

EMC REPORT

Applicant: Shanghai Wenheng Electronics Technology Co., Ltd.

Address of Applicant: Room 611, Building5, Xizi International Center No.898 Xiuwen Street, Minhang District, ShangHai

Equipment Under Test (EUT)

Product Name: Serial to Bluetooth Module

Model No.: WH-BLE102, WH-BLE103, WH-BLE104, WH-BLE105, WH-BLE106, WH-BLE107, WH-BLE108, WH-BLE109, WH-BLE201, WH-BLE202, WH-BLE203, WH-BLE204, WH-BLE205, WH-BLE206, WH-BLE207, WH-BLE208, WH-BLE209, WH-BT200, WH-BT201, WH-BT202, WH-BT203, WH-BT204, WH-BT205, WH-BT206, WH-BT207, WH-BT208, WH-BT209

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

Date of sample receipt: 08 Aug., 2018

Date of Test: 08 Aug., to 28 Aug., 2018

Date of report issue: 29 Aug., 2018

Test Result: PASS*

*In the configuration tested, the EUT complied with the standards specified above.

The CE mark as shown below can be used, under the responsibility of the manufacturer, after completion of an EC Declaration of Conformity and compliance with all relevant EC Directives. The protection requirements with respect to electromagnetic compatibility contained in Directive 2014/53/EU are considered.



Bruce Zhang
Laboratory Manager



This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the CCIS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

2 Version

| Version No. | Date | Description |
|-------------|---------------|-------------|
| 00 | 29 Aug., 2018 | Original |
| | | |
| | | |
| | | |
| | | |

Tested by:

YT Yang

Test Engineer

Date:

29 Aug., 2018

Reviewed by:

Wimer Zhang

Project Engineer

Date:

29 Aug., 2018

3 Contents

| | Page |
|--|------|
| 1 COVER PAGE..... | 1 |
| 2 VERSION | 2 |
| 3 CONTENTS | 3 |
| 4 TEST SUMMARY | 4 |
| 5 GENERAL INFORMATION..... | 5 |
| 5.1 CLIENT INFORMATION | 5 |
| 5.2 GENERAL DESCRIPTION OF E.U.T. | 5 |
| 5.3 TEST MODE | 5 |
| 5.4 DESCRIPTION OF SUPPORT UNITS..... | 5 |
| 5.5 MEASUREMENT UNCERTAINTY | 5 |
| 5.6 DESCRIPTION OF CABLE USED..... | 5 |
| 5.7 LABORATORY FACILITY | 6 |
| 5.8 LABORATORY LOCATION | 6 |
| 5.9 MONITORING OF EUT FOR THE IMMUNITY TEST..... | 6 |
| 5.10 TEST INSTRUMENTS LIST..... | 7 |
| 6 EMC REQUIREMENTS SPECIFICATION IN ETSI EN 301489 | 9 |
| 6.1 EMI (EMISSION) | 9 |
| 6.1.1 Radiated Emission | 9 |
| 6.1.2 Conducted Emissions..... | 15 |
| 6.1.3 Harmonics Test Results | 18 |
| 6.1.4 Flicker Test Results | 18 |
| 6.2 EMS (IMMUNITY)..... | 19 |
| 6.2.1 Electrostatic Discharge..... | 21 |
| 6.2.2 Radiated Immunity | 23 |
| 7 TEST SETUP PHOTO | 25 |
| 8 EUT CONSTRUCTIONAL DETAILS | 28 |

4 Test Summary

| Test Item | Test Requirement | Test Method | Application | Result |
|--|------------------|---------------|-------------|--------------|
| EMI Test Items | | | | |
| Radiated Emission | ETSI EN301 489-1 | EN 55032 | Enclosure | PASS |
| Conducted Emission | ETSI EN301 489-1 | EN 55032 | AC port | PASS |
| Harmonic Current Emissions | ETSI EN301 489-1 | EN 61000-3-2 | AC port | Not Required |
| Voltage Fluctuations and Flicker | ETSI EN301 489-1 | EN 61000-3-3 | AC port | Not Required |
| EMS Test Items | | | | |
| ESD (Electrostatic Discharge) | ETSI EN301 489-1 | EN 61000-4-2 | Enclosure | PASS |
| Radiated Immunity | ETSI EN301 489-1 | EN 61000-4-3 | Enclosure | PASS |
| EFT (Electrical Fast Transients) | ETSI EN301 489-1 | EN 61000-4-4 | AC port | N/A |
| Surge Immunity | ETSI EN301 489-1 | EN 61000-4-5 | AC port | N/A |
| Injected Currents | ETSI EN301 489-1 | EN 61000-4-6 | AC port | N/A |
| Voltage Dips and Interruptions | ETSI EN301 489-1 | EN 61000-4-11 | AC port | N/A |
| <i>Remark:</i> <i>Pass: Meet the requirement</i> <i>N/A: Not Applicable.</i> | | | | |

5 General Information

5.1 Client Information

| | |
|---------------|---|
| Applicant: | Shanghai Wenheng Electronics Technology Co., Ltd. |
| Address: | Room 611, Building5, Xizi International Center No.898 Xiuwen Street, Minhang District, ShangHai |
| Manufacturer: | Shanghai Wenheng Electronics Technology Co., Ltd. |
| Address: | Room 611, Building5, Xizi International Center No.898 Xiuwen Street, Minhang District, ShangHai |

5.2 General Description of E.U.T.

| | |
|------------------------|---|
| Product Name: | Serial to Bluetooth Module |
| Model No.: | WH-BLE102, WH-BLE103, WH-BLE104, WH-BLE105, WH-BLE106, WH-BLE107, WH-BLE108, WH-BLE109, WH-BLE201, WH-BLE202, WH-BLE203, WH-BLE204, WH-BLE205, WH-BLE206, WH-BLE207, WH-BLE208, WH-BLE209, WH-BT200, WH-BT201, WH-BT202, WH-BT203, WH-BT204, WH-BT205, WH-BT206, WH-BT207, WH-BT208, WH-BT209 |
| Tx Frequency: | BLE: 2402MHz~2480MHz |
| Rx Frequency | BLE: 2402MHz~2480MHz |
| Hardware version: | V1.1 |
| Software version: | V1.0.5 |
| Modulation technology: | BLE: GFSK |
| Antenna Type: | PCB Antenna |
| Antenna Gain: | BLE: 0.5 dBi |
| Power supply: | AC 230V/50Hz |

5.3 Test mode

| | |
|-----|--------------------------|
| TM1 | Kept the EUT in BLE mode |
|-----|--------------------------|

5.4 Description of Support Units

| Manufacturer | Description | Model | S/N | FCC ID/DoC |
|--------------|----------------|-------------------|---------|------------|
| LENOVO | Laptop | SL510 | 2847A65 | DoC |
| / | Adapter | DQS051-0501200-HC | N/A | N/A |
| / | Test component | USR-BLE-EVK | N/A | N/A |

5.5 Measurement Uncertainty

| Parameter | Expanded Uncertainty (Confidence of 95%) |
|-------------------------------------|--|
| Conducted Emission (9kHz ~ 30MHz) | ±2.22 dB |
| Radiated Emission (9kHz ~ 30MHz) | ±2.76 dB |
| Radiated Emission (30MHz ~ 1000MHz) | ±4.28 dB |
| Radiated Emission (1GHz ~ 18GHz) | ±5.72 dB |
| Radiated Emission (18GHz ~ 26.5GHz) | ±2.88 dB |

5.6 Description of Cable Used

| |
|-----|
| N/A |
|-----|

5.7 Laboratory Facility

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

- **FCC - Registration No.: 727551**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been accredited as a testing laboratory by FCC (Federal Communications Commission). The Registration No. is 727551.

- **IC - Registration No.: 10106A-1**

The 3m Semi-anechoic chamber of Shenzhen Zhongjian Nanfang Testing Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1.

- **CNAS - Registration No.: CNAS L6048**

Shenzhen Zhongjian Nanfang Testing Co., Ltd. is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L6048.

- **A2LA - Registration No.: 4346.01**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: <https://portal.a2la.org/scopepdf/4346-01.pdf>

5.8 Laboratory Location

Shenzhen Zhongjian Nanfang Testing Co., Ltd.

Address: No. B-C, 1/F., Building 2, Laodong No.2 Industrial Park, Xixiang Road, Bao'an District, Shenzhen, Guangdong, China

Tel: +86-755-23118282, Fax: +86-755-23116366

Email: info@ccis-cb.com, Website: <http://www.ccis-cb.com>

5.9 Monitoring of EUT for the Immunity Test

| | |
|---------|--------------------------------|
| Visual: | N/A |
| Sound: | N/A |
| Other: | Monitored the data link of EUT |

