



FCC Test Report

Product Name: LTE Multi-mode USB Rotator

Model Number: E397u-53

Report No: SYBH(Z-RF)026052011-2002
FCC ID: QISE397U-53

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Notice

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Notice 2

Table 1 Modification Information

Modification Information	1	
	2	
	3	<i>Not Applicable!</i>
	4	
	5	
	6	
	7	



REGULATION	FCC CFR47 Part 2: Subpart J;
	FCC CFR47 Part 27 : Subpart C&L;
START OF TEST	Apr.17, 2011
END OF TEST	Apr.25, 2011
Final Judgement:	Pass

Approved By

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1 Summary

The table below summarizes the measurements and results for the EUT. Detailed results and descriptions are shown in the following pages.

Table 2 Summary of results

FCC Measurement Specification	FCC Limits Part(s)	Description	Result
2.1046	27.50(d)	Effective Isotropic radiated power of Transmitter	PASS
2.1047	---	Modulation Characteristics	PASS
2.1049	---	Occupied Bandwidth	PASS
2.1051	27.53(h)	Band Edges Compliance	PASS
2.1051	27.53(h)	Spurious Emission at Antenna Terminal	PASS
2.1053	27.53(h)	Radiated Spurious Emission	PASS
2.1055	27.54	Frequency Stability	PASS



2 Product Description

2.1 Production Information

2.1.1 General Description

E397u-53 LTE/CDMA dual mode USB Rotator is subscriber equipment in the LTE/CDMA system. E397u-53 implement such functions as RF signal receiving/transmitting, LTE, CDMA2000 1x and the CDMA2000 1x EV-DO Rev.A/Rev.0 protocol processing, data service etc. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface and Micro SD card interface. E397u-53 has three internal antennas as default.

2.1.2 Support function and Service

The EUT supports the function and service as follows:

Table 3 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*	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 , 3GPP2C.S0033

Table 4 LTE Service and Test mode List

Service Name	Characteristic	Corresponding Test Mode	Note
Data	Modulation: QPSK	TM4	
Data	Modulation: 16-QAM	TM5	

Note: * The LTE test condition & settings are defined in 3GPP.



2.2 Modification Information

For original equipment, following table is not application.

Table 5 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***

3.1 Testing Period

The test have been performed during the period of

Apr.17, 2011 to Apr.25, 2011

3.2 General Set up Description

TM1: CDMA Mode with QPSK Modulation

TM3: CDMA Mode with HPSK Modulation

TM4: LTE Mode with QPSK Modulation

TM5: LTE Mode with 16-QAM Modulation



4 Product Description

4.1 Technical Characteristics

4.1.1 Frequency Range

Table 6 Frequency Range

Uplink band:	1710 to 1755 MHz
Downlink band:	2110 to 2155 MHz

4.1.2 Channel Spacing / Separation

Table 7 Channel Spacing / Separation

Channel spacing:	50 KHz
Channel separation:	1.23 MHz/1.4MHz/3MHz/5MHz/10MHz

4.1.3 Type of Emission

Table 8 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 9 Environmental Requirements

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

4.1.5 Power Source

Table 10 Power Source

Charger voltage range:	~100-240 V, 50/60Hz
Charger current maximal:	0.2 A Max
Battery Rated capacity:	2200mAh
Battery Nominal Voltage:	 3.7V

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 11 Applied DC Voltages and Currents

Voltage:	 +5V
Current:	500mA According to CFR (FCC) part 2, subpart 2, section 2.1033(c) (8)



4.2 EUT Identification List

4.2.1 Board Information

Table 12 Board Information

LTE Multi-mode USB Rotator		
E397u-53		
Board and Module		
Description	Hardware Version	IMEI
Main board of Mobile Phone	CD1E397uM	357149040003968

4.2.2 FCC Identification

Grantee Code: QIS
Product Code: E397u-53
FCC Identification: QISE397U-53



5 Main Test Instruments

Table 13 Main Test Equipments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Universal Radio Communication Tester	R&S	CMW 500	103216	Nov.26,2011
Power supply	KEITHLEY	2303	1288003	Sep.27,2011
Universal Radio Communication Tester	R&S	CMU200	105822	Oct.24,2011
Wireless Communication Test set	Agilent	N4010A	MY49081592	Dec.14,2011
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.04,2011
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2011
Temperature Chamber	WEISS	WKL64	24600294	Jan.03,2012
Signal generator	Agilent	E8257D	MY49281095	Jul.09.2011
Vector Signal Generator	R&S	SMU200A	104162	Sep.07,2011
Test receiver	R&S	ESU26	36090302083	Jun.24.2011
EMI Test receiver	R&S	FSQ43	100048	Jun.23,2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Dec.13,2011
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Dec.13,2011
Horn Antenna	R & S	HF906	359287/005	May.07, 2011
Horn Antenna	R & S	HF906	359287/006	Apr.27, 2012
Horn Antenna	R & S	HF906	100684	Jun.28,2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2536	Sep.21, 2011
Broadband Antenna	SCHAFFNER	CBL 6112B	2941	Jun.11, 2011
Broadband Antenna	SCHAFFNER	VULB 9163	9163-357	Sep.28,2011
Horn Antenna	ETS-LINDGREN	3160	60008	Sep.20,2011
Horn Antenna	ETS-LINDGREN	3160	91989	Sep.28,2011

6 Transmitter Measurements

6.1 Effective Isotropic radiated power (EIRP)

6.1.1 Test Conditions

Table 14 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	22.5°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. LTE TM4 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 27.50(d)2

