



CE EMC TEST REPORT

Product : Digital Broadcasting Device (iBeacon/Eddystone)

Trademark :  **cubeacon**

Model Name : CB10026CR

Report No. : BCTC-LH170903647-2E

Prepared for

PT. Eyro Digital Teknologi

Jl. Amir Mahmud IX/23 Gunung Anyar. Surabaya 60294. Indonesia.

Prepared by

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TEST RESULT CERTIFICATION

Applicant's name..... : PT. Eyro Digital Teknologi
Address..... : Jl. Amir Mahmud IX/23 Gunung Anyar. Surabaya 60294. Indonesia.
Manufacture's Name..... : PT. Eyro Digital Teknologi
Address..... : 6th Floor, H Building, Gangzhihong Science Park, Qinglong Road, Longhua District, Shenzhen, China

Product description

Product name..... : Digital Broadcasting Device (iBeacon/Eddystone)

Trademark :  **cubeacon**

Model and/or type reference : CB10026CR

Standards..... : Draft EN 301 489-1 V2.2.0 (2017-03)
Draft EN 301 489-17 V3.2.0 (2017-03)

This device described above has been tested by BCTC, and the test results show that the equipment under test (EUT) is in compliance with the 2014/53/EU RED Directive Art.3.1(b) requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test..... :

Date (s) of performance of tests..... : Sep. 06 - Sep. 13, 2017

Date of Issue..... : Sep. 13, 2017

Test Result : **Pass**

Prepared by(Engineer): Snow Zeng



Reviewer(Supervisor): Jade Yang



Approved(Manager): Carson Zhang





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 BCTC Testing Co., Ltd.

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1. TEST SUMMARY

Test Procedures According To The Technical Standards:

Draft EN 301 489-1 V2.2.0 (2017-03)

Draft EN 301 489-17 V3.2.0 (2017-03)

| EMC Emission | | | | |
|---------------------------------------|-----------------------------------|--------------------------|----------|--------|
| Standard | Test Item | Limit | Judgment | Remark |
| EN 55032:2015 | Conducted Emission | Class B | PASS | |
| | Radiated Emission | Class B | PASS | |
| EN 61000-3-2:2014 | Harmonic Current Emission | Class A or D NOTE (2) | N/A | |
| EN 61000-3-3:2013 | Voltage Fluctuations & Flicker | ----- | N/A | |
| EMC Immunity | | | | |
| Section EN 55024:2010+A1:2015 | Test Item | Performance Criteria | Judgment | Remark |
| EN 61000-4-2:2009 | Electrostatic Discharge | B | PASS | |
| EN 61000-4-3:2006 +A1:2008+A2:2010 | RF electromagnetic field | A | PASS | |
| EN 61000-4-4:2012 | Fast transients | B | N/A | |
| EN 61000-4-5:2014 | Surges | B | N/A | |
| EN 61000-4-6:2014 | Injected Current | A | N/A | |
| EN 61000-4-11:2004 | Volt. Interruptions Volt. Dips | B / C / C NOTE (3) | N/A | |

NOTE:

- (1) "N/A" denotes test is not applicable in this Test Report
- (2) The power consumption of EUT is less than 75W and no Limits apply.
- (3) Voltage dip: 100% reduction – Performance Criteria **B**
 Voltage dip: 30% reduction – Performance Criteria **C**
 Voltage Interruption: 100% Interruption – Performance Criteria **C**
- (4) For client's request and manual description, the test will not be executed.



1.1 TEST FACILITY

Shenzhen BCTC Testing Co., Ltd.

BCTC Building & 1-2F, East of B Building, Pengzhou Industrial, Fuyuan 1st Road, Qiaotou Community, Fuyong Street, Bao'an District, Shenzhen, China

1.2 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 %**.

A. Conducted Measurement :

| Method | Measurement Frequency Range | U , (dB) | NOTE |
|--------|-----------------------------|----------|------|
| ANSI | 150 KHz ~ 30M z | 3.2 | |


B. Radiated Measurement :

| Method | Measurement Frequency Range | U , (dB) | NOTE |
|--------|-----------------------------|----------|------|
| ANSI | 30MHz ~ 1000MHz | 4.7 | |
| | 1GHz ~6000GHz | 5.0 | |



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

| | | |
|------------------------|---|---|
| EUT Name | : | Digital Broadcasting Device (iBeacon/Eddystone) |
| Model No. | : | CB10026CR |
| Serial Model | : | CB10026CR |
| Model Difference | : | All the same, Only model name is different |
| Trademark | : |  |
| Power | : | DC3V |
| Operation frequency | : | 2402MHz-2480MHz |
| Modulation | : | GFSK, $\pi/4$ -DQPSK, 8-DPSK |
| Antenna Type | : | PCB Antenna, Maximum Gain is 2dBi |
| Intend use environment | : | Residential, commercial and light industrial environment |

Note:

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



2.1 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.


| For all Test Mode | Description |
|-------------------|-------------|
| Mode 1 | BT Mode |

2.2 DESCRIPTION OF TEST SETUP

EUT

2.3 DESCRIPTION TEST PERIPHERAL AND EUT PERIPHERAL

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 | Mfr/Brand | Model/Type No. | Series No. | Note |
|------|--|--|----------------|------------|---|
| E-1 | Digital Broadcasting Device (iBeacon/Eddystone) |  cubeacon | CB10026CR | N/A | EUT |
| E-2 | Adapter (provide by BCTC) | N/A | BT-TC-012 | N/A | I/P: AC 100-240V, 50/60Hz, 0.8A O/P: DC 5V 1.0A |
| C1 | USB Cable (provide by BCTC) | N/A | SW1202HU | N/A | 0.8m |

Note:

- (1) The support equipment was authorized by Declaration of Confirmation.
- (2) For detachable type I/O cable should be specified the length in cm in 『Length』 column.



2.4 MEASUREMENT INSTRUMENTS LIST

2.4.1 CONDUCTED EMISSION

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Last cal. | Next Cal. |
|------|-------------------|--------------|----------|------------|---------------|---------------|
| 1 | LISN | R&S | ENV216 | 101313 | Aug. 15, 2017 | Aug. 14, 2018 |
| 2 | LISN | EMCO | 3816/2 | 00042990 | Aug. 15, 2017 | Aug. 14, 2018 |
| 3 | 50Ω Switch | ANRITSU CORP | MP59B | 6200983704 | Aug. 15, 2017 | Aug. 14, 2018 |
| 4 | Test Cable | N/A | C01 | N/A | Aug. 15, 2017 | Aug. 14, 2018 |
| 5 | EMI Test Receiver | R&S | ESCI | 101160 | Aug. 15, 2017 | Aug. 14, 2018 |

2.4.2 RADIATED TEST SITE

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Last cal. | Next Cal. |
|------|-------------------|--------------|-----------------|------------|---------------|---------------|
| 1 | Bilog Antenna | TESEQ | CBL6111D | 31216 | Aug. 15, 2017 | Aug. 14, 2018 |
| 2 | Test Cable | N/A | R-01 | N/A | Aug. 15, 2017 | Aug. 14, 2018 |
| 3 | Test Cable | N/A | R-02 | N/A | Aug. 15, 2017 | Aug. 14, 2018 |
| 4 | EMI Test Receiver | R&S | ESCI-7 | 101318 | Aug. 15, 2017 | Aug. 14, 2018 |
| 5 | Antenna Mast | EM | SC100_1 | N/A | N/A | N/A |
| 6 | Turn Table | EM | SC100 | 060531 | N/A | N/A |
| 7 | 50Ω Switch | Anritsu Corp | MP59B | 6200983705 | Aug. 15, 2017 | Aug. 14, 2018 |
| 8 | Spectrum Analyzer | Aglient | E4407B | MY45108040 | Aug. 15, 2017 | Aug. 14, 2018 |
| 9 | Horn Antenna | EM | EM-AH-1018 0 | 2011071402 | Aug. 15, 2017 | Aug. 14, 2018 |
| 10 | Amplifier | EM | EM-30180 | 060538 | Aug. 15, 2017 | Aug. 14, 2018 |

2.4.3 ESD

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Last cal. | Next Cal. |
|------|--------------------|--------------|----------------------|------------|---------------|---------------|
| 1 | ESD TEST GENERATOR | EVERFINE | EMS61000-2 A-V200 | 11040001T | Aug. 15, 2017 | Aug. 14, 2018 |

2.4.4 RS

| Item | Kind of Equipment | Manufacturer | Type No. | Last cal. | Last cal. | Next Cal. |
|------|------------------------|--------------|------------|------------|---------------|---------------|
| 1 | Signal Generator | R&S | SMT 06 | 832080/007 | Aug. 15, 2017 | Aug. 14, 2018 |
| 2 | Log-Bicon Antenna | Schwarzbeck | VULB9161 | 4022 | Aug. 15, 2017 | Aug. 14, 2018 |
| 3 | Power Amplifier | AR | 150W1000M1 | 320946 | Aug. 15, 2017 | Aug. 14, 2018 |
| 4 | Microwave Horn Antenna | AR | AT4002A | 321467 | Aug. 15, 2017 | Aug. 14, 2018 |
| 5 | Power Amplifier | AR | 25S1G4A | 308598 | Aug. 15, 2017 | Aug. 14, 2018 |



3. EMC EMISSION TEST

3.1 CONDUCTED EMISSION MEASUREMENT

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

| 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.

