Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 26			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	825.499998	-0.002	847.500003	0.004
3.4	825.499995	-0.006	847.500004	0.005
4.6	825.499999	-0.001	847.499998	-0.002

Note: The applicant defined the normal working voltage is from 3.4Vdc to 4.6Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 26			
	Channel Bandwidth: 3 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	825.499997	-0.004	847.499999	-0.001
-30	825.500005	0.006	847.500002	0.002
-20	825.500002	0.002	847.500003	0.004
-10	825.500003	0.004	847.499995	-0.006
0	825.500005	0.006	847.500002	0.002
10	825.499999	-0.001	847.500003	0.004
20	825.500005	0.006	847.500001	0.001
30	825.499995	-0.006	847.500003	0.004
40	825.499995	-0.006	847.500004	0.005
50	825.499998	-0.002	847.499999	-0.001
60	825.500005	0.006	847.499998	-0.002
70	825.500004	0.005	847.500003	0.004
80	825.500004	0.005	847.499999	-0.001
85	825.500001	0.001	847.500002	0.002

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 26			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	826.499999	-0.001	846.499997	-0.004
3.4	826.500002	0.002	846.500001	0.001
4.6	826.499995	-0.006	846.500004	0.005

Note: The applicant defined the normal working voltage is from 3.4Vdc to 4.6Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 26			
	Channel Bandwidth: 5 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	826.500001	0.001	846.499998	-0.002
-30	826.499997	-0.004	846.500001	0.001
-20	826.500002	0.002	846.500003	0.004
-10	826.500003	0.004	846.499996	-0.005
0	826.499998	-0.002	846.500002	0.002
10	826.500001	0.001	846.499997	-0.004
20	826.499998	-0.002	846.500004	0.005
30	826.500004	0.005	846.499999	-0.001
40	826.500002	0.002	846.499997	-0.004
50	826.500005	0.006	846.499998	-0.002
60	826.500001	0.001	846.499997	-0.004
70	826.500003	0.004	846.500001	0.001
80	826.500001	0.001	846.499999	-0.001
85	826.500005	0.006	846.500002	0.002

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 26			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	828.999995	-0.006	843.999998	-0.002
3.4	828.999997	-0.004	844.000002	0.002
4.6	829.000001	0.001	844.000002	0.002

Note: The applicant defined the normal working voltage is from 3.4Vdc to 4.6Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 26			
	Channel Bandwidth: 10 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	828.999997	-0.004	843.999995	-0.006
-30	828.999998	-0.002	843.999999	-0.001
-20	829.000002	0.002	843.999997	-0.004
-10	828.999999	-0.001	843.999995	-0.006
0	829.000003	0.004	843.999999	-0.001
10	828.999997	-0.004	843.999998	-0.002
20	828.999995	-0.006	843.999997	-0.004
30	828.999995	-0.006	844.000002	0.002
40	828.999998	-0.002	843.999995	-0.006
50	829.000002	0.002	843.999999	-0.001
60	828.999997	-0.004	844.000002	0.002
70	829.000001	0.001	843.999997	-0.004
80	829.000001	0.001	843.999995	-0.006
85	828.999997	-0.004	843.999997	-0.004

Frequency Error vs. Voltage

Voltage (Vdc)	LTE Band 26			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
4.0	831.499995	-0.006	841.500001	0.001
3.4	831.499997	-0.004	841.500002	0.002
4.6	831.500003	0.004	841.499997	-0.004

Note: The applicant defined the normal working voltage is from 3.4Vdc to 4.6Vdc.

Frequency Error vs. Temperature

Temp. (℃)	LTE Band 26			
	Channel Bandwidth: 15 MHz			
	Low Channel		High Channel	
	Frequency (MHz)	Frequency Error (ppm)	Frequency (MHz)	Frequency Error (ppm)
-40	831.499996	-0.005	841.500004	0.005
-30	831.500003	0.004	841.500002	0.002
-20	831.499997	-0.004	841.499997	-0.004
-10	831.499998	-0.002	841.499996	-0.005
0	831.499995	-0.006	841.499995	-0.006
10	831.500003	0.004	841.499996	-0.005
20	831.500003	0.004	841.499999	-0.001
30	831.500002	0.002	841.499998	-0.002
40	831.499998	-0.002	841.499997	-0.004
50	831.499999	-0.001	841.500002	0.002
60	831.500002	0.002	841.499995	-0.006
70	831.499999	-0.001	841.500001	0.001
80	831.500002	0.002	841.500003	0.004
85	831.499998	-0.002	841.499998	-0.002

4.4 Occupied Bandwidth Measurement

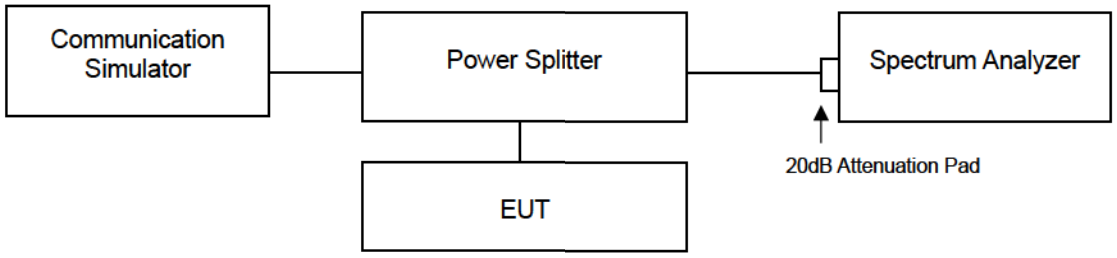
4.4.1 Test Procedure

For the 26dBc bandwidth measurement method, please refer to section 5.4.3 of ANSI C63.26.

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The span range for the spectrum analyzer shall be wide enough to see sufficient roll off of the signal to make the measurement.
b) The nominal RBW shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set ≥ 3 × RBW.
c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation. See guidance provided in 4.2.3.
d) The dynamic range of the spectrum analyzer at the selected RBW shall be more than 10 dB below the target "−X dB" requirement, i.e., if the requirement calls for measuring the −26 dB OBW, the spectrum analyzer noise floor at the selected RBW shall be at least 36 dB below the reference level.
e) Set spectrum analyzer detection mode to peak, and the trace mode to max hold.
f) Determine the following reference values: Set the EUT to transmit a modulated signal. Allow the trace to stabilize. Set the spectrum analyzer marker to the highest level of the displayed trace (this is the reference value).
g) Determine the "−X dB amplitude" as equal to (Reference Value − X). Alternatively, this calculation can be performed on the spectrum analyzer using the delta-marker measurement function.
h) Place two markers, one at the lowest and the other at the highest frequency of the envelope of the spectral display such that each marker is at or slightly below the "−X dB amplitude" determined in step f). If a marker is below this "−X dB amplitude" value it should be as close as possible to this value. The OBW is the positive frequency difference between the two markers.
i) The OBW shall be reported by providing plot(s) of the measuring instrument display, to include markers depicting the relevant frequency and amplitude information (e.g., marker table). The frequency and amplitude axis and scale shall be clearly labeled. Tabular data may be reported in addition to the plot(s).

For the occupied bandwidth measurement method, please refer to section 5.4.4 of ANSI C63.26.

