



# EMC Test Report

**Product Name:Fixed Wireless Terminal**

**Model Number:ETS222M**

**Report No: SYBHZ(R)E020112008EB-1**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

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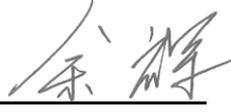
Modification Information:

Table 1 Modification Information

Modification Information	1	
	2	
	3	<i>Not Applicable!</i>
	4	
	5	
	6	
	7	

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REPORT ON	Fixed Wireless Terminal
	M/N: ETS222M
REGULATION	FCC CFR47 Part 15: Subpart B; FCC CFR47 Part 22: Subpart H;
START OF TEST	Oct.06, 2008
END OF TEST	Oct.16, 2008
Final Judgement:	Pass

Approver	<u>2009-03-23</u>	张兴海	
	Date	Name	
Reviewer	<u>2009-03-23</u>	余辉	
	Date	Name	
	<u>2009-03-20</u>	徐广义	
	Date	Name	

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## 1 Status

### 1.1 Product Information

CLIENT: Huawei Technologies Co., Ltd.  
ADDRESS: Bantian Longgang District Shenzhen, P.R. China  
MANUFACTURING DESCRIPTION Fixed Wireless Terminal  
MANUFACTURERS MODEL NUMBER ETS222M

### 1.2 Applied Standard

FCC Measurement Specification	FCC Limits Part(s)	Description	Result
-	15.107	Conducted Emission at Power Port	PASS
-	15.109	Radiated Emission of Enclosure in Idle Mode	PASS
2.1051	22.917	Radiated Spurious Emission	PASS

### 1.3 Test Site

Site 1:  
RELIABILITY LABORATORY OF HUAWEI TECHNOLOGIES CO., LTD

### 1.4 Test environment condition

Ambient temperature	20~25°C
Relative humidity	40%~52%
Atmospheric pressure	101kPa

## 2 Summary of Results

Table 2 below shows a brief summary of the results obtained.

Table 2 Summary of results

<b>EUT Classification:Wireless terminal</b>				
<b>Test Items</b>	<b>Test Configuration &amp;Test Mode</b>	<b>Required Performance Criteria</b>	<b>Result</b>	<b>Site</b>
<u>Radiated Emissions</u> Enclosure Port	TC1-TC3 (TM1)	N/A	Pass	Site1
<u>Conducted Emissions</u>	TC1-TC3 (TM1~TM2)	N/A	Pass	Site1
<u>Radiated Spurious Emissions</u> Enclosure Port	TC1-TC3 (TM1~TM2)	N/A	Pass	Site1

Note:

- 1, Measurement taken is within the measurement uncertainty of measurement system.
- 2, TC = Test configuration
- 3, NT=no test. Because of not containing devices susceptible to magnetic fields, the EUT has been exempt from immunity test of power frequency magnetic field.
4. The voltage and frequency of the power supply:120V/60Hz and 230V/50Hz

### 3 Equipment Specification

#### 3.1 General Description

ETS222M is CDMA Fixed Wireless Terminals. It's operated in Band Class 0 (800MHz). The Fixed Wireless Terminal implements such functions as RF signal receiving / Transmitting, CDMA protocol processing, voice, data etc. The TX is 824.025MHz-848.985MHz and the RX 869.026MHz-893.985MHz. Externally it provides upgrade interface, antenna interface, and power interface, in addition to the charging interface.

##### 3.1.1 Main Equipment Technical Data

Description:	Fixed Wireless Terminal
Models:	ETS222M
Input Rated Voltage:	~ 230V
Rated Consumption Power:	Max 2.0 W
Maximum Emission Power:	Max 30dBm(E.R.P.)
Dimensions:	189(depth)×83(width)×57(height)(mm <sup>3</sup> )
Weight:	<0.5 kg

Table 3 Sub-Assembly Identity

Mode		Work Frequency	
		Transmitt Frequency(MHz)	Receive Frequency (MHz)
CDMA	CDMA 800	824.025MHz~848.985MHz	869.026MHz~893.985MHz

#### 3.2 Sub-Assembly Identity

Table 4 Sub-Assembly Identity

Board				
Model Name	Qty.	Serial Number	Description	
WLR2SEAU	1	731052100254	Centre Processing Unit	
WLA2PIPU	1	731052100248	Interface Processing Unit	
Accessory				
Name	Qty.	Manufacture	Serials number	Description
Adaptor	1	ShenZhen OCT Xinqiao Technology co.,Ltd	HF-120050E3	Input voltage: ~100V-240V/50-60Hz Output voltage:+12.0V, 0.5A Rate power: 6W
Adaptor	1	Dongguan Shilong Fuhua Electronic Co.,Ltd.	HF-120050E3	Input voltage: ~ 100V-240V/50-60Hz Output voltage: +12.0V, 0.5A Rate power: 6W
Adaptor	1	Shenzhen Moso Power Supply Techonoly Co.,Ltd.	HF-120050E3	Input voltage: ~100V-240V/50-60Hz Output voltage: +12.0V, 0.5A Rate power: 6W
NI-MH Battery	1	HUAWEI Techonoly Co.,Ltd.	HGB-2A10x3	Rated capacity: 1000mAH Nominal Voltage:  +3.6V

