# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| FCC ID | : | 2AAAS-US01 |
| Equipment | : | NFC dongle |
| Brand Name | : | Vivint |
| Model Name | : | US01 |
| Applicant | : | Vivint, Inc.<br>4931 N. 300 W.Provo, UT 84604, United States |
| Manufacturer | : | Vivint, Inc.<br>4931 N. 300 W.Provo, UT 84604, United States |
| Standard | : | FCC Part 15 Subpart C §15.225 |

**The product was received on Nov. 15, 2022 and testing was performed from Dec. 21, 2022 to Jan. 04, 2023. We, Sporton International Inc. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures 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 from Sporton International Inc. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.**

Louis Wu

**Approved by: Louis Wu**

***Sporton International Inc. EMC & Wireless Communications Laboratory***
*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.)*

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# History of this test report

| Report No. | Version | Description | Issue Date |
|---|---|---|---|
| FR2N0920 | 01 | Initial issue of report | Jan. 13, 2023 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| 3.1 | 15.207 | AC Power Line Conducted Emissions | Pass | 5.96 dB under the limit at 13.560MHz |
| 3.2 | 15.215(c) | 20dB Spectrum Bandwidth | Pass | - |
| | 2.1049 | 99% OBW Spectrum Bandwidth | Reporting only | - |
| 3.3 | 15.225(e) | Frequency Stability | Pass | - |
| 3.4 | 15.225(a)(b)(c) | Field Strength of Fundamental Emissions | Pass | Max level 23.76 dBμV/m at 13.560 MHz |
| 3.5 | 15.225(d) 15.209 | Radiated Spurious Emissions | Pass | 2.63 dB under the limit at 40.680MHz |
| 3.6 | 15.203 | Antenna Requirements | Pass | - |

**Declaration of Conformity:**

1. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
   It's means measurement values may risk exceeding the limit of regulation standards, if measurement uncertainty is include in test results.
2. The measurement uncertainty please refer to report "Uncertainty of Evaluation".

**Comments and Explanations:**

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity.

**Reviewed by: Avis Chuang**

**Report Producer: Michelle Chen**

# 1. General Description

## 1.1 Product Feature of Equipment Under Test

NFC

| Product Feature | |
|---|---|
| **Antenna Type** | NFC: Loop Antenna |

**Remark:** The EUT's information above is declared by manufacturer. Please refer to Comments and Explanations in report summary.

## 1.2 Modification of EUT

No modifications made to the EUT during the testing.

## 1.3 Testing Location

| | | |
|---|---|---|
| **Test Site** | Sporton International Inc. EMC & Wireless Communications Laboratory | |
| **Test Site Location** | No.52, Huaya 1st Rd., Guishan Dist.,<br>Taoyuan City 333, Taiwan (R.O.C.)<br>TEL: +886-3-327-3456<br>FAX: +886-3-328-4978 | |
| **Test Site No.** | **Sporton Site No.** | |
| | TH03-HY | CO05-HY |
| **Test Engineer** | Louis Chung | Calvin Wang |
| **Temperature** | 19.3~22.4℃ | 23~26℃ |
| **Relative Humidity** | 55.8~62.2% | 45~55% |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

| | |
|---|---|
| **Test Site** | Sporton International Inc. Wensan Laboratory |
| **Test Site Location** | No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist.,<br>Taoyuan City 333010, Taiwan (R.O.C.)<br>TEL: +886-3-327-0868<br>FAX: +886-3-327-0855 |
| **Test Site No.** | **Sporton Site No.** |
| | 03CH11-HY (TAF Code: 3786) |
| **Test Engineer** | Yuan Lee |
| **Temperature** | 18.5~20.7℃ |
| **Relative Humidity** | 49.6~63.8% |
| **Remark** | The Radiated Spurious Emission Test Items subcontracted to Sporton International Inc. Wensan Laboratory. |

**Note:** The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW1190 and TW3786

## 1.4 Applicable Standards

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

- FCC Part 15 Subpart C §15.225
- FCC KDB 414788 D01 Radiated Test Site v01r01
- ANSI C63.10-2013

**Remark:**

1. All the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

# 2. Test Configuration of Equipment Under Test

## 2.1 Descriptions of Test Mode

Investigation has been done on all the possible configurations.

The following table is a list of the test modes shown in this test report.

| Test Items | |
|---|---|
| AC Power Line Conducted Emissions | Field Strength of Fundamental Emissions |
| 20dB Spectrum Bandwidth | Frequency Stability |
| Radiated Emissions 9kHz~30MHz | Radiated Emissions 30MHz~1GHz |

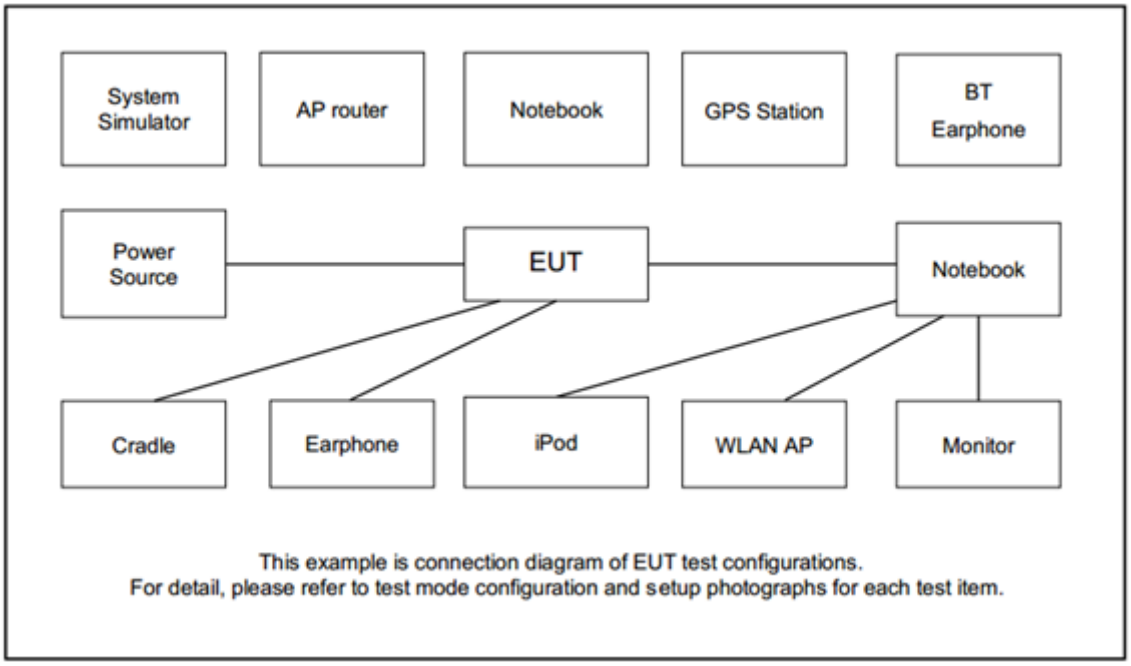
The EUT pre-scanned in reader mode with NFC tag (NFC V) and without reading tag. Based on the highest field strength of fundamental and spurious emissions, the worst case type (type V) was recorded in this report.

The measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and only the worst case emissions were reported in this report.

**Remark:** Only radiated measurements are used to show compliance with FCC limits for fundamental and spurious emissions.

| Test Cases | |
|---|---|
| **AC Conducted Emission** | Mode 1: NFC Tx + USB Cable (Charging from Notebook) |

## 2.2 Connection Diagram of Test System




## 2.3 Table for Supporting Units

| Item | Equipment | Brand Name | Model Name | FCC ID | Data Cable | Power Cord |
|---|---|---|---|---|---|---|
| 1. | NFC Card | N/A | N/A | N/A | N/A | N/A |
| 2. | WLAN AP | ASUS | RT-AC66U | MSQ-RTAC66U | N/A | Unshielded, 1.8 m |
| 3. | Notebook | Dell | Latitude 3400 | FCC DoC | Dell | AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m |
| 4. | Notebook | ACER | 15IHU6 | PD9AX201NG | ACER | AC I/P: Unshielded, 1.0 m DC O/P: Shielded, 1.8 m |
| 5. | USB Cable | i-wiz | US-121 | N/A | Shielded, 1.5m | N/A |
| 6. | iPod | Apple | A1285 | FCC DoC | Shielded, 1.0m | N/A |

## 2.4 EUT Operation Test Setup

The EUT is programmed to be in continuously transmitting mode.

