# FCC Test Report

| | | |
|---|---|---|
| **Report No.** | : | **1812C50109512501** |
| **Applicant** | : | **Shenzhen Longer Technology Co., Ltd.** |
| **Address** | : | **FL 10, Building 2B, Intelligent Park, 76 BaoHe Ave, Longgang, Shenzhen, China** |
| **Product Name** | : | **Engraver** |
| **Report Date** | : | **Apr. 21, 2025** |

**Shenzhen Anbotek Compliance Laboratory Limited**

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# TEST REPORT

| | | |
|---|---|---|
| Applicant | : | Shenzhen Longer Technology Co., Ltd. |
| Manufacturer | : | Shenzhen Longer Technology Co., Ltd. |
| Product Name | : | Engraver |
| Model No. | : | RAY5, RAY5 5W, RAY5 10W, RAY5 20W, RAY5 30W, RAY5 Pro, RAY5 Pro 10W, RAY5 Pro 20W, RAY5 Pro 30W, RAY5 Pro 40W, Laser B1, Laser B1 10W, Laser B1 20W, Laser B1 30W, Laser B1 40W, Laser S1, Laser S1 10W, Laser S1 20W, LaserS1 30W, Laser S1 40W, Laser S1 60W, RAY5 S, Laser B1 24W, Laser B1 36W, Laser B1 48W, RAY5 mini, RAY5 miniX, RAY5 miniS, RAY5 miniBox, RayBox, RAY6, RAY2, RAY3, RAY4 |
| Trade Mark | : | LONGER |
| Rating(s) | : | Input: DC 12V, 5A |
| **Test Standard(s)** | **:** | **FCC Part15 Subpart C, Section 15.247** |
| **Test Method(s)** | **:** | **ANSI C63.10: 2020, KDB 558074 D01 15.247 Meas Guidance v05r02** |

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

| | |
|---|---|
| Date of Receipt | Mar. 25, 2025 |
| Date of Test | Mar. 25, 2025 to Apr. 21, 2025 |
| Prepared by | (Lene Chen) |
| Approved & Authorized Signer | (Hugo Chen) |

# Revision History

| Report Version | Description | Issued Date |
|---|---|---|
| R00 | Original Issue. | Apr. 21, 2025 |
| | | |
| | | |

# 1. General Information

## 1.1. Client Information

| | | |
|---|---|---|
| Applicant | : | Shenzhen Longer Technology Co., Ltd. |
| Address | : | FL 10, Building 2B, Intelligent Park, 76 BaoHe Ave, Longgang, Shenzhen, China |
| Manufacturer | : | Shenzhen Longer Technology Co., Ltd. |
| Address | : | FL 10, Building 2B, Intelligent Park, 76 BaoHe Ave, Longgang, Shenzhen, China |
| Factory | : | Shenzhen Longer Technology Co., Ltd. |
| Address | : | FL 10, Building 2B, Intelligent Park, 76 BaoHe Ave, Longgang, Shenzhen, China |

## 1.2. Description of Device (EUT)

| | | | |
|---|---|---|---|
| Product Name | : | Engraver | |
| Model No. | : | RAY5, RAY5 5W, RAY5 10W, RAY5 20W, RAY5 30W, RAY5 Pro, RAY5 Pro 10W, RAY5 Pro 20W, RAY5 Pro 30W, RAY5 Pro 40W, Laser B1, Laser B1 10W, Laser B1 20W, Laser B1 30W, Laser B1 40W, Laser S1, Laser S1 10W, Laser S1 20W, LaserS1 30W, Laser S1 40W, Laser S1 60W, RAY5 S, Laser B1 24W, Laser B1 36W, Laser B1 48W, RAY5 mini, RAY5 miniX, RAY5 miniS, RAY5 miniBox, RayBox, RAY6, RAY2, RAY3, RAY4<br>(Note: All samples are the same except the model number and Laser power, side, so we prepare “RAY5” for test only.) | |
| Trade Mark | : | LONGER | |
| Test Power Supply | : | AC 120V, 60Hz for Adapter/ AC 240V, 60Hz for Adapter | |
| Test Sample No. | : | 1-2-1(Normal Sample), 1-2-2(Engineering Sample) | |
| Product Description | : | Operation Frequency: | 802.11b/ g/ n(HT20): 2412-2462MHz<br>802.11n (HT40): 2422-2452MHz |
| | | Number of Channel: | 802.11b/ g/ n(HT20): 11 Channels<br>802.11n (HT40): 7 Channels |
| | | Modulation Type: | CCK, DQPSK, DBPSK for DSSS;<br>64QAM, 16QAM, QPSK, BPSK for OFDM |
| | | Antenna Type: | FPC antenna |
| | | Antenna Gain(Peak): | 5dBi |
| | | Adapter: | M/N: KYL-01205000<br>Input: 100-240V~ 50-60Hz, 1.5A<br>Output: DC 12V, 5A |
| **Remark:** 1) All of the RF specification are provided by customer. 2) For a more detailed features description, please refer to the manufacturer’s specifications or the User’s Manual. | | | |

## 1.3. Auxiliary Equipment Used During Test

| | | |
|---|---|---|
| Adapter | : | N.A. |

## 1.4. Description of Test Modes

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

**RADIATED EMISSION TEST (BELOW 1GHz):**

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).

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

| Mode | Available Channel | Test Channel | Modulation Tech. | Data Rate (Mbps) |
|---|---|---|---|---|
| 802.11n (HT20) | 1 to 11 | 1, 6, 11 | OFDM | 6.5 |

For the test results, only the worst case was shown in test report.

**RADIATED EMISSION TEST (ABOVE 1GHz):**

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports (if EUT with antenna diversity architecture).

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

| Mode | Available Channel | Test Channel | Modulation Tech. | Data Rate (Mbps) |
|---|---|---|---|---|
| 802.11n (HT40) | 3 to 9 | 3, 6, 9 | OFDM | 13.5 |

**POWER LINE CONDUCTED EMISSION TEST:**

The EUT was tested with the following mode

| Mode | Available Channel | Test Channel | Modulation Tech. | Data Rate (Mbps) |
|---|---|---|---|---|
| 802.11b | 1 to 11 | 1, 6, 11 | DSSS | 1.0 |
| 802.11g | 1 to 11 | 1, 6, 11 | OFDM | 6.0 |
| 802.11n (HT20) | 1 to 11 | 1, 6, 11 | OFDM | 6.5 |
| 802.11n (HT40) | 3 to 9 | 3, 6, 9 | OFDM | 13.5 |

**BANDEDGE MEASUREMENT:**

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

| Mode | Available Channel | Test Channel | Modulation Tech. | Data Rate (Mbps) |
|---|---|---|---|---|
| 802.11b | 1 to 11 | 1, 6, 11 | DSSS | 1.0 |
| 802.11g | 1 to 11 | 1, 6, 11 | OFDM | 6.0 |
| 802.11n (HT20) | 1 to 11 | 1, 6, 11 | OFDM | 6.5 |
| 802.11n (HT40) | 3 to 9 | 3, 6, 9 | OFDM | 13.5 |

**ANTENNA PORT CONDUCTED MEASUREMENT:**

This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

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

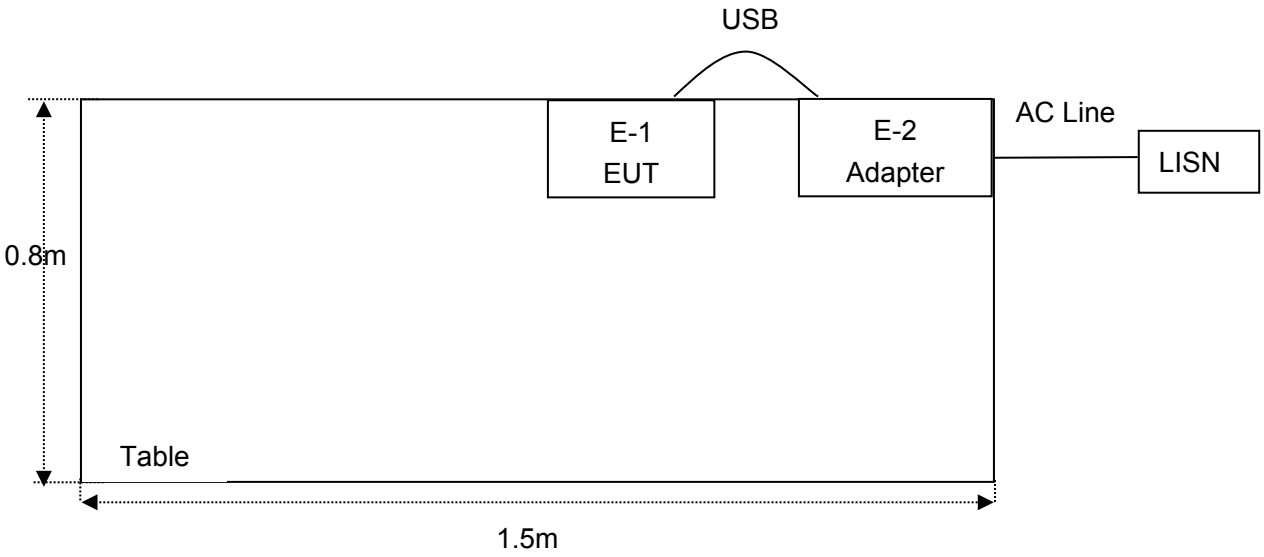
| Mode | Available Channel | Test Channel | Modulation Tech. | Data Rate (Mbps) |
|---|---|---|---|---|
| 802.11b | 1 to 11 | 1, 6, 11 | DSSS | 1.0 |
| 802.11g | 1 to 11 | 1, 6, 11 | OFDM | 6.0 |
| 802.11n (HT20) | 1 to 11 | 1, 6, 11 | OFDM | 6.5 |
| 802.11n (HT40) | 3 to 9 | 3, 6, 9 | OFDM | 13.5 |

