

## Industrial Internet Innovation Center (Shanghai) Co.,Ltd.

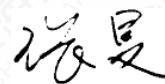
## EMC TEST REPORT

|             |                                                                                               |
|-------------|-----------------------------------------------------------------------------------------------|
| PRODUCT     | Wireless data POS System                                                                      |
| BRAND       | SUNMI                                                                                         |
| MODEL       | T5820                                                                                         |
| APPLICANT   | Shanghai Sunmi Technology Co.,Ltd.                                                            |
| FCC ID      | 2AH25T5820C                                                                                   |
| IC          | 22621-T5820C                                                                                  |
| ISSUE DATE  | January 17, 2023                                                                              |
| STANDARD(S) | FCC CFR47 Part 2, FCC CFR47 Part 15C, ANSI C63.10-2013,<br>RSS-210 Issue 10, RSS-Gen Issue 5. |

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## 1 Summary of Test Report

### 1.1 Test Standard (s)

| No.                                                                                                               | Test Standard(s)   | Title                                                                                          | Version    |
|-------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------------------------------------------------------------------|------------|
| 1                                                                                                                 | FCC CFR47 Part 2   | Frequency allocations and radio treaty matters;<br>general rules and regulations               | 2021/10/01 |
| 2                                                                                                                 | FCC CFR47 Part 15C | Radio Frequency Devices-Intentional Radiators                                                  | 2021/10/01 |
| 3                                                                                                                 | ANSI C63.10        | American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices | 2013       |
| 4                                                                                                                 | RSS-210            | License-Exempt Radio Apparatus: Category I Equipment                                           | Issue 10   |
| 5                                                                                                                 | RSS-Gen            | General Requirements for Compliance of Radio Apparatus                                         | Issue 5    |
| <p>NOTE:</p> <p>According to customer requirements, test and report using the latest version of the standard.</p> |                    |                                                                                                |            |

### 1.2 Summary of Test Results

| No.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Item(s)             | Sub-clause of FCC Standard        | Sub-clause of IC Standard         | Verdicts for Single Item | Detailed Results |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------------------------|-----------------------------------|--------------------------|------------------|
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 20 dB bandwidth     | 2.1049                            | RSS-Gen 6.7                       | Pass                     | See section 6.1  |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Frequency Stability | 15.225(e)                         | RSS-210 B.6.b                     | Pass                     | See section 6.2  |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Radiated Emission   | 15.225 (a) (b) (c) (d) and 15.209 | RSS-210 B.6.a (i , ii , iii , iv) | Pass                     | See section 6.3  |
| 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Conducted Emissions | 15.207                            | RSS-Gen 8.8                       | Pass                     | See section 6.4  |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Occupied bandwidth  | N/A                               | RSS-Gen 6.7                       | Pass                     | See section 6.5  |
| <p>NOTE:</p> <p>The T5820, manufactured by Shanghai Sunmi Technology Co.,Ltd. is a new product for testing. Industrial Internet Innovation Center (Shanghai) Co., Ltd. only performed test cases which identified with Pass/Fail/Inc result in section 1.3.</p> <p>Industrial Internet Innovation Center (Shanghai) Co., Ltd. has verified that the compliance of the tested device specified in section 4 of this test report is successfully evaluated according to the procedure and test methods as defined in type certification requirement listed in section 1 of this test report.</p> |                     |                                   |                                   |                          |                  |

## 2 General Information of The Laboratory

### 2.1 Testing Laboratory

|                      |                                                            |
|----------------------|------------------------------------------------------------|
| Lab Name             | Industrial Internet Innovation Center (Shanghai) Co.,Ltd.  |
| Address              | Building 4, No. 766, Jingang Road, Pudong, Shanghai, China |
| Telephone            | 021-68866880                                               |
| FCC Registration No. | 958356                                                     |
| FCC Designation No.  | CN1177                                                     |
| IC designation No.   | CN0067                                                     |

### 2.2 Laboratory Environmental Requirements

|                      |              |
|----------------------|--------------|
| Temperature          | 15℃~35℃      |
| Relative Humidity    | 25%RH~75%RH  |
| Atmospheric Pressure | 86kPa~106kPa |
| Supply Voltage       | 120V/60Hz    |

### 2.3 Project Information

|                 |                                        |
|-----------------|----------------------------------------|
| Project Manager | Gao Hongning                           |
| Test Date       | November 22, 2022 to November 23, 2022 |

### 3 General Information of The Customer

#### 3.1 Applicant

|           |                                                                   |
|-----------|-------------------------------------------------------------------|
| Company   | Shanghai Sunmi Technology Co.,Ltd.                                |
| Address   | Room 505, No.388, Song Hu Road, Yang Pu District, Shanghai, China |
| Telephone | 13510126210                                                       |

#### 3.2 Manufacturer

|           |                                                                   |
|-----------|-------------------------------------------------------------------|
| Company   | Shanghai Sunmi Technology Co.,Ltd.                                |
| Address   | Room 505, No.388, Song Hu Road, Yang Pu District, Shanghai, China |
| Telephone | 13510126210                                                       |

#### 3.3 Factory

|         |     |
|---------|-----|
| Company | N/A |
| Address | N/A |

## 4 General Information of The Product

### 4.1 Product Description for Equipment under Test (EUT)

|                                                                      |                                                                                                                                                                                                            |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product                                                              | Wireless data POS System                                                                                                                                                                                   |
| Model                                                                | T5820                                                                                                                                                                                                      |
| Date of Receipt                                                      | October 24, 2022                                                                                                                                                                                           |
| EUT ID*                                                              | S06aa                                                                                                                                                                                                      |
| SN/IMEI                                                              | 860450060018740'860450060018757                                                                                                                                                                            |
| Supported Radio Technology and Bands                                 | GSM850/GSM900/GSM1800/GSM1900<br>WCDMA Band I/II/ IV/V/VIII<br>LTE Band 1/2/3/4/5/7/12/17/28/38/41<br>BT 5.1<br>WLAN 802.11b,g,n<br>WLAN 802.11a,n,ac<br>NFC<br>Wireless Charging<br>GPS<br>GLONASS<br>BDS |
| Hardware Version                                                     | V01                                                                                                                                                                                                        |
| Software Version                                                     | XQT530_V004_20220923                                                                                                                                                                                       |
| NOTE1: EUT ID is the internal identification code of the laboratory. |                                                                                                                                                                                                            |
| NOTE2: Photographs of EUT are shown in ANNEX A of this test report.  |                                                                                                                                                                                                            |

### 4.2 Description for Auxiliary Equipment (AE)

| AE ID*                                                              | Description | Model             | SN/Remark |
|---------------------------------------------------------------------|-------------|-------------------|-----------|
| CB01                                                                | Adapter     | TPA-23A050200UU01 | N/A       |
| UA01                                                                | USB Cable   | N/A               | N/A       |
| AE1                                                                 | Type-A card | N/A               | N/A       |
| NOTE: *AE ID is the internal identification code of the laboratory. |             |                   |           |

