



FCC PART 15B, CLASS B TEST REPORT

For

Grandstream Networks, Inc.

126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

FCC ID: YZZGRP2613

| | |
|---|----------------------------------|
| Report Type: Original Report | Product Type: IP Phone |
| Report Number: RSZ190328011-00 | |
| Report Date: 2019-04-26 | |
| Alvin Huang  | |
| Reviewed By: Lab Manager | |
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The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity.

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

| | |
|-----------------------------|--|
| Product | IP Phone |
| Model | GRP2613 |
| Voltage Range | DC 5V from adapter or DC 48V from POE |
| Measure | 203mm (L) * 193 mm (W) * 51.8mm (H) |
| Highest operating frequency | 133MHz |
| Date of Test | 2019-04-01 to 2019-04-11 |
| Sample serial number | 190328011 |
| Received date | 2019-03-28 |
| Sample/EUT Status | Good condition |
| Adpter Information | <p>Adapter 1 (MASSPOWER) Information: Model:NBS05B050060VU Input: AC100-240V, 50/60Hz, 0.2A Output: DC5.0V ,0.6A</p> <p>Adapter 2 (SUNLIGHT) Information: Model: F06US0500060A Input: AC100-240V, 50/60Hz, 0.2A max L.P.S Output: DC5.0V ,0.6A</p> <p>Adapter 3 (Frecom) Information: Model: F05L5-050060SPA U L.P.S Input: AC100-240V, 50/60Hz, 0.2A Output: DC5.0V ,0.6A</p> |

Objective

This test report is prepared on behalf of *Grandstream Networks, Inc.* in accordance with Part 2-Subpart J, Part 15-Subparts A, B of the Federal Communication Commissions rules.

The objective of the manufacturer is to determine the compliance of the EUT with FCC Part 15 B.

Related Submittal(s)/Grant(s)

N/A

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on CISPR 16-4-2:2011, the expanded combined standard uncertainty of test at Bay Area Compliance Laboratories Corp. (Shenzhen) is shown as below. And the uncertainty will be taken into consideration for the test data recorded in the report

| Parameter | | uncertainty |
|------------------------|------------|---------------------|
| Conducted Emissions | | $\pm 1.95\text{dB}$ |
| Emissions, radiated | Below 1GHz | $\pm 4.75\text{dB}$ |
| | Above 1GHz | $\pm 4.88\text{dB}$ |

Note: Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 342867, the FCC Designation No.: CN1221.

The test site has been registered with ISED Canada under ISED Canada Registration Number 3062B.

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in normal mode.

EUT Exercise Software

No exercise software was made to the EUT tested.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

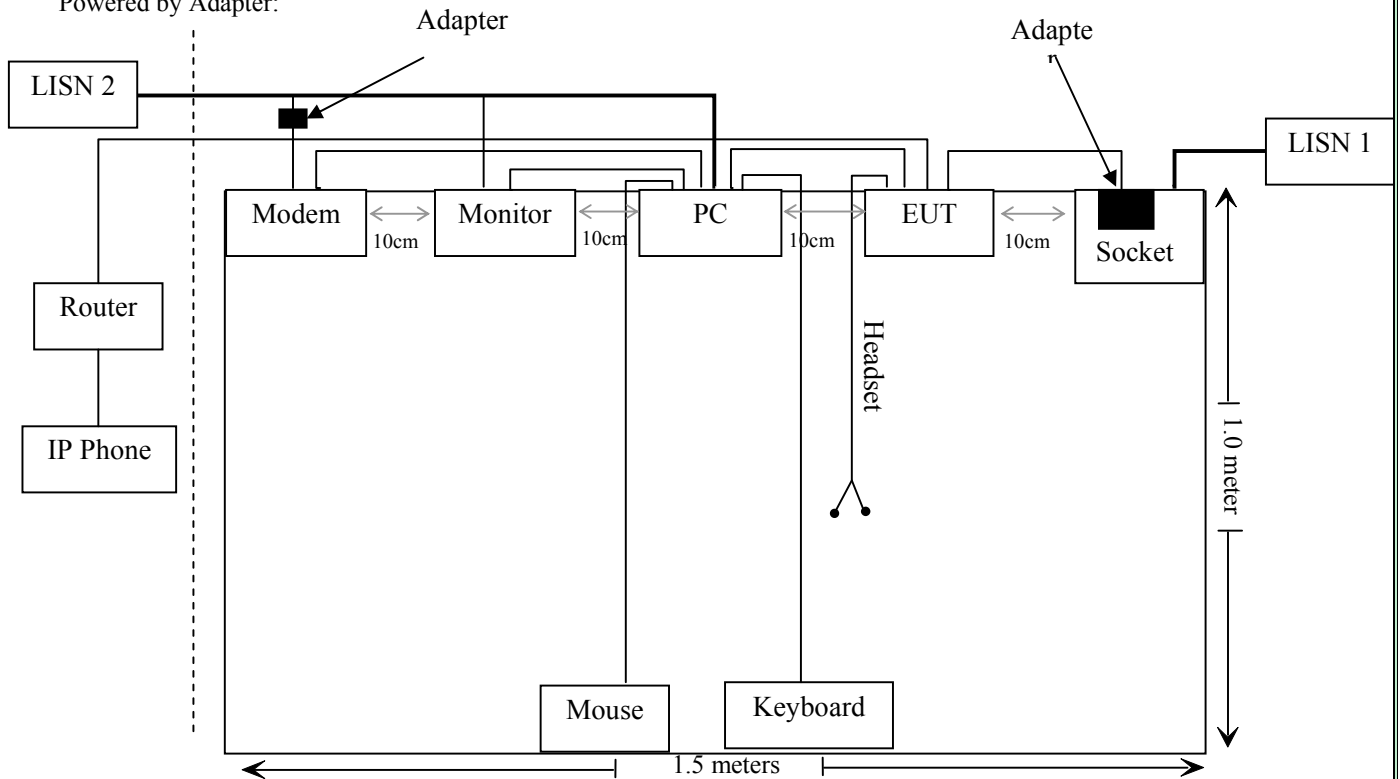
| Manufacturer | Description | Model | Serial Number |
|--------------|-------------|------------|------------------|
| BULL | Socket | GN-415K | 5503290068073 |
| Gigabit | POE | N/A | N/A |
| TCL | Monitor | TFT1560PS | ALA560S05C180409 |
| DELL | Host PC | DCSCSF | 127BP2X |
| DELL | Mouse | MOC5UO | G1900NKD |
| Microsoft | Keyboard | 1406 | 0200706128743 |
| DELL | Monitor | TFT1560PS | ALA560806C160409 |
| SAST | Modem | AEM-2100 | 0293 |
| SAGEMCOM | Router | F@ST 1704N | N/A |
| Grandstream | Headset | N/A | N/A |
| Grandstream | IP Phone | GRP2613 | N/A |

External I/O Cable

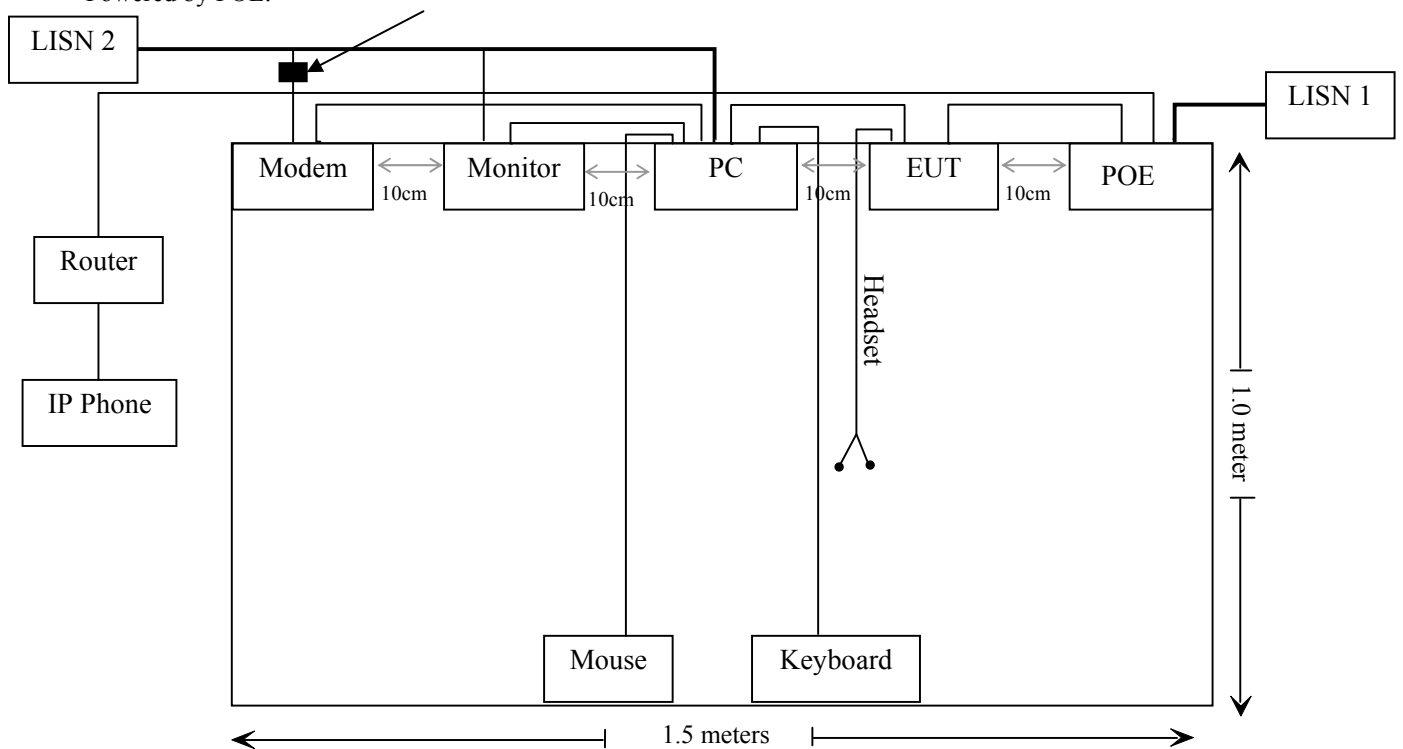
| Cable description | Length (m) | From/port | To |
|-------------------------------------|------------|-----------|----------|
| Un-shielded un-detachable AC cable | 1.0 | Socket | Lisn 1 |
| Un-shielded detachable RJ45 cable | 10.0 | Router | EUT /POE |
| Un-shielded detachable RJ45 cable | 1.5 | POE | EUT |
| Un-shielded detachable DC cable | 1.8 | EUT | Adapter |
| Un-shielded detachable AC cable | 1.2 | POE | Lisn 1 |
| Un-shielded detachable RJ45 cable | 1.5 | Router | IP phone |
| Un-shielded detachable RJ45 cable | 1.5 | EUT | PC |
| Un-shielded detachable AC cable | 1.2 | Monitor | Lisn 2 |
| Un-shielded detachable AC cable | 1.2 | PC | Lisn 2 |
| Shielded detachable RS232 cable | 1.0 | PC | Modem |
| Shielded detachable VGA cable | 1.0 | PC | Monitor |
| Un-shielded un-detachable USB cable | 1.2 | PC | Mouse |
| Un-shielded un-detachable USB cable | 1.5 | PC | Keyboard |
| Un-shielded detachable AC cable | 1.2 | Adapter | Lisn 2 |
| Un-shielded detachable DC cable | 1.2 | Adapter | Modem |

