



EMC Test Report

**Product Name:
Wireless Gateway**

Model Number: B970b

Report No: SYBHZ(R)E019022010EB-1

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

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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.
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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	<i>Not Applicable!</i>
	5	
	6	
	7	

REPORT ON **EMC TEST OF Wireless Gateway**

REGULATION **M/N: B970b**
FCC CFR47 Part 15: Subpart B;
FCC CFR47 Part 22: Subpart H;
FCC CFR47 Part 24: Subpart E;

START OF TEST **Feb.14, 2010**

END OF TEST **Feb.24, 2010**

Final Judgement: **Pass**

Approver

2010-04-01
Date

张兴海
Name

Signature



2010-04-01
Date

徐广义
Name

Signature

徐广义

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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: Wireless Gateway
MANUFACTURERS MODEL NUMBER: B970b

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	22.917/24.238	Radiated Spurious Emission	PASS

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/TC2 (TM1-TM5)	N/A	Pass	Site1
<u>Conducted Emissions</u>	TC1 (TM1-TM10)	N/A	Pass	Site1
<u>Radiated Spurious Emissions</u> Enclosure Port	TC1 (TM6-TM10)	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 B970b Wireless Gateway is subscriber equipment in the UMTS/GSM system, also supports wireless Internet accessing function, routing function, and network address translation (NAT) function. The WCDMA frequency is Band I and Band VIII. The GSM/GPRS/EDGE frequency band includes 850M, EGSM900, DCS1800 and PCS1900, the WLAN frequency is 2.4G. B970b implements such functions as RF signal receiving/transmitting, HSDPA/ WCDMA and EDGE/GPRS/GSM protocol processing, data service ,etc. Externally it provides USB interface (to connect to the laptop etc.), USIM card interface, RJ11 interface (to connect to fixed telephone), RJ45 interface (to connect to pc) and external antenna interface. It has four internal antennas as default.

3.1.1 Main Equipment Technical Data

Description:	Wireless Gateway
Models:	B970b
Input Rated Voltage:	+5.0V
Extrme voltage:	+4.75V and +5.6V
Rated Power:	<9W
Dimensions:	155 mm × 115 mm × 28 mm
Weight:	<500g

Table 3 Sub-Assembly Identity

Mode		Work Frequency	
		Transmitt Frequency(MHz)	Receive Frequency (MHz)
GSM	PCS1900	1850-1910	1930-1990
GSM	GSM850	824-849	869-894
WLAN	WLAN	2410-2483.5	2410-2483.5

3.2 Sub-Assembly Identity

Table 4 Sub-Assembly Identity

Board				
Model Name	Qty.	Serial	Description	
B970b	1	WLA2TCEU WLA1TIZU	Main board of Wireless Gateway	
Accessory				
Name	Qt y.	Manufacture	Serials number	Description
Adaptor	1	Huawei Technologies CO.,LTD	BYA9C1600004	Adapter Model: UE15W1-050200SPAV Input voltage: ~100V-240V/50-60Hz Output voltage: +5.0V,2A 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	Length	Quantity	Type of Cable
AC Power Port	1.5m	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	3608105673	2009-10-10
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).

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

TC2:EUT connected to the notebook by USB port.

Table 7 Configuration table

TC1/TC2	TM1~TM10
---------	----------

4.3.2 Test Mode

There were 10 test Modes. TM1 to TM10 were shown in the diagrams below:

TM1: operate in idle GSM850;

TM2: operate in idle EDGE850;

TM3: operate in idle GSM1900;

TM4: operate in idle EDGE1900;

TM5: operate in idle WLAN;

TM6: operate in traffic GSM850;

TM7: operate in traffic EDGE850;

TM8: operate in traffic GSM1900;

TM9: operate in traffic EDGE1900;

TM10: operate in traffic WLAN;

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 EGSM and DCS, 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.

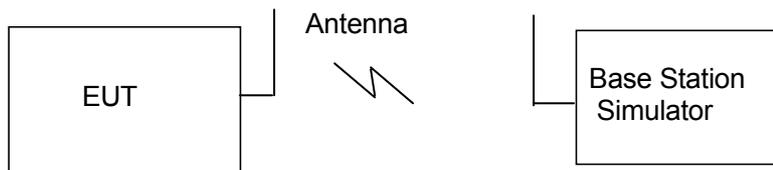


Figure 1.: Test configuration 1

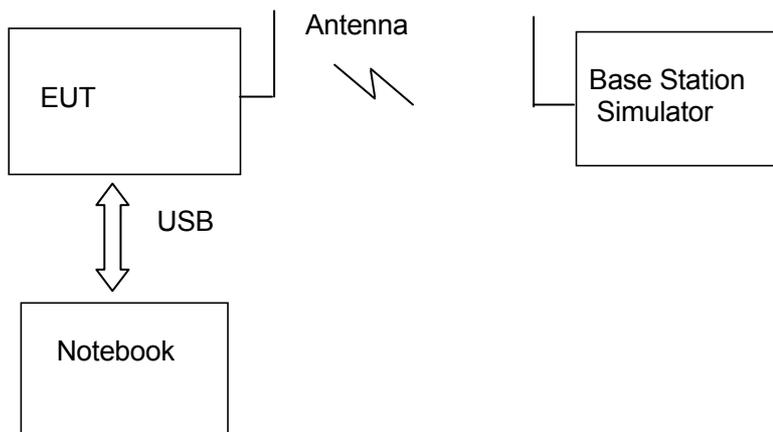


Figure 2.: Test configuration 2

Idle Mode:

The EUT is required to be in the idle mode.

For GSM850 and PCS1900, 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.

Please refer to following figure:

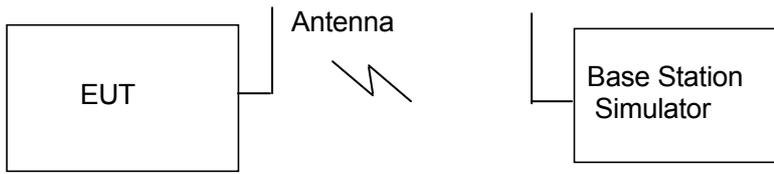


Figure 3. Test configuration 1

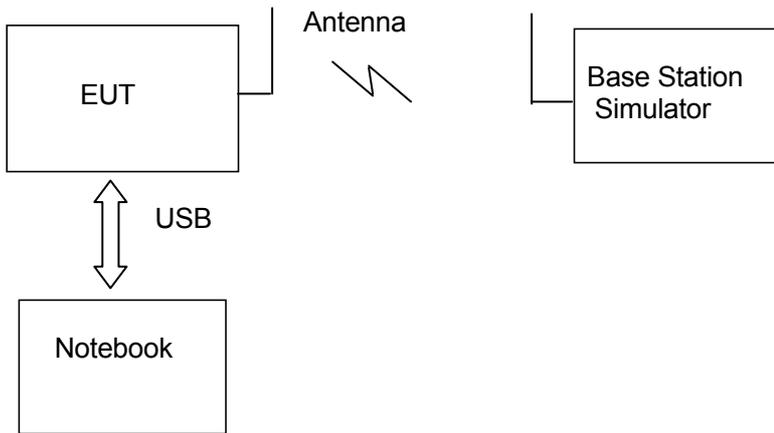


Figure 4. Test configuration 2

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:

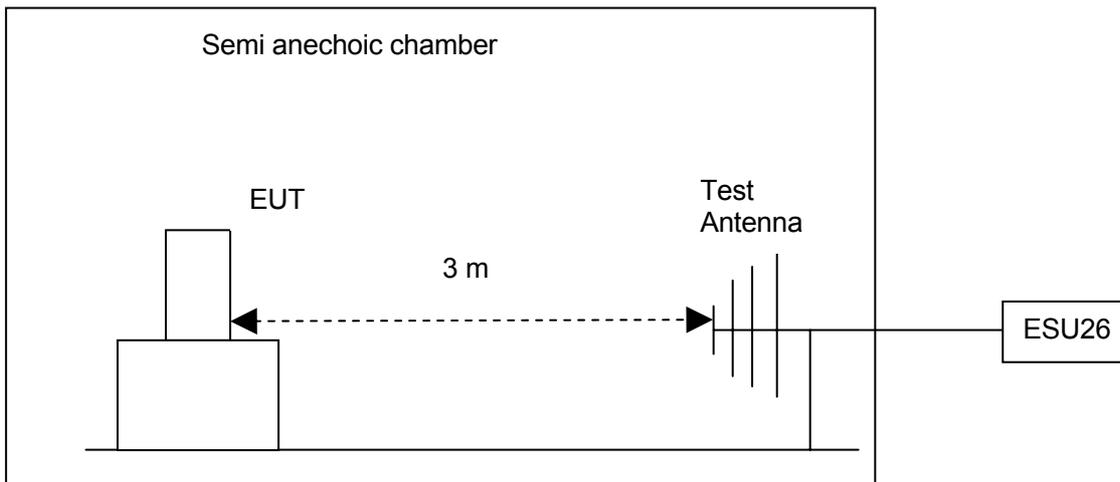


Figure 5. Test set-up

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.

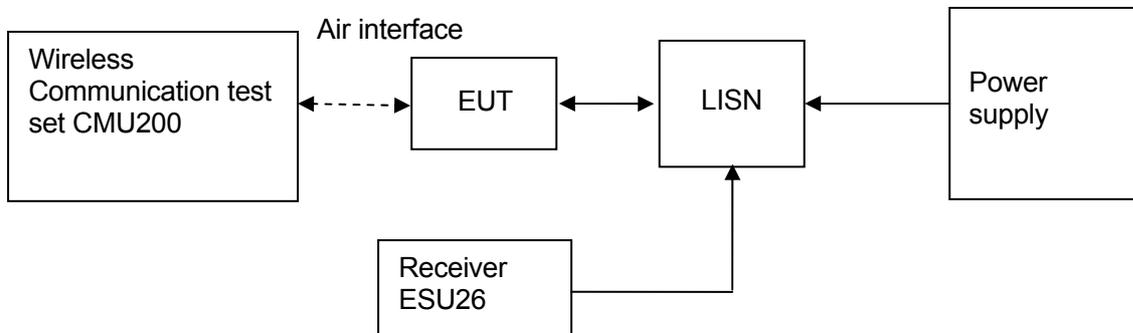


Figure 6. Test Set-up

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

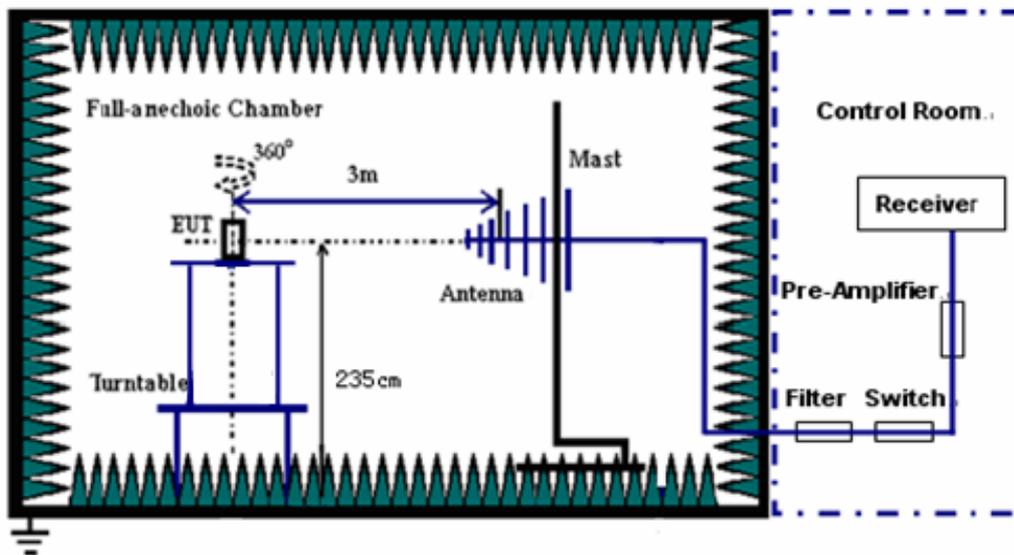
5.3.1 Test Procedure

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:

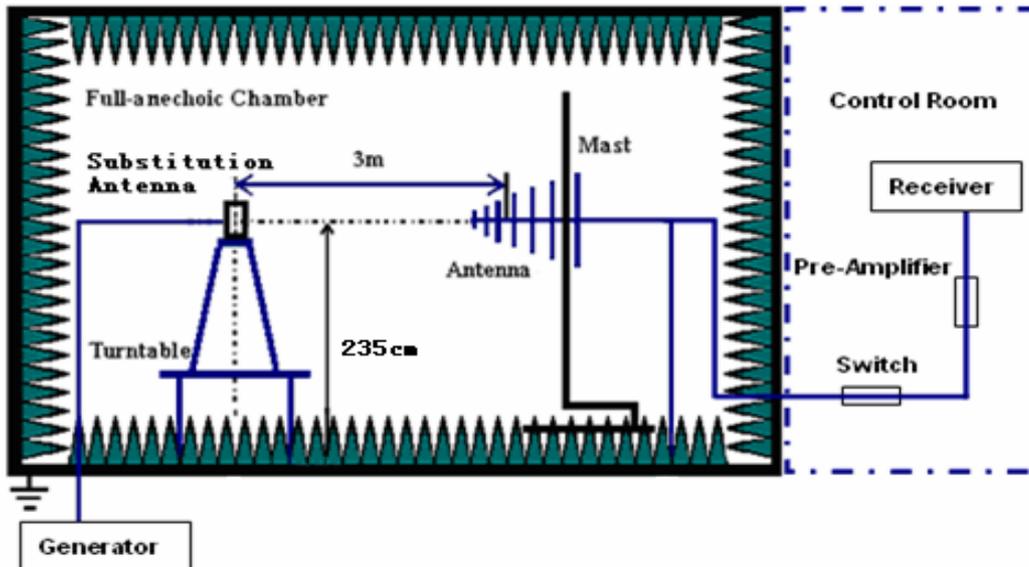
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect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

Test the Radiated maximum output power by the 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]	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 FCC 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	Jul.07, 2009	12
	Broadband Antenna	VULB 9163	SCHAFFNER	Jun.24.2009	12
	Horn Antenna	HF906	R&S	Jun.19.2009	12
CE	EMI Test receiver	ESU26	R&S	Jul.07, 2009	12
	Artificial Mains Network	ENV216	R&S	Jul.07, 2009	12
RSE	EMI Test receiver	ESIB26	R&S	April.22, 2009	12
	Horn Antenna	3117	EMCO	Sep.11.2009	12
	Broadband Antenna	CBL 6112B	SCHAFFNER	Sep.22.2009	12
	Horn Antenna	3160	EMCO	Jun.19.2009	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 14 System Measurement Uncertainty

