



# FCC TEST REPORT (PART 27)

**REPORT NO.:** 140084N016-3

MODEL NO.: Lenovo A606

FCC ID: YCNA606

**RECEIVED:** Aug. 04, 2014

**TESTED:** Aug. 04, 2014 ~ Aug. 21, 2014

**ISSUED:** Aug. 22, 2014

APPLICANT: Lenovo Mobile Communication Technology Ltd.

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Optoelectronics Park, Torch Hi-tech Industry Development Zone, Xiamen, P.R.China

ISSUED BY: Bureau Veritas Shenzhen Co., Ltd. Dongguan

Branch

LAB ADDRESS: No. 34, Chenwulu Section, Guantai Road, Houjie

Town, Dongguan City, Guangdong 523942, China

**TEST LOCATION:** No. 34, Chenwulu Section, Guantai Road, Houjie

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## **RELEASE CONTROL RECORD**

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF140804N016-2	Original release	Aug. 22, 2014

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#### 1 CERTIFICATION

**PRODUCT:** Lenovo Mobile Phone

MODEL: Lenovo A606

BRAND: lenovo

**APPLICANT:** Lenovo Mobile Communication Technology Ltd.

**TESTED:** Aug. 04, 2014 ~ Aug. 21, 2014

TEST SAMPLE: ENGINEERING SAMPLE

STANDARDS: FCC Part 27, Subpart C, M

FCC Part 2

ANSI C63.4-2003

The above equipment has been tested by **Bureau Veritas Shenzhen Co., Ltd. Dongguan 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.

TESTED BY : , DATE : Aug. 22, 2014

Glyn He/ Project Engineer

**APPROVED BY**: , **DATE**: Aug. 22, 2014

Sam Tung / Technical Manager



#### 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 27 & Part 2					
STANDARD SECTION TEST TYPE AND LIMIT		RESULT	REMARK		
2.1046 27.50(h)	Fauivalent Isotronically Radiated Power		Meet the requirement of limit.		
2.1055 27.54	Frequency Stability		Meet the requirement of limit.		
2.1049 Occupied Bandwidth		PASS	Meet the requirement of limit.		
27.50(d)(5) Peak to average ratio		PASS	Meet the requirement of limit.		
2.1051 27.53(m) Band Edge Measurements		PASS	Meet the requirement of limit.		
2.1051 27.53(m)	Conducted Spurious Emissions	PASS	Meet the requirement of limit.		
2.1053 27.53(m)	Radiated Spurious Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -5.48dB at 10140 MHz.		

#### 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	9kHz~30MHz	2.67dB
	9KHz ~ 30MHz	2.74dB
Radiated emissions	30MHz ~ 1GMHz	4.06dB
ixadiated emissions	1GHz ~ 18GHz	4.58dB
	18GHz ~ 40GHz	1.94dB

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

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#### **TEST SITE AND INSTRUMENTS** 2.2

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Spectrum Analyzer	Agilent	E4446A	MY46180622	Apr. 29,14	Apr. 28,15
Spectrum Analyzer (10Hz–40GHz)	Rohde&Schwarz	FSV40	101003	Apr. 09,14	Apr. 08,15
Signal Analyzer	Rohde&Schwarz	FSV7	102331	Nov. 25,13	Nov. 24,14
EMI Test Receiver	Rohde&Schwarz	ESVD	ESVS10	May 18,14	May 17,15
Loop antenna (9kHz~30MHz)	Daze	ZN30900A	0708	Nov. 28,13	Nov. 27,14
Bilog Antenna (20MHz~2GHz)	Teseq	CBL 6111D	30643	Jul. 27, 14	Jul. 26, 15
Horn Antenna (1GHz -18GHz)	ETS -Lindgren	3117	00062558	Oct. 18, 12	Oct. 17, 14
Horn Antenna (15GHz-40GHz)	SCHWARZBECK	BBHA 9170	BBHA9170242	Feb. 13,14	Feb. 12,15
Signal Amplifier	Agilent	8447D	2944A10488	Jun. 25,14	Jun. 24,15
Pre-Amplifier (100MHz-26.5GHz)	Agilent	8449B	3008A00409	May 13,14	May 12,15
Pre-Amplifier (18GHz-40GHz)	EMCI	EMC 184045	980102	Nov. 04,13	Nov. 03,14
Digital Multimeter	FLUKE	15B	A1220010DG	Oct. 30, 13	Oct. 29, 14
Power Sensor	Anritsu	MA2411B	1126068	Feb. 21,14	Feb. 20,15
Power Meter	Anritsu	ML2495A	1139001	Feb. 21,14	Feb. 20,15
3m Semi-anechoic Chamber	ETS-LINDGREN	9m*6m*6m	NSEMC003	Apr. 19,14	Apr. 18,15
Humid & Temp Programmable Tester	Haida	HD-2257	110807201	Sep. 17,13	Sep. 16,14
Universal Radio Communication Tester	Rohde&Schwarz	CMU 200	123259	Apr. 16,13	Apr. 15,15
RADIO COMMUNICATION ANALYZER	Anritsu	8820C	6201300716	Sep. 26,13	Sep. 26,14
Test Software	ADT	ADT_Radiated _V7.6.15.9.2	N/A	N/A	N/A

- NOTE: 1. The calibration interval of the above test instruments is 12 months or 24 months and the calibrations are traceable to CEPREI/CHINA, GRGT/CHINA and NIM/CHINA.
  - 2. The test was performed in Dongguan 966 Chamber.
  - 3. The horn antenna are used only for the measurement of emission frequency above 1GHz if tested.
  - 4. The FCC Site Registration No. is 494399.

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## **3 GENERAL INFORMATION**

