



TEST REPORT

No. I20Z70084-EMC01

for

Samsung Electronics. Co., Ltd.

Mobile phone

Model Name: SM-M015G/DS

FCC ID: ZCASMM015G

with

Hardware Version: REV1.0

Software Version: M015G.001

Issued Date: 2020-4-23

Note:

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I20Z70084-EMC01	Rev.0	1 st edition	2020-04-23

Note: the latest revision of the test report supersedes all previous versions.

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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 (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: 2020-04-20
Testing End Date: 2020-04-23

1.5. Signature



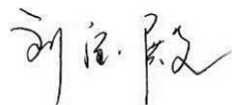
Li Yan

(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. Applicant Information

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Address /Post: 19 Chapin Rd.,Building D Pine Brook, NJ 07058
Contact: Jenni Chun
Email: j1.chun@samsung.com
Telephone: +1-201-937-4203

2.2. Manufacturer Information

Company Name: Samsung Electronics. Co., Ltd.
R5, A Tower 22 Floor A-1,(Maetan dong)
Address /Post: 129,Samsung-ro,Yeongtong-gu, Suwon-Si, Gyeonggi-do 16677,
Korea
Contact: JP KIM
Email: jp426.kim@samsung.com
Telephone: +82-10-4376-0326

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

3.1. About EUT

Description	Mobile phone
Model Name	SM-M015G/DS
FCC ID	ZCASMM015G
Extreme vol. Limits	3.6VDC to 4.2VDC (nominal: 3.85VDC)

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

3.2. Internal Identification of EUT used during the test

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	/	/	/
EUT2	/	/	/

*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	/	/
AE3	Charger	/	/
AE4	Charger	/	/
AE5	USB Cable	/	/
AE6	Headset	/	/
AE1			
	Model	HQ-61N	
	Manufacturer	Ningde Amperex Technology Limited	
	Capacitance	3900mAh/4000mAh	
	Nominal voltage	3.86 V	
AE3			
	Model	ETA0U83EWE	
	Manufacturer	Samsung Electronics Co., Ltd	
	Length of cable	/	
AE4			
	Model	ETA0U83JWS	
	Manufacturer	Samsung Electronics Co., Ltd	
	Length of cable	/	
AE5			
	Model	ECB-DU68WE	
	Manufacturer	SHENGHUA	
	Length of cable	95cm	
AE6			
	Model	EHS61ASFWE	
	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+ AE1 + AE4+ AE5+ AE6	Charger +FM
Set.2	EUT1+ AE1 + AE5	USB mode

Note:

The Equipment Under Test (EUT) model SM-M015G/DS (FCC ID: ZCASMM015G) is a variant product of SM-A015F/DS (FCC ID: ZCASMA015F), according to the declaration of changes provided by the applicant and FCC KDB publication 484596 D01, All results are derived from test report No. I19Z70269-EMC03.

For detail differences between two models please refer the Declaration of Changes document.

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	2019
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-1 (23 meters×17meters×10meters) 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, 10 m distance
Site voltage standing-wave ratio (S_{VSWR})	Between 0 and 6 dB, from 1GHz to 6GHz
Uniformity of field strength	Between 0 and 6 dB, from 80 to 3000 MHz

Semi-anechoic chamber SAC-2 (10 meters×6.7meters×6.1meters) 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
	BR	Re-use test data from basic model report

Items	Test Name	Clause in FCC rules	Section in this report	Verdict	Test Location
1	Radiated Emission	15.109(a)	A.1	BR	CTTL(huayuan North Road)
2	Conducted Emission	15.107(a)	A.2	BR	CTTL(huayuan North Road)

7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATION INTERVAL
1	Test Receiver	ESU26	100235	R&S	2020-03-01	1 Year
2	Test Receiver	ESC13	100344	R&S	2020-02-14	1 Year
3	Universal Radio Communication Tester	CMW500	150344	R&S	2019-12-27	1 year
4	Universal Radio Communication Tester	CMW500	116588	R&S	2019-12-26	1 year
5	LISN	ENV216	101200	R&S	2020-03-14	1 year
6	Signal Power	SMBV100A	260613	R&S	2019-12-27	1 year
7	EMI Antenna	VULB 9163	9163-483	Schwarzbeck	2020-08-20	1 year
7	EMI Antenna	3115	6914	ETS-Lindgren	2020-01-03	1 year
8	PC	M4000E-17	M706GWXD	LENOVO	N/A	N/A
9	Printer	P1606dn	VNC3L52122	HP	N/A	N/A

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 MS and charging mode of MS) 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 MS is operating in the USB mode and charging mode. During the test MS 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 M4000E-17, and the serial number of the PC is M706GWXD. The software is used to let the PC keep on copying data to MS, 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 ($\mu\text{V}/\text{m}$)		
	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/3MHz	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): $U = 5.44 \text{ dB}$, $k=2$.

