



Report No: SYBH(R) 161082007EB-1
FCC ID: QISEC226

**FCC TEST REPORT OF
HUAWEI CDMA EV-DO Rev.A
1900MHz USB Modem**

M/N: EC226

Aug. 18, 2007

Reliability Laboratory of Huawei Technologies Co., Ltd.

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1 Summary

The table below summarizes the measurements and results for the Huawei HUAWEI EC226 CDMA EV-DO Rev.A USB Modem. 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	24.232	Effective Radiated Power of Transmitter	PASS
2.1047		Modulation Characteristics	PASS
2.1049		Occupied Bandwidth	PASS
2.1051	24.238	Band Edges Compliance	PASS
2.1051	24.238	Spurious Emission at Antenna Terminal	PASS
2.1053	24.238	Radiated Spurious Emission	PASS
2.1055	24.235	Frequency Stability	PASS
-	15.107	Conducted Emission at Power Port	PASS
-	15.109	Radiated Emission of Enclosure in Idle Mode	PASS

2 Product Description

2.1 Production Information

2.1.1 General Description

HUAWEI EC226 CDMA EV-DO Rev.A USB Modem is a subscriber equipment in the CDMA 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 supports the function and service as follows:

Table 2 CDMA Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
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 , 3GPP2C.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  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

Jul. 19, 2007 to Aug. 16, 2007

3.2 General Set up Description

The USB Modem can Support PCS Band , and Support 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 PCS Band.

CDMA:

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

EVDO:

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 3GPP2C.S0033.

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 4 Frequency Range

Uplink band:	1850 to 1910 MHz
Downlink band:	1930 to 1990 MHz

4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

Channel spacing:	50 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

DC voltage nominal:	 +5v; 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 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

1900MHz USB MODEM		
EC226		
Board and Module		
Equipment Designation / Description	Serial Number	Remarks
Main board	KK1AB10780800222	CE31TCPU

Table 11

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: EC226
FCC Identification: QISEC226

5 Main Test Instruments

Table 12 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until (MM.DD.YYYY)
3m Semi Anechoic Chamber	S+M	N/A	N/A	12.24.2007
3m Full Anechoic Chamber	S+M	N/A	N/A	12.05.2007
Signal Analyzer	R&S	FSQ 26	100266	09.23.2007
Test Receiver Display Unit	R&S	ESMI 804.8932.52	829214/011	11.29.2007
Test Receiver RF Unit	R&S	ESMI 1032.5640.53	829550/008	05.21.2008
Receiver	R&S	ESIB 26	100318	05.29.2008
Receiver	R&S	ESCS30	830245/018	05.21.2008
Pre-Amplifier	Agilent	8447D	2944A10146	02.08.2008
Pre-Amplifier	Agilent	83017A	3950M00246	01.08.2008
Loop Antenna	Schwarzbeck	FMZB1516	1516115	05.03.2008
BiLog Antenna	Schaffner	CBL 6112B	2747	05.04.2008
BiLog Antenna	Schaffner	CBL 6112B	2536	02.26.2008
Horn Antenna	R&S	HF906 4044.4507.02	359287/005	02.26.2008
Horn Antenna	R&S	HF906 4044.4507.02	359287/006	05.21.2008
Horn Antenna	ETS-Lindgren	3116	00031541	05.21.2008
Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	06.26.2008
Signal Generator	R&S	SMT06	830264/009	04.24.2008
Signal Generator	R&S	SMR 40	100325	04.20.2008
Artificial Mains Network	R&S	ENV4200	100001	09.29.2007
Power Supply	Keithley	2306	1045337	04.28.2008
Climate Chamber	WEISS	ACS-1	3604040034	08.16.2008
Universal Radio Communication Tester	R&S	CMU200	108522	01.01.2008
Universal Radio Communication Tester	Agilent	8960	GB46490162	12.24.2008

6 Transmitter Measurements

6.1 Effective Radiated Power of Transmitter (EIRP)

6.1.1 Test Conditions

Table 13 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	22.5
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

6.1.2 Test Specifications and Limits

6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 24.232

6.1.2.2 Supporting Standards

Table 14 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 24.232, mobile/portable stations are limited to 2 watts EIRP peak power.

$W(\text{dBm}) = 10 \cdot \log(W_{\text{watts}})$.

Table 15 Limits

Maximum Output Power (Watts)	< 2 Watts
Maximum Output Power (dBm)	< 33 dBm

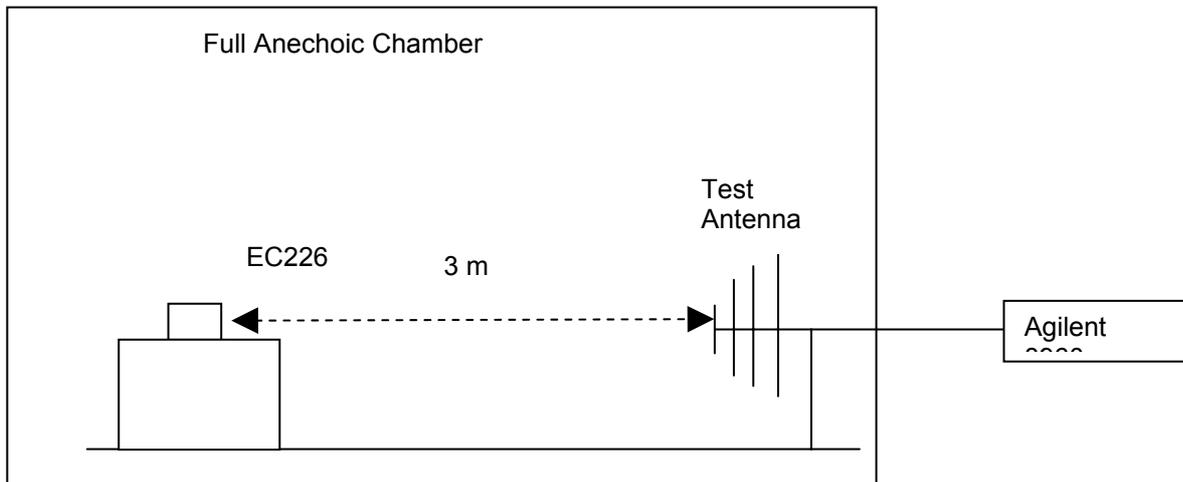
6.1.3 Test Method and Setup

- 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 E to the wireless communication tester Agilent 8960 via the air interface. The band class is set as PCS.
- Test the Radiated maximum output power by the Agilent 8960 received from test antenna.
- 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 EIRP

