

FCC Part 15 Subpart C Test Report

for NFC

Product Name : Android Moblie Data Terminal
Model Name : Z-220X

Prepared for:
ZEBEX INDUSTRIES INC.
B1-1,NO.207 SEC3,BEIXIN ED,XINDIAN DIST,NEW TAIPEI CITY
23142,TAIWAN
TEL: +886-2-89132598

Prepared by:
Unilab (Shanghai) Co., Ltd.
FCC 2.948 register number is 714465
No. 1350, Lianxi Rd. Pudong New District, Shanghai, China
TEL: +86-21-50275125
FAX: +86-21-50277862

Report Number : UL32220141104FCC003-3
Date of Report : 05-01-2015
Date of Test : 05-11-2014~04-01-2015

Notes :

The test results only relate to these samples which have been tested.
Partly using this report will not be admitted unless been allowed by Unilab.
Unilab is only responsible for the complete report with the reported stamp of Unilab.

Applicant: ZEBEX INDUSTRIES INC.
B1-1,NO.207 SEC3,BEIXIN ED,XINDIAN DIST,NEW TAIPEI CITY
23142,TAIWAN

Manufacturer: Mexxen Technology(ShangHai)INC.
Unit B,12F,Building 11,No. 518,xinzhuan Rd., Songjiang
District,Shanghai,China

Product Name: Android Moblie Data Terminal

Brand Name: ZEBEX

Model Name: Z-220X

FCC ID: JNF-Z-220X

Serial Number: N/A

EUT Voltage: AC input for adapter: AC 100~240V 50/60Hz
Battery: 3.6V~4.2V

Date of Receipt: 04-11-2014

Date of Test: 05-11-2014~04-01-2015

Test Standard: FCC CFR Tile 47 Part 15 Subpart C
ANSI C 63.4: 2009

Test Result: PASS

Prepared by : Andy Wei
(Technical Engineer: Andy Wei)

Reviewed by : Forest Cao
(Senior Engineer: Forest Cao)

Approved by : Eva Wang
(Supervisor: Eva Wang)

TABLE OF CONTENTS

| | | |
|-------------------|--|-----------|
| 1. | GENERAL INFORMATION | 4 |
| 1.1 | EUT DESCRIPTION..... | 4 |
| 1.2 | TEST MODE | 4 |
| 2. | TEST METHODOLOGY | 4 |
| 2.1 | EUT CONFIGURATION | 4 |
| 2.2 | EUT EXERCISE | 4 |
| 2.3 | GENERAL TEST PROCEDURES | 5 |
| 2.4 | FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS | 5 |
| 3. | TECHNICAL SUMMARY | 6 |
| 3.1 | SUMMARY OF STANDARDS AND TEST RESULTS | 6 |
| 3.2 | TEST UNCERTAINTY | 6 |
| 3.3 | TEST EQUIPMENT LIST | 6 |
| 3.4 | TEST FACILITY | 6 |
| 3.5 | TEST SETUP CONFIGURATION | 6 |
| 4. | 20DB BANDWIDTH..... | 7 |
| 4.1 | TEST SETUP | 7 |
| 4.2 | LIMITS..... | 7 |
| 4.3 | TEST PROCEDURE | 7 |
| 4.4 | TEST RESULTS | 8 |
| 5. | IN-BAND EMISSION (RADIATION) | 9 |
| 5.1 | TEST SETUP | 9 |
| 5.2 | LIMITS..... | 9 |
| 5.3 | TEST PROCEDURE | 9 |
| 5.4 | RESULTS & PERFORMANCE | 10 |
| 6. | OUT-OF-BAND EMISSION (RADIATION) | 12 |
| 6.1 | TEST SETUP | 12 |
| 6.2 | LIMITS..... | 12 |
| 6.3 | TEST PROCEDURE | 13 |
| 6.4 | RESULTS & PERFORMANCE | 14 |
| 7. | FREQUENCY STABILITY | 18 |
| 7.1 | TEST SETUP | 18 |
| 7.2 | LIMITS..... | 18 |
| 7.3 | TEST PROCEDURE | 18 |
| 7.4 | RESULTS & PERFORMANCE | 19 |
| 8. | AC POWER LINE CONDUCTED EMISSIONS..... | 20 |
| 8.1 | TEST SETUP | 20 |
| 8.2 | LIMITS..... | 20 |
| 8.3 | TEST PROCEDURE | 20 |
| 8.4 | RESULTS & PERFORMANCE | 21 |
| APPENDIX 1 | PHOTOGRAPHS OF TEST SETUP..... | 22 |
| APPENDIX 2 | PHOTOGRAPHS OF EUT | 22 |

1. GENERAL INFORMATION

1.1 EUT DESCRIPTION

| | |
|---|---------------------------------------|
| Product Name: | Android Moblie Data Terminal |
| Model Name: | Z-220X |
| Hardware Version: | V3.0 |
| Software Version: | GST_A81_M20_4500XXXX_MUL_V03_20141201 |
| RF Exposure Environment: | Uncontrolled |
| NFC | |
| Operation Frequency: | 13.56MHz |
| Type of Modulation: | ASK |
| Channel Number: | 1 |
| Antenna Type: | FPCB |
| Antenna Peak Gain: | 3.0dBi |
| Component | |
| AC Adapter: | Model Name: TS22-501000U |
| | Input: AC 100-240V 50/60Hz 0.2A |
| | Output: DC 5V/1A |
| Note:The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description. | |

1.2 TEST MODE

Unilab has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

| |
|----------------|
| Test Mode |
| Mode 1: NFC TX |

Note:1. TX means Transmittre(continuously transmitting).

2. For the radiated emission test, every axis (X, Y, Z) was verified, and show the worst esult on this report.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.225.

2.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application

2.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

2.3 GENERAL TEST PROCEDURES

Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4: 2009 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4: 2009.

2.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz | MHz | MHz | GHz |
|----------------------------|-----------------------|-----------------|------------------|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| ¹ 0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2655 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | (²) |
| 13.36 - 13.41 | | | |

1 Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

2 Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

3. TECHNIACL SUMMARY

3.1 SUMMARY OF STANDARDS AND TEST RESULTS

The EUT have been tested according to the applicable standards as referenced below:

| Test Item | FCC | Result |
|-----------------------------------|---------------------------|--------|
| 20dB Bandwidth | §2.1049 | P |
| In-Band Emission | §15.225 (a)(b)(c) | P |
| Out-Of-Band Emission | §15.225 (d) §15.209(a) | P |
| Frequency Stability | §15.225 (e) | P |
| AC Power Line Conducted Emissions | §15.207 (a) | P |

Note: P means pass, F means failure, N/A means not applicable

3.2 TEST UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

| Test item | Value (dB) |
|-----------------------|------------|
| Conducted disturbance | 3.4 |
| Radiated disturbance | 4.2 |

3.3 TEST EQUIPMENT LIST

| Equipment | Manufacturer | Model | Serial No. | Due Date | Cal interval |
|----------------------------------|--------------|-----------|----------------|------------|--------------|
| Receiver | Agilent | N9038A | MY51210142 | 26/12/2015 | 1 year |
| LISN | R&S | ENV216 | 100069 | 22/08/2015 | 1 year |
| 3m Chamber & Accessory Equipment | ETS-LINDGREN | FACT-3 | CT-0000336 | 26/11/2017 | 3 years |
| DC Power Supply | Agilent | 6612C | MY43002989 | 03/03/2015 | 1 year |
| Temperature Chamber | WEISS | DU/20/40 | 58226017340050 | 02/12/2015 | 1 year |
| Loop Antenna | Schwarzbeck | FMZB1519 | 1519-020 | 25/03/2016 | 2 years |
| Biconilog Antenna | Schwarzbeck | VULB 9160 | 3316 | 19/09/2016 | 2 years |

