



RF TEST REPORT

Applicant Quectel Wireless Solutions Co., Ltd
FCC ID XMR202006EC25AUX
Product LTE Module
Brand Quectel
Model EC25-AUX, EC25-AUX MINIPCIE
Report No. R2108A0762-R1
Issue Date December 1, 2021

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2020)/ FCC CFR 47 Part 22H (2020)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

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TABLE OF CONTENT

1. Test Laboratory	4
1.1. Notes of the Test Report	4
1.2. Test facility	4
1.3. Testing Location	4
2. General Description of Equipment under Test	5
2.3. Applicant and Manufacturer Information	5
2.4. General Information	5
3. Applied Standards	7
4. Test Configuration	8
5. Test Case Results	10
5.1. RF Power Output and Effective Radiated Power	10
5.2. Occupied Bandwidth	18
5.3. Band Edge Compliance	27
5.4. Peak-to-Average Power Ratio (PAPR)	35
5.5. Frequency Stability	38
5.6. Spurious Emissions at Antenna Terminals	44
5.7. Radiates Spurious Emission	51
6. Main Test Instruments	57
ANNEX A: The EUT Appearance	59
ANNEX B: Test Setup Photos	60
ANNEX C: Product Change Description	61
ANNEX D: Verify data	62

Summary of measurement results

No.	Test Case	Clause in FCC rules	Verdict
1	RF Power Output and Effective Radiated Power	2.1046 22.913(a)(5)	PASS
2	Occupied Bandwidth	2.1049	PASS
3	Band Edge Compliance	2.1051 / 22.917(a)	PASS
4	Peak-to-Average Power Ratio	22.913(d)/ KDB 971168 D01(5.7)	PASS
5	Frequency Stability	2.1055 / 22.355	PASS
6	Spurious Emissions at Antenna Terminals	2.1051 / 22.917(a)	PASS
7	Radiates Spurious Emission	2.1053 / 22.917 (a)	PASS

Date of Testing: April 12, 2018~ April 18, 2018 and May 12, 2020~ May 13, 2020

Note: 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.

EC25-AUX, EC25-AUX MINIPCIE (Report No.: R2108A0762-R1) is a variant model of EC25-AUX, EC25-AUX MINIPCIE (Report No.: R2005A0269-R1). There is only changed the Power Amplifier and Software Version of product.

Tested cases refer to the following table. Please refer to Appendix C for Verify data

Test Case	Original	Variant
RF Power Output and Effective Radiated Power	PASS	Retest(GSM850 /WCDMA Band V/ LTE band5)
Occupied Bandwidth	PASS	Verify the worst combination of each frequency band(GSM850 / WCDMA Band V/ LTE band5)
Band Edge Compliance	PASS	Verify the worst combination of each frequency band(GSM850 / WCDMA Band V/ LTE band5)
Peak-to-Average Power Ratio	PASS	Retest(GSM850 / WCDMA Band V/ LTE band 5)
Frequency Stability	PASS	Retest(GSM850 / WCDMA Band V/ LTE band 5)
Spurious Emissions at Antenna Terminals	PASS	Verify the worst combination of each frequency band(GSM850 / WCDMA Band V/ LTE band5)
Radiates Spurious Emission	PASS	Retest(GSM850 / WCDMA Band V/ LTE band 5)

The detailed product change description please refers to the Difference Declaration Letter.



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 electromagnetic emissions measurements.

A2LA (Certificate Number: 3857.01)

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

1.3. Testing Location

Company: TA Technology (Shanghai) Co., Ltd.
Address: No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City: Shanghai
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E-mail: xukai@ta-shanghai.com

2. General Description of Equipment under Test

2.3. Applicant and Manufacturer Information

Applicant	Quectel Wireless Solutions Co., Ltd
Applicant address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233
Manufacturer	Quectel Wireless Solutions Co., Ltd
Manufacturer address	Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai, China 200233

2.4. General Information

EUT Description			
Model	EC25-AUX, EC25-AUX MINIPCIE		
IMEI:	862708040005709		
Hardware Version	R2.0		
Software Version	EC25AUXGAR08A05M1G		
Power Supply	External supply power		
Antenna Type	The EUT don't have standard Antenna, The Antenna used for testing in this report is the after-market accessory (Dipole Antenna)		
Antenna Gain	1.89dBi		
Test Mode(s)	GSM 850; WCDMA Band V;LTE Band 5;		
Test Modulation	(GSM)GMSK,8PSK; (WCDMA) BPSK, QPSK; (LTE)QPSK 16QAM;		
GPRS Multislot Class	33		
EGPRS Multislot Class	33		
HSDPA UE Category	24		
HSUPA UE Category	6		
DC-HSDPA UE Category	24		
LTE Category	4		
Maximum E.R.P.	GSM 850:	32.42dBm	
	WCDMA Band V:	23.47dBm	
	LTE Band 5:	23.47dBm	
Rated Power Supply Voltage	3.8 V		
Extreme Voltage	Minimum: 3.3 V Maximum: 4.3V		
Extreme Temperature	Lowest: -40°C Highest: +85°C		
Operating Frequency Range(s)	Band	Tx (MHz)	Rx (MHz)
	GSM850	824 ~ 849	869 ~ 894
	WCDMA Band V	824 ~ 849	869 ~ 894



	LTE Band 5	824 ~ 849	869 ~ 894
Note: 1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.			

The series model number is: EC25-AUX MINIPCIE. The difference of these models are have different marketing requirement.



3. Applied Standards

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

Test standards:

FCC CFR 47 Part 22H (2020)

FCC CFR47 Part 2 (2020)

Reference standard:

ANSI C63.26 (2015)

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 (Z axis, horizontal polarization) and the worst case was recorded.

All mode and data rates and positions were investigated. Subsequently, only the worst case emissions are reported.

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

Test modes are chosen to be reported as the worst case configuration below:

Test items	Modes/Modulation	
	GSM 850	WCDMA Band V
RF Power Output and Effective Radiated power	GSM GPRS EGPRS	RMC HSDPA/HSUPA DC-HSDPA
Occupied Bandwidth	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
Band Edge Compliance	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
Peak-to-Average Power Ratio	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
Frequency Stability	GSM GPRS(1Tx slot) EGPRS(1Tx slot)	RMC
Spurious Emissions at Antenna Terminals	GSM	RMC
Radiates Spurious Emission	GSM	RMC

Test modes are chosen as the worst case configuration below for LTE Band 5.

Test items	Bandwidth (MHz)				Modulation		RB			Test Channel		
	1.4	3	5	10	QPSK	16QAM	1	50%	100%	L	M	H
RF power output and Effective Radiated power	O	O	O	O	O	O	O	O	O	O	O	O
Occupied Bandwidth	O	O	O	O	O	O	-	-	O	-	O	-
Band Edge Compliance	O	O	O	O	O	O	O	-	O	O	-	O



Peak-to-Average Power Ratio	O	O	O	O	O	O	-	-	O	O	O	O
Frequency Stability	O	O	O	O	O	O	O	O	O	O	O	O
Spurious Emissions at Antenna Terminals	O	O	O	O	O	-	O	-	-	O	O	O
Radiates Spurious Emission	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 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 is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

The testing follows FCC KDB 971168 v03r01 Section 5.8 and ANSI C63.26 (2015).

a) Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.

b) Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).

c) Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.

d) Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading. $LOSS = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$

e) Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation: $ERP \text{ (dBm)} = LVL \text{ (dBm)} + LOSS \text{ (dB)}$

f) The maximum ERP is the maximum value determined in the preceding step.

g) When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g. transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:

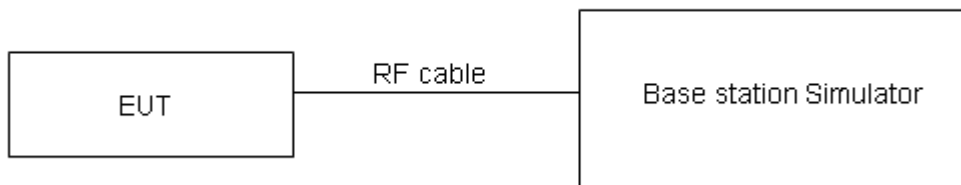
$$EIRP \text{ (dBm)} = \text{Output Power (dBm)} - \text{Losses (dB)} + \text{Antenna Gain (dBi)}$$

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

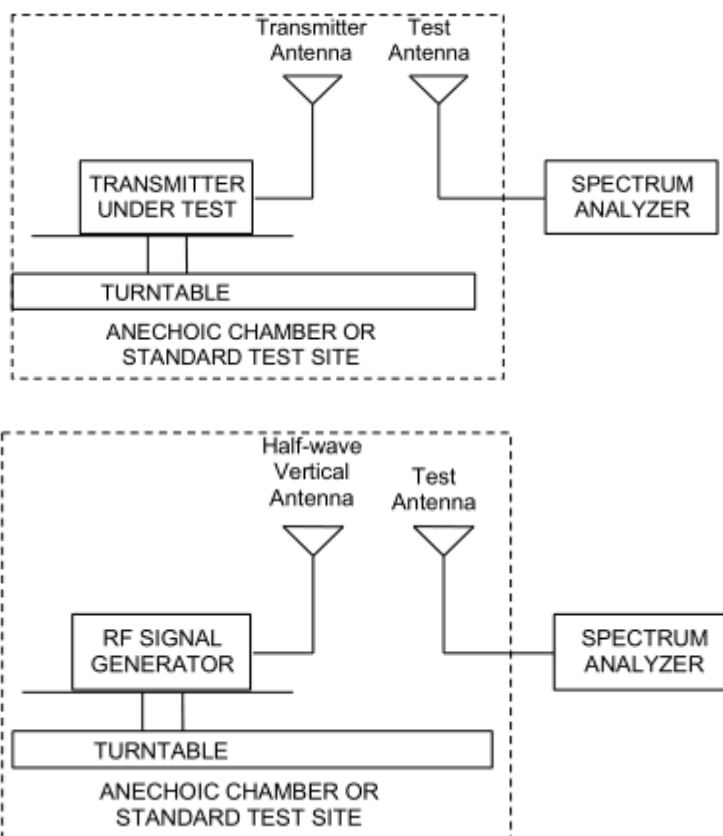
$$EIRP \text{ (dBm)} = ERP \text{ (dBm)} + 2.15 \text{ (dB.)}$$

The RB allocation refers to section 5.1, using the maximum output power configuration.

Test Setup



The loss between RF output port of the EUT and the input port of the tester has been taken into consideration.



Limits

No specific RF power output requirements in part 2.1046.

Rule Part 22.913(a)(5) specifies that "Mobile/portable stations are limited to 7 watts ERP".

Limit	$\leq 7 \text{ W}$ (38.45 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 $k = 2$, $U = 0.4 \text{ dB}$ for RF power output, $k = 2$, $U = 1.19 \text{ dB}$ for ERP .

Test Results

GSM 850		Conducted Power (dBm)			ERP (dBm)		
		Channel 128	Channel 190	Channel 251	Channel 128	Channel 190	Channel 251
		824.2 (MHz)	836.6 (MHz)	848.8 (MHz)	824.2 (MHz)	836.6 (MHz)	848.8 (MHz)
GSM	Results	32.38	32.54	32.65	32.12	32.28	32.39
GPRS/EGPRS (GMSK)	1TXslot	32.50	32.61	32.68	32.24	32.35	32.42
	2TXslots	32.07	32.15	32.28	31.81	31.89	32.02
	3TXslots	29.66	29.91	30.03	29.40	29.65	29.77
	4TXslots	28.62	28.78	29.01	28.36	28.52	28.75
EGPRS (8PSK)	1TXslot	25.91	26.19	26.21	25.65	25.93	25.95
	2TXslots	25.73	25.87	25.96	25.47	25.61	25.70
	3TXslots	23.47	23.98	24.02	23.21	23.72	23.76
	4TXslots	22.54	22.76	22.92	22.28	22.50	22.66

WCDMA Band V		Conducted Power (dBm)			ERP (dBm)		
		Channel 4132	Channel 4183	Channel 4233	Channel 4132	Channel 4183	Channel 4233
		826.4 (MHz)	836.6 (MHz)	846.6 (MHz)	826.4 (MHz)	836.6 (MHz)	846.6 (MHz)
RMC	12.2k	23.69	23.73	23.71	23.43	23.47	23.45
HSDPA	Sub - Test 1	23.15	23.15	23.15	22.89	22.89	22.89
	Sub - Test 2	23.14	23.17	23.12	22.88	22.91	22.86
	Sub - Test 3	22.61	22.67	22.64	22.35	22.41	22.38
	Sub - Test 4	22.62	22.68	22.62	22.36	22.42	22.36
HSUPA	Sub - Test 1	23.11	23.14	23.10	22.85	22.88	22.84
	Sub - Test 2	22.10	22.12	22.09	21.84	21.86	21.83
	Sub - Test 3	22.57	22.60	22.58	22.31	22.34	22.32
	Sub - Test 4	22.03	22.09	22.06	21.77	21.83	21.80
	Sub - Test 5	23.04	23.07	23.04	22.78	22.81	22.78
DC-HSDPA	Sub - Test 1	23.03	23.09	23.05	22.77	22.83	22.79
	Sub - Test 2	23.02	23.08	23.04	22.76	22.82	22.78
	Sub - Test 3	22.60	22.57	22.55	22.34	22.31	22.29
	Sub - Test 4	22.59	22.56	22.54	22.33	22.30	22.28



