

FCC TEST REPORT

Product : Mobile Phone
Trade mark : MI
Model/Type reference : 2016102
Report Number : 1610280464RFM-3
Date of Issue : Dec. 09, 2016
FCC ID : 2AFZZ-RT6102
Test Standards : FCC 47 CFR Part 27
 FCC 47 CFR Part 2 Subpart J
Test result : PASS

Prepared for:

Xiaomi Communications Co., Ltd.
The Rainbow City of China Resources, NO.68, Qinghe Middle Street,
Haidian District, Beijing, China

Prepared by:

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Version

Version No.	Date	Description
V1.0	Dec. 09, 2016	Original



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1 General Information

1.1 Client Information

Applicant:	Xiaomi Communications Co., Ltd.
Address of Applicant:	The Rainbow City of China Resources, NO.68, Qinghe Middle Street, Haidian District, Beijing, China
Manufacturer:	Xiaomi Communications Co., Ltd.
Address of Manufacturer:	The Rainbow City of China Resources, NO.68, Qinghe Middle Street, Haidian District, Beijing, China

1.2 General Description of EUT

Product Name:	Mobile Phone	
Model No.(EUT):	2016102	
Add. Mode No.:	N/A	
Trade Mark:	MI	
EUT Supports Radios application:	GSM850/900/1800/1900 WCDMA Band I/Band II/Band V/Band VIII LTE FDD Band 1 /Band 3 /Band 4 /Band 5 /Band 7 /Band 8 /Band 20 LTE TDD Band 38 /Band 40 Wlan 2400MHz-2483.5MHz 802.11b/g/n(HT20&HT40) Wlan 5150MHz-5350MHz, 5470MHz-5725MHz, 5725MHz-5850MHz only support 802.11a Bluetooth V3.0+EDR&Bluetooth V4.0 BLE GPS, Glonass	
Power Supply:	AC adapter	Model: MDY-08-EF Input: 100-240V~50/60Hz 0.35A MAX Output: DC 5.0V == 2000mA
	Battery	Model: BN43 Brand: MI Rated Voltage: 3.85Vdc Battery Capacity: 4000mAh(Li-on Rechargeable)
USB Micro-B Plug cable:	117cm(Shielded without ferrite)	
Sample Received Date:	Sep. 12, 2016	
Sample tested Date:	Nov. 10, 2016 ~ Dec. 08, 2016	

1.3 Product Specification subjective to this standard

Support Networks:	LTE Band 4/ Band 7	
Type of Modulation:	LTE:	QPSK, 16QAM
Frequency Range	LTE Band 4(Channel Bandwidth: 1.4 MHz):	1710.7-1754.3 MHz
	LTE Band 4 (Channel Bandwidth: 3 MHz):	1711.5-1753.5 MHz
	LTE Band 4 (Channel Bandwidth: 5 MHz):	1712.5-1752.5 MHz
	LTE Band 4 (Channel Bandwidth: 10 MHz):	1715-1750 MHz
	LTE Band 4 (Channel Bandwidth: 15 MHz):	1717.5-1747.5 MHz
	LTE Band 4 (Channel Bandwidth: 20 MHz):	1720-1745 MHz
	LTE Band 7 (Channel Bandwidth: 5 MHz):	2502.5-2567.5 MHz
	LTE Band 7 (Channel Bandwidth: 10 MHz):	2505-2565 MHz
	LTE Band 7 (Channel Bandwidth: 15 MHz):	2507.5-2562.5 MHz
	LTE Band 7 (Channel Bandwidth: 20 MHz):	2510-2560 MHz

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Max RF Output Power:	LTE Band 4 (Channel Bandwidth: 1.4 MHz):	23.15dBm
	LTE Band 4 (Channel Bandwidth: 3 MHz):	23.16dBm
	LTE Band 4 (Channel Bandwidth: 5 MHz):	23.19dBm
	LTE Band 4 (Channel Bandwidth: 10 MHz):	23.23dBm
	LTE Band 4 (Channel Bandwidth: 15 MHz):	23.29dBm
	LTE Band 4 (Channel Bandwidth: 20 MHz):	23.32dBm
	LTE Band 7 (Channel Bandwidth: 5 MHz):	23.02dBm
	LTE Band 7 (Channel Bandwidth: 10 MHz):	23.06dBm
	LTE Band 7 (Channel Bandwidth: 15 MHz):	23.12dBm
	LTE Band 7 (Channel Bandwidth: 20 MHz):	23.15dBm
Type of Emission:	LTE Band 4 (Channel Bandwidth: 1.4 MHz):	1M1G7D, 1M1W7D
	LTE Band 4 (Channel Bandwidth: 3 MHz):	2M8G7D, 2M8W7D
	LTE Band 4 (Channel Bandwidth: 5 MHz):	4M5G7D, 4M5W7D
	LTE Band 4 (Channel Bandwidth: 10 MHz):	9M1G7D, 9M1W7D
	LTE Band 4 (Channel Bandwidth: 15 MHz):	13M5G7D, 13M5W7D
	LTE Band 4 (Channel Bandwidth: 20 MHz):	18M5G7D, 18M5W7D
	LTE Band 7 (Channel Bandwidth: 5 MHz):	4M5G7D, 4M5W7D
	LTE Band 7 (Channel Bandwidth: 10 MHz):	9M1G7D, 9M0W7D
	LTE Band 7 (Channel Bandwidth: 15 MHz):	13M5G7D, 13M4W7D
	LTE Band 7 (Channel Bandwidth: 20 MHz):	18M4G7D, 18M3W7D
IMEI:	SIM1: 863195030012243	
	SIM2: 863195030012250	
Type of Antenna:	LDS Antenna	
Antenna Gain:	Band 4: -0.56dBi Band 7: -0.35dBi	
Sample Type:	Portable device	
Normal Test voltage:	3.85Vdc	
Extreme Test voltage:	3.6 ~ 4.4Vdc	
Operating Temperature:	-30°C to +50°C	
Software Version:	MIUI8	
Hardware Version:	P3	

1.4 Description of Support Units

The EUT has been tested independently

1) Support equipment

Description	Manufacturer	Model No.	Certification	Supplied by
N/A	N/A	N/A	N/A	N/A

2) Cable

Cable No.	Description	Manufacturer	Cable Type/Length	Supplied by
1	Antenna Cable	SMA	30cm	UnionTrust

1.5 Test Location

All tests were performed at:

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: 16/F, Block A, Building 6, Baoneng Science and Technology Park, Qingxiang Road No.1, Longhua New District, Shenzhen, China 518109

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1.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L9069

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable under the ISO/IEC/EN 17025 to international or national standards. Equipment has been calibrated by accredited calibration laboratories.

1.7 Deviation from Standards

None.

1.8 Abnormalities from Standard Conditions

None.

1.9 Other Information Requested by the Customer

None.

1.10 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	$\pm 6.3 \times 10^{-8}$
2	RF power, conducted	± 0.52 dB
3	Spurious emissions, radiated (Below 1GHz)	± 5.3 dB
	Spurious emissions, radiated (Above 1GHz)	± 5.1 dB
4	Conduction emission (9KHz~150KHz)	± 3.8 dB
	Conduction emission (150KHz~30MHz)	± 3.4 dB
5	Temperature	± 0.64 °C
6	Humidity	± 2.8 %
7	Supply voltages	± 0.49 %

2 Test Summary

Applied Standard: FCC Part 27 & Part 2 (LTE 4)			
Test Item	Test Requirement	Test method	Result
Equivalent Isotropic Radiated Power (EIRP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Peak-to-average ratio	FCC 47 CFR Part 27.50(d)(5)	KDB 971168 D01v02r02	PASS
99%&26dB Occupied Bandwidth	FCC 47 CFR Part 2.1049(h)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53(h)(1)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53(h)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53(h)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Applied Standard: FCC Part 27 & Part 2 (LTE 7)			
Test Item	Test Requirement	Test method	Result
Equivalent Isotropic Radiated Power (EIRP)	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(h)(2)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Conducted Output Power	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(h)(2)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Peak-to-average ratio	N/A	KDB 971168 D01v02r02	PASS
99%&26dB Occupied Bandwidth	FCC 47 CFR Part 2.1049(h)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Band Edge at antenna terminals	FCC 47 CFR Part 27.53(m)(4)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Spurious emissions at antenna terminals	FCC 47 CFR Part 2.1051 & FCC 47 CFR Part 27.53(m)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Field strength of spurious radiation	FCC 47 CFR Part 2.1053 & FCC 47 CFR Part 27.53(m)	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS
Frequency stability	FCC 47 CFR Part 2.1055 & FCC 47 CFR Part 27.54	ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02	PASS

Remark:

Tx: In this whole report Tx (or tx) means Transmitter.

Rx: In this whole report Rx (or rx) means Receiver.

RF: In this whole report RF means Radiated Frequency.

CH: In this whole report CH means channel.

N/A: In this whole report not application.

