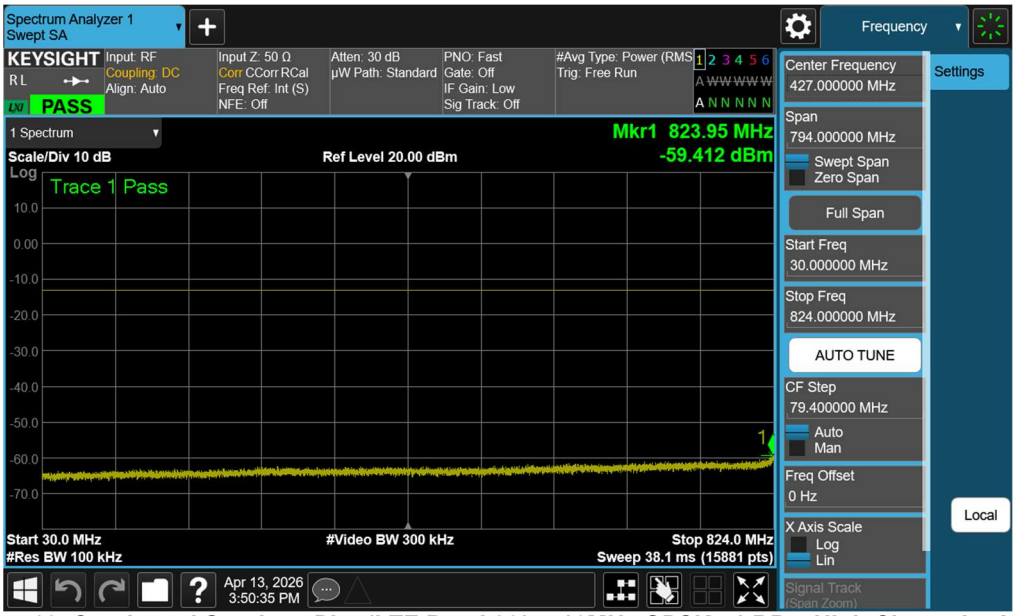
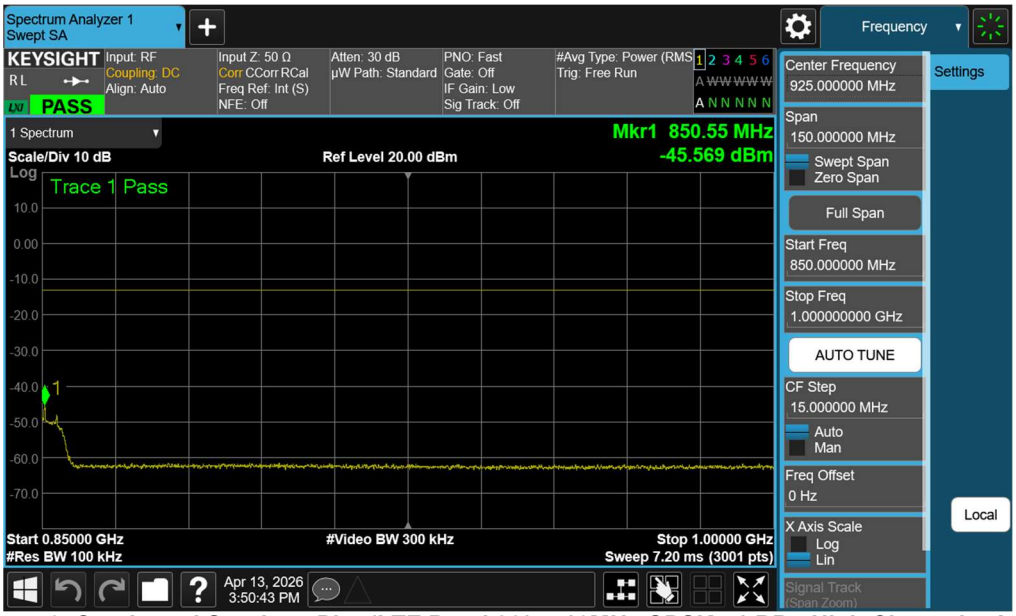
LTE Band 26/5 – Ant2



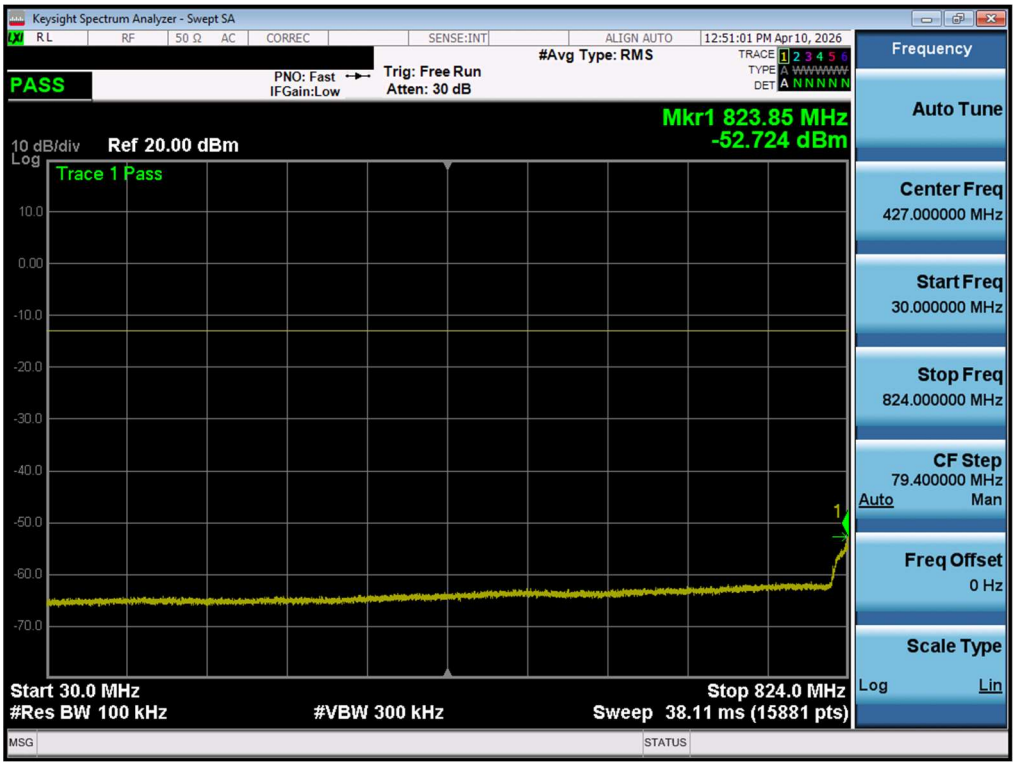
Plot 7-69. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB – High Channel – Ant2)