Band	Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Power (dBm)	ERP (dBm)	Verdict
LTE Band5	1.4	20407	1	#0	QPSK	23.57	23.31	PASS
LTE Band5	1.4	20407	1	#Mid	QPSK	23.73	23.47	PASS
LTE Band5	1.4	20407	1	#Max	QPSK	23.57	23.31	PASS
LTE Band5	1.4	20407	3	#0	QPSK	23.67	23.41	PASS
LTE Band5	1.4	20407	3	#Mid	QPSK	23.72	23.46	PASS
LTE Band5	1.4	20407	3	#Max	QPSK	23.68	23.42	PASS
LTE Band5	1.4	20407	6	#0	QPSK	22.51	22.25	PASS
LTE Band5	1.4	20407	1	#0	QAM16	22.63	22.37	PASS
LTE Band5	1.4	20407	1	#Mid	QAM16	22.69	22.43	PASS
LTE Band5	1.4	20407	1	#Max	QAM16	22.46	22.20	PASS
LTE Band5	1.4	20407	3	#0	QAM16	22.44	22.18	PASS
LTE Band5	1.4	20407	3	#Mid	QAM16	22.43	22.17	PASS
LTE Band5	1.4	20407	3	#Max	QAM16	22.44	22.18	PASS
LTE Band5	1.4	20407	6	#0	QAM16	21.36	21.10	PASS
LTE Band5	1.4	20525	1	#0	QPSK	23.52	23.26	PASS
LTE Band5	1.4	20525	1	#Mid	QPSK	23.67	23.41	PASS
LTE Band5	1.4	20525	1	#Max	QPSK	23.46	23.20	PASS
LTE Band5	1.4	20525	3	#0	QPSK	23.49	23.23	PASS
LTE Band5	1.4	20525	3	#Mid	QPSK	23.48	23.22	PASS
LTE Band5	1.4	20525	3	#Max	QPSK	23.63	23.37	PASS
LTE Band5	1.4	20525	6	#0	QPSK	22.53	22.27	PASS
LTE Band5	1.4	20525	1	#0	QAM16	22.77	22.51	PASS
LTE Band5	1.4	20525	1	#Mid	QAM16	22.93	22.67	PASS
LTE Band5	1.4	20525	1	#Max	QAM16	22.78	22.52	PASS
LTE Band5	1.4	20525	3	#0	QAM16	22.69	22.43	PASS
LTE Band5	1.4	20525	3	#Mid	QAM16	22.69	22.43	PASS
LTE Band5	1.4	20525	3	#Max	QAM16	22.78	22.52	PASS
LTE Band5	1.4	20525	6	#0	QAM16	21.46	21.20	PASS
LTE Band5	1.4	20643	1	#0	QPSK	23.48	23.22	PASS
LTE Band5	1.4	20643	1	#Mid	QPSK	23.63	23.37	PASS
LTE Band5	1.4	20643	1	#Max	QPSK	23.38	23.12	PASS
LTE Band5	1.4	20643	3	#0	QPSK	23.49	23.23	PASS
LTE Band5	1.4	20643	3	#Mid	QPSK	23.49	23.23	PASS
LTE Band5	1.4	20643	3	#Max	QPSK	23.40	23.14	PASS
LTE Band5	1.4	20643	6	#0	QPSK	22.45	22.19	PASS
LTE Band5	1.4	20643	1	#0	QAM16	22.41	22.15	PASS
LTE Band5	1.4	20643	1	#Mid	QAM16	22.77	22.51	PASS
LTE Band5	1.4	20643	1	#Max	QAM16	22.56	22.30	PASS
LTE Band5	1.4	20643	3	#0	QAM16	22.79	22.53	PASS
LTE Band5	1.4	20643	3	#Mid	QAM16	22.79	22.53	PASS



LTE Band5	1.4	20643	3	#Max	QAM16	22.73	22.47	PASS
LTE Band5	1.4	20643	6	#0	QAM16	21.74	21.48	PASS
LTE Band5	3	20415	1	#0	QPSK	23.46	23.20	PASS
LTE Band5	3	20415	1	#Mid	QPSK	23.40	23.14	PASS
LTE Band5	3	20415	1	#Max	QPSK	23.38	23.12	PASS
LTE Band5	3	20415	8	#0	QPSK	22.47	22.21	PASS
LTE Band5	3	20415	8	#Mid	QPSK	22.47	22.21	PASS
LTE Band5	3	20415	8	#Max	QPSK	22.34	22.08	PASS
LTE Band5	3	20415	15	#0	QPSK	22.39	22.13	PASS
LTE Band5	3	20415	1	#0	QAM16	22.24	21.98	PASS
LTE Band5	3	20415	1	#Mid	QAM16	22.19	21.93	PASS
LTE Band5	3	20415	1	#Max	QAM16	22.22	21.96	PASS
LTE Band5	3	20415	8	#0	QAM16	21.03	20.77	PASS
LTE Band5	3	20415	8	#Mid	QAM16	21.03	20.77	PASS
LTE Band5	3	20415	8	#Max	QAM16	20.87	20.61	PASS
LTE Band5	3	20415	15	#0	QAM16	21.47	21.21	PASS
LTE Band5	3	20525	1	#0	QPSK	23.70	23.44	PASS
LTE Band5	3	20525	1	#Mid	QPSK	23.64	23.38	PASS
LTE Band5	3	20525	1	#Max	QPSK	23.58	23.32	PASS
LTE Band5	3	20525	8	#0	QPSK	22.47	22.21	PASS
LTE Band5	3	20525	8	#Mid	QPSK	22.47	22.21	PASS
LTE Band5	3	20525	8	#Max	QPSK	22.53	22.27	PASS
LTE Band5	3	20525	15	#0	QPSK	22.44	22.18	PASS
LTE Band5	3	20525	1	#0	QAM16	22.99	22.73	PASS
LTE Band5	3	20525	1	#Mid	QAM16	22.93	22.67	PASS
LTE Band5	3	20525	1	#Max	QAM16	23.35	23.09	PASS
LTE Band5	3	20525	8	#0	QAM16	21.56	21.30	PASS
LTE Band5	3	20525	8	#Mid	QAM16	21.57	21.31	PASS
LTE Band5	3	20525	8	#Max	QAM16	21.61	21.35	PASS
LTE Band5	3	20525	15	#0	QAM16	21.52	21.26	PASS
LTE Band5	3	20635	1	#0	QPSK	23.45	23.19	PASS
LTE Band5	3	20635	1	#Mid	QPSK	23.39	23.13	PASS
LTE Band5	3	20635	1	#Max	QPSK	23.36	23.10	PASS
LTE Band5	3	20635	8	#0	QPSK	22.19	21.93	PASS
LTE Band5	3	20635	8	#Mid	QPSK	22.20	21.94	PASS
LTE Band5	3	20635	8	#Max	QPSK	22.09	21.83	PASS
LTE Band5	3	20635	15	#0	QPSK	22.03	21.77	PASS
LTE Band5	3	20635	1	#0	QAM16	21.99	21.73	PASS
LTE Band5	3	20635	1	#Mid	QAM16	22.12	21.86	PASS
LTE Band5	3	20635	1	#Max	QAM16	21.95	21.69	PASS
LTE Band5	3	20635	8	#0	QAM16	20.89	20.63	PASS
LTE Band5	3	20635	8	#Mid	QAM16	20.81	20.55	PASS



LTE Band5	3	20635	8	#Max	QAM16	20.95	20.69	PASS
LTE Band5	3	20635	15	#0	QAM16	20.82	20.56	PASS
LTE Band5	5	20425	1	#0	QPSK	23.47	23.21	PASS
LTE Band5	5	20425	1	#Mid	QPSK	23.38	23.12	PASS
LTE Band5	5	20425	1	#Max	QPSK	23.36	23.10	PASS
LTE Band5	5	20425	12	#0	QPSK	22.63	22.37	PASS
LTE Band5	5	20425	12	#Mid	QPSK	22.63	22.37	PASS
LTE Band5	5	20425	12	#Max	QPSK	22.53	22.27	PASS
LTE Band5	5	20425	25	#0	QPSK	22.62	22.36	PASS
LTE Band5	5	20425	1	#0	QAM16	22.48	22.22	PASS
LTE Band5	5	20425	1	#Mid	QAM16	22.12	21.86	PASS
LTE Band5	5	20425	1	#Max	QAM16	22.07	21.81	PASS
LTE Band5	5	20425	12	#0	QAM16	21.50	21.24	PASS
LTE Band5	5	20425	12	#Mid	QAM16	21.50	21.24	PASS
LTE Band5	5	20425	12	#Max	QAM16	21.31	21.05	PASS
LTE Band5	5	20425	25	#0	QAM16	21.66	21.40	PASS
LTE Band5	5	20525	1	#0	QPSK	23.41	23.15	PASS
LTE Band5	5	20525	1	#Mid	QPSK	23.36	23.10	PASS
LTE Band5	5	20525	1	#Max	QPSK	23.04	22.78	PASS
LTE Band5	5	20525	12	#0	QPSK	22.57	22.31	PASS
LTE Band5	5	20525	12	#Mid	QPSK	22.61	22.35	PASS
LTE Band5	5	20525	12	#Max	QPSK	22.29	22.03	PASS
LTE Band5	5	20525	25	#0	QPSK	22.52	22.26	PASS
LTE Band5	5	20525	1	#0	QAM16	22.59	22.33	PASS
LTE Band5	5	20525	1	#Mid	QAM16	22.65	22.39	PASS
LTE Band5	5	20525	1	#Max	QAM16	22.58	22.32	PASS
LTE Band5	5	20525	12	#0	QAM16	21.14	20.88	PASS
LTE Band5	5	20525	12	#Mid	QAM16	21.18	20.92	PASS
LTE Band5	5	20525	12	#Max	QAM16	20.98	20.72	PASS
LTE Band5	5	20525	25	#0	QAM16	21.35	21.09	PASS
LTE Band5	5	20625	1	#0	QPSK	23.03	22.77	PASS
LTE Band5	5	20625	1	#Mid	QPSK	23.28	23.02	PASS
LTE Band5	5	20625	1	#Max	QPSK	23.01	22.75	PASS
LTE Band5	5	20625	12	#0	QPSK	22.11	21.85	PASS
LTE Band5	5	20625	12	#Mid	QPSK	22.11	21.85	PASS
LTE Band5	5	20625	12	#Max	QPSK	22.03	21.77	PASS
LTE Band5	5	20625	25	#0	QPSK	21.99	21.73	PASS
LTE Band5	5	20625	1	#0	QAM16	22.48	22.22	PASS
LTE Band5	5	20625	1	#Mid	QAM16	22.30	22.04	PASS
LTE Band5	5	20625	1	#Max	QAM16	21.94	21.68	PASS
LTE Band5	5	20625	12	#0	QAM16	20.90	20.64	PASS
LTE Band5	5	20625	12	#Mid	QAM16	20.91	20.65	PASS