#### 4 System Configuration during EMC Test

The Equipment under Test (EUT) was functioning correctly during all tests. The EUT was installed within the test site and was configured to simulate a typical user installation.

##### 4.1 Cables Used during Test

Table 5 Cable Used during Test

Port	Connector	Type of Cable
USB	USB	N/A

##### 4.2 Associated Equipment Used during Test

Table 6 Associated Equipment Used during Test

Name	Model	Manufacturer	S/N	Cal Date
Radio Communication Tester	CMU200	R&S	249421	2008-9-9

##### 4.3 Test Configurations and Test Mode

###### 4.3.1 Test Configuration.

The EUT will be connected to test system (Base Station Simulator) in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment).

Table 7 Configuration table

Test configuration	Test mode
TC1/TC2/TC3	TM1~TM2

TC1:EUT is powered with an adapter(FuHua), and connected to the test system (Base Station Simulator).

TC2:EUT is powered with an adapter(Moso), and connected to the test system. (Base Station Simulator).

TC3:EUT is powered with an adapter(Xinqiao), and connected to the test system (Base Station Simulator).

###### 4.3.2 Test Mode

TM1: operate in idle CDMA 800;

TM2: operate in traffic CDMA 800;

#### 4.4 Test conditions and test Connections

##### 4.4.1 Test Conditions

The EUT will be connected to test system (Base Station Simulator) in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment).

##### 4.4.2 Test Connections

Traffic Mode:

The EUT will be connected to test system (Base Station Simulator) in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment).

When the EUT is required to be in the traffic mode, a call is set up using Loop back Service Option according to the radio configuration supported by the fixed terminal (see clause 1.3 in 3GPP2 C.S0011-A), and the following conditions shall be met:

The EUT shall be commanded to operate at maximum transmit power 24dBm;

The "variable Data Rate Transmission" shall be disabled;  
The Fixed terminal shall be set for maximum data transmission rate.  
Assign channel frequency to an appropriate channel number, For ETS2225 the channel numbers is set to 283 (Transmit frequency 833.49MHz) here.

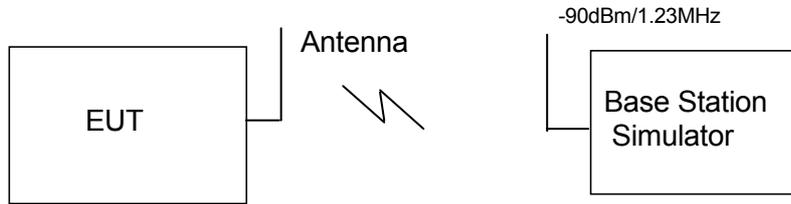


Figure 1. Test Configuration

Idle Mode:

The EUT will be connected to test system (Base Station Simulator) in order to simulate normal operating conditions (with reference to the guidance given in the standard for this type of equipment)  
When the EUT is required to be in the idle mode, then the following conditions shall be met:  
Enable the receiver for CDMA-only mode;  
The test system shall simulate a Base Station with the Paging Channel or the Quick Paging Channel or Forward Common Control Channel/Broadcast Control Channel on one carrier. The Base Station Simulator shall be synchronized and be able to respond to paging messages. The fixed terminal shall not initiate a call (originated call), re-registration, or message transmission.

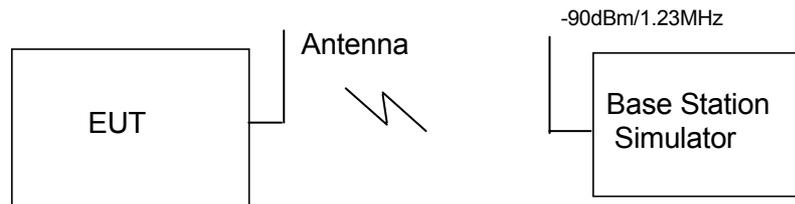


Figure 2. Test Configuration

Electromagnetic Interference (EMI)

**4.5 Radiated Disturbance 30MHz to 1000MHz**

**4.5.1 Test Procedure**

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4 (2003). The test distance was 3m. The EUT was set-up on insulator 80cm above the Ground Plane. The set-up and test methods were according to ANSI C63.4. The Radiated Disturbance measurements were made using a Rohde and Schwarz ESMI Test Receiver and control software ES-K1.

