FCC TEST REPORT

Product Name:	Mobile Phone
Trade Mark:	MI
Model No.:	MCG3B
Report Number:	170803008RFM-3
Test Standards:	FCC 47 CFR Part 27 FCC 47 CFR Part 2
FCC ID:	2AFZZ-RMS3B
Test Result:	PASS
Date of Issue:	September 4, 2017

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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Date: September 4, 2017

Version

Version No.	Date	Description
V1.0	September 4, 2017	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:	N/A
Address of Manufacturer:	N/A

1.2 EUT INFORMATION

1.2.1 General Description of EUT

Product Name:	Mobile Phone		
Model No.:	MCG3B		
Add. Model No.:	N/A		
Trade Mark:	MI		
DUT Stage:	Identical Prototype		
EUT Supports Function:	GSM Bands:	GSM850/1900	
	UTRA Bands:	Band II/ Band V	
	E-UTRA Bands:	FDD Band 4/ Band 5/ Band 7	
		TDD Band 38	
	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
		Bluetooth: V3.0+HS & V4.1 LE	
	RNSS Bands:	1559 MHz to 1610 MHz	GPS/ GLONASS/
	BSR:	VHF Band II	FM
Software Version:	MIUI8		
Hardware Version:	P2.0		
Sample Received Date:	August 4, 2017		
Sample Tested Date:	August 5, 2017 to September 3, 2017		

1.2.2 Description of Accessories

Adapter(1)	
Trade Mark:	XIAOMI
Model No.:	MDY-09-EE
Input:	100-240 V~50/60 Hz 0.2A Max
Output:	5.0 V ⎓ 1.0 A
AC Cable:	N/A
DC Cable:	0.8 Meter, Shielded without ferrite
Manufacturer:	Dongguan Aohai Power Technology Co., Ltd.

Adapter(2)	
Trade Mark:	XIAOMI
Model No.:	MDY-09-EE
Input:	100-240 V~50/60 Hz 0.2A Max
Output:	5.0 V ⎓ 1.0 A
AC Cable:	N/A
DC Cable:	0.8 Meter, Shielded without ferrite
Manufacturer:	Dongguan Aohai Power Technology Co., Ltd.

Battery(1)	
Trade Mark:	MI
Model No.:	BN34
Battery Type:	Lithium-ion Rechargeable Battery
Rated Voltage:	3.85 Vdc
Limited Charge Voltage:	4.4 Vdc
Rated Capacity:	2910mAh
Manufacturer:	SCUD(Fujian)Electronics Co., Ltd.

Battery(2)	
Trade Mark:	MI
Model No.:	BN34
Battery Type:	Lithium-ion Rechargeable Battery
Rated Voltage:	3.85 Vdc
Limited Charge Voltage:	4.4 Vdc
Rated Capacity:	2910mAh
Manufacturer:	Sunwoda Electronic Co., Ltd.

Cable(1)	
Trade Mark:	N/A
Model No.:	KLC-2639
Description:	USB Micro-B Plug Cable
Cable Type:	Shielded without ferrite
Length:	0.8 Meter

Cable(2)	
Trade Mark:	N/A
Model No.:	0US231XI0015
Description:	USB Micro-B Plug Cable
Cable Type:	Shielded without ferrite
Length:	0.8 Meter

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

Support Networks:	LTE	
Type of Modulation:	LTE Band 4/7/38	QPSK, 16QAM,
IEMI:	Radiation: 865183030024549, 865183030024556	
	Conducted: 865183030024846, 865183030024853	
Antenna Type:	PIFA Antenna	
Antenna Gain:	LTE Band 4:	0.3 dBi
	LTE Band 7:	-1.3 dBi
	LTE Band 38:	-1.5 dBi
Normal Test Voltage:	3.85 Vdc	
Extreme Test Voltage:	3.6 to 4.4Vdc	
Extreme Test Temperature:	-30 °C to +50 °C	

Summary of Results:

Band	BW (MHz)	Frequency Range (MHz)	Max RF Output Power (dBm)		Type of Emission		
			Conducted (Average)	ERP/EIRP (Average)	QPSK	16QAM	64QAM
LTE Band 4	1.4	1710.7-1754.3	22.55	18.73	1M10G7D	1M10W7D	--
	3	1711.5-1753.5	22.56	19.33	2M74G7D	2M75W7D	--
	5	1712.5-1752.5	22.59	19.56	4M52G7D	4M53W7D	--
	10	1715-1750	22.63	18.82	9M06G7D	9M06W7D	--
	15	1717.5-1747.5	22.69	19.54	13M5G7D	13M5W7D	--
	20	1720-1745	22.72	19.21	17M9G7D	17M9W7D	--
LTE Band 7	5	2502.5-2567.5	23.10	18.78	4M52G7D	4M52W7D	--
	10	2505-2565	23.14	17.85	8M95G7D	8M93W7D	--
	15	2507.5-2562.5	23.20	18.53	13M5G7D	13M5W7D	--
	20	2510-2560	23.23	19.25	17M9G7D	17M9W7D	--
LTE Band 38	5	2572.5-2617.5	23.12	18.21	4M51G7D	4M52W7D	--
	10	2575-2615	23.16	19.12	8M95G7D	8M91W7D	--
	15	2577.5-2612.5	23.19	19.34	13M5G7D	13M5W7D	--
	20	2580-2610	23.26	19.41	17M8G7D	17M9W7D	--

1.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested independently

1) Support Equipment

Description	Manufacturer	Model No.	Serial Number	Supplied by
--	--	--	--	--

2) Support Cable

Cable No.	Description	Connector	Length	Supplied by
1	Antenna Cable	SMA	0.30 Meter	UnionTrust

1.5 TEST LOCATION

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
Telephone: +86 (0) 755 2823 0888
Fax: +86 (0) 755 2823 0886

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.

IC-Registration No.: 21600-1
The 3m Semi-anechoic chamber of Shenzhen UnionTrust Quality and Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 21600-1.

A2LA-Lab Certificate No.: 4312.01
Shenzhen UnionTrust Quality and Technology Co., Ltd. has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2005 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

FCC Accredited Lab.
Designation Number: CN1194
Test Firm Registration Number: 259480

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

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Measurement Uncertainty
1	Conducted emission 9KHz-150KHz	±3.8 dB
2	Conducted emission 150KHz-30MHz	±3.4 dB
3	Radiated emission 9KHz-30MHz	±4.9 dB
4	Radiated emission 30MHz-1GHz	±4.7 dB
5	Radiated emission 1GHz-18GHz	±5.1 dB
6	Radiated emission 18GHz-26GHz	±5.2 dB
7	Radiated emission 26GHz-40GHz	±5.2 dB

2. TEST SUMMARY

FCC 47 CFR Part 27 Test Cases (LTE Band 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 Bandwidth	FCC 47 CFR Part 2.1049(h) FCC 47 CFR Part 27.53(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

FCC 47 CFR Part 27 Test Cases (LTE Band 7&38)			
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	FCC 47 CFR Part 27.50(d)(5)	KDB 971168 D01v02r02	PASS
99%&26dB Bandwidth	FCC 47 CFR Part 2.1049(h) FCC 47 CFR Part 27.53(m)	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

3. EQUIPMENT LIST

Radiated Emission Test Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☑	3M Chamber & Accessory Equipment	ETS-LINDGREN	3M	N/A	Dec. 20, 2015	Dec. 19, 2018
☑	Receiver	R&S	ESIB26	100114	Dec. 22, 2016	Dec. 22, 2017
☑	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec. 22, 2016	Dec. 22, 2017
☐	Loop Antenna	ETS-LINDGREN	6502	00202525	Jun. 24, 2015	Jun. 23, 2018
☑	Broadband Antenna	ETS-LINDGREN	3142E	00201566	Jul. 24, 2015	Jul. 23, 2018
☑	Preamplifier	HP	8447F	2805A02960	Dec. 22, 2016	Dec. 22, 2017
☑	Broadband Antenna (Pre-amplifier)	ETS-LINDGREN	3142E-PA	00201891	Dec. 30, 2016	Dec. 30, 2017
☑	Horn Antenna	ETS-LINDGREN	3117	00164202	Jul. 24, 2015	Jul. 23, 2018
☑	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3117-PA	00201874	Dec. 30, 2016	Dec. 30, 2017
☑	Horn Antenna	ETS-LINDGREN	3116C	00200180	Jul. 28, 2015	Jul. 27, 2018
☑	Horn Antenna (Pre-amplifier)	ETS-LINDGREN	3116C-PA	00202652	Jul. 29, 2015	Jul. 28, 2018
☑	Multi device Controller	ETS-LINDGREN	7006-001	00160105	N/A	N/A
☑	Highpass Filter (1.2GHz~18GHz)	Micro-Tronics	HPM50108	G552	Jan. 19, 2017	Jan. 19, 2018
☑	Highpass Filter (3GHz~18GHz)	Micro-Tronics	HPM50117	G005	Jan. 30, 2017	Jan. 30, 2018
☑	Test Software	Audix	e3	Software Version: 9.160323		

2/3/4G RF Test System Equipment List						
Used	Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm dd, yyyy)	Cal. Due date (mm dd, yyyy)
☐	Spectrum Analyzer	R&S	FSP 13	1164.4391.13	Mar. 22, 2017	Mar. 21, 2018
☑	Receiver	R&S	ESR7	1316.3003K07 -101181-K3	Dec. 22, 2016	Dec. 22, 2017
☑	EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY51440197	Dec. 22, 2016	Dec. 22, 2017
☑	Wideband Radio Communication Tester	R&S	CMW500	116254	Mar. 22, 2017	Mar. 21, 2018
☑	Universal Radio Communication Tester	R&S	CMU200	114713	Dec. 22, 2016	Dec. 22, 2017
☑	DC Source	KIKUSUI	PWR400L	LK003024	Sep. 21, 2016	Sep. 20, 2017
☑	Temp & Humidity chamber	Votisch	VT4002	58566133290 020	Jun. 19, 2017	Jun. 18, 2018
☐	Temp & Humidity chamber	Ispec	GL(U)04KA(W)	1692H201P3	Sep. 21, 2016	Sep. 20, 2017
☑	Test Software	ECIT	AutomationTestSystem		Software Version: 2.170530	