#### 3.1 GENERAL DESCRIPTION OF EUT

PRODUCT Lenovo Mobile Phone				
MODEL NO.	Lenovo A606			
MID	60600031			
POWER SUPPLY	5Vdc (adapter or host equipment) 3.8Vdc (battery)			
MODULATION TECHNOLOGY	LTE Band 7	QPSK, 16QAM		
	LTE Band 7 Channel Bandwidth: 5MHz	2502.5MHz ~ 2567.5MHz		
FREQUENCY RANGE	LTE Band 7 Channel Bandwidth: 10MHz	2505MHz ~ 2565MHz		
T NEGOLIIO I IVIIIOL	LTE Band 7 Channel Bandwidth: 15MHz	2507.5MHz ~ 2562.5MHz		
	LTE Band 7 Channel Bandwidth: 20MHz	2510MHz ~ 2560MHz		
	LTE Band 7	QPSK: 4M50G7D		
	Channel Bandwidth: 5MHz	16QAM: 4M49W7D		
	LTE Band 7 Channel Bandwidth: 10MHz	QPSK: 8M94G7D		
EMISSION DESIGNATOR		16QAM: 8M94W7D		
	LTE Band 7 Channel Bandwidth: 15MHz	QPSK: 13M4G7D		
		16QAM: 13M5W7D		
	LTE Band 7 Channel Bandwidth: 20MHz	QPSK: 18M0G7D		
		16QAM: 17M9W7D		
	LTE Band 7 Channel Bandwidth: 5MHz	QPSK: 175.39 mW		
		16QAM: 135.83 mW		
	LTE Band 7	QPSK: 168.66 mW		
MAX. EIRP POWER	Channel Bandwidth: 10MHz	16QAM: 132.43 mW		
III JULI I GWER	LTE Band 7	QPSK: 165.20 mW		
	Channel Bandwidth: 15MHz	16QAM: 130.92 mW		
	LTE Band 7	QPSK: 166.72 mW		
	Channel Bandwidth: 20MHz	16QAM: 133.05 mW		
ANTENNA TYPE	Fixed Internal antenna with -5dBi gain			
HW VERSION	HW VERSION LWDM015C			
SW VERSION	<b>SW VERSION</b> LWD3I20.1.6.1.0T05A0731_M015			

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IDAIACABLE	USB Cable: Shielded, Detachable,1.0m Earphone Cable: Unshielded, Detachable,1.5m
I/O PORTS	Refer to users' manual

#### NOTE:

1. The EUT consumes power from the following adapter.

ADAPTER		
BRAND:	lenovo	
MODEL:	C-P56	
NPUT:	AC 100-240V, 50/60Hz, 300mA	
оитрит:	DC 5V, 1000mA	
MANUFACTURER:	Huntkey	

2. The EUT matched the following USB cable:

USB CABLE	9
BRAND:	LIQI
MODEL:	LQ-0350005-02
SIGNAL LINE:	1.0 METER

3. 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.

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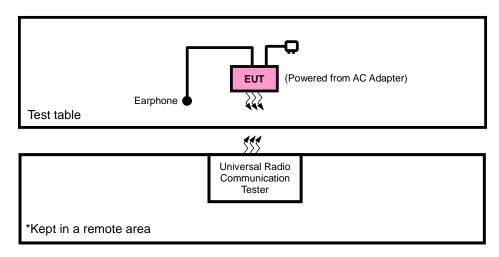
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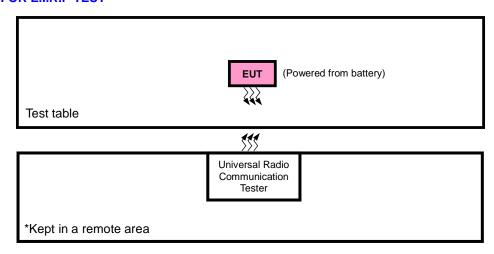


#### 3.2 CONFIGURATION OF SYSTEM UNDER TEST

#### FOR RADIATION EMISSION TEST



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



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#### 3.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	N/A				

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	N/A

**NOTE:** All power cords of the above support units are non shielded (1.8m).

#### 3.4 TEST ITEM AND TEST CONFIGURATION

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 EIRP and X-axis for radiated emission. Following channel(s) was (were) selected for the final test as listed below:

EUT CONFIGURE MODE	DESCRIPTION
Α	EUT + Adapter with LTE link
В	EUT + Battery with LTE link

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#### LTE BAND 7

EUT CONFIGURE MODE	TEST ITEM	AVAILABLE CHANNEL	TESTED CHANNEL	CHANNEL BANDWIDTH	MODULATION	MODE
	5100	20775 to 21425	20775, 21100, 21425	5MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20800 to 21400	20800, 21100, 21400	10MHz	QPSK, 16QAM	1 RB / 0RB Offset
В	EIRP	20825 to 21375	20825, 21100, 21375	15MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20850 to 21350	20850, 21100 21350	20MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20775 to 21425	21100	5MHz	QPSK	1 RB / 0 RB Offset
	FREQUENCY	20800 to 21400	21100	10MHz	QPSK	1 RB / 0RB Offset
В	STABILITY	20825 to 21375	21100	15MHz	QPSK	1 RB / 0 RB Offset
		20850 to 21350	21100	20MHz	QPSK	1 RB / 0 RB Offset
		20775 to 21425	20775, 21100, 21425	5MHz	QPSK, 16QAM	25 RB / 0 RB Offset
-	OCCUPIED	20800 to 21400	20800, 21100, 21400	10MHz	QPSK, 16QAM	50 RB / 0 RB Offset
В	BANDWIDTH	20825 to 21375	20825, 21100, 21375	15MHz	QPSK, 16QAM	75 RB / 0 RB Offset
		20850 to 21350	20850, 21100 21350	20MHz	QPSK, 16QAM	100 RB / 0 RB Offset
		20775 to 21425	20775, 21100, 21425	5MHz	QPSK, 16QAM	1 RB / 0 RB Offset
-	PEAK TO	20800 to 21400	20800, 21100, 21400	10MHz	QPSK, 16QAM	1 RB / 0RB Offset
В	AVERAGE RATIO	20825 to 21375	20825, 21100, 21375	15MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20850 to 21350	20850, 21100 21350	20MHz	QPSK, 16QAM	1 RB / 0 RB Offset
		20775 to 24 425	20775 24425	ENALL-	ODCK	1 RB / 12 RB Offset
		20775 to 21425	20775, 21425	5MHz	QPSK	25 RB / 0 RB Offset
		20800 to 21400	20800, 21400	10MHz	QPSK	1 RB / 24 RB Offset
_		20800 to 21400	20000, 21400	TOWIEZ	QPSK	50 RB / 0 RB Offset
В	BAND EDGE	20025 to 24275	20025 24275	45141-	ODCK	1 RB / 37 RB Offset
		20825 to 21375	20825, 21375	15MHz	QPSK	75 RB / 0 RB Offset
		20050 to 21250	20050 21250	20MH-	QPSK	1 RB / 50 RB Offset
		20850 to 21350	20850, 21350	20MHz	QPSK	100 RB / 0 RB Offset
		20775 to 21425	21100	5MHz	QPSK	1 RB / 0 RB Offset
В	CONDCUDETED	20800 to 21400	21100	10MHz	QPSK	1 RB / 0RB Offset
В	EMISSION	20825 to 21375	21100	15MHz	QPSK	1 RB / 0 RB Offset
		20850 to 21350	21100	20MHz	QPSK	1 RB / 0 RB Offset
		20775 to 21425	21100	5MHz	QPSK	1 RB / 0 RB Offset
^	RADIATED	20800 to 21400	21100	10MHz	QPSK	1 RB / 0RB Offset
Α	EMISSION	20825 to 21375	21100	15MHz	QPSK	1 RB / 0 RB Offset
		20850 to 21350	21100	20MHz	QPSK	1 RB / 0 RB Offset

**Note:** This device was tested under all bandwidths, RB configurations and modulations. The worst case was found in QPSK modulation.

