ACCREDITED
TESTING LABORATORY
CERTIFICATE # 4821.01

BACL
Bay Area Compliance Labs Corp.

FCC PART 15B, CLASS B

TEST REPORT

For

Grandstream Networks, Inc.

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

FCC ID: YZZGSC3510

Report Type:	**Product Type:**
Original Report	SIP Two-Way Intercom Speaker

Report Number:	RSZ190315003-00A
Report Date:	2019-06-28
Reviewed By:	Alvin Huang Lab Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F., West Wing, Third Phase of Wanli Industrial Building, Shihua Road, Futian Free Trade Zone, Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product	SIP Two-Way Intercom Speaker
Tested Model	GSC3510
Multiple Model#	GSC3505
Voltage Range	DC 48V from POE
Measure	210 mm (L) * 210 mm (W) * 72 mm (H)
Highest operating frequency	5825MHz
Date of Test	2019/06/13~2019/06/27
Sample serial number	190315003
Received date	2019/03/15
Sample/EUT Status	Good condition

Notes: This series products model: GSC3505 and GSC3510 are identical schematics, Model GSC3510 was selected for fully testing, the detailed information can be referred to the declaration which was stated and guaranteed by the applicant.

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)

FCC Part 15.247 DTS&DSS and Part 15.407 NII submissions with FCC ID: YZZGSC3510.

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 expended 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		±1.95dB
Emissions, radiated	Below 1GHz	±4.75dB
	Above 1GHz	±4.88dB

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 a manufacturer testing fashion.

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

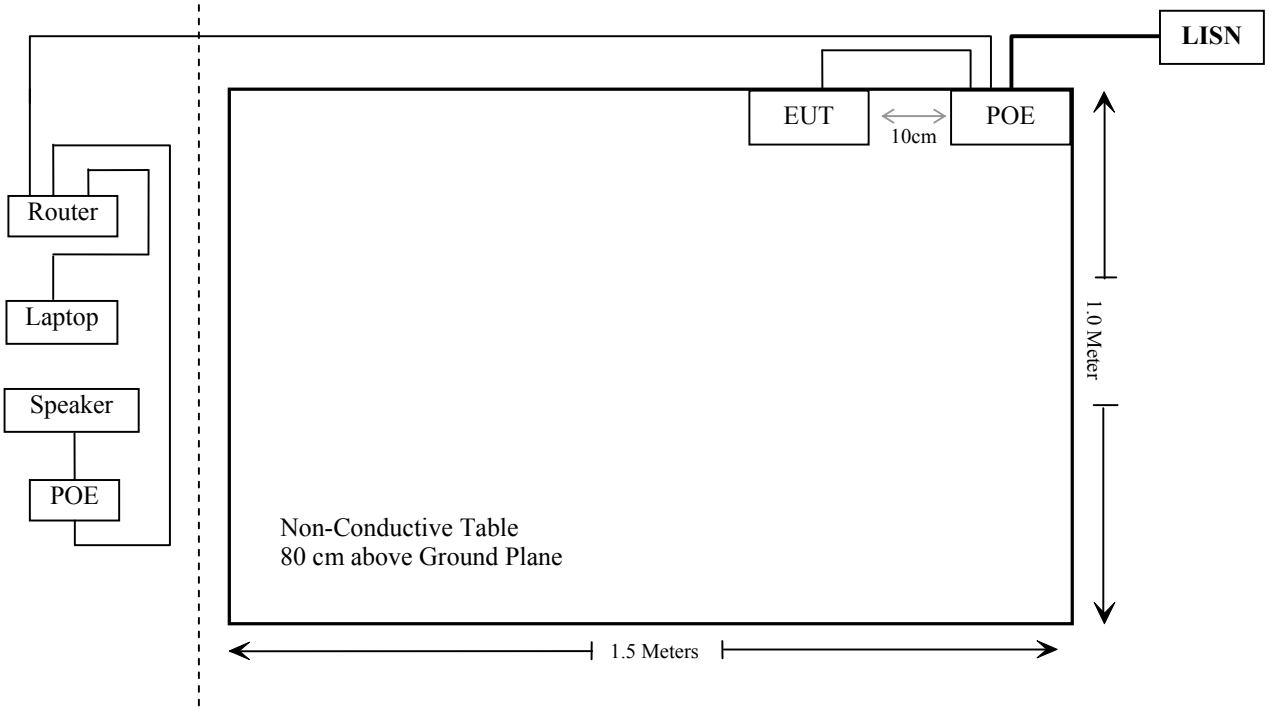
Manufacturer	Description	Model	Serial Number
NETGEAR	POE	FS108P	1DL1733C00493
Dcoma	POE	PSE801G	Un-known
SAGEMCOM	Router	F@ST1704N	3c81d839027c
HP	Laptop	Compaq CQ45	5CG334081V
Grandstream	Speaker	GSC3510	Un-known

