

FCC TEST REPORT
FOR
Apogee Inc.
USB Wired Mac Keyboard
Test Model: K166-1259-UK
Additional Model No.: /

Prepared for : Apogee Inc.
Address : 1405 Pioneer Street, Brea CA 92821 USA.

Prepared by : Shenzhen LCS Compliance Testing Laboratory Ltd.
Address : 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue,
Bao'an District, Shenzhen, Guangdong, China

Tel : (+86)755-82591330
Fax : (+86)755-82591332
Web : www.LCS-cert.com
Mail : webmaster@LCS-cert.com

Date of receipt of test sample : November 10, 2017
Number of tested samples : 1
Sample number : Prototype
Date of Test : November 10, 2017~ November 13, 2017
Date of Report : November 14, 2017

FCC TEST REPORT

FCC Rules Part 15 Subpart B

Report Reference No. : LCS171013060AE1

Date of Issue..... : November 14, 2017

Testing Laboratory Name : Shenzhen LCS Compliance Testing Laboratory Ltd.

Address..... : 1/F., Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China

Testing Location/ Procedure : Full application of Harmonised standards ☒
Partial application of Harmonised standards ☐
Other standard testing method ☐

Applicant's Name : Apogee Inc..

Address..... : 1405 Pioneer Street, Brea CA 92821 USA.

Test Specification

Standard..... : FCC CFR 47 PART 15 Subpart B / ANSI C63.4: 2014

Test Report Form No..... : LCSEMC-1.0

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

Master TRF : Dated 2011-03

Shenzhen LCS Compliance Testing Laboratory Ltd. All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen LCS Compliance Testing Laboratory Ltd. is acknowledged as copyright owner and source of the material. Shenzhen LCS Compliance Testing Laboratory Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

Test Item Description..... : USB Wired Mac Keyboard

Trade Mark..... : Kanex

Test Model..... : K166-1259-UK

Ratings..... : DC 5V by USB charging

Result : Positive

Compiled by:

Linda He

Linda He/ Administrators

Supervised by:

Dick Su

Dick Su/ Technique principal

Approved by:

Gavin Liang

Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCS171013060AE1	<u>November 14, 2017</u> Date of issue
--	---

Test Model.....	: K166-1259-UK
EUT.....	: USB Wired Mac Keyboard
Applicant.....	: Apogee Inc.
Address.....	: 1405 Pioneer Street, Brea CA 92821 USA
Telephone.....	: /
Fax.....	: /
Manufacturer.....	: Shenzhen Hangshi Technology Co.,Ltd
Address.....	: Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China.
Telephone.....	: /
Fax.....	: /
Factory.....	: Shenzhen Hangshi Technology Co.,Ltd
Address.....	: Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China.
Telephone.....	: /
Fax.....	: /

Test Result	Positive
--------------------	-----------------

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	November 14, 2017	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION.....	6
1.1 Description of Device (EUT).....	6
1.2 Support equipment List.....	6
1.3 External I/O	6
1.4 Description of Test Facility	7
1.5 Statement of the Measurement Uncertainty.....	7
1.6 Measurement Uncertainty.....	7
1.7 List of Measuring Equipment	8
1.8 Description of Test Modes.....	8
2. TEST METHODOLOGY	9
2.1 EUT Configuration	9
2.2 EUT Exercise.....	9
2.3 General Test Procedures	9
3. SYSTEM TEST CONFIGURATION.....	10
3.1 Justification.....	10
3.2 EUT Exercise Software	10
3.3 Special Accessories	10
3.4 Block Diagram/Schematics.....	10
3.5 Equipment Modifications	10
3.6 Test Setup	10
4. SUMMARY OF TEST RESULTS	11
5. RADIATED MEASUREMENT	12
5.1 Standard Applicable.....	12
5.2 Instruments Setting.....	12
5.3 Test Procedures.....	13
5.4 Test Setup Layout.....	14
5.5 EUT Operation during Test	14
5.6 Results for Radiated Emissions	14
6. LINE CONDUCTED EMISSIONS.....	17
6.1 Standard Applicable.....	17
6.2 Block Diagram of Test Setup.....	17
6.3 Test Results.....	17
7. TEST SETUP PHOTOGRAPHS OF EUT	19
8. EXTERIOR PHOTOGRAPHS OF THE EUT	19
9. INTERIOR PHOTOGRAPHS OF THE EUT	19

