



# TEST REPORT

No. I20Z60442-EMC01

for

**TCL Communication Ltd.**

**LINKHUB**

**Model Name: HH42NK**

**FCC ID: 2ACCJB120**

with

**Hardware Version: PIO**

**Software Version: HH42NK\_V1.1.0B06**

**Issued Date: 2020-05-09**

**Note:**

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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>
I20Z60442-EMC01	Rev.0	1 <sup>st</sup> edition	2020-04-27
I20Z60442-EMC01	Rev.1	Renew AE information during the test ,operating mode description and the results table in Page12-14	2020-05-09

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

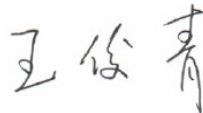
### **2.2. Testing Environment**

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

### **2.3. Project data**

Testing Start Date: 2020-03-30  
Testing End Date: 2020-04-26

### **2.4. Signature**



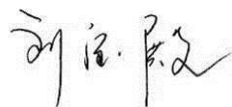
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**Wang Junqing**  
**(Prepared this test report)**



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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.  
Address: 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  
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#### **3.2. Manufacturer Information**

Company Name: TCL Communication Ltd.  
Address: 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	LINKHUB
Model Name	HH42NK
FCC ID	2ACCJB120
Operating Voltages	Nominal:12V

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.

355317110002085

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

EUT ID*	SN or IMEI	HW Version	SW Version
EUT1	355317110002085	PIO	HH42NK_V1.1.0B06
EUT11	355317110003695	PIO	HH42NK_V1.1.0B06

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

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

AE ID*	Description	SN	Remarks
AE1	Power adapter	/	CH009
PC	Test computer	HA007(12b)T	/
Telephone	Fixed phone	AC5KDK004073	/

AE1

Model	CBA0096AGNC2
Manufacturer	Tenpao
Capacitance	/
Nominal voltage	12V

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

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

EUT set-up No.	Combination of EUT and AE	Remarks
Set.1	EUT1+AE1+PC+Telephone	GSM850/WCDMA850MHz/LTE Band5/ LTE Band12/ LTE Band13 Receiver mode
Set.2	EUT1+AE1+PC+Telephone	With external antenna
Set.3	EUT11+AE1+PC+Telephone	New Sample

Note:

The device supports GSM 850/1900/900/1800 and UMTS FDD Band 1/2/4/5/8 and E-UTRA FDD Band 2/3/4/5/7/8/12/13/17/28/66. It has WLAN(802.11b/g/n, 802.11n supports 20MHz and 40MHz bandwidth) functions.

The device contains receivers which tune and operate between 30MHz-960MHz in the following bands: GSM850, WCDMA850 and LTE Band 5/12/13/17. 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	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.

## 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 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



## 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	2021-03-05	1 Year
2	Test Receiver	ESC13	100766	R&S	2021-03-13	1 Year
3	Universal Radio Communication Tester	CMW500	150344	R&S	2020-12-27	1 year
4	Universal Radio Communication Tester	CMW500	116588	R&S	2019-12-26	1 year
5	LISN	ENV216	101200	R&S	2020-12-05	1 year
6	EMI Antenna	VULB 9163	9163-1222	Schwarzbeck	2020-09-17	1 year
7	EMI Antenna	3115	00167250	ETS-Lindgren	2020-05-15	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 (Receiver 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 EUT is operating in the receiver mode with power adaptor. During the test EUT is connected with PC and telephone. The model of the PC is Lenovo T430, and the serial number of the PC is PB-7A0D8. The model of the telephone is HA007(12b)T, and the serial number of the telephone is AC5KDK004073.

#### **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

$G_{\text{PL}}$ : 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:

##### 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)	Limit (dB $\mu$ V/m)
5760.000	39.7	-33.8	35.1	38.400	H	54
5990.633	38.5	-33.5	35.1	36.900	H	54
5759.433	36.6	-33.8	35.1	35.300	V	54
5991.200	34.7	-33.5	35.1	33.100	H	54
5760.567	33.7	-33.8	35.1	32.400	H	54
17988.100	33.5	-17.7	45.6	5.600	H	54

##### 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)	Limit (dB $\mu$ V/m)
17952.967	46.4	-17.7	45.6	18.500	H	74
17947.300	45.7	-17.7	45.6	17.800	H	74
5990.633	44.6	-33.5	35.1	43.000	V	74
17964.867	44.6	-17.7	45.6	16.700	H	74
17788.067	44.5	-18.5	45.6	17.400	H	74
17990.367	44.4	-17.7	45.6	16.500	H	74

**Measurement results for Set.2(with external antenna):**
**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)	Limit (dB $\mu$ V/m)
5760.000	48.8	-33.8	35.1	47.500	H	54
5991.200	48.2	-33.5	35.1	46.600	H	54
5759.433	45.8	-33.8	35.1	44.500	V	54
5990.633	45.0	-33.5	35.1	43.400	H	54
5760.567	43.8	-33.8	35.1	42.500	H	54
17993.200	43.8	-17.7	45.6	15.900	H	54

**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)	Limit (dB $\mu$ V/m)
17875.333	51.9	-18.5	45.6	24.800	H	74
17930.300	51.8	-17.7	45.6	23.900	H	74
17953.533	51.6	-17.7	45.6	23.700	V	74
5990.633	51.4	-33.5	35.1	49.800	H	74
5760.000	51.3	-33.8	35.1	50.000	H	74
17871.933	51.2	-18.5	45.6	24.100	H	74

**Measurement results for Set.3:****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)	Limit (dB $\mu$ V/m)
17917.267	43.4	-17.7	45.6	15.500	H	54
17997.733	43.4	-17.7	45.6	15.500	H	54
17973.367	43.3	-17.7	45.6	15.400	V	54
17993.767	43.3	-17.7	45.6	15.400	H	54
17975.633	43.2	-17.7	45.6	15.300	H	54
17998.300	43.0	-17.7	45.6	15.100	H	54

**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)	Limit (dB $\mu$ V/m)
17935.400	52.6	-17.7	45.6	24.700	H	74
17997.167	52.1	-17.7	45.6	24.200	H	74
17990.367	52.1	-17.7	45.6	24.200	V	74
17988.100	52.1	-17.7	45.6	24.200	H	74
17994.333	51.5	-17.7	45.6	23.600	H	74
17786.367	51.5	-18.5	45.6	24.400	H	74

The measurements results for Set.1:

Full Spectrum

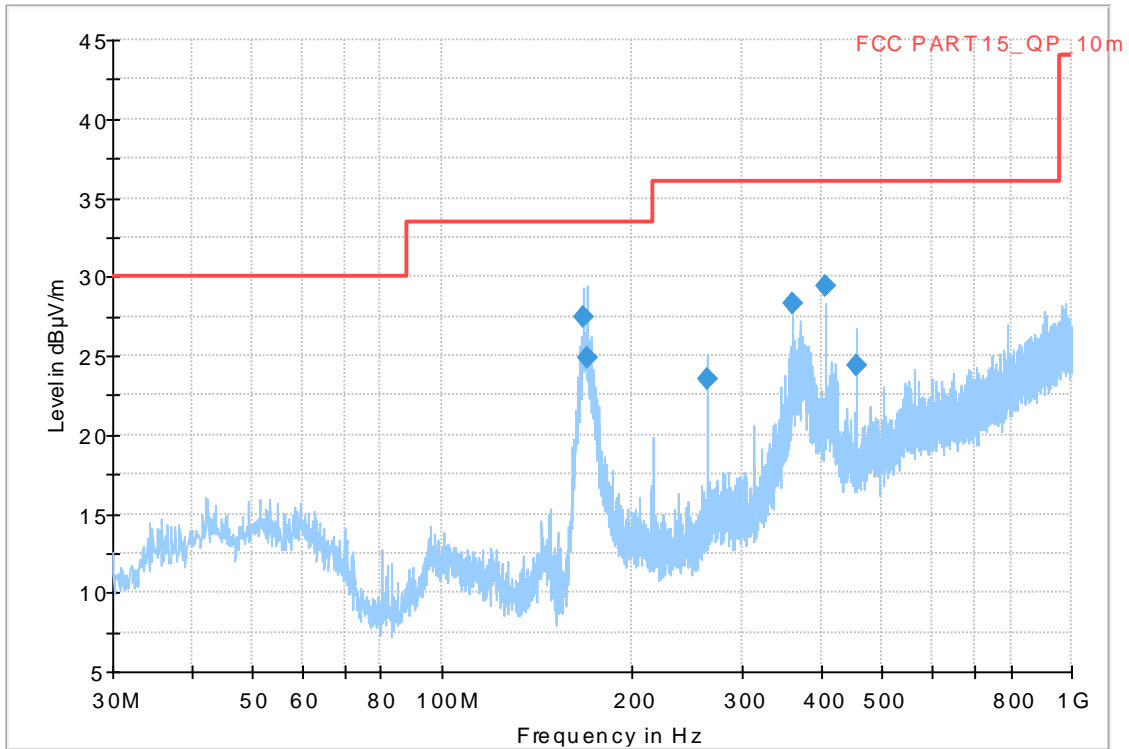
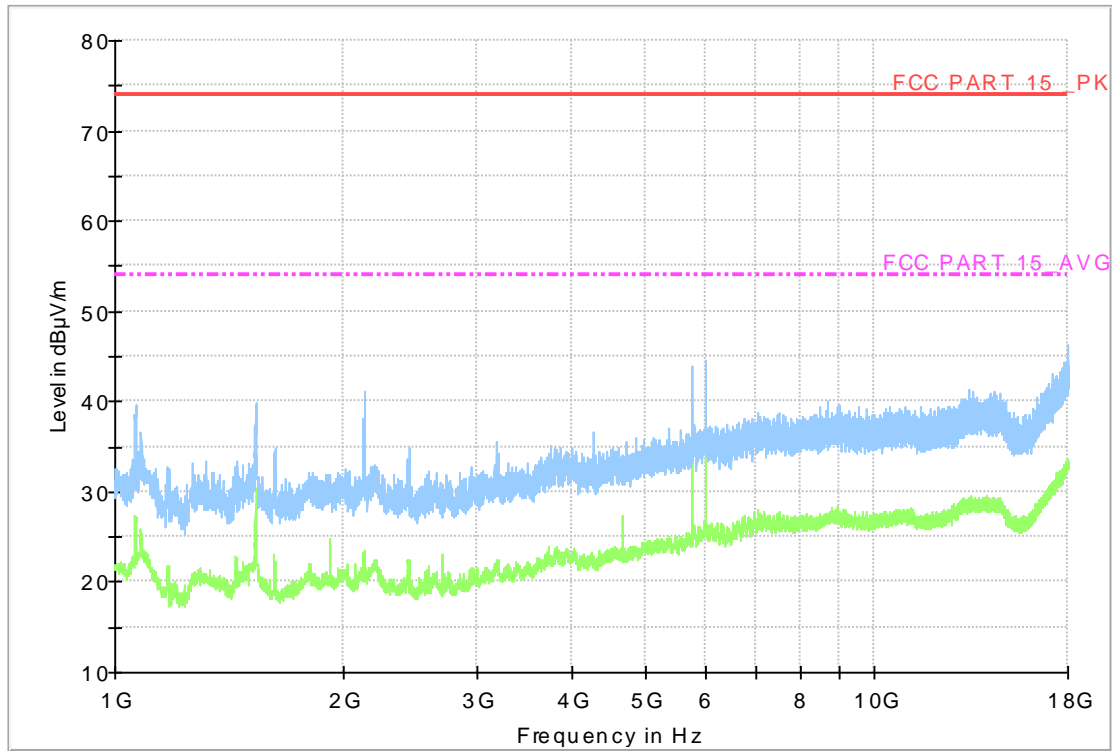


Fig A.1 Radiated Emission (GSM850MHz from 30MHz to 1GHz)

Final\_Result

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
167.994000	27.43	33.50	6.09	1000.0	120.000	125.0	V	86.0
169.976000	24.90	33.50	8.62	1000.0	120.000	108.0	V	66.0
264.024000	23.51	36.00	12.51	1000.0	120.000	102.0	V	90.0
359.994000	28.30	36.00	7.72	1000.0	120.000	112.0	V	291.0
408.009000	29.46	36.00	6.56	1000.0	120.000	390.0	H	-18.0
456.024000	24.33	36.00	11.69	1000.0	120.000	377.0	H	106.0

Full Spectrum



**Fig A.2 Radiated Emission (GSM850MHz from 1GHz to 18GHz)**



The measurements results for Set.2(with external antenna):

Full Spectrum

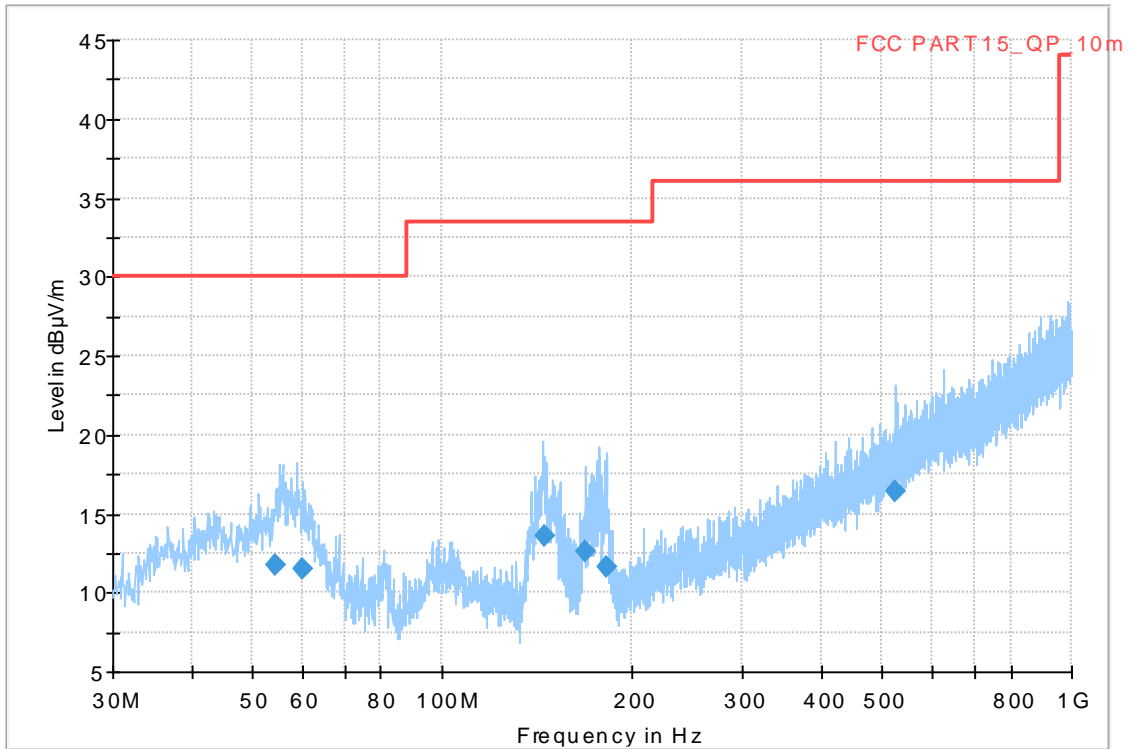
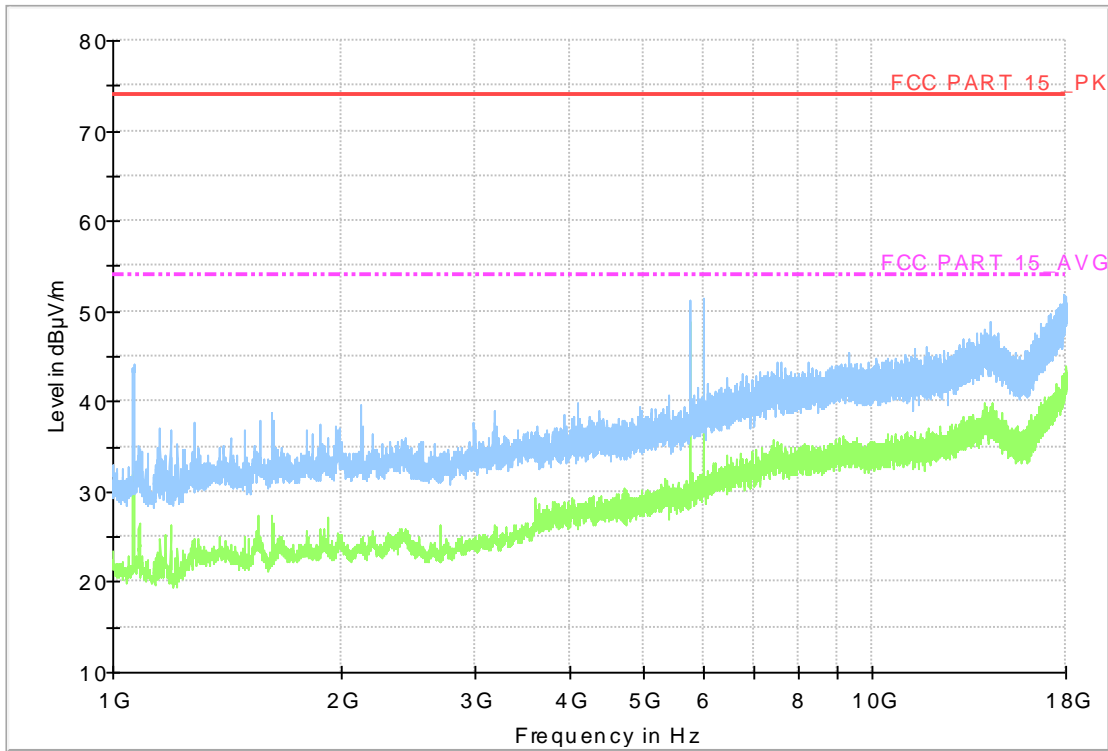


Fig A.3 Radiated Emission (GSM850MHz from 30MHz to 1GHz)

Final\_Result

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
54.287000	11.74	30.00	18.26	1000.0	120.000	325.0	V	267.0
60.130000	11.45	30.00	18.55	1000.0	120.000	175.0	V	182.0
145.518000	13.64	33.50	19.88	1000.0	120.000	102.0	V	77.0
169.315000	12.56	33.50	20.96	1000.0	120.000	125.0	V	280.0
182.752000	11.60	33.50	21.92	1000.0	120.000	121.0	V	279.0
525.023000	16.47	36.00	19.55	1000.0	120.000	391.0	V	65.0

Full Spectrum



**Fig A.4 Radiated Emission (GSM850MHz from 1GHz to 18GHz)**

The measurements results for Set.3:

Full Spectrum

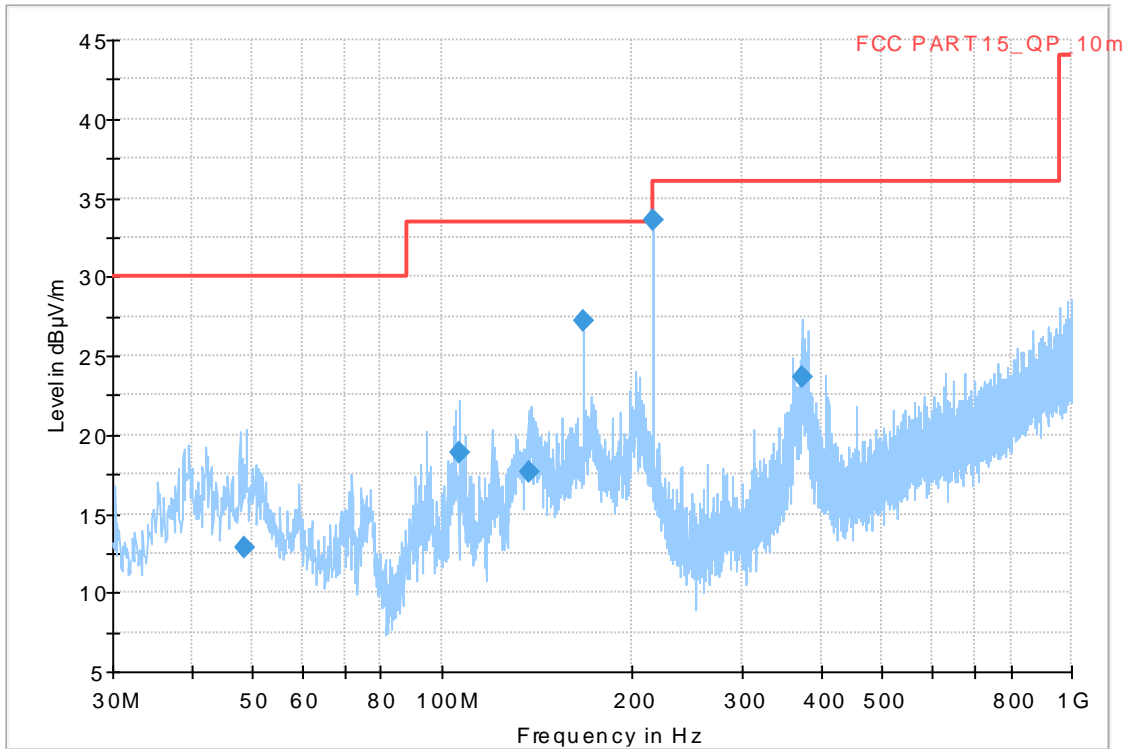
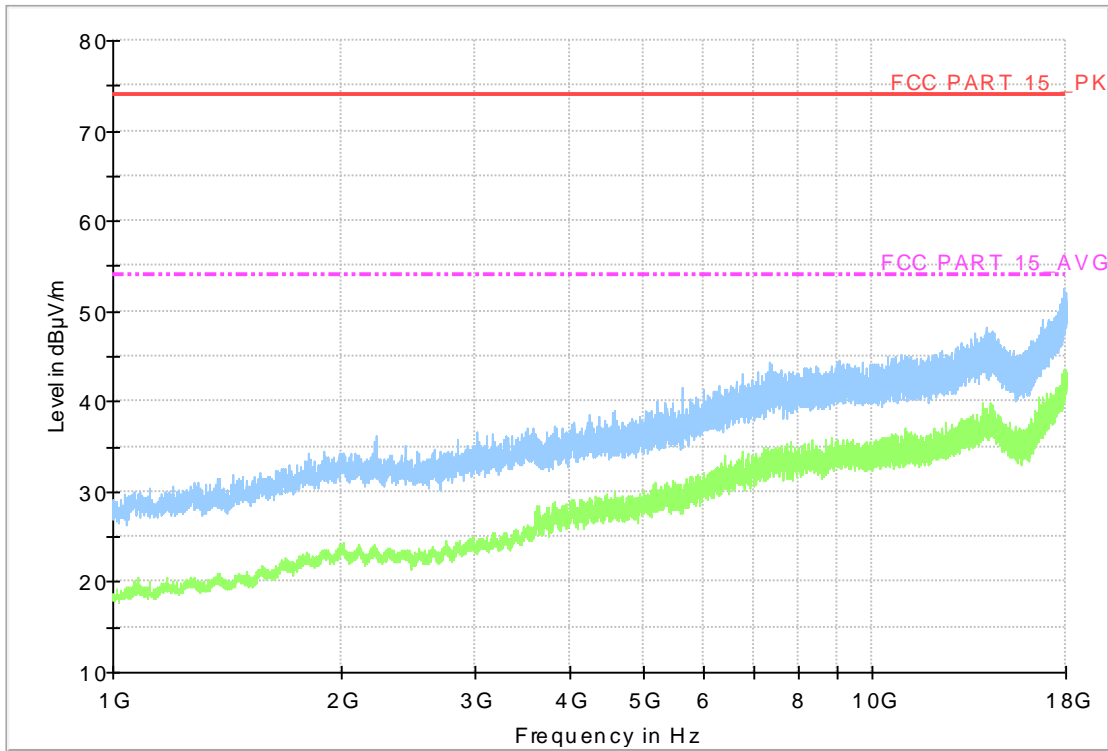


Fig A.5 Radiated Emission (GSM850MHz from 30MHz to 1GHz)

Final\_Result

Frequency (MHz)	QuasiPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
48.615000	12.89	30.00	17.11	1000.0	120.000	225.0	V	150.0
106.690000	18.87	33.50	14.65	1000.0	120.000	113.0	V	91.0
137.749000	17.62	33.50	15.90	1000.0	120.000	125.0	V	210.0
168.031000	27.17	33.50	6.35	1000.0	120.000	125.0	V	9.0
216.009000	33.55	36.00	2.47	1000.0	120.000	100.0	V	110.0
373.246000	23.61	36.00	12.41	1000.0	120.000	105.0	V	30.0

Full Spectrum



**Fig A.6 Radiated Emission (GSM850MHz 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 EUT is operating in the receiver mode with power adaptor. During the test EUT is connected with PC and telephone. The model of the PC is Lenovo T430, and the serial number of the PC is PB-7A0D8. The model of the telephone is HA007(12b)T, and the serial number of the telephone is AC5KDK004073.

### 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,  $k=2$ .

The measurements for Set.1:

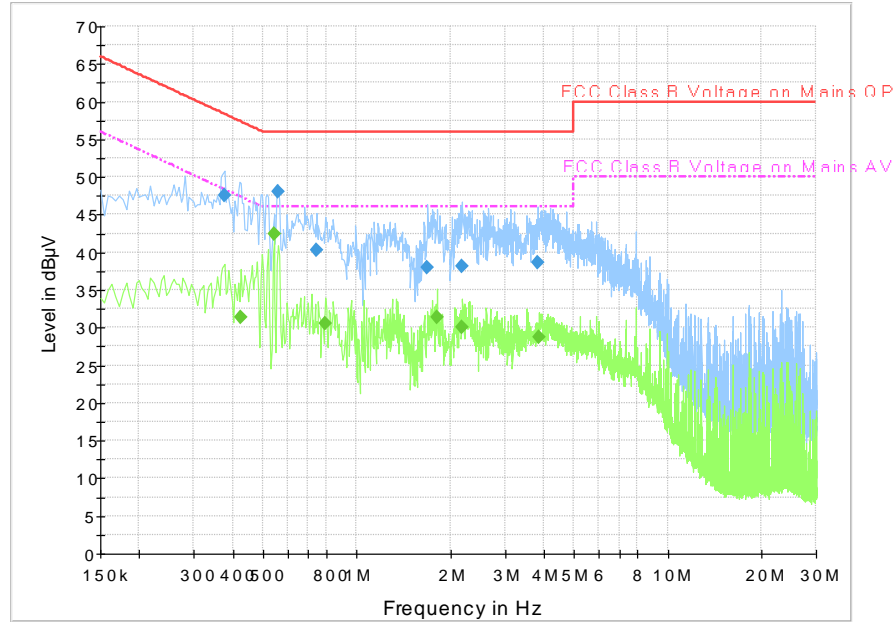


Fig A.7 Radiated Emission from 30MHz to 1GHz

#### Final Result 1

Frequency (MHz)	QuasiPeak (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.375000	47.5	1000.0	9.000	On	L1	19.8	10.9	58.4	
0.559500	48.1	1000.0	9.000	On	L1	19.9	7.9	56.0	
0.744000	40.3	1000.0	9.000	On	L1	19.9	15.7	56.0	
1.689000	38.0	1000.0	9.000	On	L1	19.8	18.0	56.0	
2.184000	38.2	1000.0	9.000	On	L1	19.8	17.8	56.0	
3.817500	38.7	1000.0	9.000	On	L1	19.8	17.3	56.0	

#### Final Result 2

Frequency (MHz)	Average (dBuV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBuV)	Comment
0.424500	31.3	1000.0	9.000	On	L1	19.8	16.0	47.4	
0.541500	42.3	1000.0	9.000	On	N	19.9	3.7	46.0	
0.793500	30.6	1000.0	9.000	On	L1	19.8	15.4	46.0	
1.810500	31.4	1000.0	9.000	On	L1	19.8	14.6	46.0	
2.184000	30.0	1000.0	9.000	On	L1	19.8	16.0	46.0	
3.858000	28.8	1000.0	9.000	On	L1	19.8	17.2	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 Wang Huan Li Pengfei

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