

FCC Test Report

Report No.: OKA-ESH-P22120819B-3

FCC ID: 2AYF8-YBES800

Product: Electric Scooter

Test Model: ES800

Received Date: Dec.14, 2022

Test Date: Dec.14, 2022 to Jan.16, 2023

Issued Date: Feb.15, 2023

Applicant: Zhejiang Okai Vehicle Co., Ltd.

Address: No. 9, Xinxing Road, Xinbi Town, Jinyun County, Zhejiang, China

Manufacturer: Zhejiang Okai Vehicle Co., Ltd.

Address: No. 9, Xinxing Road, Xinbi Town, Jinyun County, Zhejiang, China

Issued By: BUREAU VERITAS ADT (Shanghai) Corporation

Lab Address: No. 829, Xinzhuang Road, Shanghai, P.R.China (201612)

**FCC Registration /
Designation Number:** 176467/ CN1213



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Release Control Record

| Issue No. | Description | Date Issued |
|----------------------|------------------|--------------|
| OKA-ESH-P22120819B-3 | Original release | Feb.15, 2023 |

1 Certificate of Conformity

Product: Electric Scooter

Brand: OKAI

Test Model: ES800

Applicant: Zhejiang Okai Vehicle Co., Ltd.

Test Date: Dec.14, 2022 to Jan.16, 2023

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.225)
ANSI C63.10:2020

The above equipment has been tested by **BUREAU VERITAS ADT (Shanghai) Corporation**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :


Yuan ZHANG

, **Date:**

Feb.15, 2023

Project Engineer

Approved by :



, **Date:**

Feb.15, 2023

2 Summary of Test Results

The EUT has been tested according to the following specifications:

| 47 CFR FCC Part 15, Subpart C | | | |
|-------------------------------|---|--------|--------------------------------|
| FCC Clause | Test Item | Result | Remarks |
| 15.203 | Antenna Requirement | PASS | No antenna connector is used. |
| 15.207 | AC Power Conducted Emission | PASS | Meet the requirement of limit. |
| 15.215(c) | 20dB Spectrum Bandwidth | PASS | Meet the requirement of limit. |
| 15.225(e) | Frequency Stability | PASS | Meet the requirement of limit. |
| 15.225(a)(b)(c) | Field Strength of Fundamental Emissions | PASS | Meet the requirement of limit. |
| 15.225 / 15.209 / | Radiated Emissions Measurement | PASS | Meet the requirement of limit. |

2.1 Test Instruments

| Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Next Cal. |
|------------------------------------|--------------|-------------|------------|-------------|------------|
| Loop Antenna | ETS-LINDGREN | 6502 | E1A1039 | Jul.23,22 | Jul.22,23 |
| Hybrid Antenna(25MHz-1.5GHz) | Schwarzbeck | VULB9168 | E1A1012 | Jul.26, 21 | Jul.25, 23 |
| Horn Antenna(1GHz -18GHz) | Schwarzbeck | BBHA9120D | E1A1017 | Jul.25, 22 | Jul.24, 24 |
| Double Ridge Horn Antenna(18G-40G) | COM-POWER | AH-840 | E1A1040 | Jul.25, 22 | Jul.24, 24 |
| Pre-Amplifier(100kHz-1.3GHz) | Agilent | 8447D | E1A2001 | Mar.03, 22 | Mar.02, 23 |
| Pre-Amplifier(0.5GHz-18GHz) | EMCI | EMC184045SE | E1A2009 | Aug.04, 22 | Aug.03, 23 |
| Pre-Amplifier(18GHz-40GHz) | EMCI | EMC051845SE | E1A2008 | Aug.04, 22 | Aug.03, 23 |
| EMI test receiver | R&S | ESR7 | E1R1005 | Mar.03, 22 | Mar.02, 23 |
| Spectrum Analyzer | Keysight | N9030B | E1S1003 | Sep.14, 22 | Sep.13, 23 |
| Spectrum Analyzer | Keysight | N9020A | E1S1004 | Mar.03, 22 | Mar.02, 23 |
| EMI test receiver | R&S | ESR3 | E1R1008 | Jun.20, 22 | Jun.19, 23 |
| LISN | R&S | ENV216 | E1L1011 | Jun.20, 22 | Jun.19, 23 |
| Humidity&Temp Tester | Baolima | WS508 | E1H1011 | Apr. 01, 22 | Mar.31, 23 |
| RF Control Unit | Toscend | JS0806-2 | E1C5003 | N/A | N/A |
| Test Software | Toscend | JS32-CE | N/A | N/A | N/A |
| Test Software | Toscend | JS32-RE | N/A | N/A | N/A |
| Test Software | Toscend | JS1120-3 | N/A | N/A | N/A |

2.2 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT:

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

| Measurement | Frequency | Expanded Uncertainty ($k=2$) (\pm) |
|------------------------------------|----------------|---|
| Conducted Emissions at mains ports | 150kHz ~ 30MHz | 1.83 dB |
| Radiated Emissions up to 1 GHz | 30MHz ~ 1GHz | 5.36 dB |
| Radiated Emissions above 1 GHz | 1GHz ~ 6GHz | 3.47 dB |
| | 6GHz ~ 18GHz | 3.75 dB |
| | 18GHz ~ 40GHz | 3.30 dB |

2.3 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

| | |
|-----------------------|---|
| Product | Electric Scooter |
| Brand | OKAI |
| Test Model | ES800 |
| Power Rating | Powered by battery; AC Adaptor: Input: 100-240VAC, 50/60Hz, 2,5A (Max.) Output: 58.8VDC, 4.0A |
| Modulation Type | ASK |
| Modulation Technology | NFC |
| Operating Frequency | 13.56MHz |
| Number of Channel | 1 |
| Antenna Type | PCB Antenna |
| Antenna Connector | -- |

Note:

1. For more details, please refer to the User's manual of the EUT.

3.2 Description of Test Modes

| CHANNEL | FREQUENCY | MODULATION TYPE |
|---------|-----------|-----------------|
| 1 | 13.56 MHz | ASK |

3.2.1 Test Mode Applicability:

| EUT Configure Mode | Applicable to | | | | Description |
|--------------------|------------------|-----------------|-----|----|-------------|
| | RE (9 kHz~30MHz) | RE (30MHz~1GHz) | PLC | BW | |
| - | √ | √ | √ | √ | - |

Where **RE≥1G**: Radiated Emission above 1GHz **RE< 1G**: Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **BW**: 20dB Spectrum Bandwidth

NOTE:

Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration (Z plane as worst plane) from all possible combinations.

