# FCC RADIO TEST REPORT

| | | |
|---|---|---|
| FCC ID | : | QXO-AP510I |
| Equipment | : | 802.11ax Access Point |
| Brand Name | : | Extreme Networks |
| Model Name | : | AP560i |
| Applicant | : | Extreme Networks, Inc.<br>6480 Via Del Oro, San Jose, CA 95119 |
| Manufacturer | : | Extreme Networks, Inc.<br>6480 Via Del Oro, San Jose, CA 95119 |
| Standard | : | 47 CFR FCC Part 15.247 |

The product was received on Feb. 15, 2019, and testing was started from Feb. 19, 2019 and completed on Mar. 13, 2019. We, SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013 and shown compliance with the applicable technical standards.

The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any agency of government.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

*SPORTON INTERNATIONAL INC. EMC & Wireless Communications Laboratory*

*No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.)*

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# History of this test report

| Report No. | Version | Description | Issued Date |
|---|---|---|---|
| FR8O1739-07AB | 01 | Initial issue of report | Apr. 10, 2019 |
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# Summary of Test Result

| Report Clause | Ref Std. Clause | Test Items | Result (PASS/FAIL) | Remark |
|---|---|---|---|---|
| 1.1.2 | 15.203 | Antenna Requirement | PASS | - |
| 3.1 | 15.207 | AC Power-line Conducted Emissions | PASS | - |
| 3.2 | 15.247(d) | Emissions in Restricted Frequency Bands | PASS | - |

| **Declaration of Conformity:** |
|---|
| The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers. |
| **Comments and Explanations:** |
| 1. The test configuration, test mode and test software were written in this test report are declared by the manufacturer.<br>2. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification. |

**Reviewed by: Cliff Chang**
**Report Producer: Wendy Pan**

# 1 General Description

## 1.1 Information

### 1.1.1 RF General Information

| Frequency Range (MHz) | IEEE Std. | Ch. Frequency (MHz) | Channel Number |
|---|---|---|---|
| 2400-2483.5 | 802.15.4 | 2405-2480 | 11-26 [16] |

| Band | Mode | BWch (MHz) | Nant |
|---|---|---|---|
| 2.4-2.4835GHz | Thread | 3 | 1TX |

Note:
- Thread uses a O-QPSK (250kbps) modulation for DSSS.
- BWch is the nominal channel bandwidth.
- Nss-Min is the minimum number of spatial streams.
- Nant is the number of outputs. e.g., 2(2,3) means have 2 outputs for port 2 and port 3. 2 means have 2 outputs for port 1 and port 2.

### 1.1.2 Antenna Information

| Ant. | Port | | | Brand | Model Name | Antenna Type | Connector | Radio | Antenna Gain(dBi) |
|---|---|---|---|---|---|---|---|---|---|
| | 1TX | 2TX | 4TX | | | | | | |
| 1 | 1 | 1 | 1 | WNC | Starlord 510i | PIFA | I-PEX | R1-5GHz | Note 1 |
| 2 | - | 2 | 2 | WNC | Starlord 510i | PIFA | I-PEX | R1-5GHz | Note 1 |
| 3 | - | - | 3 | WNC | Starlord 510i | PIFA | I-PEX | R1-5GHz | Note 1 |
| 4 | - | - | 4 | WNC | Starlord 510i | PIFA | I-PEX | R1-5GHz | Note 1 |
| 5 | R2-1 | R2-1 | R1-4<br>R2-1 | WNC | Starlord 510i | PIFA | I-PEX | R1-2.4GHz<br>R2-5GHz | Note 1 |
| 6 | - | R2-2 | R1-3<br>R2-2 | WNC | Starlord 510i | PIFA | I-PEX | R1-2.4GHz<br>R2-5GHz | Note 1 |
| 7 | - | R1-2 | R1-2<br>R2-3 | WNC | Starlord 510i | PIFA | I-PEX | R1-2.4GHz<br>R2-5GHz | Note 1 |
| 8 | R1-1 | R1-1 | R1-1<br>R2-4 | WNC | Starlord 510i | PIFA | I-PEX | R1-2.4GHz<br>R2-5GHz | Note 1 |
| 9 | 1 | - | - | WNC | Starlord 510i | PIFA | I-PEX | R3 | Note 1 |

Note1:

| Ant. | Antenna Gain(dBi) | | | |
|---|---|---|---|---|
| | WLAN 2.4GHz | WLAN 5GHz | Bluetooth | Thread |
| 1 | - | 5.89 | - | - |
| 2 | - | 5.36 | - | - |
| 3 | - | 5.67 | - | - |
| 4 | - | 5.36 | - | - |
| 5 | 3.48 | 4.57 | - | - |
| 6 | 3.80 | 4.40 | - | - |
| 7 | 3.84 | 4.98 | - | - |
| 8 | 3.90 | 5.18 | - | - |
| 9 | - | - | 4.40 | 4.40 |

Note2: The above information was declared by manufacturer.

Note3:

**For 2.4GHz function:**

**For IEEE 802.11b/g/n/ax mode (1TX, 2TX, 4TX/4RX):**

For 1TX

Only Port 1 can be use as transmitting antenna.

For 2TX

Port 1 and Port 2 can be use as transmitting antenna.

Port 1 and Port 2 could transmit simultaneously.

For 4TX

Port 1, Port 2, Port 3 and Port 4 can be use as transmitting antenna.

Port 1, Port 2, Port 3 and Port 4 could transmit simultaneously.

For 4RX

Port 1, Port 2, Port 3 and Port 4 can be used as receiving antennas.

Port 1, Port 2, Port 3 and Port 4 could receive simultaneously.

**For 5GHz function:**
**For IEEE 802.11a/n/ac/ax mode (1TX, 2TX, 4TX/4RX):**
For 1TX
Only Port 1 can be use as transmitting antenna.
For 2TX
Port 1 and Port 2 can be use as transmitting antenna.
Port 1 and Port 2 could transmit simultaneously.
For 4TX
Port 1, Port 2, Port 3 and Port 4 can be use as transmitting antenna.
Port 1, Port 2, Port 3 and Port 4 could transmit simultaneously.
For 4RX
Port 1, Port 2, Port 3 and Port 4 can be used as receiving antennas.
Port 1, Port 2, Port 3 and Port 4 could receive simultaneously.
**For Bluetooth and Thread mode (1TX/1RX):**
Only Port 1 can be use as transmitting/receiving antenna.

### 1.1.3 EUT Operational Condition

| | | | | |
|---|---|---|---|---|
| **EUT Power Type** | From PoE | | | |
| **Beamforming Function** | ☐ | With beamforming | ☒ | Without beamforming |
| **Function** | ☒ | Point-to-multipoint | ☐ | Point-to-point |
| **Test Software Version** | Tftpd32、Telnet | | | |

Note: The above information was declared by manufacturer.

### 1.1.4 Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR8O1739-01AB

Below is the table for the change of the product with respect to the original one.

| Modifications | Performance Checking |
|---|---|
| Adding a model name: AP560i<br>Based on above modification.<br>1. Adding the outdoor function.<br>2. Changing the EUT case.<br>3. Removing USB Port.<br>4. Power Supply: From PoE only. | 1. AC power-line conducted emissions<br>2. Emissions in Restricted Frequency Bands<br>Note:<br>For Emissions in Restricted Frequency Bands above 1GHz:<br>After evaluating, the test mode was based on test mode of original maximum output power to retest. Please refer to test result for detail test mode. |

### 1.1.5 Table for Multiple Listing

The EUT has three radios, the information as following table:

| Radio | Function | | |
|---|---|---|---|
| | WLAN 2.4GHz | WLAN 5GHz | Bluetooth/Thread |
| 1 | V | V | - |
| 2 | - | V | - |
| 3 | - | - | V |

### 1.1.6 Table for EUT support function

| Function | Support Type | Support Band |
|---|---|---|
| AP | Master | WLAN 2.4GHz/Bluetooth/Thread/WLAN 5GHz Band 1~4 |
| Client | Slave without Radar Detection (Sensor Mode) | WLAN 2.4GHz/Bluetooth/Thread/WLAN 5GHz Band 1+4 |
| Bridge | Master | WLAN 2.4GHz/Bluetooth/Thread/WLAN 5GHz Band 1+4 |
| Mesh | Master | WLAN 2.4GHz/Bluetooth/Thread/WLAN 5GHz Band 1+4 |

Note: The above information was declared by manufacturer.