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#### **TEST CONDITION:**

TEST ITEM	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
EIRP	24deg. C, 60%RH	3.8Vdc from Battery	Blue Zheng
FREQUENCY STABILITY	24deg. C, 61%RH	3.8Vdc from Battery	Yuqiang Yin
OCCUPIED BANDWIDTH	24deg. C, 61%RH	3.8Vdc from Battery	Yuqiang Yin
PEAK TO AVERAGE RATIO	24deg. C, 61%RH	3.8Vdc from Battery	Yuqiang Yin
BAND EDGE	24deg. C, 61%RH	3.8Vdc from Battery	Yuqiang Yin
CONDCUDETED EMISSION	24deg. C, 61%RH	3.8Vdc from Battery	Yuqiang Yin
RADIATED EMISSION	24deg. C, 60%RH	5Vdc from adapter	Blue Zheng

### 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

The radiated peak output power shall be according to the specific rule Part 27.50(h)(2) that "User stations are limited to 2 watts" and 27.50(i) specific that "Peak transmit power must be measure over any interval of continuous transmission using instrumentation calibration in terms of rms-equivalent voltage."

#### 4.1.2 TEST PROCEDURES

### **EIRP MEASUREMENT:**

- a. All measurements were done at low, middle and high operational frequency range. RBW and VBW is 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. EIRP = Output power level of S.G TX cable loss + Antenna gain of substitution horn.

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

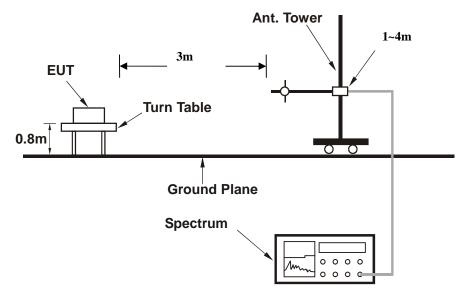
- a. The EUT was set up for the maximum power with LTE link data modulation and link up with simulator.
- b. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator.

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#### 4.1.3 TEST SETUP

#### **EIRP MEASUREMENT:**



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

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



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

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### 4.1.4 TEST RESULTS

### AVERAGE CONDUCTED OUTPUT POWER (dBm)

	LTE Band 7									
BW	Modulation	RB	RB	Low CH 20775	Mid CH 21100	High CH 21425	MPR			
5	Modulation	Size	Offset	Frequency 2502.5 MHz	Frequency 2535 MHz	Frequency 2567.5 MHz	IVII IX			
		1	0	22.39	22.43	22.34	0			
		1	12	22.32	22.39	22.27	0			
		1	24	22.29	22.31	22.3	0			
	QPSK	12	0	21.39	21.51	21.28	1			
		12	6	21.44	21.41	21.22	1			
		12	13	21.49	21.43	21.27	1			
5 MHz		25	0	21.44	21.46	21.19	1			
S IVITZ		1	0	21.38	21.42	21.33	1			
		1	12	21.31	21.38	21.26	1			
		1	24	21.28	21.3	21.29	1			
	16QAM	12	0	20.38	20.5	20.27	2			
		12	6	20.43	20.4	20.21	2			
		12	13	20.48	20.42	20.26	2			
		25	0	20.43	20.45	20.18	2			

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				LTE Band 7			
BW	Modulation	RB Size	RB Offset	Low CH 20800 Frequency	Mid CH 21100 Frequency	High CH 21400 Frequency	MPR
				2505 MHz	2535 MHz	2565 MHz	l l
		1	0	22.4	22.44	22.35	0
		1	24	22.33	22.4	22.28	0
		1	49	22.3	22.32	22.31	0
	QPSK	25	0	21.4	21.52	21.29	1
		25	12	21.45	21.42	21.23	1
		25	25	21.5	21.44	21.28	1
10 MHz		50	0	21.45	21.47	21.2	1
10 WITZ		1	0	21.39	21.43	21.34	1
		1	24	21.32	21.39	21.27	1
		1	49	21.29	21.31	21.3	1
	16QAM	25	0	20.39	20.51	20.28	2
		25	12	20.44	20.41	20.22	2
		25	25	20.49	20.43	20.27	2
		50	0	20.44	20.46	20.19	2
	Modulation	RB	RB	Low CH 20825	Mid CH 21100	High CH 21375	
BW		Size	Offset	Frequency 2507.5 MHz	Frequency 2535 MHz	Frequency 2562.5 MHz	MPR
		1	0	22.49	22.53	22.44	0
		1	37	22.42	22.49	22.37	0
		1	74	22.39	22.41	22.4	0
	QPSK	36	0	21.49	21.61	21.38	1
		36	19	21.54	21.51	21.32	1
		36	39	21.59	21.53	21.37	1
45		75	0	21.54	21.56	21.29	1
15 MHz		1	0	21.48	21.52	21.43	1
		1	37	21.41	21.48	21.36	1
		1	74	21.38	21.4	21.39	1
	16QAM	36	0	20.48	20.6	20.37	2
		36	19	20.53	20.5	20.31	2
		36	39	20.58	20.52	20.36	2
		75	0	20.53	20.55	20.28	2

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	LTE Band 7										
BW	Modulation	RB	RB	Low CH 20850	Mid CH 21100	High CH 21350	MPR				
BW	Modulation	Size	Offset	Frequency 2510 MHz	Frequency 2535 MHz	Frequency 2560 MHz	IVIPR				
		1	0	22.56	22.6	22.51	0				
		1	50	22.49	22.56	22.44	0				
	QPSK	1	99	22.46	22.48	22.47	0				
		50	0	21.56	21.68	21.45	1				
		50	25	21.61	21.58	21.39	1				
		50	50	21.66	21.6	21.44	1				
20 MHz		100	0	21.61	21.63	21.36	1				
ZU IVITIZ		1	0	21.55	21.59	21.5	1				
		1	50	21.48	21.55	21.43	1				
		1	99	21.45	21.47	21.46	1				
	16QAM	50	0	20.55	20.67	20.44	2				
		50	25	20.6	20.57	20.38	2				
		50	50	20.65	20.59	20.43	2				
		100	0	20.6	20.62	20.35	2				

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#### **EIRP**

#### LTE BAND 7

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

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
20775	2504.7	-25.66	42.48	16.82	48.08	Н
21100	2537.2	-25.12	42.78	17.66	58.34	Н
21425	2569.7	-25.72	43.97	18.25	66.83	Н
20775	2504.7	-22.65	45.09	22.44	175.39	V
21100	2537.2	-22.39	44.26	21.87	153.82	V
21425	2569.7	-22.74	45.15	22.41	174.18	V

**NOTE**: EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

#### **CHANNEL BANDWIDTH: 5MHz 16QAM**

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
20775	2504.7	-26.77	42.48	15.71	37.24	Н
21100	2537.2	-26.30	42.78	16.48	44.46	Н
21425	2569.7	-26.83	43.97	17.14	51.76	Н
20775	2504.7	-23.76	45.09	21.33	135.83	V
21100	2537.2	-23.57	44.26	20.69	117.22	V
21425	2569.7	-23.85	45.15	21.30	134.90	V

NOTE: EIRP (dBm) = LVL (dBm) + Correction Factor (dB)-2.15dB.

