



# FCC RF Test Report

**Product Name: LTE 2D USB Rotator**

**Model Number: E397BU-501**

**Report No: SYBH(Z-RF)006112011-2001  
FCC ID:QISE397BU-501**

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2. The laboratory has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements. The site recognition number is 97456.
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# 1 General Information

## 1.1 Applied Standard

Applied Rules: 47 CFR FCC Part 2:2010, Subpart J  
47 CFR FCC Part 27:2010, Subpart C&L

## 1.2 Test Location

Test Location 1: Reliability Laboratory of Huawei Technologies Co., Ltd.  
Address: Huawei Base, Bantian, Longgang District, Shenzhen 518129, P.R.  
China

## 1.3 Test Environment Condition

Ambient Temperature: 20 – 25 °C  
Ambient Relative Humidity: 45 – 55 %  
Atmospheric Pressure: 101 kPa

## 2 Summary

Table 1 Summary of results

Test Case	FCC Part No.	Requirements	Result
LTE Band 4			
Transmitter Output Power	2.1046 & 27.50(d)	limited to a peak EIRP of 1 watt	Pass
Modulation Characteristics	2.1047	Digital modulation	Pass
Occupied Bandwidth	2.1049	(Not specified)	Pass
Band Edges Compliance	2.1051 & 27.53(h)	Below -13 dBm/0.1%*EBW, in 1 MHz range	Pass
Spurious Emission at Antenna Terminals	2.1051 & 27.53(h)	Below -13 dBm/1 kHz, 9 kHz to 150 kHz Below -13 dBm/10 kHz, 150 kHz to 30 MHz Below -13 dBm/1 MHz, 30 MHz to 10 <sup>th</sup> harmonics	Pass
Field Strength of Spurious Radiation	2.1053 & 27.53(h)	Below -13 dBm/1 MHz	Pass
Frequency Stability	2.1055 & 27.54	Stay within the authorized bands of operation	Pass

Table 2 Summary of results

Test Case	FCC Part No.	Requirements	Result
LTE Band 17			
Transmitter Output Power	2.1046 & 27.50(c)	Peak ERP not exceed 3 watt	Pass
Modulation Characteristics	2.1047	Digital modulation	Pass
Occupied Bandwidth	2.1049	(Not specified)	Pass
Band Edges Compliance	2.1051 & 27.53(g)	Below -13 dBm/30 kHz, in 100 kHz range	Pass
Spurious Emission at Antenna Terminals	2.1051 & 27.53(g)	Below -13 dBm/1 kHz, 9 kHz to 150 kHz Below -13 dBm/10 kHz, 150 kHz to 30 MHz Below -13 dBm/100 kHz, 30 MHz to 10 <sup>th</sup> harmonics	Pass
Field Strength of Spurious Radiation	2.1053 & 27.53(g)	Below -13 dBm/100 kHz	Pass
Frequency Stability	2.1055 & 27.54	Stay within the authorized bands of operation	Pass



## 3 Product Description

### 3.1 Production Information

#### 3.1.1 General Description

E397Bu-501 LTE/DC-HSPA+/HSPA+/WCDMA/EDGE/GPRS/GSM dual mode 9 bands 2D USB Rotator is subscriber equipment in the LTE/UMTS/GSM system. E397Bu-501 implement such functions as RF signal receiving/transmitting, LTE/DC-HSPA+/HSPA+/WCDMA and EDGE/GPRS/GSM protocol processing, data service etc. Externally it provides USB interface (to connect to the notebook etc.), USIM card interface and Micro SD card interface.