Radiated Emission Test RE (9 kHz~30MHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|--------------------|--------|-------------------|----------------|-----------------|
| - | NFC TX | 13.56MHz | 13.56MHz | ASK |

Radiated Emission Test RE (30MHz~1GHz):

☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|--------------------|--------|-------------------|----------------|-----------------|
| - | NFC TX | 13.56MHz | 13.56MHz | ASK |

Power Line Conducted Emission Test:

☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|--------------------|--------|-------------------|----------------|-----------------|
| - | NFC TX | 13.56MHz | 13.56MHz | ASK |

20dB Spectrum Bandwidth

☒ Following channel(s) was (were) selected for the final test as listed below.

| EUT CONFIGURE MODE | MODE | AVAILABLE CHANNEL | TESTED CHANNEL | MODULATION TYPE |
|--------------------|--------|-------------------|----------------|-----------------|
| - | NFC TX | 13.56MHz | 13.56MHz | ASK |

3.2.2 Test Condition:

| Applicable to | Normal Environmental Conditions | Normal Input Power |
|------------------|---------------------------------|-----------------------------------|
| RE (9 kHz~30MHz) | 23deg. C, 58%RH | Working mode: Powered by battery |
| RE (30MHz~1GHz) | 23deg. C, 58%RH | Working mode: Powered by battery |
| PLC | 23deg. C, 58%RH | Charging mode: 100-240Vac,50/60Hz |
| BW | 25deg. C, 60%RH | Working mode: Powered by battery |

3.3 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.4 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standard:

FCC Part 15, Subpart C (15.225)

ANSI C63.10:2020

All relaxed test items have been performed and recorded as per the above standard.

4 Test Procedure and Results

4.1 AC Power Conducted Emission

4.1.1 Limits

| Frequency (MHz) | Conducted Limit (dBuV) | |
|-----------------|------------------------|---------|
| | Quasi-peak | Average |
| 0.15 - 0.5 | 66 - 56 | 56 - 46 |
| 0.50 - 5.0 | 56 | 46 |
| 5.0 - 30.0 | 60 | 50 |

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.1.2 Test Procedures

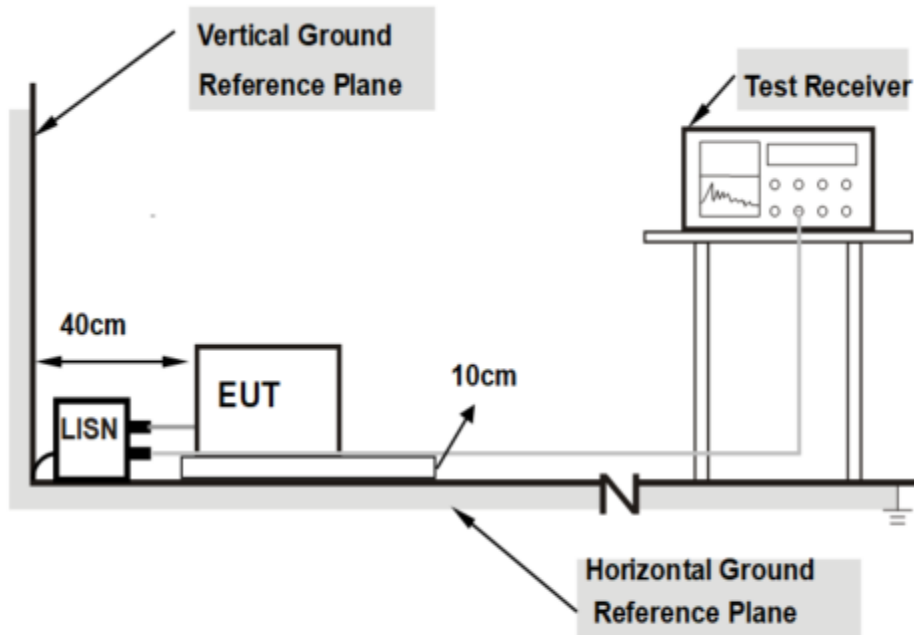
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

4.1.3 Deviation from Test Standard

No deviation.

4.1.4 Test Setup



Note: 1.Support units were connected to second LISN.

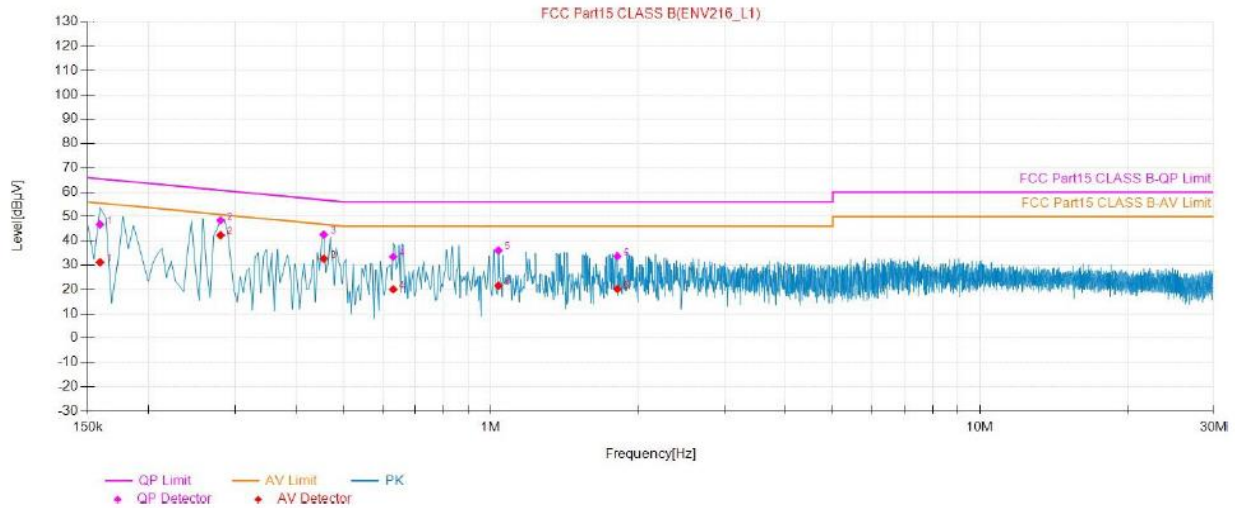
For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.5 EUT Operating Conditions

Same as 4.1.6.

4.1.6 Test Results

| Phase | Line (L) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|--------------|---------------|-------------------|--------------------------------|
| Power supply | AC 120V, 60Hz | | |
| Test Mode | Charging | | |