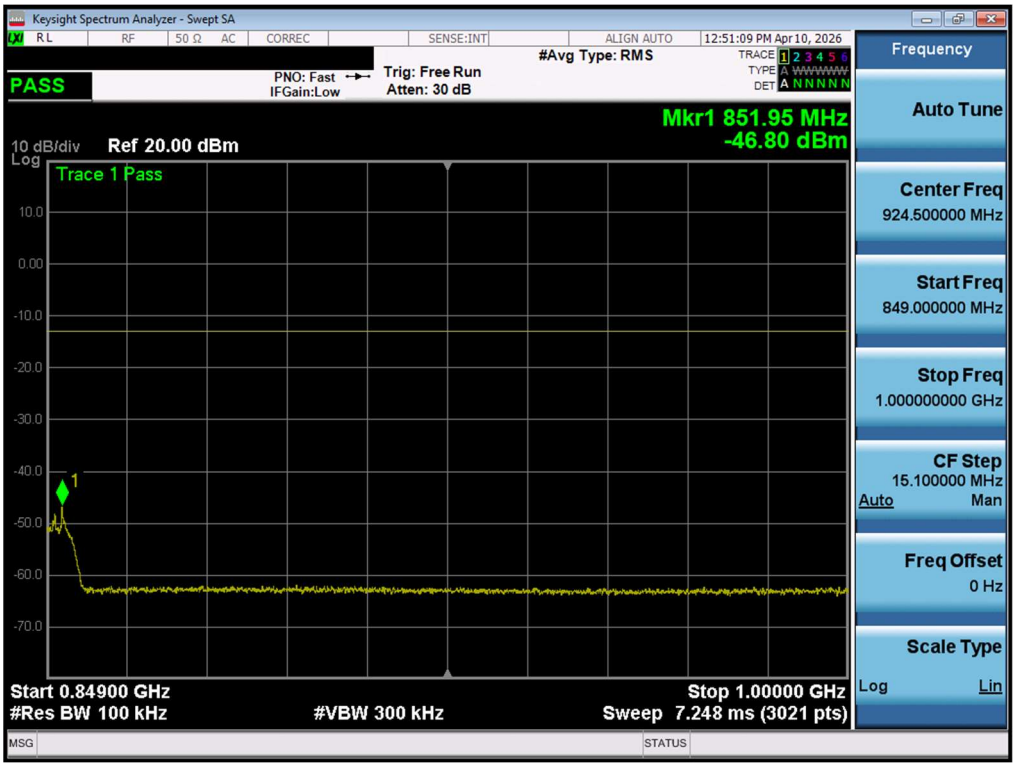
Plot 7-70. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - High Channel – Ant2)

Plot 7-71. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - High Channel – Ant2)