3.4 TEST FACILITY

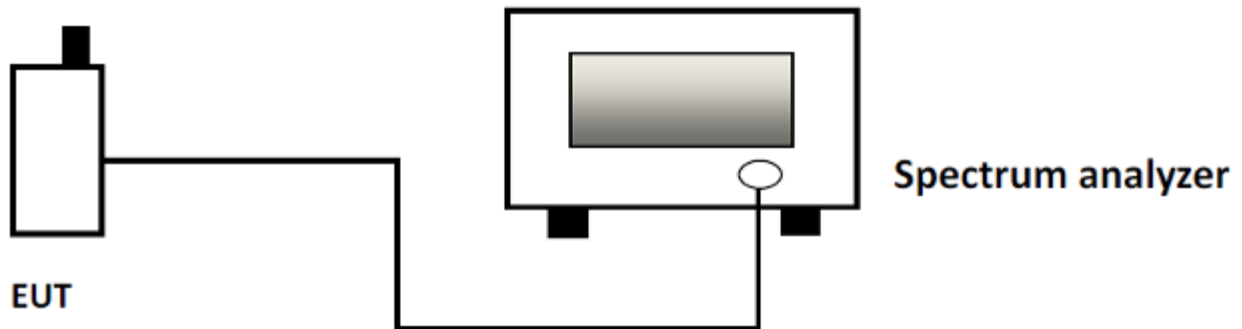
All test facilities used to collect the test data are located at No. 1350, Lianxi Rd. Pudong New District, Shanghai, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4: 2009, CISPR 16-1-1 and other equivalent standards. The laboratory is compliance with the requirements of the ISO/IEC/E 17025.

3.5 TEST SETUP CONFIGURATION

The information contained within this report is intended to show verification of compliance of the EUT to the requirements of CFR 47 FCC Part 15.247. Unilab has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report.

4. 20DB BANDWIDTH

4.1 TEST SETUP



4.2 LIMITS

The 20dB bandwidth of the emissions in the band 13.553MHz~13.567MHz.

4.3 TEST PROCEDURE

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a channel

RBW \geq 1% of the 20 dB bandwidth

VBW \geq RBW

Sweep = auto

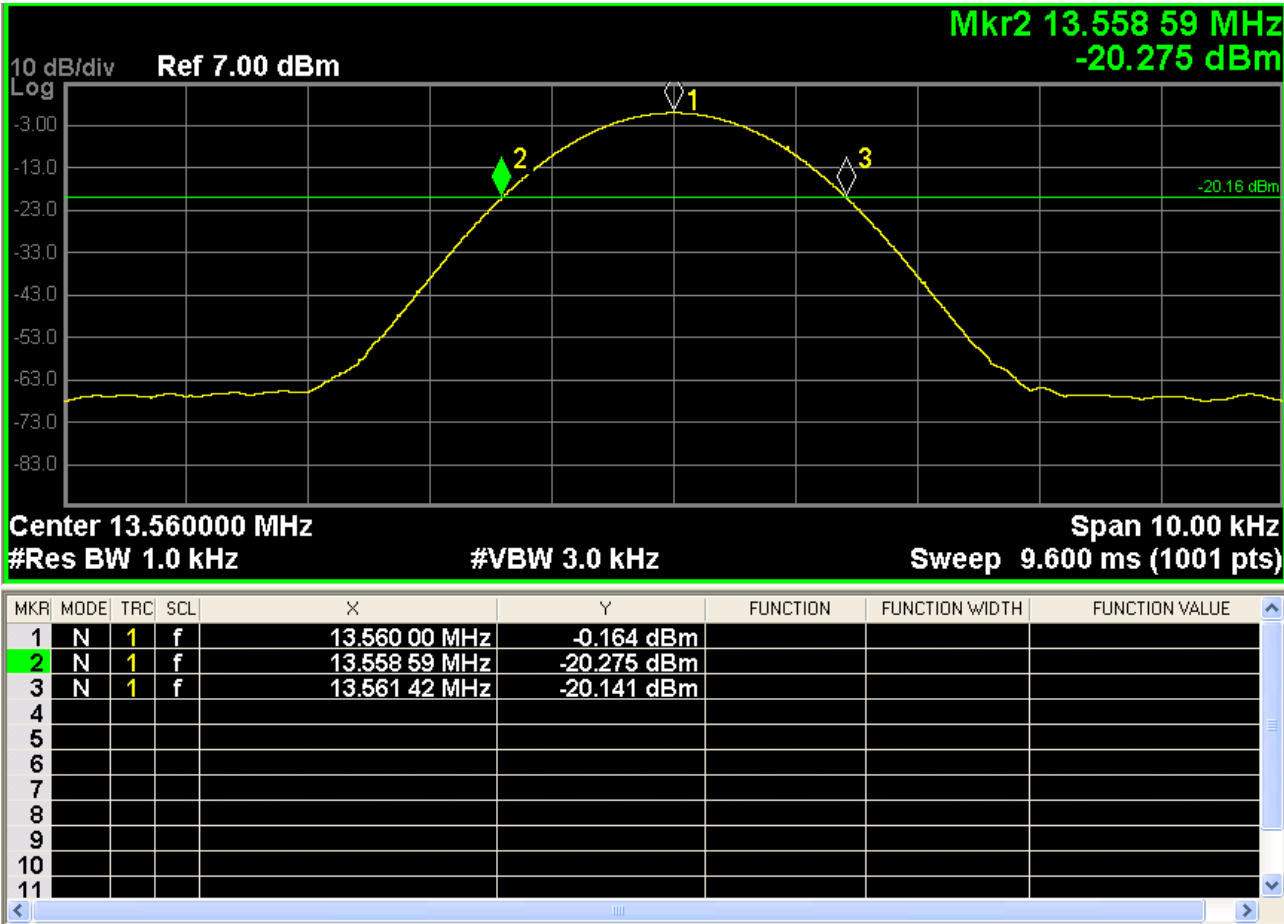
Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

4.4 TEST RESULTS

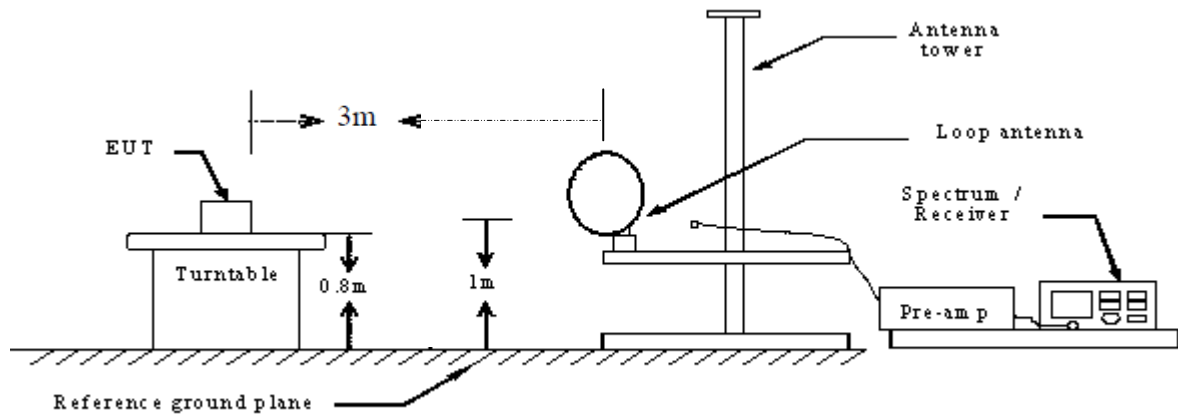
| Channel | 20dB bandwidth (KHz) |
|----------|----------------------|
| 13.56MHz | 2.83 |