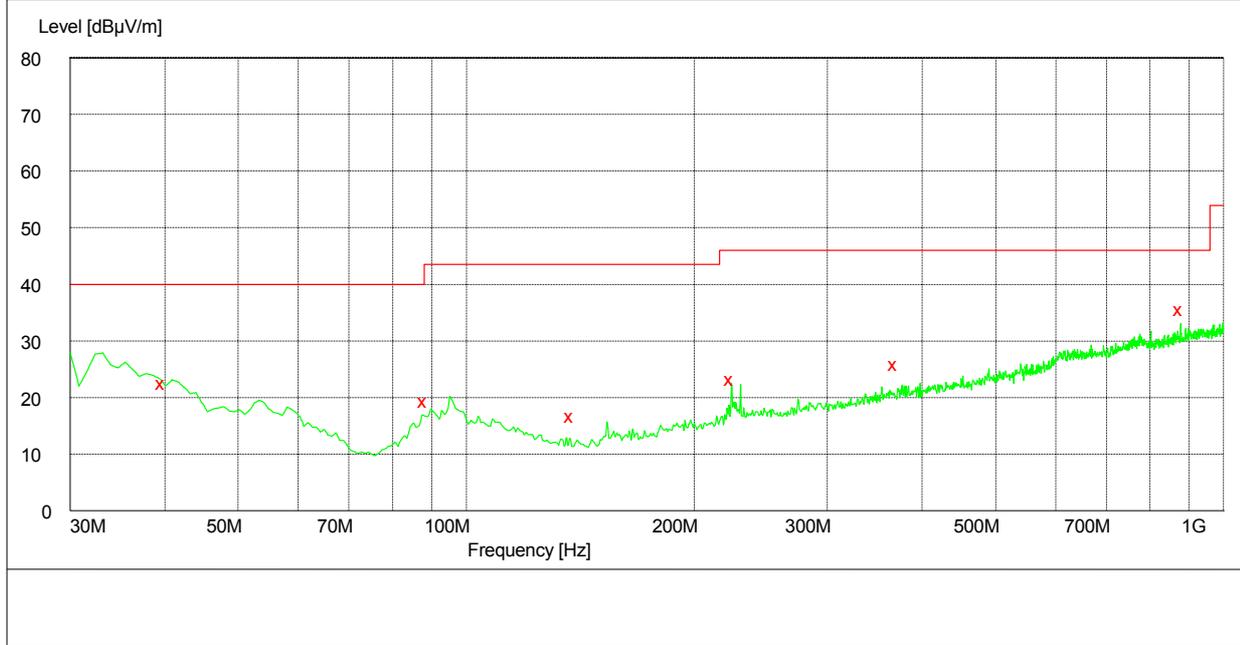
Items		Extended Uncertainty
RE	Field strength (dB μ V/m)	U=4.20dB; k=2(30MHz-1GHz)
RE	Field strength (dB μ V/m)	U=4.10dB; k=2(1GHz-18GHz)
RSE	ERP (dBm)	U=2.2dB; k=2
CE	Disturbance Voltage (dB μ V)	U=3.3dB; k=2

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.

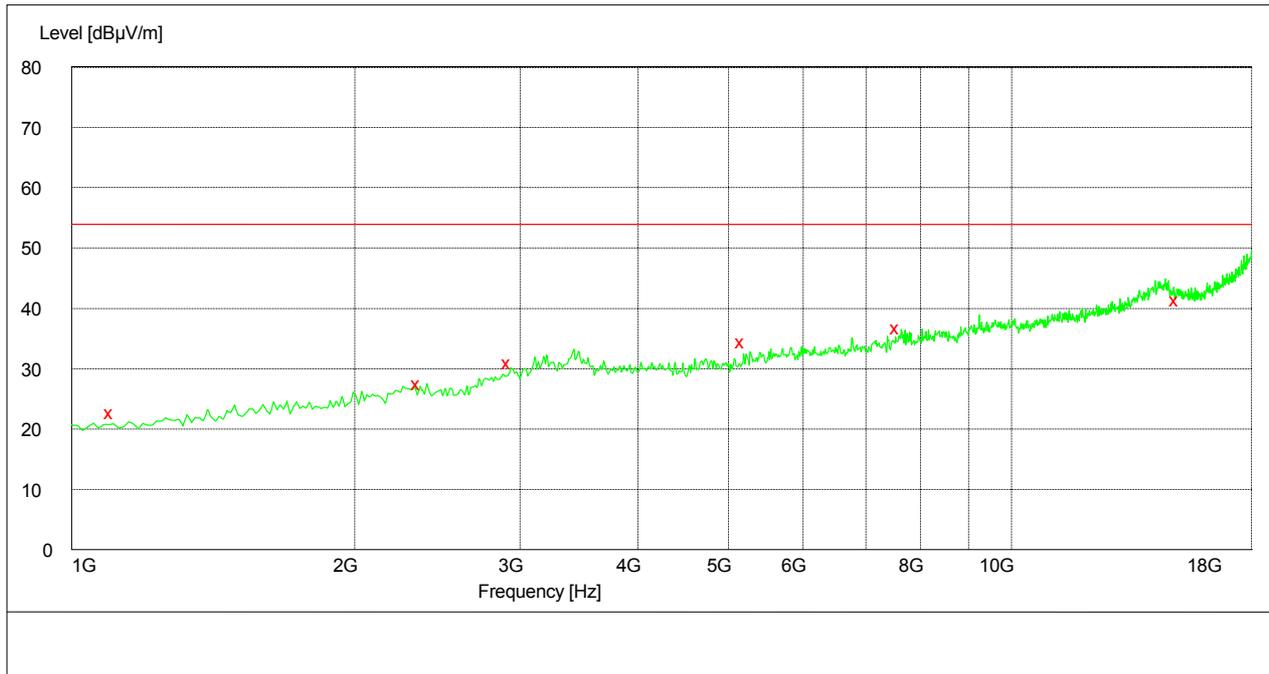
30MHz-1GHz



MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
39.780000	22.80	13.0	40.0	17.2	100.0	285.00	HORIZONTAL
88.260000	19.60	11.2	43.5	23.9	221.0	352.00	VERTICAL
137.760000	16.90	8.8	43.5	26.6	284.0	54.00	HORIZONTAL
223.980000	23.50	13.2	46.0	22.5	122.0	227.00	VERTICAL
368.460000	26.00	17.4	46.0	20.0	167.0	74.00	VERTICAL
878.100000	35.80	26.0	46.0	10.2	110.0	33.00	HORIZONTAL

