



Report No: SYBH(R) 87122006EB
FCC ID: QISETS3228

FCC TEST REPORT OF Huawei Fixed Wireless Terminal

M/N: ETS3228

Jan. 18, 2007

Reliability Laboratory of Huawei Technologies Co., Ltd.

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REPORT ON FCC Test of **Huawei Fixed Wireless Terminal**

M/N: ETS3228

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REGULATION **FCC CFR47 Part 2: Subpart J;**
FCC CFR47 Part 22: Subpart H;
FCC CFR47 Part 24: Subpart E;
FCC CFR47 Part 15: Subpart B;

CONCLUSION There are 9 items need to be tested, 9 items have been tested. The sample of the model completely meets the requirements

Final Judgement: Pass

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1 Summary

The table below summarizes the measurements and results for the Huawei Fixed Wireless Terminal. 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 & 24.232	Effective Radiated Power of Transmitter	PASS
2.1047		Modulation Characteristics	PASS
2.1049		Occupied Bandwidth	PASS
2.1051	22.917 & 24.238	Band Edges compliance	PASS
2.1051	22.917 & 24.238	Spurious Emission at Antenna Terminal	PASS
2.1053	22.917 & 24.238	Radiated Spurious Emission	PASS
2.1055	22.355 & 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 Fixed Wireless Terminal is subscriber equipment in the GSM system. The frequency band is US Cellular and PCS band. The Fixed Wireless Terminal implements such functions as RF signal receiving / Transmitting, GSM protocol processing and voice service etc.

2.1.2 Support function and Service

The Fixed Wireless Terminal support the function and service as follows:

Table 2 Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
Voice	Modulation: GMSK	TM1	

Note: * Refer to ANSI/TIA-98-E section 1.3 for the information of TM (Test Mode) .

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 **2714.01** in Jan of 2004.

3.1 Testing Period

The test have been performed during the period of

Jan. 01, 2007 to Jan. 15, 2007

3.2 General Set up Description

Huawei Fixed Wireless Terminal can support GSM mode of US Cellular Band and PCS Band. During this measurement, the Mobile Station just works in GSM mode of US Cellular Band and PCS Band.

TM1: Circuit Switch (Speech Service)

Parameter	Cellular Band	PCS Band
Total slot	8	8
Measure slot	3	3
Power level range	5-19	0-15
Transmit Frequency range	824MHz ~ 849MHz	1850MHz~1910 MHz

4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 4 Frequency Range

	Cellular Band	PCS Band
Uplink band:	824 to 849 MHz	1850 to 1910 MHz
Downlink band:	869 to 894 MHz	1930 to 1990 MHz

4.1.2 Channel Spacing / Separation

Table 5 Channel Spacing / Separation

Channel spacing:	200 kHz
Channel separation:	200 kHz

4.1.3 Type of Emission

Table 6 Type of Emission

Emission Designation:	300kGXW
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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:	~220V
AC voltage range	~100V-240V
AC 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:	 + 3.6V
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

Product Description: 800MHz Fixed Wireless Terminal		
M/N: ETS3228		
Board and Module		
Equipment Designation / Description	Serial Number	Remarks
-Main board	03017773	WL71GIPU
-Sub board	03017455	MG00GSMF
-LCD	23040034	CGM12864GSLI-D
-Battery	HGB-2A10X3	

4.2.2 Adapter Technical Data

No.1

AC/DCAdapter Model: UE41120050DC
 Manufacturer: SHILONG FUHUA Electronic Co., Ltd
 Input Voltage: ~190-300V ;50/60Hz
 Output Voltage:  +12.0V
 Rated Power: 6W

No.2

AC/DCAdapter Model: DY41F005A
 Manufacturer: Highlight Electronic Co., Ltd Shenzhen
 Input Voltage: ~190-300V ;50/60Hz
 Output Voltage:  +12.0V
 Rated Power: 6W

No.3

AC/DCAdapter Model: HGP1205
 Manufacturer: TECH-POWER Internation Co., Ltd.
 Input Voltage: ~190-300V ;50/60Hz
 Output Voltage:  +12.0V
 Rated Power: 6W

4.2.3 Battery Technical Data

Type: NI-MH Battery
 Manufacturer: Shenzhen BYD Co., Ltd.
 Battery Model: HGB-2A10X3
 Rated capacity: 1000mAH
 Nominal Voltage:  +3.6V
 Charging Voltage:  +4.2V

4.2.4 FCC Identification

Grantee Code: QIS
Product Code: ETS3228
FCC Identification: QISETS3228

5 Main Test Instruments

Table 11 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	05.18.2007
Test Receiver Display Unit	R&S	ESMI 804.8932.52	829214/011	05.30.2007
Test Receiver RF Unit	R&S	ESMI 1032.5640.53	829550/008	05.30.2007
Receiver	R&S	ESIB 26	100318	08.17.2007
Receiver	R&S	ESCS30	830245/018	05.30.2007
Pre-Amplifier	Agilent	8447D	2944A10146	05.30.2007
Pre-Amplifier	Agilent	83017A	3950M00246	02.03.2007
Loop Antenna	Schwarzbeck	FMZB1516	1516115	02.08.2007
BiLog Antenna	Schaffner	CBL 6112B	2747	08.30.2007
BiLog Antenna	Schaffner	CBL 6112B	2536	08.30.2007
Horn Antenna	R&S	HF906 4044.4507.02	359287/005	12.05.2007
Horn Antenna	R&S	HF906 4044.4507.02	359287/006	12.05.2007
Horn Antenna	ETS-Lindgren	3117	00062533	04.14.2007
Horn Antenna	ETS-Lindgren	3117	00062549	04.14.2007
Horn Antenna	ETS-Lindgren	3116	00031541	02.15.2007
Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	08.28.2007
Signal Generator	R&S	SMT06	830264/009	05.29.2007
Signal Generator	R&S	SMR 40	100325	12.09.2007
Artificial Mains Network	Schwarzbeck	NNLK8121	8121416	05.29.2007
Power Supply	Keithley	2306	1045337	04.20.2007
Climate Chamber	ESPEC	MW3030	0611403	05.08.2007
Universal Radio Communication Tester	R&S	CMU200	105822	07.04.2007