#### 3.1.2 Board

LTE 2D USB Rotator		
E397Bu-501		
Board and Module		
Equipment Designation / Description	Serial Number	Hardware Version
MAINBOARD	E3R01A11A1800260	CD2E397UM

## 4 Test Description

### 4.1 Supported Frequency Range

Characteristics	Description
Downlink	BAND 4 : 2110.7 to 2155 MHz; BAND 17: 734MHz – 746 MHz
Uplink	BAND 4: 1710 to 1755 MHz; BAND 17: 704 MHz –716 MHz

### 4.2 Transmitter / Receiver Characteristics

Characteristics	Description
System Type	LTE
TX Output Power (per Antenna Port)	LTE : 23dBm
Channel Spacing(s) / Bandwidth(s)	LTE system: Band 4:1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 20 MHz LTE system: Band 17: 5 MHz, 10 MHz,
Designation of Emissions	LTE system: 1M08D9W(1.4 MHz ,QPSK modulation), 1M08W7D (1.4 MHz ,16QAM modulation) 2M70D9W(3 MHz ,QPSK modulation) 2M68W7D (3 MHz ,16QAM modulation) 4M49D9W(5 MHz ,QPSK modulation) 4M49W7D (5 MHz ,16QAM modulation) 8M99D9W(10 MHz ,QPSK modulation) 8M94W7D (10 MHz ,16QAM modulation) 17M88D9W(20 MHz ,QPSK modulation) 17M93W7D (20 MHz ,16QAM modulation)

### 4.3 Antenna Gain

#### BAND4

Antenna Gain(dBi):	3.36
Antenna Gain(dBd):	1.21

#### BAND17

Antenna Gain(dBi):	1.48
Antenna Gain(dBd):	-0.77

### 4.4 Power Supply

Specification	Description
Power Supply Type	Directly Connected to DC /AC Power Supply
Input to Adapter (DC power)	DC Voltage Nominal: $\equiv$ +5V DC Voltage Range: $\equiv$ +4.75 V to +5.25V

## 5 General Test Conditions / Configurations

### 5.1 RF Channels under Test

Test Mode (For Band 4)	TX / RX	RF Channel		
		Bottom (B)	Middle (M)	Top (T)
TM1/TM2	TX (1.4M)	Channel 19957	Channel 20175	Channel 20393
		1710.7 MHz	1732.5MHz	1754.3 MHz
	TX (3M)	Channel 19965	Channel 20175	Channel 20385
		1711.5 MHz	1732.5MHz	1753.5 MHz
	TX (5M)	Channel 19975	Channel 20175	Channel 20375
		1712.5 MHz	1732.5MHz	1752.5 MHz
	TX (10M)	Channel 20000	Channel 20175	Channel 20350
		1715.0 MHz	1732.5MHz	1750.0 MHz
	TX (20M)	Channel 20050	Channel 20175	Channel 20300
		1720.0 MHz	1732.5MHz	1745.0 MHz
	RX (1.4M)	Channel 1957	Channel 2175	Channel 2393
		2110.7 MHz	2132.5MHz	2154.3 MHz
	RX (3M)	Channel 1965	Channel 2175	Channel 2385
		2111.5 MHz	2132.5MHz	2153.5MHz
	RX (5M)	Channel 1975	Channel 2175	Channel 2375
		2112.5 MHz	2132.5MHz	2152.5 MHz
	RX (10M)	Channel 2000	Channel 2175	Channel 2350
		2115.0 MHz	2132.5MHz	2150.0 MHz
	RX (20M)	Channel 2050	Channel 2175	Channel 2300
		2120 MHz	2132.5 MHz	2145 MHz

Test Mode (For Band 17)	TX / RX	RF Channel		
		Bottom (B)	Middle (M)	Top (T)
TM1/TM2	TX (5M)	Channel 23755	Channel 23790	Channel 23825
		706.5 MHz	710.0MHz	713.5 MHz
	TX (10M)	Channel 23780	Channel 23790	Channel 23800
		709.0MHz	710.0MHz	711.0 MHz
	RX (5M)	Channel 5755	Channel 5790	Channel 5825
		736.5 MHz	740MHz	743.5 MHz
	RX (10M)	Channel 5780	Channel 5790	Channel 5800
		739 MHz	740MHz	741 MHz

## 5.2 Test Modes

Test Mode	Test Modes Description
TM1	LTE QPSK Modulation
TM2	LTE 16QAM Modulation

## 5.3 Test Environments

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Temperature	TN	Ambient
Voltage	VL	4.75V
	VN	5.0V
	VH	5.25V

