**SGS-CSTC Standards Technical Services Co., Ltd.**

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# *TEST REPORT*

| | |
|---|---|
| **Application No.:** | SZEM1408004752RF |
| **Applicant:** | Seeed Technology Limited |
| **Manufacturer:** | Seeed Technology Limited |
| **Factory:** | Seeed Technology Limited |
| Product Name: | LinkIt ONE |
| Model No.(EUT): | LinkIt ONE v1.0 |
| Trade Mark: | LinkIt ONE |
| **Standards:** | EN 301 489-1 V1.9.2 (2011-09)<br>EN 301 489-17 V2.2.1 (2012-09) |
| **Date of Receipt:** | 2014-09-09 |
| **Date of Test:** | 2014-10-17 to 2014-10-28 |
| **Date of Issue:** | 2014-11-21 |
| **Test Result:** | **PASS *** |

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.
* The other tests (e.g. Low Voltage Directive 2006/95/EC) required in R&TTE Directive 1999/5/EC were not included in the report, only part tests related to EMC were performed and reported in this report. Hence to clarify compliance with R&TTE directive 1999/5/EC shall comply with the other essential required tests additionally.

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.

Authorized Signature:




Jack Zhang
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.
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. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

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# 2 Test Summary

| Electromagnetic Compatibility (EMC) Part | | | | |
|---|---|---|---|---|
| **Electromagnetic Interference (EMI)** | | | | |
| **Test** | **Test Requirement** | **Test Method** | **Limit** | **Result** |
| **Radiated Emission** | EN 301 489-17 V2.2.1 (2012-09)Clause 7.1 | EN 301 489-1 V1.9.2 (2011-09) Clause 8.2 | Clause 8.2.3 | PASS |
| **Conducted Emission (AC port)** | EN 301 489-17 V2.2.1 (2012-09) Clause 7.1 | EN 301 489-1 V1.9.2 (2011-09) Clause 8.4 | Clause 8.4.3 | PASS |
| **Harmonic Emission on AC, 50Hz to 2kHz** | EN 301 489-17 V2.2.1 (2012-09) Clause 7.1 | EN 301 489-1 V1.9.2 (2011-09) Clause 8.5 | Clause 8.5 | PASS |
| **Flicker Emission on AC** | EN 301 489-17 V2.2.1 (2012-09) Clause 7.1 | EN 301 489-1 V1.9.2 (2011-09) Clause 8.6 | Clause 8.6 | PASS |
| **Electromagnetic Susceptibility(EMS)** | | | | |
| **ESD (Electrostatic Discharge)** | EN 301 489-17 V2.2.1 (2012-09) Clause 7.2 | EN 301 489-1 V1.9.2 (2011-09) Clause 9.3 | Clause 9.3.3 | PASS |
| **Radiated Immunity, 80MHz to 2.7 GHz** | EN 301 489-17 V2.2.1 (2012-09) Clause 7.2 | EN 301 489-1 V1.9.2 (2011-09) Clause 9.2 | Clause 9.2.3 | PASS |
| **EFT (Electrical Fast Transients)** | EN 301 489-17 V2.2.1 (2012-09) Clause 7.2 | EN 301 489-1 V1.9.2 (2011-09) Clause 9.4 | Clause 9.4.3 | PASS |
| **Surge Immunity** | EN 301 489-17 V2.2.1 (2012-09) Clause 7.2 | EN 301 489-1 V1.9.2 (2011-09) Clause 9.8 | Clause 9.8.3 | PASS |
| **Injected Currents 150kHz to 80MHz** | EN 301 489-17 V2.2.1 (2012-09) Clause 7.2 | EN 301 489-1 V1.9.2 (2011-09) Clause 9.5 | Clause 9.5.3 | PASS |
| **Voltage Dips and Interruptions** | EN 301 489-17 V2.2.1 (2012-09) Clause 7.2 | EN 301 489-1 V1.9.2 (2011-09) Clause 9.7 | Clause 9.7.3 | PASS |

Remark:

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

N/A: In this whole report not application.

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# 4 General Information

## 4.1 Client Information

| | |
|---|---|
| Applicant: | Seeed Technology Limited |
| Address of Applicant: | 5th Floor, 8th Building, shilling industrial Park, XiLi Town, NanShan dist. Shenzhen, Guangdong, China |
| Manufacturer: | Seeed Technology Limited |
| Address of Manufacturer: | 5th Floor, 8th Building, shilling industrial Park, XiLi Town, NanShan dist. Shenzhen, Guangdong, China |
| Factory: | Seeed Technology Limited |
| Address of Factory: | 5th Floor, 8th Building, shilling industrial Park, XiLi Town, NanShan dist. Shenzhen, Guangdong, China |

## 4.2 General Description of EUT

| | |
|---|---|
| Product Name: | LinkIt ONE |
| Model No.: | LinkIt ONE v1.0 |
| Trade Mark: | LinkIt ONE |
| Sample Type: | Fixed production |
| Antenna Type: | Dedicated |
| Antenna Gain: | 2 dBi |
| USB Cable: | 80cm (shieldeded) |
| Earphone Cable: | 100 cm (Unshielded) |
| **For Bluetooth** | |
| Frequency Range: | 2402MHz to 2480MHz |
| Bluetooth Version: | V4.0 dual mode |
| Modulation Technique: | Frequency Hopping Spread Spectrum(FHSS) |
| Modulation Type: | GFSK for BLE mode<br>GFSK ; Pi/4DQPSK ; 8DPSK for classical mode |
| Number of Channels: | 40 for BLE mode<br>79 for classical mode |
| **For Wi-Fi** | |
| Type of Modulation: | IEEE for 802.11b: DSSS (CCK, DQPSK, DBPSK)<br>IEEE for 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK)<br>IEEE for 802.11n (HT20 and HT40): OFDM (64QAM, 16QAM, QPSK, BPSK) |
| Operating Frequency: | IEEE 802.11b/g/n(HT20): 2412MHz to 2472MHz<br>IEEE 802.11n(HT40): 2422MHz to 2462MHz |
| Type of Modulation: | IEEE for 802.11b: DSSS (CCK, DQPSK, DBPSK)<br>IEEE for 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK)<br>IEEE for 802.11n (HT20 and HT40): OFDM (64QAM, 16QAM, QPSK, BPSK) |
| Operating Frequency: | IEEE 802.11b/g/n(HT20): 2412MHz to 2472MHz<br>IEEE 802.11n(HT40): 2422MHz to 2462MHz |

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## 4.3 Details of EUT

| | |
|---|---|
| EUT power supply: | Battery Lithium-ion<br>Nominal voltage: 3.7V |
| Test Voltage: | AC 230V 50Hz |
| Test Mode: | |
| Bluetooth mode: | Audio playback from 2.4GHz Bluetooth source |
| AC Charge + Bluetooth: | Keep the EUT communicate with other Bluetooth devices e and AC charge it |
| Wi-Fi mode: | The EUT wireless linked to TP-link router, Switching packets. |
| AC Charge + Wi-Fi mode: | The EUT wireless linked to TP-link router, Switching packets and AC charge. |
| Idle mode: | The EUT power on idle mode |

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## 4.4 Description of Support Units

The EUT has been tested with associated equipment below.

| Description | Manufacturer | Model No. |
|---|---|---|
| For Bluetooth | | |
| iPhone5 | Apple | A1429 |
| For Wi-Fi | | |
| Router | TP-link | N/A |

## 4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch E&E Lab

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

## 4.6 Test Facility

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

- **CNAS (No. CNAS L2929)**

  CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **VCCI**

  The 10m Semi-anechoic chamber and Shielded Room (7.5m x 4.0m x 3.0m) of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-823, R-4188, T-1153 and C-2383 respectively.

- **FCC – Registration No.: 556682**

  SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen 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 No.: 556682.

- **Industry Canada (IC)**

  Two 3m Semi-anechoic chambers of SGS-CSTC Standards Technical Services Co., Ltd. have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1 & 4620C-2.

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## 4.7 Deviation from Standards

None.

## 4.8 Abnormalities from Standard Conditions

None.

## 4.9 Other Information Requested by the Customer

None.

## 4.10 Monitoring of EUT for the Immunity Test

Visual: Monitored the communication of the EUT.

Audio: None.

## 4.11 Measurement Uncertainty (95% confidence levels, k=2)

| No. | Item | Measurement Uncertainty |
|---|---|---|
| 1 | Conduction emission | 3.45dB (9kHz to 150kHz) |
| | | 3.0dB (150kHz to 30MHz) |
| 2 | Radiated emission | 4.5dB (30MHz-1GHz ) |
| | | 4.8dB (1GHz-6GHz ) |
| 3 | Temperature test | 1℃ |
| 4 | Humidity test | 3% |
| 5 | DC power test | 0.5 % |

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# 5 Equipment List

| RE in Chamber（30MHz-1GHz） | | | | | |
|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Due date (yyyy-mm-dd)** |
| 1 | 3m Semi-Anechoic Chamber | ETS-LINDGREN | N/A | SEL0017 | 2015-06-10 |
| 2 | EMI Test Receiver | Agilent Technologies | N9038A | SEL0312 | 2015-09-16 |
| 3 | EMI Test software | AUDIX | E3 | SEL0050 | N/A |
| 4 | Coaxial cable | SGS | N/A | SEL0027 | 2015-05-29 |
| 5 | Coaxial cable | SGS | N/A | SEL0189 | 2015-05-29 |
| 6 | BiConiLog Antenna (26-3000MHz) | ETS-LINDGREN | 3142C | SEL0015 | 2015-10-24 |
| 7 | Pre-amplifier (0.1-1300MHz) | Agilent Technologies | 8447D | SEL0053 | 2015-05-16 |
| 8 | Band filter | Amindeon | 82346 | SEL0094 | 2015-05-16 |
| 9 | Signal Generator | Rohde & Schwarz | SMY01 | SEL0155 | 2015-10-24 |
| 10 | Barometer | Chang Chun | DYM3 | SEL0088 | 2015-05-16 |
| 11 | Humidity/ Temperature Indicator | Shanhai Qixiang | ZJ1-2B | SEL0103 | 2015-10-24 |
| 12 | DC Power Supply | Zhao Xin | RXN-305D | SEL0117 | 2015-10-24 |
| 13 | Signal Generator (10M-27GHz) | Rohde & Schwarz | SMR27 | SEL0067 | 2015-05-16 |

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| Re (above 1GHz) | | | | | |
|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Due date (yyyy-mm-dd)** |
| 1 | Shielding effectiveness of Anechoic Chamber | ChangZhou ZhongYu | 854 | SEL0169 | 2015-06-10 |
| 2 | DC Power Supply | Zhao Xin | RXN-305D | SEL0117 | 2015-10-24 |
| 3 | Spectrum Analyzer | Rohde & Schwarz | FSP | SEL0154 | 2015-10-24 |
| 4 | Pre-Amplifier (0.1-26.5GHz) | Compliance Directions Systems Inc. | PAP-0126 | SEL0168 | 2015-10-24 |
| 5 | Positioning | ChangZhou ZhongYu | CC-C-IF | SEL0127 | N/A |
| 6 | EMI Test Software | Audix | E3 | SEL0050 | N/A |
| 7 | Coaxial cable | SGS | N/A | SEL0172 | 2015-05-29 |
| 8 | Coaxial cable | SGS | N/A | SEL0173 | 2015-05-29 |
| 9 | Signal Generator | Rohde & Schwarz | SML03 | SEL0068 | 2015-05-16 |
| 10 | Double-ridged horn (1-18GHz) | ETS-LINDGREN | 3117 | SEL0006 | 2015-10-24 |
| 11 | Humidity/ Temperature Indicator | HYGRO | ZJ1-2B | SEL0033 | 2015-10-24 |
| 12 | Barometer | ChangChun | DYM3 | SEL0088 | 2015-05-16 |
| 13 | Band filter | amideon | 82346 | SEL0094 | 2015-05-16 |
| 14 | Signal Generator (10M-27GHz) | Rohde & Schwarz | SMR27 | SEL0067 | 2015-05-16 |

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| Conducted Emission | | | | | |
|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Due date (yyyy-mm-dd)** |
| 1 | Shielding Room | ZhongYu Electron | GB-88 | SEL0042 | 2015-06-10 |
| 2 | LISN | Rohde & Schwarz | ENV216 | SEL0152 | 2015-10-24 |
| 3 | LISN | ETS-LINDGREN | 3816/2 | SEL0021 | 2015-05-16 |
| 4 | 8 Line ISN | Fischer Custom Communications Inc. | FCC-TLISN-T8-02 | SEL0162 | 2015-08-30 |
| 5 | 4 Line ISN | Fischer Custom Communications Inc. | FCC-TLISN-T4-02 | SEL0163 | 2015-08-30 |
| 6 | 2 Line ISN | Fischer Custom Communications Inc. | FCC-TLISN-T2-02 | SEL0164 | 2015-08-30 |
| 7 | EMI Test Receiver | Rohde & Schwarz | ESCI | SEL0022 | 2015-05-16 |
| 8 | Coaxial Cable | SGS | N/A | SEL0025 | 2015-05-29 |
| 9 | DC Power Supply | Zhao Xin | RXN-305D | SEL0117 | 2015-10-24 |
| 10 | Humidity/ Temperature Indicator | Shanhai Qixiang | ZJ1-2B | SEL0103 | 2015-10-24 |
| 11 | Barometer | Chang Chun | DYM3 | SEL0088 | 2015-05-16 |

| Harmonics / Flicker test | | | | | |
|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Due date (yyyy-mm-dd)** |
| 1 | AC Power Source | California Instruments | 5001ix | SEL0052 | 2015-05-16 |
| 2 | Power Analyzer | California Instruments | PACS-1 | SEL0051 | 2015-05-16 |
| 3 | CTS 3.0 Software | California Instruments | N/A | SEL0087 | N/A |
| 4 | Barometer | Chang Chun | DYM3 | SEL0088 | 2015-05-16 |