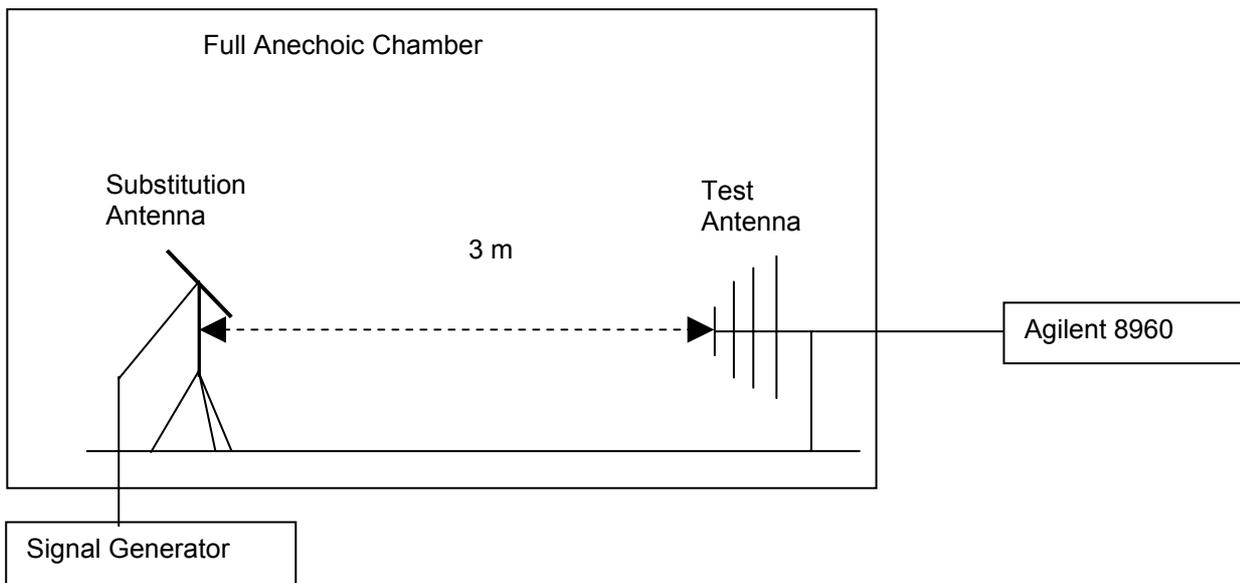


Figure 1. Test Set-up

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

There is a constant difference of 2.15 dB between EIRP and ERP.

ERP (dBm) =EIRP (dBm) – 2.15 (ITU-R Recommendation SM.329-10).

6.1.4 Measurement Results

Table 16 Measurement Results

TEST CONDITIONS	RF Output Power		
	Channel25(B)	Channel600(M)	Channel1175(T)

		1851.25MHz		1880.0MHz		1908.75MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T _{nom} (25 °C) V _{nom} (5.0 V)	25.23	33	25.18	33	24.51	33
TM3	T _{nom} (25 °C) V _{nom} (5.0 V)	24.27	33	25.05	33	24.61	33
Subtype 0	T _{nom} (25 °C) V _{nom} (5.0 V)	24.60	33	24.39	33	24.30	33
Subtype 2	T _{nom} (25 °C) V _{nom} (5.0 V)	24.87	33	24.76	33	24.48	33

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:	enclosure
Ambient temperature:	23.5
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

6.2.2 Test Specifications and Limits

6.2.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 24.232

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 24.232, in no any case may the peak power of a mobile station transmitter exceed 2 W. The calculated longitude EIRP by following formula:

$$EIRP(dBm) = 10 * \log(EIRP_{in\ watts}).$$

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

$$P_{cod.}(dBm) = EIRP(dBm) - Gain(dBi).$$

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

Table 19 Limits

Maximum Output Power (Watts)	< 2 Watts=33 dBm
Antenna Gain(dBi):	1.7dBi
Maximum Conducted Output Power (dBm)	< 31.3dBm

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 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

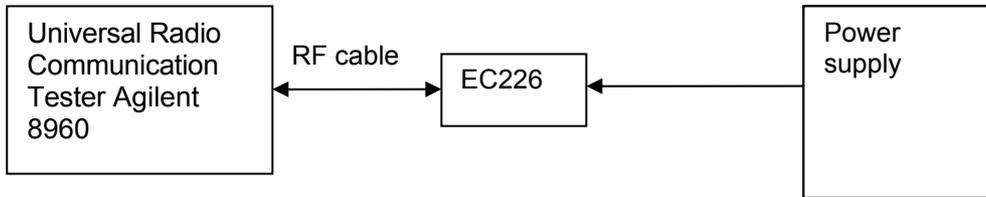


Figure 2. Test Set-up

6.2.4 Measurement Results

Table 20 Measurement Results

TEST CONDITIONS		RF Output Power					
		Channel25(B) 1851.25MHz		Channel600(M) 1880.0MHz		Channel1175(T) 1908.75MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	T _{nom} (25 °C) V _{nom} (5.0 V)	23.90	31.3	23.99	31.3	23.17	31.3
TM3	T _{nom} (25 °C) V _{nom} (5.0 V)	23.76	31.3	23.82	31.3	23.16	31.3
Subtype 0	T _{nom} (25 °C) V _{nom} (5.0 V)	23.65	31.3	23.45	31.3	23.10	31.3
Subtype 2	T _{nom} (25 °C) V _{nom} (5.0 V)	23.20	31.3	23.37	31.3	23.03	31.3

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:	22.5 °C
Relative humidity:	54 %
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 24 subpart E

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 24 subpart E.