5.10 Test Instruments list

| Radiated Emission: | | | | | |
|--------------------|-----------------|---------------|--------------------|----------------------|--------------------------|
| Test Equipment | Manufacturer | Model No. | Serial No. | Cal. Date (mm-dd-yy) | Cal. Due date (mm-dd-yy) |
| 3m SAC | SAEMC | 9m*6m*6m | 966 | 07-22-2017 | 07-21-2020 |
| BiConiLog Antenna | SCHWARZBECK | VULB9163 | 497 | 03-16-2018 | 03-15-2019 |
| Horn Antenna | SCHWARZBECK | BBHA9120D | 916 | 03-16-2018 | 03-15-2019 |
| EMI Test Software | AUDIX | E3 | Version: 6.110919b | | |
| Pre-amplifier | HP | 8447D | 2944A09358 | 03-07-2018 | 03-06-2019 |
| Pre-amplifier | CD | PAP-1G18 | 11804 | 03-07-2018 | 03-06-2019 |
| Spectrum analyzer | Rohde & Schwarz | FSP30 | 101454 | 03-07-2018 | 03-06-2019 |
| EMI Test Receiver | Rohde & Schwarz | ESRP7 | 101070 | 03-07-2018 | 03-06-2019 |
| Simulated Station | Anritsu | MT8820C | 6201026545 | 03-07-2018 | 03-06-2019 |
| Cable | ZDECL | Z108-NJ-NJ-81 | 1608458 | 03-07-2018 | 03-06-2019 |
| Cable | MICRO-COAX | MFR64639 | K10742-5 | 03-07-2018 | 03-06-2019 |
| Cable | SUHNER | SUCOFLEX100 | 58193/4PE | 03-07-2018 | 03-06-2019 |

| Conducted Emission: | | | | | |
|---------------------|-----------------|------------|--------------------|----------------------|--------------------------|
| Test Equipment | Manufacturer | Model No. | Serial No. | Cal. Date (mm-dd-yy) | Cal. Due date (mm-dd-yy) |
| EMI Test Receiver | Rohde & Schwarz | ESCI | 101189 | 03-07-2018 | 03-06-2019 |
| Pulse Limiter | SCHWARZBECK | OSRAM 2306 | 9731 | 03-07-2018 | 03-06-2019 |
| LISN | CHASE | MN2050D | 1447 | 03-19-2018 | 03-18-2019 |
| LISN | Rohde & Schwarz | ESH3-Z5 | 8438621/010 | 07-21-2017 | 07-20-2018 |
| ISN | Schwarzbeck | CAT3 8158 | CCIS0185 | 03-14-2018 | 03-13-2019 |
| ISN | Schwarzbeck | CAT5 8158 | CCIS0186 | 03-14-2018 | 03-13-2019 |
| ISN | Schwarzbeck | NTFM 8158 | CCIS0187 | 03-14-2018 | 03-13-2019 |
| Cable | HP | 10503A | N/A | 03-07-2018 | 03-06-2019 |
| EMI Test Software | AUDIX | E3 | Version: 6.110919b | | |

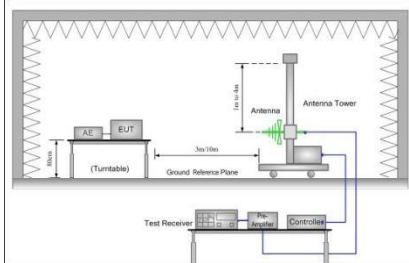
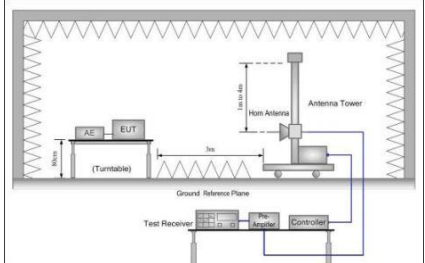
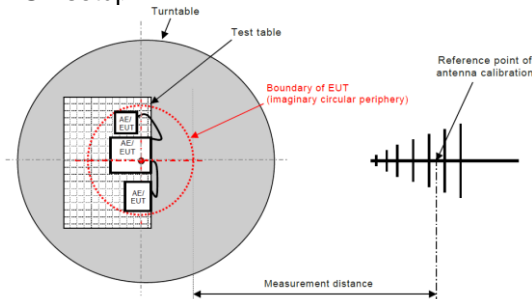
| ESD: | | | | | |
|----------------|--------------|-----------|------------|----------------------|--------------------------|
| Test Equipment | Manufacturer | Model No. | Serial No. | Cal. Date (mm-dd-yy) | Cal. Due date (mm-dd-yy) |
| ESD Simulator | Haefely | ONYX30 | 183900 | 04-06-2018 | 04-05-2019 |

| Radiated Immunity: | | | | | |
|-------------------------------|--------------------|--------------|------------|----------------------|--------------------------|
| Test Equipment | Manufacturer | Model No. | Serial No. | Cal. Date (mm-dd-yy) | Cal. Due date (mm-dd-yy) |
| Signal Generator | Rohde & Schwarz | SMR27 | SEL0068 | 03-07-2018 | 03-06-2019 |
| RF Amplifier 80M-1GHz | Amplifier Research | AR 150W1000 | SEL0066 | 03-07-2018 | 03-06-2019 |
| RF Amplifier 1GHz-4.2GHz | Amplifier Research | AR 25S1G4AM1 | SEL0065 | 03-07-2018 | 03-06-2019 |
| RF Amplifier 4GHz-6GHz | Amplifier Research | 35S4G8A | SEL0068 | 03-07-2018 | 03-06-2019 |
| Power Meter | Rohde & Schwarz | NRVS | SEL0069 | 03-07-2018 | 03-06-2019 |
| Power Sensor | Rohde & Schwarz | URV5-Z2 | SEL0071 | 03-07-2018 | 03-06-2019 |
| Power Sensor | Rohde & Schwarz | URV5-Z2 | SEL0072 | 03-07-2018 | 03-06-2019 |
| Software EMC32 | Rohde & Schwarz | EMC32-S | SEL0082 | N/A | N/A |
| Log-periodic Antenna | Amplifier Research | AT1080 | SEL0073 | 03-07-2018 | 03-06-2019 |
| Antenna Tripod | Amplifier Research | TP1000A | SEL0074 | N/A | N/A |
| High Gain Horn Antenna | Amplifier Research | AT4002A | SEL0075 | 03-07-2018 | 03-06-2019 |
| Nexus Conduiting Amplifier | B&K | 2690 | SEL0077 | N/A | N/A |
| MUTH Simulator | B&K | 4227 | SEL0078 | N/A | N/A |
| Sound Level Calibrator | B&K | 4231 | SEL0079 | N/A | N/A |
| Audio Analyzer | Rohde & Schwarz | UPL 16 | SEL0076 | 03-07-2018 | 03-06-2019 |

6 EMC Requirements Specification in ETSI EN 301489

6.1 EMI (Emission)

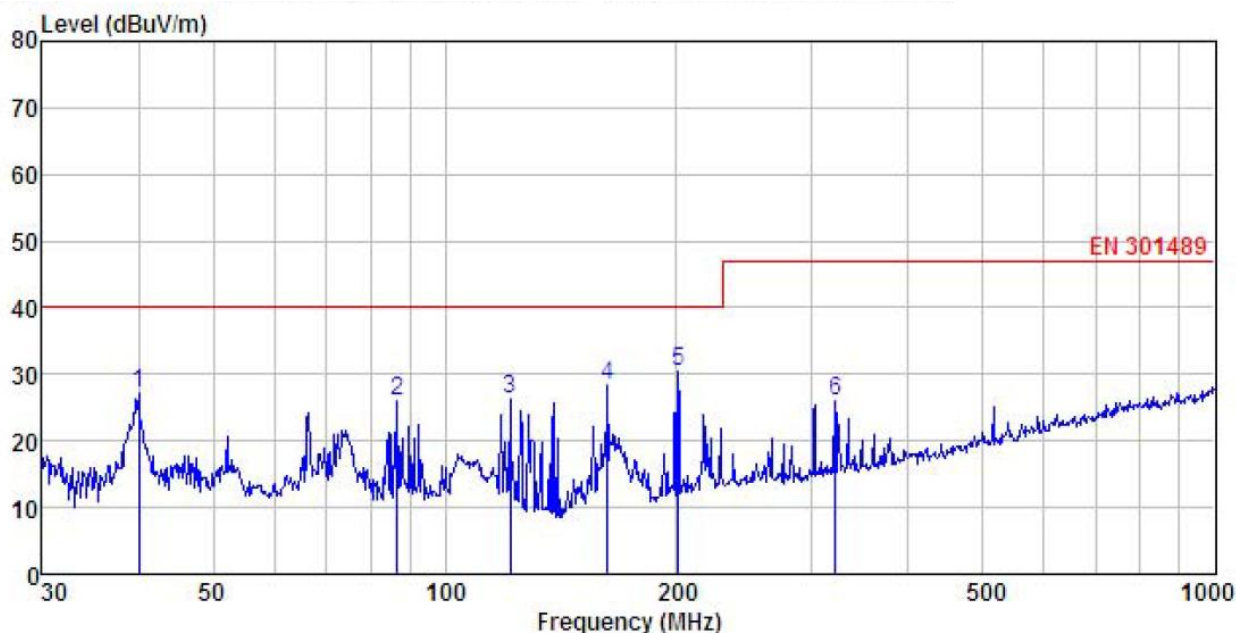
6.1.1 Radiated Emission

| | | | | | |
|-----------------------|---|------------|--|--------|----------|
| Test Requirement: | ETSI EN 301 489 -1 | | | | |
| Test Method: | EN 55032 | | | | |
| Test Frequency Range: | 30MHz to 6GHz | | | | |
| Test Distance: | 3m | | | | |
| Receiver setup: | Frequency | Detector | RBW | VBW | Remark |
| | 30MHz-1GHz | Quasi-peak | 100kHz | 300kHz | QP Value |
| | Above 1GHz | Peak | 1MHz | 3MHz | PK Value |
| | | Average | 1MHz | 3MHz | AV Value |
| Limit: | Frequency | | Limit (dBuV/m @3m) | | Remark |
| | 30MHz-230MHz | | 40.0 | | QP Value |
| | 230MHz-1GHz | | 47.0 | | QP Value |
| | 1GHz-3GHz | | 50.0 | | AV Value |
| | | | 70.0 | | PK Value |
| | 3GHz-6GHz | | 54.0 | | AV Value |
| 74.0 | | | PK Value | | |
| Test setup: | Below 1GHz: | | Above 1GHz: | | |
| |  | |  | | |
| | <p>EUT setup:</p>  | | | | |
| Test Procedure: | <p>30MHz to 1GHz:</p> <ol style="list-style-type: none">1. The radiated emissions test was conducted in a semi-anechoic chamber.2. The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation.3. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emissions spectrum plots of the EUT.4. The frequencies of maximum emission were determined in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. | | | | |

| | |
|-------------------|--|
| | <p>Measurements were performed for both horizontal and vertical antenna polarization.</p> <p>Above 1GHz:</p> <ol style="list-style-type: none"> 1. The radiated emissions test was conducted in a fully-anechoic chamber. 2. The tabletop EUT was placed upon anon-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane, but separated from metallic contact with the ground reference plane by 0.1m of insulation. 3. Before final measurements of radiated emissions, a pre-scan was performed in the spectrum mode with the peak detector to find out the maximum emission spectrum plots of the EUT. 4. The frequencies of maximum emission were determined in the final radiated emissions measurement. At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the maximum disturbance. <p>Measurements were performed for both horizontal and vertical antenna polarization.</p> |
| Test environment: | Temp.: 25.5°C Humid.: 55% Press.: 101kPa |
| Test Instruments: | Refer to section 5.10 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