Measurement results for Set.1:

Charging Mode/Average detector

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Antenna Pol. (H/V)
17959.200	46.4	-17.7	45.6	18.500	H
17955.800	46.1	-17.7	45.6	18.200	H
17952.400	46.0	-17.7	45.6	18.100	V
17820.933	46.0	-18.5	45.6	18.900	H
17948.433	45.9	-17.7	45.6	18.000	H
17956.933	45.9	-17.7	45.6	18.000	H

Charging Mode/Peak detector

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Antenna Pol. (H/V)
17951.267	57.9	-17.7	45.6	30.000	H
17945.033	57.9	-17.7	45.6	30.000	H
17942.200	57.3	-17.7	45.6	29.400	V
17737.633	57.1	-18.5	45.6	30.000	H
17838.500	57.1	-18.5	45.6	30.000	H
17844.167	57.1	-18.5	45.6	30.000	H

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

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Antenna Pol. (H/V)
17963.733	45.8	-17.7	45.6	17.900	H
17952.967	45.7	-17.7	45.6	17.800	H
17963.167	45.7	-17.7	45.6	17.800	V
17953.533	45.7	-17.7	45.6	17.800	H
17938.800	45.7	-17.7	45.6	17.800	H
17937.667	45.7	-17.7	45.6	17.800	H

USB Mode/ Peak detector

Frequency (MHz)	Measurement Result (dB μ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB μ V)	Antenna Pol. (H/V)
17973.367	57.8	-17.7	45.6	29.900	H
17398.200	57.2	-19.2	41.5	34.900	H
17960.900	57.1	-17.7	45.6	29.200	V
17906.500	57.0	-18.5	45.6	29.900	H
17956.367	56.9	-17.7	45.6	29.000	H
17819.800	56.9	-18.5	45.6	29.800	H

Note: The measurement results of Set.1, Set.2 showed here are worst cases of the combinations of different USB cables.

Charging Mode, Set.1

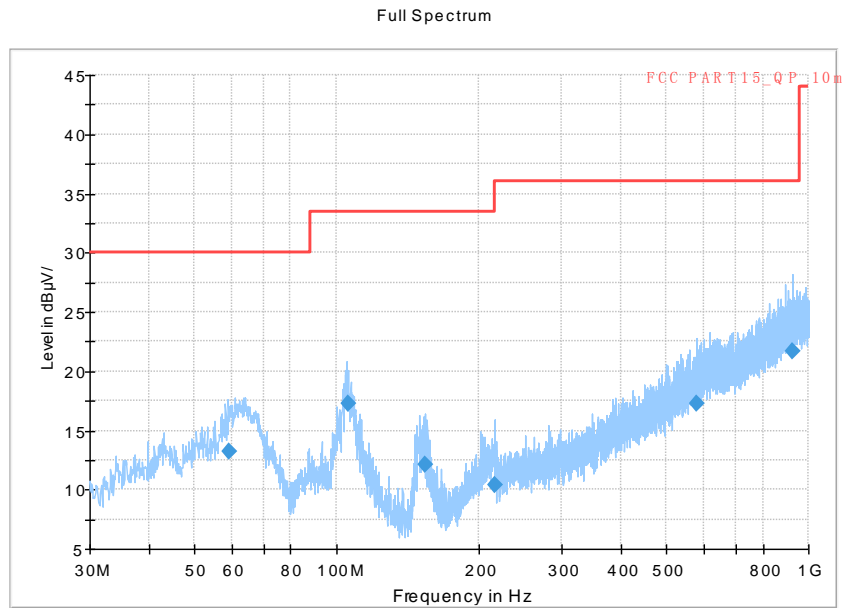


Fig A.1 Radiated Emission from 30MHz to 1GHz

Final_Result

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
59.063000	13.16	30.00	16.84	1000.0	120.000	104.0	V	-22.0
105.655000	17.29	33.50	16.23	1000.0	120.000	104.0	V	265.0
153.657000	12.08	33.50	21.44	1000.0	120.000	124.0	V	81.0
216.466000	10.42	36.00	25.60	1000.0	120.000	124.0	V	294.0
578.295000	17.23	36.00	18.79	1000.0	120.000	392.0	V	78.0
924.797000	21.69	36.00	14.33	1000.0	120.000	314.0	V	30.0

