

# FCC Test Report

APPLICANT : Bullitt Group  
EQUIPMENT : Rugged Smart Phone  
BRAND NAME : CAT  
MODEL NAME : S42  
FCC ID : ZL5S42  
STANDARD : 47 CFR Part 15 Subpart B  
CLASSIFICATION : Certification

The product was received on May 22, 2020 and testing was completed on Jun. 04, 2020. We, Sporton International (Shenzhen) Inc., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2014 and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Shenzhen) Inc., the test report shall not be reproduced except in full.



Reviewed by: Derreck Chen / Supervisor



Approved by: Eric Shih / Manager



**Sporton International (ShenZhen) Inc.**

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People's Republic of China**



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## REVISION HISTORY

| REPORT NO.  | VERSION | DESCRIPTION             | ISSUED DATE   |
|-------------|---------|-------------------------|---------------|
| FC052014-01 | Rev. 01 | Initial issue of report | Jul. 10, 2020 |
|             |         |                         |               |
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## SUMMARY OF TEST RESULT

| Report Section | FCC Rule | Description           | Limit           | Result | Remark                                                     |
|----------------|----------|-----------------------|-----------------|--------|------------------------------------------------------------|
| 3.1            | 15.107   | AC Conducted Emission | < 15.107 limits | PASS   | Under limit<br>3.22 dB at<br>0.500 MHz                     |
| 3.2            | 15.109   | Radiated Emission     | < 15.109 limits | PASS   | Under limit<br>4.12 dB at<br>163.860 MHz<br>for Quasi-Peak |

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.



## 1. General Description

### 1.1. Applicant

**Bullitt Group**

One Valpy, Valpy Street, Reading, Berkshire, England RG1 1AR

### 1.2. Manufacturer

**Bullitt Group**

One Valpy, Valpy Street, Reading, Berkshire, England RG1 1AR

### 1.3. Product Feature of Equipment Under Test

| Product Feature                 |                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Equipment                       | Rugged Smart Phone                                                                                                                                                    |
| Brand Name                      | CAT                                                                                                                                                                   |
| Model Name                      | S42                                                                                                                                                                   |
| FCC ID                          | ZL5S42                                                                                                                                                                |
| EUT supports Radios application | GSM/WCDMA/LTE/NFC<br>WLAN 2.4GHz 802.11b/g/n HT20<br>WLAN 5GHz 802.11a/n HT20/HT40<br>WLAN 5GHz 802.11ac VHT20/VHT40/VHT80<br>Bluetooth BR/EDR/LE<br>GNSS/FM Receiver |
| IMEI Code                       | Conduction: 359145660001926/359145660005927<br>Radiation: 359145660002965/359145660006966                                                                             |
| HW Version                      | V1.0                                                                                                                                                                  |
| SW Version                      | LTE_C01091.10_NE_S42G_0.030.00                                                                                                                                        |
| EUT Stage                       | Production Unit                                                                                                                                                       |

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.



## 1.4. Product Specification of Equipment Under Test

| Standards-related Product Specification |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Tx Frequency</b>                     | GSM850: 824.2 MHz ~ 848.8 MHz<br>GSM1900: 1850.2 MHz ~ 1909.8MHz<br>WCDMA Band V: 826.4 MHz ~ 846.6 MHz<br>WCDMA Band IV : 1712.4 MHz ~ 1752.6 MHz<br>WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz<br>LTE Band 2 : 1850.7 MHz ~ 1909.3 MHz<br>LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz<br>LTE Band 5 : 824.7 MHz ~ 848.3 MHz<br>LTE Band 7 : 2502.5 MHz ~ 2567.5 MHz<br>LTE Band 12 : 699.7 MHz ~ 715.3 MHz<br>LTE Band 13 : 779.5 MHz ~ 784.5 MHz<br>LTE Band 14 : 790.5 MHz ~ 795.5 MHz<br>LTE Band 17 : 706.5 MHz ~ 713.5 MHz<br>LTE Band 25 : 1850.7 MHz ~ 1914.3 MHz<br>LTE Band 26 : 814.7 MHz ~ 848.3 MHz<br>LTE Band 41 : 2498.5 MHz ~ 2687.5 MHz<br>LTE Band 66 : 1710.7 MHz ~ 1779.3 MHz<br>LTE Band 71: 665.5 MHz ~ 695.5MHz<br>802.11b/g/n: 2412 MHz ~ 2462 MHz<br>802.11a/n/ac: 5180 MHz ~ 5240 MHz;<br>5260 MHz ~ 5320 MHz;<br>5500 MHz ~ 5720 MHz;<br>5745 MHz ~ 5825 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz<br>NFC : 13.56 MHz                               |
| <b>Rx Frequency</b>                     | GSM850: 869.2 MHz ~ 893.8 MHz<br>GSM1900: 1930.2 MHz ~ 1989.8 MHz<br>WCDMA Band V: 871.4 MHz ~ 891.6 MHz<br>WCDMA Band IV : 2112.4 MHz ~ 2152.6 MHz<br>WCDMA Band II: 1932.4 MHz ~ 1987.6 MHz<br>LTE Band 2 : 1930.7 MHz ~ 1989.3 MHz<br>LTE Band 4 : 2110.7 MHz ~ 2154.3 MHz<br>LTE Band 5 : 869.7 MHz ~ 893.3 MHz<br>LTE Band 7 : 2622.5 MHz ~ 2687.5 MHz<br>LTE Band 12 : 729.7 MHz ~ 745.3 MHz<br>LTE Band 13 : 748.5 MHz ~ 753.5 MHz<br>LTE Band 14 : 760.5 MHz ~ 765.5 MHz<br>LTE Band 17 : 736.5 MHz ~ 743.5 MHz<br>LTE Band 25 : 1930.7 MHz ~ 1994.3 MHz<br>LTE Band 26 : 859.7 MHz ~ 893.3 MHz<br>LTE Band 41 : 2498.5 MHz ~ 2687.5 MHz<br>LTE Band 66 : 2110.7 MHz~ 2199.3 MHz<br>LTE Band 71: 619.5 MHz ~ 649.5MHz<br>802.11b/g/n: 2412 MHz ~ 2462 MHz<br>802.11a/n/ac: 5180 MHz ~ 5240 MHz;<br>5260 MHz ~ 5320 MHz;<br>5500 MHz ~ 5720 MHz;<br>5745 MHz ~ 5825 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz<br>GNSS : 1559 MHz ~ 1610 MHz<br>NFC : 13.56 MHz |

