Report on EMC Test of HUAWEI HSDPA/UMTS/EDGE/GPRS/GSM USB MODEM M/N: E220

Report No: SYBH(R)010102007EB-1

Reliability Laboratory of Huawei Technologies Co., Ltd.

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Notice 1

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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.
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Notice 2

Modification Information:

Table 1 Modification Information

Modification Information	1	
	2	
	3	Not Applicable!
	4	
	5	
	6	
	7	

REPORT ON	**HUAWEI HSDPA/UMTS/EDGE/GPRS/GSM USB MODEM** **M/N: E220**
REGULATION	**FCC CFR47 Part 15: Subpart B;** **FCC CFR47 Part 24 Subpart E;：**
START OF TEST	**Sep.10, 2007**
END OF TEST	**Sep.20, 2007**
Final Judgement:	**Pass**

Approver	**2007-09-21**	**张兴海**	
	Date	**Name**	**Signature**
Reviewer	**2007-09-21**	**余 辉**	
	Date	**Name**	**Signature**
Operator	**2007-09-21**	**张 飞**	
	Date	**Name**	**Signature**

REPORT BODY CONTENT

1 Status

1.1 Product Information

CLIENT:	Huawei Technologies Co., Ltd.
ADDRESS:	Bantian Longgang District Shenzhen, P.R. China
MANUFACTURING DESCRIPTION	HUAWEI HSDPA/UMTS/EDGE/GPRS/GSM USB MODEM
MANUFACTURERS MODEL NUMBER	E220

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	24.238	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℃
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**
Radiated Emissions Enclosure Port	TC1 (TM3~TM4)	N/A	Pass	Site1
Conducted Emissions	TC1 (TM1~TM2)	N/A	Pass	Site1
Radiated Spurious Emissions Enclosure Port 9kHz –26.5GHz	TC1 (TM1~TM4)	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 E220 HSDPA/UMTS/EDGE/GPRS/GSM dual mode 4 BAND USB Modem is subscriber equipment in the UMTS/GSM system. The WCDMA frequency is Band 1.The GSM/GPRS/EDGE frequency band includes EGSM900, DCS1800 and PCS1900, but only 1900MHz bands test data is included in this report. For PCS 1900, the TX frequency is 1850MHz-1910MHz and the RX frequency is 1930MHz-1990MHz. E220 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 notebook etc.), USIM card interface and antenna interface. E220 has an internal antenna as default.

3.2 Technical Data

3.2.1 Main Equipment Technical Data

Description:	HSDPA/UMTS/EDGE/GPRS/GSM USB MODEM
Models:	E220
Input Rated Voltage:	⎓ 5V
Rated Power:	3W
Dimensions:	88(depth) × 43(width) × 15(height)mm^3
Weight:	38g
S/N:	E01CA10790309431

Table 3 Sub-Assembly Identity

Mode		Work Frequency	
		Transmitt Frequency (MHz)	Receive Frequency (MHz)
GSM	GSM900	890-915	935-960
	DCS1800	1710-1785	1805-1880
	PCS1900	1850-1910	1930-1990
WCDMA	WCDMA2100	1940-1960	2030-2050

Figure 1. EUT Appearance

3.3 Sub-Assembly Identity

Table 4 Sub-Assembly Identity

Board			
Model Name	**Qty.**	**Serial Number**	**Description**
Huawei E220	1	E01CA10790309431	Main board of data card
Accessory			
Name	Qty.	**Serials number**	**Description**

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	Shielding

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	3604091211	2006-10-12
Notebook	T43	IBM	3106093834	NA
Notebook	X40	IBM	3105051015	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~TM4

TC1: EUT was powered by USB cable connected to the notebook.

4.3.2 Test Mode

There was 4 test Modes. TM1 to TM4 were shown below:

TM1: operate in traffic GPRS 1900;
TM2: operate in traffic mode EGPRS 1900;
TM3: operate in idle mode GPRS 1900;
TM4: operate in idle mode EGPRS 1900;

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,GSM see ETSI TS 151.010).

For 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.

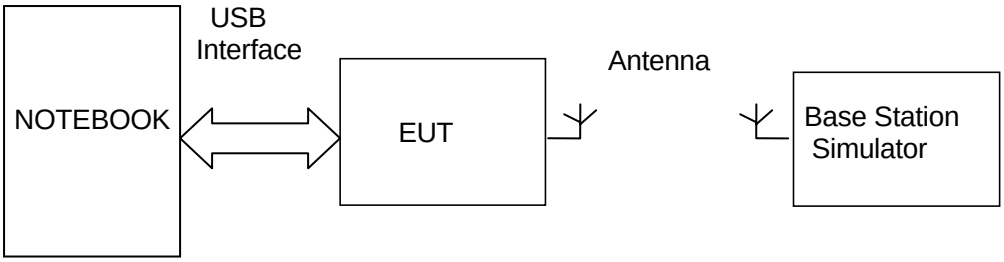


Figure 2.: Test Configuration 1 (TM1-TM2)

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 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.

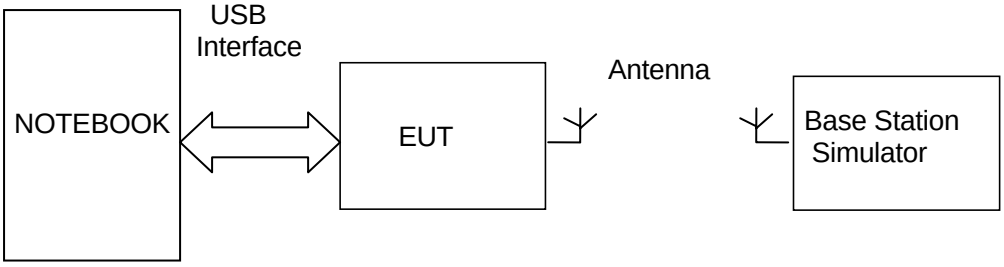


Figure 3. Test Configuration 1 (TM3-TM4)

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 to idle mode according to TC1 and the test performed at worst emission state.

