



TEST REPORT

No. I19Z61022-EMC01

for

Surf Communication Solutions Ltd.

4G dashcam

Model Name: AI-12

FCC ID: 2APWTAI-12

with

Hardware Version: PVT2.0

Software Version: V 1.0.1

Issued Date: 2019-08-16

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

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I19Z61022-EMC01	Rev.0	1 st edition	2019-08-16

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1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2005 accredited test laboratory under NATIONAL VOLUNTARY LABORATORY ACCREDITATION PROGRAM (NVLAP) with lab code 600118-0, and is also an FCC accredited test laboratory (CN5017), and ISED accredited test laboratory (CN0066). The detail accreditation scope can be found on NVLAP website.

1.2. Testing Location

CTTL (huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China
100191

CTTL (BDA)

Address: No.18A, Kangding Street, Beijing Economic-Technology Development
Area, Beijing, P. R. China 100176

1.3. Testing Environment

Normal Temperature: 15-35°C

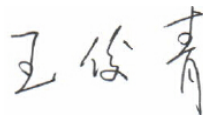
Relative Humidity: 20-75%

1.4. Project data

Testing Start Date: 2019-07-22

Testing End Date: 2019-08-15

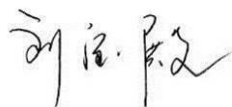
1.5. Signature



Wang Junqing
(Prepared this test report)



Zhang Ying
(Reviewed this test report)



Liu Baodian
Deputy Director of the laboratory
(Approved this test report)

2. Client Information

2.1. Certification Manager Information

Company Name: GD DIGITAL LIMITED
Address /Post: 5th Floor, Block A, 4th Building, Tianan Digital City, Longgang District,
Shenzhen, China
Contact Person: May
Contact Email: gdyw008@hkgaodi.com
Telephone: 15986626881
Fax: /

2.2. Applicant Information

Company Name: Surf Communication Solutions Ltd.
Address /Post: 7 Hamada Street ,Yokneam Ilit Israe
Contact: Mr Adi Toister
Email: adi@surfsolutions.com
Telephone: +972544858102
Fax: /

2.3. Manufacturer Information

Company Name: Surf Communication Solutions Ltd.
Address /Post: 7 Hamada Street ,Yokneam Ilit Israel
Contact: Mr Adi Toister
Email: adi@surfsolutions.com
Telephone: +972544858102
Fax: /

3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. About EUT

Description	4G dashcam
Model Name	AI-12
FCC ID	2APWTAI-12
Extreme vol. Limits	3.6VDC to 4.2VDC (nominal: 3.8VDC)

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL, Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT.

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	357660101000131	PVT2.0	V 1.0.1

*EUT ID: is used to identify the test sample in the lab internally.

3.3. Internal Identification of AE used during the test

AE ID*	Description	SN	Remarks
AE1	Battery	/	/
AE1-1	Battery	/	/
AE1-2	Battery	/	/
AE2	USB Cable	/	With sample
AE3	USB Cable	/	/

AE1

Model	902030
Manufacturer	HUIZHOU NEW JINKE ENERGY DEVELOPMENT CO. LTD
Capacitance	550mAh

AE1-1

Model	902030
Manufacturer	Dongguan Golden CEL Battery Co., Ltd
Capacitance	460mAh

AE2

Model	/
Manufacturer	/
Length of cable	/



AE3

Model /

Manufacturer /

Length of cable /

*AE ID: is used to identify the test sample in the lab internally.

Note: The USB cables are shielded.

3.4. EUT set-ups

EUT set-up No.	Combination of EUT and AE	Remarks
Set.1	EUT1+ AE2+ PC	Charger + Camera
Set.2	EUT1+ AE3+ PC	USB

4. Reference Documents

4.1. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 15, Subpart B	Radio frequency devices - Unintentional Radiators	2016
ANSI C63.4	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	2014

Note: The test methods have no deviation with standards.