## 5 Test Configuration Information

### 5.1 Laboratory Environmental Conditions

#### 5.1.1 Permanent Facilities

|                                                                      |                                             |
|----------------------------------------------------------------------|---------------------------------------------|
| Semi-anechoic chamber SAC3-1 (9 m*8m*6.2m) & SAC3-2 (9.8m*6.7m*6.7m) |                                             |
| Shielding effectiveness                                              | 0.014MHz ~1MHz, >60dB; 1MHz~1000MHz, >90dB. |
| Electrical insulation                                                | > 2MΩ                                       |
| Ground system resistance                                             | < 4Ω                                        |
| Normalised site attenuation (NSA)                                    | < ± 4 dB, 3m distance, from 30 to 1000 MHz  |
| Site voltage standing-wave ratio (SVSWR)                             | Between 0 and 6 dB, from 1GHz to 18GHz      |
| Uniformity of field strength                                         | Between 0 and 6 dB, from 80 to 6000 MHz     |

|                          |                                            |
|--------------------------|--------------------------------------------|
| Shielded room            |                                            |
| Shielding effectiveness  | 0.014MHz~1MHz, >60dB; 1MHz~1000MHz, >90dB. |
| Electrical insulation    | > 2 MΩ                                     |
| Ground system resistance | < 4Ω                                       |

## 5.2 Decision of final test mode

The EUT was tested in conjunction with the accessories in Section 4.2. We tested all of the following test modes and selected the worst mode from the test results and recorded them in the report.

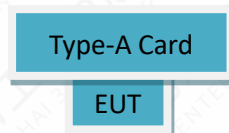
The test configuration modes are as the following:

| Test Item           | Test setup and operating modes |
|---------------------|--------------------------------|
| 20 dB bandwidth     | Mode 1: TX Mode                |
| Frequency Stability | Mode 1: TX Mode                |
| Radiated emission   | Mode 1: TX Mode                |
| Conducted Emissions | Mode 2: TX Mode + CB01 + UA01  |
| Occupied bandwidth  | Mode 1: TX Mode                |
| Note: N/A           |                                |

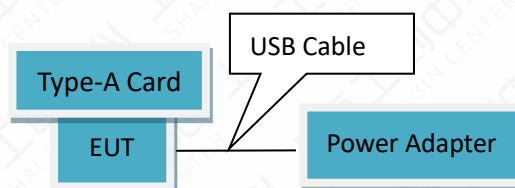
## 5.3 EUT System Operation

1. Connect the EUT with AE.
2. Setup the EUT according to the standard.
3. Start testing and monitoring the function.
4. TX mode: Enter working mode according to NFC transmission command. The EUT will transmit the NFC command continuously during the test, and will read the information from the Type A Card continuously.

## 5.4 EUT Connection Diagram of Test System



<Figure 5.4-1> Mode 1



<Figure 5.4-1> Mode 2

### 5.5 Test Equipment Utilized

| No. | Name                   | Model           | S/N          | Manufacturer | Cal. Date  | Cal. Interval |
|-----|------------------------|-----------------|--------------|--------------|------------|---------------|
| 1   | Test Receiver          | ESCI            | 101235       | R&S          | 2022-02-23 | 1 year        |
| 2   | Test Receiver          | ESU40           | 100307       | R&S          | 2022-02-23 | 1 year        |
| 3   | Trilog Antenna         | VULB9163        | VULB9163-515 | Schwarzbeck  | 2022-03-11 | 1 year        |
| 4   | Loop Antenna           | AL-130R         | 121083       | COM-POWER    | 2021-11-25 | 2 years       |
| 5   | Temperature Box        | B-TF-107C       | 201804107    | Boyi         | 2022-10-17 | 1 year        |
| 6   | EMI Test Software      | EMC32 V10.35.02 | N/A          | R&S          | N/A        | N/A           |
| 7   | Vector Signal Analyser | FSQ26           | 101091       | R&S          | 2022-08-23 | 1 year        |
| 8   | Climate chamber        | B-TF-107C       | 201804107    | Boyi         | 2022-06-30 | 1 year        |

### 5.6 Measurement Uncertainty

| Item (s)                                                                                                                                         | Uncertainty |
|--------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 20 dB bandwidth                                                                                                                                  | 60.8 Hz     |
| Frequency Stability                                                                                                                              | 60.8 Hz     |
| Electric Field Strength of Fundamental Emissions                                                                                                 | 4.48 dB     |
| Electric Field Radiated Emissions (Below 30MHz)                                                                                                  | 4.48 dB     |
| Electric Field Radiated Emissions (Above 30MHz)                                                                                                  | 4.94 dB     |
| Conducted Emissions                                                                                                                              | 3.56 dB     |
| Occupied bandwidth                                                                                                                               | 60.8 Hz     |
| Note: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$ . |             |

## 6 Test Results

### 6.1 20dB Bandwidth

#### 6.1.1 Measurement Methods

- The transmitter output signal was picked up by coil antenna to the spectrum analyzer.
- The transmitter output signal was picked up by coil antenna connected to the spectrum analyzer.
- The bandwidth of the center frequency was measured with 140Hz RBW, 420Hz VBW and 14kHz span.

#### 6.1.2 EUT Connection Diagram of Test System

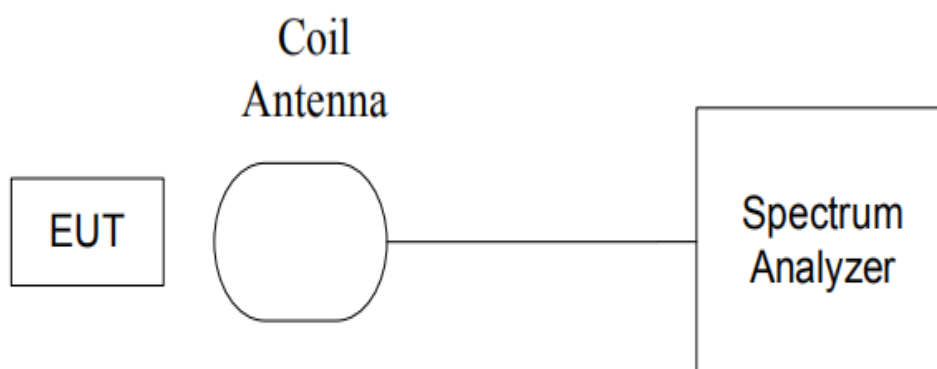


Figure 6.1.2-1 20dB Bandwidth Connection Diagram

#### 6.1.3 Test Condition

The measurement of EUT is carried out under the transmit state of NFC and without modulation.

EUT had been not connected to a travel adapter.

During the measurements, the ambient temperature is in the range of 15~25°C.

#### 6.1.4 Limit/Criterion

The 20dB bandwidth shall be less than 80% of the permitted frequency band. For 13.56MHz NFC, the permitted frequency band is 14kHz, so the limit is 11.2kHz.