1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT : USB Wired Mac Keyboard
Model Number : K166-1259-UK
Additional Model No. : /
Model Declaration : N/A
Power Supply : DC 5V by USB charging
Extreme temp. Tolerance : 10°C to +55°C

1.2 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
Dell	PC	OptPlex 9020 MT	BQ7X422	DoC
Dell	Mouse	N1050	17302NX1723998	DoC
Brother	Printer	HL-2140	E65602L0J131945	DoC

1.3 External I/O

I/O Port Description	Quantity	Cable
-	-	-
-	-	-

1.4 Description of Test Facility

CNAS Registration Number is L4595.

FCC Registration Number is 254912.

Industry Canada Registration Number is 9642A-1.

ESMD Registration Number is ARCB0108.

UL Registration Number is 100571-492.

TUV SUD Registration Number is SCN1081.

TUV RH Registration Number is UA 50296516-001

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 List of Measuring Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2017-06-17	2018-06-16
2	Amplifier	Agilent	8449B	3008A02120	2017-06-15	2018-06-14
3	Amplifier	MITEQ	AMF-6F-2604 00	9121372	2017-06-15	2018-06-14
4	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2017-06-09	2018-06-08
5	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	2017-06-17	2018-06-16
6	EMI Test Receiver	R&S	ESCI	101142	2017-06-17	2018-06-16
7	Artificial Mains	R&S	ENV216	101288	2017-06-17	2018-06-16
8	Artificial Mains	R&S	ENV216	101281	2017-06-17	2018-06-16
9	EMI Test Software	R&S	E3	N/A	2017-06-17	2018-06-16

1.8 Description of Test Modes

Link PC

Pre-test AC conducted emission at both voltage AC 120V/60Hz and AC 240V/60Hz, recorded worst case.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4: 2014, FCC CFR PART 15C 15.107, 15.109, .

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 engineering 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 15.107, 15.109, under the FCC Rules Part 15 Subpart B.

2.3 General Test Procedures

2.3.1 Conducted Emissions

According to the requirements in Section 6.2 of ANSI C63.4: 2014, AC power-line conducted emissions shall be 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 and 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 Section 6.3 of ANSI C63.4: 2014.

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a continuous transmits condition.

3.2 EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (EMI test.exe) provided by application.

3.3 Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	PC	B470	--	DOC
Lenovo	AC/DC ADAPTER	ADP-90DDB	--	DOC

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 RESULTS

Applied Standard: FCC Part 15 Subpart B		
FCC Rules	Description of Test	Result
§15.109(a)	Radiated Emissions Measurement	Compliant
§15.107(a)	AC Line Conducted Emissions	Compliant

5. RADIATED MEASUREMENT

5.1 Standard Applicable

According to the general radiated emission limits in §15.109

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Note: (1) The smaller limit shall apply at the cross point between two frequency bands.

(2) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

5.2 Instruments Setting

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

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	30 MHz
Stop Frequency	1000MHz
RBW/ VBW	120kHz/300KHz

5.3 Test Procedures

1) 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.