5. LABORATORY ENVIRONMENT

Semi-anechoic chamber SAC-2 (10 metersx6.7metersx6.1meters) did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 15 %, Max. = 75 %
Shielding effectiveness	0.014MHz - 1MHz, >60dB; 1MHz - 1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω
Normalised site attenuation (NSA)	< ± 4 dB, 3m distance, from 30 to 1000 MHz
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 18GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

Shielded room did not exceed following limits along the EMC testing:

Temperature	Min. = 15 °C, Max. = 35 °C
Relative humidity	Min. = 20 %, Max. = 75 %
Shielding effectiveness	0.014MHz-1MHz, >60dB; 1MHz—1000MHz, >90dB.
Electrical insulation	> 2 MΩ
Ground system resistance	< 4 Ω

6. SUMMARY OF TEST RESULTS

Abbreviations used in this clause:		
Verdict Column	P	Pass
	NA	Not applicable
	F	Fail

Items	Test Name	Clause in FCC rules	Section in this report	Verdict	Test Location
1	Radiated Emission	15.109(a)	B.1	P	CTTL(BDA)
2	Conducted Emission	15.107(a)	B.2	P	CTTL(BDA)

7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATION INTERVAL
1	Test Receiver	ESU26	100376	R&S	2019-11-27	1 Year
2	EMI Antenna	3117	00139065	ETS-Lindgren	2019-11-15	1 year
3	Universal Radio Communication Tester	CMW500	159408	R&S	2020-03-03	1 year
4	EMI Antenna	VULB 9163	9163-514	Schwarzbeck	2020-02-03	1 year
5	Test Receiver	ESCI	100766	R&S	2020-03-20	1 Year
6	LISN	ESH3-Z5	825562/028	R&S	2019-08-22	1 Year
7	PC	OPTIPLEX 380	2X1YV2X	DELL	N/A	N/A
8	Printer	P1606dn	VNC3L52122	HP	N/A	N/A
9	Keyboard	L100	CN0RH659658 907ATOI40	DELL	N/A	N/A
10	Mouse	M-UAE119	LZ935220ZRC	Lenovo	N/A	N/A

Test Item	Test Software and Version	Software Vendor
Radiated Continuous Emission	EMC32 V9.01	R&S
Conducted Emission	EMC32 V8.52.0	R&S

ANNEX A: MEASUREMENT RESULTS

A.1 Radiated Emission

Reference

FCC: CFR Part 15.109(a).

A.1.1 Method of measurement

The field strength of radiated emissions from the unintentional radiator (USB mode of EUT and charging mode of EUT) at distances of 10 meters (for 30MHz-1GHz) and 3 meters (for above 1GHz) is tested. Tested in accordance with the procedures of ANSI C63.4 – 2014, section 8.3.

The EUT was placed on a non-conductive table. The measurement antenna was placed at a distance of 3/10 meters from the EUT. During the tests, the antenna height and the EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. This maximization process was repeated with the EUT positioned in each of its three orthogonal orientations.

A.1.2 EUT Operating Mode

The EUT is operating in the USB mode and charging mode. During the test EUT is connected to a PC via a USB cable in the case of USB mode and is connected to a charger in the case of charging mode. The model of the PC is DELL OPTIPLEX 380, and the serial number of the PC is 2X1YV2X. The software is used to let the PC keep on copying data to EUT, reading and erasing the data after copy action was finished.

Note: I/O information: Printer – USB, Mouse – PS/2, Keyboard – USB.

A.1.3 Measurement Limit

Frequency range (MHz)	Field strength limit ($\mu\text{V/m}$)		
	Quasi-peak	Average	Peak
30-88	100		
88-216	150		
216-960	200		
960-1000	500		
>1000		500	5000

Note: the above limit is for 3 meters test distance. 10 meters' limit is got by converting.

A.1.4 Test Condition

Frequency range (MHz)	RBW/VBW	Sweep Time (s)	Detector
30-1000	120kHz (IF Bandwidth)	5	Peak/Quasi-peak
Above 1000	1MHz/1MHz	15	Peak, Average

A.1.5 Measurement Results

A "reference path loss" is established and the A_{Rpl} is the attenuation of "reference path loss". It includes the antenna factor of receive antenna and the path loss.

The measurement results are obtained as described below:

$$\text{Result} = P_{\text{Mea}} + A_{\text{Rpl}} = P_{\text{Mea}} + G_A + G_{\text{PL}}$$

Where

G_A : Antenna factor of receive antenna

G_{PL} : Path Loss

P_{Mea} : Measurement result on receiver.