External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded Detachable AC Cable	1.0	LISN	POE
Unshielded Detachable RJ45 Cable	1.2	POE	Router
Unshielded Detachable RJ45 Cable	1.0	Router	POE
Unshielded Detachable RJ45 Cable	1.3	Router	Laptop
Unshielded Detachable RJ45 Cable	1.2	Speaker	POE

Block Diagram of Test Setup

For conducted emission:



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	2019-01-25	2020-01-25
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2019-03-02	2020-03-02
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
Ducommun Technologies	Horn Antenna	ARH-4223-02	1007726-04	2017-12-29	2020-12-28
Ducommun Technologies	Horn Antenna	ARH-4283-02	1007726-03	2017-12-29	2020-12-28
Heatsink Required	Amplifier	QLW-18405536-J0	15964001002	2018-11-12	2019-11-12
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2018-07-11	2019-07-11
UTiFLEX MICRO-C0AX	RF Cable	UFA147A-2362-100100	MFR64639 231029-003	2018-11-12	2019-11-12
Ducommun technologies	RF Cable	104PEA	218124002	2018-11-12	2019-11-12
Ducommun technologies	RF Cable	RG-214	1	2018-11-12	2019-11-12
Ducommun technologies	RF Cable	RG-214	2	2018-11-12	2019-11-12
Rohde & Schwarz	Auto test software	EMC 32	V9.10	NCR	NCR

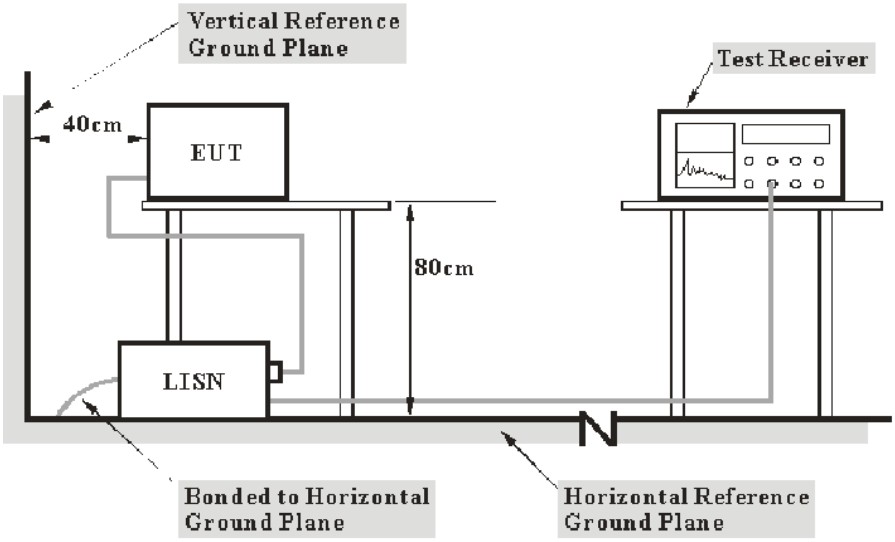
*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

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 host PC was connected to the first LISN and the other relevant equipments were conncected 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:

Correction Factor = LISN VDF + Cable Loss + 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:

Margin = Limit – 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

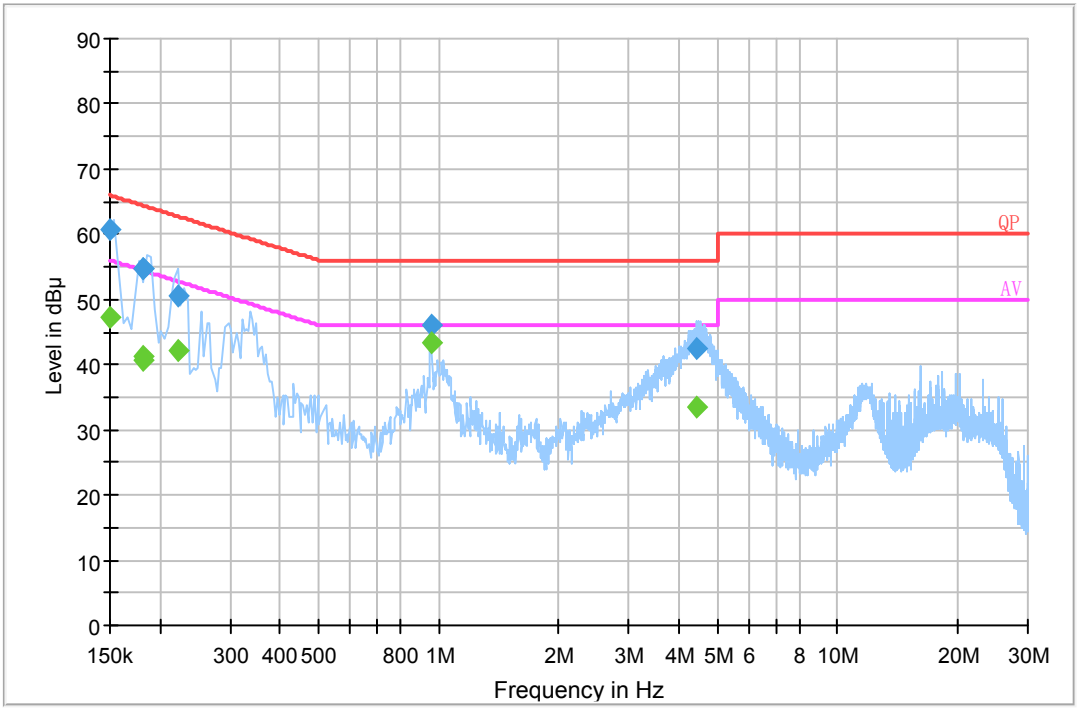
Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	50 %
ATM Pressure:	101.0 kPa

The testing was performed by Joson Xiao on 2019-06-13.

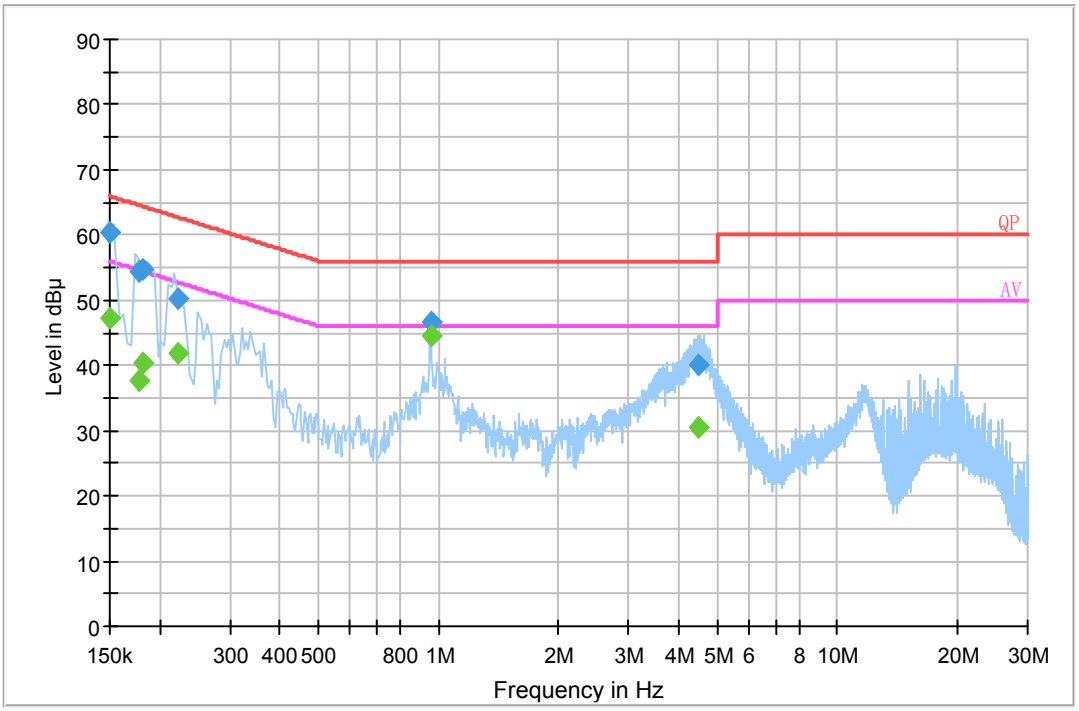
EUT Operation Mode: Working (two different models are test, and worst case is the GSC3510, the data as below)