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| ESD | | | | | |
|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Due date (yyyy-mm-dd)** |
| 1 | ESD Simulator | SCHAFFNER | NSG 438 | SEL0035 | 2015-03-16 |
| 2 | ESD Ground Plane | SGS(3m*3m) | N/A | SEL0004 | N/A |
| 3 | Humidity/ Temperature Indicator | Shanhai Qixiang | ZJ1-2B | SEL0101 | 2015-10-24 |
| 4 | DC Power Supply | Zhao Xin | RXN-305D | SEL0117 | 2015-10-24 |
| 5 | Barometer | Chang Chun | DYM3 | SEL0088 | 2015-05-16 |

| EFT, Surge, Voltage dips and Interruption, Power-frequency Magnetic Field | | | | | |
|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Due date (yyyy-mm-dd)** |
| 1 | EMC Immunity Test System | Thermo ELECTRON | EMCPro Plus | SEL0007 | 2015-10-24 |
| 2 | ProPLUS Capacitive Clamp | Thermo ELECTRON | N/A | SEL0008 | N/A |
| 3 | MAGNETIC FIELD IMMUNITY LOOP | FCC | F-1000-4-8/ 9/10-L-1M | SEL0010 | 2015-10-24 |
| 4 | Barometer | Chang Chun | DYM3 | SEL0088 | 2015-05-16 |

| Conducted Immunity | | | | | |
|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Due date (yyyy-mm-dd)** |
| 1 | RF-Generator | SCHAFFNER | NSG 2070 | SEL0039 | 2015-10-24 |
| 2 | Coupling/Decoupling Network | SCHAFFNER | CDN M016 | SEL0040 | 2015-10-24 |
| 3 | EM CLAMP | SCHAFFNER | KEMZ 801 | SEL0041 | 2015-10-24 |
| 4 | DC Power Supply | Zhao Xin | RXN-305D | SEL0117 | 2015-10-24 |
| 5 | Barometer | Chang Chun | DYM3 | SEL0088 | 2015-05-16 |

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| Radiated Immunity | | | | | |
|---|---|---|---|---|---|
| **Item** | **Test Equipment** | **Manufacturer** | **Model No.** | **Inventory No.** | **Cal.Due date (yyyy-mm-dd)** |
| 1 | 3m Semi-Anechoic Chamber | ETS-LINDGREN | N/A | SEL0017 | 2015-06-10 |
| 2 | Signal Generator | Rohde & Schwarz | SML03 | SEL0068 | 2015-05-16 |
| 3 | RF Amplifier 30M-1GHz | Amplifier Research | 250W1000A | SEL0066 | 2015-10-24 |
| 4 | RF Amplifier 0.8-3.0GHz | Amplifier Research | 60S1G3 | SEL0065 | 2015-10-24 |
| 5 | Power Meter | Rohde & Schwarz | NRVD | SEL0069 | 2015-05-16 |
| 6 | Power Sensor | Rohde & Schwarz | URV5-Z2 | SEL0071 | 2015-05-16 |
| 7 | Power Sensor | Rohde & Schwarz | URV5-Z2 | SEL0072 | 2015-05-16 |
| 8 | Software EMC32 | Rohde & Schwarz | EMC32-S | SEL0082 | N/A |
| 9 | Log-periodic Antenna | Amplifier Research | AT1080 | SEL0073 | N/A |
| 10 | Antenna Tripod | Amplifier Research | TP1000A | SEL0074 | N/A |
| 11 | High Gain Horn Antenna (0.8-5GHz) | Amplifier Research | AT4002A | SEL0075 | N/A |
| 12 | DC Power Supply | Zhao Xin | RXN-305D | SEL0117 | 2015-10-24 |
| 13 | Humidity/ Temperature Indicator | HYGRO | ZJ1-2B | SEL0033 | 2015-10-24 |
| 14 | Barometer | ChangChun | DYM3 | SEL0088 | 2015-05-16 |
| 15 | NOISE GENERATOR | Beijin daming jidian | DM1660 | EMC0047 | 2015-10-24 |

Note: The calibration interval is one year, all the instruments are valid.

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# 6 EMC Requirements Specification in EN 301 489-17

**EMI in EN 301 489-1, sub clause 7.1 table 1.**

**EMS in EN 301 489-1, sub clause 7.2 table 2.**

## 6.1 EMI (Emission)

### 6.1.1 Radiated Emission

**Test Requirement:** EN 301 489-17 Clause 7.1

**Test Method:** EN 301 489-1 Clause 8.2.2

**EUT Operation:**

Ambient: Temp.: 23.0 °C Humid.: 56 % Press.: 1020 mbar

Test Mode: Bluetooth mode, WIFI mode, AC Charge + wifi mode and AC Charge + Bluetooth mode.

Test Status: Pretest the EUT at different test modes and found the AC Charge + Bluetooth mode and AC Charge + Wi-Fi mode which were worst cases, the test worst case modes are recorded in the report.

**Receive Setup:**

| Frequency range (MHz) | Detector | RBW | VBW |
|---|---|---|---|
| 30-1000 | Quasi-peak | 120kHz | 300kHz |
| Above 1000 | Peak | 1MHz | 3MHz |

**Limit:**

| Frequency | Limit(@3m) | Remark |
|---|---|---|
| 30MHz-230MHz | 40dBuv/m | QP value |
| 230MHz-1GHz | 47dBuv/m | QP value |
| 1GHz-3GHz | 50dBuv/m | Average value |
| | 70dBuv/m | PK value |
| 3GHz-6GHz | 54dBuv/m | Average value |
| | 74dBuv/m | PK value |

**Test Setup:**

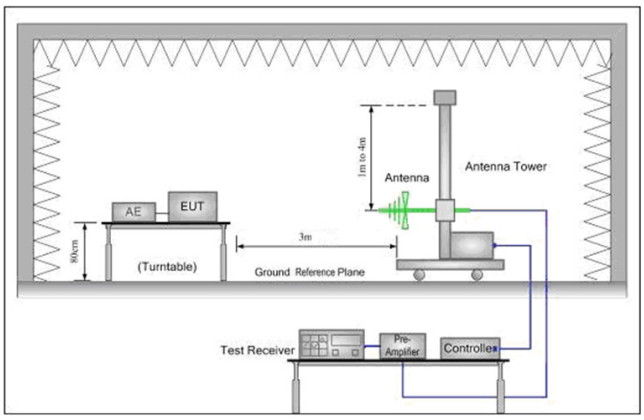



Figure 1. 30MHz to 1GHz

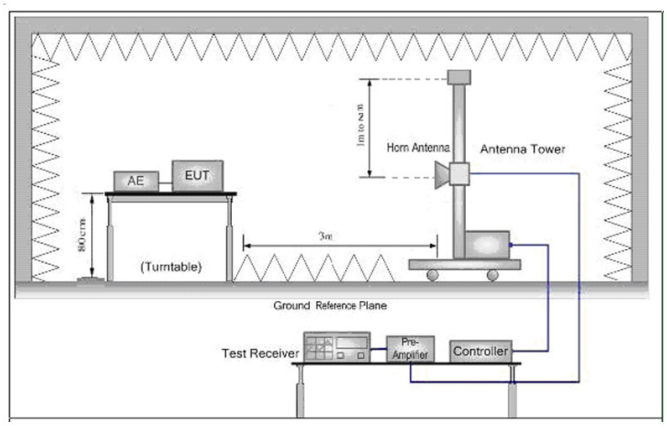



Figure 2. Above 1 GHz

**Test Procedure:**

1. From 30 MHz to1GHz test procedure as below:

1) The radiated emissions were tested in a semi-anechoic chamber.

2) The EUT is placed on a turntable, which is 0.8m above ground plane.

3) The turntable shall be rotated for 360 degrees to determine the position of

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maximum emission level.

4) EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
5) Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6) And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7) Repeat above procedures until the measurements for all frequencies are complete.

2. Above 1GHz test procedure as below:

1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and receiving antenna is moved from 1m to 2m.

**Equipment Used:** Refer to section 5 for details.

**Measurement Data:**

**For Bluetooth:**

**Below 1GHz(QP)**

| Frequency (MHz) | Cable Loss (dB) | Antenna Factor (dB/m) | Preamp Factor (dB) | Read Level (dBuV) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarity |
|---|---|---|---|---|---|---|---|---|
| 30.962 | 0.60 | 18.09 | 27.35 | 41.01 | 32.35 | 40 | -7.65 | Vertical |
| 50.409 | 0.80 | 8.63 | 27.29 | 36.56 | 18.70 | 40 | -21.30 | Vertical |
| 103.806 | 1.21 | 8.90 | 27.17 | 27.55 | 10.49 | 40 | -29.51 | Vertical |
| 183.201 | 1.37 | 9.97 | 26.76 | 27.82 | 12.40 | 40 | -27.60 | Vertical |
| 339.589 | 2.03 | 14.27 | 26.70 | 27.16 | 16.76 | 47 | -30.24 | Vertical |
| 446.414 | 2.40 | 16.83 | 27.42 | 27.78 | 19.59 | 47 | -27.41 | Vertical |
| 30.000 | 0.60 | 18.70 | 27.36 | 40.46 | 32.40 | 40 | -7.60 | Horizontal |
| 55.221 | 0.80 | 7.88 | 27.28 | 36.79 | 18.19 | 40 | -21.81 | Horizontal |
| 104.536 | 1.21 | 8.87 | 27.17 | 29.53 | 12.44 | 40 | -27.56 | Horizontal |
| 184.490 | 1.38 | 9.99 | 26.75 | 26.64 | 11.26 | 40 | -28.74 | Horizontal |
| 638.369 | 2.78 | 20.55 | 27.49 | 24.01 | 19.85 | 47 | -27.15 | Horizontal |
| 916.069 | 3.62 | 23.26 | 26.71 | 24.39 | 24.56 | 47 | -22.44 | Horizontal |

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**Above 1GHz**
**Peak measurement**

| Frequency (MHz) | Cable Loss (dB) | Antenna Factor (dB/m) | Preamp Factor (dB) | Read Level (dBuV) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarity |
|---|---|---|---|---|---|---|---|---|
| 1082.028 | 12.47 | 24.14 | 37.95 | 50.22 | 48.88 | 70 | -21.12 | Vertical |
| 1209.161 | 11.20 | 24.23 | 37.97 | 49.10 | 46.56 | 70 | -23.44 | Vertical |
| 2168.510 | 5.71 | 28.05 | 38.10 | 46.68 | 42.34 | 70 | -27.66 | Vertical |
| 3698.711 | 7.80 | 32.50 | 38.45 | 42.42 | 44.27 | 74 | -29.73 | Vertical |
| 4253.498 | 8.53 | 33.65 | 38.62 | 40.04 | 43.60 | 74 | -30.40 | Vertical |
| 5768.088 | 10.12 | 34.22 | 38.92 | 39.32 | 44.74 | 74 | -29.26 | Vertical |
| 1133.628 | 11.94 | 24.17 | 37.96 | 52.13 | 50.28 | 70 | -19.72 | Horizontal |
| 1774.224 | 6.83 | 26.64 | 38.06 | 51.55 | 46.96 | 70 | -23.04 | Horizontal |
| 1961.484 | 5.68 | 28.00 | 38.09 | 52.12 | 47.71 | 70 | -22.29 | Horizontal |
| 3199.044 | 7.05 | 31.79 | 38.23 | 45.04 | 45.65 | 74 | -28.35 | Horizontal |
| 3698.711 | 7.80 | 32.50 | 38.45 | 43.10 | 44.95 | 74 | -29.05 | Horizontal |
| 5585.026 | 9.96 | 34.31 | 38.89 | 41.97 | 47.35 | 74 | -26.65 | Horizontal |

**Average measurement**

| Frequency (MHz) | Cable Loss (dB) | Antenna Factor (dB/m) | Preamp Factor (dB) | Read Level (dBuV) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarity |
|---|---|---|---|---|---|---|---|---|
| 1082.028 | 12.47 | 24.14 | 37.95 | 36.61 | 35.27 | 50 | -14.73 | Vertical |
| 1209.161 | 11.20 | 24.23 | 37.97 | 35.90 | 33.36 | 50 | -16.64 | Vertical |
| 2168.510 | 5.71 | 28.05 | 38.10 | 33.29 | 28.95 | 50 | -21.05 | Vertical |
| 3698.711 | 7.80 | 32.50 | 38.45 | 32.61 | 34.46 | 54 | -19.54 | Vertical |
| 4253.498 | 8.53 | 33.65 | 38.62 | 30.00 | 33.56 | 54 | -20.44 | Vertical |
| 5768.088 | 10.12 | 34.22 | 38.92 | 30.20 | 35.62 | 54 | -18.38 | Vertical |
| 1133.628 | 11.94 | 24.17 | 37.96 | 35.40 | 33.55 | 50 | -16.45 | Horizontal |
| 1774.224 | 6.83 | 26.64 | 38.06 | 36.19 | 31.60 | 50 | -18.40 | Horizontal |
| 1961.484 | 5.68 | 28.00 | 38.09 | 5.81 | 1.40 | 50 | -48.60 | Horizontal |
| 3199.044 | 7.05 | 31.79 | 38.23 | 33.20 | 33.81 | 54 | -20.19 | Horizontal |
| 3698.711 | 7.80 | 32.50 | 38.45 | 30.11 | 31.96 | 54 | -22.04 | Horizontal |
| 5585.026 | 9.96 | 34.31 | 38.89 | 30.79 | 36.17 | 54 | -17.83 | Horizontal |

