



Report No: SYBH(R)129112007EB-2

FCC ID: QISEC228

**FCC TEST REPORT OF  
CDMA2000 EV-DO Rev.A  
USB MODEM**

**M/N: EC228**

**Jan. 10, 2008**

**Reliability Laboratory of Huawei Technologies Co., Ltd.**

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**REPORT ON FCC Test of HUAWEI EC228 CDMA EV-DO Rev A 800MHz  
USB Modem**

M/N: EC228

Report No: SYBH(R)129112007EB-2

**REGULATION**                      **FCC CFR47 Part 2: Subpart J;**  
**FCC CFR47 Part 22: Subpart H;**

**CONCLUSION**                      There are 7 items need to be tested, 7 items have been tested. The sample of the model completely meets the requirements

**Final Judgement: Pass**

**General Manager**

2008. 1.10  
Date

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signature



**Technical Responsibility  
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# 1 Summary

The table below summarizes the measurements and results for the HUAWEI EC228 CDMA EV-DO Rev.A 800M USB Modem. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

<b>FCC Measurement Specification</b>	<b>FCC Limits Part(s)</b>	<b>Description</b>	<b>Result</b>
2.1046	22.913	Effective Radiated Power of Transmitter	PASS
2.1047		Modulation Characteristics	PASS
2.1049		Occupied Bandwidth	PASS
2.1051	22.917	Band Edges compliance	PASS
2.1051	22.917	Spurious Emission at Antenna Terminal	PASS
2.1053	22.917	Radiated Spurious Emission	PASS
2.1055	22.355	Frequency Stability	PASS

Note : The Radiated Spurious Emissions' test results are shown in the EMC report.

## 2 Product Description

### 2.1 Production Information

#### 2.1.1 General Description

HUAWEI EC228 CDMA EV-DO Rev.A USB Modem is a subscriber equipment in the CDMA 1X and CDMA2000 1xEV-DO Rev. A system, Supporting 800 MHz/1900 MHz frequency band. The USB Modem implements such functions as RF signal receiving / Transmitting, CDMA protocol processing, CDMA2000 1xEV-DO Rev. A protocol processing, high-rate packet data services etc. The USB Modem uses MSM6800 chipset and Zero-IF technologies.

#### 2.1.2 Support function and Service

The USB Modem support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note (Corresponding coding and transmission rates)
data and SMS	Modulation: QPSK	TM1	
data and SMS	Modulation: HPSK	TM3	
Data(EV-DO)	Default Access Channel MAC	Subtype 0	Modulation: HPSK
data(EV-DO)	Enhanced Access Channel MAC	Subtype 2	<p>The R-Data packet size determines the modulation format,</p> <p>R-Data Packet Size : 128, 256, 512, 768 or 1024 Modulation: BPSK</p> <p>R-Data Packet Size : 1536 , 2048 , 3072 , 4096 , 6144 or 8192 Modulation: QPSK</p> <p>R-Data Packet Size : 12288 Modulation: 8-PSK</p>

Note: \*The test conditions and settings are defined in ANSI/TIA-98-E section 1.3, 3GPP2 C.S0033.

## 2.2 Modification Information

For original equipment, following table is not application.

Table 3 Modification Information

Model Number	Board/Module	Original Version	New Version	Modify Information
Not applicable!				

## 3 Test Site Description

The test site of:

**Huawei Technologies Co. Ltd.**  
**P.O. Box 518129**  
**Huawei base, bantian,**  
**Longgang District, Shenzhen, China**



The test site description has been submitted to FCC and registration granted under the registration number **97456** on March 11. 2003. The test site has been accredited by



and the accredited number is **2174.01** in Jan of 2004.

### 3.1 Testing Period

The test have been performed during the period of

Dec.15, 2007 to Jan.10, 2008

### 3.2 General Set up Description

The USB Modem works on Cellular Band , and supports the CDMA2000 1x standard and the CDMA2000 1xEV-DO Rev. A standard. During this measurement, the USB Modem works in CDMA / EV-DO mode and Cellular Band.

#### CDMA MODE:

**TM1:** Forward Traffic Channel Radio Configuration 1, Reverse Traffic Channel Radio Configuration 1

**TM3:** Forward Traffic Channel Radio Configuration 3, Reverse Traffic Channel Radio Configuration 3

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-104

$\frac{\text{Pilot Ec}}{I_{\text{or}}}$	dB	-7
$\frac{\text{Traffic Ec}}{I_{\text{or}}}$	dB	-7.4

**EVDO MODE:**

Current Physical Layer Subtype :

**Subtype 0\*** indicates that the protocol subtype assigned to the Access Channel MAC protocol is Default Access Channel MAC and its Subtype ID number is 0x0000.

**Subtype 2\*** indicates that the protocol subtype assigned to the Access Channel MAC protocol is Enhanced Access Channel MAC and its Subtype ID number is 0x0002

Note: \*The test settings are defined in 3GPP2 C.S0033

## 4 Product Description

### 4.1 Technical Characteristics

#### 4.1.1 Frequency Range

Table 4 Frequency Range

Uplink band:	824 to 849 MHz
Downlink band:	869 to 894 MHz

#### 4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

Channel spacing:	30 kHz
Channel separation:	1.23 MHz

#### 4.1.3 Type of Emission

Table 6 Type of Emission

Emission Designation:	1M25F9W
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According to CFR 47 (FCC) part 2, subpart C, section 2.201 and 2.202

#### 4.1.4 Environmental Requirements

Table 7 Environmental Requirements

Minimum temperature:	- 10 °C
Maximum temperature:	+ 55 °C
Relative Humidity:	5%-95%

#### 4.1.5 Power Source

Table 8 Power Source

DC voltage nominal:	 +5.0V; Supplied by USB port of Notebook
DC voltage range	 +4.75-5.25V
DC current maximal:	500mA

#### 4.1.6 Tune-up Procedure

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (9).

