FCC PART 15B
TEST REPORT

No. I21Z62136-EMC01

for

TCL Communication Ltd.

GSM/UMTS/LTE Mobile phone

Model name: T602DL

FCC ID: 2ACCJH152

with

Hardware Version: PIO

Software Version: vU48

Issued Date: 2021-12-17

Note:

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Test Laboratory:

CTTL-Telecommunication Technology Labs, CAICT

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I21Z62136-EMC01	Rev.0	1st edition	2021-12-17

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

CONTENTS

1. Test Laboratory

1.1. Testing Location

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° C

Relative Humidity: 20-75%

1.3. Project data

Testing Start Date: 2021-11-22

Testing End Date: 2021-12-15

1.4. Signature

Wang Xue

(Prepared this test report)

Zhang Ying

(Reviewed this test report)

Zhang Xia

(Approved this test report)

2. Client Information

2.1. Applicant Information

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Contact Person	Gong Zhizhou
Contact Email	zhizhou.gong@tcl.com
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2.2. Manufacturer Information

Company Name:	TCL Communication Ltd.
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Contact Person	Gong Zhizhou
Contact Email	zhizhou.gong@tcl.com
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Fax:	0086-755-36612000-81722

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

3.1. About EUT

Description	GSM/UMTS/LTE Mobile phone
Model Name	T602DL
FCC ID:	2ACCJH152

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	016053000010422	PIO	vU48

*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	/	/
AE2	Battery	/	/
AE3	Charger1	/	/
AE4	Charger2	/	/
AE5	Data Cable	/	/

AE1

Model	TLi028C7
Manufacturer	VEKEN
Capacity	3000mAh
Nominal Voltage	

AE2

Model	TLi028C1
Manufacturer	BYD
Capacity	3000mAh
Nominal Voltage	

AE3

Model	CBA0058AGTC5
Manufacturer	PUAN
Length of cable	

AE4

Model	CBA0058AGTC7
Manufacturer	CHENYANG
Length of cable	

AE5

Model	CDA00000552C2
Manufacturer	SHENGHUA
Length of cable	

*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 + AE1/2 + AE3 + AE5	Charger1+REAR Camera+ GSM 850 idle
Set.2	EUT1 + AE1/2 + AE4 + AE5	Charger1+MP4+WCDMA 850 idle
Set.3	EUT1 + AE1/2 + AE5 + PC	USB+ Front Camera + LTE Band 5 idle

Note:

The device supports GSM/GPRS/EGPRS 850/900/1800/1900, UMTS FDD Band 2/4/5; LTE FDD Band 2/4/5/12/13/25/26/66/71, TDD Band 41. It has WLAN (802.11b/g/n, 802.11n supports 20MHz and 40MHz bandwidth), Bluetooth (EDR, BLE) and GNSS (GPS&GLONASS&BDS& GALILEO) functions.

The device contains receivers which tune and operate between 30MHz-960MHz in the following bands: GSM850, WCDMA850, LTE Band 5, LTE Band 12, LTE Band 13, LTE Band 26 and LTE Band 71. All licensed band receivers that tune in the range of 30MHz-960MHz are investigated. Only the worst-case emissions are reported.

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 (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 M**错误!未找到引用源。**
Ground system resistance	< 4 **错误!未找到引用源。**
Normalised site attenuation (NSA)	**<** ±4 dB, 3m 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 6000 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 M**错误!未找到引用源。**
Ground system resistance	< 4 **错误!未找到引用源。**

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(huayuan North Road)**
2	Conducted Emission	15.107(a)	B.2	P	**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	2022-02-23	1 Year
2	LISN	ENV216	101200	R&S	2022-05-30	1 year
3	Universal Radio Communication Tester	CMW500	163975	R&S	2022-01-11	1 year
4	Test Receiver	ESCI 7	100344	R&S	2022-02-23	1 Year
5	EMI Antenna	VULB 9163	01223	Schwarzbeck	2022-03-22	1 year
6	EMI Antenna	3115	6914	ETS-Lindgren	2022-02-03	1 year

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 3 meters 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 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.

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 (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.

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_{RpI} 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_{RpI} = 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): U = 4.74 dB, k=2.