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**For Wi-Fi:**

**Below 1GHz(QP)**

| Frequency (MHz) | Cable Loss (dB) | Antenna Factor (dB/m) | Preamp Factor (dB) | Read Level (dBuV) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarity |
|---|---|---|---|---|---|---|---|---|
| 30.000 | 0.60 | 18.70 | 27.36 | 30.92 | 22.86 | 40 | -17.14 | Vertical |
| 104.536 | 1.21 | 8.87 | 27.17 | 33.87 | 16.78 | 40 | -23.22 | Vertical |
| 324.456 | 1.98 | 14.78 | 26.58 | 31.59 | 21.77 | 47 | -25.23 | Vertical |
| 432.546 | 2.34 | 16.55 | 27.33 | 30.02 | 21.58 | 47 | -25.42 | Vertical |
| 711.674 | 2.94 | 21.60 | 27.40 | 26.33 | 23.47 | 47 | -23.53 | Vertical |
| 875.247 | 3.51 | 23.00 | 26.89 | 25.14 | 24.76 | 47 | -22.24 | Vertical |
| 30.962 | 0.60 | 18.09 | 27.35 | 27.76 | 19.10 | 40 | -20.90 | Horizontal |
| 185.138 | 1.38 | 10.00 | 26.75 | 26.52 | 11.15 | 40 | -28.85 | Horizontal |
| 321.061 | 1.97 | 14.66 | 26.56 | 27.41 | 17.48 | 47 | -29.52 | Horizontal |
| 533.832 | 2.64 | 18.64 | 27.64 | 25.71 | 19.35 | 47 | -27.65 | Horizontal |
| 656.530 | 2.82 | 20.81 | 27.47 | 25.83 | 21.99 | 47 | -25.01 | Horizontal |
| 925.756 | 3.63 | 23.30 | 26.64 | 24.98 | 25.27 | 47 | -21.73 | Horizontal |

**Above 1GHz**

**Peak measurement**

| Frequency (MHz) | Cable Loss (dB) | Antenna Factor (dB/m) | Preamp Factor (dB) | Read Level (dBuV) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarity |
|---|---|---|---|---|---|---|---|---|
| 1582.001 | 8.14 | 26.08 | 38.04 | 41.06 | 37.24 | 70 | -32.76 | Vertical |
| 1809.539 | 6.60 | 26.78 | 38.07 | 45.58 | 40.89 | 70 | -29.11 | Vertical |
| 3020.781 | 6.75 | 30.82 | 38.15 | 40.67 | 40.09 | 74 | -33.91 | Vertical |
| 3785.876 | 7.93 | 32.84 | 38.48 | 40.46 | 42.75 | 74 | -31.25 | Vertical |
| 4284.092 | 8.57 | 33.69 | 38.63 | 41.17 | 44.80 | 74 | -29.20 | Vertical |
| 5417.471 | 9.80 | 34.39 | 38.86 | 40.63 | 45.96 | 74 | -28.04 | Vertical |
| 1467.318 | 8.99 | 25.29 | 38.02 | 41.67 | 37.93 | 70 | -32.07 | Horizontal |
| 1812.785 | 6.58 | 26.81 | 38.07 | 45.93 | 41.25 | 70 | -28.75 | Horizontal |
| 3268.571 | 7.16 | 31.80 | 38.27 | 41.62 | 42.31 | 74 | -31.69 | Horizontal |
| 3854.321 | 8.02 | 32.96 | 38.51 | 40.55 | 43.02 | 74 | -30.98 | Horizontal |
| 4865.277 | 9.24 | 34.17 | 38.76 | 41.43 | 46.08 | 74 | -27.92 | Horizontal |
| 5476.026 | 9.85 | 34.36 | 38.87 | 40.74 | 46.08 | 74 | -27.92 | Horizontal |

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**Average measurement**

| Frequency (MHz) | Cable Loss (dB) | Antenna Factor (dB/m) | Preamp Factor (dB) | Read Level (dBuV) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarity |
|---|---|---|---|---|---|---|---|---|
| 1582.001 | 8.14 | 26.08 | 38.04 | 28.40 | 24.58 | 70 | -45.42 | Vertical |
| 1809.539 | 6.60 | 26.78 | 38.07 | 30.61 | 25.92 | 70 | -44.08 | Vertical |
| 3020.781 | 6.75 | 30.82 | 38.15 | 29.49 | 28.91 | 74 | -45.09 | Vertical |
| 3785.876 | 7.93 | 32.84 | 38.48 | 30.30 | 32.59 | 74 | -41.41 | Vertical |
| 4284.092 | 8.57 | 33.69 | 38.63 | 31.70 | 35.33 | 74 | -38.67 | Vertical |
| 5417.471 | 9.80 | 34.39 | 38.86 | 30.29 | 35.62 | 74 | -38.38 | Vertical |
| 1467.318 | 8.99 | 25.29 | 38.02 | 29.51 | 25.77 | 50 | -24.23 | Horizontal |
| 1812.785 | 6.58 | 26.81 | 38.07 | 33.80 | 29.12 | 50 | -20.88 | Horizontal |
| 3268.571 | 7.16 | 31.80 | 38.27 | 30.90 | 31.59 | 54 | -22.41 | Horizontal |
| 3854.321 | 8.02 | 32.96 | 38.51 | 30.60 | 33.07 | 54 | -20.93 | Horizontal |
| 4865.277 | 9.24 | 34.17 | 38.76 | 32.39 | 37.04 | 54 | -16.96 | Horizontal |
| 5476.026 | 9.85 | 34.36 | 38.87 | 30.70 | 36.04 | 54 | -17.96 | Horizontal |

**Remark:**

1) The EUT was test at 3m in field chamber.

**Level = Read Level + Antenna Factor + Cable Loss – Preamp Factor.**

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## 6.1.2 Conducted Emission

**Test Requirement:** EN 301 489-17 Clause 7.1

**Test Method:** EN 301 489-1 Clause 8.4.2

**Detector:** Peak for pre-scan (9kHz Resolution Bandwidth)

Quasi-Peak if maximized peak within 6dB of Quasi-Peak limit

**EUT Operation:**

Ambient: Temp.: 23.0 °C Humid.: 55 % Press.: 1005 mbar

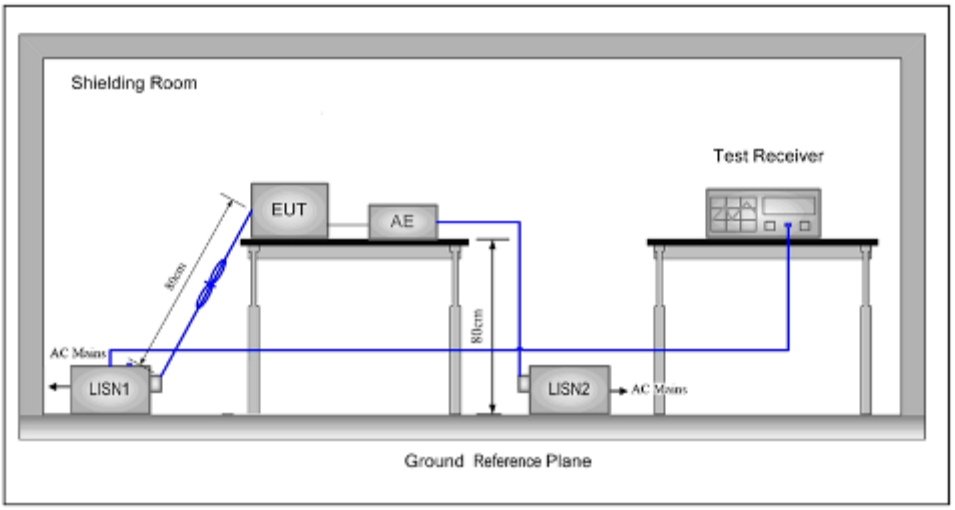
Test Mode: AC Charge + Bluetooth mode and AC Charge + wifi mode.

**Equipment Used:** Refer to section 5 for details.

**Limit:** Limits for conducted disturbance at the mains ports of class B

| Frequency Range (MHz) | Class B Limit (dBuV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |
| NOTE 1: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz. | | |
| NOTE 2: The lower limit is applicable at the transition frequency. | | |

**Test Setup:**




**Test Procedure:**

1) The mains terminal disturbance voltage test was conducted in a shielded room.

2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a 50Ω/50µH + 5Ω linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.

3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground

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reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane.

4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the LISN 2.

**Measurement Data:**

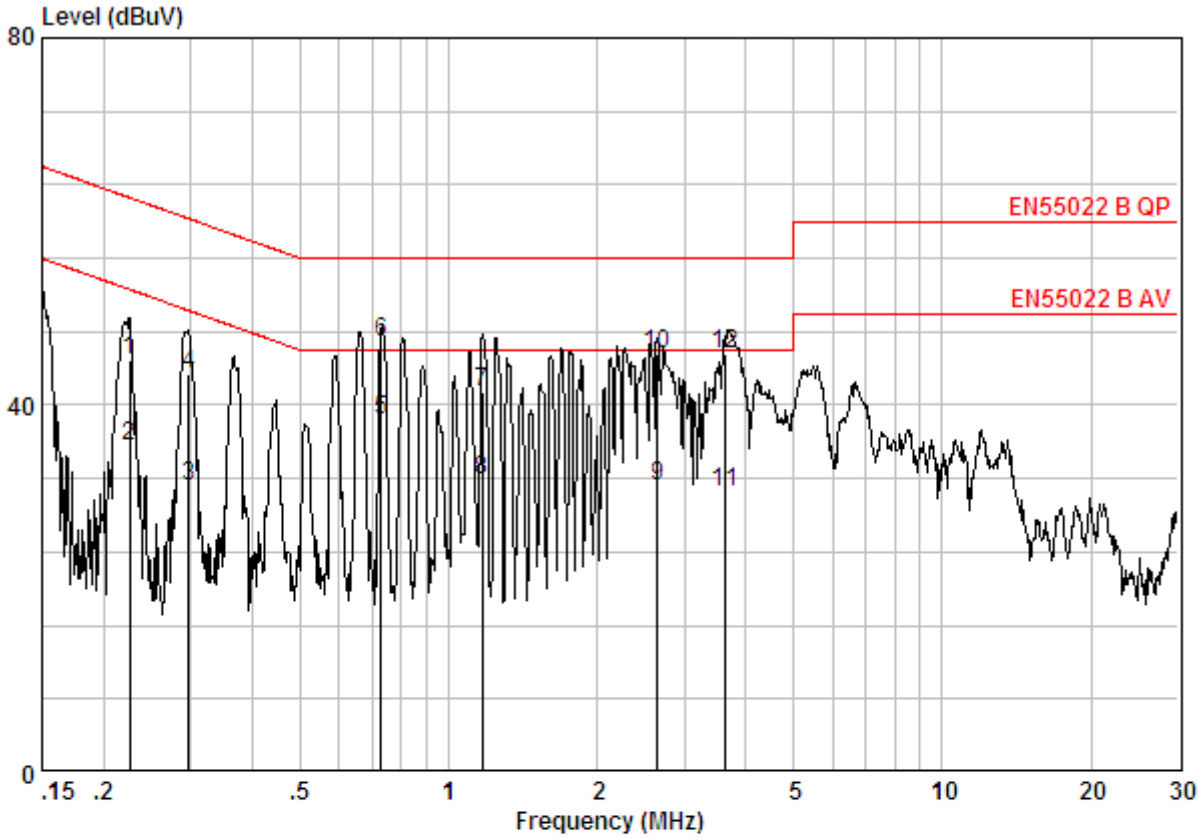
An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