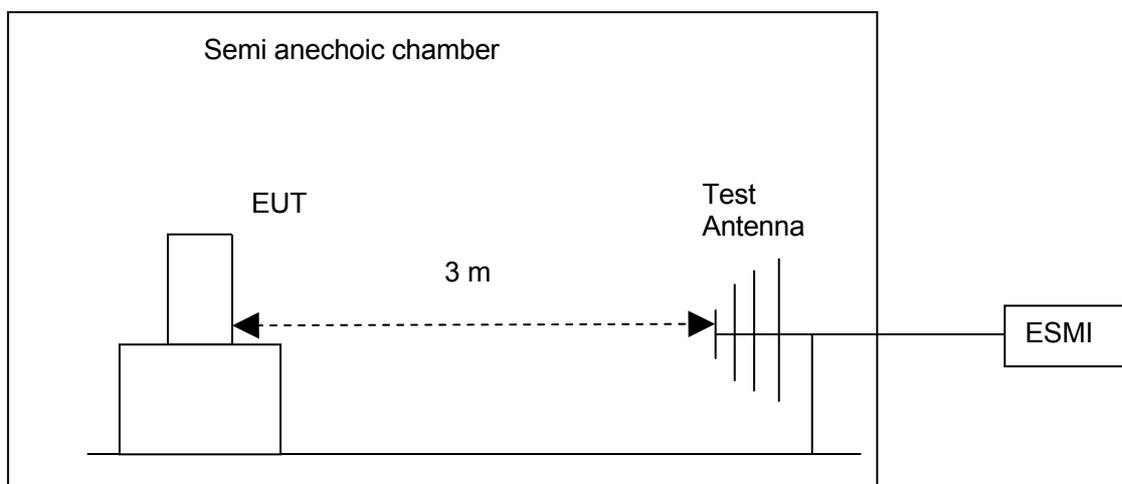
A preliminary scan and a final scan of the emissions were made from 30 MHz to 1GHz by using test script of software; the emissions were measured using a Quasi-Peak Detector. The maximal emission value was acquired by adjusting the antenna height, polarisation and turntable azimuth in accordance with the software setup. Normally, the height range of antenna was 1m to 4m, the azimuth range of turntable was 0° to 360°, The receive antenna has two polarizations V and H.

Huawei Mobile Station was communicated with the BTS simulator through Air interface. The Mobile Station operated on the typical channel and the Mobile Station worked in idle mode, transmitter was not work in this test.

EUT was configured in idle mode and the test performed at worst emission state.

Measurement bandwidth: 30 MHz – 1000 MHz: 120 k Hz

Test set up figure:



**Figure 3.** Test set-up

**4.5.2 Test Results**

The EUT has met the requirements for Radiated Emission of enclosure port.

Table 8 Test Limits

Frequency of Emission (MHz)	Radiated Limit	
	Unit(μV/m)	Unit(dBμV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
960-1000	500	54

#### 4.6 Conducted Disturbance 0.15 MHz to 30MHz

##### 4.6.1 Test Procedure

The Table-top EUT was placed upon a non-metallic table 0.8 m above the horizontal metal reference ground plane. EUT was connected to LISN and LISN was connected to reference Ground Plane. EUT was 80cm from LISN. The set-up and test methods were according to ANSI C63.4: 2003.

Conducted Disturbance at AC Port measurements were undertaken on the L and N Lines. The emissions were measured using a Quasi-Peak Detector and Average Detector.

Huawei Mobile Station was communicated with the BTS simulator through Air interface, the BTS simulator controls the Mobile Station to transmitter the maximum power which defined in specification of product. The Mobile Station operated on the typical channel.

Measurement bandwidth (RBW) for 150kHz to 30 MHz: 9 kHz;

Test Set-up figure:

The Mobile Station was setup in the screened chamber and operated under nominal conditions.