The ancillary equipment, NFC card, is used to make the EUT (NFC) continuously transmitting signal (Power Level: Default) at 13.56MHz and is placed around 0 cm gap to the EUT.

# 3. Test Results

## 3.1 AC Power Line Conducted Emissions Measurement

### 3.1.1 Limit 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.

| Frequency of Emission (MHz) | Conducted Limit (dBμV) | |
|---|---|---|
| | 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.

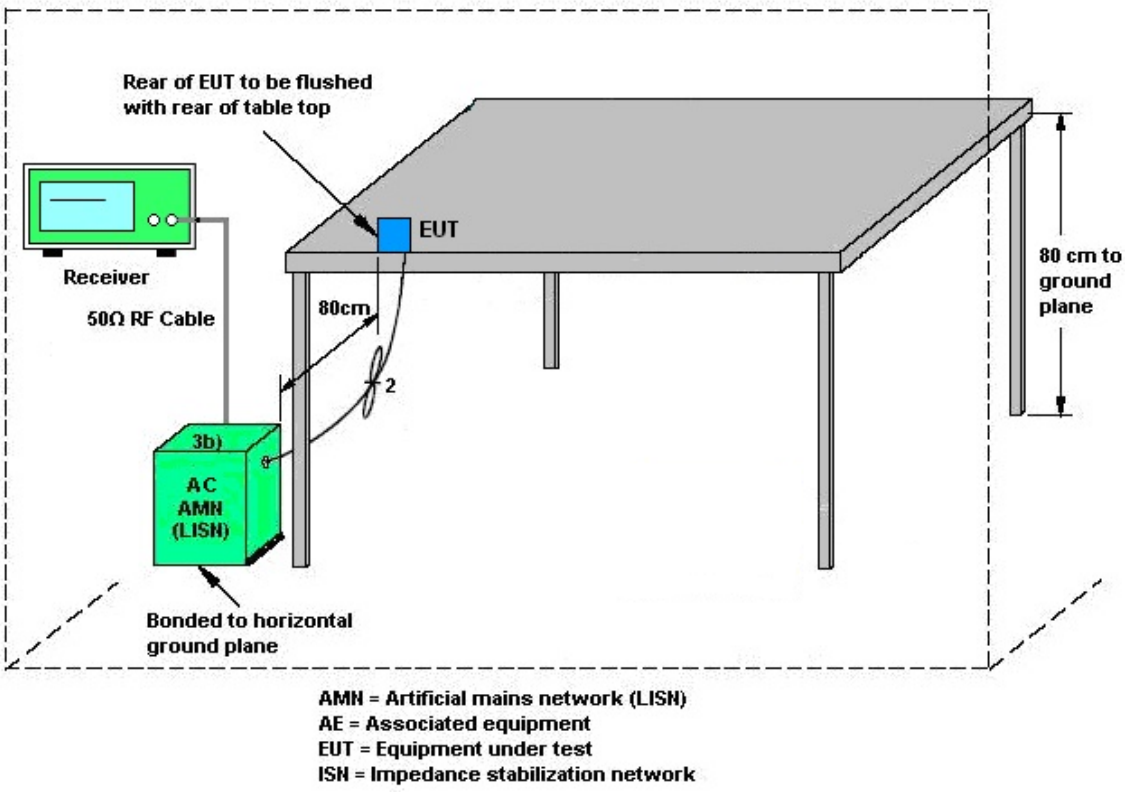
### 3.1.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.1.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is 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 shall be used.
6. Both Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9 kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

### 3.1.4 Test setup




AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

### 3.1.5 Test Result of AC Conducted Emission

Please refer to Appendix A.

# 3.2 20dB and 99% OBW Spectrum Bandwidth Measurement

## 3.2.1 Limit

Intentional radiators must be designed to ensure that the 20 dB and 99% emission bandwidth in the specific band 13.553~13.567 MHz.

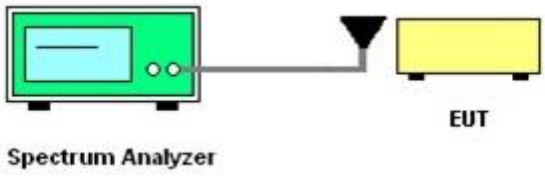
## 3.2.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

## 3.2.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT in peak Max Hold Mode.
2. The resolution bandwidth of 1 kHz and the video bandwidth of 3 kHz were used.
3. Measured the spectrum width with power higher than 20 dB below carrier.
4. Measured the 99% OBW.

## 3.2.4 Test Setup




## 3.2.5 Test Result of Near Field Test Items

Please refer to Appendix B.

## 3.3 Frequency Stability Measurement

### 3.3.1 Limit

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% (100ppm) of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed by using a new battery.

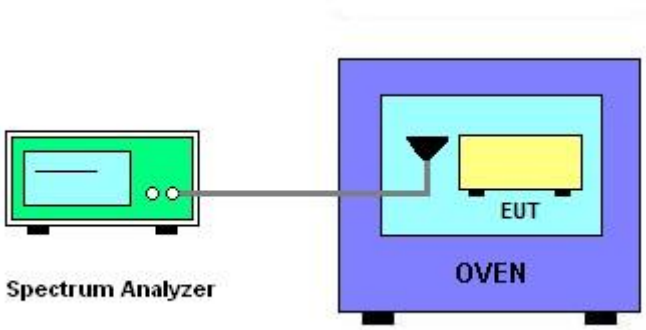
### 3.3.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.3.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT.
2. EUT has transmitted signal and fixed channelize.
3. Set the spectrum analyzer span to view the entire emissions bandwidth.
4. Set RBW = 1 kHz, VBW = 3 kHz with peak detector and maxhold settings.
5. The fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × $10^6$ ppm and the limit is less than ±100ppm.
6. Extreme temperature rule is -20°C~50°C.

### 3.3.4 Test Setup




### 3.3.5 Test Result of Near Field Test Items

Please refer to Appendix B.

# 3.4 Field Strength of Fundamental Emissions and Mask Measurement

## 3.4.1 Limit

| Rules and specifications | FCC CFR 47 Part 15 section 15.225 | | | |
|---|---|---|---|---|
| Description | Compliance with the spectrum mask is tested with RBW set to 9kHz. | | | |
| Freq. of Emission (MHz) | Field Strength (μV/m) at 30m | Field Strength (dBμV/m) at 30m | Field Strength (dBμV/m) at 10m | Field Strength (dBμV/m) at 3m |
| 1.705~13.110 | 30 | 29.5 | 48.58 | 69.5 |
| 13.110~13.410 | 106 | 40.5 | 59.58 | 80.5 |
| 13.410~13.553 | 334 | 50.5 | 69.58 | 90.5 |
| 13.553~13.567 | 15848 | 84.0 | 103.08 | 124.0 |
| 13.567~13.710 | 334 | 50.5 | 69.58 | 90.5 |
| 13.710~14.010 | 106 | 40.5 | 59.58 | 80.5 |
| 14.010~30.000 | 30 | 29.5 | 48.58 | 69.5 |

**Remark:**

1. The field strength test result is in 3m test distance, follow test rules the test data use distance extrapolation factor and reported in this report at 30m test result.
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)

## 3.4.2 Measuring Instruments

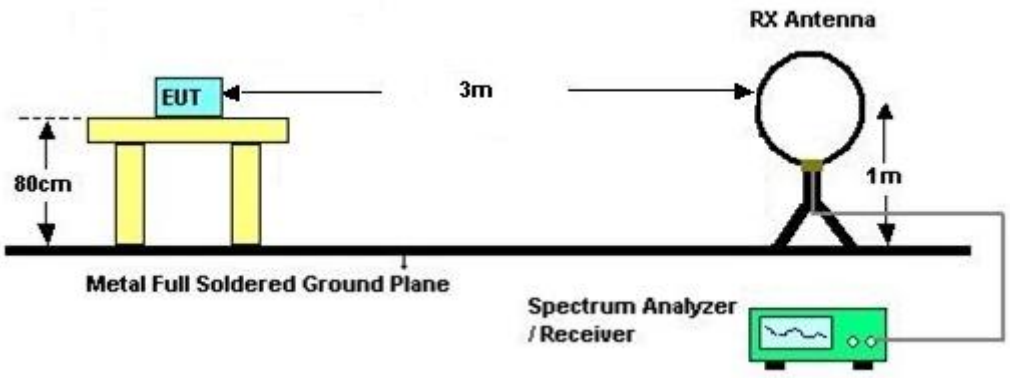
Please refer to the measuring equipment list in this test report.