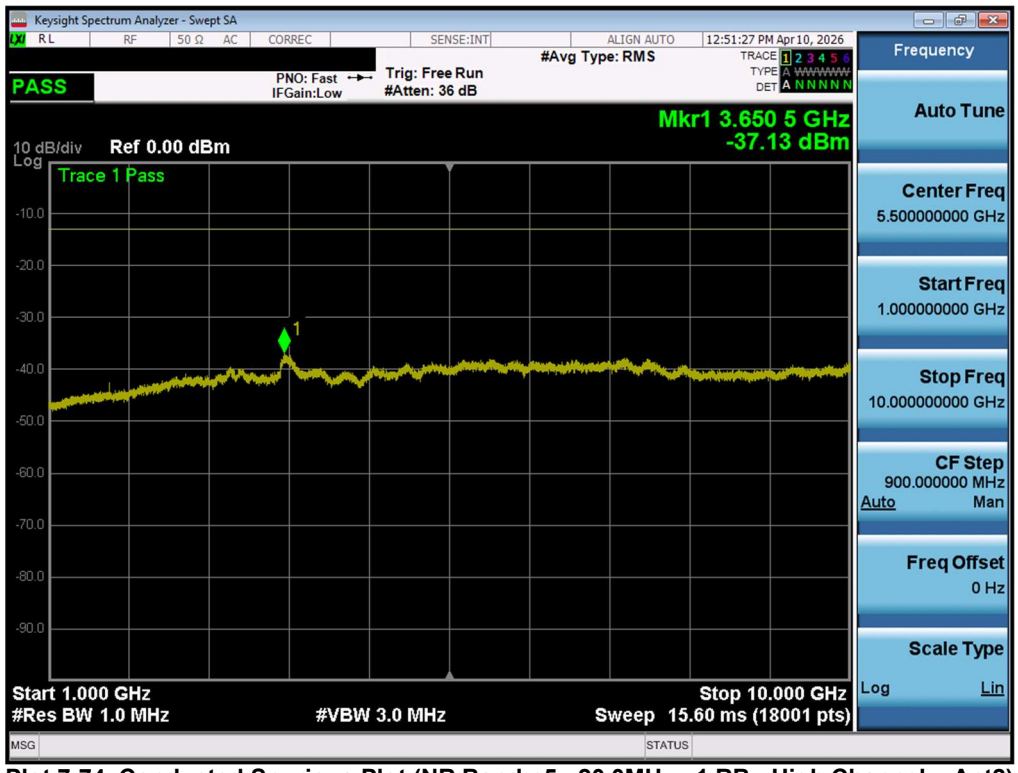
NR Band n5 – Ant2



Plot 7-72. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - High Channel – Ant2)



Plot 7-73. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - High Channel – Ant2)



Plot 7-74. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - High Channel – Ant2)

7.5 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 log$_{10}$(P$_{[Watts]}$), where P is the transmitter power in Watts.

Test Procedure Used

ANSI C63.26:2015 – Section 5.7.3

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

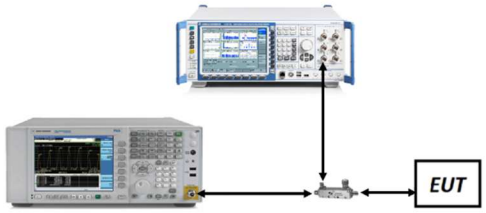


Figure 7-4. Test Instrument & Measurement Setup

Test Notes

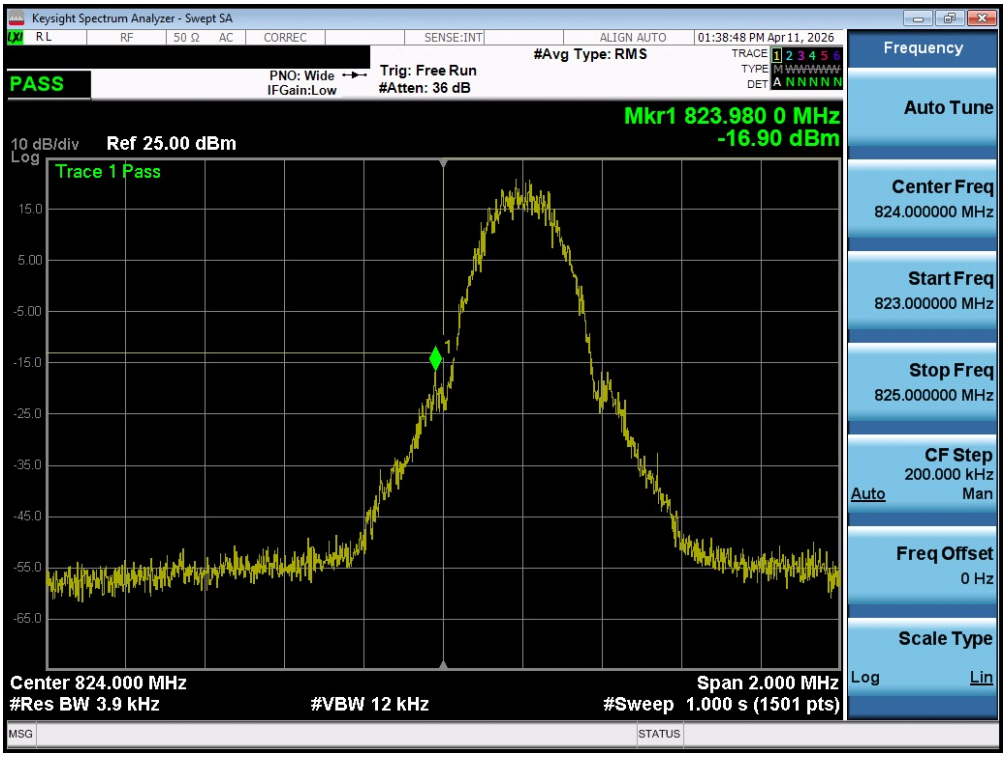
1. Per 22.917(b) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

