



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-R2
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 24E (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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Summary of measurement results

No.	Test Case	Clause in FCC rules	Verdict
1	RF Power Output and Effective Isotropic Radiated Power	2.1046 24.232(c)	PASS
2	Occupied Bandwidth	2.1049	PASS
3	Band Edge Compliance	2.1051 / 24.238(a)	PASS
4	Peak-to-Average Power Ratio	24.232/KDB 971168 D01(5.7)	PASS
5	Frequency Stability	2.1055 / 24.235	PASS
6	Spurious Emissions at Antenna Terminals	2.1051 / 24.238(a)	PASS
7	Radiates Spurious Emission	2.1053 / 24.238(a)	PASS
Date of Testing: (Original) April 12, 2018~ April 18, 2018 and May 12, 2020~ May 13, 2020 (Variant) September 28, 2021~ October 4, 2021			
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.			

EC25-AUX, EC25-AUX MINIPCIE (Report No.: R2108A0762-R2) is a variant model of EC25-AUX, EC25-AUX MINIPCIE (Report No.: R2005A0269-R2). 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(GSM1900/ WCDMA Band II/ LTE Band 2)
Occupied Bandwidth	PASS	Verify the worst combination of each frequency band(GSM1900/ WCDMA Band II/ LTE Band 2)
Band Edge Compliance	PASS	Verify the worst combination of each frequency band(GSM1900/ WCDMA Band II/ LTE Band 2)
Peak-to-Average Power Ratio	PASS	Retest(GSM1900/ WCDMA Band II/ LTE Band 2)
Frequency Stability	PASS	Retest(GSM1900/ WCDMA Band II/ LTE Band 2)
Spurious Emissions at Antenna Terminals	PASS	Verify the worst combination of each frequency band(GSM1900/ WCDMA Band II/ LTE Band 2)
Radiates Spurious Emission	PASS	Retest(GSM1900/ WCDMA Band II/ LTE Band 2)

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
Post code: 201201
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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	1.38dBi		
Test Mode(s)	GSM1900; WCDMA Band II; LTE Band 2;		
Test Modulation	(GSM)GMSK,8PSK; (WCDMA) BPSK, QPSK, 16QAM (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.I.R.P	GSM 1900:	31.31dBm	
	WCDMA Band II:	25.05dBm	
	LTE Band 2:	24.96dBm	
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)
	GSM1900	1850 ~ 1910	1930 ~ 1990
	WCDMA Band II	1850 ~ 1910	1930 ~ 1990



	LTE Band 2	1850 ~ 1910	1930 ~ 1990
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 24E (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 and RB size and modulations 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 1900	WCDMA Band II
RF Power Output and Effective Isotropic 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 to be reported as the worst case configuration below for LTE Band 2:

Test items	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	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Occupied Bandwidth	O	O	O	O	O	O	O	O	-	-	O	O	O	O
Band Edge Compliance	O	O	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	O	O
Frequency Stability	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Conducted Spurious Emissions	O	O	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 Isotropic Radiated Power

Ambient condition

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

Methods of Measurement

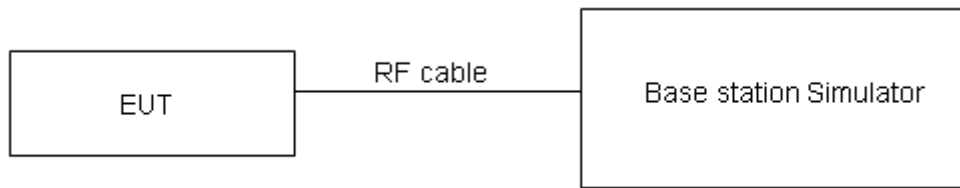
During the process of the testing, The EUT is controlled by the Base Station Simulator to ensure max power transmission and proper modulation.

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

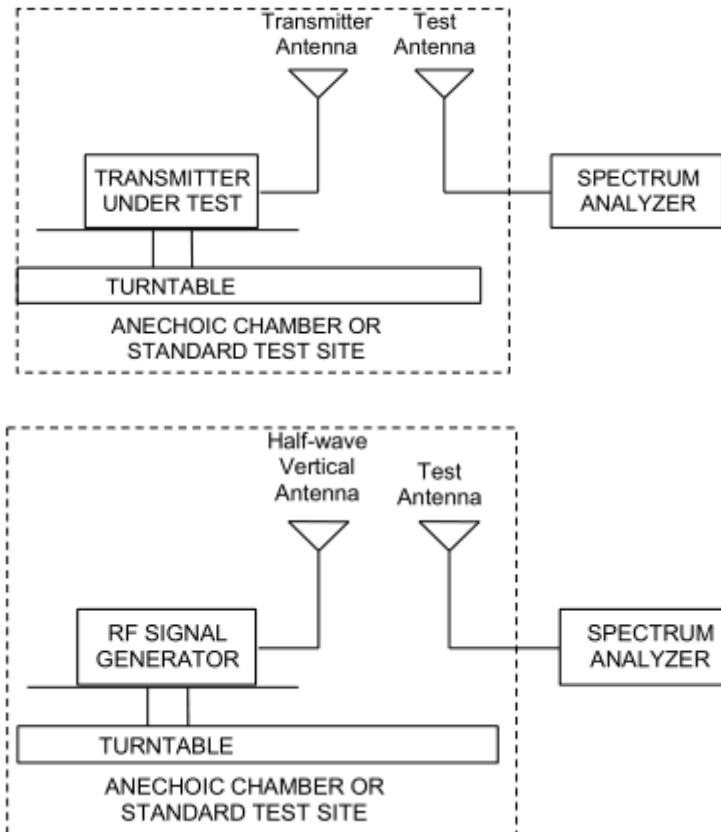
- Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
- Key the transmitter, 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).
- 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.
- 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. $LOSS = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$
- Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation: $ERP \text{ (dBm)} = \text{LVL (dBm)} + \text{LOSS (dB)}$
- The maximum ERP is the maximum value determined in the preceding step.
- 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 24.232(c) Mobile and portable stations are limited to 2 watts EIRP.

Rule Part 24.232(e) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

Limit	$\leq 2 \text{ W}$ (33 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 EIRP.

Test Results

GSM 1900		Conducted Power (dBm)			EIRP (dBm)		
		Channel 512	Channel 661	Channel 810	Channel 512	Channel 661	Channel 810
		1850.2 (MHz)	1880 (MHz)	1909.8 (MHz)	1850.2 (MHz)	1880 (MHz)	1909.8 (MHz)
GSM	Results	29.90	29.93	29.81	31.28	31.31	31.19
GPRS/EGPRS (GMSK)	1TXslot	29.79	29.78	29.64	31.17	31.16	31.02
	2TXslots	28.91	28.72	28.61	30.29	30.10	29.99
	3TXslots	26.75	26.92	26.91	28.13	28.30	28.29
	4TXslots	25.62	25.84	25.83	27.00	27.22	27.21
EGPRS (8PSK)	1TXslot	25.92	26.15	25.76	27.30	27.53	27.14
	2TXslots	25.36	25.78	25.74	26.74	27.16	27.12
	3TXslots	23.73	23.84	23.96	25.11	25.22	25.34
	4TXslots	22.71	22.49	22.52	24.09	23.87	23.90

WCDMA Band II		Conducted Power (dBm)			EIRP (dBm)		
		Channel 9262	Channel 9400	Channel 9538	Channel 9262	Channel 9400	Channel 9538
		1852.4 (MHz)	1880 (MHz)	1907.6 (MHz)	1852.4 (MHz)	1880 (MHz)	1907.6 (MHz)
RMC	12.2k	23.59	23.67	23.66	24.97	25.05	25.04
HSDPA	Sub - Test 1	23.05	23.09	23.10	24.43	24.47	24.48
	Sub - Test 2	23.04	23.11	23.07	24.42	24.49	24.45
	Sub - Test 3	22.51	22.61	22.59	23.89	23.99	23.97
	Sub - Test 4	22.52	22.62	22.57	23.90	24.00	23.95
HSUPA	Sub - Test 1	23.01	23.08	23.05	24.39	24.46	24.43
	Sub - Test 2	22.00	22.06	22.04	23.38	23.44	23.42
	Sub - Test 3	22.47	22.54	22.53	23.85	23.92	23.91
	Sub - Test 4	21.93	22.03	22.01	23.31	23.41	23.39
	Sub - Test 5	22.94	23.01	22.99	24.32	24.39	24.37
DC-HSDPA	Sub - Test 1	22.93	23.03	23.00	24.31	24.41	24.38
	Sub - Test 2	22.92	23.02	22.99	24.30	24.40	24.37
	Sub - Test 3	22.50	22.51	22.50	23.88	23.89	23.88
	Sub - Test 4	22.49	22.50	22.49	23.87	23.88	23.87