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#### **CHANNEL BANDWIDTH: 10MHz QPSK**

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
20800	2505.0	-25.68	42.41	16.73	47.10	Н
21100	2535.0	-24.98	42.78	17.80	60.26	Н
21400	2565.0	-25.77	43.95	18.18	65.77	Н
20800	2505.0	-22.67	44.77	22.10	162.18	V
21100	2535.0	-22.25	44.26	22.01	158.85	V
21400	2565.0	-22.79	45.06	22.27	168.66	V

NOTE: EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

#### **CHANNEL BANDWIDTH: 10MHz 16QAM**

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
20800	2505.0	-26.81	42.41	15.60	36.31	Н
21100	2535.0	-26.17	42.78	16.61	45.81	Н
21400	2565.0	-26.82	43.95	17.13	51.64	Н
20800	2505.0	-23.80	44.77	20.97	125.03	V
21100	2535.0	-23.44	44.26	20.82	120.78	V
21400	2565.0	-23.84	45.06	21.22	132.43	V

**NOTE**: EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

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#### **CHANNEL BANDWIDTH: 15MHz QPSK**

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
20825	2507.5	-25.72	42.42	16.70	46.77	Н
21100	2535.0	-24.99	42.78	17.79	60.12	Н
21375	2562.5	-25.99	43.81	17.82	60.53	Н
20825	2507.5	-22.71	44.54	21.83	152.41	V
21100	2535.0	-22.26	44.26	22.00	158.49	V
21375	2562.5	-23.01	45.19	22.18	165.20	V

**NOTE:** EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

#### **CHANNEL BANDWIDTH: 15MHz 16QAM**

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
20825	2507.5	-26.79	42.42	15.63	36.56	Н
21100	2535.0	-26.23	42.78	16.55	45.19	Н
21375	2562.5	-27.00	43.81	16.81	47.97	Н
20825	2507.5	-23.78	44.54	20.76	119.12	V
21100	2535.0	-23.50	44.26	20.76	119.12	V
21375	2562.5	-24.02	45.19	21.17	130.92	٧

**NOTE:** EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

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#### **CHANNEL BANDWIDTH: 20MHz QPSK**

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
20850	2510.0	-25.64	42.63	16.99	50.00	Н
21100	2535.0	-25.20	42.78	17.58	57.28	Н
21350	2560.0	-25.84	43.65	17.81	60.39	Н
20850	2510.0	-22.63	44.58	21.95	156.68	V
21100	2535.0	-22.47	44.26	21.79	151.01	V
21350	2560.0	-22.86	45.08	22.22	166.72	V

NOTE: EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

#### **CHANNEL BANDWIDTH: 20MHz 16QAM**

Channel	Frequency (MHz)	LVL (dBm)	Correction Factor(dB)	EIRP(dBm)	EIRP(mW)	Polarization (H/V)
20850	2510.0	-26.83	42.63	15.80	38.02	Н
21100	2535.0	-26.28	42.78	16.50	44.67	Н
21350	2560.0	-26.82	43.65	16.83	48.19	Н
20850	2510.0	-23.82	44.58	20.76	119.12	V
21100	2535.0	-23.55	44.26	20.71	117.76	V
21350	2560.0	-23.84	45.08	21.24	133.05	V

**NOTE**: EIRP (dBm) = LVL (dBm) + Correction Factor (dB)

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#### **4.2 FREQUENCY STABILITY MEASUREMENT**

#### 4.2.1 LIMITS OF FREQUENCY STABILITY MEASUREMENT

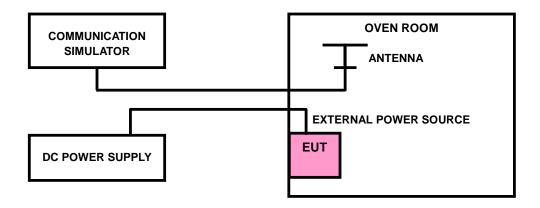
The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

#### 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  $\pm 0.5\,^{\circ}\mathrm{C}$  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

	FREQUENCY ERROR (ppm)					
VOLTAGE (Volts)		LIMIT (ppm)				
(10110)	5MHz					
3.8(normal)	-0.001	-0.002	-0.006	-0.005	2.5	
3.6(Min.)	-0.005	-0.005	-0.006	-0.002	2.5	
4.2(Max.)	-0.006	-0.006	-0.005	-0.004	2.5	

**NOTE:** The applicant defined the normal working voltage of the battery is from 3.6Vdc to 4.2Vdc.

### FREQUENCY ERROR vs. TEMPERATURE

TEMP. (℃)		LIMIT (ppm)			
	5MHz	10MHz	15MHz	20MHz	
-30	-0.005	-0.003	-0.005	-0.002	2.5
-20	-0.004	-0.001	-0.003	-0.001	2.5
-10	-0.003	0.001	-0.003	-0.001	2.5
0	-0.002	0.002	-0.002	0.001	2.5
+10	-0.001	0.003	0.000	0.002	2.5
+20	0.002	0.001	0.001	0.003	2.5
+30	0.003	0.002	0.003	0.002	2.5
+40	0.003	0.003	0.003	0.002	2.5
+50	0.003	0.005	0.005	0.003	2.5
+60	0.006	0.006	0.005	0.004	2.5

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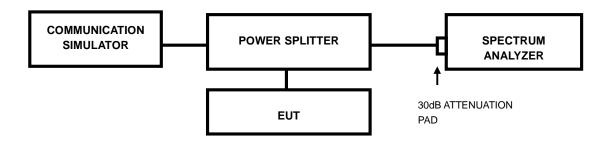