1GHz-18GHz



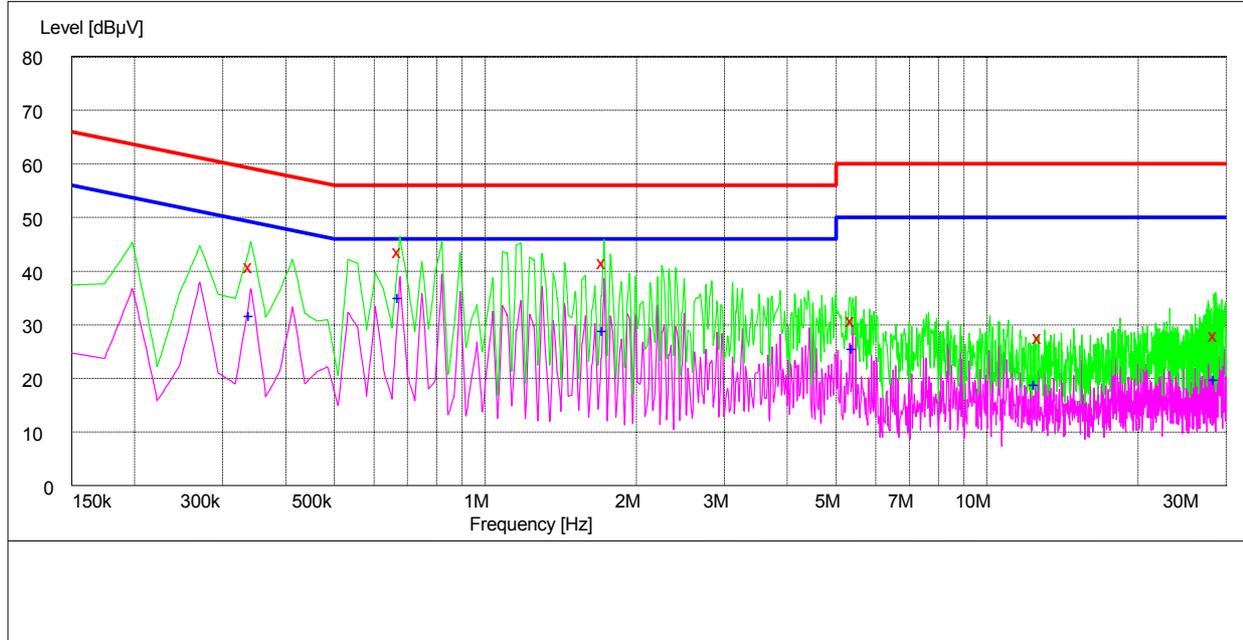
MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
1108.500000	21.90	-15.9	54.0	32.1	129.0	90.00	HORIZONTAL
2379.000000	28.80	-10.0	54.0	25.2	150.0	273.00	HORIZONTAL
2909.500000	30.50	-7.6	54.0	23.5	148.0	13.00	HORIZONTAL
5061.500000	33.00	-1.4	54.0	21	148.0	170.00	HORIZONTAL
7510.000000	37.40	4.1	54.0	16.6	139.0	224.00	VERTICAL
15995.500000	40.20	17.3	54.0	13.8	100.0	110.00	HORIZONTAL

8.2 Conducted Disturbance

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

AC Power Port Test Data



MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.341040	41.20	10.0	59	17.8	L1	FLO
0.675360	43.70	10.1	56	12.3	L1	FLO
1.726080	42.00	10.1	56	14	L1	FLO
5.403600	31.10	10.2	60	28.9	L1	FLO
12.782520	27.60	10.3	60	32.4	L1	FLO
28.591080	28.30	10.4	60	31.7	L1	FLO

MEASUREMENT RESULT: AV Detector

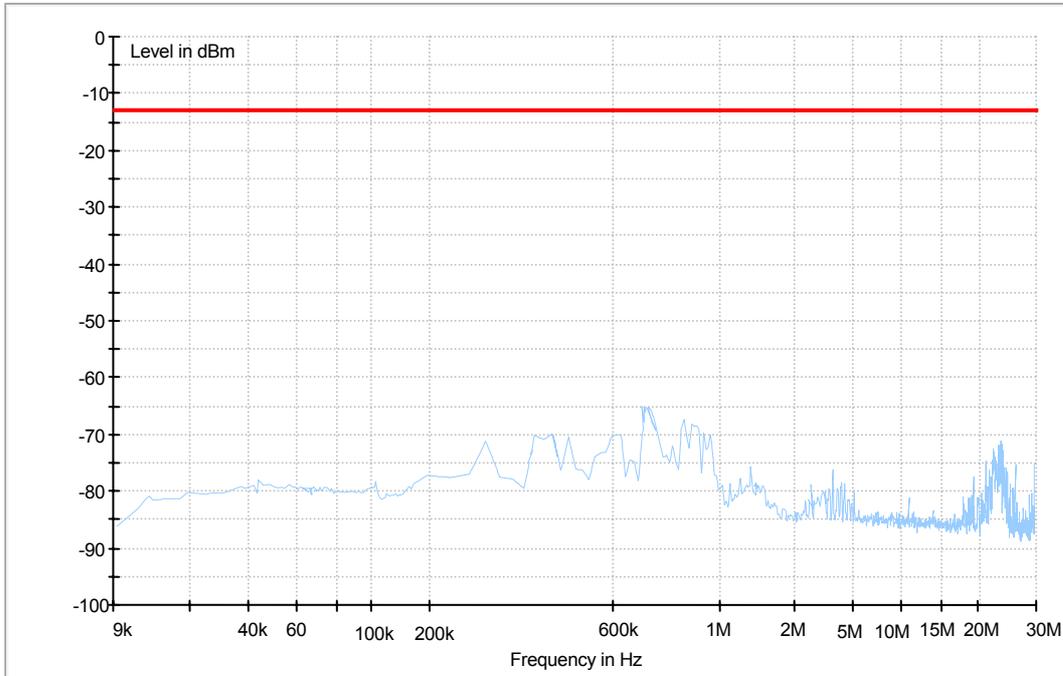
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.341040	31.90	10.0	49	17.1	L1	FLO
0.675360	34.30	10.1	46	11.7	L1	FLO
1.726080	29.10	10.1	46	16.9	L1	FLO
5.403600	26.10	10.2	60	33.9	L1	FLO
12.782520	19.60	10.3	60	40.4	L1	FLO
28.591080	20.80	10.4	50	29.2	L1	FLO

8.3 Radiated Spurious Emission

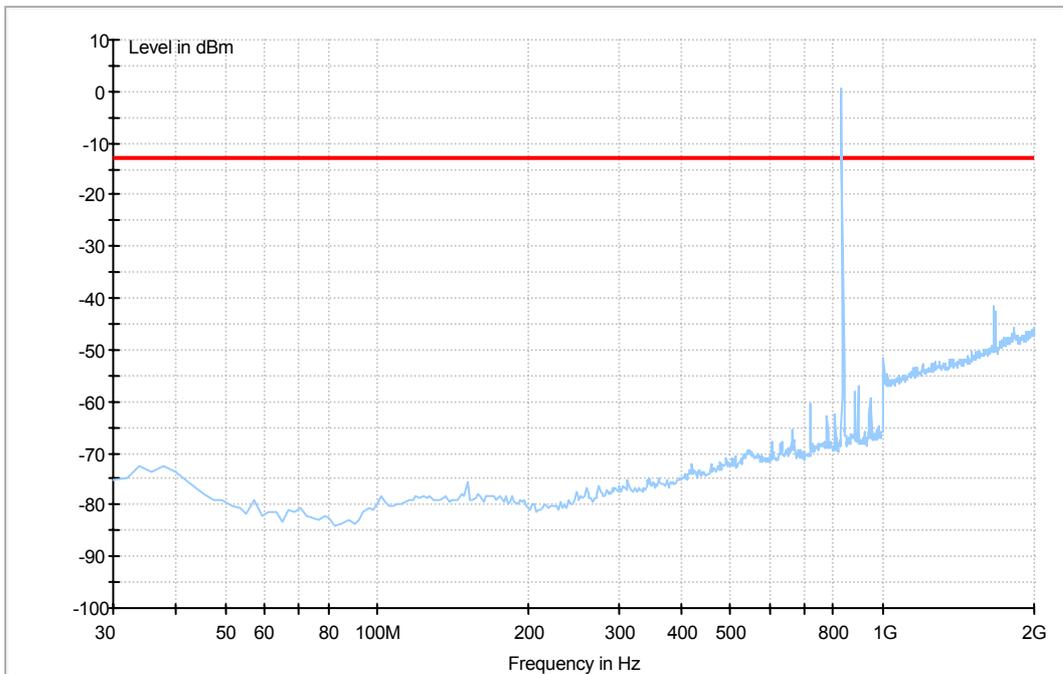
This test results are the maximum level of radiated spurious emissions in vertical and horizontal polarity.