## 1.5. List of channels

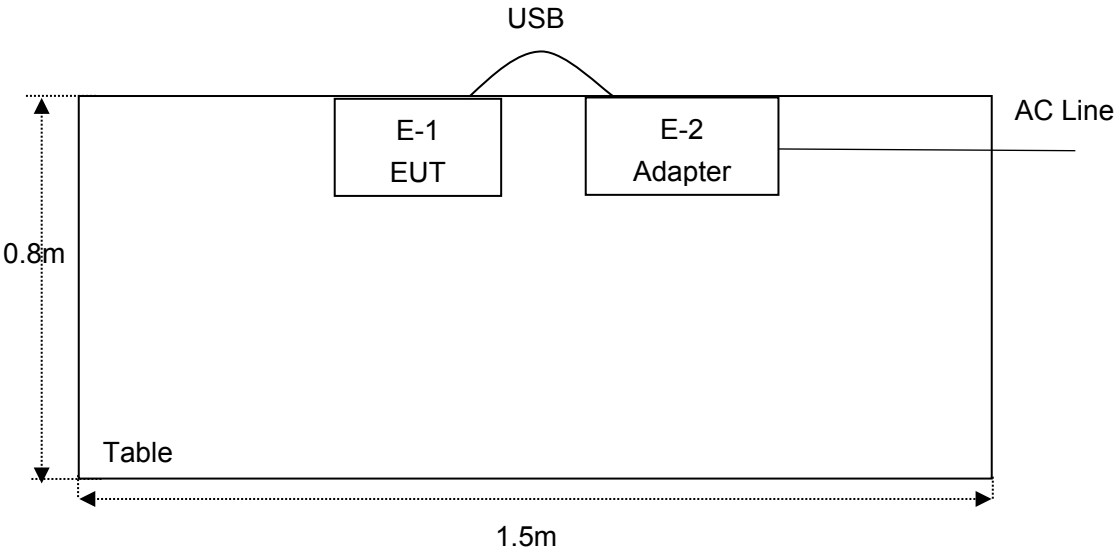
| Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) | Channel | Freq. (MHz) |
|---|---|---|---|---|---|---|---|
| 01 | 2412 | 04 | 2427 | 07 | 2442 | 10 | 2457 |
| 02 | 2417 | 05 | 2432 | 08 | 2447 | 11 | 2462 |
| 03 | 2422 | 06 | 2437 | 09 | 2452 | | |

## 1.6. Description Of Test Setup

CE




RE



## 1.7. Test Equipment List

| Item | Equipment | Manufacturer | Model No. | Serial No. | Last Cal. | Cal. Interval |
|---|---|---|---|---|---|---|
| 1. | L.I.S.N. Artificial Mains Network | Rohde & Schwarz | ENV216 | 100055 | Sep. 09, 2024 | 1 Year |
| 2. | Three Phase V-type Artificial Power Network | CYBERTEK | EM5040DT | E215040DT001 | Jan. 13, 2025 | 1 Year |
| 3. | EMI Test Receiver | Rohde & Schwarz | ESCI | 100627 | Jan. 13, 2025 | 1 Year |
| 4. | EMI Test Receiver | Rohde & Schwarz | ESR26 | 101481 | Jan. 14, 2025 | 1 Year |
| 5. | MXA Spectrum Analysis | Agilent | N9020A | MY51170037 | Sep. 09, 2024 | 1 Year |
| 6. | EMI Preamplifier | SKET Electronic | LNPA-0118G-45 | SKET-PA-002 | Jan. 13, 2025 | 1 Year |
| 7. | Double Ridged Horn Antenna | SCHWARZBECK | BBHA 9120D | 02555 | Oct. 16, 2022 | 3 Year |
| 8. | Bilog Broadband Antenna | Schwarzbeck | VULB9163 | 345 | Oct. 23, 2022 | 3 Year |
| 9. | Loop Antenna(9K-30M) | Schwarzbeck | FMZB1519B | 00053 | Sep. 12, 2024 | 1 Year |
| 10. | Horn Antenna | A-INFO | LB-180400-KF | J211060628 | Jan. 22, 2024 | 3 Year |
| 11. | Pre-amplifier | SONOMA | 310N | 186860 | Jan. 14, 2025 | 1 Year |
| 12. | EMI Test Software EZ-EMC | SHURPLE | N/A | N/A | N/A | N/A |
| 13. | MXA Spectrum Analysis | KEYSIGHT | N9020A | MY53280032 | Sep. 09, 2024 | 1 Year |
| 14. | MXG RF Vector Signal Generator | Agilent | N5182A | MY47420647 | Jan. 14, 2025 | 1 Year |
| 15. | Signal Generator | Agilent | E4421B | MY41000743 | Feb. 21, 2025 | 1 Year |
| 16. | DC Power Supply | IVYTECH | IV3605 | 1804D360510 | Sep. 09, 2024 | 1 Year |
| 17. | Constant Temperature Humidity Chamber | ZHONGJIAN | ZJ-KHWS80B | N/A | Oct. 14, 2024 | 1 Year |
| 18. | Spectrum Analyzer | Rohde & Schwarz | FSV40-N | 102150 | May. 06, 2024 | 1 Year |

## 1.8. Measurement Uncertainty

| Parameter | Uncertainty |
|---|---|
| Conducted emissions (AMN 150kHz~30MHz) | 3.2dB |
| Occupied Bandwidth | 925Hz |
| Conducted Output Power | 0.76dB |
| Time | 2% |
| Power Spectral Density | 0.76dB |
| Conducted Spurious Emission | 1.24dB |
| Radiated spurious emissions (Below 30MHz) | 3.26dB |
| Radiated spurious emissions (30MHz~1GHz) | Horizontal: 3.70dB; Vertical: 4.42dB |
| Radiated spurious emissions (above 1GHz) | 1G-6GHz: 4.64dB<br>6G-18GHz: 4.82dB<br>18G-40GHz: 5.62dB |
| The measurement uncertainty and decision risk evaluated according to AB/WI-RF-F-032.<br>This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2. | |

## 1.9. Additional Instructions

Power level setup in software:
EspRFTestTool_v3.6_Manual

Operation Band:

| Mode | Power level | Transmitting type |
|---|---|---|
| 802.11b | default | data pack TX |
| 802.11g | default | data pack TX |
| 802.11n(HT20) | default | data pack TX |
| 802.11n(HT40) | default | data pack TX |

## 1.10. Description of Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

**FCC-Registration No.: 434132**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 434132.

**CAB identifier: CN0059**

**ISED-Registration No.: 8058A**

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A.

**Test Location**

Shenzhen Anbotek Compliance Laboratory Limited.
Sogood Industrial Zone Laboratory & 1/F. of Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Subdistrict, Bao'an District, Shenzhen, Guangdong, China.

## 1.11. Disclaimer

1. The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
2. The test report is invalid if there is any evidence and/or falsification.
3. The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
4. This document may not be altered or revised in any way unless done so by Anbotek and all revisions are duly noted in the revisions section.
5. Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.
6. The authenticity of the information provided by the customer is the responsibility of the customer and the laboratory is not responsible for its authenticity.
7. The data in this report will be synchronized with the corresponding national market supervision and management departments and cross-border e-commerce platforms as required by regulatory agencies.

The laboratory is only responsible for the data released by the laboratory, except for the part provided by the applicant.

