



Test report No. : 4790144110-US-R0-V0  
Page : 1 of 34  
Issued date : 2021/11/25  
FCC ID : HFS-A5WM

## **RADIO TEST REPORT**

**Product** : Server

**Model Name** : A5WM

**FCC ID** : HFS-A5WM

**Test Regulation** : FCC 47 CFR Part 15 Subpart C (Section 15.225)

**Received Date** : 2021/11/1

**Test Date** : 2021/11/1 ~ 2021/11/8

**Issued Date** : 2021/11/25

**Applicant** : Quanta Computer Inc.  
No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City  
33377, Taiwan

**Issued By** : Underwriters Laboratories Taiwan Co., Ltd.  
Building B and Building E, No. 372-7, Sec. 4, Zhongxing  
Rd., Zhudong Township, Hsinchu County, Taiwan

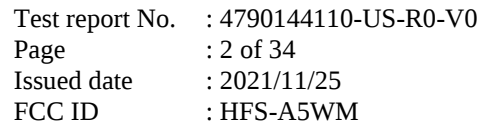


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Facsimile (FAX) : +886-3-583-7948

Doc No: 17-EM-F0875 / 5.0





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Test report No. : 4790144110-US-R0-V0  
Page : 4 of 34  
Issued date : 2021/11/25  
FCC ID : HFS-A5WM

## 1. Attestation of Test Results

**APPLICANT:** Quanta Computer Inc.  
No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City  
33377, Taiwan

**MANUFACTURER:** Quanta Computer Inc.  
No. 188, Wenhua 2nd Road, Guishan District, Taoyuan City  
33377, Taiwan

**EUT DESCRIPTION:** Server

**BRAND:** Quanta Computer Inc.

**MODEL:** A5WM

**SAMPLE STAGE:** Identical Prototype

**DATE of TESTED:** 2021/11/1 ~ 2021/11/8

| APPLICABLE STANDARDS                          |              |
|-----------------------------------------------|--------------|
| STANDARD                                      | Test Results |
| FCC 47 CFR PART 15 Subpart C (Section 15.225) | PASS         |

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Sally Lu  
Project Handler

Date : 2021/11/25

Approved and Authorized By:

Mike Cai  
Engineer Project Associate

Date : 2021/11/25

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## 2. Summary of Test Results

| FCC Clause | Test Item                                                                                    | Result |
|------------|----------------------------------------------------------------------------------------------|--------|
| 15.203     | Antenna requirement                                                                          | PASS   |
| 15.207     | AC Power Conducted Emission                                                                  | PASS   |
| 15.215 (c) | 20dB Bandwidth                                                                               | PASS   |
| 15.225 (a) | The field strength of any emissions within the band 13.553-13.567 MHz                        | PASS   |
| 15.225 (b) | The field strength of any emissions within the bands 13.410-13.553 MHz and 13.567-13.710 MHz | PASS   |
| 15.225 (c) | The field strength of any emissions within the bands 13.110-13.410 MHz and 13.710-14.010 MHz | PASS   |
| 15.225 (d) | The field strength of any emissions appearing outside of the 13.110-14.010 MHz band          | PASS   |
| 15.225 (e) | The frequency tolerance                                                                      | PASS   |

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### 3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB174176 D01 Line Conducted FAQ v01r01, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013.

### 4. Facilities and Accreditation

|                                  |                                                                                                       |
|----------------------------------|-------------------------------------------------------------------------------------------------------|
| <b>Test Location</b>             | Underwriters Laboratories Taiwan Co., Ltd.                                                            |
| <b>Address</b>                   | Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan |
| <b>Accreditation Certificate</b> | Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.                |

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## 5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor  $k=2$ .

| Measurement                                    | Frequency      | Uncertainty  |
|------------------------------------------------|----------------|--------------|
| Conducted disturbance at mains terminals ports | 150kHz ~ 30MHz | $\pm 3.1$ dB |
| RF Conducted                                   | 9 kHz - 40GHz  | $\pm 1.9$ dB |
| Radiated disturbance below 30MHz               | 9 kHz - 30 MHz | $\pm 1.9$ dB |
| Radiated disturbance below 1 GHz               | 30MHz ~ 1GHz   | $\pm 5.4$ dB |
| Radiated disturbance above 1 GHz               | 1GHz ~ 40GHz   | $\pm 4.7$ dB |

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## 6. Equipment under Test

### 6.1. Description of EUT

|                                        |                      |
|----------------------------------------|----------------------|
| <b>Product</b>                         | Server               |
| <b>Brand Name</b>                      | Quanta Computer Inc. |
| <b>Model Name</b>                      | A5WM                 |
| <b>Operating Frequency</b>             | 13.56 MHz            |
| <b>Modulation</b>                      | ASK                  |
| <b>Normal Voltage</b>                  | 240Vac/ 60Hz         |
| <b>Sample ID</b>                       | 4252684              |
| <b>Maximum Field Strength (dBuV/m)</b> | 51.03 dBuV/m         |

Note:

1. The EUT contains following accessory devices:

| <b>Product</b> | <b>Brand</b> | <b>Model</b> | <b>Description</b> |
|----------------|--------------|--------------|--------------------|
| K2 card        | Annapurna    | K2V4         | -                  |
| K2 card        | Annapurna    | K2X-N        | -                  |

2. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.
3. The EUT is Class A digital device that is marketed for use in a commercial, industrial or business environment.

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## 6.2. Test Condition

| Test Item                        | Test Site No. | Environmental Condition | Input Power     | Test Date                 | Tested by        |
|----------------------------------|---------------|-------------------------|-----------------|---------------------------|------------------|
| Radiated Spurious Emission       | 966-2         | 21~27°C/<br>51~57%RH    | 240Vac/<br>60Hz | 2021/11/01~<br>2021/11/08 | WaterNil<br>Guan |
| AC power Line Conducted Emission | SR1           | 21~27°C/<br>51~57%RH    | 240Vac/<br>60Hz | 2021/11/01~<br>2021/11/08 | WaterNil<br>Guan |

FCC Test Firm Registration Number: 498077

## 6.3. Channel List

1 channels are provided to this EUT:

| Channel | Frequency (MHz) |
|---------|-----------------|
| 1       | 13.56           |

## 6.4. Description of Available Antennas

| Ant. No. | Transmitter Circuit | Brand Name     | Model Name   | Ant. Type     | Maximum Gain (dBi) |
|----------|---------------------|----------------|--------------|---------------|--------------------|
| 1        | Chain (0)           | Smart Approach | SM-MFAD4-C02 | FR4 Loop Coil | -                  |

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

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## 6.5. Test Mode Applicability and Tested Channel Detail

- The EUT only one power source types: 240Vac.
- All final radiated testing was performed with the EUT in X axis.
- For below 30MHz Radiated Emission Measurement, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.

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## 7. Test Equipment

| Test Equipment List                          |                    |                         |                       |            |              |
|----------------------------------------------|--------------------|-------------------------|-----------------------|------------|--------------|
| Equipment                                    | Manufacturer       | Model No.               | Serial No.            | Cal. Date  | Expired date |
| Spectrum Analyzer                            | Keysight           | N9010A                  | MY56070827            | 2020/11/11 | 2021/11/10   |
| EMI Test Receiver                            | Rohde & Schwarz    | ESR7                    | 101754                | 2020/12/11 | 2021/12/10   |
| Loop Antenna                                 | ETS lindgren       | 6502                    | 00213440              | 2020/12/25 | 2021/12/24   |
| Trilog-Broadband Antenna with 5dB Attenuator | Schwarzbeck & EMCI | VULB 9168 & N-6-05      | 774 & AT-N0538        | 2021/1/13  | 2022/1/12    |
| Preamplifier (30-1000 MHz)                   | EMCI               | EMC330E                 | 980405                | 2021/6/8   | 2022/6/7     |
| Cables                                       | Hanyitek           | K1K50-UP0264-K1K50-2500 | 170214-4 & 170425-2   | 2021/1/22  | 2022/1/21    |
| Temperature & Humidity Test Chamber          | GIANT FORCE        | GTH-150- 40-CP-AR       | MAA1701-010           | 2021/3/22  | 2022/3/21    |
| EMI Test Receiver                            | Rohde & Schwarz    | ESR7                    | 101753                | 2020/11/17 | 2021/11/16   |
| Two-Line V-Network                           | Rohde & Schwarz    | ENV216                  | 102136                | 2021/8/30  | 2022/8/29    |
| Impuls-Begrenzer Pulse Limiter               | Rohde & Schwarz    | ESH3-Z2                 | 102219-Qt             | 2021/8/26  | 2022/8/25    |
| Cables                                       | TITAN              | CFD200                  | T0732ACFD2 0020A300-1 | 2021/3/2   | 2022/3/1     |

| UL Software                      |        |               |
|----------------------------------|--------|---------------|
| Description                      | Name   | Version       |
| Radiated measurement             | e3     | 6.191211 (V6) |
| AC power Line Conducted Emission | EZ_EMC | UL-3A1.2      |