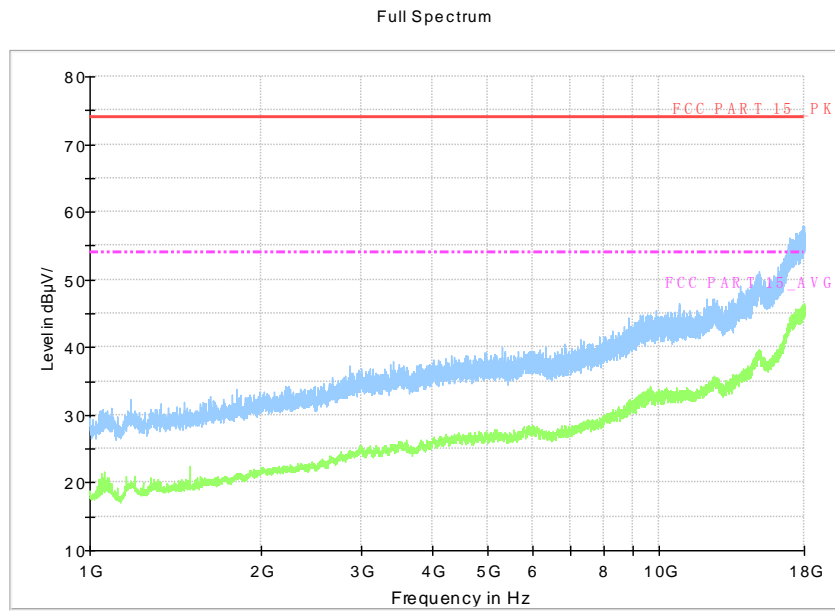


Fig A.2 Radiated Emission from 1GHz to 18GHz

USB Mode, Set.2

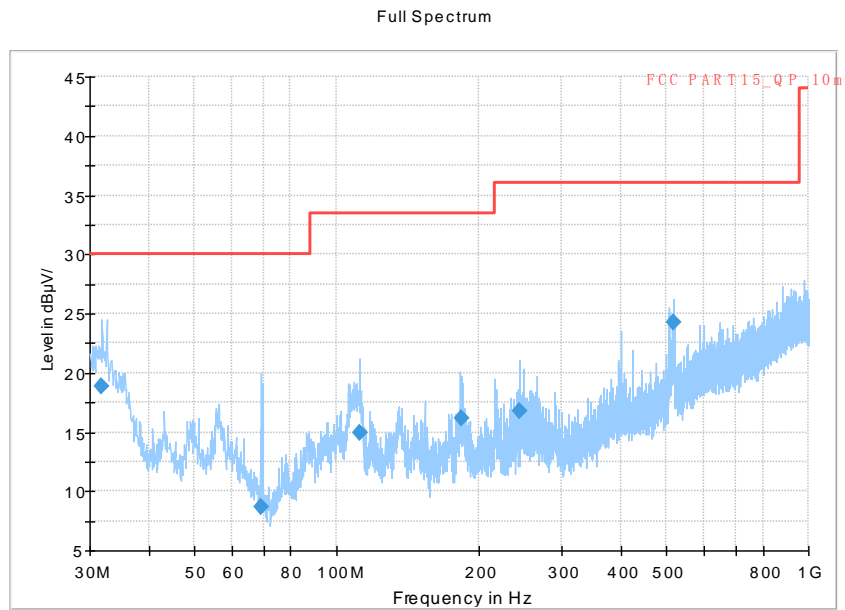


Fig A.3 Radiated Emission from 30MHz to 1GHz

Final Result

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
31.783000	18.86	30.00	11.14	1000.0	120.000	102.0	V	116.0
69.405000	8.74	30.00	21.26	1000.0	120.000	175.0	V	30.0
112.062000	14.92	33.50	18.60	1000.0	120.000	180.0	V	97.0
183.463000	16.12	33.50	17.40	1000.0	120.000	101.0	V	245.0
243.479000	16.82	36.00	19.20	1000.0	120.000	107.0	V	152.0
518.044000	24.27	36.00	11.75	1000.0	120.000	301.0	V	164.0

