

FCC PART 15B, CLASS B MEASUREMENT AND TEST REPORT

For

Grandstream Networks, Inc.

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

FCC ID: YZZGSC3615

Report Type: Original Report	Product Type: FHD Infrared Weatherproof IP Box Camera
Report Number: RSZ200421004-00	
Report Date: 2020-05-14	
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TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY	3
MEASUREMENT UNCERTAINTY	4
TEST FACILITY	4
SYSTEM TEST CONFIGURATION	5
DESCRIPTION OF TEST CONFIGURATION	5
EUT EXERCISE SOFTWARE	5
SPECIAL ACCESSORIES	5
EQUIPMENT MODIFICATIONS	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
EXTERNAL I/O CABLE.....	6
BLOCK DIAGRAM OF TEST SETUP	7
SUMMARY OF TEST RESULTS	8
TEST EQUIPMENT LIST	9
FCC §15.107 – AC LINE CONDUCTED EMISSIONS.....	10
APPLICABLE STANDARD	10
EUT SETUP	10
EMI TEST RECEIVER SETUP.....	10
TEST PROCEDURE	11
CORRECTED FACTOR & MARGIN CALCULATION	11
TEST RESULTS SUMMARY	11
TEST DATA	11
FCC §15.109 - RADIATED SPURIOUS EMISSIONS	16
APPLICABLE STANDARD	16
EUT SETUP	16
EMI TEST RECEIVER SETUP.....	17
TEST PROCEDURE	17
CORRECTED AMPLITUDE & MARGIN CALCULATION	17
TEST RESULTS SUMMARY	17
TEST DATA	17

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	FHD Infrared Weatherproof IP Box Camera
Tested Model	GSC3615
Voltage Range	DC 12.0V from adapter or DC 48V from POE
Highest operating frequency	512MHz
Date of Test	2020-04-27 to 2020-05-13
Sample serial number	RSZ200421004-EM-S1(Assigned by BACL, Shenzhen)
Received date	2020-04-21
Sample/EUT Status	Good condition

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)

No related submittal(s).

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		$\pm 1.95\text{dB}$
Radiated Emissions	Below 1GHz	$\pm 4.75\text{dB}$
	Above 1GHz	$\pm 4.88\text{dB}$

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. 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 a manufacturer testing fashion.

EUT operation mode: Working

EUT Exercise Software

No exercise software was used.

Special Accessories

No special accessory.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

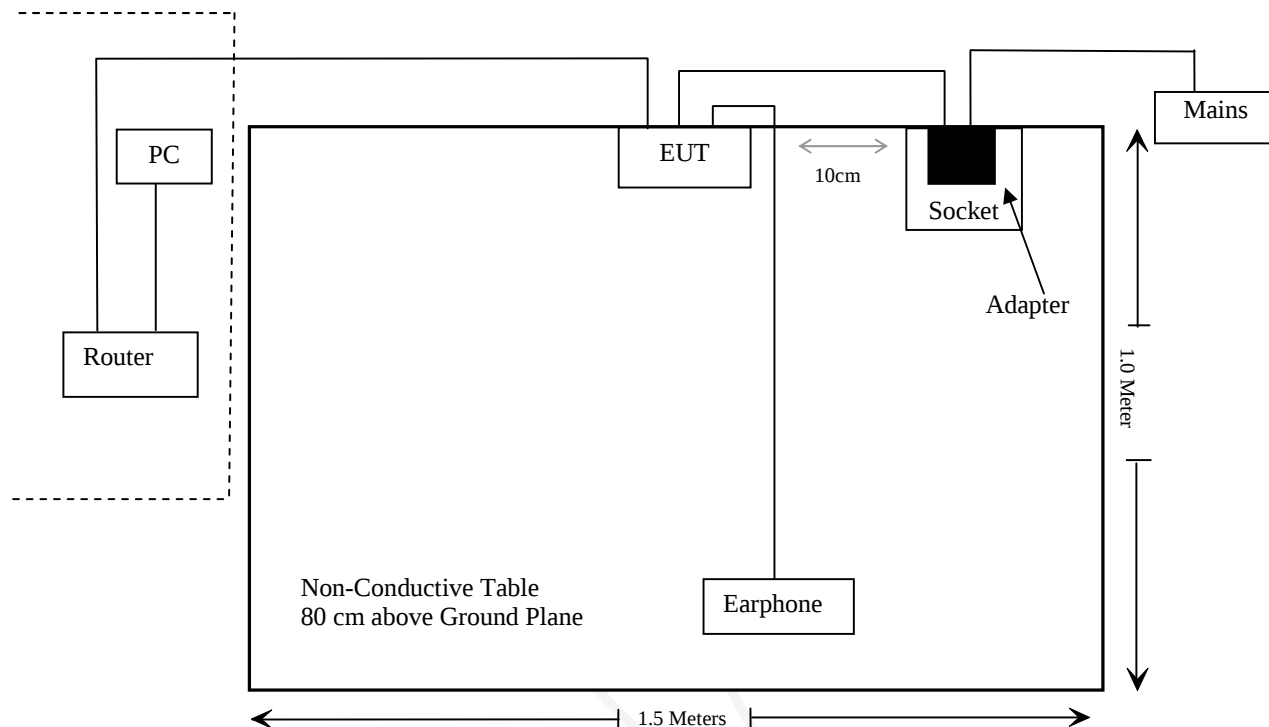
Manufacturer	Description	Model	Serial Number
Unkown	Earphone	001	Unkown
HIKVISION	Router	DS-3WR03-E	10021642429
BULL	Socket	GN-415K	5503290068073
DELL	PC	Optiplex380	127BP2X
Mass power	Adapter	PEA-120100VA	Unkown
GOSPELL	POE	G0720-480-050	Unkown