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 |



3.2 RADIATED EMISSION MEASUREMENT

3.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT (Below 1000MHz)

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

3.2.2 LIMITS OF RADIATED EMISSION MEASUREMENT (Above 1000MHz)

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

Notes:

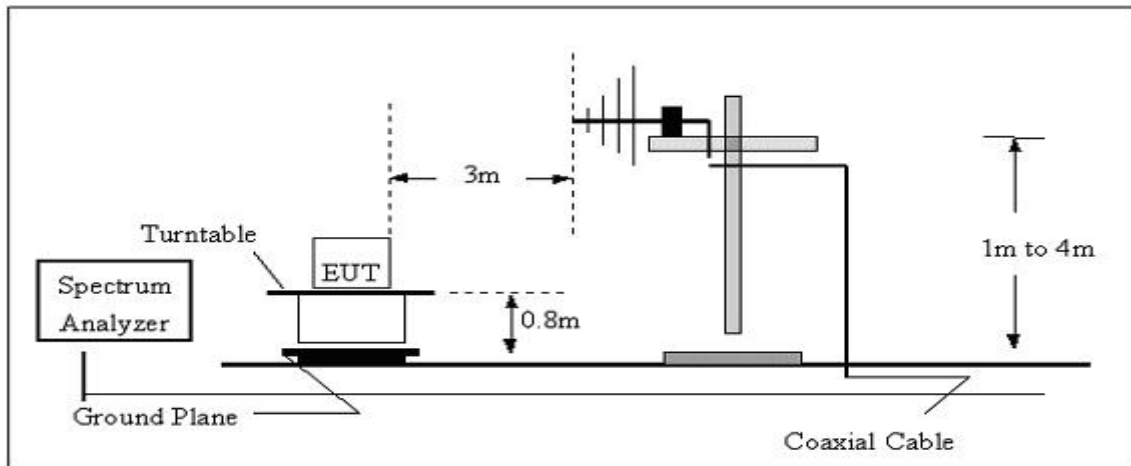
- (1) The limit for radiated test was performed according to as following:
CISPR 22/ FCC PART 15B /ICES-003.
- (2) The tighter limit applies at the band edges.
- (3) Emission level (dBuV/m)=20log Emission level (uV/m).

3.2.3 TEST PROCEDURE

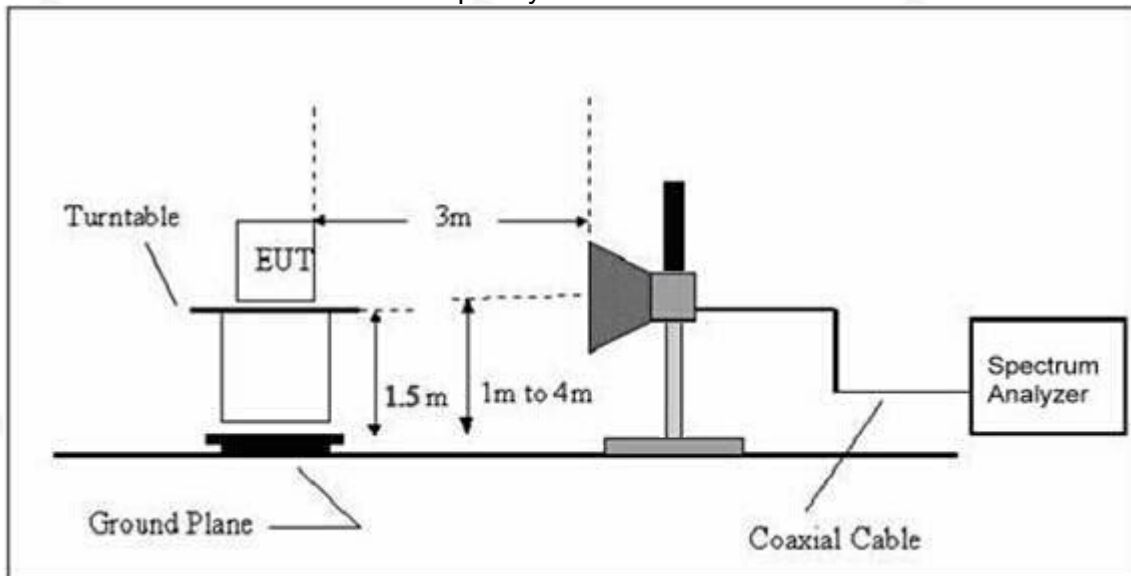
- a. The measuring distance of at 10 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
- b. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- c. The height of the equipment or of the substitution antenna shall be 0.8 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.
- 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.

3.2.4 TEST SETUP

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-Up Frequency Over 1GHz



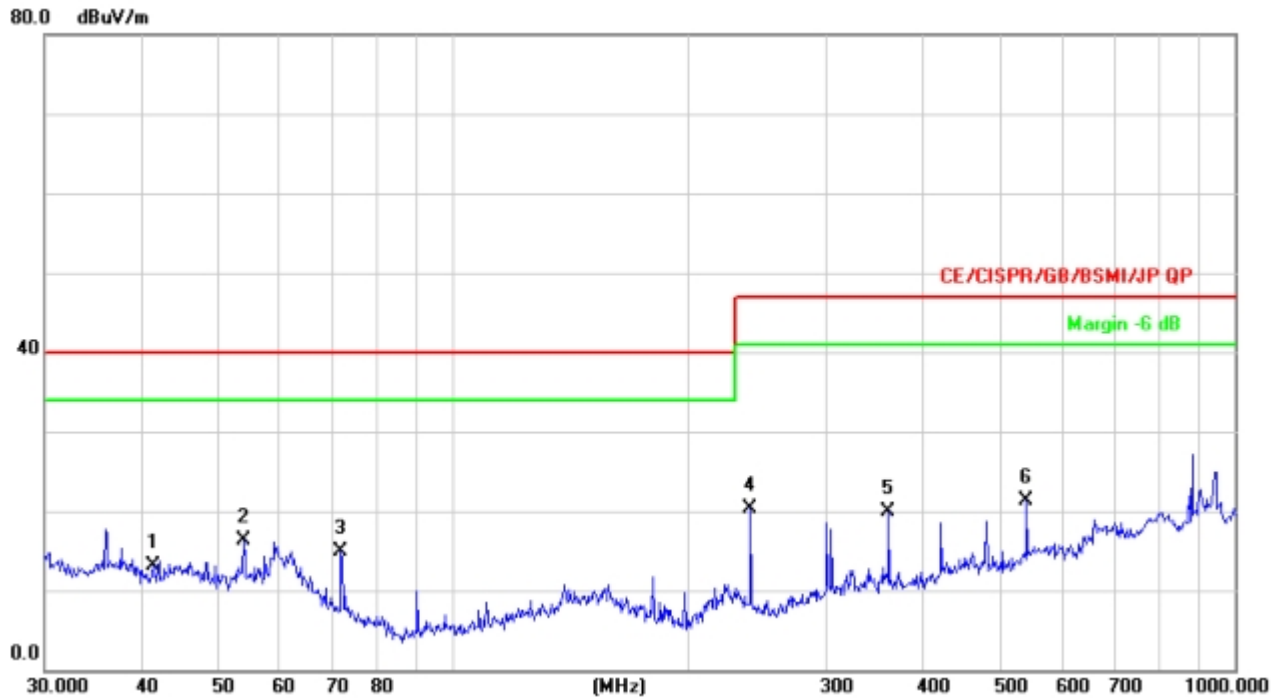
3.2.5 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.2 Unless otherwise a special operating condition is specified in the follows during the testing.



3.2.6 TEST RESULTS (30-1000MHz)

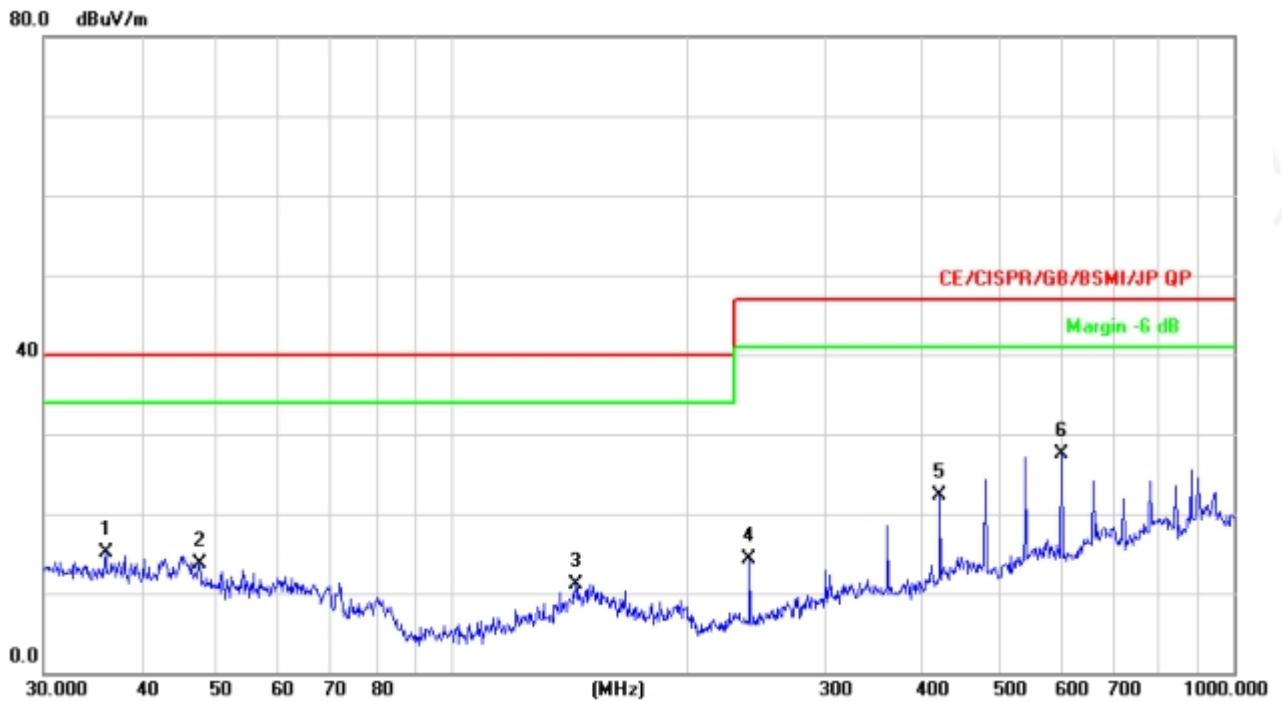
| | | | |
|----------------|----------|---------------------|------------|
| Temperature : | 24 °C | Relative Humidity : | 54% |
| Pressure : | 1010 hPa | Polarization : | Horizontal |
| Test Voltage : | DC3V | Test Mode : | Mode 1 |