AC 120V/60 Hz, Line



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.150000	60.8	19.8	66.0	5.2	QP
0.181500	54.8	19.9	64.4	9.6	QP
0.182500	54.8	19.8	64.4	9.6	QP
0.221500	50.7	19.8	62.8	12.1	QP
0.955690	45.9	19.8	56.0	10.1	QP
4.419070	42.5	19.9	56.0	13.5	QP
0.150000	47.3	19.8	56.0	8.7	Ave.
0.181500	40.6	19.9	54.4	13.8	Ave.
0.182500	41.3	19.8	54.4	13.1	Ave.
0.221500	42.0	19.8	52.8	10.7	Ave.
0.955690	43.4	19.8	46.0	2.6	Ave.
4.419070	33.6	19.9	46.0	12.4	Ave.

AC 120V/60 Hz, Neutral



Frequency (MHz)	Corrected Amplitude (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Detector (PK/Ave./QP)
0.150000	60.5	19.8	66.0	5.5	QP
0.178500	54.5	19.8	64.6	10.1	QP
0.181500	54.8	19.8	64.4	9.6	QP
0.221500	50.2	19.8	62.8	12.6	QP
0.955690	46.8	19.8	56.0	9.2	QP
4.485870	40.1	19.9	56.0	15.9	QP
0.150000	47.3	19.8	56.0	8.7	Ave.
0.178500	37.8	19.8	54.6	16.8	Ave.
0.181500	40.3	19.8	54.4	14.1	Ave.
0.221500	41.8	19.8	52.8	11.0	Ave.
0.955690	44.4	19.8	46.0	1.6	Ave.
4.485870	30.5	19.9	46.0	15.5	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

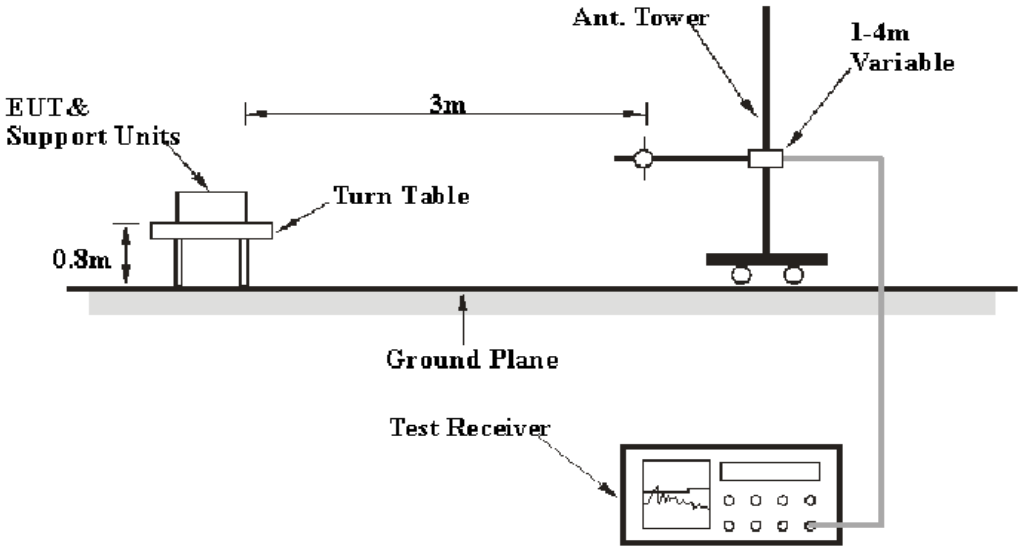
FCC §15.109 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