Please reference the document Tune-up Procedure in TCF.

#### 4.1.7 Applied DC Voltages and Currents

According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8).

The voltage and current in the final RF stage is:

Table 9 Applied RF module DC Voltages and Currents

Voltage:	 + 2.8V
Current:	150mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)

## 4.2 EUT Identification List

### 4.2.1 Board Information

Table 10 Board Information

800MHz USB MODEM		
EC228		
Board and Module		
Equipment Designation / Description	Serial Number	Remarks
Main board	KS1AA107B1900120	CE32TCPU

### 4.2.2 Adapter Technical Data

Not Applicable.

### 4.2.3 Battery Technical Data

Not Applicable.

### 4.2.4 FCC Identification

**Grantee Code:** QIS  
**Product Code:** EC228  
**FCC Identification:** QISEC228

## 5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
Test Receiver Display Unit	R&S	ESMI 804.8932.52	829214/011	04.22.2008
Test Receiver RF Unit	R&S	ESMI 1032.5640.53	829550/008	04.22.2008
Receiver	R&S	ESIB 26	100318	05.21.2008
Receiver	R&S	ESCS30	830245/018	05.29.2008
Pre-Amplifier	Agilent	8447D	2944A10146	05.21.2008
Pre-Amplifier	Agilent	83017A	3950M00246	05.21.2008
Loop Antenna	Schwarzbeck	FMZB1516	1516115	05.29.2008
BiLog Antenna	Schaffner	CBL 6112B	2747	02.25.2008
BiLog Antenna	Schaffner	CBL 6112B	2536	06.07.2008
Horn Antenna	ETS-Lindgren	3117	00062549	06.05.2008
Horn Antenna	ETS-Lindgren	3116	00031541	03.20.2008
Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	08.27.2008
Signal Generator	R&S	SMT06	830264/009	09.29.2008
Signal Generator	R&S	SMR 40	100325	08.09.2008
Artificial Mains Network	R&S	ENV4200	100001	07.20.2008
Power Supply	Keithley	2306	1045337	08.14.2008
Climate Chamber	WEISS	WK11-180	58226049470010	12.09.2008
Universal Radio Communication Tester	R&S	CMU200	108522	01.01.2008
Universal Radio Communication Tester	Agilent	8960	GB46490162	6.24.2008
Vector Signal Generator	R&S	SMU200A	101394	9.29.2008
Signal Analyzer	R&S	FSU26	1166.1660K26	8.21.2008
Power Divider	R&S	11667B	F048AXH049	5.23.2008

## 6 Transmitter Measurements

### 6.1 Effective Radiated Power of Transmitter (ERP)

#### 6.1.1 Test Conditions

Table 12 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	23.5
Relative humidity:	55%
Test Configurations:	CDMA TM1 and TM3 at frequency B、 M、 T EVDO Subtype 0 and Subtype 2 at frequency B、 M、 T

#### 6.1.2 Test Specifications and Limits

##### 6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

##### 6.1.2.2 Supporting Standards

Table 13 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations

##### 6.1.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of a mobile station transmitter exceed 7 W. The calculated longitude ERP by following formula :  $ERP(\text{dBm}) = 10 \cdot \log(ERP_{\text{in mwatts}})$ .

Table 14 Limits

Maximum Output Power (Watts)	< 7 Watts
Maximum Output Power (dBm)	< 38.5 dBm

#### 6.1.3 Test Method and Setup

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP 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 USB Modem to the wireless communication tester Agilent 8960 via the air interface. The band class is set as US Cellular.

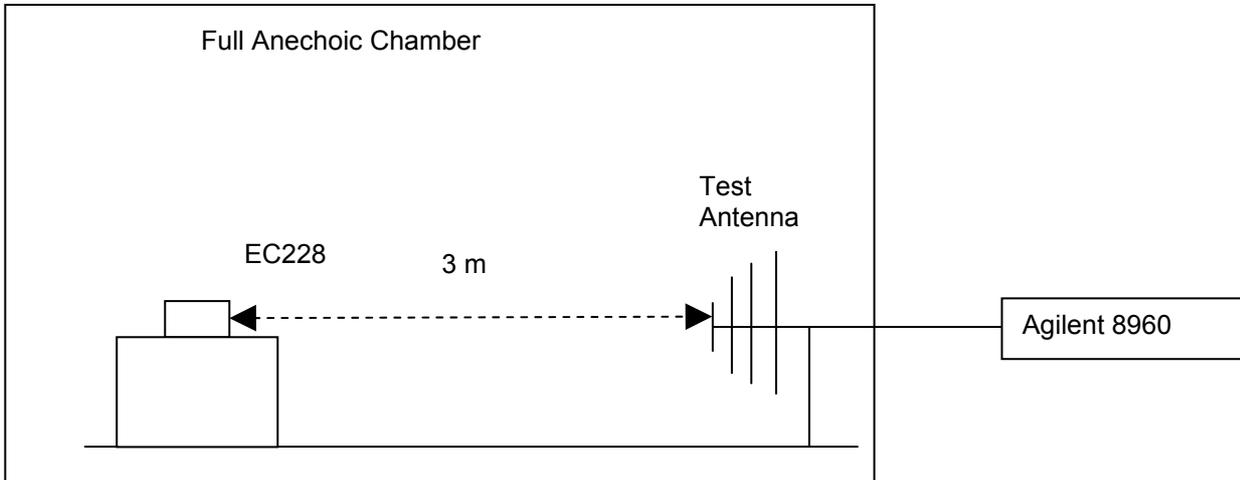
(b) Test the Radiated maximum output power by the Agilent 8960 received from test antenna.

