



EMC Test Report

Product Name: Cordless Phone

Model Number: FC312E

Report No: SYBH(Z-EMC)022122010-2
FCC ID: QISFC312E

Reliability Laboratory of Huawei Technologies Co., Ltd.

Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R. China

Tel: +86 755 28780808 Fax: +86 755 89652518



Notice

1. The laboratory has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L0310.
2. The laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 97456.
3. The test report is invalid if not marked with "exclusive stamp for the test report".
4. The test report is invalid if not marked with the stamps or the signatures of the persons responsible for performing, revising and approving the test report.
5. The test report is invalid if there is any evidence of erasure and/or falsification.
6. If there is any dissidence for the test report, please file objection to the test centre within 15 days from the date of receiving the test report.
7. Normally, the test report is only responsible for the samples that have undergone the test.
8. Context of the test report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of the laboratory.



Notice 2

Modification Information:

Table 1 Modification Information

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



REPORT BODY CONTENT

1	Status	6
1.1	Product Information	6
1.2	Applied Standard	6
1.3	Test Site	6
1.4	Test environment condition	6
2	Summary of Results	7
3	Equipment Specification	8
3.1	General Description	8
3.2	Sub-Assembly Identity	8
4	System Configuration during EMC Test	10
4.1	Cables Used during Test	10
4.2	Associated Equipment Used during Test	10
4.3	Test Configurations and Test Mode	10
4.4	Test conditions and test Connections	10
5	Electromagnetic Interference (EMI)	12
5.1	Radiated Disturbance 30MHz to 18GHz	12
5.2	Conducted Disturbance 0.15 MHz to 30MHz	13
5.3	Radiated Spurious Emissions	13
6	Main Test Instruments	16
7	System Measurement Uncertainty	17
8	Graph and Data of Emission Test	18
8.1	Radiated Disturbance	18
9	Conducted Disturbance	19
9.1	AC Power Port Test Data	19
9.2	Radiated Spurious Emission	20



1 Status

1.1 Product Information

CLIENT:	Huawei Technologies Co., Ltd.
ADDRESS:	Bantian Longgang District Shenzhen, P.R. China
MANUFACTURING DESCRIPTION	Cordless Phone
MANUFACTURERS MODEL NUMBER	FC312E

1.2 Applied Standard

APPLIED STANDARD	FCC CFR47 Part 15: Subpart B;
	ANSI C63.4
	FCC CFR47 Part 22: Subpart H; FCC CFR47 Part 24: Subpart E;

1.3 Test Site

Site 1:
EMC LABORATORY OF 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

EUT Classification: Wireless Terminal				
Test Items	Test Configuration & Test Mode	Required Performance Criteria	Result	Site
<u>Radiated Emissions</u> Enclosure Port	TC1 (TM3-TM4)	N/A	Pass	Site1
<u>Conducted Emissions</u>	TC1 (TM1-TM4)	N/A	Pass	Site1
<u>Radiated Spurious Emissions</u> Enclosure Port	TC1 (TM1-TM2)	N/A	Pass	Site1
Note: 1, Measurement taken is within the measurement uncertainty of measurement system. 2, TC = Test configuration				

3 Equipment Specification

3.1 General Description

Cordless Phone FC312E is subscriber equipment in the GSM system. The GSM frequency band includes GSM850 and PCS1900. The TX frequency is 824MHz-849MHz and RX frequency is 869MHz-894MHz; For PCS 1900, the TX frequency is 1850MHz-1910MHz and the RX frequency is 1930MHz-1990MHz. FC312E implements such functions as RF signal receiving/sending, GSM protocol processing, voice etc. Externally it provides SIM card interface.

3.1.1 Main Equipment Technical Data

Description:	Cordless Phone
Models:	FC312E
Input Rated Voltage:	 +3.7 V
Dimensions:	143.4mm×48.6mm×25mm
Weight:	<1 kg

Table 3 Sub-Assembly Identity

Mode		Work Frequency	
		Transmitt Frequency(MHz)	Receive Frequency (MHz)
GSM	GSM850	824-849	869-894
	PCS1900	1850-1910	1930-1990

3.2 Sub-Assembly Identity

Table 4 Sub-Assembly Identity

Board				
Model Name	Qt y.	Hardware Version	Serial	Description
FC312E	1	WG01FC312EI	ZNA6RB10B1900 09	Interface Processing Unit
Accessory				
Name	Qt y.	Manufacture	Serials number	Description
Adapter	1	Shen Zhen Huntkey Power Technology Co.,Ltd	TPAAA2002687	Adapter Model: HS-050040U2 Input Voltage : 100-240V ~50/60Hz, 0.2A Output Voltage:  5.0V 400mA Rated Power: 2W
Adapter	1	Shen Zhen Huntkey Power Technology Co.,Ltd	HKAAA1732589	Adapter Model: HS-050040U2 Input Voltage : 100-240V ~50/60Hz, 0.2A Output Voltage:  5.0V 400mA Rated Power: 2W
Adapter	1	Shen Zhen Huntkey Power Technology Co.,Ltd	BYAA41904043	Adapter Model: HS-050040U2 Input Voltage : 100-240V ~50/60Hz, 0.2A Output Voltage:  5.0V 400mA