6.1.2.2 Supporting Standards

Table 15 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 16 Limits

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

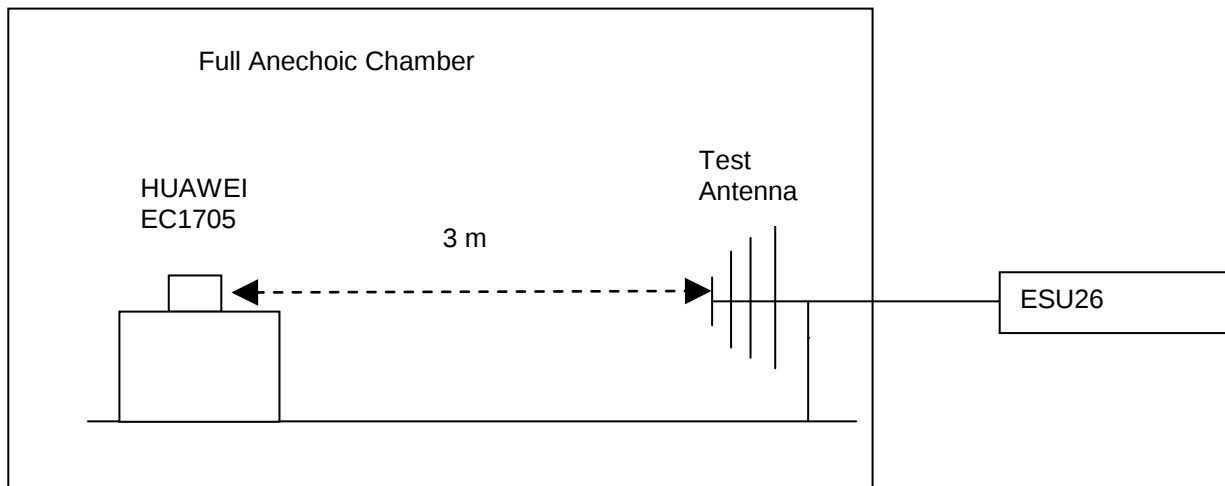
6.1.3 Test Method and Setup

- 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 EUT to the wireless communication tester via the air interface. The band class is set as AWS.
- Test the Radiated maximum output power by the wireless communication tester received from test antenna.

- (c) Use substitution method to verify the maximum output power. The EUT is substituted by a horn antenna. The horn 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 wireless communication tester, 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

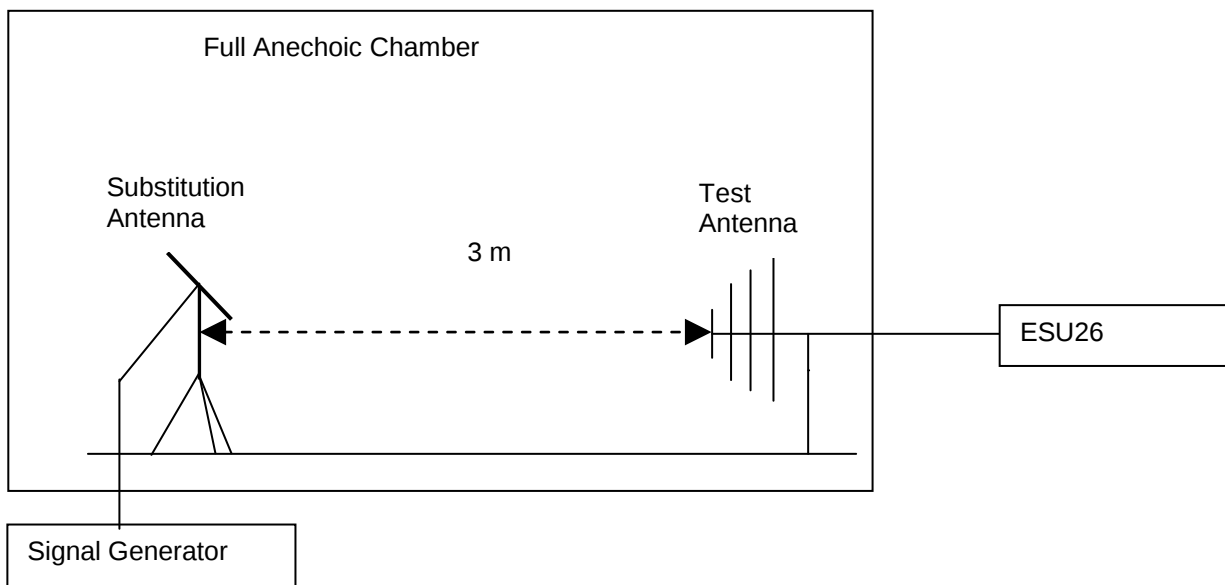


Figure 1. Test Set-up

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 17 CDMA Measurement Results

TEST CONDITIONS		RF Output Power (EIRP)					
		Channel 25(B) 1711.25MHz		Channel 450(M) 1732.50MHz		Channel 875(T) 1753.75MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	Tnorm (24 °C) Vnorm (5 V)	26.71	33	26.62	33	26.66	33
TM3	Tnorm (24 °C) Vnorm (5 V)	26.66	33	26.78	33	26.72	33
Subtype 0	Tnorm (24 °C) Vnorm (5 V)	26.79	33	26.84	33	26.81	33
Subtype 2	Tnorm (24 °C) Vnorm (5 V)	26.65	33	26.88	33	26.78	33

Table 18 LTE Measurement Results-QPSK

RF Output Power (EIRP)				
TEST CONDITIONS	T _{norm} (25 °C), V _{norm} (5 V)			
	Channel	Frequency (MHz)	Measured (dBm)	Limit (dBm)
1.4MHz(BW)	19957(B)	1710.7	23.76	33
	20175(M)	1732.5	23.62	33
	20393(T)	1754.3	23.85	33
3MHz(BW)	19965(B)	1711.5	23.77	33
	20175(M)	1732.5	23.42	33
	20385(T)	1753.5	23.98	33
5MHz(BW)	19975(B)	1712.5	23.78	33
	20175(M)	1732.5	23.55	33
	20375(T)	1752.5	23.88	33
10MHz(BW)	20000(B)	1715.0	23.85	33
	20175(M)	1732.5	23.98	33
	20350(T)	1750.0	23.98	33

Table 19LTE Measurement Results-16QAM

RF Output Power (EIRP)	
TEST CONDITIONS	T _{norm} (25 °C), V _{norm} (5 V)



	Channel	Frequency (MHz)	Measured (dBm)	Limit (dBm)
1.4MHz(BW)	19957(B)	1710.7	22. 73	33
	20175(M)	1732.5	22. 89	33
	20393(T)	1754.3	23. 17	33
3MHz(BW)	19965(B)	1711.5	22. 67	33
	20175(M)	1732.5	22. 74	33
	20385(T)	1753.5	23. 33	33
5MHz(BW)	19975(B)	1712.5	22. 77	33
	20175(M)	1732.5	22. 6	33
	20375(T)	1752.5	22. 95	33
10MHz(BW)	20000(B)	1715.0	22. 85	33
	20175(M)	1732.5	23. 35	33
	20350(T)	1750.0	23. 07	33

6.1.4.1 Substitution Results

Table 20 Substitution Results (CDMA)

Test Mode	Freq. [MHz]	Meas. Level [dBm]	Substitution Antenna Type	SGP [dBm]	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (ERP) [dBm]	FCC limit [dBm]	Result
TM1	1711.25	26.71	Horn Ant.	23.29	4.5	1	26.79	33	Pass
TM1	1732.5	26.62	Horn Ant.	23.02	4.5	1	26.52	33	Pass
TM1	1753.75	26.66	Horn Ant.	22.83	4.8	1	26.63	33	Pass
TM3	1711.25	26.66	Horn Ant.	23.12	4.5	1	26.62	33	Pass
TM3	1732.5	26.78	Horn Ant.	23.25	4.5	1	26.75	33	Pass
TM3	1753.75	26.72	Horn Ant.	22.99	4.8	1	26.79	33	Pass
Subtype 0	1711.25	26.79	Horn Ant.	23.22	4.5	1	26.72	33	Pass
Subtype 0	1732.5	26.84	Horn Ant.	23.36	4.5	1	26.86	33	Pass
Subtype 0	1753.75	26.81	Horn Ant.	23.05	4.8	1	26.85	33	Pass
Subtype 2	1711.25	26.65	Horn Ant.	23.15	4.5	1	26.65	33	Pass
Subtype 2	1732.5	26.88	Horn Ant.	23.34	4.5	1	6.84	33	Pass
Subtype 2	1753.75	26.78	Horn Ant.	22.97	4.8	1	26.77	33	Pass

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

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

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.

