



# FCC PART 15B TEST REPORT

No. I22Z61591-EMC01

for

**HMD Global Oy**

**GSM/WCDMA/LTE phone**

**Model name: TA-1420**

**FCC ID: 2AJOTTA-1420**

with

**Hardware Version: 1.0**

**Software Version: 00.2231.20.01**

**Issued Date: 2022-09-28**

**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>
I22Z61591-EMC01	Rev.0	1 <sup>st</sup> edition	2022-09-23
I22Z61591-EMC01	Rev.1	2 <sup>nd</sup> edition. Add the test results of FM.	2022-09-27
I22Z61591-EMC01	Rev.2	3 <sup>rd</sup> edition. Update the section 3.4.	2022-09-28

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



## **CONTENTS**

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

## **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: 2022-09-13

Testing End Date: 2022-09-26

### **1.4. Signature**



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An Hui

(Prepared this test report)



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Zhang Ying

(Reviewed this test report)



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Zhang Xia

Deputy Director of the laboratory

(Approved this test report)



## **2. Client Information**

### **2.1. Applicant Information**

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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	GSM/WCDMA/LTE phone
Model Name	TA-1420
FCC ID:	2AJOTTA-1420

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	004402972592855	1.0	00.2231.20.01

\*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	TRAVEL CHARGER	/	/
AE2	USB cable	/	/
AE3	battery	/	/
AE4	HEADSET	/	/

##### AE1

Model	DSA-5PF18-05 FUS 050100
Manufacturer	SHENZHEN BAIJUNDA ELECTRONIC CO LTD
Length of cable	/

##### AE2

Model	USB cable
Manufacturer	/
Length of cable	/

##### AE3

Model	HE402
Manufacturer	SHENZHEN UTILITY ENERGY CO., LTD.
Length of cable	/

##### AE4

Model	HEADSET
Manufacturer	/
Length of cable	/

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

### 3.4. EUT set-ups

<b>EUT set-up No.</b>	<b>Combination of EUT and AE</b>	<b>Remarks</b>
Set.4	EUT1 + AE2 + AE3	USB + Front camera +LTE B26 idle
Set.5	EUT1 + AE1 +AE2+ AE3	Charger + REAR Camera + GSM 850 idle
Set.6	EUT1 + AE1 +AE2+ AE3	Charger + FM

Note:

Equipment Under Test (EUT) is a model of GSM/UMTS/LTE Mobile phone with integrated antenna.

It supports

GSM Frequency Band GSM 900/GSM 1800/GSM 1900/GSM 850

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

LTE Frequency Band LTE FDD Bands 2/4/5/7/12/13/17/25/26/66/71, LTE FDD Bands 41.

It has MP3, Camera, USB memory, Bluetooth 5.0, Wi-Fi (802.11b/g/n, 802.11n supports 20MHzbandwidth) , GPS and GLONASS functions

The device contains receivers which tune and operate between 30MHz-960MHz in the following bands: GSM850, WCDMA850, LTE Band 5/12/13/17/26/71. 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.

<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 MΩ
Ground system resistance	< 4 Ω
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 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

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	100344	R&S	2023-03-21	1 Year
2	LISN	ENV216	101200	R&S	2023-06-29	1 year
3	Universal Radio Communication Tester	CMW500	116588	R&S	2022-12-20	1 year
4	Test Receiver	ESW44	103023	R&S	2022-10-28	1 Year
5	EMI Antenna	VULB 9163	302	Schwarzbeck	2022-12-28	1 year
6	EMI Antenna	3115	00167250	ETS-Lindgren	2023-06-20	1 year
7	Signal Generator	SMBV100A	260613	R&S	2023-01-09	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 ( $\mu\text{V}/\text{m}$ )		
	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/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:

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

Where

$G_A$ : Antenna factor of receive antenna

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

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

Measurement uncertainty (worst case):  $U = 4.74 \text{ dB}$ ,  $k=2$ .

#### Measurement results for Set.4:

##### Charing 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)	Limit (dB $\mu$ V/m)	Margin (dB)
6049.680	42.9	-37.8	34.4	46.3	H	54.0	11.1
6050.020	42.7	-37.8	34.4	46.1	H	54.0	11.3
17799.060	41.6	-29.9	46.0	25.5	V	54.0	12.4
17552.900	41.4	-29.5	44.4	26.5	V	54.0	12.6
17649.120	41.0	-29.6	45.2	25.4	H	54.0	13.0
17646.400	41.0	-29.6	45.2	25.4	H	54.0	13.0

##### Charging 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)	Limit (dB $\mu$ V/m)	Margin (dB)
17645.040	51.9	-29.6	45.2	36.3	V	74.0	22.1
17788.520	51.7	-29.9	46.0	35.6	H	74.0	22.3
17802.800	51.6	-29.6	46.0	35.3	V	74.0	22.4
17806.200	51.5	-29.6	46.0	35.2	V	74.0	22.5
17898.680	51.4	-29.5	46.0	35.0	V	74.0	22.6
17618.180	51.3	-29.5	45.2	35.6	V	74.0	22.7