(c) 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 step (b) on Agilent 8960, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

**Test setup**

**Step 1: Pre-test**



**Step 2: Substitution method to verify the maximum ERP**

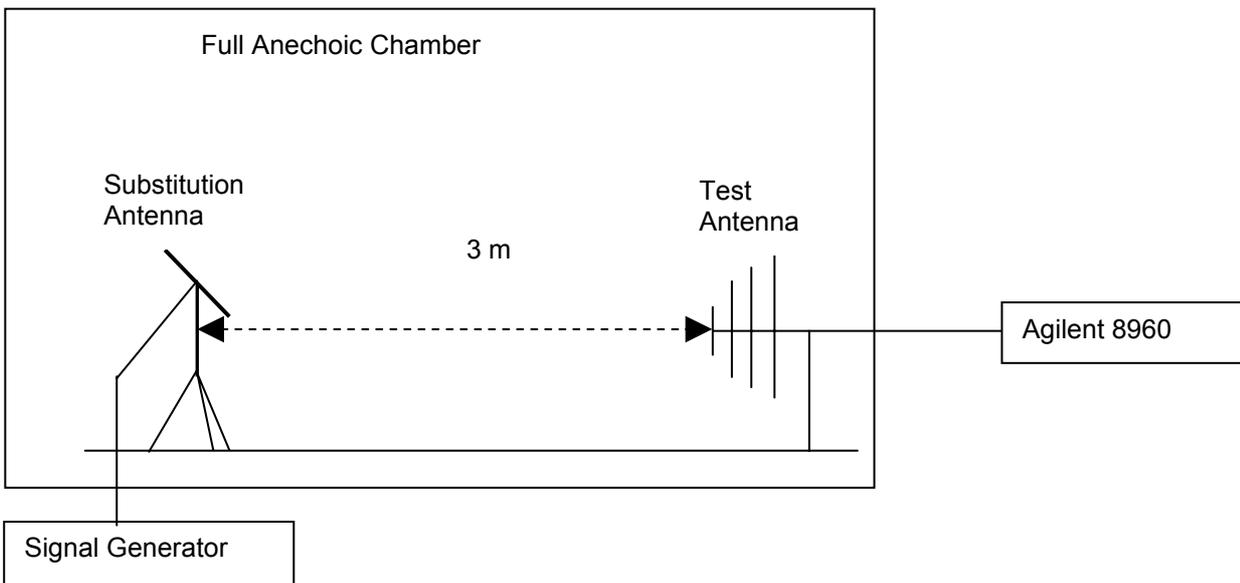


Figure 1. Test Set-up

NOTE: Effective radiated power (ERP) refers to the radiation power output of the EUT, assuming all emissions are radiated from half-wave dipole antennas.

**6.1.4 Measurement Results**

Table 15 Measurement Results

TEST CONDITIONS	RF Output Power		
	Channel 1013(B) 824.7MHz	Channel 283(M) 833.49MHz	Channel 777(T) 848.31MHz

		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5.0V)	24.75	38.5	24.62	38.5	24.97	38.5
TM3	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5.0V)	24.91	38.5	24.49	38.5	24.99	38.5
Subtype 0	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5.0V)	25.14	38.5	24.78	38.5	24.58	38.5
Subtype 2	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5.0V)	24.67	38.5	24.81	38.5	24.98	38.5

### 6.1.4.1 Substitution Results

Table 16 Substitution Results

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBd]	Cable Loss [dB]	Substitution Level (ERP) [dBm]	Limit [dBm]	Result
TM1	824.7	24.75	Dipole Ant.	<b>29.35</b>	-4.02	0.6	24.73	38.5	<b>Pass</b>
TM1	833.49	24.62	Dipole Ant.	<b>29.06</b>	-3.88	0.6	24.58	38.5	<b>Pass</b>
TM1	848.31	24.97	Dipole Ant.	<b>29.56</b>	-4.02	0.6	24.94	38.5	<b>Pass</b>
TM3	824.7	24.91	Dipole Ant.	<b>29.43</b>	-4.02	0.6	24.81	38.5	<b>Pass</b>
TM3	833.49	24.49	Dipole Ant.	<b>28.93</b>	-3.88	0.6	24.45	38.5	<b>Pass</b>
TM3	848.31	24.99	Dipole Ant.	<b>29.55</b>	-4.02	0.6	24.93	38.5	<b>Pass</b>
Subtype 0	824.7	25.14	Dipole Ant.	<b>29.64</b>	-4.02	0.6	25.12	38.5	<b>Pass</b>
Subtype 0	833.49	24.78	Dipole Ant.	<b>29.22</b>	-3.88	0.6	24.74	38.5	<b>Pass</b>
Subtype 0	848.31	24.58	Dipole Ant.	<b>29.15</b>	-4.02	0.6	24.53	38.5	<b>Pass</b>
Subtype 2	824.7	24.67	Dipole Ant.	<b>29.24</b>	-4.02	0.6	24.62	38.5	<b>Pass</b>
Subtype 2	833.49	24.81	Dipole Ant.	<b>29.26</b>	-3.88	0.6	24.78	38.5	<b>Pass</b>
Subtype 2	848.31	24.98	Dipole Ant.	<b>29.57</b>	-4.02	0.6	24.95	38.5	<b>Pass</b>

Note: a, For get the ERP (Efficient Radiated Power) in substitution method, the following formula should take to calculate it,

$$\text{ERP [dBm]} = \text{SGP [dBm]} - \text{Cable Loss [dB]} + \text{Gain [dBd]}$$

NOTE: SGP- Signal Generator Level

b, A CDMA signal with bandwidth of 1.23MHz is created by the vector generator R&S SMU200A.

c, RBW=10kHz, VBW=300kHz, and integrated by the instrument to 1.23MHz.