Measurement Data:

| | | | |
|-----------------|----------------|---------------|----------|
| Test By: | Caffrey | Test mode: | TM 1 |
| Test Frequency: | 30 MHz - 1 GHz | Polarization: | Vertical |



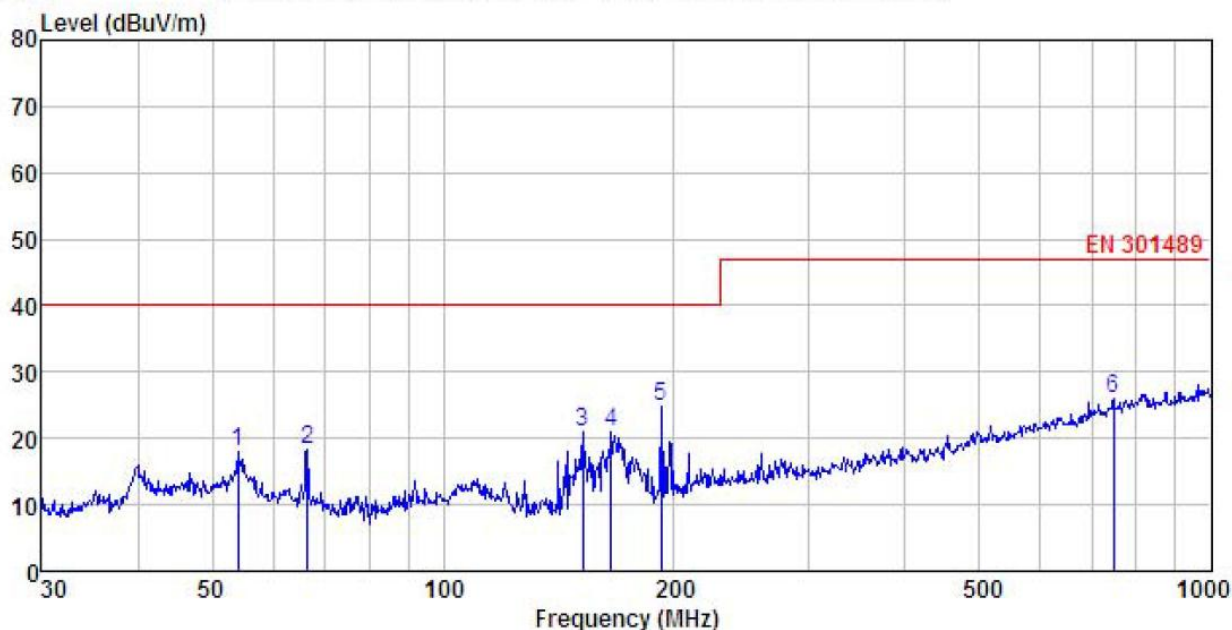
Site : 3m chamber
 Condition : EN 301489 3m VULB9163(30M2G) VERTICAL
 EUT : Serial to Bluetooth Module
 Model : WH-BLE102
 Test mode : TM1 Mode
 Power Rating : AC 230V/50Hz
 Environment : Temp:25.3°C Humi:57%
 Test Engineer: Caffrey
 REMARK :

| | Freq | Read | Antenna | Cable | Preamp | Level | Limit | Over | |
|---|---------|-------|---------|-------|--------|--------|--------|--------|--------|
| | MHz | Level | Factor | Loss | Factor | Level | Line | Limit | Remark |
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 | 39.994 | 42.99 | 12.80 | 1.21 | 29.90 | 27.10 | 40.00 | -12.90 | QP |
| 2 | 86.807 | 44.26 | 9.42 | 1.91 | 29.59 | 26.00 | 40.00 | -14.00 | QP |
| 3 | 121.549 | 43.52 | 9.96 | 2.19 | 29.38 | 26.29 | 40.00 | -13.71 | QP |
| 4 | 162.611 | 45.64 | 9.18 | 2.61 | 29.11 | 28.32 | 40.00 | -11.68 | QP |
| 5 | 200.688 | 44.95 | 11.53 | 2.87 | 28.83 | 30.52 | 40.00 | -9.48 | QP |
| 6 | 321.061 | 37.36 | 14.04 | 3.01 | 28.50 | 25.91 | 47.00 | -21.09 | QP |

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

| | | | |
|-----------------|----------------|---------------|------------|
| Test By: | Caffrey | Test mode: | TM 1 |
| Test Frequency: | 30 MHz - 1 GHz | Polarization: | Horizontal |



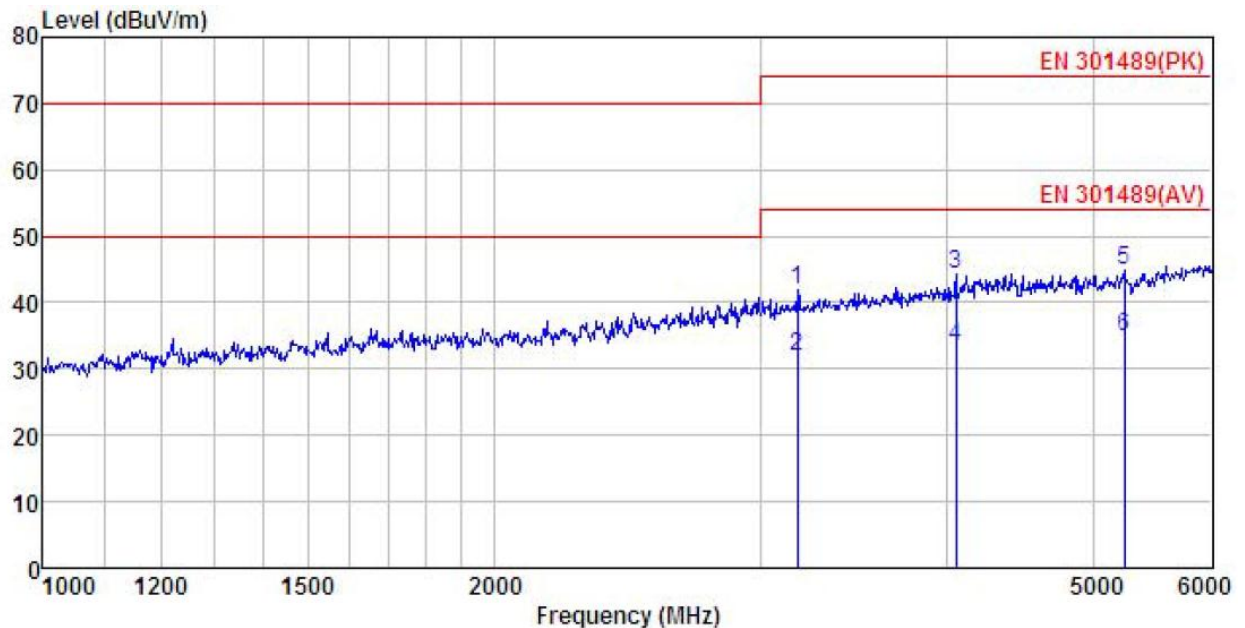
Site : 3m chamber
 Condition : EN 301489 3m VULB9163(30M2G) HORIZONTAL
 EUT : Serial to Bluetooth Module
 Model : WH-BLE102
 Test mode : TM1 Mode
 Power Rating : AC 230V/50Hz
 Environment : Temp:25.3°C Humi:57%
 Test Engineer: Caffrey
 REMARK :

| | Freq | Read | Antenna | Cable | Preamp | Level | Limit | Over | |
|---|---------|-------|---------|-------|--------|--------|--------|--------|--------|
| | MHz | Level | Factor | Loss | Factor | dBuV/m | dBuV/m | Limit | Remark |
| | | dBuV | dB/m | dB | dB | | | dB | |
| 1 | 54.071 | 33.09 | 13.37 | 1.34 | 29.80 | 18.00 | 40.00 | -22.00 | QP |
| 2 | 66.499 | 36.38 | 10.20 | 1.41 | 29.75 | 18.24 | 40.00 | -21.76 | QP |
| 3 | 152.130 | 38.83 | 8.71 | 2.53 | 29.20 | 20.87 | 40.00 | -19.13 | QP |
| 4 | 165.487 | 38.08 | 9.27 | 2.62 | 29.09 | 20.88 | 40.00 | -19.12 | QP |
| 5 | 192.419 | 39.59 | 11.27 | 2.82 | 28.88 | 24.80 | 40.00 | -15.20 | QP |
| 6 | 747.483 | 29.32 | 20.94 | 4.35 | 28.49 | 26.12 | 47.00 | -20.88 | QP |

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

| | | | |
|-----------------|---------------|---------------|----------|
| Test By: | Caffrey | Test mode: | TM 1 |
| Test Frequency: | 1 GHz - 6 GHz | Polarization: | Vertical |