**Measurement results for Set.5:**
**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)
17468.920	41.8	-30.1	44.4	27.5	54.0	12.2	V
17462.460	41.5	-30.1	44.4	27.2	54.0	12.5	H
17559.360	41.5	-29.5	44.4	26.6	54.0	12.5	H
17904.120	41.3	-29.3	46.0	24.7	54.0	12.7	H
17552.560	41.2	-29.5	44.4	26.3	54.0	12.8	V
17561.740	41.2	-29.8	45.2	25.7	54.0	12.8	H

**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)
17530.460	52.2	-29.3	44.4	37.2	74.0	21.8	V
17487.960	52.0	-29.8	44.4	37.4	74.0	22.0	H
17465.860	51.8	-30.1	44.4	37.5	74.0	22.2	V
17530.120	51.7	-29.3	44.4	36.7	74.0	22.3	V
17952.740	51.6	-28.9	46.7	33.9	74.0	22.4	V
17629.400	51.6	-29.4	45.2	35.8	74.0	22.4	H

**Measurement results for Set.6:**
**Charing 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)	Limit (dB $\mu$ V/m)	Margin (dB)
17988.440	41.0	-29.1	46.7	23.398	H	54.0	13.0
17957.500	41.0	-28.9	46.7	23.283	H	54.0	13.0
17240.440	40.8	-30.0	43.4	27.464	H	54.0	13.2
17951.720	40.6	-28.9	46.7	22.883	H	54.0	13.4
17951.040	40.6	-28.9	46.7	22.883	V	54.0	13.4
17753.500	40.5	-29.6	46.0	24.156	V	54.0	13.5

**Charging 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)	Limit (dB $\mu$ V/m)	Margin (dB)
17252.340	53.1	-30.0	43.4	39.764	H	74.0	20.9
17949.340	52.4	-28.9	46.7	34.683	V	74.0	21.6
17979.940	52.3	-29.1	46.7	34.701	V	74.0	21.7
17756.560	52.3	-29.6	46.0	35.956	V	74.0	21.7
17281.240	52.1	-29.7	43.4	38.434	H	74.0	21.9
17238.740	51.9	-29.6	43.4	38.109	H	74.0	22.1

Measurement results for Set.4:

Full Spectrum

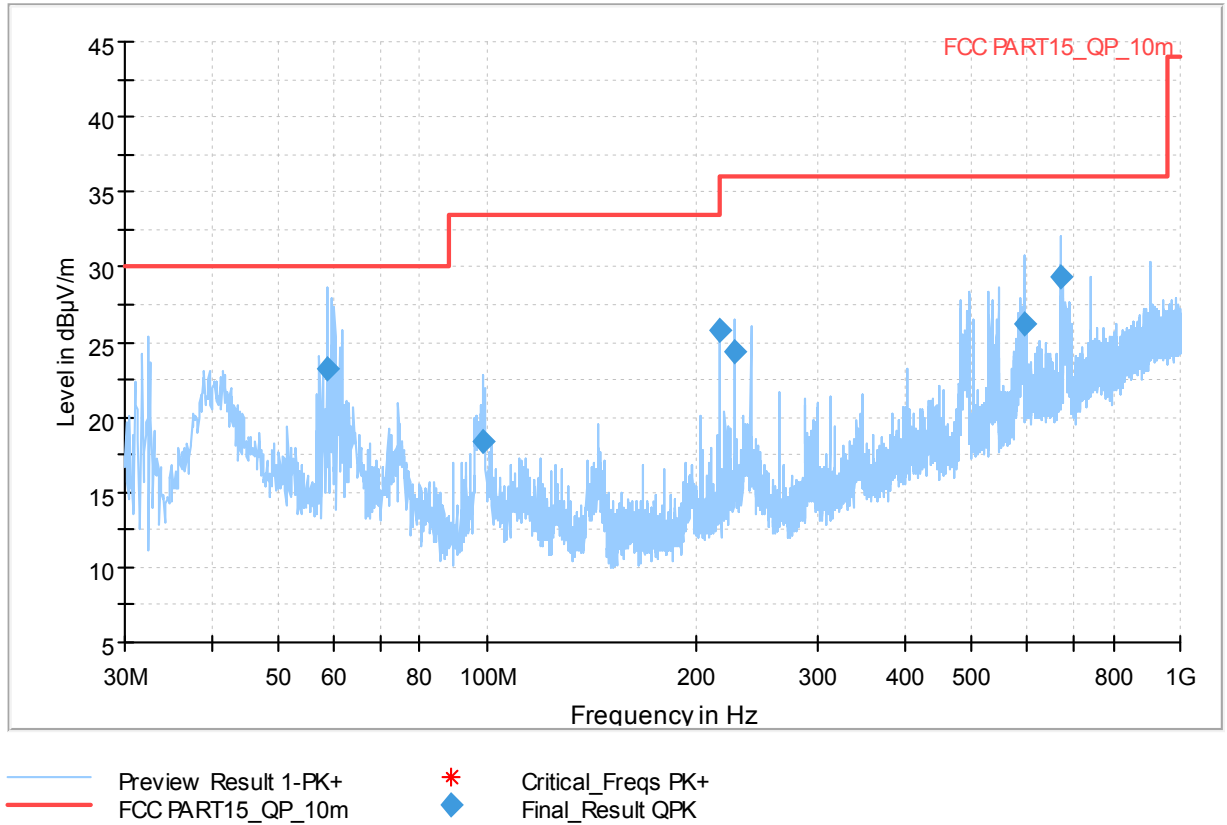


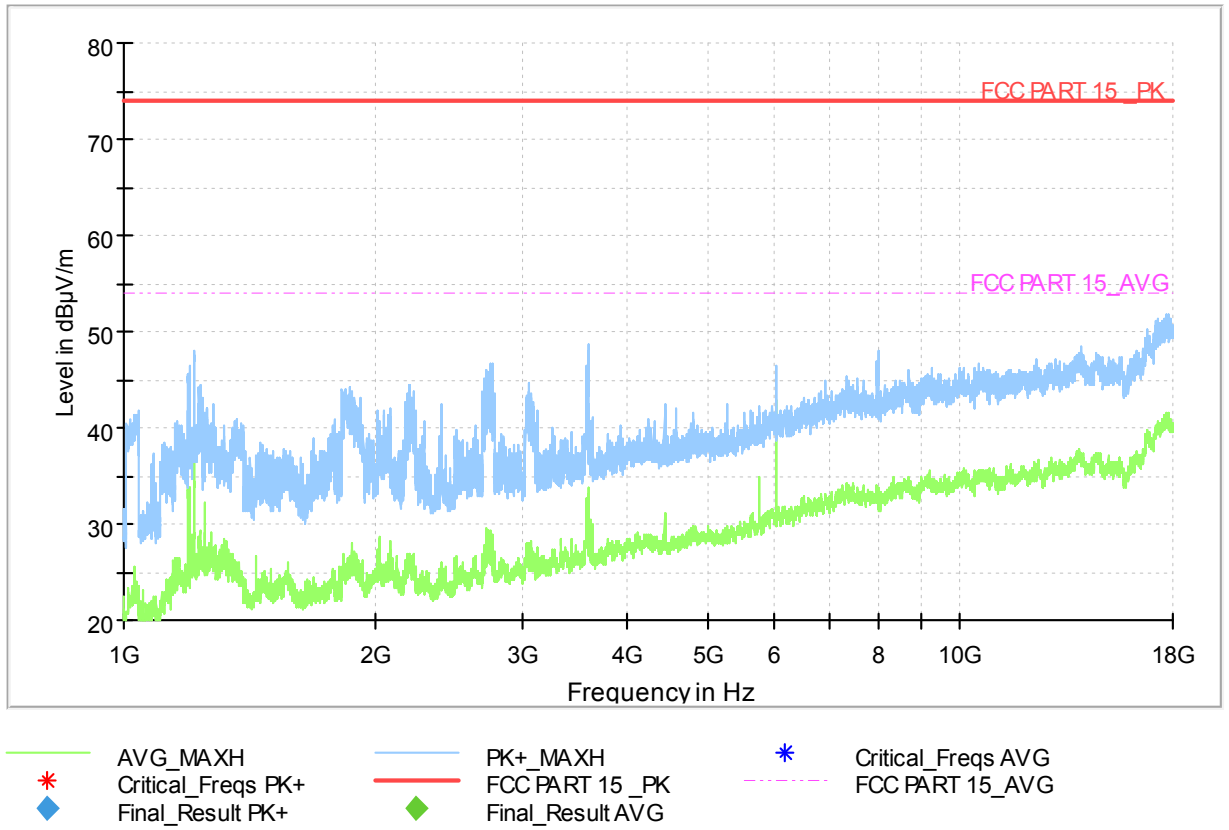
Fig A.1 Radiated Emission from 30MHz to 1GHz

Final Result 1

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
58.809000	23.20	30.00	6.80	283.0	V	265.0
98.676000	18.34	33.52	15.18	108.0	V	45.0
216.046000	25.76	36.02	10.26	125.0	V	203.0
228.074000	24.43	36.02	11.59	125.0	V	47.0
595.510000	26.27	36.02	9.75	203.0	V	-4.0
673.110000	29.41	36.02	6.61	183.0	V	8.0