LTE Band5	5	20625	12	#Max	QAM16	21.10	20.84	PASS
LTE Band5	5	20625	25	#0	QAM16	20.84	20.58	PASS
LTE Band5	10	20450	1	#0	QPSK	23.71	23.45	PASS
LTE Band5	10	20450	1	#Mid	QPSK	23.36	23.10	PASS
LTE Band5	10	20450	1	#Max	QPSK	23.40	23.14	PASS
LTE Band5	10	20450	25	#0	QPSK	22.59	22.33	PASS
LTE Band5	10	20450	25	#Mid	QPSK	22.56	22.30	PASS
LTE Band5	10	20450	25	#Max	QPSK	22.48	22.22	PASS
LTE Band5	10	20450	50	#0	QPSK	22.58	22.32	PASS
LTE Band5	10	20450	1	#0	QAM16	22.67	22.41	PASS
LTE Band5	10	20450	1	#Mid	QAM16	22.21	21.95	PASS
LTE Band5	10	20450	1	#Max	QAM16	22.95	22.69	PASS
LTE Band5	10	20450	25	#0	QAM16	21.67	21.41	PASS
LTE Band5	10	20450	25	#Mid	QAM16	21.65	21.39	PASS
LTE Band5	10	20450	25	#Max	QAM16	21.28	21.02	PASS
LTE Band5	10	20450	50	#0	QAM16	21.59	21.33	PASS
LTE Band5	10	20525	1	#0	QPSK	23.35	23.09	PASS
LTE Band5	10	20525	1	#Mid	QPSK	23.70	23.44	PASS
LTE Band5	10	20525	1	#Max	QPSK	23.01	22.75	PASS
LTE Band5	10	20525	25	#0	QPSK	22.52	22.26	PASS
LTE Band5	10	20525	25	#Mid	QPSK	22.56	22.30	PASS
LTE Band5	10	20525	25	#Max	QPSK	22.37	22.11	PASS
LTE Band5	10	20525	50	#0	QPSK	22.59	22.33	PASS
LTE Band5	10	20525	1	#0	QAM16	22.93	22.67	PASS
LTE Band5	10	20525	1	#Mid	QAM16	23.56	23.30	PASS
LTE Band5	10	20525	1	#Max	QAM16	22.47	22.21	PASS
LTE Band5	10	20525	25	#0	QAM16	21.57	21.31	PASS
LTE Band5	10	20525	25	#Mid	QAM16	21.59	21.33	PASS
LTE Band5	10	20525	25	#Max	QAM16	21.11	20.85	PASS
LTE Band5	10	20525	50	#0	QAM16	21.37	21.11	PASS
LTE Band5	10	20600	1	#0	QPSK	23.26	23.00	PASS
LTE Band5	10	20600	1	#Mid	QPSK	23.40	23.14	PASS
LTE Band5	10	20600	1	#Max	QPSK	23.19	22.93	PASS
LTE Band5	10	20600	25	#0	QPSK	22.26	22.00	PASS
LTE Band5	10	20600	25	#Mid	QPSK	22.25	21.99	PASS
LTE Band5	10	20600	25	#Max	QPSK	22.05	21.79	PASS
LTE Band5	10	20600	50	#0	QPSK	22.13	21.87	PASS
LTE Band5	10	20600	1	#0	QAM16	21.89	21.63	PASS
LTE Band5	10	20600	1	#Mid	QAM16	21.74	21.48	PASS
LTE Band5	10	20600	1	#Max	QAM16	22.12	21.86	PASS
LTE Band5	10	20600	25	#0	QAM16	21.05	20.79	PASS
LTE Band5	10	20600	25	#Mid	QAM16	21.04	20.78	PASS



LTE Band5	10	20600	25	#Max	QAM16	21.21	20.95	PASS
LTE Band5	10	20600	50	#0	QAM16	20.78	20.52	PASS

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 3kHz, VBW is set to 10kHz for GSM 850,

RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band V,

RBW is set to 30 kHz, VBW is set to 91kHz for LTE Band 5 (1.4MHz),

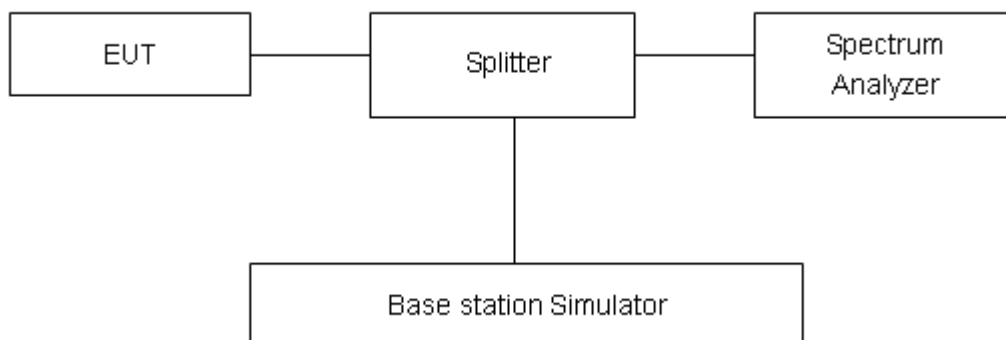
RBW is set to 62 kHz, VBW is set to 180kHz for LTE Band 5 (3MHz),

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

RBW is set to 200 kHz, VBW is set to 620kHz for LTE Band 5 (10MHz),

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

Mode	Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
GSM 850 (GSM)	128	824.2	0.2417	0.2976
	190	836.6	0.2398	0.2968
	251	848.8	0.2437	0.295
GPRS 850 (GMSK)	128	824.2	0.2411	0.314
	190	836.6	0.2463	0.3105
	251	848.8	0.2452	0.3067
EGPRS 850 (8-PSK)	128	824.2	0.2469	0.3098
	190	836.6	0.2408	0.298
	251	848.8	0.2446	0.3079
WCDMA Band V (RMC)	4132	826.4	4.1255	4.691
	4183	836.6	4.1177	4.692
	4233	846.6	4.1181	4.672