8.3.1 For GSM 850

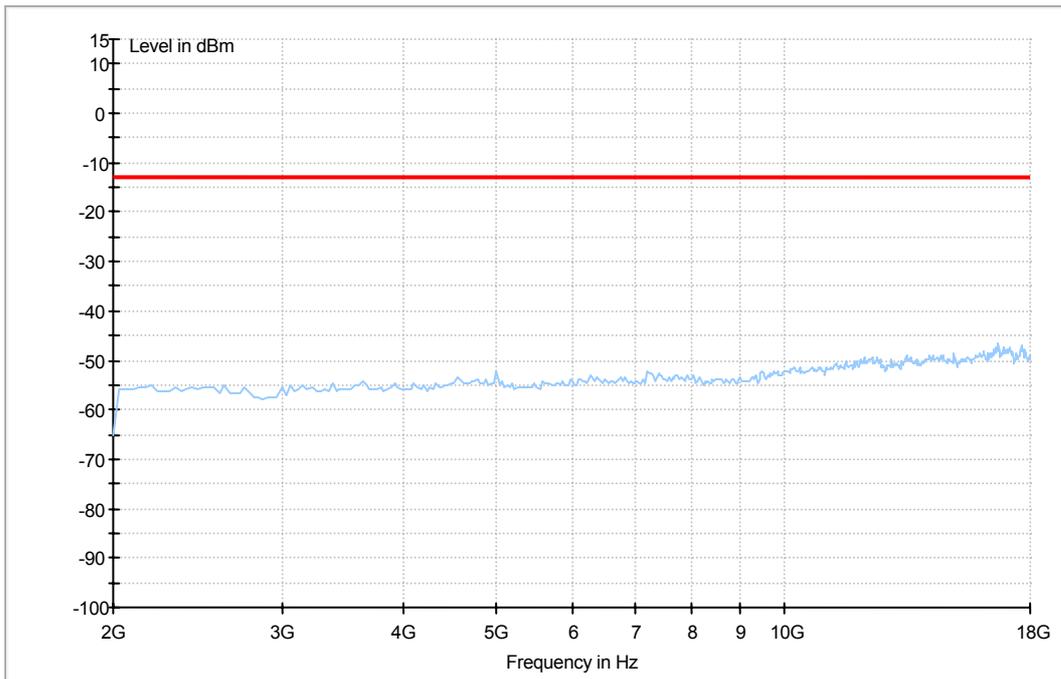
Traffic Mode (9kHz-30MHz)



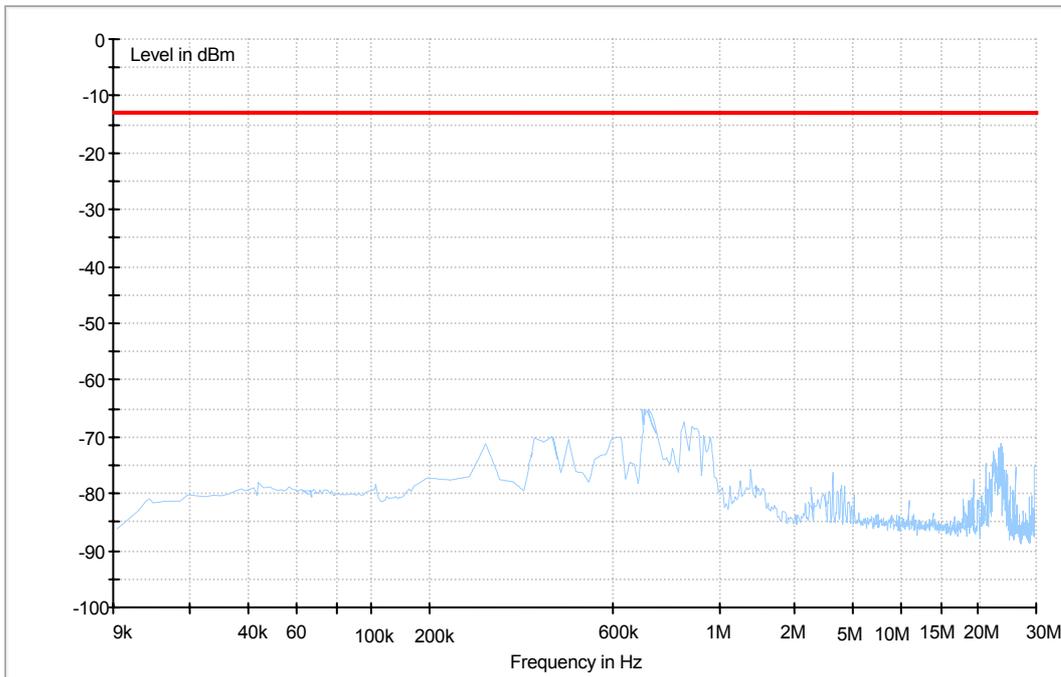
Traffic Mode (30MHz-2GHz)



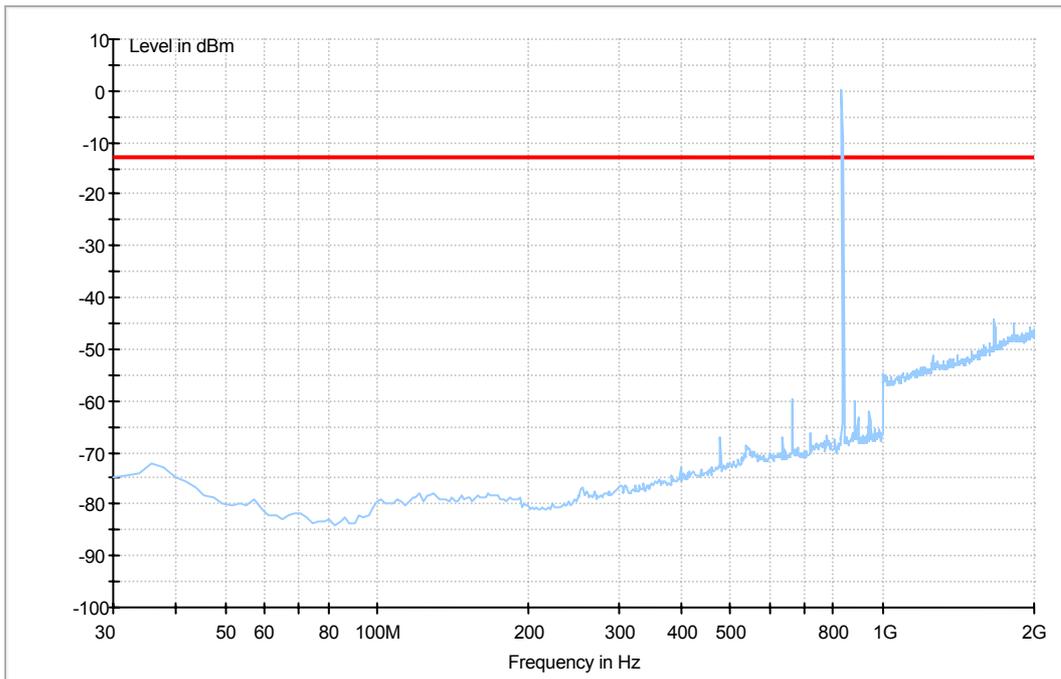
Traffic Mode (2GHz-18GHz)



