FCC 15B TEST REPORT

No. I22Z60940-EMC01

for

TCL Communication Ltd.

Mobile Hot Spot

Model Name: MW513U

FCC ID: 2ACCJB183

with

Hardware Version: 06

Software Version: MW513U_ZZ_02.00_06

Issued Date: 2022-07-29

Note:

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Test Laboratory:

CTTL, Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I22Z60940-EMC01	Rev.0	1st edition	2022-07-19
I22Z60940-EMC01	Rev.1	2nd edition, the note for EUT2 was added on page 6.	2022-07-29

CONTENTS

1. Test Laboratory

1.1. Testing Location

Location 1: CTTL(Huayuan North Road)

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

1.2. Testing Environment

Normal Temperature: 15-35℃

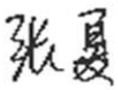
Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2022-05-23

Testing End Date: 2022-07-15

1.4. Signature



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(Prepared this test report)

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2. Client Information

2.1. Applicant Information

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2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
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Email:	peter.yang@tcl.com
Telephone:	+86075536645759
Fax:	/

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

3.1. About EUT

Description	Mobile Hot Spot
Model Name	MW513U
FCC ID	2ACCJB183

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,UT50a	352950940201148	06	MW513U_ZZ_02.00_06
EUT2,UT88a	352950940208549	06	MW513U_ZZ_02.00_06

*EUT ID: is used to identify the test sample in the lab internally. The HW and SW version information were provided by the applicant. According to the declaration from applicant, EUT2 (UT88a) has the second LCD and pin to pin Memory.

3.3. Internal Identification of AE used during the test

AE ID*	Description	Note
AE1	Adapter	/
AE2	Battery	/
AE3	USB Cable	/

AE1

Model	QC13US
Manufacturer	PUAN

AE2

Model	TLi044A7
Manufacturer	veken
Capacity	4400 mAh
Voltage	3.85V

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

3.4. EUT set-ups

EUT set-up No.	Combination of EUT and AE	Remarks
Set.1	EUT1/2 + AE2 + AE3+AE1	Charger
Set.2	EUT1/2 + AE2 + AE3 +PC	USB and LAN to PC
Set.3	EUT1/2 + AE2 + AE3+ AE1+PC	Charger, LAN to PC

3.5. General Description

The device contains receivers which tune and operate between 30MHz-960MHz in the cellular bands.

Specifications of the EUT were provided to fulfil the test.

Samples undergoing test were selected by the client.

EUT feature information is supplied by the applicant or manufacturer, which is the basis of testing.

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 ℃, Max. = 35 ℃
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

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

Temperature	Min. = 15 ℃, Max. = 35 ℃
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	P	**CTTL(Huayuan North Road)**
2	Conducted Emission	15.107(a)	A.2	P	**CTTL(Huayuan North Road)**

7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CALIBRATION INTERVAL	CAL DUE DATE
1	LISN	ENV216	101200	Rohde & Schwarz	1 year	2023-05-30
2	Test Receiver	ESCI	100344	Rohde & Schwarz	1 year	2023-03-21
3	Universal Radio Communication Tester	CMW500	116588	R&S	1 year	2022-12-20
4	Test Receiver	ESW44	103023	R&S	1 year	2022-10-28
5	Test Receiver	ESW44	103015	R&S	1 year	2023-01-23
6	BiLog Antenna	VULB9163	483	Schwarzbeck	1 year	2022-08-24
7	BiLog Antenna	9163	302	ETS-Lindgren	1 year	2022-12-28
8	EMI Antenna	3115	00167250	ETS-Lindgren	1 year	2022-07-01
9	PC	M4000e-17	M706GWXD	Lenovo	N/A	N/A
10	Printer	P1606dn	VNC3L52122	HP	N/A	N/A

Note: The test equipments were in calibration due dates when used for testing.

Test Item	Test Software and Version	Software Vendor
Radiated Continuous Emission	EMC32 V10.60.10	R&S
Conducted Emission	EMC32 V8.53.0	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 (charging mode) 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 charging mode. During the test MS is connected to a charger in the case of charging mode.