## 2. Summary of Test Results

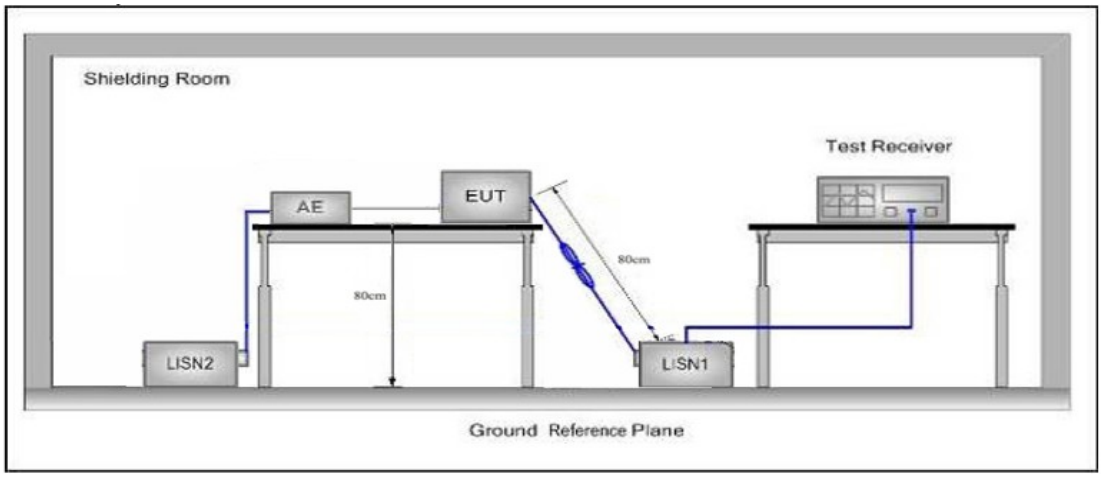
| Standard Section | Test Item | Result |
|---|---|---|
| 15.203/15.247(c) | Antenna Requirement | PASS |
| 15.207 | Conducted Emission | PASS |
| 15.205/15.209 | Spurious Emission | PASS |
| 15.247(b)(3) | Conducted Peak Output Power | PASS |
| 15.247(a)(2) | 6dB Occupied Bandwidth | PASS |
| 15.247(e) | Power Spectral Density | PASS |
| 15.247(d) | Band Edge | PASS |
| **Remark:** “N/A” is an abbreviation for Not Applicable. | | |

# 3. Conducted Emission Test

## 3.1. Test Standard and Limit

| Test Standard | FCC Part15 Section 15.207 | | |
|---|---|---|---|
| Test Limit | Frequency | Maximum RF Line Voltage (dBuV) | |
| | | Quasi-peak Level | Average Level |
| | 150kHz~500kHz | 66 ~ 56 * | 56 ~ 46 * |
| | 500kHz~5MHz | 56 | 46 |
| | 5MHz~30MHz | 60 | 50 |
| **Remark:** (1) *Decreasing linearly with logarithm of the frequency.<br>(2) The lower limit shall apply at the transition frequency. | | | |

## 3.2. Test Setup




## 3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10: 2020 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

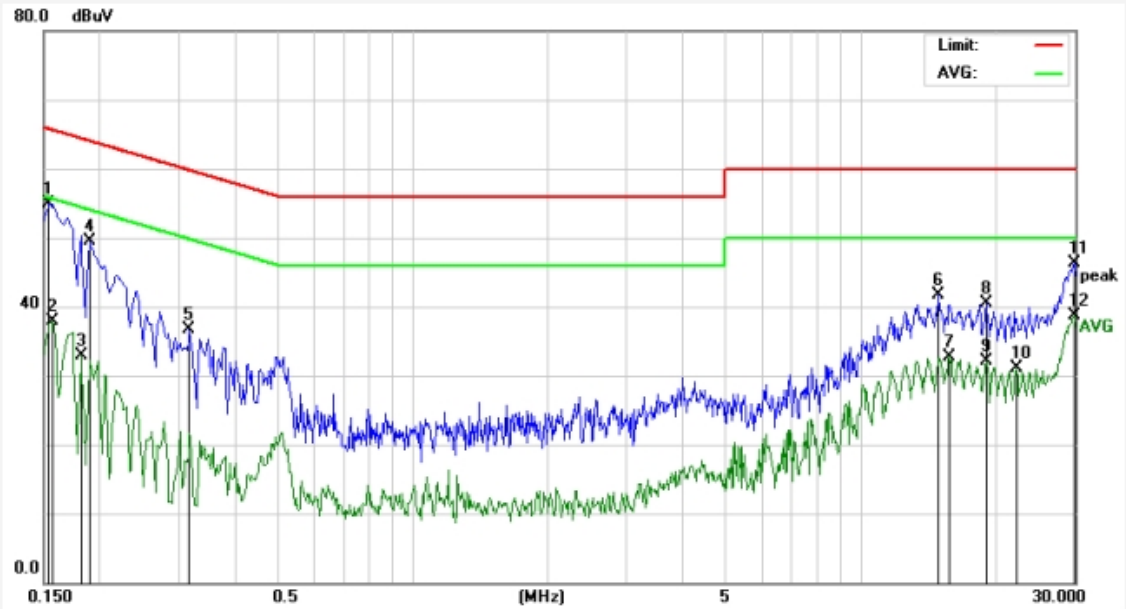
The frequency range from 150kHz to 30MHz is checked.

## 3.4. Test Data

During the test, pre-scan all modes, and found the 802.11n(HT40) CH06 of which is the worst case, only the worst case is recorded in the report.

**Conducted Emission Test Data**

| | |
|---|---|
| Test Site: | 1# Shielded Room |
| Operating Condition: | 802.11n(HT40) CH06 |
| Test Specification: | AC 120V, 60Hz for Adapter |
| Comment: | Live Line |
| | Tem.: 24.2℃ Hum.: 48% |

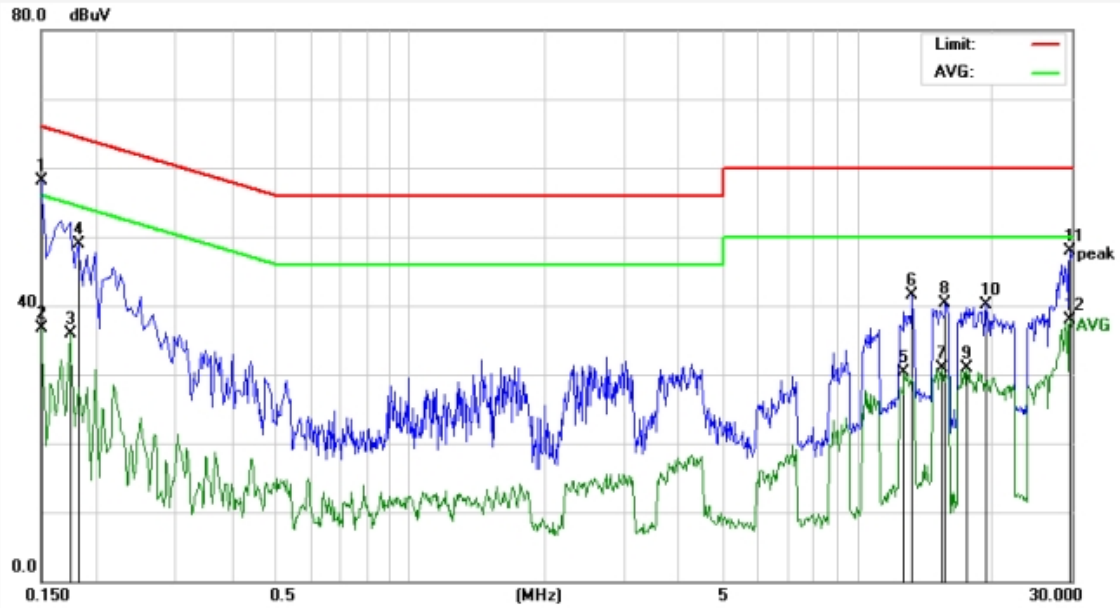



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1539 | 44.79 | 10.12 | 54.91 | 65.78 | -10.87 | QP | |
| 2 | 0.1580 | 27.69 | 10.12 | 37.81 | 55.56 | -17.75 | AVG | |
| 3 | 0.1819 | 22.73 | 10.12 | 32.85 | 54.39 | -21.54 | AVG | |
| 4 | 0.1900 | 39.41 | 10.12 | 49.53 | 64.03 | -14.50 | QP | |
| 5 | 0.3180 | 26.60 | 10.13 | 36.73 | 59.76 | -23.03 | QP | |
| 6 | 14.8980 | 31.56 | 10.17 | 41.73 | 60.00 | -18.27 | QP | |
| 7 | 15.6540 | 22.63 | 10.17 | 32.80 | 50.00 | -17.20 | AVG | |
| 8 | 19.0620 | 30.40 | 10.19 | 40.59 | 60.00 | -19.41 | QP | |
| 9 | 19.0620 | 21.96 | 10.19 | 32.15 | 50.00 | -17.85 | AVG | |
| 10 | 22.2139 | 20.85 | 10.19 | 31.04 | 50.00 | -18.96 | AVG | |
| 11 | 29.9740 | 35.86 | 10.37 | 46.23 | 60.00 | -13.77 | QP | |
| 12 | 29.9740 | 28.28 | 10.37 | 38.65 | 50.00 | -11.35 | AVG | |

