



TEST REPORT

No. I14Z49154-EMC01

for

TCL Communication Ltd.

HSUPA/HSDPA/UMTS tri-band/GSM quad-band mobile phone

Model Name: 4023A

FCC ID: 2ACCJH008

with

Hardware Version: PIO

Software Version: v7G1D

Issued Date: 2014-12-31

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.

Test Laboratory:

FCC 2.948 Listed: No.525429

CTTL, Telecommunication Technology Labs, Academy of Telecommunication Research, MIIT

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

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
I14Z49154-EMC01	Rev.0	1st edition	2014-12-31

CONTENTS

1. TEST LABORATORY	4
1.1. TESTING LOCATION.....	4
1.2. TESTING ENVIRONMENT	4
1.3. PROJECT DATA	4
1.4. SIGNATURE	4
2. CLIENT INFORMATION	5
2.1. APPLICANT INFORMATION.....	5
2.2. MANUFACTURER INFORMATION.....	5
3. EQUIPMENT UNDER TEST (EUT) AND ANCILLARY EQUIPMENT (AE)	6
3.1. ABOUT EUT	6
3.2. INTERNAL IDENTIFICATION OF EUT USED DURING THE TEST	6
3.3. INTERNAL IDENTIFICATION OF AE USED DURING THE TEST.....	6
3.4. EUT SET-UPS	8
4. REFERENCE DOCUMENTS.....	9
4.1. REFERENCE DOCUMENTS FOR TESTING.....	9
5. LABORATORY ENVIRONMENT.....	10
6. SUMMARY OF TEST RESULTS.....	11
7. TEST EQUIPMENTS UTILIZED.....	12
ANNEX A: MEASUREMENT RESULTS	13

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

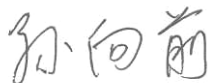
Testing Start Date: 2014-12-24

Testing End Date: 2014-12-27


1.4. Signature



Zhang Hui
(Prepared this test report)



Sun Xiangqian
(Reviewed this test report)



Lu Bingsong
Director of the laboratory
(Approved this test report)



2. Client Information

2.1. Applicant Information

Company Name: TCL Communication Ltd.
Address /Post: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,
Pudong Area Shanghai, P.R. China.
City: Shanghai
Postal Code: 201203
Country: China
Contact Person: Gong Zhizhou
Contact Email: zhizhou.gong@tcl.com
Telephone: 0086-21-51798260
Fax: 0086-21-61460602

2.2. Manufacturer Information

Company Name: TCL Communication Ltd.
Address /Post: 5F, C building, No. 232, Liang Jing Road ZhangJiang High-Tech Park,
Pudong Area Shanghai, P.R. China.
City: Shanghai
Postal Code: 201203
Country: China
Telephone: 0086-21-51798260
Fax: 0086-21-61460602

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

3.1. About EUT

Description	HSUPA/HSDPA/UMTS tri-band/GSM quad-band mobile phone
Model Name	4023A
FCC ID	2ACCJH008
Extreme vol. Limits	3.5VDC to 4.35VDC (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
EUT4	014257000100230	PIO	v7G1D

*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	/	14TCT-BA-2228
AE2	Battery	/	14TCT-BA-2233
AE3	Battery	/	14TCT-BA-2226
AE4	Battery	/	14TCT-BA-2238
AE5	Battery	/	/
AE6	Battery	/	/
AE7	Battery	/	/
AE8	Battery	/	/
AE9	Travel charger	/	14TCT-CH-1053
AE10	Travel charger	/	14TCT-CH-1909
AE11	Travel charger	/	14TCT-CH-1985
AE12	Travel charger	/	14TCT-CH-2276
AE13	USB cable	/	14TCT-DC-1230
AE14	USB cable	/	/
AE15	USB cable	/	/
AE16	USB cable	/	/

AE1, AE2, AE3, AE4,

Model	CAB1150000C1
Manufacturer	BYD
Capacitance	1150mAh
Nominal voltage	3.7V



AE5

Model	CAB1150001CB
Manufacturer	OCEANSUN
Capacitance	1150mAh
Nominal voltage	3.7V

AE6

Model	CAB31P0000CB
Manufacturer	OCEANSUN
Capacitance	1300mAh
Nominal voltage	3.7V