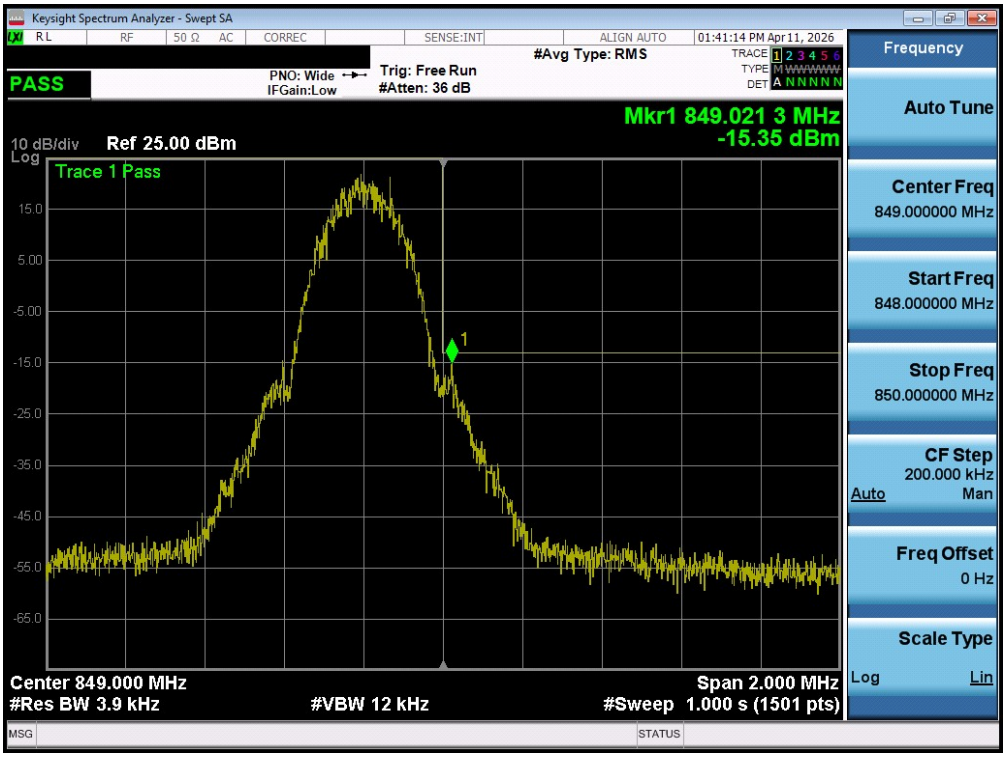
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
GSM-Cell	250kHz	Low	Band Edge	-16.90	-13.0	-3.90
		High	Extended	-15.35	-13.0	-2.35
WCDMA-Cell	5MHz	Low	Band Edge	-17.84	-13.0	-4.84
		High	Extended	-18.31	-13.0	-5.31
LTE-B26-5	15MHz	Low	Band Edge	-27.90	-13.0	-14.90
		High	Band Edge	-33.22	-13.0	-20.22
	10MHz	Low	Band Edge	-26.09	-13.0	-13.09
		High	Band Edge	-25.57	-13.0	-12.57
	5MHz	Low	Band Edge	-18.34	-13.0	-5.34
		High	Band Edge	-20.10	-13.0	-7.10
	3MHz	Low	Band Edge	-14.87	-13.0	-1.87
		High	Band Edge	-16.29	-13.0	-3.29
	1.4MHz	Low	Band Edge	-23.50	-13.0	-10.50
		High	Band Edge	-15.35	-13.0	-2.35
NR-n5	20MHz	Low	Band Edge	-27.58	-13.0	-14.58
		High	Band Edge	-28.43	-13.0	-15.43
	15MHz	Low	Band Edge	-26.81	-13.0	-13.81
		High	Band Edge	-31.32	-13.0	-18.32
	10MHz	Low	Band Edge	-22.40	-13.0	-9.40
		High	Band Edge	-28.62	-13.0	-15.62
	5MHz	Low	Band Edge	-18.44	-13.0	-5.44
		High	Band Edge	-17.09	-13.0	-4.09

Table 7-12. Conducted Band Edge Results – Ant1

GSM/GPRS Cell – Ant1

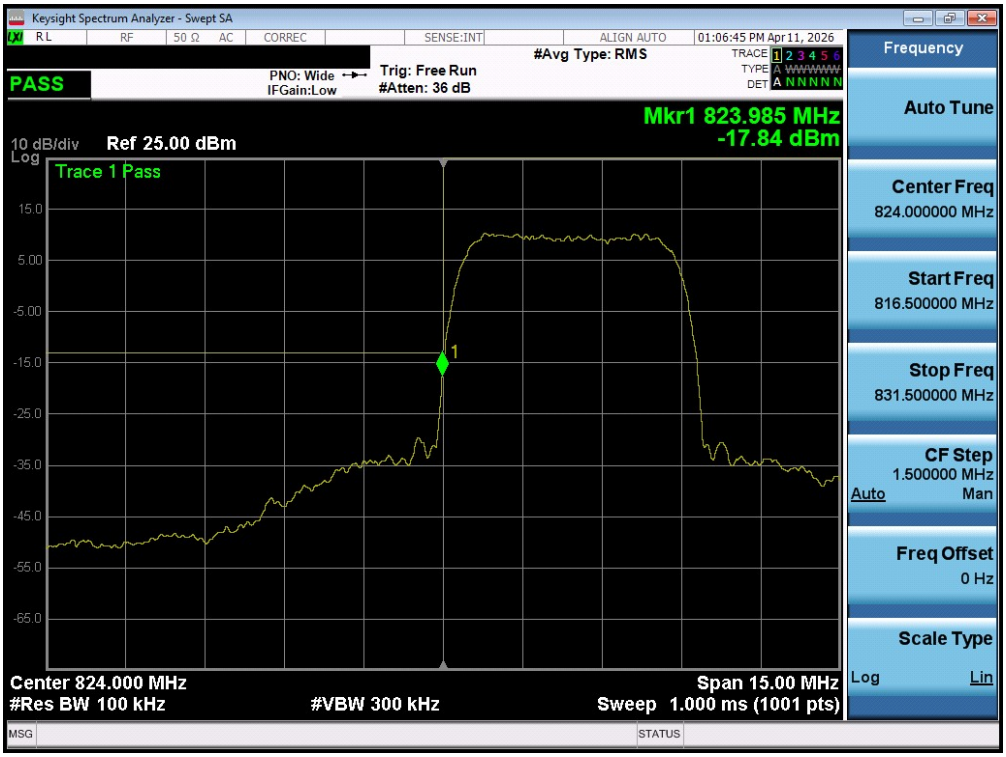


Plot 7-75. Lower Band Edge Plot (GPRS Cell – Ch. 128 – Ant1)