4. TEST CONFIGURATION

4.1 ENVIRONMENTAL CONDITIONS FOR TESTING

4.1.1 Normal or Extreme Test Conditions

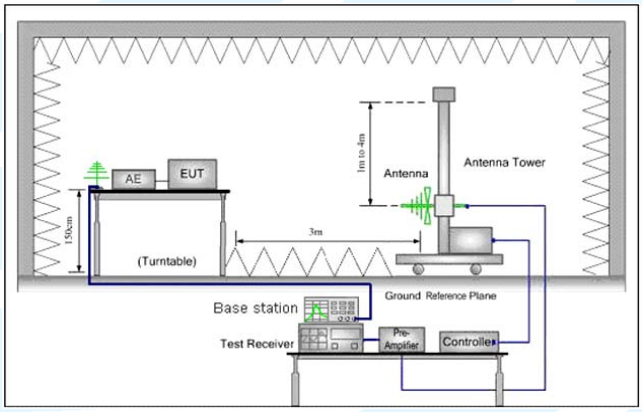
Test Environment	Selected Values During Tests		
Test Condition	Ambient		
	Temperature (°C)	Voltage (V)	Relative Humidity (%)
TN/VN	+15 to +35	3.85	20 to 75
TL/VL	-30	3.6	20 to 75
TH/VL	+50	3.6	20 to 75
TL/VH	-30	4.4	20 to 75
TH/VH	+50	4.4	20 to 75

Remark:

1) The EUT just work in such extreme temperature of -30 °C to +50 °C and the extreme voltage of 3.6 V to 4.4 V, so here the EUT is tested in the temperature of -30 °C to +50 °C and the voltage of 3.6 V to 4.4 V.
2) VN: Normal Voltage; TN: Normal Temperature;
   TL: Low Extreme Test Temperature; TH: High Extreme Test Temperature;
   VL: Low Extreme Test Voltage; VH: High Extreme Test Voltage.

4.2 TEST SETUP

4.2.1 For Radiated Emissions test setup



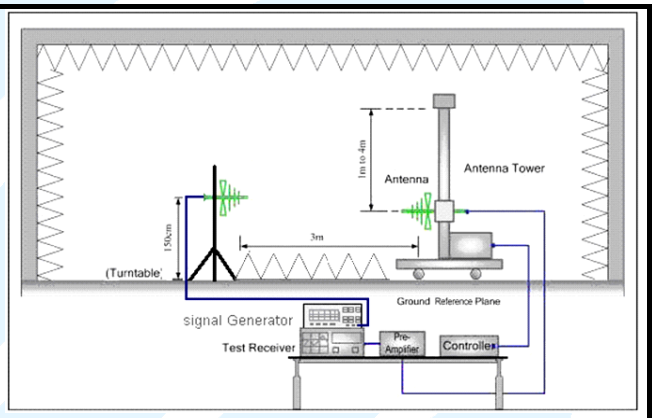
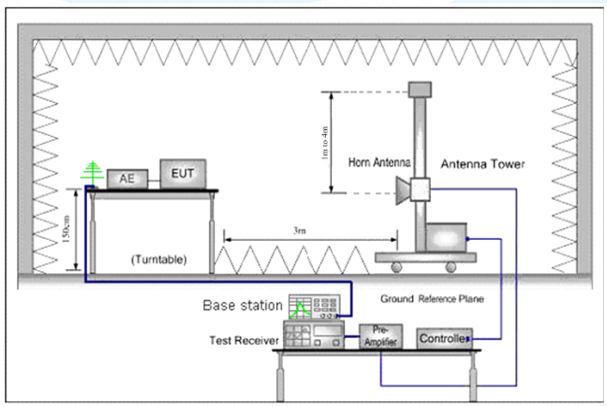


Figure 1. 30MHz to 1GHz



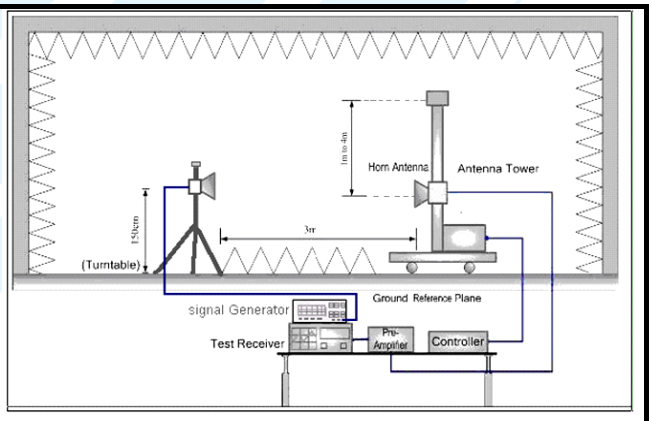
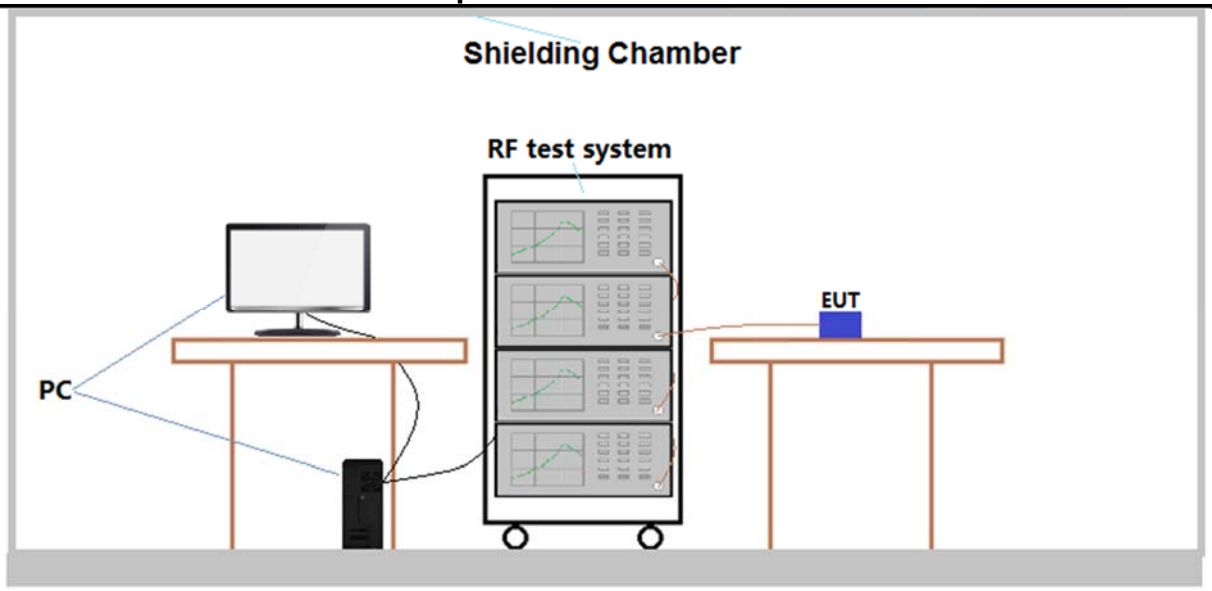
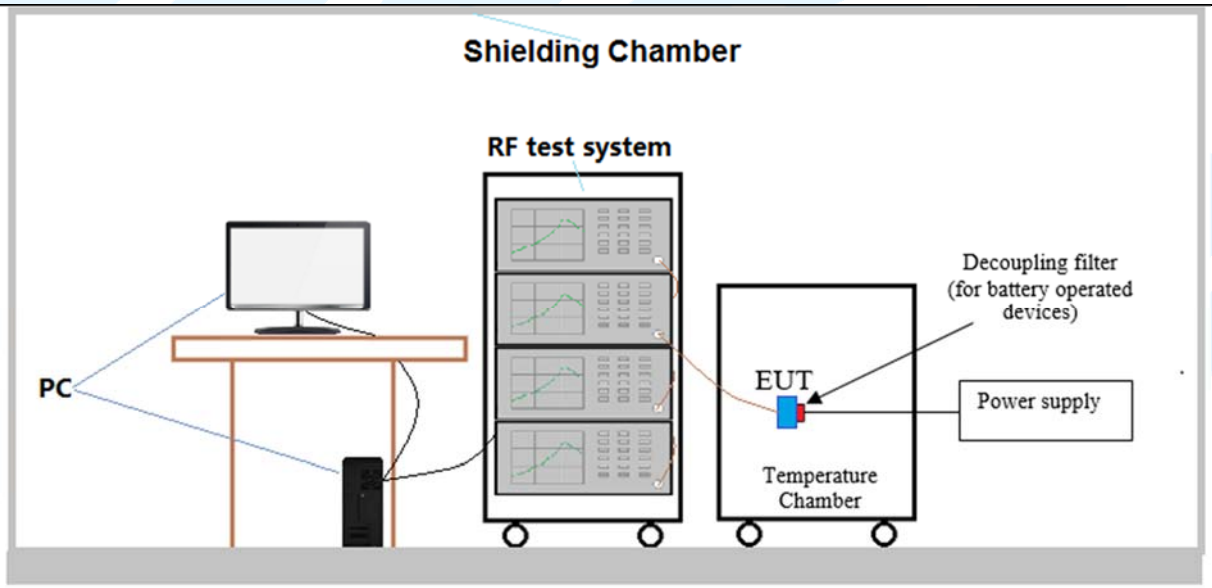


Figure 2. Above 1GHz

4.2.2 For Conducted RF test setup



Normal Environment



Extreme Environment

4.3 TEST CHANNELS

Band	Test Frequency ID	Bandwidth (MHz)	Number [UL]	Frequency of Uplink (MHz)
LTE Band 4 TX:1710-1755MHz	Low Range	1.4	19957	1710.7
		3	19965	1711.5
		5	19975	1712.5
		10	20000	1715
		15	20025	1717.5
		20	20050	1720
	Middle Range	1.4/3/5/10/ 15/20	20175	1732.5
	High Range	1.4	20393	1754.3
		3	20385	1753.5
		5	20375	1752.5
		10	20350	1750
		15	20325	1747.5
		20	20300	1745
LTE Band 7 TX:2500-2570MHz	Low Range	5	20775	2502.5
		10	20800	2505
		15	20825	2507.5
		20	20850	2510
	Middle Range	5/10/15/20	21100	2535
	High Range	5	21425	2567.5
		10	21400	2565
		15	21375	2562.5
		20	21350	2560
LTE Band 38 TX:2570-2620MHz	Low Range	5	37775	2572.5
		10	37800	2575
		15	37825	2577.5
		20	37850	2580
	Middle Range	5/10/ 15/20	38000	2595
	High Range	5	38225	2617.5
		10	38200	2615
		15	38175	2612.5
		20	38150	2610

4.4 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	Mode	Antenna Port	Worst-case axis positioning
LTE Band 4	1TX	Chain 0	Y axis
LTE Band 7	1TX	Chain 0	Y axis
LTE Band 38	1TX	Chain 0	Y 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.

