TESTING LABORATORY
CERTIFICATE#4323.01

FCC PART 15B

TEST REPORT

For

AKUVOX (XIAMEN) NETWORKS CO., LTD.

10/F, No.56, Software Park II, Xiamen, China

FCC ID: 2AHCR-R20XV2

Report Type:	**Product Type:**
Original Report	Door Phone

Test Engineer:	Chao Gao
Report Number:	RXM191012053-00B
Report Date:	2019-11-04
Reviewed By:	Oscar Ye EMC Manager
Prepared By:	Bay Area Compliance Laboratories Corp. (Kunshan) No.248 Chenghu Road, Kunshan,Jiangsu province, China Tel: +86-0512-86175000 Fax: +86-0512-88934268 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Applicant	AKUVOX (XIAMEN) NETWORKS CO., LTD
Test Model	R20A
Series Model	R20V
Model Difference	Model Names
Product	Door Phone
Rate Voltage	DC 12V power by External power supply or DC 48V power by POE
Highest Operation Frequency	400 MHz

Note: The product's series model number: R20V.The difference between them was explained in the attached declaration letter.

**All measurement and test data in this report was gathered from production sample serial number: 20191012053. (Assigned by the BACL. The EUT supplied by the applicant was received on 2019-10-12)*

Objective

This report is prepared on behalf of *AKUVOX (XIAMEN) NETWORKS CO., LTD* in accordance with Part 2-Subpart J, and Part 15-Subparts A and B of the Federal Communication Commission's rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15C DXX Submittal with FCC ID: 2AHCR-R20XV2.

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

Test Facility

The test site used by Bay Area Compliance Laboratories Corp. (Kunshan) to collect test data is located on the No.248 Chenghu Road, Kunshan, Jiangsu province, China.

Bay Area Compliance Laboratories Corp. (Kunshan) Lab is accredited to ISO/IEC 17025 by A2LA (Lab code: 4323.01) and the FCC designation No. CN1185 under the FCC KDB 974614 D01 and CAB identifier CN0004 under the ISED requirement. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2014.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

Test mode 1: DC 12V from Adapter + LAN port Link(100Mbps)
Test mode 2: DC 48V from POE + LAN port Link (100Mbps)

Note: The EUT can connect to the LAN port link, The EUT and the LAN port ping link the data to maintain the communication status with each other.

EUT Exercise Software

No exercise software was used to test.

Special Accessories

No special accessory was used.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

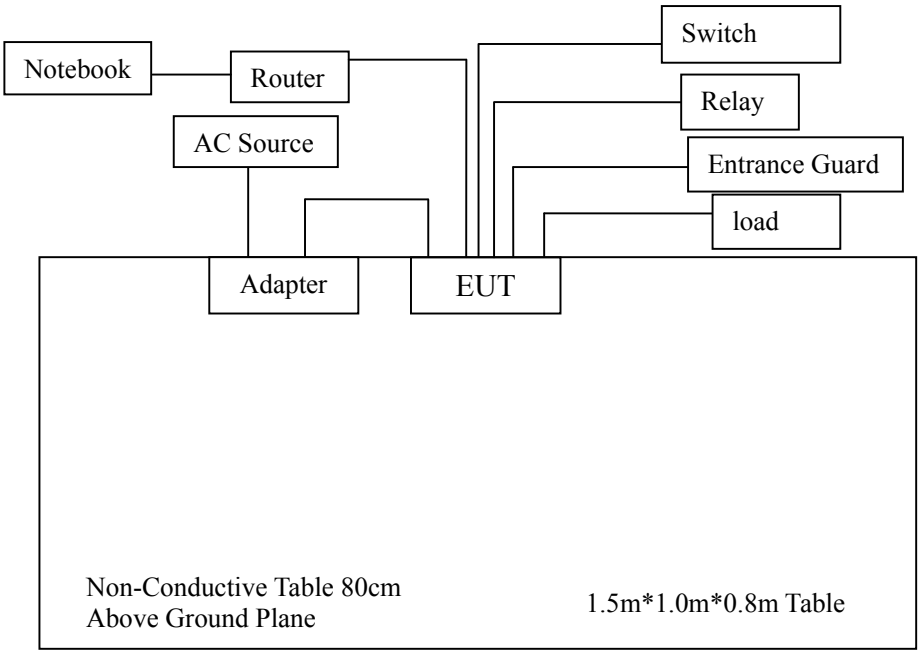
Manufacturer	Description	Model	Serial Number
DELL	Notebook	E6410	3094742521
NTEGEAR	POE	GS308P	4F217B5000891
NTEGEAR	POE Adapter	2ABF060R	N/A
GOLDEN PROFIT ELEC TRONICS	Adapter	GPE018W-120100-2	N/A
TP-LINK	Router	EC26CA652860	1153145002998
Schneider Electric	Relay	RXM2LB2BD	N/A
WeiShi	Entrance guard	Q3	N/A
AnYong	Load	RXLG	N/A
FuShi	Switch	AR22PR-310B	N/A