Block Diagram of Test Setup

Powered by Adapter:



Powered by POE:



SUMMARY OF TEST RESULTS

| FCC Rules | Description of Test | Results |
|-----------|-----------------------------|------------|
| §15.107 | AC Line Conducted Emissions | Compliance |
| §15.109 | Radiated Spurious Emissions | Compliance |

TEST EQUIPMENT LIST

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Due Date |
|--|--------------------------|---------------------|------------------------|------------------|----------------------|
| AC Line Conducted Emission Test | | | | | |
| Rohde & Schwarz | EMI Test Receiver | ESCS30 | 100176 | 2018-07-11 | 2019-07-11 |
| Rohde & Schwarz | LISN | ENV216 | 3560.6650.12-101613-Yb | 2018-12-21 | 2019-12-21 |
| Rohde & Schwarz | Transient Limiter | ESH3Z2 | DE25985 | 2018-11-12 | 2019-11-12 |
| Rohde & Schwarz | CE Test software | EMC 32 | V8.53.0 | NCR | NCR |
| Unknown | Conducted Emission Cable | 78652 | UF A210B-1-0720-504504 | 2018-11-12 | 2019-11-12 |
| Radiated Emission Test | | | | | |
| A.H. System | Horn Antenna | SAS-200/571 | 135 | 2018-09-01 | 2021-08-31 |
| Rohde & Schwarz | Signal Analyzer | FSV40 | 101473 | 2019-01-09 | 2020-01-08 |
| Sunol Sciences | Broadband Antenna | JB1 | A040904-1 | 2017-12-22 | 2020-12-21 |
| COM-POWER | Pre-amplifier | PA-122 | 181919 | 2018-11-12 | 2019-11-12 |
| Sonoma instrument | Amplifier | 310N | 186238 | 2018-11-12 | 2019-11-12 |
| Rohde & Schwarz | EMI Test Receiver | ESR | 1316.3003K03-101746-zn | 2018-07-11 | 2019-07-11 |
| Ducommun technologies | RF Cable | UFA147A-2362-100100 | MFR64639-231029-003 | 2018-07-11 | 2021-07-10 |
| Ducommun technologies | RF Cable | 104PEA | 218124002 | 2018-11-12 | 2019-11-12 |
| Ducommun technologies | RF Cable | RG-214 | 1 | 2018-11-19 | 2019-05-21 |
| Ducommun technologies | RF Cable | RG-214 | 2 | 2018-11-12 | 2019-11-12 |
| Heatsink Required | Amplifier | QLW-18405536-J0 | 15964001002 | 2018-11-12 | 2019-11-12 |
| Rohde & Schwarz | Auto test software | EMC 32 | V9.10 | NCR | NCR |

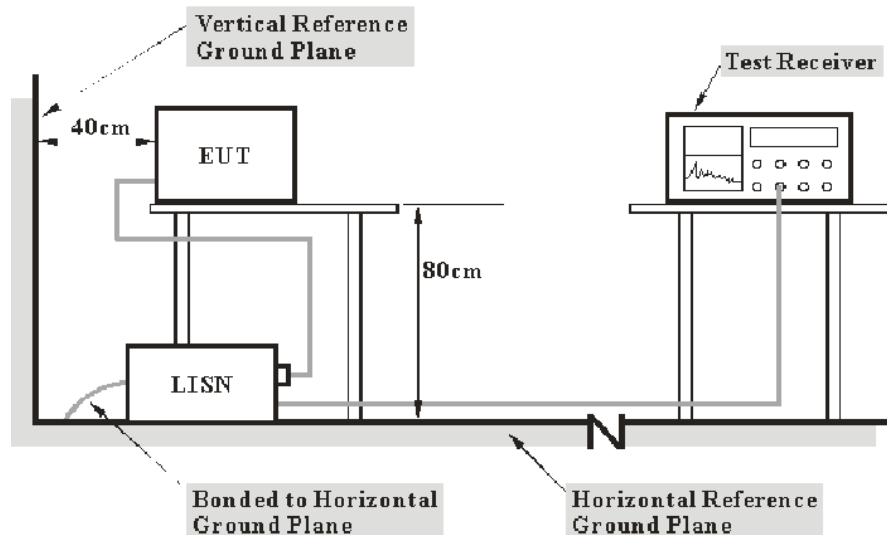
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

FCC §15.107 – AC LINE CONDUCTED EMISSIONS

Applicable Standard

According to FCC §15.107

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The measurement procedure of EUT setup is according with per ANSI C63.4-2014. The related limit was specified in FCC Part 15.107 Class B.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | IF B/W |
|------------------|--------|
| 150 kHz – 30 MHz | 9 kHz |

Test Procedure

During the conducted emission test, the adapter and AC mains port of POE were connected to the first LISN and the other relevant equipments were connected to the second LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN/ISN VDF (Voltage Division Factor), Cable Loss and Transient Limiter Attenuation. The basic equation is as follows:

$$\text{Correction Factor} = \text{LISN VDF} + \text{Cable Loss} + \text{Transient Limiter Attenuation}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.107,

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(Lm)} \leq L_{lim} + U_{cispr}$$

In BACL., $U_{(Lm)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

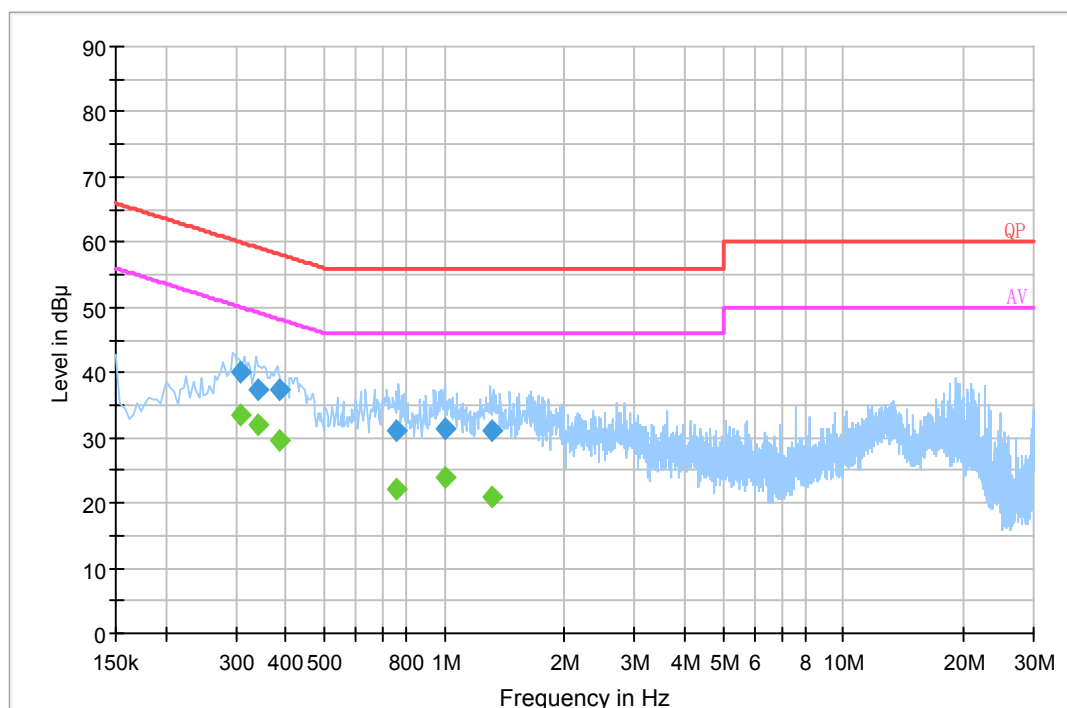
| | |
|--------------------|-----------|
| Temperature: | 25 °C |
| Relative Humidity: | 56 % |
| ATM Pressure: | 101.0 kPa |

The testing was performed by Haiguo Li on 2019-04-04.