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**For Bluetooth mode:**

**Live Line:**

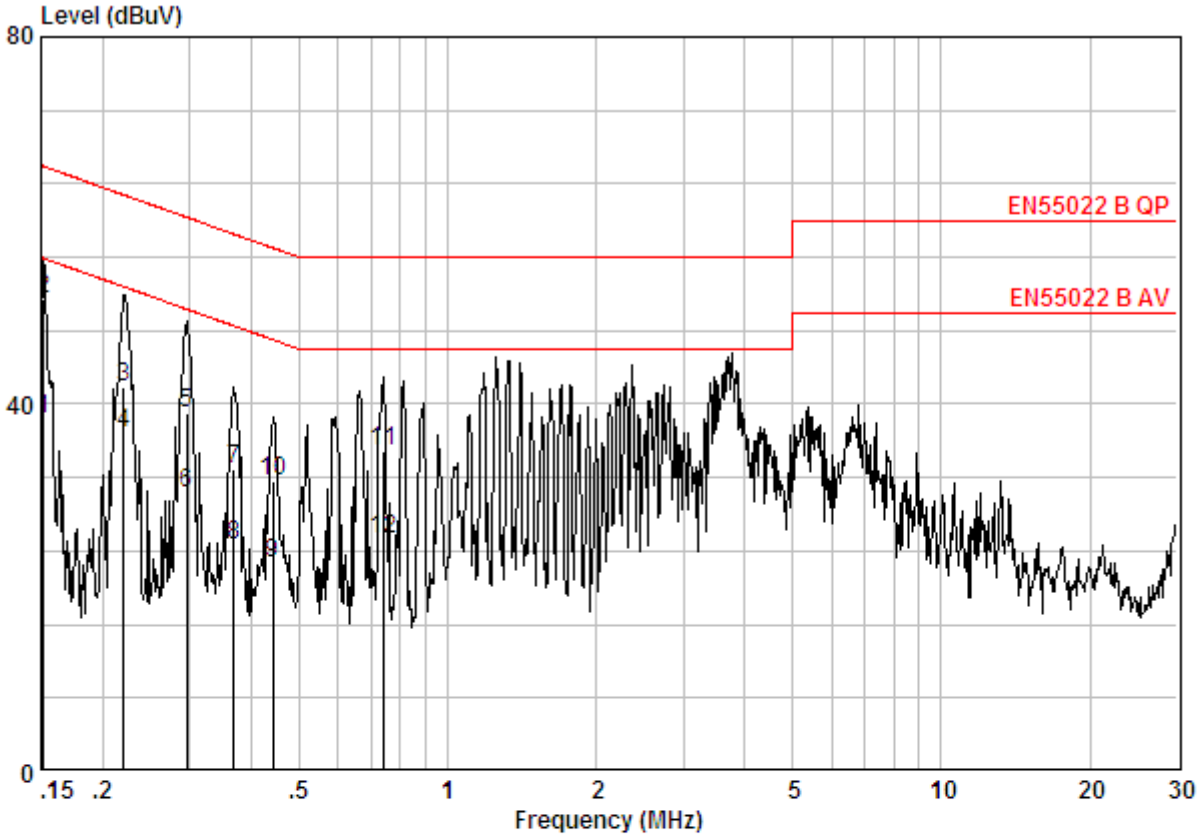



Site : Shielding Room
Condition : EN55022 B QP CE LINE
Job No. : 4752RF
Mode : AC charge + BT

| | Freq | Cable Loss | LISN Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB | dBuV | dBuV | dBuV | dB | |
| 1 | 0.22556 | 0.02 | 9.70 | 35.15 | 44.87 | 62.61 | -17.74 | QP |
| 2 | 0.22556 | 0.02 | 9.70 | 25.78 | 35.50 | 52.61 | -17.11 | Average |
| 3 | 0.29711 | 0.01 | 9.70 | 21.40 | 31.11 | 50.32 | -19.21 | Average |
| 4 | 0.29711 | 0.01 | 9.70 | 33.70 | 43.41 | 60.32 | -16.91 | QP |
| 5 @ | 0.73000 | 0.02 | 9.80 | 28.60 | 38.42 | 46.00 | -7.58 | Average |
| 6 @ | 0.73000 | 0.02 | 9.80 | 37.10 | 46.92 | 56.00 | -9.08 | QP |
| 7 | 1.170 | 0.02 | 9.80 | 31.60 | 41.42 | 56.00 | -14.58 | QP |
| 8 | 1.170 | 0.02 | 9.80 | 22.00 | 31.82 | 46.00 | -14.18 | Average |
| 9 | 2.650 | 0.02 | 9.83 | 21.40 | 31.25 | 46.00 | -14.75 | Average |
| 10 | 2.650 | 0.02 | 9.83 | 35.80 | 45.65 | 56.00 | -10.35 | QP |
| 11 | 3.640 | 0.02 | 9.87 | 20.70 | 30.58 | 46.00 | -15.42 | Average |
| 12 | 3.640 | 0.02 | 9.87 | 35.70 | 45.58 | 56.00 | -10.42 | QP |

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**Neutral Line:**



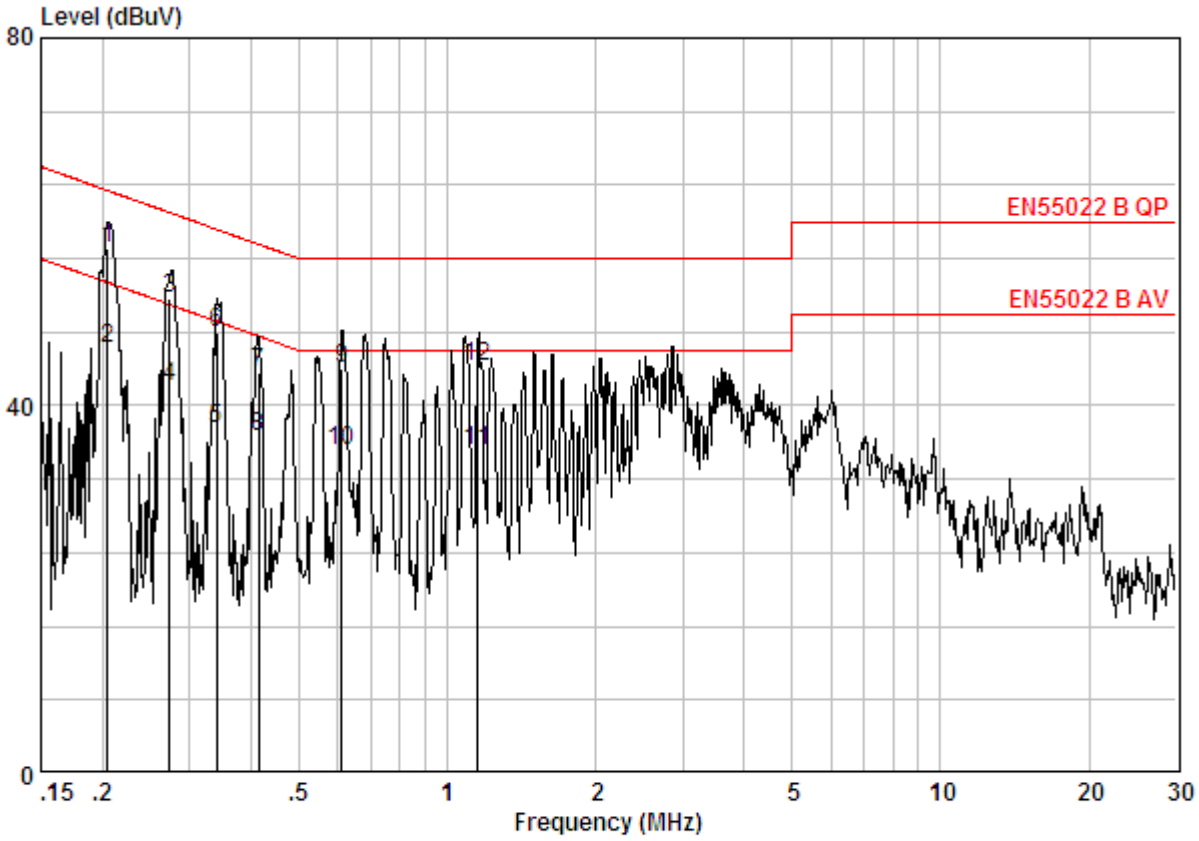

Site : Shielding Room
Condition : EN55022 B QP CE NEUTRAL
Job No. : 4752RF
Mode : AC charge + BT

| | Freq | Cable Loss | LISN Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB | dBuV | dBuV | dBuV | dB | |
| 1 | 0.15160 | 0.02 | 9.70 | 28.68 | 38.40 | 55.91 | -17.51 | Average |
| 2 | 0.15160 | 0.02 | 9.70 | 41.80 | 51.52 | 65.91 | -14.39 | QP |
| 3 | 0.22083 | 0.02 | 9.70 | 32.11 | 41.82 | 62.79 | -20.96 | QP |
| 4 | 0.22083 | 0.02 | 9.70 | 27.07 | 36.79 | 52.79 | -16.00 | Average |
| 5 | 0.29554 | 0.01 | 9.70 | 29.34 | 39.05 | 60.37 | -21.32 | QP |
| 6 | 0.29554 | 0.01 | 9.70 | 20.66 | 30.37 | 50.37 | -20.00 | Average |
| 7 | 0.36920 | 0.01 | 9.77 | 23.05 | 32.83 | 58.52 | -25.69 | QP |
| 8 | 0.36920 | 0.01 | 9.77 | 14.78 | 24.56 | 48.52 | -23.96 | Average |
| 9 | 0.44208 | 0.01 | 9.80 | 12.90 | 22.71 | 47.02 | -24.31 | Average |
| 10 | 0.44208 | 0.01 | 9.80 | 21.73 | 31.54 | 57.02 | -25.48 | QP |
| 11 | 0.73910 | 0.02 | 9.80 | 25.13 | 34.95 | 56.00 | -21.05 | QP |
| 12 | 0.73910 | 0.02 | 9.80 | 15.45 | 25.27 | 46.00 | -20.73 | Average |

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**For Wi-Fi:**

**Live Line:**

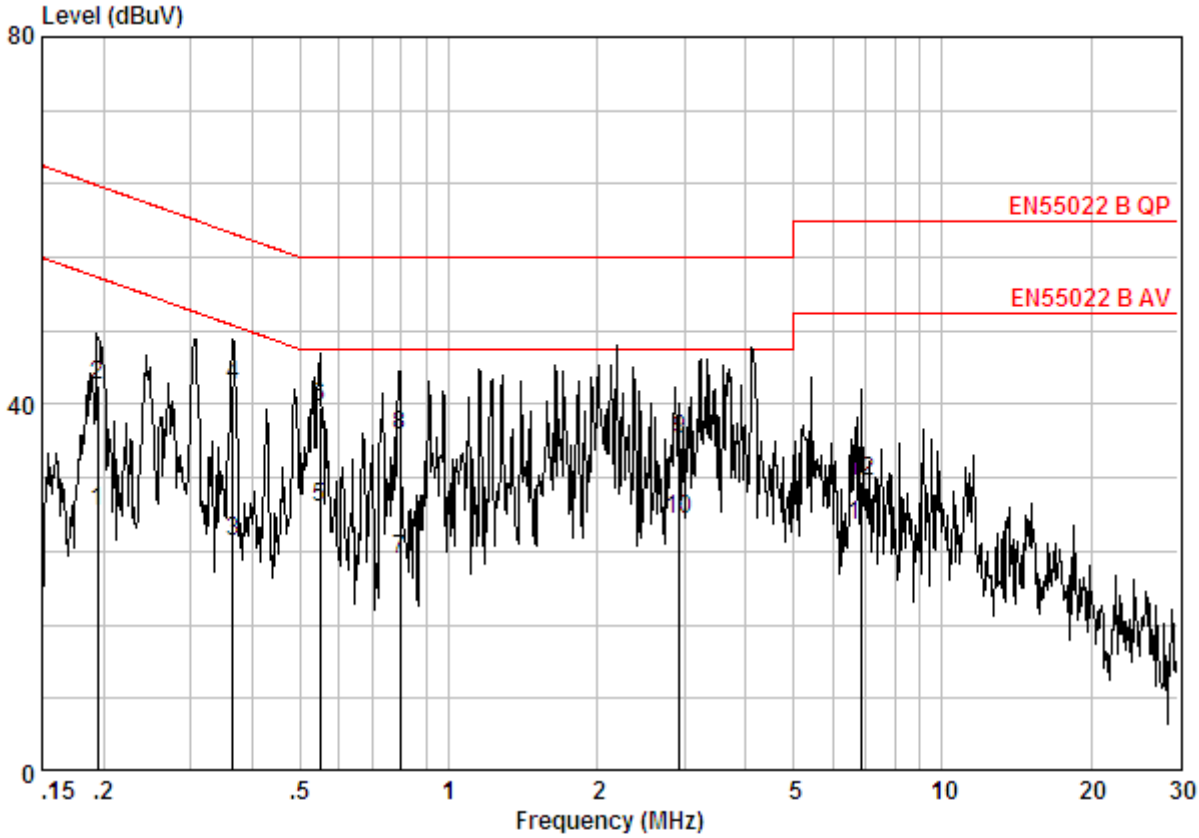



Site : Shielding Room
Condition : EN55022 B QP CE LINE
Job No. : 4752RF
Mode : AC charge +WIFI mode

| | Freq | Cable Loss | LISN Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dB | dB | dBuV | dBuV | dBuV | dB | |
| 1 @ | 0.20500 | 0.02 | 9.70 | 47.40 | 57.12 | 63.41 | -6.29 | QP |
| 2 @ | 0.20500 | 0.02 | 9.70 | 36.40 | 46.12 | 53.41 | -7.29 | Average |
| 3 @ | 0.27400 | 0.01 | 9.70 | 42.00 | 51.71 | 61.00 | -9.28 | QP |
| 4 @ | 0.27400 | 0.01 | 9.70 | 32.40 | 42.11 | 51.00 | -8.88 | Average |
| 5 | 0.34100 | 0.01 | 9.74 | 27.83 | 37.59 | 49.18 | -11.59 | Average |
| 6 | 0.34100 | 0.01 | 9.74 | 38.18 | 47.93 | 59.18 | -11.24 | QP |
| 7 | 0.41485 | 0.01 | 9.80 | 33.70 | 43.51 | 57.55 | -14.04 | QP |
| 8 | 0.41485 | 0.01 | 9.80 | 26.82 | 36.63 | 47.55 | -10.92 | Average |
| 9 | 0.61075 | 0.02 | 9.80 | 34.16 | 43.98 | 56.00 | -12.02 | QP |
| 10 | 0.61075 | 0.02 | 9.80 | 25.32 | 35.14 | 46.00 | -10.86 | Average |
| 11 | 1.150 | 0.02 | 9.80 | 25.20 | 35.02 | 46.00 | -10.98 | Average |
| 12 | 1.150 | 0.02 | 9.80 | 34.50 | 44.32 | 56.00 | -11.68 | QP |

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**Neutral Line:**




Site : Shielding Room
Condition : EN55022 B QP CE NEUTRAL
Job No. : 4752RF
Mode : AC charge + WIFI mode

| | | Freq | Cable Loss | LISN Factor | Read Level | Level | Limit Line | Over Limit | Remark |
|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dB | dB | dBuV | dBuV | dBuV | dB | |
| 1 | | 0.19447 | 0.02 | 9.70 | 18.65 | 28.37 | 53.84 | -25.47 | Average |
| 2 | | 0.19447 | 0.02 | 9.70 | 32.40 | 42.12 | 63.84 | -21.72 | QP |
| 3 | | 0.36531 | 0.01 | 9.77 | 15.27 | 25.05 | 48.61 | -23.56 | Average |
| 4 | | 0.36531 | 0.01 | 9.77 | 32.37 | 42.15 | 58.61 | -16.46 | QP |
| 5 | | 0.54934 | 0.01 | 9.80 | 18.88 | 28.69 | 46.00 | -17.31 | Average |
| 6 | @ | 0.54934 | 0.01 | 9.80 | 29.78 | 39.59 | 56.00 | -16.41 | QP |
| 7 | | 0.79600 | 0.02 | 9.80 | 13.26 | 23.08 | 46.00 | -22.92 | Average |
| 8 | | 0.79600 | 0.02 | 9.80 | 26.77 | 36.59 | 56.00 | -19.41 | QP |
| 9 | | 2.931 | 0.02 | 9.84 | 26.25 | 36.11 | 56.00 | -19.89 | QP |
| 10 | | 2.931 | 0.02 | 9.84 | 17.61 | 27.47 | 46.00 | -18.53 | Average |
| 11 | | 6.878 | 0.01 | 9.99 | 16.85 | 26.85 | 50.00 | -23.15 | Average |
| 12 | | 6.878 | 0.01 | 9.99 | 21.66 | 31.67 | 60.00 | -28.33 | QP |

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### 6.1.3 Harmonics Test Results

**Test Requirement:** EN 301 489-17

**Test Method:** EN 301 489-1 Clause 8.5

**Test Result:** See Remark Below

**Remark:**

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.