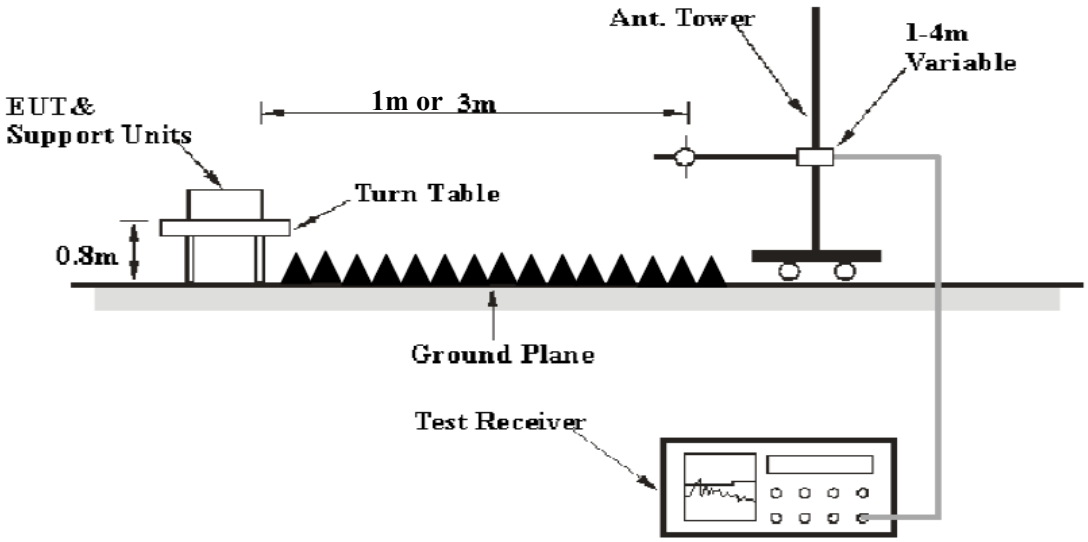
FCC §15.109

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 30 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:

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss - 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:

Margin = Limit – Corrected Amplitude

For above 18GHz testing:
According to ANSI C63.10-2013,9.4: For field strength measurements made at other than the distance at which the applicable limit is specified,extrapolate the measured field strength to the field strength at the distance specified by the limit using an inverse distance correction factor (20 dB/decade of distance). In some cases, a different distance correction factor may be required;

$$E_{\mathrm{SpecLimit}} = E_{\mathrm{Meas}} + 20\log\left(\frac{d_{\mathrm{Meas}}}{d_{\mathrm{SpecLimit}}}\right)$$

where

$E_{\mathrm{SpecLimit}}$	is the field strength of the emission at the distance specified by the limit, in dBµV/m
E_{Meas}	is the field strength of the emission at the measurement distance, in dBµV/m
d_{Meas}	is the measurement distance, in m
$d_{\mathrm{SpecLimit}}$	is the distance specified by the limit, in m