External I/O Cable

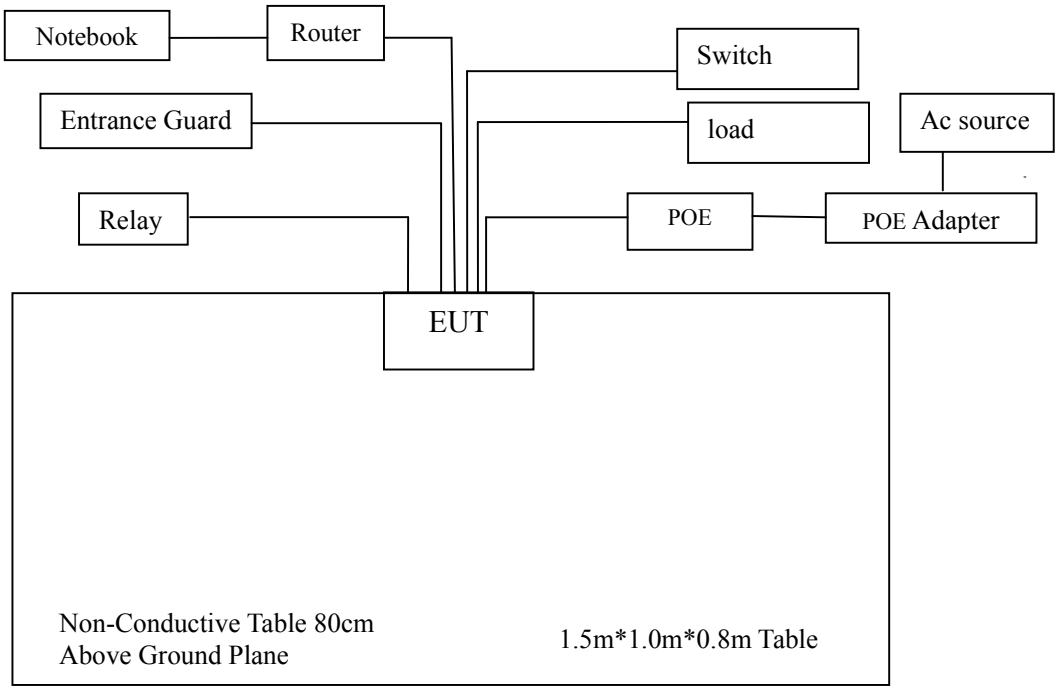
Cable Description	Length (m)	From/Port	To
Power Cable	1.0	EUT	adapter
RJ45 Cable	5.0	EUT	POE
Power Cable	1.2	POE	POE Adapter
RJ45 cable	10.0	EUT	Router
RJ45 cable	1.00	Router	Notebook
Signal Cable	5.0	EUT	Switch
Signal Cable	5.0	EUT	Relay
Signal Cable	5.0	EUT	Entrance Guard
Power supply cable	5.0	EUT	Load

Block Diagram of Radiated Test Setup

Test mode 1



Test mode 2



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§15.107	Conducted Emissions	Compliant
§15.109	Radiated Emissions	Compliant

FCC §15.107 –CONDUCTED EMISSIONS

Applicable Standard

According to FCC§15.107

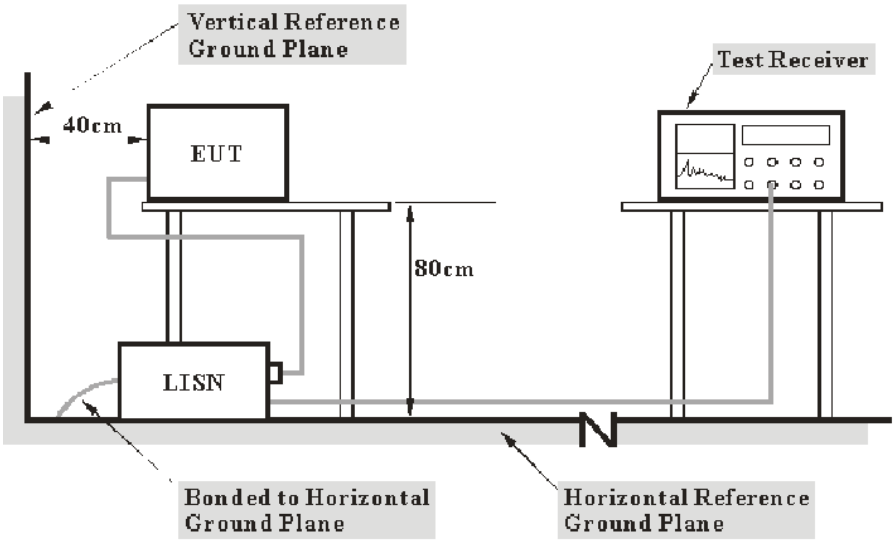
Measurement Uncertainty

Input quantities to be considered for conducted disturbance measurements maybe receiver reading, attenuation of the connection between LISN and receiver, LISN voltage division factor, LISN VDF frequency interpolation and receiver related input quantities, etc.

Item		Measurement Uncertainty	U_{cispr}
AMN	150kHz~30MHz	3.19 dB	3.4 dB

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

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 ANSI C63.4-2014. The related limit was specified in FCC Part 15.107 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 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 was connected to the outlet of the LISN.