### 6.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.

## 6.2 Conducted Power of Transmitter

### 6.2.1 Test Conditions

Table 17 Test Conditions

Preconditioning:	0.5 hour
Measured at:	antenna connector
Ambient temperature:	23.5
Relative humidity:	55%
Test Configurations:	CDMA TM1 and TM3 at frequency B、 M 、 T EVDO Subtype 0 and Subtype 2 at frequency B、 M 、 T

### 6.2.2 Test Specifications and Limits

#### 6.2.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913

#### 6.2.2.2 Supporting Standards

Table 18 Supporting Standards:

ANSI/TIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations

#### 6.2.2.3 Limits

Compliance with part 22.913, in no any case may the peak power of a mobile station transmitter exceed 7 W. The calculated longitude ERP by following formula:

$$ERP(dBm) = 10 * \log(ERP_{in\ mwatts}).$$

And for conducted power, we can use Antenna Gain to calculate the limit. So the conducted power:

$$P_{cod.}(dBm) = ERP(dBm) - Gain(dBd).$$

$$\text{and Gain (dBd)} = \text{Gain(dBi)} - 2.15dB$$

Table 19 Limits

Maximum Output Power (Watts)	< 7 Watts=38.5 dBm
Antenna Gain(dBd):	-3.95dBd
Maximum Conducted Output Power (dBm)	< 42.45 dBm

### 6.2.3 Test Method and Setup

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP 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 USB Modem to the wireless communication tester Agilent 8960 via the antenna connector. The band class is set as US Cellular.

(b) Test the Conducted maximum output power by the Agilent 8960.

#### Test setup

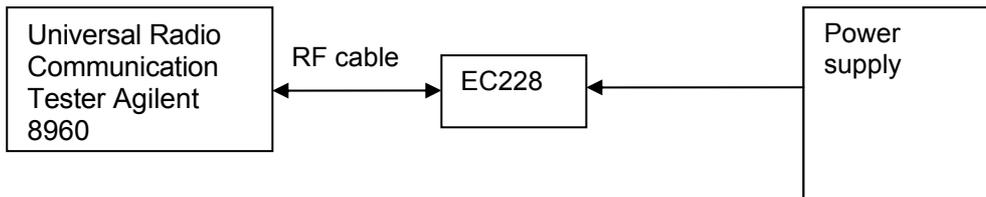


Figure 2. Test Set-up

### 6.2.4 Measurement Results

Table 20 Measurement Results

TEST CONDITIONS		RF Output Power					
		Channel 1013(B) 824.7MHz		Channel 283(M) 833.49MHz		Channel 777(T) 848.31MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5.0V)	24.52	42.45	24.41	42.45	24.73	42.45
TM3	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5.0V)	24.76	42.45	24.27	42.45	24.83	42.45
Subtype 0	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5.0V)	24.92	42.45	24.59	42.45	24.36	42.45
Subtype 2	T <sub>nom</sub> (25 °C) V <sub>nom</sub> (5.0V)	24.46	42.45	24.58	42.45	24.75	42.45

### 6.2.5 Conclusion

The equipment **PASSED** the requirement of this clause.

## 6.3 Modulation Characteristics

### 6.3.1 Test Conditions

Table 21 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	22 °C
Relative humidity:	52 %
Test Configurations:	CDMA mode TM1 and TM3 at frequency M EVDO mode Subtype 0 and Subtype 2 at frequency M

### 6.3.2 Test Specifications and Limits

#### 6.3.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 22 subpart H.

#### 6.3.2.2 Supporting Standards

Table 22 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations.

#### 6.3.2.3 Limits

No specific modulation characteristics requirement limits in part 2.1047 and part 22 subpart H.

Table 23 Limits

Limits	Not applicable
--------	----------------

### 6.3.3 Test Method and Setup

Connect the USB MODEM to Universal Radio Communication Tester CMU200 via the antenna connector. The band class is set as US Cellular; the USB MODEM's output is matched with 50 Ω loads, test method was according to ANSI/TIA-98-E. The waveform quality and constellation of the USB MODEM were tested.

#### Test setup

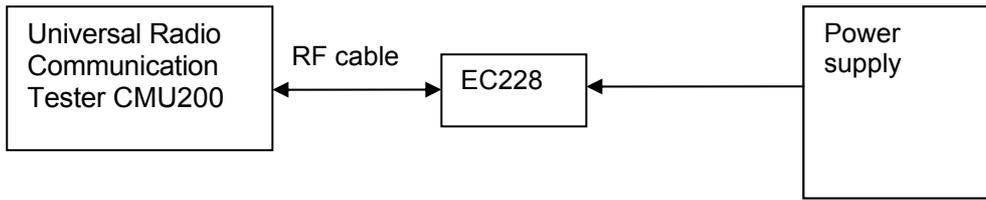


Figure 3. Test Set-up

6.3.4 Measurement Results

Table 24 Measurement Results

TEST CONDITIONS		Modulation Characteristic	
		Channel283(M)	
		833.49Mhz	
		Measured	
		CDMA Mode TM1 & TM3	EVDO Mode Subtype 0 & Subtype 2
T <sub>nom</sub> (25 °C)	V <sub>nom</sub> (5.0V)	Refer to Appendix A	Refer to Appendix A

6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.