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## 8. Description of Test Setup

### Support Equipment

| ID | Equipment    | Brand Name | Model Name | S/N           | Remark             |
|----|--------------|------------|------------|---------------|--------------------|
| A  | Monitor      | LG         | 22MP58VQ   | 710NTVS2L751  | Provided by Lab    |
| B  | Keyboard     | Microsoft  | 1576       | NA            | Provided by Lab    |
| C  | Mouse        | Microsoft  | 1113       | X821908-015   | Provided by Lab    |
| D  | HUB          | D-Link     | DES-1005A  | QS2E1J3001782 | Provided by Lab    |
| E  | Power Source | LITEON     | PS-2162-1Q | NA            | Supplied by client |

### I/O Cables

| ID | Equipment               | Brand Name | Model Name  | Length (m) | Remark                            |
|----|-------------------------|------------|-------------|------------|-----------------------------------|
| 1  | VGA Cable               | HOTRON     | E246588     | 1.46       | With one core,<br>Provided by Lab |
| 2  | Keyboard with USB Cable | Microsoft  | 1576        | 1.95       | Provided by Lab                   |
| 3  | Mouse with USB Cable    | Microsoft  | 1113        | 1.8        | With one core,<br>Provided by Lab |
| 4  | RJ45                    | Fastlink   | FL-61STU-04 | 10         | Number x 3<br>Provided by Lab     |
| 5  | Fiber Cable             | TE         | QSFP-25     | 1          | Supplied by client                |
| 6  | AC Power Cable          | PowerSync  | TPCPHN0006  | 1.7        | Number x 2<br>Provided by Lab     |

### Test Setup

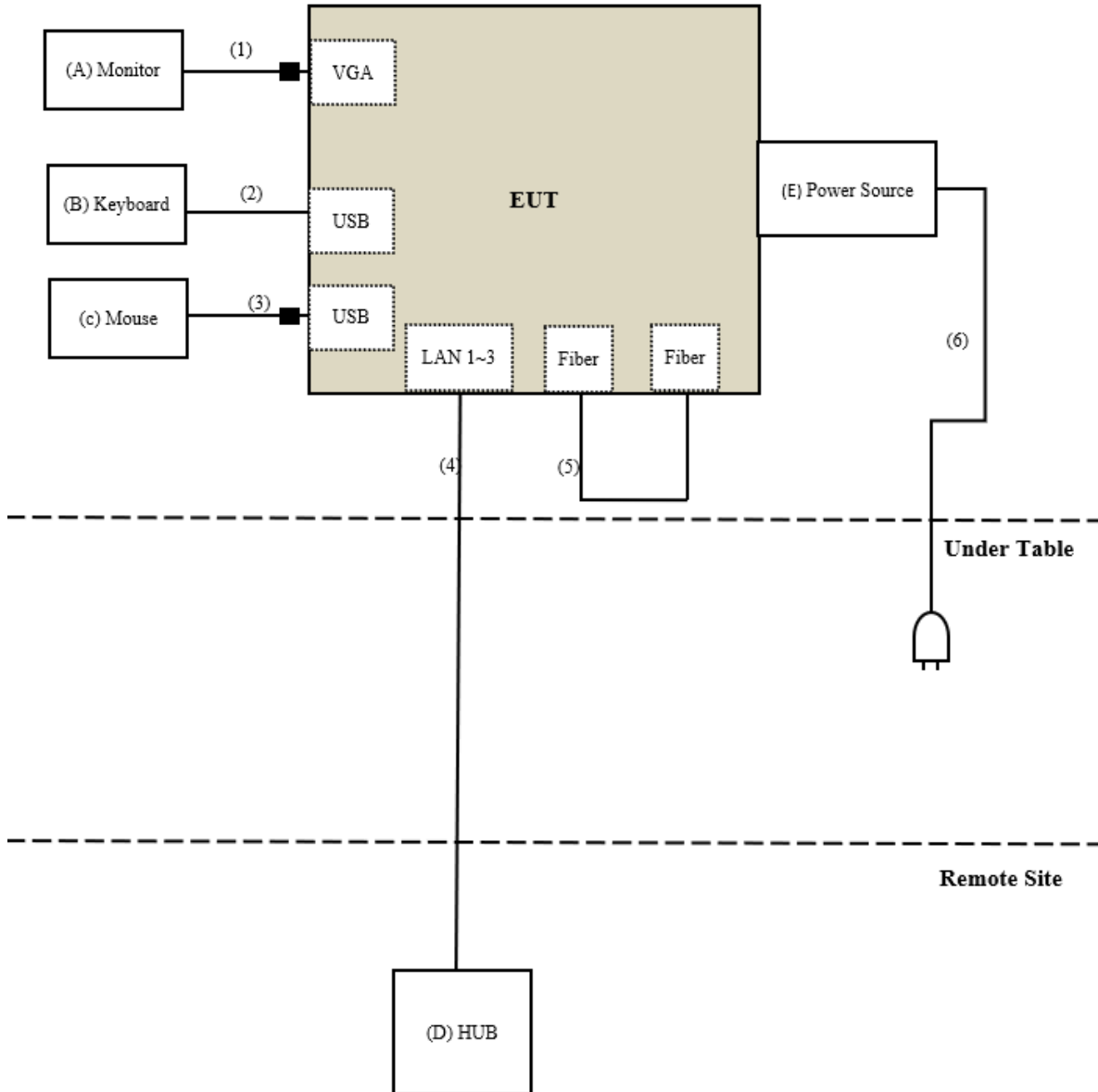
Controlled using a bespoke application (IPMITOOL) on a EUT. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

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### Setup Diagram for Test



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## 9. Test Result

### 9.1. Radiated Spurious Emission

#### Requirements

- (a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- (b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- (c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209 as below table:

| Frequencies<br>(MHz) | Field Strength<br>(microvolts/meter) | Measurement Distance<br>(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                                |

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

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## **Test Procedures**

[For 9 kHz ~ 30 MHz]

- a. 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 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. For measurement below 30MHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

NOTE:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

[For above 30 MHz]

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. 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.
- e. For measurement below 1GHz, the initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured. If the emission level of the EUT measured by the peak detector is lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. All modes of operation were investigated (includes all external accessories) and the worst-case emissions are reported.

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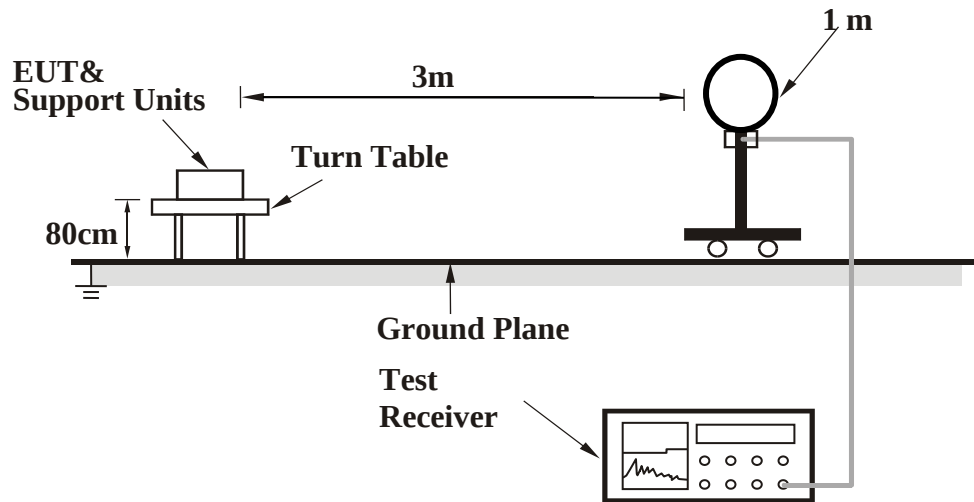
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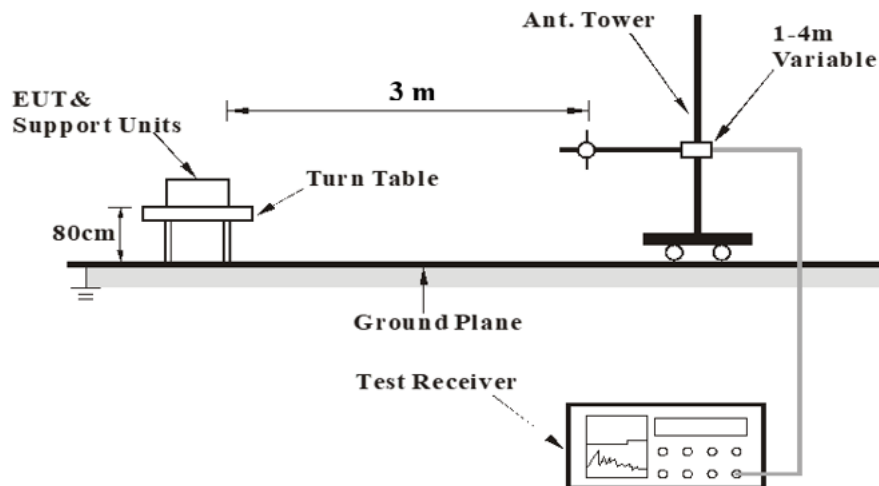
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## Test Setup

<Frequency Range 9 kHz ~ 30 MHz>



<Frequency Range 30 MHz ~ 1 GHz >



For the actual test configuration, please refer to the Setup Configurations.