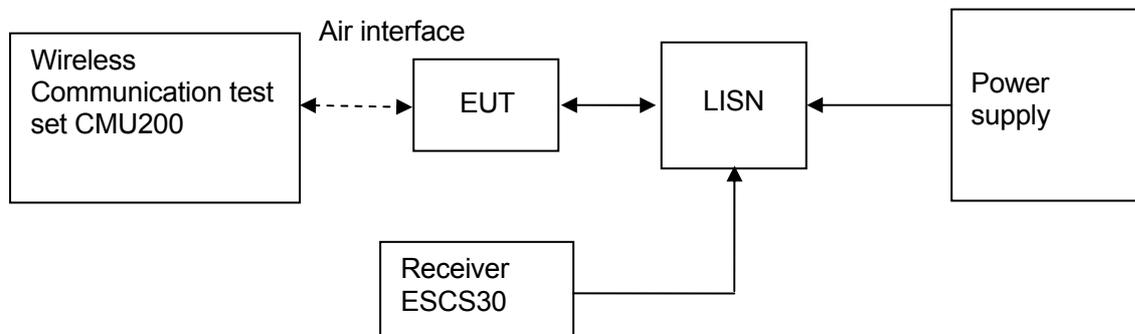


Figure 4. Test Set-up

##### 4.6.2 Test Results

The EUT has met requirements for Conducted disturbance of power lines.

Table 9 Test Limit of DC&AC Power Port

Frequency range	150kHz~ 30MHz	
Classification	Class B	
Limit(Class B)	Voltage limits	
	QP	AV
0.15MHz~0.5MHz	66~56 dB $\mu$ V	56~46 dB $\mu$ V
0.5MHz~5MHz	56 dB $\mu$ V	46 dB $\mu$ V
5MHz~30MHz	60 dB $\mu$ V	50 dB $\mu$ V

#### 4.7 Radiated Spurious Emissions

##### 4.7.1 Test Procedure

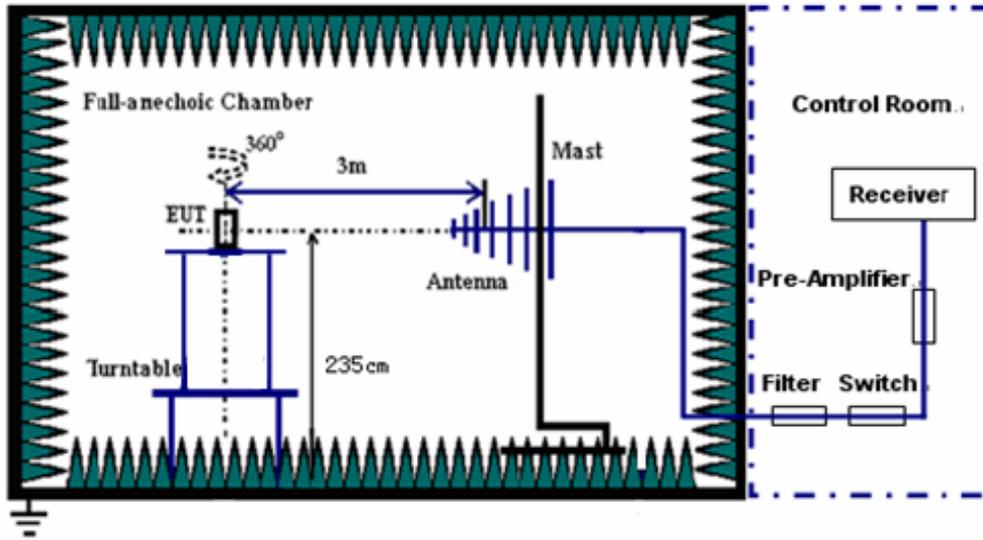
A test site fulfilling the requirements of ITU-R Recommendation SM329-10 was used. The EUT was placed on a non-conducting support in the anechoic chamber and was operated from a power source via an RF filter to avoid radiation from the power leads.

Step 1:

For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to

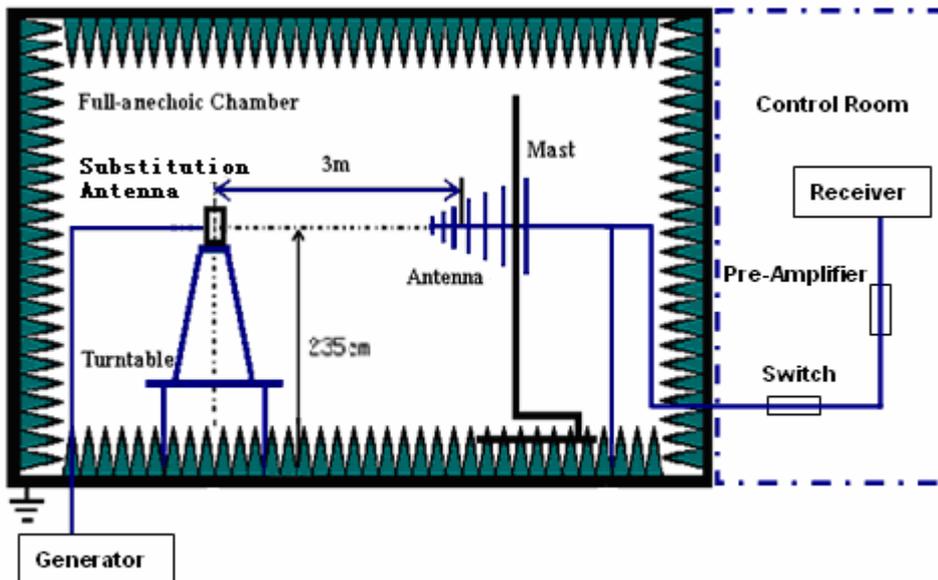
give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the EUT to the BTS simulator via the air interface.

