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# FCC TEST REPORT

## (PART 27)

**REPORT NO.:** RF131210C14-2

**MODEL NO.:** B100

**FCC ID:** ZL5B100

**RECEIVED:** Dec. 10, 2013

**TESTED:** Dec. 13, 2013 ~ Dec. 26, 2013

**ISSUED:** Dec. 31, 2013

**APPLICANT:** Bullitt Group

**ADDRESS:** No. 4, The Aquarium, King Street, Reading, United Kingdom, RG1 2AN.

**ISSUED BY:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

**LAB ADDRESS:** No. 47, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan, R.O.C.

**TEST LOCATION:** No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF131210C14-2	Original release	Dec. 31, 2013



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## 1 CERTIFICATION

**PRODUCT:** Rugged Mobile Phone

**MODEL NO.:** B100

**BRAND:** CAT

**APPLICANT:** Bullitt Group

**TESTED:** Dec. 13, 2013 ~ Dec. 26, 2013

**TEST SAMPLE:** Production Unit

**TEST STANDARDS:** FCC Part 27, Subpart C, L

**FCC Part 2**

ANSI C63.4-2003

The above equipment (model: B100) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**PREPARED BY** : Gina Lin, **DATE:** Dec. 31, 2013

Gina Liu / Specialist

**APPROVED BY** : Sam Chen, **DATE:** Dec. 31, 2013

Sam Chen / Senior Project Engineer



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## 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

WCDMA			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
2.1046 27.50(d)(4)	Equivalent isotropically radiated power	PASS	Meet the requirement of limit.
2.1055 27.54	Frequency Stability	PASS	Meet the requirement of limit.
2.1049 27.53(h)	Occupied Bandwidth	PASS	Meet the requirement of limit.
27.50(d)(5)	Peak to average ratio	PASS	Meet the requirement of limit.
27.53(h)	Band Edge Measurements	PASS	Meet the requirement of limit.
2.1051 27.53(h)	Conducted Spurious Emissions	PASS	Meet the requirement of limit.
2.1053 27.53(h)	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -26.73dB at 5197.8MHz.

### 2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emissions	150kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	2.93 dB
	200MHz ~1000MHz	2.95 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.



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## 2.2 TEST SITE AND INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100744	Apr. 15, 2013	Apr. 14, 2014
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 21, 2013	Dec. 20, 2014
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Mar. 25, 2013	Mar. 24, 2014
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Jan. 07, 2013	Jan. 06, 2014
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 18, 2013	Dec. 17, 2014
Loop Antenna	HFH2-Z2	100070	Jan. 31, 2012	Jan. 30, 2014
Preamplifier EMCI	EMC 012645	980115	Dec. 28, 2012	Dec. 27, 2013
Preamplifier EMCI	EMC 184045	980116	Dec. 28, 2012	Dec. 27, 2013
Preamplifier EMCI	EMC 330H	980112	Dec. 28, 2012	Dec. 27, 2013
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4	Oct. 18, 2013	Oct. 17, 2014
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 18, 2013	Oct. 17, 2014
RF signal cable Worken	RG-213	NA	Dec. 29, 2012	Dec. 28, 2013
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA
Mini-Circuits Power Splitter	ZN2PD-9G	NA	Jul. 18, 2013	Jul. 17, 2014
JFW 20dB attenuation	50HF-020-SMA	NA	NA	NA
Communications Tester-Wireless	E5515C	MY52102544	Sep. 05, 2012	Sep. 04, 2014
Radio Communication Analyzer	MT8820C	6201300640	Aug. 01, 2013	Jul. 31, 2014

**NOTE:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 10
3. The horn antenna and HP preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
4. The FCC Site Registration No. is 690701.
5. The IC Site Registration No. is IC 7450F-10.



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### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Rugged Mobile Phone	
MODEL NO.	B100	
POWER SUPPLY	5Vdc (adapter or host equipment) 3.7Vdc (battery)	
MODULATION TECHNOLOGY	WCDMA	QPSK, BPSK
FREQUENCY RANGE	WCDMA	1712.4MHz ~1752.6MHz
EMISSION DESIGNATOR	WCDMA	4M18F9W
MAX. EIRP POWER	WCDMA	106.88mW
ANTENNA TYPE	Fixed Internal Antenna	
DATA CABLE	Refer to Note as below	
I/O PORTS	Refer to users' manual	
ACCESSORY DEVICES	Refer to Note as below	