Remark:
Result(dBμV) = Reading(dBμV) + Factor(dB);
Over Limit(dB) = Result(dBμV) - Limit(dBμV)

**Conducted Emission Test Data**

| | |
|---|---|
| Test Site: | 1# Shielded Room |
| Operating Condition: | 802.11n(HT40) CH06 |
| Test Specification: | AC 120V, 60Hz for Adapter |
| Comment: | Neutral Line |
| | Tem.: 24.2℃ Hum.: 48% |

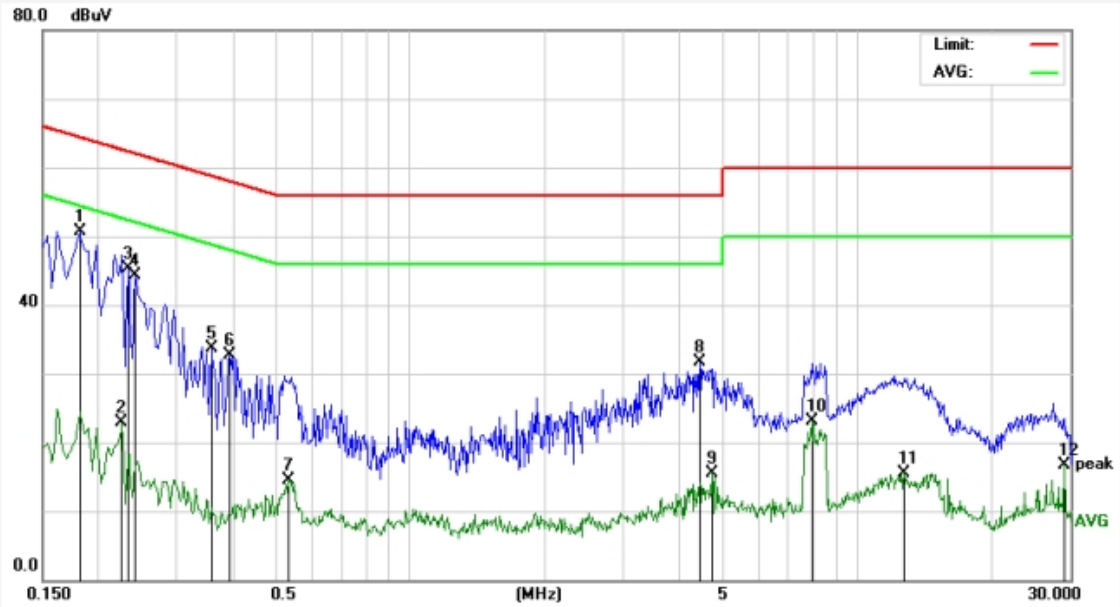



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1500 | 48.08 | 10.11 | 58.19 | 65.99 | -7.80 | QP | |
| 2 | 0.1500 | 26.67 | 10.11 | 36.78 | 55.99 | -19.21 | AVG | |
| 3 | 0.1740 | 25.70 | 10.12 | 35.82 | 54.76 | -18.94 | AVG | |
| 4 | 0.1819 | 38.86 | 10.12 | 48.98 | 64.39 | -15.41 | QP | |
| 5 | 12.7020 | 20.16 | 10.15 | 30.31 | 50.00 | -19.69 | AVG | |
| 6 | 13.2660 | 31.34 | 10.15 | 41.49 | 60.00 | -18.51 | QP | |
| 7 | 15.4020 | 20.68 | 10.17 | 30.85 | 50.00 | -19.15 | AVG | |
| 8 | 15.6660 | 30.15 | 10.17 | 40.32 | 60.00 | -19.68 | QP | |
| 9 | 17.4780 | 20.67 | 10.18 | 30.85 | 50.00 | -19.15 | AVG | |
| 10 | 19.2620 | 30.00 | 10.20 | 40.20 | 60.00 | -19.80 | QP | |
| 11 | 29.7820 | 37.57 | 10.36 | 47.93 | 60.00 | -12.07 | QP | |
| 12 | 29.7820 | 27.59 | 10.36 | 37.95 | 50.00 | -12.05 | AVG | |

Remark:
Result(dBμV) = Reading(dBμV) + Factor(dB);
Over Limit(dB) = Result(dBμV) - Limit(dBμV)

**Conducted Emission Test Data**

| | |
|---|---|
| Test Site: | 1# Shielded Room |
| Operating Condition: | 802.11n(HT40) CH06 |
| Test Specification: | AC 240V, 60Hz for Adapter |
| Comment: | Live Line |
| | Tem.: 24.2℃ Hum.: 48% |

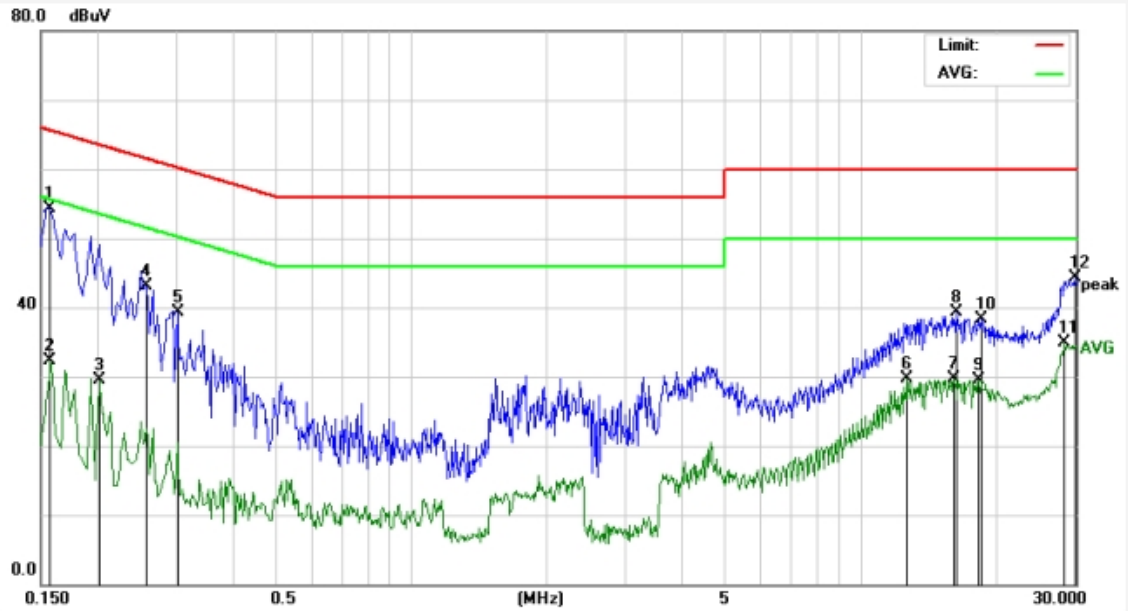



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1819 | 40.52 | 10.12 | 50.64 | 64.39 | -13.75 | QP | |
| 2 | 0.2260 | 12.75 | 10.12 | 22.87 | 52.59 | -29.72 | AVG | |
| 3 | 0.2340 | 35.27 | 10.12 | 45.39 | 62.30 | -16.91 | QP | |
| 4 | 0.2420 | 34.13 | 10.12 | 44.25 | 62.02 | -17.77 | QP | |
| 5 | 0.3580 | 23.55 | 10.12 | 33.67 | 58.77 | -25.10 | QP | |
| 6 | 0.3940 | 22.54 | 10.11 | 32.65 | 57.98 | -25.33 | QP | |
| 7 | 0.5340 | 4.36 | 10.15 | 14.51 | 46.00 | -31.49 | AVG | |
| 8 | 4.4460 | 21.57 | 10.11 | 31.68 | 56.00 | -24.32 | QP | |
| 9 | 4.7220 | 5.49 | 10.11 | 15.60 | 46.00 | -30.40 | AVG | |
| 10 | 7.9180 | 12.97 | 10.12 | 23.09 | 50.00 | -26.91 | AVG | |
| 11 | 12.7700 | 5.45 | 10.15 | 15.60 | 50.00 | -34.40 | AVG | |
| 12 | 29.1900 | 6.29 | 10.34 | 16.63 | 50.00 | -33.37 | AVG | |

Remark:
Result(dBμV) = Reading(dBμV) + Factor(dB);
Over Limit(dB) = Result(dBμV) - Limit(dBμV)

**Conducted Emission Test Data**

| | |
|---|---|
| Test Site: | 1# Shielded Room |
| Operating Condition: | 802.11n(HT40) CH06 |
| Test Specification: | AC 240V, 60Hz for Adapter |
| Comment: | Neutral Line |
| | Tem.: 24.2℃ Hum.: 48% |