For the measurement results refer to appendix A.

## 6.4 Occupied Bandwidth

### 6.4.1 Test Conditions

Table 25 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	CDMA TM1 and TM3 at frequency B、 M 、 T EVDO Mode Subtype 0 and Subtype 2 at frequency B、 M 、 T

### 6.4.2 Test Specifications and Limits

#### 6.4.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 22 subpart H.

#### 6.4.2.2 Supporting Standards

Table 26 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations.

#### 6.4.2.3 Limits

No specific occupied bandwidth requirement in part 22 subpart H, but the occupied bandwidth was defined in part 2.1049: the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured.

Table 27 Limits

Upper /lower frequency limits	0.5% of the mean power
-------------------------------	------------------------

### 6.4.3 Test Method and Setup

USB Modem was connected to the wireless signal analyzer R&S FSU26 via the one RF connector. The band class is set as US Cellular; USB Modem was controlled to transmit maximum power. Measure and record the occupied bandwidth of the USB Modem by the R&S FSU26.

The OBW, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured under the following conditions as applicable:

Refer to 47CFR part2.1049 section (g)&(h).

(g) Transmitter in which the modulating base band comprises not more than three independent channels - when modulated by the full complement of signals for which the transmitter is rated. The level of modulation for each channel should be set to that prescribed in rule parts applicable to the

services for which the transmitter is intended. If specific modulation levels are not set forth in the rules, the tests should provide the manufacturer’s maximum rated condition.

(h) Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudorandom generators or other devices required in normal service. Additionally, the occupied bandwidth shall be shown for operation with any devices used for modifying the spectrum when such devices are optional at discretion of the user.

Measurement bandwidth (RBW): 30 kHz (Resolution bandwidth)  
 Video bandwidth (VBW): 300 kHz

**Test Set-up**

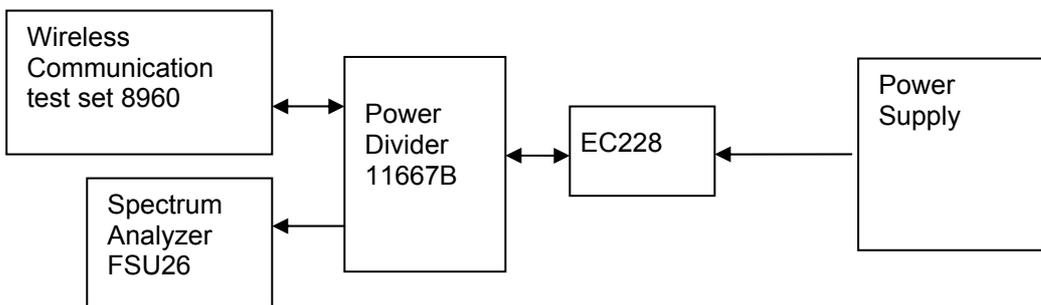


Figure 4. Test Set-up

**6.4.4 Measurement Results**

Table 28 Measurement Results

TEST CONDITIONS		Occupied Bandwidth											
		Channel1013 (B) 824.70MHz				Channel283 (M) 833.49Mhz				Channel777(T) 848.31MHz			
		Measured (MHz)				Measured (MHz)				Measured (MHz)			
		CDMA		EVDO		CDMA		EVDO		CDMA		EVDO	
		TM1	TM3	Subtype 0	Subtype 2	TM1	TM3	Subtype 0	Subtype 2	TM1	TM3	Subtype 0	Subtype 2
T <sub>nom</sub> (25 °C)	V <sub>nom</sub> (5.0V)	1.28	1.27	1.27	1.27	1.27	1.26	1.26	1.27	1.28	1.27	1.27	1.27

## 6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix B.

## 6.5 Band Edges Compliance

### 6.5.1 Test Conditions

Table 29 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	23.5°C
Relative humidity:	55 %
Test Configurations:	CDMA TM1 and TM3 at frequency B、 T EVDO Mode Subtype 0 and Subtype 2 at frequency B、 T

### 6.5.2 Test Specifications and Limits

#### 6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 6.5.2.2 Supporting Standards

Table 30 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations.

#### 6.5.2.3 Limits

Compliance with 22.917, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

Table 31 Limits

Rated Power:	24 dBm
Required attenuation:	$43 + 10 \log(0.25) = 37$ , 24 dBm – 37 dB
Absolute level	- 13 dBm

### 6.5.3 Test Method and Setup

USB Modem was connected to the wireless signal analyzer R&S FSU26 via the one RF connector, the band class is set as Cellular. USB Modem was controlled to transmit maximum power. Measure and record band edges compliance of the USB Modem by the R&S FSU26.