AE7

Model	CAB31P0000C1
Manufacturer	BYD
Capacitance	1300mAh
Nominal voltage	3.7V

AE8

Model	CAB1300015C2
Manufacturer	LGI
Capacitance	1300mAh
Nominal voltage	3.7V

AE9、AE10、AE11

Model	CBA3002AG0C1
Manufacturer	BYD
Length of cable	117cm

AE12

Model	CBA3002AG0C3
Manufacturer	YINGJU
Length of cable	122cm

AE13

Model	CDA3122002C1
Manufacturer	JUWEI
Length of cable	/

AE14

Model	CDA3122005C1
Manufacturer	JUWEI
Length of cable	/

AE15

Model	CDA3122002C2
Manufacturer	Shenhua
Length of cable	/



AE16

Model	CDA3122005C2
Manufacturer	Shenhua
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	EUT4+ AE1 + AE9	Charger
Set.2	EUT4+ AE1 + AE12	Charger
Set.3	EUT4+ AE1 + AE13	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	10-1-13 Edition
ANSI C63.4	Methods of Measurement of Radio-Noise Emissions from Low - Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz	2009

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

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
Location Column	A/B/C/D	The test is performed in test location A, B, C or D which are described in section 1.1 of this report

Items	Test Name	Clause in FCC rules	Clause in IC rules	Section in this report	Verdict	Test Location
1	Radiated Emission	15.109(a)	Section 5	B.1	P	A
2	Conducted Emission	15.107(a)	Section 5	B.2	P	A

7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATI ON INTERVAL
1	Test Receiver	ESCI	100344	R&S	2015-03-03	1 year
2	Test Receiver	ESCI 7	100948	R&S	2015-07-16	1 year
3	Universal Radio Communication Tester	CMU200	109914	R&S	2015-04-13	1 year
4	Test Receiver	FSV	101047	R&S	2015-07-03	1 year
5	LISN	ESH2-Z5	829991/012	R&S	2015-04-14	1 year
6	EMI Antenna	VULB 9163	9163-234	Schwarzbeck	2016-09-15	3 years
7	EMI Antenna	3115	6914	ETS-Lindgren	2016-12-15	3 years
8	PC	OPTIPLEX 380	2X1YV2X	DELL	N/A	N/A
9	Monitor	E178FPc	CN-OWR979-6 4180-7AJ-D2M S	DELL	N/A	N/A
10	Printer	P1606dn	VNC3L52122	HP	N/A	N/A
11	Keyboard	L100	CN0RH659658 907ATOI40	DELL	N/A	N/A
12	Mouse	M-UAE119	LZ935220ZRC	Lenovo	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 - 2009, 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 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 MS, reading and erasing the data after copy action was finished.

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)	Result(dB μ V/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dB μ V)	Polarity
5260.000	30.5	-34.5	34.6	30.400	VERTICAL
5259.375	30.3	-34.5	34.6	30.200	HORIZONTAL
5258.750	30.2	-34.5	34.6	30.100	VERTICAL
5256.563	30.2	-34.5	34.6	30.100	VERTICAL
5258.125	30.2	-34.5	34.6	30.100	HORIZONTAL
5265.625	30.2	-34.5	34.6	30.100	HORIZONTAL

Charging Mode/Peak detector

Frequency(MHz)	Result(dB μ V/m)	G_{PL} (dB)	G_A (dB/m)	P_{Mea} (dB μ V)	Polarity
5294.375	41.9	-34.4	34.6	41.700	HORIZONTAL
5820.938	41.9	-33.8	35.1	40.600	HORIZONTAL
5318.125	41.9	-34.4	34.6	41.700	VERTICAL
5679.063	41.7	-34.2	35.1	40.800	HORIZONTAL
5697.500	41.6	-34.2	35.1	40.700	VERTICAL
5552.500	41.6	-34.2	35.1	40.700	HORIZONTAL

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

Frequency(MHz)	Result(dB μ V/m)	G _{PL} (dB)	G _A (dB/m)	P _{Mea} (dB μ V)	Polarity
5266.250	30.4	-34.5	34.6	30.300	VERTICAL
5265.313	30.3	-34.5	34.6	30.200	VERTICAL
5267.500	30.3	-34.5	34.6	30.200	HORIZONTAL
5261.250	30.3	-34.5	34.6	30.200	VERTICAL
5268.125	30.3	-34.5	34.6	30.200	HORIZONTAL
5258.438	30.2	-34.5	34.6	30.100	HORIZONTAL