So the extrapolation factor of 1m is 20*log(1/3)= -9.5 dB

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

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

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

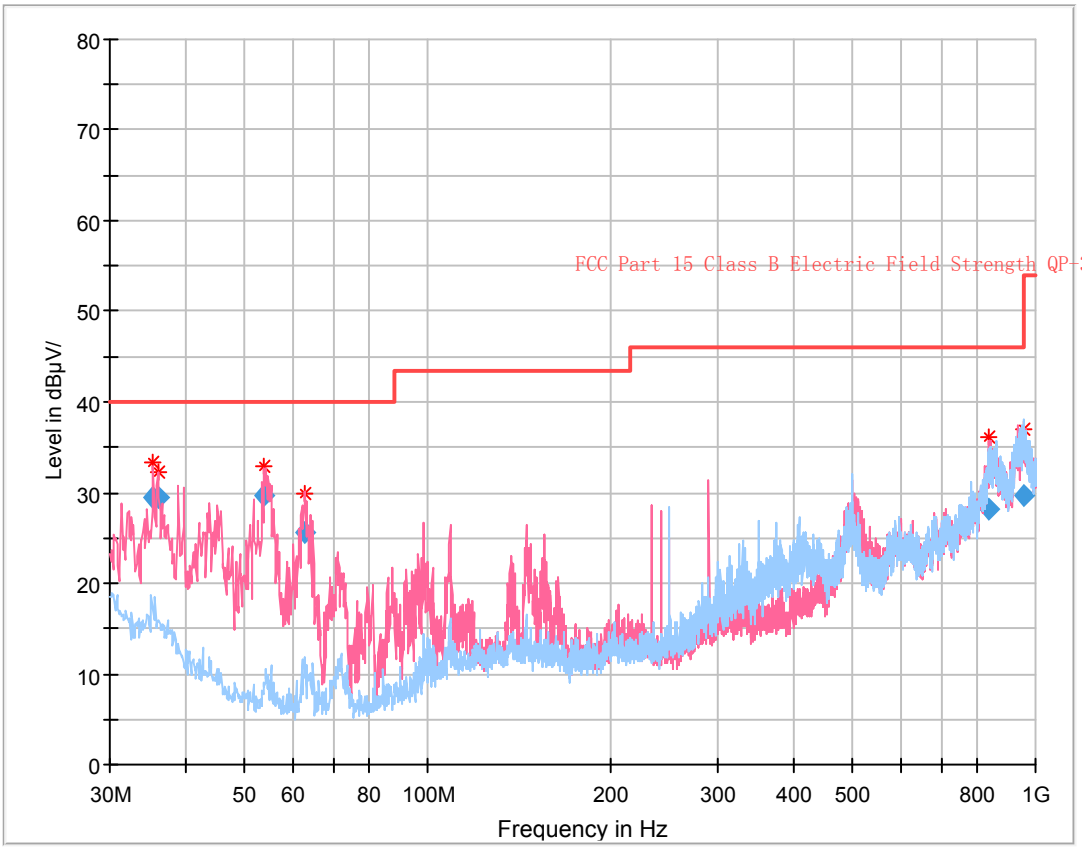
Temperature:	25~26 ℃
Relative Humidity:	52~55 %
ATM Pressure:	101.0 kPa

The testing was performed by Baston Chen and Alan He on 2019-06-13 and 2019-06-27.

EUT Operation Mode: Working

Model: GSC3510

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)
35.404625	29.47	120.0	V	186.0	-10.8	40.00	10.53
36.129250	29.53	100.0	V	89.0	-11.3	40.00	10.47
53.830625	29.58	108.0	V	14.0	-19.8	40.00	10.42
62.675125	25.69	131.0	V	225.0	-20.3	40.00	14.31
837.553500	28.22	139.0	V	19.0	5.7	46.00	17.78
958.478750	29.75	177.0	H	237.0	9.3	46.00	16.25