### 3.4.3 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT is placed on the top of the turntable 0.8 meter above ground. The phase center of the loop receiving antenna mounted antenna tower is placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable is rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the receiving antenna is fixed at one meter above ground to find the maximum emissions field strength.
4. For Fundamental emissions, use the receiver to measure QP reading.
5. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
6. Compliance with the spectrum mask is tested with RBW set to 9 kHz.
   Note: Emission level (dBμV/m) = 20 log Emission level (μV/m).

### 3.4.4 Test Setup

**For radiated test below 30MHz**




### 3.4.5 Test Result of Field Strength of Fundamental Emissions and Mask

Please refer to Appendix C.

## 3.5 Radiated Emissions Measurement

### 3.5.1 Limit

The field strength of any emissions which appear outside of 13.110 ~14.010MHz band shall not exceed the general radiated emissions limits.

| Frequencies (MHz) | Field Strength (μV/m) | Measurement Distance (meters) |
|---|---|---|
| 0.009~0.490 | 2400/F(kHz) | 300 |
| 0.490~1.705 | 24000/F(kHz) | 30 |
| 1.705~30.0 | 30 | 30 |
| 30~88 | 100 | 3 |
| 88~216 | 150 | 3 |
| 216~960 | 200 | 3 |
| Above 960 | 500 | 3 |

### 3.5.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

### 3.5.3 Measuring Instrument Setting

The following table is the setting of receiver:

| Receiver Parameter | Setting |
|---|---|
| Attenuation | Auto |
| Frequency Range: 9kHz~150kHz | RBW 200Hz for QP |
| Frequency Range: 150kHz~30MHz | RBW 9kHz for QP |
| Frequency Range: 30MHz~1000MHz | RBW 120kHz for Peak |

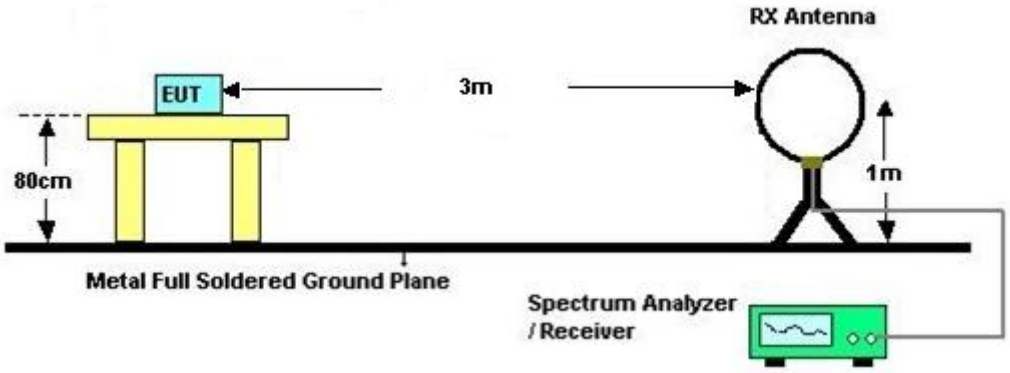
**Note:** The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz and 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

### 3.5.4 Test Procedures

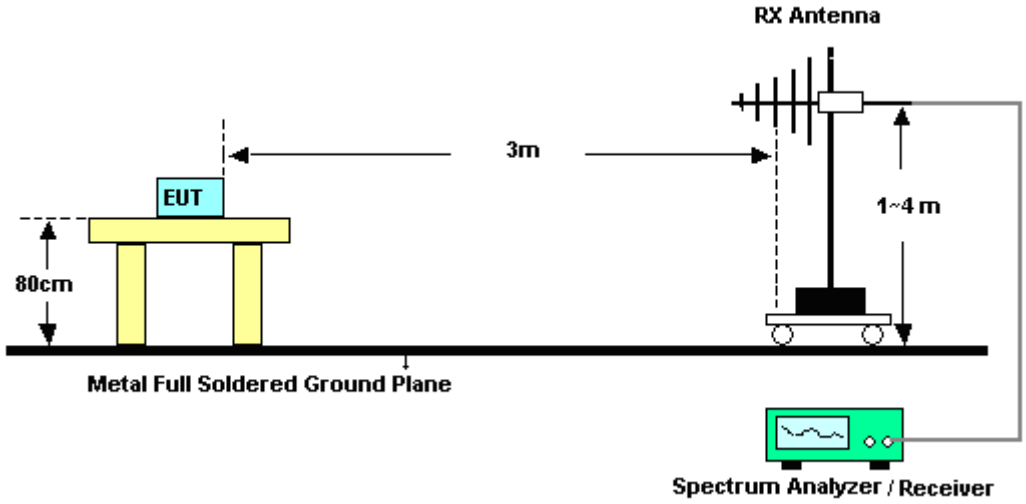
1. Configure the EUT according to ANSI C63.10. The EUT is placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower is placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable is rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna is varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower is scanned (from 1 M to 4 M) and then the turntable is rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
7. In case the emission is lower than 30 MHz, loop antenna has to be used for measurement and the recorded data shall be QP measured by receiver.
8. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as “-“.

### 3.5.5 Test Setup

**For radiated test below 30MHz**




**For radiated test above 30MHz**




### 3.5.6 Test Result of Radiated Emissions Measurement

Please refer to Appendix C.

**Remark:** There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

## 3.6 Antenna Requirements

### 3.6.1 Standard Applicable

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

### 3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

# 4. List of Measuring Equipment

| Instrument | Brand Name | Model No. | Serial No. | Characteristics | Calibration Date | Test Date | Due Date | Remark |
|---|---|---|---|---|---|---|---|---|
| AC Power Source | ChainTek | APC-1000W | N/A | N/A | N/A | Dec. 22, 2022 | N/A | Conduction (CO05-HY) |
| EMI Test Receiver | Rohde & Schwarz | ESR3 | 102388 | 9kHz~3.6GHz | Dec. 01, 2022 | Dec. 22, 2022 | Nov. 30, 2023 | Conduction (CO05-HY) |
| LISN | Rohde & Schwarz | ENV216 | 100080 | 9kHz~30MHz | Dec. 01, 2022 | Dec. 22, 2022 | Nov. 30, 2023 | Conduction (CO05-HY) |
| LISN | Rohde & Schwarz | ENV216 | 100081 | 9kHz~30MHz | Nov. 17, 2022 | Dec. 22, 2022 | Nov. 16, 2023 | Conduction (CO05-HY) |
| Software | Rohde & Schwarz | EMC32 | N/A | N/A | N/A | Dec. 22, 2022 | N/A | Conduction (CO05-HY) |
| Pulse Limiter | SCHWARZBECK | VTSD 9561-F N | 00691 | N/A | Aug. 01, 2022 | Dec. 22, 2022 | Jul. 31, 2023 | Conduction (CO05-HY) |
| LISN Cable | MVE | RG-400 | 260260 | N/A | Dec. 30, 2021 | Dec. 22, 2022 | Dec. 29, 2022 | Conduction (CO05-HY) |
| Spectrum Analyzer | Rohde & Schwarz | FSP30 | 101329 | 9kHz~30GHz | Sep. 27, 2022 | Dec. 23, 2022~ Jan. 04, 2023 | Sep. 26, 2023 | RF Near Field (TH03-HY) |
| Programmable Power Supply | GW Instek | PSS-2005 | GEO821763 | N/A | Jan. 13, 2022 | Dec. 23, 2022~ Jan. 04, 2023 | Jan. 12, 2023 | RF Near Field (TH03-HY) |
| Temperature & Humidity Cabinet Chamber | ESPEC | LHU-113 | 1012005860 | -20℃~85℃ | Dec. 05, 2022 | Dec. 23, 2022~ Jan. 04, 2023 | Dec. 04, 2023 | RF Near Field (TH03-HY) |
| Nearby field probe | LANGER EMV-TECHNIK | LF-U5 | 02-559 | 100 kHz up to 50 MHz | Apr. 04, 2022 | Dec. 23, 2022~ Jan. 04, 2023 | Apr. 03, 2023 | RF Near Field (TH03-HY) |
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100488 | 9 kHz~30 MHz | Sep. 20, 2022 | Dec. 21, 2022 | Sep. 19, 2023 | Radiation (03CH11-HY) |
| Bilog Antenna | TESEQ | CBL 6111D & N-6-06 | 35414 & AT-N0602 | 30MHz~1GHz | Oct. 08, 2022 | Dec. 21, 2022 | Oct. 07, 2023 | Radiation (03CH11-HY) |
| Amplifier | SONOMA | 310N | 187312 | 9kHz~1GHz | Dec. 09, 2022 | Dec. 21, 2022 | Dec. 08, 2023 | Radiation (03CH11-HY) |
| Spectrum Analyzer | Keysight | N9010A | MY54200486 | 10Hz~44GHz | Oct. 07, 2022 | Dec. 21, 2022 | Oct. 06, 2023 | Radiation (03CH11-HY) |
| Antenna Mast | EMEC | AM-BS-4500-B | N/A | 1~4m | N/A | Dec. 21, 2022 | N/A | Radiation (03CH11-HY) |
| Turn Table | EMEC | TT 2000 | N/A | 0~360 Degree | N/A | Dec. 21, 2022 | N/A | Radiation (03CH11-HY) |
| Software | Audix | E3 6.2009-8-24 | RK-001053 | N/A | N/A | Dec. 21, 2022 | N/A | Radiation (03CH11-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | MY2859/2 | 30MHz-40GHz | Mar. 10, 2022 | Dec. 21, 2022 | Mar. 09, 2023 | Radiation (03CH11-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | MY9837/4PE | 9kHz-30MHz | Mar. 10, 2022 | Dec. 21, 2022 | Mar. 09, 2023 | Radiation (03CH11-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 104 | MY9837/4PE | 30MHz-18GHz | Mar. 10, 2022 | Dec. 21, 2022 | Mar. 09, 2023 | Radiation (03CH11-HY) |
| Filter | Wainwright | WHK20/1000C 7/40SS | SN2 | 20MHz High Pass Filter | Sep. 12, 2022 | Dec. 21, 2022 | Sep. 11, 2023 | Radiation (03CH11-HY) |

