



FCC Test Report

Product Name: EVDO Rev.A Module

Model Number: HUAWEI EM660

Report No: SYBH(R)E063042009EB-2
FCC ID: QISEM660

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REPORT ON FCC Test of EVDO Rev.A Module
M/N: HUAWEI EM660
Report No: SYBH(R)E063042009EB-2

REGULATION FCC CFR47 Part 2: Subpart J;
FCC CFR47 Part 22: Subpart H;
FCC CFR47 Part 15: Subpart B;

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

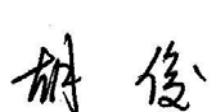
General Manager May. 9, 2009 张兴海
Date Name signature

A red circular stamp with the text "华为技术有限公司" (Huawei Technologies Co., Ltd.) around the perimeter and "张兴海" (Zhang Xinghai) in the center.

**Technical Responsibility
For Area of Testing** May. 9, 2009 余辉
Date Name signature

A handwritten signature in black ink, appearing to read "余辉".

Test Lab Engineer May. 9, 2009 胡俊
Date Name signature

A handwritten signature in black ink, appearing to read "胡俊".

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1 Summary

The table below summarizes the measurements and results for the HUAWEI EM660 EVDO Rev.A 800M/1900M Module. Detailed results and descriptions are shown in the following pages.

Table 1 Summary of results

FCC Measurement Specification	FCC Limits Part(s)	Description	Result
2.1046	22.913	Effective Radiated Power of Transmitter	PASS
2.1046	22.913	Conducted 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 Terminals	PASS
2.1055	22.355	Frequency Stability	PASS

2 Product Description

2.1 Production Information

2.1.1 General Description

HUAWEI EM660 EVDO Rev A Module is a subscriber equipment in the CDMA and CDMA2000 1xEV-DO Rev. A/ Rev. 0 system, Supporting 800 MHz/1900 MHz frequency band. The Module implements such functions as RF signal receiving / Transmitting, CDMA protocol processing, CDMA2000 1xEV-DORev. A/ Rev. 0 protocol processing, high-rate packet data services etc. The Module uses QSC6085 chipset and Zero-IF technologies.

2.1.2 Support function and Service

The Module support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note (Corresponding coding and ransmission 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	The R-Data packet size determines the modulation format, R-Data Packet Size: 128, 256, 512, 768 or 1024 Modulation: BPSK R-Data Packet Size: 1536 , 2048, 3072, 4096, 6144 or 8192 Modulation: QPSK R-Data Packet Size: 12288 Modulation: 8-PSK

Note: * The test conditions and settings are defined in ANSI/TIA-98-E section 1.3, 3GPP2 c.s0033-0-v2.0 and 3GPP2 C.S0033-A-v1.0.

2.2 Modification Information

For original equipment, following table is not application.

Table 3 Modification Information

Model Number	Board/M odule	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

3.1 Testing Period

The test have been performed during the period of

Apr. 17, 2009 to May. 9, 2009

3.2 General Set up Description

The Module can Support Cellular Band, and Support the CDMA2000 1x standard and the CDMA2000 1xEV-DO Rev. A/ Rev. 0 standard. During this measurement, the Module 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
$\frac{Pilot Ec}{I_{or}}$	dB	-7
$\frac{Traffic Ec}{I_{or}}$	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%RH

4.1.5 Power Source

Table 8 Power Source

AC voltage nominal:	--- +3.3v; Supplied by Mini PCI port of notebook
AC voltage range	--- +3.0-3.6v
AC current maximal:	1A

4.1.6 Tune-up Procedure

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

The voltage and current in the final RF stage is:

Table 9 Applied DC Voltages and Currents

Voltage:	--- +3.3V
Current:	1A 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

EVDO Rev.A Module		
HUAWEI EM660		
Board and Module		
Equipment Designation / Description	Serial Number	Remarks
-Main board	Y42AA10921100037	CE66TCPU

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: EM660
FCC Identification: QISEM660

