



# TEST REPORT

No. I20Z60090-EMC01

for

**TCL Communication Ltd.**

**LinkKey**

**Model Name: IK41UC**

**FCC ID: 2ACCJB115**

**IC Number: 9238A-0099**

with

**Hardware Version: V4.0**

**Software Version: IK41\_ZZ\_02.00\_01**

**Issued Date: 2020-03-11**

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**Test Laboratory:**

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I20Z60090-EMC01	Rev.0	1 <sup>st</sup> edition	2020-03-11

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

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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.

## **2. Test Laboratory**

### **2.1. Testing Location**

#### **CTTL(huayuan North Road)**

Address: No. 52, Huayuan North Road, Haidian District, Beijing,  
P. R. China100191

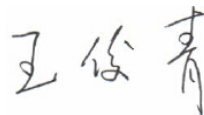
### **2.2. Testing Environment**

Normal Temperature: 15-35°C  
Relative Humidity: 20-75%

### **2.3. Project data**

Testing Start Date: 2019-11-10  
Testing End Date: 2020-03-10

### **2.4. Signature**



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**Wang Junqing**  
**(Prepared this test report)**



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**Zhang Ying**  
**(Reviewed this test report)**



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



### **3. Client Information**

#### **3.1. Applicant Information**

Company Name: TCL Communication Ltd.  
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#### **3.2. Manufacturer Information**

Company Name: TCL Communication Ltd.  
Address /Post: 5/F, Building 22E, 22 Science Park East Avenue, Hong Kong Science  
Park, Shatin, NT, Hong Kong  
Contact Person: Gong Zhizhou  
Contact Email: zhizhou.gong@tcl.com  
Telephone: 0086-755-36611722  
Fax: 0086-755-36612000-81722

## **4. Equipment Under Test (EUT) and Ancillary Equipment (AE)**

### **4.1. About EUT**

Description	LinkKey
Model Name	IK41UC
FCC ID	2ACCJB115
IC Number	9238A-0099

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.

### **4.2. Internal Identification of EUT used during the test**

<b>EUT ID*</b>	<b>SN or IMEI</b>	<b>HW Version</b>	<b>SW Version</b>
EUT1	352540110000360	V4.0	IK41_ZZ_02.00_01
EUT11	015693000200415	V4.0	IK41_ZZ_02.00_01

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

### **4.3. Internal Identification of AE used during the test**

<b>AE ID*</b>	<b>Description</b>	<b>SN</b>	<b>Remarks</b>
AE1	Test Computer	/	/
AE2	USB Cable	/	DC21a/22a

AE2

Model	/
Manufacturer	/
Length of cable	/

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

Note: The USB cables are shielded.

### **4.4. EUT set-ups**

<b>EUT set-up No.</b>	<b>Combination of EUT and AE</b>	<b>Remarks</b>
Set.1	EUT1+ AE1	PC USB
Set.2	EUT1+ AE1 + AE2	OTG USB
Set.11	EUT11+ AE1	RE tests for receivers

Note1: LinkKey IK41UC is a variant model based on IK41US for conformance test. According to the declaration of changes, tests for EUT set-up set.11 needs to been performed, the other results are cited from the initial model. The report number of initial model is I19Z61859-EMC02.

Note2: The device supports GSM 850/1900/900/1800 and UMTS FDD Band 2/4/5 and E-UTRA FDD Band 2/4/5/7/12/13/17/71.

The device contains receivers which tune and operate between 30MHz-960MHz in the following bands: GSM850, WCDMA850 and LTE Band 5/12/13/17/71. All licensed band receivers that tune in the range of 30MHz-960MHz are investigated, only the worst case emissions are reported.

## **5. Reference Documents**

### **5.1. Reference Documents for testing**

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

<b>Reference</b>	<b>Title</b>	<b>Version</b>
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
ICES-003	Information Technology Equipment (Including Digital Apparatus) — Limits and Methods of Measurement	Issue 6

Note: The test methods have no deviation with standards.