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Over | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | | 41.2765 | 22.02 | -9.01 | 13.01 | 40.00 | -26.99 | QP | | |
| 2 | * | 53.8818 | 27.19 | -10.93 | 16.26 | 40.00 | -23.74 | QP | | |
| 3 | | 71.8320 | 30.01 | -15.19 | 14.82 | 40.00 | -25.18 | QP | | |
| 4 | | 239.9874 | 34.88 | -14.49 | 20.39 | 47.00 | -26.61 | QP | | |
| 5 | | 360.4476 | 31.17 | -11.20 | 19.97 | 47.00 | -27.03 | QP | | |
| 6 | | 541.3725 | 28.57 | -7.35 | 21.22 | 47.00 | -25.78 | QP | | |



| | | | |
|----------------|----------|---------------------|----------|
| Temperature : | 24 °C | Relative Humidity : | 54% |
| Pressure : | 1010 hPa | Polarization : | Vertical |
| Test Voltage : | DC3V | Test Mode : | Mode 1 |

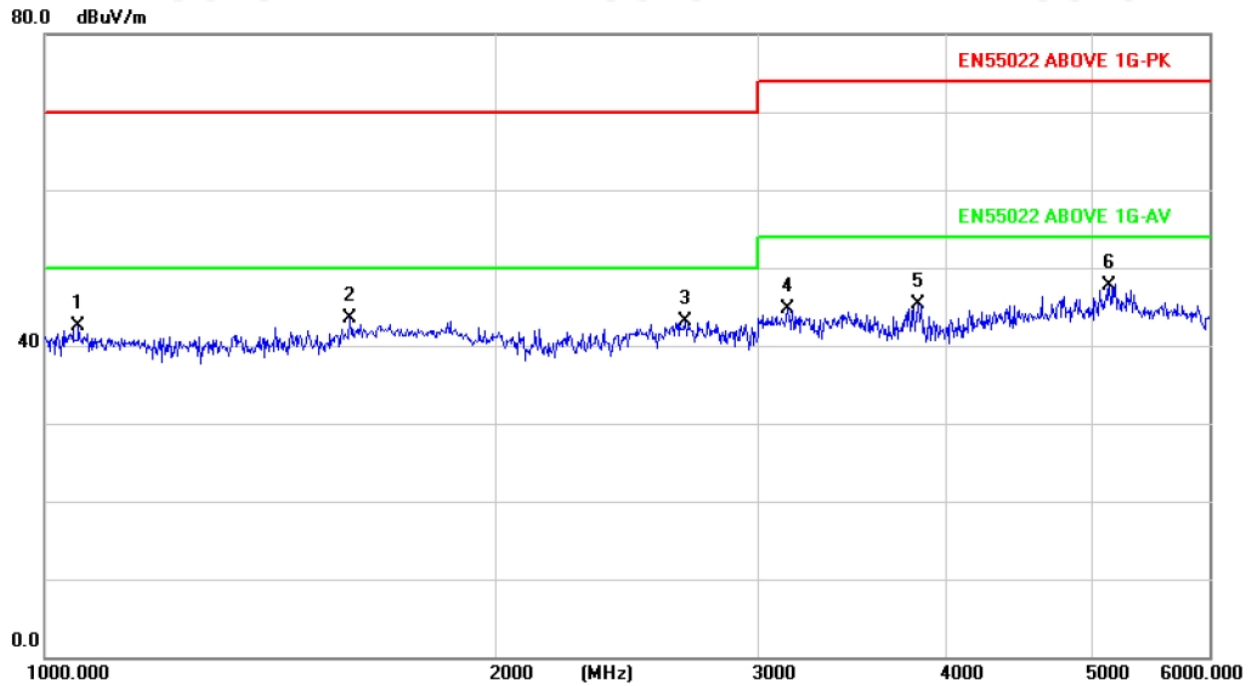


| No. | Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB/m | Measure- ment dBuV/m | Limit dBuV/m | Over dB | Detector | Antenna Height cm | Table Degree degree | Comment |
|-----|-----|--------------|--------------------------|---------------------------|----------------------------|-----------------|------------|----------|-------------------------|---------------------------|---------|
| 1 | | 36.0007 | 23.65 | -8.59 | 15.06 | 40.00 | -24.94 | QP | | | |
| 2 | | 47.4918 | 23.54 | -9.88 | 13.66 | 40.00 | -26.34 | QP | | | |
| 3 | | 143.8295 | 24.27 | -13.18 | 11.09 | 40.00 | -28.91 | QP | | | |
| 4 | | 239.9874 | 28.79 | -14.49 | 14.30 | 47.00 | -32.70 | QP | | | |
| 5 | | 420.5803 | 32.02 | -9.73 | 22.29 | 47.00 | -24.71 | QP | | | |
| 6 | * | 601.4265 | 33.22 | -5.66 | 27.56 | 47.00 | -19.44 | QP | | | |



TEST RESULTS(1000-6000MHz)

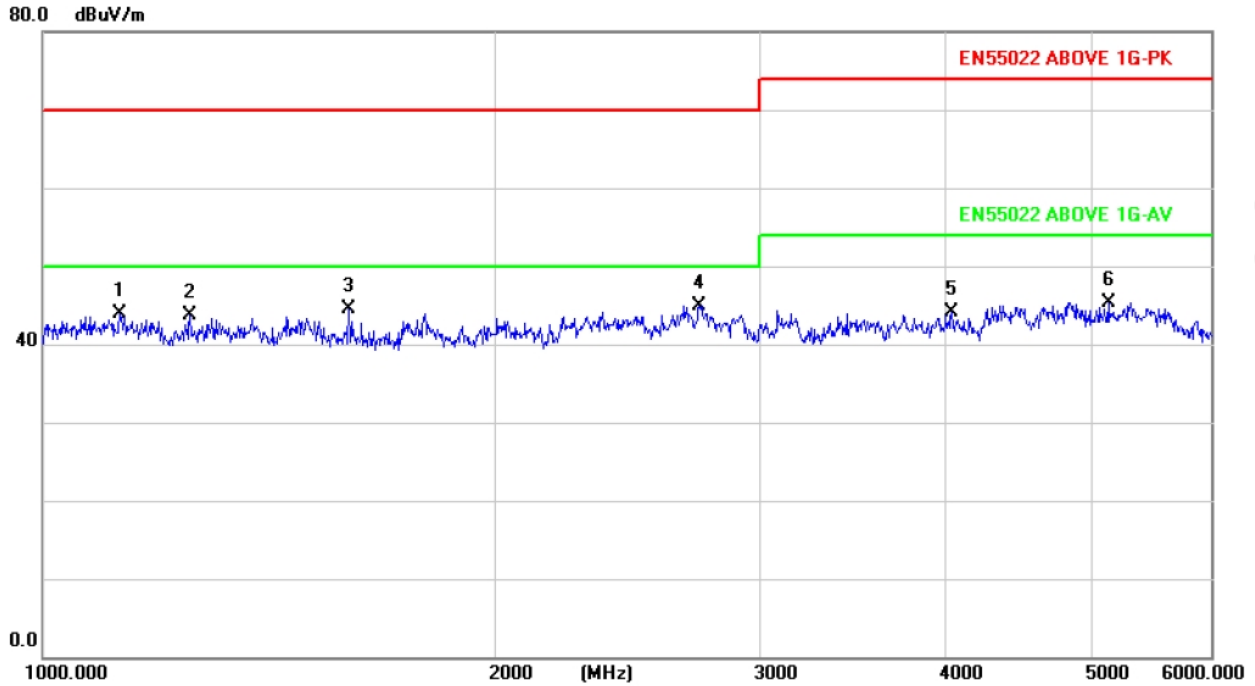
| | | | |
|----------------|----------|---------------------|----------|
| Temperature : | 24 °C | Relative Humidity : | 54% |
| Pressure : | 1010 hPa | Polarization : | Vertical |
| Test Voltage : | DC3V | Test Mode : | Mode 1 |



| No. Mk. | Freq. MHz | Reading Level dBuV | Correct Factor dB/m | Measurement dBuV/m | Limit dBuV/m | Over dB | Detector | Antenna Height cm | Table Degree degree | Comment |
|---------|-----------|--------------------|---------------------|--------------------|--------------|---------|----------|-------------------|---------------------|---------|
| 1 | 1053.335 | 45.44 | -3.00 | 42.44 | 70.00 | -27.56 | peak | | | |
| 2 | 1599.100 | 46.41 | -3.00 | 43.41 | 70.00 | -26.59 | peak | | | |
| 3 | 2679.065 | 45.51 | -2.32 | 43.19 | 70.00 | -26.81 | peak | | | |
| 4 | 3136.610 | 46.50 | -1.72 | 44.78 | 74.00 | -29.22 | peak | | | |
| 5 | 3833.659 | 45.58 | -0.33 | 45.25 | 74.00 | -28.75 | peak | | | |
| 6 * | 5143.163 | 45.57 | 2.14 | 47.71 | 74.00 | -26.29 | peak | | | |



| | | | |
|----------------|----------|---------------------|------------|
| Temperature : | 24 °C | Relative Humidity : | 54% |
| Pressure : | 1010 hPa | Polarization : | Horizontal |
| Test Voltage : | DC3V | Test Mode : | Mode 1 |