5 Main Test Instruments

Table 11 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YY YY)
Receiver	R&S	ESIB 26	100318	04.10.2010
BiLog Antenna	Schaffner	CBL 6112B	2747	10.16.2009
Horn Antenna	ETS-Lindgren	3117	00062553	07.14.2009
Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	10.11.2009
Signal Generator	R&S	SMR 40	100325	05.11.2009
Signal Generator	R&S	SMU200A	101717	04.10.2010
Power Supply	Keithley	2306	1045337	05.11.2009
Climate Chamber	WEISS	ACS-1	9777	08.13.2009
Universal Radio Communication Tester	R&S	CMU200	108035	07.15.2009
Spectrum Analyzer	R&S	FSU26	200002	06.25.2009

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°C
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. And calculate longitude ERP by following formula: $ERP(dBm) = 10 * \log (ERP_{in} \text{ watts})$.

Table 14 Limits

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

6.1.3 Test Method and Setup

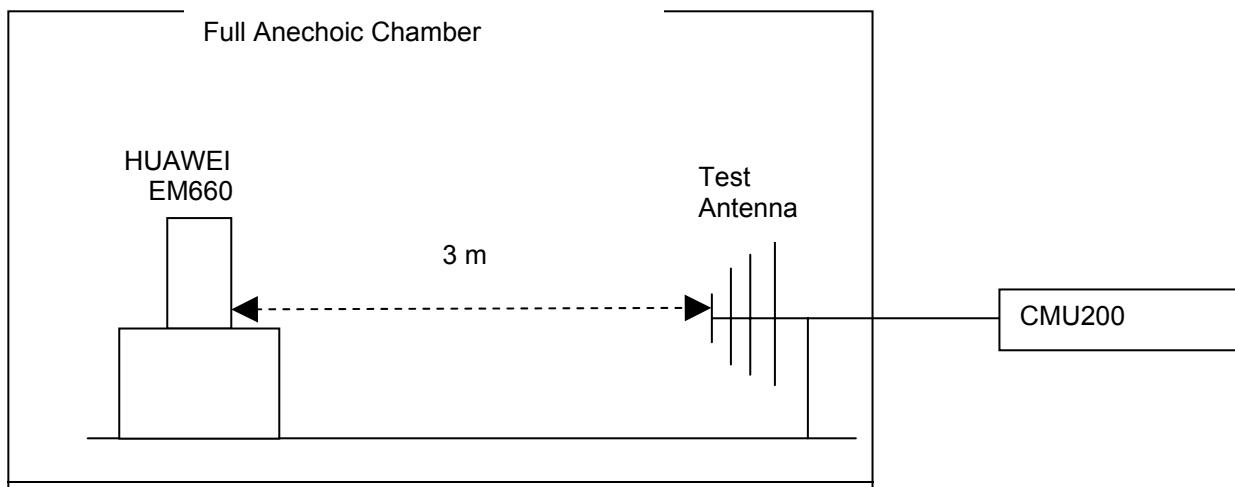
(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, ERP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect the Module to the wireless communication tester CMU200 via the air interface. The band class is set as US Cellular.

(b) Test the Radiated maximum output power by the CMU200 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 CMU200, 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