#### NOTE:

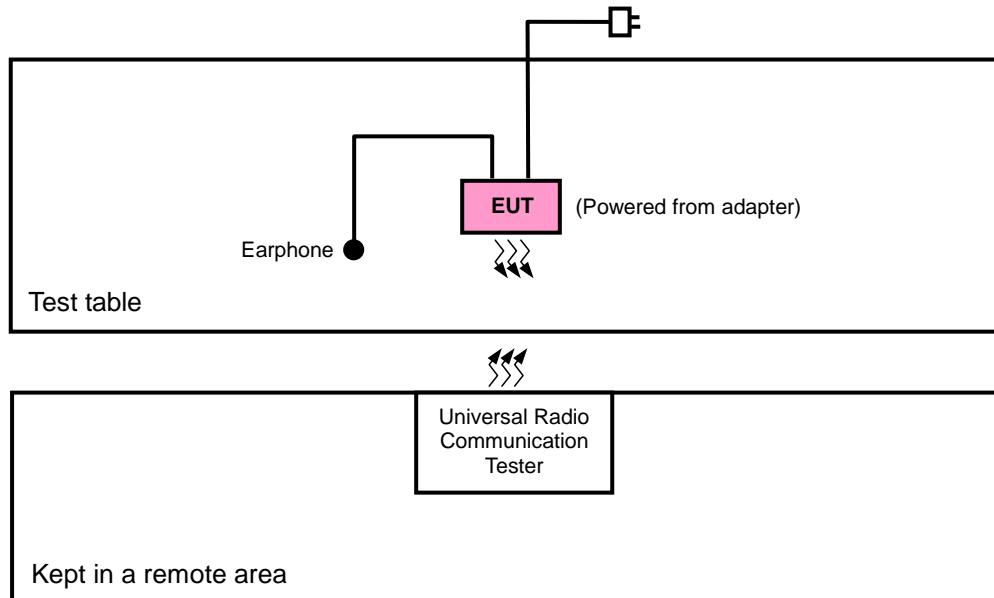
1. The EUT contains following accessory devices.

ITEM	BRAND	MODEL	SPECIFICATION
AC Adapter	CS (Cablestrong)	DSA-5PFM-05 FUS	I/P: 100-240Vac, 50/60Hz, 0.25A O/P: 5Vdc, 1A
Battery	FUJI Electronics	CB-115	3.7Vdc, 1150mAh
Earphone	LCHS	MEMD1532B080001	1.45m cable
USB Cable	JESS-LINK	PCB042100089-8	0.8m cable

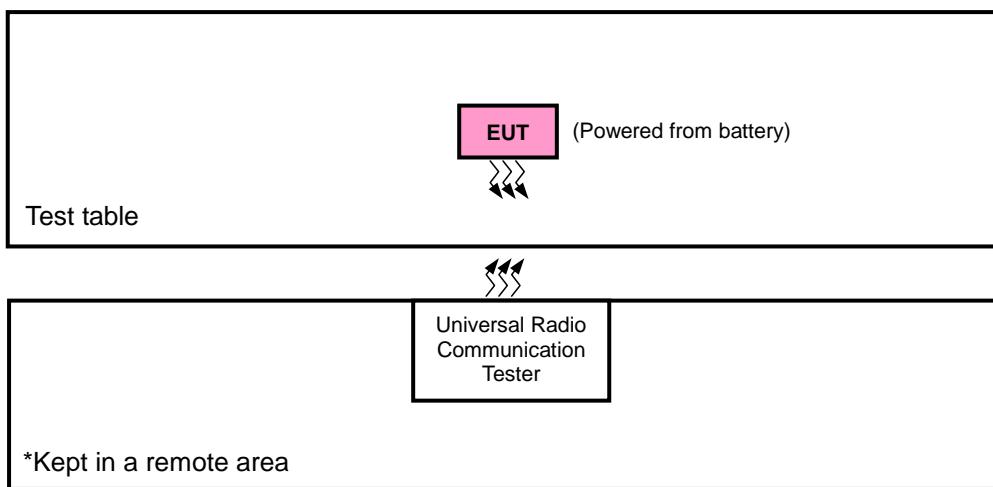
2. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

### 3.2 CONFIGURATION OF SYSTEM UNDER TEST

#### FOR RADIATION EMISSION TEST



#### FOR E.R.P. / E.I.R.P. TEST



### 3.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units.



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### 3.4 DESCRIPTION OF TEST MODES

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ axis and antenna ports. The worst case was found when positioned on Y-plane for ERP and Z-axis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

#### WCDMA

TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	MODE
EIRP	1312 to 1513	1312, 1413, 1513	WCDMA
FREQUENCY STABILITY	1312 to 1513	1413	WCDMA
OCCUPIED BANDWIDTH	1312 to 1513	1312, 1413, 1513	WCDMA
BAND EDGE	1312 to 1513	1312, 1513	WCDMA
CONDUCED EMISSION	1312 to 1513	1413	WCDMA
RADIATED EMISSION	1312 to 1513	1413	WCDMA

#### TEST CONDITION:

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
ERP/EIRP	26deg. C, 64%RH	3.7Vdc	Howard Kao
FREQUENCY STABILITY	26deg. C, 64%RH	3.7Vdc	Howard Kao
OCCUPIED BANDWIDTH	26deg. C, 64%RH	3.7Vdc	Howard Kao
BAND EDGE	26deg. C, 64%RH	3.7Vdc	Howard Kao
CONDUCED EMISSION	26deg. C, 64%RH	3.7Vdc	Howard Kao
RADIATED EMISSION	25deg. C, 65%RH	120Vac, 60Hz	Anson Lin



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### **3.5 GENERAL DESCRIPTION OF APPLIED STANDARDS**

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

**FCC 47 CFR Part 2**  
**FCC 47 CFR Part 27**  
**ANSI C63.4-2003**  
**ANSI/TIA/EIA-603-C 2004**

**NOTE:** All test items have been performed and recorded as per the above standards.



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## 4 TEST TYPES AND RESULTS

### 4.1 OUTPUT POWER MEASUREMENT

#### 4.1.1 LIMITS OF OUTPUT POWER MEASUREMENT

Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP.