## 1.2 Testing Applied Standards

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

- 47 CFR FCC Part 15
- ANSI C63.10-2013
- FCC KDB 558074 D01 v05

## 1.3 Testing Location Information

| Testing Location | | | | | | | |
|---|---|---|---|---|---|---|---|
| ☐ | HWA YA | ADD | : | No. 52, Huaya 1st Rd., Guishan Dist., Taoyuan City, Taiwan (R.O.C.) | | | |
| | | TEL | : | 886-3-327-3456 | FAX | : | 886-3-327-0973 |
| ☒ | JHUBEI | ADD | : | No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. | | | |
| | | TEL | : | 886-3-656-9065 | FAX | : | 886-3-656-9085 |

| Test Condition | Test Site No. | Test Engineer | Test Environment | Test Date |
|---|---|---|---|---|
| Radiated (Below 1GHz) | 03CH01-CB | KJ Chang | 22~25°C / 54~61% | Feb. 19, 2019 ~ Feb. 20, 2019 |
| Radiated (Above 1GHz) | 03CH01-CB | Stim Sung | 22~25°C / 51~66% | Feb. 20, 2019 ~ Mar. 13, 2019 |
| AC Conduction | CO02-CB | Peter Wu | 23.6~23.8°C / 61~62.3% | Feb. 22, 2019 |

Test site Designation No. TW0006 with FCC.
Test site registered number IC 4086B with Industry Canada.

## 1.4 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)

| Test Items | Uncertainty | Remark |
|---|---|---|
| Conducted Emission (150kHz ~ 30MHz) | 2.0 dB | Confidence levels of 95% |
| Radiated Emission (30MHz ~ 1,000MHz) | 3.6 dB | Confidence levels of 95% |
| Radiated Emission (1GHz ~ 18GHz) | 3.7 dB | Confidence levels of 95% |
| Radiated Emission (18GHz ~ 40GHz) | 3.5 dB | Confidence levels of 95% |

# 2 Test Configuration of EUT

## 2.1 Test Channel Mode

**For Radiated Emission:**

| Mode | PowerSetting |
|---|---|
| Thread_1TX | - |
| 2440MHz | 32 |

## 2.2 The Worst Case Measurement Configuration

| The Worst Case Mode for Following Conformance Tests | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Tests Item** | AC power-line conducted emissions | | | | | | | | |
| **Condition** | AC power-line conducted measurement for line and neutral | | | | | | | | |
| **Operating Mode** | Normal Link | | | | | | | | |
| | Radio 1 with 2.4GHz function | Radio 1 with 5GHz function | Radio 2 with 5GHz function | Radio 3 with Bluetooth | Radio 3 with Thread | EUT GE1 | EUT GE2 | PoE connect with EUT GE1 | PoE connect with EUT GE2 |
| 1 | ● | - | ● | ● | - | ● | ● | ● | - |
| 2 | - | ● | ● | ● | - | ● | ● | ● | - |
| 3 | ● | - | ● | - | ● | ● | ● | ● | - |
| 4 | - | ● | ● | - | ● | ● | ● | ● | - |
| Mode 3 has been evaluated to be the worst case among Mode 1~4, thus measurement for Mode 5 will follow this same test mode. | | | | | | | | | |
| 5 | ● | - | ● | - | ● | ● | ● | - | ● |
| Mode 3 generated the worst test result, so it was recorded in this report. | | | | | | | | | |

| The Worst Case Mode for Following Conformance Tests | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Tests Item** | Emissions in Restricted Frequency Bands | | | | | | | | | | |
| **Test Condition** | Radiated measurement<br>If EUT consist of multiple antenna assembly (multiple antenna are used in EUT regardless of spatial multiplexing MIMO configuration), the radiated test should be performed with highest antenna gain of each antenna type. | | | | | | | | | | |
| **Operating Mode < 1GHz** | Normal Link | | | | | | | | | | |
| | EUT at Z-axis | EUT at Y-axis | Radio 1 with 2.4GHz function | Radio 1 with 5GHz function | Radio 2 with 5GHz function | Radio 3 with Bluetooth | Radio 3 with Thread | EUT GE1 | EUT GE2 | PoE connect with EUT GE1 | PoE connect with EUT GE2 |
| 1 | ● | - | ● | - | ● | ● | - | ● | ● | ● | - |
| 2 | - | ● | ● | - | ● | ● | - | ● | ● | ● | - |
| Mode 1 has been evaluated to be the worst case between Mode 1~2, thus measurement for Mode 3 ~ 5 will follow this same test mode. | | | | | | | | | | | |
| 3 | ● | - | - | ● | ● | ● | - | ● | ● | ● | - |
| 4 | ● | - | ● | - | ● | - | ● | ● | ● | ● | - |
| 5 | ● | - | - | ● | ● | - | ● | ● | ● | ● | - |
| Mode 4 has been evaluated to be the worst case among Mode 1~5, thus measurement for Mode 6 will follow this same test mode. | | | | | | | | | | | |
| 6 | ● | - | ● | - | ● | - | ● | ● | ● | - | ● |
| Mode 6 generated the worst test result, so it was recorded in this report. | | | | | | | | | | | |
| **Operating Mode > 1GHz** | CTX | | | | | | | | | | |
| The EUT was performed at Y axis and Z axis position and the worst case was found at Y axis. So the measurement will follow this same test configuration. | | | | | | | | | | | |
| 1 | EUT in Y axis | | | | | | | | | | |

| The Worst Case Mode for Following Conformance Tests | |
|---|---|
| **Tests Item** | Simultaneous Transmission Analysis - Co-location RF Exposure Evaluation |
| **Operating Mode** | |
| 1 | WLAN 2.4GHz (Radio 1) + WLAN 5GHz (Radio 2) + Bluetooth (Radio 3) |
| 2 | WLAN 5GHz (Radio 1) + WLAN 5GHz (Radio 2) + Bluetooth (Radio 3) |
| 3 | WLAN 2.4GHz (Radio 1) + WLAN 5GHz (Radio 2) + Thread (Radio 3) |
| 4 | WLAN 5GHz (Radio 1) + WLAN 5GHz (Radio 2) + Thread (Radio 3) |
| Refer to Sporton Test Report No.: FA8O1739-07 for Co-location RF Exposure Evaluation. | |

Note: 1.The PoE is for measurement only, would not be marketed.
PoE information as below:

| Power | Brand | Model |
|---|---|---|
| PoE | Microsemi | PD-9001GR/AT/AC |

## 2.3 EUT Operation during Test

**For Normal Link:**

During the test, the EUT operation to normal function.

**For CTX Mode:**

The EUT was programmed to be in continuously transmitting mode.

## 2.4 Accessories

N/A

## 2.5 Support Equipment

**For AC power-line conducted emissions test:**

| Support Equipment | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| A | PoE | Microsemi | PD-9001GR/AT/AC | N/A |
| B | GE1 PC | DELL | T3400 | N/A |
| C | GE2 NB | DELL | E6430 | N/A |
| D | WLAN2.4G NB | DELL | E6430 | N/A |
| E | WLAN5G NB | DELL | E6430 | N/A |
| F | 802.11ax Access Point (Device) | Extreme Networks | AP505i | QXO-AP505I |
| G | Device NB | DELL | E6430 | N/A |