Measurement uncertainty (worst case): $U = 4.3 \text{ dB}$, $k=2$.

Measurement results for Set.1:

Charging Mode/Average detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
18000.000	38.7	-25.9	41.3	23.28	54.0	15.3	H
17999.500	38.3	-25.9	41.3	22.92	54.0	15.7	V
17999.000	38.7	-25.9	41.3	23.31	54.0	15.3	V
17998.500	38.8	-25.9	41.3	23.34	54.0	15.2	H
17998.000	38.6	-25.9	41.3	23.15	54.0	15.4	V
17997.500	38.6	-25.9	41.3	23.21	54.0	15.4	H

Charging Mode/Peak detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
18000.000	48.8	-25.9	41.3	33.42	74.0	25.2	V
17999.500	48.4	-25.9	41.3	33.02	74.0	25.6	V
17999.000	48.3	-25.9	41.3	32.86	74.0	25.7	V
17998.500	49.5	-25.9	41.3	34.12	74.0	24.5	V
17998.000	48.7	-25.9	41.3	33.25	74.0	25.3	H
17997.500	49.2	-25.9	41.3	33.79	74.0	24.8	V

Measurement results for Set.2:
USB Mode/Average detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17928.000	38.4	-26.1	41.3	23.20	54.0	15.6	H
17106.500	39.0	-26.0	41.6	23.44	54.0	15.0	V
17817.500	37.9	-26.5	41.3	23.14	54.0	16.1	H
17940.000	38.6	-26.0	41.3	23.31	54.0	15.4	H
17042.500	38.3	-26.4	41.7	23.07	54.0	15.7	H
17973.000	38.7	-25.9	41.3	23.29	54.0	15.3	V

USB Mode/Peak detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
18000.000	48.4	-25.9	41.3	33.02	74.0	25.6	H
17999.500	49.9	-25.9	41.3	34.49	74.0	24.1	V
17999.000	48.4	-25.9	41.3	33.00	74.0	25.6	V
17998.500	49.3	-25.9	41.3	33.84	74.0	24.7	H
17998.000	49.3	-25.9	41.3	33.88	74.0	24.7	H
17997.500	49.4	-25.9	41.3	33.92	74.0	24.6	H

Charging Mode, Set.1

15B RE 30MHz-1GHz

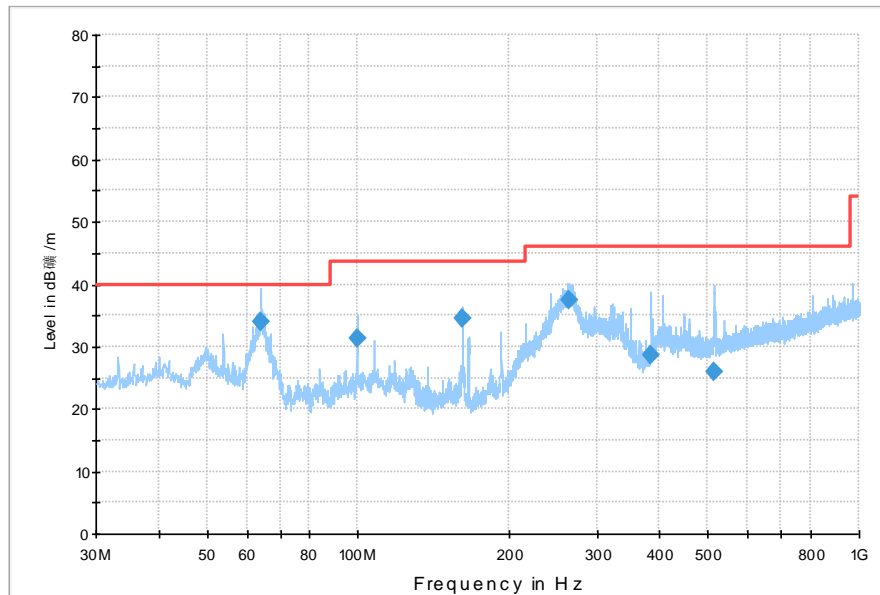


Fig A.1 Radiated Emission from 30MHz to 1GHz

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
64.144000	34.1	110.0	V	315.0	-1.8	5.9	40.0	
99.549000	31.4	100.0	V	114.0	-1.0	12.1	43.5	
161.726000	34.6	125.0	H	102.0	-3.9	8.9	43.5	
264.061000	37.4	100.0	H	280.0	0.6	8.6	46.0	
384.535000	28.6	100.0	H	210.0	4.6	17.4	46.0	
515.000000	26.1	100.0	V	13.0	7.4	19.9	46.0	