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           | FM : 88 MHz ~ 108 MHz                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Antenna Type</b>       | WWAN : LDS Antenna<br>WLAN : IFA Antenna<br>Bluetooth : IFA Antenna<br>GNSS: IFA Antenna<br>NFC : Loop Antenna<br>FM : External Earphone Antenna                                                                                                                                                                                                                                                                                                                                           |
| <b>Type of Modulation</b> | GSM: GMSK<br>GPRS: GMSK<br>EDGE(MCS 0-4): GMSK / (MCS 5-9): 8PSK<br>WCDMA : BPSK<br>HSDPA/DC-HSDPA : QPSK<br>HSUPA : QPSK<br>HSPA+ : 16QAM(16QAM uplink is not supported)<br>DC-HSDPA : 64QAM<br>LTE: QPSK / 16QAM / 64QAM<br>802.11b : DSSS (DBPSK / DQPSK / CCK)<br>802.11a/g/n/ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)<br>Bluetooth LE : GFSK<br>Bluetooth (1Mbps) : GFSK<br>Bluetooth (2Mbps) : $\pi/4$ -DQPSK<br>Bluetooth (3Mbps) : 8-DPSK<br>GNSS : BPSK<br>NFC: ASK<br>FM |

**Note:** GNSS Rx = BDS + GLONASS + GPS + Galileo + SBAS

## 1.5. Modification of EUT

No modifications are made to the EUT during all test items.

## 1.6. Test Location

Sporton International (Shenzhen) Inc. is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

|                           |                                                                                                                                                                         |                            |                                       |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------|
| <b>Test Firm</b>          | Sporton International (Shenzhen) Inc.                                                                                                                                   |                            |                                       |
| <b>Test Site Location</b> | 1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China<br>TEL: +86-755-86379589<br>FAX: +86-755-86379595 |                            |                                       |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b>                                                                                                                                                 | <b>FCC Designation No.</b> | <b>FCC Test Firm Registration No.</b> |
|                           | CO01-SZ                                                                                                                                                                 | CN1256                     | 421272                                |

|                           |                                                                                                                                                           |                            |                                       |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------------|
| <b>Test Firm</b>          | Sporton International (Shenzhen) Inc.                                                                                                                     |                            |                                       |
| <b>Test Site Location</b> | No. 3 Bldg the third floor of south, Shahe River west, Fengzeyuan Warehouse, Nanshan Shenzhen, 518055 People's Republic of China<br>TEL: +86-755-33202398 |                            |                                       |
| <b>Test Site No.</b>      | <b>Sporton Site No.</b>                                                                                                                                   | <b>FCC Designation No.</b> | <b>FCC Test Firm Registration No.</b> |
|                           | 03CH01-SZ                                                                                                                                                 | CN1256                     | 421272                                |

## 1.7. Test Software

| Item | Site      | Manufacture | Name | Version     |
|------|-----------|-------------|------|-------------|
| 1.   | 03CH01-SZ | AUDIX       | E3   | 6.2009-8-24 |
| 2.   | CO01-SZ   | AUDIX       | E3   | 6.120613b   |

## 1.8. Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 15 Subpart B
- ♦ ANSI C63.4-2014

**Remark:** All test items were verified and recorded according to the standards and without any deviation during the test.

## 2. Test Configuration of Equipment Under Test

### 2.1. Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

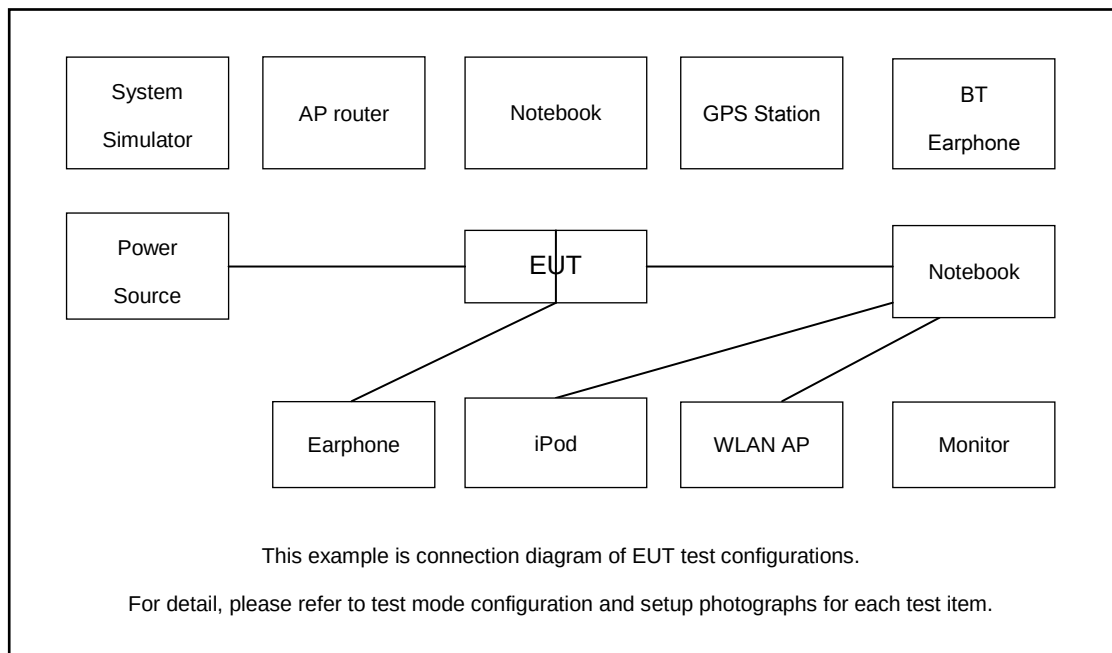
Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

