-Log | Schwarzbeck     | VULB 9118<br>E    | N/A            | 2019/05/20 | 2020/05/19 |

The calibration interval is 1 year.

### 3 TEST CONDITIONS AND RESULTS

#### 3.1 EMC EMISSION TEST

##### 3.1.1 Conducted Emission (AC Mains)

###### LIMIT

| FREQUENCY (MHz) | Class A (dBuV) |         | Class B (dBuV) |           |
|-----------------|----------------|---------|----------------|-----------|
|                 | Quasi-peak     | Average | Quasi-peak     | Average   |
| 0.15 -0.5       | 79.00          | 66.00   | 66 - 56 *      | 56 - 46 * |
| 0.50 -5.0       | 73.00          | 60.00   | 56.00          | 46.00     |
| 5.0 -30.0       | 73.00          | 60.00   | 60.00          | 50.00     |

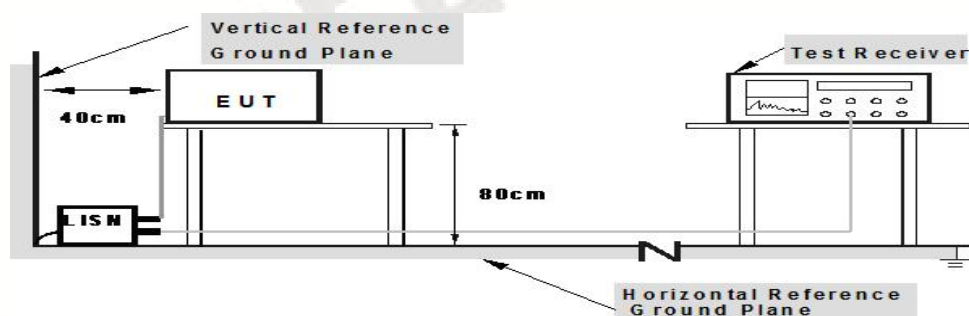
Note: (1)The tighter limit applies at the band edges.

(2)The limit of " \* " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

###### TEST PROCEDURE

- The EUT was placed 0.4 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.
- 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.
- 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.
- LISN at least 80 cm from nearest part of EUT chassis.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

###### TEST SETUP



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

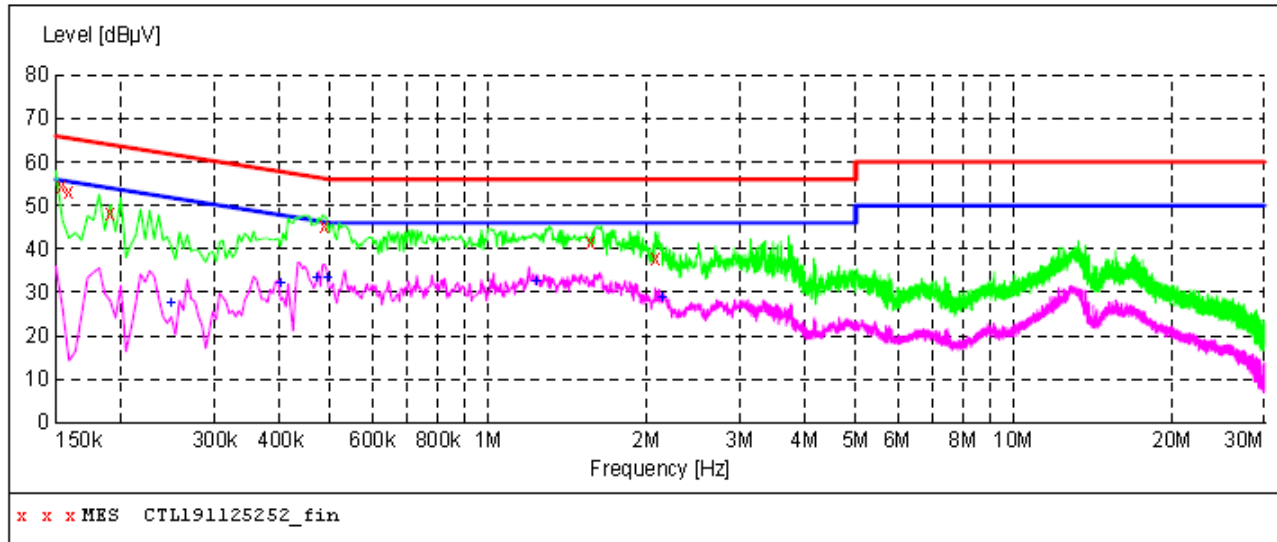
**2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes**

**TEST RESULTS****-----Passed-----**

Please refer to the below test data:

**Line:****L****SCAN TABLE: "Voltage (9K-30M) FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL191125252\_fin"**

11/25/2019 1:54PM

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.154500         | 54.50         | 10.0         | 66            | 11.3         | QP       | L1   | GND |
| 0.159000         | 53.30         | 10.0         | 66            | 12.2         | QP       | L1   | GND |
| 0.190500         | 48.30         | 10.0         | 64            | 15.7         | QP       | L1   | GND |
| 0.487500         | 45.20         | 10.0         | 56            | 11.0         | QP       | L1   | GND |
| 1.567500         | 41.40         | 10.2         | 56            | 14.6         | QP       | L1   | GND |
| 2.076000         | 37.70         | 10.3         | 56            | 18.3         | QP       | L1   | GND |