Test the Radiated maximum output power by the Rohde and Schwarz ESIB26 Test Receiver from test antenna.



Step 2:

Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step1 on ESIB26 Test Receiver, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.



According to part 22.917, the defined measurement bandwidth as following:

22.917(b) Measurement procedure: Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

- Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;
- Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;
- Measurement bandwidth (RBW) for 30 MHz up to 1 GHz: 100 kHz;
- Measurement bandwidth (RBW) for 1GHz up to 18 GHz: 1MHz;

Table 10 Radiated Spurious Emissions Limits

Frequency band	Minimum requirement (E.R.P) traffic mode
30MHz~18GHz	-13dBm

According to part 24.238, the defined measurement bandwidth as following:

24.238 (b) Measurement procedure: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;  
 Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;  
 Measurement bandwidth (RBW) for 30 MHz up to 26.5 GHz: 1 MHz;

Table 11 Radiated Spurious Emissions Limits

Frequency band	Minimum requirement (E.R.P) traffic mode
30MHz~26.5GHz	-13dBm

No peak found in pre- test. All frequency points' margin is bigger than 20dB, so the substitution method isn't used.

Calculation Sample:

Table 12 Substitution Results

Freq. [MHz]	Measure ment Value [dBm]	Substitution Antenna Type	Gain [dBd]	Cable Loss [dB]	Signal Generator Level [dBm]	Substitution Level [dBm]	FCC limit [dBm]	Result

Note: For get the E.R.P. (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$\text{E.R.P. [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level

#### 4.7.2 Test Results

The EUT has met the requirements of FCC Part22/Part24 requirement.

## 5 Main Test Instruments

Table 13 Main Test Equipments

Test item	Test Instrument	Model	Manufacturer	Cal-Date	Cal Interval (month)
RE	EMI Test receiver	ESMI	R&S	April.23, 2008	12
	Broadband Antenna	CBL 6112B (2536)	SCHAFFNER	Jun.08, 2008	12
CE	EMI Test receiver	ESCS30	R&S	May.29, 2008	12
	Artificial Mains Network	ENV4200	R&S	May.21, 2008	12
RSE	EMI Test receiver	ESIB26	R&S	May.30.2008	12
	Horn Antenna	3117	EMCO	May.20.2008	12
	Broadband Antenna	CBL 6112B(2747)	SCHAFFNER	Oct.17, 2007	12
	Horn Antenna	3160	EMCO	May.20.2008	12
Software Information					
Test Item	Software Name	Manufacturer	Version		
RE/CE	ES-K1	R&S	1.7.1		
RSE	EMC32	R&S	V5.10.99		

