

EMC Test Report

Product Name: Vodafone Mobile Wi-Fi

Model Number: R201

Report No: SYBHZ(R)E037042010EB-1

FCCID: QISR201

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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.
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Notice 2

Modification Information:

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

Table 1 Modification Information

REPORT ON **EMC TEST OF Vodafone Mobile Wi-Fi**
M/N: R201

REGULATION **FCC CFR47 Part 15: Subpart B;**
FCC CFR47 Part 22: Subpart H;
FCC CFR47 Part 24: Subpart E;

START OF TEST **Apr.22, 2010**
END OF TEST **Apr.29, 2010**

Final Judgement: **Pass**

Approver

2010-04-29
Date

张兴海
Name

张兴海
Signature



Operator

2010-04-29
Date

徐广义
Name

徐广义
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: Vodafone Mobile Wi-Fi
MANUFACTURERS MODEL NUMBER: R201

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.

EUT Classification:Wireless Terminal				
Test Items	Test Configuration &Test Mode	Required Performance Criteria	Result	Site
<u>Radiated Emissions</u> Enclosure Port	TC1~TC2 (TM1-TM7)	N/A	Pass	Site1
<u>Conducted Emissions</u>	TC1~TC2 (TM1-TM14)	N/A	Pass	Site1
<u>Radiated Spurious Emissions</u> Enclosure Port	TC1 TC2 (TM8-TM14)	N/A	Pass	Site1

Note:
1, Measurement taken is within the measurement uncertainty of measurement system.
2, TC = Test configuration

Table 2 Summary of results

3 Equipment Specification

3.1 General Description

R201 is a UMTS/GSM Vodafone Mobile Wi-Fi. It can be used as a WiFi Access Point, Max to 5 WiFi stations can be associating with R201 simultaneity. It also can be used as a USB modem by connecting with PC via USB cable. It supports wireless internet accessing function. The data service rate is HSUPA 5.76Mbps, and HSDPA 7.2Mbps. The WCDMA frequency is BAND I, BAND II and BAND VIII. The GPRS/EDGE frequency is 850/900/1800/1900 MHz. The WiFi frequency is 2.4G.

3.1.1 Main Equipment Technical Data

Description:	Vodafone Mobile Wi-Fi
Models:	R201
Input Rated Voltage:	~230V
Extrme voltage:	Max 3.5 W
Rated Power:	Max 30dBm(E.R.P)
Dimensions:	98(length)× 62(width)× 14(height) (mm3)
Weight:	< 90g

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
WCDMA	WCDMA1900	1850-1910	1930-1990

3.2 Sub-Assembly Identity

Table 4 Sub-Assembly Identity

Board				
Model Name	Qty.	Serial		Description
R201	1	AP2AB11040800233		Main board
Accessory				
Name	Qty.	Manufacture	Serials number	Description
Adapter	1	Huawei Technologies Co., Ltd.	HKAA040289423	Adapter Model: HW-050100E1W voltage nominal: ~230V Input Voltage : 100-240V ~50/60Hz, 0.2A Output Voltage: === 5.0V 1.0A
Adapter	1	Huawei Technologies Co., Ltd.	TPAA41501172	Adapter Model: HW-050100E1W voltage nominal: ~230V Input Voltage : 100-240V ~50/60Hz, 0.2A Output Voltage: === 5.0V 1.0A
Rechargeable Li-ion	1	Huawei Technologies Co., Ltd.	YGC9C25HI5200 686	Battery Model: HB7A1H Rated capacity: 1400mAh Nominal Voltage: === +3.7V Charging Voltage: === +4.2V

Rechargeable Li-ion	1	Huawei Technologies Co., Ltd.	SGCA302HI10006 30	Battery Model: HB7A1H Rated capacity: 1400mAh Nominal Voltage:  +3.7V Charging Voltage:  +4.2V
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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	3608105673	2009-10-10
Notebook	D810	DELL	3105083303	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~TM14
---------	----------

4.3.2 Test Mode

There were 12 test Modes. TM1 to TM12 were shown in the diagrams below:

- TM1: operate in idle mode GPRS 850;
- TM2: operate in idle mode GPRS1900;
- TM3: operate in idle mode EDGE 850;
- TM4: operate in idle mode EDGE1900;
- TM5: operate in idle mode WCDMA1900;
- TM6: operate in idle mode HSUPA 1900;
- TM7: operate in idle mode HSDPA 1900;
- TM8: operate in traffic mode GPRS850;
- TM9: operate in traffic mode GPRS1900;
- TM10: operate in traffic mode EDGE850;
- TM11: operate in traffic mode EDGE1900;
- TM12 operate in traffic mode WCDMA 1900;

TM13 operate in traffic mode HSUPA 1900;
TM14 operate in traffic mode HSDPA 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 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;

For GSM and EDGE, the following conditions shall also be met:

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

The downlink RXQUAL shall be monitored.

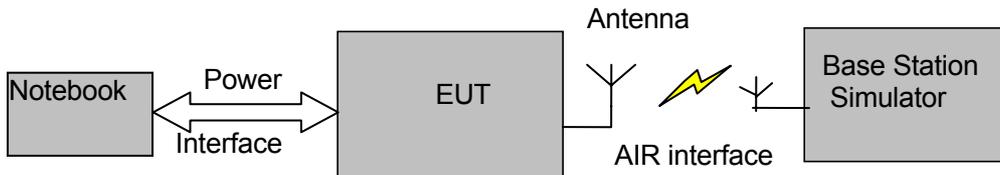


Figure 1.: Test Configuration

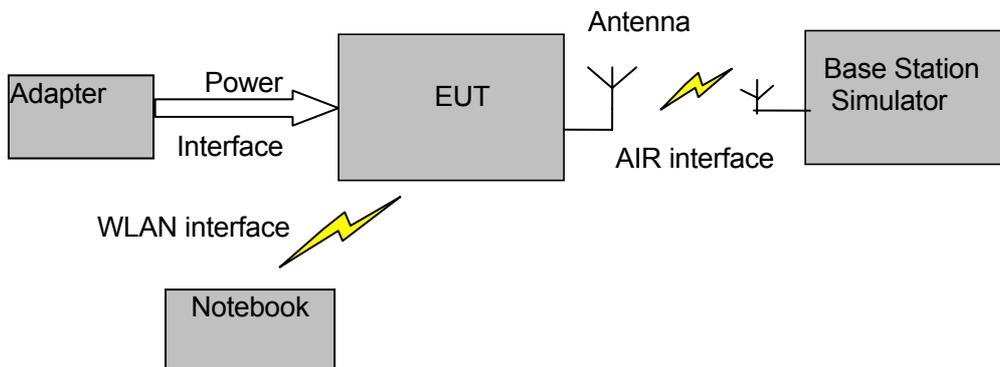


Figure 2.: Test Configuration

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 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).

For GSM and DCS, 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.

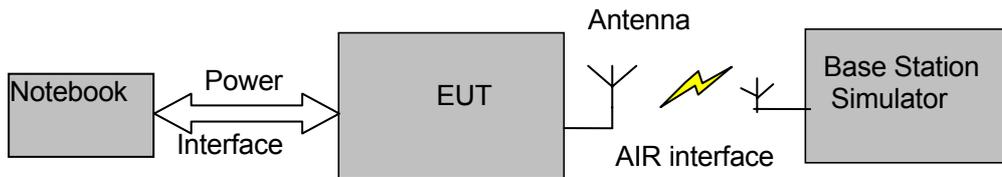


Figure 3.: Test Configuration

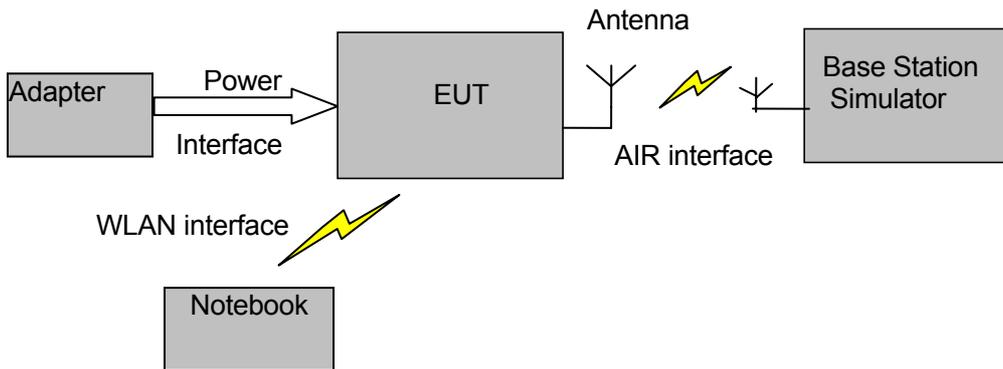


Figure 4.: Test Configuration

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:

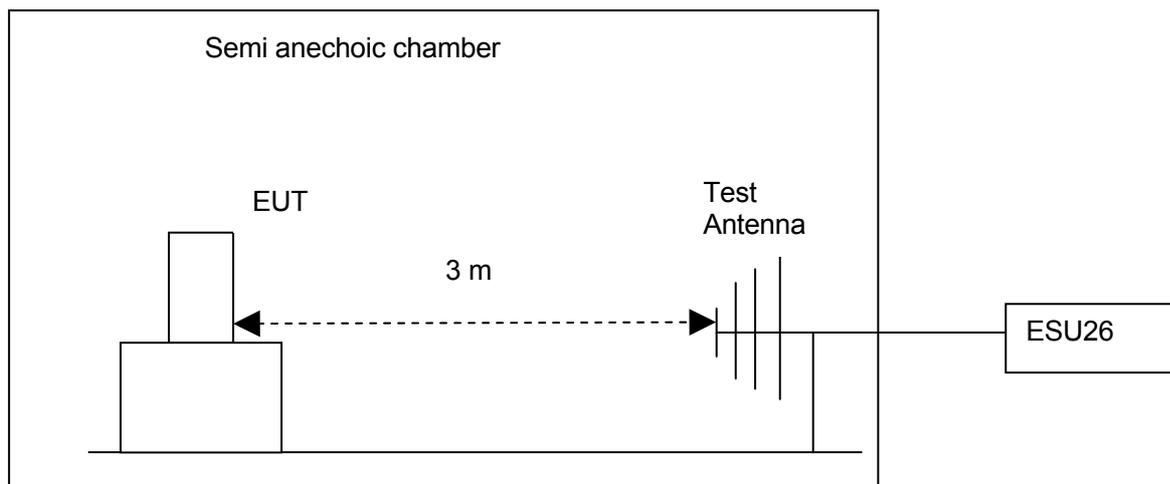


Figure 5. Test set-up

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.