**MEASUREMENT RESULT: "CTL191125252\_fin2"**

11/25/2019 1:54PM

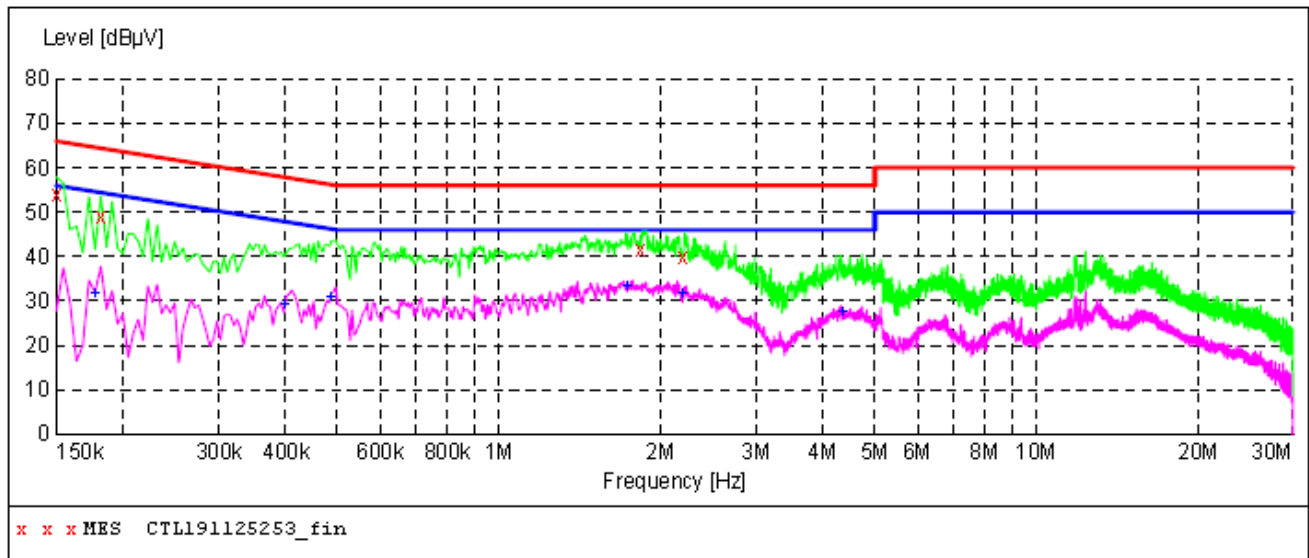
| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.249000         | 27.30         | 10.0         | 52            | 24.5         | AV       | L1   | GND |
| 0.402000         | 32.10         | 10.0         | 48            | 15.7         | AV       | L1   | GND |
| 0.469500         | 33.40         | 10.0         | 47            | 13.1         | AV       | L1   | GND |
| 0.492000         | 33.40         | 10.0         | 46            | 12.7         | AV       | L1   | GND |
| 1.230000         | 32.30         | 10.2         | 46            | 13.7         | AV       | L1   | GND |
| 2.143500         | 28.80         | 10.3         | 46            | 17.2         | AV       | L1   | GND |

Line:

N

**SCAN TABLE: "Voltage (9K-30M)FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "CTL191125253\_fin"**

11/25/2019 1:57PM

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.150000         | 54.10         | 10.0         | 66            | 11.9         | QP       | N    | GND |
| 0.181500         | 48.90         | 10.0         | 64            | 15.5         | QP       | N    | GND |
| 1.833000         | 41.60         | 10.2         | 56            | 14.4         | QP       | N    | GND |
| 2.206500         | 40.10         | 10.3         | 56            | 15.9         | QP       | N    | GND |

**MEASUREMENT RESULT: "CTL191125253\_fin2"**

11/25/2019 1:57PM

| Frequency<br>MHz | Level<br>dBμV | Transd<br>dB | Limit<br>dBμV | Margin<br>dB | Detector | Line | PE  |
|------------------|---------------|--------------|---------------|--------------|----------|------|-----|
| 0.177000         | 31.80         | 10.0         | 55            | 22.8         | AV       | N    | GND |
| 0.397500         | 29.10         | 10.0         | 48            | 18.8         | AV       | N    | GND |
| 0.487500         | 30.60         | 10.0         | 46            | 15.6         | AV       | N    | GND |
| 1.734000         | 33.40         | 10.2         | 46            | 12.6         | AV       | N    | GND |
| 2.188500         | 31.80         | 10.3         | 46            | 14.2         | AV       | N    | GND |
| 4.357500         | 27.50         | 10.3         | 46            | 18.5         | AV       | N    | GND |

### 3.1.2 Radiated Emission

#### LIMIT

##### **LIMITS OF RADIATED EMISSION MEASUREMENT (Below 1000MHz)**

| FREQUENCY (MHz) | Class B(at 10m) | Class B (at 3m) |
|-----------------|-----------------|-----------------|
|                 | dBuV/m          | dBuV/m          |
| 30 – 230        | 30              | 40              |
| 230 – 1000      | 37              | 47              |

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

| FREQUENCY (MHz) | Class A (at 10m) dBuV/m |     | Class B (at 3m) dBuV/m |     |
|-----------------|-------------------------|-----|------------------------|-----|
|                 | Peak                    | Avg | Peak                   | Avg |
| 1000-3000       | 76                      | 56  | 70                     | 50  |
| 3000-6000       | 80                      | 60  | 74                     | 54  |

Notes: (1)The limit for radiated test was performed according to as following:

ETSI EN 301 489-1/EN 55032

(2)The tighter limit applies at the band edges.