**For Radiated Below 1GHz test:**

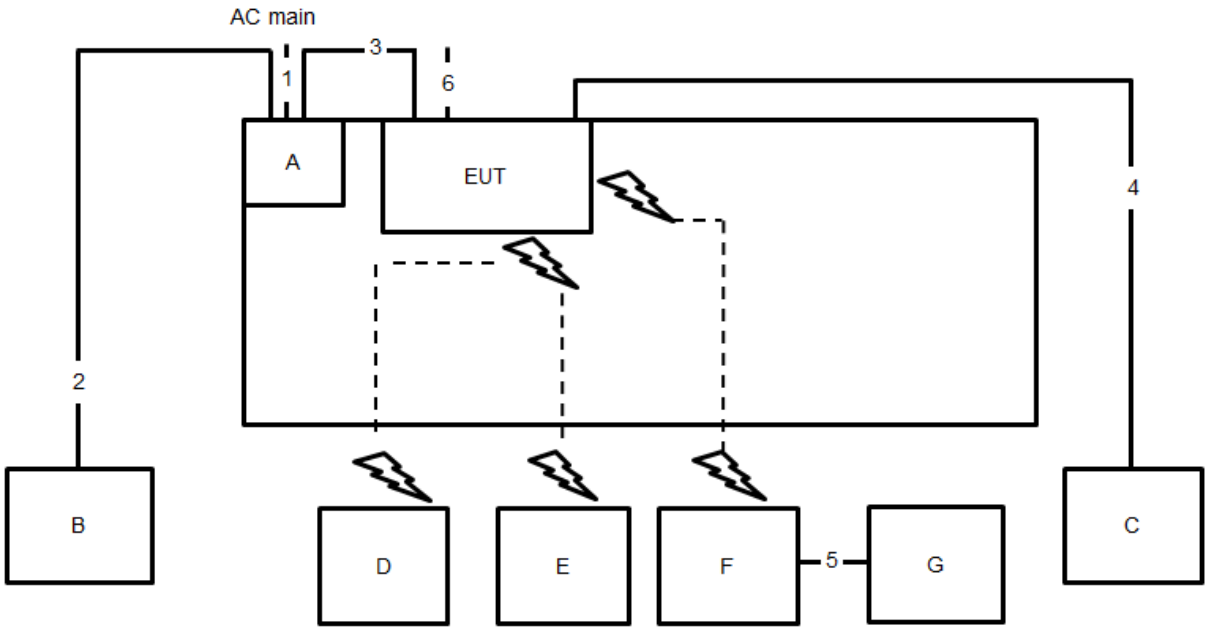
| Support Equipment | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| A | GE1 PC | ASUS | N/A | N/A |
| B | GE2 NB | DELL | E4300 | N/A |
| C | WLAN2.4G NB | DELL | E4300 | N/A |
| D | WLAN5G NB | DELL | E4300 | N/A |
| E | 802.11ax Access Point (Device) | Extreme Networks | AP505i | QXO-AP505I |
| F | Device NB | DELL | E4300 | N/A |
| G | PoE | Microsemi | PD-9001GR/AT/AC | N/A |

**For Radiated Above 1GHz test:**

| Support Equipment | | | | |
|---|---|---|---|---|
| **No.** | **Equipment** | **Brand Name** | **Model Name** | **FCC ID** |
| A | Notebook | DELL | E4300 | N/A |
| E | PoE | Microsemi | PD-9001GR/AT/AC | N/A |

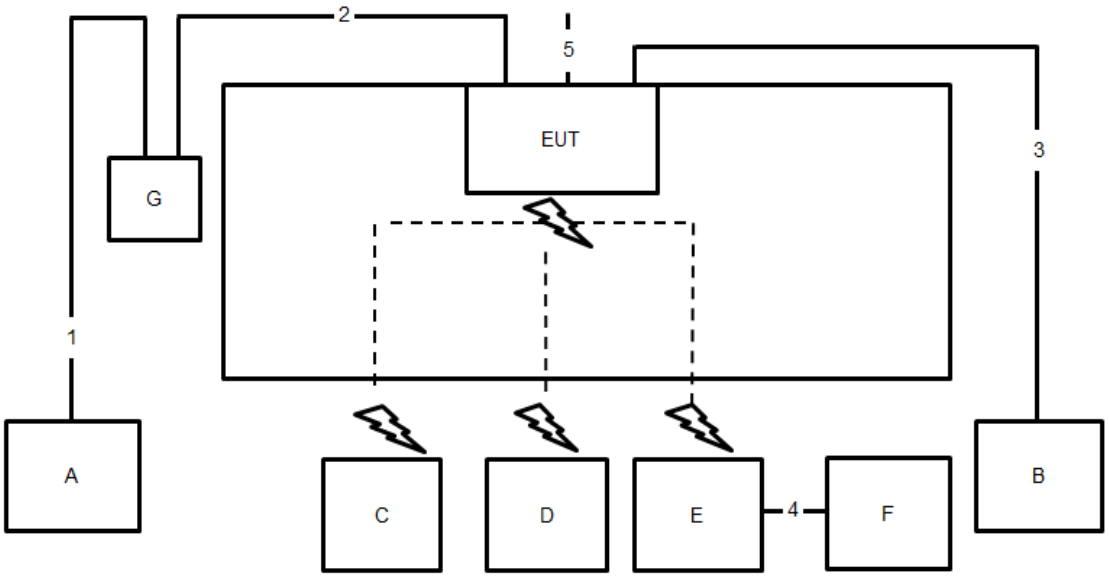
## 2.6 Test Setup Diagram

**Test Setup Diagram – AC Line Conducted Emission Test**



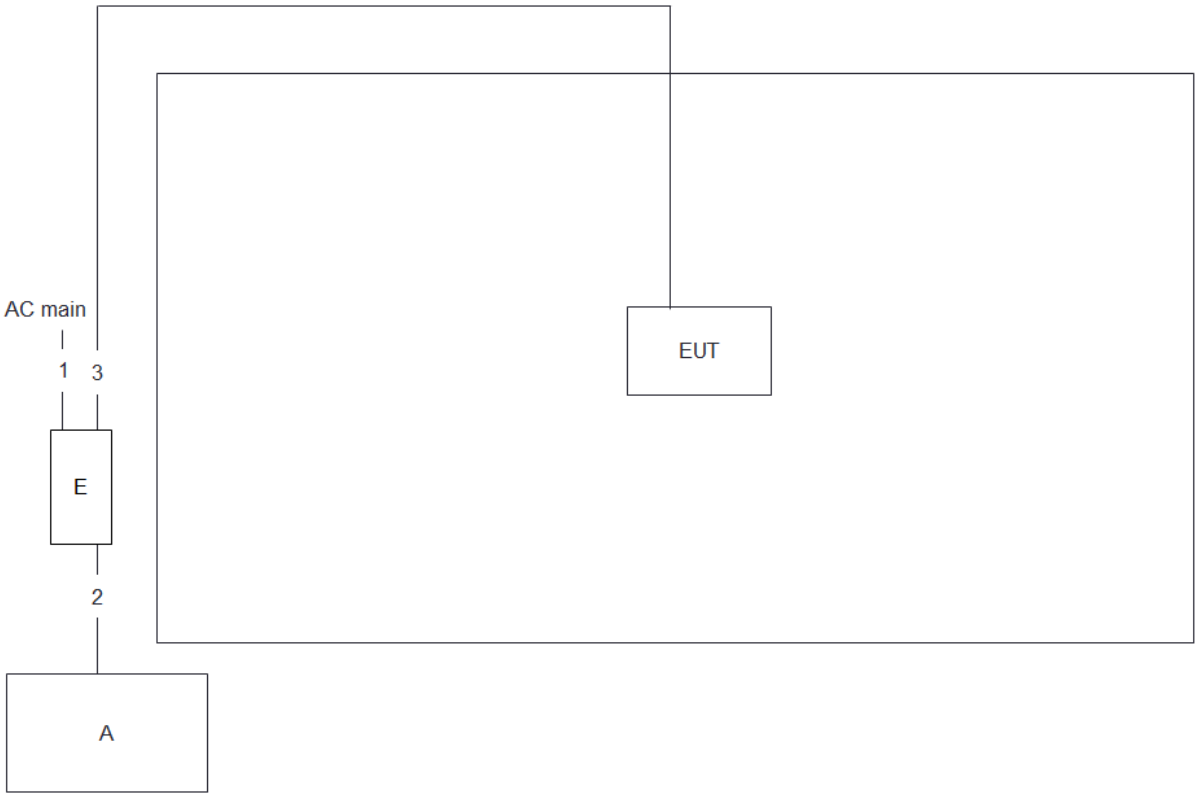

| Item | Connection | Shielded | Length |
|---|---|---|---|
| 1 | Power cable | No | 1.8m |
| 2 | RJ-45 cable | No | 10m |
| 3 | RJ-45 cable | No | 1m |
| 4 | RJ-45 cable | No | 10m |
| 5 | RJ-45 cable | No | 1m |
| 6 | Console cable | No | 1.8m |