LTE Band 5						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	1.4	20407	824.7	1.1023	1.272
			20525	836.5	1.0959	1.297
			20643	848.3	1.0948	1.292
		3	20415	825.5	2.6953	2.957
			20525	836.5	2.7015	2.973
			20635	847.5	2.6927	2.992
		5	20425	826.5	4.5189	4.987
			20525	836.5	4.5030	4.956
			20625	846.5	4.5131	4.981
		10	20450	829	8.9738	9.775
			20525	836.5	8.9754	9.838
			20600	844	8.9635	9.756
	16QAM	1.4	20407	824.7	1.097	1.32
			20525	836.5	1.1012	1.292
			20643	848.3	1.0905	1.267



		3	20415	825.5	2.6872	2.921
			20525	836.5	2.7067	2.993
			20635	847.5	2.7018	3.011
		5	20425	826.5	4.5025	4.923
			20525	836.5	4.5175	4.981
			20625	846.5	4.5141	4.972
		10	20450	829	8.9595	9.815
			20525	836.5	8.9681	9.797
			20600	844	8.9603	9.758



GSM 850 CH-Low



GSM 850 GPRS CH-Low



GSM 850 CH-Middle



GSM 850 GPRS CH-Middle



GSM 850 CH-High



GSM 850 GPRS CH-High



GSM 850 EGPRS CH-Low



WCDMA Band V CH-Low



GSM 850 EGPRS CH-Middle



WCDMA Band V CH-Middle



GSM 850 EGPRS CH-High



WCDMA Band V CH-High

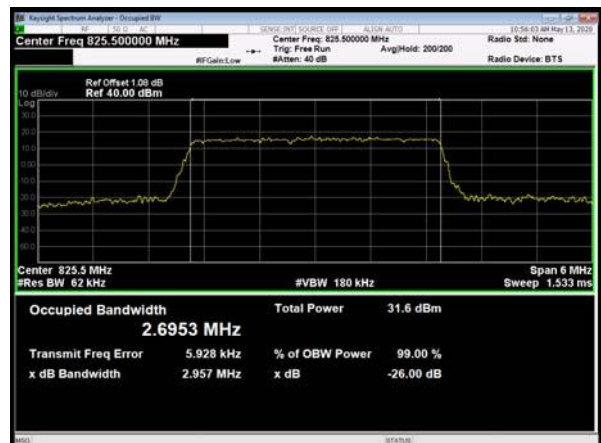




LTE Band 5 QPSK 1.4MHz CH-Low



LTE Band 5 QPSK 3MHz CH-Low



LTE Band 5 QPSK 1.4MHz CH-Middle



LTE Band 5 QPSK 3MHz CH-Middle



LTE Band 5 QPSK 1.4MHz CH-High

