FCC PART 15B

MEASUREMENT AND TEST REPORT

For

Huawei Technologies Co., Ltd

Administration Building,Headquarters of Huawei Technologies Co.,Ltd., Bantian,Longgang District, Shenzhen, 518129, P.R.C

FCC ID: QISR230D

Report Type:	Product Type:
Original Report	Remote Radio Unit

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Report Number:	RKS161113002-00A
Report Date:	2016-11-15
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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Manufacturer	Huawei Technologies Co., Ltd
Model	R230D (FCC ID: QISR230D)
Product	Remote Radio Unit
Rate Voltage	DC 54V From POE ,rated power :5.1W
Operating Frequency	50/60Hz
Dimensions outside the wall (H x W x D)	120 mm x 86 mm x 26 mm
Weight	0.1 Kg
System memory	128 MB DDR2 32 MB flash memory
Power input	AC INPUT: 100-240V, 1AMAX,50/60Hz DC OUTPUT: 54V, 0.65A PoE power supply in compliance with IEEE 802.3af
Operating temperature and altitude	-60 m to +1800 m: 0°C to+40°C, 1800 m to 5000 m: Temperature decreases by 1°C every time the altitude increases 300 m.
Storage temperature	-40°C to +70°C
Operating humidity	5% to 95% (non-condensing)
Ingress Protection Rating	IP20
Atmospheric pressure	70 kPa to 106 kPa

Manufacture information:
HUAWEI TECHNOLOGIES CO.,LTD / Administration Building,Headquarters of Huawei Technologies Co.,Ltd., Bantian,Longgang District, Shenzhen, 518129, P.R.C

**All measurement and test data in this report was gathered from production sample serial number: 20161001001 (Assigned by BACL, Kunshan). The EUT was received on 2016-10-01.*

Objective

This report is prepared on behalf of Huawei Technologies Co., Ltd in accordance with Part 2-Subpart J, and Part 15-Subparts A and B of the Federal Communication Commissions rules.

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

Related Submittal(s)/Grant(s)

FCC Part 15.247 DTS and FCC Part 15.407 NII submission with FCC ID: QISR230D.

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 Chenghu Road, Kunshan Development Zone No.248, Kunshan, Jiangsu, China

Test site at Bay Area Compliance Laboratories Corp. (Kunshan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 06, 2014. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.:815570. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

SYSTEM TEST CONFIGURATION (FCC §15.27)

Justification

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

Test Mode l: POE mode

EUT Exercise Software

NB exercise 'ping.exe' form NB1 through EUT to NB2.

Special Accessories

No special accessory was used.

Equipment Modifications

No modification was made to the EUT tested.

Support Equipment List and Details

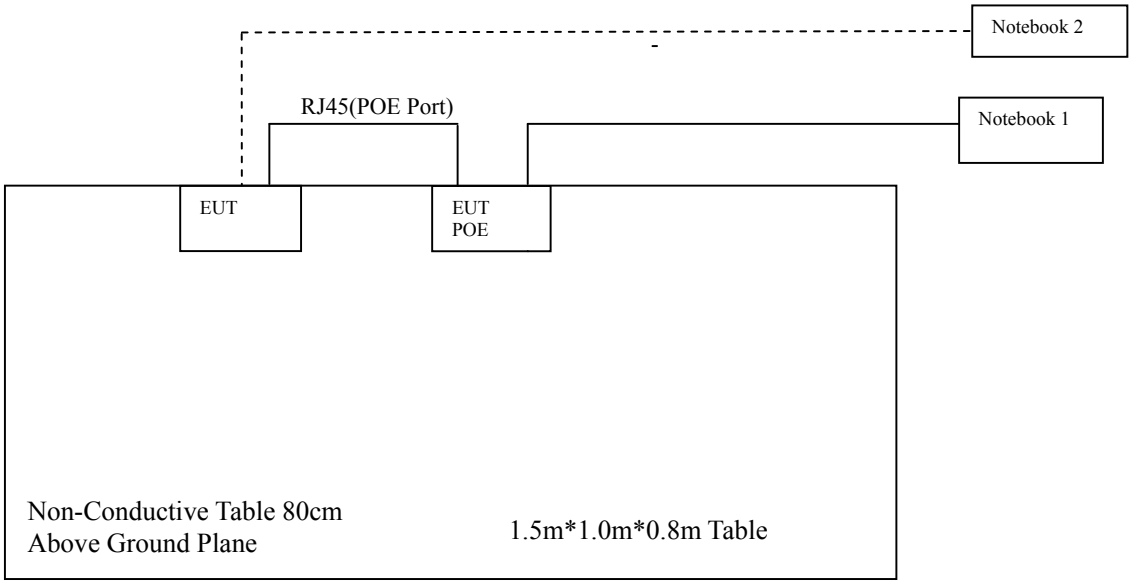
Manufacturer	Description	Model	Serial Number
HP	Notebook	5600U	5CG6240ZH1
HUAWEI	SWITCHING POWER ADAPTOR PoE INJECTOR	PoE35-54A	/