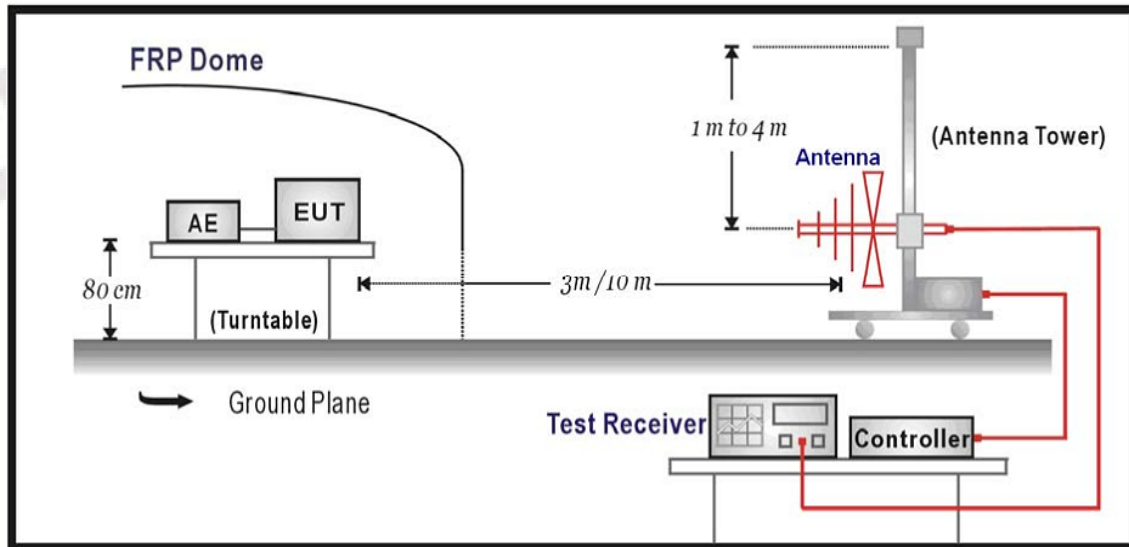
#### TEST PROCEDURE

- The EUT was placed on the top of a rotating table 3 meters away from the receiver antenna and 0.8 meters above the ground at a 9X9X6 anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The height of the equipment shall be 0.8 m; 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.
- 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/Average detector mode re-measured.
- If the Peak Mode measured value compliance with and lower than Quasi Peak/Average Mode Limit, the EUT shall be deemed to meet QP/AV Limits and then no additional QP/AV Mode measurement performed.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

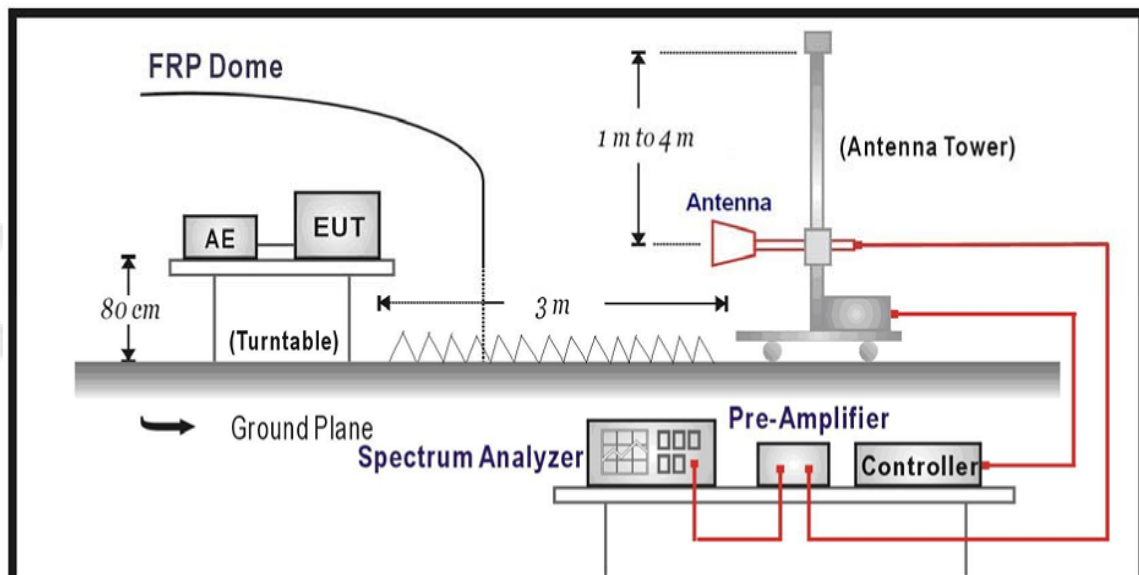


**TEST SETUP**

Below 1GHz



Above 1GHz

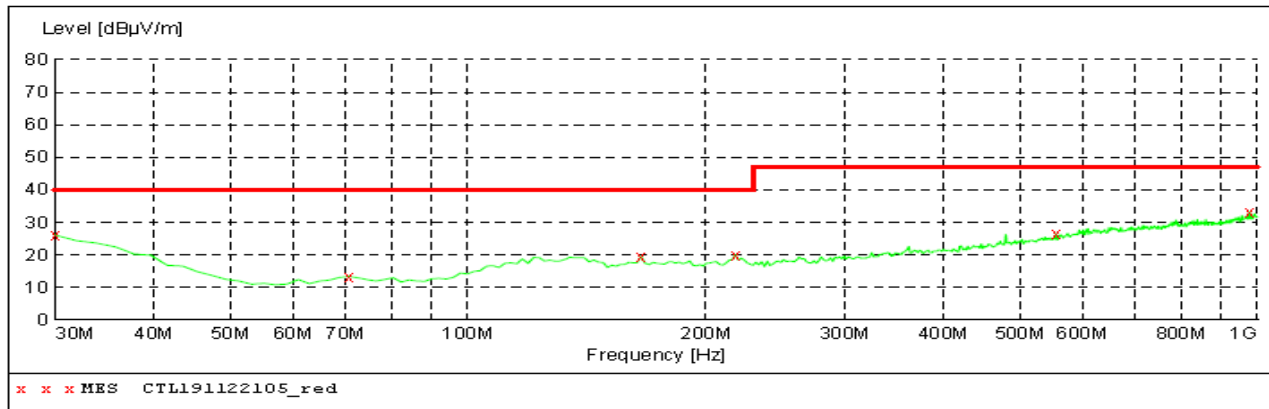
**TEST RESULTS**

-----Passed-----

Please refer to the below test data:

**Polarization:****Horizontal*****SWEEP TABLE: "test (30M-1G)"***

| Short Description: |           | Field Strength |            | Transducer |     |
|--------------------|-----------|----------------|------------|------------|-----|
| Start              | Stop      | Detector       | Meas. Time | IF Bandw.  |     |
| Frequency          | Frequency |                |            |            |     |
| 30.0 MHz           | 1.0 GHz   | MaxPeak        | 300.0 ms   | 100 kHz    | JB1 |