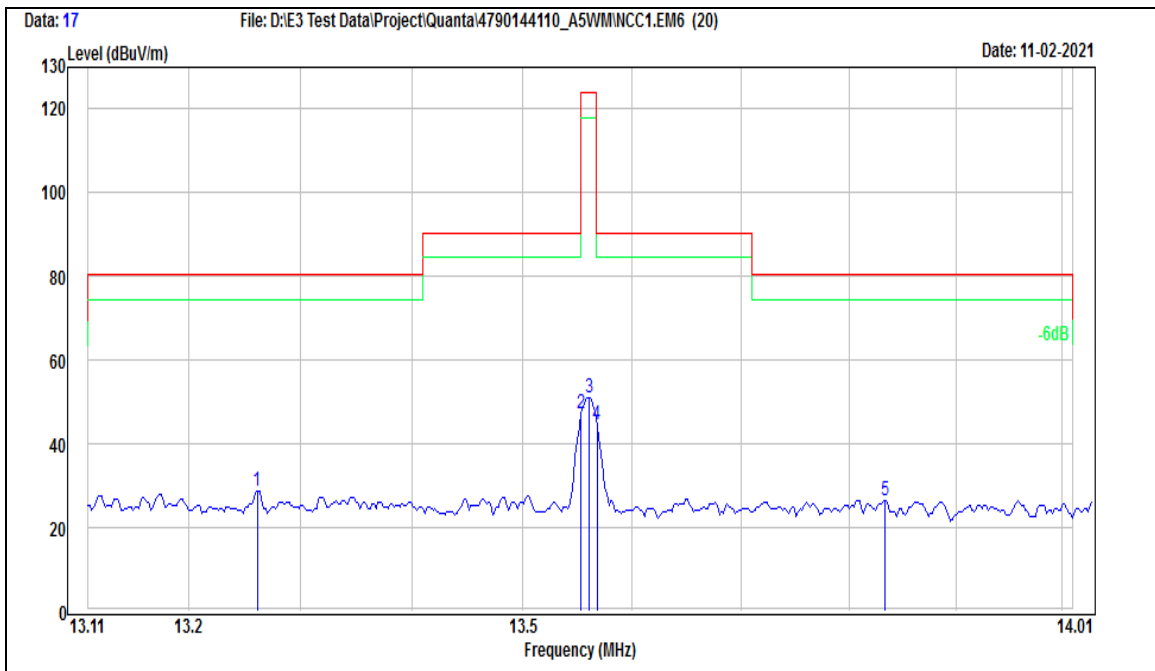
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## Test Data

| EUT Test Condition |                     |                  |          |
|--------------------|---------------------|------------------|----------|
| Frequency Range    | 13.11MHz ~ 14.01MHz | Antenna Polarity | Parallel |



| Notation | Frequency (MHz) | Reading (dBuV/m) | Correct dB/m | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|----------|-----------------|------------------|--------------|-----------------|----------------|-------------|--------|
| 1        | 13.261          | 15.92            | 12.77        | 28.69           | 80.51          | -51.82      | Peak   |
| 2        | 13.553          | 34.3             | 12.75        | 47.05           | 90.47          | -43.42      | Peak   |
| 3        | 13.561          | 38.28            | 12.75        | 51.03           | 124            | -72.97      | Peak   |
| 4        | 13.568          | 31.92            | 12.75        | 44.67           | 90.47          | -45.8       | Peak   |
| 5        | 13.834          | 13.78            | 12.74        | 26.52           | 80.51          | -53.99      | Peak   |

Note :

- Result (dBuV/m) = Reading (dBuV/m) + Correct (dB/m)
- Margin (dB) = Result (dBuV/m) - Limit (dBuV/m)
- Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
- Above limits have been translated by the formula.
- The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

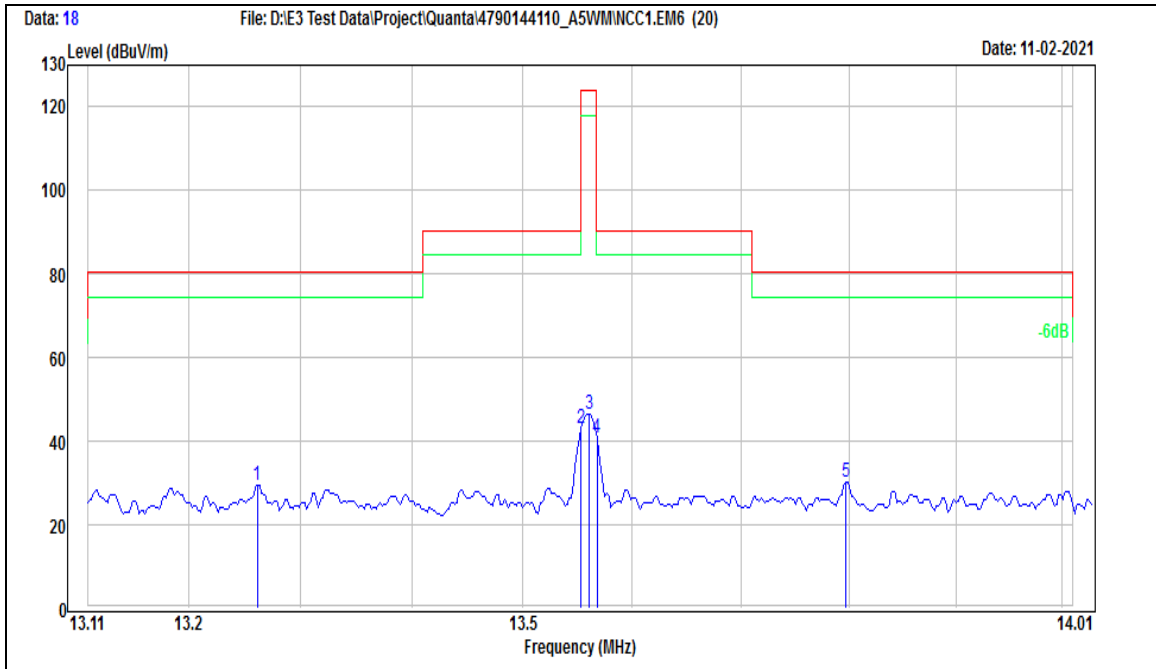
$$\begin{aligned} 13.56\text{MHz} &= 15848\mu\text{V/m} & 30\text{m} \\ &= 84\text{dBuV/m} & 30\text{m} \\ &= 84+20\log(30/3)^2 & 3\text{m} \\ &= 124\text{dBuV/m} \end{aligned}$$

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| EUT Test Condition |                     |                  |               |
|--------------------|---------------------|------------------|---------------|
| Frequency Range    | 13.11MHz ~ 14.01MHz | Antenna Polarity | Perpendicular |



| Notation | Frequency (MHz) | Reading (dBuV/m) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|----------|-----------------|------------------|----------------|-----------------|----------------|-------------|--------|
| 1        | 13.261          | 16.79            | 12.77          | 29.56           | 80.51          | -50.95      | Peak   |
| 2        | 13.553          | 30.35            | 12.75          | 43.1            | 90.47          | -47.37      | Peak   |
| 3        | 13.561          | 33.78            | 12.75          | 46.53           | 124            | -77.47      | Peak   |
| 4        | 13.568          | 27.94            | 12.75          | 40.69           | 90.47          | -49.78      | Peak   |
| 5        | 13.797          | 17.51            | 12.74          | 30.25           | 80.51          | -50.26      | Peak   |

Note :

- Result (dBuV/m) = Reading (dBuV/m) + Correct (dB/m)
- Margin (dB) = Result (dBuV/m) - Limit (dBuV/m)
- Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
- Above limits have been translated by the formula.
- The measured field strength was extrapolated to distance 30 meters, using the formula that the limit of field strength varies as the inverse distance square (40dB per decade of distance)

Example:

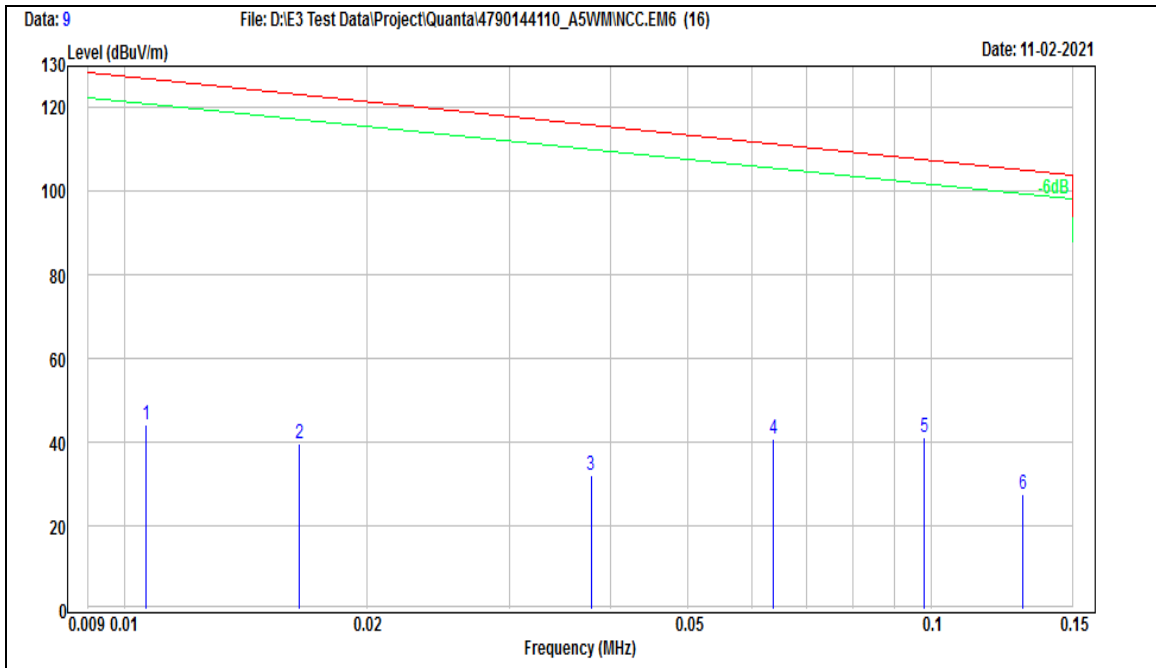
$$\begin{aligned} 13.56\text{MHz} &= 15848\mu\text{V/m} & 30\text{m} \\ &= 84\text{dBuV/m} & 30\text{m} \\ &= 84+20\log(30/3)^2 & 3\text{m} \\ &= 124\text{dBuV/m} \end{aligned}$$

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| EUT Test Condition |                  |                  |          |
|--------------------|------------------|------------------|----------|
| Frequency Range    | 9 kHz ~ 0.15 MHz | Antenna Polarity | Parallel |



| Notation | Frequency (MHz) | Reading (dBuV/m) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|----------|-----------------|------------------|----------------|-----------------|----------------|-------------|--------|
| 1        | 0.01066         | 26.65            | 17.46          | 44.11           | 127.05         | -82.94      | Peak   |
| 2        | 0.01648         | 23.5             | 16.11          | 39.61           | 123.27         | -83.66      | Peak   |
| 3        | 0.0379          | 18.26            | 13.79          | 32.05           | 116.03         | -83.98      | Peak   |
| 4        | 0.06377         | 28.27            | 12.73          | 41              | 111.51         | -70.51      | Peak   |
| 5        | 0.09808         | 29.25            | 11.81          | 41.06           | 107.77         | -66.71      | Peak   |
| 6        | 0.12995         | 15.5             | 11.94          | 27.44           | 105.33         | -77.89      | Peak   |

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The other emission levels were very low against the limit.

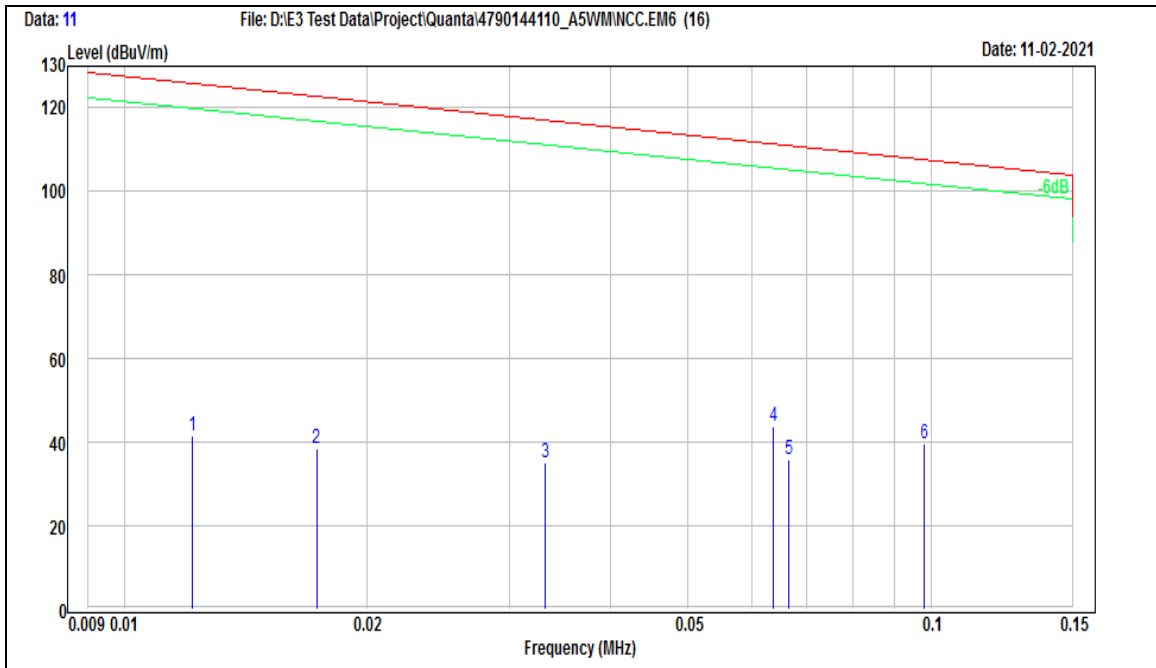
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| EUT Test Condition |                  |                  |               |
|--------------------|------------------|------------------|---------------|
| Frequency Range    | 9 kHz ~ 0.15 MHz | Antenna Polarity | Perpendicular |



| Notation | Frequency (MHz) | Reading (dBuV/m) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|----------|-----------------|------------------|----------------|-----------------|----------------|-------------|--------|
| 1        | 0.01216         | 24.35            | 17.05          | 41.4            | 125.9          | -84.5       | Peak   |
| 2        | 0.01734         | 22.76            | 15.96          | 38.72           | 122.83         | -84.11      | Peak   |
| 3        | 0.0333          | 20.9             | 14.06          | 34.96           | 117.16         | -82.2       | Peak   |
| 4        | 0.06377         | 31.2             | 12.73          | 43.93           | 111.51         | -67.58      | Peak   |
| 5        | 0.06671         | 23.27            | 12.65          | 35.92           | 111.12         | -75.2       | Peak   |
| 6        | 0.09808         | 27.99            | 11.81          | 39.8            | 107.77         | -67.97      | Peak   |

Remarks:

1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The other emission levels were very low against the limit.