Table 23 Limits

Limits	Not applicable
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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 PCS; the USB MODEM's output is matched with 50 Ω load, test method was according to ANSI/TIA-98-E and. The waveform quality and constellation of the USB MODEM was tested.

Test setup

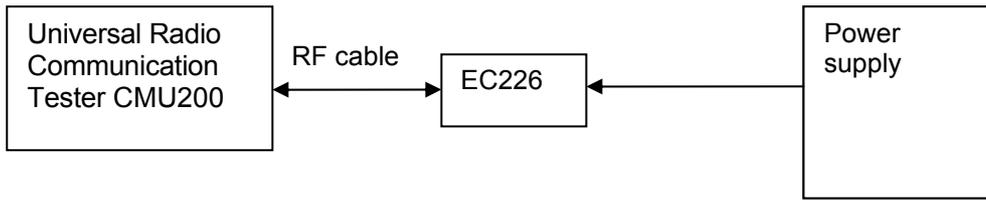


Figure 3. Test Set-up

6.3.4 Measurement Results

Table 24 Measurement Results

TEST CONDITIONS		Modulation Characteristic	
		Channel600(M)	
		1880.0MHz	
		Measured	
		CDMA TM1 & TM3	EVDO Mode Subtype 0 & Subtype2
T _{nom} (25 °C)	V _{nom} (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 with 7 pages.

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:	54 %
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 24 subpart E

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 24 subpart E, 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 FSQ26 via the one RF connector. The band class is set as PCS; USB Modem was controlled to transmit maximum power. Measure and record the occupied bandwidth of the USB Modem 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

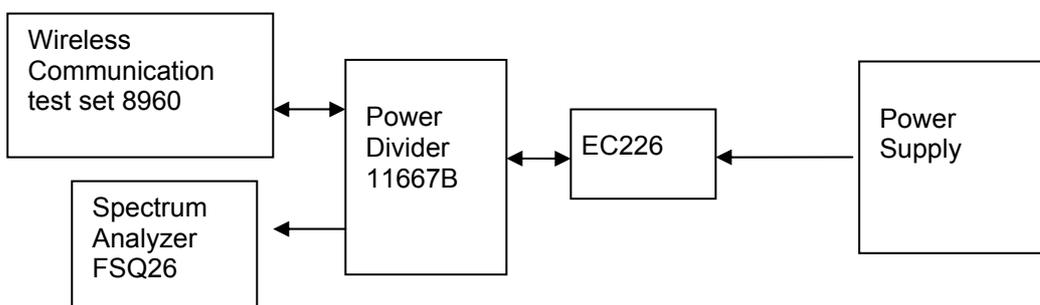


Figure 4. Test Set-up

6.4.4 Measurement Results

Table 28 Measurement Results

TEST CONDITIONS		Occupied Bandwidth											
		Channel25(B) 1851.25MHz				Channel600 (M) 1880Mhz				Channel1175(T) 1908.75MHz			
		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} (5.0 V)	1.28	1.28	1.27	1.26	1.27	1.27	1.26	1.26	1.28	1.29	1.27	1.27

Table 29

6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix_B with 13 pages.

6.5 Band Edges Compliance

6.5.1 Test Conditions

Table 30 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、 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 24.238

6.5.2.2 Supporting Standards

Table 31 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 part 24.238, 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 32 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 FSQ26 via the one RF connector, the band class is set as PCS. USB Modem was controlled to transmit maximum power. Measure and record band edges compliance of the USB Modem 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 1MHz for measurements of emissions >1MHz away from the band edges ,the limit was adjusted with -13dBm to -30dBm to compensate for the reduced measurement bandwidth.

Test Set-up

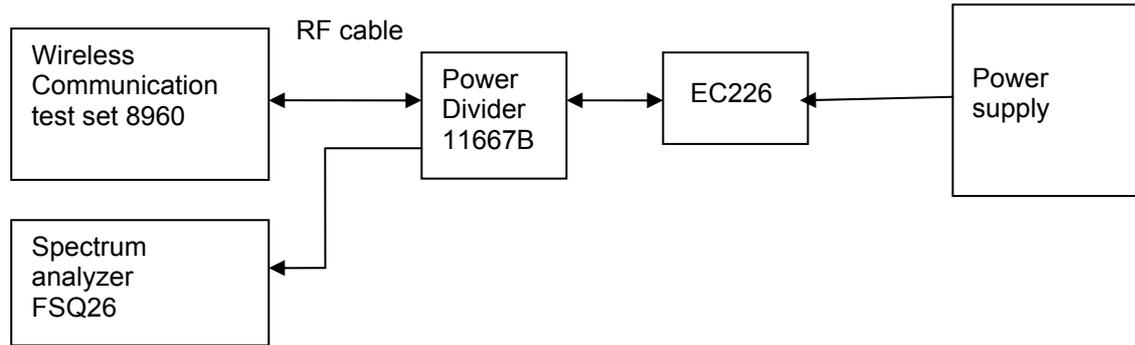


Figure 5. Test Set-up

6.5.4 Measurement Results

Table 33 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
US PCS	$T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (5.0\text{ V})$						
	1850	25 (B)	TM1 & TM3	24	<-13(See appendix_C)	- 13 dBm	Pass
	1910	1175 (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
US PCS	$T_{nom} (25\text{ }^{\circ}\text{C}), V_{nom} (5.0\text{ V})$						
	1850	25 (B)	Subtype 0 and Subtype 2	24	<-13(See appendix_C)	- 13 dBm	Pass
	1910	1175 (T)	Subtype 0 and 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 with 13 pages.