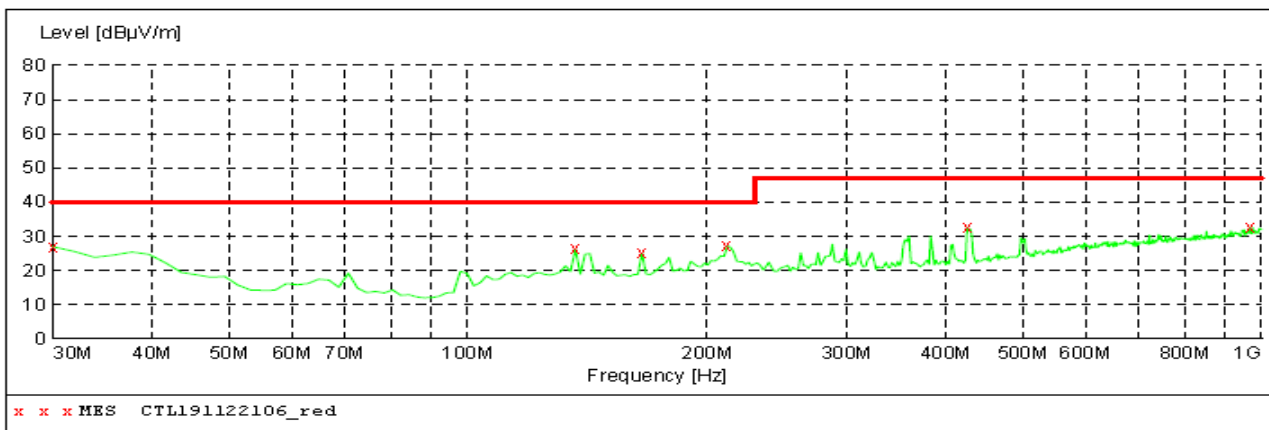
***MEASUREMENT RESULT: "CTL191122105\_red"***

2019-11-22 9:34

| Frequency<br>MHz | Level<br>dBuV/m | Transd<br>dB | Limit<br>dBuV/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------|--------------|-----------------|--------------|------|--------------|----------------|--------------|
| 30.000000        | 26.10           | 22.2         | 40.0            | 13.9         | ---  | 0.0          | 0.00           | HORIZONTAL   |
| 70.740000        | 13.40           | 9.1          | 40.0            | 26.6         | ---  | 0.0          | 0.00           | HORIZONTAL   |
| 165.800000       | 19.60           | 14.5         | 40.0            | 20.4         | ---  | 0.0          | 0.00           | HORIZONTAL   |
| 218.180000       | 20.00           | 14.4         | 40.0            | 20.0         | ---  | 0.0          | 0.00           | HORIZONTAL   |
| 555.740000       | 26.60           | 22.0         | 47.0            | 20.4         | ---  | 0.0          | 0.00           | HORIZONTAL   |
| 976.720000       | 33.30           | 27.8         | 47.0            | 13.7         | ---  | 0.0          | 0.00           | HORIZONTAL   |

**Polarization:****Vertical*****SWEEP TABLE: "test (30M-1G)"***

| Short Description: |           | Field Strength |            | Transducer |     |
|--------------------|-----------|----------------|------------|------------|-----|
| Start              | Stop      | Detector       | Meas. Time | IF Bandw.  |     |
| Frequency          | Frequency |                |            |            |     |
| 30.0 MHz           | 1.0 GHz   | MaxPeak        | 300.0 ms   | 100 kHz    | JB1 |

***MEASUREMENT RESULT: "CTL191122106\_red"***

2019-11-22 9:36

| Frequency<br>MHz | Level<br>dBuV/m | Transd<br>dB | Limit<br>dBuV/m | Margin<br>dB | Det. | Height<br>cm | Azimuth<br>deg | Polarization |
|------------------|-----------------|--------------|-----------------|--------------|------|--------------|----------------|--------------|
| 30.000000        | 27.00           | 22.2         | 40.0            | 13.0         | ---  | 0.0          | 0.00           | VERTICAL     |
| 136.700000       | 26.30           | 15.0         | 40.0            | 13.7         | ---  | 0.0          | 0.00           | VERTICAL     |
| 165.800000       | 25.10           | 14.5         | 40.0            | 14.9         | ---  | 0.0          | 0.00           | VERTICAL     |
| 212.360000       | 27.20           | 14.5         | 40.0            | 12.8         | ---  | 0.0          | 0.00           | VERTICAL     |
| 425.760000       | 32.60           | 18.9         | 47.0            | 14.4         | ---  | 0.0          | 0.00           | VERTICAL     |
| 967.020000       | 32.70           | 27.6         | 47.0            | 14.3         | ---  | 0.0          | 0.00           | VERTICAL     |

Note Above 1-6GHz have been tested and found no emission except floor noise

## 3.2 EMC IMMUNITY TEST

### 3.2.1 Immunity Performance criteria

#### A. General Requirements (ETSI EN 301489-1):

The performance criteria are used to take a decision on whether radio equipment passes or fails immunity tests.

For the purpose of the present document four categories of performance criteria apply:

- Performance criteria for continuous phenomena applied to transmitters and receivers
- Performance criteria for transient phenomena applied to transmitters and receivers
- Performance criteria for equipment which does not provide a continuous communication link
- Performance criteria for ancillary equipment tested on a stand alone basis

#### (1) Performance criteria for continuous phenomena applied to transmitters and receivers

If no further details are given in the relevant part of ETSI EN 301 489 series [i.13] dealing with the particular type of radio equipment, the following general performance criteria for continuous phenomena shall apply.

During and after the test, the equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the equipment is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.

During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.

If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

#### (2) Performance criteria for transient phenomena applied to transmitters and receivers

If no further details are given in the relevant part of ETSI EN 301 489 series [i.13] dealing with the particular type of radio equipment, the following general performance criteria for transient phenomena shall apply.