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB) | Result (dBuV) | Limit (dBuV) | Over Limit (dB) | Detector | Remark |
|---|---|---|---|---|---|---|---|---|
| 1 | 0.1580 | 44.27 | 10.12 | 54.39 | 65.56 | -11.17 | QP | |
| 2 | 0.1580 | 22.18 | 10.12 | 32.30 | 55.56 | -23.26 | AVG | |
| 3 | 0.2020 | 19.43 | 10.12 | 29.55 | 53.52 | -23.97 | AVG | |
| 4 | 0.2580 | 32.96 | 10.13 | 43.09 | 61.49 | -18.40 | QP | |
| 5 | 0.3020 | 29.19 | 10.13 | 39.32 | 60.19 | -20.87 | QP | |
| 6 | 12.7140 | 19.48 | 10.15 | 29.63 | 50.00 | -20.37 | AVG | |
| 7 | 16.0580 | 19.55 | 10.18 | 29.73 | 50.00 | -20.27 | AVG | |
| 8 | 16.2700 | 29.18 | 10.18 | 39.36 | 60.00 | -20.64 | QP | |
| 9 | 18.3140 | 19.27 | 10.19 | 29.46 | 50.00 | -20.54 | AVG | |
| 10 | 18.5180 | 28.15 | 10.19 | 38.34 | 60.00 | -21.66 | QP | |
| 11 | 28.3940 | 24.65 | 10.31 | 34.96 | 50.00 | -15.04 | AVG | |
| 12 | 29.9460 | 33.88 | 10.37 | 44.25 | 60.00 | -15.75 | QP | |

Remark:
Result(dBμV) = Reading(dBμV) + Factor(dB);
Over Limit(dB) = Result(dBμV) - Limit(dBμV)

# 4. Radiation Spurious Emission and Band Edge

## 4.1. Test Standard and Limit

| Test Standard | FCC Part15 C Section 15.209 and 15.205 | | | | |
|---|---|---|---|---|---|
| Test Limit | Frequency (MHz) | Field strength (microvolt/meter) | Limit (dBuV/m) | Remark | Measurement distance (m) |
| | 0.009MHz~0.490MHz | 2400/F(kHz) | - | - | 300 |
| | 0.490MHz-1.705MHz | 24000/F(kHz) | - | - | 30 |
| | 1.705MHz-30MHz | 30 | - | - | 30 |
| | 30MHz~88MHz | 100 | 40.0 | Quasi-peak | 3 |
| | 88MHz~216MHz | 150 | 43.5 | Quasi-peak | 3 |
| | 216MHz~960MHz | 200 | 46.0 | Quasi-peak | 3 |
| | 960MHz~1000MHz | 500 | 54.0 | Quasi-peak | 3 |
| | Above 1000MHz | 500 | 54.0 | Average | 3 |
| | | - | 74.0 | Peak | 3 |

**Remark:**
(1)The lower limit shall apply at the transition frequency.
(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

## 4.2. Test Setup

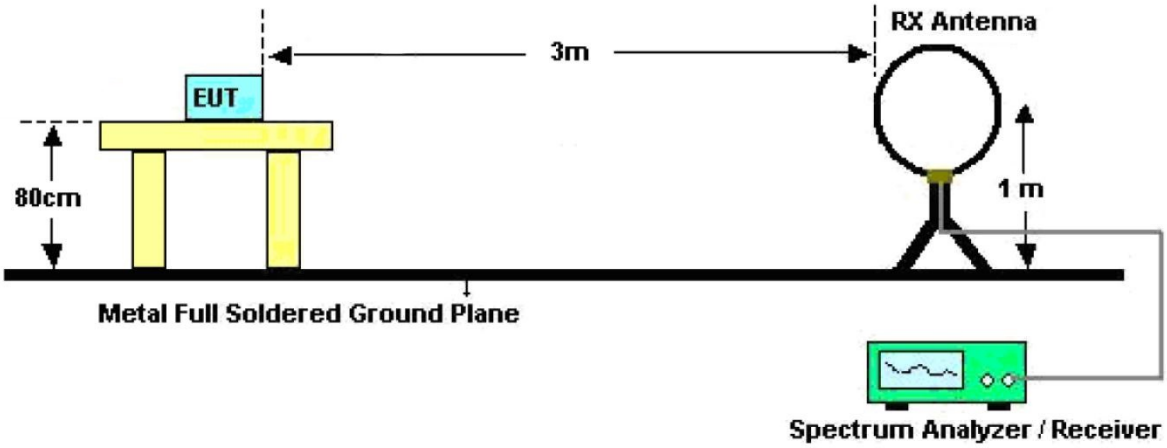



Figure 1. Below 30MHz

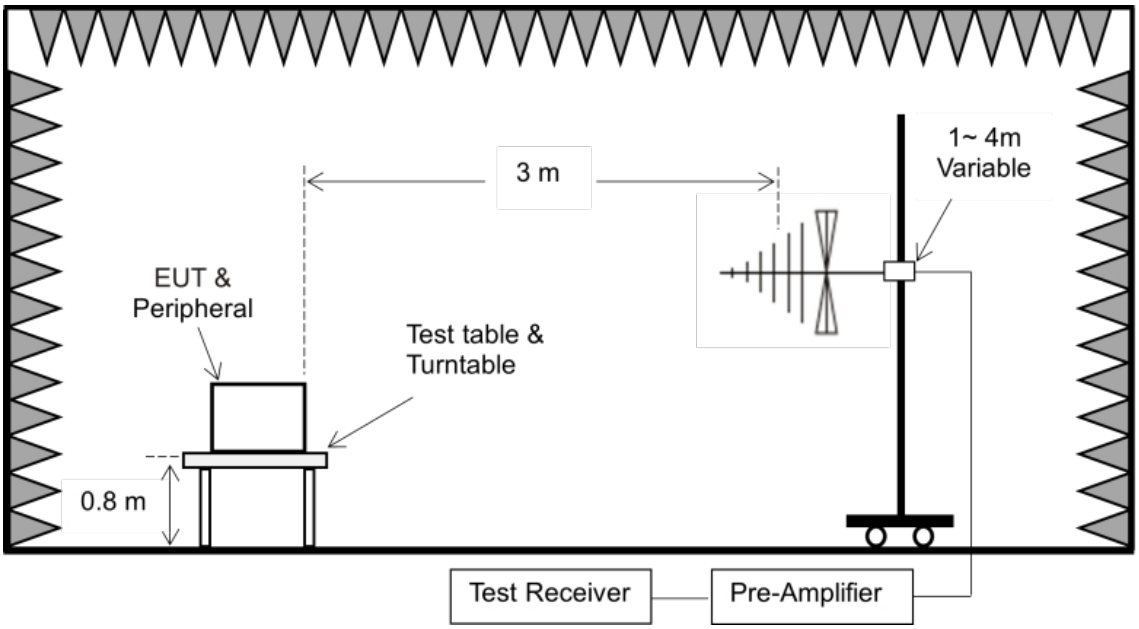



Figure 2. 30MHz to 1GHz

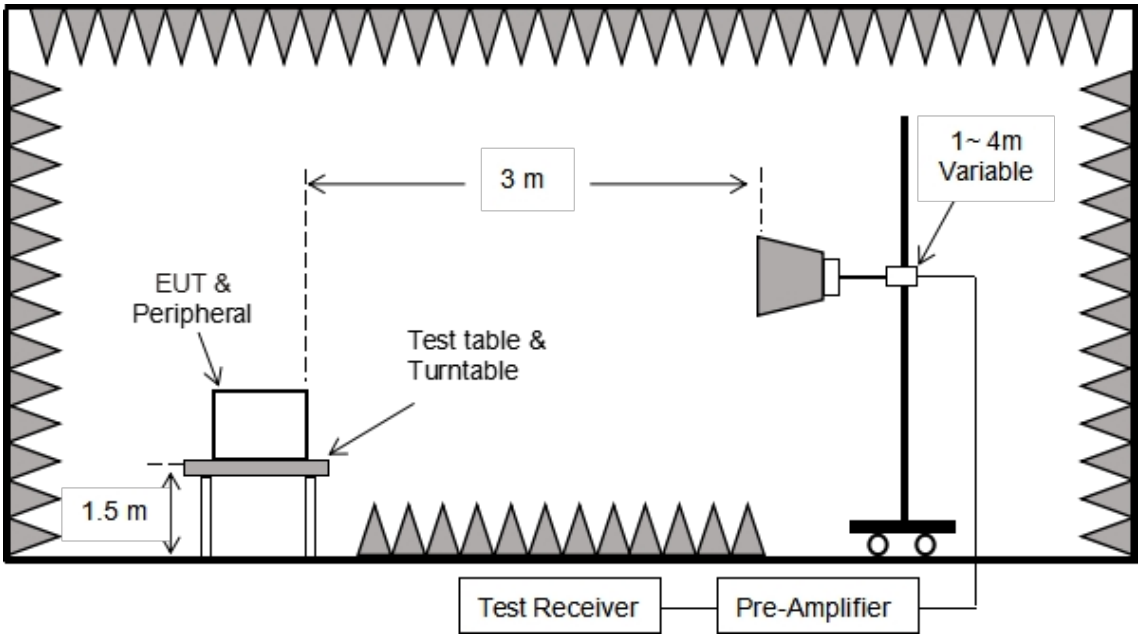



Figure 3. Above 1 GHz

## 4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.
For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.
The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:
RBW = 100kHz, VBW =300kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.
.
For above 1GHz,Set the spectrum analyzer as:
RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.
For average measurement:
–VBW=10Hz, When duty cycle is no less than 98 percent
–VBW⩾1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation, so refer to this clause 5.4 duty cycle.