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

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03-101746-zn	2019-08-05	2020-08-04
ROHDE&SCHWARZ	LISN	ENV216	3560655016	2018-11-30	2019-11-29
Audix	Test Software	e3	V9	--	--
MICRO-COAX	Coaxial Cable	Cable-6	006	2019-09-08	2020-09-07

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

Factor & Over Limit Calculation

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

Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)

The "**Over Limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit of 7 dB means the emission is 7 dB above the limit. The equation for margin calculation is as follows:

Over Limit (dB) = Read level (dBµV) + Factor (dB) - Limit (dBµV)

Test Data

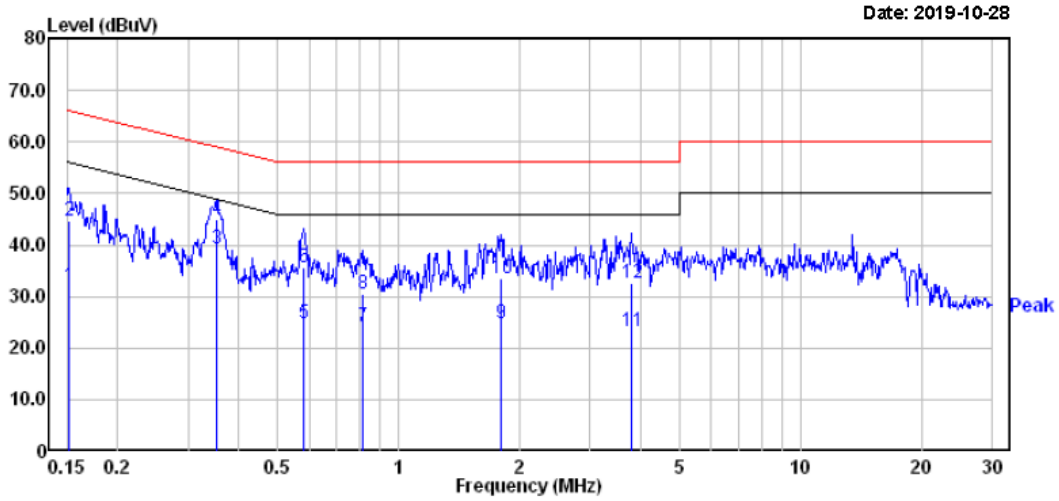
Environmental Conditions

Temperature:	22℃
Relative Humidity:	50 %
ATM Pressure:	101.1 kPa

The testing was performed by Chao Gao on 2019-10-28.

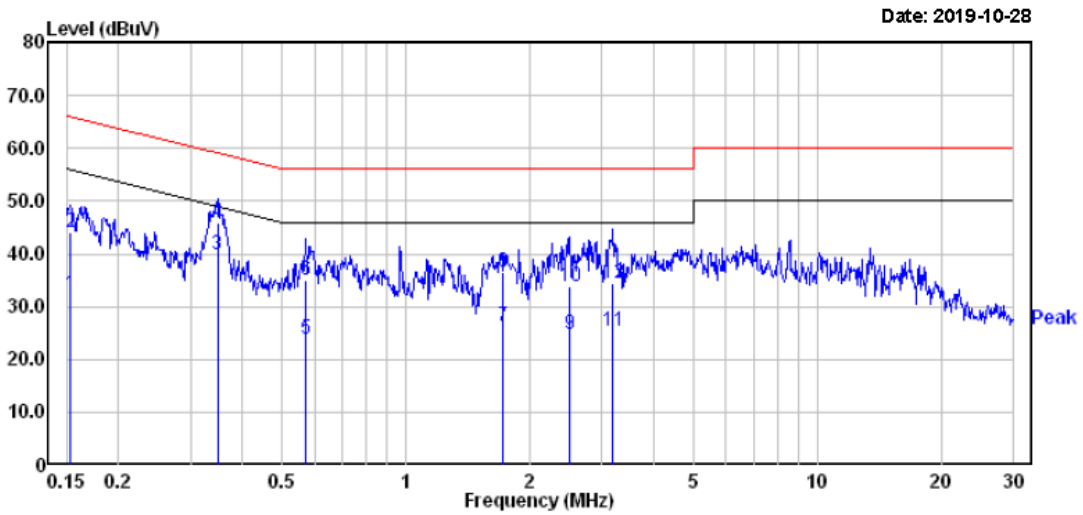
Test mode 1

Line:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.152	12.20	19.82	32.02	55.91	-23.89	Average
2	0.152	24.80	19.82	44.62	65.91	-21.29	QP
3	0.352	19.39	19.81	39.20	48.91	-9.71	Average
4	0.352	25.29	19.81	45.10	58.91	-13.81	QP
5	0.579	5.00	19.75	24.75	46.00	-21.25	Average
6	0.579	15.80	19.75	35.55	56.00	-20.45	QP
7	0.817	4.51	19.70	24.21	46.00	-21.79	Average
8	0.817	10.71	19.70	30.41	56.00	-25.59	QP
9	1.800	5.00	19.84	24.84	46.00	-21.16	Average
10	1.800	13.80	19.84	33.64	56.00	-22.36	QP
11	3.799	3.90	19.47	23.37	46.00	-22.63	Average
12	3.799	13.20	19.47	32.67	56.00	-23.33	QP