Charging Mode/Peak detector

Frequency(MHz)	Result(dB μ V/m)	G _{PL} (dB)	G _A (dB/m)	P _{Mea} (dB μ V)	Polarity
5263.438	43.4	-34.5	34.6	43.300	HORIZONTAL
5256.250	42.9	-34.5	34.6	42.800	HORIZONTAL
5807.500	42.7	-33.8	35.1	41.400	VERTICAL
5253.125	42.0	-34.5	34.6	41.900	VERTICAL
5294.375	41.9	-34.4	34.6	41.700	VERTICAL
5279.375	41.9	-34.4	34.6	41.700	HORIZONTAL

Measurement result for Set.3:
USB Mode/Average detector

Frequency(MHz)	Result(dB μ V/m)	G _{PL} (dB)	G _A (dB/m)	P _{mea} (dB μ V)	Polarity
1499.063	33.1	-40.3	24.1	49.300	HORIZONTAL
1498.438	33.0	-40.3	24.1	49.200	VERTICAL
1498.750	33.0	-40.3	24.1	49.200	VERTICAL
1498.125	32.8	-40.3	24.1	49.000	VERTICAL
1497.813	32.4	-40.3	24.1	48.600	VERTICAL
1452.813	32.2	-40.2	24.1	48.300	HORIZONTAL

USB Mode/ Peak detector

Frequency(MHz)	Result(dB μ V/m)	G _{PL} (dB)	G _A (dB/m)	P _{mea} (dB μ V)	Polarity
1464.063	52.6	-40.0	24.1	68.500	VERTICAL
1454.063	50.4	-40.2	24.1	66.500	HORIZONTAL
1452.188	50.2	-40.2	24.1	66.300	VERTICAL
1462.500	50.1	-40.0	24.1	66.000	HORIZONTAL
1452.813	49.5	-40.2	24.1	65.600	VERTICAL
1455.313	49.5	-40.2	24.1	65.600	HORIZONTAL

Note: The measurement results of Set.1, Set.2, Set.3 showed here are worst cases of the combinations of different batteries and USB cables.