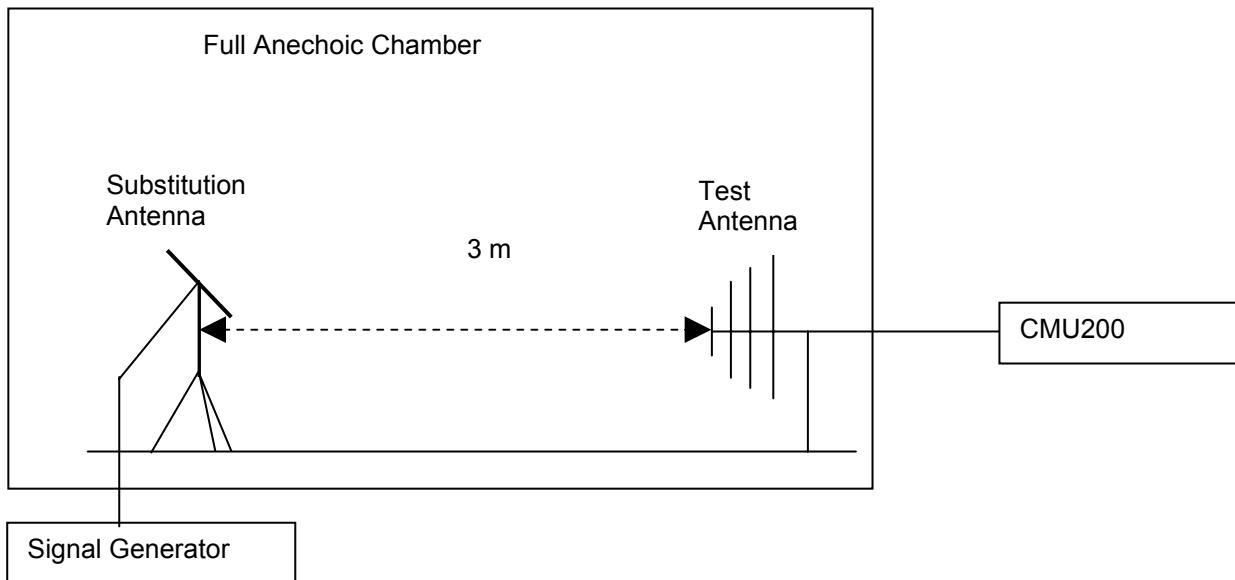


Figure 1. Test Set-up

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						
	Channel1013(B) 824.7MHz		Channel 283(M) 833.49MHz		Channel777(T) 848.31MHz		
	dBm		dBm		dBm		
	Measured	Limit	Measured	Limit	Measured	Limit	
TM1	T _{nom} (25 °C) V _{nom} (3.3 V)	26.45	38.5	26.65	38.5	26.78	38.5

TM3	T _{nom} (25 °C) V _{nom} (3.3V)	26.41	38.5	26.71	38.5	26.85	38.5
Subtype 0	T _{nom} (25 °C) V _{nom} (3.3V)	26.55	38.5	26.73	38.5	26.90	38.5
Subtype 2	T _{nom} (25 °C) V _{nom} (3.3V)	25.92	38.5	25.82	38.5	25.86	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]	FCC limit [dBm]	Result
TM1	824.7	26.54	Dipole Ant.	29.65	-2.75	0.6	26.30	38.5	Pass
TM1	833.49	26.65	Dipole Ant.	30.01	-2.87	0.6	26.54	38.5	Pass
TM1	848.31	26.78	Dipole Ant.	30.04	-2.85	0.6	26.59	38.5	Pass
TM3	824.7	26.41	Dipole Ant.	29.56	-2.75	0.6	26.21	38.5	Pass
TM3	833.49	26.71	Dipole Ant.	30.08	-2.87	0.6	26.61	38.5	Pass
TM3	848.31	26.85	Dipole Ant.	30.19	-2.85	0.6	26.74	38.5	Pass
Subtype 0	824.7	26.55	Dipole Ant.	29.66	-2.75	0.6	26.31	38.5	Pass
Subtype 0	833.49	26.73	Dipole Ant.	29.96	-2.87	0.6	26.49	38.5	Pass
Subtype 0	848.31	26.90	Dipole Ant.	30.17	-2.85	0.6	26.72	38.5	Pass
Subtype 2	824.7	26.92	Dipole Ant.	29.05	-2.75	0.6	25.70	38.5	Pass
Subtype 2	833.49	25.82	Dipole Ant.	29.06	-2.87	0.6	25.59	38.5	Pass
Subtype 2	848.31	25.86	Dipole Ant.	29.22	-2.85	0.6	25.77	38.5	Pass

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 output power

6.2.1 Test Conditions

Table 17 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	23.5°C
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:

$$\text{ERP(dBm)} = 10 * \log (\text{ERP}_{\text{in watts}}).$$

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

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

and Gain (dBd) = Gain(dBi) - 2.15dB

Table 19 Limits

Maximum Output Power (Watts)	< 7 Watts=38.5 dBm
Antenna Gain(dBi):	4.28
Antenna Gain(dBd):	2.13

Maximum Conducted Output Power (dBm)	< 36.37 dBm
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6.2.3 Test Method and Setup

(a) For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, Conducted maximum power 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 Mobile Station to the wireless communication tester CMU200 via the antenna connector. The band class is set as US Cellular.