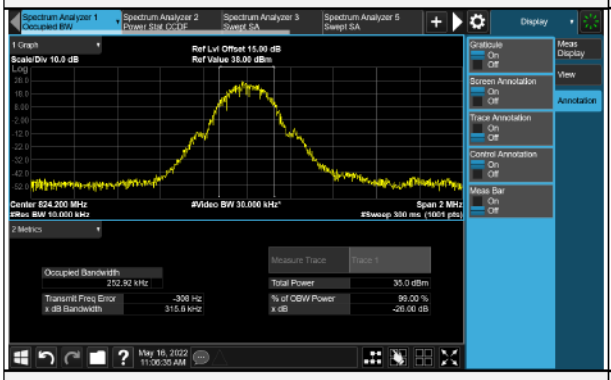
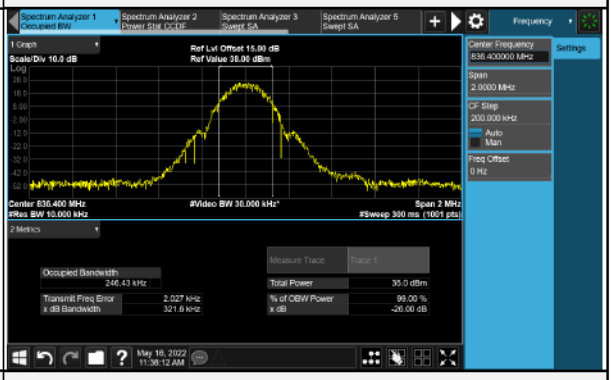
4.4.2 Test Setup



4.4.3 Test Result

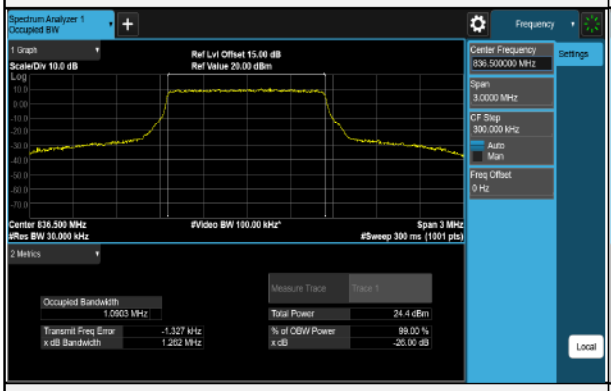
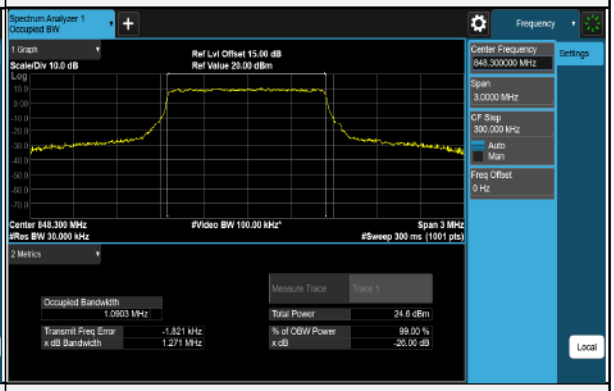
GPRS, EDGE

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (kHz)	26dB Bandwidth (kHz)
GPRS	128	824.2	252.92	315.60
GPRS	189	836.4	245.37	319.60
GPRS	251	848.8	247.20	316.70
EDGE	128	824.2	246.05	313.50
EDGE	189	836.4	246.43	321.60
EDGE	251	848.8	249.00	315.10

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
GPRS CH 128 (824.2MHz)	EDGE CH 189 (836.4MHz)

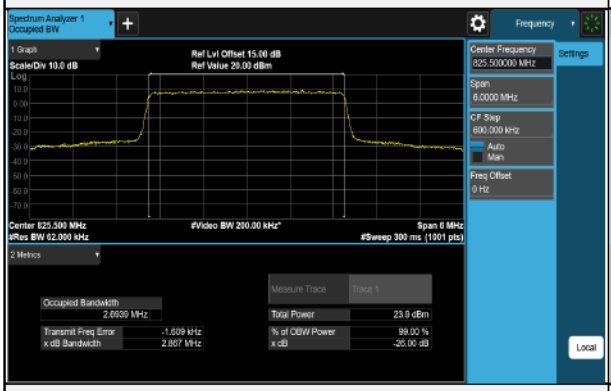
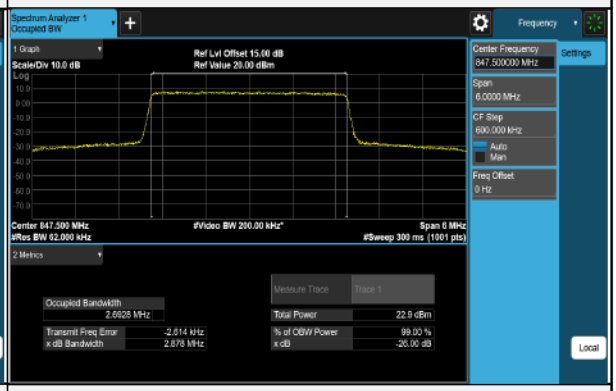
LTE Band 5 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	20407	824.7	1.0885	1.253
QPSK	20525	836.5	1.0903	1.262
QPSK	20643	848.3	1.0903	1.271
16QAM	20407	824.7	1.0869	1.260
16QAM	20525	836.5	1.0873	1.250
16QAM	20643	848.3	1.0866	1.249
64QAM	20407	824.7	1.0874	1.248
64QAM	20525	836.5	1.0872	1.251
64QAM	20643	848.3	1.0873	1.251

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
QPSK CH 20525 (836.5MHz)	QPSK CH 20643 (848.3MHz)

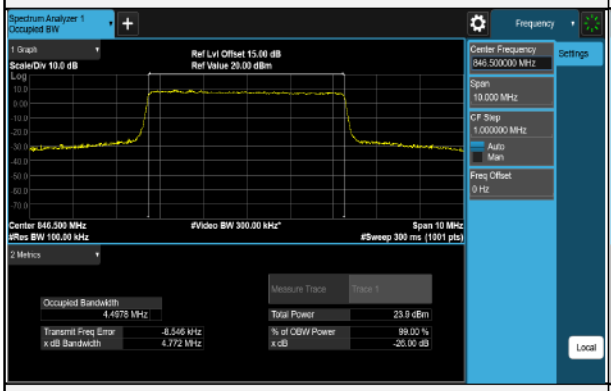
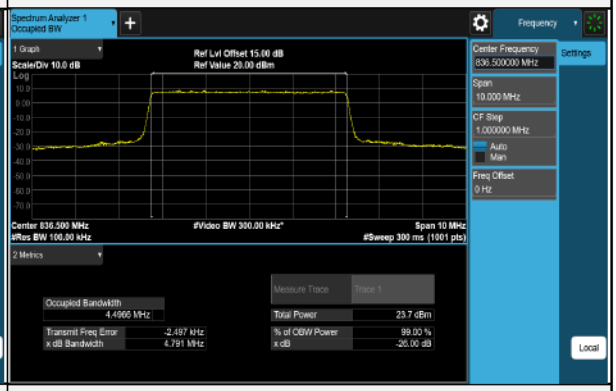
LTE Band 5 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	20415	825.5	2.6939	2.867
QPSK	20525	836.5	2.6921	2.877
QPSK	20635	847.5	2.6923	2.868
16QAM	20415	825.5	2.6925	2.870
16QAM	20525	836.5	2.6908	2.873
16QAM	20635	847.5	2.6928	2.878
64QAM	20415	825.5	2.6914	2.866
64QAM	20525	836.5	2.6922	2.862
64QAM	20635	847.5	2.6918	2.862

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
QPSK CH 20415 (825.5MHz)	16QAM CH 20635 (847.5MHz)

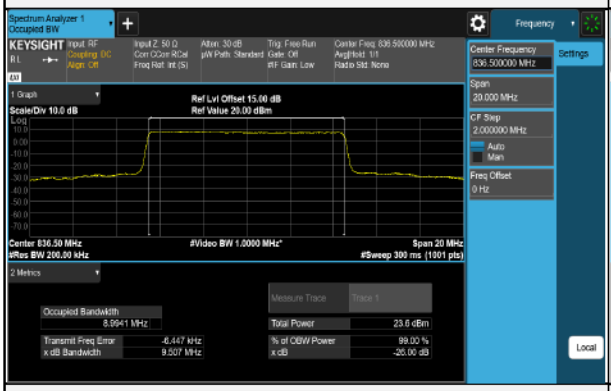
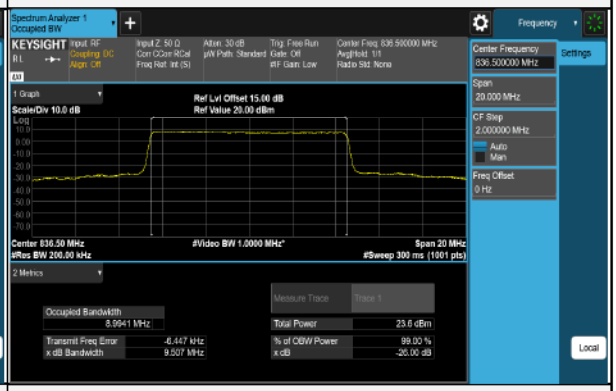
LTE Band 5 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	20425	826.5	4.4935	4.786
QPSK	20525	836.5	4.4966	4.791
QPSK	20625	846.5	4.4978	4.772
16QAM	20425	826.5	4.4893	4.769
16QAM	20525	836.5	4.4954	4.770
16QAM	20625	846.5	4.4908	4.783
64QAM	20425	826.5	4.4949	4.787
64QAM	20525	836.5	4.4965	4.784
64QAM	20625	846.5	4.4948	4.773