# 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))** | **3.5 dB** |

**Uncertainty of Radiated Emission Measurement (9 kHz ~ 30 MHz)**

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **3.9 dB** |

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

| | |
|---|---|
| **Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))** | **6.3 dB** |

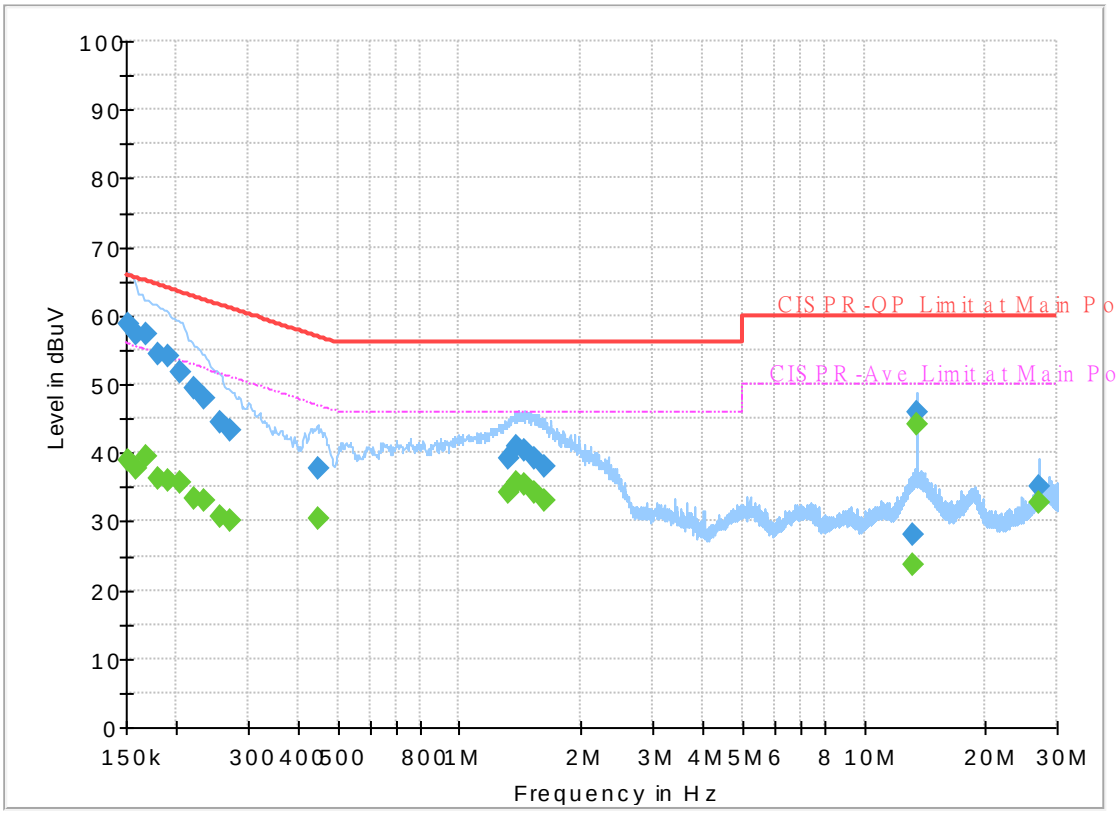
# Appendix A. Test Results of Conducted Emission Test

| | | | |
|---|---|---|---|
| **Test Engineer :** | Calvin Wang | **Temperature :** | 23~26℃ |
| | | **Relative Humidity :** | 45~55% |

# EUT Information

| | |
|---|---|
| Report NO : | 2N0920 |
| Test Mode : | Mode 1 |
| Test Voltage : | Power From System |
| Phase : | Line |