				Rated Power: 2W
--	--	--	--	-----------------

Battery

Name	Qty	Manufacture	Serials number	Description
Rechargeable Li-ion	1	Huawei Technologies Co., Ltd.	BAAAA22XC4009128	Battery Model: HB6A2L Rated capacity: 1000mAh Nominal Voltage: --- +3.7V Charging Voltage: --- +4.2V
Li-ion Battery	1	HUAWEI Techonologies Co.,Ltd.	BAAA307XB5107550	Battery Model: HBL3A Rated capacity: 600mAh Nominal Voltage: --- +3.7V Charging Voltage: --- +4.2V

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	Length	Quantity	Type of Cable
AC Power Port	1.2m	1	Unshielded

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	1117057	2010-8-4

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).

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

Table 7 Configuration table

TC1	TM1~TM4
-----	---------

4.3.2 Test Mode

There were 4 test Modes. TM1 to TM4 were shown in the diagrams below:

TM1: operate in traffic mode GSM 850;

TM2: operate in traffic mode PCS 1900;

TM8: operate in idle mode GSM 850;

TM9: operate in idle mode PCS1900;

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 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 is required to be in the traffic mode, a call is set up according to the generic call set up procedure and enter the EUT into loop back test mode.(GSM see ETSI TS 151.010).

For GSM850 and PCS1900, the following conditions shall also be met:

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

The downlink RXQUAL shall be monitored.

Assign channel frequency to an appropriate channel number. Here, set the ARFCN channel number to 661 for PCS1900 to 190 for GSM850.

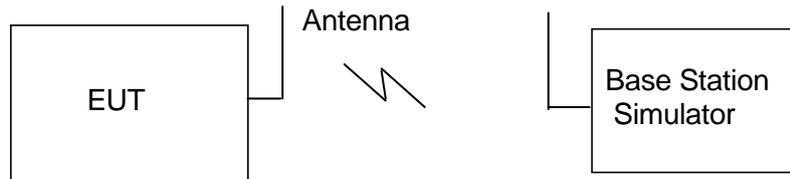


Figure 1.: Test Configuration

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). The EUT is required to be in the idle mode.

For PCS, the following conditions shall be met:

When the EUT is required to be in the idle mode, the test system shall simulate a Base Station (BS) with Broadcast Control Channel/Common Control Channel (BCCH/CCCH) on one carrier. The EUT shall be synchronized to the BCCH, listening to the CCCH and able to respond to paging messages. Periodic Location Updating shall be disabled.

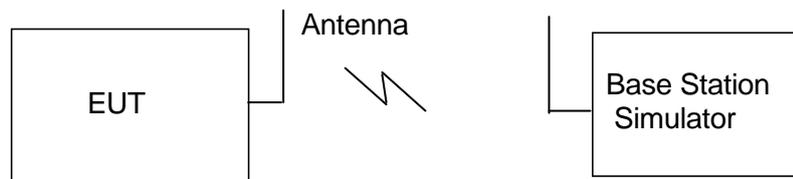


Figure 2. Test Configuration

5 Electromagnetic Interference (EMI)

5.1 Radiated Disturbance 30MHz to 18GHz

5.1.1 Test Procedure

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4dB according to the standards: ANSI C63.4. The test distance was 3m. The set-up and test methods were according to ANSI 63.4 and CAN/CSA-CEI/IEC CISPR 22

A preliminary scan and a final scan of the emissions were made from 30 MHz to 18 GHz by using test script of software; the emissions were measured using Quasi-Peak Detector (30MHz~1GHz) and AV detector (above 1GHz). 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.

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

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

Measurement bandwidth: 1GHz – 18GHz: 1MHz

Test set up figure:

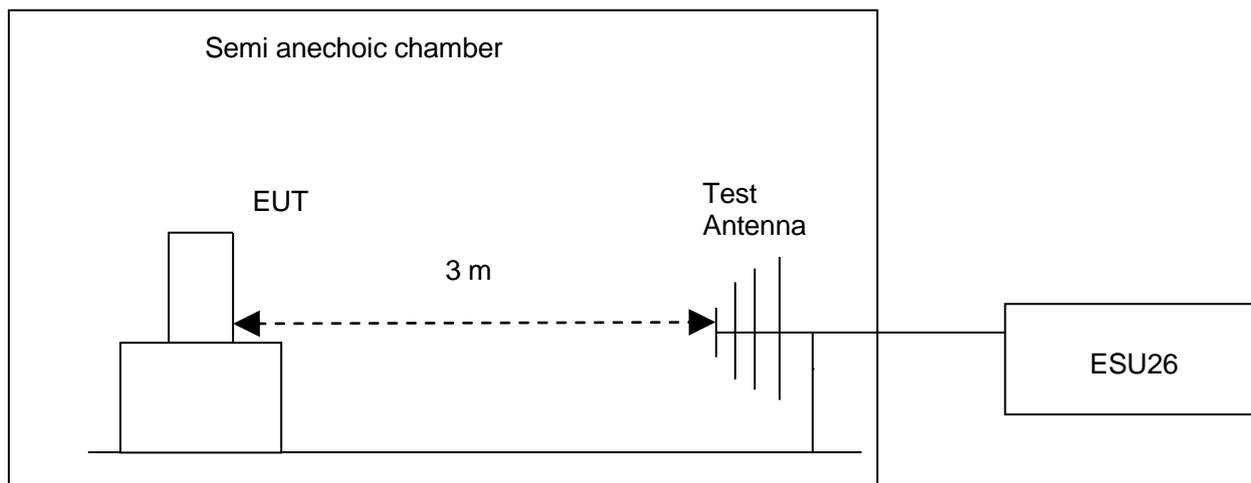


Figure 3. Test set-up

5.1.2 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($\mu\text{V}/\text{m}$)	Unit($\text{dB}\mu\text{V}/\text{m}$)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