**Test Setup Diagram - Radiated Test < 1GHz**




| Item | Connection | Shielded | Length |
|---|---|---|---|
| 1 | RJ-45 cable | No | 1.5m |
| 2 | RJ-45 cable | No | 10m |
| 3 | RJ-45 cable | No | 10m |
| 4 | RJ-45 cable | No | 10m |
| 5 | Console cable | No | 1.5m |

**Test Setup Diagram - Radiated Test > 1GHz**




| Item | Connection | Shielded | Length |
|---|---|---|---|
| 1 | Power cable | No | 1.5m |
| 2 | RJ-45 cable | No | 1.5m |
| 3 | RJ-45 cable | No | 10m |

# 3 Transmitter Test Result

## 3.1 AC Power-line Conducted Emissions

### 3.1.1 AC Power-line Conducted Emissions Limit

| AC Power-line Conducted Emissions Limit | | |
|---|---|---|
| **Frequency Emission (MHz)** | **Quasi-Peak** | **Average** |
| 0.15-0.5 | 66 - 56 * | 56 - 46 * |
| 0.5-5 | 56 | 46 |
| 5-30 | 60 | 50 |
| Note 1: * Decreases with the logarithm of the frequency. | | |

### 3.1.2 Measuring Instruments

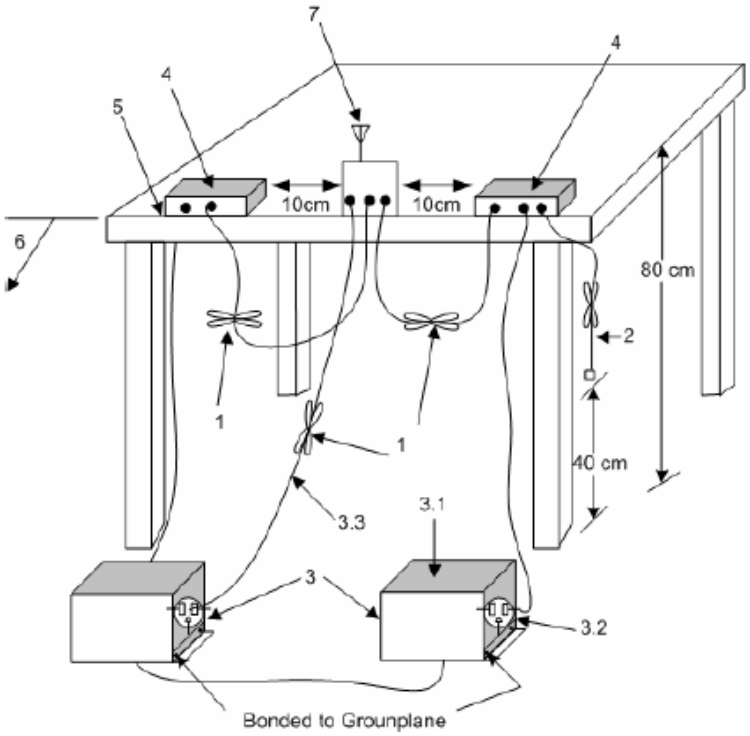
Refer a test equipment and calibration data table in this test report.

### 3.1.3 Test Procedures

| Test Method |
|---|
| ☒ Refer as ANSI C63.10-2013, clause 6.2 for AC power-line conducted emissions. |

### 3.1.4 Test Setup

**AC Power-line Conducted Emissions**




1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
3.1—All other equipment powered from additional LISN(s).
3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
3.3—LISN at least 80 cm from nearest part of EUT chassis.
4—Non-EUT components of EUT system being tested.
5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

### 3.1.5 Test Result of AC Power-line Conducted Emissions

Refer as Appendix A

# 3.2 Emissions in Restricted Frequency Bands

## 3.2.1 Emissions in Restricted Frequency Bands Limit

| Restricted Band Emissions Limit | | | |
|---|---|---|---|
| **Frequency Range (MHz)** | **Field Strength (uV/m)** | **Field Strength (dBuV/m)** | **Measure Distance (m)** |
| 0.009~0.490 | 2400/F(kHz) | 48.5 - 13.8 | 300 |
| 0.490~1.705 | 24000/F(kHz) | 33.8 - 23 | 30 |
| 1.705~30.0 | 30 | 29 | 30 |
| 30~88 | 100 | 40 | 3 |
| 88~216 | 150 | 43.5 | 3 |
| 216~960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

Note 1: Test distance for frequencies at or above 30 MHz, measurements may be performed at a distance other than the limit distance provided they are not performed in the near field and the emissions to be measured can be detected by the measurement equipment. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse of linear distance for field-strength measurements, inverse of linear distance-squared for power-density measurements).

Note 2: Test distance for frequencies at below 30 MHz, measurements may be performed at a distance closer than the EUT limit distance; however, an attempt should be made to avoid making measurements in the near field. When performing measurements below 30 MHz at a closer distance than the limit distance, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two or more distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). The test report shall specify the extrapolation method used to determine compliance of the EUT.

Note 3: Using the distance of 1m during the test for above 18 GHz, and the test value to correct for the distance factor at 3m.

## 3.2.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

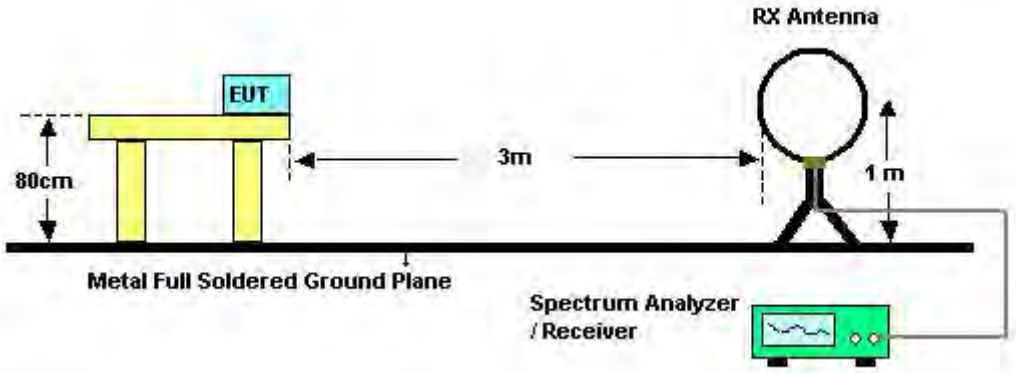
### 3.2.3 Test Procedures

| Test Method | | | |
|---|---|---|---|
| ▪ The average emission levels shall be measured in [duty cycle ≥ 98 or duty factor]. | | | |
| ▪ Refer as ANSI C63.10, clause 6.10.3 band-edge testing shall be performed at the lowest frequency channel and highest frequency channel within the allowed operating band. | | | |
| ▪ For the transmitter unwanted emissions shall be measured using following options below: | | | |
| | ▪ Refer as FCC KDB 558074, clause 8.6 for unwanted emissions into restricted bands. | | |
| | | ☐ | Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.1(trace averaging for duty cycle ≥98%). |
| | | ☐ | Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.2(trace averaging + duty factor). |
| | | ☒ | Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.5.3(Reduced VBW≥1/T). |
| | | ☐ | Refer as ANSI C63.10, clause 11.12.2.5.3 (Reduced VBW). VBW ≥ 1/T, where T is pulse time. |
| | | ☐ | Refer as ANSI C63.10, clause 7.5 average value of pulsed emissions. |
| | | ☒ | Refer as FCC KDB 558074, clause 8.6 & C63.10 clause 11.12.2.4 measurement procedure peak limit. |
| ▪ For the transmitter band-edge emissions shall be measured using following options below: | | | |
| | ▪ Refer as FCC KDB 558074 clause 8.7 & C63.10 clause 11.13.1, When the performing peak or average radiated measurements, emissions within 2 MHz of the authorized band edge may be measured using the marker-delta method described below. | | |
| | ▪ Refer as FCC KDB 558074, clause 8.7 (ANSI C63.10, clause 6.10.6) for marker-delta method for band-edge measurements. | | |
| | ▪ Refer as FCC KDB 558074, clause 8.7 for narrower resolution bandwidth (100kHz) using the band power and summing the spectral levels (i.e., 1 MHz). | | |
| | ▪ For conducted unwanted emissions into restricted bands (absolute emission limits).<br>Devices with multiple transmit chains using options given below:<br>(1) Measure and sum the spectra across the outputs or<br>(2) Measure and add 10 log(N) dB | | |
| | ▪ For FCC KDB 662911 The methodology described here may overestimate array gain, thereby resulting in apparent failures to satisfy the out-of-band limits even if the device is actually compliant. In such cases, compliance may be demonstrated by performing radiated tests around the frequencies at which the apparent failures occurred. | | |