#### 6.1.5 Test environmental conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23.6℃    |
| Relative Humidity    | 58.1%RH  |
| Atmospheric Pressure | 100.2kPa |

#### 6.1.6 Test Results

| Carrier frequency<br>(MHz) | 20dB Bandwidth<br>(kHz) | Test Results    | Conclusion |
|----------------------------|-------------------------|-----------------|------------|
| 13.56                      | 0.561                   | See Annex A.1-1 | Pass       |

## 6.2 Frequency Stability

### 6.2.1 Measurement Methods

The transmitter output single was picked up by coil antenna connected to the frequency counter. The center frequency was measured with 30Hz RBW and 1kHz span.

During the test, the EUT was placed in a thermal chamber until thermal balance and lasting appropriate time.

### 6.2.2 EUT Connection Diagram of Test System

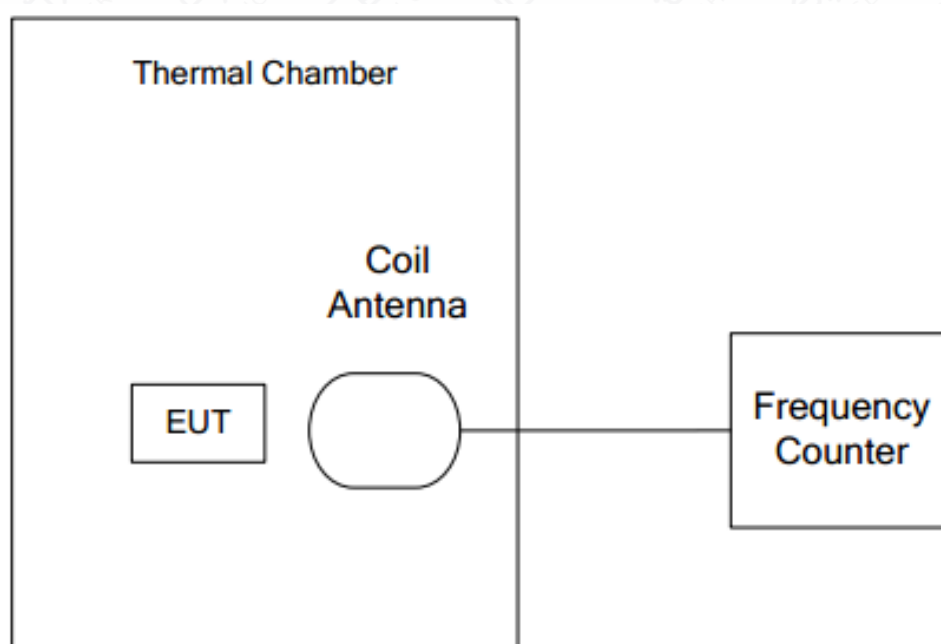


Figure 6.2.2-1 Frequency Stability Connection Diagram

### 6.2.3 Test Condition

The measurement of EUT is carried out under the transmit state of without modulation , EUT1 had been not connected to a travel adapter.

Operation Temperature:  $T_{min}=3^{\circ}\text{C}$ ,  $T_{nom}=25^{\circ}\text{C}$ , and  $T_{max}=40^{\circ}\text{C}$

Operation Voltage:  $V_{min}=2.2\text{V}$ ,  $V_{max}=3.3\text{V}$ , and  $T_{nom}=3\text{V}$ .

### 6.2.4 Limit/Criterion

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency.

### 6.2.5 Test environmental conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23.6℃    |
| Relative Humidity    | 58.1%RH  |
| Atmospheric Pressure | 100.2kPa |

### 6.2.6 Test Results

| Temperature | Voltage | Frequency Error (MHz) | Frequency Error (%) |
|-------------|---------|-----------------------|---------------------|
| Tmin        | Vnom    | See Annex A.2-1       |                     |
| Tmax        | Vnom    |                       |                     |
| Tnom        | Vnom    |                       |                     |
| Tnom        | Vmin    |                       |                     |
| Tnom        | Vmax    |                       |                     |

## 6.3 Radiated Emission

### 6.3.1 Electric Field Strength of Fundamental Emissions

#### 6.3.1.1 Method of Measurement

a. The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The transmitter carrier output levels (E-Field) from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving antenna is 1 meter above the ground. The E-field is measured with a shielded loop antenna connected to a measurement receiver. Detected E-field was maximized by rotating the EUT through 360° and adjusting the receiving antenna polarizations. Both horizontal and vertical polarizations of the antenna were set during the measurement. The maximization processes were repeated with the EUT positioned respectively in its three orthogonal axes. The measurements were performed with the peak detector and if required, the quasi-peak detector.

b. The measurement bandwidth:

| Frequency (MHz) | RBW / VBW  |
|-----------------|------------|
| 12.56-14.56     | 10 / 30kHz |

#### 6.3.1.2 EUT Connection Diagram of Test System

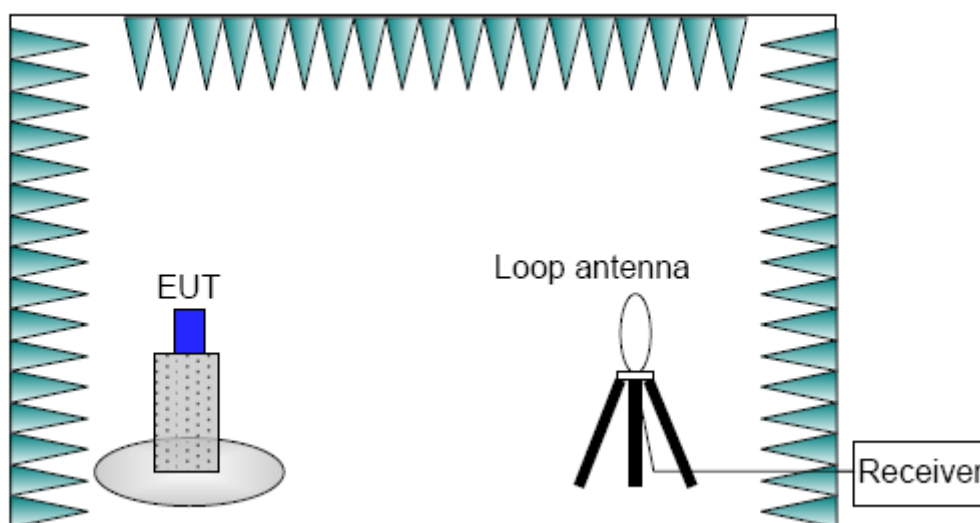


Figure 6.3.1.2-1 Electric Field Strength of Fundamental Emissions Connection Diagram

### 6.3.1.3 Test Condition

| Frequency Range (MHz) | RBW/VBW     | Sweep Time (s) |
|-----------------------|-------------|----------------|
| 12.56-14.56           | 10kHz/30kHz | AUTO           |