$F_{low}=13.55859\text{MHz}(>13.553\text{MHz})$;
 $F_{high}=13.56142\text{MHz}(<13.567\text{MHz})$;
 $20\text{dB bandwidth}=13.56142-13.55859=0.00283\text{MHz}.$

5. IN-BAND EMISSION (RADIATION)

5.1 TEST SETUP



5.2 LIMITS

| Frequency (MHz) | Limits($\mu\text{V/m}$) at 30m | Limits($\text{dB}\mu\text{V/m}$) at 3m |
|-----------------|----------------------------------|--|
| 13.110~13.4 | 106 | 80.5 |
| 13.410~13.5 | 334 | 90.5 |
| 13.553~13.5 | 15848 | 124 |
| 13.567~13.7 | 334 | 90.5 |
| 13.710~14.0 | 106 | 80.5 |

Notes: the calculate formula for below 30MHz

$$L2 = 20\lg(L1) + 40\lg(d1/d2)$$

L2: is the specified limit in dB microvolts per metre at distance d2.

L1: is the specified limit in microvolts per metre at distance d1.

For example:

L1 = 106 ($\mu\text{V/m}$), d1 = 30 (m), d2 = 3 (m), so L2 as follows:

$$20\lg(106) + 40\lg(30/3) = 80.5(\text{dB}\mu\text{V/m})$$

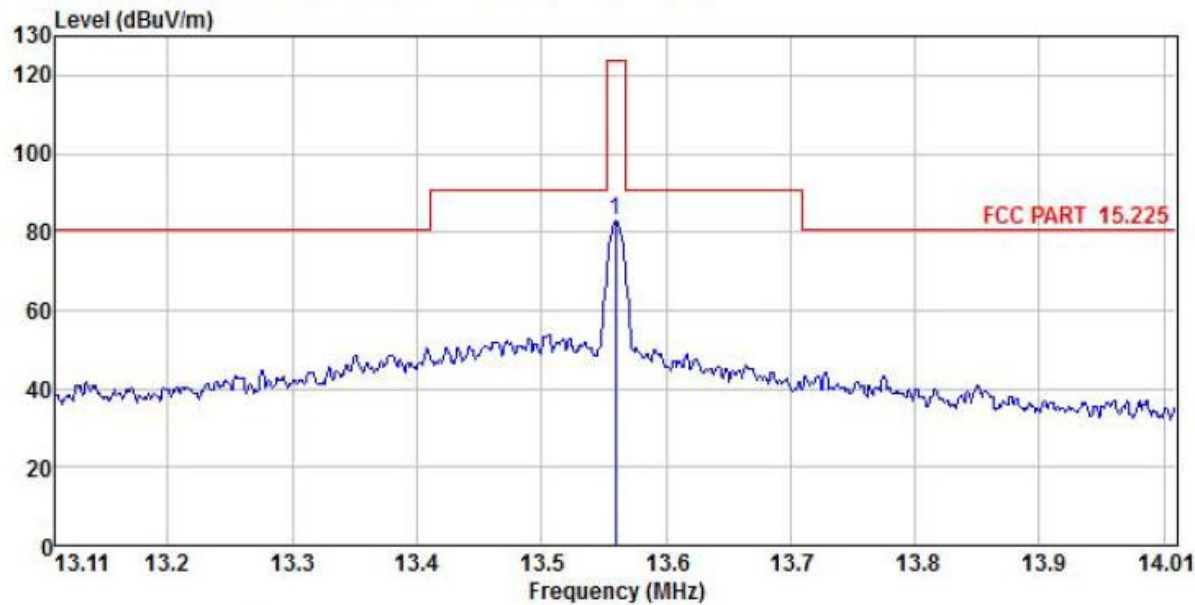
5.3 TEST PROCEDURE

Spurious emissions from the EUT are measured in the frequency range of 13.11MHz to 14.01 MHz using a tuned receiver and a shielded loop antenna. The antenna was positioned 3 meters horizontally from the EUT. The RBW of the spectrum analyzer is set 9KHz. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. The emission limits are based on measurements employing a CISPR quasi-peak detector.

5.4 RESULTS & PERFORMANCE

Test Mode : mode 1

Antenna Polarity : Horizontal

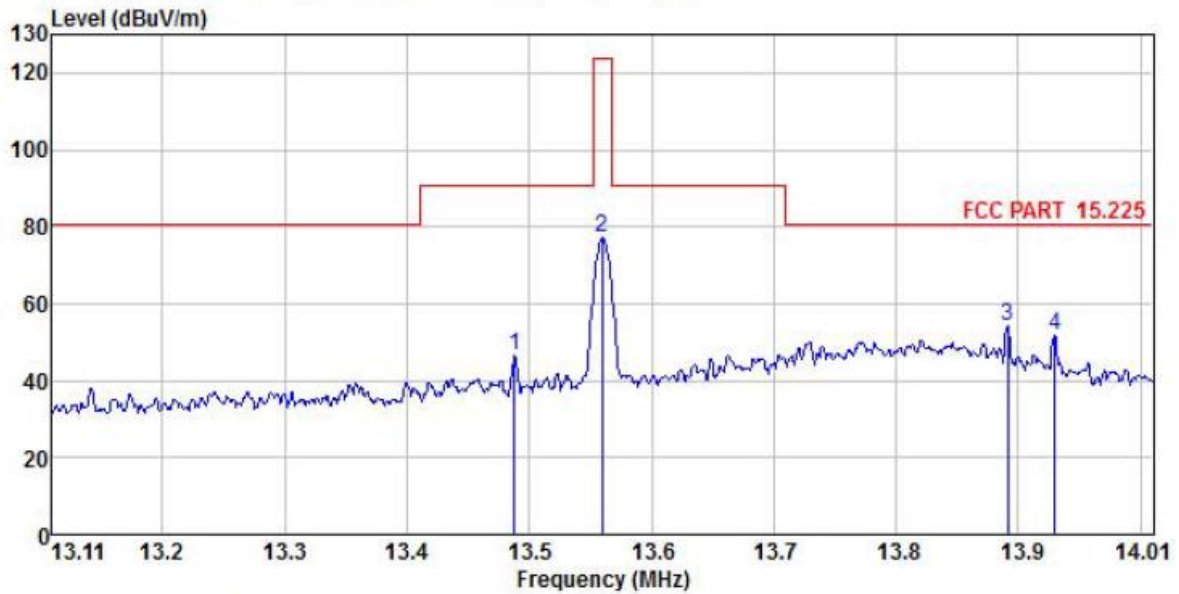


Site : chamber
Condition : FCC PART 15.225 3m FMZB 1519 HORIZONTAL
EUT :
Model Name :
Temp/Humi : 21 °C /50 %
Power Rating: AC 120V/60Hz
Mode : NFC TX
Memo :

| | Freq | ReadAntenna | Cable | Preamp | Level | Limit | Over | Remark | |
|------|-------|-------------|--------|--------|-------|--------|--------|--------|-------|
| | | Level | Factor | Loss | | Factor | Line | | Limit |
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 pp | 13.56 | 62.47 | 19.51 | 0.95 | 0.00 | 82.93 | 124.00 | -41.07 | Peak |