5.2 Conducted Disturbance 0.15 MHz to 30MHz

5.2.1 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.

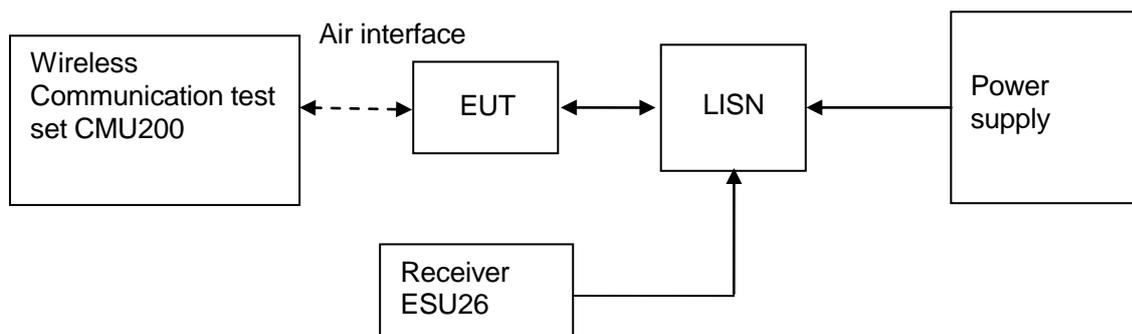


Figure 4. Test Set-up

5.2.2 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 μ V	56~46 dB μ V
0.5MHz~5MHz	56 dB μ V	46 dB μ V
5MHz~30MHz	60 dB μ V	50 dB μ V

5.3 Radiated Spurious Emissions

5.3.1 Test Procedure

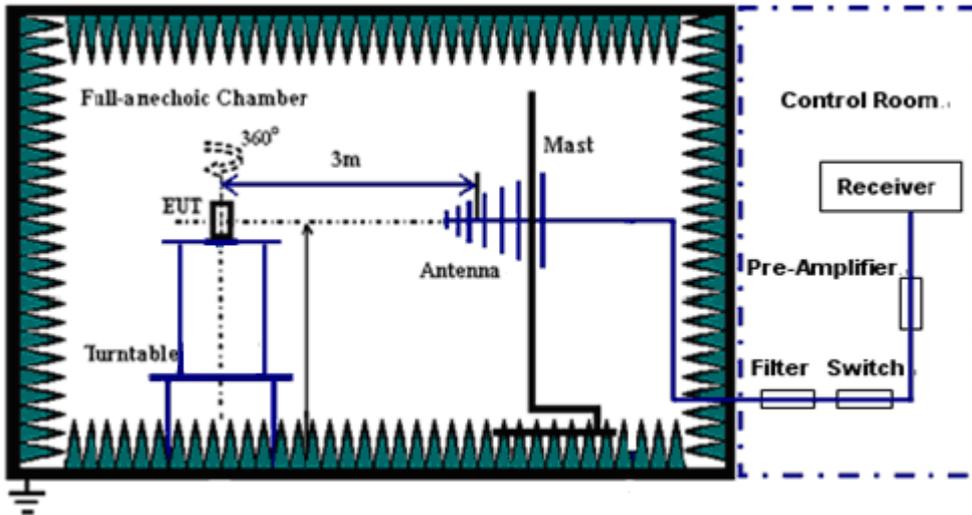
A test site fulfilling the requirements of ITU-R Recommendation SM329-10 was used. The EUT was placed on a non-conducting support in the anechoic chamber and was operated from a power source

via an RF filter to avoid radiation from the power leads.

Step 1:

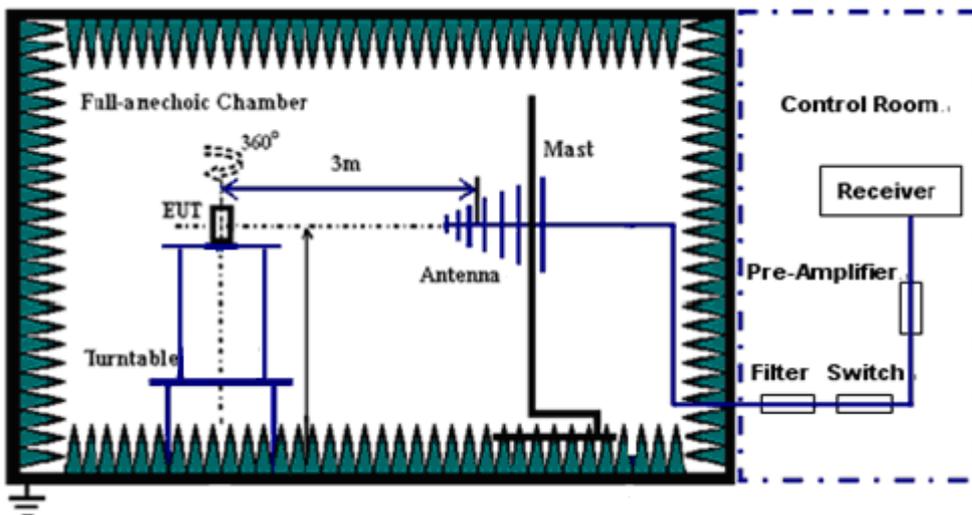
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the EUT to the BTS simulator via the air interface.