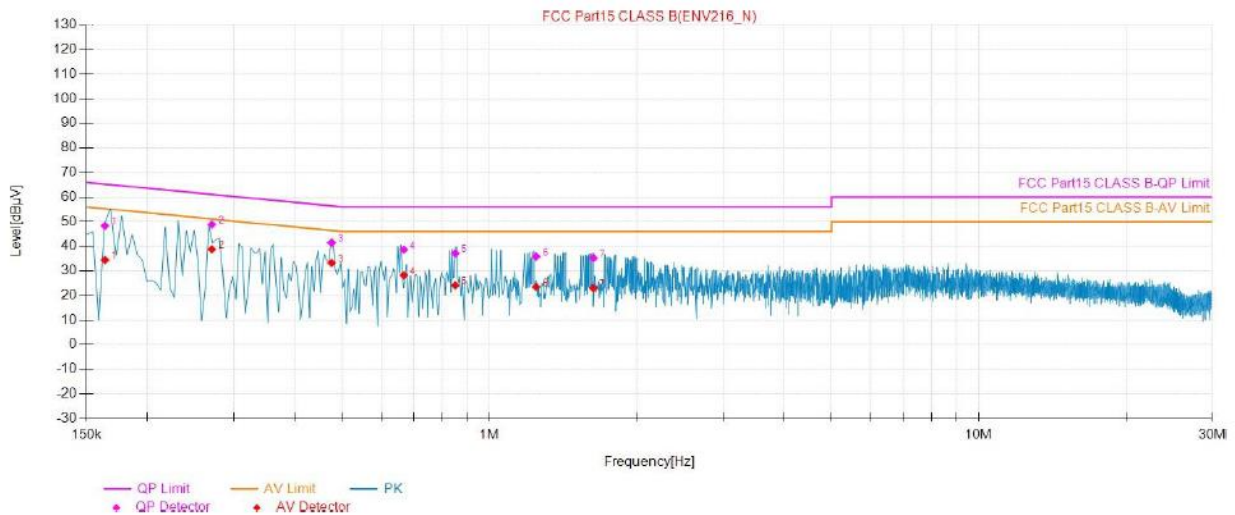
Final Data List

| NO. | Freq. [MHz] | Factor [dB] | QP Reading Value [dBμV] | QP Value [dBμV] | QP Limit [dBμV] | QP Margin [dB] | AV Reading Value [dBμV] | AV Value [dBμV] | AV Limit [dBμV] | AV Margin [dB] | Type | Verdict |
|-----|-------------|-------------|-------------------------|-----------------|-----------------|----------------|-------------------------|-----------------|-----------------|----------------|------|---------|
| 1 | 0.1590 | 9.77 | 36.95 | 46.72 | 65.52 | 18.80 | 21.40 | 31.17 | 55.52 | 24.35 | L1 | PASS |
| 2 | 0.2805 | 9.64 | 38.78 | 48.42 | 60.80 | 12.38 | 32.61 | 42.25 | 50.80 | 8.55 | L1 | PASS |
| 3 | 0.4560 | 9.59 | 32.91 | 42.50 | 56.77 | 14.27 | 23.04 | 32.63 | 46.77 | 14.14 | L1 | PASS |
| 4 | 0.6315 | 9.52 | 23.92 | 33.44 | 56.00 | 22.56 | 10.52 | 20.04 | 46.00 | 25.96 | L1 | PASS |
| 5 | 1.0365 | 9.49 | 26.53 | 36.02 | 56.00 | 19.98 | 12.02 | 21.51 | 46.00 | 24.49 | L1 | PASS |
| 6 | 1.8150 | 9.63 | 24.02 | 33.65 | 56.00 | 22.35 | 10.55 | 20.18 | 46.00 | 25.82 | L1 | PASS |

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Limit value - Emission level
4. Correction factor = Insertion loss + Cable loss
5. QP/AV Value= QP/AV Reading Value+ Correction factor

| | | | |
|--------------|---------------|-------------------|-----------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
| Power supply | AC 120V, 60Hz | | |
| Test Mode | Charging | | |



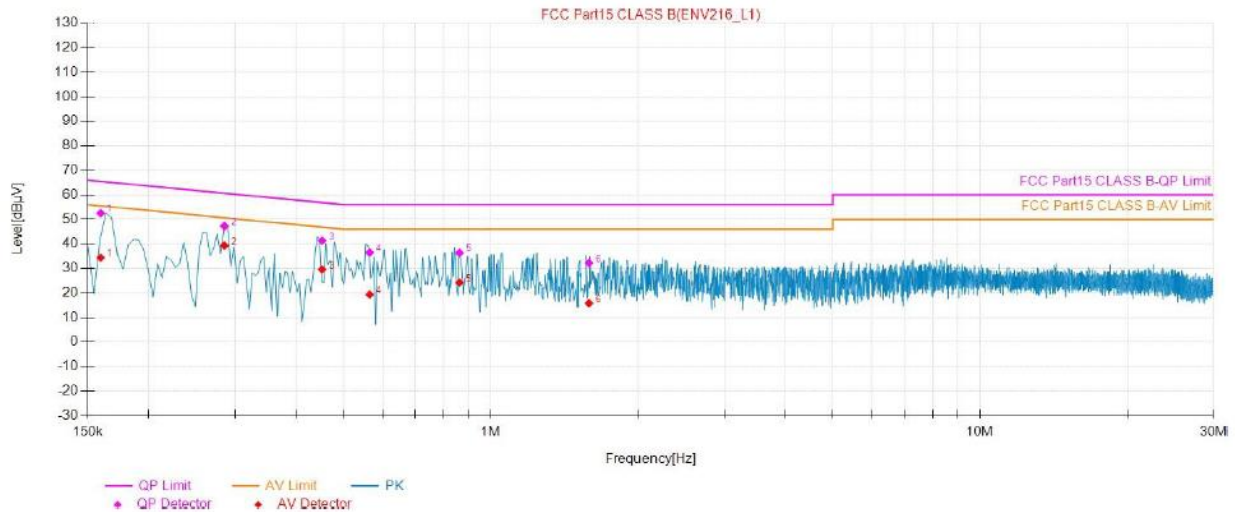
Final Data List

| NO. | Freq. [MHz] | Factor [dB] | QP Reading Value [dBμV] | QP Value [dBμV] | QP Limit [dBμV] | QP Margin [dB] | AV Reading Value [dBμV] | AV Value [dBμV] | AV Limit [dBμV] | AV Margin [dB] | Type | Verdict |
|-----|-------------|-------------|-------------------------|-----------------|-----------------|----------------|-------------------------|-----------------|-----------------|----------------|------|---------|
| 1 | 0.1638 | 9.76 | 38.56 | 48.32 | 65.27 | 16.95 | 24.65 | 34.41 | 55.27 | 20.86 | N | PASS |
| 2 | 0.2708 | 9.61 | 39.26 | 48.87 | 61.09 | 12.22 | 29.16 | 38.77 | 51.09 | 12.32 | N | PASS |
| 3 | 0.4754 | 9.59 | 31.87 | 41.46 | 56.42 | 14.96 | 23.65 | 33.24 | 46.42 | 13.18 | N | PASS |
| 4 | 0.6684 | 9.48 | 29.14 | 38.62 | 56.00 | 17.38 | 18.68 | 28.16 | 46.00 | 17.84 | N | PASS |
| 5 | 0.8512 | 9.51 | 27.60 | 37.11 | 56.00 | 18.89 | 14.58 | 24.09 | 46.00 | 21.91 | N | PASS |
| 6 | 1.2454 | 9.53 | 26.31 | 35.84 | 56.00 | 20.16 | 13.97 | 23.50 | 46.00 | 22.50 | N | PASS |
| 7 | 1.6305 | 9.57 | 25.66 | 35.23 | 56.00 | 20.77 | 13.48 | 23.05 | 46.00 | 22.95 | N | PASS |

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Limit value - Emission level
4. Correction factor = Insertion loss + Cable loss
5. QP/AV Value= QP/AV Reading Value+ Correction factor

| Phase | Line (L) | Detector Function | Quasi-Peak (QP) / Average (AV) |
|--------------|---------------|-------------------|-----------------------------------|
| Power supply | AC 230V, 50Hz | | |
| Test Mode | Charging | | |



