



EMC Test Report

Product Name: EVDO Rev.A Module

Model Number: HUAWEI EM660

Report No: SYBHZ(R)E063042009EB-1

Reliability Laboratory of Huawei Technologies Co., Ltd.

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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.
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	
	5	
	6	
	7	

REPORT ON	EVDO Rev.A Module
	M/N: HUAWEI EM660
REGULATION	FCC CFR47 Part 15: Subpart B; FCC CFR47 Part 22 FCC CFR47 Part 24
START OF TEST	Mar.05, 2009
END OF TEST	Mar.20, 2009
Final Judgement:	Pass

Approver	<u>2009-04-29</u>	张兴海		
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Reviewer	<u>2009-04-29</u>	余辉		
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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 EVDO Rev.A Module
MANUFACTURERS MODEL NUMBER HUAWEI EM660

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:
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 Module				
Test Items	Test Configuration & Test Mode	Required Performance Criteria	Result	Site
<u>Radiated Emissions</u> Enclosure Port	TC1 (TM7~TM12)	N/A	Pass	Site1
<u>Conducted Emissions</u>	TC1 (TM1~TM6)	N/A	Pass	Site1
<u>Radiated Spurious Emissions</u> Enclosure Port	TC1 (TM1~TM6)	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 EM660 EVDO Rev.A Module is a subscriber equipment in the CDMA and CDMA2000 1x /EVDO Rev.A/Rev.0 system. It supports 800 MHz frequency band and 1900MHz frequency band. By using the QSC 6085 chipset and Zero-IF technologies, HUAWEI EM660 Module implements such functions as RF signal reception/transmission, CDMA protocol process, CDMA2000 1xEV-DO Rev.A/Rev.0 protocol processing, high-rate packet data services and GPS protocol process.

3.1.1 Main Equipment Technical Data

Name	EVDO Rev.A Module
Model	HUAWEI EM660
Input Rated Voltage	3.3V
Rated Power	2.5 W
Dimensions	56.05 (depth) × 30(width) × 5 (height) (mm ³)
Weight	8g

Table 3 Sub-Assembly Identity

Mode	Work Frequency	
	Transmitt Frequency (MHz)	Receive Frequency (MHz)
Cellular-CDMA	824 to 849 MHz	869 to 894 MHz
US-PCS	1850 to 1910 MHz	1930 to 1990 MHz
GPS position location in the L1 band		1575.42 MHz center frequency

3.2 Sub-Assembly Identity

Table 4 Sub-Assembly Identity

Board			
Model Name	Qty.	Serial Number	Description
EM660	1	020FMX0450020802	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
PCI-E	PCI-E	N/A

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	108522	2008-10-10
Notebook	D640m	DELL	3106094190	NA
Notebook	T43	IBM	3106093834	N/A

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~TM12

TC1: EUT was powered by a demo board, which is connected to the notebook by USB port.

4.3.2 Test Mode

There was 12 test Modes. TM1 to TM12 were shown below:

- TM1: operate in traffic mode CDMA800 1x;
- TM2: operate in traffic mode CDMA1900 1x;
- TM3: operate in traffic mode EV-DO800 Rev.0;
- TM4: operate in traffic mode EV-DO1900 Rev.0;
- TM5: operate in traffic mode EV-DO800 Rev.A;
- TM6: operate in traffic mode EV-DO1900 Rev.A;
- TM7: operate in idle mode CDMA800 1x;
- TM8: operate in idle mode CDMA1900 1x;
- TM9: operate in idle mode EV-DO800 Rev.0;
- TM10: operate in idle mode EV-DO1900 Rev.0;
- TM11: operate in idle mode EV-DO800 Rev.A;
- TM12: operate in idle mode EV-DO1900 Rev.A;

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.(CDMA see 3GPP2 C.S0011-B).

For CDMA, the following conditions shall also be met:

Logical Test Interface for details regarding generic call set-up procedure

- set and send continuously up power control commands to the UE;
- The EUT shall be commanded to operate at maximum transmit power;

Assign channel frequency to an appropriate channel number. Set the ARFCN channel number to 283 (833.49MHz) for CDMA800, to 575 (1878.75MHz) for CDMA1900.

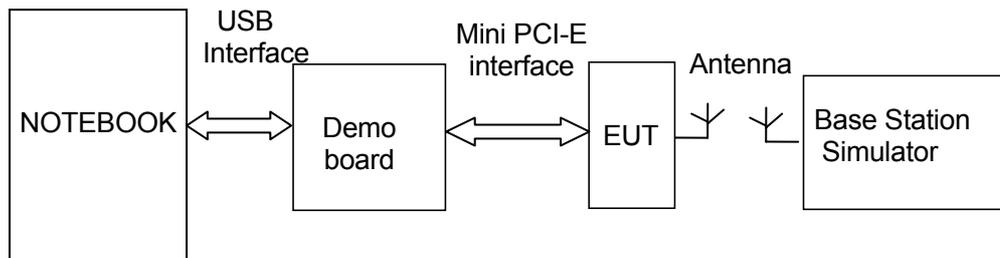


Figure 1.: TC1 (TM1-TM6)

Idle Mode:

The EUT is required to be in the idle mode.

For CDMA, 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).

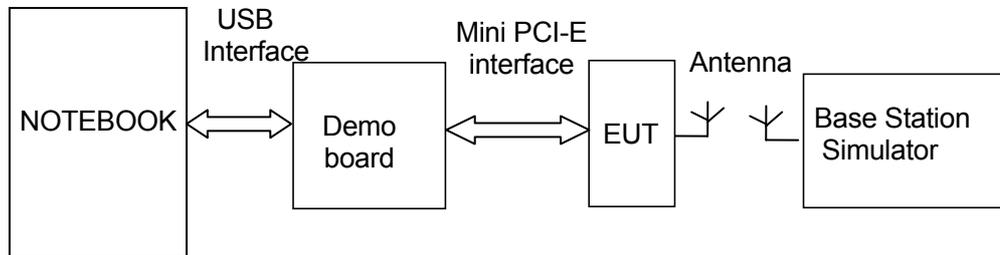


Figure 2. TC1 (TM7-TM12)

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:

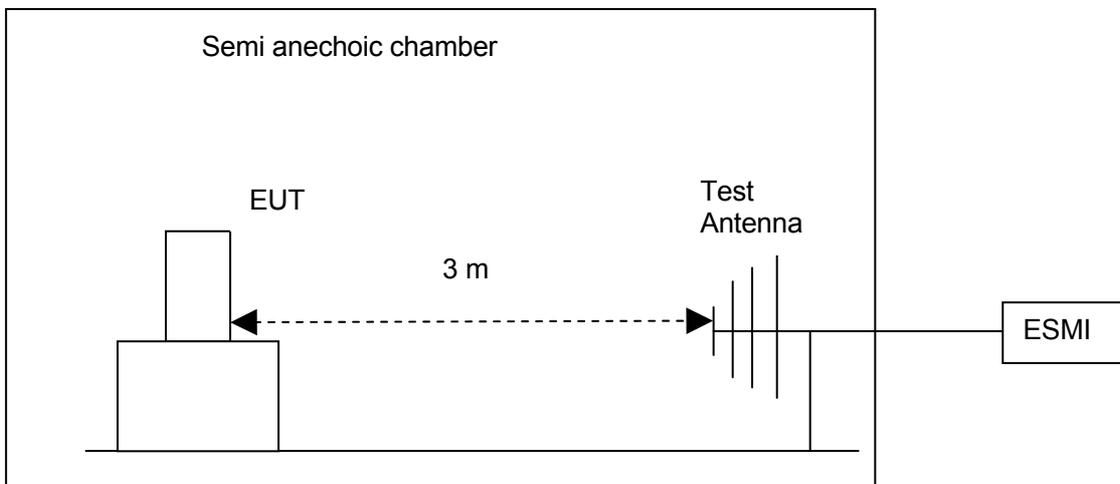


Figure 3. Test set-up

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.