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

Test set up figure:

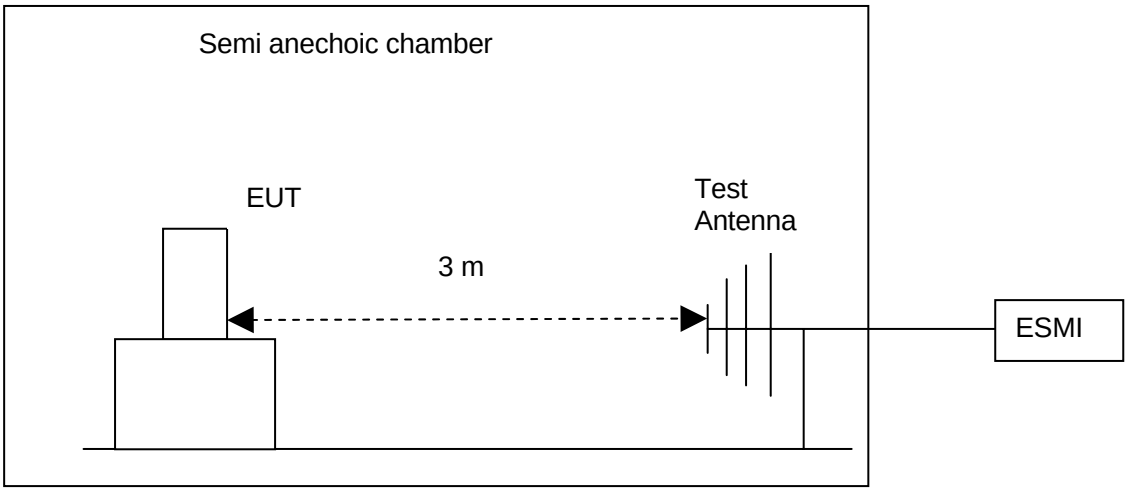


Figure 4. Test set up

5.1.2 Test Results

The EUT has met the requirements for Radiated Emission of enclosure port.
The test data is shown in section 8.1 of the report.

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

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 150kz to 30 MHz: 9 kHz;

Test Set-up figure:

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

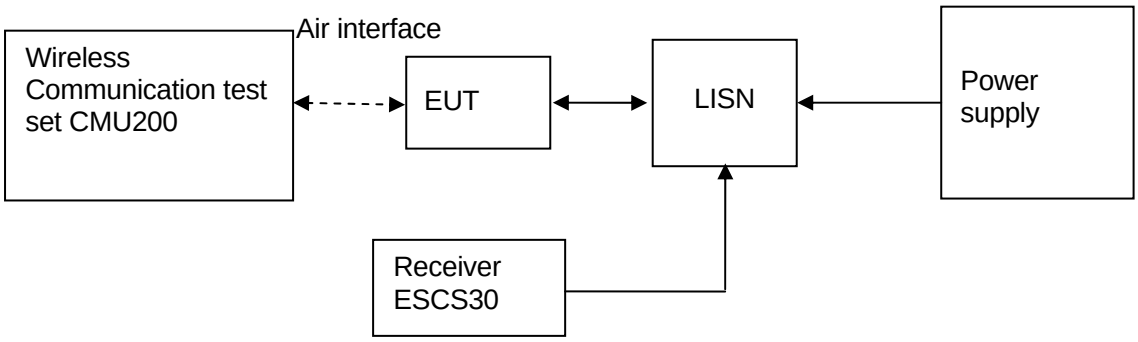


Figure 5. Test Set-up

5.2.2 Test Results

The EUT has met requirements for Conducted disturbance of power lines.
The test data is shown in section 8.2 of the report.

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 dBµV	56~46 dBµV
0.5MHz~5MHz	56 dBµV	46 dBµV
5MHz~30MHz	60 dBµV	50 dBµV