4.5 PRE-SCAN

Pre-scan under all rate at lowest middle and highest channel, find the transmitter power as below.

4.5.1 LTE Band 4

LTE Band 4 Maximum Average Power (dBm)										
Modulation	RB		Test Channel			RB		Test Channel		
	Size	Offset	Low	Mid	High	Size	Offset	Low	Mid	High
Channel Bandwidth: 1.4 MHz						Channel Bandwidth: 3 MHz				
QPSK	1	0	22.27	22.43	22.31	1	0	22.28	22.44	22.32
	1	2	22.49	**22.55**	22.46	1	7	22.50	**22.56**	22.47
	1	5	22.24	22.40	22.27	1	14	22.25	22.41	22.28
	3	0	22.25	22.41	22.29	8	0	21.49	21.53	21.52
	3	1	22.47	22.53	22.44	8	3	21.49	21.49	21.51
	3	3	22.22	22.38	22.25	8	7	21.35	21.44	21.51
	6	0	21.42	21.48	21.43	15	0	21.43	21.49	21.44
16QAM	1	0	21.50	21.43	21.39	1	0	21.51	21.44	21.40
	1	2	21.55	21.26	21.38	1	7	21.56	21.27	21.39
	1	5	**21.59**	21.07	21.37	1	14	**21.60**	21.08	21.38
	3	0	21.49	21.42	21.38	8	0	20.51	20.62	20.71
	3	1	21.54	21.25	21.37	8	3	20.58	20.58	20.60
	3	3	21.58	21.06	21.36	8	7	20.31	20.54	20.50
	6	0	20.44	20.60	20.41	15	0	20.45	20.61	20.42

LTE Band 4 Maximum Average Power (dBm)										
Modulation	RB		Test Channel			RB		Test Channel		
	Size	Offset	Low	Mid	High	Size	Offset	Low	Mid	High
Channel Bandwidth: 5 MHz						Channel Bandwidth: 10 MHz				
QPSK	1	0	22.31	22.47	22.35	1	0	22.35	22.51	22.39
	1	12	22.53	**22.59**	22.50	1	24	22.57	**22.63**	22.54
	1	24	22.28	22.44	22.31	1	49	22.32	22.48	22.35
	12	0	21.52	21.56	21.55	25	0	21.56	21.60	21.59
	12	6	21.52	21.52	21.54	25	12	21.56	21.56	21.58
	12	13	21.38	21.47	21.54	25	25	21.42	21.51	21.58
	25	0	21.46	21.52	21.47	50	0	21.50	21.56	21.51
16QAM	1	0	21.54	21.47	21.43	1	0	21.58	21.51	21.47
	1	12	21.59	21.30	21.42	1	24	21.63	21.34	21.46
	1	24	**21.63**	21.11	21.41	1	49	**21.67**	21.15	21.45
	12	0	20.54	20.65	20.74	25	0	20.58	20.69	20.78
	12	6	20.61	20.61	20.63	25	12	20.65	20.65	20.67
	12	13	20.34	20.57	20.53	25	25	20.38	20.61	20.57
	25	0	20.48	20.64	20.45	50	0	20.52	20.68	20.49
Channel Bandwidth: 15 MHz						Channel Bandwidth: 20 MHz				
QPSK	1	0	22.41	22.57	22.45	1	0	22.44	22.60	22.48
	1	37	22.63	**22.69**	22.60	1	50	22.66	**22.72**	22.63
	1	74	22.38	22.54	22.41	1	99	22.41	22.57	22.44
	37	0	21.62	21.66	21.65	50	0	21.65	21.69	21.68
	37	19	21.62	21.62	21.64	50	25	21.65	21.65	21.67
	37	39	21.48	21.57	21.64	50	50	21.51	21.60	21.67
	75	0	21.56	21.62	21.57	100	0	21.59	21.65	21.60
16QAM	1	0	21.64	21.57	21.53	1	0	21.67	21.60	21.56
	1	37	21.69	21.40	21.52	1	50	21.72	21.43	21.55
	1	74	**21.73**	21.21	21.51	1	99	**21.76**	21.24	21.54
	37	0	20.64	20.75	20.84	50	0	20.67	20.78	20.87
	37	19	20.71	20.71	20.73	50	25	20.74	20.74	20.76
	37	39	20.44	20.67	20.63	50	50	20.47	20.70	20.66
	75	0	20.58	20.74	20.55	100	0	20.61	20.77	20.58

4.5.2 LTE Band 7

LTE Band 7 Maximum Average Power (dBm)										
Modulation	RB		Test Channel			RB		Test Channel		
	Size	Offset	Low	Mid	High	Size	Offset	Low	Mid	High
Channel Bandwidth: 5 MHz						Channel Bandwidth: 10 MHz				
QPSK	1	0	22.54	22.16	22.75	1	0	22.58	22.20	22.79
	1	12	22.86	22.62	**23.10**	1	24	22.90	22.66	**23.14**
	1	24	22.23	22.15	22.75	1	49	22.27	22.19	22.79
	12	0	21.62	21.65	21.60	25	0	21.66	21.69	21.64
	12	6	21.68	21.74	21.76	25	12	21.72	21.78	21.80
	12	13	21.63	21.62	21.60	25	25	21.67	21.66	21.64
	25	0	21.58	21.67	21.83	50	0	21.62	21.71	21.87
16QAM	1	0	21.51	21.13	21.40	1	0	21.55	21.17	21.44
	1	12	21.64	**21.73**	21.61	1	24	21.68	**21.77**	21.65
	1	24	21.44	21.23	21.36	1	49	21.48	21.27	21.40
	12	0	20.63	20.71	20.67	25	0	20.67	20.75	20.71
	12	6	20.66	20.75	20.66	25	12	20.70	20.79	20.70
	12	13	20.64	20.69	20.45	25	25	20.68	20.73	20.49
	25	0	20.53	20.69	20.52	50	0	20.57	20.73	20.56
Channel Bandwidth: 15 MHz						Channel Bandwidth: 20 MHz				
QPSK	1	0	22.64	22.26	22.85	1	0	22.67	22.29	22.88
	1	37	22.96	22.72	**23.20**	1	50	22.99	22.75	**23.23**
	1	74	22.33	22.25	22.85	1	99	22.36	22.28	22.88
	37	0	21.72	21.75	21.70	50	0	21.75	21.78	21.73
	37	19	21.78	21.84	21.86	50	25	21.81	21.87	21.89
	37	39	21.73	21.72	21.70	50	50	21.76	21.75	21.73
	75	0	21.68	21.77	21.93	100	0	21.71	21.80	21.96
16QAM	1	0	21.61	21.23	21.50	1	0	21.64	21.26	21.53
	1	37	21.74	**21.83**	21.71	1	50	21.77	**21.86**	21.74
	1	74	21.54	21.33	21.46	1	99	21.57	21.36	21.49
	37	0	20.73	20.81	20.77	50	0	20.76	20.84	20.80
	37	19	20.76	20.85	20.76	50	25	20.79	20.88	20.79
	37	39	20.74	20.79	20.55	50	50	20.77	20.82	20.58
	75	0	20.63	20.79	20.62	100	0	20.66	20.82	20.65

4.5.3 LTE Band 38

LTE Band 38 Maximum Average Power (dBm)										
Modulation	RB		Test Channel			RB		Test Channel		
	Size	Offset	Low	Mid	High	Size	Offset	Low	Mid	High
Channel Bandwidth: 5 MHz						Channel Bandwidth: 10 MHz				
QPSK	1	0	22.60	22.48	22.60	1	0	22.64	22.52	22.64
	1	12	**23.12**	22.92	22.87	1	24	**23.16**	22.96	22.91
	1	24	22.56	22.09	22.37	1	49	22.60	22.13	22.41
	12	0	21.74	21.85	21.95	25	0	21.78	21.89	21.99
	12	6	22.04	21.98	21.77	25	12	22.08	22.02	21.81
	12	13	21.75	21.74	21.67	25	25	21.79	21.78	21.71
	25	0	21.93	21.82	21.77	50	0	21.97	21.86	21.81
16QAM	1	0	**22.16**	21.70	20.91	1	0	**22.20**	21.74	20.95
	1	12	22.10	21.69	20.97	1	24	22.14	21.73	21.01
	1	24	21.72	21.46	20.70	1	49	21.76	21.50	20.74
	12	0	20.78	20.81	20.71	25	0	20.82	20.85	20.75
	12	6	20.68	20.99	20.87	25	12	20.72	21.03	20.91
	12	13	20.64	20.74	20.57	25	25	20.68	20.78	20.61
	25	0	20.61	20.82	20.55	50	0	20.65	20.86	20.59
Channel Bandwidth: 15 MHz						Channel Bandwidth: 20 MHz				
QPSK	1	0	22.67	22.55	22.67	1	0	22.74	22.62	22.74
	1	37	**23.19**	22.99	22.94	1	50	**23.26**	23.06	23.01
	1	74	22.63	22.16	22.44	1	99	22.70	22.23	22.51
	37	0	21.81	21.92	22.02	50	0	21.88	21.99	22.09
	37	19	22.11	22.05	21.84	50	25	22.18	22.12	21.91
	37	39	21.82	21.81	21.74	50	50	21.89	21.88	21.81
	75	0	22.00	21.89	21.84	100	0	22.07	21.96	21.91
16QAM	1	0	**22.23**	21.77	20.98	1	0	**22.30**	21.84	21.05
	1	37	22.17	21.76	21.04	1	50	22.24	21.83	21.11
	1	74	21.79	21.53	20.77	1	99	21.86	21.60	20.84
	37	0	20.85	20.88	20.78	50	0	20.92	20.95	20.85
	37	19	20.75	21.06	20.94	50	25	20.82	21.13	21.01
	37	39	20.71	20.81	20.64	50	50	20.78	20.88	20.71
	75	0	20.68	20.89	20.62	100	0	20.75	20.96	20.69