Measurement bandwidth (RBW): 20 kHz (Resolution bandwidth)  
Video bandwidth (VBW): 200 kHz

#### Test Set-up

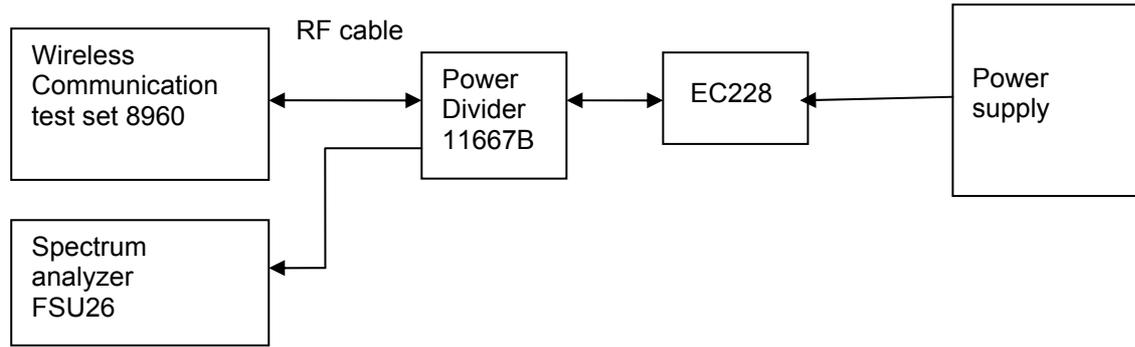


Figure 5. Test Set-up

### 6.5.4 Measurement Results

Table 32 Measurement Results outside Band Edges-- Single Carrier

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
$T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (5.0\text{V})$							
US Cellular	824	1013 (B)	TM1 & TM3	24	<-13(See appendix C)	- 13 dBm	Pass
	869	777 (T)	TM1 & TM3	24	<-13(See appendix C)	- 13 dBm	Pass

Band	Frequency of Band edges [MHz]	Channel Number	Test Mode	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
$T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (5.0\text{V})$							
US Cellular	824	1013 (B)	Subtype 0 & Subtype 2	24	<-13(See appendix C)	- 13 dBm	Pass
	869	777 (T)	Subtype 0 & Subtype 2	24	<-13(See appendix C)	- 13 dBm	Pass

### 6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause. For the measurement results refer to appendix C.

## 6.6 Spurious Emission at Antenna Terminal

### 6.6.1 Test Conditions

Table 33 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	20°C
Relative humidity:	50 %
Test Configurations:	CDMA TM1 and TM3 at frequency B/M/T EVDO Mode Subtype 0 and Subtype 2 at frequency B/M/T

### 6.6.2 Test Specifications and Limits

#### 6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917

#### 6.6.2.2 Supporting Standards

Table 34 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98-E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations.

#### 6.6.2.3 Limits

Compliance with part 22.917, all spurious emission must be attenuated below the transmitter power by at least  $43 + 10 \log_{10} P$ . (Whereas P is the rated power of the EUT).

Table 35 Limits

Rated Power:	24 dBm
Required attenuation:	$43 + 10 \log(0.25) = 37$ , 24 dBm – 37 dB
Absolute level	- 13 dBm

### 6.6.3 Test Method and Setup

USB Modem was connected to the wireless signal analyzer R&S FSU26 via the one RF connector, the band class is set as US Cellular. USB Modem was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the USB Modem by the R&S FSU26

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 150kHz: 1 kHz;  
Measurement bandwidth (RBW) for 150kHz up to 30MHz: 10kHz;

Measurement bandwidth (RBW) for 30MHz up to 1GHz: 100kHz;  
 Measurement bandwidth (RBW) for 1GHz up to 12.75GHz: 1MHz;

**Test Set-up**

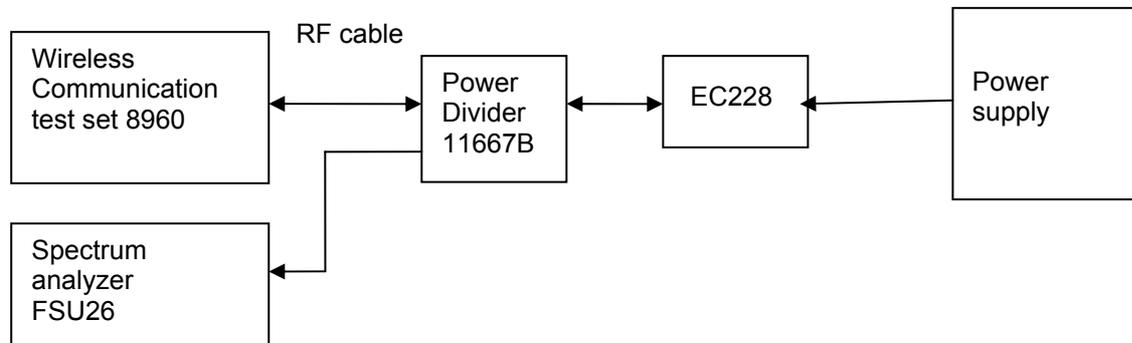


Figure 6. Test Set-up

**6.6.4 Measurement Results**

Table 36 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 1013(B)	TM1	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 0	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 2	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 283 (M)	TM1	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 0	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 2	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
Channel 777 (T)	TM1	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	TM3	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass

	Subtype 0	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass
	Subtype 2	9 kHz ~12.75GHz	24	<- 13 dBm (See appendix D)	- 13 dBm	Pass

### 6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.  
For the measurement results refer to appendix D.

## 6.7 Frequency Stability

### 6.7.1 Test Conditions

Table 37 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25 °C
Relative humidity:	55 %
Test Configurations:	CDMA TM1 and TM3 at frequency M EVDO Mode Subtype 0 and Subtype 2 at frequency M

### 6.7.2 Test Specifications and Limits

#### 6.7.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 22.355

#### 6.7.2.2 Supporting Standards

Table 38 Supporting Standards:

ANSI/TIA-603-C: 2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI/TIA-98E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations.

#### 6.7.2.3 Limits

According to part 22.355, from 821MHz to 896MHz, for mobile device, the carrier frequency of each transmitter in the Public Mobile Services must be maintained within the tolerances 2.5ppm.