The EUT was tested while operating in licensed band Rx mode. All licensed band receivers that tune in the range of 30MHz-960MHz, as listed in Section 3.4, are investigated. Only the worst case emissions are reported.

All equipment is placed on the test table top and arranged in a typical configuration in accordance with ANSI C63.4-2014 and manipulated to obtain worst case emissions.

A.1.3 Measurement Limit

Frequency range (MHz)	Field strength limit (μV/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.

Limit(10m)=Limit(3m)+20[log(3/10)]

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:

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

Where

G_A: Antenna factor of receive antenna

G_{PL}: Path Loss

P_{Mea}: Measurement result on receiver.

Measurement uncertainty (worst case): 30MHz-1GHz：5.16dB, 1GHz-18GHz：5.44dB, *k*=2.

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

Note:The measurement results showed here are worst cases.

Measurement results for Set.1:

EUT1 Charger+LTE Band 12 idle Mode

QP detector

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
51.728000	18.35	29.54	11.19	2000.0	120.000	100.0	V	226.0
75.881000	17.43	29.54	12.11	2000.0	120.000	175.0	V	315.0
82.962000	23.52	29.54	6.02	2000.0	120.000	186.0	V	291.0
119.046000	21.39	33.06	11.67	2000.0	120.000	112.0	V	45.0
141.647000	12.53	33.06	20.53	2000.0	120.000	100.0	V	46.0
315.665000	17.98	35.56	17.58	2000.0	120.000	325.0	H	72.0

Average detector

Frequency (MHz)	Measurement Result (dBμV/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver eading (dBμV)	Limit (dBμV/m)	Margin (dB)	Antenna Pol. (H/V)
17888.140	42.0	-29.5	46.0	25.580	54.000	12.000	V
17857.880	41.8	-29.3	46.0	25.182	54.000	12.200	H
17852.440	41.6	-29.3	46.0	24.982	54.000	12.400	V
17797.360	41.5	-29.9	46.0	25.432	54.000	12.500	H
17745.340	41.5	-29.6	46.0	25.156	54.000	12.500	H
17262.200	41.5	-29.7	43.4	27.890	54.000	12.500	H

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)
17272.060	52.3	-29.7	43.4	38.690	74.000	21.700	V
17954.780	52.1	-28.9	46.7	34.383	74.000	21.900	V
17751.120	51.9	-29.6	46.0	35.556	74.000	22.100	V
17908.540	51.9	-29.3	46.0	35.272	74.000	22.100	V
17629.740	51.7	-29.4	45.2	35.852	74.000	22.300	V
17596.420	51.6	-29.7	45.2	36.049	74.000	22.400	H

EUT2 Charger+LTE Band 12 idle Mode QP detector

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
40.864000	15.13	29.54	14.41	2000.0	120.000	175.0	V	221.0
80.925000	19.97	29.54	9.57	2000.0	120.000	323.0	V	266.0
85.872000	19.97	29.54	9.57	2000.0	120.000	175.0	V	293.0
157.652000	21.69	33.06	11.37	2000.0	120.000	100.0	V	72.0
195.482000	22.49	33.06	10.57	2000.0	120.000	100.0	V	59.0
267.650000	16.07	35.56	19.49	2000.0	120.000	108.0	V	136.0

Measurement results for Set.2:

EUT1 USB and LAN to PC

QP detector

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
44.550000	17.64	29.54	11.90	2000.0	120.000	225.0	V	165.0
58.809000	22.26	29.54	7.28	2000.0	120.000	125.0	V	66.0
65.890000	19.50	29.54	10.04	2000.0	120.000	296.0	V	76.0
68.994000	19.93	29.54	9.61	2000.0	120.000	106.0	V	66.0
95.960000	22.52	33.06	10.54	2000.0	120.000	125.0	V	5.0
672.431000	27.80	35.56	7.76	2000.0	120.000	175.0	V	-5.0