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
QPSK CH 20625 (846.5MHz)	QPSK CH 20525 (836.5MHz)

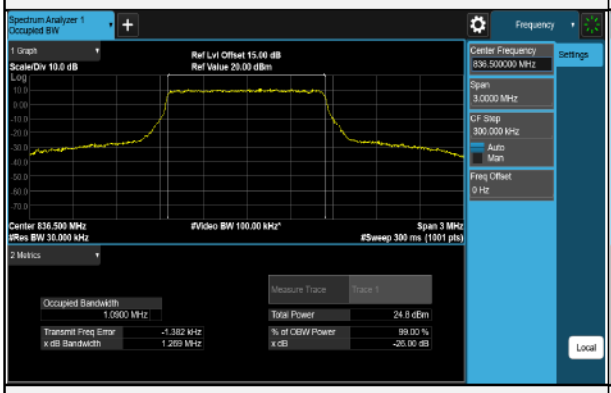
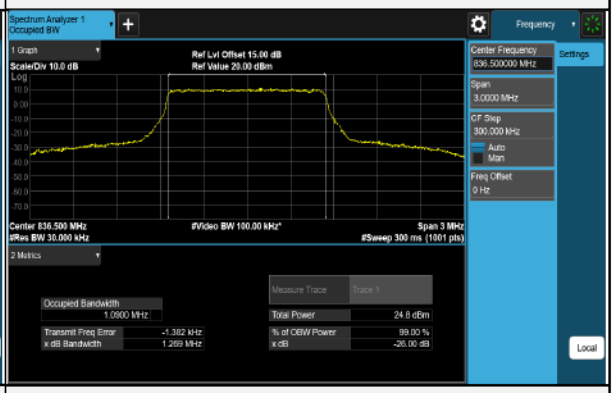
LTE Band 5 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	20450	829	8.9742	9.503
QPSK	20525	836.5	8.9941	9.507
QPSK	20600	844	8.9613	9.481
16QAM	20450	829	8.9676	9.503
16QAM	20525	836.5	8.9884	9.500
16QAM	20600	844	8.9627	9.490
64QAM	20450	829	8.9696	9.502
64QAM	20525	836.5	8.9867	9.505
64QAM	20600	844	8.9598	9.502

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
QPSK CH 20525 (836.5MHz)	QPSK CH 20525 (836.5MHz)

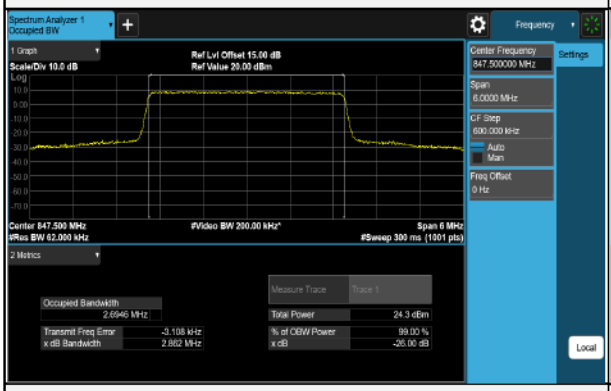
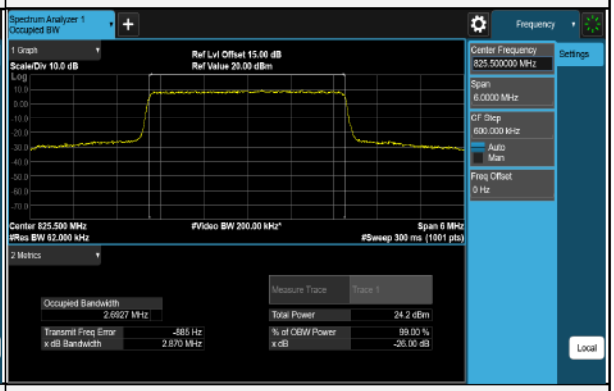
LTE Band 26 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	26797	824.7	1.0862	1.252
QPSK	26915	836.5	1.0900	1.269
QPSK	27033	848.3	1.0895	1.252
16QAM	26797	824.7	1.0876	1.255
16QAM	26915	836.5	1.0880	1.251
16QAM	27033	848.3	1.0877	1.250
64QAM	26797	824.7	1.0875	1.249
64QAM	26915	836.5	1.0874	1.249
64QAM	27033	848.3	1.0880	1.246

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
QPSK CH 26915 (836.5MHz)	QPSK CH 26915 (836.5MHz)

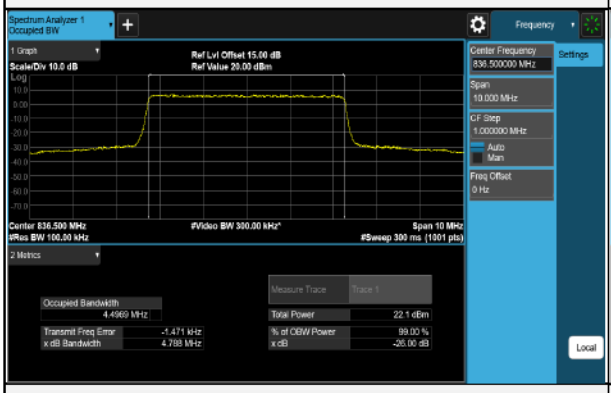
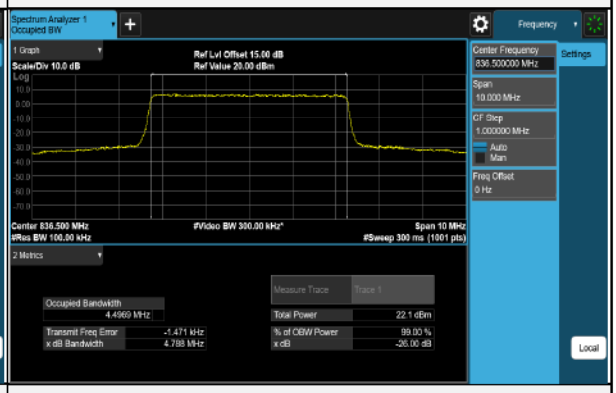
LTE Band 26 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	26805	825.5	2.6927	2.870
QPSK	26915	836.5	2.6915	2.866
QPSK	27025	847.5	2.6946	2.862
16QAM	26805	825.5	2.6916	2.870
16QAM	26915	836.5	2.6917	2.865
16QAM	27025	847.5	2.6895	2.867
64QAM	26805	825.5	2.6932	2.861
64QAM	26915	836.5	2.6923	2.861
64QAM	27025	847.5	2.6914	2.861

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
QPSK CH 27025 (847.5MHz)	QPSK CH 26805 (825.5MHz)