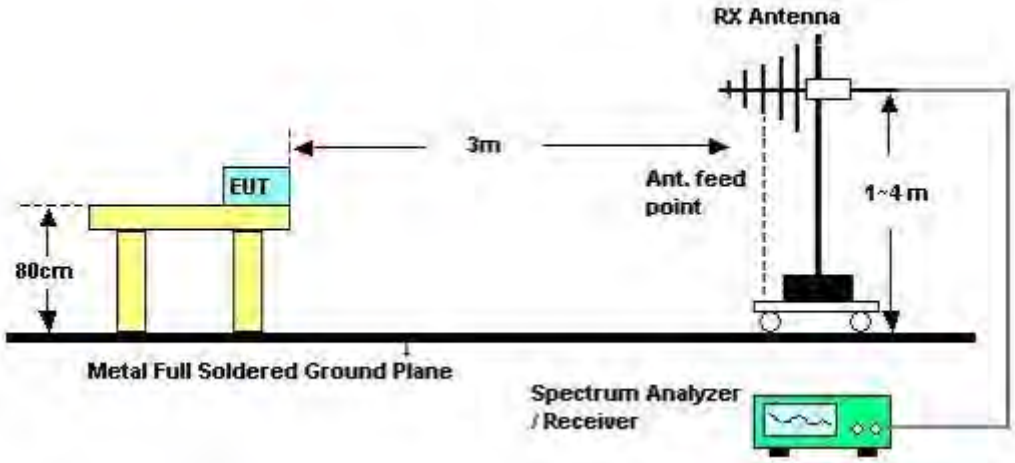
### 3.2.4 Test Setup

**Radiated - Emissions in Restricted Frequency Bands**

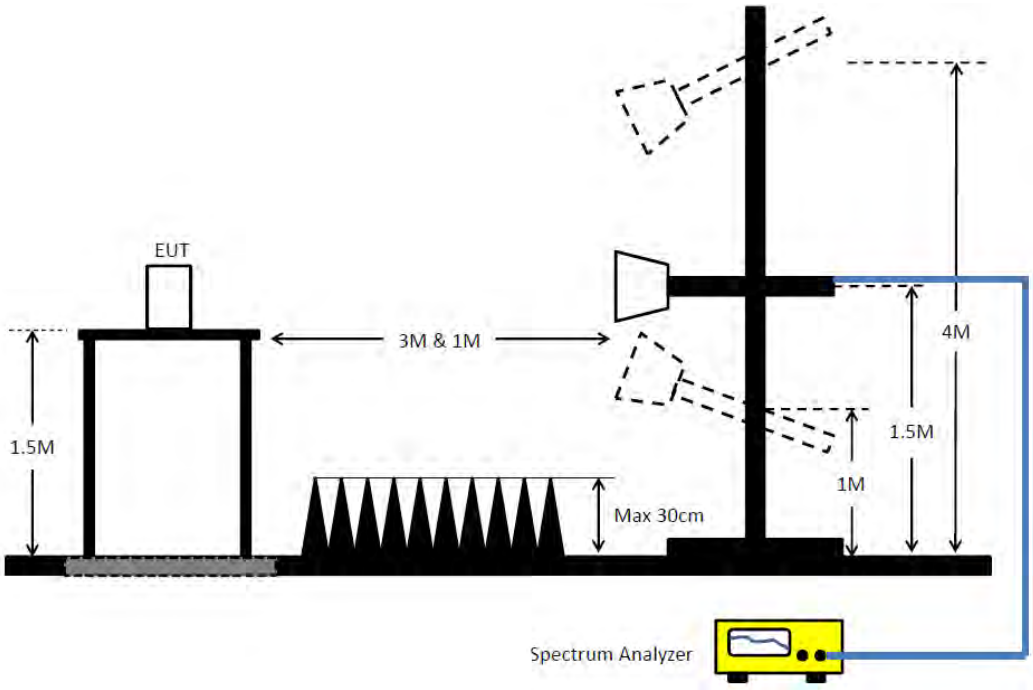
**9kHz ~30MHz**




**30MHz~1GHz**



**Above 1GHz**




### 3.2.5 Emissions in Restricted Frequency Bands (Below 30MHz)

All amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

### 3.2.6 Test Result of Emissions in Restricted Frequency Bands

Refer as Appendix B

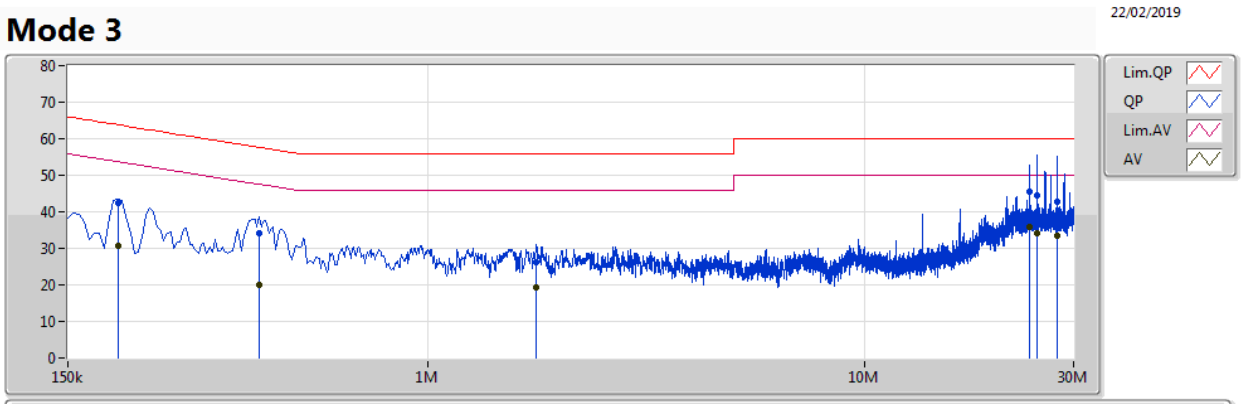
# 4 Test Equipment and Calibration Data

| Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Calibration Due Date | Remark |
|---|---|---|---|---|---|---|---|
| LISN | Schwarzbeck | NSLK 8127 | 8127650 | 9kHz ~ 30MHz | Nov. 21, 2018 | Nov. 20, 2019 | Conduction (CO02-CB) |
| LISN | Schwarzbeck | NSLK 8127 | 8127478 | 9kHz ~ 30MHz | Nov. 05, 2018 | Nov. 04, 2019 | Conduction (CO02-CB) |
| EMI Receiver | Agilent | N9038A | MY52260140 | 9kHz ~ 8.4GHz | Jan. 16, 2019 | Jan. 15, 2020 | Conduction (CO02-CB) |
| COND Cable | Woken | Cable | 2 | 0.15MHz ~ 30MHz | Nov. 06, 2018 | Nov. 05, 2019 | Conduction (CO02-CB) |
| Software | Audix | E3 | 6.120210n | - | N.C.R. | N.C.R. | Conduction (CO02-CB) |
| BILOG ANTENNA with 6dB Attenuator | TESEQ & EMCI | CBL6112D & N-6-06 | 37880 & AT-N0609 | 20MHz ~ 2GHz | Aug. 27, 2018 | Aug. 26, 2019 | Radiation (03CH01-CB) |
| Loop Antenna | Teseq | HLA 6120 | 24155 | 9kHz - 30 MHz | Mar. 16, 2018 | Mar. 15, 2019 | Radiation (03CH01-CB) |
| Pre-Amplifier | EMCI | EMC330N | 980332 | 20MHz ~ 3GHz | May 02, 2018 | May 01, 2019 | Radiation (03CH01-CB) |
| Horn Antenna | EMCO | 3115 | 00075790 | 750MHz ~ 18GHz | Nov. 13, 2018 | Nov. 12, 2019 | Radiation (03CH01-CB) |
| Horn Antenna | Schwarzbeck | BBHA 9170 | BBHA9170252 | 15GHz ~ 40GHz | Jun. 28, 2018 | Jun. 27, 2019 | Radiation (03CH01-CB) |
| Pre-Amplifier | Agilent | 8449B | 3008A02310 | 1GHz ~ 26.5GHz | Jan. 08, 2019 | Jan. 07, 2020 | Radiation (03CH01-CB) |
| Pre-Amplifier | MITEQ | TTA1840-35-H G | 1864479 | 18GHz ~ 40GHz | Jul. 04, 2018 | Jul. 03, 2019 | Radiation (03CH01-CB) |
| Spectrum Analyzer | R&S | FSP40 | 100056 | 9kHz ~ 40GHz | Jan. 31, 2019 | Jan. 30, 2020 | Radiation (03CH01-CB) |