External I/O Cable

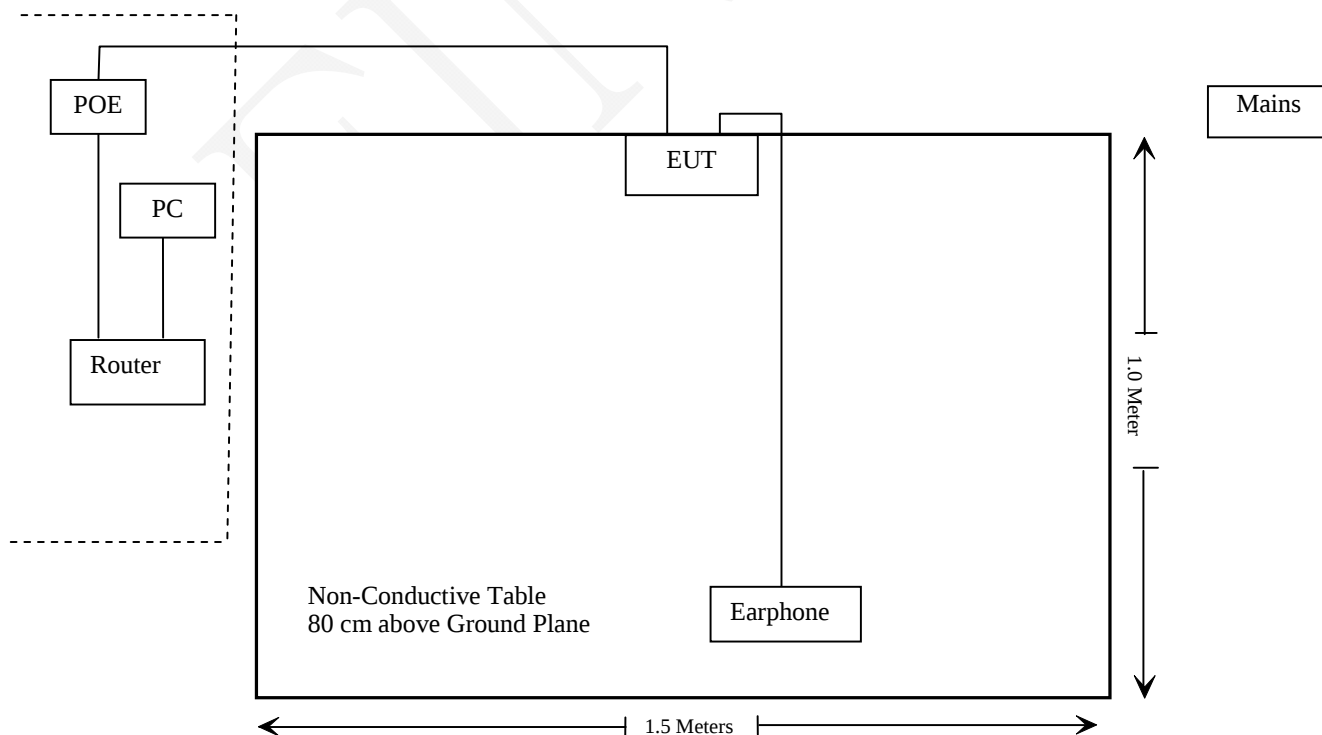
Cable Description	Length (m)	From/Port	To
Unshielded un-detachable AC cable	1.2	Socket	mains
Unshielded un-detachable earphone cable	1.2	Earphone	EUT
Unshielded un-detachable DC cable	1.5	Adapter	EUT
Shielded detachable RJ45 cable	1.0	Router	PC
Unshielded detachable RJ45 cable	8.0	EUT	Router
Unshielded detachable RJ45 cable	1.8	POE	Router
Unshielded detachable RJ45 cable	8.0	POE	EUT

Block Diagram of Test Setup

AC Mains:



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
Rohde & Schwarz	EMI Test Receiver	ESCI	101120	2019/7/9	2020/7/8
Rohde & Schwarz	LISN	ENV216	101613	2020/1/22	2021/1/21
Rohde & Schwarz	Transient Limitor	ESH3Z2	DE25985	2019/11/29	2020/11/28
Unkown	CE Cable	CE Cable	UF A210B-1-0720-504504	2019/11/29	2020/11/28
Rohde & Schwarz	CE Test software	EMC 32	V8.53.0	NCR	NCR
R&S	EMI Test Receiver	ESR3	102455	2019/7/9	2020/7/8
Sonoma instrument	Pre-amplifier	310 N	186238	2020/4/20	2021/4/20
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2017/12/22	2020/12/21
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR
COM-POWER	Pre-amplifier	PA-122	181919	2019/11/29	2020/11/28
Sunol Sciences	Horn Antenna	DRH-118	A052604	2017/12/22	2020/12/21
Yijia	Temperature & Humidity Meter	TA218B	E0938	2019/10/14	2020/10/13
Insulted Wire Inc.	RF Cable	SPS-2503-3150	02222010	2019/11/29	2020/11/28
Unkown	RF Cable	W1101-EQ1 OUT	F-19-EM005	2019/11/29	2020/11/28

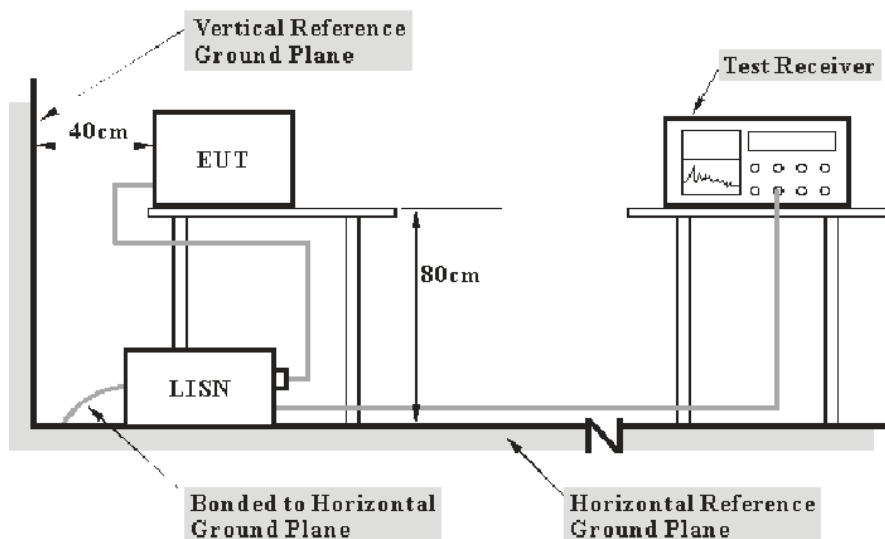
* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

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

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.

Test Data

Environmental Conditions

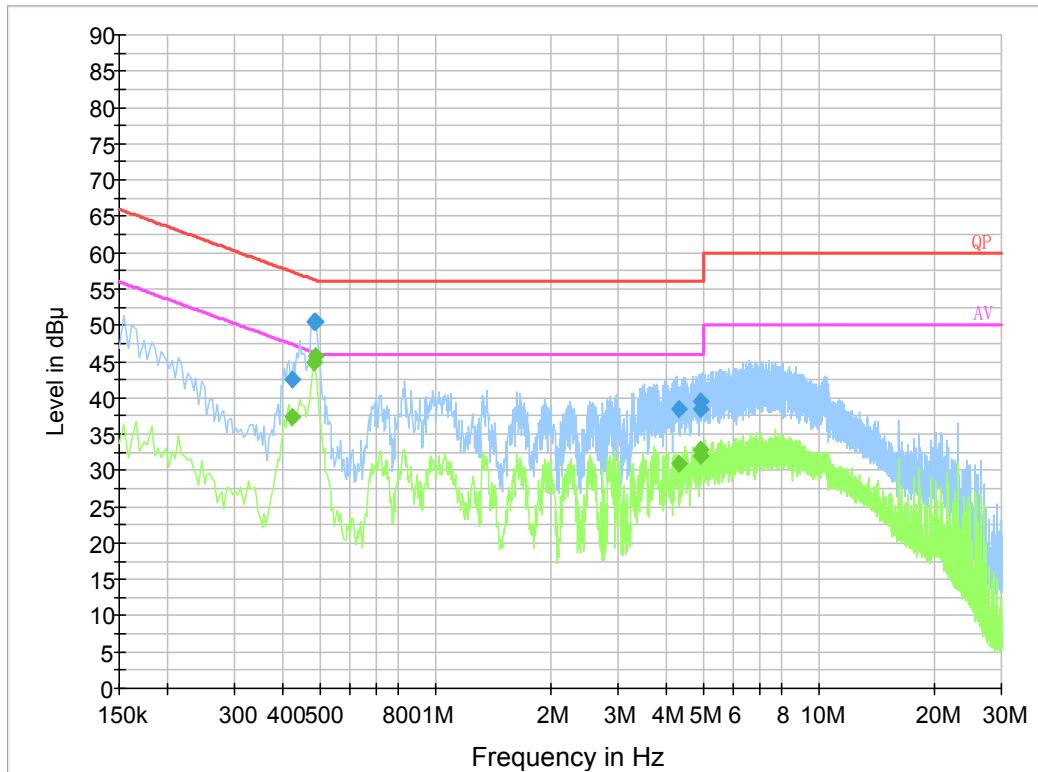
Temperature:	25 °C
Relative Humidity:	65 %
ATM Pressure:	101.0 kPa

The testing was performed by Haiguo Li on 2020-04-27 and 2020-05-13.