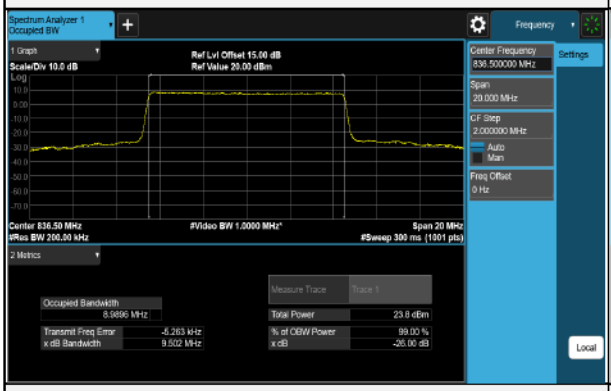
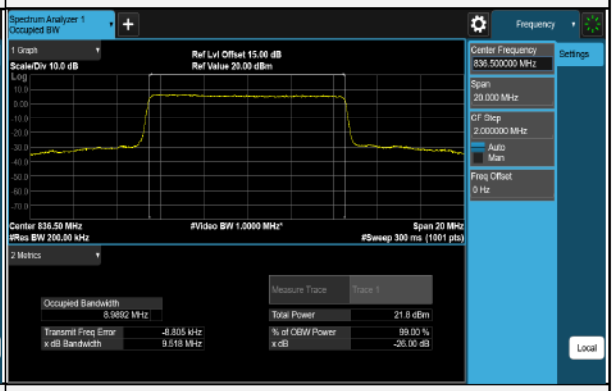
LTE Band 26 (Channel Bandwidth 5MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	26815	826.5	4.4904	4.782
QPSK	26915	836.5	4.4964	4.774
QPSK	27015	846.5	4.4937	4.780
16QAM	26815	826.5	4.4903	4.771
16QAM	26915	836.5	4.4919	4.778
16QAM	27015	846.5	4.4911	4.769
64QAM	26815	826.5	4.4912	4.768
64QAM	26915	836.5	4.4969	4.788
64QAM	27015	846.5	4.4915	4.770

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
64QAM CH 26915 (836.5MHz)	64QAM CH 26915 (836.5MHz)

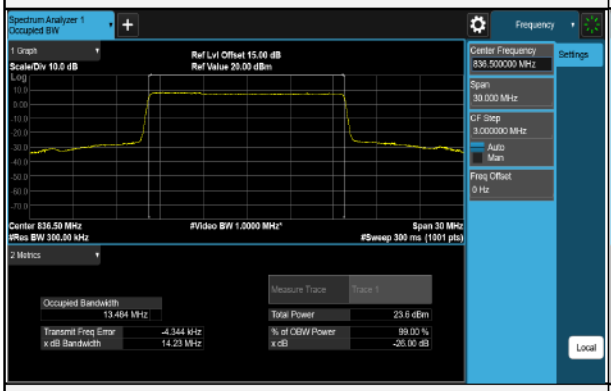
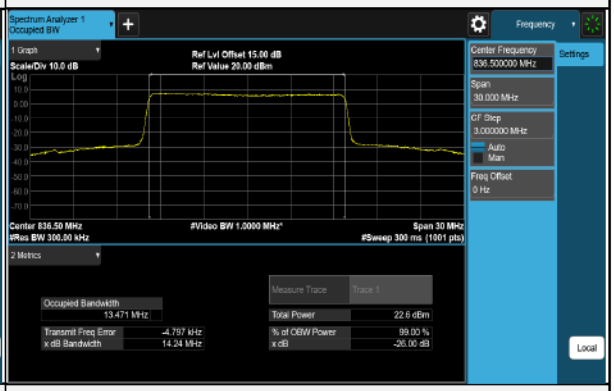
LTE Band 26 (Channel Bandwidth 10MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	26840	829	8.9678	9.503
QPSK	26915	836.5	8.9896	9.502
QPSK	26990	844	8.9581	9.480
16QAM	26840	829	8.9703	9.499
16QAM	26915	836.5	8.9888	9.500
16QAM	26990	844	8.9598	9.492
64QAM	26840	829	8.9651	9.503
64QAM	26915	836.5	8.9892	9.518
64QAM	26990	844	8.9580	9.501

Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
QPSK CH 26915 (836.5MHz)	64QAM CH 26915 (836.5MHz)

LTE Band 26 (Channel Bandwidth 15MHz)

Test Condition	Channel	Frequency (MHz)	Occupied bandwidth (MHz)	26dB Bandwidth (MHz)
QPSK	26865	831.5	13.449	14.22
QPSK	26915	836.5	13.484	14.23
QPSK	26965	841.5	13.443	14.22
16QAM	26865	831.5	13.436	14.21
16QAM	26915	836.5	13.471	14.24
16QAM	26965	841.5	13.435	14.23
64QAM	26865	831.5	13.438	14.22
64QAM	26915	836.5	13.464	14.22
64QAM	26965	841.5	13.429	14.23

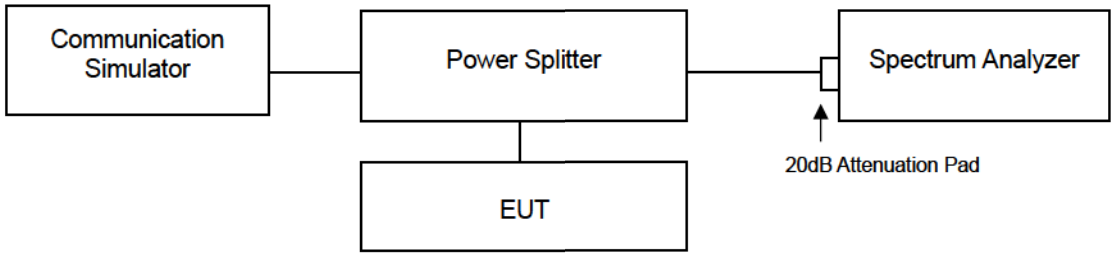
Spectrum Plot of Worst Value	
Occupied bandwidth	26dB Bandwidth
	
QPSK CH 26915 (836.5MHz)	16QAM CH 26915 (836.5MHz)

4.5 Band Edge Measurement

4.5.1 Limits of Band Edge Measurement

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. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

4.5.2 Test Setup

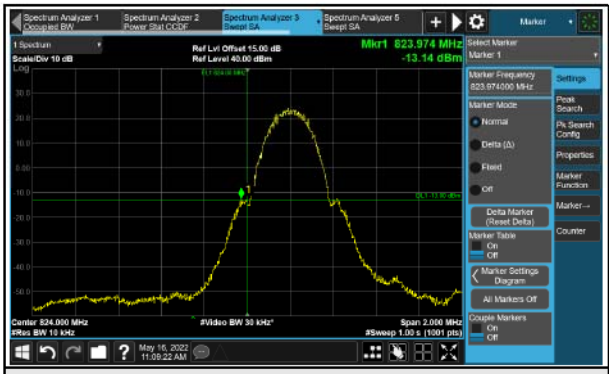
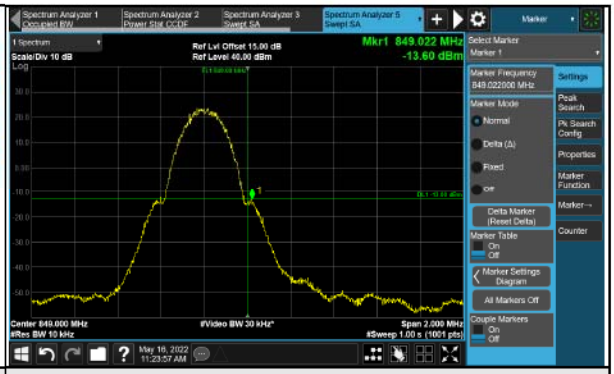


4.5.3 Test Procedures

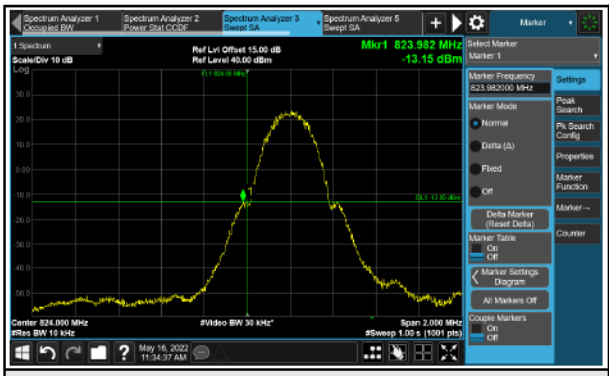
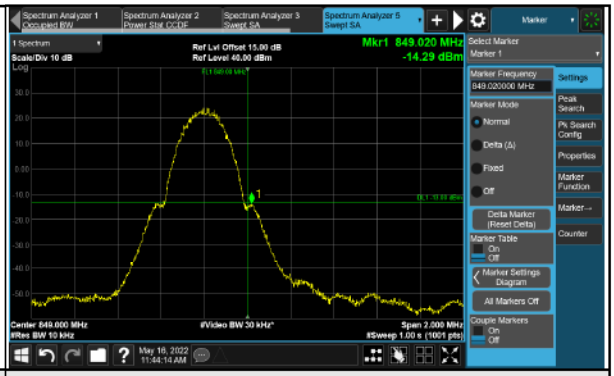
a. All measurements were done at low and high operational frequency range.
b. The center frequency of spectrum is the band edge frequency and span is 2MHz. RB of the spectrum is 10kHz and VB of the spectrum is 30kHz (GPRS / EDGE).
c. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 15kHz and VB of the spectrum is 51kHz (LTE Channel Bandwidth 1.4MHz).
d. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 30kHz and VB of the spectrum is 100kHz (LTE Channel Bandwidth 3MHz).
e. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 51kHz and VB of the spectrum is 160kHz (LTE Channel Bandwidth 5MHz).
f. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 100kHz and VB of the spectrum is 300kHz (LTE Channel Bandwidth 10MHz).
g. The center frequency of spectrum is the band edge frequency and span is 1MHz. RB of the spectrum is 150kHz and VB of the spectrum is 470kHz (LTE Channel Bandwidth 15MHz).
h. Record the max trace plot into the test report.