**4.4. Test Data**

**PASS**

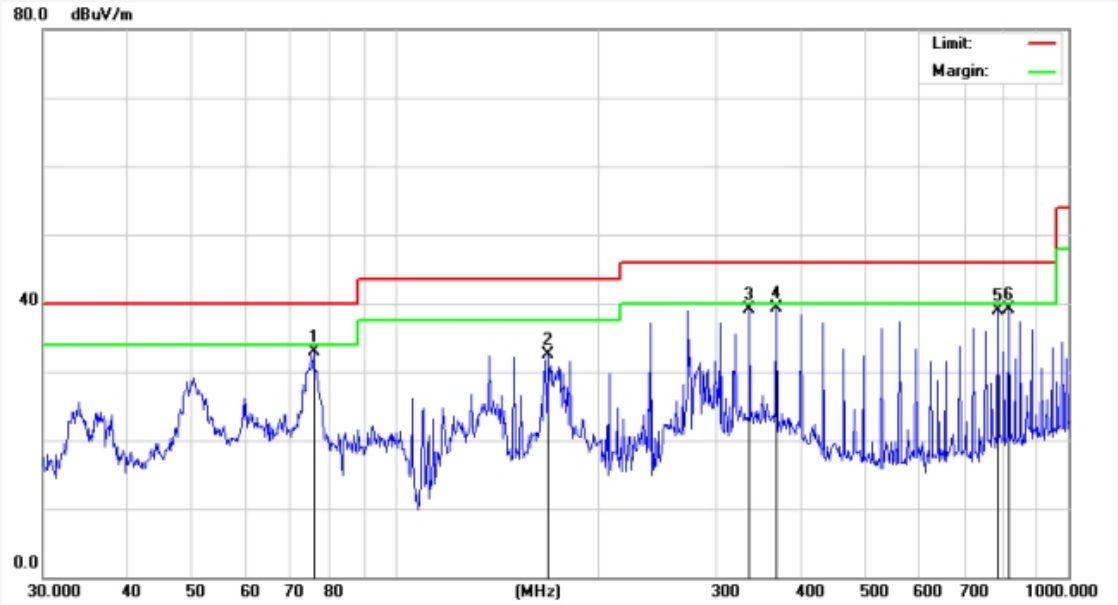
During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

During the test, pre-scan all modes, and found the 802.11n(HT40) CH06 which is the worst case, only the worst case is recorded in the report.

**Test Results (30~1000MHz)**

| | | | |
|---|---|---|---|
| Test Mode: | 802.11n(HT40) CH06 | Temp.(℃)/Hum.(%RH): | 23.5℃/50%RH |
| Polarization: | Horizontal | Power Source: | AC 120V, 60Hz for Adapter |

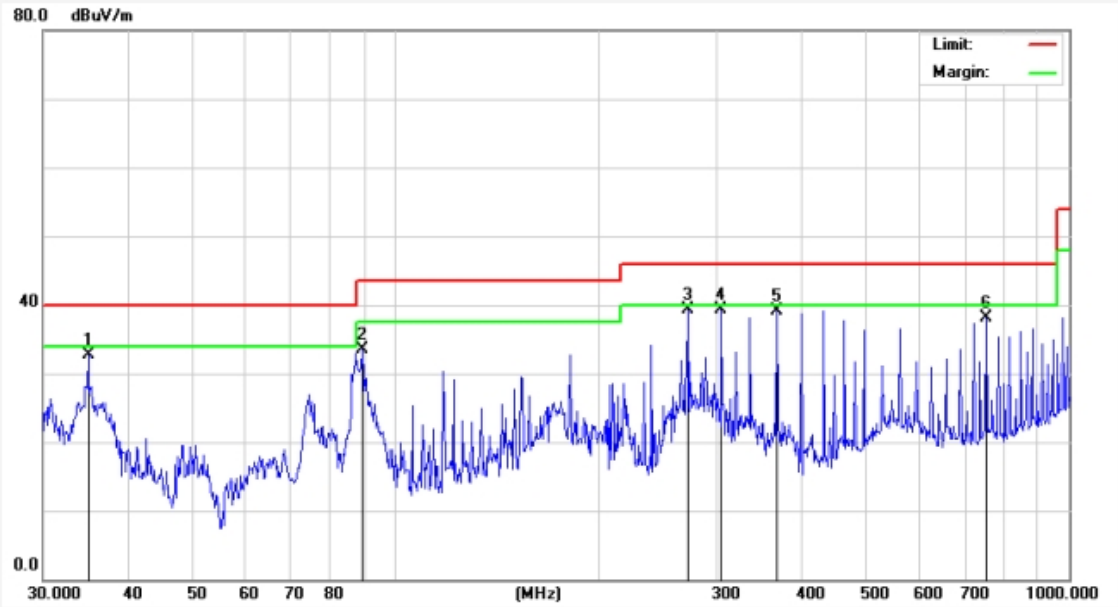



| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 75.7112 | 53.64 | -20.65 | 32.99 | 40.00 | -7.01 | QP | | | |
| 2 | 169.0054 | 53.78 | -21.36 | 32.42 | 43.50 | -11.08 | QP | | | |
| 3 | 336.0350 | 52.54 | -13.35 | 39.19 | 46.00 | -6.81 | QP | | | |
| 4 | 368.1116 | 52.27 | -12.98 | 39.29 | 46.00 | -6.71 | QP | | | |
| 5 | 785.0932 | 43.30 | -4.48 | 38.82 | 46.00 | -7.18 | QP | | | |
| 6 | 815.9678 | 42.98 | -3.84 | 39.14 | 46.00 | -6.86 | QP | | | |

Remark:
Result(dBμV/m) = Reading(dBμV) + Factor(dB/m);
Over Limit(dB) = Result(dBμV/m) - Limit(dBμV/m)

**Test Results (30~1000MHz)**

| | | | |
|---|---|---|---|
| Test Mode: | 802.11n(HT40) CH06 | Temp.(℃)/Hum.(%RH): | 23.5℃/50%RH |
| Polarization: | Vertical | Power Source: | AC 120V, 60Hz for Adapter |




| No. | Freq. (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit (dBuV/m) | Over Limit (dB) | Detector | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 35.0048 | 49.00 | -16.27 | 32.73 | 40.00 | -7.27 | QP | | | |
| 2 | 89.2762 | 49.52 | -15.92 | 33.60 | 43.50 | -9.90 | QP | | | |
| 3 | 272.2776 | 53.79 | -14.44 | 39.35 | 46.00 | -6.65 | QP | | | |
| 4 | 304.6099 | 52.49 | -13.27 | 39.22 | 46.00 | -6.78 | QP | | | |
| 5 | 368.1116 | 50.86 | -11.73 | 39.13 | 46.00 | -6.87 | QP | | | |
| 6 | 752.7432 | 43.28 | -5.17 | 38.11 | 46.00 | -7.89 | QP | | | |

Remark:

Result(dBμV/m) = Reading(dBμV) + Factor(dB/m);

Over Limit(dB) = Result(dBμV/m) - Limit(dBμV/m)

**Test Results (Above 1000MHz)**

| Test Mode: 802.11n(HT40) Mode | | | | Test channel: Lowest | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 4844.00 | 26.38 | 15.35 | 41.73 | 74.00 | -32.27 | Vertical |
| 7266.00 | 27.28 | 18.05 | 45.33 | 74.00 | -28.67 | Vertical |
| 9688.00 | 28.54 | 23.78 | 52.32 | 74.00 | -21.68 | Vertical |
| 12110.00 | * | | | 74.00 | | Vertical |
| 14532.00 | * | | | 74.00 | | Vertical |
| 4844.00 | 24.51 | 15.35 | 39.86 | 74.00 | -34.14 | Horizontal |
| 7266.00 | 28.37 | 18.05 | 46.42 | 74.00 | -27.58 | Horizontal |
| 9688.00 | 27.35 | 23.78 | 51.13 | 74.00 | -22.87 | Horizontal |
| 12110.00 | * | | | 74.00 | | Horizontal |
| 14532.00 | * | | | 74.00 | | Horizontal |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 4844.00 | 17.15 | 15.35 | 32.50 | 54.00 | -21.50 | Vertical |
| 7266.00 | 19.20 | 18.05 | 37.25 | 54.00 | -16.75 | Vertical |
| 9688.00 | 19.05 | 23.78 | 42.83 | 54.00 | -11.17 | Vertical |
| 12110.00 | * | | | 54.00 | | Vertical |
| 14532.00 | * | | | 54.00 | | Vertical |
| 4844.00 | 16.88 | 15.35 | 32.23 | 54.00 | -21.77 | Horizontal |
| 7266.00 | 18.77 | 18.05 | 36.82 | 54.00 | -17.18 | Horizontal |
| 9688.00 | 18.62 | 23.78 | 42.40 | 54.00 | -11.60 | Horizontal |
| 12110.00 | * | | | 54.00 | | Horizontal |
| 14532.00 | * | | | 54.00 | | Horizontal |