External I/O Cable

Cable Description	Length (m)	From/Port	To
RJ45	1.8	EUT	EUT POE
RJ45	15	EUT POE	Notebook

Block Diagram of Radiated Test Setup

Test Model: POE mode



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§15.107	AC Line Conducted Emissions	Compliance
§15.109	Radiated Emissions	Compliance

FCC §15.107 – AC LINE CONDUCTED EMISSIONS

Applicable Standard

According to FCC§15.107

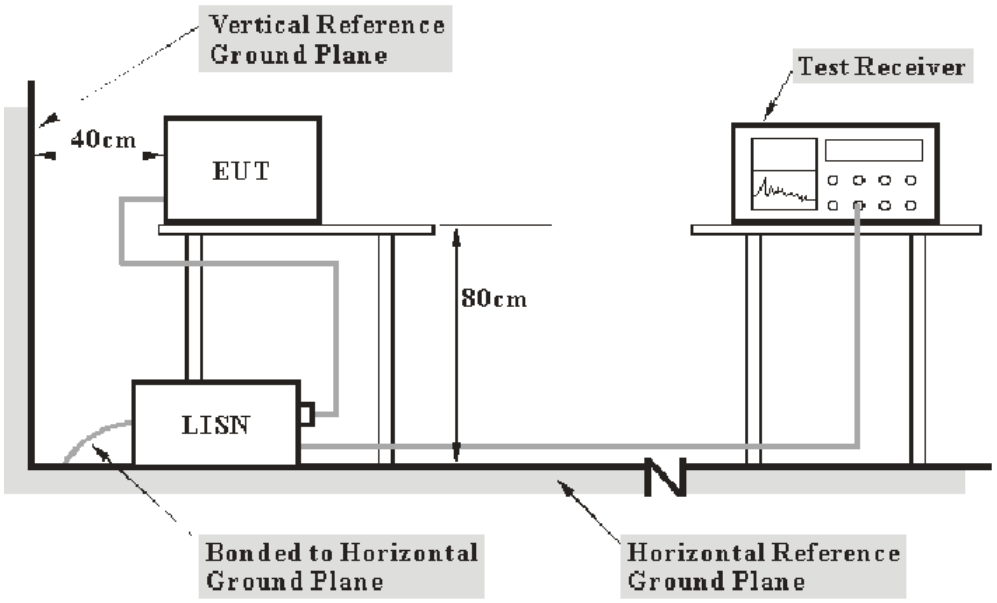
Measurement Uncertainty

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.

Based on CISPR 16-4-2:2011+A1-2014, the expended combined standard uncertainty of conducted disturbance test at Bay Area Compliance Laboratories Corp. (Kunshan) is shown as below. And the uncertainty will not be taken into consideration for the test data recorded in the report.