Table 21 Substitution Results (LTE-QPSK)

Test Mode			Meas. Level [dBm]	Substitution Antenna Type	SGP[dBm]	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (ERP) [dBm]	FCC limit [dBm]	Result
Band Width	Channel	Freq. [MHz]								
1.4MHz (BW)	19957 (B)	1710.7	23.76	Horn Ant.	20.22	4.5	1	23.72	33	Pass
	20175 (M)	1732.5	23.62	Horn Ant.	20.18	4.5	1	23.68	33	Pass
	20393 (T)	1754.3	23.85	Horn Ant.	20.01	4.8	1	23.81	33	Pass
3MHz (BW)	19965 (B)	1711.5	23.77	Horn Ant.	20.17	4.5	1	23.67	33	Pass
	20175 (M)	1732.5	23.42	Horn Ant.	19.99	4.5	1	23.49	33	Pass
	20385 (T)	1753.5	23.98	Horn Ant.	20.11	4.8	1	23.91	33	Pass
5MHz (BW)	19975 (B)	1712.5	23.78	Horn Ant.	20.21	4.5	1	23.71	33	Pass
	20175 (M)	1732.5	23.55	Horn Ant.	20.02	4.5	1	23.52	33	Pass
	20375 (T)	1752.5	23.88	Horn Ant.	20.03	4.8	1	23.83	33	Pass
10MHz (BW)	20000 (B)	1715.0	23.85	Horn Ant.	20.29	4.5	1	23.79	33	Pass
	20175 (M)	1732.5	23.98	Horn Ant.	20.41	4.5	1	23.91	33	Pass
	20350 (T)	1750.0	23.98	Horn Ant.	20.12	4.8	1	23.92	33	Pass

Table 22 Substitution Results (LTE-16QAM)

Test Mode			Meas. Level [dBm]	Substitution Antenna Type	SGP[dBm]	Substitution Gain [dBi]	Cable Loss [dB]	Substitution Level (ERP) [dBm]	FCC limit [dBm]	Result
Band Width	Channel	Freq. [MHz]								
1.4MHz (BW)	19957 (B)	1710.7	22.73	Horn Ant.	19.14	4.5	1	22.64	33	Pass
	20175 (M)	1732.5	22.89	Horn Ant.	19.23	4.5	1	22.73	33	Pass
	20393 (T)	1754.3	23.17	Horn Ant.	19.17	4.8	1	22.97	33	Pass

3MHz(BW)	19965 (B)	1711.5	22. 67	Horn Ant.	19.21	4.5	1	22. 71	33	Pass
	20175 (M)	1732.5	22. 74	Horn Ant.	19.12	4.5	1	22. 62	33	Pass
	20385 (T)	1753.5	23. 33	Horn Ant.	19.21	4.8	1	23. 01	33	Pass
5MHz(BW)	19975 (B)	1712.5	22. 77	Horn Ant.	19.07	4.5	1	22. 57	33	Pass
	20175 (M)	1732.5	22. 6	Horn Ant.	19.31	4.5	1	22. 81	33	Pass
	20375 (T)	1752.5	22. 95	Horn Ant.	18.99	4.8	1	22. 79	33	Pass
10MHz(BW)	20000 (B)	1715.0	22. 85	Horn Ant.	19.33	4.5	1	22. 83	33	Pass
	20175 (M)	1732.5	23. 35	Horn Ant.	19.6	4.5	1	23. 10	33	Pass
	20350 (T)	1750.0	23. 07	Horn Ant.	19.24	4.8	1	23. 04	33	Pass

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

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

NOTE: SGP- Signal Generator Level

b, A LTE signal with bandwidth of 1.4,3,5,10 MHz is created by the vector generator R&S SMU200A.

c, RBW=10kHz, VBW=50kHz, and integrated by the instrument to 1.4MHz.

d, RBW=30kHz, VBW=100kHz, and integrated by the instrument to 3MHz.

e, RBW=50kHz, VBW=200kHz, and integrated by the instrument to 5MHz.

f, RBW=100kHz, VBW=300kHz, and integrated by the instrument to 10MHz.

6.1.5 Conclusion

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

6.2 Conducted Power of Transmitter

6.2.1 Test Conditions

Table 23 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 Mode Subtype 0 and Subtype 2 at frequency B,M,T.
	LTE TM4 at frequency B,M,T Channel Bandwidth: All. Modulation: QPSK&16QAM RBs number: 1RB& partial RBs &Full RBs

6.2.2 Test Specifications and Limits

6.2.2.1 Specification

CFR 47 (FCC) part 2.1047 and Part 27.50(d)(2)

6.2.2.2 Supporting Standards

Table 24 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 27.54, in no any case may the peak power of a mobile station transmitter exceed 2 W. The calculated longitude EIRP by following formula:

$$\text{EIRP(dBm)} = 10 \cdot \log(\text{EIRP}_{\text{in watts}}).$$

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

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

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

Table 25 Limits

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



Antenna Gain(dBi):	2.7
Maximum Conducted Output Power (dBm)	<30.3 dBm

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 EUT to the wireless communication tester via the antenna connector. The band class is set as AWS.

(b)Test the Conducted maximum output power by the CMU 200/CMW 500.