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

LTE worse case 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	64QAM	1	Half	Full	L	M	H
ERP/EIRP	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒
	38	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒
Conducted output power	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
	38	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
99%&26dB Bandwidth	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒	☒
	38	-	-	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒	☒
peak-to-average ratio	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☒	☒
	38	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☒	☒
Band Edge at antenna terminals	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☐	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☐	☒
	38	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☐	☒	☒	☐	☒
Spurious emissions at antenna terminals	4	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒
	7	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒
	38	-	-	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☒	☒
Field strength of spurious radiation	4	☒	☒	☒	☒	☒	☒	☒	☐	☐	☒	☐	☐	☐	☒	☐
	7	-	-	☒	☒	☒	☒	☒	☐	☐	☒	☐	☐	☐	☒	☐
	38	-	-	☒	☒	☒	☒	☒	☐	☐	☒	☐	☐	☐	☒	☐
	41	-	-	☒	☒	☒	☒	☒	☐	☐	☒	☐	☐	☐	☒	☐
Frequency stability	4	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☒	☐	☒	☐
	7	-	-	☒	☒	☒	☒	☒	☐	☐	☐	☐	☒	☐	☒	☐
	38	-	-	☒	☒	☒	☒	☒	☐	☐	☐	☐	☒	☐	☒	☐

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

5.1 REFERENCE DOCUMENTS FOR TESTING

No.	Identity	Document Title
1	FCC 47 CFR Part 2 Subpart J	Frequency allocations and radio treaty matters; general rules and regulations
2	FCC 47 CFR Part 27	Miscellaneous Wireless Communications Services
3	ANSI/TIA-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

5.2 ERP OR EIRP

Test Requirement: FCC 47 CFR Part 2.1046(a)
LTE Band 4: FCC 47 CFR Part 27.50(d)(4)
LTE Band 7 & Band 38: FCC 47 CFR Part 27.50(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 0.8/1.5m high table at a 3 meter semi/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 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:

$$ERP(dBm) = Pg(dBm) – cable\ loss\ (dB) + antenna\ gain\ (dBd)$$
$$EIRP(dBm) = Pg(dBm) – cable\ loss\ (dB) + antenna\ gain\ (dBi)$$
$$EIRP=ERP+2.15dB$$

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 Y 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 4.2.1 for details.

Instruments Used: Refer to section 3 for details
Test Mode: Link mode
Test Results: Pass
Test Data: See table below

5.2.1 LTE Band 4

Maximum EIRP (dBm)					
Channel	**QPSK; RB:1**	**16QAM; RB:1**	**64QAM; RB:1**	**Limit (dBm)**	**Result**
Channel Bandwidth: 1.4MHz					
Lowest	18.56	17.89	--	30.00	Pass
Middle	**18.73**	17.68	--	30.00	Pass
Highest	18.64	17.71	--	30.00	Pass
Channel Bandwidth: 3MHz					
Lowest	19.14	18.57	--	30.00	Pass
Middle	**19.33**	18.64	--	30.00	Pass
Highest	19.26	18.59	--	30.00	Pass
Channel Bandwidth: 5MHz					
Lowest	19.42	18.34	--	30.00	Pass
Middle	**19.56**	17.98	--	30.00	Pass
Highest	19.38	17.86	--	30.00	Pass
Channel Bandwidth: 10MHz					
Lowest	18.79	17.79	--	30.00	Pass
Middle	**18.82**	18.03	--	30.00	Pass
Highest	18.69	17.92	--	30.00	Pass
Channel Bandwidth: 15MHz					
Lowest	19.42	18.20	--	30.00	Pass
Middle	**19.54**	17.83	--	30.00	Pass
Highest	19.61	17.76	--	30.00	Pass
Channel Bandwidth: 20MHz					
Lowest	18.88	18.23	--	30.00	Pass
Middle	**19.21**	17.65	--	30.00	Pass
Highest	18.93	17.57	--	30.00	Pass

5.2.2 LTE Band 7

Maximum EIRP (dBm)					
Channel	**QPSK; RB:1**	**16QAM; RB:1**	**64QAM; RB:1**	**Limit (dBm)**	**Result**
Channel Bandwidth: 5MHz					
Lowest	18.43	17.88	--	33.01	Pass
Middle	18.46	17.92	--	33.01	Pass
Highest	**18.78**	17.98	--	33.01	Pass
Channel Bandwidth: 10MHz					
Lowest	17.67	16.43	--	33.01	Pass
Middle	17.80	16.54	--	33.01	Pass
Highest	**17.85**	16.62	--	33.01	Pass
Channel Bandwidth: 15MHz					
Lowest	18.35	17.66	--	33.01	Pass
Middle	18.42	17.72	--	33.01	Pass
Highest	**18.53**	17.77	--	33.01	Pass
Channel Bandwidth: 20MHz					
Lowest	19.12	18.36	--	33.01	Pass
Middle	19.20	18.41	--	33.01	Pass
Highest	**19.25**	18.44	--	33.01	Pass

5.2.3 LTE Band 38

Maximum EIRP (dBm)					
Channel	**QPSK; RB:1**	**16QAM; RB:1**	**64QAM; RB:1**	**Limit (dBm)**	**Result**
Channel Bandwidth: 5MHz					
Lowest	**18.21**	17.88	--	33.01	Pass
Middle	18.03	17.83	--	33.01	Pass
Highest	18.00	17.79	--	33.01	Pass
Channel Bandwidth: 10MHz					
Lowest	**19.12**	18.34	--	33.01	Pass
Middle	18.90	18.21	--	33.01	Pass
Highest	18.86	18.02	--	33.01	Pass
Channel Bandwidth: 15MHz					
Lowest	**19.34**	18.89	--	33.01	Pass
Middle	19.27	18.78	--	33.01	Pass
Highest	18.94	18.35	--	33.01	Pass
Channel Bandwidth: 20MHz					
Lowest	**19.41**	18.76	--	33.01	Pass
Middle	19.26	18.65	--	33.01	Pass
Highest	18.93	18.27	--	33.01	Pass

5.3 CONDUCTED OUTPUT POWER

Test Requirement: FCC 47 CFR Part 2.1046(a)
LTE Band 4: FCC 47 CFR Part 27.50(d)(4)
LTE Band 7 & Band 38: FCC 47 CFR Part 27.50(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 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 4.2.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data: The full result refer to section 4.5 for details.

5.4 PEAK-TO-AVERAGE RATIO

Test Requirement: FCC 47 CFR Part 24.232(d)

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 ≥ 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 4.2.2 for details.

Instruments Used: Refer to section 3 for details

Test Mode: Link mode

Test Results: Pass

Test Data: See table below

5.4.1 LTE Band 4

Peak-to-average ratio (dB)						
Channel	RB Configuration	Channel Bandwidth: 20 MHz			Limit (dB)	Result
		QPSK	16QAM	64QAM		
Lowest	1 RB	4.78	5.51	--	13	Pass
	Full RB	5.51	5.74	--	13	Pass
Middle	1 RB	4.26	4.99	--	13	Pass
	Full RB	4.26	5.33	--	13	Pass
Highest	1 RB	4.43	5.16	--	13	Pass
	Full RB	4.55	5.51	--	13	Pass

LTE Band 4 / 20MHz / QPSK

1 RB	Full RB

Lowest Channel

Middle Channel

Highest Channel

LTE Band 4 / 20MHz / 16QAM

1 RB	Full RB

Lowest Channel

Middle Channel

Highest Channel

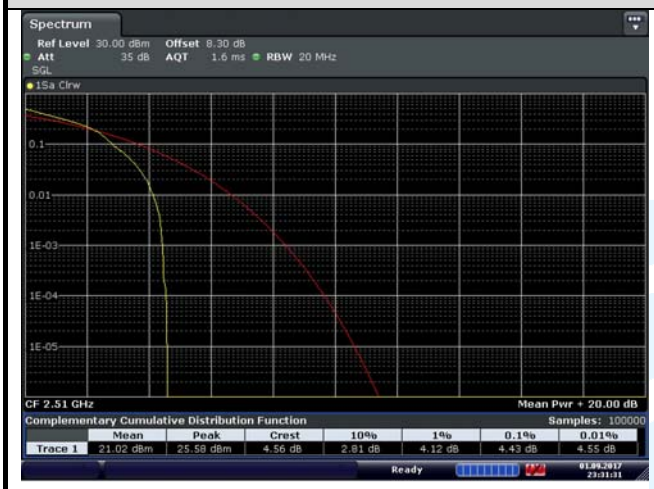
5.4.2 LTE Band 7

Peak-to-average ratio (dB)						
Channel	RB Configuration	Channel Bandwidth: 20 MHz			Limit (dB)	Result
		QPSK	16QAM	64QAM		
Lowest	1 RB	4.43	3.54	--	13	Pass
	Full RB	4.32	5.30	--	13	Pass
Middle	1 RB	4.17	4.41	--	13	Pass
	Full RB	4.70	5.83	--	13	Pass
Highest	1 RB	4.09	5.04	--	13	Pass
	Full RB	4.49	5.51	--	13	Pass

LTE Band 7 / 20MHz / QPSK

1 RB	Full RB

Lowest Channel



Middle Channel

Highest Channel

LTE Band 7 / 20MHz / 16QAM	
1 RB	Full RB
Lowest Channel	
Middle Channel	
Highest Channel	

5.4.3 LTE Band 38

Peak-to-average ratio (dB)						
Channel	RB Configuration	Channel Bandwidth: 20 MHz			Limit (dB)	Result
		QPSK	16QAM	64QAM		
Lowest	1 RB	6.32	5.30	--	13	Pass
	Full RB	5.97	6.06	--	13	Pass
Middle	1 RB	4.67	5.65	--	13	Pass
	Full RB	4.90	7.01	--	13	Pass
Highest	1 RB	5.28	5.83	--	13	Pass
	Full RB	5.54	5.83	--	13	Pass

LTE Band 38 / 20MHz / QPSK	
1 RB	Full RB
Lowest Channel	
Middle Channel	
Highest Channel	

LTE Band 38 / 20MHz / 16QAM	
1 RB	Full RB
Lowest Channel	
Middle Channel	
Highest Channel	