Test the Radiated maximum output power by the 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 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]	Measurement 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

5.3.2 Test Results

The EUT has met the requirements of Part22/24 requirement.

6 Main Test Instruments

Table 13 Main Test Equipments

Test item	Test Instrument	Model	Manufacturer	Cal-Date	Cal Interval (month)
RE	EMI Test receiver	ESU26	R&S	Jun.15, 2010	12
	Broadband Antenna	VULB 9163	SCHAFFNER	May.15, 2010	12
CE	EMI Test receiver	ESU26	R&S	Jun.15, 2010	12
	Artificial Mains Network	ENV216	R&S	Jun.15, 2010	12
RSE	EMI Test receiver	FSU43	R&S	Jun.24, 2010	12
	Broadband Antenna	VULB 9163	SCHAFFNER	Sep.21, 2010	12
	Horn Antenna	HF906	R&S	Jun.29, 2010	12
	Horn Antenna	3160	ETS-Lindgren	Sep.29, 2010	12
Software Information					
Test Item	Software Name	Manufacturer	Version		
RE/CE	ES-K1	R&S	1.7.1		
RSE	EMC32	R&S	V8.10.10		



7 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

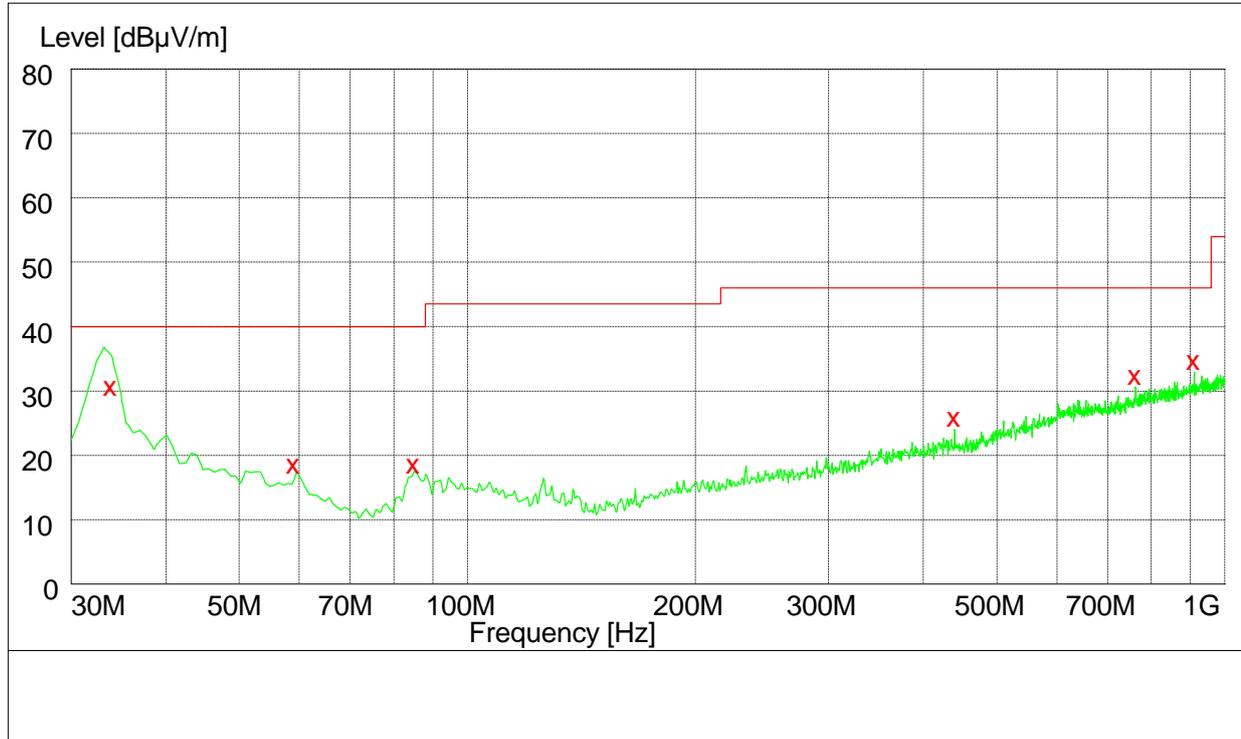
Items		Extended Uncertainty
RE	Field strength (dB μ V/m)	U=4.1dB; k=2(30MHz-1GHz)
RSE	ERP (dBm)	U=2.8dB; k=2
CE	Disturbance Voltage (dB μ V)	U=3.4dB; k=2