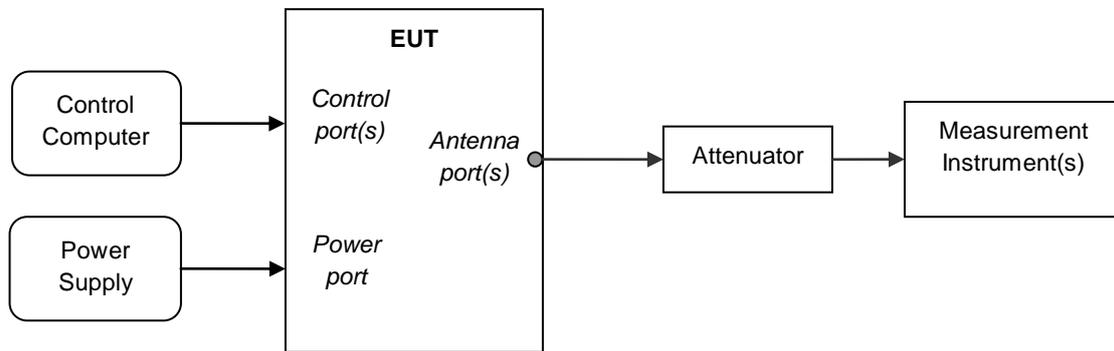
NOTE: VL= lower extreme test voltages  
VN= nominal voltage  
VH= upper extreme test voltage  
TN= normal temperature

## 5.4 Test Setups

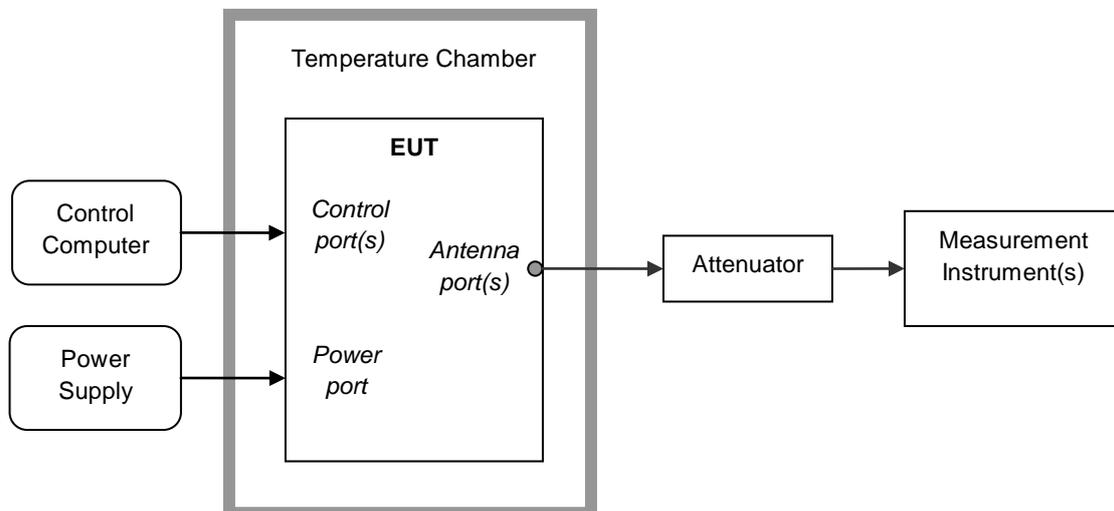
### 5.4.1 General Test Setup Configurations

Configuration	Description
Test Antenna Ports	Until otherwise declared, all TX tests are ONLY performed at the main Transmitter antenna port (e.g. TRXA, TXA and so on) of the EUT, and all RX tests are ONLY performed at the main Receiver antenna port (e.g. TRXA, RXA and so on) of the EUT.
Multiple RF Sources	Other than the tested RF source of the EUT, other RF source(s) are disabled or shutdown during measurements.