(b) Test the Conducted maximum output power by the CMU200.

Test setup

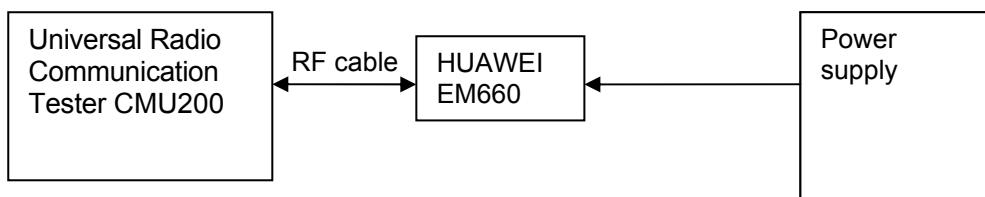


Figure 2. Test Set-up

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_{nom} (25 °C) V_{nom} (3.3V)	24.32	36.37	24.52	36.37	24.65	36.37
TM3	T_{nom} (25 °C) V_{nom} (3.3V)	24.28	36.37	24.58	36.37	24.72	36.37
Subtype 0	T_{nom} (25 °C) V_{nom} (3.3V)	24.42	36.37	24.60	36.37	24.77	36.37
Subtype 2	T_{nom} (25 °C) V_{nom} (3.3V)	23.79	36.37	23.69	36.37	23.73	36.37

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
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6.3.3 Test Method and Setup

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

Test setup

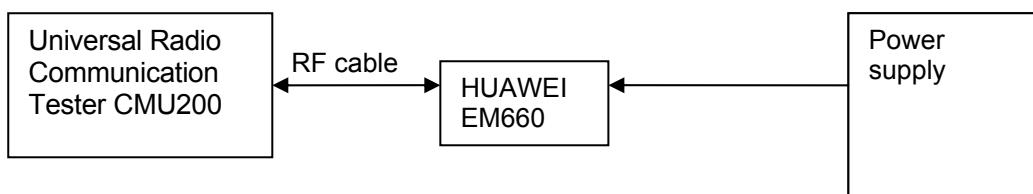


Figure 3. Test Set-up

6.3.4 Measurement Results

Table 24 Measurement Results

TEST CONDITIONS		Modulation Characteristic	
		Channel283(M) 833.49Mhz	
Measured			
CDMA Mode		EVDO Mode	
TM1 & TM3		Subtype 0 & Subtype 2	
T _{nom} (25 °C)	V _{nom} (3.3V)	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

Module was connected to the wireless signal analyzer R&S FSQ26 via the one RF connector. The band class is set as US Cellular; Module was controlled to transmit maximum power. Measure and record the occupied bandwidth of the Module by the R&S FSQ26.