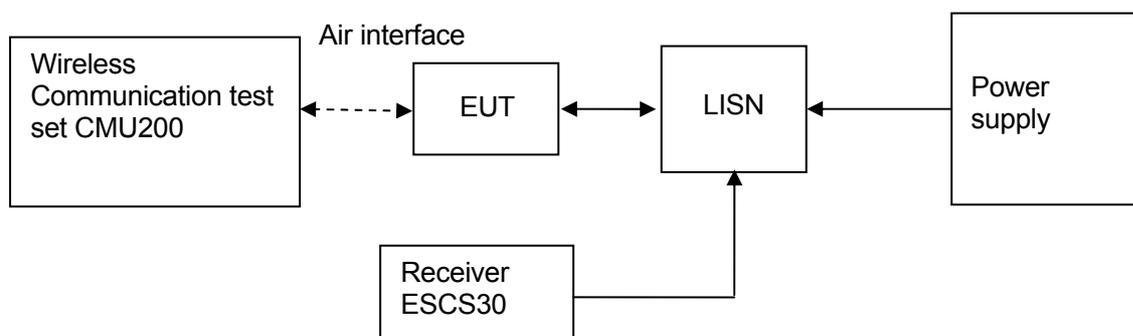


Figure 4. Test Set-up

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 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

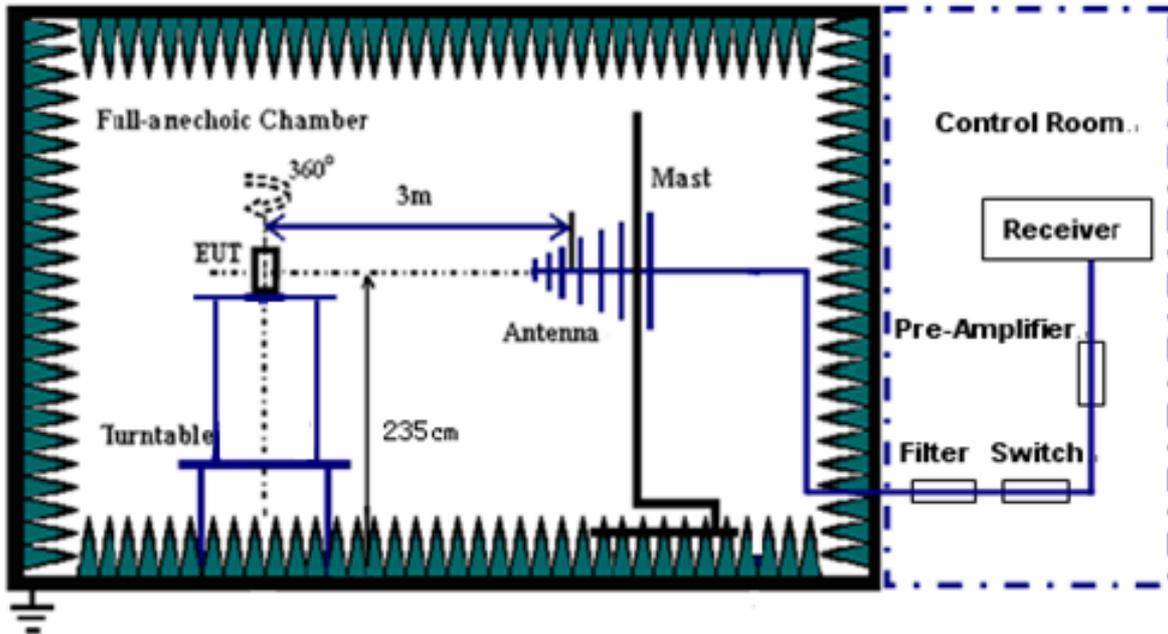
5.3.1 Test Procedure

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:

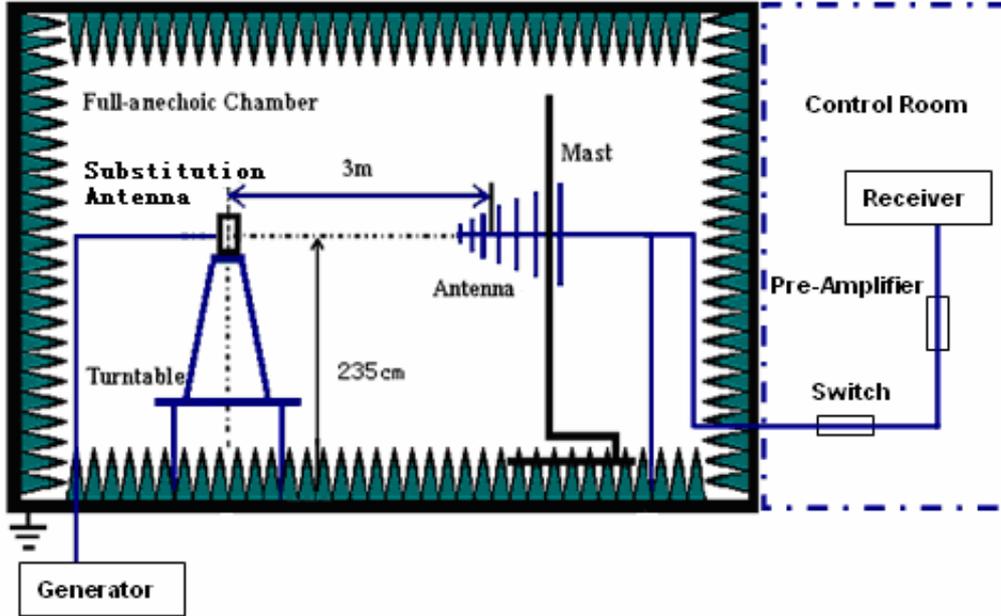
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect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

5.3.2 Test Results

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

6 Main Test Instruments

Table 12 Main Test Equipments

Test item	Test Instrument	Model	Manufacturer	Cal-Date	Cal Interval (month)
RE	EMI receiver	ESU26	R&S	Aug.28. 2008	12
	Trilog Broadband Antenna (30M~3GHz)	VULB 9163	SCHWARZBECK	Jul.22.2008	12
CE	Line Impedance Stabilization Network	ENV216	R&S	Aug.14.2008	12
	Impedance Stabilization Network	ISN T400A	TESEQ	Feb.11.2009	12
RSE	EMI Test receiver	ESIB26	R&S	May.30.2008	12
	Horn Antenna	3117	EMCO	July.16.2008	12
	Broadband Antenna	CBL 6112B (2536)	SCHAFFNER	Jun.08.2008	12
	Horn Antenna	3160	EMCO	Aug.03.2008	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:

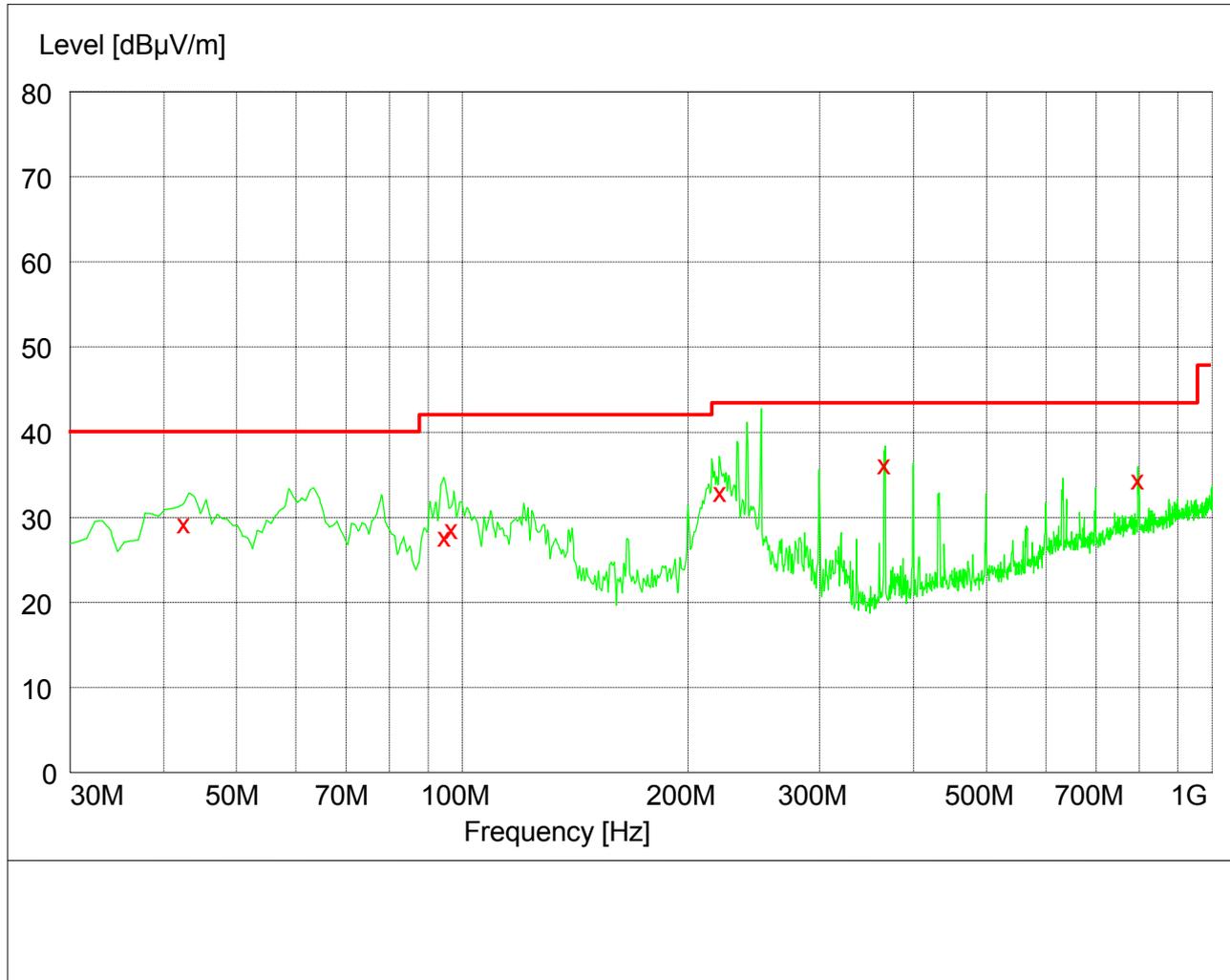
Table 13 System Measurement Uncertainty

Items		Extended Uncertainty
RE	Field strength (dB μ V/m)	U=4.6dB; k=2(30MHz-1GHz)
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.



