



# TEST REPORT

## No. I23Z60031-EMC01

for

**TCL Communication Ltd.**

**LINKHUB**

**Model Name: HH63AF**

**FCC ID: 2ACCJB195**

with

**Hardware Version: PIO**

**Software Version: HH63A\_00\_02.00\_03**

**Issued Date: 2023-01-17**

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The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

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## **REPORT HISTORY**

<b>Report Number</b>	<b>Revision</b>	<b>Description</b>	<b>Issue Date</b>
I23Z60031-EMC01	Rev.0	1 <sup>st</sup> edition	2023-01-17

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

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## 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: 2023-01-09

Testing End Date: 2023-01-16

### 1.4. Signature



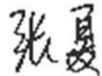
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(Approved this test report)



## **2. Client Information**

### **2.1. Applicant Information**

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

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

#### **3.1. About EUT**

Description	LINKHUB
Model Name	HH63AF
FCC ID:	2ACCJB195

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
UT04a	358814640110047	PIO	HH63A_00_02.00_03

\*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
AE1	Charger1
AE2	Charger2
AE3	Charger3

AE1

Model	CYSE12-120100U
Manufacturer	CHENYANG

AE2

Model	1-CHUSB102-131
Manufacturer	PUAN

AE3

Model	S012CDU1200100
Manufacturer	TENPAO

\*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	Charger1 + WCDMA 850 idle
Set.2	EUT1 + AE2	Charger2 + LTE B5 idle
Set.3	EUT1 + AE3	Charger3

Note:

Equipment Under Test (EUT) is a model of Linkhub with integrated and external antenna.

It supports

UMTS Band            FDD Band I(W2100) /FDD Band II(W1900) /FDD Band IV(W1700)/FDD Band V(W850)

LTE Band            FDD2/FDD4/FDD5/FDD7/FDD28/FDD 66

It has Wi-Fi (802.11a/b/g/n/ac, 802.11n supports 20MHz and 40MHz bandwidth, 802.11ac



supports 20MHz, 40MHz and 80MHz bandwidth) functions.

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

I23Z60031 is a variant model based on I22Z61951 for conformance test. According to the declaration of changes, the following test items and test modes were performed:

Test Item	Mode or Feature	EUT Set-up
Radiated Continuous Emission	Charging mode	Set.1/2/3

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.

<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.



## 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 $\Omega$
Ground system resistance	< 4 $\Omega$
Normalised site attenuation (NSA)	< $\pm 4$ 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 $\Omega$
Ground system resistance	< 4 $\Omega$

## 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)

## 7. Test Equipments Utilized

NO.	Description	TYPE	SERIES NUMBER	MANUFACTURE	CAL DUE DATE	CALIBRATION INTERVAL
1	Test Receiver	ESW44	103015	R&S	2023-01-23	1 year
2	LISN	ENV216	101200	R&S	2023-06-29	1 year
3	Universal Radio Communication Tester	CMW500	167943	R&S	2023-04-13	1 year
4	Test Receiver	ESCI 7	100344	R&S	2023-03-21	1 Year
5	EMI Antenna	VULB 9163	01223	SCHWARZBECK	2023-07-25	1 year
6	EMI Antenna	3115	00167250	ETS-Lindgren	2023-06-20	1 year
7	Software	EMC32	/	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 (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 ( $\mu\text{V/m}$ )		
	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/3MHz	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):  $U = 5.54 \text{ dB}$ ,  $k=2$ .

#### Measurement results for Set.1:

##### Charing Mode/Average detector

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)
17998.300	41.4	-29.1	46.7	23.8	54.0	12.6	H
17999.320	41.4	-29.1	46.7	23.8	54.0	12.6	V
17991.500	41.4	-29.1	46.7	23.8	54.0	12.6	H
17995.240	41.4	-29.1	46.7	23.8	54.0	12.6	V
17997.960	41.3	-29.1	46.7	23.7	54.0	12.7	H
17995.580	41.3	-29.1	46.7	23.7	54.0	12.7	V