### 6.3.1.4 Limit/Criterion

Clause 15.225(a) the field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

Clause 15.225(b) within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

Clause 15.225(c) within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

| Frequency Range (MHz)                | E-field Strength Limit @30m<br>(uV/m) | E-field Strength Limit @3m<br>(dBuV/m) |
|--------------------------------------|---------------------------------------|----------------------------------------|
| 13.560 ± 0.007                       | +15,848                               | 124                                    |
| 13.410 to 13.553<br>13.567 to 13.710 | +334                                  | 90                                     |
| 13.110 to 13.410<br>13.710 to 14.010 | +106                                  | 81                                     |

Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula:

Extrapolation (dB) = 40log<sub>10</sub>(Measurement Distance / Specification Distance)

### 6.3.1.5 Test environmental conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23.6°C   |
| Relative Humidity    | 58.1%RH  |
| Atmospheric Pressure | 100.2kPa |

## 6.3.1.6 Test Results

| Mode                                                                                                                                                                                       | Frequency (MHz) | Test Results      | Verdicts |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|----------|
| Mode 1: TX Mode                                                                                                                                                                            | 12.56-14.56     | See Annex A.3.1-1 | Pass     |
| <p>NOTE:</p> <p>a. Abbreviations used in this clause: Pass—P; Fail—F; Not applicable—N/A</p> <p>b. The result displayed take into account applicable antenna factors and cable losses.</p> |                 |                   |          |

### 6.3.2 Electric Field Radiated Emissions (Below 30MHz)

#### 6.3.2.1 Method of Measurement

a. The electric field radiated emissions from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving antenna is 1 meter above the ground. The E-field is measured with a shielded loop antenna connected to a measurement receiver. Detected E-field was maximized by rotating the EUT through 360° and adjusting the receiving antenna polarizations. Both horizontal and vertical polarizations of the antenna were set during the measurement. The maximization processes were repeated with the EUT positioned respectively in its three orthogonal axes. The measurements were performed with the peak detector and if required, the quasi-peak detector.

b. The measurement bandwidth:

| Frequency (MHz) | RBW / VBW  |
|-----------------|------------|
| 0.009-30        | 10 / 30kHz |

#### 6.3.2.2 EUT Connection Diagram of Test System

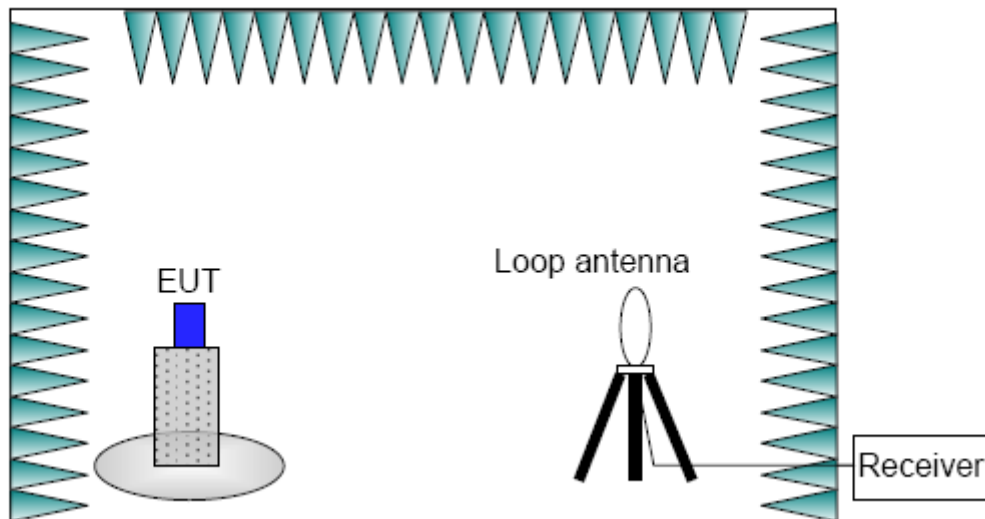


Figure 6.3.2.2-1 Electric Field Radiated Emissions (Below 30MHz) Connection Diagram

#### 6.3.2.3 Test Condition

| Frequency Range (MHz) | RBW/VBW     | Sweep Time (s) |
|-----------------------|-------------|----------------|
| 0.009-30              | 10kHz/30kHz | AUTO           |

#### 6.3.2.4 Limit/Criterion

| Frequency Range (MHz)                                                                                                                                                                                                                                                                             | E-field Strength Limit @30m<br>(mV/m) | E-field Strength Limit @3m<br>(dBuV/m) |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|----------------------------------------|
| 0.009-0490                                                                                                                                                                                                                                                                                        | 2400/F (kHz)                          | 129-94                                 |
| 0.490-1.705                                                                                                                                                                                                                                                                                       | 24000/F (kHz)                         | 74-63                                  |
| 1.705-30                                                                                                                                                                                                                                                                                          | 30                                    | 70                                     |
| <p>Note: Where the limits have been defined at one distance, and a signal level measured at another, the limits have been extrapolated using the following formula:</p> <p>Extrapolation (dB) = 40log<sub>10</sub>(Measurement Distance / Specification Distance)</p> <p>dBuA/m=dBuV/m / 120π</p> |                                       |                                        |

#### 6.3.2.5 Test environmental conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23.6℃    |
| Relative Humidity    | 58.1%RH  |
| Atmospheric Pressure | 100.2kPa |

#### 6.3.2.6 Test Results

| Mode                                                                                                                                                                                                                                                                                                         | Frequency (MHz) | Test Results      | Verdicts |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|----------|
| Mode 1: TX Mode                                                                                                                                                                                                                                                                                              | 0.009-30        | See Annex A.3.2-1 | Pass     |
| <p>NOTE:</p> <p>a. Abbreviations used in this clause: Pass—P; Fail—F; Not applicable—N/A</p> <p>b. The result displayed take into account applicable antenna factors and cable losses</p> <p>c. dBuV/m and dBuA/m can be converted to each other, so the test data of dBuV/m are reflected in the report</p> |                 |                   |          |

### 6.3.3 Electric Field Radiated Emissions (Above 30MHz)

#### 6.3.3.1 Method of Measurement

a. The electric field radiated emissions from the EUT are measured in a semi-anechoic chamber. The EUT is placed on a non-conductive stand of 80cm high, and at a measurement distance of 3m from the receiving antenna. The center of the receiving antenna is 1 meter above the ground. The E-field is measured with a shielded loop antenna connected to a measurement receiver. Detected E-field was maximized by rotating the EUT through 360° and adjusting the receiving antenna polarizations. Both horizontal and vertical polarizations of the antenna were set during the measurement. The maximization processes were repeated with the EUT positioned respectively in its three orthogonal axes. The measurements were performed with the peak detector and if required, the quasi-peak detector.

b. The measurement bandwidth:

| Frequency (MHz) | RBW / VBW        |
|-----------------|------------------|
| 30-1000         | 120 kHz / 300kHz |