5.3 Radiated Spurious Emissions

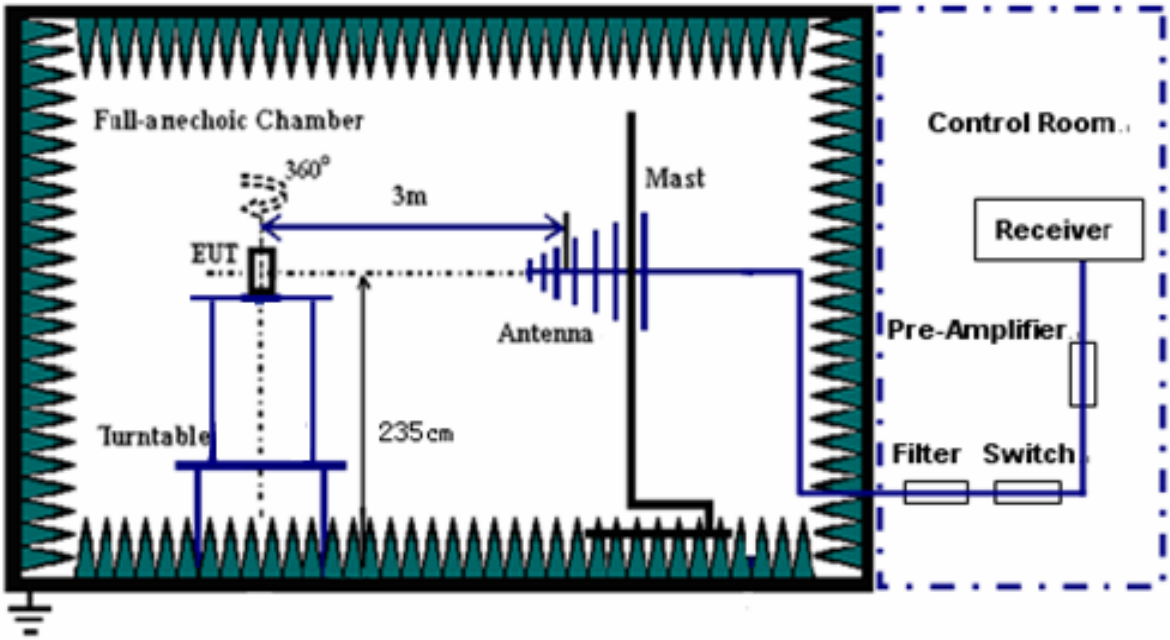
5.3.1 Test Procedure

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:

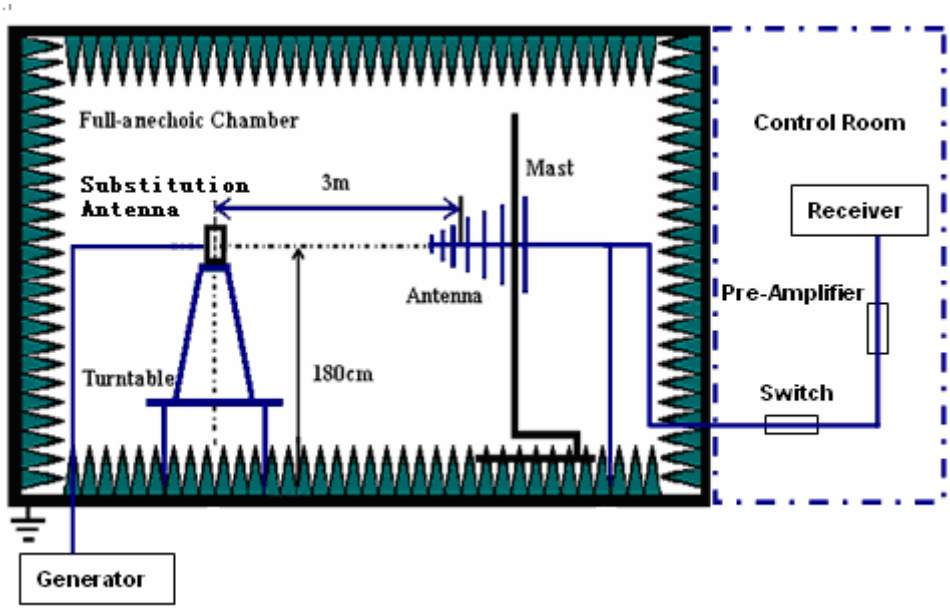
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect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

Test the Radiated maximum output power by the Rohde and Schwarz ESMI 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 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 26GHz: 1 MHz;

Table 10 Radiated Spurious Emissions Limits

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

5.3.2 Test Results

The EUT has met the requirements of TS151010-1's requirement.

The test data see section 8.5 of this report.

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.23, 2007	12
	Broadband Antenna	CBL 6112B (2941)	SCHAFFNER	Feb.26, 2007	12
CE	EMI Test receiver	ESCS30	R&S	May.29, 2007	12
	Artificial Mains Network	ENV4200	R&S	May.21, 2007	12
RSE	EMI Test receiver	ESIB26	R&S	May.30.2007	12
	Horn Antenna	3117	EMCO	May.20.2007	12
	Broadband Antenna	CBL6112B /2941	SCHAFFNER	Feb.16.2007	12
	Horn Antenna	3160	EMCO	May.20.2007	12

Software Information			
Test Item	Software Name	Manufacturer	Version
RE/CE	ES-K1	R&S	1.7.1
RSE	EMC32	R&S	V5.0