15B RE - 1GHz-3GHz

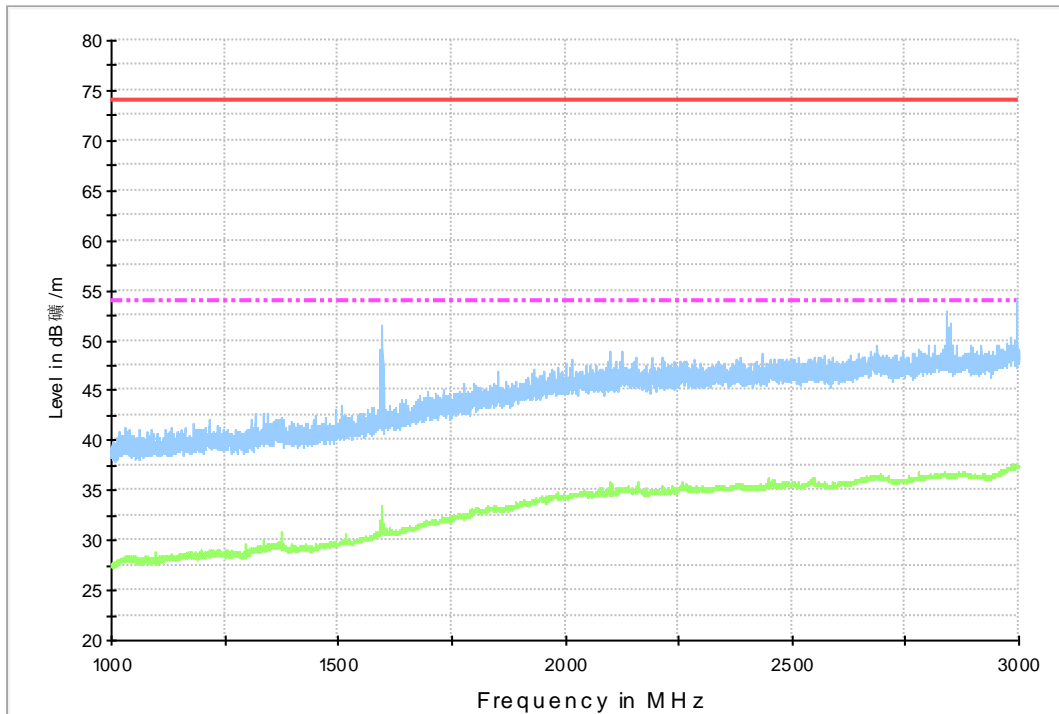


Fig A.2 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

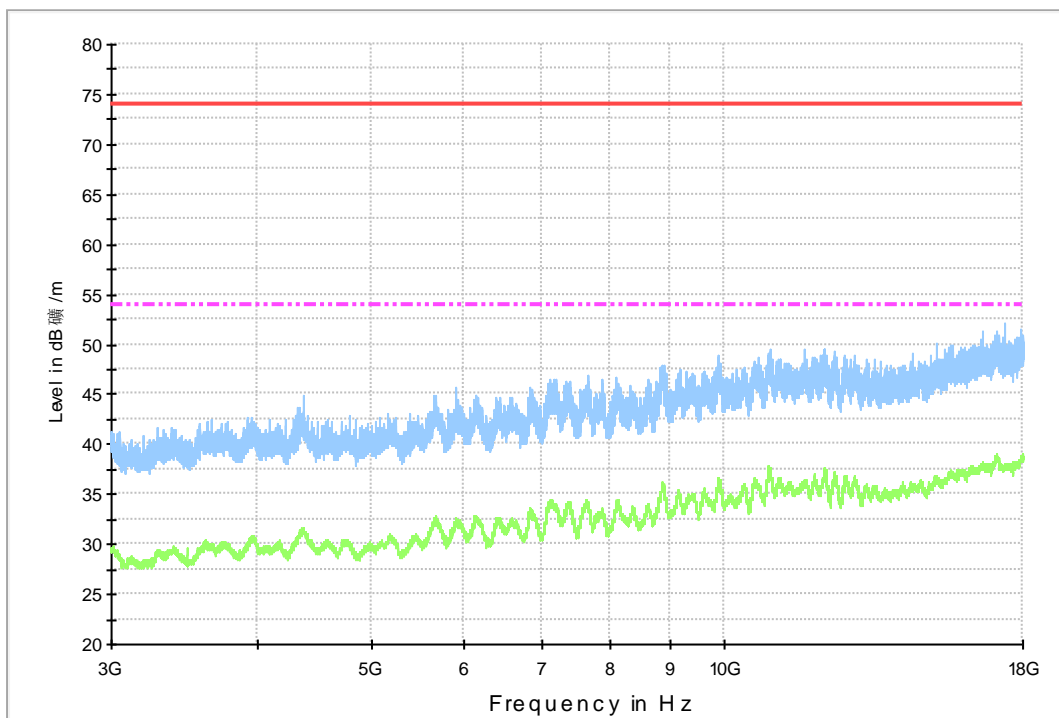


Fig A.3 Radiated Emission from 3GHz to 18GHz

USB Mode, Set.2

15B RE 30MHz-1GHz

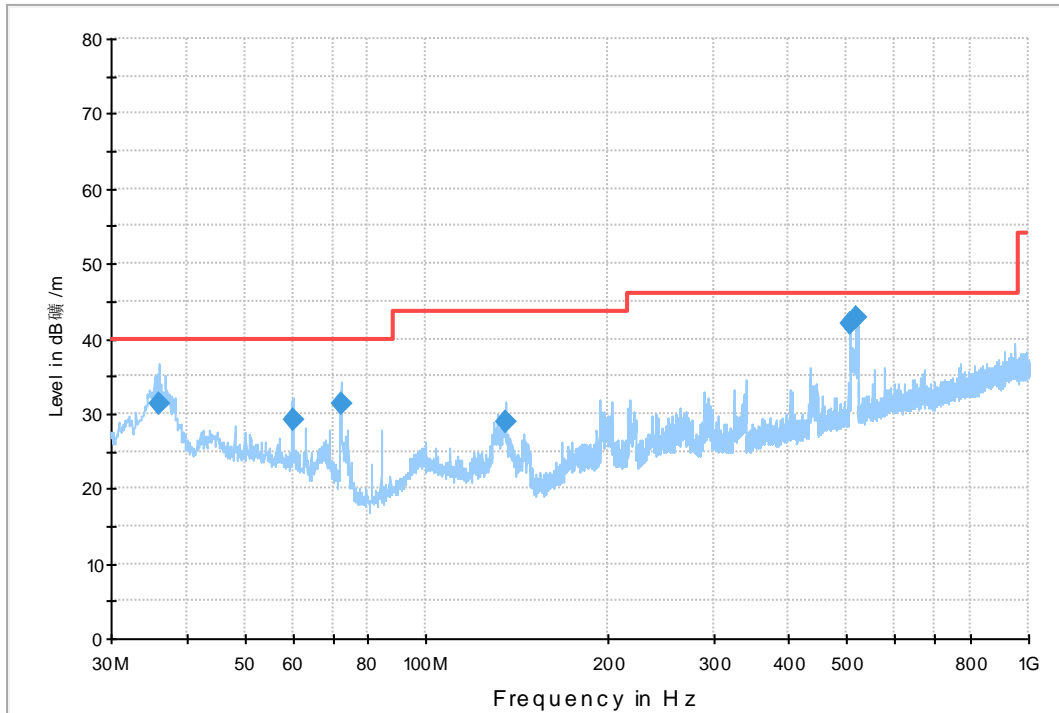


Fig A.4 Radiated Emission from 30MHz to 1GHz

Final_Result

Frequency (MHz)	QuasiPeak (dBμV/m)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit (dBμV/m)	Comment
36.014000	31.2	100.0	V	289.0	0.0	8.8	40.0	
60.070000	29.1	100.0	V	-17.0	0.1	10.9	40.0	
72.098000	31.4	116.0	V	293.0	-4.7	8.6	40.0	
135.439000	28.9	125.0	H	80.0	-4.2	14.6	43.5	
505.979000	41.9	125.0	V	-25.0	7.3	4.1	46.0	
519.268000	42.8	125.0	V	-31.0	7.5	3.2	46.0	