Port	Expanded Measurement uncertainty
AC Mains	3.26 dB (k=2, 95% level of confidence)
CAT 3	3.70 dB (k=2, 95% level of confidence)
CAT 5	3.86 dB (k=2, 95% level of confidence)
CAT 6	4.64 dB (k=2, 95% level of confidence)

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.

The EUT was connected to an AC 120V/60 Hz power source.

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 EUT 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	ESCS30	934115/007	2015-11-11	2016-11-10
Rohde & Schwarz	LISN	ESH3-Z5	862770/011	2015-11-12	2016-11-11
Rohde & Schwarz	LISN	ESH3-Z5	892239/018	2016-06-23	2017-06-22
Rohde & Schwarz	Transient Limiter	ESH3Z2	DE25985	2016-09-16	2017-09-15
Rohde & Schwarz	CE Test software	EMC 32	V 09.10.0	--	--
MICRO-COAX	Coaxial line	UFB-293B-1-0 480-50X50	97F0173	2016-10-01	2017-10-01

*** 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).

Corrected Factor & Margin Calculation

The Corrected factor is calculated by adding LISN 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 7dB 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 Class B, the worst margin reading as below:

20.36 dB at **0.235000 MHz** in the **Neutral** conducted mode

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies 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

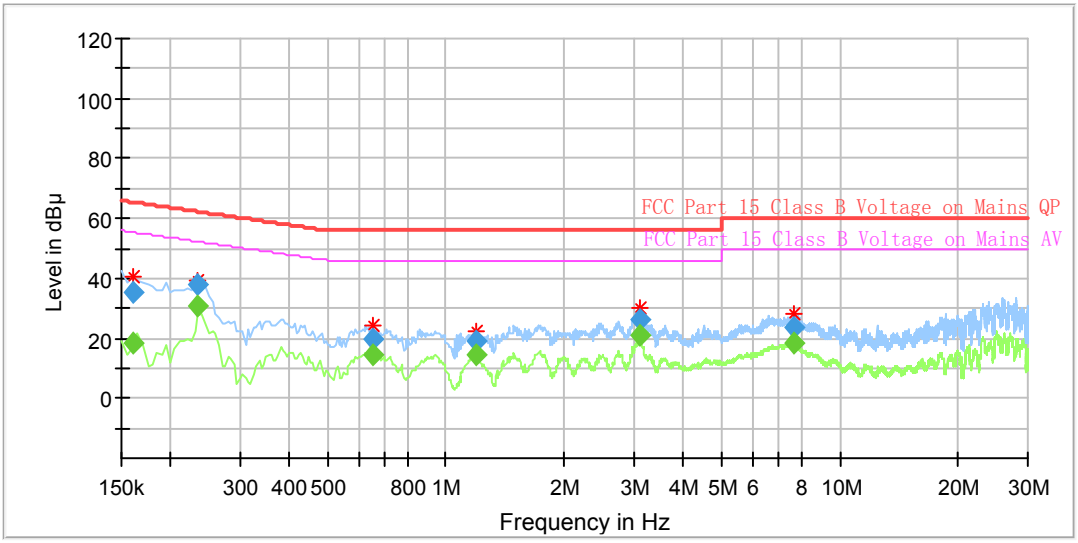
Environmental Conditions

Temperature:	25℃
Relative Humidity:	51 %
ATM Pressure:	101.0 kPa

The testing was performed by Phil Zhu on 2016-10-27.