#### 4.1.2 TEST PROCEDURES

##### **EIRP MEASUREMENT:**

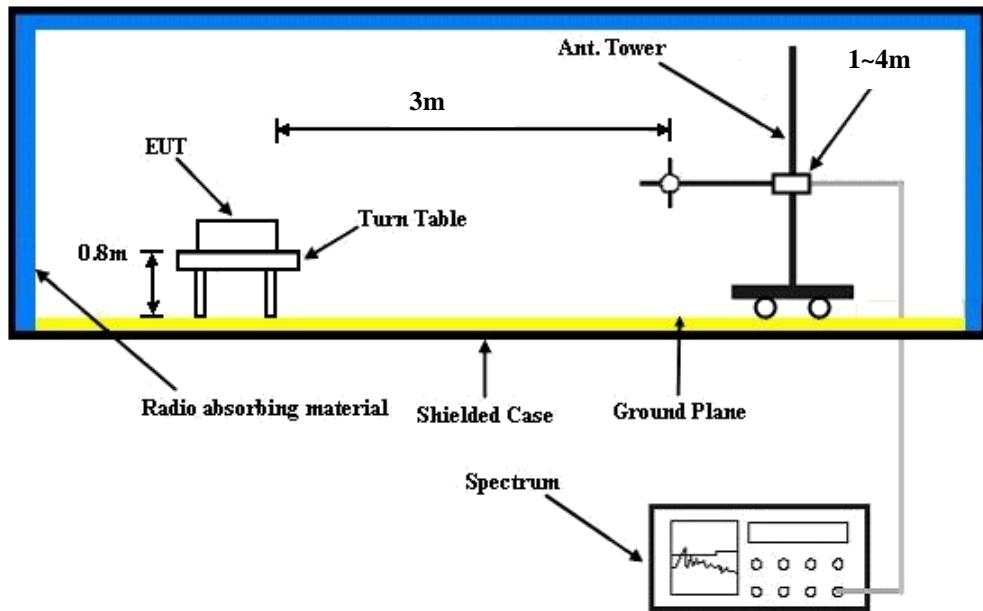
- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 1MHz for GSM, GPRS & EDGE, 5MHz for CDMA & WCDMA, and 10MHz for LTE mode.
- b. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The “Read Value” is the spectrum reading the maximum power value.
- c. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a tx cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Read Value” of step b. Record the power level of S.G
- d. 
$$\text{EIRP} = \text{Output power level of S.G} - \text{TX cable loss} + \text{Antenna gain of substitution horn.}$$

##### **CONDUCTED POWER MEASUREMENT:**

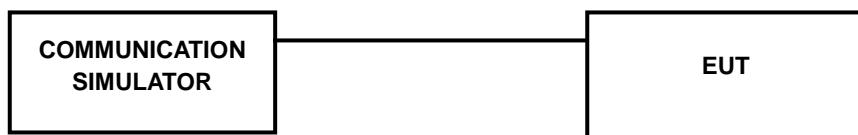
- a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
- b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

#### 4.1.3 TEST SETUP

##### EIRP / ERP MEASUREMENT:



##### CONDUCTED POWER MEASUREMENT:





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#### 4.1.4 TEST RESULTS

##### AVERAGE CONDUCTED OUTPUT POWER (dBm)

Band	WCDMA IV		
Channel	1312	1413	1513
Frequency (MHz)	1712.4	1732.6	1752.6
RMC 12.2K	23.34	23.08	23.33

##### AVERAGE EIRP (dBm)

###### WCDMA

###### CHANNEL BANDWIDTH: 5MHz QPSK

Plane	Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
Z	1312	1712.4	-16.18	36.29	20.11	102.54	H
	1413	1732.6	-16.40	36.69	20.29	106.88	
	1513	1752.6	-16.77	36.98	20.21	104.93	
	1312	1712.4	-20.69	37.11	16.42	43.83	V
	1413	1732.6	-20.87	37.60	16.73	47.10	
	1513	1752.6	-21.15	37.65	16.50	44.66	