Measurement results for Set.1:

Charing 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)
17952.400	46.7	-28.9	46.7	29.0	54.0	7.3	V
17946.167	46.3	-28.9	46.7	28.6	54.0	7.7	H
17972.800	46.2	-29.1	46.7	28.6	54.0	7.8	H
17152.833	46.1	-29.9	42.4	33.6	54.0	7.9	V
17909.333	45.9	-29.3	46.0	29.3	54.0	8.1	H
17888.367	45.9	-29.5	46.0	29.5	54.0	8.1	V

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)
17946.733	55.9	-28.9	46.7	38.2	74.0	18.1	H
17568.767	55.8	-29.8	45.2	40.3	74.0	18.2	V
17151.700	55.6	-29.9	42.4	43.1	74.0	18.4	V
17898.567	55.5	-29.5	46.0	39.1	74.0	18.5	H
17929.167	55.5	-29.4	46.7	38.2	74.0	18.5	H
17990.367	55.5	-29.1	46.7	37.9	74.0	18.5	H

Measurement results for Set.2:

Charing 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)
17969.967	46.2	-29.1	46.7	28.6	54.0	7.8	V
17968.833	45.9	-29.1	46.7	28.3	54.0	8.1	V
17141.500	45.9	-29.9	42.4	33.4	54.0	8.1	V
17930.300	45.8	-29.4	46.7	28.5	54.0	8.2	V
17941.067	45.7	-28.9	46.7	28.0	54.0	8.3	H
17907.633	45.7	-29.3	46.0	29.1	54.0	8.3	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)
17958.6	56.8	-28.9	46.7	39.1	74.0	17.2	V
17956.4	56.6	-28.9	46.7	38.9	74.0	17.4	H
17656.0	55.7	-29.6	45.2	40.1	74.0	18.3	V
17948.4	55.4	-28.9	46.7	37.7	74.0	18.6	H
17972.8	55.4	-29.1	46.7	37.8	74.0	18.6	H
17942.8	55.3	-28.9	46.7	37.6	74.0	18.7	H

Measurement results for Set.3:

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)
17900.833	47.2	-29.3	46.0	30.6	54.0	6.8	H
17186.833	47.2	-29.5	42.4	34.3	54.0	6.8	H
17989.800	47.2	-29.1	46.7	29.6	54.0	6.8	V
17558.000	47.1	-29.5	44.4	32.2	54.0	6.9	V
17883.833	47.1	-29.5	46.0	30.7	54.0	6.9	V
17926.900	46.8	-29.4	46.7	29.5	54.0	7.2	H

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)
17142.633	56.6	-29.9	42.4	44.1	74.0	17.4	H
17977.900	56.5	-29.1	46.7	38.9	74.0	17.5	H
17928.600	56.2	-29.4	46.7	38.9	74.0	17.8	V
17564.233	56.1	-29.8	45.2	40.6	74.0	17.9	V
17667.933	56.1	-29.9	45.2	40.7	74.0	17.9	H
17158.500	55.9	-29.9	42.4	43.4	74.0	18.1	V

Measurement results for Set.1:

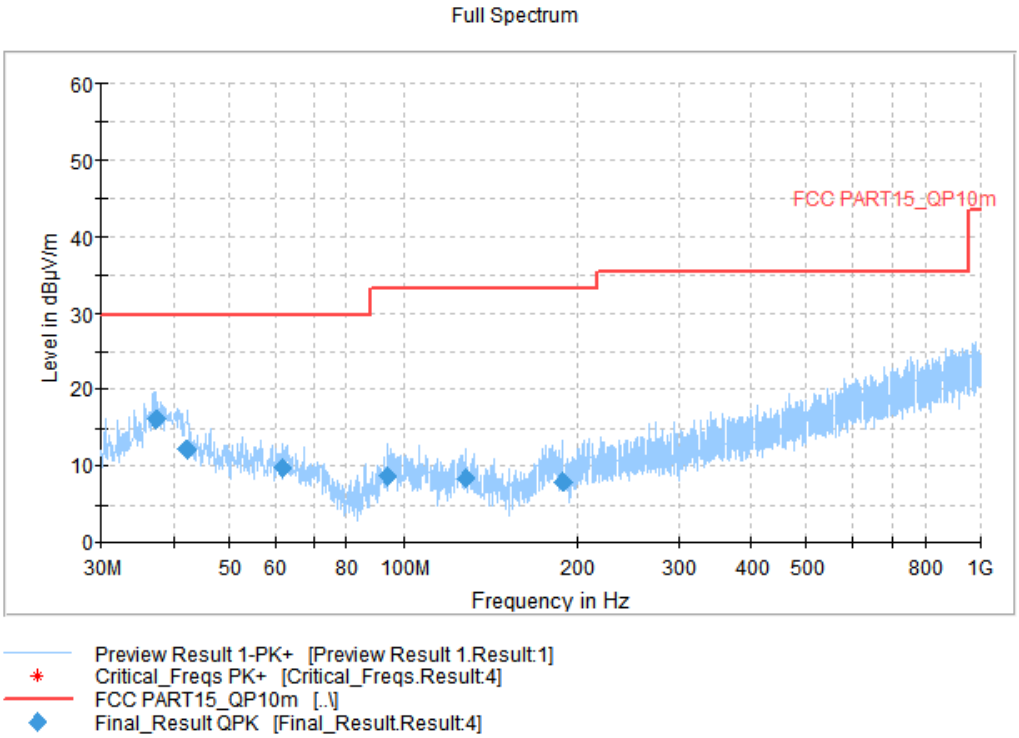

Fig A.1 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
37.275000	16.05	29.54	13.49	2000.0	120.000	310.0	V	211.0
42.222000	12.04	29.54	17.50	2000.0	120.000	118.0	V	79.0
61.622000	9.76	29.54	19.78	2000.0	120.000	230.0	V	30.0
93.923000	8.74	33.06	24.32	2000.0	120.000	230.0	V	260.0
127.970000	8.50	33.06	24.56	2000.0	120.000	125.0	V	30.0
188.692000	8.03	33.06	25.03	2000.0	120.000	205.0	V	31.0

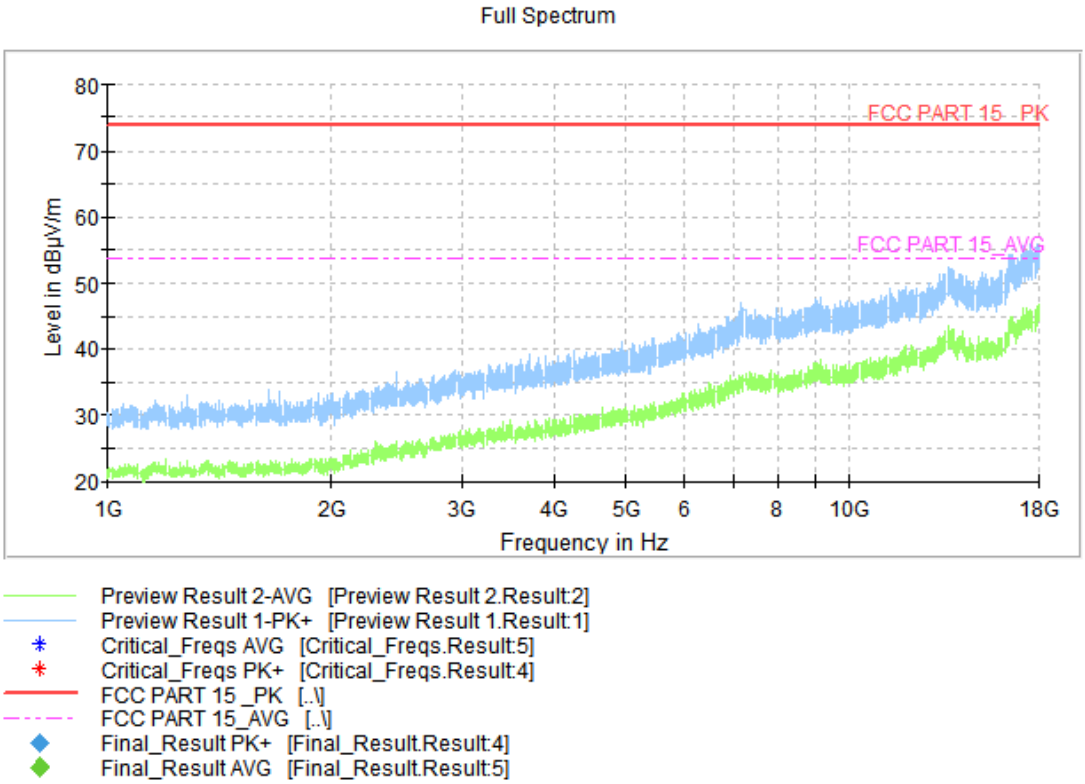

Fig A.2 Radiated Emission from 1GHz to 18GHz

Measurement results for Set.2:

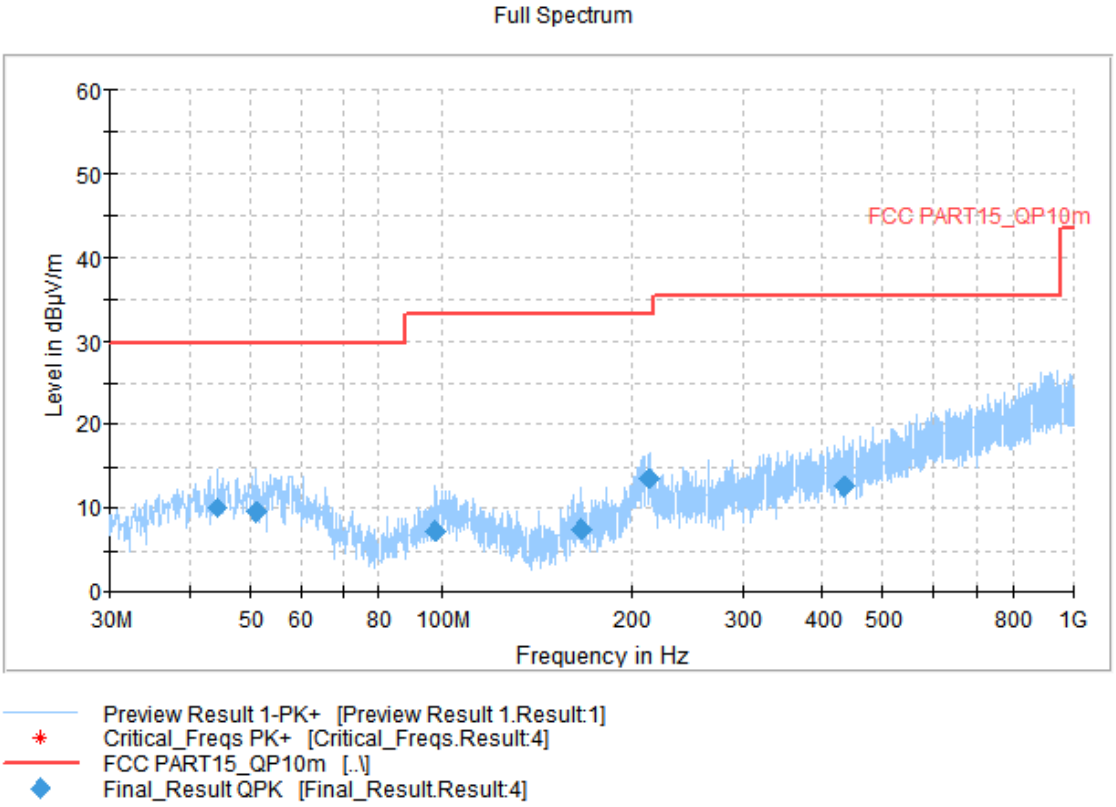

Fig A.3 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
44.259000	9.97	29.54	19.57	2000.0	120.000	181.0	V	-10.0
51.049000	9.49	29.54	20.05	2000.0	120.000	187.0	V	61.0
97.803000	7.35	33.06	25.71	2000.0	120.000	215.0	V	61.0
166.091000	7.51	33.06	25.55	2000.0	120.000	101.0	V	-30.0
213.039000	13.60	33.06	19.46	2000.0	120.000	180.0	V	120.0
434.684000	12.71	35.56	22.85	2000.0	120.000	335.0	V	69.0