Test setup

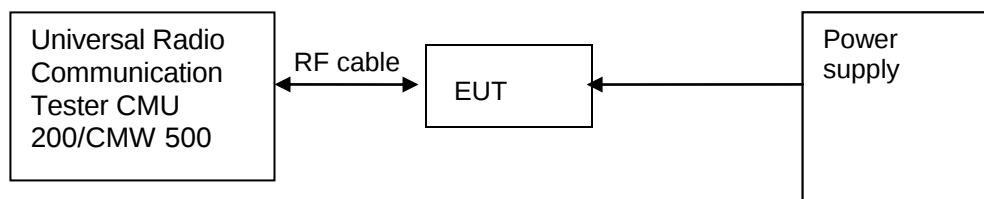


Figure 2.Test Set-up

6.2.4 Measurement Results

Table 26 CDMA Measurement Results

TEST CONDITIONS		RF Output Power(Conducted)					
		Channel 25(B) 1711.25MHz		Channel 450(M) 1732.50MHz		Channel 875(T) 1753.75MHz	
		dBm		dBm		dBm	
		Measured	Limit	Measured	Limit	Measured	Limit
TM1	Tnorm (24 °C) Vnorm (5 V)	24.01	30.3	23.92	30.3	23.96	30.3
TM3	Tnorm (24 °C) Vnorm (5 V)	23.96	30.3	24.08	30.3	24.02	30.3
Subtype 0	Tnorm (24 °C) Vnorm (5 V)	24.09	30.3	24.14	30.3	24.11	30.3
Subtype 2	Tnorm (24 °C) Vnorm (5 V)	23.95	30.3	24.18	30.3	24.08	30.3

Table 27 LTE Measurement Results



Frequencies	Test Conditions	Transmitter Maximum Output Power, Pmax					Verdict
		Modulation n	RB allocation		Pmax [dBm]	Limit [dB]	
			RBs number	RB's location			
B	1.4MHz	QPSK	1 RB	RB#0	20.77	30.3	PASS
				RB#MAX	21.06	30.3	PASS
			partial RBs	RB#0	20.85	30.3	PASS
			Full RBs	RB#0	19.82	30.3	PASS
		16QAM	1 RB	RB#0	19.84	30.3	PASS
				RB#MAX	19.94	30.3	PASS
			partial RBs	RB#0	20.03	30.3	PASS
			Full RBs	RB#0	19.05	30.3	PASS
	3MHz	QPSK	1 RB	RB#0	20.85	30.3	PASS
				RB#MAX	21.07	30.3	PASS
			partial RBs	RB#0	19.91	30.3	PASS
			Full RBs	RB#0	19.85	30.3	PASS
		16QAM	1 RB	RB#0	19.77	30.3	PASS
				RB#MAX	19.97	30.3	PASS
			partial RBs	RB#0	19.16	30.3	PASS
			Full RBs	RB#0	19.13	30.3	PASS
	5MHz	QPSK	1 RB	RB#0	20.75	30.3	PASS
				RB#MAX	21.08	30.3	PASS
			partial RBs	RB#0	20.03	30.3	PASS
			Full RBs	RB#0	19.96	30.3	PASS
		16QAM	1 RB	RB#0	19.88	30.3	PASS
				RB#MAX	20.07	30.3	PASS
			partial RBs	RB#0	19.02	30.3	PASS
			Full RBs	RB#0	19.42	30.3	PASS
	10MHz	QPSK	1 RB	RB#0	20.89	30.3	PASS
				RB#MAX	21.15	30.3	PASS
			partial RBs	RB#0	20.13	30.3	PASS
			Full RBs	RB#0	19.93	30.3	PASS
		16QAM	1 RB	RB#0	19.96	30.3	PASS
				RB#MAX	20.15	30.3	PASS
			partial RBs	RB#0	19.52	30.3	PASS
			Full RBs	RB#0	19.03	30.3	PASS
M	1.4MHz	QPSK	1 RB	RB#0	20.81	30.3	PASS
				RB#MAX	20.92	30.3	PASS
			partial RBs	RB#0	20.73	30.3	PASS
			Full RBs	RB#0	19.81	30.3	PASS
		16QAM	1 RB	RB#0	20.11	30.3	PASS
				RB#MAX	20.19	30.3	PASS
			partial RBs	RB#0	19.98	30.3	PASS
			Full RBs	RB#0	19.99	30.3	PASS
	3MHz	QPSK	1 RB	RB#0	20.72	30.3	PASS



				RB#MAX	20.65	30.3	PASS	
			partial RBs	RB#0	19.62	30.3	PASS	
			Full RBs	RB#0	19.63	30.3	PASS	
		16QAM	1 RB	RB#0	20.04	30.3	PASS	
				RB#MAX	19.82	30.3	PASS	
			partial RBs	RB#0	18.89	30.3	PASS	
			Full RBs	RB#0	18.64	30.3	PASS	
		5MHz	QPSK	1 RB	RB#0	20.85	30.3	PASS
					RB#MAX	20.72	30.3	PASS
	partial RBs			RB#0	19.66	30.3	PASS	
	Full RBs			RB#0	19.68	30.3	PASS	
	16QAM		1 RB	RB#0	19.9	30.3	PASS	
				RB#MAX	19.71	30.3	PASS	
			partial RBs	RB#0	18.74	30.3	PASS	
			Full RBs	RB#0	19.12	30.3	PASS	
	10MHz	QPSK	1 RB	RB#0	21.28	30.3	PASS	
				RB#MAX	20.54	30.3	PASS	
			partial RBs	RB#0	19.61	30.3	PASS	
			Full RBs	RB#0	19.63	30.3	PASS	
		16QAM	1 RB	RB#0	20.65	30.3	PASS	
				RB#MAX	19.98	30.3	PASS	
			partial RBs	RB#0	19.08	30.3	PASS	
			Full RBs	RB#0	18.85	30.3	PASS	
T	1.4MHz	QPSK	1 RB	RB#0	21.15	30.3	PASS	
				RB#MAX	21.27	30.3	PASS	
			partial RBs	RB#0	21.19	30.3	PASS	
			Full RBs	RB#0	20.21	30.3	PASS	
		16QAM	1 RB	RB#0	20.43	30.3	PASS	
				RB#MAX	20.35	30.3	PASS	
			partial RBs	RB#0	20.47	30.3	PASS	
			Full RBs	RB#0	19.45	30.3	PASS	
	3MHz	QPSK	1 RB	RB#0	21.28	30.3	PASS	
				RB#MAX	21.31	30.3	PASS	
			partial RBs	RB#0	20.25	30.3	PASS	
			Full RBs	RB#0	20.17	30.3	PASS	
		16QAM	1 RB	RB#0	20.63	30.3	PASS	
				RB#MAX	20.54	30.3	PASS	
			partial RBs	RB#0	19.36	30.3	PASS	
			Full RBs	RB#0	19.25	30.3	PASS	
	5MHz	QPSK	1 RB	RB#0	20.66	30.3	PASS	
				RB#MAX	21.18	30.3	PASS	
			partial RBs	RB#0	19.93	30.3	PASS	
			Full RBs	RB#0	19.91	30.3	PASS	
		16QAM	1 RB	RB#0	19.72	30.3	PASS	
				RB#MAX	20.25	30.3	PASS	
			partial RBs	RB#0	18.95	30.3	PASS	