Band	Bandwidth (MHz)	UL Channel	RB Size	RB Position	Modulation	Power (dBm)	EIRP (dBm)	Verdict
LTE Band2	1.4	18607	1	#0	QPSK	23.58	24.96	PASS
LTE Band2	1.4	18607	1	#Mid	QPSK	23.56	24.94	PASS
LTE Band2	1.4	18607	1	#Max	QPSK	23.37	24.75	PASS
LTE Band2	1.4	18607	3	#0	QPSK	23.40	24.78	PASS
LTE Band2	1.4	18607	3	#Mid	QPSK	23.39	24.77	PASS
LTE Band2	1.4	18607	3	#Max	QPSK	23.28	24.66	PASS
LTE Band2	1.4	18607	6	#0	QPSK	22.34	23.72	PASS
LTE Band2	1.4	18607	1	#0	QAM16	22.70	24.08	PASS
LTE Band2	1.4	18607	1	#Mid	QAM16	22.63	24.01	PASS
LTE Band2	1.4	18607	1	#Max	QAM16	22.17	23.55	PASS
LTE Band2	1.4	18607	3	#0	QAM16	22.40	23.78	PASS
LTE Band2	1.4	18607	3	#Mid	QAM16	22.40	23.78	PASS
LTE Band2	1.4	18607	3	#Max	QAM16	22.41	23.79	PASS
LTE Band2	1.4	18607	6	#0	QAM16	21.35	22.73	PASS
LTE Band2	1.4	18900	1	#0	QPSK	23.02	24.40	PASS
LTE Band2	1.4	18900	1	#Mid	QPSK	23.17	24.55	PASS
LTE Band2	1.4	18900	1	#Max	QPSK	22.96	24.34	PASS
LTE Band2	1.4	18900	3	#0	QPSK	23.30	24.68	PASS
LTE Band2	1.4	18900	3	#Mid	QPSK	23.31	24.69	PASS
LTE Band2	1.4	18900	3	#Max	QPSK	23.29	24.67	PASS
LTE Band2	1.4	18900	6	#0	QPSK	22.24	23.62	PASS
LTE Band2	1.4	18900	1	#0	QAM16	22.50	23.88	PASS
LTE Band2	1.4	18900	1	#Mid	QAM16	22.84	24.22	PASS
LTE Band2	1.4	18900	1	#Max	QAM16	22.58	23.96	PASS
LTE Band2	1.4	18900	3	#0	QAM16	22.32	23.70	PASS
LTE Band2	1.4	18900	3	#Mid	QAM16	22.31	23.69	PASS
LTE Band2	1.4	18900	3	#Max	QAM16	22.42	23.80	PASS
LTE Band2	1.4	18900	6	#0	QAM16	21.22	22.60	PASS
LTE Band2	1.4	19193	1	#0	QPSK	23.28	24.66	PASS
LTE Band2	1.4	19193	1	#Mid	QPSK	23.56	24.94	PASS
LTE Band2	1.4	19193	1	#Max	QPSK	23.29	24.67	PASS
LTE Band2	1.4	19193	3	#0	QPSK	23.42	24.80	PASS
LTE Band2	1.4	19193	3	#Mid	QPSK	23.50	24.88	PASS
LTE Band2	1.4	19193	3	#Max	QPSK	23.24	24.62	PASS
LTE Band2	1.4	19193	6	#0	QPSK	22.32	23.70	PASS
LTE Band2	1.4	19193	1	#0	QAM16	21.67	23.05	PASS
LTE Band2	1.4	19193	1	#Mid	QAM16	21.79	23.17	PASS
LTE Band2	1.4	19193	1	#Max	QAM16	21.68	23.06	PASS
LTE Band2	1.4	19193	3	#0	QAM16	22.25	23.63	PASS
LTE Band2	1.4	19193	3	#Mid	QAM16	22.20	23.58	PASS



LTE Band2	1.4	19193	3	#Max	QAM16	21.97	23.35	PASS
LTE Band2	1.4	19193	6	#0	QAM16	21.35	22.73	PASS
LTE Band2	3	18615	1	#0	QPSK	23.37	24.75	PASS
LTE Band2	3	18615	1	#Mid	QPSK	23.31	24.69	PASS
LTE Band2	3	18615	1	#Max	QPSK	23.28	24.66	PASS
LTE Band2	3	18615	8	#0	QPSK	22.32	23.70	PASS
LTE Band2	3	18615	8	#Mid	QPSK	22.33	23.71	PASS
LTE Band2	3	18615	8	#Max	QPSK	22.35	23.73	PASS
LTE Band2	3	18615	15	#0	QPSK	22.33	23.71	PASS
LTE Band2	3	18615	1	#0	QAM16	22.92	24.30	PASS
LTE Band2	3	18615	1	#Mid	QAM16	22.87	24.25	PASS
LTE Band2	3	18615	1	#Max	QAM16	22.96	24.34	PASS
LTE Band2	3	18615	8	#0	QAM16	21.45	22.83	PASS
LTE Band2	3	18615	8	#Mid	QAM16	21.45	22.83	PASS
LTE Band2	3	18615	8	#Max	QAM16	21.47	22.85	PASS
LTE Band2	3	18615	15	#0	QAM16	21.20	22.58	PASS
LTE Band2	3	18900	1	#0	QPSK	23.14	24.52	PASS
LTE Band2	3	18900	1	#Mid	QPSK	23.19	24.57	PASS
LTE Band2	3	18900	1	#Max	QPSK	23.14	24.52	PASS
LTE Band2	3	18900	8	#0	QPSK	22.27	23.65	PASS
LTE Band2	3	18900	8	#Mid	QPSK	22.26	23.64	PASS
LTE Band2	3	18900	8	#Max	QPSK	22.22	23.60	PASS
LTE Band2	3	18900	15	#0	QPSK	22.22	23.60	PASS
LTE Band2	3	18900	1	#0	QAM16	22.42	23.80	PASS
LTE Band2	3	18900	1	#Mid	QAM16	22.37	23.75	PASS
LTE Band2	3	18900	1	#Max	QAM16	22.45	23.83	PASS
LTE Band2	3	18900	8	#0	QAM16	21.16	22.54	PASS
LTE Band2	3	18900	8	#Mid	QAM16	21.13	22.51	PASS
LTE Band2	3	18900	8	#Max	QAM16	21.23	22.61	PASS
LTE Band2	3	18900	15	#0	QAM16	21.01	22.39	PASS
LTE Band2	3	19185	1	#0	QPSK	23.33	24.71	PASS
LTE Band2	3	19185	1	#Mid	QPSK	23.11	24.49	PASS
LTE Band2	3	19185	1	#Max	QPSK	23.17	24.55	PASS
LTE Band2	3	19185	8	#0	QPSK	22.09	23.47	PASS
LTE Band2	3	19185	8	#Mid	QPSK	22.10	23.48	PASS
LTE Band2	3	19185	8	#Max	QPSK	22.06	23.44	PASS
LTE Band2	3	19185	15	#0	QPSK	22.04	23.42	PASS
LTE Band2	3	19185	1	#0	QAM16	22.21	23.59	PASS
LTE Band2	3	19185	1	#Mid	QAM16	22.14	23.52	PASS
LTE Band2	3	19185	1	#Max	QAM16	22.08	23.46	PASS
LTE Band2	3	19185	8	#0	QAM16	21.12	22.50	PASS
LTE Band2	3	19185	8	#Mid	QAM16	21.14	22.52	PASS



LTE Band2	3	19185	8	#Max	QAM16	21.01	22.39	PASS
LTE Band2	3	19185	15	#0	QAM16	21.08	22.46	PASS
LTE Band2	5	18625	1	#0	QPSK	23.43	24.81	PASS
LTE Band2	5	18625	1	#Mid	QPSK	23.13	24.51	PASS
LTE Band2	5	18625	1	#Max	QPSK	23.25	24.63	PASS
LTE Band2	5	18625	12	#0	QPSK	22.31	23.69	PASS
LTE Band2	5	18625	12	#Mid	QPSK	22.31	23.69	PASS
LTE Band2	5	18625	12	#Max	QPSK	22.32	23.70	PASS
LTE Band2	5	18625	25	#0	QPSK	22.30	23.68	PASS
LTE Band2	5	18625	1	#0	QAM16	22.75	24.13	PASS
LTE Band2	5	18625	1	#Mid	QAM16	22.78	24.16	PASS
LTE Band2	5	18625	1	#Max	QAM16	22.69	24.07	PASS
LTE Band2	5	18625	12	#0	QAM16	21.08	22.46	PASS
LTE Band2	5	18625	12	#Mid	QAM16	21.10	22.48	PASS
LTE Band2	5	18625	12	#Max	QAM16	21.12	22.50	PASS
LTE Band2	5	18625	25	#0	QAM16	21.12	22.50	PASS
LTE Band2	5	18900	1	#0	QPSK	23.11	24.49	PASS
LTE Band2	5	18900	1	#Mid	QPSK	22.93	24.31	PASS
LTE Band2	5	18900	1	#Max	QPSK	23.00	24.38	PASS
LTE Band2	5	18900	12	#0	QPSK	22.17	23.55	PASS
LTE Band2	5	18900	12	#Mid	QPSK	22.16	23.54	PASS
LTE Band2	5	18900	12	#Max	QPSK	22.10	23.48	PASS
LTE Band2	5	18900	25	#0	QPSK	22.09	23.47	PASS
LTE Band2	5	18900	1	#0	QAM16	22.20	23.58	PASS
LTE Band2	5	18900	1	#Mid	QAM16	22.21	23.59	PASS
LTE Band2	5	18900	1	#Max	QAM16	22.46	23.84	PASS
LTE Band2	5	18900	12	#0	QAM16	20.91	22.29	PASS
LTE Band2	5	18900	12	#Mid	QAM16	20.92	22.30	PASS
LTE Band2	5	18900	12	#Max	QAM16	20.86	22.24	PASS
LTE Band2	5	18900	25	#0	QAM16	21.04	22.42	PASS
LTE Band2	5	19175	1	#0	QPSK	23.10	24.48	PASS
LTE Band2	5	19175	1	#Mid	QPSK	22.95	24.33	PASS
LTE Band2	5	19175	1	#Max	QPSK	22.84	24.22	PASS
LTE Band2	5	19175	12	#0	QPSK	22.10	23.48	PASS
LTE Band2	5	19175	12	#Mid	QPSK	22.11	23.49	PASS
LTE Band2	5	19175	12	#Max	QPSK	22.06	23.44	PASS
LTE Band2	5	19175	25	#0	QPSK	22.14	23.52	PASS
LTE Band2	5	19175	1	#0	QAM16	21.91	23.29	PASS
LTE Band2	5	19175	1	#Mid	QAM16	21.90	23.28	PASS
LTE Band2	5	19175	1	#Max	QAM16	22.19	23.57	PASS
LTE Band2	5	19175	12	#0	QAM16	21.17	22.55	PASS
LTE Band2	5	19175	12	#Mid	QAM16	21.19	22.57	PASS



