

FCC TEST REPORT

For

Shen Zhen Simagic Technology Co.,Limited

Direct drive force-feedback simwheel

Test Model: ALPHA

Additional Model No.: Please Refer to Page 6

Prepared for : Shen Zhen Simagic Technology Co.,Limited
302, Building 7, DCC Cultural and Creative Park, No. 98,
Address : Pingxin North Road, Shangmugu Community, Pinghu Street,
Longgang District, Shenzhen, China

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
101, 201 Bldg A & 301 Bldg C, Juji Industrial Park
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Date of receipt of test sample : April 19, 2021
Number of tested samples : 1
Serial number : Prototype
Date of Test : April 19, 2021 ~ April 21, 2021
Date of Report : April 26, 2021

**FCC TEST REPORT
FCC CFR 47 PART 18****Report Reference No. : LCS210327025AEA**

Date Of Issue : April 26, 2021

Testing Laboratory Name..... : Shenzhen LCS Compliance Testing Laboratory Ltd.Address : 101, 201 Bldg A & 301 Bldg C, Juji Industrial Park
Yabianxueziwei, Shajing Street, Baoan District, Shenzhen,
518000, ChinaTesting Location/ Procedure : Full application of Harmonised standards ☒
Partial application of Harmonised standards ☐
Other standard testing method ☐**Applicant's Name : Shen Zhen Simagic Technology Co.,Limited**Address : 302, Building 7, DCC Cultural and Creative Park, No. 98, Pingxin
North Road, Shangmugu Community, Pinghu Street, Longgang
District, Shenzhen, China**Test Specification**

Standard : FCC CFR 47 PART 18

Test Report Form No. : LCSEMC-1.0

TRF Originator..... : Shenzhen LCS Compliance Testing Laboratory Ltd.

Master TRF : Dated 2011-03

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Test Item Description..... : Direct drive force-feedback simwheel

Trade Mark : SIMAGIC

Test Model..... : ALPHA

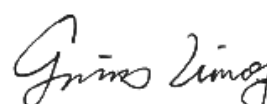
Power Supply : Input: DC 36V, 10A

Result : Positive**Compiled by:**

Jin Wang/ Administrator

Supervised by:

Linda He/ Technique principal

Approved by:

Gavin Liang/ Manager

FCC TEST REPORT

Test Report No. :	LCS210327025AEA	<u>April 26, 2021</u> Date of issue
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Test Model..... : ALPHA

EUT..... : Direct drive force-feedback simwheel

Applicant..... : Shen Zhen Simagic Technology Co.,LimitedAddress..... : 302, Building 7, DCC Cultural and Creative Park, No. 98, Pingxin
North Road, Shangmugu Community, Pinghu Street, Longgang
District, Shenzhen, China

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District, Shenzhen, China

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Factory..... : Shen Zhen Simagic Technology Co.,LimitedAddress..... : 302, Building 7, DCC Cultural and Creative Park, No. 98, Pingxin
North Road, Shangmugu Community, Pinghu Street, Longgang
District, Shenzhen, China

Telephone..... : /

Fax..... : /

Test Result	Positive
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	April 26, 2021	Initial Issue	Gavin Liang

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1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT	: Direct drive force-feedback simwheel
Test Model	: ALPHA
Additional Model No.	: ALPHA-MINI, ALPHA-ULTRA, ALPHA-GT4, ALPHA-GT1, ALPHAM-GT4, ALPHAM-GT1, ALPHAU-GT4, ALPHAU-GT1
Model Declaration	: PCB board, structure and internal of these model(s) are the same, So no additional models were tested.
Power Supply	: Input: DC 36V, 10A
Hardware Version	: /
Software Version	: /
Wireless Charging	:
Operating Frequency	: 110.0~205.0KHz
Modulation Type	: Continuous Wave
Antenna Type	: Coil Antenna
2.4G	
Frequency Range	: 2402MHz-2480MHz
Channel Number	: 79
Modulation Type	: GFSK
Antenna Description	: PCB Antenna, 0dBi(Max.)