6 Transmitter Measurements

6.1 Effective Radiated Power of Transmitter (ERP&EIRP)

6.1.1 Test Conditions

Table 12 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
Relative humidity:	50%
Test Configurations:	TM1 at frequency Bottom、 Top

6.1.2 Test Specifications and Limits

6.1.2.1 Specification

CFR 47 (FCC) part 2.1046 and part 22.913 / part 24.232

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/part24.232, in no any case may the peak power of a mobile station transmitter exceed 7 W (For cellular band) and 2W (For PCS band). The calculated longitude ERP by following formula : $ERP (dBm) = 10 * \log (ERP_{in\ watts})$. $EIRP(dBm) = ERP(dBm) + 2.15dB$.

Table 14 Limits

	Cellular band	PCS band
Maximum Output Power (Watts)	< 7 Watts	< 2 Watts
Maximum Output Power (dBm)	< 38.5 dBm	< 33 dBm

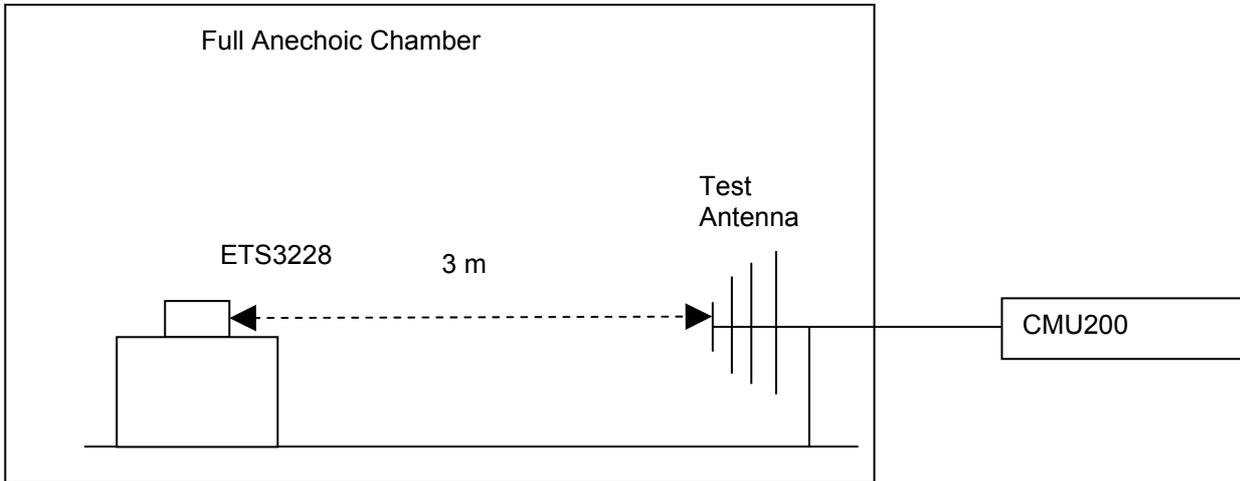
6.1.3 Test Method and Setup

- (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 fixed wireless terminal 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&EIRP