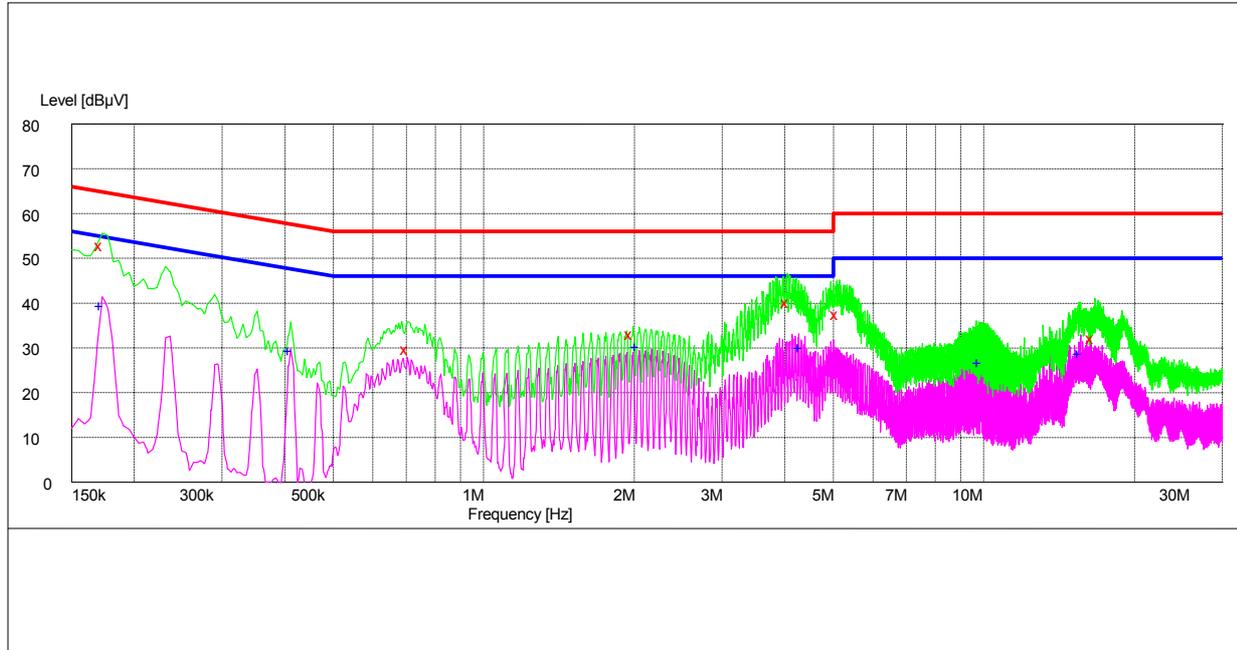
MEASUREMENT RESULT: QP Detector

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
42.600000	29.40	13.1	40.0	10.6	100.0	46.00	VERTICAL
94.800000	27.90	12.7	43.5	15.6	100.0	37.00	HORIZONTAL
96.960000	28.60	12.9	43.5	14.9	100.0	45.00	HORIZONTAL
220.980000	33.10	13.0	46.0	12.9	100.0	282.00	HORIZONTAL
366.240000	36.40	17.4	46.0	9.6	100.0	104.00	VERTICAL
797.160000	34.70	24.8	46.0	11.3	100.0	37.00	HORIZONTAL

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
0.172500	53.20	10.0	65	11.8	L3	FLO
0.703500	30.20	10.0	56	25.8	N	FLO
1.977000	33.30	10.1	56	22.7	N	FLO
4.069500	40.50	10.1	56	15.5	N	FLO
5.109000	37.90	10.1	60	22.1	N	FLO
16.552500	32.60	10.3	60	27.4	L3	FLO

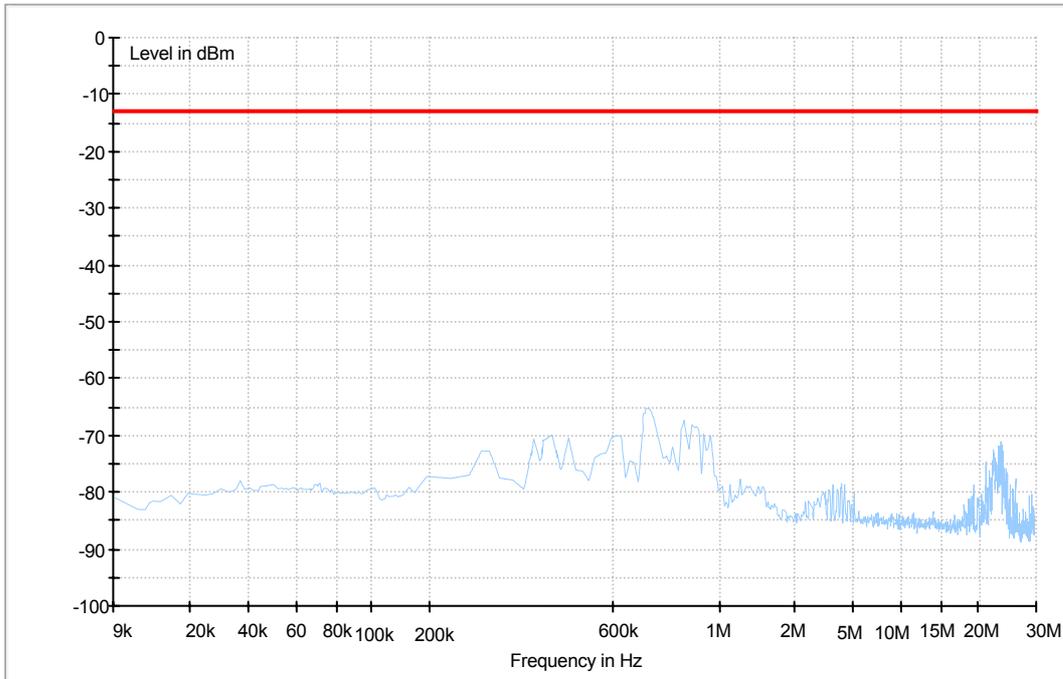
MEASUREMENT RESULT: AV Detector

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.172500	39.70	10.0	55	15.3	L3	FLO
0.411000	29.60	10.0	48	18.4	L3	FLO
2.031000	30.50	10.1	46	15.5	N	FLO
4.299000	30.30	10.1	46	15.7	N	FLO
9.820500	26.90	10.2	50	23.1	N	FLO
15.571500	29.00	10.3	50	21.0	N	FLO