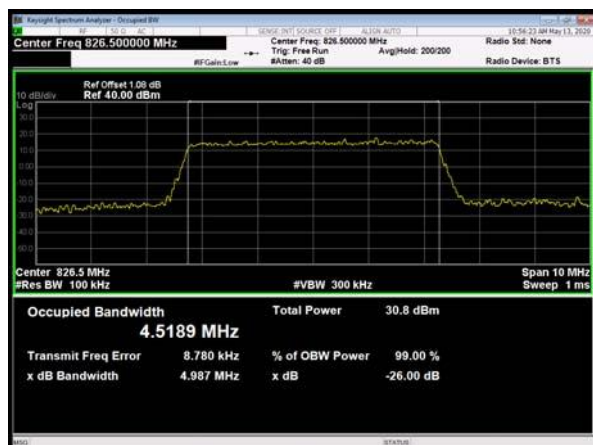


LTE Band 5 QPSK 3MHz CH-High

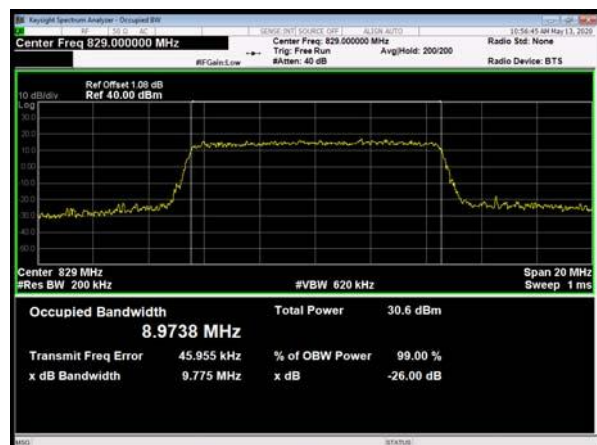




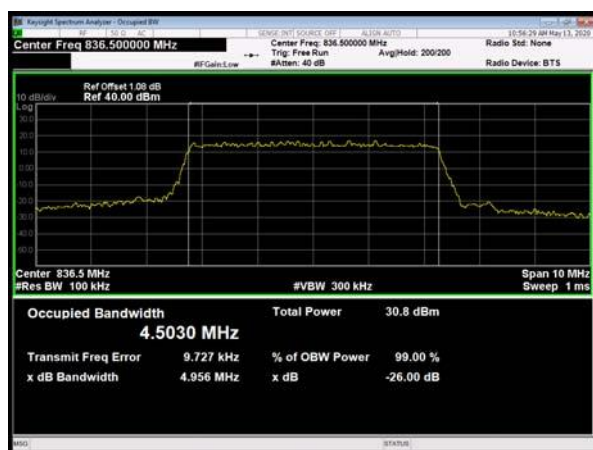
LTE Band 5 QPSK 5MHz CH-Low



LTE Band 5 QPSK 10MHz CH-Low



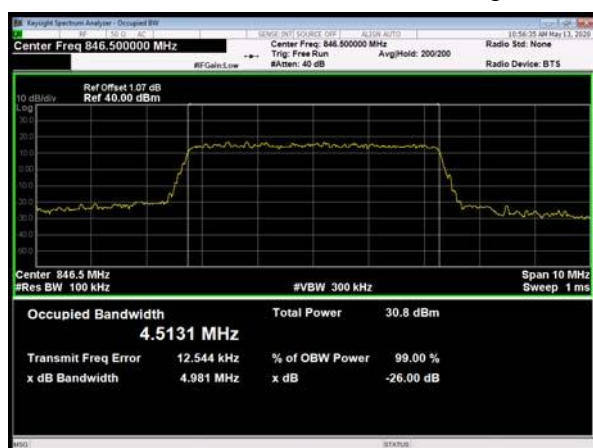
LTE Band 5 QPSK 5MHz CH-Middle



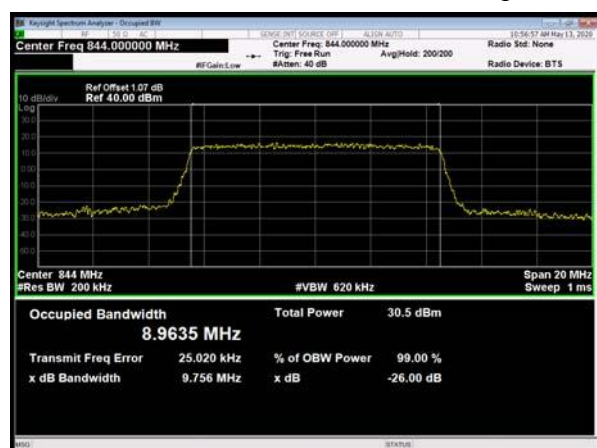
LTE Band 5 QPSK 10MHz CH-Middle



LTE Band 5 QPSK 5MHz CH-High

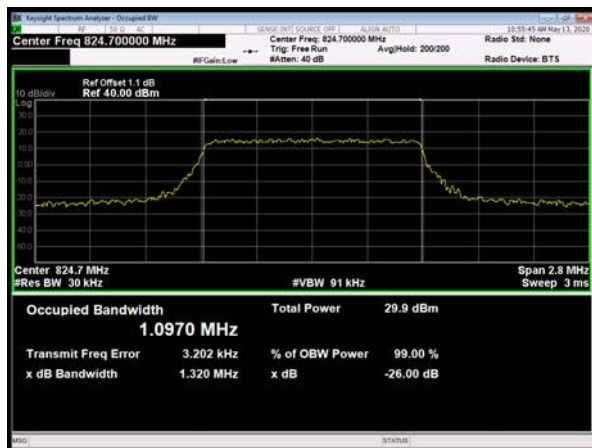


LTE Band 5 QPSK 10MHz CH-High

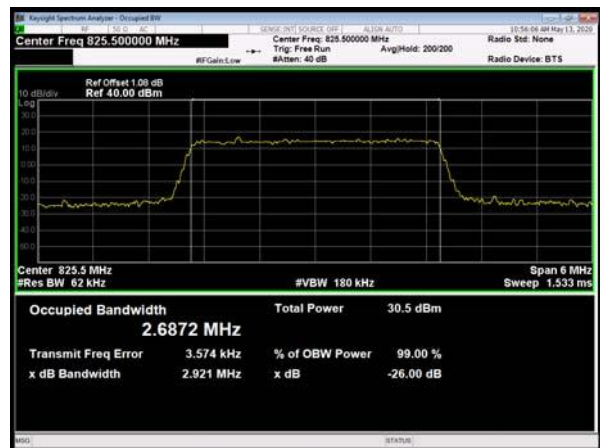




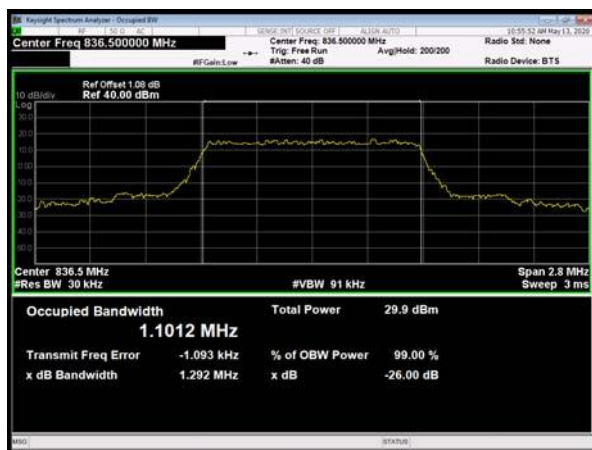
LTE Band 5 16QAM 1.4MHz CH-Low



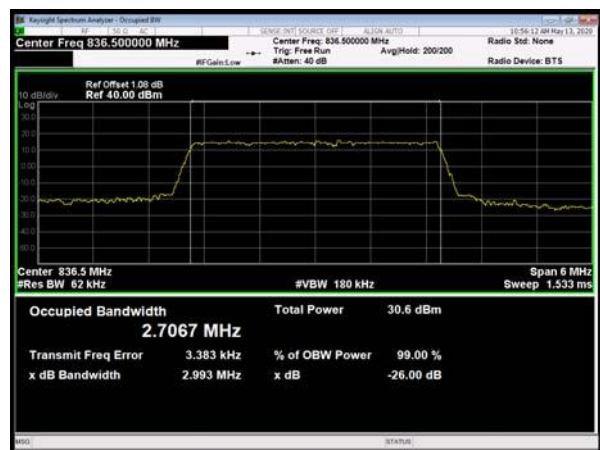
LTE Band 5 16QAM 3MHz CH-Low



LTE Band 5 16QAM 1.4MHz CH-Middle



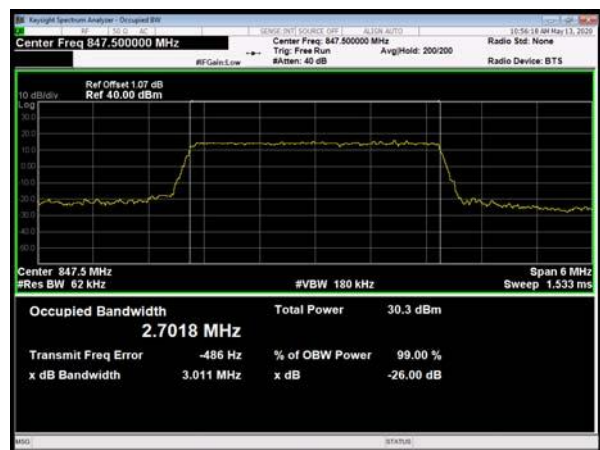
LTE Band 5 16QAM 3MHz CH-Middle



LTE Band 5 16QAM 1.4MHz CH-High

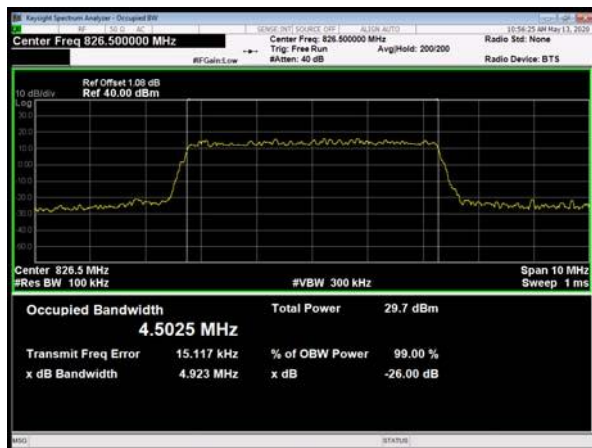


LTE Band 5 16QAM 3MHz CH-High

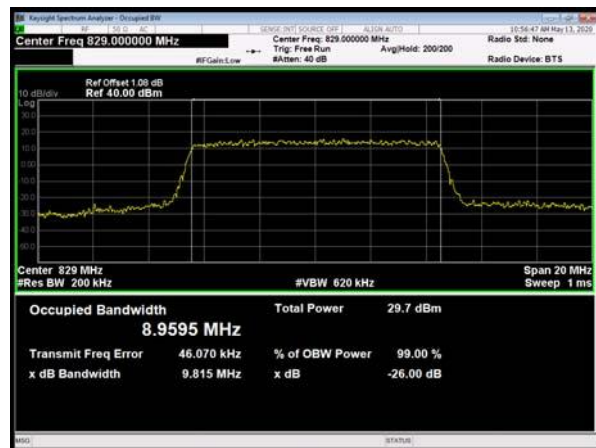




LTE Band 5 16QAM 5MHz CH-Low



LTE Band 5 16QAM 10MHz CH-Low



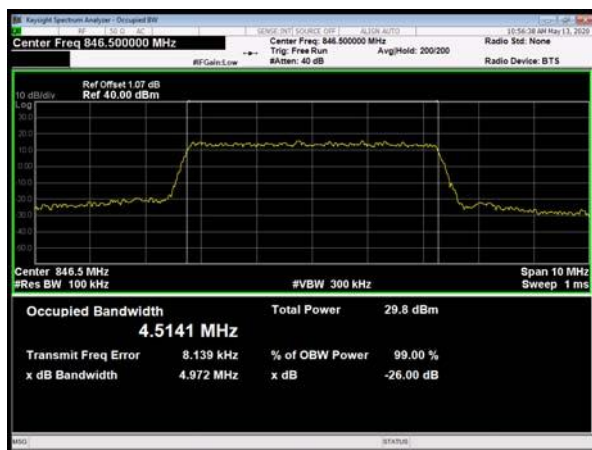
LTE Band 5 16QAM 5MHz CH-Middle



LTE Band 5 16QAM 10MHz CH-Middle



LTE Band 5 16QAM 5MHz CH-High



LTE Band 5 16QAM 10MHz 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 average detector is used.