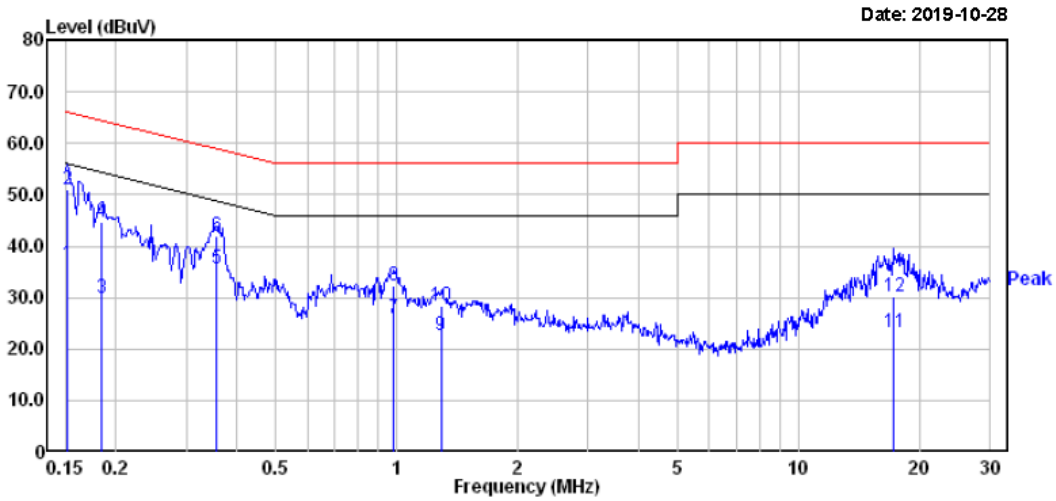
Neutral:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.153	12.40	19.82	32.22	55.82	-23.60	Average
2	0.153	24.30	19.82	44.12	65.82	-21.70	QP
3	0.348	20.00	19.81	39.81	49.00	-9.19	Average
4	0.348	26.10	19.81	45.91	59.00	-13.09	QP
5	0.573	4.00	19.75	23.75	46.00	-22.25	Average
6	0.573	15.40	19.75	35.15	56.00	-20.85	QP
7	1.716	6.40	19.84	26.24	46.00	-19.76	Average
8	1.716	16.80	19.84	36.64	56.00	-19.36	QP
9	2.500	5.19	19.48	24.67	46.00	-21.33	Average
10	2.500	14.19	19.48	33.67	56.00	-22.33	QP
11	3.190	5.80	19.46	25.26	46.00	-20.74	Average
12	3.190	15.00	19.46	34.46	56.00	-21.54	QP

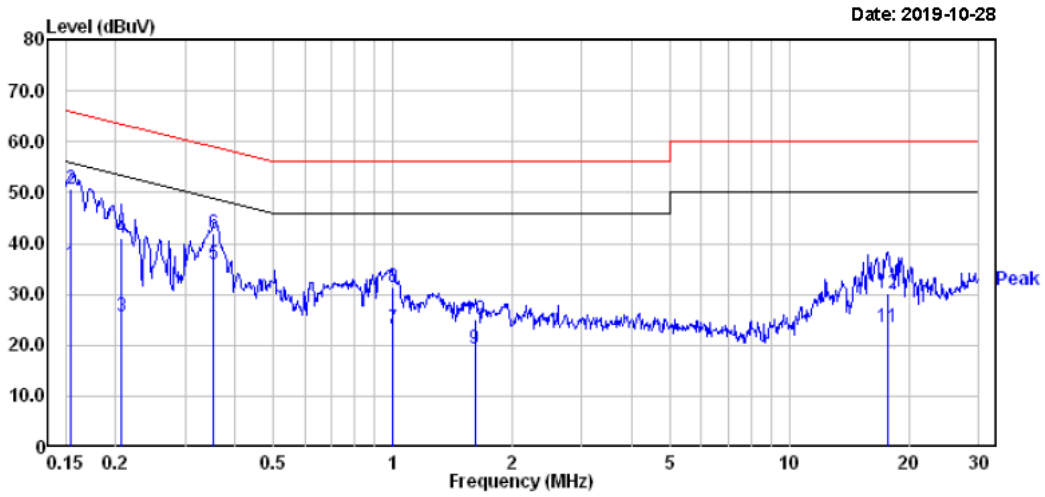
Test mode 2

Line:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.152	16.80	19.82	36.62	55.91	-19.29	Average
2	0.152	31.30	19.82	51.12	65.91	-14.79	QP
3	0.184	10.01	19.82	29.83	54.28	-24.45	Average
4	0.184	24.91	19.82	44.73	64.28	-19.55	QP
5	0.356	15.80	19.80	35.60	48.83	-13.23	Average
6	0.356	22.30	19.80	42.10	58.83	-16.73	QP
7	0.984	6.20	19.81	26.01	46.00	-19.99	Average
8	0.984	12.50	19.81	32.31	56.00	-23.69	QP
9	1.289	2.90	19.82	22.72	46.00	-23.28	Average
10	1.289	8.70	19.82	28.52	56.00	-27.48	QP
11	17.199	3.60	19.78	23.38	50.00	-26.62	Average
12	17.199	10.40	19.78	30.18	60.00	-29.82	QP

Neutral:



	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.155	16.10	19.82	35.92	55.74	-19.82	Average
2	0.155	30.90	19.82	50.72	65.74	-15.02	QP
3	0.207	5.70	19.82	25.52	53.32	-27.80	Average
4	0.207	21.10	19.82	40.92	63.32	-22.40	QP
5	0.354	16.00	19.80	35.80	48.87	-13.07	Average
6	0.354	22.20	19.80	42.00	58.87	-16.87	QP
7	1.000	3.50	19.82	23.32	46.00	-22.68	Average
8	1.000	11.70	19.82	31.52	56.00	-24.48	QP
9	1.610	-0.41	19.85	19.44	46.00	-26.56	Average
10	1.610	5.19	19.85	25.04	56.00	-30.96	QP
11	17.661	3.80	19.81	23.61	50.00	-26.39	Average
12	17.661	10.30	19.81	30.11	60.00	-29.89	QP

Note:

1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
2) Over Limit (dB) = Read level (dBμV) + Factor (dB) - Limit (dBμV)