| Test Items            | Function Type                                                                                                                                                               |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| AC Conducted Emission | Mode 1: GSM 850 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + Camera(Rear) + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 1       |
|                       | Mode 2: PCS 1900 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(5G) + Camera(Front) + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 2       |
|                       | Mode 3: WCDMA Band V Idle(Low CH) + Bluetooth Idle + WLAN Idle(2.4G) + MPEG4(Colur bar) + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Link + Battery + SIM 1 |
|                       | Mode 4: LTE Band 14 Idle(High CH) + Bluetooth Idle + WLAN Idle(5G) + NFC On + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 2             |
|                       | Mode 5: LTE Band 12 Idle(High CH) + Bluetooth Idle + WLAN Idle(5G) + H-Pattern + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 1          |
|                       | Mode 6: LTE Band 13 Idle(High CH) + Bluetooth Idle + WLAN Idle(2.4G) + FM Rx(98MHz) + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 2     |
|                       | Mode 7: LTE Band 17 Idle(Low CH) + Bluetooth Idle + WLAN Idle(5G) + FM Rx(98MHz) + Earphone 2 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 1        |
|                       | Mode 8: LTE Band 71 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + FM Rx(98MHz) + Earphone 1 + USB Cable 2(Charging from Adapter ) + SD Card Load + Battery + SIM 1   |
|                       | Mode 9: LTE Band 26 Idle(Low CH) + Bluetooth Idle + WLAN Idle(2.4G) + FM Rx(98MHz) + Earphone 1 + USB Cable 3(Charging from Adapter ) + SD Card Load + Battery + SIM 1      |
|                       | Mode 10 :GSM 850 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + GNSS RX + Earphone 1 + USB Cable 1(Data Link with Notebook) + SD Card Link + Battery + SIM 1          |
|                       | Mode 11 :GSM 850 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + GNSS RX + Earphone 1 + USB Cable 2(Data Link with Notebook) + SD Card Link + Battery + SIM 2          |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    | <p>Mode 12 :GSM 850 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + GNSS RX + Earphone 1 + USB Cable 3(Data Link with Notebook) + SD Card Link + Battery + SIM 1</p> <p>Mode 13 :LTE Band 13 Idle(High CH) + Bluetooth Idle + WLAN Idle(2.4G) + FM Rx(98MHz) + Earphone 1 + USB Cable 4(Charging from Adapter ) + SD Card Load + Battery + SIM 1</p> <p>Mode 14 :GSM 850 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + GNSS RX + Earphone 1 + USB Cable 4(Data Link with Notebook ) + SD Card Link + Battery + SIM 1</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Radiated Emissions | <p>Mode 1: GSM 850 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + Camera(Rear) + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 1</p> <p>Mode 2: PCS 1900 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(5G) + Camera(Front) + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 2</p> <p>Mode 3: WCDMA Band V Idle(Low CH) + Bluetooth Idle + WLAN Idle(2.4G) + MPEG4(Colur bar) + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Link + Battery + SIM 1</p> <p>Mode 4: LTE Band 14 Idle(High CH) + Bluetooth Idle + WLAN Idle(5G) + NFC On + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 2</p> <p>Mode 5: LTE Band 12 Idle(High CH) + Bluetooth Idle + WLAN Idle(5G) + H-Pattern + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 1</p> <p>Mode 6: LTE Band 13 Idle(High CH) + Bluetooth Idle + WLAN Idle(2.4G) + FM Rx(98MHz) + Earphone 1 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 2</p> <p>Mode 7: LTE Band 17 Idle(Low CH) + Bluetooth Idle + WLAN Idle(5G) + FM Rx(98MHz) + Earphone 2 + USB Cable 1(Charging from Adapter ) + SD Card Load + Battery + SIM 1</p> <p>Mode 8: LTE Band 71 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + Camera(Rear) + Earphone 1 + USB Cable 2(Charging from Adapter ) + SD Card Load + Battery + SIM 1</p> <p>Mode 9: LTE Band 26 Idle(Low CH) + Bluetooth Idle + WLAN Idle(2.4G) + Camera(Rear) + Earphone 1 + USB Cable 3(Charging from Adapter ) + SD Card Load + Battery + SIM 1</p> <p>Mode 10 : GSM 850 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + GNSS RX + Earphone 1 + USB Cable 1(Data Link with Notebook) + SD Card Link + Battery + SIM 1</p> <p>Mode 11 : GSM 850 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + GNSS RX + Earphone 1 + USB Cable 2(Data Link with Notebook) + SD Card Link + Battery + SIM 2</p> <p>Mode 12 : GSM 850 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + GNSS RX + Earphone 1 + USB Cable 3(Data Link with Notebook) + SD Card Link + Battery + SIM 1</p> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>Mode 13 : LTE Band 26 Idle(Low CH) + Bluetooth Idle + WLAN Idle(2.4G) + Camera(Rear) + Earphone 1 + USB Cable 4(Charging from Adapter ) + SD Card Load + Battery + SIM 1</p> <p>Mode 14 : GSM 850 Idle(Middle CH) + Bluetooth Idle + WLAN Idle(2.4G) + GNSS RX + Earphone 1 + USB Cable 4(Data Link with Notebook ) + SD Card Link + Battery + SIM 1</p> |
| <p><b>Remark:</b></p> <ol style="list-style-type: none"> <li>1. The worst case of AC is mode 6; only the test data of this mode is reported.</li> <li>2. The worst case of RE is mode 10; only the test data of this mode is reported.</li> <li>3. Data Link with Notebook means data application transferred mode between EUT and Notebook.</li> <li>4. Pre-scanned Low/Middle/High channel, the worst channel was recorded in this report.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                             |

## 2.2.Connection Diagram of Test System



The EUT has been associated with peripherals pursuant to ANSI C63.4-2014 and configuration operated in a manner tended to maximize its emission characteristics in a typical application

## 2.3. Support Unit used in test configuration and system

| Item | Equipment          | Trade Name | Model Name | FCC ID      | Data Cable | Power Cord                                                 |
|------|--------------------|------------|------------|-------------|------------|------------------------------------------------------------|
| 1.   | System Simulator   | Anritsu    | MT8820C    | N/A         | N/A        | Unshielded, 1.8m                                           |
| 2.   | FM Station         | R&S        | SMB100A    | N/A         | N/A        | Unshielded, 1.8m                                           |
| 3.   | GNSS Station       | RACELOGIC  | 18645      | N/A         | N/A        | Unshielded, 1.8m                                           |
| 4.   | WLAN AP            | D-Link     | DIR-820L   | KA2IR820LA1 | N/A        | Unshielded, 1.8m                                           |
| 5.   | Bluetooth Earphone | Samsung    | EO-MG900   | N/A         | N/A        | N/A                                                        |
| 6.   | Notebook           | Lenovo     | E540       | FCC DoC     | N/A        | AC I/P:<br>Unshielded, 1.2 m<br>DC O/P:<br>Shielded, 1.8 m |
| 7.   | Ipod               | apple      | MC69029/A  | N/A         | N/A        | N/A                                                        |
| 8.   | SD Card            | N/A        | MicroSD HC | FCC DoC     | N/A        | N/A                                                        |

## 2.4. EUT Operation Test Setup

The EUT was in GSM or WCDMA or LTE idle mode during the testing. The EUT was synchronized to the BCCH, and is in continuous receiving mode by setting system simulator's paging reorganization.