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measurement | Limit | Over | Antenna Height | Table Degree | |
|-----|-----|----------|---------------|----------------|-------------|--------|--------|----------------|--------------|---------|
| | | MHz | dBuV | dB/m | dBuV/m | dBuV/m | dB | cm | degree | Comment |
| 1 | | 1125.532 | 71.53 | -27.70 | 43.83 | 70.00 | -26.17 | | | peak |
| 2 | | 1253.277 | 71.29 | -27.62 | 43.67 | 70.00 | -26.33 | | | peak |
| 3 | | 1599.100 | 71.94 | -27.34 | 44.60 | 70.00 | -25.40 | | | peak |
| 4 | * | 2737.291 | 71.23 | -26.24 | 44.99 | 70.00 | -25.01 | | | peak |
| 5 | | 4030.897 | 70.10 | -25.92 | 44.18 | 74.00 | -29.82 | | | peak |
| 6 | | 5124.765 | 71.65 | -26.28 | 45.37 | 74.00 | -28.63 | | | peak |



3.3 HARMONICS CURRENT

3.3.1 LIMITS OF HARMONICS CURRENT

| IEC 555-2 | | | | | |
|------------------------------------|------------------|--|--------------------|------------------|--|
| Table - I | | | Table - II | | |
| Equipment Category | Harmonic Order n | Max. Permissible Harmonic Current (in Amperes) | Equipment Category | Harmonic Order n | Max. Permissible Harmonic Current (in Amperes) |
| Non Portable Tools or TV Receivers | Odd Harmonics | | TV Receivers | Odd Harmonics | |
| | 3 | 2.30 | | 3 | 0.80 |
| | 5 | 1.14 | | 5 | 0.60 |
| | 7 | 0.77 | | 7 | 0.45 |
| | 9 | 0.40 | | 9 | 0.30 |
| | 11 | 0.33 | | 11 | 0.17 |
| | 13 | 0.21 | | 13 | 0.12 |
| | 15 ≤ n ≤ 39 | 0.15 · 15/n | | 15 ≤ n ≤ 39 | 0.10 · 15/n |
| | Even Harmonics | | | Even Harmonics | |
| | 2 | 1.08 | | 2 | 0.30 |
| 4 | 0.43 | 4 | 0.15 | | |
| 8 | 0.30 | | | | |
| 8 ≤ n ≤ 40 | 0.23 · 8/n | DC | 0.05 | | |

| EN 61000-3-2/IEC 61000-3-2 | | | | | |
|-----------------------------|---|--------------------|------------------|---|--------|
| Equipment Category | Max. Permissible Harmonic Current (in Amperes) | Equipment Category | Harmonic Order n | Max. Permissible Harmonic Current (in A) (mA/w) | |
| Class A | Same as Limits Specified in 4-2.1, Table - I, but only odd harmonics required | Class D | 3 | 2.30 | 3.4 |
| | | | 5 | 1.14 | 1.9 |
| | | | 7 | 0.77 | 1.0 |
| | | | 9 | 0.40 | 0.5 |
| | | | 11 | 0.33 | 0.35 |
| | | | 13 ≤ n ≤ 39 | see Table I | 3.85/n |
| only odd harmonics required | | | | | |

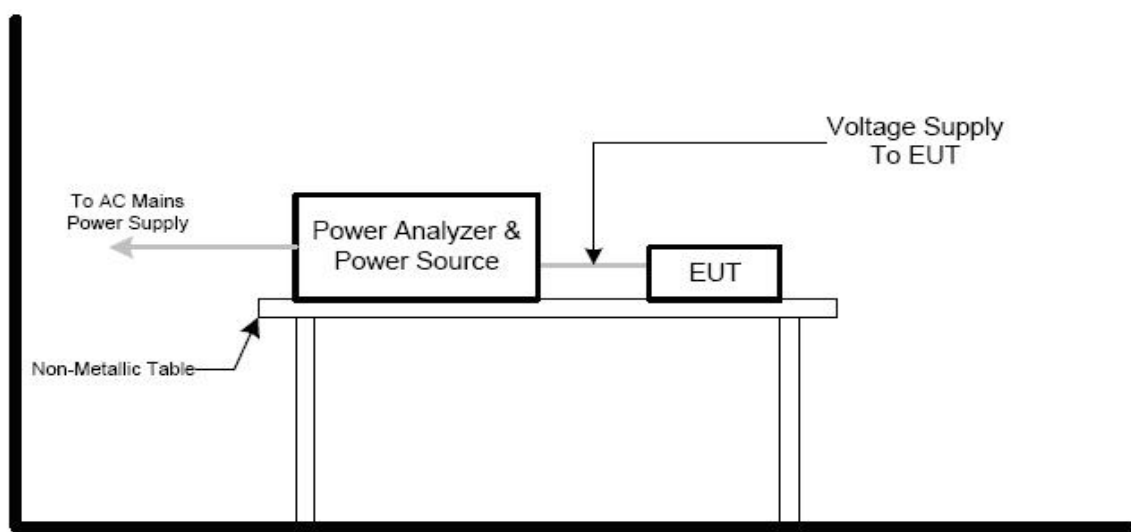
3.3.1.1 TEST PROCEDURE

- a. The EUT was placed on the top of a wooden table 0.8 meters above the ground and operated to produce the maximum harmonic components under normal operating conditions.
- b. The classification of EUT is according to section 5 of EN 61000-3-2:2014. The EUT is classified as follows:
Class A: Balanced three-phase equipment, Household appliances excluding equipment as Class D, Tools excluding portable tools, Dimmers for incandescent lamps, audio equipment, equipment not specified in one of the three other classes.
Class B: Portable tools. Portable tools.; Arc welding equipment which is not professional equipment.
Class C: Lighting equipment.
Class D: Equipment having a specified power less than or equal to 600 W of the following types: Personal computers and personal computer monitors and television receivers.
- c. The correspondent test program of test instrument to measure the current harmonics emanated from EUT is chosen. The measure time shall be not less than the time necessary for the EUT to be exercised.
- d. For the actual test configuration, please refer to the related item –EUT Test Photos.

3.3.1.2 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of **2.2** Unless otherwise a special operating condition is specified in the follows during the testing.

3.3.1.3 TEST SETUP





3.3.2 TEST RESULTS

| | | | |
|---------------|----------|---------------------|-----|
| Temperature : | 25 °C | Relative Humidity : | 45% |
| Pressure : | 1010 hPa | Test Power : | N/A |
| Test Mode | Mode 1 | | |

Note:

EUT power supply is provided by the battery, is not applicable in this test report.

3.4 VOLTAGE FLUCTUATION AND FLICKERS

3.4.1 LIMITS OF VOLTAGE FLUCTUATION AND FLICKERS

| Tests | Limits | | Descriptions |
|-------|--------------------|---------------------|----------------------------------|
| | IEC555-3 | IEC/EN 61000-3-3 | |
| Pst | ≤ 1.0, Tp= 10 min. | ≤ 1.0, Tp= 10 min. | Short Term Flicker Indicator |
| Plt | N/A | ≤ 0.65, Tp=2 hr. | Long Term Flicker Indicator |
| dc | ≤ 3% | ≤ 3.3% | Relative Steady-State V-Chang |
| dmax | ≤ 4% | ≤ 4% | Maximum Relative V-change |
| d (t) | N/A | ≤ 3.3% for > 500 ms | Relative V-change characteristic |

3.4.1.1 TEST PROCEDURE

a. Harmonic Current Test:

Test was performed according to the procedures specified in Clause 5.0 of IEC555-2 and/or Sub-clause 6.2 of IEC/EN 61000-3-2 depend on which standard adopted for compliance measurement.

b. Fluctuation and Flickers Test:

Tests was performed according to the Test Conditions/Assessment of Voltage Fluctuations specified in Clause 5.0/6.0 of IEC555-3 and/or Clause 6.0/4.0 of IEC/EN 61000-3-3 depend on which standard adopted for compliance measurement.