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

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

8 Graph and Data of Emission Test

8.1 Radiated Disturbance

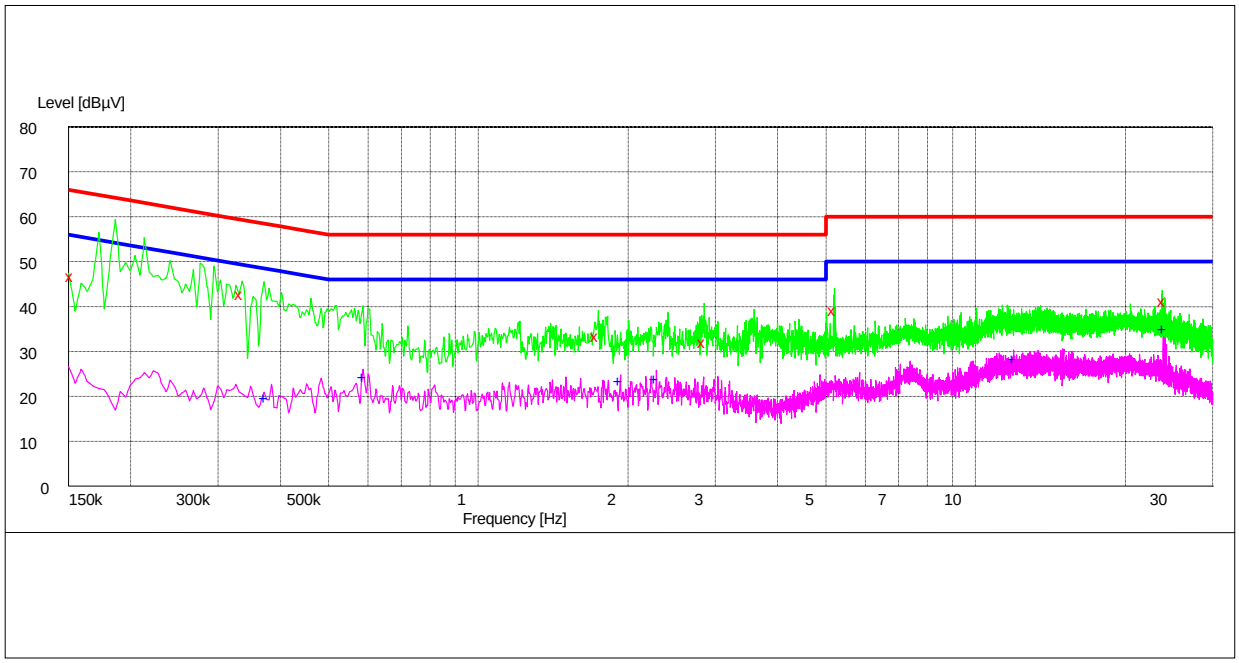
8.1.1 Radiated Disturbance

MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
94.560000	25.30	-11.8	43.5	18.2	100.0	47.00	VERTICAL
107.220000	20.00	-10.0	43.5	23.5	300.0	76.00	HORIZONTAL
162.000000	23.90	-11.7	43.5	19.6	246.0	70.00	HORIZONTAL
499.680000	28.00	-3.1	46.0	18.0	209.0	103.00	VERTICAL
601.320000	28.30	-1.9	46.0	17.7	100.0	0.00	VERTICAL
758.940000	30.40	-0.2	46.0	15.6	140.0	0.00	VERTICAL

8.2 Conducted Disturbance

8.2.1 AC Power Port Test Data



MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.150000	47.20	11.0	66	18.8	QP	L3	FLO
0.334500	43.80	10.2	59	15.2	QP	N	FLO
1.738500	33.60	10.0	56	22.4	QP	L3	FLO
2.859000	32.10	10.1	56	23.9	QP	L3	FLO
5.221500	39.50	10.2	60	20.5	QP	N	FLO
24.004500	41.50	15.2	60	18.5	QP	L3	FLO

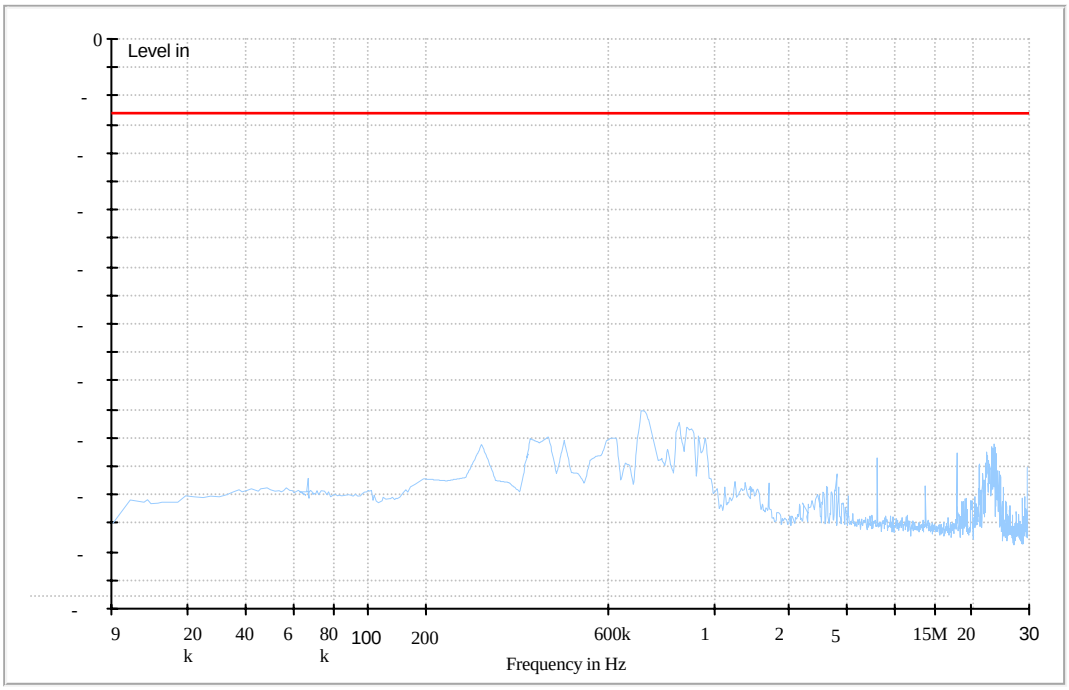
MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.375000	20.00	10.1	48	28.4	AV	N	FLO
0.591000	24.60	10.0	46	21.4	AV	N	FLO
1.936500	23.80	10.1	46	22.2	AV	L3	FLO
2.287500	24.10	10.1	46	21.9	AV	L3	FLO
12.003000	28.70	11.6	50	21.3	AV	L3	FLO
24.004500	35.40	15.2	50	14.6	AV	L3	FLO