For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:

- f) For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user in accordance with the manufacturer's instructions. A SW reboot is not allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.
- g) For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. A SW reboot is not allowed. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

For all other ports the following applies:

- h) After the test, the equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer, when the equipment is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.
- i) During the EMC exposure to an electromagnetic phenomenon, a degradation of performance is, however, allowed. No change of the actual mode of operation (e.g. unintended transmission) or

stored data is allowed.

- j) If the minimum performance level or the permissible performance loss is not specified by the manufacturer, then either of these may be deduced from the product description and documentation and what the user may reasonably expect from the equipment if used as intended.

### **(3) Performance criteria for equipment which does not provide a continuous communication link**

For radio equipment which does not provide a continuous communication link, the performance criteria described in clauses 6.1 and 6.2 are not appropriate, in these cases the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests. The performance specification shall be included in the product description and documentation. The related specifications set out in clause 5.3 have also to be taken into account.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in clauses 6.1 and 6.2.

### **(4) Performance criteria for ancillary equipment tested on a stand alone basis**

If ancillary equipment is intended to be tested on a stand alone basis, the performance criteria described in clauses 6.1 and 6.2 are not appropriate, in these cases the manufacturer shall declare, for inclusion in the test report, his own specification for an acceptable level of performance or degradation of performance during and/or after the immunity tests. The performance specification shall be included in the product description and documentation. The related specifications set out in clause 5.3 have also to be taken into account.

The performance criteria specified by the manufacturer shall give the same degree of immunity protection as called for in clauses 6.1 and 6.2.

## **B. EN301489-17**

### **General performance criteria**

- Performance criteria A for immunity tests with phenomena of a continuous nature;
- Performance criteria B for immunity tests with phenomena of a transient nature;
- Performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following.

| Criteria | During test  | After test  |
|----------|--|---|
| A        | Shall operate as intended.<br>(see note 1).<br>Shall be no loss of function.<br>Shall be no unintentional transmissions.                     | Shall operate as intended.<br>Shall be no degradation of performance (see note 3)<br>Shall be no loss of function.<br>Shall be no loss of stored data or user programmable functions.                         |
| B        | May show loss of function (one or more).<br>May show degradation of performance<br>(see note 2).<br>Shall be no unintentional transmissions. | Functions shall be self-recoverable.<br>Shall operate as intended after recovering.<br>Shall be no degradation of performance (see note 3)<br>Shall be no loss of stored data or user programmable functions. |
| C        | May be loss of function (one or more).   | Functions shall be recoverable by the operator.<br>Shall operate as intended after recovering.<br>Shall be no degradation of performance (see note 3).  |

#### **NOTE 1:**

Operate as intended during the test allows a level of degradation not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

**NOTE 2:**

Degradation of performance during the test is understood as a degradation to a level not below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

**NOTE 3:**

No degradation of performance after the test is understood as no degradation below a minimum performance level specified by the manufacturer for the use of the apparatus as intended. In some cases the specified minimum performance level may be replaced by a permissible degradation of performance. After the test no change of actual operating data or user retrievable data is allowed.

If the minimum performance level or the permissible performance degradation is not specified by the manufacturer then either of these may be derived from the product description and documentation (including leaflets and advertising) and what the user may reasonably expect from the apparatus if used as intended.

**Performance criteria for Continuous phenomena applied to Transmitters (CT)**

The performance criteria A shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an ACKnowledgement (ACK) or Not ACKnowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

**Performance criteria for Transient phenomena applied to Transmitters (TT)**

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.

Tests shall be repeated with the EUT in standby mode (if applicable) to ensure that unintentional transmission does not occur. In systems using acknowledgement signals, it is recognized that an acknowledgement (ACK) or not-acknowledgement (NACK) transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

**Performance criteria for Continuous phenomena applied to Receivers (CR)**

The performance criteria A shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test. In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

**Performance criteria for Transient phenomena applied to Receivers (TR)**

The performance criteria B shall apply, except for voltage dips of 100 ms and voltage interruptions of 5 000 ms duration for which performance criteria C shall apply.

Where the EUT is a transceiver, under no circumstances, shall the transmitter operate unintentionally during the test.

In systems using acknowledgement signals, it is recognized that an ACK or NACK transmission may occur, and steps should be taken to ensure that any transmission resulting from the application of the test is correctly interpreted.

### 3.2.2 Electrostatic Discharge

#### TEST SPECIFICATION

|                             |   |
|-----------------------------|---|
| <b>Basic Standard:</b>      | IEC/EN 61000-4-2  |
| <b>Discharge Impedance:</b> | 330 ohm / 150 pF  |
| <b>Required Performance</b> | B   |
| <b>Discharge Voltage:</b>   | Air Discharge:2kV/4kV/8kV (Direct)<br>Contact Discharge:2kV/4kV (Direct/Indirect)             |
| <b>Polarity:</b>            | Positive & Negative   |
| <b>Number of Discharge:</b> | Air Discharge: min. 10 times at each test point<br>Contact Discharge: min. 200 times in total |
| <b>Discharge Period:</b>    | 1 second minimum  |

#### TEST PROCEDURE

The test generator necessary to perform direct and indirect application of discharges to the EUT in the following manner:

- a) Contact discharge was applied to conductive surfaces and coupling planes of the EUT. During the test, it was performed with single discharges. For the single discharge time between successive single discharges was at least 1 second. The EUT shall be exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points. One of the test points shall be subjected to at least 50 indirect discharges to the center of the front edge of the horizontal coupling plane. The remaining three test points shall each receive at least 50 direct contact discharges.

If no direct contact test points are available, then at least 200 indirect discharges shall be applied in the indirect mode. Test shall be performed at a maximum repetition rate of one discharge per second.