#### 4.3 OCCUPIED BANDWIDTH MEASUREMENT

#### 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.

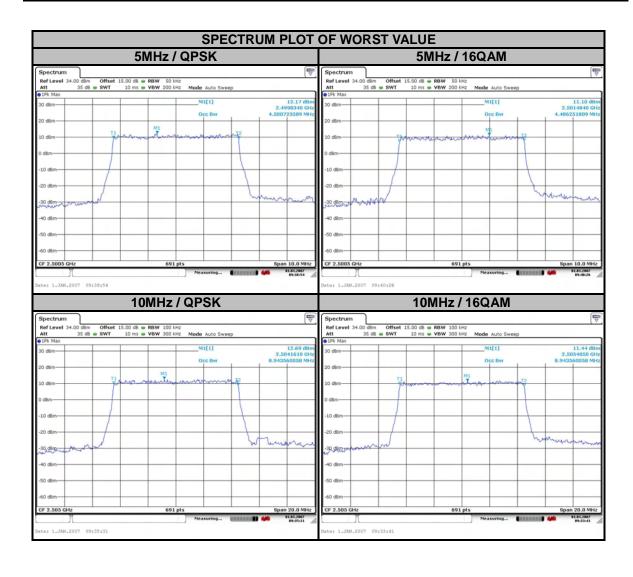
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#### 4.3.4 TEST RESULTS

LTE BAND 7							
CHANNEL BANDWIDTH: 5MHz			CHANNEL BANDWIDTH: 10MHz				
CHANNEL	FREQUENCY	99% OCCUPIED BANDWIDTH (MHz)		CHANNEL	FREQUENCY	99% OCCUPIED BANDWIDTH (MHz)	
	(MHz)	QPSK	16QAM		(MHz)	QPSK	16QAM
20775	2502.5	4.50	4.49	20800	2505	8.94	8.94
21100	2535	4.49	4.47	21100	2535	8.94	8.94
21425	2567.5	4.49	4.47	21400	2565	8.91	8.94



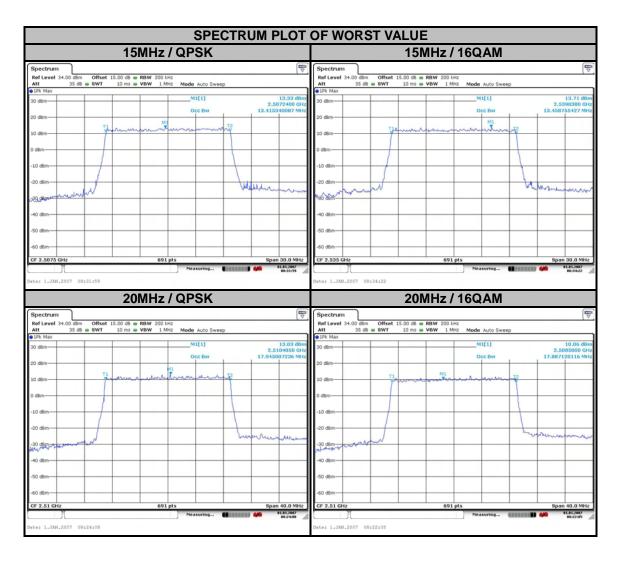
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LTE BAND 7							
CHANNEL BANDWIDTH: 15MHz				СН	ANNEL BAND	WIDTH: 20N	1Hz
CHANNEL	FREQUENCY		CCUPIED IDTH (MHz) CHANNEL FR		FREQUENCY	99% OCCUPIED BANDWIDTH (MHz)	
	(MHz)	QPSK	16QAM		(MHz)	QPSK	16QAM
20825	2507.5	13.42	13.42	20850	2510	17.95	17.89
21100	2535	13.42	13.46	21100	2535	17.95	17.83
21375	2562.5	13.42	13.42	21350	2560	17.89	17.83



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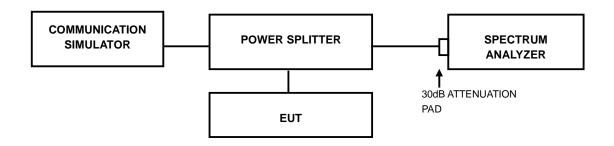


#### 4.4 PEAK TO AVERAGE RATIO

#### 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 ≥ 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%.

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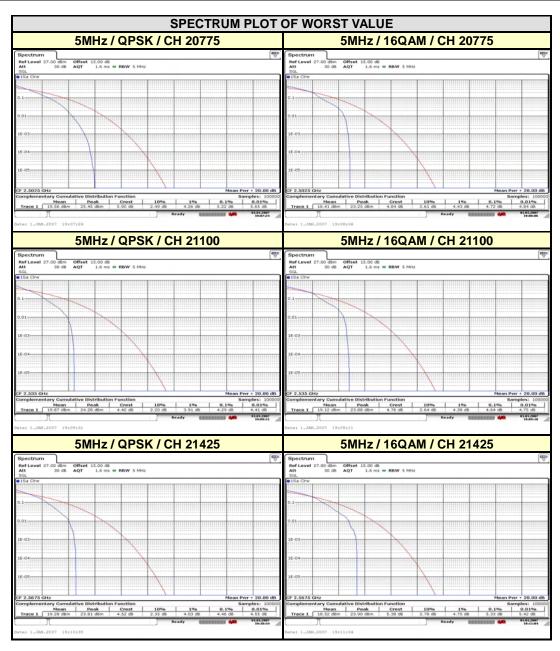
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#### 4.4.4 TEST RESULTS

#### LTE BAND 7

CHANNEL BANDWIDTH: 5MHz					
CHANNEL FREQUENCY (MHz) PEAK TO AVERAGE RATIO (dB)					
CHANNEL	FREQUENCY (MHz)	QPSK	16QAM		
20775	2502.5	5.22	4.72		
21100	2535	4.29	4.64		
21425	2567.5	4.46	5.33		

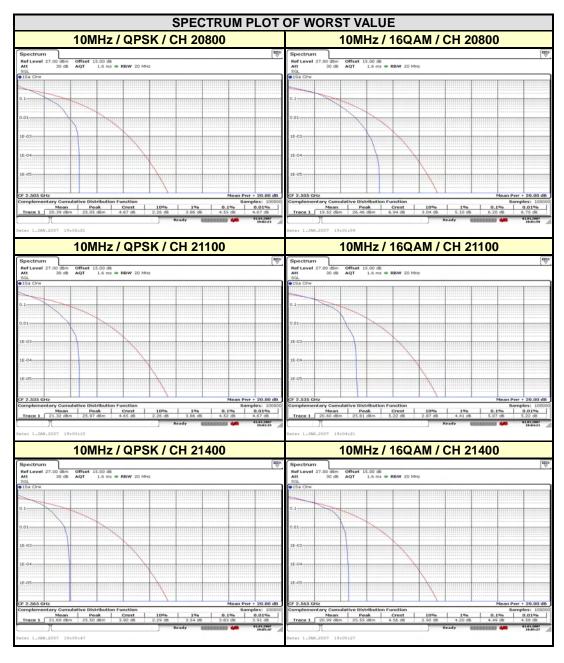


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CHANNEL BANDWIDTH: 10MHz					
CHANNEL FREQUENCY (MHz) PEAK TO AVERAGE RATIO (dB)					
CHANNEL	FREQUENCY (MHz)	QPSK	16QAM		
20800	2505	4.55	6.20		
21100	2535	4.52	5.07		
21400	2565	3.83	4.49		