##### Charging Mode/Peak detector

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)
17959.540	52.1	-28.9	46.7	34.4	74.0	21.9	H
17996.260	52.0	-29.1	46.7	34.4	74.0	22.0	V
17982.660	51.9	-29.1	46.7	34.3	74.0	22.1	H
17998.980	51.7	-29.1	46.7	34.1	74.0	22.3	V
17989.120	51.5	-29.1	46.7	33.9	74.0	22.5	V
17991.840	51.5	-29.1	46.7	33.9	74.0	22.5	V

**Measurement results for Set.2:**
**Charing Mode/Average detector**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)
17559.700	42.0	-29.5	44.4	27.1	54.0	12.0	V
17993.540	41.9	-29.1	46.7	24.3	54.0	12.1	V
17900.380	41.8	-29.3	46.0	25.2	54.0	12.2	H
17548.480	41.7	-29.5	44.4	26.8	54.0	12.3	H
17792.940	41.6	-29.9	46.0	25.5	54.0	12.4	H
17544.400	41.5	-29.5	44.4	26.6	54.0	12.5	V

**Charging Mode/Peak detector**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)
17896.980	52.6	-29.5	46.0	36.2	74.0	21.4	H
17939.820	52.2	-29.4	46.7	34.9	74.0	21.8	H
17589.960	52.0	-29.7	45.2	36.4	74.0	22.0	H
17923.840	52.0	-29.4	46.7	34.7	74.0	22.0	V
17542.360	52.0	-29.5	44.4	37.1	74.0	22.0	V
17585.540	52.0	-29.7	45.2	36.4	74.0	22.0	H

**Measurement results for Set.3:**
**Charging Mode/Average detector**

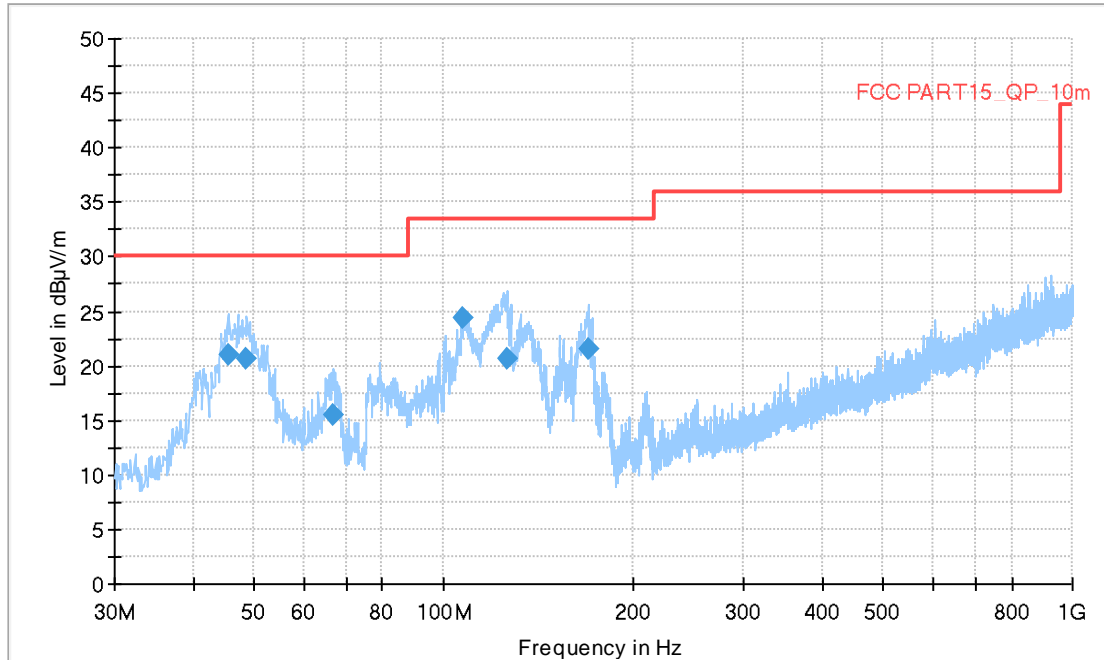
Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)
17979.260	41.7	-29.1	46.7	24.1	54.0	12.3	V
17994.220	41.4	-29.1	46.7	23.8	54.0	12.6	V
17992.520	41.3	-29.1	46.7	23.7	54.0	12.7	V
17996.260	41.3	-29.1	46.7	23.7	54.0	12.7	V
17548.480	41.1	-29.5	44.4	26.2	54.0	12.9	H
17972.800	41.1	-29.1	46.7	23.5	54.0	12.9	V

**Charging Mode/Peak detector**

Frequency (MHz)	Measurement Result (dB $\mu$ V/m)	Cable loss (dB)	Antenna Factor (dB/m)	Receiver Reading (dB $\mu$ V)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna Pol. (H/V)
17997.620	52.1	-29.1	46.7	34.5	74.0	21.9	H
17556.300	51.9	-29.5	44.4	37.0	74.0	22.1	V
17990.820	51.9	-29.1	46.7	34.3	74.0	22.1	V
17993.200	51.8	-29.1	46.7	34.2	74.0	22.2	V
17646.400	51.8	-29.6	45.2	36.2	74.0	22.2	H
17511.760	51.8	-29.3	44.4	36.7	74.0	22.2	V

**Measurement results for Set.1:**

Full Spectrum



— Preview Result 1-PK+      \* Critical\_Freacs PK+  
— FCC PART15\_QP\_10m      ◆ Final\_Result QPK

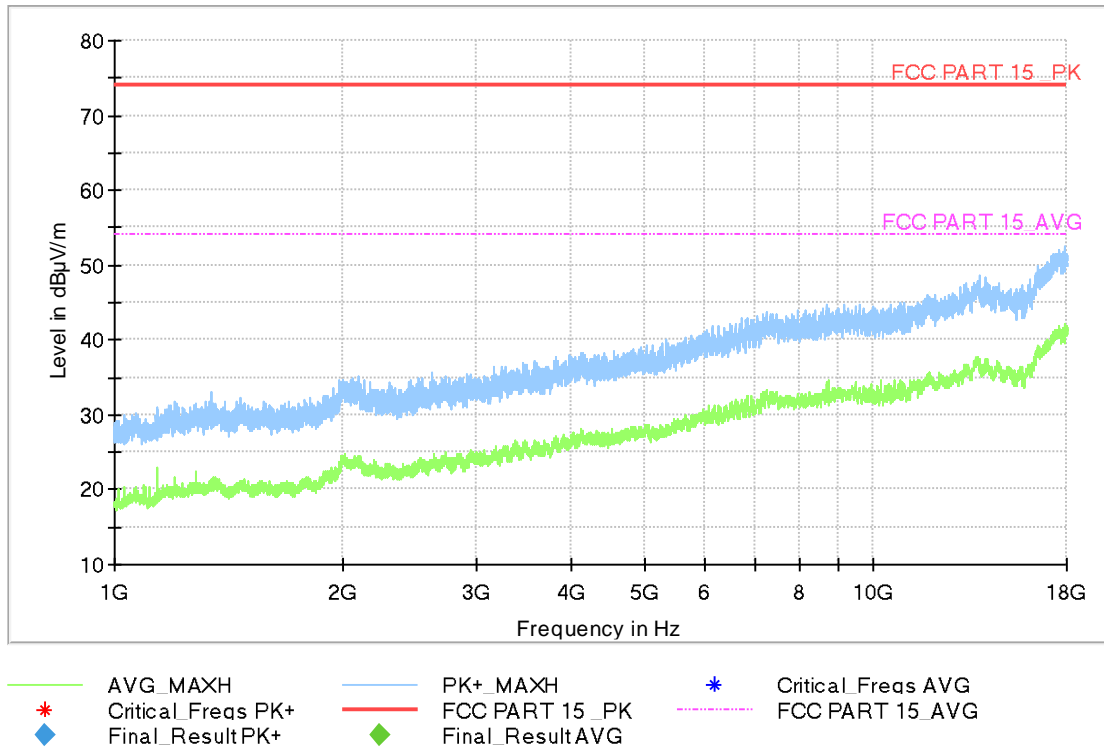
**Fig A.1 Radiated Emission from 30MHz to 1GHz**