Vertical Coupling Plane (VCP):

The coupling plane, of dimensions 0.5m x 0.5m, is placed parallel to, and positioned at a distance 0.1m from, the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

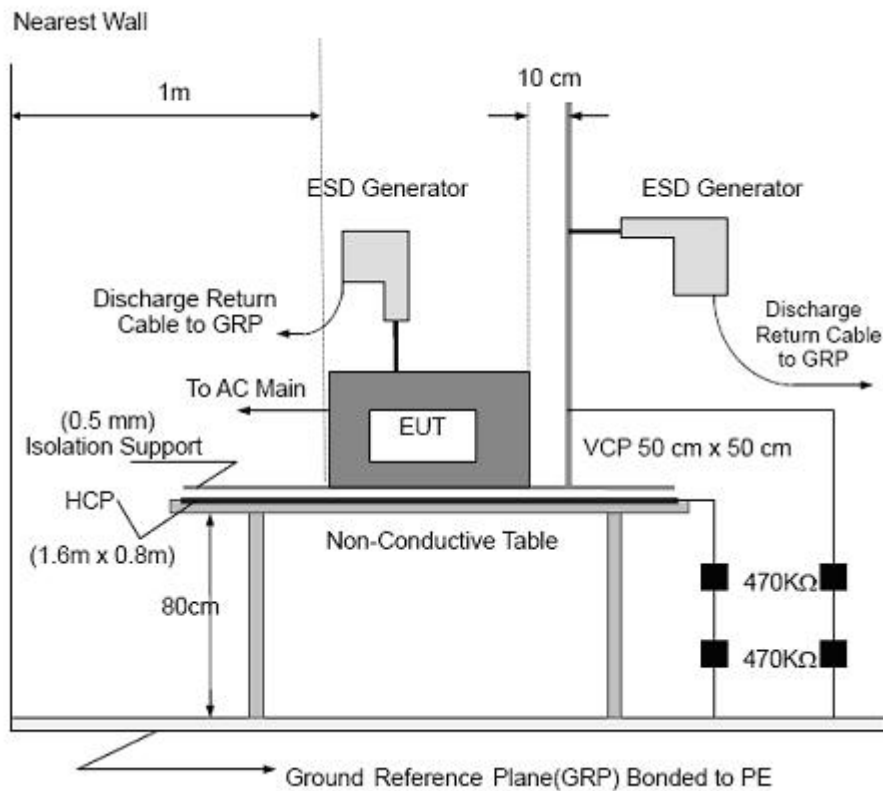
Horizontal Coupling Plane (HCP):

The coupling plane is placed under to the EUT. The generator shall be positioned vertically at a distance of 0.1m from the EUT, with the Discharge Electrode touching the coupling plane. The four faces of the EUT will be performed with electrostatic discharge.

- b) Air discharges at insulation surfaces of the EUT. It was at least ten single discharges with positive and negative at the same selected point.
- c) For the actual test configuration, please refer to the related Item –EUT Test Photos.



## TEST SETUP



Note:

### TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A Horizontal Coupling Plane (1.6m x 0.8m) was placed on the table and attached to the GRP by means of a cable with 940k total impedance. The equipment under test, was installed in a representative system as described in section 7 of IEC /EN 61000-4-2, and its cables were placed on the HCP and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

### FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of IEC/EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

**TEST RESULTS****-----Passed-----***Please refer to the below test data:*

| Direct discharge   |                        |                          |                |        |
|--------------------|------------------------|--------------------------|----------------|--------|
| Type of discharge  | Discharge voltage (KV) | Observations Performance | Criteria Level | Result |
| Contact discharge  | ±2                     | A                        | B              | Pass   |
|                    | ±4                     | B                        | B              |        |
| Air discharge      | ±2                     | A                        | B              |        |
|                    | ±4                     | A                        | B              |        |
|                    | ±8                     | B                        | B              |        |
| Indirect discharge |                        |                          |                |        |
| Type of discharge  | Discharge voltage (KV) | Observations Performance | Criteria Level | Result |
| HCP (6 sides)      | ±2                     | A                        | B              | Pass   |
|                    | ±4                     | A                        | B              |        |
| VCP (4 sides)      | ±2                     | A                        | B              |        |
|                    | ±4                     | A                        | B              |        |

*Note1: The EUT loss communication link a while and it can self-recoverable after test.***Description of Discharge Point**

Remark: CD point- Green AD point - Red



### 3.2.3 RF Electromagnetic Field

#### TEST SPECIFICATION

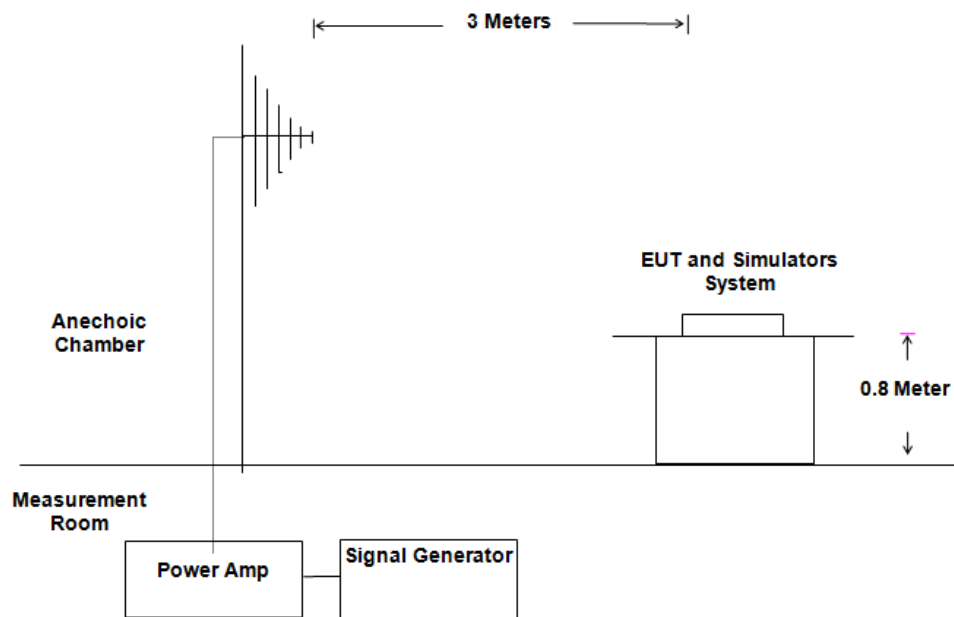
|                             |                                    |
|-----------------------------|------------------------------------|
| <b>Basic Standard:</b>      | IEC/EN 61000-4-3                   |
| <b>Required Performance</b> | A                                  |
| <b>Frequency Range:</b>     | 80 MHz - 6000 MHz                  |
| <b>Field Strength:</b>      | 3 V/m                              |
| <b>Modulation:</b>          | 1kHz Sine Wave, 80%, AM Modulation |
| <b>Frequency Step:</b>      | 1 % of fundamental                 |
| <b>Polarity of Antenna:</b> | Horizontal and Vertical            |
| <b>Test Distance:</b>       | 3 m                                |
| <b>Antenna Height:</b>      | 1.5 m                              |
| <b>Dwell Time:</b>          | at least 3 seconds                 |