Charging Mode, Set.1

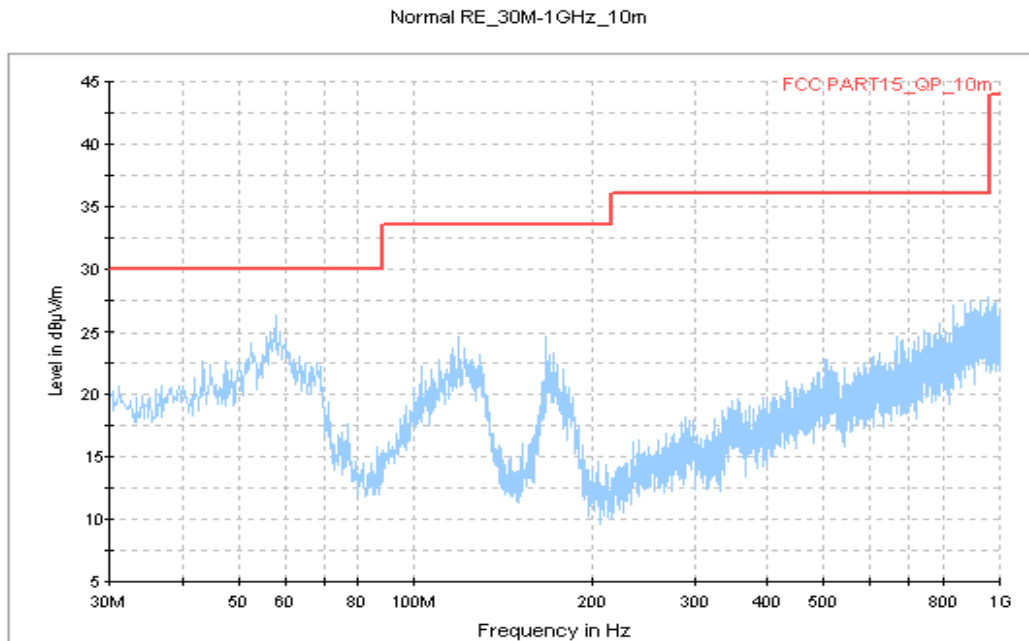


Figure A.1 Radiated Emission from 30MHz to 1GHz

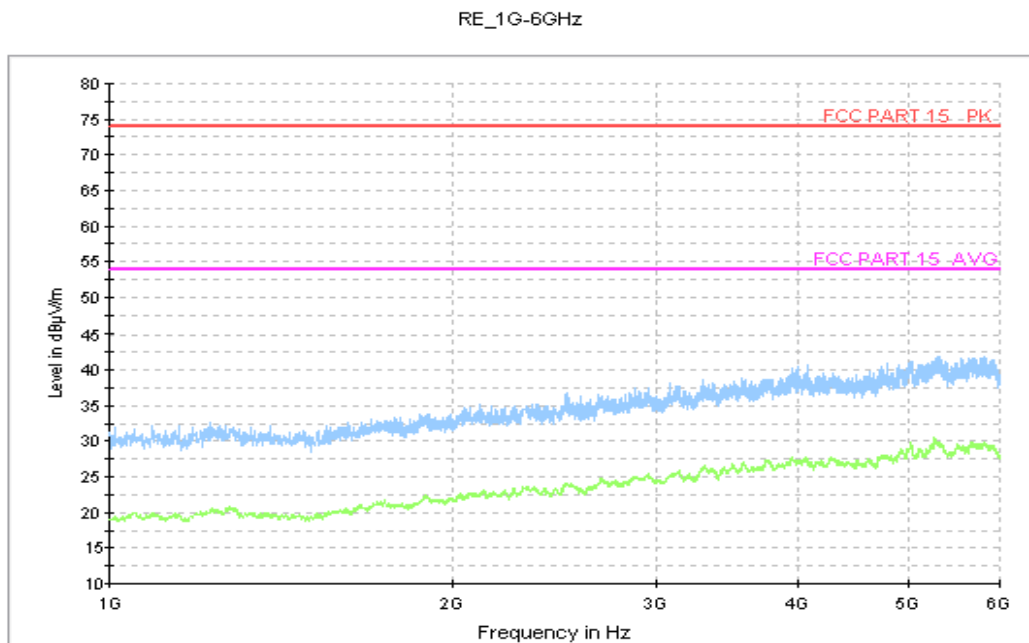


Figure A.2 Radiated Emission from 1GHz to 6GHz

Charging Mode, Set.2

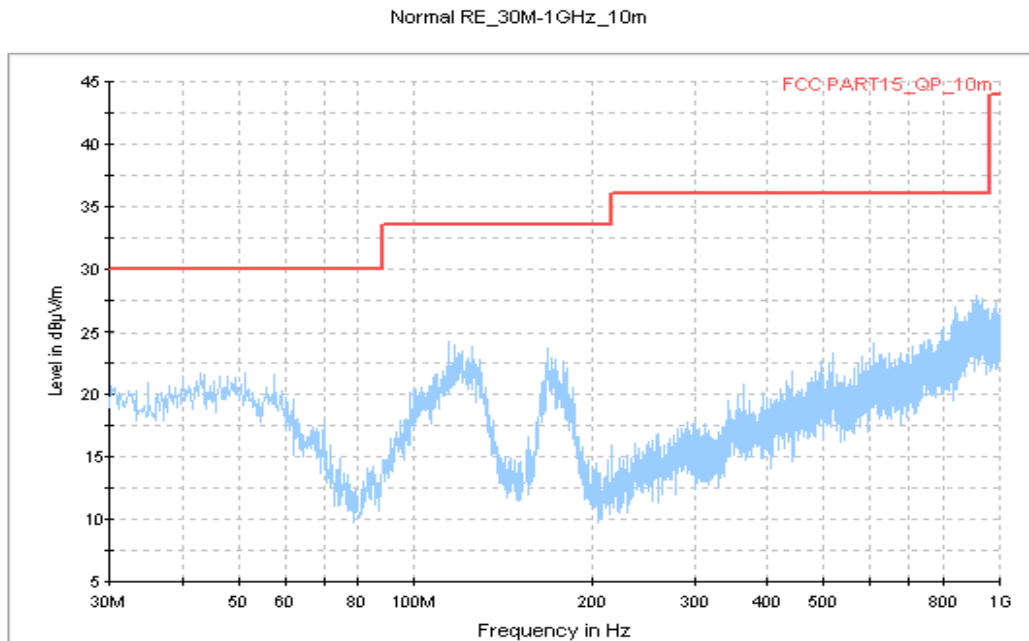


Figure A.3 Radiated Emission from 30MHz to 1GHz