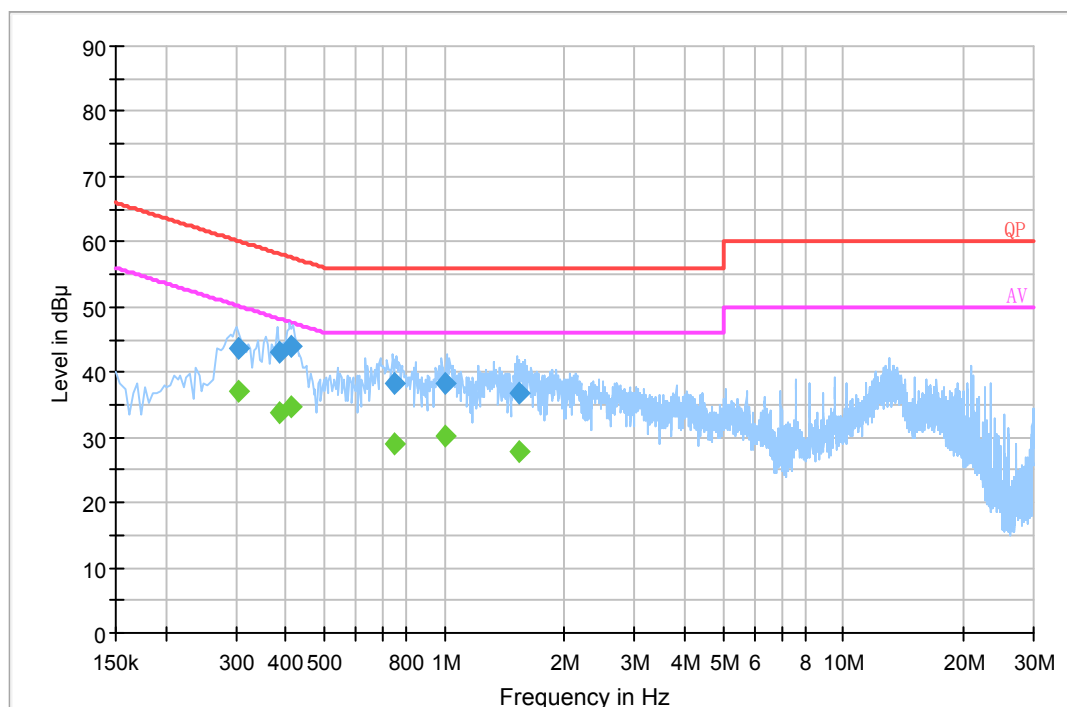
EUT Operation Mode: Working (Talking with another IP Phone and Ping with PC)

Powered by Adapter 1 (MASSPOWER):

AC 120V/60 Hz, Line



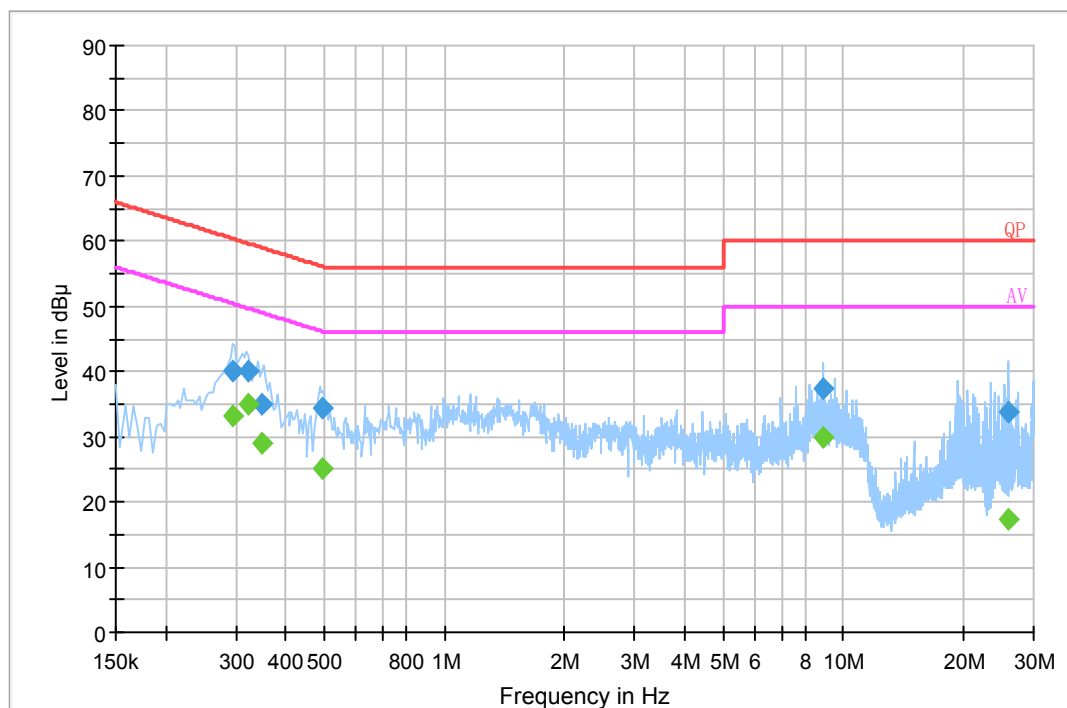
| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.309290 | 40.2 | 19.7 | 60.0 | 19.8 | QP |
| 0.340930 | 37.3 | 19.9 | 59.2 | 21.9 | QP |
| 0.384270 | 37.5 | 19.9 | 58.2 | 20.7 | QP |
| 0.758450 | 31.1 | 19.8 | 56.0 | 24.9 | QP |
| 1.002970 | 31.4 | 19.9 | 56.0 | 24.6 | QP |
| 1.322410 | 31.0 | 19.8 | 56.0 | 25.0 | QP |
| 0.309290 | 33.4 | 19.7 | 50.0 | 16.6 | Ave. |
| 0.340930 | 32.0 | 19.9 | 49.2 | 17.2 | Ave. |
| 0.384270 | 29.7 | 19.9 | 48.2 | 18.5 | Ave. |
| 0.758450 | 22.1 | 19.8 | 46.0 | 23.9 | Ave. |
| 1.002970 | 24.1 | 19.9 | 46.0 | 21.9 | Ave. |
| 1.322410 | 21.0 | 19.8 | 46.0 | 25.0 | Ave. |

AC 120V/60 Hz, Neutral

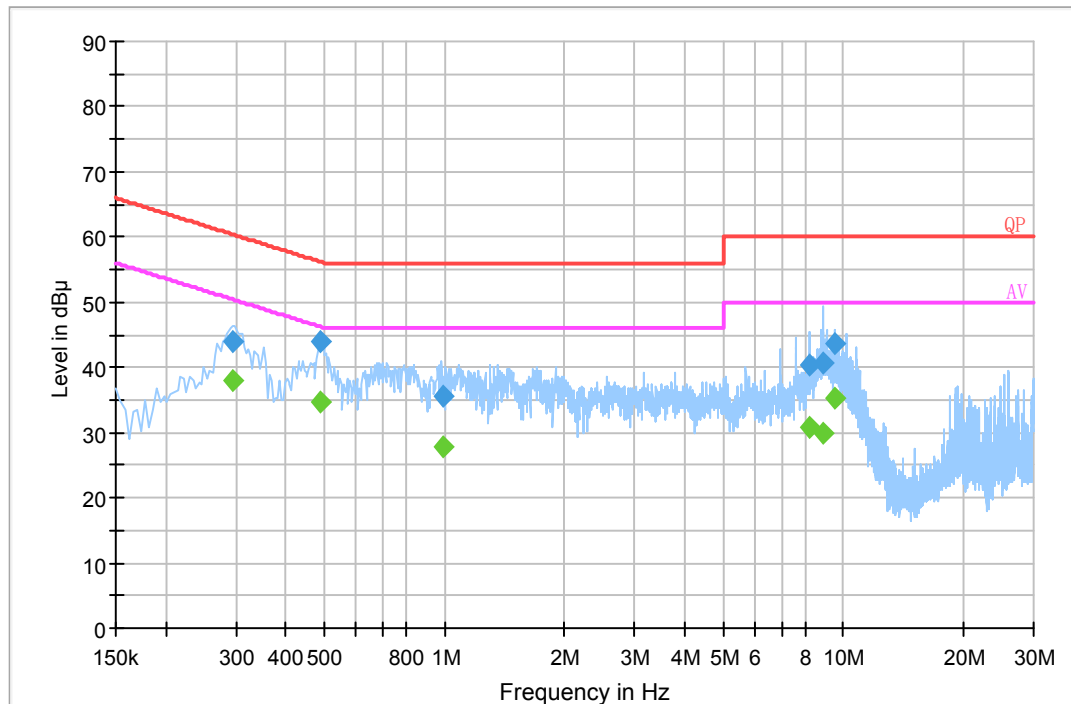
| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.305470 | 43.8 | 19.7 | 60.1 | 16.3 | QP |
| 0.384270 | 43.1 | 19.8 | 58.2 | 15.1 | QP |
| 0.411850 | 43.9 | 19.8 | 57.6 | 13.7 | QP |
| 0.753130 | 38.3 | 19.8 | 56.0 | 17.7 | QP |
| 1.002850 | 38.3 | 19.8 | 56.0 | 17.7 | QP |
| 1.536710 | 36.9 | 19.8 | 56.0 | 19.1 | QP |
| 0.305470 | 37.0 | 19.7 | 50.1 | 13.0 | Ave. |
| 0.384270 | 33.7 | 19.8 | 48.2 | 14.5 | Ave. |
| 0.411850 | 34.7 | 19.8 | 47.6 | 12.9 | Ave. |
| 0.753130 | 29.1 | 19.8 | 46.0 | 16.9 | Ave. |
| 1.002850 | 30.3 | 19.8 | 46.0 | 15.7 | Ave. |
| 1.536710 | 27.9 | 19.8 | 46.0 | 18.1 | Ave. |

Powered by Adapter 2 (SUNLIGHT):

AC 120 V/60 Hz, Line:



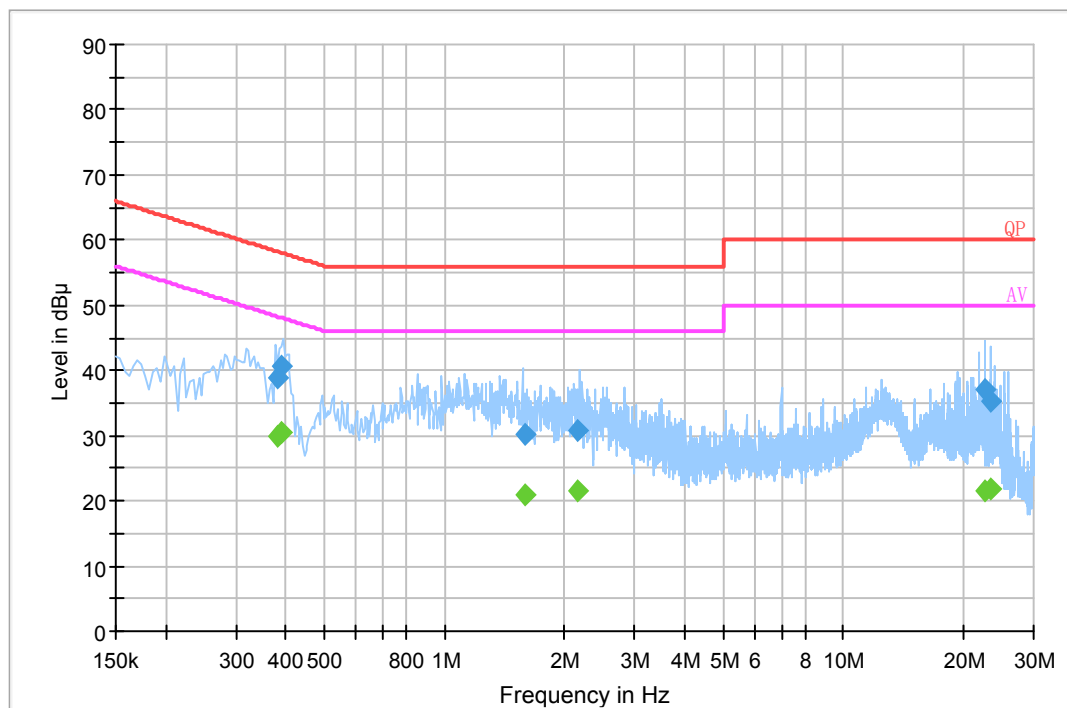
| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.293500 | 40.2 | 19.7 | 60.4 | 20.3 | QP |
| 0.321230 | 40.1 | 19.8 | 59.7 | 19.6 | QP |
| 0.348690 | 35.1 | 19.9 | 59.0 | 23.9 | QP |
| 0.493290 | 34.3 | 19.8 | 56.1 | 21.8 | QP |
| 8.884770 | 37.5 | 20.0 | 60.0 | 22.5 | QP |
| 26.011790 | 33.9 | 20.3 | 60.0 | 26.1 | QP |
| 0.293500 | 33.1 | 19.7 | 50.4 | 17.3 | Ave. |
| 0.321230 | 34.9 | 19.8 | 49.7 | 14.8 | Ave. |
| 0.348690 | 28.9 | 19.9 | 49.0 | 20.1 | Ave. |
| 0.493290 | 25.0 | 19.8 | 46.1 | 21.1 | Ave. |
| 8.884770 | 29.9 | 20.0 | 50.0 | 20.1 | Ave. |
| 26.011790 | 17.4 | 20.3 | 50.0 | 32.6 | Ave. |

AC 120V/ 60 Hz, Neutral:

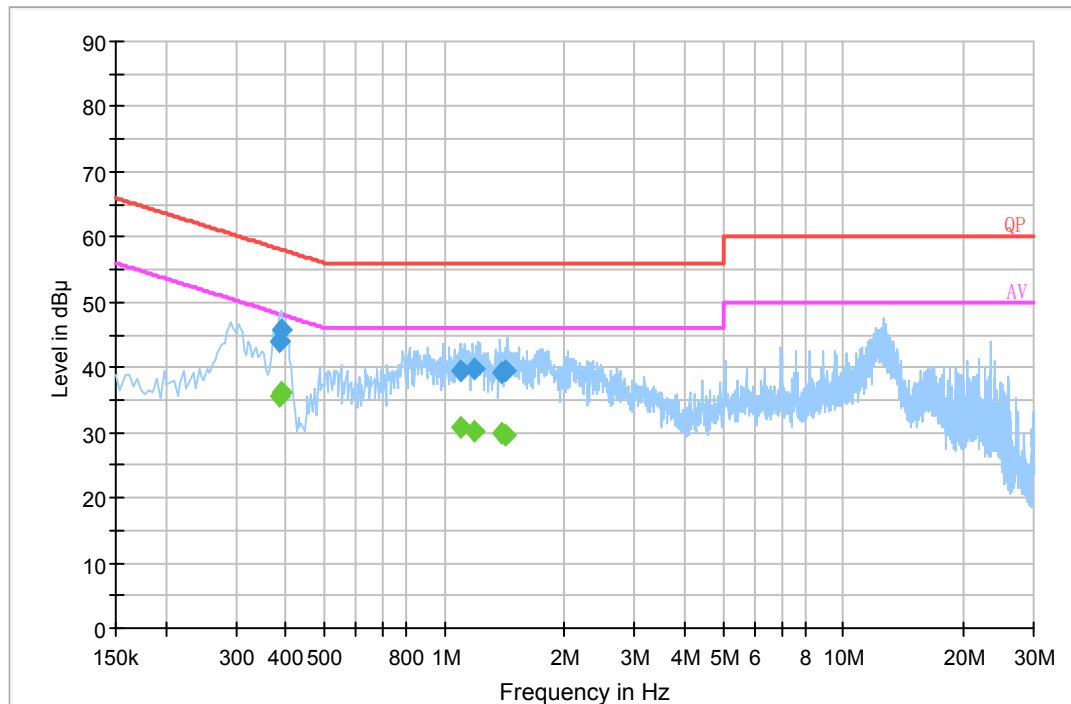
| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.293500 | 43.9 | 19.7 | 60.4 | 16.5 | QP |
| 0.490710 | 44.0 | 19.8 | 56.2 | 12.2 | QP |
| 0.995210 | 35.6 | 19.8 | 56.0 | 20.4 | QP |
| 8.238430 | 40.5 | 19.9 | 60.0 | 19.5 | QP |
| 8.888890 | 40.7 | 19.9 | 60.0 | 19.3 | QP |
| 9.511350 | 43.8 | 19.9 | 60.0 | 16.2 | QP |
| 0.293500 | 37.9 | 19.7 | 50.4 | 12.5 | Ave. |
| 0.490710 | 34.8 | 19.8 | 46.2 | 11.3 | Ave. |
| 0.995210 | 27.8 | 19.8 | 46.0 | 18.2 | Ave. |
| 8.238430 | 30.8 | 19.9 | 50.0 | 19.2 | Ave. |
| 8.888890 | 29.9 | 19.9 | 50.0 | 20.1 | Ave. |
| 9.511350 | 35.3 | 19.9 | 50.0 | 14.7 | Ave. |

Powered by Adapter 3(Frecom):

AC 120 V/60 Hz, Line:



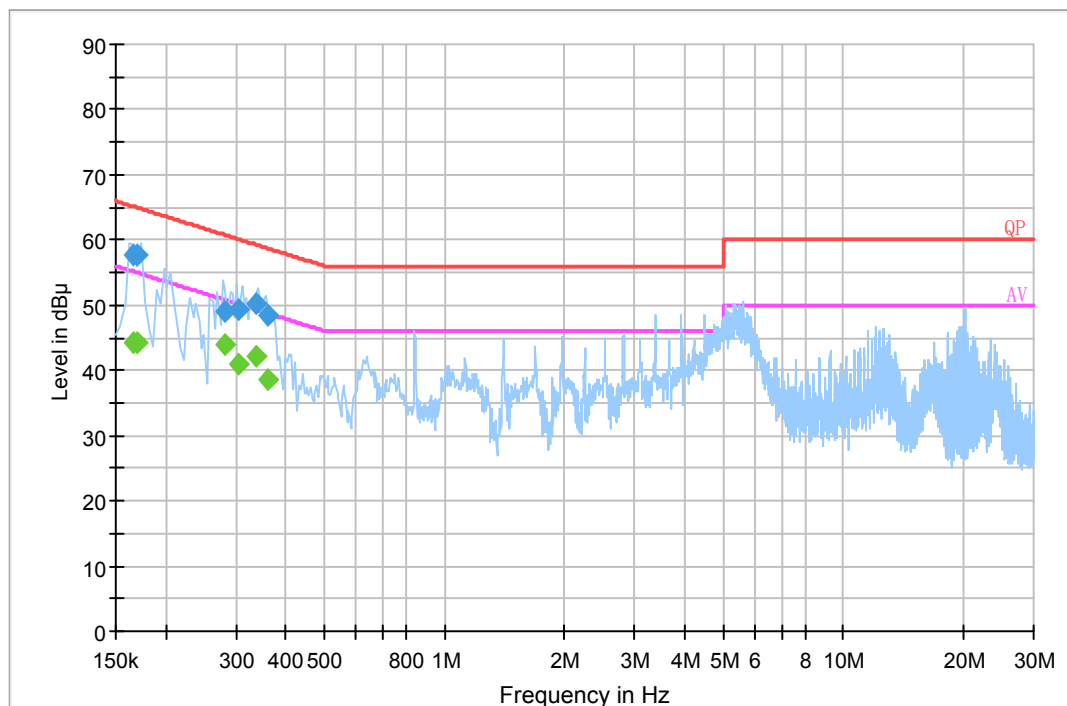
| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.383670 | 39.0 | 19.9 | 58.2 | 19.2 | QP |
| 0.392090 | 40.7 | 19.9 | 58.0 | 17.3 | QP |
| 1.586510 | 30.1 | 19.9 | 56.0 | 25.9 | QP |
| 2.145390 | 30.7 | 19.9 | 56.0 | 25.3 | QP |
| 22.535990 | 37.1 | 20.4 | 60.0 | 22.9 | QP |
| 23.324050 | 35.4 | 20.4 | 60.0 | 24.6 | QP |
| 0.383670 | 30.0 | 19.9 | 48.2 | 18.2 | Ave. |
| 0.392090 | 30.6 | 19.9 | 48.0 | 17.4 | Ave. |
| 1.586510 | 21.0 | 19.9 | 46.0 | 25.0 | Ave. |
| 2.145390 | 21.5 | 19.9 | 46.0 | 24.5 | Ave. |
| 22.535990 | 21.6 | 20.4 | 50.0 | 28.4 | Ave. |
| 23.324050 | 21.7 | 20.4 | 50.0 | 28.3 | Ave. |

AC 120V/ 60 Hz, Neutral:

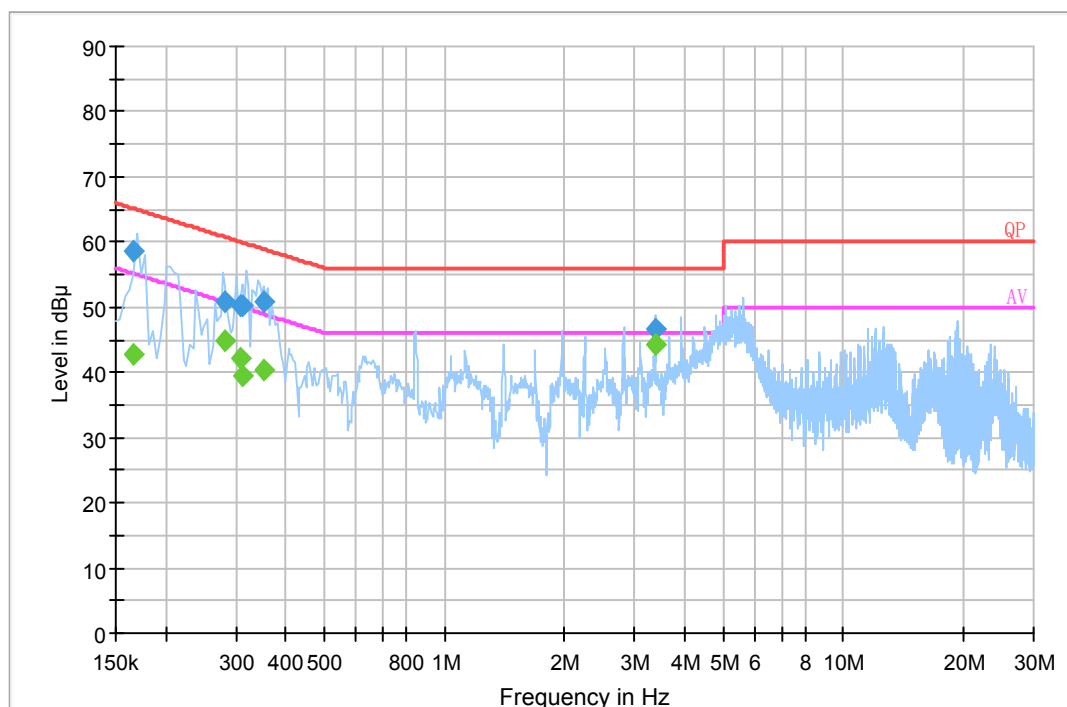
| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.384150 | 44.1 | 19.8 | 58.2 | 14.1 | QP |
| 0.388210 | 45.7 | 19.8 | 58.1 | 12.4 | QP |
| 1.093590 | 39.5 | 19.8 | 56.0 | 16.5 | QP |
| 1.191850 | 39.8 | 19.8 | 56.0 | 16.2 | QP |
| 1.385270 | 39.2 | 19.8 | 56.0 | 16.8 | QP |
| 1.424370 | 39.6 | 19.8 | 56.0 | 16.4 | QP |
| 0.384150 | 35.5 | 19.8 | 48.2 | 12.7 | Ave. |
| 0.388210 | 36.1 | 19.8 | 48.1 | 12.0 | Ave. |
| 1.093590 | 30.8 | 19.8 | 46.0 | 15.2 | Ave. |
| 1.191850 | 30.3 | 19.8 | 46.0 | 15.7 | Ave. |
| 1.385270 | 29.8 | 19.8 | 46.0 | 16.2 | Ave. |
| 1.424370 | 29.7 | 19.8 | 46.0 | 16.3 | Ave. |

Powered by POE:

AC 120 V/60 Hz, Line:



| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.165500 | 57.8 | 19.9 | 65.2 | 7.4 | QP |
| 0.169500 | 57.9 | 19.9 | 65.0 | 7.1 | QP |
| 0.282500 | 49.2 | 19.7 | 60.7 | 11.6 | QP |
| 0.305470 | 49.2 | 19.7 | 60.1 | 10.9 | QP |
| 0.336870 | 50.1 | 19.8 | 59.3 | 9.2 | QP |
| 0.360630 | 48.4 | 19.9 | 58.7 | 10.3 | QP |
| 0.165500 | 44.3 | 19.9 | 55.2 | 10.9 | Ave. |
| 0.169500 | 44.4 | 19.9 | 55.0 | 10.6 | Ave. |
| 0.282500 | 43.8 | 19.7 | 50.7 | 6.9 | Ave. |
| 0.305470 | 41.0 | 19.7 | 50.1 | 9.1 | Ave. |
| 0.336870 | 42.3 | 19.8 | 49.3 | 7.0 | Ave. |
| 0.360630 | 38.5 | 19.9 | 48.7 | 10.2 | Ave. |

AC 120V/ 60 Hz, Neutral:

| Frequency (MHz) | Corrected Amplitude (dBμV) | Correction Factor (dB) | Limit (dBμV) | Margin (dB) | Detector (PK/Ave./QP) |
|-----------------|----------------------------|------------------------|--------------|-------------|-----------------------|
| 0.165500 | 58.7 | 19.8 | 65.2 | 6.4 | QP |
| 0.282500 | 50.8 | 19.7 | 60.7 | 10.0 | QP |
| 0.306530 | 50.4 | 19.7 | 60.1 | 9.7 | QP |
| 0.313230 | 50.1 | 19.7 | 59.9 | 9.8 | QP |
| 0.352690 | 50.9 | 19.9 | 58.9 | 8.0 | QP |
| 3.371390 | 46.6 | 19.9 | 56.0 | 9.4 | QP |
| 0.165500 | 42.7 | 19.8 | 55.2 | 12.5 | Ave. |
| 0.282500 | 45.0 | 19.7 | 50.7 | 5.8 | Ave. |
| 0.306530 | 42.1 | 19.7 | 50.1 | 8.0 | Ave. |
| 0.313230 | 39.6 | 19.7 | 49.9 | 10.3 | Ave. |
| 0.352690 | 40.4 | 19.9 | 48.9 | 8.5 | Ave. |
| 3.371390 | 44.2 | 19.9 | 46.0 | 1.8 | Ave. |

Note:

- 1) Correction Factor = LISN VDF (Voltage Division Factor) + Cable Loss + Transient Limiter Attenuation
- 2) Corrected Amplitude = Reading + Correction Factor
- 3) Margin = Limit – Corrected Amplitude

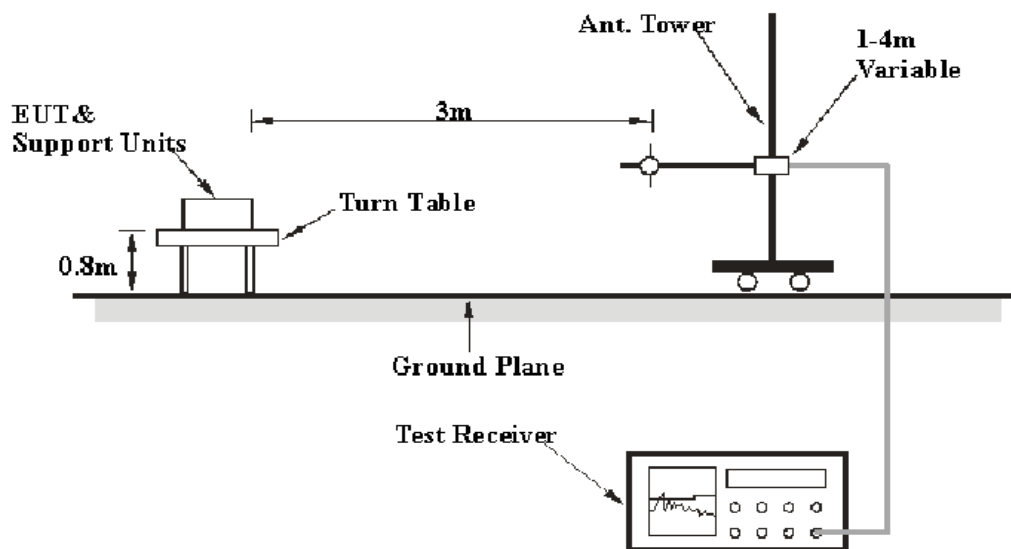
FCC §15.109 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

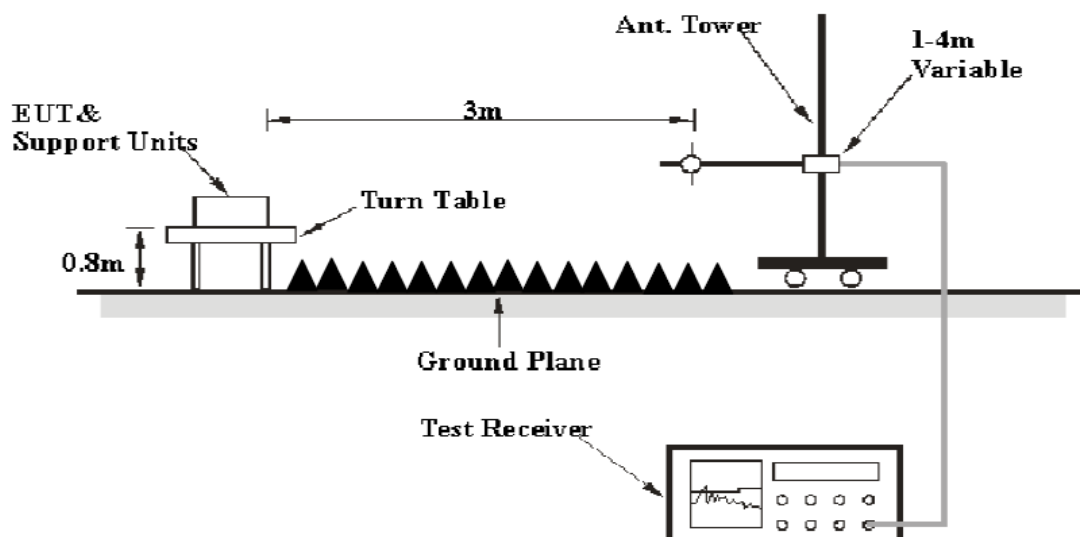
FCC §15.109

EUT Setup

Below 1GHz:



Above 1GHz:



The radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.4-2014. The specification used was the FCC Part 15.109 Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 2 GHz.

During the radiated emission test, the EMI test receiver was set with the following configurations:

| Frequency Range | RBW | Video B/W | IF B/W | Measurment |
|-------------------|---------|-----------|---------|------------|
| 30 MHz – 1000 MHz | 100 kHz | 300 kHz | 120 kHz | QP |
| Above 1 GHz | 1MHz | 3 MHz | / | PK |
| | 1MHz | 10 Hz | / | Ave. |

Test Procedure

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Loss, and subtracting the Amplifier Gain from the Meter Reading. The basic equation is as follows:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7 dB means the emission is 7 dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.109 Class B,

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level is in compliance with the limit if

$$L_m + U_{(L_m)} \leq L_{\text{lim}} + U_{\text{cispr}}$$

In BACL, $U_{(L_m)}$ is less than U_{cispr} , if L_m is less than L_{lim} , it implies that the EUT complies with the limit.

