



RF TEST REPORT

Applicant ZTE Corporation
FCC ID SRQ-K5161Z
Product Vodafone K5161z
Model K5161z
Report No. R2012A0853-R3
Issue Date January 27, 2021

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2019)/ FCC CFR47 Part 27C (2019)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Prepared by: Peng Tao

Approved by: Kai Xu

TA Technology (Shanghai) Co., Ltd.

No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China

TEL: +86-021-50791141/2/3

FAX: +86-021-50791141/2/3-8000



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Summary of Measurement Results

Number	Test Case	Clause in FCC rules	Verdict
1	RF Power Output and Effective Isotropic Radiated Power	2.1046/27.50(h)(2)	PASS
2	Occupied Bandwidth	2.1049	PASS
3	Band Edge Compliance	27.53(m)	PASS
4	Peak-to-Average Power Ratio	27.50(d)/KDB971168 D01(5.7)	PASS
5	Frequency Stability	2.1055 / 27.54	PASS
6	Spurious Emissions at Antenna Terminals	2.1051/27.53(m)	PASS
7	Radiates Spurious Emission	2.1053 /27.53(m)	PASS

Date of Testing: December 8, 2020 and January 21, 2021

Date of Sample Received: December 7, 2020

Note: PASS: The EUT complies with the essential requirements in the standard.

FAIL: The EUT does not comply with the essential requirements in the standard.

All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.



1 Test Laboratory

1.1 Notes of the Test Report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3 Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China
City: Shanghai
Post code: 201201
Country: P. R. China
Contact: Xu Kai
Telephone: +86-021-50791141/2/3
Fax: +86-021-50791141/2/3-8000
Website: <http://www.ta-shanghai.com>
E-mail: xukai@ta-shanghai.com

2 General Description of Equipment under Test

2.1 Applicant and Manufacturer Information

Applicant	ZTE Corporation
Applicant address	ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R. China
Manufacturer	ZTE Corporation
Manufacturer address	ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057, P.R. China

2.2 General information

EUT Description			
Model	K5161z		
IMEI	351825110001414		
Hardware Version	dveB		
Software Version	BD_K5161zV1.0		
Power Supply	External power supply		
Antenna Type	Internal Antenna		
Antenna Gain	0.8dBi		
Test Mode(s)	LTE Band 7;		
Test Modulation	(LTE)QPSK 16QAM;		
LTE Category	4		
Maximum E.I.R.P./ E.R.P.	LTE Band 7:	23.73dBm	
Rated Power Supply Voltage:	5.0V		
Extreme Voltage	Minimum: 4.25V Maximum: 5.75V		
Extreme Temperature	Lowest: -30°C Highest: +50°C		
Operating Voltage	Minimum: 4.8V Maximum: 5.2V		
Operating Temperature	Lowest: -10°C Highest: +55°C		
Operating Frequency Range(s)	Mode	Tx (MHz)	Rx (MHz)
	LTE Band 7	2500 ~ 2570	2620 ~ 2690
Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.			



3 Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards:

FCC CFR47 Part 27C (2019)

ANSI C63.26 (2015)

Reference standard:

FCC CFR47 Part 2 (2019)

KDB 971168 D01 Power Meas License Digital Systems v03r01

4 Test Configuration

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes. EUT stand-up position (Z axis), lie-down position (X, Y axis). Receiver antenna polarization (horizontal and vertical), the worst emission was found in position (X axis, horizontal polarization) and the worst case was recorded.

All mode and data rates and positions and RB size and modulations were investigated.

Subsequently, only the worst case emissions are reported.

The following testing in LTE is set based on the maximum RF Output Power.

The following testing in different Bandwidth is set to detail in the following table:

Test modes are chosen to be reported as the worst case configuration below for LTE Band 7:

Test items	Modes	Bandwidth (MHz)						Modulation		RB			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	50%	100%	L	M	H
RF Power Output and Effective Isotropic Radiated Power	LTE 7	-	-	O	O	O	O	O	O	O	O	O	O	O	O
Occupied Bandwidth	LTE 7	-	-	O	O	O	O	O	O	-	-	O	O	O	O
Band Edge Compliance	LTE 7	-	-	O	O	O	O	O	O	O	-	O	O	-	O
Peak-to-Average Power Ratio	LTE 7	-	-	O	O	O	O	O	O	-	-	O	O	O	O
Frequency Stability	LTE 7	-	-	O	O	O	O	O	O	O	O	O	O	O	O
Spurious Emissions at Antenna Terminals	LTE 7	-	-	O	O	O	O	O	-	O	-	-	O	O	O
Radiates Spurious Emission	LTE 7	-	-	O	O	O	O	O	-	O	-	-	-	O	-
Note	1. The mark "O" means that this configuration is chosen for testing. 2. The mark "-" means that this configuration is not testing.														

5 Test Case Results

5.1 RF Power Output and Effective Isotropic Radiated Power

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to the Base Station Simulator with a known loss. The EUT is controlled by the Base Station Simulator test set to ensure max power transmission with proper modulation.

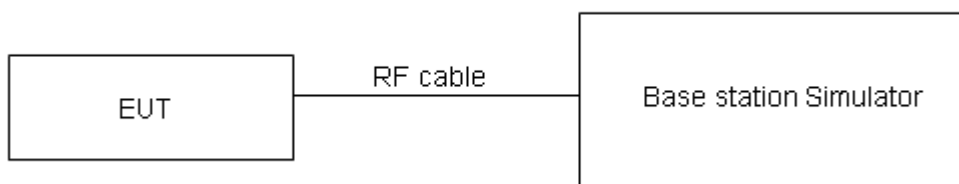
ERP can then be calculated as follows:

$EIRP \text{ (dBm)} = \text{Output Power (dBm)} - \text{Losses (dB)} + \text{Antenna Gain (dBi)}$

where: dBd refers to gain relative to an ideal dipole.

$EIRP \text{ (dBm)} = ERP \text{ (dBm)} + 2.15 \text{ (dB.)}$

Test Setup



Limits

No specific RF power output requirements in part 2.1046.

Rule Part 27.50(h) (2) specifies that “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.”

Part 27.50(h)(2) Limit	$\leq 2 \text{ W}$ (33 dBm)
------------------------	-----------------------------

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=0.4 \text{ dB}$ for RF power output, $k = 2$, $U= 1.19 \text{ dB}$ for ERP/EIRP.



Test Results

LTE Band 7				Maximum Output Power(dBm)			EIRP (dBm)		
BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)					
				20775/ 2502.5	21100/ 2535	21425/ 2567.5	20775/ 2502.5	21100/ 2535	21425/ 2567.5
5MHz	QPSK	1	0	22.36	22.11	22.20	23.16	22.91	23.00
		1	13	22.37	21.42	21.75	23.17	22.22	22.55
		1	24	22.91	22.12	22.22	23.71	22.92	23.02
		12	0	21.31	20.47	20.73	22.11	21.27	21.53
		12	6	20.97	20.11	20.44	21.77	20.91	21.24
		12	13	21.53	20.34	20.94	22.33	21.14	21.74
		25	0	21.15	20.54	20.65	21.95	21.34	21.45
	16QAM	1	0	21.13	21.19	21.08	21.93	21.99	21.88
		1	13	21.30	21.36	21.25	22.10	22.16	22.05
		1	24	21.31	21.42	21.26	22.11	22.22	22.06
		12	0	19.92	19.89	20.03	20.72	20.69	20.83
		12	6	20.13	20.20	20.08	20.93	21.00	20.88
		12	13	20.44	20.54	20.40	21.24	21.34	21.20
		25	0	20.29	20.39	20.25	21.09	21.19	21.05
BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)					
				20800/ 2505	21100/ 2535	21400/ 2565	20800/ 2505	21100/ 2535	21400/ 2565
10MHz	QPSK	1	0	22.38	22.12	22.23	23.18	22.92	23.03
		1	25	22.40	21.47	21.79	23.20	22.27	22.59
		1	49	22.93	22.16	22.25	23.73	22.96	23.05
		25	0	21.34	20.52	20.77	22.14	21.32	21.57
		25	13	21.00	20.16	20.48	21.80	20.96	21.28
		25	25	21.55	20.38	20.99	22.35	21.18	21.79
		50	0	21.23	20.56	20.69	22.03	21.36	21.49
	16QAM	1	0	21.15	21.22	21.10	21.95	22.02	21.90
		1	25	21.33	21.40	21.28	22.13	22.20	22.08
		1	49	21.34	21.44	21.29	22.14	22.24	22.09
		25	0	19.95	19.94	20.07	20.75	20.74	20.87
		25	13	20.15	20.24	20.11	20.95	21.04	20.91
		25	25	20.47	20.59	20.44	21.27	21.39	21.24
		50	0	20.32	20.44	20.29	21.12	21.24	21.09



BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)					
				20825/ 2507.5	21100/ 2535	21375/ 2562.5	20825/ 2507.5	21100/ 2535	21375/ 2562.5
15MHz	QPSK	1	0	22.37	22.08	22.21	23.17	22.88	23.01
		1	38	22.38	21.46	21.76	23.18	22.26	22.56
		1	74	22.90	22.11	22.21	23.70	22.91	23.01
		36	0	21.32	20.48	20.74	22.12	21.28	21.54
		36	18	20.97	20.11	20.44	21.77	20.91	21.24
		36	39	21.52	20.35	20.95	22.32	21.15	21.75
		75	0	21.21	20.52	20.64	22.01	21.32	21.44
	16QAM	1	0	21.10	21.20	21.08	21.90	22.00	21.88
		1	38	21.31	21.37	21.26	22.11	22.17	22.06
		1	74	21.31	21.40	21.26	22.11	22.20	22.06
		36	0	19.92	19.92	20.04	20.72	20.72	20.84
		36	18	20.12	20.19	20.07	20.92	20.99	20.87
		36	39	20.45	20.55	20.41	21.25	21.35	21.21
		75	0	20.29	20.39	20.25	21.09	21.19	21.05
BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)					
				20850/ 2510	21100/ 2535	21350/ 2560	20850/ 2510	21100/ 2535	21350/ 2560
20MHz	QPSK	1	0	22.34	22.04	22.18	23.14	22.84	22.98
		1	50	22.37	21.42	21.74	23.17	22.22	22.54
		1	99	22.88	22.10	22.18	23.68	22.90	22.98
		50	0	21.29	20.43	20.70	22.09	21.23	21.50
		50	25	20.95	20.07	20.41	21.75	20.87	21.21
		50	50	21.49	20.30	20.91	22.29	21.10	21.71
		100	0	21.18	20.47	20.60	21.98	21.27	21.40
	16QAM	1	0	21.08	21.16	21.03	21.88	21.96	21.83
		1	50	21.27	21.35	21.22	22.07	22.15	22.02
		1	99	21.29	21.37	21.24	22.09	22.17	22.04
		50	0	19.89	19.88	20.01	20.69	20.68	20.81
		50	25	20.09	20.17	20.04	20.89	20.97	20.84
		50	50	20.42	20.50	20.37	21.22	21.30	21.17
		100	0	20.27	20.35	20.22	21.07	21.15	21.02

5.2 Occupied Bandwidth

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The occupied bandwidth is measured using spectrum analyzer.

RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 7 (5MHz).

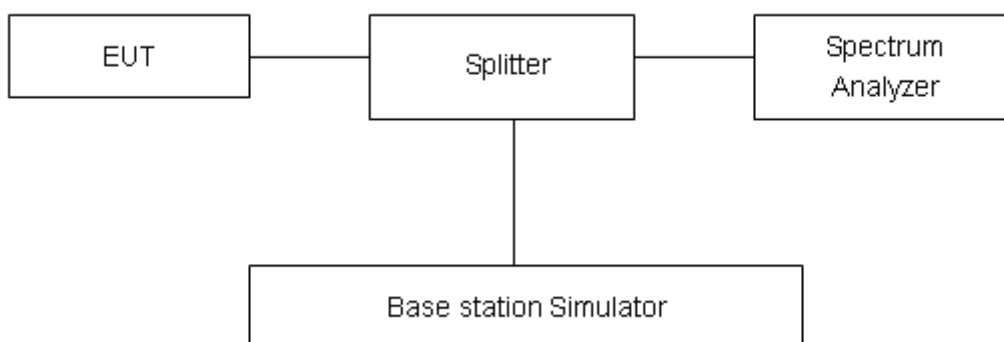
RBW is set to 200 kHz, VBW is set to 620 kHz for LTE Band 7 (10MHz).

RBW is set to 300 kHz, VBW is set to 910 kHz for LTE Band 7 (15MHz).

RBW is set to 430 kHz, VBW is set to 1.2 MHz for LTE Band 7 (20MHz).

99% power and -26dBc occupied bandwidths are recorded. Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

No specific occupied bandwidth requirements in part 2.1049.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U=624\text{Hz}$.

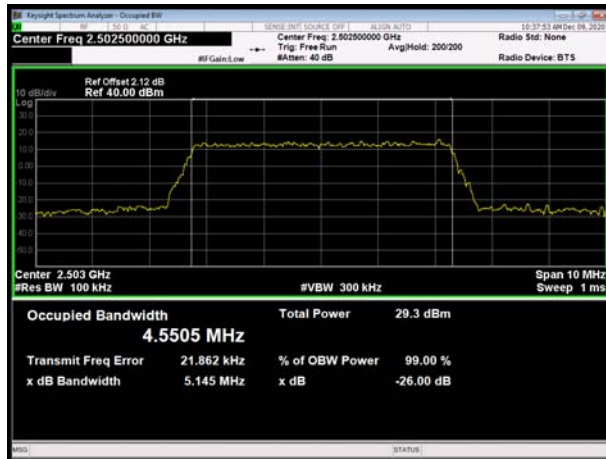


Test Result

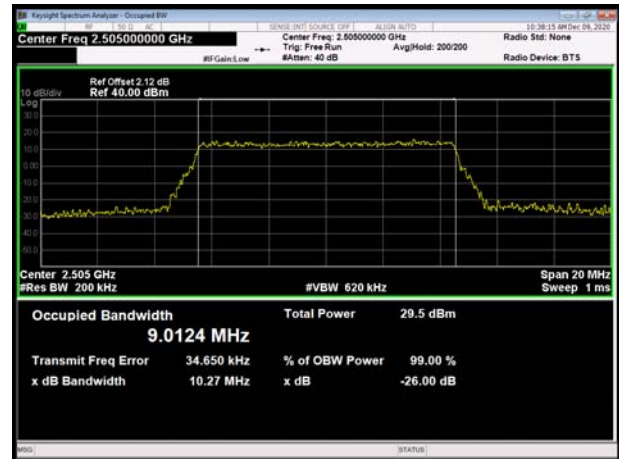
LTE Band 7						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	5	20775	2502.5	4.5505	5.1450
			21100	2535	4.5448	5.0630
			21425	2567.5	4.5313	5.1480
		10	20800	2505	9.0124	10.2700
			21100	2535	9.0408	10.3900
			21400	2565	9.0326	10.4100
		15	20825	2507.5	13.3750	14.6300
			21100	2535	13.5800	15.7800
			21375	2562.5	13.5650	15.7000
		20	20850	2510	18.0250	19.6300
			21100	2535	18.0410	19.7300
			21350	2560	18.0070	19.6700
	16QAM	5	20775	2502.5	4.5440	5.4500
			21100	2535	4.5358	5.1350
			21425	2567.5	4.5325	5.1260
		10	20800	2505	8.9566	9.5300
			21100	2535	9.0130	10.2000
			21400	2565	9.0257	10.3200
		15	20825	2507.5	13.4210	14.3000
			21100	2535	13.5270	15.7400
			21375	2562.5	13.5420	15.2200
		20	20850	2510	17.9900	19.6300
			21100	2535	18.0300	19.6900
			21350	2560	18.0110	19.6700