5.5 99%&26DB BANDWIDTH

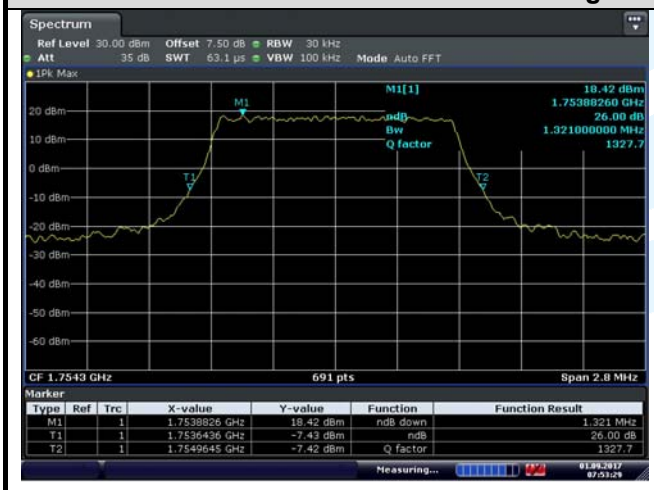
Test Requirement: FCC 47 CFR Part 2.1049(h) & FCC 47 CFR Part 24.238(b)
Test Method: ANSI/TIA/EIA-603-D 2010 & KDB 971168 D01v02r02
Limit: No Limit
Test Procedure:
The transmitter output was connected to a calibrated coaxial cable and coupler, the other end of which was connected to a spectrum analyzer. The occupied bandwidth was measured with the spectrum analyzer at the low, middle and high channel in each band. The 99% and -26dB bandwidths was 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 4.2.2 for details.
Instruments Used: Refer to section 3 for details
Test Mode: Link mode
Test Results: Pass
Test Data: See table below

5.5.1 LTE Band 4

LTE Band 4								
Channel	RB Configuration		26 dB BW (MHz)			99% BW (MHz)		
	Size	Offset	QPSK	16QAM	64QAM	QPSK	16QAM	64QAM
Channel Bandwidth: 1.4 MHz								
Lowest	6	0	1.293	1.309	--	1.102	1.098	--
Middle	6	0	1.337	1.329	--	1.102	1.098	--
Highest	6	0	1.321	1.301	--	1.102	1.098	--
Channel Bandwidth: 3 MHz								
Lowest	15	0	3.048	3.065	--	2.735	2.726	--
Middle	15	0	3.065	3.056	--	2.735	2.735	--
Highest	15	0	3.074	3.065	--	2.744	2.753	--
Channel Bandwidth: 5 MHz								
Lowest	25	0	5.022	5.007	--	4.515	4.515	--
Middle	25	0	5.036	5.051	--	4.515	4.544	--
Highest	25	0	5.022	5.080	--	4.501	4.530	--
Channel Bandwidth: 10 MHz								
Lowest	50	0	10.043	10.043	--	9.001	9.059	--
Middle	50	0	10.072	9.986	--	9.030	9.059	--
Highest	50	0	10.072	10.014	--	9.059	9.030	--
Channel Bandwidth: 15 MHz								
Lowest	75	0	14.081	14.718	--	13.415	13.459	--
Middle	75	0	14.674	14.588	--	13.459	13.415	--
Highest	75	0	14.674	14.805	--	13.459	13.459	--
Channel Bandwidth: 20 MHz								
Lowest	100	0	19.334	19.334	--	17.829	17.887	--
Middle	100	0	19.161	19.334	--	17.829	17.887	--
Highest	100	0	19.219	19.103	--	17.887	17.945	--

26dB Bandwidth

LTE Band 4_ Channel Bandwidth: 1.4 MHz	
QPSK	**16QAM**
Lowest Channel	
Middle Channel	
Highest Channel	
	