At the same time, the EUT was attached to the Bluetooth earphone or WLAN AP, and the following programs installed in the EUT were programmed during the test.

1. Data application is transferred between notebook and EUT via USB cable.
2. Turn on GNSS function to make the EUT receive continuous signals from GNSS station.
3. Turn on camera to capture images.
4. Turn on MPEG4 function.
5. Turn on NFC Function.
6. Turn on FM receiver function to make the EUT receive continuous signals from FM station.

### 3. Test Result

#### 3.1. Test of AC Conducted Emission Measurement

##### 3.1.1 Limits of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

<Class B Limit>

| Frequency of emission<br>(MHz) | Conducted 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.

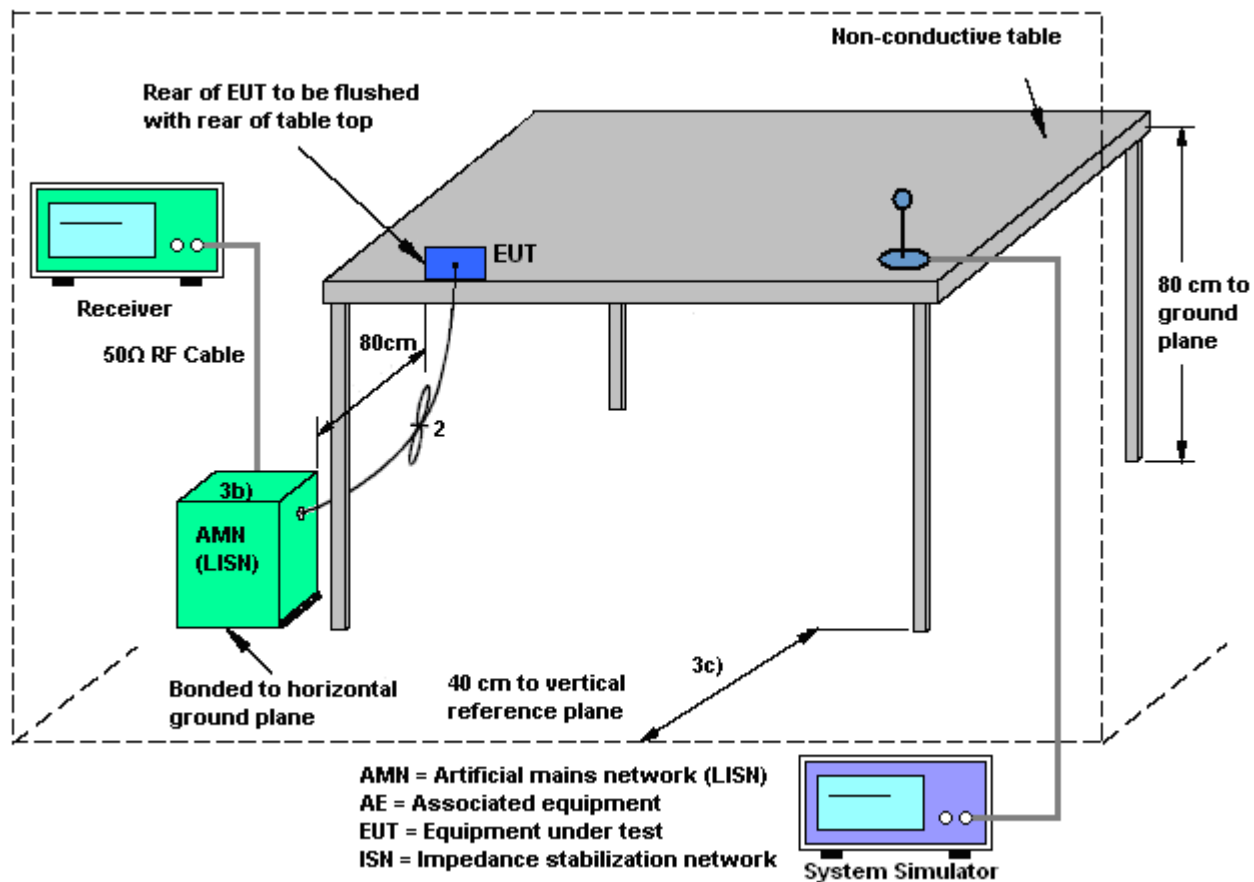
##### 3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