Test Mode : mode 1

Antenna Polarity : Vertical



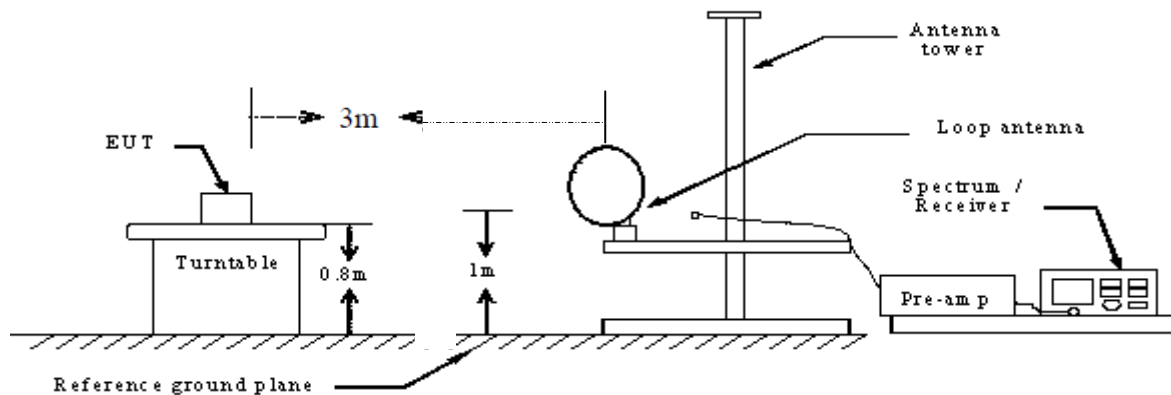
```
Site      : chamber
Condition : FCC PART  15.225 3m FMZB 1519 VERTICAL
EUT       :
Model Name :
Temp/Humi : 21 °C /50 %
Power Rating: AC 120V/60Hz
Mode      : NFC TX
Memo      :
```

| | Freq | Read Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Remark |
|------|-------|------------|----------------|------------|---------------|--------|------------|------------|--------|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 | 13.49 | 25.84 | 19.51 | 0.95 | 0.00 | 46.30 | 90.50 | -44.20 | Peak |
| 2 | 13.56 | 56.59 | 19.51 | 0.95 | 0.00 | 77.05 | 124.00 | -46.95 | Peak |
| 3 pp | 13.89 | 33.95 | 19.52 | 0.96 | 0.00 | 54.43 | 80.50 | -26.07 | Peak |
| 4 | 13.93 | 31.36 | 19.52 | 0.96 | 0.00 | 51.84 | 80.50 | -28.66 | Peak |

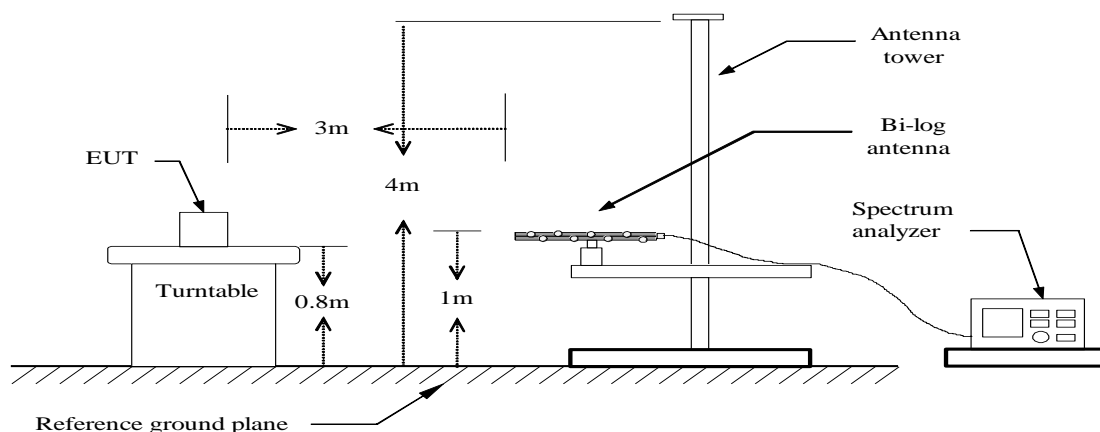
6. OUT-OF-BAND EMISSION (RADIATION)

6.1 TEST SETUP

Radiated Spurious Measurement: below 30MHz



Radiated Spurious Measurement: below 1GHz



6.2 LIMITS

| Frequency (MHz) | Limits (uV/m) | Measurement Distance (Meters) | Limits(dBuV/m) at 3m |
|-----------------|-----------------------|-------------------------------|----------------------|
| 0.009-0.490 | $2400/F(\text{KHz})$ | 300 | 128.5~93.80 |
| 0.490-1.705 | $24000/F(\text{KHz})$ | 30 | 73.80~63.00 |
| 1.705-30.0 | 30 | 30 | 69.5 |
| 30~88 | 100 | 3 | 40 |
| 88~216 | 150 | 3 | 43.5 |
| 216-960 | 200 | 3 | 46 |
| Above 960 | 500 | 3 | 54 |

Notes: the calculate formula for below 30MHz

$$L2 = 20\lg(L1) + 40\lg(d1/d2)$$

L2: is the specified limit in dB microvolts per metre at distance d2.

L1: is the specified limit in microvolts per metre at distance d1.

For example:

$$L1 = 2400/9 (\mu\text{V/m}), d1 = 300 (\text{m}), d2 = 3 (\text{m}), \text{ so } L2 \text{ as follows:}$$

$$20\lg(2400/9) + 40\lg(300/3) = 128.5(\text{dB}\mu\text{V/m})$$

6.3 TEST PROCEDURE

Radiated Emission (9 kHz – 30 MHz) :

Spurious emissions from the EUT are measured in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The antenna was positioned 3 meters horizontally from the EUT. The RBW of the spectrum analyzer is set to 200Hz(measured frequency range was 9KHz~150KHz) or 9KHz(measured frequency range was 150KHz~30MHz). Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz(these two bands employing a average detector).

Radiated Emission (30 MHz – 1000 MHz) :