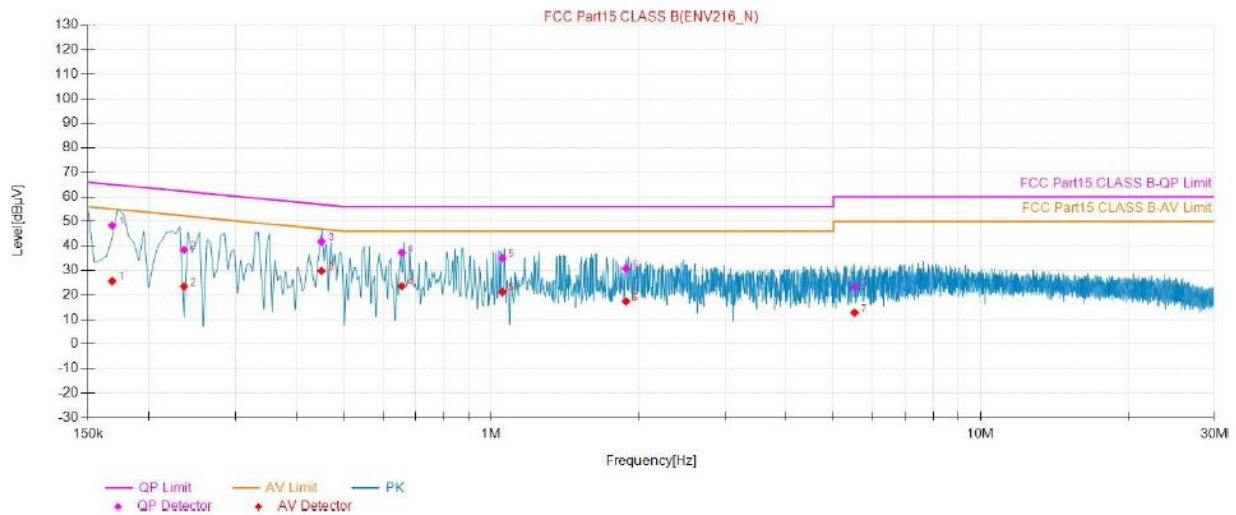
Final Data List

| NO. | Freq. [MHz] | Factor [dB] | QP Reading Value [dBμV] | QP Value [dBμV] | QP Limit [dBμV] | QP Margin [dB] | AV Reading Value [dBμV] | AV Value [dBμV] | AV Limit [dBμV] | AV Margin [dB] | Type | Verdict |
|-----|----------------|----------------|-------------------------------|-----------------------|-----------------------|----------------------|-------------------------------|-----------------------|-----------------------|----------------------|------|---------|
| 1 | 0.1595 | 9.77 | 42.74 | 52.51 | 65.49 | 12.98 | 24.57 | 34.34 | 55.49 | 21.15 | L1 | PASS |
| 2 | 0.2854 | 9.63 | 37.62 | 47.25 | 60.66 | 13.41 | 29.69 | 39.32 | 50.66 | 11.34 | L1 | PASS |
| 3 | 0.4524 | 9.59 | 31.72 | 41.31 | 56.83 | 15.52 | 19.98 | 29.57 | 46.83 | 17.26 | L1 | PASS |
| 4 | 0.5658 | 9.55 | 26.92 | 36.47 | 56.00 | 19.53 | 9.77 | 19.32 | 46.00 | 26.68 | L1 | PASS |
| 5 | 0.8633 | 9.46 | 26.90 | 36.36 | 56.00 | 19.64 | 14.75 | 24.21 | 46.00 | 21.79 | L1 | PASS |
| 6 | 1.5889 | 9.59 | 22.63 | 32.22 | 56.00 | 23.78 | 6.22 | 15.81 | 46.00 | 30.19 | L1 | PASS |

REMARKS:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Limit value - Emission level
4. Correction factor = Insertion loss + Cable loss
5. QP/AV Value= QP/AV Reading Value+ Correction factor

| | | | |
|--------------|---------------|-------------------|-----------------------------------|
| Phase | Neutral (N) | Detector Function | Quasi-Peak (QP) / Average (AV) |
| Power supply | AC 230V, 50Hz | | |
| Test Mode | Charging | | |



Final Data List

| NO. | Freq. [MHz] | Factor [dB] | QP Reading Value [dBμV] | QP Value [dBμV] | QP Limit [dBμV] | QP Margin [dB] | AV Reading Value [dBμV] | AV Value [dBμV] | AV Limit [dBμV] | AV Margin [dB] | Type | Verdict |
|-----|-------------|-------------|-------------------------|-----------------|-----------------|----------------|-------------------------|-----------------|-----------------|----------------|------|---------|
| 1 | 0.1682 | 9.76 | 38.58 | 48.34 | 65.05 | 16.71 | 15.90 | 25.66 | 55.05 | 29.39 | N | PASS |
| 2 | 0.2355 | 9.69 | 28.71 | 38.40 | 62.25 | 23.85 | 13.79 | 23.48 | 52.25 | 28.77 | N | PASS |
| 3 | 0.4503 | 9.58 | 32.19 | 41.77 | 56.87 | 15.10 | 20.21 | 29.79 | 46.87 | 17.08 | N | PASS |
| 4 | 0.6563 | 9.49 | 27.78 | 37.27 | 56.00 | 18.73 | 14.10 | 23.59 | 46.00 | 22.41 | N | PASS |
| 5 | 1.0535 | 9.51 | 25.51 | 35.02 | 56.00 | 20.98 | 11.73 | 21.24 | 46.00 | 24.76 | N | PASS |
| 6 | 1.8862 | 9.60 | 21.20 | 30.80 | 56.00 | 25.20 | 7.78 | 17.38 | 46.00 | 28.62 | N | PASS |
| 7 | 5.5320 | 9.73 | 13.48 | 23.21 | 60.00 | 36.79 | 3.04 | 12.77 | 50.00 | 37.23 | N | PASS |

REMARKS:

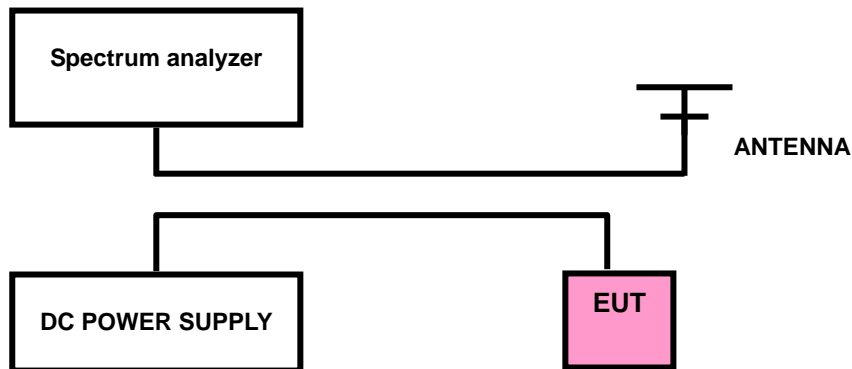
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Limit value - Emission level
4. Correction factor = Insertion loss + Cable loss
5. QP/AV Value= QP/AV Reading Value+ Correction factor