15B RE - 1GHz-3GHz

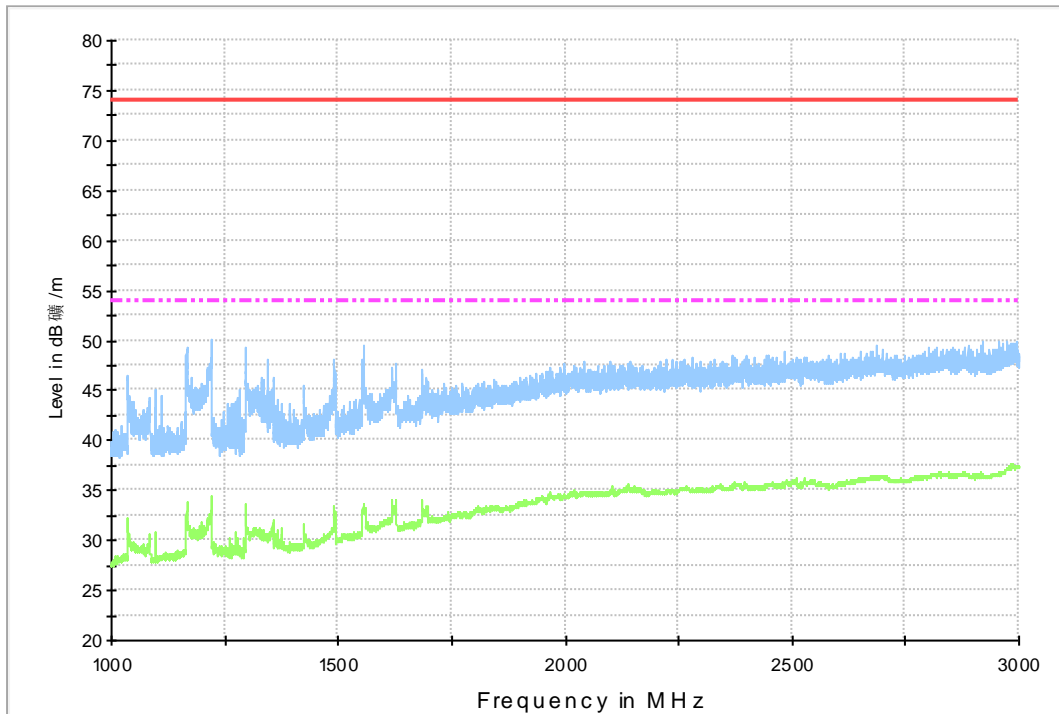


Fig A.5 Radiated Emission from 1GHz to 3GHz

15b RE - 3GHz-18GHz

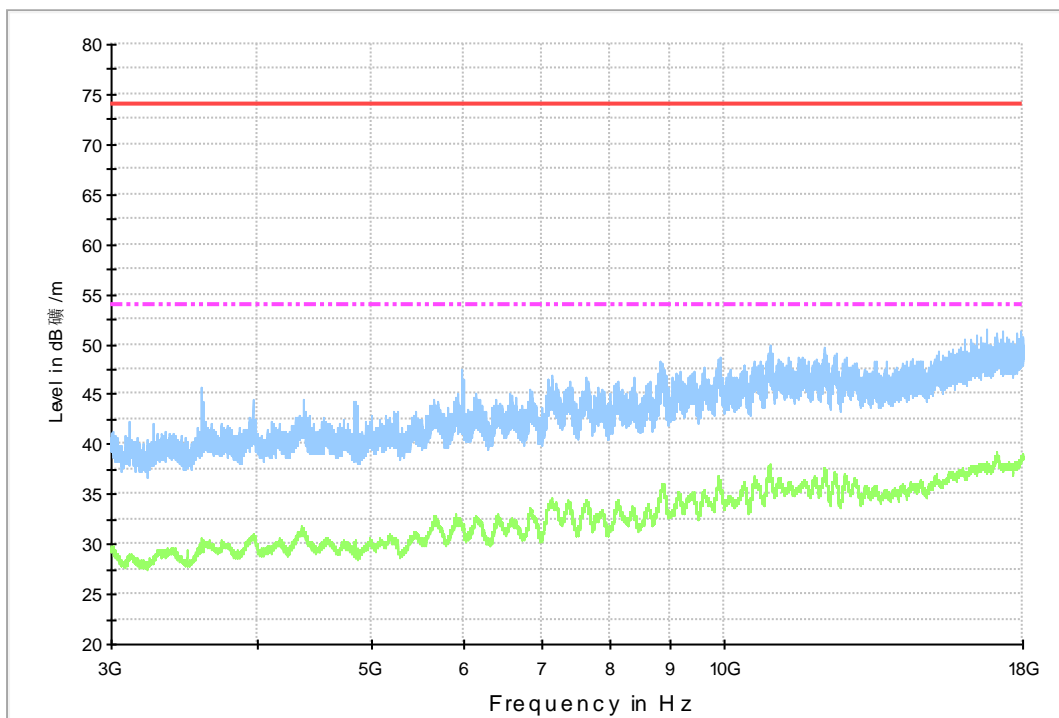


Fig A.6 Radiated Emission from 3GHz to 18GHz

A.2 Conducted Emission

Reference

FCC: CFR Part 15.107(a).

A.2.1 Method of measurement

For equipment that 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 the limits. Tested in accordance with the procedures of ANSI C63.4 – 2014, section 7.3.

A.2.2 EUT Operating Mode

The EUT is operating in the USB mode and charging mode. During the test EUT is connected to a PC via a USB cable in the case of USB mode and is connected to a charger in the case of charging mode. The model of the PC is DELL OPTIPLEX 380, and the serial number of the PC is 2X1YV2X. The software is used to let the PC keep on copying data to EUT, reading and erasing the data after copy action was finished.