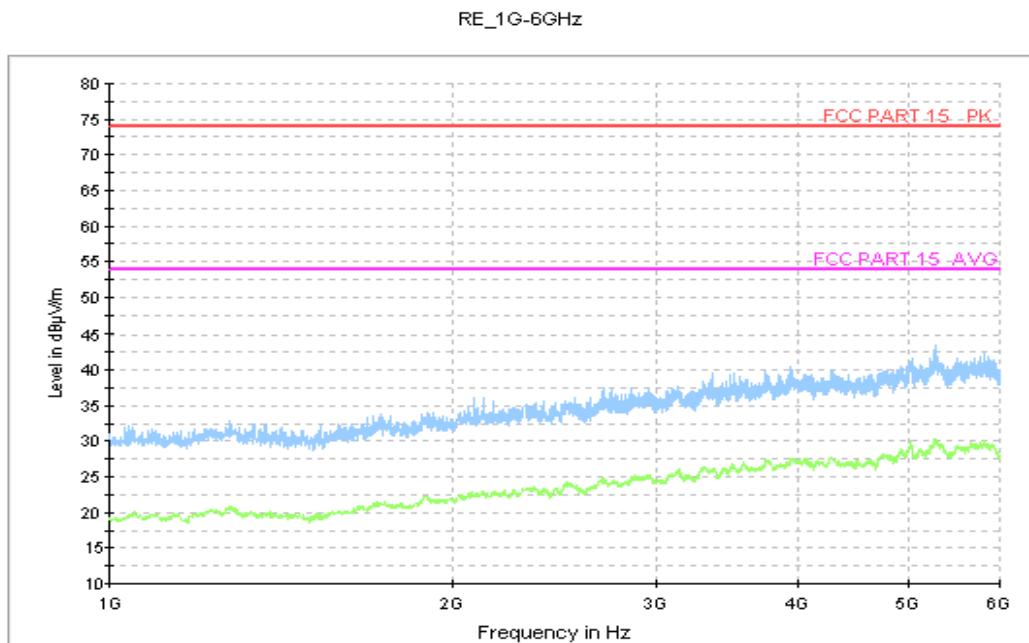


Figure A.4 Radiated Emission from 1GHz to 6GHz

USB Mode, Set.3

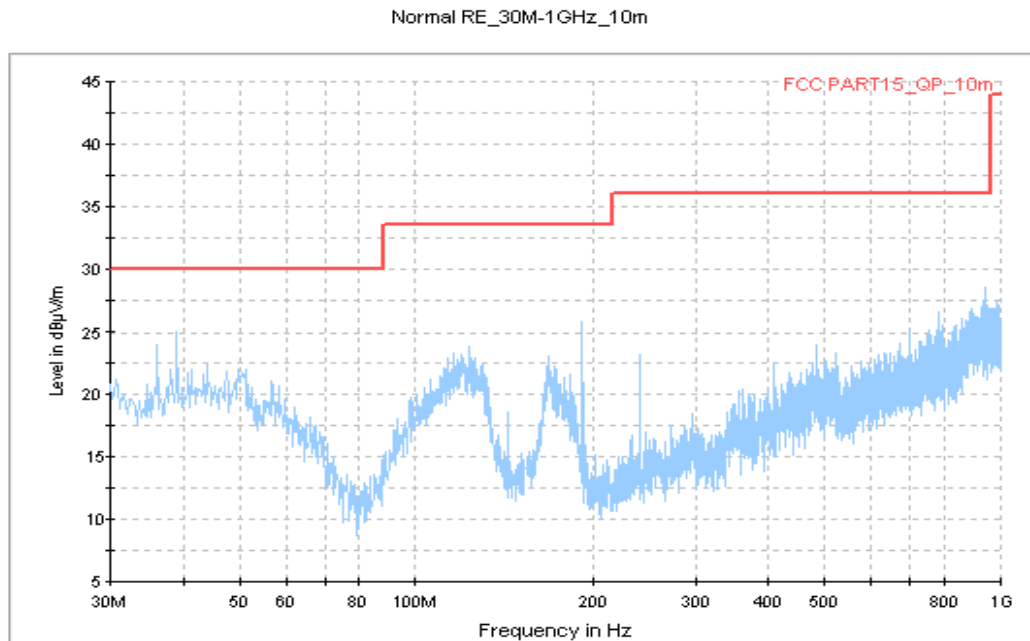


Figure A.5 Radiated Emission from 30MHz to 1GHz

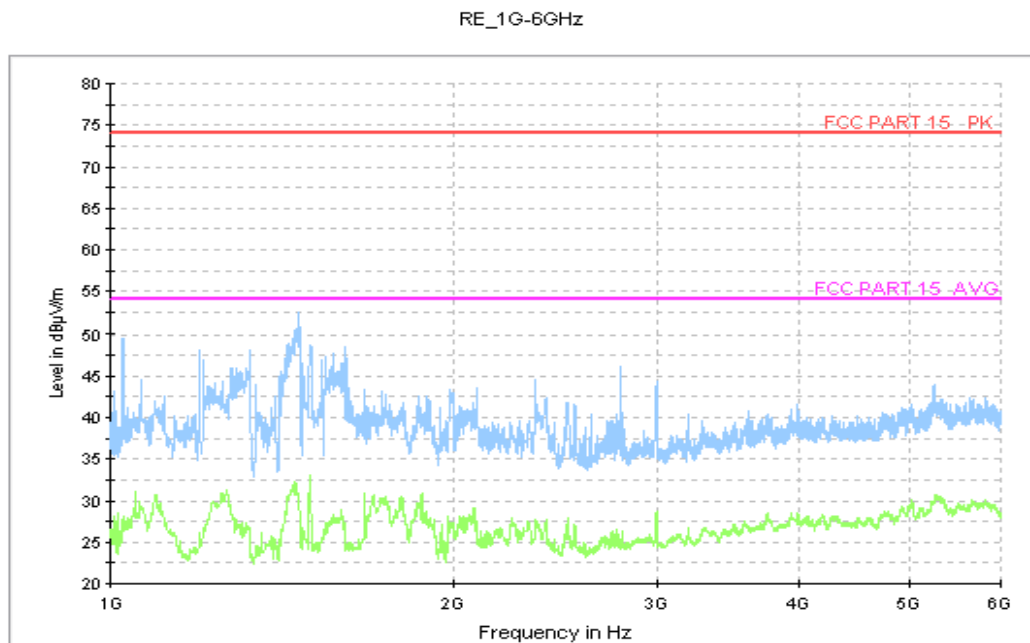


Figure A.6 Radiated Emission from 1GHz to 6GHz

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 - 2009, 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 OPTIPLEX 380, and the serial number of the PC is 2X1YV2X. The software is used to let the PC keep on copying data to MS, reading and erasing the data after copy action was finished.

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: $U = 2.9 \text{ dB}$, $k=2$.