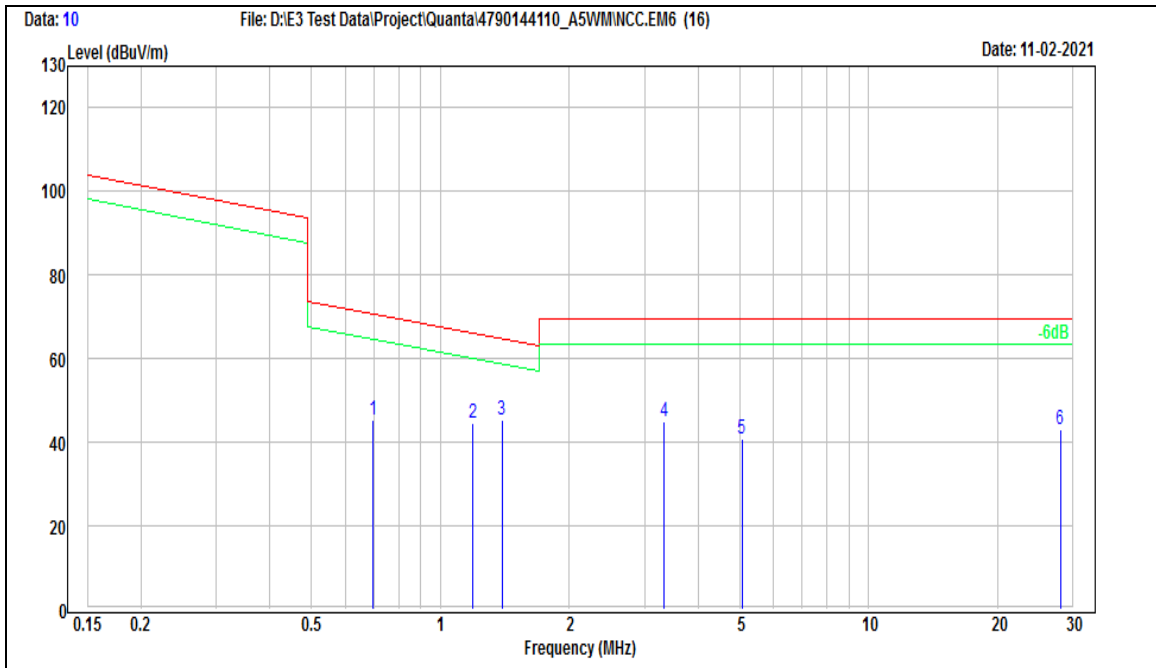
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| EUT Test Condition |                   |                  |          |
|--------------------|-------------------|------------------|----------|
| Frequency Range    | 0.15 MHz ~ 30 MHz | Antenna Polarity | Parallel |



| Notation | Frequency (MHz) | Reading (dBuV/m) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|----------|-----------------|------------------|----------------|-----------------|----------------|-------------|--------|
| 1        | 0.69725         | 32.76            | 12.5           | 45.26           | 70.74          | -25.48      | Peak   |
| 2        | 1.191           | 32.18            | 12.49          | 44.67           | 66.09          | -21.42      | Peak   |
| 3        | 1.396           | 32.75            | 12.42          | 45.17           | 64.71          | -19.54      | Peak   |
| 4        | 3.328           | 32.8             | 12.08          | 44.88           | 69.54          | -24.66      | Peak   |
| 5        | 5.058           | 28.47            | 12.17          | 40.64           | 69.54          | -28.9       | Peak   |
| 6        | 28.003          | 32.22            | 10.84          | 43.06           | 69.54          | -26.48      | Peak   |

Remarks:

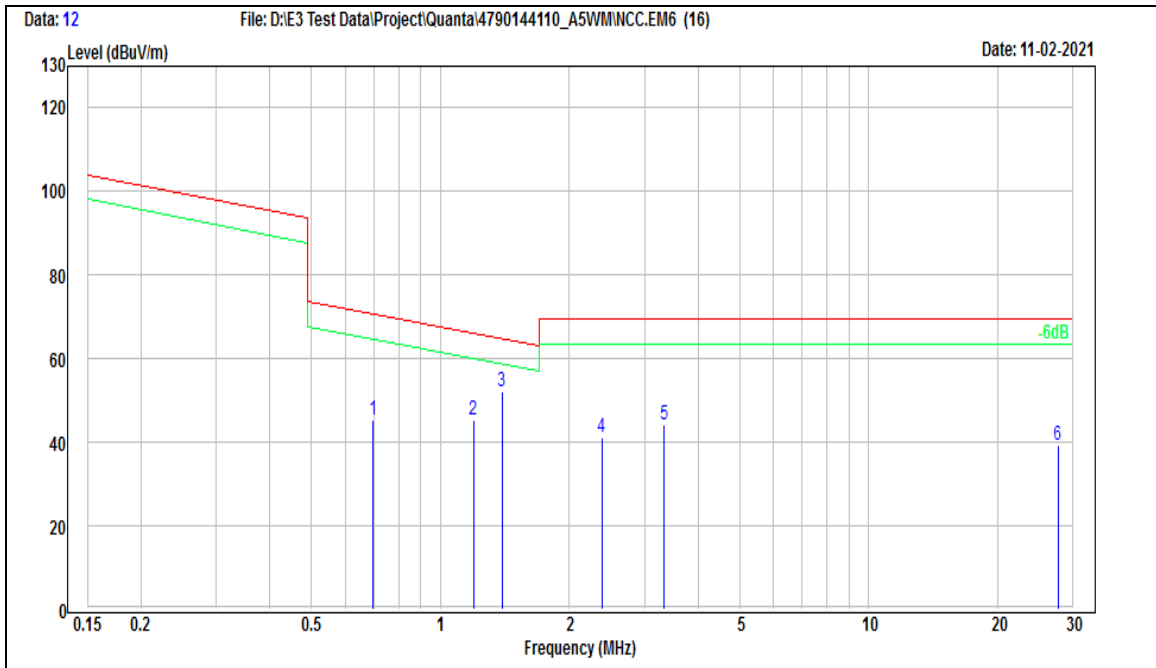
- Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
- Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
- Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
- The other emission levels were very low against the limit.

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| EUT Test Condition |                   |                  |               |
|--------------------|-------------------|------------------|---------------|
| Frequency Range    | 0.15 MHz ~ 30 MHz | Antenna Polarity | Perpendicular |



| Notation | Frequency (MHz) | Reading (dBuV/m) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|----------|-----------------|------------------|----------------|-----------------|----------------|-------------|--------|
| 1        | 0.69725         | 32.87            | 12.5           | 45.37           | 70.74          | -25.37      | Peak   |
| 2        | 1.197           | 32.71            | 12.49          | 45.2            | 66.04          | -20.84      | Peak   |
| 3        | 1.396           | 39.57            | 12.42          | 51.99           | 64.71          | -12.72      | Peak   |
| 4        | 2.384           | 29.18            | 12.18          | 41.36           | 69.54          | -28.18      | Peak   |
| 5        | 3.328           | 32.16            | 12.08          | 44.24           | 69.54          | -25.3       | Peak   |
| 6        | 27.708          | 28.55            | 10.89          | 39.44           | 69.54          | -30.1       | Peak   |

Remarks:

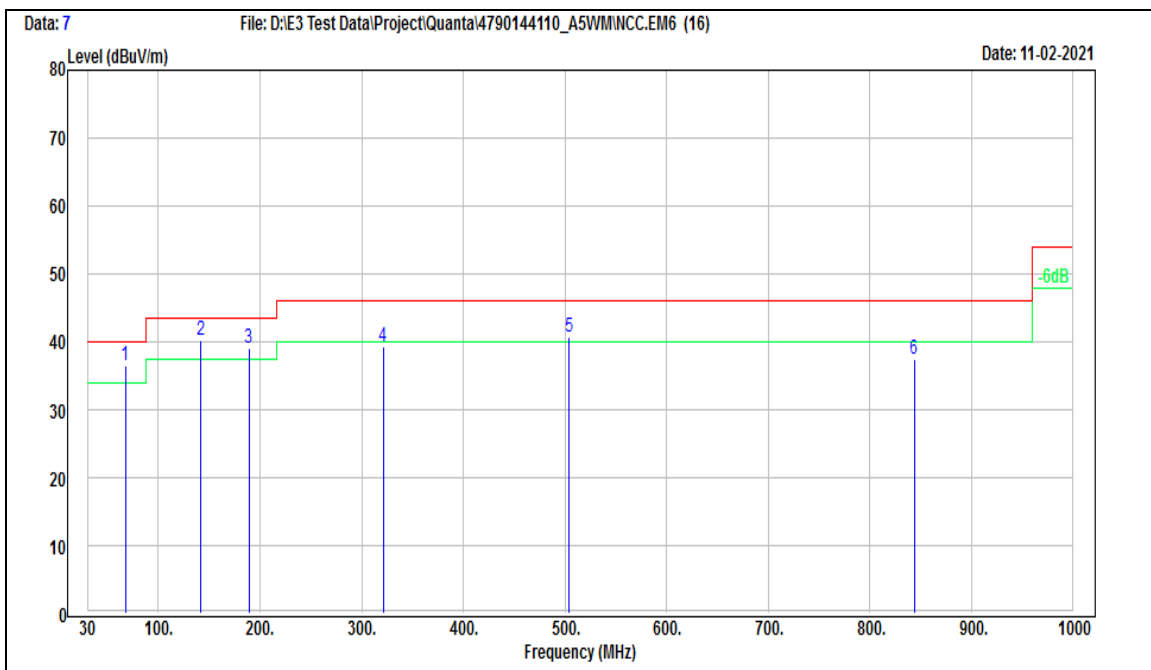
1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The other emission levels were very low against the limit.