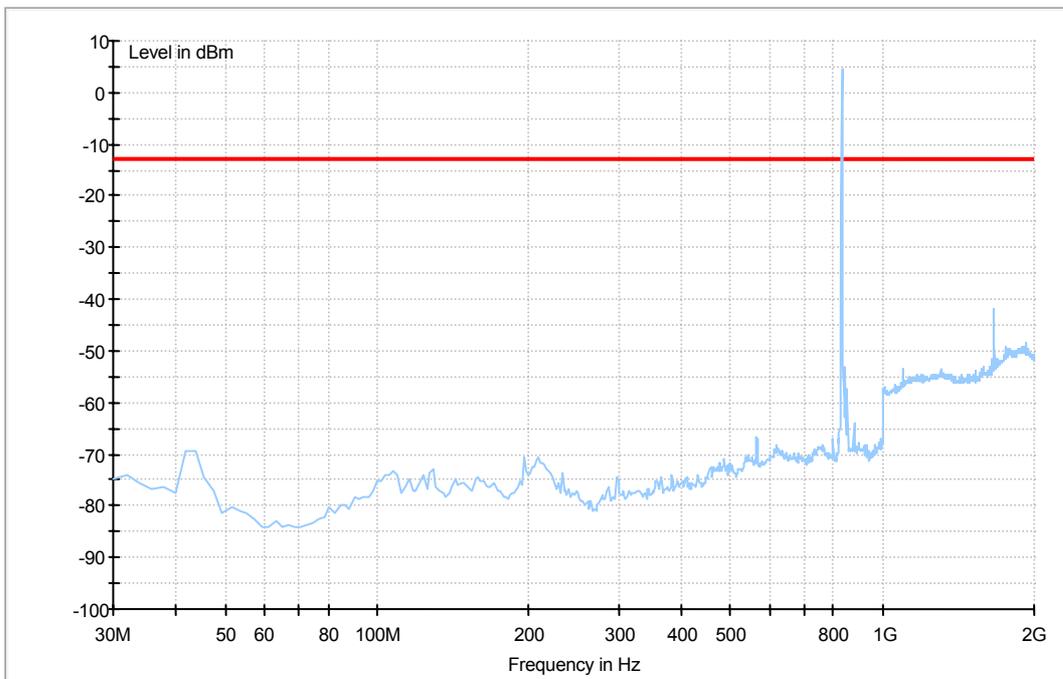
8.3 Radiated Spurious Emission

8.3.1 For CDMA 800

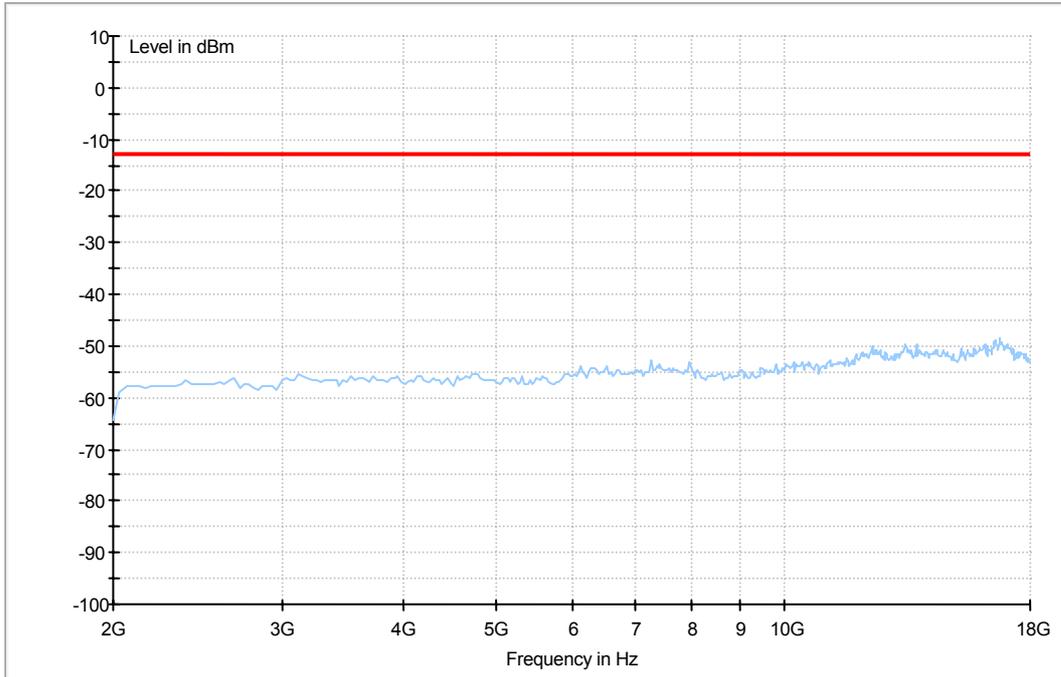
Traffic Mode (9kHz-30MHz)



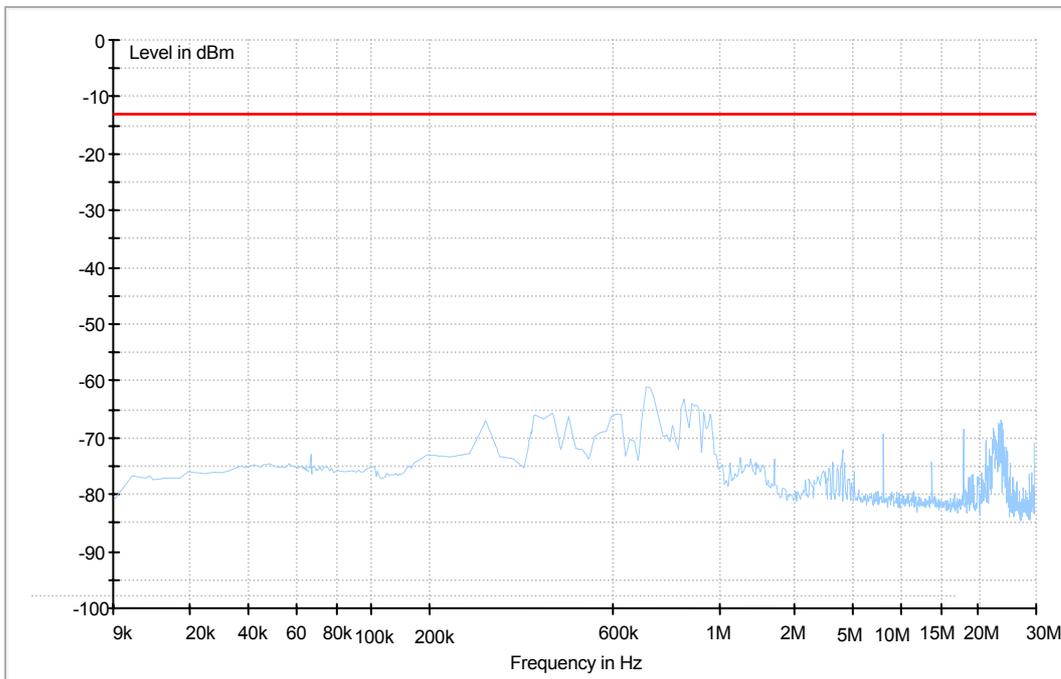
Traffic Mode (30MHz-2GHz)



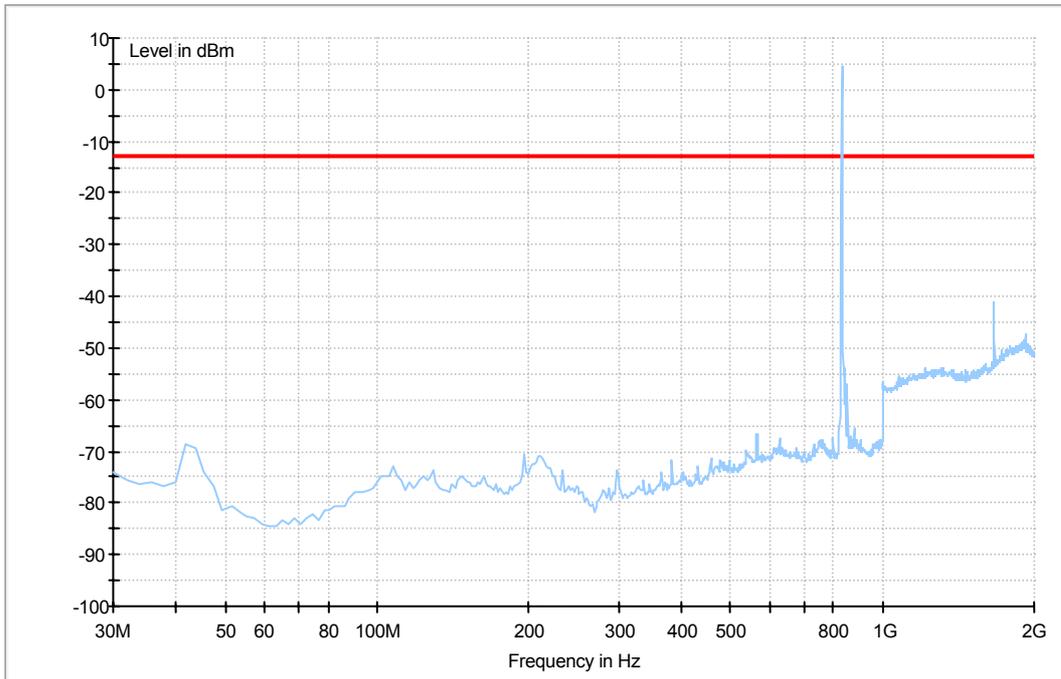
Traffic Mode (2GHz-18GHz)



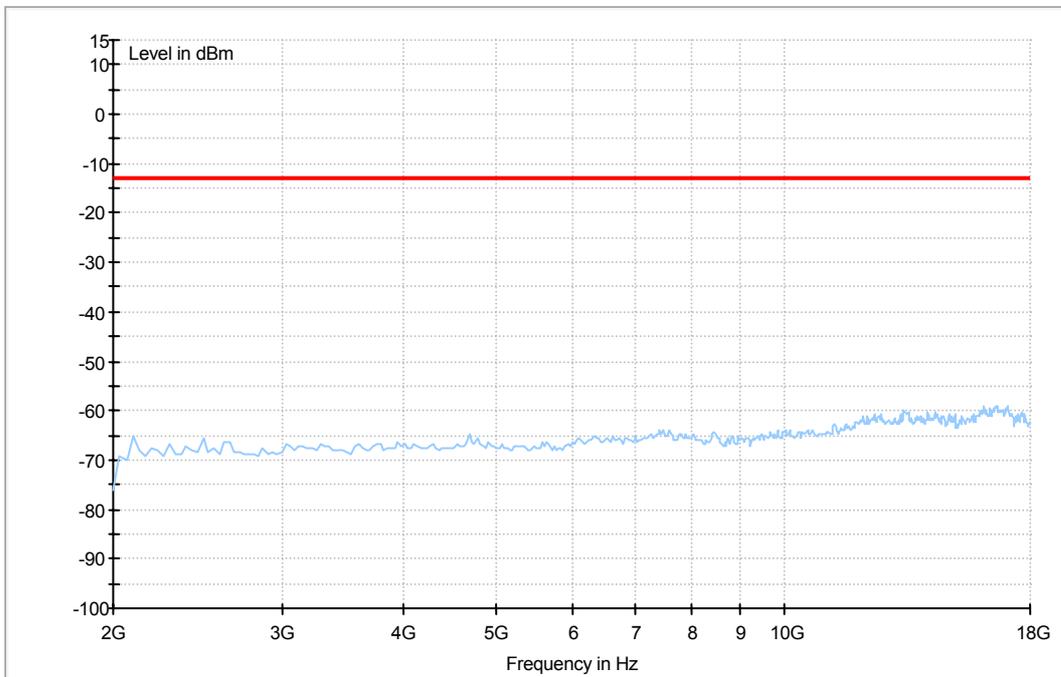
8.3.2 For EVDO.0 800
Traffic Mode (9kHz-30MHz)