| EMI Test Receiver | R&S | ESCS | 100359 | 9kHz ~ 2.75GHz | Jul. 03, 2018 | Jul. 02, 2019 | Radiation (03CH01-CB) |
| RF Cable-low | Woken | Low Cable-16+17 | N/A | 30 MHz ~ 1 GHz | Oct. 08, 2018 | Oct. 07, 2019 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-16 | N/A | 1 GHz ~ 18 GHz | Oct. 08, 2018 | Oct. 07, 2019 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-16+17 | N/A | 1 GHz ~ 18 GHz | Oct. 08, 2018 | Oct. 07, 2019 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-40G#1 | N/A | 18GHz ~ 40 GHz | Jul. 27, 2018 | Jul. 26, 2019 | Radiation (03CH01-CB) |
| RF Cable-high | Woken | High Cable-40G#2 | N/A | 18GHz ~ 40 GHz | Jul. 27, 2018 | Jul. 26, 2019 | Radiation (03CH01-CB) |

Note: Calibration Interval of instruments listed above is one year.

N.C.R. means Non-Calibration required.

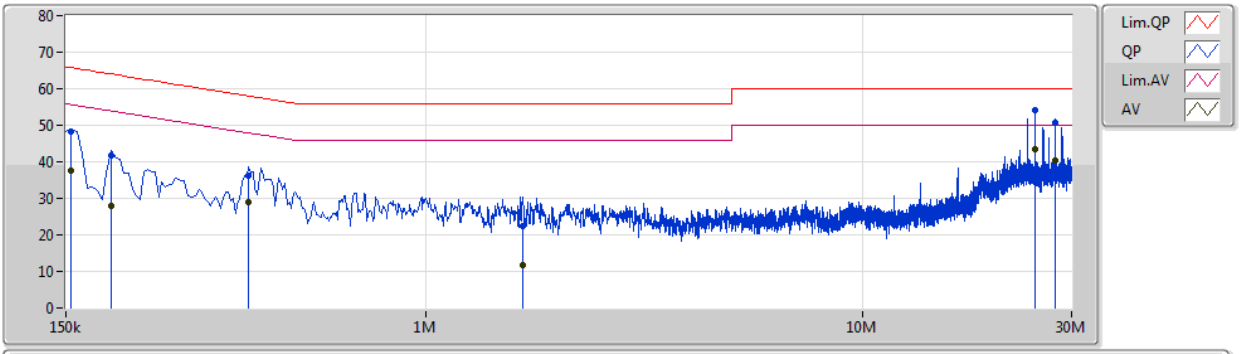
| **Test Mode** | Mode 3 | **Frequency Range** | 0.15 MHz to 30 MHz |
|---|---|---|---|




| Type | Freq | Level | Limit | Margin | Factor | Condition | Comment | Raw | AF | CL | AT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV) | (dBuV) | (dB) | (dB) | | | (dBuV) | (dB) | (dB) | (dB) |
| QP | 195k | 42.48 | 63.82 | -21.34 | 10.17 | Line | - | 32.31 | 0.05 | 0.02 | 10.10 |
| AV | 195k | 30.83 | 53.82 | -22.99 | 10.17 | Line | - | 20.66 | 0.05 | 0.02 | 10.10 |
| QP | 411k | 34.12 | 57.63 | -23.51 | 10.18 | Line | - | 23.94 | 0.06 | 0.02 | 10.10 |
| AV | 411k | 20.14 | 47.63 | -27.49 | 10.18 | Line | - | 9.96 | 0.06 | 0.02 | 10.10 |
| QP | 1.77M | 26.25 | 56.00 | -29.75 | 10.23 | Line | - | 16.02 | 0.09 | 0.04 | 10.10 |
| AV | 1.77M | 19.24 | 46.00 | -26.76 | 10.23 | Line | - | 9.01 | 0.09 | 0.04 | 10.10 |
| QP | 23.784M | 45.60 | 60.00 | -14.40 | 10.62 | Line | - | 34.98 | 0.32 | 0.18 | 10.12 |
| AV | 23.784M | 35.85 | 50.00 | -14.15 | 10.62 | Line | "Worst" | 25.23 | 0.32 | 0.18 | 10.12 |
| QP | 24.738M | 44.35 | 60.00 | -15.65 | 10.65 | Line | - | 33.70 | 0.33 | 0.20 | 10.12 |
| AV | 24.738M | 34.28 | 50.00 | -15.72 | 10.65 | Line | - | 23.63 | 0.33 | 0.20 | 10.12 |
| QP | 27.591M | 42.61 | 60.00 | -17.39 | 10.72 | Line | - | 31.89 | 0.37 | 0.22 | 10.13 |
| AV | 27.591M | 33.31 | 50.00 | -16.69 | 10.72 | Line | - | 22.59 | 0.37 | 0.22 | 10.13 |