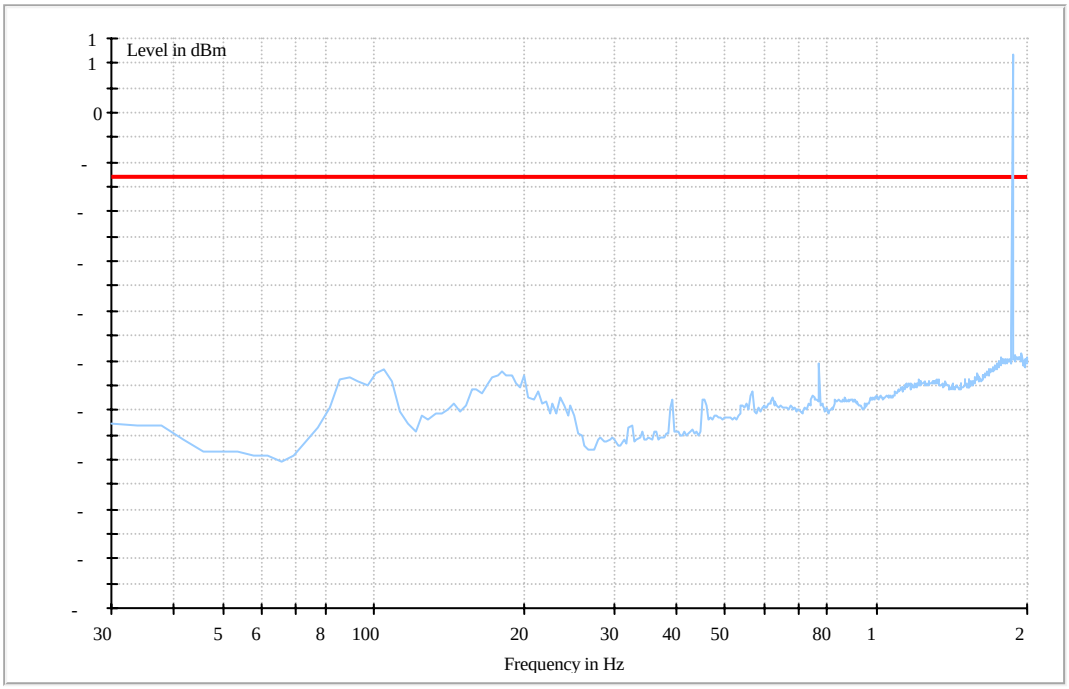
8.3 Radiated Spurious Emission

8.3.1 For GPRS 1900

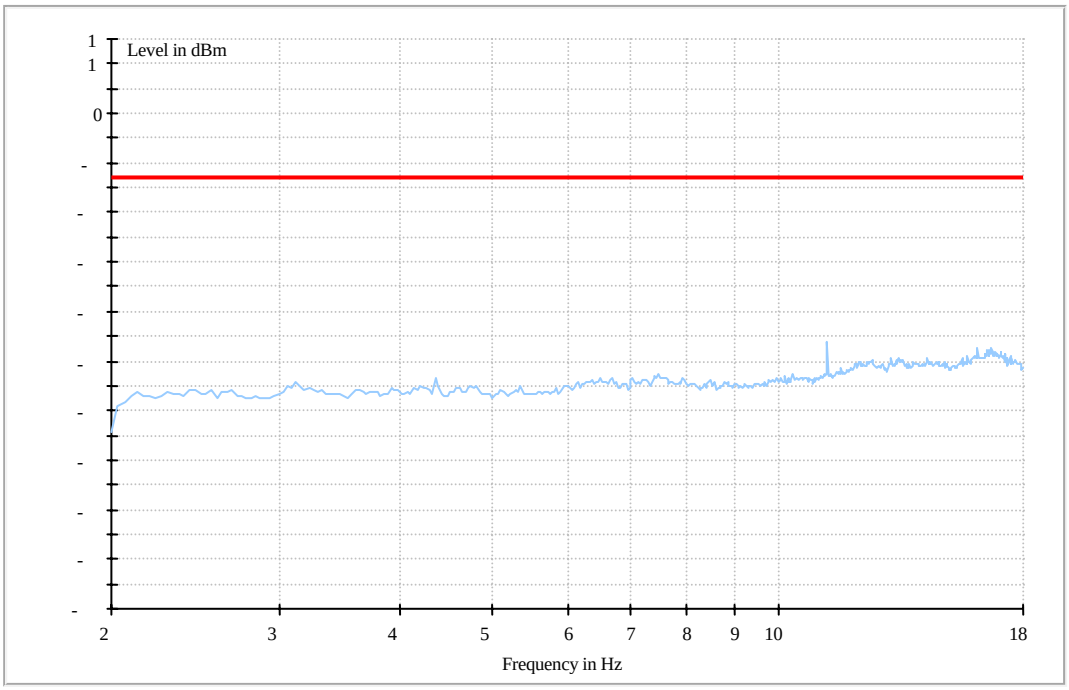
Traffic Mode (9kHz-30MHz)