### 5.4.2 Test Setup 1



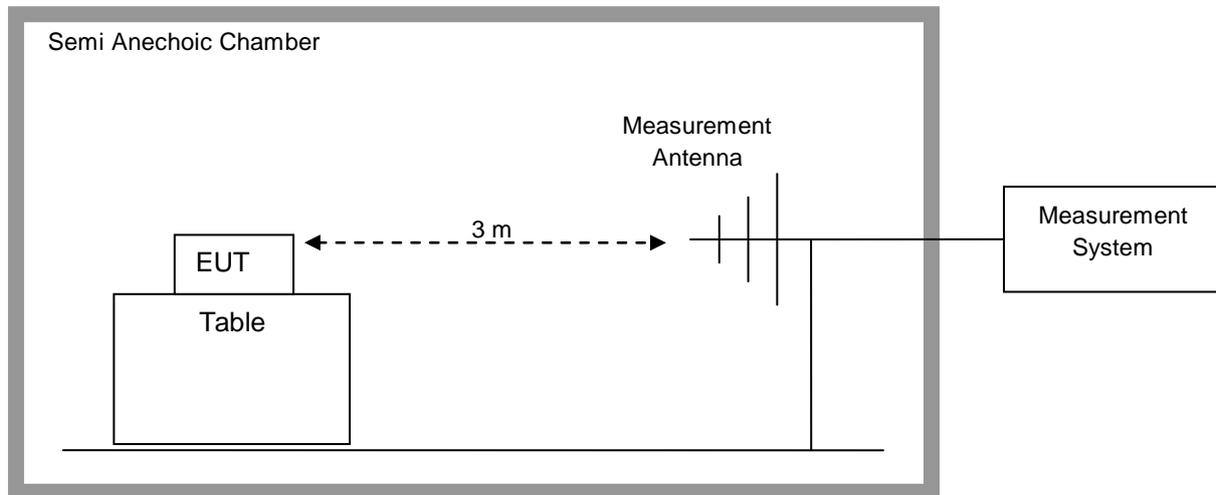
### 5.4.3 Test Setup 2



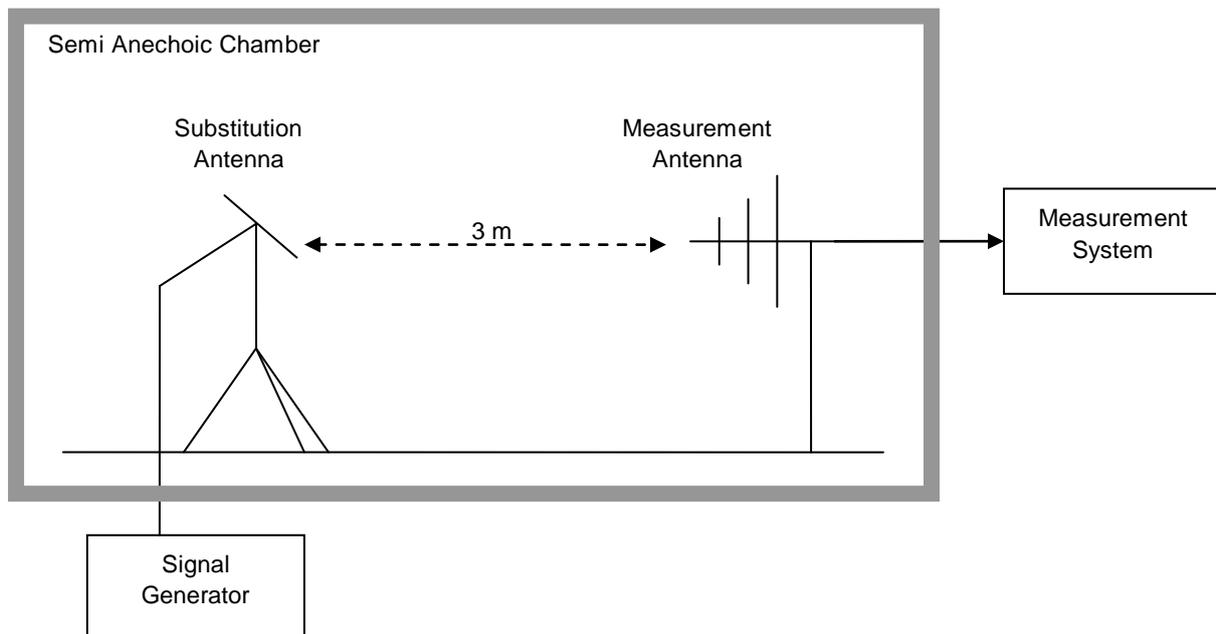
### 5.4.4 Test Setup 3

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

#### Step 1: Pre-test



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



## 5.5 Test Conditions

Test Case	Test Conditions	
Transmitter Output Power	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1 & Test Setup 3
	Detector	RMS
	RF Channels (TX)	B, M, T
	Test Mode	TM1/TM2
Modulation Characteristics	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	RF Channels (TX)	M
	Test Mode	TM1/TM2
Occupied Bandwidth	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	PK
	RF Channels (TX)	B, M, T
	Test Mode	TM1/TM2
Band Edges Compliance	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	RMS
	RF Channels (TX)	B, T
	Test Mode	TM1/TM2
Spurious Emission at Antenna Terminals	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 1
	Detector	PK
	RF Channels (TX)	B, M, T
	Test Mode	TM1
Field Strength of Spurious Radiation	Test Configuration	Ambient Temperature & Rated Voltage
	Test Setup	Test Setup 3
	Detector	PK
	RF Channels (TX)	M
	Test Mode	TM1
Frequency Stability	Test Configuration	(1) -30 °C to +50 °C with step 10 °C at Rated Voltage; (2) 85%, 100% and 115% of Rated Voltage at Ambient Temperature.
	Test Setup	Test Setup 2



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Test Case	Test Conditions	
	RF Channels (TX)	M
	Test Mode	TM1

## 6 Main Test Instruments

Equipment Description	Manufacturer	Model	Serial Number	Calibrated until
Power supply	KEITHLEY	2303	1288003	Sep.27,2012
Universal Radio Communication Tester	R&S	CMU200	117341	Jan.13.2012
Universal Radio Communication Tester	Agilent	E5515C	MY50260239	Aug.31,2012