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| EUT Test Condition |               |                  |            |
|--------------------|---------------|------------------|------------|
| Frequency Range    | 30MHz ~ 1 GHz | Antenna Polarity | Horizontal |



| Notation | Frequency (MHz) | Reading (dBuV/m) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|----------|-----------------|------------------|----------------|-----------------|----------------|-------------|--------|
| 1        | 67.83           | 49.97            | -13.49         | 36.48           | 40             | -3.52       | Peak   |
| 2        | 141.55          | 52.29            | -12.03         | 40.26           | 43.5           | -3.24       | Peak   |
| 3        | 189.08          | 52.17            | -13.09         | 39.08           | 43.5           | -4.42       | Peak   |
| 4        | 321             | 48.54            | -9.26          | 39.28           | 46             | -6.72       | Peak   |
| 5        | 504.33          | 45.38            | -4.67          | 40.71           | 46             | -5.29       | Peak   |
| 6        | 843.83          | 35.47            | 1.97           | 37.44           | 46             | -8.56       | Peak   |

Remarks:

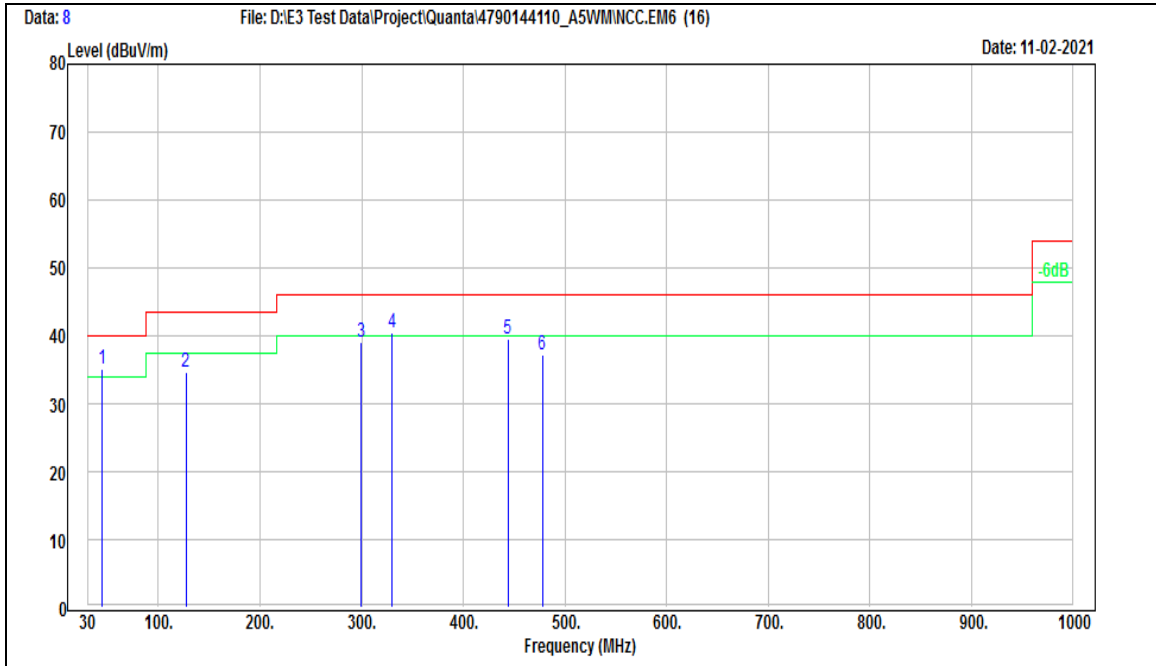
1. Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
2. Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
3. Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
4. The peak result complies with QP limit, QP result is deemed to comply with QP limit.
5. The other emission levels were very low against the limit.

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| EUT Test Condition |               |                  |          |
|--------------------|---------------|------------------|----------|
| Frequency Range    | 30MHz ~ 1 GHz | Antenna Polarity | Vertical |



| Notation | Frequency (MHz) | Reading (dBuV/m) | Correct (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Remark |
|----------|-----------------|------------------|----------------|-----------------|----------------|-------------|--------|
| 1        | 44.55           | 46.43            | -11.34         | 35.09           | 40             | -4.91       | Peak   |
| 2        | 127             | 48.24            | -13.65         | 34.59           | 43.5           | -8.91       | Peak   |
| 3        | 299.66          | 49.03            | -9.94          | 39.09           | 46             | -6.91       | Peak   |
| 4        | 329.73          | 49.42            | -9.04          | 40.38           | 46             | -5.62       | Peak   |
| 5        | 444.19          | 45.29            | -5.82          | 39.47           | 46             | -6.53       | Peak   |
| 6        | 478.14          | 42.44            | -5.17          | 37.27           | 46             | -8.73       | Peak   |

Remarks:

- Result value (dBuV/m) = Reading value (dBuV/m) + Correction Factor (dB/m).
- Margin(dB) = Result value (dBuV/m) - Limit value (dBuV/m).
- Correction Factor (dB/m) = Antenna Factor (dBuV/m) + Cable Loss (dB) - Preamp Factor (dB).
- The peak result complies with QP limit, QP result is deemed to comply with QP limit.
- The other emission levels were very low against the limit.

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## 9.2. AC Power Line Conducted Emission

### Requirements

| Frequency (MHz) | Conducted limit (dB $\mu$ V) |         |
|-----------------|------------------------------|---------|
|                 | Quasi-peak                   | Average |
| 0.15 - 0.5      | 66 - 56                      | 56 - 46 |
| 0.50 - 5.0      | 56                           | 46      |
| 5.0 - 30        | 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 0.50 MHz.

### Test Procedures

- a. 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.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

NOTE:

1. 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.

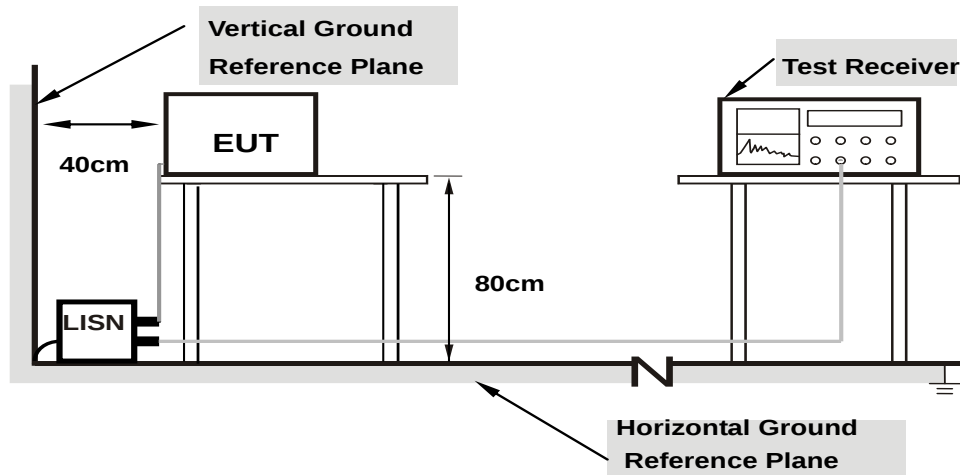
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## Test Setup



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

For the actual test configuration, please refer to the Setup Configurations.

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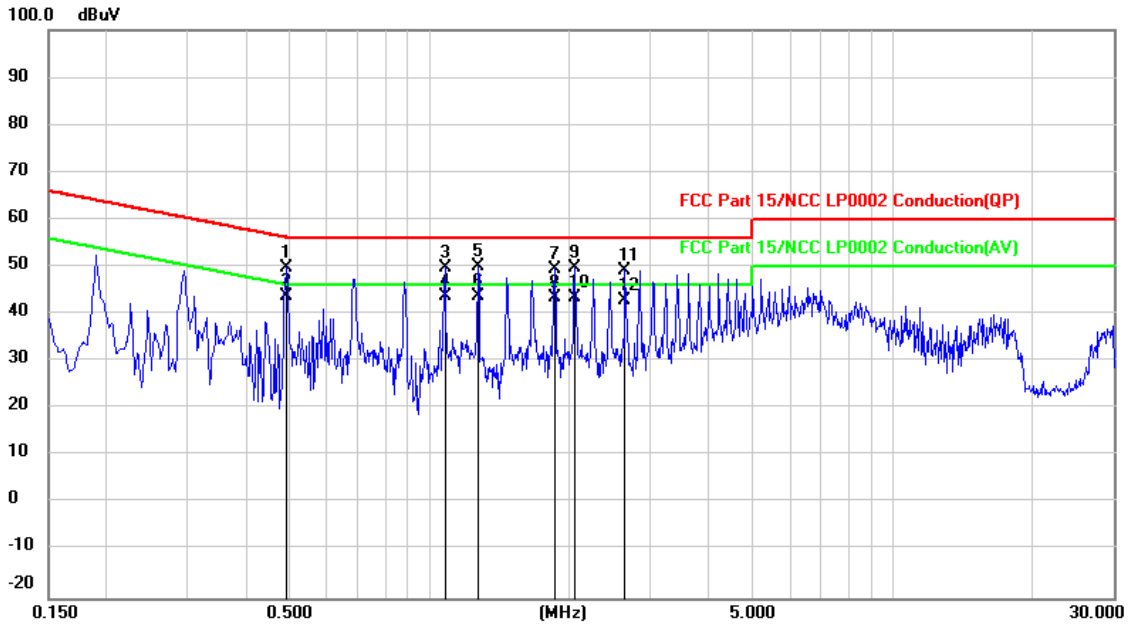
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## Test Data

| EUT Test Condition |           | Measurement Detail |                  |
|--------------------|-----------|--------------------|------------------|
| Channel            | Channel 1 | Frequency Range    | 150 kHz ~ 30 MHz |

