



# EMC Test Report

**Product Name: Wireless Gateway**

**Model Number: B933**

**Report No: SYBH(R)017112008EB-4**

**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

1. The laboratory has obtained the accreditation of China National Accreditation Service for Conformity Assessment (CNAS), and accreditation number: L0310.
2. The laboratory has obtained the accreditation of THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION (A2LA), and Accreditation Council Certificate Number: 2174.01.
3. 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.
4. The laboratory has been listed by industry Canada to perform electromagnetic emission measurement. The site recognition number is 6369A-1.
5. The laboratory also has been listed by the VCCI to perform EMC measurements. The accreditation number is R2364, C2583, and T256.
6. The test report is invalid if not marked with "exclusive stamp for the test report".
7. 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.
8. The test report is invalid if there is any evidence of erasure and/or falsification.
9. 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.
10. Normally, the test report is only responsible for the samples that have undergone the test.
11. 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 |                        |



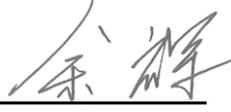
**REPORT ON** **B933 Wireless Gateway**  
**M/N: B933**

**REGULATION** **FCC CFR47 Part 15: Subpart B;**  
**FCC CFR47 Part 22: Subpart H;**

**START OF TEST** **Nov. 4, 2008**

**END OF TEST** **Nov. 10, 2008**

**Final Judgement:** **Pass**

|                 |                   |             |   |                  |
|-----------------|-------------------|-------------|---|------------------|
| <b>Approver</b> | <u>2008-11-11</u> | <u>张兴海</u>  |   |                  |
|                 | <b>Date</b>       | <b>Name</b> |   | <b>Signature</b> |
|                 | <hr/>             |             |   |                  |
| <b>Reviewer</b> | <u>2008-11-11</u> | <u>余辉</u>   |  |                  |
|                 | <b>Date</b>       | <b>Name</b> |   | <b>Signature</b> |
|                 | <hr/>             |             |   |                  |
| <b>Operator</b> | <u>2008-11-11</u> | <u>张飞</u>   |  |                  |
|                 | <b>Date</b>       | <b>Name</b> |   | <b>Signature</b> |
|                 | <hr/>             |             |   |                  |

---

---

## REPORT BODY CONTENT

|     |   |    |
|-----|---|----|
| 1   | Status .....                                  | 6  |
| 1.1 | Product Information.....                      | 6  |
| 1.2 | Applied Standard .....                        | 6  |
| 1.3 | Test Site .....                               | 7  |
| 1.4 | Test environment condition.....               | 7  |
| 2   | Summary of Results.....                       | 8  |
| 3   | Equipment Specification .....                 | 9  |
| 3.1 | General Description .....                     | 9  |
| 3.2 | Sub-Assembly Identity .....                   | 9  |
| 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 1000MHz .....   | 12 |
| 5.2 | Conducted Disturbance 0.15 MHz to 30MHz ..... | 13 |
| 5.3 | Radiated Spurious Emissions.....              | 14 |
| 6   | Main Test Instruments .....                   | 16 |
| 7   | System Measurement Uncertainty.....           | 17 |
| 8   | Graph and Data of Emission Test.....          | 18 |
| 8.1 | Radiated Disturbance .....                    | 18 |
| 8.2 | Conducted Disturbance .....                   | 19 |
| 8.3 | 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 HUAWEI HSDPA USB MODEM  
MANUFACTURERS MODEL NUMBER B933

### 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><br>Enclosure Port          | TC1<br>TM2                                | N/A                                  | Pass          | Site1       |
| <u>Conducted Emissions</u>                           | TC1<br>(TM1~TM2)                          | N/A                                  | Pass          | Site1       |
| <u>Radiated Spurious Emissions</u><br>Enclosure Port | TC1<br>TM1                                | 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.

### 3 Equipment Specification

#### 3.1 General Description

HUAWEI B933 Wireless Gateway is subscriber equipment in the UMTS system, it also provides wireless Internet accessing function, routing function, and network address translation (NAT) function. The WCDMA frequency is Band V. the WLAN frequency is 2.4G, but only WCDMA

Band V's test data are included in this report , Externally it provides one Power interface to adapter, one USIM card interface, one RJ11 interface (to connect to fixed telephone), one RJ45 interfaces (to connect to pc), and one external antenna interface for WCDMA.