	10MHz	QPSK	Full RBs	RB#0	19.44	30.3	PASS
			1 RB	RB#0	20.56	30.3	PASS
				RB#MAX	21.28	30.3	PASS
			partial RBs	RB#0	20.24	30.3	PASS
			Full RBs	RB#0	20.37	30.3	PASS
		16QAM	1 RB	RB#0	19.72	30.3	PASS
				RB#MAX	20.37	30.3	PASS
			partial RBs	RB#0	19.67	30.3	PASS
			Full RBs	RB#0	19.41	30.3	PASS

6.2.5 Conclusion

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

6.3 Modulation Characteristics

6.3.1 Test Conditions

Table 28 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 LTE TM4 at frequency M , Channel Bandwidth: All. Modulation: QPSK&16QAM RBs number: Full RBs

6.3.2 Test Specifications and Limits

6.3.2.1 Specification

CFR 47 (FCC) part 2.1047 and Part 27 Subpart C&L

6.3.2.2 Supporting Standards

Table 29 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 27.

Table 30 Limits

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

6.3.3 Test Method and Setup

Connect the EUT to Universal Radio Communication Tester via the antenna connector. The band class is set as AWS; the EUT'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 EUT was tested.

Test setup

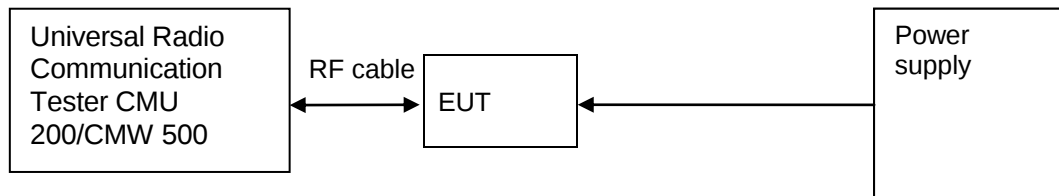


Figure 3. Test Set-up

6.3.4 Measurement Results

Table 31 CDMA Measurement Results

TEST CONDITIONS		Modulation Characteristic	
		Channel 450(M)	
		1732.5MHz	
		Measured	
		CDMA TM1 & TM3	EVDO Mode Subtype 0 & Subtype2
T _{norm} (25 °C)	V _{norm} (5V)	Refer to Appendix_A	Refer to Appendix_A

Table 32 LTE Measurement Results

TEST CONDITIONS		Modulation Characteristic			
		Channel 20175(M)			
		1732.5MHz			
		1.4MHz(BW)	3MHz(BW)	5MHz(BW)	10MHz(BW)
		Measured			
		TM4 (QPSK Modulation)		TM5 (16-QAM Modulation)	
T _{norm} (25 °C)	V _{norm} (5V)	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 33 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
	LTE TM4 at frequency M , Channel Bandwidth: All. Modulation: QPSK RBs number: Full RBs

6.4.2 Test Specifications and Limits

6.4.2.1 Specification

CFR 47 (FCC) part 2.1049 and part 27 subpart C&L

6.4.2.2 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.

6.4.2.3 Limits

No specific occupied bandwidth requirement in part 27 subpart C&L, 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 35 Limits

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

6.4.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector. The band class is set as AWS; EUT was controlled to transmit maximum power. Measure and record the occupied bandwidth of the EUT by the R&S FSQ31.

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.

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

LTE BAND Measurement bandwidth:

1.4MHz(BW)	RBW	10K
	VBW	50K
3MHz(BW)	RBW	30K
	VBW	100K
5MHz(BW)	RBW	50K
	VBW	200K
10MHz(BW)	RBW	100K
	VBW	300K

Test Set-up

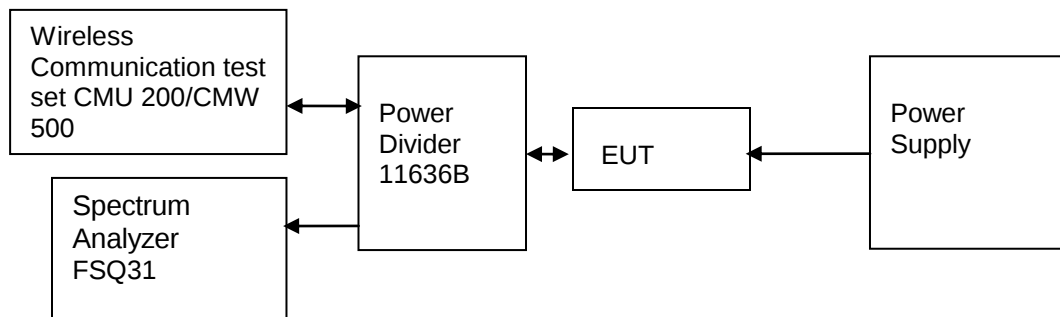


Figure 4.

Test Set-up

6.4.4 Measurement Results

Table 36 CDMA Measurement Results

		Occupied Bandwidth											
TEST CONDITIONS		Channel 25(B) 1711.25MHz				Channel 450(M) 1732.50MHz				Channel 875(T) 1753.75MHz			
		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 _{norm} (24 °C)	V _{norm} (5 V)	1.28	1.28	1.27	1.28	1.28	1.28	1.29	1.28	1.28	1.28	1.27	1.27

Table 37 LTE Measurement Results

Occupied Bandwidth			
TEST CONDITIONS	T _{norm} (25 °C), V _{norm} (5 V)		
	Channel	Frequency (MHz)	Measured (MHz)
1.4MHz(BW)	20175(M)	1732.5	1.08
3MHz(BW)	20175(M)	1732.5	2.69
5MHz(BW)	20175(M)	1732.5	4.49
10MHz(BW)	20175(M)	1732.5	8.97

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 38 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
	LTE TM4/TM5 at frequency B,T Channel Bandwidth: All Modulation: QPSK&16QAM RBs number: Full RBs

6.5.2 Test Specifications and Limits

6.5.2.1 Specification

CFR 47 (FCC) part 2.1051 and Part 27.53

6.5.2.2 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.

6.5.2.3 Limits

Compliance with 27.53(g), 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
Required attenuation:	$43 + 10 \log (0.25) = 37$, 24 dBm – 37 dB
Absolute level	- 13 dBm

6.5.3 Test Method and Setup

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the band class is set as AWS. EUT was controlled to transmit maximum power. Measure and record band

edges compliance of the EUT by the R&S FSQ31.