6.6 Spurious Emission at Antenna Terminal

6.6.1 Test Conditions

Table 34 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	20°C
Relative humidity:	50 %
Test Configurations:	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 24.238

6.6.2.2 Supporting Standards

Table 35 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 24.238, 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 36 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 FSQ26 via the one RF connector, the band class is set as PCS. USB Modem was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the USB Modem by the R&S FSQ26.

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 150kHz: 1 KHz;

Measurement bandwidth (RBW) for 150KHz up to 30MHz: 10Hz;
 Measurement bandwidth (RBW) for 30MHz up to 26GHz: 1MHz;

Test Set-up

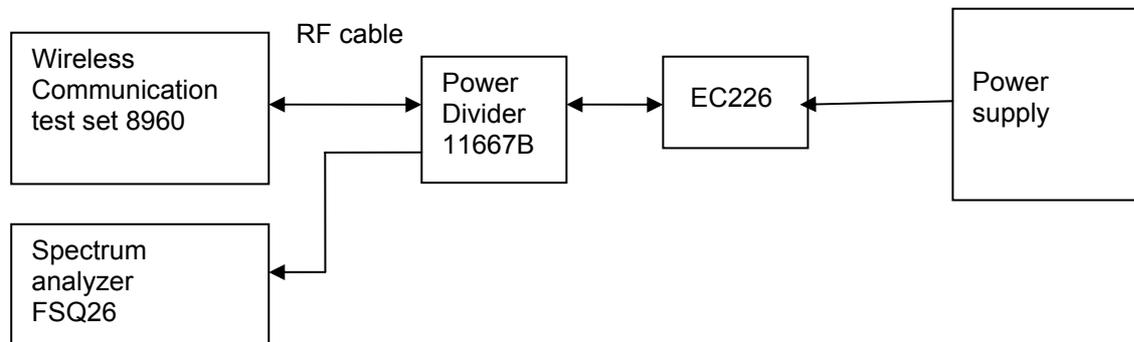


Figure 6. Test Set-up

6.6.4 Measurement Results

Table 37 Measurement Results

Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
Channel 25(B)	TM1	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	TM3	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	Subtype 0	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	Subtype 2	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
Channel 600(M)	TM1	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	TM3	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	Subtype 0	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	Subtype 2	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
Channel 1175(T)	TM1	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	TM3	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass

	Subtype 0	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	Subtype 2	9 kHz ~20GHz	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 with 55 pages.

6.7 Radiated Spurious Emission

6.7.1 Test Conditions

Table 38 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	22 °C
Relative humidity:	53 %
Test Configurations:	TM1 at frequency M EVDO Mode Subtype 0 at frequency M

6.7.2 Test Specifications and Limits

6.7.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 24.238

6.7.2.2 Supporting Standards

Table 39 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.

6.7.2.3 Limits

Compliance with part 24.238, 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 40 Limits

Rated Power:	24 dBm (0.25W)
Required attenuation:	$43 + 10 \log_{10} (0.25W) = 37 \text{ dB}$
Absolute level	$24 \text{ dBm} - 37 \text{ dB} = -13 \text{ dBm}$

6.7.3 Test Method and Setup

(a) Measurements were made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.1049(c) as appropriate. For equipment operating on frequencies below 890 MHz, an Open Field Test is normally required with the measuring instrument antenna located in the far field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of

any possible source of reflections, which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.

(b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:

- (1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
- (2) All equipment operating on frequencies higher than 25 MHz
- (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
- (4) Other types of equipment as required, when deemed necessary by the Commission.

Huawei USB Modem is equipment with non-integral antenna. And it should test according to part (b) of above section.

BTS simulator is connected to a communication antenna, by which communicate with the USB Modem inside the test site. The BTS simulator controls the USB Modem to transmit at maximum power which defined in specification of product when in traffic mode, field strength of spurious emission in idle mode were also tested. The USB Modem operates on a typical channel.

The test procedure:

- (a) 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 USB Modem to the BTS simulator via the air interface. The band class is set as PCS.
- (b) Test the Radiated maximum output power by the Rohde and Schwarz ESMI Test Receiver 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 ESMI Test Receiver, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.

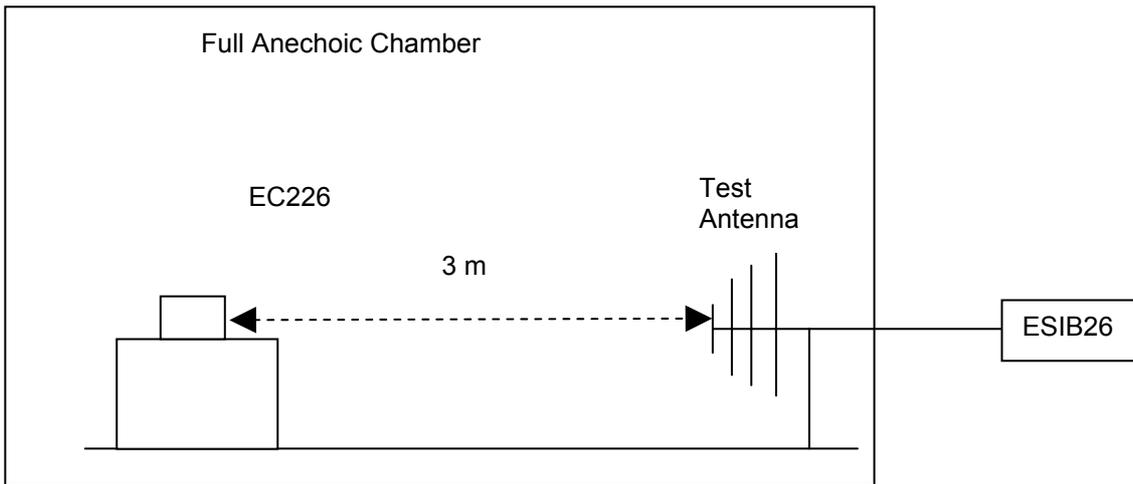
According to part 24.238, the defined measurement bandwidth as following:

24.238 (b) Measurement procedure: Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater.