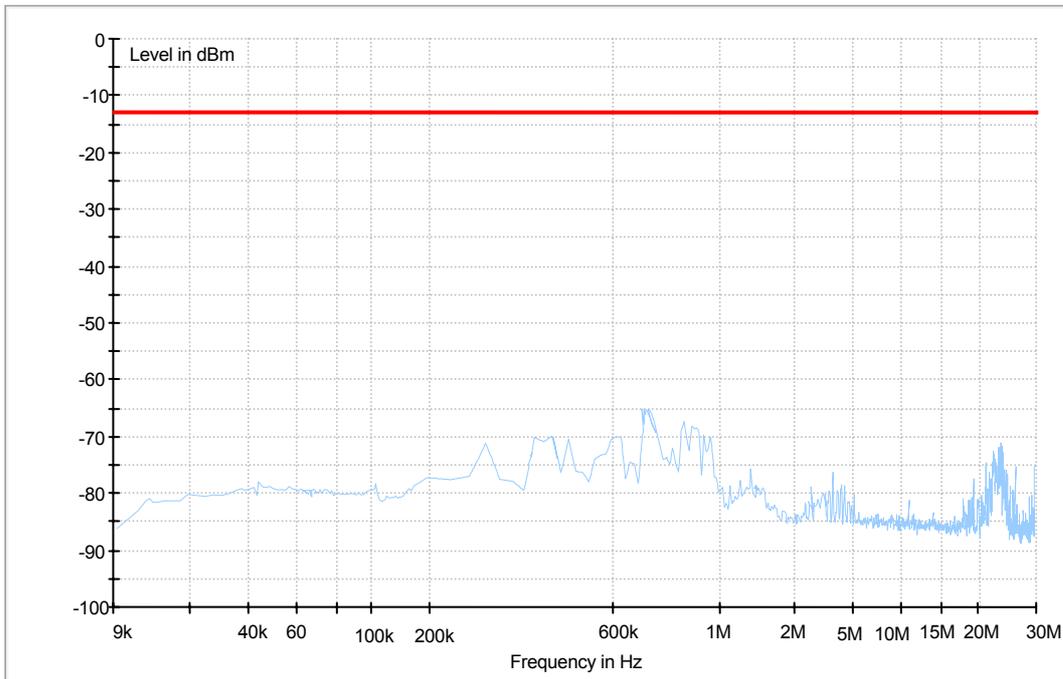
Traffic Mode (30MHz-2GHz)



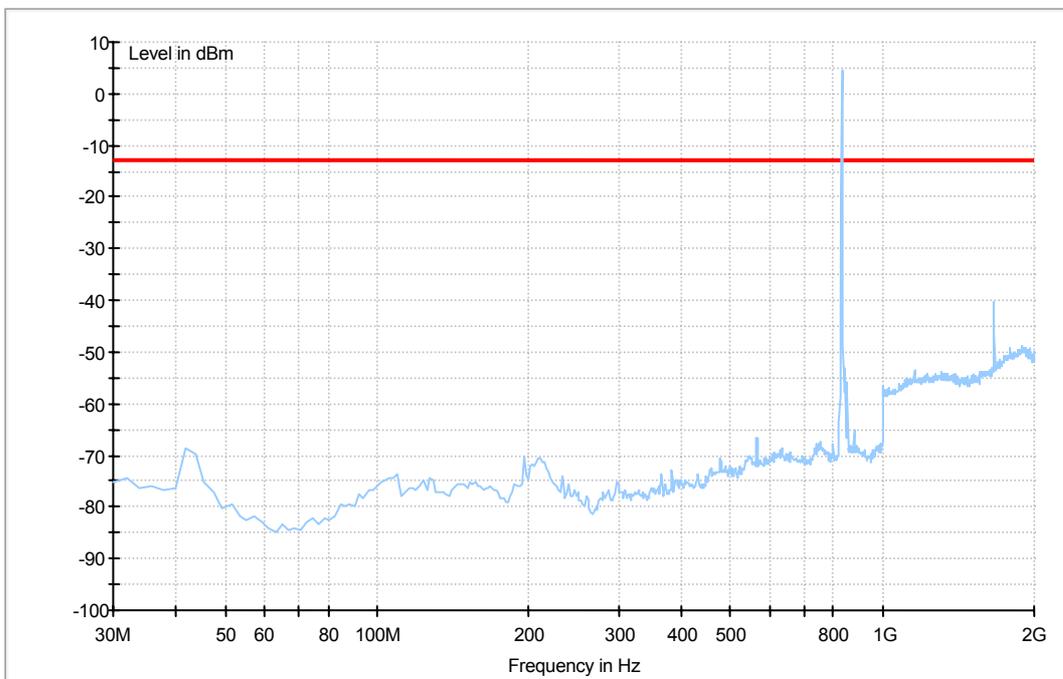
Traffic Mode (2GHz-18GHz)



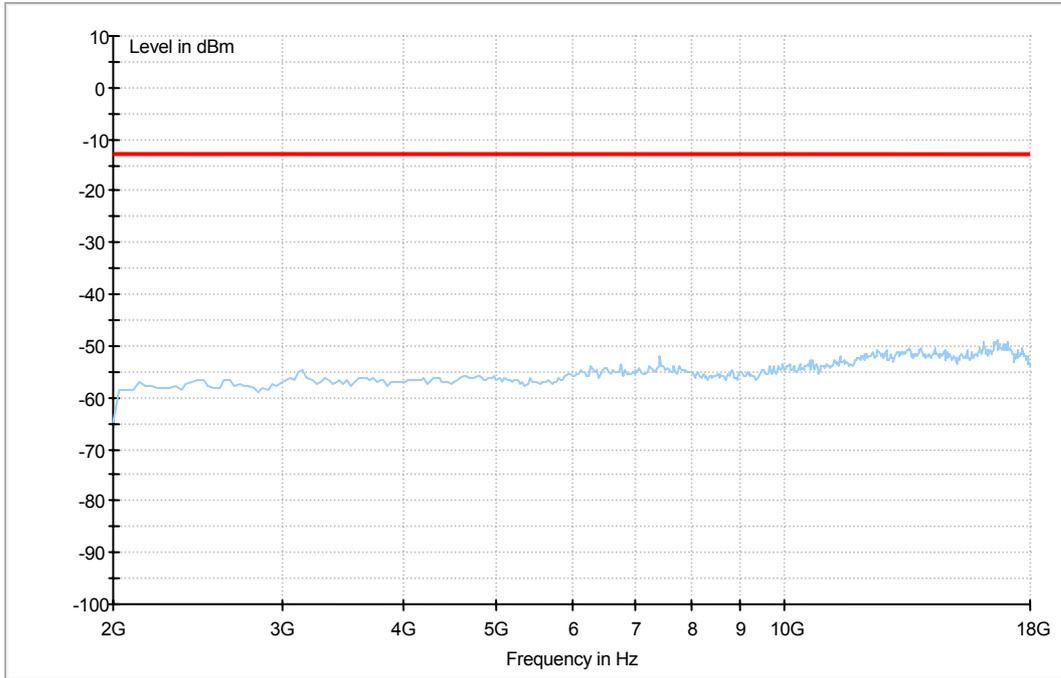
8.3.3 For EVDO.A 800 Traffic Mode (9kHz-30MHz)



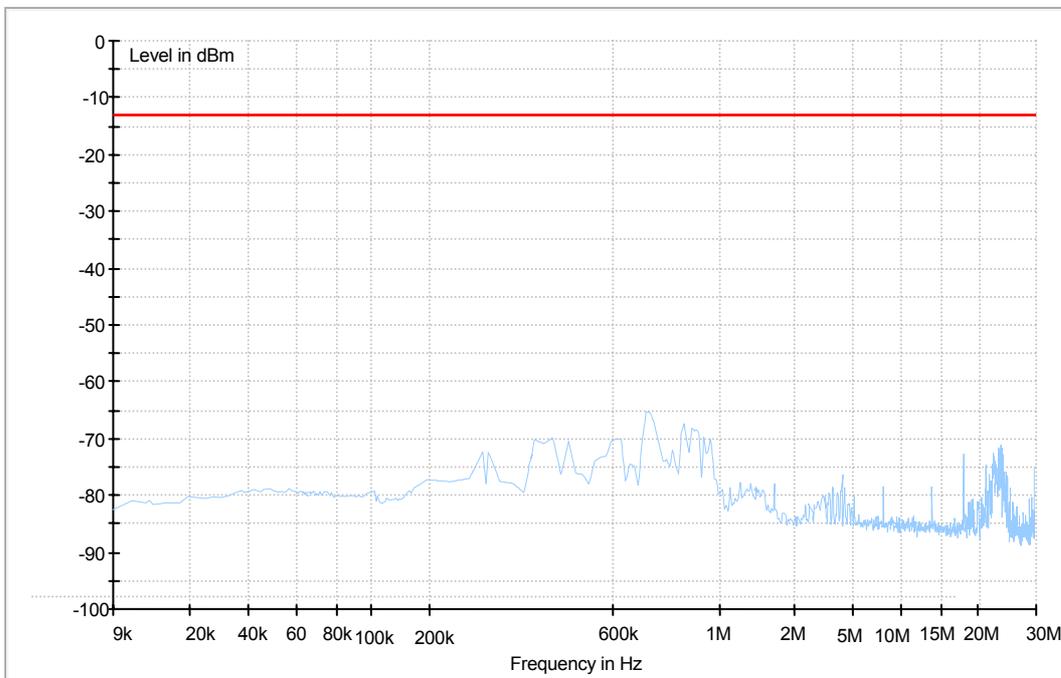
Traffic Mode (30MHz-2GHz)