Spectrum Analyzer	Agilent	E4440A	MY49420179	Apr.20,2012
Signal Analyzer	R&S	FSQ31	200021	Sep.27,2012
Temperature Chamber	WEISS	WKL64	24600294	Jan.03,2012
Signal generator	Agilent	E8257D	MY49281095	Jul.9.2012
Test receiver	R&S	ESU26	100150	May.29.2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	919/1009	Jan.29.2012
Tunable Dipole	Schwarzbeck	D69250-UHAP/D69250-VHAP	979/917	Jan.29.2012
Horn Antenna	R & S	HF906	100683	May.15, 2012
Horn Antenna	R & S	HF906	100684	Jul.01, 2012
Broadband Antenna	Schwarzbeck	VULB 9163	9163-357	May.15, 2012
Broadband Antenna	Schwarzbeck	VULB 9163	9163-356	May.15, 2012
Universal Radio Communication Tester	R & S	CMW500	20347676	Sep.07,2012
Universal Radio Communication Tester	Anritsu	MT8820C	6200971028	May.04, 2012



## 7 Test Results

No.	Test Item	Test Result
1	Transmitter Output Power	Appendix A
2	Modulation Characteristics	Appendix B
3	Occupied Bandwidth	Appendix C
4	Band Edges Compliance	Appendix D
5	Spurious Emission at Antenna Terminals	Appendix E
6	Field Strength of Spurious Radiation	Appendix F
7	Frequency Stability	Appendix G
8	Radiated Spurious Emissions	Appendix H

NOTE: The Appendix H only photos of Radiated Spurious Emissions, no test data.



## 8 Measurement Uncertainty

For a 95% confidence level ( $k=2$ ), the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 as following:

Test Item		Extended Uncertainty
Transmitter Output Power	Power (dBm)	U =0.39 dB
Occupied Bandwidth	Magnitude (%)	U=0.2%
Band Edge Compliance	Disturbance Power (dBm)	U=2.0 dB
Conducted Spurious Emissions	Disturbance Power (dBm)	U=2.0 dB
Field Strength of Spurious Radiation	ERP (dBm)	U=4.6 dB (30 MHz – 1GHz) U=3.0 dB (above 1 GHz)
Frequency Stability	Frequency Accuracy (ppm)	U=0.21 ppm

END