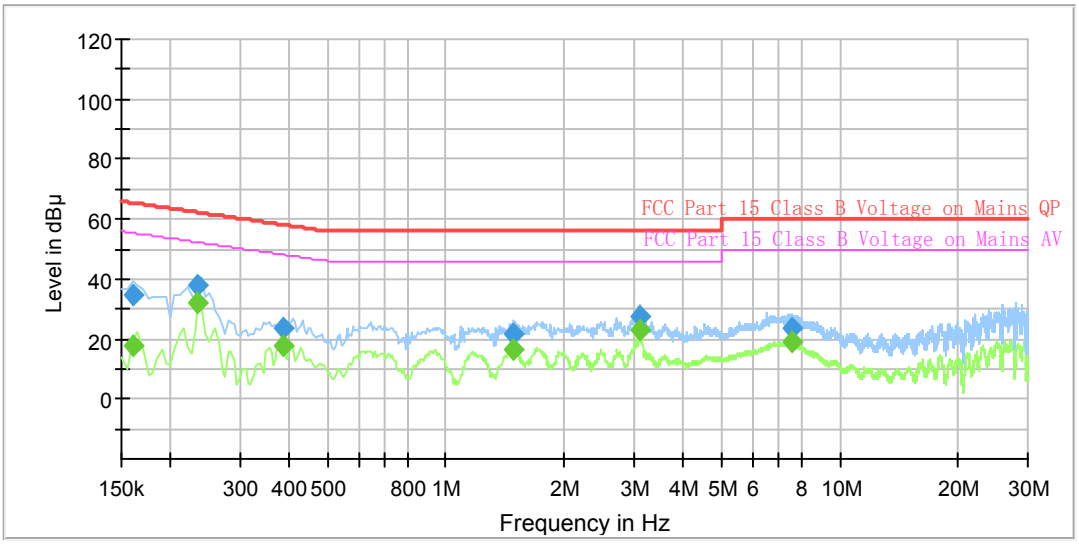
Test Model 1(worst case)

Line



Frequency (MHz)	Corrected Amplitude		Limit (dB µ V)	Margin (dB)	Line	Corr. (dB)
	QuasiPeak (dB µ V)	Average (dB µ V)				
0.160000	---	18.29	55.46	37.17	L1	10.3
0.160000	35.41	---	65.46	30.05	L1	10.3
0.235000	---	30.66	52.27	21.61	L1	10.3
0.235000	37.92	---	62.27	24.35	L1	10.3
0.655000	---	14.82	46.00	31.18	L1	10.3
0.655000	20.04	---	56.00	35.96	L1	10.3
1.195000	---	14.24	46.00	31.76	L1	10.3
1.195000	19.02	---	56.00	36.98	L1	10.3
3.110000	---	21.22	46.00	24.78	L1	10.5
3.110000	26.49	---	56.00	29.51	L1	10.5
7.680000	---	18.65	50.00	31.35	L1	10.5
7.680000	23.46	---	60.00	36.54	L1	10.5

Neutral



Frequency (MHz)	Corrected Amplitude		Limit (dB µ V)	Margin (dB µ V)	Line	Corr. (dB)
	QuasiPeak (dB µ V)	Average (dB µ V)				
0.160000	---	17.45	55.46	38.01	N	10.3
0.160000	34.38	---	65.46	31.08	N	10.3
0.235000	---	31.91	52.27	20.36	N	10.3
0.235000	38.25	---	62.27	24.02	N	10.3
0.385000	---	17.54	48.17	30.63	N	10.3
0.385000	23.66	---	58.17	34.51	N	10.3
1.490000	---	16.60	46.00	29.40	N	10.4
1.490000	21.61	---	56.00	34.39	N	10.4
3.110000	---	23.26	46.00	22.74	N	10.5
3.110000	27.32	---	56.00	28.68	N	10.5
7.595000	---	18.98	50.00	31.02	N	10.6
7.595000	23.73	---	60.00	36.27	N	10.6