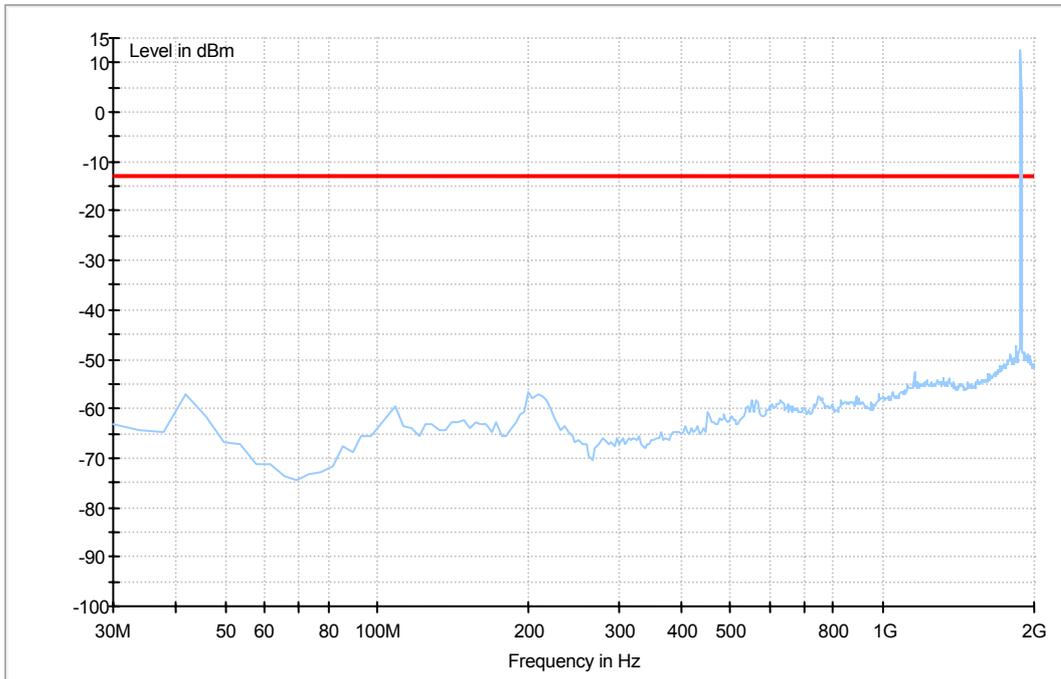
Traffic Mode (2GHz-18GHz)



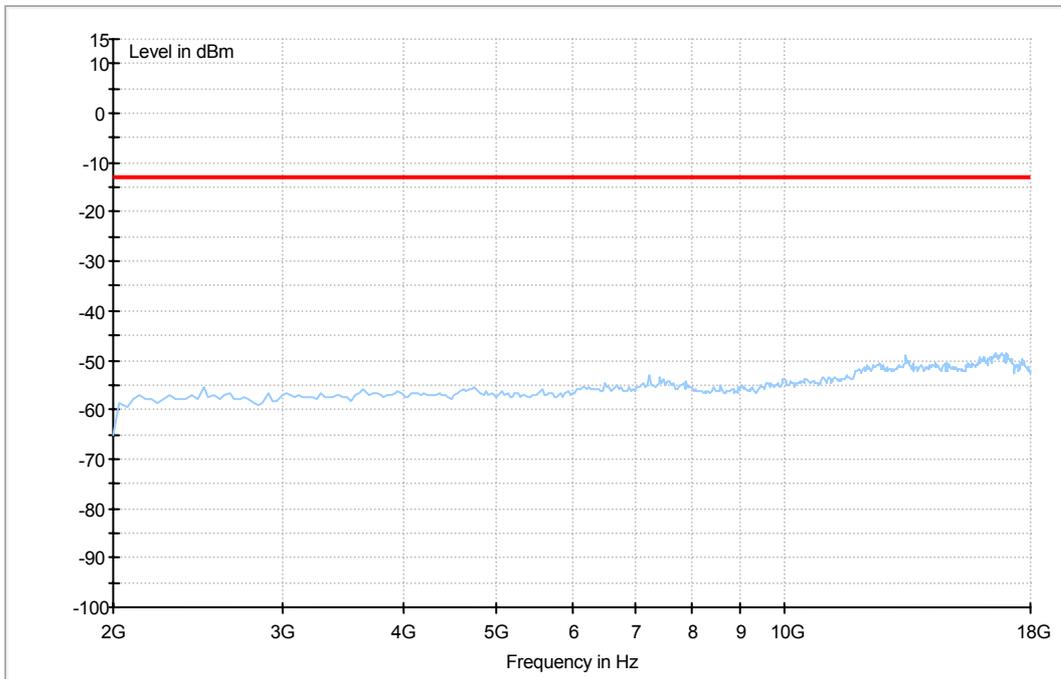
8.3.4 For PCS 1900
Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-2GHz)

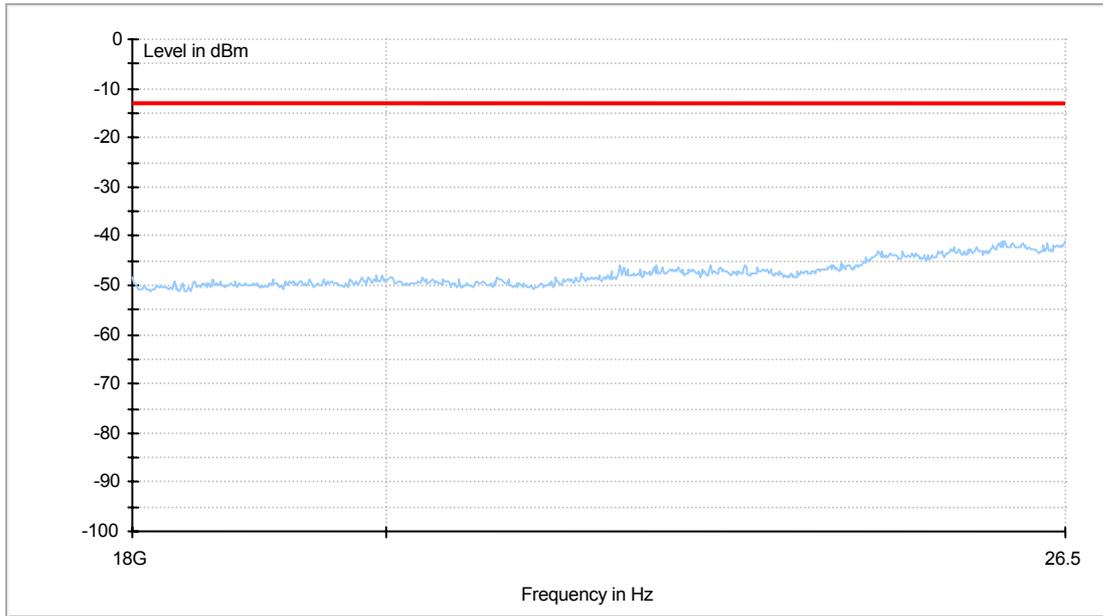


Traffic Mode (2GHz-18GHz)