1.2 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	PC	TP00094A	--	FCC
Lenovo	ADAPTER	ADLX65YCC3A		FCC

1.3 External I/O Cable

I/O Port Description	Quantity	Cable
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1.4 Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5 Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6 Measurement Uncertainty

Test Item	Frequency Range	Uncertainty	Note
Radiation Uncertainty	9KHz~30MHz	3.10dB	(1)
	30MHz~200MHz	2.96dB	(1)
	200MHz~1000MHz	3.10dB	(1)
	1GHz~26.5GHz	3.80dB	(1)
	26.5GHz~40GHz	3.90dB	(1)
Conduction Uncertainty	150kHz~30MHz	1.63dB	(1)
Power disturbance	30MHz~300MHz	1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7 Description of Test Modes

Equipment under test was operated during the measurement under the following conditions:

☒ Charging and communication mode

Modulation Type: CW (Continuous Wave)

Test Modes	
Mode	AC/DC Adapter (36V) + EUT

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with MP-5, and FCC CFR PART 18.

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT was operated in the charging and compunction mode to fix the TX frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 18.305 and 18.307 under the FCC Rules Part 18.

2.3 General Test Procedures

2.3.1 Conducted Emissions

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in FCC MP-5 for Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in FCC MP-5 for radiated emission.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a normal condition.

3.2 EUT Exercise Software

N/A.

3.3 Special Accessories

N/A.

3.4 Block Diagram/Schematics

Please refer to the related document.

3.5 Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6 Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	MXA Signal Analyzer	Agilent	N9020A	MY49100040	2020-06-17	2021-06-16
2	SPECTRUM ANALYZER	R&S	FSP40	100503	2020-11-17	2021-11-16
3	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2020-06-22	2021-06-21
4	Positioning Controller	MF	MF7082	MF78020803	2020-06-22	2021-06-21
5	EMI Test Software	AUDIX	E3	/	N/A	N/A
6	EMI Test Receiver	R&S	ESR 7	101181	2020-06-22	2021-06-21
7	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2018-07-26	2021-07-25
8	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2018-07-26	2021-07-25
9	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2018-07-02	2021-07-01
10	RF Cable-R03m	Jye Bao	RG142	CB021	2020-06-22	2021-06-21
11	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2020-06-22	2021-06-21
12	EMI Test Receiver	R&S	ESPI	101840	2020-06-22	2021-06-21
13	Artificial Mains	R&S	ENV216	101288	2020-06-22	2021-06-21
14	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2020-06-22	2021-06-21

5. SUMMARY OF TEST RESULT

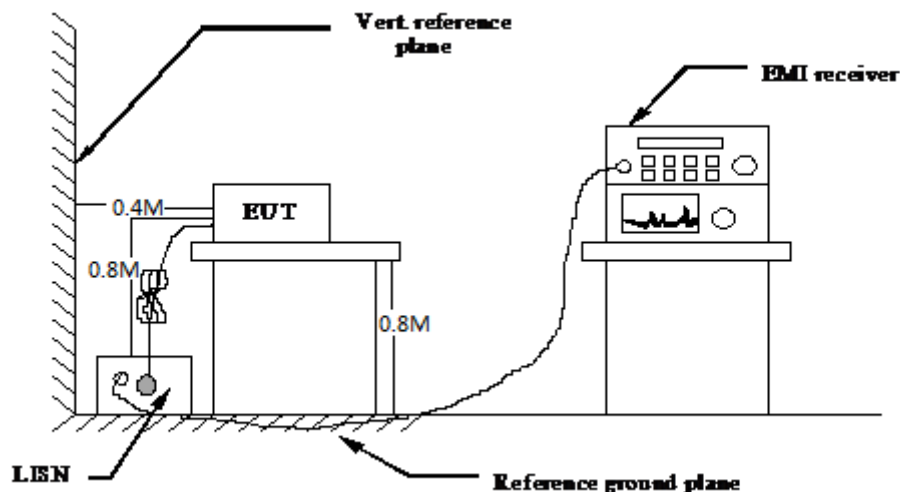
Test Item	FCC Rule No.	Temperature conditions	Power source conditions	C	NC	NA	NP	Remark
Radiated Emission	§18.305 (b)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-
AC conducted emission	§18.307 (a)	Nominal	Nominal	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-/-

Remark: The measurement uncertainty is not included in the test result.