Plot 7-76. Upper Band Edge Plot (GPRS Cell – Ch. 251 – Ant1)

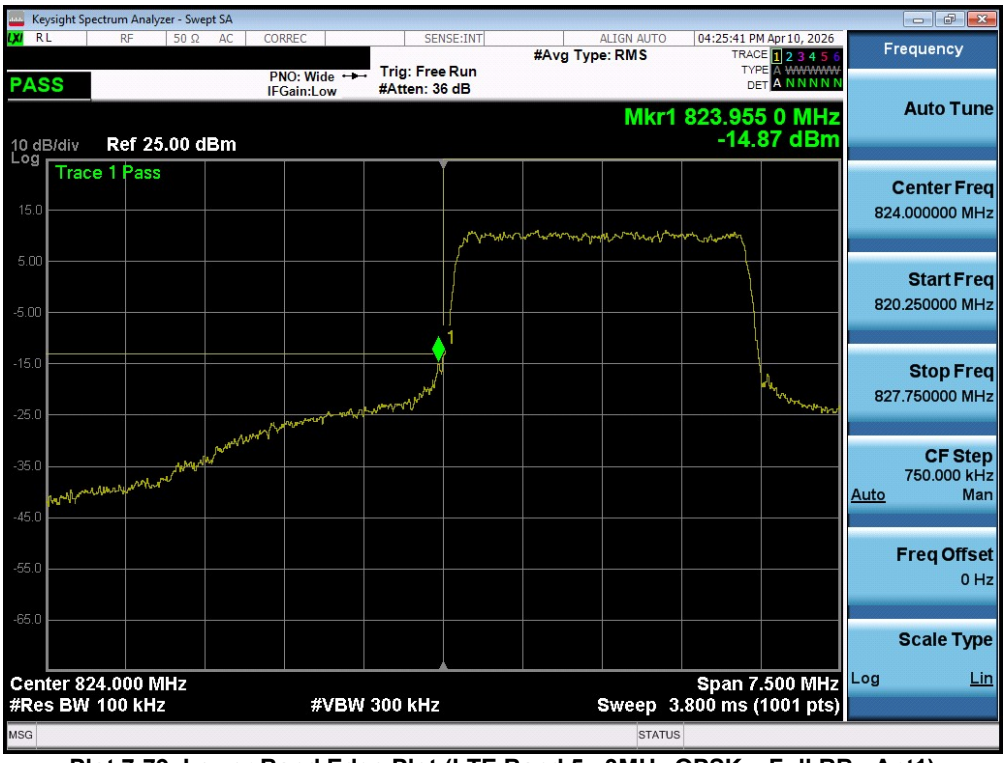
WCDMA Cell – Ant1



Plot 7-77. Lower Band Edge Plot (WCDMA Cell – Ch. 4132 – Ant1)

Plot 7-78. Upper Band Edge Plot (WCDMA Cell – Ch. 4233 – Ant1)

LTE Band 26/5 – Ant1

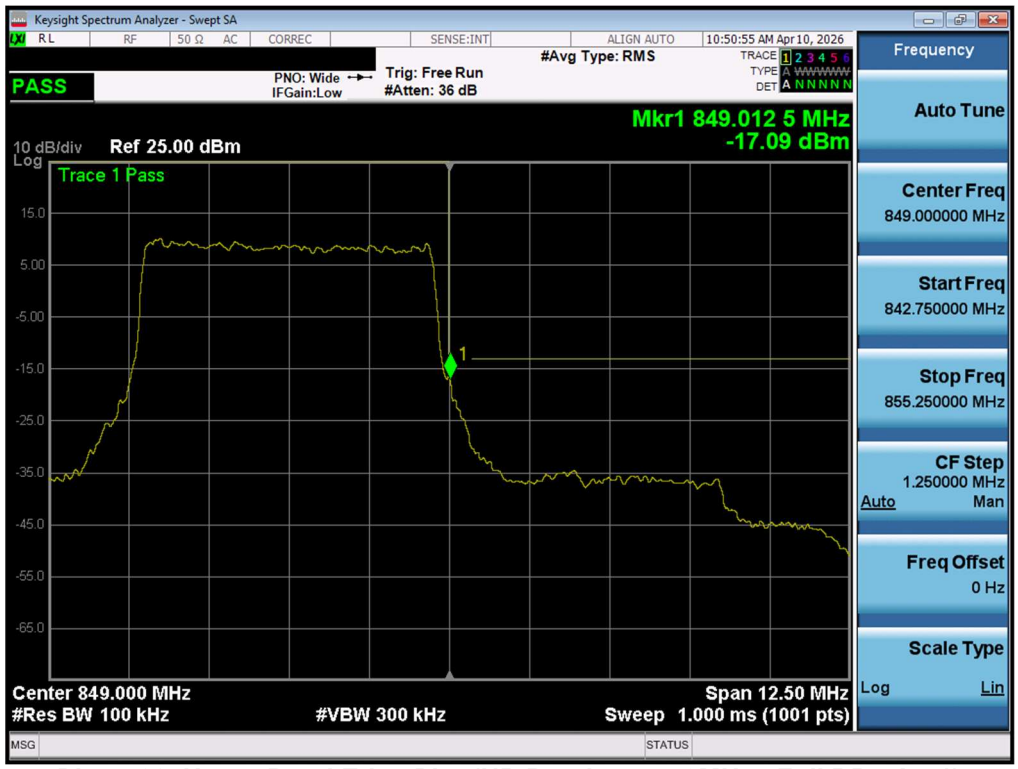


Plot 7-79. Lower Band Edge Plot (LTE Band 5 - 3MHz QPSK – Full RB - Ant1)

Plot 7-80. Upper Band Edge Plot (LTE Band 5 - 3MHz QPSK – Full RB - Ant1)

NR Band n5 – Ant1

Plot 7-81. Lower Band Edge Plot (NR Band n5 – 5.0MHz - Full RB - Ant1)

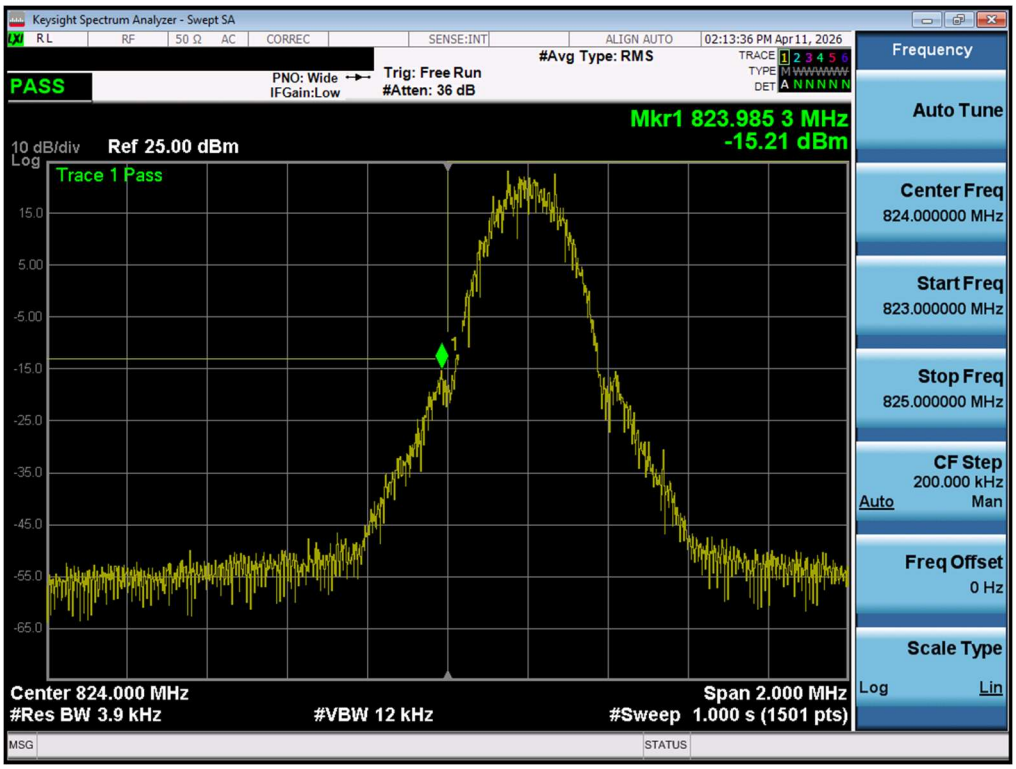


Plot 7-82. Upper Band Edge Plot (NR Band n5 – 5.0MHz - Full RB - Ant1)

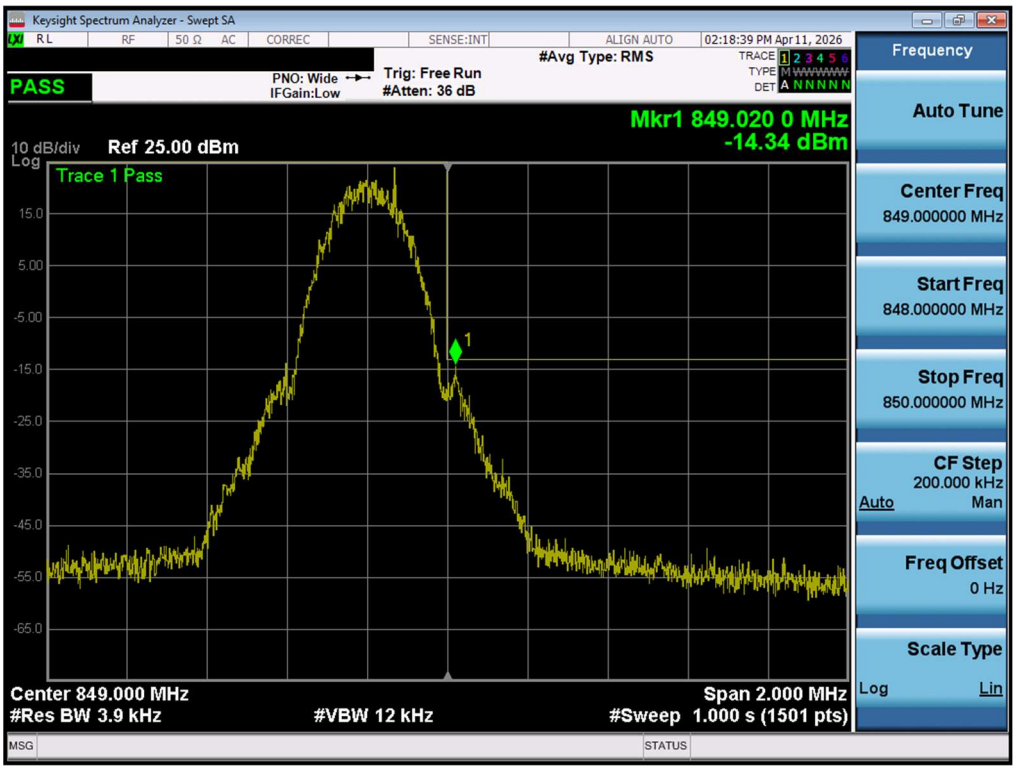
Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
GSM-Cell	250kHz	Low	Band Edge	-15.21	-13.0	-2.21
		Low	Extended	-14.34	-13.0	-1.34
WCDMA-Cell	5MHz	High	Band Edge	-19.77	-13.0	-6.77
		High	Extended	-19.34	-13.0	-6.34
LTE-B26-5	15MHz	Low	Band Edge	-28.77	-13.0	-15.77
		High	Band Edge	-31.44	-13.0	-18.44
	10MHz	Low	Band Edge	-26.43	-13.0	-13.43
		High	Band Edge	-27.34	-13.0	-14.34
	5MHz	Low	Band Edge	-19.41	-13.0	-6.41
		High	Band Edge	-19.85	-13.0	-6.85
	3MHz	Low	Band Edge	-14.84	-13.0	-1.84
		High	Band Edge	-18.46	-13.0	-5.46
	1.4MHz	Low	Band Edge	-15.22	-13.0	-2.22
		High	Band Edge	-14.90	-13.0	-1.90
NR-n5	20MHz	Low	Band Edge	-27.52	-13.0	-14.52
		High	Band Edge	-28.65	-13.0	-15.65
	15MHz	Low	Band Edge	-26.11	-13.0	-13.11
		High	Band Edge	-31.01	-13.0	-18.01
	10MHz	Low	Band Edge	-23.69	-13.0	-10.69
		High	Band Edge	-27.03	-13.0	-14.03
	5MHz	Low	Band Edge	-17.84	-13.0	-4.83
		High	Band Edge	-19.37	-13.0	-6.37