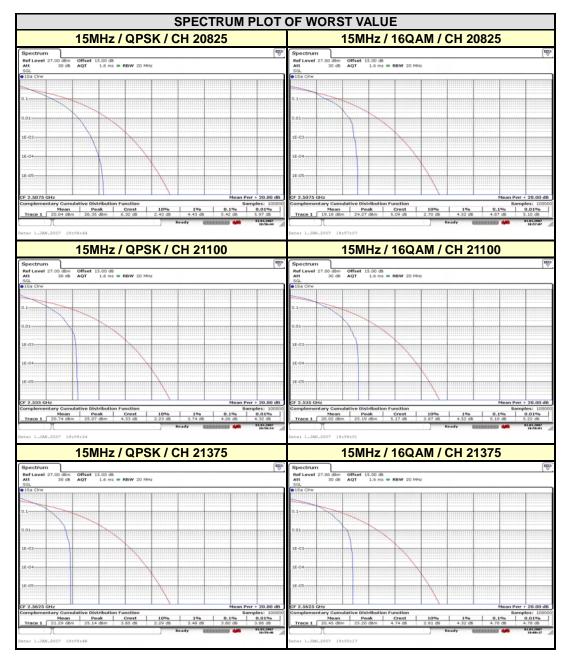
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CHANNEL BANDWIDTH: 15MHz					
PEAK TO AVERAGE RATIO (dB)					
CHANNEL	FREQUENCY (MHz)	QPSK	16QAM		
20825	2507.5	5.42	4.87		
21100	2535	4.26	5.10		
21375	2562.5	3.80	4.70		



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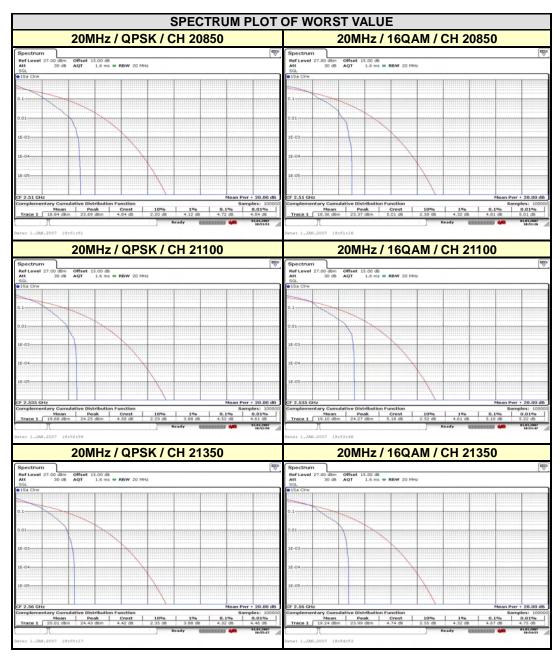
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CHANNEL BANDWIDTH: 20MHz					
PEAK TO AVERAGE RATIO (dB)					
CHANNEL	FREQUENCY (MHz)	QPSK	16QAM		
20850	2510	4.72	4.81		
21100	2535	4.52	5.10		
21350	2560	4.32	4.67		



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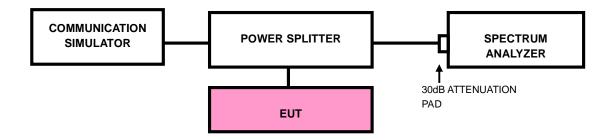


#### 4.5 BAND EDGE MEASUREMENT

#### 4.5.1 LIMITS OF BAND EDGE MEASUREMENT

According to FCC 27.53(m)(4) specified that power of any emission outside of the channel edge must be attenuated below the transmitting power (P) by a factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In the 1MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent of the emission bandwidth of the fundamental emission for mobile digital station transmitter may be employed.

#### 4.5.2 TEST SETUP



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#### 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 35MHz. RBW of the spectrum is 100kHz and VBW of the spectrum is 300kHz (Channel bandwidth 5MHz).
- d. The center frequency of spectrum is the band edge frequency and span is 50MHz. RBW of the spectrum is 200kHz and VBW of the spectrum is 1MHz (Channel bandwidth 10MHz).
- e. The center frequency of spectrum is the band edge frequency and span is 50MHz. RBW of the spectrum is 1MHz and VBW of the spectrum is 3MHz (Channel bandwidth 15MHz).
- f. The center frequency of spectrum is the band edge frequency and span is 75MHz. RBW of the spectrum is 1MHz and VBW of the spectrum is 3MHz (Channel bandwidth 20MHz).
- g. Record the max trace plot into the test report.

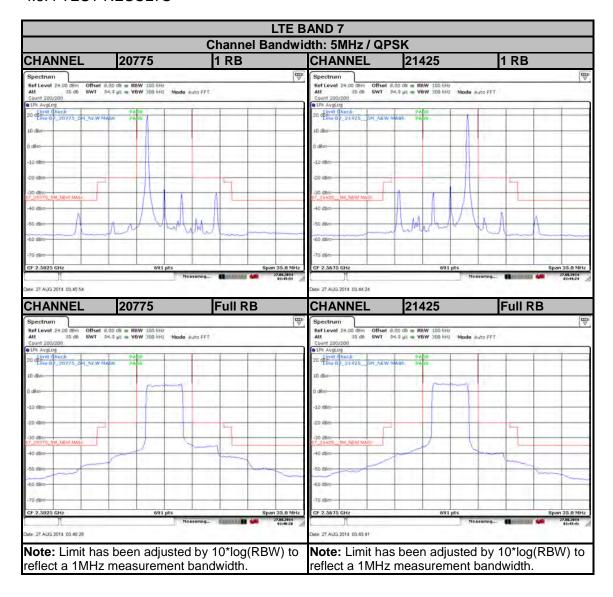
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#### 4.5.4 TEST RESULTS