B933 implements such functions as RF signal receiving/transmitting, HSDPA/WCDMA protocol processing, data service, etc. One 10/100 M bit/s high-speed Ethernet interfaces are provided at the LAN side. The voice service by directly connecting a telephone is supported.

#### 3.1.1 Main Equipment Technical Data

|                      |   |
|----------------------|---|
| Description:         | B933 Wireless Gateway                                     |
| Model:               | B933  |
| Input Rated Voltage: | ⎓ +5.0V   |
| Rated Power:         | Max 9.0 W   |
| Dimensions:          | 158 (length) ×105 (width) ×26 (height) (mm <sup>3</sup> ) |
| Weight:              | <0.5 kg   |

Table 3 Sub-Assembly Identity

| Mode  |        | Work Frequency            |                         |
|-------|--------|---------------------------|-------------------------|
|       |        | Transmitt Frequency (MHz) | Receive Frequency (MHz) |
| WCDMA | BAND V | 824-849                   | 869-894                 |

#### 3.2 Sub-Assembly Identity

Table 4 Sub-Assembly Identity

| Model Name | Qty. | Serial Number                             |                    | Description   |
|------------|------|---|--------------------|---|
| MAINBOARD  | 1    | WLB1TIPU                                  |                    | B933  |
| Accessory  |      |   |                    |   |
| Name       | Qty. | Manufacture                               | Serials number     | Description   |
| Adapter    | 1    | Dongguan Shilong Fuhua Electronic CO.,LTD | UE15W1-050200SPA V | Input: ~ 230V / 0.5A / 50-60Hz<br>Output: ⎓ +5.0V / 2A<br>Rate power: 10W |

## 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 |
|-------|-----------|---------------|
| FE    | 1m        | 1             |
| POWER | 1.5m      | 1             |

### 4.2 Associated Equipment Used during Test

Table 6 Associated Equipment Used during Test

| Name                   | Model   | Manufacturer | S/N        | Cal Date   |
|------------------------|---------|--------------|------------|------------|
| Base Station Simulator | CMU 200 | R&S          | 105822     | 2008-09-09 |
| Notebook               | D600    | DELL         | 3106044320 | NA         |

### 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                | TM1~TM2   |

TC1: EUT was powered by the power adapter, and connected to the notebook by LAN / WLAN/ port. Each POTS port of EUT should connect with a phone.

#### 4.3.2 Test Mode

There was 2 test Modes. TM1 to TM2 were shown below:

TM1: operate in traffic mode WCDMA BAND V;

TM2: operate in idle mode WCDMA BAND V;

## 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.( WCDMA see 3GPP TS 34.121).

For WCDMA, the following conditions shall also be met:

Logical Test Interface for details regarding generic call set-up procedure and BER, BLER test loop scenarios:

- set and send continuously up power control commands to the UE;

- The DTX shall be disabled;
- Inner Loop Power Control shall be enabled;
- transmitting and/or receiving (UL/DL) bit rate for reference test channel shall be 12.2 kbit / s.
- The EUT shall be commanded to operate at maximum transmit power;

Assign channel frequency to an appropriate channel number. Here, set the ARFCN channel number 4132 to WCDMA 850.

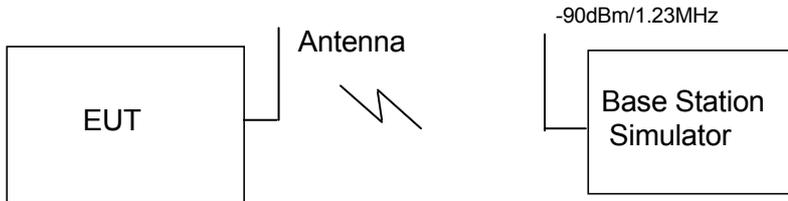


Figure 1.: TC1 (TM1)

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 WCDMA, the following conditions shall be met:

- UE shall be camped on a cell;
- UE shall perform Location Registration (LR) before the test, but not during the test;
- UE's neighbour cell list shall be empty;
- Paging repetition period and DRX cycle shall be set to minimum (shortest possible time interval).