4.2 20dB Spectrum Bandwidth Measurement

4.2.1 Limit

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

4.2.2 Test Setup



4.2.3 Test Procedures

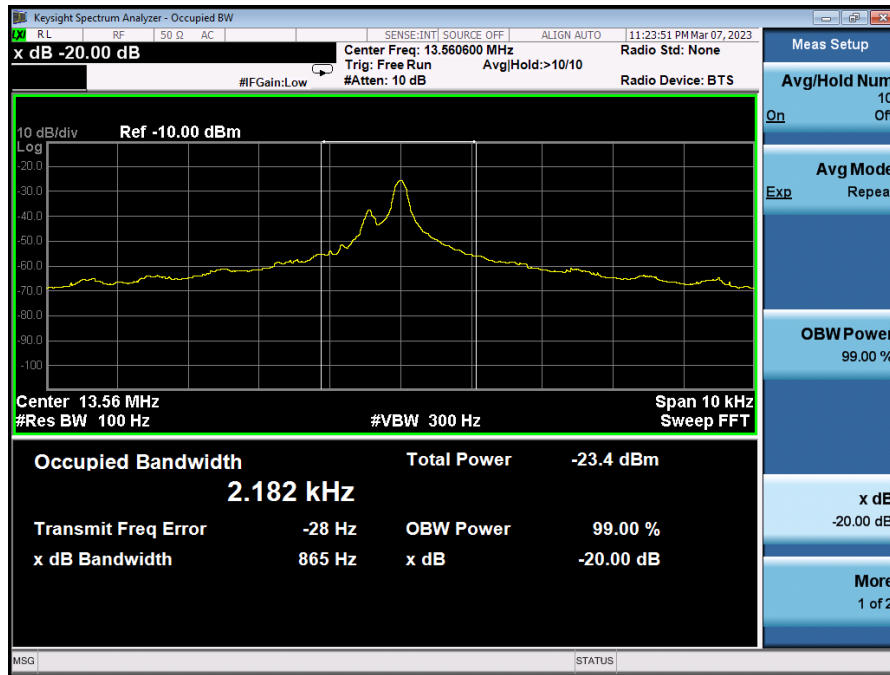
1. The resolution bandwidth of 100 Hz and the video bandwidth of 300 Hz were used.
2. EUT in peak Max hold mode.
3. Measured the spectrum width with power higher than 20dB below carrier.

4.2.4 Deviation of Test Standard

No deviation.

4.2.5 Test Results

| 20dB bandwidth (kHz) | F _L (MHz) | F _H (MHz) | Limit(MHz) | Result |
|----------------------|----------------------|----------------------|--------------------|--------|
| 0.865 | 13.5596 | 13.5604 | 13.553 ~ 13.567MHz | Pass |

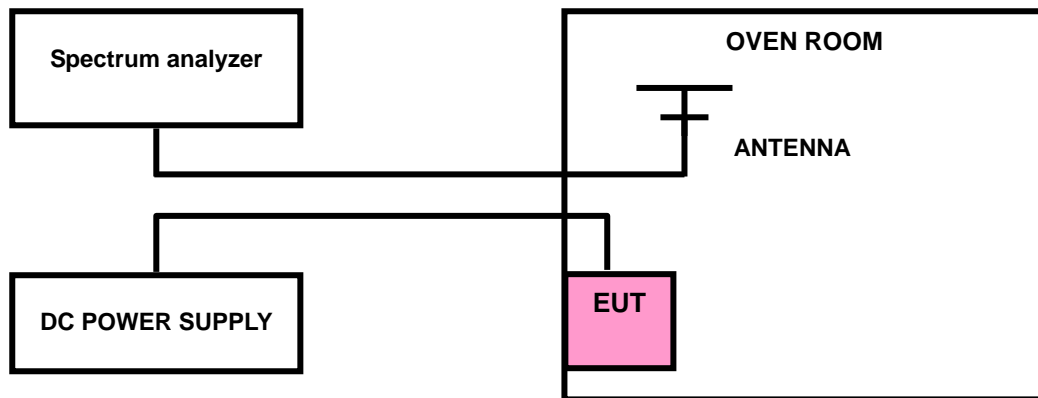


4.3 Frequency Stability Measurement

4.3.1 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 using a new battery.

4.3.2 Test Setup



4.3.3 Test Procedures

1. The spectrum analyzer connected via a receive antenna placed near the EUT.
2. Set RBW = 1 kHz, VBW = 3 kHz with peak detector and maxhold settings.
3. The f_c is declaring of channel frequency. Then the frequency error formula is $(f_c - f)/f_c \times 10^6$ ppm and the limit is less than ± 100 ppm.
4. Extreme temperature rule is -20°C~50°C

4.3.4 Deviation of Test Standard

No deviation.

4.3.5 Test Results

Nominal Operation Frequency: 13.56MHz

| Test Conditions | | Test Result (MHz) | Deviation (kHz) | Limit (kHz) | Result |
|------------------------|-------------------------|----------------------|--------------------|-----------------------|--------|
| Temp (°C) | Volt (V DC) | | | | |
| T _{nom} (-20) | V _{nom} (36) | 13.56004 | 0.04 | ±0.01% (1.3560kHz) | Pass |
| T _{nom} (-10) | V _{nom} (36) | 13.56002 | 0.02 | | Pass |
| T _{nom} (0) | V _{nom} (36) | 13.56003 | 0.03 | | Pass |
| T _{nom} (10) | V _{nom} (36) | 13.56002 | 0.02 | | Pass |
| T _{nom} (20) | V _{nom} (36) | 13.56004 | 0.04 | | Pass |
| T _{nom} (30) | V _{nom} (36) | 13.56002 | 0.02 | | Pass |
| T _{nom} (40) | V _{nom} (36) | 13.56003 | 0.03 | | Pass |
| T _{nom} (50) | V _{nom} (36) | 13.56001 | 0.01 | | Pass |
| T _{nom} (20) | V _{min} (30.6) | 13.56002 | 0.02 | | Pass |
| | V _{max} (41.4) | 13.56003 | 0.03 | | Pass |

Note: Deviation (kHz) = (Test Result-13.56MHz)*1000

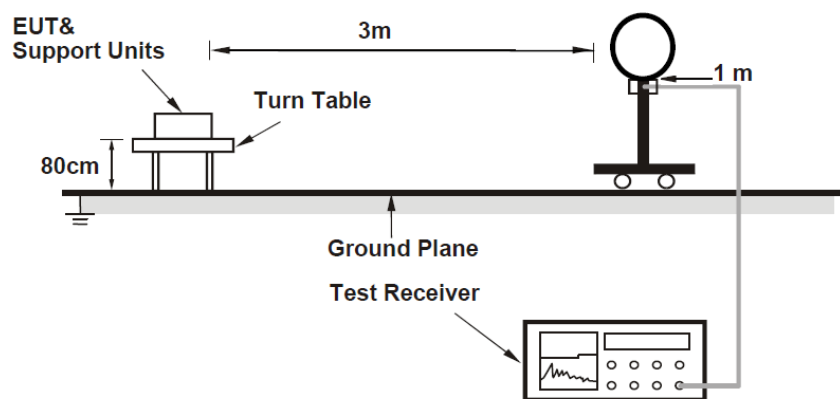
4.4 Field Strength of Fundamental Emissions and Mask Measurement