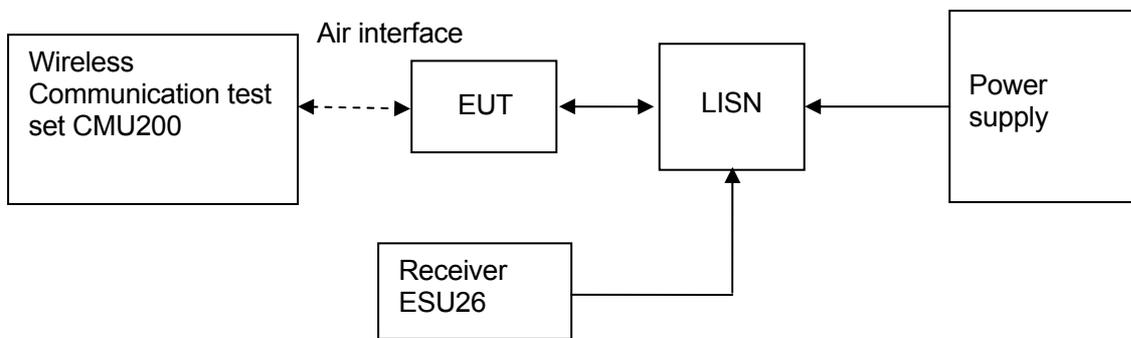


Figure 6. Test Set-up

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

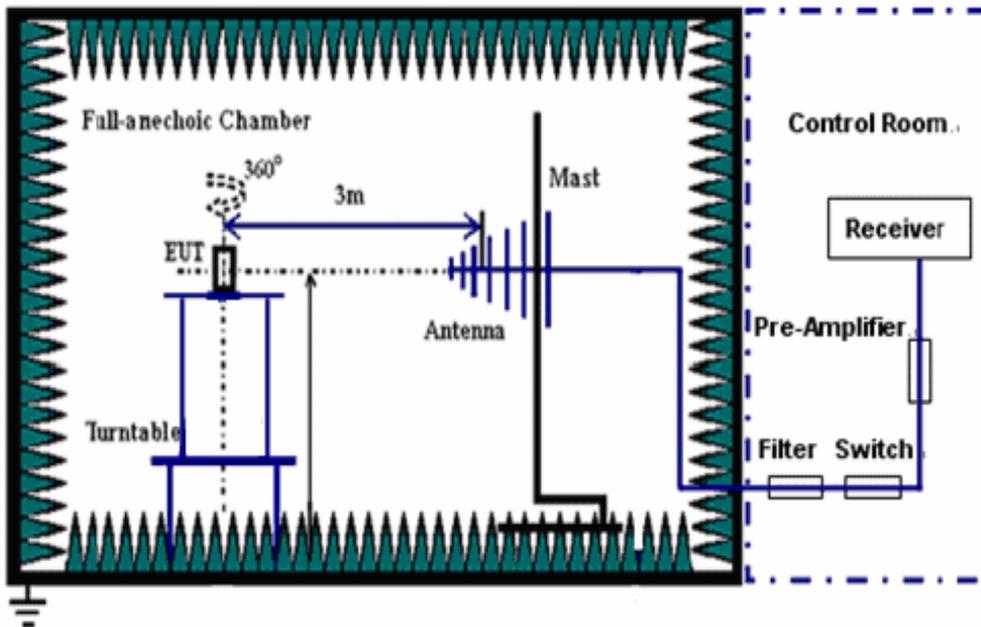
5.3.1 Test Procedure

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:

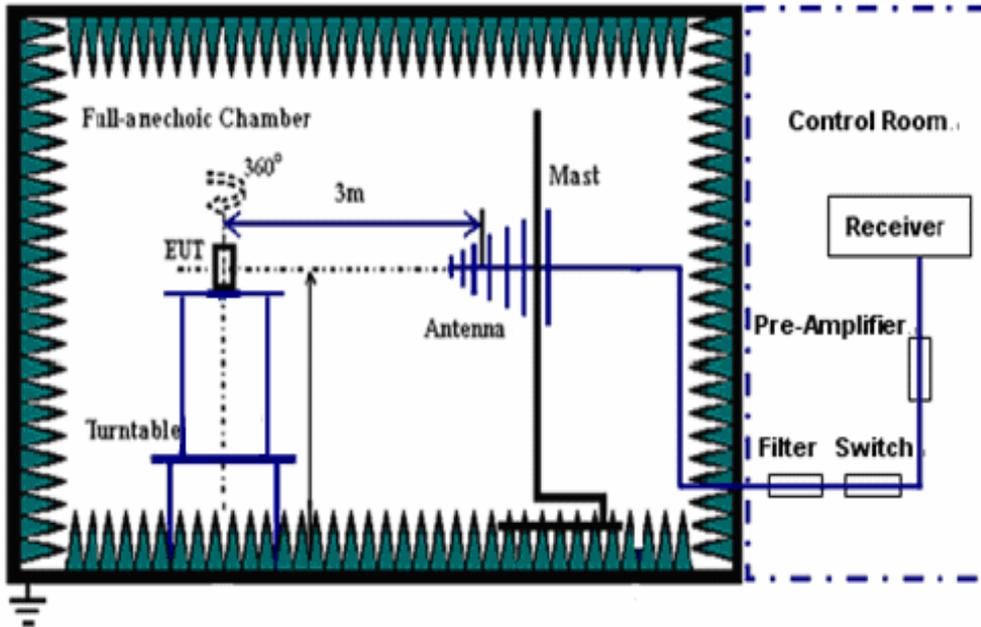
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect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

Test the Radiated maximum output power by the Rohde and Schwarz FSU43 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 FSU43 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:

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/Part24requirement.

6 Main Test Instruments

Table 12 Main Test Equipments

Test item	Test Instrument	Model	Manufacturer	Cal-Date	Cal Interval (month)
RE	EMI Test receiver	ESU26	R&S	Jul.7.2009	12
	Broadband Antenna	VULB 9163	SCHAFFNER	Sep.21.2009	12
	Horn Antenna	HF906	R&S	Jun.19.2009	12
CE	EMI Test receiver	ESU26	R&S	July.7, 2009	12
	Artificial Mains Network	ENV216	R&S	Aug.12, 2009	12
RSE	EMI Test receiver	FSU43	R&S	July.7, 2009	12
	Horn Antenna	HF906	R&S	Jun.19.2009	12
	Broadband Antenna	VULB 9163	SCHWARZBECK	Sep.21.2009	12
	Horn Antenna	3160	ETS-Lindgren	Sep.22.2009	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 13 System Measurement Uncertainty

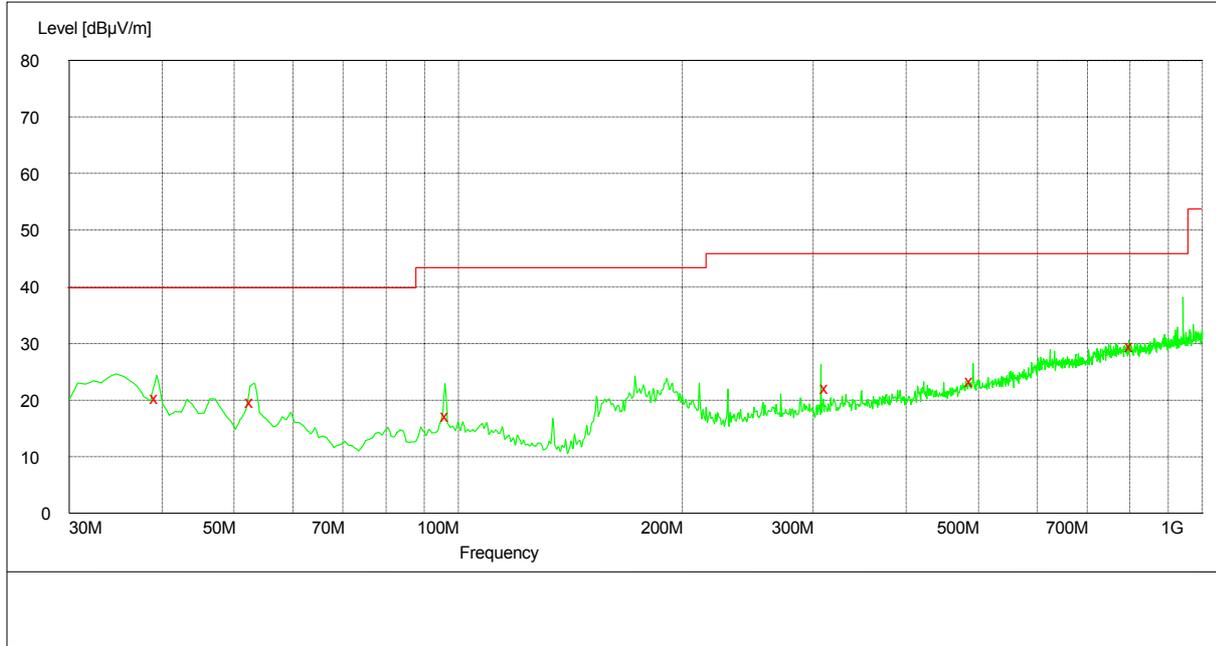
Items		Extended Uncertainty
RE	Field strength (dB μ V/m)	U=4.1dB; k=2(30MHz-1GHz)
RE	Field strength (dB μ V/m)	U=4.1dB; k=2(1GHz-18GHz)
RSE	ERP (dBm)	U=2.8dB; k=2
CE	Disturbance Voltage (dB μ V)	U=3.4dB; k=2

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.

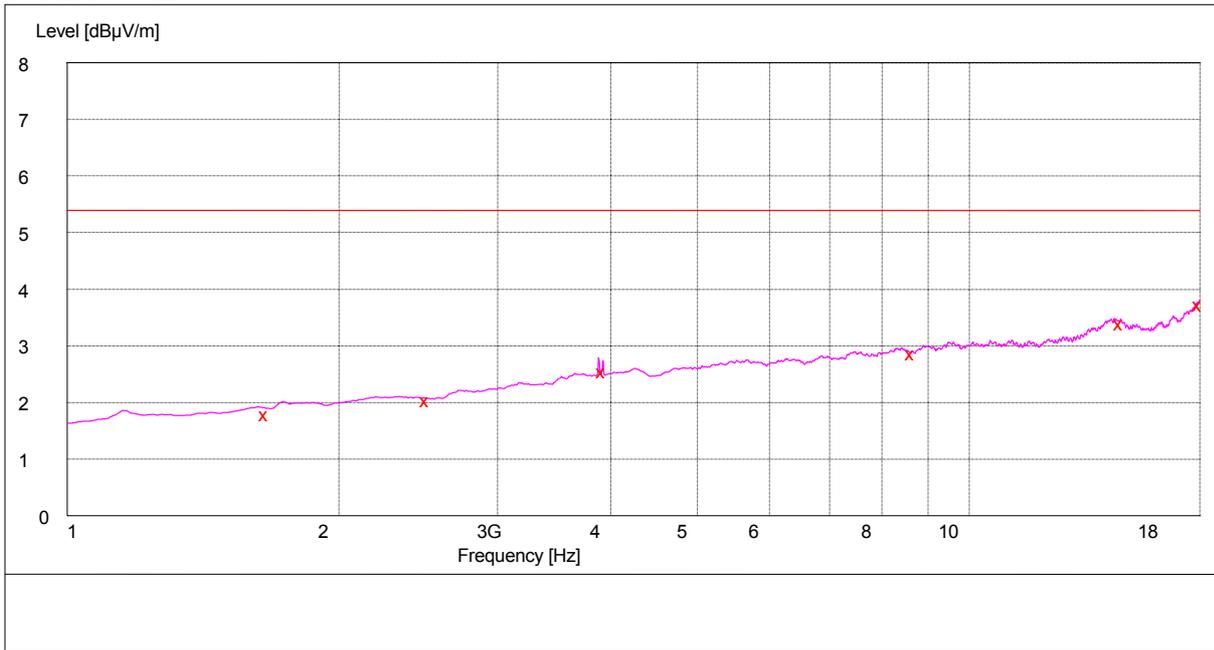
30MHz-1GHz



MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
39.040000	20.60	11.7	40.0	19.4	110.0	263.00	HORIZONTAL
52.300000	19.30	12.3	40.0	20.7	112.0	180.00	HORIZONTAL
95.400000	17.30	12.8	43.5	26.2	149.0	180.00	HORIZONTAL
310.20000	22.90	15.2	46.0	23.1	150.0	219.00	HORIZONTAL
491.10000	23.60	20.4	46.0	22.4	120.0	200.00	VERTICAL
800.30000	29.10	24.9	46.0	16.9	156.0	23.00	VERTICAL