#### 6.3.3.2 EUT Connection Diagram of Test System

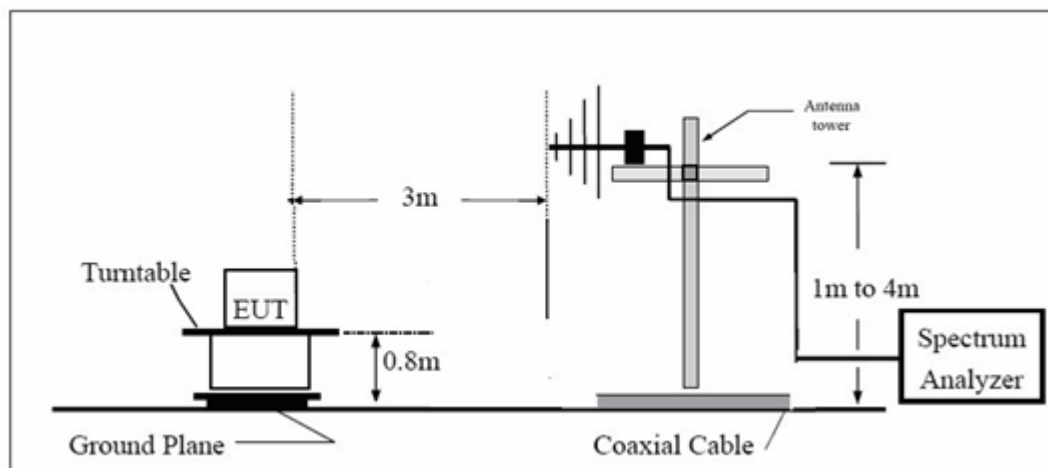


Figure 6.3.3.2-1 Electric Field Radiated Emissions (Above 30MHz) Connection Diagram

#### 6.3.3.3 Test Condition

| Frequency Range (MHz) | RBW/VBW       | Sweep Time (s) |
|-----------------------|---------------|----------------|
| 30-1000               | 120kHz/300kHz | AUTO           |

#### 6.3.3.4 Limit/Criterion

| Frequency Range (MHz) | Quasi-Peak (dBμV/m) | Peak (dBμV/m) | Average (dBμV/m) |
|-----------------------|---------------------|---------------|------------------|
| 30-88                 | 40                  | N/A           | N/A              |
| 88-216                | 43.5                | N/A           | N/A              |
| 216-960               | 46                  | N/A           | N/A              |
| Above 960             | 54                  | N/A           | N/A              |
| Above 1000            | N/A                 | 74            | 54               |

#### 6.3.3.5 Test environmental conditions

|                      |          |
|----------------------|----------|
| Temperature          | 23.6℃    |
| Relative Humidity    | 58.1%RH  |
| Atmospheric Pressure | 100.2kPa |

#### 6.3.3.6 Test Results

| Mode                                                                                                                                                                                                                                                                                                                 | Frequency (MHz) | Test Results      | Verdicts |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------------|----------|
| Mode 1: TX Mode                                                                                                                                                                                                                                                                                                      | 30-1000         | See Annex A.3.3-1 | Pass     |
| <p><b>NOTE:</b></p> <p>a. Abbreviations used in this clause: Pass—P; Fail—F; Not applicable—N/A</p> <p>b. The result displayed take into account applicable antenna factors and cable losses</p> <p>c. QP detection is used in radiated emissions test, and the Duty Cycle of NFC main frequency signal is 100%.</p> |                 |                   |          |

## 6.4 Conducted Emissions

### 6.5.1 Reference

See Clause 6.2 of ANSI C63.10-2013

### 6.5.2 Measurement Methods

The conducted emissions from the AC port of the EUT are measured in a shielding room. The EUT is connected to a Line Impedance Stabilization Network (LISN). An overview sweep with peak detection was performed. The measurements were performed with a quasi-peak detector and if required, an average detector. Tested in accordance with the procedures of ANSI C63.10-2013.

### 6.5.3 Test Setup

The measurement bandwidth and Test Condition

| Frequency Range (MHz) | RBW   | Sweep Time (s) | Test Voltage |
|-----------------------|-------|----------------|--------------|
| 0.15-30               | 9 kHz | AUTO           | 120V/60Hz    |

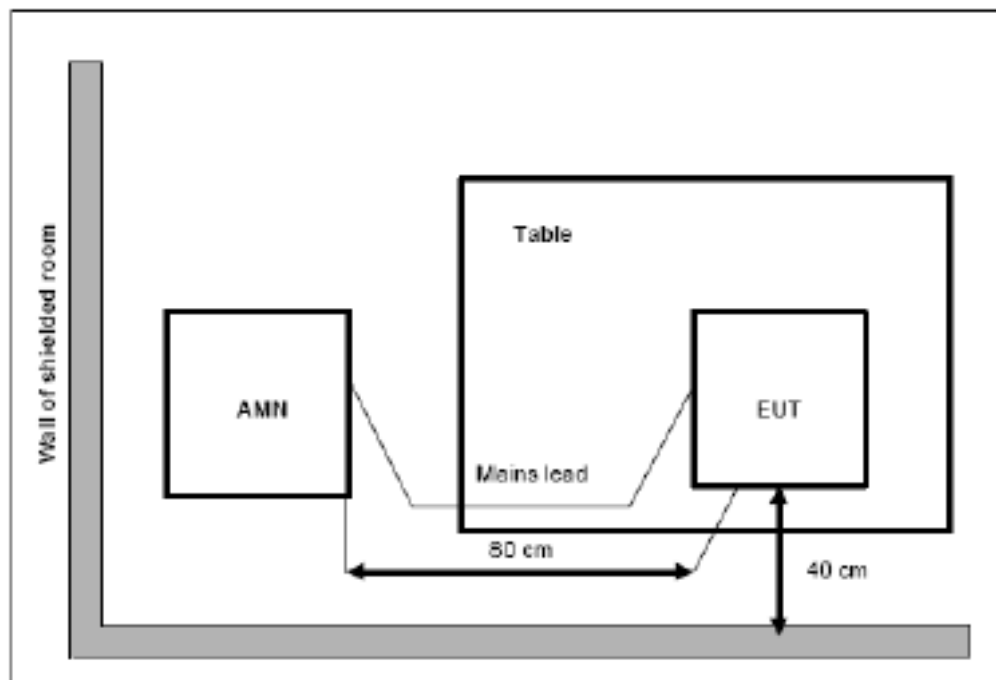


Figure 6.4.3-1 Conducted Emissions Connection Diagram

#### 6.5.4 Limits

| Frequency Range (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 |                        |           |

#### 6.5.5 Measurement Results

| Mode                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Frequency (MHz) | Test Results    | Verdicts |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|----------|
| Mode 2: TX Mode + CA01 + UA18 + BA02                                                                                                                                                                                                                                                                                                                                                                                                                                  | 0.009-30        | See Annex A.4-1 | Pass     |
| <p><b>NOTE:</b></p> <p>a. Emission level (quasi-peak or Average peak) =Raw value by receiver + Corr(Insertion loss+ cable loss)</p> <p>b. The raw value is used to calculate by software which is not shown in the sheet.</p> <p>c. Margin=limit value – emission level.</p> <p>d. L1 and N line is all have been tested , the result of them is synthesized in the above data diagram.</p> <p>e. The frequency over the limits is the NFC main signal frequency.</p> |                 |                 |          |

## 6.5 Occupied bandwidth

### 6.5.1 Reference

See Clause 6.7 of RSS-Gen.