EUT Operation Mode: Working

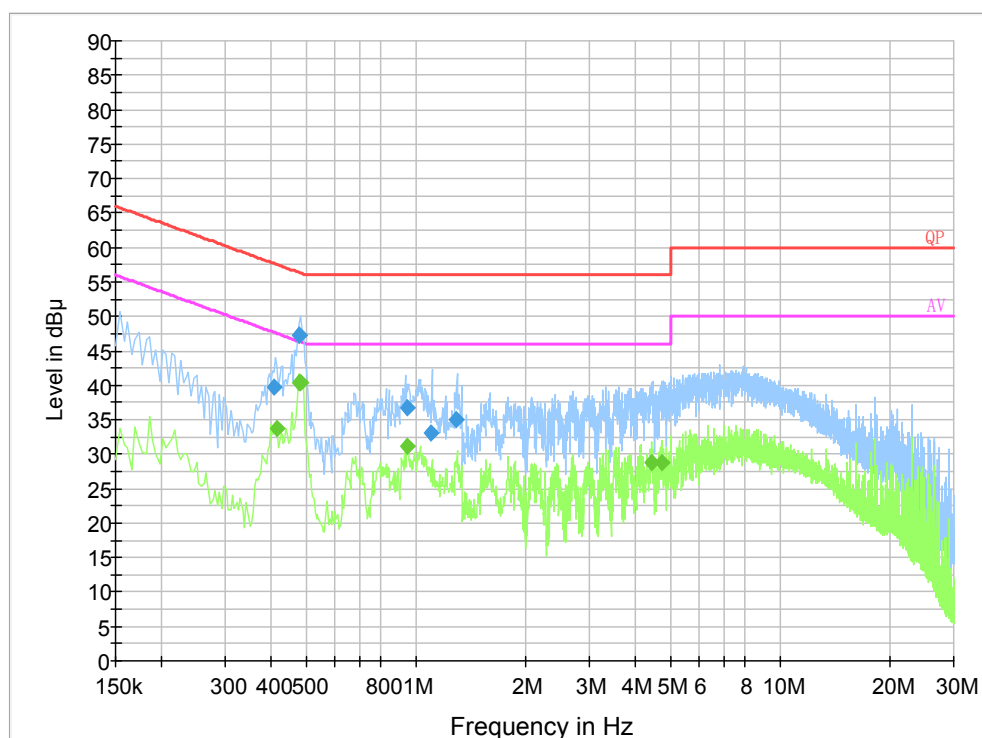
For adapter:

AC 120V/60 Hz, Line

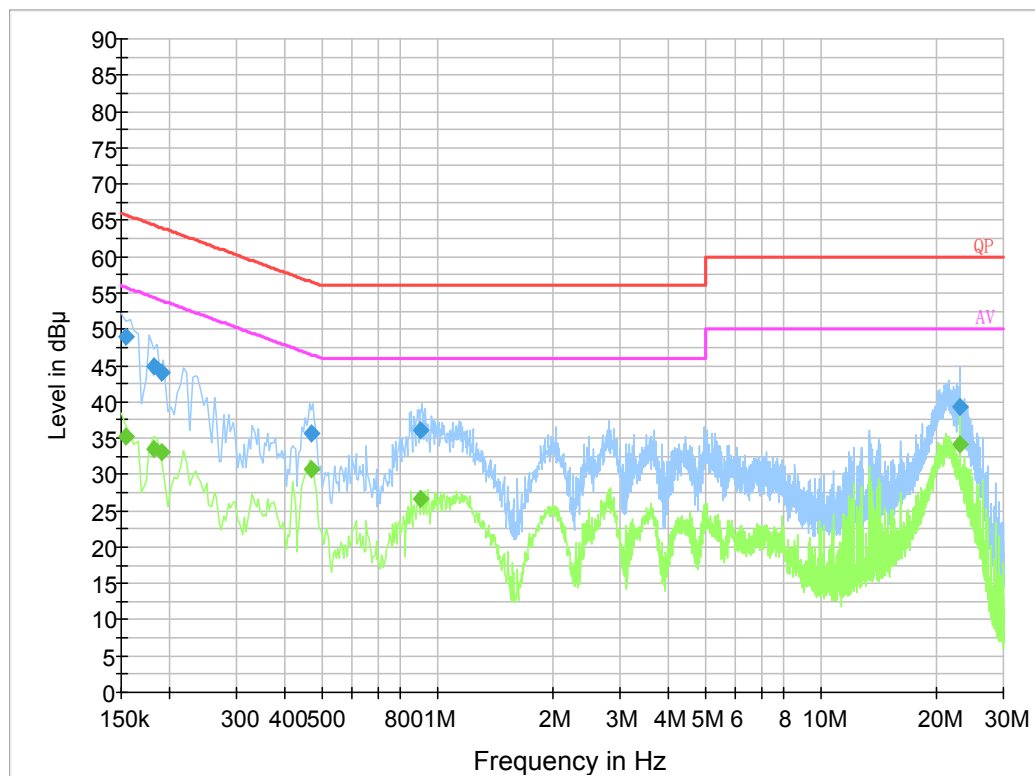


Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.424270	42.5	19.9	57.4	14.9	QP
0.485170	50.4	19.8	56.3	5.9	QP
0.486710	50.5	19.8	56.2	5.7	QP
4.301890	38.4	19.9	56.0	17.6	QP
4.939630	38.5	19.9	56.0	17.5	QP
4.944830	39.6	19.9	56.0	16.4	QP
0.424270	37.3	19.9	47.4	10.1	Ave.
0.485170	44.8	19.8	46.3	1.5	Ave.
0.486710	45.7	19.8	46.2	0.5	Ave.
4.301890	30.9	19.9	46.0	15.1	Ave.
4.939630	32.1	19.9	46.0	13.9	Ave.
4.944830	32.9	19.9	46.0	13.1	Ave.

AC 120V/60 Hz, Neutral

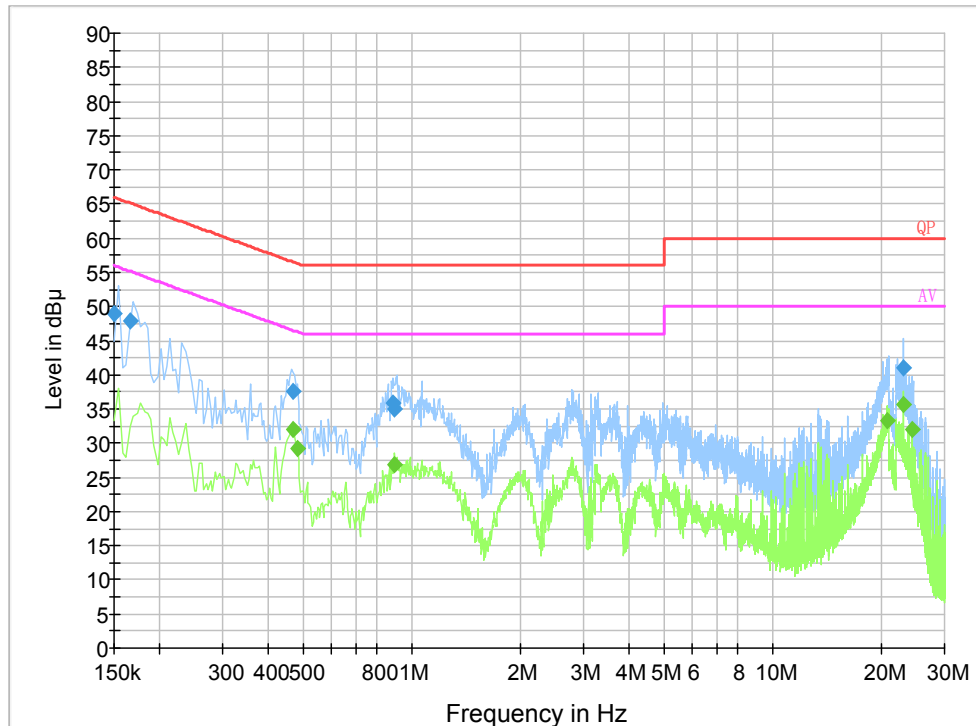


Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.407790	39.7	19.8	57.7	18.0	QP
0.478770	47.3	19.8	56.4	9.1	QP
0.478830	47.2	19.8	56.4	9.2	QP
0.947930	36.8	19.8	56.0	19.2	QP
1.105350	33.0	19.8	56.0	23.0	QP
1.290530	35.0	19.8	56.0	21.0	QP
0.418000	33.7	19.8	47.5	13.8	Ave.
0.478000	40.4	19.8	46.4	6.0	Ave.
0.482000	40.3	19.8	46.3	6.0	Ave.
0.946000	31.1	19.8	46.0	14.9	Ave.
4.430000	28.7	19.9	46.0	17.3	Ave.
4.726000	28.7	19.9	46.0	17.3	Ave.

For POE:**AC 120V/60 Hz, Line**

Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.154000	49.0	19.8	65.8	16.8	QP
0.182500	44.8	19.8	64.4	19.6	QP
0.190501	44.0	19.8	64.0	20.0	QP
0.470890	35.8	19.8	56.5	20.7	QP
0.908290	36.2	19.8	56.0	19.8	QP
23.067050	39.4	20.4	60.0	20.6	QP
0.154000	35.3	19.8	55.8	20.5	Ave.
0.182500	33.5	19.8	54.4	20.9	Ave.
0.190501	33.1	19.8	54.0	20.9	Ave.
0.470890	30.8	19.8	46.5	15.7	Ave.
0.908290	26.7	19.8	46.0	19.3	Ave.
23.067050	34.2	20.4	50.0	15.8	Ave.

AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBμV)	Correction Factor (dB)	Limit (dBμV)	Margin (dB)	Detector (PK/Ave./QP)
0.150000	49.0	19.8	66.0	17.0	QP
0.165500	47.9	19.8	65.2	17.3	QP
0.471010	37.6	19.8	56.5	18.9	QP
0.884650	35.8	19.7	56.0	20.2	QP
0.896350	35.1	19.7	56.0	20.9	QP
23.127050	41.1	20.3	60.0	18.9	QP
0.470000	31.9	19.8	46.5	14.6	Ave.
0.482000	29.2	19.8	46.3	17.1	Ave.
0.898000	26.9	19.7	46.0	19.1	Ave.
20.910000	33.3	20.4	50.0	16.7	Ave.
23.130000	35.7	20.3	50.0	14.3	Ave.
24.350000	32.0	20.3	50.0	18.0	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

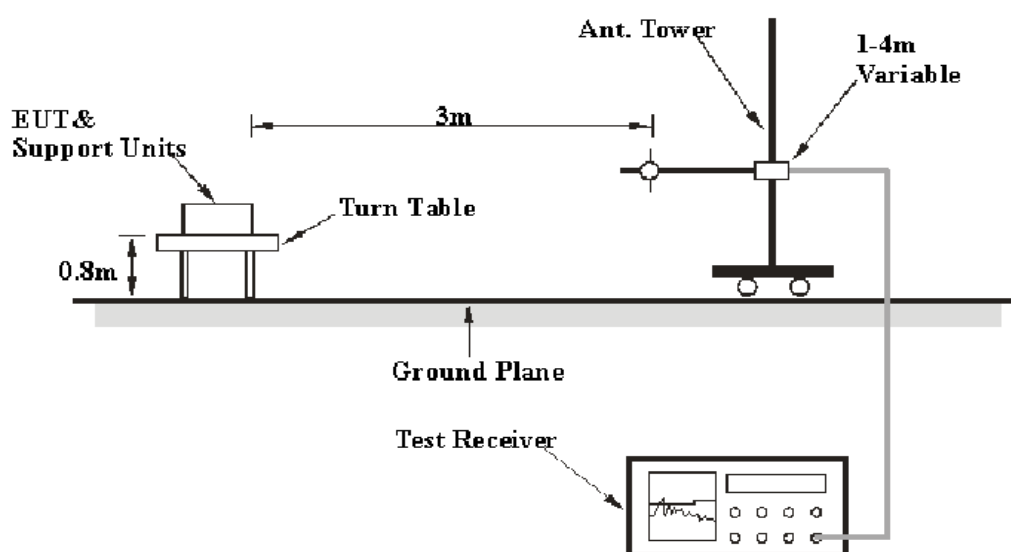
FCC §15.109 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

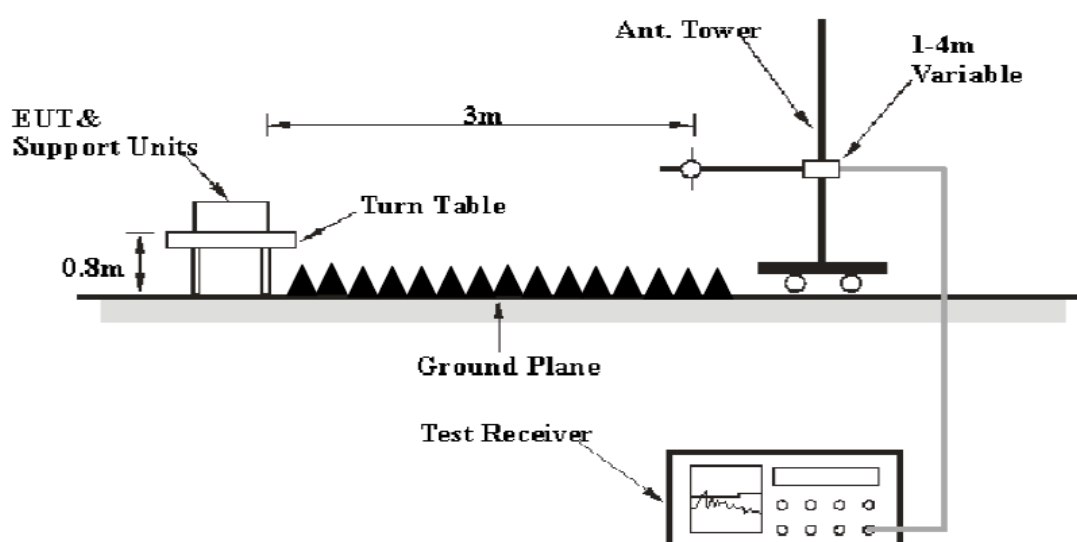
FCC §15.109

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 5 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	Measurement
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 recorded data in following table, the EUT complied with the FCC §15.109 Class B.