3 Equipment List

3M Semi/full-anechoic Chamber						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
<input checked="" type="checkbox"/>	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	12-20-2015	12-19-2018
<input type="checkbox"/>	Receiver	R&S	ESR7	1316.3003K07-101181-K3	02-23-2016	02-22-2017
<input checked="" type="checkbox"/>	Receiver	R&S	ESIB26	100114	08-06-2015	08-05-2017
<input type="checkbox"/>	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	01-27-2016	01-26-2017
<input checked="" type="checkbox"/>	Loop Antenna	ETS-LINDGREN	6502	00202525	06-24-2015	06-23-2018
<input checked="" type="checkbox"/>	Broadband Antenna	ETS-LINDGREN	3142E	00201566	07-24-2015	07-23-2018
<input checked="" type="checkbox"/>	Preamplifier	HP	8447F	2805A02960	02-05-2016	02-04-2017
<input checked="" type="checkbox"/>	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	07-24-2015	07-23-2017
<input type="checkbox"/>	Horn Antenna	ETS-LINDGREN	3117	00164202	07-24-2015	07-23-2018
<input checked="" type="checkbox"/>	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	07-29-2015	07-28-2017
<input type="checkbox"/>	Horn Antenna	ETS-LINDGREN	3116C	00200180	07-28-2015	07-27-2018
<input type="checkbox"/>	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	07-29-2015	07-28-2018
<input checked="" type="checkbox"/>	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
<input type="checkbox"/>	Band rejection filter (5150MHz~5880MHz)	micro-tronics	BRM50716	G1868	06-15-2016	06-14-2017
<input type="checkbox"/>	Band rejection filter (2400MHz~2500MHz)	micro-tronics	BRM50702	G248	06-21-2016	06-20-2017
<input checked="" type="checkbox"/>	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	01-08-2016	01-07-2017

RF test system/ Conducted RF test						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
<input checked="" type="checkbox"/>	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	01-27-2016	01-26-2017
<input checked="" type="checkbox"/>	Receiver	R&S	ESR7	1316.3003K07-101181-K3	02-23-2016	02-22-2017
<input type="checkbox"/>	Receiver	R&S	ESIB26	100114	08-06-2015	08-05-2017
<input type="checkbox"/>	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430035	01-09-2016	01-08-2017
<input type="checkbox"/>	USB Wideband Power Sensor	KEYSIGHT	U2021XA	MY55430023	12-16-2015	12-15-2017
<input type="checkbox"/>	EXG-B RF Analog Signal Generator	KEYSIGHT	N5171B	MY53051777	01-09-2016	01-08-2017
<input type="checkbox"/>	MXG X-Series RF Vector Signal Generator	KEYSIGHT	N5182B	MY51350267	01-08-2016	01-07-2017

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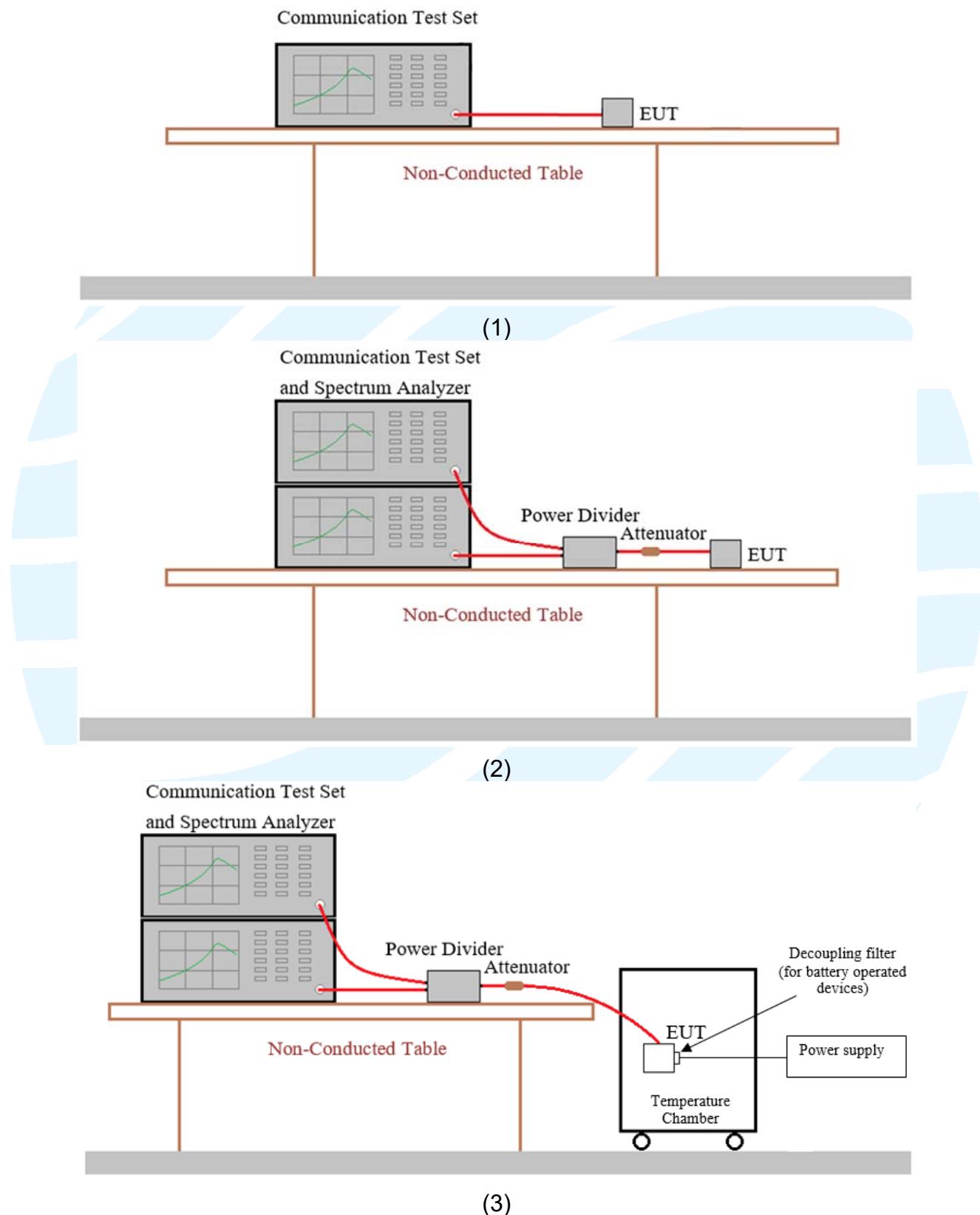
<input type="checkbox"/>	4ch. Simultaneous Sampling 14 Bits 2MS/s	KEYSIGHT	U2531A	TW55193502	11-09-2015	11-08-2017
<input checked="" type="checkbox"/>	DC Source	KIKUSUI	PWR400L	LK003024	09-21-2016	09-20-2017
<input checked="" type="checkbox"/>	Temp & Humidity chamber	Ispec	GL(U)04K A(W)	1692H201P3	09-21-2016	09-20-2017
<input checked="" type="checkbox"/>	Communication test set	R&S	CMW500	130805	08-10-2016	08-09-2017



4 Test Requirement

4.1 Test setup

4.1.1 For Conducted test setup



4.1.2 For Radiated Emissions test setup

Radiated Emissions setup:

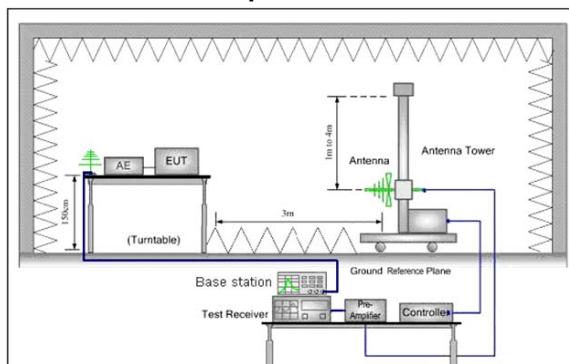


Figure 1. 30MHz to 1GHz

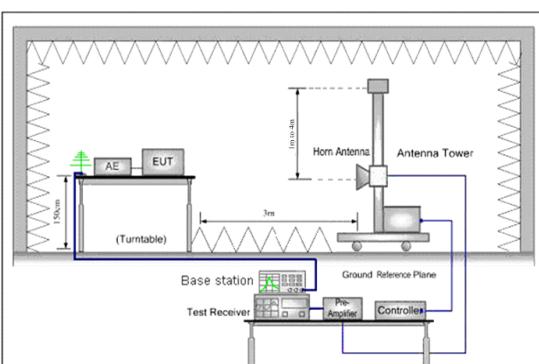


Figure 2. Above 1GHz

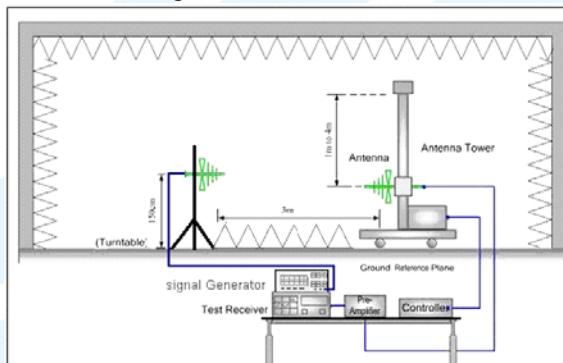


Figure 3. 30MHz to 1GHz

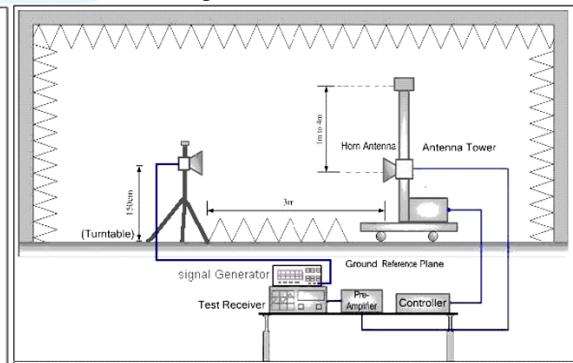


Figure 4. Above 1GHz

4.2 Test Environment

Operating Environment:

Temperature:	24.3 °C
Humidity:	58 % RH
Atmospheric Pressure:	100.29kpa

4.3 System Test Configuration

For emissions testing, the equipment under test (EUT) setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing. During testing, radiated emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario. It was powered by a 3.85Vdc rechargeable Li-on battery. Only the worst case data were recorded in this test report.

Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, X/Y/Z axis, and antenna ports.

The worst case was found when positioned as the table below.

Band	Worst-case Orientation		Radiated Emission	
	EIRP			
	Horizontal	Vertical		
LTE Band 4	Z axis	X axis	X axis	
LTE Band 7	Z axis	X axis	X axis	

All readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance. Analyzer resolution is 100 kHz or greater for frequencies below 1000MHz. The resolution is 1 MHz or greater for frequencies above 1000MHz. The spurious emissions more than 20 dB below the permissible value are not reported.