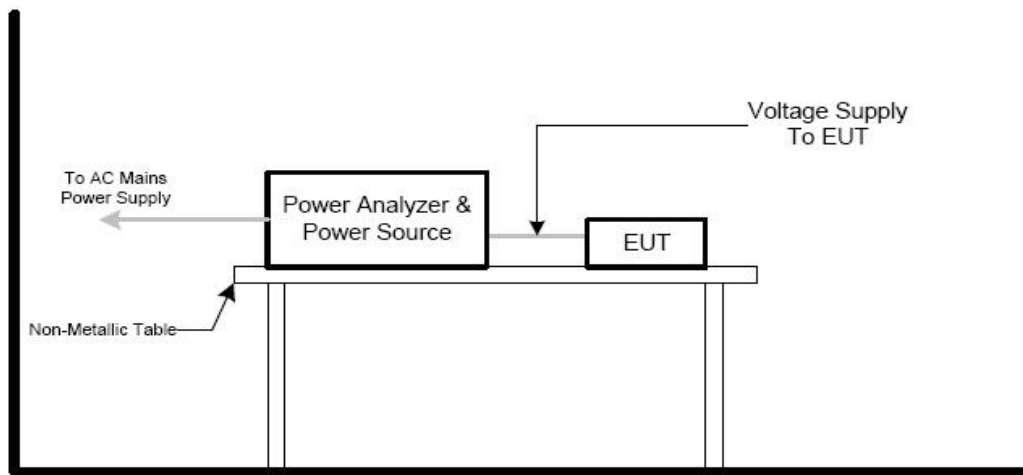
c. All types of harmonic current and/or voltage fluctuation in this report are assessed by direct measurement using flicker-meter.

d. For the actual test configuration, please refer to the related Item –EUT Test Photos.

3.4.1.2 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.2 Unless otherwise a special operating condition is specified in the follows during the testing.

3.4.1.3 TEST SETUP





3.4.2 TEST RESULTS

| | | | |
|---------------|----------|---------------------|-----|
| Temperature : | 25 °C | Relative Humidity : | 45% |
| Pressure : | 1010 hPa | Test Power : | N/A |
| Test Mode | Mode 1 | | |

Note:

EUT power supply is provided by the battery, is not applicable in this test report.



4. EMC IMMUNITY TEST

4.1 GENERAL PERFORMANCE CRITERIA

4.1.1 PERFORMANCE CRITERIA

According To **EN 301489 -17** standard, The General Performance Criteria As Following:

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

NOTE 1: 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 2: no degradation of performance after the test is understood as any 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 FOR 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 FOR 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.

PERFORMANCE FOR 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 FOR 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.

4.2 GENERAL PERFORMANCE CRITERIA TEST SETUP

The EUT tested system was configured as the statements of **2.2** Unless otherwise a special operating condition is specified in the follows during the testing.



4.3 ESD TESTING

4.3.1 TEST SPECIFICATION

| | |
|----------------------|---|
| Basic Standard: | IEC/EN 61000-4-2 |
| Discharge Impedance: | 330 ohm / 150 pF |
| Required Performance | B |
| Discharge Voltage: | Air Discharge : 2kV/4kV/8kV (Direct) Contact Discharge : 2kV/4kV (Direct/Indirect) |
| Polarity: | Positive & Negative |
| Number of Discharge: | Air Discharge: min. 20 times at each test point Contact Discharge: min. 200 times in total |
| Discharge Mode: | AC Discharge |
| Discharge Period: | 1 second minimum |

4.3.2 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.

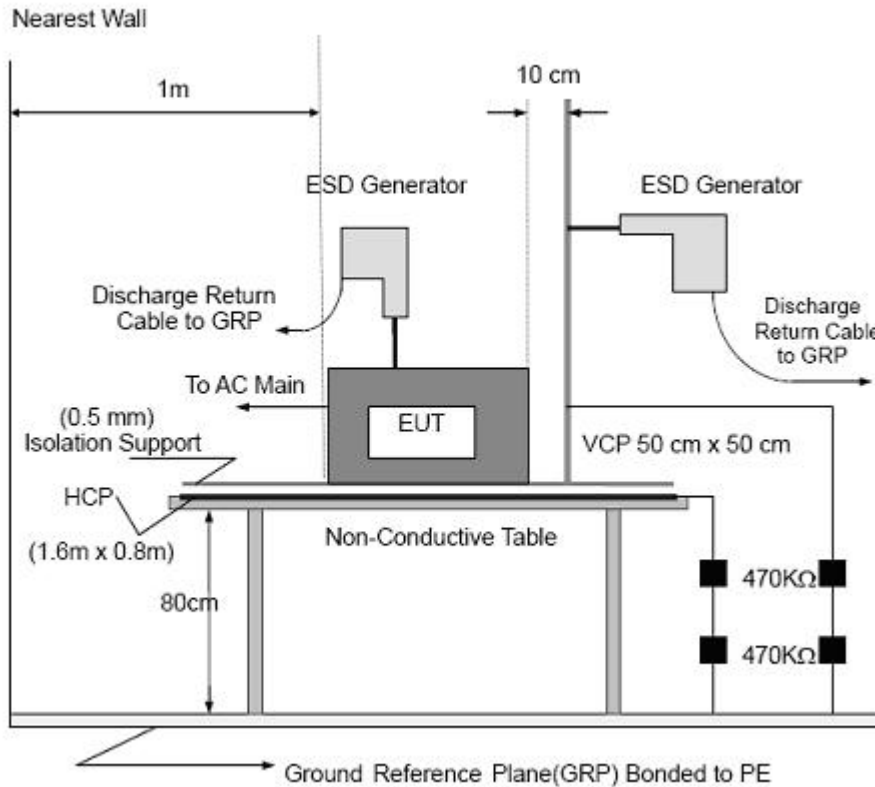
Horizontal Coupling Plane (HCP):

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.

4.3.3 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.



4.3.4 TEST RESULTS

| | | | |
|---------------|----------|---------------------|-------------------|
| Temperature : | 25 °C | Relative Humidity : | 45% |
| Pressure : | 1010 hPa | Test Power : | DC3V from battery |
| Test Mode | Mode 1 | | |

| Mode | Air Discharge | | | | | | | | Contact Discharge | | | | | | | | Observation | Criterion | Result |
|-----------------|---------------|---|---|---|----|---|----|---|-------------------|---|---|---|---|---|---|---|-------------|-----------|--------|
| | 4 | | 8 | | 10 | | 15 | | 2 | | 4 | | 6 | | 8 | | | | |
| Test level (kV) | | | | | | | | | | | | | | | | | | | |
| Test Location | + | - | + | - | + | - | + | - | + | - | + | - | + | - | + | - | | | |
| HCP | | | | | | | | | A | A | A | A | | | | | TT,TR | B | PASS |
| VCP | | | | | | | | | | | | | | | | | | | PASS |
| enclosure | A | A | A | A | | | | | | | | | | | | | | | PASS |
| slot | A | A | A | A | | | | | | | | | | | | | | | PASS |
| button | A | A | A | A | | | | | | | | | | | | | | | PASS |
| port | | | | | | | | | A | A | A | A | | | | | | | PASS |

Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) Test condition:
 Direct / Indirect (HCP/VCP) discharges: Minimum 50 times (Positive/Negative) at each point. Air discharges: Minimum 10 times (Positive/Negative) at each point.
- 3) N/A - denotes test is not applicable in this test report
- 4) There was not any unintentional transmission in standby mode

Remark:

Red Ring: air discharge test points.
 Red Cross: contact discharge test points.



4.4 RS TESTING

4.4.1 TEST SPECIFICATION

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

4.4.2 TEST PROCEDURE

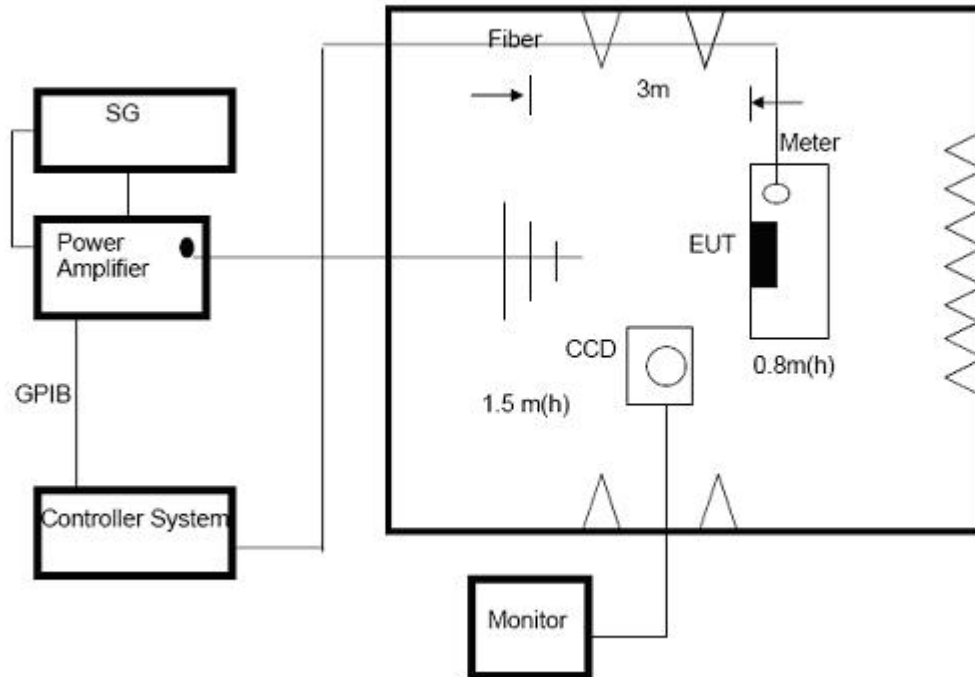
The EUT and support equipment, which are placed on a table that is 0.8 meter above ground and the testing was performed in a fully-anechoic chamber.

The testing distance from antenna to the EUT was 3 meters.

The other condition as following manner:

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

4.4.3 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.