FCC §15.109 - RADIATED EMISSIONS

Applicable Standard

FCC §15.109

Measurement Uncertainty

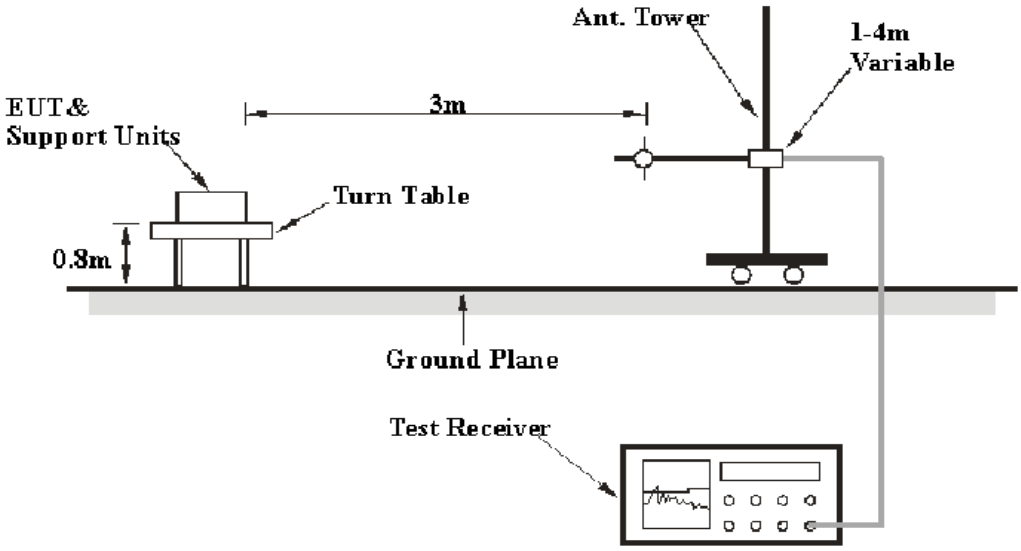
All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency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

Item		Measurement Uncertainty	U_{cispr}
Radiated Emission	30MHz~1GHz	6.11dB	6.3 dB
	1GHz~6GHz	4.45dB	5.2 dB
	6 GHz ~18 GHz	5.23dB	5.5 dB

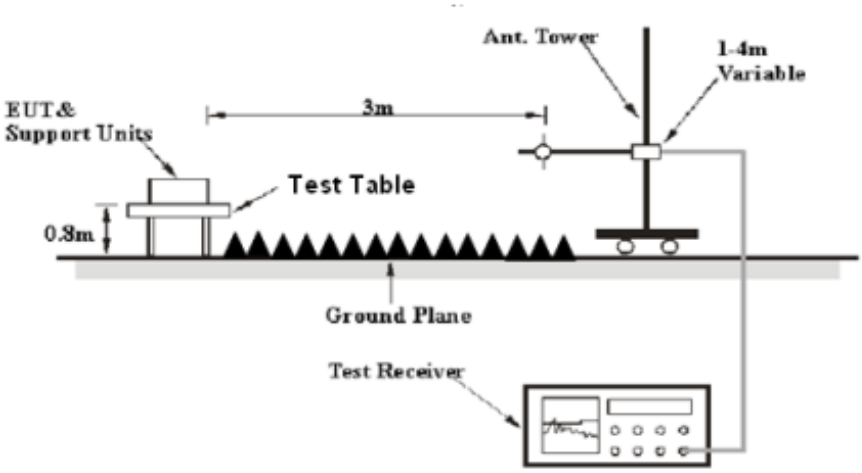
Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

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 18 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	Detector
30MHz – 1000 MHz	120 kHz	300 kHz	120kHz	QP
Above 1 GHz	1MHz	3 MHz	/	Peak
	1MHz	3 MHz	1MHz	AVG

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, Peak and average detection mode above 1 GHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrument	Amplifier	310N	185700	2019-08-14	2020-08-13
Rohde & Schwarz	EMI Test Receiver	ESR	1316.3003K03 -101746-zn	2019-07-11	2020-07-10
Sunol Sciences	Broadband Antenna	JB3	A090413-1	2016-12-26	2019-12-25
Champrotek	Chamber	Chamber A	T-KSEMC049	-	-
Champrotek	Chamber	Chamber B	T-KSEMC080	-	-
Audix	Test Software	e3	V9	--	--
Rohde & Schwarz	Auto test Software	EMC32	100361	-	-
ETS	Horn Antenna	3115	6229	2016-12-12	2019-12-11
Rohde & Schwarz	EMI Receiver	ESU40	100207	2019-08-27	2020-08-26
A.H.Systems, inc	Amplifier	2641-1	491	2019-02-20	2020-02-19
MICRO-COAX	Coaxial Cable	Cable-8	008	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-9	009	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-10	010	2019-08-15	2020-08-14
MICRO-COAX	Coaxial Cable	Cable-4	004	2018-12-12	2019-12-11
MICRO-COAX	Coaxial Cable	Cable-5	005	2018-12-12	2019-12-11

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

Factor & Over Limit Calculation (For Below 1GHz)

The Factor is calculated by adding Antenna Factor, Cable Loss and Amplifier Gain. The basic equation is as follows:

Factor (dB) = Antenna Factor (dB) + Cable Loss (dB) + Amplifier Gain (dB)