Radiated emission measurement were performed from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

4.4 Test Condition

4.4.1 Test channel

Test Mode	Test Frequency ID	Bandwidth (MHz)	Number [UL]	Frequency of Uplink (MHz)	Number [DL]	Frequency of Downlink (MHz)
LTE band 4 TX:1710-1755MHz RX:2110-255MHz	Low Range	1.4	19957	1710.7	1957	2110.7
		3	19965	1711.5	1965	2111.5
		5	19975	1712.5	1975	2112.5
		10	20000	1715	2000	2115
		15	20025	1717.5	2025	2117.5
		20	20050	1720	2050	2120
	Middle Range	1.4/3/5/10/15/20	20175	1732.5	2175	2132.5
		1.4	20393	1754.3	2393	2154.3
		3	20385	1753.5	2385	2153.5
		5	20375	1752.5	2375	2152.5
		10	20350	1750	2350	2150
		15	20325	1747.5	2325	2147.5
LTE band 7 TX:2500-2570MHz RX:2620-2690MHz	Low Range	20	20300	1745	2300	2145
		5	20775	2502.5	2775	2622.5
		10	20800	2505	2800	2625
		15	20825	2507.5	2825	2627.5
	Middle Range	20	20850	2510	2850	2630
		5/10/15/20	21100	2535	3100	2655
	High Range	5	21425	2567.5	3425	2652.5
		10	21400	2565	3400	2685
		15	21375	2562.5	3375	2647.5
		20	21350	2560	3350	2645

4.4.2 Test mode

Pre-scan under all rate at lowest middle and highest channel, find the transmitter power as below:
SIM 1 Card Conducted transmitter power measurement result.

LTE Band 4									
Channel	RB Configuration		Average Power [dBm]		Channel	RB Configuration		Average Power [dBm]	
	Size	Offset	QPSK	16QAM		Size	Offset	QPSK	16QAM
Channel Bandwidth: 1.4 MHz					Channel Bandwidth: 3 MHz				
LCH	1	0	22.64	21.34	LCH	1	0	22.65	21.35
	1	2	23.15	21.85		1	7	23.16	21.86
	1	5	22.91	21.34		1	14	22.92	21.35
	3	0	22.62	21.33		8	0	21.88	20.85
	3	1	23.13	21.84		8	3	22.00	20.92
	3	3	22.89	21.33		8	7	21.76	20.79
	6	0	22.00	20.83		15	0	22.01	20.84
MCH	1	0	22.88	21.58	MCH	1	0	22.89	21.59
	1	2	22.94	21.73		1	7	22.95	21.74
	1	5	22.76	21.28		1	14	22.77	21.29
	3	0	22.86	21.57		8	0	21.73	20.81
	3	1	22.92	21.72		8	3	21.81	20.73
	3	3	22.74	21.27		8	7	21.80	20.60
	6	0	21.76	21.01		15	0	21.77	21.02
HCH	1	0	22.87	21.77	HCH	1	0	22.88	21.78
	1	2	22.99	21.64		1	7	23.00	21.65
	1	5	22.82	21.59		1	14	22.83	21.60
	3	0	22.85	21.76		8	0	21.87	20.83
	3	1	22.97	21.63		8	3	21.96	20.95
	3	3	22.80	21.58		8	7	21.79	20.78
	6	0	21.93	21.02		15	0	21.94	21.03
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
LCH	1	0	22.68	21.38	LCH	1	0	22.72	21.42
	1	12	23.19	21.89		1	24	23.23	21.93
	1	24	22.95	21.38		1	49	22.99	21.42
	12	0	21.91	20.88		25	0	21.95	20.92
	12	6	22.03	20.95		25	12	22.07	20.99
	12	13	21.79	20.82		25	25	21.83	20.86
	25	0	22.04	20.87		50	0	22.08	20.91
MCH	1	0	22.92	21.62	MCH	1	0	22.96	21.66
	1	12	22.98	21.77		1	24	23.02	21.81
	1	24	22.80	21.32		1	49	22.84	21.36
	12	0	21.76	20.84		25	0	21.80	20.88
	12	6	21.84	20.76		25	12	21.88	20.80
	12	13	21.83	20.63		25	25	21.87	20.67
	25	0	21.80	21.05		50	0	21.84	21.09
HCH	1	0	22.91	21.81	HCH	1	0	22.95	21.85
	1	12	23.03	21.68		1	24	23.07	21.72
	1	24	22.86	21.63		1	49	22.90	21.67
	12	0	21.90	20.86		25	0	21.94	20.90

	12	6	21.99	20.98		25	12	22.03	21.02
	12	13	21.82	20.81		25	25	21.86	20.85
	25	0	21.97	21.06		50	0	22.01	21.10
Channel Bandwidth: 15 MHz					Channel Bandwidth: 20 MHz				
LCH	1	0	22.78	21.48	LCH	1	0	22.81	21.51
	1	37	23.29	21.99		1	50	23.32	22.02
	1	74	23.05	21.48		1	99	23.08	21.51
	37	0	22.01	20.98		50	0	22.04	21.01
	37	19	22.13	21.05		50	25	22.16	21.08
	37	39	21.89	20.92		50	50	21.92	20.95
	75	0	22.14	20.97		100	0	22.17	21.00
MCH	1	0	23.02	21.72	MCH	1	0	23.05	21.75
	1	37	23.08	21.87		1	50	23.11	21.90
	1	74	22.90	21.42		1	99	22.93	21.45
	37	0	21.86	20.94		50	0	21.89	20.97
	37	19	21.94	20.86		50	25	21.97	20.89
	37	39	21.93	20.73		50	50	21.96	20.76
	75	0	21.90	21.15		100	0	21.93	21.18
HCH	1	0	23.01	21.91	HCH	1	0	23.04	21.94
	1	37	23.13	21.78		1	50	23.16	21.81
	1	74	22.96	21.73		1	99	22.99	21.76
	37	0	22.00	20.96		50	0	22.03	20.99
	37	19	22.09	21.08		50	25	22.12	21.11
	37	39	21.92	20.91		50	50	21.95	20.94
	75	0	22.07	21.16		100	0	22.10	21.19

LTE Band 7									
Channel	RB Configuration		Average Power [dBm]		Channel	RB Configuration		Average Power [dBm]	
	Size	Offset	QPSK	16QA M		Size	Offset	QPSK	16QAM
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
LCH	1	0	22.59	21.24	LCH	1	0	22.63	21.28
	1	12	22.81	21.72		1	24	22.85	21.76
	1	24	22.79	21.21		1	49	22.83	21.25
	12	0	21.79	20.71		25	0	21.83	20.75
	12	6	21.85	20.88		25	12	21.89	20.92
	12	13	21.86	20.65		25	25	21.90	20.69
	25	0	21.85	20.74		50	0	21.89	20.78
MCH	1	0	22.52	21.47	MCH	1	0	22.56	21.51
	1	12	22.95	21.54		1	24	22.99	21.58
	1	24	22.74	21.45		1	49	22.78	21.49
	12	0	21.81	20.88		25	0	21.85	20.92
	12	6	21.84	20.89		25	12	21.88	20.93
	12	13	21.85	20.85		25	25	21.89	20.89
	25	0	21.88	20.88		50	0	21.92	20.92
HCH	1	0	22.62	21.07	HCH	1	0	22.66	21.11
	1	12	23.02	21.81		1	24	23.06	21.85
	1	24	22.81	21.52		1	49	22.85	21.56

	12	0	21.84	20.77		25	0	21.88	20.81
	12	6	21.92	20.83		25	12	21.96	20.87
	12	13	21.94	20.92		25	25	21.98	20.96
	25	0	22.02	20.85		50	0	22.06	20.89
Channel Bandwidth: 15 MHz					Channel Bandwidth: 20 MHz				
LCH	1	0	22.69	21.34	LCH	1	0	22.72	21.37
	1	37	22.91	21.82		1	50	22.94	21.85
	1	74	22.89	21.31		1	99	22.92	21.34
	37	0	21.89	20.81		50	0	21.92	20.84
	37	19	21.95	20.98		50	25	21.98	21.01
	37	39	21.96	20.75		50	50	21.99	20.78
	75	0	21.95	20.84		100	0	21.98	20.87
MCH	1	0	22.62	21.57	MCH	1	0	22.65	21.60
	1	37	23.05	21.64		1	50	23.08	21.67
	1	74	22.84	21.55		1	99	22.87	21.58
	37	0	21.91	20.98		50	0	21.94	21.01
	37	19	21.94	20.99		50	25	21.97	21.02
	37	39	21.95	20.95		50	50	21.98	20.98
	75	0	21.98	20.98		100	0	22.01	21.01
HCH	1	0	22.72	21.17	HCH	1	0	22.75	21.20
	1	37	23.12	21.91		1	50	23.15	21.94
	1	74	22.91	21.62		1	99	22.94	21.65
	37	0	21.94	20.87		50	0	21.97	20.90
	37	19	22.02	20.93		50	25	22.05	20.96
	37	39	22.04	21.02		50	50	22.07	21.05
	75	0	22.12	20.95		100	0	22.15	20.98

Pre-scan all mode and data rates and positions, find worse case mode are chosen to the report, the worse mode applicability and tested channel detail as below:

Item	band	Bandwidth(MHz)						modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
EIRP	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	□	□	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	□	□	☒	☒	☒
Conducted output power	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
99%&26dB Occupied Bandwidth	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	□	□	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	□	□	☒	☒	☒
peak-to-average ratio	4	□	□	□	□	□	□	☒	☒	☒	☒	☒	☒	☒	☒
	7	-	-	□	□	□	□	☒	☒	☒	☒	☒	☒	☒	☒
Band Edge at antenna terminals	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
Spurious emissions at antenna terminals	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	□	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	☒	□	☒	☒	☒
Field strength of spurious radiation	4	□	□	☒	☒	☒	☒	☒	☒	□	☒	□	☒	☒	□
	7	-	-	☒	☒	☒	☒	☒	☒	□	☒	□	☒	☒	□
Frequency stability	4	□	□	□	□	□	□	☒	☒	□	□	□	☒	□	□
	7	-	-	□	□	□	□	☒	☒	□	□	□	☒	□	□

Remark:

The mark “☒” means is chosen for testing

The mark “□” means is not chosen for testing

The mark “-” means is not supported bandwidth

5 Radio Technical Requirements Specification

Reference documents for testing:

No.	Identity	Document Title
1	FCC 47 CFR Part 27	Subpart C—Technical Standards
		Subpart M—Broadband Radio Service and Educational Broadband Service
2	FCC 47 CFR Part 2 Subpart J	Frequency allocations and radio treaty matters; general rules and regulations
3	ANSI/TIA/EIA-603-D 2010	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
4	KDB 971168 D01	KDB 971168 D01 Power Meas License Digital Systems v02r02

5.1 Equivalent Isotropic Radiated Power

Test Requirement:

FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4)/(h)(2)

Test Method:

KDB 971168 D01v02r02 & ANSI/TIA/EIA-603-D 2010

Limit:

FCC 47 CFR Part 27.50(d)(4): Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP.