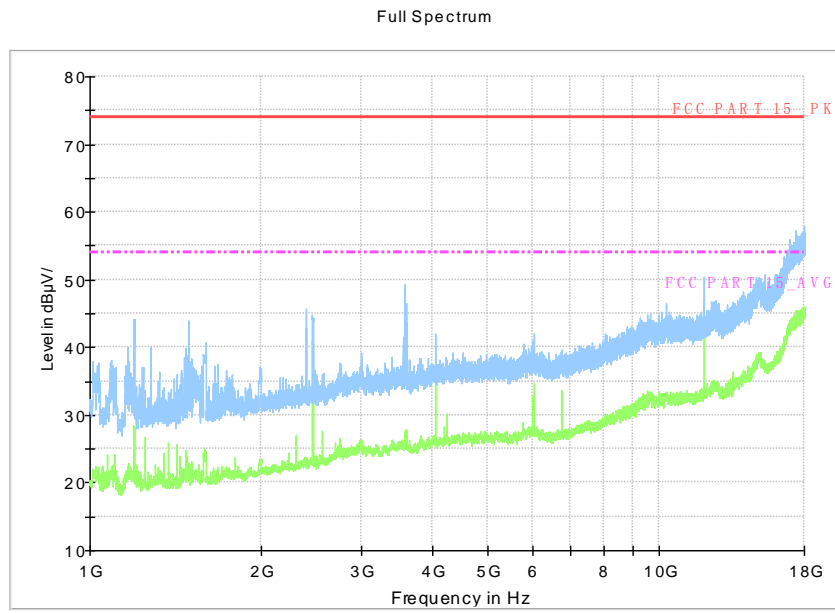


Fig A.4 Radiated Emission from 1GHz to 18GHz

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 MS is operating in the USB mode and charging mode. During the test MS 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 M4000E-17, and the serial number of the PC is M706GWXD. The software is used to let the PC keep on copying data to MS, 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 (dB μ V)	
	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: $U= 3.38$ dB, $k=2$.