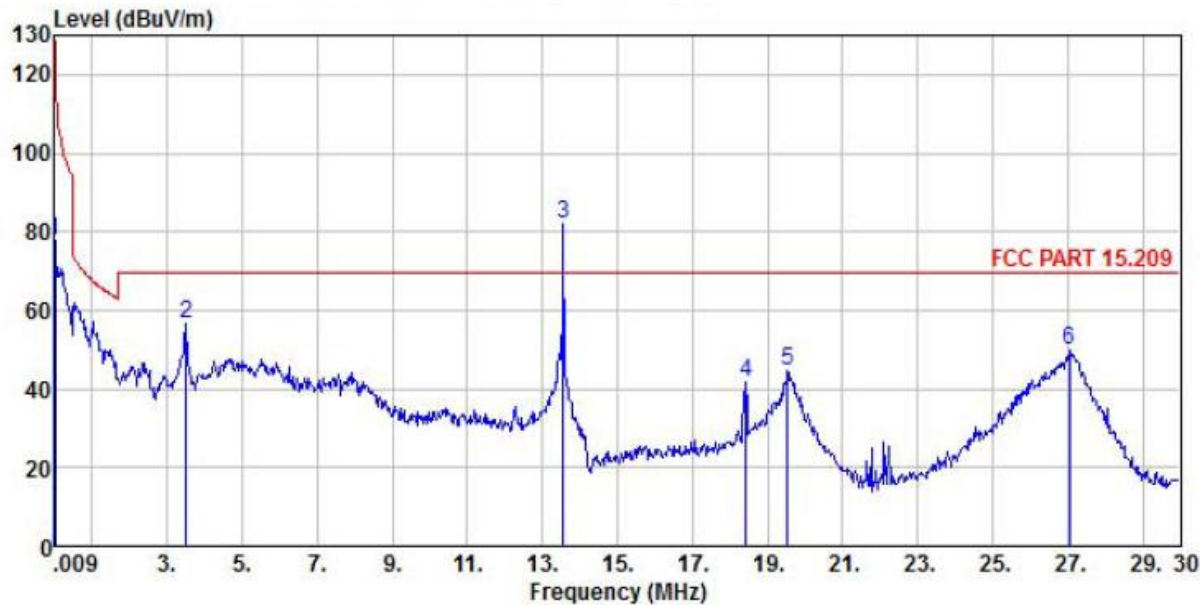
According to description of ANSI C63.4: 2009 sec.13.4, the preliminary radiated emissions measurement were carried out. The preliminary radiated measurements were performed at the measurement distance that specified for compliance to determine the emission characteristics of the EUT. The EUT configuration (in X, Y and Z axis), cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for the final radiated emissions measurements. The measurement is carried out using a spectrum analyzer or receiver. The Quasi-peak detector is used and RBW is set to 120kHz .The antenna height and turn table rotation is adjusted until the maximum power value is founded on spectrum analyzer or receiver.

6.4 RESULTS & PERFORMANCE

From 9KHz to 30MHz:

Test Mode : mode 1

Antenna Polarity : Horizontal



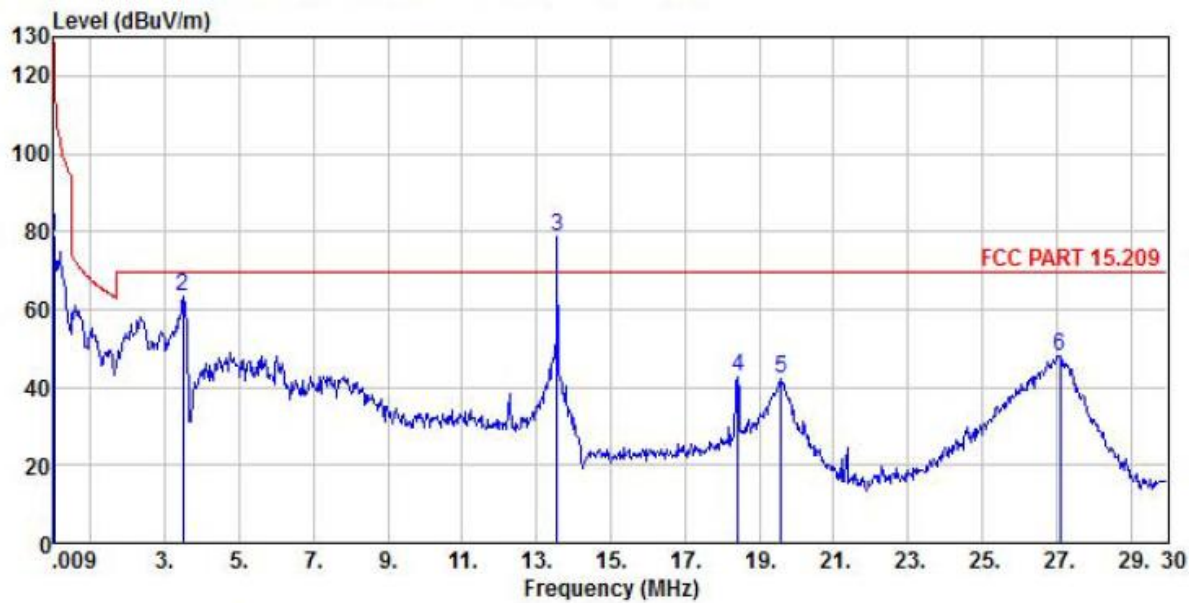
Site : chamber
Condition : FCC PART 15.209 3m FMZB 1519 HORIZONTAL
EUT :
Model Name :
Temp/Humi : 21 °C /50 %
Power Rating: AC 120V/60Hz
Mode : NFC TX
Memo :

| | Freq | ReadAntenna | Cable | Preamp | | Limit | Over | |
|------|-------|-------------|-------|--------|-------|--------|--------|-------------|
| | Level | Factor | Loss | Factor | Level | Line | Limit | Remark |
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB |
| 1 | 0.01 | 55.43 | 21.77 | 0.31 | 0.00 | 77.51 | 128.50 | -50.99 Peak |
| 2 | 3.52 | 37.17 | 19.21 | 0.41 | 0.00 | 56.79 | 69.50 | -12.71 Peak |
| 3 pp | 13.56 | 61.65 | 19.51 | 0.95 | 0.00 | 82.11 | 69.50 | 12.61 Peak |
| 4 | 18.42 | 20.63 | 19.60 | 1.37 | 0.00 | 41.60 | 69.50 | -27.90 Peak |
| 5 | 19.53 | 23.65 | 19.60 | 1.41 | 0.00 | 44.66 | 69.50 | -24.84 Peak |
| 6 | 27.06 | 28.06 | 19.58 | 2.03 | 0.00 | 49.67 | 69.50 | -19.83 Peak |

Note: 13.56 MHz was fundamental signal which can be ignored.

Test Mode : mode 1

Antenna Polarity : Vertical



Site : chamber
Condition : FCC PART 15.209 3m FMZB 1519 VERTICAL
EUT :
Model Name :
Temp/Humi : 21 °C /50 %
Power Rating: AC 120V/60Hz
Mode : NFC TX
Memo :