## Mode 3

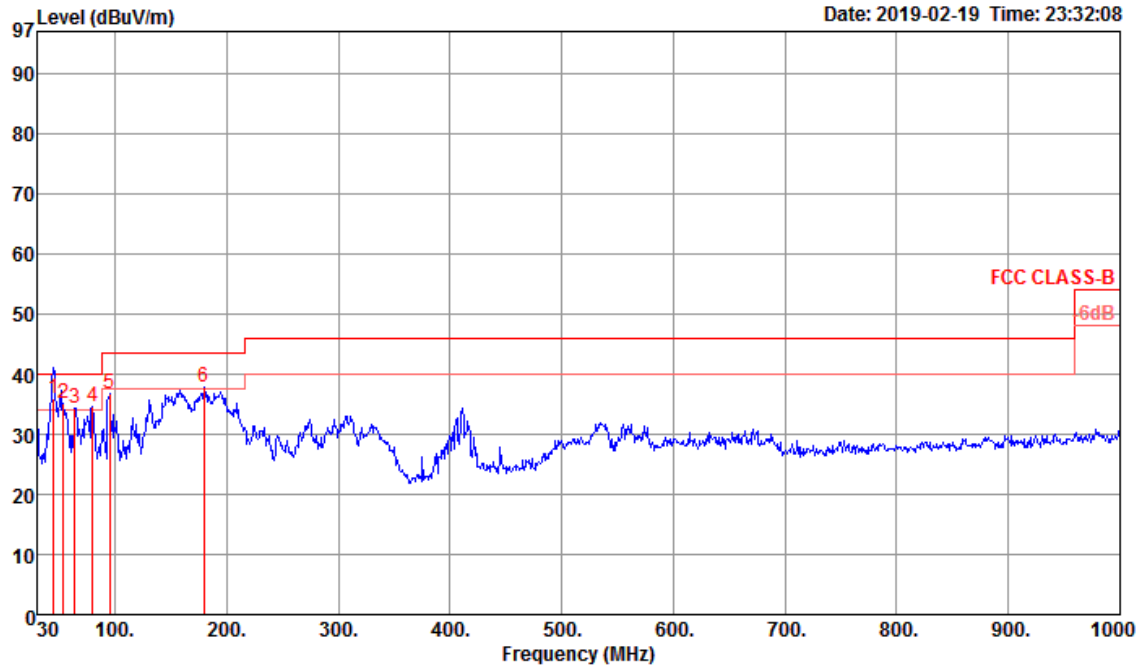
22/02/2019




| Type | Freq | Level | Limit | Margin | Factor | Condition | Comment | Raw | AF | CL | AT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV) | (dBuV) | (dB) | (dB) | | | (dBuV) | (dB) | (dB) | (dB) |
| QP | 154.5k | 48.13 | 65.75 | -17.62 | 10.15 | Neutral | - | 37.98 | 0.03 | 0.02 | 10.10 |
| AV | 154.5k | 37.44 | 55.75 | -18.31 | 10.15 | Neutral | - | 27.29 | 0.03 | 0.02 | 10.10 |
| QP | 190.5k | 41.79 | 64.01 | -22.22 | 10.15 | Neutral | - | 31.64 | 0.03 | 0.02 | 10.10 |
| AV | 190.5k | 27.88 | 54.01 | -26.13 | 10.15 | Neutral | - | 17.73 | 0.03 | 0.02 | 10.10 |
| QP | 393k | 36.32 | 58.01 | -21.69 | 10.16 | Neutral | - | 26.16 | 0.04 | 0.02 | 10.10 |
| AV | 393k | 29.12 | 48.01 | -18.89 | 10.16 | Neutral | - | 18.96 | 0.04 | 0.02 | 10.10 |
| QP | 1.662M | 22.33 | 56.00 | -33.67 | 10.19 | Neutral | - | 12.14 | 0.05 | 0.04 | 10.10 |
| AV | 1.662M | 11.63 | 46.00 | -34.37 | 10.19 | Neutral | - | 1.44 | 0.05 | 0.04 | 10.10 |
| QP | 24.729M | 54.29 | 60.00 | -5.71 | 10.59 | Neutral | "Worst" | 43.70 | 0.27 | 0.20 | 10.12 |
| AV | 24.729M | 43.28 | 50.00 | -6.72 | 10.59 | Neutral | - | 32.69 | 0.27 | 0.20 | 10.12 |
| QP | 27.587M | 50.63 | 60.00 | -9.37 | 10.65 | Neutral | - | 39.98 | 0.30 | 0.22 | 10.13 |
| AV | 27.587M | 40.25 | 50.00 | -9.75 | 10.65 | Neutral | - | 29.60 | 0.30 | 0.22 | 10.13 |

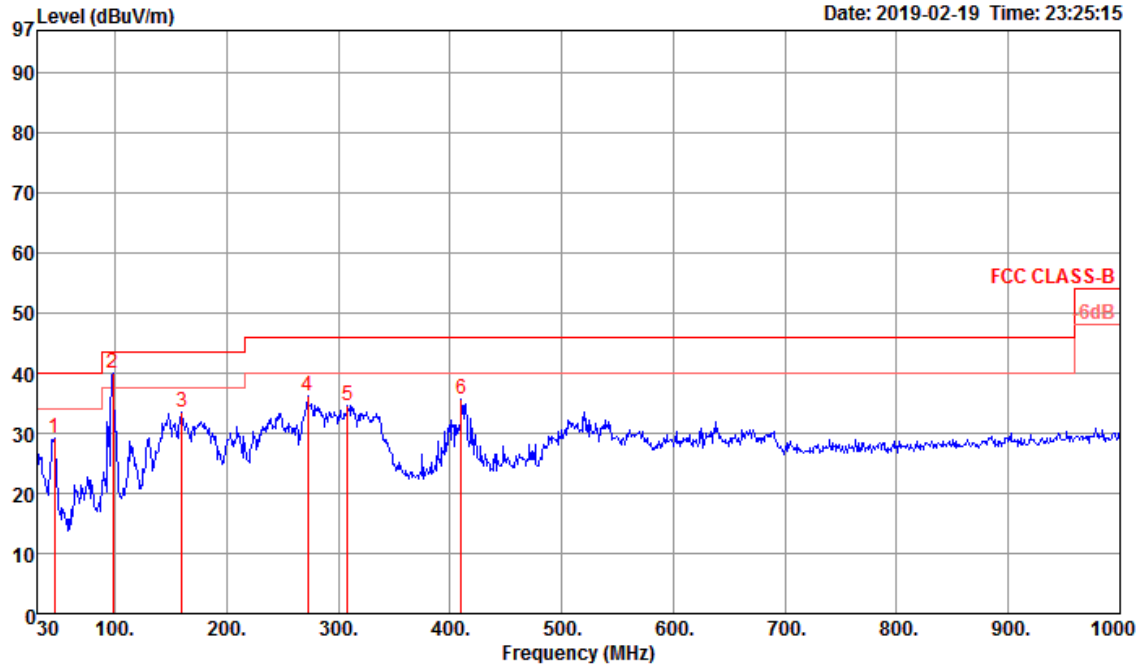
| Test Mode | Mode 6 | Frequency Range | 30 MHz to 1,000 MHz |
|---|---|---|---|

**Vertical 30 MHz to 1,000 MHz**




| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 44.55 | 35.97 | 40.00 | -4.03 | 49.16 | 0.85 | 17.54 | 31.58 | 125 | 287 | QP | VERTICAL |
| 2 | 53.28 | 35.12 | 40.00 | -4.88 | 52.06 | 0.97 | 13.70 | 31.61 | 300 | 360 | Peak | VERTICAL |
| 3 | 63.95 | 34.36 | 40.00 | -5.64 | 52.53 | 0.99 | 12.50 | 31.66 | 300 | 360 | Peak | VERTICAL |
| 4 | 79.47 | 34.62 | 40.00 | -5.38 | 51.60 | 1.13 | 13.60 | 31.71 | 300 | 360 | Peak | VERTICAL |
| 5 | 94.99 | 36.81 | 43.50 | -6.69 | 50.99 | 1.23 | 16.30 | 31.71 | 300 | 360 | Peak | VERTICAL |
| 6 | 179.38 | 37.83 | 43.50 | -5.67 | 52.38 | 1.67 | 15.55 | 31.77 | 300 | 360 | Peak | VERTICAL |

**Horizontal 30 MHz to 1,000 MHz**




| | Freq | Level | Limit Line | Over Limit | Read Level | Cable Loss | Antenna Factor | Preamp Factor | A/Pos | T/Pos | Remark | Pol/Phase |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dBuV/m | dB | dBuV | dB | dB/m | dB | cm | deg | | |
| 1 | 45.52 | 29.12 | 40.00 | -10.88 | 42.89 | 0.86 | 16.95 | 31.58 | 100 | 0 | Peak | HORIZONTAL |
| 2 | 97.90 | 40.05 | 43.50 | -3.45 | 53.69 | 1.23 | 16.83 | 31.70 | 100 | 0 | Peak | HORIZONTAL |
| 3 | 159.98 | 33.50 | 43.50 | -10.00 | 47.06 | 1.60 | 16.60 | 31.76 | 100 | 0 | Peak | HORIZONTAL |
| 4 | 272.50 | 36.17 | 46.00 | -9.83 | 46.60 | 2.02 | 19.36 | 31.81 | 100 | 0 | Peak | HORIZONTAL |
| 5 | 308.39 | 34.59 | 46.00 | -11.41 | 44.51 | 2.15 | 19.78 | 31.85 | 100 | 0 | Peak | HORIZONTAL |
| 6 | 410.24 | 35.71 | 46.00 | -10.29 | 42.25 | 2.52 | 22.90 | 31.96 | 100 | 0 | Peak | HORIZONTAL |