N/A – Not Applicable!!!

6. POWER LINE CONDUCTED MEASUREMENT

6.1. Block Diagram of Test Setup



6.2. Standard Applicable

According to §18.307 (b): For all other part 18 consumer devices which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range are listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

6.3 Test Results

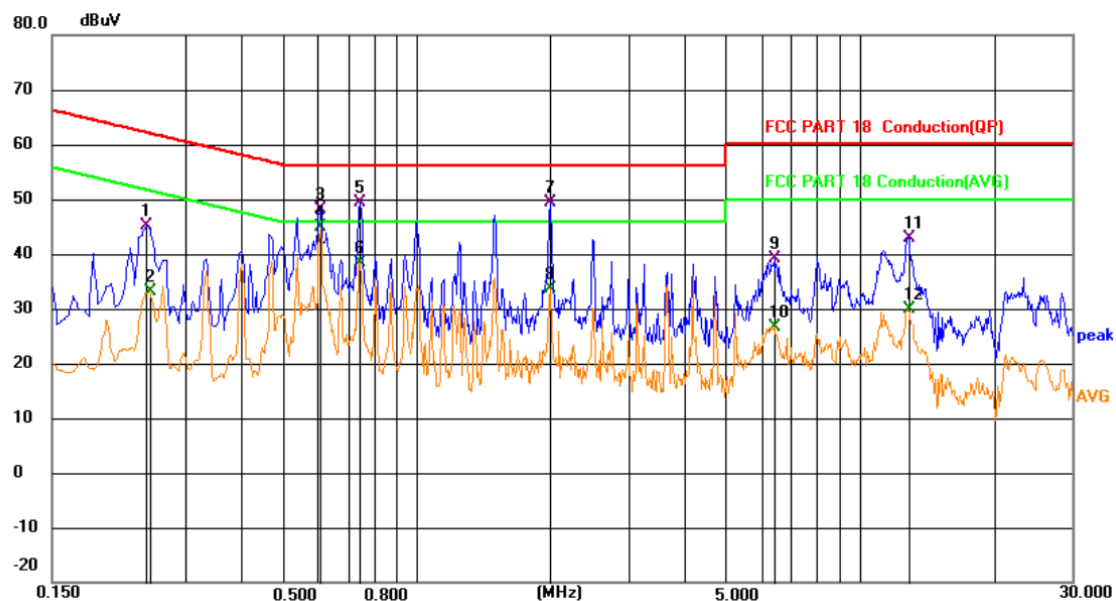
PASS

The test data please refer to following page.