1GHz-18GHz



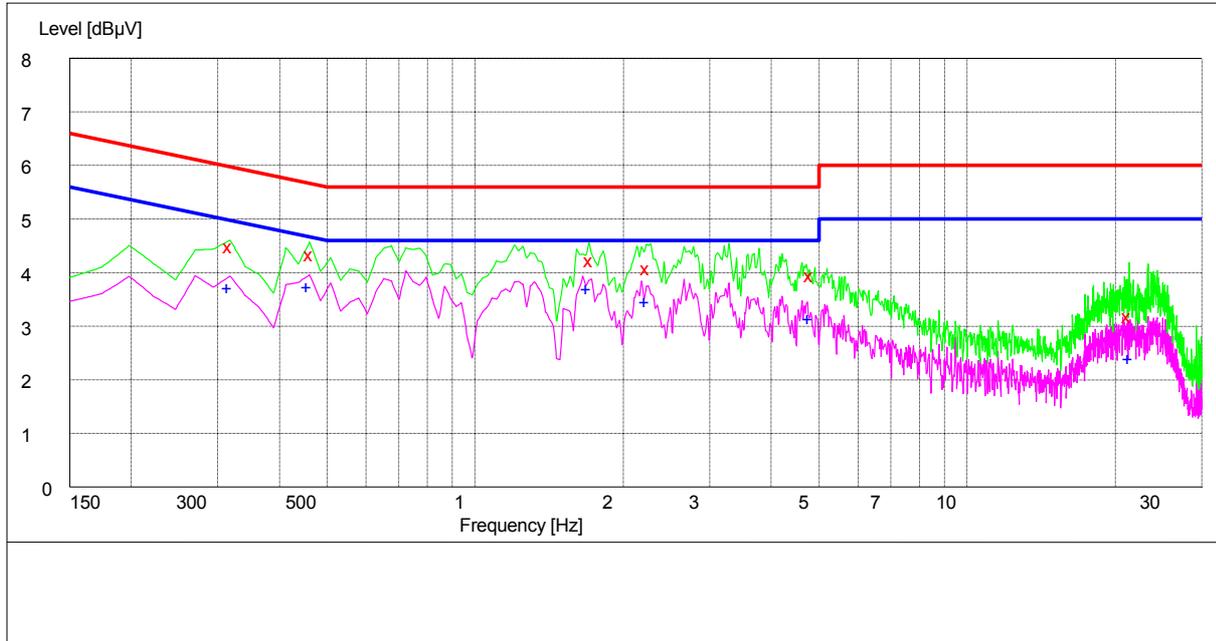
MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
1680.300000	18.30	-13.6	53.9	35.6	120.0	123.00	VERTICAL
2506.500000	20.50	-11.2	53.9	33.4	162.0	147.00	HORIZONTAL
3886.500000	24.40	-6.2	53.9	29.5	150.0	359.00	VERTICAL
8645.000000	28.80	3.2	53.9	25.1	149.0	271.00	HORIZONTAL
14705.000000	34.10	11.7	53.9	19.8	131.0	248.00	HORIZONTAL
18000.000000	37.40	17.3	53.9	16.5	101.0	188.00	VERTICAL

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
0.315	46.8	10.1	60	13.2	L1	FLO
0.465	45.1	10	57	11.9	N	FLO
1.679	45	10	56	11	N	FLO
2.238	42.2	10.2	56	13.8	N	FLO
4.814	40.1	10.2	56	15.9	N	FLO
22.132	32.6	10.3	60	27.4	L1	FLO

MEASUREMENT RESULT: AV Detector

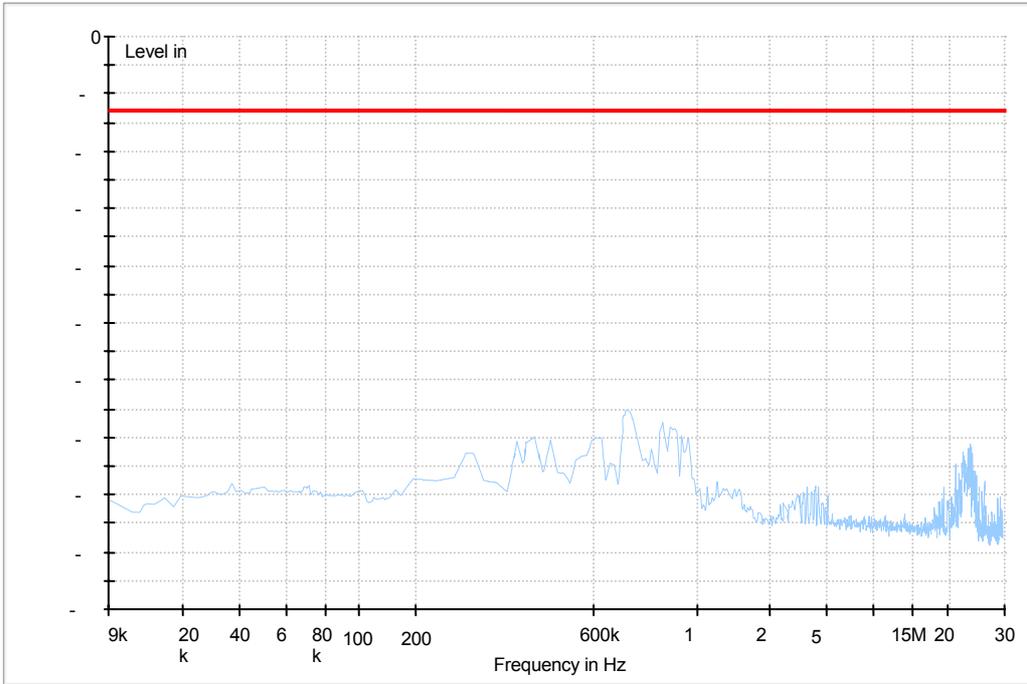
Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.315000	38.2	10.1	50	11.8	L1	FLO
0.465000	38.5	10.0	47	8.5	N	FLO
1.679000	38.4	10.1	46	7.6	N	FLO
2.238000	35.8	10.1	46	10.2	N	FLO
4.814000	32.6	10.1	46	13.4	N	FLO
22.13200	26.4	10.4	50	23.6	N	FLO

8.3 Radiated Spurious Emission

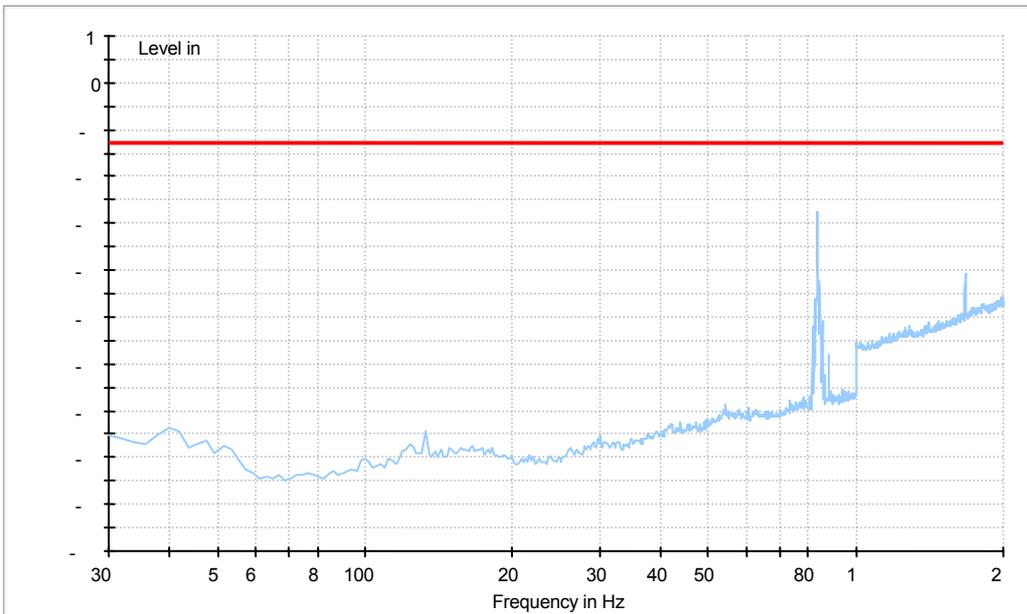
This test results are the maximum level of radiated spurious emissions in vertical and horizontal polarity.