The "**Over Limit**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, an Over Limit of 7 dB means the emission is 7 dB above the limit. The equation for margin calculation is as follows:

Over Limit (dB) = Read level (dBµV) + Factor (dB) - Limit (dBµV)

Corrected Amplitude & Margin Calculation (For Above 1GHz)

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

Test Data

Environmental Conditions

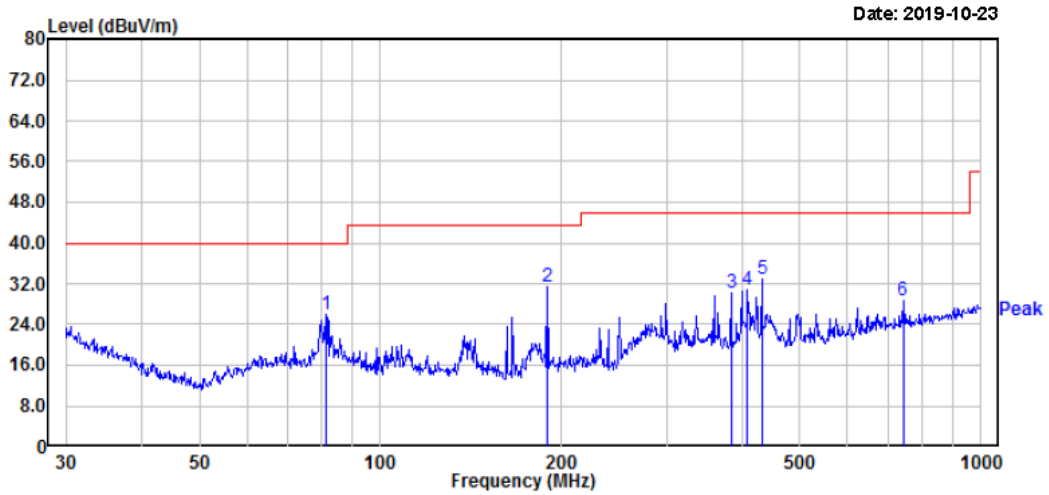
Temperature:	24℃
Relative Humidity:	53 %
ATM Pressure:	101.1 kPa

The testing was performed by Chao Gao on 2019-10-23.

Test mode 1

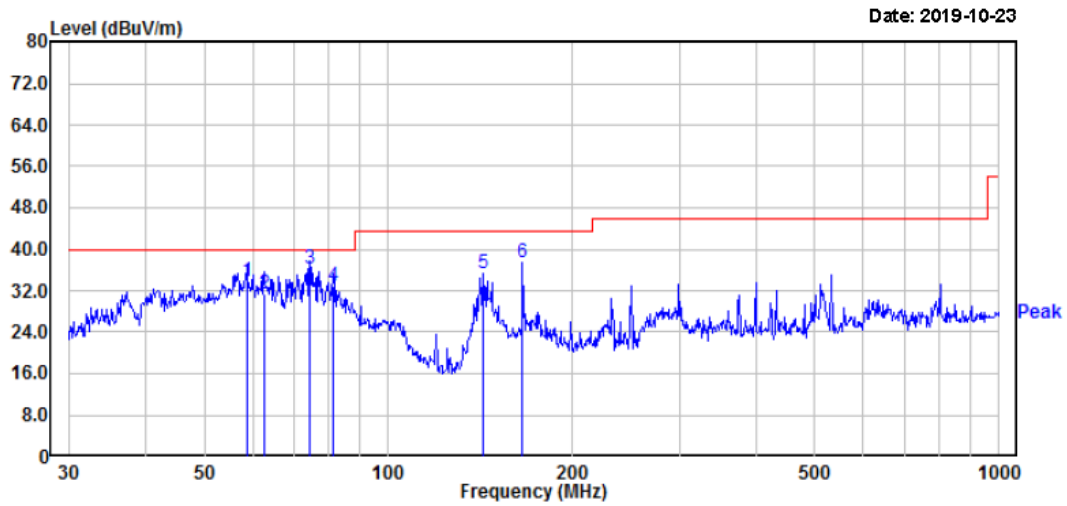
Below 1 GHz:

Horizontal:



	Freq	Read Level	Level	Limit Line	Over Limit	APos	TPos	Remark	Factor
	MHz	dBuV	dBuV/m	dBuV/m	dB	cm	deg		dB/m
1	81.21	43.04	25.86	40.00	-14.14	200	341	Peak	-17.18
2	189.74	43.70	31.39	43.50	-12.11	100	104	Peak	-12.31
3	383.93	38.21	30.14	46.00	-15.86	100	53	Peak	-8.07
4	408.95	38.12	30.69	46.00	-15.31	100	33	Peak	-7.43
5	432.55	39.76	32.80	46.00	-13.20	100	0	Peak	-6.96
6	742.26	30.09	28.61	46.00	-17.39	100	361	Peak	-1.48

Vertical:

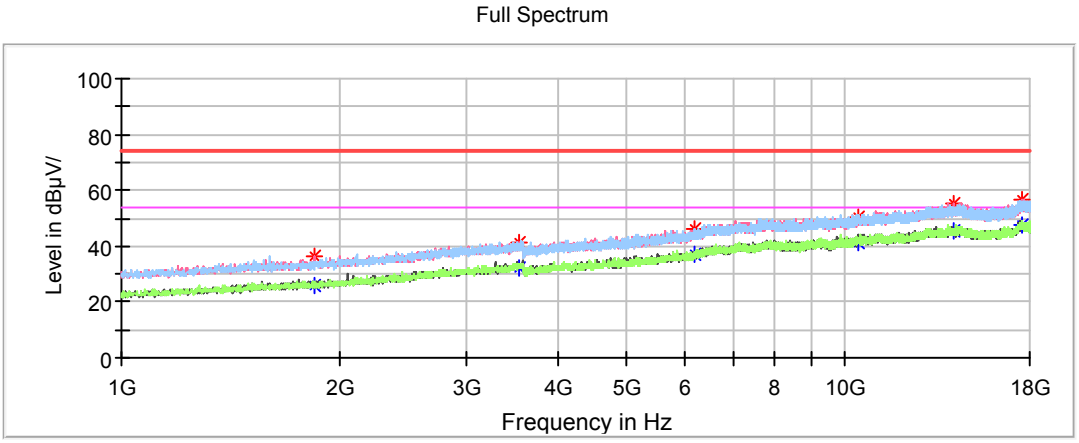


	Freq	Read Level	Level	Limit Line	Over Limit	APos	TPos	Remark	Factor
	MHz	dBuV	dBuV/m	dBuV/m	dB	cm	deg		dB/m
1	58.61	51.30	33.83	40.00	-6.17	100	7	QP	-17.47
2	62.65	48.90	31.52	40.00	-8.48	100	7	QP	-17.38
3	74.40	53.11	36.09	40.00	-3.91	100	7	QP	-17.02
4	81.21	50.00	32.82	40.00	-7.18	100	1	QP	-17.18
5	143.33	47.17	35.36	43.50	-8.14	100	335	Peak	-11.81
6	166.07	49.64	37.31	43.50	-6.19	100	290	Peak	-12.33

Note:

1) Factor (dB) = LISN VDF (dB) + Cable Loss (dB) + Transient Limiter Attenuation (dB)
2) Over Limit (dB) = Read level (dBµV) + Factor (dB) - Limit (dBµV)

Above 1 GHz:

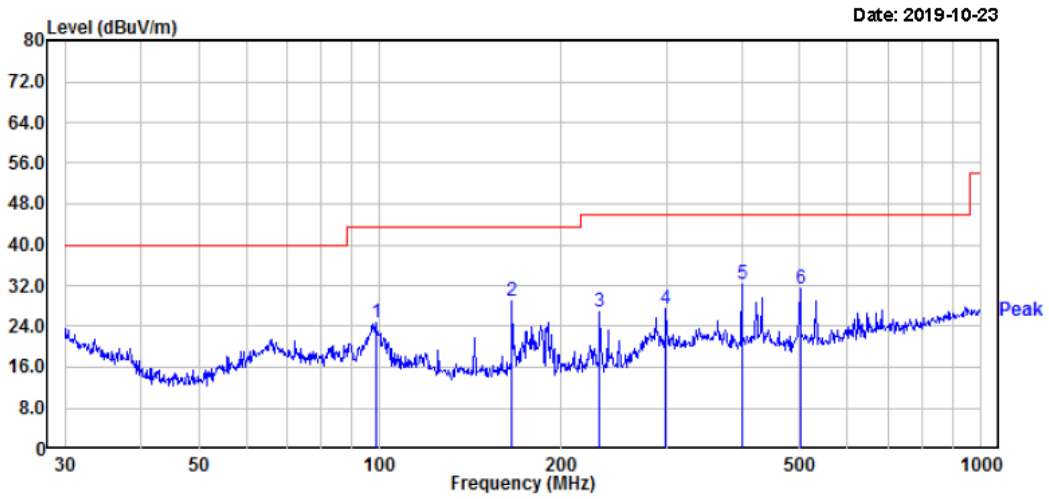


Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1844.900000	---	25.91	54.00	28.09	200.0	V	23.0	-8.8
1844.900000	36.44	---	74.00	37.56	200.0	V	23.0	-8.8
3551.700000	---	32.36	54.00	21.64	100.0	V	246.0	-3.4
3551.700000	41.00	---	74.00	33.00	100.0	V	246.0	-3.4
6196.900000	---	37.15	54.00	16.85	200.0	V	351.0	3.1
6196.900000	46.08	---	74.00	27.92	200.0	V	351.0	3.1
10406.100000	---	41.23	54.00	12.77	100.0	H	218.0	8.8
10406.100000	50.27	---	74.00	23.73	100.0	H	218.0	8.8
14141.000000	---	45.62	54.00	8.38	200.0	H	358.0	12.6
14141.000000	54.97	---	74.00	19.03	200.0	H	358.0	12.6
17534.200000	---	47.53	54.00	6.47	200.0	V	38.0	14.2
17534.200000	56.30	---	74.00	17.70	200.0	V	38.0	14.2