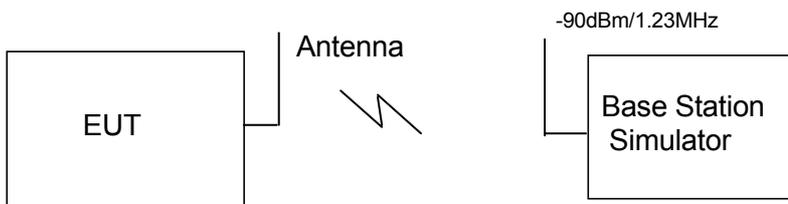


Figure 2. TC1 (TM2)

## 5 Electromagnetic Interference (EMI)

### 5.1 Radiated Disturbance 30MHz to 1000MHz

#### 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 (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:

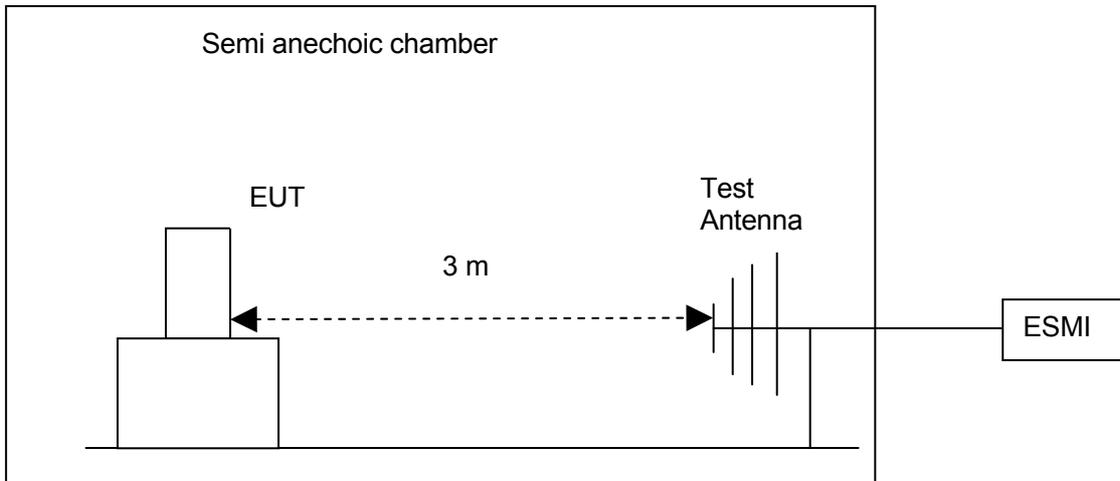


Figure 3. Test set-up

#### 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                                      |
| 960-1000                    | 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.

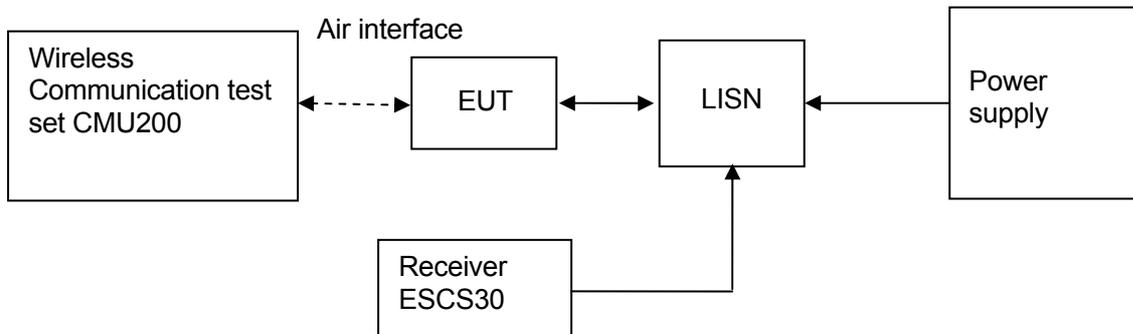


Figure 4. Test Set-up

### 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 $\mu$ 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    |