8.3.1 For GPRS 850

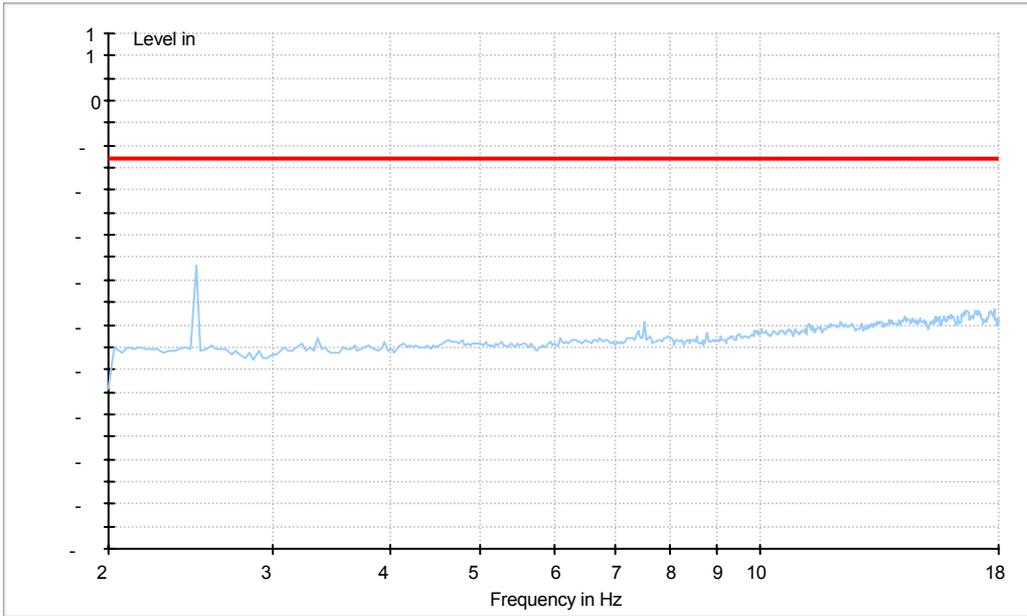
Traffic Mode (9kHz-30MHz)



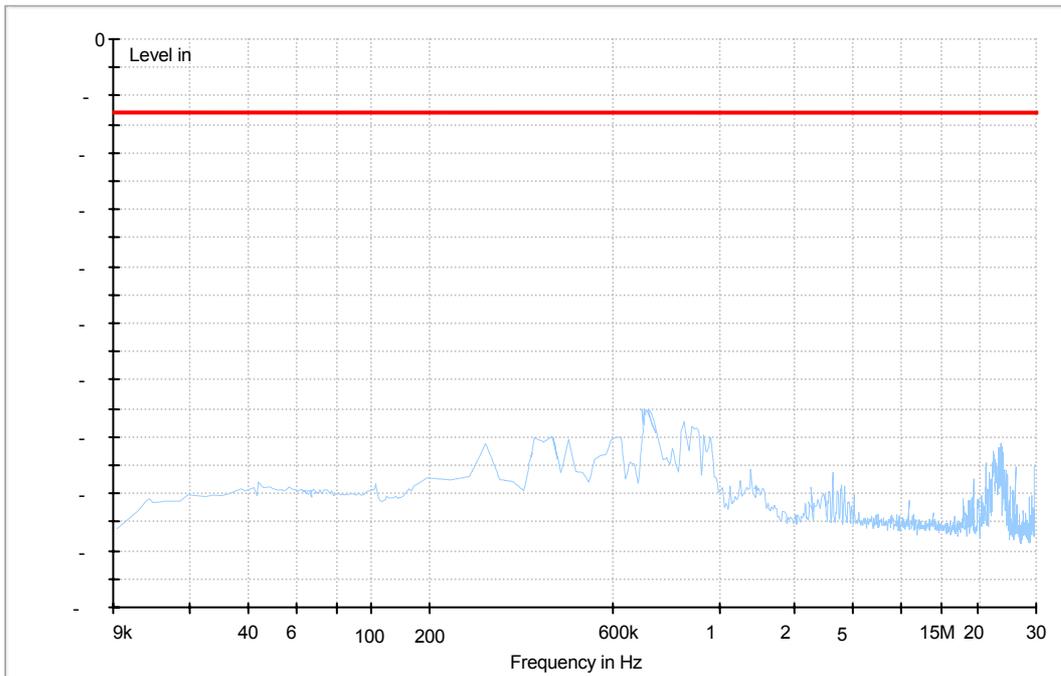
Traffic Mode (30MHz-2GHz)



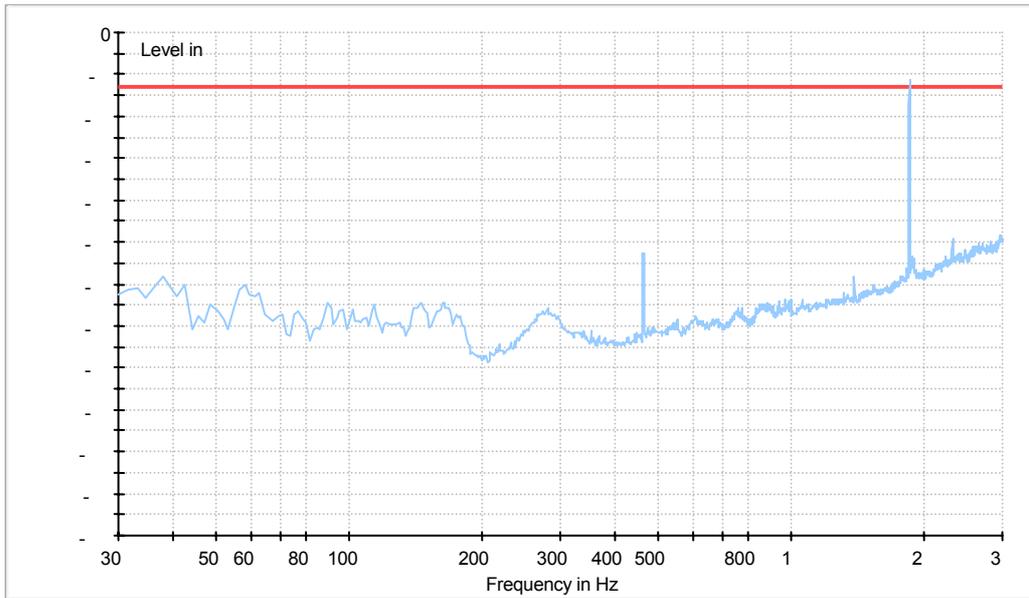
Traffic Mode (2GHz-18GHz)



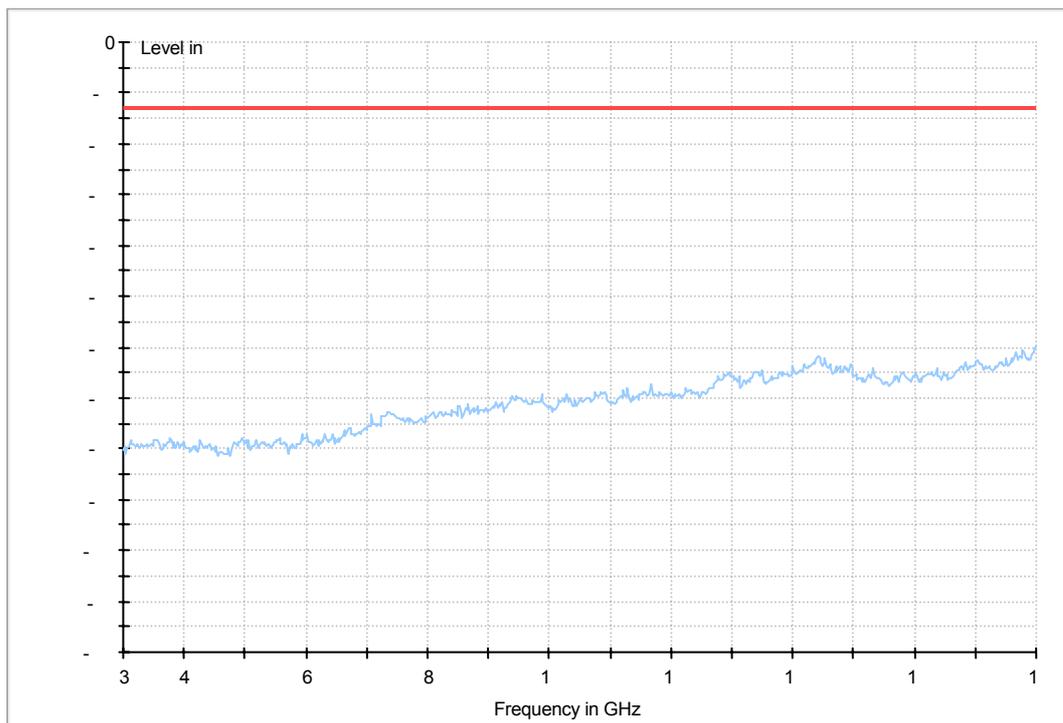
8.3.2 For GPRS 1900 Traffic Mode (9kHz-30MHz)



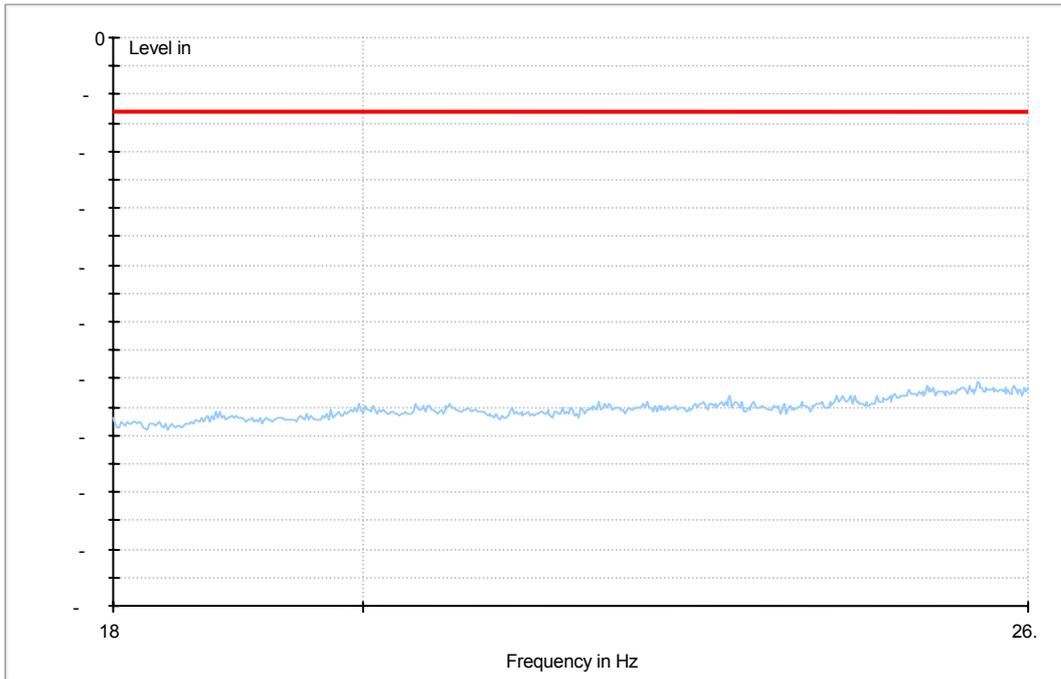
Traffic Mode (30MHz-3GHz)