Test Data

Environmental Conditions

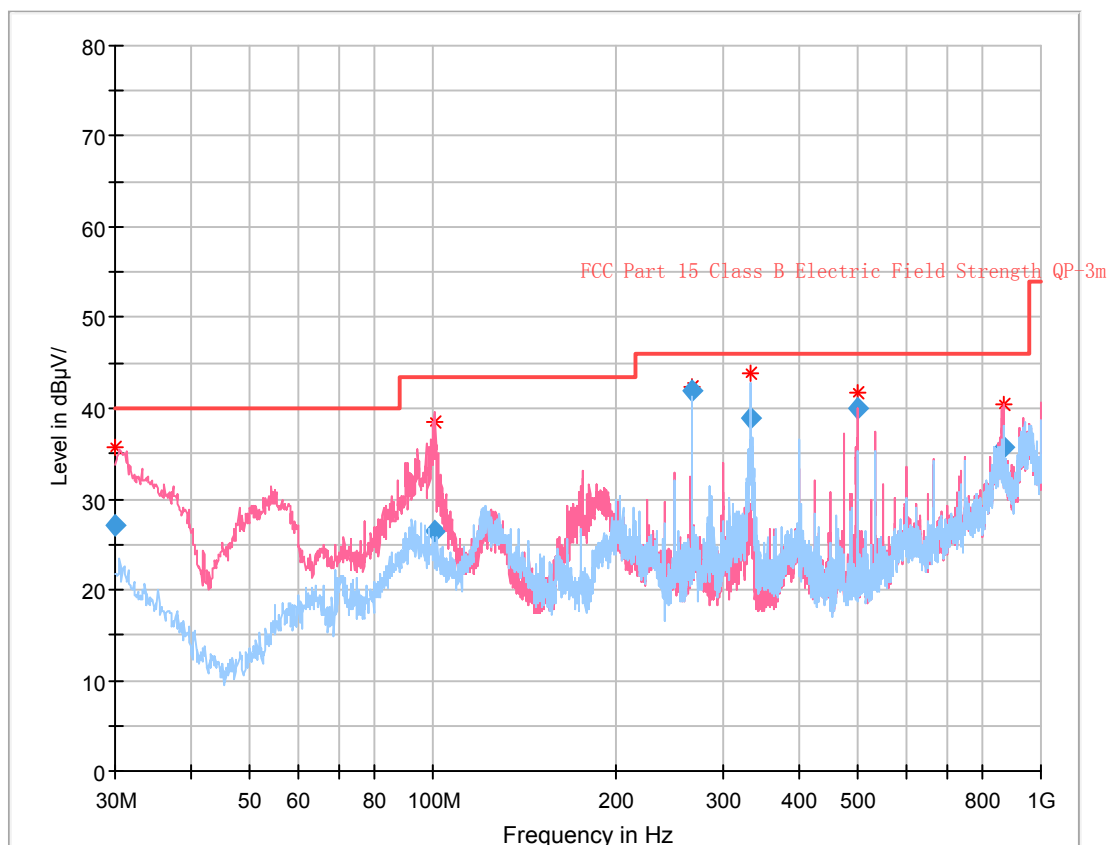
| | |
|--------------------|-----------|
| Temperature: | 25 °C |
| Relative Humidity: | 56 % |
| ATM Pressure: | 101.0 kPa |

The testing was performed by Baston Chen on 2019-04-10 to 2019-04-11 and Leo Huang on 2019-04-01.

EUT Operation Mode: Working (Talking with another IP Phone and Ping with PC)

Powered by Adapter 1 (MASSPOWER):

30 MHz~1 GHz:



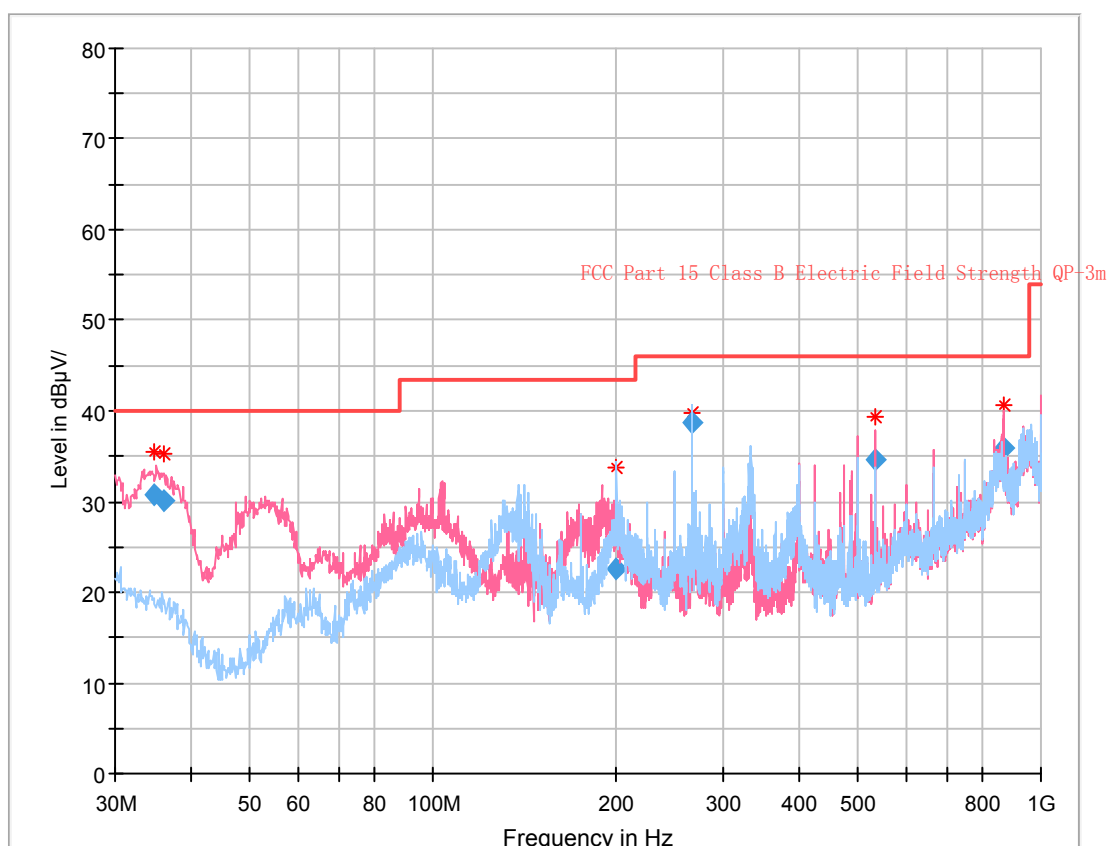
| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna height (cm) | Antenna Polarity | Turntable position (degree) | Correction Factor (dB/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|------------------------------|---------------------|------------------|-----------------------------|--------------------------|----------------|-------------|
| 30.060947 | 27.03 | 106.0 | V | 57.0 | -7.7 | 40.00 | 12.97 |
| 100.615875 | 26.37 | 116.0 | V | 121.0 | -17.1 | 43.50 | 17.13 |
| 266.668250 | 41.86 | 108.0 | H | 203.0 | -12.9 | 46.00 | 4.14 |
| 333.234125 | 38.85 | 108.0 | H | 188.0 | -10.8 | 46.00 | 7.15 |
| 499.987750 | 39.91 | 106.0 | V | 195.0 | -7.2 | 46.00 | 6.09 |
| 868.213500 | 35.63 | 115.0 | V | 193.0 | 5.9 | 46.00 | 10.37 |

1 GHz – 2 GHz:

| Frequency (MHz) | Receiver | | Turntable Degree | Rx Antenna | | Corrected Factor (dB/m) | Corrected Amplitude (dBuV/m) | FCC Part 15B | |
|-----------------|----------------|------------|------------------|------------|---------------|-------------------------|------------------------------|----------------|-------------|
| | Reading (dBuV) | PK/QP/Ave. | | Height (m) | Polar (H / V) | | | Limit (dBuV/m) | Margin (dB) |
| 1045.60 | 43.21 | PK | 34 | 1.6 | H | -5.11 | 38.10 | 74 | 35.90 |
| 1045.60 | 30.24 | Ave. | 34 | 1.6 | H | -5.11 | 25.13 | 54 | 28.87 |
| 1045.60 | 43.62 | PK | 334 | 1.1 | V | -5.11 | 38.51 | 74 | 35.49 |
| 1045.60 | 30.41 | Ave. | 334 | 1.1 | V | -5.11 | 25.30 | 54 | 28.70 |
| 1753.30 | 44.37 | PK | 320 | 2.2 | H | -2.01 | 42.36 | 74 | 31.64 |
| 1753.30 | 31.25 | Ave. | 320 | 2.2 | H | -2.01 | 29.24 | 54 | 24.76 |
| 1753.30 | 44.56 | PK | 40 | 2.0 | V | -2.01 | 42.55 | 74 | 31.45 |
| 1753.30 | 31.32 | Ave. | 40 | 2.0 | V | -2.01 | 29.31 | 54 | 24.69 |

Powered by Adapter 2 (SUNLIGHT):