### 5.3 Radiated Spurious Emissions

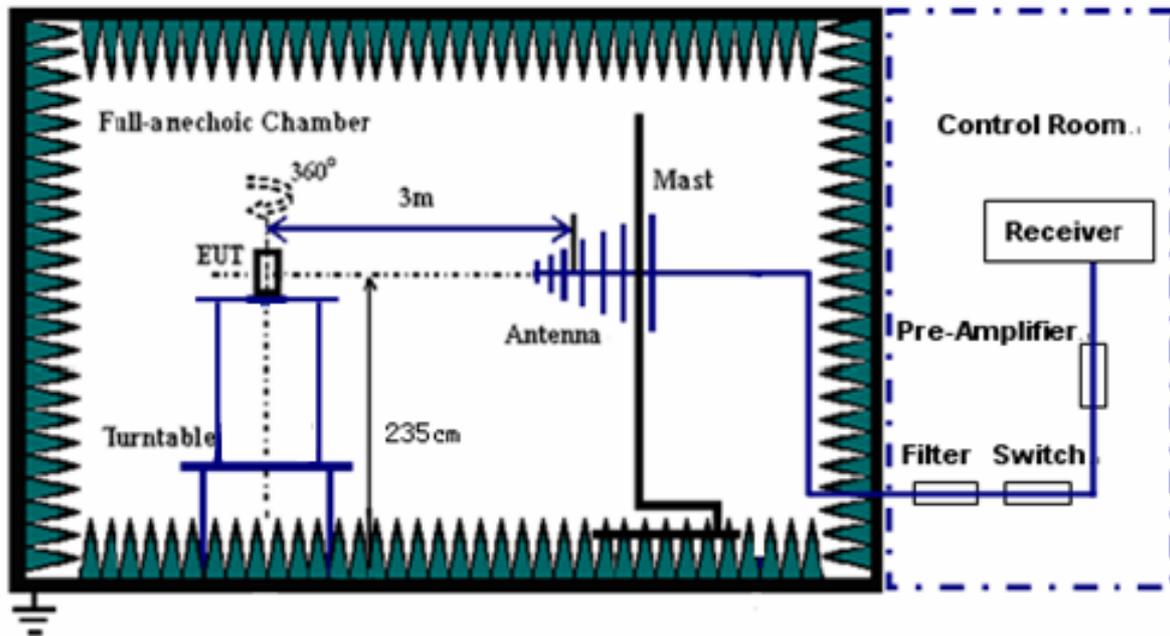
#### 5.3.1 Test Procedure

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:

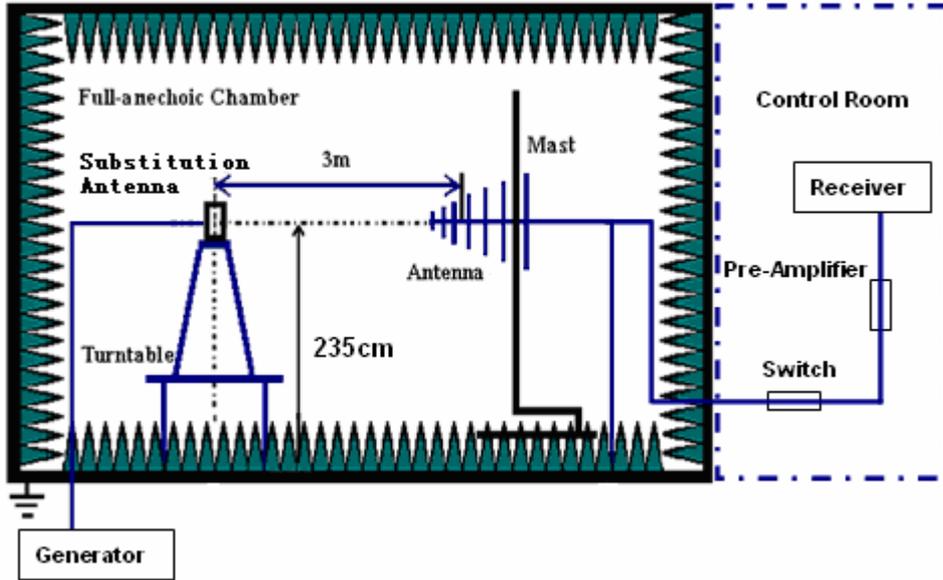
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect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

Test the Radiated maximum output power by the 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: 100 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                                   |