8 Graph and Data of Emission Test

8.1 Radiated Disturbance

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

30MHz-1GHz



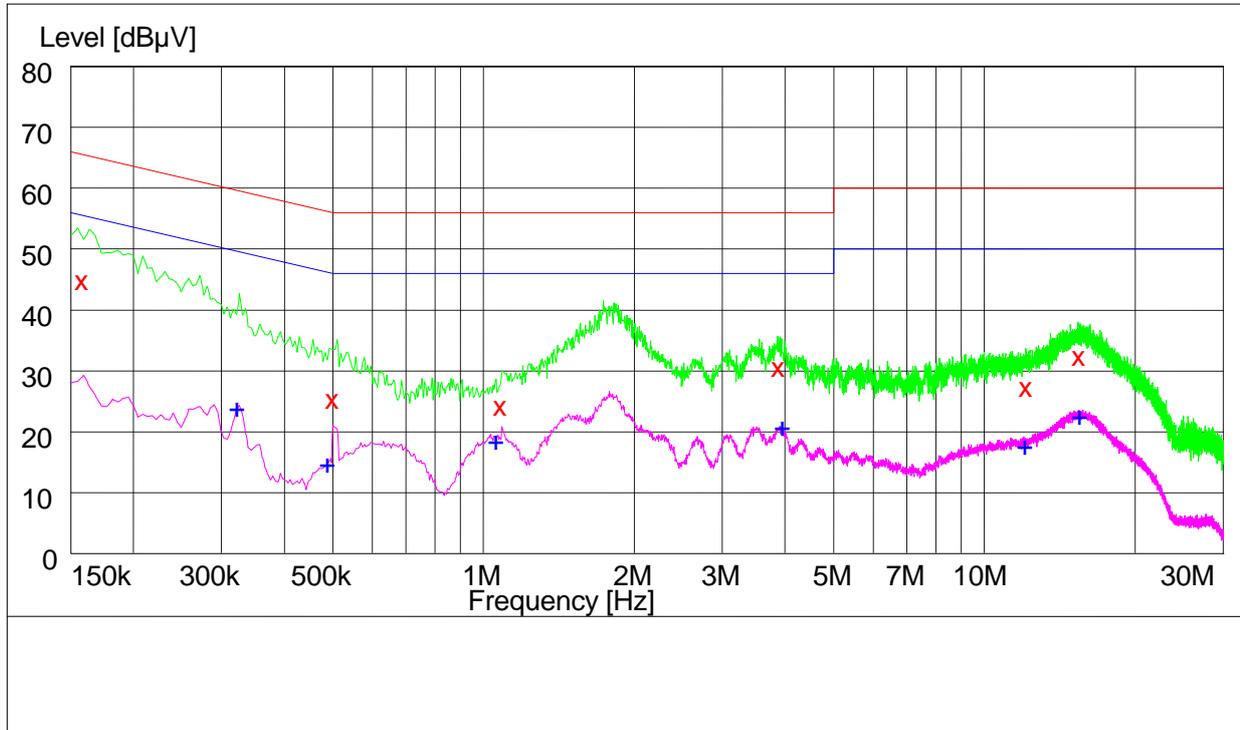
MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
33.824000	30.70	11.7	40.0	9.3	179.0	58.00	VERTICAL
58.948000	19.30	12.4	40.0	20.7	182.0	81.00	VERTICAL
84.972000	19.20	10.2	40.0	20.8	133.0	113.00	VERTICAL
439.604000	25.90	18.9	46.0	20.1	300.0	139.00	VERTICAL
761.764000	32.10	24.2	46.0	13.9	100.0	280.00	VERTICAL
910.816000	34.10	26.3	46.0	11.9	149.0	214.00	VERTICAL

9 Conducted Disturbance

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

9.1 AC Power Port Test Data



MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.158000	46.00	10.1	66	20.0	N	FLO
0.500000	26.50	10.1	56	29.5	L1	FLO
1.082000	25.20	10.1	56	30.8	L1	FLO
3.888000	30.40	10.2	56	25.6	N	FLO
12.148000	28.00	10.3	60	32.0	N	FLO
15.440000	32.20	10.3	60	27.8	N	FLO