FCC §15.109 - RADIATED EMISSIONS

Applicable Standard

FCC §15.109

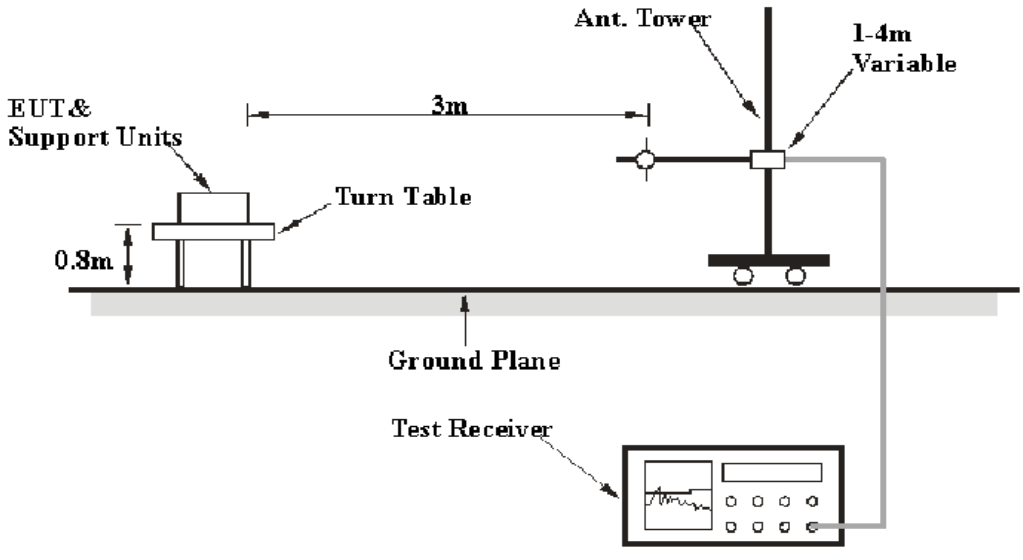
Measurement Uncertainty

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.

Based on CISPR 16-4-2:2011+A1-2014, the expended combined standard uncertainty of radiation emissions at Bay Area Compliance Laboratories Corp. (Kunshan) is shown in below table. And the uncertainty will not be taken into consideration for the test data recorded in the report

Frequency	Polarity	Measurement uncertainty
30 MHz~200 MHz	Horizontal	4.62 dB (k=2, 95% level of confidence)
	Vertical	4.54 dB (k=2, 95% level of confidence)
200 MHz~1 GHz	Horizontal	4.84 dB (k=2, 95% level of confidence)
	Vertical	5.91 dB (k=2, 95% level of confidence)
1 GHz~6 GHz	Horizontal/Vertical	4.68 dB (k=2, 95% level of confidence)
Above 6 GHz	Horizontal/Vertical	4.92 dB (k=2, 95% level of confidence)

EUT Setup



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.

EMI Test Receiver Setup

The system was investigated from 30 MHz to 9 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
30 MHz – 1000 MHz	100 kHz	300 kHz	120 kHz	QP
1GHz-9GHz	1MHz	3MHz	-	PK
1GHz-9GHz	1MHz	10Hz	-	AV

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

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Sonoma Instrunent	Amplifier	330	171377	2016-09-16	2017-09-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100195	2015-11-12	2016-11-11
Sunol Sciences	Broadband Antenna	JB3	A090314-2	2016-01-09	2017-01-08
ETS	Horn Antenna	3115	6229	2016-01-11	2017-01-10
Rohde & Schwarz	Signal Analyzer	FSIQ26	100048	2015-11-12	2016-11-11
Mini	Pre-amplifier	ZVA-183-S+	857001418	2016-09-16	2017-09-15
champrotek	Chamber	Chamber A	V 09.10.0	-	-
R&S	Auto test Software	EMC32	V 09.10.0	-	-
MICRO-COAX	Coaxial line	UFB-293B-1-04 80-50X50	97F0173	2016-10-01	2017-10-01

*** 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).

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

Test Results Summary

According to the data in the following table, the EUT complied with the FCC §15.109 Class B, with the worst margin reading of:

7.84 dB at **500.009100 MHz** in the **Horizontal** polarization mode(*Test Model1*)

Refer to CISPR16-4-2:2011 and CISPR 16-4-1:2009, the measured level complies 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