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)
17812.320	42.8	-29.6	46.0	26.476	54.000	11.200	V
17760.640	42.8	-29.6	46.0	26.472	54.000	11.200	V
17762.680	42.7	-29.6	46.0	26.372	54.000	11.300	H
17642.320	42.7	-29.6	45.2	27.053	54.000	11.300	V
17988.780	42.6	-29.1	46.7	24.998	54.000	11.400	H
17608.660	42.4	-29.5	45.2	26.672	54.000	11.600	V

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)
17639.260	53.1	-29.4	45.2	37.252	74.000	20.900	H
17821.840	53.0	-29.7	46.0	36.724	74.000	21.000	H
17518.560	52.9	-29.3	44.4	37.803	74.000	21.100	V
17966.000	52.7	-29.1	46.7	35.101	74.000	21.300	H
17162.240	52.7	-29.8	42.4	40.117	74.000	21.300	V
17083.700	52.7	-29.4	42.4	39.710	74.000	21.300	V

Measurement results for Set.3:

EUT1 Charger and LAN to PC

QP detector

Frequency (MHz)	QuasiPeak (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
44.065000	19.84	29.54	9.70	2000.0	120.000	325.0	V	225.0
56.384000	25.20	29.54	4.34	2000.0	120.000	196.0	V	135.0
68.800000	27.36	29.54	2.18	2000.0	120.000	181.0	V	117.0
71.807000	25.39	29.54	4.15	2000.0	120.000	100.0	V	105.0
86.648000	27.69	29.54	1.85	2000.0	120.000	125.0	V	-14.0
672.334000	27.41	35.56	8.15	2000.0	120.000	189.0	V	-24.0

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)
17743.300	42.1	-29.6	46.0	25.756	54.000	11.900	H
17972.800	42.0	-29.1	46.7	24.401	54.000	12.000	V
17941.860	42.0	-28.9	46.7	24.283	54.000	12.000	H
17770.840	41.9	-29.6	46.0	25.572	54.000	12.100	H
17952.740	41.9	-28.9	46.7	24.183	54.000	12.100	V
17150.340	41.8	-29.9	42.4	29.314	54.000	12.200	V

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)
17976.540	52.3	-29.1	46.7	34.701	74.000	21.700	H
17235.340	52.0	-29.6	43.4	38.209	74.000	22.000	V
17881.340	52.0	-29.5	46.0	35.580	74.000	22.000	V
17256.760	51.9	-30.0	43.4	38.564	74.000	22.100	H
17550.860	51.8	-29.5	44.4	36.934	74.000	22.200	V
17951.380	51.8	-28.9	46.7	34.083	74.000	22.200	V