## 6. 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 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 MΩ
Ground system resistance	< 4 Ω



## 7. 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)

## 8. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATION INTERVAL
1	Test Receiver	ESU26	100235	R&S	2020-03-27	1 Year
2	Test Receiver	ESC13	100344	R&S	2020-03-14	1 Year
3	Universal Radio Communication Tester	CMW500	150344	R&S	2020-11-27	1 year
4	Universal Radio Communication Tester	CMW500	116588	R&S	2020-12-05	1 year
5	LISN	ENV216	101200	R&S	2020-03-14	1 year
6	EMI Antenna	VULB 9163	9163-1222	Schwarzbeck	2020-03-14	1 year
7	EMI Antenna	3115	6914	ETS-Lindgren	2021-01-03	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) 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. During the test MS is connected to a PC via a USB cable in the case of USB 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/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:

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

Where

$G_A$ : Antenna factor of receive antenna

$G_{PL}$ : Path Loss

$P_{\text{Mea}}$ : Measurement result on receiver.

Measurement uncertainty (worst case):  $U = 5.44 \text{ dB}$ ,  $k=2$ .

#### Measurement results for Set.1:

##### USB Mode/Average detector

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
17951.833	46.5	-5.4	33.8	18.1	H
17954.100	46.4	-5.4	33.8	18.0	H
17952.967	46.4	-5.4	33.8	18.0	V
17950.133	46.4	-5.4	33.8	18.0	H
17821.500	46.3	-5.7	33.8	18.2	H
17941.633	46.3	-5.4	33.8	17.9	H

##### USB Mode/ Peak detector

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
17843.600	58.1	-5.7	33.8	30.0	H
17990.367	57.9	-5.4	33.8	29.5	H
17975.633	57.9	-5.4	33.8	29.5	V
17402.167	57.8	-5.9	33.8	29.9	H
17802.233	57.6	-5.7	33.8	29.5	H
17917.267	57.6	-5.4	33.8	29.2	H

**Measurement results for Set.2:****USB Mode with OTG Cable/Average detector**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
17958.633	46.8	-17.7	45.6	18.9	H
17826.033	46.7	-18.5	45.6	19.6	H
17823.767	46.7	-18.5	45.6	19.6	V
17955.800	46.6	-17.7	45.6	18.7	H
17960.333	46.5	-17.7	45.6	18.6	H
17911.033	46.5	-18.5	45.6	19.4	H

**USB Mode with OTG Cable/ Peak detector**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
17949.000	58.9	-17.7	45.6	31.0	H
17513.800	58.3	-19.2	45.6	31.9	H
17958.633	58.3	-17.7	45.6	30.4	V
17944.467	58.1	-17.7	45.6	30.2	H
17930.300	58.0	-17.7	45.6	30.1	H
17980.167	58.0	-17.7	45.6	30.1	H

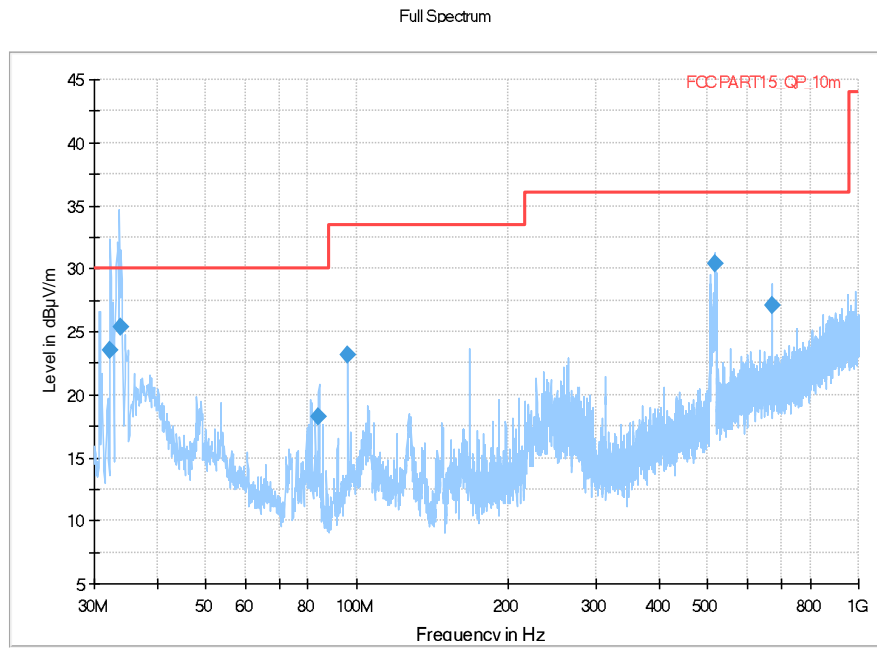
**The worst measurement results for Set.11:****USB Mode/Average detector**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
17979.033	33.6	-25.5	43.4	15.702	H
17971.100	33.5	-25.5	43.4	15.602	H
17976.200	33.4	-25.5	43.4	15.502	V
17951.267	33.4	-25.5	43.4	15.502	H
17992.067	33.2	-25.5	43.4	15.302	H
17999.433	33.2	-25.5	43.4	15.302	H