Test Data

Environmental Conditions

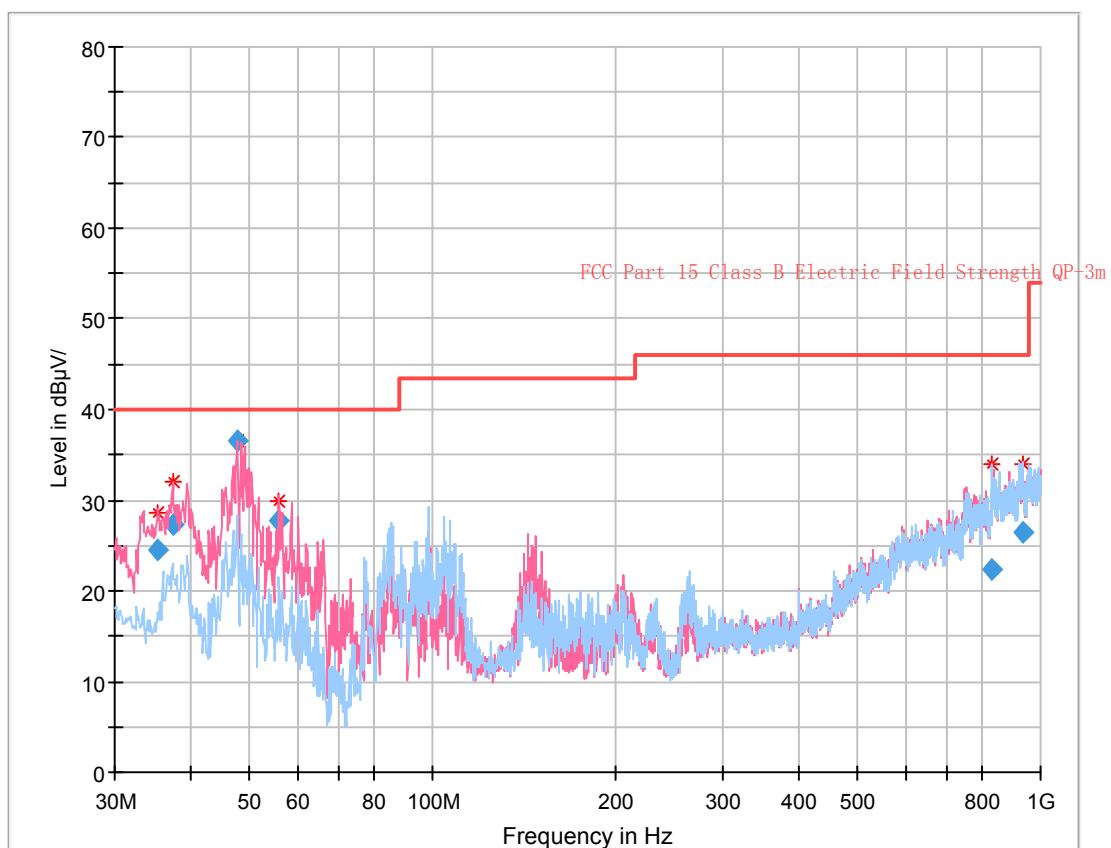
Temperature:	23~26 °C
Relative Humidity:	60~65 %
ATM Pressure:	101.0 kPa

The testing was performed by Holland Yang on 2020-04-29 and Hams He on 2020-05-13 for below 1G and Leven Gan on 2020-04-28 and Leo Huang on 2020-05-13 for above 1G.

EUT Operation Mode: Working

For adapter:

30 MHz – 1 GHz:



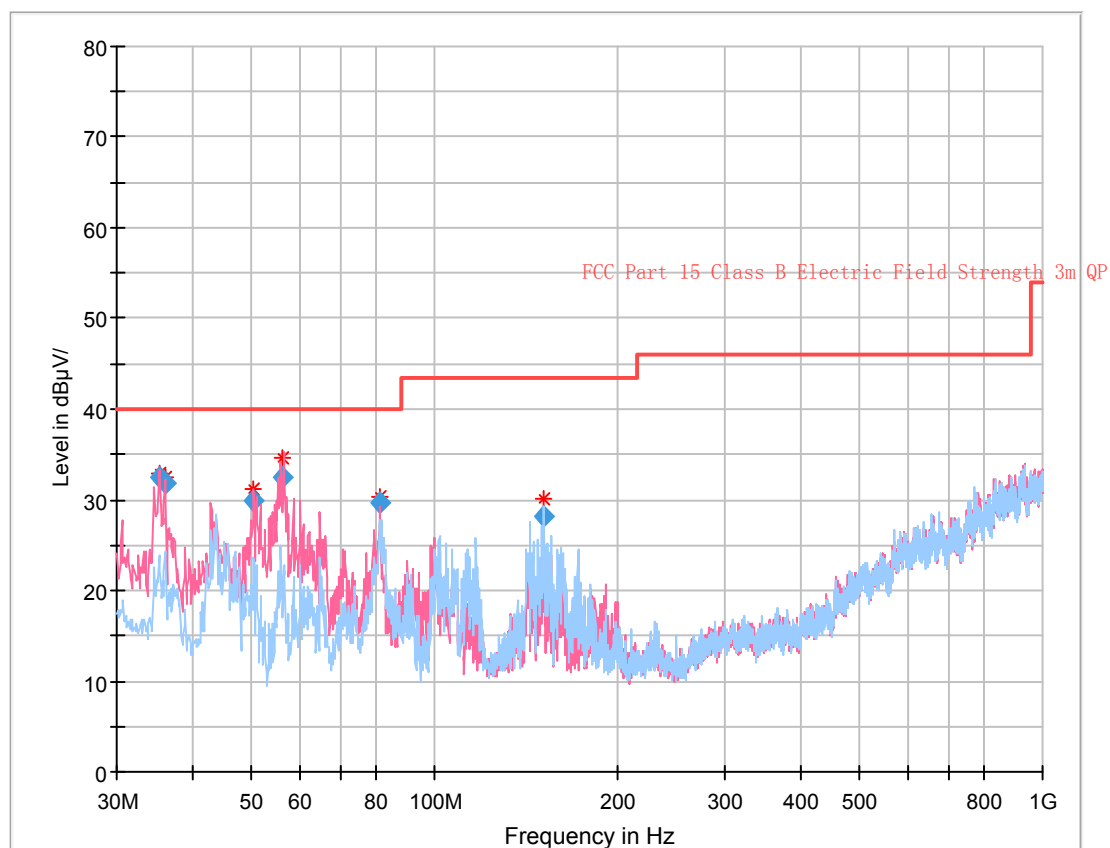
Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna height (cm)	Antenna Polarity	Turntable position (degree)	Correction Factor (dB/m)	Limit (dBμV/m)	Margin (dB)
35.334125	24.47	102.0	V	349.0	-10.7	40.00	15.53
37.525625	27.24	126.0	V	224.0	-12.2	40.00	12.76
47.797875	36.61	101.0	V	253.0	-18.6	40.00	3.39
55.923125	27.66	138.0	V	271.0	-20.0	40.00	12.34
829.384250	22.27	290.0	H	60.0	2.5	46.00	23.73
933.185875	26.39	176.0	H	34.0	4.8	46.00	19.61

Above 1 GHz

Frequency (MHz)	Measurement		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dB μ V/m)	FCC Part 15B	
	Reading (dB μ V)	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dB μ V/m)	Margin (dB)
1704.36	42.76	PK	350	1.2	H	-2.11	40.65	74	33.35
1704.36	28.45	Ave.	350	1.2	H	-2.11	26.34	54	27.66
1704.36	42.62	PK	324	2.1	V	-2.11	40.51	74	33.49
1704.36	28.47	Ave.	324	2.1	V	-2.11	26.36	54	27.64
2769.20	42.83	PK	164	2.0	H	0.83	43.66	74	30.34
2769.20	27.82	Ave.	164	2.0	H	0.83	28.65	54	25.35
2769.20	42.69	PK	167	2.4	V	0.83	43.52	74	30.48
2769.20	27.98	Ave.	167	2.4	V	0.83	28.81	54	25.19

For 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)
35.356625	32.45	102.0	V	29.0	-10.7	40.00	7.55
36.137125	31.79	103.0	V	26.0	-11.3	40.00	8.21
50.439250	29.80	118.0	V	0.0	-19.7	40.00	10.20
56.016500	32.50	108.0	V	171.0	-20.0	40.00	7.50
81.205750	29.65	104.0	V	120.0	-19.9	40.00	10.35
151.543250	28.17	190.0	H	60.0	-14.2	43.50	15.33

Above 1 GHz

Frequency (MHz)	Measurement		Turntable Degree	Rx Antenna		Corrected Factor (dB/m)	Corrected Amplitude (dBμV/m)	FCC Part 15B	
	Reading (dBμV)	PK/QP/Ave.		Height (m)	Polar (H / V)			Limit (dBμV/m)	Margin (dB)
1356.43	42.12	PK	336	1.4	H	-3.52	38.60	74	35.40
1356.43	28.43	Ave.	336	1.4	H	-3.52	24.91	54	29.09
1356.43	42.37	PK	209	2.1	V	-3.52	38.85	74	35.15
1356.43	28.52	Ave.	209	2.1	V	-3.52	25.00	54	29.00
1987.64	42.36	PK	102	2.1	H	-1.29	41.07	74	32.93
1987.64	28.43	Ave.	102	2.1	H	-1.29	27.14	54	26.86
1987.64	42.43	PK	266	2.4	V	-1.29	41.14	74	32.86
1987.64	28.34	Ave.	266	2.4	V	-1.29	27.05	54	26.95

Note:

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

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