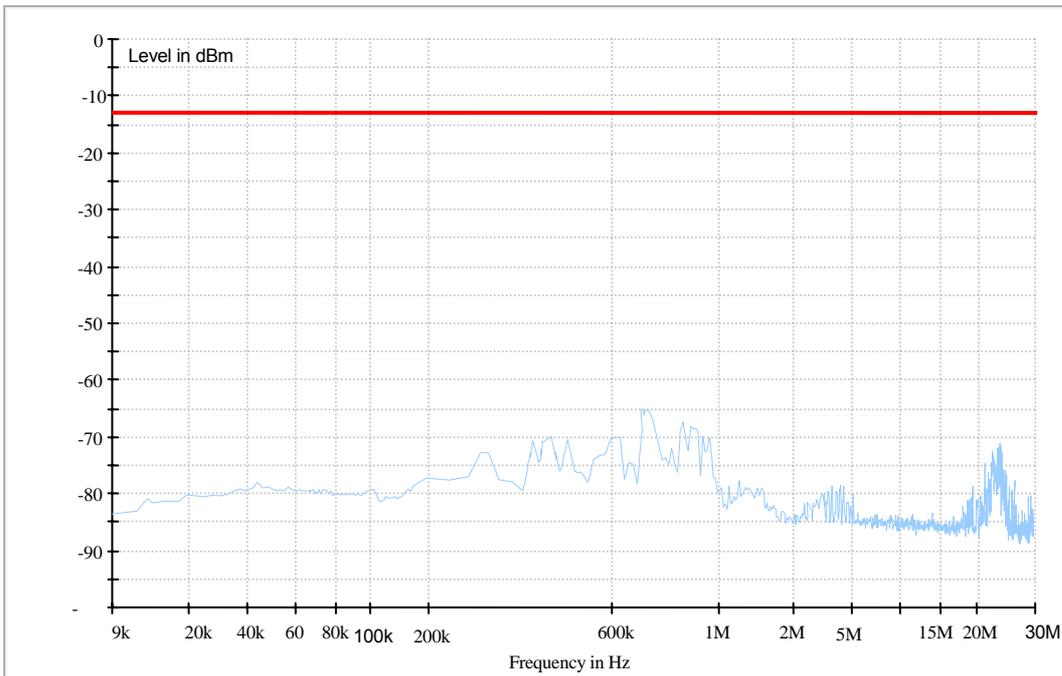


Traffic Mode (18GHz-26.5GHz)

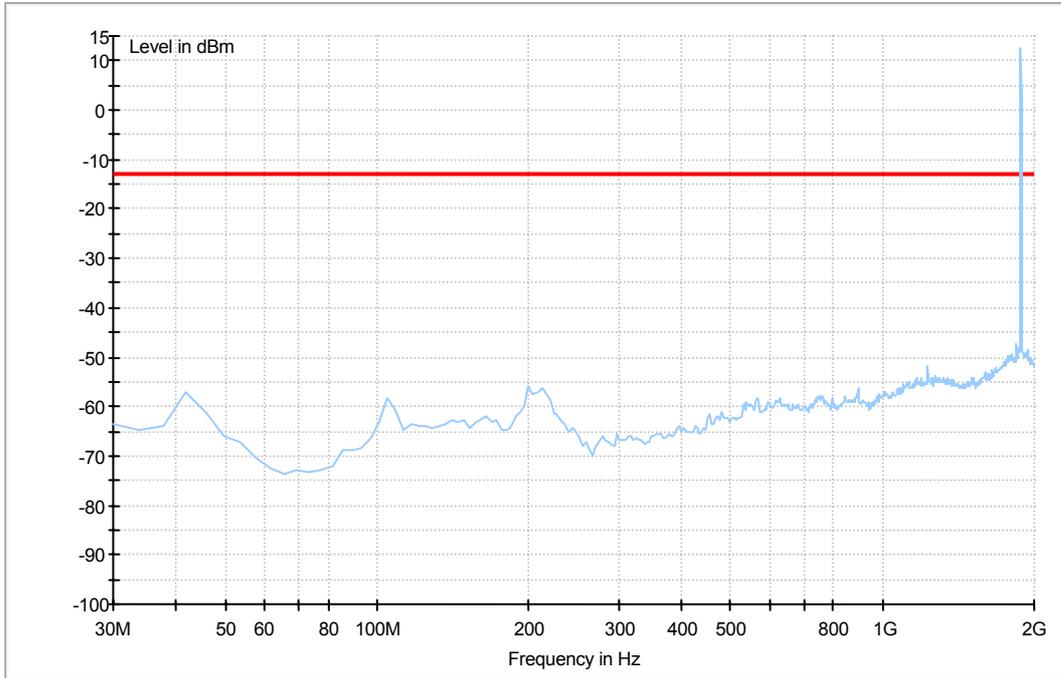


8.3.5 For EVDO.0 1900

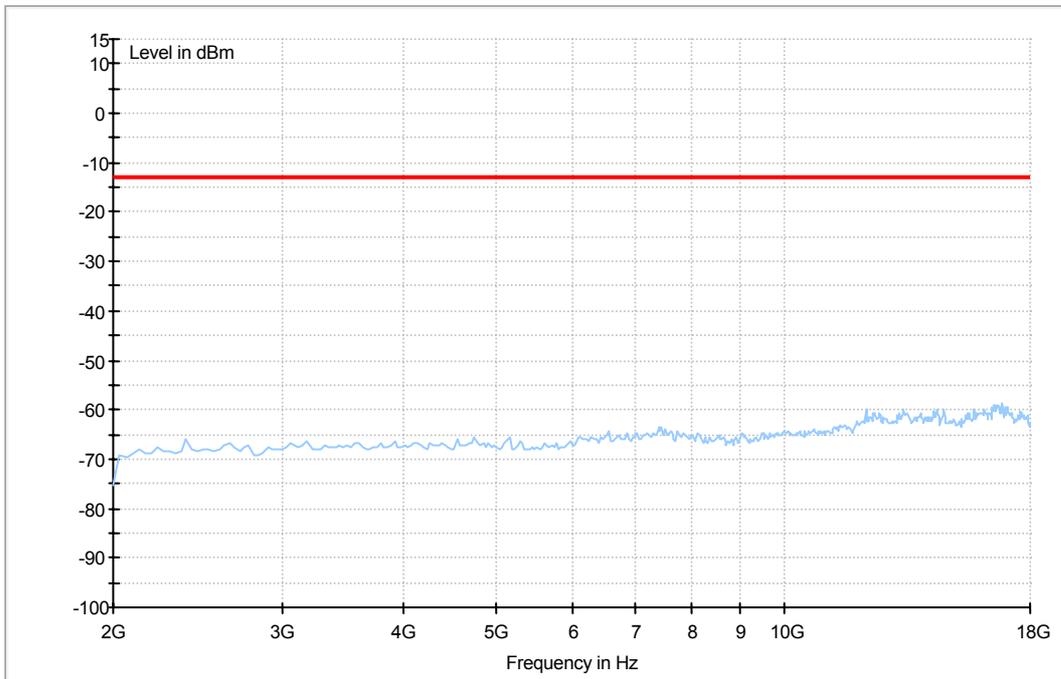
Traffic Mode (9kHz-30MHz)



Traffic Mode (30MHz-2GHz)

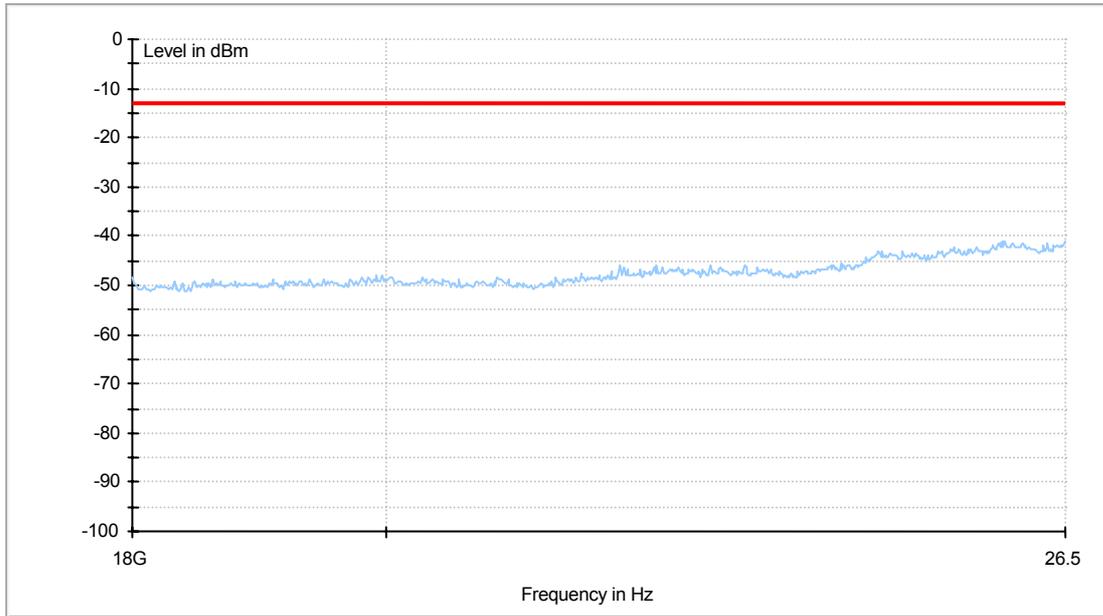


Traffic Mode (2GHz-18GHz)