4.5.4 Test Results

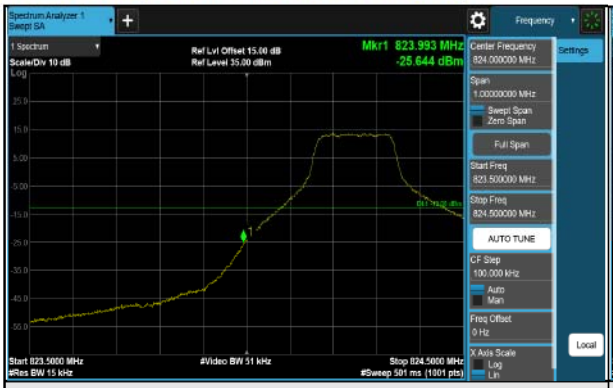
GPRS

	
824.2MHz	848.8MHz

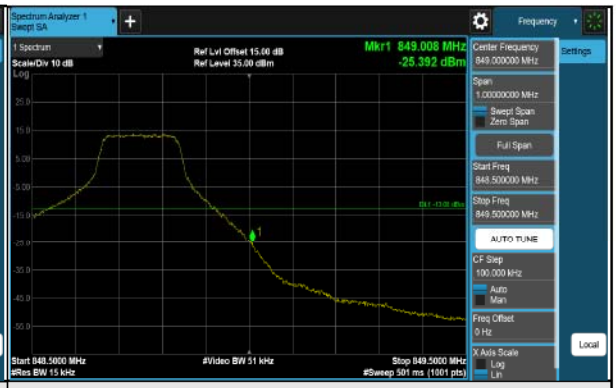
EDGE

	
824.2MHz	848.8MHz

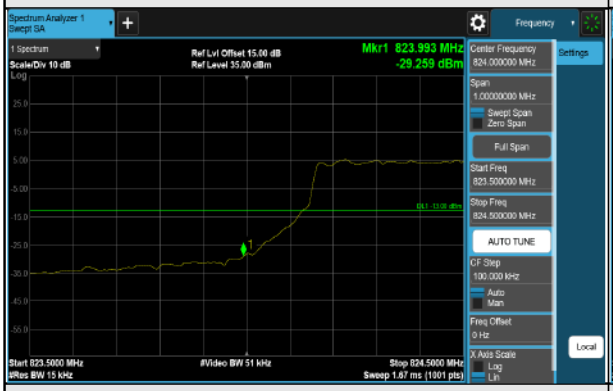
LTE Band 5 (Channel Bandwidth 1.4MHz)



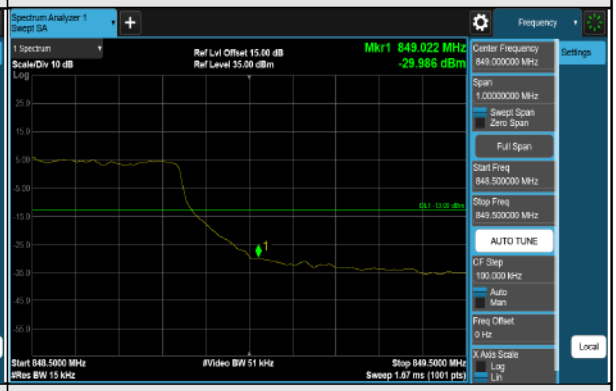
1RB (824.7MHz)



1RB (848.3MHz)

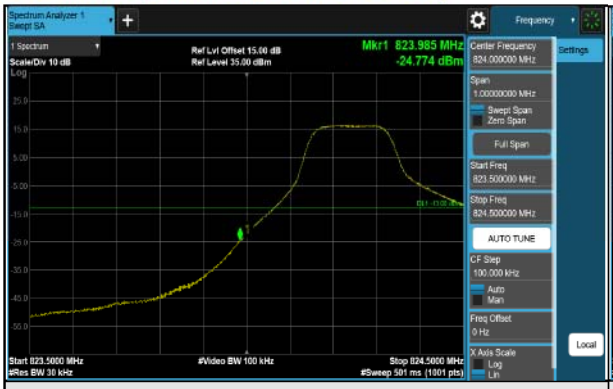


Full (824.7MHz)

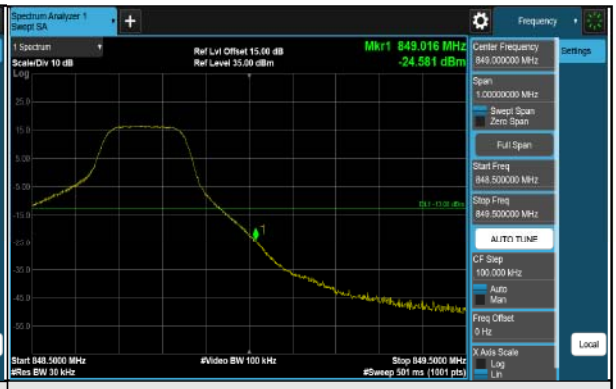


Full (848.3MHz)

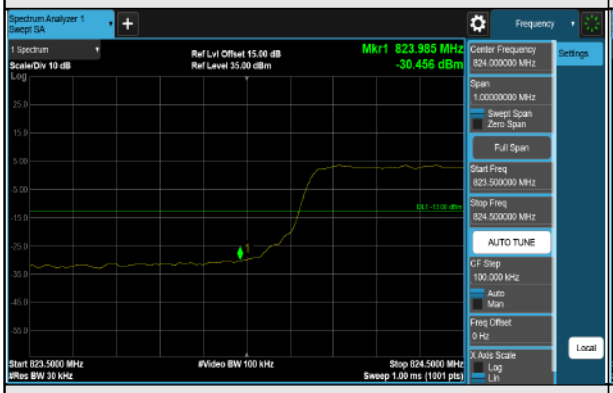
LTE Band 5 (Channel Bandwidth 3MHz)



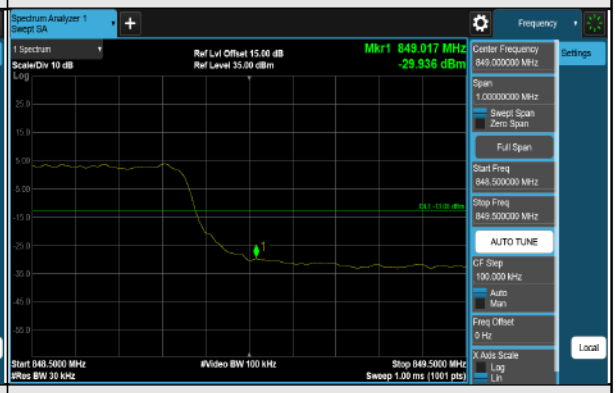
1RB (825.5MHz)



1RB (847.5MHz)