## 4.2 FREQUENCY STABILITY MEASUREMENT

### 4.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

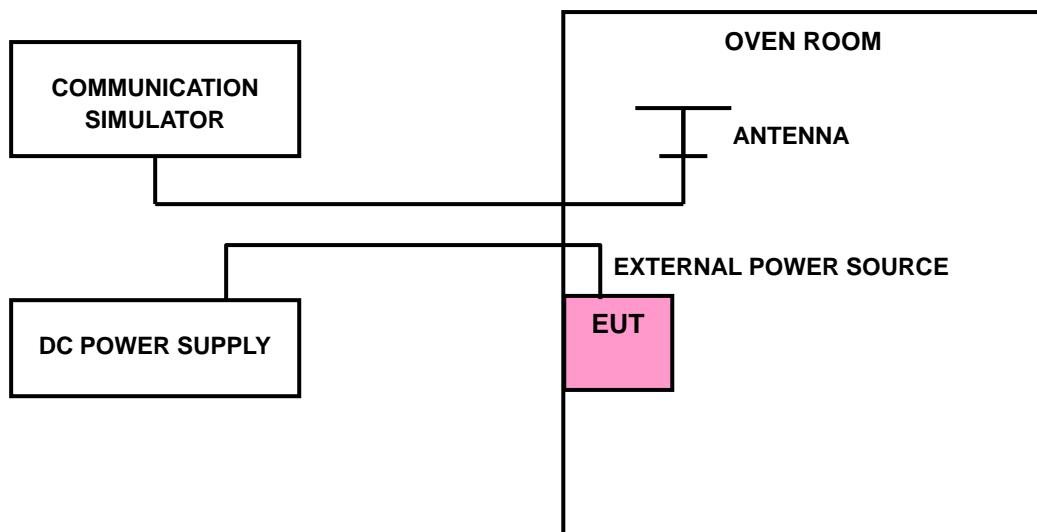
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

### 4.2.2 TEST PROCEDURE

- a. Device is placed at the oven room. The oven room could control the temperatures and humidity. Power warm up is at least 15 min and power applied should perform before recording frequency error.
- b. EUT is connected the external power supply to control the DC input power. The test voltage range is from minimum to maximum working voltage. Each step shall be record the frequency error rate.
- c. The temperature range step is 10 degrees in this test items. All temperature levels shall be hold the  $\pm 0.5^{\circ}\text{C}$  during the measurement testing. The each temperature step shall be at least 0.5 hours, consider the EUT could be test under the stability condition.

**NOTE:** The frequency error was recorded frequency error from the communication simulator.

### 4.2.3 TEST SETUP





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#### 4.2.4 TEST RESULTS

##### FREQUENCY ERROR vs. VOLTAGE

VOLTAGE (Volts)	FREQUENCY ERROR (ppm)	
	WCDMA	LIMIT (ppm)
3.8	0.002	2.5
3.6	-0.002	2.5
4.35	-0.003	2.5

**NOTE:** The applicant defined the normal working voltage of the battery is from 3.6Vdc to 4.35Vdc.

##### FREQUENCY ERROR vs. TEMPERATURE

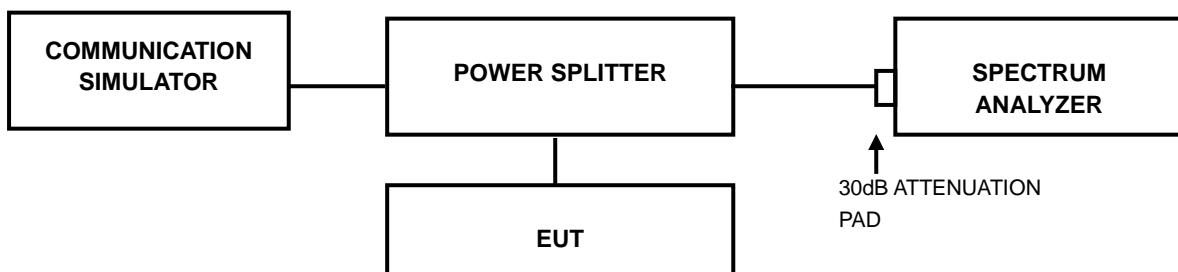
TEMP. (°C)	FREQUENCY ERROR (ppm)	
	WCDMA	LIMIT (ppm)
-30	-0.002	2.5
-20	-0.003	2.5
-10	-0.002	2.5
0	0.002	2.5
10	0.006	2.5
20	0.002	2.5
30	-0.002	2.5
40	-0.002	2.5
50	-0.004	2.5

## 4.3 OCCUPIED BANDWIDTH MEASUREMENT

### 4.3.1 LIMITS OF OCCUPIED BANDWIDTH MEASUREMENT

The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

### 4.3.2 TEST SETUP

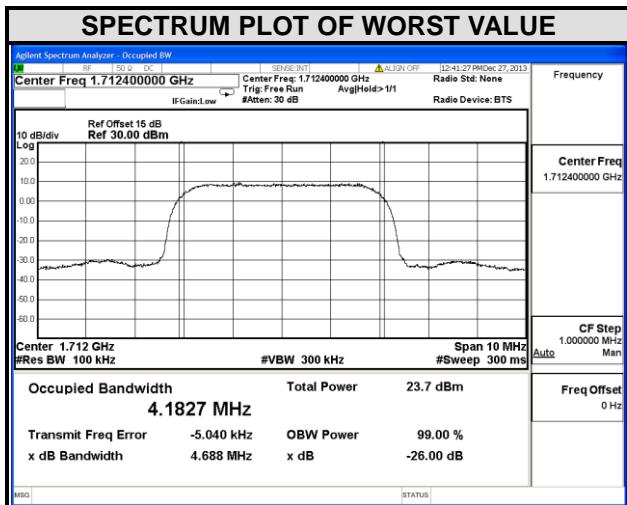


### 4.3.3 TEST PROCEDURES

- a. The conducted occupied bandwidth used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- b. Use OBW measurement function of Spectrum analyzer to measure 99 % occupied bandwidth.