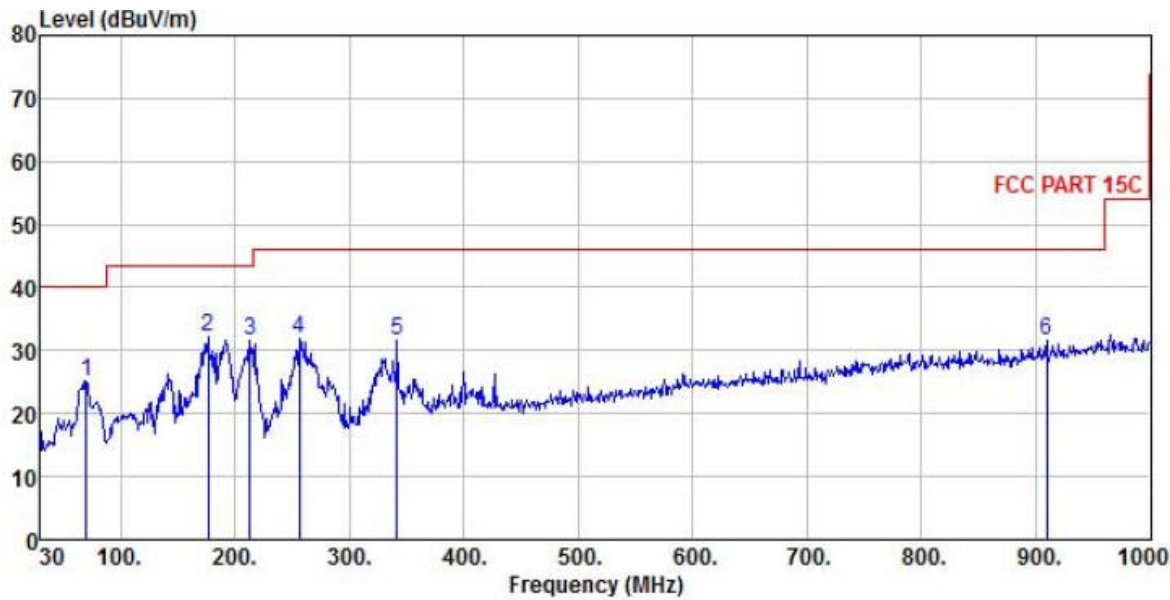
| | Freq | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Limit Level | Limit Line | Over Limit | Remark |
|------|-------|----------------------|-------------------|---------------|------------------|----------------|---------------|---------------|--------|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 | 0.01 | 56.43 | 21.77 | 0.31 | 0.00 | 78.51 | 128.50 | -49.99 | Peak |
| 2 | 3.49 | 43.75 | 19.22 | 0.41 | 0.00 | 63.38 | 69.50 | -6.12 | Peak |
| 3 pp | 13.56 | 58.37 | 19.51 | 0.95 | 0.00 | 78.83 | 69.50 | 9.33 | Peak |
| 4 | 18.42 | 21.51 | 19.60 | 1.37 | 0.00 | 42.48 | 69.50 | -27.02 | Peak |
| 5 | 19.59 | 21.17 | 19.60 | 1.42 | 0.00 | 42.19 | 69.50 | -27.31 | Peak |
| 6 | 27.09 | 26.53 | 19.58 | 2.03 | 0.00 | 48.14 | 69.50 | -21.36 | Peak |

Note: 13.56 MHz was fundamental signal which can be ignored.

From 30MHz to 1GHz:

Test Mode : mode 1

Antenna Polarity : Horizontal

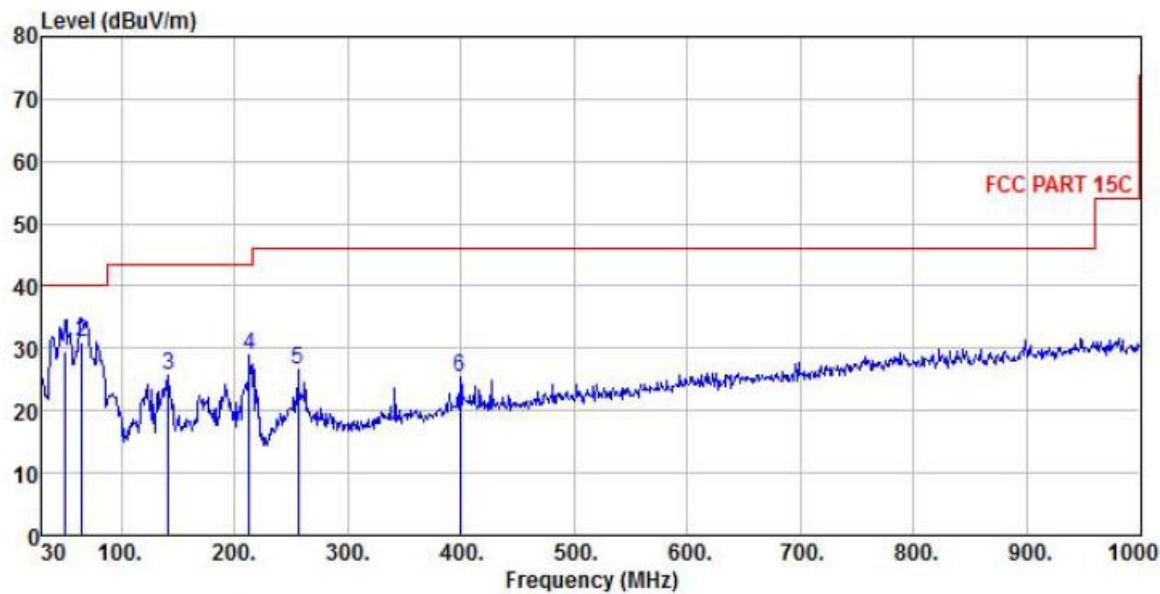


Site : chamber
Condition : FCC PART 15C 3m VULB9160 HORIZONTAL
EUT :
Model Name :
Temp/Humi : 21 °C /50 %
Power Rating: AC 120V/60Hz
Mode : NFC TX
Memo :

| | | ReadAntenna | Cable | Preamp | | Limit | Over | |
|---|--------|-------------|--------|--------|--------|--------|--------|--------------|
| | Freq | Level | Factor | Loss | Factor | Level | Line | Limit Remark |
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB |
| 1 | 69.77 | 13.13 | 10.99 | 1.12 | 0.00 | 25.24 | 40.00 | -14.76 Peak |
| 2 | 176.47 | 17.83 | 12.62 | 1.87 | 0.00 | 32.32 | 43.50 | -11.18 Peak |
| 3 | 213.33 | 19.10 | 10.61 | 1.99 | 0.00 | 31.70 | 43.50 | -11.80 Peak |
| 4 | 256.01 | 17.55 | 12.05 | 2.17 | 0.00 | 31.77 | 46.00 | -14.23 Peak |
| 5 | 341.37 | 14.99 | 14.12 | 2.52 | 0.00 | 31.63 | 46.00 | -14.37 Peak |
| 6 | 909.79 | 4.70 | 22.72 | 4.08 | 0.00 | 31.50 | 46.00 | -14.50 Peak |

Test Mode : mode 1

Antenna Polarity : Vertical

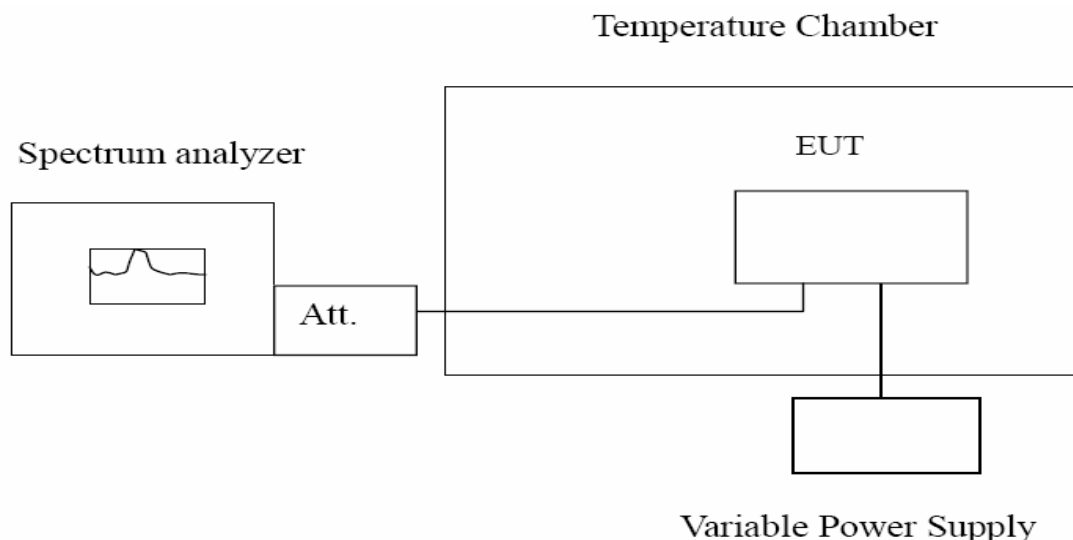


Site : chamber
Condition : FCC PART 15C 3m VULB9160 VERTICAL
EUT :
Model Name :
Temp/Humi : 21 °C /50 %
Power Rating: AC 120V/60Hz
Mode : NFC TX
Memo :