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

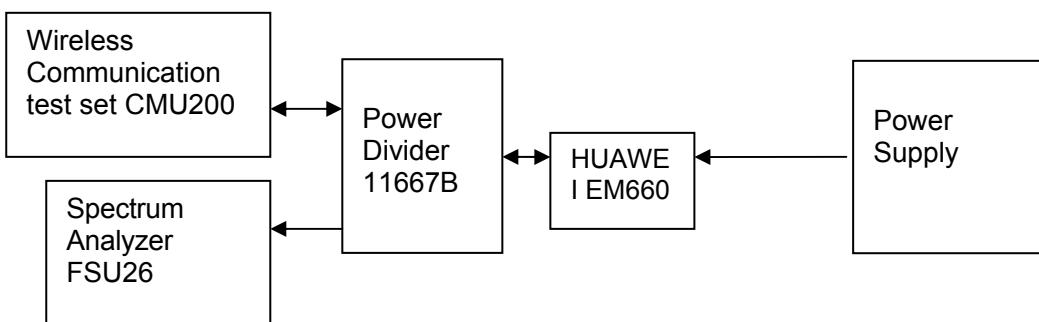


Figure 4. Test Set-up

6.4.4 Measurement Results

Table 28 Measurement Results

TEST CONDITIONS		Occupied Bandwidth											
		Channel1013(B) 824.7MHz				Channel 283(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_{nom} (25 °C)	V_{nom} (3.3V)	1.29	1.28	1.28	1.28	1.30	1.29	1.29	1.29	1.29	1.28	1.29	1.29

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

Module was connected to the wireless signal analyzer R&S FSQ26 via the one RF connector, the band class is set as Cellular. Module was controlled to transmit maximum power. Measure and record band edges compliance of the Module by the R&S FSQ26.

RBW of 20 kHz (1% of 2MHz) was used up to 5MHz away from the band edge. So the FCC rules specify that RBW of 100kHz for measurements of emissions >1MHz away from the band edges ,the limit was adjusted with -13dBm to -20dBm to compensate for the reduced measurement bandwidth.

Test Set-up

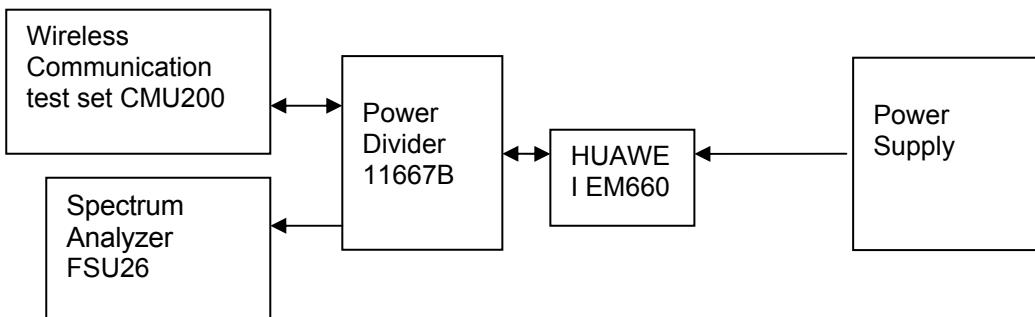


Figure 5. Test Set-up

6.5.4 Measurement Results at Band Edges

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
$T_{\text{nom}} (25^{\circ}\text{C}), V_{\text{nom}} (3.3\text{V})$							
US Cellular	824	1013 (B)	TM1 & TM3	24	<-13(See appendix C)	-13 dBm	Pass
	849	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
$T_{\text{nom}} (25^{\circ}\text{C}), V_{\text{nom}} (3.3\text{V})$							
US Cellular	824	1013 (B)	Subtype 0 & Subtype 2	24	<-13(See appendix C)	-13 dBm	Pass
	849	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. Release C

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

Module was connected to the wireless signal analyzer R&S FSQ26 via the one RF connector, the band class is set as US Cellular. Module was controlled to transmit maximum power.

Measure and record the Conducted Spurious Emission of the Module by the R&S FSQ26

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 1 GHz: 100 kHz;