4.4.1 Test 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 ($\mu\text{V/m}$) at 30m | Field Strength ($\text{dB}\mu\text{V/m}$) at 30m | Field Strength ($\text{dB}\mu\text{V/m}$) at 10m | Field Strength ($\text{dB}\mu\text{V/m}$) 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 |

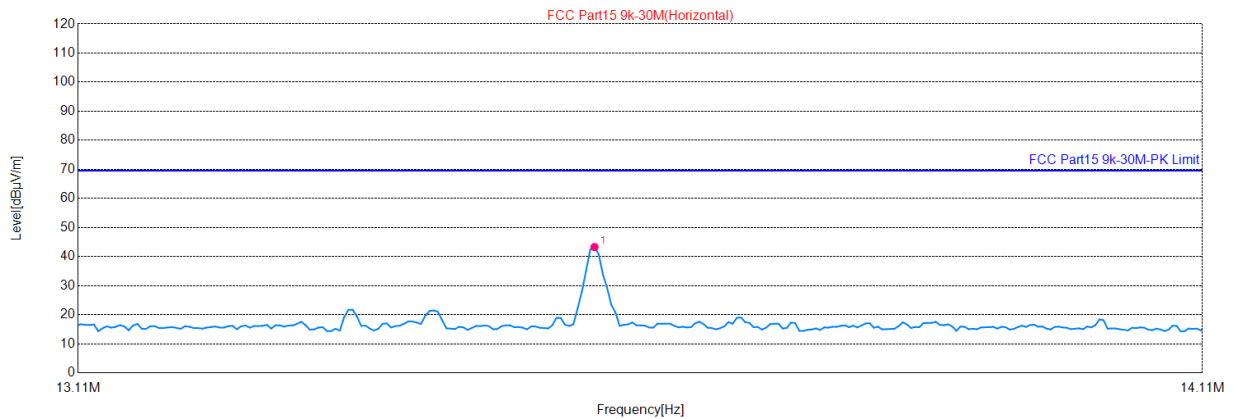
4.4.2 Test Setup

For Radiated emission below 30MHz

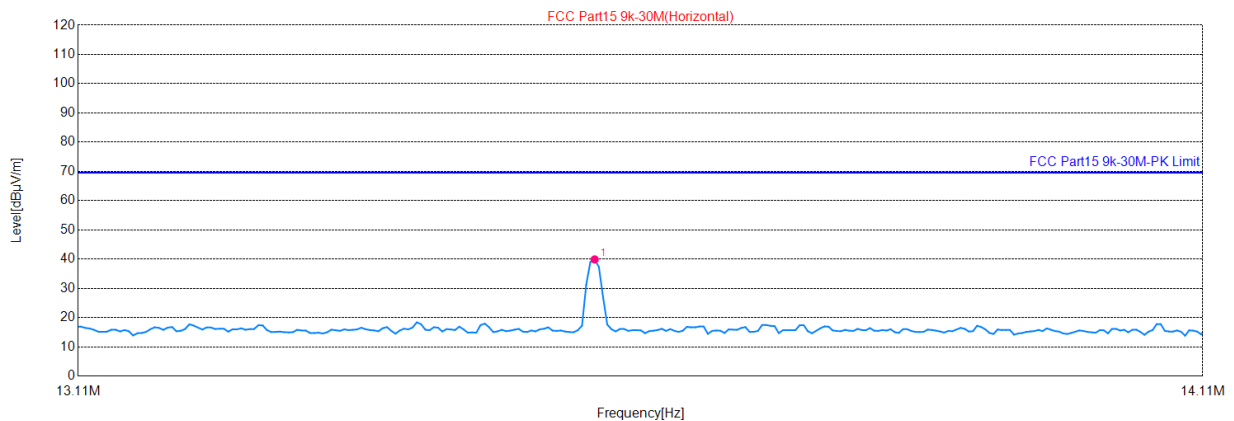


4.4.3 Test Results

| Freq. [MHz] | Reading [dBμV/m] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity |
|----------------|---------------------|----------------|-------------------|-------------------|----------------|----------|
| 13.56 | 34.29 | 9.00 | 43.29 | 124 | 80.71 | V |



| Freq. [MHz] | Reading [dBμV/m] | Factor [dB] | Level [dBμV/m] | Limit [dBμV/m] | Margin [dB] | Polarity |
|----------------|---------------------|----------------|-------------------|-------------------|----------------|----------|
| 13.56 | 30.91 | 9.00 | 39.91 | 124 | 84.09 | H |



Margin [dB] = Limit [dBμV/m] – Level [dBμV/m]

4.5 Radiated Emissions Measurement

For 15.205 requirement:

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part15, must also comply with the radiated emission limits specified in Section 15.209(a).

| Frequency (MHz) | Frequency (MHz) | Frequency (MHz) | Frequency (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 - 156.525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2690 - 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 | -- | -- | -- |

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47CFR must not exceed the limits shown in Table per Section 15.209.

FCC Part 15 Subpart C Paragraph 15.209

| Frequency [MHz] | Field Strength [uV/m] | Measured Distance [Meters] |
|--------------------|--------------------------|-------------------------------|
| 0.009 - 0.490 | 2400/F (kHz) | 300 |
| 0.490 - 1.705 | 24000/F (kHz) | 30 |
| 1.705 - 30 | 30 | 30 |
| 30 - 88 | 100 | 3 |
| 88 - 216 | 150 | 3 |
| 216 - 960 | 200 | 3 |
| Above 960 | 500 | 3 |

4.5.1 Test Procedure Reference

ANSI C63.10 Section 6.3 (General Requirements)

4.5.2 Test Procedures

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, 110-490 kHz. Radiated emission limits in these two bands are based on measurements employing an average detector.

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

For Radiated emission below 30MHz

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degree to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotate table was turned from 0 degree to 360 degree to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

For Radiated emission above 30MHz

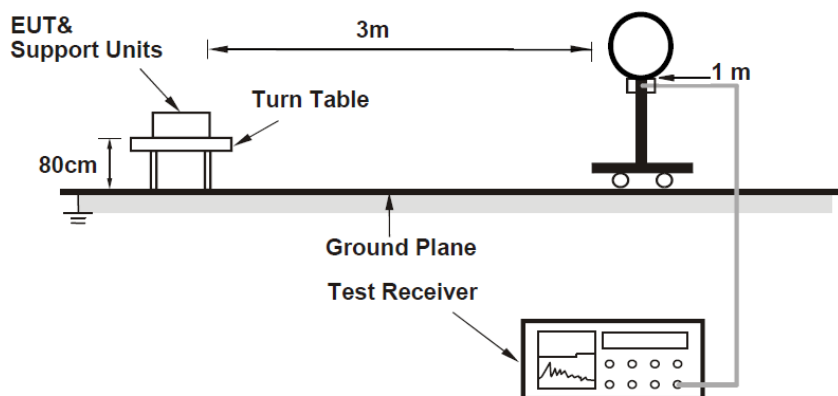
- The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