FCC 47 CFR Part 27.50(h)(2): Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.

Test Procedure:

Test procedure as below:

- 1) The EUT was powered ON and placed on a 1.5m high table at a 3 meter fully Anechoic Chamber. The antenna of the transmitter was extended to its maximum length. Modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- 2) The EUT was set 3 meters (above 18GHz the distance is 1 meter) away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 3) The disturbance of the transmitter was maximized on the test receiver display by raising and lowering from 1m to 4m the receive antenna and by rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- 4) Steps 1) to 3) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- 5) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
- 6) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 3) is obtained for this set of conditions.
- 7) The output power into the substitution antenna was then measured.
- 8) Steps 6) and 7) were repeated with both antennas polarized.
- 9) Calculate power in dBm by the following formula:

$$\text{ERP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$\text{EIRP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$\text{EIRP} = \text{ERP} + 2.15\text{dB}$$

where:

Pg is the generator output power into the substitution antenna.

- 10) Test the EUT in the lowest channel, the middle channel the Highest channel

11) The radiation measurements are performed in X, Y, Z axis positioning for EUT operation mode, and found the X axis positioning which it is worse case.

12) Repeat above procedures until all frequencies measured was complete.

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Peak	100kHz	300kHz	Peak
Above 1GHz	Peak	1MHz	3MHz	Peak

Test Setup:

Refer to section 4.1.2 for details.

Instruments Used:

Refer to section 3 for details

Test Mode:

Link mode

Test Results:

Pass

Test Data:

Channel	Frequency (MHz)	EIRP (dBm)		Limit (dBm)	Result	Antenna Polaxis.
		QPSK; RB:1	16QAM; RB:1			
LTE Band 4; Bandwidth 1.4MHz						
19957	1710.7	23.03	22.11	30.00	Pass	H
		20.46	20.12	30.00	Pass	V
20175	1732.5	23.48	22.45	30.00	Pass	H
		20.79	20.58	30.00	Pass	V
20393	1754.3	23.07	22.10	30.00	Pass	H
		20.77	20.25	30.00	Pass	V
LTE Band 4; Bandwidth 3MHz						
19965	1711.5	23.31	22.35	30.00	Pass	H
		20.60	20.29	30.00	Pass	V
20175	1732.5	23.42	22.49	30.00	Pass	H
		20.86	20.39	30.00	Pass	V
20385	1753.5	23.02	22.03	30.00	Pass	H
		20.76	19.97	30.00	Pass	V
LTE Band 4; Bandwidth 5MHz						
19975	1712.5	23.39	21.78	30.00	Pass	H
		20.37	20.00	30.00	Pass	V
20175	1732.5	23.46	22.27	30.00	Pass	H
		20.86	20.30	30.00	Pass	V
20375	1752.5	23.41	21.81	30.00	Pass	H
		20.63	20.20	30.00	Pass	V
LTE Band 4; Bandwidth 10MHz						
20000	1715	23.07	22.41	30.00	Pass	H
		20.43	20.00	30.00	Pass	V
20175	1732.5	23.47	22.49	30.00	Pass	H
		20.86	20.26	30.00	Pass	V
20350	1750	23.27	22.23	30.00	Pass	H
		20.55	20.11	30.00	Pass	V

LTE Band 4; Bandwidth 15MHz						
20025	1717.5	23.40	22.36	30.00	Pass	H
		20.95	20.03	30.00	Pass	V
20175	1732.5	23.48	22.49	30.00	Pass	H
		20.98	20.33	30.00	Pass	V
20325	1747.5	23.13	22.15	30.00	Pass	H
		20.96	20.09	30.00	Pass	V
LTE Band 4; Bandwidth 20MHz						
20050	1720	23.12	22.95	30.00	Pass	H
		20.36	20.40	30.00	Pass	V
20175	1732.5	23.36	23.24	30.00	Pass	H
		20.80	20.64	30.00	Pass	V
20300	1745	23.12	22.96	30.00	Pass	H
		20.56	20.43	30.00	Pass	V
LTE Band 7; Bandwidth 5MHz						
20775	2502.5	22.52	21.75	33.01	Pass	H
		22.94	21.79	33.01	Pass	V
21100	2535	22.98	22.03	33.01	Pass	H
		23.07	22.24	33.01	Pass	V
21425	2567.5	22.74	21.63	33.01	Pass	H
		23.46	21.96	33.01	Pass	V
LTE Band 7; Bandwidth 10MHz						
20800	2505	22.57	21.57	33.01	Pass	H
		23.16	22.18	33.01	Pass	V
21100	2535	22.91	22.01	33.01	Pass	H
		22.88	22.22	33.01	Pass	V
21400	2565	22.56	21.64	33.01	Pass	H
		23.26	21.75	33.01	Pass	V
LTE Band 7; Bandwidth 15MHz						
20825	2507.5	22.91	21.90	33.01	Pass	H
		22.97	21.80	33.01	Pass	V
21100	2535	23.03	22.14	33.01	Pass	H
		23.13	22.24	33.01	Pass	V
21375	2562.5	22.83	21.69	33.01	Pass	H
		23.08	22.15	33.01	Pass	V
LTE Band 7; Bandwidth 20MHz						
20850	2510	22.46	22.23	33.01	Pass	H
		23.22	22.22	33.01	Pass	V
21100	2535	22.92	22.27	33.01	Pass	H
		23.38	22.39	33.01	Pass	V
21350	2560	22.49	22.06	33.01	Pass	H
		23.30	22.17	33.01	Pass	V

5.2 Conducted Output Power

Test Requirement:	FCC 47 CFR Part 2.1046(a) & FCC 47 CFR Part 27.50(d)(4)/(h)(2)
Test Method:	KDB 971168 D01v02r02 & ANSI/TIA/EIA-603-D 2010
Limit:	FCC 47 CFR Part 27.50(d)(4): Fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz bands are limited to 1 watt EIRP. FCC 47 CFR Part 27.50(h)(2): Mobile and other user stations. Mobile stations are limited to 2.0 watts EIRP. All user stations are limited to 2.0 watts transmitter output power.
Test Procedure:	The EUT was set up for the maximum power with WCDMA, CDMA, and LTE link data modulation and link up with simulator. Set the EUT to transmit under low, middle and high channel and record the power level shown on simulator. Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.
Test Setup:	Refer to section 4.1.1(1) for details.
Instruments Used:	Refer to section 3 for details
Test Mode:	Link mode
Test Results:	Pass
Test Data:	The full result can be also refer to section 4.4.2 for details.

Channel	RB Configuration		Average Power [dBm]		Channel	RB Configuration		Average Power [dBm]	
	Size	Offset	QPSK	16QAM		Size	Offset	QPSK	16QAM
LTE Band 4									
Channel Bandwidth: 1.4 MHz					Channel Bandwidth: 3 MHz				
LCH	1	2	23.15	21.85	LCH	1	7	23.16	21.86
MCH	1	2	22.94	21.73	MCH	1	7	22.95	21.74
HCH	1	2	22.99	21.64	HCH	1	7	23.00	21.65
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
LCH	1	12	23.19	21.89	LCH	1	24	23.23	21.93
MCH	1	12	22.98	21.77	MCH	1	24	23.02	21.81
HCH	1	12	23.03	21.68	HCH	1	24	23.07	21.72
Channel Bandwidth: 15 MHz					Channel Bandwidth: 20 MHz				
LCH	1	37	23.29	21.99	LCH	1	50	23.32	22.02
MCH	1	37	23.08	21.87	MCH	1	50	23.11	21.90
HCH	1	37	23.13	21.78	HCH	1	50	23.16	21.81
LTE Band 7									
Channel Bandwidth: 5 MHz					Channel Bandwidth: 10 MHz				
LCH	1	12	22.81	21.72	LCH	1	24	22.85	21.76
MCH	1	12	22.95	21.54	MCH	1	24	22.99	21.58
HCH	1	12	23.02	21.81	HCH	1	24	23.06	21.85
Channel Bandwidth: 15 MHz					Channel Bandwidth: 20 MHz				
LCH	1	37	22.91	21.82	LCH	1	49	22.94	21.85
MCH	1	37	23.05	21.64	MCH	1	49	23.08	21.67
HCH	1	37	23.12	21.91	HCH	1	49	23.15	21.94