For further details, please refer to Clause 7 of EN 61000-3-2 which states:

“For the following categories of equipment, limits are not specified in this standard.

- equipment with a rated power of 75W or less, other than lighting equipment.”

### 6.1.4 Flicker Test Results

**Test Requirement:** EN 301 489-17 Clause 7.1

**Test Method:** EN 301 489-1 Clause 8.6

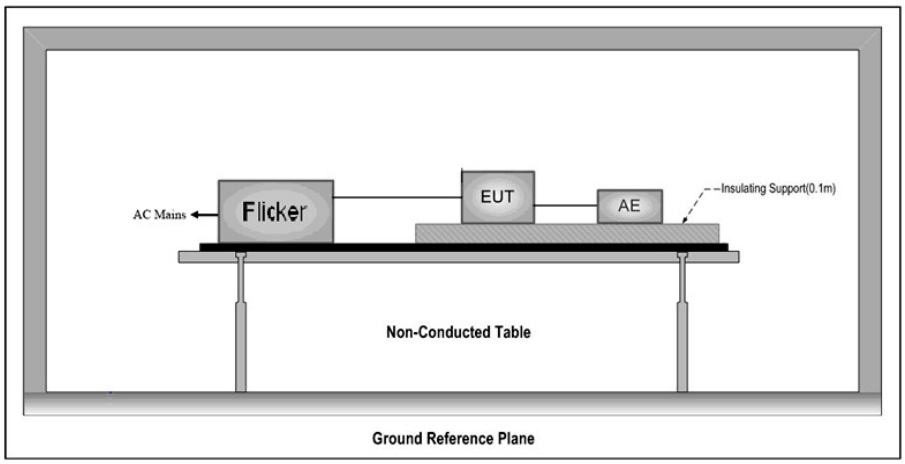
**EUT Operation:**

Ambient: Temp.: 23.0 °C Humid.: 55 % Press.:1020 mbar

Test Mode: AC Charge + Bluetooth mode and AC Charge + wifi mode.

**Equipment Used:** Refer to section 5 for details.

**Test Setup:**



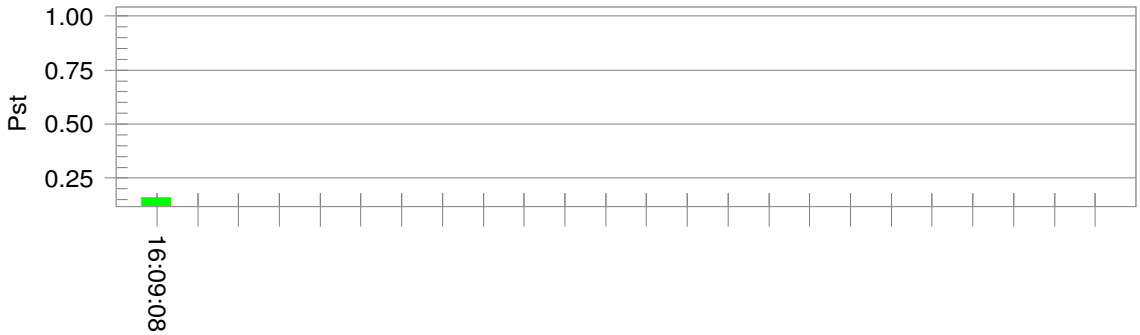

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**Test Data:**

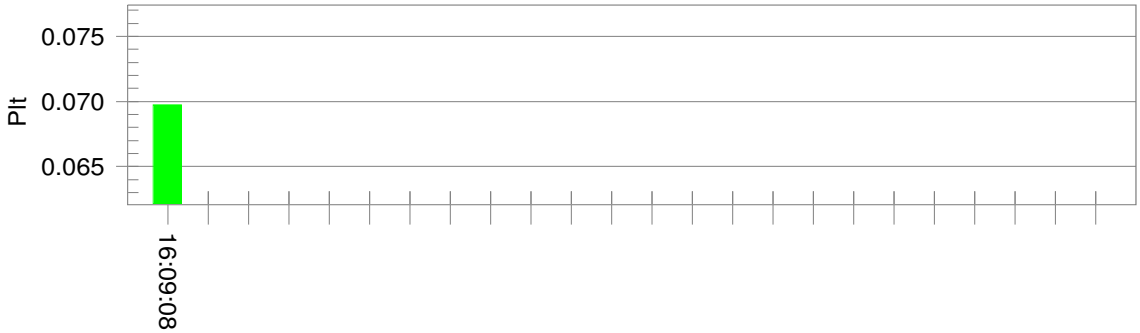
**For Bluetooth:**

**Test Result: Pass** **Status: Test Completed**

**$Pst_i$ and limit line** **European Limits**




**Plt and limit line**




**Parameter values recorded during the test:**

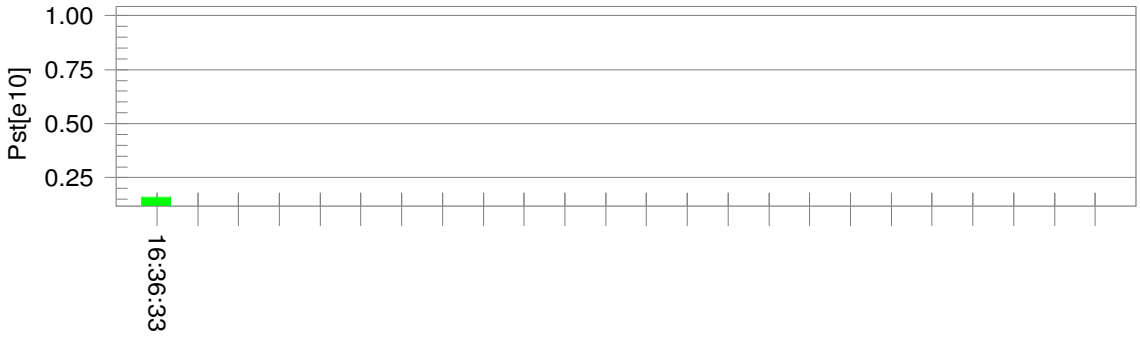
| | | | | |
|---|---|---|---|---|
| **Vrms at the end of test (Volt):** | **230.18** | | | |
| **Highest dt (%):** | **0.13** | **Test limit (%):** | **3.30** | **Pass** |
| **Time(mS) > dt:** | **0.0** | **Test limit (mS):** | **500.0** | **Pass** |
| **Highest dc (%):** | **0.00** | **Test limit (%):** | **3.30** | **Pass** |
| **Highest dmax (%):** | **0.07** | **Test limit (%):** | **4.00** | **Pass** |
| **Highest Pst (10 min. period):** | **0.160** | **Test limit:** | **1.000** | **Pass** |

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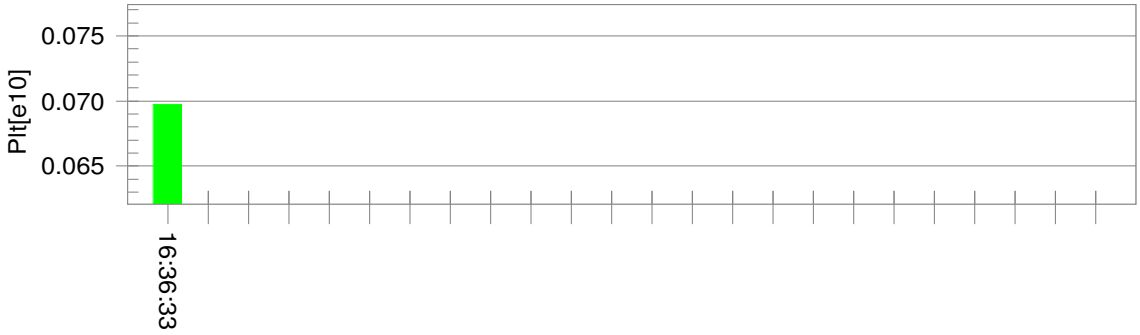
**For Wi-Fi:**

**Test Result: Pass** **Status: Test Completed**

**$Pst_i$ and limit line** **European Limits**




**Plt and limit line**




**Parameter values recorded during the test:**

| | | | | |
|---|---|---|---|---|
| **Vrms at the end of test (Volt):** | **230.00** | | | |
| **Highest dt (%):** | **-0.14** | **Test limit (%):** | **3.30** | **Pass** |
| **Time(mS) > dt:** | **0.0** | **Test limit (mS):** | **500.0** | **Pass** |
| **Highest dc (%):** | **0.00** | **Test limit (%):** | **3.30** | **Pass** |
| **Highest dmax (%):** | **-0.06** | **Test limit (%):** | **4.00** | **Pass** |
| **Highest Pst (10 min. period):** | **0.160** | **Test limit:** | **1.000** | **Pass** |

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## 6.2 EMS (Immunity)

**Performance Criteria of EN 301 489-17, sub clause 6.2 table 1.**

| Criteria | During test | After test |
|---|---|---|
| A | Shall operate as intended<br>May show degradation of performance (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 2)<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 (see note 1)<br>No unintentional transmissions | Functions shall be self-recoverable<br>Shall operate as intended after recovering<br>Shall be no degradation of performance (see note 2)<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 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 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.

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### 6.2.1 Radiated Immunity

**Test Requirement:** EN 301 489-17 Clause 7.2
**Test Method:** EN 301 489-1 Clause 9.2.2
**EUT Operation:**
Ambient: Temp.: 24.0 °C Humid.:52 % Press.: 1010 mbar
Test Mode: Bluetooth mode, AC charge+ Bluetooth mode, wifi mode, AC Charge+ wifi mode and Idle mode.
**Criterion Required:** A
**Equipment Used:** Refer to section 5 for details.
**Test Setup:**

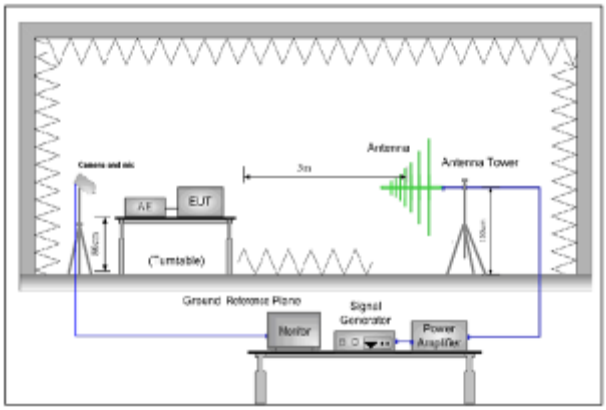



Figure 1. 80MHz to 1GHz

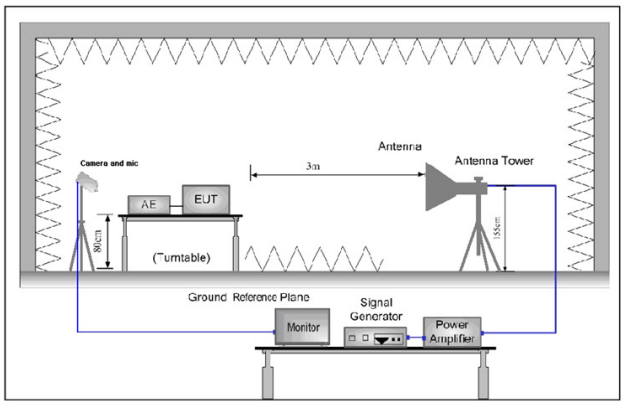



Figure 2. 1.4GHz to 2.7GHz

**Test Procedure:**

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 an audio monitor were used to monitor the performance of the EUT.