4.4.4 TEST RESULTS

| | | | |
|---------------|----------|---------------------|-------------------|
| Temperature : | 25 °C | Relative Humidity : | 45% |
| Pressure : | 1010 hPa | Test Power : | DC3V from battery |
| Test Mode | Mode 1 | | |

| Frequency Range (MHz) | RF Field Position | R.F. Field Strength | Azimuth | Observation | Perform. Criteria | Results | Judgment |
|-----------------------|-------------------|--|---------|--------------|-------------------|----------|-------------|
| 80~6000 | H / V | 3 V/m (rms) AM Modulated 1000Hz, 80% | Front | CT,CR | A | A | PASS |
| | | | Rear | | | | |
| | | | Left | | | | |
| | | | Right | | | | |

Note:

- 1) P/N denotes the Positive/Negative polarity of the output voltage.
- 2) N/A - denotes test is not applicable in this test report.
- 3) There was no change operated with initial operating during the test.
- 4) There was not any unintentional transmission in standby mode



4.5 EFT/BURST TESTING

4.5.1 TEST SPECIFICATION

| | |
|----------------------|---|
| Basic Standard: | IEC/EN 61000-4-4 |
| Required Performance | B |
| Test Voltage: | Power Line : 1 kV Signal/Control Line : 0.5 KV |
| Polarity: | Positive & Negative |
| Impulse Frequency: | 5 kHz |
| Impulse Wave shape : | 5/50 ns |
| Burst Duration: | 15 ms |
| Burst Period: | 300 ms |
| Test Duration: | Not less than 1 min. |

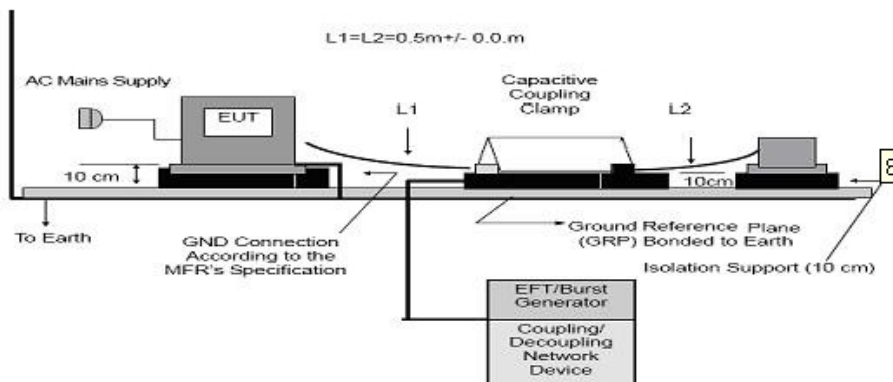
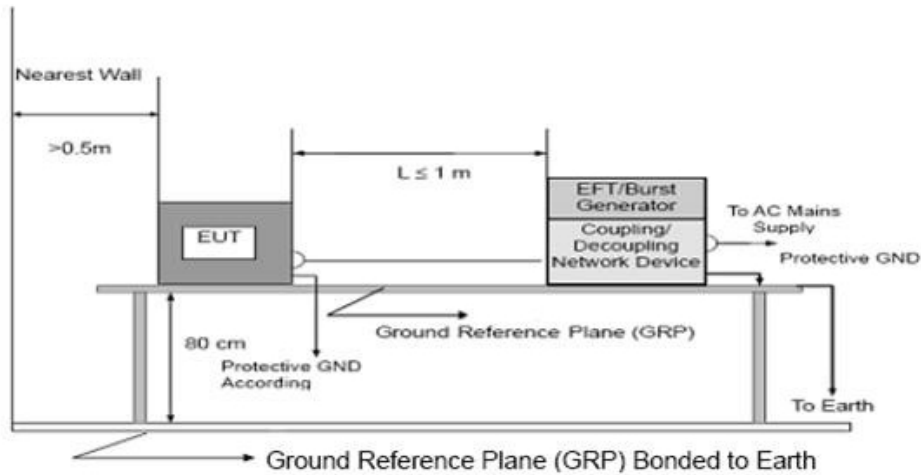
4.5.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

- a. The length of power cord between the coupling device and the EUT should not exceed 1 meter.
- b. Both positive and negative polarity discharges were applied.
- c. The duration time of each test sequential was 1 minute
- d. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.5.3 TEST SETUP



Note:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table (0.8m high) standing on the Ground Reference Plane. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

FLOOR-STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of IEC/EN 61000-4-4 and its cables, were isolated from the Ground Reference Plane by an insulating support that is 0.1-meter thick. The GRP consisted of a sheet of aluminum (at least 0.25mm thick and 2.5m square) connected to the protective grounding system.

4.5.4 TEST RESULTS

Note:

EUT power supply is provided by the battery, is not applicable in this test report.



4.6 SURGE TESTING

4.6.1 TEST SPECIFICATION

| | |
|------------------------|--|
| Basic Standard: | IEC/EN 61000-4-5 |
| Required Performance | B |
| Wave-Shape: | Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current |
| Test Voltage: | Power Line : 0.5 kV, 1 kV, 2 kV |
| Surge Input/Output: | L1-L2, L1-PE, L2-PE |
| Generator Source: | 2 ohm between networks |
| Impedance: | 12 ohm between network and ground |
| Polarity: | Positive/Negative |
| Phase Angle: | 0 /90/180/270 |
| Pulse Repetition Rate: | 1 time / min. (maximum) |
| Number of Tests: | 5 positive and 5 negative at selected points |

4.6.2 TEST PROCEDURE

a. For EUT power supply:

The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2meters in length (or shorter).

b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:

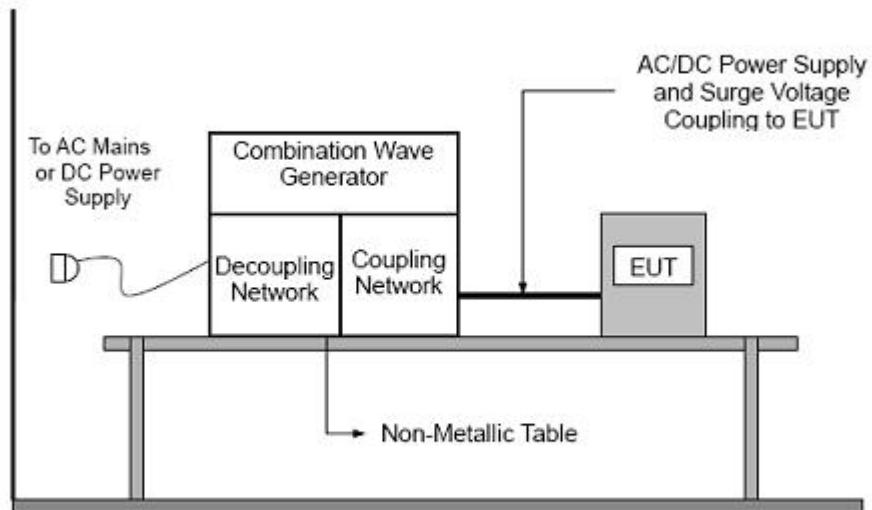
The surge is applied to the lines via the capacitive coupling. The coupling /decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

c. For test applied to unshielded symmetrically operated interconnection /telecommunication lines of EUT:

The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

d. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.6.3 TEST SETUP



4.6.4 TEST RESULTS

Note:

EUT power supply is provided by the battery, is not applicable in this test report.



4.7 INJECTION CURRENT TESTING

4.7.1 TEST SPECIFICATION

| | |
|----------------------|------------------------------------|
| Basic Standard: | IEC/EN 61000-4-6 |
| Required Performance | A |
| Frequency Range: | 0.15 MHz - 80 MHz |
| Field Strength: | 3 Vr.m.s. |
| Modulation: | 1kHz Sine Wave, 80%, AM Modulation |
| Frequency Step: | 1 % of fundamental |
| Dwell Time: | at least 3 seconds |

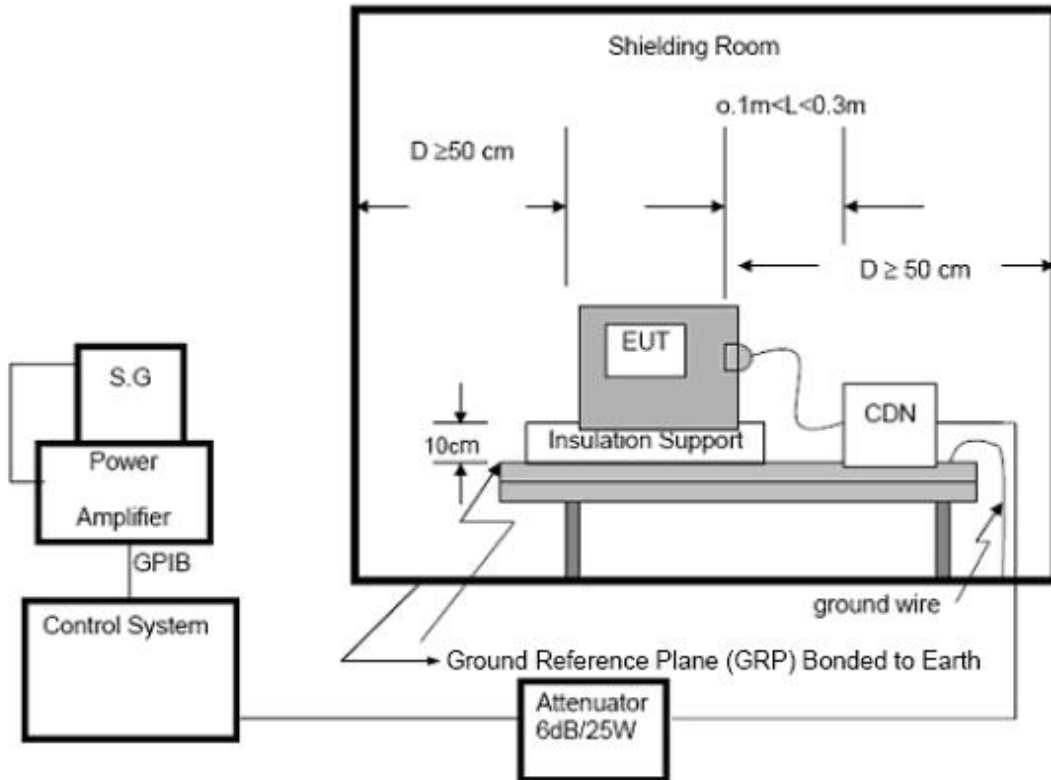
4.7.2 TEST PROCEDURE

The EUT and support equipment, are placed on a table that is 0.8 meter above a metal ground plane measured 1m*1m min. and 0.65mm thick min.