#### TEST PROCEDURE

The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber. The testing distance from antenna to the EUT was 3 meters. The other condition as following manner:

- The field strength level was 3V/m.
- The frequency range is swept from 80 MHz to 6000 MHz with the signal 80% amplitude modulated with a 1 kHz sine wave. The rate of sweep did not exceed  $1.5 \times 10^{-3}$  decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- Sweep Frequency 900 MHz, with the Duty Cycle:1/8 and Modulation: Pulse 217 Hz(if applicable)
- The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.
- For the actual test configuration, please refer to the related Item –EUT Test Photos.

## TEST SETUP



Note:

### TABLE-TOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

### FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

## TEST RESULTS

-----Passed-----

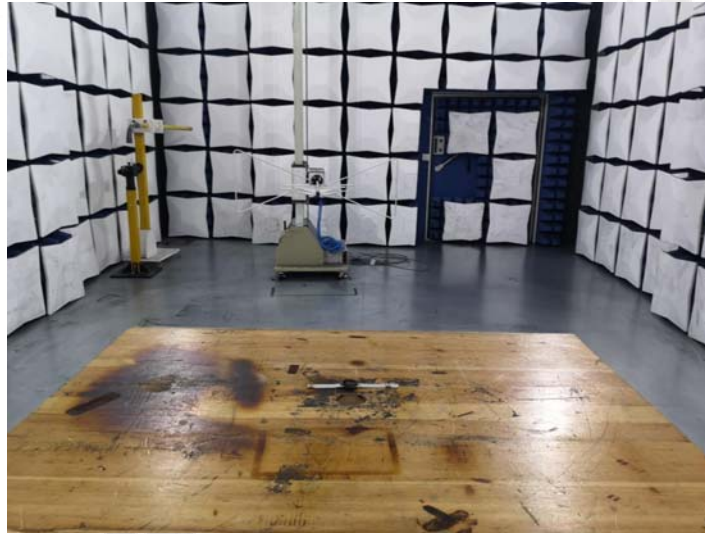
Please refer to the below test data:

| Frequency Range (MHz) | RF Field Position | R.F. Field Strength                        | Azimuth | Observations Performance | Perform. Criteria | Result |
|-----------------------|-------------------|--|---------|--------------------------|-------------------|--------|
| 80~6000               | H / V             | 3 V/m (rms)<br>AM Modulated<br>1000Hz, 80% | Top     | A                        | A                 | PASS   |
|                       |                   |  | Front   |                          |                   |        |
|                       |                   |  | Rear    |                          |                   |        |
|                       |                   |  | Left    |                          |                   |        |
|                       |                   |  | Right   |                          |                   |        |
|                       |                   |  | Bottom  |                          |                   |        |

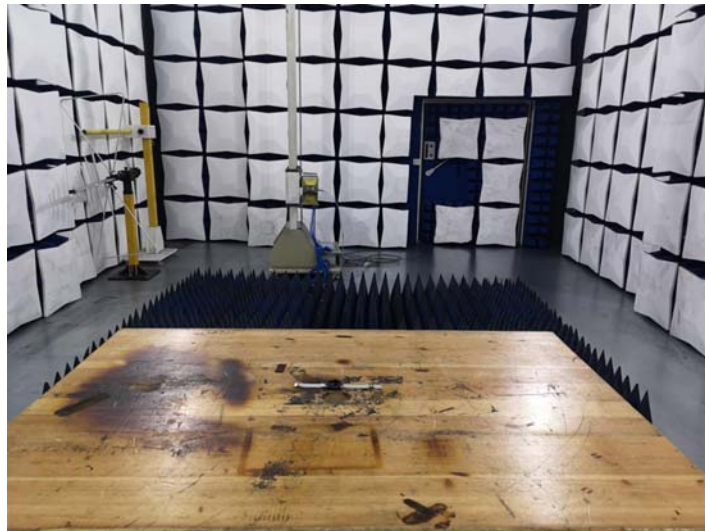
Note1: The EUT can maintain communication link and not operate unintentionally during the test also can operate without any loss of user control functions after test.