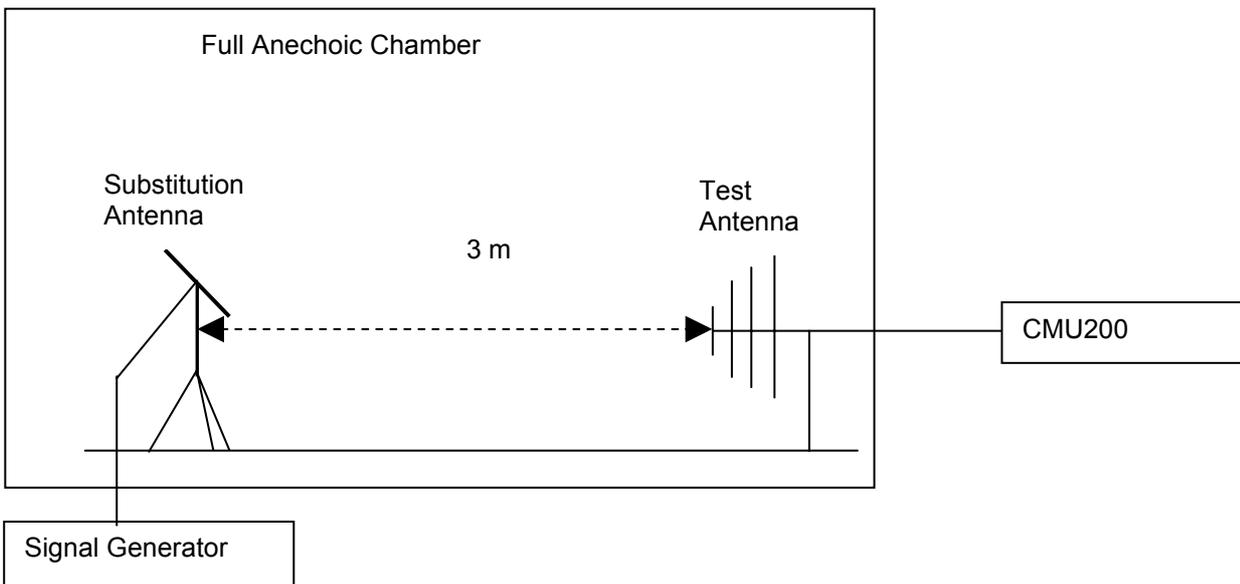


Figure 1. Test Set-up

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

6.1.4.1 Pre-test Measurement Results

Table 15 Measurement Results

GSM850		RF Output Power(ERP)					
		Channel128(B) 824.2 MHz			Channel251(T) 848.8 MHz		
		dBm			dBm		
		Measured	Limit		Measured	Limit	
TM1	T _{nom} (25 °C) V _{nom} (3.8 V)	30.97	38.5			30.24	38.5

PCS1900		RF Output Power(EIRP)					
		Channel512(B) 1850.2 MHz			Channel810(T) 1909.8 MHz		
		dBm			dBm		
		Measured	Limit		Measured	Limit	
TM1	T _{nom} (25 °C) V _{nom} (3.8 V)	30.50	33			29.93	33

6.1.4.2 Substitution Results

Table 16 Substitution Results

Cellular Band (GSM850):

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	Substitution Gain [dBd]	Cable Loss [dB]	Substitution Level(ERP) [dBm]	FCC limit [dBm]	Result
TM1	824.2	30.01	Dipole Ant.	-3.0	0.6	30.0	38.5	Pass
TM1	848.8	31.25	Dipole Ant.	-3.0	0.6	30.6	38.5	Pass

PCS Band (PCS1900):

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level(ERP) [dBm]	FCC limit [dBm]	Result
TM1	1850.2	30.25	Hor Ant.	5.4	1.0	30.1	33	Pass
TM1	1909.8	30.13	Hor Ant.	5.4	1.0	30.5	33	Pass

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

$$ERP/EIRP [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBd/dBi]$$

NOTE: SGP- Signal Generator Level

b, A GSM signal with bandwidth of 200kHz are created by the vector generator R&S SMU200A.

c, Measure parameter set as: RBW=1MHz, VBW=1MHz, SWT=542.75, SPAN=0 for TM1.

6.1.5 Conclusion

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

6.2 Modulation Characteristics

6.2.1 Test Conditions

Table 17 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	24 °C
Relative humidity:	60 %
Test Configurations:	TM1 at frequency M

6.2.2 Test Specifications and Limits

6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and part 22 subpart H / part 24 subpart E.

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

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

Table 19 Limits

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

6.2.3 Test Method and Setup

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

Test setup

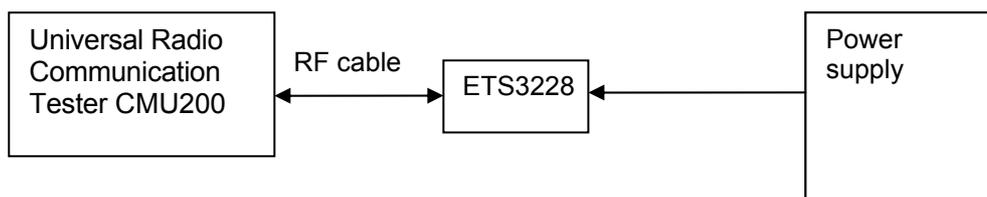


Figure 2. Test Set-up

6.2.4 Measurement Results

Table 20 Measurement Results

GSM850 TEST CONDITIONS		Modulation Characteristic	
		Channel192(M) 837.0MHz	
		Measured	
		TM1	TM3
T _{nom} (25 °C)	V _{nom} (3.8V)	Refer to Appendix B	--
PCS1900 TEST CONDITIONS		Modulation Characteristic	
		Channel610(M) 1869.8MHz	
		Measured	
		TM1	TM3
T _{nom} (25 °C)	V _{nom} (3.8V)	Refer to Appendix B	--

6.2.5 Conclusion

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

For the measurement results refer to appendix B with 3 pages.

6.3 Occupied Bandwidth

6.3.1 Test Conditions

Table 21 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	24.5 °C
Relative humidity:	56 %
Test Configurations:	TM1 at frequency Bottom、 Top

6.3.2 Test Specifications and Limits

6.3.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 22 subpart H / 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 occupied bandwidth requirement in part 22 subpart H / 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 23 Limits

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

6.3.3 Test Method and Setup

Fixed Wireless Terminal was connected to the wireless signal analyzer R&S FSQ40 via the one RF connector. The band class is set as US Cellular; Fixed Wireless Terminal was controlled to transmit maximum power. Measure and record the occupied bandwidth of the Fixed Wireless Terminal by the R&S FSQ40.