### 5.3.2 Test Results

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

## 6 Main Test Instruments

Table 11 Main Test Equipments

| Test item            | Test Instrument          | Model            | Manufacturer | Cal-Date       | Cal Interval (month) |
|----------------------|--------------------------|------------------|--------------|----------------|----------------------|
| RE                   | EMI Test receiver        | ESMI             | R&S          | April.22, 2008 | 12                   |
|                      | Broadband Antenna        | CBL 6112B (2536) | SCHAFFNER    | Aug.23, 2008   | 12                   |
| CE                   | EMI Test receiver        | ESCS30           | R&S          | May.12, 2008   | 12                   |
|                      | Artificial Mains Network | ENV4200          | R&S          | May.12, 2008   | 12                   |
| RSE                  | EMI Test receiver        | ESIB26           | R&S          | April.22, 2008 | 12                   |
|                      | Horn Antenna             | 3117             | EMCO         | Aug.22, 2008   | 12                   |
|                      | Broadband Antenna        | CBL6112B (2941)  | SCHAFFNER    | Aug.23, 2008   | 12                   |
|                      | Horn Antenna             | 3160             | EMCO         | Aug.22, 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     |                |                      |

## 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:

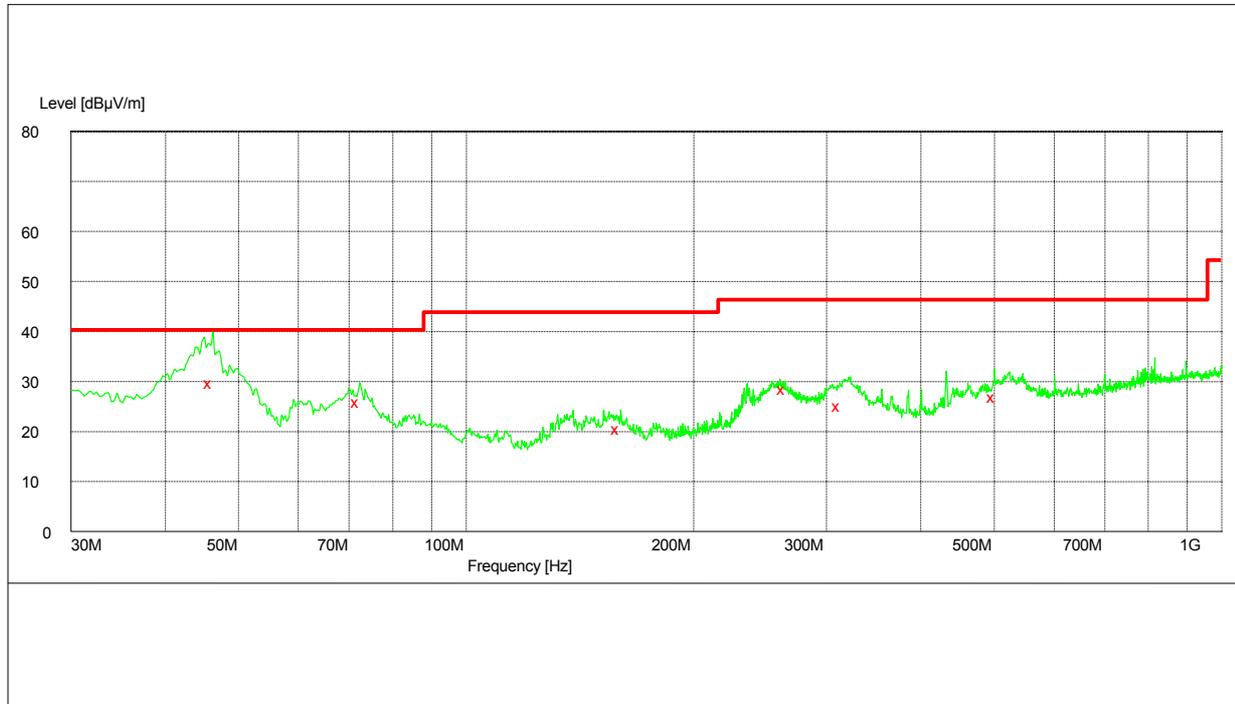
Table 12 System Measurement Uncertainty

|     | <b>Items</b>                     | <b>Extended Uncertainty</b> |
|-----|----------------------------------|-----------------------------|
| 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                |