30 MHz~1 GHz:



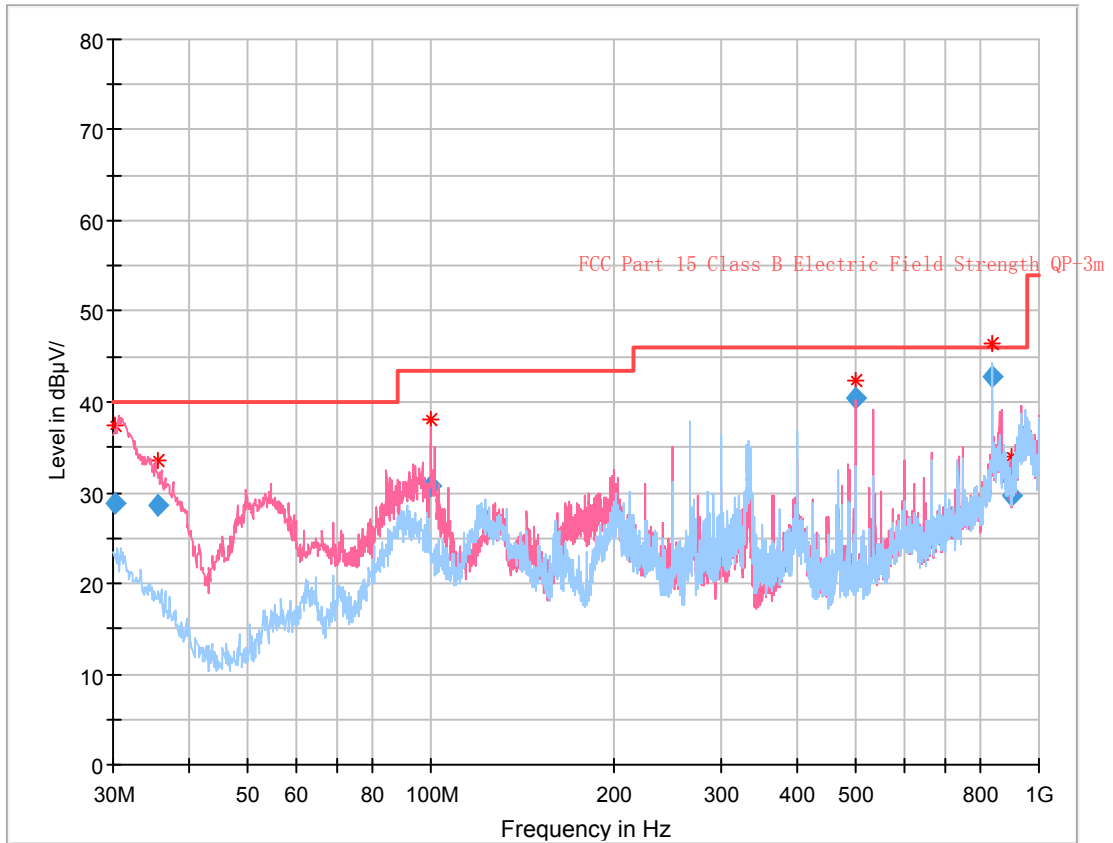
| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna height (cm) | Antenna Polarity | Turntable position (degree) | Correction Factor (dB/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|------------------------------|---------------------|------------------|-----------------------------|--------------------------|----------------|-------------|
| 34.787625 | 30.68 | 99.0 | V | 179.0 | -10.4 | 40.00 | 9.32 |
| 36.138250 | 30.05 | 138.0 | V | 210.0 | -11.3 | 40.00 | 9.95 |
| 200.619250 | 22.61 | 105.0 | H | 229.0 | -13.8 | 43.50 | 20.89 |
| 266.643875 | 38.72 | 108.0 | H | 101.0 | -12.9 | 46.00 | 7.28 |
| 533.282875 | 34.64 | 114.0 | V | 312.0 | -6.0 | 46.00 | 11.36 |
| 869.176750 | 36.01 | 112.0 | V | 193.0 | 5.9 | 46.00 | 9.99 |

1 GHz – 2 GHz:

| Frequency (MHz) | Receiver | | Turntable Degree | Rx Antenna | | Corrected Factor (dB/m) | Corrected Amplitude (dBuV/m) | FCC Part 15B | |
|-----------------|----------------|------------|------------------|------------|---------------|-------------------------|------------------------------|----------------|-------------|
| | Reading (dBμV) | PK/QP/Ave. | | Height (m) | Polar (H / V) | | | Limit (dBuV/m) | Margin (dB) |
| 1071.60 | 43.12 | PK | 46 | 2.1 | H | -4.69 | 38.43 | 74 | 35.57 |
| 1071.60 | 30.26 | Ave. | 46 | 2.1 | H | -4.69 | 25.57 | 54 | 28.43 |
| 1071.60 | 43.22 | PK | 126 | 1.6 | V | -4.69 | 38.53 | 74 | 35.47 |
| 1071.60 | 30.43 | Ave. | 126 | 1.6 | V | -4.69 | 25.74 | 54 | 28.26 |
| 1876.30 | 44.36 | PK | 71 | 1.6 | H | -1.68 | 42.68 | 74 | 31.32 |
| 1876.30 | 31.33 | Ave. | 71 | 1.6 | H | -1.68 | 29.65 | 54 | 24.35 |
| 1876.30 | 44.19 | PK | 252 | 1.6 | V | -1.68 | 42.51 | 74 | 31.49 |
| 1876.30 | 30.84 | Ave. | 252 | 1.6 | V | -1.68 | 29.16 | 54 | 24.84 |

Powered by Adapter 3 (Frecom):

30 MHz~1 GHz:



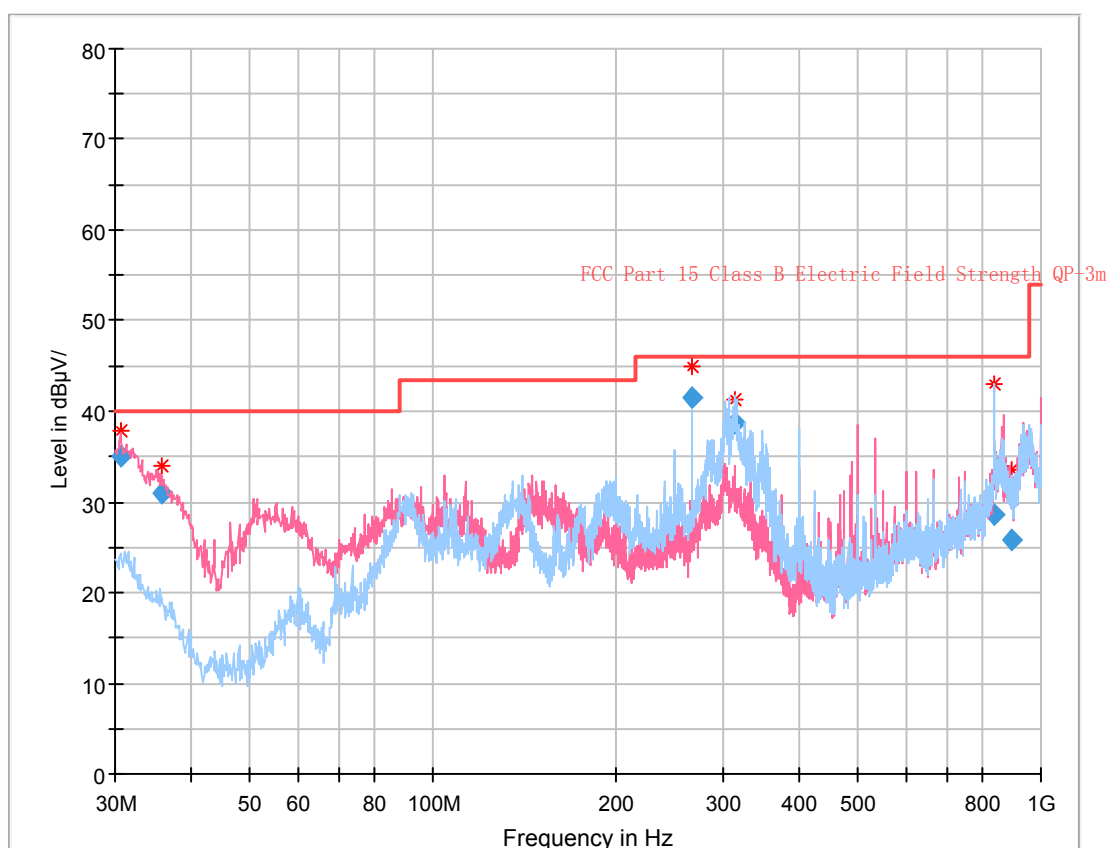
| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna height (cm) | Antenna Polarity | Turntable position (degree) | Correction Factor (dB/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|------------------------------|---------------------|------------------|-----------------------------|--------------------------|----------------|-------------|
| 30.148500 | 28.78 | 106.0 | V | 76.0 | -7.7 | 40.00 | 11.22 |
| 35.602000 | 28.54 | 116.0 | V | 169.0 | -10.9 | 40.00 | 11.46 |
| 99.593625 | 30.66 | 100.0 | V | 267.0 | -17.3 | 43.50 | 12.84 |
| 500.001625 | 40.36 | 100.0 | V | 206.0 | -7.2 | 46.00 | 5.64 |
| 836.658625 | 42.82 | 188.0 | H | 326.0 | 5.6 | 46.00 | 3.18 |
| 902.354625 | 29.66 | 119.0 | V | 185.0 | 4.4 | 46.00 | 17.34 |

1 GHz – 2GHz:

| Frequency (MHz) | Receiver | | Turntable Degree | Rx Antenna | | Corrected Factor (dB/m) | Corrected Amplitude (dBuV/m) | FCC Part 15B | |
|-----------------|----------------|------------|------------------|------------|---------------|-------------------------|------------------------------|----------------|-------------|
| | Reading (dBuV) | PK/QP/Ave. | | Height (m) | Polar (H / V) | | | Limit (dBuV/m) | Margin (dB) |
| 1035.50 | 43.26 | PK | 154 | 1.3 | H | -5.11 | 38.15 | 74 | 35.85 |
| 1035.50 | 30.42 | AV | 154 | 1.3 | H | -5.11 | 25.31 | 54 | 28.69 |
| 1035.50 | 43.52 | PK | 40 | 2.5 | V | -5.11 | 38.41 | 74 | 35.59 |
| 1035.50 | 30.26 | AV | 40 | 2.5 | V | -5.11 | 25.15 | 54 | 28.85 |
| 1824.30 | 44.35 | PK | 32 | 1.4 | H | -1.81 | 42.54 | 74 | 31.46 |
| 1824.30 | 31.24 | AV | 32 | 1.4 | H | -1.81 | 29.43 | 54 | 24.57 |
| 1824.30 | 44.43 | PK | 6 | 2.3 | V | -1.81 | 42.62 | 74 | 31.38 |
| 1824.30 | 31.26 | AV | 6 | 2.3 | V | -1.81 | 29.45 | 54 | 24.55 |

Powered by POE:

30 MHz~1 GHz:



| Frequency (MHz) | Corrected Amplitude (dBμV/m) | Antenna height (cm) | Antenna Polarity | Turntable position (degree) | Correction Factor (dB/m) | Limit (dBμV/m) | Margin (dB) |
|-----------------|------------------------------|---------------------|------------------|-----------------------------|--------------------------|----------------|-------------|
| 30.660375 | 34.96 | 106.0 | V | 190.0 | -8.0 | 40.00 | 5.04 |
| 35.819125 | 30.96 | 106.0 | V | 221.0 | -11.1 | 40.00 | 9.04 |
| 266.675500 | 41.48 | 118.0 | H | 90.0 | -12.9 | 46.00 | 4.52 |
| 313.709125 | 38.65 | 102.0 | H | 193.0 | -10.7 | 46.00 | 7.35 |
| 836.528375 | 28.62 | 373.0 | H | 57.0 | 5.6 | 46.00 | 17.38 |
| 894.856000 | 25.80 | 190.0 | V | 318.0 | 4.4 | 46.00 | 20.20 |