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

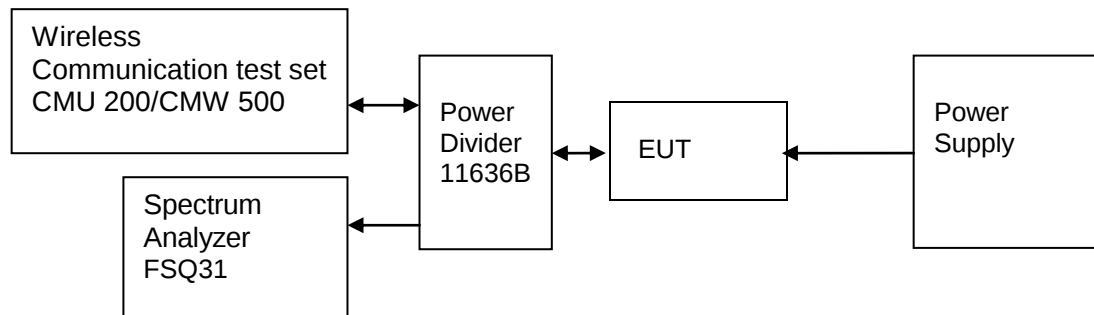


Figure 5. Test Set-up

6.5.4 Measurement Results

Table 41 CDMA 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 AWS	T_{norm} (25 °C), V_{norm} (5 V)						
	1711.25	25 (B)	TM1 & TM3	24	<-13(See appendix_C)	- 13 dBm	Pass
	1753.75	875 (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 AWS	T_{norm} (25 °C), V_{norm} (5 V)						
	1711.25	25 (B)	Subtype 0 and Subtype 2	24	<-13(See appendix_C)	- 13 dBm	Pass
	1753.75	875 (T)	Subtype 0 and Subtype 2	24	<-13(See appendix_C)	- 13 dBm	Pass

Table 42 LTE Measurement Results outside Band Edges

TEST CONDITIONS	TM4&TM5
	T_{norm} (25 °C), V_{norm} (5 V)

	Channel	Frequency (MHz)	Power [dBm]	Spurious Level measured (dBm)	FCC limit	Result
1.4MHz(BW)	19957(B)	1710.7	24	<-13(See appendix_C)	- 13 dBm	Pass
	20175(M)	1732.5	24	<-13(See appendix_C)	- 13 dBm	Pass
	20393(T)	1754.3	24	<-13(See appendix_C)	- 13 dBm	Pass
3MHz(BW)	19965(B)	1711.5	24	<-13(See appendix_C)	- 13 dBm	Pass
	20175(M)	1732.5	24	<-13(See appendix_C)	- 13 dBm	Pass
	20385(T)	1753.5	24	<-13(See appendix_C)	- 13 dBm	Pass
5MHz(BW)	19975(B)	1712.5	24	<-13(See appendix_C)	- 13 dBm	Pass
	20175(M)	1732.5	24	<-13(See appendix_C)	- 13 dBm	Pass
	20375(T)	1752.5	24	<-13(See appendix_C)	- 13 dBm	Pass
10MHz(BW)	20000(B)	1715.0	24	<-13(See appendix_C)	- 13 dBm	Pass
	20175(M)	1732.5	24	<-13(See appendix_C)	- 13 dBm	Pass
	20350(T)	1750.0	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 43 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 LTE TM4 at frequency B,M,T Channel Bandwidth: All Modulation: QPSK RBs number:1 RB

6.6.2 Test Specifications and Limits

6.6.2.1 Specification

CFR 47 (FCC) part 2.1051 and 27.53(g)

6.6.2.2 Supporting Standards

Table 44 Supporting Standards:

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

6.6.2.3 Limits

Compliance with part 27.53(g), 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 45 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

The EUT was connected to the wireless signal analyzer R&S FSQ31 via the one RF connector, the band class is set as AWS. EUT was controlled to transmit maximum power. Measure and record the Conducted Spurious Emission of the EUT by the R&S FSQ31.

According to part 27.53 the defined measurement bandwidth as following:

27.53 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 3GHz: 1 MHz;

Measurement bandwidth (RBW) for 3GHz up to 12.5GHz: 1MHz;

Measurement bandwidth (RBW) for 12.5GHz up to 20GHz: 1MHz;

Test Set-up

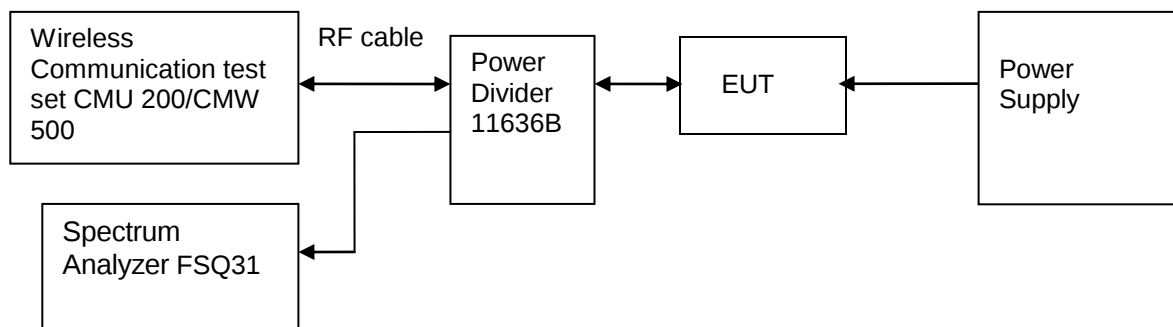


Figure 6.

Test Set-up

6.6.4 Measurement Results

Table 46 CDMA 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 450(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 875(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

Table 47 LTE Measurement Results

TEST CONDITIONS	TM4					
	T _{norm} (25 °C), V _{norm} (5 V)					
	Channel	Test Range (Frequency)	Power [dBm]	Spurious Level measured [dBm]	FCC limit	Result
1.4MHz(BW)	19957(B)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	20175(M)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	20393(T)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
3MHz(BW)	19965(B)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	20175(M)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	20385(T)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
5MHz(BW)	19975(B)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	20175(M)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	20365(T)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
10MHz(BW)	20000(B)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	20175(M)	9 kHz ~20GHz	24	<- 13 dBm (See appendix_D)	- 13 dBm	Pass
	20350(T)	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.