**Test Results (Above 1000MHz)**

| Test Mode: 802.11n(HT40) Mode | | | | Test channel: Middle | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 4874.00 | 25.87 | 15.41 | 41.28 | 74.00 | -32.72 | Vertical |
| 7311.00 | 27.15 | 18.01 | 45.16 | 74.00 | -28.84 | Vertical |
| 9748.00 | 28.50 | 23.79 | 52.29 | 74.00 | -21.71 | Vertical |
| 12185.00 | * | | | 74.00 | | Vertical |
| 14622.00 | * | | | 74.00 | | Vertical |
| 4874.00 | 26.89 | 15.41 | 42.30 | 74.00 | -31.70 | Horizontal |
| 7311.00 | 28.46 | 18.01 | 46.47 | 74.00 | -27.53 | Horizontal |
| 9748.00 | 29.14 | 23.79 | 52.93 | 74.00 | -21.07 | Horizontal |
| 12185.00 | * | | | 74.00 | | Horizontal |
| 14622.00 | * | | | 74.00 | | Horizontal |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 4874.00 | 17.38 | 15.41 | 32.79 | 54.00 | -21.21 | Vertical |
| 7311.00 | 17.75 | 18.01 | 35.76 | 54.00 | -18.24 | Vertical |
| 9748.00 | 19.10 | 23.79 | 42.89 | 54.00 | -11.11 | Vertical |
| 12185.00 | * | | | 54.00 | | Vertical |
| 14622.00 | * | | | 54.00 | | Vertical |
| 4874.00 | 17.89 | 15.41 | 33.30 | 54.00 | -20.70 | Horizontal |
| 7311.00 | 19.26 | 18.01 | 37.27 | 54.00 | -16.73 | Horizontal |
| 9748.00 | 19.64 | 23.79 | 43.43 | 54.00 | -10.57 | Horizontal |
| 12185.00 | * | | | 54.00 | | Horizontal |
| 14622.00 | * | | | 54.00 | | Horizontal |

**Test Results (Above 1000MHz)**

| Test Mode: 802.11n(HT40) Mode | | | | Test channel: Highest | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 4904.00 | 24.57 | 15.47 | 40.04 | 74.00 | -33.96 | Vertical |
| 7356.00 | 26.87 | 17.99 | 44.86 | 74.00 | -29.14 | Vertical |
| 9808.00 | 29.25 | 23.81 | 53.06 | 74.00 | -20.94 | Vertical |
| 12260.00 | * | | | 74.00 | | Vertical |
| 14712.00 | * | | | 74.00 | | Vertical |
| 4904.00 | 25.96 | 15.47 | 41.43 | 74.00 | -32.57 | Horizontal |
| 7356.00 | 27.01 | 17.99 | 45.00 | 74.00 | -29.00 | Horizontal |
| 9808.00 | 29.08 | 23.81 | 52.89 | 74.00 | -21.11 | Horizontal |
| 12260.00 | * | | | 74.00 | | Horizontal |
| 14712.00 | * | | | 74.00 | | Horizontal |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
| 4904.00 | 15.55 | 15.47 | 31.02 | 54.00 | -22.98 | Vertical |
| 7356.00 | 17.80 | 17.99 | 35.79 | 54.00 | -18.21 | Vertical |
| 9808.00 | 19.76 | 23.81 | 43.57 | 54.00 | -10.43 | Vertical |
| 12260.00 | * | | | 54.00 | | Vertical |
| 14712.00 | * | | | 54.00 | | Vertical |
| 4904.00 | 17.37 | 15.47 | 32.84 | 54.00 | -21.16 | Horizontal |
| 7356.00 | 18.42 | 17.99 | 36.41 | 54.00 | -17.59 | Horizontal |
| 9808.00 | 19.35 | 23.81 | 43.16 | 54.00 | -10.84 | Horizontal |
| 12260.00 | * | | | 54.00 | | Horizontal |
| 14712.00 | * | | | 54.00 | | Horizontal |

Remark:

1. During the test, pre-scan the 802.11b,g,n(HT20),n(HT40) mode, and found the 802.11n (HT40) mode is worse case , the report only record this mode.
2. Result=Reading + Factor
3. “*”, means this data is the too weak instrument of signal is unable to test.

**Radiated Band Edge:**

| Test Mode: 802.11b Mode | | | | Test channel: Lowest | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2310.00 | 38.10 | 9.58 | 47.68 | 74.00 | -26.32 | Horizontal |
| 2390.00 | 40.56 | 9.73 | 50.29 | 74.00 | -23.71 | Horizontal |
| 2310.00 | 39.37 | 9.58 | 48.95 | 74.00 | -25.05 | Vertical |
| 2390.00 | 46.16 | 9.73 | 55.89 | 74.00 | -18.11 | Vertical |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2310.00 | 28.72 | 9.58 | 38.30 | 54.00 | -15.70 | Horizontal |
| 2390.00 | 35.92 | 9.73 | 45.65 | 54.00 | -8.35 | Horizontal |
| 2310.00 | 30.07 | 9.58 | 39.65 | 54.00 | -14.35 | Vertical |
| 2390.00 | 38.25 | 9.73 | 47.98 | 54.00 | -6.02 | Vertical |

| Test Mode: 802.11b Mode | | | | Test channel: Highest | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2483.50 | 46.25 | 9.91 | 56.16 | 74.00 | -17.84 | Horizontal |
| 2500.00 | 40.21 | 9.94 | 50.15 | 74.00 | -23.85 | Horizontal |
| 2483.50 | 46.61 | 9.91 | 56.52 | 74.00 | -17.48 | Vertical |
| 2500.00 | 39.85 | 9.94 | 49.79 | 74.00 | -24.21 | Vertical |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2483.50 | 37.43 | 9.91 | 47.34 | 54.00 | -6.66 | Horizontal |
| 2500.00 | 29.23 | 9.94 | 39.17 | 54.00 | -14.83 | Horizontal |
| 2483.50 | 38.97 | 9.91 | 48.88 | 54.00 | -5.12 | Vertical |
| 2500.00 | 29.67 | 9.94 | 39.61 | 54.00 | -14.39 | Vertical |

Remark: 1. Result=Reading + Factor

**Radiated Band Edge:**

| Test Mode: 802.11g Mode | | | | Test channel: Lowest | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2310.00 | 36.88 | 9.58 | 46.46 | 74.00 | -27.54 | Horizontal |
| 2390.00 | 40.54 | 9.73 | 50.27 | 74.00 | -23.73 | Horizontal |
| 2310.00 | 38.87 | 9.58 | 48.45 | 74.00 | -25.55 | Vertical |
| 2390.00 | 42.54 | 9.73 | 52.27 | 74.00 | -21.73 | Vertical |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2310.00 | 29.16 | 9.58 | 38.74 | 54.00 | -15.26 | Horizontal |
| 2390.00 | 35.43 | 9.73 | 45.16 | 54.00 | -8.84 | Horizontal |
| 2310.00 | 30.10 | 9.58 | 39.68 | 54.00 | -14.32 | Vertical |
| 2390.00 | 35.87 | 9.73 | 45.60 | 54.00 | -8.40 | Vertical |

| Test Mode: 802.11g Mode | | | | Test channel: Highest | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2483.50 | 46.33 | 9.91 | 56.24 | 74.00 | -17.76 | Horizontal |
| 2500.00 | 40.35 | 9.94 | 50.29 | 74.00 | -23.71 | Horizontal |
| 2483.50 | 46.69 | 9.91 | 56.60 | 74.00 | -17.40 | Vertical |
| 2500.00 | 40.01 | 9.94 | 49.95 | 74.00 | -24.05 | Vertical |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2483.50 | 35.60 | 9.91 | 45.51 | 54.00 | -8.49 | Horizontal |
| 2500.00 | 28.33 | 9.94 | 38.27 | 54.00 | -15.73 | Horizontal |
| 2483.50 | 37.92 | 9.91 | 47.83 | 54.00 | -6.17 | Vertical |
| 2500.00 | 29.20 | 9.94 | 39.14 | 54.00 | -14.86 | Vertical |