##### 3.1.3 Test Procedure

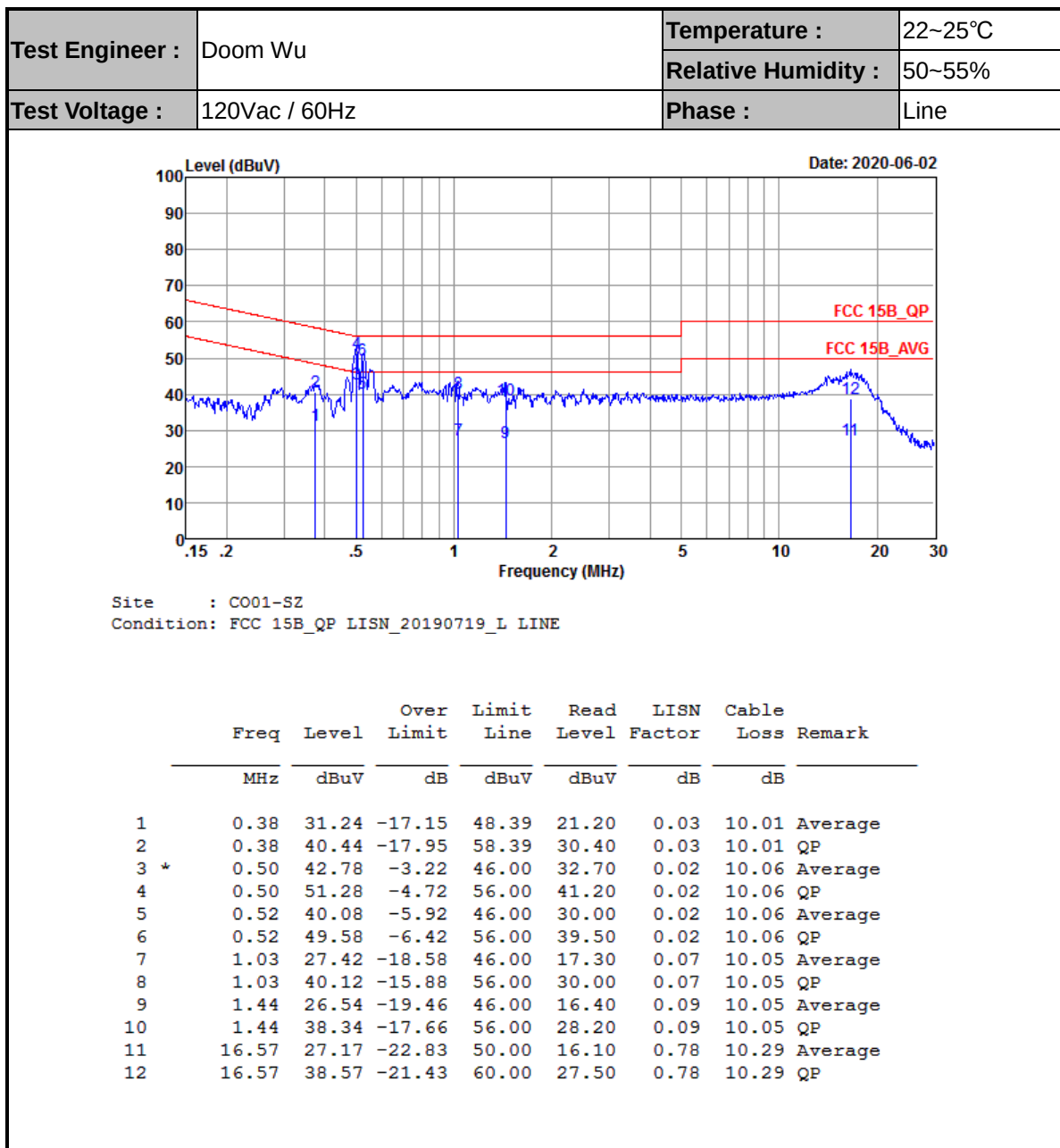
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

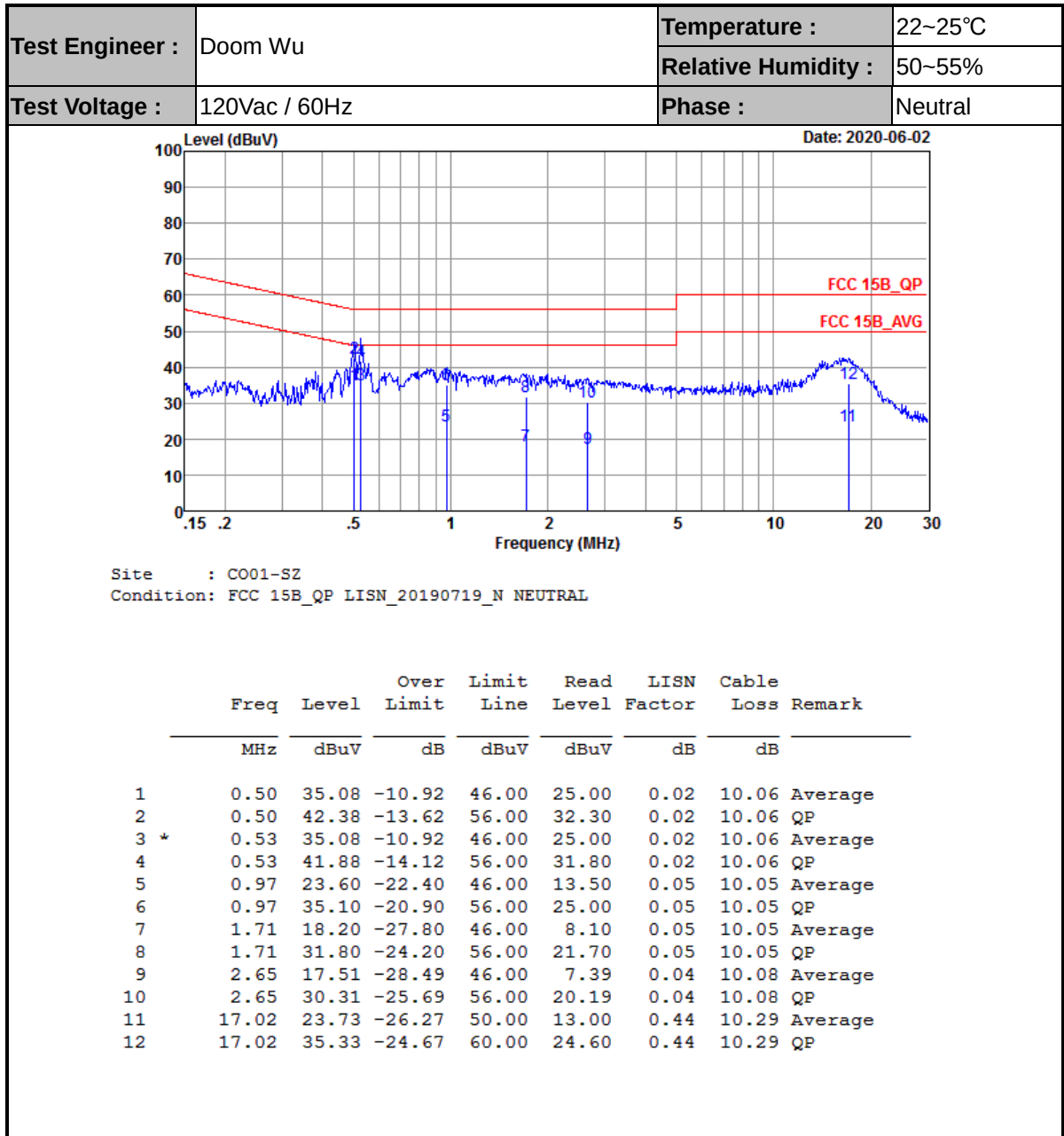
### 3.1.4 Test Setup





## 3.1.5 Test Result of AC Conducted Emission





Note:

1. Level(dBμV) = Read Level(dBμV) + LISN Factor(dB) + Cable Loss(dB)
2. Over Limit(dB) = Level(dBμV) – Limit Line(dBμV)

## 3.2. Test of Radiated Emission Measurement

### 3.2.1. Limit of Radiated Emission

The emissions from an unintentional radiator shall not exceed the field strength levels specified in the following table:

**<Class B Limit>**

| Frequency<br>(MHz) | Field Strength<br>(microvolts/meter) | Measurement Distance<br>(meters) |
|--------------------|--------------------------------------|----------------------------------|
| 30 – 88            | 100                                  | 3                                |
| 88 – 216           | 150                                  | 3                                |
| 216 - 960          | 200                                  | 3                                |
| Above 960          | 500                                  | 3                                |

### 3.2.2. Measuring Instruments

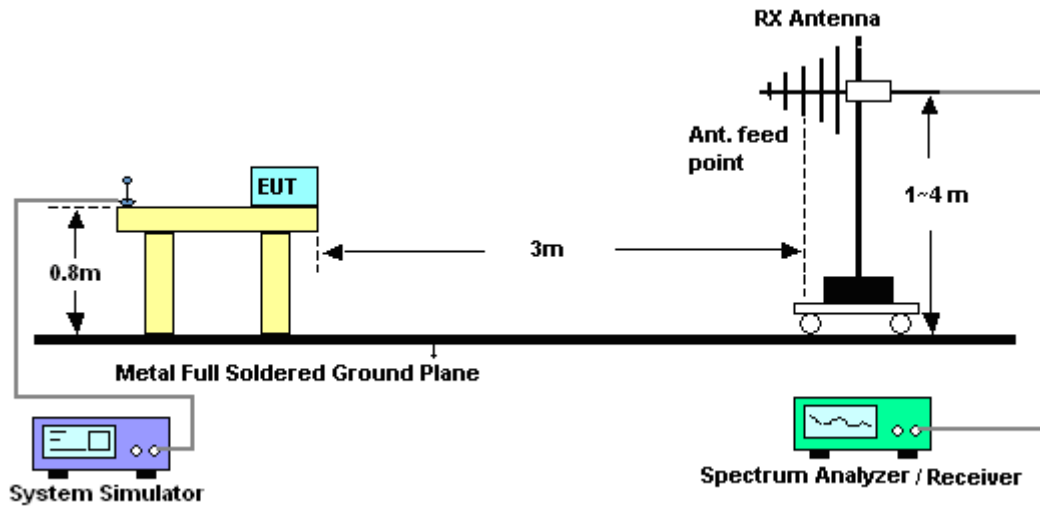
The measuring equipment is listed in the section 4 of this test report.

### 3.2.3. Test Procedures

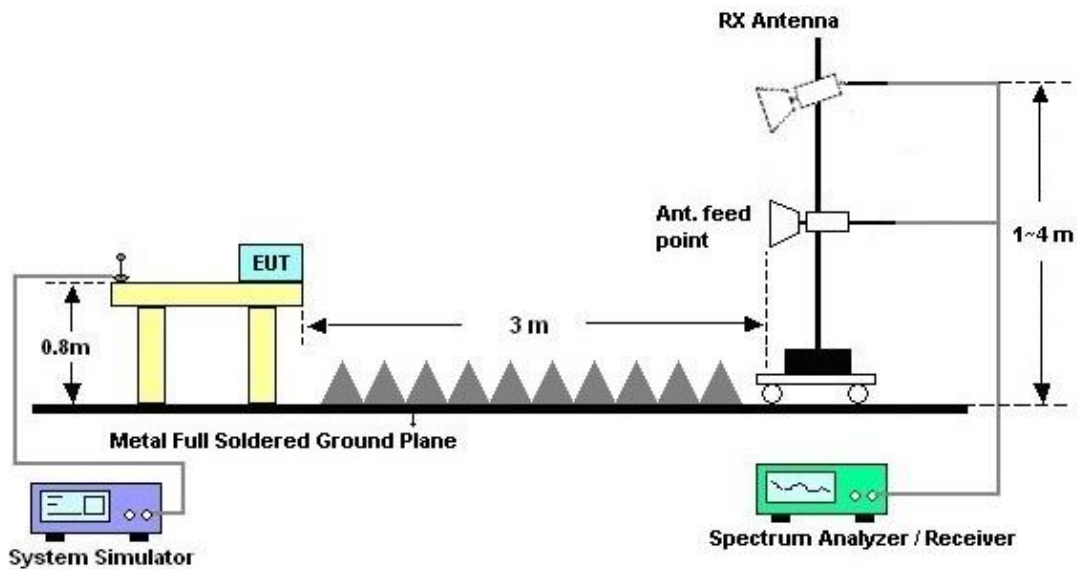
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode (RBW=120kHz/VBW=300kHz for frequency below 1GHz; RBW=1MHz VBW=3MHz (Peak), RBW=1MHz/VBW=10Hz (Average) for frequency above 1GHz).
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dBμV/m) = 20 log Emission level (μV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