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

Test Set-up

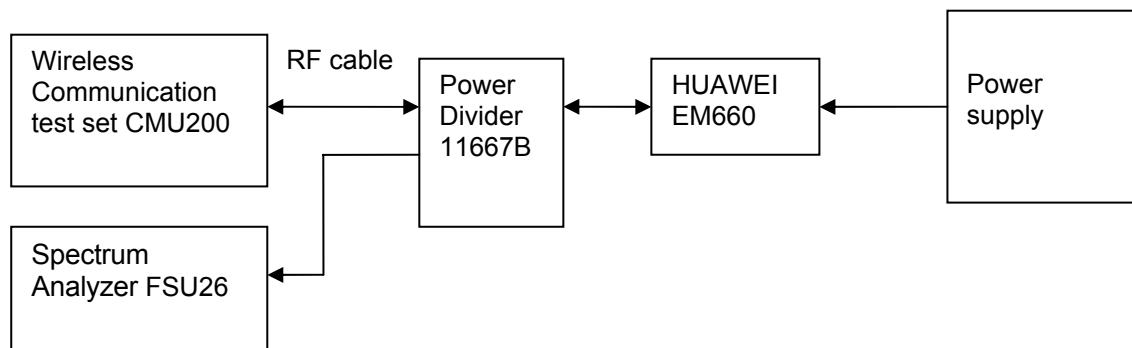


Figure 6. Test Set-up

6.6.4 Measurement Results at Conducted Spurious Emission

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:	1 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	54% at 25°C
Test Configurations:	TM1 and TM3 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
EIA/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 869MHz, 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° 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° 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.)

Test Setup

Connect the Module to the Wireless Communication test set CMU200 via the connector. Then measure the frequency error by the Wireless Communication test set CMU200. The Module's output is matched with a $50\ \Omega$ load.



Figure 7. Test Set up

6.7.4 Measurement Results

6.7.4.1 Measurement Results vs. Variation of Temperature

- TM1, 3.3V DC Channel No.283(833.49MHz)

Table 39 Measurement Results vs. Variation of Temperature—TM1

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	833.49	-34	Pass
-20 °C	833.49	-23	Pass
-10 °C	833.49	-15	Pass
0 °C	833.49	-13	Pass
+10 °C	833.49	-8	Pass
+20 °C	833.49	-10	Pass
+30 °C	833.49	-10	Pass
+40 °C	833.49	-13	Pass
+50 °C	833.49	-18	Pass

Figure 8.

- TM3, 3.3V DC Channel No.**283(833.49MHz)**

Table 40 Measurement Results vs. Variation of Temperature—TM3

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	833.49	-34	Pass
-20 °C	833.49	-25	Pass
-10 °C	833.49	-19	Pass
0 °C	833.49	-14	Pass
+10 °C	833.49	-9	Pass
+20 °C	833.49	-9	Pass
+30 °C	833.49	-11	Pass
+40 °C	833.49	-14	Pass
+50 °C	833.49	-17	Pass

- Subtype 0, 3.3V DC Channel No.**283(833.49MHz)**

Table 41 Measurement Results vs. Variation of Temperature—EVDO

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	833.49	-31	Pass
-20 °C	833.49	-25	Pass
-10 °C	833.49	-18	Pass
0 °C	833.49	-12	Pass
+10 °C	833.49	-11	Pass
+20 °C	833.49	-7	Pass
+30 °C	833.49	-11	Pass
+40 °C	833.49	-13	Pass
+50 °C	833.49	-18	Pass

- Subtype 2, 3.3V DC Channel No.**283(833.49MHz)**

Table 42 Measurement Results vs. Variation of Temperature—EVDO

Temperature	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	833.49	-34	Pass
-20 °C	833.49	-25	Pass

-10 °C	833.49	-18	Pass
0 °C	833.49	-12	Pass
+10 °C	833.49	-7	Pass
+20 °C	833.49	-10	Pass
+30 °C	833.49	-10	Pass
+40 °C	833.49	-10	Pass
+50 °C	833.49	-15	Pass

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	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.0V	833.49	4	Pass
3.3V	833.49	2	Pass
3.6V	833.49	-5	Pass

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

Table 44 Measurement Results vs. Variation of Voltage—TM3

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.0V	833.49	7	Pass
3.3V	833.49	3	Pass
3.6V	833.49	6	Pass

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

Table 45 Measurement Results vs. Variation of Voltage—EVDO

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.0V	833.49	5	Pass
3.3V	833.49	7	Pass
3.6V	833.49	-4	Pass

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

Table 46 Measurement Results vs. Variation of Voltage—EVDO

Voltage	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.0V	833.49	9	Pass
3.3V	833.49	5	Pass
3.6V	833.49	8	Pass

6.7.5 Conclusion

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

7 Appendices

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