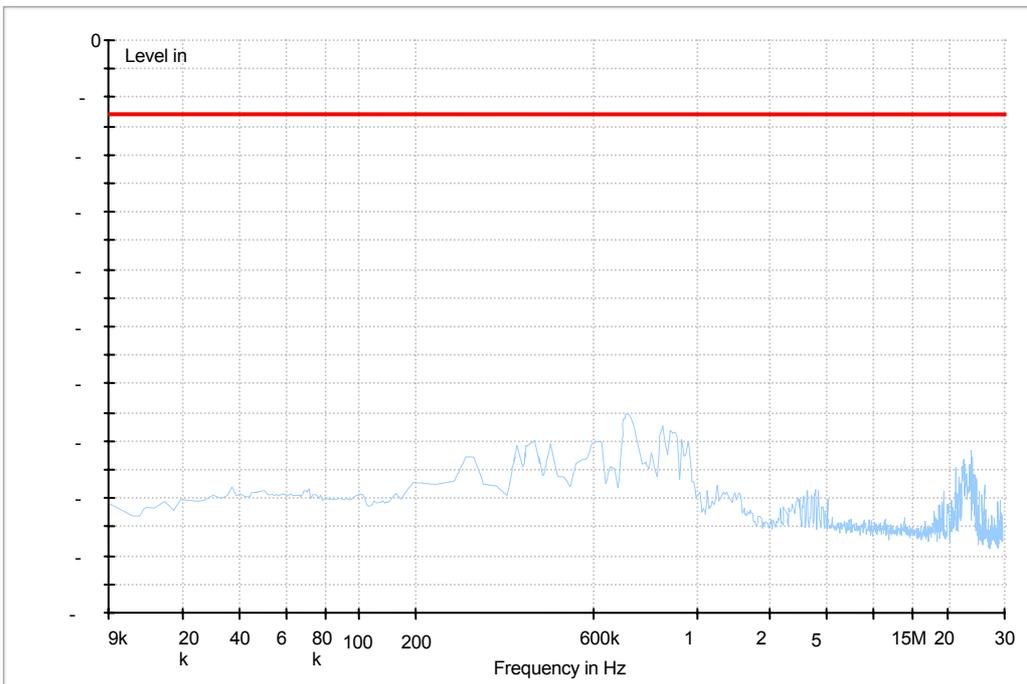
Traffic Mode (3GHz-18GHz)



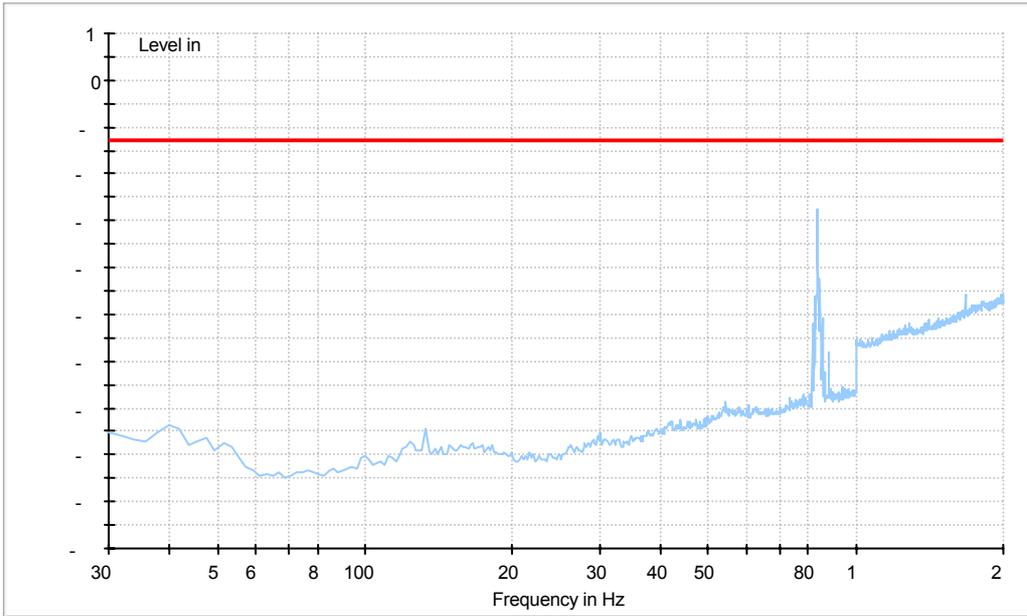
Traffic Mode (18GHz-26.5GHz)



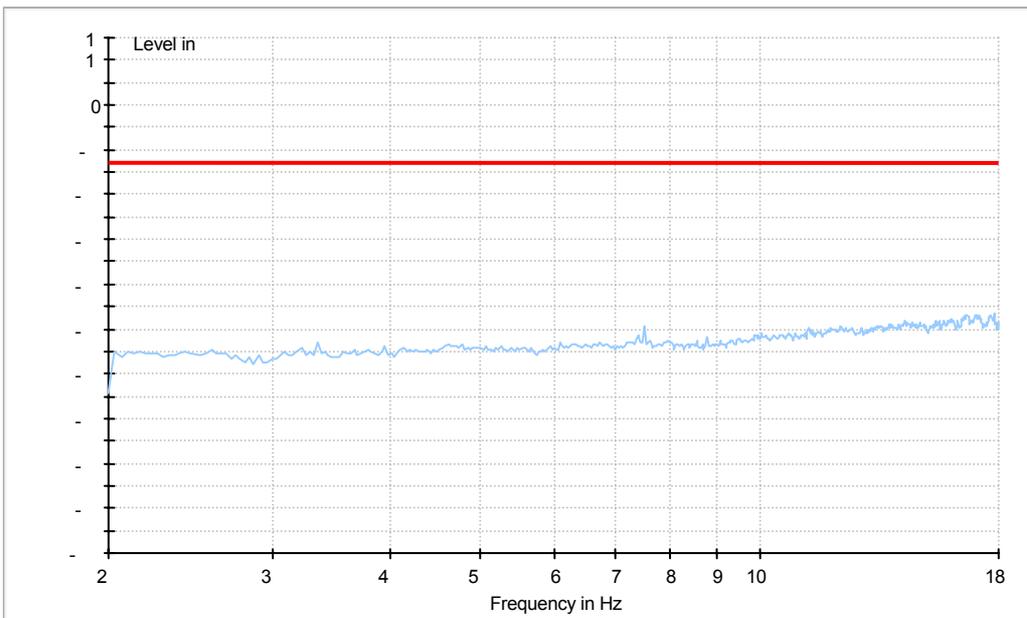
8.3.3 For EDGE 850 Traffic Mode (9kHz-30MHz)



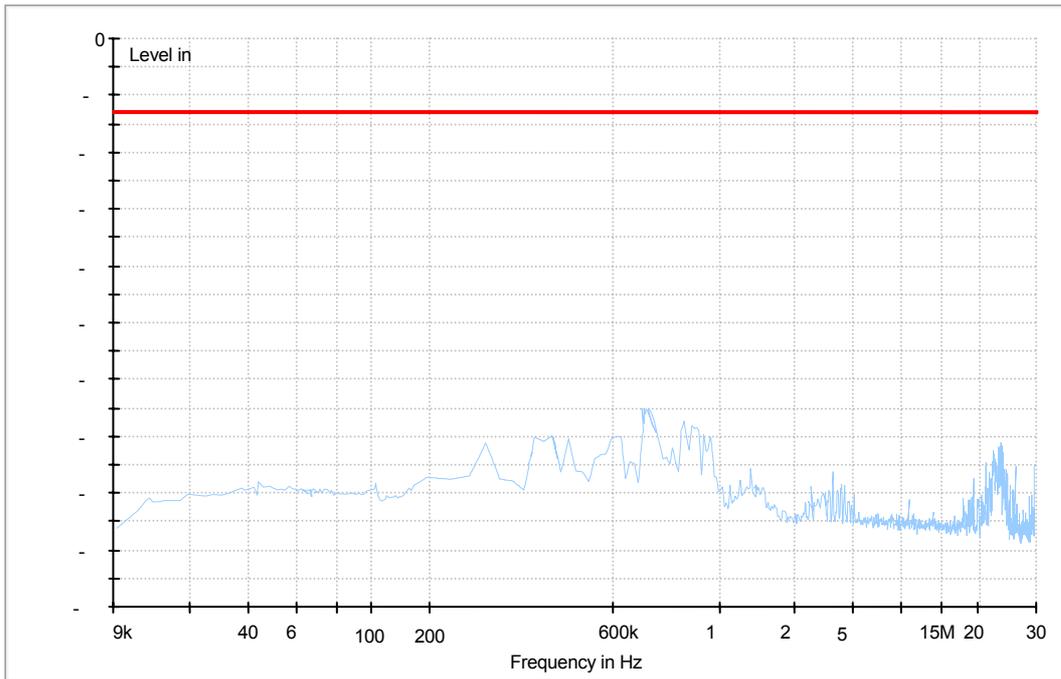
Traffic Mode (30MHz-2GHz)



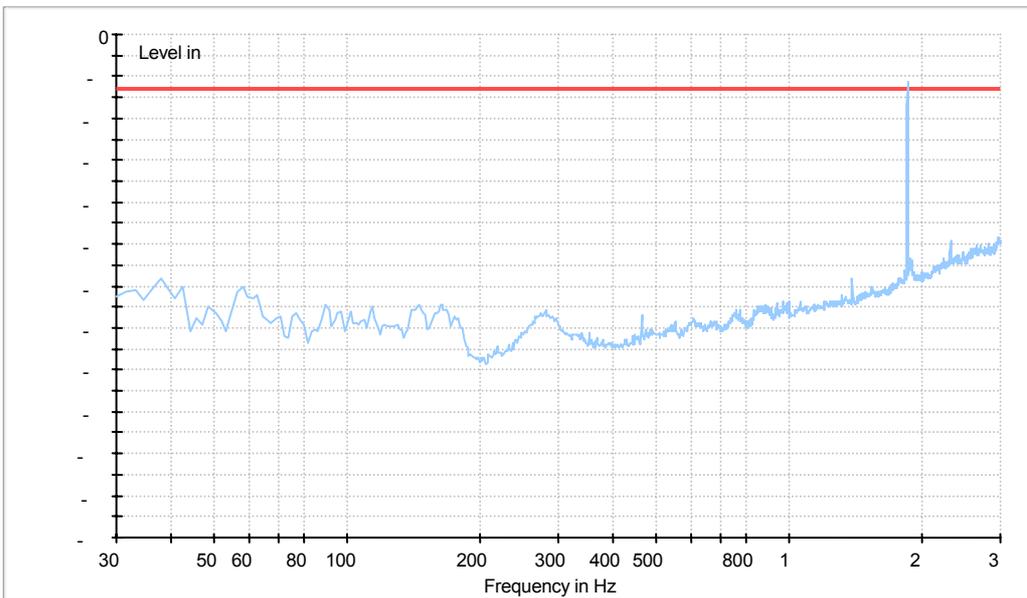
Traffic Mode (2GHz-18GHz)