| | Freq | ReadAntenna Level | Antenna Factor | Cable Loss | Preamp Factor | Level | Limit Line | Over Limit | Remark |
|---|-----------|----------------------|-------------------|---------------|------------------|--------|---------------|---------------|--------|
| | MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | |
| 1 | 50.37 | 16.09 | 12.57 | 0.96 | 0.00 | 29.62 | 40.00 | -10.38 | QP |
| 2 | pp 64.92 | 17.48 | 12.34 | 1.08 | 0.00 | 30.90 | 40.00 | -9.10 | QP |
| 3 | 141.55 | 10.72 | 13.47 | 1.62 | 0.00 | 25.81 | 43.50 | -17.69 | Peak |
| 4 | pk 213.33 | 16.33 | 10.61 | 1.99 | 0.00 | 28.93 | 43.50 | -14.57 | Peak |
| 5 | 256.01 | 12.34 | 12.05 | 2.17 | 0.00 | 26.56 | 46.00 | -19.44 | Peak |
| 6 | 399.57 | 7.43 | 15.32 | 2.65 | 0.00 | 25.40 | 46.00 | -20.60 | Peak |

7. FREQUENCY STABILITY

7.1 TEST SETUP



7.2 LIMITS

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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 using a new battery.

7.3 TEST PROCEDURE

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of emission

RBW = 1KHz;VBW = 3KHz;Sweep = auto;Detector function = peak;Trace = max hold

Frequency Stability Under Temperature Variations:

The equipment under test was connected to an external AC or DC power supply and input rated voltage. RF output was connected to a frequency counter or spectrum analyzer via feed through attenuators. The EUT was placed inside the temperature chamber. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and measure EUT operating frequency as reference frequency. Turn EUT off and set the chamber temperature to -20°C . After the temperature stabilized for approximately 30 minutes recorded the frequency. Repeat step measure with 10°C increased per stage until the highest temperature of $+50^{\circ}\text{C}$ reached.

Frequency Stability Under Voltage Variations:

Set chamber temperature to 20°C . Use a variable AC power supply / DC power source to power the EUT and set the voltage to rated voltage. Set the spectrum analyzer RBW low enough to obtain the desired frequency resolution and recorded the frequency. Reduce the input voltage to specify extreme voltage variation ($\pm 15\%$) and endpoint, record the maximum frequency change.

7.4 RESULTS & PERFORMANCE

Frequency Stability under Temperature
Voltage=3.8V

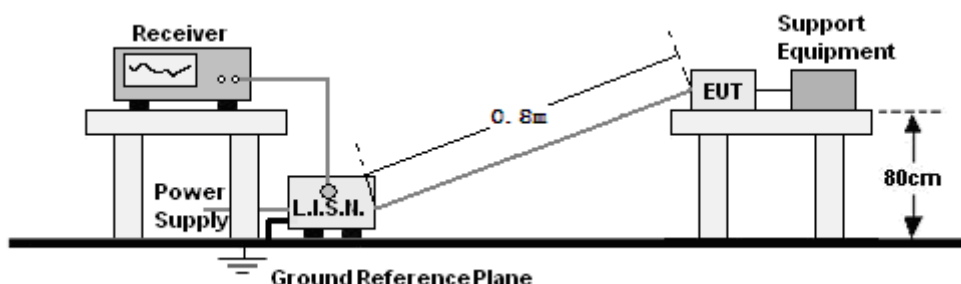
| Temperature Interval (°C) | Measurement Frequency (MHz) | Deviation (MHz) | Limit (MHz) |
|---------------------------|-----------------------------|-----------------|-------------|
| -20 | 13.56056 | 0.00056 | ±0.1356 |
| -10 | 13.56035 | 0.00035 | ±0.1356 |
| 0 | 13.56066 | 0.00066 | ±0.1356 |
| 10 | 13.56038 | 0.00038 | ±0.1356 |
| 20 | 13.56059 | 0.00059 | ±0.1356 |
| 30 | 13.56077 | 0.00077 | ±0.1356 |
| 40 | 13.56057 | 0.00057 | ±0.1356 |
| 50 | 13.56028 | 0.00028 | ±0.1356 |

Frequency Stability under Voltage
Temperature=20°C

| DC Voltage (V) | Measurement Frequency (MHz) | Deviation (MHz) | Limit (MHz) |
|----------------|-----------------------------|-----------------|-------------|
| 3.2 | 13.56032 | 0.00032 | ±0.1356 |
| 3.8 | 13.56053 | 0.00053 | ±0.1356 |
| 4.4 | 13.56086 | 0.00086 | ±0.1356 |

8. AC POWER LINE CONDUCTED EMISSIONS

8.1 TEST SETUP



8.2 LIMITS

| Frequency range (MHz) | Limits dB(μV) | |
|--------------------------|------------------|----------|
| | Quasi-peak | Average |
| 0,15 to 0,50 | 66 to 56 | 56 to 46 |
| 0,50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

NOTE: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 to 0.50 MHz.