EUT1 Charger+LTE Band 12 idle Mode, Set.1

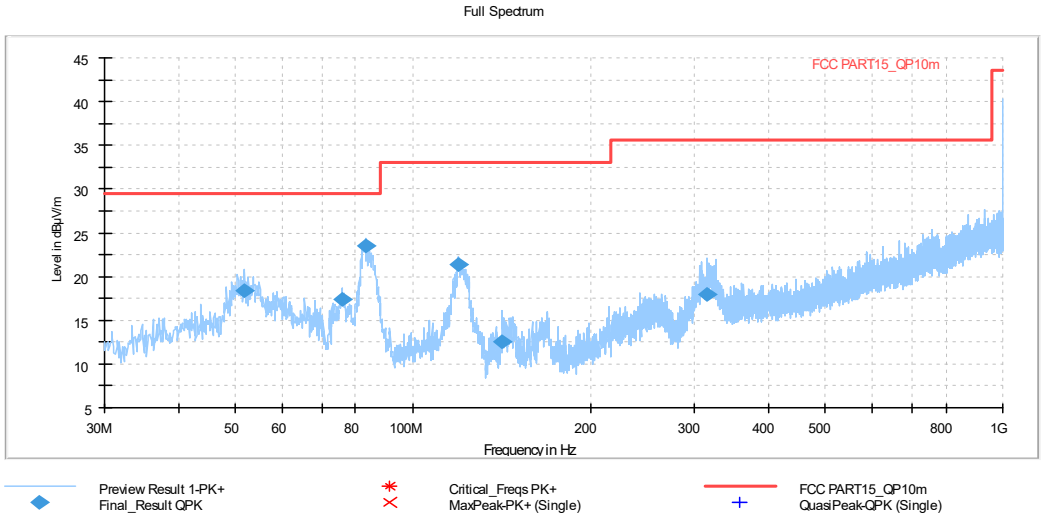

Figure A.1 Radiated Emission from 30MHz to 1GHz

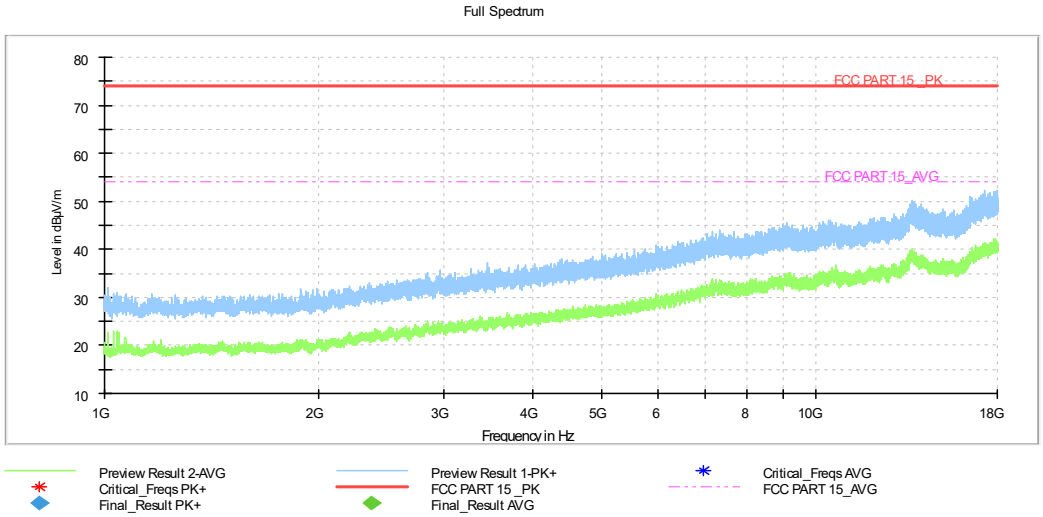

Figure A.2 Radiated Emission from 1GHz to 18GHz

EUT2 Charger+LTE Band 12 idle Mode, Set.1

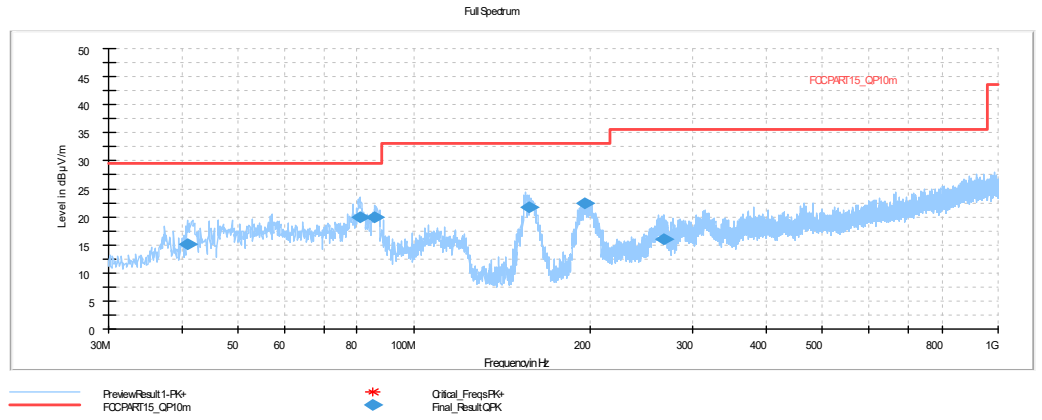

Figure A.3 Radiated Emission from 30MHz to 1GHz