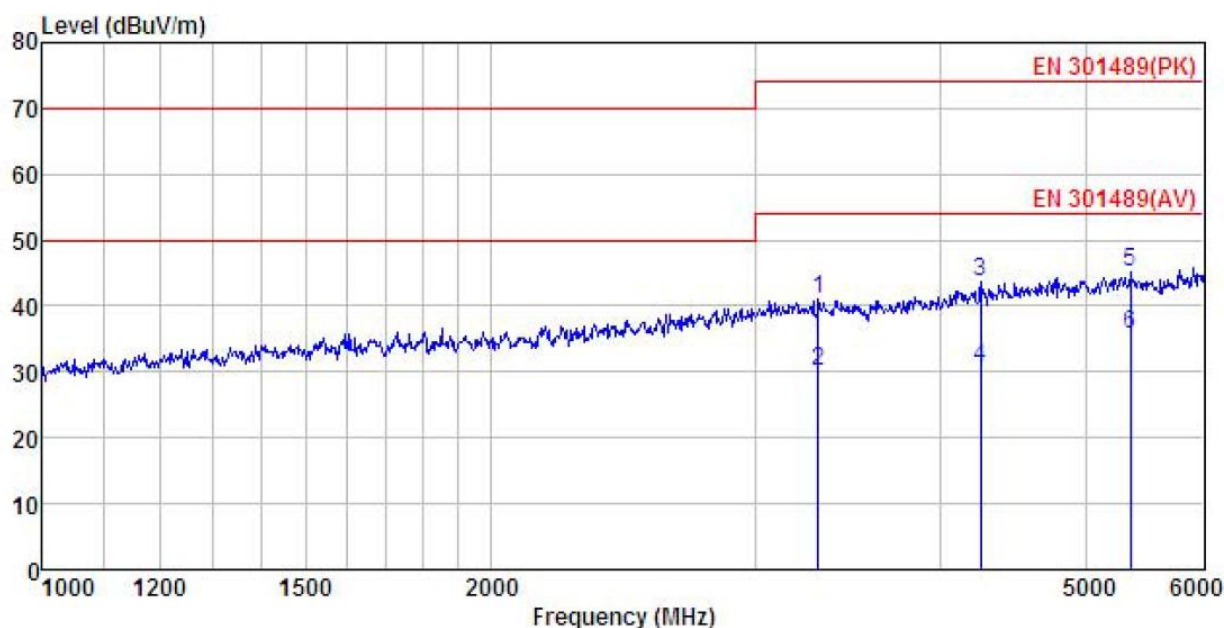
Site : 3m chamber
 Condition : EN 301489(PK) 3m BBHA9120(1G18G) VERTICAL
 EUT : Serial to Bluetooth Module
 Model : WH-BLE102
 Test mode : TM1 Mode
 Power Rating : AC 230V/50Hz
 Environment : Temp:25.5°C Humi:55%
 Test Engineer: Caffrey
 REMARK :

| | Read | Antenna | Cable | Preamp | | Limit | Over | |
|----------|-----------|-----------|---------|---------|-------------|-------------|---------|----------------|
| Freq | Level | Factor | Loss | Factor | Level | Line | Limit | Remark |
| -----MHz | -----dBuV | -----dB/m | -----dB | -----dB | -----dBuV/m | -----dBuV/m | -----dB | ----- |
| 1 | 3176.198 | 49.22 | 28.71 | 5.41 | 41.42 | 41.92 | 74.00 | -32.08 Peak |
| 2 | 3176.198 | 39.29 | 28.71 | 5.41 | 41.42 | 31.99 | 54.00 | -22.01 Average |
| 3 | 4052.622 | 49.74 | 30.30 | 6.18 | 41.81 | 44.41 | 74.00 | -29.59 Peak |
| 4 | 4052.622 | 38.79 | 30.30 | 6.18 | 41.81 | 33.46 | 54.00 | -20.54 Average |
| 5 | 5245.537 | 47.58 | 32.15 | 7.09 | 41.93 | 44.89 | 74.00 | -29.11 Peak |
| 6 | 5245.537 | 37.52 | 32.15 | 7.09 | 41.93 | 34.83 | 54.00 | -19.17 Average |

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

| | | | |
|-----------------|---------------|---------------|------------|
| Test By: | Caffrey | Test mode: | TM 1 |
| Test Frequency: | 1 GHz - 6 GHz | Polarization: | Horizontal |



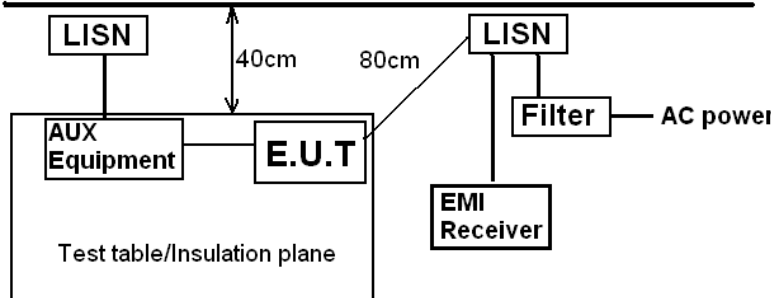
Site : 3m chamber
Condition : EN 301489(PK) 3m BBHA9120(1G18G) HORIZONTAL
EUT : Serial to Bluetooth Module
Model : WH-BLE102
Test mode : TM1 Mode
Power Rating : AC 230V/50Hz
Environment : Temp:25.5°C Humi:55%
Test Engineer: Caffrey
REMARK :

| | Freq | ReadAntenna | Cable | Preamp | | Limit | Over | |
|---|----------|-------------|--------|--------|--------|--------|--------|----------------|
| | | Level | Factor | Loss | Factor | Level | Line | Limit |
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB |
| 1 | 3309.825 | 47.99 | 28.79 | 5.53 | 41.38 | 40.93 | 74.00 | -33.07 Peak |
| 2 | 3309.825 | 37.27 | 28.79 | 5.53 | 41.38 | 30.21 | 54.00 | -23.79 Average |
| 3 | 4253.498 | 48.47 | 30.67 | 6.48 | 41.85 | 43.77 | 74.00 | -30.23 Peak |
| 4 | 4253.498 | 35.41 | 30.67 | 6.48 | 41.85 | 30.71 | 54.00 | -23.29 Average |
| 5 | 5359.542 | 47.79 | 32.26 | 7.11 | 41.88 | 45.28 | 74.00 | -28.72 Peak |
| 6 | 5359.542 | 38.21 | 32.26 | 7.11 | 41.88 | 35.70 | 54.00 | -18.30 Average |

Remark:

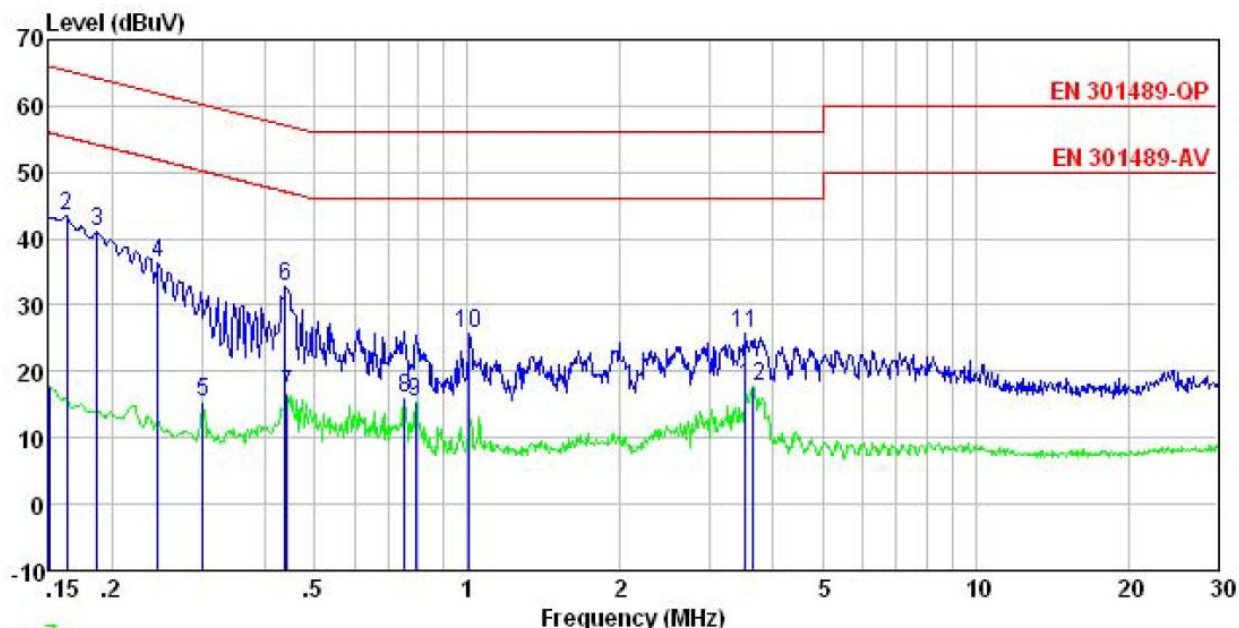
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor.
2. The emission levels of other frequencies are very lower than the limit and not show in test report.