**USB Mode/ Peak detector**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Antenna Pol. (H/V)
17993.200	44.7	-25.5	43.4	26.802	H
17946.167	44.6	-25.5	43.4	26.702	H
17847.567	44.6	-25.7	43.4	26.942	V
17952.400	44.5	-25.5	43.4	26.602	H
17815.833	44.5	-25.7	43.4	26.842	H
17997.167	44.5	-25.5	43.4	26.602	H

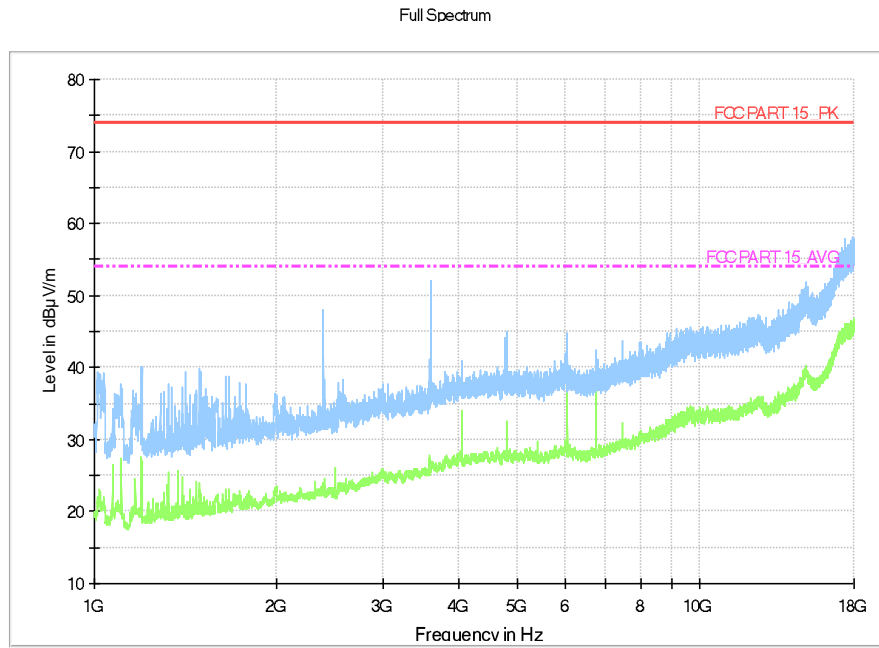
**USB Mode, Set.1:**



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

**Final\_Result**

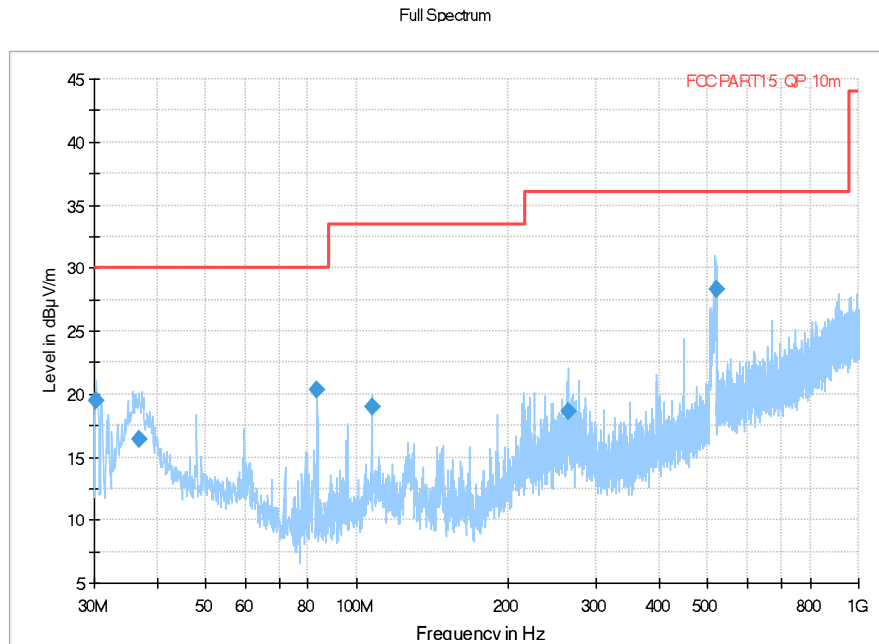
Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
32.231000	23.58	30.00	6.42	1000.0	120.000	317.0	V	282.0
33.746000	25.41	30.00	4.59	1000.0	120.000	217.0	V	-30.0
84.066000	18.27	30.00	11.73	1000.0	120.000	307.0	V	79.0
96.080000	23.22	33.50	10.30	1000.0	120.000	100.0	V	73.0
518.880000	30.44	36.00	5.58	1000.0	120.000	225.0	V	-20.0
671.983000	27.14	36.00	8.88	1000.0	120.000	225.0	V	210.0



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



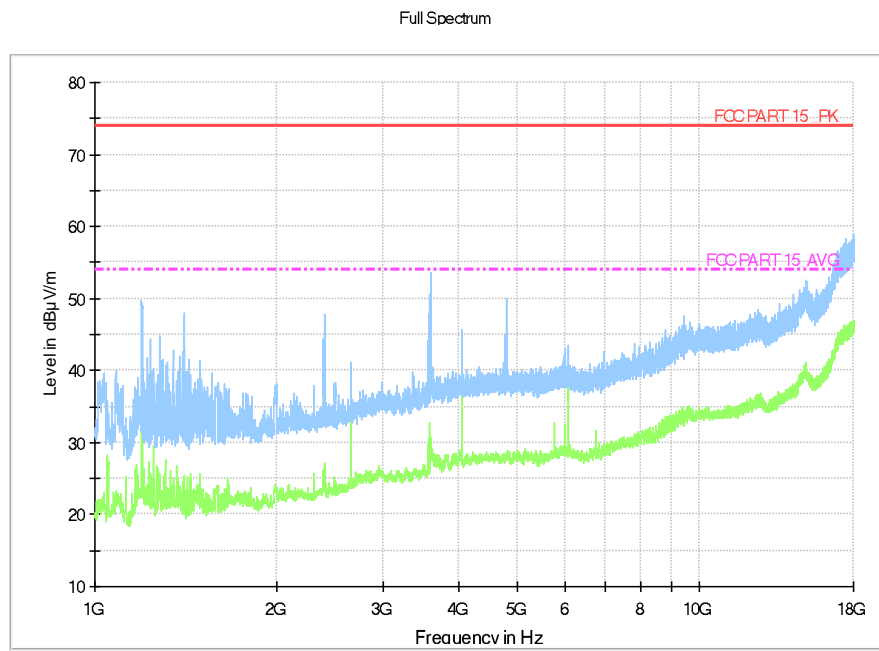
### USB Mode with OTG Cable, Set.2:



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

### Final Result

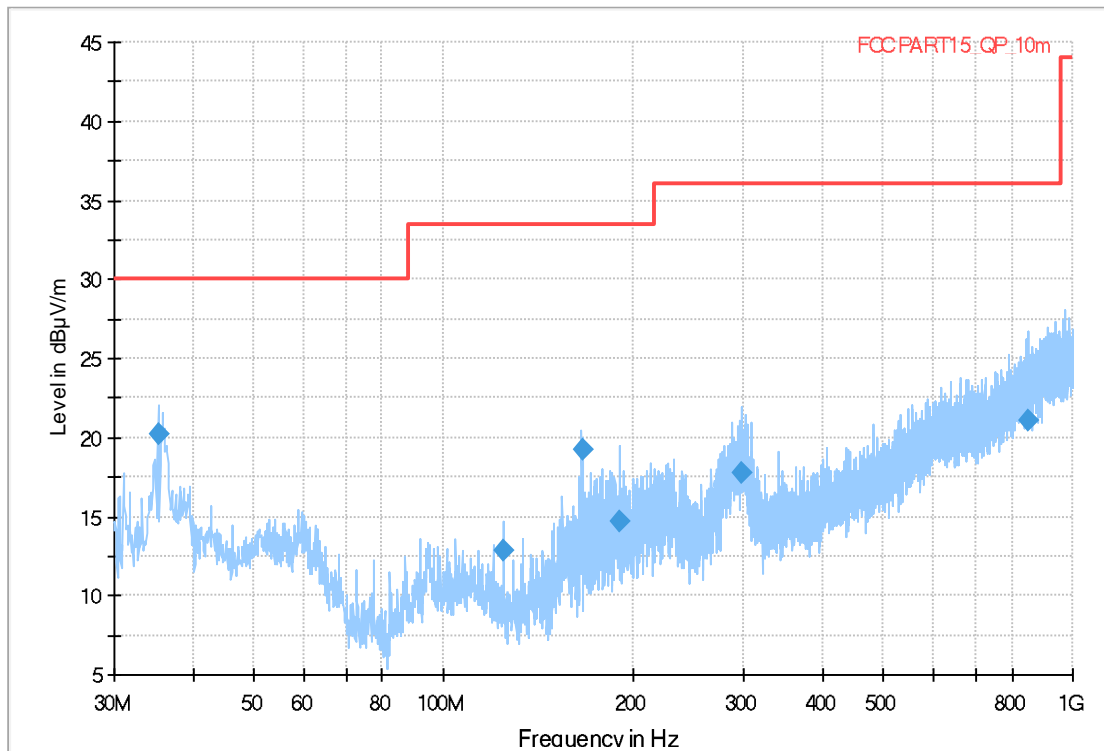
Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
30.300000	19.51	30.00	10.49	1000.0	120.000	185.0	V	241.0
36.795000	16.35	30.00	13.65	1000.0	120.000	125.0	V	158.0
83.433000	20.35	30.00	9.65	1000.0	120.000	125.0	V	19.0
107.235000	18.99	33.50	14.53	1000.0	120.000	116.0	V	19.0
264.024000	18.63	36.00	17.39	1000.0	120.000	117.0	V	20.0
519.360000	28.28	36.00	7.74	1000.0	120.000	278.0	V	-12.0