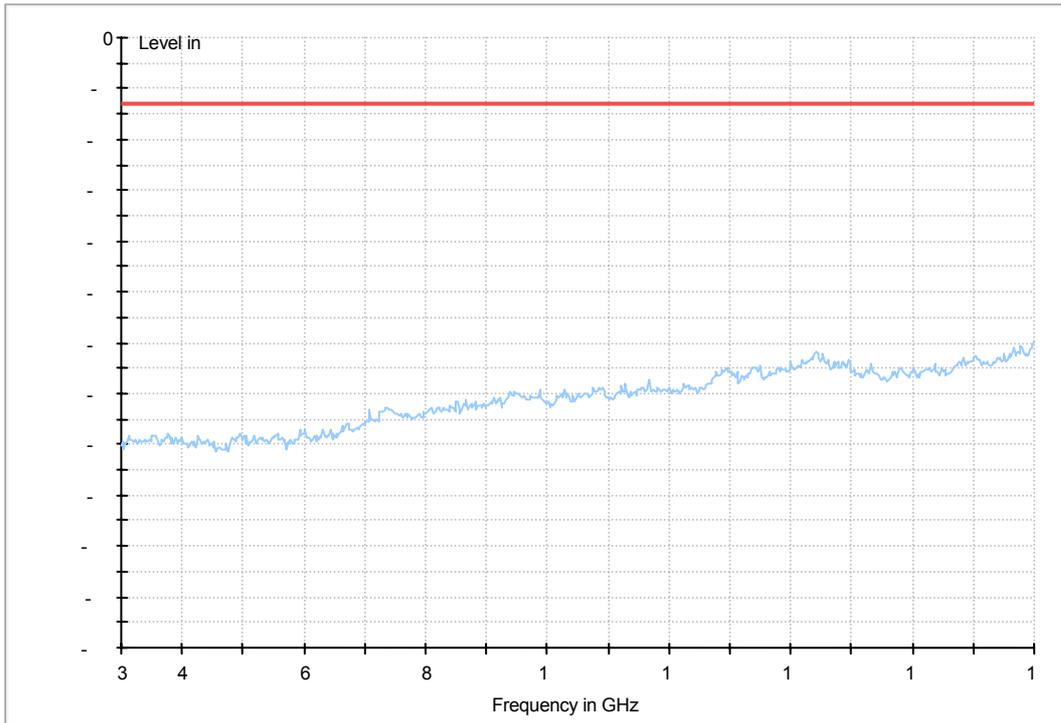
8.3.4 For EDGE 1900 Traffic Mode (9kHz-30MHz)



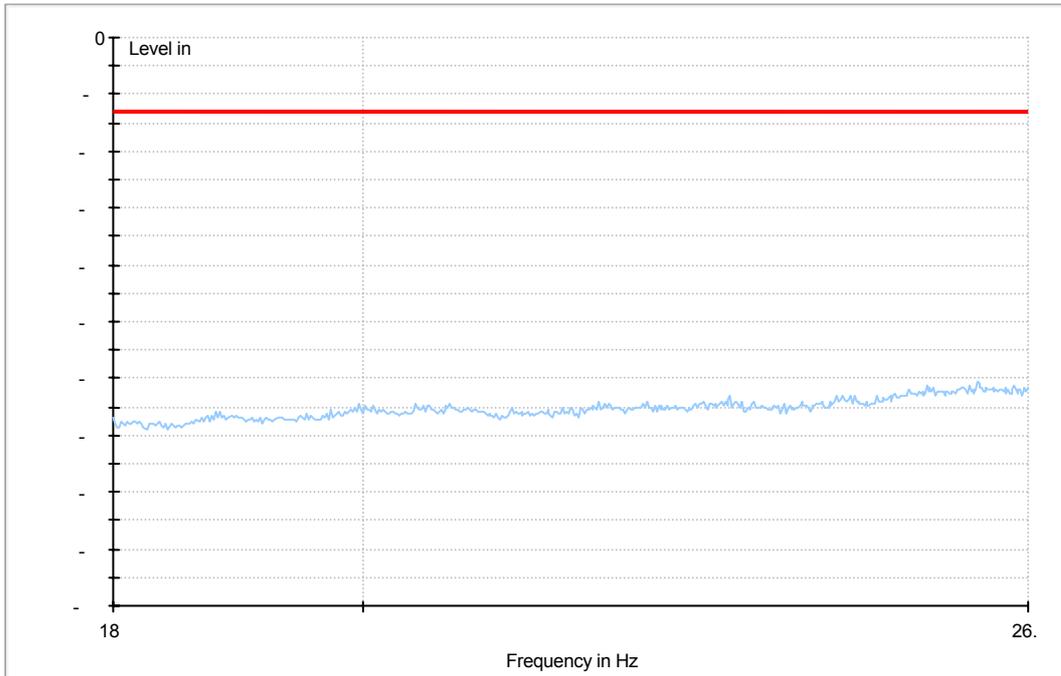
Traffic Mode (30MHz-3GHz)



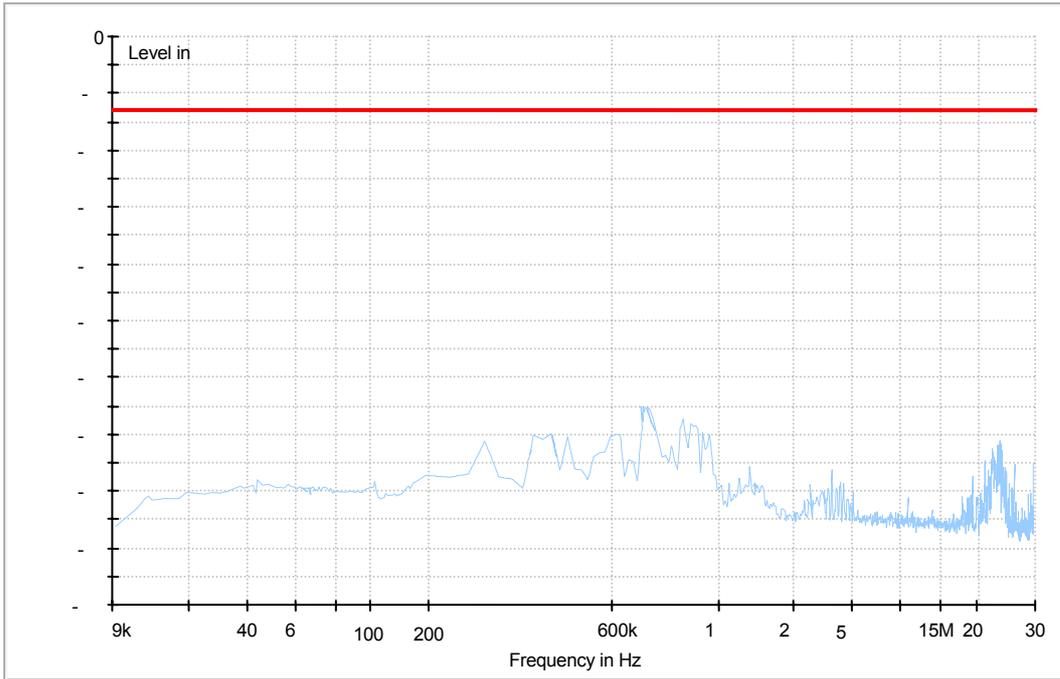
Traffic Mode (3GHz-18GHz)



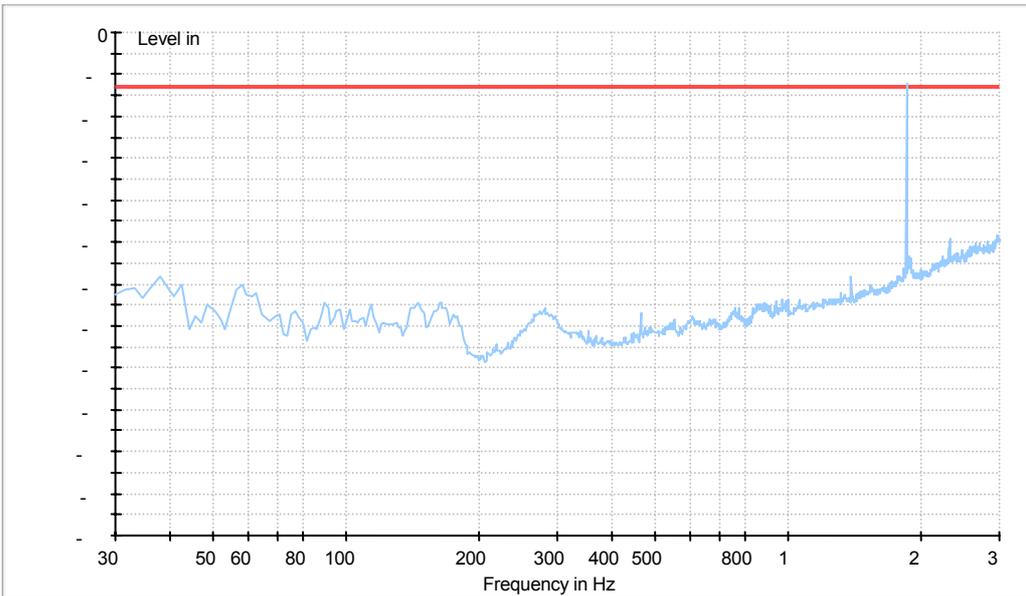
Traffic Mode (18GHz-26.5GHz)



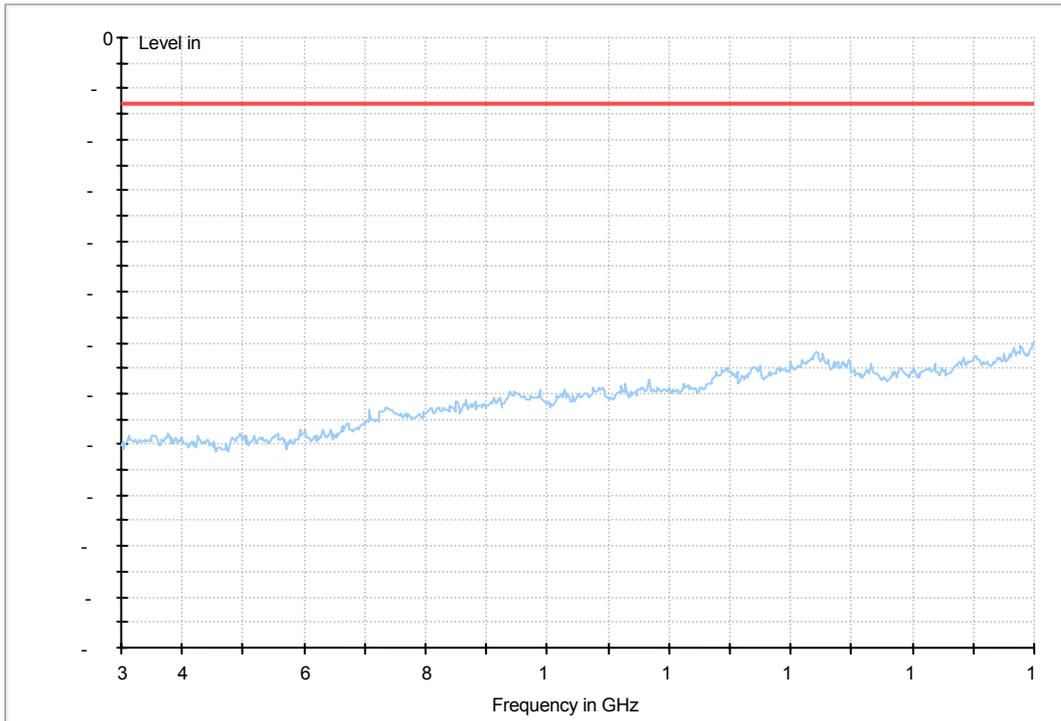
For WCDMA 1900
Traffic Mode (9kHz-30MHz)