6.1.2 Conducted Emissions

| | | | | | | |
|--|---|------|--------------|-----|-----------|--------|
| Test Requirement: | ETSI EN 301 489 -1 | | | | | |
| Test Method: | EN 55032 | | | | | |
| Test Frequency Range: | 150kHz to 30MHz | | | | | |
| Class / Severity: | Class B | | | | | |
| Receiver setup: | RBW=9kHz, VBW=30kHz | | | | | |
| Limit: | Frequency range (MHz) | | Limit (dBuV) | | | |
| | | | Quasi-peak | | Average | |
| | 0.15-0.5 | | 66 to 56* | | 56 to 46* | |
| | 0.5-5 | | 56 | | 46 | |
| | 5-30 | | 60 | | 50 | |
| * Decreases with the logarithm of the frequency. | | | | | | |
| Test setup: | <div><p style="text-align: center;">Reference Plane</p><p>Remark: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div> | | | | | |
| Test procedure | The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). Which provide a 50ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs). Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to EN55032 Class B on conducted measurement. | | | | | |
| Test environment: | Temp.: | 23°C | Humid.: | 56% | Press.: | 101kPa |
| Test Instruments: | Refer to section 5.10 for details | | | | | |
| Test mode: | Refer to section 5.3 for details | | | | | |
| Test results: | Passed | | | | | |

Measurement Data:

| | | | |
|--------------|----------------|------------|------|
| Test By: | Caffrey | Test mode: | TM1 |
| Test Voltage | AC 230 V/50 Hz | Phase: | Line |



Trace: 7

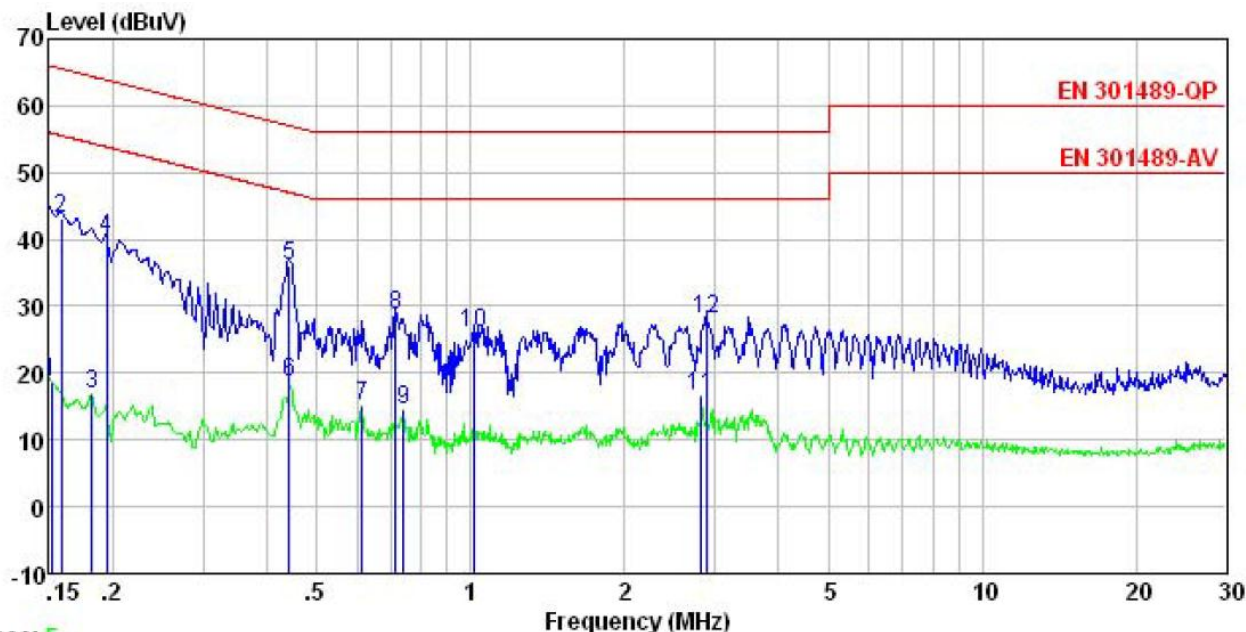
Site : CCIS Shielding Room
 Condition : EN 301489-QP LISN LINE
 EUT : Serial to Bluetooth Module
 Model : WH-BLE102
 Test Mode : TM1 mode
 Power Rating : AC 120V/60Hz
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa
 Test Engineer: Caffrey
 Remark :

| | Freq | Read | LISN | Cable | Level | Limit | Over | |
|----|-------|-------|--------|-------|-------|-------|--------|---------|
| | MHz | Level | Factor | Loss | dBuV | Line | Limit | Remark |
| | | dBuV | dB | dB | | dBuV | dB | |
| 1 | 0.150 | 6.81 | 0.18 | 10.78 | 17.77 | 56.00 | -38.23 | Average |
| 2 | 0.162 | 32.48 | 0.17 | 10.77 | 43.42 | 65.34 | -21.92 | QP |
| 3 | 0.186 | 30.09 | 0.16 | 10.76 | 41.01 | 64.20 | -23.19 | QP |
| 4 | 0.246 | 25.49 | 0.14 | 10.75 | 36.38 | 61.91 | -25.53 | QP |
| 5 | 0.302 | 4.41 | 0.13 | 10.74 | 15.28 | 50.19 | -34.91 | Average |
| 6 | 0.437 | 21.81 | 0.12 | 10.74 | 32.67 | 57.11 | -24.44 | QP |
| 7 | 0.442 | 5.62 | 0.12 | 10.74 | 16.48 | 47.02 | -30.54 | Average |
| 8 | 0.751 | 5.18 | 0.13 | 10.79 | 16.10 | 46.00 | -29.90 | Average |
| 9 | 0.792 | 4.59 | 0.13 | 10.81 | 15.53 | 46.00 | -30.47 | Average |
| 10 | 1.010 | 14.82 | 0.13 | 10.87 | 25.82 | 56.00 | -30.18 | QP |
| 11 | 3.509 | 14.65 | 0.17 | 10.90 | 25.72 | 56.00 | -30.28 | QP |
| 12 | 3.642 | 6.64 | 0.17 | 10.90 | 17.71 | 46.00 | -28.29 | Average |

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss.

| | | | |
|---------------|----------------|------------|---------|
| Test By: | Caffrey | Test mode: | TM1 |
| Test Voltage: | AC 230 V/50 Hz | Phase: | Neutral |



Trace: 5

Site : CCIS Shielding Room
 Condition : EN 301489-QP LISN NEUTRAL
 EUT : Serial to Bluetooth Module
 Model : WH-BLE102
 Test Mode : TM1 mode
 Power Rating : AC 120V/60Hz
 Environment : Temp: 23 °C Humi:56% Atmos:101KPa
 Test Engineer: Caffrey
 Remark :

| | Freq | Read | LISN | Cable | Level | Limit | Over | |
|----|-------|-------|--------|-------|-------|-------|--------|---------|
| | MHz | Level | Factor | Loss | Level | Line | Limit | Remark |
| | | dBuV | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.152 | 6.94 | 0.99 | 10.78 | 18.71 | 55.91 | -37.20 | Average |
| 2 | 0.158 | 31.51 | 0.98 | 10.77 | 43.26 | 65.56 | -22.30 | QP |
| 3 | 0.182 | 5.13 | 0.94 | 10.77 | 16.84 | 54.42 | -37.58 | Average |
| 4 | 0.194 | 28.48 | 0.93 | 10.76 | 40.17 | 63.84 | -23.67 | QP |
| 5 | 0.442 | 24.47 | 0.97 | 10.74 | 36.18 | 57.02 | -20.84 | QP |
| 6 | 0.442 | 6.92 | 0.97 | 10.74 | 18.63 | 47.02 | -28.39 | Average |
| 7 | 0.614 | 3.37 | 0.97 | 10.77 | 15.11 | 46.00 | -30.89 | Average |
| 8 | 0.712 | 16.85 | 0.97 | 10.78 | 28.60 | 56.00 | -27.40 | QP |
| 9 | 0.739 | 2.74 | 0.97 | 10.79 | 14.50 | 46.00 | -31.50 | Average |
| 10 | 1.016 | 14.26 | 0.97 | 10.87 | 26.10 | 56.00 | -29.90 | QP |
| 11 | 2.824 | 4.78 | 0.99 | 10.93 | 16.70 | 46.00 | -29.30 | Average |
| 12 | 2.884 | 16.27 | 0.99 | 10.92 | 28.18 | 56.00 | -27.82 | QP |

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level = Receiver Read level + LISN Factor + Cable Loss.

6.1.3 Harmonics Test Results

| | |
|--------------------------|---|
| Test Requirement: | ETSI EN 301 489-1/17: EN 61000-3-2 |
| Test Method: | N/A: See Remark Below |
| Remark: | <p>There is no need for Harmonics test to be performed on this product (rated power is less than 75W) in accordance with EN 61000-3-2.</p> <p>For further details, please refer to Clause 7, Note 1 of EN 61000-3-2 which states:</p> <p>“For the following categories of equipment limits are not specified in this edition of the standard.</p> <p>Note 1: Equipment with a rated power of 75W or less, other than lighting equipment.”</p> |

6.1.4 Flicker Test Results

| | |
|--------------------------|--|
| Test Requirement: | ETSI EN 301 489-1/17: EN 61000-3-3 |
| Test Method: | N/A: See Remark Below |
| Remark: | <ol style="list-style-type: none">1. The appropriate requirements of EN 61000-3-3 [9] for voltage fluctuations and flicker apply for equipment covered by the scope of the present document with an input current up to and including 16A per phase. For equipment with an input current of greater than 16A per phase EN 61000-3-11 [12] applies.2. As the section 6.1 of EN 6100-3-3, “Devices and Equipment that do(with the utmost probability) not generate relevant voltage fluctuations or flicker need not to be tested”. |