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
45.617000	20.91	30.00	9.09	120.000	100.0	V	45.0
48.721000	20.56	30.00	9.44	120.000	100.0	V	59.0
66.957000	15.55	30.00	14.45	120.000	100.0	V	253.0
107.018000	24.35	33.52	9.17	120.000	125.0	V	47.0
126.321000	20.60	33.52	12.92	120.000	175.0	V	135.0
169.874000	21.59	33.52	11.93	120.000	100.0	V	279.0



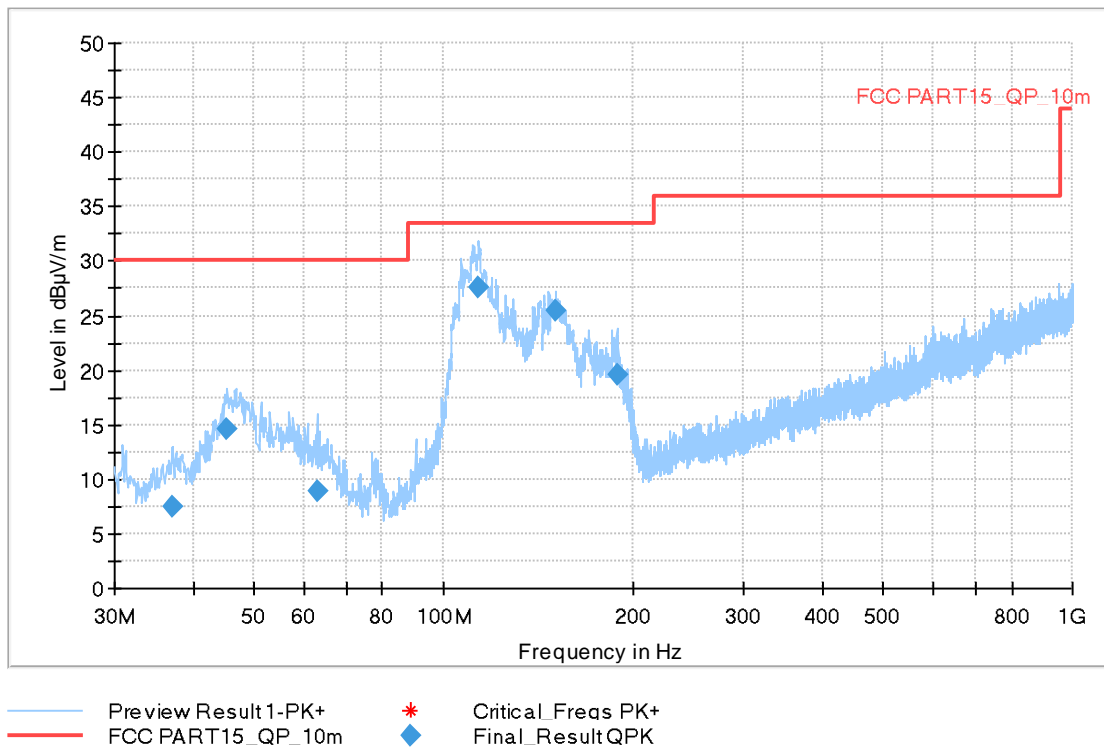
Full Spectrum



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

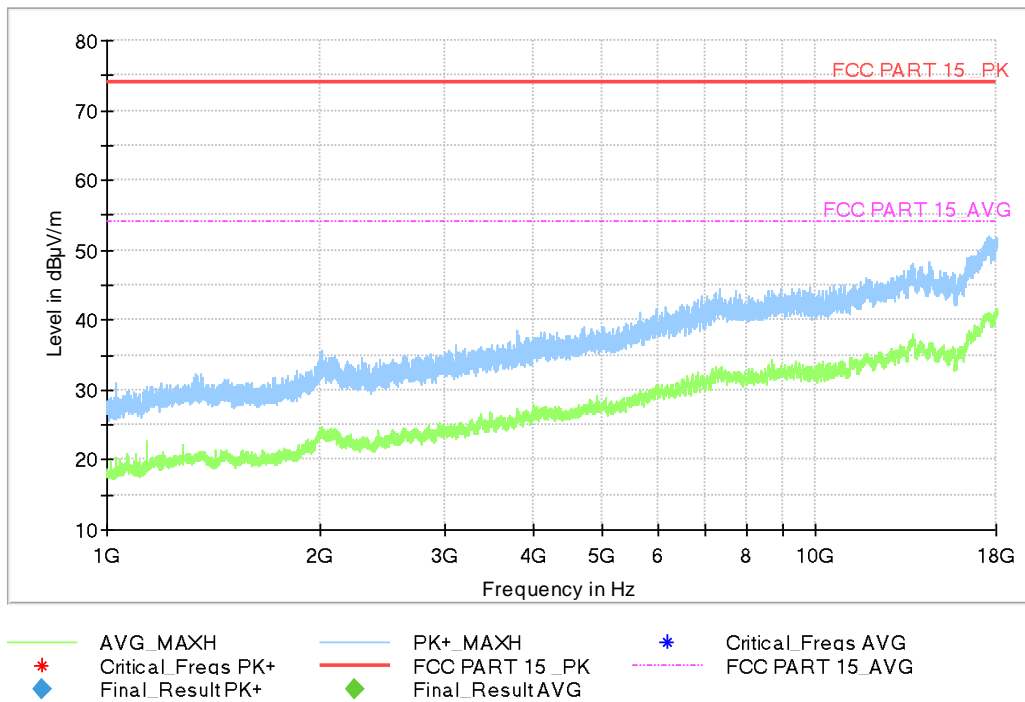
**Measurement results for Set.2:**

Full Spectrum


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

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
37.178000	7.53	30.00	22.47	120.000	325.0	V	-17.0
45.326000	14.51	30.00	15.49	120.000	100.0	V	-43.0
62.980000	8.84	30.00	21.16	120.000	183.0	V	315.0
113.711000	27.50	33.52	6.02	120.000	100.0	V	-17.0
151.056000	25.43	33.52	8.09	120.000	100.0	V	45.0
188.595000	19.64	33.52	13.88	120.000	100.0	V	253.0

Full Spectrum



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

Measurement results for Set.3:

Full Spectrum

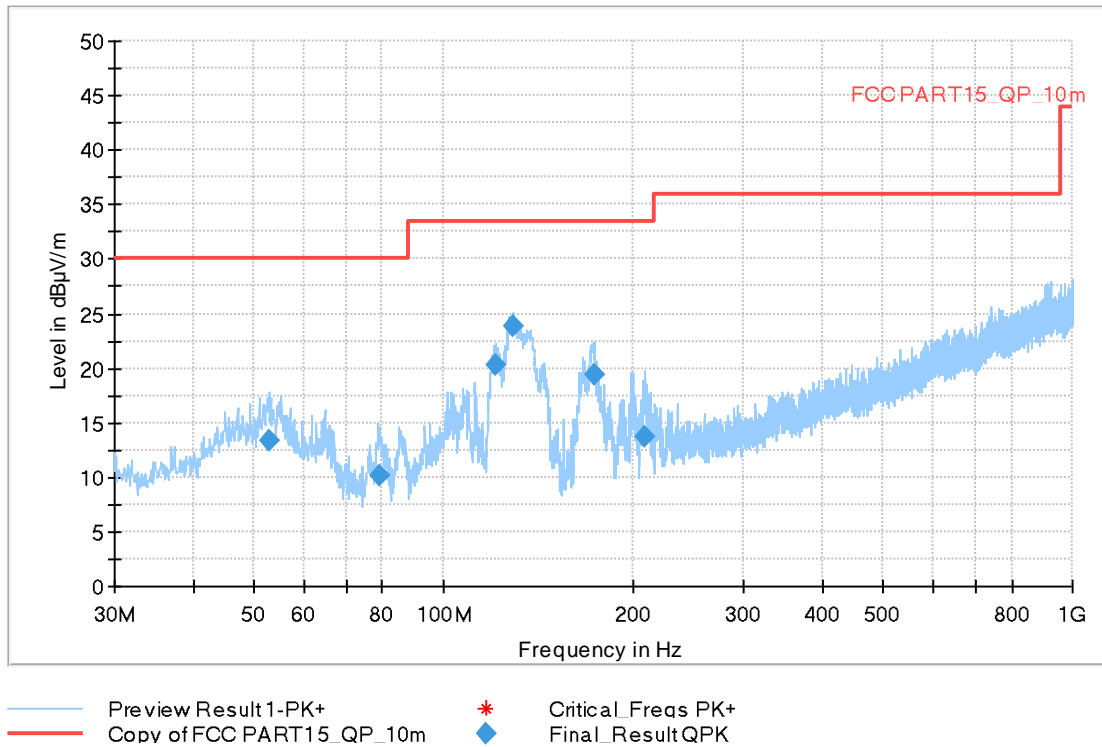
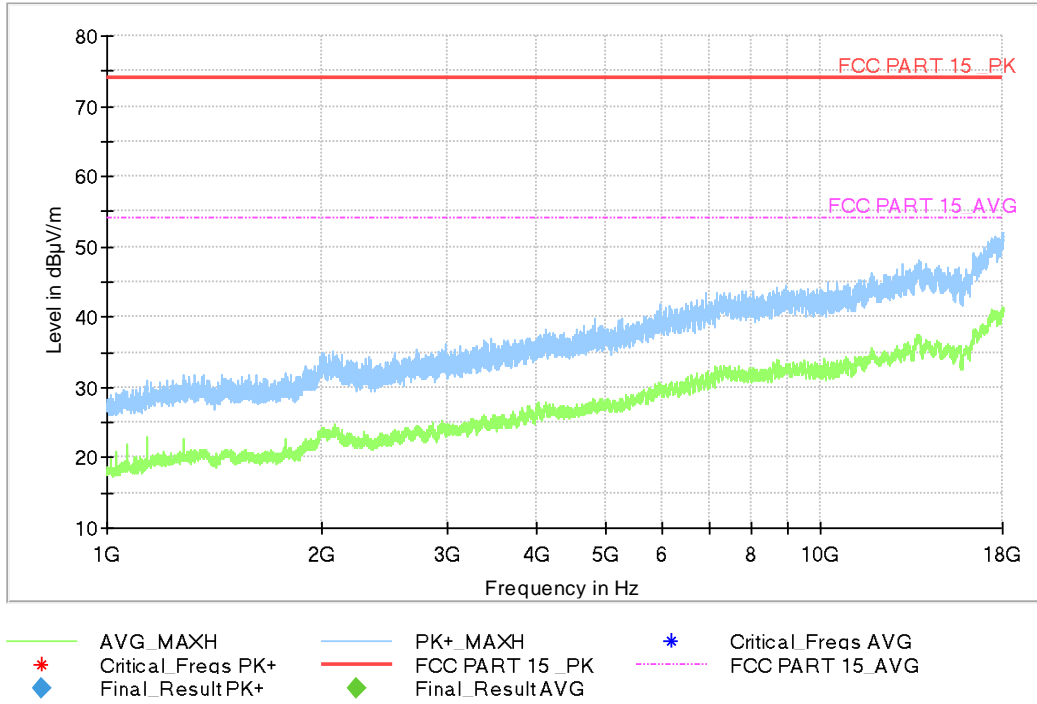


Fig A.5 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)
52.795000	13.41	30.00	16.59	120.000	100.0	V	-18.0
79.276000	10.21	30.00	19.79	120.000	100.0	V	-18.0
121.374000	20.23	33.50	13.27	120.000	108.0	V	163.0
128.746000	23.80	33.50	9.70	120.000	108.0	V	137.0
173.366000	19.46	33.50	14.04	120.000	100.0	V	278.0
208.674000	13.72	33.50	19.78	120.000	223.0	V	85.0

Full Spectrum



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

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