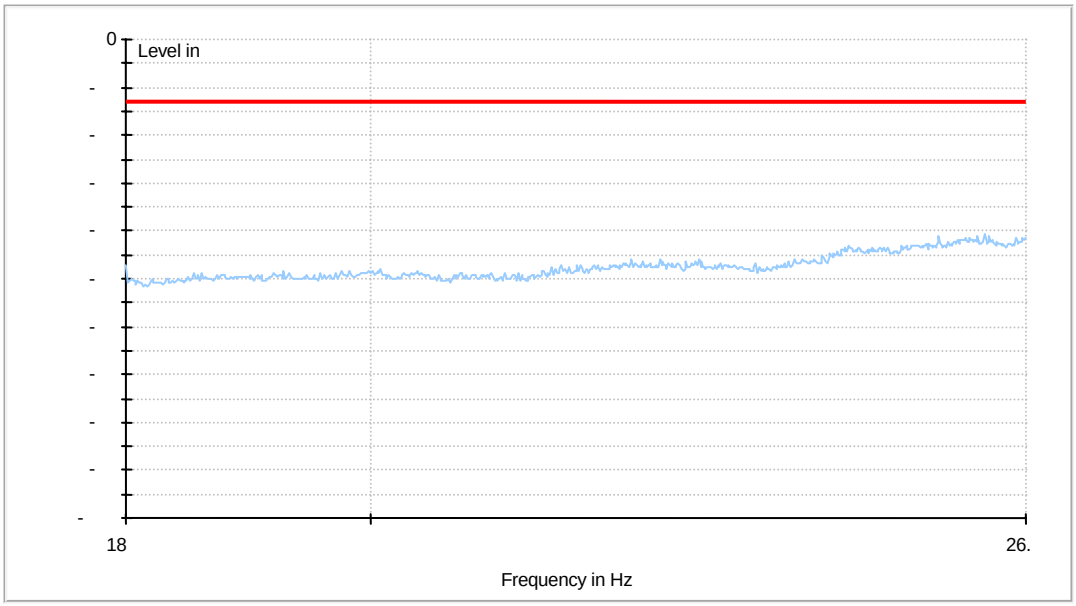
Traffic Mode (30MHz-2GHz)



Traffic Mode (2GHz-18GHz)

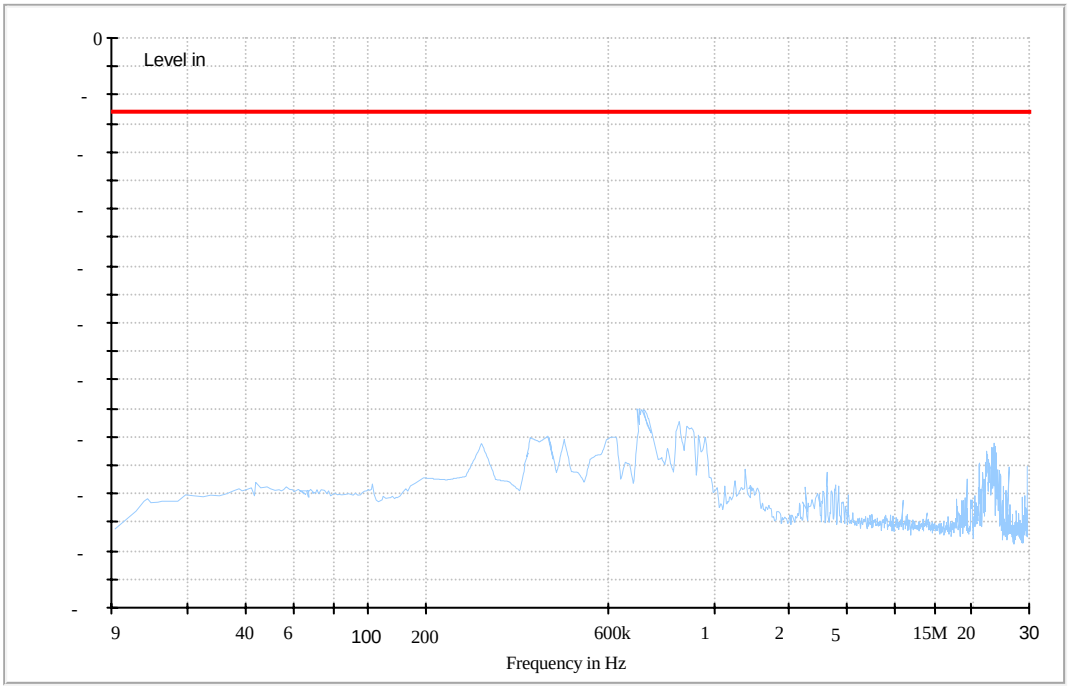


Traffic Mode (18GHz-26.5GHz)