Note: I/O information: Printer – USB, Mouse – PS/2, Keyboard – USB.

A.2.3 Measurement Limit

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
*Decreases with the logarithm of the frequency		

A.2.4 Test Condition in charging mode

Voltage (V)	Frequency (Hz)
120	60

RBW/IF bandwidth	Sweep Time(s)
9kHz	1

A.2.5 Measurement Results

Measurement uncertainty: $U= 2.9$ dB, $k=2$.

Charging Mode, Set.11

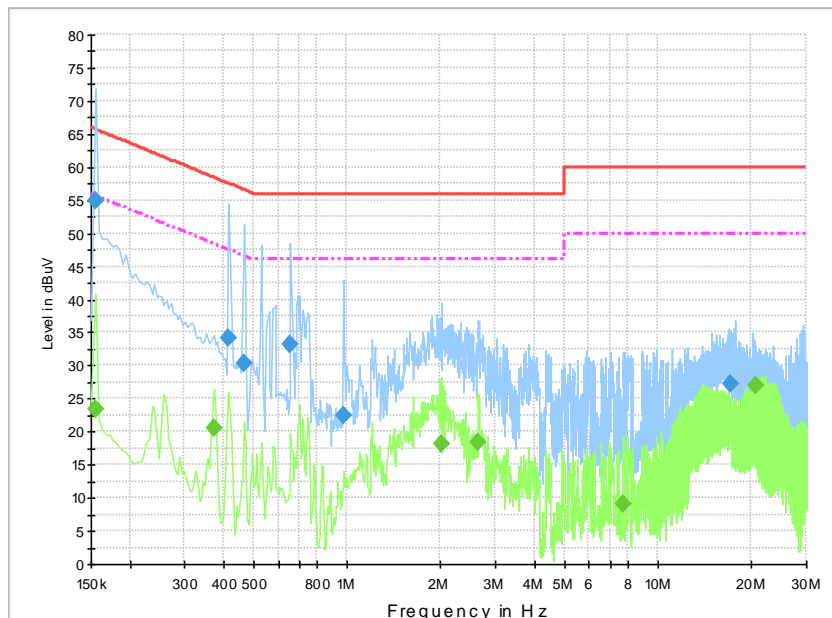


Fig A.7 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.154500	55.0	10000.0	9.000	GN	L1	10.2	10.8	65.8	
0.415500	34.1	10000.0	9.000	GN	L1	10.3	23.5	57.5	
0.465000	30.2	10000.0	9.000	GN	L1	10.3	26.4	56.6	
0.658500	33.3	10000.0	9.000	GN	L1	10.3	22.7	56.0	
0.969000	22.5	10000.0	9.000	GN	L1	10.4	33.5	56.0	
17.133000	27.2	10000.0	9.000	GN	N	11.1	32.8	60.0	