Charging Mode, Set.1

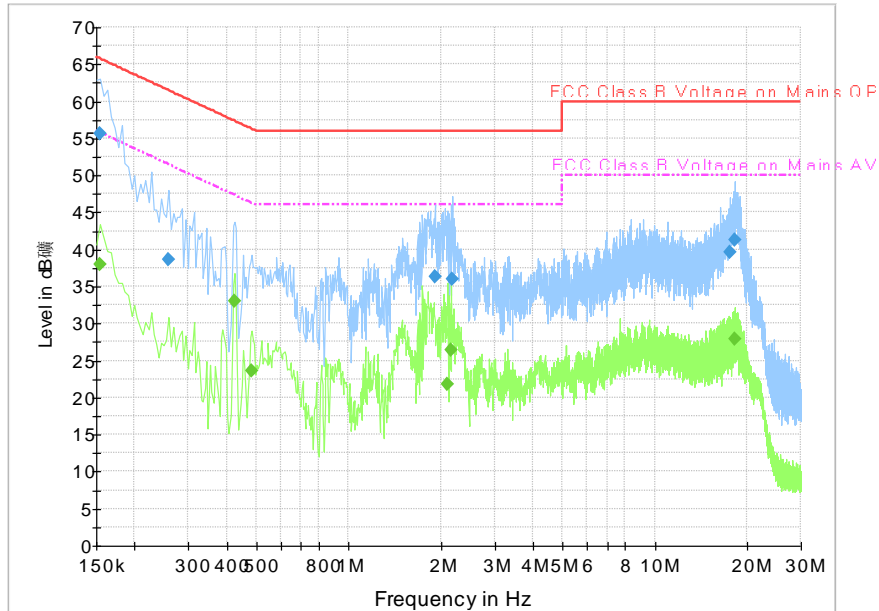


Fig A.5 Radiated Emission from 30MHz to 1GHz

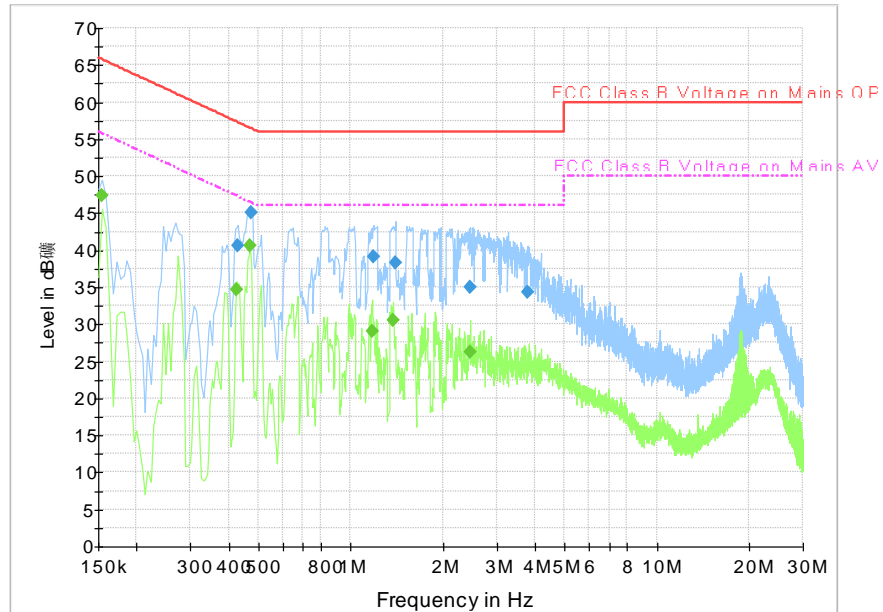
Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.154500	55.6	2000.0	9.000	On	L1	29.7	10.1	65.8	
0.258000	38.6	2000.0	9.000	On	L1	19.8	22.9	61.5	
1.909500	36.4	2000.0	9.000	On	L1	19.6	19.6	56.0	
2.179500	35.9	2000.0	9.000	On	L1	19.6	20.1	56.0	
17.533500	39.6	2000.0	9.000	On	L1	19.8	20.4	60.0	
18.262500	41.3	2000.0	9.000	On	L1	19.8	18.7	60.0	

Final Result 2

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.154500	38.0	2000.0	9.000	On	L1	29.7	17.7	55.8	
0.424500	33.0	2000.0	9.000	On	L1	19.8	14.4	47.4	
0.483000	23.6	2000.0	9.000	On	L1	19.8	22.7	46.3	
2.098500	21.9	2000.0	9.000	On	L1	19.6	24.1	46.0	
2.166000	26.4	2000.0	9.000	On	L1	19.6	19.6	46.0	
18.222000	27.8	2000.0	9.000	On	L1	19.8	22.2	50.0	

Note: The measurement results showed here are worst cases of the combinations of different USB cables.

USB Mode, Set.2

Fig A.6 Radiated Emission from 30MHz to 1GHz
Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.429000	40.6	2000.0	9.000	On	L1	19.8	16.7	57.3	
0.474000	45.2	2000.0	9.000	On	L1	19.8	11.3	56.4	
1.189500	39.2	2000.0	9.000	On	N	19.7	16.8	56.0	
1.401000	38.2	2000.0	9.000	On	N	19.6	17.8	56.0	
2.458500	35.1	2000.0	9.000	On	N	19.6	20.9	56.0	
3.799500	34.3	2000.0	9.000	On	N	19.6	21.7	56.0	

Final Result 2

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.154500	47.4	2000.0	9.000	On	L1	29.7	8.4	55.8	
0.424500	34.7	2000.0	9.000	On	L1	19.8	12.6	47.4	
0.469500	40.7	2000.0	9.000	On	L1	19.8	5.9	46.5	
1.176000	29.1	2000.0	9.000	On	L1	19.7	16.9	46.0	
1.374000	30.5	2000.0	9.000	On	L1	19.6	15.5	46.0	
2.454000	26.3	2000.0	9.000	On	N	19.6	19.7	46.0	

Note: The measurement results showed here are worst cases of the combinations of different cables.



ANNEX B: PERSONS INVOLVED IN THIS TESTING

Test Item	Test Software and Version	Software Vendor	Test operator
Conducted Emission	EMC32 V8.5.2	R&S	Shi Suolan
Radiated Emission	EMC32 V9.01.00	R&S	Li Pengfei

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