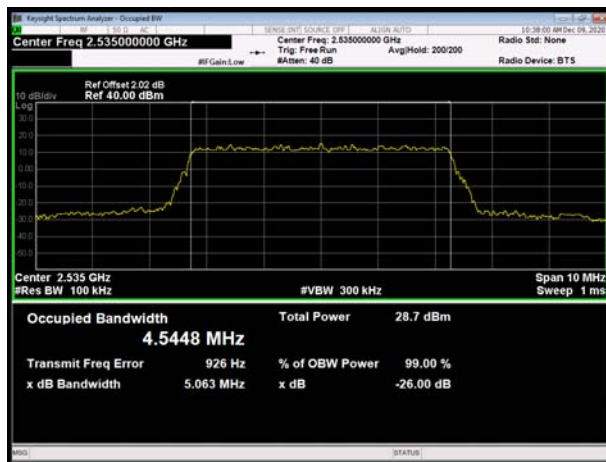
LTE Band 7 QPSK 5MHz CH-Low



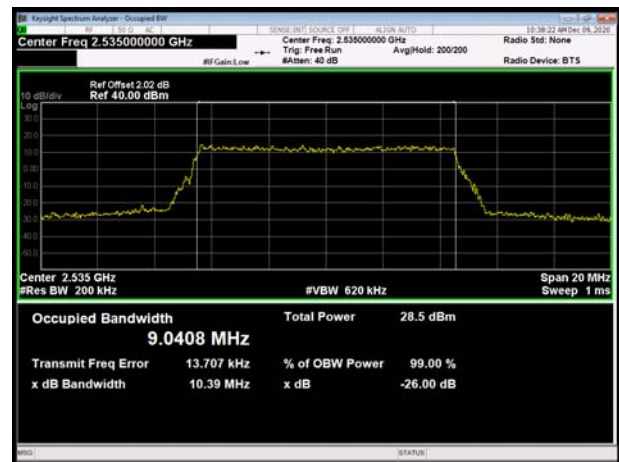
LTE Band 7 QPSK 10MHz CH-Low



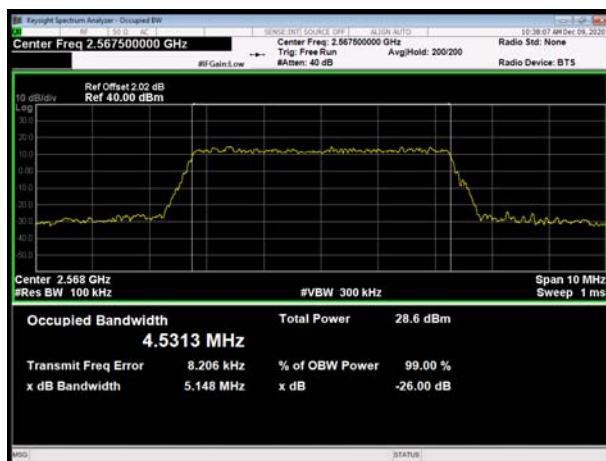
LTE Band 7 QPSK 5MHz CH-Middle



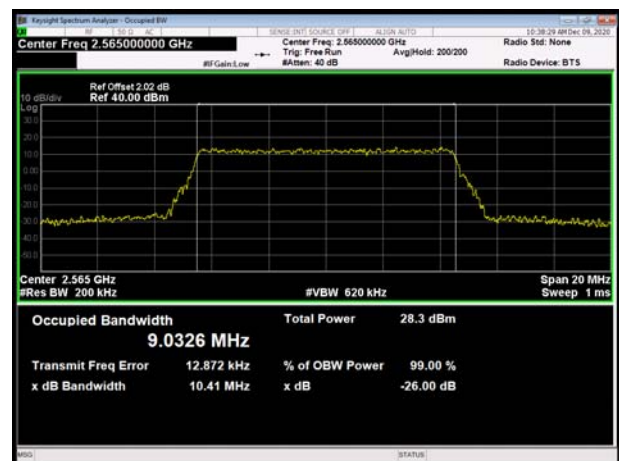
LTE Band 7 QPSK 10MHz CH-Middle



LTE Band 7 QPSK 5MHz CH-High

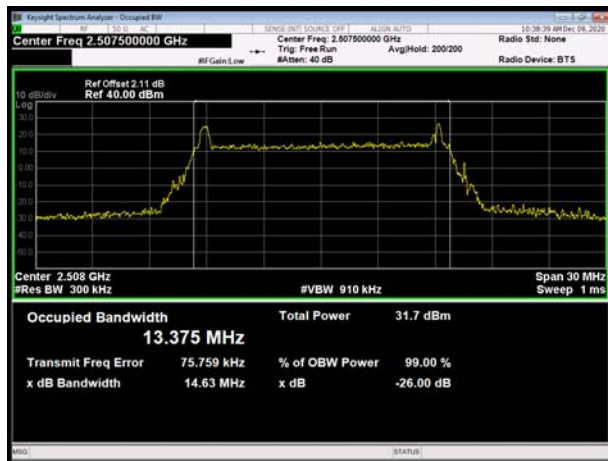


LTE Band 7 QPSK 10MHz CH-High

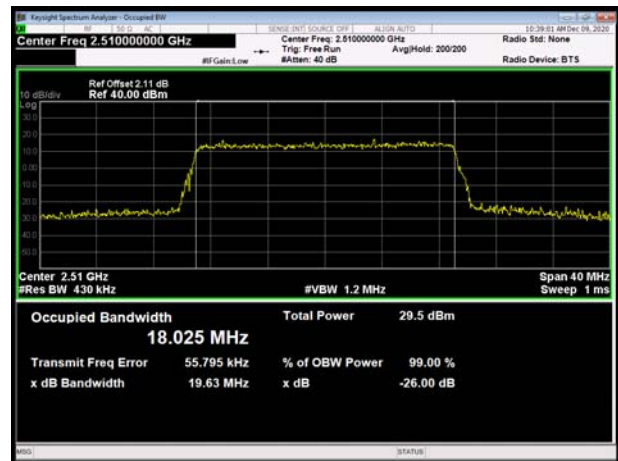




LTE Band 7 QPSK 15MHz CH-Low



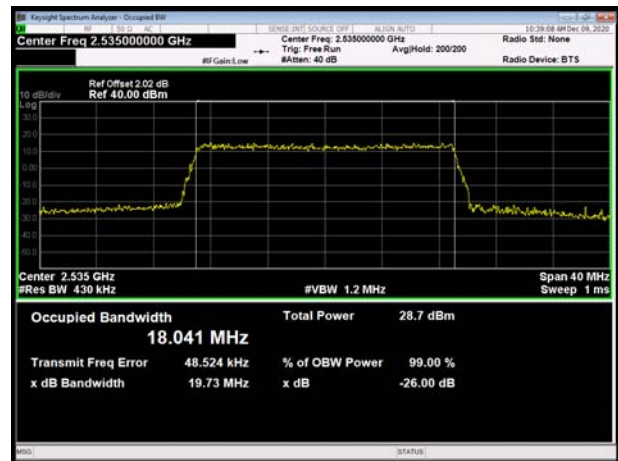
LTE Band 7 QPSK 20MHz CH-Low



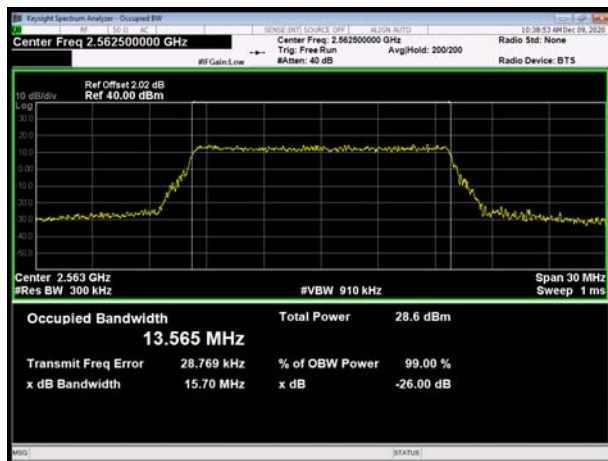
LTE Band 7 QPSK 15MHz CH-Middle



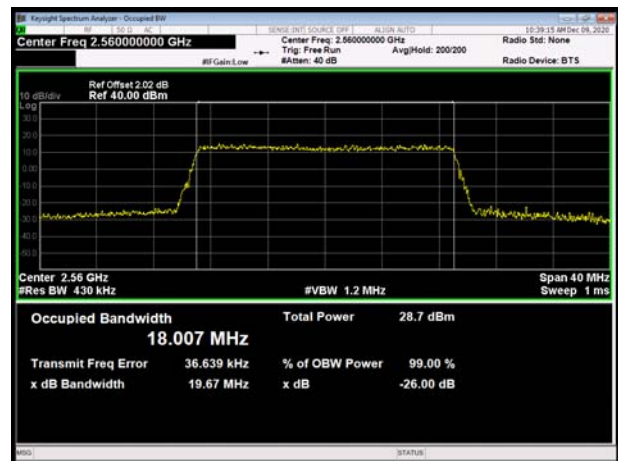
LTE Band 7 QPSK 20MHz CH-Middle



LTE Band 7 QPSK 15MHz CH-High



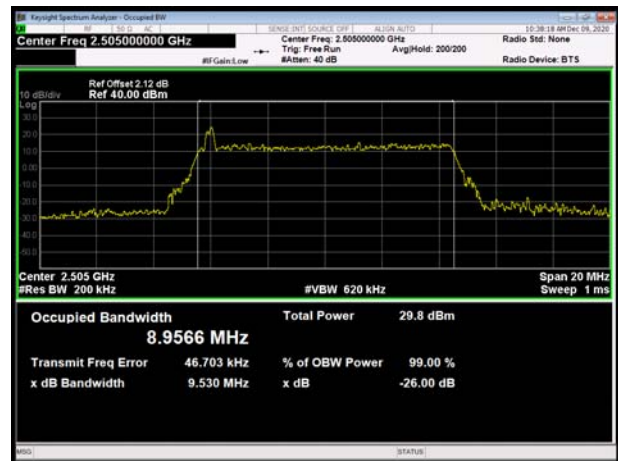
LTE Band 7 QPSK 20MHz CH-High



LTE Band 7 16QAM 5MHz CH-Low



LTE Band 7 16QAM 10MHz CH-Low



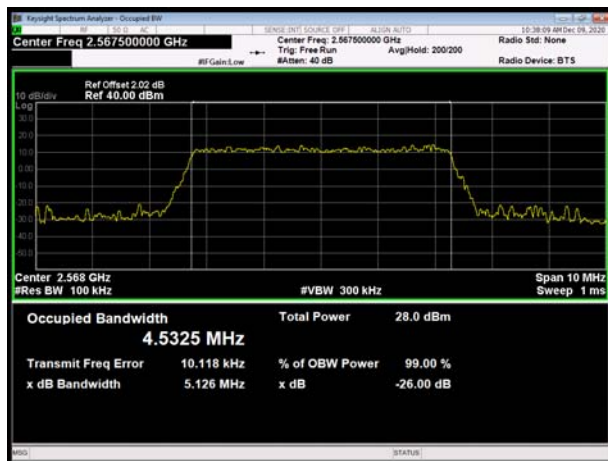
LTE Band 7 16QAM 5MHz CH-Middle



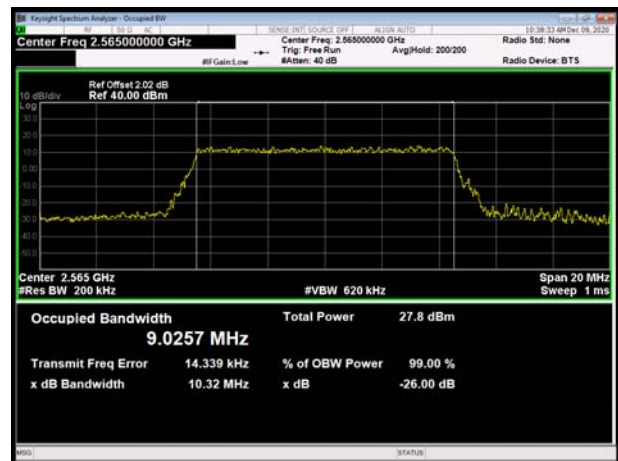
LTE Band 7 16QAM 10MHz CH-Middle



LTE Band 7 16QAM 5MHz CH-High



LTE Band 7 16QAM 10MHz CH-High

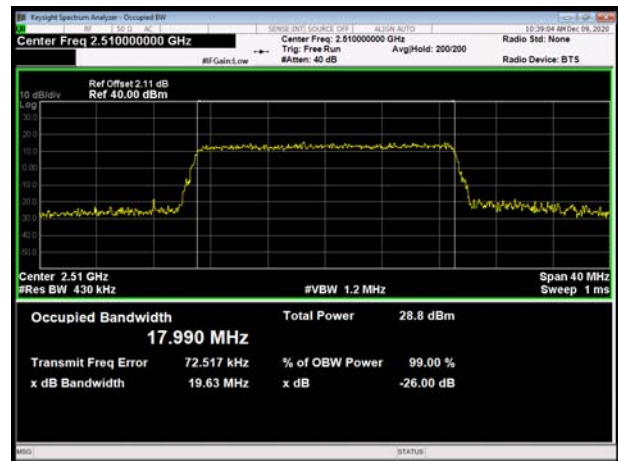




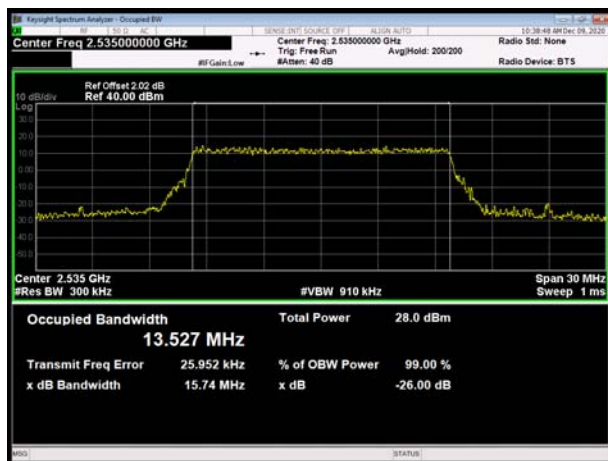
LTE Band 7 16QAM 15MHz CH-Low



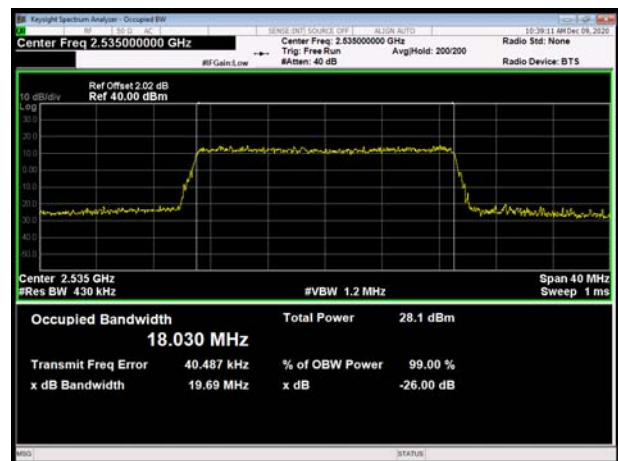
LTE Band 7 16QAM 20MHz CH-Low



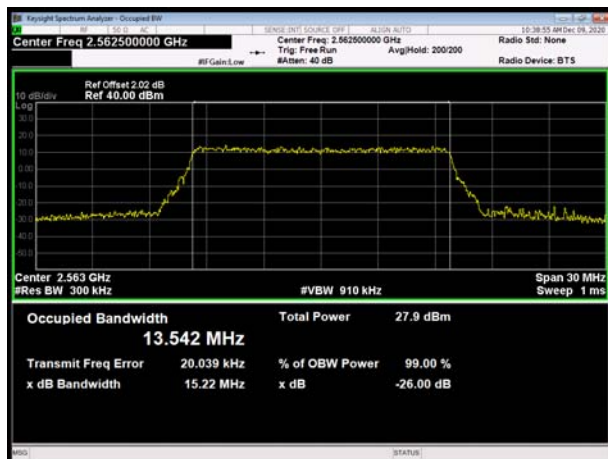
LTE Band 7 16QAM 15MHz CH-Middle



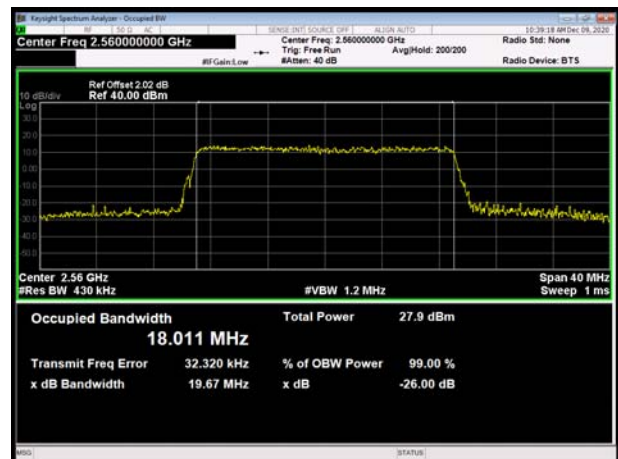
LTE Band 7 16QAM 20MHz CH-Middle



LTE Band 7 16QAM 15MHz CH-High



LTE Band 7 16QAM 20MHz CH-High



5.3 Band Edge Compliance

