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Change History		
Version	Date	Reason for change
1.0	2019-06-10	First edition



1. Technical Information

Note: Provide by applicant

1.1. Applicant and Manufacturer Information

Applicant:	Grandstream Networks, Inc.
Applicant Address:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA
Manufacturer:	Grandstream Networks, Inc.
Manufacturer Address:	126 Brookline Ave., 3rd Floor Boston, MA 02215, USA

1.2. Equipment Under Test (EUT) Description

EUT Type:	IP Multimedia Phone	
Serial No:	(N/A, marked #1 by test site)	
Hardware Version:	V1.6	
Software Version:	1.0.0.10	
Frequency Range:	Bluetooth: 2402 MHz ~ 2480 MHz 802.11b/g/n-20: 2412 MHz ~ 2462 MHz 802.11a/ac/n: 5180 MHz ~ 5240 MHz; 5260 MHz ~ 5320 MHz; 5500 MHz ~ 5700 MHz; 5745 MHz ~ 5825 MHz;	
Ancillary Equipment:	AC Adapter 1	
	Brand Name:	FRECOM
	Model No.:	F18W8-120150SPAUY
	Serial No:	(N/A, marked #1 by test site)
	Rated Input:	100-240V ~ 50/60Hz 0.6A
	Rated Output:	12.0V=1.5A
	Manufacturer:	Shenzhen Frecom Electronics Co., Ltd.
	AC Adapter 2	
	Brand Name:	SUNLIGHT
	Model No.:	H18US1200150A
	Serial No.:	(N/A, marked #1 by test site)
	Rated Input:	100-240V ~ 50/60Hz 0.8A
	Rated Output:	12.0V=1.5A
	Manufacturer:	Shenzhen Sunlight Electronic Technology Co., Ltd.
	HDMI Type1:	
Brand Name:	CE-LINK	



	Model No.:	T04130-0002
	Manufacturer:	Hinen Electronics (ShenZhen) Co., Ltd
	HDMI Type2:	
	Brand Name:	ZONG
	Model No.:	HDMI-30-1
	Manufacturer:	ZONG Cable Technology Co.,Ltd.

Note:

1. The product provides two adapters, which are shipped randomly. Both of the two adapters were tested, only the worst test result(Adapter2) were recorded in the test report.
2. The product provides two HDMI lines, which are shipped randomly.
3. For a more detailed description, please refer to specification or user's manual supplied by the applicant and/or manufacturer.



2. Test Results

2.1. Applied Reference Documents

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

No.	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Test Date	Test Engineer	Result
1	15.107	Conducted Emission	2019.06.06	Li Zihao	PASS
2	15.109	Radiated Emission	2019.05.30	Li Zihao	PASS

NOTE: The tests were performed according to the method of measurements prescribed in ANSI C63.4-2014.



2.2. EUT Setup and Operating Conditions

Test Item	
Radiated Emission	
Mode 1	EUT+ADAPTER (sunlight) + HDMI in (for DELL NB) + HDMI out (for SONY TV) + Mouse+Earphone+8G TF Card+RJ45 LINK
Mode 2	EUT+ADAPTER (frecom) + HDMI in (for DELL NB) + HDMI out (for SONY TV) + Mouse+Earphone+8G TF Card+RJ45 LINK
Mode 3	EUT+ADAPTER (sunlight) + HDMI in (for DELL NB) + HDMI out (for SONY TV) + Mouse+Earphone+8G TF Card +POE LINK
Conducted Emission	
Mode 1	EUT+ADAPTER (sunlight) + HDMI in (for DELL NB) + HDMI out (for SONY TV) + Mouse+Earphone+8G TF Card+RJ45 LINK
Mode 2	EUT+ADAPTER (frecom) + HDMI in (for DELL NB) + HDMI out (for SONY TV) + Mouse+Earphone+8G TF Card+RJ45 LINK
Mode 3	EUT+ADAPTER (sunlight) + HDMI in (for DELL NB) + HDMI out (for SONY TV) + Mouse+Earphone+8G TF Card +POE LINK
Remark: The above test modes in boldface were the worst cases of conducted emission, radiated emission tests; only the test data of these modes was reported.	

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 - 60
Atmospheric Pressure (kPa):	86 - 106

3. 47 CFR Part 15B Requirements

3.1. Conducted Emission

3.1.1. Requirement

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

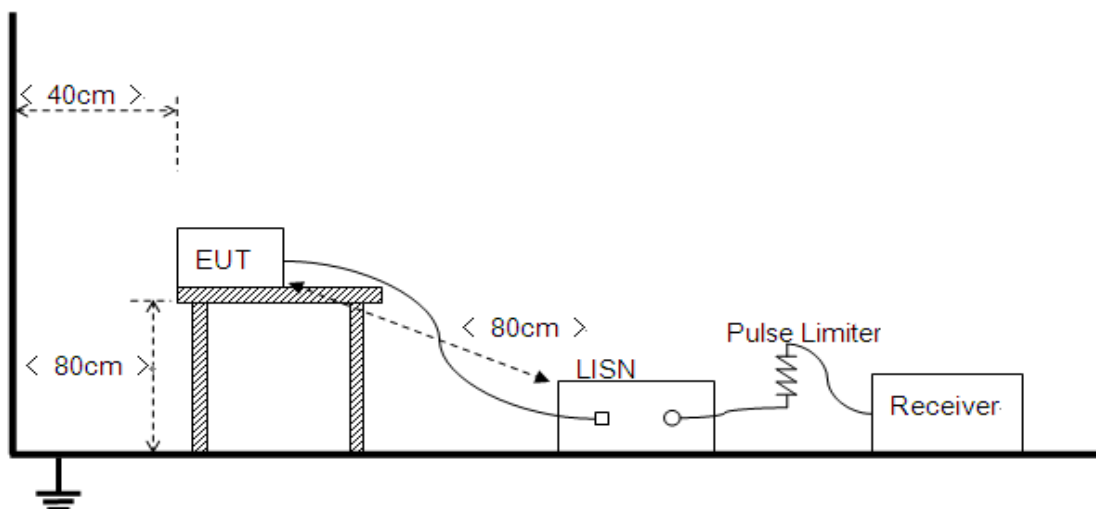
Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- The limit subjects to the Class B digital device.
- The lower limit shall apply at the band edges.
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

3.1.2. Test Setup

Please refer to Annex A for the photographs of the Test Configuration.





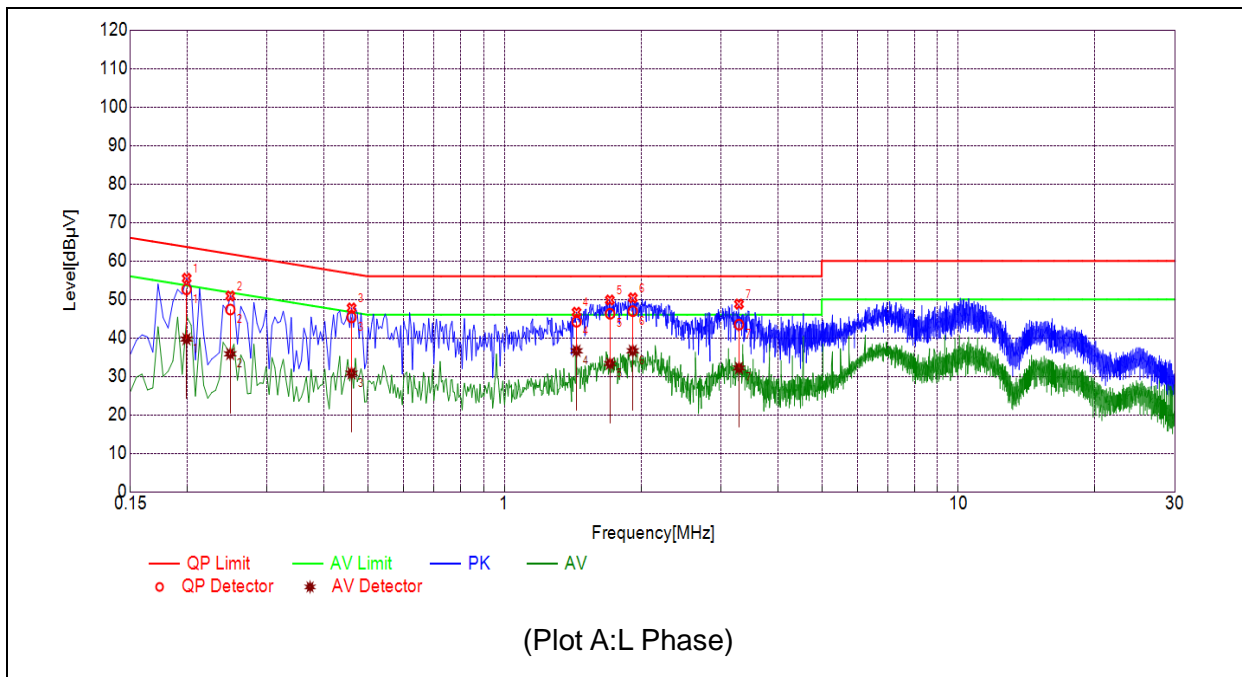
The EUT is placed on a 0.8m high insulating table, which stands on the grounded conducting floor, and keeps 0.4m away from the grounded conducting wall. The EUT is connected to the power mains through a LISN which provides $50\Omega/50\mu\text{H}$ of coupling impedance for the measuring instrument. A Pulse Limiter is used to protect the measuring instrument. The factors of the whole test system are calibrated to correct the reading.

The power strip or extension cord has been investigated to make sure that the LISN integrity is maintained with respect to the impedance characteristics as prescribed in ANSI C63.4-2014 at Clause 4.3.

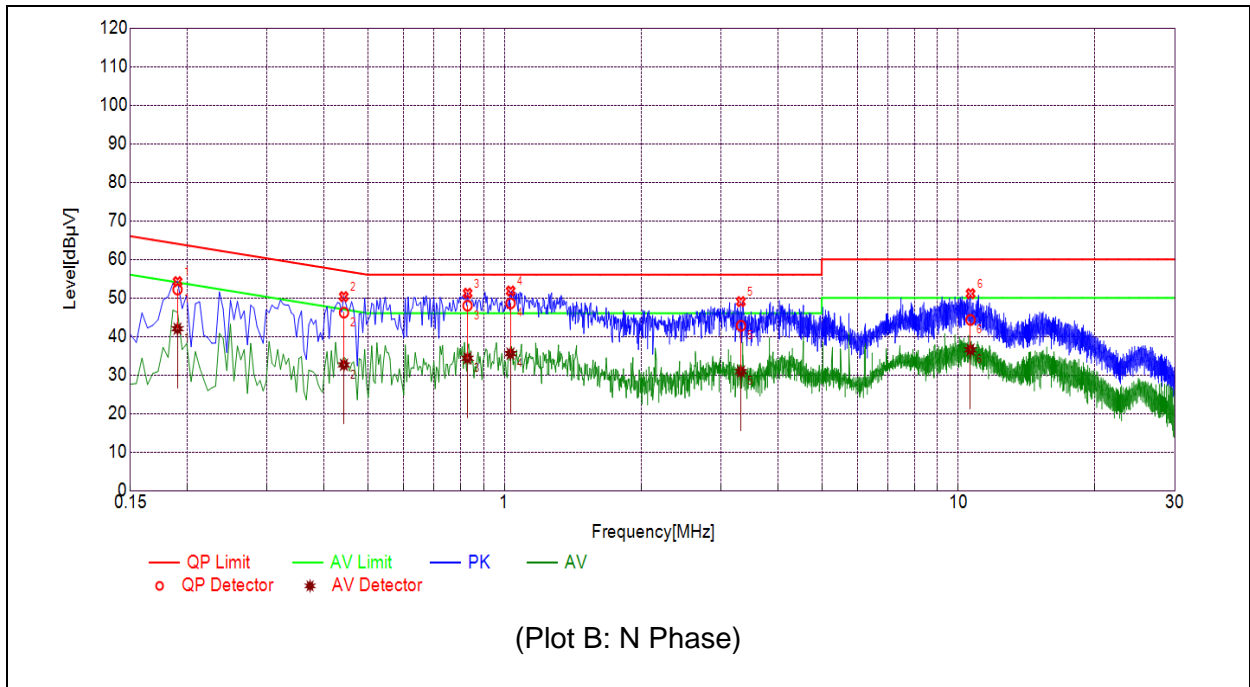
3.1.3. Test Result

The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. All test modes are considered, refer to recorded points and plots below.

A. Test Plot and Suspicious Points:



NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1993	52.63	39.70	63.64	53.64	Line	PASS
2	0.2488	47.38	35.84	61.80	51.80		PASS
3	0.4603	45.36	30.82	56.69	46.69		PASS
4	1.4415	44.22	36.64	56.00	46.00		PASS
5	1.7085	46.28	33.33	56.00	46.00		PASS
6	1.9169	46.97	36.65	56.00	46.00		PASS
7	3.2863	43.46	32.18	56.00	46.00		PASS



NO.	Fre. (MHz)	Emission Level (dBµV)		Limit (dBµV)		Power-line	Verdict
		Quai-peak	Average	Quai-peak	Average		
1	0.1904	52.18	42.00	64.02	54.02	Neutral	PASS
2	0.4429	46.18	32.63	57.01	47.01		PASS
3	0.8290	47.98	34.35	56.00	46.00		PASS
4	1.0312	48.57	35.55	56.00	46.00		PASS
5	3.3198	42.78	30.89	56.00	46.00		PASS
6	10.6311	44.29	36.55	60.00	50.00		PASS



3.2. Radiated Disturbance

3.2.1. Requirement

According to FCC section 15.109 (a), the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency range (MHz)	Field Strength Limitation at 3m Measurement Dist	
	($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)
30.0 - 88.0	100	20log 100
88.0 - 216.0	150	20log 150
216.0 - 960.0	200	20log 200
Above 960.0	500	20log 500

As shown in FCC section 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector. When average radiated emission measurements are specified in this part, including emission measurements below 1000MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit for the frequency being investigated unless a different peak emission limit is otherwise specified in the rules.

Note:

- 1) The tighter limit shall apply at the boundary between two frequency range.
- 2) Limitation expressed in $\text{dB}\mu\text{V/m}$ is calculated by $20\log$ Emission Level($\mu\text{V/m}$).

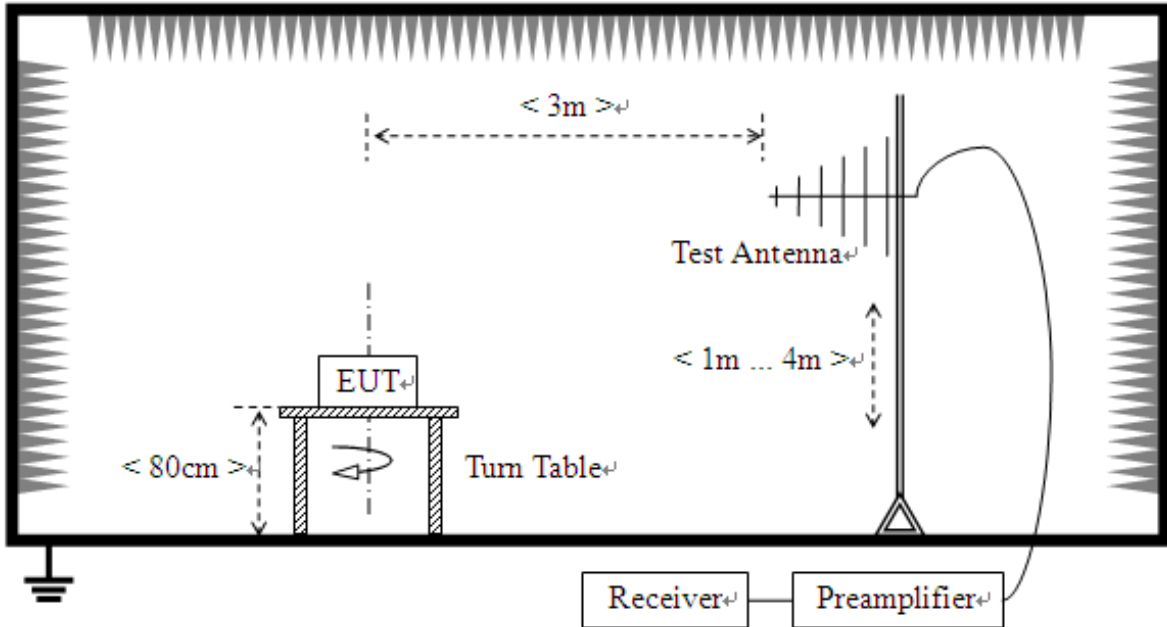
3.2.2. Frequency range of measurement

According to 15.33(b)(1), the frequency range of radiated measurement for the EUT is listed in the following table:

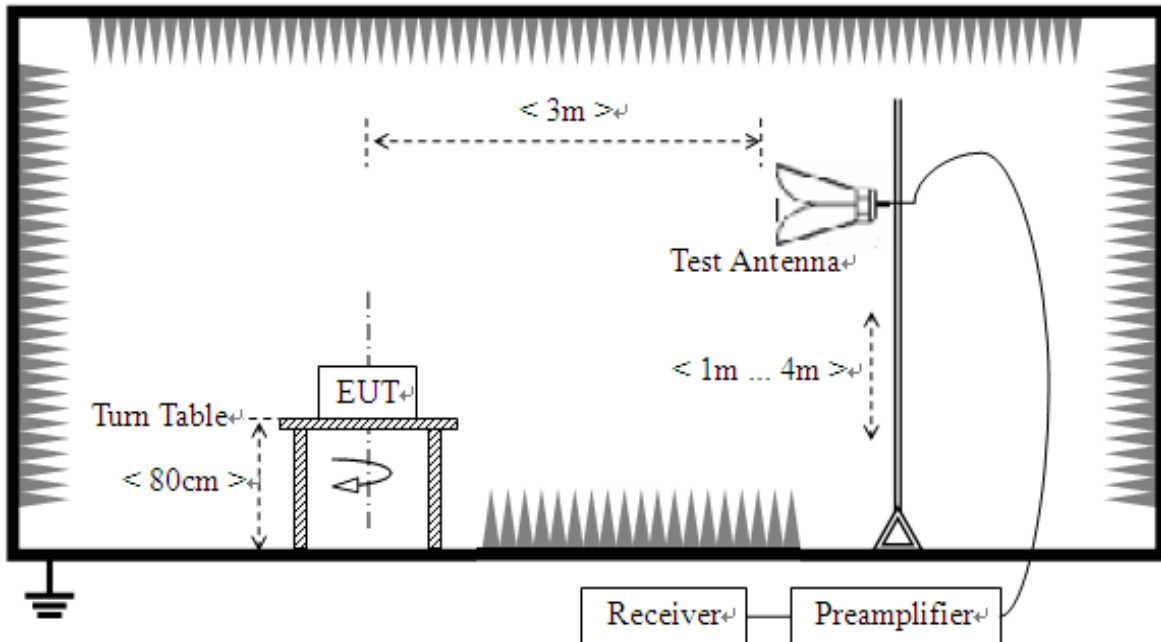
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

3.2.3. Test Setup

- 1) For radiated emissions from 30MHz to1GHz



- 2) For radiated emissions above 1GHz





The test is performed in a 3m Semi-Anechoic Chamber; the antenna factor, cable loss and so on of the site (factors) is calculated to correct the reading. The EUT is placed on a 0.8m high insulating Turn Table, and keeps 3m away from the Test Antenna, which is mounted on a variable-height antenna master tower.

For the test Antenna:

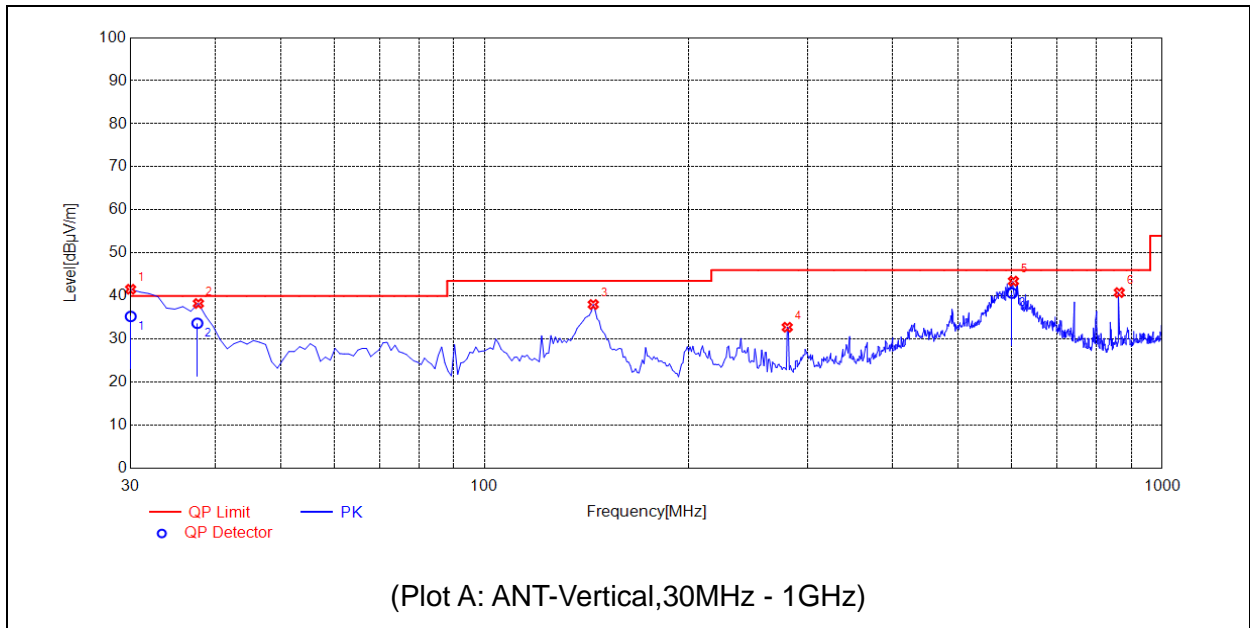
In the frequency range above 30MHz, Bi-Log Test Antenna (30MHz to 1GHz) and Horn Test Antenna (above 1GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground to determine the maximum value of the field strength. The emission levels at both horizontal and vertical polarizations should be tested.

3.2.4. Test Result

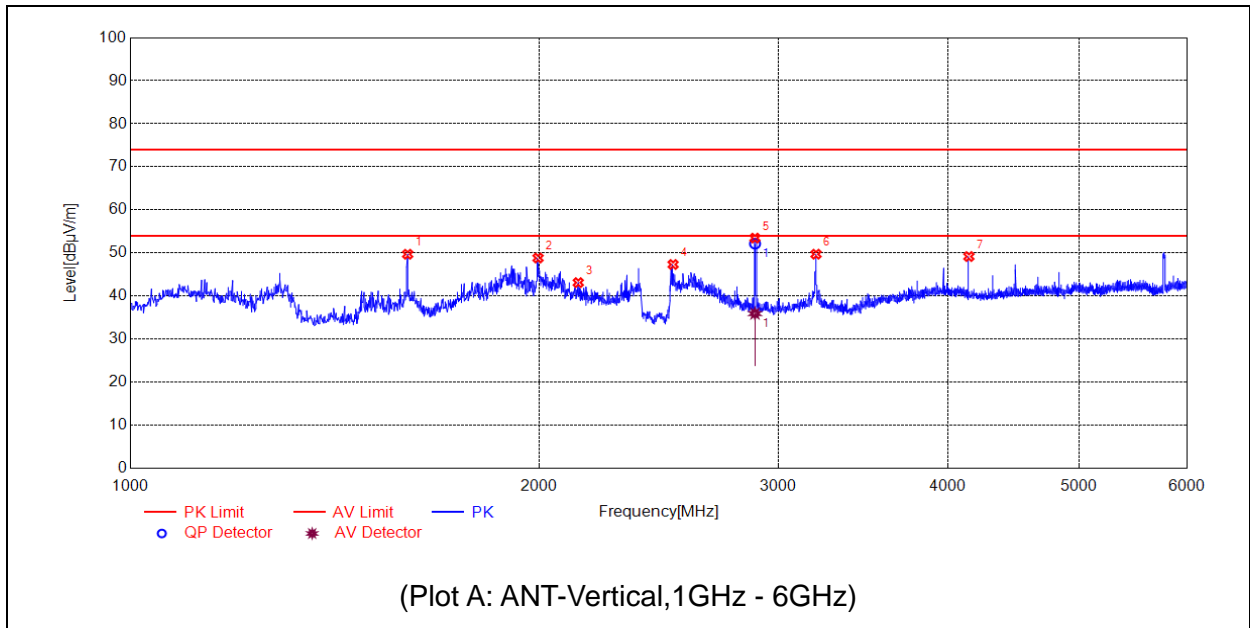
The maximum radiated emission is searched using PK, QP and AV detectors; the emission levels more than the limits, and that have narrow margins from the limits will be re-measured with AV and QP detectors. Both the vertical and the horizontal polarizations of the Test Antenna are considered to perform the tests. All test modes are considered, refer to recorded points and plots below.

The amplitude of emissions which (6GHz-30GHz) are attenuated more than 20 dB below the permissible value need not be reported.

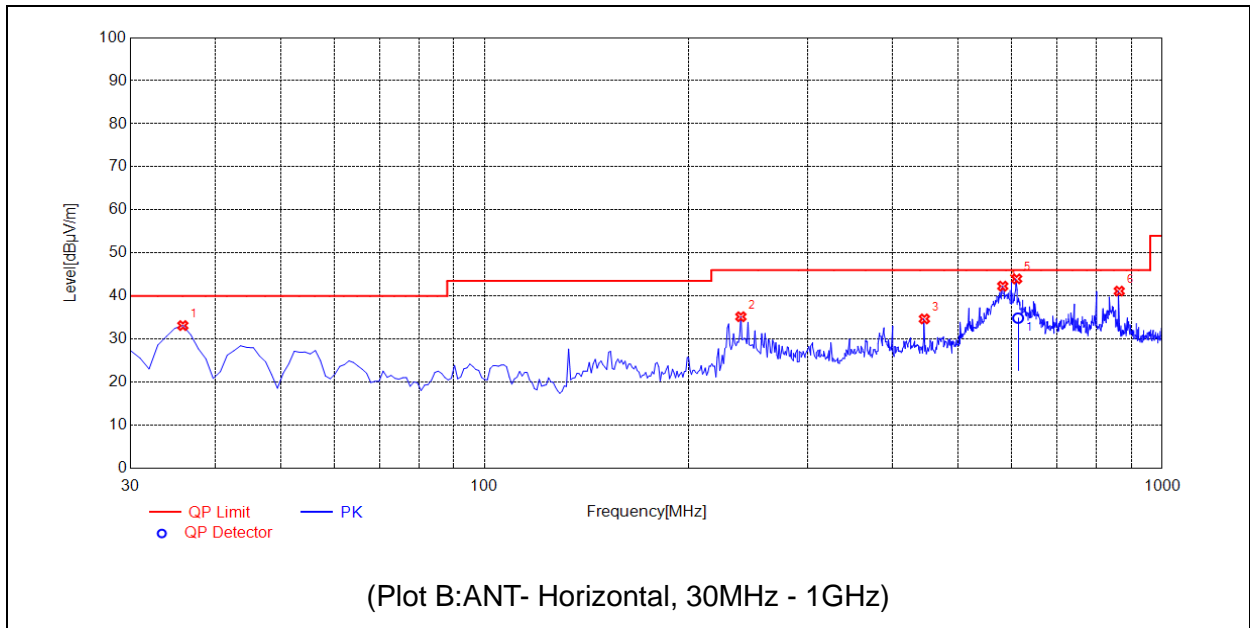
Note: All radiated emission tests were performed in X, Y, Z axis direction, and only the worst axis test condition was recorded in this test report.



No.	Fre. MHz	Pk dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	30.0051	41.58	35.27	N.A.	N.A.	40.00	N.A.	V	PASS
2	37.6289	38.27	33.68	N.A.	N.A.	40.00	N.A.	V	PASS
3	144.5746	38.04	N.A.	N.A.	N.A.	43.50	N.A.	V	PASS
4	279.5395	32.76	N.A.	N.A.	N.A.	46.00	N.A.	V	PASS
5	599.9853	43.46	40.69	N.A.	N.A.	46.00	N.A.	V	PASS
6	864.0641	40.81	N.A.	N.A.	N.A.	46.00	N.A.	V	PASS

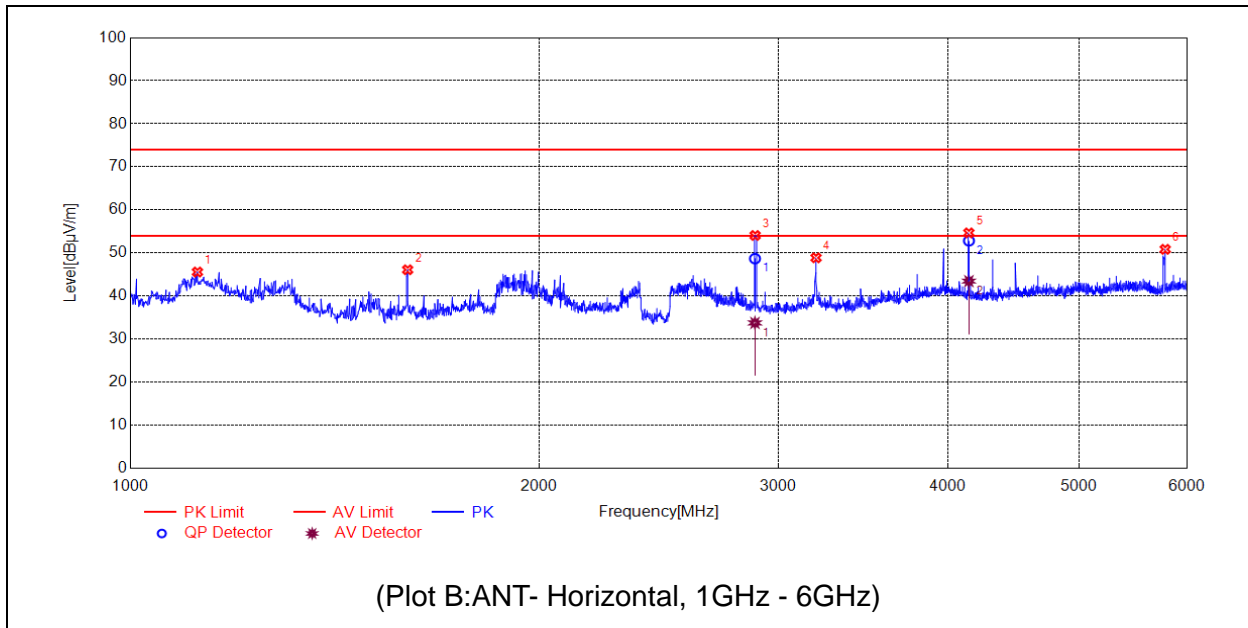


No.	Fre. MHz	Pk dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	1600.1200	49.71	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
2	1996.1992	48.83	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
3	2137.2274	43.12	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
4	2510.3021	47.33	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
5	2884.3452	53.46	N.A.	35.93	74.00	N.A.	54.00	V	PASS
6	3199.4399	49.72	N.A.	N.A.	74.00	N.A.	54.00	V	PASS
7	4146.6293	49.18	N.A.	N.A.	74.00	N.A.	54.00	V	PASS



No.	Fre. MHz	Pk dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	35.8258	33.15	N.A.	N.A.	N.A.	40.00	N.A.	H	PASS
2	238.7588	35.20	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS
3	445.5756	34.69	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS
4	581.5115	42.30	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS
5	612.6021	43.98	34.88	N.A.	N.A.	46.00	N.A.	H	PASS
6	864.0641	41.15	N.A.	N.A.	N.A.	46.00	N.A.	H	PASS

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No.	Fre. MHz	Pk dBµV/m	QP dBµV/m	AV dBµV/m	Limit-PK dBµV/m	Limit-QP dBµV/m	Limit-AV dBµV/m	ANT	Verdict
1	1120.0240	45.58	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
2	1600.1200	46.10	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
3	2884.2891	54.07	N.A.	33.76	74.00	N.A.	54.00	H	PASS
4	3199.4399	48.88	N.A.	N.A.	74.00	N.A.	54.00	H	PASS
5	4146.6003	54.67	N.A.	43.47	74.00	N.A.	54.00	H	PASS
6	5785.9572	50.85	N.A.	N.A.	74.00	N.A.	54.00	H	PASS



Annex A Test Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission Measurement

Measuring Uncertainty for a Level of Confidence of 95%(U=2Uc(y))	9kHz-150kHz	±4.1 dB
	150kHz-30MHz	±3.7dB

Uncertainty of Radiated Emission Measurement

Measuring Uncertainty for a Level of Confidence of 95%(U=2Uc(y))	30MHz-200MHz	±5.06dB
	200MHz-1000MHz	±5.24dB
	1GHz-6GHz	±5.18dB
	6GHz-18GHz	±5.48dB



Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Laboratory Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Laboratory Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd. Morlab Laboratory
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Accreditation Certificate

Accredited Testing Laboratory:	The FCC designation number is CN1192. Test firm registration number is 226174. (Shenzhen Morlab Communications Technology Co., Ltd.)
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4. Test Software Utilized

Model	Version Number	Producer
JS32-RE	Version 2.0.2.0	Tonscend
TS+ -[JS32-CE]	Version2.5.0.0	Tonscend

**5. Test Equipments Utilized**

Description	Manufacturer	Model	Serial No.	Cal. Date	Due. Date
MXE EMI Receiver	Agilent	N9038A	MY54130016	2018.08.04	2019.08.03
Test Receiver	R&S	ESPI	101052	2018.08.04	2019.08.03
LISN	Schwarzbeck	NSLK 8127	812744	2019.05.08	2020.05.07
Pulse Limiter (20dB)	VTSD	9561D	9537	2019.05.08	2020.05.07
Test Antenna - Bi-Log	Schwarzbeck	VULB 9163	9163-519	2019.05.08	2020.05.07
Test Antenna - Horn	Schwarzbeck	BBHA 9120D	1774	2019.05.08	2020.05.07
Radiated Disturbance Preamplifier	rflight	S020180L320 3	61171/61172	2018.07.12	2019.07.11
Radiated Disturbance Preamplifier	rflight	S10M100L38 02	46732	2018.07.12	2019.07.11
Semi-Anechoic Chamber	CRT	9m*6m*6m	N/A	2017.01.12	2020.01.11

————— END OF REPORT —————