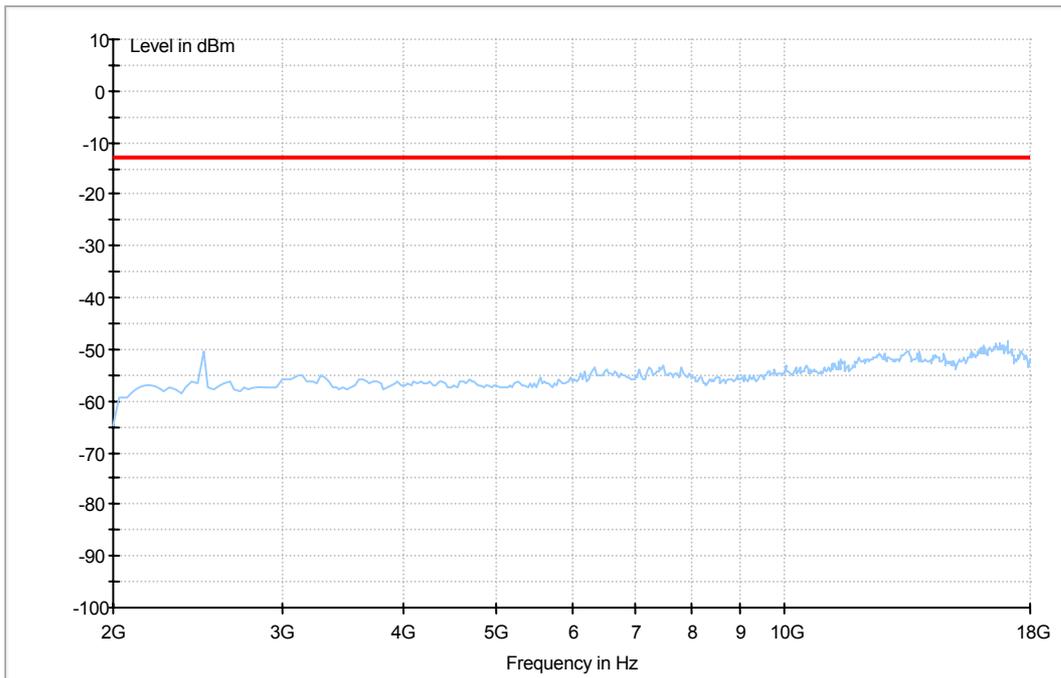
8.3.2 For EGPRS 850 Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-2GHz)

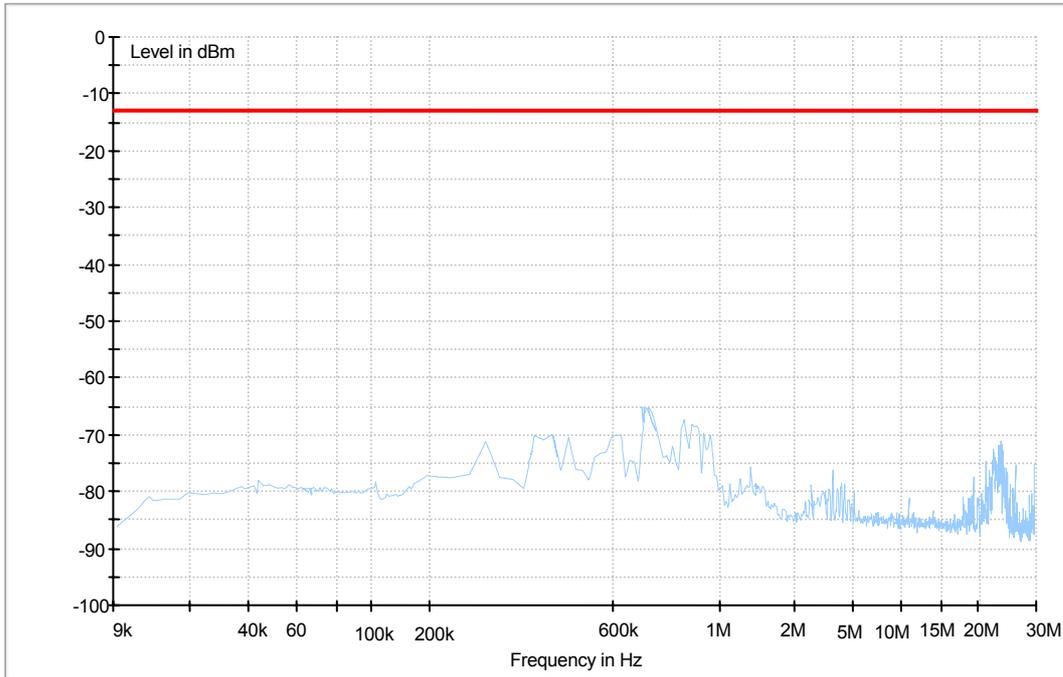


Traffic Mode (2GHz-18GHz)