EUT1 USB and LAN to PC, Set.2

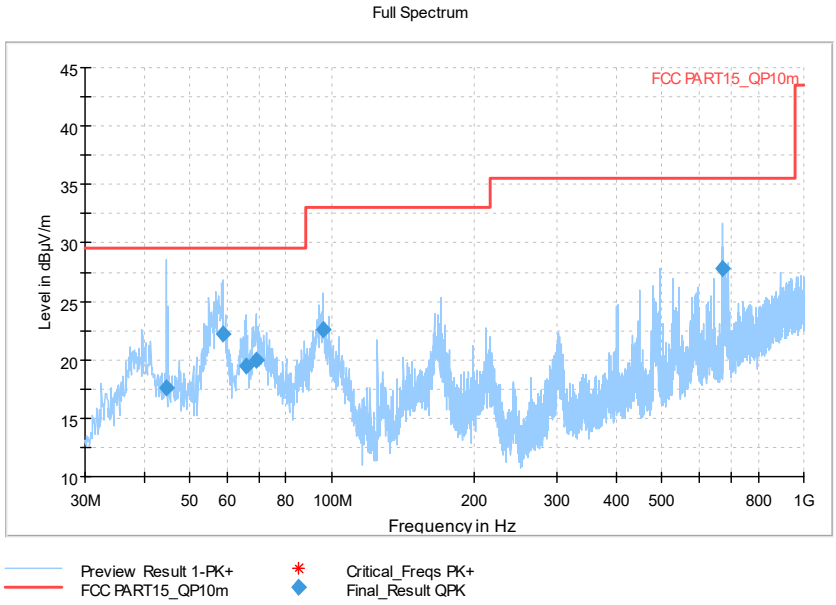

Figure A.4 Radiated Emission from 30MHz to 1GHz

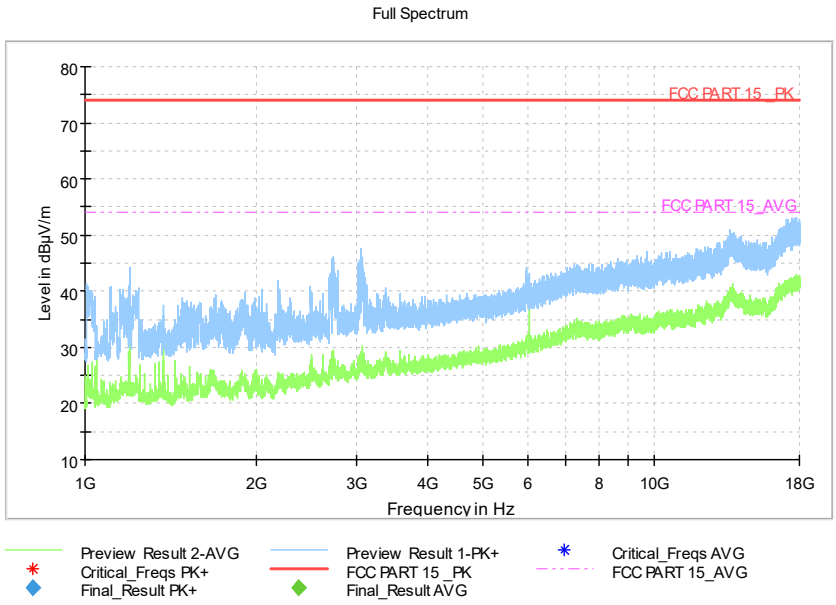

Figure A.5 Radiated Emission from 1GHz to 18GHz

EUT1 Charger and LAN to PC, Set.3

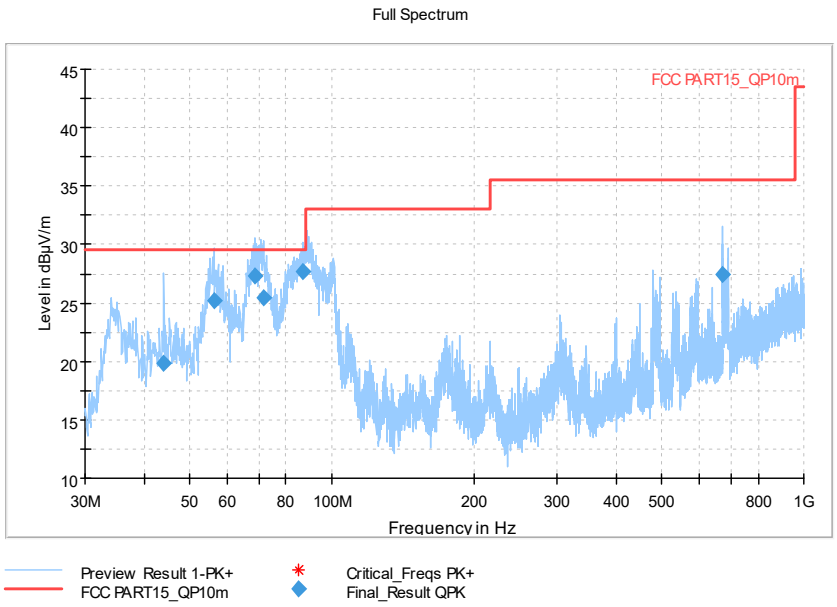

Figure A.6 Radiated Emission from 30MHz to 1GHz