## 6 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

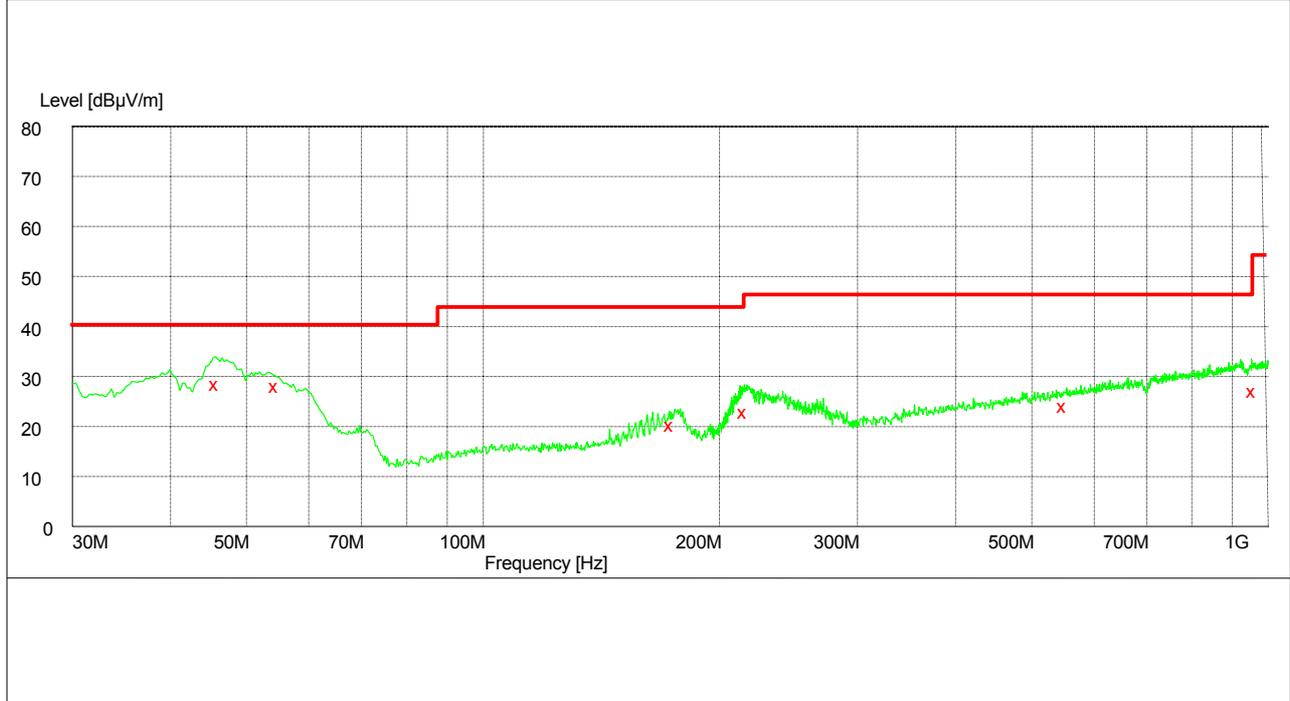
Table 14 System Measurement Uncertainty

Items		Extended Uncertainty
RE	Field strength (dB $\mu$ V/m)	U=4.6dB; k=2(30MHz-1GHz)
RSE	ERP (dBm)	U=2.2dB; k=2
CE	Disturbance Voltage(dB $\mu$ V)	U=3.3dB; k=2

## 7 Graph and Data of Emission Test

### 7.1 Radiated Disturbance

This test was carried out in all the test modes, Here only the worst test result was shown.