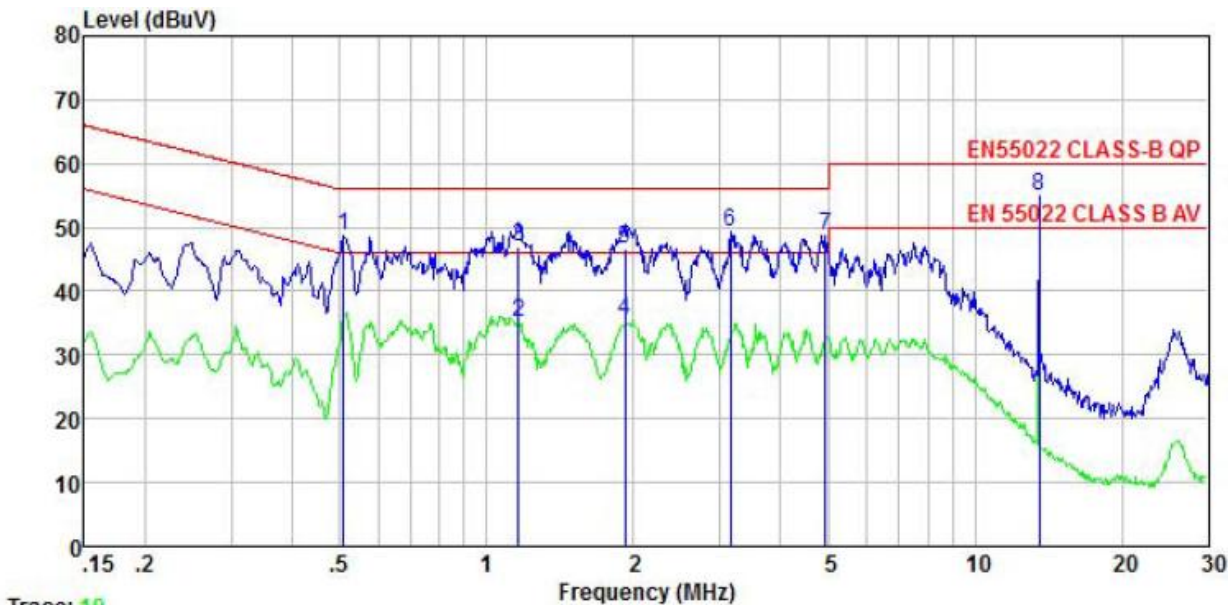
8.3 TEST PROCEDURE

According to description of ANSI C63.4: 2009 sec.13.3, the AC power line preliminary conducted emissions measurements were carried out. The preliminary conducted measurements were performed using the spectrum analyzer to observe the emission characteristics of the EUT. The EUT configuration, cable configuration and mode of operation were determined for producing the maximum level of emissions. These configurations were used for final AC power line conducted emissions measurements. The EUT is placed on a non-metallic table 0.8m above the horizontal metal reference ground plane. The EUT is connected to LISN and LISN is connected to the reference ground. All other supplemental devices are connected with EUT through other LISN. The distance between EUT and LISN is 80cm. A radio link is established between EUT and the tester. The output power of the EUT is controlled by the tester and driven to maximum value. An initial pre-scan was performed on the live L line and neutral line with peak detector (9kHz RBW). Both average detector and quasi-peak detector are performed at the frequencies with maximized peak emission. Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

8.4 RESULTS & PERFORMANCE

Test Mode:mode 1

LISN: LINE



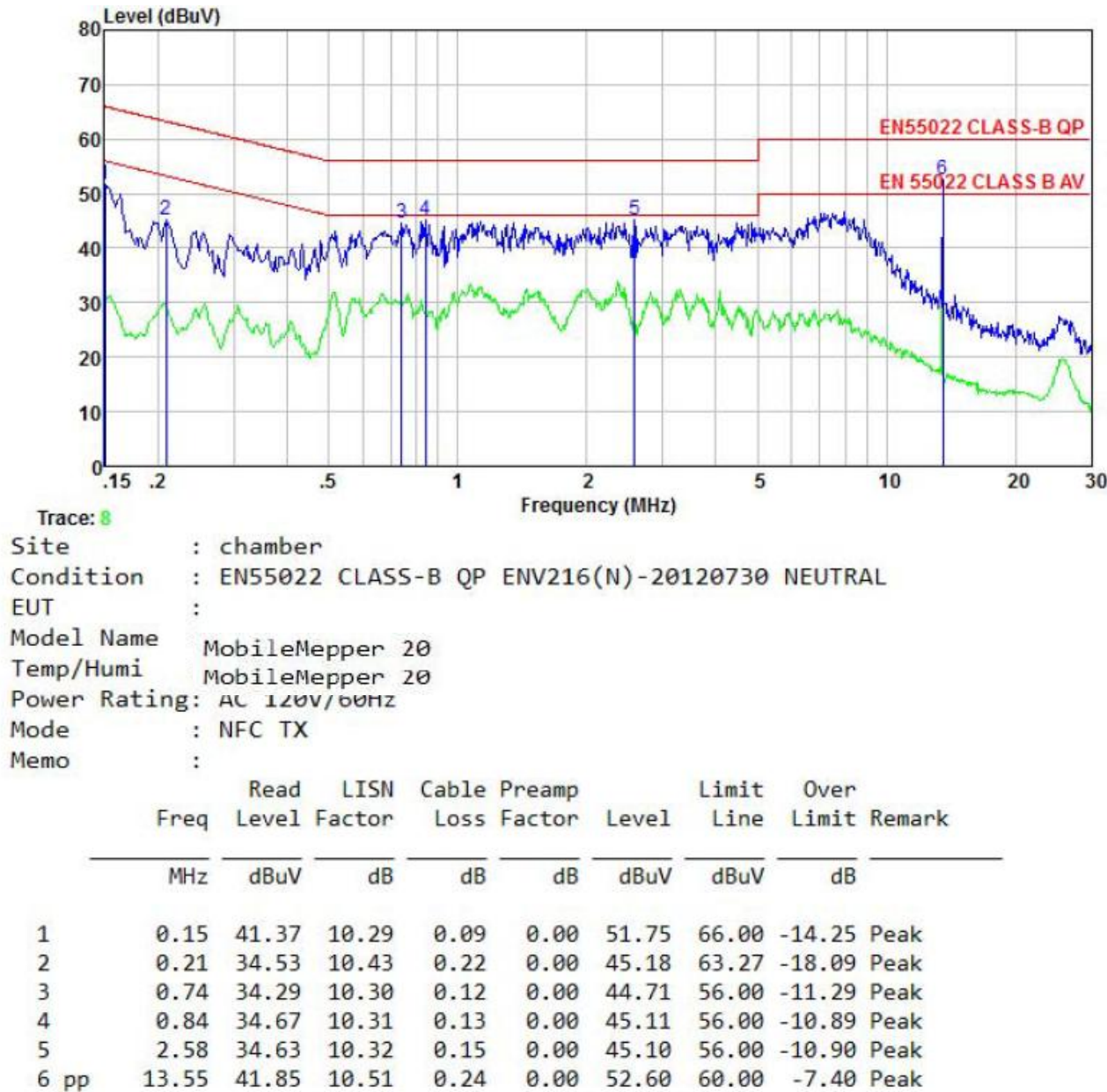
Trace: 10
Site : chamber
Condition : EN55022 CLASS-B QP ENV216(L)-20120730 LINE
EUT :
Model Name :
Temp/Humi : 21 °C /50 %
Power Rating: AC 120V/60Hz
Mode : NFC TX
Memo :

| | | Read | LISN | Cable | Preamp | | Limit | Over | |
|------|-------|-------|--------|-------|--------|-------|-------|--------|---------|
| | Freq | Level | Factor | Loss | Factor | Level | Line | Limit | Remark |
| | MHz | dBuV | dB | dB | dB | dBuV | dBuV | dB | |
| 1 | 0.51 | 37.94 | 10.56 | 0.10 | 0.00 | 48.60 | 56.00 | -7.40 | Peak |
| 2 | 1.16 | 24.53 | 10.52 | 0.14 | 0.00 | 35.19 | 46.00 | -10.81 | Average |
| 3 qp | 1.16 | 36.26 | 10.52 | 0.14 | 0.00 | 46.92 | 56.00 | -9.08 | QP |
| 4 av | 1.92 | 24.74 | 10.52 | 0.15 | 0.00 | 35.41 | 46.00 | -10.59 | Average |
| 5 | 1.92 | 35.86 | 10.52 | 0.15 | 0.00 | 46.53 | 56.00 | -9.47 | QP |
| 6 | 3.16 | 38.57 | 10.52 | 0.15 | 0.00 | 49.24 | 56.00 | -6.76 | Peak |
| 7 | 4.95 | 37.99 | 10.52 | 0.14 | 0.00 | 48.65 | 56.00 | -7.35 | Peak |
| 8 pp | 13.55 | 44.25 | 10.49 | 0.24 | 0.00 | 54.98 | 60.00 | -5.02 | Peak |

Note: Point 8 was fundamental signal which can be ignored.

Test Mode:mode 1

LISN:NEUTRAL



Note: Point 6 was fundamental signal which can be ignored.

APPENDIX 1 PHOTOGRAPHS OF TEST SETUP

Please refer to the file named "JNF-Z-220X_Part 15C Setup Photos".

APPENDIX 2 PHOTOGRAPHS OF EUT

Please refer to the two files named "JNF-Z-220X_EUT External Photos" and "JNF-Z-220X_EUT Internal Photos".

---End of the report----