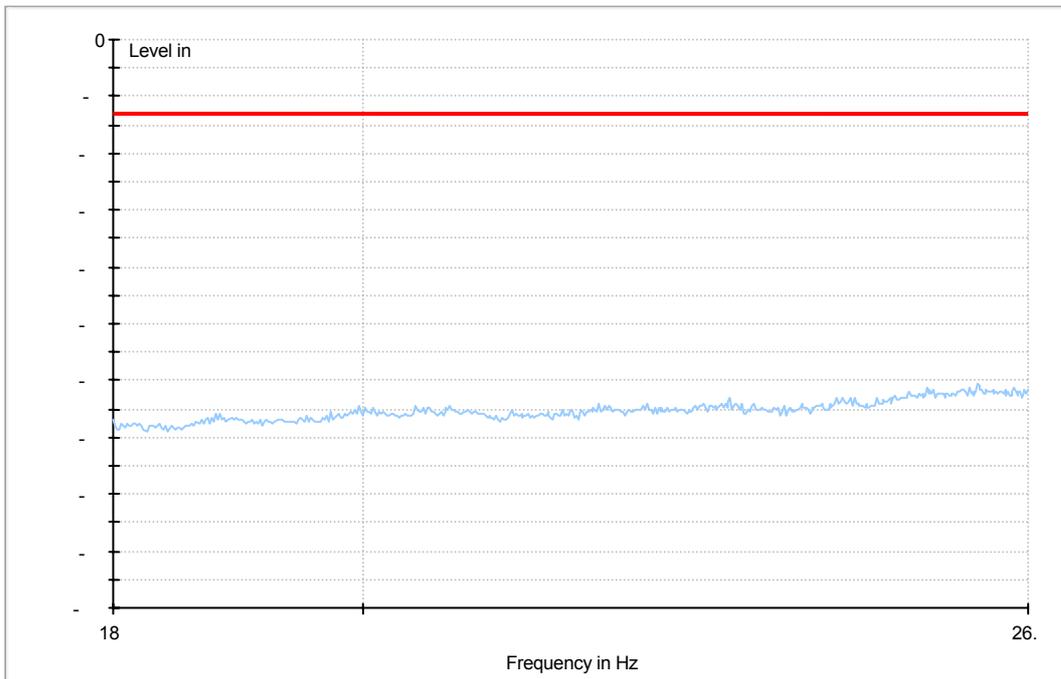
Traffic Mode (30MHz-3GHz)



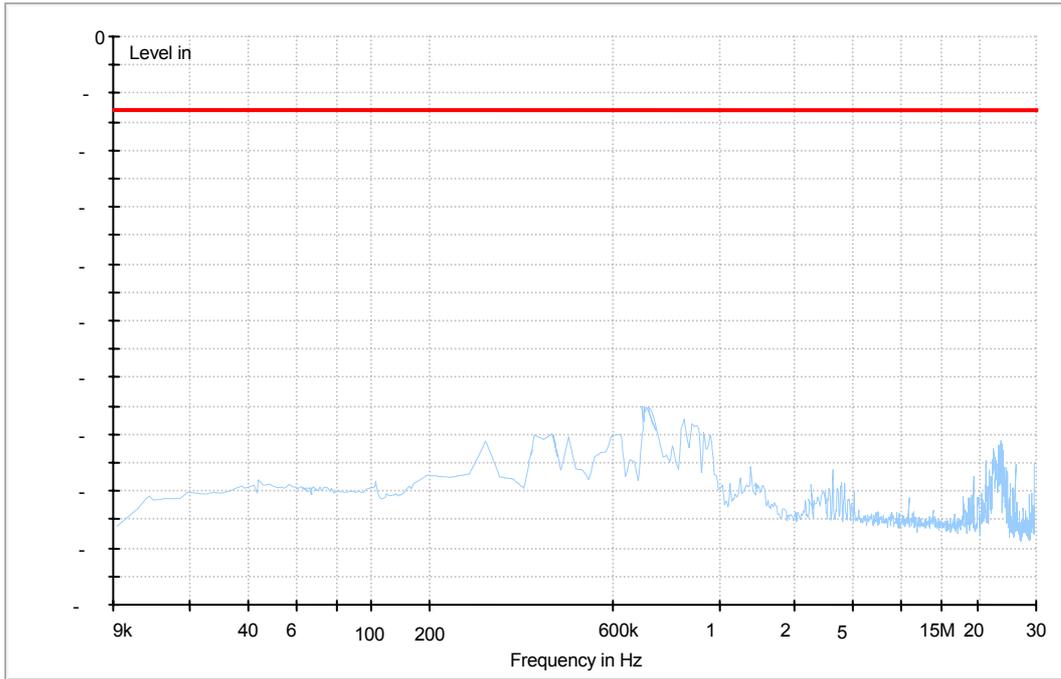
Traffic Mode (3GHz-18GHz)



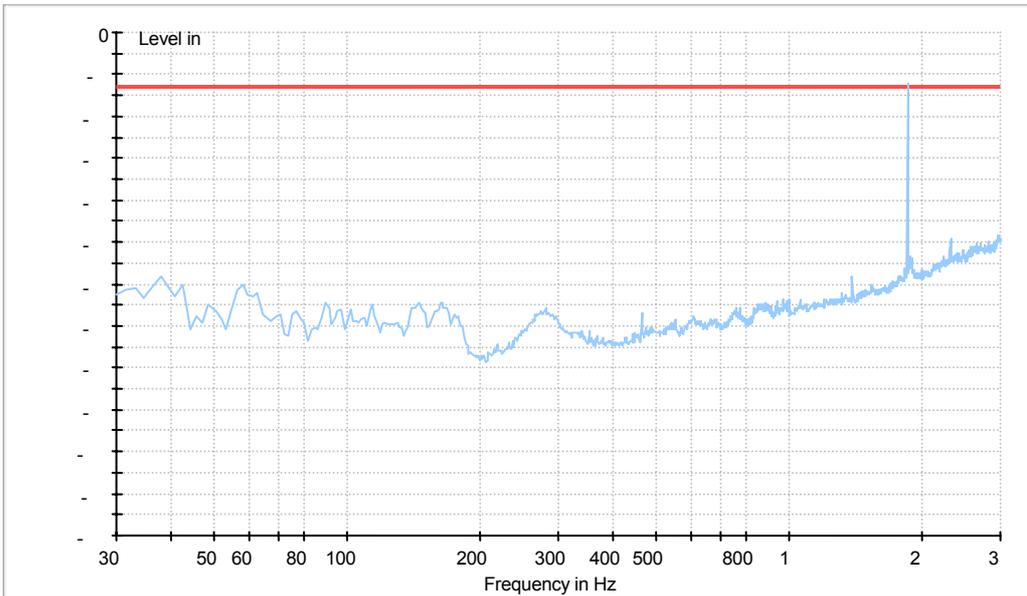
Traffic Mode (18GHz-26.5GHz)



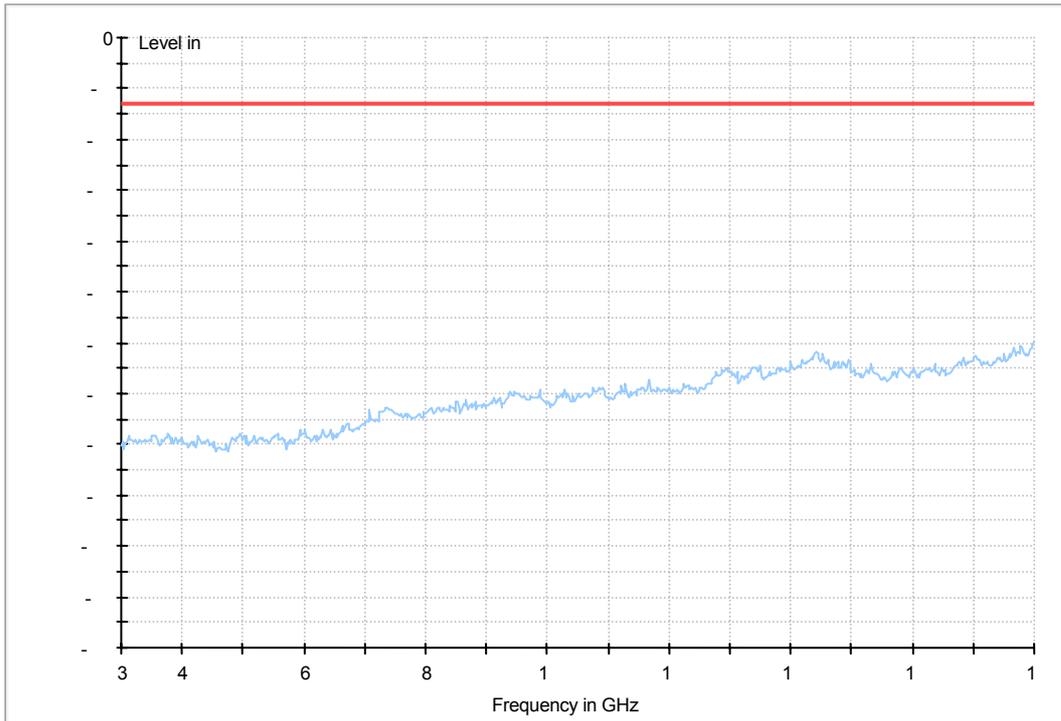
For HSUPA 1900
Traffic Mode (9kHz-30MHz)