1 GHz – 2 GHz:

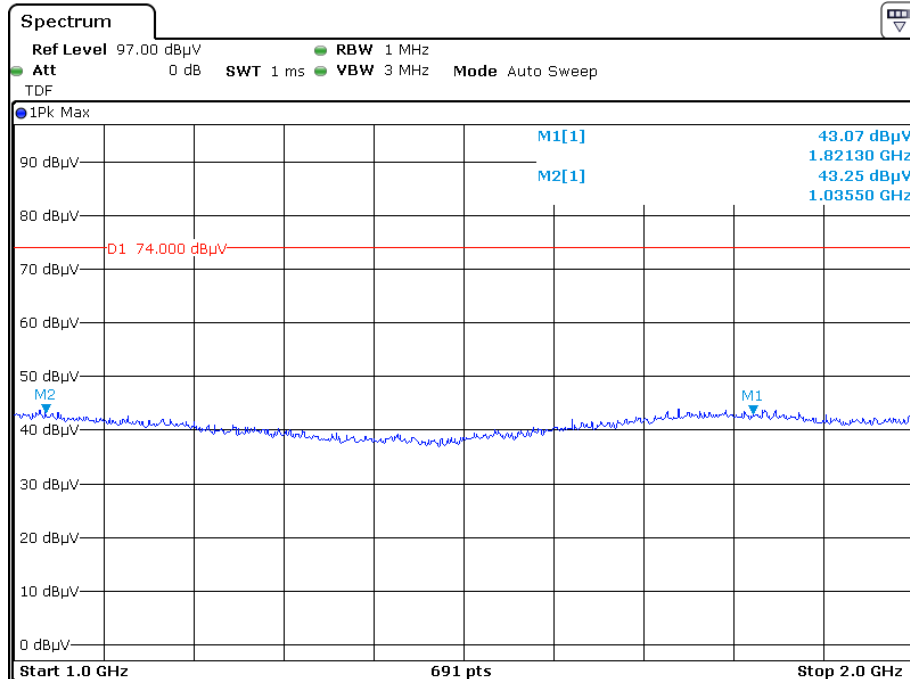
| Frequency (MHz) | Receiver | | Turntable Degree | Rx Antenna | | Corrected Factor (dB/m) | Corrected Amplitude (dBuV/m) | FCC Part 15B | |
|-----------------|----------------|------------|------------------|------------|---------------|-------------------------|------------------------------|----------------|-------------|
| | Reading (dBμV) | PK/QP/Ave. | | Height (m) | Polar (H / V) | | | Limit (dBuV/m) | Margin (dB) |
| 1036.90 | 43.54 | PK | 187 | 2.2 | H | -5.11 | 38.43 | 74 | 35.57 |
| 1036.90 | 30.29 | AV | 187 | 2.2 | H | -5.11 | 25.18 | 54 | 28.82 |
| 1036.90 | 43.64 | PK | 286 | 1.3 | V | -5.11 | 38.53 | 74 | 35.47 |
| 1036.90 | 30.37 | AV | 286 | 1.3 | V | -5.11 | 25.26 | 54 | 28.74 |
| 1777.90 | 44.36 | PK | 208 | 1.5 | H | -1.91 | 42.45 | 74 | 31.55 |
| 1777.90 | 31.45 | AV | 208 | 1.5 | H | -1.91 | 29.54 | 54 | 24.46 |
| 1777.90 | 44.46 | PK | 25 | 2.0 | V | -1.91 | 42.55 | 74 | 31.45 |
| 1777.90 | 31.23 | AV | 25 | 2.0 | V | -1.91 | 29.32 | 54 | 24.68 |

Note:

- 1) Correction Factor=Antenna factor (RX) + cable loss – amplifier factor
- 2) Corrected Amplitude = Correction Factor + Reading
- 3) Margin = Limit - Corrected Amplitude

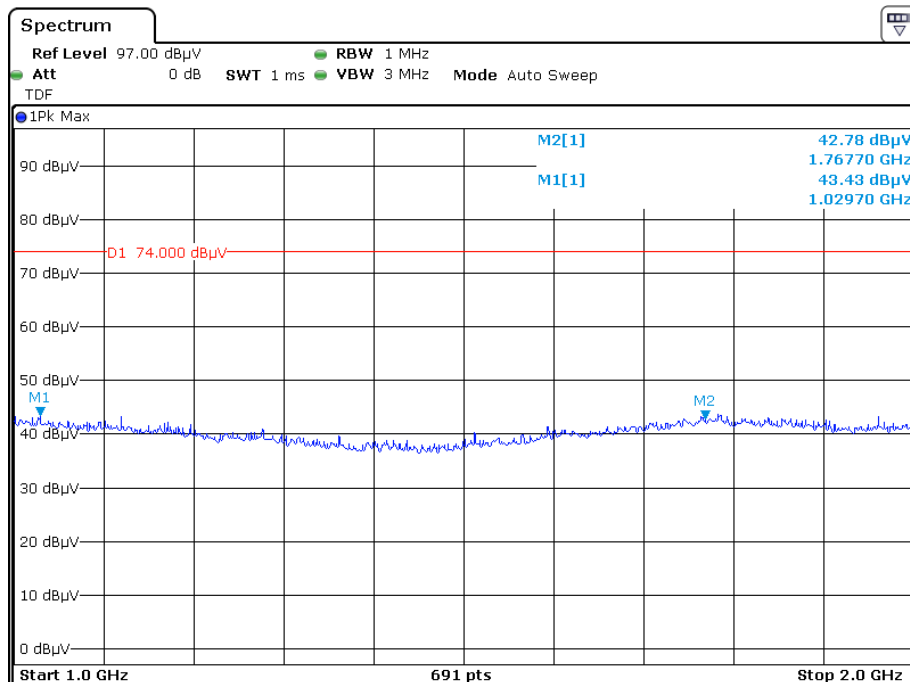
Pre-scan for peak

Horizontal – Peak (1-2GHz)



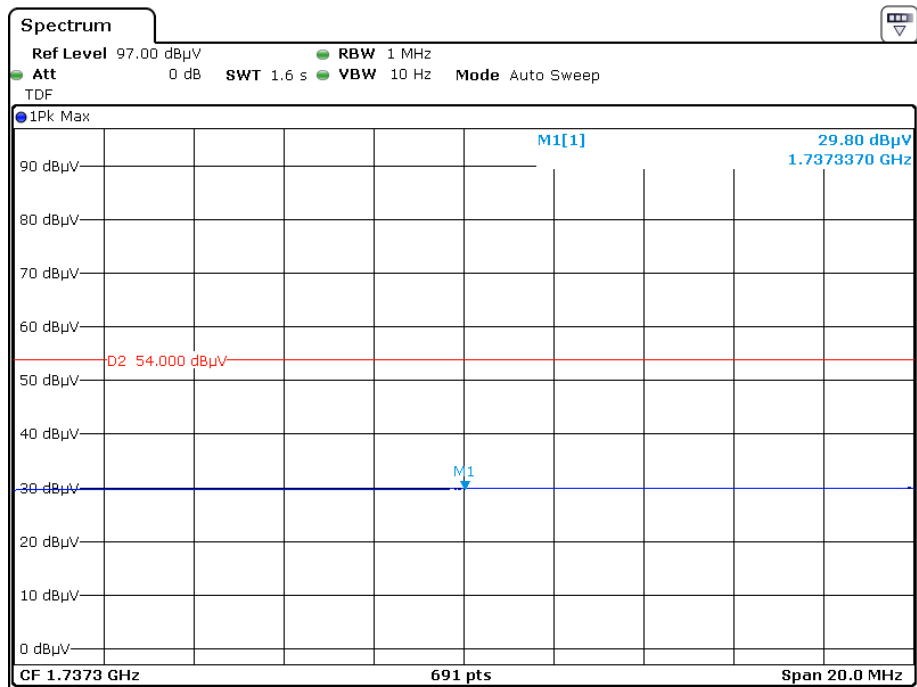
Date: 1.APR.2019 00:34:46

Vertical - Peak (1-2 GHz)



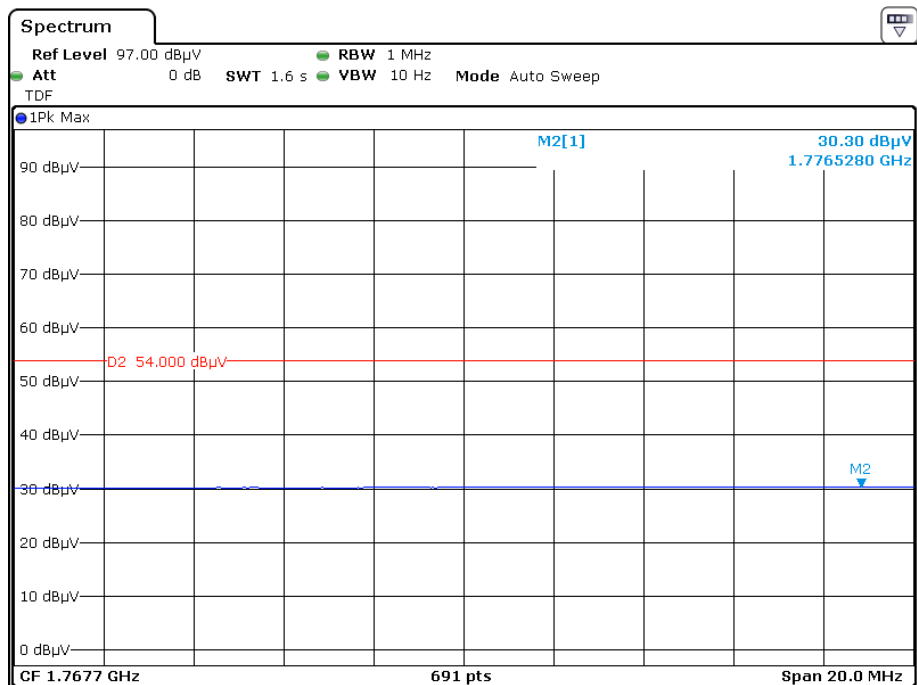
Date: 1.APR.2019 00:40:55

Horizontal – Average



Date: 1.APR.2019 00:37:36

Vertical - Average



Date: 1.APR.2019 00:42:34

***** END OF REPORT *****