### 6.5.2 Measurement Methods

The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSS.

The following conditions shall be observed for measuring the occupied bandwidth:

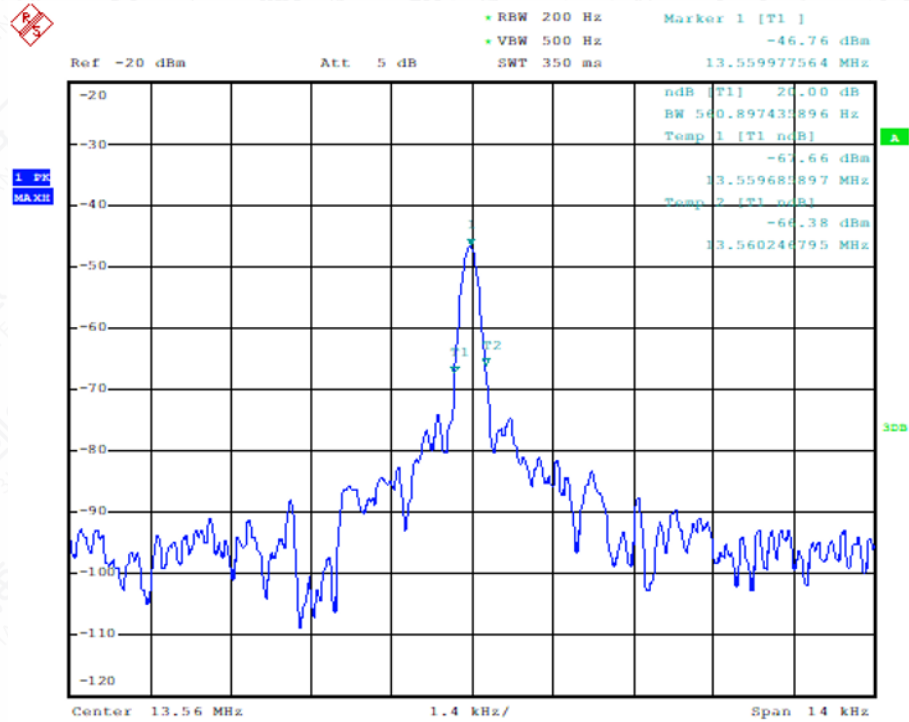
- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max Hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

### 6.5.3 Measurement Results

See Annex A.5-1

## Annex A: Measurement Data



A.1-1 Mode 1 20dB Bandwidth

| Temperature | Voltage | Frequency Error (MHz) |            |            |             |
|-------------|---------|-----------------------|------------|------------|-------------|
|             |         | Startup               | 2Min Later | 5Min Later | 10Min Later |
| Tmin        | Vnom    | 13.559977             | 13.559939  | 13.559966  | 13.559926   |
| Tmax        | Vnom    | 13.559917             | 13.559967  | 13.559928  | 13.559938   |
| Tnom        | Vnom    | 13.559925             | 13.559952  | 13.559919  | 13.559945   |
| Tnom        | Vmin    | 13.559944             | 13.559932  | 13.559992  | 13.559927   |
| Tnom        | Vmax    | 13.559939             | 13.559912  | 13.559969  | 13.559955   |
| Temperature | Voltage | Frequency Error (%)   |            |            |             |
|             |         | Startup               | 2Min Later | 5Min Later | 10Min Later |
| Tmin        | Vnom    | -0.0002               | -0.0004    | -0.0003    | -0.0005     |
| Tmax        | Vnom    | -0.0006               | -0.0002    | -0.0005    | -0.0005     |
| Tnom        | Vnom    | -0.0006               | -0.0004    | -0.0006    | -0.0004     |
| Tnom        | Vmin    | -0.0004               | -0.0005    | -0.0001    | -0.0005     |
| Tnom        | Vmax    | -0.0004               | -0.0006    | -0.0002    | -0.0003     |