The other condition as following manner:

- a. The field strength level was 3V.
- b. The frequency range is swept from 150 KHz to 80 MHz, with the signal 80%amplitude modulated with a 1kHz sine wave. The rate of sweep did not exceed 1.5×10^{-3} decade/s. Where the frequency range is swept incrementally, the step size was 1% of fundamental.
- c. The dwell time at each frequency shall be not less than the time necessary for the EUT to be able to respond.
- d. For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.7.3 TEST SETUP



For the actual test configuration, please refer to the related Item –EUT Test Photos.

NOTE:

FLOOR-STANDING EQUIPMENT

The equipment to be tested is placed on an insulating support of 0.1 meters height above a ground reference plane. All relevant cables shall be provided with the appropriate coupling and decoupling devices at a distance between 0.1 meters and 0.3 meters from the projected geometry of the EUT on the ground reference plane.

4.7.4 TEST RESULTS

Note:

EUT power supply is provided by the battery, is not applicable in this test report.

4.8 VOLTAGE INTERRUPTION/DIPS TESTING

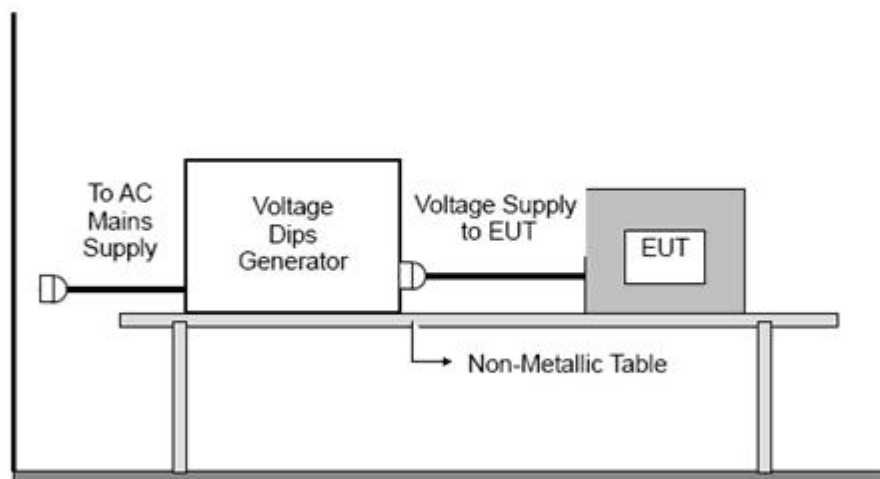
4.8.1 TEST SPECIFICATION

| | |
|-------------------------|--|
| Basic Standard: | IEC/EN 61000-4-11 |
| Required Performance | 100% reduction, 0.5 Cycle 100% reduction, 1.0 Cycle 30% reduction, 25 Cycles |
| Voltage Interruptions: | 100% reduction, 250 Cycles |
| Test Duration Time: | Minimum three test events in sequence |
| Interval between Event: | Minimum ten seconds |
| Phase Angle: | 0°/45°/90°/135°/180°/225°/270°/315°/360° |
| Test Cycle: | 3 times |

4.8.2 TEST PROCEDURE

The EUT shall be tested for each selected combination of test levels and duration with a sequence of three dips/interruptions with intervals of 10 s minimum (between each test event). Each representative mode of operation shall be tested. Abrupt changes in supply voltage shall occur at zero crossings of the voltage waveform.

4.8.3 TEST SETUP



For the actual test configuration, please refer to the related Item –EUT Test Photos.

4.8.4 TEST RESULTS

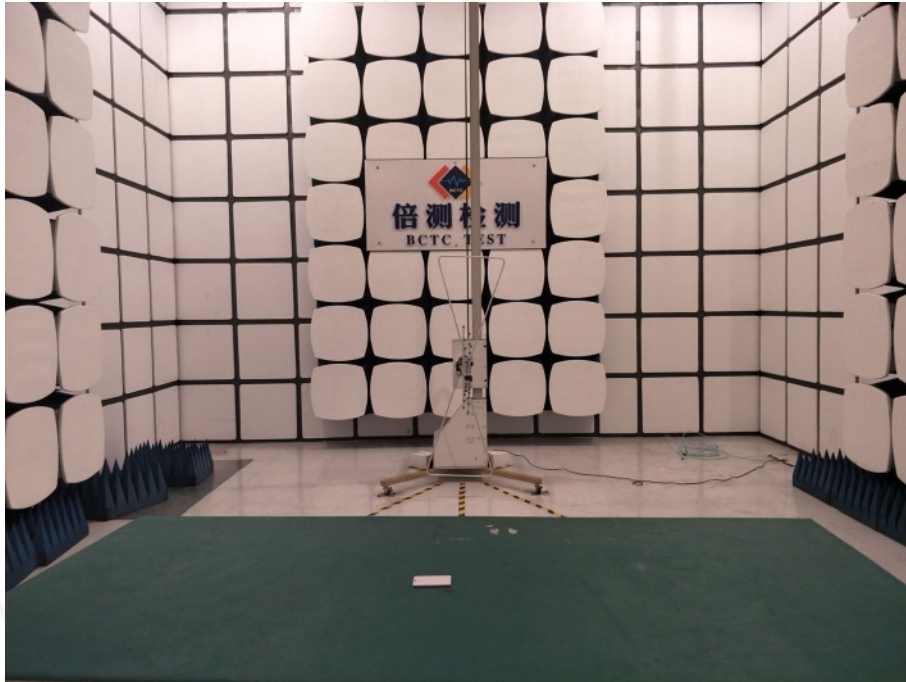
Note:

EUT power supply is provided by the battery, is not applicable in this test report.