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### 6.2.1.1 Test Results

**For Bluetooth and Wi-Fi:**

| Frequency | Level | Modulation | EUT Face | Antenna Polaxis | Result / Observations |
|---|---|---|---|---|---|
| 80MHz-1GHz, 1.4GHz to 2.7GHz | 3V/m | 1kHz, 80% Amp. Mod, 1% increment Dwell time: 3 seconds | Front | V | A |
| | | | | H | A |
| | | | Back | V | A |
| | | | | H | A |
| | | | Left | V | A |
| | | | | H | A |
| | | | Right | V | A |
| | | | | H | A |
| | | | Top | V | A |
| | | | | H | A |
| | | | Under | V | A |
| | | | | H | A |

**Remark:**

A: No performance degradation during test

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## 6.2.2 ESD

**Test Requirement:** EN 301 489-17 Clause 7.2

**Test Method:** EN 301 489-1 Clause 9.3.2

**EUT Operation:**

Ambient: Temp.: 25.0 °C Humid.: 45 % Press.: 1020 mbar

Test Mode: Bluetooth mode, AC charge+ Bluetooth mode, wifi mode, AC Charge+ wifi mode and Idle mode.

**Criterion Required:** B

**Discharge Impedance:** 330 Ω / 150 pF

**Polarity:** Positive & Negative

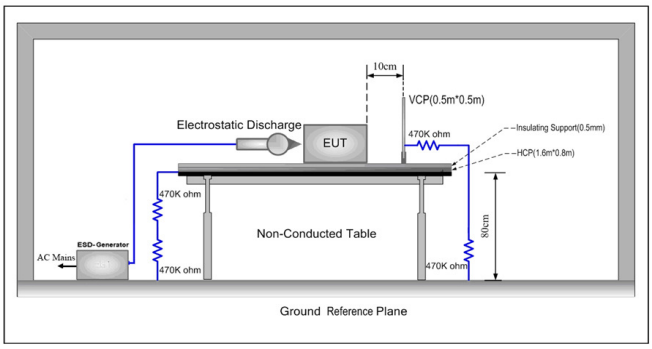
**Number of Discharge:** Minimum 10 times at each test point

**Discharge Mode:** Single Discharge

**Discharge Period:** 1 second minimum

**Equipment Used:** Refer to section 5 for details.

**Test Setup:**




Test set-up for tabletop equipment

**Test Procedure:**

1) Contact discharges to the conductive surfaces and to coupling planes:

The EUT was exposed to at least 200 discharges, 100 each at negative and positive polarity, at a minimum of four test points (a minimum of 50 discharges at each point). One of the test points was subjected to at least 50 indirect discharges (contact) to the centre 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 were available, then at least 200 indirect discharges were applied in the indirect mode. Tests were performed at a maximum repetition rate of one discharge per second.

Air discharge at slots and apertures, and insulating surfaces:

On those parts of the EUT where it was not possible to perform contact discharge testing, the equipment was investigated to identify user accessible points where breakdown may occur. This investigation was restricted to those areas normally handled by the user. A minimum of 10 single air discharges were applied to the selected test point for each such area.

The application of electrostatic discharges to the contacts of open connectors was not required by this standard.

2) The EUT was put on a 0.8m high wooden table for table-top equipment or

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0.1m high for floor standing equipment standing on the ground reference plane(GRP).

3) A horizontal coupling plane(HCP) 1.6m by 0.8m in size was placed on the table, and the EUT with its cables were isolated from the HCP by an insulating support thick than 0.5mm. The VCP 0.5m by 0.5m in size & HCP were constructed from the same material type & thinkmess as that of the GRP, and connected to the GRP via a 470kΩ resistor at each end. The distance between EUT and any of the other metallic surface excepted the GRP, HCP and VCP was greater than 1m.
4) During the contact discharges, the tip of the discharge electrode was touch the EUT before the discharge switch is operated. During the air discharges, the round discharge tip of the discharge electrode was approached as fast as possible to touch the EUT.
5) After each discharge, the ESD generator was removed from the EUT, the generator was then retriggered for a new single discharge. For ungrounded product, a discharge cable with two resistances was used after each discharge to remove remnant electrostatic voltage. 10 times of each polarity single discharge were applied to HCP and VCP.

**Test Results:**

**For Bluetooth and Wi-Fi:**

Observations: Test Point:

1. All insulated enclosure and seams.
2. All accessible metal parts of the enclosure.

Direct Application Test Results

| Direct Application | | | Test Results | |
|---|---|---|---|---|
| Discharge Level (kV) | Pulse No. | Test Point | Contact Discharge | Air Discharge |
| ± 2,4,8 | 10 for every level | 1 | N/A | N/A |
| ± 2,4 | 10 for every level | 2 | N/A | N/A |

Indirect Application for tabletop equipment Test Results

| Indirect Application | | Test Results | |
|---|---|---|---|
| Discharge Level (kV) | Pulse No. | Horizontal Coupling | Vertical Coupling |
| ±2,4 | 10 for every level | A | A |

**Remark:**

A: No performance degradation during test.

N/A: Not applicable




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### 6.2.3 RF Common Mode 0.15MHz to 80MHz

**Test Requirement:** EN 301 489-17 Clause 7.2

**Test Method:** EN 301 489-1 Clause 9.5.2

**Test Level:** 3V rms

**Modulation:** 80%, 1kHz Amplitude Modulation

**Test Port :** AC port.

**Criterion Required:** A

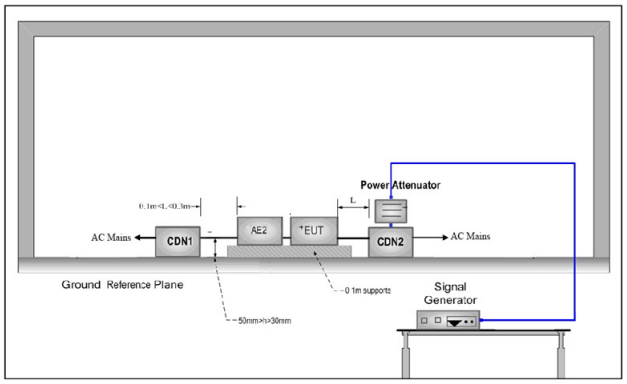
**EUT Operation:**

Ambient: Temp.:23.0 °C Humid.: 55 % Press.: 1020 mbar

Test Mode: AC charge+ Bluetooth mode, AC Charge+ wifi mode and Idle mode.

**Equipment Used:** Refer to section 5 for details.

**Test Setup:**




For AC port

**Test Procedure:**

1) The EUT was placed on an insulating support of 0.1m height above a ground reference Plane, arranged and connected to satisfy its functional requirement. All cables exiting the EUT was supported at a height of at least 30 mm above the ground reference plane.

2) The coupling and decoupling devices were required, they were located between 0.1 m and 0.3 m from the EUT. This distance was to be measured horizontally from the projection of the EUT on to the ground reference plane to the coupling and decoupling device.

3) Each AE, used with clamp injection, shall be placed on an insulating support 0.1 m above the ground reference plane. A decoupling network shall be installed on each cable between the EUT and AE except the cable under test. All cables connected to each AE, other than those being connected to the EUT, shall be provided with decoupling networks. The decoupling networks connected to each AE (except those on cables between the EUT and AE) shall be applied no further than 0.3 m from the AE. The cable(s) between the AE and the decoupling network (s) or in between the AE and the injection clamp shall not be bundled nor wrapped and shall be kept between 30 mm and 50 mm above the ground reference plane.

4) The frequency range was swept from 150 kHz to 80 MHz, using the signal levels established during the setting process, and with the disturbance signal 80 % amplitude modulated with a 1 kHz sine wave, pausing to adjust the RF

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signal level or to change coupling devices as necessary. Where the frequency was swept incrementally, the step size does not exceed 1 % of the preceding frequency value. The dwell time of the amplitude modulated carrier at each frequency was not less than the time necessary for the EUT to be exercised and to respond, and was not less than 0.5 s.

#### 6.2.3.1 Test Results

**For Bluetooth and Wi-Fi:**

| Frequency | Line | Test Level | Modulation | Step Size | Dwell Time | Observation (Performance Criterion) |
|---|---|---|---|---|---|---|
| 150kHz to 80MHz | AC port (2 Line) | 3Vrms | 80%, 1kHz Amp. Mod. | 1% | 2s | A |

**Remark:**

A: No performance degradation during test.

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## 6.2.4 Electrical Fast Transients (EFT)

**Test Requirement:** EN 301 489-17 Clause 7.2

**Test Method:** EN 301 489-1 Clause 9.4.2

**Test Level:** ± 1.0kV on AC port.

**Polarity:** Positive & Negative

**Repetition Frequency:** 5kHz

**Burst Period:** 300ms

**Test Duration:** 2 minute per level & polarity

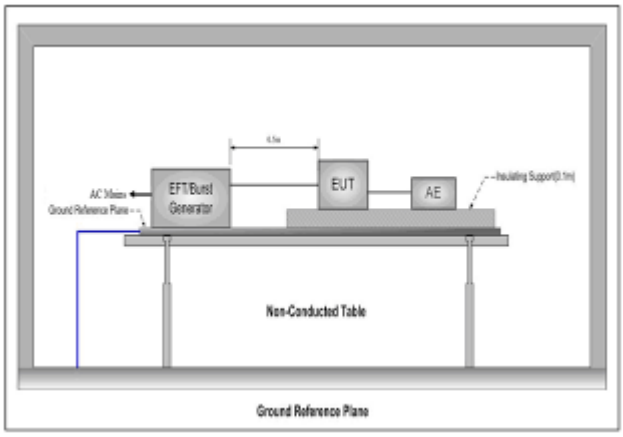
**EUT Operation:**

Ambient: Temp.: 23.0 °C Humid.: 55 % Press.: 1020 mbar

Test Mode: AC charge+ Bluetooth mode, AC Charge+ wifi mode and Idle mode.

**Equipment Used:** Refer to section 5 for details.

**Test Setup:**




For AC port

**Test Procedure:**

1) The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0.1m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.

2) The GRP shall project beyond the EUT and the clamp by at least 0.1m on all sides. The distance between the EUT and any other of the metallic surface except the GRP was greater than 0.5m. All cables to the EUT was placed on the insulation support 0.1m above GRP. A cable not subject to EFT was routed as far as possible from cable under test to minimize the coupling between the cables.

3) The length of signal and power cable between the EUT and EFT generator was 0.5m. If the cable is a non-detachable supply cable more than 0.5m, the excess length of this cable shall be folded to avoid a flat coil and situated at a distance of 0.1m above the GRP.

4) The EUT was conducted the below specified test voltages for line and neutral or line, neutral and earth simultaneously (for telecommunication, single, control and DC port line with capacitive coupling clamp), 120 seconds duration. If the equipment contains identical ports, only one was

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tested; multicomputer cables, such as a 50-pair telecommunication cable, were tested as a single cable. Cables did not be split or divided into groups of conductors for this test; interface ports, which were intended by the manufacturer to be connected to data cables not longer than 3 m, did not be tested.

**Test Results**

**For Bluetooth and Wi-Fi:**

| Lead under Test | Level (kV) | Coupling Direct/Clamp | EUT operating mode | Observations (Performance Criterion) |
|---|---|---|---|---|
| Live | ± 1.0 | Direct | above modes | A |
| Neutral | ± 1.0 | Direct | above modes | A |
| Live, Neutral | ± 1.0 | Direct | above modes | A |

**Remark:**

A: No performance degradation during test.

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## 6.2.5 Surge

**Test Requirement:** EN 301 489-17 Clause 7.2

**Test Method:** EN 301 489-1 Clause 9.8.2

**Test Level:** For AC port

± 1kV Live to Neutral

**Criterion Required:** B

**Polarity:** Positive & Negative

**Interval:** 60s between each surge

**No. of Surges:** 5 positive, 5 negative at 0°, 90°, 180°, 270°.

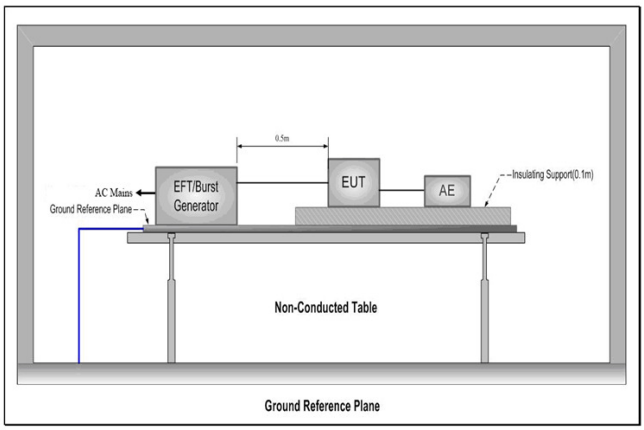
**EUT Operation:**

Ambient: Temp.: 23.0 °C Humid.: 55 % Press.: 1005 mbar

Test Mode: AC charge+ Bluetooth mode, AC Charge+ wifi mode and Idle mode.

**Equipment Used:** Refer to section 5 for details.

**Test Setup:**




For AC port

**Test Procedure:**

1) The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0.1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.

2) The 1.2/50 μs surge was to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks were 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 so that the specified wave may be applied on the lines under test.

3) The power cord between the EUT and the coupling/decoupling network was not exceed 2 m in length. The interconnection line between the EUT and the coupling/ decoupling network shall not exceed 2 m in length.

4) The EUT was conducted 0.5 kV and 1 kV test voltage for line to line and line to neutral and conducted 0.5 kV, 1 kV and 2 kV test voltage for line to earth

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and neutral to earth, five positive pulses and five negative pulses each at 0°, 90°, 180° and 270° for a.c. power ports and five positive pulses and five negative surge pulses for d.c. power ports (for telecommunication port, It was 0.5 kV for indoor cable longer than 10m line to ground and 0.5kV,1kV test voltage for outdoor cable line to ground, five positive pulses and five negative surge pulses), The test levels were applied on the EUT with a 2 Ω generator source impedance for power supply terminals and 40Ω output impedance for interconnection lines. The tests were done at repetition rate one per minute.