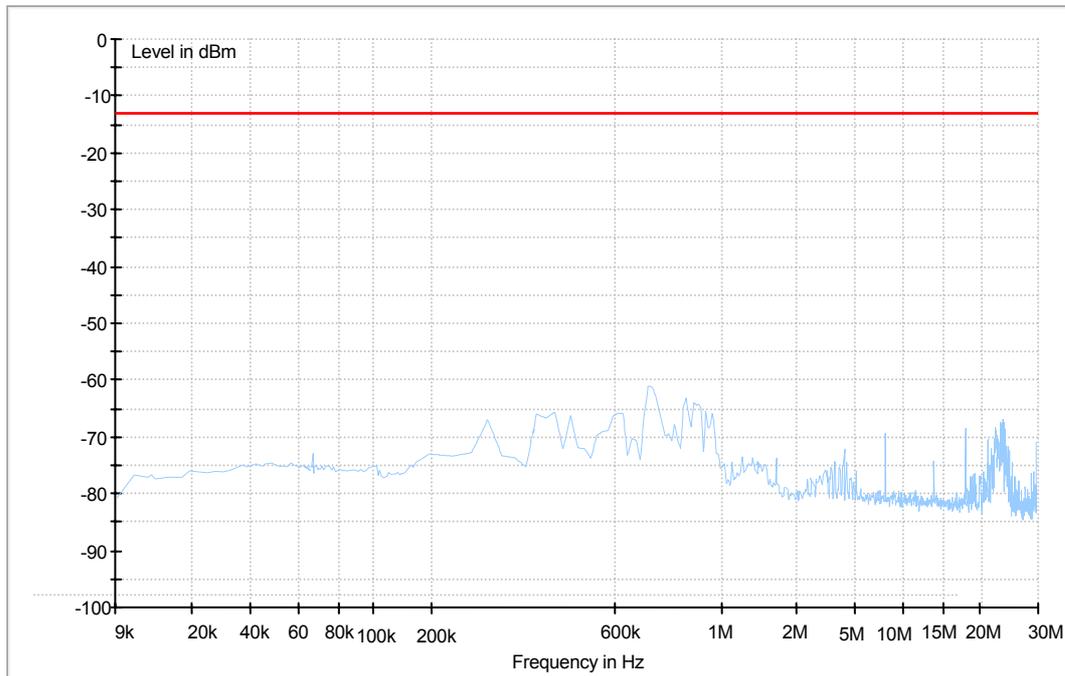




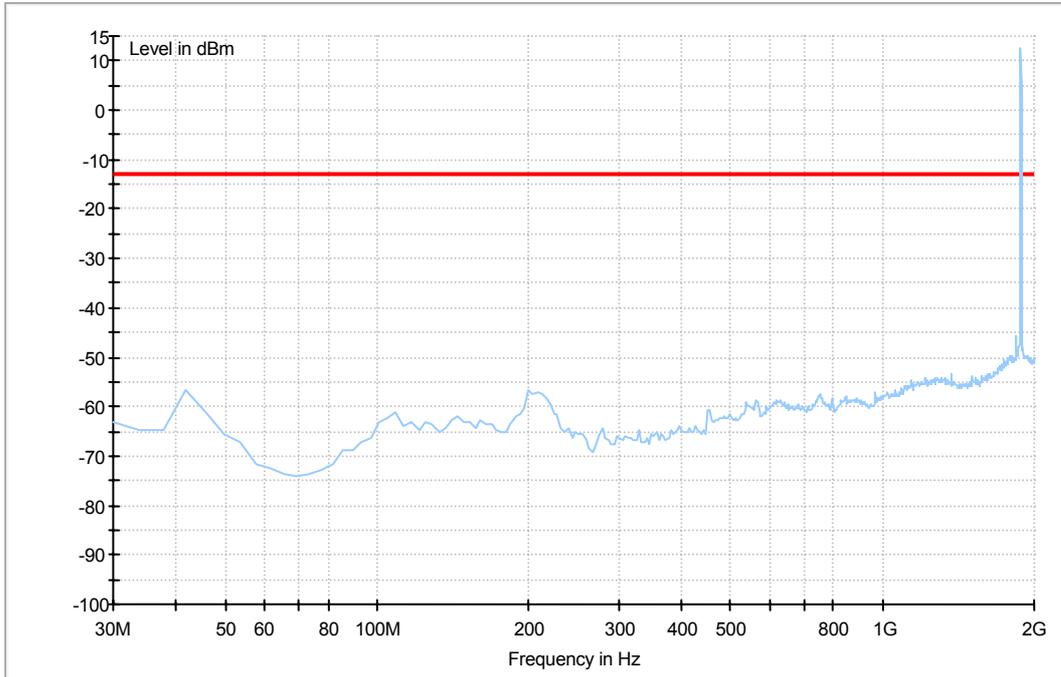
Traffic Mode (18GHz-26.5GHz)



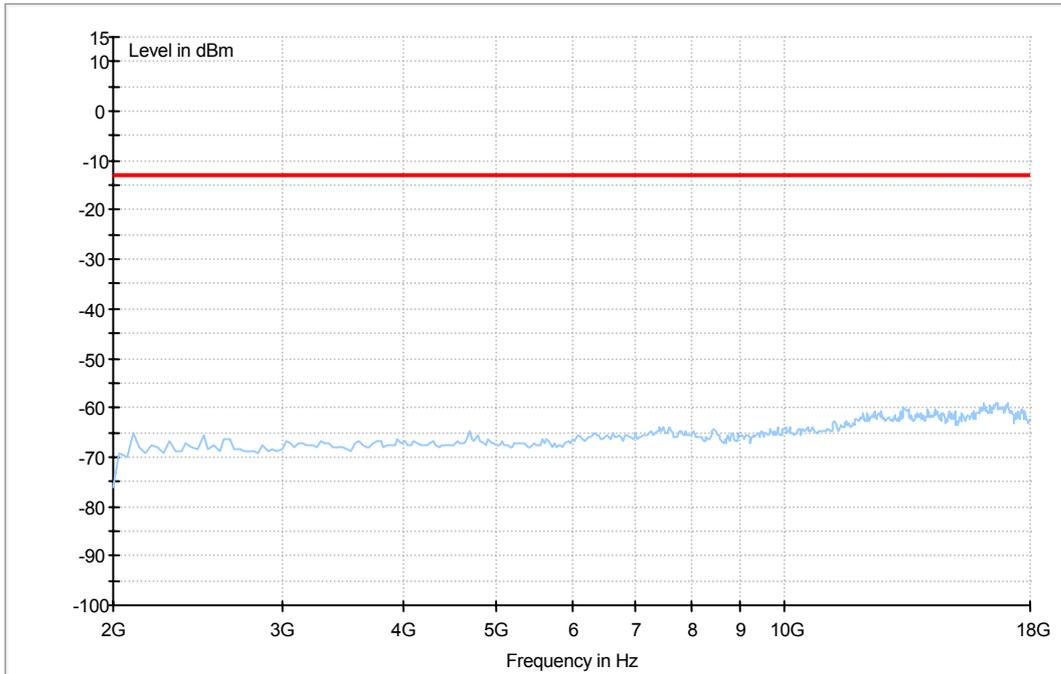
8.3.6 For EVDO.A 1900
Traffic Mode (9kHz-30MHz)



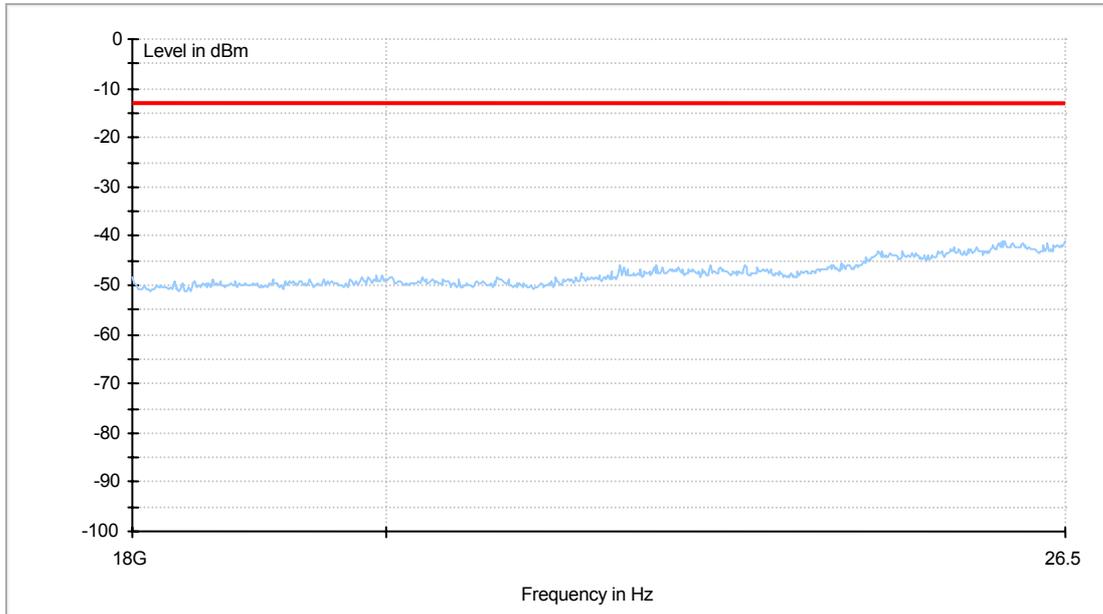
Traffic Mode (30MHz-2GHz)



Traffic Mode (2GHz-18GHz)



Traffic Mode (18GHz-26.5GHz)



END