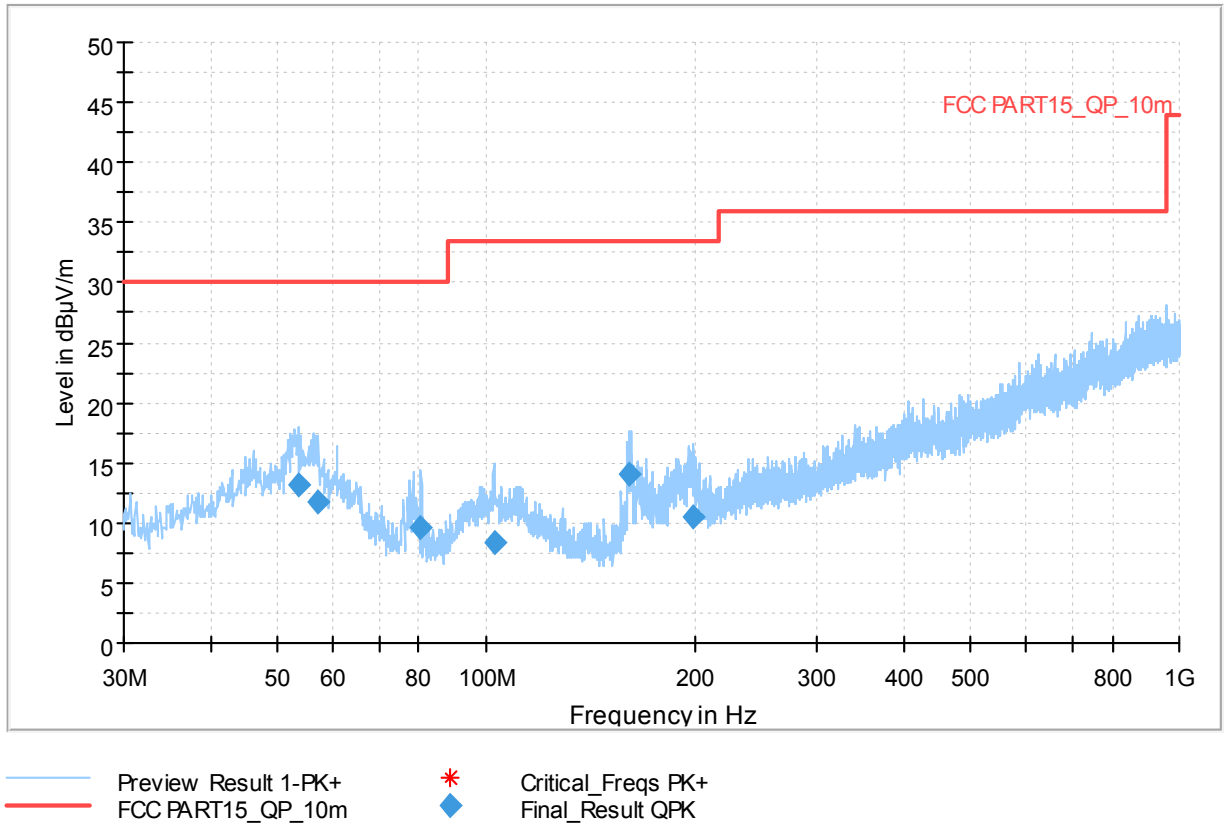
Full Spectrum



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

**Measurement results for Set.5:**

Full Spectrum

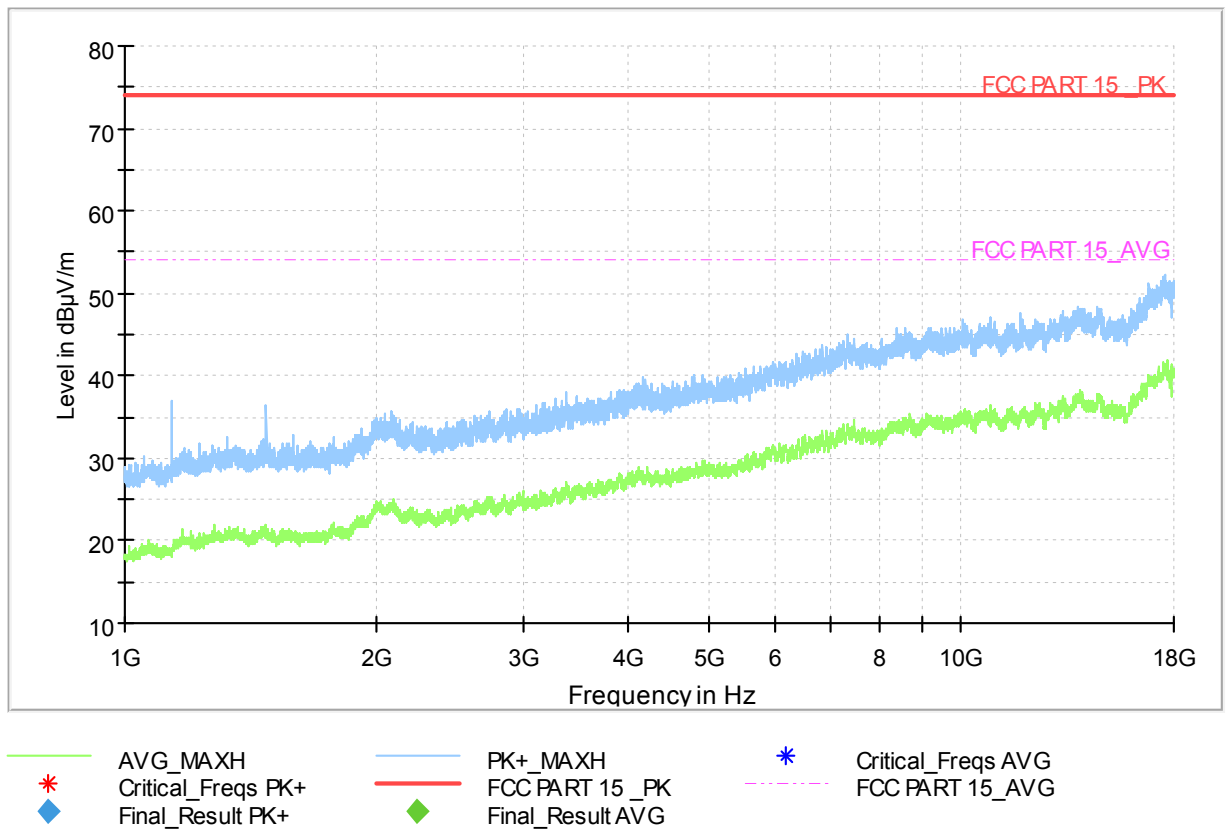


**Fig A.3 Radiated Emission from 30MHz to 1GHz**

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
53.668000	13.26	30.00	16.74	108.0	V	238.0
57.354000	11.72	30.00	18.28	304.0	V	84.0
80.537000	9.52	30.00	20.48	325.0	V	291.0
102.556000	8.42	33.52	25.10	225.0	H	-45.0
161.144000	14.09	33.52	19.43	100.0	V	8.0
198.780000	10.45	33.52	23.07	125.0	V	72.0