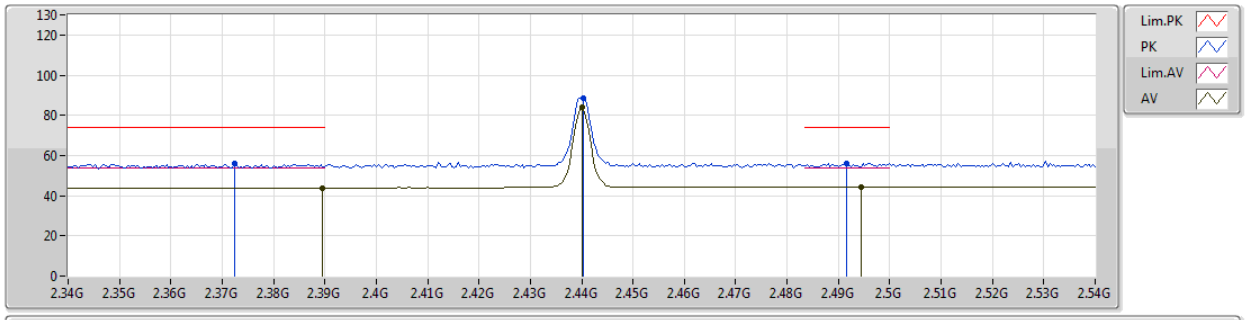
**Summary**

| Mode | Result | Type | Freq (Hz) | Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Factor (dB) | Dist (m) | Condition | Azimuth (°) | Height (m) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.4-2.4835GHz | - | - | - | - | - | - | - | - | - | - | - | - |
| Thread_1TX | Pass | AV | 2.4868G | 44.42 | 54.00 | -9.58 | 32.42 | 3 | Horizontal | 54 | 2.07 | - |

**Thread_1TX**

**2440MHz_TX**

20/02/2019



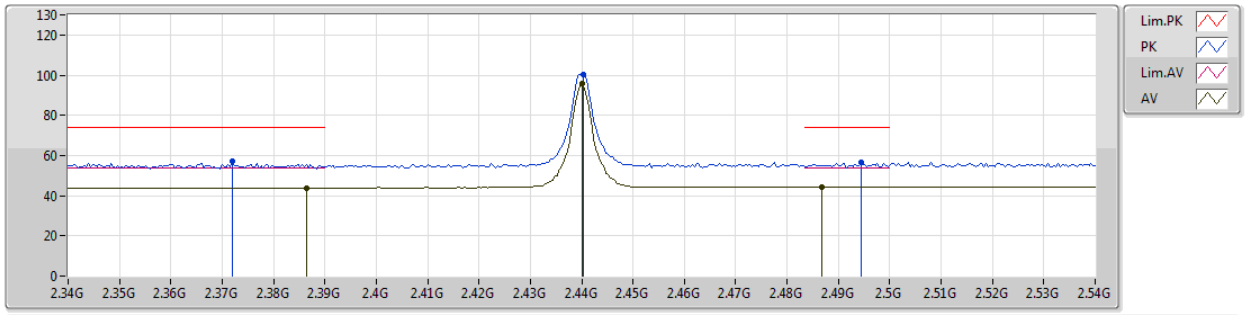

EUT Y_1TX
Setting 32
06-5-5
FSP(100080)

| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | |
| PK | 2.3724G | 55.92 | 74.00 | -18.08 | 32.06 | 3 | Vertical | 35 | 2.90 | - |
| AV | 2.3896G | 43.90 | 54.00 | -10.10 | 32.13 | 3 | Vertical | 35 | 2.90 | - |
| PK | 2.4404G | 88.49 | Inf | -Inf | 32.28 | 3 | Vertical | 35 | 2.90 | - |
| AV | 2.44G | 83.99 | Inf | -Inf | 32.28 | 3 | Vertical | 35 | 2.90 | - |
| PK | 2.4916G | 56.09 | 74.00 | -17.91 | 32.43 | 3 | Vertical | 35 | 2.90 | - |
| AV | 2.4944G | 44.31 | 54.00 | -9.69 | 32.45 | 3 | Vertical | 35 | 2.90 | - |

**Thread_1TX**

**2440MHz_TX**

20/02/2019



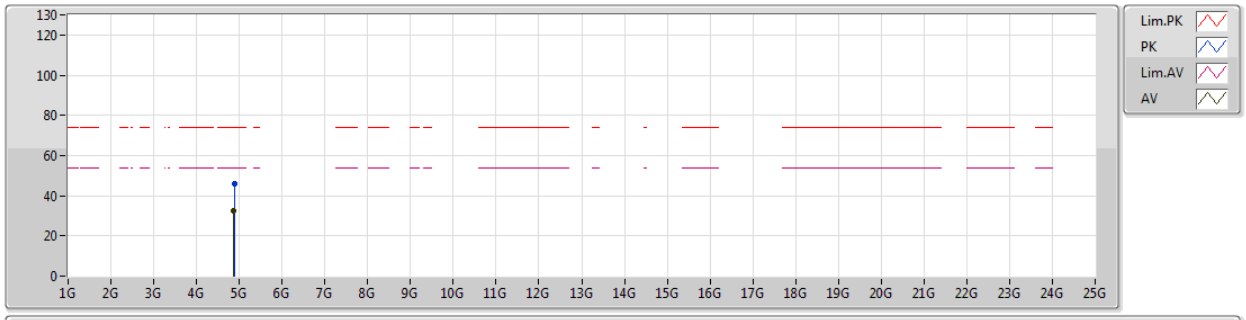

EUT Y_1TX
Setting 32
06-S-5
FSP(100080)

| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | |
| PK | 2.372G | 57.15 | 74.00 | -16.85 | 32.06 | 3 | Horizontal | 54 | 2.07 | - |
| AV | 2.3864G | 43.92 | 54.00 | -10.08 | 32.11 | 3 | Horizontal | 54 | 2.07 | - |
| PK | 2.4404G | 100.21 | Inf | -Inf | 32.28 | 3 | Horizontal | 54 | 2.07 | - |
| AV | 2.44G | 95.85 | Inf | -Inf | 32.28 | 3 | Horizontal | 54 | 2.07 | - |
| PK | 2.4944G | 56.47 | 74.00 | -17.53 | 32.45 | 3 | Horizontal | 54 | 2.07 | - |
| AV | 2.4868G | 44.42 | 54.00 | -9.58 | 32.42 | 3 | Horizontal | 54 | 2.07 | - |

**Thread_1TX**

**2440MHz_TX**

20/02/2019



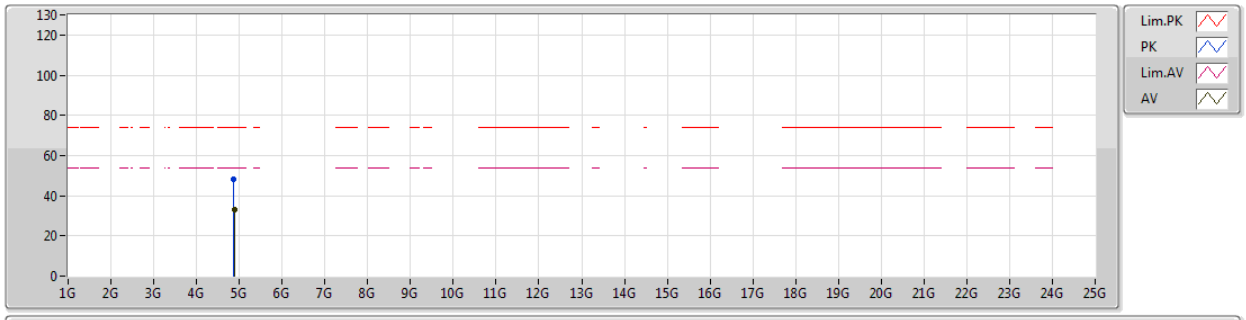

EUT Y_1TX
Setting 32
06-S-5
FSP(100080)

| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | |
| PK | 4.87936G | 46.17 | 74.00 | -27.83 | 6.72 | 3 | Vertical | 19 | 1.64 | - |
| AV | 4.87048G | 32.63 | 54.00 | -21.37 | 6.71 | 3 | Vertical | 19 | 1.64 | - |

**Thread_1TX**

**2440MHz_TX**

20/02/2019




EUT Y_1TX
Setting 32
06-S-5
FSP(100080)

| Type | Freq | Level | Limit | Margin | Factor | Dist | Condition | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| | (Hz) | (dBuV/m) | (dBuV/m) | (dB) | (dB) | (m) | | (°) | (m) | |
| PK | 4.87296G | 48.24 | 74.00 | -25.76 | 6.71 | 3 | Horizontal | 58 | 1.78 | - |
| AV | 4.88004G | 32.97 | 54.00 | -21.03 | 6.72 | 3 | Horizontal | 58 | 1.78 | - |