RBW is set to 3kHz, VBW is set to 10kHz for GSM 850,

RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band V,

RBW is set to 15kHz, VBW is set to 43kHz for LTE Band 5 (1.4MHz),

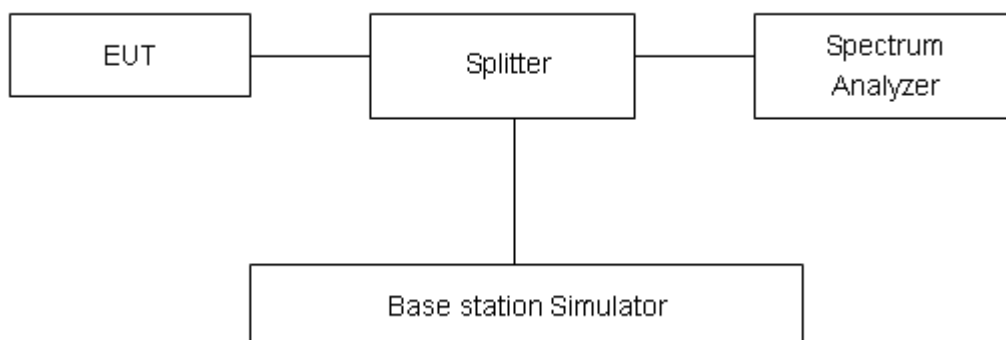
RBW is set to 30kHz, VBW is set to 91kHz for LTE Band 5 (3MHz),

RBW is set to 51kHz, VBW is set to 150kHz for LTE Band 5 (5MHz),

RBW is set to 100kHz, VBW is set to 300kHz for LTE Band 5 (10MHz),

Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

Rule Part 22.917(a) specifies that “The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.”

Limit	-13 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 $k = 1.96$, $U=0.684$ dB.



Test Result:

GSM 850 CH-Low



GSM 850 CH-High



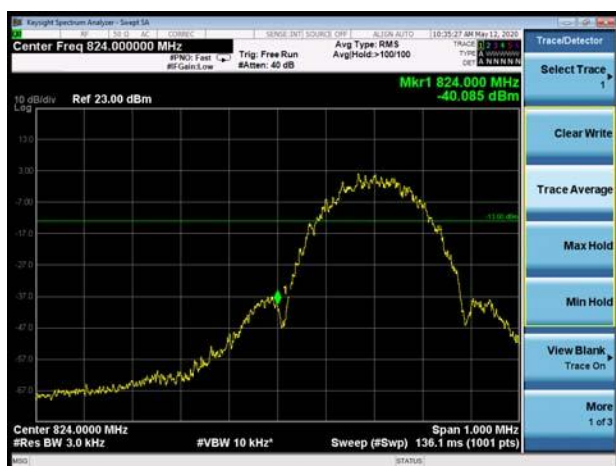
GSM 850 GPRS CH-Low



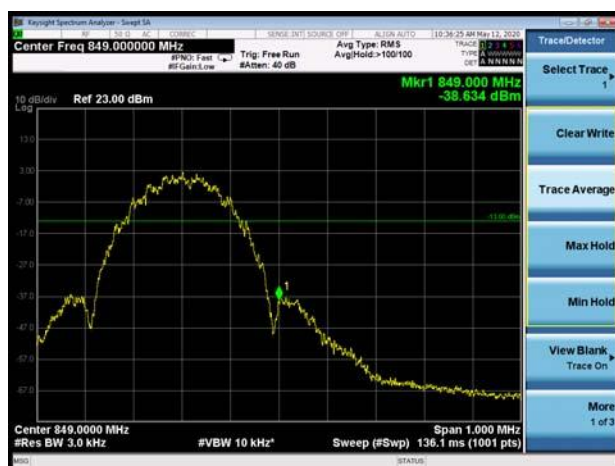
GSM 850 GPRS CH-High



GSM 850 EGPRS CH-Low



GSM 850 EGPRS CH-High





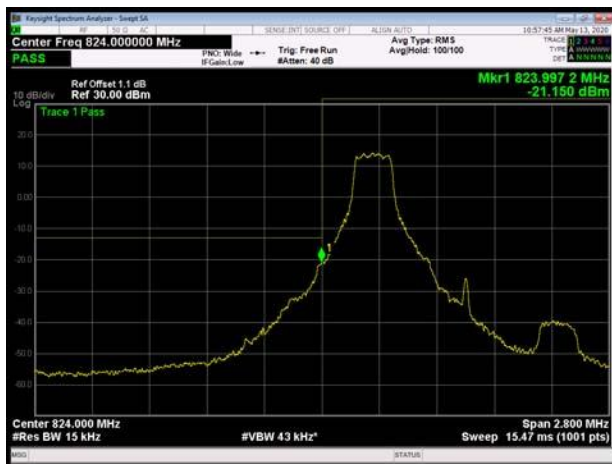
WCDMA Band V CH-Low



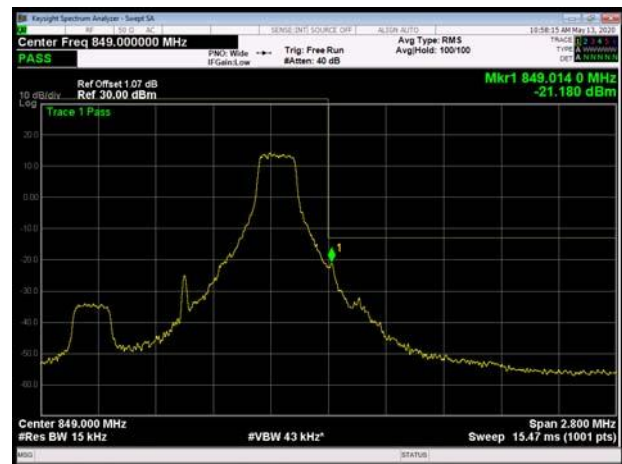
WCDMA Band V CH-High



LTE Band 5 QPSK 1.4MHz CH-Low 1RB



LTE Band 5 QPSK 1.4MHz CH-High 1RB



LTE Band 5 QPSK 1.4MHz CH-Low 100%RB

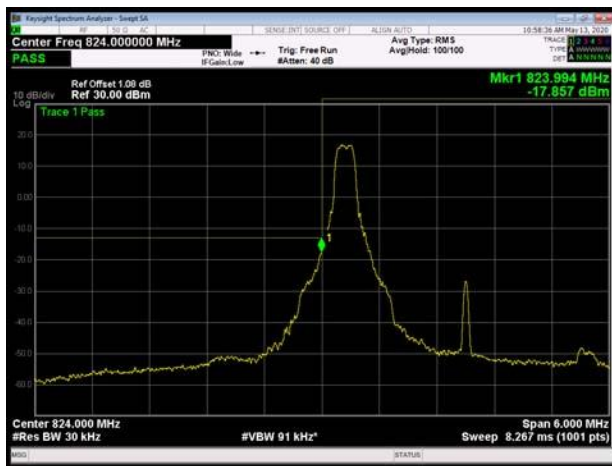


LTE Band 5 QPSK 1.4MHz CH-High 100%RB

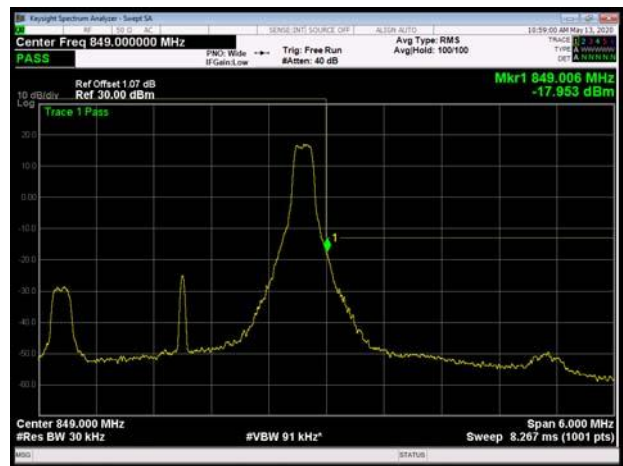




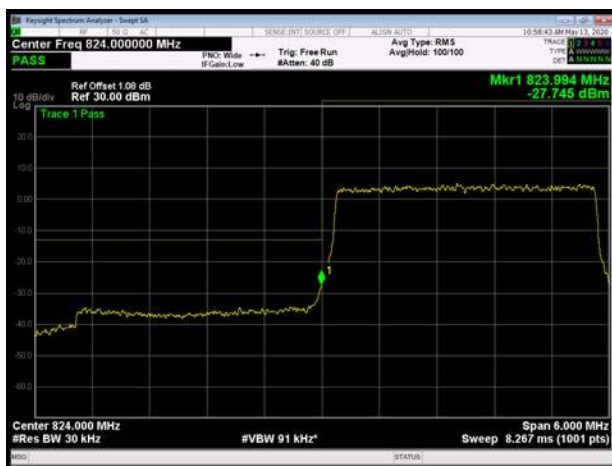
LTE Band 5 QPSK 3MHz CH-Low 1RB



LTE Band 5 QPSK 3MHz CH-High 1RB



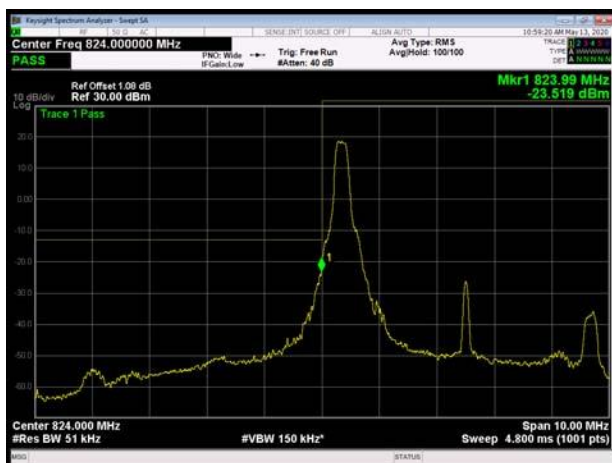
LTE Band 5 QPSK 3MHz CH-Low 100%RB



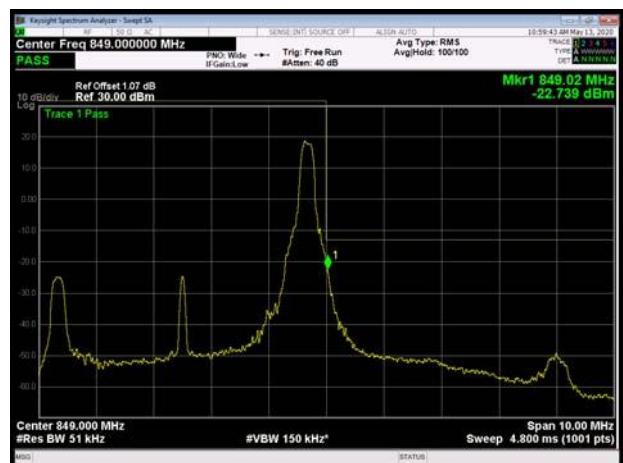
LTE Band 5 QPSK 3MHz CH-High 100%RB



LTE Band 5 QPSK 5MHz CH-Low 1RB



LTE Band 5 QPSK 5MHz CH-High 1RB





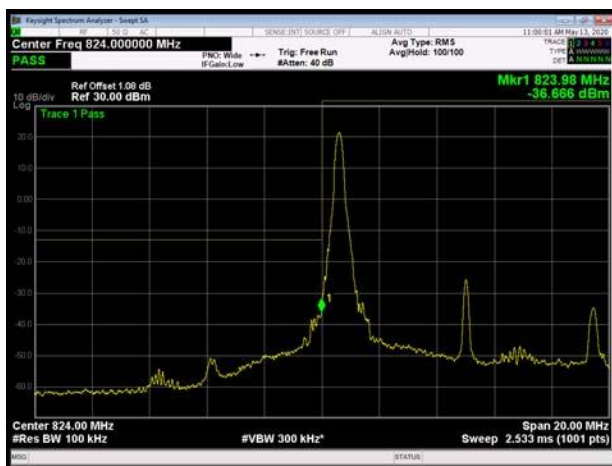
LTE Band 5 QPSK 5MHz CH-Low 100%RB



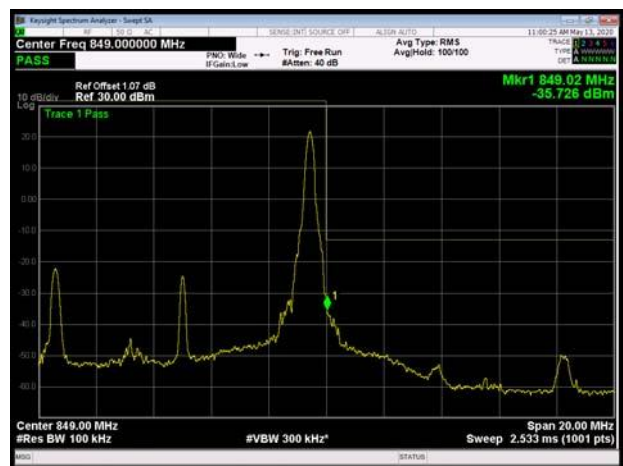
LTE Band 5 QPSK 5MHz CH-High 100%RB



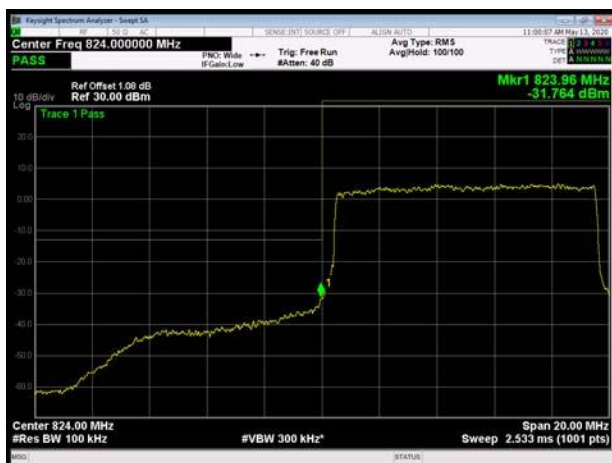
LTE Band 5 QPSK 10MHz CH-Low 1RB



LTE Band 5 QPSK 10MHz CH-High 1RB



LTE Band 5 QPSK 10MHz CH-Low 100%RB



LTE Band 5 QPSK 10MHz CH-High 100%RB