### Phase of Power : Line (L)



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FCC ID : HFS-A5WM

| No. | Frequency<br>(MHz) | Reading<br>(dBuV) | Correct<br>dB | Result<br>(dBuV) | Limit<br>(dBuV) | Margin<br>(dB) | Remark |
|-----|--------------------|-------------------|---------------|------------------|-----------------|----------------|--------|
| 1   | 0.4905             | 30.29             | 19.49         | 49.78            | 56.16           | -6.38          | QP     |
| 2   | 0.4905             | 24.30             | 19.49         | 43.79            | 46.16           | -2.37          | AVG    |
| 3   | 1.0786             | 30.34             | 19.51         | 49.85            | 56.00           | -6.15          | QP     |
| 4   | 1.0786             | 24.22             | 19.51         | 43.73            | 46.00           | -2.27          | AVG    |
| 5   | 1.2746             | 30.48             | 19.51         | 49.99            | 56.00           | -6.01          | QP     |
| 6   | 1.2746             | 24.38             | 19.51         | 43.89            | 46.00           | -2.11          | AVG    |
| 7   | 1.8629             | 29.98             | 19.53         | 49.51            | 56.00           | -6.49          | QP     |
| 8   | 1.8629             | 23.92             | 19.53         | 43.45            | 46.00           | -2.55          | AVG    |
| 9   | 2.0591             | 30.20             | 19.53         | 49.73            | 56.00           | -6.27          | QP     |
| 10  | 2.0591             | 24.04             | 19.53         | 43.57            | 46.00           | -2.43          | AVG    |
| 11  | 2.6474             | 29.57             | 19.54         | 49.11            | 56.00           | -6.89          | QP     |
| 12  | 2.6474             | 23.42             | 19.54         | 42.96            | 46.00           | -3.04          | AVG    |

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

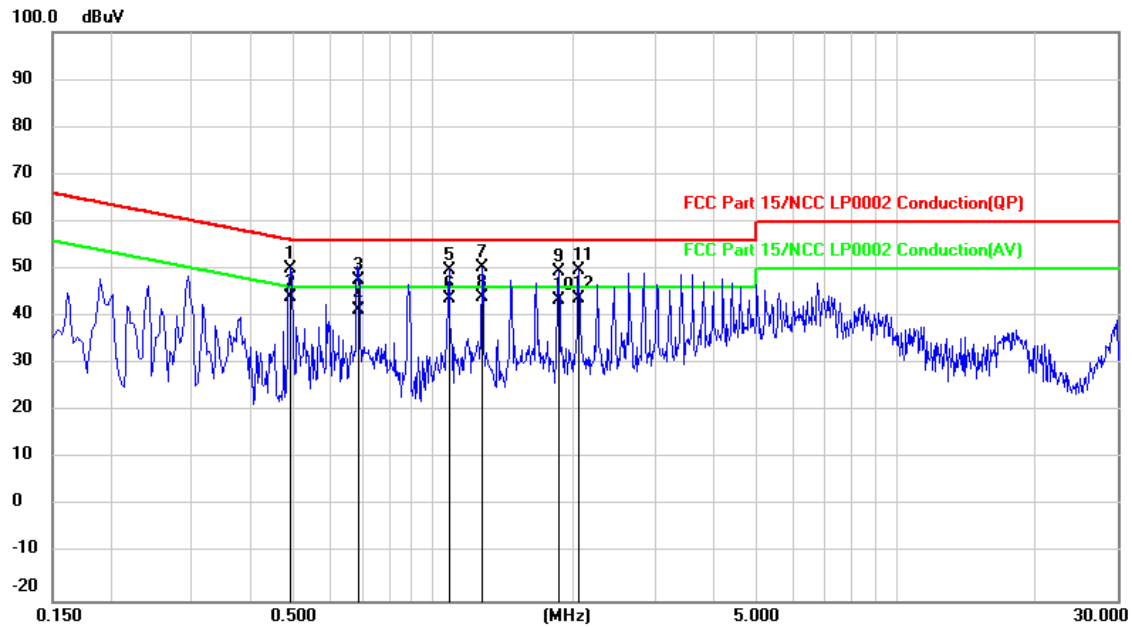
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### Phase of Power : Neutral (N)



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FCC ID : HFS-A5WM

| No. | Frequency | Reading | Correct | Result | Limit  | Margin | Remark |
|-----|-----------|---------|---------|--------|--------|--------|--------|
|     | (MHz)     | (dBuV)  | dB      | (dBuV) | (dBuV) | (dB)   |        |
| 1   | 0.4905    | 30.65   | 19.49   | 50.14  | 56.16  | -6.02  | QP     |
| 2   | 0.4905    | 24.63   | 19.49   | 44.12  | 46.16  | -2.04  | AVG    |
| 3   | 0.6866    | 28.12   | 19.50   | 47.62  | 56.00  | -8.38  | QP     |
| 4   | 0.6866    | 21.76   | 19.50   | 41.26  | 46.00  | -4.74  | AVG    |
| 5   | 1.0785    | 30.33   | 19.50   | 49.83  | 56.00  | -6.17  | QP     |
| 6   | 1.0785    | 24.16   | 19.50   | 43.66  | 46.00  | -2.34  | AVG    |
| 7   | 1.2746    | 30.70   | 19.50   | 50.20  | 56.00  | -5.80  | QP     |
| 8   | 1.2746    | 24.51   | 19.50   | 44.01  | 46.00  | -1.99  | AVG    |
| 9   | 1.8629    | 30.05   | 19.52   | 49.57  | 56.00  | -6.43  | QP     |
| 10  | 1.8629    | 23.97   | 19.52   | 43.49  | 46.00  | -2.51  | AVG    |
| 11  | 2.0590    | 30.29   | 19.52   | 49.81  | 56.00  | -6.19  | QP     |
| 12  | 2.0590    | 24.13   | 19.52   | 43.65  | 46.00  | -2.35  | AVG    |

Remarks:

1. Result value (dBuV) = Reading value (dBuV) + Correction Factor (dB)
2. Margin(dB) = Result value (dBuV) - Limit value (dBuV)
3. Correction Factor(dB) = Insertion loss(dB) + Cable loss(dB)
4. The other emission levels were very low against the limit.

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### 9.3. 20dB Bandwidth

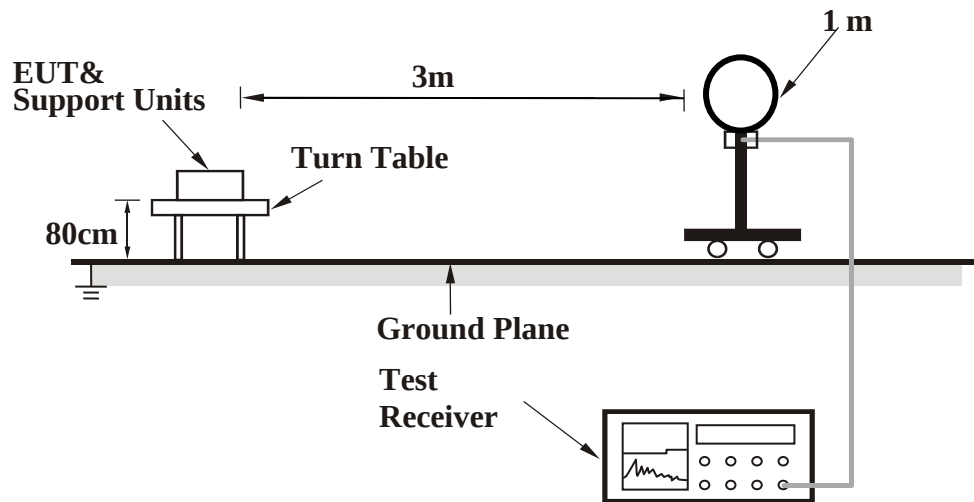
#### Requirements

The 20 dB bandwidth shall be specified in operating frequency band.

#### Test Procedures

- The testing follows the guidelines in ANSI C63.10-2013.
- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room.
- 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 EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The bandwidth of the fundamental frequency was measured by spectrum analyzer with 1kHz RBW and 3kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

#### Test Setup



For the actual test configuration, please refer to the Setup Configurations.