4.5.3 Deviation from Test Standard

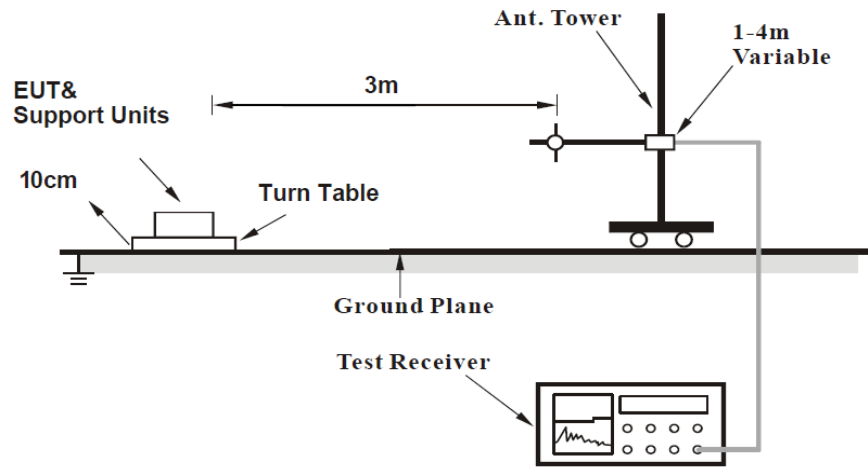
No deviation.

4.5.4 Test Setup

For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz

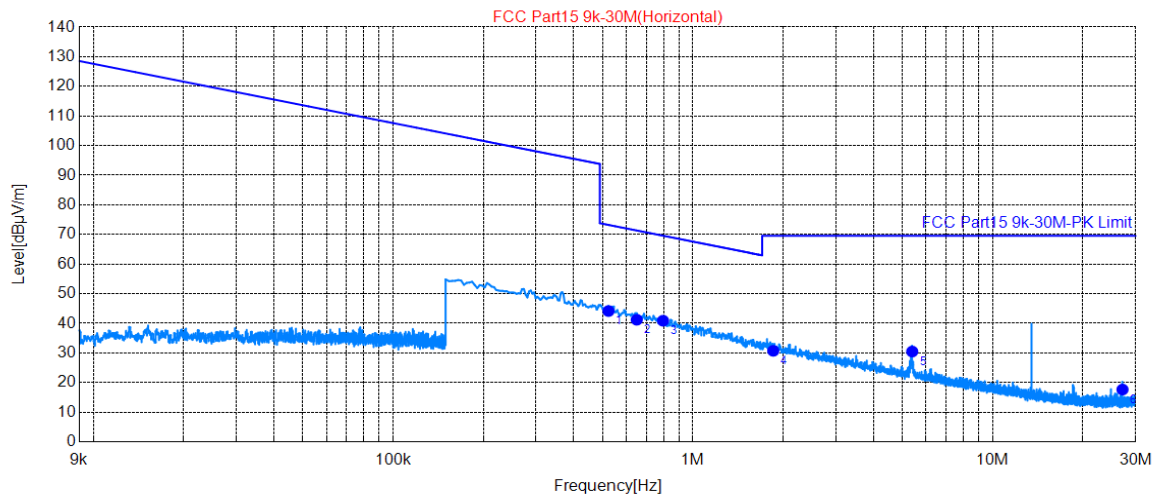


For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.5.5 Test Results

Radiated Emissions Range 9kHz~30MHz

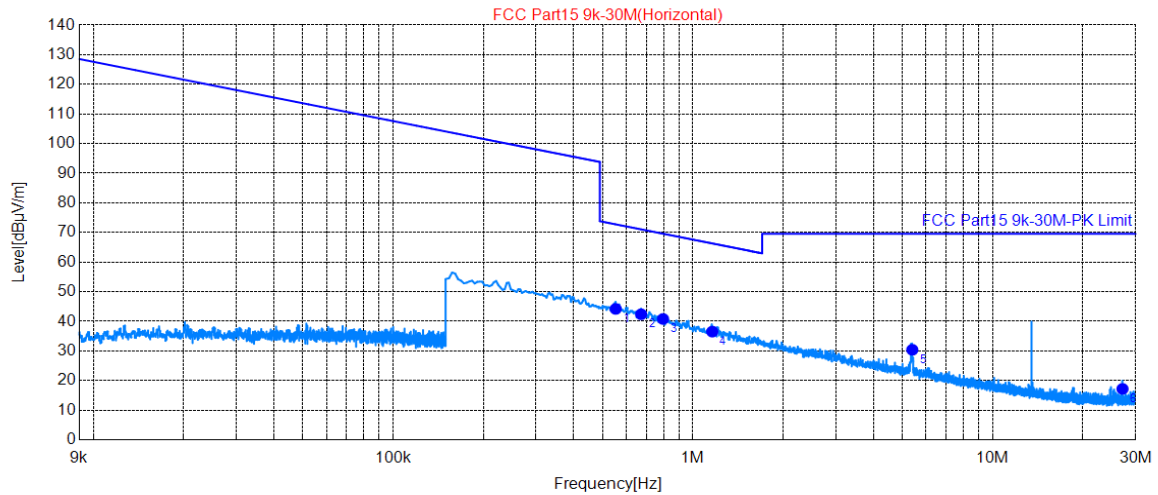
| | | | |
|-----------------|--------------|-------------------|-----------------|
| Channel | NFC | Detector Function | Quasi-Peak (QP) |
| Frequency Range | 9kHz ~ 30MHz | Antenna Polarity | Horizontal |



Final Data List

| NO. | Freq. [MHz] | QP Reading [dBμV/m] | Factor [dB] | QP Value [dBμV/m] | QP Limit [dBμV/m] | QP Margin [dB] | Height[c m] | Angle [°] |
|-----|-------------|---------------------|-------------|-------------------|-------------------|----------------|-------------|-----------|
| 1 | 0.5231 | 33.46 | 10.71 | 44.17 | 73.23 | 29.06 | 100 | 226 |
| 2 | 0.6500 | 30.51 | 10.71 | 41.22 | 71.35 | 30.13 | 100 | 242 |
| 3 | 0.7955 | 30.2 | 10.71 | 40.91 | 69.59 | 28.68 | 100 | 134 |
| 4 | 1.8552 | 19.95 | 10.80 | 30.75 | 69.54 | 38.79 | 100 | 134 |
| 5 | 5.3924 | 20.16 | 10.33 | 30.49 | 69.54 | 39.05 | 100 | 217 |
| 6 | 27.123 | 11.03 | 6.64 | 17.67 | 69.54 | 51.87 | 100 | 262 |

| | | | |
|-----------------|--------------|-------------------|-----------------|
| Channel | NFC | Detector Function | Quasi-Peak (QP) |
| Frequency Range | 9kHz ~ 30MHz | Antenna Polarity | Vertical |