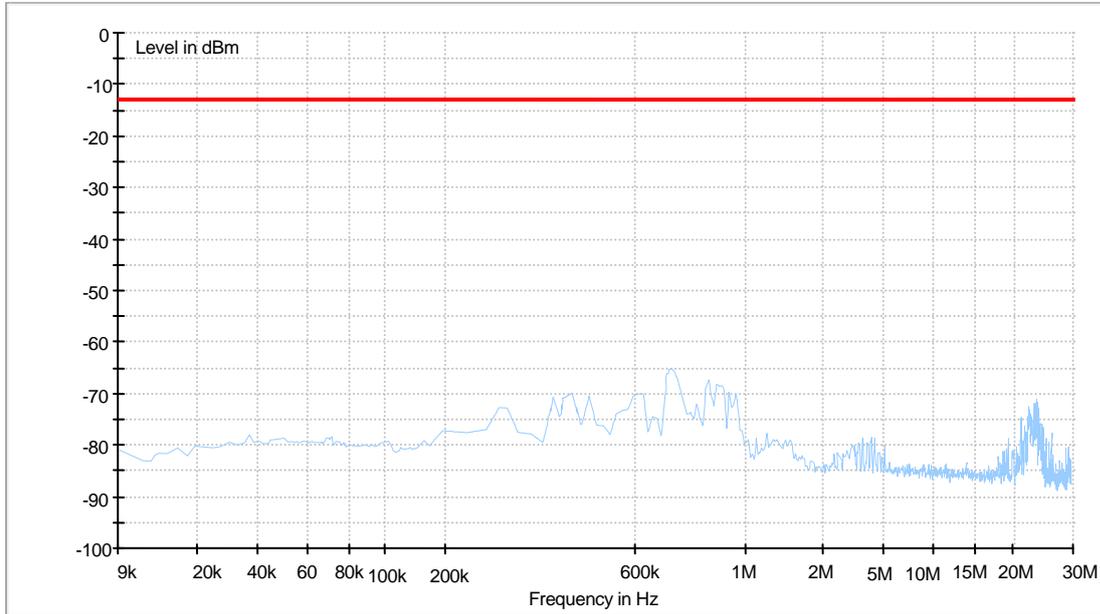
MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.322000	24.70	10.0	50	25.3	L1	FLO
0.488000	15.20	10.1	46	30.8	L1	FLO
1.058000	19.50	10.1	46	26.5	L1	FLO
3.946000	20.80	10.2	46	25.2	N	FLO
12.038000	18.80	10.3	50	31.2	N	FLO
15.470000	23.00	10.3	50	27.0	N	FLO

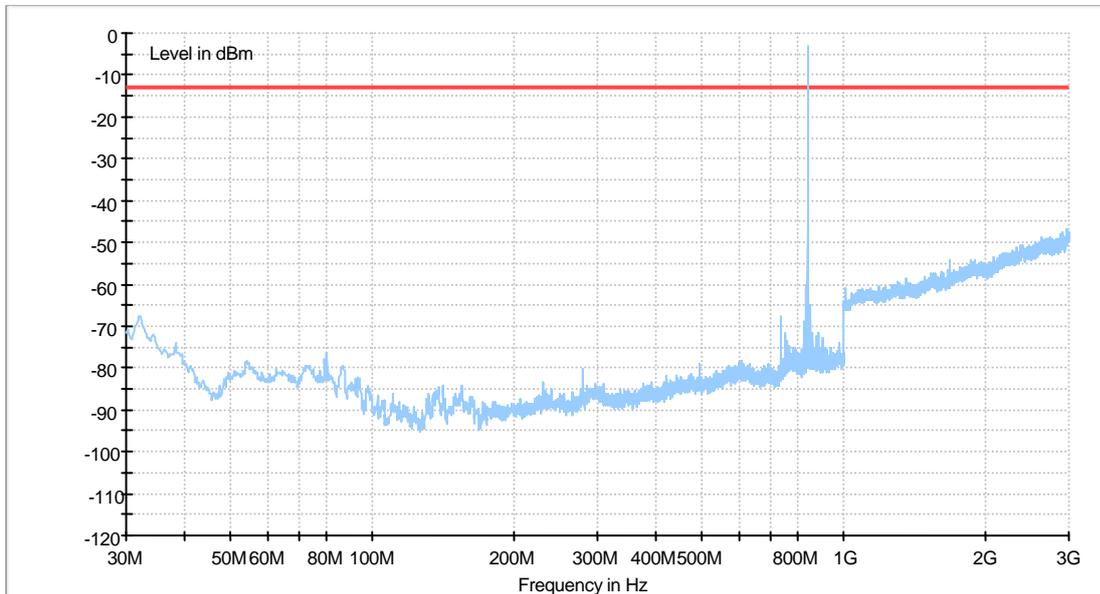
9.2 Radiated Spurious Emission

9.2.1 For GSM 850

Traffic Mode (9kHz-30MHz)