#### 4.3.4 TEST RESULTS

WCDMA		
CHANNEL	FREQUENCY (MHz)	99% OCCUPIED BANDWIDTH (MHz)
1312	1712.4	4.18
1413	1732.6	4.18
1513	1752.6	4.18

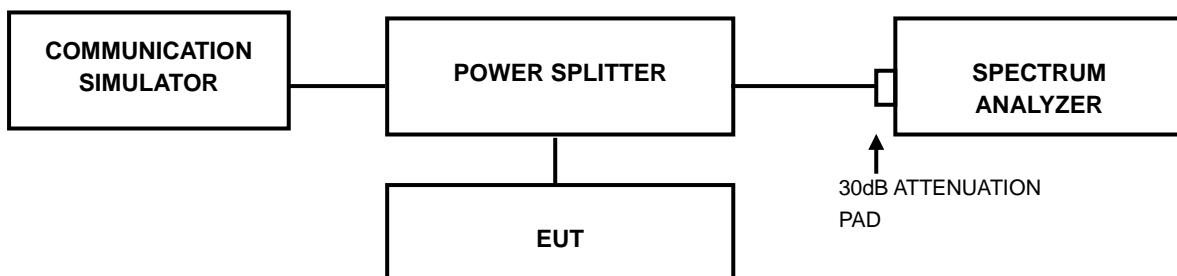


## 4.4 PEAK TO AVERAGE RATIO

### 4.4.1 LIMITS OF PEAK TO AVERAGE RATIO MEASUREMENT

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

### 4.4.2 TEST SETUP

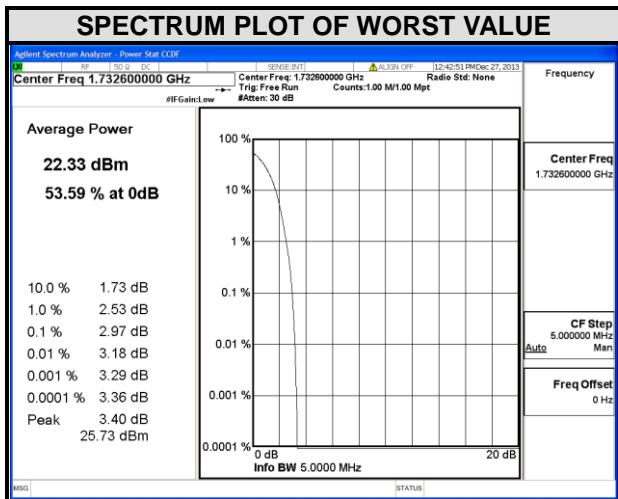


### 4.4.3 TEST PROCEDURES

1. Set resolution/measurement bandwidth  $\geq$  signal's occupied bandwidth;
2. Set the number of counts to a value that stabilizes the measured CCDF curve;
3. Record the maximum PAPR level associated with a probability of 0.1%.

#### 4.4.4 TEST RESULTS

WCDMA		
CHANNEL	FREQUENCY (MHz)	PEAK TO AVERAGE RATIO (dB)
1312	1712.4	2.75
1413	1732.6	2.97
1513	1752.6	2.92

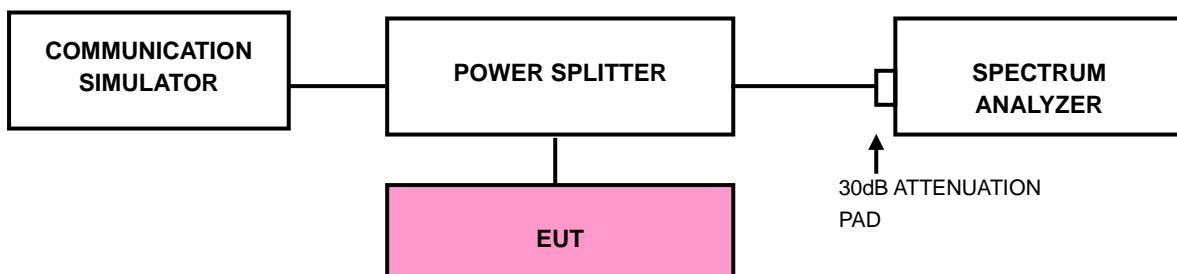


## 4.5 BAND EDGE MEASUREMENT

### 4.5.1 LIMITS OF BAND EDGE MEASUREMENT

For operations in the 1710 – 1755 MHz MHz bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB.