Temperature	23.3°C	Humidity	53.7%
Test Engineer	Jay Li	Configurations	Transmit

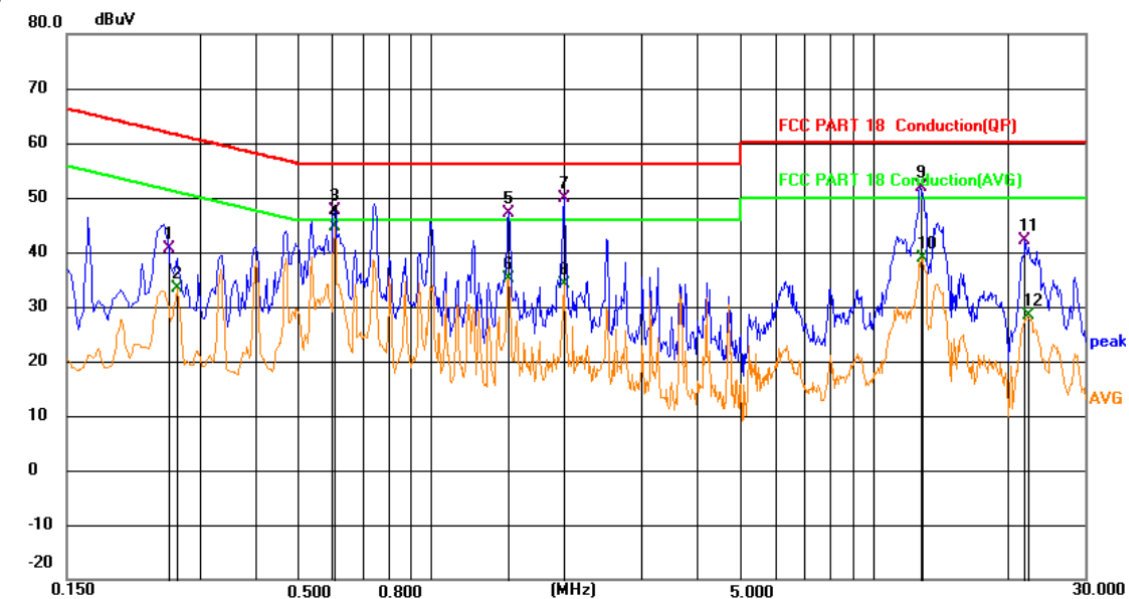
AC Power Line Conducted Emission (Power input to adapter @ AC 120V/60Hz (Worst Case))

Line



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.2446	28.25	16.95	45.20	61.94	-16.74	QP	
2		0.2490	16.24	16.91	33.15	51.79	-18.64	AVG	
3		0.6045	32.53	15.51	48.04	56.00	-7.96	QP	
4	*	0.6045	29.47	15.51	44.98	46.00	-1.02	AVG	
5		0.7439	33.05	16.43	49.48	56.00	-6.52	QP	
6		0.7439	21.98	16.43	38.41	46.00	-7.59	AVG	
7		1.9950	34.16	15.20	49.36	56.00	-6.64	QP	
8		1.9950	18.45	15.20	33.65	46.00	-12.35	AVG	
9		6.4096	27.11	12.02	39.13	60.00	-20.87	QP	
10		6.4096	14.71	12.02	26.73	50.00	-23.27	AVG	
11		12.8310	29.59	13.35	42.94	60.00	-17.06	QP	
12		12.8310	16.60	13.35	29.95	50.00	-20.05	AVG	