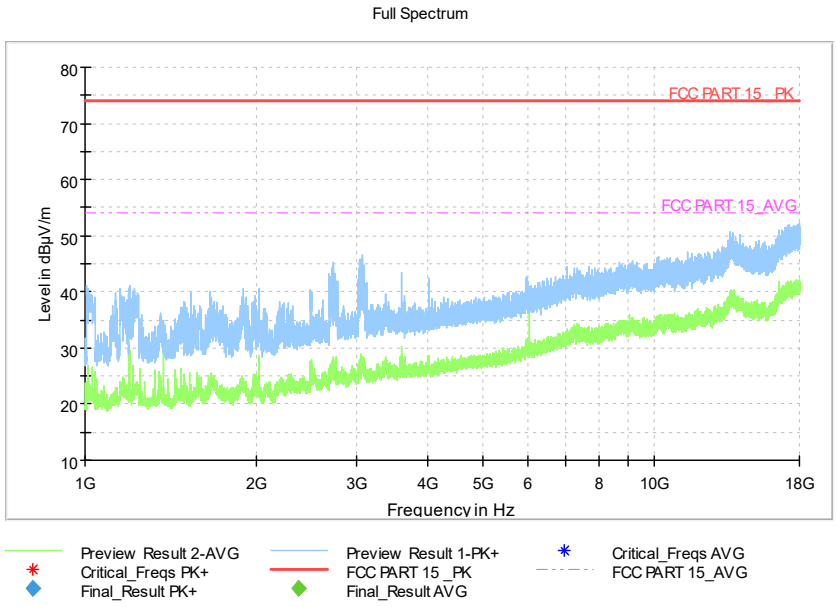

Figure A.7 Radiated Emission from 1GHz to 18GHz

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 charging mode and usb mode.

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*=3.08dB, *k*=2.

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

Note:The measurement results showed here are worst cases.