## 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.



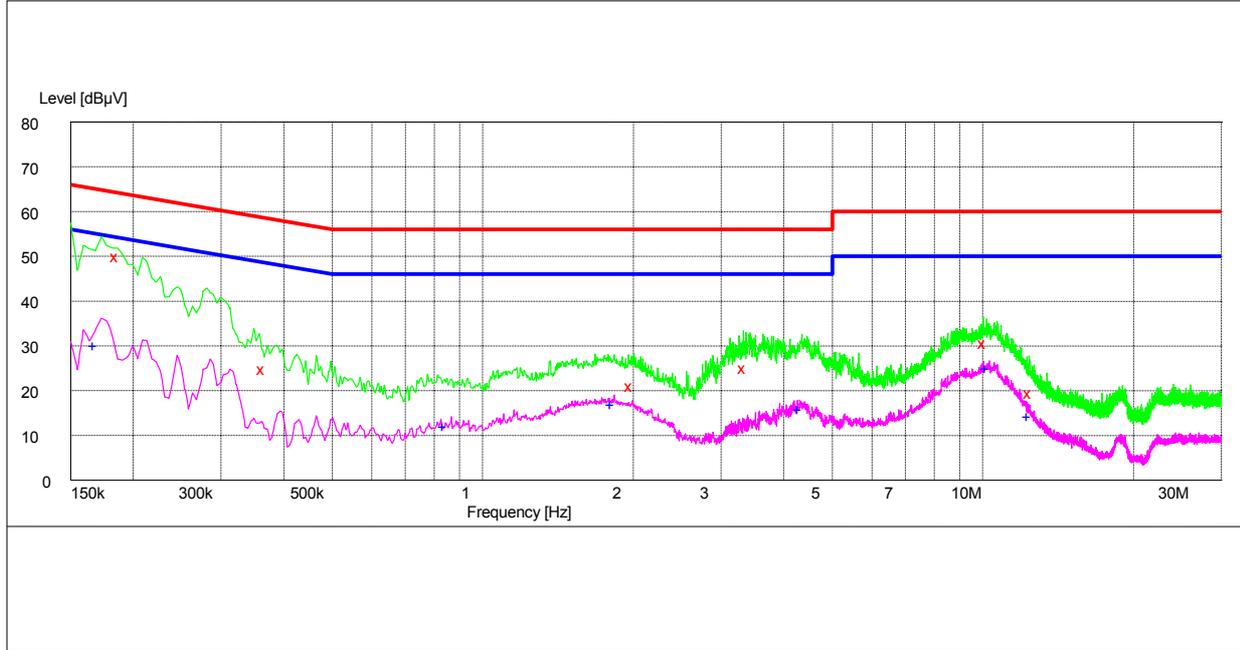
#### MEASUREMENT RESULT: QP Detector

| Frequency MHz | Level dBµV/m | Transd dB | Limit dBµV/m | Margin dB | Height cm | Azimuth deg | Polarisation |
|---------------|--------------|-----------|--------------|-----------|-----------|-------------|--------------|
| 46.020000     | 29.80        | -14.5     | 40.0         | 10.2      | 100.0     | 214.00      | VERTICAL     |
| 72.000000     | 27.30        | -18.8     | 40.0         | 18.7      | 231.0     | 77.00       | HORIZONTAL   |
| 158.880000    | 20.20        | -14.6     | 43.5         | 23.3      | 100.0     | 257.00      | HORIZONTAL   |
| 259.380000    | 28.50        | -12.5     | 46.0         | 17.5      | 196.0     | 109.00      | HORIZONTAL   |
| 312.000000    | 25.20        | -9.2      | 46.0         | 20.8      | 206.0     | 77.00       | VERTICAL     |
| 499.980000    | 27.10        | -5.7      | 46.0         | 18.9      | 114.0     | 0.00        | VERTICAL     |

## 8.2 Conducted Disturbance

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

### 8.2.1 AC Power Port Test Data



#### MEASUREMENT RESULT: QP Detector

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE  |
|---------------|------------|-----------|------------|-----------|------|-----|
| 0.186000      | 50.40      | 10.1      | 64         | 13.6      | N    | FLO |
| 0.366000      | 25.30      | 10.0      | 59         | 33.7      | L3   | FLO |
| 1.990500      | 21.30      | 10.1      | 56         | 34.7      | N    | FLO |
| 3.354000      | 25.40      | 10.1      | 56         | 30.6      | L3   | FLO |
| 10.117500     | 30.90      | 10.2      | 60         | 29.1      | N    | FLO |
| 12.471000     | 19.80      | 10.2      | 60         | 40.2      | N    | FLO |