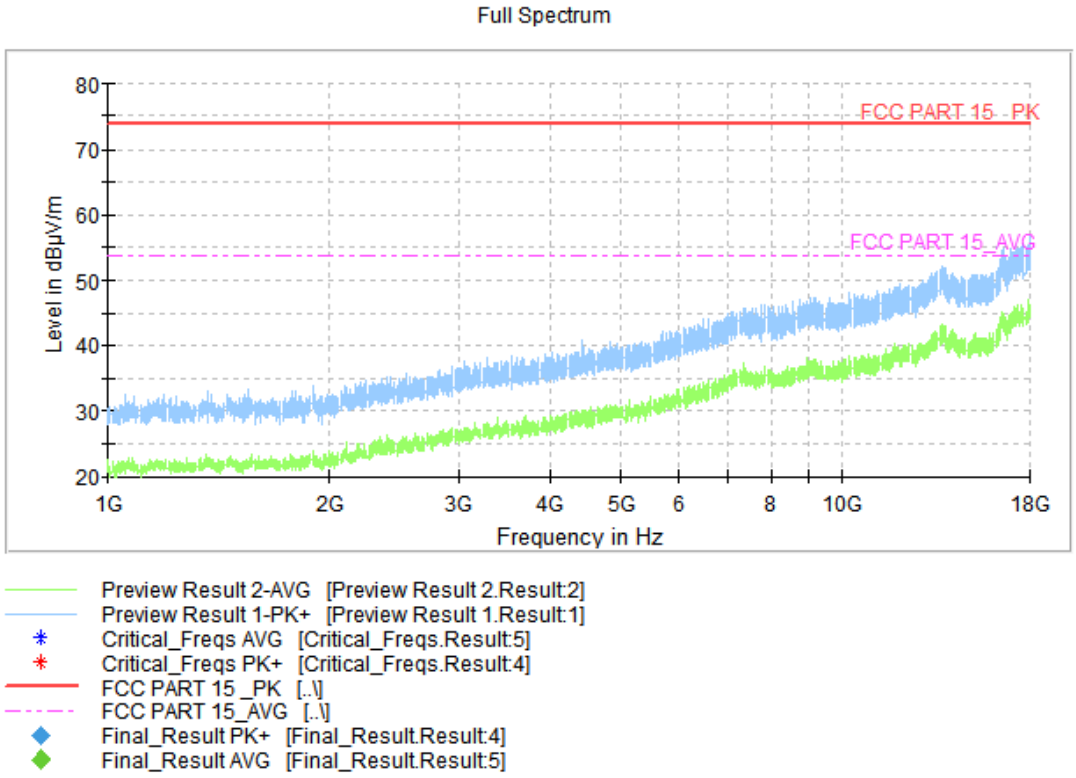

Fig A.4 Radiated Emission from 1GHz to 18GHz

Measurement results for Set.3:

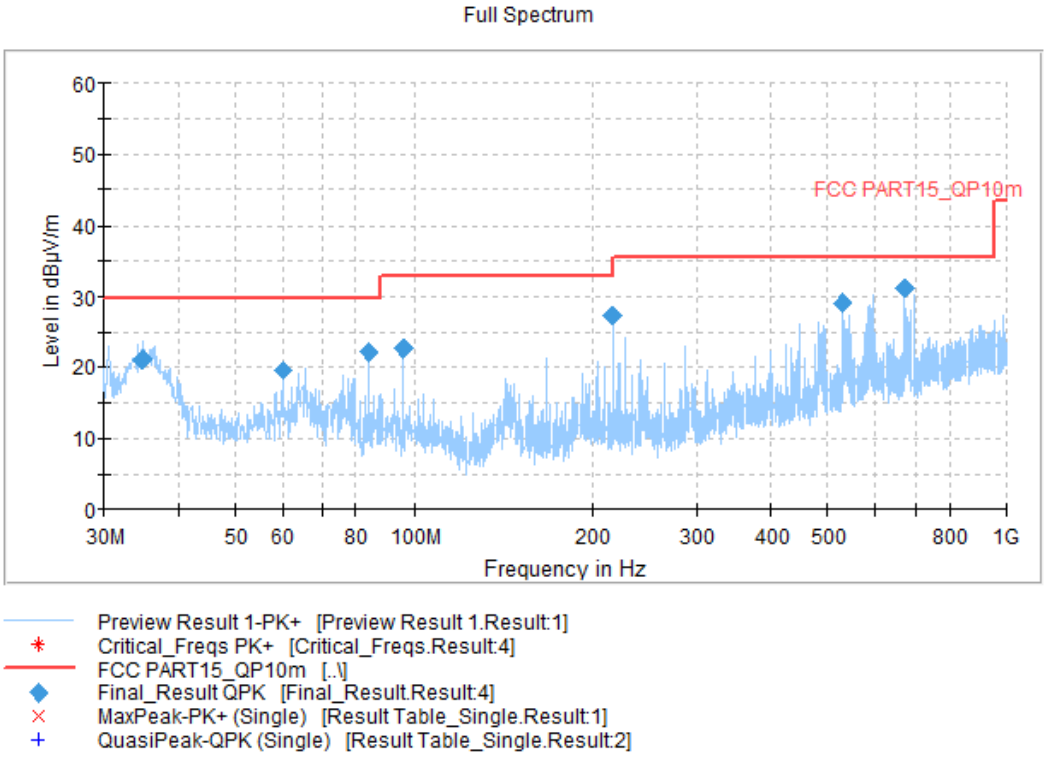

Fig A.5 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
34.753000	21.07	29.54	8.47	2000.0	120.000	285.0	V	210.0
59.973000	19.66	29.54	9.88	2000.0	120.000	292.0	V	300.0
83.932000	22.03	29.54	7.51	2000.0	120.000	180.0	V	261.0
215.949000	27.34	33.06	5.72	2000.0	120.000	125.0	V	169.0
528.871000	29.00	35.56	6.56	2000.0	120.000	225.0	V	9.0
673.207000	31.20	35.56	4.36	2000.0	120.000	180.0	V	-11.0