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The band edge of the lowest and highest channels were measured.

The testing follows KDB 971168 D01 v03r01 Section 6.0

The EUT was connected to spectrum analyzer and system simulator via a power divider.

The band edges of low and high channels for the highest RF powers were measured.

RBW is set to $\geq 1\%EBW$, VBW is set to 3x RBW.

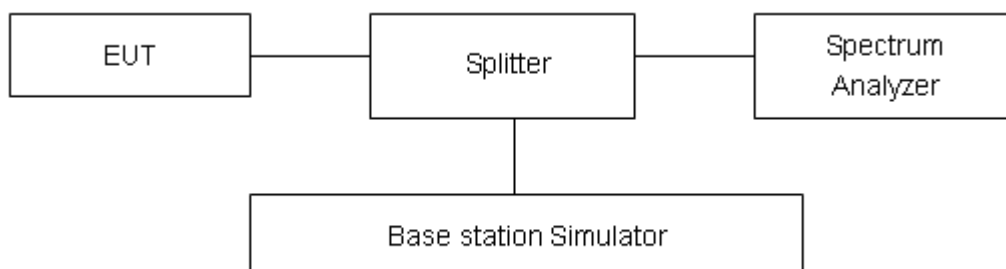
on spectrum analyzer.

Set spectrum analyzer with RMS detector.

The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

Checked that all the results comply with the emission limit line.

Test Setup



Limits

Rule Part 27.53(i) By a factor of not less than $43 + 10 \log (P)$ dB on all frequencies between 2305 and 2320 MHz.

Rule Part 27.53(m) (4)/ specifies that “for BRS and EBS stations. 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)(4) of this section. In addition, the attenuation factor shall not be less that $43 + 10 \log (P)$ 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.



Example:

The limit line is derived from $43 + 10\log(P)$ dB below the transmitter power P (Watts)

$$= P(W) - [43 + 10\log(P)] \text{ (dB)}$$

$$= [30 + 10\log(P)] \text{ (dBm)} - [43 + 10\log(P)] \text{ (dB)} = -13\text{dBm}.$$

Measurement Uncertainty

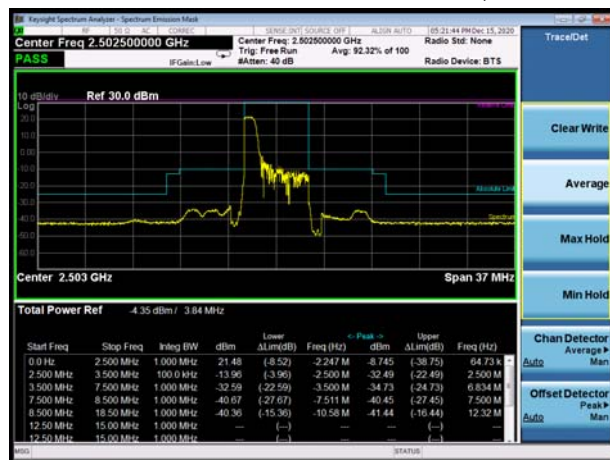
The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 1.96$, $U=0.684\text{dB}$.



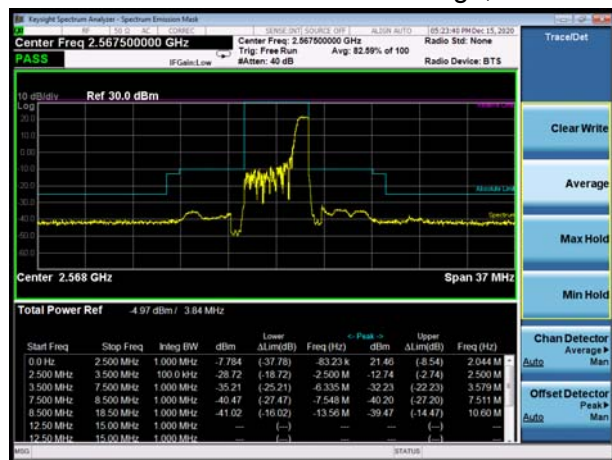
Test Result

All the test traces in the plots shows the test results clearly.