LTE Band2	5	19175	12	#Max	QAM16	21.15	22.53	PASS
LTE Band2	5	19175	25	#0	QAM16	21.01	22.39	PASS
LTE Band2	10	18650	1	#0	QPSK	23.17	24.55	PASS
LTE Band2	10	18650	1	#Mid	QPSK	23.10	24.48	PASS
LTE Band2	10	18650	1	#Max	QPSK	23.10	24.48	PASS
LTE Band2	10	18650	25	#0	QPSK	22.24	23.62	PASS
LTE Band2	10	18650	25	#Mid	QPSK	22.26	23.64	PASS
LTE Band2	10	18650	25	#Max	QPSK	22.25	23.63	PASS
LTE Band2	10	18650	50	#0	QPSK	22.24	23.62	PASS
LTE Band2	10	18650	1	#0	QAM16	22.33	23.71	PASS
LTE Band2	10	18650	1	#Mid	QAM16	22.49	23.87	PASS
LTE Band2	10	18650	1	#Max	QAM16	22.41	23.79	PASS
LTE Band2	10	18650	25	#0	QAM16	21.22	22.60	PASS
LTE Band2	10	18650	25	#Mid	QAM16	21.29	22.67	PASS
LTE Band2	10	18650	25	#Max	QAM16	21.31	22.69	PASS
LTE Band2	10	18650	50	#0	QAM16	21.21	22.59	PASS
LTE Band2	10	18900	1	#0	QPSK	22.95	24.33	PASS
LTE Band2	10	18900	1	#Mid	QPSK	23.18	24.56	PASS
LTE Band2	10	18900	1	#Max	QPSK	23.03	24.41	PASS
LTE Band2	10	18900	25	#0	QPSK	22.01	23.39	PASS
LTE Band2	10	18900	25	#Mid	QPSK	22.01	23.39	PASS
LTE Band2	10	18900	25	#Max	QPSK	21.98	23.36	PASS
LTE Band2	10	18900	50	#0	QPSK	22.04	23.42	PASS
LTE Band2	10	18900	1	#0	QAM16	22.63	24.01	PASS
LTE Band2	10	18900	1	#Mid	QAM16	22.72	24.10	PASS
LTE Band2	10	18900	1	#Max	QAM16	22.60	23.98	PASS
LTE Band2	10	18900	25	#0	QAM16	21.11	22.49	PASS
LTE Band2	10	18900	25	#Mid	QAM16	21.13	22.51	PASS
LTE Band2	10	18900	25	#Max	QAM16	21.24	22.62	PASS
LTE Band2	10	18900	50	#0	QAM16	21.13	22.51	PASS
LTE Band2	10	19150	1	#0	QPSK	22.94	24.32	PASS
LTE Band2	10	19150	1	#Mid	QPSK	23.28	24.66	PASS
LTE Band2	10	19150	1	#Max	QPSK	22.79	24.17	PASS
LTE Band2	10	19150	25	#0	QPSK	22.12	23.50	PASS
LTE Band2	10	19150	25	#Mid	QPSK	22.14	23.52	PASS
LTE Band2	10	19150	25	#Max	QPSK	22.05	23.43	PASS
LTE Band2	10	19150	50	#0	QPSK	22.09	23.47	PASS
LTE Band2	10	19150	1	#0	QAM16	21.88	23.26	PASS
LTE Band2	10	19150	1	#Mid	QAM16	22.52	23.90	PASS
LTE Band2	10	19150	1	#Max	QAM16	21.86	23.24	PASS
LTE Band2	10	19150	25	#0	QAM16	21.13	22.51	PASS
LTE Band2	10	19150	25	#Mid	QAM16	21.14	22.52	PASS



LTE Band2	10	19150	25	#Max	QAM16	21.13	22.51	PASS
LTE Band2	10	19150	50	#0	QAM16	21.03	22.41	PASS
LTE Band2	15	18675	1	#0	QPSK	23.22	24.60	PASS
LTE Band2	15	18675	1	#Mid	QPSK	23.38	24.76	PASS
LTE Band2	15	18675	1	#Max	QPSK	22.85	24.23	PASS
LTE Band2	15	18675	36	#0	QPSK	22.15	23.53	PASS
LTE Band2	15	18675	36	#Mid	QPSK	22.14	23.52	PASS
LTE Band2	15	18675	36	#Max	QPSK	22.11	23.49	PASS
LTE Band2	15	18675	75	#0	QPSK	22.11	23.49	PASS
LTE Band2	15	18675	1	#0	QAM16	22.18	23.56	PASS
LTE Band2	15	18675	1	#Mid	QAM16	22.28	23.66	PASS
LTE Band2	15	18675	1	#Max	QAM16	22.11	23.49	PASS
LTE Band2	15	18675	36	#0	QAM16	21.07	22.45	PASS
LTE Band2	15	18675	36	#Mid	QAM16	21.04	22.42	PASS
LTE Band2	15	18675	36	#Max	QAM16	21.12	22.50	PASS
LTE Band2	15	18675	75	#0	QAM16	21.12	22.50	PASS
LTE Band2	15	18900	1	#0	QPSK	22.95	24.33	PASS
LTE Band2	15	18900	1	#Mid	QPSK	23.04	24.42	PASS
LTE Band2	15	18900	1	#Max	QPSK	23.04	24.42	PASS
LTE Band2	15	18900	36	#0	QPSK	22.00	23.38	PASS
LTE Band2	15	18900	36	#Mid	QPSK	21.99	23.37	PASS
LTE Band2	15	18900	36	#Max	QPSK	22.04	23.42	PASS
LTE Band2	15	18900	75	#0	QPSK	22.01	23.39	PASS
LTE Band2	15	18900	1	#0	QAM16	22.49	23.87	PASS
LTE Band2	15	18900	1	#Mid	QAM16	22.41	23.79	PASS
LTE Band2	15	18900	1	#Max	QAM16	22.42	23.80	PASS
LTE Band2	15	18900	36	#0	QAM16	21.10	22.48	PASS
LTE Band2	15	18900	36	#Mid	QAM16	21.10	22.48	PASS
LTE Band2	15	18900	36	#Max	QAM16	21.13	22.51	PASS
LTE Band2	15	18900	75	#0	QAM16	20.80	22.18	PASS
LTE Band2	15	19125	1	#0	QPSK	22.93	24.31	PASS
LTE Band2	15	19125	1	#Mid	QPSK	22.78	24.16	PASS
LTE Band2	15	19125	1	#Max	QPSK	22.58	23.96	PASS
LTE Band2	15	19125	36	#0	QPSK	22.03	23.41	PASS
LTE Band2	15	19125	36	#Mid	QPSK	22.07	23.45	PASS
LTE Band2	15	19125	36	#Max	QPSK	21.97	23.35	PASS
LTE Band2	15	19125	75	#0	QPSK	21.93	23.31	PASS
LTE Band2	15	19125	1	#0	QAM16	21.83	23.21	PASS
LTE Band2	15	19125	1	#Mid	QAM16	21.60	22.98	PASS
LTE Band2	15	19125	1	#Max	QAM16	21.01	22.39	PASS
LTE Band2	15	19125	36	#0	QAM16	21.04	22.42	PASS
LTE Band2	15	19125	36	#Mid	QAM16	21.05	22.43	PASS



LTE Band2	15	19125	36	#Max	QAM16	20.87	22.25	PASS
LTE Band2	15	19125	75	#0	QAM16	20.84	22.22	PASS
LTE Band2	20	18700	1	#0	QPSK	23.24	24.62	PASS
LTE Band2	20	18700	1	#Mid	QPSK	23.35	24.73	PASS
LTE Band2	20	18700	1	#Max	QPSK	22.82	24.20	PASS
LTE Band2	20	18700	50	#0	QPSK	22.01	23.39	PASS
LTE Band2	20	18700	50	#Mid	QPSK	21.99	23.37	PASS
LTE Band2	20	18700	50	#Max	QPSK	21.93	23.31	PASS
LTE Band2	20	18700	100	#0	QPSK	21.96	23.34	PASS
LTE Band2	20	18700	1	#0	QAM16	22.19	23.57	PASS
LTE Band2	20	18700	1	#Mid	QAM16	22.46	23.84	PASS
LTE Band2	20	18700	1	#Max	QAM16	22.00	23.38	PASS
LTE Band2	20	18700	50	#0	QAM16	21.12	22.50	PASS
LTE Band2	20	18700	50	#Mid	QAM16	21.09	22.47	PASS
LTE Band2	20	18700	50	#Max	QAM16	20.96	22.34	PASS
LTE Band2	20	18700	100	#0	QAM16	20.94	22.32	PASS
LTE Band2	20	18900	1	#0	QPSK	22.77	24.15	PASS
LTE Band2	20	18900	1	#Mid	QPSK	23.16	24.54	PASS
LTE Band2	20	18900	1	#Max	QPSK	23.00	24.38	PASS
LTE Band2	20	18900	50	#0	QPSK	21.90	23.28	PASS
LTE Band2	20	18900	50	#Mid	QPSK	21.90	23.28	PASS
LTE Band2	20	18900	50	#Max	QPSK	21.93	23.31	PASS
LTE Band2	20	18900	100	#0	QPSK	21.92	23.30	PASS
LTE Band2	20	18900	1	#0	QAM16	21.68	23.06	PASS
LTE Band2	20	18900	1	#Mid	QAM16	21.47	22.85	PASS
LTE Band2	20	18900	1	#Max	QAM16	21.44	22.82	PASS
LTE Band2	20	18900	50	#0	QAM16	20.90	22.28	PASS
LTE Band2	20	18900	50	#Mid	QAM16	20.90	22.28	PASS
LTE Band2	20	18900	50	#Max	QAM16	20.90	22.28	PASS
LTE Band2	20	18900	100	#0	QAM16	20.73	22.11	PASS
LTE Band2	20	19100	1	#0	QPSK	22.89	24.27	PASS
LTE Band2	20	19100	1	#Mid	QPSK	23.00	24.38	PASS
LTE Band2	20	19100	1	#Max	QPSK	22.59	23.97	PASS
LTE Band2	20	19100	50	#0	QPSK	21.92	23.30	PASS
LTE Band2	20	19100	50	#Mid	QPSK	21.93	23.31	PASS
LTE Band2	20	19100	50	#Max	QPSK	21.86	23.24	PASS
LTE Band2	20	19100	100	#0	QPSK	21.84	23.22	PASS
LTE Band2	20	19100	1	#0	QAM16	21.73	23.11	PASS
LTE Band2	20	19100	1	#Mid	QAM16	21.97	23.35	PASS
LTE Band2	20	19100	1	#Max	QAM16	21.62	23.00	PASS
LTE Band2	20	19100	50	#0	QAM16	20.93	22.31	PASS
LTE Band2	20	19100	50	#Mid	QAM16	20.88	22.26	PASS