Charging Mode, Set.1

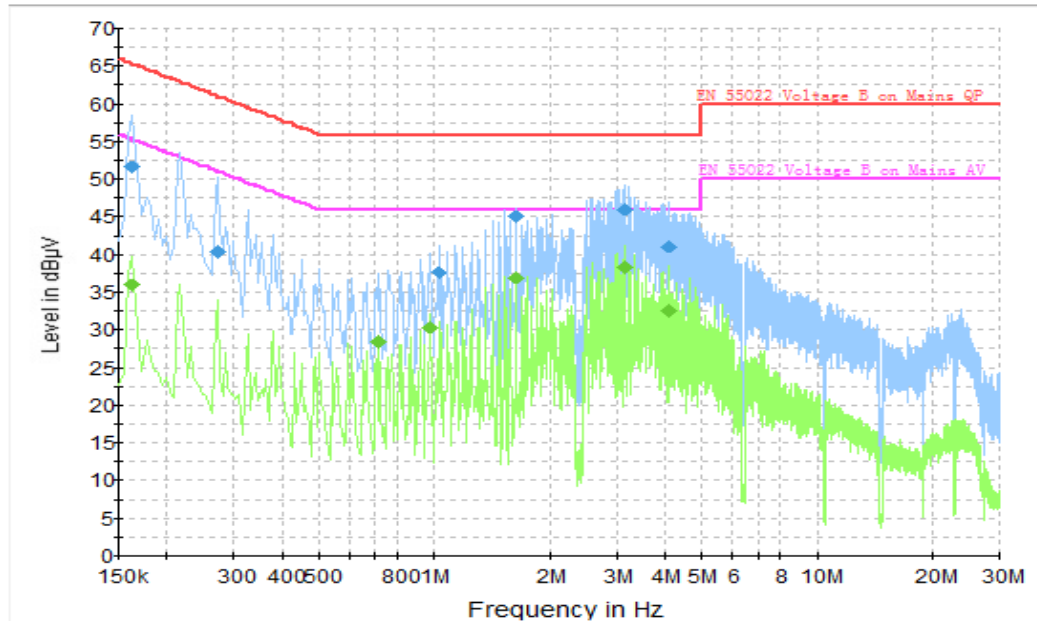


Figure A.7 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time(ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.163500	51.7	2000.0	9.000	On	L1	19.9	13.6	65.3
0.271500	40.5	2000.0	9.000	On	L1	19.9	20.6	61.1
1.023000	37.7	2000.0	9.000	On	L1	19.7	18.3	56.0
1.635000	45.1	2000.0	9.000	On	L1	19.7	10.9	56.0
3.160500	46.0	2000.0	9.000	On	L1	19.7	10.0	56.0
4.132500	41.1	2000.0	9.000	On	L1	19.7	14.9	56.0

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time(ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.163500	36.1	2000.0	9.000	On	L1	19.9	19.2	55.3
0.717000	28.3	2000.0	9.000	On	L1	19.9	17.7	46.0
0.973500	30.4	2000.0	9.000	On	L1	19.8	15.6	46.0
1.635000	36.9	2000.0	9.000	On	L1	19.7	9.1	46.0
3.160500	38.3	2000.0	9.000	On	L1	19.7	7.7	46.0
4.132500	32.6	2000.0	9.000	On	L1	19.7	13.4	46.0