**Test Results:**

**For Bluetooth and Wi-Fi:**

| **For AC port (2 line)** | | | | | |
|---|---|---|---|---|---|
| **Pulse No** | **Line-Line** | **Level (kV)** | **Surge interval** | **phase (deg)** | **Observation (Performance Criterion)** |
| 1–5 | L-N | +1 | 60s | 0° | A |
| 6–10 | L-N | -1 | 60s | 0° | A |
| 11–15 | L-N | +1 | 60s | 90° | A |
| 16–20 | L-N | -1 | 60s | 90° | A |
| 21–25 | L-N | +1 | 60s | 180° | A |
| 26–30 | L-N | -1 | 60s | 180° | A |
| 31–35 | L-N | +1 | 60s | 270° | A |
| 36–40 | L-N | -1 | 60s | 270° | A |

**Remark:**

A: No performance degradation during test.

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## 6.2.6 Voltage Dips and Interruptions

**Test Requirement:** EN 301 489-17 Clause 7.2

**Test Method:** EN 301 489-1 Clause 9.7.2

**Test Level:** Voltage dip: 0 % residual voltage for 0.5 cycle;
Voltage dip: 0 % residual voltage for 1 cycle;
Voltage dip: 70 % residual voltage for 25 cycles;
Voltage interruption: 0 % residual voltage for 250 cycles.

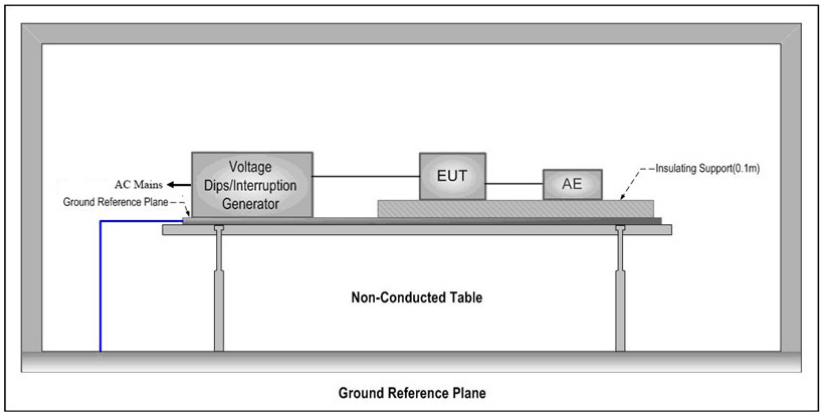
**No. of Dips / Interruptions:** 3 per Level

**EUT Operation:**

Ambient: Temp.: 23.0 °C Humid.: 55 % Press.:1005 mbar

Test Mode: AC Charge+ Bluetooth mode, AC charge+ Wi-Fi mode and Idle mode

**Test Setup:**




**Test Procedure:**

1) The EUT was placed on a ground reference plane(GRP) insulated by an insulating support 0.1 m thick and the GRP was placed on a 0.8m high wooden table for table-top equipment. For floor standing equipment, the EUT was placed on a 0.1m high wooden support above the GRP.
2) The test was performed with the EUT connected to the test generator with the shortest power supply cable as specified by the EUT manufacturer.
3) The EUT was tested for each selected combination of test level and duration with a sequence of three dips /interruptions with intervals of 10 s minimum. Each representative mode of operation was tested.
4) For EUT with more than one power cord, each power cord was tested individually.

**Equipment Used:** Refer to section 5 for details.

**Test Results:**

| EUT operating mode | % $U_T$ | Phase | Duration of dropout in Periods | No. of dropout | Time between dropout | Observations (Performance Criterion) |
|---|---|---|---|---|---|---|
| Above modes | 0 | 0°&180° | 0.5 | 3 | 10s | A |
| Above modes | 0 | 0°&180° | 1 | 3 | 10s | A |
| Above modes | 70 | 0°&180° | 25 | 3 | 10s | A |
| Above modes | 0 | 0°&180° | 250 | 3 | 10s | C |

A: No performance degradation during test.
C: The EUT power off during the test, but it can recover automatic.

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# 7 Photographs–EUT Test Setup

**Test Model No.: LinkIt ONE v1.0**

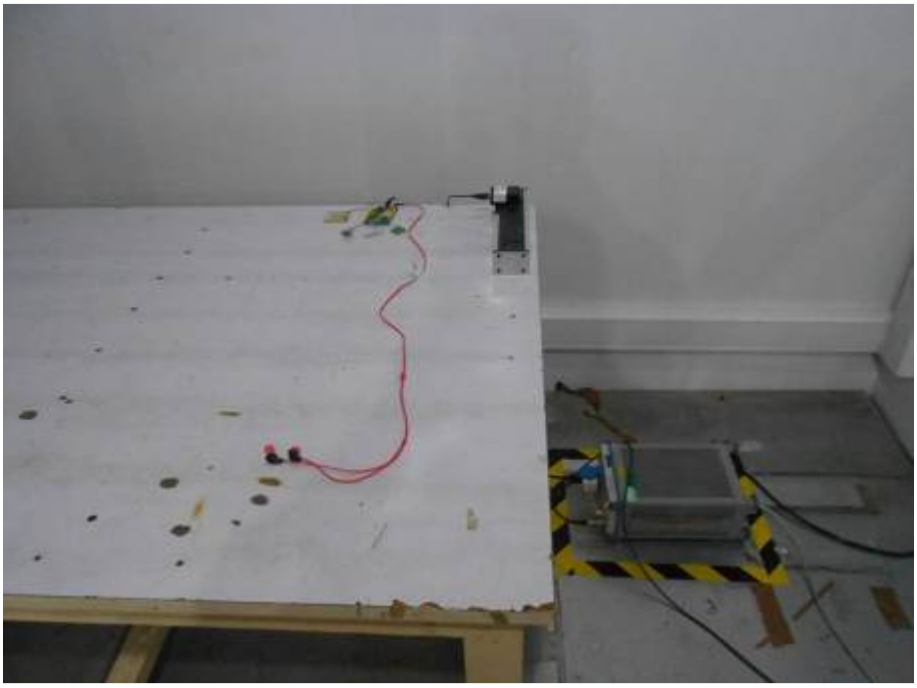
## 7.1 Radiated Emission



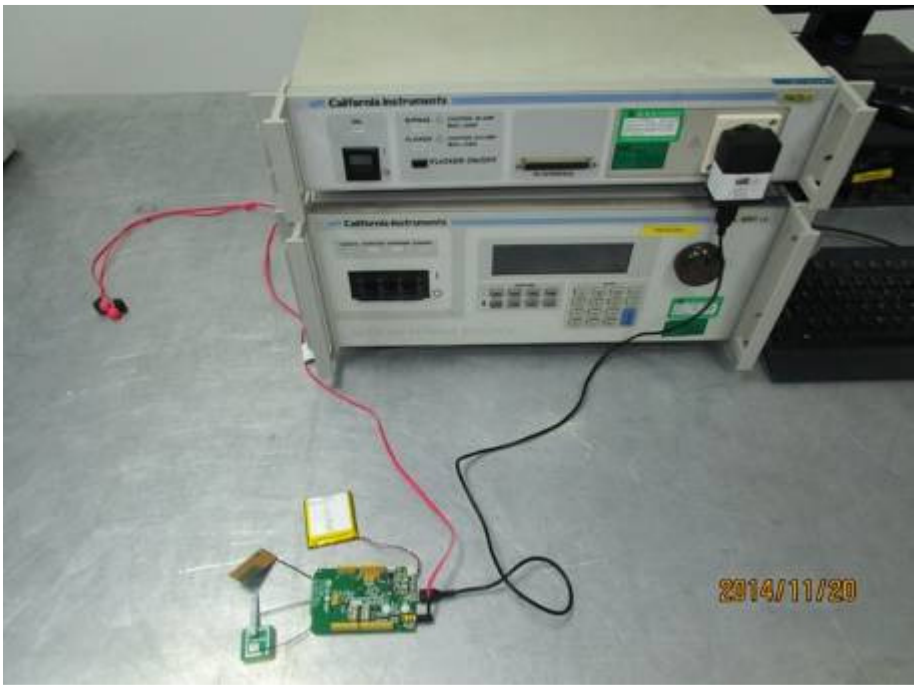


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## 7.2 Conducted Emission



## 7.3 Flicker

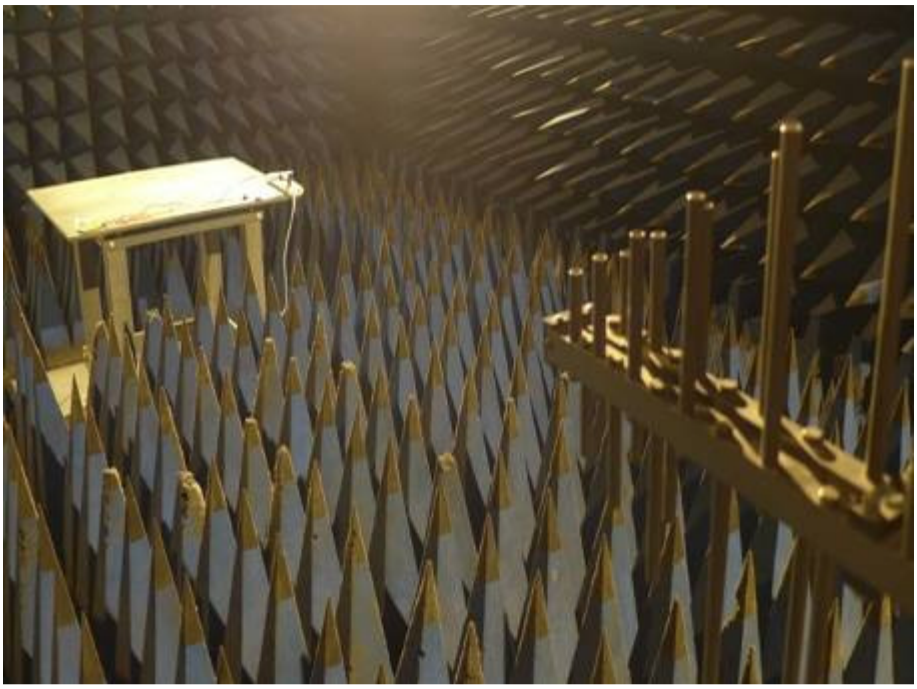



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## 7.4 ESD



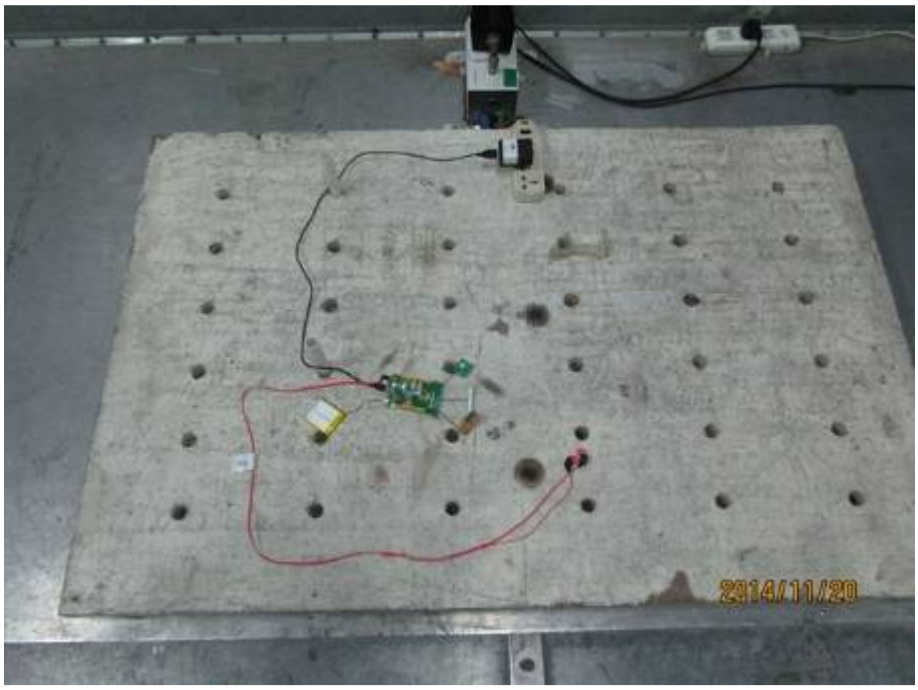
## 7.5 Radiated Immunity



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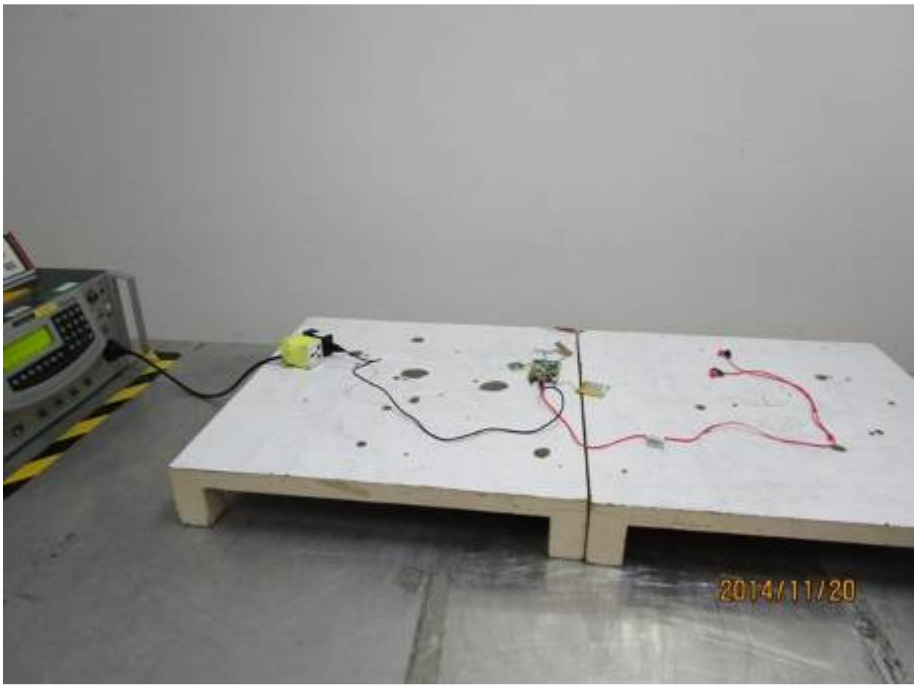