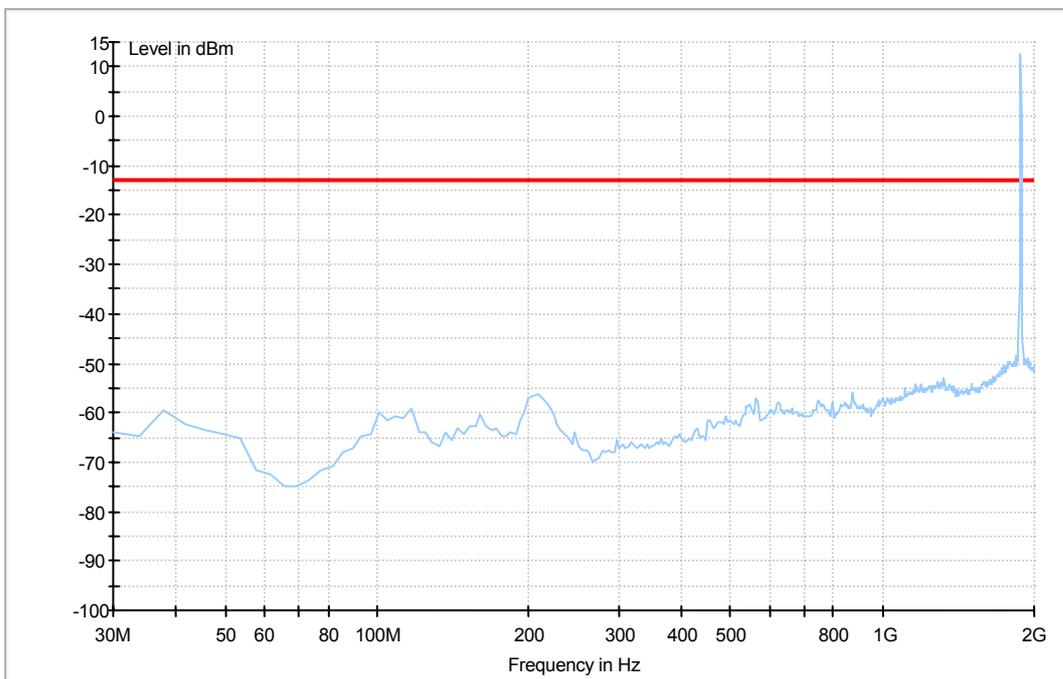


8.3.3 For PCS 1900

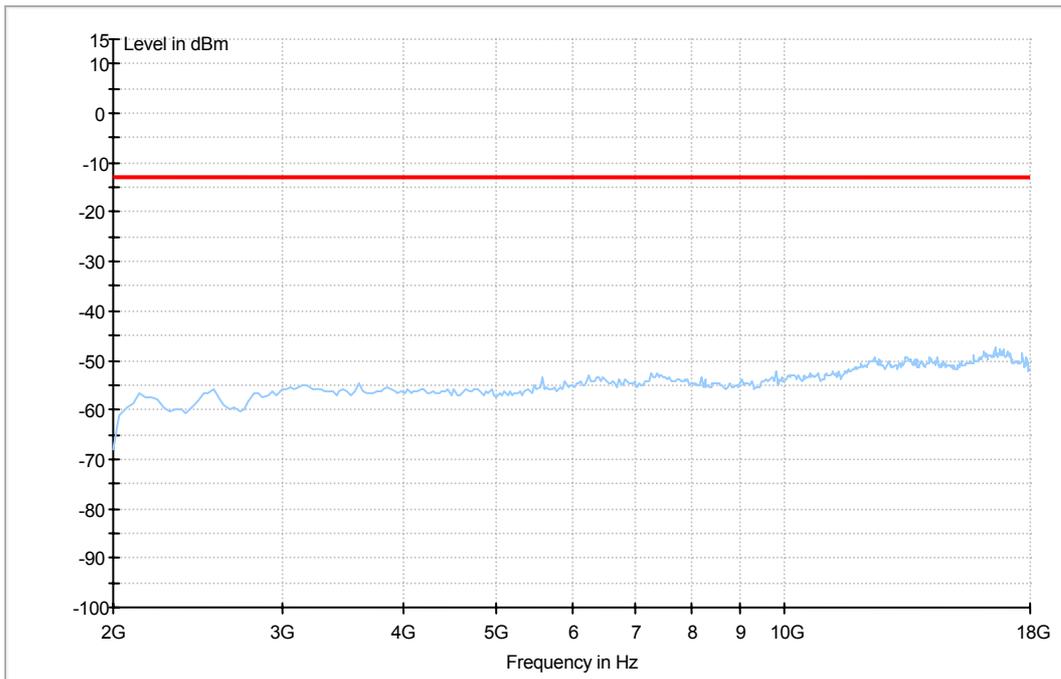
Traffic Mode (9kHz-30MHz)



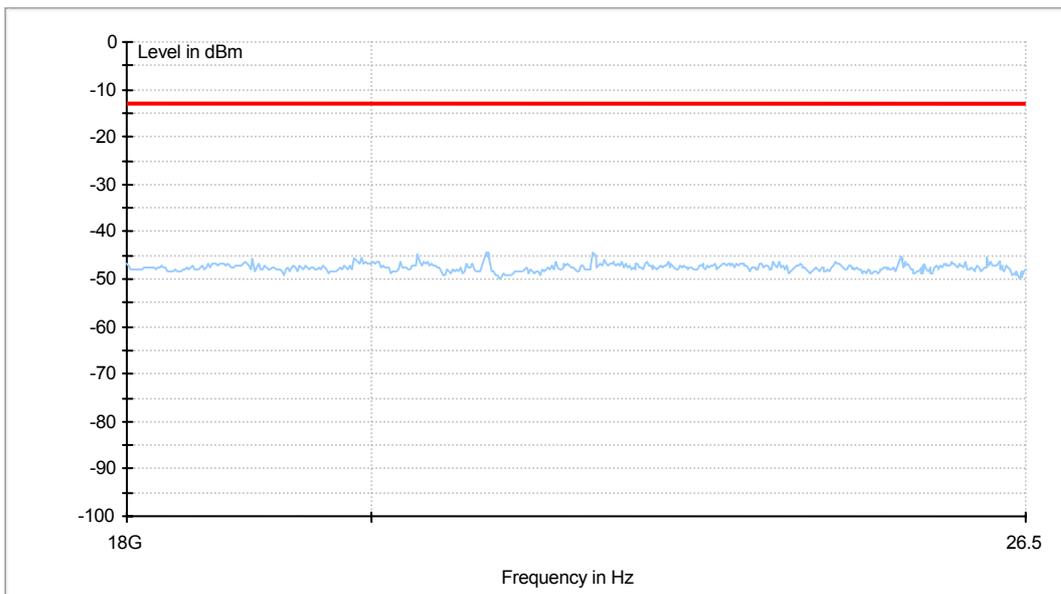
Traffic Mode (30MHz-2GHz)



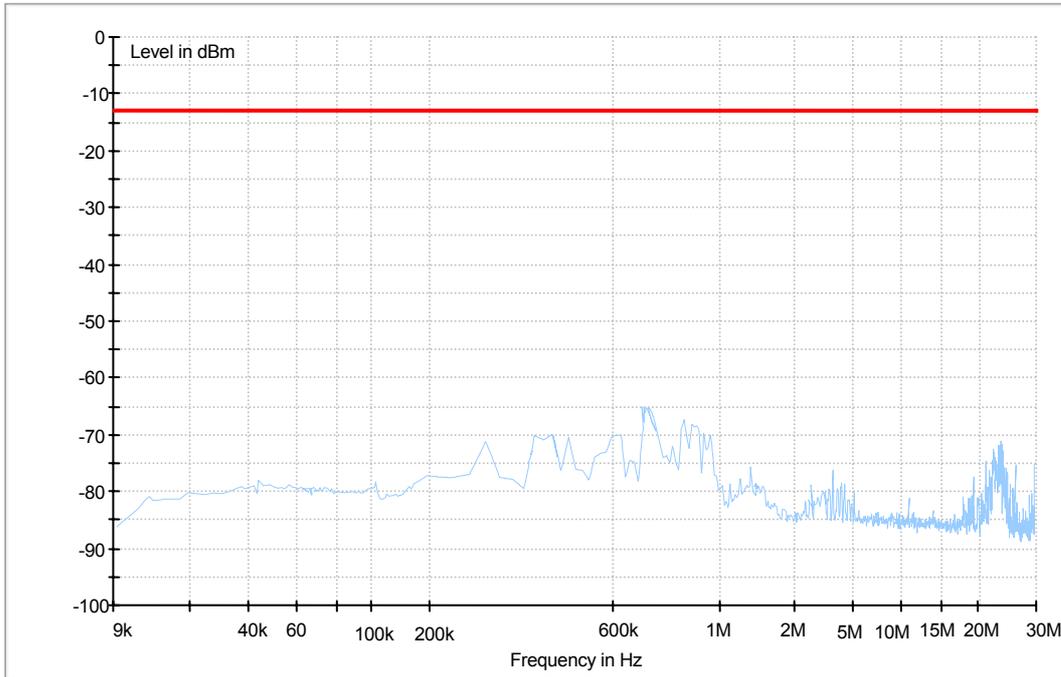
Traffic Mode (2GHz-18GHz)