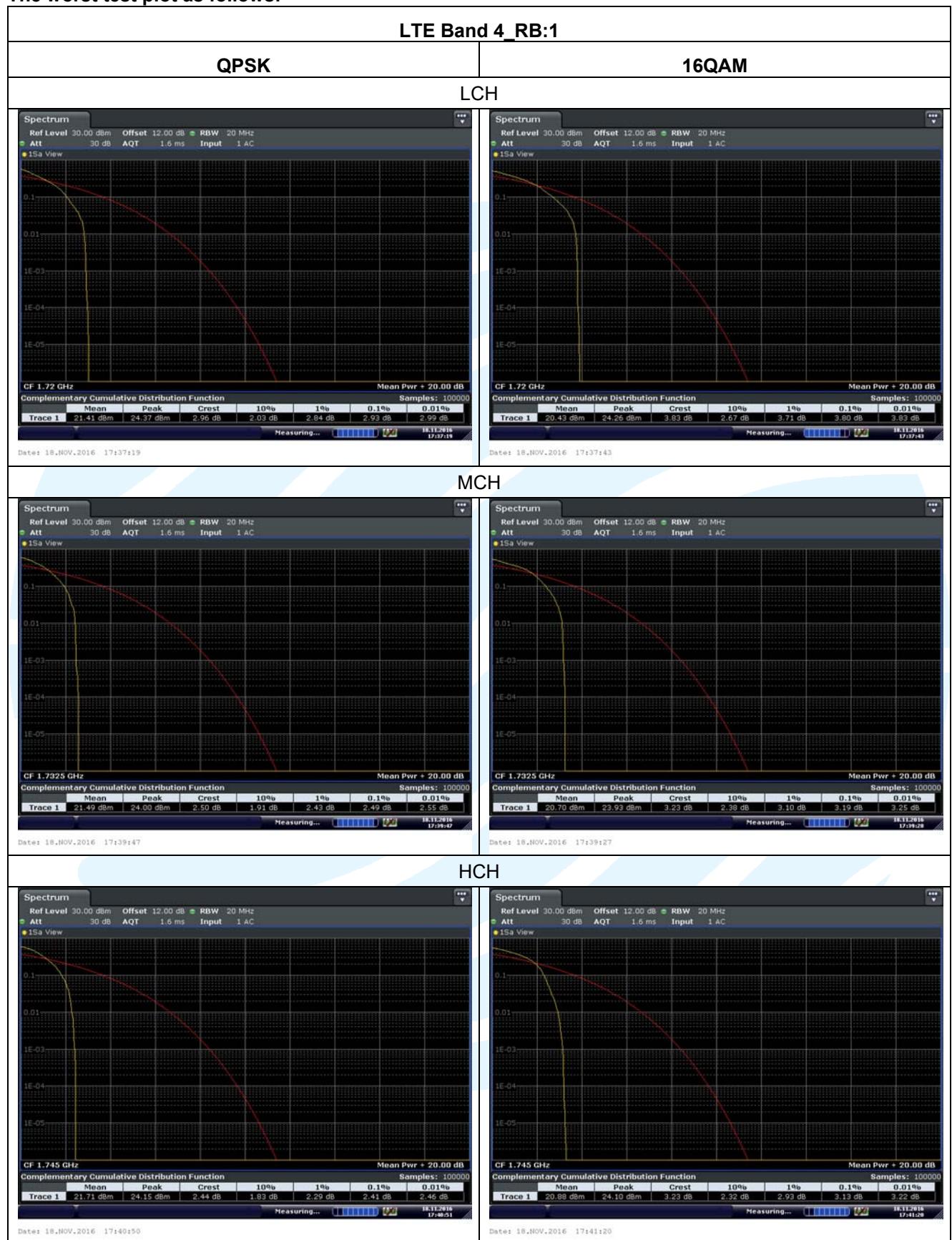
5.3 Peak-to-average ratio

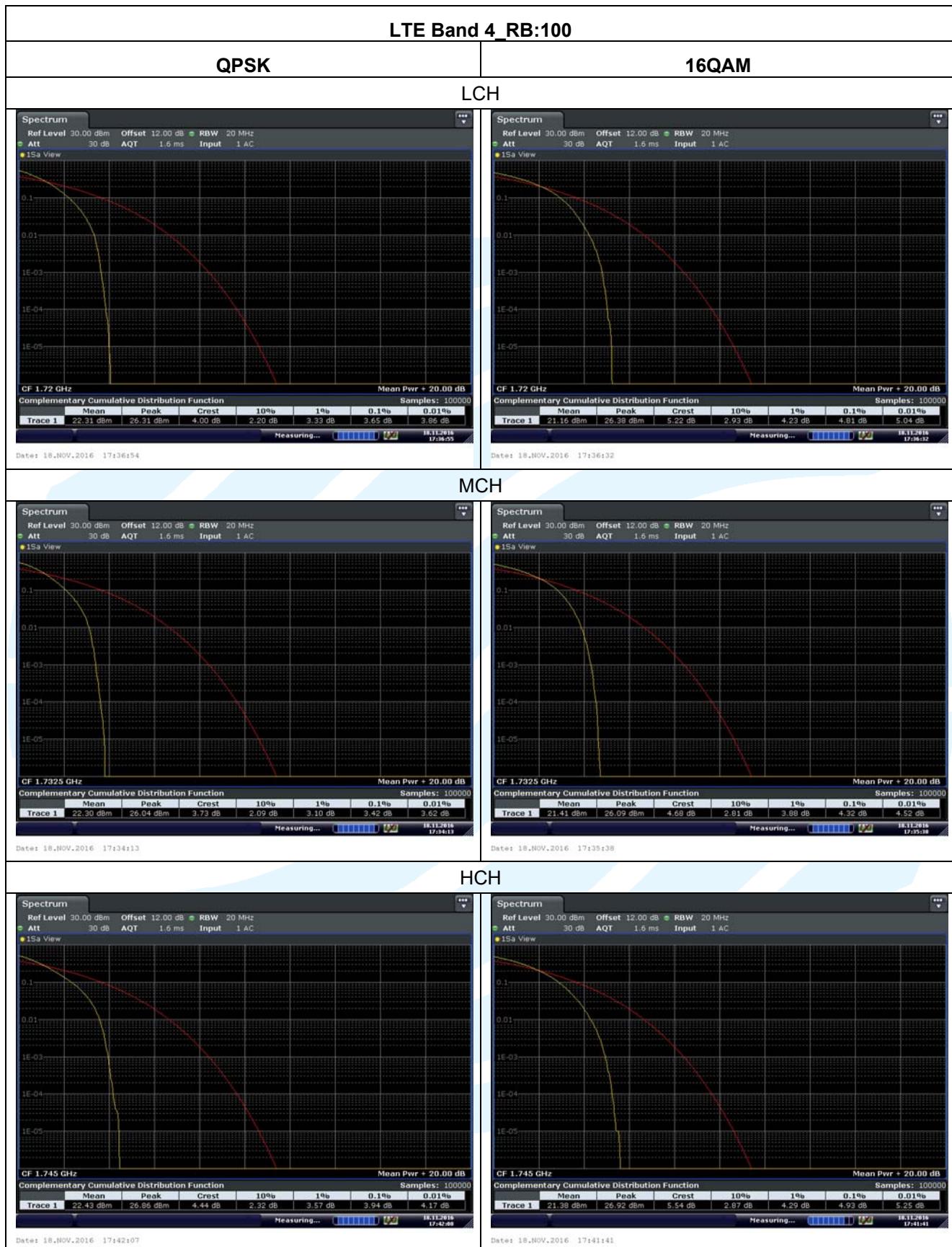
Test Requirement:	FCC 47 CFR Part 27.50(d)(5)
Test Method:	KDB 971168 D01v02r02
Limit:	In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB
Test Procedure:	The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. a) Set resolution/measurement bandwidth \geq signal's occupied bandwidth b) Set the number of counts to a value that stabilizes the measured CCDF curve c) Record the maximum PAPR level associated with a probability of 0.1 %
	Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.
Test Setup:	Refer to section 4.1.1(1) for details.
Instruments Used:	Refer to section 3 for details
Test Mode:	Link mode
Test Results:	Pass
Test Data:	The full result can be also refer to section 4.4.2 for details.

Peak-to-average ratio (dB)

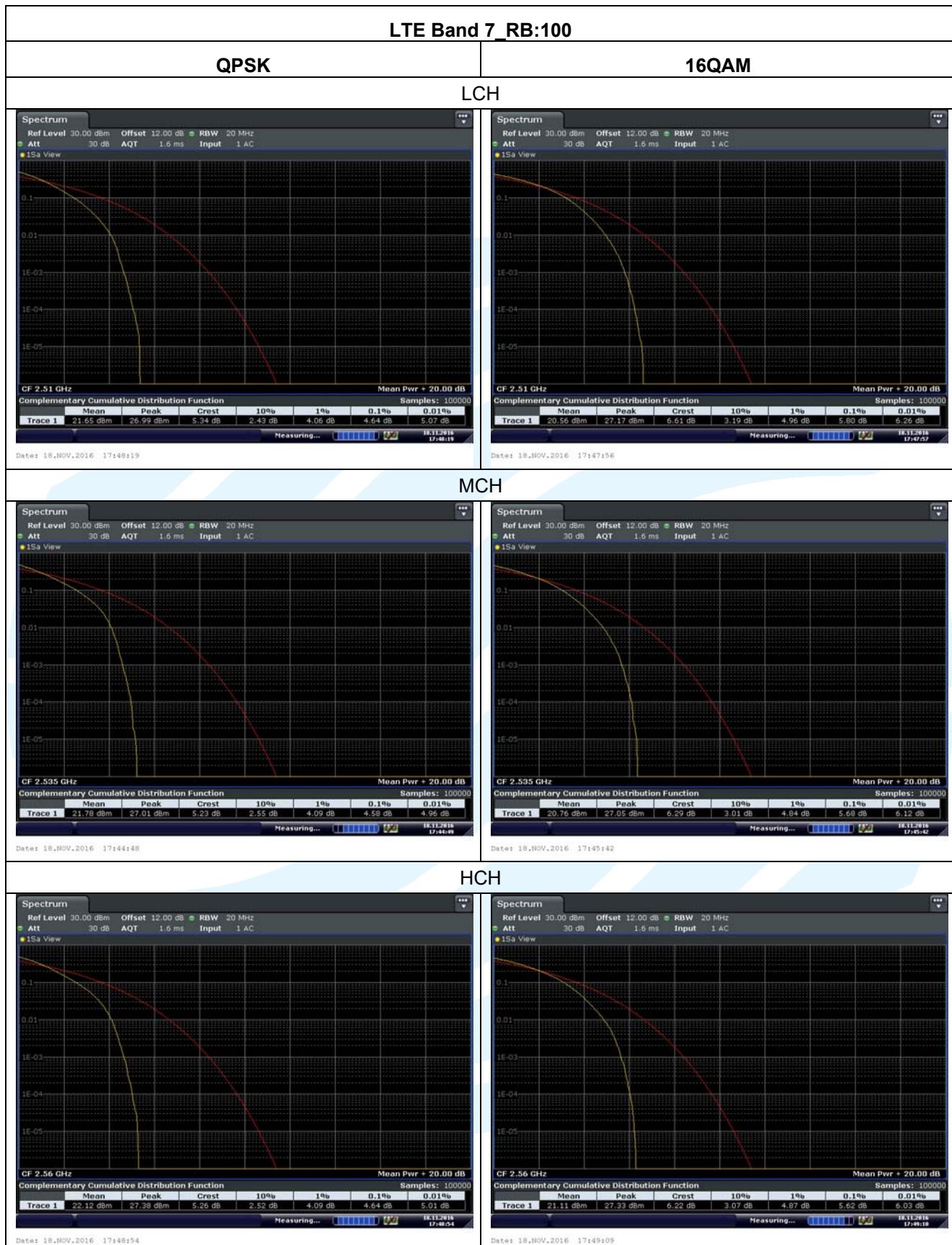
Channel	RB Configuration		Modulation	
	Size	Offset	QPSK	16QAM
LTE Band 4_ Channel Bandwidth: 20 MHz				
LCH	1	0	2.93	3.80
	100	0	3.65	4.81
MCH	1	0	2.49	3.19
	100	0	3.42	4.32
HCH	1	0	2.41	3.13
	100	0	3.94	4.93
LTE Band 7_ Channel Bandwidth: 20 MHz				
LCH	1	0	3.94	4.64
	100	0	4.64	5.80
MCH	1	0	3.42	4.38
	100	0	4.58	5.68
HCH	1	0	4.46	5.33
	100	0	4.64	5.62