6.2 EMS (Immunity)

Performance Criteria of ETSI EN 301 489-1/17, sub clause 6

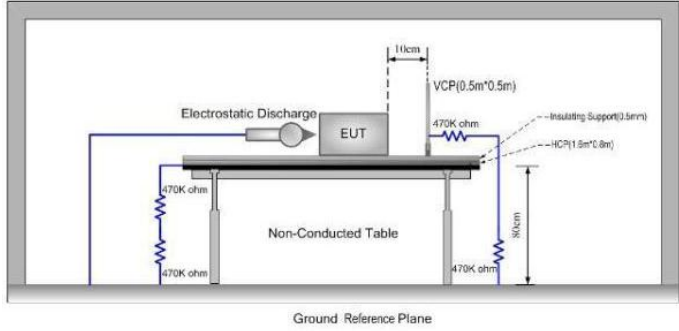
| Criteria | Performance Criteria of EN 301 489-1 clause 6 |
|----------|---|
| CT/CR | <p>During and after the test, the equipment shall continue to operate as intended. No degradation of performance or loss of function is allowed below a permissible performance level specified by the manufacturer when the equipment is used as intended. In some cases this permissible performance level may be replaced by a permissible loss of performance.</p> <p>During the test the EUT shall not unintentionally transmit or change its actual operating state and stored data.</p> <p>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.</p> |
| TT/TR | <p>For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:</p> <ul style="list-style-type: none"> • 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. • 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. <p>Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.</p> <p>For all other ports the following applies:</p> <ul style="list-style-type: none"> • 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 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. • 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. |

| Criteria | Performance Criteria of EN 301 489-17 clause 6 |
|----------|---|
| 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. |
| 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. |
| 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. |
| 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. |

Table 1: Performance criteria

| Criteria | During test | After test |
|---|--|--|
| A | Shall operate as intended. (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 3). 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 2). Shall be no unintentional transmissions. | Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no degradation of performance (see note 3). 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 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. | | |

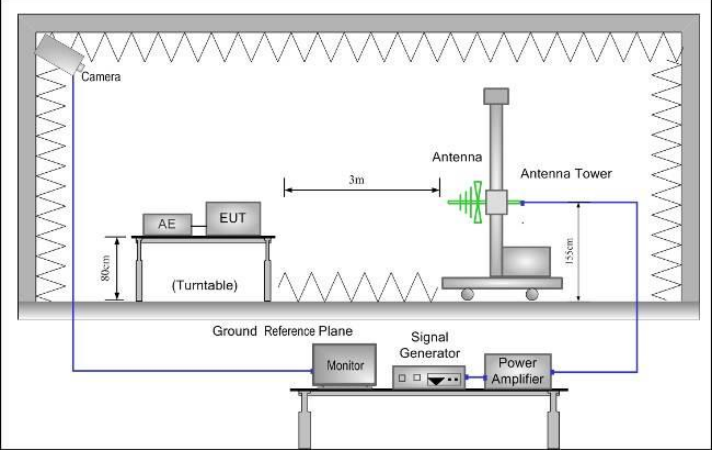
6.2.1 Electrostatic Discharge

| | |
|----------------------|--|
| Test Requirement: | ETSI EN 301 489-1 |
| Test Method: | EN 61000-4-2 |
| Discharge Voltage: | Contact Discharge, HCP and VCP: $\pm 2\text{kV}$, $\pm 4\text{kV}$, Air Discharge: $\pm 2\text{kV}$, $\pm 4\text{kV}$, $\pm 8\text{kV}$ |
| Polarity: | Positive & Negative |
| Number of Discharge: | Contact Discharge: Minimum 25 times at each test point, Air Discharge: Minimum 10 times at each test point. |
| Discharge Mode: | Single Discharge |
| Discharge Period: | 1 second minimum |
| Testsetup: |  |
| Test Procedure: | <p>1) Air discharge: The test was applied on non-conductive surfaces of EUT. The round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT. After each discharge, the discharge electrode was removed from the EUT. The generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. This procedure was repeated until all the air discharge completed</p> <p>2) Contact discharge: The test was applied on conductive surfaces of EUT. the generator was re-triggered for a new single discharge and repeated 10 times for each pre-selected test point. the tip of the discharge electrode was touch the EUT before the discharge switch was operated.</p> <p>3) Indirect discharge for horizontal coupling plane At least 10 single discharges shall be applied at the front edge of each HCP opposite the centre point of each unit of the EUT and 0.1m from the front of the EUT. The long axis of the discharge electrode shall be in the plane of the HCP and perpendicular to its front edge during the discharge. Consideration should be given to exposing all sides of the EUT.</p> <p>4) Indirect discharge for vertical coupling plane At least 10 single discharges were applied to the center of one vertical edge of the coupling plane. The coupling plane, of dimensions 0.5m X 0.5m, was placed parallel to, and positioned at a distance of 0.1m from the EUT. Discharges were applied to the coupling plane, with this plane in sufficient different positions that the four faces of the EUT are completely illuminated.</p> |
| Test environment: | Temp.: 26°C Humid.: 54% Press.: 101kPa |
| Test Instruments: | Refer to section 5.10 for details |
| Test mode: | Refer to section 5.3 for details |
| Test results: | Passed |

Measurement Record:

| | | | | |
|------------------------|---------------------------------------|-------------------|--------------------------------------|--------|
| Measurement Record: | | | | |
| Test points: | I: N/A | | | |
| | II: N/A | | | |
| Direct discharge | | | | |
| Discharge Voltage (KV) | Type of discharge | Test points | Observations (Performance Criterion) | Result |
| $\pm 2, \pm 4$ | Contact | II | N/A | N/A |
| $\pm 2, \pm 4, \pm 8$ | Air | I | N/A | N/A |
| Indirect discharge | | | | |
| Discharge Voltage (KV) | Type of discharge | Test points | Observation Performance | Result |
| $\pm 2, \pm 4$ | HCP-Bottom/Top/ Front/Back/Left/Right | Edge of the HCP | TT/TR | Pass |
| $\pm 2, \pm 4$ | VCP-Front/Back /Left/Right | Center of the VCP | TT/TR | Pass |

6.2.2 Radiated Immunity

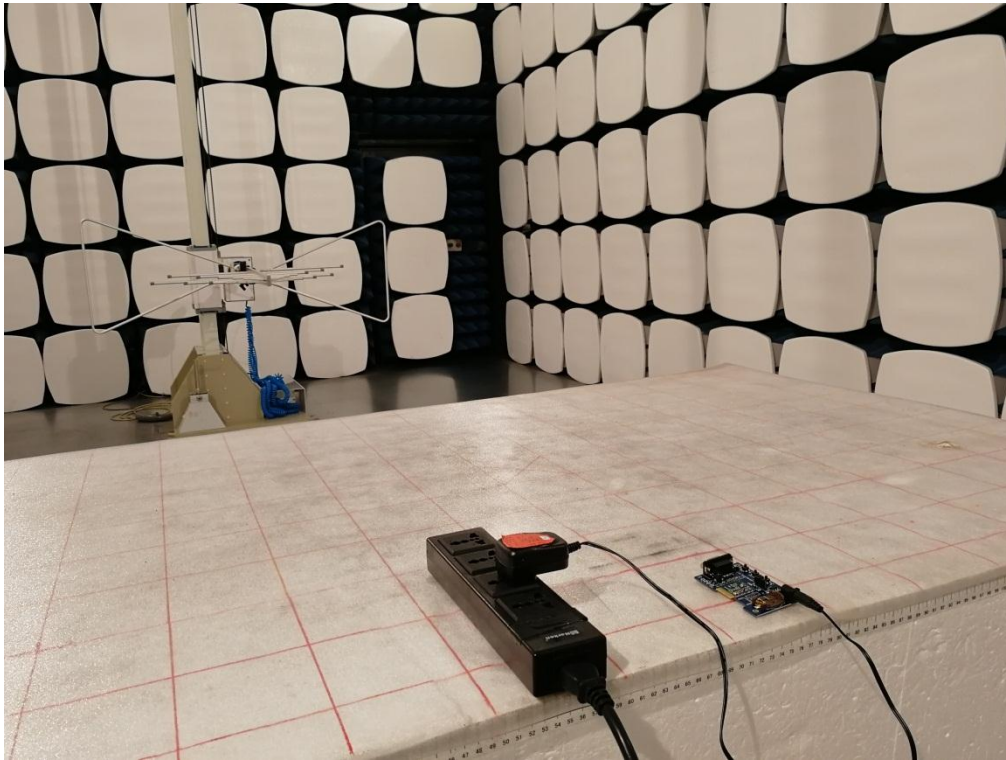
| | | | | | |
|-------------------|--|------|---------|-----|----------------|
| Test Requirement: | ETSI EN 301 489 -1 | | | | |
| Test Method: | EN 61000-4-3 | | | | |
| Frequency range: | 80MHz to 6GHz | | | | |
| Test Level: | 3V/m | | | | |
| Modulation: | 80%, 1kHz Amplitude Modulation | | | | |
| Testsetup: |  | | | | |
| Test Procedure: | <ol style="list-style-type: none"> 1. For table-top equipment, the EUT was placed in the chamber on a non-conductive table 0.8m high. For arrangement of floor-standing equipment, the EUT was mounted on a non-conductive support 0.1m above the supporting plane. For human body-mounted equipment, the EUT may be tested in the same manner as table top items. 2. If possible, a minimum of 1 m of cable is exposed to the electromagnetic field. Excess length of cables interconnecting units of the EUT shall be bundled low-inductively in the approximate center of the cable to form a bundle 30 cm to 40 cm in length. 3. The EUT was initially placed with one face coincident with the calibration plane. The EUT face being illuminated was contained within the UFA (Uniform Field Area). 4. The frequency ranges to be considered were swept with the signal modulated and pausing to adjust the RF signal level or to switch oscillators and antennas as necessary. Where the frequency range was swept incrementally, the step size was not exceed 1 % of the preceding frequency value. 5. The dwell time of the amplitude modulated carrier at each frequency was not be less than the time necessary for the EUT to be exercised and to respond, and was not less than 0,5 s. 6. The test normally was performed with the generating antenna facing each side of the EUT. 7. The polarization of the field generated by each antenna necessitates testing each selected side twice, once with the antenna positioned vertically and again with the antenna positioned horizontally. 8. The EUT was performed in a configuration to actual installation conditions, a video camera and/or a audio monitor were used to monitor the performance of the EUT. | | | | |
| Test environment: | Temp.: | 26°C | Humid.: | 54% | Press.: 101kPa |
| Test Instruments: | Refer to section 5.10 for details | | | | |
| Test mode: | Refer to section 5.3 for details | | | | |
| Test results: | Passed | | | | |