### 6.7.3 Test Method and Setup

The frequency stability shall be measured with variation of ambient temperature as follows:

(1) From  $-30^{\circ}$  to  $+50^{\circ}$  centigrade for all equipment except that specified in subparagraphs (2) and (3) of paragraph 2.1055

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than  $10^{\circ}$  centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point, which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provided with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter

keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment.)

The EUT can only work in such extreme voltage 4.75V and 5.25V , so here the EUT is tested in the 4.75V and 5.25V.

**Test Set up**

Connect the USB Modem to the Wireless Communication test set 8960 via the connector. Then measure the frequency error by the Wireless Communication test set 8960. The USB Modem’s output is matched with a 50 Ω loads.

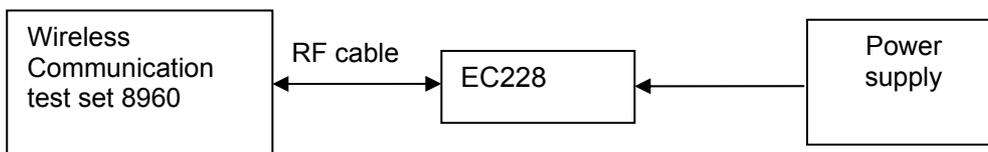


Figure 7. Test Set up

**6.7.4 Measurement Results**

**6.7.4.1 Measurement Results vs. Variation of Temperature**

- TM1, 5.0V DC Channel No.283(833.49MHz)

Table 39 Measurement Results vs. Variation of Temperature - TM1

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	23.65	833.49	7	Pass
-20 °C	23.68	833.49	8	Pass
-10 °C	23.72	833.49	-6	Pass
0 °C	23.82	833.49	-4	Pass
+10 °C	23.84	833.49	-2	Pass
+20 °C	23.98	833.49	-4	Pass
+30 °C	23.89	833.49	-1	Pass
+40 °C	23.80	833.49	-6	Pass
+50 °C	23.78	833.49	-8	Pass

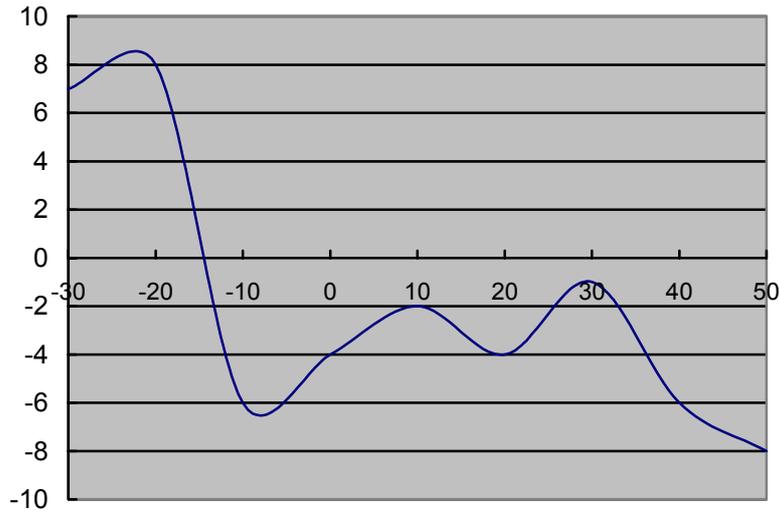


Figure 8. TM1 Test Graph

- **TM3, 5.0V DC Channel No.283(833.49MHz)**

Table 40 Measurement Results vs. Variation of Temperature - TM3

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	23.58	833.49	-8	Pass
-20 °C	23.60	833.49	6	Pass
-10 °C	23.66	833.49	-9	Pass
0 °C	23.68	833.49	6	Pass
+10 °C	23.70	833.49	-6	Pass
+20 °C	23.78	833.49	-2	Pass
+30 °C	23.68	833.49	5	Pass
+40 °C	23.57	833.49	8	Pass
+50 °C	23.52	833.49	-9	Pass

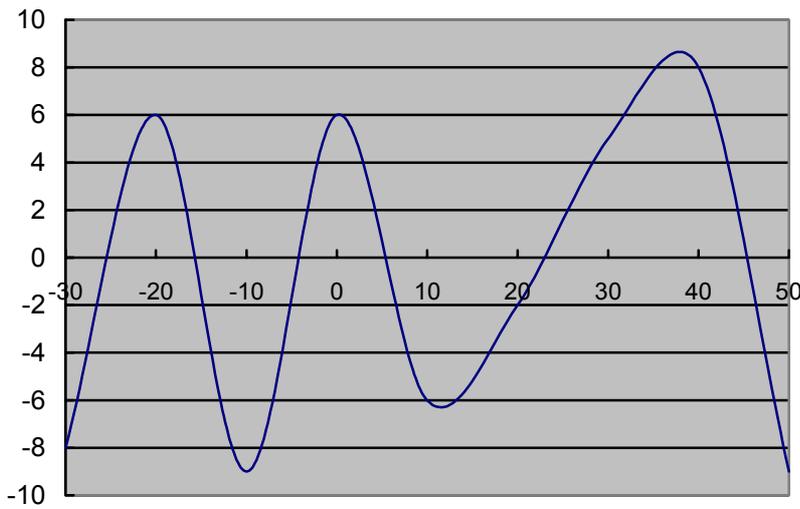


Figure 9. TM3 Test Graph

- Subtype 0, 5.0V DC Channel No.283(833.49MHz)