Full Spectrum




# Final_Result

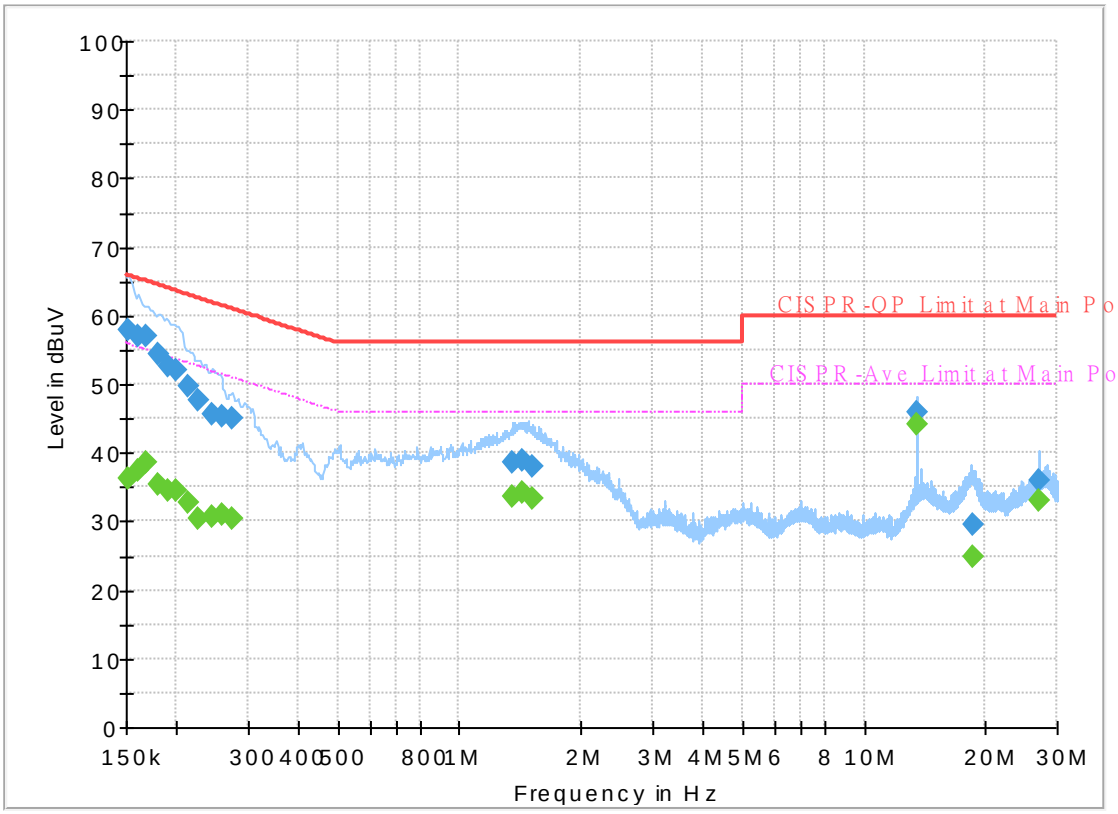
| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Line | Filter | Corr. (dB) |
|---|---|---|---|---|---|---|---|
| 0.152250 | --- | 38.77 | 55.88 | 17.11 | L1 | OFF | 19.8 |
| 0.152250 | 58.71 | --- | 65.88 | 7.17 | L1 | OFF | 19.8 |
| 0.159000 | --- | 37.85 | 55.52 | 17.67 | L1 | OFF | 19.8 |
| 0.159000 | 57.33 | --- | 65.52 | 8.19 | L1 | OFF | 19.8 |
| 0.168000 | --- | 39.37 | 55.06 | 15.69 | L1 | OFF | 19.8 |
| 0.168000 | 57.38 | --- | 65.06 | 7.68 | L1 | OFF | 19.8 |
| 0.179250 | --- | 36.25 | 54.52 | 18.27 | L1 | OFF | 19.8 |
| 0.179250 | 54.34 | --- | 64.52 | 10.18 | L1 | OFF | 19.8 |
| 0.190500 | --- | 35.98 | 54.02 | 18.04 | L1 | OFF | 19.8 |
| 0.190500 | 53.97 | --- | 64.02 | 10.05 | L1 | OFF | 19.8 |
| 0.204000 | --- | 35.74 | 53.45 | 17.71 | L1 | OFF | 19.8 |
| 0.204000 | 51.82 | --- | 63.45 | 11.63 | L1 | OFF | 19.8 |
| 0.219750 | --- | 33.28 | 52.83 | 19.55 | L1 | OFF | 19.8 |
| 0.219750 | 49.31 | --- | 62.83 | 13.52 | L1 | OFF | 19.8 |
| 0.233250 | --- | 32.94 | 52.33 | 19.39 | L1 | OFF | 19.8 |
| 0.233250 | 47.99 | --- | 62.33 | 14.34 | L1 | OFF | 19.8 |
| 0.255750 | --- | 30.74 | 51.57 | 20.83 | L1 | OFF | 19.8 |
| 0.255750 | 44.54 | --- | 61.57 | 17.03 | L1 | OFF | 19.8 |
| 0.271500 | --- | 30.00 | 51.07 | 21.07 | L1 | OFF | 19.8 |
| 0.271500 | 43.15 | --- | 61.07 | 17.92 | L1 | OFF | 19.8 |
| 0.447000 | --- | 30.52 | 46.93 | 16.41 | L1 | OFF | 19.8 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.447000 | 37.76 | --- | 56.93 | 19.17 | L1 | OFF | 19.8 |
| 1.315500 | --- | 34.24 | 46.00 | 11.76 | L1 | OFF | 19.8 |
| 1.315500 | 39.15 | --- | 56.00 | 16.85 | L1 | OFF | 19.8 |
| 1.385250 | --- | 35.61 | 46.00 | 10.39 | L1 | OFF | 19.8 |
| 1.385250 | 40.83 | --- | 56.00 | 15.17 | L1 | OFF | 19.8 |
| 1.455000 | --- | 35.45 | 46.00 | 10.55 | L1 | OFF | 19.8 |
| 1.455000 | 40.34 | --- | 56.00 | 15.66 | L1 | OFF | 19.8 |
| 1.533750 | --- | 34.33 | 46.00 | 11.67 | L1 | OFF | 19.8 |
| 1.533750 | 39.29 | --- | 56.00 | 16.71 | L1 | OFF | 19.8 |
| 1.621500 | --- | 33.02 | 46.00 | 12.98 | L1 | OFF | 19.8 |
| 1.621500 | 38.10 | --- | 56.00 | 17.90 | L1 | OFF | 19.8 |
| 13.256250 | --- | 23.65 | 50.00 | 26.35 | L1 | OFF | 20.0 |
| 13.256250 | 28.03 | --- | 60.00 | 31.97 | L1 | OFF | 20.0 |
| 13.557750 | --- | 44.03 | 50.00 | 5.97 | L1 | OFF | 20.0 |
| 13.557750 | 45.84 | --- | 60.00 | 14.16 | L1 | OFF | 20.0 |
| 27.118500 | --- | 32.88 | 50.00 | 17.12 | L1 | OFF | 20.0 |
| 27.118500 | 35.21 | --- | 60.00 | 24.79 | L1 | OFF | 20.0 |

# EUT Information

| | |
|---|---|
| Report NO : | 2N0920 |
| Test Mode : | Mode 1 |
| Test Voltage : | Power From System |
| Phase : | Neutral |

Full Spectrum




# Final_Result

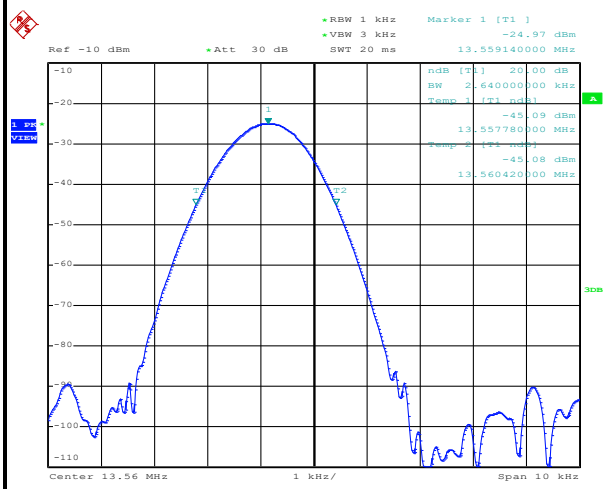
| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Line | Filter | Corr. (dB) |
|---|---|---|---|---|---|---|---|
| 0.152250 | --- | 36.40 | 55.88 | 19.48 | N | OFF | 19.8 |
| 0.152250 | 57.76 | --- | 65.88 | 8.12 | N | OFF | 19.8 |
| 0.161250 | --- | 37.48 | 55.40 | 17.92 | N | OFF | 19.8 |
| 0.161250 | 57.04 | --- | 65.40 | 8.36 | N | OFF | 19.8 |
| 0.168000 | --- | 38.65 | 55.06 | 16.41 | N | OFF | 19.8 |
| 0.168000 | 56.92 | --- | 65.06 | 8.14 | N | OFF | 19.8 |
| 0.179250 | --- | 35.34 | 54.52 | 19.18 | N | OFF | 19.8 |
| 0.179250 | 54.32 | --- | 64.52 | 10.20 | N | OFF | 19.8 |
| 0.190500 | --- | 34.55 | 54.02 | 19.47 | N | OFF | 19.8 |
| 0.190500 | 52.65 | --- | 64.02 | 11.37 | N | OFF | 19.8 |
| 0.199500 | --- | 34.37 | 53.63 | 19.26 | N | OFF | 19.8 |
| 0.199500 | 52.06 | --- | 63.63 | 11.57 | N | OFF | 19.8 |
| 0.213000 | --- | 32.71 | 53.09 | 20.38 | N | OFF | 19.8 |
| 0.213000 | 49.65 | --- | 63.09 | 13.44 | N | OFF | 19.8 |
| 0.226500 | --- | 30.44 | 52.58 | 22.14 | N | OFF | 19.8 |
| 0.226500 | 47.79 | --- | 62.58 | 14.79 | N | OFF | 19.8 |
| 0.244500 | --- | 30.68 | 51.94 | 21.26 | N | OFF | 19.8 |
| 0.244500 | 45.47 | --- | 61.94 | 16.47 | N | OFF | 19.8 |
| 0.258000 | --- | 31.08 | 51.50 | 20.42 | N | OFF | 19.8 |
| 0.258000 | 45.45 | --- | 61.50 | 16.05 | N | OFF | 19.8 |
| 0.273750 | --- | 30.44 | 51.00 | 20.56 | N | OFF | 19.8 |