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

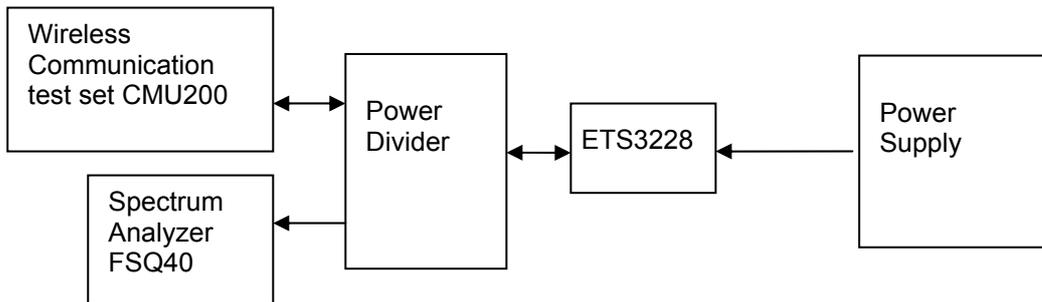


Figure 3. Test Set-up

6.3.4 Measurement Results

Table 24 Measurement Results

GSM850 TEST CONDITIONS		Occupied Bandwidth					
		Channel128 (B) 824.2MHz				Channel251(T) 848.8MHz	
		Measured (kHz)				Measured (kHz)	
		TM1	TM3			TM1	TM3
T _{nom} (25 °C)	99%	238.7	--	--	--	236.6	--
V _{nom} (3.8V)	26dB	309.1	--	--	--	308.2	--
PCS1900 TEST CONDITIONS		Occupied Bandwidth					
		Channel1013 (B) 824.70MHz				Channel777(T) 848.31MHz	
		Measured (kHz)				Measured (kHz)	
		TM1	TM3			TM1	TM3

T_{nom} (25 °C)	99%	237.6	--	--	--	240.8	--
V_{nom} (3.8V)	26dB	304.9	--	--	--	308.1	--

6.3.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix C with 5 pages.

6.4 Band Edges Compliance

6.4.1 Test Conditions

Table 25 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	25°C
Relative humidity:	56 %
Test Configurations:	TM1 at frequency Bottom、 Top

6.4.2 Test Specifications and Limits

6.4.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917 / part 24.238

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

Compliance with part 22.917/ 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 27 Limits

	Cellular Band	PCS Band
Rated Power:	33 dBm	30 dBm
Required attenuation:	$43 + 10 \log(2) = 46$, 33 dBm – 46 dB	$43 + 10 \log(1) = 43$, 30 dBm – 43 dB
Absolute level	- 13 dBm	- 13 dBm

6.4.3 Test Method and Setup

Fixed Wireless Terminal was connected to the wireless signal analyzer R&S FSQ40 via the one RF connector, the band class is set as US Cellular. Fixed Wireless Terminal was controlled to transmit maximum power. Measure and record Band edge compliance of the Fixed Wireless Terminal by the R&S FSQ40.

RBW of 2 kHz (1% of 200kHz) 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

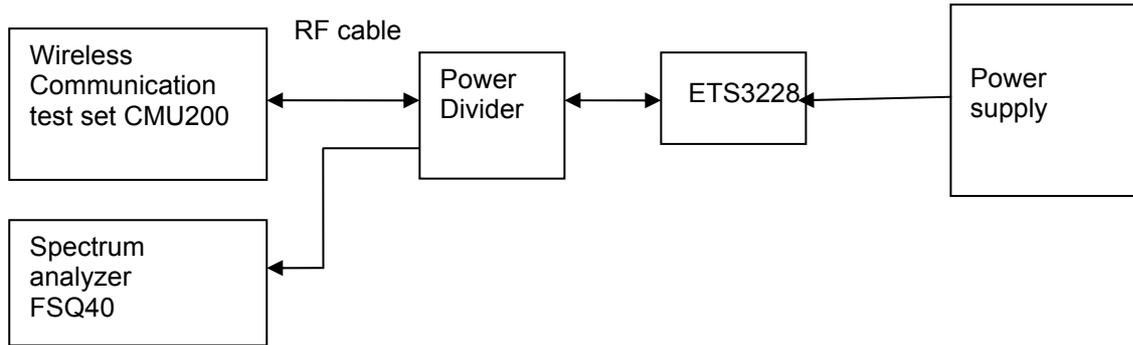


Figure 4. Test Set-up

6.4.4 Measurement Results

Table 28 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 °C), V_{nom} (3.8V)							
Cellular Band	824	128 (B)	TM1	33	-21.68	- 13 dBm	Pass
	869	251 (T)	TM1	33	-19.11	- 13 dBm	Pass
PCS Band	1850	512 (B)	TM1	30	-28.18	- 13 dBm	Pass
	1910	810 (T)	TM1	30	-27.33	- 13 dBm	Pass

6.4.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to appendix D with 3 pages.

6.5 Spurious Emission at Antenna Terminal

6.5.1 Test Conditions

Table 29 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	20°C
Relative humidity:	50 %
Test Configurations:	TM1 at frequency Middle Frequency

6.5.2 Test Specifications and Limits

6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and part 22.917 / part 24.238

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 part 22.917 / 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 31 Limits

	Cellular Band	PCS Band
Rated Power:	33 dBm	30 dBm
Required attenuation:	$43 + 10 \log (2) = 46$, 33 dBm – 46 dB	$43 + 10 \log (1) = 43$, 30 dBm – 43 dB
Absolute level	- 13 dBm	- 13 dBm

6.5.3 Test Method and Setup

Fixed Wireless Terminal was connected to the wireless signal analyzer R&S FSQ40 via the one RF connector, the band class is set as US Cellular. Fixed Wireless Terminal was controlled to transmit maximum power.

Measure and record the Conducted Spurious Emission of the Fixed Wireless Terminal by the R&S FSQ40.