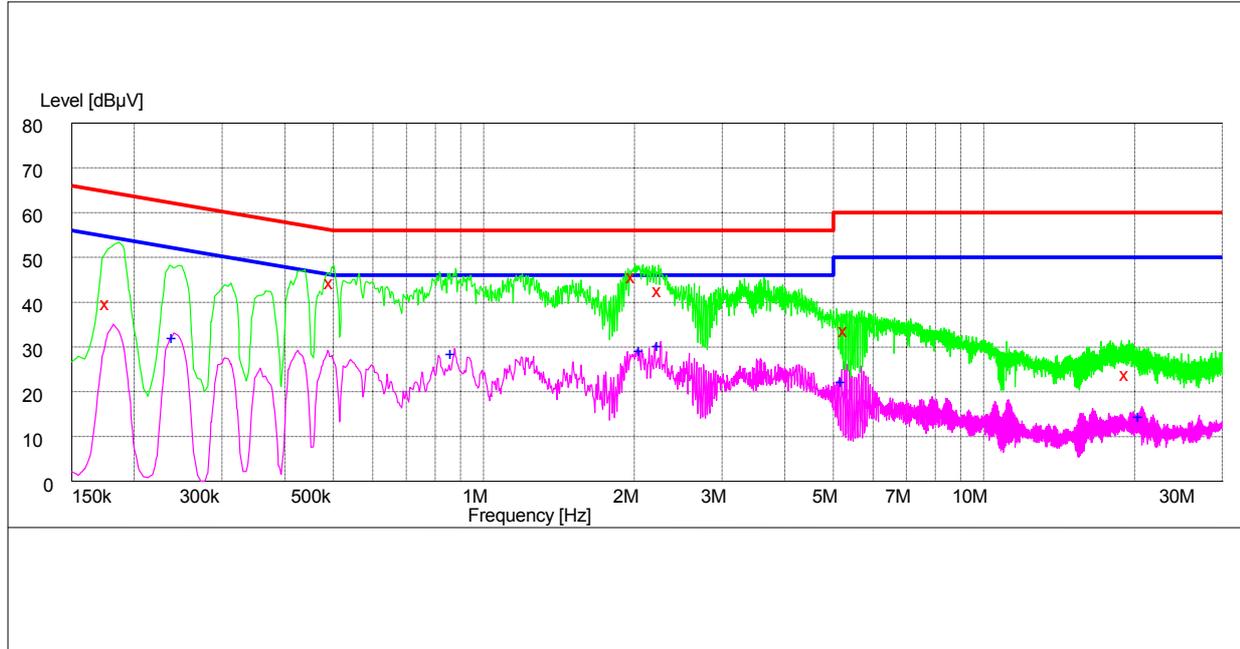
MEASUREMENT RESULT: QP Detector

Frequency (MHz)	Level (dBµV/m)	Transd (dB)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
45.600000	30.50	-14.4	40.0	9.5	107.0	300.00	VERTICAL
101.340000	17.90	-15.7	40.0	22.1	219.0	0.00	HORIZONTAL
176.460000	30.30	-14.0	43.5	13.2	238.0	0.00	HORIZONTAL
285.780000	22.40	-10.4	46.0	23.6	100.0	22.00	HORIZONTAL
549.000000	19.80	-4.8	46.0	26.2	254.0	117.00	VERTICAL
989.660000	22.50	-1.3	54.0	31.5	252.0	171.00	VERTICAL

## 7.2 Conducted Disturbance

This test was carried out in all the test modes, Here only the worst test result was shown.

### 7.2.1 AC Power Port Test Data



—:QP Preview Result

—:AV Preview Result

MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.177000	40.4	10.1	65	24.6	N	FLO
0.496500	45.1	10	56	10.9	L3	FLO
1.995000	46.4	10.1	56	9.6	L3	FLO
2.247000	43.4	10.1	56	12.6	L3	FLO
5.293500	34.5	10.2	60	25.5	N	FLO
19.333500	24.7	10.3	60	35.3	L3	FLO

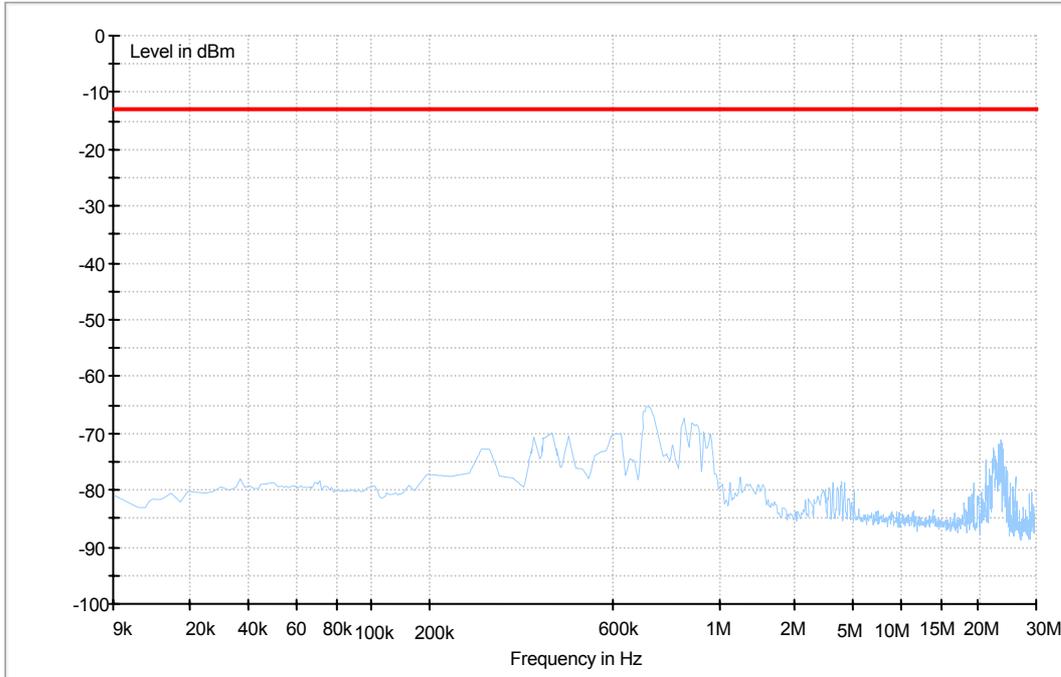
MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.240000	32.5	10.1	52	19.5	L3	FLO
0.865500	29.1	10	46	16.9	L3	FLO
2.067000	29.8	10.1	46	16.2	L3	FLO
2.242500	30.8	10.1	46	15.2	L3	FLO
5.230500	22.8	10.2	50	27.2	L3	FLO
20.557500	15	10.3	50	35	L3	FLO