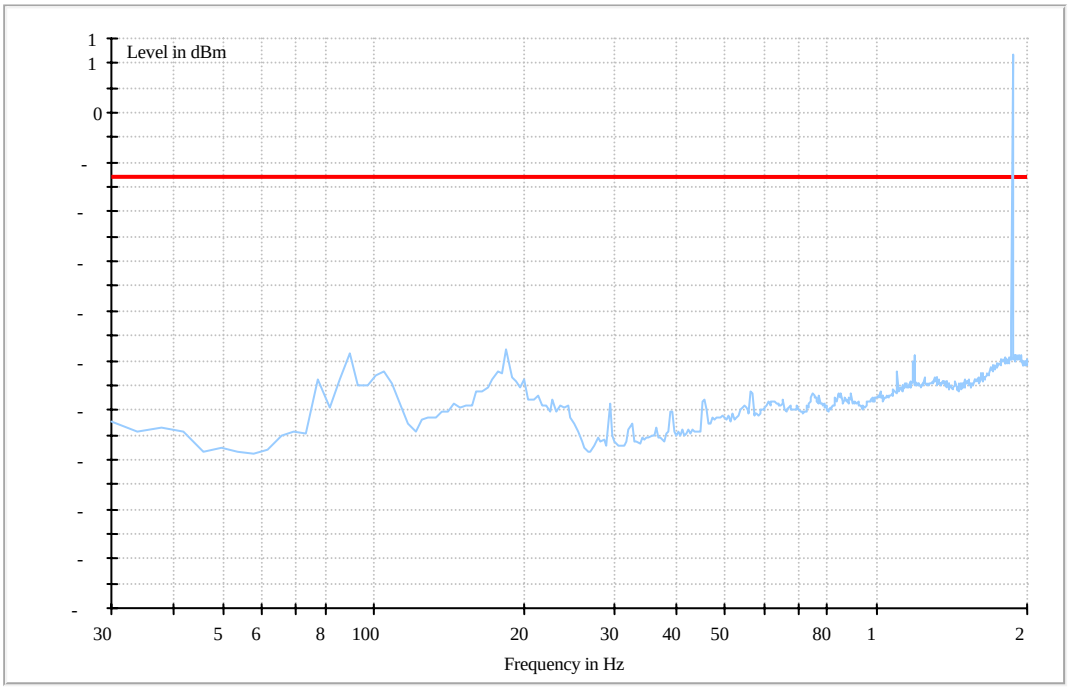


8.3.2 For EGPRS 1900

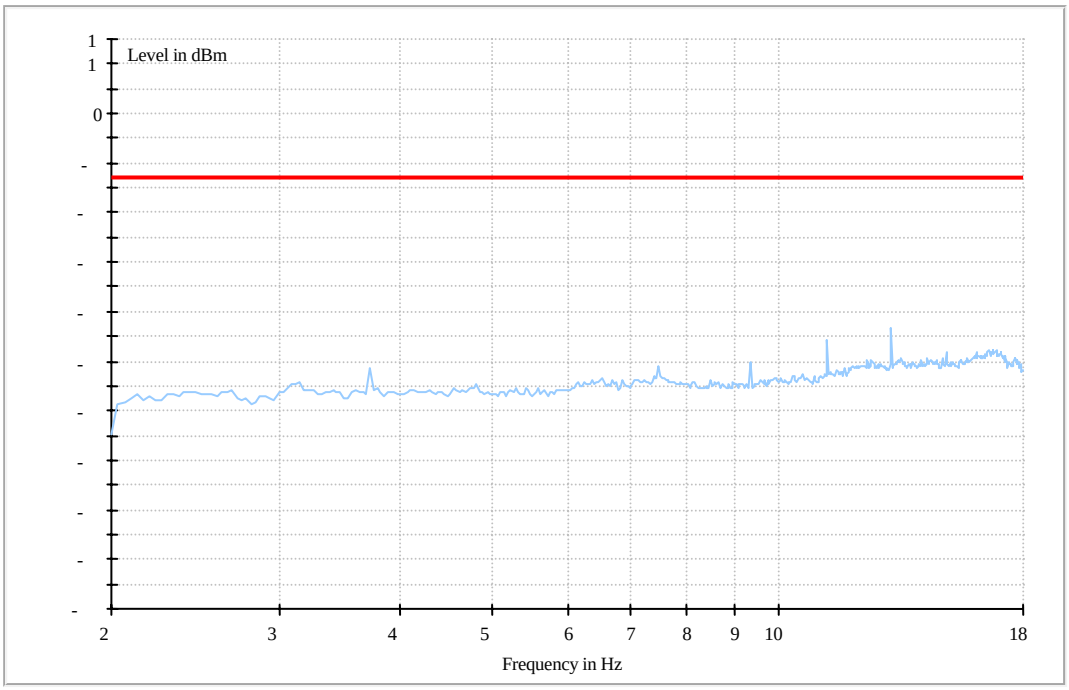
Traffic Mode (9kHz-30MHz)



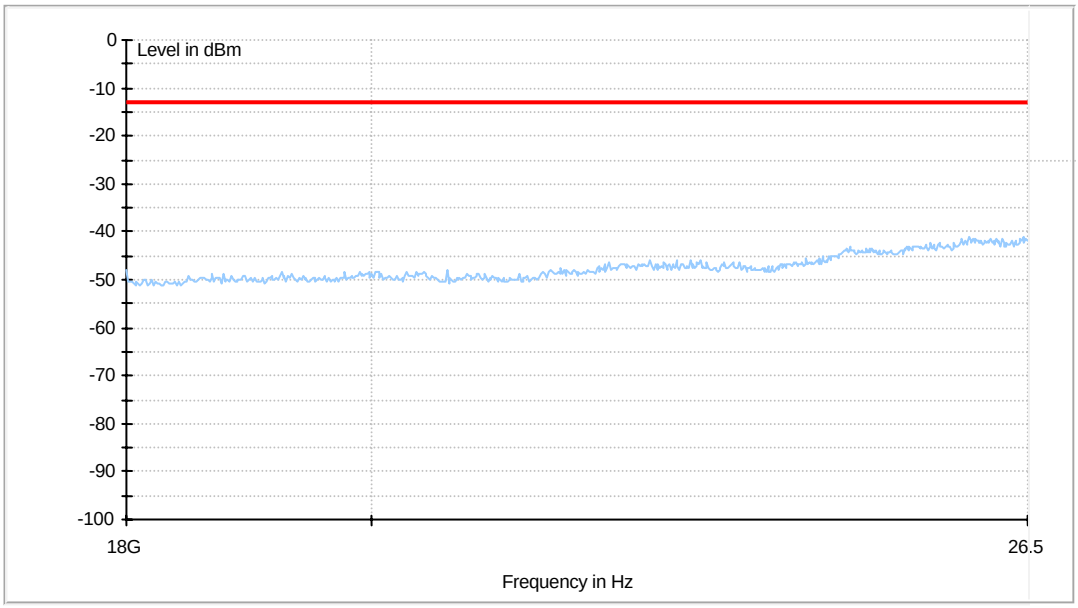
Traffic Mode (30MHz-2GHz)