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 20GHz: 100 kHz;

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 20GHz: 1 MHz;

Test Set-up

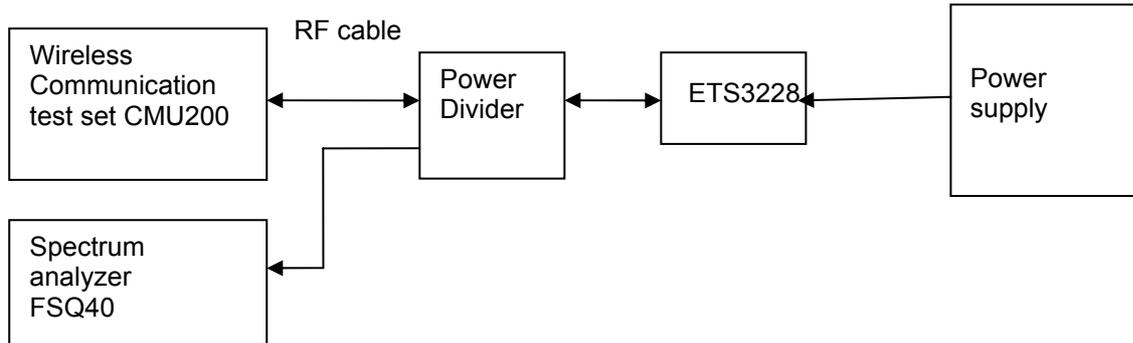


Figure 5. Test Set-up

6.5.4 Measurement Results

Table 32 Measurement Results

GSM850						
Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit (dBm)	Result
Channel 283(M)	TM1	9 kHz~30MHz	33	-82.28	- 13	Pass
		30MHz~400MHz	33	-62.77	- 13	Pass
		400MHz~20GHz	33	-36.69	- 13	Pass
PCS1900						
Channel Number	Test Mode	Test Range (Frequency)	Output Power [dBm]	Spurious Level measured [dBm]	FCC limit (dBm)	Result
Channel 610(M)	TM1	9 kHz~30MHz	30	-51.18	- 13	Pass
		30MHz~400MHz	30	-59.34	- 13	Pass
		400MHz~20GHz	30	-31.74	- 13	Pass

6.5.5 Conclusion

The equipment **PASSED** the requirement of this clause.
 For the measurement results refer to appendix E with 5 pages.

6.6 Radiated Spurious Emission

6.6.1 Test Conditions

Table 33 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25 °C
Relative humidity:	50 %
Test Configurations:	TM1 at frequency M

6.6.2 Test Specifications and Limits

6.6.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 22.917 / part 24.238

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 22.917 / 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 35 Limits

	Cellular Band	PCS Band
Rated Power:	33 dBm	30 dBm
Required attenuation:	$43 + 10 \log (2) = 46$, 33 dBm – 46 dB	$43 + 10 \log (1) = 43$, 30 dBm – 43 dB
Absolute level	- 13 dBm	- 13 dBm

6.6.3 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 Fixed Wireless Terminal 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 Fixed Wireless Terminal inside the test site. The BTS simulator controls the Fixed Wireless Terminal 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 Fixed Wireless Terminal operates on a typical channel.

The test procedure:

- (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 Fixed Wireless Terminal to the BTS simulator via the air interface. The band class is set as US Cellular.
- (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 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 20 GHz: 100 kHz;

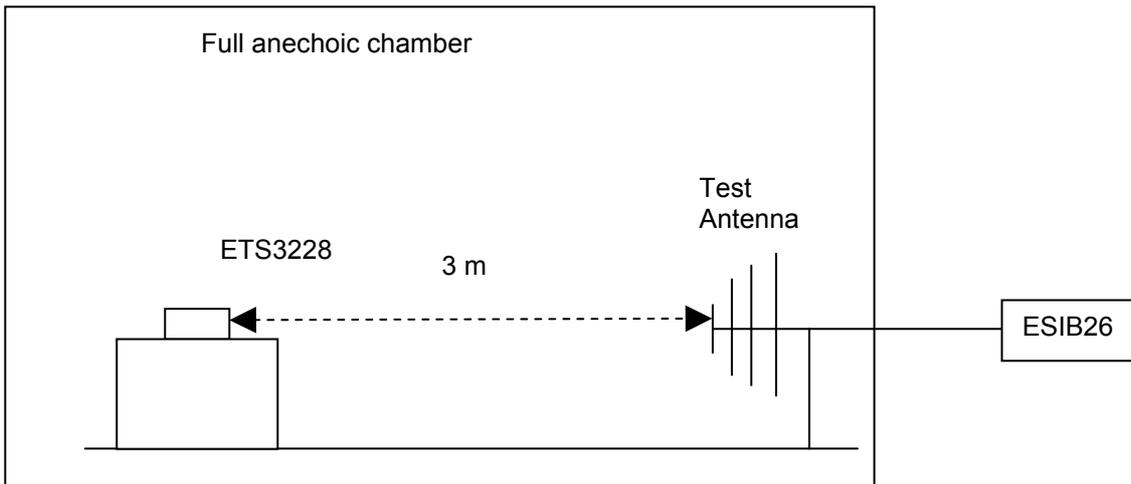
According to part 24.238, the defined measurement bandwidth as following:

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 20 GHz: 1 MHz;