Measurement bandwidth (RBW) for 9 kHz up to 1GHz: 100KHz;
Measurement bandwidth (RBW) for 1GHz up to 18GHz: 1MHz;
Measurement bandwidth (RBW) for 18GHz up to 26.5GHz: 1MHz;

Test setup

Step 1: Pre-test



Step 2: Substitution method to verify the maximum ERP

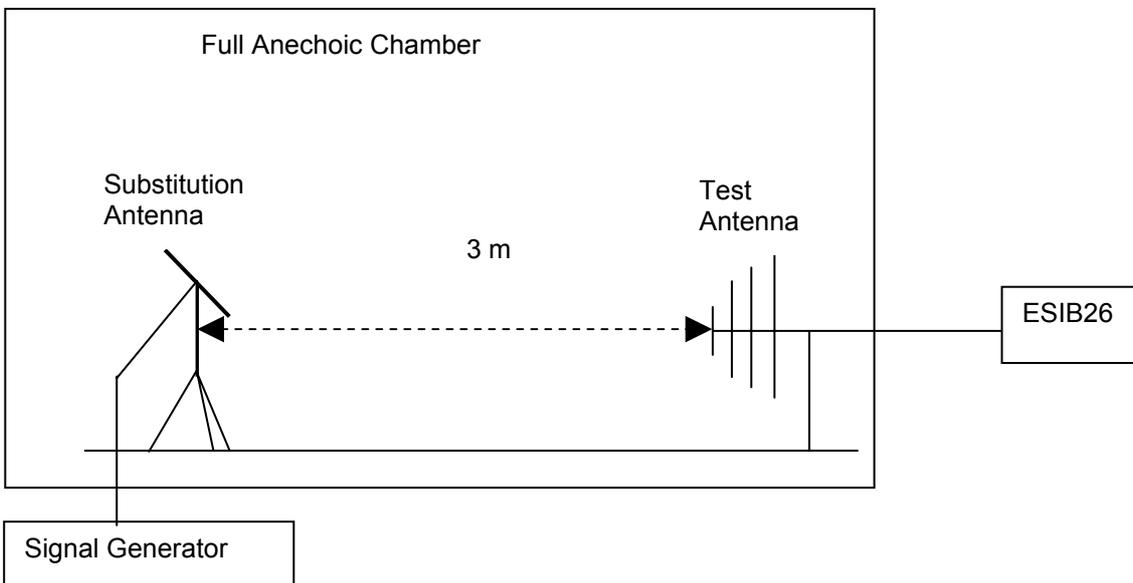


Figure 7. Test Set-up

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

6.7.4 Measurement Results

6.7.4.1 Pre-test Measurement Results

Table 41 Measurement Results

Channel Number	Test Range (Frequency)	Rated Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
600	9 kHz ~26.5GHz	24	<- 13 dBm (See appendix E)	- 13 dBm	Pass

6.7.4.2 Substitution Results

No peak found in pre- test. All frequency points' margin are bigger than 20dB, so the substitution method isn't used.

Calculation Sample:

Table 42 Substitution Results

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,

$$E.R.P. [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBd]$$

NOTE: SGP- Signal Generator Level

6.7.5 Conclusion

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

6.8 Frequency Stability

6.8.1 Test Conditions

Table 43 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	56 % at 25 °C
Test Configurations:	TM1 and TM3 at frequency M EVDO Mode Subtype 0 and Subtype 2 at frequency M

6.8.2 Test Specifications and Limits

6.8.2.1 Specification

CFR 47 (FCC) part 2.1055 and part 24.235

6.8.2.2 Supporting Standards

Table 44 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.

6.8.2.3 Limits

No specific frequency stability requirement in part 2.1055 and part 24.235.

6.8.3 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 Set up

Connect the EC226 to the Wireless Communication test set 8960 via the connector. Then measure the frequency error by the Wireless Communication test set 8960. The EC226 's output is matched with a 50 Ω load.

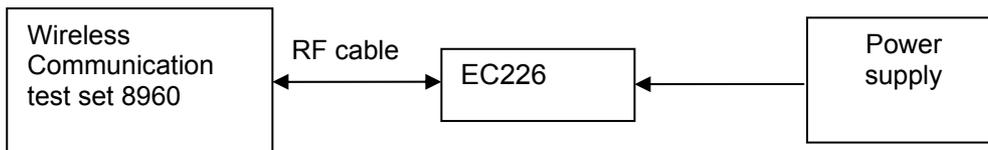


Figure 8. Test Set up

6.8.4 Measurement Results

6.8.4.1 Measurement Results vs. Variation of Temperature

- TM1, 5.0 V DC Channel No.600(1880.0MHz)

Table 45 Measurement Results vs. Variation of Temperature - TM1

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	23.78	1880.0	7.89	Pass
-20 °C	23.80	1880.0	-2.48	Pass
-10 °C	23.82	1880.0	5.35	Pass
0 °C	23.85	1880.0	-6.84	Pass
+10 °C	23.90	1880.0	4.28	Pass
+20 °C	23.89	1880.0	-1.67	Pass
+30 °C	23.99	1880.0	-3.46	Pass
+40 °C	23.89	1880.0	1.84	Pass
+50 °C	23.78	1880.0	-10.00	Pass