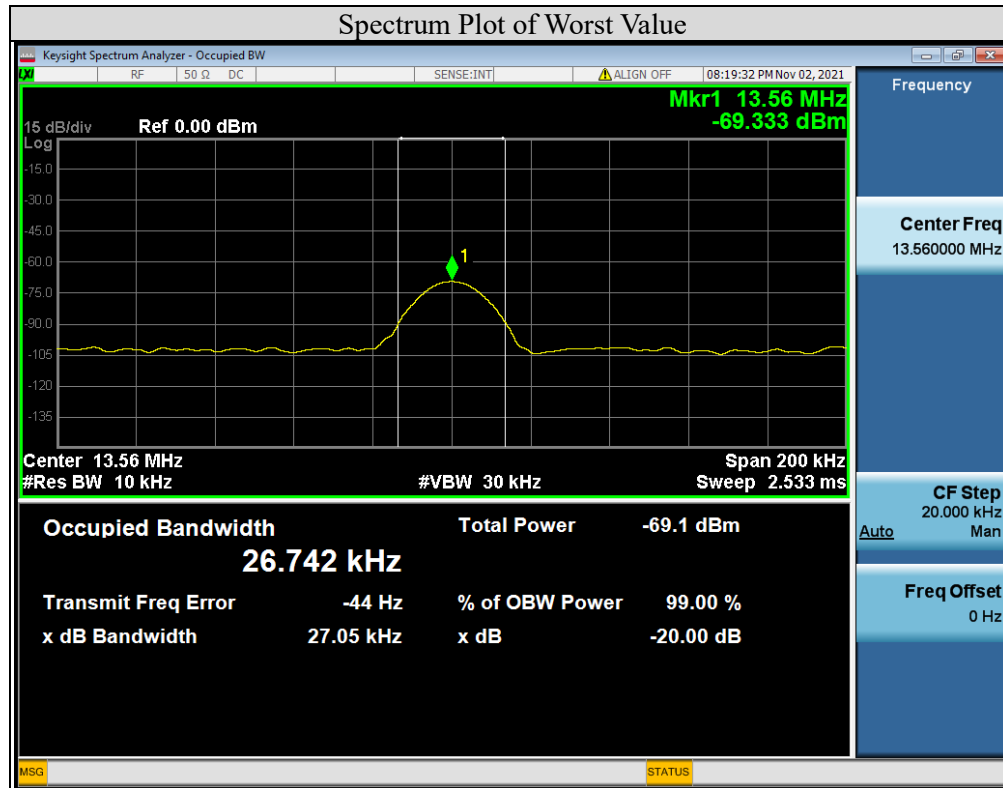
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## Test Data

| Channel | Frequency (MHz) | 20dB Bandwidth (MHz) |
|---------|-----------------|----------------------|
| 1       | 13.56           | 0.027                |



Note: The characteristics of the signal will cause the spectrum analyzer RBW to be unable to set comply with 1~5% emission bandwidth. However, set the RBW:10KHz for spectrum analyzer already can meet the emission is contained within the operated frequency band designated in the rule section, so no longer continue to reduce RBW setting.

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## 9.4. Frequency Stability

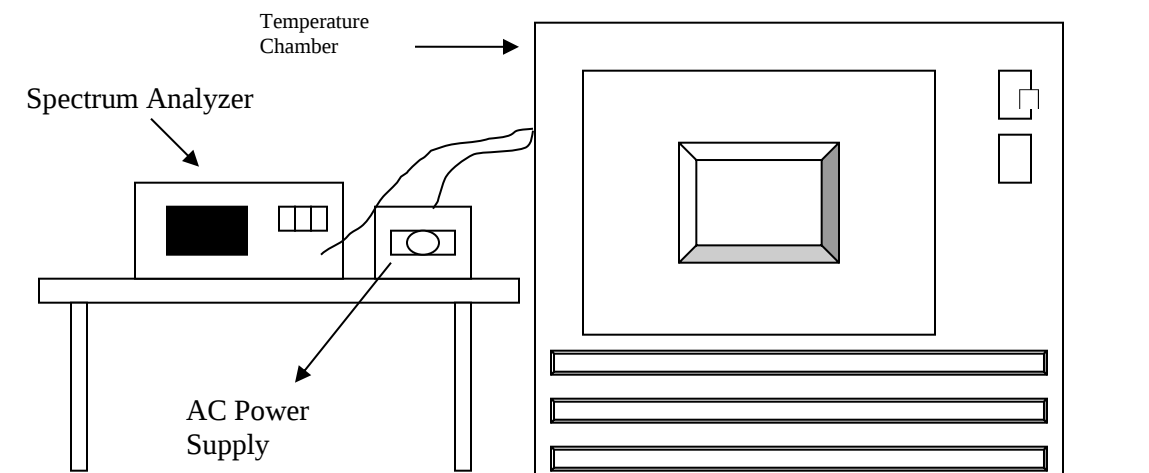
### Requirements

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.

### Test Procedures

- The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
- Turned the EUT on and coupled its output to a spectrum analyzer.
- Turned the EUT off and set the chamber to the highest temperature specified.
- Allowed sufficient time (approximately 30 min) for the temperature of the chamber to stabilize then turned the EUT on and measured the operating frequency after 2, 5, and 10 minutes.
- Repeated step 2 and 3 with the temperature chamber set to the lowest temperature.
- The test chamber was allowed to stabilize at  $+20$  degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from  $85\%$  to  $115\%$  and the frequency record.

### Test Setup



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## Test Data

| Frequency Stability Versus Temp. |                          |                                |                      |                                |                      |                                |                      |                                |                      |
|----------------------------------|--------------------------|--------------------------------|----------------------|--------------------------------|----------------------|--------------------------------|----------------------|--------------------------------|----------------------|
| TEMP.<br>(°C)                    | Power<br>Supply<br>(Vac) | 0 Minute                       |                      | 2 Minute                       |                      | 5 Minute                       |                      | 10 Minute                      |                      |
|                                  |                          | Measured<br>Frequency<br>(MHz) | Freq. Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Freq. Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Freq. Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Freq. Drift<br>(ppm) |
| 50                               | 220                      | 13.55997                       | -0.00022             | 13.55996                       | -0.00029             | 13.55996                       | -0.00029             | 13.55997                       | -0.00022             |
| 40                               | 220                      | 13.55997                       | -0.00022             | 13.55997                       | -0.00022             | 13.55996                       | -0.00029             | 13.55997                       | -0.00022             |
| 30                               | 220                      | 13.55997                       | -0.00022             | 13.55997                       | -0.00022             | 13.55997                       | -0.00022             | 13.55997                       | -0.00022             |
| 20                               | 220                      | 13.55999                       | -0.00007             | 13.55997                       | -0.00022             | 13.55998                       | -0.00015             | 13.55998                       | -0.00015             |
| 10                               | 220                      | 13.55996                       | -0.00029             | 13.55996                       | -0.00029             | 13.55996                       | -0.00029             | 13.55996                       | -0.00029             |
| 0                                | 220                      | 13.55994                       | -0.00044             | 13.55993                       | -0.00052             | 13.55994                       | -0.00044             | 13.55995                       | -0.00037             |
| -10                              | 220                      | 13.56002                       | 0.00015              | 13.56002                       | 0.00015              | 13.56003                       | 0.00022              | 13.56002                       | 0.00015              |
| -20                              | 220                      | 13.56002                       | 0.00015              | 13.56002                       | 0.00015              | 13.56002                       | 0.00015              | 13.56002                       | 0.00015              |
| TEMP.<br>(°C)                    | Power<br>Supply<br>(Vac) | 0 Minute                       |                      | 2 Minute                       |                      | 5 Minute                       |                      | 10 Minute                      |                      |
|                                  |                          | Measured<br>Frequency<br>(MHz) | Freq. Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Freq. Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Freq. Drift<br>(ppm) | Measured<br>Frequency<br>(MHz) | Freq. Drift<br>(ppm) |
| 20                               | 253                      | 13.55999                       | -0.00007             | 13.55997                       | -0.00022             | 13.55998                       | -0.00015             | 13.55998                       | -0.00015             |
| 20                               | 220                      | 13.55999                       | -0.00007             | 13.55997                       | -0.00022             | 13.55998                       | -0.00015             | 13.55998                       | -0.00015             |
| 20                               | 187                      | 13.55999                       | -0.00007             | 13.55997                       | -0.00022             | 13.55998                       | -0.00015             | 13.55998                       | -0.00015             |

**END OF REPORT**

**Underwriters Laboratories Taiwan Co., Ltd.**

Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Telephone :+886-2-7737-3000

Facsimile (FAX) :+886-3-583-7948

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