### 3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz

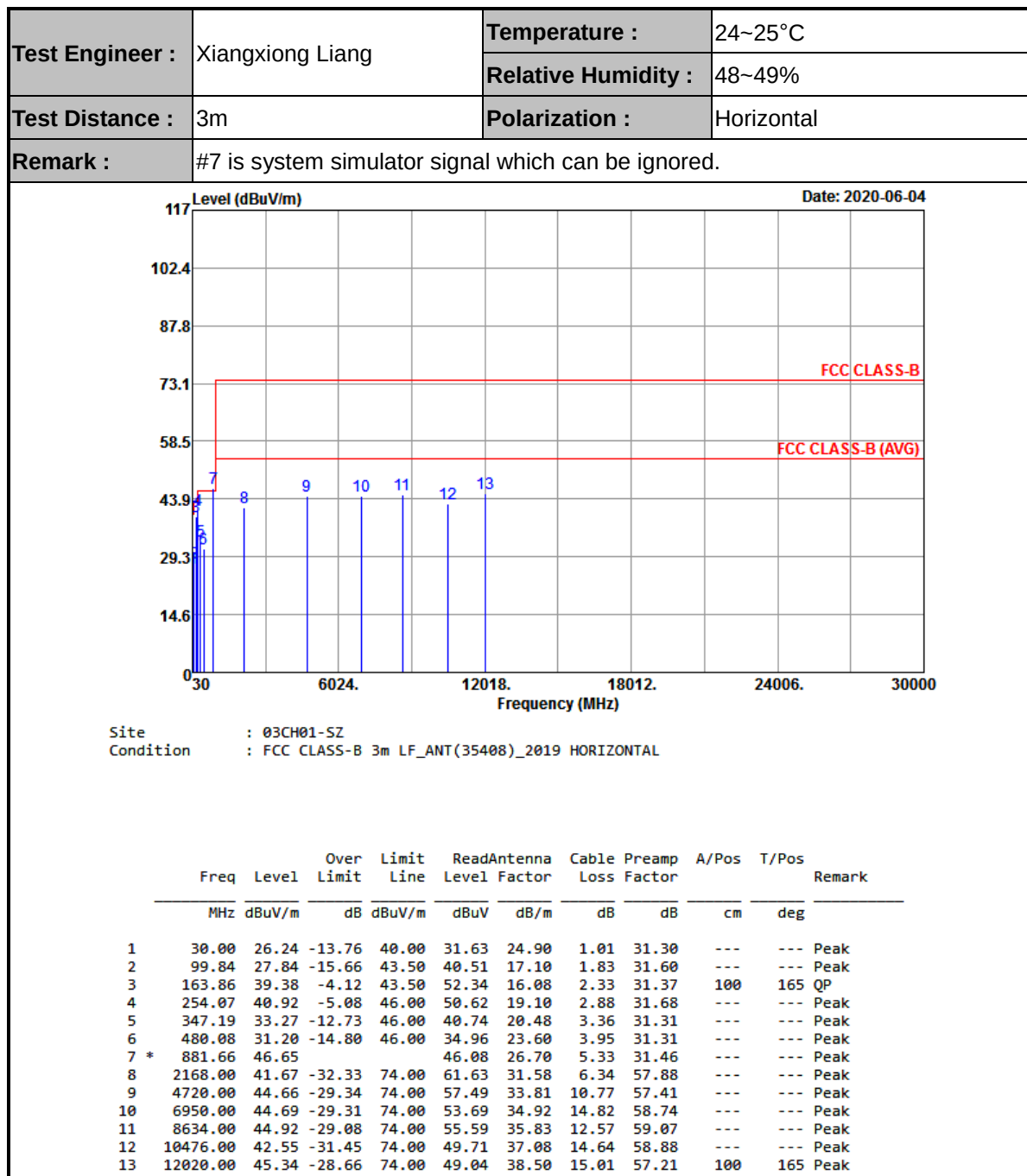


For radiated emissions above 1GHz



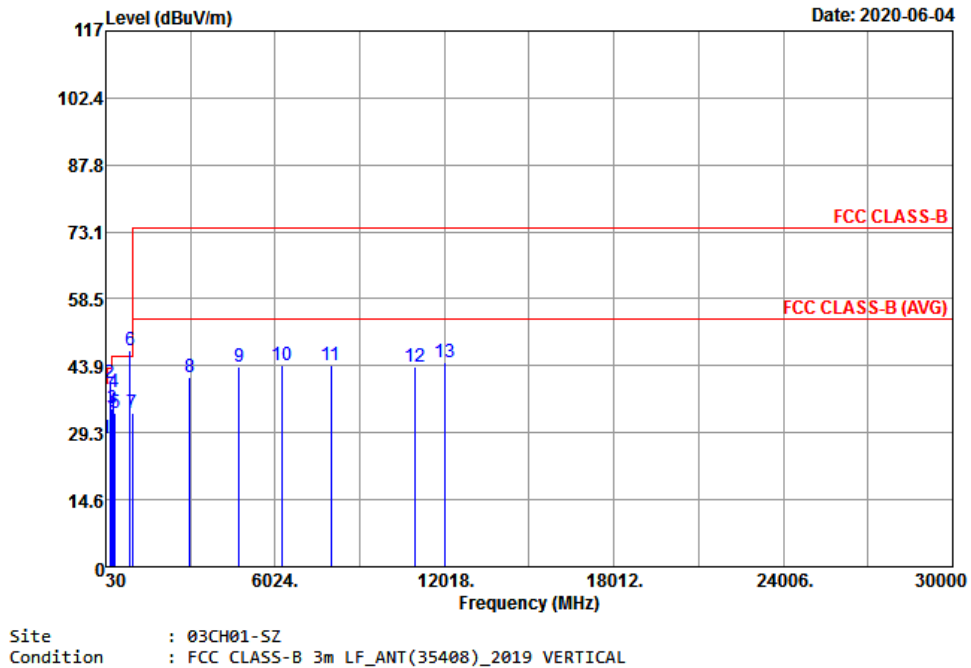


## 3.2.5. Test Result of Radiated Emission





|                 |                                                     |                     |          |
|-----------------|-----------------------------------------------------|---------------------|----------|
| Test Engineer : | Xiangxiong Liang                                    | Temperature :       | 24~25°C  |
|                 |                                                     | Relative Humidity : | 48~49%   |
| Test Distance : | 3m                                                  | Polarization :      | Vertical |
| Remark :        | #6 is system simulator signal which can be ignored. |                     |          |