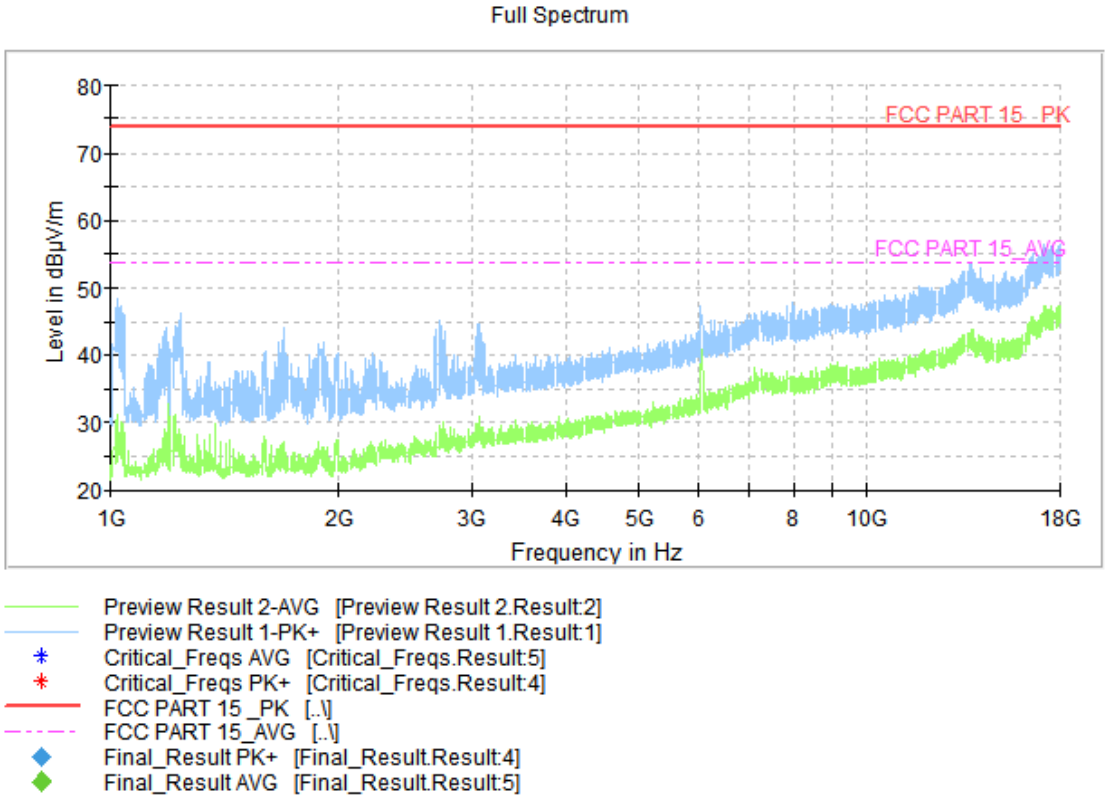

Fig A.6 Radiated Emission from 1GHz to 18GHz

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 (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*= 3.1 dB, *k*=2.

Charging Mode, Set.1:

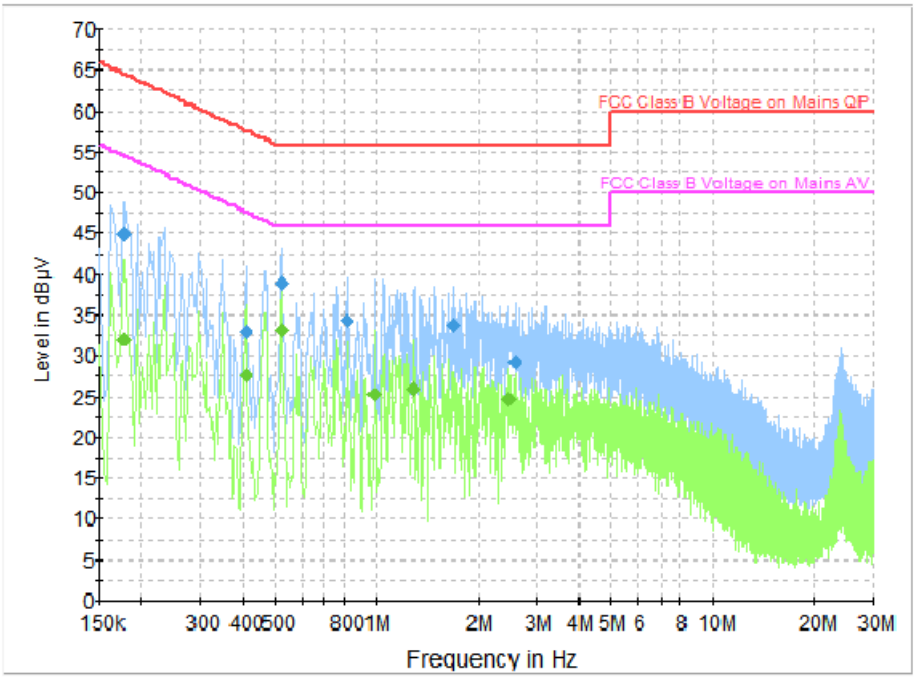

Fig A.7 Conducted Emission from 150kHz to 30MHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.178000	44.9	2000.0	9.000	On	L1	20.0	19.6	64.6	
0.410000	33.0	2000.0	9.000	On	L1	19.9	24.7	57.6	
0.522000	39.0	2000.0	9.000	On	L1	19.9	17.0	56.0	
0.814000	34.3	2000.0	9.000	On	N	19.8	21.7	56.0	
1.690000	33.9	2000.0	9.000	On	N	19.8	22.1	56.0	
2.582000	29.3	2000.0	9.000	On	N	19.7	26.7	56.0	

Final Result 2

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.178000	32.0	2000.0	9.000	On	L1	20.0	22.6	54.6	
0.410000	27.5	2000.0	9.000	On	L1	19.9	20.1	47.6	
0.522000	33.1	2000.0	9.000	On	L1	19.9	12.9	46.0	
0.986000	25.2	2000.0	9.000	On	L1	19.6	20.8	46.0	
1.282000	25.9	2000.0	9.000	On	L1	19.5	20.2	46.0	
2.486000	24.8	2000.0	9.000	On	L1	19.5	21.2	46.0	

Charging Mode, Set.2:

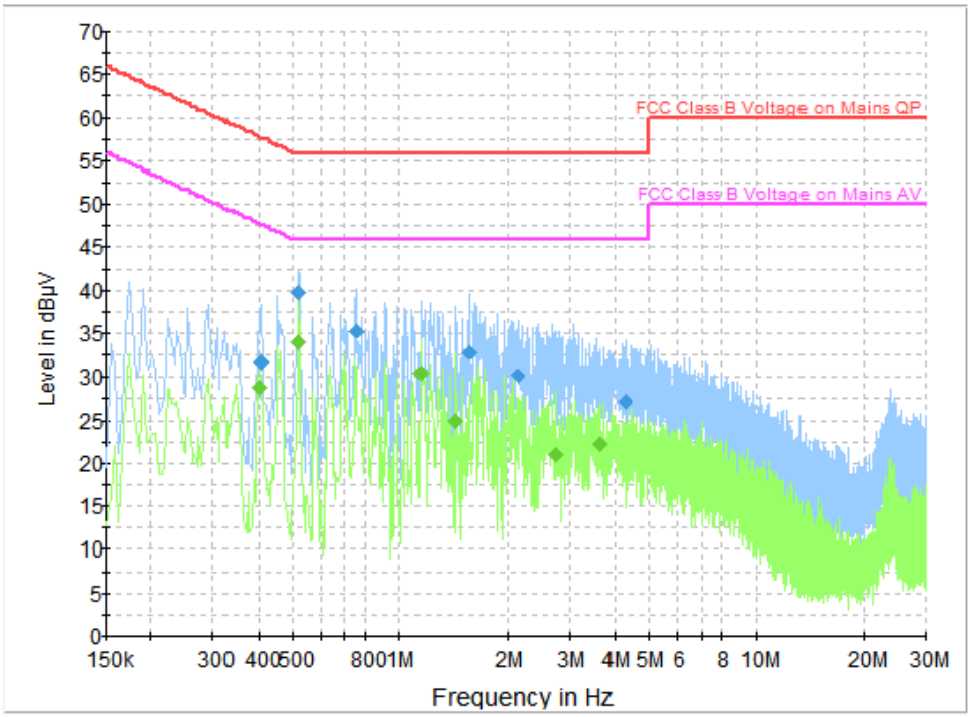

Fig A.8 Conducted Emission from 150kHz to 30MHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.406000	31.7	2000.0	9.000	On	N	19.9	26.0	57.7	
0.518000	39.9	2000.0	9.000	On	L1	19.9	16.1	56.0	
0.754000	35.3	2000.0	9.000	On	N	19.8	20.7	56.0	
1.562000	32.9	2000.0	9.000	On	N	19.7	23.1	56.0	
2.134000	30.3	2000.0	9.000	On	L1	19.5	25.7	56.0	
4.254000	27.2	2000.0	9.000	On	L1	19.6	28.8	56.0	

Final Result 2

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.402000	28.9	2000.0	9.000	On	L1	19.9	18.9	47.8	
0.518000	33.9	2000.0	9.000	On	L1	19.9	12.1	46.0	
1.146000	30.6	2000.0	9.000	On	L1	19.5	15.4	46.0	
1.434000	25.0	2000.0	9.000	On	L1	19.5	21.0	46.0	
2.746000	21.0	2000.0	9.000	On	L1	19.5	25.0	46.0	
3.642000	22.2	2000.0	9.000	On	L1	19.5	23.8	46.0	

USB Mode, Set.3:

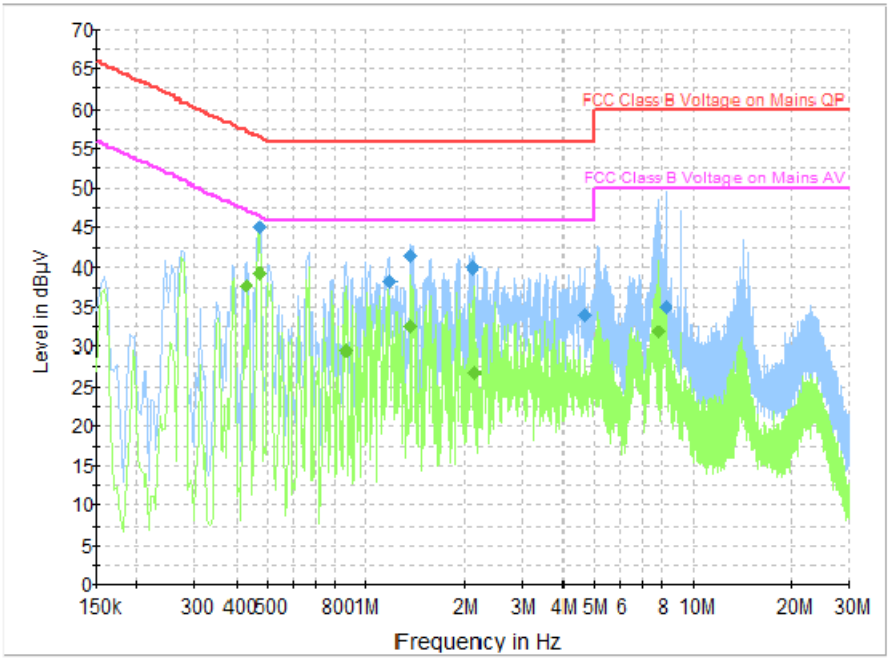

Fig A.9 Conducted Emission from 150kHz to 30MHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.474000	45.1	2000.0	9.000	On	L1	19.9	11.3	56.4	
1.190000	38.2	2000.0	9.000	On	L1	19.5	17.8	56.0	
1.362000	41.5	2000.0	9.000	On	L1	19.5	14.5	56.0	
2.126000	39.9	2000.0	9.000	On	N	19.8	16.1	56.0	
4.630000	34.0	2000.0	9.000	On	N	19.7	22.0	56.0	
8.238000	35.0	2000.0	9.000	On	L1	19.5	25.0	60.0	

Final Result 2

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.430000	37.8	2000.0	9.000	On	L1	19.9	9.4	47.3	
0.474000	39.2	2000.0	9.000	On	N	20.0	7.2	46.4	
0.870000	29.6	2000.0	9.000	On	N	19.8	16.4	46.0	
1.362000	32.6	2000.0	9.000	On	L1	19.5	13.4	46.0	
2.138000	26.7	2000.0	9.000	On	N	19.8	19.3	46.0	
7.754000	31.9	2000.0	9.000	On	N	19.7	18.1	50.0	

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