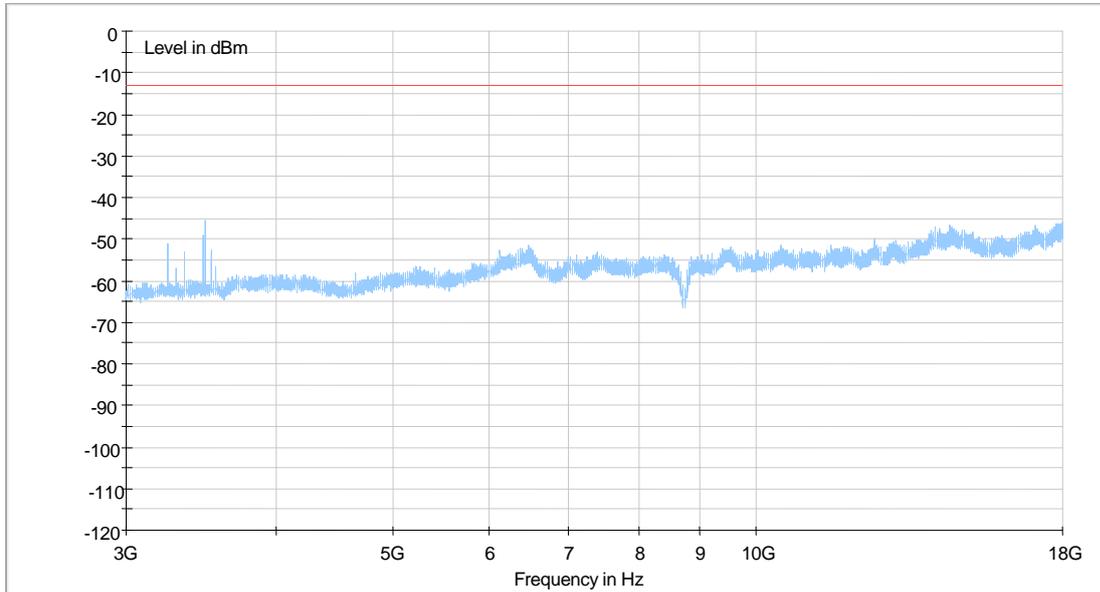


Traffic Mode (30MHz-3GHz)

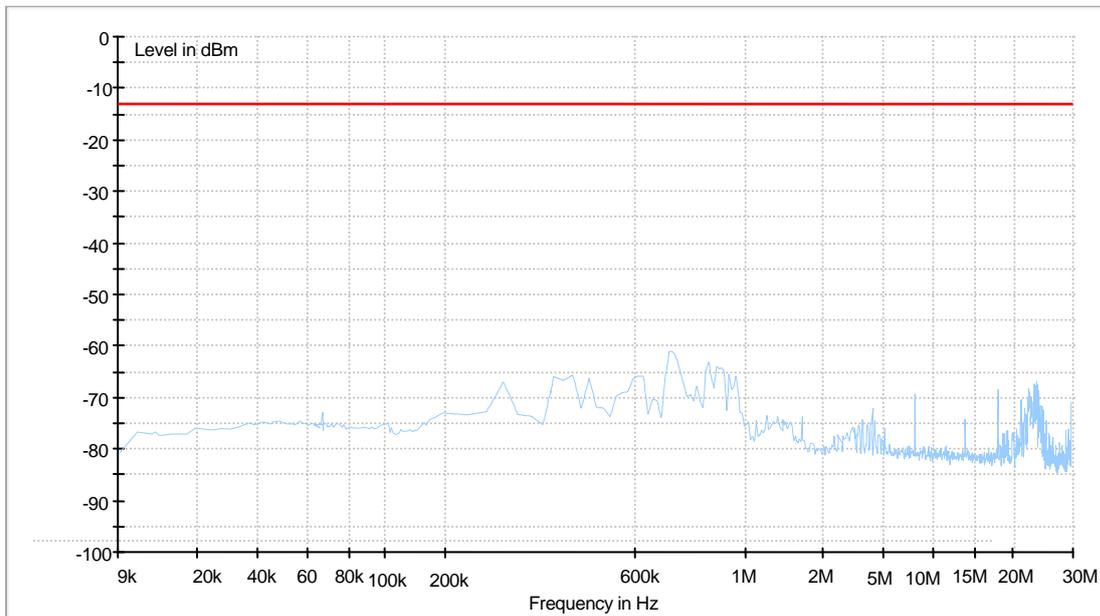


Note: The peak exceeds the limit line is carrier frequency.

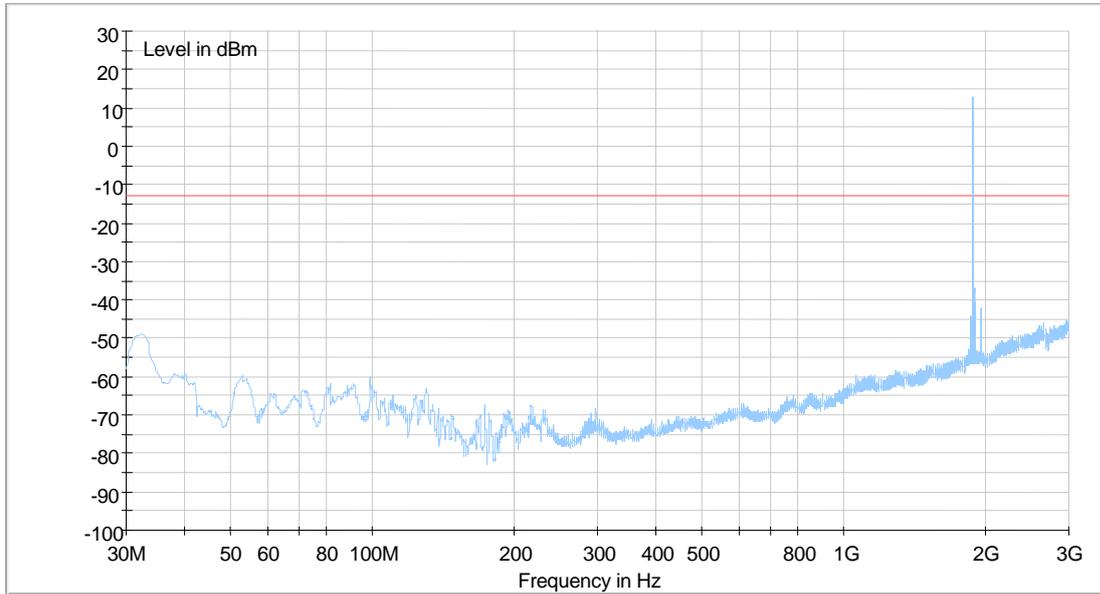
Traffic Mode (3GHz-18GHz)