Test setup

Step 1: Pre-test



Step 2: Substitution method to verify the maximum ERP

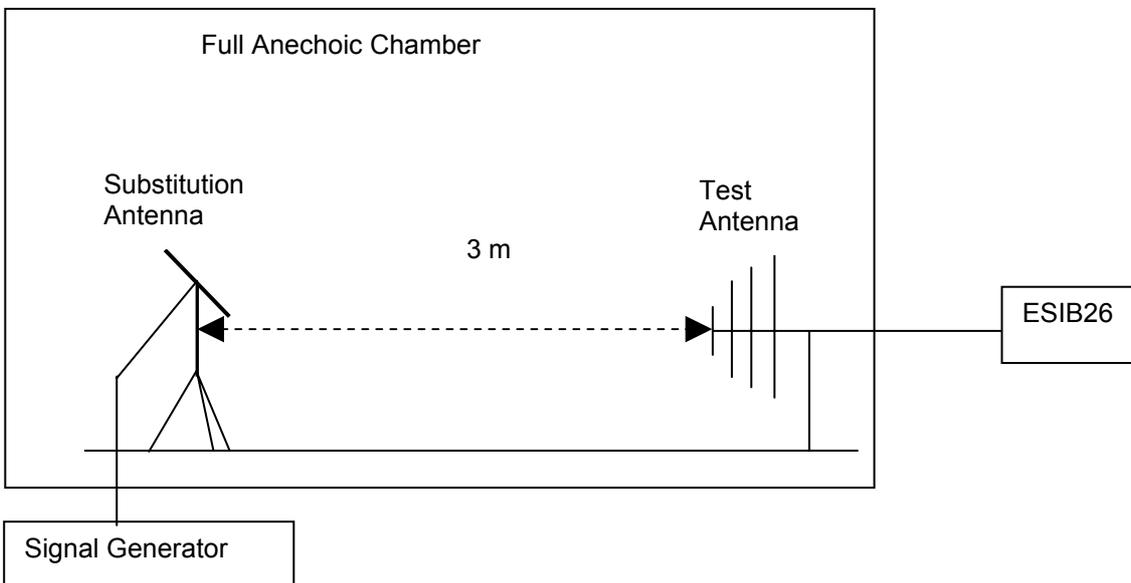


Figure 6. Test Set-up

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

6.6.4 Measurement Results

6.6.4.1 Pre-test Measurement Results

Table 36 Measurement Results

GSM850					
Channel Number	Test Range (Frequency)	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
283	9 kHz ~12.75GHz	33	<- 13 dBm (See appendix F)	- 13 dBm	Pass
PCS1900					
Channel	Test Range	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result

Number	(Frequency)				
610	9 kHz ~12.75GHz	30	<- 13 dBm (See appendix F)	- 13 dBm	Pass

6.6.4.2 Substitution Results

Table 37 Substitution Results

Cellular Band:

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	Substitution Gain [dBd]	Cable Loss [dB]	Substitution Level(ERP) [dBm]	FCC limit [dBm]	Result
TM1	2480.9	-48.50	Dipole Ant.	3.85	1.2	-49.0	-13	Pass

PCS Band:

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	Substitution Gain [dBd]	Cable Loss [dB]	Substitution Level(EIRP) [dBm]	FCC limit [dBm]	Result
TM1	13158.3	-39.20	Horn Ant.	11.25	3.1	-38.1	-13	Pass

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

$$ERP [dBm] = SGP [dBm] - Cable Loss [dB] + Gain [dBd]$$

NOTE: SGP- Signal Generator Level

6.6.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix F with 17 pages.

6.7 Frequency Stability

6.7.1 Test Conditions

Table 38 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Antenna connector
Ambient temperature:	See below
Relative humidity:	50 % at 25 °C
Test Configurations:	TM1 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 / part 24.235

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-98E: 2003	Recommended Minimum Performance Standards for cdma2000 Spread Spectrum Mobile Stations.

6.7.2.3 Limits

According to part 22.355 part 24.235, 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 ° to +50 ° 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 Fixed Wireless Terminal to the Wireless Communication test set CMU200 via the connector. Then measure the frequency error by the Wireless Communication test set CMU200. The Fixed Wireless Terminal's output is matched with a 50 Ω load.

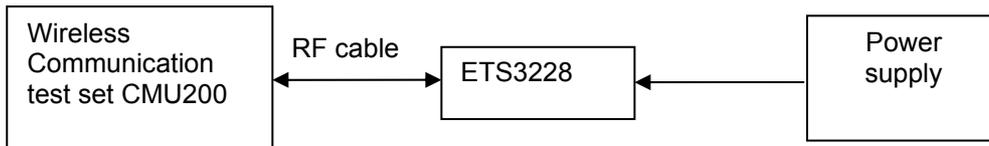


Figure 7. Test Set up

6.7.4 Measurement Results

6.7.4.1 Measurement Results vs. Variation of Temperature

- GSM850, TM1, 3.8V DC Channel No.192(837.0MHz)

Table 40 Measurement Results vs. Variation of Temperature - GSM850

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	33	837.0	-37	Pass
-20 °C	33	837.0	-50	Pass
-10 °C	33	837.0	-50	Pass
0 °C	33	837.0	-51	Pass
+10 °C	33	837.0	-51	Pass
+20 °C	33	837.0	-51	Pass
+30 °C	33	837.0	70	Pass
+40 °C	33	837.0	-41	Pass
+50 °C	33	837.0	-55	Pass