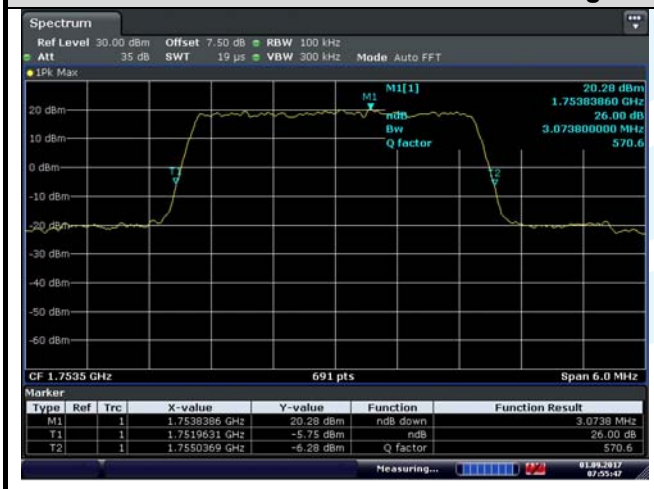
LTE Band 4_ Channel Bandwidth: 3 MHz

QPSK	16QAM

Lowest Channel

Middle Channel

Highest Channel



LTE Band 4_ Channel Bandwidth: 5 MHz

QPSK	16QAM

Lowest Channel

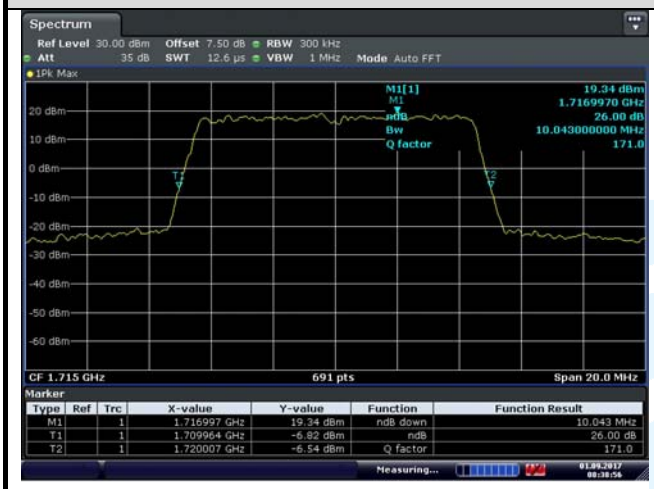
Middle Channel

Highest Channel

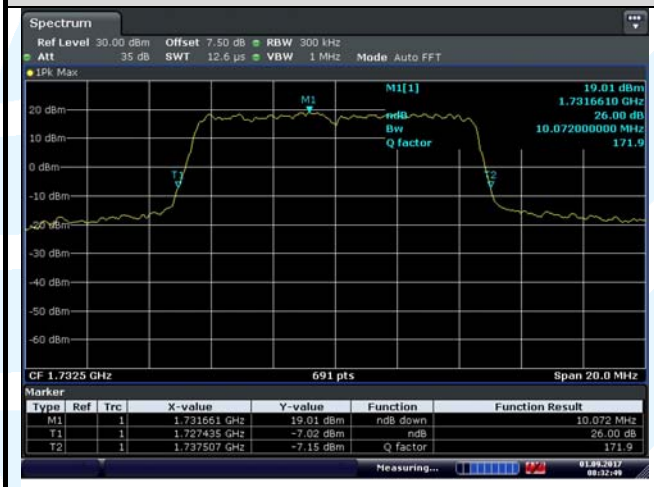
LTE Band 4_ Channel Bandwidth: 10 MHz

QPSK	16QAM

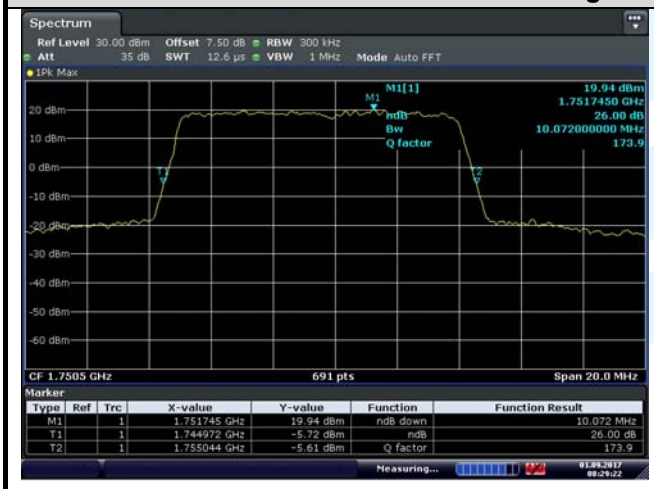
Lowest Channel



Middle Channel



Highest Channel



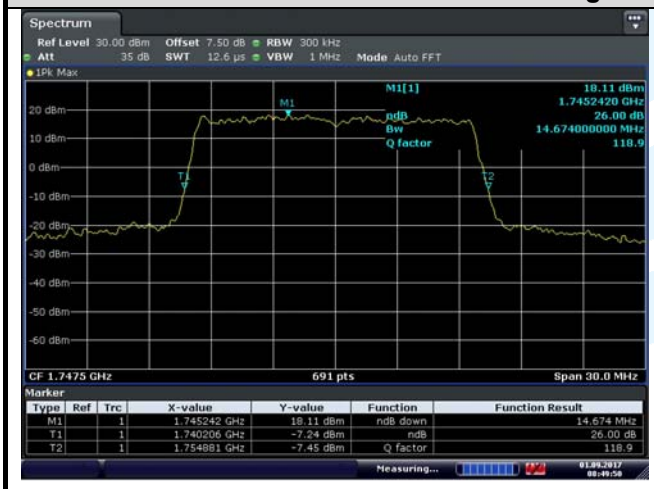
LTE Band 4_ Channel Bandwidth: 15 MHz

QPSK	16QAM

Lowest Channel

Middle Channel

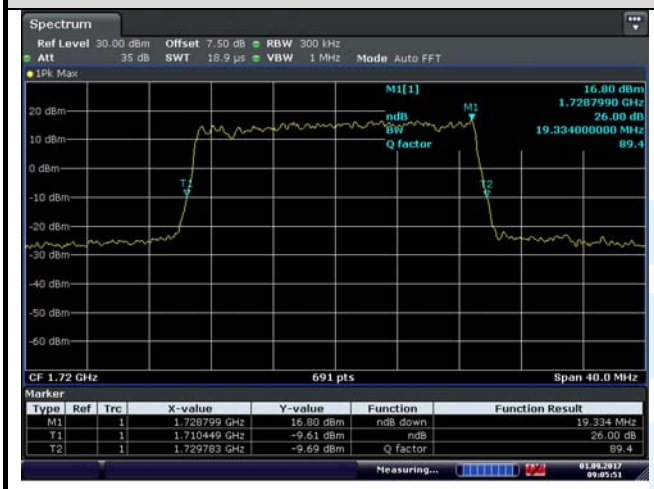
Highest Channel



LTE Band 4_ Channel Bandwidth: 20 MHz

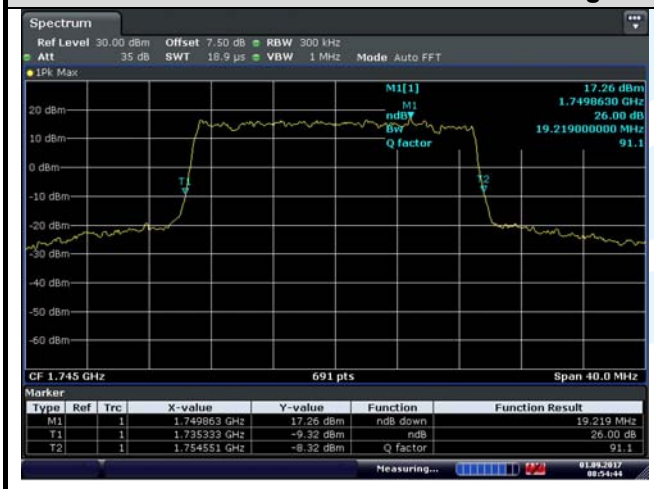
QPSK	16QAM

Lowest Channel

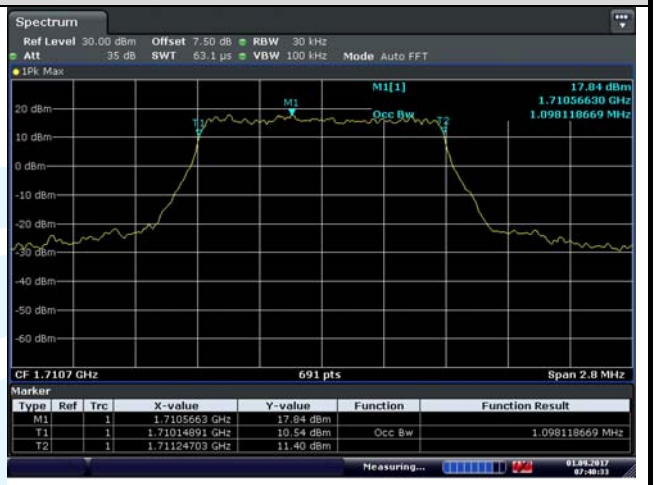
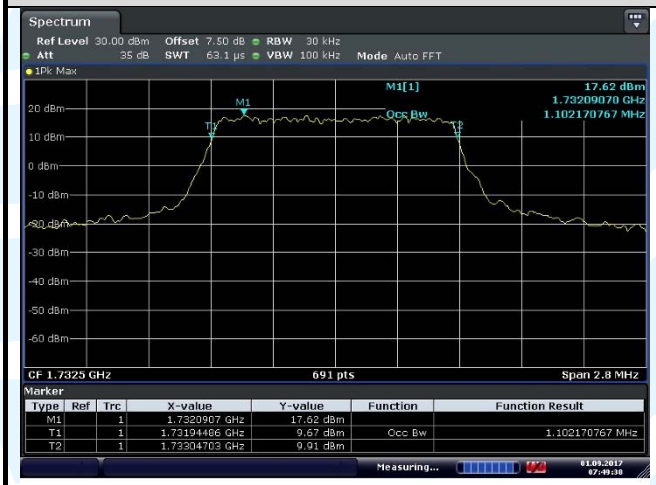
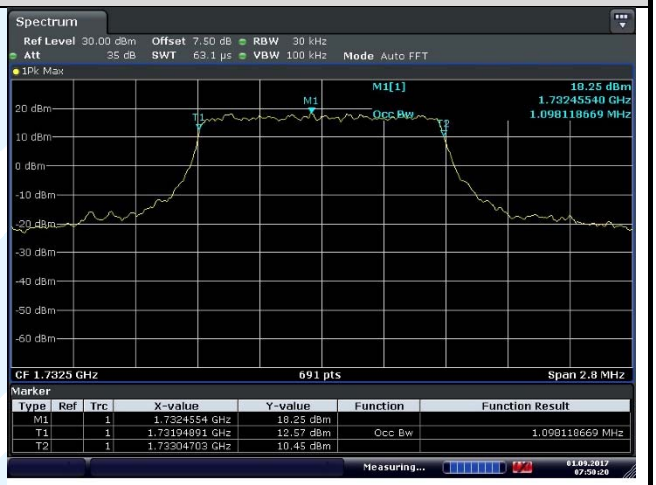
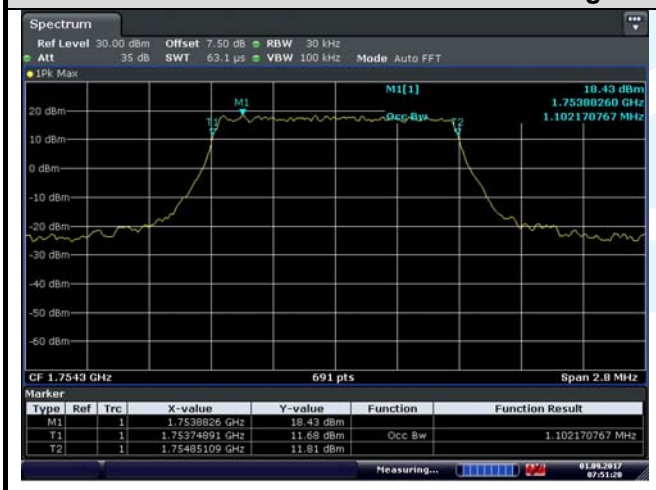
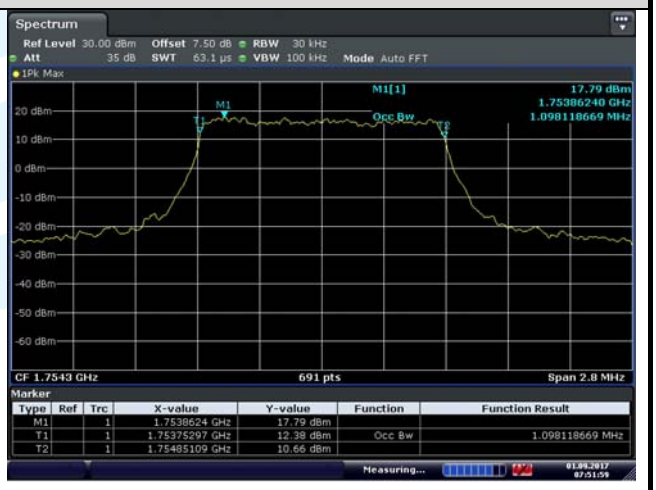


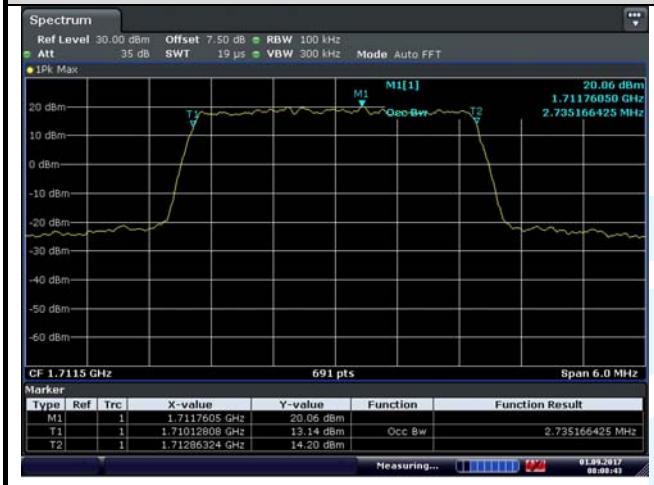
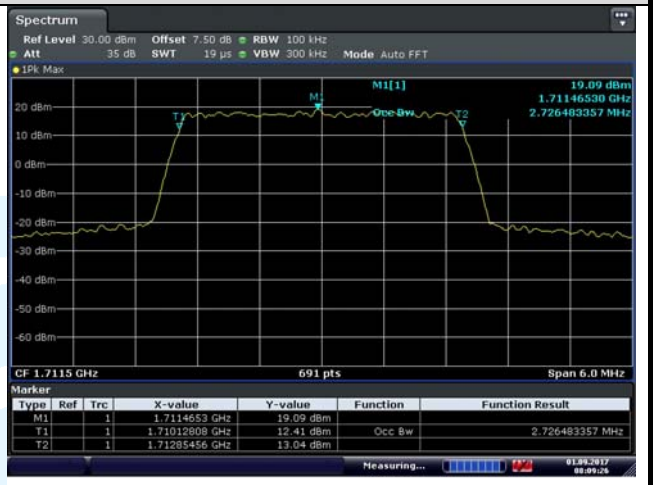
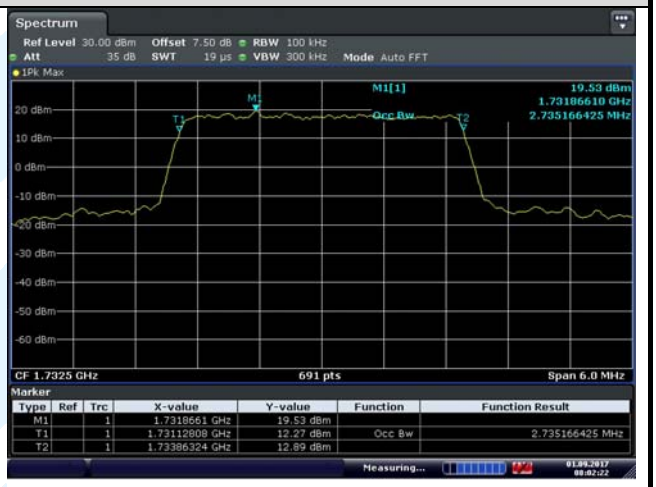
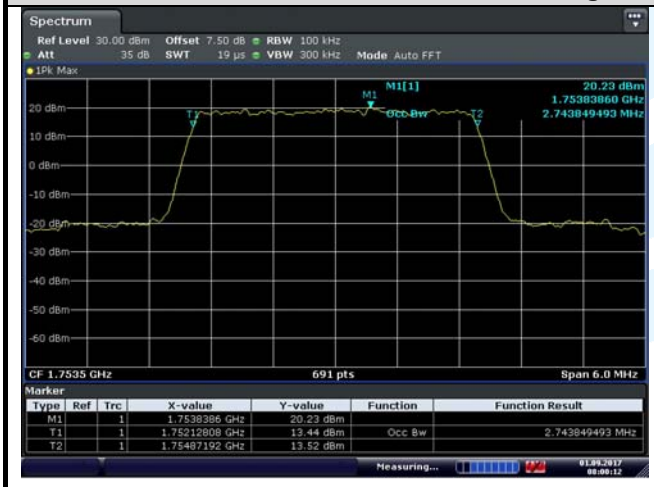
Middle Channel