9.2.2 For PCS 1900 Traffic Mode (9kHz-30MHz)

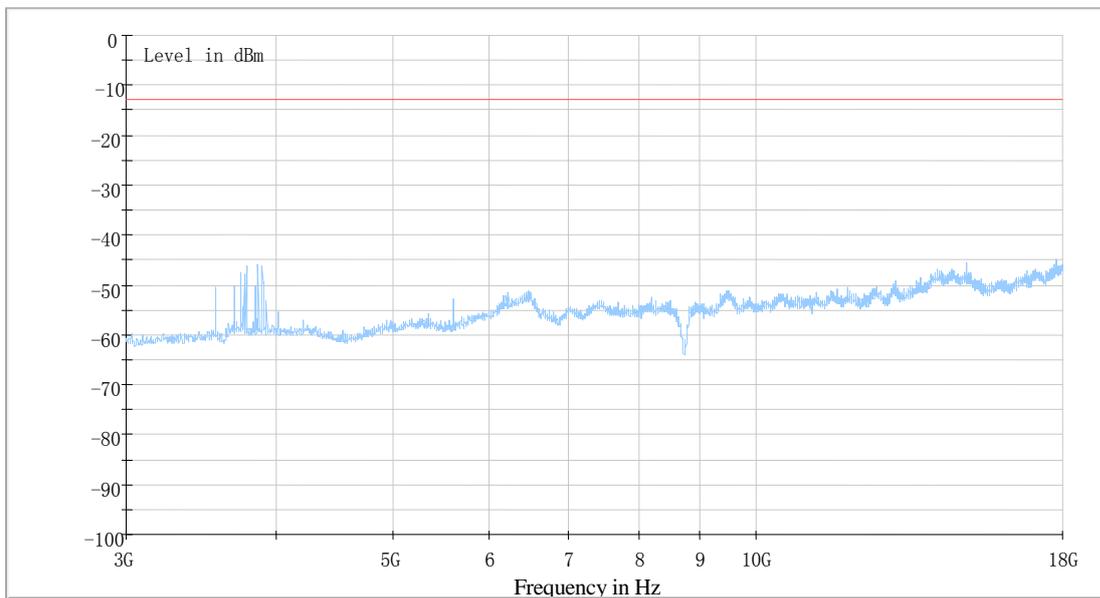


Traffic Mode (30MHz-3GHz)

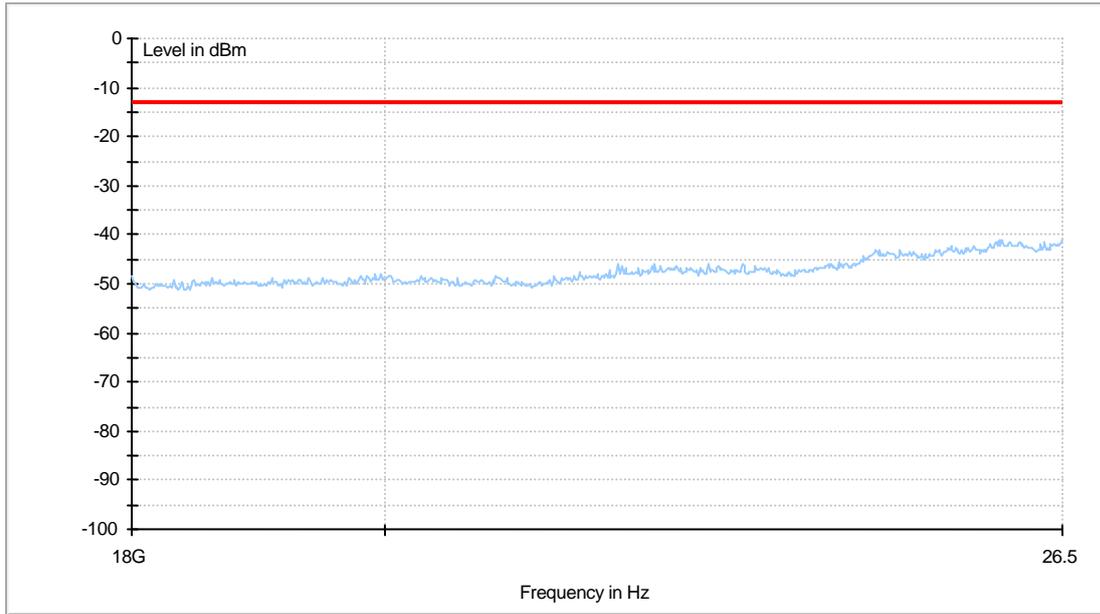


Note: The peak exceeds the limit line is carrier frequency.

Traffic Mode (3GHz-18GHz)



Traffic Mode (18GHz-26.5GHz)



END