Final Data List

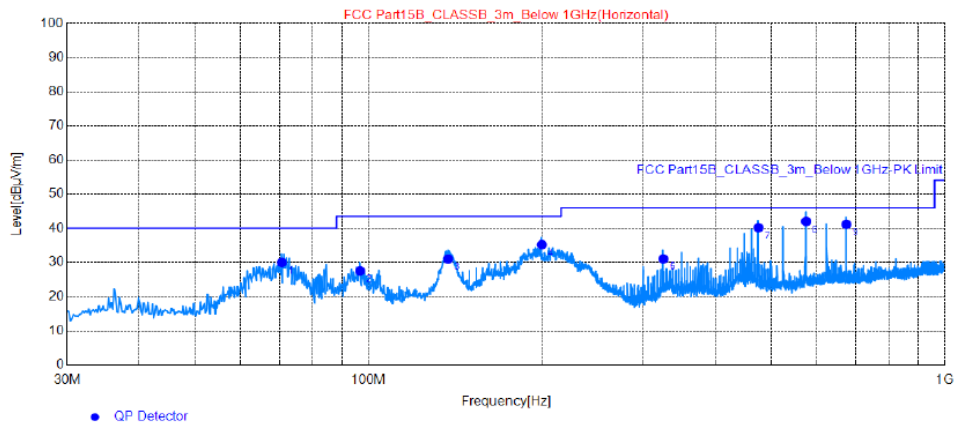
| NO. | Freq. [MHz] | QP Reading [dBμV/m] | Factor [dB] | QP Value [dBμV/m] | QP Limit [dBμV/m] | QP Margin [dB] | Height[c m] | Angle [°] |
|-----|----------------|------------------------|----------------|----------------------|----------------------|-------------------|----------------|--------------|
| 1 | 0.5530 | 33.5 | 10.71 | 44.21 | 72.75 | 28.54 | 100 | 226 |
| 2 | 0.6724 | 31.69 | 10.71 | 42.40 | 71.05 | 28.65 | 100 | 242 |
| 3 | 0.7955 | 30.11 | 10.71 | 40.82 | 69.59 | 28.77 | 100 | 134 |
| 4 | 1.1612 | 25.82 | 10.73 | 36.55 | 66.31 | 29.76 | 100 | 134 |
| 5 | 5.3961 | 20.09 | 10.33 | 30.42 | 69.54 | 39.12 | 100 | 217 |
| 6 | 27.123 | 10.58 | 6.64 | 17.22 | 69.54 | 52.32 | 100 | 262 |

Radiated Emissions Range 30MHz~1GHz

Below is the worst test data

| | | | |
|-----------------|--------------|-------------------|-----------------|
| Channel | NFC | Detector Function | Quasi-Peak (QP) |
| Frequency Range | 30MHz ~ 1GHz | Antenna Polarity | Horizontal |

Test Plot:



Final Data List

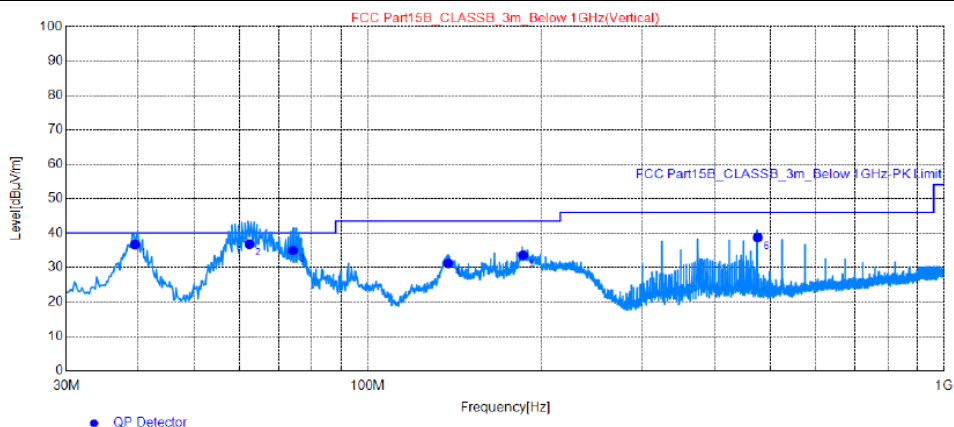
| NO. | Freq. [MHz] | QP Reading [dB μV/m] | Factor [dB] | QP Value [dB μV/m] | QP Limit [dB μV/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
|-----|----------------|-------------------------|----------------|-----------------------|-----------------------|-------------------|----------------|--------------|------------|
| 1 | 70.74 | 42.77 | -12.78 | 29.99 | 40.00 | 10.01 | 200 | 76 | Horizontal |
| 2 | 96.73 | 42.6 | -15.07 | 27.53 | 43.50 | 15.97 | 200 | 290 | Horizontal |
| 3 | 137.4 | 41.32 | -10.32 | 31.00 | 43.50 | 12.50 | 200 | 146 | Horizontal |
| 4 | 199.9 | 47.38 | -12.19 | 35.19 | 43.50 | 8.31 | 200 | 148 | Horizontal |
| 5 | 324.8 | 38.32 | -7.28 | 31.04 | 46.00 | 14.96 | 200 | 74 | Horizontal |
| 6 | 324.8 | 38.69 | -7.28 | 31.41 | 46.00 | 14.59 | 200 | 74 | Horizontal |
| 7 | 475.0 | 44.23 | -4.02 | 40.21 | 46.00 | 5.79 | 200 | 341 | Horizontal |
| 8 | 574.9 | 43.89 | -1.89 | 42.00 | 46.00 | 4.00 | 200 | 226 | Horizontal |
| 9 | 675.0 | 41.7 | -0.56 | 41.14 | 46.00 | 4.86 | 200 | 344 | Horizontal |

REMARKS:

1. Emission Level(dBuV/m) = Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Limit value – Emission Level

| | | | |
|-----------------|--------------|-------------------|-----------------|
| Channel | NFC | Detector Function | Quasi-Peak (QP) |
| Frequency Range | 30MHz ~ 1GHz | Antenna Polarity | Vertical |

Test Plot:



Final Data List

| NO. | Freq. [MHz] | QP Reading [dB μ V/m] | Factor [dB] | QP Value [dB μ V/m] | QP Limit [dB μ V/m] | QP Margin [dB] | Height [cm] | Angle [°] | Polarity |
|-----|----------------|------------------------------|----------------|----------------------------|----------------------------|-------------------|----------------|--------------|----------|
| 1 | 39.47 | 47.11 | -10.43 | 36.68 | 40.00 | 3.32 | 106.1 | 338 | Vertical |
| 2 | 62.34 | 48.27 | -11.49 | 36.78 | 40.00 | 3.22 | 122.1 | 2.4 | Vertical |
| 3 | 74.15 | 48.49 | -13.56 | 34.93 | 40.00 | 5.07 | 100 | 360 | Vertical |
| 4 | 138.0 | 41.46 | -10.27 | 31.19 | 43.50 | 12.31 | 100 | 97 | Vertical |
| 5 | 185.9 | 44.9 | -11.35 | 33.55 | 43.50 | 9.95 | 100 | 341 | Vertical |
| 6 | 475.0 | 42.72 | -4.02 | 38.70 | 46.00 | 7.30 | 100 | 148 | Vertical |

REMARKS:

1. Emission Level(dBuV/m) = Original Spectrum reading (dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Limit value – Emission Level

5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

--- END ---