### 4.5.2 TEST SETUP



### 4.5.3 TEST PROCEDURES

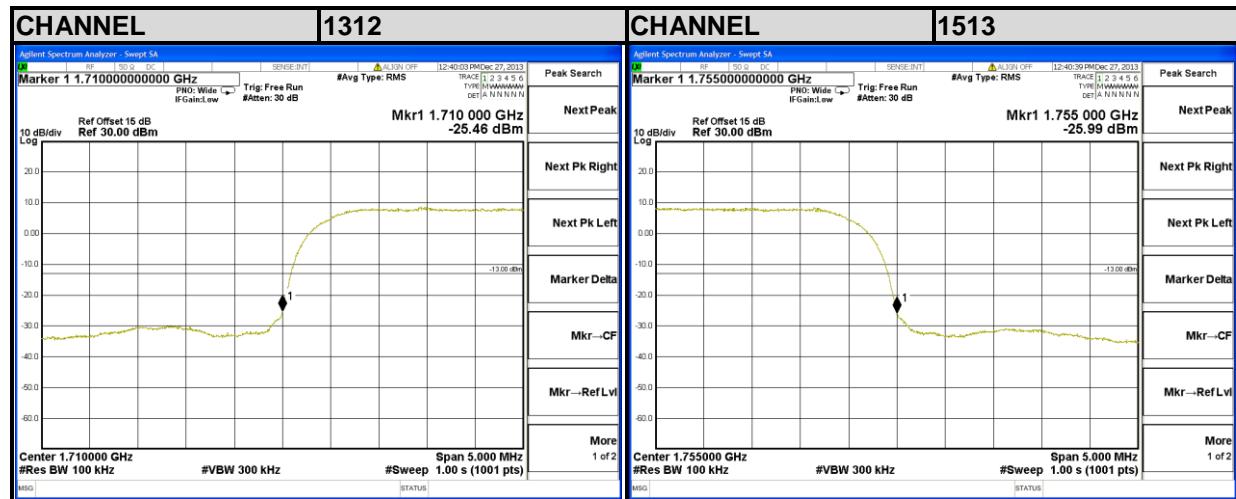
- a. The EUT was set up for the maximum peak power with LTE link data modulation. The power was measured with R&S Spectrum Analyzer. All measurements were done at 2 channels (low and high operational frequency range.).
- b. The band edge measurement used the power splitter via EUT RF power connector between simulation base station and spectrum analyzer.
- c. The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz.
- d. The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 91kHz and VB of the spectrum is 300kHz (LTE Band 4 Bandwidth 5MHz).
- e. Record the max trace plot into the test report.



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#### 4.5.4 TEST RESULTS

##### WCDMA



## 4.6 CONDUCTED SPURIOUS EMISSIONS

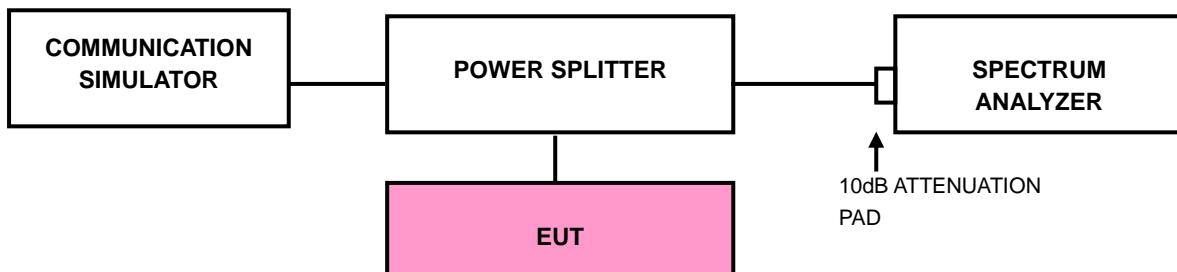
### 4.6.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB. The limit of emission equal to  $-13\text{dBm}$

### 4.6.2 TEST PROCEDURE

- a. The EUT makes a phone call to the communication simulator. All measurements were done at low, middle and high operational frequency range.
- b. Measuring frequency range is from 30 MHz to 8GHz for LTE Band 17 and from 30MHz to 18GHz for LTE Band 4. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

### 4.6.3 TEST SETUP

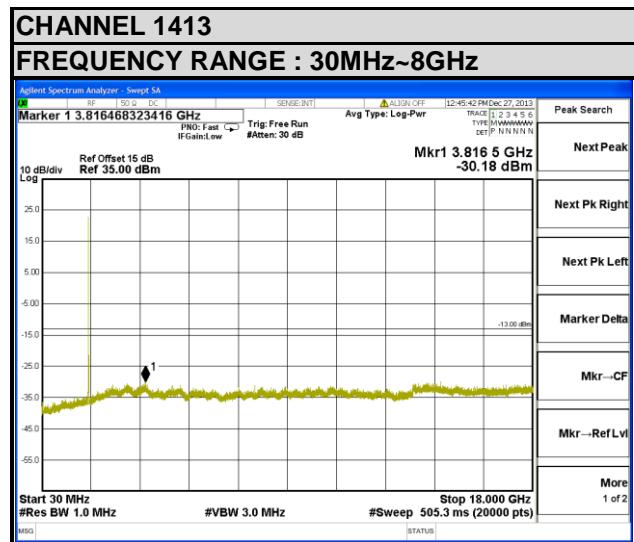




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#### 4.6.4 TEST RESULTS

##### WCDMA





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## 4.7 RADIATED EMISSION MEASUREMENT