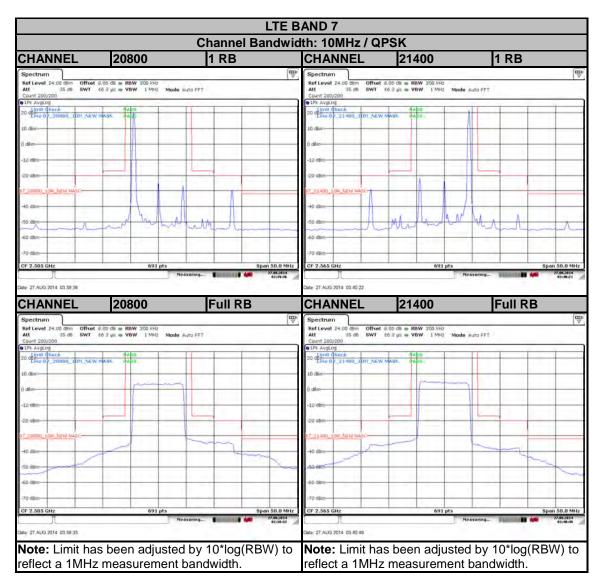


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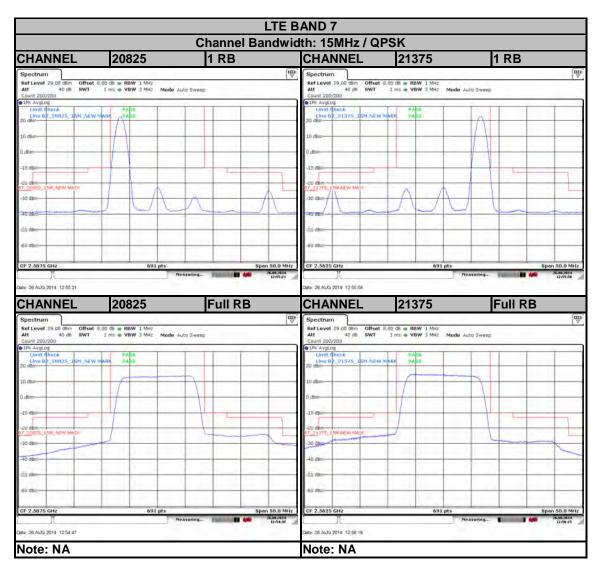


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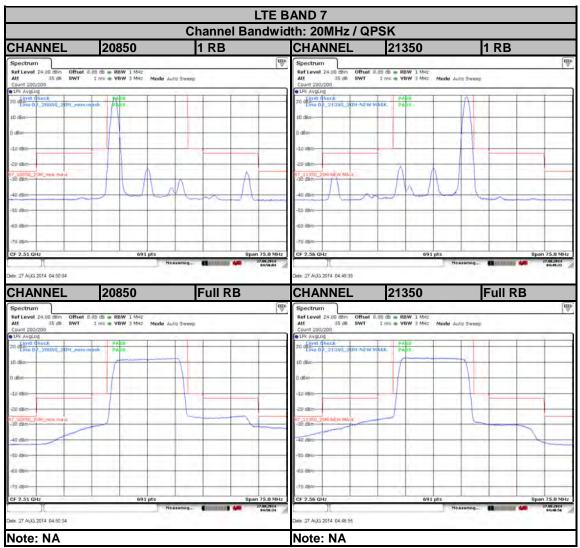


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#### 4.6 CONDUCTED SPURIOUS EMISSIONS

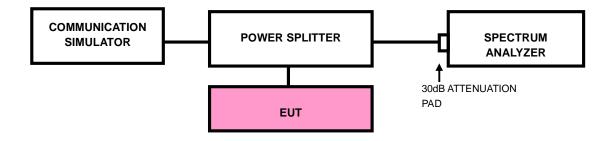
## 4.6.1 LIMITS OF CONDUCTED SPURIOUS EMISSIONS MEASUREMENT

The power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) by at least 55 +10 log10(P) dB. The limit of emission is equal to -25dBm.

#### 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 30MHz to 26GHz for LTE Band 7. 10dB attenuation pad is connected with spectrum. RBW=1MHz and VBW=3MHz are used for conducted emission measurement.

## 4.6.3 TEST SETUP

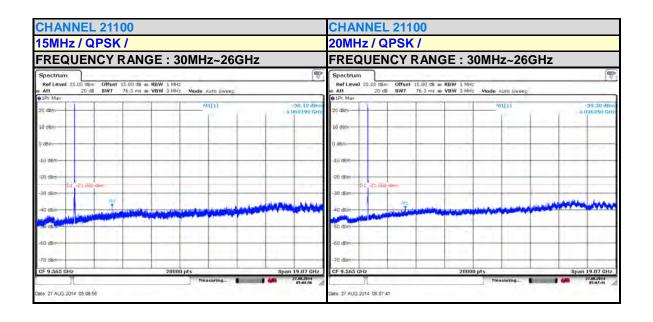




# 4.6.4 TEST RESULTS

## LTE BAND 7

CHANNEL 21100				CHANNEL 21100				
5MHz / QPSK			10MHz / QPSK					
FREQUENCY RA	NGE: 30MHz~26G	Hz	FREQU	JENCY I	RANGE:	30MHz~2	6GHz	
Spectrum		(III)	Spectrum					(mm) ∀
	dB = RBW 1 MHz ws = VBW 3 MHz Mode Auto Sweep		Ref Level 2 Att		15.00 d8 = RBW 11 76.3 ms = VBW 33	AHZ Mode Auto Swi	еер	
20 dBW	WILI	94.01 dtm (6.02380) GH	20 dBm			with	T III	90.91 dun 6.029720 GH
zó dlev			10 dien					_
() dam			ti dam-			1-11-	1-1	
-10 dem-			-10 d8m-					
meb 060, cs- 10				-23,000 dem				
-50 dim-		Maria Maria	-30 dBm	411		a back a large and	-	-
-S0 dBm-			-SO dB/II-	A STATE OF THE PARTY OF THE PAR				
-60 dBm			-60 dBm				-	_
-70 d8m-			-70 d8m-					
CF 9.565 GHz	20000 pts	Span 19.07 GHz	CF 9.565 GHz		20	000 pts		Span 19.07 GHz
3866 27 AUG 2014 05 10:10	Pleasuring	27.89.2914 95:19:19	DM6 27 AUG 201	4 05 09 29		Measuring	Matamag 44	27,08,2914 95,09128



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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 log10(P) dB. The limit of emission is equal to -13dBm.

#### 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
- 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.

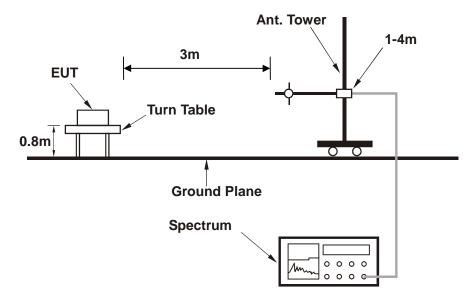
#### 4.7.3 DEVIATION FROM TEST STANDARD

No deviation

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# 4.7.4 TEST SETUP



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

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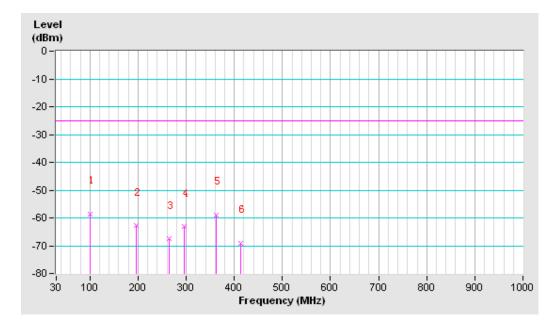
# 4.7.5 TEST RESULTS