Neutral

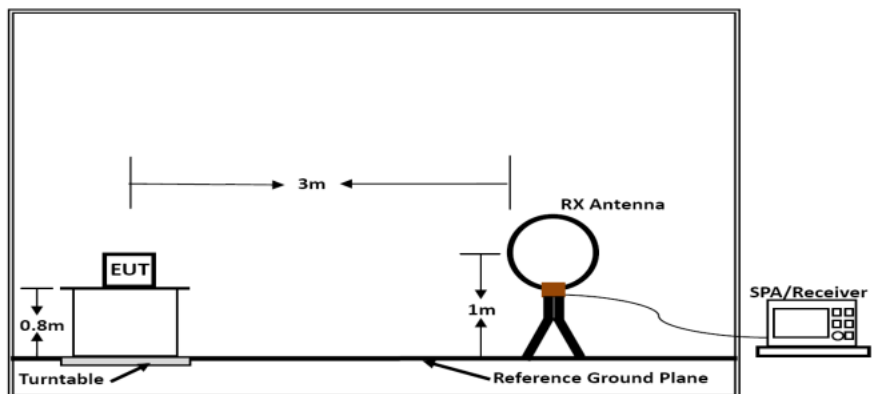


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.2545	23.72	16.87	40.59	61.61	-21.02	QP	
2		0.2671	16.52	16.78	33.30	51.21	-17.91	AVG	
3		0.6045	32.22	15.51	47.73	56.00	-8.27	QP	
4	*	0.6045	29.21	15.51	44.72	46.00	-1.28	AVG	
5		1.4955	32.07	15.14	47.21	56.00	-8.79	QP	
6		1.4955	19.88	15.14	35.02	46.00	-10.98	AVG	
7		1.9995	34.59	15.19	49.78	56.00	-6.22	QP	
8		1.9995	18.93	15.19	34.12	46.00	-11.88	AVG	
9		12.7364	38.42	13.50	51.92	60.00	-8.08	QP	
10		12.9166	25.70	13.22	38.92	50.00	-11.08	AVG	
11		21.9571	33.23	8.79	42.02	60.00	-17.98	QP	
12		22.2764	19.57	8.76	28.33	50.00	-21.67	AVG	

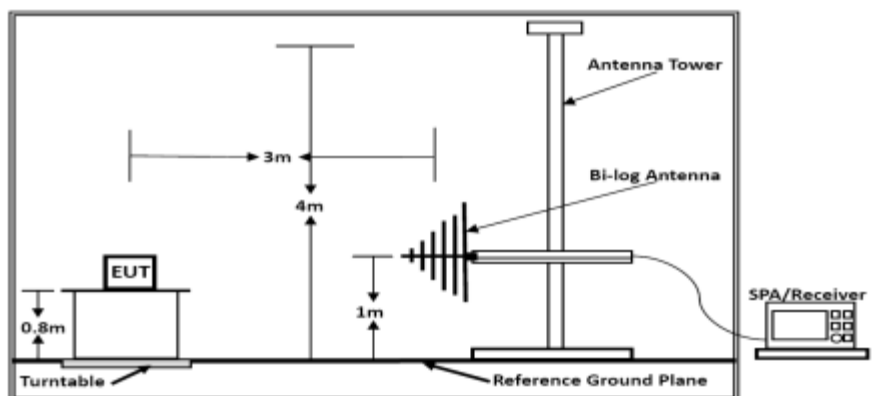
***Note: Pre-scan all modes and recorded the worst case results in this report.
 Measurement = Reading + Correct, Margin = Measurement - Limit.

7. RADIATED EMISSION MEASUREMENT

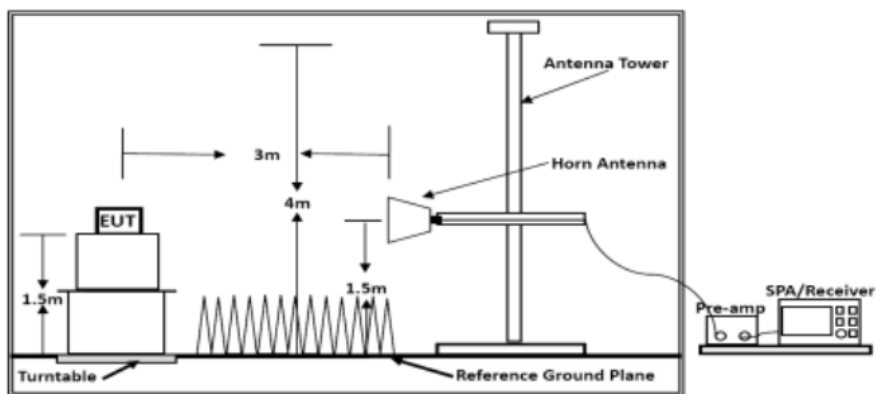
7.1. Block Diagram of Test Setup



Below 30MHz



Below 1GHz



Above 1GHz

7.2. Radiated Emission Limit

Except as provided elsewhere in this Subpart 18.305 (b), the field strength levels of emissions which lie outside the bands specified in §18.301, unless otherwise indicated, shall not exceed the following table:

Frequency MHz	Distance Meters	Field Strengths Limit	
		dB μ V/m	Remark
0.009~30MHz	3	107.9	Quasi-peak

Remark:

- (1) Emission level dB μ V/m for 0.009~30MHz = 20log (25) + 40log (300/3) dB μ V/m;
- (2) Calculated according FCC 18.305.
- (3) The smaller limit shall apply at the cross point between two frequency bands.
- (4) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

7.3. EUT Configuration on Measurement

The following equipment are installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4. Operating Condition of EUT

- (1) Setup the EUT as shown in Section 4.1.
- (2) Let the EUT work in worst test mode (Mode 1) and measure it.

7.5. Measuring Setting

The following table is the setting of spectrum analyzer and receiver.

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP/Average
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP/Average
Start ~ Stop Frequency	30MHz~1000MHz / RB 100kHz for QP

7.6. Test Procedure

1) Sequence of testing 9 kHz to 30 MHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.
- If the EUT is a floor standing device, it is placed on the ground.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions.
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna height is 1.0 meter.
- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).
- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.
- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.
- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.
- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.
- Auxiliary equipment and cables were positioned to simulate normal operation conditions
- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.
- The measurement distance is 3 meter.
- The EUT was set into operation.

Premeasurement:

- The turntable rotates from 0° to 315° using 45° steps.
- The antenna is polarized vertical and horizontal.
- The antenna height changes from 1 to 3 meter.
- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

- The final measurement will be performed with minimum the six highest peaks.
- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position ($\pm 45^\circ$) and antenna movement between 1 and 4 meter.
- The final measurement will be done with QP detector with an EMI receiver.
- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

7.7. Test Results

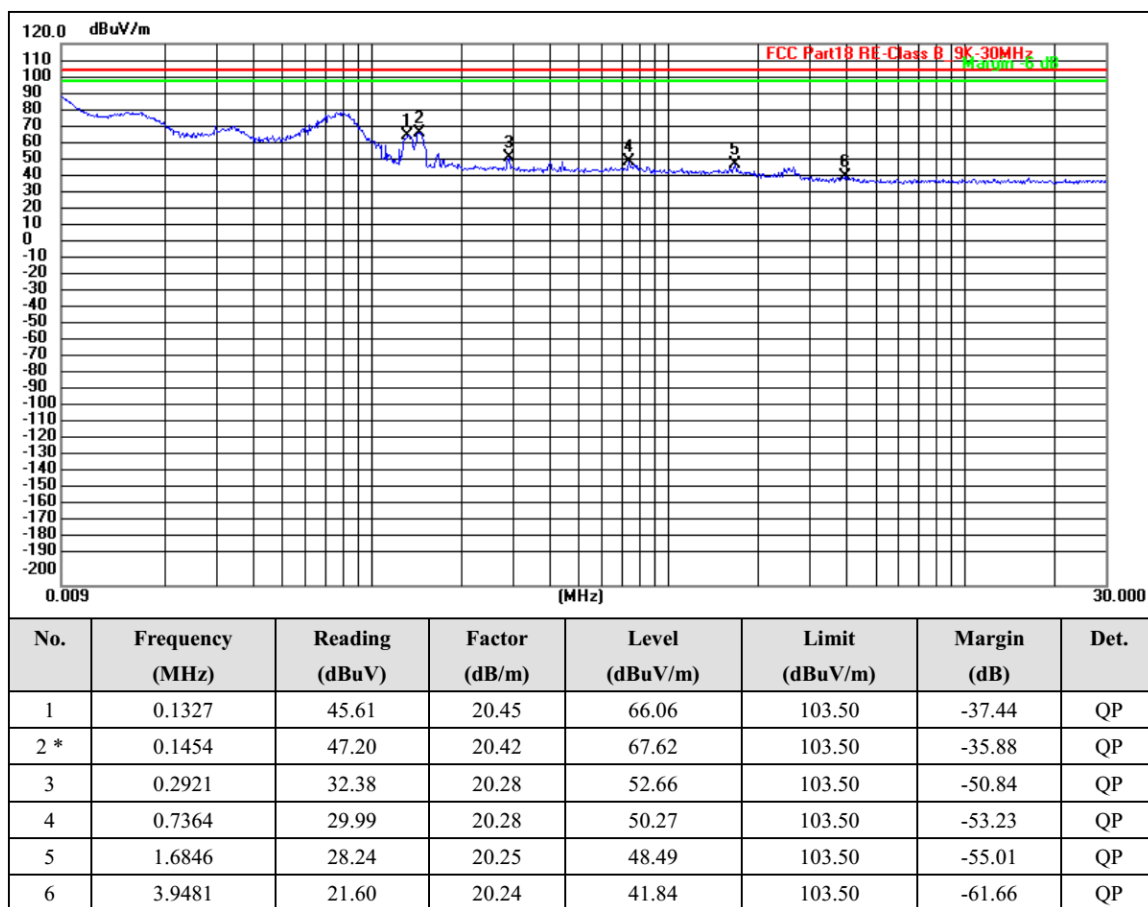
PASS.