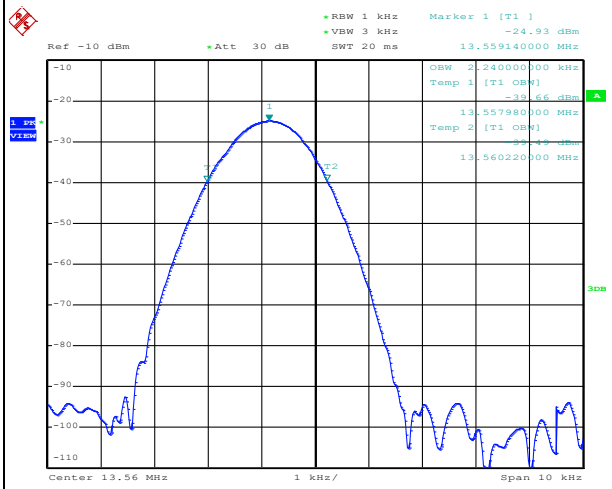
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.273750 | 44.93 | --- | 61.00 | 16.07 | N | OFF | 19.8 |
| 1.349250 | --- | 33.59 | 46.00 | 12.41 | N | OFF | 19.8 |
| 1.349250 | 38.57 | --- | 56.00 | 17.43 | N | OFF | 19.8 |
| 1.434750 | --- | 34.16 | 46.00 | 11.84 | N | OFF | 19.8 |
| 1.434750 | 38.99 | --- | 56.00 | 17.01 | N | OFF | 19.8 |
| 1.515750 | --- | 33.25 | 46.00 | 12.75 | N | OFF | 19.8 |
| 1.515750 | 38.15 | --- | 56.00 | 17.85 | N | OFF | 19.8 |
| 13.560000 | --- | 44.04 | 50.00 | 5.96 | N | OFF | 20.0 |
| 13.560000 | 45.77 | --- | 60.00 | 14.23 | N | OFF | 20.0 |
| 18.633750 | --- | 24.84 | 50.00 | 25.16 | N | OFF | 20.1 |
| 18.633750 | 29.59 | --- | 60.00 | 30.41 | N | OFF | 20.1 |
| 27.118500 | --- | 33.04 | 50.00 | 16.96 | N | OFF | 20.2 |
| 27.118500 | 35.97 | --- | 60.00 | 24.03 | N | OFF | 20.2 |

# Appendix B. Test Results of Near Field Test Items

## B1. Test Result of 20dB Spectrum Bandwidth

| Test mode | NFC Tx | Test Frequency (MHz) | 13.56 |
|---|---|---|---|




| 20dB Bandwidth (kHz) | 2.640 | 99% OccupiedBW(kHz) | 2.240 |
|---|---|---|---|
| Frequency range (MHz) | **$f_L$ > 13.553** | 13.55778 | **Test Result** |
| | **$f_H$ < 13.567** | 13.56042 | **Complies** |

**Remark:** Because the measured signal is CW adjusting the RBW per C63.10 would not be practical since measured bandwidth will always follow the RBW and the result will be approximately twice the RBW.

## B2. Test Result of Frequency Stability

| Voltage vs. Frequency Stability | | Temperature vs. Frequency Stability | | |
|---|---|---|---|---|
| Voltage (Vdc) | Measurement Frequency (MHz) | Temperature (℃) | Time | Measurement Frequency (MHz) |
| **5** | 13.559100 | **-20** | **0** | 13.559110 |
| **4.75** | 13.559100 | | **2** | 13.559100 |
| **5.75** | 13.559100 | | **5** | 13.559100 |
| | | | **10** | 13.559100 |
| | | **-10** | **0** | 13.559140 |
| | | | **2** | 13.559140 |
| | | | **5** | 13.559140 |
| | | | **10** | 13.559140 |
| | | **0** | **0** | 13.559140 |
| | | | **2** | 13.559140 |
| | | | **5** | 13.559140 |
| | | | **10** | 13.559140 |
| | | **10** | **0** | 13.559130 |
| | | | **2** | 13.559130 |
| | | | **5** | 13.559130 |
| | | | **10** | 13.559130 |
| | | **20** | **0** | 13.559100 |
| | | | **2** | 13.559100 |
| | | | **5** | 13.559100 |
| | | | **10** | 13.559120 |
| | | **30** | **0** | 13.559090 |
| | | | **2** | 13.559080 |
| | | | **5** | 13.559090 |
| | | | **10** | 13.559090 |
| | | **40** | **0** | 13.559070 |
| | | | **2** | 13.559080 |
| | | | **5** | 13.559080 |
| | | | **10** | 13.559070 |

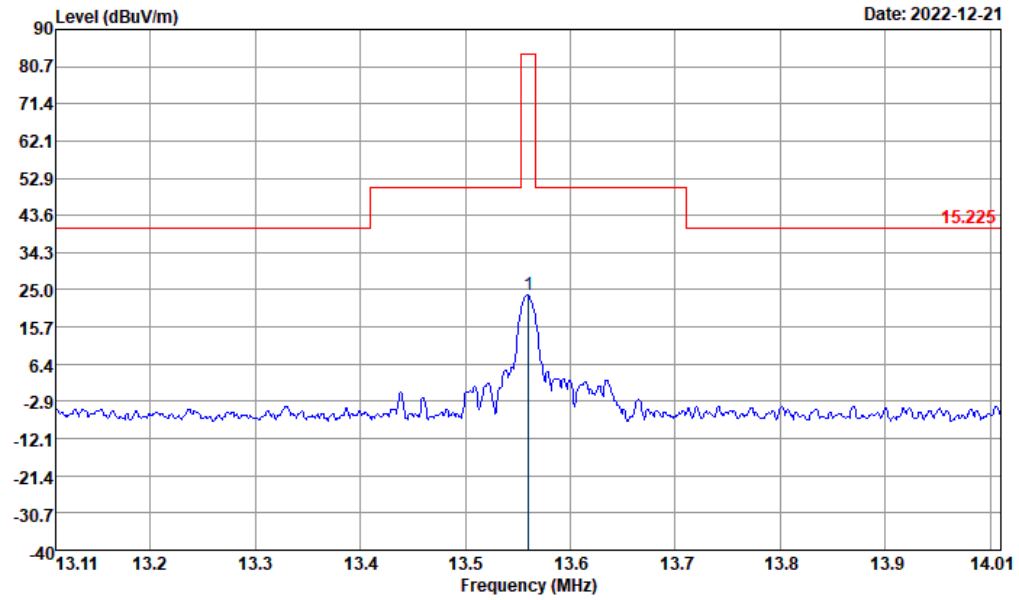
| Voltage vs. Frequency Stability | | Temperature vs. Frequency Stability | | |
|---|---|---|---|---|
| **Voltage (Vdc)** | **Measurement Frequency (MHz)** | **Temperature (℃)** | **Time** | **Measurement Frequency (MHz)** |
| | | **50** | **0** | 13.559060 |
| | | | **2** | 13.559060 |
| | | | **5** | 13.559060 |
| | | | **10** | 13.559060 |
| **Max.Deviation (MHz)** | -0.000900 | **Max.Deviation (MHz)** | | -0.000940 |
| **Max.Deviation (ppm)** | -66.3717 | **Max.Deviation (ppm)** | | -69.3215 |
| **Limit** | **FS < ±100 ppm** | **Limit** | | **FS < ±100 ppm** |
| **Test Result** | **PASS** | **Test Result** | | **PASS** |

**Remark:** If the voltage is under 4.75V, the EUT will turn off.

# Appendix C. Test Results of Radiated Test Items

## C1. Test Result of Field Strength of Fundamental Emissions

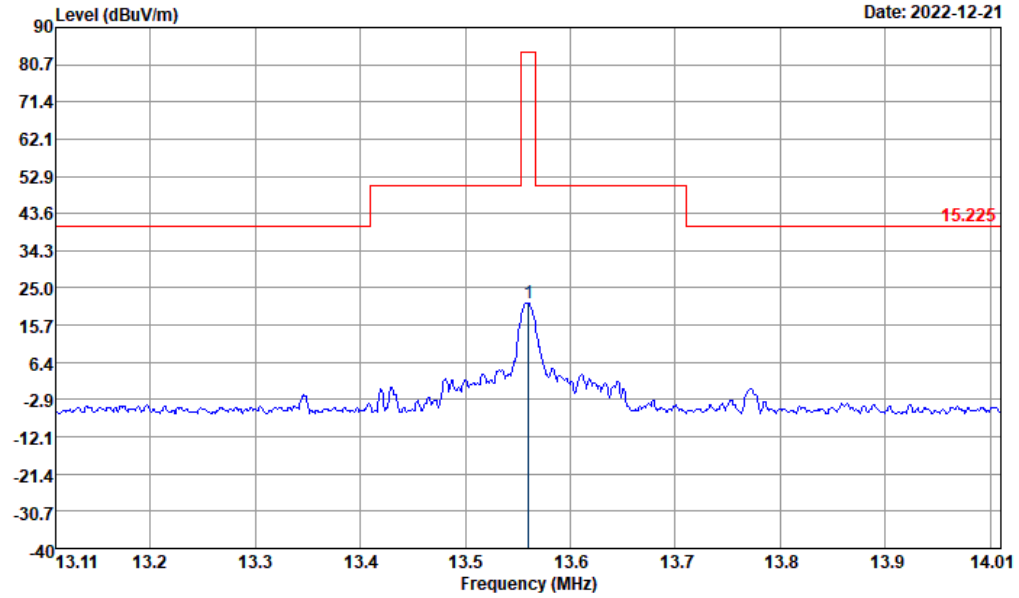
| Test Mode : | NFC Tx | Test Frequency (MHz) | 13.56 |
|---|---|---|---|