6.7 Radiated Spurious Emissions

6.7.1 Test Conditions

Table 48 Test Conditions

Preconditioning:	0.5 hour
Measured at:	enclosure
Ambient temperature:	25°C
Relative humidity:	55%
Test Configurations:	CDMA TM1 at frequency M EVDO Mode Subtype 0 and Subtype 2 at frequency M LTE TM4 at frequency M
	LTE TM4 at frequency M Channel Bandwidth: All Modulation: QPSK RBs number: 1RB

6.7.2 Test Specifications and Limits

6.7.2.1 Specification

CFR 47 (FCC) part 2.1053 and part 27.53(h)

6.7.2.2 Supporting Standards

Table 49 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

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 50 Limits

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

6.7.3 Test Method and Setup

A test site fulfilling the requirements of ITU-R Recommendation SM329-11 was used. The EUT was placed on a non-conducting support in the anechoic chamber and was operated from a power source via an RF filter to avoid radiation from the power leads.

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

24.238(b) Measurement procedure: Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

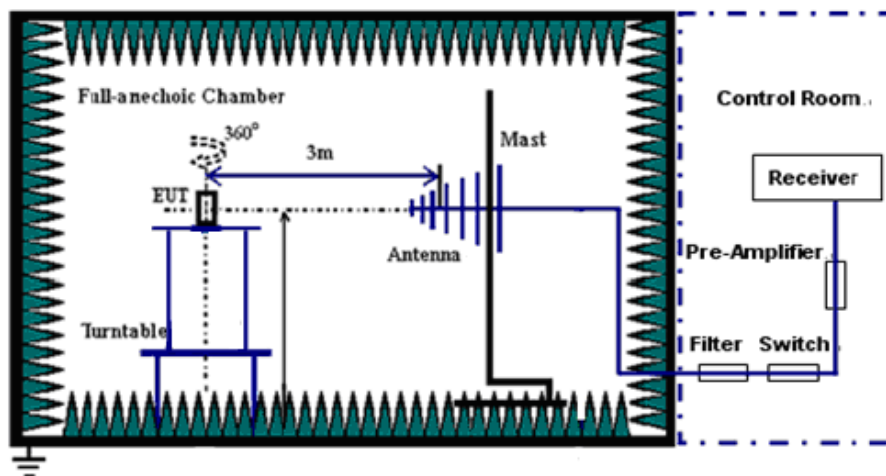
Measurement bandwidth (RBW) for 9 kHz up to 150 kHz: 1 kHz;
Measurement bandwidth (RBW) for 150 kHz up to 30 MHz: 10 kHz;
Measurement bandwidth (RBW) for 30MHz up to 18GHz: 1MHz;

Test Set-up

Step 1:

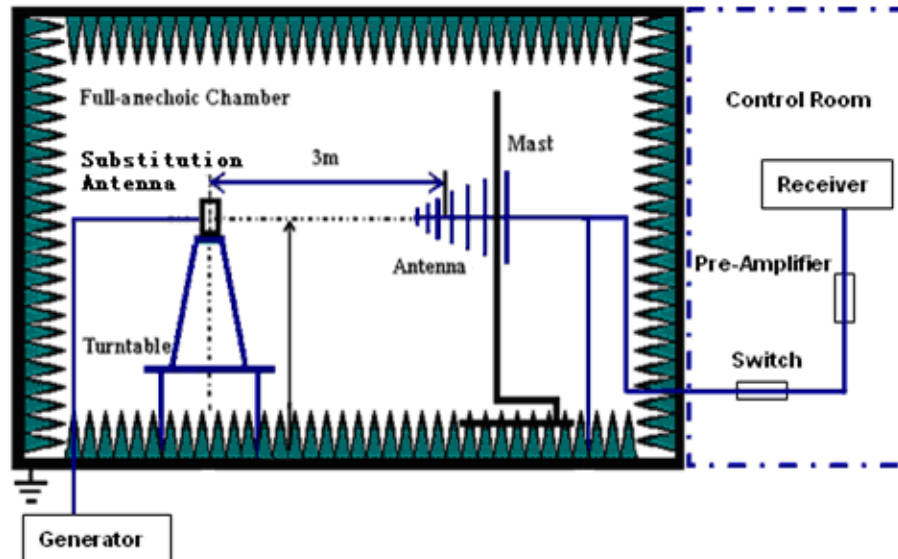
For transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, EIRP shall be measured when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in 2.1033(c)(8). Connect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

Test the Radiated maximum output power by the Test Receiver from test antenna.



Step 2:

Use substitution method to verify the maximum output power. The EUT is substituted by a dipole antenna. The dipole is connected to a signal generator. And then adjust the output level of the signal generator to get the same received power recorded in step1 on Test Receiver, and record the power level of Signal Generator. Of course, the cable loss at the test frequency should be compensated.



Test should be performed in normal voltage condition.

Table 51 Substitution Results

Freq. [MHz]	Measure ment 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,

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

NOTE: SGP- Signal Generator Level

6.7.4 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 52 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
	LTE TM4 at frequency M
	Channel Bandwidth: All
	Modulation: QPSK
	RBs number: Full RBs

6.8.2 Test Specifications and Limits

6.8.2.1 Specification

CFR 47 (FCC) part 2.1055 and Part 27.54

6.8.2.2 Supporting Standards

Table 53 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 27.54.

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 Setup

Connect the EUT to the Wireless Communication test set CMU 200/CMW 500 via the connector. Then measure the frequency error by the Wireless Communication test set CMU 200/CMW 500. The EUT's output is matched with a 50 Ω load.

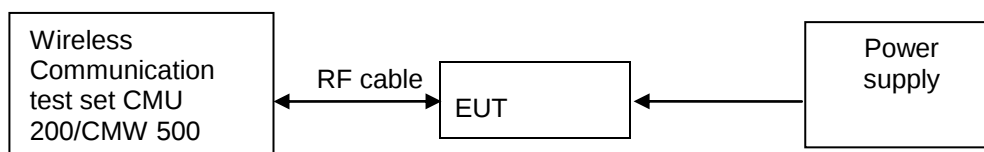


Figure 7.