Only report the worst test data (Mode 1) in test report;

The test data please refer to following page:

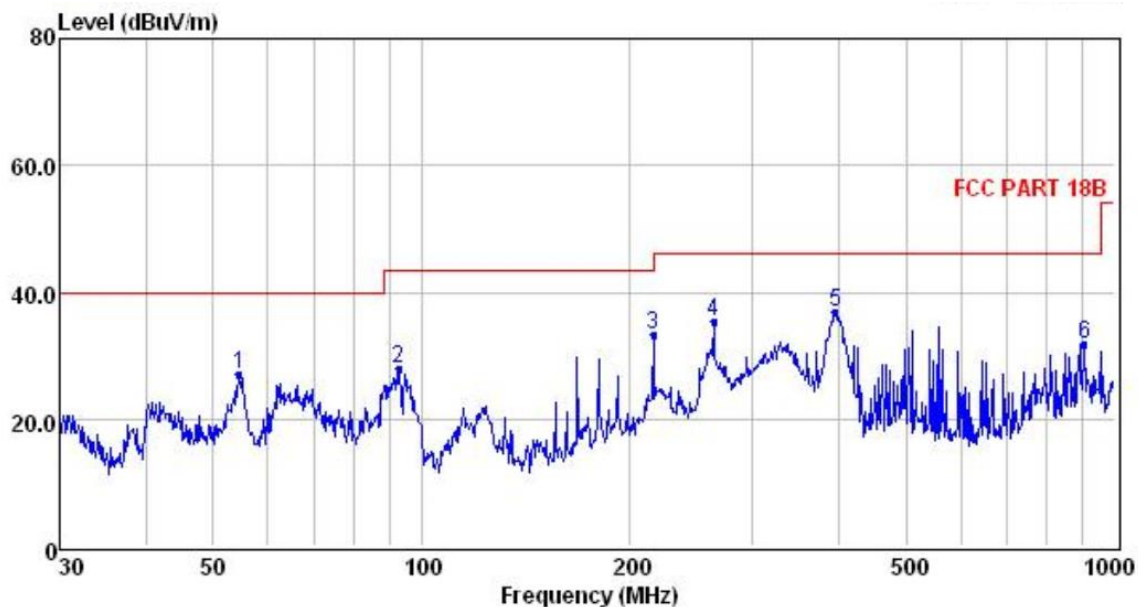
Temperature	24.2°C	Humidity	54.8%
Test Engineer	Jay Li	Configurations	Transmit

0.009 MHz – 30 MHz



Remark: Measured at antenna position 0 degree and 90 degree, recorded worst case at 0 degree.