Measurement Record:

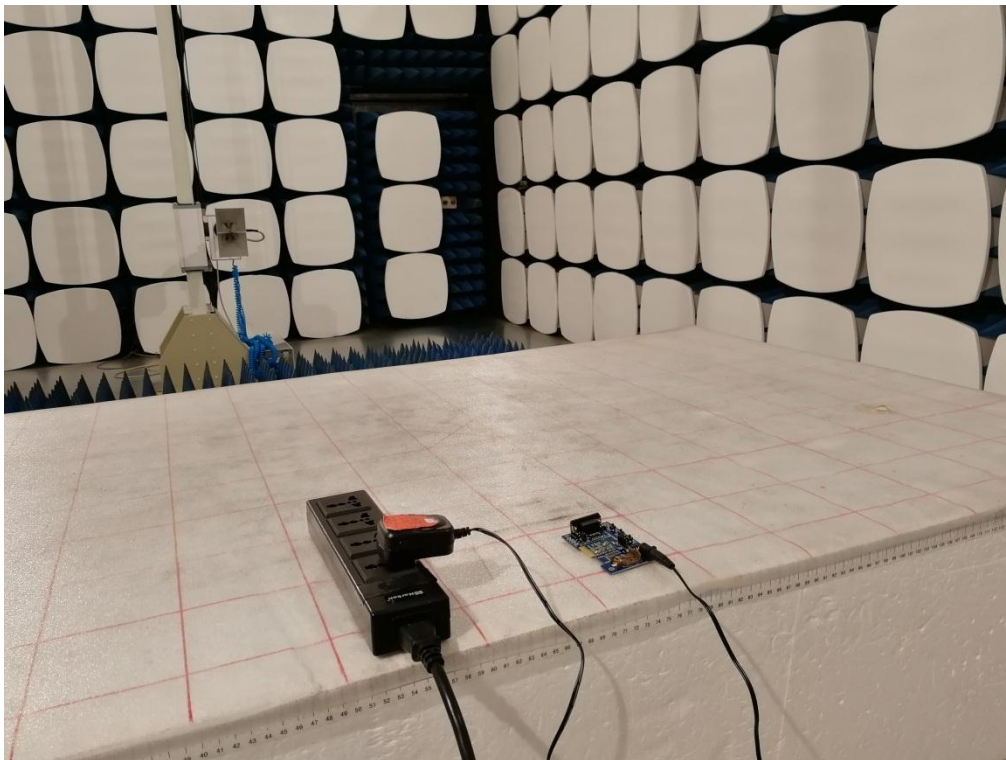
| Frequency | Level | Modulation | Antenna Polarization | EUT Face | Observations (Performance Criterion) | Result |
|------------|-------|---|----------------------|----------|--------------------------------------|--------|
| 80MHz-6GHz | 3V/m | 1kHz, 80% Amp. Mod, 1% increment, dwell time=3seconds | V | Front | CT/CR | Pass |
| | | | H | | | |
| | | | V | Rear | | |
| | | | H | | | |
| | | | V | Left | | |
| | | | H | | | |
| | | | V | Right | | |
| | | | H | | | |
| | | | V | Top | | |
| | | | H | | | |
| | | | V | Bottom | | |
| | | | H | | | |