LTE Band2	20	19100	50	#Max	QAM16	20.91	22.29	PASS
LTE Band2	20	19100	100	#0	QAM16	20.84	22.22	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 1900,

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

RBW is set to 30 kHz, VBW is set to 91kHz for LTE Band 2 (1.4MHz),

RBW is set to 62 kHz, VBW is set to 180 kHz for LTE Band 2 (3MHz),

RBW is set to 100 kHz, VBW is set to 300 kHz for LTE Band 2 (5MHz),

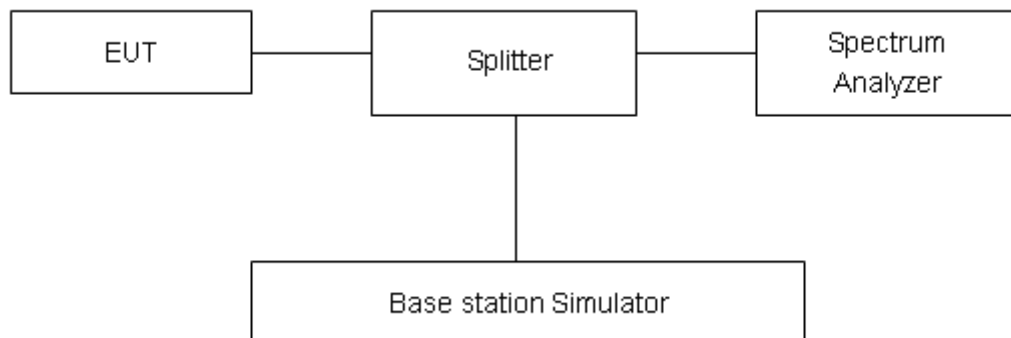
RBW is set to 200 kHz, VBW is set to 620kHz for LTE Band 2 (10MHz),

RBW is set to 300kHz,VBW is set to 910kHz for LTE Band 2 (15MHz).

RBW is set to 430kHz,VBW is set to 1.2MHz for LTE Band 2 (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

Mode	Channel	Frequency (MHz)	99% Power Bandwidth (MHz)	-26dBc Bandwidth(MHz)
GSM 1900 (GSM)	512	1850.2	0.2437	0.2997
	661	1880.0	0.2422	0.2994
	810	1909.8	0.2445	0.2993
GPRS 1900 (GMSK)	512	1850.2	0.2442	0.3048
	661	1880.0	0.2453	0.3136
	810	1909.8	0.2455	0.3099
EGPRS 1900 (8-PSK)	512	1850.2	0.2471	0.3132
	661	1880.0	0.2454	0.308
	810	1909.8	0.2452	0.313
WCDMA Band II (RMC)	9262	1852.4	4.1129	4.684
	9400	1880	4.1211	4.665
	9538	1907.6	4.1184	4.696

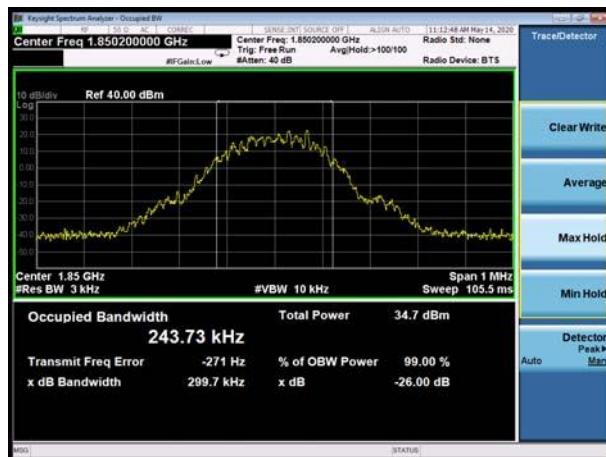
LTE Band 2					
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
QPSK	1.4	18607	1850.7	1.0966	1.28
		18900	1880.0	1.0916	1.29
		19193	1909.3	1.0952	1.269
	3	18615	1851.5	2.7051	2.996
		18900	1880	2.7062	2.974
		19185	1908.5	2.7103	2.99
	5	18625	1852.5	4.5114	4.967
		18900	1880	4.5136	4.96
		19175	1907.5	4.5119	4.946
	10	18650	1855	8.976	9.805
		18900	1880	8.9633	9.733
		19150	1905	8.951	9.743
	15	18675	1857.5	13.412	14.59
		18900	1880	13.41	14.56



	20	19125	1902.5	13.388	14.6
		18700	1860	17.944	19.35
		18900	1880	17.898	19.19
		19100	1900	17.919	19.33
16QAM	1.4	18607	1850.7	1.1017	1.267
		18900	1880.0	1.0983	1.29
		19193	1909.3	1.0984	1.283
	3	18615	1851.5	2.702	2.96
		18900	1880	2.7048	2.963
		19185	1908.5	2.697	2.988
	5	18625	1852.5	4.5325	4.968
		18900	1880	4.5377	5.031
		19175	1907.5	4.5246	4.999
	10	18650	1855	8.967	9.839
		18900	1880	8.9735	9.802
		19150	1905	8.9495	9.810
	15	18675	1857.5	13.474	14.63
		18900	1880	17.432	14.53
		19125	1902.5	13.398	14.61
	20	18700	1860	17.855	19.3
		18900	1880	17.878	19.36
		19100	1900	17.850	19.32



GSM1900 GSM CH-Low



GSM1900 GPRS CH-Low



GSM 1900 GSM CH-Middle



GSM 1900 GPRS CH-Middle



GSM 1900 GSM CH-High



GSM 1900 GPRS CH-High





GSM1900 EGPRS CH-Low



WCDMA Band II RMC CH-Low



GSM 1900 EGPRS CH-Middle



WCDMA Band II RMC CH-Middle



GSM 1900 EGPRS CH-High



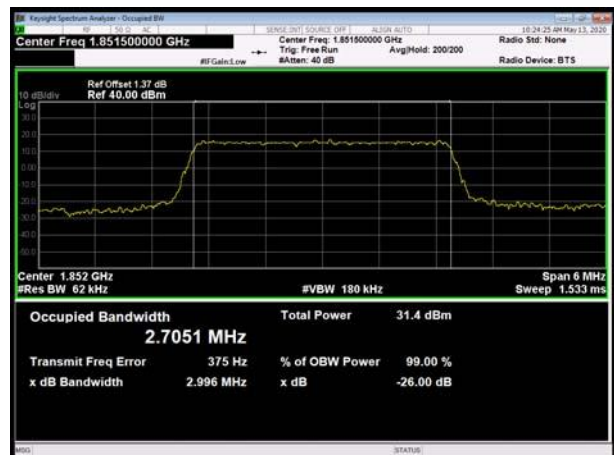
WCDMA Band II RMC CH-High



LTE Band 2 1.4MHz QPSK CH-Low



LTE Band 2 3MHz QPSK CH-Low



LTE Band 2 1.4MHz QPSK CH-Middle



LTE Band 2 3MHz QPSK CH-Middle



LTE Band 2 1.4MHz QPSK CH-High



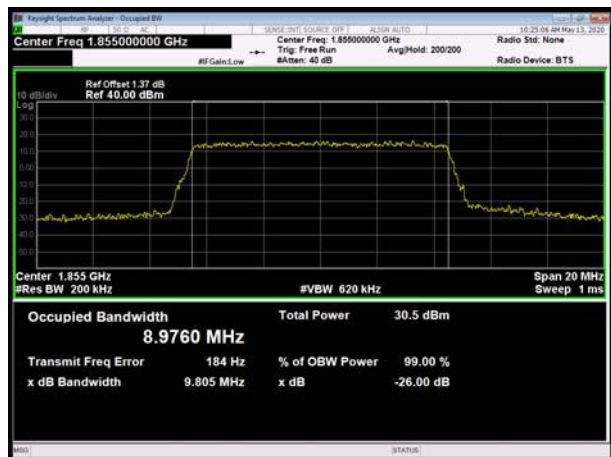
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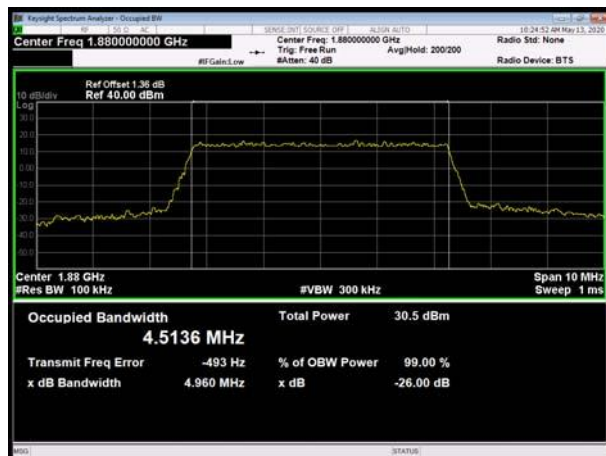
LTE Band 2 5MHz QPSK CH-Low



LTE Band 2 10MHz QPSK CH-Low



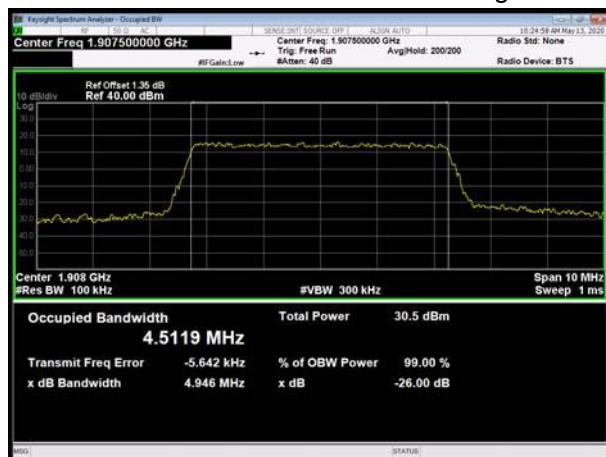
LTE Band 2 5MHz QPSK CH-Middle



LTE Band 2 10MHz QPSK CH-Middle



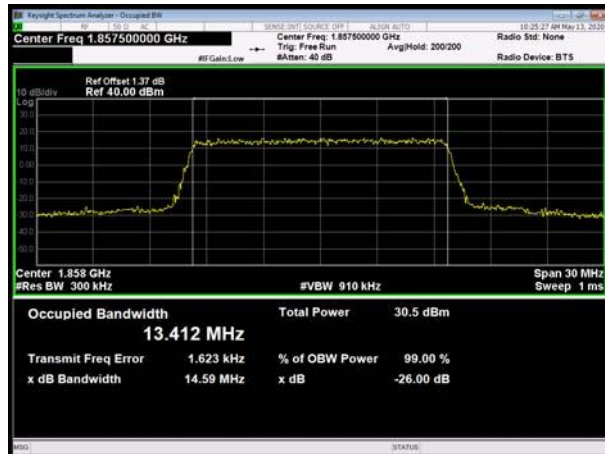
LTE Band 2 5MHz QPSK CH-High



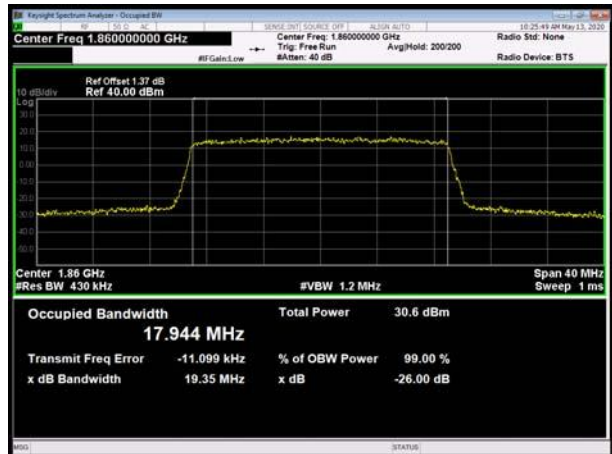
LTE Band 2 10MHz QPSK CH-High



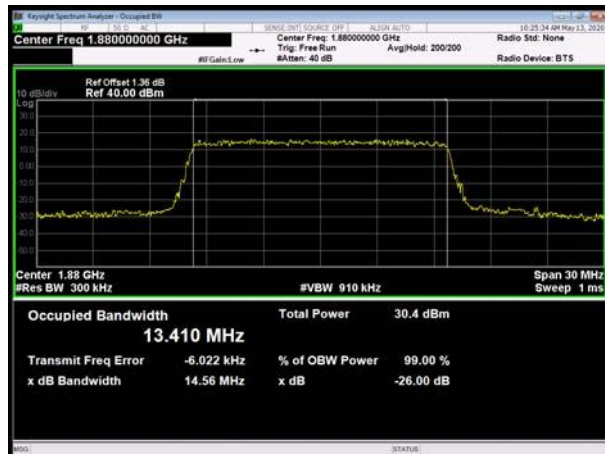
LTE Band 2 15MHz QPSK CH-Low



LTE Band 2 20MHz QPSK CH-Low



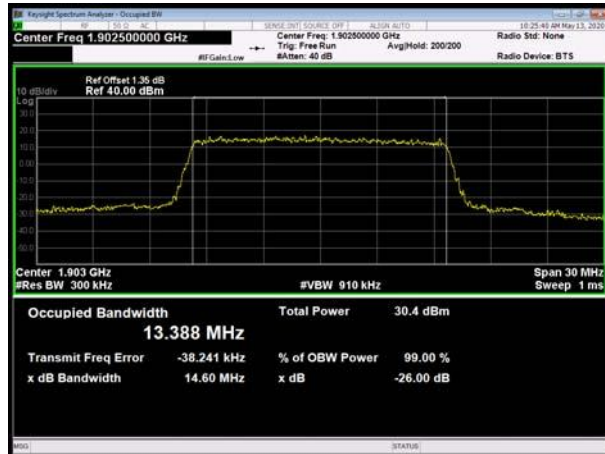
LTE Band 2 15MHz QPSK CH-Middle



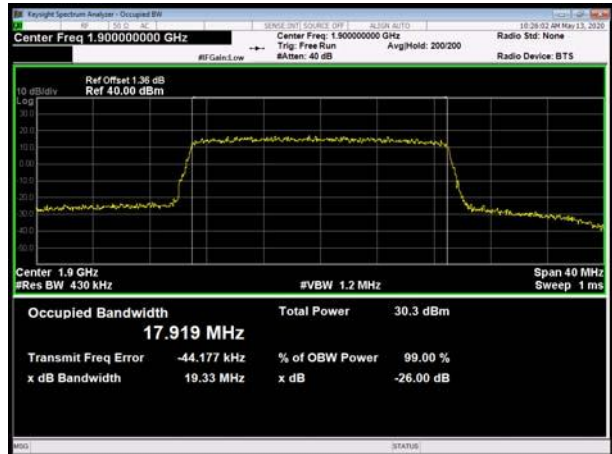
LTE Band 2 20MHz QPSK CH-Middle



LTE Band 2 15MHz QPSK CH-High

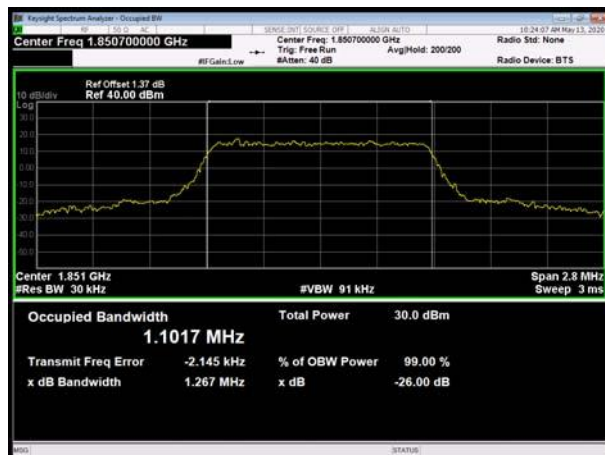


LTE Band 2 20MHz QPSK CH-High

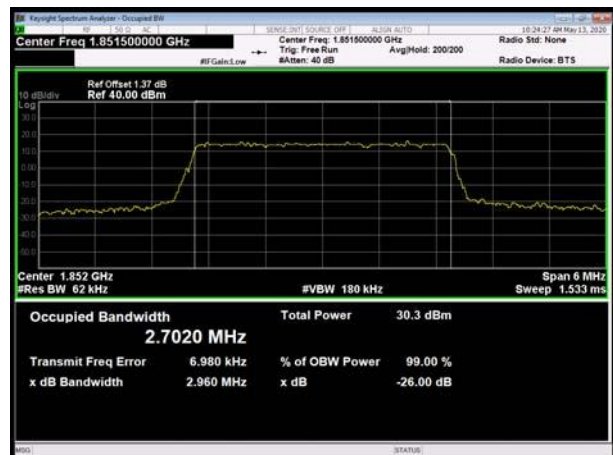




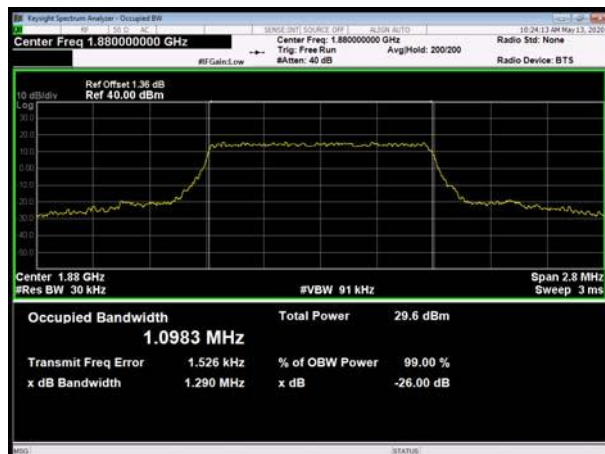
LTE Band 2 1.4MHz 16QAM CH-Low



LTE Band 2 3MHz 16QAM CH-Low



LTE Band 2 1.4MHz 16QAM CH-Middle



LTE Band 2 3MHz 16QAM CH-Middle



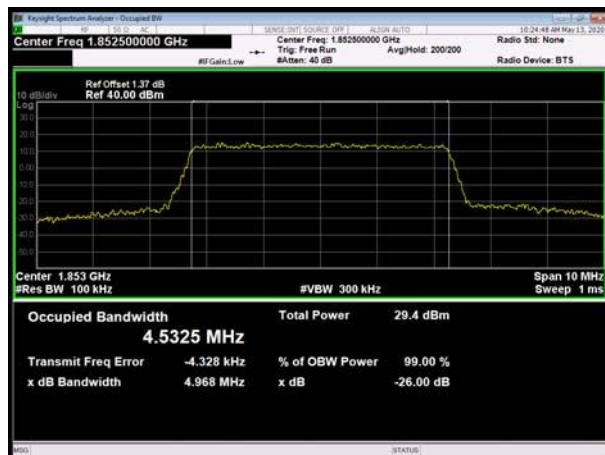
LTE Band 2 1.4MHz 16QAM CH-High



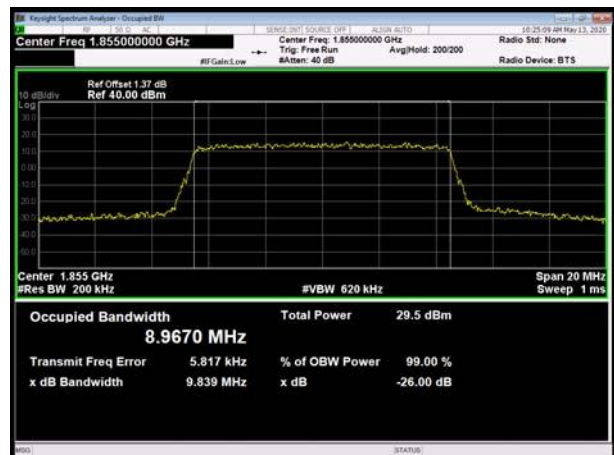
LTE Band 2 3MHz 16QAM CH-High



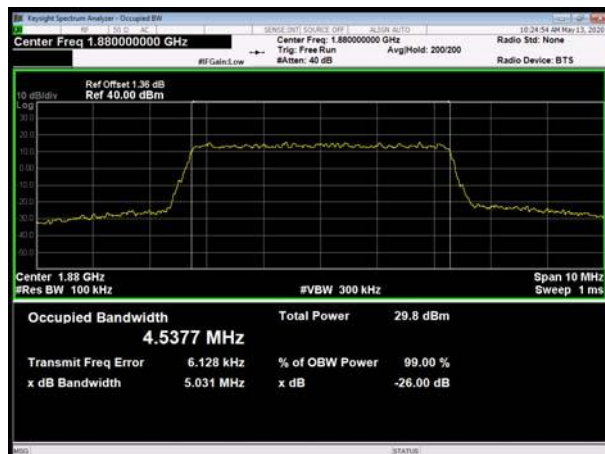
LTE Band 2 5MHz 16QAM CH-Low



LTE Band 2 10MHz 16QAM CH-Low



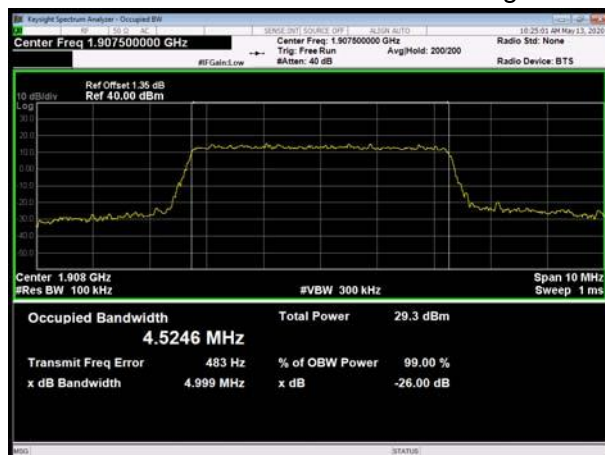
LTE Band 2 5MHz 16QAM CH-Middle



LTE Band 2 10MHz 16QAM CH-Middle



LTE Band 2 5MHz 16QAM CH-High



LTE Band 2 10MHz 16QAM CH-High



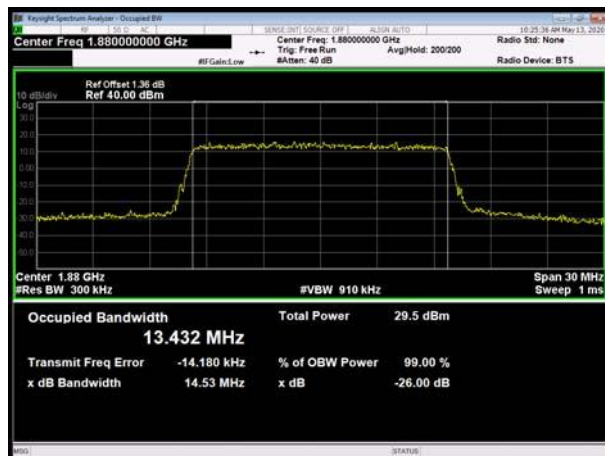
LTE Band 2 15MHz 16QAM CH-Low



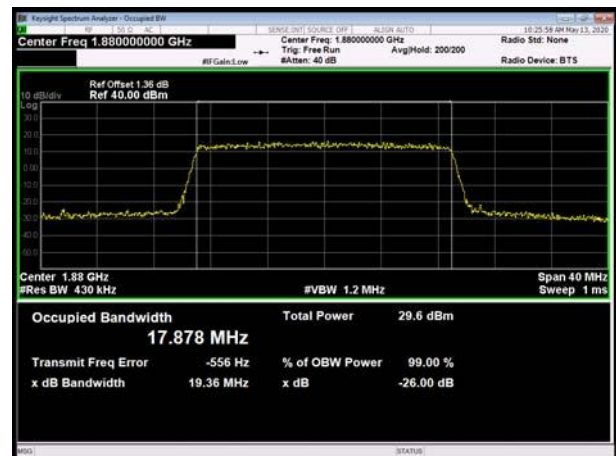
LTE Band 2 20MHz 16QAM CH-Low



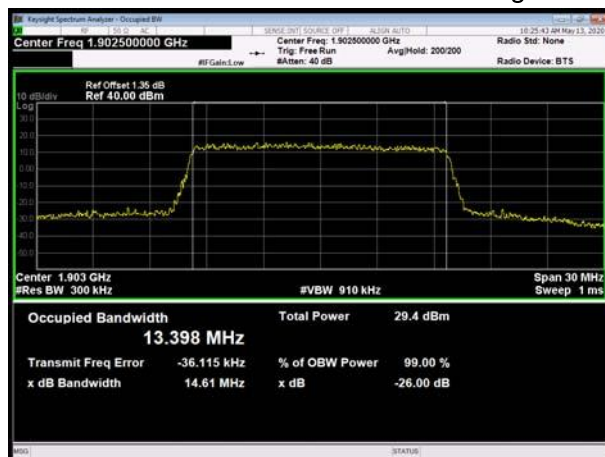
LTE Band 2 15MHz 16QAM CH-Middle



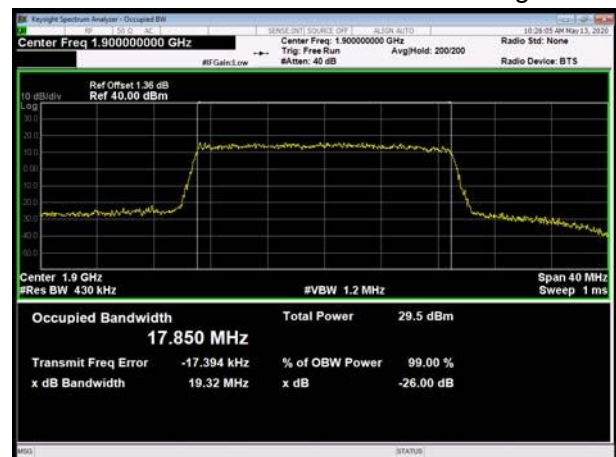
LTE Band 2 20MHz 16QAM CH-Middle



LTE Band 2 15MHz 16QAM CH-High



LTE Band 2 20MHz 16QAM CH-High



5.3. Band Edge Compliance

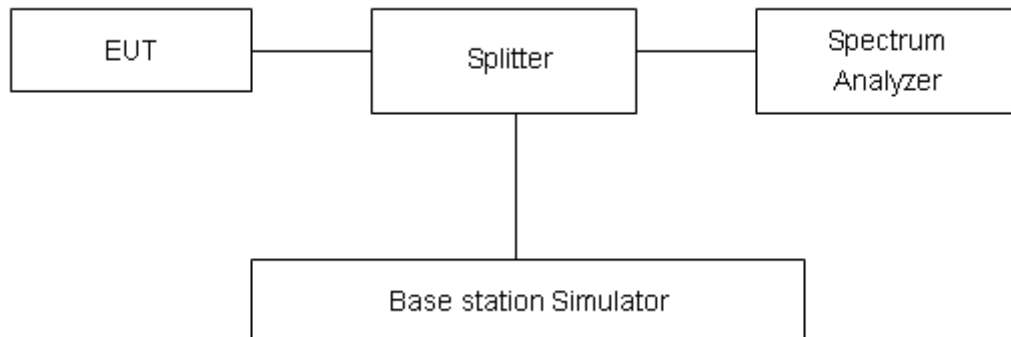
Ambient condition

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 and RBW is set to 3kHz, VBW is set to 10kHz for GSM 1900, RBW is set to 51kHz, VBW is set to 160kHz for WCDMA Band II, RBW is set to 15kHz, VBW is set to 43kHz for LTE Band 2 (1.4MHz), RBW is set to 30kHz, VBW is set to 91kHz for LTE Band 2 (3MHz), RBW is set to 51kHz, VBW is set to 150kHz for LTE Band 2 (5MHz), RBW is set to 100kHz, VBW is set to 300kHz for LTE Band 2 (10MHz), RBW is set to 150kHz, VBW is set to 470kHz for LTE Band 2 (15MHz), RBW is set to 200kHz, VBW is set to 620kHz for LTE Band 2 (20MHz). Spectrum analyzer plots are included on the following pages.

Test Setup



Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10} (P)$ 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:

GSM1900 GSM CH-Low



GSM 1900 GSM CH-High



GSM1900 GPRS CH-Low



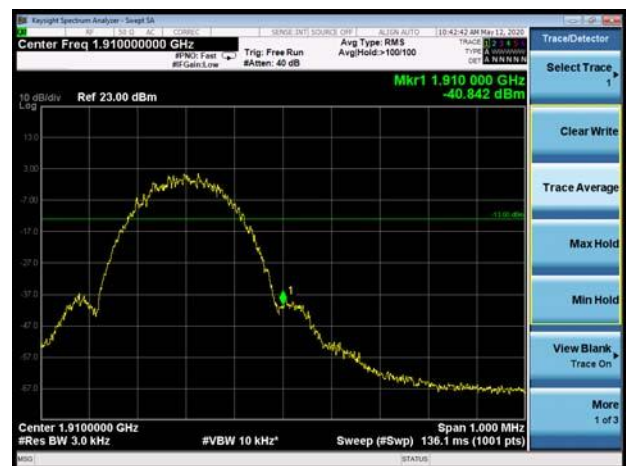
GSM 1900 GPRS CH-High



GSM1900 EGPRS CH-Low



GSM 1900 EGPRS CH-High



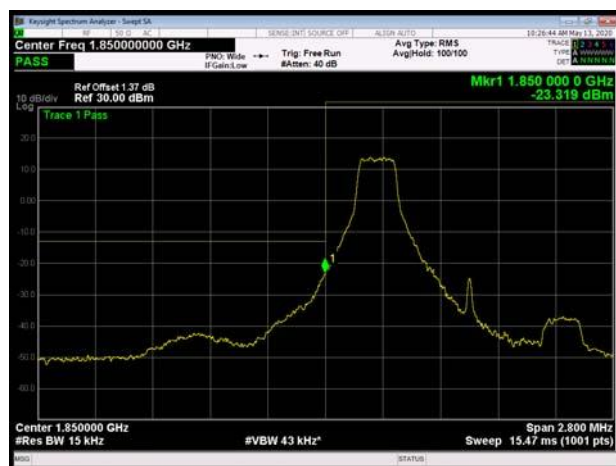
WCDMA Band II RMC CH-Low



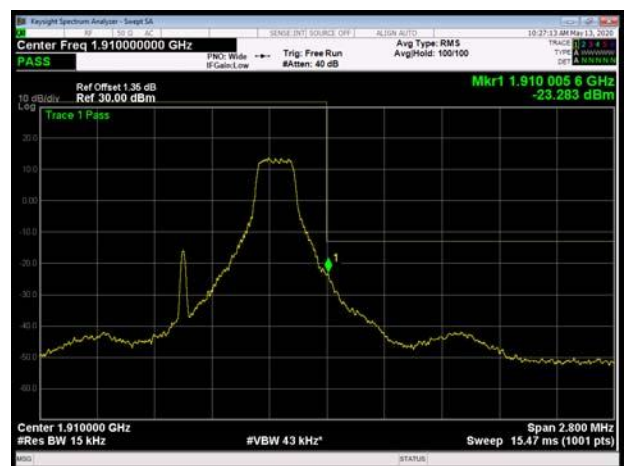
WCDMA Band II RMC CH-High



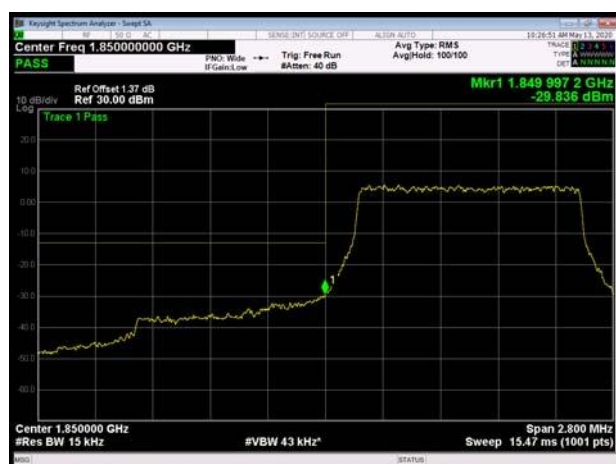
LTE Band 2 1.4MHz QPSK 1RB CH-Low



LTE Band 2 1.4MHz QPSK 1RB CH-High



LTE Band 2 1.4MHz QPSK 100%RB CH-Low

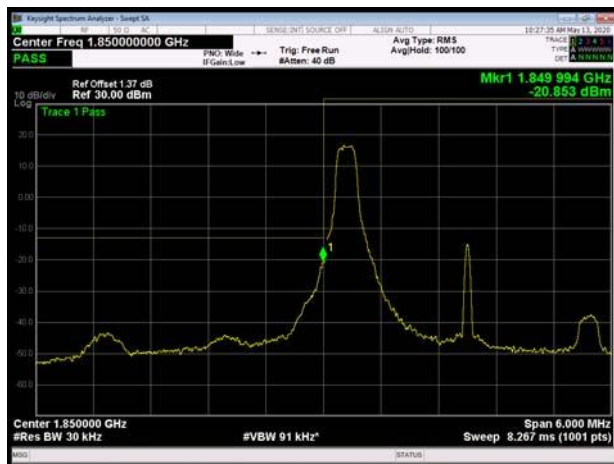


LTE Band 2 1.4MHz QPSK 100%RB CH-High

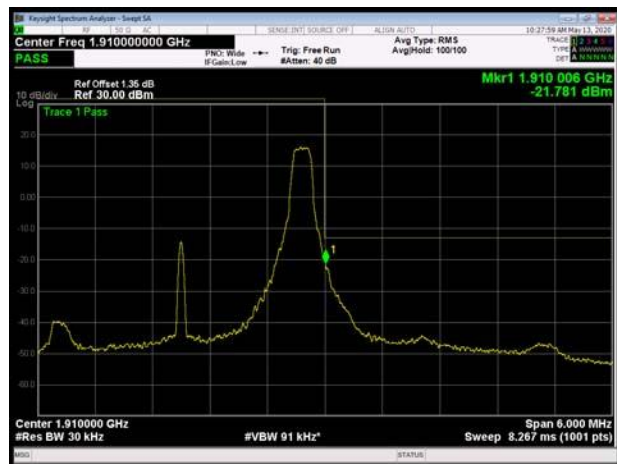




LTE Band 2 3MHz QPSK 1RB CH-Low



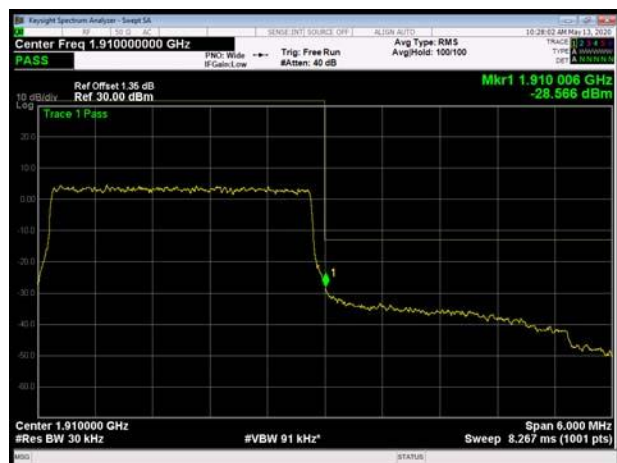
LTE Band 2 3MHz QPSK 1RB CH-High



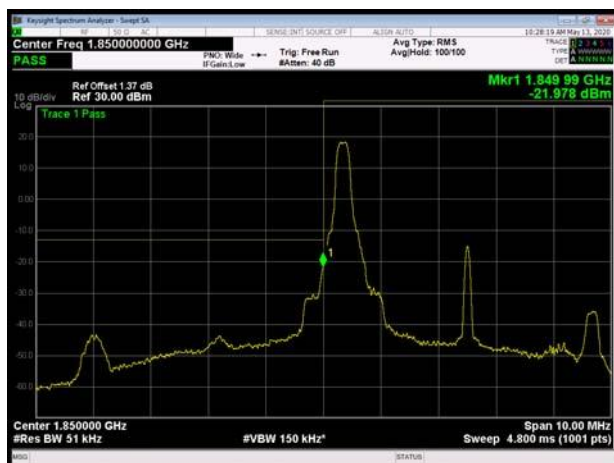
LTE Band 2 3MHz QPSK 100%RB CH-Low



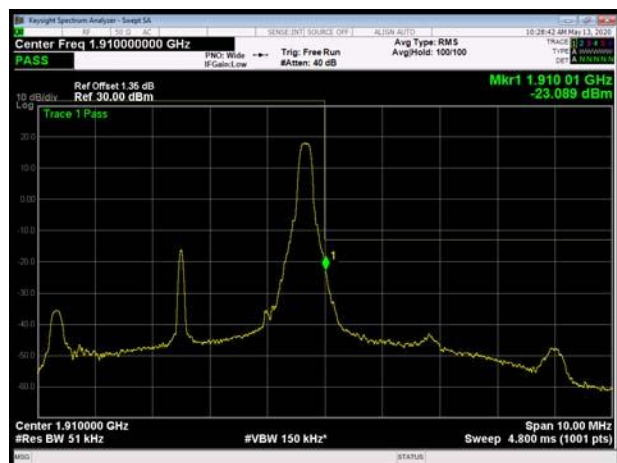
LTE Band 2 3MHz QPSK 100%RB CH-High



LTE Band 2 5MHz QPSK 1RB CH-Low



LTE Band 2 5MHz QPSK 1RB CH-High





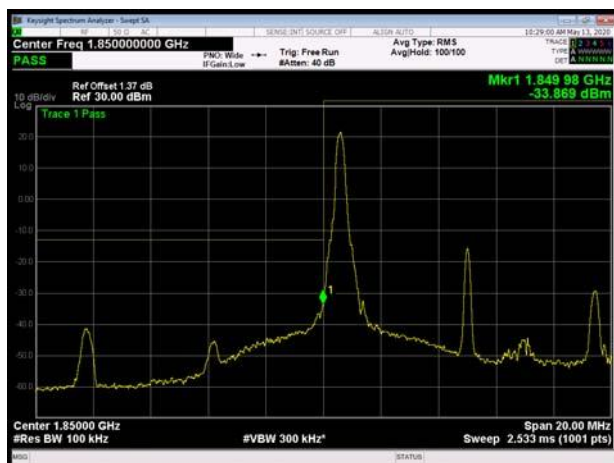
LTE Band 2 5MHz QPSK 100%RB CH-Low



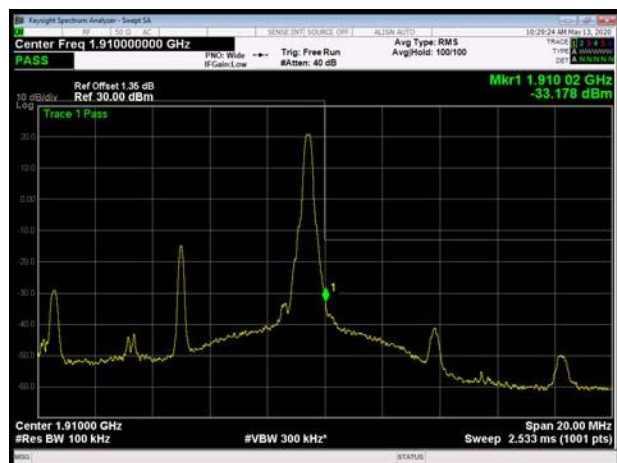
LTE Band 2 5MHz QPSK 100%RB CH-High



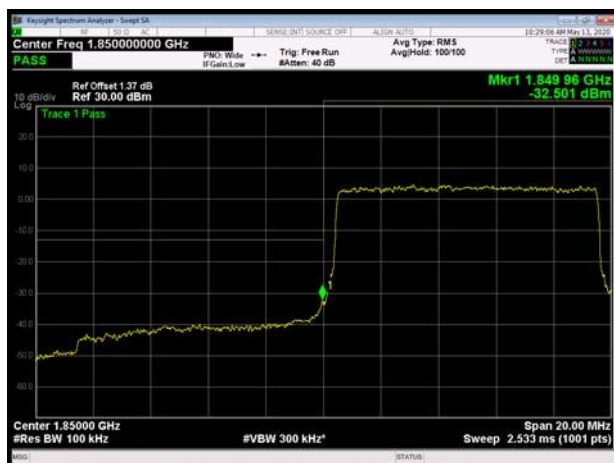
LTE Band 2 10MHz QPSK 1RB CH-Low



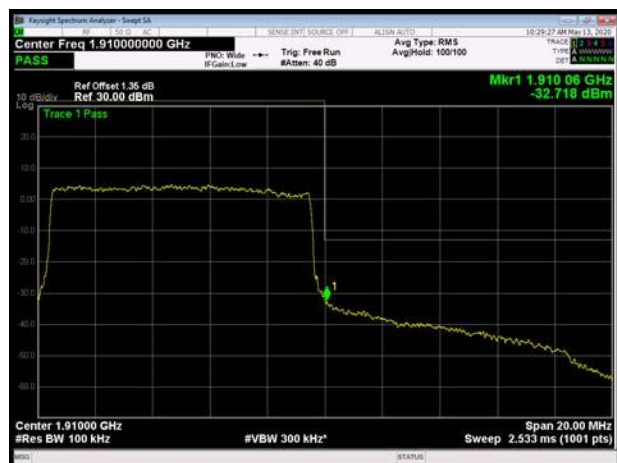
LTE Band 2 10MHz QPSK 1RB CH-High



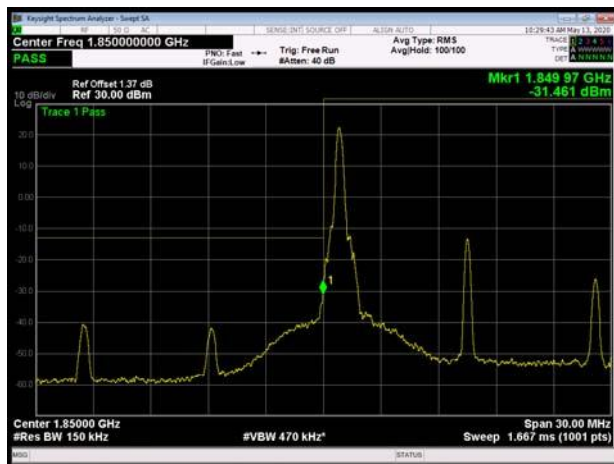
LTE Band 2 10MHz QPSK 100%RB CH-Low



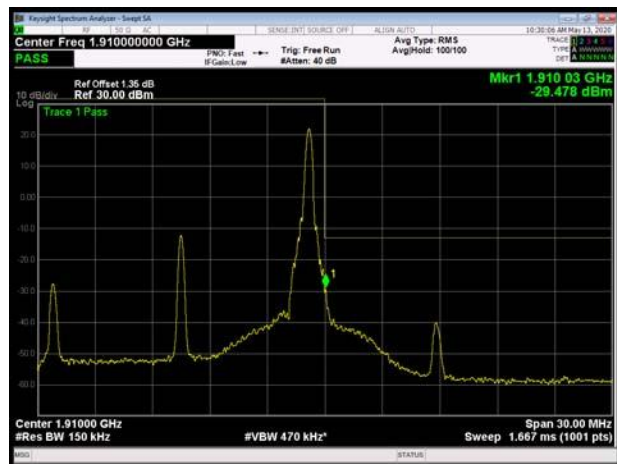
LTE Band 2 10MHz QPSK 100%RB CH-High



LTE Band 2 15MHz QPSK 1RB CH-Low



LTE Band 2 15MHz QPSK 1RB CH-High



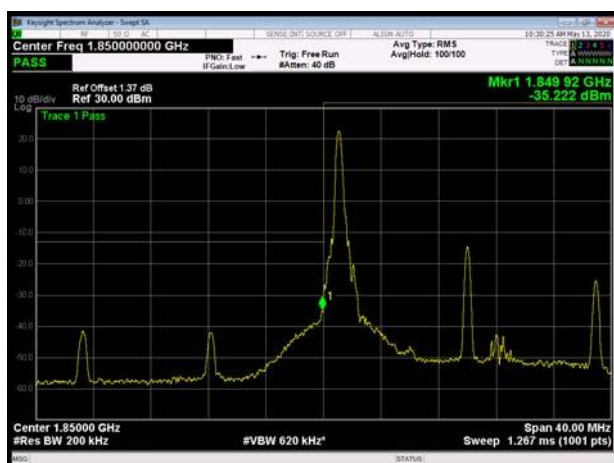
LTE Band 2 15MHz QPSK 100%RB CH-Low



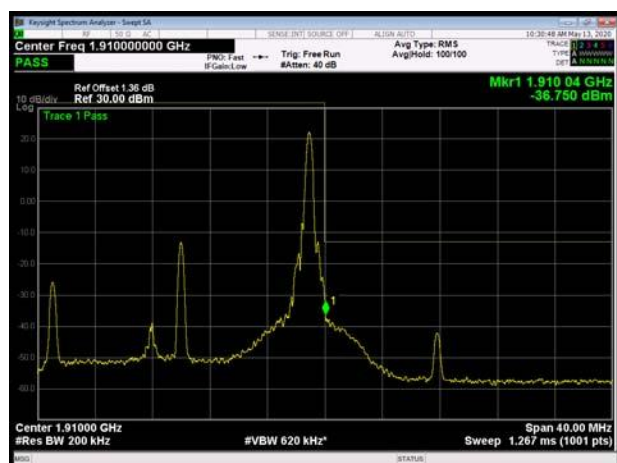
LTE Band 2 15MHz QPSK 100%RB CH-High



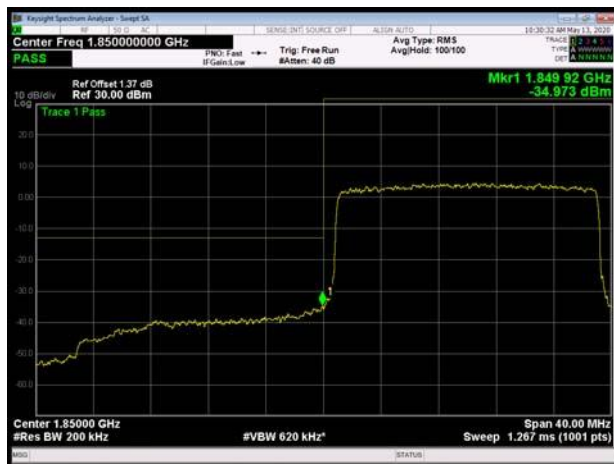
LTE Band 2 20MHz QPSK 1RB CH-Low



LTE Band 2 20MHz QPSK 1RB CH-High



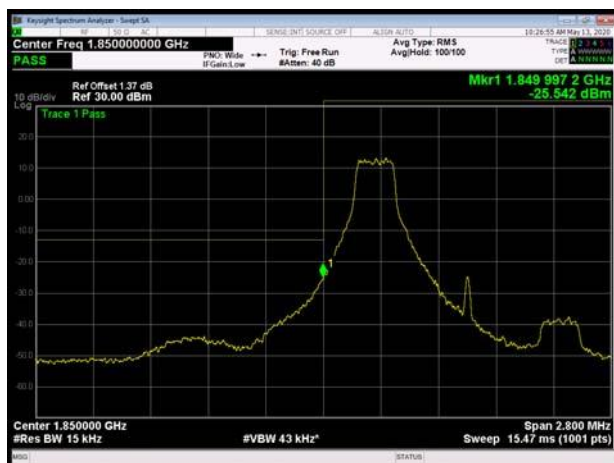
LTE Band 2 20MHz QPSK 100%RB CH-Low



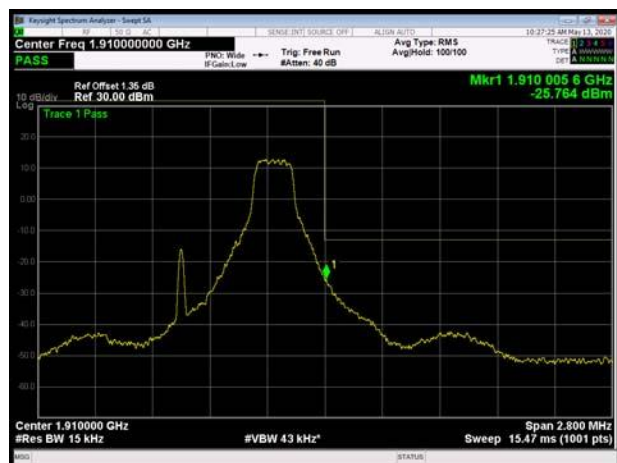
LTE Band 2 20MHz QPSK 100%RB CH-High



LTE Band 2 1.4MHz 16QAM 1RB CH-Low



LTE Band 2 1.4MHz 16QAM 1RB CH-High



LTE Band 2 1.4MHz 16QAM 100%RB CH-Low



LTE Band 2 1.4MHz 16QAM 100%RB CH-High