Remark: 1. Result=Reading + Factor

**Radiated Band Edge:**

| Test Mode: 802.11n (HT20) Mode | | | | Test channel: Lowest | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2310.00 | 34.88 | 9.58 | 44.46 | 74.00 | -29.54 | Horizontal |
| 2390.00 | 38.54 | 9.73 | 48.27 | 74.00 | -25.73 | Horizontal |
| 2310.00 | 37.87 | 9.58 | 47.45 | 74.00 | -26.55 | Vertical |
| 2390.00 | 40.54 | 9.73 | 50.27 | 74.00 | -23.73 | Vertical |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2310.00 | 27.84 | 9.58 | 37.42 | 54.00 | -16.58 | Horizontal |
| 2390.00 | 33.18 | 9.73 | 42.91 | 54.00 | -11.09 | Horizontal |
| 2310.00 | 27.71 | 9.58 | 37.29 | 54.00 | -16.71 | Vertical |
| 2390.00 | 33.87 | 9.73 | 43.60 | 54.00 | -10.40 | Vertical |

| Test Mode: 802.11n (HT20) Mode | | | | Test channel: Highest | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2483.50 | 44.02 | 9.91 | 53.93 | 74.00 | -20.07 | Horizontal |
| 2500.00 | 38.21 | 9.94 | 48.15 | 74.00 | -25.85 | Horizontal |
| 2483.50 | 45.61 | 9.91 | 55.52 | 74.00 | -18.48 | Vertical |
| 2500.00 | 39.85 | 9.94 | 49.79 | 74.00 | -24.21 | Vertical |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2483.50 | 33.58 | 9.91 | 43.49 | 54.00 | -10.51 | Horizontal |
| 2500.00 | 28.48 | 9.94 | 38.42 | 54.00 | -15.58 | Horizontal |
| 2483.50 | 34.74 | 9.91 | 44.65 | 54.00 | -9.35 | Vertical |
| 2500.00 | 29.34 | 9.94 | 39.28 | 54.00 | -14.72 | Vertical |

Remark: 1. Result=Reading + Factor

**Radiated Band Edge:**

| Test Mode: 802.11n (HT40) Mode | | | | Test channel: Lowest | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2310.00 | 37.35 | 9.58 | 46.93 | 74.00 | -27.07 | Horizontal |
| 2390.00 | 41.54 | 9.73 | 51.27 | 74.00 | -22.73 | Horizontal |
| 2310.00 | 39.87 | 9.58 | 49.45 | 74.00 | -24.55 | Vertical |
| 2390.00 | 42.75 | 9.73 | 52.48 | 74.00 | -21.52 | Vertical |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2310.00 | 28.76 | 9.58 | 38.34 | 54.00 | -15.66 | Horizontal |
| 2390.00 | 34.23 | 9.73 | 43.96 | 54.00 | -10.04 | Horizontal |
| 2310.00 | 28.91 | 9.58 | 38.49 | 54.00 | -15.51 | Vertical |
| 2390.00 | 33.27 | 9.73 | 43.00 | 54.00 | -11.00 | Vertical |

| Test Mode: 802.11n (HT40) Mode | | | | Test channel: Highest | | |
|---|---|---|---|---|---|---|
| Peak value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2483.50 | 43.93 | 9.91 | 53.84 | 74.00 | -20.16 | Horizontal |
| 2500.00 | 38.89 | 9.94 | 48.83 | 74.00 | -25.17 | Horizontal |
| 2483.50 | 45.74 | 9.91 | 55.65 | 74.00 | -18.35 | Vertical |
| 2500.00 | 40.35 | 9.94 | 50.29 | 74.00 | -23.71 | Vertical |
| Average value: | | | | | | |
| Frequency (MHz) | Reading (dBuV) | Factor (dB/m) | Result (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | Polarization |
| 2483.50 | 33.28 | 9.91 | 43.19 | 54.00 | -10.81 | Horizontal |
| 2500.00 | 30.48 | 9.94 | 40.42 | 54.00 | -13.58 | Horizontal |
| 2483.50 | 34.74 | 9.91 | 44.65 | 54.00 | -9.35 | Vertical |
| 2500.00 | 30.34 | 9.94 | 40.28 | 54.00 | -13.72 | Vertical |

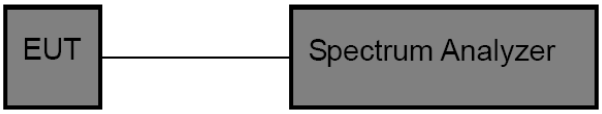
Remark: 1. Result=Reading + Factor

# 5. Maximum Output Power Test

## 5.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | FCC Part15 C Section 15.247 (b)(3) |
| Test Limit | 30dBm |

## 5.2. Test Setup




## 5.3. Test Procedure

1. Measure the duty cycle D of the transmitter output signal.
2. Set span to at least 1.5 times the OBW.
3. Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
4. Set VBW ≥ [3 × RBW].
5. Number of points in sweep ≥ [2 × span / RBW].
6. Sweep time = auto.
7. Detector = RMS
8. Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the ON and OFF periods of the transmitter.
9. Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
10. Add [10 log (1 / D)], where D is the duty cycle, to the measured power to compute the average power during the actual transmission times.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

## 5.4. Test Data

Pass
Please refer to Appendix C of the Appendix Test Data.

**Additional test for duty cycle.**

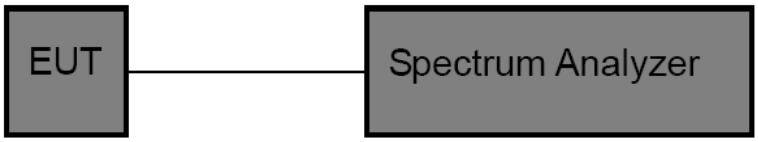
Please refer to Appendix G of the Appendix Test Data.

# 6. 6dB Occupy Bandwidth Test

## 6.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | FCC Part15 C Section 15.247 (a)(2) |
| Test Limit | >500kHz |

## 6.2. Test Setup




## 6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:

6dB Bandwidth:

a) Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.
b) Set the VBW ≥ [3 × RBW].
c) Detector = peak.
d) Trace mode = max-hold.
e) Sweep = No faster than coupled (auto) time.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “−6 dB down amplitude”. If a marker is below this “−6 dB down amplitude” value, then it shall be as close as possible to this value.

99% Occupied Bandwidth:
RBW=1~5% OBW, VBW=3*RBW, Sweep Time= Auto, Detector= Peak, Trace= Max hold

## 6.4. Test Data

Pass

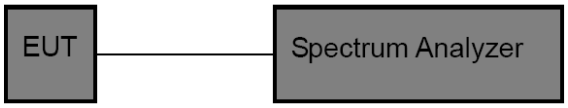
Please refer to Appendix A of the Appendix Test Data.

# 7. Power Spectral Density Test

## 7.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | FCC Part15 C Section15.247 (e) |
| Test Limit | 8dBm/3kHz |

## 7.2. Test Setup




## 7.3. Test Procedure

1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 1.5xDTS BW
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

## 7.4. Test Data

Pass

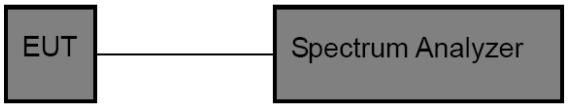
Please refer to Appendix D of the Appendix Test Data.

# 8. 100kHz Bandwidth of Frequency Band Edge Requirement

## 8.1. Test Standard and Limit

| | |
|---|---|
| Test Standard | FCC Part15 C Section 15.247 (d) |
| Test Limit | in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a). |

## 8.2. Test Setup




## 8.3. Test Procedure

Using the following spectrum analyzer setting:

1. Set the RBW = 100kHz.
2. Set the VBW = 300kHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

## 8.4. Test Data

Pass

Please refer to Appendix E & Appendix F of the Appendix Test Data.

# 9. Antenna Requirement

## 9.1. Test Standard and Requirement

| | |
|---|---|
| Test Standard | FCC Part15 Section 15.203 /247(c) |
| Requirement | 1) 15.203 requirement:<br>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.<br>2) 15.247(c) (1)(i) requirement:<br>Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi. |

## 9.2. Antenna Connected Construction

The antenna is a FPC antenna which permanently attached, and the best case gain of the antenna is 5dBi It complies with the standard requirement.

# APPENDIX I -- TEST SETUP PHOTOGRAPH

Please refer to separated files Appendix I -- Test Setup Photograph_RF

# APPENDIX II -- EXTERNAL PHOTOGRAPH

Please refer to separated files Appendix II -- External Photograph

# APPENDIX III -- INTERNAL PHOTOGRAPH

Please refer to separated files Appendix III -- Internal Photograph

---------- End of Report ----------