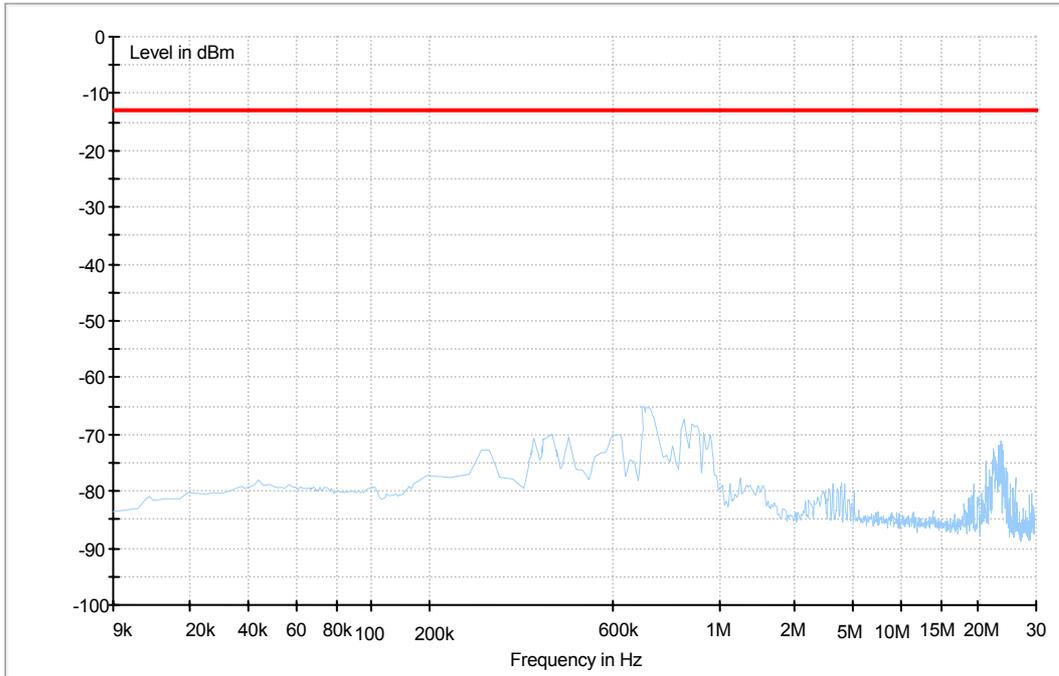
#### MEASUREMENT RESULT: AV Detector

| Frequency MHz | Level dBµV | Transd dB | Limit dBµV | Margin dB | Line | PE  |
|---------------|------------|-----------|------------|-----------|------|-----|
| 0.168000      | 30.30      | 10.0      | 55         | 24.7      | N    | FLO |
| 0.843000      | 12.30      | 10.0      | 46         | 33.7      | L3   | FLO |
| 1.824000      | 17.00      | 10.1      | 46         | 29.0      | N    | FLO |
| 4.317000      | 16.10      | 10.1      | 46         | 29.9      | L3   | FLO |
| 10.230000     | 25.30      | 10.1      | 50         | 24.7      | N    | FLO |
| 12.408000     | 14.50      | 10.2      | 50         | 35.5      | N    | FLO |