Site : 03CH11-HY
Condition : 15.225 3m LOOP_100488_220920 HORIZONTAL
: RBW:9.000KHz VBW:9.000KHz SWT:Auto

| Frequency ( MHz ) | Level ( dBµV/m ) | Distance extrapolation Factor ( dB ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 13.56 | 23.76 | 40 | -60.24 | 84 | 43.95 | 19.64 | 0.17 | 100 | 4 | QP |

| Test Mode : | NFC Tx | Test Frequency (MHz) | 13.56 |
|---|---|---|---|




Site : 03CH11-HY
Condition : 15.225 3m LOOP_100488_220920 VERTICAL
: RBW:9.000KHz VBW:9.000KHz SWT:Auto

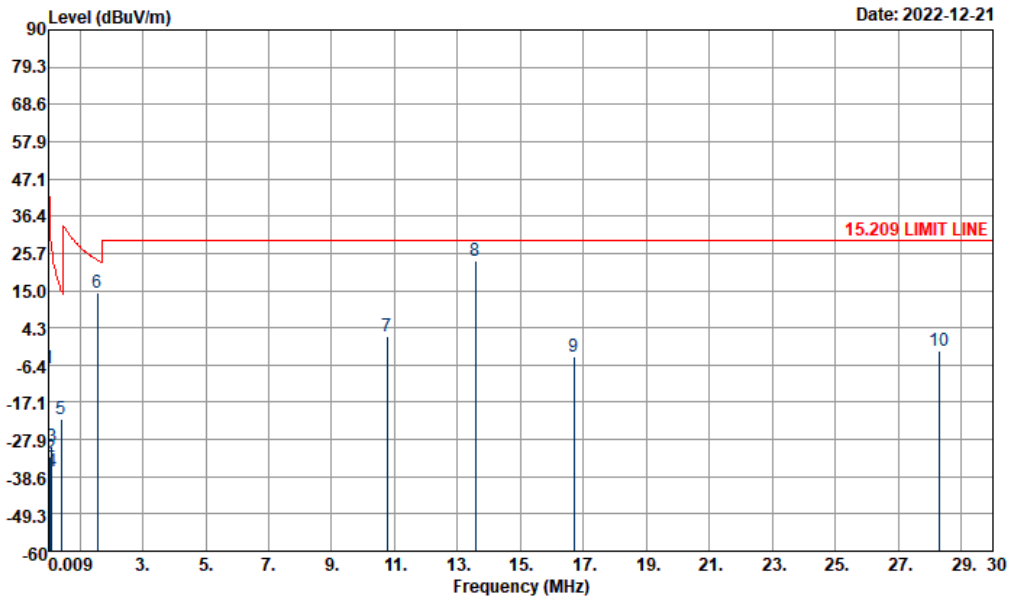
| Frequency ( MHz ) | Level ( dBµV/m ) | Distance extrapolation Factor ( dB ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 13.56 | 21.33 | 40 | -62.67 | 84 | 41.52 | 19.64 | 0.17 | 100 | 256 | QP |

**Note :**

1. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
2. Level = Antenna Factor + Cable Loss + Read Level - Distance extrapolation factor.

## C2. Results of Radiated Spurious Emissions (9 kHz~30MHz)

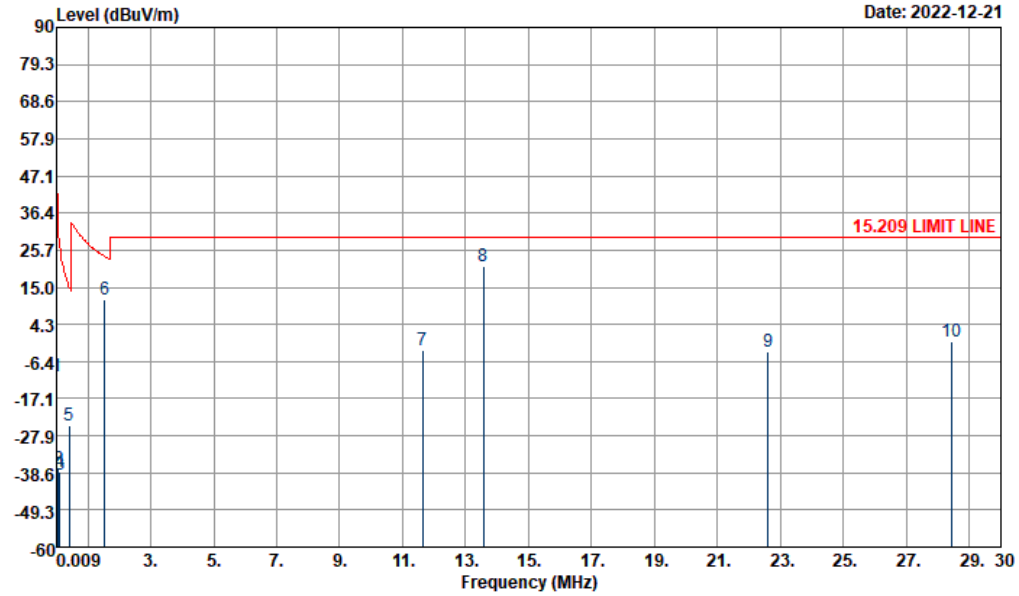
| Test Mode : | NFC Tx | Polarization : | Horizontal |
|---|---|---|---|




Site : 03CH11-HY
Condition : 15.209 LIMIT LINE 3m LOOP_100488_220920 HORIZONTAL

| Frequency ( MHz ) | Level ( dBµV/m ) | Distance extrapolation Factor ( dB ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.01925 | -7.37 | 80 | -49.29 | 41.92 | 52.65 | 19.83 | 0.15 | - | - | Average |
| 0.06927 | -32.79 | 80 | -63.58 | 30.79 | 27.35 | 19.72 | 0.14 | - | - | Average |
| 0.10502 | -30.06 | 80 | -57.24 | 27.18 | 30.18 | 19.62 | 0.14 | - | - | QP |
| 0.1144 | -36.95 | 80 | -63.39 | 26.44 | 23.29 | 19.62 | 0.14 | - | - | Average |
| 0.4118 | -22.06 | 80 | -37.37 | 15.31 | 38.25 | 19.54 | 0.15 | - | - | Average |
| 1.564 | 14.47 | 40 | -9.25 | 23.72 | 34.74 | 19.58 | 0.15 | - | - | QP |
| 10.752 | 1.77 | 40 | -27.73 | 29.5 | 22.01 | 19.61 | 0.15 | - | - | QP |
| 13.56 | 23.69 | 40 | -5.81 | 29.5 | 43.88 | 19.64 | 0.17 | - | - | QP |
| 16.684 | -3.81 | 40 | -33.31 | 29.5 | 16.27 | 19.73 | 0.19 | - | - | QP |
| 28.3 | -2.53 | 40 | -32.03 | 29.5 | 16.75 | 20.48 | 0.24 | - | - | QP |