Highest Channel

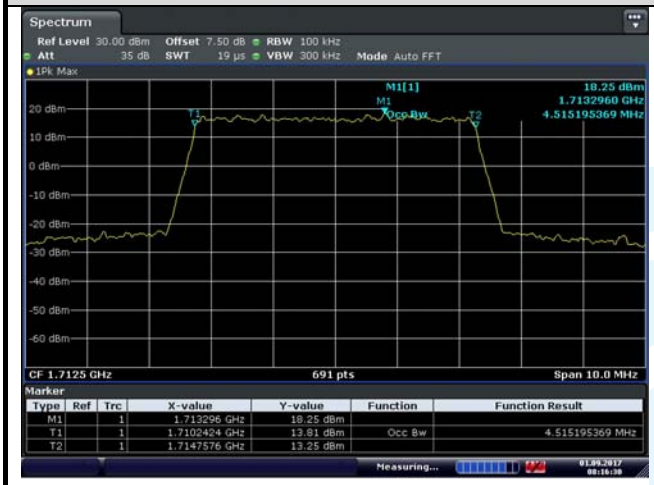
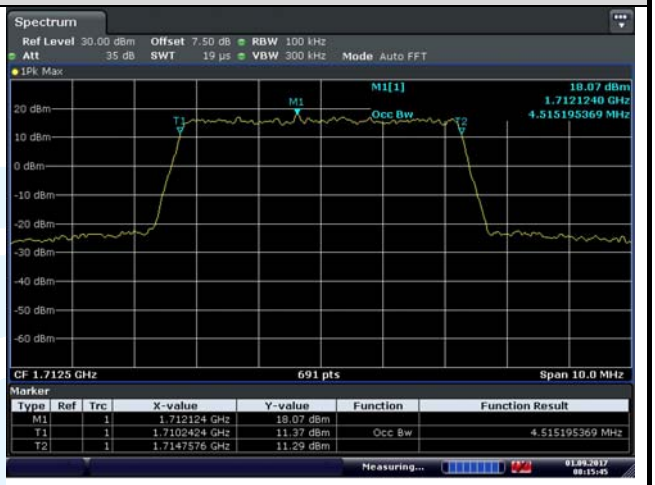
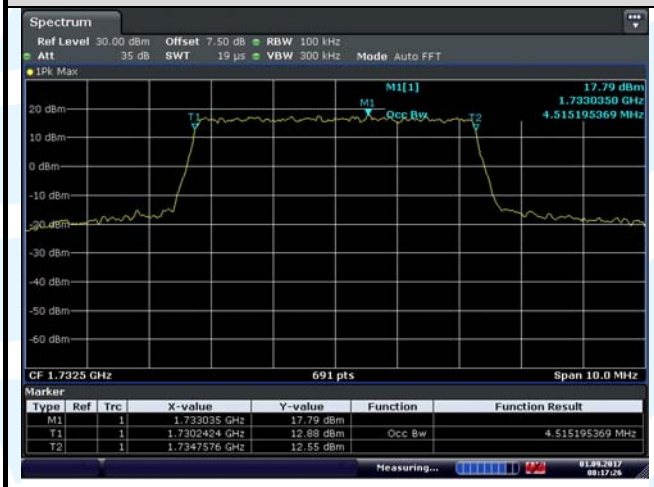
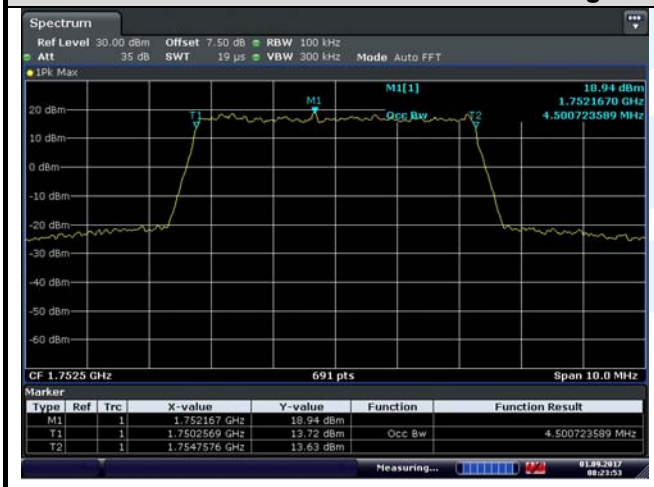
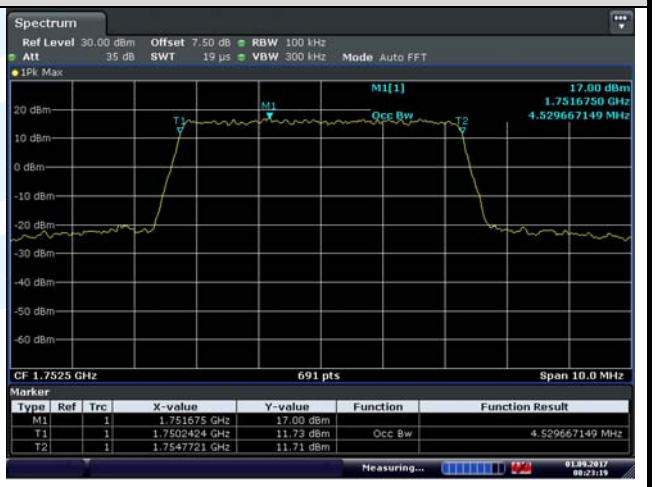


99% Bandwidth

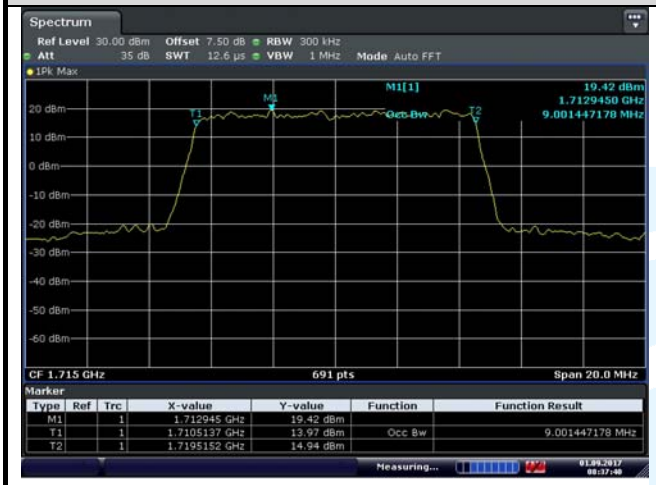
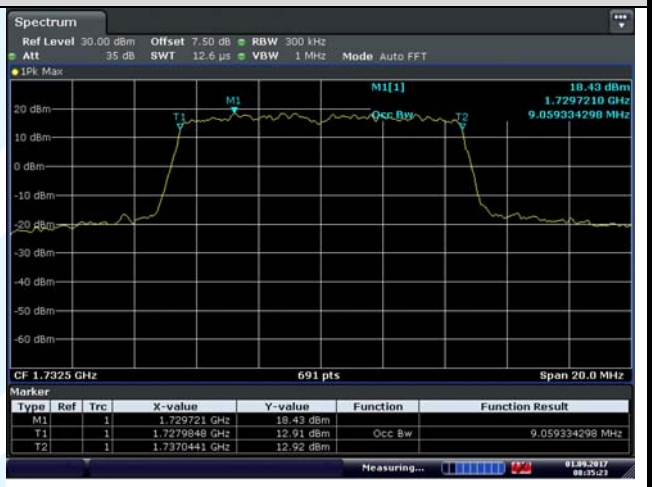
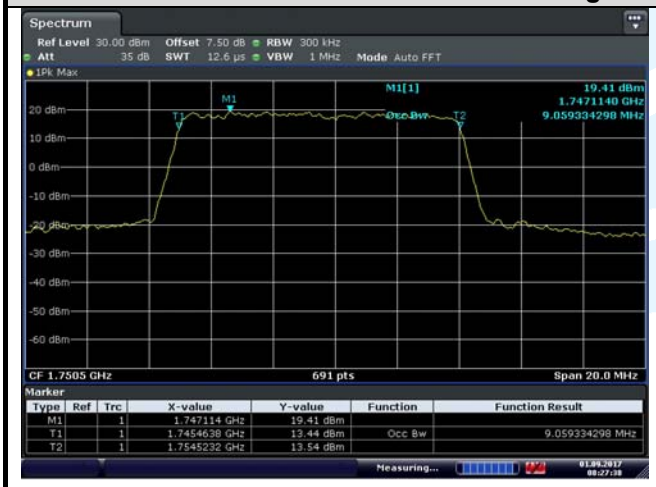
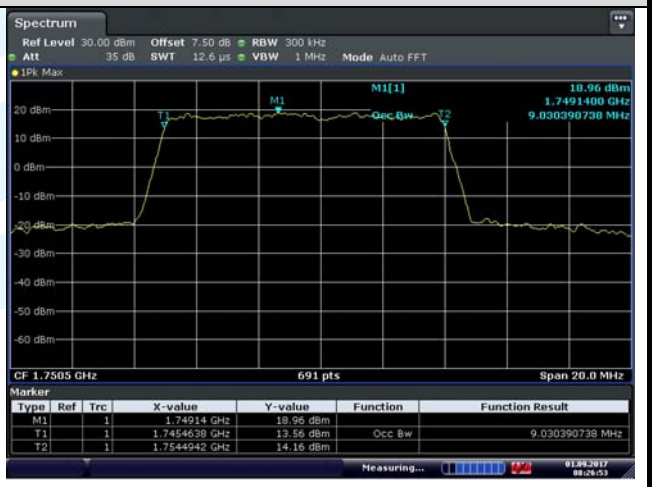
LTE Band 4_ Channel Bandwidth: 1.4 MHz	
QPSK	**16QAM**
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