Test mode 2

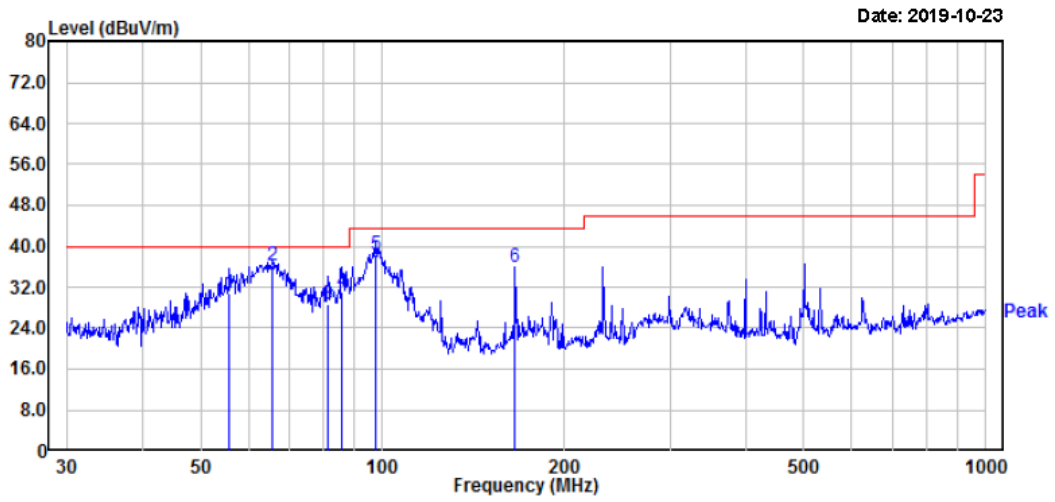
Below 1 GHz:

Horizontal:



	Freq	Read Level	Level	Limit Line	Over Limit	APos	TPos	Remark	Factor
	MHz	dBuV	dBuV/m	dBuV/m	dB	cm	deg		dB/m
1	98.49	39.76	24.74	43.50	-18.76	200	285	Peak	-15.02
2	166.07	41.22	28.89	43.50	-14.61	200	46	Peak	-12.33
3	232.53	39.92	26.89	46.00	-19.11	200	304	Peak	-13.03
4	299.32	37.88	27.59	46.00	-18.41	100	260	Peak	-10.29
5	400.43	39.84	32.24	46.00	-13.76	200	274	Peak	-7.60
6	501.18	36.94	31.46	46.00	-14.54	200	249	Peak	-5.48

Vertical:

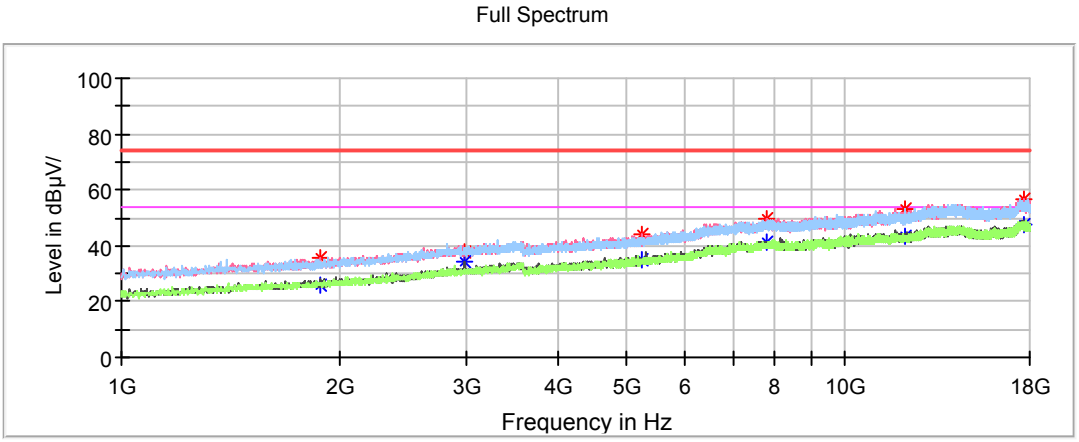


	Freq	Read Level	Level	Limit Line	Over Limit	APos	TPos	Remark	Factor
	MHz	dBuV	dBuV/m	dBuV/m	dB	cm	deg		dB/m
1	55.81	48.20	30.90	40.00	-9.10	100	3	QP	-17.30
2	65.57	53.30	36.11	40.00	-3.89	100	362	QP	-17.19
3	81.21	46.00	28.82	40.00	-11.18	100	145	QP	-17.18
4	85.90	48.40	31.18	40.00	-8.82	100	3	QP	-17.22
5	97.80	53.50	38.30	43.50	-5.20	100	349	QP	-15.20
6	166.07	48.21	35.88	43.50	-7.62	100	241	Peak	-12.33

Note:

1) Factor (dB) = Antenna Factor (dB) + Cable Loss (dB) + Amplifier Gain (dB)
2) Over Limit (dB) = Read level (dBµV) + Factor (dB) - Limit (dBµV)

Above 1 GHz:



Frequency (MHz)	MaxPeak (dB µ V/m)	Average (dB µ V/m)	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
1877.200000	---	25.89	54.00	28.11	200.0	V	203.0	-8.7
1877.200000	35.47	---	74.00	38.53	200.0	V	203.0	-8.7
2972.000000	37.49	---	74.00	36.51	200.0	V	144.0	-4.5
2972.000000	---	34.38	54.00	19.62	200.0	V	144.0	-4.5
5250.000000	---	34.72	54.00	19.28	200.0	V	296.0	0.6
5250.000000	44.21	---	74.00	29.79	200.0	V	296.0	0.6
7771.100000	49.96	---	74.00	24.04	200.0	V	340.0	6.6
7771.100000	---	40.99	54.00	13.01	200.0	V	340.0	6.6
12077.20000	---	43.10	54.00	10.90	100.0	H	39.0	10.1
12077.20000	52.85	---	74.00	21.15	100.0	H	39.0	10.1
17651.50000	56.57	---	74.00	17.43	200.0	V	129.0	14.0
17651.50000	---	47.78	54.00	6.22	200.0	V	129.0	14.0

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