Temperature	24.6°C	Humidity	54.1%
Test Engineer	Jay Li	Configurations	Transmit

Below 1GHz*Horizontal*

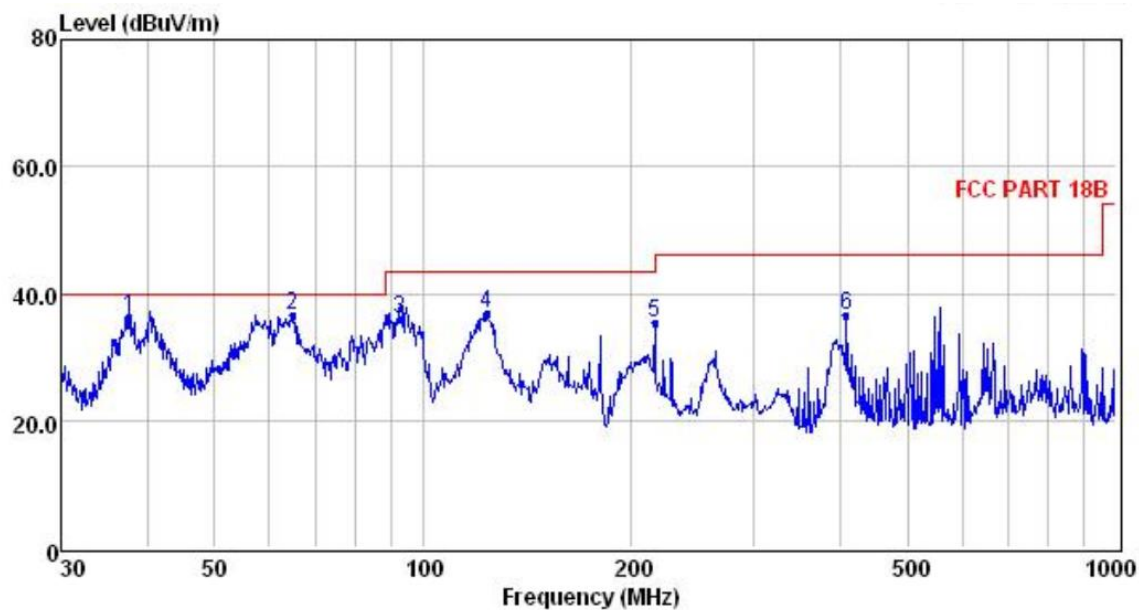
	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	54.45	43.60	0.46	13.05	27.09	40.00	-12.91	QP
2	92.79	45.12	0.56	12.42	28.00	43.50	-15.50	QP
3	216.02	51.66	0.88	11.07	33.23	46.00	-12.77	QP
4	263.82	52.75	1.03	12.17	35.50	46.00	-10.50	QP
5	396.24	51.35	1.30	14.97	36.79	46.00	-9.21	QP
6	906.48	40.08	2.03	21.13	31.92	46.00	-14.08	QP

Note: 1. All readings are Quasi-peak values.

2. Measured= Reading + Antenna Factor + Cable Loss

3. The emission that are 20db below the official limit are not reported

Vertical



	Freq	Reading	CabLos	Antfac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	37.68	52.87	0.38	12.99	36.27	40.00	-3.73	QP
2	64.89	55.28	0.52	10.75	36.49	40.00	-3.51	QP
3	92.79	53.20	0.56	12.42	36.08	43.50	-7.42	QP
4	123.70	56.49	0.71	9.91	36.93	43.50	-6.57	QP
5	216.02	53.91	0.88	11.07	35.48	46.00	-10.52	QP
6	408.95	51.00	1.28	15.24	36.66	46.00	-9.34	QP

Note: 1. All readings are Quasi-peak values.

2. Measured= Reading + Antenna Factor + Cable Loss

3. The emission that are 20db below the official limit are not reported

8. PHOTOGRAPHS OF TEST SETUP

Please refer to separated files for Test Setup Photos of the EUT.

9. EXTERNAL PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

10. INTERNAL PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

-----THE END OF REPORT-----