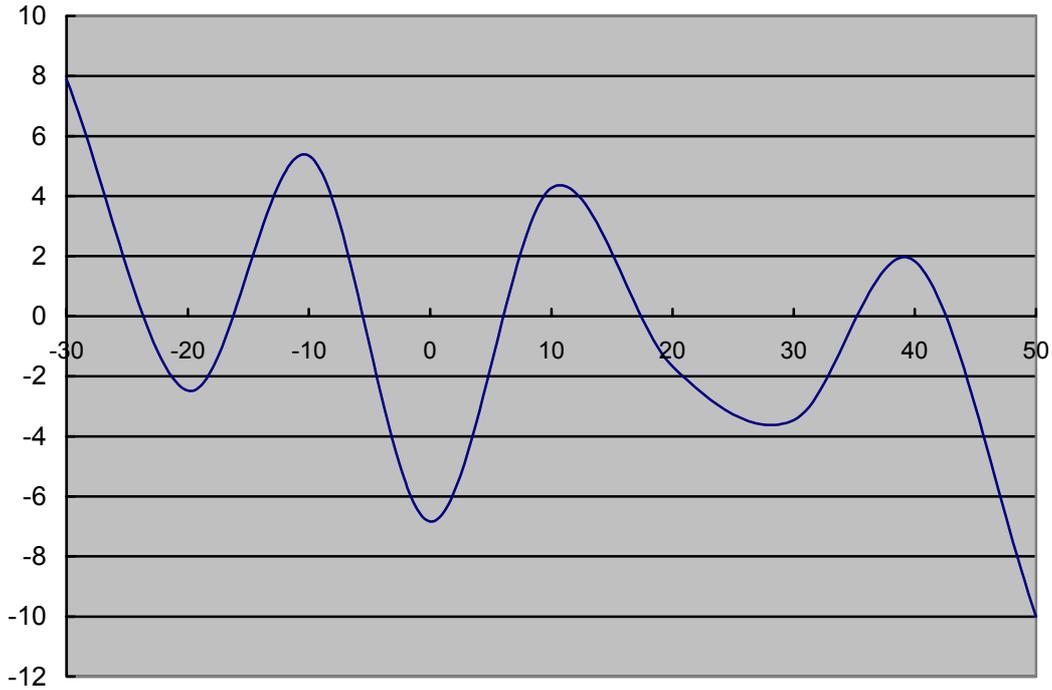


Figure 9. TM1 Test Graph

- TM3, 5.0V DC Channel No.600(1880.0MHz)

Table 46 Measurement Results vs. Variation of Temperature -

TM3

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	23.52	1880.0	12.56	Pass
-20 °C	23.66	1880.0	-13.52	Pass
-10 °C	23.68	1880.0	-8.76	Pass
0 °C	23.70	1880.0	5.48	Pass
+10 °C	23.84	1880.0	6.76	Pass
+20 °C	23.81	1880.0	-10.52	Pass
+30 °C	23.79	1880.0	8.78	Pass
+40 °C	23.71	1880.0	2.69	Pass
+50 °C	23.66	1880.0	10.36	Pass

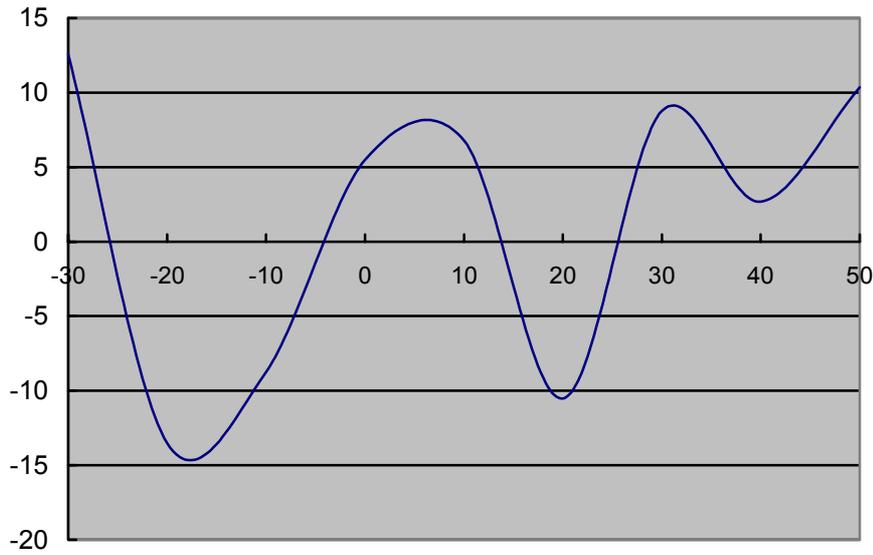
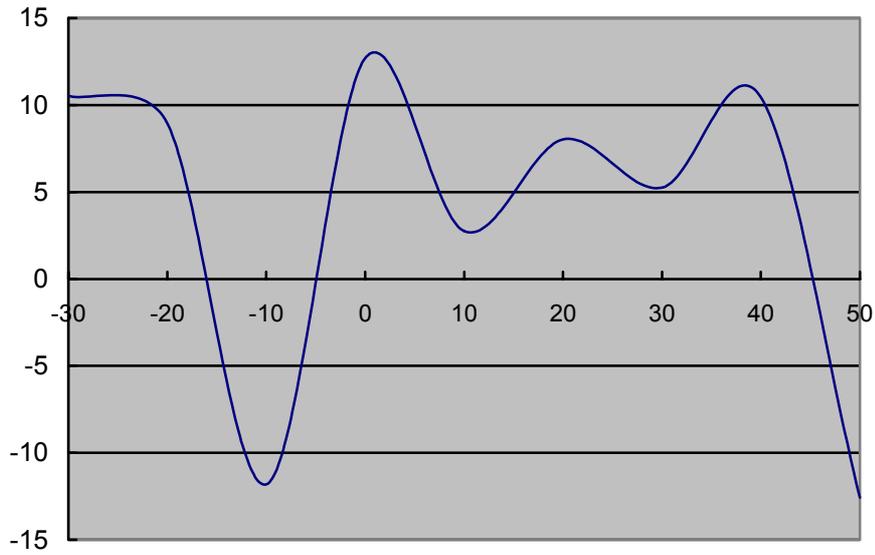