EUT1 Charger+LTE Band 12 idle Mode, Set.1

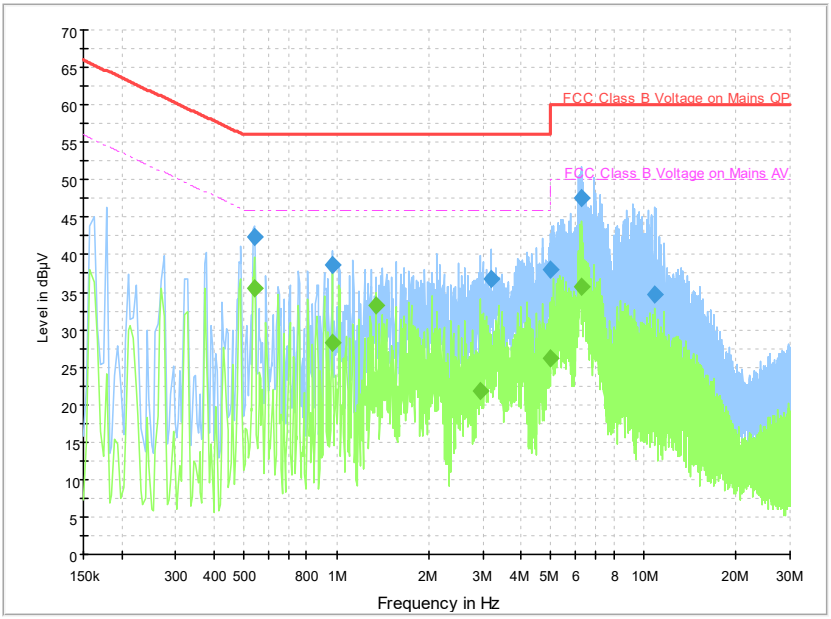

Figure A.9 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.542000	42.3	5000.0	9.000	On	N	19.8	13.7	56.0
0.970000	38.7	5000.0	9.000	On	N	19.6	17.3	56.0
3.182000	36.8	5000.0	9.000	On	L1	19.6	19.2	56.0
4.998000	38.0	5000.0	9.000	On	N	19.5	18.0	56.0
6.262000	47.6	5000.0	9.000	On	L1	19.7	12.4	60.0
10.874000	34.7	5000.0	9.000	On	N	19.5	25.3	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.542000	35.5	5000.0	9.000	On	N	19.8	10.5	46.0
0.970000	28.3	5000.0	9.000	On	N	19.6	17.7	46.0
1.346000	33.3	5000.0	9.000	On	L1	19.7	12.7	46.0
2.934000	21.8	5000.0	9.000	On	N	19.6	24.2	46.0
4.970000	26.2	5000.0	9.000	On	N	19.6	19.8	46.0
6.262000	35.7	5000.0	9.000	On	L1	19.7	14.3	50.0