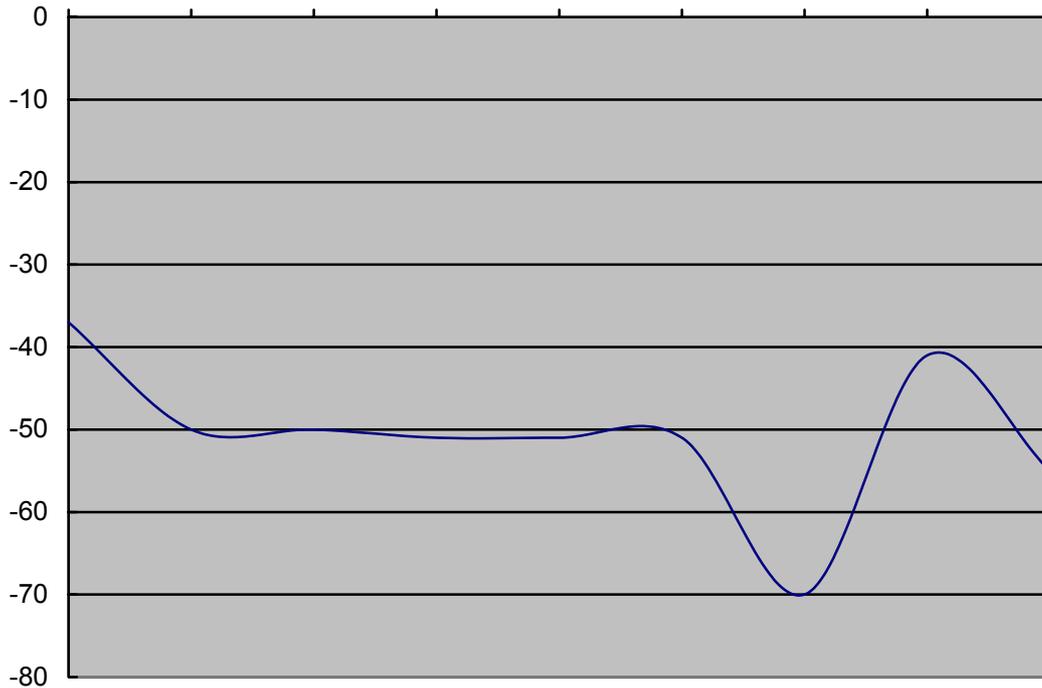


Figure 8. TM1 Test Graph

- PCS1900, TM1, 3.8V DC Channel No.610(1869.8MHz)

Table 41 Measurement Results vs. Variation of Temperature - PCS1900

Temperature	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	30	1869.8	-49	Pass
-20 °C	30	1869.8	-46	Pass
-10 °C	30	1869.8	45	Pass
0 °C	30	1869.8	45	Pass
+10 °C	30	1869.8	32	Pass
+20 °C	30	1869.8	32	Pass
+30 °C	30	1869.8	-49	Pass
+40 °C	30	1869.8	-49	Pass
+50 °C	30	1869.8	-39	Pass

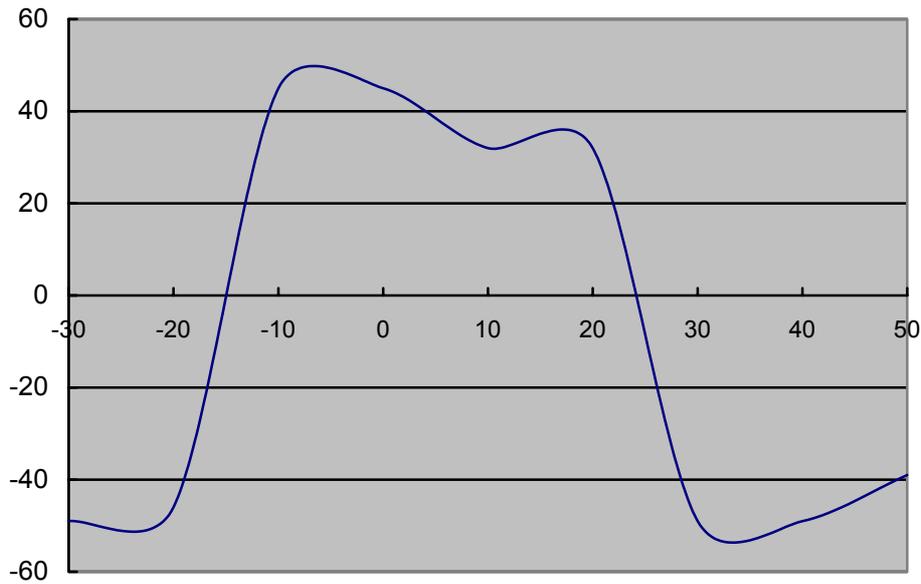


Figure 9. TM3 Test Graph

6.7.4.2 Measurement Results vs. Variation of Voltage

- GSM850, TM1, 25 °C ,Channel No. **192(837.0MHz)**

Table 42 Measurement Results vs. Variation of Voltage - GSM850

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.6	33	837.0	-25	Pass
3.8	33	837.0	-23	Pass
4.2	33	837.0	-23	Pass

- PCS1900, TM3, 25 °C ,Channel No. **610(1869.8MHz)**

Table 43 Measurement Results vs. Variation of Voltage - PCS1900

Voltage	Power (dBm)	Nominal Frequency (MHz)	Measured Frequency Error(Hz)	Result
3.6	30	1869.8	53	Pass
3.8	30	1869.8	49	Pass
4.2	30	1869.8	57	Pass

6.7.5 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 44 Test Conditions

Preconditioning:	0.5 hour
Measured at:	Power port
Ambient temperature:	23.5°C
Relative humidity:	55 %
Test Configurations:	TM1 at frequency 850MHz

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 45 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 part 15.107, conducted emission must meet the requirement of following table.

Table 46 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 Fixed Wireless Terminal was communicated with the BTS simulator through Air interface, the BTS simulator controls the Fixed Wireless Terminal to transmitter the maximum power which defined in specification of product. The Fixed Wireless Terminal 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.