The worst test plot as follows:









5.4 99%&26dB Occupied Bandwidth

Test Requirement: FCC 47 CFR Part 2.1049(h)
Test Method: ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02
Test Procedure: The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The 99% and -26dB bandwidths were also measured and recorded.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup: Refer to section 4.1.1(2) for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

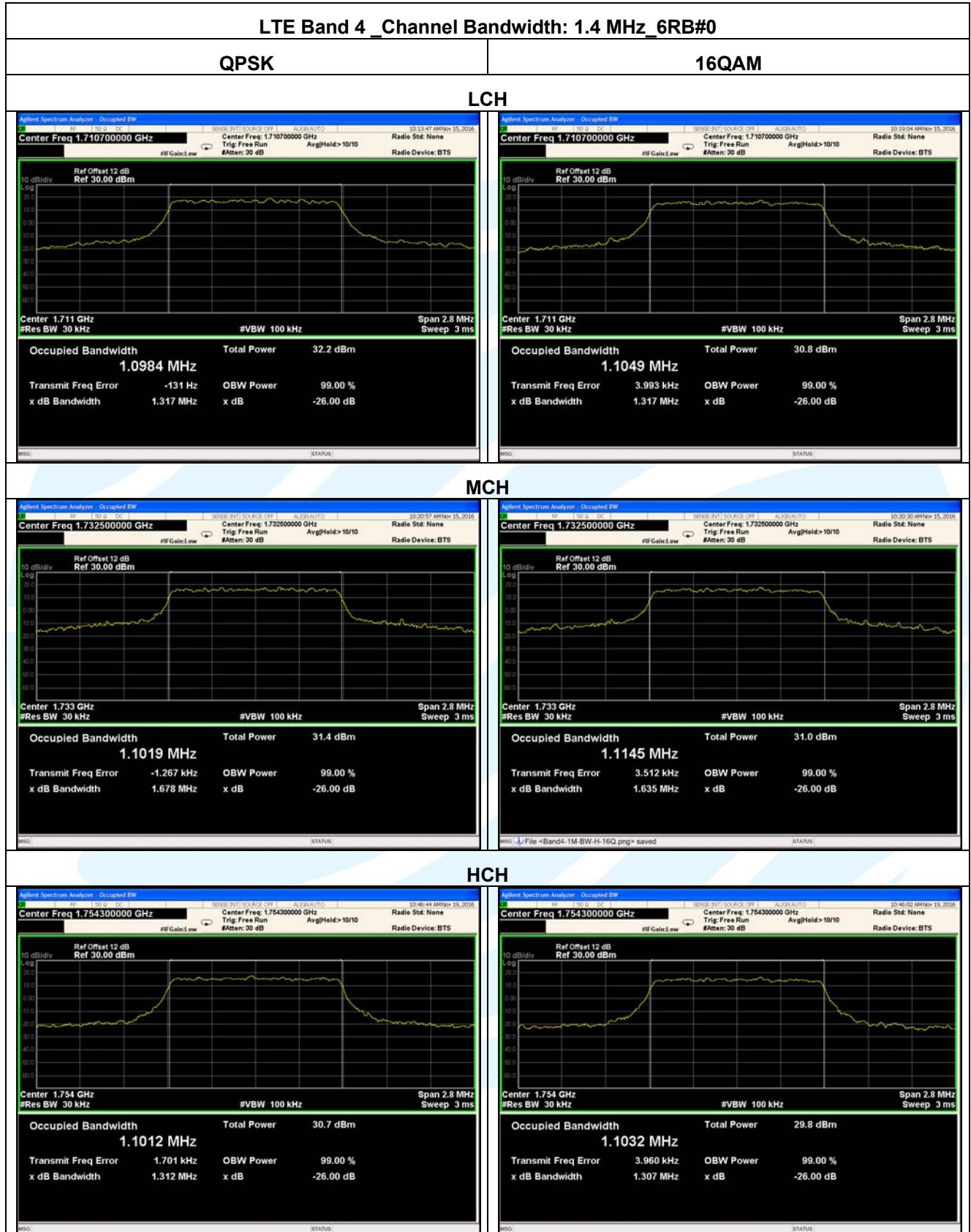
Test Results: Pass

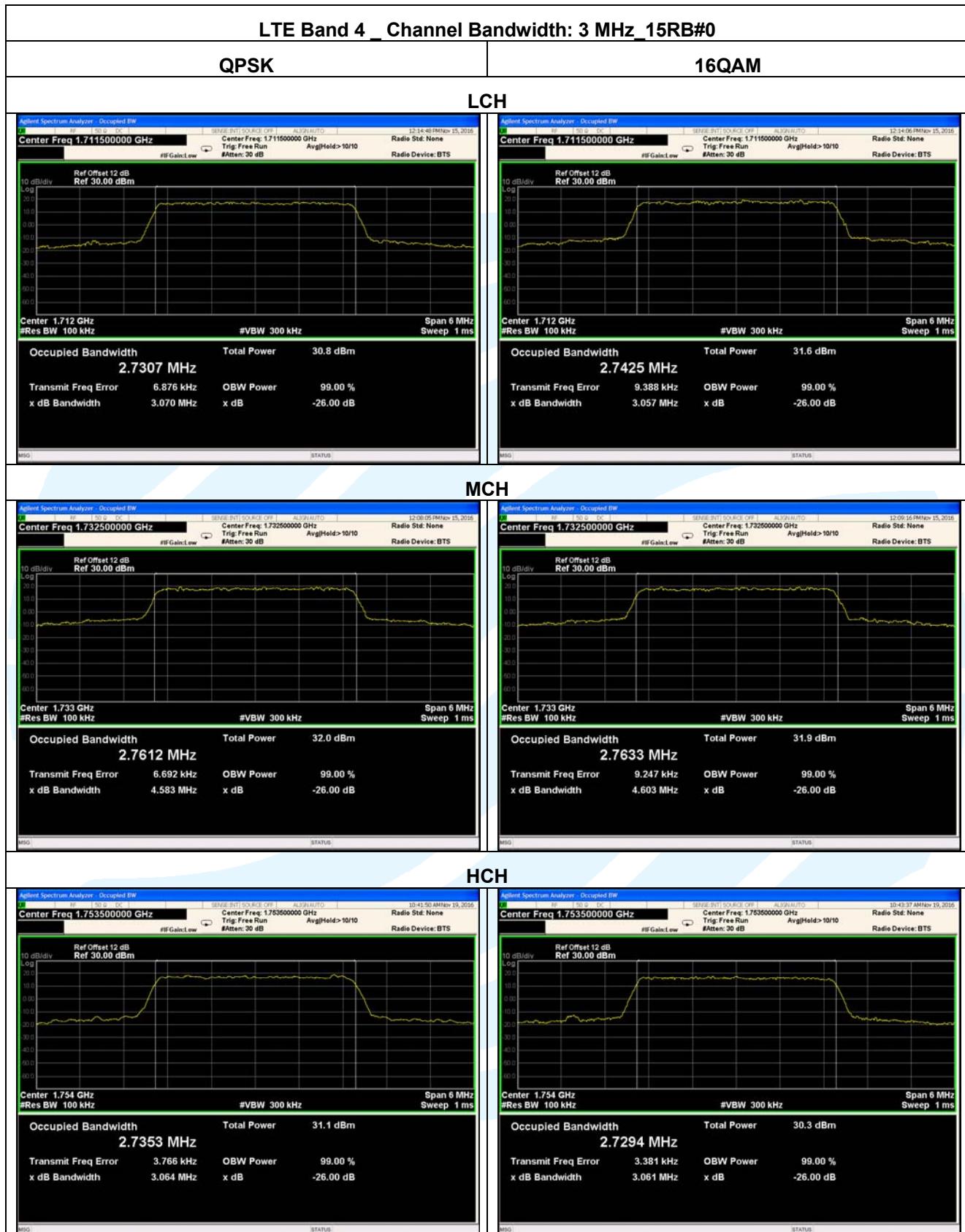
Test Data:

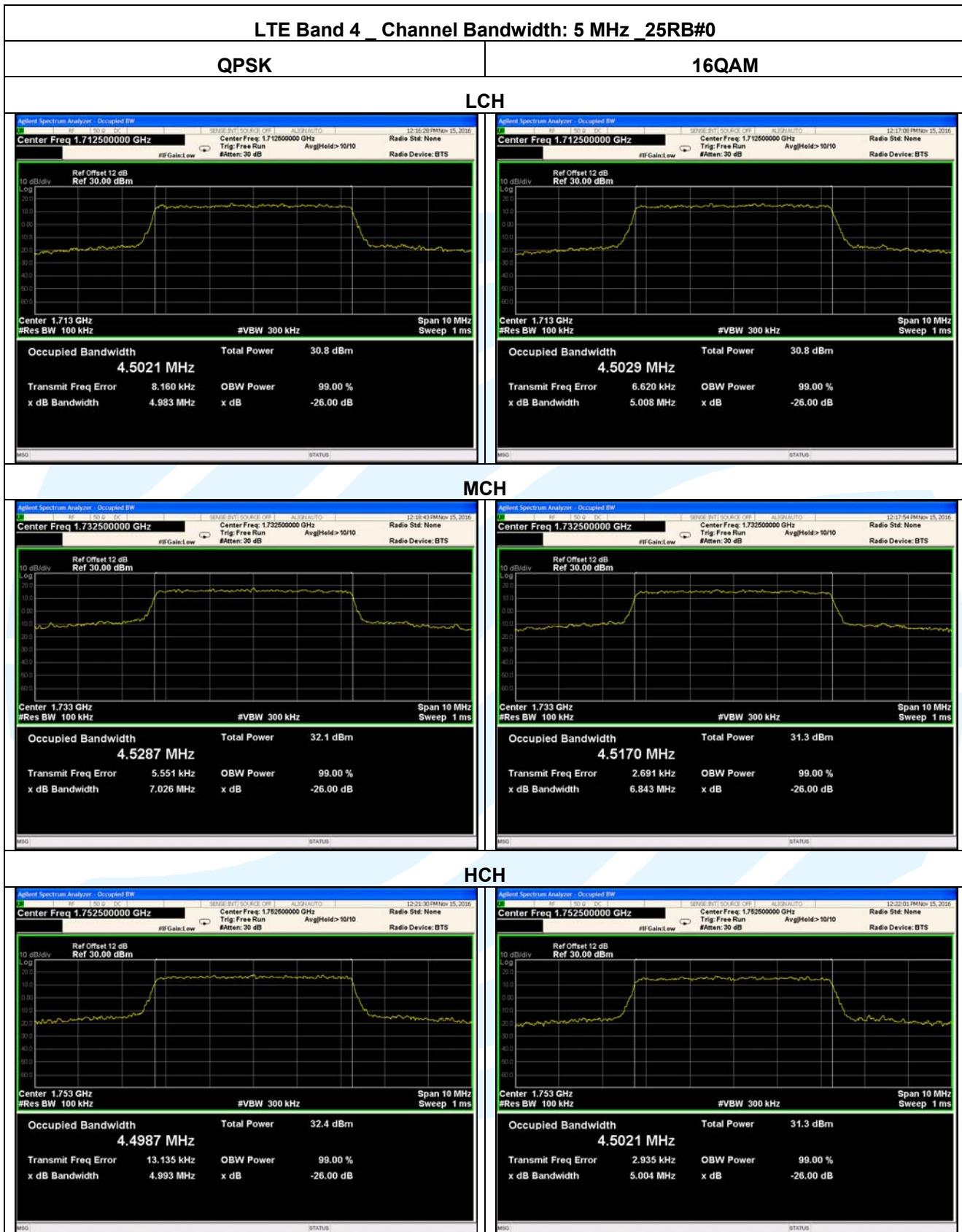
For LTE Band 4						
Channel	RB Configuration		26 dB BW (MHz)		99% BW (MHz)	
	Size	Offset	QPSK	16QAM	QPSK	16QAM
Channel Bandwidth: 1.4 MHz						
LCH	6	0	1.317	1.317	1.0984	1.1049
MCH	6	0	1.678	1.635	1.1019	1.1145
HCH	6	0	1.312	1.307	1.1012	1.1032
Channel Bandwidth: 3 MHz						
LCH	15	0	3.070	3.057	2.7307	2.7425
MCH	15	0	4.583	4.603	2.7612	2.7633
HCH	15	0	3.064	3.061	2.7353	2.7294
Channel Bandwidth: 5 MHz						
LCH	25	0	4.983	5.008	4.5021	4.5029
MCH	25	0	7.026	6.843	4.5287	4.5170
HCH	25	0	4.993	5.004	4.4987	4.5021
Channel Bandwidth: 10 MHz						
LCH	50	0	10.00	9.975	9.0437	9.0152
MCH	50	0	11.90	10.84	9.1118	9.0563
HCH	50	0	10.08	10.05	9.0441	9.0186
Channel Bandwidth: 15 MHz						
LCH	75	0	14.66	14.75	13.436	13.422
MCH	75	0	19.14	15.84	13.525	13.483
HCH	75	0	14.81	14.78	13.455	13.437
Channel Bandwidth: 20 MHz						
LCH	100	0	20.61	20.46	18.364	18.299
MCH	100	0	28.52	23.31	18.504	18.486
HCH	100	0	20.75	20.48	18.469	18.400

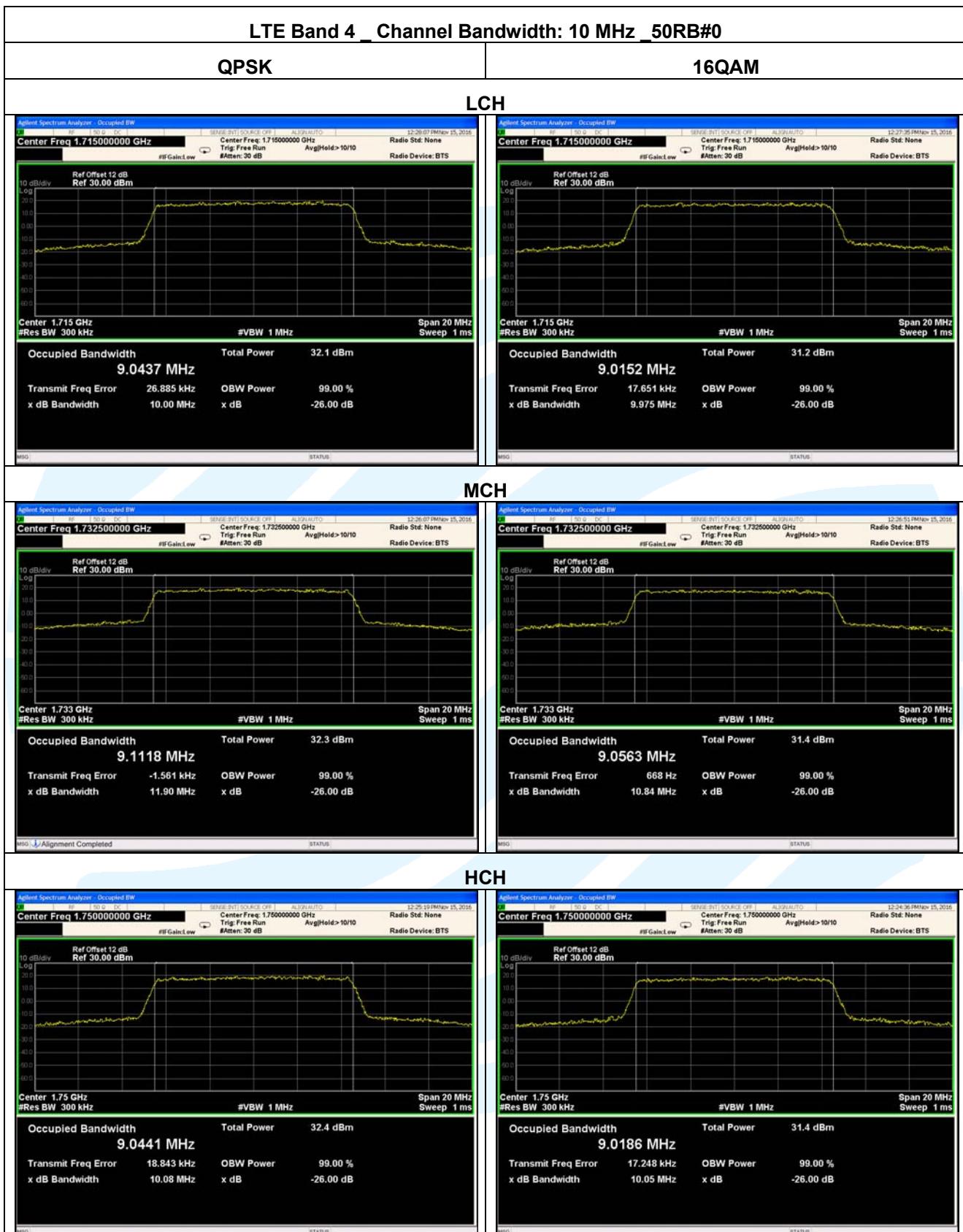
For LTE Band 7						
Channel	RB Configuration		26 dB BW (MHz)		99% BW (MHz)	
	Size	Offset	QPSK	16QAM	QPSK	16QAM
Channel Bandwidth: 5 MHz						
LCH	25	0	4.952	5.004	4.4905	4.5009
MCH	25	0	4.984	4.981	4.4894	4.4898
HCH	25	0	4.999	4.986	4.4937	4.4985
Channel Bandwidth: 10 MHz						
LCH	50	0	10.05	9.974	9.0432	8.9924
MCH	50	0	10.06	9.972	9.0620	9.0009
HCH	50	0	9.989	9.969	9.0506	8.9932
Channel Bandwidth: 15 MHz						
LCH	75	0	14.65	14.68	13.443	13.422
MCH	75	0	14.70	14.60	13.468	13.433
HCH	75	0	14.67	14.67	13.456	13.425
Channel Bandwidth: 20 MHz						
LCH	100	0	20.39	20.31	18.337	18.271
MCH	100	0	20.64	20.52	18.411	18.337
HCH	100	0	20.56	20.43	18.367	18.285