LTE Band 7 QPSK 5MHz CH-Low, 1 RB



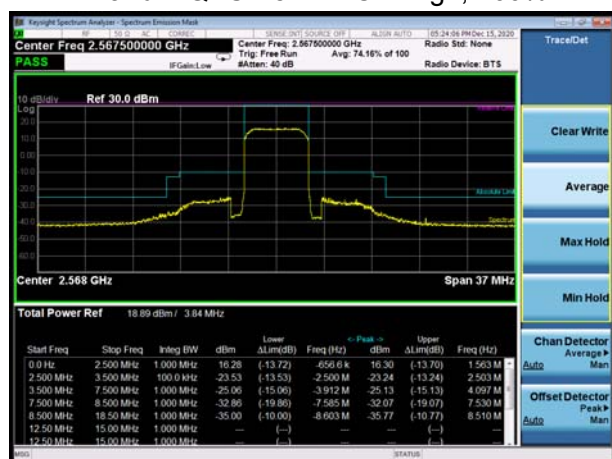
LTE Band 7 QPSK 5MHz CH-High, 1 RB



LTE Band 7 QPSK 5MHz CH-Low, 100%RB



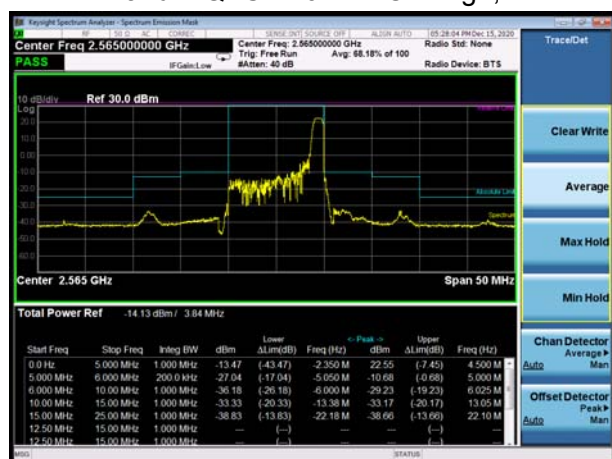
LTE Band 7 QPSK 5MHz CH-High, 100%RB



LTE Band 7 QPSK 10MHz CH-Low, 1 RB



LTE Band 7 QPSK 10MHz CH-High, 1 RB





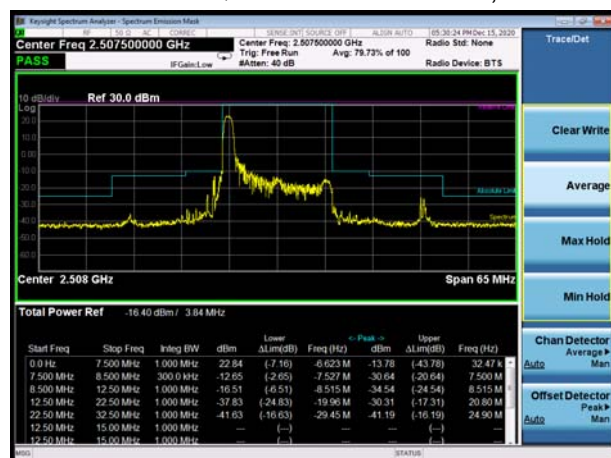
LTE Band 7 QPSK 10MHz CH-Low, 100%RB



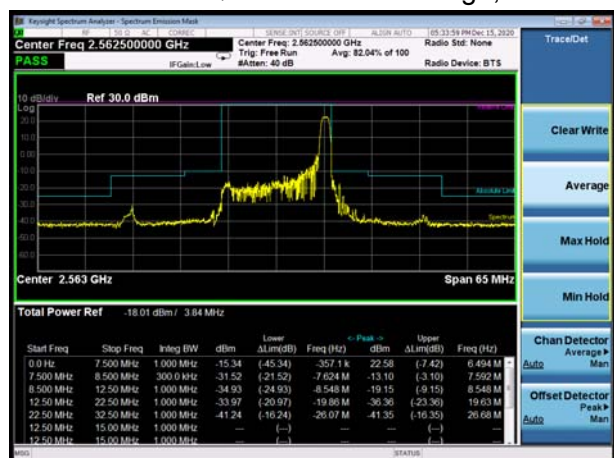
LTE Band 7 QPSK 10MHz CH-High, 100%RB



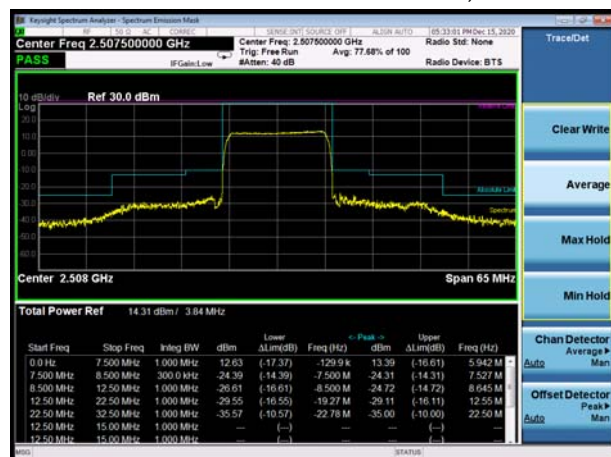
LTE Band 7 QPSK 15MHz CH-Low, 1 RB



LTE Band 7 QPSK 15MHz CH-High, 1 RB



LTE Band 7 QPSK 15MHz CH-Low, 100%RB



LTE Band 7 QPSK 15MHz CH-High, 100%RB





LTE Band 7 QPSK 20MHz CH-Low, 1 RB



LTE Band 7 QPSK 20MHz CH-High, 1 RB



LTE Band 7 QPSK 20MHz CH-Low, 100%RB



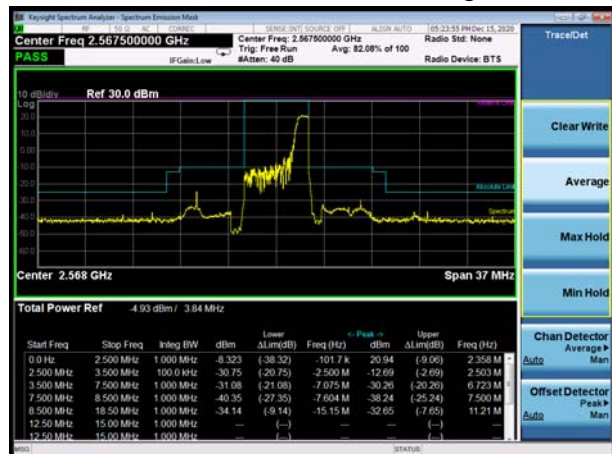
LTE Band 7 QPSK 20MHz CH-High, 100%RB



LTE Band 7 16QAM 5MHz CH-Low, 1 RB



LTE Band 7 16QAM 5MHz CH-High, 1 RB





LTE Band 7 16QAM 5MHz CH-Low, 100%RB



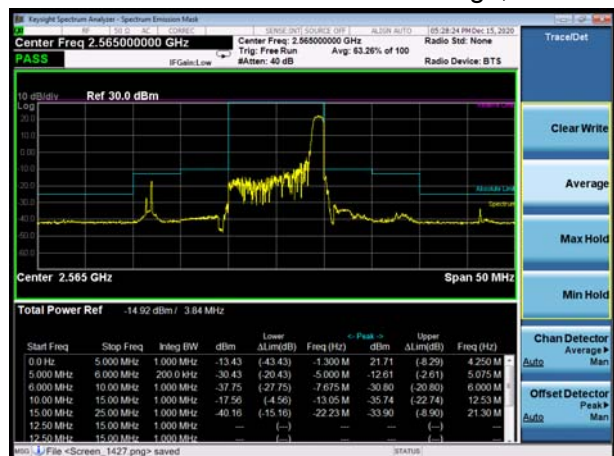
LTE Band 7 16QAM 5MHz CH-High, 100%RB



LTE Band 7 16QAM 10MHz CH-Low, 1 RB



LTE Band 7 16QAM 10MHz CH-High, 1 RB



LTE Band 7 16QAM 10MHz CH-Low, 100%RB

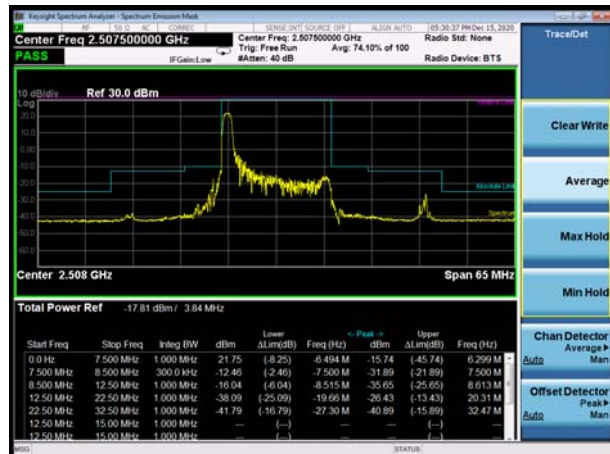


LTE Band 7 16QAM 10MHz CH-High, 100%RB

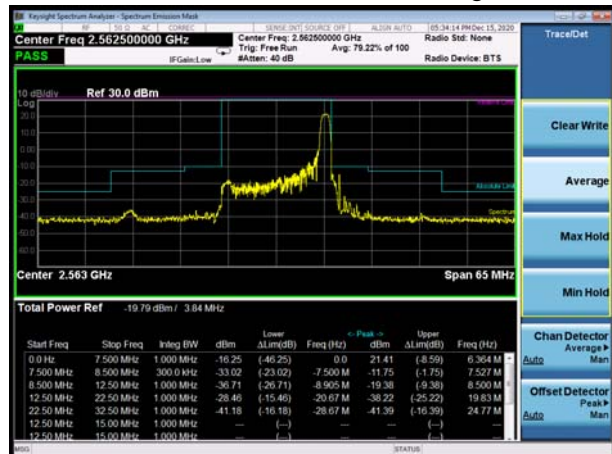




LTE Band 7 16QAM 15MHz CH-Low, 1 RB



LTE Band 7 16QAM 15MHz CH-High, 1 RB



LTE Band 7 16QAM 15MHz CH-Low, 100%RB



LTE Band 7 16QAM 15MHz CH-High, 100%RB



LTE Band 7 16QAM 20MHz CH-Low, 1 RB

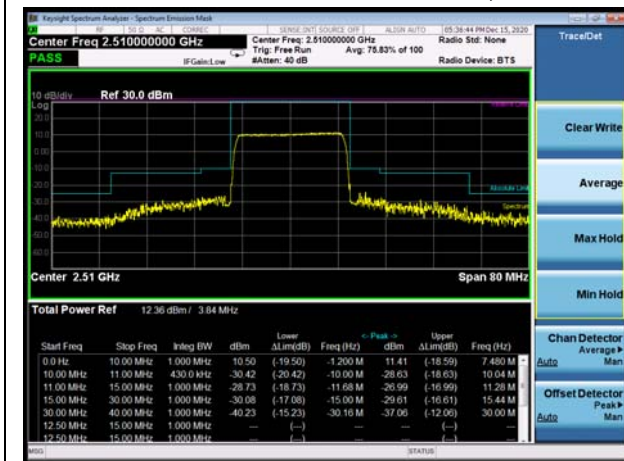


LTE Band 7 16QAM 20MHz CH-High, 1 RB





LTE Band 7 16QAM 20MHz CH-Low, 100%RB



LTE Band 7 16QAM 20MHz CH-High, 100%RB



5.4 Peak-to-Average Power Ratio (PAPR)

Ambient condition

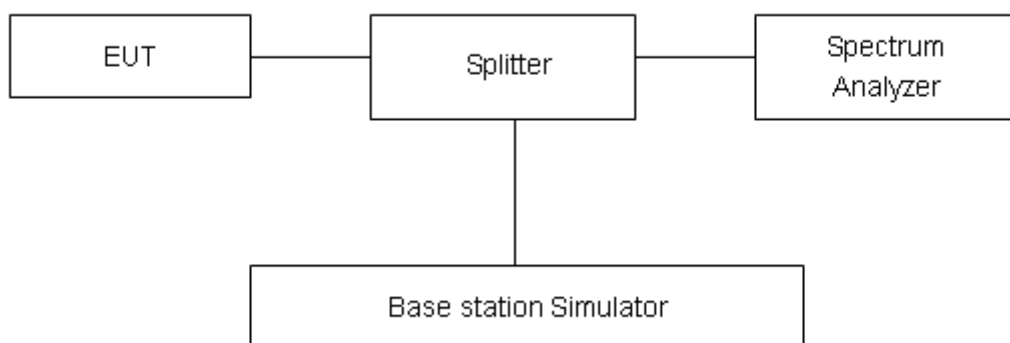
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

Measure the total peak power and record as PPk. And measure the total average power and record as PAvg. Both the peak and average power levels must be expressed in the same logarithmic units (e.g., dBm). Determine the PAPR from:

$$\text{PAPR (dB)} = \text{PPk (dBm)} - \text{PAvg (dBm)}.$$

Test Setup



Limits

Rule Part 27.50(d)(5) Equipment employed must be authorized in accordance with the provisions of 24.51. Power measurements for transmissions by stations authorized under this section may be made either in accordance with a Commission-approved average power technique or in compliance with paragraph (d)(6) of this section. 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.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 0.4$ dB.