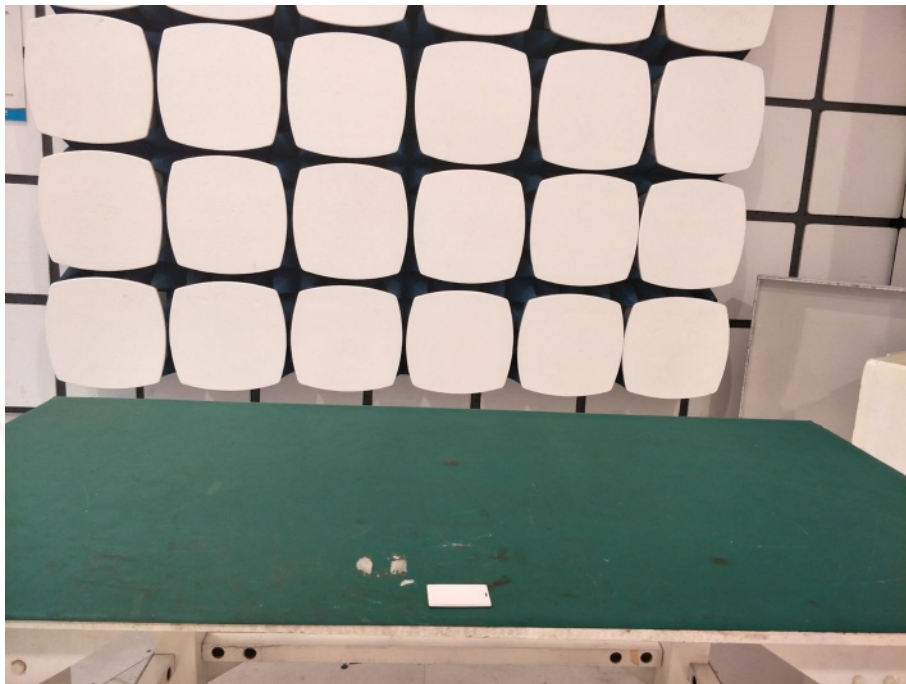


5 PHOTOS OF TEST SETUP

RE

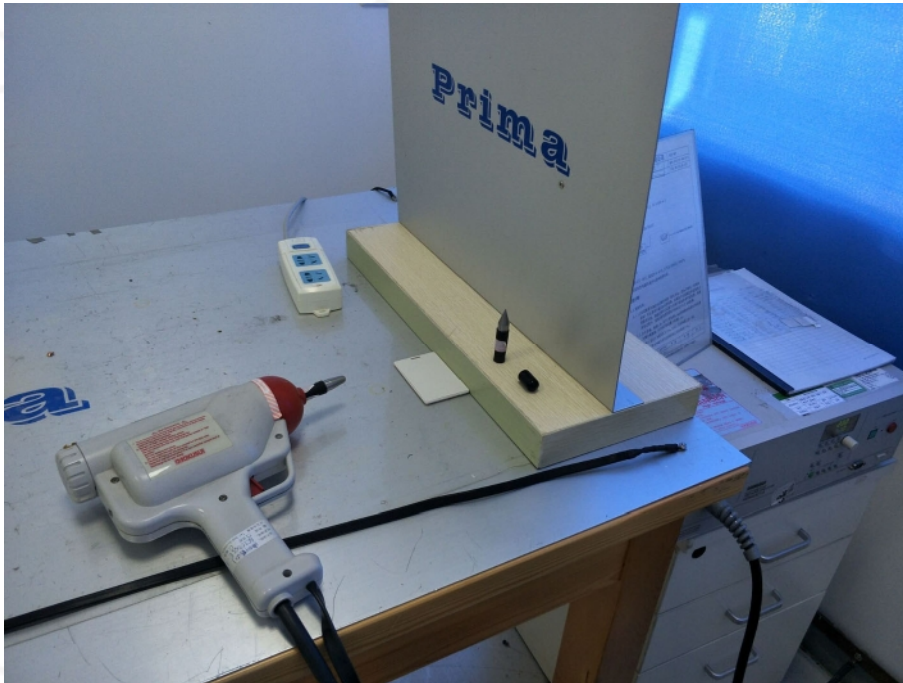


RS



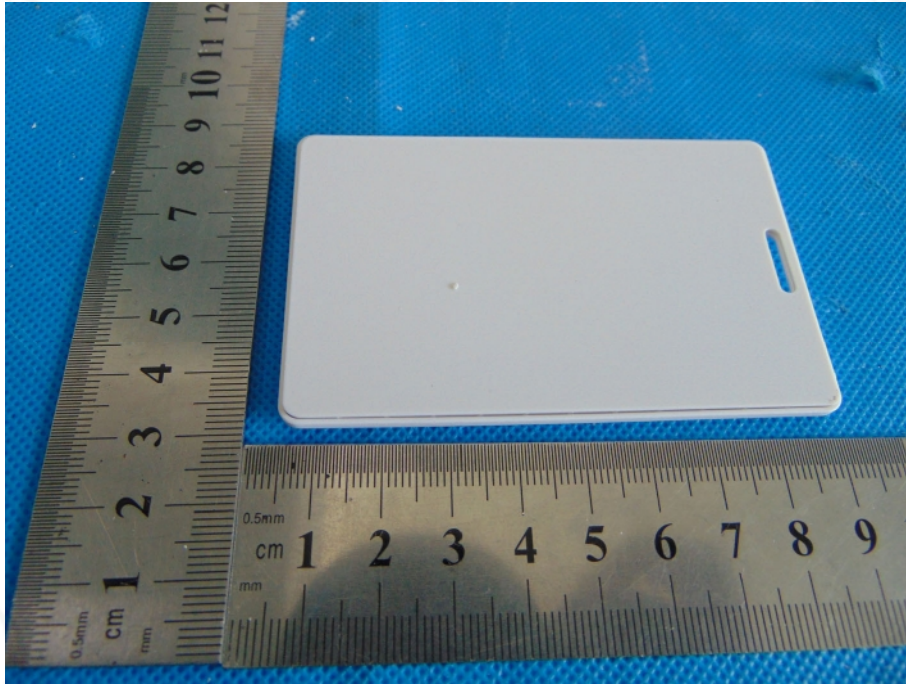


ESD

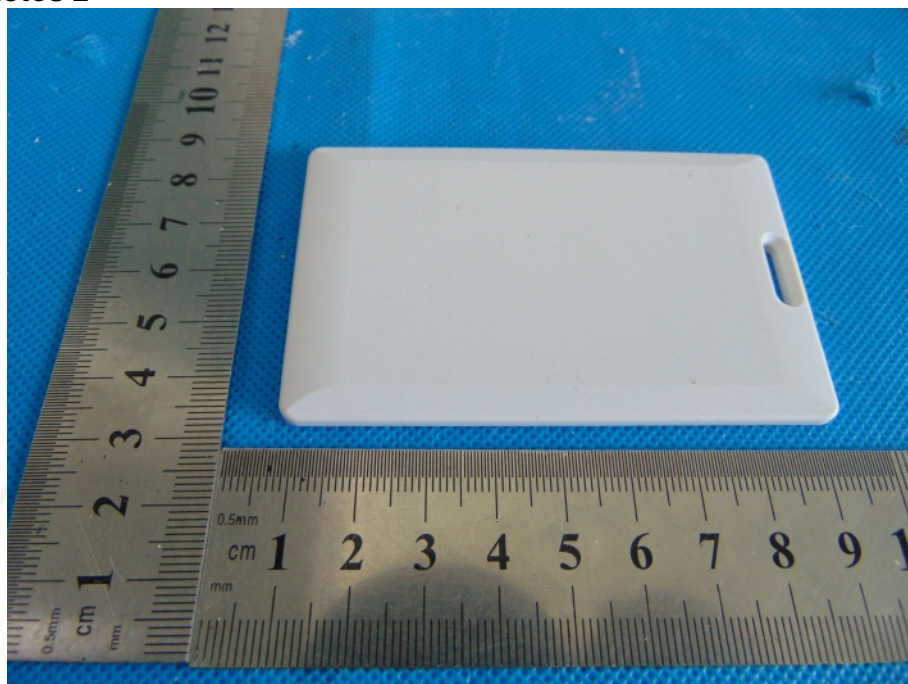


6 PHOTOS OF EUT

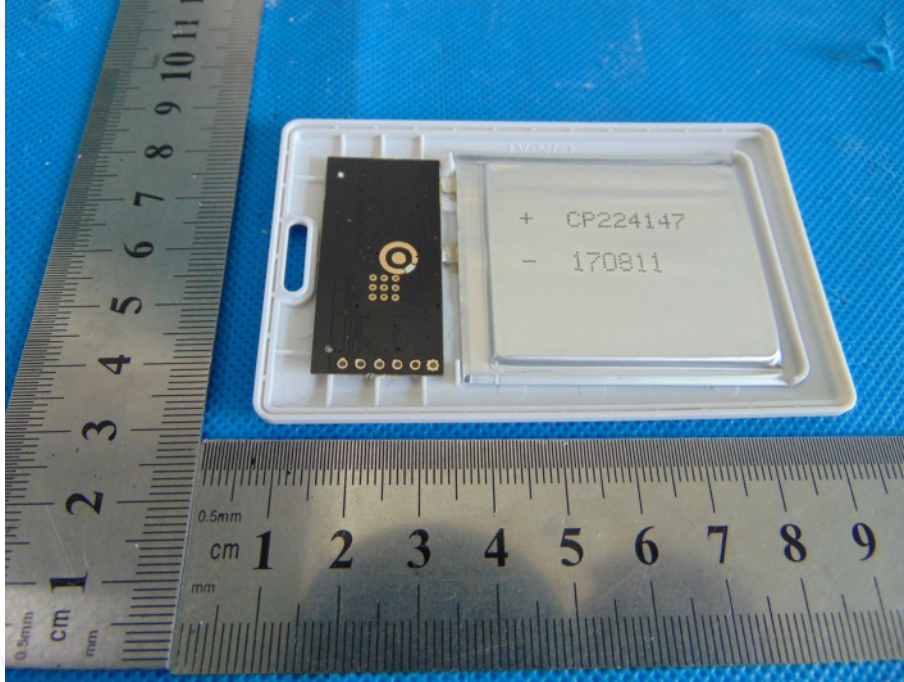
EUT Photos 1



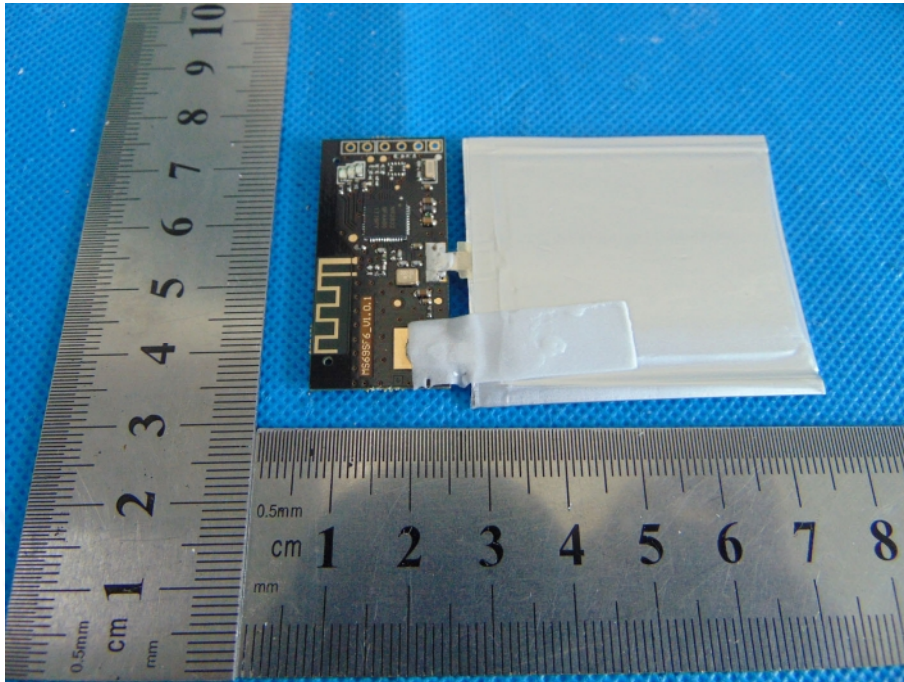
EUT Photos 2



EUT Photos 3



EUT Photos 4



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