|     | Freq     | Level  | Over<br>Limit | Limit<br>Line | ReadAntenna<br>Level | Factor | Cable<br>Loss | Preamp<br>Factor | A/Pos | T/Pos | Remark |
|-----|----------|--------|---------------|---------------|----------------------|--------|---------------|------------------|-------|-------|--------|
|     | MHz      | dBuV/m | dB            | dBuV/m        | dBuV                 | dB/m   | dB            | dB               | cm    | deg   |        |
| 1   | 50.37    | 27.94  | -12.06        | 40.00         | 43.91                | 14.30  | 1.30          | 31.57            | ---   | ---   | Peak   |
| 2   | 164.83   | 40.12  | -3.38         | 43.50         | 53.11                | 16.05  | 2.33          | 31.37            | 100   | 146   | Peak   |
| 3   | 255.04   | 34.42  | -11.58        | 46.00         | 43.99                | 19.20  | 2.89          | 31.66            | ---   | ---   | Peak   |
| 4   | 299.66   | 38.06  | -7.94         | 46.00         | 47.04                | 19.30  | 3.12          | 31.40            | ---   | ---   | Peak   |
| 5   | 347.19   | 33.63  | -12.37        | 46.00         | 41.10                | 20.48  | 3.36          | 31.31            | ---   | ---   | Peak   |
| 6 * | 881.66   | 47.27  |               |               | 46.70                | 26.70  | 5.33          | 31.46            | ---   | ---   | Peak   |
| 7   | 960.23   | 33.72  | -20.28        | 54.00         | 32.31                | 27.10  | 5.59          | 31.28            | ---   | ---   | Peak   |
| 8   | 2998.00  | 41.40  | -32.60        | 74.00         | 57.09                | 32.70  | 8.91          | 57.30            | ---   | ---   | Peak   |
| 9   | 4758.00  | 43.81  | -30.19        | 74.00         | 56.62                | 33.80  | 10.82         | 57.43            | ---   | ---   | Peak   |
| 10  | 6252.00  | 44.01  | -29.99        | 74.00         | 52.93                | 34.68  | 14.31         | 57.91            | ---   | ---   | Peak   |
| 11  | 8010.00  | 43.88  | -30.12        | 74.00         | 54.82                | 35.70  | 12.56         | 59.20            | ---   | ---   | Peak   |
| 12  | 10962.00 | 43.82  | -30.18        | 74.00         | 50.03                | 37.38  | 14.75         | 58.34            | ---   | ---   | Peak   |
| 13  | 12042.00 | 44.63  | -29.37        | 74.00         | 48.35                | 38.51  | 15.01         | 57.24            | 100   | 154   | Peak   |

Note:

- Level(dBμV/m) = Read Level(dBμV) + Antenna Factor(dB/m) + Cable Loss(dB) - Preamp Factor(dB)
- Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)



## 4. List of Measuring Equipment

| Instrument                        | Manufacturer | Model No.                    | Serial No.   | Characteristics | Calibration Date | Test Date     | Due Date      | Remark                |
|-----------------------------------|--------------|------------------------------|--------------|-----------------|------------------|---------------|---------------|-----------------------|
| EMI Test Receiver&SA              | Agilent      | N9038A                       | MY52260185   | 20Hz~26.5GHz    | Jul. 22, 2019    | Jun. 04, 2020 | Jul. 21, 2020 | Radiation (03CH01-SZ) |
| EXA Spectrum Analyzer             | KEYSIGHT     | N9010A                       | MY55150213   | 10Hz~44GHz      | Apr. 17, 2020    | Jun. 04, 2020 | Apr. 16, 2021 | Radiation (03CH01-SZ) |
| HF Amplifier                      | KEYSIGHT     | 83017A                       | MY53270104   | 0.5GHz~26.5GHz  | Dec. 27, 2019    | Jun. 04, 2020 | Dec. 26, 2020 | Radiation (03CH01-SZ) |
| Bilog Antenna                     | TeseQ        | CBL6112D                     | 35407        | 30MHz-2GHz      | Jul. 19, 2019    | Jun. 04, 2020 | Jul. 18, 2020 | Radiation (03CH01-SZ) |
| Double Ridge Horn Antenna         | SCHWARZBECK  | BBHA9120D                    | 9120D-1355   | 1GHz~18GHz      | Apr. 01, 2020    | Jun. 04, 2020 | Mar. 31, 2021 | Radiation (03CH01-SZ) |
| LF Amplifier                      | Burgeon      | BPA-530                      | 102209       | 0.01~3000Mhz    | Apr. 17, 2020    | Jun. 04, 2020 | Apr. 16, 2021 | Radiation (03CH01-SZ) |
| HF Amplifier                      | MITEQ        | AMF-7D-0010<br>1800-30-10P-R | 1943528      | 1GHz~18GHz      | Oct. 18, 2019    | Jun. 04, 2020 | Oct. 17, 2020 | Radiation (03CH01-SZ) |
| HF Amplifier                      | MITEQ        | TTA1840-35-H<br>G            | 1871923      | 18GHz~40GHz     | Jul. 22, 2019    | Jun. 04, 2020 | Jul. 21, 2020 | Radiation (03CH01-SZ) |
| SHF-EHF Horn                      | com-power    | AH-840                       | 101071       | 18GHz-40GHz     | Apr. 17, 2020    | Jun. 04, 2020 | Apr. 16, 2021 | Radiation (03CH01-SZ) |
| AC Power Source                   | Chroma       | 61601                        | 616010001985 | N/A             | NCR              | Jun. 04, 2020 | NCR           | Radiation (03CH01-SZ) |
| Turn Table                        | EM           | EM1000                       | N/A          | 0~360 degree    | NCR              | Jun. 04, 2020 | NCR           | Radiation (03CH01-SZ) |
| Antenna Mast                      | EM           | EM1000                       | N/A          | 1 m~4 m         | NCR              | Jun. 04, 2020 | NCR           | Radiation (03CH01-SZ) |
| EMI Receiver                      | R&S          | ESR7                         | 101630       | 9kHz~7GHz;      | Dec. 26, 2019    | Jun. 02, 2020 | Dec. 25, 2020 | Conduction (CO01-SZ)  |
| AC LISN                           | EMCO         | 3816/2SH                     | 00103912     | 9kHz~30MHz      | Oct. 17, 2019    | Jun. 02, 2020 | Oct. 16, 2020 | Conduction (CO01-SZ)  |
| AC LISN (for auxiliary equipment) | EMCO         | 3816/2SH                     | 00103892     | 9kHz~30MHz      | Oct. 17, 2019    | Jun. 02, 2020 | Oct. 16, 2020 | Conduction (CO01-SZ)  |
| AC Power Source                   | Chroma       | 61602                        | 616020000891 | 100Vac~250Vac   | Jul. 23, 2019    | Jun. 02, 2020 | Jul. 22, 2020 | Conduction (CO01-SZ)  |

NCR: No Calibration Required.

## 5. Uncertainty of Evaluation

### Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

|                                                                         |       |
|-------------------------------------------------------------------------|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 2.7dB |
|-------------------------------------------------------------------------|-------|

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

|                                                                         |       |
|-------------------------------------------------------------------------|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 4.7dB |
|-------------------------------------------------------------------------|-------|

### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

|                                                                         |       |
|-------------------------------------------------------------------------|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 5.0dB |
|-------------------------------------------------------------------------|-------|

### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

|                                                                         |       |
|-------------------------------------------------------------------------|-------|
| Measuring Uncertainty for a Level of Confidence of 95% ( $U = 2Uc(y)$ ) | 4.3dB |
|-------------------------------------------------------------------------|-------|