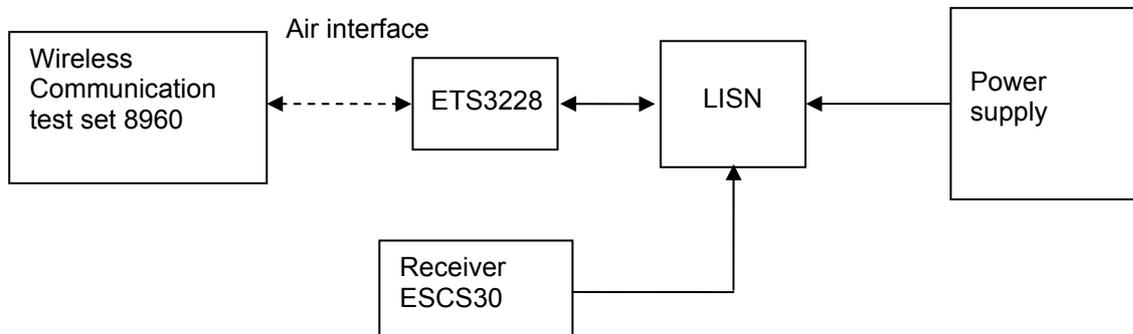


Figure 10. Test Set-up

7.1.4 Measurement Results

Table 47 MEASUREMENT RESULT:QP DECTER

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.348000	37.10	10.2	59	21.9	N	FLO
0.370500	36.10	10.2	59	22.4	N	FLO
0.906000	17.10	9.9	56	38.9	N	FLO
2.377500	18.70	10.1	56	37.3	L3	FLO
9.024000	9.00	10.7	60	51.0	N	FLO
25.201500	25.00	14.7	60	35.0	N	FLO

Table 48 MEASUREMENT RESULT:AV DECTER

Frequency (MHz)	Level (dBμV)	Transd (dB)	Limit (dBμV)	Margin (dB)	Line	PE
0.357000	20.50	10.2	49	28.3	L3	FLO
0.595500	16.70	10.0	46	29.3	L3	FLO
1.068000	14.30	9.9	46	31.7	L3	FLO
2.256000	11.70	10.1	46	34.3	L3	FLO
10.176000	7.80	11.1	50	42.2	N	FLO

7.1.5 Conclusion

The equipment **PASSED** the requirement of this clause.
For the measurement results refer to appendix G with 2 pages.

7.2 Radiated Emission of Enclosure in Ideal Mode

7.2.1 Test Conditions

Table 49 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25 °C
Relative humidity:	45 %
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 50 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 part15.109. The limit showed in following table.

Table 51 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 Fixed Wireless Terminal was communicated with the BTS simulator through Air interface. The Fixed Wireless Terminal operated on the typical channel and the Fixed Wireless Terminal worked in idle mode, transmitter was not work in this test.

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

Test set up

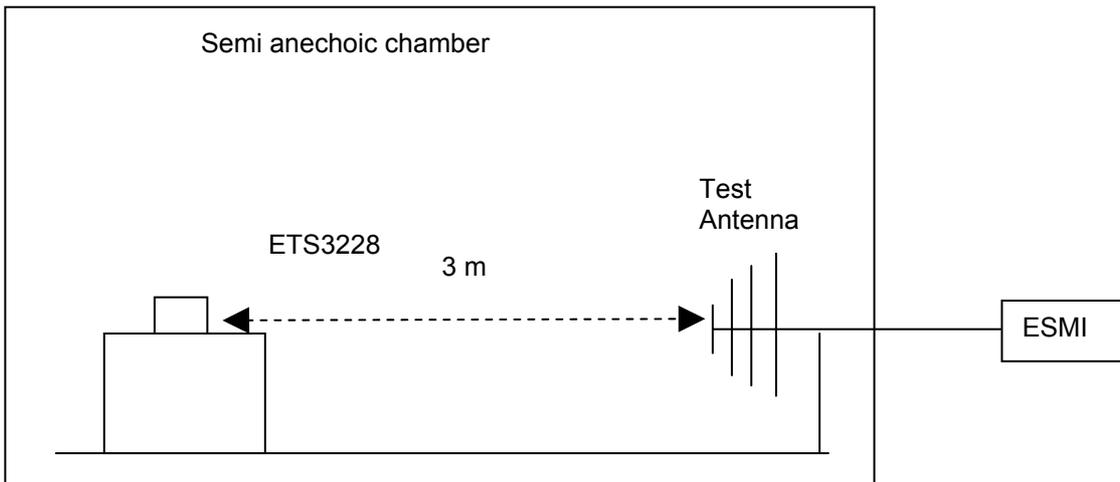


Figure 11. Test set up

7.2.4 Measurement Results

Table 52 MEASUREMENT RESULT: QP DECTER

Frequency (MHz)	Level (dBμV/m)	Transd (dB)	Limit (dBμV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Polarisation
66.900000	24.00	-11.5	40.0	16.0	150.0	200.00	HORIZONTAL
69.900000	25.00	-11.5	40.0	15.0	160.0	254.00	HORIZONTAL
166.080000	30.50	-11.5	43.5	13	182.0	254.00	HORIZONTAL
236.280000	34.40	-9.0	47.0	12.6	147.0	245.00	HORIZONTAL
324.800000	40.00	-5.8	47.0	7.0	150.0	200.00	HORIZONTAL
378.540000	37.10	-4.8	47.0	9.9	100.0	0.00	HORIZONTAL

7.2.5 Conclusion

The equipment **PASSED** the requirement of this clause. For the measurement results refer to appendix H with 2 pages.

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 53 System Measurement Uncertainty

Items		Extended Uncertainty
Effective Radiated Power of Transmitter	ERP(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=3dB; 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	3 pages
Appendix B	Measurement Results Occupied Bandwidth	5 pages
Appendix C	Measurement Results Band Edges	3 pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	5 pages
Appendix E	Measurement Results Radiated Spurious Emission	17 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	2 pages