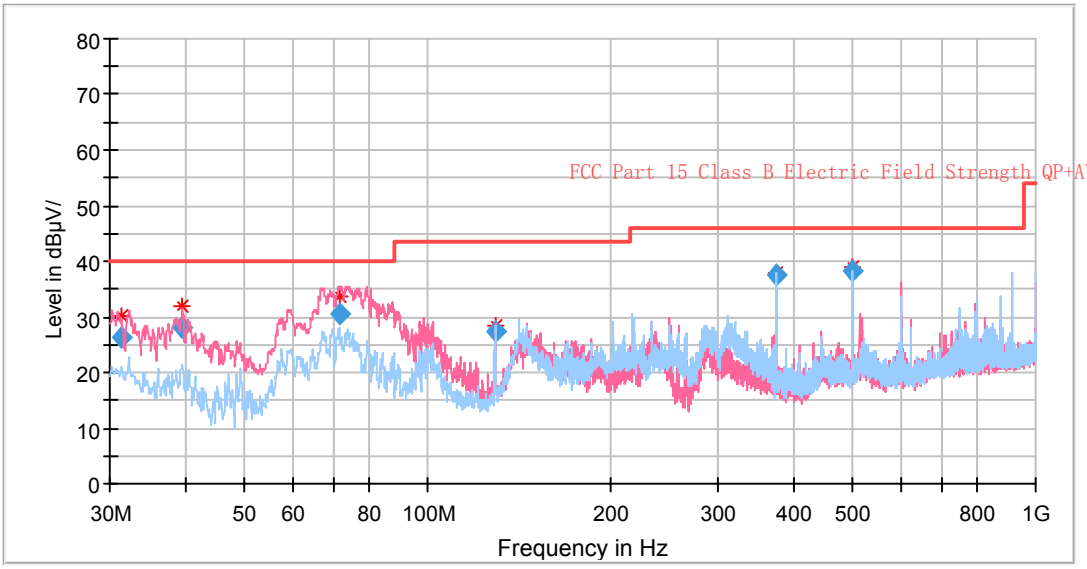
Environmental Conditions

Temperature:	27 ℃
Relative Humidity:	56 %
ATM Pressure:	101.0 kPa

The testing was performed by Phil Zhu on 2016-10-27.

Test Model 1

1)30MHz ~ 1GHz



Frequency (MHz)	Corrected Amplitude (dB µ V)	Detector	Limit (dB µ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
31.393850	26.48	QuasiPeak	40.00	13.52	100.0	V	220.0	-5.8
39.474700	28.18	QuasiPeak	40.00	11.82	100.0	V	172.0	-10.0
71.433400	30.70	QuasiPeak	40.00	9.30	100.0	V	133.0	-17.1
129.318650	27.44	QuasiPeak	43.50	16.06	100.0	V	177.0	-13.5
375.016950	37.46	QuasiPeak	46.00	8.54	100.0	H	75.0	-9.0
500.009100	38.16	QuasiPeak	46.00	7.84	199.0	H	102.0	-5.6

1) Above 1GHz

Frequency (MHz)	MaxPeak (dB μ V)	Average (dBV/m)	Limit (dB μ V/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB /m)
1411.252505	36.06	---	73.90	37.84	150.0	H	240.0	-8.2
1411.252505	---	22.48	53.90	31.42	150.0	H	240.0	-8.2
1816.703407	---	22.38	53.90	31.52	150.0	V	112.0	-5.9
1816.703407	35.86	---	73.90	38.04	150.0	V	112.0	-5.9
2399.849699	---	23.45	53.90	30.45	150.0	H	319.0	-3.4
2399.849699	36.86	---	73.90	37.04	150.0	H	319.0	-3.4
3906.723447	---	29.02	53.90	24.88	150.0	V	351.0	4.5
3906.723447	42.89	---	73.90	31.01	150.0	V	351.0	4.5
4827.565131	---	38.18	53.90	15.72	150.0	H	209.0	7.8
4827.565131	62.04	---	73.90	11.86	150.0	H	209.0	7.8
7242.795591	48.17	---	73.90	25.73	150.0	V	170.0	14.8
7242.795591	---	33.84	53.90	20.06	150.0	V	170.0	14.8

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