### 4.7.1 LIMITS OF RADIATED EMISSION MEASUREMENT

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least  $43 + 10 \log_{10}(P)$  dB. The limit of emission equal to  $-13\text{dBm}$

### 4.7.2 TEST PROCEDURES

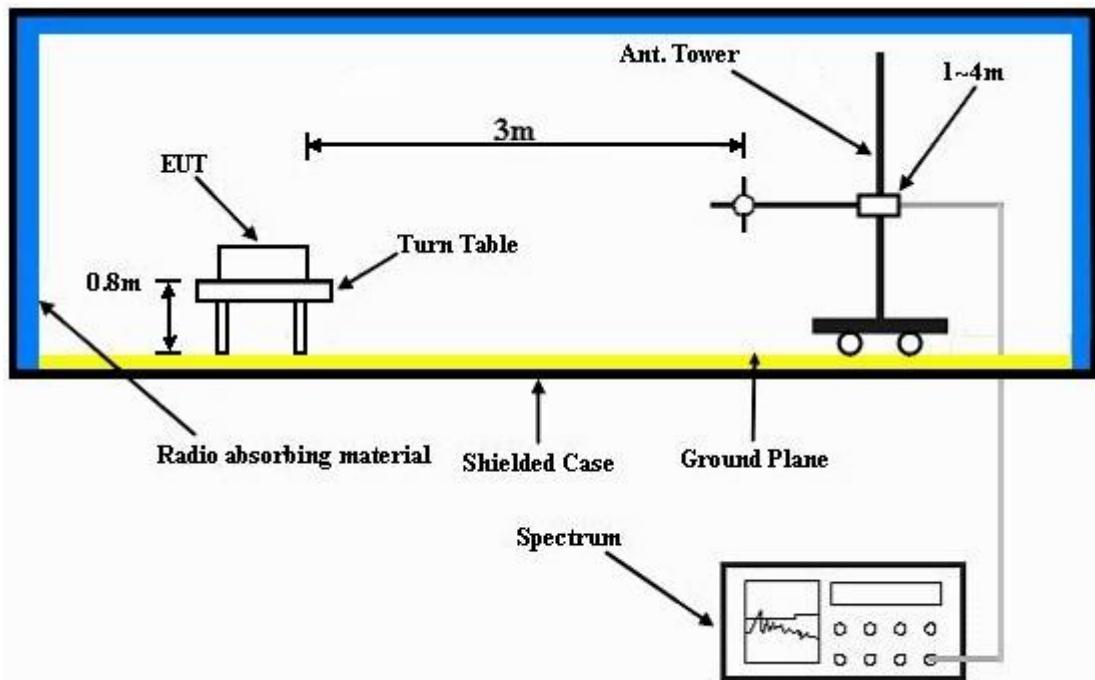
- a. Substitution method is used for E.I.R.P measurement. In the semi-anechoic chamber, EUT placed on the 0.8m height of Turn Table, rotated the table around 360 degrees to search the maximum radiation power and receiver antenna shall be rotated vertical and horizontal polarization and moved height from 1m to 4m to find the maximum polar radiated power. The "Read Value" is the spectrum reading the maximum power value.
- b. The substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to "Read Value" of step a. Record the power level of S.G
- c. EIRP = Output power level of S.G - TX cable loss + Antenna gain of substitution horn.
- d. E.R.P power can be calculated form E.I.R.P power by subtracting the gain of dipole, E.R.P power = E.I.P.R power - 2.15dBi.

**NOTE:** The resolution bandwidth of spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz.

### 4.7.3 DEVIATION FROM TEST STANDARD

No deviation

#### 4.7.4 TEST SETUP



For the actual test configuration, please refer to the attached file (Test Setup Photo).