7 Test Setup Photo

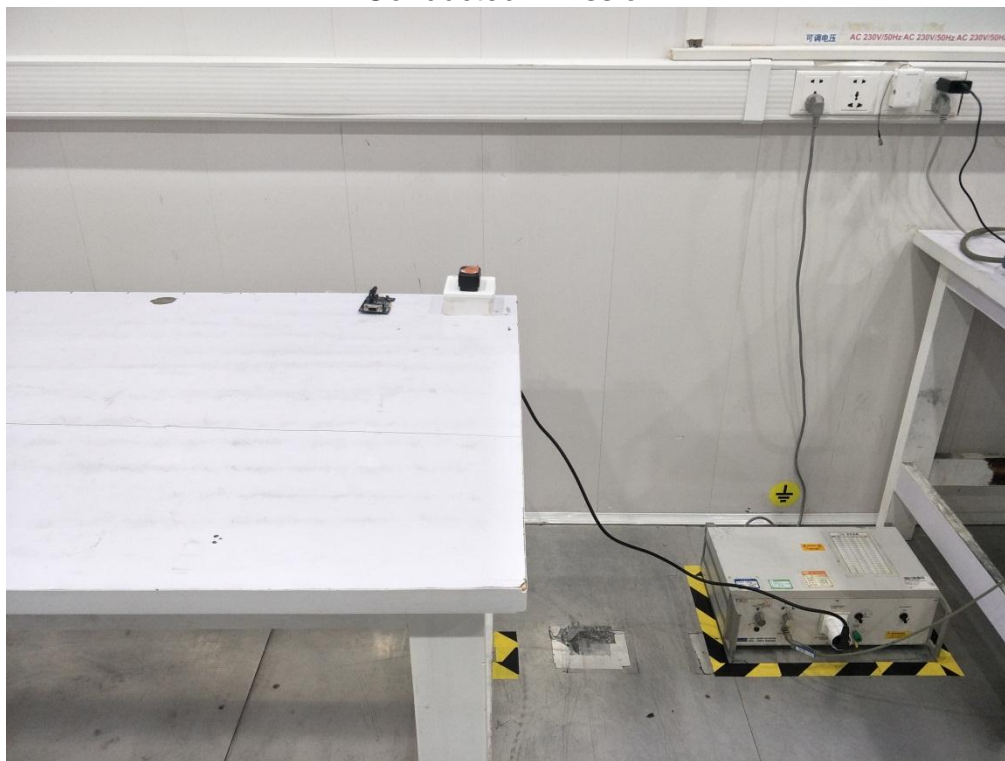
Radiated Emission Below 1GHz



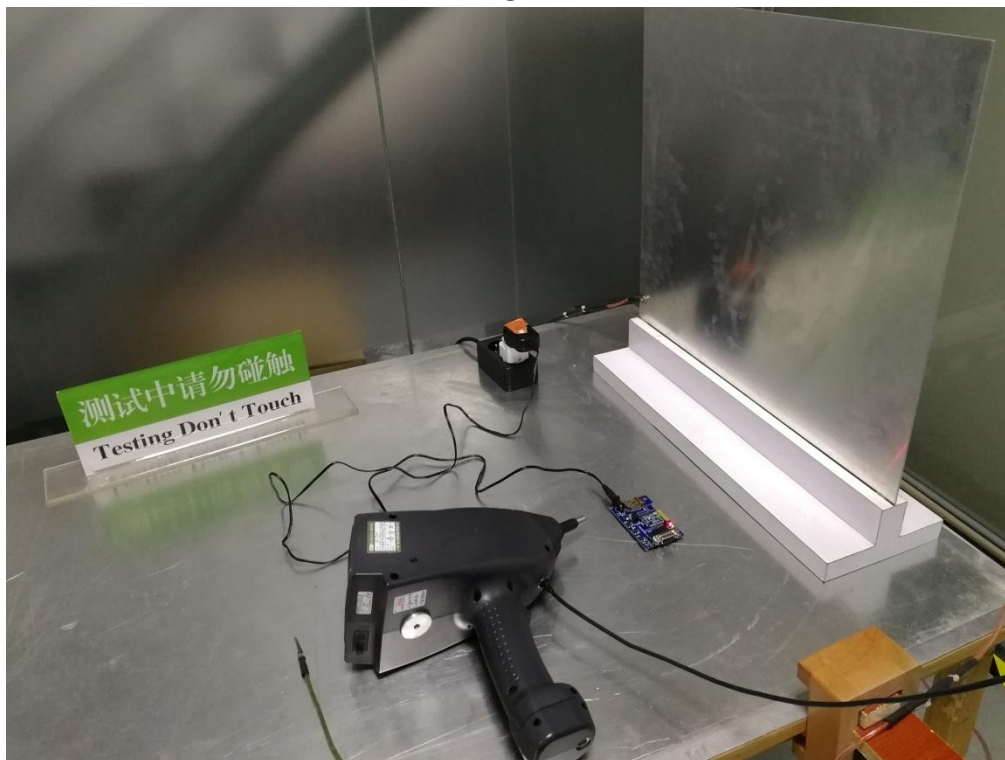
Radiated Emission Above 1GHz

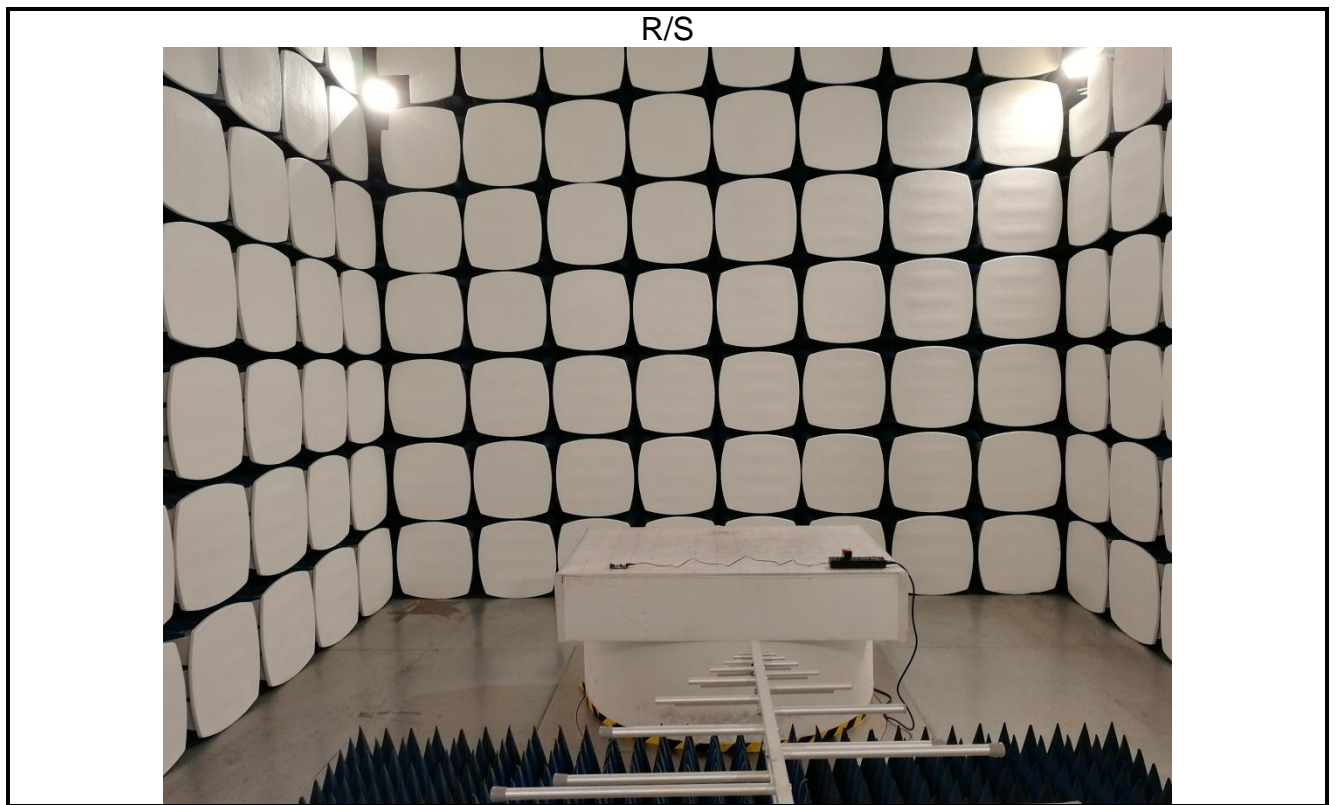


Conducted Emission

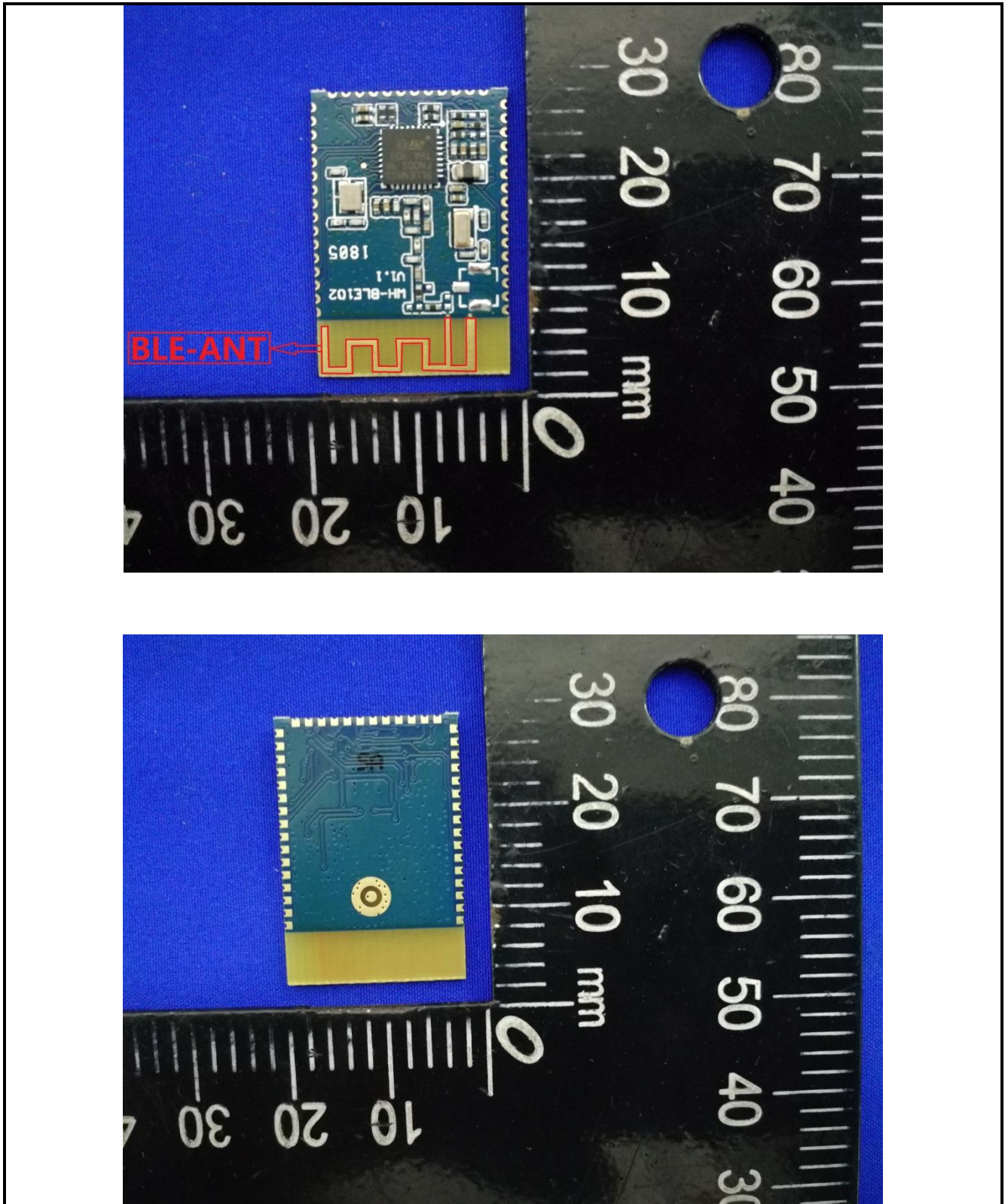


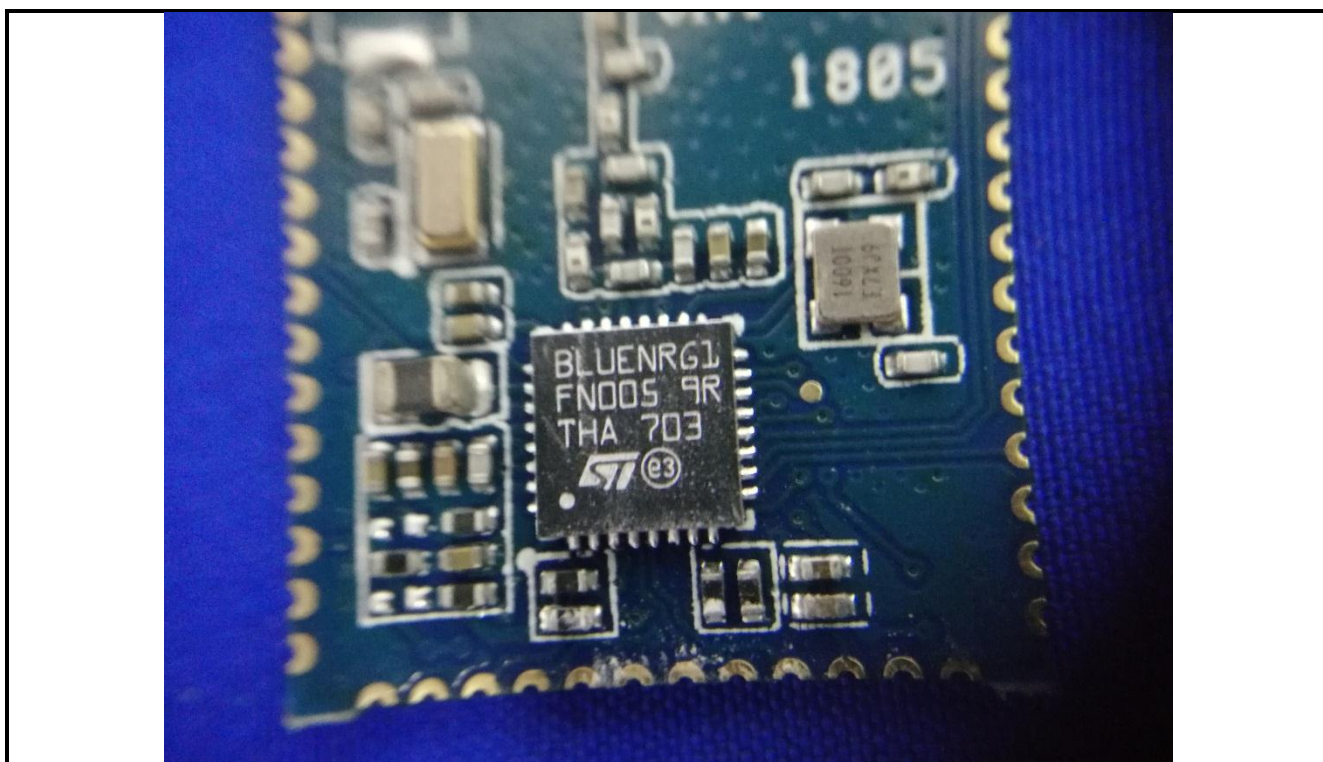
ESD





8 EUT Constructional Details





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