Test Set up

6.8.4 Measurement Results

6.8.4.1 Measurement Results vs. Variation of Temperature

● TM1, 5 V DC Channel No.450(1732.5MHz)

Table 54 Measurement Results vs. Variation of Temperature—TM1

Temperature	Normal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	1732.5	-3	Pass
-20 °C	1732.5	10	Pass
-10 °C	1732.5	-15	Pass
0 °C	1732.5	-12	Pass
+10 °C	1732.5	-11	Pass
+20 °C	1732.5	-16	Pass
+30 °C	1732.5	15	Pass
+40 °C	1732.5	-13	Pass
+50 °C	1732.5	-11	Pass

● **TM3, 5V DC Channel No.450(1732.5MHz)**

Table 55 Measurement Results vs. Variation of
Temperature—TM3

Temperature	Norminal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	1732.5	-12	Pass
-20 °C	1732.5	-15	Pass
-10 °C	1732.5	-14	Pass
0 °C	1732.5	10	Pass
+10 °C	1732.5	6	Pass
+20 °C	1732.5	-12	Pass
+30 °C	1732.5	-11	Pass
+40 °C	1732.5	13	Pass
+50 °C	1732.5	-10	Pass

● **Subtype 0, 5V DC Channel No.450(1732.5MHz)**

Table 56 Measurement Results vs. Variation of
Temperature— Subtype 0

Temperature	Norminal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	1732.5	-12	Pass
-20 °C	1732.5	8	Pass
-10 °C	1732.5	-13	Pass
0 °C	1732.5	9	Pass
+10 °C	1732.5	-11	Pass
+20 °C	1732.5	10	Pass
+30 °C	1732.5	12	Pass
+40 °C	1732.5	-10	Pass
+50 °C	1732.5	7	Pass

● **Subtype 2, 5V DC Channel No.450(1732.5MHz)**

Table 57 Measurement Results vs. Variation of
Temperature— Subtype 2

Temperature	Norminal Frequency (MHz)	Measured Frequency Error(Hz)	Result
-30 °C	1732.5	11	Pass
-20 °C	1732.5	12	Pass

-10 °C	1732.5	-13	Pass
0 °C	1732.5	10	Pass
+10 °C	1732.5	-7	Pass
+20 °C	1732.5	-11	Pass
+30 °C	1732.5	-10	Pass
+40 °C	1732.5	-15	Pass
+50 °C	1732.5	11	Pass

● TM4, 5V DC Channel No.20175(1732.5MHz)

Table 58 Measurement Results vs. Variation of
Temperature— LTE BAND IV

LTE BAND IV				
TEST CONDITIONS	T _{norm} (25 °C), V _{norm} (5 V)			
	Temperature	Normalinal Frequency(MHz)	Measured Frequency Error(Hz)	Result
1.4MHz(BW)	-30 °C	1732.5	8	Pass
	-20 °C	1732.5	11	Pass
	-10 °C	1732.5	-11	Pass
	0 °C	1732.5	10	Pass
	+10 °C	1732.5	-13	Pass
	+20 °C	1732.5	12	Pass
	+30 °C	1732.5	6	Pass
	+40 °C	1732.5	8	Pass
	+50 °C	1732.5	-10	Pass
3MHz(BW)	-30 °C	1732.5	-6	Pass
	-20 °C	1732.5	12	Pass
	-10 °C	1732.5	-7	Pass
	0 °C	1732.5	4	Pass
	+10 °C	1732.5	11	Pass
	+20 °C	1732.5	15	Pass
	+30 °C	1732.5	-18	Pass
	+40 °C	1732.5	-10	Pass
	+50 °C	1732.5	-5	Pass
5MHz(BW)	-30 °C	1732.5	3	Pass
	-20 °C	1732.5	8	Pass
	-10 °C	1732.5	9	Pass

	0 °C	1732.5	11	Pass
	+10 °C	1732.5	-4	Pass
	+20 °C	1732.5	-3	Pass
	+30 °C	1732.5	7	Pass
	+40 °C	1732.5	12	Pass
	+50 °C	1732.5	9	Pass
10MHz(BW)	-30 °C	1732.5	10	Pass
	-20 °C	1732.5	-9	Pass
	-10 °C	1732.5	-6	Pass
	0 °C	1732.5	14	Pass
	+10 °C	1732.5	-3	Pass
	+20 °C	1732.5	9	Pass
	+30 °C	1732.5	11	Pass
	+40 °C	1732.5	-8	Pass
	+50 °C	1732.5	-15	Pass

6.8.4.2 Measurement Results vs. Variation of Voltage

- TM1, 25 °C ,Channel No. **450(1732.5MHz)**

Table 59 Measurement Results vs. Variation of Voltage—
TM1

Voltage	Normal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75 V	1732.5	12	Pass
5 V	1732.5	10	Pass
5.25 V	1732.5	11	Pass

- TM3, 25 °C ,Channel No. **450(1732.5MHz)**

Table 60 Measurement Results vs. Variation of Voltage—
TM3

Voltage	Normal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75 V	1732.5	13	Pass
5 V	1732.5	12	Pass
5.25 V	1732.5	-8	Pass

● **Subtype 0, 25 °C ,Channel No. 450 (1732.5MHz)**

Table 61 Measurement Results vs. Variation of Voltage—
Subtype 0

Voltage	Norminal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75 V	1732.5	11	Pass
5 V	1732.5	-12	Pass
5.25 V	1732.5	13	Pass

● **Subtype 2, 25 °C ,Channel No. 450 (1732.5MHz)**

Table 62 Measurement Results vs. Variation of Voltage—
Subtype 2

Voltage	Norminal Frequency (MHz)	Measured Frequency Error(Hz)	Result
4.75 V	1732.5	10	Pass
5 V	1732.5	25	Pass
5.25 V	1732.5	21	Pass

● **TM4, 25 °C ,Channel No. 20175(1732.5MHz)**

Table 63 Measurement Results vs. Variation of Voltage—
LTE BAND IV

LTE BAND IV				
TEST CONDITIONS	T _{norm} (25 °C), V _{norm} (5 V)			
	Voltage	Norminal Frequency(MHz)	Measured Frequency Error(Hz)	Result
1.4MHz(BW)	4.75 V	1732.5	9	Pass
	5 V	1732.5	12	Pass
	5.25 V	1732.5	-6	Pass
3MHz(BW)	4.75 V	1732.5	8	Pass
	5 V	1732.5	-7	Pass
	5.25 V	1732.5	-11	Pass



5MHz(BW)	4.75 V	1732.5	9	Pass
	5 V	1732.5	15	Pass
	5.25 V	1732.5	-13	Pass
10MHz(BW)	4.75 V	1732.5	12	Pass
	5 V	1732.5	10	Pass
	5.25 V	1732.5	15	Pass

6.8.5 Conclusion

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

7 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 64 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=3dB; k=2
Conducted Output Power	Power(dBm)	U=0.39dB; k=2
Conducted Emission at Power Port	Disturbance Voltage (dBμV)	U=4dB; k=2
Radiated Emission of enclosure at ideal mode	Field strength (dBμV/m)	U=5dB; k=2

8 Appendixes

Appendix A	Measurement Results Modulation Characteristics	15 pages
Appendix B	Measurement Results Occupied Bandwidth	25 Pages
Appendix C	Measurement Results Band Edges	29 Pages
Appendix D	Measurement Results Spurious Emission at Antenna Terminal	91 Pages
Appendix E	Measurement Results Radiated Spurious Emissions	22 Pages
Appendix F	Photos of Radiated Spurious Emissions	7 Pages