### A.2-1 Mode 1 Frequency Stability

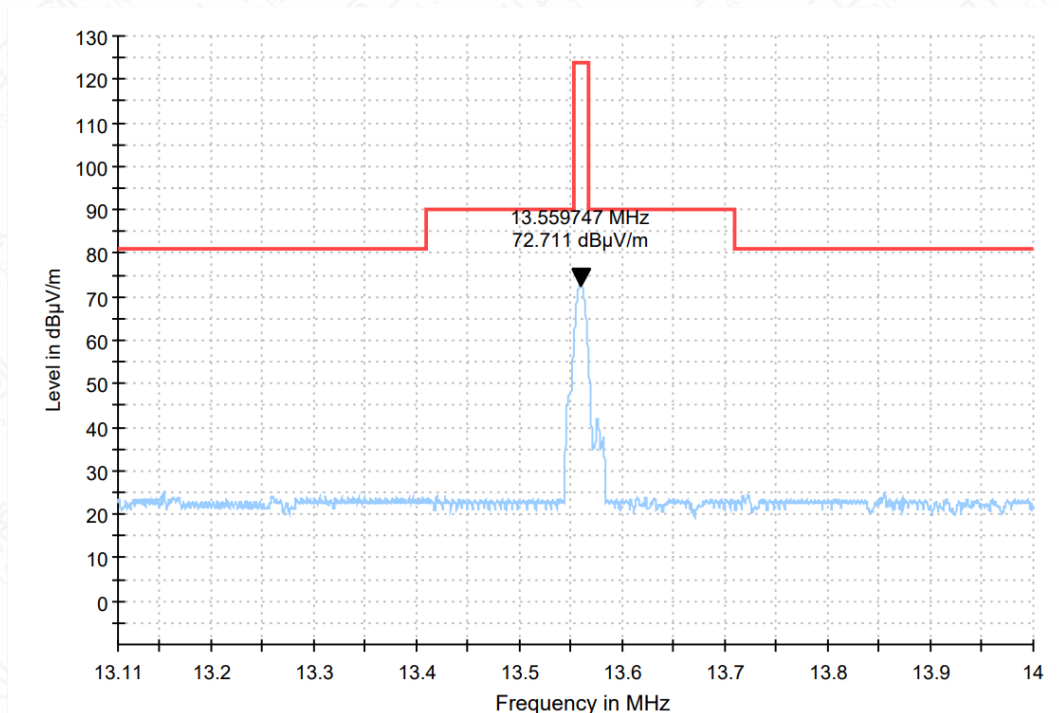


Figure A.3.1-1 Mode 1 Electric Field Strength of Fundamental Emissions

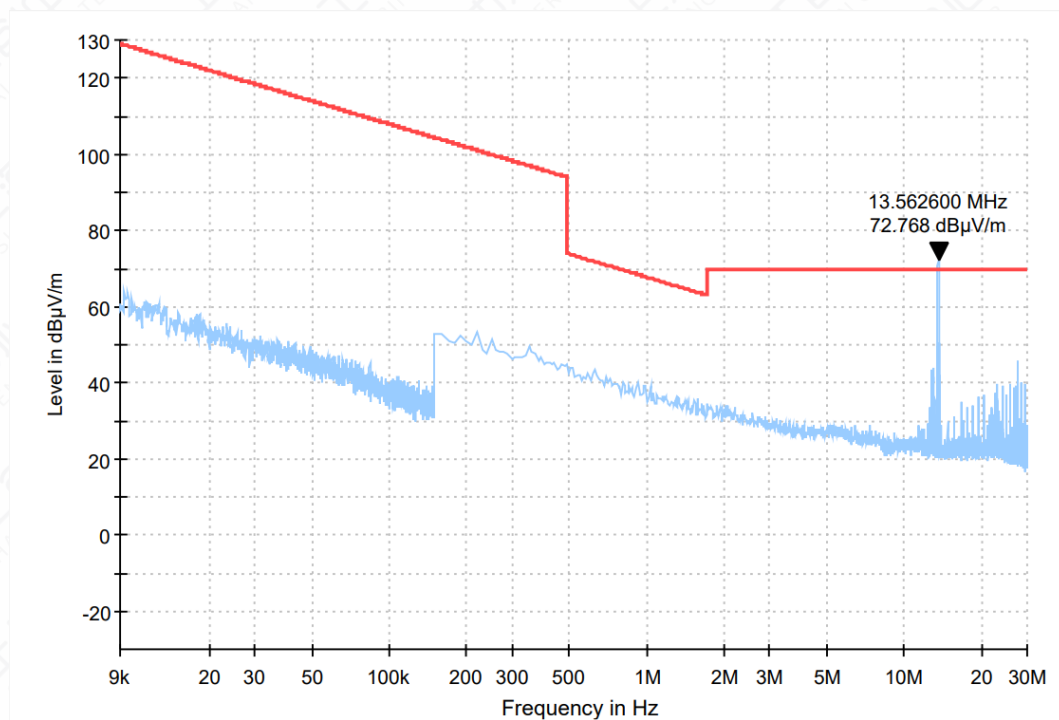


Figure A.3.2-1 Mode 1 Electric Field Radiated Emissions (Below 30MHz)

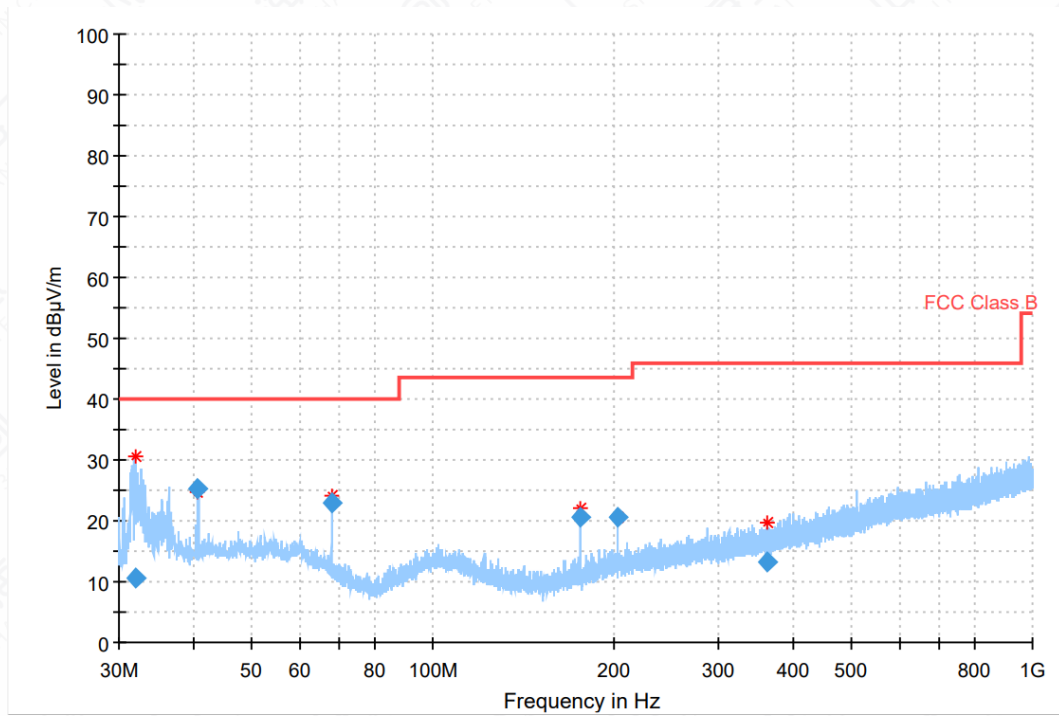


Figure A.3.3-1 Mode 1 Electric Field Radiated Emissions (Above 30MHz)

| Frequency (MHz) | QuasiPeak (dBμV/m) | Limit (dBμV/m) | Margin (dB) | Height (cm) | Pol     | Azimuth (deg) | Corr. (dB) |
|-----------------|--------------------|----------------|-------------|-------------|---------|---------------|------------|
| 31.888725       | 10.45              | 40.00          | 29.55       | 1000.0      | 120.000 | 103.0         | V          |
| 40.677581       | 25.42              | 40.00          | 14.58       | 1000.0      | 120.000 | 179.0         | H          |
| 67.799819       | 22.84              | 40.00          | 17.16       | 1000.0      | 120.000 | 125.0         | H          |
| 176.270123      | 20.72              | 43.50          | 22.78       | 1000.0      | 120.000 | 104.0         | H          |
| 203.415419      | 20.48              | 43.50          | 23.02       | 1000.0      | 120.000 | 125.0         | H          |
| 362.071451      | 13.12              | 46.00          | 32.88       | 1000.0      | 120.000 | 125.0         | V          |