| Test Mode : | NFC Tx | Polarization : | Vertical |
|---|---|---|---|




Site : 03CH11-HY
Condition : 15.209 LIMIT LINE 3m LOOP_100488_220920 VERTICAL

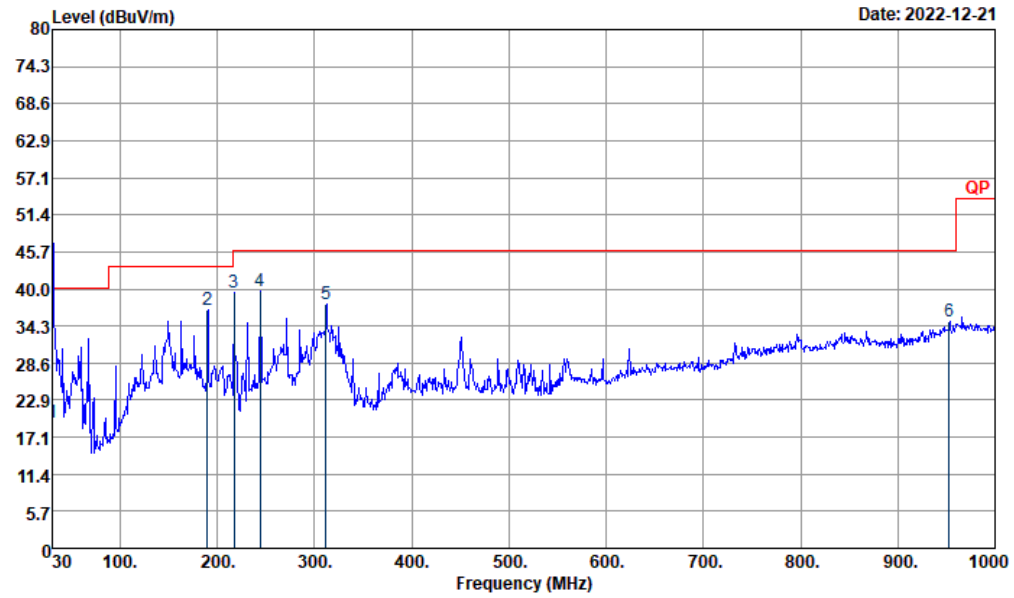
| Frequency ( MHz ) | Level ( dBµV/m ) | Distance extrapolation Factor ( dB ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Cable Loss ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 0.0193 | -10.86 | 80 | -52.75 | 41.89 | 49.16 | 19.83 | 0.15 | - | - | Average |
| 0.06654 | -37.34 | 80 | -68.48 | 31.14 | 22.8 | 19.72 | 0.14 | - | - | Average |
| 0.10134 | -38.97 | 80 | -66.46 | 27.49 | 21.27 | 19.62 | 0.14 | - | - | QP |
| 0.11364 | -38.44 | 80 | -64.93 | 26.49 | 21.8 | 19.62 | 0.14 | - | - | Average |
| 0.40874 | -25.04 | 80 | -40.42 | 15.38 | 35.27 | 19.54 | 0.15 | - | - | Average |
| 1.549 | 11.31 | 40 | -12.49 | 23.8 | 31.58 | 19.58 | 0.15 | - | - | QP |
| 11.632 | -3.37 | 40 | -32.87 | 29.5 | 16.85 | 19.62 | 0.16 | - | - | QP |
| 13.56 | 21.02 | 40 | -8.48 | 29.5 | 41.21 | 19.64 | 0.17 | - | - | QP |
| 22.615 | -3.43 | 40 | -32.93 | 29.5 | 16.08 | 20.27 | 0.22 | - | - | QP |
| 28.445 | -0.82 | 40 | -30.32 | 29.5 | 18.48 | 20.46 | 0.24 | - | - | QP |

**Note :**

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Distance extrapolation factor = 40 log (specific distance / test distance) (dB)
3. Level = Antenna Factor + Cable Loss + Read Level - Distance extrapolation factor.
4. 13.56 MHz is fundamental signal which can be ignored

## C3. Results of Radiated Spurious Emissions (30MHz~1GHz)

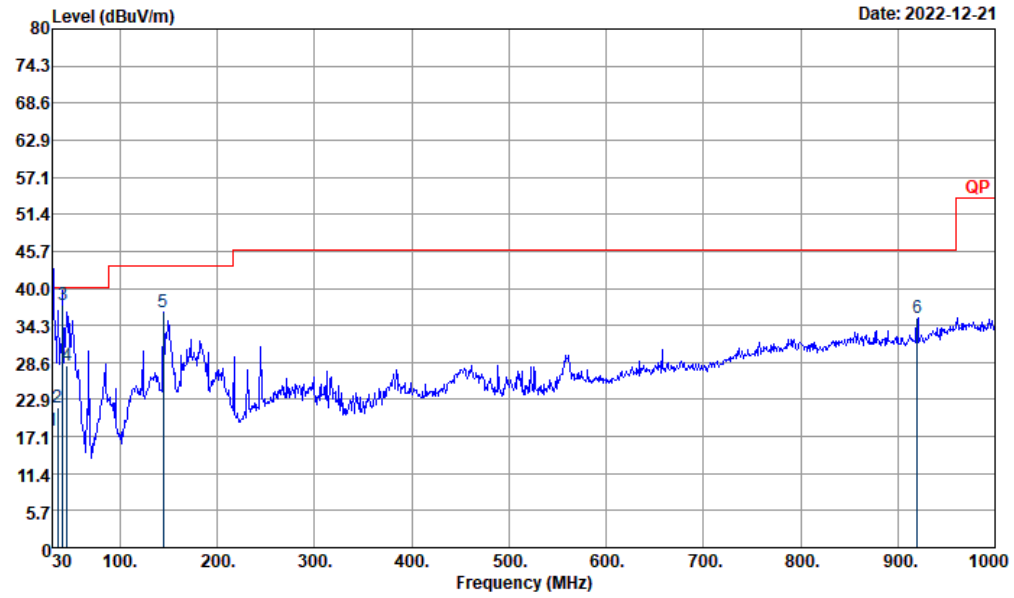
| Test Mode : | NFC Tx | Polarization : | Horizontal |
|---|---|---|---|




Site : 03CH11-HY
Condition : QP 3m 2_BILOG_35414_221008 HORIZONTAL

| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Path Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 19.43 | -20.57 | 40 | 26.8 | 23.92 | 1.07 | 32.36 | 100 | 122 | QP |
| 189.84 | 36.86 | -6.64 | 43.5 | 52.64 | 14.53 | 2.2 | 32.51 | - | - | Peak |
| 216.84 | 39.49 | -6.51 | 46 | 54.91 | 14.71 | 2.32 | 32.45 | - | - | Peak |
| 244.11 | 39.75 | -6.25 | 46 | 52.21 | 17.38 | 2.49 | 32.33 | - | - | Peak |
| 311.9 | 37.58 | -8.42 | 46 | 47.54 | 19.25 | 2.82 | 32.03 | - | - | Peak |
| 953.1 | 35.07 | -10.93 | 46 | 29.92 | 30.33 | 5.69 | 30.87 | - | - | Peak |

| Test Mode : | NFC Tx | Polarization : | Vertical |
|---|---|---|---|




Site : 03CH11-HY
Condition : QP 3m 2_BILOG_35414_221008 VERTICAL

| Frequency ( MHz ) | Level ( dBµV/m ) | Over Limit ( dB ) | Limit Line ( dBµV/m ) | Read Level (dBµV) | Antenna Factor ( dB ) | Path Loss ( dB ) | Preamp Factor ( dB ) | Ant Pos ( cm ) | Table Pos ( deg ) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| 30 | 18.03 | -21.97 | 40 | 25.4 | 23.92 | 1.07 | 32.36 | 100 | 230 | QP |
| 35.94 | 21.67 | -18.33 | 40 | 31.91 | 21.28 | 0.88 | 32.4 | 100 | 343 | QP |
| 40.68 | 37.37 | -2.63 | 40 | 50 | 18.87 | 0.93 | 32.43 | 100 | 355 | QP |
| 45.12 | 28.18 | -11.82 | 40 | 43.11 | 16.54 | 0.99 | 32.46 | 100 | 355 | QP |
| 143.94 | 36.38 | -7.12 | 43.5 | 49.92 | 16.98 | 1.93 | 32.45 | - | - | Peak |
| 920.2 | 35.44 | -10.56 | 46 | 32.36 | 28.72 | 5.45 | 31.09 | - | - | Peak |

**Note:**

1. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
2. Emission level (dBµV/m) = 20 log Emission level (µV/m).
3. Corrected Reading: Antenna Factor + Path Loss + Read Level - Preamp Factor= Level.
4. Path Loss= Cable Loss + Filter Loss
5. The emission position marked as "-" means no suspected emission found with sufficient margin against limit line or noise floor only.