Figure 10. TM3 Test Graph

● **Subtype 0, 5.0V DC Channel No.600(1880.0MHz)**

Table 47 Measurement Results vs. Variation of Temperature - Subtype 0

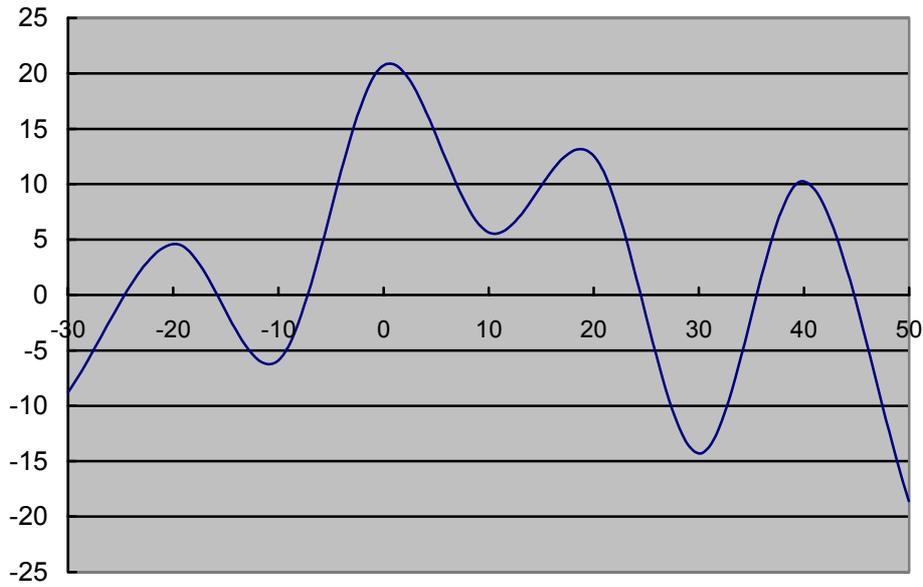
Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	23.08	1880.0	10.53	Pass
-20 °C	23.11	1880.0	8.94	Pass
-10 °C	23.28	1880.0	-11.82	Pass
0 °C	23.36	1880.0	12.69	Pass
+10 °C	24.34	1880.0	2.74	Pass
+20 °C	23.45	1880.0	8.01	Pass
+30 °C	23.48	1880.0	5.25	Pass
+40 °C	23.32	1880.0	10.45	Pass
+50 °C	23.10	1880.0	-12.58	Pass



● **Subtype 2, 5.0V DC Channel No.600(1880.0MHz)**

Table 48 Measurement Results vs. Variation of Temperature - Subtype 2

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	23.12	1880.0	-8.78	Pass
-20 °C	23.15	1880.0	4.59	Pass
-10 °C	23.20	1880.0	-5.89	Pass
0 °C	23.18	1880.0	20.71	Pass
+10 °C	23.38	1880.0	5.63	Pass
+20 °C	23.35	1880.0	12.58	Pass
+30 °C	23.37	1880.0	-14.31	Pass
+40 °C	23.16	1880.0	10..25	Pass
+50 °C	23.10	1880.0	-18.59	Pass



6.8.4.2 Measurement Results vs. Variation of Voltage

- TM1, 25 °C ,Channel No. **600(1880.0MHz)**

Table 49 Measurement Results vs. Variation of Voltage - TM1

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75	23.85	1880.0	10.94	Pass
5.0	24.01	1880.0	2.16	Pass
5.25	23.98	1880.0	12.25	Pass

- TM3, 25 °C ,Channel No. **600(1880.0MHz)**

Table 50 Measurement Results vs. Variation of Voltage - TM3

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75	23.11	1880.0	9.57	Pass
5.0	23.89	1880.0	-5.62	Pass
5.25	23.92	1880.0	-10.08	Pass

- Subtype 0, 25 °C ,Channel No. **600(1880.0MHz)**

Table 51 Measurement Results vs. Variation of Voltage - Subtype 0

Voltage	Power	Nominal	Measured Frequency	Result
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	(dBm)	Frequency (MHz)	Error(Hz)	
4.75	23.40	1880.0	10.67	Pass
5.0	23.46	1880.0	5.83	Pass
5.25	23.35	1880.0	10.53	Pass

● **Subtype 2, 25 °C ,Channel No. 600(1880.0MHz)**

Table 52 Measurement Results vs. Variation of Voltage - Subtype 2

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75	23.17	1880.0	10.23	Pass
5.0	23.32	1880.0	6.38	Pass
5.25	23.27	1880.0	-10.56	Pass

6.8.5 Conclusion

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

7 EMC Test

7.1 Conducted Emission at Power Port

7.1.1 Test Conditions

Table 53 Test Conditions

Preconditioning:	1 hour
Measured at:	Power port
Ambient temperature:	23.5°C
Relative humidity:	55 %
Test Configurations:	TM1 at frequency M

7.1.2 Test Specifications and Limits

7.1.2.1 Specification

CFR 47 (FCC) part 15.107

7.1.2.2 Supporting Standards

Table 54 Supporting Standards:

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
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7.1.2.3 Limits

Compliance with part15.107, conducted emission must meet the requirement of following table.

Table 55 Limits

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

Note: * Decreases with the logarithm of the frequency.

7.1.3 Test Method and Setup

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

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

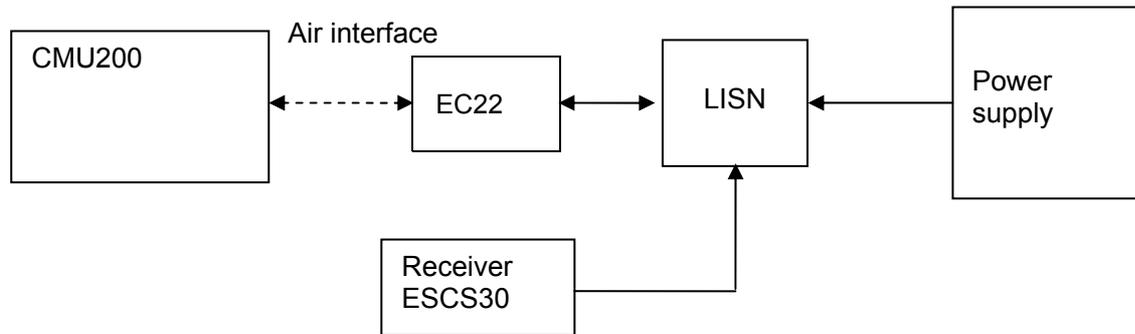


Figure 11. Test Set-up

7.1.4 Measurement Results

Table 56 MEASUREMENT RESULT:QP DECTER

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.3255	41.9	10.2	60	18.1	N	FLO
0.8115	42.3	9.9	56	13.7	L3	FLO
1.752	43.2	10	56	12.8	L3	FLO
2.625	41.1	10.1	56	14.9	L3	FLO
5.253	36.4	10.2	60	23.6	L3	FLO
23.6535	39.8	15.3	60	20.2	L3	FLO