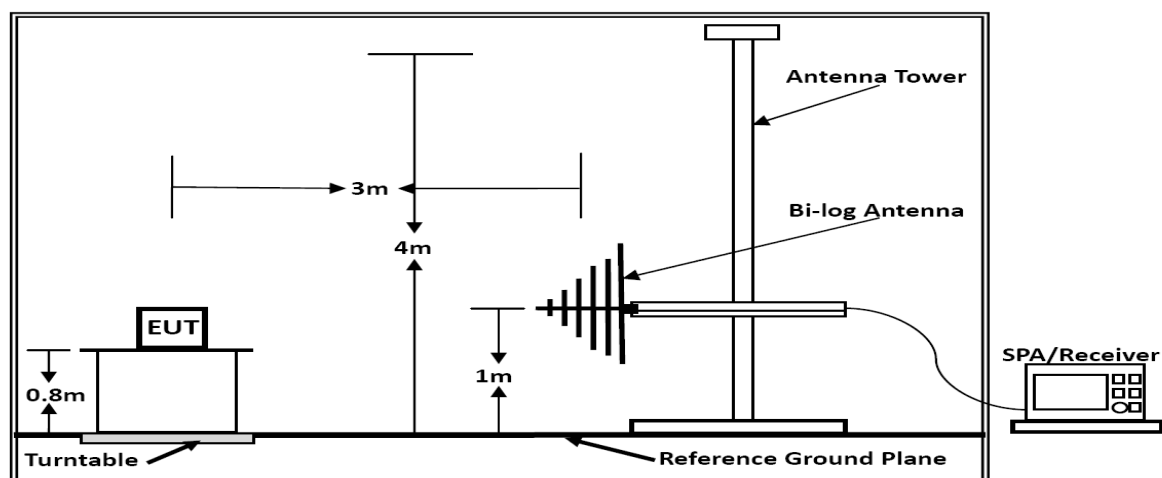
Premeasurement:

- 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.

5.4 Test Setup Layout



Below 1GHz

5.5 EUT Operation during Test

The EUT was connected to test PC, and run EMI test soft.

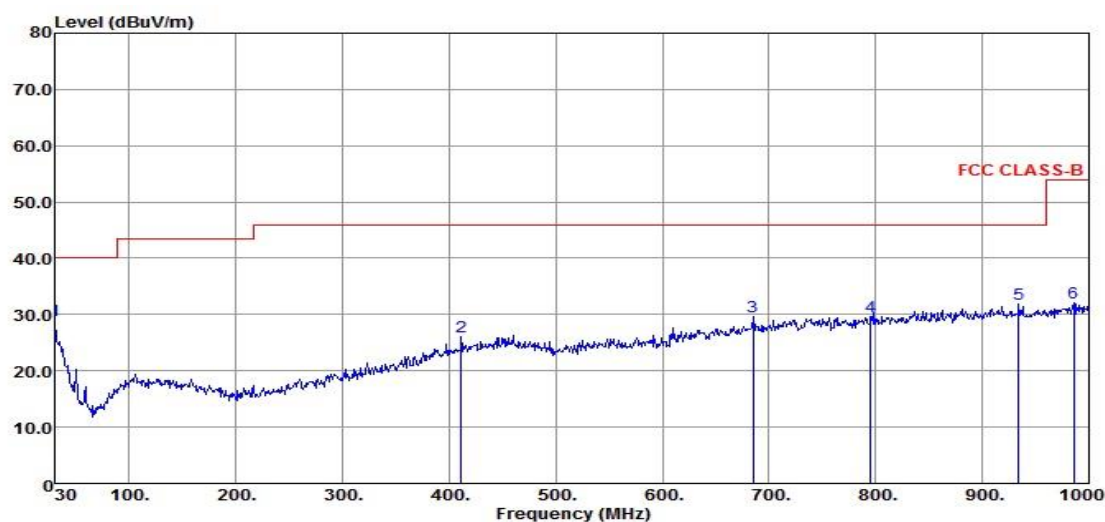
5.6 Results for Radiated Emissions

PASS.