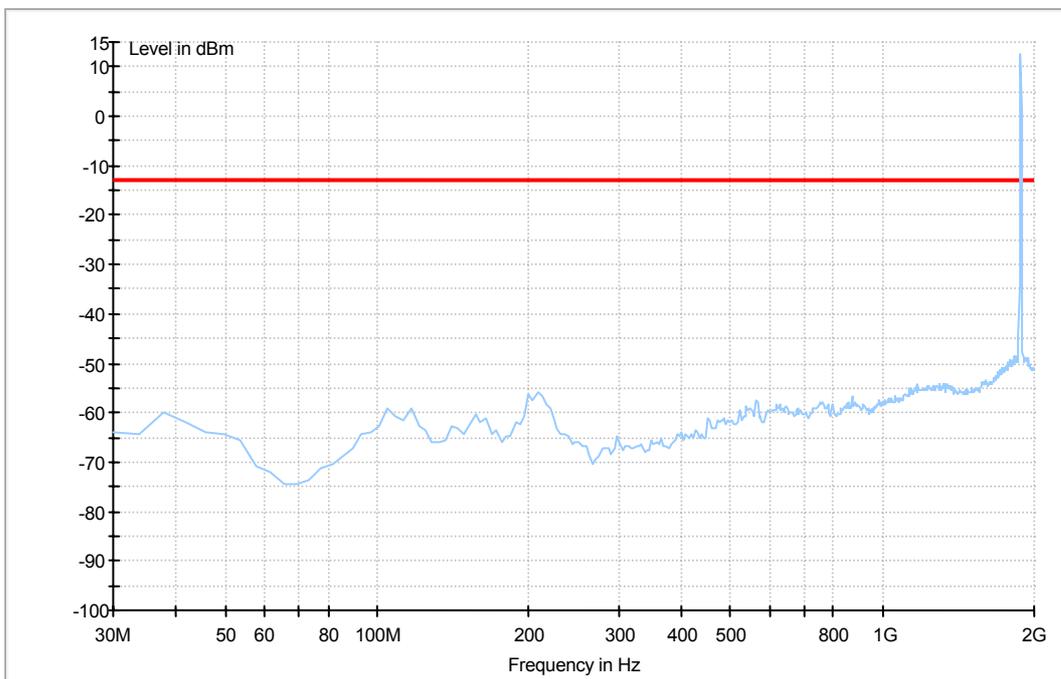
Traffic Mode (18GHz-26.5GHz)



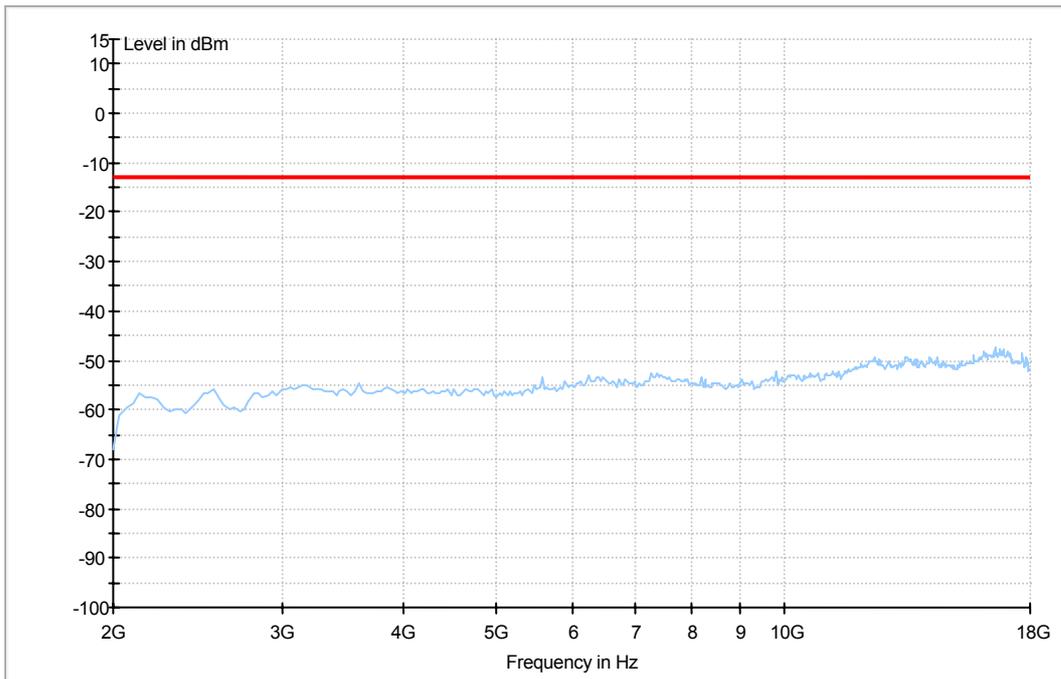
8.3.4 For EGPRS 1900 Traffic Mode (9kHz-30MHz)



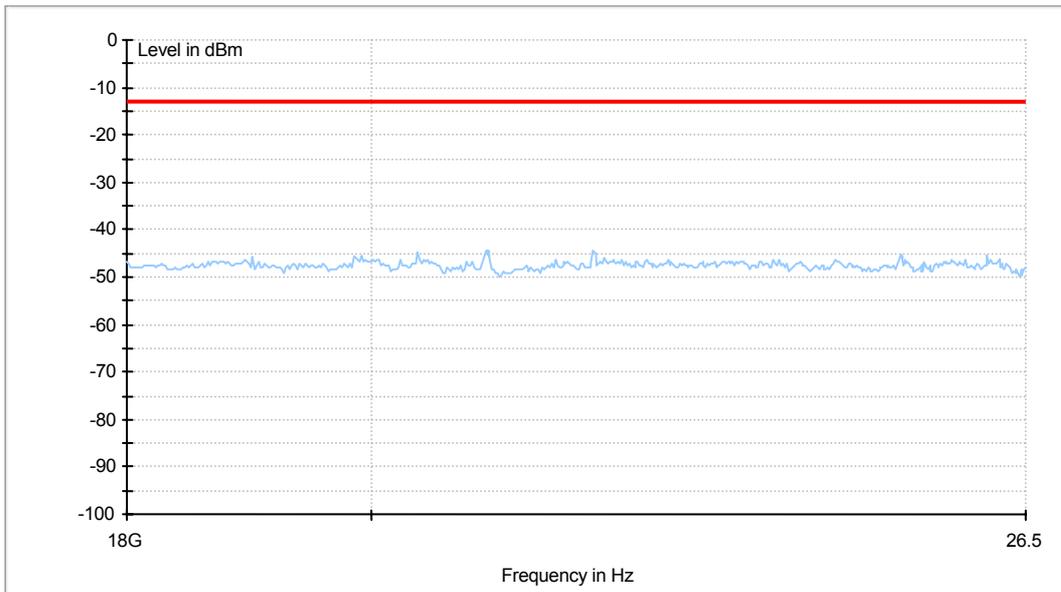
Traffic Mode (30MHz-2GHz)



Traffic Mode (2GHz-18GHz)



Traffic Mode (18GHz-26.5GHz)



END