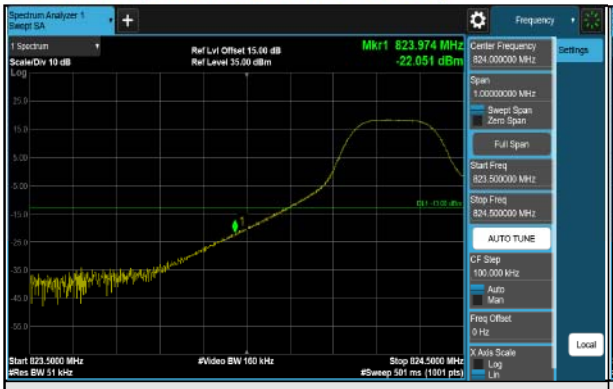


Full (825.5MHz)



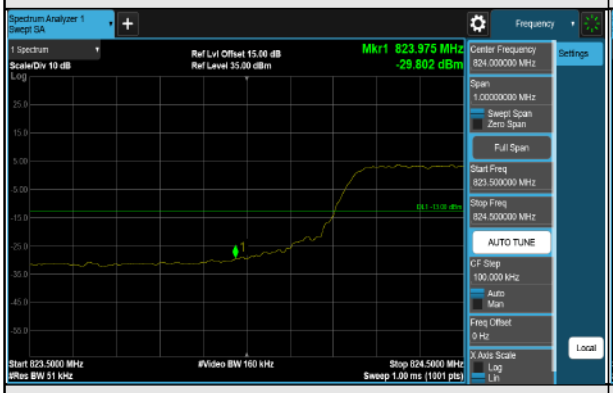
Full (847.5MHz)

LTE Band 5 (Channel Bandwidth 5MHz)

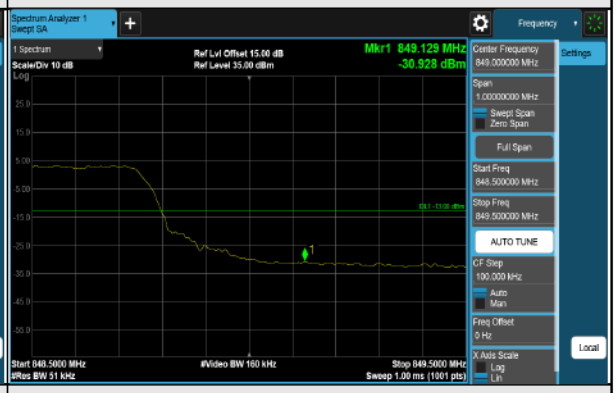


1RB (826.5MHz)

1RB (846.5MHz)



Full (826.5MHz)



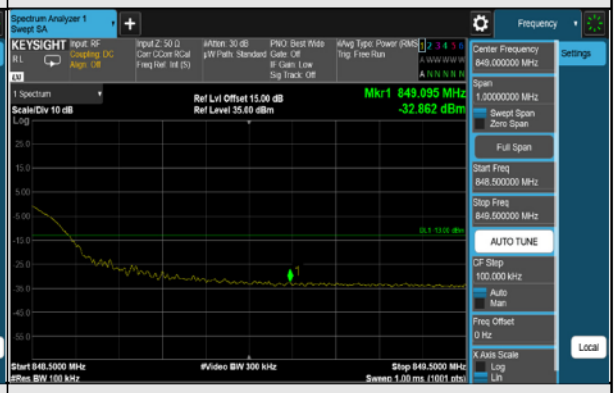
Full (846.5MHz)

LTE Band 5 (Channel Bandwidth 10MHz)

1RB (829MHz)

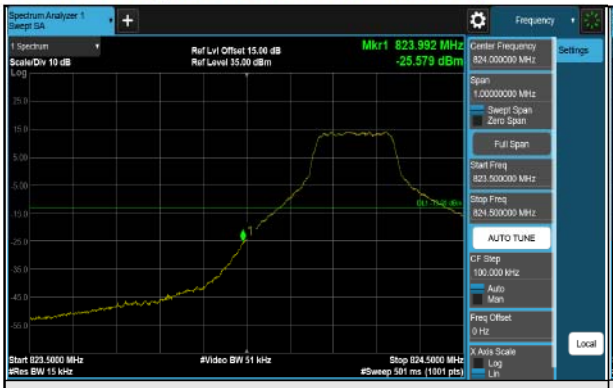
1RB (844MHz)

Full (829MHz)

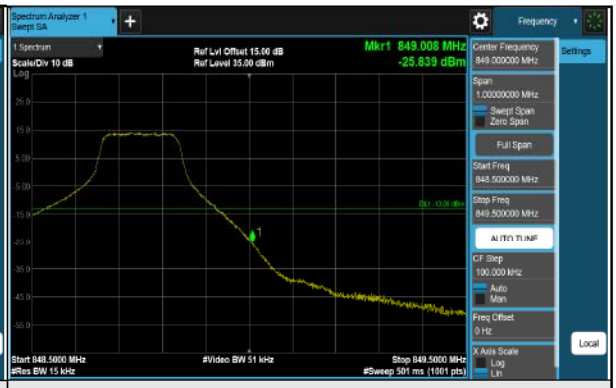


Full (844MHz)

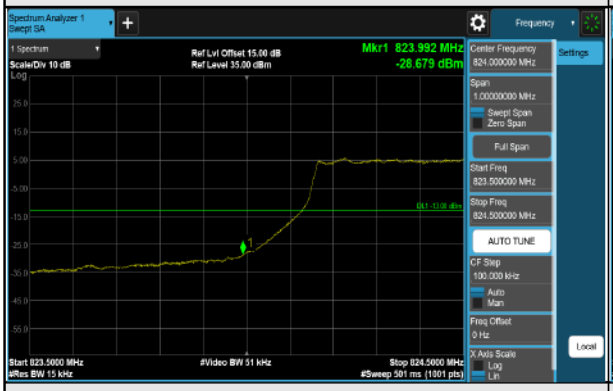
LTE Band 26 (Channel Bandwidth 1.4MHz)



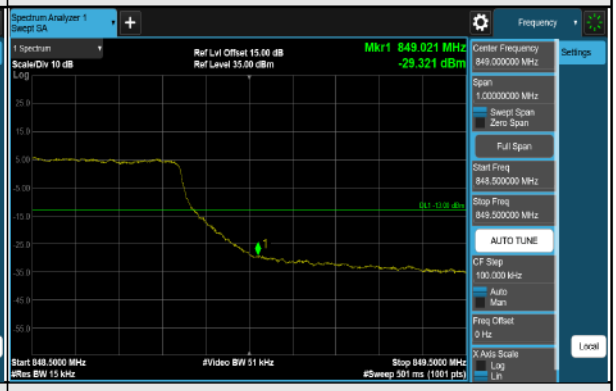
1RB (824.7MHz)



1RB (848.3MHz)

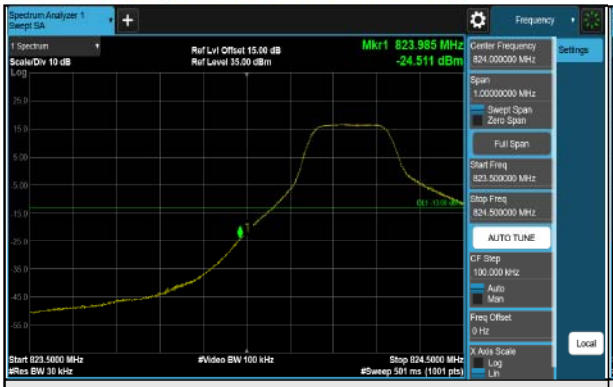


Full (824.7MHz)

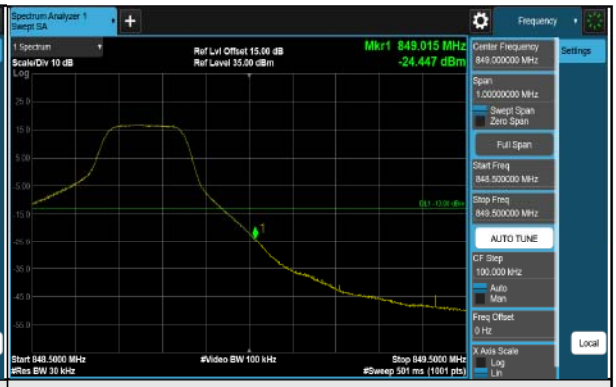


Full (848.3MHz)