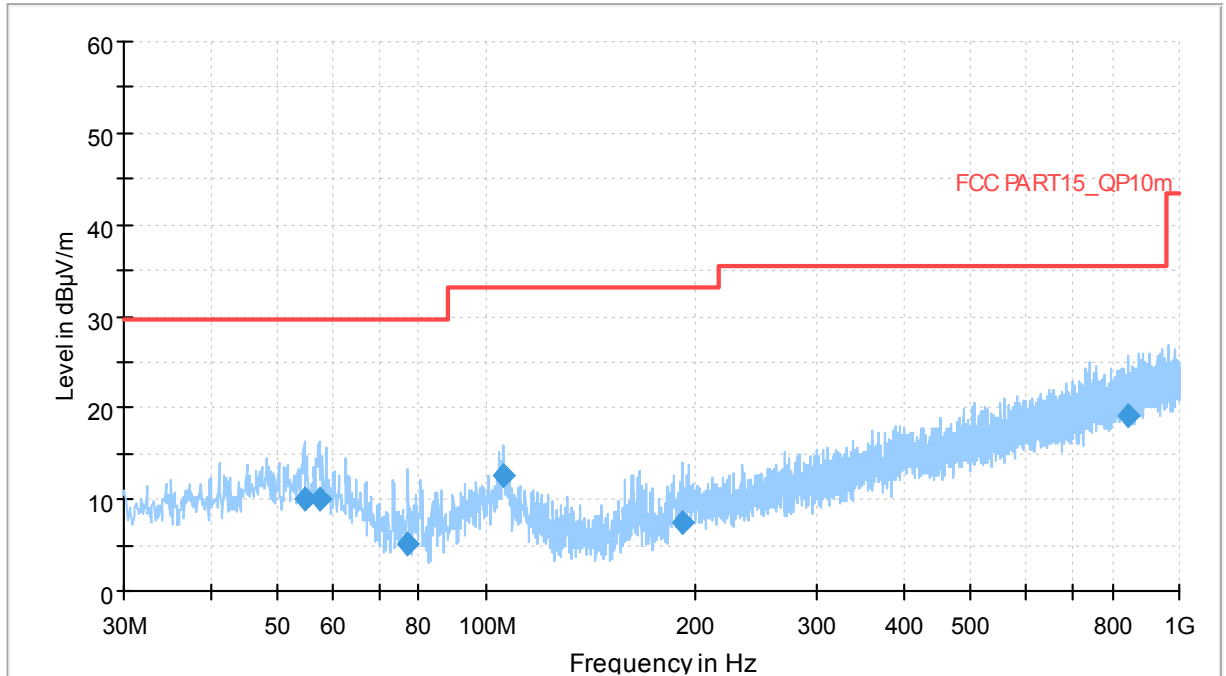
Full Spectrum



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

**Measurement results for Set.6:**

Full Spectrum



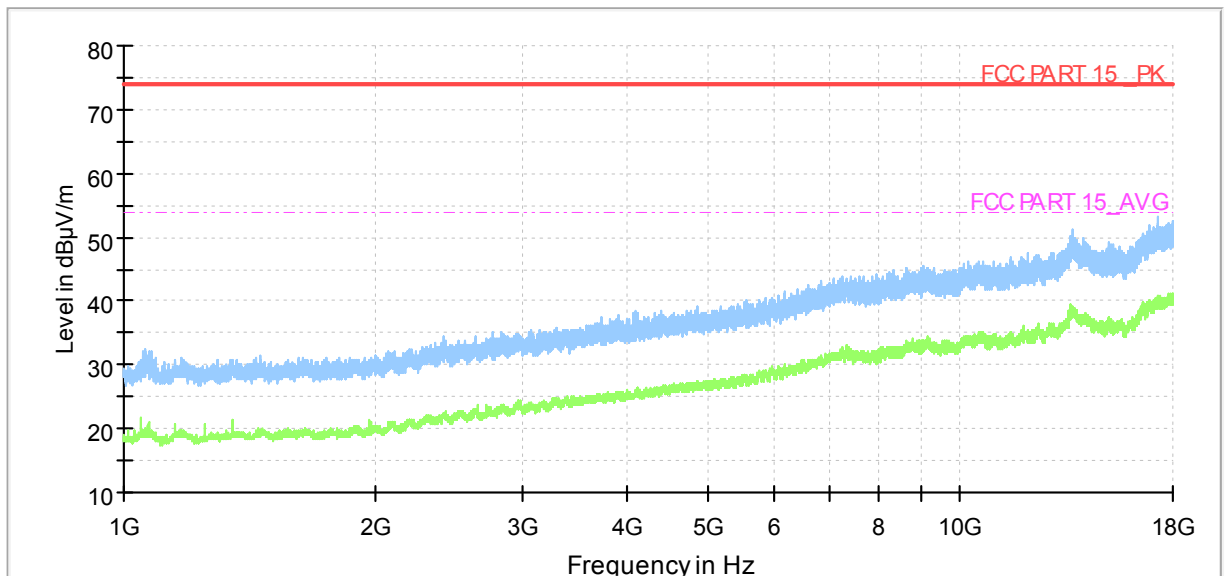
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- \* Critical\_Freqs PK+ [Critical\_Freqs.Result:4]
- FCC PART15\_QP10m [.]
- ◆ Final\_Result QPK [Final\_Result.Result:4]

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

**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)
54.638000	10.11	29.54	19.43	125.0	V	45.0
57.451000	10.08	29.54	19.46	175.0	V	225.0
77.142000	5.24	29.54	24.30	325.0	V	45.0
106.048000	12.63	33.06	20.43	98.0	V	161.0
191.602000	7.46	33.06	25.60	275.0	V	47.0
845.091000	19.25	35.56	16.31	275.0	H	135.0

Full Spectrum



- Preview Result 2-AVG [Preview Result 2.Result:2]
- Preview Result 1-PK+ [Preview Result 1.Result:1]
- \* Critical\_Freqs AVG [Critical\_Freqs.Result:5]
- \* Critical\_Freqs PK+ [Critical\_Freqs.Result:4]
- FCC PART 15\_PK [..]
- - - FCC PART 15\_AVG [..]
- ◆ Final\_Result PK+ [Final\_Result.Result:4]
- ◆ Final\_Result AVG [Final\_Result.Result:5]

**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 (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:  $U= 3.1 \text{ dB}$ ,  $k=2$ .