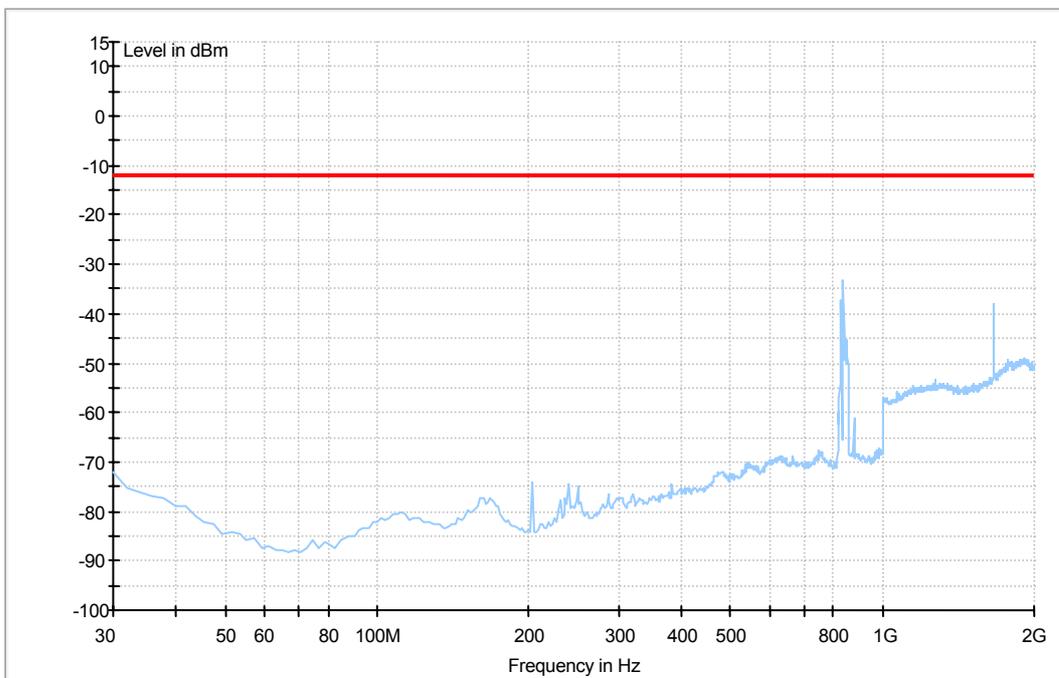
### 8.3 Radiated Spurious Emission

#### 8.3.1 For WCDMA BAND V

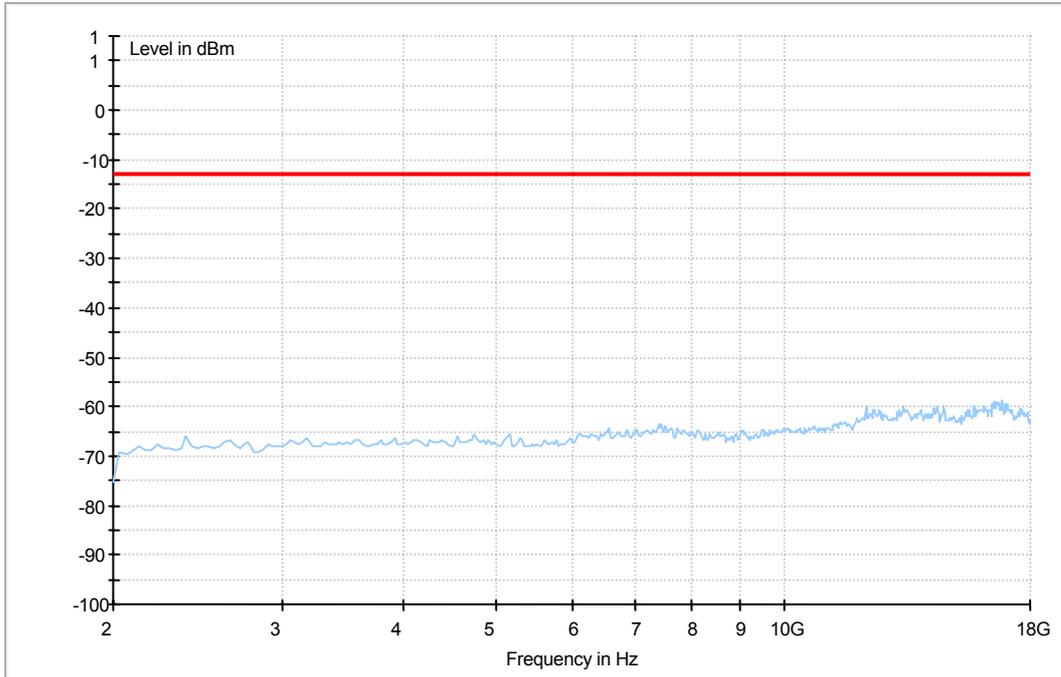
Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-2GHz)



Traffic Mode (2GHz-18GHz)



**END**