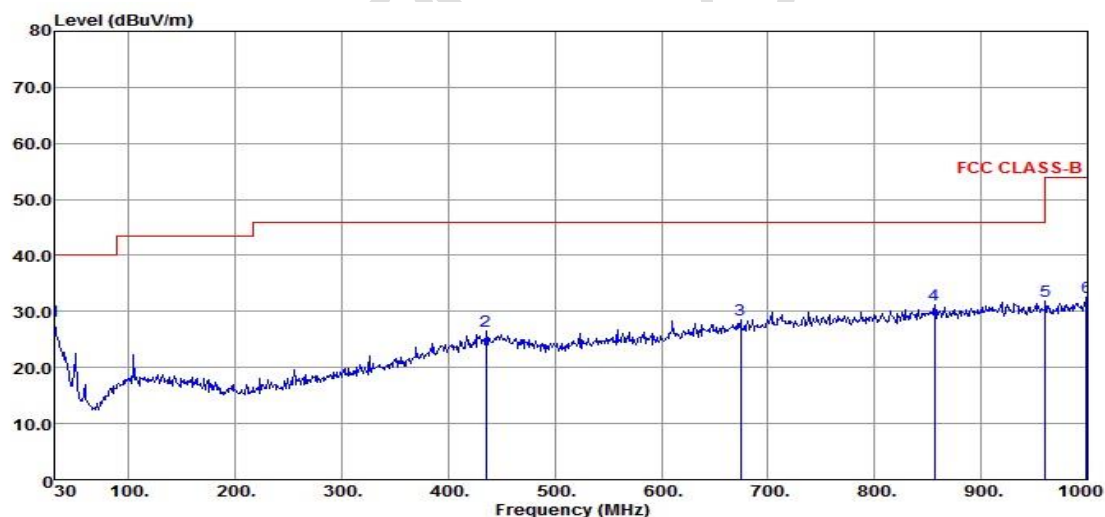
The test data please refer to following page:

Below 1GHz

Temperature	25°C	Humidity	60%
Test Engineer	wangchuang	Configurations	Link PC

Horizontal:

Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Preamp Factor dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector
30.00	37.05	17.28	0.65	26.07	28.91	40.00	-11.09	Peak
411.21	33.49	16.72	1.67	25.87	26.01	46.00	-19.99	Peak
684.75	34.33	19.62	2.05	26.38	29.62	46.00	-16.38	Peak
795.33	33.18	20.43	2.20	26.18	29.63	46.00	-16.37	Peak
934.04	33.33	21.73	2.41	25.61	31.86	46.00	-14.14	Peak
985.45	32.49	22.24	2.47	25.22	31.98	54.00	-22.02	Peak

Vertical:

Freq (MHz)	Read Level (dBμV)	Antenna Factor (dB/m)	Cable Loss dB	Preamp Factor dB	Result Level (dBμV/m)	Limit Line (dBμV/m)	Over Limit (dB)	Detector
30.00	36.50	17.28	0.65	26.07	28.36	40.00	-11.64	Peak
435.46	33.79	16.99	1.67	26.00	26.45	46.00	-19.55	Peak
674.08	33.42	19.49	2.05	26.39	28.57	46.00	-17.43	Peak
856.44	33.81	20.99	2.30	26.00	31.10	46.00	-14.90	Peak
960.23	32.93	21.99	2.41	25.41	31.92	54.00	-22.08	Peak
999.03	32.96	22.29	2.47	25.12	32.60	54.00	-21.40	Peak

*****Note:**

- 1) *Emission level (dBuV/m) = 20 log Emission level (uV/m).*
- 2) *Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.*
- 3) *As the highest working frequency of the device is below 108MHz, the frequency range from 30MHz to 1GHz is checked.*