Table 57 MEASUREMENT RESULT:AV DECTER

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.312	32.4	10.2	50	17.6	L3	FLO
0.8385	31.5	9.9	46	14.5	L3	FLO
1.7475	34.6	10	46	11.4	L3	FLO
2.679	35.3	10.1	46	10.7	L3	FLO
5.244	33.6	10.2	50	16.4	L3	FLO
24.2655	29.2	15.1	50	20.8	L3	FLO

7.1.5 Conclusion

Two adapters are all tested in the EMC test, here the worse result are showed.
The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix F.

7.2 Radiated Emission of Enclosure in Ideal Mode

7.2.1 Test Conditions

Table 58 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25 °C
Relative humidity:	53 %
Test Configurations:	TM1 at frequency M

7.2.2 Test Specifications and Limits

7.2.2.1 Specification

CFR 47 (FCC) part 15.109

7.2.2.2 Supporting Standards

Table 59 Supporting Standards:

ANSI C63.4: 2003	Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
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7.2.2.3 Limits

The Radiated Emission of enclosure of EUT should compliance with the requirement of part 15.109. The limit showed in following table.

Table 60 Limits

Frequency of Emission (MHz)	Radiated Limit	
	Unit(μ v/m)	Unit(dB μ V/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
960-1000	500	54

7.2.3 Test Method and Setup

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 EC226 was communicated with the BTS simulator through Air interface. The EC226 operated on the typical channel and the EC226 worked in idle mode, transmitter was not work in this test.

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

Test set up

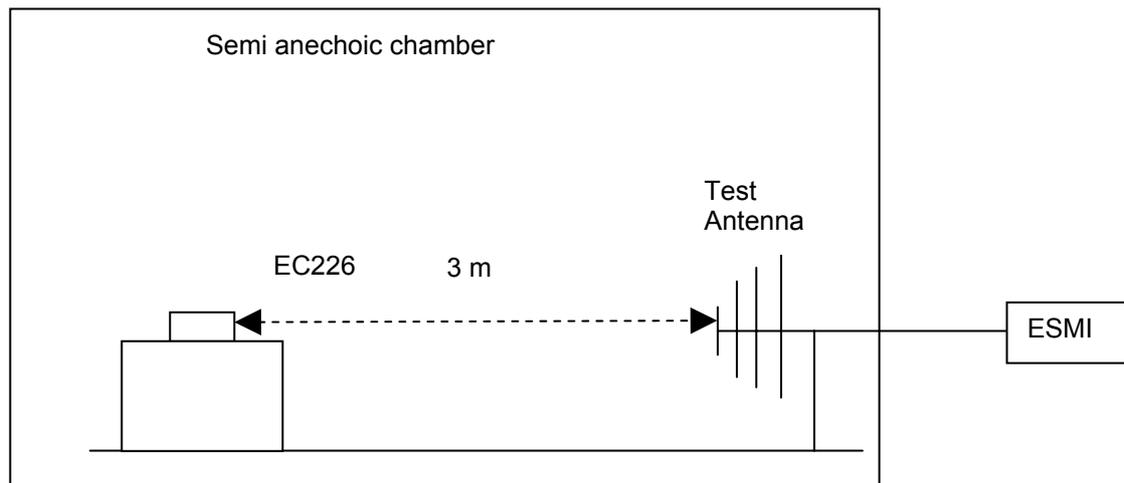


Figure 12. Test set up

7.2.4 Measurement Results

Table 61 MEASUREMENT RESULT: QP DECTER

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
30.18	22.7	-4.2	40	17.3	173	223	HORIZONTAL
79.2	23.4	-14.9	40	16.6	195	350	HORIZONTAL
171.78	27.8	-11.9	43.5	15.7	174	0	HORIZONTAL
212.16	29.1	-11.7	43.5	14.4	126	94	HORIZONTAL
378.78	31.3	-5.1	46	14.7	100	254	HORIZONTAL
528.06	30.8	-2.7	46	15.2	195	95	HORIZONTAL

7.2.5 Conclusion

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

8 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Table 62 System Measurement Uncertainty

Items		Extended Uncertainty
Effective Radiated Power of Transmitter	EIRP (dBm)	U=3dB; k=2
Band Width	Magnitude (%)	U = 0.2%; k=2
Band Edge Compliance	Disturbance Power (dBm)	U = 2.0dB; k=2
Conducted Spurious Emission at Antenna Terminal	Disturbance Power (dBm)	U = 2.0dB; k=2
Frequency Stability	Frequency Accuracy(ppm)	U = 0.21ppm; k=2
Field Strength of Spurious Radiation	ERP(dBm)	U=2.2dB; k=2
Conducted Output Power	Power(dBm)	U=0.39dB; k=2
Conducted Emission at Power Port	Disturbance Voltage (dB μ V)	U=4dB; k=2
Radiated Emission of enclosure at ideal mode	Field strength (dB μ V/m)	U=4.6dB; k=2

9 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	55 pages
Appendix E	Measurement Results Radiated Spurious Emission	6 pages
Appendix F	Measurement Results Conducted Emission at Power Port	2 pages
Appendix G	Measurement Results Radiated Emission of Enclosure at Ideal Mode	2 pages
Appendix H	Photos of Test Setup	6 pages