Final Result 2

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.154500	23.3	10000.0	9.000	GND	L1	10.2	32.4	55.8	
0.375000	20.5	10000.0	9.000	GND	N	10.3	27.9	48.4	
2.008500	18.2	10000.0	9.000	GND	L1	10.4	27.8	46.0	
2.647500	18.3	10000.0	9.000	GND	L1	10.5	27.7	46.0	
7.741500	9.2	10000.0	9.000	GND	N	10.7	40.8	50.0	
20.548500	27.1	10000.0	9.000	GND	L1	11.4	22.9	50.0	

USB Mode, Set.2

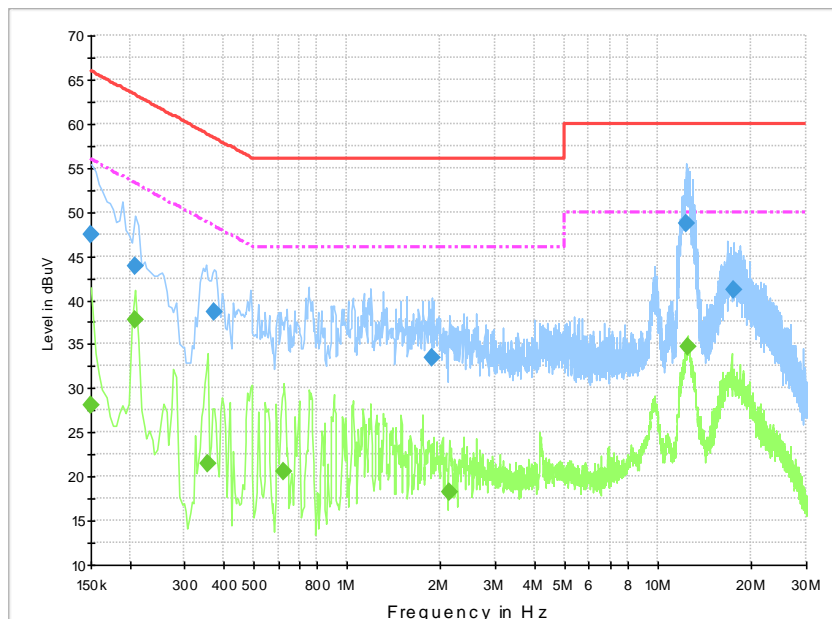


Fig A.8 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.150000	47.5	10000.0	9.000	GN	N	10.3	18.5	66.0	
0.208500	43.8	10000.0	9.000	GN	N	10.3	19.5	63.3	
0.375000	38.7	10000.0	9.000	GN	L1	10.3	19.7	58.4	
1.878000	33.5	10000.0	9.000	GN	L1	10.4	22.5	56.0	
12.385500	48.7	10000.0	9.000	GN	N	10.9	11.3	60.0	
17.479500	41.1	10000.0	9.000	GN	N	11.1	18.9	60.0	

Final Result 2

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.150000	28.1	10000.0	9.000	GND	N	10.3	27.9	56.0	
0.208500	37.8	10000.0	9.000	GND	L1	10.3	15.5	53.3	
0.357000	21.5	10000.0	9.000	GND	N	10.3	27.3	48.8	
0.627000	20.5	10000.0	9.000	GND	N	10.3	25.5	46.0	
2.125500	18.3	10000.0	9.000	GND	L1	10.4	27.8	46.0	
12.507000	34.6	10000.0	9.000	GND	N	10.9	15.4	50.0	

ANNEX B: Persons involved in this testing

Test Item	Tester
Conducted Continuous Emission	Guo Qian
Radiated Continuous Emission	Li Zongliang

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