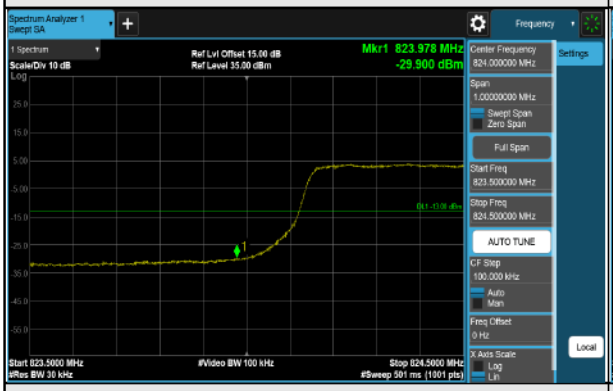
LTE Band 26 (Channel Bandwidth 3MHz)



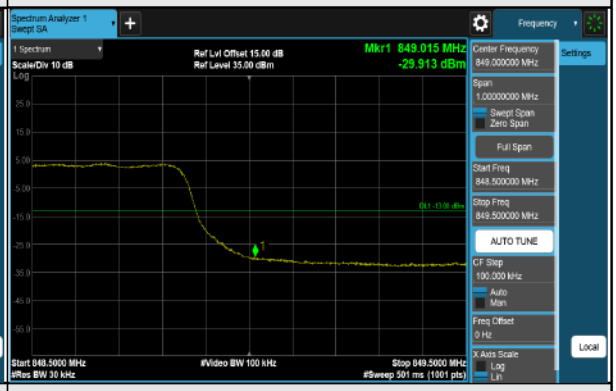
1RB (825.5MHz)



1RB (847.5MHz)



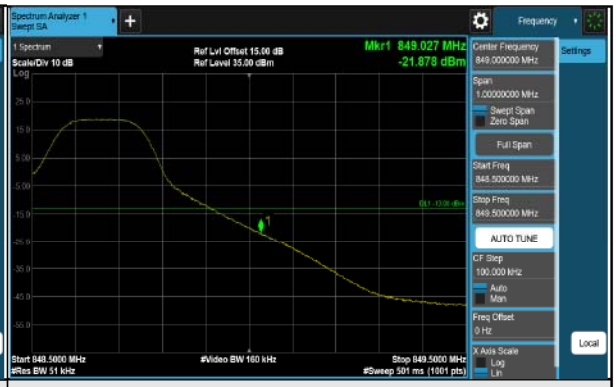
Full (825.5MHz)



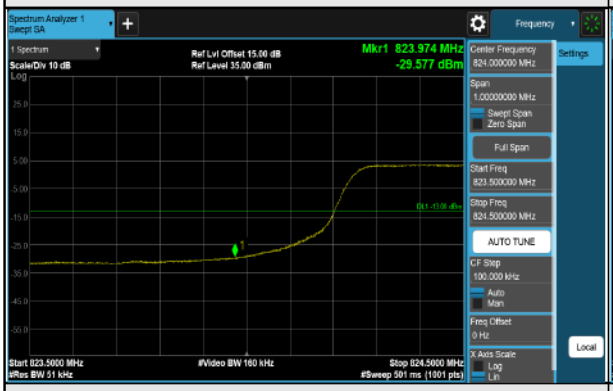
Full (847.5MHz)

LTE Band 26 (Channel Bandwidth 5MHz)

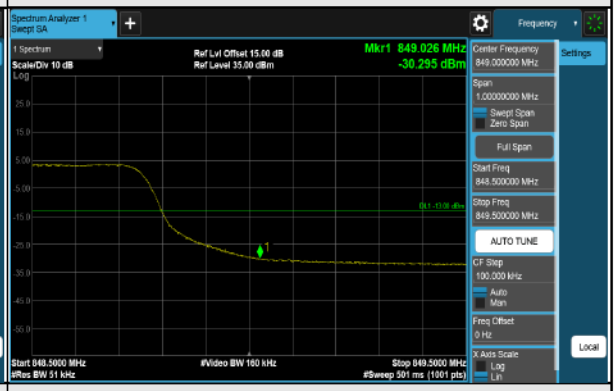
1RB (826.5MHz)



1RB (846.5MHz)



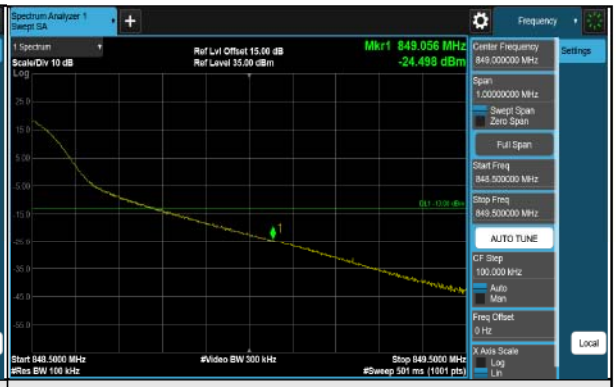
Full (826.5MHz)



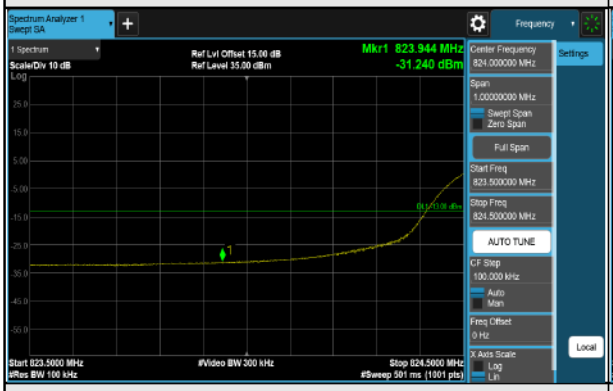
Full (846.5MHz)

LTE Band 26 (Channel Bandwidth 10MHz)

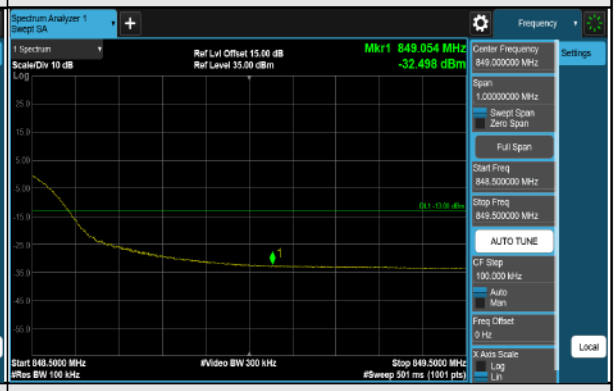
1RB (829MHz)



1RB (844MHz)

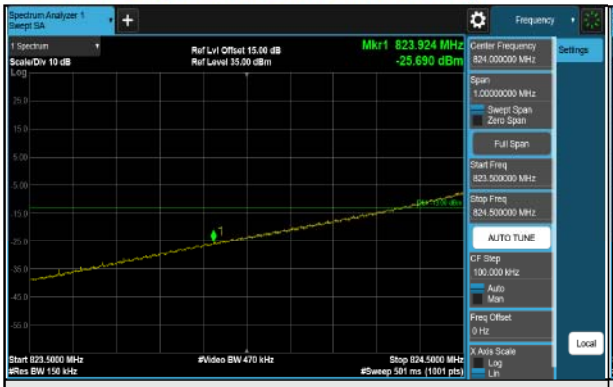


Full (829MHz)



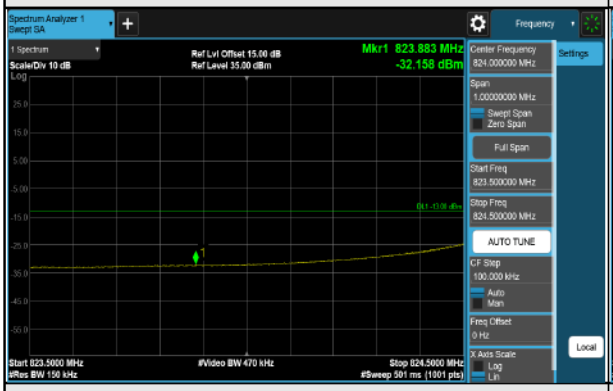
Full (844MHz)

LTE Band 26 (Channel Bandwidth 15MHz)