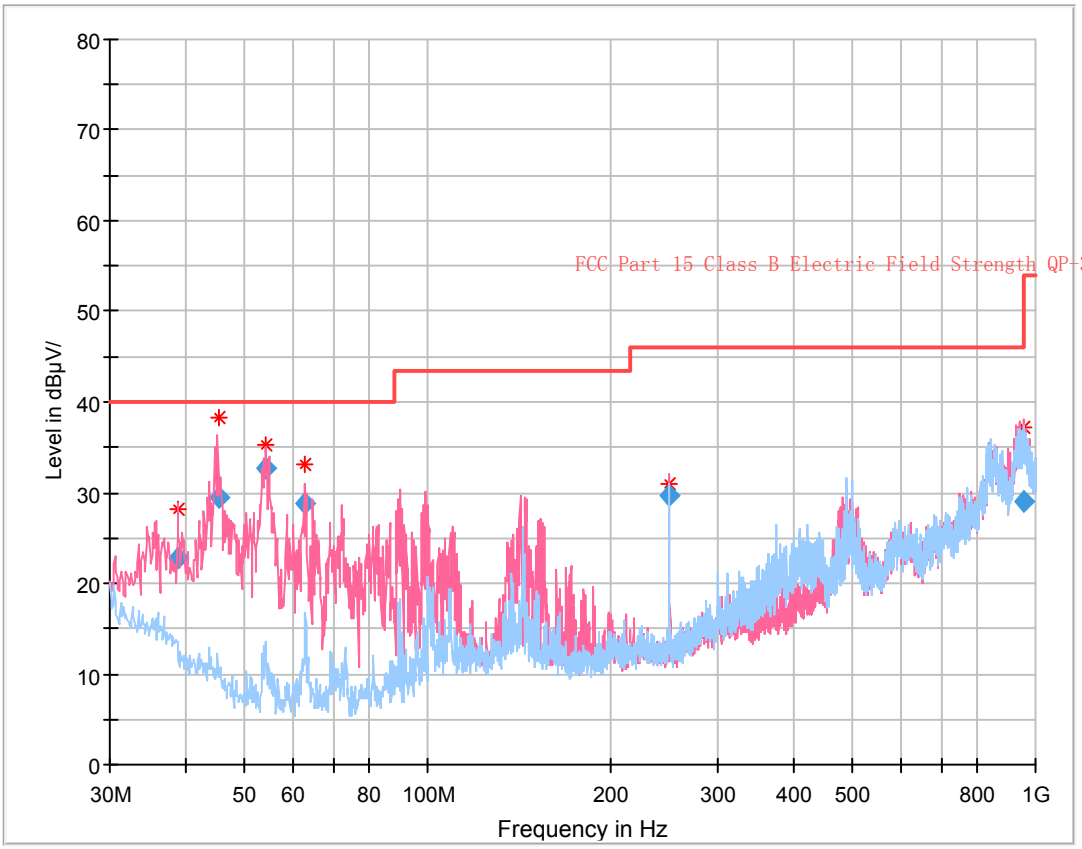
1 GHz – 30 GHz:

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)
1132.26	47.29	PK	15	2.4	H	-5.43	41.86	74	32.14
1132.26	30.12	Ave.	15	2.4	H	-5.43	24.69	54	29.31
1132.26	47.15	PK	238	1.2	V	-5.43	41.72	74	32.28
1132.26	30.03	Ave.	238	1.2	V	-5.43	24.60	54	29.40
2464.93	51.67	PK	110	1.1	H	-0.25	51.42	74	22.58
2464.93	45.11	Ave.	110	1.1	H	-0.25	44.86	54	9.14
2464.93	48.94	PK	228	2.3	V	-0.25	48.69	74	25.31
2464.93	42.44	Ave.	228	2.3	V	-0.25	42.19	54	11.81

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

Model: GSC3505

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)
38.926125	22.75	100.0	V	279.0	-13.1	40.00	17.25
45.293250	29.50	116.0	V	0.0	-17.4	40.00	10.50
54.159375	32.76	116.0	V	0.0	-19.9	40.00	7.24
62.968125	28.85	211.0	V	332.0	-20.3	40.00	11.15
250.018125	29.61	106.0	V	249.0	-14.1	46.00	16.39
955.647250	29.13	116.0	V	194.0	9.5	46.00	16.87

1 GHz – 30 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)
1070.20	47.53	PK	223	2.2	H	-5.73	41.80	74	32.20
1070.20	28.10	Ave.	223	2.2	H	-5.73	22.37	54	31.63
1070.20	48.36	PK	274	2.0	V	-5.73	42.63	74	31.37
1070.20	28.25	Ave.	274	2.0	V	-5.73	22.52	54	31.48
2460.60	59.96	PK	330	1.4	H	-0.25	59.71	74	14.29
2460.60	28.39	Ave.	330	1.4	H	-0.25	28.14	54	25.86
2460.60	63.05	PK	341	1.3	V	-0.25	62.80	74	11.20
2460.60	31.03	Ave.	341	1.3	V	-0.25	30.78	54	23.22

Note:

4) Correction Factor=Antenna factor (RX) + cable loss – amplifier factor
5) Corrected Amplitude = Correction Factor + Reading
6) Margin = Limit - Corrected Amplitude

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