Table 41 Measurement Results vs. Variation of Temperature - EVDO

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	23.54	833.49	10	Pass
-20 °C	23.58	833.49	8	Pass
-10 °C	23.60	833.49	9	Pass
0 °C	23.61	833.49	4	Pass
+10 °C	23.63	833.49	-4	Pass
+20 °C	23.62	833.49	3	Pass
+30 °C	23.59	833.49	-2	Pass
+40 °C	23.50	833.49	8	Pass
+50 °C	23.48	833.49	-9	Pass

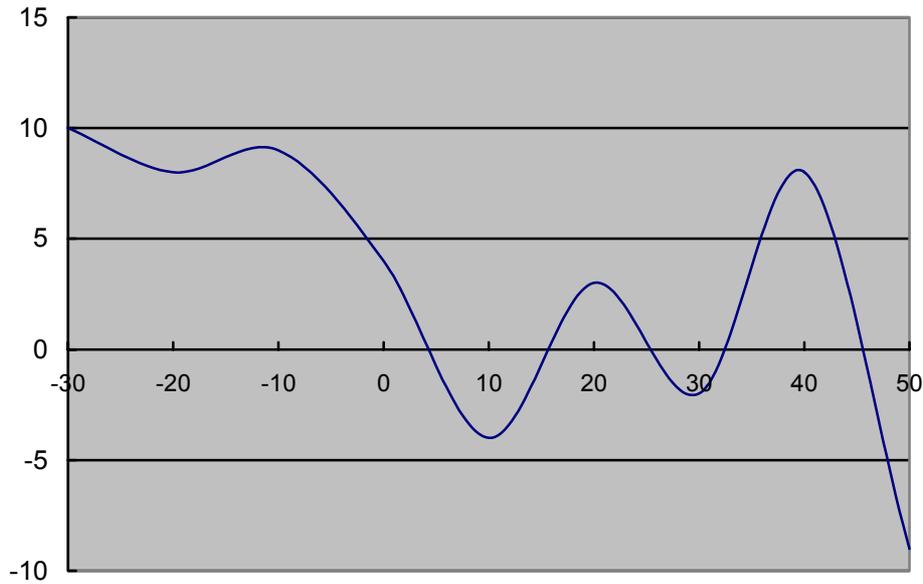


Figure 10. TM3 Test Graph

- Subtype 2, 5.0V DC Channel No. **283(833.49MHz)**

Table 42 Measurement Results vs. Variation of Temperature - EVDO

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	23.08	833.49	-9	Pass
-20 °C	23.09	833.49	10	Pass
-10 °C	23.10	833.49	7	Pass
0 °C	23.11	833.49	5	Pass
+10 °C	23.10	833.49	-4	Pass
+20 °C	23.12	833.49	-3	Pass
+30 °C	23.14	833.49	-6	Pass
+40 °C	23.08	833.49	-8	Pass
+50 °C	23.06	833.49	-10	Pass

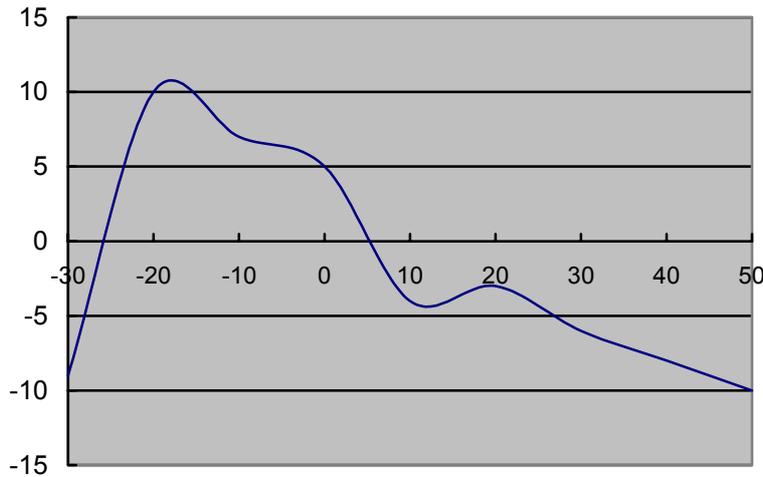


Figure 11. TM3 Test Graph

**6.7.4.2 Measurement Results vs. Variation of Voltage**

- TM1, 25 °C ,Channel No. **283(833.49MHz)**

Table 43 Measurement Results vs. Variation of Voltage - TM1

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75	23.90	833.49	2	Pass
5.0	23.92	833.49	7	Pass
5.25	23.99	833.49	-4	Pass

- TM3, 25 °C ,Channel No. **283(833.49MHz)**

Table 44 Measurement Results vs. Variation of Voltage - TM3

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75	23.47	833.49	-5	Pass
5.0	23.76	833.49	2	Pass
5.25	23.82	833.49	8	Pass

- Subtype 0 , 25 °C ,Channel No. **283(833.49MHz)**

Table 45 Measurement Results vs. Variation of Voltage - EVDO

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75	23.50	833.49	8	Pass
5.0	23.64	833.49	7	Pass
5.25	23.71	833.49	-4	Pass

- Subtype 2 , 25 °C ,Channel No. **283(833.49MHz)**

Table 46 Measurement Results vs. Variation of Voltage - EVDO

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75	23.06	833.49	8	Pass
5.0	23.11	833.49	6	Pass
5.25	23.14	833.49	7	Pass

### 6.7.5 Conclusion

The equipment **PASSED** the requirement of this clause.

## 7 Appendixes

Appendix A	Measurement Results Modulation Characteristics	7 pages
Appendix B	Measurement Results Occupied Bandwidth	13 pages
Appendix C	Measurement Results Band Edges	13 pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	73 pages