Test Results

LTE Band 7								
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
QPSK	5	20775	2502.5	26.86	21.12	5.74	≤13	PASS
		21100	2535	26.26	20.31	5.95	≤13	PASS
		21425	2567.5	25.92	20.36	5.56	≤13	PASS
	10	20800	2505	27.22	21.54	5.68	≤13	PASS
		21100	2535	26.40	20.41	5.99	≤13	PASS
		21400	2565	26.11	20.41	5.70	≤13	PASS
	15	20825	2507.5	27.58	21.61	5.97	≤13	PASS
		21100	2535	26.86	20.54	6.32	≤13	PASS
		21375	2562.5	26.61	20.54	6.07	≤13	PASS
	20	20850	2510	27.41	21.76	5.65	≤13	PASS
		21100	2535	26.62	20.65	5.97	≤13	PASS
		21350	2560	26.52	20.68	5.84	≤13	PASS
16QAM	5	20775	2502.5	26.55	19.98	6.57	≤13	PASS
		21100	2535	25.28	19.61	5.67	≤13	PASS
		21425	2567.5	25.97	19.66	6.31	≤13	PASS
	10	20800	2505	26.84	20.38	6.46	≤13	PASS
		21100	2535	26.35	19.71	6.64	≤13	PASS
		21400	2565	26.08	19.70	6.38	≤13	PASS
	15	20825	2507.5	27.11	20.63	6.48	≤13	PASS
		21100	2535	26.56	19.84	6.72	≤13	PASS
		21375	2562.5	26.33	19.83	6.50	≤13	PASS
	20	20850	2510	27.18	20.79	6.39	≤13	PASS
		21100	2535	26.61	19.95	6.66	≤13	PASS
		21350	2560	26.49	19.97	6.52	≤13	PASS

5.5 Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

Frequency Stability (Temperature Variation)

The temperature inside the climate chamber is varied from -30°C to +50°C in 10°C step size.

(1) With all power removed, the temperature was decreased to -10°C and permitted to stabilize for three hours.

(2) Measure the carrier frequency with the test equipment in a “call mode”. These measurements should be made within 1 minute of powering up the mobile station, to prevent significant self warming.

(3) Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements.

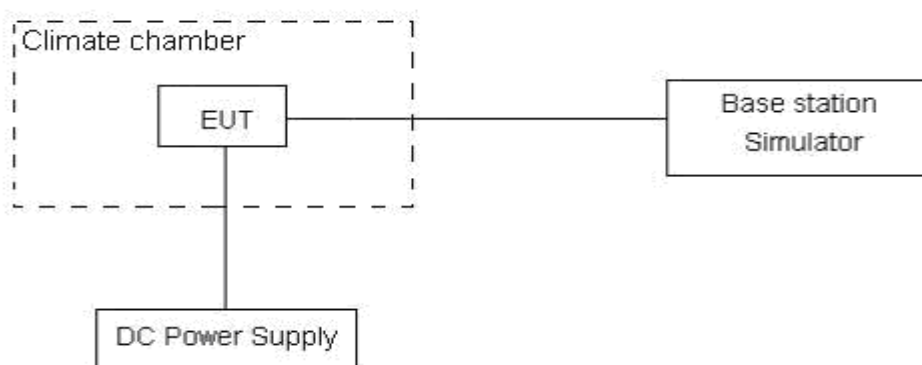
Frequency Stability (Voltage Variation)

The frequency stability shall be measured with variation of primary supply voltage as follows:

Primary Supply Voltage: The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

This transceiver is specified to operate with an input voltage of between 4.25 V and 5.75 V, with a nominal voltage of 5.0V.

Test setup



Limits

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

Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 3$, $U = 0.01\text{ppm}$.



Test Result

LTE Band 7						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	5MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	7.00	16.29	0.00372	0.00867	PASS
Extreme (50℃)		15.07	14.63	0.00802	0.00778	PASS
Extreme (40℃)		9.63	3.52	0.00512	0.00187	PASS
Extreme (30℃)		13.27	12.64	0.00706	0.00673	PASS
Extreme (20℃)		11.60	4.76	0.00617	0.00253	PASS
Extreme (10℃)		1.22	15.87	0.00065	0.00844	PASS
Extreme (0℃)		10.14	12.53	0.00539	0.00666	PASS
Extreme (-10℃)		15.35	12.40	0.00817	0.00660	PASS
Extreme (-20℃)		9.55	13.69	0.00508	0.00728	PASS
Extreme (-30℃)		14.45	14.08	0.00769	0.00749	PASS
25℃	LV	12.58	5.70	0.00669	0.00303	PASS
	HV	17.84	10.19	0.00949	0.00542	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	10MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	3.63	6.72	0.00193	0.00357	PASS
Extreme (50℃)		4.66	7.59	0.00248	0.00404	PASS
Extreme (40℃)		3.48	17.84	0.00185	0.00949	PASS
Extreme (30℃)		2.15	5.23	0.00114	0.00278	PASS
Extreme (20℃)		10.08	8.03	0.00536	0.00427	PASS
Extreme (10℃)		17.79	15.12	0.00946	0.00805	PASS
Extreme (0℃)		13.40	1.14	0.00713	0.00061	PASS
Extreme (-10℃)		4.16	17.98	0.00221	0.00957	PASS
Extreme (-20℃)		7.69	10.22	0.00409	0.00543	PASS
Extreme (-30℃)		17.04	13.13	0.00906	0.00698	PASS
25℃	LV	7.70	5.01	0.00409	0.00266	PASS
	HV	2.80	14.83	0.00149	0.00789	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	15MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	2.56	9.63	0.00136	0.00512	PASS
Extreme (50℃)		4.86	7.09	0.00259	0.00377	PASS



Extreme (40℃)		6.54	16.91	0.00348	0.00899	PASS
Extreme (30℃)		9.09	5.89	0.00484	0.00314	PASS
Extreme (20℃)		14.58	10.67	0.00776	0.00567	PASS
Extreme (10℃)		17.23	11.39	0.00916	0.00606	PASS
Extreme (0℃)		4.77	13.74	0.00254	0.00731	PASS
Extreme (-10℃)		15.94	9.24	0.00848	0.00492	PASS
Extreme (-20℃)		2.40	1.68	0.00128	0.00090	PASS
Extreme (-30℃)		6.34	15.80	0.00337	0.00840	PASS
25℃	LV	16.02	8.38	0.00852	0.00446	PASS
	HV	16.62	7.04	0.00884	0.00375	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	20MHz					
Temperature	Voltage	16QAM	QPSK	16QAM	QPSK	
Normal (25℃)	Normal	17.67	7.86	0.00940	0.00418	PASS
Extreme (50℃)		15.12	13.43	0.00804	0.00714	PASS
Extreme (40℃)		16.41	9.49	0.00873	0.00505	PASS
Extreme (30℃)		12.10	17.48	0.00644	0.00930	PASS
Extreme (20℃)		7.97	8.32	0.00424	0.00442	PASS
Extreme (10℃)		6.08	13.69	0.00323	0.00728	PASS
Extreme (0℃)		17.43	10.29	0.00927	0.00547	PASS
Extreme (-10℃)		6.71	3.07	0.00357	0.00163	PASS
Extreme (-20℃)		17.37	6.48	0.00924	0.00345	PASS
Extreme (-30℃)		10.38	4.55	0.00552	0.00242	PASS
25℃	LV	7.42	14.62	0.00395	0.00778	PASS
	HV	3.43	13.75	0.00182	0.00732	PASS

5.6 Spurious Emissions at Antenna Terminals

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to Spectrum Analyzer and Base Station Simulator via power Splitter. The measurement is carried out using a spectrum analyzer. The spectrum analyzer scans from 9kHz to the 10th harmonic of the carrier. The peak detector is used.

RBW is set to 1 kHz (0.009MHz~ 0.15 MHz),

RBW is set to 10 kHz (0.15 MHz~ 30 MHz)

RBW is set to 100 kHz (30MHz~1000 MHz)

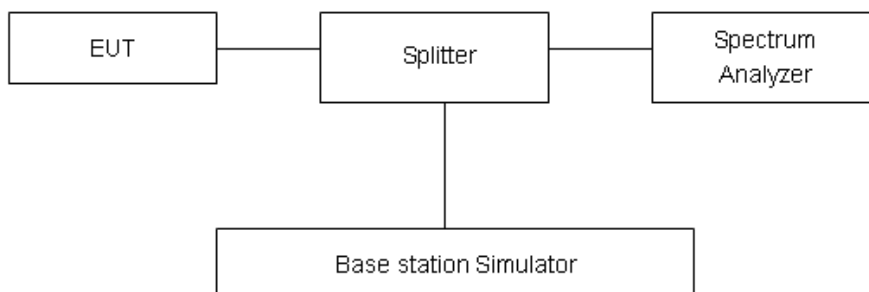
RBW is set to 1000 kHz (above 1000MHz)

Sweep is set to ATUO.

Of those disturbances below (limit – 20 dB), the mark is not required for the EUT.

The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup



Limits

Rule Part 27.53(m) $55 + 10 \log (P)$ 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)(4) of this section.

Part 27.53(m) Limit	-25 dBm
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 99.75% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
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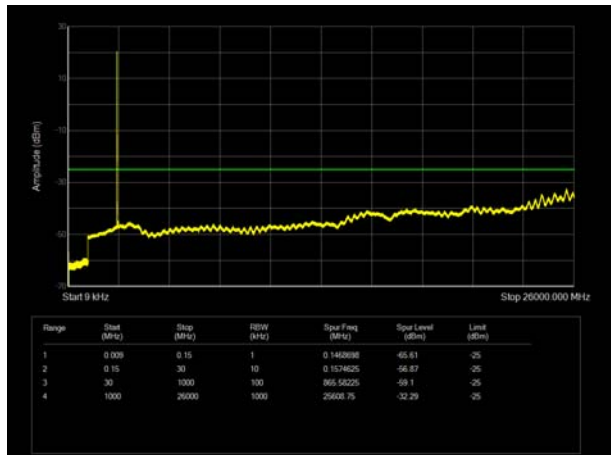
9kHz-1GHz	0.684 dB
1GHz-27GHz	1.407 dB

Test Result

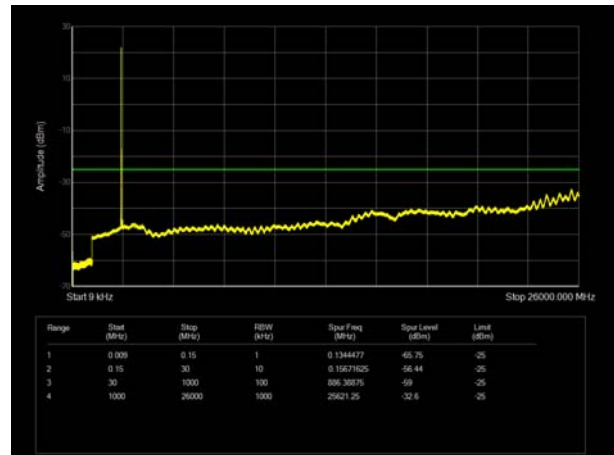
Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions more than 20 dB below the limit are not reported.

The signal beyond the limit is carrier.