6. LINE CONDUCTED EMISSIONS

6.1 Standard Applicable

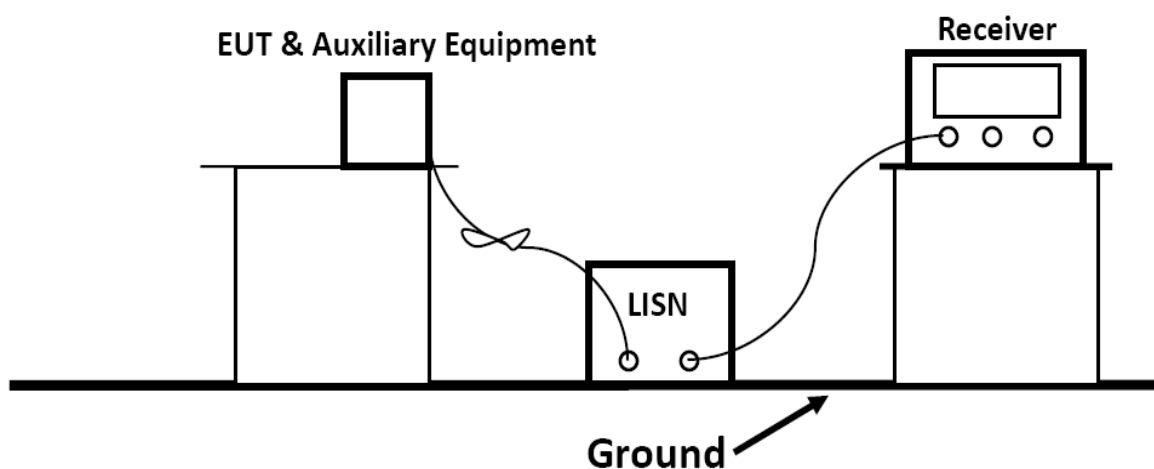
According to the general radiated emission limits in §15.107

Frequency (MHz)			Limit (dB μ V)	
			Quasi-peak Level	Average Level
0.15	~	0.50	66.0 ~ 56.0 *	56.0 ~ 46.0 *
0.50	~	5.00	56.0	46.0
5.00	~	30.00	60.0	50.0

NOTE1-The lower limit shall apply at the transition frequencies.
NOTE2-The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.

* Decreasing linearly with the logarithm of the frequency

6.2 Block Diagram of Test Setup



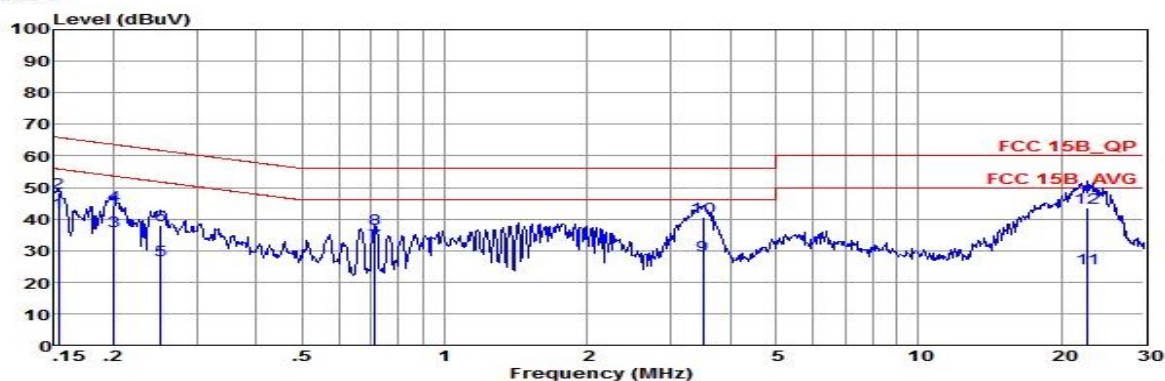
6.3 Test Results

The test data please refer to following page.