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

**USB Mode, the worst results for Set.11:**

Full Spectrum

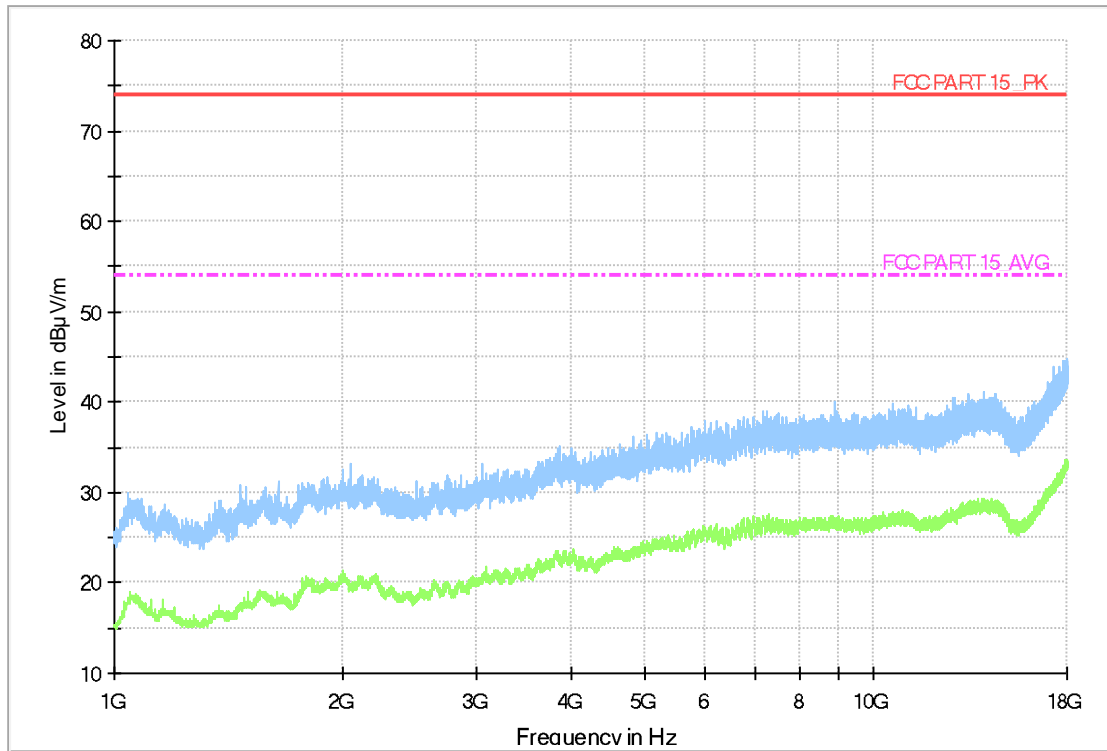


**Fig A.5 Radiated Emission from 30MHz to 1GHz**

**Final\_Result**

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
35.298000	20.24	30.00	9.76	1000.0	120.000	108.0	V	-6.0
124.672000	12.80	33.50	20.72	1000.0	120.000	124.0	V	291.0
166.594000	19.23	33.50	14.29	1000.0	120.000	104.0	V	116.0
190.475000	14.73	33.50	18.79	1000.0	120.000	192.0	V	175.0
297.586000	17.82	36.00	18.20	1000.0	120.000	104.0	V	151.0
850.080000	21.03	36.00	14.99	1000.0	120.000	124.0	V	295.0

Full Spectrum



**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. During the test MS is connected to a PC via a USB cable in the case of USB 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 $\mu$ 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,  $k=2$ .

USB Mode, Set.1:

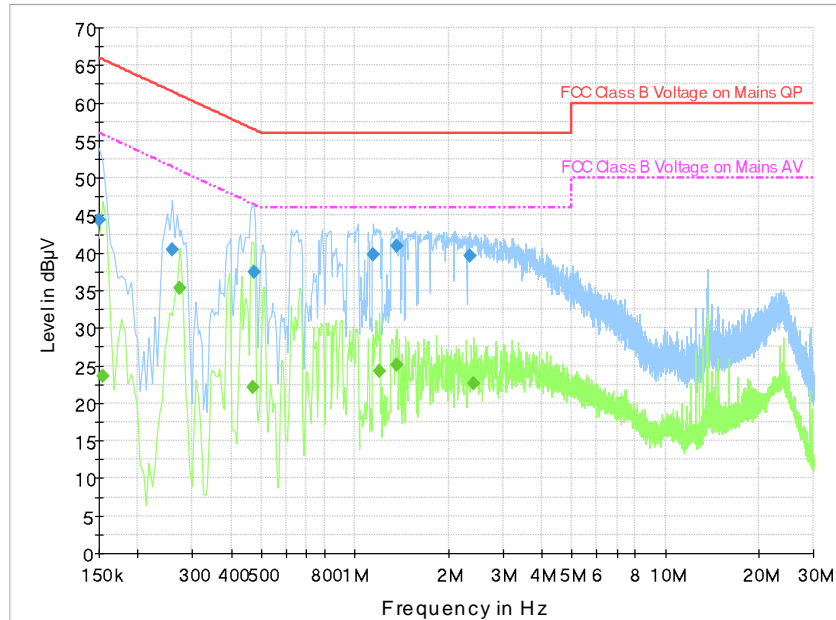


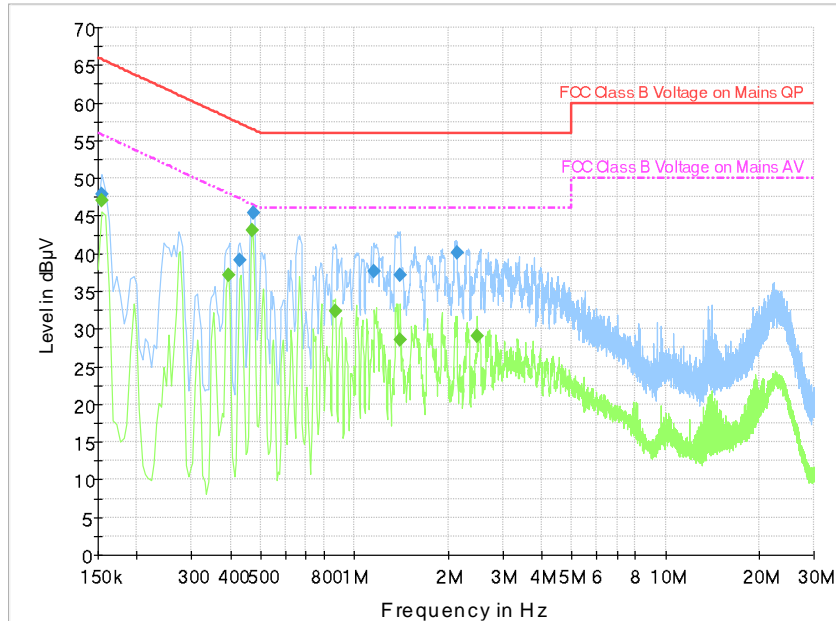
Fig A.7 Conducted Emission from 150kHz to 30MHz

#### Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.150000	44.4	2000.0	9.000	On	N	30.6	21.6	66.0	
0.258000	40.4	2000.0	9.000	On	N	19.8	21.1	61.5	
0.474000	37.5	2000.0	9.000	On	L1	19.8	18.9	56.4	
1.149000	39.8	2000.0	9.000	On	N	19.7	16.2	56.0	
1.369500	40.9	2000.0	9.000	On	L1	19.6	15.1	56.0	
2.337000	39.6	2000.0	9.000	On	N	19.6	16.4	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	23.7	2000.0	9.000	On	L1	29.7	32.1	55.8	
0.271500	35.3	2000.0	9.000	On	L1	19.8	15.8	51.1	
0.469500	22.2	2000.0	9.000	On	L1	19.8	24.3	46.5	
1.203000	24.3	2000.0	9.000	On	L1	19.7	21.7	46.0	
1.369500	25.1	2000.0	9.000	On	L1	19.6	20.9	46.0	
2.409000	22.6	2000.0	9.000	On	L1	19.6	23.4	46.0	

**USB Mode with OTG Cable, 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
0.154500	47.8	1000.0	9.000	On	L1	29.7	17.9	65.8	
0.429000	39.1	1000.0	9.000	On	N	19.8	18.2	57.3	
0.474000	45.4	1000.0	9.000	On	N	19.8	11.1	56.4	
1.153500	37.6	1000.0	9.000	On	L1	19.7	18.4	56.0	
1.405500	37.1	1000.0	9.000	On	N	19.6	18.9	56.0	
2.134500	40.1	1000.0	9.000	On	N	19.6	15.9	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	47.1	1000.0	9.000	On	L1	29.7	8.7	55.8	
0.393000	37.2	1000.0	9.000	On	L1	19.8	10.8	48.0	
0.469500	43.0	1000.0	9.000	On	L1	19.8	3.5	46.5	
0.865500	32.4	1000.0	9.000	On	N	19.7	13.6	46.0	
1.405500	28.5	1000.0	9.000	On	N	19.6	17.5	46.0	
2.485500	29.1	1000.0	9.000	On	N	19.6	16.9	46.0	



**ANNEX B: PERSONS INVOLVED IN THIS TESTING**

<b>Test Item</b>	<b>Test Software and Version</b>	<b>Software Vendor</b>	<b>Test operator</b>
Conducted Emission	EMC32 V8.5.2	R&S	Shi Suolan
Radiated Emission	EMC32 V9.01.00	R&S	Yan Hanchen Li Pengfei

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