## 4 TEST SETUP PHOTOS

Radiated Emission 30MHz-1GHz



Radiated Emission 1GHz-6GHz



Conducted disturbance





Electrostatic discharge



RF Electromagnetic Field

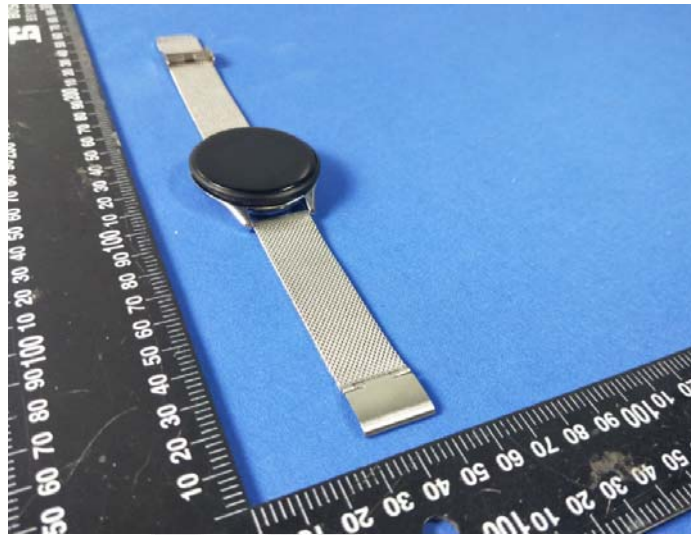




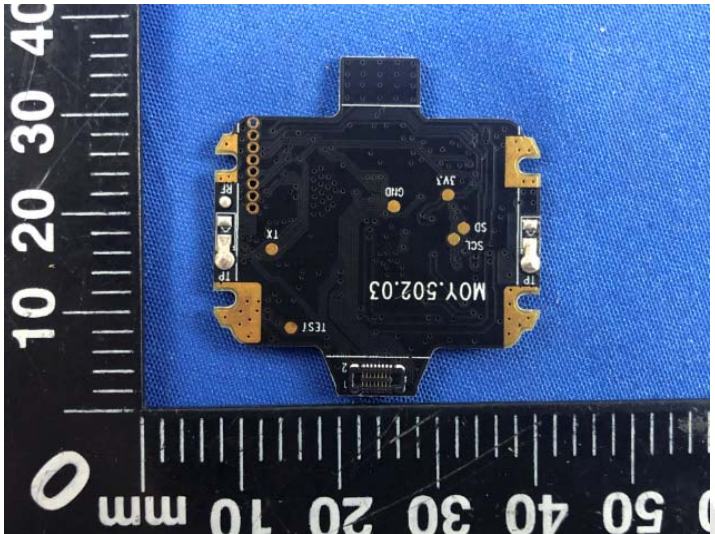
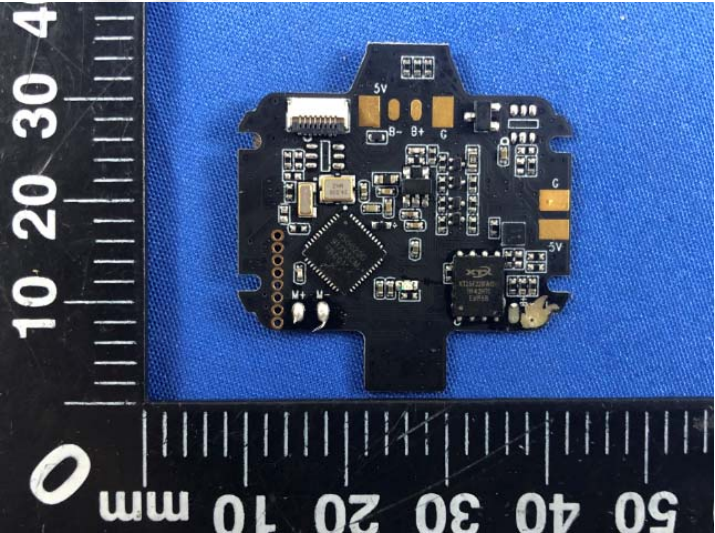
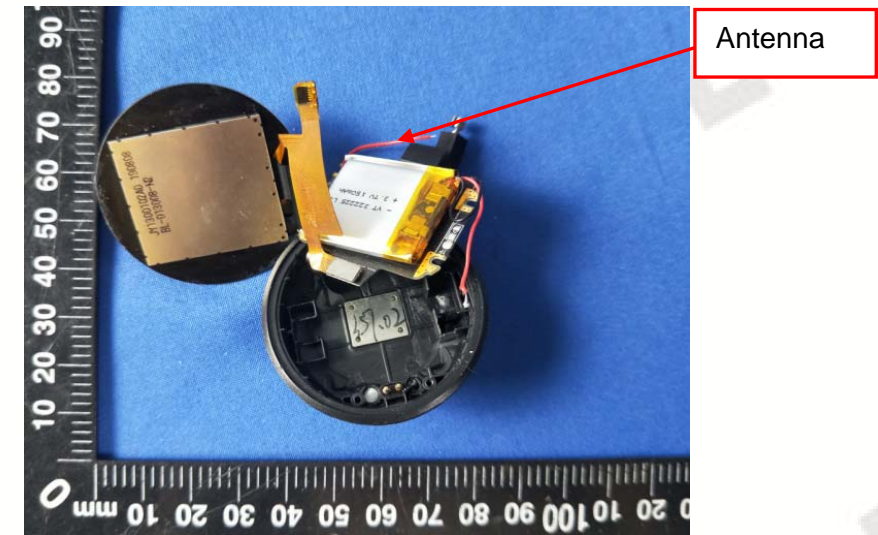
## 5 PHOTOS OF THE EUT

### External Photos of EUT

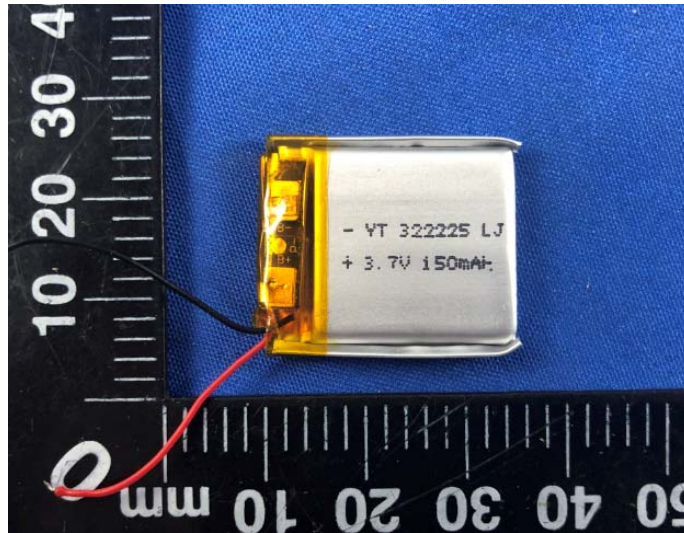




Internal Photos of EUT







\*\*\*\*\* End of Report \*\*\*\*\*