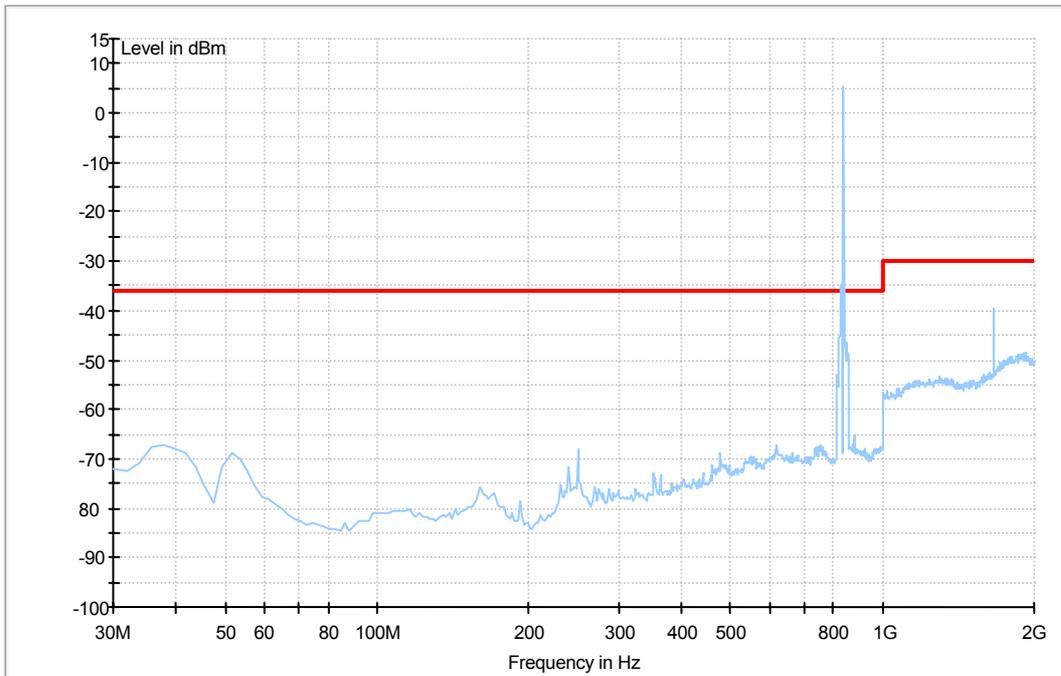
### 7.3 Radiated Spurious Emission

#### 7.3.1 For CDMA800

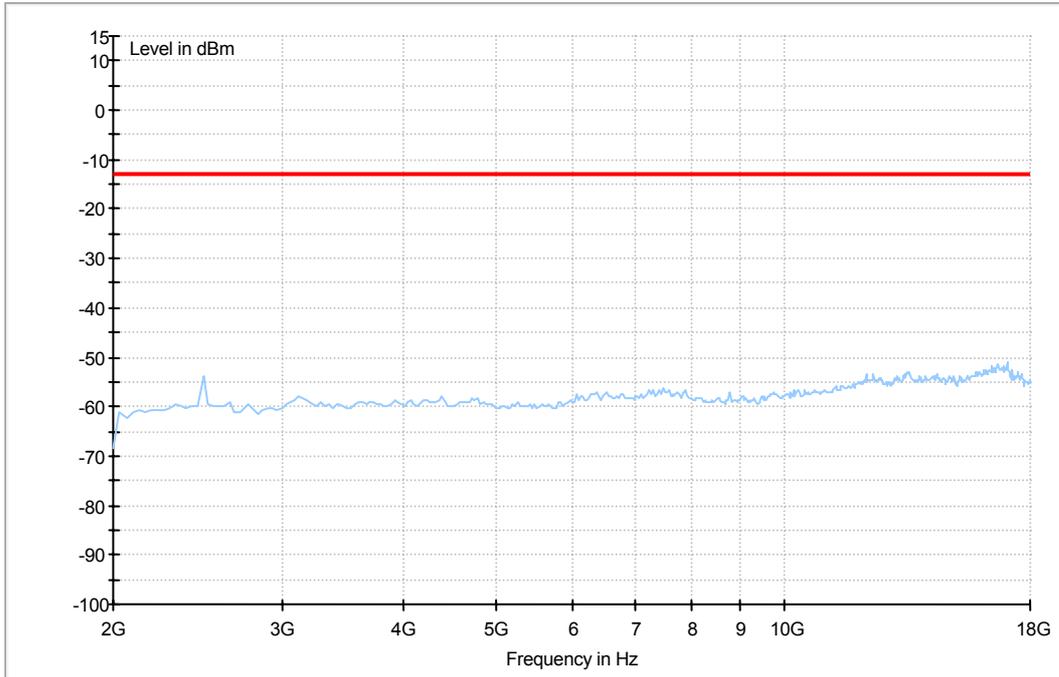
Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-2GHz)



Traffic Mode (2GHz-18GHz)



-----**The End**-----