EUT1 USB and LAN to PC, Set.2

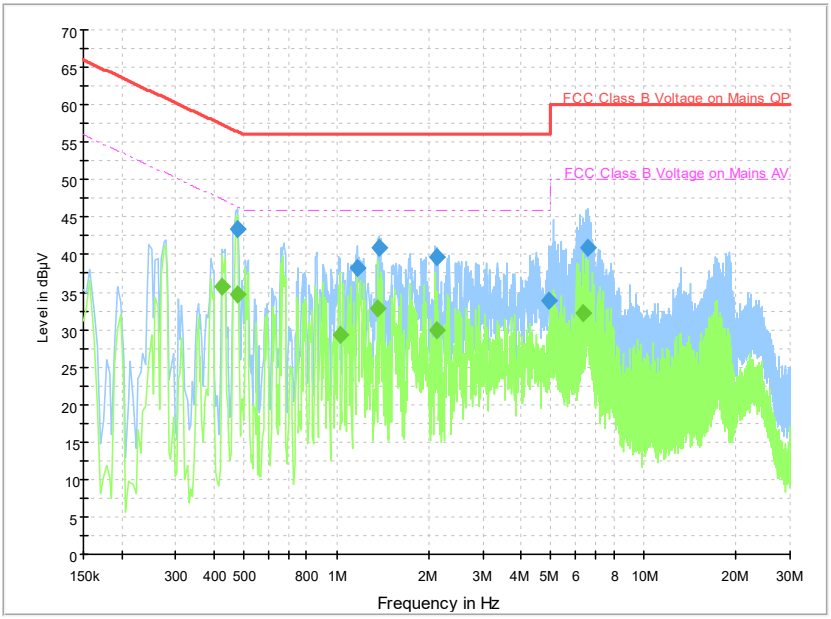

Figure A.10 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.478000	43.5	5000.0	9.000	On	N	19.8	12.9	56.4
1.170000	38.2	5000.0	9.000	On	N	19.6	17.8	56.0
1.378000	41.0	5000.0	9.000	On	L1	19.7	15.0	56.0
2.126000	39.7	5000.0	9.000	On	N	19.7	16.3	56.0
4.910000	33.9	5000.0	9.000	On	L1	19.6	22.1	56.0
6.546000	40.9	5000.0	9.000	On	L1	19.7	19.1	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.426000	35.7	5000.0	9.000	On	L1	19.7	11.7	47.3
0.478000	34.7	5000.0	9.000	On	N	19.8	11.7	46.4
1.030000	29.2	5000.0	9.000	On	L1	19.8	16.8	46.0
1.366000	32.9	5000.0	9.000	On	L1	19.7	13.1	46.0
2.126000	29.8	5000.0	9.000	On	N	19.7	16.2	46.0
6.322000	32.2	5000.0	9.000	On	L1	19.7	17.8	50.0

EUT1 Charger and LAN to PC, Set.3

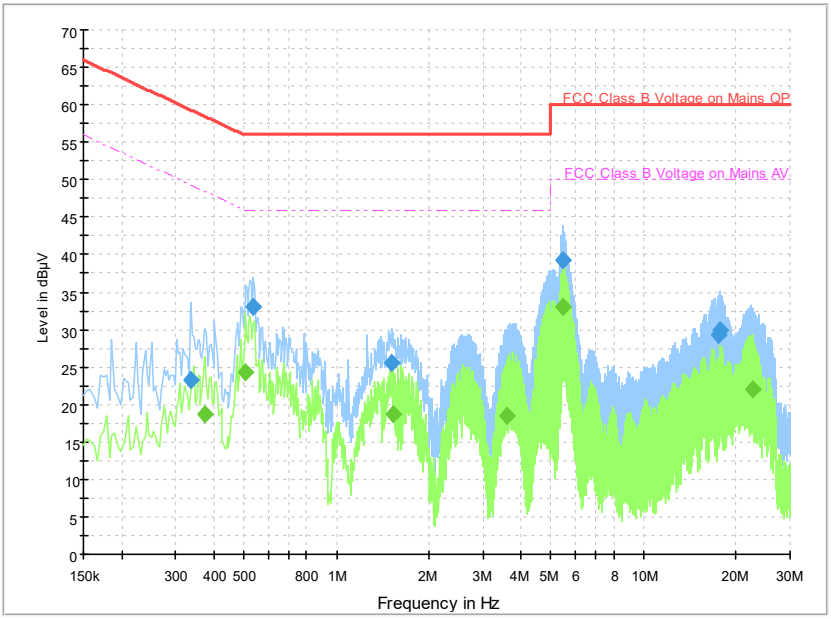

Figure A.11 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.334000	23.2	5000.0	9.000	On	N	19.8	36.2	59.4
0.538000	33.0	5000.0	9.000	On	L1	19.7	23.0	56.0
1.518000	25.6	5000.0	9.000	On	L1	19.7	30.4	56.0
5.466000	39.4	5000.0	9.000	On	L1	19.6	20.6	60.0
17.578000	29.3	5000.0	9.000	On	N	19.9	30.7	60.0
17.670000	30.0	5000.0	9.000	On	N	19.9	30.0	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.374000	18.7	5000.0	9.000	On	L1	19.8	29.7	48.4
0.506000	24.3	5000.0	9.000	On	L1	19.7	21.7	46.0
1.522000	18.7	5000.0	9.000	On	L1	19.7	27.3	46.0
3.578000	18.5	5000.0	9.000	On	L1	19.6	27.5	46.0
5.438000	33.0	5000.0	9.000	On	L1	19.6	17.0	50.0
22.566000	22.0	5000.0	9.000	On	L1	19.8	28.0	50.0

ANNEX B: Persons involved in this testing

Test Item	Tester
Conducted Continuous Emission	Yan Hanchen, Chen Tianwei
Radiated Continuous Emission	Chen Tianwei, Li Pengfei, Yan Hanchen, Ding Zai

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