Traffic Mode (2GHz-18GHz)

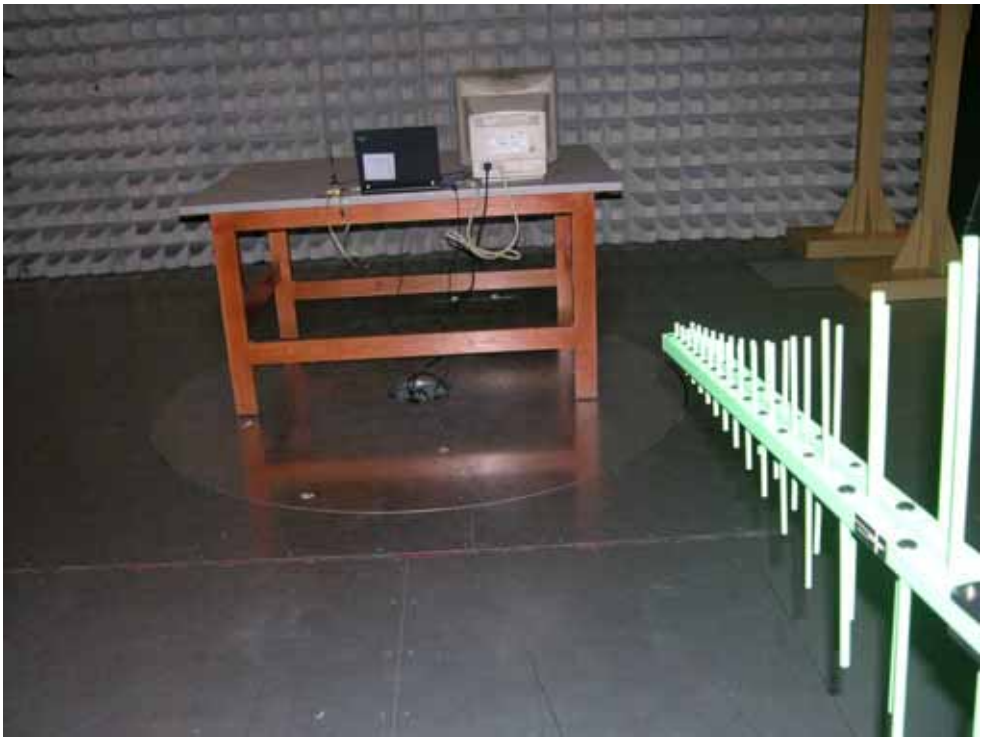


Traffic Mode (18GHz-26.5GHz)



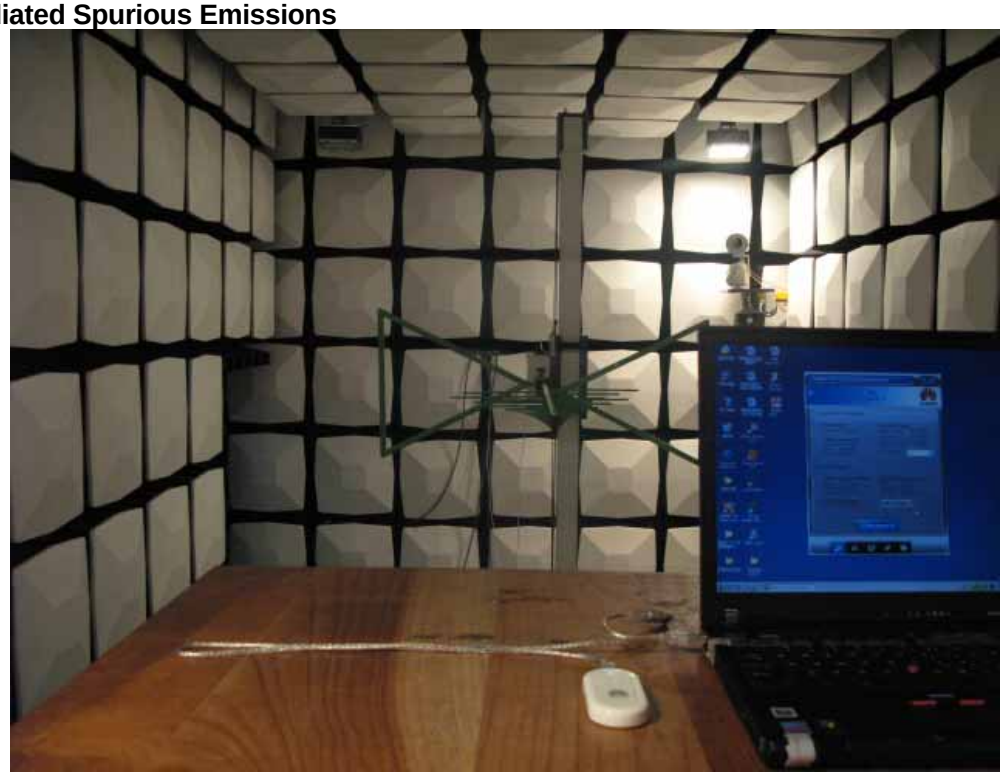
9 Photographs of Test Set-ups

9.1 Radiated Emissions



Radiated Disturbance Emission

9.2 Radiated Spurious Emissions



Radiated Spurious Emission 30M~2GHz

Radiated Spurious Emission 2G~18GHz

Radiated Spurious Emission 18G~26.5GHz

9.3 Conducted Emissions

Conducted Emissions of AC Power Port

END