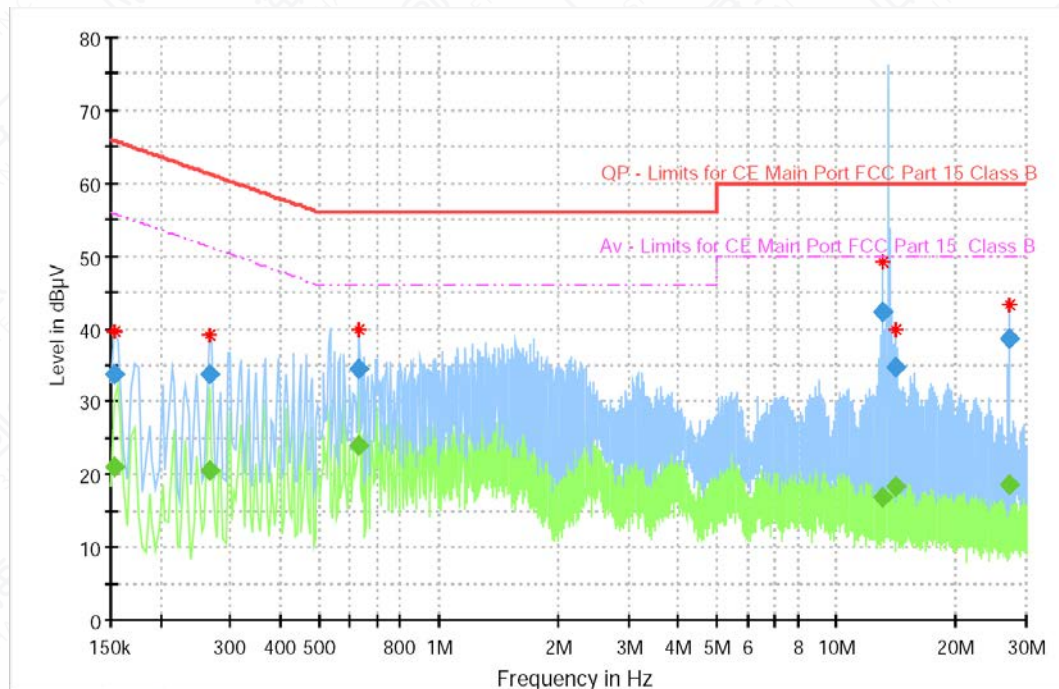


Figure A.4-1 Mode 2 Conducted Emissions

Note: The frequency over the limits is the NFC main signal frequency.

| Frequency (MHz) | QuasiPeak (dBμV) | Average (dBμV) | Limit (dBμV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|----------------|--------------|-------------|-----------------|-----------------|------|--------|------------|
| 0.153731        | ---              | 20.92          | 55.80        | 34.87       | 15000           | 9.000           | L1   | ON     | 9.6        |
| 0.153731        | 33.82            | ---            | 65.80        | 31.97       | 15000           | 9.000           | L1   | ON     | 9.6        |
| 0.265669        | ---              | 20.67          | 51.25        | 30.58       | 15000           | 9.000           | L1   | ON     | 9.6        |
| 0.265669        | 33.75            | ---            | 61.25        | 27.50       | 15000           | 9.000           | L1   | ON     | 9.6        |
| 0.631331        | ---              | 24.08          | 46.00        | 21.92       | 15000           | 9.000           | L1   | ON     | 9.6        |
| 0.631331        | 34.45            | ---            | 56.00        | 21.55       | 15000           | 9.000           | L1   | ON     | 9.6        |
| 13.134750       | ---              | 16.81          | 50.00        | 33.19       | 15000           | 9.000           | L1   | ON     | 10.0       |
| 13.134750       | 42.28            | ---            | 60.00        | 17.72       | 15000           | 9.000           | L1   | ON     | 10.0       |
| 14.093681       | ---              | 18.27          | 50.00        | 31.73       | 15000           | 9.000           | L1   | ON     | 10.0       |
| 14.093681       | 34.84            | ---            | 60.00        | 25.16       | 15000           | 9.000           | L1   | ON     | 10.0       |
| 27.126938       | ---              | 18.52          | 50.00        | 31.48       | 15000           | 9.000           | N    | ON     | 10.1       |
| 27.126938       | 38.62            | ---            | 60.00        | 21.38       | 15000           | 9.000           | N    | ON     | 10.1       |

| Center Freq. (MHz) | Threshold Level | $f_L$ (MHz) | $f_H$ (MHz) |
|--------------------|-----------------|-------------|-------------|
| 13.55995           | 99% OBW         | 13.55990    | 13.55998    |

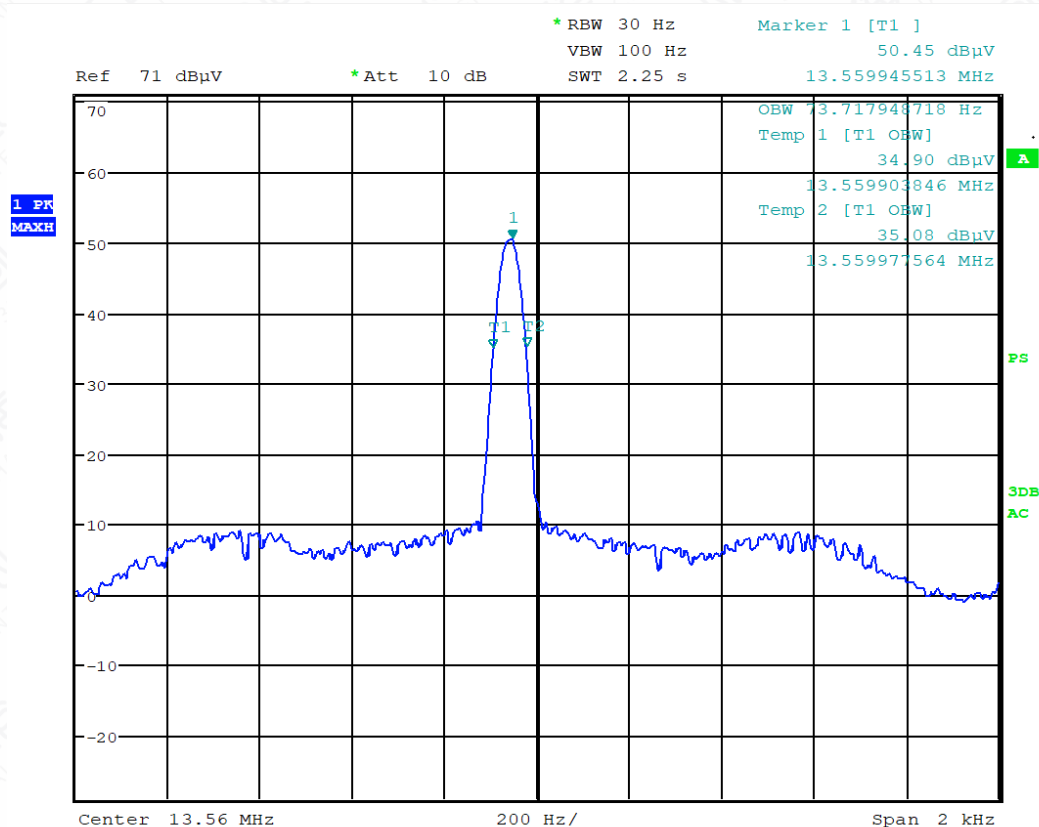


Figure A.4-1 Mode 1 Occupied bandwidth

**Annex B: Revised History**

| Version | Revised Content |
|---------|-----------------|
| V00     | Initial         |

**Annex C: Accreditation Certificate**





**Accredited Laboratory**

A2LA has accredited

**INDUSTRIAL INTERNET INNOVATION CENTER  
(SHANGHAI) CO., LTD.**

Shanghai, People's Republic of China

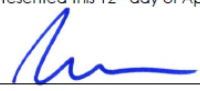
for technical competence in the field of

**Electrical Testing**

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).



Presented this 12<sup>th</sup> day of April 2021.



Vice President, Accreditation Services  
For the Accreditation Council  
Certificate Number 3682.01  
Valid to February 28, 2023

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.