## 7.6 RF Common Mode




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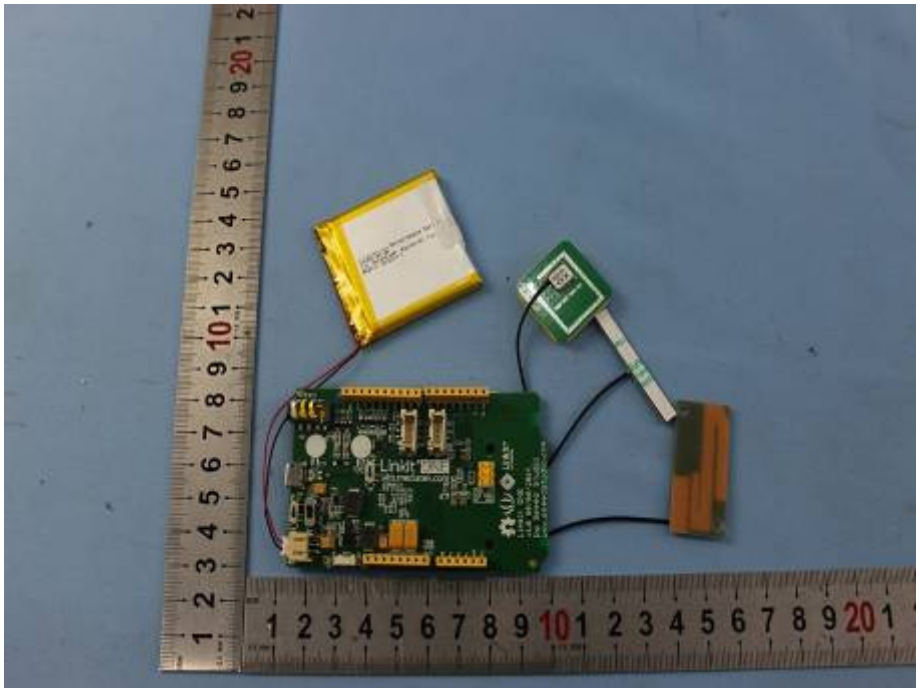
## 7.7 EFT / Surge / Voltage Dips and Interruptions

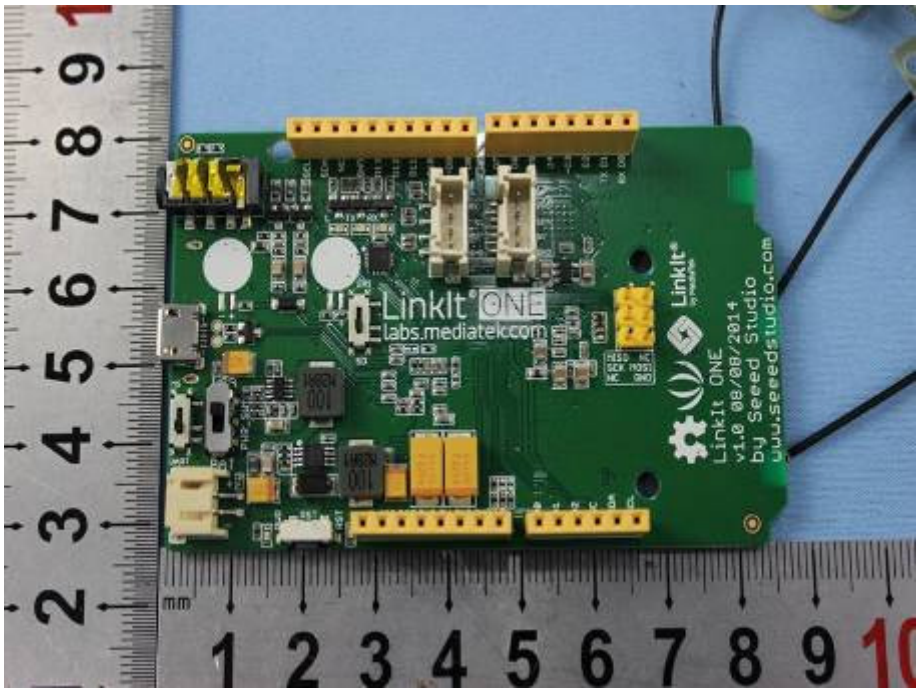



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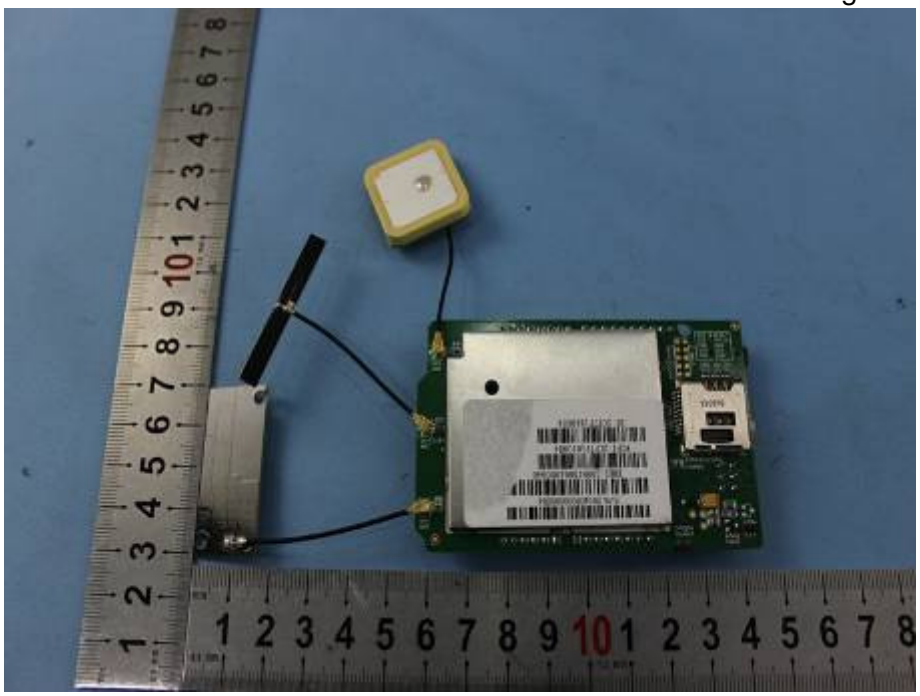
# 8 Photographs–EUT Constructional Details

**Test Model No.: LinkIt ONE v1.0**



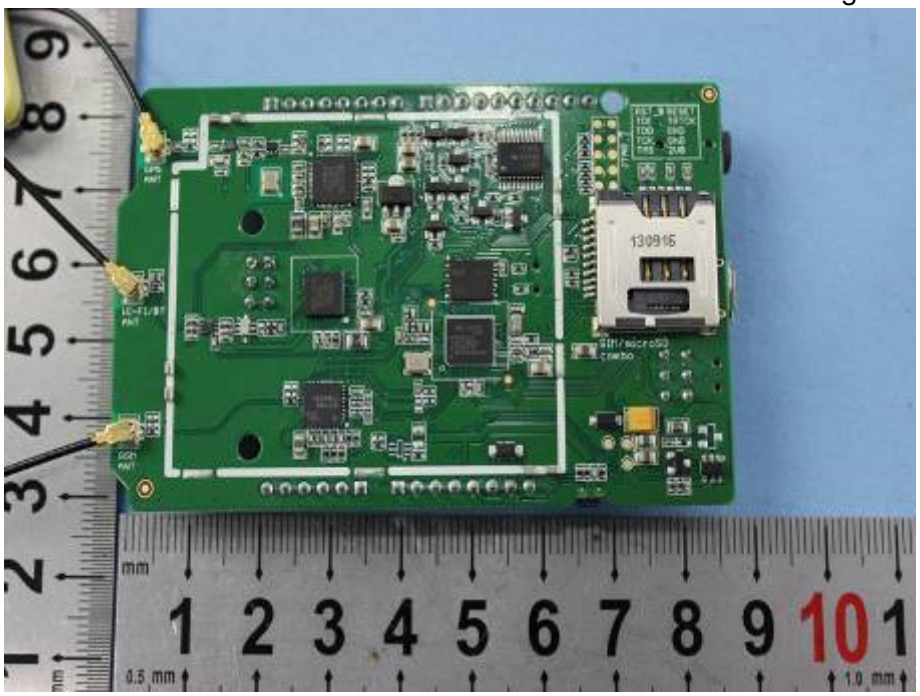


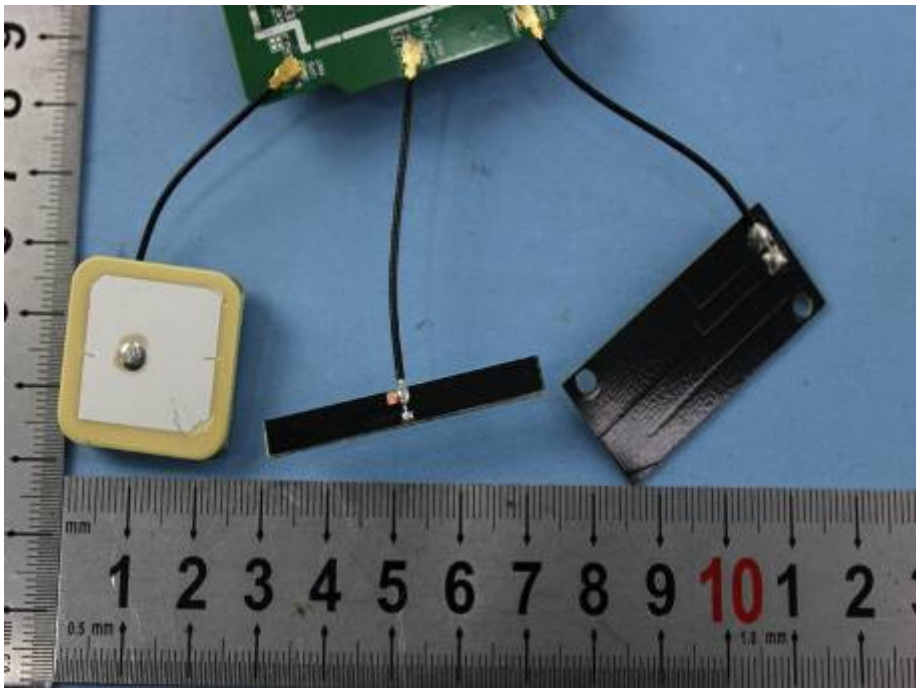

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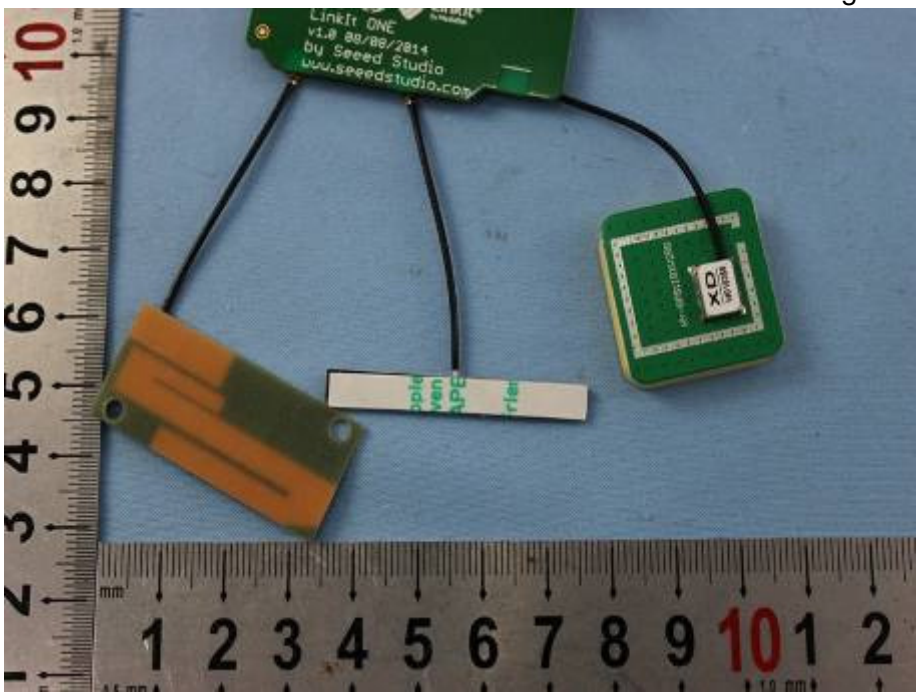


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