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## 4.7.5 TEST RESULTS

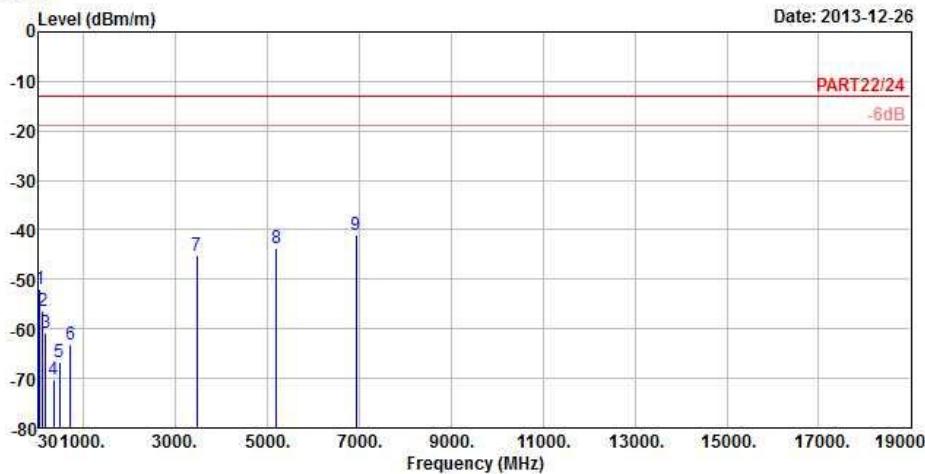
### WCDMA



Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 15



Site : 966 Chamber 5  
Condition : PART22/24 3m HORIZONTAL  
Brand/Model: B100  
Remark : Band IV Link  
Tested by : Anson Lin  
Temperature : 25°C  
Humidity : 65%  
Plane : Z

Freq	Read		Limit Line	Over Limit	Factor	Remark
	Level	Level				
MHz	dBm/m	dBm	dBm/m	dB	dB/m	
1	42.96	-51.91	-50.58	-13.00	-38.91	-1.33 Peak
2	108.84	-56.41	-45.82	-13.00	-43.41	-10.59 Peak
3	180.12	-60.81	-55.14	-13.00	-47.81	-5.67 Peak
4	351.10	-70.32	-64.32	-13.00	-57.32	-6.00 Peak
5	484.80	-66.61	-63.13	-13.00	-53.61	-3.48 Peak
6	720.70	-63.07	-64.66	-13.00	-50.07	1.59 Peak
7	3465.20	-45.22	-36.20	-13.00	-32.22	-9.02 Peak
8	5197.80	-43.58	-40.52	-13.00	-30.58	-3.06 Peak
9 pp	6930.40	-41.17	-43.47	-13.00	-28.17	2.30 Peak



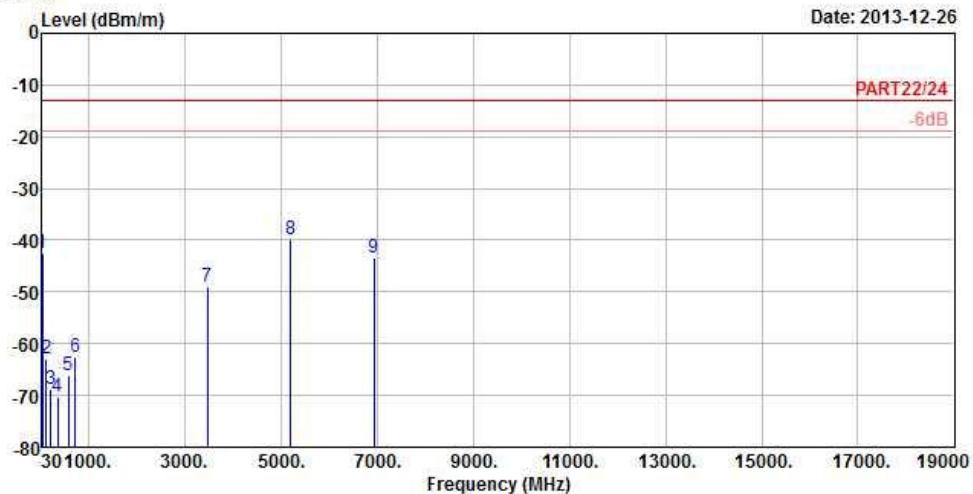
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Bureau Veritas Consumer Products Services Ltd., Taoyuan Branch

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Data: 16



Site : 966 Chamber 5  
Condition : PART22/24 3m VERTICAL  
Brand/Model: B100  
Remark : Band IV Link  
Tested by : Anson Lin  
Temprature : 25°C  
Humidity : 65%  
Plane : Z

Freq	Level	Read		Limit Line	Over		Remark
		MHz	dBm/m	dBm	dBm/m	dB	
1	30.81	-42.43	-42.77	-13.00	-29.43	0.34	Peak
2	106.95	-62.78	-52.23	-13.00	-49.78	-10.55	Peak
3	215.22	-68.91	-61.66	-13.00	-55.91	-7.25	Peak
4	349.00	-70.21	-64.20	-13.00	-57.21	-6.01	Peak
5	573.00	-66.23	-65.14	-13.00	-53.23	-1.09	Peak
6	719.30	-62.71	-64.29	-13.00	-49.71	1.58	Peak
7	3465.20	-49.01	-39.99	-13.00	-36.01	-9.02	Peak
8 pp	5197.80	-39.73	-36.67	-13.00	-26.73	-3.06	Peak
9	6930.40	-43.26	-45.56	-13.00	-30.26	2.30	Peak



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## 5 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Fax: 886-2-26051924

**Hsin Chu EMC/RF Lab:**

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**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

The address and road map of all our labs can be found in our web site also.



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## 6 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB

No modifications were made to the EUT by the lab during the test.

---END---