LTE Band 4_ Channel Bandwidth: 3 MHz	
QPSK	16QAM
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

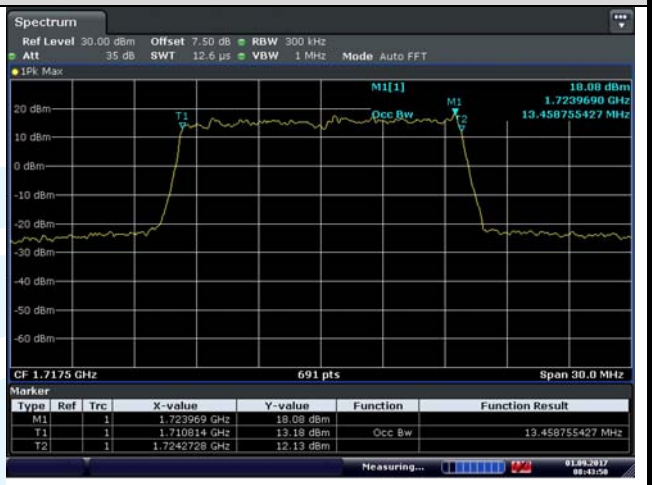
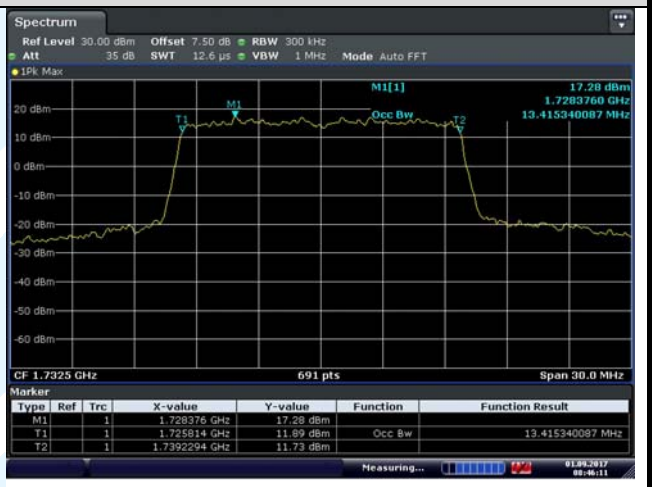
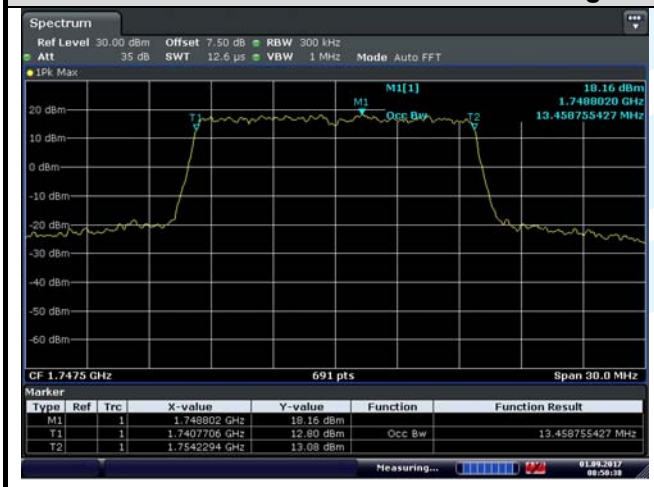
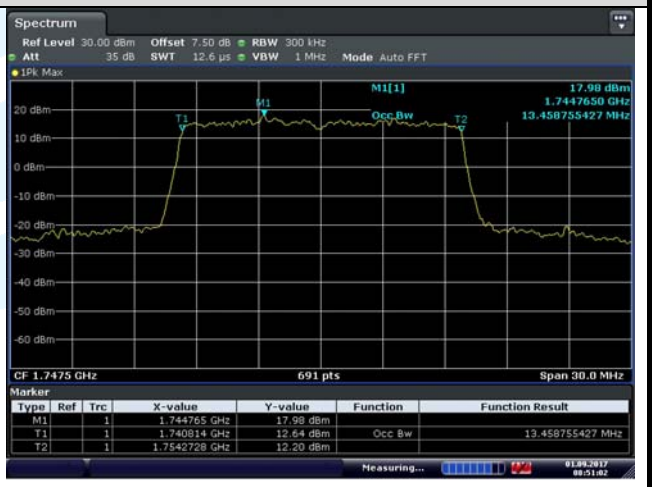
LTE Band 4_ Channel Bandwidth: 5 MHz

QPSK	16QAM
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

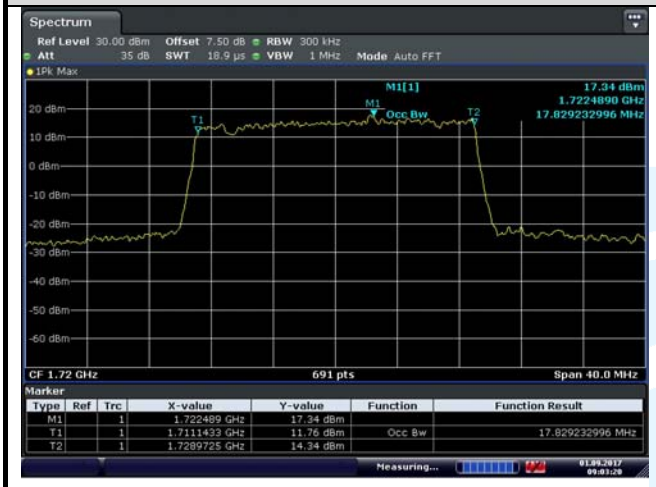
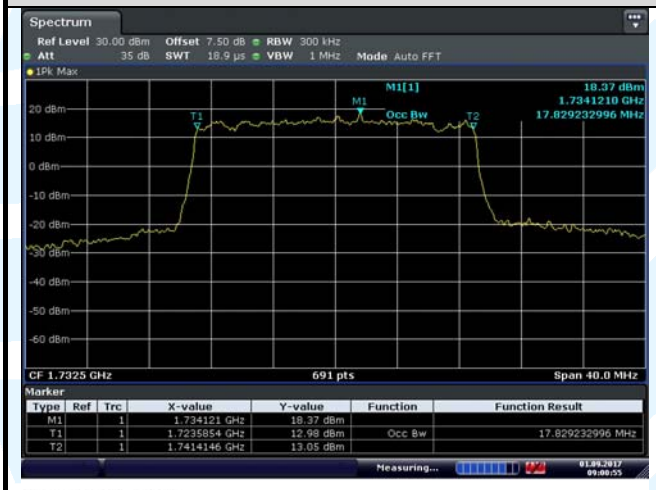
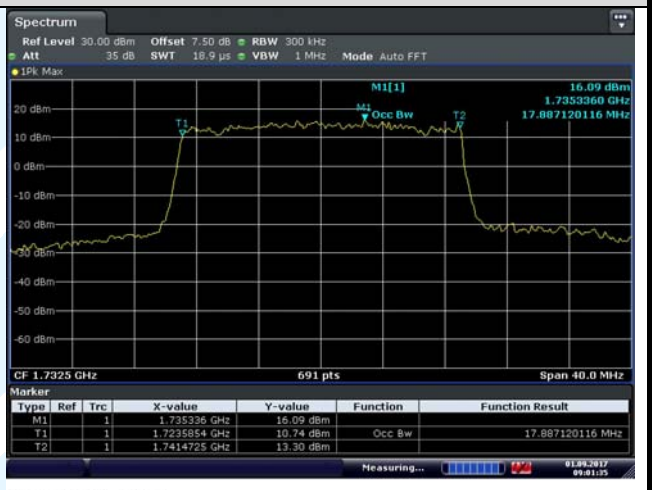
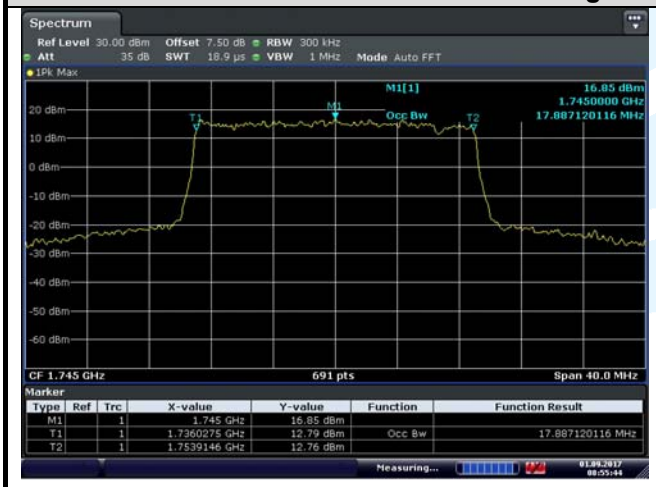
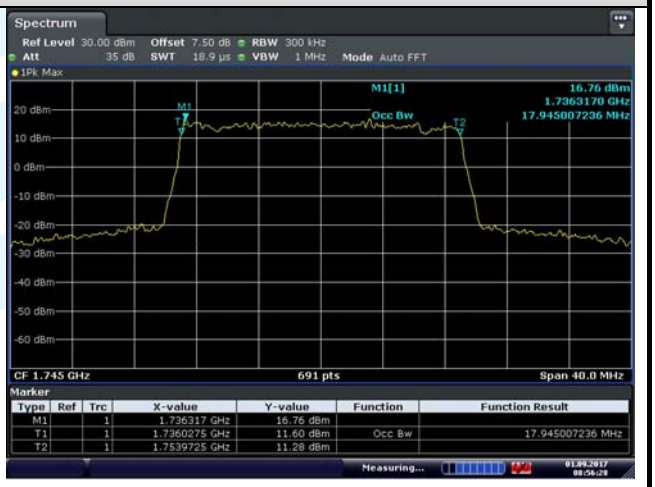
LTE Band 4_ Channel Bandwidth: 10 MHz

QPSK	16QAM
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

LTE Band 4_ Channel Bandwidth: 15 MHz

QPSK	16QAM
Lowest Channel	
	
Middle Channel	
	
Highest Channel	
	

LTE Band 4_ Channel Bandwidth: 20 MHz

QPSK	16QAM
Lowest Channel	
	
Middle Channel	
	
Highest Channel