#### Charging Mode, Set.4:

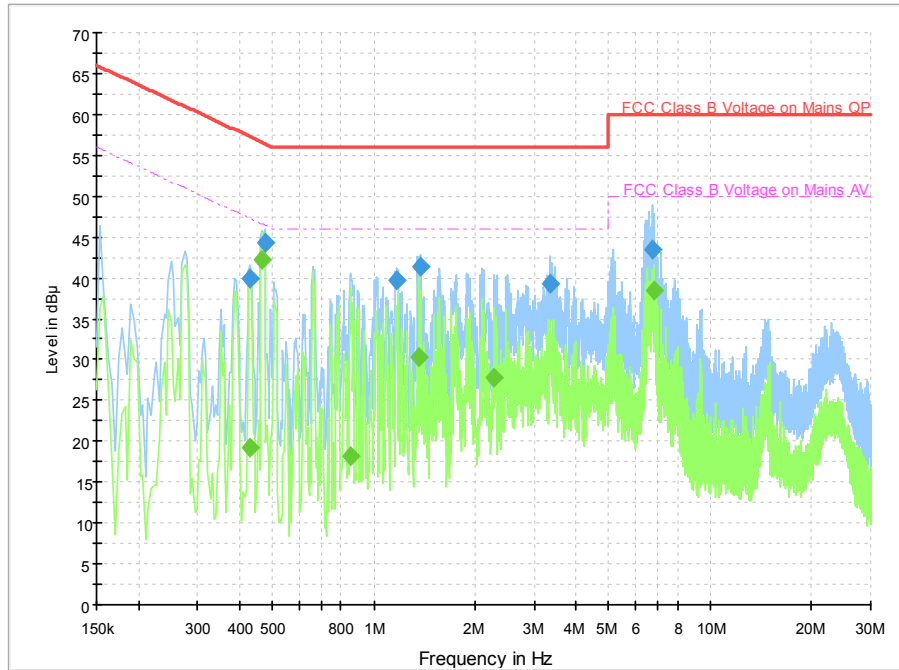


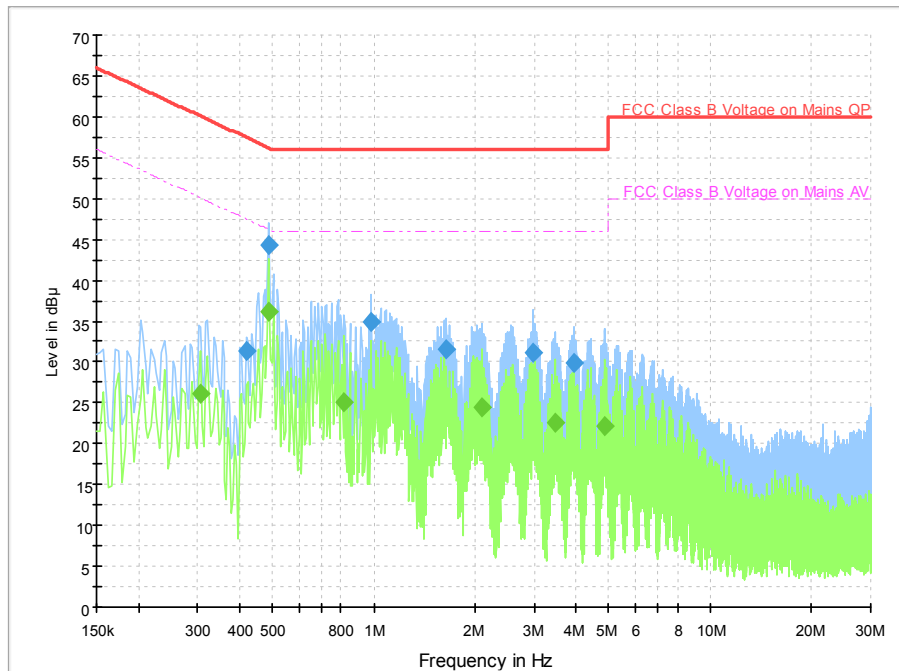
Fig A.7 Conducted Emission from 150kHz to 30MHz

#### Final Result 1

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.430000	39.9	2000.0	9.000	On	L1	19.7	17.3	57.3
0.474000	44.3	2000.0	9.000	On	L1	19.7	12.1	56.4
1.170000	39.7	2000.0	9.000	On	N	19.6	16.3	56.0
1.382000	41.4	2000.0	9.000	On	L1	19.6	14.6	56.0
3.358000	39.3	2000.0	9.000	On	L1	19.6	16.7	56.0
6.702000	43.4	2000.0	9.000	On	N	19.6	16.6	60.0

#### Final Result 2

Frequency (MHz)	CAverage (dB $\mu$ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.430000	19.2	2000.0	9.000	On	N	19.7	28.1	47.3
0.466000	42.3	2000.0	9.000	On	L1	19.7	4.3	46.6
0.850000	18.3	2000.0	9.000	On	N	19.6	27.7	46.0
1.358000	30.3	2000.0	9.000	On	N	19.6	15.7	46.0
2.274000	27.8	2000.0	9.000	On	N	19.6	18.2	46.0
6.778000	38.5	2000.0	9.000	On	L1	19.6	11.5	50.0