The test plot as follows:



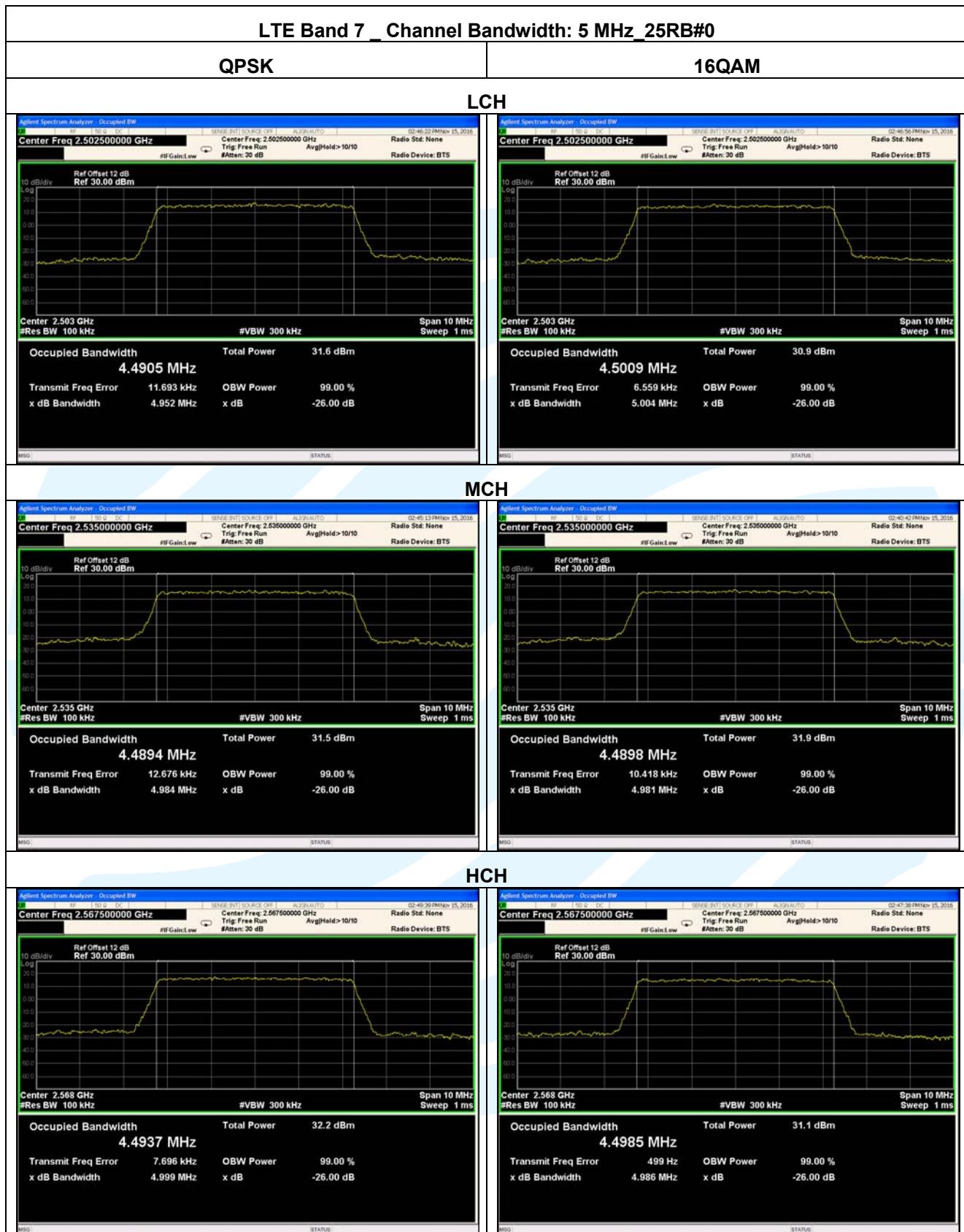




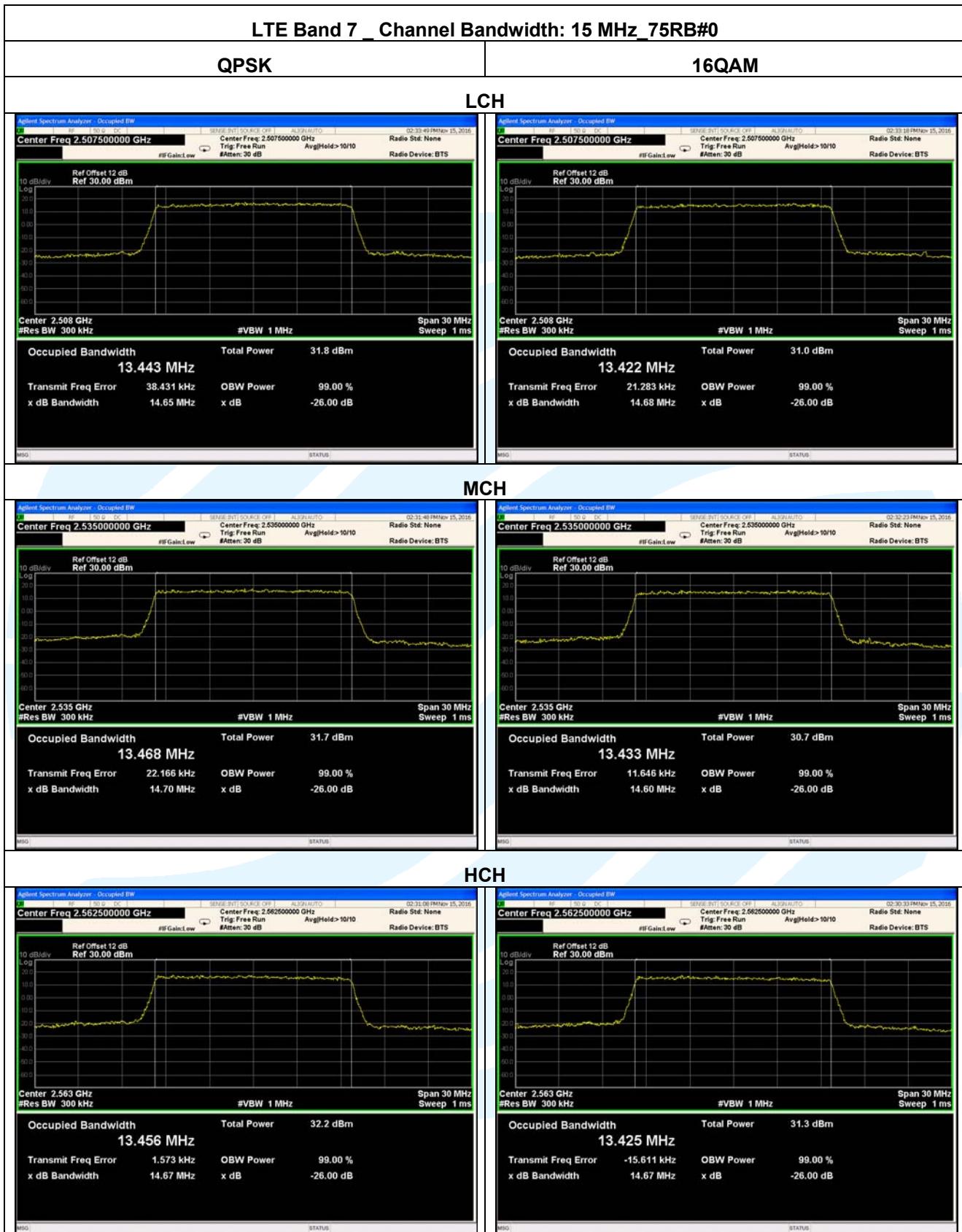














5.5 Band Edge at antenna terminals

Test Requirement:

FCC 47 CFR Part 27.53(h)/(l)/(m)

Test Method:

ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02

Limit:

FCC 47 CFR Part 27.53(h)(1): Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10} (P)$ dB. The emission limit equal to -13 dBm.

FCC 47 CFR Part 27.53(m)(4): For mobile digital stations, the attenuation 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 addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

Test Procedure:

LTE_Band 4:

The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer.

For each band edge measurement:

- 1) Set the spectrum analyzer span to include the block edge frequency.
- 2) Set a marker to point the corresponding band edge frequency in each test case.
- 3) Set display line at -13 dBm
- 4) Set resolution bandwidth to at least 1% of emission bandwidth.

Such as:

- a) The center frequency of spectrum is the band edge frequency and span is 1 MHz. RB of the spectrum is 3 kHz and VB of the spectrum is 10 kHz (GSM/GPRS/EDGE).
- b) The center frequency of spectrum is the band edge frequency and span is 5 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 300 kHz (WCDMA).
- c) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 20 kHz and VB of the spectrum is 20 kHz (LTE Bandwidth 1.4 MHz).
- d) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 30 kHz and VB of the spectrum is 30 kHz (LTE Bandwidth 3 MHz).
- e) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 51 kHz and VB of the spectrum is 51 kHz (LTE Bandwidth 5 MHz).
- f) The center frequency of spectrum is the band edge frequency and span is 2 MHz. RB of the spectrum is 100 kHz and VB of the spectrum is 100 kHz (LTE Bandwidth 10 MHz)

- 5) Record the max trace plot into the test report

LTE_Band 7:

Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately

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outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

Note: The cable loss and attenuator loss were offset into measure device as an amplitude offset.

Test Setup:

Refer to section 4.1.1(2) for details.

Instruments Used:

Refer to section 3 for details

Test Mode:

Link mode

Test Results:

Pass

The test plot as follows:
