



RF TEST REPORT

Applicant	Xiaomi Communications Co., Ltd.
FCC ID	2AFZZK7AG
Product	Mobile Phone
Brand	Redmi
Model	M2101K7AG
Report No.	R2012A0833-R1V2
Issue Date	January 22, 2021

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 2 (2019)/ FCC CFR 47 Part 22H (2019)**. 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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Version	Revision description	Issue Date
Rev.0	Initial issue of report.	January 14, 2021
Rev.1	Update the ERP data for LTE Band 5 Update information for General Information	January 18, 2021
Rev.2	Update the Max.ERP data for LTE Band 5 in page 7.	January 22, 2021
Note: This revised report (Report No. R2012A0833-R1V2) supersedes and replaces the previously issued report (Report No. R2012A0833-R1V1). Please discard or destroy the previously issued report and dispose of it accordingly.		

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: December 16, 2020 ~ January 3, 2021			
Date of Sample Received: December 14, 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.			



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
City: Shanghai
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2. General Description of Equipment under Test

2.3. Applicant and Manufacturer Information

Applicant	Xiaomi Communications Co., Ltd.
Applicant address	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Manufacturer	Xiaomi Communications Co., Ltd.
Manufacturer address	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

2.4. General Information

EUT Description				
Model	M2101K7AG			
IMEI	IMEI 1: 868824050045644 IMEI 2: 868824050045651			
Hardware Version	P2			
Software Version	MIUI12			
Power Supply	Battery / AC adapter			
Antenna Type	Internal Antenna			
Antenna Gain	Band	Frequency (MHz)	Antenna Gain(dBi)	
			Main Antenna	Diversity Antenna
	GSM 850	820	-5.11	-3.86
		840	-3.56	-3.97
		850	-3.12	-4.40
	WCDMA Band V	830	-3.41	-4.06
		840	-3.56	-3.97
		850	-3.12	-4.40
	LTE Band 5	820	-5.11	-3.86
		830	-3.41	-4.06
		840	-3.56	-3.97
		850	-3.12	-4.40
Test Mode(s)	GSM 850; WCDMA Band V; LTE Band 5;			
Test Modulation	(GSM/GPRS)GMSK, (EGPRS) GMSK/ 8PSK; (WCDMA) BPSK, QPSK, 16QAM; (LTE)QPSK, 16QAM, 64QAM;			
GPRS Multislot Class	33			
EGPRS Multislot Class	33			
HSDPA UE Category	24			
HSUPA UE Category	8			



LTE Category	7		
Maximum E.R.P.	GSM 850:	27.41dBm	
	WCDMA Band V:	18.29dBm	
	LTE Band 5:	19.14dBm	
Rated Power Supply Voltage	3.87V		
Extreme Voltage	Minimum: 3.29V Maximum: 4.45V		
Extreme Temperature	Lowest: -30°C Highest: +50°C		
Operating Voltage	Minimum: 3.6V Maximum: 4.2V		
Operating Temperature	Lowest: 0°C Highest: +40°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.			



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 (2019)

ANSI C63.26 (2015)

Reference standard:

FCC CFR47 Part 2 (2019)

KDB 971168 D01 Power Meas License Digital Systems v03r01

4. Test Configuration

There is more than one SIM card slot, each one should be applied throughout the compliance test respectively, and however, only the worst case (SIM 1) will be recorded in this report.

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 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/HSPA+
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	64QAM	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	O
Occupied Bandwidth	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
Peak-to-Average Power Ratio	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
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 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.

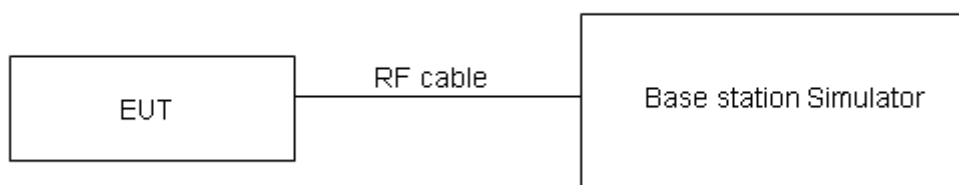
ERP can then be calculated as follows:

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

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 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		Maximum Output Power (dBm)			ERP (dBm)					
					Main Antenna			Diversity Antenna		
		Channel 128	Channel 190	Channel 251	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)	824.2 (MHz)	836.6 (MHz)	848.8 (MHz)
GSM(GMSK)	Results	32.73	32.96	32.68	25.47	27.25	27.41	26.72	26.84	26.13
GPRS/EGPRS (GMSK)	1TXslot	32.70	33.01	32.65	25.44	27.30	27.38	26.69	26.89	26.10
	2TXslots	29.51	29.65	29.86	22.25	23.94	24.59	23.50	23.53	23.31
	3TXslots	27.92	27.92	28.11	20.66	22.21	22.84	21.91	21.80	21.56
	4TXslots	26.70	26.82	26.72	19.44	21.11	21.45	20.69	20.70	20.17
EGPRS (8PSK)	1TXslot	26.93	27.04	27.17	19.67	21.33	21.90	20.92	20.92	20.62
	2TXslots	24.41	24.27	24.60	17.15	18.56	19.33	18.40	18.15	18.05
	3TXslots	22.55	22.65	23.16	15.29	16.94	17.89	16.54	16.53	16.61
	4TXslots	21.43	21.54	21.98	14.17	15.83	16.71	15.42	15.42	15.43

WCDMA Band V		Maximum Output Power (dBm)			ERP (dBm)					
					Main Antenna			Diversity Antenna		
		Channel 4132	Channel 4183	Channel 4233	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)	826.4 (MHz)	836.6 (MHz)	846.6 (MHz)
RMC		23.51	23.62	23.56	17.95	17.91	18.29	17.30	17.50	17.01
HSDPA	Sub - Test 1	22.97	23.04	23.00	17.41	17.33	17.73	16.76	16.92	16.45
	Sub - Test 2	22.96	23.06	22.97	17.40	17.35	17.70	16.75	16.94	16.42
	Sub - Test 3	22.43	22.56	22.49	16.87	16.85	17.22	16.22	16.44	15.94
	Sub - Test 4	22.44	22.57	22.47	16.88	16.86	17.20	16.23	16.45	15.92
HSUPA	Sub - Test 1	22.93	23.03	22.95	17.37	17.32	17.68	16.72	16.91	16.40
	Sub - Test 2	21.92	22.01	21.94	16.36	16.30	16.67	15.71	15.89	15.39
	Sub - Test 3	22.39	22.49	22.43	16.83	16.78	17.16	16.18	16.37	15.88
	Sub - Test 4	21.85	21.98	21.91	16.29	16.27	16.64	15.64	15.86	15.36
	Sub - Test 5	22.86	22.96	22.89	17.30	17.25	17.62	16.65	16.84	16.34
DC-HSDPA	Sub - Test 1	22.85	22.98	22.90	17.29	17.27	17.63	16.64	16.86	16.35
	Sub - Test 2	22.84	22.97	22.89	17.28	17.26	17.62	16.63	16.85	16.34
	Sub - Test 3	22.42	22.46	22.40	16.86	16.75	17.13	16.21	16.34	15.85
	Sub - Test 4	22.41	22.45	22.39	16.85	16.74	17.12	16.20	16.33	15.84



HSPA+	16QAM	22.40	22.53	22.46	16.84	16.82	17.19	16.19	16.41	15.91
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LTE Band 5				Maximum Output Power (dBm)			ERP (dBm)					
			Main Antenna				Diversity Antenna					
BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)								
				20407 /824.7	20525 /836.5	20643 /848.3	20407 /824.7	20525 /836.5	20643 /848.3	20407 /824.7	20525 /836.5	20643 /848.3
1.4MHz	QPSK	1	0	24.48	24.34	24.33	18.92	18.63	19.06	18.27	18.22	17.78
		1	2	24.33	24.41	24.37	18.77	18.70	19.10	18.12	18.29	17.82
		1	5	24.24	24.19	24.21	18.68	18.48	18.94	18.03	18.07	17.66
		3	0	24.42	24.37	24.30	18.86	18.66	19.03	18.21	18.25	17.75
		3	2	24.34	24.39	24.28	18.78	18.68	19.01	18.13	18.27	17.73
		3	3	24.42	24.28	24.37	18.86	18.57	19.10	18.21	18.16	17.82
		6	0	23.39	23.47	23.27	17.83	17.76	18.00	17.18	17.35	16.72
	16QAM	1	0	23.59	23.61	23.67	18.03	17.90	18.40	17.38	17.49	17.12
		1	2	23.57	23.55	23.59	18.01	17.84	18.32	17.36	17.43	17.04
		1	5	23.41	23.38	23.45	17.85	17.67	18.18	17.20	17.26	16.90
		3	0	23.40	23.34	23.41	17.84	17.63	18.14	17.19	17.22	16.86
		3	2	23.44	23.41	23.49	17.88	17.70	18.22	17.23	17.29	16.94
		3	3	23.39	23.36	23.42	17.83	17.65	18.15	17.18	17.24	16.87
		6	0	22.57	22.56	22.66	17.01	16.85	17.39	16.36	16.44	16.11
	64QAM	1	0	23.32	23.28	23.34	17.76	17.57	18.07	17.11	17.16	16.79
		1	2	23.22	23.20	23.26	17.66	17.49	17.99	17.01	17.08	16.71
		1	5	23.15	23.14	23.16	17.59	17.43	17.89	16.94	17.02	16.61
		3	0	23.29	23.19	23.26	17.73	17.48	17.99	17.08	17.07	16.71
		3	2	23.17	23.12	23.20	17.61	17.41	17.93	16.96	17.00	16.65
		3	3	23.18	23.15	23.21	17.62	17.44	17.94	16.97	17.03	16.66
		6	0	22.27	22.26	22.36	16.71	16.55	17.09	16.06	16.14	15.81
BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)								
				20415 /825.5	20525 /836.5	20635 /847.5	20415 /825.5	20525 /836.5	20635 /847.5	20415 /825.5	20525 /836.5	20635 /847.5
3MHz	QPSK	1	0	24.50	24.38	24.36	18.94	18.67	19.09	18.29	18.26	17.81
		1	7	24.31	24.44	24.41	18.75	18.73	19.14	18.10	18.32	17.86
		1	14	24.27	24.24	24.25	18.71	18.53	18.98	18.06	18.12	17.70
		8	0	23.52	23.49	23.43	17.96	17.78	18.16	17.31	17.37	16.88
		8	4	23.46	23.49	23.40	17.90	17.78	18.13	17.25	17.37	16.85
		8	7	23.52	23.39	23.47	17.96	17.68	18.20	17.31	17.27	16.92



	16QAM	15	0	23.39	23.51	23.30	17.83	17.80	18.03	17.18	17.39	16.75
		1	0	23.62	23.63	23.70	18.06	17.92	18.43	17.41	17.51	17.15
		1	7	23.60	23.55	23.63	18.04	17.84	18.36	17.39	17.43	17.08
		1	14	23.43	23.42	23.48	17.87	17.71	18.21	17.22	17.30	16.93
		8	0	22.51	22.47	22.53	16.95	16.76	17.26	16.30	16.35	15.98
		8	4	22.55	22.54	22.61	16.99	16.83	17.34	16.34	16.42	16.06
		8	7	22.49	22.48	22.55	16.93	16.77	17.28	16.28	16.36	16.00
		15	0	22.60	22.60	22.69	17.04	16.89	17.42	16.39	16.48	16.14
	64QAM	1	0	23.35	23.30	23.37	17.79	17.59	18.10	17.14	17.18	16.82
		1	7	23.25	23.20	23.28	17.69	17.49	18.01	17.04	17.08	16.73
		1	14	23.17	23.13	23.19	17.61	17.42	17.92	16.96	17.01	16.64
		8	0	22.40	22.32	22.38	16.84	16.61	17.11	16.19	16.20	15.83
		8	4	22.28	22.25	22.32	16.72	16.54	17.05	16.07	16.13	15.77
		8	7	22.28	22.27	22.34	16.72	16.56	17.07	16.07	16.15	15.79
		15	0	22.30	22.30	22.39	16.74	16.59	17.12	16.09	16.18	15.84
BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)								
				20425 /826.5	20525 /836.5	20625 /846.5	20425 /826.5	20525 /836.5	20625 /846.5	20425 /826.5	20525 /836.5	20625 /846.5
5MHz	QPSK	1	0	24.48	24.33	24.33	18.92	18.62	19.06	18.27	18.21	17.78
		1	13	24.30	24.44	24.39	18.74	18.73	19.12	18.09	18.32	17.84
		1	24	24.23	24.18	24.20	18.67	18.47	18.93	18.02	18.06	17.65
		12	0	23.50	23.45	23.40	17.94	17.74	18.13	17.29	17.33	16.85
		12	6	23.44	23.45	23.35	17.88	17.74	18.08	17.23	17.33	16.80
		12	13	23.49	23.38	23.44	17.93	17.67	18.17	17.28	17.26	16.89
		25	0	23.41	23.48	23.27	17.85	17.77	18.00	17.20	17.36	16.72
	16QAM	1	0	23.56	23.60	23.67	18.00	17.89	18.40	17.35	17.48	17.12
		1	13	23.58	23.54	23.61	18.02	17.83	18.34	17.37	17.42	17.06
		1	24	23.40	23.38	23.44	17.84	17.67	18.17	17.19	17.26	16.89
		12	0	22.49	22.46	22.51	16.93	16.75	17.24	16.28	16.34	15.96
		12	6	22.51	22.48	22.56	16.95	16.77	17.29	16.30	16.36	16.01
		12	13	22.47	22.44	22.52	16.91	16.73	17.25	16.26	16.32	15.97
		25	0	22.58	22.56	22.64	17.02	16.85	17.37	16.37	16.44	16.09
	64QAM	1	0	23.29	23.27	23.34	17.73	17.56	18.07	17.08	17.15	16.79
		1	13	23.23	23.19	23.26	17.67	17.48	17.99	17.02	17.07	16.71
		1	24	23.18	23.12	23.19	17.62	17.41	17.92	16.97	17.00	16.64
		12	0	22.40	22.35	22.40	16.84	16.64	17.13	16.19	16.23	15.85
		12	6	22.25	22.21	22.30	16.69	16.50	17.03	16.04	16.09	15.75



		12	13	22.26	22.23	22.31	16.70	16.52	17.04	16.05	16.11	15.76
		25	0	22.28	22.26	22.34	16.72	16.55	17.07	16.07	16.14	15.79
BW	Modulation	RB size	RB offset	Channel/Frequency(MHz)								
				20450 /829	20525 /836.5	20600 /844	20450 /829	20525 /836.5	20600 /844	20450 /829	20525 /836.5	20600 /844
10MHz	QPSK	1	0	24.45	24.29	24.30	18.89	18.58	19.03	18.24	18.17	17.75
		1	25	24.29	24.40	24.37	18.73	18.69	19.10	18.08	18.28	17.82
		1	49	24.21	24.17	24.17	18.65	18.46	18.90	18.00	18.05	17.62
		25	0	23.47	23.40	23.36	17.91	17.69	18.09	17.26	17.28	16.81
		25	13	23.42	23.41	23.32	17.86	17.70	18.05	17.21	17.29	16.77
		25	25	23.46	23.33	23.40	17.90	17.62	18.13	17.25	17.21	16.85
		50	0	23.38	23.43	23.23	17.82	17.72	17.96	17.17	17.31	16.68
	16QAM	1	0	23.60	23.56	23.62	18.04	17.85	18.35	17.39	17.44	17.07
		1	25	23.54	23.52	23.57	17.98	17.81	18.30	17.33	17.40	17.02
		1	49	23.38	23.35	23.42	17.82	17.64	18.15	17.17	17.23	16.87
		25	0	22.46	22.42	22.48	16.90	16.71	17.21	16.25	16.30	15.93
		25	13	22.48	22.46	22.53	16.92	16.75	17.26	16.27	16.34	15.98
		25	25	22.44	22.39	22.48	16.88	16.68	17.21	16.23	16.27	15.93
		50	0	22.56	22.52	22.61	17.00	16.81	17.34	16.35	16.40	16.06
	64QAM	1	0	23.27	23.23	23.29	17.71	17.52	18.02	17.06	17.11	16.74
		1	25	23.19	23.17	23.22	17.63	17.46	17.95	16.98	17.05	16.67
		1	49	23.12	23.06	23.13	17.56	17.35	17.86	16.91	16.94	16.58
		25	0	22.35	22.27	22.33	16.79	16.56	17.06	16.14	16.15	15.78
		25	13	22.21	22.17	22.24	16.65	16.46	16.97	16.00	16.05	15.69
		25	25	22.23	22.18	22.27	16.67	16.47	17.00	16.02	16.06	15.72
		50	0	22.26	22.22	22.31	16.70	16.51	17.04	16.05	16.10	15.76

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 6.2kHz, VBW is set to 18kHz 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),

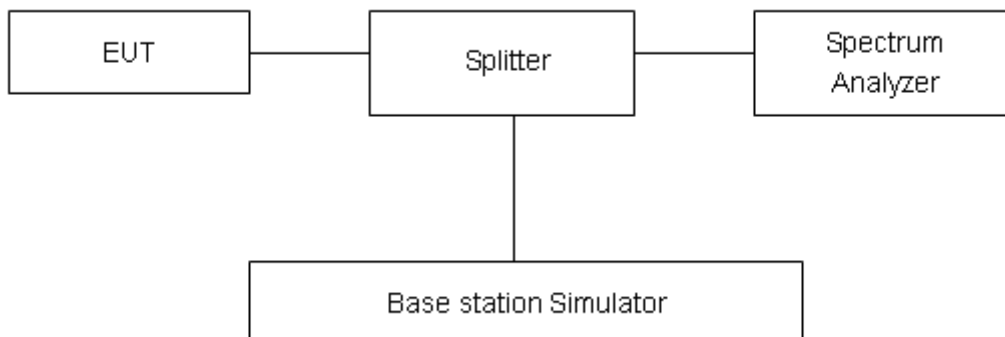
RBW is set to 62 kHz, VBW is set to 180kHz for LTE Band 5 (3MHz),

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 (GMSK)	128	824.2	0.2431	0.316
	190	836.6	0.2449	0.304
	251	848.8	0.2482	0.313
GPRS 850 (GMSK)	128	824.2	0.2468	0.318
	190	836.6	0.2439	0.314
	251	848.8	0.2458	0.310
EGPRS 850 (8PSK)	128	824.2	0.2467	0.308
	190	836.6	0.2440	0.319
	251	848.8	0.2444	0.311
WCDMA Band V (RMC)	4132	826.4	4.1220	4.697
	4183	836.6	4.1332	4.693
	4233	846.6	4.1356	4.694

LTE Band 5						
RB	Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	99% Power Bandwidth(MHz)	-26dBc Bandwidth(MHz)
100%	QPSK	1.4	20407	824.7	1.0955	1.233
			20525	836.5	1.0976	1.248
			20643	848.3	1.0914	1.242
		3	20415	825.5	2.7039	3.008
			20525	836.5	2.7102	2.990
			20635	847.5	2.7074	3.000
		5	20425	826.5	4.5121	4.941
			20525	836.5	4.5273	4.993
			20625	846.5	4.5242	4.980
		10	20450	829	8.9892	9.748
			20525	836.5	8.9514	9.771
			20600	844	8.9953	9.755
	16QAM	1.4	20407	824.7	1.0943	1.244
			20525	836.5	1.0985	1.240
			20643	848.3	1.0922	1.234



		3	20415	825.5	2.6883	2.972
			20525	836.5	2.7054	2.971
			20635	847.5	2.7046	3.019
		5	20425	826.5	4.5150	4.903
			20525	836.5	4.5110	4.948
			20625	846.5	4.5117	4.952
		10	20450	829	8.9952	9.675
			20525	836.5	8.9978	9.675
			20600	844	8.9927	9.690
	64QAM	1.4	20407	824.7	1.0946	1.238
			20525	836.5	1.0910	1.260
			20643	848.3	1.0970	1.255
		3	20415	825.5	2.6985	3.013
			20525	836.5	2.7004	3.022
			20635	847.5	2.7020	2.999
		5	20425	826.5	4.5460	4.968
			20525	836.5	4.5271	4.942
			20625	846.5	4.5123	4.940
		10	20450	829	8.9986	9.733
			20525	836.5	8.9827	9.708
			20600	844	9.0099	9.746



GSM 850 CH-Low



GSM 850 GPRS CH-Low



GSM 850 CH-Middle



GSM 850 GPRS CH-Middle



GSM 850 CH-High



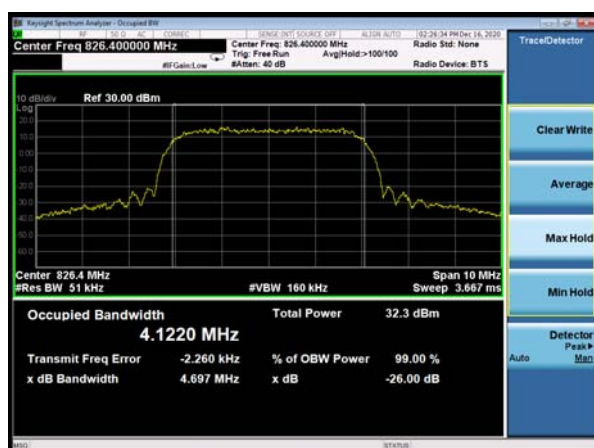
GSM 850 GPRS CH-High



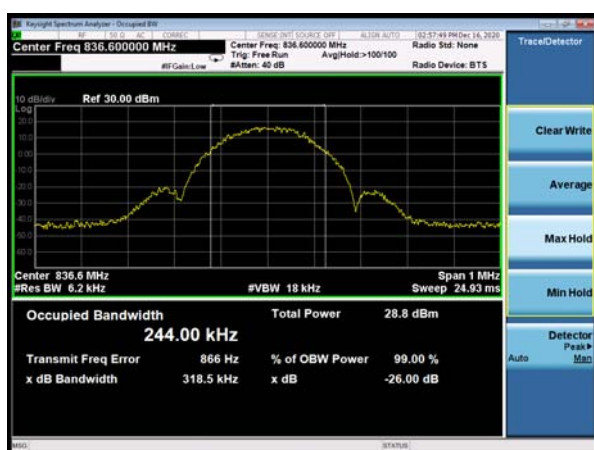
GSM 850 EGPRS CH-Low



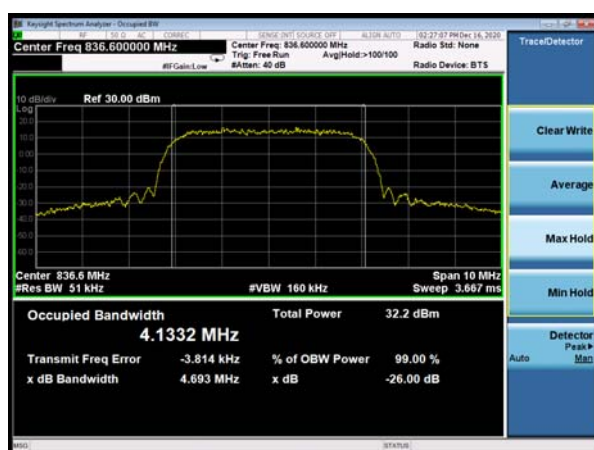
WCDMA Band V CH-Low



GSM 850 EGPRS CH-Middle



WCDMA Band V CH-Middle



GSM 850 EGPRS CH-High

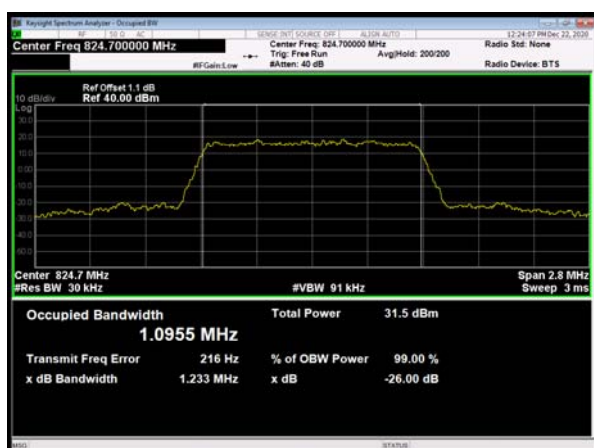


WCDMA Band V CH-High

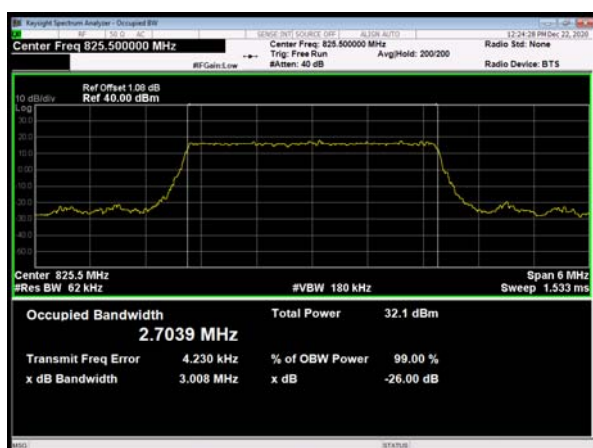




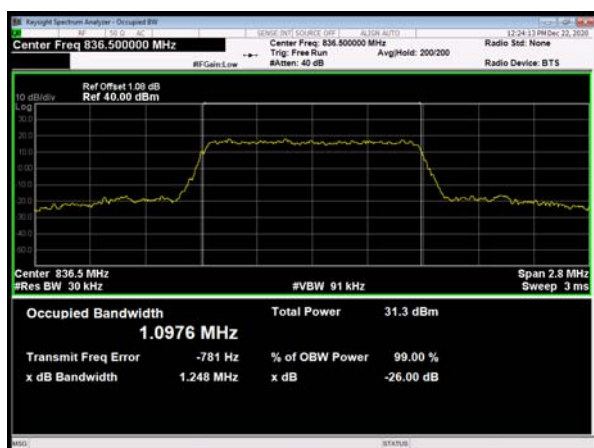
LTE Band 5 QPSK 1.4MHz CH-Low



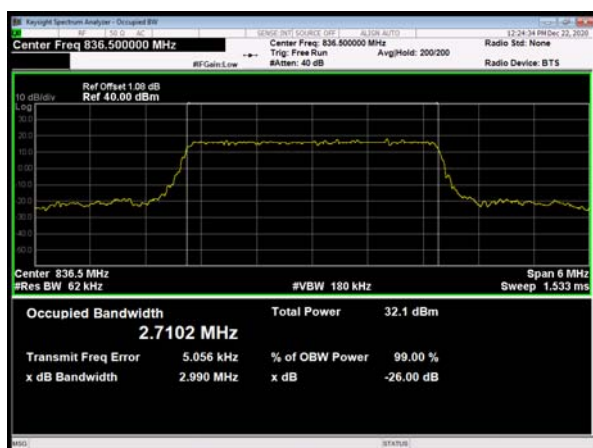
LTE Band 5 QPSK 3MHz CH-Low



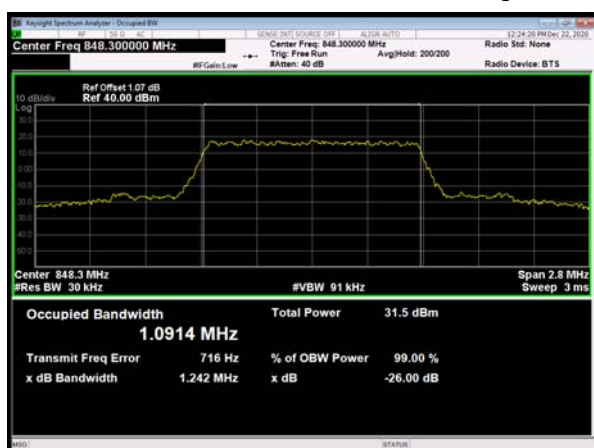
LTE Band 5 QPSK 1.4MHz CH-Middle



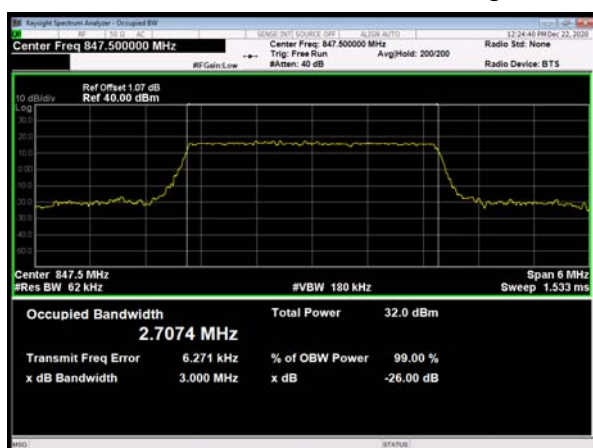
LTE Band 5 QPSK 3MHz CH-Middle



LTE Band 5 QPSK 1.4MHz CH-High

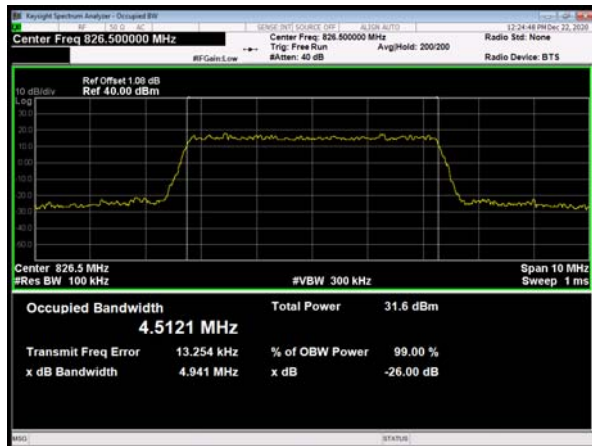


LTE Band 5 QPSK 3MHz CH-High

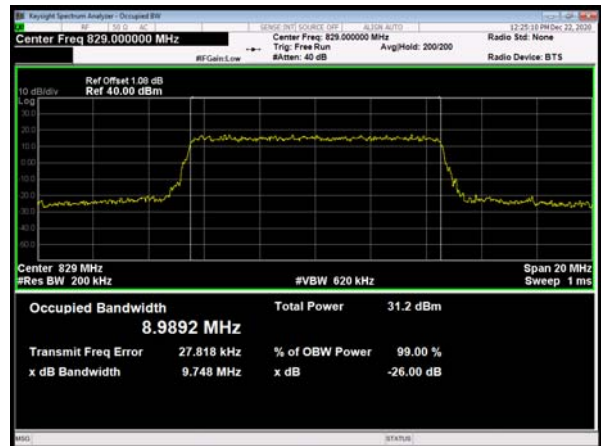




LTE Band 5 QPSK 5MHz CH-Low



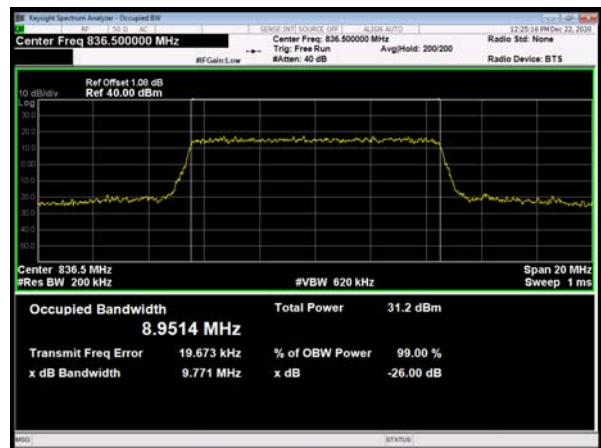
LTE Band 5 QPSK 10MHz CH-Low



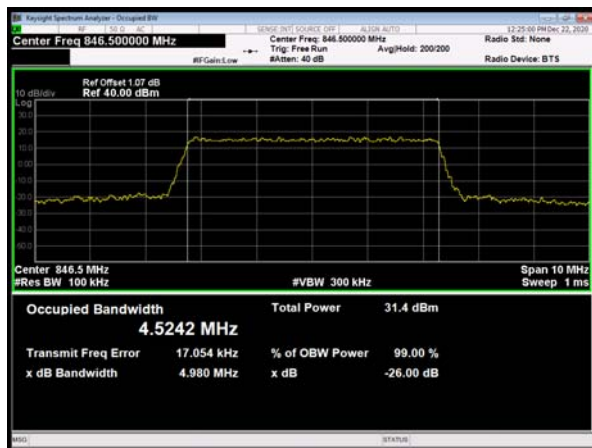
LTE Band 5 QPSK 5MHz CH-Middle



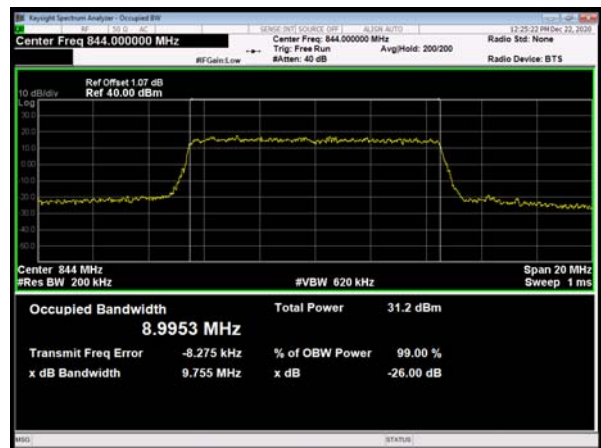
LTE Band 5 QPSK 10MHz CH-Middle



LTE Band 5 QPSK 5MHz CH-High

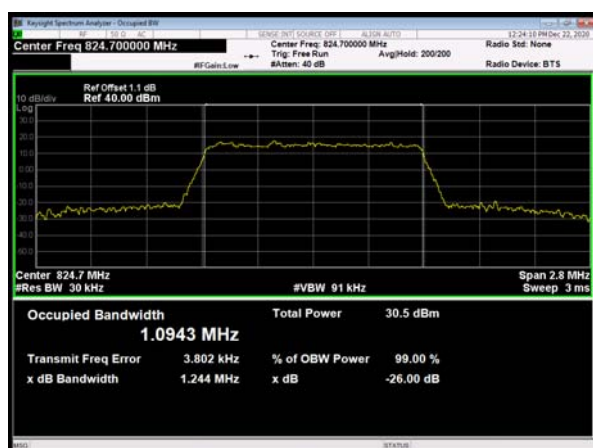


LTE Band 5 QPSK 10MHz CH-High

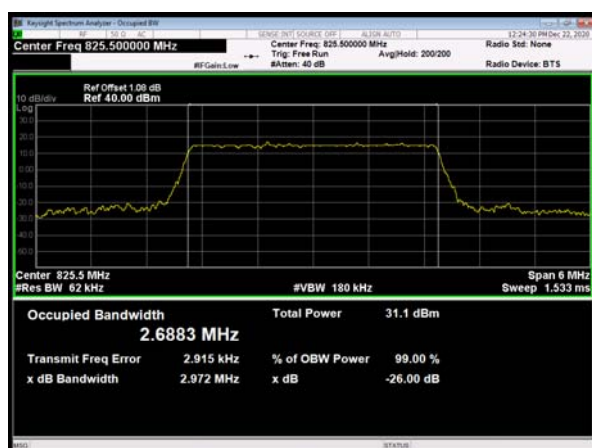




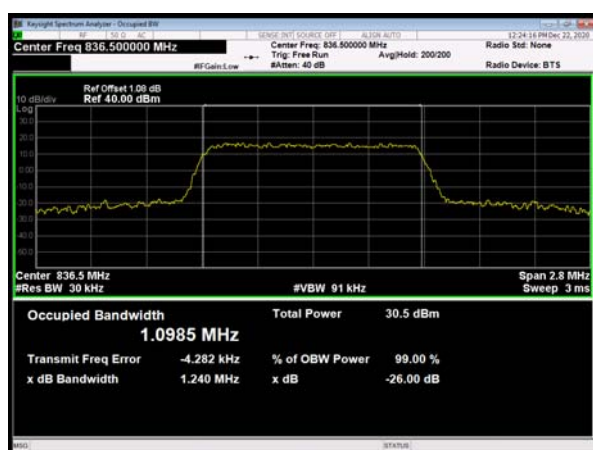
LTE Band 5 16QAM 1.4MHz CH-Low



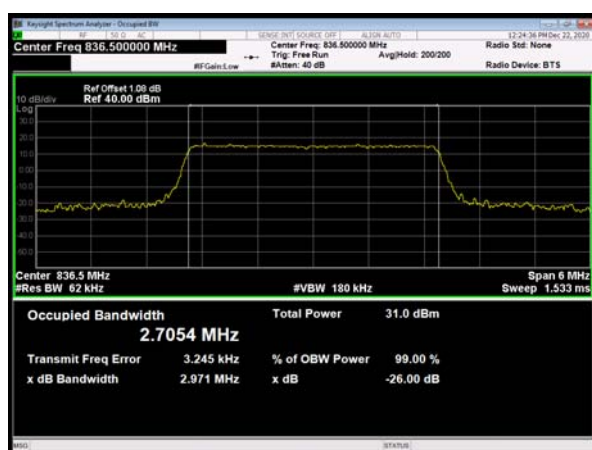
LTE Band 5 16QAM 3MHz CH-Low



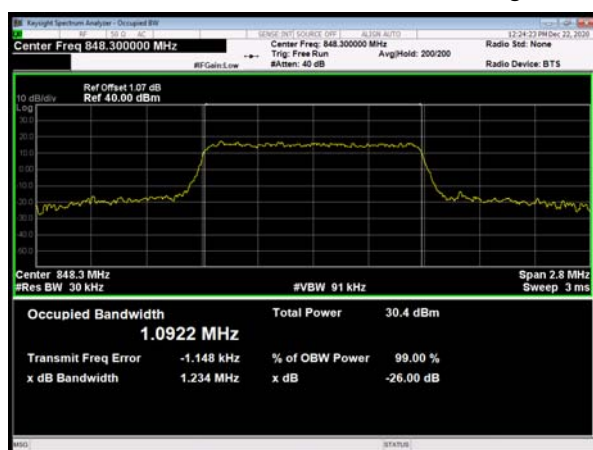
LTE Band 5 16QAM 1.4MHz CH-Middle



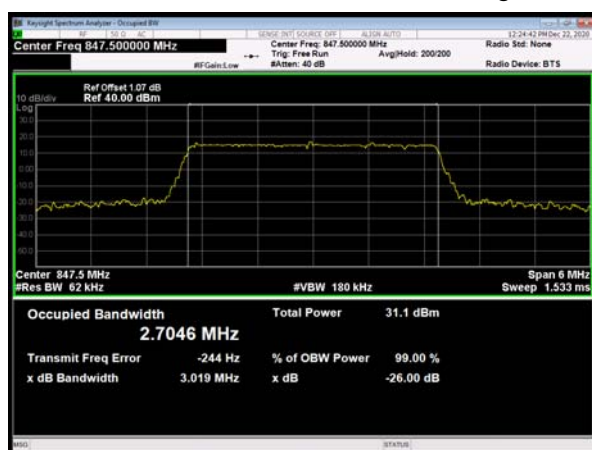
LTE Band 5 16QAM 3MHz CH-Middle



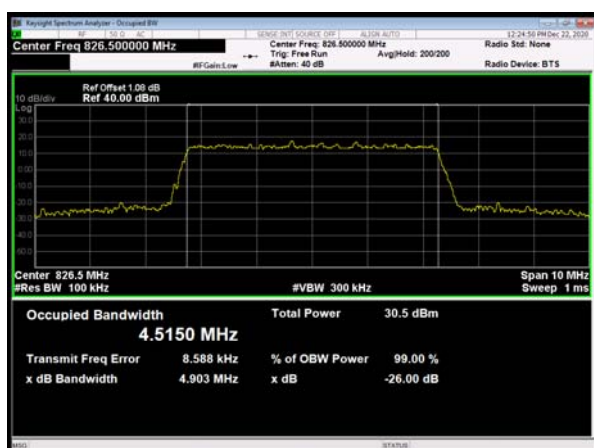
LTE Band 5 16QAM 1.4MHz CH-High



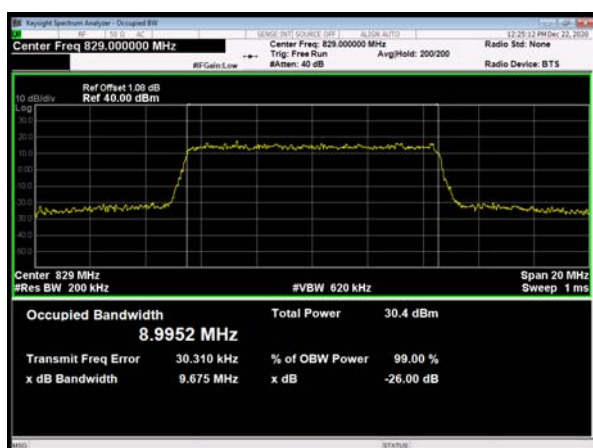
LTE Band 5 16QAM 3MHz CH-High



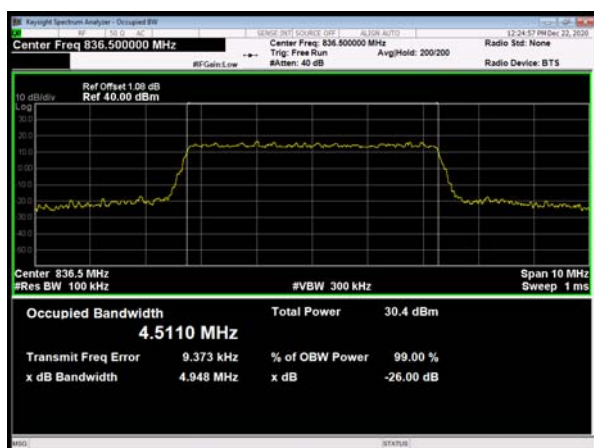
LTE Band 5 16QAM 5MHz CH-Low



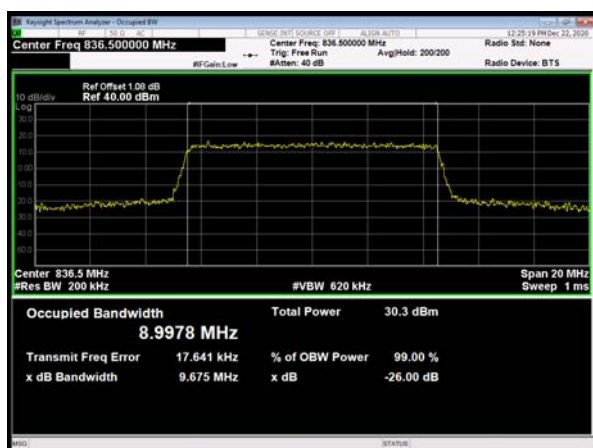
LTE Band 5 16QAM 10MHz CH-Low



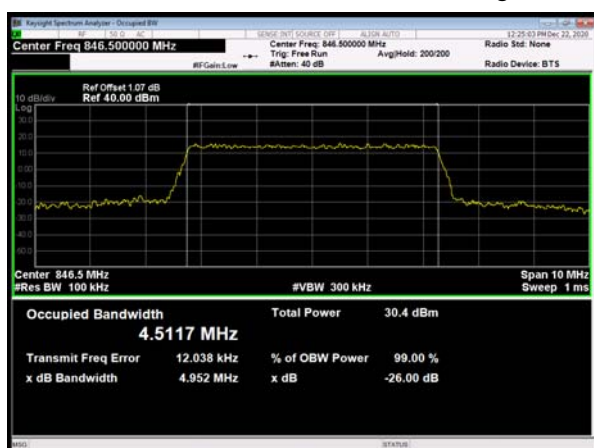
LTE Band 5 16QAM 5MHz CH-Middle



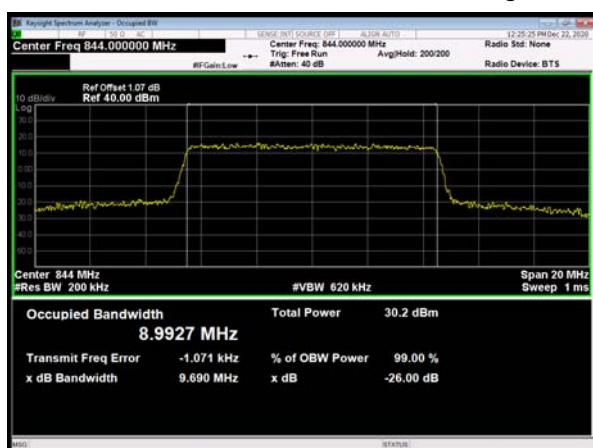
LTE Band 5 16QAM 10MHz CH-Middle



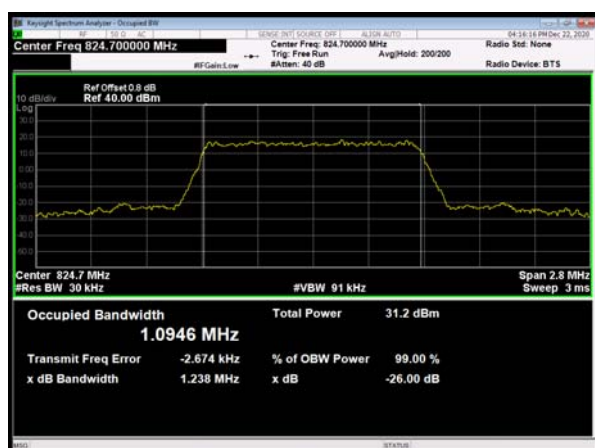
LTE Band 5 16QAM 5MHz CH-High



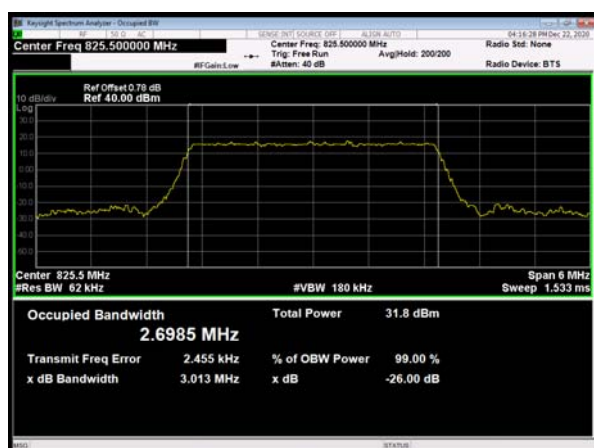
LTE Band 5 16QAM 10MHz CH-High



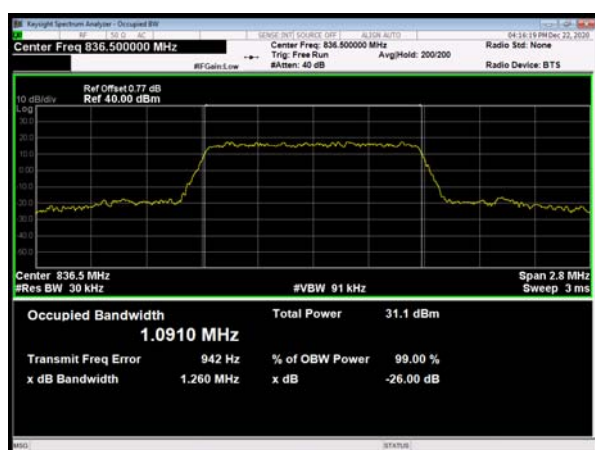
LTE Band 5 64QAM 1.4MHz CH-Low



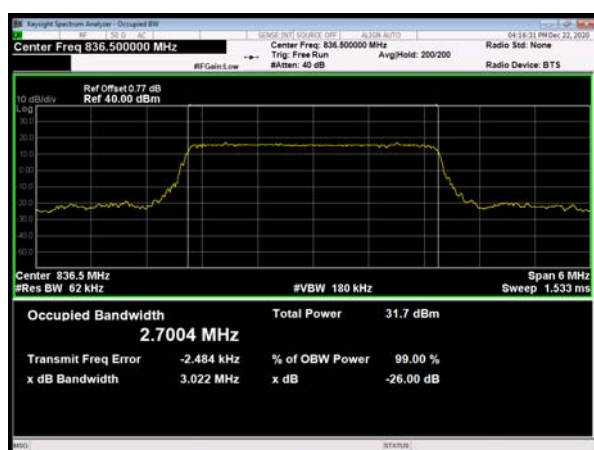
LTE Band 5 64QAM 3MHz CH-Low



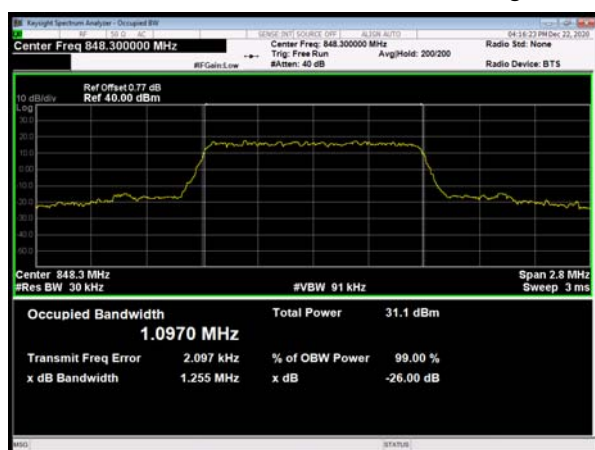
LTE Band 5 64QAM 1.4MHz CH-Middle



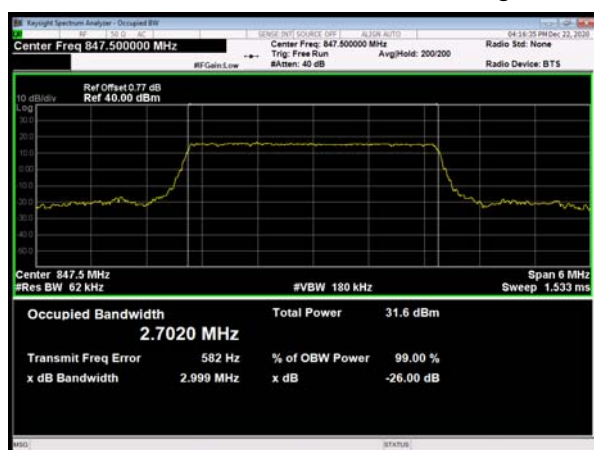
LTE Band 5 64QAM 3MHz CH-Middle



LTE Band 5 64QAM 1.4MHz CH-High

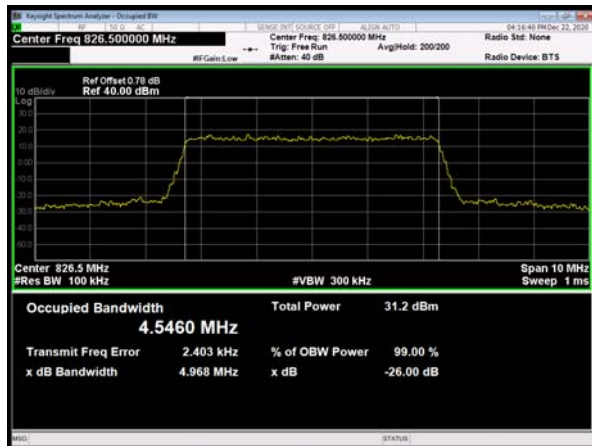


LTE Band 5 64QAM 3MHz CH-High





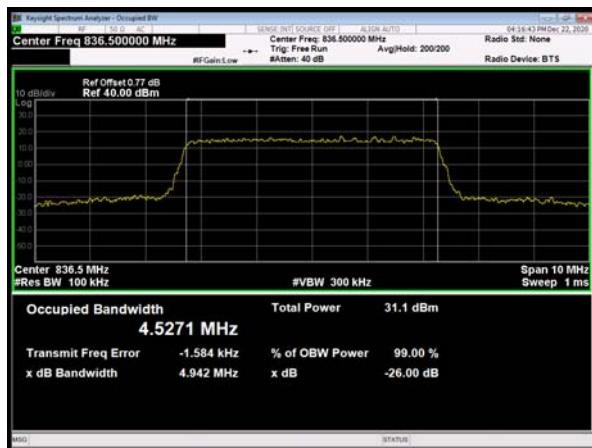
LTE Band 5 64QAM 5MHz CH-Low



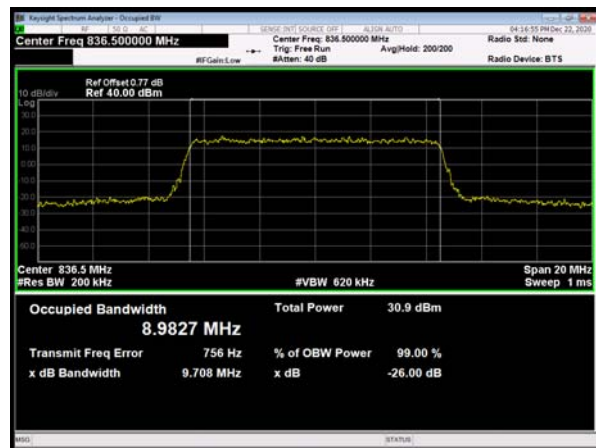
LTE Band 5 64QAM 10MHz CH-Low



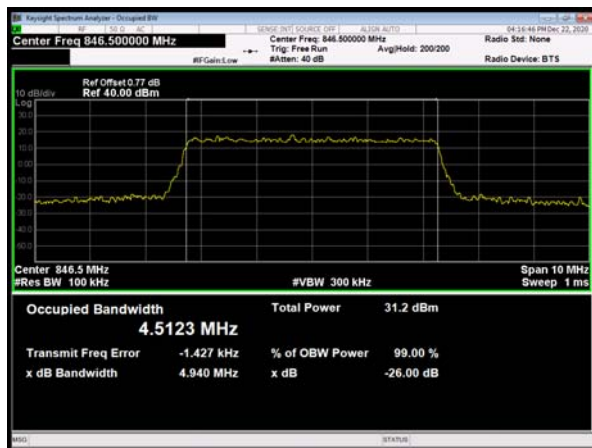
LTE Band 5 64QAM 5MHz CH-Middle



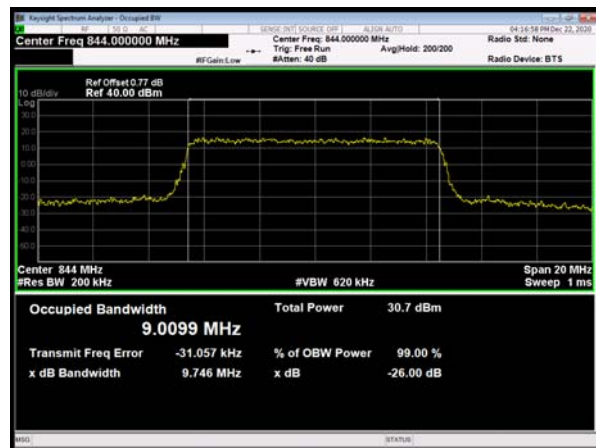
LTE Band 5 64QAM 10MHz CH-Middle



LTE Band 5 64QAM 5MHz CH-High



LTE Band 5 64QAM 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 6.2kHz,VBW is set to 18kHz 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),

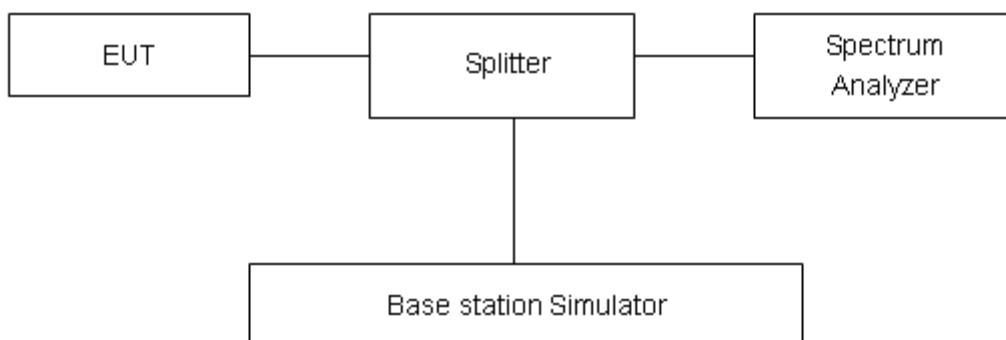
RBW is set to 30kHz,VBW is set to 91kHz for LTE Band 5 (3MHz),

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



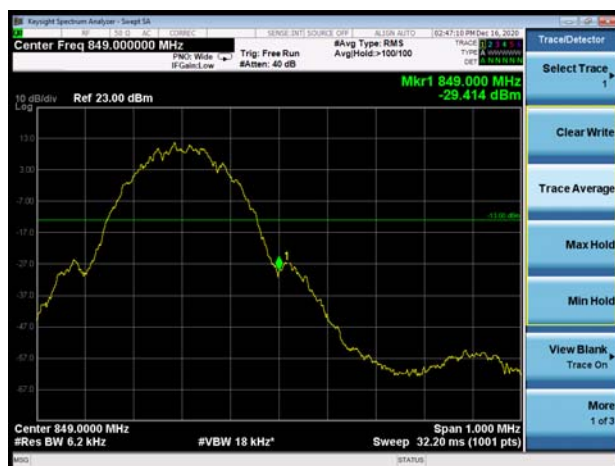
GSM 850 CH-High



GSM 850 GPRS CH-Low



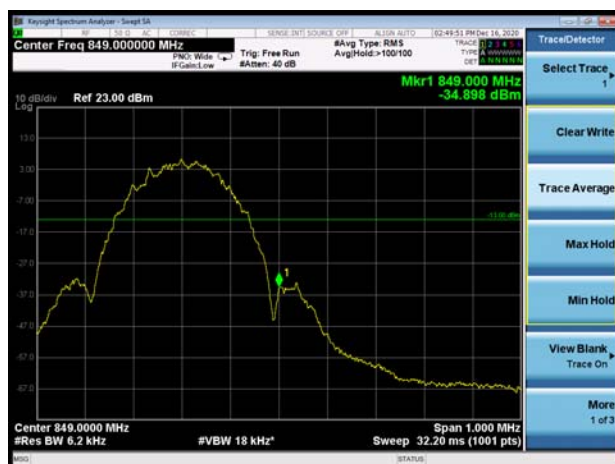
GSM 850 GPRS CH-High



GSM 850 EGPRS CH-Low



GSM 850 EGPRS CH-High





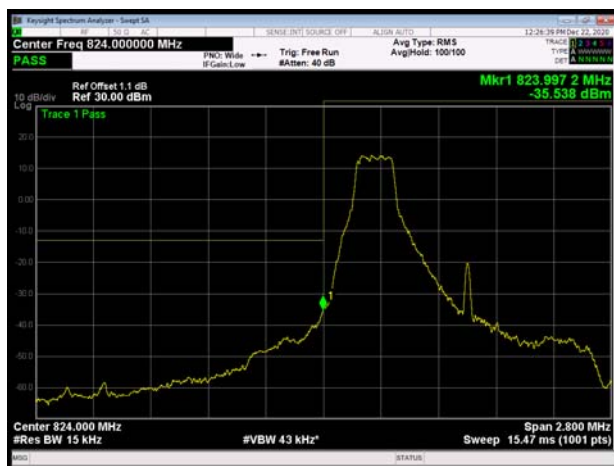
WCDMA Band V CH-Low



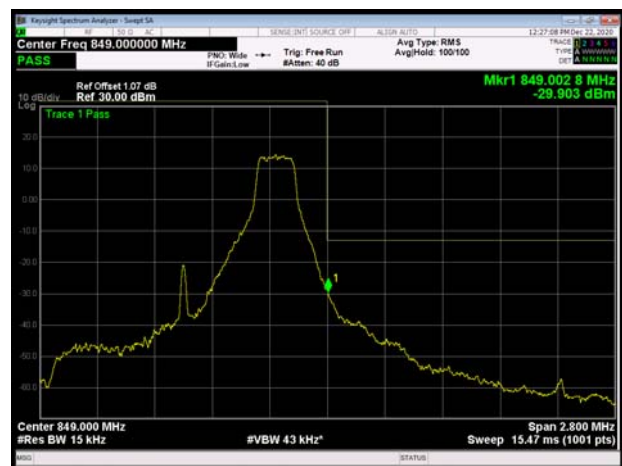
WCDMA Band V CH-High



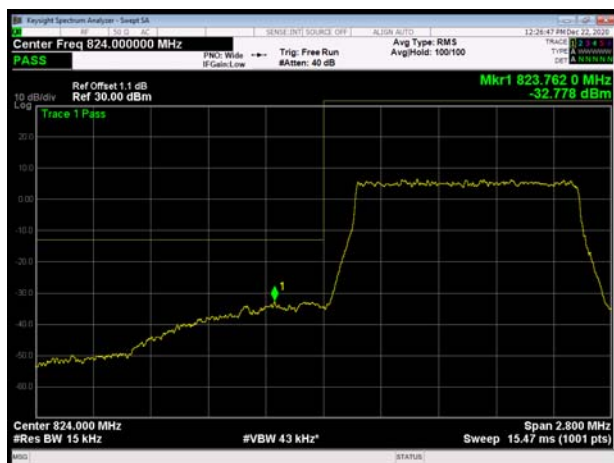
LTE Band 5 QPSK 1.4MHz CH-Low 1RB



LTE Band 5 QPSK 1.4MHz CH-High 1RB



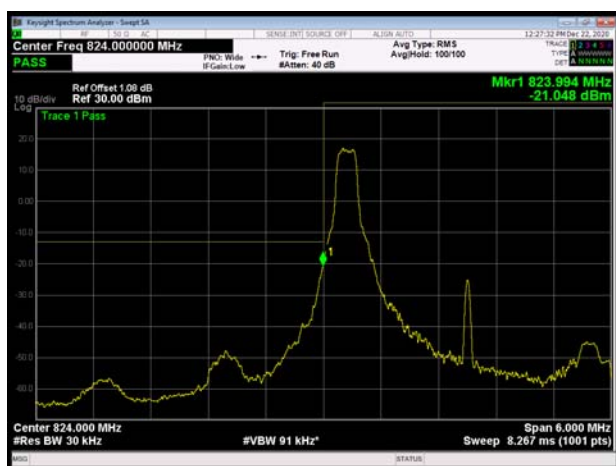
LTE Band 5 QPSK 1.4MHz CH-Low 100%RB



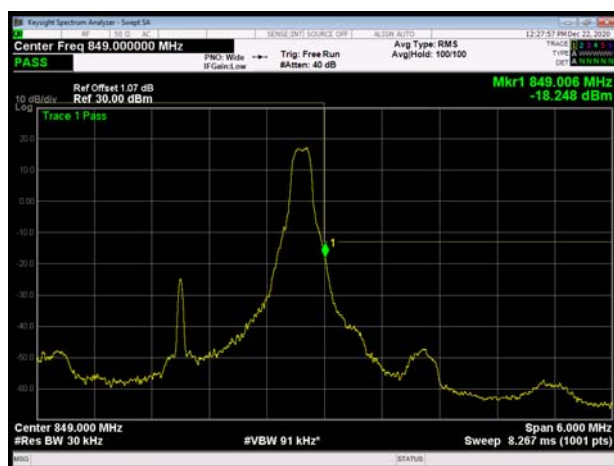
LTE Band 5 QPSK 1.4MHz CH-High 100%RB



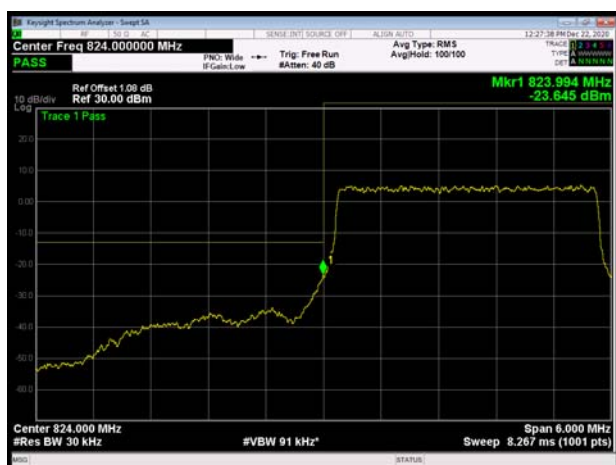
LTE Band 5 QPSK 3MHz CH-Low 1RB



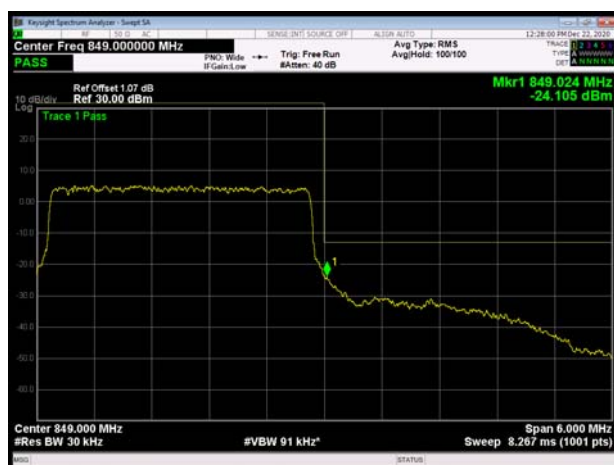
LTE Band 5 QPSK 3MHz CH-High 1RB



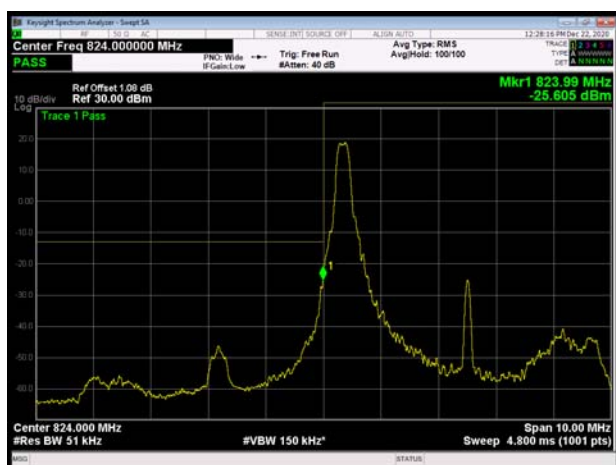
LTE Band 5 QPSK 3MHz CH-Low 100%RB



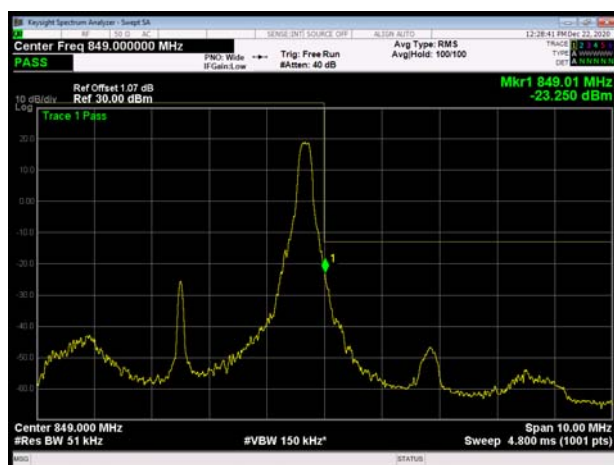
LTE Band 5 QPSK 3MHz CH-High 100%RB



LTE Band 5 QPSK 5MHz CH-Low 1RB

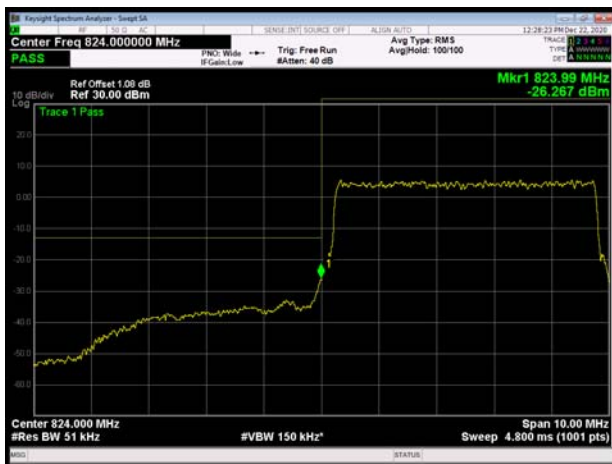


LTE Band 5 QPSK 5MHz CH-High 1RB





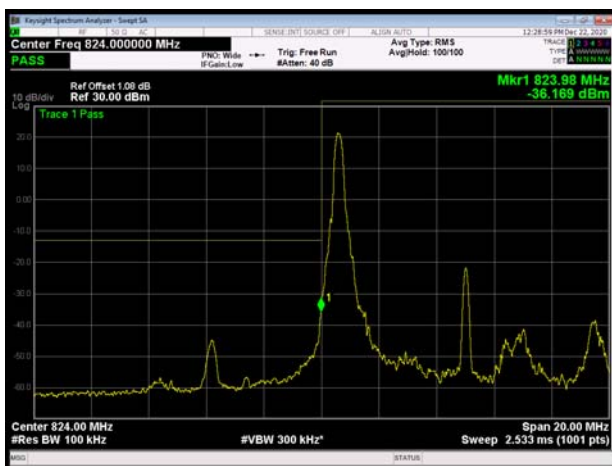
LTE Band 5 QPSK 5MHz CH-Low 100%RB



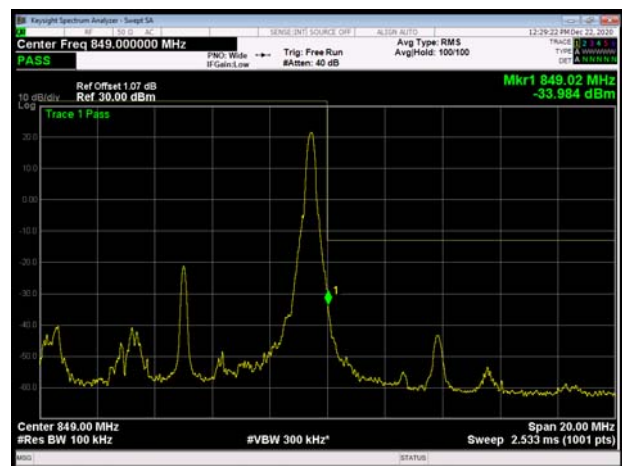
LTE Band 5 QPSK 5MHz CH-High 100%RB



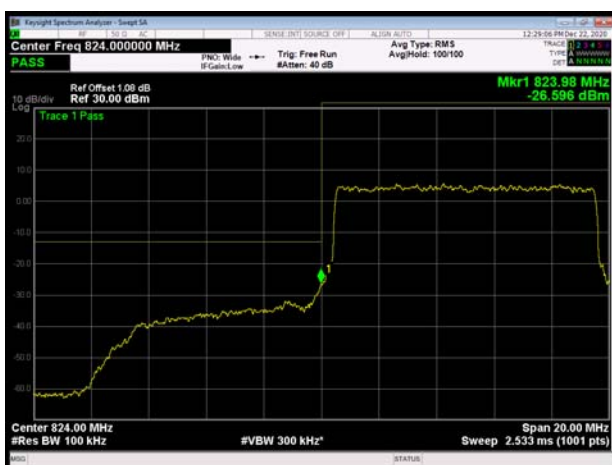
LTE Band 5 QPSK 10MHz CH-Low 1RB



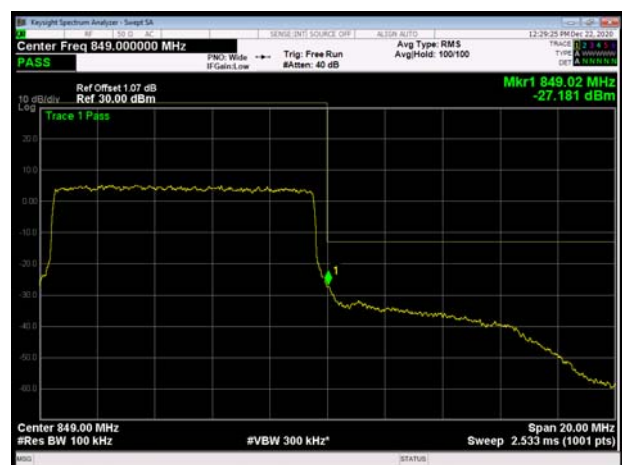
LTE Band 5 QPSK 10MHz CH-High 1RB



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

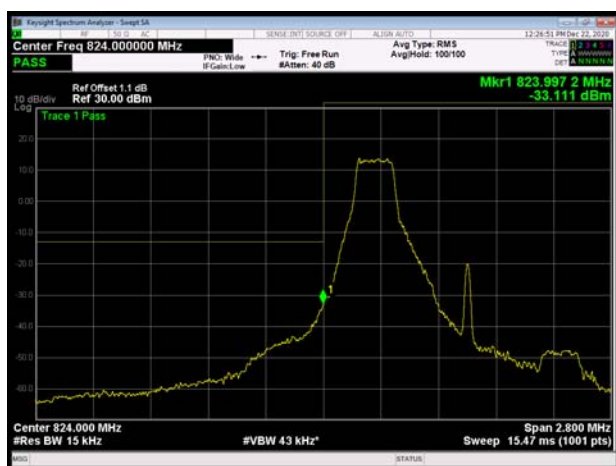


LTE Band 5 QPSK 10MHz CH-High 100%RB

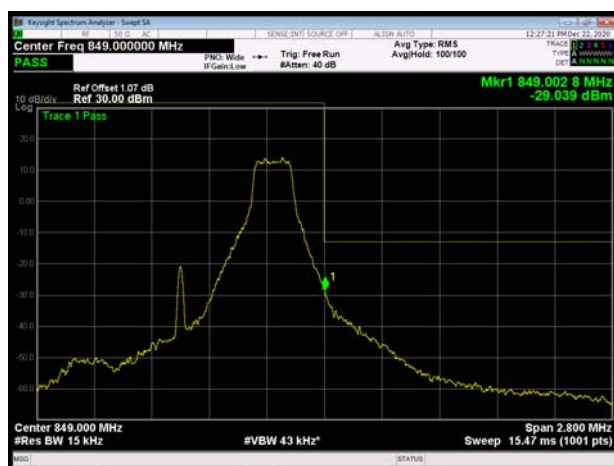




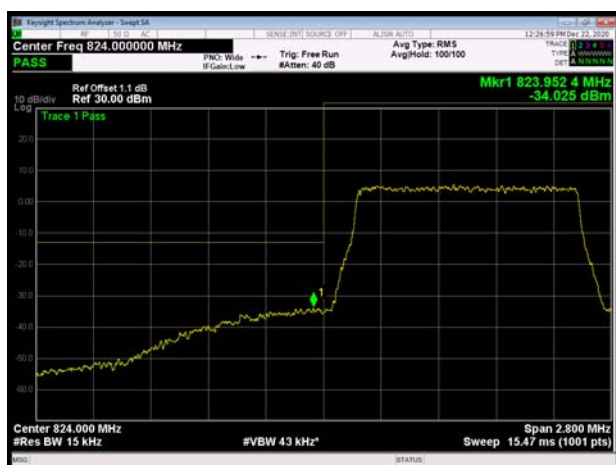
LTE Band 5 16QAM 1.4MHz CH-Low 1RB



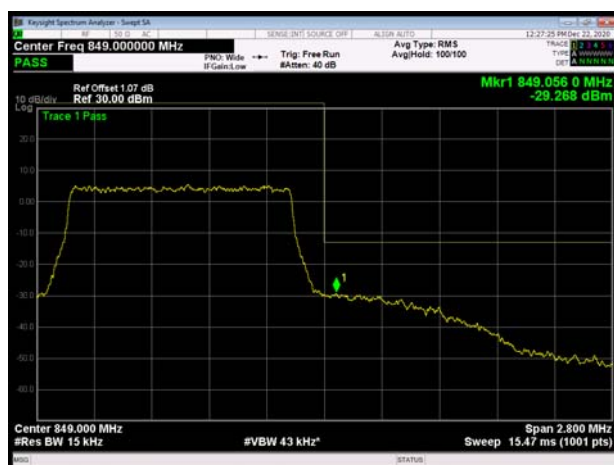
LTE Band 5 16QAM 1.4MHz CH-High 1RB



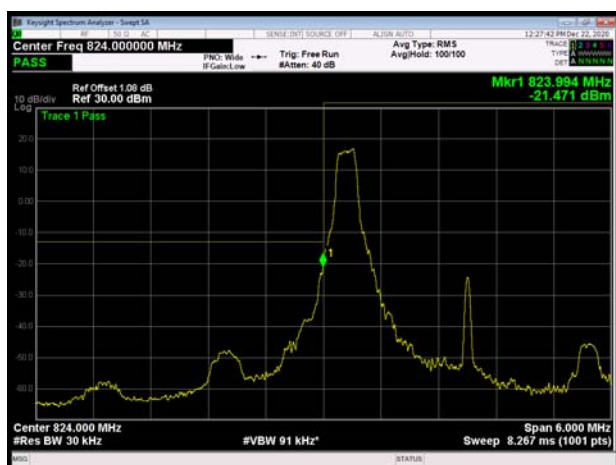
LTE Band 5 16QAM 1.4MHz CH-Low 100%RB



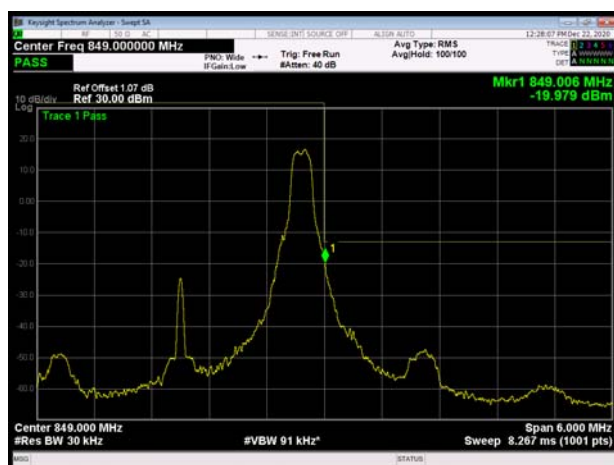
LTE Band 5 16QAM 1.4MHz CH-High 100%RB



LTE Band 5 16QAM 3MHz CH-Low 1RB

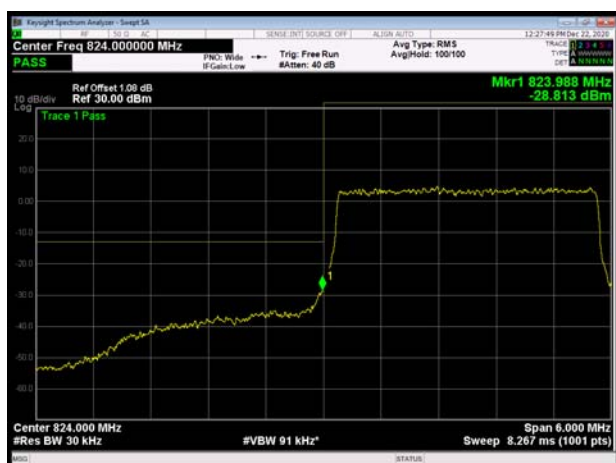


LTE Band 5 16QAM 3MHz CH-High 1RB

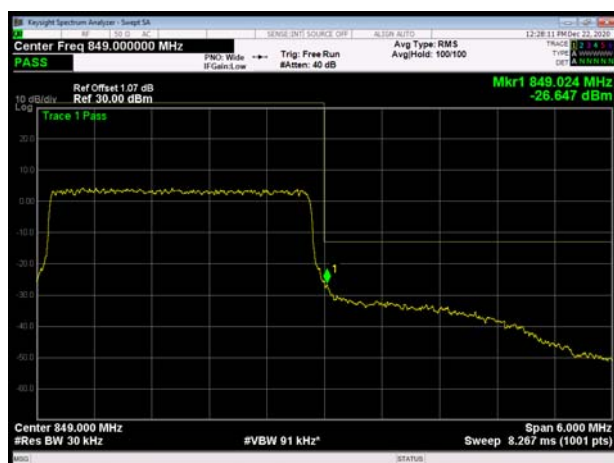




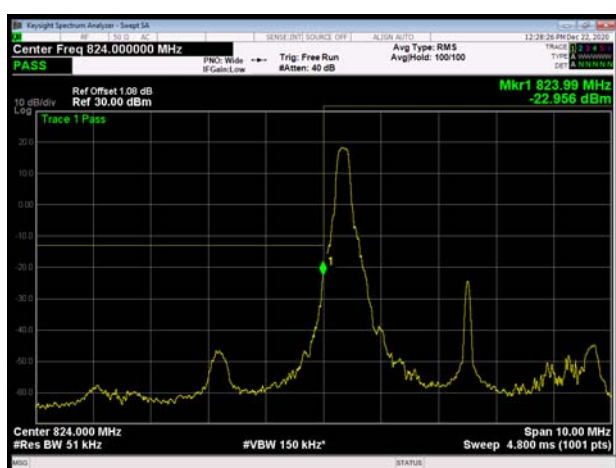
LTE Band 5 16QAM 3MHz CH-Low 100%RB



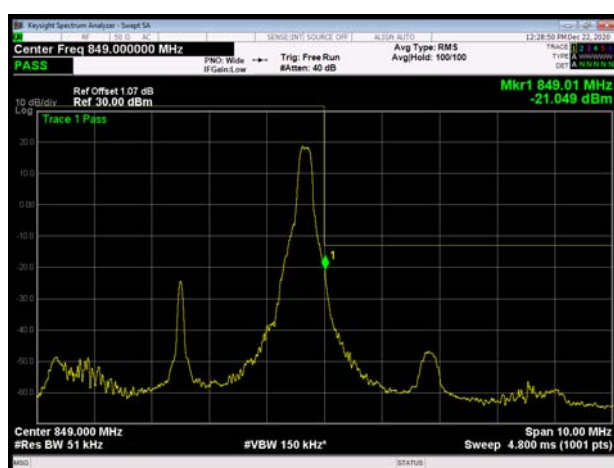
LTE Band 5 16QAM 3MHz CH-High 100%RB



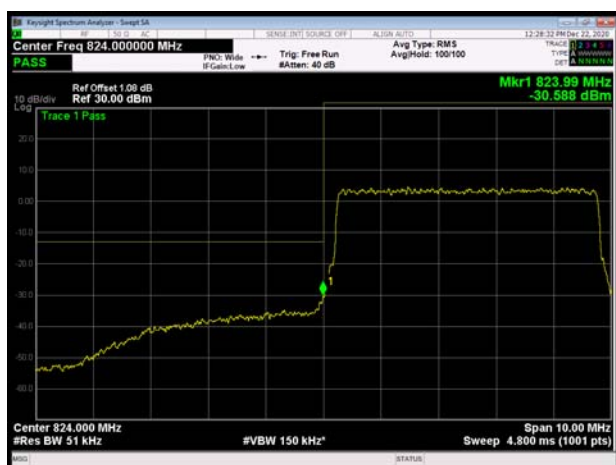
LTE Band 5 16QAM 5MHz CH-Low 1RB



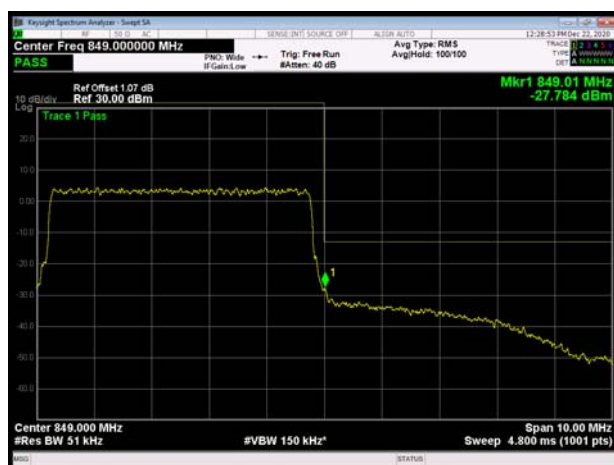
LTE Band 5 16QAM 5MHz CH-High 1RB



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

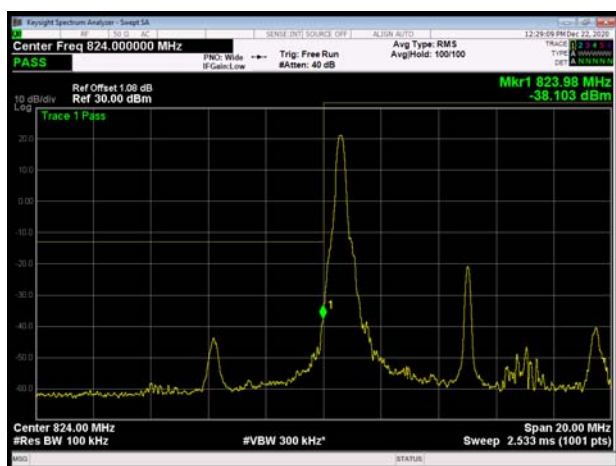


LTE Band 5 16QAM 5MHz CH-High 100%RB

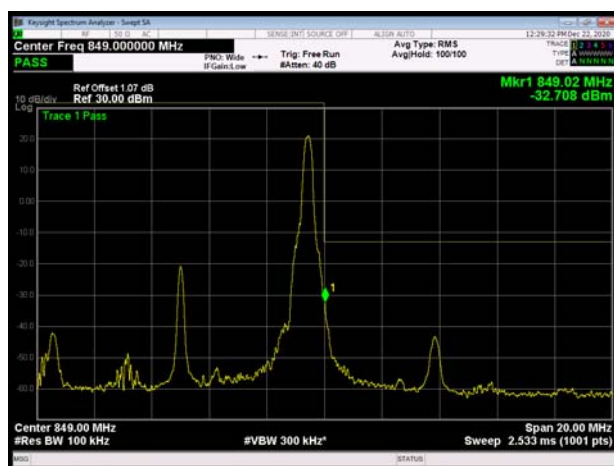




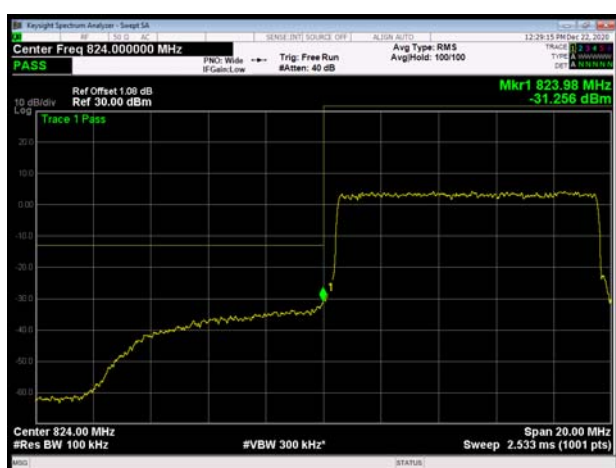
LTE Band 5 16QAM 10MHz CH-Low 1RB



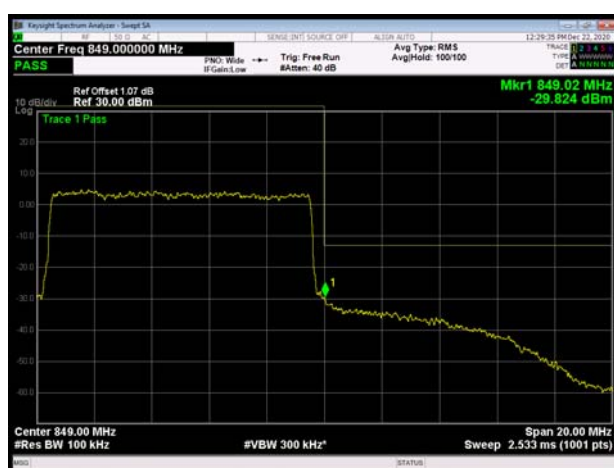
LTE Band 5 16QAM 10MHz CH-High 1RB



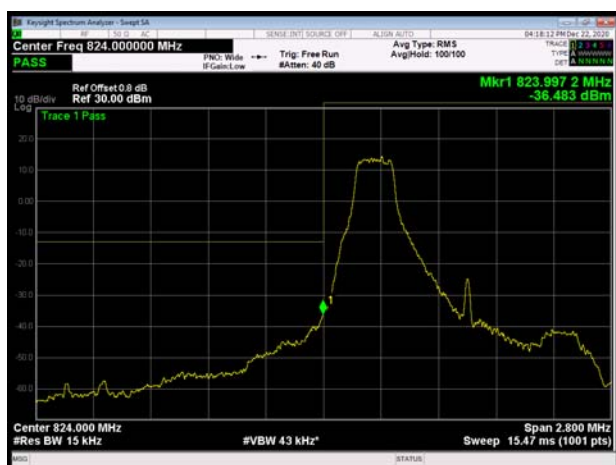
LTE Band 5 16QAM 10MHz CH-Low 100%RB



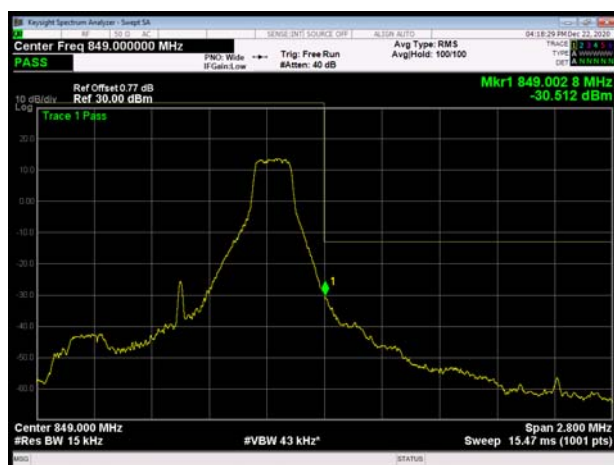
LTE Band 5 16QAM 10MHz CH-High 100%RB



LTE Band 5 64QAM 1.4MHz CH-Low 1RB

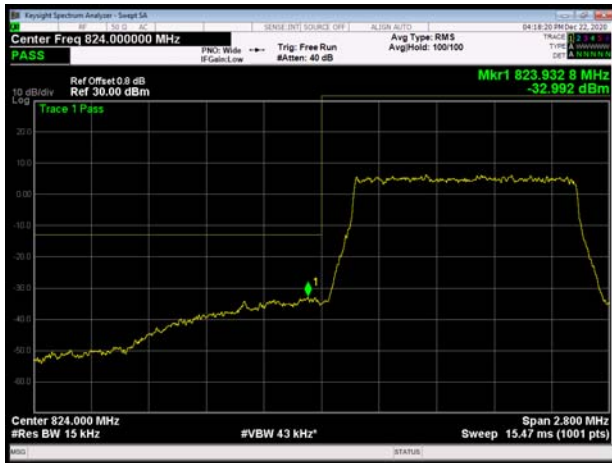


LTE Band 5 64QAM 1.4MHz CH-High 1RB





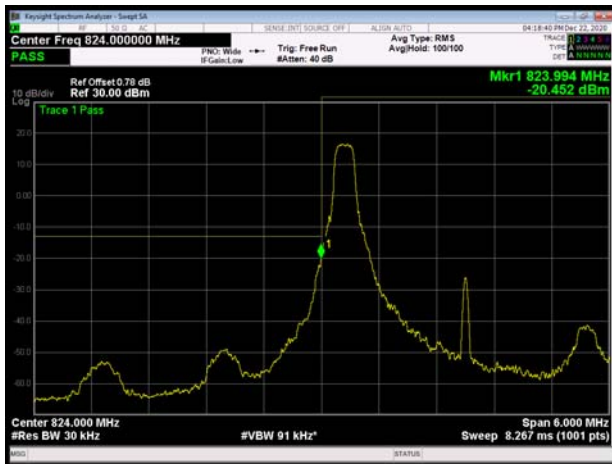
LTE Band 5 64QAM 1.4MHz CH-Low 100%RB



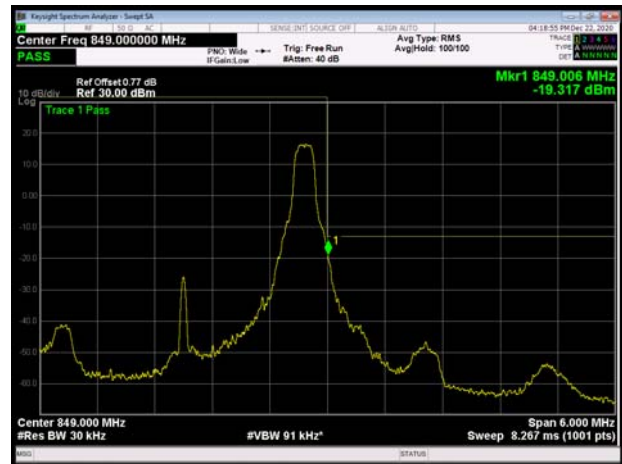
LTE Band 5 64QAM 1.4MHz CH-High 100%RB



LTE Band 5 64QAM 3MHz CH-Low 1RB



LTE Band 5 64QAM 3MHz CH-High 1RB



LTE Band 5 64QAM 3MHz CH-Low 100%RB

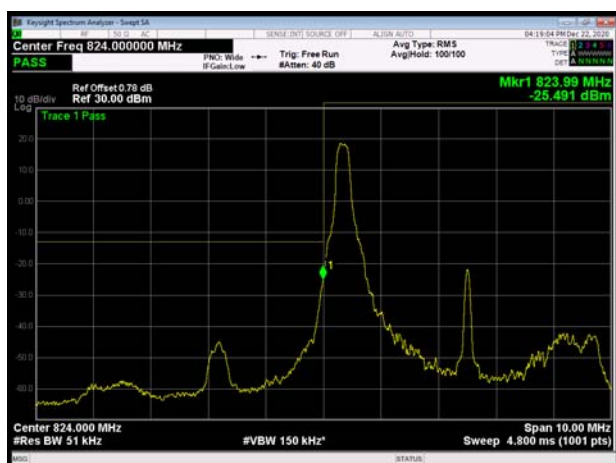


LTE Band 5 64QAM 3MHz CH-High 100%RB

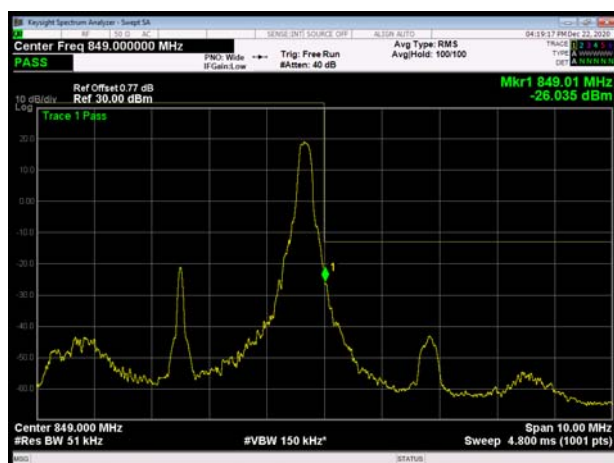




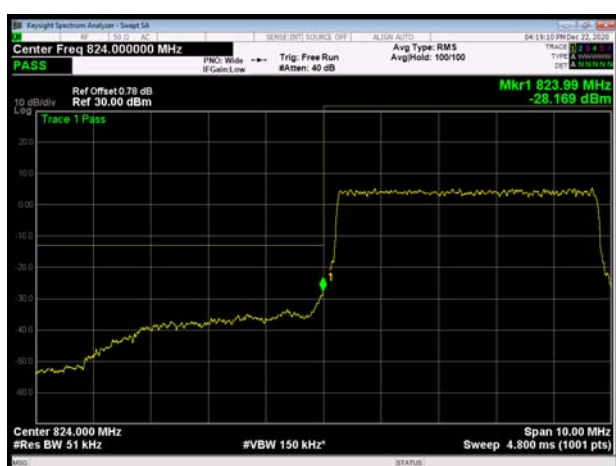
LTE Band 5 64QAM 5MHz CH-Low 1RB



LTE Band 5 64QAM 5MHz CH-High 1RB



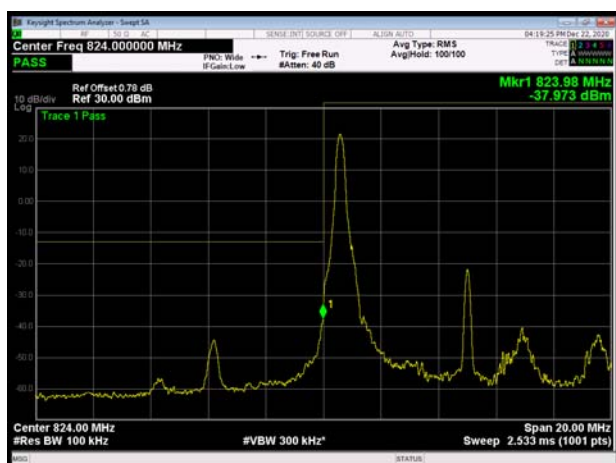
LTE Band 5 64QAM 5MHz CH-Low 100%RB



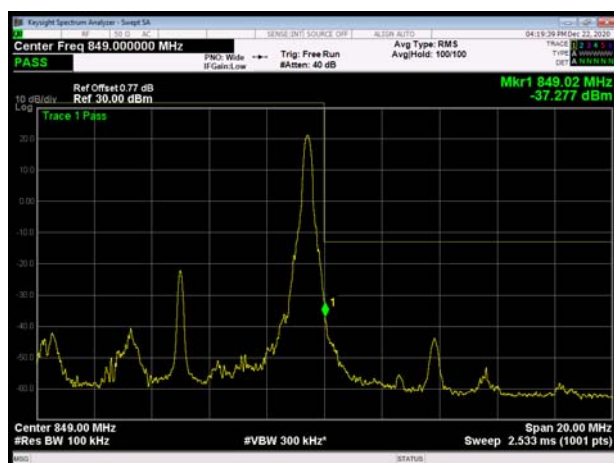
LTE Band 5 64QAM 5MHz CH-High 100%RB



LTE Band 5 64QAM 10MHz CH-Low 1RB

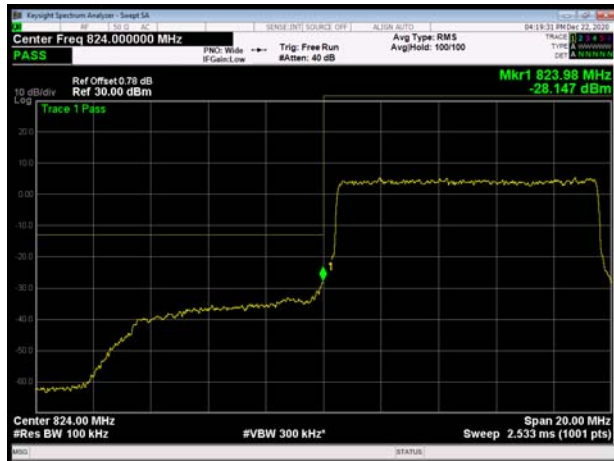


LTE Band 5 64QAM 10MHz CH-High 1RB





LTE Band 5 64QAM 10MHz CH-Low 100%RB



LTE Band 5 64QAM 10MHz CH-High 100%RB



5.4. Peak-to-Average Power Ratio (PAPR)

Ambient condition

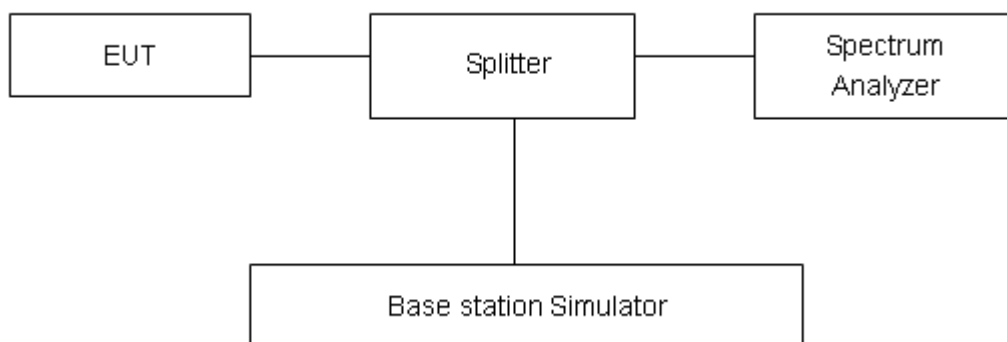
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

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

$$PAPR (dB) = P_{Pk} (dBm) - P_{Avg} (dBm).$$

Test Setup



Limits

According to the Sec. 22.913(d), The peak-to-average ratio (PAR) of the transmission must 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

Mode	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
GSM 850 (GMSK)	128	824.2	33.96	32.73	1.23	≤13	PASS
	190	836.6	34.20	32.96	1.24	≤13	PASS
	251	848.8	33.96	32.68	1.28	≤13	PASS
GPRS 850 (GMSK)	128	824.2	33.97	32.70	1.27	≤13	PASS
	190	836.6	34.32	33.01	1.31	≤13	PASS
	251	848.8	33.95	32.65	1.30	≤13	PASS
EGPRS 850 (8PSK)	128	824.2	28.80	26.93	1.87	≤13	PASS
	190	836.6	28.92	27.04	1.88	≤13	PASS
	251	848.8	29.02	27.17	1.85	≤13	PASS
WCDMA Band V (RMC)	4132	826.4	26.10	23.17	2.93	≤13	PASS
	4183	836.6	26.03	23.13	2.90	≤13	PASS
	4233	846.6	25.93	23.02	2.91	≤13	PASS

LTE Band 5								
Modulation	Bandwidth (MHz)	Channel	Frequency (MHz)	Peak (dBm)	Avg (dBm)	PAPR (dB)	Limit (dB)	Conclusion
QPSK	1.4	20407	824.7	27.68	23.42	4.26	≤13	PASS
		20525	836.5	27.39	23.42	3.97	≤13	PASS
		20643	848.3	27.16	23.40	3.76	≤13	PASS
	3	20415	825.5	27.60	23.45	4.15	≤13	PASS
		20525	836.5	27.30	23.43	3.87	≤13	PASS
		20635	847.5	27.17	23.36	3.81	≤13	PASS
	5	20425	826.5	27.73	23.43	4.30	≤13	PASS
		20525	836.5	27.41	23.42	3.99	≤13	PASS
		20625	846.5	27.35	23.37	3.98	≤13	PASS
	10	20450	829	27.68	23.48	4.20	≤13	PASS
		20525	836.5	27.42	23.38	4.04	≤13	PASS
		20600	844	27.37	23.30	4.07	≤13	PASS
16QAM	1.4	20407	824.7	27.79	22.42	5.37	≤13	PASS
		20525	836.5	27.47	22.43	5.04	≤13	PASS
		20643	848.3	27.29	22.41	4.88	≤13	PASS
	3	20415	825.5	27.83	22.49	5.34	≤13	PASS
		20525	836.5	27.47	22.42	5.05	≤13	PASS



	5	20635	847.5	27.39	22.42	4.97	≤13	PASS
		20425	826.5	27.82	22.47	5.35	≤13	PASS
		20525	836.5	27.52	22.46	5.06	≤13	PASS
		20625	846.5	27.46	22.43	5.03	≤13	PASS
	10	20450	829	27.79	22.50	5.29	≤13	PASS
		20525	836.5	27.54	22.44	5.10	≤13	PASS
		20600	844	27.50	22.34	5.16	≤13	PASS
64QAM	1.4	20407	824.7	27.38	23.09	4.29	≤13	PASS
		20525	836.5	27.06	23.08	3.98	≤13	PASS
		20643	848.3	26.81	23.03	3.78	≤13	PASS
	3	20415	825.5	27.23	23.07	4.16	≤13	PASS
		20525	836.5	26.96	23.10	3.86	≤13	PASS
		20635	847.5	26.86	23.05	3.81	≤13	PASS
	5	20425	826.5	27.36	23.06	4.30	≤13	PASS
		20525	836.5	27.06	23.05	4.01	≤13	PASS
		20625	846.5	27.06	23.07	3.99	≤13	PASS
	10	20450	829	27.38	23.19	4.19	≤13	PASS
		20525	836.5	27.10	23.07	4.03	≤13	PASS
		20600	844	27.05	22.99	4.06	≤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 0°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.

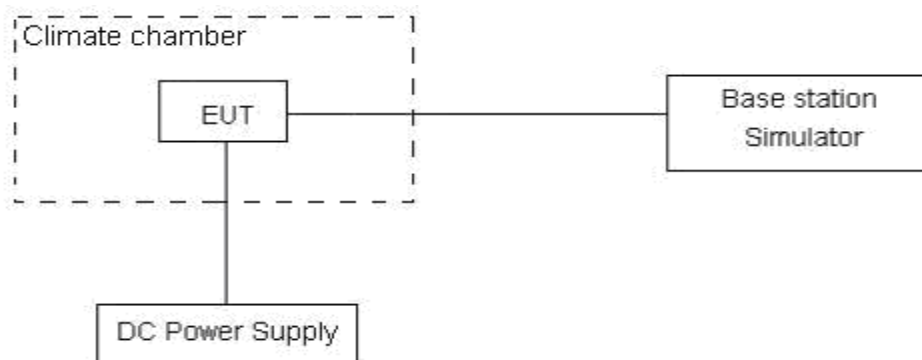
(3) Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, un-powered, before making measurements. Frequency Stability (Voltage Variation)

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 3.29V and 4.45V, with a nominal voltage of 3.87V.

Test setup



Limits

According to the Sec. 22.355, the frequency stability of the carrier shall be accurate to within 2.5 ppm of the received frequency for mobile stations.

Limits	≤ 2.5 ppm
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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 $k = 3$, $U = 0.01\text{ppm}$.



Test Result

GSM 850						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
Temperature	Voltage	GMSK	8PSK	GMSK	8PSK	
Normal (25℃)	Normal	15.70	1.03	0.00835	0.00055	PASS
Extreme (50℃)		16.37	9.35	0.00871	0.00497	PASS
Extreme (40℃)		12.46	4.27	0.00663	0.00227	PASS
Extreme (30℃)		15.44	7.07	0.00821	0.00376	PASS
Extreme (20℃)		5.66	12.73	0.00301	0.00677	PASS
Extreme (10℃)		12.09	4.69	0.00643	0.00249	PASS
Extreme (0℃)		1.56	8.00	0.00083	0.00425	PASS
Extreme (-10℃)		13.36	10.93	0.00711	0.00581	PASS
Extreme (-20℃)		3.94	4.85	0.00209	0.00258	PASS
Extreme (-30℃)		5.75	12.30	0.00306	0.00654	PASS
25℃	LV	17.21	7.70	0.00915	0.00410	PASS
	HV	10.26	8.15	0.00546	0.00434	PASS

WCDMA Band V						
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
Temperature	Voltage	QPSK	BPSK	QPSK	BPSK	
Normal (25℃)	Normal	13.88	15.49	0.00739	0.00824	PASS
Extreme (50℃)		12.32	3.82	0.00655	0.00203	PASS
Extreme (40℃)		5.69	11.47	0.00302	0.00610	PASS
Extreme (30℃)		17.95	15.29	0.00955	0.00813	PASS
Extreme (20℃)		3.33	4.39	0.00177	0.00233	PASS
Extreme (10℃)		8.91	16.62	0.00474	0.00884	PASS
Extreme (0℃)		11.59	10.41	0.00616	0.00554	PASS
Extreme (-10℃)		6.07	8.78	0.00323	0.00467	PASS
Extreme (-20℃)		11.82	17.01	0.00629	0.00905	PASS
Extreme (-30℃)		9.40	16.74	0.00500	0.00890	PASS
25℃	LV	2.76	14.05	0.00147	0.00747	PASS
	HV	7.98	2.65	0.00424	0.00141	PASS



LTE Band 5								
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	1.4MHz							
Temperature	Voltage	64QAM	16QAM	QPSK	64QAM	16QAM	QPSK	
Normal (25℃)	Normal	8.83	14.98	10.29	0.00470	0.00797	0.00547	PASS
Extreme (50℃)		3.41	4.09	15.19	0.00182	0.00217	0.00808	PASS
Extreme (40℃)		14.40	13.48	10.51	0.00766	0.00717	0.00559	PASS
Extreme (30℃)		16.34	11.04	2.22	0.00869	0.00587	0.00118	PASS
Extreme (20℃)		15.30	11.56	4.16	0.00814	0.00615	0.00221	PASS
Extreme (10℃)		13.92	3.07	14.19	0.00740	0.00164	0.00755	PASS
Extreme (0℃)		1.18	11.52	10.02	0.00063	0.00613	0.00533	PASS
Extreme (-10℃)		15.13	17.00	11.49	0.00805	0.00904	0.00611	PASS
Extreme (-20℃)		8.13	2.29	1.83	0.00432	0.00122	0.00097	PASS
Extreme (-30℃)		14.97	8.05	5.83	0.00796	0.00428	0.00310	PASS
25℃	LV	16.32	11.42	6.05	0.00868	0.00607	0.00322	PASS
	HV	3.52	11.56	15.11	0.00187	0.00615	0.00803	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	3MHz							
Temperature	Voltage	64QAM	16QAM	QPSK	64QAM	16QAM	QPSK	
Normal (25℃)	Normal	1.98	8.82	1.48	0.00105	0.00469	0.00079	PASS
Extreme (50℃)		1.97	13.63	13.78	0.00105	0.00725	0.00733	PASS
Extreme (40℃)		5.75	7.94	17.53	0.00306	0.00423	0.00933	PASS
Extreme (30℃)		8.00	11.72	7.52	0.00425	0.00624	0.00400	PASS
Extreme (20℃)		13.81	17.20	4.62	0.00734	0.00915	0.00246	PASS
Extreme (10℃)		9.94	17.84	7.23	0.00529	0.00949	0.00385	PASS
Extreme (0℃)		13.84	11.87	16.25	0.00736	0.00631	0.00865	PASS
Extreme (-10℃)		5.67	13.08	1.75	0.00302	0.00696	0.00093	PASS
Extreme (-20℃)		17.82	10.07	13.73	0.00948	0.00536	0.00730	PASS
Extreme (-30℃)		10.94	9.91	17.68	0.00582	0.00527	0.00940	PASS
25℃	LV	12.37	3.62	5.24	0.00658	0.00193	0.00279	PASS
	HV	6.72	5.20	8.19	0.00358	0.00277	0.00436	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	5MHz							
Temperature	Voltage	64QAM	16QAM	QPSK	64QAM	16QAM	QPSK	
Normal (25℃)	Normal	15.25	3.85	5.79	0.00811	0.00205	0.00308	PASS
Extreme (50℃)		7.08	14.23	8.14	0.00377	0.00757	0.00433	PASS



Extreme (40℃)		12.79	16.65	8.83	0.00681	0.00886	0.00470	PASS
Extreme (30℃)		12.63	13.94	10.59	0.00672	0.00741	0.00564	PASS
Extreme (20℃)		12.37	13.58	17.25	0.00658	0.00722	0.00917	PASS
Extreme (10℃)		13.72	14.31	6.57	0.00730	0.00761	0.00350	PASS
Extreme (0℃)		8.52	10.73	9.97	0.00453	0.00571	0.00530	PASS
Extreme (-10℃)		15.10	7.46	15.27	0.00803	0.00397	0.00812	PASS
Extreme (-20℃)		9.02	14.98	14.10	0.00480	0.00797	0.00750	PASS
Extreme (-30℃)		12.38	12.13	16.94	0.00658	0.00645	0.00901	PASS
25℃	LV	1.47	16.90	7.80	0.00078	0.00899	0.00415	PASS
	HV	13.96	12.44	6.62	0.00743	0.00662	0.00352	PASS
Condition		Freq.Error (Hz)	Freq.Error (Hz)	Freq.Error (Hz)	Frequency Stability (ppm)	Frequency Stability (ppm)	Frequency Stability (ppm)	Verdict
BANDWIDTH	10MHz							
Temperature	Voltage	64QAM	16QAM	QPSK	64QAM	16QAM	QPSK	
Normal (25℃)	Normal	9.74	14.12	13.45	0.00518	0.00751	0.00716	PASS
Extreme (50℃)		9.61	12.81	5.07	0.00511	0.00682	0.00270	PASS
Extreme (40℃)		11.48	14.11	8.59	0.00611	0.00751	0.00457	PASS
Extreme (30℃)		1.26	9.10	5.04	0.00067	0.00484	0.00268	PASS
Extreme (20℃)		2.67	1.09	10.89	0.00142	0.00058	0.00579	PASS
Extreme (10℃)		8.38	3.27	6.17	0.00446	0.00174	0.00328	PASS
Extreme (0℃)		13.21	7.24	12.66	0.00703	0.00385	0.00673	PASS
Extreme (-10℃)		6.12	17.98	7.36	0.00325	0.00957	0.00391	PASS
Extreme (-20℃)		10.33	7.16	7.30	0.00549	0.00381	0.00388	PASS
Extreme (-30℃)		8.12	8.01	12.17	0.00432	0.00426	0.00647	PASS
25℃	LV	14.89	7.34	6.75	0.00792	0.00390	0.00359	PASS
	HV	9.41	4.97	6.03	0.00501	0.00264	0.00321	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),

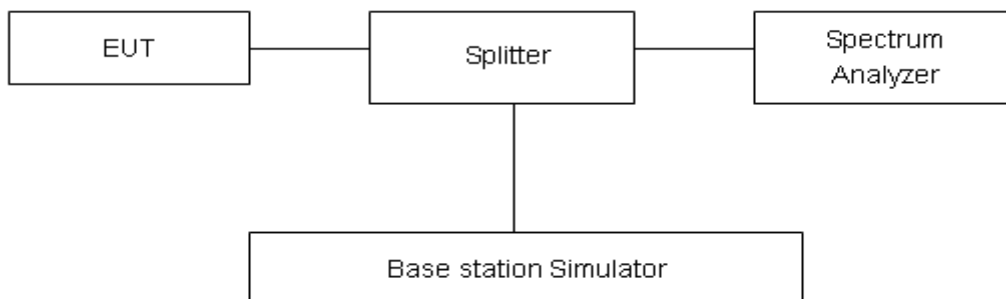
RBW is set to 100 kHz (30MHz~1000 MHz),

RBW is set to 1000 kHz (above 1000MHz),

Sweep is set to ATUO.

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

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 99.75% confidence level for the normal distribution is with the coverage factor $k = 1.96$.

Frequency	Uncertainty
9kHz-1GHz	0.684 dB
1GHz-18GHz	1.407 dB

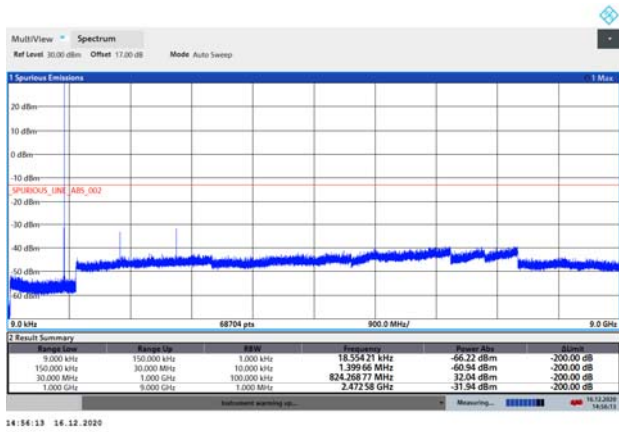


Test Result

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.

GSM 850 CH-Low 9kHz ~ 9GHz



GPRS 850 CH-Low 9kHz ~ 9GHz



GSM 850 CH-Middle 9kHz ~ 9GHz



GPRS 850 CH-Middle 9kHz ~ 9GHz



GSM 850 CH-High 9kHz ~ 9GHz

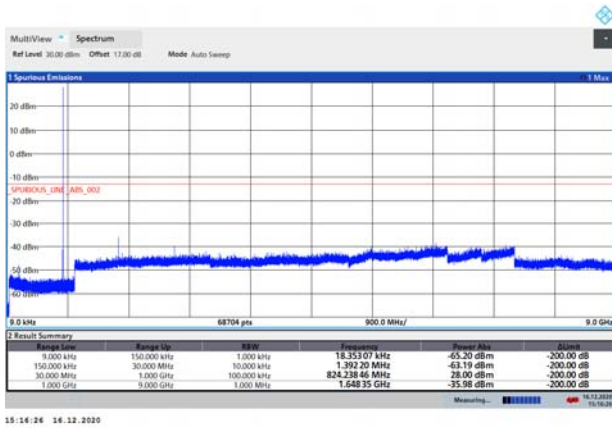


GPRS 850 CH-High 9kHz ~ 9GHz



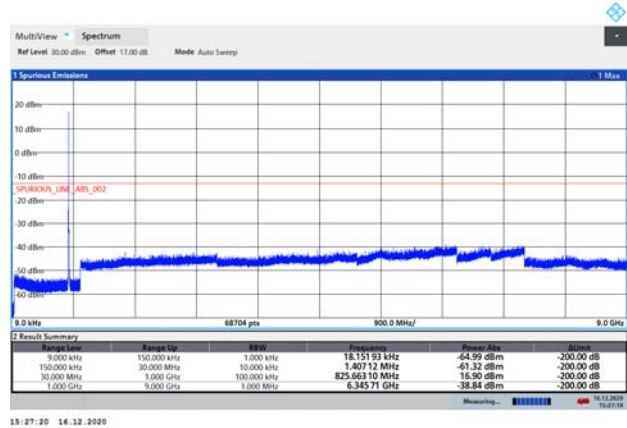


EGPRS 850 CH-Low 9kHz ~ 9GHz



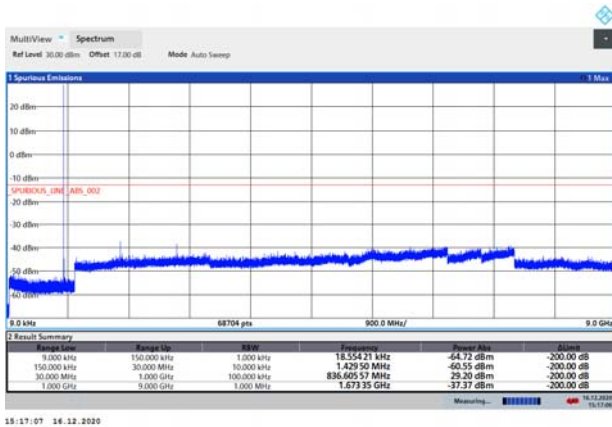
15:14:24 16.12.2020

WCDMA BAND V CH-Low 9kHz ~ 9GHz



15:27:20 16.12.2020

EGPRS 850 CH-Middle 9kHz ~ 9GHz



15:17:07 16.12.2020

WCDMA BAND V CH-Middle 9kHz ~ 9GHz



15:17:54 16.12.2020

EGPRS 850 CH-High 9kHz ~ 9GHz



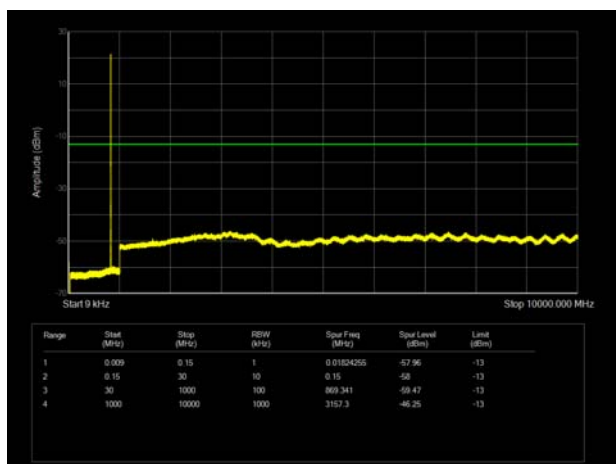
15:19:04 16.12.2020

WCDMA BAND V CH-High 9kHz ~ 9GHz

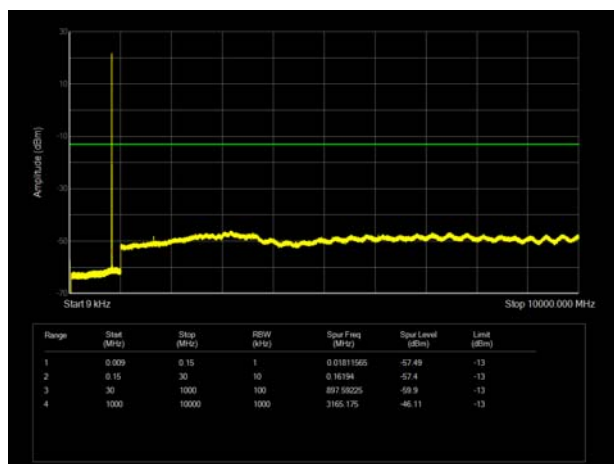


15:19:11 16.12.2020

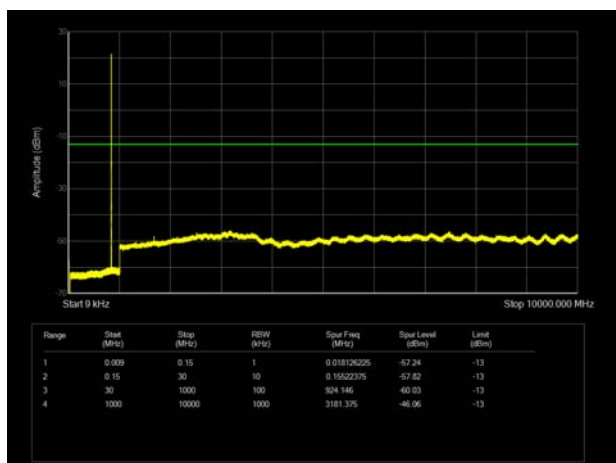
LTE Band 5 1.4MHz CH-Low 9kHz~10GHz



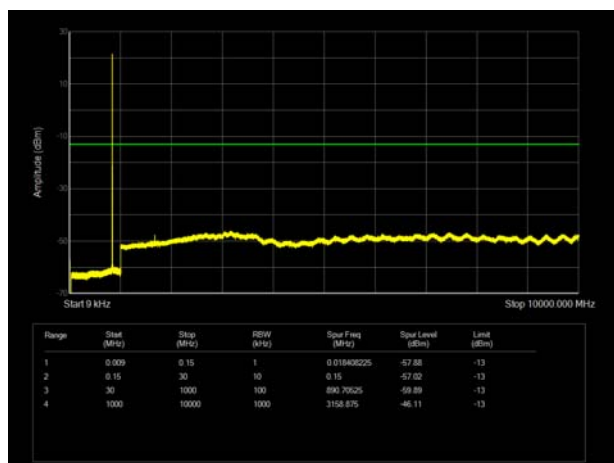
LTE Band 5 3MHz CH-Low 9kHz~10GHz



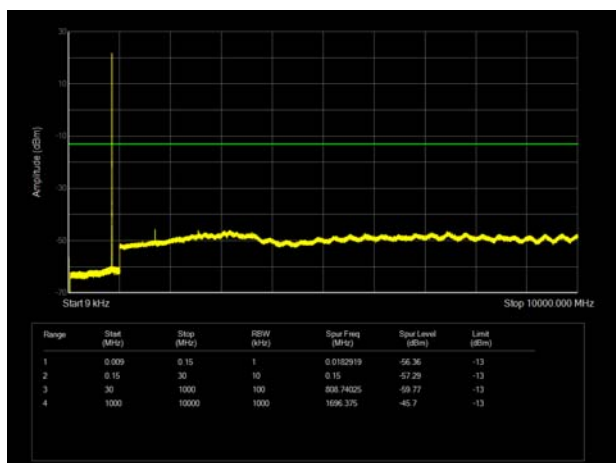
LTE Band 5 1.4MHz CH-Middle 9kHz~10GHz



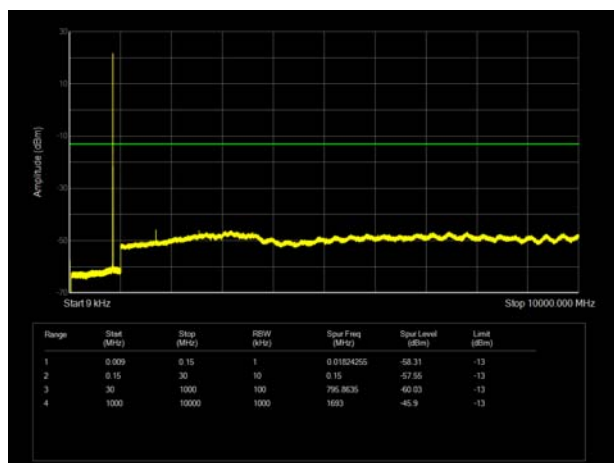
LTE Band 5 3MHz CH-Middle 9kHz~10GHz



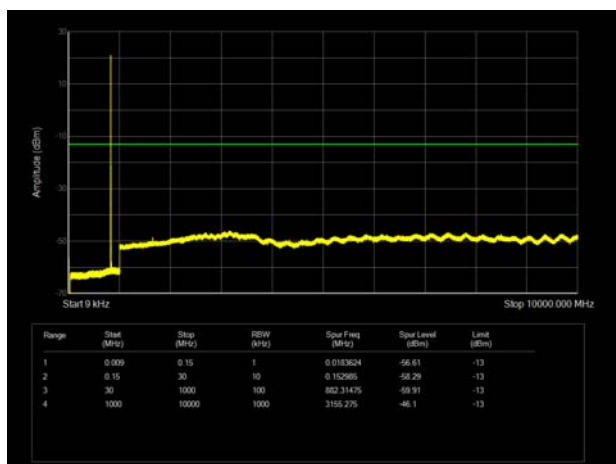
LTE Band 5 1.4MHz CH-High 9kHz~10GHz



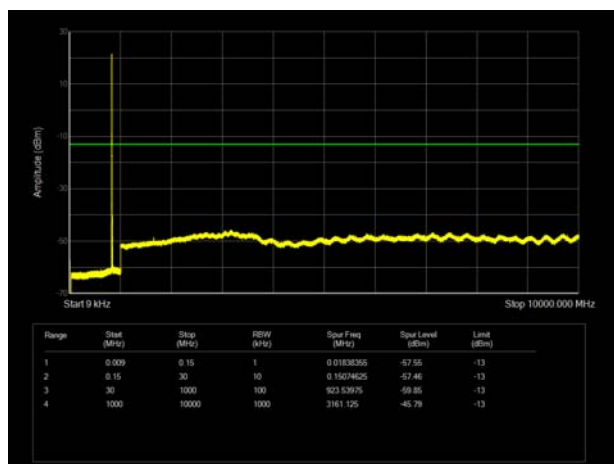
LTE Band 5 3MHz CH-High 9kHz~10GHz



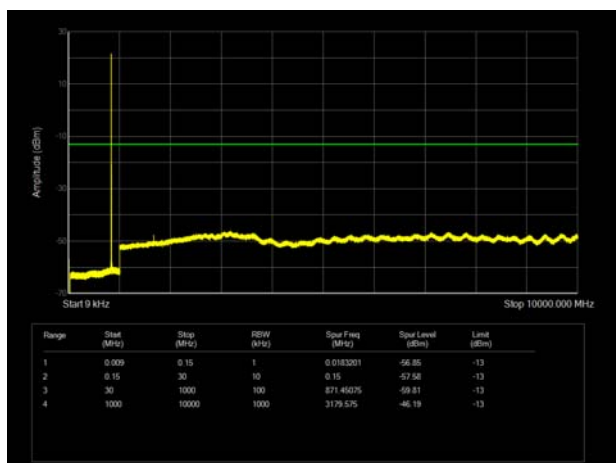
LTE Band 5 5MHz CH-Low 9kHz~10GHz



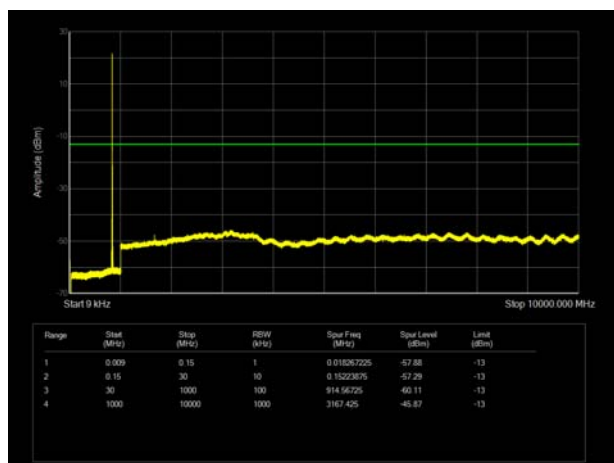
LTE Band 5 10MHz CH-Low 9kHz~10GHz



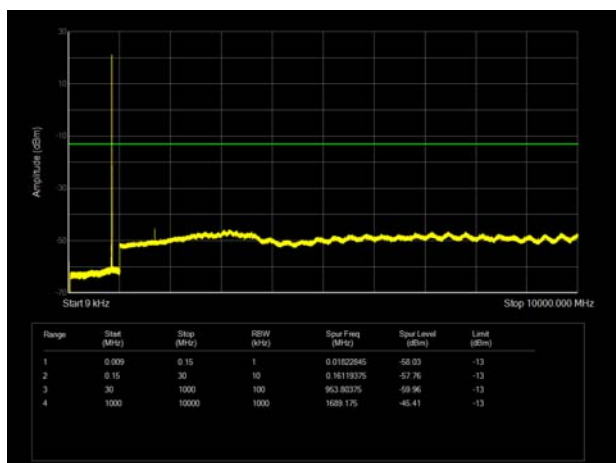
LTE Band 5 5MHz CH-Middle 9kHz~10GHz



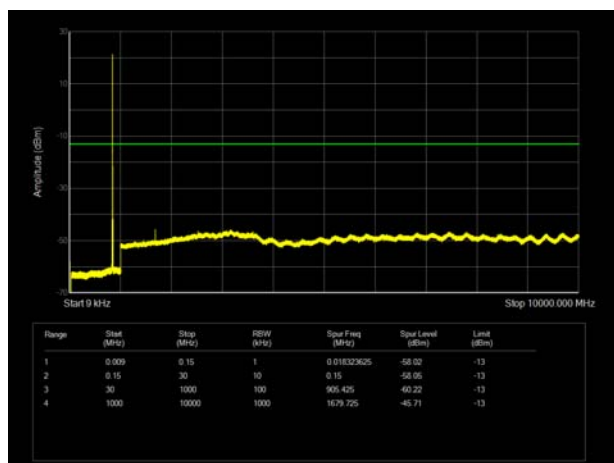
LTE Band 5 10MHz CH-Middle 9kHz~10GHz



LTE Band 5 5MHz CH-High 9kHz~10GHz



LTE Band 5 10MHz CH-High 9kHz~10GHz



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 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:

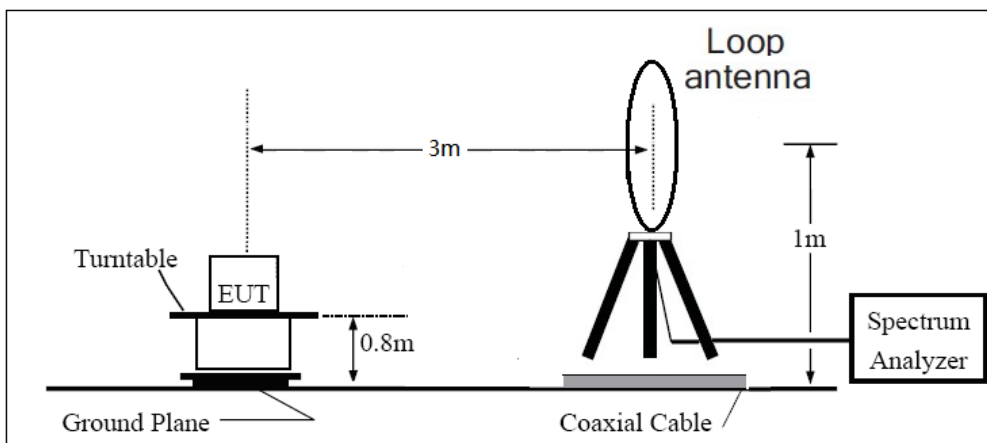
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi)

and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $ERP = EIRP - 2.15\text{dBi}$.

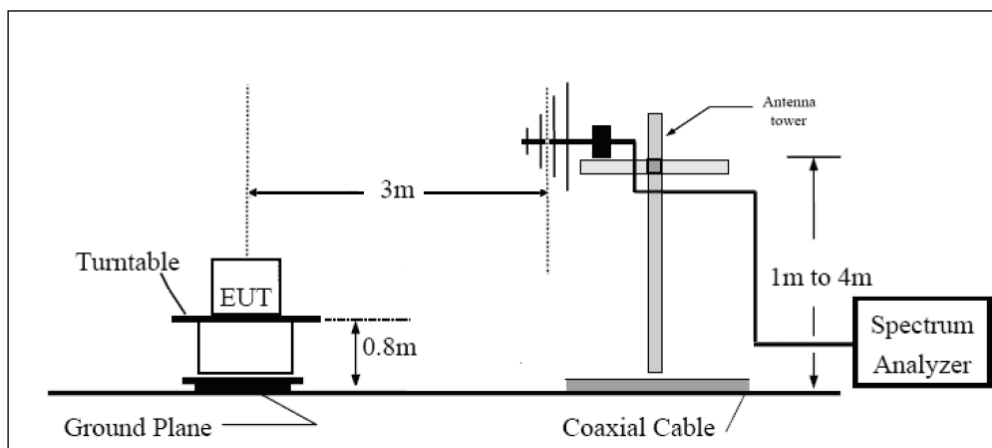
The modulation mode and RB allocation refer to section 5.1, using the maximum output power configuration.

Test setup

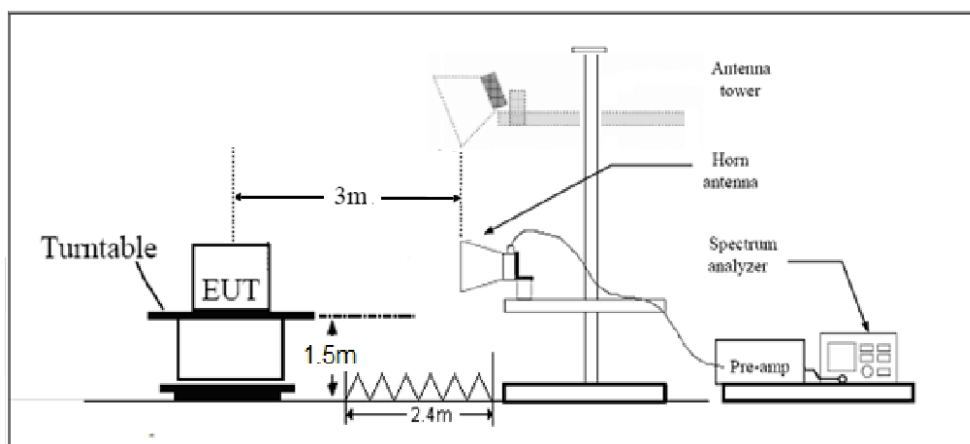
9KHz ~ 30MHz



30MHz ~ 1GHz



Above 1GHz



Note: Area side: 2.4mX3.6m

Limits

Rule Part 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 $k = 1.96$, $U = 3.55$ 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.

Main Antenna:

GSM 850 CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.20	-51.57	2.00	10.75	Horizontal	-44.97	-13.00	31.97	180
3	2509.69	-40.02	2.51	11.05	Horizontal	-33.63	-13.00	20.63	270
4	3346.40	-57.41	4.20	11.15	Horizontal	-52.61	-13.00	39.61	315
5	4183.00	-57.83	5.20	11.15	Horizontal	-54.03	-13.00	41.03	90
6	5019.60	-58.01	5.50	11.95	Horizontal	-53.71	-13.00	40.71	180
7	5856.20	-58.17	5.70	13.55	Horizontal	-52.47	-13.00	39.47	0
8	6692.80	-57.57	6.30	13.75	Horizontal	-52.27	-13.00	39.27	180
9	7529.40	-54.48	6.80	13.85	Horizontal	-49.58	-13.00	36.58	45
10	8366.00	-55.73	6.90	14.25	Horizontal	-50.53	-13.00	37.53	90

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.

WCDMA Band V CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.20	-66.41	2.00	10.75	Horizontal	-59.81	-13.00	46.81	135
3	2509.80	-65.21	2.51	11.05	Horizontal	-58.82	-13.00	45.82	225
4	3346.40	-61.67	4.20	11.15	Horizontal	-56.87	-13.00	43.87	90
5	4183.00	-58.59	5.20	11.15	Horizontal	-54.79	-13.00	41.79	45
6	5019.60	-55.96	5.50	11.95	Horizontal	-51.66	-13.00	38.66	315
7	5856.20	-56.80	5.70	13.55	Horizontal	-51.10	-13.00	38.10	90
8	6692.80	-57.67	6.30	13.75	Horizontal	-52.37	-13.00	39.37	180
9	7529.40	-53.89	6.80	13.85	Horizontal	-48.99	-13.00	35.99	315
10	8366.00	-53.64	6.90	14.25	Horizontal	-48.44	-13.00	35.44	45

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 5 1.4MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.00	-69.92	2.00	10.75	Horizontal	-63.32	-13.00	50.32	315
3	2509.50	-65.10	2.51	11.05	Horizontal	-58.71	-13.00	45.71	315
4	3346.00	-63.07	4.20	11.15	Horizontal	-58.27	-13.00	45.27	90
5	4182.50	-58.29	5.20	11.15	Horizontal	-54.49	-13.00	41.49	45
6	5019.00	-54.70	5.50	11.95	Horizontal	-50.40	-13.00	37.40	315
7	5855.50	-57.61	5.70	13.55	Horizontal	-51.91	-13.00	38.91	315
8	6692.00	-57.77	6.30	13.75	Horizontal	-52.47	-13.00	39.47	135
9	7528.50	-54.33	6.80	13.85	Horizontal	-49.43	-13.00	36.43	90
10	8365.00	-54.11	6.90	14.25	Horizontal	-48.91	-13.00	35.91	180
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 5 5MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1668.60	-68.02	2.00	10.75	Horizontal	-61.42	-13.00	48.42	45
3	2503.30	-64.49	2.51	11.05	Horizontal	-58.10	-13.00	45.10	225
4	3466.20	-62.74	4.20	11.15	Horizontal	-57.94	-13.00	44.94	45
5	4215.90	-58.58	5.20	11.15	Horizontal	-54.78	-13.00	41.78	315
6	5165.60	-54.99	5.50	11.95	Horizontal	-50.69	-13.00	37.69	135
7	5815.30	-58.21	5.70	13.55	Horizontal	-52.51	-13.00	39.51	45
8	6765.00	-58.33	6.30	13.75	Horizontal	-53.03	-13.00	40.03	90
9	7614.70	-54.31	6.80	13.85	Horizontal	-49.41	-13.00	36.41	180
10	8464.40	-53.96	6.90	14.25	Horizontal	-48.76	-13.00	35.76	270
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 5 10MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1664.40	-68.99	2.00	10.75	Horizontal	-62.39	-13.00	49.39	135
3	2496.60	-65.60	2.51	11.05	Horizontal	-59.21	-13.00	46.21	90
4	3346.00	-62.14	4.20	11.15	Horizontal	-57.34	-13.00	44.34	45
5	4182.50	-58.30	5.20	11.15	Horizontal	-54.50	-13.00	41.50	315
6	5019.00	-55.28	5.50	11.95	Horizontal	-50.98	-13.00	37.98	225
7	5855.50	-58.31	5.70	13.55	Horizontal	-52.61	-13.00	39.61	180
8	6692.00	-56.52	6.30	13.75	Horizontal	-51.22	-13.00	38.22	0
9	7528.50	-53.34	6.80	13.85	Horizontal	-48.44	-13.00	35.44	135
10	8365.00	-54.57	6.90	14.25	Horizontal	-49.37	-13.00	36.37	270

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.

**Diversity Antenna:****GSM 850 CH-Middle**

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.20	-51.57	2.00	10.75	Horizontal	-44.97	-13.00	31.97	225
3	2509.80	-46.03	2.51	11.05	Horizontal	-39.64	-13.00	26.64	180
4	3346.40	-60.57	4.20	11.15	Horizontal	-55.77	-13.00	42.77	180
5	4183.00	-57.61	5.20	11.15	Horizontal	-53.81	-13.00	40.81	90
6	5019.60	-55.17	5.50	11.95	Horizontal	-50.87	-13.00	37.87	90
7	5856.20	-58.01	5.70	13.55	Horizontal	-52.31	-13.00	39.31	225
8	6692.80	-56.72	6.30	13.75	Horizontal	-51.42	-13.00	38.42	180
9	7529.40	-53.15	6.80	13.85	Horizontal	-48.25	-13.00	35.25	90
10	8366.00	-54.11	6.90	14.25	Horizontal	-48.91	-13.00	35.91	45

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.

WCDMA Band V CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.20	-68.23	2.00	10.75	Horizontal	-61.63	-13.00	48.63	45
3	2509.80	-64.32	2.51	11.05	Horizontal	-57.93	-13.00	44.93	225
4	3346.40	-62.39	4.20	11.15	Horizontal	-57.59	-13.00	44.59	180
5	4183.00	-59.28	5.20	11.15	Horizontal	-55.48	-13.00	42.48	90
6	5019.60	-55.14	5.50	11.95	Horizontal	-50.84	-13.00	37.84	45
7	5856.20	-57.60	5.70	13.55	Horizontal	-51.90	-13.00	38.90	270
8	6692.80	-57.77	6.30	13.75	Horizontal	-52.47	-13.00	39.47	0
9	7529.40	-53.09	6.80	13.85	Horizontal	-48.19	-13.00	35.19	180
10	8366.00	-54.77	6.90	14.25	Horizontal	-49.57	-13.00	36.57	45

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 5 1.4MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1673.00	-69.44	2.00	10.75	Horizontal	-62.84	-13.00	49.84	315
3	2509.50	-63.41	2.51	11.05	Horizontal	-57.02	-13.00	44.02	315
4	3346.00	-61.95	4.20	11.15	Horizontal	-57.15	-13.00	44.15	90
5	4182.50	-58.91	5.20	11.15	Horizontal	-55.11	-13.00	42.11	45
6	5019.00	-55.31	5.50	11.95	Horizontal	-51.01	-13.00	38.01	315
7	5855.50	-58.41	5.70	13.55	Horizontal	-52.71	-13.00	39.71	315
8	6692.00	-57.75	6.30	13.75	Horizontal	-52.45	-13.00	39.45	135
9	7528.50	-54.03	6.80	13.85	Horizontal	-49.13	-13.00	36.13	90
10	8365.00	-54.19	6.90	14.25	Horizontal	-48.99	-13.00	35.99	180

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 5 5MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1668.60	-69.03	2.00	10.75	Horizontal	-62.43	-13.00	49.43	45
3	2503.30	-65.52	2.51	11.05	Horizontal	-59.13	-13.00	46.13	225
4	3466.20	-61.04	4.20	11.15	Horizontal	-56.24	-13.00	43.24	45
5	4215.90	-59.03	5.20	11.15	Horizontal	-55.23	-13.00	42.23	315
6	5165.60	-55.30	5.50	11.95	Horizontal	-51.00	-13.00	38.00	135
7	5815.30	-58.09	5.70	13.55	Horizontal	-52.39	-13.00	39.39	45
8	6765.00	-58.13	6.30	13.75	Horizontal	-52.83	-13.00	39.83	90
9	7614.70	-55.65	6.80	13.85	Horizontal	-50.75	-13.00	37.75	180
10	8464.40	-53.41	6.90	14.25	Horizontal	-48.21	-13.00	35.21	270

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 5 10MHz CH-Middle

Harmonic	Frequency (MHz)	SG (dBm)	Cable Loss (dB)	Gain (dBi)	Antenna Polarization	ERP Level (dBm)	Limit (dBm)	Margin (dB)	Azimuth (deg)
2	1664.40	-68.39	2.00	10.75	Horizontal	-61.79	-13.00	48.79	135
3	2496.60	-65.26	2.51	11.05	Horizontal	-58.87	-13.00	45.87	90
4	3346.00	-62.85	4.20	11.15	Horizontal	-58.05	-13.00	45.05	45
5	4182.50	-57.94	5.20	11.15	Horizontal	-54.14	-13.00	41.14	315
6	5019.00	-55.72	5.50	11.95	Horizontal	-51.42	-13.00	38.42	225
7	5855.50	-57.94	5.70	13.55	Horizontal	-52.24	-13.00	39.24	180
8	6692.00	-58.27	6.30	13.75	Horizontal	-52.97	-13.00	39.97	0
9	7528.50	-54.01	6.80	13.85	Horizontal	-49.11	-13.00	36.11	135
10	8365.00	-54.63	6.90	14.25	Horizontal	-49.43	-13.00	36.43	270

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
Universal Radio Communication Tester	Key sight	E5515C	MY48367192	2020-05-27	2021-05-26
Signal Analyzer	R&S	FSV30	100815	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	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	2020-12-10	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.