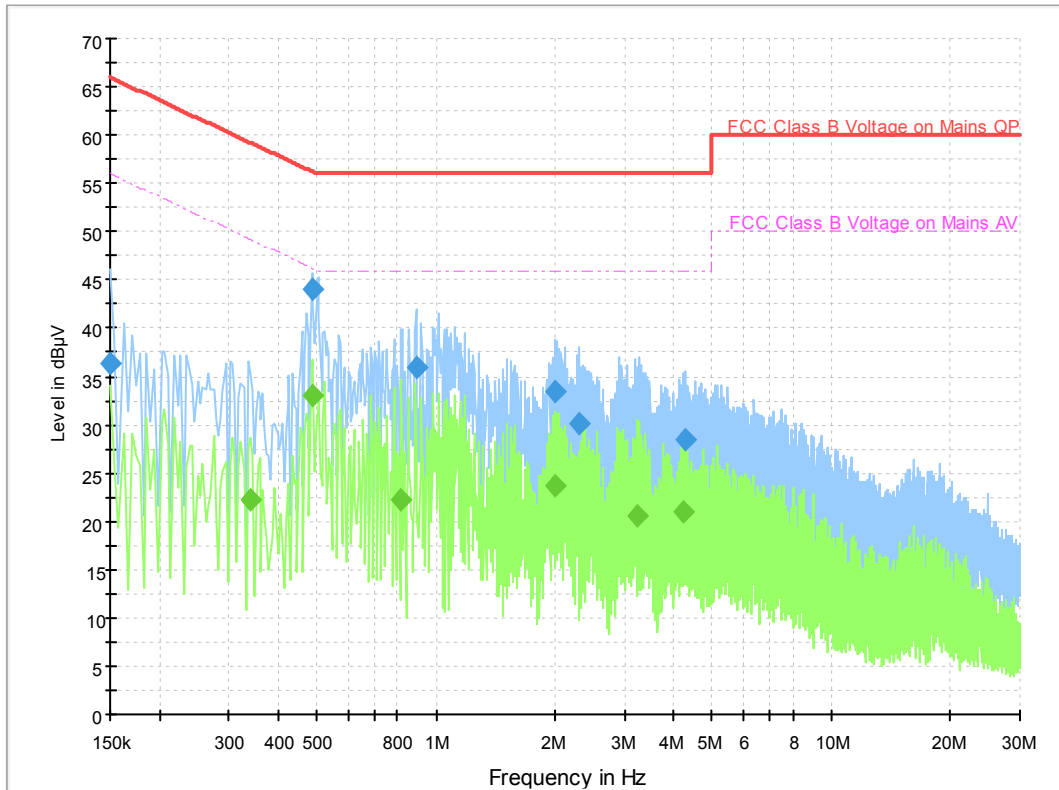
**Charging Mode, Set.5:**

**Fig A.8 Conducted Emission from 150kHz to 30MHz**
**Final Result 1**

Frequency (MHz)	QuasiPeak (dB $\mu$ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.418000	31.4	2000.0	9.000	On	L1	19.7	26.0	57.5
0.486000	44.4	2000.0	9.000	On	L1	19.7	11.9	56.2
0.982000	34.8	2000.0	9.000	On	L1	19.7	21.2	56.0
1.646000	31.6	2000.0	9.000	On	L1	19.6	24.4	56.0
2.978000	31.2	2000.0	9.000	On	L1	19.6	24.8	56.0
3.950000	29.8	2000.0	9.000	On	L1	19.6	26.2	56.0

**Final Result 2**

Frequency (MHz)	CAverage (dB $\mu$ V)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB $\mu$ V)
0.306000	26.2	2000.0	9.000	On	L1	19.7	23.9	50.1
0.486000	36.1	2000.0	9.000	On	L1	19.7	10.1	46.2
0.818000	25.1	2000.0	9.000	On	L1	19.7	20.9	46.0
2.090000	24.4	2000.0	9.000	On	L1	19.6	21.6	46.0
3.462000	22.5	2000.0	9.000	On	L1	19.6	23.5	46.0
4.886000	22.2	2000.0	9.000	On	L1	19.6	23.8	46.0



**Charging Mode, Set.6:**

**Fig A.9 Conducted Emission from 150kHz to 30MHz**
**Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	36.3	5000.0	9.000	On	L1	20.0	29.7	66.0
0.486000	44.1	5000.0	9.000	On	L1	19.8	12.1	56.2
0.890000	36.0	5000.0	9.000	On	L1	19.7	20.0	56.0
2.010000	33.5	5000.0	9.000	On	L1	19.6	22.5	56.0
2.302000	30.0	5000.0	9.000	On	L1	19.6	26.0	56.0
4.274000	28.4	5000.0	9.000	On	N	19.6	27.6	56.0

**Final Result 2**

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.338000	22.3	5000.0	9.000	On	L1	19.8	27.0	49.3
0.490000	33.0	5000.0	9.000	On	L1	19.8	13.2	46.2
0.818000	22.1	5000.0	9.000	On	L1	19.7	23.9	46.0
2.010000	23.8	5000.0	9.000	On	L1	19.6	22.2	46.0
3.234000	20.6	5000.0	9.000	On	L1	19.5	25.4	46.0
4.218000	21.0	5000.0	9.000	On	L1	19.6	25.0	46.0

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