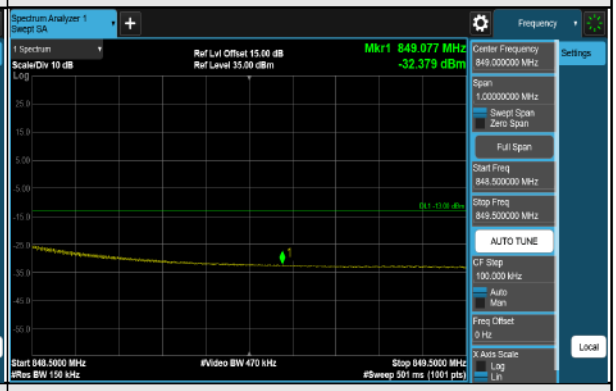


1RB (831.5MHz)

1RB (841.5MHz)



Full (831.5MHz)



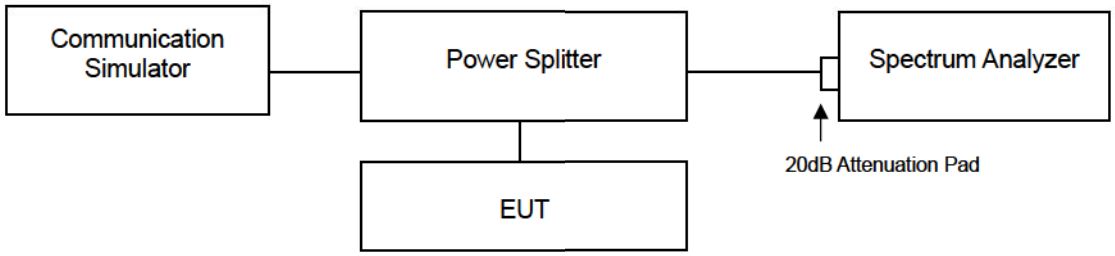
Full (841.5MHz)

4.6 Peak to Average Ratio

4.6.1 Limits of Peak to Average Ratio Measurement

In measuring transmissions in this band using an average power technique, the peak to-average ratio (PAR) of the transmission may not exceed 13 dB

4.6.2 Test Setup



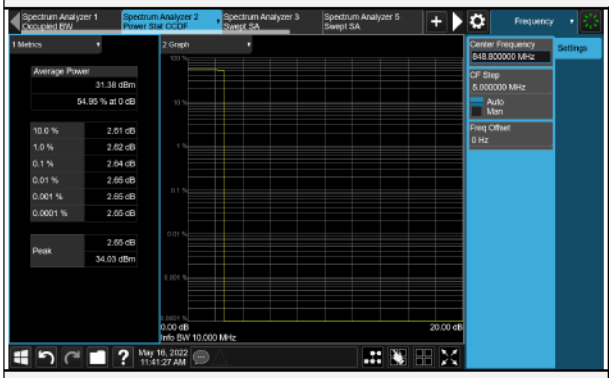
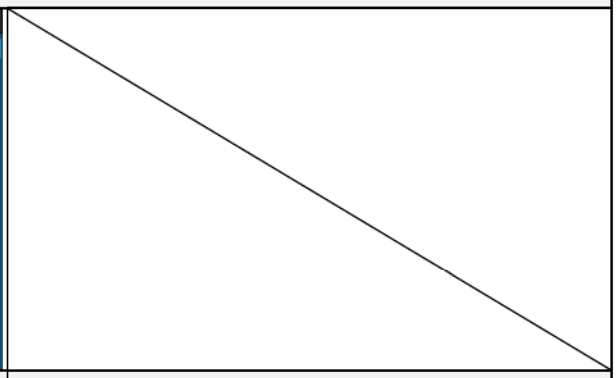
4.6.3 Test Procedures

a. Set resolution/measurement bandwidth ≥ signal's occupied bandwidth;
b. Set the number of counts to a value that stabilizes the measured CCDF curve;
c. Record the maximum PAPR level associated with a probability of 0.1%.

4.6.4 Test Results

GPRS, EDGE

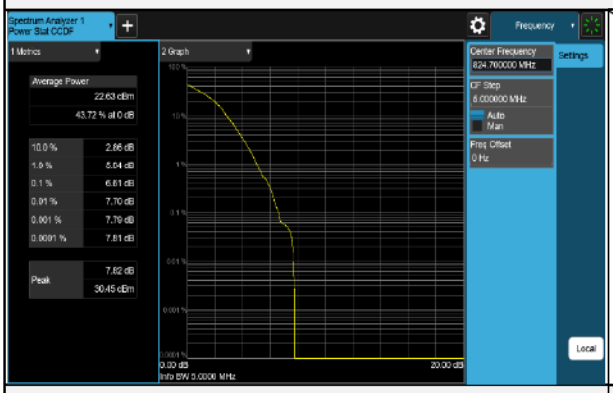
Test Condition	Channel	Frequency (MHz)	Measure. Value (dB)	Limit (dB)	Result
GPRS	128	824.2	2.63	13	Pass
GPRS	189	836.4	2.63	13	Pass
GPRS	251	848.8	2.63	13	Pass
EDGE	128	824.2	2.62	13	Pass
EDGE	189	836.4	2.63	13	Pass
EDGE	251	848.8	2.64	13	Pass

Spectrum Plot of Worst Value	
	
EDGE CH 251 (848.8MHz)	

LTE Band 5 (Channel Bandwidth 1.4MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value (dB)	Limit (dB)	Result
QPSK	20407	824.7	5.42	13	Pass
QPSK	20525	836.5	5.18	13	Pass
QPSK	20643	848.3	5.03	13	Pass
16QAM	20407	824.7	6.61	13	Pass
16QAM	20525	836.5	6.31	13	Pass
16QAM	20643	848.3	6.08	13	Pass
64QAM	20407	824.7	6.48	13	Pass
64QAM	20525	836.5	6.33	13	Pass
64QAM	20643	848.3	6.30	13	Pass

Spectrum Plot of Worst Value

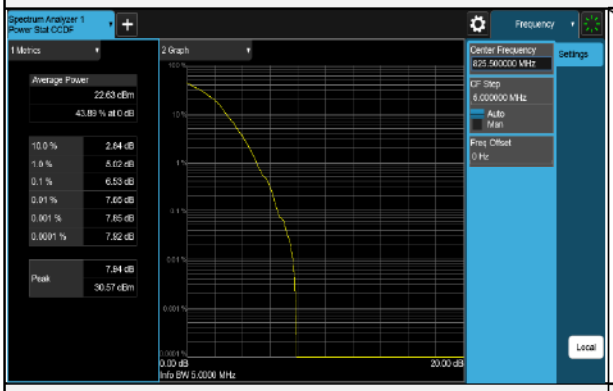


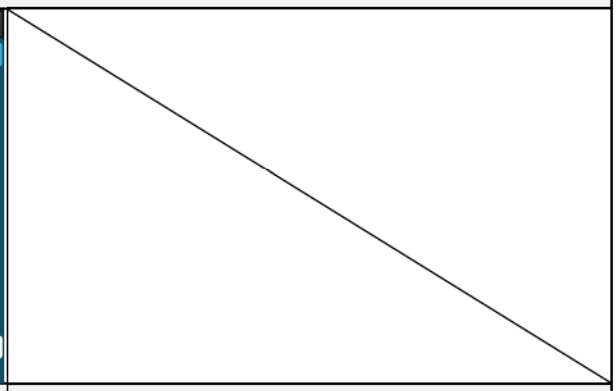
16QAM CH 20407 (824.7MHz)

LTE Band 5 (Channel Bandwidth 3MHz)

Test Condition	Channel	Frequency (MHz)	Measure. Value (dB)	Limit (dB)	Result
QPSK	20415	825.5	5.31	13	Pass
QPSK	20525	836.5	5.11	13	Pass
QPSK	20635	847.5	4.94	13	Pass
16QAM	20415	825.5	6.53	13	Pass
16QAM	20525	836.5	6.23	13	Pass
16QAM	20635	847.5	6.01	13	Pass
64QAM	20415	825.5	6.47	13	Pass
64QAM	20525	836.5	6.25	13	Pass
64QAM	20635	847.5	6.21	13	Pass

Spectrum Plot of Worst Value





16QAM CH 20415 (825.5MHz)