Table 7-13. Conducted Band Edge Results – Ant2

GSM/GPRS Cell – Ant2



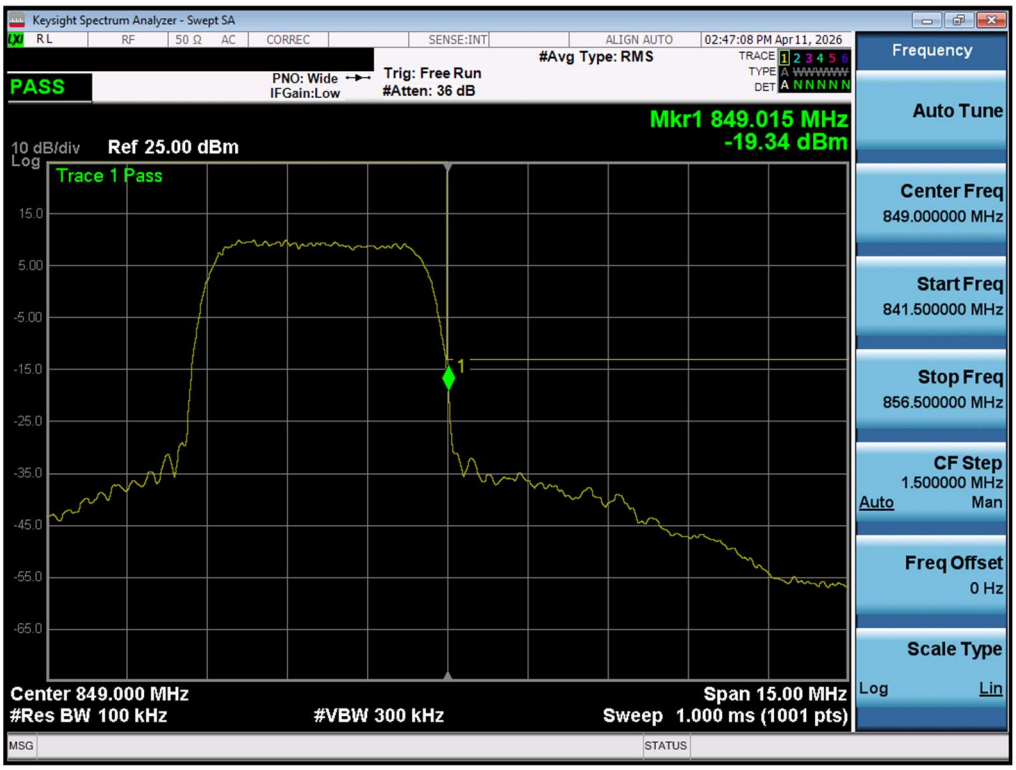
Plot 7-83. Lower Band Edge Plot (GPRS Cell – Ch. 128 – Ant2)



Plot 7-84. Upper Band Edge Plot (GPRS Cell – Ch. 251 – Ant2)

WCDMA Cell – Ant2

Plot 7-85. Lower Band Edge Plot (WCDMA Cell – Ch. 4132 – Ant2)



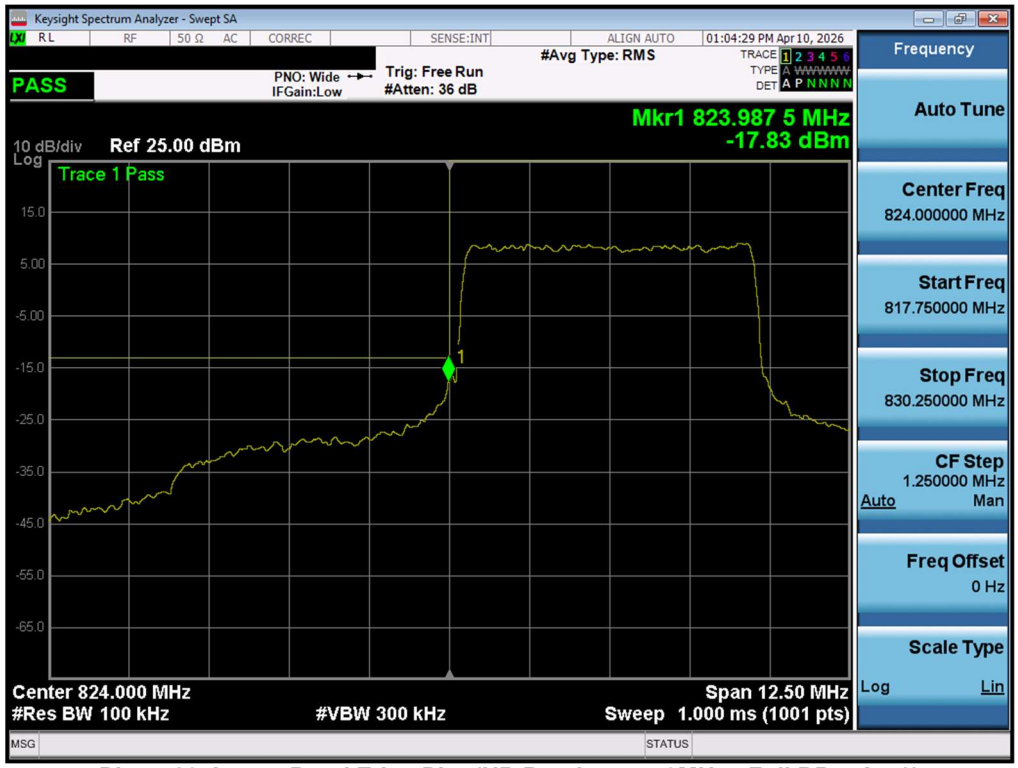
Plot 7-86. Upper Band Edge Plot (WCDMA Cell – Ch. 4233 – Ant2)

LTE Band 26/5 – Ant2

Plot 7-87. Lower Band Edge Plot (LTE Band 5 - 3MHz QPSK – Full RB – Ant2)

Plot 7-88. Upper Band Edge Plot (LTE Band 5 - 3MHz QPSK – Full RB – Ant2)

NR Band n5 – Ant2



Plot 7-89. Lower Band Edge Plot (NR Band n5 – 5.0MHz - Full RB – Ant2)

Plot 7-90. Upper Band Edge Plot (NR Band n5 – 5.0MHz - Full RB – Ant2)

7.6 Peak-Average Ratio

Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedure Used

ANSI C63.26:2015 – Section 5.2.3.4

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

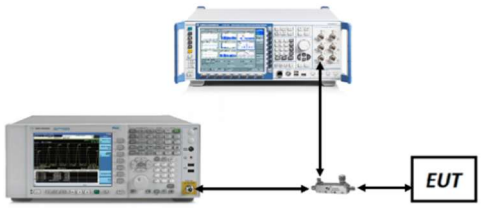


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

For the QAM modulations, 256QAM was found to have the worst-case peak-to-average ratio so it is the only QAM measurement included in this section.

Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
GSM-Cell	N/A	GMSK	29.25	2.70	13.0	-10.30
GSM-Cell Edge		8-PSK	22.33	5.87	13.0	-7.13
WCDMA		Spread Spectrum	25.09	2.88	13.0	-10.12
LTE-B26-5	15 MHz	QPSK	24.03	5.94	13.0	-7.06
		256QAM	20.03	6.33	13.0	-6.67
	10 MHz	QPSK	23.98	5.48	13.0	-7.52
		256QAM	19.98	6.43	13.0	-6.57
	5 MHz	QPSK	24.00	5.52	13.0	-7.48
		256QAM	20.00	6.40	13.0	-6.60
	3 MHz	QPSK	23.91	5.42	13.0	-7.58
		256QAM	19.97	7.62	13.0	-5.38
	1.4 MHz	QPSK	21.97	7.14	13.0	-5.86
		256QAM	19.57	8.73	13.0	-4.27
NR-n5	20 MHz	π/2 BPSK	24.52	4.42	13.0	-8.58
		QPSK	22.05	7.80	13.0	-5.20
		256QAM	18.53	8.28	13.0	-4.72
	15 MHz	π/2 BPSK	24.45	4.48	13.0	-8.52
		QPSK	21.96	7.88	13.0	-5.12
		256QAM	18.48	8.30	13.0	-4.70
	10 MHz	π/2 BPSK	24.49	4.43	13.0	-8.57
		QPSK	22.01	7.52	13.0	-5.48
		256QAM	18.48	8.28	13.0	-4.72
	5 MHz	π/2 BPSK	24.47	4.62	13.0	-8.38
		QPSK	21.96	7.62	13.0	-5.38
		256QAM	18.39	8.22	13.0	-4.78

Table 7-14. Peak-Average Ratio Results – Ant1

GPRS Cell – Ant1

Plot 7-91. PAR Plot (GPRS, Ch. 190 – Ant1)

Plot 7-92. PAR Plot (EDGE, Ch. 190 – Ant1)