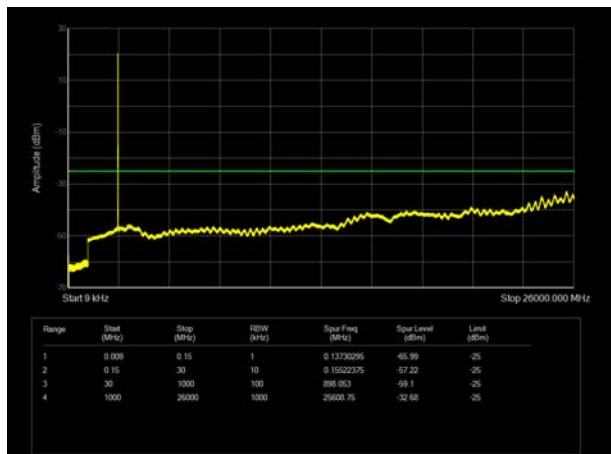
LTE Band 7 5MHz CH- Low 9kHz~26GHz



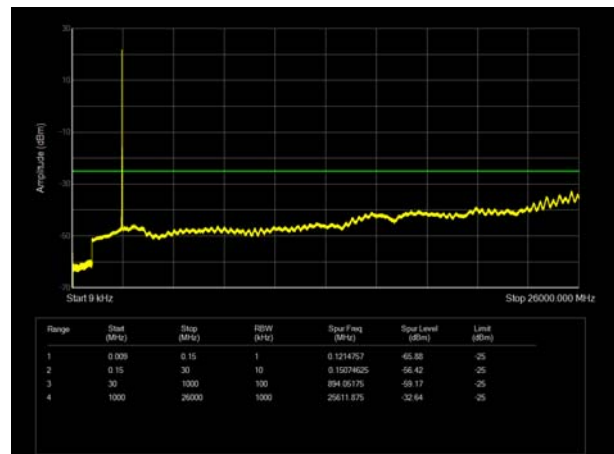
LTE Band 7 10MHz CH- Low 9kHz~26GHz



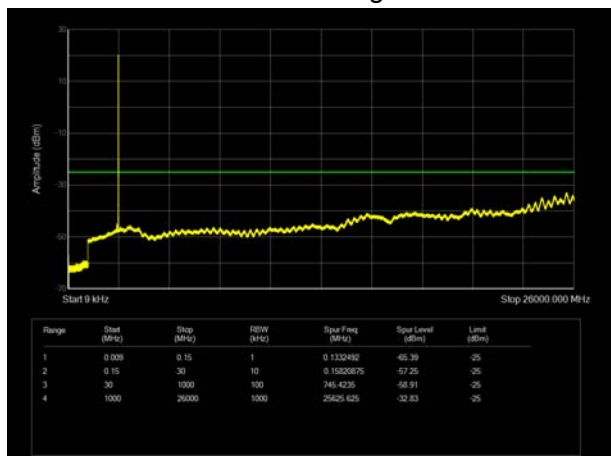
LTE Band 7 5MHz CH- Middle 9kHz~26GHz



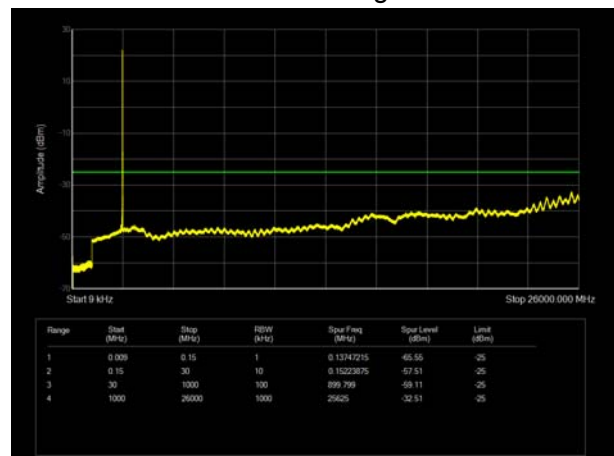
LTE Band 7 10MHz CH- Middle 9kHz~26GHz



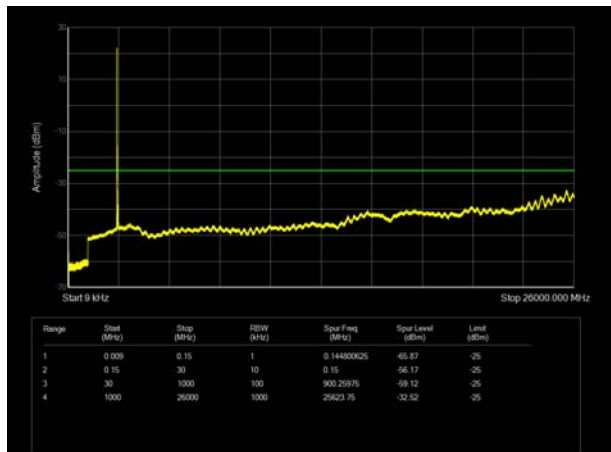
LTE Band 7 5MHz CH-High 9kHz~26GHz



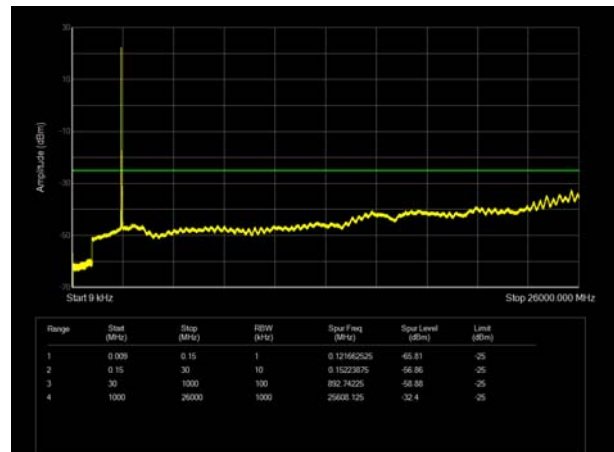
LTE Band 7 10MHz CH-High 9kHz~26GHz



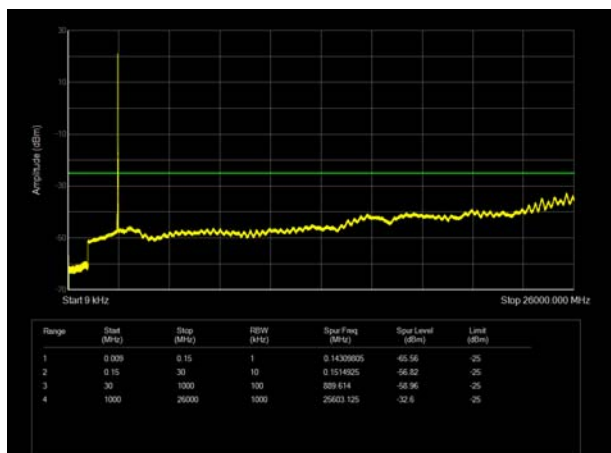
LTE Band 7 15MHz CH- Low 9kHz~26GHz



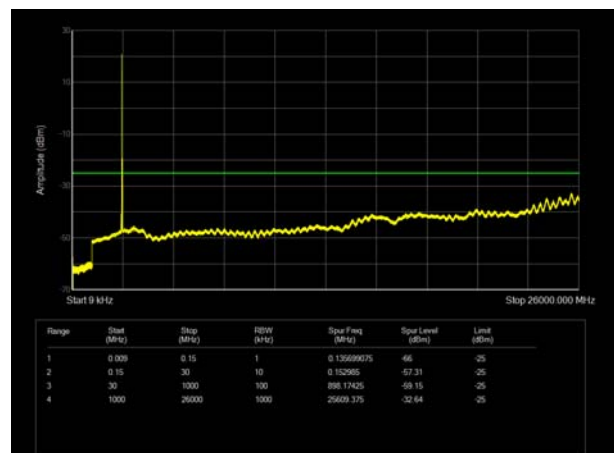
LTE Band 7 20MHz CH-Low 9kHz~26GHz



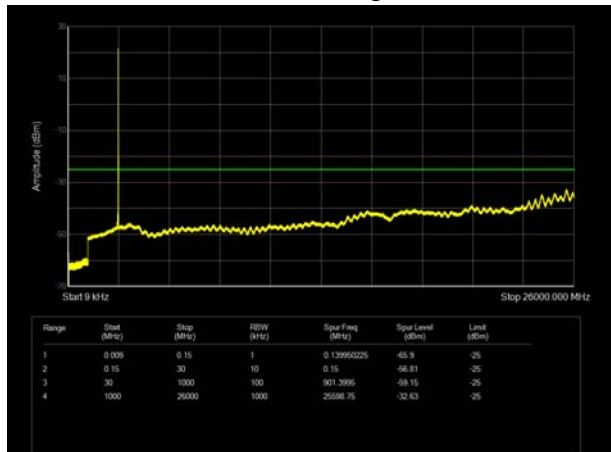
LTE Band 7 15MHz CH- Middle 9kHz~26GHz



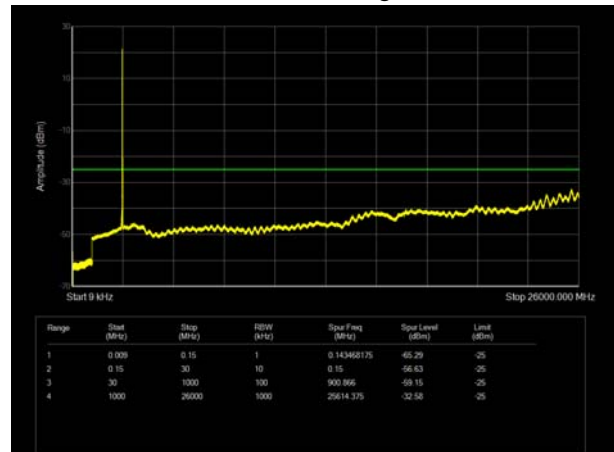
LTE Band 7 20MHz CH- Middle 9kHz~26GHz



LTE Band 7 15MHz CH-High 9kHz~26GHz



LTE Band 7 20MHz CH- High 9kHz~26GHz



5.7 Radiates Spurious Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

1. The testing follows FCC KDB 971168 D01 v03r01 Section 5.8 and ANSI C63.26 (2015).
2. Below 1GHz: The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H). Above 1GHz: (Note: the FCC's permission to use 1.5m as an alternative per TCBC Conf call of Dec. 2, 2014.) The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
3. A loop antenna, A log-periodic antenna or horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
4. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=200Hz,VBW=600Hz for 9kHz-150kHz , RBW=10kHz, VBW=30kHz 150kHz-30MHz ,RBW=100kHz,VBW=300kHz for 30MHz to 1GHz and RBW=1MHz, VBW=3MHz for above 1GHz And the maximum value of the receiver should be recorded as (Pr).
5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
7. The measurement results are obtained as described below:

$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$$
The measurement results are amend as described below:

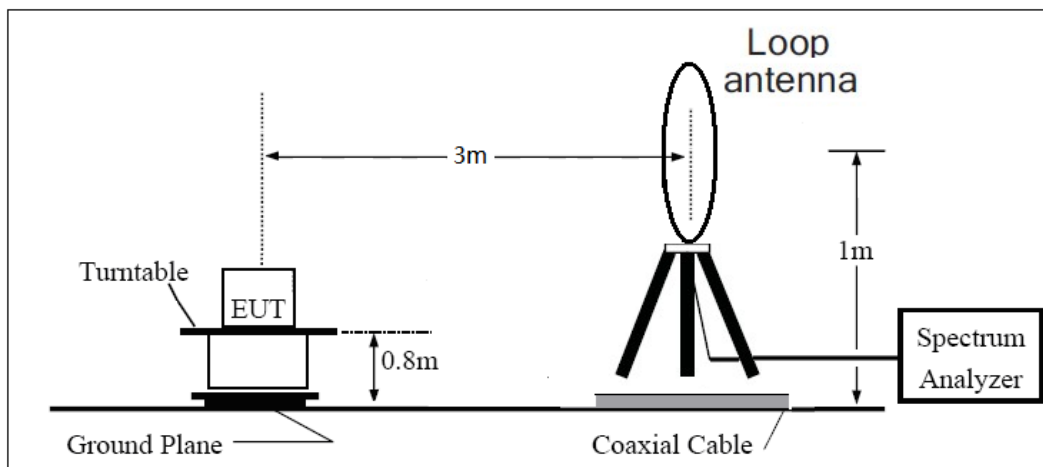
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, ERP

= EIRP-2.15dBi.

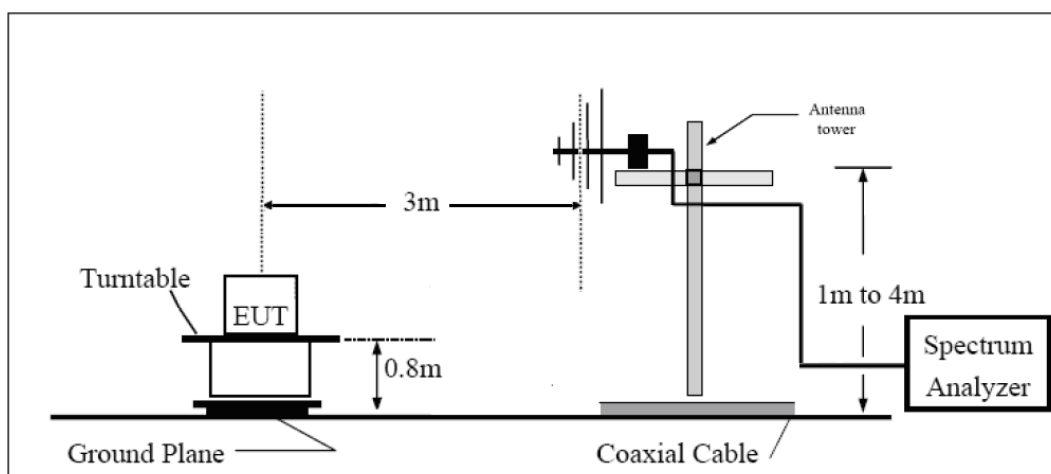
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

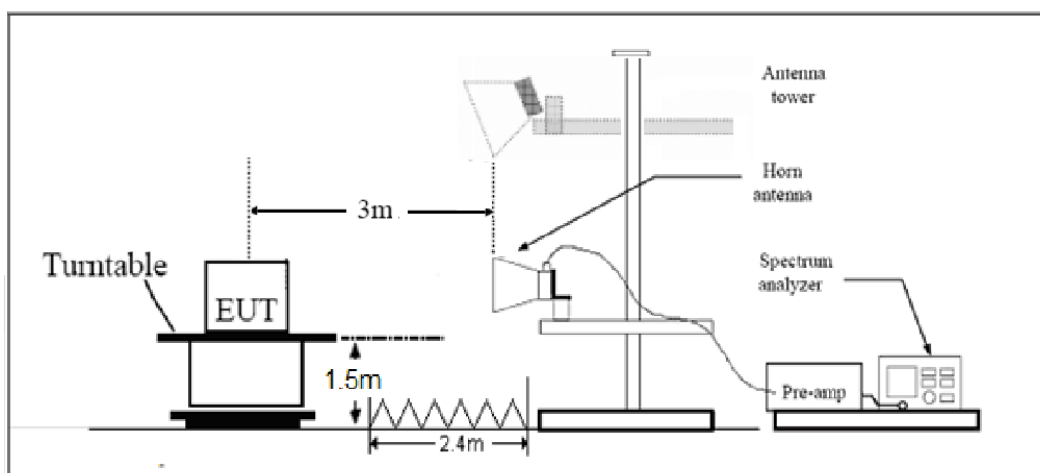
9KHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

**Limits**

Rule Part 27.53(m) $55 + 10 \log (P)$ 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)(4) of this section.

Part 27.53(m) Limit	-25 dBm
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = \pm 1.96$, $U = \pm 3.55$ dB.

Test Result

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

LTE Band 7 QPSK 5MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5065.9	-56.87	2.00	9.15	Horizontal	-49.72	-25.0	24.72	135
3	7598.3	-39.77	2.50	11.35	Horizontal	-30.92	-25.0	5.92	45
4	10131.2	-54.18	4.20	12.05	Horizontal	-46.33	-25.0	21.33	90
5	12664.0	-55.01	5.20	12.85	Horizontal	-47.36	-25.0	22.36	135
6	15196.8	-56.23	5.50	14.23	Horizontal	-47.50	-25.0	22.50	270
7	17729.6	-52.47	5.70	14.15	Horizontal	-44.02	-25.0	19.02	45
8	20262.4	--	--	--	--	--	--	--	--
9	22795.2	--	--	--	--	--	--	--	--
10	25328.0	--	--	--	--	--	--	--	--

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.

LTE Band 7 QPSK 10MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5061.2	-54.70	2.00	9.15	Horizontal	-47.55	-25.0	22.55	270
3	7592.3	-35.91	2.50	11.35	Horizontal	-27.06	-25.0	2.06	135
4	10122.4	-53.81	4.20	12.05	Horizontal	-45.96	-25.0	20.96	225
5	12653.0	-53.51	5.20	12.85	Horizontal	-45.86	-25.0	20.86	135
6	15183.6	-56.00	5.50	14.23	Horizontal	-47.27	-25.0	22.27	0
7	17714.2	-53.83	5.70	14.15	Horizontal	-45.38	-25.0	20.38	45
8	20244.8	--	--	--	--	--	--	--	--
9	22775.4	--	--	--	--	--	--	--	--
10	25306.0	--	--	--	--	--	--	--	--

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.

2. The worst emission was found in the antenna is Horizontal position.



LTE Band 7 QPSK 15MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5056.6	-53.67	2.00	10.15	Horizontal	-45.52	-25.0	20.52	180
3	7584.9	-34.97	2.50	11.35	Horizontal	-26.12	-25.0	1.12	90
4	10113.2	-53.48	4.20	12.05	Horizontal	-45.63	-25.0	20.63	315
5	12641.5	-55.67	5.20	14.85	Horizontal	-46.02	-25.0	21.02	135
6	15169.8	-54.84	5.50	13.23	Horizontal	-47.11	-25.0	22.11	0
7	17698.1	-52.20	5.70	12.15	Horizontal	-45.75	-25.0	20.75	45
8	20226.4	--	--	--	--	--	--	--	--
9	22754.7	--	--	--	--	--	--	--	--
10	25283.0	--	--	--	--	--	--	--	--
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									

LTE Band 7 QPSK 20MHz CH-Middle, RB 1

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	5052.4	-51.90	2.00	10.15	Horizontal	-43.75	-25.0	18.75	45
3	7578.0	-40.87	2.50	11.35	Horizontal	-32.02	-25.0	7.02	135
4	10140.0	-53.61	4.20	12.05	Horizontal	-45.76	-25.0	20.76	270
5	12675.0	-56.24	5.20	14.85	Horizontal	-46.59	-25.0	21.59	90
6	15210.0	-55.76	5.50	13.23	Horizontal	-48.03	-25.0	23.03	90
7	17745.0	-51.07	5.70	12.15	Horizontal	-44.62	-25.0	19.62	135
8	20280.0	--	--	--	--	--	--	--	--
9	22815.0	--	--	--	--	--	--	--	--
10	25350.0	--	--	--	--	--	--	--	--
Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor. 2. The worst emission was found in the antenna is Horizontal position.									



6 Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Base Station Simulator	R&S	CMW500	113824	2020-05-18	2021-05-17
Power Splitter	Hua Xiang	SHX-GF2-2-13	10120101	/	/
Spectrum Analyzer	Key sight	N9010A	MY50210259	2020-05-18	2021-05-17
Signal Analyzer	R&S	FSV30	100815	2019-12-15	2020-12-14
				2020-12-13	2021-12-12
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2020-04-02	2023-04-01
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9163	391	2019-12-16	2021-12-15
Horn Antenna	R&S	HF907	102723	2018-08-11	2021-08-10
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2021-06-19
Signal generator	R&S	SMB 100A	102594	2020-05-18	2021-05-17
Climatic Chamber	ESPEC	SU-242	93000506	2017-12-17	2020-12-16
				2020-12-13	2021-12-12
Preamplifier	R&S	SCU18	102327	2020-05-18	2021-05-17
MOB COMMS DC SUPPLY	Keysight	66319D	MY43004105	2020-05-18	2021-05-17
RF Cable	Agilent	SMA 15cm	0001	2020-06-12	2020-12-11
				2020-12-10	2021-06-09
Software	R&S	EMC32	9.26.0	/	/

*****END OF REPORT *****



ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.



ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.