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

Charging Mode, Set.2

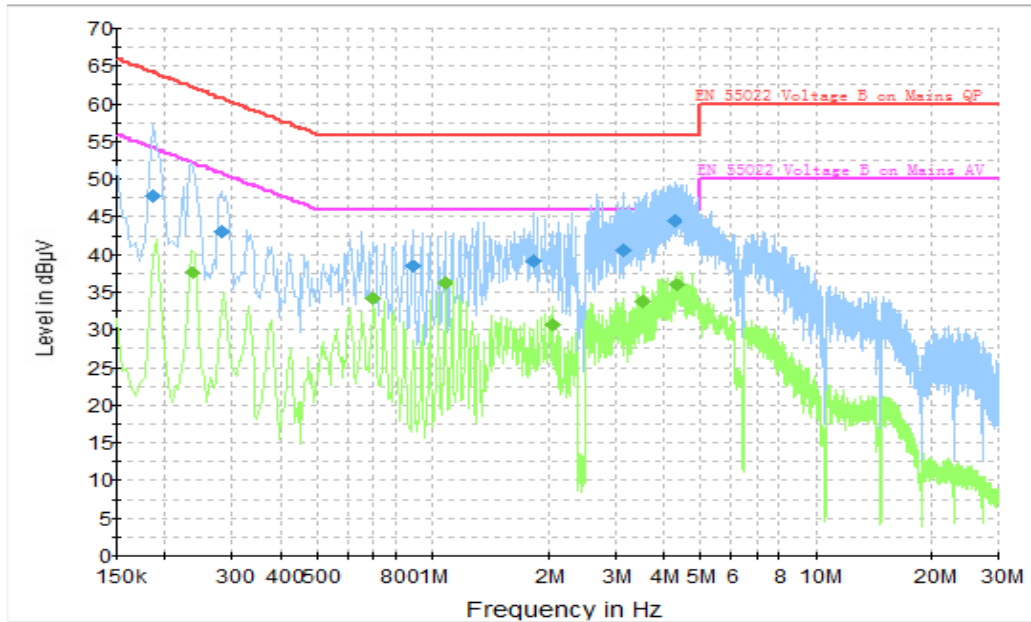


Figure A.8 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time(ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.186000	47.9	2000.0	9.000	On	L1	19.9	16.3	64.2
0.280500	43.1	2000.0	9.000	On	L1	19.8	17.7	60.8
0.883500	38.5	2000.0	9.000	On	L1	19.8	17.5	56.0
1.824000	39.1	2000.0	9.000	On	L1	19.7	16.9	56.0
3.160500	40.6	2000.0	9.000	On	L1	19.7	15.4	56.0
4.276500	44.6	2000.0	9.000	On	L1	19.6	11.4	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time(ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.235500	37.7	2000.0	9.000	On	L1	19.8	14.5	52.3
0.694500	34.2	2000.0	9.000	On	L1	19.9	11.8	46.0
1.077000	36.2	2000.0	9.000	On	L1	19.8	9.8	46.0
2.058000	30.7	2000.0	9.000	On	L1	19.7	15.3	46.0
3.520500	33.8	2000.0	9.000	On	L1	19.7	12.2	46.0
4.366500	36.1	2000.0	9.000	On	L1	19.7	9.9	46.0

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

USB Mode, Set.3

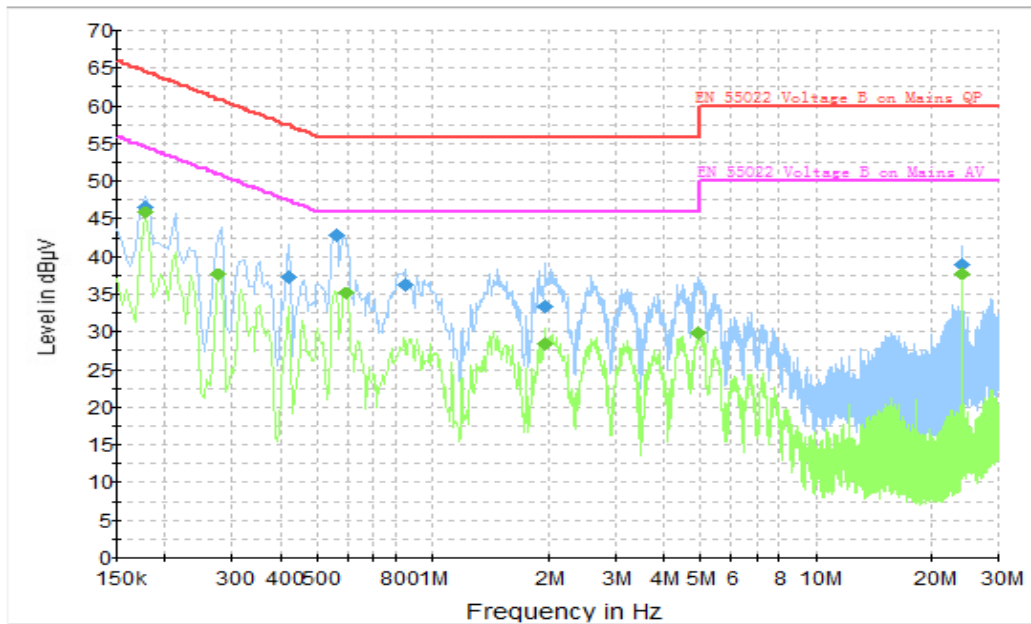


Figure A.9 Conducted Emission

Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Meas. Time(ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.177000	46.6	2000.0	9.000	On	N	19.9	18.0	64.6
0.420000	37.3	2000.0	9.000	On	N	20.0	20.1	57.4
0.559500	42.9	2000.0	9.000	On	L1	20.0	13.1	56.0
0.843000	36.4	2000.0	9.000	On	N	19.9	19.6	56.0
1.963500	33.3	2000.0	9.000	On	N	19.7	22.7	56.0
24.054000	38.9	2000.0	9.000	On	L1	19.8	21.1	60.0

Final Result 2

Frequency (MHz)	CAverage (dBμV)	Meas. Time(ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.177000	45.9	2000.0	9.000	On	N	19.9	8.7	54.6
0.276000	37.6	2000.0	9.000	On	N	19.9	13.3	50.9
0.595500	35.1	2000.0	9.000	On	L1	20.0	10.9	46.0
1.963500	28.3	2000.0	9.000	On	N	19.7	17.7	46.0
4.951500	30.0	2000.0	9.000	On	N	19.6	16.0	46.0
24.054000	37.8	2000.0	9.000	On	N	19.9	12.2	50.0

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

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