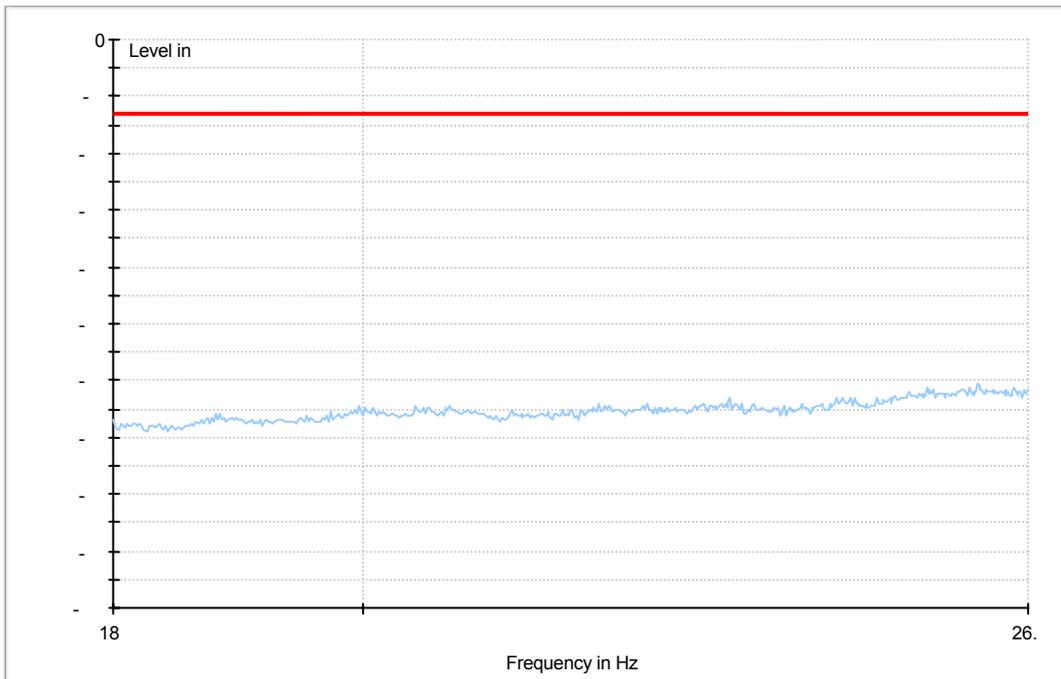
Traffic Mode (30MHz-3GHz)



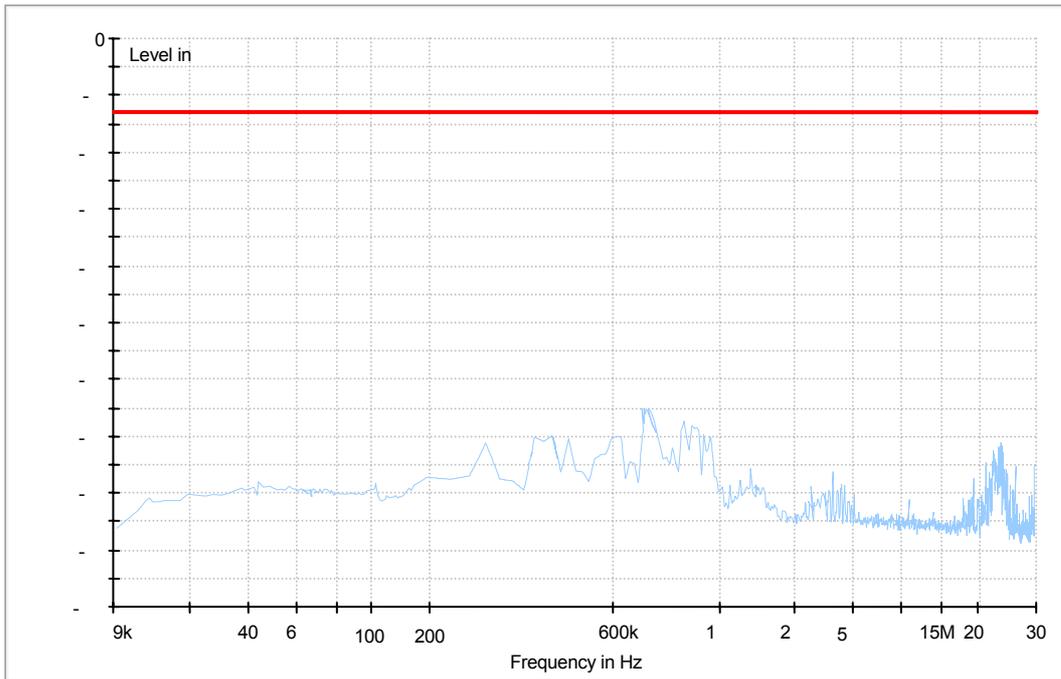
Traffic Mode (3GHz-18GHz)



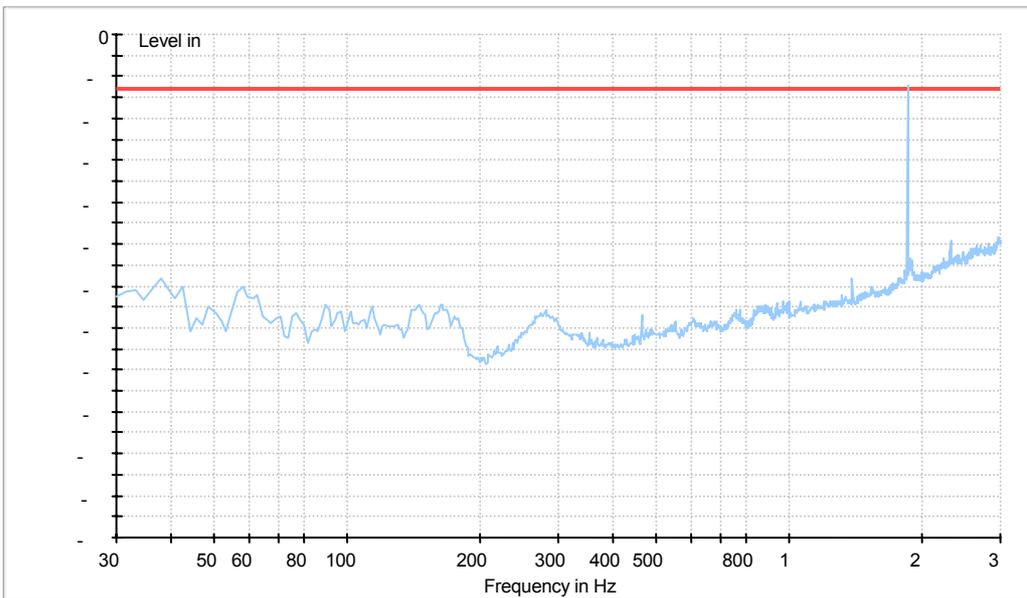
Traffic Mode (18GHz-26.5GHz)



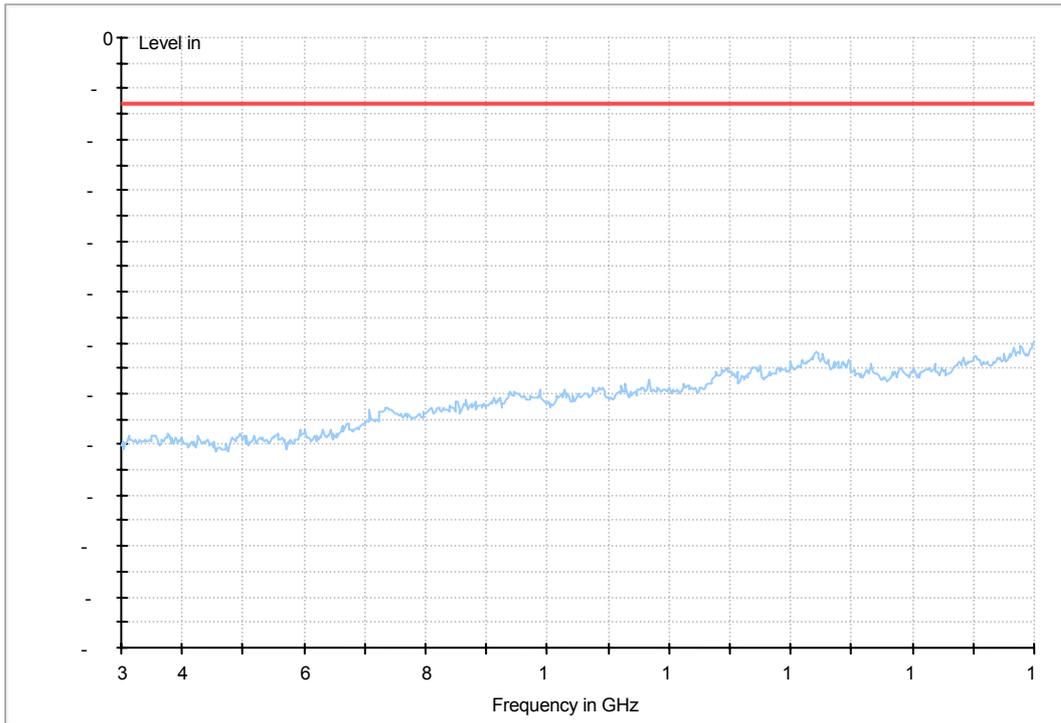
For HUDPA 1900
Traffic Mode (9kHz-30MHz)



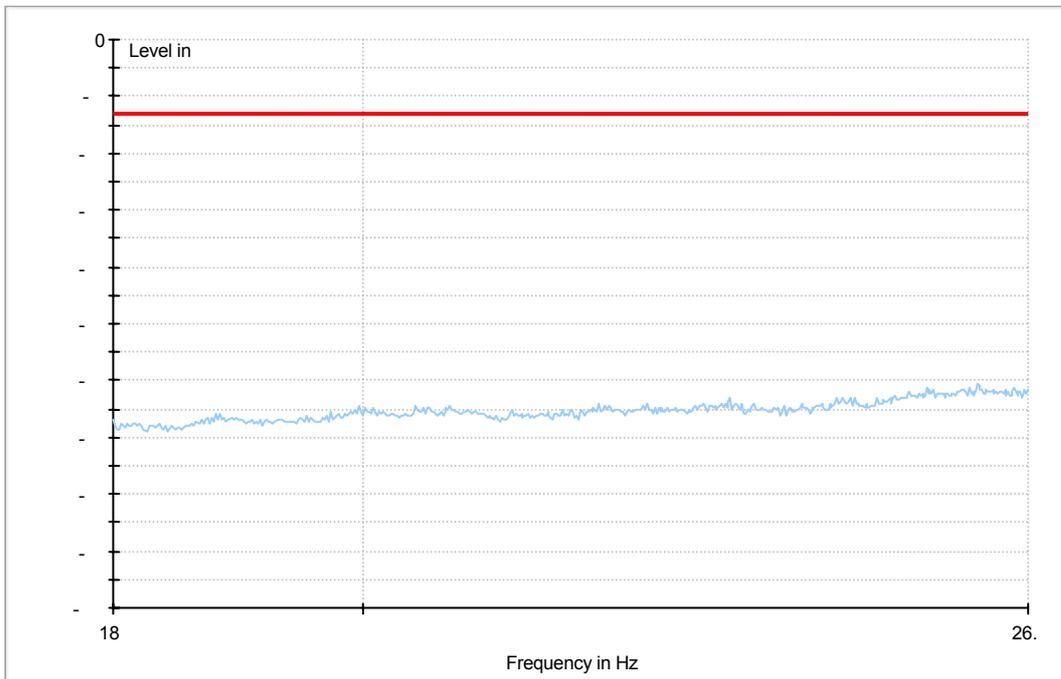
Traffic Mode (30MHz-3GHz)



Traffic Mode (3GHz-18GHz)



Traffic Mode (18GHz-26.5GHz)



END