## **BELOW 1GHz WORST-CASE DATA: LTE BAND 7**

SPURIOUS EMISSION FREQUENCY RANGE	OPERATING CHANNEL	Channel 21100
-----------------------------------	-------------------	---------------

	SPURIOUS EMISSION LEVEL							
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)				
99.52	Н	-58.66	-25	-33.66				
196.52	Н	-62.88	-25	-37.88				
264.42	Н	-67.56	-25	-42.56				
296.75	Н	-63.21	-25	-38.21				
363.03	Н	-58.90	-25	-33.90				
413.15	Н	-69.21	-25	-44.21				

**NOTE:** The emission behavior belongs to narrowband spurious emission.



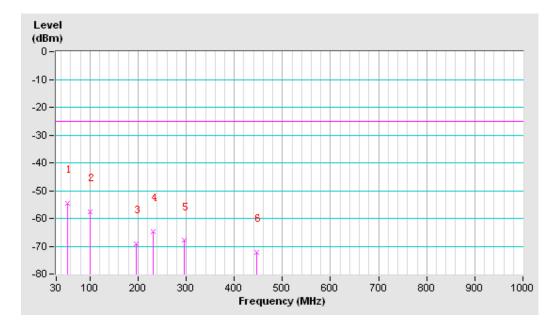
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SPURIOUS EMISSION FREQUENCY RANGE Below 1000MHz	OPERATING CHANNEL	Channel 21100
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	SPURIOUS EMISSION LEVEL							
Frequency (MHz)	Antenna Polarization	Level (dBm)	Limit (dBm)	Margin (dB)				
54.25	V	-54.51	-25	-29.51				
99.52	V	-57.70	-25	-32.7				
196.52	V	-69.18	-25	-44.18				
230.47	V	-64.58	-25	-39.58				
296.75	V	-67.95	-25	-42.95				
447.10	V	-72.23	-25	-47.23				

**NOTE:** The emission behavior belongs to narrowband spurious emission.



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# **ABOVE 1GHz**

## **CHANNEL BANDWIDTH: 5MHz / QPSK**

MODE	TX channel 21100	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 60%RH	IINPUT POWER	DC 5V from adapter
TESTED BY	Blue Zheng		

	ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Margin (dB)	
1	5070	-56.12	-25	-40.46	2.54	-37.92	-12.92	
2	7605	-58.25	-25	-38.40	4.38	-34.02	-9.02	
3	10140	-57.87	-25	-34.26	3.27	-30.99	-5.99	
4	12675	-107	-25	-78.96	4.76	-74.20	-49.20	
	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq. (MHz)	Reading	Limit (dBm)	S.G Power Value	Correction	EIRP (dBm)	Margin (dB)	
	,	(dBm)	,	(dBm)	Factor (dB)	,	• ,	
1	5070	-55.34	-25		2.54	-35.15	-10.15	
1 2	,	, ,	` ,	(dBm)		` '	-10.15 -11.29	
	5070	-55.34	-25	(dBm) -37.69	2.54	-35.15		

**NOTE:** EIRP (dBum) = S.G Power Value (dBm) + Correction Factor (dB).

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# **CHANNEL BANDWIDTH: 10MHz/QPSK**

MODE	TX channel 21100	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 60%RH	IINPUT POWER	DC 5V from adapter
TESTED BY	Blue Zheng		

	ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Margin (dB)	
1	5070	-55.78	-25	-40.12	2.54	-37.58	-12.58	
2	7605	-58.02	-25	-38.17	4.38	-33.79	-8.79	
3	10140	-57.36	-25	-33.75	3.27	-30.48	-5.48	
4	12675	-107	-25	-78.96	4.76	-74.20	-49.20	
	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Margin (dB)	
1	5070	-54.01	-25	-36.37	2.54	-33.83	-8.83	
2	7605	-58.17	-25	-39.65	4.38	-35.27	-10.27	
3	10140	-57.79	-25	-35.45	3.27	-32.18	-7.18	
4	12675	-107	-25	-88.34	4.76	-83.58	-58.58	

**NOTE:** EIRP (dBum) = S.G Power Value (dBm) + Correction Factor (dB).

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## **CHANNEL BANDWIDTH: 15MHz/QPSK**

MODE	TX channel 21100	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 60%RH	IINPUT POWFR	DC 5V from adapter
TESTED BY	Blue Zheng		

	ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Margin (dB)	
1	5070	-56.99	-25	-41.34	2.54	-38.80	-13.80	
2	7605	-59.12	-25	-39.28	4.38	-34.90	-9.90	
3	10140	-58.96	-25	-35.35	3.27	-32.08	-7.08	
4	12675	-107	-25	-78.96	4.76	-74.20	-49.20	
	ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	Limit (dBm)	S.G Power Value	Correction Factor (dB)	EIRP (dBm)	Margin (dB)	
				(dBm)	` ,			
1	5070	-54.99	-25	-37.35	2.54	-34.81	-9.81	
1	5070 7605	-54.99 -59.36	-25 -25	` '	` ,	-34.81 -36.48	-9.81 -11.48	
-				-37.35	2.54			

**NOTE:** EIRP (dBum) = S.G Power Value (dBm) + Correction Factor (dB).

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# **CHANNEL BANDWIDTH: 20MHz/QPSK**

MODE	TX channel 21100	FREQUENCY RANGE	Above 1000MHz
ENVIRONMENTAL CONDITIONS	24deg. C, 60%RH	IINPUT POWER	DC 5V from adapter
TESTED BY	Blue Zheng		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Margin (dB)
1	5070	-56.62	-25	-40.97	2.54	-38.43	-13.43
2	7605	-58.73	-25	-38.89	4.38	-34.51	-9.51
3	10140	-58.32	-25	-34.71	3.27	-31.44	-6.44
4	12675	-107	-25	-78.96	4.76	-74.20	-49.20
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M							
No.	Freq. (MHz)	Reading (dBm)	Limit (dBm)	S.G Power Value (dBm)	Correction Factor (dB)	EIRP (dBm)	Margin (dB)
1	5070	-54.66	-25	-37.02	2.54	-34.48	-9.48
2	7605	-58.96	-25	-40.46	4.38	-36.08	-11.08
3	10140	-58.37	-25	-36.04	3.27	-32.77	-7.77
4	12675	-107	-25	-88.34	4.76	-83.58	-58.58

**NOTE:** EIRP (dBum) = S.G Power Value (dBm) + Correction Factor (dB).

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# 5 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch, were founded in 2002 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:

Dongguan EMC/RF Lab:

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Email: <u>customerservice.dg@cn.bureauveritas.com</u>

Web Site: 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 any modifications are made to the EUT by the lab during the test.

---END---

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