Test Results for AC 120V/60Hz(Worst Case)

Line

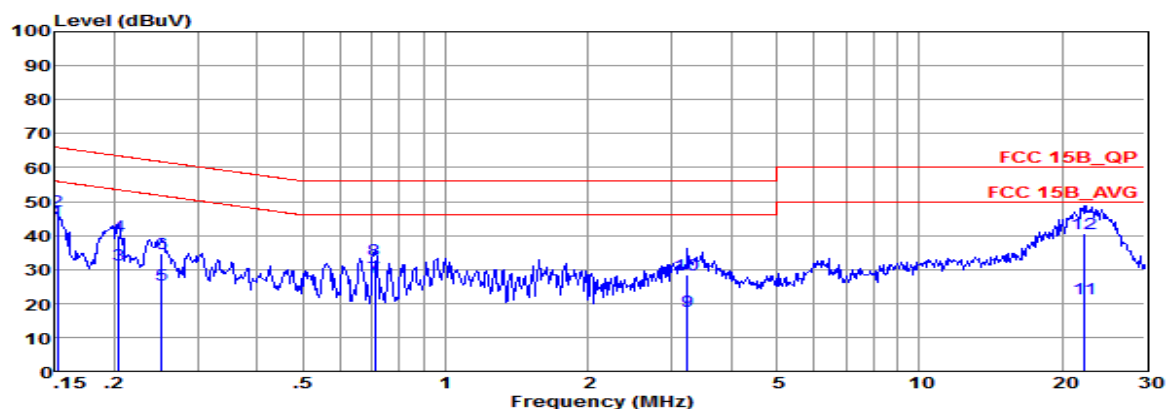
Data: 1



	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1 *	0.15	42.13	-13.69	55.82	31.40	0.14	10.59	Average
2	0.15	48.33	-17.49	65.82	37.60	0.14	10.59	QP
3	0.20	36.01	-17.57	53.58	25.40	0.11	10.50	Average
4	0.20	44.31	-19.27	63.58	33.70	0.11	10.50	QP
5	0.25	27.06	-24.63	51.69	16.50	0.11	10.45	Average
6	0.25	38.16	-23.53	61.69	27.60	0.11	10.45	QP
7	0.71	32.07	-13.93	46.00	21.80	0.11	10.16	Average
8	0.71	36.97	-19.03	56.00	26.70	0.11	10.16	QP
9	3.51	28.34	-17.66	46.00	18.00	0.13	10.21	Average
10	3.51	40.44	-15.56	56.00	30.10	0.13	10.21	QP
11	22.78	24.34	-25.66	50.00	13.30	0.46	10.58	Average
12	22.78	43.44	-16.56	60.00	32.40	0.46	10.58	QP

Neutral

Data: 2



	Freq	Level	Over	Limit	Read	LISN	Cable	Remark
	MHz	dBuV	Limit	Line	Level	Factor	Loss	
			dB	dBuV	dBuV	dB	dB	
1 *	0.15	44.14	-11.77	55.91	33.40	0.14	10.60	Average
2	0.15	47.34	-18.57	65.91	36.60	0.14	10.60	QP
3	0.20	31.31	-22.14	53.45	20.70	0.11	10.50	Average
4	0.20	39.71	-23.74	63.45	29.10	0.11	10.50	QP
5	0.25	25.56	-26.13	51.69	15.00	0.11	10.45	Average
6	0.25	34.76	-26.93	61.69	24.20	0.11	10.45	QP
7	0.71	27.77	-18.23	46.00	17.50	0.11	10.16	Average
8	0.71	32.87	-23.13	56.00	22.60	0.11	10.16	QP
9	3.24	17.63	-28.37	46.00	7.31	0.12	10.20	Average
10	3.24	28.43	-27.57	56.00	18.11	0.12	10.20	QP
11	22.30	21.24	-28.76	50.00	10.20	0.45	10.59	Average
12	22.30	40.64	-19.36	60.00	29.60	0.45	10.59	QP

Remarks: 1. Measured = Reading + Lisen Factor + Cable Loss.

2. The emission levels that are 20dB below the official limit are not reported.

1. Pre-scan all modes and recorded the worst case results in this report;

7. TEST SETUP PHOTOGRAPHS OF EUT

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

8. EXTERIOR PHOTOGRAPHS OF THE EUT

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

9. INTERIOR PHOTOGRAPHS OF THE EUT

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

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